

REPORT ON
Preliminary Geotechnical Investigation
Proposed Mixed Use
Residential - Commercial Development
Palermo Land
Dundas Street West & Bronte Road
Oakville, Ontario

PREPARED FOR:
Palermo Village Corp (PVC)

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1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Palermo Village Corp (PVC) to carry out a geotechnical investigation for the proposed mixed use residential - commercial development located at Palermo Land, at Dundas Street west and Bronte Road, Oakville, Ontario.

It is understood that the proposed subdivision will consist of low-rise, mid-rise and high-rise residential development with one level of basement or more. The finish floor elevation of the proposed construction, and the invert of the site services is not known to us at the time of writing this report.

The purpose of this geotechnical investigation was to obtain information about the subsurface conditions at sixty-five (65) borehole locations and from the findings in the boreholes to make engineering recommendations pertaining to the geotechnical design of residential development including underground utilities, roads and to comment on the foundation conditions for the building construction.

This report deals with geotechnical issues only. The findings of Phase 1 and Phase 2 Environmental Site Assessment (ESA) by DS will be documented in separate reports.

In addition, a geohydrology study is carried out by others. Therefore, comments regarding the type and extent of groundwater control required should be obtained from the geohydrology report.

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 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 Palermo Village Corp (PVC) and its architect and designers. Third party use of this report without DS consent is prohibited.

2. FIELD AND LABORATORY WORK

A total of sixty-six (66) boreholes (BH21-1 to BH21-15, BH21-19 to BH21-68 and BH21-52A, see Drawing 1 for borehole locations) were drilled at the subject site by DS, to depths ranging from 2.1 to 13.8m.

It should be noted that boreholes BH21-16, BH21-17 and BH21-18 were not drilled and were replaced with BH21-30, BH21-36 and BH21-68 for slope stability study.

Boreholes (BH21-30, BH21-36 and BH21-68, see Drawing 1 for borehole locations) were drilled at the subject site to depths ranging from 5.5 to 7.7m to shale bedrock, to conduct a slope stability study in the area of the creek, located to the west of the property. This slope stability study will be issued in a separate report.

The boreholes were drilled with solid and hollow stem continuous flight augers 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 from geotechnical boreholes were tested for moisture contents. Grain size analyses of twenty four (24) selected soil samples were conducted and the results are presented in Drawings 68 and 69. Atterberg Limits testing were conducted on twenty one (21) soil samples and results are presented on the respective borehole logs.

Water level observations were made during and upon completion of drilling. Twelve (12) monitoring wells of 50mm diameter were installed in boreholes BH21-1 to BH21-8, BH21-15, BH21-30, BH21-36 and BH21-68 for the long-term groundwater levels monitoring.

The elevation surveying of the borehole locations was undertaken by DS Consultants Ltd. personnel, using the differential GPS unit.

3. SUBSURFACE CONDITIONS

The borehole location plan is shown on **Drawing 1**. General notes on sample description are provided on **Drawing 1A**. The subsurface conditions in the boreholes by DS are presented in the individual borehole logs presented on **Drawings 2 to 67**.

3.1 Soil and Bedrock Conditions

Topsoil:

A surficial topsoil layer, varying from 150 to 280 mm in thickness, was present at the surface of all 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. Shallow hand-dug test-pits should be carried out to calculate the amount of topsoil at site accurately.

Fill and Weathered/Disturbed Soils:

In BH21-10, sandy silt fill with 150 mm asphalt paving at surface was found extending to a depth of 0.8 m. In BH21-11, sand and gravel fill was found to a depth of 0.8 m. In all other boreholes, weathered/disturbed clayey silt with inclusions of topsoil and organics was found below the topsoil, extending to a depth of 0.8 m. The weathered/disturbed clayey silt was generally very soft to firm in consistency, with some stiff layers in some boreholes.

Glacial Till (Clayey Silt Till, Silty Clay Till, Sandy Silt Till):

Below the topsoil, glacial till deposits (varying from clayey silt to silty clay/till to sandy silt till) were encountered in all the boreholes, overlying till shale complex/shale bedrock. However, boreholes BH21-10 to BH21-15 were terminated in this till deposit. The sandy silt till deposits were found in a very dense state with, measured SPT 'N' value more than 100 blows per 300 mm of penetration.

Grain size analyses of three sandy silt till samples were conducted and the result is presented in **Drawings 68 and 69**, with the following fractions:

Clay: 8 to 17%
Silt: 43 to 47%
Sand: 22 to 29%
Gravel: 14 to 20%

The clayey/till deposits were found to have a firm to hard consistency, with measured SPT 'N' values ranging from 7 to more than 50 blows per 300 mm of penetration.

Grain size analyses of twenty one (21) clayey till samples were conducted and the results are presented in **Drawings 68 and 69**, with the following fractions:

Clay: 17 to 42%
Silt: 45 to 56%
Sand: 10 to 26%
Gravel: 1 to 7%

Atterberg limits tests of the twenty one (21) above clayey till samples were conducted. The results are shown on the borehole logs and are summarized as follows:

Liquid limit (W_L): 25.9 to 40.5%
Plastic limit (W_P): 13.9 to 18.7%
Plasticity index (PI): 8.7 to 21.8 %

Clayey/Sandy Silt Till/ Shale Complex:

Below the silt till in about twenty three Borehole locations, at approximate depths ranging from 2.1 to 7.3m and extending to approximate depths ranging from 3.1 to 8.2m, a deposit of clayey silt and sandy silt till / shale complex was found overlying shale bedrock. This deposit generally consisted of clayey silt till/sandy silt till mixed with highly weathered shale. This deposit was found to have generally a very stiff to hard consistency, with measured SPT 'N' values varying from 29 to more than 50 blows per 300 mm of penetration and very dense, with measured SPT 'N' value of more than 100 blows per 300 mm.

Boreholes BH21-6, BH21-7 and BH21-8 were terminated in this deposit at this at depths of 8.2, 8.0 and 5.2m due to auger refusal, probably due to shale bedrock.

Shale Bedrock:

Shale bedrock of Queenston Formation was encountered in all the boreholes except BH21-10 to BH21-15 and BH21-10 to BH21-15, BH21-6, BH21-7 and BH21-8. The shale bedrock was encountered at depths ranging from 3.1 to 12.2m below the existing grade, corresponding to Elevations varying from 138.8 to 160.0m. Shale bedrock was not proven by rock coring. The depth and elevation of the shale bedrock surface in the boreholes are presented on the borehole records attached to this report.

Because of the method of drilling and sampling, the surface elevations of the bedrock can be different than indicated on the borehole logs. With augering, the auger may penetrate some of the more weathered shale and the coring may therefore begin below the bedrock surface. Commonly the overburden overlying the shale contains slabs of limestone which would give a false indication of the bedrock level. Similarly, the depth of weathering cannot be determined accurately due to the presence of limestone layers.

The shale bedrock generally contains layers of siltstone, limestone and dolostone. Typically, the hard layers comprise about 15 to 20 percent of the unit. However, higher concentrations of hard layers can be present. The hard layers are usually less than 100 to 150 mm thick, but some layers are much thicker. The thicker layers have been observed to be as much as 750 to 900 mm at other sites. The layers are actually lenses and they can vary significantly in thickness over short distance.

Methane gas is anticipated in the bedrock. Appropriate care and monitoring is essential in all confined bedrock excavations. Stress relief features such as folds and faults are common in the shale bedrock. **Appendix A** presents more details and general comments about the shale bedrock.

3.2 Groundwater Conditions

Stabilized groundwater levels in the monitoring wells were recorded at depths ranging from 2.3 to 6.7 m below the existing grade, corresponding to Elevations 148.0 to 161.1 m. The groundwater levels measured in the monitoring wells are summarized in **Table 2**.

Table 2: 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)
BH21-1	153.7	Mar. 11/21	3.1	150.6
BH21-2	157.2	Mar. 1/21	4.6	152.6
BH21-3	164.8	May 9/21	4.2	160.6
BH21-4	162.0	Mar. 1/21	3.4	158.6
BH21-5	159.5	Mar. 1/21	3.1	156.4
BH21-6	156.7	Feb. 25/21	6.7	150.0
BH21-7	152.6	Feb. 25/21	1.2	151.4
BH21-8	164.3	May 9/21	3.1	161.2
BH21-15	152.4	May 9/21	4.4	148.0
BH21-30	160.5	April 14/21	2.3	158.2
BH21-36	160.0	April 14/21	2.4	157.6
BH21-68	161.1	April 14/21	5.2	155.9

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

Therefore, reference should be made to the hydrogeology study report prepared by Others for further details on the volume flow and groundwater control.

4. DISCUSSION AND RECOMMENDATIONS

It is proposed to develop the site as a residential subdivision. The lots will therefore be serviced by a network of roads, storm and sanitary sewers and watermains.

4.1 SITE GRADING & ENGINEERED FILL

The site will be developed as residential subdivision with 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 topsoil, fill materials and weathered/disturbed native soils containing topsoil/organics and other unsuitable materials should be stripped to expose the inorganic subgrade. The exposed subgrade should then be proof rolled with a heavy sheepfoot

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 B**. 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 B** are adhered to. To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential.

The following is a recommended procedure for an 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 suggested 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 native soils and existing fill materials free from topsoil and organics to be excavated are considered suitable for re-use as engineered fill, provided that their moisture contents at the time of construction are at or near optimum. 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 200 mm and compacted using heavy equipment suitable for these types of soils (e.g. heavy sheepsfoot compactors).

4.2 ROADS/PAVEMENTS

The investigation has shown that the predominant subgrade soil, after stripping the topsoil, fill and otherwise unsuitable subsoil, will generally consist of silty clay till and shale bedrock.

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

For Minor Local or local roads

40 mm HL3 Asphaltic Concrete
60 mm HL8 Asphaltic Concrete
150 mm Granular 'A'
350 mm Granular 'B'

For collector roads

40 mm HL3 Asphaltic Concrete
80 mm HL8 Asphaltic Concrete
150 mm Granular 'A'
350 mm Granular 'B'

These values may need to be adjusted according to the Town of Oakville 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.

Driveway pavements should be constructed as per the Town of Oakville standards.

4.2.1 STRIPPING, SUB-EXCAVATION AND GRADING

The site should be stripped of all topsoil, fill materials and weathered/disturbed soils containing topsoil/organics 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 some subsoils 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 $\pm 2\%$ 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 fill should be placed in thin layers and compacted to at least 98% of its SPMDD. 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 Town of Oakville requires the installation of full-length subdrains on all roads. 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 UNDERGROUND UTILITIES

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

4.3.1 TRENCHING

The boreholes show that below the existing topsoil and fill, the trenches will be predominantly dug through the glacial tills (clayey silt till, silty clay till, sandy silt till, till/shale complex and shale bedrock). Excavations can be carried out with heavy hydraulic backhoe. Groundwater levels in the monitoring wells were recorded at depths ranging from 3.9 to 4.6 m below the existing grade,

corresponding to Elevations 160.5 to 161.1 m. No major problems due to groundwater seepage are anticipated during construction in trenches dug through the clayey soils and shale bedrock. It is expected that any seepage, which occurs during wet periods or from the wet sand seams/layers in the till, can be removed by pumping from sumps.

Excavation of the shale can be carried out using heaviest available single tooth ripper equipment. The limestone beds are present and may overly the shale bedrock surface at some locations. It may be necessary at some locations to utilize jackhammer type equipment to “open” the limestone layers for the ripper.

The sides of excavations in the natural strata 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. Where wet sand and sandy silt layers in the till are encountered, flattened slopes will be required.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, fill material can be classified as Type 3 Soil above the groundwater table and Type 4 Soil in perched water conditions. The very stiff to hard clayey silt to silty clay till can be classified as Type 2 Soil above the groundwater table and Type 3 Soil below the groundwater table. Sandy soil can be classified as Type 3 soil above groundwater and as Type 4 soil below groundwater.

It should be noted that the till is a non-sorted sediment and therefore contain cobble and boulders. Possible large obstructions such as buried concrete pieces are also anticipated in the fill material. Provisions must be made in the excavation contract for the removal of possible boulders in the till, obstructions in the fill material and limestone layers in shale bedrock.

4.3.2 BEDDING

The boreholes show that the pipes will predominantly be laid within the native soils which will provide adequate support for the sewer pipes and allow the use of normal Class B type bedding. The bedding should conform to the current Ontario Provincial Standard specifications (OPSS 401/OPSD 802) and/or standards set by the local municipality.

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 or fill materials are encountered at the trench base level. 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. Where the bedding

falls below the anticipated water table, the bedding stone must be surrounded with a geotextile filter cloth.

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.

For deep trenches (if any), i.e. more than 2.0 m below the shale surface, a minimum 50 mm thick polystyrene etc. layer will be required at both sides of the pipe to avoid rock squeezing. The polystyrene layer should extend vertically to at least 0.3 m above the pipe. The rock trench should be wide enough so that at each side, the horizontal distance between the pipe side and the cut rock surface is at least 0.3 m.

4.3.3 BACKFILLING OF TRENCHES

Based on visual and tactile examination, the on-site excavated inorganic native soils are considered to be suitable for re-use as backfill in the service trenches provided their moisture contents at the time of construction are within 2 percent of their optimum moisture content.

The clayey deposits especially when its consistency is 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 be 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.

Selected inorganic fill and the native soils free from topsoil and organics can be used as general construction backfill where it can be compacted with sheep's foot type compactors. Loose lifts of soil, which are to be compacted, should not exceed 200 mm. Depending on the time of construction and weather, some excavated material may be too wet to compact and will require aeration prior to its use.

Imported granular fill, which can be compacted with handheld equipment, should be used in confined areas.

The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular B should be used.

The backfill should be placed in maximum 200 mm thick layers at or near ($\pm 2\%$) their optimum moisture content and each layer should be compacted to at least 95% SPMDD. In the upper 1.5 m

of subgrade, underneath the road base, the compaction should be increased to 98% SPMDD. 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 catch-basins 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 catch-basins.

It should be noted that the excavated soils are subject to moisture content increase during wet weather which would make these materials too wet for adequate compaction. Stockpiles should be compacted at the surface or be covered with tarpaulins to minimize moisture uptake.

4.3.4 ANTI SEEPAGE COLLARS/TRENCH PLUGS

For sewer installed under the groundwater table, seepage between the trench backfill material and the trench wall may cause erosion of the backfill materials. It is recommended that nominal anti-seepage collars (maximum spacing 50m) be provided to prevent erosion of the backfill materials. Anti seepage collar should not be located at pipe joint.

The anti-seepage collar may consist of a clay plug surrounding the sewer pipe. A typical clay plug will be about 1 m thick and extends laterally to a minimum distance of 0.5 m from the pipe circumference with a minimum of 0.3 m embedment into the shale or native sub-grade.

The on-site native silty clay soils may be suitable for such purpose subject to additional sampling and testing.

4.3.5 THRUST BLOCKS AND JOINT RESTRAINTS

For the design of thrust blocks on undisturbed native soils or engineered fill, an allowable (or SLS) bearing resistance of 150 kPa and factored ULS bearing resistance of 225 kPa can be used.

4.4 FOUNDATION CONDITIONS

4.4.1 House Foundations

It is understood that the proposed subdivision will consist of single-family homes (detached, and townhomes) with one level of basement.

The native soils encountered in the boreholes are competent to support the proposed houses on conventional footings. The spread and strip footings founded on the undisturbed native soils/bedrock can be designed for a bearing capacity of 200 kPa at SLS (Serviceability Limit State),

and for a factored geotechnical resistance of 300 kPa at ULS (Ultimate Limit State), at or be low a depth of 1.2 m below existing grades.

Subject to design grades, higher bearing capacity values are available for hard native soils and bedrock, if required.

Should the proposed footings be founded above the competent native soils, subject to design grades, the proposed houses can also be supported by spread and strip footings founded on engineered fill for a bearing capacity of 150 kPa at the serviceability limit states (SLS) and for a factored geotechnical resistance of 225 kPa at the ultimate limit states (ULS), provided all requirements in section 4.1 and **Appendix B** are adhered to.

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.

All footings exposed to seasonal freezing conditions must have at least 1.2 metres of soil cover for frost protection.

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 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.

4.4.2 Mid and High-rise Building Foundations

The proposed mid and high-rise building locations, number of floors/underground parking levels and design grades are not known at this stage. Therefore, recommendations regarding bearing pressures and other geotechnical parameters can be provided when the proposed building design information is available, due to the difference in ground elevations. The soil conditions are capable of supporting the mid-rise and high-rise development on conventional foundations.

4.5 FLOOR SLAB

The house floor slab can be supported on grade provided all topsoil, fill, and surficially weathered/disturbed native soils are removed and the base thoroughly proof rolled.

The fill required to raise the grade can consist of inorganic soil, placed in shallow lifts and compacted to 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

Where engineered fill is used to support the foundations, the floor slab can also be supported by engineered fill.

A moisture barrier consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the floor slab.

A perimeter and underfloor drainage system will be required, as shown on **Drawing 70**.

4.6 EARTH PRESSURES

The lateral earth pressures acting on retaining walls or underground 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, assumed to be 0.40 for vertical walls
and horizontal backfill for permanent construction

γ = Unit weight of backfill, a value of 21 kN/m³ 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 build up of any hydrostatic pressure behind the wall.

4.7 EARTHQUAKE CONSIDERATIONS

Based on the borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed buildings can be classified as 'Class C' for seismic site response

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

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

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

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. DS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

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

DS CONSULTANTS LTD.




Labib Mousa, P. Eng.




Fanyu Zhu, Ph.D., P.Eng.




Shabbir Dandukwala, M.Eng., P.Eng.

Project No.: 20-078-100- Geotechnical Investigation
Proposed Residential Development
1297 Dundas Street, Oakville, Ontario

Drawings

Appendix A

General Comments on Bedrock in Toronto Area

Appendix B

General Requirements for Engineered Fill

Drawings



 Borehole Locations



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

Project: Geotechnical Investigation-Palermo land, Oakville, ON

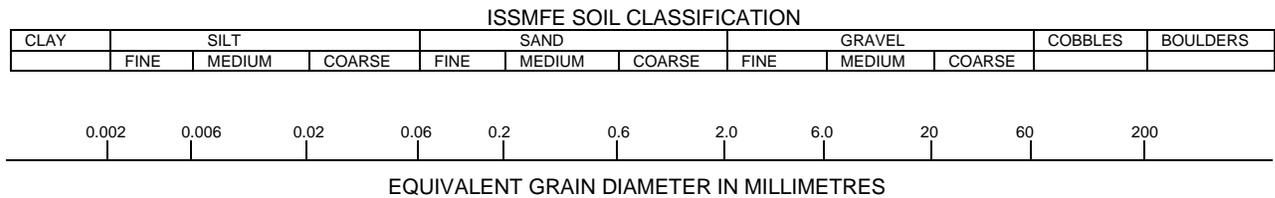
Title: **Dundas St and Bronte Road, Oakville**



Client: Palermo Village Corp (PVC)	Size: 11 x 17	Approved By: LM	Drawn By: SG	Date: June 2021
	Rev: 0	Scale: As Shown	Project No.: 19-323-100	Figure No.: 1
Image/Map Source: Google Satellite Image				

Drawing 1A: Notes On 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.



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.

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809927.136 E 598862.527

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-01-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20 40 60 80 100	20 40 60 80 100						
153.7	TOPSOIL: 200mm													
153.6	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, soft (weathered)	1	SS	3						○				
152.9	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard	2	SS	29						○				
152.1		3	SS	29						○				
151.2		4	SS	41						○				
150.3		5	SS	35						○				
149.1	SANDY SILT TILL: trace clay, trace gravel, reddish brown, moist, very dense	6	SS	50/ 450mm						○				
147.6	SHALE BEDROCK: weathered, reddish brown	7	SS	50/ 125mm										
146.4	END OF BOREHOLE: Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water level Reading: Date: Water Level (mbgl): March 1, 2021 3.1													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4810217.231 E 598588.943

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Feb-26-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20 40 60 80 100	20 40 60 80 100						
157.2	TOPSOIL: 230mm													
156.9	CLAYEY SILT: trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered)	1	SS	3										
156.4	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff	2	SS	27										
154.9	SANDY SILT TILL: some clay, trace gravel, brown, moist, very dense	3	SS	20										
152.6	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, weathered shale, reddish brown, very stiff to hard	4	SS	50/ 150mm										
151.1	SHALE BEDROCK: weathered, reddish brown	5	SS	50/ 280mm										
150.9	END OF BOREHOLE: Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water level Reading: Date: _____ Water Level (mbgl): March 1, 2021 4.6	6	SS	29										
		7	SS	50/ 25mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810583.864 E 598197.563	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-26-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40	60	80				100
164.8	TOPSOIL: 190mm													
164.6	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered)	1	SS	6										Metals and ORPs, PAHs
164.0	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard	2	SS	29										PHCs
163.0		3	SS	34										VOCs, pH
162.0		4	SS	42										
161.0		5	SS	45										
160.5														
160.0		6	SS	50/430mm										
159.7	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, weathered shale, reddish brown, hard													
158.7	SHALE BEDROCK: weathered, reddish brown	7	SS	50/200mm										
158.4	END OF BOREHOLE: Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water level Reading: Date: Mar 9, 2021 Water Level (mbgs): 4.24													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810475.152 E 597957.671	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-01-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
162.0	TOPSOIL: 170mm													
160.8 0.2	CLAYEY SILT: sandy, trace gravel, brown, moist, soft (weathered)	1	SS	3										
161.2 0.8	CLAYEY SILT TILL: sandy, trace gravel, brown, very stiff	2	SS	28										
		3	SS	25										
159.9 2.1	CLAYEY SILT TILL/SHALE COMPLEX: trace clay, trace gravel, reddish brown, moist, hard	4	SS	50/ 800mm										
158.9 3.1	SHALE BEDROCK: weathered, reddish brown	5	SS	54										
157.1 4.9	END OF BOREHOLE: Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Auger refusal at 4.9 mbgs. 3) Water level Reading: Date: Water Level (mbgl): March 1, 2021 3.4													

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

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

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810260.042 E 598322.459	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-01-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40						
159.5	TOPSOIL: 280mm													
159.2		1	SS	3										
0.3	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown to red, moist, soft (weathered)													
158.7		2	SS	18										
0.8	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown to red, moist to wet, stiff to hard													
		3	SS	29										
		4	SS	43										
		5	SS	50/ 480mm										
154.9														
154.8	SHALE BEDROCK: weathered, reddish brown	6	SS	50/ 120mm										
4.7	END OF BOREHOLE: Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water level Reading: Date: Water Level (mbgl): March 1, 2021 3.1													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809978.197 E 598416.255	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-25-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20 40 60 80 100	20 40 60 80 100						
156.7	TOPSOIL: 150mm													
156.0	CLAYEY SILT: trace gravel, trace organics, brown to red, moist, firm (weathered)	1	SS	7		156								
155.9	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/ boulder, brown, moist, very stiff to hard	2	SS	25		155								
		3	SS	31		155								
		4	SS	47		154								
		5	SS	43		153								
	disturbed at 4.6m					152								
	grey at 5 m	6	SS	disturbed		152								
						151								
150.6	SILTY CLAY TILL: sandy, occasional cobbles/boulder, grey, moist, very stiff	7	SS	21		150								
149.4	CLAYEY SILT TILL/SHALE COMPLEX: trace gravel, trace sand, weathered shale, reddish brown, hard	8	SS	50/300mm		149								
148.5	END OF BOREHOLE: Notes: 1) Auger Refusal at 8.1m probably due to shale bedrock. 2) 50mm dia. monitoring well installed upon completion. 3) Water level Reading: Date: Feb. 25, 2021 Water Level (mbgl): 6.7													

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809723.542 E 598696.743

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Feb-25-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
152.6	TOPSOIL: 150mm													
150.9 0.2	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, soft (weathered)	1	SS	3						○				
151.8 0.8	CLAYEY SILT TILL: sandy, trace gravel, occasional cobbles/ boulder, brown to red, moist, very stiff to hard	2	SS	27						○				
		3	SS	25						○				
		4	SS	39						○				
		5	SS	41						○				
148.0 4.6	SILTY CLAY TILL: sandy, trace gravel, occasional cobbles/boulder, grey, moist, very stiff to hard	6	SS	29						○				
		7	SS	19						○				
144.4 8.2	reddish grey, shale fragments below 8 m END OF BOREHOLE: Notes: 1) Auger Refusal at 8.1m probably due to shale bedrock 2) 50mm dia. monitoring well installed upon completion. 3) Water level Reading: Date: Water Level (mbgl): Feb. 25, 2021 1.2	8	SS	80						○				

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810599.539 E 598151.616	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-26-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)						
164.3	TOPSOIL: 150mm												
164.0	CLAYEY SILT: sandy, trace gravel, trace organics, brown, wet, firm (weathered) CLAYEY SILT TILL : sandy, trace gravel, occasional cobbles/boulder, brown, moist, very stiff to hard	1	SS	5									GR SA SI CL
163.5		2	SS	26									Metals & ORPs, PAHs
163.0		3	SS	23									PHCs, VOCs, DUP05(PHCs)
162.5		4	SS	34									
162.0		5	SS	43									
159.7	CLAYEY SILT TILL/SHALE COMPLEX: trace gravel, trace sand, weathered shale, reddish brown, moist, hard	6	SS	50/430mm									
159.1	END OF BOREHOLE: Notes: 1) Auger Refusal at 5.1m probably due to shale bedrock. 2) 50mm dia. monitoring well installed upon completion. 3) Water level Reading: Date: Mar 9, 2021 Water Level (mbgs): 3.11												

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810583.23 E 598163.837	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-26-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40						
164.8	TOPSOIL: 180mm													
164.6	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered)	1	SS	8										PAHs
164.0	CLAYEY SILT TILL : sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard	2	SS	27										Metals & ORPs
		3	SS	24										
		4	SS	48										
		5	SS	51										PHCs
160.0	SHALE BEDROCK: weathered, reddish brown	6	SS	50/ 380mm										VOCs
159.6	END OF BOREHOLE:													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809786.472 E 598802.835	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-24-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40	60	80				100
153.9	ASPHALT: 150mm													
153.0	FILL: sandy silt, sand and gravel, trace asphalt, trace cobbles, black to red, moist (weathered)	1	SS											Metals & ORPs
153.1	CLAYEY SILT TILL : sandy, trace gravel, occasional cobble/boulder, reddish brown, moist, very stiff	2	SS											PHCs, VOCs
151.8		3	SS											pH
2.1	END OF BOREHOLE													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809820.793 E 598807.547	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-24-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40	60	80				100
154.2														
153.9	TOPSOIL: 280mm													
0.3	FILL: sand and gravel, some clay, trace cobbles, black to brown, dry to moist, loose	1	SS								○			Metals & ORPs
153.4														
0.8	CLAYEY SILT TILL : sandy, trace gravel, reddish brown, moist, very stiff	2	SS								○			
		3	SS								○			
152.1														
2.1	END OF BOREHOLE													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809829.672 E 598797.314	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-25-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40	60	80				100
154.1	TOPSOIL: 150mm													
154.0	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered) CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff	1	SS											Metals & ORPs
153.3		2	SS											PHCs, DUP04(PHCs)
152.0		3	SS											
2.1	END OF BOREHOLE													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809801.827 E 598789.908	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-24-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE			"N" BLOWS 0.3 m	SHEAR STRENGTH (kPa)								
153.9	TOPSOIL: 180mm	[Hatched Box]	1	SS											GR SA SI CL	
153.0	CLAYEY SILT: trace gravel, concrete pieces, trace topsoil/rootlets, dark brown, moist, firm (weathered)	[Hatched Box]	2	SS											Metals & ORPs	
153.1	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff	[Hatched Box]	3	SS											VOCs, DUP03(VOCs)	
151.8	END OF BOREHOLE															

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809653.492 E 598738.306

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Feb-24-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
152.4	TOPSOIL: 150mm													
150.9	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered)	1	SS	8		Cement								Metals & ORPs, PAHs
151.6	CLAYEY SILT TILL: sandy, trace gravel, occasional cobbles/boulder, brown, moist, very stiff to hard	2	SS	32										pH
		3	SS	31										PHCs, VOCs
		4	SS	36										
		5	SS	48		Bentonite								
	grey below 4.6m	6	SS	31										
						W. L. 148.0 m Mar 09, 2021								
146.3	SILTY CLAY TO CLAYEY SILT TILL: trace sand, trace gravel, occasional cobbles/boulder, grey, moist, very stiff to hard	7	SS	23										
		8	SS	30		Filter Pack 145m Slotted Pipe								
		9	SS	35		Bentonite								
142.7	END OF BOREHOLE: Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water level Reading: Date: Mar 9, 2021 Water Level (mbgs): 4.44													

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ, DS.GDT, 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809786.472 E 598802.835	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-24-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40	60	80				100
153.9	ASPHALT: 150mm													
153.0	FILL: sandy silt, sand and gravel, trace asphalt, trace cobbles, black to red, moist (weathered)	1	SS											Metals & ORPs
153.1	CLAYEY SILT TILL : sandy, trace gravel, occasional cobble/boulder, reddish brown, moist, very stiff	2	SS											PHCs, VOCs
151.8		3	SS											pH
2.1	END OF BOREHOLE													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809829.672 E 598797.314	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-25-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40	60	80				100
154.1	TOPSOIL: 150mm													
154.0	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered)	1	SS											Metals & ORPs
153.3	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff	2	SS											PHCs, DUP04(PHCs)
152.0	END OF BOREHOLE	3	SS											

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809801.827 E 598789.908	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-24-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40	60	80				100
153.9	TOPSOIL: 180mm													
153.0	CLAYEY SILT: trace gravel, concrete pieces, trace topsoil/rootlets, dark brown, moist, firm (weathered) CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff	1	SS											Metals & ORPs
153.1		2	SS											VOCs, DUP03(VOCs)
151.8		3	SS											
2.1	END OF BOREHOLE													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809642.782 E 598752.691	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Feb-24-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
152.1	TOPSOIL: 160mm												GR SA SI CL	
152.0	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered) CLAYEY SILT TILL: sandy, trace gravel, some sand seams, occasional cobble/boulder, brown, moist, very stiff to hard grey below 4.6m	1	SS	10									Metals & ORPs	
151.3		2	SS	23										PAHs
151.0		3	SS	34										PHCs, DUP01(PHCs)
150.0		4	SS	40										VOCs, DUP02(VOCs)
149.0		5	SS	42										
148.0		6	SS	40										
147.0		7	SS	36										
145.4	END OF BOREHOLE:													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810512.709 E 598060.437	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Apr-01-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
162.4 0.2	TOPSOIL: 150mm													
160.9 0.8	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered)	1	SS	4										
161.6 1.0	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard	2	SS	21										
		3	SS	30										
		4	SS	35										
159.3 3.1	SHALE BEDROCK: reddish brown, weathered	5	SS	50/ 20mm										
157.6 4.8	END OF BOREHOLE: Notes: 1) Borehole dry upon completion.	6	SS	55/ 15mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810569.527 E 598093.151	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Apr-01-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
164.6	TOPSOIL: 150mm													
164.4 0.2	CLAYEY SILT: trace sand, trace topsoil/rootlets, trace gravel, brown, moist, firm (weathered)	1	SS	4										
163.8 0.8	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard	2	SS	22										
		3	SS	23										
		4	SS	33										
161.5 3.1	SILTY CLAY TILL: some sand, trace gravel, occasional cobble/boulder, grey, moist, hard	5	SS	30									5 16 46 33	
160.3 4.3	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, reddish brown, moist, hard	6	SS	50/ 75mm										
159.9 4.7	SHALE BEDROCK: reddish brown, weathered													
159.0 5.6	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.	7	SS	50/ 75mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810588.27 E 598142.544	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-31-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)						
164.4	TOPSOIL: 150mm													
164.0	CLAYEY SILT: trace sand, trace topsoil/rootlets, trace gravel, brown, moist, firm (weathered)		1	SS	5									
163.6	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/ boulder, brown, moist, very stiff to hard		2	SS	18									
			3	SS	25									
			4	SS	35									
			5	SS	33									
159.8	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard		6	SS	56/ 75mm									
158.9	SHALE BEDROCK: reddish brown, weathered		7	SS	61/ 100mm									
158.7	END OF BOREHOLE: Note: 1) Borehole open upon completion.													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810438.007 E 598061.784	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Apr-01-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
162.6	TOPSOIL: 150mm					20 40 60 80 100								
160.9 0.2	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, brown, moist, soft (weathered)	1	SS	3			○ UNCONFINED							
161.8 0.8	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard	2	SS	16			○ UNCONFINED							
		3	SS	28			○ UNCONFINED							
		4	SS	40			○ UNCONFINED							
	grey below 3.1m	5	SS	31			○ UNCONFINED							
158.0														
157.6 4.8	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, reddish brown, moist, hard SHALE BEDROCK: reddish brown, weathered	6	SS	91			○ UNCONFINED							
156.4														

6.2 **END OF BOREHOLE:**
 Notes:
 1) Borehole bottom wet upon completion.

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810498.017 E 598126.867	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-31-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE			"N" BLOWS 0.3 m	SHEAR STRENGTH (kPa)					
164.1	TOPSOIL: 250mm												
163.3	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered)		1	SS	5								
163.3	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		2	SS	21								
163.3			3	SS	27								
163.3			4	SS	27								
163.3			5	SS	26								
163.3			6	SS	57/100mm								
159.4	SHALE BEDROCK: reddish brown, weathered		6	SS	57/100mm								
157.8	END OF BOREHOLE: Notes: 1) Water at 4.7m during drilling.		7	SS	60/50mm								

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810532.05 E 598164.721	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-31-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
164.6 0.2	TOPSOIL: 150mm		1	SS	3										
163.8 0.8	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, soft (weathered)		2	SS	22										
	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		3	SS	29										
			4	SS	40										
			5	SS	20									7 21 48 24	
160.0 4.6	SILTY CLAY TILL: sandy, trace gravel, occasional cobble/boulder, greyish brown, moist, very stiff		6	SS	27										
158.5 6.2	SHALE BEDROCK: reddish brown, weathered END OF BOREHOLE: Notes: 1) Borehole bottom wet upon completion.		7	SS	62/76mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810398.244 E 598130.526	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Apr-01-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
161.2	TOPSOIL: 150mm													
160.0	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, fill mixed with organics, dark grey, moist, firm (weathered) CLAYEY SILT TILL: sandy, trace gravel, grey, moist, stiff to hard	1	SS	5										
160.4		2	SS	10										
159.2		3	SS	35										
158.8		4	SS	19										
158.1	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, reddish brown, moist, hard	5	SS	52/ 125mm										
156.6		6	SS	55/ 75mm										
155.0	SHALE BEDROCK: reddish brown, weathered	7	SS	55/ 25mm										

6.2 **END OF BOREHOLE:**
Notes:
1) Borehole open and wet upon completion.

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810500.2 E 598196.047	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-31-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
163.5	TOPSOIL: 180mm													
163.0 0.2	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, soft (weathered)	1	SS	4		163								
162.7 0.8	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff	2	SS	15		162								
		3	SS	29		162								
161.2 2.3	SILTY CLAY TILL: sandy, trace gravel, greyish brown, moist, hard	4	SS	34		161							5	22 49 24
		5	SS	35		160								
158.8 4.7	SHALE BEDROCK: reddish brown, weathered	6	SS	61/ 127mm		159								
157.3 6.2	END OF BOREHOLE: Notes: 1) Water at 6.0m upon completion.	7	SS	60/ 127mm		158								

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4810551.473 E 598295.897

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-31-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
163.2	TOPSOIL: 230mm														
162.9	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, grey, moist, soft (weathered) CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/ boulder, grey, moist, very stiff to hard		1	SS	3										
162.4			2	SS	17										
162.0			3	SS	24										
161.6			4	SS	34										
161.2			5	SS	28										
158.6	SHALE BEDROCK: reddish brown, weathered		6	SS	61/100mm										
157.0			7	SS	63/50mm										
157.0	END OF BOREHOLE:														

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4810363.466 E 598184.917

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Apr-01-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40						
161.8 0.2	TOPSOIL: 150mm		1	SS	2										
161.0 0.8	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, very soft (weathered)		2	SS	12										
	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/ boulder, greyish brown, moist, stiff to hard		3	SS	29										
			4	SS	48										
			5	SS	53										4 23 48 25
157.2 4.6	CLAYE SILT TILL/SHALE COMPLEX: sandy, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard		6	SS	61										
155.4 6.4	SHALE BEDROCK: reddish brown, weathered		7	SS	70										
154.4 7.4	END OF BOREHOLE: Note: 1) Water at 5.2m upon completion.		8	AC	53 / 25mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810498.831 E 598303.898	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-31-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
164.8	TOPSOIL: 200mm													
164.6	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, soft (weathered)	1	SS	3										
164.0	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/ boulder, greyish brown, moist, very stiff to hard	2	SS	23										
163.0		3	SS	32										
162.0	reddish brown below 1.5m	4	SS	42										
161.0		5	SS	43										
160.0	grey below 4.6m	6	SS	44										
158.7	SANDY SILT TILL: trace clay, trace gravel, occasional cobble/ boulder, reddish brown, moist, very dense	7	SS	53/ 100mm										
157.2	SHALE BEDROCK: reddish brown, weathered	8	AS	57/ 12mm										
157.6	END OF BOREHOLE: Note: 1) Borehole open and dry upon completion.													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4810254.969 E 598132.309

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Apr-05-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			20 40 60 80 100	20 40 60 80 100						
160.5	TOPSOIL: 150mm														
160.0	CLAYEY SILT: trace sand, trace gravel, some topsoil/rootlets, brown, moist, very soft (weathered)		1	SS	5										
159.7	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		2	SS	22										
			3	SS	26										
			4	SS	30										
	greyish brown at 3.1m		5	SS	39										
155.9	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard		6	SS	55/ 30mm										
154.4	SHALE BEDROCK: reddish brown, weathered		7	SS	60/ 100mm										
152.8	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion. 2) Water Level Readings: Date: Water Level (mbgl): April 14, 2021 2.29														

W. L. 158.2 m
Apr 14, 2021
Bentonite

Filter Pack
Slotted Pipe

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ_DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4810321.862 E 598245.425

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: May-04-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)		
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)								WATER CONTENT (%)	
160.6	TOPSOIL: 180mm																
160.0	CLAYEY SILT: trace sand, trace gravel, some topsoil/rootlets, brown, moist, very soft (weathered)		1	SS	3												
159.8	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		2	SS	18												
159.0			3	SS	29									6	18	52	24
158.0			4	SS	40												
157.5	CLAYEY SILT TILL/SHALE COMPLEX: sandy, trace gravel, trace shale, occasional cobble/boulder, reddish brown, moist, hard		5	SS	52/ 100mm												
155.9	SHALE BEDROCK: reddish brown, weathered		6	SS	52/ 100mm												
154.4	END OF BOREHOLE: Notes: 1) Borehole open and wet upon completion.		7	SS	50/ 50mm												

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4810445.798 E 598355.19

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-30-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40						
161.8															
160.6	TOPSOIL: 200mm		1	SS	3										
161.0	CLAYEY SILT: trace sand, trace gravel, some topsoil, brown, moist, very soft (weathered)		2	SS	19										
161.8	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		3	SS	31										
162.6			4	SS	35										
163.4			5	SS	40										
164.2	greyish brown at 3.1m														
157.2			6	SS	60/100mm										
154.6	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard														
155.6	SHALE BEDROCK: reddish brown, weathered														
155.6	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.		7	SS	55/50mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810490.335 E 598357.41	DRILLING DATA Method: Soli Stem Auger Diameter: 150mm Date: Mar-30-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
163.1	TOPSOIL: 180mm					163								
160.0 0.2	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, grey, moist, very soft (weathered) CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, greyish brown, moist, very stiff to hard grey below 3.1m	1	SS	5		162								
162.3 0.8		2	SS	28		162								
		3	SS	30		161								
		4	SS	33		160								
		5	SS	47		159								
158.2 4.9	SHALE BEDROCK: reddish brown, weathered	6	SS	52/ 125mm		158								
156.9 6.2	END OF BOREHOLE:	7	AS	63/ 25mm		157								

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810358.284 E 598333.282	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-30-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (C _u) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)						
160.1	TOPSOIL 150mm												
159.3	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered)	1	SS	8									
159.3	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff to hard	2	SS	22									
		3	SS	22									
		4	SS	52/125mm									
157.0	SANDY SILT TILL: some clay, trace gravel, occasional cobble/boulder, reddish brown, moist, very dense	5	SS	58/75mm									
155.5	SHALE BEDROCK: reddish brown, weathered	6	SS	70/125mm									
154.6	END OF BOREHOLE: Notes: 1) Water at 3.7m upon completion.												

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810400.678 E 598436.494	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-30-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
161.0	TOPSOIL: 180mm													
160.8 0.2	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered) SILTY CLAY TILL: sandy, trace gravel, brown, moist, very stiff to hard	1	SS	5										
160.2 0.8		2	SS	26										
159.8		3	SS	25										
159.2		4	SS	27										4 22 51 23
158.8		5	SS	28										
156.3 4.7	SHALE BEDROCK: trace limestone, grey, weathered	6	SS	56/ 125mm										
154.8 6.2	END OF BOREHOLE: Notes: 1) Borehole wet upon completion.	7	SS	65/ 125mm										

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810164.68 E 598207.405	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Apr-05-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20 40 60 80 100	20 40 60 80 100						
160.0	TOPSOIL: 150mm													
159.9	CLAYEY SILT: trace sand, trace gravel, some topsoil/rootlets, brown, moist, firm (weathered)	1	SS	5										
159.2	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard	2	SS	22										
		3	SS	25										
		4	SS	43										
	greyish brown at 3.1m	5	SS	31										
155.4	SILTY CLAY TILL: trace sand, trace gravel, greyish brown, moist, very stiff	6	SS	21										
153.9	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard	7	SS	50/ 50mm										
153.0	SHALE BEDROCK: reddish brown, weathered	8	SS	52/ 25mm										
152.8	END OF BOREHOLE: Notes: 1) Borehole open upon completion. 2) Water Level Readings: Date: Water Level (mbgl): Apr 14, 2021 2.37m													

W. L. 157.6 m
Apr 14, 2021

154 Filter Pack
153 Slotted Pipe

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4810355.175 E 598433.26

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-30-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40							60
159.9	TOPSOIL: 180mm															
159.8	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered)		1	SS	5											
159.1	SILTY CLAY TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		2	SS	24											
159.0			3	SS	30											
158.8			4	SS	36											
158.5	greyish brown		5	SS	72/ 100mm										5	22 51 22
155.3	SHALE BEDROCK: reddish brown, weathered		6	SS	92/ 100mm											
153.7	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.		7	SS	64/ 12mm											

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810130.712 E 598284.099	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Apr-05-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
158.4	TOPSOIL: 150mm													
158.0	SILTY CLAY: trace sand, trace gravel, some topsoil, brown, moist, soft (weathered)	1	SS	3		158								
157.6	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard	2	SS	18		157								
		3	SS	30										
		4	SS	41										
		5	SS	39										
153.8	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard	6	SS	50/ 130mm		154								
152.4	SHALE BEDROCK: reddish brown, weathered	7	SS	50/ 12mm		153								
150.0	END OF BOREHOLE: Notes: 1) Borehole open upon completion.													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4810224.181 E 598406.106

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-26-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
159.3	TOPSOIL: 150mm														
159.0 0.2	CLAYEY SILT: trace gravel, trace topsoil, brown, moist, soft (weathered)		1	SS	3										
158.5 0.8	CLAYEY SILT TILL: sandy, trace gravel, trace cobble, brown, moist, very stiff to hard		2	SS	19										
			3	SS	25										
			4	SS	35										
	grey to reddish brown below 3.1m		5	SS	94/ 50mm										
154.7 4.6	SHALE BEDROCK: reddish brown, weathered		6	SS	92/ 100mm										
153.1 6.2	END OF BOREHOLE: Notes: 1) Borehole dry and open upon completion.		7	SS	60/ 50mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810307.192 E 598504.579	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-30-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)						
159.0	TOPSOIL: 180mm												
158.8	CLAYEY SILT: trace gravel, trace topsoil/rootlets, reddish brown, moist, firm (weathered)	1	SS	8									
158.2	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, greyish brown, moist, very stiff to hard	2	SS	21									
157.8		3	SS	38									
157.4		4	SS	56/100mm									
155.9	SANDY SILT TILL: some clay, trace gravel, reddish brown, moist, very dense	5	SS	60/125mm									
154.3	SHALE BEDROCK: reddish brown, weathered	6	SS	56/100mm									
152.8	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.	7	SS	56/12mm									

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810208.898 E 598489.781	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-26-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)						
158.8	TOPSOIL: 180mm												
158.6	CLAYEY SILT: sandy, trace gravel, brown, moist, firm (weathered)	1	SS	5									
158.0		2	SS	19									
157.2		3	SS	30									
156.4		4	SS	31									
155.4	SHALE BEDROCK: reddish brown, weathered	5	SS	60/250mm									
154.6		6	SS	60/100mm									
153.8		7	SS	60/102mm									
151.4		8	SS	63/102mm									
7.4	END OF BOREHOLE: Notes: 1) Water at 5.3m upon completion.												

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4810111.218 E 598490.656

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Apr-05-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (C _u) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
156.2	TOPSOIL: 180mm														
156.0 0.2	CLAYEY SILT: trace gravel, some topsoil, brown, moist, very soft (weathered)		1	SS	2										
155.4 0.8	SILTY CLAY TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		2	SS	15									4	17 55 24
			3	SS	28										
			4	SS	50/ 30mm										
153.1 3.1	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard		5	SS	50/ 30mm										
151.6 4.7	SHALE BEDROCK: reddish brown, weathered END OF BOREHOLE: Notes: 1) Borehole open upon completion.		6	SS	52/ 12mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810170.6 E 598615.88	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-26-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
156.7	TOPSOIL: 155mm	1	SS	3										
156.0	CLAYEY SILT: trace gravel, trace topsoil/rootlets, brown, moist, soft (weathered)	2	SS	17									2 19 54 25	
155.9	SILTY CLAY TILL: sandy, trace gravel, brown, moist, very stiff to hard cobble/boulder below 1.5m	3	SS	31										
	grey below 2.3m	4	SS	72/ 75mm										
153.6	SHALE BEDROCK: reddish brown, weathered	5	SS	61/ 25mm										
		6	SS	75/ 100mm										
150.5	END OF BOREHOLE Notes: 1) Water at 4.9m upon completion.	7	SS	65/ 25mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810096.353 E 598554.958	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-25-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
155.7	TOPSOIL: 180mm													
155.6	CLAYEY SILT: trace topsoil/rootlets, greyish brown, moist, soft (weathered) CLAYEY SILT TILL: sandy, trace gravel, sand seams, brown, moist, very stiff to hard	1	SS	3										
154.9		2	SS	20										
154.8		3	SS	29										
154.7		4	SS	44										
152.6	SANDY SILT TILL: trace to some clay, trace gravel, reddish brown, moist, very dense	5	SS	87										
151.7	SHALE BEDROCK: reddish brown, weathered													
151.0	END OF BOREHOLE:	6	SS	50/25mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809952.415 E 598432.379

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-25-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)						
155.9	TOPSOIL: 255mm													
155.9	CLAYEY SILT: trace gravel, trace topsoil/rootlets, brown, very moist, soft (weathered) CLAYEY SILT TILL: sandy, trace gravel, brown, moist, stiff to hard greyish brown below 2.3m	[Strata Plot]	1	SS	3									
155.1			2	SS	17									
154.0			3	SS	24									
153.0			4	SS	23									
152.0			5	SS	30									
151.0			6	SS	10								4 26 50 20	
149.7	SANDY SILT TILL: some clay, trace gravel/cobble, grey, moist, dense to very dense	[Strata Plot]	7	SS	46									
148.0			8	SS	90/75mm									
146.8	SHALE BEDROCK: reddish brown, weathered	[Strata Plot]	9	SS	87/75mm									
145.1			10	SS	50/25mm									
10.8	END OF BOREHOLE: Notes: 1) Water at 9.7m upon completion.													

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ_DS.GDT_21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809948.228 E 598486.805	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-25-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)						
156.2	TOPSOIL: 180mm													
156.0	CLAYEY SILT: trace topsoil/rootlets, trace gravel, brown, moist, soft (weathered/disturbed)		1	SS	4									
155.4	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff to hard		2	SS	24									
	occasional sand seams below 1.5m		3	SS	21									
	greyish brown, cobble below 2.3m		4	SS	31									
153.1	SILTY CLAY TILL: sandy, trace gravel, brown to grey, moist, very stiff		5	SS	19									
			6	SS	12									
149.8	SHALE BEDROCK: reddish brown, weathered		7	SS	57									

END OF BOREHOLE:
Notes:
1) Borehole wet at bottom upon completion.

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809999.914 E 598511.808

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-25-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
156.5	TOPSOIL: 250mm														
156.0	CLAYEY SILT: trace topsoil/rootlets, brown, moist, soft (weathered)		1	SS	3										
155.7	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff to hard greyish brown below 2.3m		2	SS	16										
155.0			3	SS	30										
154.0			4	SS	30										
153.0			5	SS	30										
151.9			6	SS	18										
150.4	SILTY CLAY TILL: trace sand, trace gravel, cobble, grey, moist, very stiff		7	SS	92										
148.9	SANDY SILT TILL: some clay, trace gravel, reddish brown, very moist, very dense		8	SS	50/25mm										
148.0	SHALE BED ROCK: weathered, reddish brown END OF BOREHOLE: Notes: 1) Borehole open and wet upon completion.														

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810112.545 E 598621.164	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-26-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)						
156.1	TOPSOIL: 150mm												
156.0	CLAYEY SILT: trace gravel, trace topsoil/ rootlets, brown, moist, firm (weathered) CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff to hard grey below 2.3m	1	SS	4									
155.3		2	SS	25									
154.8		3	SS	37									
154.3		4	SS	40									
153.0	SHALE BEDROCK: reddish brown, weathered	5	SS	93/275mm									
151.4	END OF BOREHOLE	6	SS	63/75mm									

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810051.419 E 598648.254	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-26-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)						
155.5	TOPSOIL: 150mm												
154.9	CLAYEY SILT: trace topsoil, trace gravel, brown, moist, firm (weathered)	1	SS	5									
154.7	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff to hard	2	SS	20									
		3	SS	26									
	brown to grey below 2.3 m	4	SS	44									
152.4	SHALE BEDROCK: reddish brown, weathered	5	SS	68									
150.6	END OF BOREHOLE: Notes: 1) Borehole open and dry after 4.42m.	6	SS	64/ 75mm									

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809952.349 E 598588.393

DRILLING DATA
 Method: Solide Stem Auger
 Diameter: 150mm
 Date: Mar-25-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)	
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40	60	80				100
154.9	TOPSOIL: 230mm														
154.0	CLAYEY SILT: sandy, trace gravel, trace topsoil/rootlets, brown, very moist, firm (weathered)		1	SS	5										
154.1	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff to hard		2	SS	30										
154.8			3	SS	37										
155.0	sand seams, grey below 2.3m		4	SS	32										
155.5	reddish brown at 3.1m		5	SS	40										
150.3	SANDY SILT TILL: trace clay, trace gravel, cobble, greyish brown, moist, very dense		6	SS	55										
148.7	SHALE BEDROCK: reddish brown, weathered		7	SS	50/6mm										
148.0	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.														

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809839.682 E 598595.772

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-24-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
153.6	TOPSOIL: 150mm		1	SS	3										
152.8	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, brown, moist, soft (weathered)		2	SS	23										
	CLAYEY SILT TILL: sandy, trace gravel, moist, brown, very stiff to hard		3	SS	29										
			4	SS	46										
	grey below 3.1m		5	SS	55										
			6	SS	27										
			7	SS	60/ 76mm										
146.0	SANDY SILT TILL: trace clay, trace gravel, occasional cobble/boulder, reddish brown, moist, very dense		8	SS	77/ 76mm										
144.5	SHALE BEDROCK: reddish brown, weathered		9	SS	50/ 25mm										
142.9	END OF BOREHOLE: Notes: 1) Borehole dry and open upon completion.		10	SS	60/ 75mm										

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 23, 2021 - GEO.GPJ - DS.GDT - 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA	DRILLING DATA
CLIENT: ARGO Development Corporation	Method: Solid Stem Auger
PROJECT LOCATION: 3069 Dundas St W, Oakville, ON	Diameter: 150mm
DATUM: Geodetic	Date: Mar-23-2021
BOREHOLE LOCATION: See Drawing 1 N 4809824.096 E 598768.411	REF. NO.: 19-323-100
	ENCL NO.:

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)									
152.4	TOPSOIL: 150mm															
150.0 0.2	CLAYEY SILT: trace sand, trace gravel, trace topsoil, brown, moist, firm (weathered)	1	SS	6												
151.6 0.8	CLAYEY SILTY TILL: sandy, trace gravel, brown, moist, very stiff to hard	2	SS	24												
		3	SS	33												
		4	SS	36												
	grey below 3.1 m	5	SS	26												
148.7 3.7	END OF BOREHOLE:															

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809891.464 E 598646.937

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-24-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
154.8	TOPSOIL: 180mm														
154.6	CLAYEY SILT: trace sand, trace topsoil/ rootlets, dark brown, very moist, soft (weathered)		1	SS	2										
154.0	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff to hard		2	SS	21										
			3	SS	32										
			4	SS	37										
	grey below 3.1m		5	SS	31										
			6	SS	24										
148.7	SANDY SILT TILL: trace clay, trace gravel, cobble/boulder, reddish brown, very moist, dense to very dense		7	SS	31										
			8	SS	50/ 25mm										
145.7	CHALE: reddish brown, weathered		9	SS	100/ 25mm										
145.6	END OF BOREHOLE: Notes: 1) Water at 8.23m. 2) Borehole open upon completion.														

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809962.814 E 598744.733

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: May-07-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
153.5	TOPSOIL: 150mm														
150.9 0.2	CLAYEY SILT: trace sand, trace gravel, some topsoil, brown, moist, soft (weathered)		1	SS	3										
152.7 0.8	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		2	SS	17										
			3	SS	30										
	grey at 3.1m		4	SS	32									5	12 45 38
			5	SS	56										
148.9															
148.6 4.7	CLAYEY SILT TILL/SHALE COMPLEX: trace sand, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard		6	SS	51/ 75mm										
	SHALE BEDROCK: reddish brown, weathered														
147.3															
6.2	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.		7	SS	50/ 25mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809785.038 E 598596.701

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-24-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40						
151.0	TOPSOIL: 150mm		1	SS	3										
150.8	CLAYEY SILT: trace sand, trace gravel, trace top soil/rootlets, grey, moist, soft (weathered)		2	SS	22										
150.2	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard		3	SS	24										
			4		45										
			5	SS	46										
			6	SS	46										
144.9	SANDY SILT TILL: trace clay, trace gravel, occasional cobble/boulder, reddish brown, moist, dense to very dense		7	SS	52/ 130mm										
			8	SS	56/ 130mm										
			9	SS	70/ 100mm										
			10	SS	97/ 130mm										
138.8	SHALE BEDROCK: reddish brown, weathered		11	SS	70/ 130mm										
137.1	END OF BOREHOLE: Notes: 1) Water at 12.5m upon completion.		12	SS	60/ 10mm										
139.9			13	AS	10mm										

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021 - GEO.GPJ, DS.GDT, 21-6-16

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809844.939 E 598683.658

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-23-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
154.3	TOPSOIL: 150mm														
154.0	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, moist, soft (weathered)		1	SS	3										
153.5	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff		2	SS	19										
			3	SS	27										
			4	SS	28										
			5	SS	26										
149.7	SILTY CLAY TILL: some sand, trace gravel, trace cobble, grey, moist, stiff to very stiff		6	SS	13										
			7	SS	23										
146.7	SANDY SILT TILL: some clay, trace gravel, reddish brown, moist, very dense		8	SS	52/ 30mm										
145.2	SHALE BEDROCK: reddish brown, weathered		9	SS	51/ 25mm										
143.5	END OF BOREHOLE:		10	AC	75mm										
10.8	Notes: 1) Water level at 10.3m upon completion.														

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ_DS.GDT_21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809914.001 E 598723.828

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Mar-23-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)								
154.7	TOPSOIL: 250mm															
154.4	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, grey, moist, firm (weathered) CLAYEY SILT TILL: sandy, trace gravel, grey, moist, very stiff to hard grey, occasional cobble/boulder below 2.3m		1	SS	5											
153.9			2	SS	20											
153.1			3	SS	29											
152.2			4	SS	50											
151.3			5	SS	53											
150.4			6	SS	23											
149.5																
148.6	SANDY SILT TILL: trace clay, trace gravel, occasional cobble/boulder, reddish brown, very moist, very dense		7	SS	96/ 75mm											
147.1	SHALE BEDROCK: reddish brown, weathered		8	SS	75/ 25mm											
145.9	END OF BEDROCK: Notes: 1) Water at 8.5 m upon completion.		9	AS	55/ 12mm											

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809896.795 E 598807.42

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Apr-06-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
154.5	TOPSOIL: 180mm														
154.0	CLAYEY SILT: trace sand, trace gravel, some topsoil/rootlets, brown, moist, soft (weathered) CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard grey at 4.6m		1	SS	3										
153.7			2	SS	21										
153.1			3	SS	28										
152.2			4	SS	38										
151.2			5	SS	38										
150.4			6	SS	26										
148.4	SANDY SILT TILL/SHALE COMPLEX: trace clay, trace gravel, occasional cobble/ boulder, reddish brown, moist, very dense		7	SS	61										
147.5	SHALE BEDROCK: reddish brown, weathered		8	SS	61/50mm										
145.3	END OF BOREHOLE: Notes: 1) Water at 6.1m. 2) Borehole open and wet upon completion.		9	AG	60/12mm										

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809746.686 E 598742.538	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-22-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40						
152.6	TOPSOIL: 150mm													
152.4	CLAYEY SILT: trace sand, trace of topsoil/rootlets, brown, moist, soft (weathered)	1	SS	3										
151.8	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff to hard	2	SS	24										
		3	SS	35										
		4	SS	32										
		5	SS	40										
		6	SS	17										
	grey below 6.1m	7	SS	56/ 100mm										
		8	SS	57										
143.5	SANDY SILT TILL: trace clay, trace gravel, occasional cobble/boulder, greyish brown, moist, very dense	9	SS	56/ 75mm										
	reddish brown below 10.7m	10	SS	70/ 100mm										
140.7	SHALE BEDROCK: reddish brown, weathered	11	SC	93/ 100mm										
140.6	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.													

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ_DS.GDT_21-6-16

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809696.617 E 598746.308	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-22-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
153.1	TOPSOIL: 150mm													
150.0	CLAYEY SILT: trace sand, trace gravel, trace topsoil/rootlets, brown, moist, firm (weathered)	1	SS	5										
152.3		2	SS	28										
		3	SS	38										
		4	SS	40										
		5	SS	46										
		6	SS	31										
	grey below 6.1m													
		7	SS	23										
145.5	SANDY SILT TILL: some clay, trace gravel, trace cobble, greyish brown, moist, compact to very dense	8	SS	29										
		9	SS	64										
		10	SS	110/127mm										
142.4	SHALE BEDROCK: reddish brown, weathered	11	SS	100/125mm										
141.9		12	AS	100/125mm										
11.2	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.													

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021 - GEO.GPJ, DS.GDT, 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809833.601 E 598855.111

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: May-06-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
154.2	TOPSOIL: 150mm														
154.0	CLAYEY SILT: trace sand, trace gravel, some topsoil, brown, moist, firm (weathered) CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard grey at 4.6m		1	SS	5										
153.4			2	SS	22										
153.0			3	SS	25										3 17 56 24
152.0			4	SS	29										
151.0			5	SS	30										
149.0	6	SS	22											3 14 46 37	
148.1	CLAYEY SILT TILL/SHALE COMPLEX: sandy, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard		7	SS	54										
146.6	SHALE BEDROCK: reddish brown, weathered		8	SS	61/30mm										
146.2	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.		9	CC	55/12mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809757.003 E 598809.821	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Mar-22-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40							60
153.7	TOPSOIL: 200mm														
153.6	CLAYEY SILT: trace sand, trace topsoil/rootlets, trace gravel, brown, moist, soft (weathered) CLAYEY SILT TILL: sandy, trace gravel, brown to grey, moist, very stiff to hard	1	SS	3											
152.9		2	SS	16											
		3	SS	26											
		4	SS	23											
		5	SS	31											
		6	SS	20											
147.6	SILTY CLAY TILL: sandy, trace gravel, grey, moist, very stiff to hard greyish brown at 7.62	7	SS	22											
		8	SS	81											
144.6	SANDY SILT TILL: trace clay, trace gravel, reddish brown, moist, very dense	9	SS	51/ 100mm											
		10	SS	92/ 100mm											
143.0	SHALE BEDROCK: reddish brown, weathered	11	SS	83/ 100mm											
141.7		12	SS	83/ 100mm											
12.0	END OF BOREHOLE: Notes: 1) Water at 10.4 m. 2) Borehole wet upon completion.														

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021 - GEO.GPJ, DS.GDT, 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4809792.817 E 598870.725

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Apr-06-2021
 REF. NO.: 19-323-100
 ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
153.5	TOPSOIL: 180mm														
153.0	CLAYEY SILT: trace sand, trace gravel, some topsoil/rootlets, brown, moist, soft (weathered)		1	SS	3										
152.7	CLAYEY SILT TILL: trace sand, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		2	SS	16										
			3	SS	30										
			4	SS	31										
			5	SS	30										
	grey at 4.6m		6	SS	23										
			7	SS	78										
145.9	CLAYEY SILT TILL/SHALE COMPLEX: sandy, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard		8	SS	51/ 30mm										
			9	SS	52/ 25mm										
143.7	SHALE BEDROCK: reddish brown, weathered		10	SS	51/ 12mm										
143.4	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.														

DS SOIL LOG - 19-323-100 PALERMO VILLAGE - MARCH 29, 2021 - GEO.GPJ, DS.GDT, 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809866.089 E 598922.356	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Apr-07-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)										
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE			"N" BLOWS 0.3 m	20							40	60	80	100	20	40	60	80	100	10
152.8	TOPSOIL: 180mm																							
150.0 0.2	CLAYEY SILT: trace sand, trace gravel, some topsoil/rootlets, brown, moist, soft (weathered)		1	SS	3																			
152.0 0.8	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		2	SS	21																3	20	54	23
			3	SS	24																			
			4	SS	45																			
	grey at 3.1m		5	SS	75																1	13	46	40
148.2 4.6	CLAYEY SILT TILL/SHALE COMPLEX: sandy, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard		6	SS	52/ 130mm																			
147.4 147.2	SHALE BEDROCK: reddish brown, weathered		7	AC																				
5.6	END OF BOREHOLE: Notes: 1) Borehole open and dry upon completion.																							

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4809978.645 E 598828.216	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Apr-07-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	POCKET PEN. (C _u) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE			"N" BLOWS 0.3 m	SHEAR STRENGTH (kPa)							
153.0	TOPSOIL: 180mm														
150.0 0.2	CLAYEY SILT: trace sand, trace gravel, some topsoil/rootlets, greyish brown, moist, firm (weathered) SILTY CLAY TILL: trace sand, trace gravel, occasional cobble/boulder, brown, moist, firm to hard grey at 2.3m		1	SS	4										
152.2 0.8			2	SS	7										
			3	SS	19										
			4	SS	40										
149.9 3.1	CLAYEY SILT TILL/SHALE COMPLEX: sandy, trace gravel, occasional cobble/ boulder, reddish brown, moist, hard		5	SS	42										
148.4 4.7	SHALE BEDROCK: reddish brown, weathered END OF BOREHOLE: Notes: 1) Borehole open and wet upon completion.		6	SS	50/ 25mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810066.326 E 598787.93	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Apr-07-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40						
154.6	TOPSOIL: 150mm													
154.0	CLAYEY SILT: trace sand, trace gravel, some topsoil, brown, moist, firm (weathered)	1	SS	4										
153.8	CLAYEY SILT TILL/SHALE COMPLEX: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard	2	SS	19										
		3	SS	26										5 18 51 26
		4	SS	39										
151.5	SANDY SILT TILL: trace clay, some gravel, grey, moist, very dense	5	SS	51/ 130mm										20 25 43 12
150.0	SHALE BEDROCK: reddish brown, weathered	6	SS	50/ 51mm										

END OF BOREHOLE:
Notes:
1) Borehole open and wet upon completion.

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA CLIENT: ARGO Development Corporation PROJECT LOCATION: 3069 Dundas St W, Oakville, ON DATUM: Geodetic BOREHOLE LOCATION: See Drawing 1 N 4810125.921 E 598737.948	DRILLING DATA Method: Solid Stem Auger Diameter: 150mm Date: Apr-07-2021 REF. NO.: 19-323-100 ENCL NO.:
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SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
156.4 0.2	TOPSOIL: 150mm													
156.0 0.6	CLAYEY SILT: trace sand, trace gravel, some topsoil, brown, moist, soft (weathered)	1	SS	3										
155.6 1.0	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard	2	SS	25										
		3	SS	30										
		4	SS	42										
		5	SS	47										
151.6 4.8	pieces of shale at 4.6m SHALE BEDROCK: reddish brown, weathered	6	SS	50/ 25mm										
150.5 5.9	END OF BOREHOLE: Notes: 1) Borehole open and wet upon completion.	7	AS	50/ 12mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

PROJECT: Geotechnical, Hydrogeology Investigation and Phase Two ESA
 CLIENT: ARGO Development Corporation
 PROJECT LOCATION: 3069 Dundas St W, Oakville, ON
 DATUM: Geodetic
 BOREHOLE LOCATION: See Drawing 1 N 4810274.868 E 598069.286

DRILLING DATA
 Method: Solid Stem Auger
 Diameter: 150mm
 Date: Apr-05-2021
 REF. NO.: 19-323-100
 ENCL NO.:

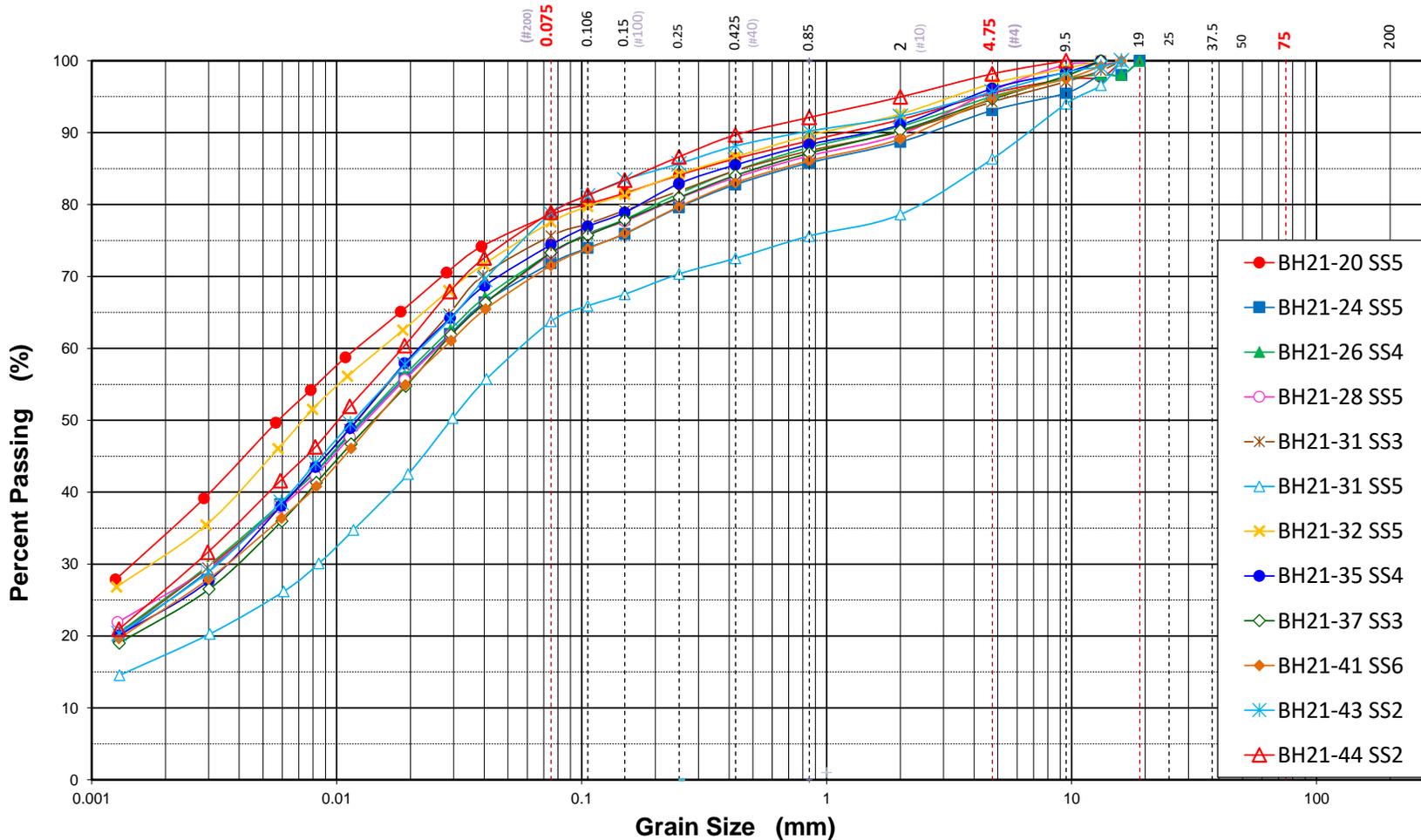
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	POCKET PEN. (C _u) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m			20	40						
161.1	TOPSOIL: 180mm													
160.0	CLAYEY SILT: trace sand, trace gravel, some topsoil, brown, moist, soft (weathered)	1	SS	3										
160.3	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard	2	SS	17										
160.8		3	SS	25										
		4	SS	41										
		5	SS	27										
156.5	SHALE BEDROCK: reddish brown, weathered	6	AS	50/ 25mm										
155.6	END OF BOREHOLE: Notes: 1) Borehole open upon completion. 2) Water Level Readings: Date: Water Level (mbgl): April 14, 2021 5.17m	7	SS	60/ 25mm										

DS SOIL LOG 19-323-100 PALERMO VILLAGE - MARCH 29, 2021-GEO.GPJ DS.GDT 21-6-16

GROUNDWATER ELEVATIONS
 Measurement 1st 2nd 3rd 4th

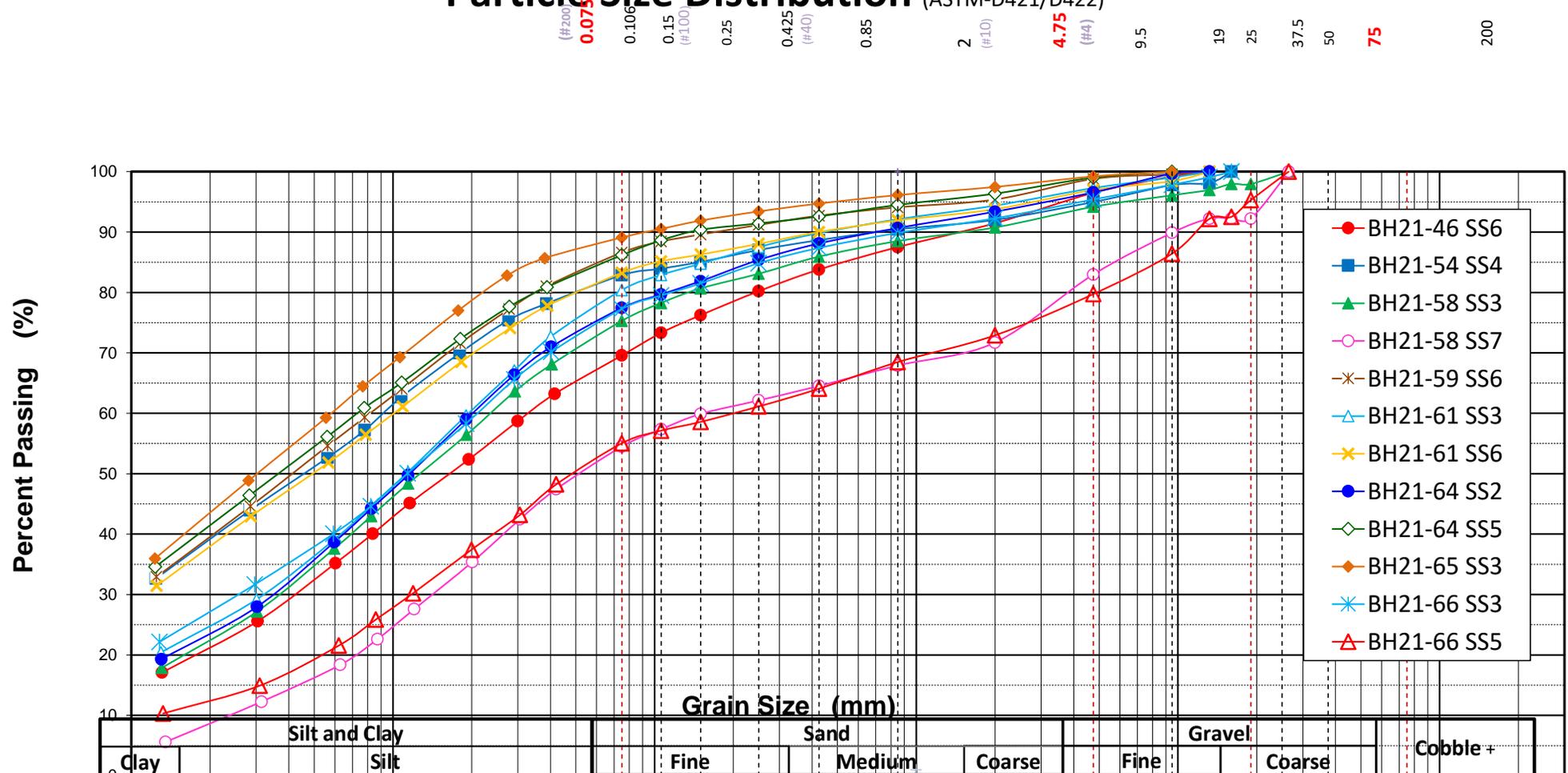
GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ●=3% Strain at Failure

Particle Size Distribution (ASTM-D421/D422)

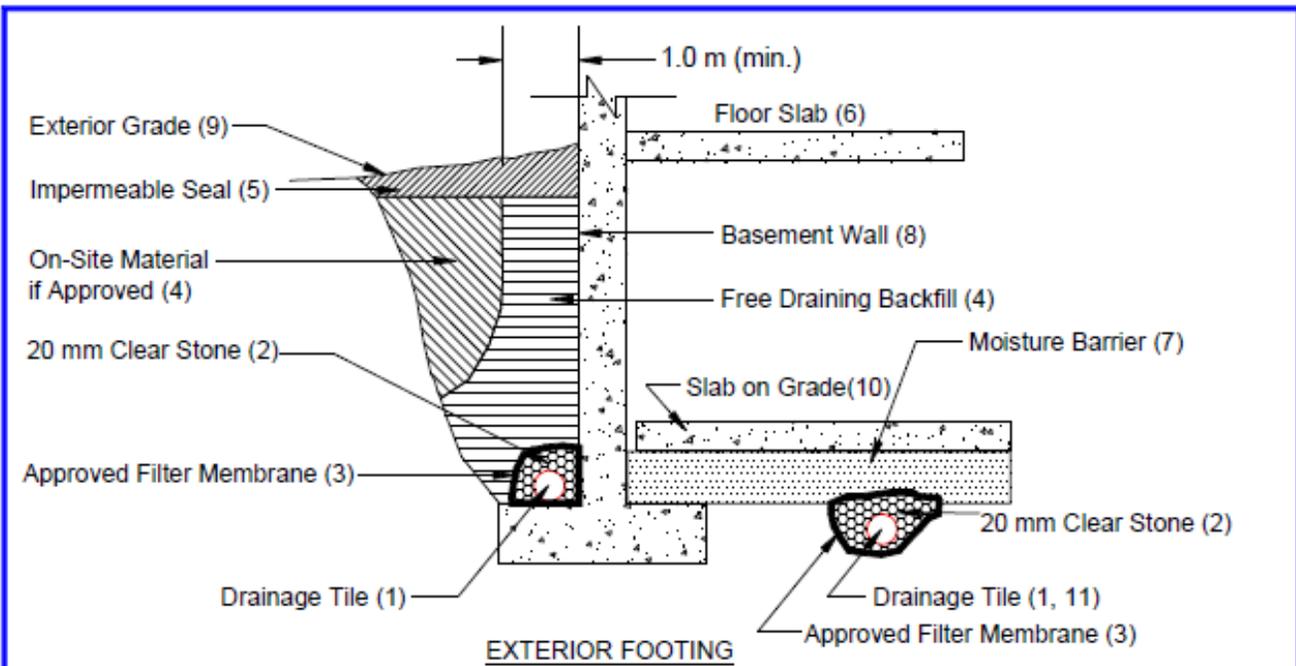


Silt and Clay		Sand			Gravel		Cobble +
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	
<p>DS CONSULTANTS LTD. 6221 Highway 7, Unit 16 Vaughan, Ontario, L4H 0K8 Telephone: (905) 264-9393 www.dsconsultants.ca</p>	Project	Newmark Property, Dundas & Bronte				Project No	19-323-100
	Location	3069 Dundas St. W., Oakville, ON.				Date	May-05-2021
	Client	Palermo Village Corp (PVC)				Figure No	68

Particle Size Distribution (ASTM-D421/D422)



 <p>DS CONSULTANTS LTD. 6221 Highway 7, Unit 16 Vaughan, Ontario, L4H 0K8 Telephone: (905) 264-9393 www.dsconsultants.ca</p>	Project	Newmark Property, Dundas & Bronte			Project No	19-323-100
	Location	3069 Dundas St. W., Oakville, ON.			Date	May-10-2021
	Client	Palermo Village Corp (PVC)			Figure No	69



Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place 100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Free Draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18") of the wall. Use hand controlled light compaction equipment within 1.8 m (6') of wall. The minimum width of the Granular 'B' backfill must be 1.0 m.
5. Impermeable backfill seal - compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Maximum thickness of seal to be 0.5 m.
6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
7. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
8. Basement wall to be damp proofed /water proofed.
9. Exterior grade to slope away from building.
10. Slab on grade should not be structurally connected to the wall or footing.
11. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
12. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
13. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
14. Do not connect the underfloor drains to perimeter drains.
15. Review the geotechnical report for specific details.

**DRAINAGE AND BACKFILL RECOMMENDATIONS
Basement with Underfloor Drainage**

(not to scale)

Appendix A

General Comments on Bedrock in Toronto Area

General Comments – Bedrock in Greater Toronto Area

The bedrock that makes spread footings or caissons a popular choice for high-rise foundation support is a shale or shale limestone composition. The highest member, the Queenston Formation, is generally found west of Toronto, while the Georgian Bay Formation underlies most of Metro Toronto, with the Collingwood and Whitby Formations east of Toronto. The Queenston is, relatively speaking, the weaker of the four formations that are likely to support caissons or footings.

The Georgian Bay as well as the Queenston and Collingwood/Whitby Formation are of Middle Ordovician Age. It is defined as the rock unit that overlies the bluish grey shales of the Collingwood Formation and is in turn overlain by the red shale of the Queenston Formation. The Georgian Bay Formation consists of bluish and grey shale with interbeds of sandstone, limestone and dolostone. Towards the west where the Georgian Bay formation underlies the Queenston Formation, the limestone content increases significantly and limestone and/or sandstone may comprise as much as 70 to 90 percent of the bedrock. The hard layers are usually less than about 100 to 150 mm thick but some layers are much thicker. The thicker layers have been observed to be as much as 750 to 900 mm at some sites. The layers are actually lenses and they can vary significantly in thickness over short distances.

The upper portion of the bedrock is commonly weathered for a depth of 600 to 1000 mm and within this weathered zone hard limestone layers or lenses are common. These hard limestone layers can result in contractual problems for augers, and can provide misleading bedrock elevations. Where the weathering is more extensive a shale till layer may be found above the bedrock. In the sound bedrock, the limestone, sandstone, dolostone is hard to very hard.

Stress relief features such as folds and faults are common in the bedrock. In these features, the rock is heavily fractured and sheared, and contains layers of shale rubble and clay. Weathering is much deeper than the surrounding rock in these features and often there is a lateral migration of the stress relief features resulting in sound unweathered bedrock overlying fractured and weathered bedrock. The stress relief features are usually in the order of 4 to 6 m wide, but the depth can vary from 4 to 5 m to in excess of 10 m. These features occur randomly.

The bedrock contains significant high locked in horizontal stresses. These stresses can impose significant loads on tunnel walls but the slower rate of construction for basements allows for a relaxation of these stresses and they are not normally a problem for basement construction.

Groundwater seepage below the top 1000 mm is generally small, however, at several locations in Toronto and Mississauga large quantities have been encountered.

Bedding joints in the bedrock are very close-to-close, smooth planar in the shale and rough planar in the limestone. Significant vertical jointing is common.

Where the bedrock was cored, a detailed description of the rock core is appended to the borehole log.

Design features related to the bedrock are discussed in other sections of this report, and these general comments must be considered with these comments.

Methane gas exists in the bedrock, normally below the top 1000 mm and more concentrated with depth. Appropriate care and monitoring is essential in all confined bedrock excavations, particularly caissons and tunnels.

Appendix B

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.

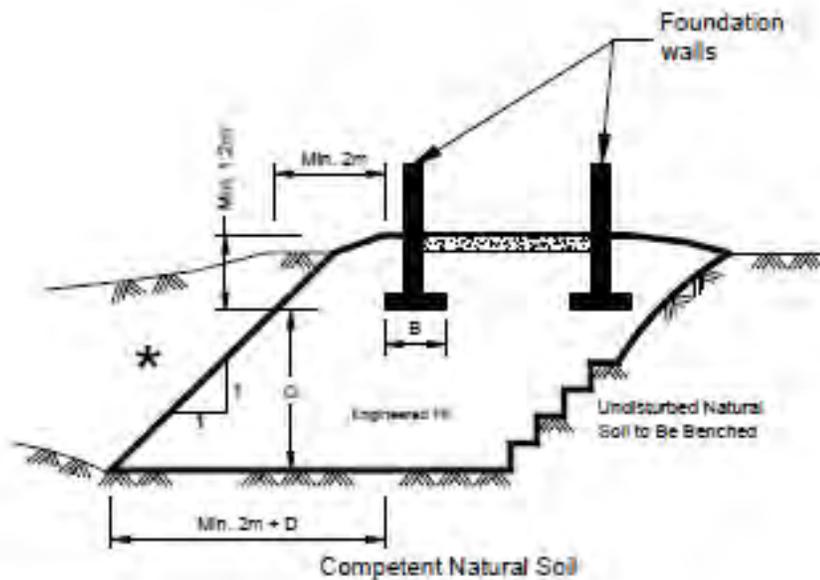
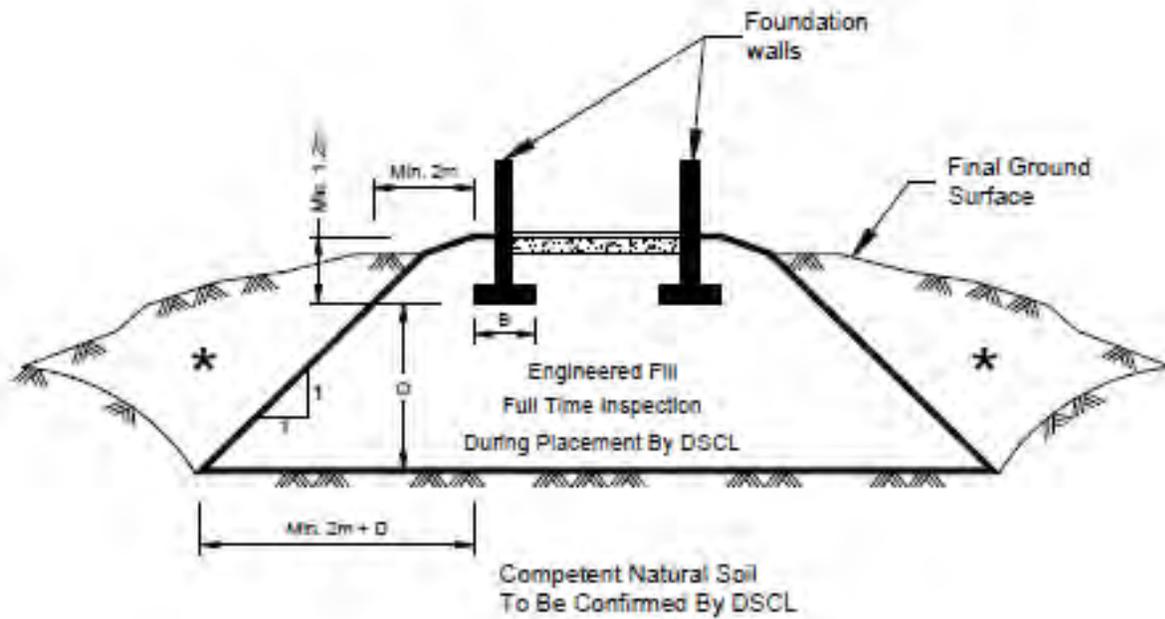
Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

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 (DSCL). Without this confirmation no responsibility for the performance of the structure can be accepted by DSCL. 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 DSCL 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 DSCL during placement of engineered fill is required. Work cannot commence or continue without the presence of the DSCL 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 DSCL prior to footing concrete placements. All excavations must be backfilled under full time supervision by DSCL 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 DSCL.
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.