REPORT ON

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
1850 AND 1890 MAYFIELD ROAD, CALEDON, ONTARIO

PREPARED FOR:
Argo Mayfield West IV Limited

Project No: 24-197-100
Date: July 26, 2024

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1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Argo Mayfield West IV Limited to carry out a preliminary geotechnical investigation for the proposed low-rise development located at 1850 and 1890 Mayfield Road, Caledon, Ontario.

It is understood that the proposed development will consist of a residential subdivision (single-family dwellings and townhomes) serviced by a network of roads and utility pipes. The finish floor elevation of the proposed residential house/townhouse and the invert/bottom of the site services are not known at the time of writing this report.

The purpose of this preliminary geotechnical investigation was to obtain information about the subsurface conditions at boreholes locations and from the findings in the boreholes to make preliminary engineering recommendations pertaining to the geotechnical design of underground utilities, roads and to comment on the foundation conditions for the proposed development.

This report deals with geotechnical issues only. The findings of Phase One Environmental Site Assessment (ESA) by DS are addressed separately.

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 Argo Mayfield West IV Limited and its architect and designers. Third party use of this report without DS consent is prohibited.

2. FIELD AND LABORATORY WORK

The field work for this investigation was carried out by DS from June 08 to June 09, 2024. A total of eight (8) boreholes (BH24-1 to BH24-8, see **Drawing 1** for borehole locations) were drilled to a depth of 6.7 m below existing grade.

Boreholes were drilled with solid stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of DS personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in

accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the DS laboratory for detailed examination by the project engineer and for laboratory testing.

In addition to visual examination in the laboratory, all the soil samples were tested for water contents and results are presented on the respective borehole logs. Selected four (4) soil samples were subjected to grain size analyses and the results are presented on **Drawing 11**. Atterberg Limits tests were carried out on three (3) selected soil samples and the results are presented on the respective borehole logs and on **Drawing 12**.

Groundwater level observations were made during drilling and in the open boreholes at the completion of the drilling operations. Monitoring wells of 50 mm diameter were installed in four (4) boreholes (BH24-1, BH24-2, BH24-7 and BH24-8) to allow for groundwater level monitoring and potential hydrogeological testing/study.

The geodetic ground surface elevations at the locations of the boreholes/monitoring wells were established by DS using differential GPS system. It should be noted that the elevations at the as-drilled borehole/well locations were not provided by a professional surveyor and should be considered to be approximate. Contractors performing any work referenced to the borehole/well elevations should confirm the borehole elevations for their work.

3. SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

The site currently occupied with agricultural fields. 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 are presented in the individual borehole logs presented on **Drawing 2** to **Drawing 9**. Generalized Sub-surface soil profile for boreholes BH24-1 to BH24-8 is presented on **Drawing 10**.

Topsoil:

A surficial topsoil layer, ranging in thickness from 250 to 280 mm was encountered at all borehole locations except for borehole BH24-8.

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 test-pits in the close distance should be carried out to further explore the topsoil conditions.

Reworked (Weathered/Disturbed) Native Soils:

Reworked (weathered/disturbed) native soils consisting of clayey silt/silty clay were encountered in boreholes BH24-1, BH24-2, BH24-4 and BH24-5, extending to a depth of approximately 0.8 m below existing ground surface. These materials typically contained trace organic matter and are inferred to

represent portions of the underlying native silty clay to clayey silt (till) that have been reworked (e.g., potentially as a result of farm tilling operations and weathering). Standard penetration tests carried out within these materials gave N values ranging from 4 to 6 blows per 0.3 m penetration, indicating a firm consistency.

Fill Materials:

Fill materials generally consisting of clayey silt were encountered in boreholes BH24-3, BH24-6, BH24-7 and BH24-8. Clayey silt fill material extended to depths ranging from 0.8 to 1.5 m. Inclusions of organics, brick pieces and rootlets were found in the fill materials. The consistency of clayey silt fill was firm to stiff, but generally firm, as indicated as measured SPT 'N' values ranging from 4 to 14 blows per 300 mm penetration.

Silty sand fill material was encountered in one borehole BH24-8, extending to a depth of 0.8 m. The silty sand was present in a loose state, with a measured SPT 'N' value of 5 blows per 300 mm of penetration. Inclusions of brick pieces were found in the borehole.

Clayey Silt to Silty Clay Till

Clayey silt to silty clay till was encountered in all boreholes at upper, middle and lower levels of the boreholes. Upper clayey silt to silty clay till deposits were encountered below reworked (weathered/disturbed) native soils or below fill materials in all boreholes except borehole BH24-6 and extended to depths ranging from 5.0 to 6.7 m. Middle and lower clayey silt to silty clay till deposits were encountered in boreholes BH24-3, BH24-4 and BH24-6, at varying depths and varying thicknesses. The clayey silt to silty clay till was found to have a stiff to hard consistency (generally very stiff), as indicated by measured SPT 'N' values of 8 to 34 blows per 300 mm penetration.

Grain size analysis of three (3) silty clay till samples (BH24-1/SS5, BH24-5/SS5 and BH24-8/SS6) were conducted and the results are presented on **Drawings 10.** The fractions of soil particles of the sample are presented as follows:

Clay: 25 to 34%
Silt: 46 to 48%
Sand: 16 to 25%
Gravel: 2 to 4%

Atterberg limits tests of the same samples (BH24-1/SS5, BH24-4/SS5 and BH24-8/SS6) were also conducted. The results are shown on the borehole logs and on **Drawing 11** and are summarized as follows:

Liquid limit (WL): 25 to 31%
Plastic limit (WP): 12 to 14%
Plasticity index (PI): 13 to 17

Clayey silt to Silt:

Clayey silt to silt deposits were encountered below the clayey silt to silty clay till in two boreholes (BH24-1 and BH24-4) and extended to depths ranging from 6.1 to 6.7 m below existing ground surface. The clayey silt to silt were present a stiff to hard consistency, with measured SPT 'N' values ranging from 8 to 54 blows per 300 mm of penetration.

Grain size analyses of one (1) soil sample (BH24-1/SS7) was conducted and the results are provided on the respective borehole logs and on **Drawings 11**, with the following fractions:

Clay: 15%
Silt: 69%
Sand: 12%
Gravel: 4%

Sandy Silt Till:

Sandy silt till was encountered at various depths in two boreholes (BH24-3 and BH24-6) and extended to depths ranging from 2.8 to 6.7 m below existing ground surface. The sandy silt till was present in a compact to very dense state, with measured SPT 'N' values ranging from 16 to 54 blows per 300 mm of penetration.

Silty Sand (Cohesionless Deposits):

Cohesionless silty sand was encountered at a depth of 2.0 to 2.5 m in borehole BH24-3. The silty sand was found to have a compact state, with measured SPT 'N' values ranging from 17 to 24 blows per 300 mm penetration.

3.2 GROUNDWATER CONDITIONS

Four (4) monitoring wells (BH24-1, BH24-2, BH24-7 and BH24-8) were installed at the site for groundwater table monitoring. On July 23, 2024, groundwater levels in monitoring wells were recorded at depths ranging from 0.5 to 5.0 m below existing ground surface, corresponding to Elev. 254.5 to 257.6 m, as listed in **Table 1**:

Table 1: Groundwater Levels Observed in Monitoring Wells

Well ID	Ground Surface Elevation (masl)	Date of Observation	Groundwater Level Depth (mbgs)	Groundwater Level Elevations (masl)	Notes
BH24-1	258.3	July 23, 2024	0.7	257.6	Well screened from 3.1 to 6.1 m
BH24-2	259.5	July 23, 2024	5.0	254.5	Well screened from 3.1 to 6.1 m
BH24-7	255.9	July 23, 2024	0.5	255.4	Well screened from 3.1 to 6.1 m
BH24-8	257.5	July 23, 2024	1.3	256.2	Well screened from 3.1 to 6.1 m

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events. Further groundwater monitoring should be carried out to confirm the groundwater conditions.

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. Based on the borehole information, preliminary geotechnical discussion and recommendations for the proposed development are presented as follows.

4.1. SITE GRADING & ENGINEERED FILL

For the residential subdivision with residential lots/buildings, underground services, roads, and driveways, it is recommended that all backfill to be placed for grading purposes be constructed as engineered fill to provide competent subgrade below house foundations, roads, boulevards, etc.

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

General guidelines for the placement and preparation of engineered fill are presented in **Appendix A**. 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 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 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 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 any existing fill materials free from organics/topsoil and organics to be excavated from cut-areas 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 borehole investigation has shown that the predominant subgrade soil, after stripping the topsoil and any other organic and otherwise unsuitable subsoil, will generally consist of silty clay to clayey silt till and sandy silt till.

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

For Local Roads

40 mm HL3 Asphaltic Concrete
65 mm HL8 Asphaltic Concrete
150 mm Granular ‘A’
300 mm Granular ‘B’

For Collector Roads

40 mm HL3 Asphaltic Concrete

90 mm HL8 Asphaltic Concrete

150 mm Granular 'A'

450 mm Granular 'B'

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

4.2.1. STRIPPING, SUB-EXCAVATION AND GRADING

The site should be stripped of all organic soil/topsoil, fill materials, weathered/disturbed soils, 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 ±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 installation of full-length subdrains on all roads is recommended. 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. WATERMAIN/SEWERS

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.

The type of material for the pipes to be used for watermains or sewers will be the choice of civil engineer.

4.3.1. TRENCHING

The boreholes show that below the existing topsoil and fill/weathered/disturbed native soils, the trenches will be predominantly dug through the silty clay to clayey silt till and sandy silt to silty sand (till). Groundwater seepage within the clayey silt to silty clay till is expected to be slow to moderate and manageable by gravity drainage and pumping from filtered sumps. Positive dewatering will be required for any excavations in (sandy) soils (sandy silt to silty sand (till)) below groundwater table. The groundwater table must be lowered to at least 1.0 m below the excavation base.

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

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

4.3.2. BEDDING

Subject to design grades, the sewer pipes are anticipated to be laid within the native soils and/or engineered fill 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.

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

4.3.3. BACKFILLING OF TRENCHES

Based on visual and tactile examination, the on-site excavated inorganic 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. Significant aeration of the wet excavated soils will be required prior to their use as backfill material.

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 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 (±2%) their optimum moisture content and each layer should be compacted to at least 95% SPMDD. In the upper 1.5 m of the 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.

The topsoil encountered at the site can be used for landscaping fill area to raise the grades. Topsoil cannot be reused as foundation or trench backfill material.

4.4. FOUNDATION CONDITIONS

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

The undisturbed native soils below fill materials and disturbed/weathered 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 can be designed for a bearing capacity of 150 kPa at SLS (Serviceability Limit State), and for a factored geotechnical resistance of 225 kPa at ULS (Ultimate Limit State) at or below the founding levels provided in **Table 2** below:

Table 2: Bearing Values and Founding Levels of Spread/Strip Footings

BH No.	Material	Bearing Capacity at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Depth below Existing Ground (m)	Founding Level at or Below Elevation (m)
BH24-1	Silty Clay Till	150	225	1.1	257.2
BH24-2	Clayey Silt to Silty Clay Till	150	225	1.1	258.4
BH24-3	Clayey Silt to Silty Clay Till	150	225	1.6	256.2
BH24-4	Clayey Silt to Silty Clay Till	150	225	1.1	256.5
BH24-5	Clayey Silt to Silty Clay Till	150	225	1.1	257.1
BH24-6	Sandy Silt Till	150	225	1.6	255.7
BH24-7	Clayey Silt to Silty Clay Till	150	225	1.1	254.8
BH24-8	Clayey Silt to Silty Clay Till	150	225	1.6	255.9

Where the grade needs to be raised, the proposed structures can be supported by spread and strip footings founded on engineered fill for bearing capacity values of 150 kPa at SLS (Serviceability Limit State), and for a factored geotechnical resistance of 225 kPa at ULS (Ultimate Limit State). The engineered fill supporting footings should be constructed in accordance with the guidelines presented in **Appendix A** and in **Section 4.1**.

Variations in the soil conditions are expected in between the borehole locations, and during construction, the soil bearing pressures should be confirmed by the Geotechnical Engineer.

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 1.4 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.

4.5. FLOOR SLAB

The floor slab can be supported on grade provided all topsoil, fill, reworked native and surficially softened/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 around the exterior basement walls, as shown on **Drawing 13**. Seepage rate to the drainage system should be evaluated in the hydrogeological study.

4.6. EARTH PRESSURES

The lateral earth pressures acting on foundation walls or retaining walls 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/m^3 may be assumed

h = Depth to point of interest in metres

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

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

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 organic soil/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

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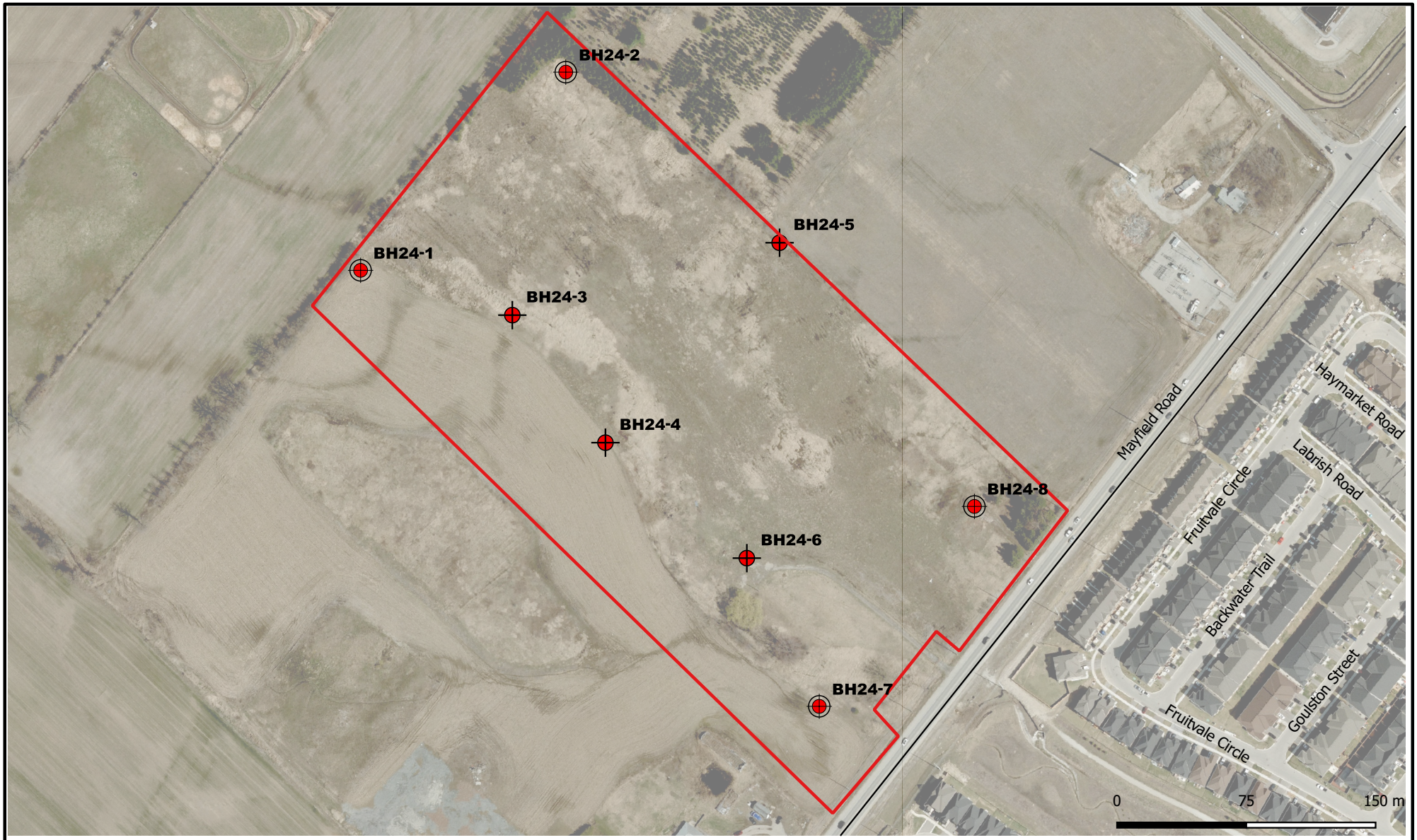
Drawings

J:\2024 Projects\24-197-100 Geo - Env - 1850 & 1890 Mayfield Road\Geotechnical\QGIS\1-QGIS\Drawing 1 Borehole Location Plan.qgs Jul-23 14:14



Legend

- Approx Site Boundary
- Borehole
- Monitoring Well

DS CONSULTANTS LTD.
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Client: ARGO DEVELOPMENT CORPORATION

Project: GEOTECHNICAL INVESTIGATION
1850 & 1890 Mayfield Road, Caledon, ON

Title: **BOREHOLE LOCATION PLAN**

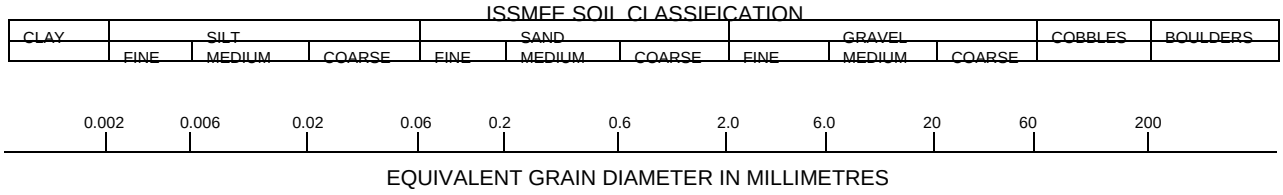
N

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	D.W	K.T	July 2024
Rev: 0	Scale: As Shown	Project No.: 24-197-100	Drawing 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 DSCL 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.

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Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH24-1

PROJECT: Geotechnical Investigation
CLIENT: Argo Development Corporation
PROJECT LOCATION: 1850 and 1890 Mayfield Rd., Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4840709.5 E 592375.6

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jul-08-2024

REF. NO.: 24-197-100
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
258.3												
0.0 / 258.1	**TOPSOIL:** 250mm											
0.3 / 257.5	**CLAYEY SILT:** trace sand, trace gravel, trace rootlets, brown, moist, firm (weathered/disturbed)		1	SS	5		258					
0.8	**SILTY CLAY TILL:** trace to some sand, trace gravel, brown to grey, moist, stiff to very stiff		2	SS	18	W. L. 257.6 m Jul 23, 2024	257					
			3	SS	21							
			4	SS	25		256					
			5	SS	16		255					2 16 48 34
	grey below 3.7m						254					
253.4			6	SS	8							
4.9	**CLAYEY SILT TO SILT:** trace to some sand, trace gravel, grey, very moist to moist, stiff to hard						253					
			7	SS	54		252					4 12 69 15
251.6												
6.7	**END OF BOREHOLE:**											

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date:	Water Level(mbgl):
July 23, 2024	0.7

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

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

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LOG OF BOREHOLE BH24-2

PROJECT: Geotechnical Investigation
CLIENT: Argo Development Corporation
PROJECT LOCATION: 1850 and 1890 Mayfield Rd., Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4840824.5 E 592494.1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jul-08-2024

REF. NO.: 24-197-100
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
259.5							
0.0 / 259.3	**TOPSOIL:** 250mm						
0.3 / 258.7	**CLAYEY SILT:** trace sand, trace gravel, trace rootlets, brown, moist, firm (weathered/disturbed)		1	SS	6		259
0.8	**CLAYEY SILT TO SILTY CLAY TILL:** trace to some sand, trace gravel, brown to grey, moist, stiff to very stiff		2	SS	16		258
			3	SS	19		
			4	SS	27		257
	grey below 3.1m		5	SS	17		256
			6	SS	9	W. L. 254.5 m Jul 23, 2024	255
			7	SS	11		254
252.8							253
6.7	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): July 23, 2024 5.0						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

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LOG OF BOREHOLE BH24-3

PROJECT: Geotechnical Investigation
CLIENT: Argo Development Corporation
PROJECT LOCATION: 1850 and 1890 Mayfield Rd., Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4840683.7 E 592463.6

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jul-09-2024

REF. NO.: 24-197-100
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.8								
0.0 / 257.5	**TOPSOIL:** 280mm							
0.3	**FILL:** clayey silt, trace sand, trace gravel, trace rootlets, grey to brown, moist, firm		1	SS	4			
			2	SS	6		257	
1 / 256.3								
1.5 / 255.8	**CLAYEY SILT TO SILTY CLAY TILL:** trace to some sand, trace gravel, brown, moist, very stiff		3	SS	17		256	
2								
2.0 / 255.3	**SILTY SAND:** some clay, trace gravel, trace cobble, brown, moist to very moist, compact		4	SS	24			wet spoon
2.5	**CLAYEY SILT TO SILTY CLAY TILL:** trace to some sand, trace gravel, brown to grey, moist, stiff to very stiff						255	
3			5	SS	21			wet spoon
4							254	
	grey below 4.6m		6	SS	9		253	wet spoon
5								
6							252	
251.5								
6.3 / 251.1	**SANDY SILT TILL:** trace clay, trace gravel, grey, moist, compact		7	SS	29			
6.7	**END OF BOREHOLE:** Notes: 1) Water encountered at 2.3m during drilling.							

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

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LOG OF BOREHOLE BH24-4

PROJECT: Geotechnical Investigation
CLIENT: Argo Development Corporation
PROJECT LOCATION: 1850 and 1890 Mayfield Rd., Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4840609.4 E 592517.4

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jul-09-2024

REF. NO.: 24-197-100
ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.6												
0.0 / 257.3	**TOPSOIL:** 270mm											
0.3 / 256.8	**CLAYEY SILT:** trace sand, trace gravel, trace rootlets, brown, moist, firm (weathered/disturbed)		1	SS	4		257					
0.8	**CLAYEY SILT TO SILTY CLAY TILL:** trace to some sand, trace gravel, brown to grey, moist, stiff to hard		2	SS	15							
			3	SS	32		256					
			4	SS	15		255					
	silty sand layer at 3.1m		5	SS	14							wet spoon
	grey below 3.6m						254					
252.6			6	SS	12		253					
5.0 / 251.5	**CLAYEY SILT TO SILT:** trace sand, trace gravel, grey, very moist, stiff						252					
6.1 / 250.9	**SILTY CLAY TILL:** some sand, trace gravel, greyish brown, moist, very stiff		7	SS	29		251					
6.7	**END OF BOREHOLE:** Notes: 1) Water encountered at 3.1m during drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

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LOG OF BOREHOLE BH24-5

PROJECT: Geotechnical Investigation
CLIENT: Argo Development Corporation
PROJECT LOCATION: 1850 and 1890 Mayfield Rd., Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4840725.7 E 592618.2

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jul-08-2024

REF. NO.: 24-197-100
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
258.2												
0.0 / 258.0	**TOPSOIL:** 250mm											
0.3 / 257.4	**CLAYEY SILT:** trace sand, trace gravel, trace rootlets, brown, moist, firm (weathered/disturbed)		1	SS	5		258					
0.8	**CLAYEY SILT TO SILTY CLAY TILL:** trace to some sand, trace gravel, brown to grey, moist, stiff to very stiff		2	SS	19		257					
			3	SS	24							
			4	SS	16		256					
	grey below 3.1m		5	SS	9		255					3 22 48 27
			6	SS	9		254					
	brownish grey at 6.1m		7	SS	13		253					
251.5							252					
6.7	**END OF BOREHOLE:** Notes: 1) Borehole was open without water upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

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LOG OF BOREHOLE BH24-6

PROJECT: Geotechnical Investigation
CLIENT: Argo Development Corporation
PROJECT LOCATION: 1850 and 1890 Mayfield Rd., Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4840542.5 E 592599.4

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jul-09-2024

REF. NO.: 24-197-100
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
257.3							
0.0 / 257.1	**TOPSOIL:** 250mm						
0.3	**FILL:** clayey silt, trace sand, trace gravel, trace rootlets, brown, moist, firm		1	SS	7		257
			2	SS	6		
255.8							256
1.5	**SANDY SILT TILL:** trace to some clay, trace gravel, trace cobble, brown, very moist, compact (verify)		3	SS	16		
254.5			4	SS	27		255
2.8	**CLAYEY SILT TO SILTY CLAY TILL:** some sand, trace gravel, trace cobble, brown to grey, moist, stiff to hard grey below 3.1m		5	SS	34		254
			6	SS	12		253
							252
			7	SS	23		251
250.6							
6.7	**END OF BOREHOLE:** Notes: 1)Water encountered at 1.5m during drilling.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

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

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

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GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

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LOG OF BOREHOLE BH24-7

PROJECT: Geotechnical Investigation
CLIENT: Argo Development Corporation
PROJECT LOCATION: 1850 and 1890 Mayfield Rd., Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4840456.6 E 592642

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jul-09-2024

REF. NO.: 24-197-100
ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
255.9												
0.0 / 255.7	**TOPSOIL:** 250mm											
0.3 / 255.1	**FILL:** clayey silt, trace sand, trace gravel, trace rootlets, brown, moist, firm		1	SS	6							
0.8	**CLAYEY SILT TO SILTY CLAY TILL:** some sand, trace gravel, trace cobble, brown to grey, moist, stiff to very stiff		2	SS	14		W. L. 255.4 m Jul 23, 2024					
			3	SS	23		255					
			4	SS	29		254					
	grey below 2.9m		5	SS	17		253					
							252					
	silt layer at 4.8m		6	SS	8		251					
							250					
249.2			7	SS	19							
6.7	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): July 23, 2024 0.5											

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

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

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LOG OF BOREHOLE BH24-8

PROJECT: Geotechnical Investigation
CLIENT: Argo Development Corporation
PROJECT LOCATION: 1850 and 1890 Mayfield Rd., Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4840572.2 E 592731

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jul-08-2024

REF. NO.: 24-197-100
ENCL NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.5												
0.0	**FILL:** silty sand, trace brick pieces, trace gravel, dark brown, moist, loose		1	SS	5		257					
256.7												
0.8	**FILL:** clayey silt, trace sand, trace gravel, trace brick pieces, brown, moist, stiff		2	SS	14	▽						
256.0							W. L. 256.2 m Jul 23, 2024					
1.5	**CLAYEY SILT TO SILTY CLAY TILL:** some sand, trace gravel, occasional cobble, brown to grey, moist, stiff to hard		3	SS	19							
			4	SS	24		255					
	grey below 3.1m		5	SS	34		254					
			6	SS	13		253					4 25 46 25
							252					
	reddish brown at 6.1m		7	SS	12		251					
250.8												
6.7	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): July 23, 2024 1.3											

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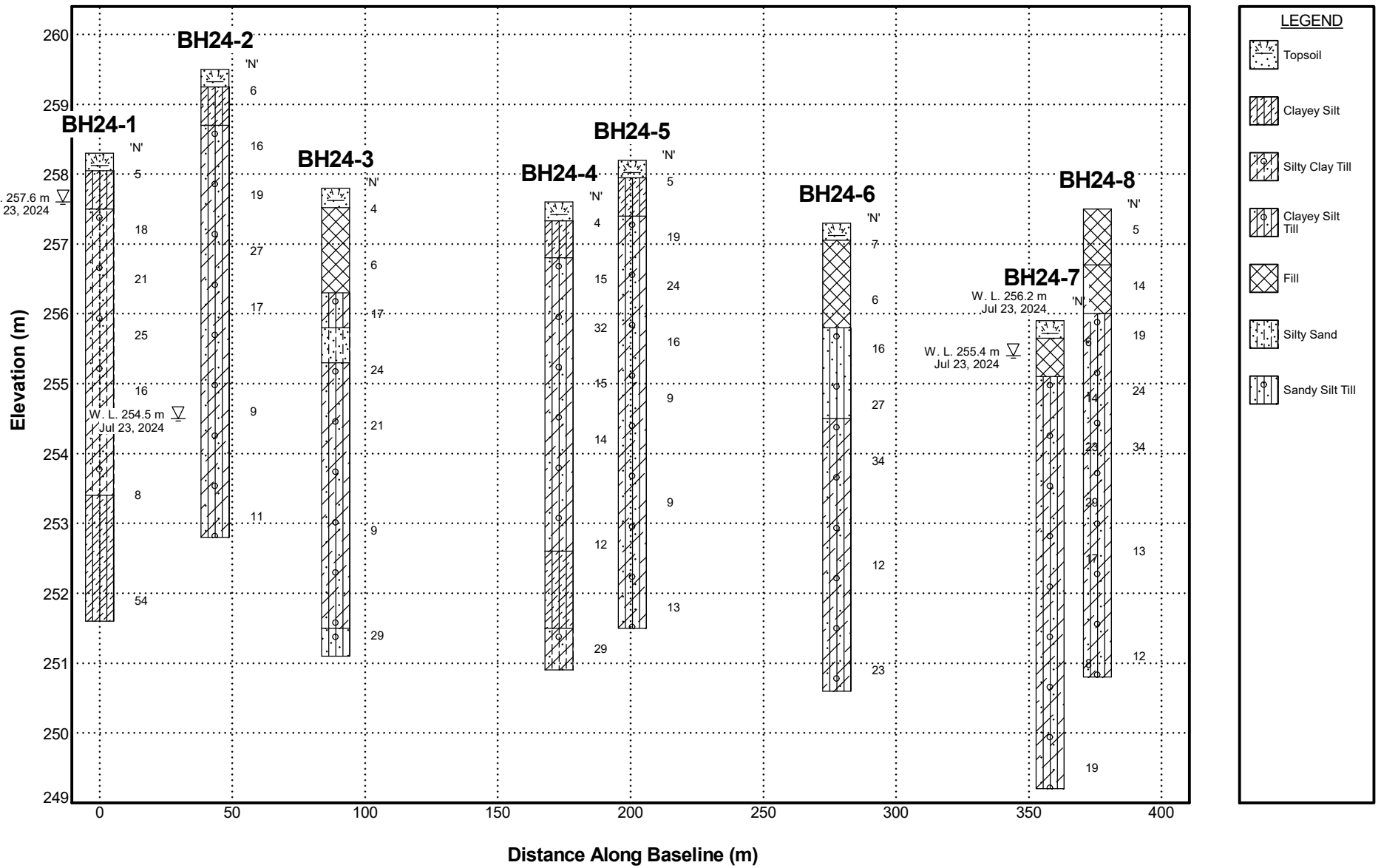
GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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



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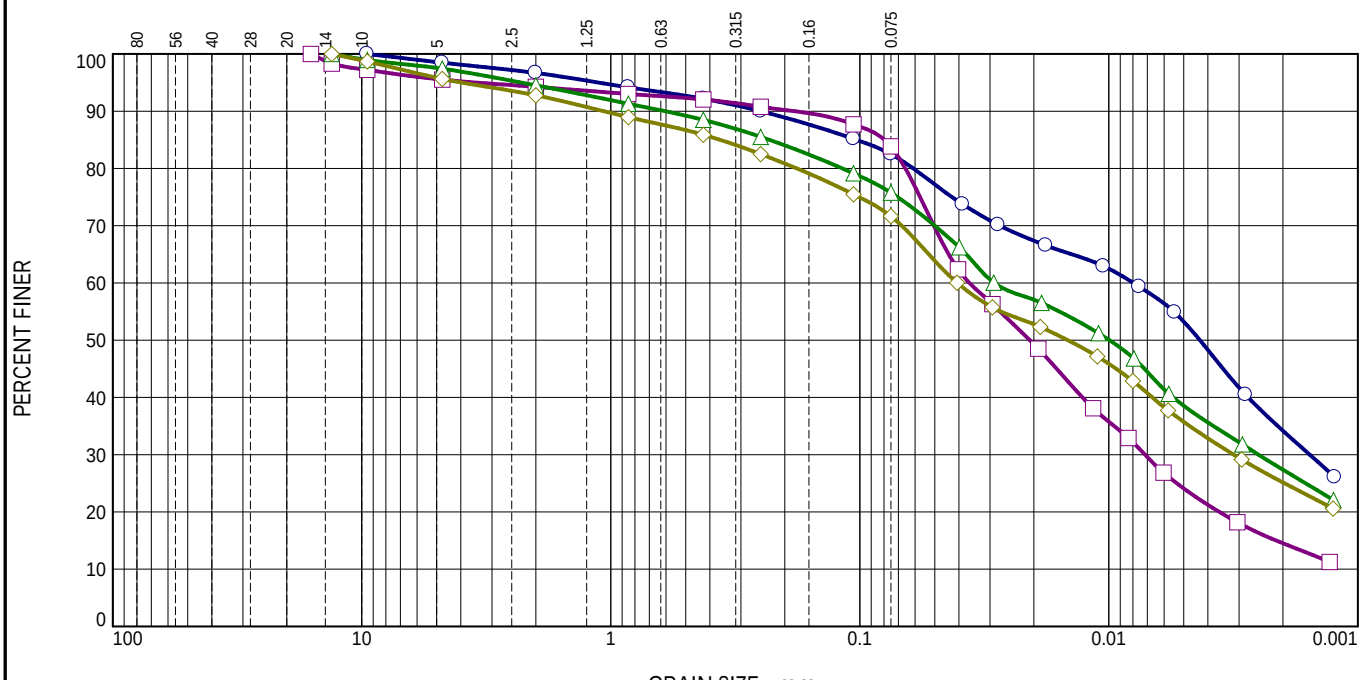
Generalized Sub-surface Profile (NTS)

DRAWING NO.	10
JOB NO.	24-197-100
DATE	July, 2024

DS FENCE (M) 24-197-100 GEO COPY.GPJ DS.GDT 7/25/24

Particle Size Distribution Report

ASTM D422



	% +75mm	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.5	1.8	4.5	9.7	48.3	34.2
□	0.0	0.0	4.5	1.2	2.2	8.2	69.4	14.5
△	0.0	0.0	2.6	2.9	6.0	12.7	48.4	27.4
◇	0.0	0.0	4.4	2.8	6.9	14.2	46.5	25.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	31	14	0.1034	0.0080	0.0043	0.0016				
□			0.0795	0.0363	0.0208	0.0072	0.0021			
△	26	12	0.2312	0.0289	0.0099	0.0025				
◇	25	12	0.3638	0.0406	0.0146	0.0031				

Material Description	USCS	AASHTO
○ Silty clay till, some sand, trace gravel	CL	A-6(12)
□ Silt, some clay, some sand, trace gravel		
△ Silty clay till, sandy, trace gravel	CL	A-6(8)
◇ Silty clay till, sandy, trace gravel	CL	A-6(6)

Project No. 24-197-100 Client: Argo Development Corporation

Project: 1850 and 1890 Mayfield Rd., Caledon, ON

○Location: BH24-1 SS5 Sample Number: VM-5672

□Location: BH24-1 SS7 Sample Number: VM-5672

△Location: BH24-5 SS5 Sample Number: VM-5672

◇Location: BH24-8 SS6 Sample Number: VM-5672

Remarks:

○F.M.=0.38

□F.M.=0.46

△F.M.=0.57

◇F.M.=0.72

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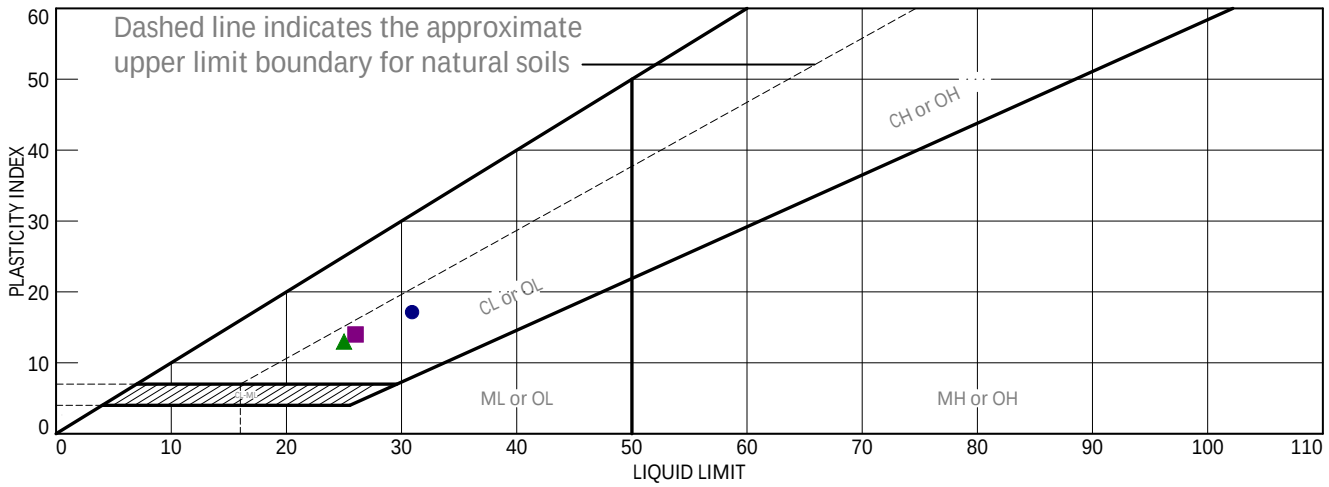
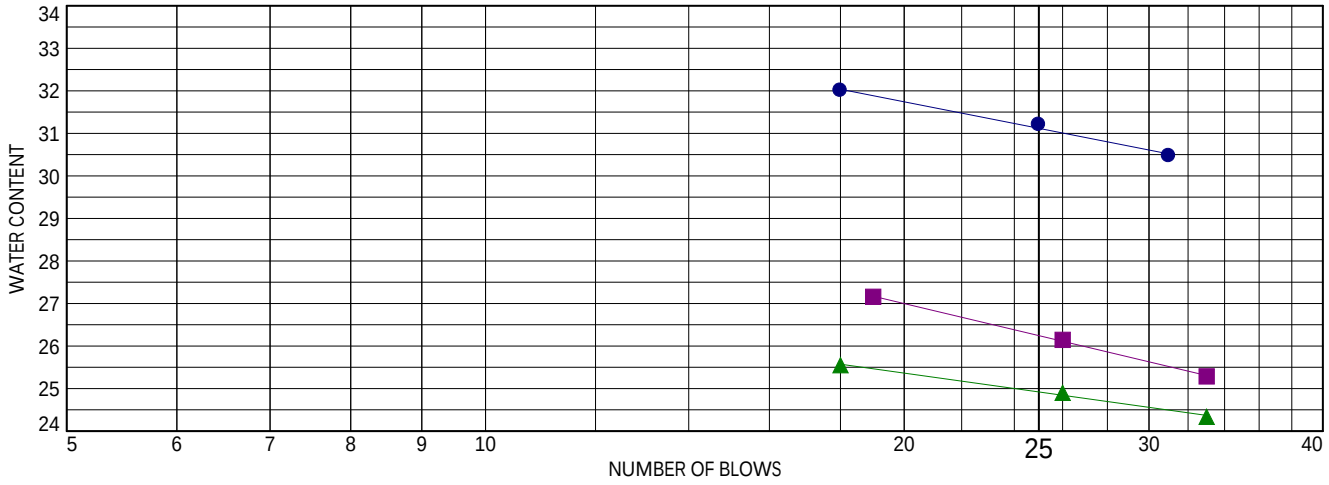
CCIL

Figure 11

Tested By: Helen/Nisha Checked By: Kirupa

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty clay till, some sand, trace gravel	31	14	17	92.2	82.5	CL
■	Silty clay till, sandy, trace gravel	26	12	14	88.5	75.8	CL
▲	Silty clay till, sandy, trace gravel	25	12	13	85.9	71.7	CL

Project No. 24-197-100 Client: Argo Development Corporation

Project: 1850 and 1890 Mayfield Rd., Caledon, ON

●Location: BH24-1 SS5 Sample Number: VM-5672

■Location: BH24-5 SS5 Sample Number: VM-5672

▲Location: BH24-8 SS6 Sample Number: VM-5672

Remarks:

●Sampled on July 08, 2024

■Sampled on July 08, 2024

▲Sampled on July 08, 2024

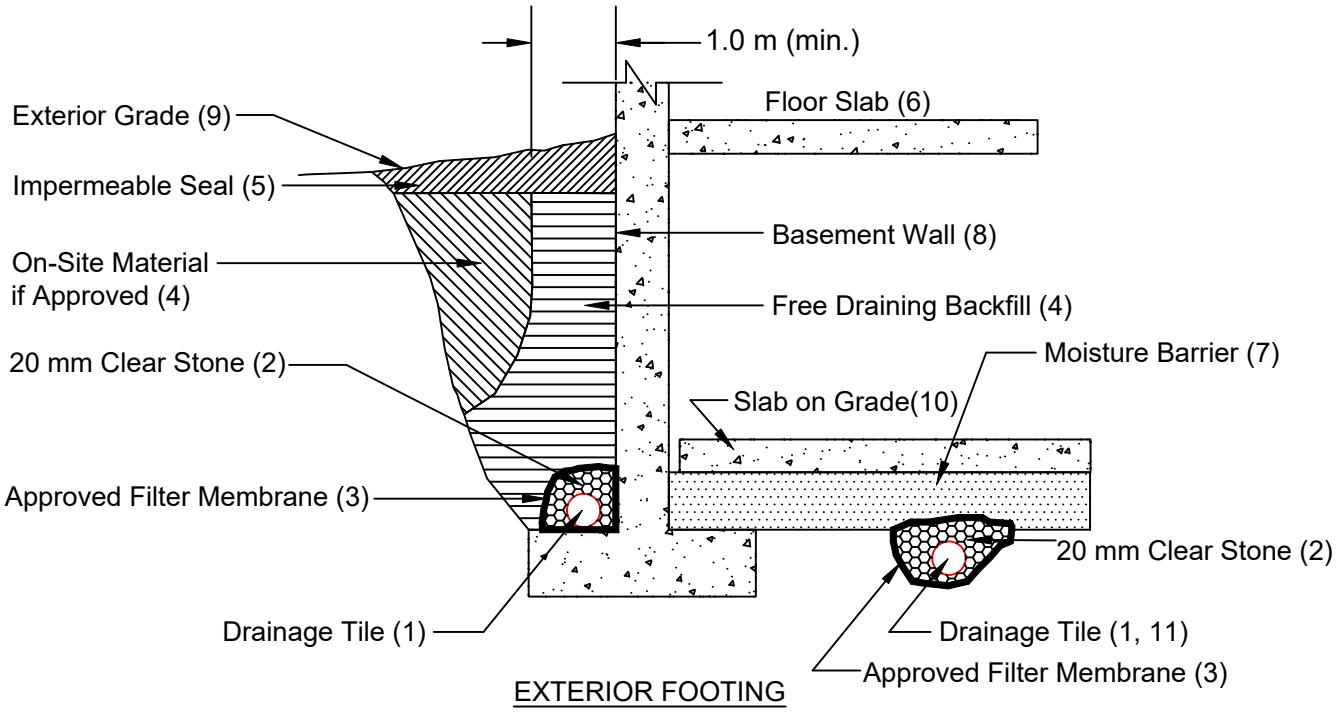
DS CONSULTANTS LTD.

Geotechnical ❖ Environmental ❖ Materials ❖ Hydrogeology

CCIL

Figure 12

Tested By: Nisha Checked By: Kirupa



EXTERIOR FOOTING

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, place100 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
Engineered Fill Guidelines

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.

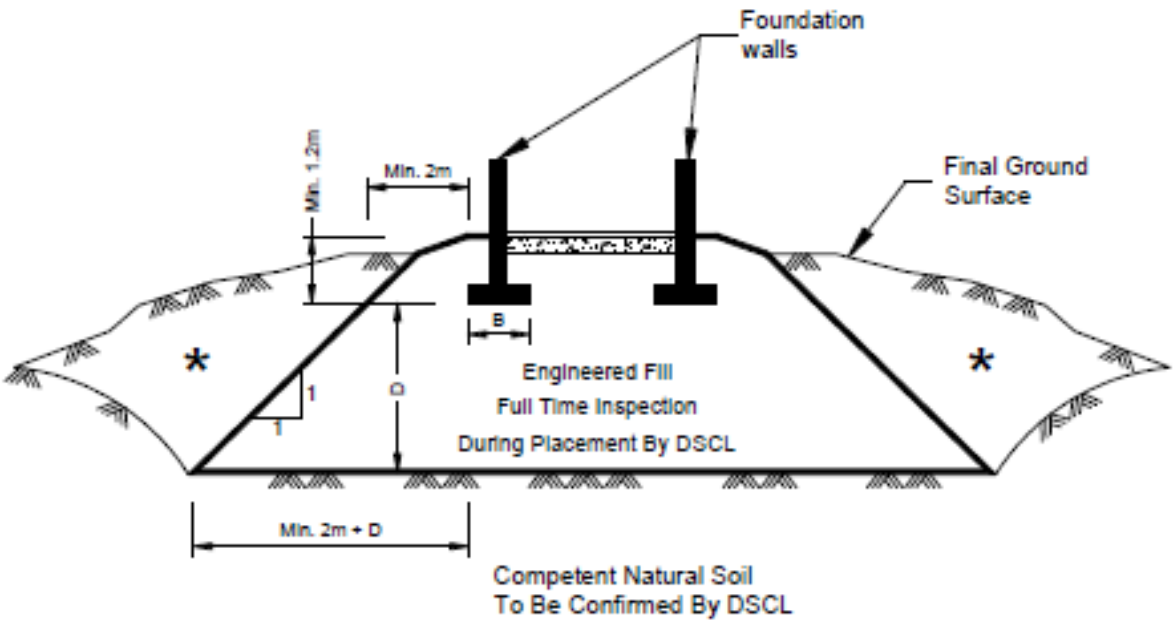
10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from DSCL prior to footing concrete placements. All excavations must be backfilled under full time supervision by DSCL to the same 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.

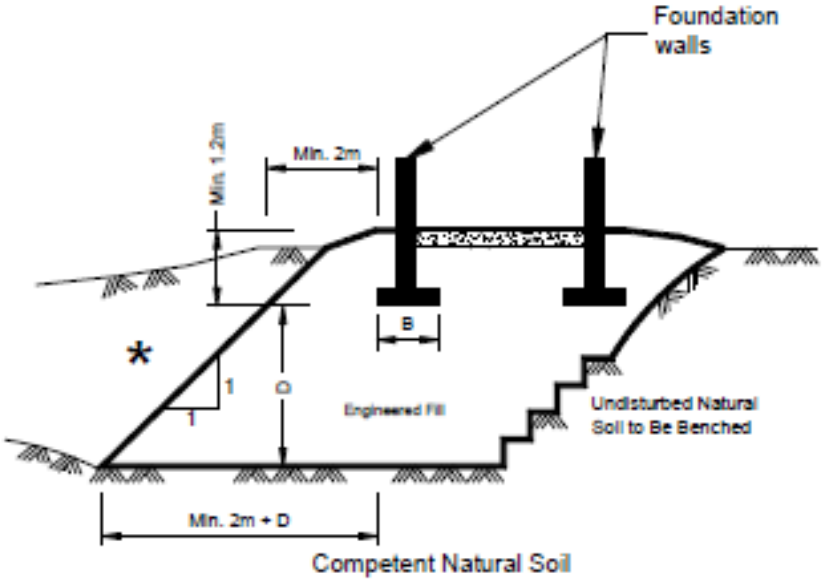
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any 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.