REPORT ON

Preliminary Geotechnical Investigation
Proposed Residential Development
5150-5170 Ninth Line
Mississauga, Ontario

PREPARED FOR:

Mattamy (5150 Ninth Line) Limited

Project No: 18-748-100
Date: August 9, 2019

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1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Mattamy (5150 Ninth Line) Limited to prepare a preliminary geotechnical investigation report for the proposed residential development located at 5150 and 5170 Ninth Line in Mississauga, Ontario.

It is understood that the proposed development will consist of a residential subdivision including residential houses, roads and sewers.

DS Consultants carried out an environmental investigation at the subject site in January 2019 and drilled six (6) boreholes to depths of 2.1 to 11.3m. Sirati and Partners Consultants Limited (Sirati) carried out geotechnical investigations at these parcels in February and July 2017, including drilling of eight (8) boreholes to depths of 8.2 to 9.7m. This report is a consolidated report, prepared on the basis of all the boreholes drilled by DS and Sirati.

This report deals with geotechnical issues only. Environmental investigation reports by DS are submitted under separate covers.

The purpose of this 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 building construction.

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

This report has been prepared for Mattamy (5150 Ninth Line) Limited and its architect and designers. Third party use of this report without DS consent is prohibited.

2. AVAILABLE REPORTS

The following geotechnical reports are available for the subject property. This geotechnical report is consolidated to include the factual information available from these reports. Logs from these reports are included in Appendix A of this report.

1. Preliminary Geotechnical Investigation Report by Sirati for 5150 Ninth Line, Mississauga; Sirati Project No. SP17-109-10, report dated February 15, 2017
2. Preliminary Geotechnical Investigation Report by Sirati for 5170 Ninth Line, Mississauga; Sirati Project No. SP17-227-10, report dated July 20, 2017

3. FIELD AND LABORATORY WORK

A total of six (6) boreholes (BH19-1 to BH19-6, see Drawing 1 for borehole locations) were drilled at the subject site in January 2019 to depths ranging from 2.1 to 11.3m. Boreholes were drilled with solid 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.

Water level observations were made during and upon completion of drilling. Two (2) monitoring wells of 50mm diameter were installed for the long-term groundwater monitoring in boreholes BH19-1 and BH19-4.

The surface elevations at the borehole locations were surveyed by DS staff, using a differential GPS unit leased from Sokkia.

4. 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 are presented in the individual borehole logs presented on **Drawings 2 to 7**. The borehole logs by Sirati are attached in Appendix A of this report.

4.1 Soil Conditions

Topsoil & Fill Materials: A 150 to 350 mm thick surficial layer of topsoil was found at borehole locations. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Fill material consisting of clayey silt, sandy silt and silty sand was encountered in Sirati boreholes, extending to depths ranging from 0.8 to 2.3m. Fill materials in BH6 was reported to contain metal fragments.

Weathered/Disturbed Native: Below the topsoil, a layer of weathered/disturbed native clayey silt to sandy silt was encountered in majority of the boreholes, extending to depths of 0.8 to 1.5m below existing grade. This weathered/disturbed soil layer contained trace to some topsoil/organics and was generally present in very loose to loose/soft to firm state.

Glacial Till Deposits: Below the fill material or weathered/disturbed native, glacial till deposits consisting of sandy silt till and clayey silt to silty clay till were encountered in all the boreholes, extending to the maximum explored depths of boreholes. The till deposits were present in a firm to hard consistency and compact to dense state, with measured SPT 'N' values ranging from 7 to 35 blows per 300mm penetration. Occasional cobble and boulder and wet sand seams were inferred within the till deposits.

4.2 Groundwater Conditions

During drilling or upon completion, no free-standing water was found in the boreholes on short-term basis. Long-term (stabilized) groundwater levels in the monitoring wells were found at depths ranging from 6.2 to 7.3m below the existing grade, corresponding to Elevations 184.0 to 187.2m, as summarized on **Table 1** below.

Table 1: Groundwater Levels Observed in Monitoring Wells

Borehole	Surface Elevation (m)	Date of Observation	Water Level Depth (mbgs)	Water Level Elev. (m)
BH19-1	190.5	February 4, 2019	6.5	184.0
BH19-2	192.8	February 4, 2019	6.2	186.6
BH4*	192.2	July 11, 2017	7.3	184.9
BH9*	194.0	February 8, 2017	6.8	187.2

*Sirati Wells

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

5. 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.

5.1 SITE GRADING & ENGINEERED FILL

The development of the site will require demolition of existing structures, clearing and stripping of all topsoil, fill materials and weathered/disturbed native soils containing topsoil/organics. Since all areas will be developed as either residential lots and/or road/driveways, it is recommended that all fill be placed as engineered fill to provide competent subgrade below house foundations, roads, boulevards, etc.

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

General guidelines for the placement and preparation of engineered fill are presented on **Appendix B**. To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential.

The inorganic native till deposits free from topsoil & organics, are considered suitable for 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 150 to 200 mm and compacted using heavy equipment suitable for these types of soils (e.g. heavy sheepsfoot compactors).

5.2 ROADS

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

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
50 mm HL8 Asphaltic Concrete
200 mm Granular 'A'
250 mm Granular 'B'

For collector roads

40 mm HL3 Asphaltic Concrete
80 mm HL8 Asphaltic Concrete
200 mm Granular 'A'
300 mm Granular 'B'

These values may need to be adjusted according to the City of Mississauga 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.

5.2.1 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 ±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 95% of its SPMDD. The degree of compaction should be increased to 98% within the top 1.0 m of the subgrade, or as per Township Standards. The compaction of the new fill should be checked by frequent field density tests.

5.2.2 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.

5.2.3 DRAINAGE

The City of Mississauga 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 5.2.1, by means of good planning any water trapped in the granular sub-base materials should be drained rapidly towards subdrains or other interceptors.

5.3 SEWERS

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

5.3.1 TRENCHING

Based on the borehole information, trenches will be dug through the cohesive glacial till deposits. No major problems due to groundwater seepage are anticipated during construction in trenches dug to depths of about 4 to 5m. It is expected that any seepage, which occurs during wet periods or from the wet sandy seams in the till, can be removed by pumping from sumps.

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 layers and soft/loose soils 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, the stiff to hard or compact to dense glacial till soils can be classified as Type 2 Soil above groundwater and Type 3 Soil below groundwater. The fill materials and weathered/disturbed native soils can be classified as Type 3 Soil above groundwater and Type 4 Soil below the water table.

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 or obstructions in the fill material.

5.3.2 BEDDING

The boreholes show that in their undisturbed state, the native soils will provide adequate support for the sewer pipes and allow the use of normal Class B type bedding. The recommended minimum thickness of granular bedding below the invert of the pipes is 150 mm. The thickness of the bedding may, however, may have to be increased depending on the pipe diameter or if wet or weak subgrade conditions are encountered.

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.

5.3.3 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.

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 1.0 m, 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 to raise the grades. Topsoil cannot be reused as foundation and trench backfill material.

5.4 FOUNDATION CONDITIONS

It is understood that the proposed subdivision will consist of single-family homes (detached, townhomes, back-to-backs, and stacked) with one level basement. The finish floor elevations of these proposed singles are not known to us at the time of writing this report.

Based on the borehole information, soil bearing pressure value of 150 kPa at SLS (225 kPa at ULS) is feasible on the undisturbed inorganic native soils at or below the depths provided on **Table 2**. These bearing values would be suitable for the use of normal spread footing foundations to support normal single-family dwellings.

Table 2: Bearing Values and Founding Levels of Spread 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)
BH19-1	Sandy silt till	150	225	1.8	188.7
BH19-2	Sandy silt till	150	225	1.1	190.2
BH19-3	Clayey silt till	150	225	1.1	188.5
BH19-4	Sandy silt till	150	225	1.1	191.7
BH19-5	Sandy silt till	150	225	1.1	190.6
BH19-6	Clayey silt till	150	225	1.1	190.9

Alternatively, 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 on **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.

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

It should be noted that the recommended bearing capacities have been calculated by DS from the borehole information for the preliminary design stage only. The investigation and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by DS to validate the information for use during the construction stage.

6. GENERAL COMMENTS AND LIMITATIONS OF REPORT

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

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

The 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.

Alka Sangar, M.Eng., P.Eng.

Fanyu Zhu, PhD., P.Eng.

Drawings

J:\-GIS\18-748 5150 Ninth line\1-QGIS\Geotechnical\Figure 1 - Borehole Location Plan.qgs

Legend

- Approx. Property Boundary
- Borehole by DS
- Monitoring Well by DS
- Monitoring Well Location by Others
- Borehole Location by Others

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Client: MATTAMY (5150 NINTH LINE) LIMITED

Project: GEOTECHNICAL INVESTIGATION
5150 Ninth Line, Mississauga,ON

Title: **BOREHOLE LOCATION PLAN**

N

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	A.S	S.Y	August 2019
Rev: 0	Scale: As Shown	Project No.: 18-748-100	Figure No.: 1

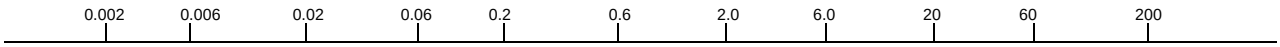
Image/Map Source: *Google Satellite Image*

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 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.

ISSMFE SOIL CLASSIFICATION

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



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

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

UNIFIED SOIL CLASSIFICATION

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

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

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH/MW19-1

PROJECT: Geotechnical Investigation - Proposed Residential Subdivision
CLIENT: Mattamy (5150 Ninth Line) Limited
PROJECT LOCATION: 5150 & 5170 Ninth Line, Mississauga, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4821304.684 E 601978.502

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/24/2019

REF. NO.: 18-748-100
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
190.5							
190.3	**TOPSOIL:** 150mm						
0.2	**CLAYEY SILT TO SANDY SILT:** trace topsoil, brown to dark brown, moist to very moist, soft to firm(weathered/disturbed)		1	SS	2		190
1			2	SS	8		
189.0							189
1.5	**SANDY SILT TILL:** some clay to clayey, trace gravel, greyish brown, moist, compact to dense		3	SS	19		
2			4	SS	30		188
3			5	SS	32		187
4							
185.9							186
4.6	**CLAYEY SILT TO SILTY CLAY TILL:** some sand, trace gravel, grey, moist, firm to hard		6	SS	12		
5							185
6	very moist below 6.1m		7	SS	11	▽	
						W. L. 184.0 m Feb 04, 2019	184
7							183
	grey below 7.6m		8	SS	7		
8							182
9	very stiff below 9.1m		9	SS	15		181
10							
179.2							180
11			10	SS	18		
11.3	**END OF BOREHOLE** Notes: 1) 50mm monitoring well installed upon completion.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

DS SOIL LOG 5150 NINTH LINE - MATTAMY HOMES - REVISED-GEO.GPJ DS.GDT 8/9/19

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

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

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH/MW19-4

PROJECT: Geotechnical Investigation - Proposed Residential Subdivision
CLIENT: Mattamy (5150 Ninth Line) Limited
PROJECT LOCATION: 5150 & 5170 Ninth Line, Mississauga, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4821190.173 E 601810.369

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/23/2019

REF. NO.: 18-748-100
ENCL NO.: 5

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m	ELEVATION
192.8					
192.6	**TOPSOIL:** 150mm				
0.2	**CLAYEY SILT:** trace topsoil, brown, moist, stiff (weathered/disturbed)	1	SS	14	
192.0					
0.8	**SANDY SILT TILL:** some clay, trace gravel, brown, moist, compact	2	SS	16	192
		3	SS	21	191
190.5					
2.3	**CLAYEY SILT TO SILTY CLAY TILL:** some sand, trace gravel, greyish brown, moist, very stiff to hard	4	SS	21	
		5	SS	35	190
					189
		6	SS	18	188
	grey, stiff below 5.2m				
					187
		7	SS	13	
					186
		8	SS	11	185
184.6					
8.2	**END OF BOREHOLE**				

Notes:
1) 50mm monitoring well installed upon completion.

W. L. 186.6 m
Feb 04, 2019

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

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

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

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

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

DS SOIL LOG 5150 NINTH LINE - MATTAMY HOMES - REVISED-GEO.GPJ DS.GDT 8/9/19

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH19-2

PROJECT: Geotechnical Investigation - Proposed Residential Subdivision
CLIENT: Mattamy (5150 Ninth Line) Limited
PROJECT LOCATION: 5150 & 5170 Ninth Line, Mississauga, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4821148.928 E 601945.2

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/24/2019

REF. NO.: 18-748-100
ENCL NO.: 3

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
191.3							
191.0 0.0	**TOPSOIL:** 150mm						
0.2	**SANDY SILT:** trace clay, trace topsoil, brown, moist, loose (weathered/ disturbed)		1	SS	6		191
190.5 0.8	**SANDY SILT TILL:** some clay to clayey, trace gravel, greyish brown, moist, compact to dense		2	SS	18		190
			3	SS	22		
			4	SS	34		189
188.4 2.9	**END OF BOREHOLE** Notes: 1) Borehole open and dry upon completion. 2) Borehole backfilled with bentonite upon completion.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

DS SOIL LOG 5150 NINTH LINE - MATTAMY HOMES - REVISED-GEO.GPJ DS.GDT 8/9/19

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH19-3

PROJECT: Geotechnical Investigation - Proposed Residential Subdivision
CLIENT: Mattamy (5150 Ninth Line) Limited
PROJECT LOCATION: 5150 & 5170 Ninth Line, Mississauga, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4821288.223 E 602026.882

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/24/2019

REF. NO.: 18-748-100
ENCL NO.: 4

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
189.6												
189.4 0.0	**TOPSOIL:** 150mm											
0.2	**SANDY SILT:** trace clay, trace to some topsoil, dark brown, moist, loose (weathered/disturbed))		1	SS	6		189					
188.8												
1 0.8	**CLAYEY SILT TILL:** some sand, trace gravel, greyish brown, moist, very stiff		2	SS	19							
			3	SS	22		188					
2 187.5												
2.1	**END OF BOREHOLE**											

Notes:
1) Borehole open and dry upon completion.
2) Borehole backfilled with bentonite upon completion.

DS SOIL LOG 5150 NINTH LINE - MATTAMY HOMES - REVISED-GEO.GPJ DS.GDT 8/9/19

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

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH19-5

PROJECT: Geotechnical Investigation - Proposed Residential Subdivision
CLIENT: Mattamy (5150 Ninth Line) Limited
PROJECT LOCATION: 5150 & 5170 Ninth Line, Mississauga, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4821205.549 E 601909.149

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/23/2019

REF. NO.: 18-748-100
ENCL NO.: 6

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
191.7											
190.6	**TOPSOIL:** 150mm										
0.2	**CLAYEY SILT:** some topsoil/rootlets, dark brown, very moist, firm (weathered/disturbed)		1	SS	6		191				
190.9											
0.8	**SANDY SILT TILL:** some clay to clayey, trace gravel, grey, moist, compact to dense		2	SS	34						
			3	SS	22		190				
189.6											
2.1	**END OF BOREHOLE**										

Notes:
1) Borehole open and dry upon completion.
2) Borehole backfilled with bentonite upon completion.

DS SOIL LOG 5150 NINTH LINE - MATTAMY HOMES - REVISED-GEO.GPJ DS.GDT 8/9/19

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH19-6

PROJECT: Geotechnical Investigation - Proposed Residential Subdivision
CLIENT: Mattamy (5150 Ninth Line) Limited
PROJECT LOCATION: 5150 & 5170 Ninth Line, Mississauga, Ontario
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4821150.513 E 601864.924

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan/24/2019

REF. NO.: 18-748-100
ENCL NO.: 7

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION
192.0							
192.0	**TOPSOIL:** 150mm						
0.2	**CLAYEY SILT:** trace topsoil, trace sand, brown, moist, firm (weathered/disturbed)		1	SS	8		
191.2							
0.8	**CLAYEY SILT TILL:** trace sand, trace gravel, greyish brown, moist, stiff to hard		2	SS	12		191
			3	SS	36		
189.9							190
2.1	**END OF BOREHOLE**						

Notes:
1) Borehole open and dry upon completion.
2) Borehole backfilled with bentonite upon completion.

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

DS SOIL LOG 5150 NINTH LINE - MATTAMY HOMES - REVISED-GEO.GPJ DS.GDT 8/9/19

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

Appendix A

Logs & Location Plan of Sirati Boreholes

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

750 Millway Avenue, Unit-8,
Vaughan, ON L4K 0M7
Phone#905-669-4477, Fax#905-669-4488

North:

Legend:

Property Boundary

BH3
Elev. 190.8 mASL
Borehole Location and Ground Elevation

MW4
Elev. 192.6 mASL
Monitoring Well Location and Ground Elevation

Project Title:
Geotechnical Investigation

Site Location:
5170 9th Line, Mississauga, Ontario

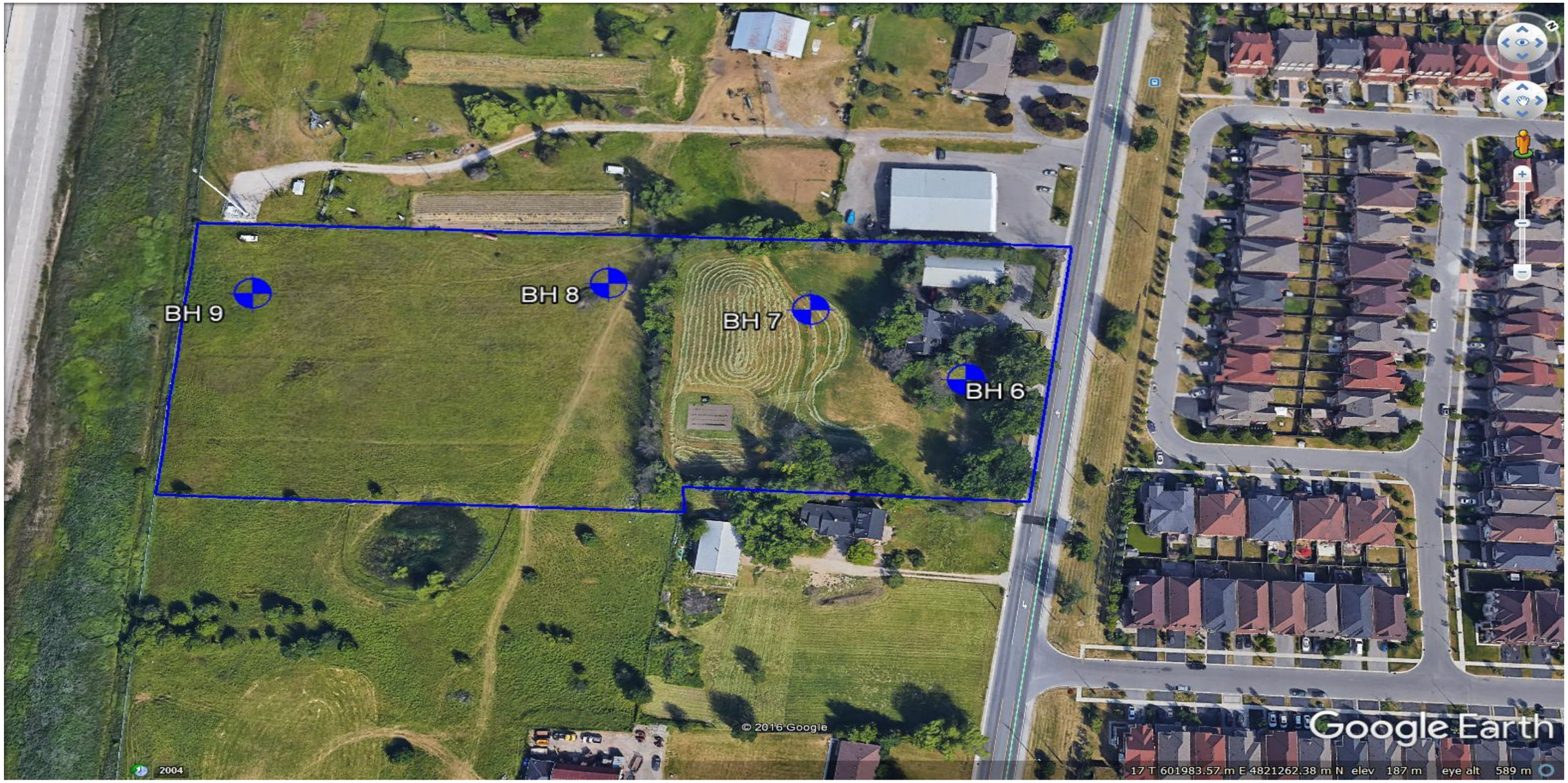
Figure Title:
Borehole Location Plan

Scale:
0m 15m 30m

Project Number:
SP17-227-10

Date:
July 2017

Figure Number:
1



NOTES:

1. The boundaries and soil types have been established only at borehole locations. Between and beyond boreholes they are assumed and may be subject to considerable error.
2. Soil samples will be retained in storage for 3 months and then destroyed unless the client advises an extended time period is required.
3. Topsoil / granular quantities should not be established from the information provided at the borehole locations.
4. Borehole elevations should not be used to design building(s) or floor slab(s) or parking lot(s) grades.
5. This drawing forms part of the report (project number as referenced) and should only be used in conjunction with

Client:	Mattamy Homes		
Drawn:	JD	Approved:	AS
Date:	15-Feb-17	Scale:	N.T.S
Original Size:	Tabloid	Rev:	N/A

Project No	SP17-109-10	Drawing No:	1
Title:	Borehole Location Plan		
Project:	Geotechnical Investigation and Phase 1 ESA 5150 9th Line, Milton, ON.		

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH1

PROJECT: Geotechnical Investigation- Proposed Development
CLIENT: Mattamy Homes
PROJECT LOCATION: 5170 9th Line, Mississauga, Ontario.
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4821371 E 601966

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jun/30/2017

REF. NO.: SP17-227-10
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS "N" 0.3 m	ELEVATION
191.1					
0.0	**FILL:** sand and gravel over clayey silt, some topsoil, grey, moist, loose	1	SS	7	191
190.0		2	SS	13	190
1.1	**SILTY CLAY TILL:** some sand, trace gravel, brown, moist, stiff to very stiff	3	SS	22	189
		4	SS	20	
	grey below 3.0 m	5	SS	17	188
		6	SS	15	187
		7	SS	11	186
		8	SS	14	185
	W. L. 184.3 m Jul 11, 2017				184
182.9					183
8.2	**END OF BOREHOLE:**				

Notes:
1. Monitoring well installed in the borehole upon completion.
2. Water level in monitoring well at 6.76 m on July 11, 2017.

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

REMARKS AND GRAIN SIZE DISTRIBUTION (%)	GR	SA	SI	CL
	2	24	40	34

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

SPCL SOIL LOG SP17-227.GPJ SPCL.GDT 7/18/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
$+^3$, $\times^3$: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH2

PROJECT: Geotechnical Investigation- Proposed Development
CLIENT: Mattamy Homes
PROJECT LOCATION: 5170 9th Line, Mississauga, Ontario.
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4821371 E 601893

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jun/30/2017

REF. NO.: SP17-227-10
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
192.3							
0.0 / 192.0	**TOPSOIL:** 300 mm		1	SS	7		192
0.3 / 191.3	**FILL:** sand, some silt to silty, trace clay, brown, moist, loose		2	SS	12		191
1.0	**SILTY CLAY TILL:** some sand, trace gravel, brown, moist, stiff to very stiff		3	SS	18		
			4	SS	19		190
			5	SS	23		189
			6	SS	28		188
	grey below 6.1 m		7	SS	17		187
							186
			8	SS	19		185
184.1							
8.2	**END OF BOREHOLE:**						

Notes:
1) Borehole was open and dry upon completion of drilling.

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

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

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

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

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

SPCL SOIL LOG SP17-227.GPJ SPCL.GDT 7/18/17

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH3

PROJECT: Geotechnical Investigation- Proposed Development
CLIENT: Mattamy Homes
PROJECT LOCATION: 5170 9th Line, Mississauga, Ontario.
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4821315 E 601849

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jun/30/2017

REF. NO.: SP17-227-10
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
190.4							
0.0 / 190.1	**TOPSOIL:** 300 mm	1	SS	5		190	
0.3 / 189.6	**FILL:** clayey silt, trace sand, brown, moist, firm						
0.8	**SILTY CLAY TILL:** sandy, trace gravel, grey, moist, stiff to very stiff	2	SS	21		189	2 24 43 31
		3	SS	26		188	
		4	SS	29		187	
	grey below 3.0 m	5	SS	22		186	
		6	SS	10		185	
		7	SS	11		184	
		8	SS	18		183	
182.2							
8.2	**END OF BOREHOLE:**						

Notes:
1) Borehole was open and dry upon completion of drilling.

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

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

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

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

GRAPH NOTES
$+^3$, $\times^3$: Numbers refer to Sensitivity
○ $^{\varepsilon_f}$=3% Strain at Failure

SPCL SOIL LOG SP17-227.GPJ SPCL.GDT 7/18/17

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH4

PROJECT: Geotechnical Investigation- Proposed Development
CLIENT: Mattamy Homes
PROJECT LOCATION: 5170 9th Line, Mississauga, Ontario.
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4821248 E 601794

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jun/30/2017

REF. NO.: SP17-227-10
ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
192.2					
0.0 / 191.9	**TOPSOIL:** 350 mm	1	SS	9	192
0.4 / 191.2	**FILL:** clayey silt, some topsoil, dark brown, moist, stiff	2	SS	14	
1.0	**SILTY CLAY TILL:** some sand, trace gravel, brown to grey, moist, stiff to very stiff	3	SS	22	191
		4	SS	24	190
		5	SS	30	189
	grey below 4.6 m	6	SS	12	188
		7	SS	11	187
		8	SS	14	186
184.0					185
8.2	**END OF BOREHOLE:**				184

Notes:
1. Monitoring well installed in the borehole upon completion.
2. Water level in mornitoring well at 7.33m on July 11, 2017.

W. L. 184.9 m
Jul 11, 2017

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

STRATA PLOT | GROUND WATER CONDITIONS | 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: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

SPCL SOIL LOG SP17-227.GPJ SPCL.GDT 7/18/17

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH6

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Mattamy Homes
PROJECT LOCATION: 5150 9th Line, Mississauga, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jan-31-2017

REF. NO.: SP17-109-10
ENCL NO.: 2

SOIL PROFILE			SAMPLES			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 / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w w_L) WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m							GR SA SI CL
191.9												
0.0 / 191.7	**TOPSOIL:** 250mm											
0.3 / 191.1	**FILL:** sandy silt, some clay, brown, moist, loose		1	SS	5							
0.8 / 189.6	**FILL:** clayey silt, some sand, occasional metal fragments, trace gravel, greyish brown, moist, stiff		2	SS	8		191					
			3	SS	8		190					
2.3	**SILTY CLAY TILL:** some sand, trace gravel, greyish brown, moist, stiff		4	SS	10		189					4 27 38 31
			5	SS	10		188					
			6	SS	8		187					
			7	SS	11		186					
			8	SS	13		185					
183.7							184					
8.2	**END OF BOREHOLE** Notes: 1) Borehole dry on completion.											

SPCL SOIL LOG SP17-109-10 - 5150 NINTH LINE, MISSISSAUGA.GPJ SPCL.GDT 17-2-22

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH7

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Mattamy Homes
PROJECT LOCATION: 5150 9th Line, Mississauga, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jan-31-2017

REF. NO.: SP17-109-10
ENCL NO.: 3

(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
191.1												
0.0 / 190.8	**TOPSOIL:** 300mm						191					
0.3 / 190.2	**FILL:** sandy silt, trace topsoil, brown, moist, very loose		1	SS	3							
1 0.9	**SILTY CLAY TILL:** some sand to sandy, trace gravel, brown, moist, very stiff to hard		2	SS	23		190					
2			3	SS	31		189					
			4	SS	32							
3			5	SS	22		188					
4	grey below 4.6m stiff below 4.6m		6	SS	11		187					
5							186					
6			7	SS	10		185					
7							184					
8 182.9			8	SS	15		183					
8.2	**END OF BOREHOLE** Notes: 1) Borehole dry on completion.											

SPCL SOIL LOG SP17-109-10 - 5150 NINTH LINE, MISSISSAUGA.GPJ SPCL.GDT 17-2-22

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH8

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Mattamy Homes
PROJECT LOCATION: 5150 9th Line, Mississauga, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jan-31-2017

REF. NO.: SP17-109-10
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
193.4												
0.0 / 193.2	**TOPSOIL:** 250mm											
0.3 / 192.5	**FILL:** sandy silt, trace clay, brown, moist, loose		1	SS	6		193					
0.9	**SILTY CLAY TILL:** some sand to sandy, trace gravel, brown, moist, stiff to hard		2	SS	23		192					
			3	SS	26							
			4	SS	28		191					7 26 40 27
			5	SS	32		190					
	grey below 4.6m		6	SS	14		189					
			7	SS	12		188					
			8	SS	11		187					
			9	SS	22		186					
183.7							185					
9.7	**END OF BOREHOLE** Notes: 1) Borehole dry on completion.						184					

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

SPCL SOIL LOG SP17-109-10 - 5150 NINTH LINE, MISSISSAUGA.GPJ SPCL.GDT 17-2-22

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH9

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Mattamy Homes
PROJECT LOCATION: 5150 9th Line, Mississauga, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jan-30-2017

REF. NO.: SP17-109-10
ENCL NO.: 5

(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
194.0								
0.0 / 193.8	**TOPSOIL:** 200mm							
0.2 / 193.2	**FILL:** sandy silt, trace rootlets, brown, moist, loose		1	SS	5			
0.8 / 191.7	**POSSIBLE FILL:** sandy silt to silty sand, brown, very moist, loose		2	SS	8		193	
			3	SS	8		192	
2.3	**SILTY CLAY TILL:** some sand, trace gravel, grey, moist, stiff		4	SS	10		191	
			5	SS	10		190	
			6	SS	8		189	
			7	SS	8	W. L. 187.2 m Feb 08, 2017	188	
185.8			8	SS	10		186	wet spoon @ 7.6 m
8.2	**END OF BOREHOLE** Notes: 1)Monitoring well installed in the borehole upon completion 2) Water level in monitoring well at 6.8m on 09Feb ,2017							

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

SPCL SOIL LOG SP17-109-10 - 5150 NINTH LINE, MISSISSAUGA.GPJ SPCL.GDT 17-2-22

Appendix B
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.

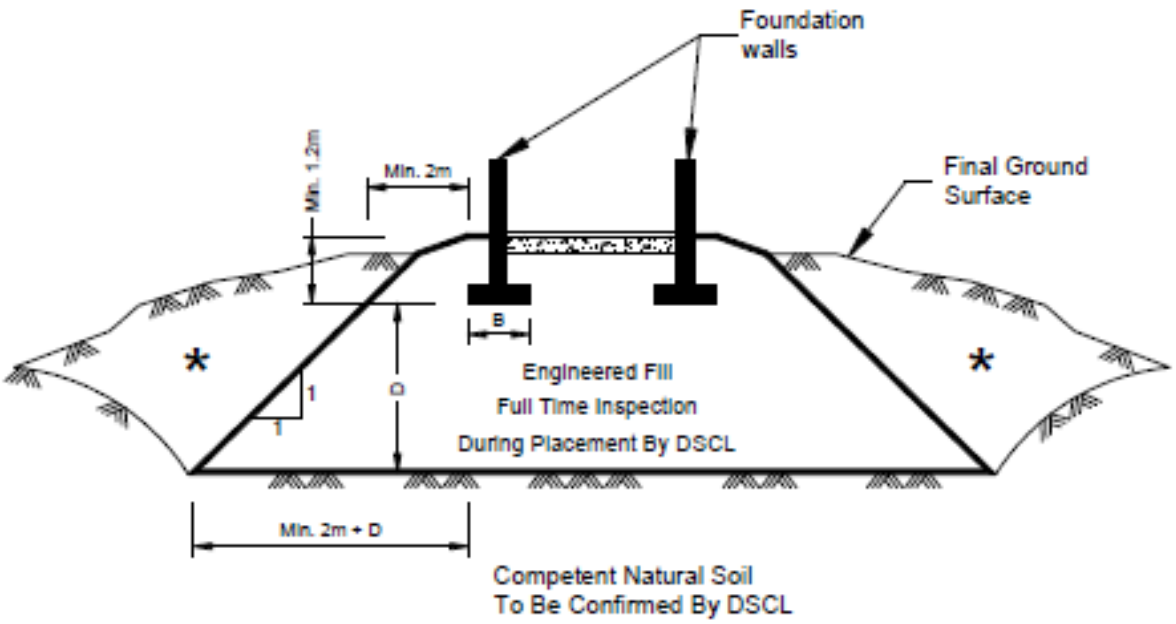
10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from DSCL prior to footing concrete placements. All excavations must be backfilled under full time supervision by DSCL to the same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

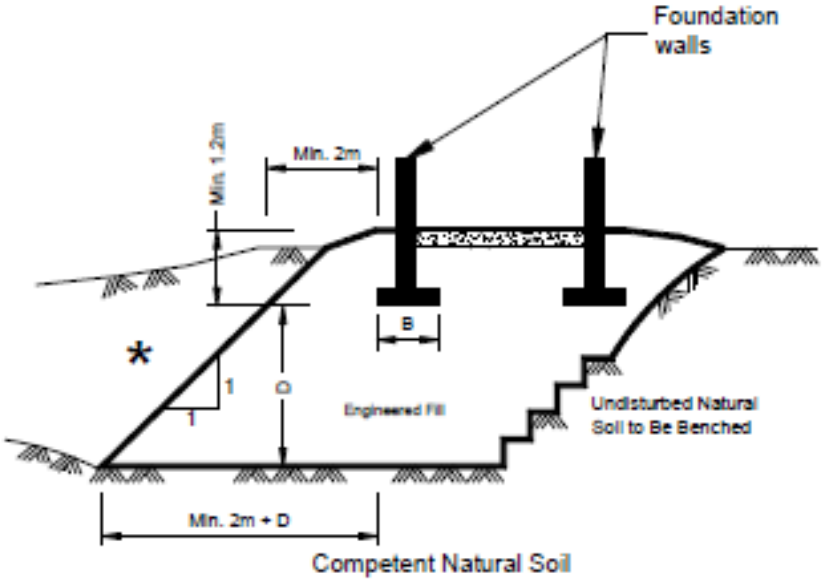
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any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