Preliminary Hydrogeological Investigation
Mayfield West Phase 1 Expansion (Stage 2) Caledon, ON

Prepared For:

Argo Kennedy Limited

Project No.: 19-312-101
Date: August 26th, 2021

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19-312-101 **August 26, 2021**

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RE: Preliminary Hydrogeological Investigation– Mayfield West Phase 1 Expansion (Stage 2) - Caledon, ON

DS Consultants Limited (DS) was retained by Argo Kennedy Limited to complete a Preliminary Hydrogeological Investigation for the proposed Mayfield West Phase 1 Secondary Plan Expansion (Stage 2) in Caledon, Ontario. The subject lands ('site') encompass an area of approximately 100 hectares. The site is currently rural and used for agricultural purposes.

It is DS' understanding that the proposed development is to include single detached homes, townhouses, and parks. It is assumed that the detached homes will have one (1) level of basement. It is further understood that four (4) Storm Water Management (SWM) ponds are proposed across the site. The site is to include a network of roads and will be fully serviced with municipal water, storm and sanitary sewers. A natural heritage system (NHS) is located on the Hicks and Newhouse property extending from southwest to northeast, and the Greenbelt is located along the eastern boundary of the Russell property extending from north to south.

This preliminary hydrogeological investigation includes an overview of the existing geological and hydrogeological conditions at the Site and an assessment of the hydrogeological constraints and impacts of the proposed development on local groundwater and surface water features. The investigation also provides an estimation of construction dewatering for conceptual structures which extend into the water table. A water balance assessment was completed including pre- and post-development predictions on overall effects to the hydrologic function of the Site. The water balance provides support for overall servicing and the integration of Low Impact Development (LID) measures. A Wetland Water Balance Risk Evaluation was completed to assess potential risks the development poses to retained features as a result of changes to feature catchment hydrology.

If needed, the results of this investigation can be used in support of an application for a Category 3 Permit to Take Water (PTTW) or an Environmental Activity Sector Registry (EASR) for construction dewatering from the Ministry of the Environment Conservation and Parks (MECP). Based on the results of our investigation, the following conclusions and recommendations are presented:

Based on the results of this investigation, the following conclusions and recommendations are presented:

1. Based on the MECP WWR search, there are eighty-eight (88) water wells within 500 meters of the site Fifty-two (52) wells were noted as domestic (DO) wells, eight (8) wells were noted for livestock (ST) use, and one (1) well was noted as a public supply well (PS). The depths of these wells range from 21 to 50 mbgs. A door-to-door water well survey is recommended to be completed within the study area to confirm the presence and the condition of domestic wells.

2. In December 2019, DS drilled eight (8) boreholes on the Hicks Property (BH19-2 to BH19-9) as part of the concurrently running hydrogeological, geotechnical, and environmental investigation. Boreholes were advanced to depths ranging from 6.5 to 13.2 mbgs (253.4-259.2 masl). Monitoring wells were installed in all the boreholes and screened to a depth of 4.6 to 13.1 mbgs (253.5-261.1 masl). An additional five (5) boreholes (BH21-1 to BH21-5) were advanced in January 2021, DS drilled one (1) borehole on the Hicks Property and four (4) boreholes on the Newhouse Property. Access was not permitted to the Russell Property, therefore no boreholes were drilled. The boreholes were advanced to depths ranging from 6.4 to 8.2 mbgs (254.1-256.5 masl).

3. The surficial geology at the site and study area is characterized as till (5d), dominated by clay to silt-textured till derived from glaciolacustrine deposits or shale, and modern alluvial deposits (19) dominated by clay, silt, sand, gravel, and potential organic remains. At the site, the overburden geology generally consisted of clayey silt and sandy silt to silty sand till with intermittent sand layers.

4. Groundwater levels were measured in all available wells on the Hicks property on January 2nd, 2020 and on February 3rd, 2021 in all wells on the Hicks and Newhouse properties. Groundwater levels ranged from 262.7 to 272.0 masl on the Hicks property and from 258.0 to 261.1 on the Newhouse property. Groundwater flow direction was inferred to be west and east towards the tributaries of Etobicoke Creek which intersects the southern and eastern limits of the Newhouse property and the central portion of the Hicks property with a horizontal groundwater gradient of approximately 0.02 m/m.

5. Single Well Response Tests (SWRTs) to assess hydraulic conductivity (K) of the Site's overburden was calculated using the Bouwer & Rice method. The k-values ranged between 2.8 X 10^{-8} to 6.8 x 10^{-6} m/s on the Hicks Property and between 1.4 X 10^{-6} to 4.5 x 10^{-6} m/s on the Newhouse property.

6. On January 3rd, 2020, DS collected three (3) unfiltered groundwater samples from wells BH19-4, BH19-6 and BH19-7, and on February 5th, 2021 one (1) unfiltered groundwater sample was collected from BH21-3. The reported analytical results indicate TSS exceeded the Peel Region's sanitary/storm criteria in all four (4) samples. Manganese from BH21-3 also exceeded both criteria, and aluminum from BH21-3 exceeded only sanitary sewer criteria. Several parameters exceeded PWQO. A discharge plan will be required for the discharge of pumped groundwater from construction dewatering activities. If the water is to be discharge to local surface water, approvals will be required from the Toronto Region Conservation Authority (TRCA).

7. Based on results of the pre-development and post-development water balance completed for the proposed development, the proposed impervious areas will produce a reduction in annual AET at the Hicks, Newhouse and Russell properties of 72,042 m^3/year, 62,829m^3/year and 87,526 m^3/year, respectively. A reduction in annual infiltration is estimated of 8,991 m^3/year, 13,107 m^3/year and 15,424 m^3/year, respectively. An increase of annual runoff is estimated for the Hicks, Newhouse and Russell properties of 45,251 m^3/year, 44,347 m^3/year and 59,472 m^3/year, respectively.

8. A reduction in recharge on at the Site as a result of the development may result in a lowering of the water table and thus a reduction in groundwater contribution to sensitive surface water features including the wetland and tributary. To reduce risk to the tributary and wetlands, the infiltration deficit should be removed by designing LIDs which encourage the infiltration of clean sources of stormwater generated over the proposed development area.
9. Results of the Wetland Water Balance Risk Evaluation for impervious cover (IC) score indicate that wetland catchment W1 to W5 have a low risk based on proposed land use types. An evaluation of risk as a result of reductions in catchment size scores a risk level of low for catchment W2 to W5 and medium for catchment W1.
10. Construction dewatering is anticipated within the site boundaries for the proposed developments. No below grade plans were available to DS at the time of writing this report. Site servicing trenches and SWM ponds will be excavated mainly through the sandy silt soils within the proposed development The highest dewatering rate anticipated during construction of an assumed 30 m long 2 m wide trench would be approximately 66,000 L/day (66 m^3/day). Construction dewatering for the SWM ponds are estimated to range between 651,000 to 880,000 L/day (651-881 m^3/day). The construction dewatering for detached residential block was estimated to be 424,000 L/day (424 m^3/day). These values incorporate storm water and a 100% safety factor to account for any unforeseen conditions.
11. Since the expected design dewatering preliminary rates for the unsealed excavations are above the MECP's daily water taking limit of 400,000 L/day, with the exception of a single site servicing trench, a PTTW application will be required to be submitted to the MECP for short-term dewatering prior to construction.
12. Groundwater availability to users in the area of the proposed development draw supply from depths greater than the proposed construction. The study area is generally not serviced by municipal water supply. Several domestic wells are recorded in the study area. A door-to-door water well survey is recommended to be completed within the study area to confirm the presence and the condition of domestic wells.
13. In conformance with Regulation 903 of the Ontario Water Resources Act, the decommissioning of any dewatering system and monitoring wells should be carried out by a licensed contractor under the supervision of a licensed water well technician.

Should you have any questions regarding these findings, please do not hesitate to contact the undersigned.

DS Consultants Ltd.

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Table of Contents

FIGURES

APPENDICES:

1.0 INTRODUCTION

DS Consultants Limited (DS) was retained by Argo Kennedy Limited to complete a Preliminary Hydrogeological Investigation for the proposed Mayfield West Phase 1 Secondary Plan Expansion (Stage 2) in Caledon, Ontario ('site'). The site is currently rural and used for agricultural purposes.

The site is currently comprised of three (3) rural parcels used for agricultural purposes. The Site occupies an area of about 100 hectares (247.45-acres) and is located at the intersection of Old School Road and Hwy 10 and extends approximately 2 km east of Highway 10 as shown in **Figure 1**. The Site is currently undeveloped and situated within a residential, agricultural, and rural landscape with an NHS located on the Hicks and Newhouse properties extending from the southwest corner of the site on Hicks to the northeast corner of the Newhouse Property. Etobicoke creek and two (2) of its tributaries flow through southern and eastern portions of the Newhouse property and extends across the central portion of the Hicks property. The Humber River flows through the northeast portion of the Russell property.

This preliminary hydrogeological investigation includes an overview of the existing geological and hydrogeological conditions at the Site and an assessment of the hydrogeological constraints and impacts of the proposed development on local groundwater and surface water features. The investigation also provides an estimation of construction dewatering for conceptual structures which extend into the water table. A site water balance assessment was completed including pre- and post-development predictions on overall effects to the hydrologic function of the Site. The water balance was completed to provide support for overall servicing and the integration of Low Impact Development (LID) measures. A Wetland Water Balance Risk Evaluation was also completed to assess potential risks as a result of changes to wetland hydrology.

1.1 Purpose

The purpose of this Hydrogeological Investigation is to assess the current groundwater and surface water conditions at the Site in order to evaluate the following:

- Temporary construction dewatering for the excavation for the proposed development on all three (3) properties;
- Explore the potential need for a Permit to Take Water (PTTW) or Environmental Activity and Sector Registration (EASR) for the purposes of Construction Dewatering from the MECP;
- Temporary management and discharge of groundwater during short term construction dewatering;
- Assess groundwater quality to identify potential adverse impacts to Peel Region's sewer system or nearby natural features; and
- Assess the potential impacts post-development may have to natural features located on site and within the study area.

1.2 Scope of Work

The scope of work for this investigation included:

- Site visits;
- Desktop review of pertinent geological and hydrogeological resources;
- Review the MECP PTTW Water Well Records and water use in the surrounding area;
- Field work including monitoring well drilling program consisting of one (1) monitoring well on the Hicks Property and four (4) monitoring wells on the Newhouse property. No wells were installed on the Russel Property;
- Installation and monitoring of surface water and shallow groundwater stations including nested piezometers and staff gauges.
- Conducting single well response tests (slug tests) to determine hydraulic conductivity values across the site;
- Characterize the stratigraphy and measure the ground water levels across the site;
- Collection and analysis of groundwater samples in order to quantify and characterize any possible contaminants that may impact future discharge applications;
- Estimation of construction dewatering volumes, which is to be used to predict the short-term groundwater control requirements for the proposed development;
- Desktop Pre- and Post Site Water Balance Assessment in support of LID measures; and
- Desktop Wetland Water Balance Risk Evaluation to establish the potential risks the proposed development may have to the ecological integrity of wetlands and catchment features within the site and study area.

2.0 FIELDWORK

In December 2019, DS drilled eight (8) boreholes on the Hicks Property (BH19-2 to BH19-9) as part of the concurrently running hydrogeological, geotechnical, and environmental investigation. Boreholes were advanced to depths ranging from 6.5 to 13.2 mbgs (253.4-259.2 masl). Monitoring wells were installed in all the boreholes and screened to a depth of 4.6 to 13.1 mbgs (253.5-261.1 masl). An additional five (5) boreholes (BH21-1 to BH21-5) were advanced in January 2021, DS drilled one (1) borehole on the Hicks Property and four (4) boreholes on the Newhouse Property. Access was not permitted to the Russell Property, therefore no boreholes were drilled. The boreholes were advanced to depths ranging from 6.4 to 8.2 mbgs (254.1-256.5 masl). All wells were completed with 50 mm diameter PVC pipes with either 1.50

m or 3.05 m well screens and were installed using above ground mounted protective casings. All monitoring wells were developed before any use to allow for groundwater level monitoring, hydraulic conductivity testing, and to assess groundwater quality. Thirteen (13) single well response tests (SWRTs) were completed by performing a rising head test (slug test) to estimate hydraulic conductivity values of soils at the site. One (1) groundwater sample was also collected from the Hicks property in 2019 and analyzed Provincial Water Quality Objectives (PWQO) and Ontario Drinking Water Standards (ODWS). One (1) unfiltered groundwater sample was collected from the Newhouse property in 2021 and analyzed against the parameters listed in the Peel Region Sanitary and Storm sewer discharge criteria and against PWQO. The borehole and monitoring well location plan is shown in **Figure 3**.

The investigation also involved commencing a long-term surface water and groundwater monitoring program to measure shallow groundwater levels, surface water levels and flow at stations instrumented along wetlands and water courses. A site reconnaissance visit was completed in April 2021 to map and characterize any visible surface water inlets and outlets or areas of groundwater seepage within the vicinity of wetlands and the NHS areas in general. The wetlands and watercourses were instrumented with staff gauges consisting of a metal t-bar driven into the stream bed and outfitted with slotted screen to serve as data logger housing. The top of t-bar was surveyed as a measuring point for obtaining relative water level measurements. A total of twelve (12) staff gauges were installed across the Site including wetland staff gauges SG1A/B, SG2A/B, SG3A/B, SG4A/B, SG5A/B and stream stations SG-EC1 and SG-EC2 installed along Etobicoke Creek. Nested piezometers were also installed within wetland areas to monitor shallow groundwater levels. A total of ten (10) piezometer nests including PZ1A-S/D, PZ1B-S/D, PZ2A-S/D, PZ2B, PZ3A-S/D, PZ3B-S/D, PZ4A-S/D, PZ4B-S/D, PZ5A-S/D, PZ5B-S/D, PZSEEP1-S/D and PZHDF-S/D were installed to monitor shallow groundwater levels in the location of wetlands and potentially sensative areas of the Site. The shallow piezometers were screened to depths of 0.6 to 1.1 m below existing ground surface (mbgs), and the deep piezometers were screened to depths of 1.4 m to 2.0 mbgs.

Pressure recording transducers (Levelogger™) were installed within all staff gauge locations and select piezometer and monitoring well locations to allow for continuous monitoring of stabilized water levels. The Leveloggers™ were pre-programmed to collect a reading at every 15-minute intervals. A barometric logger was installed at a central location of the Site to record ambient air pressure for correction of water level data.

DS commenced the monitoring program at the Site in May 2021, with a site visit to collect groundwater and surface water level and stream flow measurements. Currently, 2 monitoring intervals have been completed including one in May and in June 2021. Monitoring will continue on a monthly basis until April 2022.

3.0 PHYSICAL SETTING

Available topographic maps, environmental, geotechnical, and hydrogeological reports were used to develop an understanding of the physical setting of the study area. Borehole logs and the MECP WWRs were used to interpret the geological and hydrogeological conditions at the development site.

3.1 Physiography and Drainage

According to the Ontario Geological Survey mapping across the region, the site lies within the South Slope physiographic region of southern Ontario and is characterized by drumlinized till plains. The site is currently being used for residential and agricultural purposes. Surface elevation at the site ranges from approximately 260.5 to 274.2 masl. Etobicoke creek and two (2) of its tributaries intersect the southern and eastern limits of the Newhouse property and intersect the central portion of the Hicks property. The Humber river intersects the northwestern corner of the Russell property. the drainage is generally directed by streams and the local topography of the site. The groundwater flow direction is generally southwest and locally south, west and east towards the tributaries of Etobicoke Creek. The interpreted groundwater flow direction map is shown in **Figure 4.**

3.2 Geology

The following presents a brief description of regional and development site geology based on the review of available information and development site-specific soil investigations.

3.2.1 Quaternary Geology

The surficial geology at the site and study area is characterized as till (5d), dominated by clay to silt-textured till derived from glaciolacustrine deposits or shale, and modern alluvial deposits (19) dominated by clay, silt, sand, gravel, and potential organic remains. The site borders lands to east and south characterized by deposits of coarse and fine textured glaciolacustrine deposits, respectively. At the site, the overburden geology generally consisted of clayey silt and sandy silt to silty sand till with intermittent sand layers. The surficial geology map is shown in **Figure 2.**

3.2.2 Bedrock Geology

According to the Ontario Geological Survey mapping across the region the bedrock at the site is predominantly comprised of limestone, dolostone, and siltstone as part of the Queenston Formation. Bedrock was not encountered during the current investigation. Due to the thickness of the overburden and deep nature of the expected contact, it is not expected that bedrock will influence the groundwater system in respect to the current hydrogeological investigation.

3.2.3 Site Geology

On-site subsurface soil conditions were summarized from the boreholes advanced by DS for the current investigation. Detailed subsurface conditions are presented in **Figure 5** and the borehole logs are presented in **Appendix A**. The subsurface conditions in the boreholes are summarized in **Table 3-1.**

Table 3-1: Summary of Drill Program Soil Stratigraphy Encountered

	Newhouse	Hicks
Topsoil & Weather/Disturbed Soil	• 75-230 mm thick topsoil	• 250-350 mm thick topsoil • Silty clay, silty sand to sandy silt deposits encountered below the topsoil extending to depths ranging between 0.8 to 1.5 mbgs. • Very soft to stiff consistency.
Cohesionless Deposits (Sandy Silt/Silty Sand, Sand, Silt and Sand and Gravel)	• Encountered in most of the boreholes and extended to varying depths between 1.5 to 7.5 mbgs • Loose to dense state	• Encountered in most of the boreholes and extended to various depths. • Wet to saturated below the depths of 0.8 to 4.6 mbgs. • Loose to very dense state.
Clayey Silt Till/Clayey Silt	• Clayey silt till encountered in all of the boreholes and generally below the topsoil extending to the maximum depth of 2.6 mbgs • Clayey silt units were identified below the cohesionless deposits in BH21-1 and BH21-2 extending to the maximum explored depth and 2.3 mbgs, respectively. • Firm to very stiff consistency	• Cohesive deposits of clayey silt till and clayey silt encountered in BH19-3 to BH19-6. • Very Stiff to hard consistency.
Silt Sand Till/Sandy Silt Till	• Encountered in all of the boreholes and extended to depths ranging from 7.5 mbgs to the maximum explored depth. • Loose to very dense state	• The deposits were encountered in all boreholes except for BH19-4. • Generally, in a dense to very dense state with occasional compact layers

3.3 Hydrogeology

The hydrogeology at the site was evaluated using the on-site monitoring wells installed by DS, and the MECP WWRs in the study area.

3.3.1 Local Groundwater Use

As part of the hydrogeological investigation, DS completed a search of the MECP water well records (WWRs) database. Based on the MECP WWR search, there are eighty-eight (88) water wells within 500 meters of the site (**Appendix E**). Fifty-two (52) wells were noted as domestic (DO) wells, eight (8) wells were noted for livestock (ST) use, and one (1) well was noted as a public supply well (PS). The depths of these wells range from 21 to 50 mbgs. All other wells were noted as test holes, monitoring well, not in use or unknown. **Figure**

1 shows the MECP water well location plan. A door-to-door water well survey is recommended to be completed within the study area to confirm the presence and the condition of domestic wells.

3.3.2 Groundwater Conditions

Groundwater levels were measured in all available wells on the Hicks property on January 2nd, 2020 and on February 3rd and May 3rd, 2021 in all wells on the Hicks and Newhouse properties. Groundwater levels ranged from 262.7 to 272.0 masl on the Hicks property and from 258.0 to 261.1 on the Newhouse property. **Figure 4** shows a groundwater contour map completed for measurements collected May 2021. Based on groundwater elevations, the flow direction is inferred to be generally west to southwest to where Etobicoke Creek flows from the site. There are localized contours toward Etobicoke Creek including those in the southeast corner of the Hicks Property which show northwest groundwater flow direction. Average horizontal groundwater gradients across the site are approximately 0.02 m/m . The levels are expected to fluctuate with seasonal variations and responses to storm events.

Table 3-2: Groundwater Levels in Monitoring Wells

Well ID	Ground Surface Elevation (masl)	Well Depth (mbgs)	Screened Interval (mbgs)	Date	Depth to Water (mbgs)	Groundwater Elevation (masl)
Hicks						
BH19-2	266.60	13.20	10.2-13.2	2020-01-02	0.60	266.00
				2021-02-03	2.20	264.40
				2021-05-03	1.31	265.29
BH19-3	269.50	12.20	9.2-12.2	2020-01-02	2.90	266.60
				2021-02-03	3.10	266.40
				2021-05-03	3.23	266.27
BH19-4	270.30	6.10	3.1-6.1	2020-01-02	4.00	266.30
				2021-02-03	3.90	266.40
				2021-05-03	3.94	266.36
BH19-5	274.20	6.10	3.1-6.1	2020-01-02	2.20	272.00
				2021-02-03	3.00	271.30
				2021-05-03	3.04	271.16
BH19-6	267.80	12.20	9.2-12.2	2020-01-02	3.20	264.60
				2021-02-03	3.40	264.40
				2021-05-03	4.11	263.69
BH19-7	265.70	4.60	3.1-4.6	2020-01-02	2.90	262.80
				2021-02-03	3.00	262.70
				2021-05-03	2.83	262.87
BH19-8	270.80	12.20	10.7-12.2	2020-01-02	0.30	270.50
				2021-02-03	3.50	267.30
				2021-05-03	0.48	270.32
BH19-9	271.60	6.10	3.1-6.1	2020-01-02	1.10	270.50

Well ID	Ground Surface Elevation (masl)	Well Depth (mbgs)	Screened Interval (mbgs)	Date	Depth to Water (mbgs)	Groundwater Elevation (masl)
				2021-02-03	3.70	267.90
				2021-05-03	1.29	270.31
BH21-5	263.80	6.10	4.6-6.1	2021-02-03	frozen above ground	
				2021-05-03	-1.00	264.80
Newhouse						
BH21-1	263.00	7.60	6.1-7.6	2021-02-03	1.90	261.10
				2021-05-03	1.87	261.13
BH21-2	260.50	6.10	4.6-6.1	2021-02-03	2.50	258.00
				2021-05-03	1.36	259.14
BH21-3	263.20	6.10	4.6-6.1	2021-02-03	3.60	259.70
				2021-05-03	3.38	259.82
BH21-4	262.90	6.10	4.6-6.1	2021-02-03	3.80	259.10
				2021-05-03	3.75	259.15

3.3.3 Hydraulic Conductivity

In total, fourteen (14) Single Well Response Tests (slug tests) were completed by DS in wells BH19-2 to BH19-9 on January 2nd, 2020, and on February 3rd ,2021 in wells BH21-1, BH21-3 and BH21-4 to estimate hydraulic conductivity (k) for the representative geological units in which the wells were screened. The testing was completed using data loggers placed at the bottom of the monitoring wells to accurately measure the change in the hydraulic head versus time. Tests were completed by removing water 'instantaneously' from the well with the use of Waterra®. Hydraulic conductivity (k) values were calculated using the Bouwer and Rice method using the AquiferTest® Software. The semi-log plots for normalized drawdown versus time are provided in **Appendix B.** The k-values ranged between 2.8 X 10^{-8} to 6.8 x 10^{-6} m/s on the Hicks Property and between 1.4 X 10^{-6} to 4.5 x 10^{-6} m/s on the Newhouse property. **Table 3-3** presents the Hydraulic Conductivity (k) values for the representative geological units.

Table 3-3: Summary of Hydraulic Conductivity (k) Test Results

Well ID	Screened Interval (mbgs)	Screened Formation (mbgs)	K- Value- Slug Test (m/s)
Hicks			
BH19-2	10.2-13.2	Sand and Gravel	3.2 x 10^{-7}
BH19-3	9.2-12.2	Sandy Silt Till	2.8 x 10^{-8}
BH19-4	3.1-6.1	Silty Sand & Sandy Silt	1.3 x 10^{-6}
BH19-5	3.1-6.1	Sandy Silt Till & Silty Sand	1.6 x 10^{-6}
BH19-6	9.2-12.2	Sandy Silt Till	1.0 x 10^{-7}

Well ID	Screened Interval (mbgs)	Screened Formation (mbgs)	K- Value- Slug Test (m/s)
BH19-7	3.1-4.6	Silty Sand	9.1×10^{-7}
BH19-8	10.7-12.2	Gravelly Silty Sand Till	6.8×10^{-6}
BH19-9	3.1-6.1	Sandy Silt ot Silty Sand Till	6.7×10^{-8}
Newhouse			
BH21-1	6.1-7.6	Sand	4.5×10^{-6}
BH21-3	4.6-6.1	Sand	3.9×10^{-6}
BH21-4	4.6-6.1	Sandy Silt to Silty Sand Till	1.4×10^{-6}
		Geomean	7.0×10^{-7}

3.3.4 Groundwater Quality

On January 3rd, 2020, DS collected three (3) unfiltered groundwater samples from wells BH19-4, BH19-6 and BH19-7. Analytical results were compared against PWQO to assess suitability for discharge overland. On February 5th, 2021 one (1) unfiltered groundwater sample was collected from BH21-3 and compared against the Peel Region's sewar use bylaw and against PWQO. The samples were placed in pre-cleaned laboratory supplied vials and/or bottles provided with analytical test group-specific preservatives, as required. Dedicated nitrile gloves were used during sample handling. The groundwater samples were submitted to SGS Laboratories in Lakefield, Ontario. SGS is certified by the Canadian Association of Laboratory Accreditation Inc. (CALA) and the Canadian Standard Association (CSA). The reported analytical results indicate TSS exceeded the Peel Region's sanitary/storm criteria in all four (4) samples. Manganese from BH21-3 also exceeded both criteria, and aluminum from BH21-3 exceeded only sanitary sewer criteria. Several parameters exceeded PWQO. Exceedances are summarized in **Table 3-4**, and the certificates of analyses are provided in **Appendix D.**

Table 3-4: Parameters in Groundwater Exceeding Peel Region Criteria and PWQO

Parameter	Unit	Sanitary By-Law Criteria	Storm By-Law Criteria	PWQO	BH19-4	BH19-6	BH19-7	*BH21-3
Total Suspended Solids (TSS)	mg/L	350	15	-	**2320**	**397**	**430**	**79200**
Aluminum-Total	mg/L	50	-	0.075	**1.39**	**0.816**	**0.572**	**113**
Aluminum-Dissolved	mg/L	-	-	0.000015	**0.000313**	**0.000183**	**0.000447**	-
Arsenic-Total	mg/L	-	0.02	0.005	0.0015	**0.0106**	0.0011	**0.0505**
Cadmium-Total	mg/L	0.7	0.008	0.0001	0.000035	0.000034	0.00013	**0.00119**
Chromium-Total	mg/L	-	0.08	0.1	0.00214	0.00269	0.00137	**0.173**
Cobalt-Total	mg/L	5	-	0.0009	**0.00257**	**0.00102**	0.000408	**0.113**
Copper-Total	mg/L	-	0.05	0.001	**0.0101**	**0.0044**	**0.0032**	**0.386**
Iron-Total	mg/L	-	-	0.3	**3.84**	**1.4**	**0.587**	-
Lead- Total	mg/L	-	0.12	0.001	**0.00667**	**0.00214**	**0.00122**	**0.122**
Manganese-Total	mg/L	5	0.05	-	**0.534**	**0.182**	**0.0699**	**11.9**

Parameter	Unit	Sanitary By-Law Criteria	Storm By-Law Criteria	PWQO	BH19-4	BH19-6	BH19-7	*BH21-3
Nickel-Total	mg/L	-	0.08	0.025	0.0037	0.0018	0.0017	**0.226**
Phosphorus-Total	mg/L	-	0.4	0.01	0.00007	0.00006	<0.00003	**8.69**
Silver-Total	mg/L	5	0.12	0.0001	<0.00005	<0.00005	<0.00005	**0.00067**
Zinc-Total	mg/L	-	0.04	0.02	0.012	0.007	0.006	**0.592**
4AAP-Phenolics	mg/L	1	0.08	0.001	-	-	-	**<0.002**

0.00-Exceeds Sanitary Criteria; 0.00-Exceeds Storm Criteria; 0.00-Exceeds Sanitary & Storm Criteria; 0.00- Exceeds PWQO;
*** - High sediment detected in sample**

3.3.5 Surface Water Conditions

The Study area includes Etobicoke creek which enters the Site approximately 150m west of Hicks Rd. within the Hick's property and flows southwest where it exists the Newhouse Property approximately 400m south of Old School Rd. at Hurontario St. Additionally, the Humber river traverses the northwestern corner of the Russell property flowing in a southeast direction. The watercourses include tributaries and headwater drainage features (HDF's) which have been assessed by Beacon Environmental within the Newhouse and Hick's properties. Mapping for wetlands and HDF's were provided to DS for review and incorporation into our monitoring program where required. Five (5) wetlands in total were identified.

A total of Fourteen (14) monitoring stations were monitored including those installed in Wetland 1 through Wetland 5, or along tributaries, creeks, HDF's and groundwater seepage areas. A summary of the field measurements for the period from May to June 2021 is presented in **Table 2**. A discussion on the surface water conditions at all surface stations is provided below.

Wetland 1

Wetland 1 is located in the southern corner of Newhouse property alongside Etobicoke Creek reaches EC1 and Headwater Drainage Features (HDF's) EC10-A, EC1-C and EC1-A. The wetland was equipped with two stations, each comprised of a staff gauge and nested piezometers. Station 1A (SG1A, PZ1A-S and PZ1A-D) is located at the inlet location along HDF EC1-C, and Station 1B (SG1B, PZ1B-S and PZ1B-D) at the outlet along reach HDF EC1-A near the confluence with Etobicoke Creek. All Staff gauge and deep piezometers were instrumented with a datalogger to allow for continuous monitoring of surface water and groundwater levels. Based on the review of the monitoring data to date for Wetland 1, the following groundwater and surface water conditions are noted.

There were no surface water flows observed entering or leaving the location of SG1A through May and June however wet soil condition were observed along the banks of EC1-C suggesting its an area of groundwater discharge. Shallow surface water levels at SG1A were measured during the May and June 2021 monitoring rounds at 0.24m and 0.10m, respectively. Compared to the surface water level elevation, the deep piezometer was elevated in both May and June suggesting a shallow groundwater gradient

toward the watercourse. Shallow groundwater levels in piezometers PZ1A-S and PZ1A-D were noted to be above the ground surface in May and June 2021 with levels in the deep piezometer above that of the shallow piezometer suggesting an upward groundwater gradient.

At the downgradient monitoring location SG1B, flow was measured in May at 0.3 L/sec corresponding to a water level depth of 0.36m. Dry conditions were noted in June. Compared to the surface water level elevation, groundwater levels in PZ1A-S/D were both lower in May and fell below the stream bed in June. Shallow groundwater levels in the deep piezometer (PZ1A-D) were noted to be below that of the shallow piezometer suggesting a downward groundwater gradient.

Based on the above, it is expected that wetland 1 received contribution from groundwater during the May and June 2021 monitoring period at SG1A. Based on the presence of flow at SG1B, it is expected that the groundwater contribution along EC1-C extends south toward the confluence with Etobicoke Creek however becomes groundwater recharge conditions before station SG1B . Further monitoring will be required to discuss seasonal fluctuations and the potential for groundwater to provide baseflow contributions to Wetland 1 throughout the year and seasonally. A summary of the water levels in each the surface water monitoring stations is provided in Table 2.

Wetland 2

Wetland 2 comprises of two hydrologically connected wetland units located in north corner of Newhouse property alongside a tributary to Etobicoke Creek TEC1. The wetland units extend south toward the confluence of TEC1 and Etobicoke Creek and was equipped with two stations comprised of a staff gauge and nested piezometers. Station 2A (SG2A, PZ2A-S and PZ2A-D) is located at the inlet location along the north side of Wetland 2A where the tributary enters the Newhouse property. Station EC1 (SGEC1, EC1-S and EC1-D) is located south of wetland 2B at the confluence of TEC1 and Etobicoke Creek (EC2). Additionally, nested piezometers (SEEP1-D and SEEP1-S) were installed within an observed groundwater discharge area along HDF EC4-A. All Staff gauge and deep piezometers were instrumented with a datalogger to allow for continuous monitoring of surface water and groundwater levels. Based on the review of the monitoring data to date for Wetland 2, the following groundwater and surface water conditions are noted.

There were no surface water flows observed entering the location of SG2A through May and June. Surface water ponding was noted downgradient of the culvert crossing Old School Rd. Shallow groundwater levels in piezometers PZ2A-S and PZ2A-D were noted to be below the ground surface in May and June 2021. Water levels in the deep piezometer (PZ2A-D) were comparable to water levels in the shallow piezometer suggesting there is an even gradient at this location.

At the downgradient monitoring location SGEC1, flow was measured in May at 28.54 L/sec corresponding to a water level depth of 0.55m. Dry conditions were noted in June. Flows at this location consist of the combined flows of TEC1 and EC2. During the May monitoring event, flow from TEC1 was measured at 7.43 L/sec and was also dry in June. Shallow groundwater levels in piezometers PZEC1-S and PZEC1-D were noted to be below the ground surface in May and June 2021. Water levels in the deep piezometer

(PZEC1-D) were comparable to water levels in the shallow piezometer suggesting there is an even gradient at this location.

At the groundwater seepage location along HDF EC4-A, flow was observed and estimated to be approximately 3.5 L/sec. The seepage location consists of saturated soils which extend into the agricultural field and eventually channelize before discharging into TEC1 at the north extent of Wetland 2b. Saturated soils were also observed along the seep in June 2021 however there were no flowing conditions. Shallow groundwater levels in piezometers PZSEEP1-S and PZSEEP1-D were noted to be above the ground surface in May and slightly below ground surface in June 2021. Water levels in the deep piezometer (PZEC1-D) were slightly below water levels in the shallow piezometer suggesting that the seepage area is mainly the result of horizontal groundwater gradients intersecting the surface at this location.

Based on the above, it is expected that wetland 2 received contribution from groundwater during the May 2021 monitoring period. Based on the presence of flow at the seepage area and at the downstream confluence with EC1/EC2, it is expected that the groundwater contribution extends along most of TEC1. Further monitoring will be required to discuss seasonal fluctuations and the capacity for groundwater to provide baseflow contributions to Wetland 2 throughout the year and seasonally. A summary of the water levels in each the surface water monitoring stations is provided in Table 2.

Wetland 3

Wetland 3 is in located in central portions of the Hicks property along Etobicoke creek (EC2). The wetland was equipped with two stations, each comprised of a staff gauge and nested piezometers. Station 3A (SG3A, PZ3A-S and PZ3A-D) is located at the inlet location to the east where HDF EC7-A intersects the Creek. Station 3B (SG3B, PZ3B-S and PZ3B-D) is located approximately 160m west at the outlet along EC2. All Staff gauge and deep piezometers were instrumented with a datalogger to allow for continuous monitoring of surface water and groundwater levels. Shallow piezometers were measured manually once a month. The water level data in both wetlands were collected both manually and continuously. Based on the review of the monitoring data to date for Wetland 3, the following groundwater and surface water conditions are noted.

Throughout May and June, a beaver dam was observed approximately 20m upgradient of SG3B. The damming resulted in flooding of Wetland 3. Ponding was observed to extend upgradient of the Wetland 3 inlet at SG3A. As a result, flow monitoring at SG3A was not possible as the ponding was unchanneled and appeared stagnant. Shallow groundwater levels in piezometers PZ3A-S and PZ3A-D are noted to be below the ground surface in May and June 2021. Water levels in the deep piezometer (PZ2A-D) were lower than water levels in the shallow piezometer suggesting there is a downward gradient however this is expected as a result of the flooding. Once normal conditions return to Wetland 3, groundwater gradients are anticipated to change.

At the downgradient monitoring location SG3B, flow was measured in May at 19.10 L/sec corresponding to a water level depth of 0.29m. ponded conditions were noted in June. Shallow groundwater levels in piezometers PZ3B-S and PZ3B-D were noted to be below the ground surface in May and June 2021. Water

levels in the deep piezometer (PZ3B-D) were comparable to water levels in the shallow piezometer in May and lower than the shallow piezometer in June suggesting there is an even to downward gradient at this location. Compared to the surface water level elevation, the water level in the deep piezometer was comparable in May and lower in June suggesting there is potential for groundwater recharge in this area.

Based on the above, it is not yet possible to discern whether Wetland 3 receives groundwater contribution during normal conditions (i.e. no beaver dam). Further monitoring will be required to characterize representative conditions as well as seasonal fluctuations throughout the year. A summary of the water levels in each the surface water monitoring stations is provided in Table 2.

Wetland 4

Wetland 4 is located in the northern corner of the Hicks property along Etobicoke Creek EC2. The wetland was equipped with two stations, each comprised of a staff gauge and nested piezometers. Station 4A (SG4A, PZ4A-S and PZ4A-D) is located at the wetland inlet along the north side of Wetland 4 where the tributary enters the Hicks property. Station 4B (SG4B, PZ4B-S and PZ4B-D) is located approximately 190m south at the wetland outlet along the south side of Wetland 4. All Staff gauge and deep piezometers were instrumented with a datalogger to allow for continuous monitoring of surface water and groundwater levels. Based on the review of the monitoring data to date for Wetland 1, the following groundwater and surface water conditions are noted.

Surface water flows were observed entering the location of SG4A through May and June via a culvert crossing Old School Rd. Flow was measured in May at 18.3 L/sec corresponding to a water level depth of 0.55m and in June at 9.4 L/sec corresponding to a water level depth of 0.31m. Shallow groundwater levels in piezometers PZ4A-S and PZ4A-D were noted to be below the ground surface in May and June 2021 with levels in the deep piezometer comparable to that of the shallow piezometer in May and higher than the shallow piezometer in June suggesting an even to upward groundwater gradient. Compared to the surface water level elevation, the deep piezometer was slightly elevated in May and June suggesting there is a horizontal groundwater gradient recharging the watercourse.

At the downgradient monitoring location SG4B, flow was measured in May at 14.1 L/sec corresponding to a water level depth of 0.45m. In June, flow was measured at 4.8 L/sec corresponding to a water level depth of 0.16m. Shallow groundwater levels in piezometers PZ4B-S and PZ4B-D were noted to be below the ground surface in May and June 2021 with levels in the deep piezometer (PZ1A-D) below that of the shallow piezometer suggesting a downward groundwater gradient. Compared to the surface water level elevation, the deep piezometer was elevated in both May and June suggesting there is a horizontal groundwater gradient recharging the watercourse.

Based on the above, it was observed that Etobicoke Creek (EC2) in the vicinity of Wetland 4 had a reduction in flow from upstream station SG4A to downstream station SG4B in both May and June despite some groundwater recharge conditions. It is expected that both groundwater discharge and recharge occurs along EC2 in the vicinity of Wetland 4. Withdrawal from vegetation is also expected to be a significant mechanism in reducing streamflow in May and June. Further monitoring will be required to discuss seasonal fluctuations and the capacity for groundwater to provide baseflow contributions to

Wetland 2 throughout the year and seasonally. A summary of the water levels in each the surface water monitoring stations is provided in Table 2.

Wetland 5

Wetland 5 is located in the northern portion of Russell Property a long a tributary of Humber River (KC1) downstream of a culvert crossing Old School Rd. The wetland is equipped with two (2) staff gauges; one (SG5A) at the inflow point northwest of the wetland next to the Old School Rd culvert and one (SG5B) at the downstream portion of the wetland located east of Heart Lake Rd. Both the Staff gauges were instrumented with a datalogger to allow for continuous monitoring of surface water. Based on the review of the monitoring data to date for Wetland 5, the following groundwater and surface water conditions are noted.

Surface water flows in the location of SG5A and SG5B were observed in May and June 2021. Flow measurement obtained at the location of Staff Gauge SG5A in May and June 2021 were 31.80 L/s and 19.93 L/s respectively, and at the location of SG5B, flow recorded was 7.88L/s and 3.95 L/s respectively. The reduction in flow could be an indication of groundwater recharge conditions. Further monitoring including measurements of groundwater levels will be required to discuss seasonal fluctuations and to characterize the area as in terms of groundwater discharge or recharge. A summary of the water levels in each the surface water monitoring stations is provided in Appendix C.

4.0 SITE WATER BALANCE ASSESSMENT

4.1 Existing Conditions

The subject Site has a total area of 993,531 m^2 consisting of three (3) properties: Hicks (303,566 m^2), Newhouse (321,393 m^2), and Russell (368,572 m^2). The site is presently occupied by sparse residential dwellings. The remainder of the site consists of woodland, agricultural field and open space and is considered as a pervious area. **Figure 6A** shows the pre-development conceptual model considered for establishing current hydrologic conditions.

Table 4-1: Pre-depdfvelopment Land Use

	Hicks Property	Newhouse Property	Russel Property
Site Area (m^2)	**303,566**	**321,393**	**368,572**
Impervious Area (m^2)	**1,848**	**8,609**	**5,312**
Building and Driveway	1,848	8,609	5,312
Pervious Area (m^2)	**301,718**	**312,784**	**363,260**
Woodland	79,835	85,874	27,459
Agricultural	206,859	140,016	310,780
Urban Lawn	15,023	86,894	25,021

4.2 Proposed Development

The area proposed for development includes the entire existing Site with a size of 993,531 m^2. It is proposed that the site will be re-developed with single detached houses and townhouse blocks. For the water balance calculations in this report, it is estimated that redevelopment of the property will include buildings and roads with a combined area of about 636,031 m^2. Out of the total area, 357,500m^2 area will remain as open space/park, woodland, greenbelt and stormwater facilities and are considered as a pervious area. **Figure 6B** shows the post-development conceptual model considered for establishing post-hydrologic conditions.

Table 4-2: Post-development Land Use

	Hicks Property	Newhouse Property	Russel Property
Site Area (m^2)	**303,566**	**321,393**	**368,572**
Impervious Area (m^2)	**154,774**	**125,395**	**166,057**
Unconnected	102358	107,975	147,547
Connected	31,780	17,420	18,510
Pervious Area (m^2)	**148,791**	**195,998**	**202,515**
Pasture and Shrub	17,365	68,326	85,641
Woodland (NHS)	79,835	85,874	27,459
Urban Lawn	13,481	20,508	46,575
Urban Lawn with Roof Surplus	38,110	21,290	42,840

4.3 Water Balance Components (Thornthwaite Monthly Water Balance Model)

The Thornthwaite water balance (Thornthwaite, 1948; Mather, 1978; 1979) is an accounting type method used to analyze the allocation of water among various components of the hydrologic cycle. Inputs to the model are monthly temperature, site latitude, and precipitation. Outputs include monthly potential and actual evapotranspiration, evaporation, water surplus, total infiltration, and total runoff. For ease of calculation, a spreadsheet model was used for the computation.

When precipitation (P) occurs, it can either runoff (R) through the surface water system, infiltrate (I) to the water table, or evaporate/evapotranspiration (ET) from the earth's surface and vegetation. The sum of R and I is termed as the water surplus (S). When long-term averages of P, R, I and ET are used, there is no net change in groundwater storage (ST). Annually, however, there is a potential for small changes in ST. The annual water budget can be stated as **P = ET + R + I + ST** and the components are discussed below.

4.3.1 Pre-development Water Balance

To predict outputs of the pre-development water balance, various inputs were entered into the Thornthwaite model including monthly precipitation and temperature, site latitude, water holding capacity values for native soils and factors of infiltration. Various inputs and outputs of the model are described in detail below. The detailed calculations are presented in **Appendix F.**

Precipitation (P)

Based on the 30-year average for the Orangeville MOE Climate Station in Ontario, the average precipitation for the area is about 902 mm/year for the period between 1981 and 2010. Also, the average monthly temperature from this station has been used. The monthly distribution of precipitation is presented in **Table F1, Appendix F.**

Storage (St)

Groundwater storage (ST) of native soils for the existing Site was estimated using values of Water Holding Capacity (mm) of respective land use and soil types identified in Table 3.1 of the Storm Water Management (SWM) Planning & Design Manual (MOE, March 2003). The land uses, soil types and respective water holding capacities shown in **Table 4-3** were chosen to represent existing conditions and applied to March for monthly calculations.

Table 4-3 Existing Conditions – Water Holding Capacity and AET of Native Soils in Pervious Areas

Property	Land uses / soil types	Water Holding Capacity (mm/year)	AET (mm/year)
Hicks, Newhouse & Russell	**Urban Lawn /Silt Loam**	125	531
	Moderately Rooted Crops/Silt Loam	200	545
	Mature Forest	400	557

Using the procedures outlined in the SWM Planning & Design Manual for each of the above land uses and soil types, the annual change in storage is 0. ST across is the lowest in August for all land use types, and highest from March to May and November to February. The monthly distributions of ST are presented in **Table F-2, Appendix F.**

Evapotranspiration (Et)

Monthly Potential Evapotranspiration (PET) is estimated using monthly temperature data and is defined as a water loss from a homogeneous vegetation-covered area that never lacks water (Thornthwaite,1948; Mather, 1978). In the Thornthwaite water balance model, PET is calculated using the Hamon equation (Hamon, 1061);

PET Hamon = 13.97 x d x D^2 x Wt

Where:

d = the number of days in the month

D = the mean monthly hours of daylight in units of 12 hours

Wt = a saturated water vapour density term = 4.95 * e0.627/100

T = the monthly mean temperature in degrees Celsius

The calculated PET for the study area is 568 mm/year, or about 63% of the total precipitation. A comparison between PET and Precipitation (P) produces a soil moisture deficit in the order of 96.6 mm by August in the study area.

The calculated Actual Evapotranspiration (AET) is based on PET and changes in ST (Δ ST). Where there is not enough P to satisfy PET, a reduction in ST occurs. As a result, volumes of AET are less than PET. The monthly distribution of ST for the land use/soil types representing existing conditions at the site produced an annual AET of 531-557 mm/yr.

Precipitation Surplus (S)

Precipitation surplus is calculated as P-ET. For pervious areas, ET is considered AET and for impervious areas ET is evaporation. A surplus of 902 mm/year (100% of P) is calculated for impervious areas. For the pervious land use/soil type representing existing conditions at the site, P-AET produces a precipitation surplus of 345-371 mm/year (38-41% of P). The more detailed calculations are included in **Table F-2, Appendix F.**

Infiltration (I) and Runoff (R)

For pervious areas, precipitation surplus has two (2) components in the Thornthwaite model: a runoff component (overland flow that occurs when soil moisture capacity is exceeded) and an infiltration component. The accumulation of infiltration factors for topography, soil types and cover as prescribed in Table 3.1 of the SWM Planning & Design Manual give infiltration factors for existing conditions on the Site as shown below in **Table 4-4**.

Table 4-4 Existing Conditions – Infiltration Factor

Land uses / soil types	Topography	Soil	Cover	Total infiltration factor
Urban Lawn /Silt Loam	0.30	0.20	0.10	0.60
Moderately Rooted Crops (Agriculture)/Silt Loam	0.2	0.2	0.1	0.50
Woodland/Silt Loam	0.2	0.2	0.2	0.60

Considering the above infiltration factors, the respective total annual volume of infiltration for the Hicks, Newhouse and Russell properties are estimated to be 56,181 m^3/year, 58,830 m^3/year and 65,721 m^3/year, respectively.

The runoff component calculated in the pre-development model is the remaining volume of precipitation surplus following infiltration. Considering the precipitation surpluses and the total infiltration volume, the total annual volume of runoff for the Hicks, Newhouse and Russell properties are estimated to be 51,840 m^3/year, 58,340 m^3/year and 67,180 m^3/year, respectively.

Detailed calculations and the monthly distribution of infiltration and runoff are presented in **Table F-2, Appendix F.**

4.3.2 Post-development Water Balance

Post-development conditions include impervious areas, pervious areas of urban lawn (open space), moderately rooted crops (Agricultural/Greenbelt), and Woodland (NHS) with silty loam soils. To predict outputs of the post-development water balance, the same 30-year average climate data and site latitude inputs were used. Changes in land use including landscaped areas include a reduction in soil water holding capacity inputs and factors of infiltration. Various inputs and outputs of the post-development model are presented in **Table E-3, Appendix F.**

Storage (St)

Groundwater storage (ST) of native soils for the post-development site remains the same for undeveloped areas. The same water holding capacity was chosen as above to represent post-development conditions and applied to March for monthly calculations. Similar to the pre-development conditions, using the procedures outlined in the SWM Planning & Design Manual for each of the above land use, the annual change in storage is 0. The monthly distribution of ST is presented in **Table F-3, Appendix F.**

Evapotranspiration (Et)

For pervious areas, monthly PET is estimated using the same inputs and calculations described in the pre-development model. The unit area outputs for evapotranspiration remains the same (531-557 mm/year). A decrease in pervious surfaces means there is less area where evapotranspiration can occur. As a result, a reduction in annual volume AET occurs. Detailed calculations and the monthly distribution of AET are presented in **Appendix F.**

Precipitation Surplus (S)

For the pervious land use/soil type representing post-development conditions at the site, P-AET produces a precipitation surplus of 345-371 mm/year, and a surplus of 902 mm/year (100% of P) is calculated for impervious areas. The more detailed calculations are included in **Table F-3, Appendix F.**

Infiltration (I) and Runoff (R)

The accumulation of infiltration factors for topography, soil types and cover are prescribed in Table 3.1 of the SWM Planning & Design Manual. The infiltration factors remain unchanged. The annual volume of infiltration for the Hicks, Newhouse and Russel properties are estimated at 47,190 m^3/year, 45,723 m^3/year and 50,298 m^3/year, respectively.

The runoff component calculated in the post-development model is the remaining volume of precipitation surplus following infiltration. Considering the precipitation surpluses and the total infiltration volume, the total runoff for the Hicks, Newhouse and Russel properties are estimated at 107,057 m^3/year, 102,688

m^3/year and 126,652 m^3/year, respectively. Detailed calculations and the monthly distribution of infiltration and runoff are presented in **Table F-3, Appendix F.**

4.3.3 Water Balance Analysis Results

Based on results of the pre-development and post-development water balance completed, the proposed developments will in general produce a decrease in annual evapotranspiration at each property, a reduction in annual infiltration and a general increase in annual runoff at all properties. The effects are mainly the result of increased impervious area and decreased pervious areas of the Site. The analysis is summarised as below in **Table 4-5**. The detailed calculations are presented in **Appendix F.**

Table 4-5- Summary of Water Balance Analysis- Pre-Development and Post-Development

Characteristic	Pre-Development	Post-Development (no mitigation)	Change (Pre- to Post Development)
Hicks			
Proposed Development Area (m^2)	303,566	303,566	0
Precipitation (m^3/year)	273,695	273,695	0
Total Evapotranspiration (m^3/year)	165,174	93,132	-72,042
Total Evaporation (m^3/year)	500	36,282	35,782
Total Infiltration (m^3/year)	56,181	47,190	-8,991
Total Runoff (m^3/year)	51,840	97,092	45,251
Newhouse			
Proposed Development Area (m^2)	321,393	321,393	0
Precipitation (m^3/year)	289,768	289,768	0
Total Evapotranspiration (m^3/year)	170,269	107,440	-62,829
Total Evaporation (m^3/year)	2,329	33,917	31,588
Total Infiltration (m^3/year)	58,830	45,723	-13,107
Total Runoff (m^3/year)	58,340	102,688	44,347
Russell			
Proposed Development Area (m^2)	368,572	368,572	0
Precipitation (m^3/year)	332,305	332,305	0
Total Evapotranspiration (m^3/year)	197,966	110,440	-87,526
Total Evaporation (m^3/year)	1,437	44,915	43,478
Total Infiltration (m^3/year)	65,721	50,298	-15,424
Total Runoff (m^3/year)	67,180	126,652	59,472

Based on the results of the site water balance, there is an overall infiltration deficit for the site including 8,991 m^3/yr for the Hicks property, 13,107 m^3/yr for Newhouse and 15,424 m^3/yr for the Russell property. To mitigate the effects of reduced infiltration, a LID plan should be integrated into the development designs with areas to promote the collection and infiltration of clean sources of stormwater. Before the designs of LIDs, a feature based water balance should be completed to consider infiltration targets for

features prior to addressing site-wide infiltration deficits.

5.0 WETLAND WATER BALANCE RISK EVALUATION

5.1 Pre-development Subcatchments

Pre-development catchment mapping showing topographical drainage divides and wetland catchments were prepared from 2002 GPA DEM data set using GIS spatial analyst tool a to document existing drainage patterns across the site and determine which areas are within the catchments of wetlands W1 through W5. Wetland and constraints mapping was provided by Beacon. The Pre-Development catchment map is presented overlaying the TRCA watershed boundary in **Figure 6A**. The delineated catchments boundaries fit well into the TRCA subwatershed map at the water-divide between Etobicoke Creek and Humber River Watershed. The catchment areas of W1 through W4 are at the east side of Etobicoke Watershed, while wetland W5 catchment at the western border of Humber River Watershed

The pre-development mapping shows catchments for 6 wetland units including W1, W2A, W2B and W3 through W5. Catchments for wetlands W4 and W3 includes northeast areas of the Site which drain across Hicks Rd N. The largest sub-catchment is mapped draining directly into W5 and includes approximately 890.9 ha of upgradient area along the western boundary of Humber River watershed. All wetlands are within the Sites extent, however only small portions of their catchments are within the proposed development area.

5.2 Post-Development Subcatchments

Post-development wetland catchments were provided by DSEL to document proposed changes to existing drainage patterns for wetland catchments W1 to W5. The Post-Development Catchment Map is presented in **Figure 6B**. Based on the post-development wetland catchments provided, changes to catchment boundaries for Wetland 1 to 5 include area reductions. A summary of changes to catchment size and imperviousness is provided below.

5.3 Wetland Water Balance Risk Evaluation

To aid in determining the level of risk and evaluation requirements for the study, an assessment was completed using the Wetland Water Balance Risk Evaluation guidelines provided by the Toronto and Region Conservation Authority (TRCA, Nov 2017). The guideline provides criteria used to evaluate the magnitude of potential hydrological impact on a wetland. The criteria include:

i) The proportion of impervious cover in the catchment of the wetland that would result from the proposal;
ii) The degree of change in the size of the wetland catchment;
iii) Water taking from, or discharge to, surface water bodies or aquifers directly connected to the wetland, and;
iv) The impact on locally significant recharge areas.

Considering the above criteria, increases to impervious cover and changes to wetland catchment size were evaluated.

5.3.1 Impervious Cover Score

An increase in the percent of impervious cover within a wetland catchment has the effect of reducing infiltration and potentially decreasing baseflow and/or interflow contributions to the wetland. It further increases runoff contributions and risks of flooding and potentially increases stormwater sediment and contaminant loading. To assess the risk of the proposed impervious surfaces on sensitive features including Wetlands 1 through 5, the Impervious Cover Score (S) was calculated for each of the catchments. The equation defining S is as follows:

$$S = \frac{IC \cdot Cdev}{C}$$

where,

IC - is the proportion of impervious cover proposed within the specific catchment (as a percentage between 0 and 100)

Cdev - is the total proposed development area within the catchment (in ha)

C - is the size of the wetland's catchment (in ha).

Results of the calculation of impervious cover (IC) are provided in **Table 5-1** and show that wetland catchment W1 to W5 are presented with low risk based on the proposed development area with a 65% imperviousness over the Hicks and Russell property, and a 75% imperviousness over the Newhouse property. It should be noted that the catchment for Wetland 2 includes combinations of Hicks and Newhouse property and as such includes proportions of 65% and 75% proposed imperviousness.

Table 5-1 –Impervious Cover Score - Probability and Magnitude of Hydrological Change

Subcatchment Area Name	Pre-development Catchment Size (m^2)	Proposed Impervious Cover (m^2)	Impervious Cover (IC) (%)	Sensitive Feature	Expected magnitude of hydrological change
Wetland 1 (W1)	552,512	51,425	9.3	Wetland	Low
Wetland 2A &2B (W2A & W2B)	2,020,072	44,718	2.2	Wetland	Low
Wetland 3 (W3)	6,705,886	112,130	1.7	Wetland	Low
Wetland 4 (W4)	6,507,880	29,749	0.5	Wetland	Low
Wetland 5 (W5)	8,908,677	61,703	0.7	Wetland	Low

Note: * Impervious Cover Score (S) calculated using equation 1 (TRCA - Wetland Water Balance Risk Evaluation, Nov 2017)

5.3.2 Change in Catchment Size

Changes to catchment size directly effects the volume and timing of stormwater contributions to downgradient features. To evaluate the magnitude of hydrological change these effects can have, pre-development and post-development catchments were compared. **Table 5-2** provides the area breakdown for pre and post-development conditions. The same magnitude thresholds used for impervious cover

(10% and 25 %) are used as thresholds to define catchment size alteration. As a result, changes to catchment size for W1 to W6 is considered high risk.

Table 5-2 –Changes to Catchment Size - Probability and Magnitude of Hydrological Change

Subcatchment Area Name	Pre-development catchment area (m^2)	Post-Development Catchment Area (m^2)	% Change in Catchment Area	Sensitive Feature	Magnitude of Hydrological Change *
Wetland 1 (W1)	552,512	483,946	12.4 % decrease	Wetland	Medium
Wetland 2A &2B (W2A & W2B)	2,020,072	1,954,359	3.3 % decrease	Wetland	Low
Wetland 3 (W3)	6,705,886	6,533,378	2.6 % decrease	Wetland	Low
Wetland 4 (W4)	6,507,880	6,462,112	0.7% decrease	Wetland	Low
Wetland 5 (W5)	8,908,677	8,813,750	1.1% decrease	Wetland	Low

Note: * Based on Table 2: Criteria used to evaluate the probability and magnitude of hydrological change (TRCA - Wetland Water Balance Risk Evaluation, Nov 2017)

6.0 CONSTRUCTION DEWATERING

Construction dewatering is anticipated within the site boundaries for the proposed developments. No below grade plans were available to DS at the time of writing this report. Site servicing trenches and SWM ponds will be excavated mainly through the sandy silt soils within the proposed development and are estimated to extend approximately 4 mbgs and 7 mbgs, respectively. The water table across the site ranges from 258 to 272 masl or approximately 0.3 to 4 mbgs. As a result, groundwater will be encountered during installation of site services and excavation for the SWM pond. Similarly, excavations for the houses are anticipated to extend into the water table and basements are estimated approximately 2 mbgs. Townhouse blocks are anticipated to be constructed slab on grade, therefore no major dewatering issues are expected.

The following section calculates the estimated dewatering required during the construction of the proposed developments using the steady-state flow equation for an unsealed excavation.

6.1 Total Estimation of Flow Rate- (Short Term/Construction Dewatering)

This section calculates the estimated dewatering needed considering the open-cut excavation methods. The estimated construction dewatering flow rates are presented in **Table 6-1.** These values incorporate a 100% safety factor for precipitation and stormwater that may enter the excavation. According to the precipitation data obtained from the Georgetown WWTP climate station, the largest precipitation event occurred in September 2020 (31 mm).

Trench excavation dimensions of 30 m long and 2 m wide were assumed (open at any given time) with an approximate depth of 4 mbgs. Dimensions of the SWM ponds and detached residential blocks were estimated based on site plans provided by the client. Due to the variability of hydraulic conductivity, the

estimated preliminary dewatering values are based on the geomean k-value obtained from the in-situ hydraulic testing and highest groundwater level recorded in BH19-8 on January 2, 2020 (0.3 mbgs/270.5 masl), and was used in the calculation using the Dupuit expression for an unconfined aquifer in steady-state conditions.

Additional pumping capacity may be required to maintain dry conditions within the open excavations following significant precipitation events. Please note that it is the responsibility of the contractor to ensure dry conditions are maintained within the excavation at all times.

It is expected that the initial dewatering rate will be higher to remove groundwater from within the overburden formation. The dewatering rates are expected to decrease once the target water level is achieved in the excavation footprint as groundwater will have been removed locally from storage resulting in lower seepage rates into the excavation.

The maximum flow calculation is intended to provide a conservative estimate to account for unforeseeable conditions that may arise during construction. It should be noted that the dewatering estimate provided in this report is preliminary and that no detailed below grade designs were available for review at the time of writing this report. Once the detailed design depths are finalized, the dewatering estimates must be revised to include the final layout of the development.

Table 6-1: Estimated Preliminary Construction Dewatering Volumes

	Dewatering Q (m^3/day)	Storm Water (m^3/day)	Dewatering Q (100% safety factor & Storm Water) (m^3/day)	Zone of Influence (m)
Site Servicing Trench	32	2	66	33
SWM Pond- Newhouse	111	592	814	95
SWM Pond A- Hicks	99	453	651	85
SWM Pond B- Hicks	115	629	859	97
SWM Pond -Russell	116	648	880	98
Detached Residential Block	88	248	424	55

6.2 Permit Requirements

6.2.1 Environmental Activity and Sector Registry (EASR) /Permit to Take Water (PTTW) Application

An EASR is required to be submitted to the MECP if the taking of groundwater and stormwater for a temporary construction project is between 50,000 L/day and 400,000 L/ day. The EASR application is an online registry and should be submitted to the MECP before any construction dewatering. A PTTW is only required to be submitted to the MECP if the taking of groundwater and stormwater for a temporary construction project is more than 400,000 L/ day.

Since the expected design dewatering preliminary rates for the unsealed excavations are above the MECP's daily water taking limit of 400,000 L/day, with the exception of a single site servicing trench, a

PTTW application will be required to be submitted to the MECP for short-term dewatering prior to construction. These values can change based on actual soil condition at the site and the design.

6.3 Point of Discharge

A discharge plan will be required for the discharge of pumped groundwater from construction dewatering activities. The plan must identify the discharge location and ensure the discharge will not result in any adverse impacts by identifying the discharge measures to be installed and control measures to limit the turbidity of the discharge water. A discharge permit will be required in order to discharge this water to the Region's sewers. Water quality results indicated that several parameters exceeded Peel Region's storm sewer criteria and PWQO. TSS, manganese and aluminium exceeded sanitary sewer criteria.

If the water is to be discharge to local surface water, approvals will be required from the Toronto Region Conservation Authority (TRCA). As such, the quality of groundwater discharge will have to conform to the applicable standards. These include the PWQO. Discharge agreements from the Peel Region may be required if water is discharged to the sewer system.

Table 6-2 provides a recommended monitoring program, triggers for mitigation and recommended mitigation measures for groundwater levels and the discharge of water during construction.

Table 6-2: Monitoring and Mitigation Plan

PERIOD	MONITORING LOCATION	MONITORING FREQUENCY	METHOD	TRIGGERS FOR MITIGATION	COMMENTS / RECOMENDATIONS
WATER LEVELS					
Pre-Construction	Groundwater level monitoring (available on-site monitoring wells)	Continuously for one week	Dataloggers within the existing wells	None	Complete hydrographs to document baseline water levels
During construction	Existing monitoring wells or replacements adjacent to dewatering area	Daily until target water level is reached	Dataloggers with weekly downloads	Target drawdown not reached or exceeded	increased / reduced pumping; if pumping is approaching 400 m^3/day, a PTTW will be required
	Discharge volume	Daily at discharge location	Manual with totalizing flow meter in-line	Flow exceeds predicted volumes	Reduce to maximum allowed or obtain a PTTW
Post-Construction	Existing monitoring wells or replacements adjacent to dewatering area	Weekly for one month or until water levels reach 90% of original static level	Datalogger water level monitoring with weekly downloads	NA	NA

PERIOD	MONITORING LOCATION	MONITORING FREQUENCY	METHOD	TRIGGERS FOR MITIGATION	COMMENTS / RECOMENDATIONS
WATER QUALITY					
During construction (discharge to sewer)	Groundwater Discharge from dewatering	Sample for parameters listed in the Sewer Use By-Law Field monitoring for turbidity and correlation with lab results	Once a the start of dewatering at the point of discharge Weekly from the dewatering system for the first month of active dewatering Assuming water quality is compliant, monthly for the remainder of the dewatering period.	Discharge quality exceeds the Sewer Use By-Law criteria Field TSS/Turbidity exceed the criteria	More frequent monitoring will be considered Enhanced treatment of the discharge water will be considered if needed

7.0 POTENTIAL IMPACTS

The following are the predicted potential impacts as a result of construction dewatering:

7.1 Local Groundwater Use

Groundwater users in the study area of the proposed development generally draw supply from depths greater than the proposed construction. The study area is generally not serviced by municipal water supply. Several domestic well are recorded in the study area. A door-to-door water well survey is recommended to be completed within the study area to confirm the presence and the condition of domestic wells.

7.2 Current PTTW Search

The MECP PTTW Open Data Catalogue was searched within a 1 km radius of the Site. The search indicated that there were no active PTTWs within 1 km of the Site. Therefore, groundwater interferences from surrounding activities are not expected to occur.

7.3 Surface Water

Groundwater contributions to the tributary and wetlands occur on a seasonal basis in winter and spring as groundwater levels rise. A reduction in recharge over the Site as a result of the development may result in a lowering of the water table and thus a reduction in groundwater contribution. The water balance completed for the Site shows there is a total Site infiltration deficit. To reduce risk to watercourses and

wetlands which partially rely on groundwater contribution, the infiltration deficit should be removed by designing LIDs which encourage the infiltration of clean sources of stormwater generated over the proposed development area. The LID strategy should strive to match pre-development and post-development infiltration volumes while incorporating designs aimed to maintain contributions to the tributary and wetlands.

Discharged water from temporary construction dewatering activities should be managed to avoid direct discharge of potentially impacted water into sensitive features such as the wetland. To manage the potential risks to surface water quality, a discharge plan should be developed for the discharge of pumped groundwater from the construction dewatering. It should be noted that construction dewatering in proximity to the tributary and wetland may occur and that any zone of influence from proposed construction dewatering should be assessed during detailed design to determine potential risks to surface water features.

7.4 Groundwater Quality

To prevent degradation of groundwater quality within the immediate vicinity of the proposed development, it is suggested that only clean sources of stormwater be considered for infiltration LIDs. Additionally, engineered designs for discharged water from construction dewatering activities and storm sewer systems should ensure an adequate level of treatment to protect receiving areas and shallow groundwater quality. Despite an appropriate level of treatment, it is expected that small increases in urban pollutants such as those associated with de-icing (chloride and sodium) will occur in the shallow groundwater zone. Discharge permits and agreements may be required from the Peel Region for short-term and long-term discharge.

7.5 Well Decommissioning

Following the completion of construction activities, all dewatering wells, well points, eductors, and monitoring wells installed at various stages of this project must be decommissioned. The installation and eventual decommissioning of the wells and the dewatering system must be carried out by a licenced water well contractor in accordance with Regulation 903 of the Ontario Water Resources Act.

8.0 GENERAL COMMENTS AND LIMITATIONS OF REPORT

DS Consultants Limited (DS) should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, DS will assume no responsibility for interpretation of the recommendations in the report.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to DS at the time of preparation. Unless otherwise agreed in writing by DS, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the Site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted hydrogeological practices.

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 such third parties. DS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

DS Consultants Ltd.

Prepared By:

Scott Watson, B.A.T.
Project Manager

Reviewed By:

Martin Gedeon, M.Sc., P.Geo.
Senior Hydrogeologist

9.0 REFERENCES

Chapman, L.J., and D.F. Putnam; The Physiography of Southern Ontario, Third Edition, Ontario Geological Survey Special Volume 2; 1984, & 2007.

Environment Canada (Climate Data)
http://climate.weather.gc.ca/historical_data/search_historic_data_e.html

Freeze, R.A. and J.A. Cherry. “Groundwater”. Prentice-Hall, Inc. Englewood Cliffs, NJ. 1979.

Ontario Regulation 245/11- Environmental Activity and Sector Registry.

Ontario Ministry of Environment and Climate Change, Permit to Take Water Manual, April 2005

Powers, J. Patrick, P.E. (1992); Construction Dewatering: New Methods and Applications - Second Edition, New York: John Wiley & Sons.

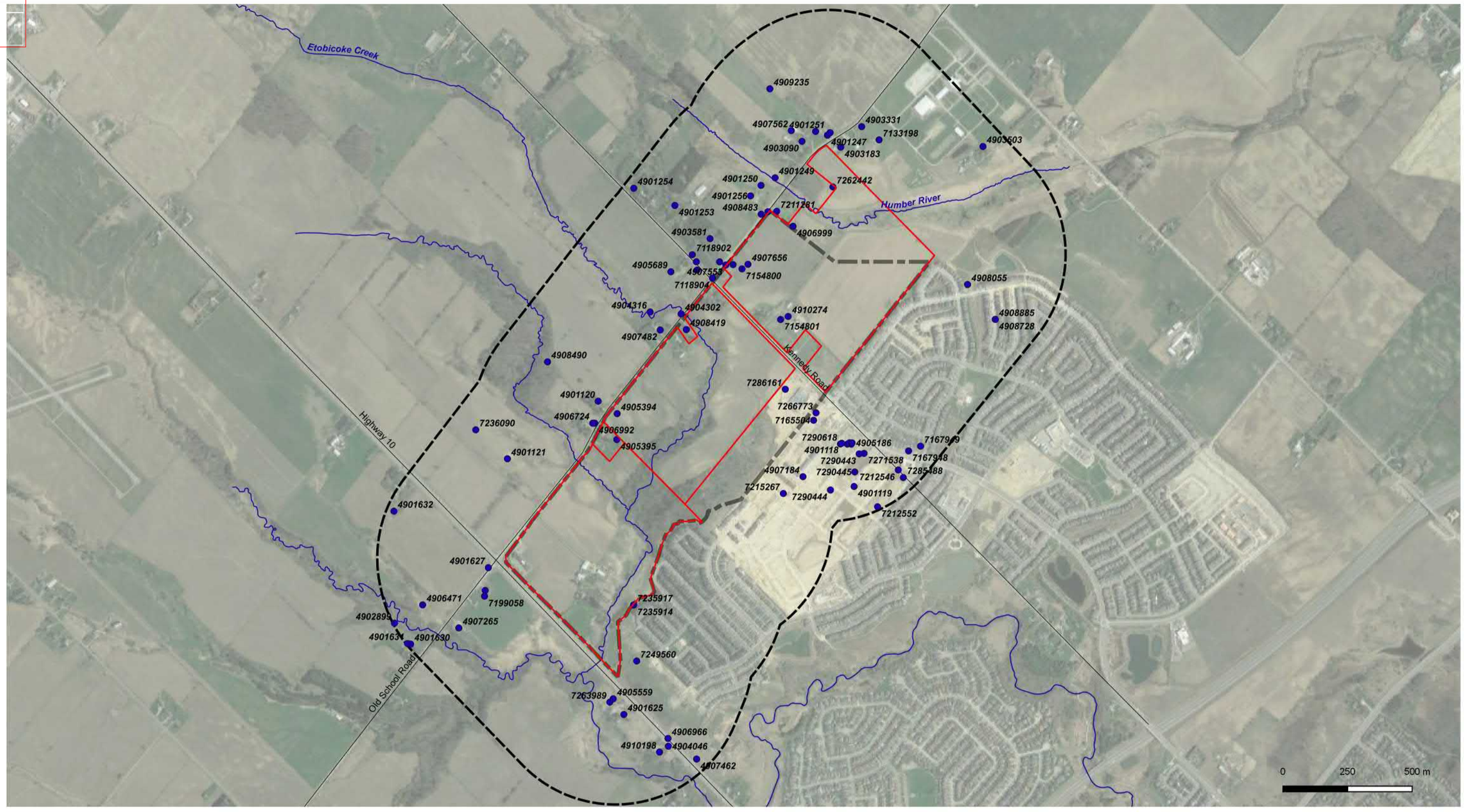
Pat M. Cashman and Martin Preene; Groundwater Lowering in Construction- Second Edition, CRC Press.

Stormwater Management Planning and Design Manual- MECP (2003)

The Peel Region Sewers By-Law

Wetland Water Balance Risk Evaluation, Toronto and Region Conservation Authority, 2017

FIGURES

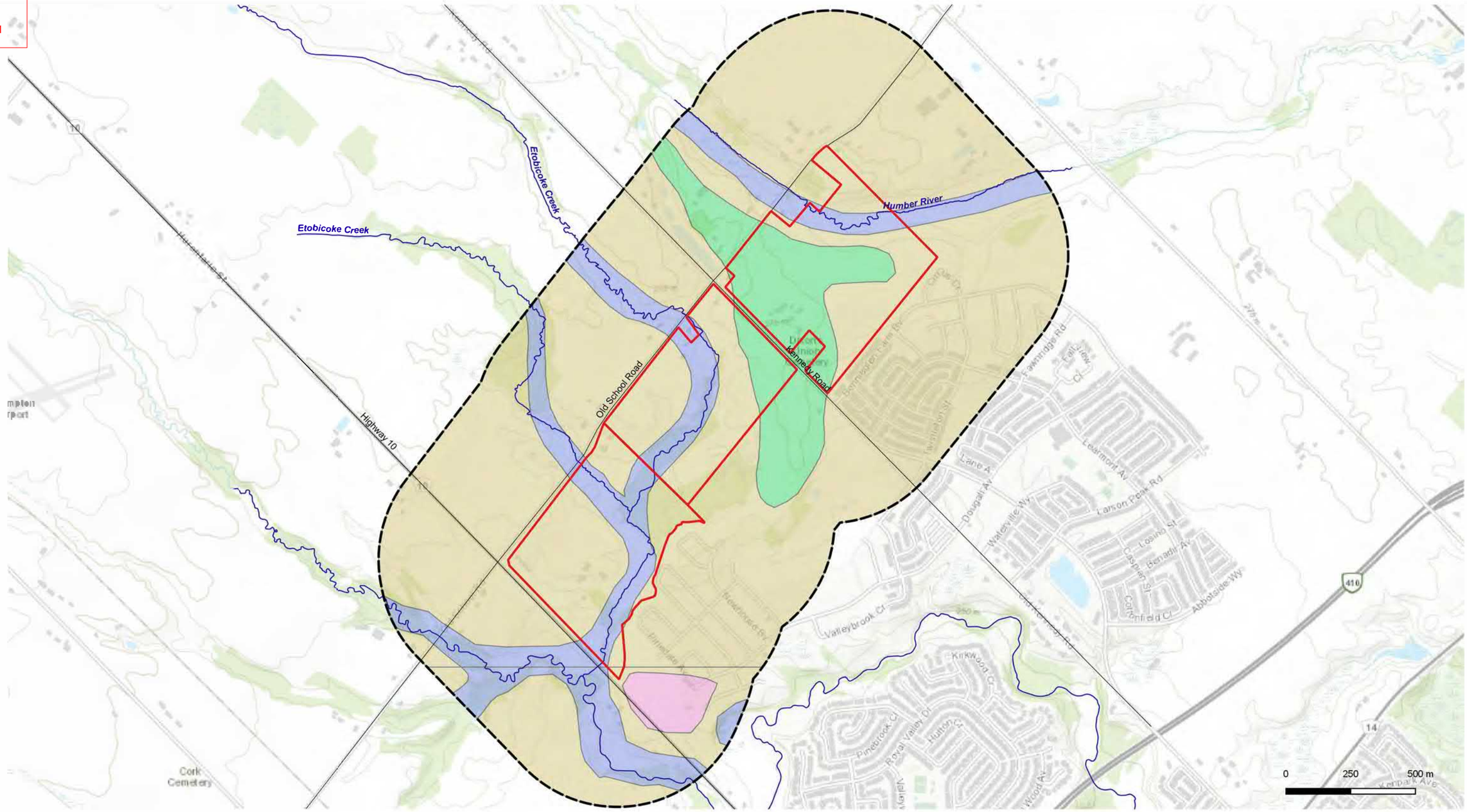


Legend

- Mayfield West Phase 1 Expansion (Stage 2) Boundary
- Approx Site Boundary
- 500m Buffer
- Registered Water Well (MECP WWR)

DS CONSULTANTS LTD. 6221 Highway 7, UNIT 16 Vaughan, Ontario L4H 0K8 Telephone: (905) 264-9393 www.dsconsultants.ca	Project: HYDROGEOLOGICAL INVESTIGATION Hicks Property - Old School and Kennedy Rd, Caledon, ON			N
	Title: **SITE LOCATION AND MECP WELL RECORDS**			
Client: Argo Kennedy Limited	Size: 11x17	Approved By: D.G	Drawn By: S.Y	Date: January 2021
	Rev. 0	Scale: As Shown	Project No.: 19-312-101	Figure No.: 1
		Image/Map Source: *Google Satellite Image*		

C:\Projects\Hicks\HydroG\Figure 1 - Site location and MECP Well records-Combined.qgs Aug-26 13:21



Legend

- Approx Site Boundary
- 500m Buffer
- 19 - Modern Alluvium
- 5d - Till
- 8b - Glaciolacustrine Deposits
- 9c - Coarse-textured Glacial Lake Deposits

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Project: HYDROGEOLOGICAL INVESTIGATION
Old School and Kennedy Rd, Caledon, ON

Title: **SURFICIAL GEOLOGY MAP**

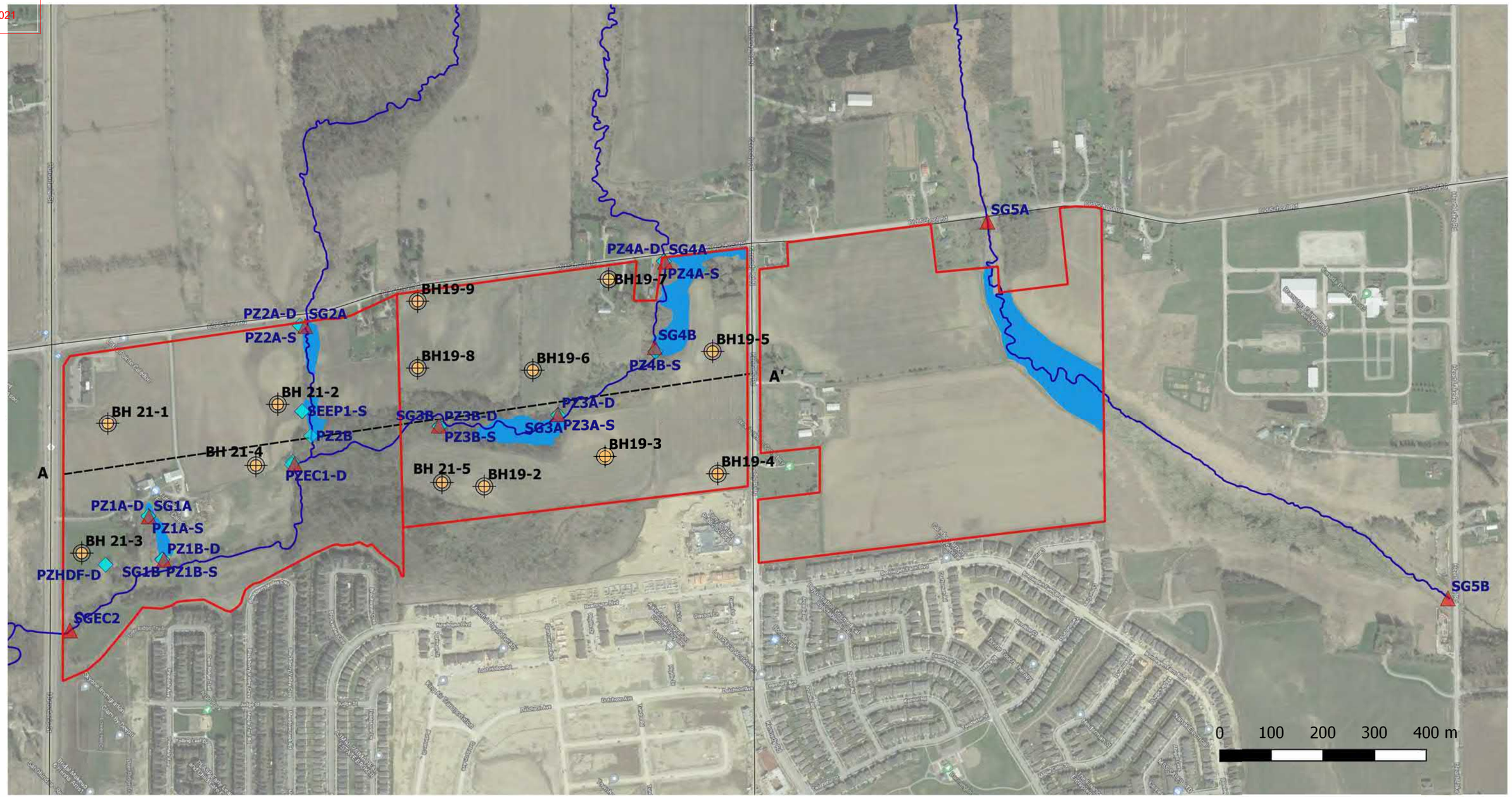
N

Client: Argo Kennedy Limited

Size:	Approved By:	Drawn By:	Date:
11x17	D.G	S.Y	January 2021
Rev. 0	Scale: As Shown	Project No.: 19-312-101	Figure No.: **2**

Image/Map Source: *Esri Topo Map and https://www.mndm.gov.on.ca/*

C:\0Sharon\19-312-100 Hicks Property_Argo Dev\1-QGIS\HydroG\Figure 2 – Surficial Geology Map.qgs Feb-08 09:22



Legend

- Monitoring Well
- Staff Gauge
- Piezometer
- Wetland
- Approx Site Boundary
- Watercourse
- Road

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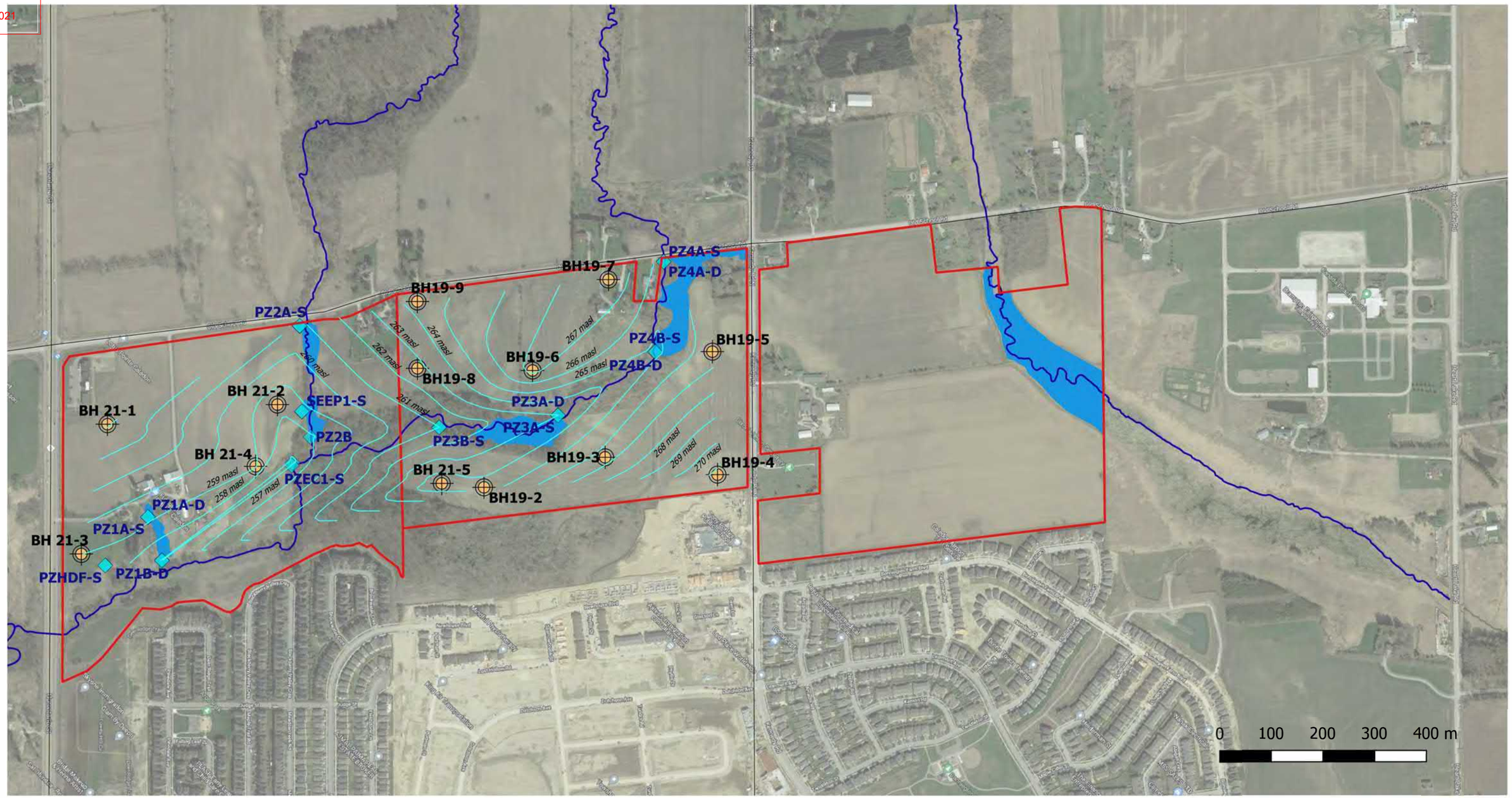
Project: HYDROGEOLOGICAL INVESTIGATION
OLD SCHOOL AND KENNEDY RD., CALEDON, ON

Title: **BOREHOLE AND MONITORING LOCATIONS PLAN**

Client: Argo Kennedy Limited

Size:	Approved By:	SW	Drawn By:	MM	Date:	July 2021
11x17	Scale:	As Shown	Project No.:	19-312-100	Figure No.:	3
Rev. 0						

Google Satellite Image



Legend

- Groundwater Level, May 2021
- Monitoring Well
- Piezometer
- Wetland
- Approx Site Boundary
- Watercourse
- Road

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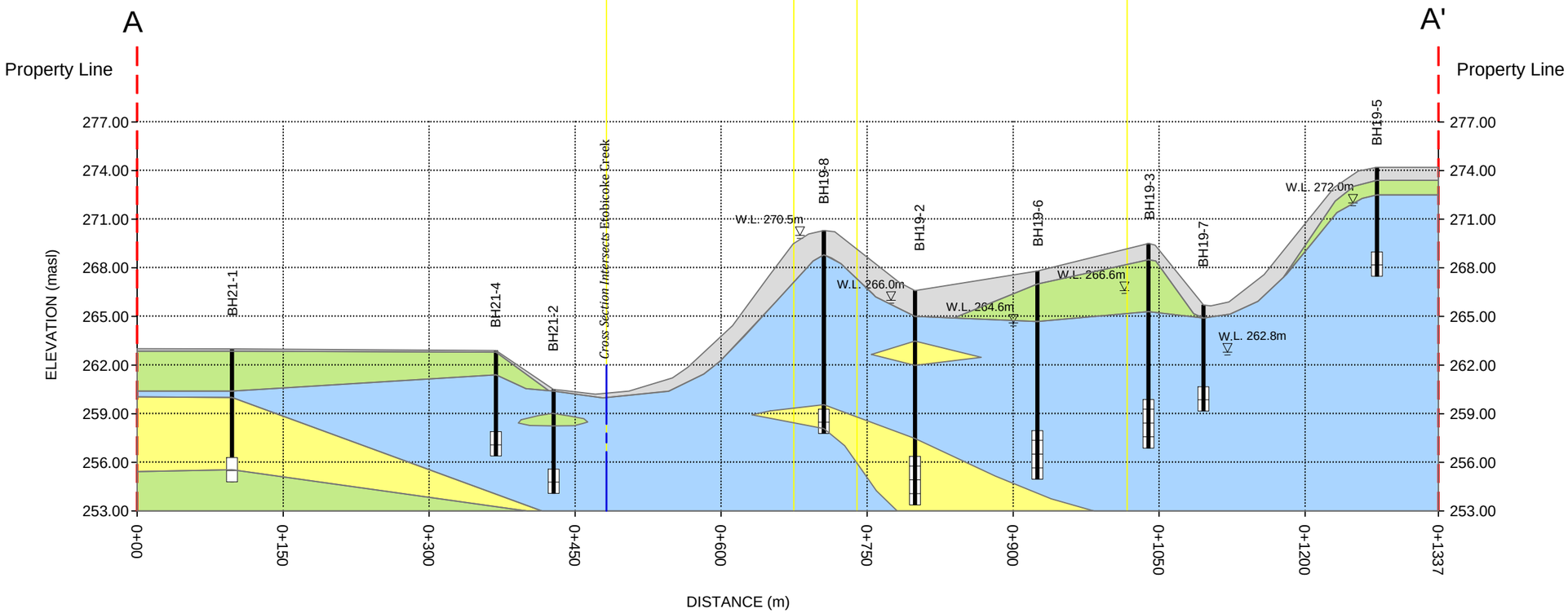
Project: HYDROGEOLOGICAL INVESTIGATION
OLD SCHOOL AND KENNEDY RD., CALEDON, ON

Title: **GROUNDWATER EVELVATION CONTOUR AND FLOW DIRECTION**

Client: Argo Kennedy Limited

Size:	Approved By:	Drawn By:	Date:
11x17	SW	MM	July 2021
Rev. 0	Scale: As Shown	Project No.: 19-312-100	Figure No.: 4

Google Satellite Image



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Vertical Scale: 1:3000

Path:----

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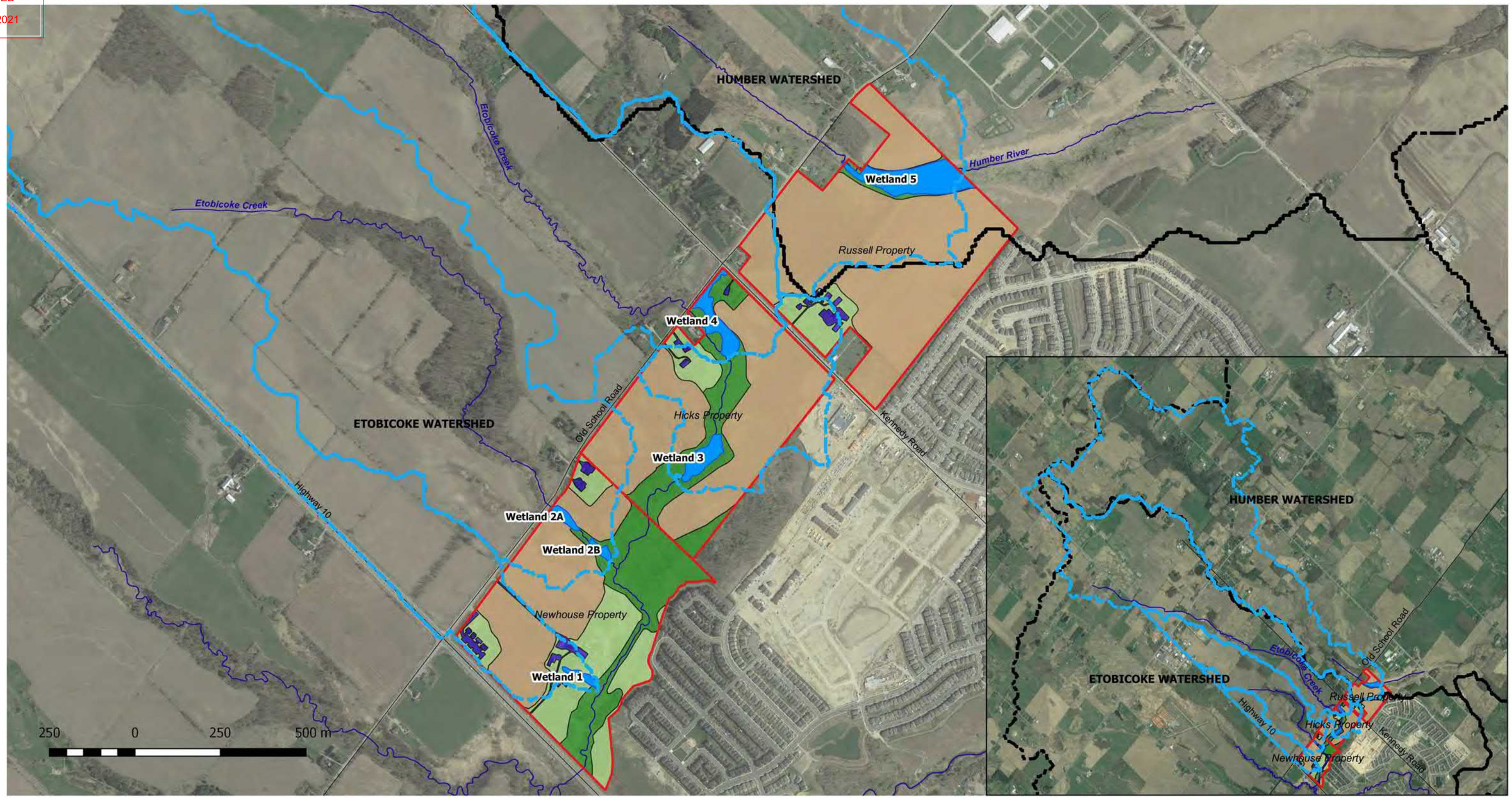
Project: HYDROGEOLOGICAL INVESTIGATION
Old School and Kennedy Rd, Caledon, ON

Title: **GEOLOGICAL CROSS SECTION A-A'**

Client: Argo Kennedy Limited

Size:	Approved By:	Drawn By:	Date:
11 X 17	D.G	S.Y	February 2021
Rev.	Scale:	Project No:	Figure No.
	As Shown	19-312-101	5



Legend

- Wetland
- Wetland Catchment
- Approx Site Boundary
- TRCA Watershed Boundary
- Agricultural
- Building/Driveway
- Open Space
- Woodland
- Water
- Road

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Project: HYDROGEOLOGICAL INVESTIGATION
Old School and Kennedy Rd, Caledon, ON

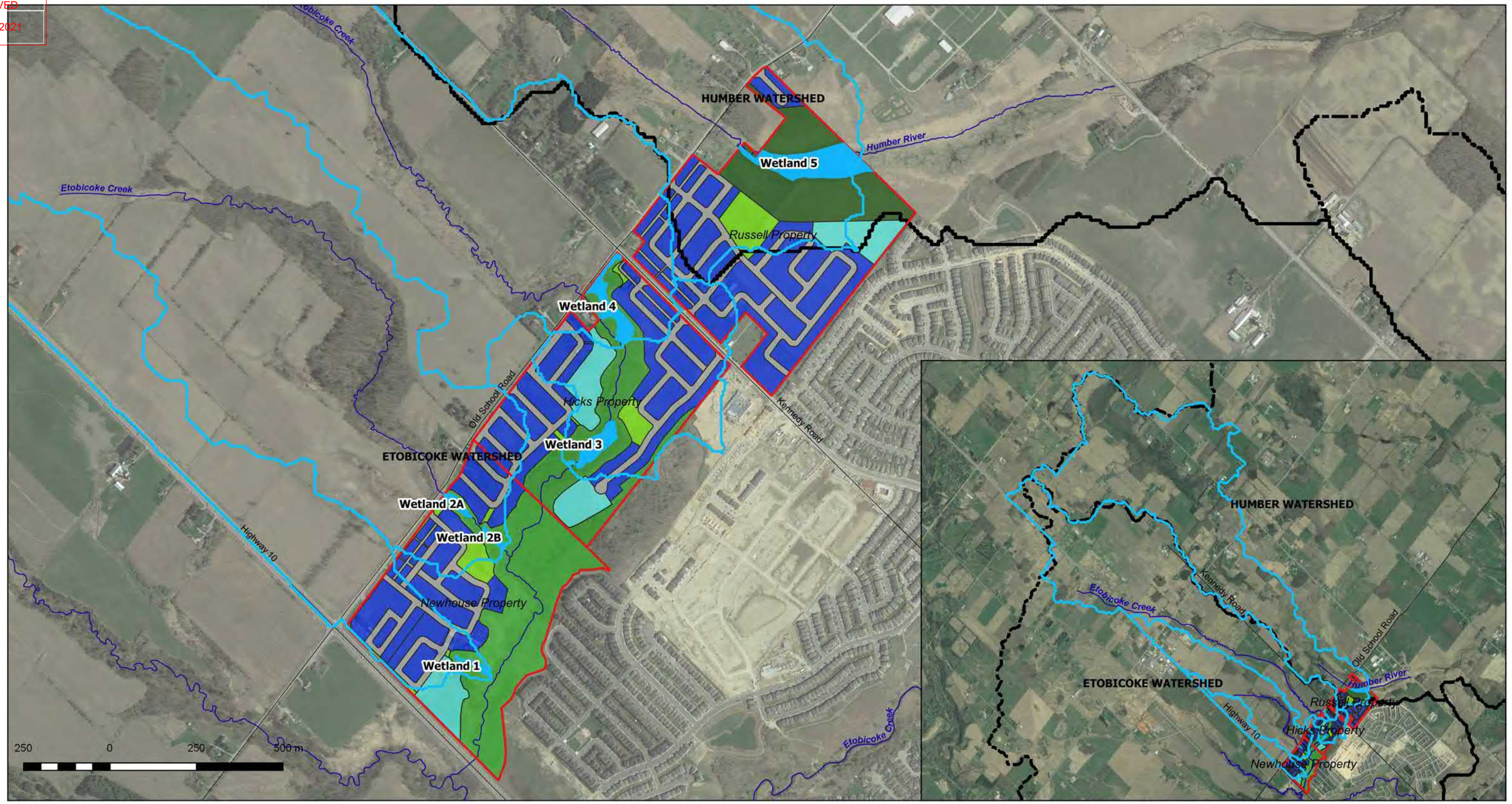
Title: **PRE-DEVELOPMENT SUBCATCHMENTS**

N

Client: Argo Kennedy Limited

Size:	Approved By:	Drawn By:	Date:
11x17	SW	MM	March 2021
Rev. 0	Scale: As Shown	Project No.: 19-312-101	Figure No.: **6A**

Image/Map Source: *Google Satellite Image*



Legend

- Wetland
- Wetland Catchment
- TRCA Watershed Boundary
- Approx Site Boundary
- Water
- Road
- Building
- Park/Open Space
- Road
- SWM Pond
- Woodland (NHS)

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Project: HYDROGEOLOGICAL INVESTIGATION
Old School and Kennedy Rd, Caledon, ON

Title: **POST-DEVELOPMENT CATCHMENT**

Client: Argo Kennedy Limited

Size:	Approved By: SW	Drawn By: MM	Date: January 2021
11x17			
Rev. 0	Scale: As Shown	Project No.: 19-312-101	Figure No.: **6B**
	Image/Map Source: *Google Satellite Image*		

Appendix A

DS CONSULTANTS LTD.
Geotechnical ❖ Environmental ❖ Materials ❖ Hydrogeology

LOG OF BOREHOLE BH19-2

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Hicks Property, Old School Rd, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4845547.679 E 593238.693

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Dec/11/2019

REF. NO.: 19-312-100
ENCL NO.: 2

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
266.6 / 0.0	**TOPSOIL:** 250mm					
266.4 / 0.3	**WEATHERED/ DISTURBED SOIL:** silty clay, trace sand, trace gravel, trace rootlets, brown, moist, firm to stiff	1	SS	7		
265.1 / 1.5	**SANDY SILT:** trace clay, trace gravel, brown, moist, compact	2	SS	12		
264.3 / 2.3	**SILTY SAND TILL:** trace clay, trace gravel, brown, wet, dense	3	SS	18		
263.5 / 3.1	**SAND:** trace gravel, brown, wet, compact	4	SS	46		
262.0 / 4.6	**SANDY SILT TILL:** trace to some clay, trace gravel/ cobble, wet sand seams, grey, moist, very dense	5	SS	23		
	sandy below 6.1m	6	SS	67		
		7	SS	95/ 280mm		
	sand seams, pinkish grey below 7.6m	8	SS	90		
257.5 / 9.1	**SAND AND GRAVEL:** trcae clay, trace silt, trace cobble, reddish brown, very dense	9	SS	50/ 25mm		
		10	SS	50/ 100mm		
		11	SS	50/ 75mm		
253.4 / 13.2	grey shale fragments below 13.0m	12	SS	50/ 75mm		
	END OF BOREHOLE:					

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

Date:	Water Level (mbgl):
Jan 02, 2020	0.6
Feb 03, 2021	2.2
May 03, 2021	1.3

W. L. 266.0 m Jan 02, 2020
W. L. 265.3 m May 03, 2021
W. L. 264.4 m Feb 03, 2021
Bentonite
Filter Pack
Slotted Pipe

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

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

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

METHANE AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
34	37	23	6

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 19-312-100.GPJ DS.GDT 5/17/21

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Geotechnical ❖ Environmental ❖ Materials ❖ Hydrogeology

LOG OF BOREHOLE BH19-3

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Hicks Property, Old School Rd, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4845754.107 E 593363.181

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Dec/10/2019

REF. NO.: 19-312-100
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
269.5					
269.0 0.0	**TOPSOIL:** 250mm				
0.3	**WEATHERED/ DISTURBED SOIL:** silty clay, trace organics, trace rootlets, brown, moist, very soft to stiff	1	SS	1	269
268.5 1.0	**CLAYEY SILTY TILL:** sandy, trace gravel, brown, moist, very stiff to hard	2	SS	15	
		3	SS	26	268
2	cobble at 2.3m	4	SS	28	267
3		5	SS	34	
265.3 4					
4.2	**SANDY SILT TILL:** trace clay, trace to some gravel, brown, moist, dense to very dense	6	SS	59	265
5	grey below 4.6m				
6	reddish brown below 6.1m	7	SS	54	263
7					
8	moist to very moist below 7.6m	8	SS	37	262
9					261
	cobble/ boulder between 9.1m and 12.2m	9	SS	50/ 100mm	
10					260
		10	SS	50/ 25mm	258
12					
256.9		11	SS	50/ 25mm	257
12.6	**END OF BOREHOLE:**				

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

Date:	Water Level (mbgl):
Jan 02, 2020	2.9
Feb 03, 2021	3.1
May 03, 2021	3.2

GROUND WATER CONDITIONS: W. L. 266.6 m Jan 02, 2020; May 03, 2021; Bentonite; Filter Pack; Slotted Pipe

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

METHANE AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
5	35	55	5

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 19-312-100.GPJ DS.GDT 5/17/21

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LOG OF BOREHOLE BH19-4

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Hicks Property, Old School Rd, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4846044.868 E 593365.481

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Dec/11/2019

REF. NO.: 19-312-100
ENCL NO.: 4

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
270.3 / 0.0	**TOPSOIL:** 250mm				
0.3 / 269.5	**WEATHERED/ DISTURBED SOIL:** sandy silt to silty sand, trace rootlets, brown, moist, loose	1	SS	4	270
0.8 / 268.8	**WEATHERED/ DISTURBED SOIL:** silty sand, brown, wet, loose	2	SS	9	
1.5	**SILTY SAND:** trace clay, brown, moist to very moist, loose to compact	3	SS	6	
		4	SS	13	268
	wet below 3.1m	5	SS	11	267
265.7					
4.6 / 264.2	**SANDY SILT:** trace clay, trace gravel, brown, wet, compact	6	SS	10	
6.1 / 263.6	**CLAYEY SILT TILL:** sandy, trace gravel, grey, moist, very stiff	7	SS	18	264
6.7	**END OF BOREHOLE:**				

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

Date:	Water Level (mbgl):
Jan 02, 2020	4.0
Feb 03, 2021	3.9
May 03, 2021	3.9

Bentonite
W. L. 266.3 m
Jan 02, 2020
Slotted Pipe

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

METHANE AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
0	57	41	2

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 19-312-100.GPJ DS.GDT 5/17/21

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LOG OF BOREHOLE BH19-5

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Hicks Property, Old School Rd, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4845883.951 E 593540.33

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Dec/10/2019

REF. NO.: 19-312-100
ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
274.2						
274.0 0.0	**TOPSOIL:** 250mm	1	SS	2		274
0.3 273.4	**WEATHERED/ DISTURBED SOIL:** silty sand, trace clay, trace gravel, brown, very moist, very loose					
1 0.8	**CLAYEY SILT:** some sand, trace gravel, trace rootlets, brown, very moist, firm to stiff	2	SS	8		
272.5						273
2 1.7	**SANDY SILT:** trace to some clay, trace gravel, brown, very moist, loose to compact	3	SS	4		
		4	SS	16	W. L. 272.0 m Jan 02, 2020	
271.1						
3 3.1	**SANDY SILT TILL:** trace clay, trace gravel, brown, very moist, compact	5	SS	20	W. L. 271.2 m May 03, 2021	
4 269.6						270
4.6	**SILTY SAND:** trace clay, grey, saturated, compact	6	SS	24		
5 6						
267.5		7	SS	12		268
6.7	**END OF BOREHOLE:**					

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

Date:	Water Level (mbgl):
Jan 02, 2020	2.2
Feb 03, 2021	3.0
May 03, 2021	3.0

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

Bentonite
Filter Pack
Slotted Pipe

POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
		0	64	34	2

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

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

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LOG OF BOREHOLE BH19-6

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Hicks Property, Old School Rd, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4845710.392 E 592894.139

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Dec/09/2019

REF. NO.: 19-312-100
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
267.8							
0.0 / 267.5	**TOPSOIL:** 350mm		1	SS	5		
0.4 / 267.0	**WEATHERED/ DISTURBED SOIL:** sandy silt, trace clay, trace organics, trace rootlets, dark brown, stiff		2	SS	17		267
0.8	**CLAYEY SILT TILL:** some sand, trace gravel, occasional cobble, brown, moist to very moist, very stiff to hard		3	SS	36		266
264.7	sandy, sand seams below 2.3m		4	SS	31		265
3.1	**SANDY SILT TILL:** trace clay, trace gravel, brown, moist to very moist, dense to very dense		5	SS	35	W. L. 264.6 m Jan 02, 2020n Feb 03, 2021	
						W. L. 263.7 m May 03, 2021	264
	trace cobbles, grey below 4.6m		6	SS	50/ 75mm		263
261.7							262
6.1	**SANDY SILT TILL:** trace to some clay, trace gravel, trace cobble/ boulder, grey, moist, very dense		7	SS	90/ 230mm		261
			8	SS	81		260
			9	SS	52		259
						Filter Pack	258
						Slotted Pipe	257
			10	SS	71		256
255.0			11	SS	59		255
12.8	**END OF BOREHOLE:**						

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

Date:	Water Level (mbgl):
Jan 02, 2020	3.2
Feb 03, 2021	3.4
May 03, 2021	4.1

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

METHANE AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
3	41	45	11

DS SOIL LOG 19-312-100.GPJ DS.GDT 5/17/21

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

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LOG OF BOREHOLE BH19-7

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Hicks Property, Old School Rd, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4845619.26 E 592985.417

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Dec/09/2019

REF. NO.: 19-312-100
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
265.7							
0.0 / 265.4	**TOPSOIL:** 350mm		1	SS	4		
0.4 / 264.9	**WEATHERED/ DISTURBED SOIL:** sandy silty, some clay, trace gravel, trace rootlets, brown, very moist, loose		2	SS	7		265
0.8 / 263.9	**SANDY SILT TILL:** trace to some clay, trace gravel, brown, moist, loose to compact		3	SS	12	Bentonite	264
1.8	**SILTY SAND:** brown, moist to very moist, compact		4	SS	27		263
	wet below 3.1m		5	SS	25	W. L. 262.8 m Jan 02, 2020 Filter Pack Slotted Pipe	
261.1							
4.6	**SANDY SILT TILL:** trace to some clay, trace gravel/ cobble, grey, moist, dense to very dense		6	SS	36		261
	reddish brown below 6.1m		7	SS	80/ 255mm		260
259.2							
6.5	**END OF BOREHOLE:**						

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

Date:	Water Level (mbgl):
Jan 02, 2020	2.9
Feb 03, 2021	3.0
May 03, 2021	2.8

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

METHANE AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
2	56	39	3

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

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

DS SOIL LOG 19-312-100.GPJ DS.GDT 5/17/21

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LOG OF BOREHOLE BH19-8

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Hicks Property, Old School Rd, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4845773.544 E 593145.616

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Dec/09/2019

REF. NO.: 19-312-100
ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
270.8							
0.0 / 270.5	**TOPSOIL:** 350mm						
0.4 / 269.3	**WEATHERED/ DISTURBED SOIL:** silty sand, trace clay, some organics, dark brown, very moist to wet, very loose to loose		1	SS	2		
			2	SS	7		
1.5 / 268.5	**SANDY SILT:** trace clay, trace sand, greyish brown, wet, compact		3	SS	12		269
2.3 / 267.7	**SILTY SAND TILL:** trace clay, trace gravel, brown, very moist, compact		4	SS	21		268
3.1 / 264.7	**SANDY SILT TILL:** trace clay, trace to some gravel, brown, moist, dense grey below 3.4m		5	SS	30	W. L. 270.5 m Jan 02, 2020 W. L. 267.3 m Feb 03, 2021	
			6	SS	36	Bentonite	266
6.1 / 261.7	**SILT:** some clay to clayey, trace sand, grey, wet, loose to compact		7	SS	7		265
			8	SS	21		264
9.1 / 260.1	**SILTY SAND TILL:** trace clay, trace gravel, grey, very moist to wet, very dense		9	SS	50/ 125mm		263
10.7 / 258.6	**GRAVELLY SILTY SAND TILL:** trace to some clay, grey, wet, very dense		10	SS	53	Filter Pack Slotted Pipe	262
12.2 / 258.3	**SILTY SAND TILL:** trace clay, reddish brown, wet, very dense		11	SS	50/ 25mm		261
12.5	**END OF BOREHOLE:**						260
	Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water level Reading: Date: Water Level (mbgl): Jan 02, 2020 0.3 Feb 03, 2021 3.5 May 03, 2021 0.5						259

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

METHANE AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
25	44	23	8

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 19-312-100.GPJ DS.GDT 5/17/21

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LOG OF BOREHOLE BH19-9

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Hicks Property, Old School Rd, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4846001.322 E 593125.224

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Dec/10/2019

REF. NO.: 19-312-100
ENCL NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
271.6												
0.0 / 271.3	**TOPSOIL:** 350mm											
0.4 / 270.8	**WEATHERED/ DISTURBED SOIL:** sandy silt, trace clay, trace organics/ rootles, dark brown, wet, very loose		1	SS	3		271					
1 0.8	**SILTY SAND:** trace clay, brown, wet, compact		2	SS	15	▽	W. L. 270.5 m Jan 02, 2020					
2 / 269.3			3	SS	21		W. L. May 03, 2021					
2.3 / 268.5	**SILT:** trace clay, trace sand, grey, moist, compact		4	SS	22		269					
3.1	**SANDY SILT TO SILTY SAND TILL:** trace clay, trace to some gravel, grey, wet, compact to very dense		5	SS	23		268 W. L. 267.9 m Feb 03, 2021					
4							Filter Pack					
	cobble below 4.6m		6	SS	83		Slotted Pipe					15 39 41 5
5 / 265.5							266					
6.1 / 264.9	**SILT:** trace to some clay, trace sand, grey, moist, very dense		7	SS	68		265					
6.7	**END OF BOREHOLE:**											

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

Date:	Water Level (mbgl):
Jan 02, 2020	1.1
Feb 03, 2021	3.7
May 03, 2021	1.3

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

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

DS SOIL LOG 19-312-100.GPJ DS.GDT 5/17/21

DS CONSULTANTS LTD.
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LOG OF BOREHOLE BH21-1

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Old School Rd & Hurontario St., ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4845119.609 E 592638.335

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/25/2021

REF. NO.: 19-312-100
ENCL NO.: 10

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
263.0								20 40 60 80 100	10 20 30			
262.8 0.0	**TOPSOIL:** 225mm											
0.2	**FILL:** clayey silt, trace gravel, sand seams, trace topsoil/ organics, brown, moist, firm		1	SS	4							
262.2												
1 0.8	**SILTY CLAY TILL:** sandy, trace gravel, sand seams, brown, moist, very stiff to hard		2	SS	23		262					
2			3	SS	34	▼						2 18 49 31
260.4							W. L. 261.1 m Feb 03, 2021					
2.6	**SAND TO SILTY SAND:** trace silt, brown, wet, loose to compact		4	SS	18		Bentonite					
3			5	SS	19		260					
4							259					
5			6	SS	7		258					
6	grey below 6m						257					
			7	SS	9		Filter Pack					0 59 40 1
7							Slotted Pipe					
255.5							256					
7.5	**SILTY CLAY:** trace gravel, wet sand seams, grey, very moist, very stiff		8	SS	19		255					
8 254.8												
8.2	**END OF BOREHOLE:**											

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

Date:	Water Level (mbgl):
Feb 03, 2021	1.9
May 03, 2021	1.9

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

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

DS SOIL LOG 19-312-101 PHASE 2 GEO_ARGO DEVELOPMENTS.GPJ DS.GDT 5/25/21

DS CONSULTANTS LTD.
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LOG OF BOREHOLE BH21-2

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Old School Rd & Hurontario St., ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4845378.629 E 592843.693

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/25/2021

REF. NO.: 19-312-100
ENCL NO.: 11

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
260.5					
260.3 / 0.0	**TOPSOIL:** 200mm				
0.2 / 259.7	**FILL:** sandy silt to silty sand, trace clay, brown, moist, loose	1	SS	4	260
1 0.8 / 259.0	**SILTY SAND:** trace clay, grey, wet, compact	2	SS	14	
1.5 / 258.2	**CLAYEY SILT TO SILT:** trace gravel, sand seams, grey, moist, stiff	3	SS	10	
2.3	**SILTY SAND TO SANDY SILT TILL:** some clay, trace gravel, grey, wet, compact	4	SS	16	
		5	SS	12	257
		6	SS	49	256
254.1	very dense below 6.1m	7	SS	50/ 125mm	255
6.4	**END OF BOREHOLE:**				

Notes:
1) Water depth at 2.3m below grade during drilling.
2) 50mm dia. monitoring well installed upon completion.
3) Water level Reading:

Date:	Water Level (mbgl):
Feb 03, 2021	2.5
May 03, 2021	1.4

W. L. 259.2 m May 03, 2021
Bentonite
W. L. 258.0 m Feb 03, 2021
Filter Pack
Slotted Pipe

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

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LOG OF BOREHOLE BH21-3

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Old School Rd & Hurontario St., ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4844906.84 E 592779.707

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/25/2021

REF. NO.: 19-312-100
ENCL NO.: 12

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"
263.2				
263.0 0.0	**TOPSOIL:** 225mm			
0.2	**FILL:** clayey silt, trace gravel, trace topsoil, trace rootlets, brown, moist, firm	1	SS	4
262.1		2	SS	7
1.1 261.7	**CLAYEY SILT:** trace sand, brown, moist, firm (weathered/ disturbed)			
1.5	**SANDY SILT TO SILTY SAND:** trace clay, silty clay seams, brown, moist, loose	3	SS	7
260.9				
2.3	**SILT TO SANDY SILT:** trace clay, brown, wet, compact	4	SS	22
260.2				
3.0	**SILTY SAND:** trace clay, brown, wet, dense	5	SS	33
		6	SS	26
256.5		7	SS	24
6.7	**END OF BOREHOLE:**			

Notes:
1) Water depth at 3m below grade during drilling.
2) 50mm dia. monitoring well installed upon completion.
3) Water level Reading:

Date:	Water Level (mbgl):
Feb 03, 2021	3.6
May 03, 2021	3.4

GROUND WATER CONDITIONS: Bentonite; W. L. 259.8 m; W. L. 259.6 m Feb 03, 2021; Filter Pack; Slotted Pipe

ELEVATION: 263, 262, 261, 260, 259, 258, 257

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

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

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

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

METHANE AND GRAIN SIZE DISTRIBUTION (%)

	GR	SA	SI	CL
3	0	25	65	10
5	0	56	43	1

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

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LOG OF BOREHOLE BH21-4

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Old School Rd & Hurontario St., ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4845264.429 E 592898.163

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/25/2021

REF. NO.: 19-312-100
ENCL NO.: 13

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
262.9 / 0.0	**TOPSOIL:** 200mm						
0.2 / 261.4	**FILL:** clayey silt, trace gravel, trace rootlets/ topsoil, brown, moist, firm to stiff (weathered/ disturbed) sand seams below 0.8m		1	SS	7		
			2	SS	11		262
1.5 / 259.9	**SANDY SILT TO SILTY SAND:** trace clay, brown, very moist, compact wet below 2.3m		3	SS	13		261
			4	SS	17		260
3.0 / 256.9	**SANDY SILT:** some clay, seams of silty clay, brown, moist, compact		5	SS	26	W. L. 259.1 m Feb 03, 2021	
			6	SS	26		258
6.0 / 256.4	**SILTY SAND TILL:** trace clay, trace gravel, brown, wet, very dense		7	SS	88/ 255mm		257
6.5	**END OF BOREHOLE:**						

Notes:
1) Water depth at 4.5m below grade during drilling.
2) 50mm dia. monitoring well installed upon completion.
3) Water level Reading:

Date:	Water Level (mbgl):
Feb 03, 2021	3.8
May 03, 2021	3.8

Bentonite
Filter Pack
Slotted Pipe

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

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

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 19-312-101 PHASE 2 GEO_ARGO DEVELOPMENTS.GPJ DS.GDT 5/25/21

DS CONSULTANTS LTD.
Geotechnical ❖ Environmental ❖ Materials ❖ Hydrogeology

LOG OF BOREHOLE BH21-5

PROJECT: Geotechnical Investigation
CLIENT: Argo Developments
PROJECT LOCATION: Old School Rd & Hurontario St., ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4845495.406 E 593175.652

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/25/2021

REF. NO.: 19-312-100
ENCL NO.: 14

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
363.8 / 0.0	**TOPSOIL:** 280mm						
363.5 / 0.3	**FILL:** clayey silt, trace gravel, sand seams, brown, moist, stiff		1	SS	8		
363.0 / 0.8	**SILTY SAND TILL:** trace clay, trace gravel, brown, wet, loose to very dense		2	SS	8		363
			3	SS	24		362
	trace cobble below 2.3m		4	SS	35		361
			5	SS	74/200mm		360
			6	SS	50/75mm		359
357.8 / 6.0	**SILT:** trace clay, sand seams, brown, very moist, dense		7	SS	39		358
357.1 / 6.7	**END OF BOREHOLE:**						

W. L. 364.8 m, May 03, 2021

Bentonite
Filter Pack
Slotted Pipe

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

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

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

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

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

Notes:
1) Water depth at 3m below grade during drilling.
2) 50mm dia. monitoring well installed upon completion.
3) Water level Reading:

Date:	Water Level (mbgl):
Feb 03, 2021	frozen
May 03, 2021	-1.0 (above ground level)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 19-312-101 PHASE 2 GEO_ARGO DEVELOPMENTS.GPJ DS.GDT 5/25/21

Appendix B

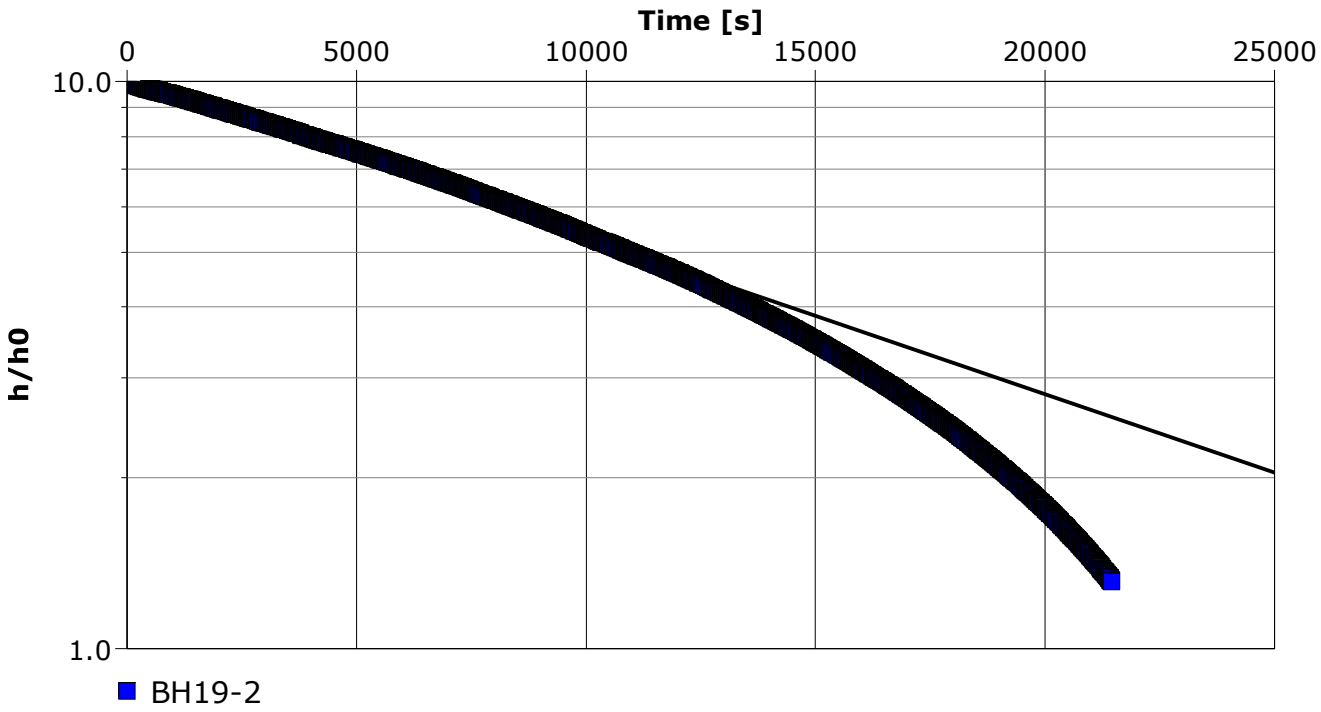
Slug Test Analysis Report

Project: Newhouse, Hicsk & Russel Properties

Number: 19-312-101

Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH19-2	Test Well: BH19-2
Test Conducted by: DG		Test Date: 1/3/2020
Analysis Performed by: DG	BH19-2	Analysis Date: 1/6/2020
Aquifer Thickness: 14.00 m		

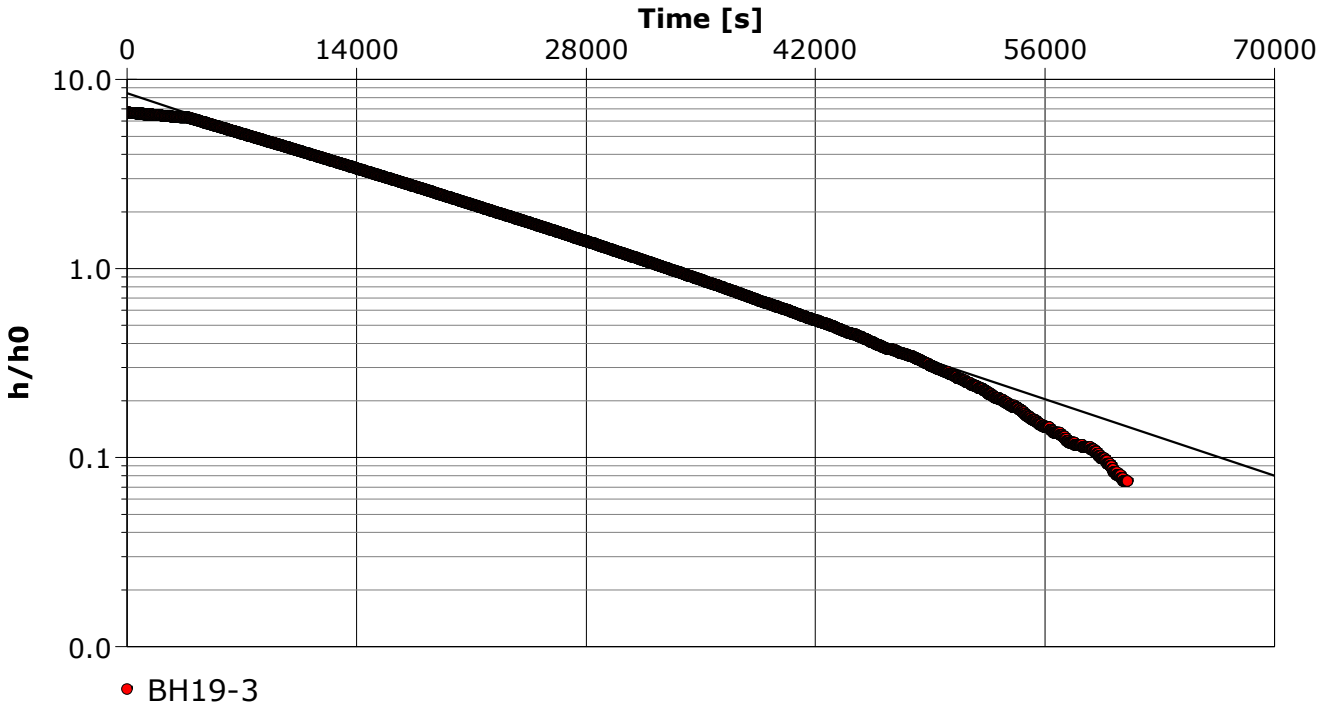


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH19-2	3.15×10^{-8}	

	Slug Test Analysis Report
	Project: Newhouse, Hicsk & Russel Properties
	Number: 19-312-101
	Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH19-3	Test Well: BH19-3
Test Conducted by: DG		Test Date: 1/3/2020
Analysis Performed by: DG	BH19-7	Analysis Date: 1/6/2020
Aquifer Thickness: 12.60 m		

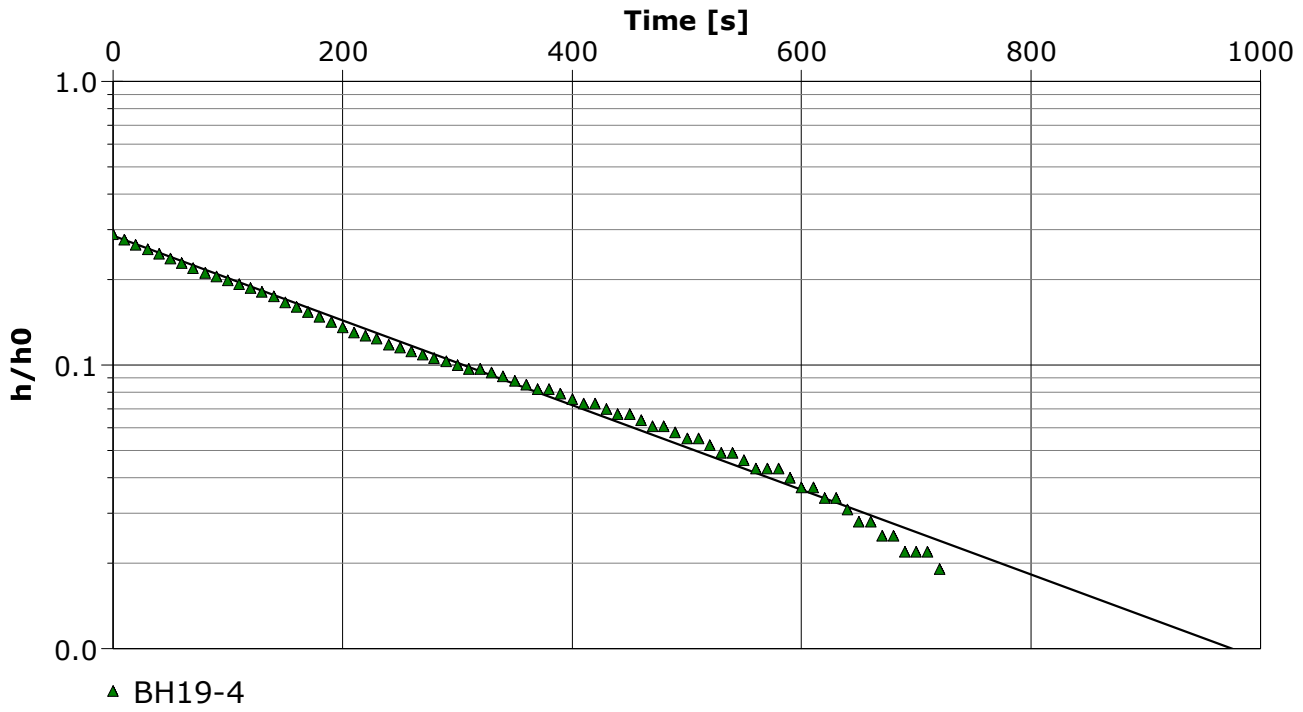


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH19-3	2.84×10^{-8}	

	Slug Test Analysis Report
	Project: Newhouse, Hicsk & Russel Properties
	Number: 19-312-101
	Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH19-4	Test Well: BH19-4
Test Conducted by: DG		Test Date: 1/6/2020
Analysis Performed by: DG	BH19-4	Analysis Date: 1/6/2020
Aquifer Thickness: 6.70 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH19-4	1.33×10^{-6}	

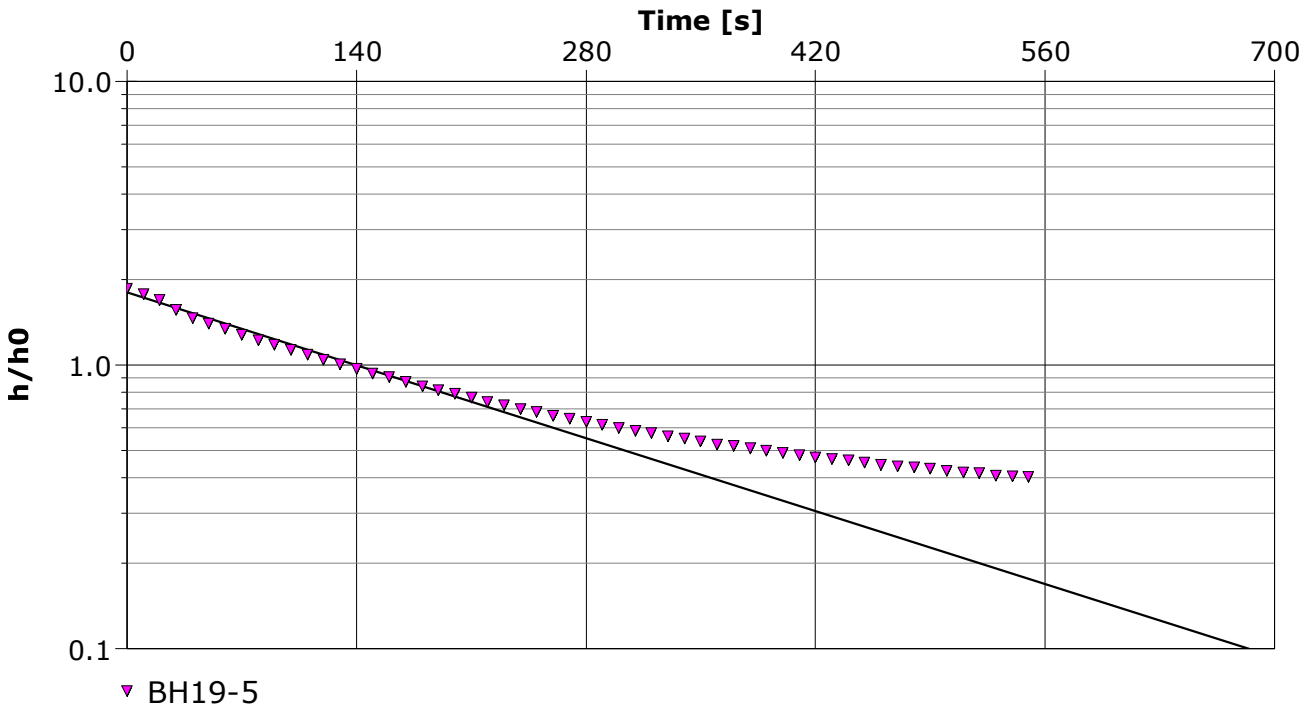
Slug Test Analysis Report

Project: Newhouse, Hicsk & Russel Properties

Number: 19-312-101

Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH19-5	Test Well: BH19-5
Test Conducted by: DG		Test Date: 1/3/2020
Analysis Performed by: DG	BH19-5	Analysis Date: 1/6/2020
Aquifer Thickness: 6.70 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH19-5	1.64×10^{-6}	

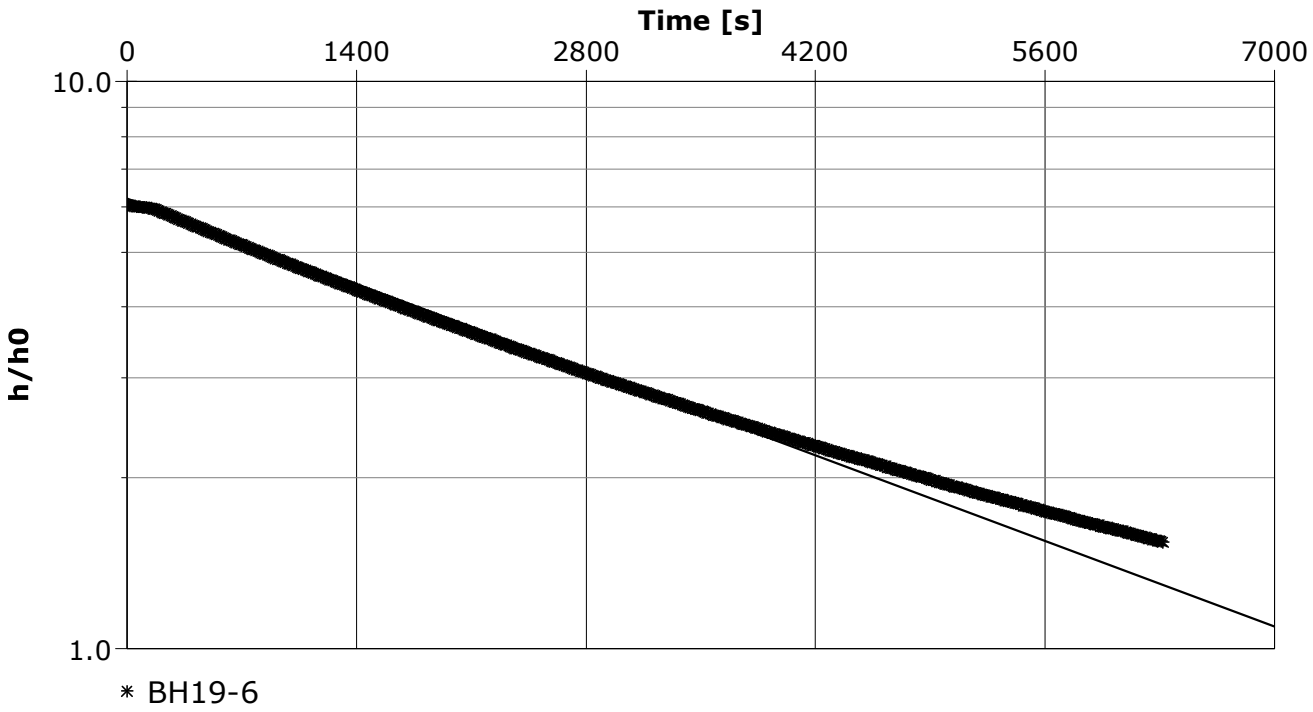
Slug Test Analysis Report

Project: Newhouse, Hicsk & Russel Properties

Number: 19-312-101

Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH19-6	Test Well: BH19-6
Test Conducted by: DG		Test Date: 1/3/2020
Analysis Performed by: DG	BH19-6	Analysis Date: 1/6/2020
Aquifer Thickness: 13.00 m		

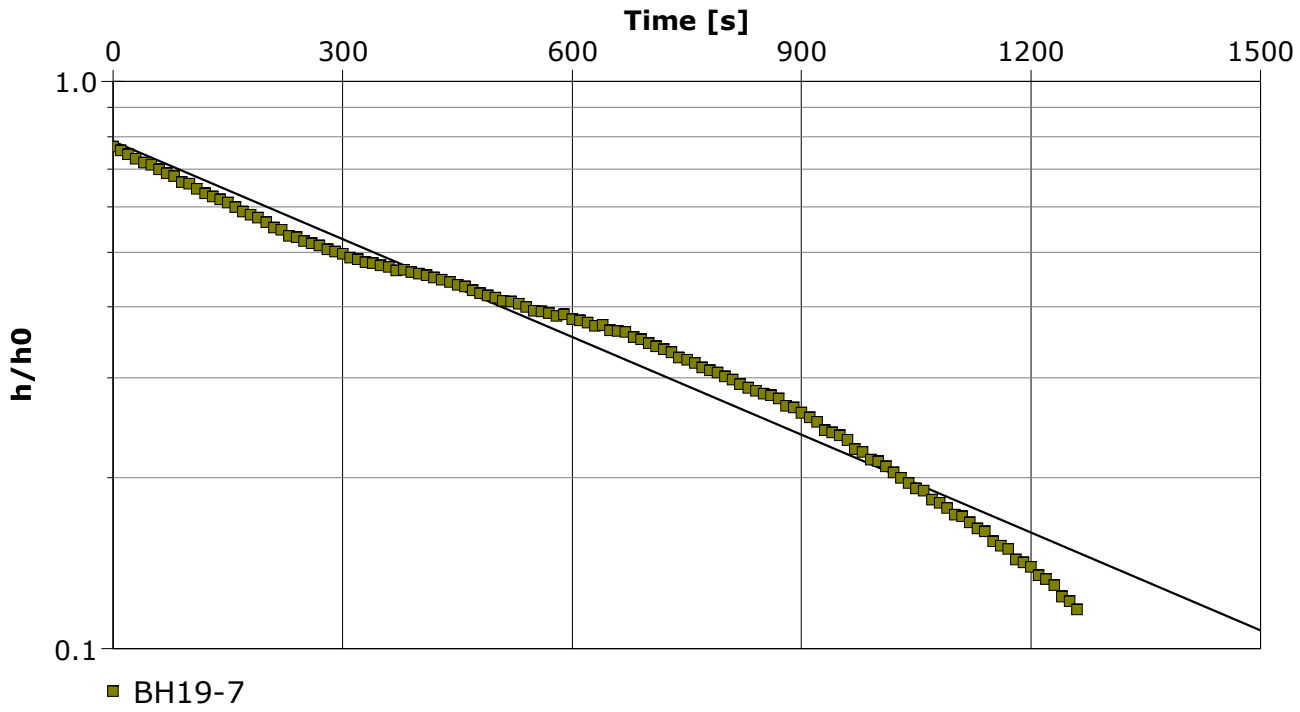


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH19-6	1.04×10^{-7}	

	Slug Test Analysis Report
	Project: Newhouse, Hicsk & Russel Properties
	Number: 19-312-101
	Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH19-7	Test Well: BH19-7
Test Conducted by: DG		Test Date: 1/3/2020
Analysis Performed by: DG	BH19-7	Analysis Date: 1/6/2020
Aquifer Thickness: 6.50 m		

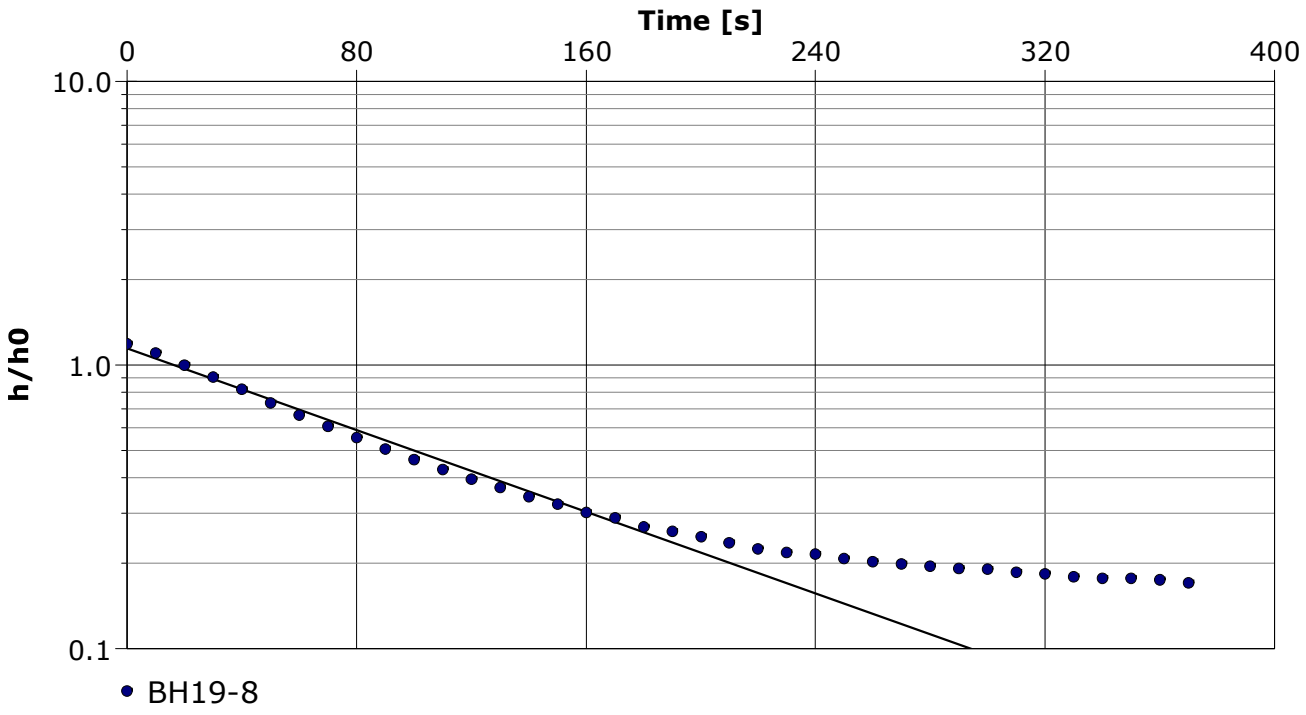


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH19-7	9.07×10^{-7}	

	Slug Test Analysis Report
	Project: Newhouse, Hicsk & Russel Properties
	Number: 19-312-101
	Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH19-8	Test Well: BH19-8
Test Conducted by: DG		Test Date: 1/3/2020
Analysis Performed by: DG	BH19-8	Analysis Date: 1/6/2020
Aquifer Thickness: 12.50 m		

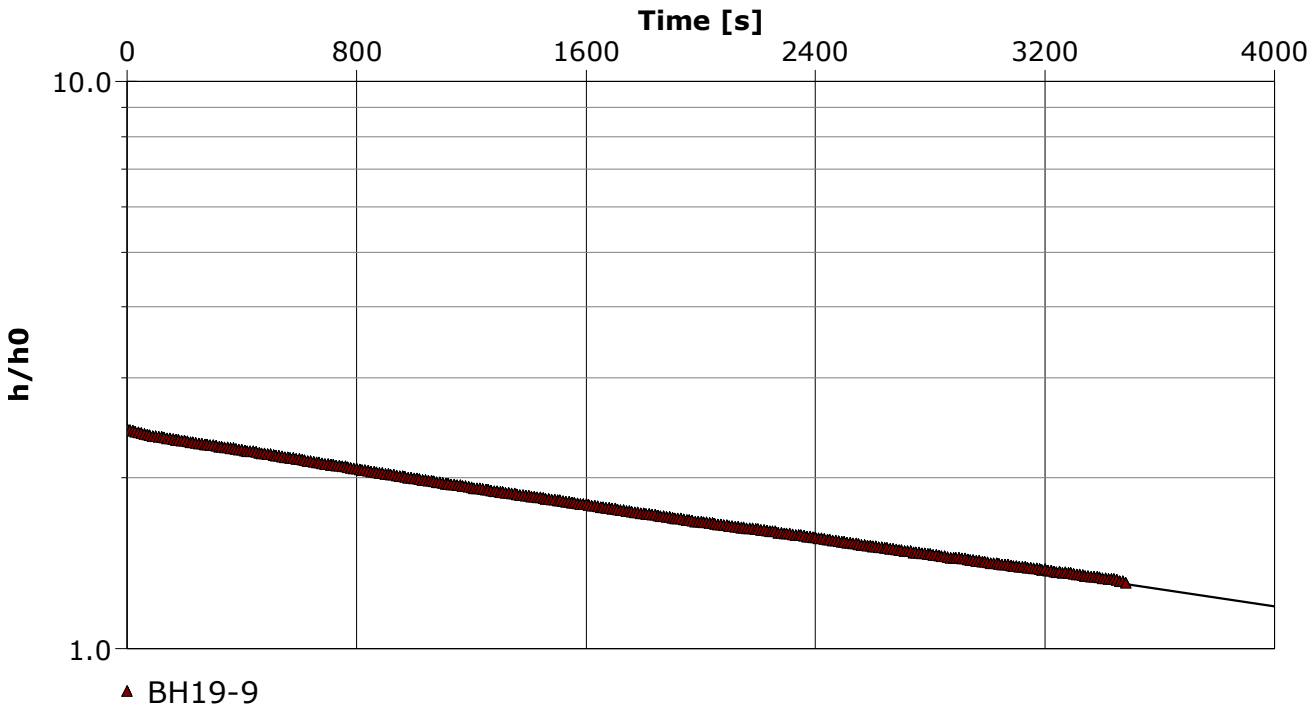


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH19-8	6.76×10^{-6}	

	Slug Test Analysis Report
	Project: Newhouse, Hicsk & Russel Properties
	Number: 19-312-101
	Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH19-9	Test Well: BH19-9
Test Conducted by: DG		Test Date: 1/3/2020
Analysis Performed by: DG	BH19-9	Analysis Date: 1/6/2020
Aquifer Thickness: 6.70 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH19-9	6.74×10^{-8}	

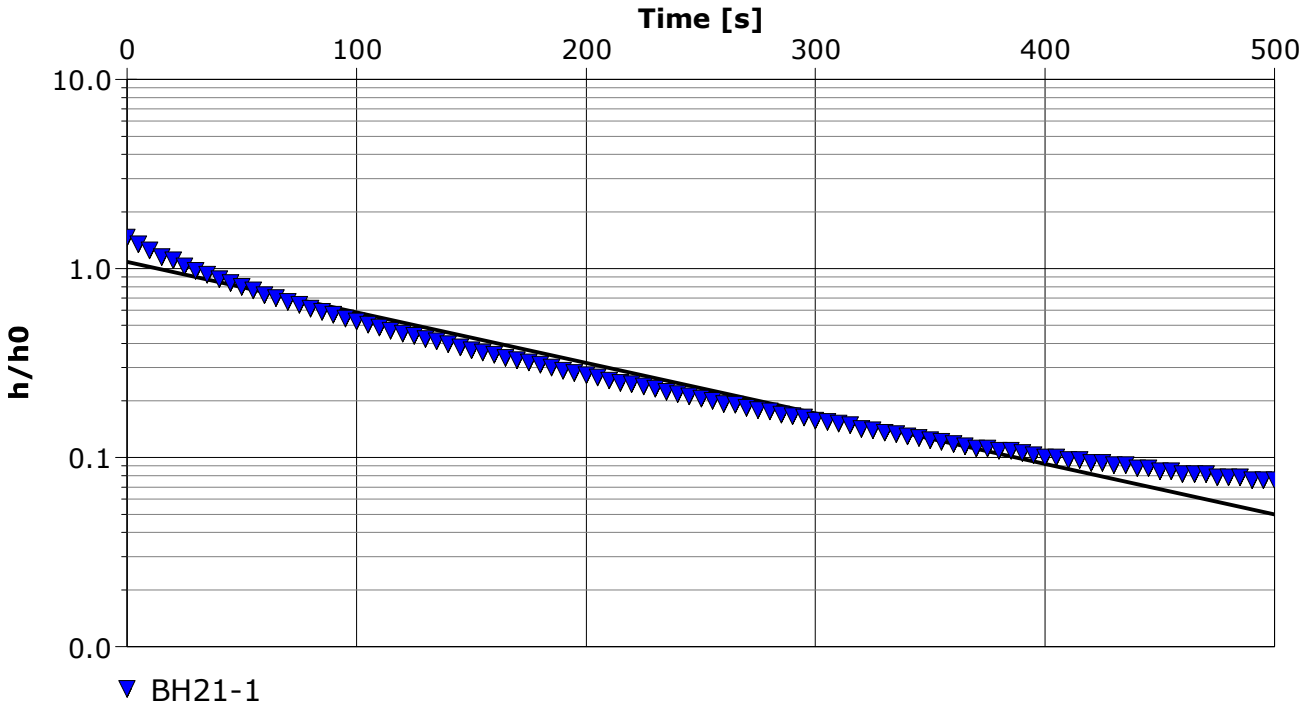
Slug Test Analysis Report

Project: Newhouse, Hicsk & Russel Properties

Number: 19-312-101

Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH21-1	Test Well: BH21-1
Test Conducted by:		Test Date: 2/3/2021
Analysis Performed by: DG	BH21-1	Analysis Date: 1/26/2021
Aquifer Thickness: 10.00 m		

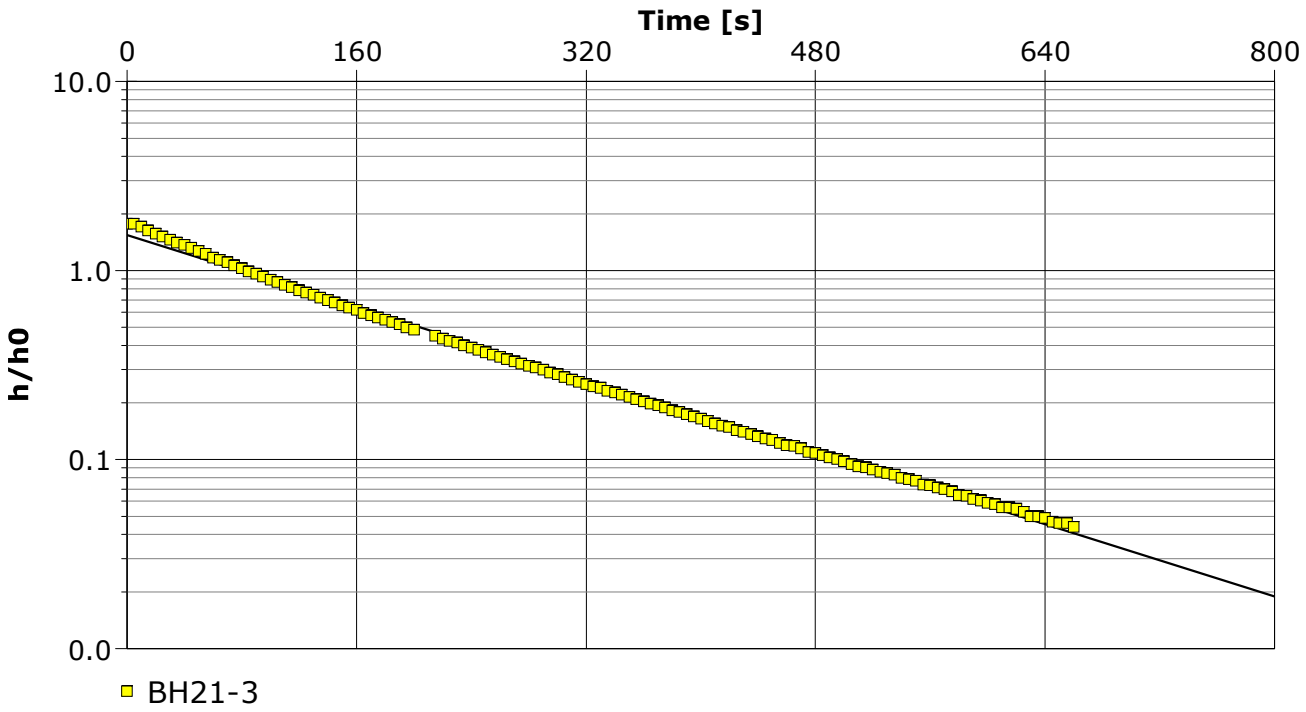


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH21-1	4.50×10^{-6}	

	Slug Test Analysis Report
	Project: Newhouse, Hicsk & Russel Properties
	Number: 19-312-101
	Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH21-3	Test Well: BH21-3
Test Conducted by: MP		Test Date: 2/3/2021
Analysis Performed by: DG	BH21-3	Analysis Date: 1/26/2021
Aquifer Thickness: 10.00 m		

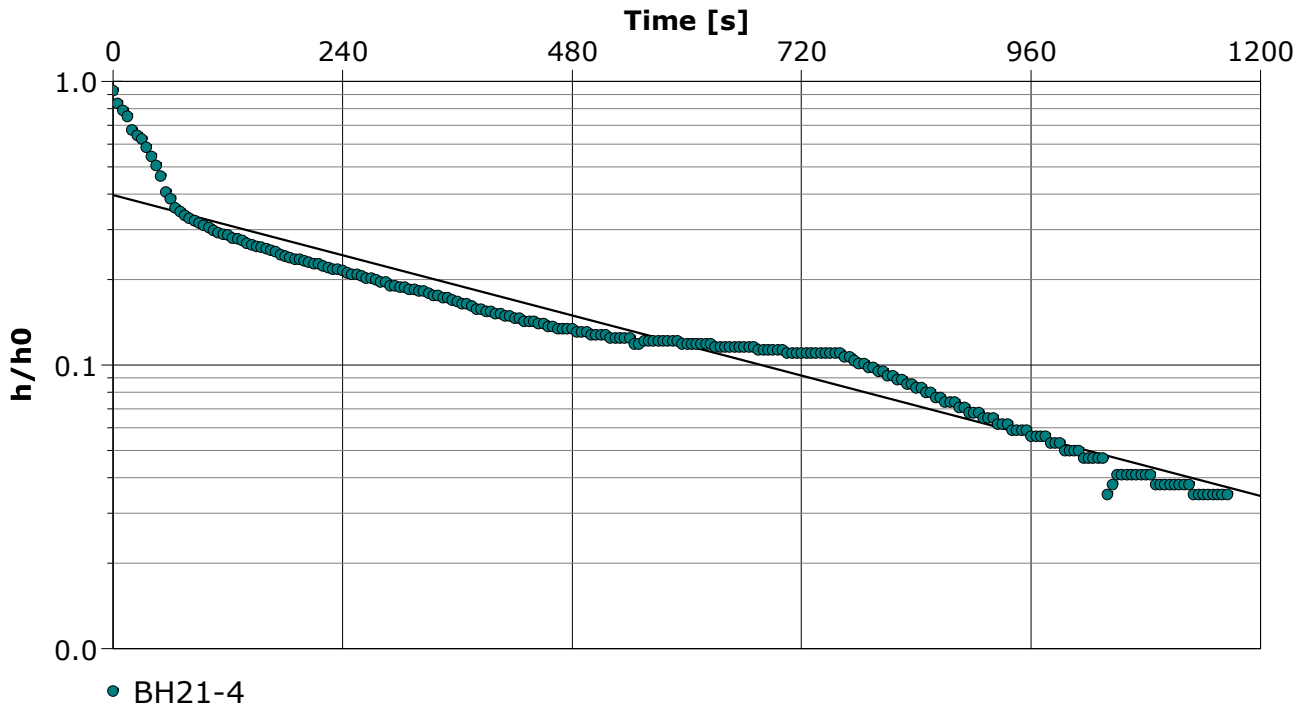


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH21-3	3.93×10^{-6}	

	Slug Test Analysis Report
	Project: Newhouse, Hicsk & Russel Properties
	Number: 19-312-101
	Client: Argo Develpments

Location: Caledon, Ontario	Slug Test: BH21-4	Test Well: BH21-4
Test Conducted by: MP		Test Date: 2/3/2021
Analysis Performed by: DG	BH21-4	Analysis Date: 1/26/2021
Aquifer Thickness: 10.00 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH21-4	1.44×10^{-6}	

Appendix C

Appendix D

Summary of Groundwater and Surface water Monitoring

SG Details				4-May-21			22-Jun-21		
SG ID	TOP Elevation (masl)	Stick-up TOC (m) (t-bar)	Surface Elev. (masl)	Depth to Water (TOP)	Depth to Water (mbgs)	Water Level (masl)	Depth to Water (TOP)	Depth to Water (mbgs)	Water Level (masl)
SG1A	259.720	1.49	258.230	1.25	0.24	258.470	1.39	0.10	258.330
SG1B	256.891	1.62	255.271	1.26	0.36	255.631		dry	
SG2A	261.996	1.50	260.496	0.83	0.67	261.166		1.50	261.996
SGEC2	254.295	1.43	251.256	1.11	0.32	253.185	0.79	0.64	253.505
SGEC1	258.070	1.67	256.400	1.12	0.55	256.950	0.68	0.99	257.390
SG3A	264.260	1.34	262.920	1.00	0.34	263.260		dry	
SG3B	262.304	1.68	260.624	1.39	0.29	260.914	1.59	0.09	260.714
SG4A	266.571	1.55	265.021	1.00	0.55	265.571	1.24	0.31	265.331
SG4B	265.447	1.57	263.877	1.12	0.45	264.327	1.41	0.16	264.037
SG5A	265.509	1.33	264.179	0.94	0.39	264.569	1.06	0.27	264.449
SG5B	263.097	1.32	261.777	0.84	0.48	262.257	0.90	0.42	262.197

PZ Details					4-May-21			22-Jun-21		
PZ ID	TOP Elevation (masl)	Depth (m)(TOP)	Stick-up (m)	Surface Elev. (masl)	Depth to Water (TOP)	Depth to Water (mbgs)	Water Level (masl)	Depth to Water (TOP)	Depth to Water (mbgs)	Water Level (masl)
PZ1A-S	259.810	1.87	0.81	259.000	0.81	0.00	259.000	0.97	0.16	258.840
PZ1A-D	260.030	3.27	0.94	259.090	0.82	-0.12	259.210	0.94	0.00	259.090
PZHDF-S	259.454	1.78	0.90	258.554	1.39	0.49	258.064	1.54	0.64	257.914
PZHDF-D	259.049	1.87	0.55	258.499	0.85	0.30	258.199	1.01	0.46	258.039
PZ1B-S	256.972	1.89	0.85	256.127	1.41	0.57	255.562	1.82	0.98	255.152
PZ1B-D	257.588	3.39	1.43	256.158	2.10	0.67	255.488	2.56	1.13	255.028
PZ2A-S	261.915	1.78	0.82	261.095	0.96	0.14	260.955	1.30	0.48	260.615
PZ2A-D	261.600	1.88	0.48	261.120	0.65	0.17	260.950	0.98	0.50	260.620
SEEP1-S	260.841	1.91	1.22	259.621	1.45	0.23	259.391	1.81	0.59	259.031
SEEP1-D	260.084	1.91	0.52	259.564	0.82	0.30	259.264	1.19	0.67	258.894
PZEC1-S	258.275	1.89	0.84	257.440	1.40	0.57	256.875	1.57	0.74	256.705
PZEC1-D	258.320	2.67	0.82	257.500	1.47	0.65	256.850	1.60	0.78	256.720
PZ3A-S	264.084	1.90	0.77	263.314	0.97	0.20	263.114	1.44	0.67	262.644
PZ3A-D	264.042	2.47	1.02	263.022	1.13	0.11	262.912	1.57	0.55	262.472
PZ3B-S	262.105	1.62	1.10	261.005	1.17	0.07	260.935	1.26	0.16	260.845
PZ3B-D	261.980	2.44	0.98	261.000	0.99	0.01	260.990	1.39	0.41	260.590
PZ4A-S	266.883	1.87	0.83	266.053	1.24	0.41	265.643	1.65	0.82	265.233
PZ4A-D	266.685	2.43	0.62	266.065	1.10	0.48	265.585	1.26	0.64	265.425
PZ4B-S	265.537	1.84	0.88	264.657	1.01	0.13	264.527	0.95	0.07	264.587
PZ4B-D	265.687	2.51	1.03	264.657	1.30	0.27	264.387	1.20	0.17	264.487

STREAM FLOW MEASURMENTS
Hicks Property, Caledon, ON

Flow Measurment Location:
Wetland 1 (SG1B)

Date:
5/4/2021

Stream Section Dimensions						
Stream Section ID	H1	H2	H3	H4	H5	H6
Stream Section Width (m)	0.25					
Section Water Column Height	0.02					
Section Area (m2)	0.005	0	0	0	0	0
Average stream section flow velocity (m/s)						
Average Velocity (m/s)	0.06					
Stream Section Flow Rate (m3/s)						
Stream Section Flow Rate (m3/s)	0.0003	0	0	0	0	0

Total Stream Flow Rate	
0.00	m3/s
26	m3/day
0.30	L/s
25,920	L/day

very little flow, spot reading

Flow Measurment Location:
Wetland 2 (SG2B)

Date:
5/4/2021

Stream Section Dimensions						
Stream Section ID	H1	H2	H3	H4	H5	H6
Stream Section Width (m)	0.25	0.25	0.25			
Section Water Column Height	0.07	0.256	0.125			
Section Area (m2)	0.0175	0.064	0.03125	0	0	0
Average stream section flow velocity (m/s)						
Average Velocity (m/s)	0.08	0.06	0.07			
Stream Section Flow Rate (m3/s)						
Stream Section Flow Rate (m3/s)	0.0014	0.00384	0.0021875	0	0	0

Total Stream Flow Rate	
0.01	m3/s
642	m3/day
7.43	L/s
641,736	L/day

Flow Measurment Location:
Etobicoke Creek outlet (EC1), SG-EC

Date:
5/4/2021

Stream Section Dimensions							
Stream Section ID	H1	H2	H3	H4	H5	H6	H7
Stream Section Width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Section Water Column Height	0.007	0.129	0.37	0.012	0.119	0.258	0.03
Section Area (m2)	0.00175	0.03225	0.0925	0.003	0.02975	0.0645	0.0075
Average stream section flow velocity (m/s)							
Average Velocity (m/s)	0.07	0.14	0.13	0.19	0.12	0.12	0.05
Stream Section Flow Rate (m3/s)							
Stream Section Flow Rate (m3/s)	0.0001225	0.004515	0.012025	0.00057	0.00357	0.00774	

Total Stream Flow Rate	
0.03	m3/s
2466	m3/day
28.54	L/s
2,466,072	L/day

Flow Measurment Location: **Wetland 3 (SG3B)** **Date:** **5/4/2021**

Stream Section Dimensions								
Stream Section ID	H1	H2	H3	H4	H5	H6	H7	
Stream Section Width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Section Water Column Height	0.035	0.112	0.111	0.049	0.096	0.112	0.024	
Section Area (m2)	0.00875	0.028	0.02775	0.01225	0.024	0.028	0.006	
Average stream section flow velocity (m/s)								
Average Velocity (m/s)	0.09	0.11	0.18	0.16	0.17	0.15	0.12	
Stream Section Flow Rate (m3/s)								
Stream Section Flow Rate (m3/s)	0.0007875	0.00308	0.004995	0.00196	0.00408	0.0042		

Total Stream Flow Rate	
0.02	m3/s
1650	m3/day
19.10	L/s
1,650,456	L/day

Flow Measurment Location: **Wetland 4 (SG4A)** **Date:** **5/4/2021**

Stream Section Dimensions							
Stream Section ID	H1	H2	H3	H4	H5	H6	H7
Stream Section Width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Section Water Column Height	0.027	0.015	0.005	0.053	0.016	0.041	0.004
Section Area (m2)	0.00675	0.00375	0.00125	0.01325	0.004	0.01025	0.001
Average stream section flow velocity (m/s)							
Average Velocity (m/s)	0.34	0.48	0.58	0.64	0.45	0.31	0.19
Stream Section Flow Rate (m3/s)							
Stream Section Flow Rate (m3/s)	0.002295	0.0018	0.000725	0.00848	0.0018	0.0031775	0.00019

Total Stream Flow Rate	
0.02	m3/s
1579	m3/day
18.28	L/s
1,579,176	L/day

Flow Measurment Location: **Wetland 4 (SG4B)** **Date:** **5/4/2021**

Stream Section Dimensions								
Stream Section ID	H1	H2	H3	H4	H5	H6	H7	
Stream Section Width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Section Water Column Height	0.029	0.041	0.007	0.018	0.046	0.05	0.012	
Section Area (m2)	0.00725	0.01025	0.00175	0.0045	0.0115	0.0125	0.003	
Average stream section flow velocity (m/s)								
Average Velocity (m/s)	0.2	0.23	0.34	0.33	0.33	0.29	0.26	
Stream Section Flow Rate (m3/s)								
Stream Section Flow Rate (m3/s)	0.00145	0.0023575	0.000595	0.001485	0.003795	0.003625	0.00078	

Total Stream Flow Rate	
0.01	m3/s
1217	m3/day
14.09	L/s
1,217,160	L/day

Flow Measurment Location: **Wetland 4 (SG4C)** **Date:** **5/4/2021**

Stream Section Dimensions								
Stream Section ID	H1	H2	H3	H4	H5	H6	H7	
Stream Section Width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Section Water Column Height	0.03	0.045	0.015	0.032	0.062	0.006	0.016	
Section Area (m2)	0.0075	0.01125	0.00375	0.008	0.0155	0.0015	0.004	
Average stream section flow velocity (m/s)								
Average Velocity (m/s)	0.13	0.37	0.46	0.78	0.69	0.84	0.52	
Stream Section Flow Rate (m3/s)								
Stream Section Flow Rate (m3/s)	0.000975	0.0041625	0.001725	0.00624	0.010695	0.00126	0.00208	

Total Stream Flow Rate	
0.03	m3/s
2345	m3/day
27.14	L/s
2,344,680	L/day

Flow Measurment Location: **Wetland 5 (SG5A)** **Date:** **5/4/2021**

Stream Section Dimensions							
Stream Section ID	H1	H2	H3	H4	H5	H6	H7
Stream Section Width (m)	0.25	0.25	0.5	0.25	0.25	0.25	0.25
Section Water Column Height	0.03	0.055	0.021	0.086	0.004	0.096	0.036
Section Area (m2)	0.0075	0.01375	0.0105	0.0215	0.001	0.024	0.009
Average stream section flow velocity (m/s)							
Average Velocity (m/s)	0.18	0.23	0.31	0.37	0.48	0.50	0.40
Stream Section Flow Rate (m3/s)							
Stream Section Flow Rate (m3/s)	0.00135	0.0031625	0.003255	0.007955	0.00048	0.012	0.0036

Total Stream Flow Rate	
0.03	m3/s
2748	m3/day
31.80	L/s
2,747,736	L/day

Flow Measurment Location: **Wetland 5 (SG5B)** **Date:** **5/4/2021**

Stream Section Dimensions						
Stream Section ID	H1	H2	H3	H4	H5	H6
Stream Section Width (m)	0.25	0.25	0.25			
Section Water Column Height	0.013	0.02	0.032			
Section Area (m2)	0.00325	0.005	0.008	0	0	0
Average stream section flow velocity (m/s)						
Average Velocity (m/s)	0.17	0.49	0.61			
Stream Section Flow Rate (m3/s)						
Stream Section Flow Rate (m3/s)	0.0005525	0.00245	0.00488	0	0	0

Total Stream Flow Rate	
0.01	m3/s
681	m3/day
7.88	L/s
681,048	L/day

Flow Measurment Location: **Etobicoke Creek Outlet (ECO) - SGout** **Date:** **5/4/2021**

Stream Section Dimensions							
Stream Section ID	H1	H2	H3	H4	H5	H6	H7
Stream Section Width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Section Water Column Height	0.042	0.053	0.02	0.069	0.034	0.132	0.087
Section Area (m2)	0.0105	0.01325	0.005	0.01725	0.0085	0.033	0.02175
Average stream section flow velocity (m/s)							
Average Velocity (m/s)	0.18	0.27	0.26	0.29	0.28	0.28	0.15
Stream Section Flow Rate (m3/s)							
Stream Section Flow Rate (m3/s)	0.00189	0.0035775	0.0013	0.0050025	0.00238	0.00924	

Total Stream Flow Rate	
0.02	m3/s
2021	m3/day
23.39	L/s
2,020,896	L/day

STREAM FLOW MEASURMENTS
Hicks Property, Caledon, ON

Flow Measurment Location: **Wetland 4 (SG4A)** **Date:** **6/22/2021**

Stream Section Dimensions						
Stream Section ID	H1	H2	H3	H4	H5	
Stream Section Width (m)	0.25	0.25	0.25	0.25	0.25	
Section Water Column Height	0.26	0.37	0.4	0.28	0.2	
Section Area (m2)	0.065	0.0925	0.1	0.07	0.05	
Average stream section flow velocity (m/s)						
Average Velocity (m/s)	0	0.03	0.04	0.03	0.01	
Stream Section Flow Rate (m3/s)						
Stream Section Flow Rate (m3/s)	0	0.002775	0.004	0.0021	0.0005	

Total Stream Flow Rate	
0.01	m3/s
810	m3/day
9.38	L/s
810,000	L/day

Flow Measurment Location: **Wetland 4 (SG4B)** **Date:** **6/22/2021**

Stream Section Dimensions								
Stream Section ID	H1	H2	H3	H4	H5	H6	H7	
Stream Section Width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Section Water Column Height	0.13	0.2	0.38	0.43	0.43	0.43	0.24	
Section Area (m2)	0.0325	0.05	0.095	0.1075	0.1075	0.1075	0.06	
Average stream section flow velocity (m/s)								
Average Velocity (m/s)	0	0.01	0.02	0.01	0.01	0.002		
Stream Section Flow Rate (m3/s)								
Stream Section Flow Rate (m3/s)	0	0.0005	0.0019	0.001075	0.001075	0.000215	0	

Total Stream Flow Rate	
0.00	m3/s
412	m3/day
4.77	L/s
411,696	L/day

Flow Measurment Location: **Wetland 5 (SG5A)** **Date:** **6/22/2021**

Stream Section Dimensions						
Stream Section ID	H1	H2	H3	H4	H5	H6
Stream Section Width (m)	0.25	0.25	0.5	0.25	0.25	0.25
Section Water Column Height	0.18	0.14	0.12	0.19	0.12	0.08
Section Area (m2)	0.045	0.035	0.06	0.0475	0.03	0.02
Average stream section flow velocity (m/s)						
Average Velocity (m/s)	0.088	0.089	0.038	0.166	0.071	0.028
Stream Section Flow Rate (m3/s)						
Stream Section Flow Rate (m3/s)	0.00396	0.003115	0.00228	0.007885	0.00213	0.00056

Total Stream Flow Rate	
0.02	m3/s
1722	m3/day
19.93	L/s
1,721,952	L/day

Flow Measurment Location: **Wetland 5 (SG5B)** **Date:** **6/22/2021**

Stream Section Dimensions						
Stream Section ID	H1	H2	H3	H4	H5	H6
Stream Section Width (m)	0.25	0.25	0.5	0.25	0.25	0.25
Section Water Column Height	0.10	0.12	0.20	0.18	0.22	0.10
Section Area (m2)	0.025	0.03	0.1	0.045	0.055	0.025
Average stream section flow velocity (m/s)						
Average Velocity (m/s)	0	0.013	0.011	0.011	0.013	0.05
Stream Section Flow Rate (m3/s)						
Stream Section Flow Rate (m3/s)	0	0.00039	0.0011	0.000495	0.000715	0.00125

Total Stream Flow Rate	
0.00	m3/s
341	m3/day
3.95	L/s
341,280	L/day

Appendix E

PRELIMINARY REPORT

CA14195-FEB21 R1

19-312-101

Prepared for

DS Consultants

PRELIMINARY REPORT

CA14195-FEB21 R1

First Page

CLIENT DETAILS

Client	DS Consultants
Address	6221 Highway 7 Unit 16 Vaughan, Ontario L4H 0K8. Canada
Contact	Dorothy Garda
Telephone	905-264-9393
Facsimile	905-264-2685
Email	dorothy.garda@dsconsultants.ca
Project	19-312-101
Order Number	
Samples	Ground Water (1)

LABORATORY DETAILS

Project Specialist	Brad Moore Hon. B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2143
Facsimile	705-652-6365
Email	brad.moore@sgs.com
SGS Reference	CA14195-FEB21
Received	02/05/2021
Approved	01/01/1970
Report Number	CA14195-FEB21 R1
Date Reported	02/12/2021

COMMENTS

RL - SGS Reporting Limit
Temperature of Sample upon Receipt: 7 degrees C
Cooling Agent Present:Yes
Custody Seal Present:Yes

Chain of Custody Number:018753

SVOC prep has a low bias for 4-Terphenyl-d14 (surr) due to sample matrix (very high TSS)

Ecoli test elevated as High sediment in sample: result is from 1 mL filter

SIGNATORIES

The signatories will be applied on the final report.

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

PRELIMINARY REPORT

CA14195-FEB21 R1

Client: DS Consultants
Project: 19-312-101
Project Manager: Dorothy Garda
Samplers: Dorothy Garda

PACKAGE: **General Chemistry** (WATER)

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	9
Sample Name	BH21-3
Sample Matrix	Ground Water
Sample Date	04/02/2021

Parameter	Units	RL	L1	Result
General Chemistry				
Biochemical Oxygen Demand (BOD5)	mg/L	2		rpt
Total Suspended Solids	mg/L	2		79200
Total Kjeldahl Nitrogen	as N mg/L	0.5		< 0.5
Metals and Inorganics				
Fluoride	mg/L	0.06		0.14
Cyanide (total)	mg/L	0.01		< 0.01
Sulphate	mg/L	2		83
Aluminum (total)	mg/L	0.001	0.075	113
Aluminum (0.2µm)	mg/L	0.001	0.015	0.010
Antimony (total)	mg/L	0.0009	0.02	< 0.0009
Arsenic (total)	mg/L	0.0002	0.005	0.0505
Cadmium (total)	mg/L	0.000003	0.0001	0.00119
Chromium (total)	mg/L	0.00008	0.1	0.173
Copper (total)	mg/L	0.0002	0.001	0.386
Cobalt (total)	mg/L	0.000004	0.0009	0.113
Lead (total)	mg/L	0.00001	0.011	0.122
Manganese (total)	mg/L	0.00001		11.9
Molybdenum (total)	mg/L	0.00004	0.04	0.00158
Nickel (total)	mg/L	0.0001	0.025	0.226
Phosphorus (total)	mg/L	0.003	0.01	8.69
Selenium (total)	mg/L	0.00004	0.1	0.00238

PRELIMINARY REPORT

CA14195-FEB21 R1

Client: DS Consultants
Project: 19-312-101
Project Manager: Dorothy Garda
Samplers: Dorothy Garda

PACKAGE: **Metals and Inorganics** (WATER)

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	9
Sample Name	BH21-3
Sample Matrix	Ground Water
Sample Date	04/02/2021

Parameter	Units	RL	L1	Result
Metals and Inorganics (continued)				
Silver (total)	mg/L	0.00005	0.0001	0.00067
Tin (total)	mg/L	0.00006		0.00149
Titanium (total)	mg/L	0.00005		1.39
Zinc (total)	mg/L	0.002	0.02	0.592
Microbiology				
E. Coli	cfu/100mL	0	100	< 100↑
Nonylphenol and Ethoxylates				
Nonylphenol	mg/L	0.001		< 0.001
Nonylphenol Ethoxylates	mg/L	0.01		< 0.01
Nonylphenol diethoxylate	mg/L	0.01		< 0.01
Nonylphenol monoethoxylate	mg/L	0.01		< 0.01
Oil and Grease				
Oil & Grease (total)	mg/L	2		< 2
Oil & Grease (animal/vegetable)	mg/L	4		< 4
Oil & Grease (mineral/synthetic)	mg/L	4		< 4

PRELIMINARY REPORT

CA14195-FEB21 R1

Client: DS Consultants
Project: 19-312-101
Project Manager: Dorothy Garda
Samplers: Dorothy Garda

PACKAGE: **Other (ORP)** (WATER)

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	9
Sample Name	BH21-3
Sample Matrix	Ground Water
Sample Date	04/02/2021

Parameter	Units	RL	L1	Result
Other (ORP)				
pH	No unit	0.05	8.6	7.57
Mercury (total)	mg/L	0.00001	0.0002	0.00002
PCBs				
Polychlorinated Biphenyls (PCBs) - Total	mg/L	0.0001		< 0.0001
Phenols				
4AAP-Phenolics	mg/L	0.002	0.001	< 0.002
SVOCs				
di-n-Butyl Phthalate	mg/L	0.002		< 0.002
Bis(2-ethylhexyl)phthalate	mg/L	0.002		< 0.002
VOCs				
Chloroform	mg/L	0.0005		< 0.0005
1,2-Dichlorobenzene	mg/L	0.0005		< 0.0005
1,4-Dichlorobenzene	mg/L	0.0005		< 0.0005
cis-1,2-Dichloroethene	mg/L	0.0005		< 0.0005
trans-1,3-Dichloropropene	mg/L	0.0005		< 0.0005
Methylene Chloride	mg/L	0.0005	0.1	< 0.0005
1,1,2,2-Tetrachloroethane	mg/L	0.0005	0.07	< 0.0005
Methyl ethyl ketone	mg/L	0.02		< 0.02
Styrene	mg/L	0.0005		< 0.0005
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005	0.05	< 0.0005
Trichloroethylene	mg/L	0.0005	0.02	< 0.0005

PRELIMINARY REPORT

CA14195-FEB21 R1

Client: DS Consultants
Project: 19-312-101
Project Manager: Dorothy Garda
Samplers: Dorothy Garda

PACKAGE: **VOCs - BTEX** (WATER)

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	9
Sample Name	BH21-3
Sample Matrix	Ground Water
Sample Date	04/02/2021

Parameter	Units	RL	L1	Result
VOCs - BTEX				
Benzene	mg/L	0.0005	0.1	< 0.0005
Ethylbenzene	mg/L	0.0005	0.008	< 0.0005
Toluene	mg/L	0.0005	0.0008	< 0.0005
Xylene (total)	mg/L	0.0005		< 0.0005
m-p-xylene	mg/L	0.0005	0.002	< 0.0005
o-xylene	mg/L	0.0005	0.04	< 0.0005

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E L1
BH21-3				
Aluminum	SM 3030/EPA 200.8	mg/L	113	0.075
Arsenic	SM 3030/EPA 200.8	mg/L	0.0505	0.005
Cadmium	SM 3030/EPA 200.8	mg/L	0.00119	0.0001
Chromium	SM 3030/EPA 200.8	mg/L	0.173	0.1
Cobalt	SM 3030/EPA 200.8	mg/L	0.113	0.0009
Copper	SM 3030/EPA 200.8	mg/L	0.386	0.001
Lead	SM 3030/EPA 200.8	mg/L	0.122	0.011
Nickel	SM 3030/EPA 200.8	mg/L	0.226	0.025
Phosphorus	SM 3030/EPA 200.8	mg/L	8.69	0.01
Silver	SM 3030/EPA 200.8	mg/L	0.00067	0.0001
Zinc	SM 3030/EPA 200.8	mg/L	0.592	0.02
4AAP-Phenolics	SM 5530B-D	mg/L	< 0.002	0.001

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 375.4 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphate	DIO5011-FEB21	mg/L	2	<2	0	20	100	80	120	101	75	125

Biochemical Oxygen Demand

Method: SM 5210 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0014-FEB21	mg/L	2	< 2	22	30	101	70	130	100	70	130

Cyanide by SFA

Method: SM 4500 | Internal ref.: ME-CA-IENVISFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cyanide (total)	SKA0061-FEB21	mg/L	0.01	<0.01	ND	10	90	90	110	84	75	125

QC SUMMARY

Fluoride by Specific Ion Electrode

Method: SM 4500 I Internal ref.: ME-CA-[ENVIEWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
Fluoride	EWL0135-FEB21	mg/L	0.06	<0.06	3	10	102	90	110	NV	75	125

Mercury by CVAAS

Method: EPA 7471A/SM 3112B I Internal ref.: ME-CA-[ENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
Mercury (total)	EHG0010-FEB21	mg/L	0.00001	< 0.00001	ND	20	81	80	120	77	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0036-FEB21	mg/L	0.00005	<0.00005	ND	20	104	90	110	95	70	130
Aluminum (total)	EMS0036-FEB21	mg/L	0.001	<0.001	8	20	97	90	110	112	70	130
Aluminum (0.2µm)	EMS0036-FEB21	mg/L	0.001	<0.001	8	20	97	90	110	112	70	130
Arsenic (total)	EMS0036-FEB21	mg/L	0.0002	<0.0002	13	20	104	90	110	109	70	130
Cadmium (total)	EMS0036-FEB21	mg/L	0.000003	<0.000003	ND	20	101	90	110	105	70	130
Cobalt (total)	EMS0036-FEB21	mg/L	0.000004	<0.000004	8	20	101	90	110	103	70	130
Chromium (total)	EMS0036-FEB21	mg/L	0.00008	<0.00008	6	20	101	90	110	115	70	130
Copper (total)	EMS0036-FEB21	mg/L	0.0002	<0.0002	3	20	99	90	110	102	70	130
Manganese (total)	EMS0036-FEB21	mg/L	0.00001	<0.00001	1	20	102	90	110	105	70	130
Molybdenum (total)	EMS0036-FEB21	mg/L	0.00004	<0.00004	6	20	96	90	110	102	70	130
Nickel (total)	EMS0036-FEB21	mg/L	0.0001	<0.0001	3	20	96	90	110	101	70	130
Lead (total)	EMS0036-FEB21	mg/L	0.00001	<0.00001	8	20	100	90	110	104	70	130
Phosphorus (total)	EMS0036-FEB21	mg/L	0.003	0.003	10	20	99	90	110	NV	70	130
Antimony (total)	EMS0036-FEB21	mg/L	0.0009	<0.0009	ND	20	103	90	110	116	70	130
Selenium (total)	EMS0036-FEB21	mg/L	0.00004	<0.00004	14	20	104	90	110	101	70	130
Tin (total)	EMS0036-FEB21	mg/L	0.00006	<0.00006	ND	20	97	90	110	NV	70	130
Titanium (total)	EMS0036-FEB21	mg/L	0.00005	<0.00005	15	20	96	90	110	NV	70	130
Zinc (total)	EMS0036-FEB21	mg/L	0.002	<0.002	4	20	101	90	110	127	70	130
Silver (total)	EMS0043-FEB21	mg/L	0.00005	<0.00005	ND	20	101	90	110	105	70	130
Arsenic (total)	EMS0043-FEB21	mg/L	0.0002	<0.0002	4	20	104	90	110	103	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cadmium (total)	EMS0043-FEB21	mg/L	0.000003	<0.000003	15	20	102	90	110	108	70	130
Cobalt (total)	EMS0043-FEB21	mg/L	0.000004	<0.000004	5	20	103	90	110	102	70	130
Chromium (total)	EMS0043-FEB21	mg/L	0.00008	<0.00008	5	20	104	90	110	105	70	130
Copper (total)	EMS0043-FEB21	mg/L	0.0002	<0.0002	4	20	103	90	110	110	70	130
Manganese (total)	EMS0043-FEB21	mg/L	0.00001	<0.00001	1	20	99	90	110	106	70	130
Molybdenum (total)	EMS0043-FEB21	mg/L	0.00004	<0.00004	10	20	99	90	110	102	70	130
Nickel (total)	EMS0043-FEB21	mg/L	0.0001	<0.0001	4	20	103	90	110	99	70	130
Lead (total)	EMS0043-FEB21	mg/L	0.00001	<0.00001	1	20	99	90	110	106	70	130
Phosphorus (total)	EMS0043-FEB21	mg/L	0.003	<0.003	0	20	97	90	110	NV	70	130
Antimony (total)	EMS0043-FEB21	mg/L	0.0009	<0.0009	1	20	103	90	110	115	70	130
Selenium (total)	EMS0043-FEB21	mg/L	0.00004	<0.00004	1	20	103	90	110	120	70	130
Tin (total)	EMS0043-FEB21	mg/L	0.00006	<0.00006	11	20	103	90	110	NV	70	130
Titanium (total)	EMS0043-FEB21	mg/L	0.00005	<0.00005	8	20	97	90	110	NV	70	130
Zinc (total)	EMS0043-FEB21	mg/L	0.002	<0.002	2	20	103	90	110	126	70	130

QC SUMMARY

Microbiology

Method: SM 9222D | Internal ref.: ME-CA-IENVIMIC-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
E. Coli	BAC9114-FEB21	cfu/100mL	-	ACCEPTED	ACCEPTED							

Nonylphenol and Ethoxylates

Method: ASTM D7065-06 | Internal ref.: ME-CA-IENVIGC-LAK-AN-015

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
Nonylphenol diethoxylate	GCM0113-FEB21	mg/L	0.01	< 0.01			105	55	120			
Nonylphenol Ethoxylates	GCM0113-FEB21	mg/L	0.01	< 0.01								
Nonylphenol monoethoxylate	GCM0113-FEB21	mg/L	0.01	< 0.01			96	55	120			
Nonylphenol	GCM0113-FEB21	mg/L	0.001	< 0.001			96	55	120			

QC SUMMARY

Oil & Grease

Method: MOE E3401 | Internal ref.: ME-CA-IENVIGC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (total)	GCM0104-FEB21	mg/L	2	<2	NSS	20	103	75	125			

Oil & Grease-AV/MS

Method: MOE E3401/SM 5520F | Internal ref.: ME-CA-IENVIGC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (animal/vegetable)	GCM0104-FEB21	mg/L	4	< 4	NSS	20	NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0104-FEB21	mg/L	4	< 4	NSS	20	NA	70	130			

pH

Method: SM 4500 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0124-FEB21	No unit	0.05	NA	0		101			NA		

QC SUMMARY

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0079-FEB21	mg/L	0.002	<0.002	ND	10	100	80	120	99	75	125

Polychlorinated Biphenyls

Method: MOE E3400/EPA 8082A | Internal ref.: ME-CA-[ENV]GC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Polychlorinated Biphenyls (PCBs) - Total	GCM0118-FEB21	mg/L	0.0001	<0.0001	ND	30	138	60	140	NSS	60	140

QC SUMMARY

Semi-Volatile Organics

Method: EPA 3510C/8270D | Internal ref.: ME-CA-[ENV]GC-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Bis(2-ethylhexyl)phthalate	GCM0116-FEB21	mg/L	0.002	< 0.002	NSS	30	107	50	140	NSS	50	140
di-n-Butyl Phthalate	GCM0116-FEB21	mg/L	0.002	< 0.002	NSS	30	105	50	140	NSS	50	140

Suspended Solids

Method: SM 2540D | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0113-FEB21	mg/L	2	< 2	0	10	101	90	110	NA		

QC SUMMARY

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F I Internal ref.: ME-CA-[ENV]SFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen	SKA0097-FEB21	as N mg/L	0.5	<0.5	ND	10	102	90	110	NV	75	125
Total Kjeldahl Nitrogen	SKA0103-FEB21	as N mg/L	0.5	<0.5	ND	10	103	90	110	NV	75	125

QC SUMMARY

Volatile Organics

Method: EPA 5030B/8260C | Internal ref.: ME-CA-[ENVIGC-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1,1,2,2-Tetrachloroethane	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	98	60	130	100	50	140
1,2-Dichlorobenzene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	100	60	130	101	50	140
1,4-Dichlorobenzene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	100	60	130	100	50	140
Benzene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	100	60	130	99	50	140
Chloroform	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	99	60	130	98	50	140
cis-1,2-Dichloroethene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	101	60	130	99	50	140
Ethylbenzene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	104	60	130	101	50	140
m-p-xylene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	103	60	130	102	50	140
Methyl ethyl ketone	GCM0125-FEB21	mg/L	0.02	<0.02	ND	30	99	50	140	101	50	140
Methylene Chloride	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	100	60	130	99	50	140
o-xylene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	103	60	130	103	50	140
Styrene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	101	60	130	103	50	140
Tetrachloroethylene (perchloroethylene)	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	100	60	130	96	50	140
Toluene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	100	60	130	99	50	140
trans-1,3-Dichloropropene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	99	60	130	101	50	140
Trichloroethylene	GCM0125-FEB21	mg/L	0.0005	<0.0005	ND	30	99	60	130	97	50	140

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

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

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated. This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY

Environment, Health & Safety - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: U18755

Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Scott Ron
Received Date: 02 / 05 / 2021 (mm/dd/yy)
Received Time: 14 : 40 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☒ No ☐
Custody Seal Intact: Yes ☒ No ☐
Cooling Agent Present: Yes ☒ No ☐ Type: Ice
Temperature Upon Receipt (°C) 7c 7c 7c
LAB LIMS #: CA14195-FEB21

REPORT INFORMATION	INVOICE INFORMATION
Company: DS	☒ (same as Report Information)
Contact: Dorothy Gorda	Company: Accounting
Address: 16-6221 Hwy 7 Vaughan, ON	Contact:
Phone: 905-329-2735	Address:
Fax:	Phone:
Email: dorothy.gorda@dsconsultants.ca	Email:

Quotation #:
Project #: 19-312-101
P.O. #:
Site Location/ID:

TURNAROUND TIME (TAT) REQUIRED

☒ Regular TAT (5-7days)

TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☐ Table 1 ☐ Res/Park Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium/Fine
☐ Table ____
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☒ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA
☐ ODWS Not Reportable *See note

Sewer By-Law:
☐ Sanitary
☐ Storm
Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M & I: Metals & Inorganics (incl CrVI, CN, Hg pH,(B(HWS),EC,SAR--soil) (Cl, Na--water)	M & I: Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI	M & I: ICP Metals only Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Pb,Mo,Ni,	SVOC: PAHs only	SVOC: SVOCs all incl PAHs, ABNs, CPs	PCB: PCBs ☐ Total ☐ Aroclor	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides Organochlorine or specify other	Other (please specify)	Other (please specify)	Other (please specify)	Other (please specify)	Other (please specify)	Other (please specify)	Other (please specify)	TCLP: Specify TCLP tests ☐M&I ☐VOC ☐PCB ☐B(a)P ☐ABN ☐Ignit.	COMMENTS:
																					Appendix 2: 406/19 Leachate Screening Levels Table:	Sewer Use: Specify pkg: Reel	Water Characterization Pkg General ☐ Extended ☐		
1	BH21-3	02/04/21	5pm	17	GW	N																X			unfiltered sample
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

Observations/Comments/Special Instructions

Sampled By (NAME): Dorothy Gorda Signature: Date: 02 / 04 / 21 (mm/dd/yy)
Relinquished by (NAME): Dorothy Gorda Signature: Date: 02 / 05 / 21 (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Form No: 14 Date of Issue: 20 May, 2020

Note: Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. (2) Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). (3) Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. This document is issued by the Company under its General Conditions of Service accessible at http://www.sgs.com/terms_and_conditions.htm. (Printed copies are available upon request.) Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Appendix F

TABLE F-1

CLIMATE NORMALS 1981-2010 (ORANGEVILLE MOE CLIMATE STATION)

Water Balance - Hicks, Newhouse & Russel Properties, Caledon, ON

	Thornthwaite (1948)					
Month	Mean Temperature (°C)	Heat Index	Unadjusted Potential Evapotranspiration (mm)	Daylight Correction Value	Adjusted Potential Evapotranspiration (mm)	Total Precipitation (mm)
January	-7.5	0.0	0.0	0.81	0.0	64.3
February	-6.5	0.0	0.0	0.82	0.0	54.5
March	-2.1	0.0	0.0	1.02	0.0	60.9
April	5.3	1.1	25.9	1.13	29.2	70.1
May	11.7	3.6	58.1	1.27	73.8	86.6
June	16.9	6.3	84.7	1.29	109.3	81.3
July	19.4	7.8	97.5	1.30	126.8	80.8
August	18.4	7.2	92.4	1.20	110.9	88.2
September	14.3	4.9	71.4	1.04	74.3	87.0
October	7.8	2.0	38.4	0.95	36.5	76.6
November	2.0	0.2	9.5	0.8	7.6	87.1
December	-4.1	0.0	0.0	0.76	0.0	64.2
TOTALS		**33.1**	**478.0**		**568.4**	**901.6**

Notes: Daylight Correction values obtained from Instruction and Tables For Computing Potential Evapotranspiration and The Water Balance (Thornthwaite & Mather, 1957)

TABLE F-2
Pre-development Site Water Balance
Water Balance - Newhouse Property, Caledon, ON

	Catchments and Hydrologic Components		Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
	PET - Adjusted Potential Evapotranspiration (mm)		0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	568
	P - Total Precipitation (mm)		60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	902
	P-PET (mm)		60.90	40.87	12.75	-27.96	-46.00	-22.68	12.75	40.11	79.46	64.20	64.30	54.50	-
	Soil Moisture Deficit (mm)		0.00	0.00	0.00	-27.96	-73.96	-96.64	-83.89	-43.78	0.00	0.00	0.00	0.00	-
SITE	Pervious Area (Urban Lawn)	Soil Moisture Storage (mm)	125.00	125.00	125.00	97.04	51.04	28.36	41.11	81.22	125.00	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	106.14	108.04	95.40	74.25	36.49	7.64	0.00	0.00	0.00	531
		P-AET (mm)	60.90	40.87	12.75	-24.84	-27.24	-7.20	12.75	40.11	79.46	64.20	64.30	54.50	371
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-24.84	-52.08	-59.28	-46.54	-6.42	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	24.84	27.24	7.20	-12.75	-40.11	-6.42	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	73.04	64.20	64.30	54.50	371
		MECP Infiltration Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Run-Off Coefficient	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Infiltration (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	36.52	32.10	32.15	27.25	185
		Run-Off (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	36.52	32.10	32.15	27.25	185
		Catchment Area (m^2) = 86894	Subcatchment Monthly Volumes												
		AET (m^3)	0.00	2540.15	6417.09	9222.60	9388.42	8289.88	6452.17	3170.67	663.70	0.00	0.00	0.00	46145
		Infiltration (m^3)	2645.92	1775.56	553.97	0.00	0.00	0.00	0.00	0.00	3173.24	2789.30	2793.64	2367.86	16100
		Run-Off (m^3)	2645.92	1775.56	553.97	0.00	0.00	0.00	0.00	0.00	3173.24	2789.30	2793.64	2367.86	16100
	Pervious Area (Moderatley Rooted Crops)	Soil Moisture Storage (mm)	200.00	200.00	200.00	172.04	126.04	103.36	116.11	156.22	200.00	200.00	200.00	200.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	107.31	115.08	101.21	74.25	36.49	7.64	0.00	0.00	0.00	545
		P-AET (mm)	60.90	40.87	12.75	-26.01	-34.28	-13.01	12.75	40.11	79.46	64.20	64.30	54.50	357
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.01	-60.29	-73.29	-60.54	-20.43	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.01	34.28	13.01	-12.75	-40.11	-20.43	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	59.03	64.20	64.30	54.50	357
		MECP Infiltration Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Run-Off Coefficient	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Infiltration (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	29.51	32.10	32.15	27.25	178
		Run-Off (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	29.51	32.10	32.15	27.25	178
		Catchment Area (m^2) = 140016	Subcatchment Monthly Volumes												
		AET (m^3)	0.00	4093.06	10340.16	15025.04	16112.68	14170.41	10396.68	5109.04	1069.45	0.00	0.00	0.00	76317
		Infiltration (m^3)	4263.50	2861.05	892.63	0.00	0.00	0.00	0.00	0.00	4132.47	4494.53	4501.53	3815.45	24961
		Run-Off (m^3)	4263.50	2861.05	892.63	0.00	0.00	0.00	0.00	0.00	4132.47	4494.53	4501.53	3815.45	24961
	Pervious Area (Woodland)	Soil Moisture Storage (mm)	400.00	400.00	400.00	372.04	326.04	303.36	316.11	356.22	400.00	400.00	400.00	400.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	108.29	120.94	106.04	74.25	36.49	7.64	0.00	0.00	0.00	557
		P-AET (mm)	60.90	40.87	12.75	-26.99	-40.14	-17.84	12.75	40.11	79.46	64.20	64.30	54.50	345
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.99	-67.12	-84.97	-72.22	-32.11	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.99	40.14	17.84	-12.75	-40.11	-32.11	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	47.35	64.20	64.30	54.50	345
		MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
		Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
		Infiltration (mm)	36.54	24.52	7.65	0.00	0.00	0.00	0.00	0.00	28.41	38.52	38.58	32.70	207
		Run-Off (mm)	24.36	16.35	5.10	0.00	0.00	0.00	0.00	0.00	18.94	25.68	25.72	21.80	138
		Catchment Area (m^2) = 85874	Subcatchment Monthly Volumes												
		AET (m^3)	0.00	2510.32	6341.73	9298.96	10385.35	9106.15	6376.40	3133.43	655.90	0.00	0.00	0.00	47808
		Infiltration (m^3)	3137.82	2105.65	656.95	0.00	0.00	0.00	0.00	0.00	2439.89	3307.85	3313.00	2808.07	17769
		Run-Off (m^3)	2091.88	1403.77	437.97	0.00	0.00	0.00	0.00	0.00	1626.59	2205.23	2208.67	1872.04	11846
	Impervious Area (Buildings and Driveway)	Precipitation Surplus (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	902
		Evaporation Factor	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-
		Run-Off Coefficient	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	-
		Evaporation (mm)	18.27	21.03	25.98	24.39	24.24	26.46	26.10	22.98	26.13	19.26	19.29	16.35	270
		Run-Off (mm)	42.63	49.07	60.62	56.91	56.56	61.74	60.90	53.62	60.97	44.94	45.01	38.15	631
		Catchment Area (m^2) = 8609	Subcatchment Monthly Volumes												
		Evaporation (m^3)	157.29	181.05	223.66	209.98	208.68	227.80	224.70	197.84	224.96	165.81	166.07	140.76	2329
		Run-Off (m^3)	367.01	422.45	521.88	489.94	486.93	531.53	524.29	461.62	524.90	386.89	387.50	328.44	5433
			Total Catchment Volumes												
		Total AET (m^3)	0.00	9143.52	23098.98	33546.61	35886.45	31566.44	23225.25	11413.14	2389.05	0.00	0.00	0.00	170269
		Total Evaporation (m^3)	157.29	181.05	223.66	209.98	208.68	227.80	224.70	197.84	224.96	165.81	166.07	140.76	2329
		Total Infiltration (m^3)	10047.25	6742.26	2103.55	0.00	0.00	0.00	0.00	0.00	9745.60	10591.68	10608.18	8991.38	58830
		Total Runoff (m^3)	9368.31	6462.83	2406.45	489.94	486.93	531.53	524.29	461.62	9457.20	9875.95	9891.34	8383.79	58340

TABLE F-2
Pre-development Site Water Balance
Water Balance - Hicks Property, Caledon, ON

		Catchments and Hydrologic Components	Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	**568**
		P - Total Precipitation (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
		P-PET (mm)	60.90	40.87	12.75	-27.96	-46.00	-22.68	12.75	40.11	79.46	64.20	64.30	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-27.96	-73.96	-96.64	-83.89	-43.78	0.00	0.00	0.00	0.00	-
SITE	Pervious Area (Urban Lawn)	Soil Moisture Storage (mm)	125.00	125.00	125.00	97.04	51.04	28.36	41.11	81.22	125.00	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	106.14	108.04	95.40	74.25	36.49	7.64	0.00	0.00	0.00	**531**
		P-AET (mm)	60.90	40.87	12.75	-24.84	-27.24	-7.20	12.75	40.11	79.46	64.20	64.30	54.50	**371**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-24.84	-52.08	-59.28	-46.54	-6.42	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	24.84	27.24	7.20	-12.75	-40.11	-6.42	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	73.04	64.20	64.30	54.50	**371**
		MECP Infiltration Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Run-Off Coefficient	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Infiltration (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	36.52	32.10	32.15	27.25	**185**
		Run-Off (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	36.52	32.10	32.15	27.25	**185**
		Catchment Area (m^2) = 15023	Subcatchment Monthly Volumes												
		AET (m^3)	0.00	439.17	1109.47	1594.52	1623.19	1433.26	1115.53	548.19	114.75	0.00	0.00	0.00	**7978**
		Infiltration (m^3)	457.46	306.98	95.78	0.00	0.00	0.00	0.00	0.00	548.63	482.25	483.00	409.39	**2783**
		Run-Off (m^3)	457.46	306.98	95.78	0.00	0.00	0.00	0.00	0.00	548.63	482.25	483.00	409.39	**2783**
	Pervious Area (Moderatley Rooted Crops)	Soil Moisture Storage (mm)	200.00	200.00	200.00	172.04	126.04	103.36	116.11	156.22	200.00	200.00	200.00	200.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	107.31	115.08	101.21	74.25	36.49	7.64	0.00	0.00	0.00	**545**
		P-AET (mm)	60.90	40.87	12.75	-26.01	-34.28	-13.01	12.75	40.11	79.46	64.20	64.30	54.50	**357**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.01	-60.29	-73.29	-60.54	-20.43	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.01	34.28	13.01	-12.75	-40.11	-20.43	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	59.03	64.20	64.30	54.50	**357**
		MECP Infiltration Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Run-Off Coefficient	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Infiltration (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	29.51	32.10	32.15	27.25	**178**
		Run-Off (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	29.51	32.10	32.15	27.25	**178**
		Catchment Area (m^2) = 206859	Subcatchment Monthly Volumes												
		AET (m^3)	0.00	6047.05	15276.47	22197.87	23804.74	20935.24	15359.97	7548.06	1579.99	0.00	0.00	0.00	**112749**
		Infiltration (m^3)	6298.86	4226.89	1318.77	0.00	0.00	0.00	0.00	0.00	6105.27	6640.18	6650.52	5636.91	**36877**
		Run-Off (m^3)	6298.86	4226.89	1318.77	0.00	0.00	0.00	0.00	0.00	6105.27	6640.18	6650.52	5636.91	**36877**
	Pervious Area (Woodland)	Soil Moisture Storage (mm)	400.00	400.00	400.00	372.04	326.04	303.36	316.11	356.22	400.00	400.00	400.00	400.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	108.29	120.94	106.04	74.25	36.49	7.64	0.00	0.00	0.00	**557**
		P-AET (mm)	60.90	40.87	12.75	-26.99	-40.14	-17.84	12.75	40.11	79.46	64.20	64.30	54.50	**345**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.99	-67.12	-84.97	-72.22	-32.11	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.99	40.14	17.84	-12.75	-40.11	-32.11	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	47.35	64.20	64.30	54.50	**345**
		MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
		Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
		Infiltration (mm)	36.54	24.52	7.65	0.00	0.00	0.00	0.00	0.00	28.41	38.52	38.58	32.70	**207**
		Run-Off (mm)	24.36	16.35	5.10	0.00	0.00	0.00	0.00	0.00	18.94	25.68	25.72	21.80	**138**
		Catchment Area (m^2) = 79835	Subcatchment Monthly Volumes												
		AET (m^3)	0.00	2333.81	5895.82	8645.11	9655.11	8465.86	5928.05	2913.11	609.79	0.00	0.00	0.00	**44447**
		Infiltration (m^3)	2917.19	1957.60	610.76	0.00	0.00	0.00	0.00	0.00	2268.33	3075.26	3080.05	2610.62	**16520**
		Run-Off (m^3)	1944.79	1305.06	407.17	0.00	0.00	0.00	0.00	0.00	1512.22	2050.18	2053.37	1740.41	**11013**
	Impervious Area (Buildings and Driveway)	Precipitation Surplus (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
		Evaporation Factor	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-
		Run-Off Coefficient	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	-
		Evaporation (mm)	18.27	21.03	25.98	24.39	24.24	26.46	26.10	22.98	26.13	19.26	19.29	16.35	**270**
		Run-Off (mm)	42.63	49.07	60.62	56.91	56.56	61.74	60.90	53.62	60.97	44.94	45.01	38.15	**631**
		Catchment Area (m^2) = 1848	Subcatchment Monthly Volumes												
		Evaporation (m^3)	33.76	38.86	48.01	45.07	44.79	48.89	48.23	42.46	48.28	35.59	35.64	30.21	**500**
		Run-Off (m^3)	78.77	90.67	112.01	105.16	104.51	114.08	112.53	99.08	112.66	83.04	83.17	70.49	**1166**
			Total Catchment Volumes												
		Total AET (m^3)	0.00	8820.03	22281.75	32437.51	35083.04	30834.36	22403.55	11009.35	2304.53	0.00	0.00	0.00	**165174**
		Total Evaporation (m^3)	33.76	38.86	48.01	45.07	44.79	48.89	48.23	42.46	48.28	35.59	35.64	30.21	**500**
		Total Infiltration (m^3)	9673.51	6491.47	2025.30	0.00	0.00	0.00	0.00	0.00	8922.23	10197.69	10213.57	8656.92	**56181**
		Total Runoff (m^3)	8779.88	5929.60	1933.73	105.16	104.51	114.08	112.53	99.08	8278.78	9255.64	9270.06	7857.20	**51840**

TABLE F-2
Pre-development Site Water Balance
Water Balance - Russell, Property, Caledon, ON

Catchments and Hydrologic Components			Month												Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	**568**
		P - Total Precipitation (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
		P-PET (mm)	60.90	40.87	12.75	-27.96	-46.00	-22.68	12.75	40.11	79.46	64.20	64.30	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-27.96	-73.96	-96.64	-83.89	-43.78	0.00	0.00	0.00	0.00	-
SITE	Pervious Area (Urban Lawn)	Soil Moisture Storage (mm)	125.00	125.00	125.00	97.04	51.04	28.36	41.11	81.22	125.00	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	106.14	108.04	95.40	74.25	36.49	7.64	0.00	0.00	0.00	**531**
		P-AET (mm)	60.90	40.87	12.75	-24.84	-27.24	-7.20	12.75	40.11	79.46	64.20	64.30	54.50	**371**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-24.84	-52.08	-59.28	-46.54	-6.42	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	24.84	27.24	7.20	-12.75	-40.11	-6.42	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	73.04	64.20	64.30	54.50	**371**
		MECP Infiltration Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Run-Off Coefficient	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Infiltration (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	36.52	32.10	32.15	27.25	**185**
		Run-Off (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	36.52	32.10	32.15	27.25	**185**
		Catchment Area (m^2) = **25021**	**Subcatchment Monthly Volumes**												
		AET (m^3)	0.00	731.43	1847.79	2655.63	2703.37	2387.05	1857.89	912.99	191.11	0.00	0.00	0.00	**13287**
		Infiltration (m^3)	761.89	511.27	159.51	0.00	0.00	0.00	0.00	0.00	913.73	803.17	804.42	681.82	**4636**
		Run-Off (m^3)	761.89	511.27	159.51	0.00	0.00	0.00	0.00	0.00	913.73	803.17	804.42	681.82	**4636**
	Pervious Area (Moderatley Rooted Crops)	Soil Moisture Storage (mm)	200.00	200.00	200.00	172.04	126.04	103.36	116.11	156.22	200.00	200.00	200.00	200.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	107.31	115.08	101.21	74.25	36.49	7.64	0.00	0.00	0.00	**545**
		P-AET (mm)	60.90	40.87	12.75	-26.01	-34.28	-13.01	12.75	40.11	79.46	64.20	64.30	54.50	**357**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.01	-60.29	-73.29	-60.54	-20.43	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.01	34.28	13.01	-12.75	-40.11	-20.43	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	59.03	64.20	64.30	54.50	**357**
		MECP Infiltration Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Run-Off Coefficient	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Infiltration (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	29.51	32.10	32.15	27.25	**178**
		Run-Off (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	29.51	32.10	32.15	27.25	**178**
		Catchment Area (m^2) = **310780**	**Subcatchment Monthly Volumes**												
		AET (m^3)	0.00	9084.93	22950.97	33349.51	35763.63	31452.57	23076.43	11340.01	2373.74	0.00	0.00	0.00	**169392**
		Infiltration (m^3)	9463.25	6350.37	1981.28	0.00	0.00	0.00	0.00	0.00	9172.40	9976.03	9991.57	8468.75	**55404**
		Run-Off (m^3)	9463.25	6350.37	1981.28	0.00	0.00	0.00	0.00	0.00	9172.40	9976.03	9991.57	8468.75	**55404**
	Pervious Area (Woodland)	Soil Moisture Storage (mm)	400.00	400.00	400.00	372.04	326.04	303.36	316.11	356.22	400.00	400.00	400.00	400.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	108.29	120.94	106.04	74.25	36.49	7.64	0.00	0.00	0.00	**557**
		P-AET (mm)	60.90	40.87	12.75	-26.99	-40.14	-17.84	12.75	40.11	79.46	64.20	64.30	54.50	**345**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.99	-67.12	-84.97	-72.22	-32.11	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.99	40.14	17.84	-12.75	-40.11	-32.11	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	47.35	64.20	64.30	54.50	**345**
		MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
		Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
		Infiltration (mm)	36.54	24.52	7.65	0.00	0.00	0.00	0.00	0.00	28.41	38.52	38.58	32.70	**207**
		Run-Off (mm)	24.36	16.35	5.10	0.00	0.00	0.00	0.00	0.00	18.94	25.68	25.72	21.80	**138**
		Catchment Area (m^2) = **27459**	**Subcatchment Monthly Volumes**												
		AET (m^3)	0.00	802.70	2027.84	2973.44	3320.83	2911.79	2038.92	1001.95	209.73	0.00	0.00	0.00	**15287**
		Infiltration (m^3)	1003.35	673.31	210.07	0.00	0.00	0.00	0.00	0.00	780.18	1057.72	1059.37	897.91	**5682**
		Run-Off (m^3)	668.90	448.87	140.05	0.00	0.00	0.00	0.00	0.00	520.12	705.15	706.25	598.61	**3788**
	Impervious Area (Buildings and Driveway)	Precipitation Surplus (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
		Evaporation Factor	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-
		Run-Off Coefficient	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	-
		Evaporation (mm)	18.27	21.03	25.98	24.39	24.24	26.46	26.10	22.98	26.13	19.26	19.29	16.35	**270**
		Run-Off (mm)	42.63	49.07	60.62	56.91	56.56	61.74	60.90	53.62	60.97	44.94	45.01	38.15	**631**
		Catchment Area (m^2) = **5312**	**Subcatchment Monthly Volumes**												
		Evaporation (m^3)	97.06	111.72	138.02	129.57	128.77	140.57	138.65	122.08	138.81	102.32	102.48	86.86	**1437**
		Run-Off (m^3)	226.47	260.68	322.04	302.33	300.47	327.99	323.52	284.85	323.89	238.74	239.11	202.67	**3353**
			Total Catchment Volumes												
		Total AET (m^3)	0.00	10619.06	26826.59	38978.59	41787.83	36751.41	26973.24	13254.94	2774.59	0.00	0.00	0.00	**197966**
		Total Evaporation (m^3)	97.06	111.72	138.02	129.57	128.77	140.57	138.65	122.08	138.81	102.32	102.48	86.86	**1437**
		Total Infiltration (m^3)	11228.49	7534.94	2350.86	0.00	0.00	0.00	0.00	0.00	10866.31	11836.93	11855.36	10048.48	**65721**
		Total Runoff (m^3)	11120.50	7571.18	2602.88	302.33	300.47	327.99	323.52	284.85	10930.14	11723.09	11741.35	9951.84	**67180**

TABLE E-3

Post-development Site Water Balance

Water Balance - Newhouse, Property, Caledon, ON

Catchments and Hydrologic Components		Month												Total
		March	April	May	June	July	August	September	October	November	December	January	February	
PET - Adjusted Potential Evapotranspiration (mm)		0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	**568**
P - Total Precipitation (mm)		60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
P-PET (mm)		60.90	40.87	12.75	-27.96	-46.00	-22.68	12.75	40.11	79.46	64.20	64.30	54.50	-
Soil Moisture Deficit (mm)		0.00	0.00	0.00	-27.96	-73.96	-96.64	-83.89	-43.78	0.00	0.00	0.00	0.00	-
Pervious Area (Pasture and Shrub)	**Soil Moisture Storage (mm)**	200.00	200.00	200.00	172.04	126.04	103.36	116.11	156.22	200.00	200.00	200.00	200.00	-
	Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	107.31	115.08	101.21	74.25	36.49	7.64	0.00	0.00	0.00	**545**
	P-AET (mm)	60.90	40.87	12.75	-26.01	-34.28	-13.01	12.75	40.11	79.46	64.20	64.30	54.50	**357**
	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.01	-60.29	-73.29	-60.54	-20.43	0.00	0.00	0.00	0.00	-
	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.01	34.28	13.01	-12.75	-40.11	-20.43	0.00	0.00	0.00	-
	Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	59.03	64.20	64.30	54.50	**357**
	MECP Infiltration Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
	Run-Off Coefficient	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
	Infiltration (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	29.51	32.10	32.15	27.25	**178**
	Run-Off (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	29.51	32.10	32.15	27.25	**178**
	Catchment Area (m^2) = 68326	**Subcatchment Monthly Volumes**												
	AET (m^3)	0.00	1997.36	5045.88	7332.04	7862.80	6914.99	5073.46	2493.15	521.88	0.00	0.00	0.00	**37242**
	Infiltration (m^3)	2080.54	1396.16	435.59	0.00	0.00	0.00	0.00	0.00	2016.59	2193.28	2196.69	1861.89	**12181**
	Run-Off (m^3)	2080.54	1396.16	435.59	0.00	0.00	0.00	0.00	0.00	2016.59	2193.28	2196.69	1861.89	**12181**
Pervious Area (Woodland)	**Soil Moisture Storage (mm)**	250.00	250.00	250.00	222.04	176.04	153.36	166.11	206.22	250.00	250.00	250.00	250.00	-
	Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	107.70	117.42	103.14	74.25	36.49	7.64	0.00	0.00	0.00	**550**
	P-AET (mm)	60.90	40.87	12.75	-26.40	-36.62	-14.94	12.75	40.11	79.46	64.20	64.30	54.50	**352**
	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.40	-63.02	-77.96	-65.21	-25.10	0.00	0.00	0.00	0.00	-
	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.40	36.62	14.94	-12.75	-40.11	-25.10	0.00	0.00	0.00	-
	Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	54.36	64.20	64.30	54.50	**352**
	MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
	Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
	Infiltration (mm)	36.54	24.52	7.65	0.00	0.00	0.00	0.00	0.00	32.62	38.52	38.58	32.70	**211**
	Run-Off (mm)	24.36	16.35	5.10	0.00	0.00	0.00	0.00	0.00	21.74	25.68	25.72	21.80	**141**
	Catchment Area (m^2) = 85874	**Subcatchment Monthly Volumes**												
	AET (m^3)	0.00	2510.32	6341.73	9248.60	10083.39	8856.98	6376.40	3133.43	655.90	0.00	0.00	0.00	**47207**
	Infiltration (m^3)	3137.82	2105.65	656.95	0.00	0.00	0.00	0.00	0.00	2800.79	3307.85	3313.00	2808.07	**18130**
	Run-Off (m^3)	2091.88	1403.77	437.97	0.00	0.00	0.00	0.00	0.00	1867.19	2205.23	2208.67	1872.04	**12087**
Pervious Area (Urban Lawn)	**Soil Moisture Storage (mm)**	125.00	125.00	125.00	97.04	51.04	28.36	41.11	81.22	125.00	125.00	125.00	125.00	-
	Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	106.14	108.04	95.40	74.25	36.49	7.64	0.00	0.00	0.00	**531**
	P-AET (mm)	60.90	40.87	12.75	-24.84	-27.24	-7.20	12.75	40.11	79.46	64.20	64.30	54.50	**371**
	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-24.84	-52.08	-59.28	-46.54	-6.42	0.00	0.00	0.00	0.00	-
	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	24.84	27.24	7.20	-12.75	-40.11	-6.42	0.00	0.00	0.00	-
	Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	73.04	64.20	64.30	54.50	**371**
	MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
	Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
	Infiltration (mm)	36.54	24.52	7.65	0.00	0.00	0.00	0.00	0.00	43.82	38.52	38.58	32.70	**222**
	Run-Off (mm)	24.36	16.35	5.10	0.00	0.00	0.00	0.00	0.00	29.21	25.68	25.72	21.80	**148**
	Catchment Area (m^2) = 20508	**Subcatchment Monthly Volumes**												
	AET (m^3)	0.00	599.51	1514.53	2176.67	2215.81	1956.54	1522.81	748.32	156.64	0.00	0.00	0.00	**10891**
	Infiltration (m^3)	749.37	502.87	156.89	0.00	0.00	0.00	0.00	0.00	898.72	789.98	791.21	670.62	**4560**
	Run-Off (m^3)	499.58	335.25	104.60	0.00	0.00	0.00	0.00	0.00	599.15	526.65	527.47	447.08	**3040**

TABLE E-3

Post-development Site Water Balance

Water Balance - Newhouse, Property, Caledon, ON

Catchments and Hydrologic Components			Month											Total
			March	April	May	June	July	August	September	October	November	December	January	February	
PET - Adjusted Potential Evapotranspiration (mm)			0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	**568**
P - Total Precipitation (mm)			60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
P-PET (mm)			60.90	40.87	12.75	-27.96	-46.00	-22.68	12.75	40.11	79.46	64.20	64.30	54.50	-
Soil Moisture Deficit (mm)			0.00	0.00	0.00	-27.96	-73.96	-96.64	-83.89	-43.78	0.00	0.00	0.00	0.00	-
	Impervious Area (Unconnected)	Precipitation Surplus (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
		Evaporation Factor	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-
		Run-Off Coefficient	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	-
		Evaporation (mm)	18.27	21.03	25.98	24.39	24.24	26.46	26.10	22.98	26.13	19.26	19.29	16.35	**270**
		Run-Off (mm)	42.63	49.07	60.62	56.91	56.56	61.74	60.90	53.62	60.97	44.94	45.01	38.15	**631**
		Catchment Area (m^2) = **107975**	**Subcatchment Monthly Volumes**												
		Evaporation (m^3)	1972.70	2270.71	2805.19	2633.51	2617.31	2857.02	2818.14	2481.26	2821.38	2079.60	2082.84	1765.39	**29205**
		Run-Off (m^3)	4602.97	5298.33	6545.44	6144.85	6107.06	6666.37	6575.67	5789.61	6583.23	4852.39	4859.95	4119.24	**68145**
	Pervious Area (Urban Lawn with Roof Surplus)	Total Precipitation Plus Roof Surplus (mm)	95.78	110.25	136.20	127.87	127.08	138.72	136.83	120.47	136.99	100.97	101.13	85.72	**1418**
		P-PET (mm)	95.78	81.02	62.35	18.60	0.28	27.84	62.58	83.98	129.35	100.97	101.13	85.72	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
		Soil Moisture Storage (mm)	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	**568**
		P-AET (mm)	95.78	81.02	62.35	18.60	0.28	27.84	62.58	83.98	129.35	100.97	101.13	85.72	**850**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	95.78	81.02	62.35	18.60	0.28	27.84	62.58	83.98	129.35	100.97	101.13	85.72	**850**
		MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
		Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
		Infiltration (mm)	57.47	48.61	37.41	11.16	0.17	16.70	37.55	50.39	77.61	60.58	60.68	51.43	**510**
		Run-Off (mm)	38.31	32.41	24.94	7.44	0.11	11.14	25.03	33.59	51.74	40.39	40.45	34.29	**340**
		Catchment Area (m^2) = **21290**	**Subcatchment Monthly Volumes**												
		AET (m^3)	0.00	622.36	1572.26	2326.23	2699.53	2360.58	1580.85	776.85	162.61	0.00	0.00	0.00	**12101**
		Infiltration (m^3)	1223.51	1034.92	796.47	237.61	3.59	355.63	799.35	1072.82	1652.31	1289.80	1291.81	1094.93	**10853**
		Run-Off (m^3)	815.67	689.95	530.98	158.41	2.39	237.08	532.90	715.21	1101.54	859.87	861.21	729.95	**7235**
	Impervious Area (Connected)	Precipitation Surplus (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
		Evaporation Factor	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-
		Run-Off Coefficient	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	-
		Evaporation (mm)	18.27	21.03	25.98	24.39	24.24	26.46	26.10	22.98	26.13	19.26	19.29	16.35	**270**
		Run-Off (mm)	42.63	49.07	60.62	56.91	56.56	61.74	60.90	53.62	60.97	44.94	45.01	38.15	**631**
		Catchment Area (m^2) = **17420**	**Subcatchment Monthly Volumes**												
		Evaporation (m^3)	318.26	366.34	452.57	424.87	422.26	460.93	454.66	400.31	455.18	335.51	336.03	284.82	**4712**
		Run-Off Directed to Pervious (m^3)	742.61	854.80	1056.00	991.37	985.28	1075.51	1060.88	934.06	1062.10	782.85	784.07	664.57	**10994**
			Total Catchment Volumes												
Total AET (m^3)			0.00	5729.56	14474.40	21083.55	22861.53	20089.09	14553.52	7151.76	1497.04	0.00	0.00	0.00	**107440**
Total Evaporation (m^3)			2290.96	2637.05	3257.76	3058.38	3039.57	3317.95	3272.81	2881.57	3276.57	2415.11	2418.87	2050.21	**33917**
Total Infiltration (m^3)			7191.24	5039.60	2045.91	237.61	3.59	355.63	799.35	1072.82	7368.41	7580.91	7592.72	6435.51	**45723**
Total Runoff (m^3)			10090.64	9123.45	8054.58	6303.26	6109.45	6903.45	7108.57	6504.82	12167.70	10637.43	10653.99	9030.21	**102688**

TABLE F-3

Post-development Site Water Balance

Water Balance - Kennedy, Property, Caledon, ON

Catchments and Hydrologic Components			Month											Total
			March	April	May	June	July	August	September	October	November	December	January	February	
		PET - Adjusted Potential Evapotranspiration (mm)	0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	**568**
		P - Total Precipitation (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
		P-PET (mm)	60.90	40.87	12.75	-27.96	-46.00	-22.68	12.75	40.11	79.46	64.20	64.30	54.50	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	-27.96	-73.96	-96.64	-83.89	-43.78	0.00	0.00	0.00	0.00	-
	Pervious Area (Pasture and Shrub)	Soil Moisture Storage (mm)	200.00	200.00	200.00	172.04	126.04	103.36	116.11	156.22	200.00	200.00	200.00	200.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	107.31	115.08	101.21	74.25	36.49	7.64	0.00	0.00	0.00	**545**
		P-AET (mm)	60.90	40.87	12.75	-26.01	-34.28	-13.01	12.75	40.11	79.46	64.20	64.30	54.50	**357**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.01	-60.29	-73.29	-60.54	-20.43	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.01	34.28	13.01	-12.75	-40.11	-20.43	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	59.03	64.20	64.30	54.50	**357**
		MECP Infiltration Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Run-Off Coefficient	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-
		Infiltration (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	29.51	32.10	32.15	27.25	**178**
		Run-Off (mm)	30.45	20.43	6.38	0.00	0.00	0.00	0.00	0.00	29.51	32.10	32.15	27.25	**178**
		Catchment Area (m^2) = 17365	Subcatchment Monthly Volumes												
		AET (m^3)	0.00	507.61	1282.36	1863.37	1998.26	1757.38	1289.37	633.61	132.63	0.00	0.00	0.00	**9465**
		Infiltration (m^3)	528.75	354.82	110.70	0.00	0.00	0.00	0.00	0.00	512.50	557.40	558.27	473.18	**3096**
		Run-Off (m^3)	528.75	354.82	110.70	0.00	0.00	0.00	0.00	0.00	512.50	557.40	558.27	473.18	**3096**
	Pervious Area (Woodland)	Soil Moisture Storage (mm)	250.00	250.00	250.00	222.04	176.04	153.36	166.11	206.22	250.00	250.00	250.00	250.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	107.70	117.42	103.14	74.25	36.49	7.64	0.00	0.00	0.00	**550**
		P-AET (mm)	60.90	40.87	12.75	-26.40	-36.62	-14.94	12.75	40.11	79.46	64.20	64.30	54.50	**352**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.40	-63.02	-77.96	-65.21	-25.10	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.40	36.62	14.94	-12.75	-40.11	-25.10	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	54.36	64.20	64.30	54.50	**352**
		MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
		Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
		Infiltration (mm)	36.54	24.52	7.65	0.00	0.00	0.00	0.00	0.00	32.62	38.52	38.58	32.70	**211**
		Run-Off (mm)	24.36	16.35	5.10	0.00	0.00	0.00	0.00	0.00	21.74	25.68	25.72	21.80	**141**
		Catchment Area (m^2) = 79835	Subcatchment Monthly Volumes												
		AET (m^3)	0.00	2333.81	5895.82	8598.29	9374.38	8234.21	5928.05	2913.11	609.79	0.00	0.00	0.00	**43887**
		Infiltration (m^3)	2917.19	1957.60	610.76	0.00	0.00	0.00	0.00	0.00	2603.85	3075.26	3080.05	2610.62	**16855**
		Run-Off (m^3)	1944.79	1305.06	407.17	0.00	0.00	0.00	0.00	0.00	1735.90	2050.18	2053.37	1740.41	**11237**
	Pervious Area (Urban Lawn)	Soil Moisture Storage (mm)	125.00	125.00	125.00	97.04	51.04	28.36	41.11	81.22	125.00	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	106.14	108.04	95.40	74.25	36.49	7.64	0.00	0.00	0.00	**531**
		P-AET (mm)	60.90	40.87	12.75	-24.84	-27.24	-7.20	12.75	40.11	79.46	64.20	64.30	54.50	**371**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-24.84	-52.08	-59.28	-46.54	-6.42	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	24.84	27.24	7.20	-12.75	-40.11	-6.42	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	73.04	64.20	64.30	54.50	**371**
		MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
		Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
		Infiltration (mm)	36.54	24.52	7.65	0.00	0.00	0.00	0.00	0.00	43.82	38.52	38.58	32.70	**222**
		Run-Off (mm)	24.36	16.35	5.10	0.00	0.00	0.00	0.00	0.00	29.21	25.68	25.72	21.80	**148**
		Catchment Area (m^2) = 34118	Subcatchment Monthly Volumes												
		AET (m^3)	0.00	997.36	2519.60	3621.15	3686.26	3254.93	2533.37	1244.93	260.59	0.00	0.00	0.00	**18118**
		Infiltration (m^3)	1246.67	836.59	261.01	0.00	0.00	0.00	0.00	0.00	1495.13	1314.23	1316.27	1115.66	**7586**
		Run-Off (m^3)	831.11	557.72	174.01	0.00	0.00	0.00	0.00	0.00	996.75	876.15	877.52	743.77	**5057**

TABLE F-3

Post-development Site Water Balance

Water Balance - Kennedy, Property, Caledon, ON

Catchments and Hydrologic Components			Month											Total
			March	April	May	June	July	August	September	October	November	December	January	February	
PET - Adjusted Potential Evapotranspiration (mm)			0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	**568**
P - Total Precipitation (mm)			60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
P-PET (mm)			60.90	40.87	12.75	-27.96	-46.00	-22.68	12.75	40.11	79.46	64.20	64.30	54.50	-
Soil Moisture Deficit (mm)			0.00	0.00	0.00	-27.96	-73.96	-96.64	-83.89	-43.78	0.00	0.00	0.00	0.00	-
	Impervious Area (Unconnected)	Precipitation Surplus (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
		Evaporation Factor	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-
		Run-Off Coefficient	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	-
		Evaporation (mm)	18.27	21.03	25.98	24.39	24.24	26.46	26.10	22.98	26.13	19.26	19.29	16.35	**270**
		Run-Off (mm)	42.63	49.07	60.62	56.91	56.56	61.74	60.90	53.62	60.97	44.94	45.01	38.15	**631**
		Catchment Area (m^2) = **102358**	**Subcatchment Monthly Volumes**												
		Evaporation (m^3)	1870.08	2152.58	2659.25	2496.50	2481.15	2708.39	2671.54	2352.18	2674.61	1971.41	1974.48	1673.55	**27686**
		Run-Off (m^3)	4363.51	5022.69	6204.93	5825.18	5789.35	6319.57	6233.59	5488.42	6240.75	4599.96	4607.12	3904.95	**64600**
	Pervious Area (Urban Lawn with Roof Surplus)	Total Precipitation Plus Roof Surplus (mm)	96.45	111.02	137.15	128.76	127.97	139.69	137.78	121.31	137.94	101.68	101.83	86.31	**1428**
		P-PET (mm)	96.45	81.79	63.30	19.49	1.17	28.81	63.53	84.82	130.30	101.68	101.83	86.31	-
		Soil Moisture Deficit (mm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
		Soil Moisture Storage (mm)	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	-
		Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	**568**
		P-AET (mm)	96.45	81.79	63.30	19.49	1.17	28.81	63.53	84.82	130.30	101.68	101.83	86.31	**859**
		Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
		Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
		Precipitation Surplus (mm)	96.45	81.79	63.30	19.49	1.17	28.81	63.53	84.82	130.30	101.68	101.83	86.31	**859**
		MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
		Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
		Infiltration (mm)	57.87	49.07	37.98	11.70	0.70	17.28	38.12	50.89	78.18	61.01	61.10	51.79	**516**
		Run-Off (mm)	38.58	32.71	25.32	7.80	0.47	11.52	25.41	33.93	52.12	40.67	40.73	34.53	**344**
		Catchment Area (m^2) = **38110**	**Subcatchment Monthly Volumes**												
		AET (m^3)	0.00	1114.06	2814.41	4164.06	4832.28	4225.53	2829.79	1390.59	291.09	0.00	0.00	0.00	**21662**
		Infiltration (m^3)	2205.41	1870.14	1447.45	445.73	26.69	658.72	1452.71	1939.61	2979.55	2324.91	2328.53	1973.64	**19653**
		Run-Off (m^3)	1470.27	1246.76	964.97	297.15	17.80	439.15	968.47	1293.07	1986.37	1549.94	1552.36	1315.76	**13102**
	Impervious Area (Connected)	Precipitation Surplus (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
		Evaporation Factor	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-
		Run-Off Coefficient	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	-
		Evaporation (mm)	18.27	21.03	25.98	24.39	24.24	26.46	26.10	22.98	26.13	19.26	19.29	16.35	**270**
		Run-Off (mm)	42.63	49.07	60.62	56.91	56.56	61.74	60.90	53.62	60.97	44.94	45.01	38.15	**631**
		Catchment Area (m^2) = **31780**	**Subcatchment Monthly Volumes**												
		Evaporation (m^3)	580.62	668.33	825.64	775.11	770.35	840.90	829.46	730.30	830.41	612.08	613.04	519.60	**8596**
		Run-Off Directed to Pervious (m^3)	1354.78	1559.44	1926.50	1808.60	1797.48	1962.10	1935.40	1704.04	1937.63	1428.19	1430.42	1212.41	**20057**
			Total Catchment Volumes												
Total AET (m^3)			0.00	4952.84	12512.19	18246.87	19891.18	17472.05	12580.59	6182.24	1294.10	0.00	0.00	0.00	**93132**
Total Evaporation (m^3)			2450.70	2820.92	3484.90	3271.62	3251.50	3549.28	3500.99	3082.48	3505.02	2583.49	2587.52	2193.15	**36282**
Total Infiltration (m^3)			6898.02	5019.14	2429.93	445.73	26.69	658.72	1452.71	1939.61	7591.03	7271.80	7283.13	6173.10	**47190**
Total Runoff (m^3)			9138.44	8487.06	7861.78	6122.33	5807.15	6758.71	7202.06	6781.49	11472.27	9633.62	9648.63	8178.08	**97092**

TABLE F-3

Post-development Site Water Balance

Water Balance - Russel, Property, Caledon, ON

Catchments and Hydrologic Components		Month												Total
		March	April	May	June	July	August	September	October	November	December	January	February	
PET - Adjusted Potential Evapotranspiration (mm)		0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	**568**
P - Total Precipitation (mm)		60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
P-PET (mm)		60.90	40.87	12.75	-27.96	-46.00	-22.68	12.75	40.11	79.46	64.20	64.30	54.50	-
Soil Moisture Deficit (mm)		0.00	0.00	0.00	-27.96	-73.96	-96.64	-83.89	-43.78	0.00	0.00	0.00	0.00	-
Pervious Area (Pasture and Shrub)	Soil Moisture Storage (mm)	200.00	200.00	200.00	172.04	126.04	103.36	116.11	156.22	200.00	200.00	200.00	200.00	-
	Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	107.31	115.08	101.21	74.25	36.49	7.64	0.00	0.00	0.00	**545**
	P-AET (mm)	60.90	40.87	12.75	-26.01	-34.28	-13.01	12.75	40.11	79.46	64.20	64.30	54.50	**357**
	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.01	-60.29	-73.29	-60.54	-20.43	0.00	0.00	0.00	0.00	-
	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.01	34.28	13.01	-12.75	-40.11	-20.43	0.00	0.00	0.00	-
	Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	59.03	64.20	64.30	54.50	**357**
	MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
	Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
	Infiltration (mm)	36.54	24.52	7.65	0.00	0.00	0.00	0.00	0.00	35.42	38.52	38.58	32.70	**214**
	Run-Off (mm)	24.36	16.35	5.10	0.00	0.00	0.00	0.00	0.00	23.61	25.68	25.72	21.80	**143**
	Catchment Area (m^2) = 85641	Subcatchment Monthly Volumes												
	AET (m^3)	0.00	2503.52	6324.55	9190.06	9855.31	8667.32	6359.13	3124.94	654.13	0.00	0.00	0.00	**46679**
	Infiltration (m^3)	3129.32	2099.95	655.17	0.00	0.00	0.00	0.00	0.00	3033.14	3298.89	3304.03	2800.46	**18321**
	Run-Off (m^3)	2086.21	1399.97	436.78	0.00	0.00	0.00	0.00	0.00	2022.10	2199.26	2202.69	1866.97	**12214**
Pervious Area (Woodland)	Soil Moisture Storage (mm)	250.00	250.00	250.00	222.04	176.04	153.36	166.11	206.22	250.00	250.00	250.00	250.00	-
	Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	107.70	117.42	103.14	74.25	36.49	7.64	0.00	0.00	0.00	**550**
	P-AET (mm)	60.90	40.87	12.75	-26.40	-36.62	-14.94	12.75	40.11	79.46	64.20	64.30	54.50	**352**
	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-26.40	-63.02	-77.96	-65.21	-25.10	0.00	0.00	0.00	0.00	-
	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	26.40	36.62	14.94	-12.75	-40.11	-25.10	0.00	0.00	0.00	-
	Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	54.36	64.20	64.30	54.50	**352**
	MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
	Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
	Infiltration (mm)	36.54	24.52	7.65	0.00	0.00	0.00	0.00	0.00	32.62	38.52	38.58	32.70	**211**
	Run-Off (mm)	24.36	16.35	5.10	0.00	0.00	0.00	0.00	0.00	21.74	25.68	25.72	21.80	**141**
	Catchment Area (m^2) = 27459	Subcatchment Monthly Volumes												
	AET (m^3)	0.00	802.70	2027.84	2957.34	3224.27	2832.12	2038.92	1001.95	209.73	0.00	0.00	0.00	**15095**
	Infiltration (m^3)	1003.35	673.31	210.07	0.00	0.00	0.00	0.00	0.00	895.58	1057.72	1059.37	897.91	**5797**
	Run-Off (m^3)	668.90	448.87	140.05	0.00	0.00	0.00	0.00	0.00	597.05	705.15	706.25	598.61	**3865**
Pervious Area (Urban Lawn)	Soil Moisture Storage (mm)	125.00	125.00	125.00	97.04	51.04	28.36	41.11	81.22	125.00	125.00	125.00	125.00	-
	Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	106.14	108.04	95.40	74.25	36.49	7.64	0.00	0.00	0.00	**531**
	P-AET (mm)	60.90	40.87	12.75	-24.84	-27.24	-7.20	12.75	40.11	79.46	64.20	64.30	54.50	**371**
	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-24.84	-52.08	-59.28	-46.54	-6.42	0.00	0.00	0.00	0.00	-
	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	24.84	27.24	7.20	-12.75	-40.11	-6.42	0.00	0.00	0.00	-
	Precipitation Surplus (mm)	60.90	40.87	12.75	0.00	0.00	0.00	0.00	0.00	73.04	64.20	64.30	54.50	**371**
	MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
	Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
	Infiltration (mm)	36.54	24.52	7.65	0.00	0.00	0.00	0.00	0.00	43.82	38.52	38.58	32.70	**222**
	Run-Off (mm)	24.36	16.35	5.10	0.00	0.00	0.00	0.00	0.00	29.21	25.68	25.72	21.80	**148**
	Catchment Area (m^2) = 46575	Subcatchment Monthly Volumes												
	AET (m^3)	0.00	1361.52	3439.56	4943.32	5032.20	4443.38	3458.37	1699.48	355.74	0.00	0.00	0.00	**24734**
	Infiltration (m^3)	1701.86	1142.04	356.31	0.00	0.00	0.00	0.00	0.00	2041.03	1794.08	1796.87	1523.01	**10355**
	Run-Off (m^3)	1134.57	761.36	237.54	0.00	0.00	0.00	0.00	0.00	1360.69	1196.05	1197.92	1015.34	**6903**

Catchments and Hydrologic Components		Month												Total
		March	April	May	June	July	August	September	October	November	December	January	February	
PET - Adjusted Potential Evapotranspiration (mm)		0.00	29.23	73.85	109.26	126.80	110.88	74.25	36.49	7.64	0.00	0.00	0.00	**568**
P - Total Precipitation (mm)		60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
P-PET (mm)		60.90	40.87	12.75	-27.96	-46.00	-22.68	12.75	40.11	79.46	64.20	64.30	54.50	-
Soil Moisture Deficit (mm)		0.00	0.00	0.00	-27.96	-73.96	-96.64	-83.89	-43.78	0.00	0.00	0.00	0.00	-
Impervious Area (Unconnected)	Precipitation Surplus (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
	Evaporation Factor	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-
	Run-Off Coefficient	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	-
	Evaporation (mm)	18.27	21.03	25.98	24.39	24.24	26.46	26.10	22.98	26.13	19.26	19.29	16.35	**270**
	Run-Off (mm)	42.63	49.07	60.62	56.91	56.56	61.74	60.90	53.62	60.97	44.94	45.01	38.15	**631**
	Catchment Area (m^2) = **147547**	Subcatchment Monthly Volumes												
	Evaporation (m^3)	2695.68	3102.91	3833.27	3598.67	3576.54	3904.09	3850.97	3390.63	3855.40	2841.75	2846.18	2412.39	**39908**
	Run-Off (m^3)	6289.92	7240.13	8944.29	8396.89	8345.25	9109.55	8985.61	7911.46	8995.93	6630.76	6641.09	5628.91	**93120**
Pervious Area (Urban Lawn with Roof Surplus)	Total Precipitation Plus Roof Surplus (mm)	79.32	91.30	112.79	105.89	105.24	114.88	113.31	99.77	113.44	83.62	83.75	70.98	**1174**
	P-PET (mm)	79.32	62.07	38.94	-3.37	-21.56	4.00	39.06	63.28	105.81	83.62	83.75	70.98	-
	Soil Moisture Deficit (mm)	0.00	0.00	0.00	-3.37	-24.93	-20.94	0.00	0.00	0.00	0.00	0.00	0.00	-
	Soil Moisture Storage (mm)	125.00	125.00	125.00	121.63	100.07	104.06	125.00	125.00	125.00	125.00	125.00	125.00	-
	Actual Potential Evapotranspiration (mm)	0.00	29.23	73.85	108.89	121.59	106.72	74.25	36.49	7.64	0.00	0.00	0.00	**559**
	P-AET (mm)	79.32	62.07	38.94	-3.00	-16.35	8.16	39.06	63.28	105.81	83.62	83.75	70.98	**616**
	Actual Soil Moisture Deficit (mm)	0.00	0.00	0.00	-3.00	-19.35	-11.19	0.00	0.00	0.00	0.00	0.00	0.00	-
	Change in Soil Moisture Deficit (mm)	0.00	0.00	0.00	3.00	16.35	-8.16	-11.19	0.00	0.00	0.00	0.00	0.00	-
	Precipitation Surplus (mm)	79.32	62.07	38.94	0.00	0.00	0.00	27.87	63.28	105.81	83.62	83.75	70.98	**616**
	MECP Infiltration Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
	Run-Off Coefficient	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-
	Infiltration (mm)	47.59	37.24	23.37	0.00	0.00	0.00	16.72	37.97	63.48	50.17	50.25	42.59	**369**
	Run-Off (mm)	31.73	24.83	15.58	0.00	0.00	0.00	11.15	25.31	42.32	33.45	33.50	28.39	**246**
	Catchment Area (m^2) = **42840**	Subcatchment Monthly Volumes												
	AET (m^3)	0.00	1252.33	3163.72	4664.70	5208.89	4571.73	3181.01	1563.18	327.21	0.00	0.00	0.00	**23933**
	Infiltration (m^3)	2038.82	1595.42	1000.98	0.00	0.00	0.00	716.40	1626.52	2719.62	2149.30	2152.65	1824.56	**15824**
	Run-Off (m^3)	1359.21	1063.62	667.32	0.00	0.00	0.00	477.60	1084.35	1813.08	1432.87	1435.10	1216.37	**10550**
Impervious Area (Connected)	Precipitation Surplus (mm)	60.90	70.10	86.60	81.30	80.80	88.20	87.00	76.60	87.10	64.20	64.30	54.50	**902**
	Evaporation Factor	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-
	Run-Off Coefficient	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	-
	Evaporation (mm)	18.27	21.03	25.98	24.39	24.24	26.46	26.10	22.98	26.13	19.26	19.29	16.35	**270**
	Run-Off (mm)	42.63	49.07	60.62	56.91	56.56	61.74	60.90	53.62	60.97	44.94	45.01	38.15	**631**
	Catchment Area (m^2) = **18510**	Subcatchment Monthly Volumes												
	Evaporation (m^3)	338.18	389.27	480.89	451.46	448.68	489.77	483.11	425.36	483.67	356.50	357.06	302.64	**5007**
	Run-Off Directed to Pervious (m^3)	789.08	908.29	1122.08	1053.40	1046.93	1142.81	1127.26	992.51	1128.55	831.84	833.14	706.16	**11682**
		Total Catchment Volumes												
Total AET (m^3)		0.00	5920.07	14955.67	21755.42	23320.67	20514.55	15037.43	7389.55	1546.82	0.00	0.00	0.00	**110440**
Total Evaporation (m^3)		3033.86	3492.18	4314.16	4050.13	4025.22	4393.87	4334.09	3815.99	4339.07	3198.26	3203.24	2715.03	**44915**
Total Infiltration (m^3)		7873.36	5510.72	2222.54	0.00	0.00	0.00	716.40	1626.52	8689.38	8299.99	8312.92	7045.94	**50298**
Total Runoff (m^3)		11538.83	10913.94	10425.98	8396.89	8345.25	9109.55	9463.21	8995.81	14788.86	12164.09	12183.03	10326.21	**126652**

TABLE F-4

Water Balance Summary

Water Balance - Newhouse, Hicks, Russell Property, Caledon, ON

Total Runoff (m^3)	March	April	May	June	July	August	Sept	October	Nov	Dec	January	February	Annual Total
Newhouse													
Pre-development	9368	6463	2406	490	487	532	524	462	9457	9876	9891	8384	**58340**
Post-development no mitigation	10091	9123	8055	6303	6109	6903	7109	6505	12168	10637	10654	9030	**102688**
Deficit	-722	-2661	-5648	-5813	-5623	-6372	-6584	-6043	-2710	-761	-763	-646	**-44347**
Hicks													
Pre-development	8780	5930	1934	105	105	114	113	99	8279	9256	9270	7857	**51840**
Post-development no mitigation	9138	8487	7862	6122	5807	6759	7202	6781	11472	9634	9649	8178	**97092**
Deficit	-359	-2557	-5928	-6017	-5703	-6645	-7090	-6682	-3193	-378	-379	-321	**-45251**
Russle													
Pre-development	11121	7571	2603	302	300	328	324	285	10930	11723	11741	9952	**67180**
Post-development no mitigation	11539	10914	10426	8397	8345	9110	9463	8996	14789	12164	12183	10326	**126652**
Deficit	-418	-3343	-7823	-8095	-8045	-8782	-9140	-8711	-3859	-441	-442	-374	**-59472**
Site Total													
Pre-development	29269	19964	6943	897	892	974	960	846	28666	30855	30903	26193	**177361**
Post-development no mitigation	30768	28524	26342	20822	20262	22772	23774	22282	38429	32435	32486	27535	**326431**
Deficit	-1499	-8561	-19399	-19925	-19370	-21798	-22813	-21437	-9763	-1580	-1583	-1342	**-149070**

* - (ve) value implies a net increase

Total Infiltration (m^3)	March	April	May	June	July	August	Sept	October	Nov	Dec	January	February	Annual Total
Newhouse													
Pre-development	10047	6742	2104	0	0	0	0	0	9746	10592	10608	8991	**58830**
Post-development no mitigation	7191	5040	2046	238	4	356	799	1073	7368	7581	7593	6436	**45723**
Deficit	2856	1703	58	-238	-4	-356	-799	-1073	2377	3011	3015	2556	**13107**
Hicks													
Pre-development	9674	6491	2025	0	0	0	0	0	8922	10198	10214	8657	**56181**
Post-development no mitigation	6898	5019	2430	446	27	659	1453	1940	7591	7272	7283	6173	**47190**
Deficit	2775	1472	-405	-446	-27	-659	-1453	-1940	1331	2926	2930	2484	**8991**
Russle													
Pre-development	11228	7535	2351	0	0	0	0	0	10866	11837	11855	10048	**65721**
Post-development no mitigation	7873	5511	2223	0	0	0	716	1627	8689	8300	8313	7046	**50298**
Deficit	3355	2024	128	0	0	0	-716	-1627	2177	3537	3542	3003	**15424**
Site Total													
Pre-development	30949	20769	6480	0	0	0	0	0	29534	32626	32677	27697	**180732**
Post-development no mitigation	21963	15569	6698	683	30	1014	2968	4639	23649	23153	23189	19655	**143211**
Deficit	8987	5199	-219	-683	-30	-1014	-2968	-4639	5885	9474	9488	8042	**37521**

* - (ve) value implies a net increase