Report on
Geotechnical Investigation
Mayfield West Phase 1 Expansion (Stage 2)
South of Old School Road
From Hurontario Street to East of Kennedy Road
Caledon, Ontario

Prepared For:
Argo Kennedy Limited

Project No: 19-312-100
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Table of Contents

DRAWINGS

1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Argo Kennedy Limited to undertake a geotechnical investigation for the proposed Mayfield West Phase 1 Expansion (Stage 2) development, located at the south of Old School Road from Hurontario Street to east of Kennedy Road in Caledon, Ontario.

It is understood that the project will entail residential subdivisions consisting of houses, roads, sewers and stormwater management ponds.

DS drilled eight (8) boreholes (BH19-2 through BH19-9) in December 2019 in Hick's property to the west of Kennedy Road, and a preliminary geotechnical report (No. 19-312-100, dated March 18, 2020) was submitted to ARGO Developments.

In January 2021, DS drilled 5 boreholes (BH21-1 to BH21-5) at the west part of the site, to the east of Hurontario Street.

No boreholes were drilled at the east part of the site, to the east of Kennedy Road, due to access permission problems. A desktop review of the subsurface conditions in this area was carried out in this report.

This geotechnical investigation report was prepared on the basis of all boreholes mentioned above and the desktop review of the subsurface conditions to the east of Kennedy Road.

This report deals with the geotechnical aspects of the site only. DS also carried out environmental and hydrogeological investigations at the subject site. Environmental and hydrogeological findings are documented under separate covers.

The purpose of this geotechnical investigation was to obtain information about the subsurface conditions by means of boreholes and from the findings in the boreholes to make preliminary recommendations pertaining to the geotechnical design of underground utilities and subdivision roads, storm water management ponds, and to comment on the foundation conditions for general house construction.

This report is provided on the basis of the terms of reference presented above and, on the assumption, that the design will be in accordance with the applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this office can be relied upon.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for Argo Kennedy Limited and its designers. Third party use of this report without DS Consultants Ltd. (DS) consent is prohibited.

2. FIELD AND LABORATORY WORK

In December 2019, eight (8) boreholes (BH19-2 through BH19-9) were drilled at the subject site to depths ranging from 6.5 to 13.2m. In January 2021, five (5) boreholes (BH21-1 through BH21-5) were drilled at the subject site to depths ranging from 6.4 to 8.2 m. The boreholes were drilled with hollow/solid stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of DS personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the DS laboratory for detailed examination by the project engineer and for laboratory testing.

As well as visual examination in the laboratory, all soil samples for the boreholes drilled by DS were tested for moisture contents. Grain size analyses and Atterberg Limits tests were conducted out on selected soil samples and the results are presented in **Drawings 15** and **16.**

Groundwater level observations were made during drilling and in the open boreholes at the completion of the drilling operations. All boreholes were equipped with 50mm dia. monitoring wells for the long-term groundwater level monitoring.

The surface elevations at the borehole locations were surveyed by DS staff using differential GPS system.

3. SOIL AND GROUNDWATER CONDITIONS

A total of 13 boreholes (BH19-2 to BH19-9, and BH21-1 to BH21-5) were drilled at the site between Hurontario Street and Kennedy Road, as presented in **Section 3.1** below. At the east part of the site to the east of Kennedy Road where no boreholes were drilled for this investigation, a desktop review of subsurface conditions is carried out, as presented in **Section 3.2**.

3.1 Subsurface Conditions from Hurontario St to Kennedy Rd

The locations of the boreholes (BH19-2 to BH19-9, and BH21-1 to BH21-5) are shown on **Drawing 1**. Notes on sample description are presented on **Drawing 1B**. The subsurface conditions

encountered in boreholes are presented in the individual borehole logs (**Drawing 2** to **14**). The subsurface conditions encountered in boreholes are summarized in the following paragraphs.

3.1.1 Soil Conditions

Topsoil:

A surficial layer of topsoil of 200mm to 350mm thick was found in the boreholes. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Fill and Weathered/Disturbed Soils:

Below the topsoil, fill and weathered/disturbed soils of silty clay, silty sand to sandy silt deposits were encountered. The weathered/disturbed materials were considered due to ploughing activities in the past. Traces of rootlets, organics and topsoil inclusions were also observed in the fill and weathered deposit. The fill and weathered/disturbed soils extended to depths ranging from 0.8 to 1.5m below ground surface and were found to have very soft to stiff consistency/very loose to compact state, with measured SPT 'N' values ranging from 1 to 15 blows per 300mm penetration.

Cohesionless Deposits (Sandy Silt/Silty sand, Sand, Silt and Sand and Gravel):

Cohesionless deposits of sandy silt/silty sand, sand, silt and sand and gravel were encountered in most of the boreholes and extended to various depths. These deposits were found in loose to very dense state, with measured SPT 'N' values ranging from 4 to more than 50 blows per 300 mm penetration. Most of the cohesionless deposits were found to be wet to saturated and below groundwater table.

Grain size analyses of seven (7) sand to silty sand, sandy silt and sand and gravel samples (BH19-2/SS10, BH19-4/SS5, BH19-5/SS6, BH19-7/SS5, BH21-1/SS7, BH21-3/SS3 and BH21-3/SS6) were conducted and the results are presented in **Drawings 15** and **16**, with the following fractions:

Clay: 1% to 10%
Silt: 23% to 65%
Sand: 25% to 64%
Gravel: up to 34%

Cohesive Deposits (Clayey Silt to Silty Clay Till, Clayey Silt to Silty Clay):

Cohesive deposits of clayey silt to silty clay till and clayey silt to silty clay were encountered in boreholes BH19-3 to BH19-6, BH21-1 and BH21-2 at various depths. The cohesive deposits were found to have a firm to hard consistency, with measured SPT 'N' values ranging from 8 to 36 blows per 300 mm penetration.

Grain size analysis of one (1) silty clay till sample (BH21-1/SS3) was conducted and the results are presented in **Drawing 16**, with the following fractions:

Clay: 31%
Silt: 49%
Sand: 18%
Gravel: 2%

Atterberg Limits test of one (1) silty clay till sample (BH21-1/SS3) was conducted and the results are shown in the borehole log of BH21-1.

Silty Sand Till/Sandy Silt Till:

The silty sand till to sandy silt till deposits were encountered in all boreholes except BH19-4, BH21-1 and BH21-3. These deposits were found generally in a loose to very dense state with measured SPT 'N' values ranging from 8 to more than 50 blows per 300mm penetration.

Grain size analyses of four (4) silty sand to sandy silt till samples (BH19-3/SS9, BH19-6/SS9, BH19-8/SS10, BH19-9/SS6) were conducted and the results are presented in **Drawing 15**, with the following fractions:

Clay: 5% to 11%
Silt: 23% to 55%
Sand: 35% to 44%
Gravel: 3% to 25%

3.1.2 Groundwater Conditions

All boreholes were equipped with 50mm dia. monitoring wells for the measurements of long-term groundwater levels. The measured groundwater levels in the boreholes at different dates are shown in the borehole logs.

The highest groundwater level measured in each borehole is listed on **Table 1** below.

Table 1: Summary of Groundwater Level Measurements in Monitoring Wells

Borehole No.	Ground Surface Elev. (m)	Date of Observation	Depth of Groundwater (m)	Elevation of Groundwater (m)
BH19-2	266.6	Jan.2, 2020	0.6	266.0
BH19-3	269.5	Jan.2, 2020	2.9	266.6
BH19-4	270.3	May 3, 2021	3.9	266.4
BH19-5	274.2	Jan.2, 2020	2.2	272.0
BH19-6	267.8	Jan.2, 2020	3.2	264.6
BH19-7	265.7	May 3, 2021	2.8	262.9
BH19-8	270.8	Jan.2, 2020	0.3	270.5
BH19-9	271.6	Jan.2, 2020	1.1	270.5
BH21-1	263.0	May 3, 2021	1.9	261.1
BH21-2	260.5	May 3, 2021	1.4	259.1
BH21-3	263.2	May 3, 2021	3.4	259.8
BH21-4	262.9	May 3, 2021	3.8	259.1
BH21-5	263.8	May 3, 2021	-1.0*	264.8*

*Note: Groundwater table measured in BH21-5 was 1.0 m above ground surface.

As listed on **Table 1**, the groundwater table measured in the monitoring wells ranged from 1.0 m above ground surface to 3.9 m below the ground surface, corresponding to elevations ranging from 259.1 to 272.0 m.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

3.2 Subsurface Desktop Review to East of Kennedy Rd

A geotechnical desktop study was conducted for the east part of the site, to the east of Kennedy Road. The geotechnical information available for this study consists of boreholes from Ontario Geotechnical Boreholes Database, and boreholes drilled by Forward Engineering.

The geotechnical information from the existing boreholes is limited. New boreholes at the site are required to explore more detailed soil and groundwater conditions across the site.

(1). Soil Conditions in Boreholes from Ontario Geotechnical Boreholes Database

Ontario Geotechnical Boreholes database contains records of boreholes constructed during past geotechnical investigations. The data includes information on the geological stratum identified down each hole as well as the hole depth. The data can be viewed using Google Earth.

From Ontario Geotechnical Boreholes, 6 boreholes (numbered H1 to H6 for convenience of reference) in the surrounding areas are selected for this study. The depth of the boreholes ranges from of 0.9 to 1.5 m. The locations of the boreholes are shown in **Drawing 1A**. The soil conditions in the boreholes are summarized on **Table 2**.

Table 2: Subsurface Conditions in Ontario Geotechnical Boreholes
(see **Drawing 1A** for Location Plan)

Ref. No.	Borehole Information	Borehole Log - Soil Conditions
H1	**Borehole ID: 589881** Completion Year: Elevation (DEM): 269.7 m Total Depth: 0.9 m Static Water Level: m	**Borehole Log (metres):** 0 ~ 0.9 m till, silt, sand
H2	**Borehole ID: 590056** Completion Year: Elevation (DEM): 272.9 m Total Depth: 1.5 m Static Water Level: m	**Borehole Log (metres):** 0 ~ 1.5 m sand
H3	**Borehole ID: 589781** Completion Year: Elevation (DEM): 269.0 m Total Depth: 1.4 m Static Water Level: m	**Borehole Log (metres):** 0 ~ 1.4 m fine sand, silt
H4	**Borehole ID: 589900** Completion Year: Elevation (DEM): 278.1 m Total Depth: 1.1 m Static Water Level: m	**Borehole Log (metres):** 0 ~ 1.1 m till, silt, sand
H5	**Borehole ID: 590396** Completion Year: Elevation (DEM): 270.5 m Total Depth: 1.5 m Static Water Level: m	**Borehole Log (metres):** 0 ~ 1.5 m till, silt, sand
H6	**Borehole ID: 590545** Completion Year: Elevation (DEM): 272.7 m Total Depth: 1.5 m Static Water Level: m	**Borehole Log (metres):** 0 ~ 1.5 m till, silt, sand

The soils in the boreholes as listed on Table 2 consisted of sand and silt deposits and silt to sand tills.

(2). Soil Conditions in Boreholes by Forward Engineering

The client provided us with a letter report entitled “Proposed Southfields Village No. 2 Public School, Hydrogeological Investigation, Part Lot 22, Concession 1, EHS, Caledon, Ontario”, prepared

by Terraprobe Inc., No. 1-16-0771-46, dated January 20, 2017. The school site was located at northwest of Kennedy Road and Newhouse Boulevard. The letter report includes 25 boreholes (BH-1 to BH-25) drilled by Forward Engineering. The borehole location plan and the logs of 9 boreholes (BH-1 to BH-9) of 5.0 to 6.5 m in depth are attached in **Appendix B**. The other boreholes (BH-10 to BH-25) are shallow boreholes, which are not included in this report.

In the boreholes as attached in **Appendix B**, organic soil/topsoil and fill/disturbed materials were found extending to depths of up to 1.7 m. Most native soils consisted of loose to dense cohesionless (sandy) deposits (sand/silt, sandy silt to silty sand). Firm to hard clayey silt till was encountered at the lower portion of BH-1 to BH-8. Wet soils and groundwater were found typically at depth of 2 to 3 m in most boreholes.

4. GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

It is proposed to develop the site as residential subdivisions. The lots will therefore be serviced by a network of roads, watermains, storm and sanitary sewers, and storm water management ponds (SWM ponds).

4.1 Site Grading and Engineered Fill

The site will be developed as residential subdivision swith residential lots, roads and driveways. It is recommended that all fill to be placed for grading purposes be constructed as engineered fill to provide competent subgrade below house foundations, roads, boulevards, etc.

Prior to placement of engineered fill, all existing surficial topsoil, fill materials, weathered/disturbed soils and other unsuitable materials should be stripped to expose the competent inorganic subgrade. The exposed subgrade should then be proof rolled with a heavy sheepsfoot roller to identify weak areas. Any weak or excessively wet zones identified during proof-rolling should be sub-excavated and replaced with compacted competent material to establish stable and uniform conditions. Prior to placement of engineered fill, the subgrade should be inspected and approved by a geotechnical engineer.

General guidelines for the placement and preparation of engineered fill are presented on **Appendix A**. Bearing capacity values of 150 kPa at SLS and 225 kPa at ULS can be used on engineered fill, provided that all requirements on **Appendix A** are adhered to. To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential. Despite full time supervision, it has been found that contractors frequently bulldoze loose fill into areas and compact only the surface. The inspector, either busy on other portions of the site or absent during "off hours" will be unaware of this condition. For this reason, we cannot guarantee the performance of the engineered fill, and this guarantee must be the responsibility of the contractor.

The owner and his representatives must accept the risk involved in the use of engineered fill and offset this risk with the monetary savings of avoiding deep foundations. This potential problem must be recognized and discussed at a pre-construction meeting. Procedures can then be instigated to reduce the risk of settlement resulting from un-compacted fill.

The following is a recommended procedure for engineered fill:

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained, and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and DS. Without this confirmation no responsibility for the performance of the structure can be accepted by DS. Survey drawing of the pre and post fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a DS engineer prior to placement of fill.

5. The approved engineered fill must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Granular Fill preferred. Engineered fill should not be placed (where it will support footings) during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur.

6. Full-time geotechnical inspection by DS during placement of engineered fill is required. Work cannot commence or continue without the presence of the DS representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to sketches for minimum requirements. Take careful note that the projection of the compacted pad

beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. Bearing capacity values of 150 kPa at SLS and 225 kPa at ULS may be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is recommended, and footings should be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

10. After completion of the pad a second contractor may be selected to install footings. All excavations must be backfilled under full time supervision by DS to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with the approval of DS.

11. After completion of compaction, the surface of the pad must be protected from disturbance from traffic, rain and frost.

12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

The inorganic clayey silt (till) are considered suitable for use as engineered fill, provided that their moisture contents at the time of construction are at or near optimum. The clayey tills are likely to be excavated in cohesive chunks or blocks and will be difficult to compact. They should be pulverized and placed in thin layers not exceeding 150 to 200 mm and compacted using heavy equipment suitable for these types of soils (e.g. heavy sheepsfoot compactors).

4.2 Roads

The investigation has shown that the predominant subgrade soil, after stripping the topsoil, loose fill and any other organic and otherwise unsuitable subsoil, will generally consist of sandy silt to silty sand, clayey silt till, silty sand and sandy silt till.

Based on the above and assuming that traffic usage will be residential minor local or local, the following minimum pavement thickness is recommended for roads to be constructed within the subdivision:

40 mm HL3 Asphaltic Concrete

65 mm HL8 Asphaltic Concrete

200 mm Granular ‘A’

250 mm Granular ‘B’

For collector streets/bus routes, the following minimum pavement thickness is recommended:

40 mm HL3 Asphaltic Concrete

85 mm HL8 Asphaltic Concrete

200 mm Granular 'A'

350 mm Granular 'B'

These values may need to be adjusted according to the Town of Caledon Standards. The site subgrade and weather conditions (i.e. if wet) at the time of construction may necessitate the placement of thicker granular sub-base layer in order to facilitate the construction. Furthermore, heavy construction equipment may have to be kept off the newly constructed roads before the placement of asphalt and/or immediately thereafter, to avoid damaging the weak subgrade by heavy truck traffic.

4.2.1 Stripping, Sub-excavation and Grading

The site should be stripped of all topsoil, existing fill, weathered soils, and any organic or otherwise unsuitable soils to the full depth of the roads, both in cut and fill areas.

Following stripping, the site should be graded to the subgrade level and approved. The subgrade should then be proof-rolled, in the presence of the Geotechnical Engineer, by at least several passes of a heavy compactor having a rated capacity of at least 8 tonnes. Any soft spots thus exposed should be removed and replaced by select fill material, similar to the existing subgrade soil and approved by the Geotechnical Engineer. The subgrade should then be re-compacted from the surface to at least 98% of its Standard Proctor Maximum Dry Density (SPMDD). The final subgrade should be cambered or otherwise shaped properly to facilitate rapid drainage and to prevent the formation of local depressions in which water could accumulate.

Owing to the clayey (i.e. impervious) nature of the same subsoil at the site, proper cambering and allowing the water to escape towards the sides (where it can be removed by means of subdrains) is considered to be beneficial for this project. Otherwise, any water collected in the granular sub-base materials could be trapped thus causing problems due to softened subgrade, differential frost heave, etc. For the same reason damaging the subgrade during and after placement of the granular materials by heavy construction traffic should be avoided. If the moisture content of the local material cannot be maintained at ±2% of the optimum moisture content, imported granular material may need to be used.

Any fill required for re-grading the site or backfill should be select, clean material, free of topsoil, organic or other foreign and unsuitable matter. The backfill should be placed in thin layers and compacted to at least 98% of its SPMDD, or as per the City Standards. The compaction of the new fill should be checked by frequent field density tests.

4.2.2 Construction

Once the subgrade has been inspected and approved, the granular base and sub-base course materials should be placed in layers not exceeding 200 mm (uncompacted thickness) and should be compacted to at least 100% of their respective SPMDD. The grading of the material should conform to current OPS Specifications.

The placing, spreading and rolling of the asphalt should be in accordance with OPS Specifications or, as required by the local authorities.

Frequent field density tests should be carried out on both the asphalt and granular base and sub-base materials to ensure that the required degree of compaction is achieved.

4.2.3 Drainage

The subdrains should be properly filtered to prevent the loss of (and clogging by) soil fines.

All paved surfaces should be sloped to provide satisfactory drainage towards catch basins. As discussed in **Section 4.2.1**, by means of good planning any water trapped in the granular sub-base materials should be drained rapidly towards subdrains or other interceptors.

4.3 Sewers

As a part of the site development, a network of new storm and sanitary sewers is to be constructed. It is assumed that the trenches are generally within 4 to 5 m below the existing grade.

4.3.1 Trenching

Based on the boreholes, the trenches will be dug through the weathered soil, sandy silt to silt sand, silty sand till and clayey silt till. Excavations can be carried out with heavy hydraulic backhoe. The groundwater in the monitoring wells was found at depths from 1.0 m above ground surface to 3.9m below ground surface. Dewatering will be required prior to any excavations below the groundwater table. Otherwise, it will result in an unstable base and flowing sides. The groundwater table must be lowered to at least 1.0 m below the deepest excavation base. A contractor specializing in dewatering should be retained to design the dewatering systems.

DS is carrying out hydrogeological study at the subject site and more comments regarding the type and extent of groundwater control required will be addressed in the hydrogeological report.

It should be noted that the till is a non-sorted sediment and therefore may contain boulders. Provisions must be made in the excavation contract for the removal of possible boulders in the till material.

The sides of excavations in the natural strata above groundwater can be expected to be temporarily stable at relatively steep side slopes for short periods of time but they should be cut back at slopes

no steeper than 1:1 in order to comply with the safety regulations. If steep side slopes are required, the sides should be supported by braced skeleton or close sheeting. Any excavation below groundwater will require dewatering.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill/weathered soils, the cohesionless (sandy) deposits and soft to stiff clayey soil can be classified as Type 3 Soil above groundwater and as Type 4 Soil below groundwater table. The very stiff to hard clayey silt silty clay deposits can be classified as Type 2 Soil above the groundwater table and as Type 3 Soil below groundwater.

4.3.2 Bedding

The undisturbed native soils will provide adequate support for the sewer pipes and allow the use of normal Class B type bedding. The recommended minimum thickness of granular bedding below the invert of the pipes is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or in accordance with local standards or if wet or weak subgrade conditions are encountered, especially when the soil at the trench base level consists of wet, dilatant silt. The bedding material should consist of well graded granular material such as Granular 'A' or equivalent. After installing the pipe on the bedding, a granular surround of approved bedding material, which extends at least 300 mm above the obvert of the pipe, or as set out by the local Authority, should be placed.

To avoid the loss of soil fines from the subgrade, uniformly graded clear stone should not be used unless, below the granular bedding material, a suitable, approved filter fabric (geotextile) is placed. The geotextile should extend along the sides of the trench and should be wrapped all around the poorly graded bedding material.

4.3.3 Backfilling of Trenches

Based on visual and tactile examination, the on-site excavated inorganic sandy silt to silty sand, silty sand till and clayey silt to silty clay deposits, free from topsoil and organics are considered to be suitable for re-use as backfill in the service trenches provided their moisture contents at the time of construction are at or near optimum.

Granular B material should be used as backfill for trenches located under slab on grade or paved areas. Compaction of the granular soils should be carried out with vibratory compactors and loose lifts not exceeding about 200 mm.

The clayey silt to silty clay deposits especially when its consistency is very stiff to hard is likely to be excavated in cohesive chunks or blocks and will be difficult to compact in confined areas. For use as backfill, the clayey material will have to pulverized and placed in thin layers. The clayey soils will have to be compacted using heavy equipment suitable for these soils which may be difficult to

operate in the narrow confines of the trenches. Unless the clayey materials are properly pulverized and compacted in sufficiently thin lifts post-construction settlements could occur. Their use in narrow trenches such as laterals (where heavy compaction equipment cannot be operated) may not be feasible.

The backfill should be placed in maximum 200 mm thick layers at or near (±2%) their optimum moisture content, and each layer should be compacted to at last 95% SPMDD. The degree of compaction should be increased to 98% of SPMDD within 2.0m below the road surface. Unsuitable materials such as organic soils, boulders, cobbles, frozen soils, etc. should not be used for backfilling.

The on-site excavated soils and especially the clayey soils should not be used in confined areas (e.g. around catchbasins and laterals under roadways) where heavy compaction equipment cannot be operated. The use of imported granular fill together with an appropriate frost taper would be preferable in confined areas and around structures, such as catchbasins.

4.4 Foundation Conditions

It is understood that the proposed subdivision will consist of houses/townhouses with a basement.

The proposed houses/townhouses can be supported by spread and strip footings founded on the undisturbed competent native soils below the fill and below the weathered/disturbed soils for a bearing capacity of 150 kPa at SLS (Serviceability Limit State), and for a factored geotechnical resistance of 225 kPa at ULS (Ultimate Limit State).

Alternatively, footings can be supported by Engineered fill for a bearing capacity values of 150 kPa at SLS and 225 kPa at ULS, provided all requirements on **Appendix A** are adhered to. Prior to the placement of the engineered fill, all of the existing fill and surficially softened native soils must be removed and the exposed surface proof rolled. Any soft spots revealed during proof rolling must be sub-excavated and re-engineered. The engineered fill consisting of approved inorganic material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential.

Foundations designed to the specified bearing capacities at the serviceability limit states (SLS) are expected to settle less than 25 mm total and 19 mm differential.

Where it is necessary to place footings at different levels, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

It should be noted that the recommended bearing capacities have been calculated by DS from the borehole information for the preliminary design stage only. The investigation and comments are

necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by DS to validate the information for use during the construction stage.

4.5 Earth Pressures

The lateral earth pressures acting on basement walls and retaining structures may be calculated from the following expression:

$$p = K(\gamma h + q)$$

where p = Lateral earth pressure in kPa acting at depth h

K = Earth pressure coefficient equal to 0.40 for vertical walls and horizontal backfill used for permanent construction. Water pressure must be considered, if continuous wall drains are not used.

γ = Unit weight of backfill, a value of 21.0 kN/m^3 may be assumed

h = Depth to point of interest in metres

q = Equivalent value of surcharge on the ground surface in kPa

The above expression assumes that the perimeter drainage system prevents the buildup of any hydrostatic pressure behind the wall.

4.6 SWM Ponds

Storm water management (SWM) ponds are proposed across the site. It is understood that Boreholes BH19-6, BH21-3, BH21-5/BH19-2 (see Drawing 1 for location plan) are located in the SWM pond areas. The design water levels and bottom elevation of SWM ponds are not available to us at the time of writing this report. Preliminary geotechnical recommendations and comments on the SWM ponds are as follows.

1. The soils explored in the SWM pond areas contain cohesionless (sandy) deposits. Based on the borehole information, a **clay liner** will be required at the pond bottom and side slopes, extending to at least 0.3m above the normal water level of the pond. The clay liner should consist of silty clay material with minimum 20% clay content (finer than 0.002 mm) and a plasticity index (PI) of minimum of 8.0. The clay liner should be compacted to 100% of SPMDD. The clay liner should be minimum 0.6m thick, but thicker liner will be required

where the groundwater table is high. The thickness of clay liner and any requirements for the under-liner drainage to prevent uplift failure must be further studied when the design details (i.e. design water levels, pond base elevation etc.) of the pond are available.

2. For the design of the pond, the side slopes should be no steeper than 3 horizontal to 1 vertical (3H:1V) above the water level in the pond. Below the water level, the side slopes should be flattened to 4H:1V or flatter.

3. **Berms/embankments** will be required where the ponds are constructed above the existing ground surface. The embankment fill should consist of inorganic low permeability material (silty clay), with minimum 20% clay (finer than 0.002 mm) and a plasticity index (PI) of minimum 8.0. The embankment fill must be compacted to 100% SPMDD.

4. Dewatering will be required for any excavation below the groundwater table. It should be noted that the till is a non-sorted sediment and therefore may contain boulders. Provisions must be made in the excavation contract for the removal of possible boulders in the tills. All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill and the cohesionless (sandy) deposits of sand, silt, sandy silt to silty sand can be classified as Type 3 soil above groundwater table and as Type 4 Soil below groundwater. The very stiff to hard clayey silt / silty clay till can be classified as Type 2 Soil above groundwater table and as Type 3 Soil below groundwater.

5. Stability analyses of the pond slopes and embankment slopes will be required when the design details of the ponds are available.

In the area (BH21-5/BH19-2) where SWM pond and pumping station will be constructed, the groundwater table is high. In BH21-5, the measured groundwater table was 1.0 m **above** the ground surface. In BH19-2, the measured groundwater table was at a depth of 0.6 m below the ground surface. Without dewatering/de-pressurization of hydrostatic pressure in the cohesionless deposits below the sandy silt till to silty sand till, excavations in this area must be limited in order to avoid uplift failure of the ground.

Based on the existing borehole information, **Table 3** provides the preliminary safe excavation depths at the borehole locations, without positive dewatering or de-pressurization of the lower cohesionless deposits. A factor of Safety of 1.43 was used to calculate the safe excavation depths, in accordance with the Canadian Foundation Manual.

Table 3: Approximate Safe Excavation Depth (SED) in Boreholes Without Positive Dewatering/Depressurization

Borehole No.	Ground Surface Elevation (m)	Depth of Groundwater Table (m)	Safe Excavation Depth - SED (m)	Safe Excavation Elevation (m)
BH21-5	263.8	-1.0*	1.1	262.7
BH19-2	266.6	0.6	3.1	263.5

*Note: Groundwater table above existing ground surface.

Safe Excavation Depths should be further evaluated with additional boreholes and monitoring wells.

The base of SWM pond in the area of BH21-5/BH19-2 should be raised as high possible, in order to prevent uplift failure of the clay liner or to reduce the seepage rate of the under-liner drainage. Depending on the base elevation of the pond, a permanent under-liner drainage system will likely be required to reduce the hydrostatic pressure at the base of the clay liner and to prevent uplift failure of the clay liner. It is desirable to discharge the seepage from the under-liner drainage system by gravity drains, so that continuous mechanical pumping could be avoided.

5. SLOPE STABILITY ASSESSMENT

A slope stability assessment for the slopes at the site between Kennedy Road and Hurontario Street was carried out by DS Consultants Ltd.

Site visits were made on December 10, 2019 and March 25, 2021 by a senior geotechnical engineer from DS to visually examine the slope conditions at the above noted site. The site plan is shown on **Drawing 1**. Selected photographs (Photos C1 to C24) taken during the site visits are presented in **Appendix C**.

Based on our site observations, the slope conditions are described as follows:

- There is a wide flood plain in the creek area, where the ground is covered with trees, bushes, high grass etc. The creek is typically 3 to 5 m wide, and is about 1 to 2 m below the flood plain level.
- The slopes at both sides of the creek area are generally gentle in steepness, flatter than 3 horizontal to 1 vertical (3H:1V). A few local slopes of about 2H:1V and steeper are observed at the site.
- It is difficult to accurately estimate the height of the slopes, as the top of slope locations are not obvious, and the slopes are gentle is steepness. Typically, the elevation difference between the creek level and the tree line areas at both sides of the creek area is about 3 to 6 m.

Based on our site observations, the subject slopes are generally considered stable in terms of long-term stability. The line staked out (agreed) by TRCA during the site walk on March 30, 2021 is considered to be the long-term stable top of slope (LTSTOS) line or constraint to development limits, except for a few local areas where the slopes are 2H:1V or steeper.

During the site visits, the geotechnical engineer from DS identified 3 local areas where the slopes are 2H:1V or steeper. New boreholes will be drilled in these areas for detailed slope stability analyses to determinate the locations of the long-term stable top of slope (LTSTOS) line. A detailed slope stability assessment report will be prepared. Based on our site observations, the impact of the detailed slope stability analyses on the development limit is anticipated to be minor, compared to the line staked out (agreed) by TRCA.

6. GENERAL COMMENTS AND LIMITATIONS OF REPORT

DS Consultants Ltd. (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 sub-surface conditions are interpreted as relevant to the design and construction of the proposed sanitary sewer. Comments relating to construction are intended for the guidance of the design engineer to establish constructability and must not be considered as being specifications or recommendations to the prospective contractors, or as being the only suitable methods. Prospective contractors should evaluate all of the factual information, obtain additional subsurface information as they might deem necessary and should select their construction methods, sequencing and equipment based on their own experience in similar ground conditions. The readers of this report are also reminded that the conditions are known only at the borehole locations and in view of the generally wide spacing of the boreholes, conditions may vary significantly between boreholes.

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.

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

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LICENSED PROFESSIONAL ENGINEER
A. SANGAR
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Drawings

Legend

- Borehole Drilled in 2021
- Borehole Drilled in 2019

0 100 200 300 m

DS CONSULTANTS LTD.
6221 Highway 7, UNIT 16
Vaughan, Ontario L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca

Project: Geotechnical Investigation - 321 Jarvis St., Toronto, ON

Title: **Borehole Location Plan**

Client: Centrecourt Development

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	AS	MM	Feb 17, 2021
Rev: 0	Scale: As Shown	Project No.: 18-632-100	Drawing No.: 1

Image/Map Source: *Google Satellite Image*

Legend

Existing Borehole

0 250 500 m

DS CONSULTANTS LTD.
6221 Highway 7, UNIT 16
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Telephone: (905) 264-9393
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Project: Desktop Review - Old School Rood, Mississauga, ON

Title: **Location Plan of Existing Boreholes (H1 to H6)**

N

Client: Agro Kennedy

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	FZ	MM	May, 2021
Rev: 0	Scale: As Shown	Project No.: 19-312-100	Drawing No.: 1A

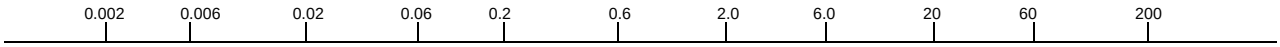
Image/Map Source: *Google Satellite Image*

Drawing 1B: Notes on Soil Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by DS also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

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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
266.6					
266.4 0.3	**TOPSOIL:** 250mm **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	
	sand seams, pinkish grey below 7.6m	7	SS	95/ 280mm	
257.5 9.1	**SAND AND GRAVEL:** trcae clay, trace silt, trace cobble, reddish brown, very dense	8	SS	90	
		9	SS	50/ 25mm	
		10	SS	50/ 100mm	
		11	SS	50/ 75mm	
253.4 13.2	grey shale fragments below 13.0m **END OF BOREHOLE:**	12	SS	50/ 75mm	

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

ELEVATION: 266, 263, 262, 261, 260, 259, 258, 257, 256, 254

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

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 BH19-3

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

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS "N" 0.3 m	ELEVATION
269.5 / 0.0	**TOPSOIL:** 250mm	1	SS	1	269
0.3	**WEATHERED/ DISTURBED SOIL:** silty clay, trace organics, trace rootlets, brown, moist, very soft to stiff				
268.5 / 1.0	**CLAYEY SILTY TILL:** sandy, trace gravel, brown, moist, very stiff to hard	2	SS	15	268
	cobble at 2.3m	3	SS	26	
		4	SS	28	267
		5	SS	34	
265.3					266
4.2	**SANDY SILT TILL:** trace clay, trace to some gravel, brown, moist, dense to very dense grey below 4.6m	6	SS	59	265
	reddish brown below 6.1m	7	SS	54	264
	moist to very moist below 7.6m	8	SS	37	263
	cobble/ boulder between 9.1m and 12.2m	9	SS	50/ 100mm	262
		10	SS	50/ 25mm	261
256.9		11	SS	50/ 25mm	260
12.6	**END OF BOREHOLE:**				259
					258
					257

W. L. 266.6 m Jan 02, 2020
W. L. 266.0 m May 03, 2021
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
9	5	35	55	5

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

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 BH19-4

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

(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
270.3												
270.0 0.0	**TOPSOIL:** 250mm											
0.3	**WEATHERED/ DISTURBED SOIL:** sandy silt to silty sand, trace rootlets, brown, moist, loose		1	SS	4		270					
269.5 0.8	**WEATHERED/ DISTURBED SOIL:** silty sand, brown, wet, loose		2	SS	9							
268.8 1.5	**SILTY SAND:** trace clay, brown, moist to very moist, loose to compact		3	SS	6		Bentonite					
			4	SS	13		268					
	wet below 3.1m		5	SS	11		267					0 57 41 2
265.7 4.6	**SANDY SILT:** trace clay, trace gravel, brown, wet, compact		6	SS	10		W. L. 266.3 m Jan 02, 2020 Slotted Pipe					
							265					
264.2 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

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

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
274.2							
274.0 0.0	**TOPSOIL:** 250mm						
0.3	**WEATHERED/ DISTURBED SOIL:** silty sand, trace clay, trace gravel, brown, very moist, very loose	1	SS	2		274	
273.4 0.8	**CLAYEY SILT:** some sand, trace gravel, trace rootlets, brown, very moist, firm to stiff	2	SS	8			
272.5 1.7	**SANDY SILT:** trace to some clay, trace gravel, brown, very moist, loose to compact	3	SS	4		273	
		4	SS	16	Bentonite W. L. 272.0 m Jan 02, 2020		
271.1 3.1	**SANDY SILT TILL:** trace clay, trace gravel, brown, very moist, compact	5	SS	20	W. L. 271.2 m May 03, 2021		
269.6 4.6	**SILTY SAND:** trace clay, grey, saturated, compact	6	SS	24	Filter Pack Slotted Pipe	270	0 64 34 2
		7	SS	12		268	
267.5 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 ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

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

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

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

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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
	sandy, sand seams below 2.3m		4	SS	31		265
264.7							
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	263
	trace cobbles, grey below 4.6m		6	SS	50/ 75mm		
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	
			10	SS	71		257
							256
			11	SS	59		
255.0							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

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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 May 03, 2021	
			6	SS	36	W. L. 267.3 m Feb 03, 2021	266
6.1 / 261.7	**SILT:** some clay to clayey, trace sand, grey, wet, loose to compact		7	SS	7	Bentonite	265
			8	SS	21		263
9.1 / 260.1	**SILTY SAND TILL:** trace clay, trace gravel, grey, very moist to wet, very dense		9	SS	50/ 125mm		261
10.7 / 258.6	**GRAVELLY SILTY SAND TILL:** trace to some clay, grey, wet, very dense		10	SS	53	Filter Pack Slotted Pipe	260
12.2 / 258.3	**SILTY SAND TILL:** trace clay, reddish brown, wet, very dense		11	SS	50/ 25mm		259
12.5	**END OF BOREHOLE:** 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						

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
	25	44	23	8

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 BH19-9

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	NUMBER	TYPE	BLOWS 0.3 m "N"
271.6 / 0.0	**TOPSOIL:** 350mm			
271.3 / 0.4	**WEATHERED/ DISTURBED SOIL:** sandy silt, trace clay, trace organics/ rootles, dark brown, wet, very loose	1	SS	3
270.8 / 0.8	**SILTY SAND:** trace clay, brown, wet, compact	2	SS	15
269.3 / 2.3	**SILT:** trace clay, trace sand, grey, moist, compact	3	SS	21
268.5 / 3.1	**SANDY SILT TO SILTY SAND TILL:** trace clay, trace to some gravel, grey, wet, compact to very dense	4	SS	22
	cobble below 4.6m	5	SS	23
265.5 / 6.1	**SILT:** trace to some clay, trace sand, grey, moist, very dense	6	SS	83
264.9 / 6.7	**END OF BOREHOLE:**	7	SS	68

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

GROUND WATER CONDITIONS: W. L. 270.5 m Jan 02, 2020n; May 03, 2021; W. L. 267.9 m Feb 03, 2021; Filter Pack; Slotted Pipe

ELEVATION: 271, 269, 268, 266, 265

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
15	39	41	5

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 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
263.0 / 0.0	**TOPSOIL:** 225mm						
262.8 / 0.2	**FILL:** clayey silt, trace gravel, sand seams, trace topsoil/ organics, brown, moist, firm		1	SS	4		
262.2 / 0.8	**SILTY CLAY TILL:** sandy, trace gravel, sand seams, brown, moist, very stiff to hard		2	SS	23		262
			3	SS	34	W. L. 261.1 m Feb 03, 2021	
260.4 / 2.6	**SAND TO SILTY SAND:** trace silt, brown, wet, loose to compact		4	SS	18	Bentonite	
			5	SS	19		260
			6	SS	7		259
	grey below 6m		7	SS	9	Filter Pack Slotted Pipe	258
255.5 / 7.5	**SILTY CLAY:** trace gravel, wet sand seams, grey, very moist, very stiff		8	SS	19		257
254.8 / 8.2	**END OF BOREHOLE:**						256
							255

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

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	2	18	49	31
7	0	59	40	1

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

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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

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	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 2 258.2	**CLAYEY SILT TO SILT:** trace gravel, sand seams, grey, moist, stiff	3	SS	10	W. L. 259.2 m May 03, 2021	
2.3	**SILTY SAND TO SANDY SILT TILL:** some clay, trace gravel, grey, wet, compact	4	SS	16	W. L. 258.0 m Feb 03, 2021	
3		5	SS	12		257
4						256
5		6	SS	49	Filter Pack	
6					Slotted Pipe	255
254.1	very dense below 6.1m	7	SS	50/ 125mm		
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

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

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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"	GROUND WATER CONDITIONS	ELEVATION
263.2						
263.0 0.0	**TOPSOIL:** 225mm					263
0.2	**FILL:** clayey silt, trace gravel, trace topsoil, trace rootlets, brown, moist, firm	1	SS	4		
262.1		2	SS	7		262
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		Bentonite
260.9						261
2.3	**SILT TO SANDY SILT:** trace clay, brown, wet, compact	4	SS	22		
260.2						260
3.0	**SILTY SAND:** trace clay, brown, wet, dense	5	SS	33	W. L. 259.8 m W. L. 259.6 m Feb 03, 2021	
						259
		6	SS	26		Filter Pack
						Slotted Pipe
						257
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

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
	0	25	65	10
	0	56	43	1

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

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

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

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

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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:

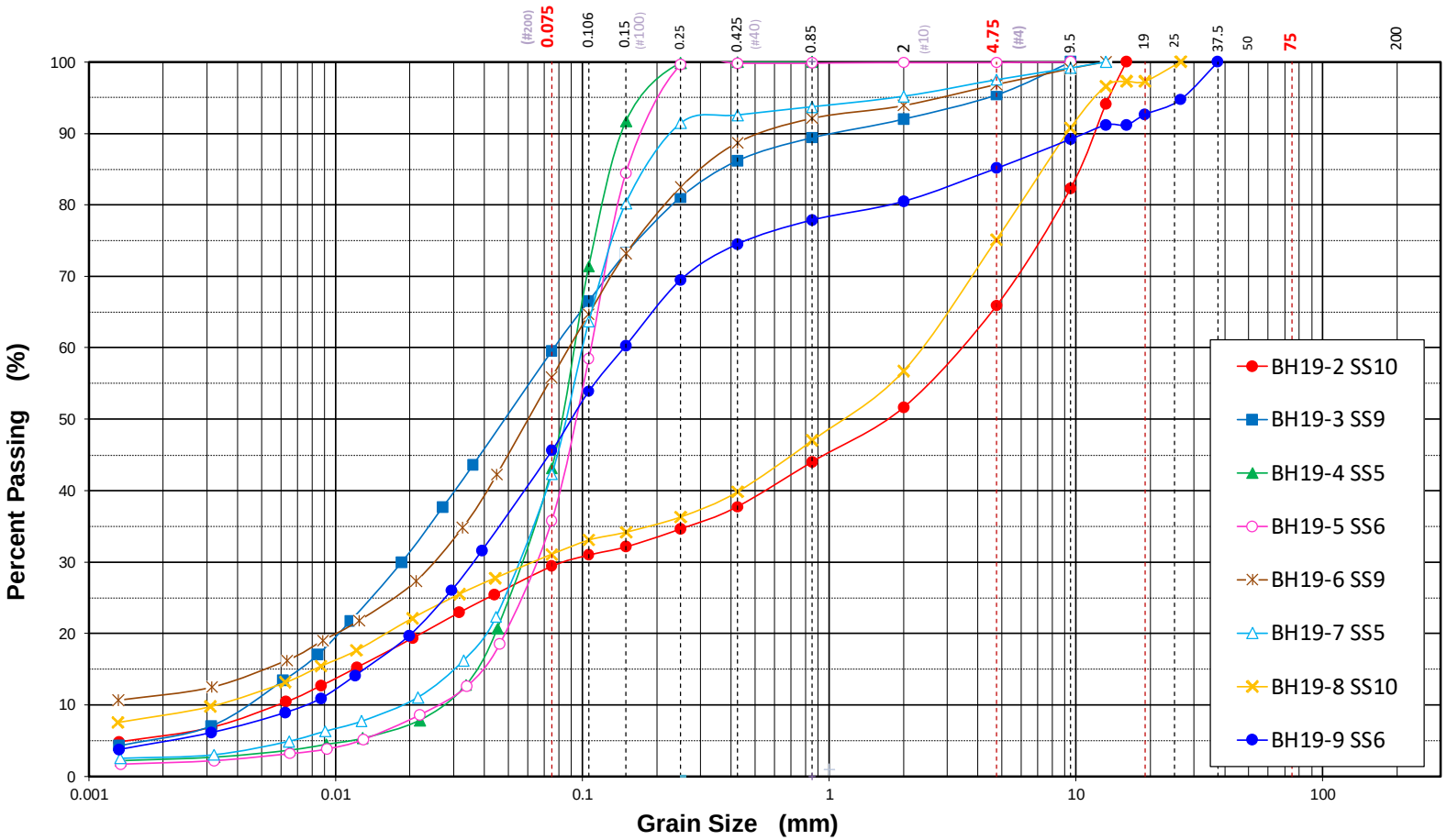
Date:	Water Level (mbgl):
Feb 03, 2021	frozen
May 03, 2021	-1.0 (above ground level)

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

Particle Size Distribution (ASTM-D421/D422)



Silt and Clay		Sand			Gravel		Cobble +
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	

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Vaughan, Ontario, L4H 0K8
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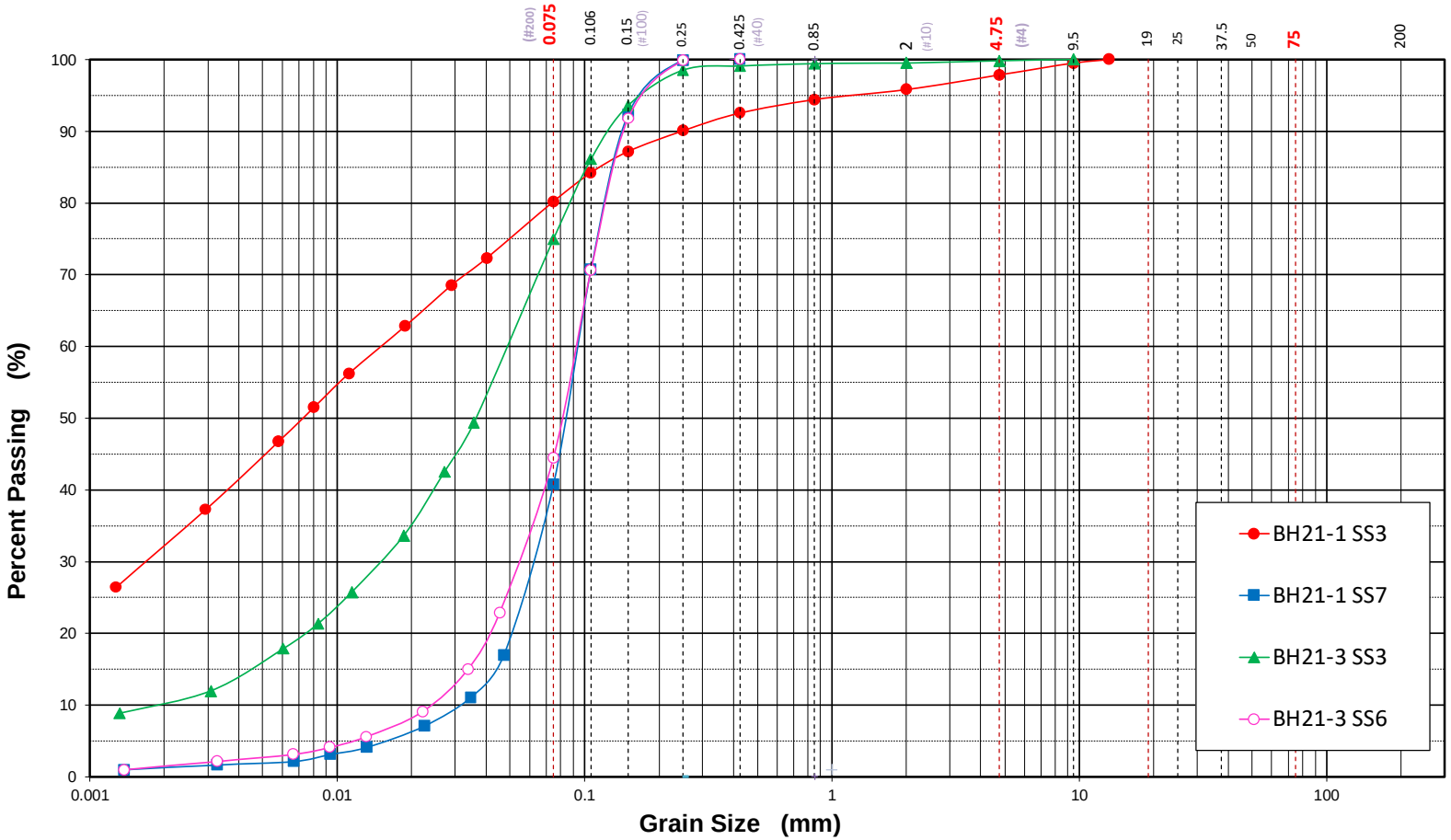
www.dsconsultants.ca

Project	**Hicks Property, ON**	Project No	**19-312-100**
Location	**Kennedy Road and Old School Road, Caledon, ON**	Date	**Dec/17/2019**
Client	**Argo Developments**	Dwg. No	15

Particle Size Distribution (ASTM-D421/D422)



Silt and Clay		Sand			Gravel		Cobble +
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	

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Project	**PRELIMINARY GEOTECHNICAL INVESTIGATION**	Project No	**19-312-100**
Location	**Old School Rd. & Hurontario St. , ON.**	Date	**Feb/18/2021**
Client	**Argo Developments**	Dwg No	16

Appendix A

General Requirements for Engineered Fill

GENERAL REQUIREMENTS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most of Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular 'B' sand and gravel fill material.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows; however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and DS Consultants Ltd (DS). Without this confirmation no responsibility for the performance of the structure can be accepted by DS. Survey drawing of the pre and post fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a DS engineer prior to placement of fill.

5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

6. Full-time geotechnical inspection by DS during placement of engineered fill is required. Work cannot commence or continue without the presence of the DS representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

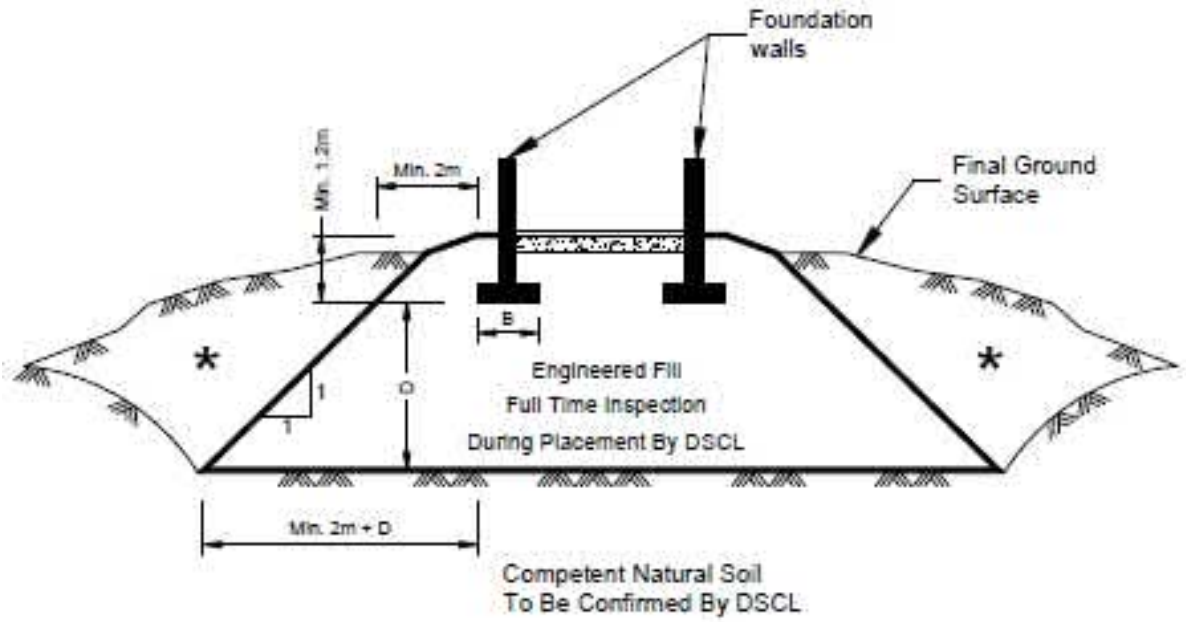
10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from DS prior to footing concrete placements. All excavations must be backfilled under full time supervision by DS to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with the approval of DS.

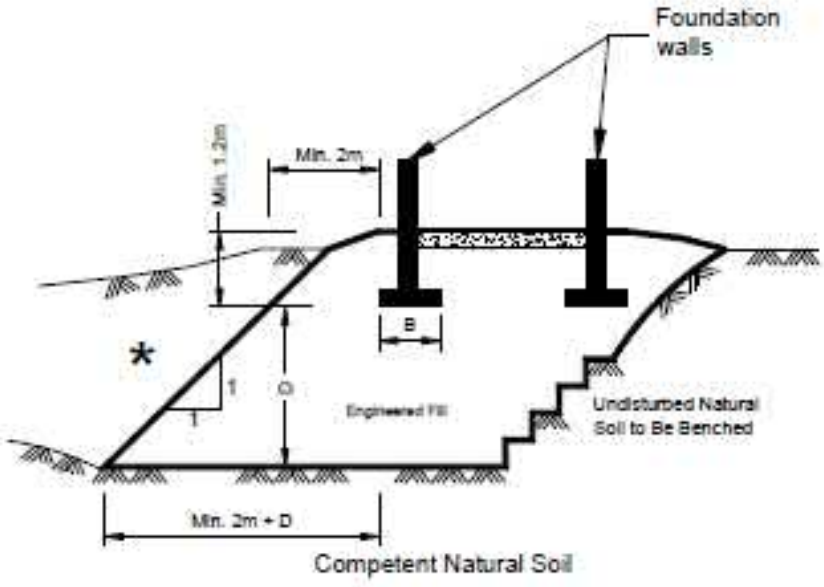
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.

12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.

14. These guidelines are to be read in conjunction with DS Consultants Ltd report attached.

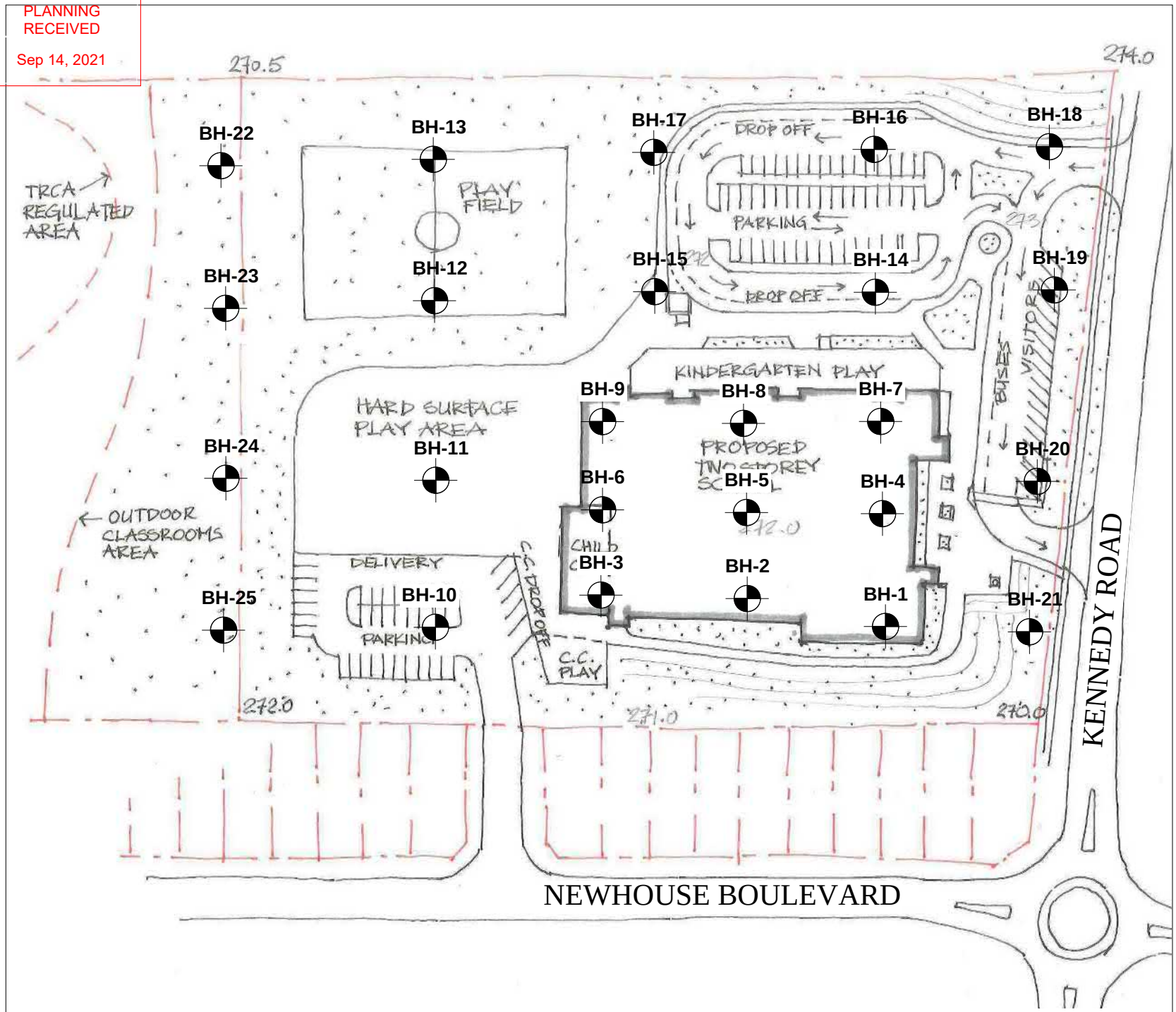




* Backfill in this area to be as per the DSCL report.

Appendix B

Location Plan and Logs of Previous Boreholes (BH-1 to BH-9) by Forward Engineering



NOTES:

BH-1 = BOREHOLE 1

N

BOREHOLE LOCATION PLAN

Rev.	DATE	REVISION / ISSUE
04		
03		
02		
01		

Project Name: PROPOSED SOUTHFIELD No.2 PUBLIC SCHOOL

Address: CALEDON, ONTARIO

PROJECT No.	:5941
DESIGN BY	:P.R.
DRAWING DATE	:OCT. 14, 2016
DRAWN BY: P.R.	PAGE 1 of 1
CHECKED BY: G.S.	

FORWARD ENGINEERING
& Associates Inc.

Forward Engineering & Associates Inc.
244 Brockport Drive, Unit 15
Toronto, Ontario M9W 6X9
Tel: 416-798-3500 Fax: 416-798-8481

www.forwardengineering.ca

Project No: 5941

Log of Borehole BH-1

Project: PROPOSED SOUTHFIELD No. 2 PUBLIC SCHOOL

Client: PDSB c/o MG ARCHITECT INC.

Location: KENNEDY ROAD & NEWHOUSE BOULEVARD, CALEDON, ON.

Enclosure: 2

Engineer: P.R.

Depth (m)	Description	Elevation (m)	Number	Blows/ft	Recovery	Standard Penetration Test (Blows/ft) 20 40 60 80	Water Content % 20 40 60 80
	Ground Surface	270.42					
0	ORGANIC SOIL (±200 mm)	0.00	1	7		7	
1	SANDY SILT/SILTY FINE SAND with traces to some clay in the upper zone. loose to compact, brown, moist to wet.		2	14		14	
2			3	15		15	
	CLAYEY SILT TILL	268.13					
	very stiff, greyish brown, moist.	2.29	4	24		24	
3	grading grey.		5	30		30	
4	grading with fine sand seams, hard.		6	66		66	
5		265.39					
	End of Borehole	5.03					
6	Upon completion of drilling, the borehole was open to 4.7 m and water level was measured at 4.1 m.						
7	Hours later, the borehole was open to 3.0 m and water level was measured at 2.4 m.						
8							

Drill Method: SOLID AUGER

Drill Date: 26 OCT. 2016

FORWARD ENGINEERING & ASSOCIATES INC.
15-244 Brockport Drive, Toronto, Ontario, M9W 6X9

Datum: GEODETIC

Checked by: G.S.

Sheet: 1 of 1

Project No: 5941

Log of Borehole BH-2

Project: PROPOSED SOUTHFIELD No. 2 PUBLIC SCHOOL

Client: PDSB c/o MG ARCHITECT INC.

Location: KENNEDY ROAD & NEWHOUSE BOULEVARD, CALEDON, ON.

Enclosure: 3

Engineer: P.R.

Depth (m)	Description	Elevation (m)	Number	Blows/ft	Recovery	Standard Penetration Test (Blows/ft) 20 40 60 80	Water Content % 20 40 60 80
	Ground Surface	272.17					
0	ORGANIC SOIL (±125 mm)	0.00	1	5		5	
	DISTURBED SOIL brown sandy silt/silty sand with some rootlets, loose, moist.	271.41 0.76	2	13		13	
1	SANDY SILT/SILTY FINE SAND compact, brown/rust brown, very moist.		3	13		13	
2	grading brown, wet.		4	17		17	
3			5	15		15	
4	CLAYEY SILT TILL with sand inclusions. very stiff, greyish, moist.	267.60 4.57	6	22		22	
5	End of Borehole	267.14 5.03					
6	Upon completion of drilling, the borehole was open to 3.2 m and water level was measured at 3.0 m.						
7	Hours later, the borehole was open to 2.9 m and water level was measured at 2.5 m.						
8							

Drill Method: SOLID AUGER

Drill Date: 26 OCT. 2016

FORWARD ENGINEERING & ASSOCIATES INC.
15-244 Brockport Drive, Toronto, Ontario, M9W 6X9

Datum: GEODETIC

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Sheet: 1 of 1

Project No: 5941

Log of Borehole BH-3

Project: PROPOSED SOUTHFIELD No. 2 PUBLIC SCHOOL

Client: PDSB c/o MG ARCHITECT INC.

Location: KENNEDY ROAD & NEWHOUSE BOULEVARD, CALEDON, ON.

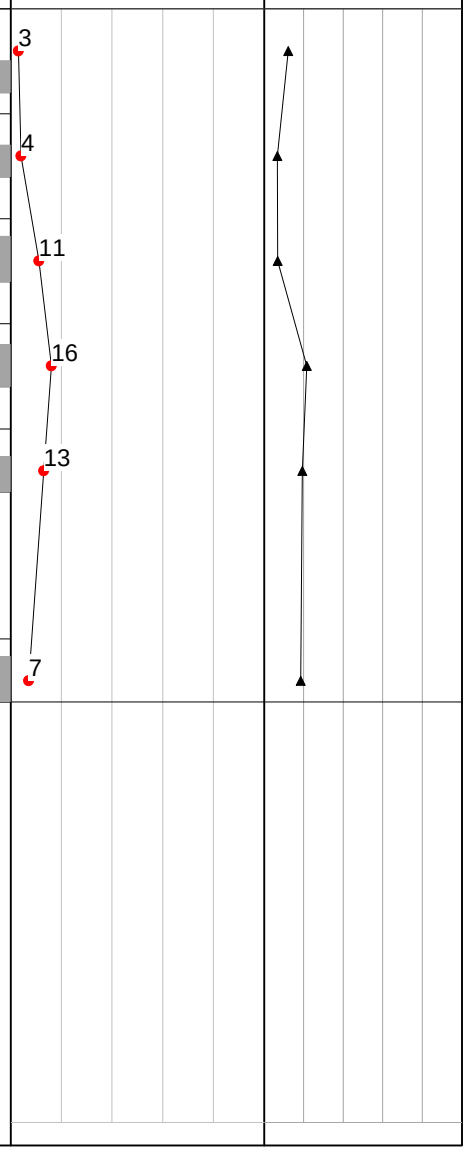
Enclosure: 4

Engineer: P.R.

Depth (m)	Description	Elevation (m)	Number	Blows/ft	Recovery
	Ground Surface	272.92			
0	ORGANIC SOIL (±75 mm)	0.00	1	3	
1	DISTURBED SOIL/OLD FILL brown sandy silt/silty fine sand with some rootlets, very loose, moist. Grading possible old fill.		2	4	
2	SILTY FINE SAND/SANDY SILT compact, brown/rust brown, very moist.	271.19 1.73	3	11	
3	grading sandy silt, brown, very moist to wet.		4	16	
4			5	13	
5	CLAYEY SILT (TILL) with sand inclusions. firm, greyish brown, wet.	268.35 4.57 267.89 5.03	6	7	
	End of Borehole				

Upon completion of drilling, the borehole was open to 3.4 m and water level was measured at 3.2 m.

Hours later, the borehole was open to 3.0 m and water level was measured at 2.7 m.



Drill Method: SOLID AUGER

Drill Date: 26 OCT. 2016

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Datum: GEODETIC

Checked by: G.S.

Sheet: 1 of 1

Project No: 5941

Log of Borehole BH-4

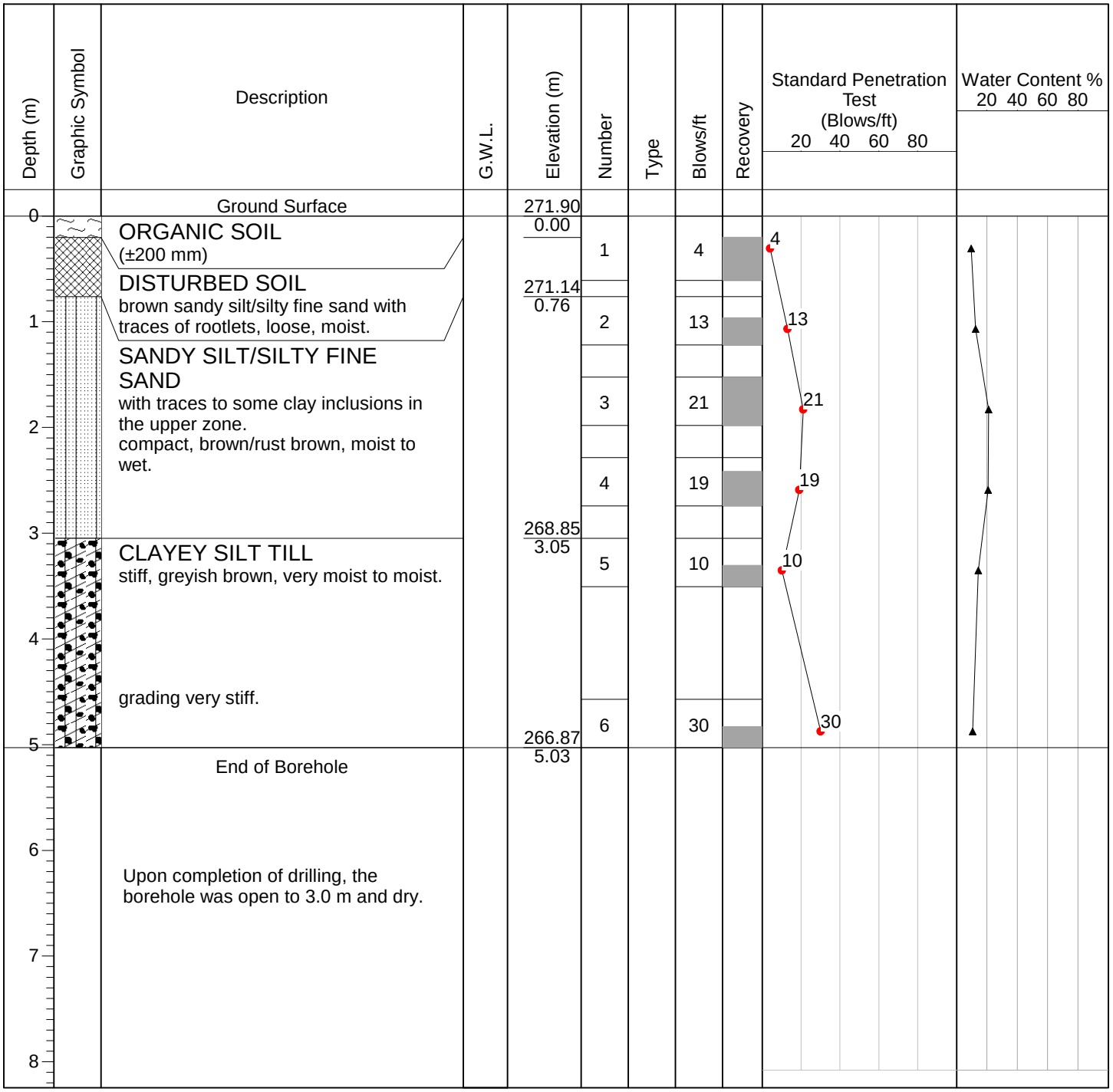
Project: PROPOSED SOUTHFIELD No. 2 PUBLIC SCHOOL

Client: PDSB c/o MG ARCHITECT INC.

Location: KENNEDY ROAD & NEWHOUSE BOULEVARD, CALEDON, ON.

Enclosure: 5

Engineer: P.R.



Drill Method: SOLID AUGER

Drill Date: 26 OCT. 2016

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Datum: GEODETIC

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Sheet: 1 of 1

Project No: 5941

Log of Borehole BH-5

Project: PROPOSED SOUTHFIELD No. 2 PUBLIC SCHOOL

Client: PDSB c/o MG ARCHITECT INC.

Location: KENNEDY ROAD & NEWHOUSE BOULEVARD, CALEDON, ON.

Enclosure: 6

Engineer: P.R.

Depth (m)	Description	Elevation (m)	Number	Blows/ft	Recovery	Standard Penetration Test (Blows/ft) 20 40 60 80	Water Content % 20 40 60 80
	Ground Surface	272.93					
0	ORGANIC SOIL (±100 mm)	0.00	1	5		5	
	DISTURBED SOIL brown sandy silt/silty fine sand with traces of rootlets, loose, moist.	272.17 0.76	2	18		18	
1	SANDY SILT/SILTY FINE SAND compact, brown, moist to very moist.		3	10		10	
2			4	28		28	
3	grading wet.		5	11		11	
4	CLAYEY SILT (TILL) with sand inclusions. firm, greyish brown, wet.	268.36 4.57	6	6		6	
5	End of Borehole	267.90 5.03					
6	Upon completion of drilling, the borehole was open to 3.8 m and water level was measured at 3.6 m.						
7							
8							

Drill Method: SOLID AUGER

Drill Date: 26 OCT. 2016

FORWARD ENGINEERING & ASSOCIATES INC.
15-244 Brockport Drive, Toronto, Ontario, M9W 6X9

Datum: GEODETIC

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Sheet: 1 of 1

Project No: 5941

Log of Borehole BH-6

Project: PROPOSED SOUTHFIELD No. 2 PUBLIC SCHOOL

Client: PDSB c/o MG ARCHITECT INC.

Location: KENNEDY ROAD & NEWHOUSE BOULEVARD, CALEDON, ON.

Enclosure: 7

Engineer: P.R.

Depth (m)	Description	Elevation (m)	Number	Blows/ft	Recovery	Standard Penetration Test (Blows/ft) 20 40 60 80	Water Content % 20 40 60 80
	Ground Surface	274.01					
0	ORGANIC SOIL (±250 mm)	0.00					
	DISTURBED SOIL brown sandy silt/silty fine sand with traces of rootlets, loose, moist.	273.10	1	8		8	
1		0.91	2	17		17	
	SILT TILL/CLAYEY SILT TILL very stiff to hard, brown, moist.						
	grading with sand layer/seam.		3	32		32	
2		271.72					
	SILTY FINE SAND/SANDY SILT compact, brown, moist.	2.29	4	26		26	
3			5	25		25	
4	grading wet.		6	13		13	
5							
6		267.91					
	CLAYEY SILT (TILL) firm, brown, wet.	6.10	7	7		7	
		267.46					
7	End of Borehole	6.55					
	Upon completion of drilling, the borehole was open to 4.7 m and water level was measured at 4.5 m.						
	Hours later, the borehole was open to 4.4 m and water level was measured at 3.9 m.						
8							

Drill Method: SOLID AUGER

Drill Date: 26 OCT. 2016

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Datum: GEODETIC

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Sheet: 1 of 1

Project No: 5941

Log of Borehole BH-7

Project: PROPOSED SOUTHFIELD No. 2 PUBLIC SCHOOL

Client: PDSB c/o MG ARCHITECT INC.

Location: KENNEDY ROAD & NEWHOUSE BOULEVARD, CALEDON, ON.

Enclosure: 8

Engineer: P.R.

Depth (m)	Description	Elevation (m)	Number	Blows/ft	Recovery	Standard Penetration Test (Blows/ft) 20 40 60 80	Water Content % 20 40 60 80
0	Ground Surface	272.65					
	ORGANIC SOIL (±200 mm)	0.00	1	8		8	
1	DISTURBED SOIL brown sandy silt/silty fine sand with traces of rootlets, loose, moist.	271.74 0.91	2	11		11	
	SANDY SILT/SILTY FINE SAND compact, brown, moist to very moist.		3	11		11	
2	grading wet.		4	22		22	
3			5	22		22	
4		268.08 4.57					
	CLAYEY SILT TILL with sand inclusions. very stiff, grey, moist.	267.62 5.03	6	22		22	
5	End of Borehole						
6	Upon completion of drilling, the borehole was open to 3.4 m and was wet at the bottom.						
7	Hours later, the borehole was open to 3.4 m and water level was measured at 3.1 m.						
8							

Drill Method: SOLID AUGER

Drill Date: 26 OCT. 2016

FORWARD ENGINEERING & ASSOCIATES INC.
15-244 Brockport Drive, Toronto, Ontario, M9W 6X9

Datum: GEODETIC

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Sheet: 1 of 1

Project No: 5941

Log of Borehole BH-8

Project: PROPOSED SOUTHFIELD No. 2 PUBLIC SCHOOL

Client: PDSB c/o MG ARCHITECT INC.

Location: KENNEDY ROAD & NEWHOUSE BOULEVARD, CALEDON, ON.

Enclosure: 9

Engineer: P.R.

Depth (m)	Description	Elevation (m)	Number	Type	Blows/ft	Recovery	Standard Penetration Test (Blows/ft) 20 40 60 80	Water Content % 20 40 60 80
	Ground Surface	273.84						
0	ORGANIC SOIL (±180 mm)	0.00	1		6		6	
	DISTURBED SOIL brown sandy silt/ with rootlets, loose, moist.	273.08 0.76	2		15		15	
1	SANDY SILT/SILTY FINE SAND compact to dense, brown, moist.		3		17		17	
2			4		32		32	
3	grading compact, wet.		5		16		16	
4								
	grading sandy silt and silt.		6		12		12	
5								
6	CLAYEY SILT TILL hard, grey, moist.	267.74 6.10	7		37		37	
	End of Borehole	267.29 6.55						
7	Upon completion of drilling, the borehole was open to 4.8 m and water level was measured at 4.6 m. Hours later, the borehole was open to 4.5 m and water level was measured at 4.2 m.							
8								

Drill Method: SOLID AUGER

Drill Date: 26 OCT. 2016

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15-244 Brockport Drive, Toronto, Ontario, M9W 6X9

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Sheet: 1 of 1

Project No: 5941

Log of Borehole BH-9

Project: PROPOSED SOUTHFIELD No. 2 PUBLIC SCHOOL

Client: PDSB c/o MG ARCHITECT INC.

Location: KENNEDY ROAD & NEWHOUSE BOULEVARD, CALEDON, ON.

Enclosure: 10

Engineer: P.R.

Depth (m)	Description	G.W.L.	Elevation (m)	Number	Type	Blows/ft	Recovery	Standard Penetration Test (Blows/ft) 20 40 60 80	Water Content % 20 40 60 80
	Ground Surface		274.60						
0	ORGANIC SOIL (±200 mm)		0.00	1		8		8	
	DISTURBED SOIL brown sandy silt with traces of rootlets, loose, moist.		273.84 0.76	2		17		17	
1	SANDY SILT/SILTY FINE SAND compact to dense, brown, moist.			3		26		26	
2				4		43		43	
3	grading layer of silt.			5		31		31	
4									
5	grading wet.			6		17		17	
6	grading sandy silt and silt.			7		13		13	
			268.05						
7	End of Borehole Upon completion of drilling, the borehole was open to 5.0 m and water level was measured at 4.9 m. Hours later, the borehole was open to 3.3 m and water level was measured at 2.7 m.		6.55						
8									

Drill Method: SOLID AUGER

Drill Date: 26 OCT. 2016

FORWARD ENGINEERING & ASSOCIATES INC.
15-244 Brockport Drive, Toronto, Ontario, M9W 6X9

Datum: GEODETIC

Checked by: G.S.

Sheet: 1 of 1

Appendix C

Selected Photographs for Slope Stability Assessment
(Photos C1 to C24 taken on Dec. 10, 2019 and Mar.25, 2021)

Photo C1: Creek view from Old School Road (looking south – downstream)
December 10, 2020

Photo C2: Creek and Old School Road (looking north – upstream)
December 10, 2020

Photo C3: Creek and flood plain conditions at northeast part of site (looking northwest - upstream)
December 10, 2020

Photo C4: Creek and flood plain conditions at northeast part of site (looking southeast - downstream)
December 10, 2020

Photo C5: East slope top area at northeast part of site, to northwest of BH19-5 (looking northwest)
December 10, 2020

Photo C6: South slope top area at middle-east part of site (looking west)
December 10, 2020

Photo C7: Creek and flood plain conditions at middle-east part of site (looking west)
December 10, 2020

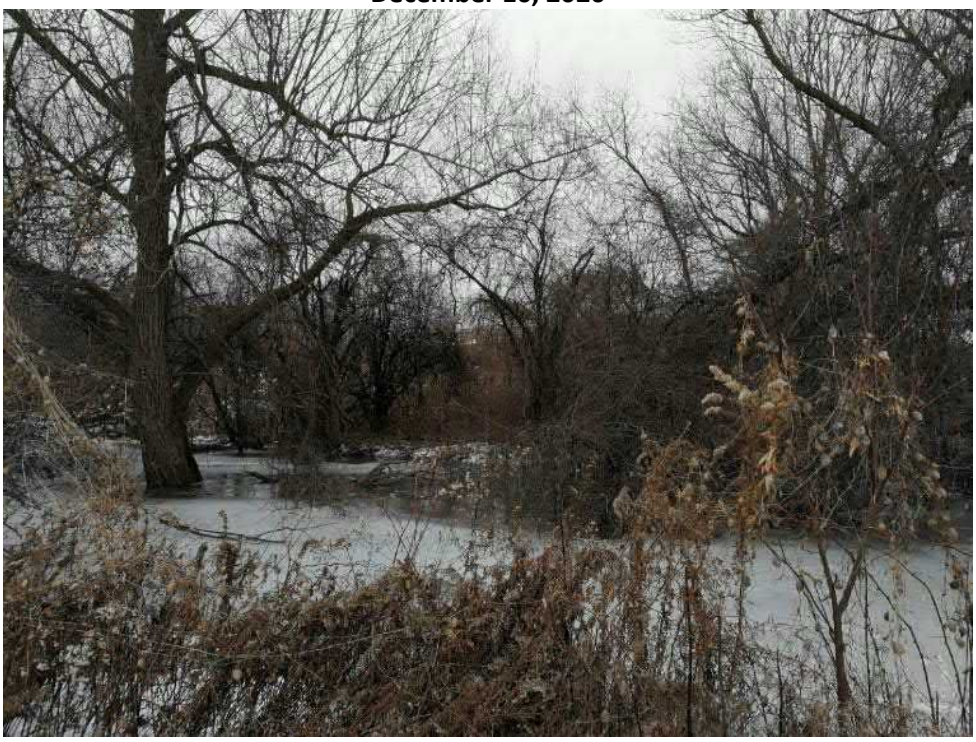

Photo C8: Creek and flood plain conditions at middle-east part of site (looking northwest)
December 10, 2020

Photo C9: South slope conditions at middle-east part of site, to northwest of BH19-3 (looking northeast), December 10, 2020

Photo C10: South slope top area of middle part of site, to north of BH19-2 (looking southwest) December 10, 2020

Photo C11: Northwest slope top area of northeast part of site, to east of BH19-6 (looking northeast)
December 10, 2020

Photo C12: North slope top area of middle part of site, to south of BH19-6 & BH19-8 (looking west)
December 10, 2020

Photo C13: Slope and flood plain conditions at middle-west part of site (looking northeast)
December 10, 2020

Photo C14: Slope and flood plain conditions at middle-west part of site (looking southeast)
December 10, 2020

Photo C15: East side of wet area to northeast of BH21-2 (looking south from Old School Rd)
March 25, 2021

Photo C16: West side of wet area to northeast of BH21-2 (looking south from Old School Rd)
March 25, 2021

Photo C17: Slope to southeast of BH21-2 (looking southwest)
March 25, 2021

Photo C18: Gentle slope to east of BH21-4 (looking northeast)
March 25, 2021

Photo C19: Slope and flood plain conditions to south of BH21-4 (looking south)
March 25, 2021

Photo C20: Slope conditions to west of BH21-4 (looking west)
March 25, 2021

Photo C21: Slope conditions at west part of site near Hurontario St (looking west) March 25, 2021

Photo C22: Slope and flood plain conditions at west part of site near Hurontario St (looking northwest), March 25, 2021

Photo C23: Top of slope near Hurontario St (looking east)
March 25, 2021

Photo C24: Creek which was more than 15 m away from slope toe at west part of site (looking west)
March 25, 2021