CONSOLIDATED REPORT ON

Preliminary Geotechnical Investigation
Proposed Residential Development
Parcels A to J
Ninth Line, Mississauga, Ontario

PREPARED FOR:

Derry Britannia Developments Limited

PREPARED BY:

DS Consultants Ltd.

Project No: 18-692-100 R1
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1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Derry Britannia Developments Limited to prepare a consolidated preliminary geotechnical investigation report for the proposed residential development located at Ninth Line in Mississauga, Ontario.

The subject property consists of ten (10) parcels, Parcels A to J, located on the west side of Ninth Line between Derry Road West and Britannia Road West, bounded by Highway 407 ETR on the west side. It is understood that the redevelopment of the site will consist of a subdivision including residential houses, roads and sewers.

DS Consultants carried out an environmental investigation at the subject site and drilled nineteen (19) boreholes in May 2019. AMEC Earth & Environmental (AMEC), Shad and Associates Inc. (Shad), AME Materials engineering (AME), and Sirati and Partners Consultants Limited (Sirati) have carried out geotechnical investigations at these parcels previously.

This report is a consolidated report, prepared on the basis of all the boreholes drilled on these parcels by DS and other consultants.

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 DS boreholes locations, review the other consultants borehole logs (AMEC, Shad, AME & Sirati) 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.

The geotechnical recommendations in this report are preliminary. Further geotechnical investigations are recommended for the final design of the developments.

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.

Geotechnical reports prepared by other consultants were provided to our office by the client. At the time of preparation of this report, no design information is available to us. 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 Derry Britannia Developments 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. These geotechnical reports are consolidated to include the factual information available from all these reports. Logs from all these reports are included in Appendices A to J of this report.

1. Parcel A - Preliminary Geotechnical Investigation Report by AMEC for 6588 & 6596 Ninth Line, Mississauga; AMEC Project No. TT63043, report dated April 28, 2006;
2. Parcel B - Preliminary Geotechnical Investigation Report by Shad for Property P455; Shad Project No. T08046, report dated October 8, 2008;
3. Parcel C - Geotechnical Investigation Report by AME for 6432 Ninth Line, Mississauga; AME Project No. 40859, report dated January 2006;
4. Parcel D - Preliminary Geotechnical Investigation Report by Shad for Property P456; Shad Project No. T08046, report dated October 7, 2008;
5. Parcel E - Preliminary Geotechnical Investigation Report by Sirati for 6314 Ninth Line, Mississauga; Sirati Project No. SP16-181-10, report dated January 30, 2017;
6. Parcel F - Preliminary Geotechnical Investigation Report by Shad for 6302 Ninth Line, Mississauga; Shad Project No. T08040, report dated September 8, 2008;
7. Parcel G - Preliminary Geotechnical Investigation Report by Shad for Property P457; Shad Project No. T08046, report dated October 6, 2008;
8. Parcel H - Preliminary Geotechnical Investigation Report by Shad for 6252 Ninth Line, Mississauga; Shad Project No. T08005, report dated May 30, 2008;
9. Parcel I - Preliminary Geotechnical Investigation Report by Shad for Property P458-6168 Ninth Line, Mississauga; Shad Project No. T18723-B, report dated April 6, 2018;
10. Parcel J - Preliminary Geotechnical Investigation Report by AMEC for 6136 Ninth Line, Mississauga; AMEC Project No. TT63045, report dated May 26, 2006.

3. FIELD AND LABORATORY WORK

A total of nineteen (19) boreholes (BH19-1 through BH19-19, see Drawings 1 to 4 for borehole locations) were drilled at the subject site by DS, to depths ranging from 3.3 to 8m. Boreholes were drilled with solid and hollow stem continuous flight augers equipment by a drilling sub-contractor under the direction and supervision of DS personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard

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

As well as visual examination in the laboratory, all soil samples from geotechnical boreholes were tested for moisture contents. Grain size analyses of five (5) selected soil samples were conducted and the results are presented in **Drawing 25**. Atterberg Limits testing was conducted on selected two soil samples and results are presented on the respective borehole logs.

Water level observations were made during and upon completion of drilling. Eight (8) monitoring wells of 50mm diameter were installed for the long-term groundwater monitoring in boreholes BH19-6 to BH19-8, BH19-11, BH19-12, BH19-15, BH19-17 and BH19-18.

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 plans are shown on Drawings 1 to 4. General notes on sample description are provided on Drawing 5. The subsurface conditions in the boreholes by DS are presented in the individual borehole logs presented on **Drawings 6 to 24**. The borehole logs by others are attached in Appendices A to J.

The subsurface conditions are detailed below for each separate parcel of the project.

4.1 Parcel A

AMEC drilled two boreholes (BH1 and BH4) on Parcel A, to a depth of 4.6m below the existing grade. Other two boreholes (BH2 and BH3) were located outside of Parcel A boundary, but very close to the north property line. Therefore, soil and groundwater conditions in all four (4) boreholes are summarized in this section. AMEC borehole logs and location plan are attached in **Appendix A** of this report.

4.1.1 Soil Conditions

Topsoil & Weathered/Disturbed Native Soils: A surficial layer of topsoil, about 280mm to 410mm thick, was found in all boreholes. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Below the topsoil, a weathered/disturbed clayey silt to silty clay layer was found in all boreholes, extending to a depth of 0.6m below the existing grade. This material contained trace topsoil/organics and rootlets.

Silty Clay to Clayey Silt Till: Below the weathered/ disturbed soils in BH2 to BH4 and silty sand to sandy silt till in BH1, silty clay to clayey silt till deposits were encountered, extending to the maximum explored depth of BH1, overlying sandy silt to silty sand till in BH2 and BH3; and overlying till/shale complex in

BH4. These deposits were found to have generally a stiff to hard consistency with occasional stiff layers, with measured SPT 'N' values ranging from 14 to more than 50 blows per 300 mm of penetration.

Sandy Silt to Silty Sand Till: Below the weathered/ disturbed soils in BH1 and clayey silt to silty clay till in BH2 & BH3, sandy silt to silty sand till deposits were encountered, overlying clayey silt to silty clay till in BH1, extending to the maximum explored depth of BH2, overlying till/shale complex in BH3. These deposits were found to be in dense to very dense state, with measured SPT 'N' values ranging from 32 to more than 50 blows per 300 mm of penetration.

Till / Shale Complex: A till shale complex unit was encountered in BH3 and BH4 below the till deposits and overlying shale bedrock. This unit is transition zone from till to shale bedrock and contain properties of hard/dense sandy silt to silty sand till with bedrock slabs.

Shale Bedrock: Shale bedrock of Queenston Formation was encountered in BH4 at a depth of 2.9m, corresponding to Elevation 193.5m. Shale bedrock was not proven by rock coring.

4.1.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels were found in BH1 to BH3 at depths ranging from 0.9 to 3.8m below the existing grade. BH4 was found dry and open upon completion.

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

4.2 Parcel B

Three boreholes (BH19-3 to BH19-5, See Drawing 2 for borehole locations) were drilled on Parcel B by DS to a depth of 4.8m below the existing grade. Shad drilled five (5) boreholes (BH1 to BH5) on Parcel B in October 2008, to depths varying from 4.1 to 5.1m below the existing grade. DS borehole logs for Parcel B are provided on Drawings 8 to 10. Shad borehole logs and location plan are attached in Appendix B of this report.

4.2.1 Soil Conditions

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

Fill materials consisting of sandy silt, silty sand, sand and clayey silt were encountered in the boreholes, extending to depths of 0.8 to 1.5m. The clayey silt fill encountered in BH19-3 below the sandy silt fill is possibly the weathered/disturbed native as a result of agricultural use of the land. A ploughed/

disturbed silty clay / clayey silt layer, extending to depths of 0.5 m to 1.8 m, was also noted on Shad borehole logs.

Clayey Silt to Silty Clay Till Deposit: Below the fill material or weathered/disturbed native, a clayey silt to silty clay till deposit was encountered in all boreholes, overlying shale bedrock or sandy silt to silty sand till. The cohesive till deposits were present in a stiff to hard consistency, with measured SPT 'N' values ranging from 11 to over 50 blows per 300mm penetration. Occasional cobble and boulder and wet sand seams were inferred within the till deposits.

Sandy Silt to Silty Sand Till: Below the clayey silt till in BH19-4 & BH19-5, a sandy silt to silty sand till deposit was encountered, overlying shale bedrock. Sandy silt to silty sand till was present in a very dense state, with measured SPT 'N' values of greater than 50 blows per 300 mm of penetration. Occasional cobble and boulder and wet sand seams were inferred within the till deposits.

Shale Bedrock: Shale bedrock of Queenston Formation was encountered in the boreholes (DS & Shad) at depths ranging from 2.5 to 4.6m below the existing grade. Shale bedrock was not proven by rock coring. The approximate depth and elevation of the shale bedrock surface at the borehole locations are listed on Table 4.2.1 below.

Table 4.2.1: Approximate Depth and Elevation of Shale Bedrock Surface

Borehole No.	Depth of Shale Bedrock Surface below Existing Ground (m)	Approximate Elevation of Shale Bedrock Surface (m)	Notes
BH19-3	4.6	189.3	Augered
BH19-4	4.6	189.3	Augered
BH19-5	4.6	188.6	Augered
BH1	2.7	-	Augered
BH2	2.7	-	Augered
BH3	2.5	-	Augered
BH4	3.8	-	Augered
BH5	3.0	-	Augered

4.2.2 Groundwater Conditions

During drilling or upon completion, all DS boreholes were found dry and open. Short-term groundwater (upon completion of boreholes) in Shad boreholes was measured at 1.8 m, 2.7m and 4.2 m depths at BH1, BH3 and BH4, respectively.

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

4.3 Parcel C

Three boreholes (BH19-1, BH19-2 & BH19-6, See Drawing 2 for borehole locations) were drilled on Parcel C by DS to depths ranging from 3.3 to 7.9m below the existing grade. AME drilled eight (8)

boreholes (BH1 to BH8) on Parcel C in January 2006, to depths varying from 2.0 to 4.8m below the existing grade. AME borehole logs and location plan are attached in Appendix C of this report.

4.3.1 Soil Conditions

Topsoil, Fill and Weathered/Disturbed Soils: A surficial layer of topsoil of 50mm to 200mm thick was found in the boreholes. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Fill materials consisting of sandy silt and clayey silt were encountered in the boreholes, extending to depths of 0.8 to 1.6m. The clayey silt fill encountered in BH19-1 and BH19-2 is possibly the native soil weathered/disturbed as a result of agricultural use of the land.

Clayey Silt Till: Below the fill materials or weathered/ disturbed soils, clayey silt till deposits were encountered, overlying sandy silt to silty sand till or overlying till/shale complex and shale bedrock. These deposits were found to have generally a stiff to hard consistency, with measured SPT 'N' values ranging from 12 to more than 50 blows per 300 mm of penetration. Occasional cobble/boulders were inferred within the till deposit during drilling.

Sandy Silt to Silty Sand Till: Below the clayey silt till in BH19-1, BH19-6, AME BH1 to BH3, & BH8, sandy silt to silty sand till deposits were encountered, extending to the maximum explored depths of boreholes. These deposits were found to be in dense to very dense state, with measured SPT 'N' values ranging from 41 to more than 50 blows per 300 mm of penetration. Occasional cobble/boulders were inferred within the till deposit during drilling.

Till / Shale Complex: A till shale complex unit was encountered in BH19-2 below the clayey silt till deposit. This unit is the transition zone from till to shale bedrock and contain properties of hard/dense till and bedrock slabs.

Shale Bedrock: Shale bedrock was encountered in AME boreholes BH5 to BH7 at depths ranging from 2.1to 2.7m below the existing grade, corresponding to Elevation 190.0 to 190.7m. Shale bedrock was not proven by rock coring.

Table 4.3.1: Approximate Depth and Elevation of Shale Bedrock Surface

Borehole No.	Depth of Shale Bedrock Surface below Existing Ground (m)	Approximate Elevation of Shale Bedrock Surface (m)	Notes
BH5	2.1	190.7	Augered
BH6	2.1	190.0	Augered
BH7	2.7	190.1	Augered

4.3.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels were found in boreholes at depths ranging from 1.8 to 4.6m below the existing grade. Long-term (stabilized) groundwater levels in the monitoring wells were found at depths ranging from 0.8m above the ground to 0.7m below the existing grade, as summarized on Table 4.3.2 below.

Table 4.3.2: Groundwater Levels Observed in Monitoring Wells

Borehole	Surface Elevation (m)	Date of Observation	Water Level Depth (mbgs)	Water Level Elev. (m)
BH19-6	191.7	May 17, 2018	0.3	191.4
BH1*	191.0	Jan. 17, 2006	0.7	190.3
BH2*	191.1	Jan. 17, 2006	0.5	190.6
BH6*	192.1	Jan. 17, 2006	-0.7**	192.8**
BH7*	192.8	Jan. 17, 2006	-0.8**	193.6**

*AME Wells; **Artisan Conditions (above grade water levels)

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

4.4 Parcel D

Shad drilled seven boreholes (BH1 to BH7, See Drawing 2 for borehole locations) on Parcel D in October 2008, to depths varying from 4.8 to 5.1m below the existing grade. Shad borehole logs and location plan are attached in **Appendix D** of this report.

4.4.1 Soil Conditions

Topsoil & Weathered/Disturbed Native Soils: A surficial topsoil layer was contacted at all borehole locations, generally ranging in thickness from 100 to 200mm, with the exception of BH6 where the topsoil layer was 450mm thick. 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.

The topsoil layer at all borehole locations was underlain by a weathered and disturbed silty clay / clayey silt with trace topsoil and organics, extending to depths ranging from 0.9 m to 1.8 m below the existing grade. The weathered/disturbed layer is possibly a result of agricultural use of the land.

Silty Clay to Clayey Silt Till: Clayey silt / silty clay till was encountered below the weathered/disturbed layer at all borehole locations and extended to maximum explored depths of boreholes. Occasional sand seams were encountered within the till deposit across the site. Furthermore, it should be noted that, at the boreholes drilled in the vicinity of the north property line (i.e., BH5 and BH6), weathered shale fragments were present within the till below a depth of about 2.5 m below the ground surface.

Standard Penetration Tests performed within the glacial clayey silt / silty clay till deposit yielded 'N'-values ranging from 16 to over 50 blows per 300mm penetration, indicating a very stiff to hard consistency. However, immediately below the weathered/disturbed layer, stiff deposits with lower 'N'-values of 10 and 14 blows per 300mm spoon penetration were also encountered.

4.4.2 Groundwater Conditions

Groundwater conditions were monitored during drilling and upon the completion of drilling. Short-term (unstabilized) groundwater in boreholes was measured at depths ranging from 1.5m to 4.4m below existing ground surface, except for BH3 and BH6 which were found to be dry.

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

4.5 Parcel E

Four boreholes (BH19-12 to BH19-15, see Drawing 3 for borehole locations) were drilled on Parcel E by DS Consultants Ltd. to depths ranging from 4.8 to 6.7m. Sirati drilled four boreholes (BH1 to BH4) on Parcel E in January 2017, to a depth of 8.2m below the existing grade. Sirati's borehole logs and location plan is attached in **Appendix E** of this report.

4.5.1 Soil Conditions

Topsoil & Fill Materials: A 100 to 250 mm thick surficial layer of topsoil was found at the location of BH19-13, BH19-14, and BH4. Fill material was encountered in all the boreholes, extending to depths ranging from 0.9 to 2.3m. Fill material was heterogeneous and consisted of sand & gravel, sandy silt and clayey silt to silty clay. Inclusions of topsoil and organics were noted in the fill material. A buried topsoil layer about 50mm thick was noted in Sirati BH1 within the fill.

Silty Clay/Clayey Silt: Below the fill material, upper native soil consisting of clayey silt to silty clay was encountered in the boreholes, overlying silty clay till. Clayey silt to silty clay was present in a firm to stiff consistency, with measured SPT 'N' values ranging from 5 to 9 blows per 300mm penetration.

Glacial Till Deposits: Below the clayey silt to silty clay or fill material, glacial till deposits consisting of sandy 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 stiff to hard consistency and dense to very dense state, with measured SPT 'N' values ranging from 12 to over 50 blows per 300mm penetration. Occasional cobble and boulder and wet sand seams were inferred within the till deposits.

4.5.2 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 0.4 to 2.1m below the existing grade, corresponding to Elevations 188.8 to 190.7m, as summarized on Table 4.5.2 below.

Table 4.5.2: Groundwater Levels Observed in Monitoring Wells

Borehole	Surface Elevation (m)	Date of Observation	Water Level Depth (mbgs)	Water Level Elev. (m)
BH19-12	190.9	May 17, 2018	0.9	190.0
BH19-15	191.1	May 17, 2018	0.4	190.7
BH1*	191.1	Jan. 23, 2017	0.7	190.4
BH3*	190.9	Jan. 23, 2017	0.8	190.1
BH4*	190.9	Jan. 23, 2017	2.1	188.8

*Sirati Wells

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

4.6 Parcel F

Four boreholes (BH19-16 to BH19-19, see Drawing 3 for borehole locations) were drilled by DS on Parcel F to a depth of about 6.5m below the existing grade. DS's borehole logs are provided on Drawings 21 to 24.

It is understood that Shad drilled five (5) boreholes (BH1 to BH5) in Parcel F in September 2008, however the borehole logs and location plan were missing from Shad's report provided to our office.

4.6.1 Soil Conditions

Fill Materials: Fill material was encountered in all the boreholes, extending to depths ranging from 1.5 to 2.6m. Fill material was heterogeneous and consisted of wood chips, gravelly sand and clayey silt. Inclusions of topsoil and organics in varying proportions were noted in the fill materials.

Clayey Silt/Silty Clay: Below the fill material, upper native soil consisting of clayey silt to silty clay was encountered in boreholes BH19-16 to BH19-18, overlying clayey silt till. Clayey silt to silty clay was present in a firm to very stiff consistency, with measured SPT 'N' values ranging from 6 to 16 blows per 300mm penetration.

Cohesive Till Deposits: Below the clayey silt to silty clay or fill material, clayey silt till deposits were encountered in all boreholes extending to the maximum explored depths. The till deposits were present in a stiff to hard consistency, with measured SPT 'N' values ranging from 10 to over 50 blows per 300mm penetration. Occasional cobble and boulder and wet sand seams were inferred within the till deposits.

Sand: A water bearing sand deposit was found embedded within the clayey silt till in BH19-19, at a depth of 6.1m. Occasional wet sand seams embedded in till were also noted in other boreholes. Sand was present in a compact state, with measured SPT 'N' value of 21 blows per 300mm penetration.

4.6.2 Groundwater Conditions

During drilling or upon completion, no free standing water was found in the boreholes, except in BH19-19 where the short-term water level was found at a depth of 5.5m. Stabilized groundwater levels in the monitoring wells installed in BH19-17 and BH19-18 were found at a depth of 0.6m below the existing grade, corresponding to Elevations 190.3 to 190.5m, as summarized on Table 4.6.2 below.

Table 4.6.2: Groundwater Levels Observed in Monitoring Wells

Borehole	Surface Elevation (m)	Date of Observation	Water Level Depth (mbgs)	Water Level Elev. (m)
BH19-17	191.0	May 17, 2018	0.6	190.5
BH19-18	190.9	May 17, 2018	0.6	190.3

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

4.7 Parcel G

Shad drilled five (5) boreholes (BH1 to BH5) on Parcel G in October 2008, to a depth of about 5m below the existing grade. Shad borehole logs and location plan is attached in Appendix G of this report.

4.7.1 Soil Conditions

Topsoil & Weathered/Disturbed Native Soils: A surficial layer of topsoil of 100mm to 150mm thick was found at borehole locations. This was then underlain by a weathered and disturbed silty clay / clayey silt deposit with traces of topsoil and/or organic stains, extending to depths ranging from 0.6 to 1.5 m below existing ground surface.

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.

Silty Clay to Clayey Silt Till: Clayey silt to silty clay till was encountered below the weathered/disturbed layer at all borehole locations and extended to the maximum explored depths of boreholes. Standard Penetration Tests were performed within the glacial clayey silt / silty clay till deposit, and the 'N'-values were found to predominantly range from 15 to in excess of 50 blows per 300mm penetration, indicating a very stiff to hard consistency. However, at BH4, lower 'N'-values of 4 and 14 blows were also measured, indicating firm to stiff layers within the glacial deposit at this location.

4.7.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels in Shad boreholes were found at depths ranging from 1.2 to 4.4m below the existing grade.

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

4.8 Parcel H

One borehole (BH19-7, See Drawing 4 for borehole location) was drilled by DS Consultants in Parcel H, to a depth of 8m below the existing grade. Shad drilled five boreholes (BH-F1 to BH-F5) on Parcel H in May 2008, to a depth of about 5m below the existing grade. Shad borehole logs and location plan are attached in Appendix H of this report.

4.8.1 Soil Conditions

Topsoil, Fill & Weathered/Disturbed Native Soils: A surficial layer of topsoil of 100mm to 400mm thick was found at borehole locations. This was then underlain by a fill layer or weathered and disturbed silty clay / clayey silt with trace topsoil/organics, extending to depths ranging from 0.8 to 2.3m below the existing ground surface.

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.

Silty Clay to Clayey Silt Till: Clayey silt / silty clay till was encountered below the fill materials or weathered/disturbed layer at all borehole locations and extended to the maximum explored depths of boreholes. Standard Penetration Tests were performed within the glacial clayey silt / silty clay till deposit, and the 'N'-values were found to predominantly range from 10 to in excess of 50 blows per 300mm penetration, indicating a stiff to hard consistency. Occasional cobble/boulder and sand seams/layers were present embedded within the till deposits.

4.8.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels in Shad boreholes were found at depths ranging from 1.3 to 4.2m below the existing grade. The stabilized (long-term) groundwater table in the monitoring well installed in BH19-7 was measured at a depth of 1.1m on May 17, 2019, corresponding to Elevation. 189.6m.

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

4.9 Parcel I

One borehole (BH19-8, See Drawing 4 for borehole location) was drilled by DS Consultants in Parcel I, to a depth of 6.6m below the existing grade. Shad drilled six boreholes (BH1 to BH6) on Parcel I in March 2018, to a depth of about 5m below the existing grade. Shad borehole logs and location plan are attached in Appendix I of this report.

4.9.1 Soil Conditions

Topsoil, Fill & Weathered/Disturbed Native Soils: A surficial layer of topsoil of 300mm to 500mm thick was found at Shad borehole locations. The surficial topsoil was then underlain by a fill layer or weathered and disturbed clayey silt to sandy silt with traces of topsoil and/or organic stains, extending to depths ranging from 0.8 to 2.3m below existing ground surface.

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.

Clayey Silt to Silty Clay: Clayey silt to silty clay deposit was encountered below the fill materials or weathered/ disturbed native soils that extended to depths of 1.9 to 6.1m below the existing ground surface. Standard Penetration Tests performed within the clayey silt to silty clay deposit revealed its soft to very stiff consistency, as indicated with measured SPT 'N'-values of 2 to 18 blows per 300mm penetration. The moisture contents in the tested samples of clayey silt to silty clay ranged between 14 to 35%.

In BH19-8, a layer of soft silty clay was encountered at depth of 4.6 to 6.1m, with a measured SPT 'N' value of 2 blows per 300mm penetration.

Silty Clay to Clayey Silt Till: Clayey silt / silty clay till was encountered below the silty clay to clayey silt and extended to the maximum explored depths of boreholes. Standard Penetration Tests performed within the glacial clayey silt to silty clay till deposit indicated a very stiff to hard consistency, with measured SPT 'N'-values ranging from 18 to in excess of 50 blows per 300mm penetration. Occasional cobble/boulder were present embedded within the till deposits.

4.9.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels were found in boreholes at depths ranging from 1.0 to 4.6m below the existing grade. Stabilized groundwater levels in the monitoring wells were found at 0.1m above the ground to 0.4m below the existing grade, corresponding to Elevations 189.5 to 190.1m, as summarized on Table 4.9.2 below.

Table 4.9.2: Groundwater Levels Observed in Monitoring Wells

Borehole	Surface Elevation (m)	Date of Observation	Water Level Depth (mbgs)	Water Level Elev. (m)
BH19-8	190.0	May 17, 2019	-0.1**	190.1
BH3*	190.0	April 4, 2018	0.5	189.5
BH4*	190.1	April 4, 2018	0.1	190.0

*Shad Wells; **Artesian Conditions (above ground water levels)

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

4.10 Parcel J

Three boreholes (BH19-9 to BH19-11, See Drawing 4 for borehole location) were drilled by DS Consultants in Parcel J, to depths varying from 3.1 to 6.1m below the existing grade. AMEC drilled five boreholes (BH1 to BH5) on Parcel J in May 2006, to depths ranging from 5.5 to 6m below the existing grade. AMEC borehole logs and location plan are attached in Appendix J of this report.

4.10.1 Soil Conditions

Topsoil & Fill Materials: A surficial layer of topsoil of 100mm to 360mm thick was found in all boreholes. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Below the topsoil, fill materials consisting of clayey silt to sandy silt, sandy silt to silty sand and silt were found in boreholes BH19-9 to BH19-11, extending to a depth of 2.3m below the existing grade. Fill materials contained traces of topsoil/organics and concrete fragments; and was generally present in a loose state, with occasional compact layers.

Clayey Silt to Silty Clay: Below the fill materials in DS boreholes and surficial topsoil in AMEC boreholes, a clayey silt to silty clay deposit was encountered, extending to the maximum explored depths of boreholes or underlain by clayey silt to silty clay till deposit. These deposits were found to have generally a firm to hard consistency, with measured SPT 'N' values ranging from 4 to more than 30 blows per 300 mm of penetration.

In BH19-11 and BH2, weak soils of soft to firm silty clay was encountered at depths of 4.6 to 6.1m, with measured SPT 'N' values of 4 to 6 blows per 300mm penetration.

Clayey Silt to Silty Clay Till: Below the clayey silt to silty clay deposit, a clayey silt to silty clay till deposit was encountered in AMEC boreholes BH1 and BH4 below depths of 4.0 to 5.5m, extending to the maximum explored depths of boreholes. These deposits were found to have very stiff to hard consistency, with measured SPT 'N' values ranging from 20 to more than 50 blows per 300 mm of penetration.

4.10.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels were found in AMEC BH1 to BH3 at depths ranging from 3.1 to 3.4m below the existing grade. The stabilized (long-term) groundwater table in the monitoring well installed in DS borehole BH19-11, was measured at a depth of 0.2m on May 17, 2019, corresponding to Elevation. 190.0m.

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

4.11 Comments on Shale Bedrock

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

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

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

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 WEAK SOIL CONDITIONS AND ARTESIAN GROUNDWATER CONDITIONS

In Parcel I and Parcel J, weak soils of soft to firm silty clay deposits were encountered in BH19-8 in Parcel I and BH19-11 and BH2 in Parcel J. Excessive settlements may occur in these areas due to loads from grade raise and from house/structures. Additional boreholes are required to delineate the horizontal and vertical extents of weak soils. Depending upon the final grade levels and proposed facilities/structures in this area, surcharge preloading may be required to consolidate the weak ground, in order to reduce the post-construction settlements. This must be further investigated during the final geotechnical investigation stage.

Water levels above ground (artesian conditions) were observed in BH6 and BH7 (AME boreholes) in Parcel C and BH19-8 in Parcel J. A hydrogeologist should be retained to review the artesian groundwater conditions for the proposed excavations such as basement excavation and trenching for underground services.

5.2 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 L**. To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential.

The inorganic clayey silt to silty clay (till), sandy silt and silt, free to 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).

5.3 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 clayey silt to silty clay soils.

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
150 mm Granular ‘A’
300 mm Granular ‘B’

For collector roads

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

These values may need to be adjusted according to the 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.

5.3.1 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.

5.3.2 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.

5.3.3 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 5.3.1, by means of good planning any water trapped in the granular sub-base materials should be drained rapidly towards subdrains or other interceptors.

5.4 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.

5.4.1 TRENCHING

Groundwater table was very high at the time of our investigation, almost at the surface to about 0.8m below the surface. Artisan conditions were encountered in Parcel C and Parcel I with above groundwater levels. Water levels in AME monitoring wells installed in Parcel C at BH6 & BH7 locations was recorded at about 0.7 to 0.8m above the existing grades. Water level in DS monitoring well installed in Parcel I was also recorded at 0.1m above the existing grade.

Further monitoring of groundwater table is recommended at this site. Section 5.1 of this report presents more comments on the artesian groundwater conditions.

Dewatering will be required prior to any excavation in sand and sandy silt to silty sand till below the groundwater table, otherwise it will result in an unstable base and flowing sides. To prevent disturbance of the soil at the bedding level, the groundwater table must be lowered to at least 1.0 m below the lowest excavation base.

The boreholes show that below the existing topsoil and fill, the trenches will be predominantly dug through the silty clay to clayey silt till, sandy silt to silty sand till, till/shale complex and shale bedrock. Groundwater seepage within the clayey silt to silty clay (till) is expected to be minor and manageable by gravity drainage and pumping from filtered sumps.

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

For deep trenches, i.e. more than 2.0 m below the shale surface, a minimum 50 mm thick polystyrene etc. layer will be required at both sides of the pipe to avoid rock squeezing. The polystyrene layer should

extend vertically to at least 0.3 m above the pipe. The rock trench should be wide enough so that at each side, the horizontal distance between the pipe side and the cut rock surface is at least 0.3 m.

The construction program should be well planned so that the excavation and construction of the sewers would minimize the exposure time for the shale. Otherwise, the application of a thin layer of lean concrete or sprayed concrete may be required.

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 clayey 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 clayey soils can be classified as Type 2 Soil above groundwater and Type 3 Soil below groundwater. The fill, weathered/disturbed soft to firm native soils and cohesionless soils (silty sand/sand and gravel, sand) 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.

For sewer trenches dug in shale (weathered or un-weathered) and sewers installed under the groundwater table, seepage between the trench backfill material and the trench wall may cause erosion of the backfill materials. it is recommended that nominal anti-seepage collars be provided to prevent erosion of the backfill materials.

The anti-seepage collar may consist of a clay plug surrounding the sewer pipe. A typical clay plug will be about 1 m thick and extends laterally to a minimum distance of 0.5 m from the pipe circumference with a minimum of 0.3 m embedment into the shale. The on-site native clayey soils may be suitable for such purpose subject to additional sampling and testing.

5.4.2 BEDDING

The boreholes show that the sewer pipes will be predominantly laid within the native soils which will provide adequate support for the sewer pipes and allow the use of normal Class B type bedding.

The recommended minimum thickness of granular bedding below the invert of the pipes is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or in accordance with local standards or if wet or weak subgrade conditions are encountered, especially when the soil at the trench base level consists of wet, dilatant silt or soft clay. 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.

5.4.3 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 1.0 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.

5.5 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.

It should be noted that soft soil conditions were encountered in boreholes BH19-8 in Parcel I and BH19-11 and BH2 in Parcel J) below a depth of about 4.6m, extending to depths of 6.1m and greater than 6.1m respectively. If there is any grade raise proposed in this area, this soft silty clay deposit will undergo consolidation settlement from increased loading conditions from grade raise and house load, resulting in excessive long-term settlements. Depending upon the proposed grade raise (If any) and basement floor elevations of the proposed houses, ground improvement such as surcharge preloading may be required in this area. More comments on the weak soils are presented in Section 5.1 of this report.

The grading plan and founding elevations of the proposed houses/structures must be reviewed by our office when available. Additional boreholes will be required in this area, when final grading plans are available and reviewed.

In other areas where the native soils are competent (stiff to hard or compact to dense soils), the proposed singles homes with one level basement can be supported by spread and strip footings founded on the undisturbed native soils for a bearing capacity of 150 kPa at SLS (Serviceability Limit State), and for a factored geotechnical resistance of 225 kPa at ULS (Ultimate Limit State).

Alternatively, 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 L** 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.

5.6 FLOOR SLAB

The floor slab can be supported on grade provided all topsoil, fill, 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 drainage system will be required around the exterior basement walls. Basement floor slab should be kept at least 0.5m above the stabilized groundwater table. Otherwise, underfloor drainage system will also be required. The perimeter and underfloor drainage system shown on Drawing 26 is recommended for the basement walls where open cut procedures are used.

5.7 EARTH PRESSURES

The lateral earth pressures acting on foundation and basement 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

□ = Unit weight of backfill, a value of 21 kN/m3 may be assumed

h = Depth to point of interest in metres

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

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

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

C:\0Sharon\18-692-100 Ninth Line_Mattamy Development\1-QGIS\Parcel A\Geotechnical\Figure 1 - Borehole Location Plan.qgs

Legend

- Parcel 'A' Boundary
- Borehole (AMEC)

DS CONSULTANTS LTD.
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www.dsconsultants.ca

Project: GEOTECHNICAL INVESTIGATION
Ninth Line Properties, Ninth Line, Mississauga, ON

Title: **BOREHOLE LOCATION PLAN**

N

Client: DERRY BRITANNIA DEVELOPMENTS LTD.

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	A.S	S.Y	April 2020
Rev: 0	Scale: As Shown	Project No.: 18-692-100	Figure No.: 1

Image/Map Source: *Google Satellite Image*

C:\0Sharon\18-692-100 Ninth Line_Mattamy Development\1-QGIS\Parcel B,C and D\Geotechnical\Figure 2 - Borehole Location Plan.qgs

Legend

- Parcels 'B, C & 'D' Boundary
- Borehole (DS)
- Borehole (AME)
- Borehole (Shad & Associates INC.)

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Project: GEOTECHNICAL INVESTIGATION
Ninth Line Properties, Ninth Line, Mississauga, ON

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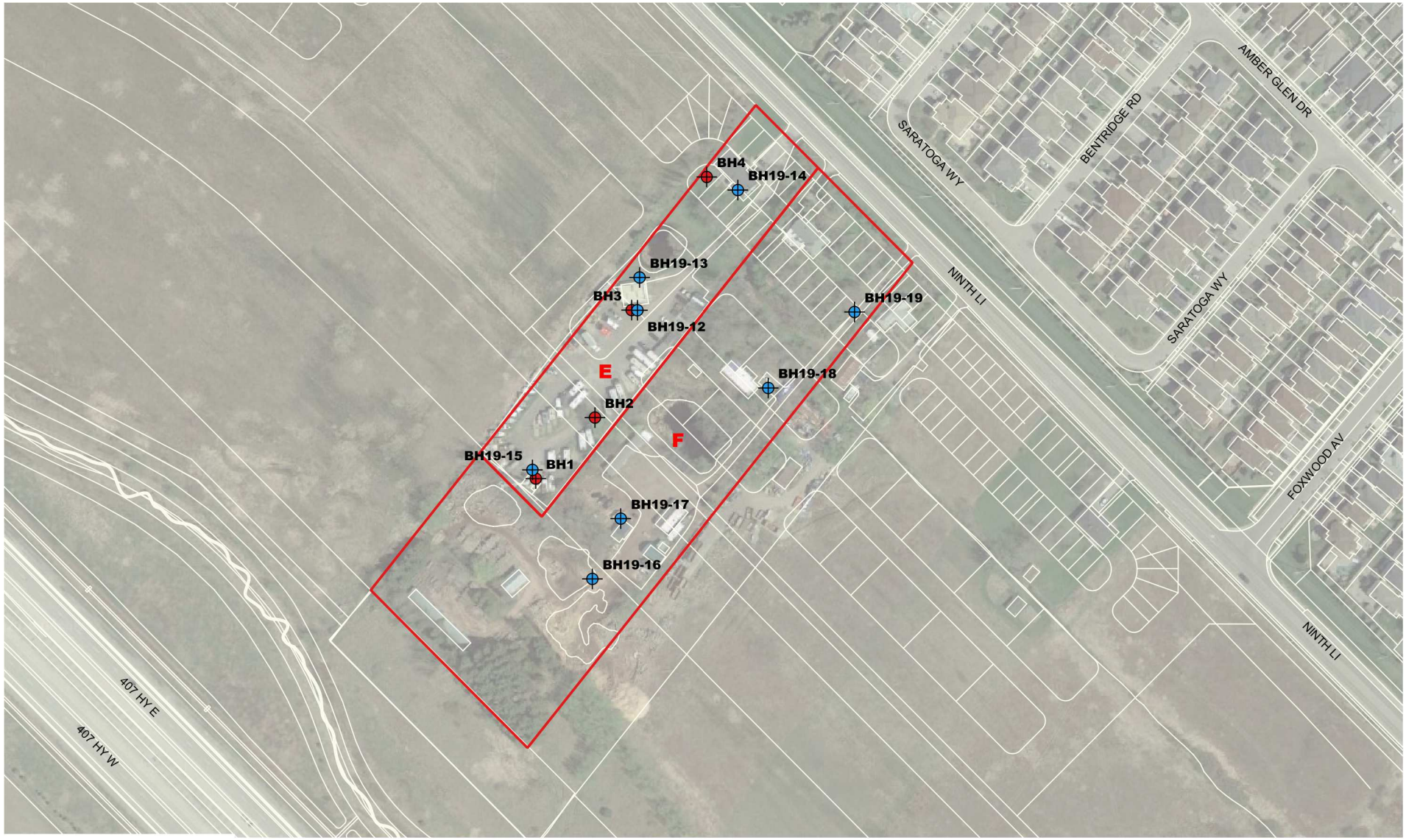
N

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	A.S	S.Y	April 2020
Rev: 0	Scale: As Shown	Project No.: 18-692-100	Figure No.: 2

Image/Map Source: *Google Satellite Image*

C:\0Sharon\18-692-100 Ninth Line_Mattamy Development\1-QGIS\Parcel E and F\Geotechnical\Figure 3 - Borehole Location Plan.qgs



Legend

- Parcels 'E & F' Boundary
- Borehole (DS)
- Borehole (Sirati & Partners Consultants Ltd.

0 40 80 m

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Project: GEOTECHNICAL INVESTIGATION
6302 and 6314 Ninth Line, Mississauga, ON

Title: **BOREHOLE LOCATION PLAN**

N

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	A.S	S.Y	April 2020
Rev: 0	Scale: As Shown	Project No.: 18-692-100	Figure No.: 3

Image/Map Source: *Google Satellite Image*

C:\0Sharon\18-692-100 Ninth Line_Mattamy Development\1-QGIS\Parcel G,H,I and J\Geotechnical\Figure 4 - Borehole Location Plan.qgs

Legend

- Parcels 'G, H, I & J' Boundary
- Borehole (DS)
- Borehole (Shad & Associates Inc.)
- Borehole (AMEC)

0 75 150 m

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Client: DERRY BRITANNIA DEVELOPMENTS LTD.

Project: GEOTECHNICAL INVESTIGATION
Part of Lot 7, Concession 9, 6252, 6168 & 6136 Ninth Line, Mississauga

Title: **BOREHOLE LOCATION PLAN**

N

Size:	Approved By:	Drawn By:	Date:
8.5 x 11	A.S	S.Y	April 2020
Rev: 0	Scale: As Shown	Project No.: 18-692-100	Figure No.: 4

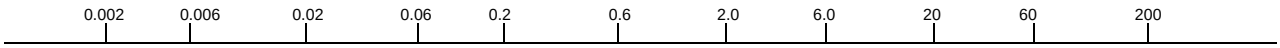
Image/Map Source: *Google Satellite Image*

Drawing 5: 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.

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LOG OF BOREHOLE BH19-1

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4824306.5 E 598905.1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-13-2019

REF. NO.: 18-692-100
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)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
192.0												
0.0	**FILL:** sandy silt, some asphalt, concrete, trace organics, brown, very moist, compact		1	SS	13							
191.2							191					
0.8	**FILL:** silty clay, trace topsoil, greyish brown, trace gravel, moist, loose (possibly weathered/disturbed native)		2	SS	5							
190.4							190					
1.6	**CLAYEY SILT TILL:** sandy, trace gravel, occasional cobble/boulder, brown, moist, stiff		3	SS	14							8 22 51 19
189.7							189					
2.3	**SANDY SILT TILL:** some clay, occasional sand seams, trace gravel, brown to grey, moist, dense		4	SS	41							
188.9							188					
3.1	**SILTY SAND TILL:** trace clay, trace gravel, occasional cobble/boulder, reddish brown, moist, very dense		5	SS	59							5 34 53 8
	wet below 4.6m		6	SS	98							
187.0							187					
5.0	**END OF BOREHOLE:** Notes: 1) Water level at 4.6 mbgl during drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

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LOG OF BOREHOLE BH19-2

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4824265.4 E 598859.3

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-13-2019

REF. NO.: 18-692-100
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
192.3							
192.2 / 0.0	**TOPSOIL:** 125mm						
0.1	**FILL:** clayey silt, some organics, trace topsoil, dark grey to grey, very moist, compact		1	SS	10		192
1	possibly weathered/disturbed native below 0.8m		2	SS	11		191
190.8							
1.5	**CLAYEY SILT TILL:** sandy, trace gravel, occasional cobble/boulder, reddish brown, moist, hard		3	SS	34		
2							190
			4	SS	68		
3 / 189.2							
3.1 / 189.0	**CLAYEY SILT TILL/ SHALE COMPLEX:** reddish brown, moist, hard		5	SS	58		189
3.3	**END OF BOREHOLE:**						

Notes:
1) Borehole dry 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 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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 BH19-3

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4824425.6 E 598780.34

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
193.9 / 0.0	**TOPSOIL:** 150mm						
193.7 / 0.2	**FILL:** sandy silt, trace rootlets, brown, moist to very moist, loose		1	SS	8		
193.1 / 0.8	**FILL:** clayey silt, some topsoil, dark brown, moist, compact (possibly weathered/disturbed native)		2	SS	13		193
192.4 / 1.5	**CLAYEY SILT TILL:** sandy, trace gravel, occasional cobble/boulder, reddish brown, moist, very stiff to hard		3	SS	17		192
	grey below 2.3m		4	SS	27		191
			5	SS	50/ 100mm		190
189.3 / 4.6	**SHALE:** weathered, reddish brown		6	SS	50/ 125mm		
189.1 / 4.8	**END OF BOREHOLE:** Notes: 1) Borehole dry 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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH19-4

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4824458.5 E 598788.2

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
193.9							
193.8 0.0	**TOPSOIL:** 150mm						
0.2	**FILL:** silty sand, trace gravel, trace organics, grey, wet, very loose		1	SS	1		
193.1							
0.8	**CLAYEY SILT:** some sand, grey, moist, stiff		2	SS	11		193
192.4							
1.5	**CLAYEY SILT TILL:** sandy, occasional sand seams, trace gravel, occasional cobble/boulder, reddish brown, moist, very stiff		3	SS	21		192
	grey below 2.3m		4	SS	25		
190.8							191
3.1	**SANDY SILT TO SILTY SAND TILL:** trace clay, trace gravel, grey, occasional cobble/boulder, moist to very moist, very dense		5	SS	60		
189.3							190
4.6	**SHALE:** weathered, reddish brown		6	SS	50/ 125mm		
189.1							
4.8	**END OF BOREHOLE:**						

Notes:
1) Borehole dry upon completion.

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ 8=3% Strain at Failure

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH19-5

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4824437.8 E 598809.9

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 10

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
193.2							
0.0 / 192.9	**TOPSOIL:** 300mm		1	SS	2		193
0.3 / 192.4	**FILL:** sandy silt, trace wood pieces, trace organics/rootlets, brown, wet, very loose						
0.8	**CLAYEY SILT TILL:** sandy, trace gravel, reddish brown, moist, hard to very stiff		2	SS	31		192
	grey below 1.5m		3	SS	25		
190.9							191
2.3	**SANDY SILT TO SILTY SAND TILL:** trace clay, trace gravel, occasional cobble/boulder, grey, moist, very dense		4	SS	56		
			5	SS	50/ 25mm		190
188.6							189
4.6 / 188.4	**SHALE:** weathered, reddish brown		6	SS	50/ 100mm		
4.8	**END OF BOREHOLE:** Notes: 1) Borehole dry 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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH19-6

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4824280 E 598941.9

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 11

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
191.7												
0.0 / 191.5	**TOPSOIL:** 200mm											
0.2 / 190.9	**FILL:** clayey silt, trace sand, trace topsoil/ rootlets, brown, moist, very loose		1	SS	2	▽	W. L. 191.2 m May 22, 2019					
0.8	**CLAYEY SILT TILL:** sandy, trace gravel, occasional cobble, brown, moist, stiff to hard		2	SS	12		190					
			3	SS	18							
188.6			4	SS	41		189					
3.1	**SANDY SILT TO SILTY SAND TILL:** trace clay, trace gravel, occasional/ cobble boulder, brown, moist, dense to very dense		5	SS	80		188					
	wet below 4.6m		6	SS	46		187					8 41 48 3
			7	SS	50/ 10mm		186					
183.8			8	SS	50/ 50mm		185					
							184					
7.9	**END OF BOREHOLE:**											

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

Date	Water Level(m)
May 17, 2019	0.3 mbgl

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

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

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LOG OF BOREHOLE BH19-7

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823818.8 E 599415.58

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 12

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
190.7					
0.0 / 190.5	**TOPSOIL:** 250mm				
0.3 / 189.9	**FILL:** clayey silt, trace topsoil/ organics, brown, very moist, very loose	1	SS	4	
0.8	**CLAYEY SILT TILL:** sandy, trace gravel, occasional cobble/boulder, brown, moist, stiff to hard	2	SS	12	190
		3	SS	20	189
	grey below 2.3m	4	SS	34	188
		5	SS	34	
		6	SS	28	187
		7	SS	46	186
	25mm sand layer at 7.5m	8	SS	93	185
8.0 / 182.7	**END OF BOREHOLE:**				184
					183

GROUND WATER CONDITIONS: W. L. 189.6 m, May 17, 2019

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

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

Date	Water Level(m)
May 17, 2019	1.1 mbgl

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

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH19-8

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823515.5 E 599584.8

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 13

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION
190.0							
189.9 0.1	**FILL:** sand, greyish brown, very moist, very loose		1	SS	3		W. L. 190.1 m May 17, 2019
	FILL: clayey silt to sandy silt, brown, very moist, very loose to loose		2	SS	8		189
			3	SS	5		188
187.7 2.3	**CLAYEY SILT:** trace sand, brown, moist to very moist, stiff to very stiff		4	SS	13		
			5	SS	18		187
185.4 4.6	**SILTY CLAY:** trace sand, grey, wet, soft		6	SS	2		186
							185
183.9 6.1	**CLAYEY SILT TILL:** sandy, trace gravel, grey, moist, very stiff		7	SS	18		184
183.4 6.6	**END OF BOREHOLE:**						

Notes:
1) 50 mm dia.monitoring well installed upon completion
Date Water Level(m)
May 17, 2019 0.1 m above ground

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

METHANE AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
0	5	43	52

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH19-9

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823402.4 E 599775.4

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 14

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
190.0							
0.0	**FILL:** silt to clayey silt, trace gravel, concrete fragments, grey, very moist, loose		1	SS	9		
1			2	SS	4		189
188.5							
1.5	**FILL:** sandy silt to silty sand, trace topsoil/ organics, greyish brown, wet, loose (possibly weathered/disturbed native)		3	SS	5		
2							188
187.7							
2.3	**CLAYEY SILT:** trace sand, brown, moist, very stiff		4	SS	19		
3							
186.9							187
3.1	**END OF BOREHOLE:** Notes: 1) Borehole dry 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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH19-10

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823439.3 E 599792.3

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 15

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
190.0							
0.0 / 189.8	**TOPSOIL:** 150mm						
0.2 / 189.2	**FILL:** sandy silt, brown, very moist, loose		1	SS	5		
0.8 / 188.5	**FILL:** clayey silt, trace sand, brownish grey, moist, compact		2	SS	12		189
1.5 / 187.7	**FILL:** silt to sandy silt, trace clay, brown, wet, loose		3	SS	7		188
2.3 / 186.9	**CLAYEY SILT:** trace sand, brown, moist, very stiff		4	SS	17		187
3.1	**END OF BOREHOLE:** Notes: 1) Borehole dry 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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH19-11

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823500.3 E 599757.7

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 16

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
190.2							
190.0	**TOPSOIL:** 100mm						
0.1	**FILL:** sandy silt, trace topsoil/ organics, brownish grey, moist, loose		1	SS	5	▽ W. L. 190.0 m May 17, 2019	190
189.4							
0.8	**POSSIBLE FILL:** silt to sandy silt, trace clay, brown, very moist to wet, loose		2	SS	6		189
187.9			3	SS	4		188
2.3	**CLAYEY SILT:** trace sand, occasional sand seams, brown, moist, stiff to very stiff		4	SS	13		
	grey below 3.1m		5	SS	20		187
185.6							186
4.6	**SILTY CLAY:** trace sand, grey, wet, soft to firm		6	SS	4		185
183.9			7	SS	5		184
6.3	**END OF BOREHOLE:**						

Notes:
1) Water level at 4.6 mbgl during drilling
2) 50 mm dia. monitoring well installed upon completion

Date	Water Level(mbgl)
May 17, 2019	0.2 m

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 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH19-12

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823919.7 E 599210.4

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 17

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
190.9							
0.0	**FILL:** asphalt, silty sand with gravel, grey, very moist, loose		1	SS	6		
190.1							
0.8	**FILL:** clayey silt, trace topsoil, trace sand, grey, very moist, loose		2	SS	8	▽ W. L. 190.0 m May 17, 2019	190
189.4							
1.5	**CLAYEY SILT:** trace sand, greyish brown, moist, stiff (weathered/disturbed)		3	SS	8		189
188.6							
2.3	**CLAYEY SILT TILL:** sandy, trace gravel, greyish brown to grey, moist, very stiff to hard		4	SS	23		188
	grey below 3.1m		5	SS	35		187
			6	SS	16		186
			7	SS	56		185
184.6							
6.3	**END OF BOREHOLE:**						

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

Date	Water Level(m)
May 17, 2019	0.9 mbgl

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

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LOG OF BOREHOLE BH-19-13

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823934.6 E 599211.1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 18

(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)	METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
190.7											
190.6	**TOPSOIL:** 100mm										
0.1	**FILL:** clayey silt, trace sand, greyish brown, moist, loose		1	SS	6		190				
1			2	SS	6						
189.2											
1.5	**CLAYEY SILT TILL:** sandy, trace gravel, greyish brown, moist, stiff to hard		3	SS	14		189				
2			4	SS	20		188				
3	occasional sand seams, grey below 3.1m		5	SS	32		187				
4											
5			6	SS	21		186				
185.5											
5.2	**END OF BOREHOLE:** Notes: 1) Borehole open and dry upon completion										

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH-19-14

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823969.7 E 599261.8

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 19

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
191.3							
0.0 / 191.1	**TOPSOIL:** 200mm						
0.2	**FILL:** clayey silt, trace rootlets, trace organics, brown, moist, very loose to loose		1	SS	2		191
			2	SS	7		
189.8							190
1.5	**CLAYEY SILT:** trace sand, greyish brown, moist, firm (weathered/disturbed)		3	SS	7		
189.0							189
2.3	**CLAYEY SILT TILL:** sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard		4	SS	20		
			5	SS	20		188
							187
186.5			6	SS	50/125mm		
4.8	**END OF BOREHOLE:** Notes: 1) Borehole dry and open 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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH-19-15

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823846.4 E 599163.6

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 20

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
191.1							
0.0	**FILL:** sandy silt mixed with topsoil, sand & gravel, dark grey, moist, loose		1	SS	7	▽ W. L. 190.7 m May 17, 2019	191
190.3							
0.8	**FILL:** clayey silt, brown, very moist, loose (possibly weathered/disturbed native)		2	SS	5		190
189.6							
1.5	**FILL:** clayey silt, trace sand, brown, moist, firm (Possibly weathered/disturbed native)		3	SS	5		189
188.8							
2.3	**CLAYEY SILT TILL:** sandy, trace gravel, occasional sand seams, occasional cobble/boulder, grey, moist, very stiff to hard		4	SS	22		
			5	SS	22		188
							187
			6	SS	34		
							186
			7	SS	47		185
184.4							
6.7	**END OF BOREHOLE:** Notes: 1) 50 mm dia. monitoring well installed upon completion Date Water Level(m) May 17, 2019 0.41 mbgl						

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 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH-19-16

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823789.2 E 599191.4

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 21

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
191.2							
0.0	**FILL:** woodchips, loose		1	SS	8		191
190.4							
0.8	**FILL:** clayey silt, trace to some organics, dark grey, very moist, loose		2	SS	8		190
			3	SS	6		
	Possibly weathered/disturbed native 2.3m						189
188.6			4	SS	7		
2.6	**SILTY CLAY:** trace sand, brown, moist to wet, firm to very stiff						
			5	SS	16		188
187.2							
4.0	**CLAYEY SILT TILL:** sandy, trace gravel, grey, moist, hard						187
			6	SS	31		
							186
			7	SS	30		185
184.5							
6.7	**END OF BOREHOLE:** Notes: 1) Borehole dry 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
0	7	45	48

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 BH-19-17

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823824.9 E 599204.1

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 22

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
191.0							
0.0	**FILL:** woodchips, dark brown, very loose		1	SS	2		
190.2							
0.8	**FILL:** clayey silt, trace topsoil/ organics, brown and grey, very moist to wet, very loose to loose		2	SS	3		190
189.2			3	SS	8		189
1.8	**CLAYEY SILT:** trace sand, brown, moist, firm						
188.7							
2.3	**CLAYEY SILT TILL:** sandy, trace gravel, brown, moist, stiff to hard		4	SS	14		188
	grey below 3.1m		5	SS	24		
	occasional cobble/boulder below 4.6 m		6	SS	25		186
			7	SS	79		185
184.5							
6.5	**END OF BOREHOLE:** Notes: 1) 50 mm dia. monitoring well installed upon completion Date Water Level(m) May 17, 2019 0.6 mbgl						

W. L. 190.5 m
May 17, 2019

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

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

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH-19-18

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823885 E 599270.6

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 23

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	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
190.9												
0.0	**FILL:** gravelly sand, trace silt, brown, moist, loose		1	SS	7							
190.1						▽	W. L. 190.3 m May 17, 2019					
0.8	**FILL:** clayey silt, some organics, trace gravel, brown to grey, moist, loose		2	SS	7		190					
189.1			3	SS	6		189					
1.8	**CLAYEY SILT:** trace sand, brown, moist, firm											
188.6												
2.3	**CLAYEY SILT TILL:** sandy, occasional sand seams, trace gravel, occasional cobble/boulder, brown, moist , stiff to very stiff		4	SS	19		188					
			5	SS	27							
							187					
	grey below 4.6m		6	SS	12		186					
							185					
			7	SS	29							
184.2												
6.7	**END OF BOREHOLE:** Notes: 1) 50 mm dia. monitoring well installed upon completion Date Water Level(m) May 17, 2019 0.6 mbgl											

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

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

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LOG OF BOREHOLE BH-19-19

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Derry Britannia Developments Ltd.
PROJECT LOCATION: Ninth Line, Mississauga, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4823920.3 E 599309.4

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: May-14-2019

REF. NO.: 18-692-100
ENCL NO.: 24

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
191.1							191
0.0	**FILL:** clayey silt, trace topsoil/ rootlets, brown, compact		1	SS	10		
			2	SS	10		190
189.6							
1.5	**CLAYEY SILT TILL:** sandy, trace gravel, occasional cobble, greyish brown, moist, stiff to very stiff		3	SS	10		189
			4	SS	21		188
			5	SS	22		187
	grey below 4.6m		6	SS	13		186
185.6							
5.5	**SAND:** trace gravel, grey, wet, compact		7	SS	21		185
184.6							
6.5	**CLAYEY SILT TILL:** sandy, trace gravel, grey, moist, very stiff						
184.4							
6.7	**END OF BOREHOLE:** Notes: 1) Water level at 6.1 m 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)

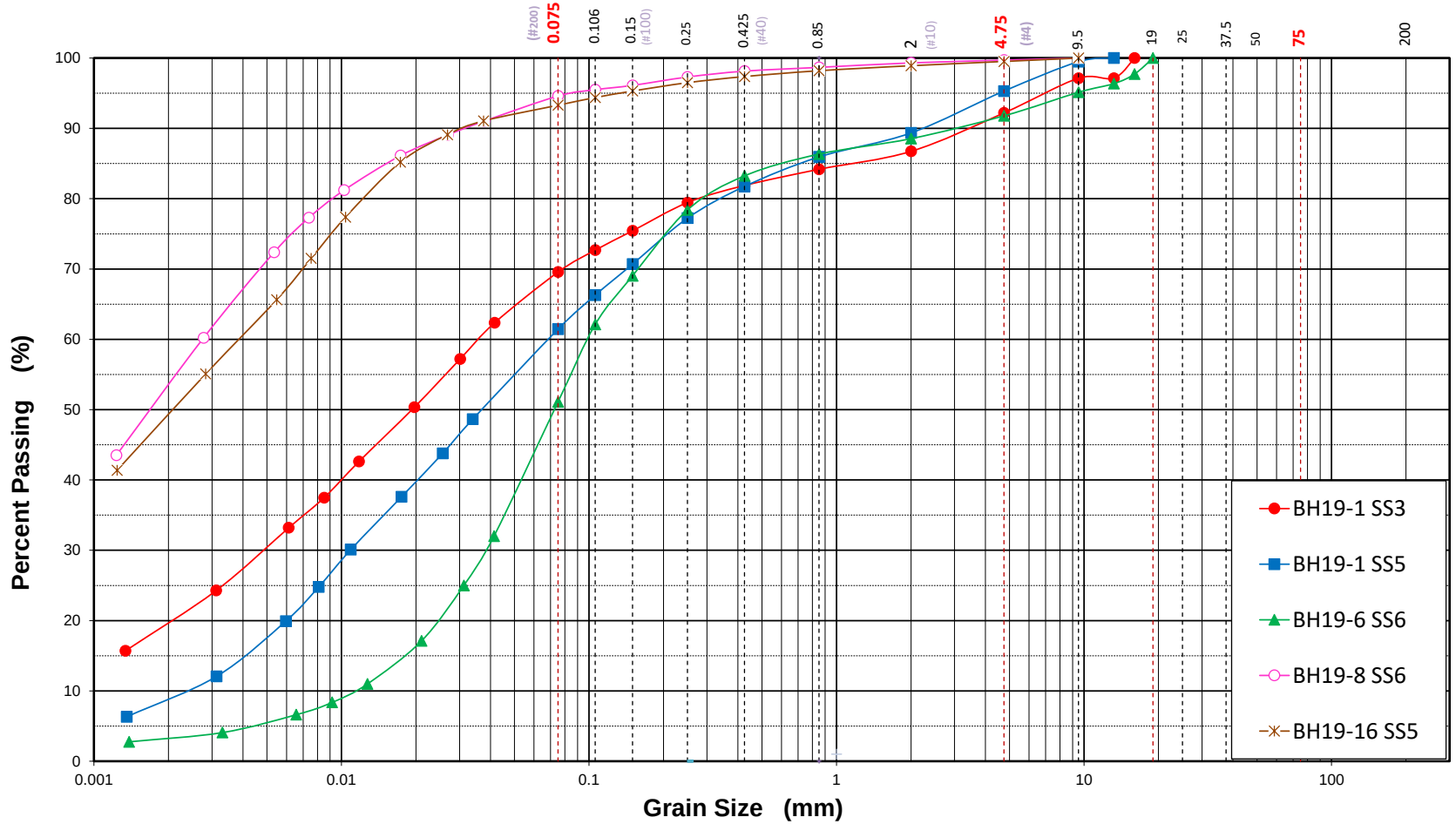
METHANE AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

Particle Size Distribution (ASTM-D421/D422)



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

DS CONSULTANTS LTD.
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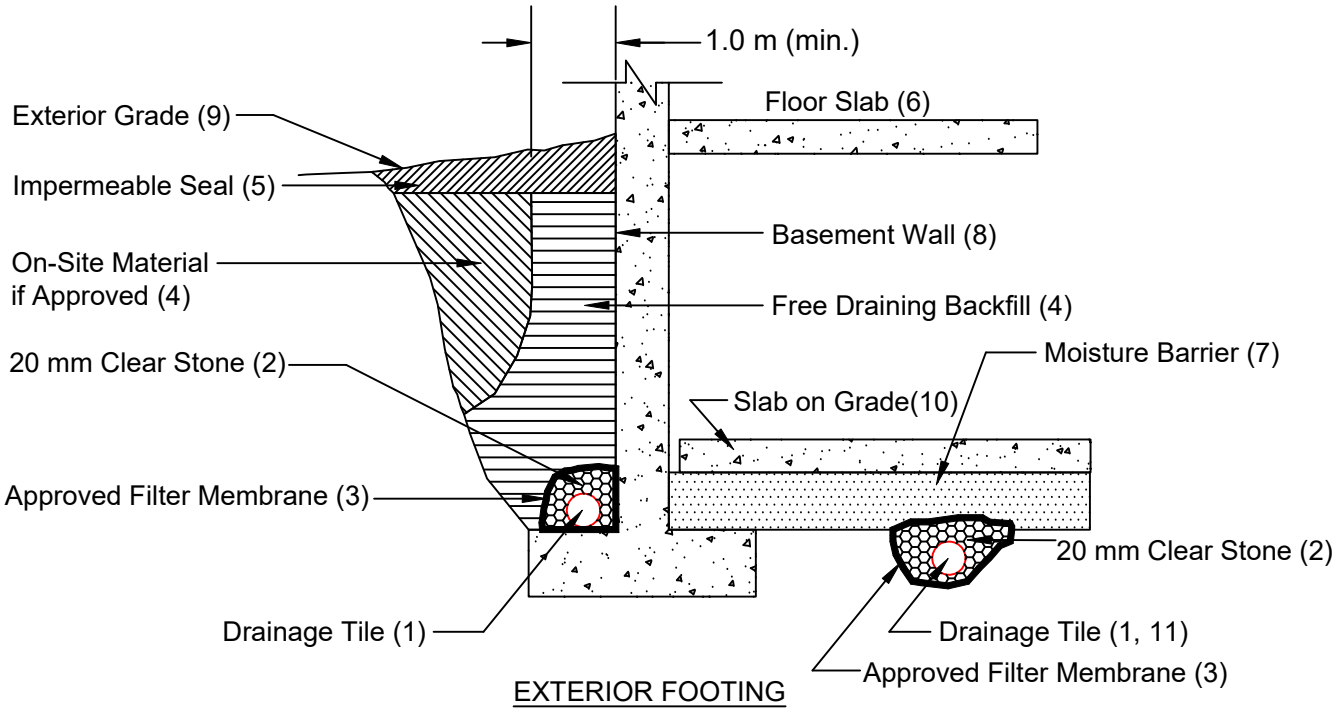
Project	**Ninth Line Properties**	Project No	**18-692-100**
Location	**Mississauga, ON**	Date	**Jun-01-2019**
Client	**Derry Britannia Developments Limited**	Figure No	25



EXTERIOR FOOTING

Notes

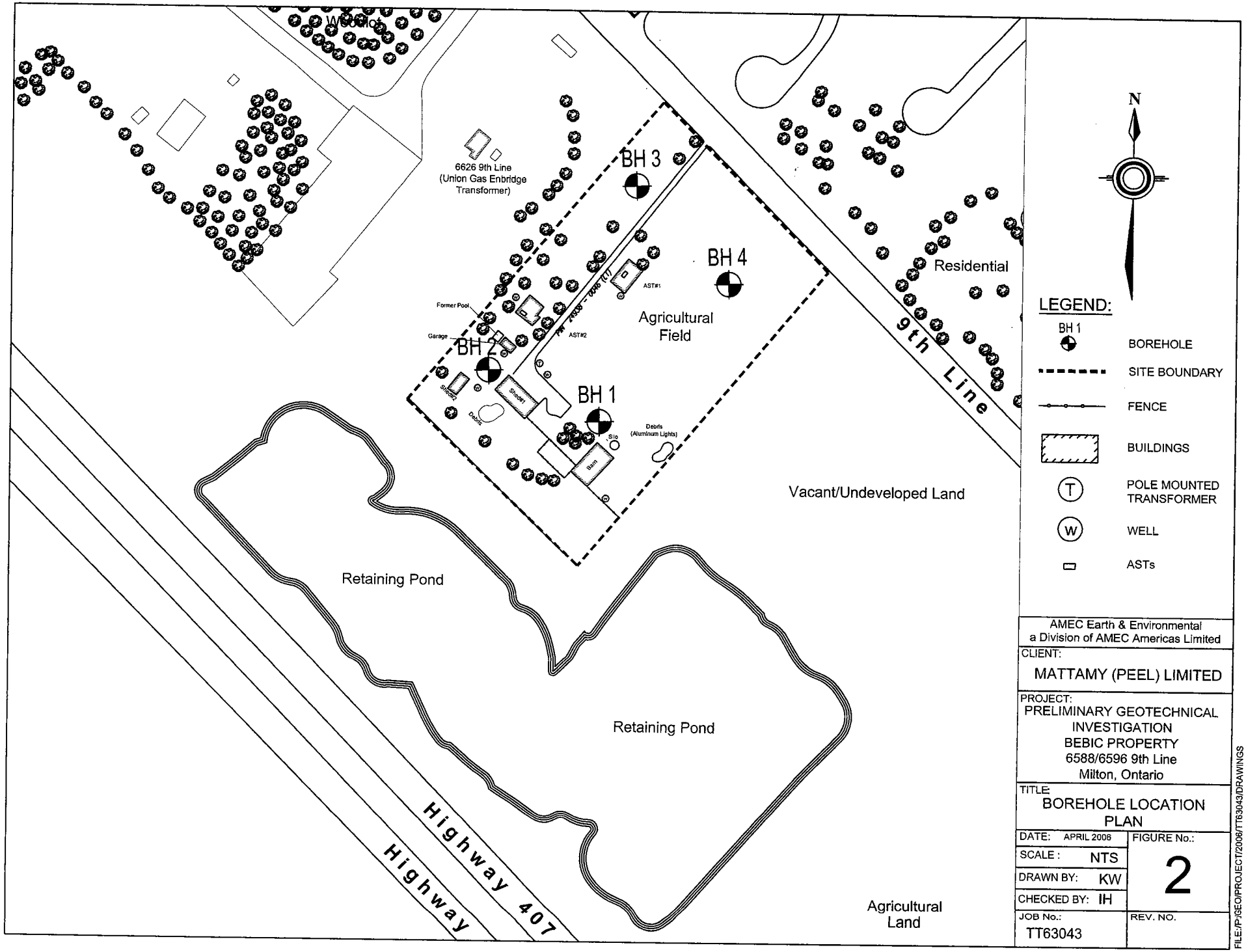
1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with 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

Logs & Location Plan of AMEC Boreholes Drilled in Parcel A



AMEC Earth & Environmental
a Division of AMEC Americas Limited

CLIENT:
MATTAMY (PEEL) LIMITED

PROJECT:
PRELIMINARY GEOTECHNICAL
INVESTIGATION
BEBIC PROPERTY
6588/6596 9th Line
Milton, Ontario

TITLE:
BOREHOLE LOCATION
PLAN

DATE: APRIL 2006	FIGURE No.: 2
SCALE : NTS	
DRAWN BY: KW	
CHECKED BY: IH	
JOB No.: TT63043	REV. NO.

FILE:P:\GEO\PROJECT\2006\TT63043\DRAWINGS

amec

amec

RECORD OF BOREHOLE No BH 1 1 OF 1

CLIENT Mattamy Homes Limited (Peel Div) LOCATION 6588 and 6596 Ninth Line, Milton, Ontario ORIGINATED BY JF

REF. TT63043 BOREHOLE TYPE Solid Stem Augering COMPILED BY SN

DATUM Geodetic DATE 25 April 2006 CHECKED BY IH

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
198.1 0.0	**about 280 mm TOPSOIL**							198				
197.8 0.3	dark brown to brown **SILTY CLAY** (Disturbed Native) some sand, trace rootlets and organics moist		1	SS	11							
197.5 0.6	brown **SILTY SAND / SANDY SILT TILL** trace clay, trace to some gravel dense to very dense moist occasional cobbles		2	SS	32		1	197				
			3	SS	50/3		2	196				
195.5 2.6	brown to reddish brown **CLAYEY SILT TILL** trace gravel trace shale fragments hard moist		4	SS	34	▽	3	195				
			5	SS	50/13		4	194				
193.5 4.6	**End of Borehole**		6	SS	50/3							

Groundwater in open borehole on completion: 3.8 m

Depth of cave-in on completion: 3.8 m

$+^3$ $\times^3$ Numbers refer to Sensitivity

RECORD OF BOREHOLE No BH 2 1 OF 1

CLIENT Mattamy Homes Limited (Peel Div) LOCATION 6588 and 6596 Ninth Line, Milton, Ontario ORIGINATED BY JF

REF. TT63043 BOREHOLE TYPE Solid Stem Augering COMPILED BY SN

DATUM Geodetic DATE 25 April 2006 CHECKED BY IH

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
198.8												
0.0	**about 410 mm TOPSOIL**											
198.4			1	SS	10							
0.4	dark brown to brown											
198.2	**SILTY CLAY**											
0.6	(Disturbed Native) some sand, trace rootlets and organics							198				
	moist		2	SS	14		1					
	brown											
	SILTY CLAY / CLAYEY SILT TILL some sand, trace gravel stiff to hard											
	moist		3	SS	65			197				
							2					
			4	SS	58							
						▽		196				
195.7							3					
3.1	brown to reddish brown **SILTY SAND TILL** some gravel very dense											
	moist		5	SS	65			195				
							4					
	occasional cobbles											
			6	SS	68			194				
193.8							5					
5.0	**End of Borehole**											

Groundwater in open borehole on completion: 2.9 m

Depth of cave-in on completion: 2.9 m

REMARKS: Borehole moved 4.0 m south west as the original location was under power lines

$+^3$ $\times^3$ Numbers refer to Sensitivity

RECORD OF BOREHOLE No BH 3 1 OF 1

CLIENT Mattamy Homes Limited (Peel Div) LOCATION 6588 and 6596 Ninth Line, Milton, Ontario ORIGINATED BY JF

REF. TT63043 BOREHOLE TYPE Solid Stem Augering COMPILED BY SN

DATUM Geodetic DATE 25 April 2006 CHECKED BY IH

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: O UNCONFINED + FIELD VANE; ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
197.1												
0.0	**about 360 mm TOPSOIL**											
196.8			1	SS	12			197				
0.4	dark brown to brown **CLAYEY SILT** (Distubed Native) trace rootlets and organics, moist											
196.5												
0.6	brown **CLAYEY SILT TILL** some sand, trace gravel hard		2	SS	35	▽	1	196				
195.8												
1.4	brown to reddish brown **SILTY SAND TILL** trace to some gravel occasional cobbles dense to very dense, moist		3	SS	32		2	195				
			4	SS	55		3	194				
			5	SS	50/15							
193.2												
4.0	reddish brown **TILL / SHALE** hard, damp						4	193				
192.5			6	SS	50/8							
4.7	**End of Borehole**											

Groundwater in open borehole on completion: 0.9 m

Borehole moved 0.6 m north as the original location was close to gas line

$+^3$ $\times^3$ Numbers refer to Sensitivity

RECORD OF BOREHOLE No BH 4 1 OF 1

CLIENT Mattamy Homes Limited (Peel Div) LOCATION 6588 and 6596 Ninth Line, Milton, Ontario ORIGINATED BY JF

REF. TT63043 BOREHOLE TYPE Solid Stem Augering COMPILED BY SN

DATUM Geodetic DATE 25 April 2006 CHECKED BY IH

ELEV DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" VALUES	DEPTH (m)	ELEVATION SCALE
196.4 0.0	**about 300 mm TOPSOIL**					
196.1 0.3	dark brown to brown **SILTY CLAY** (Disturbed Native) some sand, trace organics / moist	1	SS	11		196
195.8 0.6	brown to reddish brown **CLAYEY SILT TILL** trace gravel occasional cobbles very stiff to hard damp	2	SS	29	1	195
	trace shale fragments	3	SS	50/15		
194.5 2.0	reddish brown **TILL / SHALE** hard damp	4	SS	50/10	2	194
193.5 2.9	red **WEATHERED SHALE**	5	SS	50/8	3	193
					4	
191.9 4.6	**End of Borehole**	6	SS	50/1		192

No noticeable groundwater in open borehole on completion

GROUND WATER CONDITIONS

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● 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

UNIT WEIGHT γ kN/m³

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

$+^3$ $\times^3$ Numbers refer to Sensitivity

Appendix B

Logs & Location Plan of Shad Boreholes Drilled in Parcel B

N E S W

LEGEND:

Borehole ○

NOTES:

1. All borehole locations are approximate.
2. Drawing not to scale.
3. The drawing should be read in conjunction with the associated report By Shad & Associates Inc., T08046

CLIENT:
Derry Britannia Developments Limited
C/o Mattamy Developments Corporation

MATTAMY homes

SHAD & ASSOCIATES INC.
GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS ENGINEERS

83 Citation Drive, Unit 9,
Vaughan, Ontario, L4K 2Z6
Tel: (905) 760-5566
Fax: (905) 760-5567
www.shadinc.ca

SHAD & ASSOCIATES INC.

Drawn By: S.A.
Checked By: N.S.
Datum: -
Projection: -
Scale: N.T.S.

TITLE: BOREHOLE LOCATION PLAN

PROJECT: **Geotechnical Investigation**
Property P455
Ninth Line, Milton, Ontario

DATE: October 2008
PROJECT NO.: **T08046**
FIGURE No.: **2**

RECORD OF BOREHOLE BH 1

CLIENT: Mattamy Development Corporation
LOCATION: Ninth Line, Milton, Ontario
ORIGINATED BY: N.S.

REF.: T08046 - P455
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.

DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9, Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DESCRIPTION	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	WATER CONTENT (%)
0.0	Ground Surface						
-0.3	**300 mm TOPSOIL**	S1	SS	41	12		21
-0.9	**Sand FILL** moist to wet	S2	SS	50	13		13
-1.8	brown to dark brown **ploughed/disturbed Silty Clay/Clayey Silt** some rootlets occasional topsoil damp	S3	SS	30	13	Water level (1.8 m)	27
-2.7	greyish brown **CLAYEY SILT/SILTY CLAY TILL** some shale fragments moist, very stiff to hard	S4	SS	53	38		19
-5.1	reddish brown **Highly weathered Shale** moist,hard	S5	SS	15	50/13 cm		
		S6	SS	13	50/5 cm		
		S7	AU				
	End of Borehole Water Level on Completion: 1.8 m						

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: 20 40 60 80 100

WATER CONTENT (%): 10 20 30

TOV ppm

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

DEPTH SCALE (metres): 0 1 2 3 4 5 6 7

RECORD OF BOREHOLE BH 2

CLIENT: Mattamy Development Corporation
LOCATION: Ninth Line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08046 - P455
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.
DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0		Ground Surface								26		
-0.1	0	**100 mm TOPSOIL**										
		dark brown **ploughed/disturbed Silty Clay/Clayey Silt** some sand trace rootlets trace organics moist		S1	SS	48	29					
-0.9										14		
	1	stiff		S2	SS	46	14					
		greyish brown **CLAYEY SILT/SILTY CLAY TILL** trace shale fragments damp, hard		S3	SS	38	37			15		
	2			S4	SS	53	62					
-2.7												
	3			S5	SS	3	50/10 cm					
		reddish brown **Highly Weathered SHALE** moist, hard		S6	AU					5		
	4											
				S7	AU							
-5.1	5	**End of Borehole** Dry on Completion										
	6											
	7											

RECORD OF BOREHOLE BH 3

CLIENT: Mattamy Development Corporation
LOCATION: Ninth Line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08046 - P455
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.
DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS
0.0		Ground Surface						
	0	**300 mm TOPSOIL**						
-0.3				S1	SS	46	10	
-0.5		mottled brown **ploughed/disturbed Silty Clay/Clayey Silt** some sand, trace rootlets trace organics damp						
	1			S2	SS	48	42	
		reddish brown **CLAYEY SILT/SILTY CLAY TILL** trace to some shale fragments damp, hard						
				S3	SS	48	42	
	2							
-2.5				S4	SS	38	61/13 cm	
		reddish brown **Highly Weathered SHALE** moist, hard						
	3			S5	SS	25	50/14 cm	
-4.1	4			S6	AU			
		End of Borehole						
		Auger Refusal at : 4.1 m						
		Water Level on Completion: 2.7 m						
	5							
	6							
	7							

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH kPa
20 40 60 80 100

WATER CONTENT (%)
10 20 30

23
13
12
15
6

TOV ppm

REMARKS

GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

RECORD OF BOREHOLE BH 4

CLIENT: Mattamy Development Corporation
LOCATION: Ninth Line, Milton, Ontario
ORIGINATED BY: N.S.

REF.: T08046 - P455
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.

DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9, Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	WATER CONTENT (%)
0.0	0	Ground Surface						
		250 mm TOPSOIL						30
-0.3		mottled brown **ploughed/disturbed Silty Clay/Clayey Silt** with sand and rootlets trace of organics moist	S1	SS	50	4		22
-1.0	1		S2	SS	38	14		
		brown to mottled brown **CLAYEY SILT/SILTY CLAY TILL** trace to some shale fragments damp,stiff to very stiff	S3	SS	53	23		
	2		S4	SS	56	35		
	3	brown hard, moist	S5	SS	46	40		19
-3.8	4	reddish brown **Highly Weathered SHALE** damp, hard	S6	AU	-	-		
-4.2		**End of Borehole**					▼ (4.2 m)	
	5	Water Level on Completion: 4.2 m						
	6							
	7							

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: 20 40 60 80 100

WATER CONTENT (%): 10 20 30

TOV ppm

REMARKS

GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

RECORD OF BOREHOLE BH 5

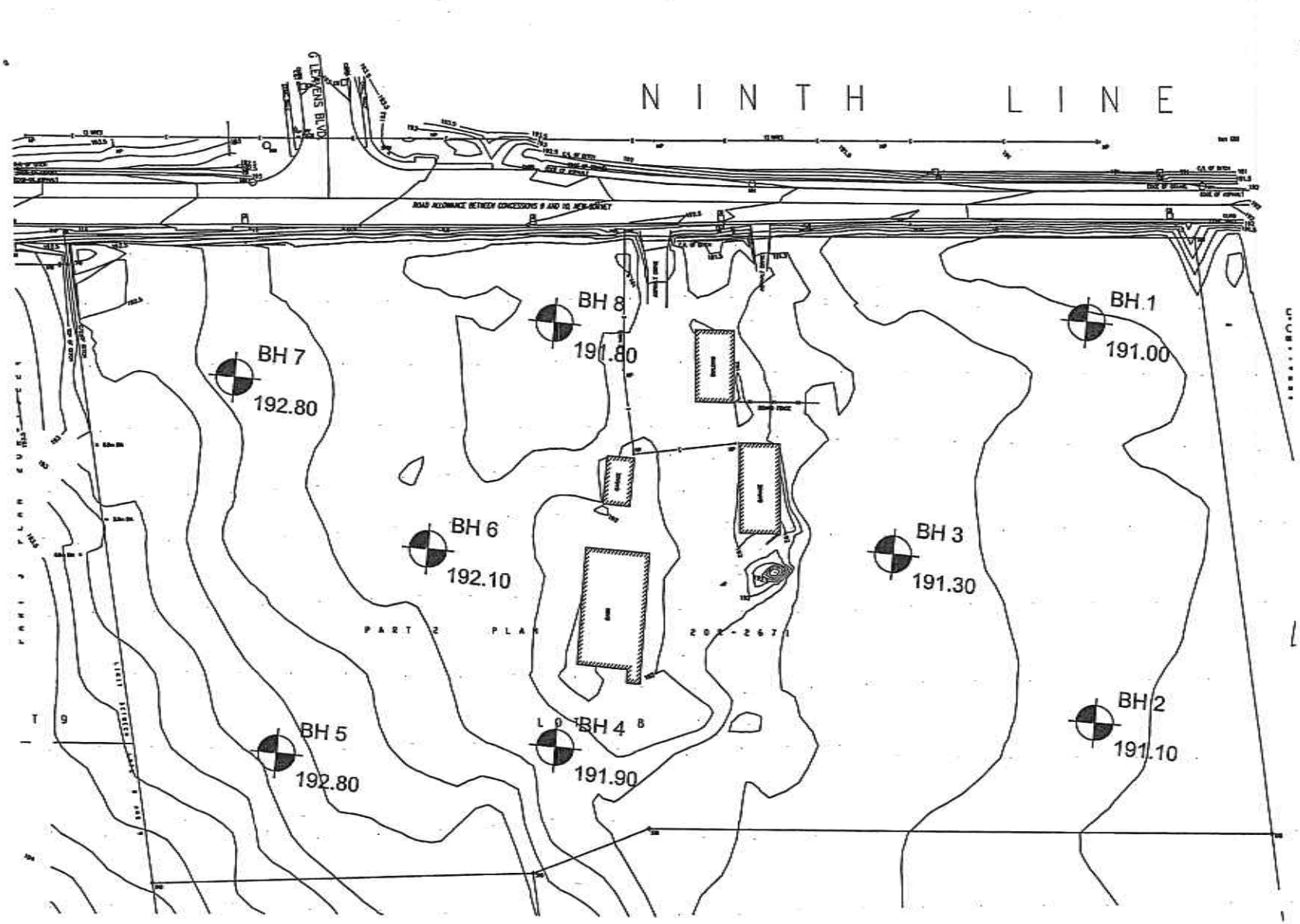
CLIENT: Mattamy Development Corporation
LOCATION: Ninth Line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08046 - P455
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.
DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0		Ground Surface										
-0.3	0	**350 mm TOPSOIL**		S1	SS	48	13			35		
-0.8		brown **ploughed/disturbed Silty Clay/Clayey Silt** trace rootlets, trace topsoil moist								17		
	1	very stiff		S2	SS	58	28					
		rteddish brown **CLAYEY SILT/SILTY CLAY TILL** some weathered shale fragments damp,hard		S3	SS	38	50/15 cm			12		
	2			S4	SS	15	40/10 cm					
-3.0	3	reddish brown **Highly Weathered SHALE** damp, hard		S5	SS	29	84/5 cm					
-4.1	4	**End of Borehole** Auger Refusal at 4.1 m Dry on Completion		S6	AU	-	-			5		
	5											
	6											
	7											

Appendix C

Logs & Location Plan of AME Boreholes Drilled in Parcel C



AME – MATERIALS ENGINEERING
117 Ringwood Drive, Unit # 6
Stouffville, Ontario, L4A 8C1
Tel: (905) 640 7772 Fax: (905) 640 8512

BOREHOLE LOCATION PLAN
6432 NINTH LINE
ARGO DEVELOPMENTS
Milton **Ontario**

Project No.:	40859.10
Scale:	N.T.S.
Date:	January 2006
Drawing No.:	1B

Log of Borehole 1

Project No.: 40859.10

Project Name: 6432 North Line

Figure No. 2

Location: Milton, Ontario

Date Drilled: 01/02/06

Drill Type: Solid Stem Auger

Datum: Geodetic

Split Spoon Sample | Combustible Vapour Reading
Auger Sample | Natural Moisture Content
SPT (N) Value | Atterberg Limits
Dynamic Cone Test | Undrained Triaxial at % Strain at Failure
Shelby Tube
Shear Strength by Vane Test | Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Total Combustible Vapours (ppm) (25 50 75) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (10 20 30)	SAMPLES	Natural Unit Weight kN/m³
		~ 80 mm TOPSOIL over CLAYEY SILT TILL: brown to brownish-grey, moist, trace gravel, very stiff to hard	191.00 190.92 190.30	0 1 2			46.07	
		SANDY SILT TILL: grey, moist, trace gravel, very dense	186.90	3 4	50/80 mm 50/50 mm 50/130 mm			
		End of borehole at 4.70 m	186.30					

LOG OF BOREHOLE 40859.10, 6432 NORTH LINE, MILTON.GPJ AME_ON.GDT 01/31/06

Notes:

Date/Time	Water Level (m)	Depth to Cave (m)
Upon Competion	Dry	No Cave
January 9, 2006	0.50	
January 10, 2006	0.50	
January 17, 2006	0.70	

Log of Borehole 2

Project No.: 40859.10

Project Name: 6432 North Line

Figure No. 3

Location: Milton, Ontario

Date Drilled: 01/02/06

Drill Type: Solid Stem Auger

Datum: Geodetic

Split Spoon Sample | Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Shear Strength by Vane Test (S)

Combustible Vapour Reading | Natural Moisture Content | Atterberg Limits | Undrained Triaxial at % Strain at Failure | Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH	Standard Penetration Test N Value / Shear Strength kPa	Total Combustible Vapours (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Weight kN/m³
		~ 150 mm TOPSOIL over	191.10	0	20 40 60 80 / 50 100 150 200	25 50 75 / 10 20 30		
		CLAYEY SILT TILL: brown to brownish-grey, moist, trace gravel, very stiff to hard	190.95					
			190.60	1				
				2	50/150 mm			
				3	50/150 mm			
		SANDY SILT TILL: grey, moist, trace gravel, very dense	186.90	4	50/100 mm			
		End of borehole at 4.83 m	186.27					

LOG OF BOREHOLE 40859.10, 6432 NORTH LINE, MILTON.GPJ AME_ON.GDT 01/31/06

Notes:

Date/Time	Water Level (m)	Depth to Cave (m)
Upon Competion	Dry	No Cave
January 9, 2006	0.80	
January 10, 2006	0.80	
January 17, 2006	0.50	

Sheet No. 1 of 1

Log of Borehole 3

Project No.: 40859.10

Project Name: 6432 North Line

Figure No. 4

Location: Milton, Ontario

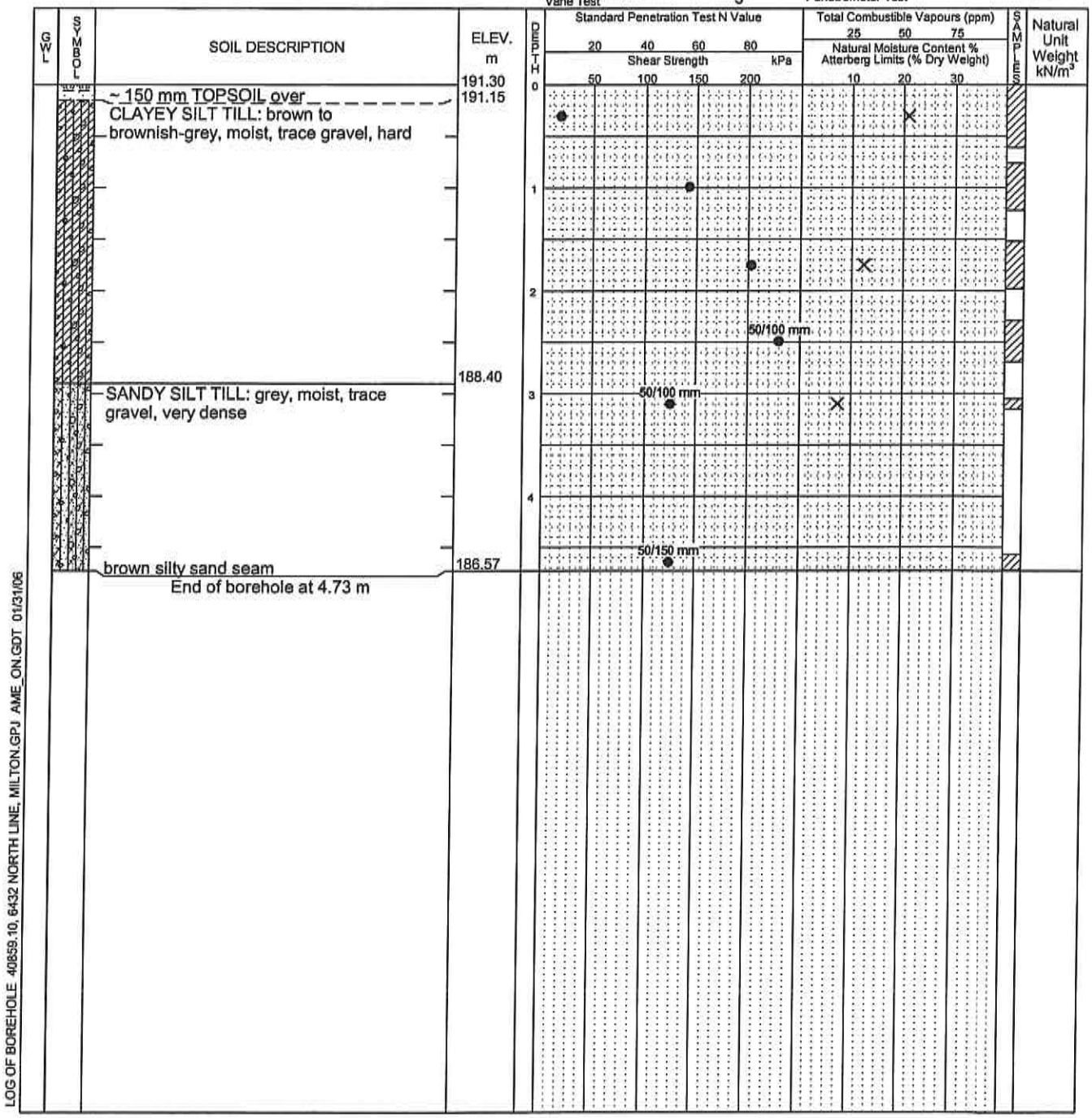
Date Drilled: 01/02/06

Drill Type: Solid Stem Auger

Datum: Geodetic

Split Spoon Sample | Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Shear Strength by Vane Test

Combustible Vapour Reading | Natural Moisture Content | Atterberg Limits | Undrained Triaxial at % Strain at Failure | Shear Strength by Penetrometer Test



LOG OF BOREHOLE 40859.10, 6432 NORTH LINE, MILTON.GPJ AME_ON.GDT 01/31/06

Notes:

Date/Time	Water Level (m)	Depth to Cave (m)
Upon Competion	Dry	No Cave

Sheet No. 1 of 1

Log of Borehole 4

Project No.: 40859.10

Project Name: 6432 North Line

Figure No. 5

Location: Milton, Ontario

Date Drilled: 01/02/06

Drill Type: Solid Stem Auger

Datum: Geodetic

Split Spoon Sample | Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Shear Strength by Vane Test

Combustible Vapour Reading | Natural Moisture Content | Atterberg Limits | Undrained Triaxial at % Strain at Failure | Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 50 100 150 200)	Total Combustible Vapours (ppm) (25 50 75) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (10 20 30)	SAMPLES	Natural Unit Weight kN/m³
		~150 mm TOPSOIL over	191.90	0				
		CLAYEY SILT TILL: brown to brownish-grey, moist, trace gravel, hard	191.75					
				1				
			189.92					
		End of borehole at 1.98 m						

LOG OF BOREHOLE 40859.10, 6432 NORTH LINE, MILTON.GPJ AME_ON.GDT 01/31/06

Notes:

Date/Time	Water Level (m)	Depth to Cave (m)
Upon Competion	Dry	No Cave

Sheet No. 1 of 1

Log of Borehole 5

Project No.: 40859.10

Project Name: 6432 North Line

Figure No. 6

Location: Milton, Ontario

Date Drilled: 01/02/06

Drill Type: Solid Stem Auger

Datum: Geodetic

Split Spoon Sample | Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Shear Strength by Vane Test

Combustible Vapour Reading | Natural Moisture Content | Atterberg Limits | Undrained Triaxial at % Strain at Failure | Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH
		~ 50 mm TOPSOIL over	192.80	0
		CLAYEY SILT TILL: brown to brownish-grey, moist, trace gravel, hard	192.75	
			192.20	1
			190.70	2
		SHALE: red, weathered, dry		
				3
				4
			188.05	
		End of borehole at 4.75 m		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Total Combustible Vapours (ppm): 25 50 75

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES

Natural Unit Weight kN/m³

50/50 mm

50/30 mm

50/30 mm

LOG OF BOREHOLE 40859.10, 6432 NORTH LINE, MILTON.GPJ AME_ON.GDT 01/31/06

Notes:

Date/Time	Water Level (m)	Depth to Cave (m)
Upon Competion	0.60	3.70

Sheet No. 1 of 1

Log of Borehole 6

Project No.: 40859.10

Project Name: 6432 North Line

Figure No. 7

Location: Milton, Ontario

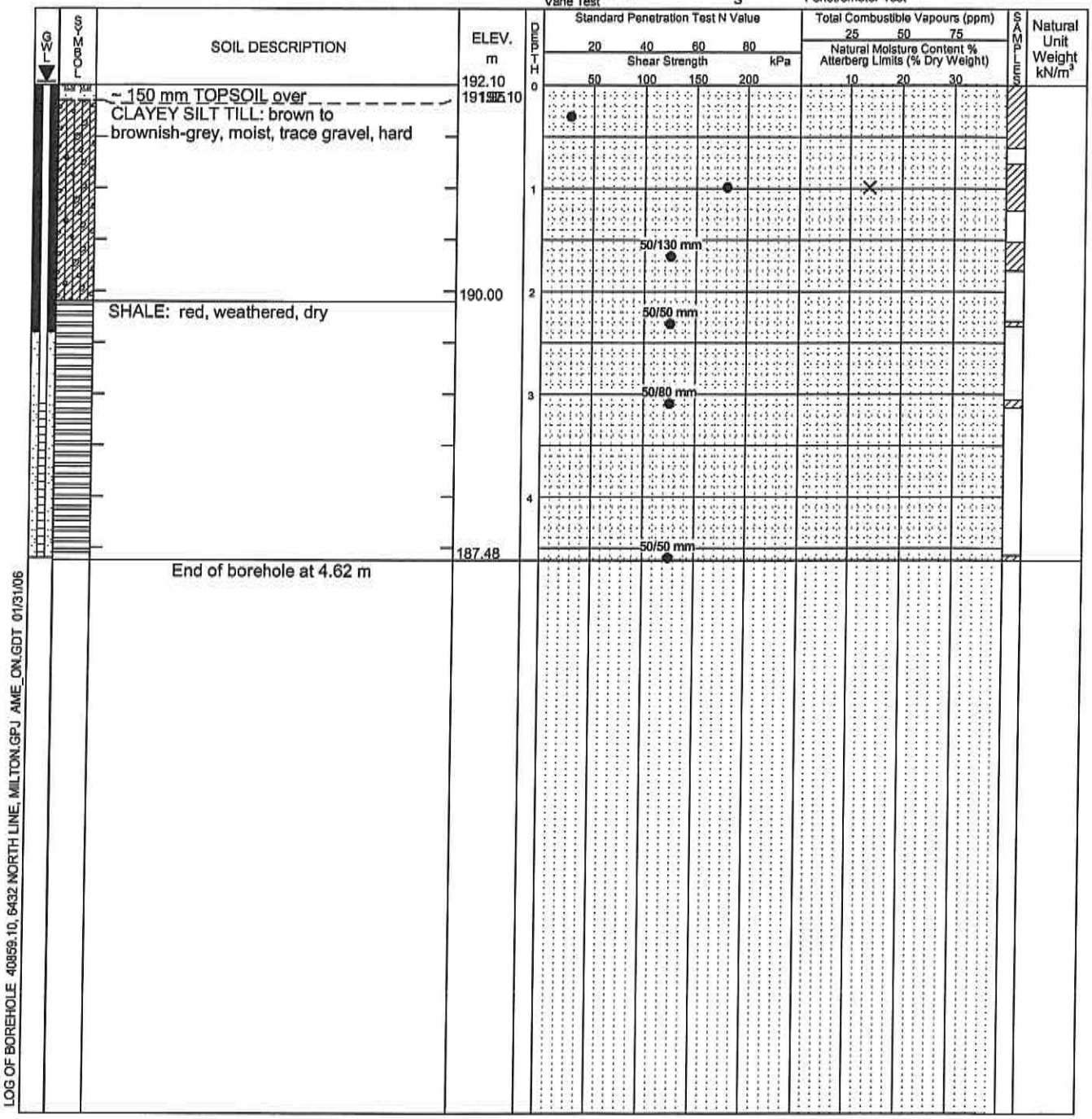
Date Drilled: 01/02/06

Drill Type: Solid Stem Auger

Datum: Geodetic

Split Spoon Sample | Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Shear Strength by Vane Test

Combustible Vapour Reading | Natural Moisture Content | Atterberg Limits | Undrained Triaxial at % Strain at Failure | Shear Strength by Penetrometer Test



LOG OF BOREHOLE 40859.10, 6432 NORTH LINE, MILTON.GPJ AME_ON.GDT 01/31/06

Notes:

Date/Time	Water Level (m)	Depth to Cave (m)
Upon Competion	Dry	No Cave
January 9, 2006	-0.60	
January 10, 2006	-0.70	
January 17, 2006	0.00	

Sheet No. 1 of 1

Log of Borehole 7

Project No.: 40859.10

Project Name: 6432 North Line

Figure No. 8

Location: Milton, Ontario

Date Drilled: 01/02/06

Drill Type: Solid Stem Auger

Datum: Geodetic

193.60

Split Spoon Sample | Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Shear Strength by Vane Test

Combustible Vapour Reading | Natural Moisture Content | Atterberg Limits | Undrained Triaxial at % Strain at Failure | Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH
		~ 100 mm TOPSOIL over	192.80	0
		CLAYEY SILT TILL: brown to brownish-grey, moist, trace gravel, hard	192.70	
		occasional shale fragments		
		SHALE: red, weathered, dry	190.10	
		End of borehole at 4.65 m	188.15	

Standard Penetration Test N Value: 20 40 60 80 — Shear Strength: 50 100 150 200 kPa

Total Combustible Vapours (ppm): 25 50 75 — Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

50/130 mm

50/30 mm

50/80 mm

SAMPLES

Natural Unit Weight kN/m³

LOG OF BOREHOLE 40859.10, 6432 NORTH LINE, MILTON.GPJ AME_ON.GDT 01/31/06

Notes:

Date/Time	Water Level (m)	Depth to Cave (m)
Upon Competion	1.80	No Cave
January 9, 2006	0.60	
January 10, 2006	0.50	
January 17, 2006	-0.80	

Sheet No. 1 of 1

Log of Borehole 8

Project No.: 40859.10

Project Name: 6432 North Line

Figure No. 9

Location: Milton, Ontario

Date Drilled: 01/02/06

Drill Type: Solid Stem Auger

Datum: Geodetic

Split Spoon Sample | Combustible Vapour Reading
Auger Sample | Natural Moisture Content
SPT (N) Value | Atterberg Limits
Dynamic Cone Test | Undrained Triaxial at % Strain at Failure
Shelby Tube
Shear Strength by Vane Test | Shear Strength by Penetrometer Test

GWL	SYMBOL	SOIL DESCRIPTION	ELEV. m	DEPTH
		FILL: granulars, sand, and topsoil	191.80	0
		CLAYEY SILT TILL: brown, moist, trace gravel, hard	190.70	1
		SANDY SILT TILL: grey, moist, trace gravel, very dense	189.70	2
		End of borehole at 2.59 m	189.21	

Standard Penetration Test N Value: 20 40 60 80
Shear Strength kPa: 50 100 150 200
Total Combustible Vapours (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30
50/150 mm

SAMPLES

Natural Unit Weight kN/m³

LOG OF BOREHOLE 40859.10, 6432 NORTH LINE, MILTON.GPJ AME_ON.GDT 01/31/06

Notes:

Date/Time	Water Level (m)	Depth to Cave (m)
Upon Competion	Dry	No Cave

Sheet No. 1 of 1

Appendix D

Logs & Location Plan of Shad Boreholes Drilled in Parcel D

CLIENT: Derry Britannia Development Limited C/o Mattamy Development Corporation	**Drawn By:** S.A. **Checked By:** N.S.	**TITLE:** BOREHOLE LOCATION PLAN	**DATE:** October 2008 **PROJECT NO.:** T08046
SHAD & ASSOCIATES INC. GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS ENGINEERS 83 Citation Drive, Unit 9, Vaughan, Ontario, L4K 2Z6 Tel: (905) 760-5566 Fax: (905) 760-5567 www.shadinc.ca	**Datum:** - **Projection:** - **Scale:** N.T.S.	**PROJECT:** **Geotechnical Investigation** Property P456 Ninth Line, Milton, Ontario	**FIGURE No.:** **2**

RECORD OF BOREHOLE BH 1

CLIENT: Mattamy Development Corporation
LOCATION: 9th Line, Milton, Ontario
ORIGINATED BY: N.S.

REF.: T08046 - P456
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.

DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0		Ground Surface										
-0.2	0	**200 mm TOPSOIL**									>40	
		mottled brown **ploughed/disturbed Silty Clay/Clayey Silt** occ. topsoil, organic stains damp to moist		S1	SS	30	6					
-1.2	1			S2	SS	38	9				34	
		greyish brown **SILTY CLAY/CLAYEY SILT TILL** occ. oxidized fissures Silty Sand/Sandy Silt interbedding damp, stiff		S3	SS	58	10			15		
	2	hard		S4	SS	61	40					
	3			S5	SS	58	54			12		
		grey		S6	SS	46	56	▼		12		
-4.8	4			S7	SS	30	110/28 cm			9		
		End of Borehole Water Level on Completion: 3.9 m										
	5											
	6											
	7											

RECORD OF BOREHOLE BH 2

CLIENT: Mattamy Development Corporation
LOCATION: 9th Line, Milton, Ontario
ORIGINATED BY: N.S.

REF.: T08046 - P456
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.

DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0		Ground Surface										
-0.2	0	**200 mm TOPSOIL**		S1	SS	25	5			32		
	1	mottled brown **ploughed/disturbed** **Silty Clay/Clayey Silt** occ. topsoil, organic stains moist		S2	SS	30	5			28		
-1.8				S3	SS	50	17					
	2	very stiff brown **SILTY CLAY/CLAYEY SILT TILL** occ. sand seams interbeddings damp, hard		S4	SS	29	71/30 cm			12		
	3	grey		S5	SS	53	74/25 cm					
	4			S6	SS	50	81	▼		6		
-5.1	5			S7	SS	60	55					
		End of Borehole Water Level on Completion: 4.2 m										
	6											
	7											

RECORD OF BOREHOLE BH 3

CLIENT: Mattamy Development Corporation
LOCATION: 9th Line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08046 - P456
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.
DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0		Ground Surface										
-0.1	0	**100 mm TOPSOIL**		S1	SS	30	2				>40	
		mottled brown **ploughed/disturbed Silty Clay/Clayey Silt** occ. topsoil, organic stains moist to wet		S2	SS	30	13			20		
-1.1	1	very stiff		S3	SS	56	28			12		
	2	brown to mottled brown **SILTY CLAY/CLAYEY SILT TILL** occ. sand seams interbeddings occ. oxidized fissures damp, hard		S4	SS	63	73					
	3	grey		S5	SS	63	54			10		
	4			S6	SS	60	59	▼				
				S7	SS	58	79			8		
-5.1	5	**End of Borehole** Dry on Completion										
	6											
	7											

RECORD OF BOREHOLE BH 4

CLIENT: Mattamy Development Corporation
LOCATION: 9th Line, Milton, Ontario
ORIGINATED BY: N.S.

REF.: T08046 - P456
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.

DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS
0.0		Ground Surface						
-0.1	0	**100 mm TOPSOIL**		S1	SS	30	8	
		mottled brown **ploughed/disturbed** **Silty Clay/Clayey Silt** occ. topsoil, organic stains damp to moist		S2	SS	30	12	
-1.4	1	stiff to very stiff		S3	SS	56	14	
	2	mottled brown **SILTY CLAY/CLAYEY SILT TILL** occ. oxidized fissures damp, hard		S4	SS	63	40	
	3	grey		S5	SS	63	84/30 cm	
	4			S6	SS	60	80	▼
-4.8				S7	SS	58	96/30 cm	
	5	**End of Borehole** Water Level on Completion: 4.2 m						
	6							
	7							

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

WATER CONTENT (%) (10 20 30)
34
29
15
7
8

TOV ppm

REMARKS
GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

RECORD OF BOREHOLE BH 5

CLIENT: Mattamy Development Corporation
LOCATION: 9th Line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08046 - P456
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.
DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0		Ground Surface										
-0.1	0	**100 mm TOPSOIL**										
		mottled brown **ploughed/disturbed Silty Clay/Clayey Silt** some rootlets, trace organics damp		S1	SS	20	4			28		
-1.1	1			S2	SS	53	10					
		brown **SILTY CLAY/CLAYEY SILT TILL** damp, stiff to very stiff		S3	SS	44	16	▼		15		
	2			S4	SS	60	23			10		
		reddish brown trace to some shale fragments damp, occ moist seams, hard		S5	SS	60	56					
	3			S6	SS	5	50/10 cm					
	4			S7	SS	44	74			12		
-5.1	5	**End of Borehole** Water Level on Completion: 1.5 m										
	6											
	7											

RECORD OF BOREHOLE BH 6

CLIENT: Mattamy Development Corporation
LOCATION: 9th Line, Milton, Ontario
ORIGINATED BY: N.S.

REF.: T08046 - P456
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.

DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS
0.0		Ground Surface						
	0	**450 mm TOPSOIL**		S1	SS	36	10	
-0.5		mottled brown **ploughed/disturbed** **Silty Clay/Clayey Silt** some rootlets, trace organics moist						
-0.9	1	very stiff		S2	SS	46	17	
		light brown **SILTY CLAY/CLAYEY SILT TILL** occ. sand seams moist, hard		S3	SS	50	34	
	2			S4	SS	58	93	
	3	reddish brown trace to some shale fragments damp		S5	SS	43	93	
	4	greyish red some highly weathered shale interbeddings		S6	SS	5	50/10 cm	
-5.1	5			S7	SS	0	50/3 cm	
		End of Borehole Dry on Completion						
	6							
	7							

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH kPa
▲ 20 40 60 80 100 ▲

WATER CONTENT (%)
10 20 30

" N " VALUES	WATER CONTENT (%)
10	34
17	16
34	
93	10
93	9
50/10 cm	
50/3 cm	5

TOV ppm

REMARKS
-
GRAIN SIZE DISTRIBUTION (%)

SAMPLE NUMBER	GR	SA	SI	CL

RECORD OF BOREHOLE BH 7

CLIENT: Mattamy Development Corporation
LOCATION: 9th Line, Milton, Ontario
ORIGINATED BY: N.S.

REF.: T08046 - P456
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: N.S.

DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS
0.0		Ground Surface						
-0.2	0	**200 mm TOPSOIL**		S1	SS	36	8	
		mottled brown **ploughed/disturbed** **Silty Clay/Clayey Silt** trace topsoil, organic stains damp		S2	SS	50	11	
-1.1	1	very stiff		S3	SS	63	32	
		brown **SILTY CLAY/CLAYEY SILT TILL** occ. sand seam interbeddings embeddings damp, hard		S4	SS	63	55	
	2			S5	SS	36	90/28 cm	
	3	grey occ. sand seams intebeddings damp, occ. moist to wet seams		S6	SS	41	82	
	4			S7	SS	58	91/28 cm	
-5.1	5	**End of Borehole** Water Level on Completion: 4.4 m						
	6							
	7							

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

WATER CONTENT (%) (10 20 30)
35
19
11
8

TOV ppm

REMARKS
GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Appendix E

Logs & Location Plan of Sirati Boreholes Drilled in Parcel E

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			Project No: SP-16-181-10	Drawing No: 1
				Title:	Borehole Location Plan
Drawn:	JD	Approved:	AS	Project:	Preliminary Geotechnical Investigation 6314 Ninth Line, Mississauga, ON
Date:	18-Jan-17	Scale:	N.T.S		
Original Size:	Tabloid	Rev:	N/A		

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

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

LOG OF BOREHOLE BH1

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Mattamy Homes
PROJECT LOCATION: 6314 Ninth Line, Mississauga, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jan/09/2017

REF. NO.: SP16-181-10
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 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)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
191.1												
190.9 0.0	**GRANULAR BASE:** 150mm (Sand & Gravel)						191					
0.2	**FILL:** sand & gravel, interbedded with a layer of topsoil, brown, moist, dense		1	SS	39							
190.3												
190.2	**POSSIBLE FILL:** clayey silt, some sand, brown, wet, very soft											
1 0.9	**SILTY CLAY:** trace sand, brown, moist, stiff		2	SS	8			W. L. 190.4 m Jan 23, 2017 Jan 13, 2017				
	layer of silt at 1.2m											
			3	SS	9							0 2 53 45
2 188.8							189					
2.3	**SILTY CLAY TILL:** sandy, trace gravel, occasional cobble/boulder, grey, moist, stiff to very stiff		4	SS	12							
3			5	SS	29		188					
4 186.7							187					
4.4	**SANDY SILT TILL:** some clay to clayey, trace gravel, occasional cobble/boulder, grey, moist, dense to very dense		6	SS	51							10 36 38 16
5							186					
6			7	SS	38		185					
7							184					
			8	SS	50/ 150mm							
8 182.9							183					
8.2	**END OF BOREHOLE**											

Notes:
1) Monitoring well installed in the borehole upon completion.
2)Water level in monitoring well at 0.85m on Jan 13,2017
3)Water level in monitoring well at 0.71m on Jan 23,2017

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 SP16-181-10 - 6314 NINTH LINE, MISSISSAUGA.GPJ SPCL.GDT 1/24/17

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

LOG OF BOREHOLE BH2

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Mattamy Homes
PROJECT LOCATION: 6314 Ninth Line, Mississauga, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jan/10/2017

REF. NO.: SP16-181-10
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
190.9							
0.0	**FILL:** clayey silt mixed with shale fragments, brownish grey, moist, hard		1	SS	41		
190.1							
0.8	**FILL:** clayey silt, trace organics, brownish grey, moist, firm		2	SS	7		190
1			3	SS	8		
188.9							189
2.0	**SILTY CLAY:** trace sand, brown, moist, stiff						
188.6							
2.3	**SILTY CLAY TILL:** sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		4	SS	17		
3			5	SS	33		188
4							187
186.5							
4.4	**SANDY SILT TILL:** some clay to cleyey, trace gravel, occasional cobble/boulder, grey, moist, compact to very dense		6	SS	19		
5							186
6			7	SS	50		185
7							184
8			8	SS	50/ 100mm		183
182.7							
8.2	**END OF BOREHOLE** Notes: 1) Borehole dry on 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)

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

SPCL SOIL LOG SP16-181-10 - 6314 NINTH LINE, MISSISSAUGA.GPJ SPCL.GDT 1/24/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

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

LOG OF BOREHOLE BH3

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Mattamy Homes
PROJECT LOCATION: 6314 Ninth Line, Mississauga, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jan/10/2017

REF. NO.: SP16-181-10
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 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)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
190.9												
0.0	**FILL:** sand and gravel mixed with clayey silt, dark grey, moist, very dense		1	SS	50/ 100mm							
190.1												
0.8	**FILL:** silty clay, trace to some organics, grey, moist, firm		2	SS	6		W. L. 190.1 m Jan 23, 2017					
189.4												
1.5	**SILTY CLAY TILL:** sandy, trace gravel, occasional cobble/boulder, brown, moist, stiff to very stiff		3	SS	13		189					
			4	SS	20		W. L. 188.7 m Jan 13, 2017					
			5	SS	27		188					
	grey below 4.3m		6	SS	14		187					
	interbed of silt at 4.8m						186					
184.8							185					
6.1	**SANDY SILT TILL:** some clay to clayey, trace gravel, occasional cobble/boulder, grey, moist, very dense		7	SS	50/ 150mm		184					
182.7			8	SS	51		183					
8.2	**END OF BOREHOLE**											

Notes:
1) Monitoring well installed in the borehole upon completion.
2)Water level in monitoring well at 2.25m on Jan 13,2017
3)Water level in monitoring well at 0.77m on Jan 23,2017

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

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

SPCL SOIL LOG SP16-181-10 - 6314 NINTH LINE, MISSISSAUGA.GPJ SPCL.GDT 1/24/17

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

LOG OF BOREHOLE BH4

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Mattamy Homes
PROJECT LOCATION: 6314 Ninth Line, Mississauga, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jan/10/2017

REF. NO.: SP16-181-10
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
190.9												
0.0 / 190.7	**TOPSOIL:** 250mm											
0.3	**FILL:** clayey silt, trace gravel, trace sand, trace rootlets, brown, moist, soft to firm		1	SS	6							
			2	SS	6		190					
			3	SS	3		189					
188.6												
2.3	**SILTY CLAY TILL:** sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard		4	SS	20		188					6 26 48 20
			5	SS	35		187					
186.5												
4.4	**SANDY SILT TILL:** some clay to cleyey, trace gravel, grey, moist, dense to very dense		6	SS	53		186					
			7	SS	40		185					
			8	SS	50/ 150mm		184					
182.7							183					
8.2	**END OF BOREHOLE**											

W. L. 188.8 m Jan 23, 2017
W. L. 184.6 m Jan 13, 2017

Notes:
1) Monitoring well installed in the borehole upon completion.
2) Water level in monitoring well at 6.3m on Jan 13,2017
3)Water level in monitoring well at 2.09m on Jan 23,2017

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 SP16-181-10 - 6314 NINTH LINE, MISSISSAUGA.GPJ SPCL.GDT 1/24/17

Appendix F

Logs & Location Plan of Shad Boreholes Drilled in Parcel F
(Missing from Shad's geotechnical report)

Appendix G

Logs & Location Plan of Shad Boreholes Drilled in Parcel G

LEGEND:

Borehole

NOTES:

1. All borehole locations are approximate.
2. Drawing not to scale.
3. The drawing should be read in conjunction with the associated report By Shad & Associates Inc., T08046

CLIENT:
Derry Britannia Developments Limited
C /o Mattamy Development Corporation

SHAD & ASSOCIATES INC.
GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS ENGINEERS

83 Citation Drive, Unit 9,
Vaughan, Ontario, L4K 2Z6
Tel: (905) 760-5566
Fax: (905) 760-5567
www.shadinc.ca

Drawn By: S.A.
Checked By: N.S.
Datum: -
Projection: -
Scale: N.T.S.

TITLE: BOREHOLE LOCATION PLAN

PROJECT: **Geotechnical Investigation**

Property P457
Ninth Line, Milton, Ontario

DATE: October 2008
PROJECT NO.: **T08046**
FIGURE No.: **2**

RECORD OF BOREHOLE BH 1

CLIENT: Mattamy Development Corporation
LOCATION: Ninth line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08046 - P457
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: S.A.
DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS
		Ground Surface						
	0	**150 mm Topsoil**						
		mottled brown **ploughed / disturbed** **Silty Clay/Clayey Silt** occasional topsoil, organic stains damp		S1	SS	28	6	
	1			S2	SS	56	31	
		brown **SILTY CLAY/CLAYEY SILT TILL** occasional oxidized fisssures damp, hard		S3	SS	56	31	
	2			S4	SS	61	38	
	3			S5	SS	46	54	
	4	grey		S6	SS	56	26	▼
				S7	SS	64	26	
	5	**End of Borehole** Water Level on Completion: 3.9 m						
	6							
	7							

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa ▲ 20 40 60 80 100 ▲

WATER CONTENT (%) 10 20 30

SAMPLE	WATER CONTENT (%)
S1	29
S2	15
S5	17
S6	12
S7	15

TOV ppm

REMARKS

GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

RECORD OF BOREHOLE BH 2

CLIENT: Mattamy Development Corporation
LOCATION: Ninth line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08046 - P457
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: S.A.
DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface										
	0	**100 mm Topsoil**		S1	SS	46	12			26		
		mottled brown **ploughed / disturbed** **Silty Clay/Clayey Silt** occasional organic stains moist										
	1	brown **CLAYEY SILT/SILTY CALY TILL** occasional oxidized fissures damp, very stiff to hard		S2	SS	53	31					
				S3	SS	46	17			15		
	2			S4	SS	56	49					
	3			S5	SS	61	48			11		pp>225 kPa
	4			S6	SS	46	26			11		pp>225 kPa
		grey occasional sand seams										
	5			S7	SS	56	36			12		
		End of Borehole										
		Water Level on Completion: 4.35 m										
	6											
	7											

RECORD OF BOREHOLE BH 3

CLIENT: Mattamy Development Corporation
LOCATION: Ninth line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08046 - P457
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: S.A.
DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface										
	0	**150 mm Topsoil**		S1	SS	48	6			33		
		mottled brown **ploughed / disturbed, Silty Clay/Clayey Silt** occasional organic stains moist										
	1			S2	SS	48	9			34		
				S3	SS	48	21					pp>225 kPa
	2	brown **CLAYEY SILT/SILTY CLAY TILL** damp, very stiff to hard		S4	SS	63	48			14		pp>225 kPa
	3			S5	SS	56	47	▼				
		grey occasional sandy seams		S6	SS	43	33			13		
	4			S7	SS	10	84/25 mm			11		
	5	**End of Borehole**										
		Water Level on Completion: 3.3 m										
	6											
	7											

RECORD OF BOREHOLE BH 4

CLIENT: Mattamy Development Corporation
LOCATION: Ninth line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08046 - P457
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: S.A.
DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface										
	0	**150 mm Topsoil**		S1	SS	46	7			31		
		mottled brown **ploughed / disturbed** **Silty Clay/Clayey Silt** occasional organic stains and rootlets moist										
	1	mottled brown to brown **SILTY CLAY/CLAYEY SILT TILL** moist to wet, firm		S2	SS	43	4			28		
		moist, stiff to very stiff		S3	SS	66	14					
	2			S4	SS	55	28	▼		25		
	3			S5	SS	58	13					pp=100 kPa
	4	grey hard occasional sand seams		S6	SS	38	101/230 mm			6		
	5			S7	SS	28	105/150 mm			9		pp >225 kPa
		End of Borehole										
		Water Level on Completion: 2.10 m										
	6											
	7											

RECORD OF BOREHOLE BH 5

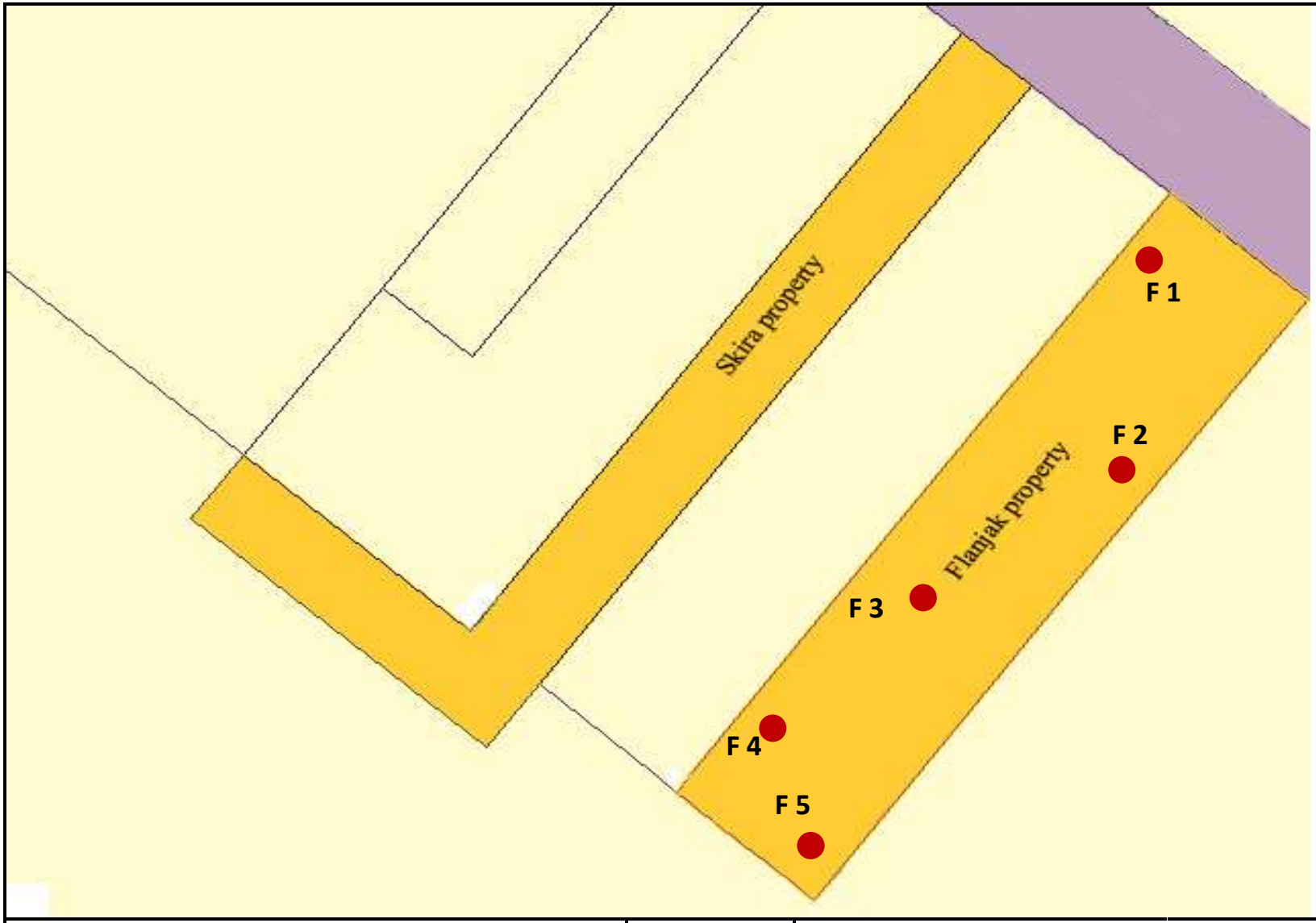
CLIENT: Mattamy Development Corporation
LOCATION: Ninth line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08046 - P457
BOREHOLE TYPE: Solid Stem Auger
COMPILED BY: S.A.
DATUM: N/A
DATE: October 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface										
	0	**150 mm Topsoil**								32		
		mopttled brown **Ploughed / disturbed** **Silty Clay/Clayey Silt** occasional topsoil, organic stains and rootlets moist		S1	SS	48	9					
				S2	SS	40	4			27		
	1											
		brown **SILTY CLAY/CLAYEY SILT TILL** moist, stiff to very stiff		S3	SS	48	15					pp = 100 kPa
	2											
				S4	SS	45	21			28		pp = 175 kPa
		grey damp										
	3			S5	SS	53	20					
				S6	SS		50/130 mm			9		
	4											
				S7	SS		50/130 mm			13		
	5	**End of Borehole**										
		Water Level on Completion: 1.2 m										
	6											
	7											

Appendix H

Logs & Location Plan of Shad Boreholes Drilled in Parcel H



LEGEND:

Borehole
F 1

NOTES:

1. All borehole locations are approximate.
2. Drawing not to scale.
3. The drawing should be read in conjunction with the associated report By Shad & Associates Inc., T08005

CLIENT:
Mattamy Development Corp

SHAD & ASSOCIATES INC.
GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS ENGINEERS

83 Citation Drive, Unit 9,
Vaughan, Ontario, L4K 2Z6
Tel: (905) 760-5566
Fax: (905) 760-5567
www.shadinc.ca

Drawn By: S.A.
Checked By: N.S.
Datum: -
Projection: -
Scale: N.T.S.

TITLE: BOREHOLE LOCATION PLAN

PROJECT: **Geotechnical Investigation**
Flanjak Property
Milton, Ontario

DATE: MAY 2008
PROJECT NO.: **T08005**
FIGURE No.: **2**

RECORD OF BOREHOLE BH-F1

CLIENT: Mattamy Development Corp
LOCATION: 6252 - 9th Line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08005
BOREHOLE TYPE: Solid Stem Augering
COMPILED BY: N.S.
DATUM: N/A
DATE: May 23, 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface										
	0	**Topsoil**		1	SS	18	4			22		
		moist, stiff								20		
	1			2	SS	56	18					
		brown **Clayey Silt TILL** damp, very stiff to hard		3	SS	25	22			16		
	2			4	SS	50	37			11		
		grey oxidized fissures										
	3			5	SS	23	37					
	4			6	SS	55	26	▼		10		
		grey **Silty Clay TILL** with **Silty Sand** inclusions damp, hard		7	SS	43	59					
	5	**End of Borehole** Measured depth on completion: 5.0 m Ground water depth on completion: 4.2 m										
	6											
	7											

RECORD OF BOREHOLE BH-F2

CLIENT: Mattamy Development Corp
REF.: T08005
DATUM: N/A

LOCATION: 6252 - 9th Line, Milton, Ontario
BOREHOLE TYPE: Solid Stem Augering
DATE: May 23, 2008

ORIGINATED BY: N.S.
COMPILED BY: N.S.
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface										
	0	**Topsoil**										
		mottled brown ploughed/disturbed **Clayey Silt FILL** trace organics, trace rootlets wet		1	SS	10	10			28, 23		
	1	brown **Clayey Silt TILL** moist to wet		2	SS	47	7			24, 26		
		firm		3	SS	27	11			26		
	2	stiff to very stiff		4	SS	53	25	▼				
	3	oxidized fissures damp, hard		5	SS	27	53			15, 10		
	4			6	SS	60	35			13		
		trace shale fragments grey		7	SS	45	72					
	5	**End of Borehole** Measured depth on completion: 5.0 m Groundwater depth on completion: 2.25 m										
	6											
	7											

RECORD OF BOREHOLE BH-F3

CLIENT: Mattamy Development Corp
REF.: T08005
DATUM: N/A

LOCATION: 6252 - 9th Line, Milton, Ontario
BOREHOLE TYPE: Solid Stem Augering
DATE: May 23, 2008

ORIGINATED BY: N.S.
COMPILED BY: N.S.
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface										
	0	**Topsoil**		1	SS	38	7			29		
	1	mottled brown ploughed/disturbed **Clayey Silt FILL** trace organics, trace rootlets		2	SS	13	7			22		
	2	molted brown **Clayey Silt** oxidized fissures wet, firm		3	SS	48	5			29		
	3	brown **Clayey Silt TILL** moist to wet, very stiff		4	SS	30	20	▼		23		
		grey damp		5	SS	63	24					
	4			6	SS	40	29			11		
		grey **Silty Clay TILL** damp, hard		7	SS	55	98					
	5	**End of Borehole** Measured depth on completion: 5.0 m Groundwater depth on completion: 2.4 m										
	6											
	7											

RECORD OF BOREHOLE BH-F4

CLIENT: Mattamy Development Corp
LOCATION: 6252 - 9th Line, Milton, Ontario
ORIGINATED BY: N.S.
REF.: T08005
BOREHOLE TYPE: Solid Stem Augering
COMPILED BY: N.S.
DATUM: N/A
DATE: May 23, 2008
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface										
	0	**Topsoil**		1	SS	15	8			25		
										21		
	1	mottled brown ploughed/disturbed **Clayey Silt FILL** trace rootlets, trace organics moist		2	SS	43	8			23		
				3	SS	10	5			23		
	2	mottled brown **Silty ClayTILL** moist to wet, firm		4	SS	56	18	▼				
		brown moist										
	3	greyish brown **Silty Clay /Clayey Silt TILL** damp, stiff to very stiff		5	SS	60	13					
	4			6	SS	56	16					
		grey hard		7	SS	46	55			13		
	5	**End of Borehole** Measured depth on completion: 5.0 m Groundwater depth on completion: 2.1 m										
	6											
	7											

RECORD OF BOREHOLE BH-F5

CLIENT: Mattamy Development Corp
REF.: T08005
DATUM: N/A

LOCATION: 6252 - 9th Line, Milton, Ontario
BOREHOLE TYPE: Solid Stem Augering
DATE: May 26, 2008

ORIGINATED BY: N.S.
COMPILED BY: N.S.
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario,L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 10 20 30	TOV ppm	REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface										
	0	**Topsoil**		1	SS	19	7			25		
										26		
	1	brown ploughed **SiltyClay/Clayey Silt FILL** some **Sand** moist		2	SS	13	4			25		
				3	SS	33	9			23		
	2	brown **Clayey Silt TILL** with **Silty Clay** zones occasional oxidized fissures moist, stiff to very stiff		4	SS	35	20					
		grey		5	SS	35	10					
	3											
	4			6	SS	50	19					
		with **Silty Clay** zones damp, hard		7	SS	51	89					
	5	**End of Borehole** Measured depth on completion: 1.5 m Groundwater depth on completion: 1.3 m										
	6											
	7											

Appendix I

Logs & Location Plan of Shad Boreholes Drilled in Parcel I

N
W E
S

LEGEND:

BH 1
Borehole Locations

NOTES:

1. Borehole locations are approximate.
2. Drawing not to scale.
3. The drawing should be read in conjunction with the associated report by Shad & Associates Inc., T18723-B.

CLIENT:
Mattamy Development Corp.

SHAD & ASSOCIATES INC.
GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS CONSULTING ENGINEERS
83 Citation Drive, Unit 9
Vaughan, Ontaruio, L4K 2Z6
Tel: (905) 760-5566
Fax: (905) 760-5567
www.shadinc.com

SHAD & ASSOCIATES INC.

Drawn By:	M.Z.
Checked By:	S.C.
Datum:	-
Projection:	-
Scale:	N.T.S.

TITLE:
BOREHOLE LOCATION PLAN

PROJECT:
Preliminary Geotechnical Investigation
P458 Property
6168 Ninth Line
Mississauga, ON

Date: April, 2018
Project No.: T18723-B
Figure No.: 2

RECORD OF BOREHOLE 1

Project No.: T18723-B **CLIENT:** Mattamy Development Corp. **ORIGINATED BY:** M.Z.

DATE: March 20, 2018 **LOCATION:** Mississauga, Ontario **COMPILED BY:** M.Z.

DATUM: Geodetic **BOREHOLE TYPE:** Solid Stem Auger **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
190.2		Ground Surface										
189.9	0	**Topsoil**										Ground surface frozen at the time of fieldwork.
189.5		mottled brown **Ploughed Sandy Silt Fill** some organic stains, moist		1	SS	30	5			34, 27		
		trace organis stains, trace rootlets										
	1	stiff, damp to moist		2	SS	30	12			23		Gradation Analysis & Atterberg Limits, S(2): 1 10 58 31 LL: 33% PL: 19% PI: 14%
188.3		brown **Silty Clay** oxx. oxidized fissures damp, very stiff		3	SS	35	24			18		
	2	very stiff		4	SS	30	38			12		
		greyish brown **Silty Clay Till** some oxidized fissures damp, hard										
	3			5	SS	30	68			10		
	4	grey										
185.2				6	SS	30	35			12		
	5	**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: Dry										
	6											
	7											

RECORD OF BOREHOLE 2

Project No.: T18723-B **CLIENT:** Mattamy Development Corp. **ORIGINATED BY:** M.Z.

DATE: March 20, 2018 **LOCATION:** Mississauga, Ontario **COMPILED BY:** M.Z.

DATUM: Geodetic **BOREHOLE TYPE:** Solid Stem Auger **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
189.9		Ground Surface										
189.6	0	**Topsoil**										Ground surface frozen at the time of fieldwork.
		mottled brown **Ploughed Sandy Silt Fill** some organic stains, moist		1	SS	30	5			31		
189.0										30		
	1	stiff trace to some sand		2	SS	30	10			25		
		brown **Silty Clay** damp to moist, very stiff		3	SS	35	19			23		
	2	occ. silt seams, occ. oxidized fissures		4	SS	30	25			22		
	3			5	SS	30	17			22		
186.6		damp to moist, very stiff								11		Gradation Analysis & Atterberg Limits, S(6): 5 18 49 28 LL: 22% PL: 14% PI: 8%
		grey **Silty Clay Till** some oxidized fissures occ. sand seams damp, hard		6	SS	30	42			9		
	4			7	SS	23	35	March 20, 2018		11		
184.9	5	**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: 4.6m										
	6											
	7											

RECORD OF BOREHOLE 3

Project No.: T18723-B **CLIENT:** Mattamy Development Corp. **ORIGINATED BY:** M.Z.

DATE: March 21, 2018 **LOCATION:** Mississauga, Ontario **COMPILED BY:** M.Z.

DATUM: Approximate Geodetic **BOREHOLE TYPE:** Solid Stem Auger **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS
~190.0	0	Ground Surface						
		Topsoil		1	SS	23	5	
189.5		mottled brown **Ploughed Clayey Sandy Silt Fill** some organic stains, moist						
189.1	1	occ. sand seams moist, stiff		2	SS	28	12	
		brown **Silty Clay** damp to moist, very stiff		3	SS	15	17	
	2			4	SS	25	21	
	3			5	SS	23	16	
		grey occ. sand seams moist to wet, stiff						
185.9	4	damp to moist, stiff		6	SS	35	11	
		grey **Silty Clay Till** occ. sand seams damp, very stiff		7	SS	35	24	
185.0	5	**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: 3.1m Measured Water Level in installed Piezometer on: March 29, 2018: 0.8 m April 4, 2018: 0.5 m						
	6							
	7							

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

SHEAR STRENGTH kPa (20 40 60 80 100)

WATER CONTENT (%) (5 15 25 35)

WATER CONTENT (%)
28
24
24
24
24
26
26
14

MONITORING WELL

March 29, 2018
April 4, 2018

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

Ground surface frozen at the time of fieldwork.

Borehole moved to 20m west, 5m south of staked location due to access.

RECORD OF BOREHOLE 4

Project No.: T18723-B **CLIENT:** Mattamy Development Corp. **ORIGINATED BY:** M.Z.

DATE: March 21, 2018 **LOCATION:** Mississauga, Ontario **COMPILED BY:** M.Z.

DATUM: Geodetic **BOREHOLE TYPE:** Solid Stem Auger **CHECKED BY:** H.S.

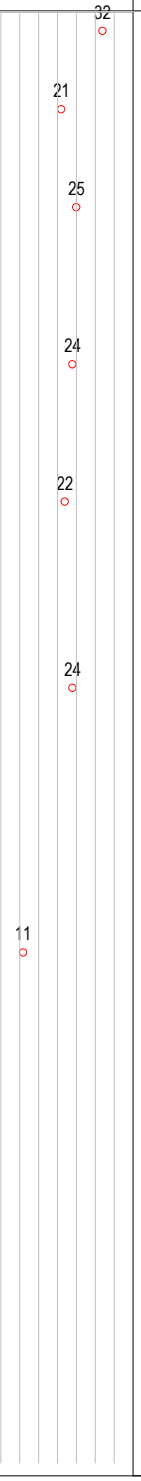
SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS
190.1		Ground Surface						
	0	**Topsoil**						
189.8		mottled brown **Ploughed Sandy Silt Fill** occ. organic stains, moist		1	SS	30	5	
189.4		occ. organic stains, trace rootlets						
	1	brown **Clayey Sandy Silt** occ. oxidized fissures wet, loose		2	SS	28	9	March 21, 2018
188.7		brown **Silty Clay** occ. oxidized fissures damp to moist, very stiff		3	SS	35	21	
	2			4	SS	30	25	
	3	greyish brown occ. silt seams		5	SS	35	25	
186.7		grey **Silty Clay Till** damp, very stiff						
	4							
185.2		occ. silty sand till seams hard		6	SS	15	50/13cm	
	5	**End of Borehole**						
		Cave-in Depth on Completion: None Groundwater Depth on Completion: 1.3m Measured Water Level in installed Piezometer on: March 28, 2018: 0.4 m April 4, 2018: 0.1 m						
	6							
	7							

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

SHEAR STRENGTH kPa (20 40 60 80 100)

WATER CONTENT (%) (5 15 25 35)



MONITORING WELL

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

Ground surface frozen at the time of fieldwork.

RECORD OF BOREHOLE 5

Project No.: T18723-B **CLIENT:** Mattamy Development Corp. **ORIGINATED BY:** M.Z.

DATE: March 20, 2018 **LOCATION:** Mississauga, Ontario **COMPILED BY:** M.Z.

DATUM: Geodetic **BOREHOLE TYPE:** Solid Stem Auger **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
191.3		Ground Surface										
191.0	0	**Topsoil**										Ground surface frozen at the time of fieldwork.
		mottled brown **Ploughed Sandy Silt Fill** some organic stains, moist		1	SS	30	6			17		
190.6		mottled brown, occ. organic stains										
	1	brown **Clayey Sandy Silt** occ. sand interbeddings moist to wet, loose to compact		2	SS	30	10	▼ March 20, 2018		22		
				3	SS	35	13					
189.4		brown								24		
	2	greyish brown **Silty Clay** occ. sand seams damp to moist, very stiff		4	SS	35	25			21		
	3	moist, stiff		5	SS	15	13			23		
187.6		grey **Silty Clay Till** occ. sand seams damp to moist, very stiff		6	SS	28	23			12		
186.8	4											
186.3		grey **Silty Clay** damp to moist, very stiff		7	SS	30	27			21		
	5	**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: 1.0m										
	6											
	7											

RECORD OF BOREHOLE 6

Project No.: T18723-B **CLIENT:** Mattamy Development Corp. **ORIGINATED BY:** M.Z.

DATE: March 21, 2018 **LOCATION:** Mississauga, Ontario **COMPILED BY:** M.Z.

DATUM: Geodetic **BOREHOLE TYPE:** Solid Stem Auger **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS
189.9		Ground Surface						
189.6	0	**Topsoil**		1	SS	20	5	March 21, 2018
189.3		mottled brown **Ploughed Clayey Sandy Silt Fill** occ. organic stains, moist						
188.5	1	brown **Clayey Sandy Silt** occ. sand interbeddings moist to wet, loose		2	SS	30	8	
186.3	2	brown **Silty Clay** occ. silt seams damp to moist, very stiff some oxidized fissures		3	SS	28	16	
	3	moist		4	SS	30	30	
				5	SS	17	18	
184.9	4	grey **Silty Clay Till** occ. sand seams damp to moist, very stiff		6	SS	23	16	
	5	damp **End of Borehole** Cave-in Depth on Completion: 4.5m Groundwater Depth on Completion: 1.1m		7	SS	28	26	
	6							
	7							

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

SHEAR STRENGTH kPa (20 40 60 80 100)

WATER CONTENT (%) (5 15 25 35)

SAMPLE NUMBER	WATER CONTENT (%)
1	37
2	23
3	22
4	24
5	24
6	26
7	14
	11

MONITORING WELL

REMARKS AND

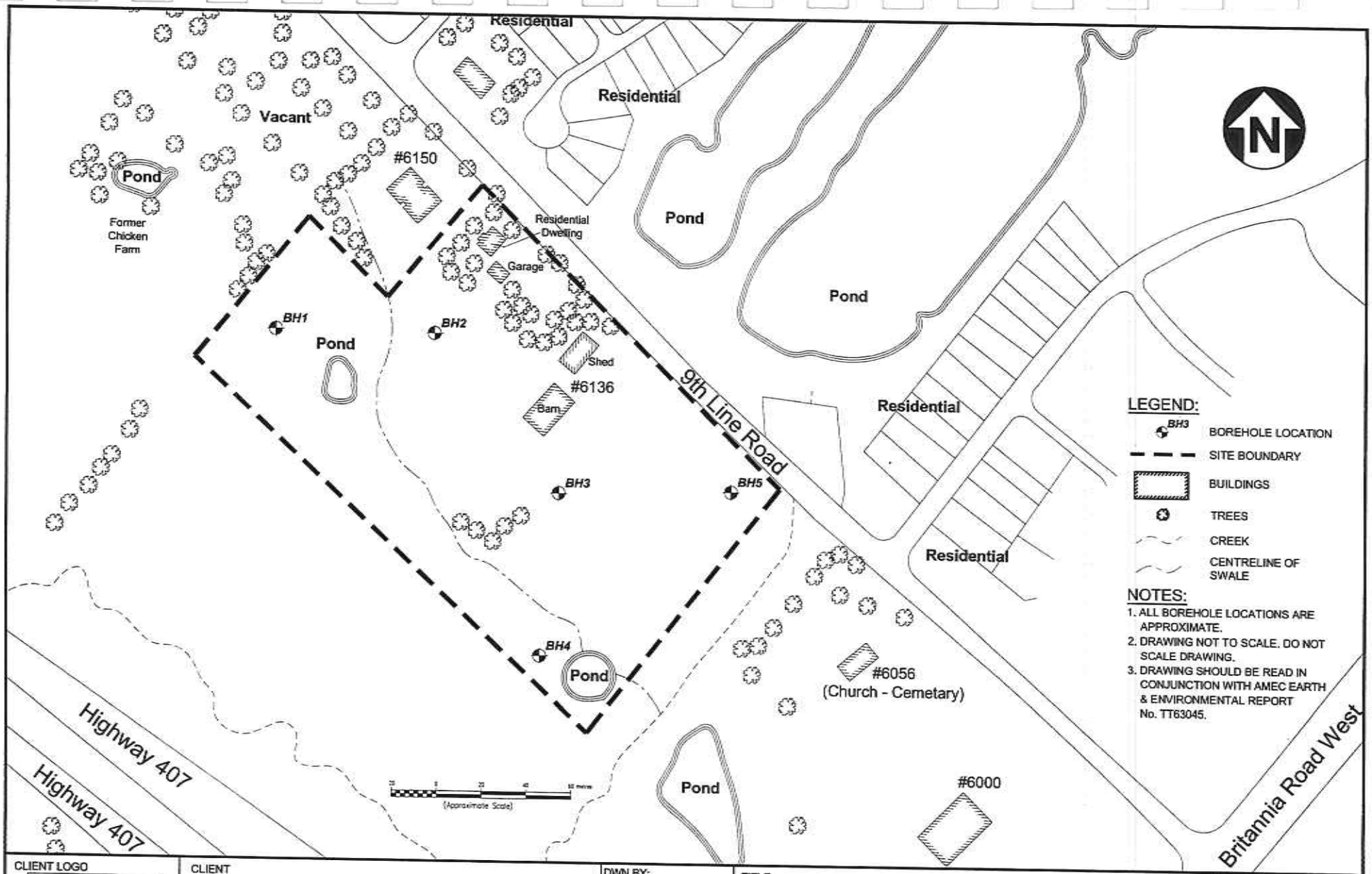
GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

Ground surface frozen at the time of fieldwork.

Appendix J

Logs & Location Plan of AMEC Boreholes Drilled in Parcel J



CLIENT LOGO

CLIENT
MATTAMY HOMES LIMITED
(PEEL DIVISION)

DWN BY: KW
CHK'D BY: RCW
DATUM: -
PROJECTION: -
SCALE: AS SHOWN

TITLE
BOREHOLE LOCATION PLAN

REV. NO.: A
DATE: 23 MAY 2006
PROJECT NO: TT63045
FIGURE No. 2

AMEC Earth & Environmental
a Division of AMEC Americas Limited
104 Crockford Blvd, Scarborough, Ontario, M1R 3C3

PROJECT
PRELIMINARY
GEOTECHNICAL INVESTIGATION
NUNAN/HALK PROPERTY
6136 9th Line, Milton, Ontario

Z:\Projects\2006\TT63045-Mattamy-NUNAN HALK\Drawings\TT63045 - Borehole Location Plan_Fig2.dwg - Layout1 - May. 26, 2006 10:38am - kent.wong

amec

RECORD OF BOREHOLE No BH 1 1 OF 1

CLIENT Mattamy Homes Limited (Peel Div) LOCATION 6136 Ninth Line, Milton, Ontario (NUNAN / HALK) ORIGINATED BY MA

REF. TT63045 BOREHOLE TYPE Solid Stem Augering COMPILED BY SN

DATUM Geodetic DATE 11 May 2006 CHECKED BY IH

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
189.8												
0.0	**about 360 mm TOPSOIL**											
189.4			1	SS	8							
0.4	dark brown to brown **SILTY CLAY / CLAYEY SILT** trace rootlets in SS1 stiff to hard moist											
			2	SS	11		1	189				
	grey											
			3	SS	17		2	188				
	brownish grey											
			4	SS	33		3	187				
			5	SS	25	▽						
185.8							4	186				
4.0	grey **SILTY CLAY** stiff moist											
			6	SS	8		5	185				
184.3												
5.5	grey **SILTY CLAY / CLAYEY SILT TILL** trace sand and gravel hard moist						6	184				
			7	SS	61/23							
183.3												
6.5	**End of Borehole**											

Groundwater in open borehole on completion: 3.4 m

$+^3$ $\times^3$ Numbers refer to Sensitivity

amec

RECORD OF BOREHOLE No BH 2 1 OF 1

CLIENT Mattamy Homes Limited (Peel Div) LOCATION 6136 Ninth Line, Milton, Ontario (NUNAN / HALK) ORIGINATED BY MA

REF. TT63045 BOREHOLE TYPE Solid Stem Augering COMPILED BY SN

DATUM Geodetic DATE 11 May 2006 CHECKED BY IH

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
190.1 0.0	**about 250 mm TOPSOIL**							190				
189.9 0.3	dark brown to brown **SILTY CLAY / CLAYEY SILT** stiff to hard moist		1	SS	12		1	189				
	trace rootlets		2	SS	28							
	brown and grey		3	SS	12		2	188				
			4	SS	31	▽	3	187				
186.6 3.5	grey **SILTY CLAY** firm to stiff moist		5	SS	39							
			6	SS	12		4	186				
			7	SS	6		5	185				
			8	SS	8		6	184				
183.5 6.6	**End of Borehole**											

Groundwater in open borehole on completion: 3.1 m

+³ ×³ Numbers refer to Sensitivity

amec

RECORD OF BOREHOLE No BH 3 1 OF 1

CLIENT Mattamy Homes Limited (Peel Div) LOCATION 6136 Ninth Line, Milton, Ontario (NUNAN / HALK) ORIGINATED BY MA

REF. TT63045 BOREHOLE TYPE Solid Stem Augering COMPILED BY SN

DATUM Geodetic DATE 11 May 2006 CHECKED BY IH

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
189.8												
0.0	**about 250 mm TOPSOIL**											
189.6												
0.3	brown **SILTY CLAY / CLAYEY SILT** trace rootlets in SS1 stiff to hard moist		1	SS	8							
			2	SS	8		1	189				
			3	SS	20		2	188				
			4	SS	35							
			5	SS	32	▽	3	187				
186.1												
3.7	grey **SILTY CLAY** stiff wet		6	SS	8		4	186				
			7	SS	11		5	185				
184.8												
5.0	**End of Borehole**											

Groundwater in open borehole on completion: 3.1 m

+3 ×3 Numbers refer to Sensitivity

amec

RECORD OF BOREHOLE No BH 4 1 OF 1

CLIENT Mattamy Homes Limited (Peel Div) LOCATION 6136 Ninth Line, Milton, Ontario (NUNAN / HALK) ORIGINATED BY MA

REF. TT63045 BOREHOLE TYPE Solid Stem Augering COMPILED BY SN

DATUM Geodetic DATE 11 May 2006 CHECKED BY IH

ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH (m)	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
189.4												
0.0	**about 360 mm TOPSOIL**											
189.0			1	SS	8			189				
0.4	dark brown to brown **SILTY CLAY / CLAYEY SILT** stiff to hard moist trace rootlets		2	SS	14		1	188				
			3	SS	28		2					
			4	SS	42		3	187				
			5	SS	27			186				
185.4							4					
4.0	grey **SILTY CLAY / CLAYEY SILT TILL** some sand and gravel very stiff moist to wet		6	SS	20			185				
184.4							5					
5.0	**End of Borehole**											

No noticeable groundwater in open borehole on completion

$+^3$ $\times^3$ Numbers refer to Sensitivity

amec

RECORD OF BOREHOLE No BH 5 1 OF 1

CLIENT Mattamy Homes Limited (Peel Div) LOCATION 6136 Ninth Line, Milton, Ontario (NUNAN / HALK) ORIGINATED BY MA

REF. TT63045 BOREHOLE TYPE Solid Stem Augering COMPILED BY SN

DATUM Geodetic DATE 11 May 2006 CHECKED BY IH

ELEV / DEPTH (m)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
189.6												
0.0	**about 250 mm TOPSOIL**											
189.4												
0.3	dark brown to yellowish brown **SILTY CLAY / CLAYEY SILT** trace rootlets in SS1 stiff to hard moist		1	SS	10							
			2	SS	10		1	189				
			3	SS	23		2	188				
			4	SS	44		3	187				
			5	SS	20							
185.9								186				
3.7	grey **SILTY CLAY** stiff moist to wet		6	SS	13		4					
			7	SS	14		5	185				
184.6												
5.0	**End of Borehole**											

No noticeable groundwater in open borehole on completion

+3 ×3 Numbers refer to Sensitivity

Appendix K

General Comments on Bedrock in Toronto Area

General Comments – Bedrock in Greater Toronto Area

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

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

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

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

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

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

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

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

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

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

Appendix L
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.

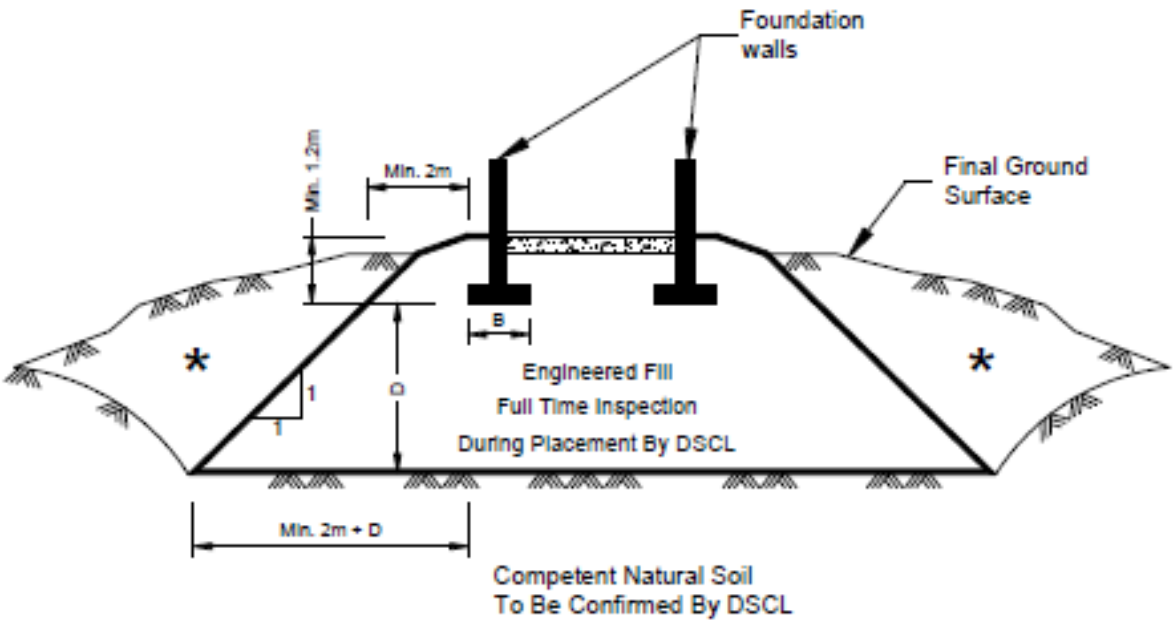
10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from DSCL prior to footing concrete placements. All excavations must be backfilled under full time supervision by DSCL to the same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

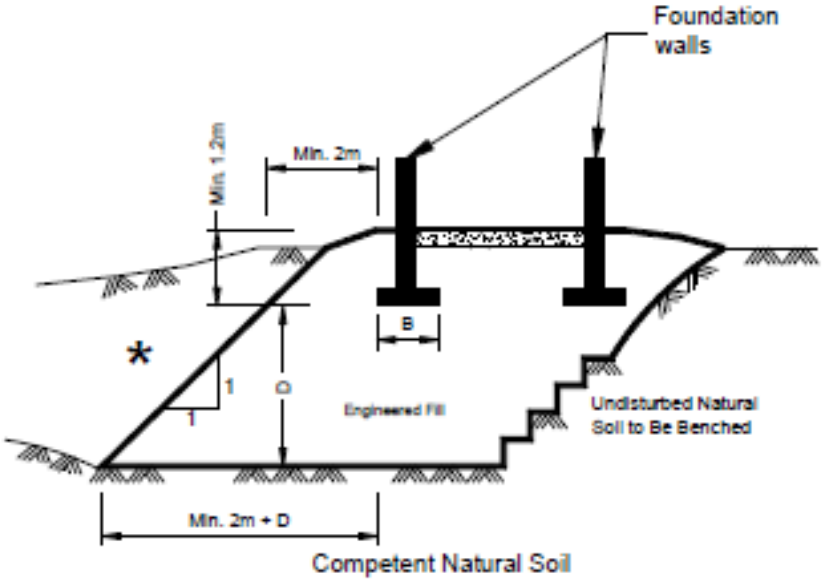
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any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