REPORT ON
SLOPE STABILITY INVESTIGATION
DON MILLS ROAD AND EGLINTON AVENUE EAST
TORONTO, ONTARIO

Prepared for:

TORONTO AND REGION CONSERVATION AUTHORITY

Prepared By:

SIRATI & PARTNERS CONSULTANTS LIMITED

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

Project: SP16-146-10
November 8, 2016

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1. INTRODUCTION

Sirati & Partners Consultants Limited (SPCL) was retained by the Toronto and Region Conservation Authority (TRCA) to undertake a slope stability investigation at the site located on the south-west corner of Eglinton Avenue East and Don Mills Road in Toronto, Ontario.

The purpose of this geotechnical investigation was to determine the subsurface conditions at three (3) borehole locations and from the findings in the boreholes, carry out the detailed slope stability study and make recommendations for the Long-term Stable Slope Crest (LTSSC) as per TRCA's Guidelines.

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

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and 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 Toronto and Region Conservation Authority (TRCA), City of Toronto and its designers. Third party use of this report without Sirati & Partners Consultants Limited (SPCL) consent is prohibited. The limitation conditions presented in **Appendix D** form an integral part of the report and they must be considered in conjunction with this report.

2. FIELD AND LABORATORY WORK

A total of three boreholes (BH1 to BH3, see Drawing 1 for location plan) were drilled for the slope stability investigation to depths ranging from 31.1 to 32.2m. Boreholes were drilled with hollow stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of SPCL 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 SPCL laboratory for detailed examination by the project engineer and for laboratory testing.

As well as visual examination in the laboratory, all of the soil samples were tested for moisture content. Seven (7) soil samples were selected and subjected to grain size analyses. Gradation curves for grain size analyses are provided in Drawings 5 and 6. Five (5) soil samples were selected and subjected to Atterberg Limits testing. Results of the Atterberg Limits testing are presented on respective borehole logs.

Water level observations were made during drilling and in the open boreholes at the completion of the drilling operations. Monitoring wells were installed in two boreholes (BH1 and BH3) for the long-term (stabilized) groundwater level monitoring.

The elevations at the borehole locations were surveyed by SPCL personnel using differential GPS.

3. SITE AND SUBSURFACE CONDITIONS

The Project area is located largely within Ernest Thompson (E.T.) Seton Park, situated at the southwest corner of Don Mills Road and Eglinton Avenue East, in the City of Toronto. The Site is bounded by the Ontario Science Centre to the south, parking lots to the east, and parkland on the west.

The approximate study area includes the crest of the slope west of the parking lots located immediately southwest of the Don Mills Road and Eglinton Avenue East intersection. The study area extends approximately 200 m in a northwest – southeast direction, and continues down the valley wall toward the wetland/ravine. There is an approximate 30 m difference in elevation from the crest of the slope to the bottom of the study area.

The borehole locations are shown on Drawing 1. Notes on sample descriptions and the general features of fill material and glacial till are presented on Drawing 1A. Detailed subsurface conditions are presented on the Borehole Logs, Drawings 2 to 4. The soil and groundwater conditions are summarized as follows.

3.1 Soil Conditions

Topsoil /Fill Material:

A surficial topsoil layer ranging in thickness from 150 to 250 mm was encountered at all borehole locations. Fill material was found in BH1 and BH3, extending to depths ranging from 1.5 to 1.6 m. The explored fill generally consisted of clayey silt to sandy silt, with trace inclusions of topsoil in varying proportions. Fill material was present in stiff to very stiff or compact to dense state, with measured SPT ‘N’ values ranging from 14 to 31 blows per 300mm of spoon penetration.

Upper Silty Clay Deposit:

The upper silty clay deposit was encountered in all boreholes, extending to depths ranging from 6.5 to 9.1 m. Silty clay was present in a very stiff to hard consistency, with measured SPT ‘N’ values ranging from 18 to 52 blows per 300 mm of spoon penetration. Occasional wet sand seams/layers were encountered within the silty clay during drilling.

Two soil samples from upper silty clay (BH1/SS5 and BH3/SS8) were subjected to grain size analyses. Gradation curves are presented on Drawing 5, and fractions are summarized below:

Clay:	37 to 47%
Silt:	52%
Sand:	1 to 11%

Two soil samples from upper silty clay (BH1/SS5 and BH3/SS8) were subjected to Atterberg Limits testing. Results of the consistency limits are shown on the borehole logs, and are summarized below:

Liquid Limit: 35 to 37%
Plastic Limit: 18 to 20%
Plasticity Index: 17

Middle Sand:

Below the upper silty clay deposit, middle deposit of fine to coarse sand was encountered in the boreholes, extending to depths ranging from 10.7 to 15.2 m. Sand deposit was present in a dense to very dense state, with measured SPT 'N' values ranging from 30 to more than 50 blows per 300 mm of spoon penetration.

Two soil samples from middle sand deposit (BH1/SS9 and BH3/SS11) were subjected to grain size analyses. Gradation curves are presented on Drawing 6, and fractions are summarized below:

Fines (Clay+Silt): 1%
Sand: 99%

Lower Silty Clay:

Lower silty clay deposit was encountered in the boreholes below the middle sand at depths ranging from 10.7 to 15.2m and extended to depths ranging from 29.2 m to more than 31.1 m. The lower silty clay deposit contained occasional seams/interbeds of silt and sand. This deposit was present in a very stiff to hard, generally very stiff consistency, with measured SPT 'N' values ranging from 16 to 33 blows per 300 mm of spoon penetration.

Three soil samples from lower silty clay (BH1/SS14, BH1/SS20 and BH3/SS20) were subjected to grain size analyses. Gradation curves are presented on Drawing 5, and fractions are summarized below:

Clay: 29 to 34%
Silt: 64 to 70 %
Sand: 1 to 3%

Three soil samples from lower silty clay (BH1/SS14, BH1/SS20 and BH3/SS20) were subjected to Atterberg Limits testing. Results of the consistency limits are shown on the borehole logs, and are summarized below:

Liquid Limit: 28 to 33%
Plastic Limit: 18 to 20%
Plasticity Index:10 to 13

Bottom Sandy Silt to Silty Sand:

Bottom sand silt to silty sand layer, about 2 m thick, was encountered in BH1 and BH2, extending to the maximum explored depth of BH1 and overlying shale bedrock in BH2. The bottom layer of cohesionless soils was water bearing and present in dense to very dense state.

Shale Bedrock (Georgian Bay Formation):

Shale bedrock of Georgian Formation was encountered in BH2 at a depth of 32.0m, corresponding to Elevation 91.8m. Depth of shale bedrock was confirmed with the spoon sample/augering and no rock coring was carried out.

3.2 Groundwater Conditions

During drilling, the short-term groundwater (un-stabilized) was observed in boreholes at depths varying from 29 to 30m below the existing grade. The long-term (stabilized) groundwater levels observed in the monitoring well installed in BH1 was observed to be at a depth of 26.7m, corresponding to Elevation 98.1m on September 14, 2016. Other monitoring well installed in BH3 was found to be clogged and dry at a depth of 13m 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. SLOPE STABILITY ASSESSMENT

The slope stability assessment in this report is based on subsurface conditions in the boreholes, the observations during our site visits, and the slope profiles provided by the client. Stability analyses of the slopes were carried out using the computer program SLIDE 6 with the Bishop's Method of analysis. The slope conditions and the results of slope stability analyses are presented as follows.

4.1 Slope Conditions

Site visit were made by a senior geotechnical engineer of SPCL on September 14, 2016 to carry out the visual assessment of the slope. The existing site and slope conditions, including general topography of the slopes, vegetation cover, and any evidence of slope failure and erosion were examined during the site visit. Photographs of the site taken during our site visits are shown in Appendix A of this report. Based on our observations during the site visits, the slope conditions are summarized as follows:

- The height of the subject slopes was about 26 to 31 m from the top of the slope to the toe of the slope. The steepness of the slopes generally ranged from 1.5 H: 1V to 1.8 H: 1V.

- The slope was generally covered with mature trees and other vegetation. (See pictures in Appendix A). During our site visit, few bending / tilted trees and exposed root mass were noted on the slope but majority of trees were generally standing straight.

- A shallow slope failure/slip surface was observed in the west study area during our site visit. Surficial erosion was also noted in some areas, especially near the west slope area.

- No water seepage was observed on the slope surface or at the toe of slope area.

- There is an unclassified wetland located at the bottom of the slope which is generally located at more than 15m away from the toe of slope. There is no other water course located near the toe of slope.

- A drainage gully was present in the slope between Section G-G and H-H, just south of BH1, running from north to south. The gully was wet at bottom at the time of our site visit. Another narrow erosion gully was observed between Sections B-B and C-C.

Eight (8) slope profiles (Cross Sections A-A to H-H, see Drawing 1 for profile locations) were derived from the topographic map provided by the client, as presented in Appendix B (Drawings B1 to B8) of the report.

4.2 Toe Erosion Considerations

There is an unclassified wetland located at the bottom of the slope which is generally located at more than 15m away from the toe of slope area. There is a wide flood plain between the toe of slope area and the wetland. There is no other water course located near the toe of slope. In accordance with the Provincial Guidelines entitled “Understanding Natural Hazards” and considering the soil and water course conditions, it is our opinion that a creek bank erosion allowance is not required for the analyses of the long-term stable slopes at this site.

4.3 Soil Parameters and Groundwater

Based on the borehole information as described in Section 3 of this report, soil parameters used in the slope stability analyses are given on Table 1.

Table 1: Soil Parameters for Slope Stability Analyses

Soil Type (See Section 3 for soil description)	**Soil Unit Weight (kN/m^3)**	**Long-term Strength**	
		c' (kPa)	**Ø (degree)**
Fill Material	20.0	0	30
Upper Silty Clay	20.0	10	30
Middle Sand	21.5	0	36
Lower Silty Clay	20.0	8	30
Sandy silt to silty sand	21.0	0	34
Shale Bedrock	23.0	Infinite Strength	

Water level in the monitoring well installed in BH1 was observed to be at Elev. 98.1m on September 14, 2016. The direction of local groundwater is expected to be in the south-west direction towards the toe of slope to wetland.

4.4 Stability of Existing Slope

Eight (8) slope profiles (Cross Sections A-A to H-H, see Drawing 1 for profile locations) were derived from the topographic map provided by the client, as presented in Appendix B (Drawings B1 to B8) of the report.

Stability analyses of the existing slopes at Section B-B, Section D-D and Section G-G have been carried out and the results are presented on Drawings C1 to C3, using the soil parameters listed in Table 1 and considering the soil profiles in the nearby boreholes.

The calculated factor of safety (FS) of the existing slopes at Section B-B, Section D-D and Section G-G range from 1.19 to 1.31, which are less than the generally acceptable value of 1.5 for long-term stability of slopes. The existing slopes at Section B-B, Section D-D and Section G-G are considered unstable in terms of their long-term stability.

4.5 Long-term Stable Slope

In order to determine the steepness of the long-term stable slope, analyses of imaginary flatter slopes of 2H:1V have been carried out at Section B-B, Section D-D and Section G-G, as shown on Drawings C4 to C6 in Appendix C. The calculated factors of safety (FS) of the imaginary 2.0H: 1V slope on Drawings C4 to C6 are 1.50 to 1.53, which are equal or greater than the minimum acceptable value of 1.5. The 2.0H: 1V slope shown on Drawings C4 to C6 are considered stable in terms of long-term stability.

Based on the slope stability analyses results, the slopes of 2H: 1V or flatter inclination are considered to be the stable in terms of long-term stability of slopes.

In summary, the long term stable slope lines and crest/top of stable slopes at Sections A-A to H-H are shown on Drawings B1 to B8 in Appendix B.

4.6 Crest of Long Term Stable Slope

Based on the analysis results, the points representing the long-term stable slope crest at the cross sections A-A to H-H are as follows.

- Point “S1” on Drawing B1 represents the long term stable crest of slope at Section A-A
- Point “S2” on Drawing B2 represents the long term stable crest of slope at Section B-B
- Point “S3” on Drawing B3 represents the long term stable crest of slope at Section C-C
- Point “S4” on Drawing B4 represents the long term stable crest of slope at Section D-D
- Point “S5” on Drawing B5 represents the long term stable crest of slope at Section E-E
- Point “S6” on Drawing B6 represents the long term stable crest of slope at Section F-F

- Point "S7" on Drawing B7 represents the long term stable crest of slope at Section G-G
- Point "S8" on Drawing B8 represents the long term stable crest of slope at Section H-H

Based on the long-term stable slopes at Sections A-A to H-H and our field observations, the recommended Long-term Stable Slope Crest (LTSSC) line (**Line S1-S2-S3-S4-S5-S6-S7-S7a-S8**) is shown on Drawing 1. TRCA has reviewed the Long-term Stable Slope Crest (LTSSC) line.

4.7. General Comments on Slope Stability

Additional comments related to the slope stability at the site are as follows:

- In order to prevent soil erosion at the slope surface, the vegetation and trees on the existing slopes must be preserved. Surface water must be directed away from the slope or carried down the slope in suitable conduits
- Snow must not be piled near the top of the slope.
- Additional fill cannot be placed on the existing slope surfaces or near the top of the slope.

5. GENERAL COMMENTS ON REPORT

Sirati & Partners Consultants Limited 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, Sirati & Partners will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for the purposes of this study. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

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

Yours truly,

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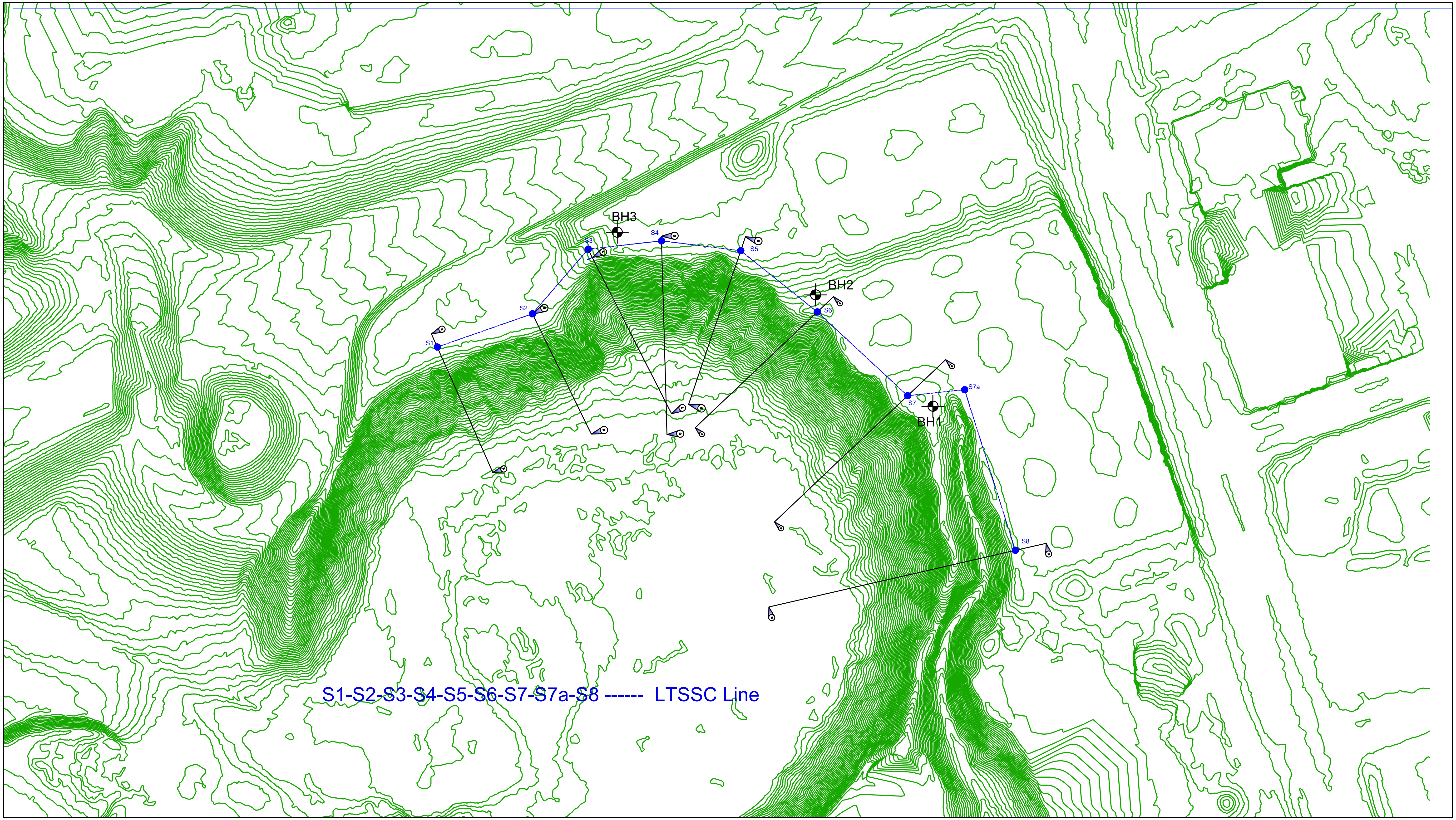
Drawings



Client: **TRCA**

Project No.: **SP16-146-10**

Drawing No.: **1**

Drawn: **AS**

Approved: **AS**

Title: **BOREHOLE LOCATION PLAN**

Date: **Sept. 23, 2016**

Scale: **AS Shown**

Project: **Slope Stability Investigation**
Don Mills Road & Eglinton Avenue, Toronto, ON

Original Size: **Tabloid**

Rev: **N/A**

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Drawing 1A: Notes On Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by Sirati & Partners Consultants Limited also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has 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		

0.002 0.006 0.02 0.06 0.2 0.6 2.0 6.0 20 60 200

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 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.

LOG OF BOREHOLE BH1

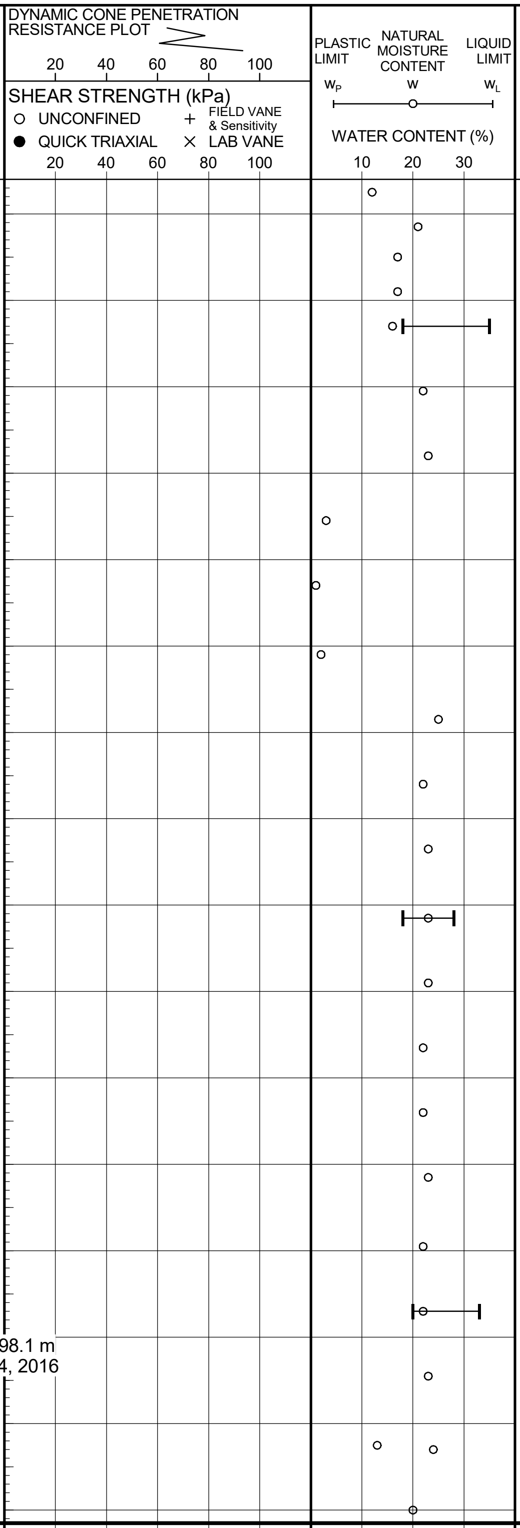
PROJECT: Slope Stability Investigation
CLIENT: Toronto and Region Conservation Authority (TRCA)
PROJECT LOCATION: Eglinton Avenue East & Don Mills Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Aug-21-2016

REF. NO.: SP16-146-10
ENCL NO.: 2

SOIL PROFILE (m) ELEV DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
124.8					
124.6 0.3	**TOPSOIL:** 250mm	1	SS	14	
	FILL: clayey silt, some sand to sandy, trace gravel, trace topsoil, greyish brown, moist, very stiff (possibly disturbed native)	2	SS	16	
123.3 1.5	**SILTY CLAY:** some sand, brown, moist, very stiff grey below 3.1m	3	SS	18	
		4	SS	24	
		5	SS	29	0 11 52 37
		6	SS	20	
		7	SS	20	
117.2 7.6	**SAND:** trace silt. brown, moist, dense to very dense	8	SS	53	
		9	SS	65	0 99 (1)
		10	SS	49	
112.6 12.2	**SILTY CLAY:** trace sand, occasional wet sand & silt seams, grey, moist, very stiff to hard	11	SS	26	
		12	SS	29	
		13	SS	23	
		14	SS	24	0 3 65 32
		15	SS	20	
		16	SS	20	
		17	SS	17	
		18	SS	17	
		19	SS	33	
		20	SS	25	0 2 64 34
		21	SS	30	
95.6 29.2	**SILTY SAND:** trace clay, grey, moist to wet, dense to very dense	22	SS	116/ 250mm	
94.2 30.6	**SILTY CLAY:** trace sand, grey, moist, hard	23	SS	40	
93.7 31.1	**END OF BOREHOLE** Notes: 1) Monitoring well was installed in the borehole upon completion. 2) Water level in monitoring well at 26.7m on Sept. 14, 2016.				

GROUND WATER CONDITIONS: W. L. 98.1 m
Sep 14, 2016



POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m^3)

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

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

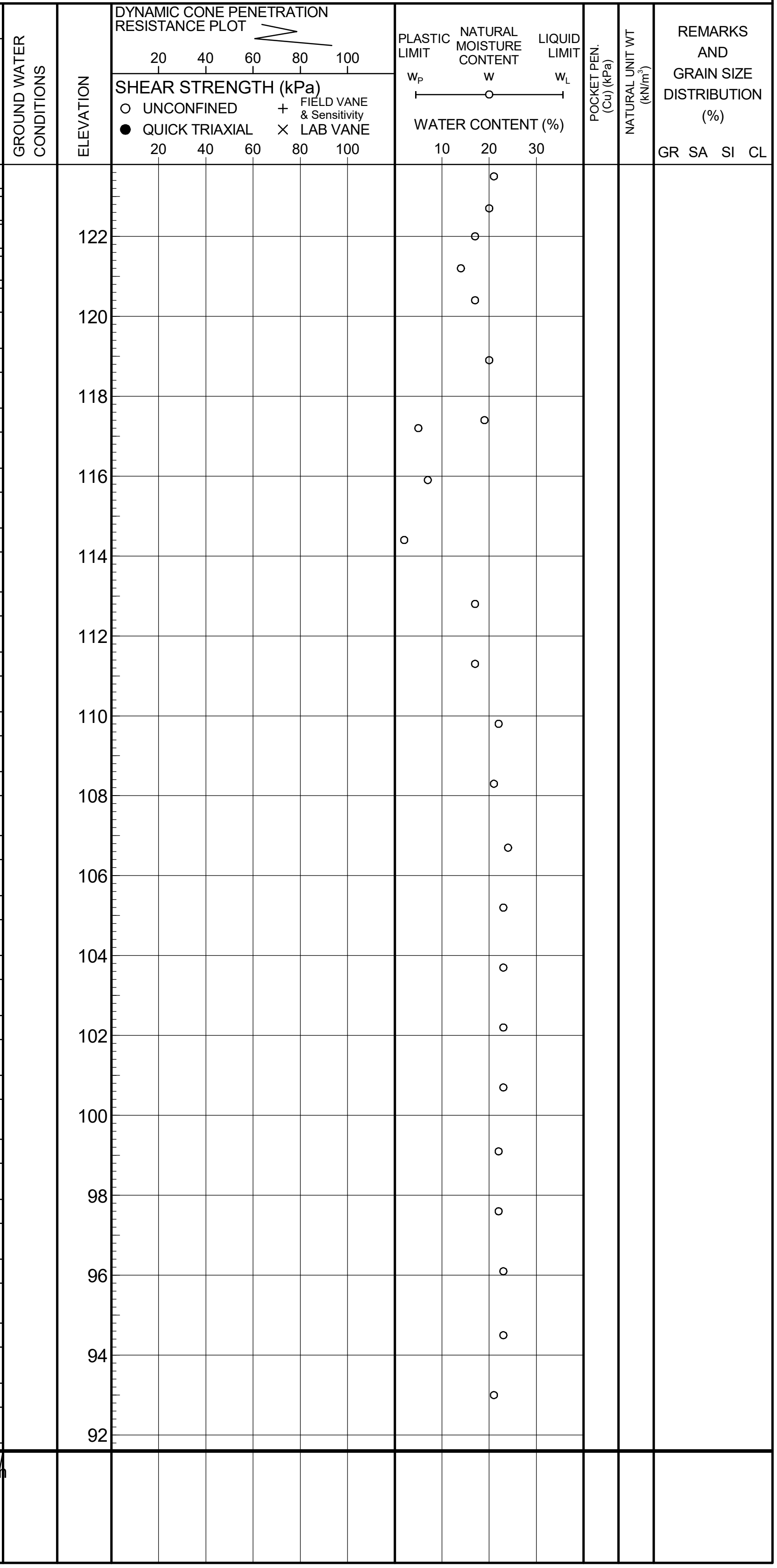
LOG OF BOREHOLE BH2

PROJECT: Slope Stability Investigation
CLIENT: Toronto and Region Conservation Authority (TRCA)
PROJECT LOCATION: Eglinton Avenue East & Don Mills Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Aug-23-2016

REF. NO.: SP16-146-10
ENCL NO.: 3

SOIL PROFILE		SAMPLES		
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3 m
123.8 0.0	**TOPSOIL:**200mm	1	SS	11
123.2 0.6	**SANDY SILT:** mixed with organics, grey, moist, compact	2	SS	21
122.3 1.5	**SILTY CLAY:** trace sand, grey, moist, very stiff to hard	3	SS	52
		4	SS	26
		5	SS	48
	wet sand layer at 4.6m	6	SS	25
		7	SS	33
117.3 6.5	**SAND:** coarse to fine sand, trace silt, light brown, moist, dense to very dense	8	SS	54
		9	SS	43
113.1 10.7	**SILTY CLAY:** trace sand, occasional seams/layers of silt, grey, moist, very stiff	10	SS	23
		11	SS	29
		12	SS	23
		13	SS	19
	Interbed of wet silty sand at 16.8m	14	SS	21
	seams of wet sand at 15.3m	15	SS	18
		16	SS	17
		17	SS	16
		18	SS	21
		19	SS	17
		20	SS	18
		21	SS	18
		22	SS	28
93.8 30.0	**SANDY SILT TO SILTY SAND:** trace clay, grey, wet, dense to very dense	23	SS	39
91.8 32.0	**SHALE BEDROCK:** grey	24	SS	95/ 125mm
91.6 32.2	**END OF BOREHOLE** Notes: 1) Monitoring well was installed in the borehole upon completion.			



GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

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

○ ε=3% Strain at Failure

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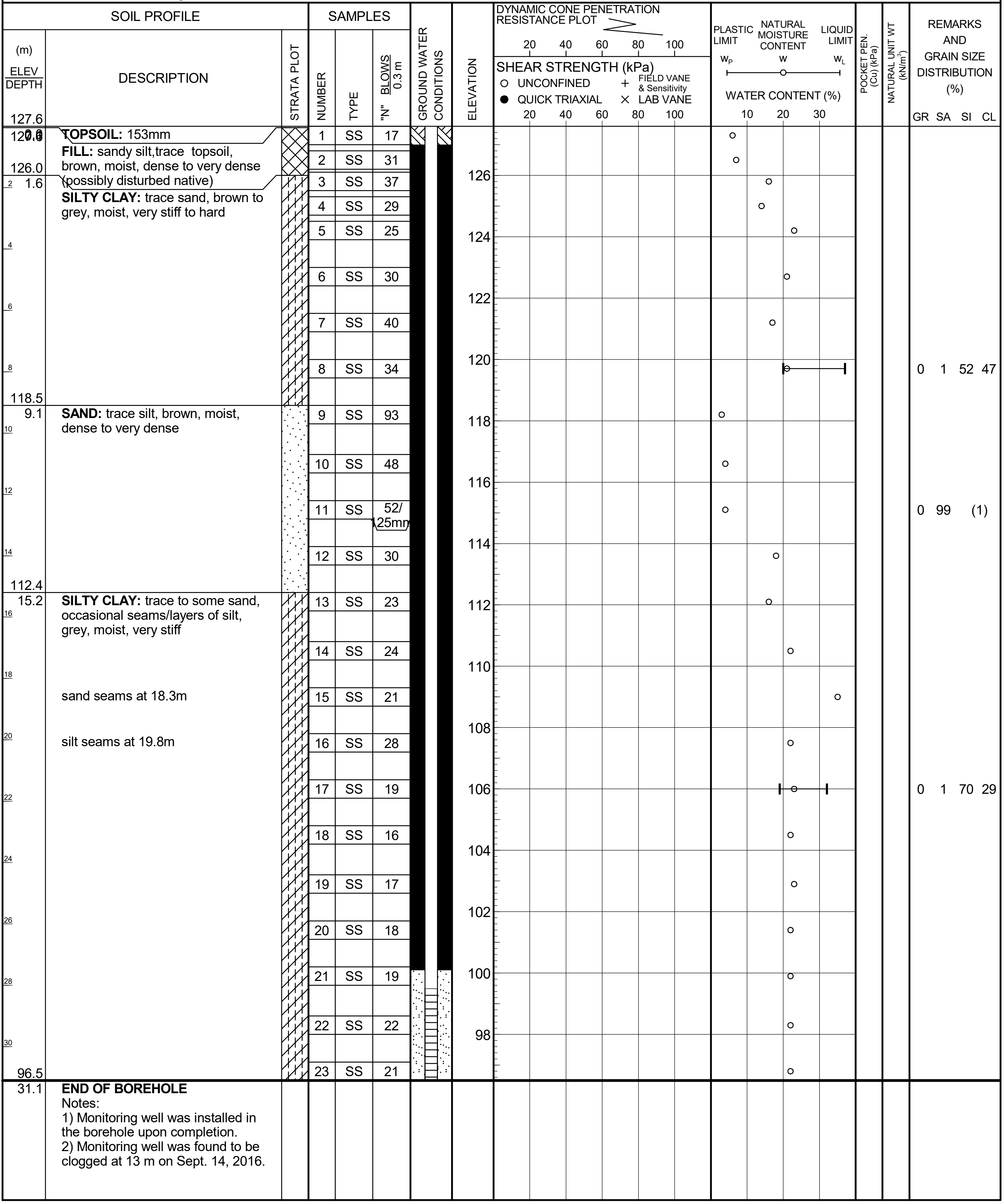
LOG OF BOREHOLE BH3

1 OF 1

PROJECT: Slope Stability Investigation
CLIENT: Toronto and Region Conservation Authority (TRCA)
PROJECT LOCATION: Eglinton Avenue East & Don Mills Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Aug-22-2016

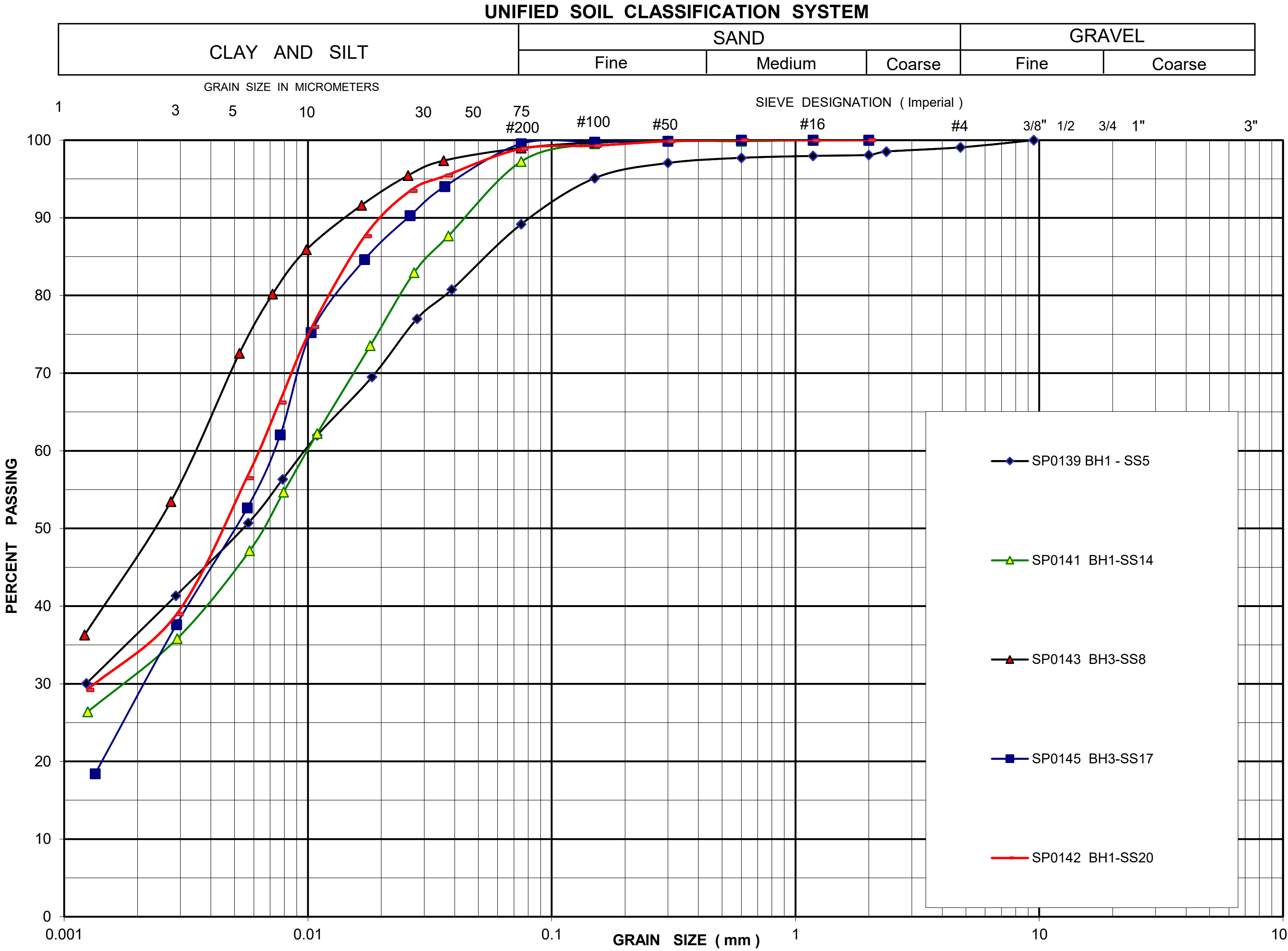
REF. NO.: SP16-146-10
ENCL NO.: 4



SOIL PROFILE (m) ELEV DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
127.6 0.0	**TOPSOIL:** 153mm	1	SS	17	
126.0	**FILL:** sandy silt,trace topsoil, brown, moist, dense to very dense (possibly disturbed native)	2	SS	31	
1.6	**SILTY CLAY:** trace sand, brown to grey, moist, very stiff to hard	3	SS	37	
		4	SS	29	
		5	SS	25	
		6	SS	30	
		7	SS	40	
		8	SS	34	0 1 52 47
118.5 9.1	**SAND:** trace silt, brown, moist, dense to very dense	9	SS	93	
		10	SS	48	
		11	SS	52/ 125mm	0 99 (1)
		12	SS	30	
112.4 15.2	**SILTY CLAY:** trace to some sand, occasional seams/layers of silt, grey, moist, very stiff	13	SS	23	
		14	SS	24	
	sand seams at 18.3m	15	SS	21	
	silt seams at 19.8m	16	SS	28	
		17	SS	19	0 1 70 29
		18	SS	16	
		19	SS	17	
		20	SS	18	
		21	SS	19	
		22	SS	22	
96.5		23	SS	21	
31.1	**END OF BOREHOLE** Notes: 1) Monitoring well was installed in the borehole upon completion. 2) Monitoring well was found to be clogged at 13 m on Sept. 14, 2016.				

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

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



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GRAIN SIZE DISTRIBUTION

Silty Clay

Fig. 5

Project: SP16-146-10

Date: Aug. 2016

APPENDIX A: Photographs of Site

Photo 1: Tableland in area of Slope Sections C-C to E-E (Looking East from BH3)

Photo 2: Tableland in area of Slope Sections C-C and B-B (Looking West from BH3)

Photo 3: Existing slope Conditions in area of Section A-A & B-B (looking northeast)

Photo 4: Wetland Conditions at the toe of slope area at Section A-A (looking south)

Photo 5: Exposed Tree Roots, Bending Trees in area of Section C-C (Looking North)

Photo 6: General vegetation and Trees on the slope Surface between Section C-C & D-D (looking north)

Photo 7: Slope Conditions between at Section D-D & E-E (Looking northeast)

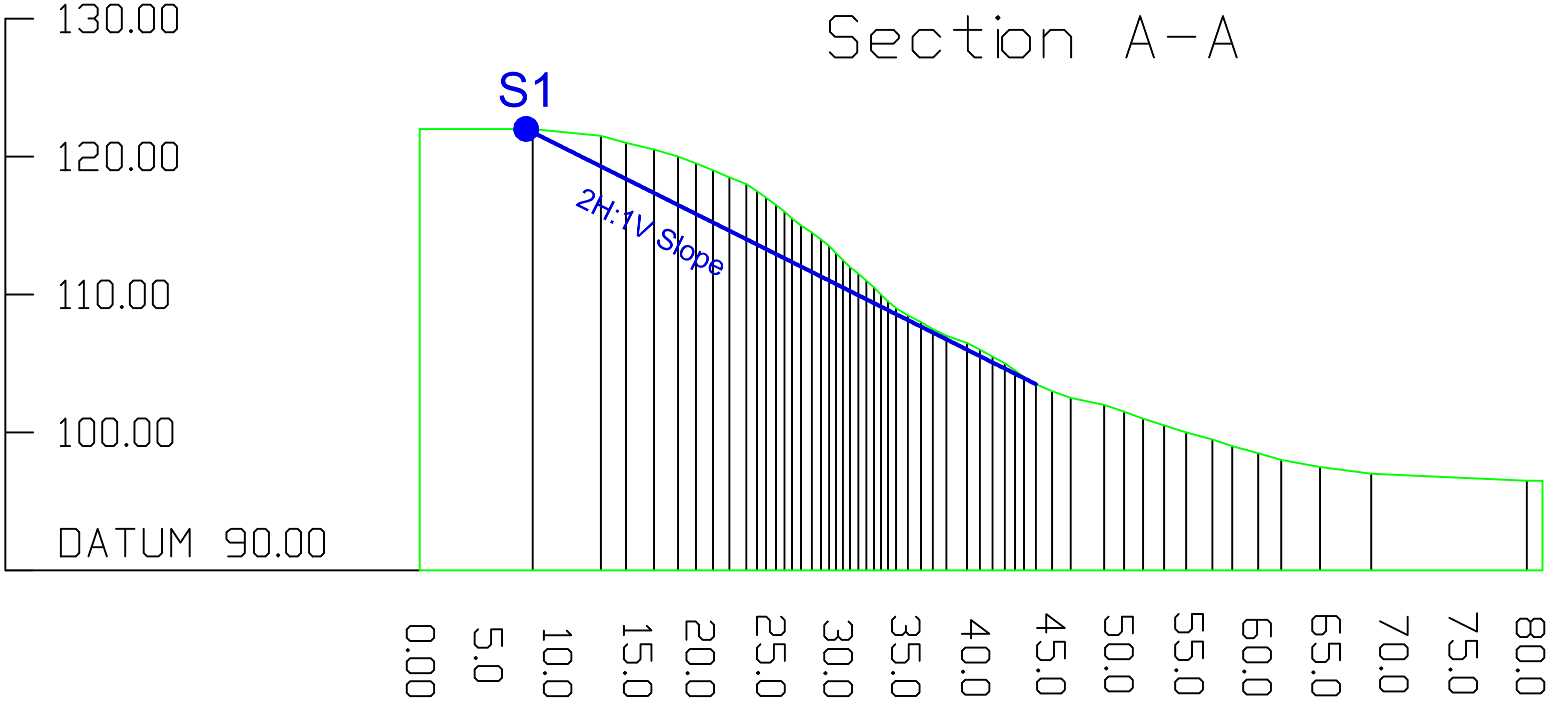
Photo 8: Exiting Slope Conditions between Section E-E & F-F (Looking Northeast)

Photo 9: Crest of slope Area (Sidewalk) Between Sections G-G & F-F (looking Northwest)

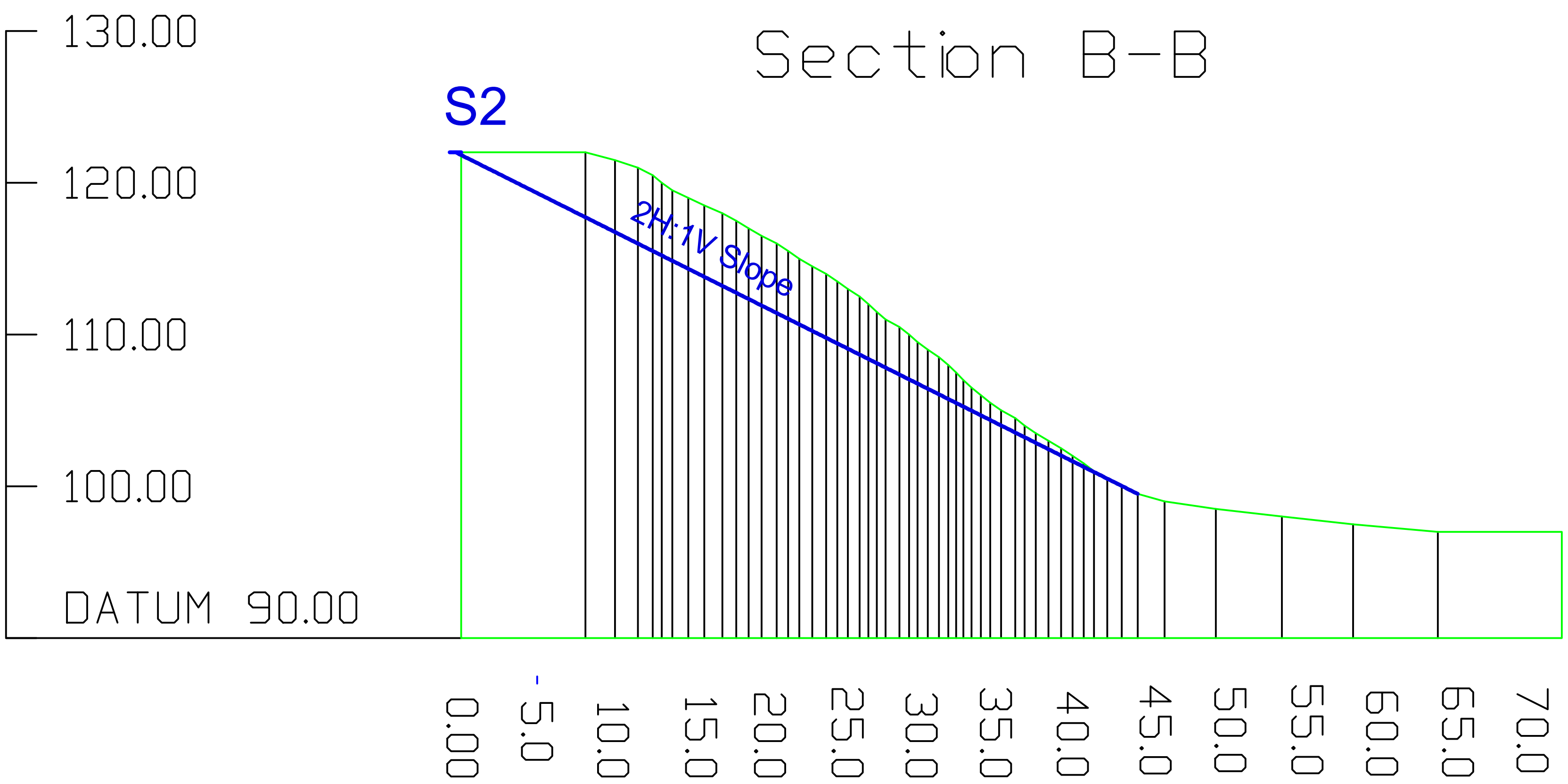
Photo 10: Slope Conditions behind Retaining Wall between Section G-G & F-F (looking southwest)

Photo 11: Drainage Gully between Section G-G & H-H (looking North)

Appendix B: Existing Slope Profiles

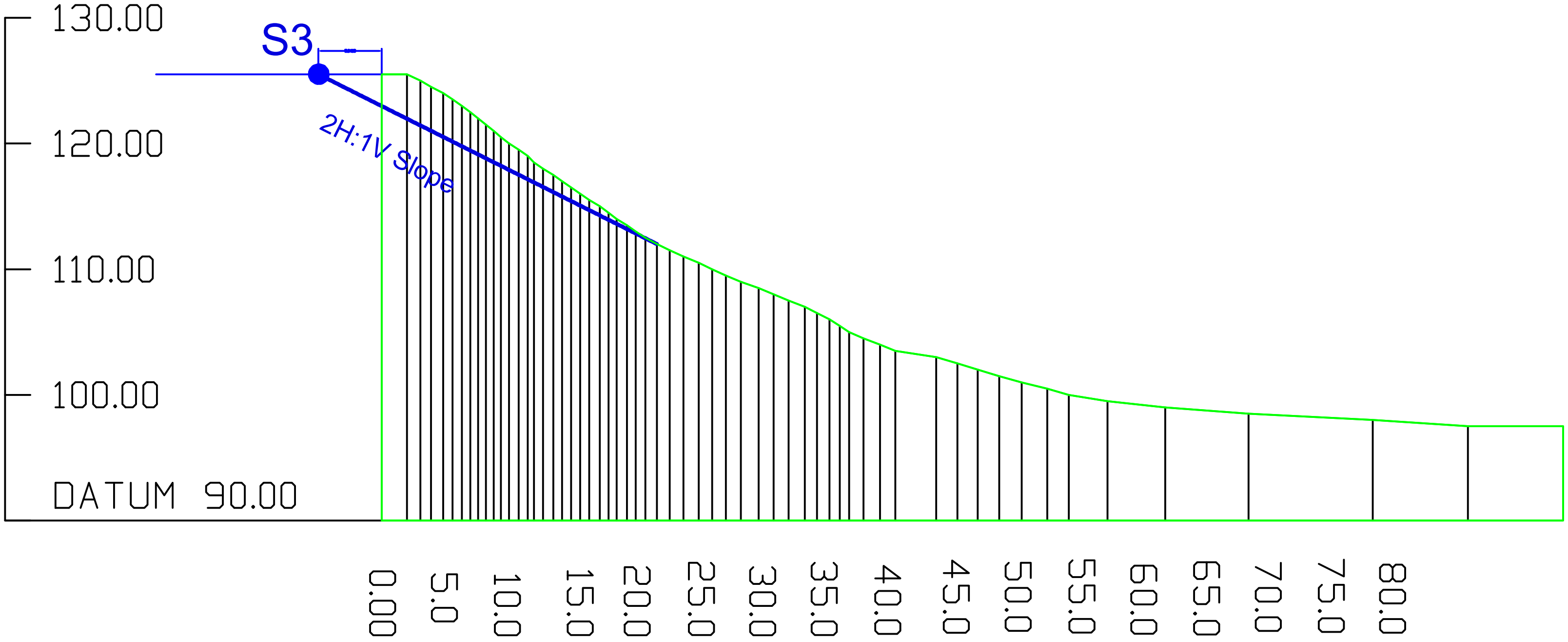


Client:	TRCA			Project No.: SP16-146-10	Drawing No.: B1
Drawn: AS		Approved: AS		Title:	Slope Section A-A
Date: September 24, 2016		Scale: As Shown		Project:	Slope Stability Investigation Don Mills Road & Eglinton Avenue, Toronto, Ontario
Original Size:	Tabloid	Rev:	N/A	750 Millway Avenue, Unit-8, Vaughan, ON L4K 0M7 Phone#905-669-4477, Fax#905-669-4488	Sirati & Partners Consultants Ltd. Geotechnical & Environmental Services Engineering Solutions



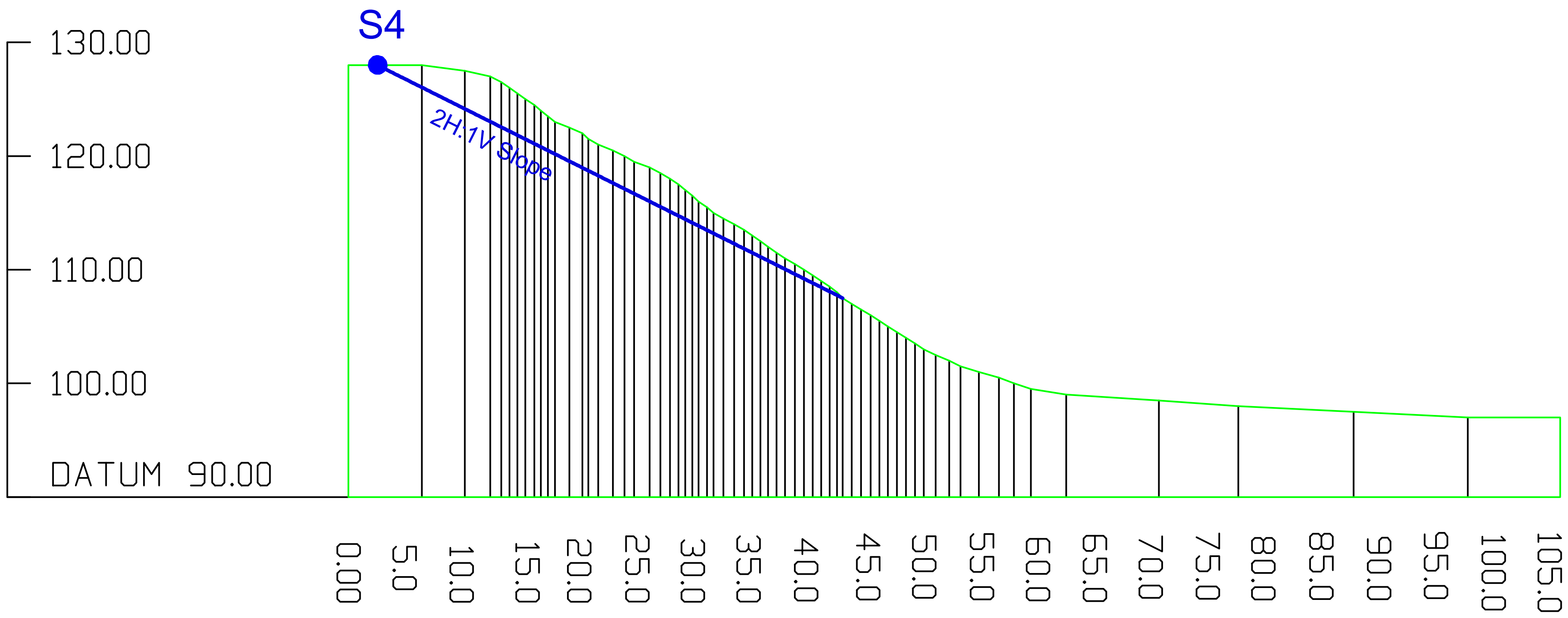
Client: TRCA		Project No.: SP16-146-10	Drawing No.: B2
Drawn: AS	Approved: AS	Title: Slope Section B-B	
Date: September 24, 2016	Scale: As Shown	Project: Slope Stability Investigation Don Mills Road & Eglinton Avenue, Toronto, Ontario	
Original Size: Tabloid	Rev: N/A	750 Millway Avenue, Unit-8, Vaughan, ON L4K 0M7 Phone#905-669-4477, Fax#905-669-4488	Sirati & Partners Consultants Ltd. Geotechnical & Environmental Services Engineering Solutions

Section C-C



Client: **TRCA**		Project No.: **SP16-146-10**	Drawing No.: **B3**
Drawn: **AS**	Approved: **AS**	Title: **Slope Section C-C**	
Date: **September 24, 2016**	Scale: **As Shown**	Project: **Slope Stability Investigation** **Don Mills Road & Eglinton Avenue, Toronto, Ontario**	
Original Size: **Tabloid**	Rev: **N/A**	750 Millway Avenue, Unit-8, Vaughan, ON L4K 0M7 Phone#905-669-4477, Fax#905-669-4488	Sirati & Partners Consultants Ltd. Geotechnical & Environmental Services Engineering Solutions

Section D-D



Client: TRCA		Project No.: SP16-146-10	Drawing No.: B4
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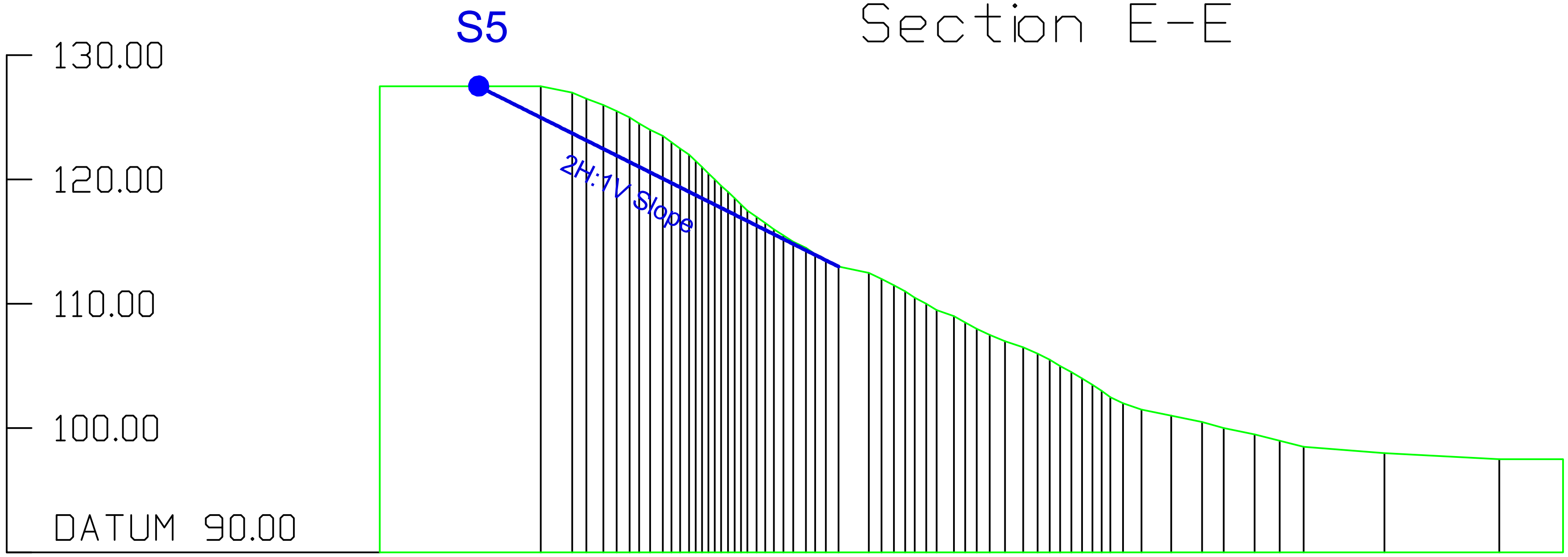
Date: September 24, 2016	Scale: As Shown	Project: Slope Stability Investigation Don Mills Road & Eglinton Avenue, Toronto, Ontario	
Original Size: Tabloid	Rev: N/A	750 Millway Avenue, Unit-8, Vaughan, ON L4K 0M7 Phone#905-669-4477, Fax#905-669-4488	Sirati & Partners Consultants Ltd. Geotechnical & Environmental Services Engineering Solutions

Section E-E



Client:	**TRCA**			Project No.: **SP16-146-10**	Drawing No.: **B5**
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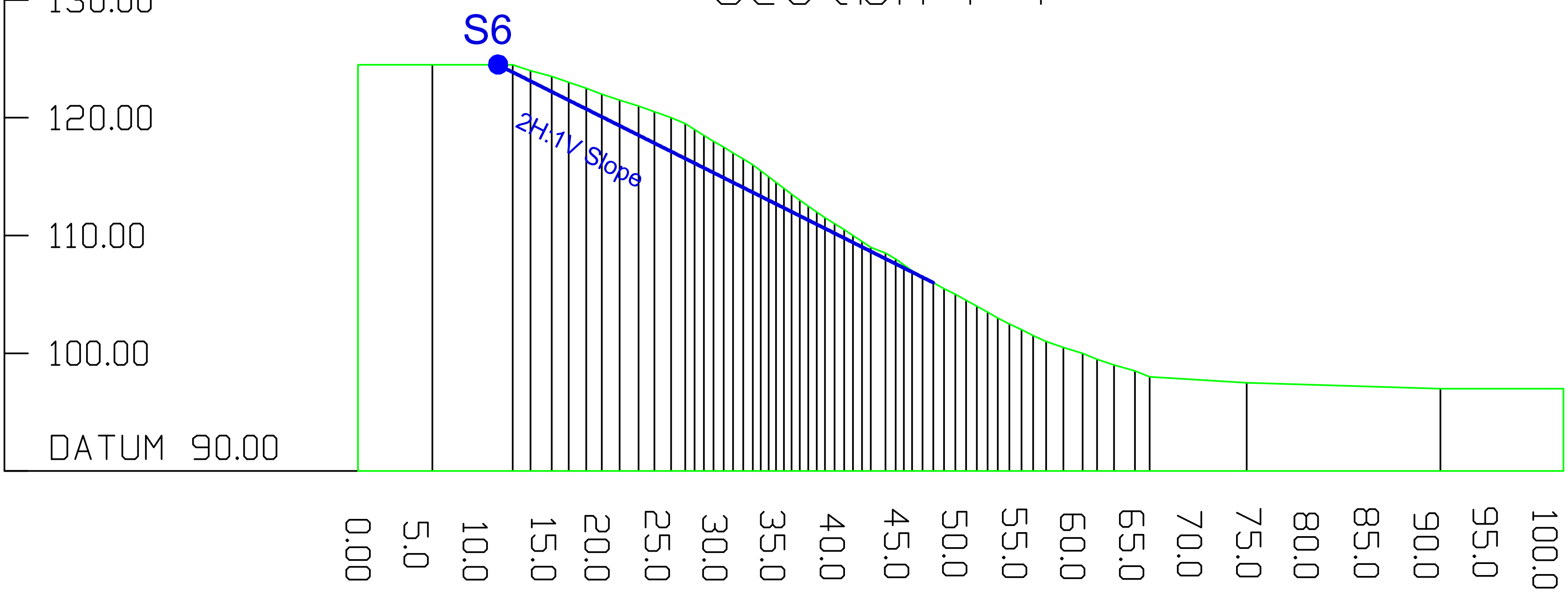
Date:	**September 24, 2016**	Scale:	**As Shown**	Project:	**Slope Stability Investigation** **Don Mills Road & Eglinton Avenue, Toronto, Ontario**
Original Size:	**Tabloid**	Rev:	**N/A**	750 Millway Avenue, Unit-8, Vaughan, ON L4K 0M7 Phone#905-669-4477, Fax#905-669-4488	Sirati & Partners Consultants Ltd. Geotechnical & Environmental Services Engineering Solutions

Section F-F



Client:	TRCA			Project No.:	SP16-146-10	Drawing No.:	B6
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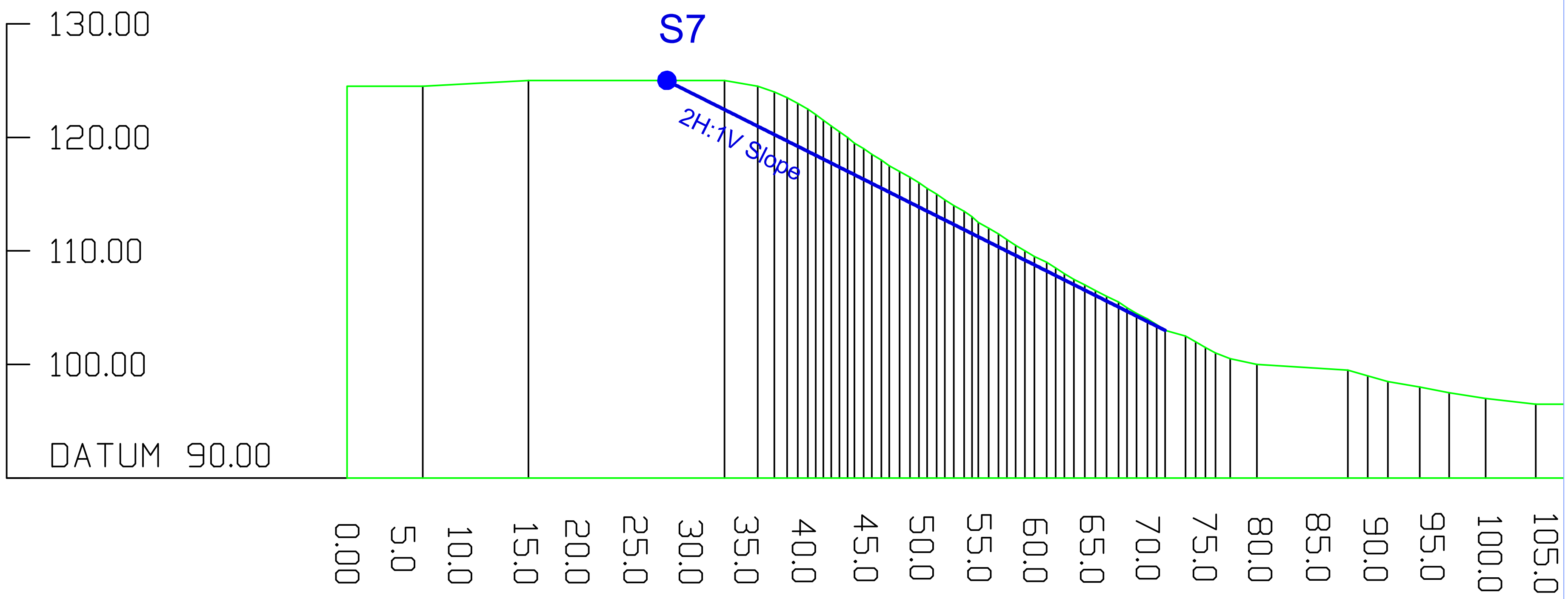
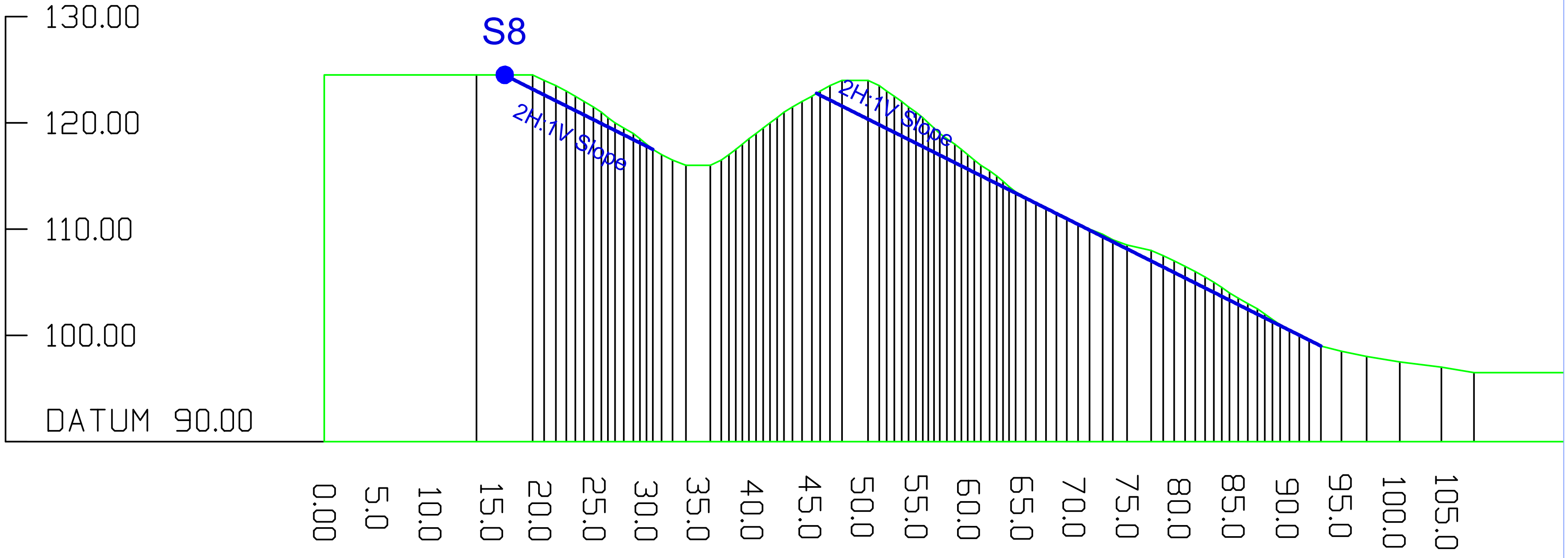
Date:	September 24, 2016	Scale:	As Shown	Project:	Slope Stability Investigation Don Mills Road & Eglinton Avenue, Toronto, Ontario		
Original Size:	Tabloid	Rev:	N/A	750 Millway Avenue, Unit-8, Vaughan, ON L4K 0M7 Phone#905-669-4477, Fax#905-669-4488		Sirati & Partners Consultants Ltd. Geotechnical & Environmental Services Engineering Solutions	

Section G-G



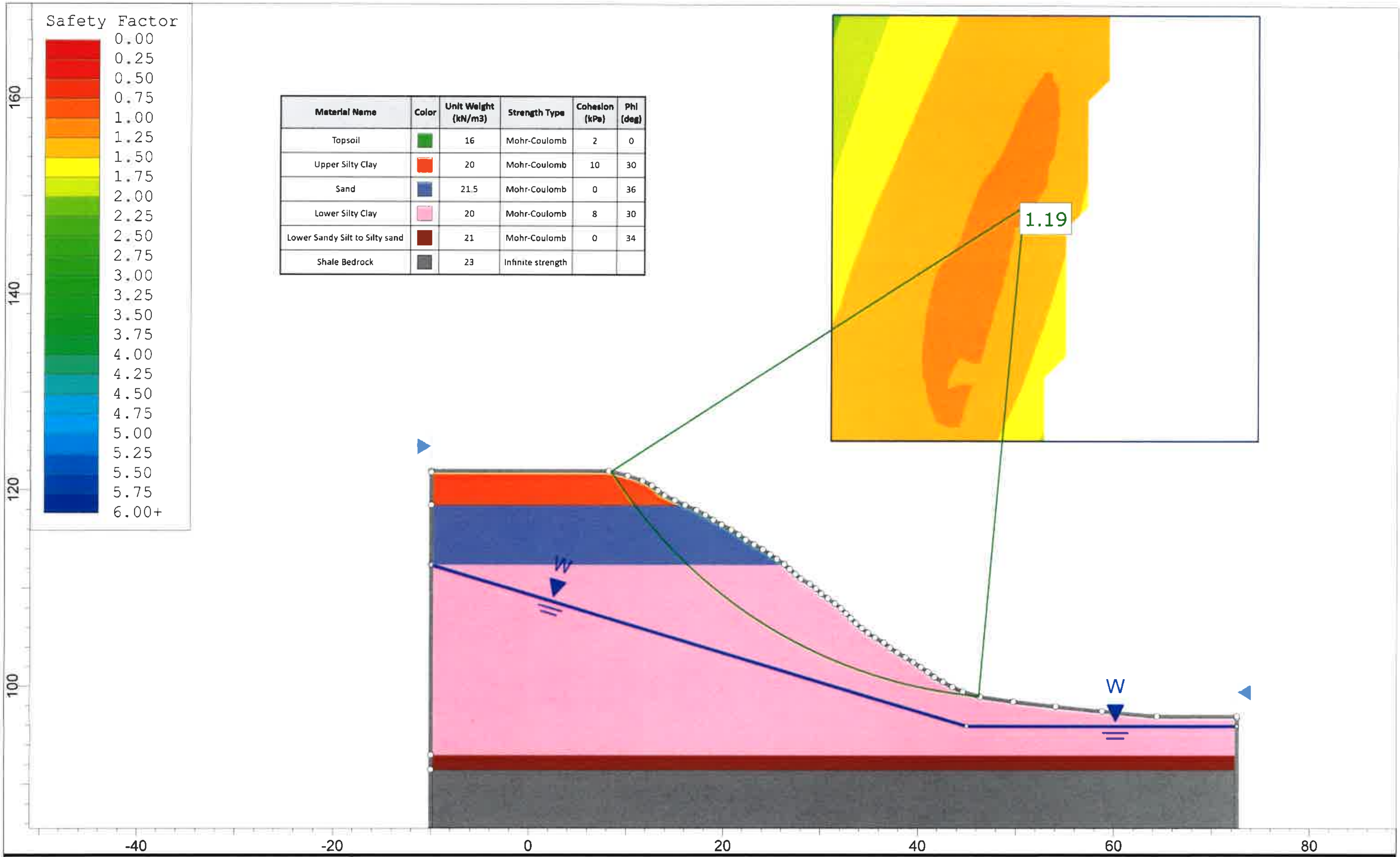
Client: TRCA		Project No.: SP16-146-10	Drawing No.: B7
Drawn: AS	Approved: AS	Title: Slope Section G-G	
Date: September 24, 2016	Scale: As Shown	Project: Slope Stability Investigation Don Mills Road & Eglinton Avenue, Toronto, Ontario	
Original Size: Tabloid	Rev: N/A	750 Millway Avenue, Unit-8, Vaughan, ON L4K 0M7 Phone#905-669-4477, Fax#905-669-4488	Sirati & Partners Consultants Ltd. Geotechnical & Environmental Services Engineering Solutions

Section H-H



Client: **TRCA**		Project No.: **SP16-146-10**	Drawing No.: **B8**
Drawn: **AS**	Approved: **AS**	Title: **Slope Section H-H**	
Date: **September 24, 2016**	Scale: **As Shown**	Project: **Slope Stability Investigation** **Don Mills Road & Eglinton Avenue, Toronto, Ontario**	
Original Size: **Tabloid**	Rev: **N/A**	750 Millway Avenue, Unit-8, Vaughan, ON L4K 0M7 Phone#905-669-4477, Fax#905-669-4488	Sirati & Partners Consultants Ltd. Geotechnical & Environmental Services Engineering Solutions

Appendix C: Results of Slope Stability Analyses



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Topsoil	🟩	16	Mohr-Coulomb	2	0
Upper Silty Clay	🟥	20	Mohr-Coulomb	10	30
Sand	🟦	21.5	Mohr-Coulomb	0	36
Lower Silty Clay	🟪	20	Mohr-Coulomb	8	30
Lower Sandy Silt to Silty sand	🟫	21	Mohr-Coulomb	0	34
Shale Bedrock	⬛	23	Infinite strength		

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SLIDEINTERPRET 7.017

Project
SP16-146-10 Slope Stability Investigation-Eglinton Avenue & Don Mills Road, Toronto, ON

Analysis Description
Existing Slope at Section B-B

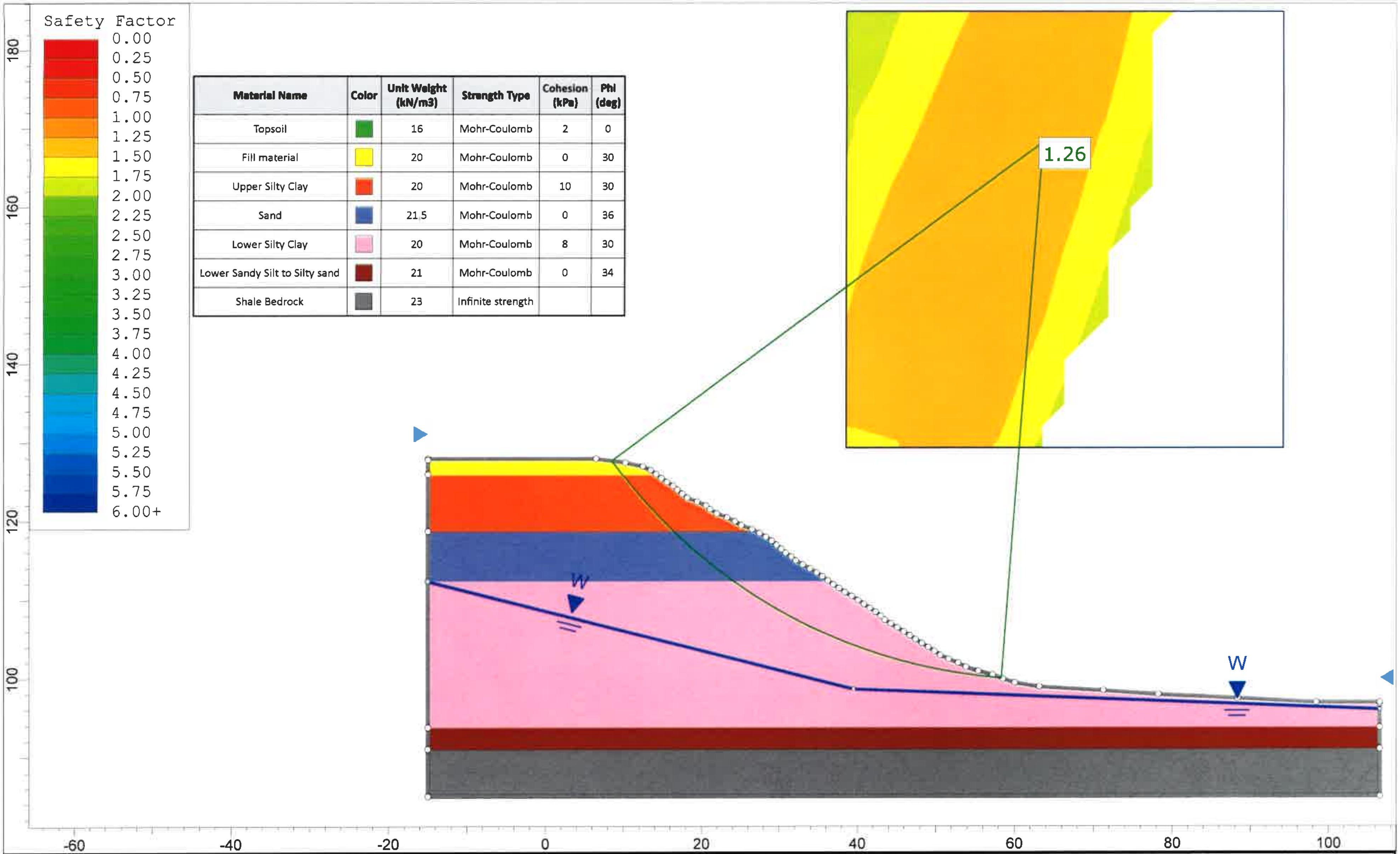
Drawn By AS

Scale 1:550

Company SPCL

Date 2016-09-23

File Name Drawing C1.slim



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Topsoil	🟩	16	Mohr-Coulomb	2	0
Fill material	🟨	20	Mohr-Coulomb	0	30
Upper Silty Clay	🟥	20	Mohr-Coulomb	10	30
Sand	🟦	21.5	Mohr-Coulomb	0	36
Lower Silty Clay	🟪	20	Mohr-Coulomb	8	30
Lower Sandy Silt to Silty sand	🟫	21	Mohr-Coulomb	0	34
Shale Bedrock	⬛	23	Infinite strength		

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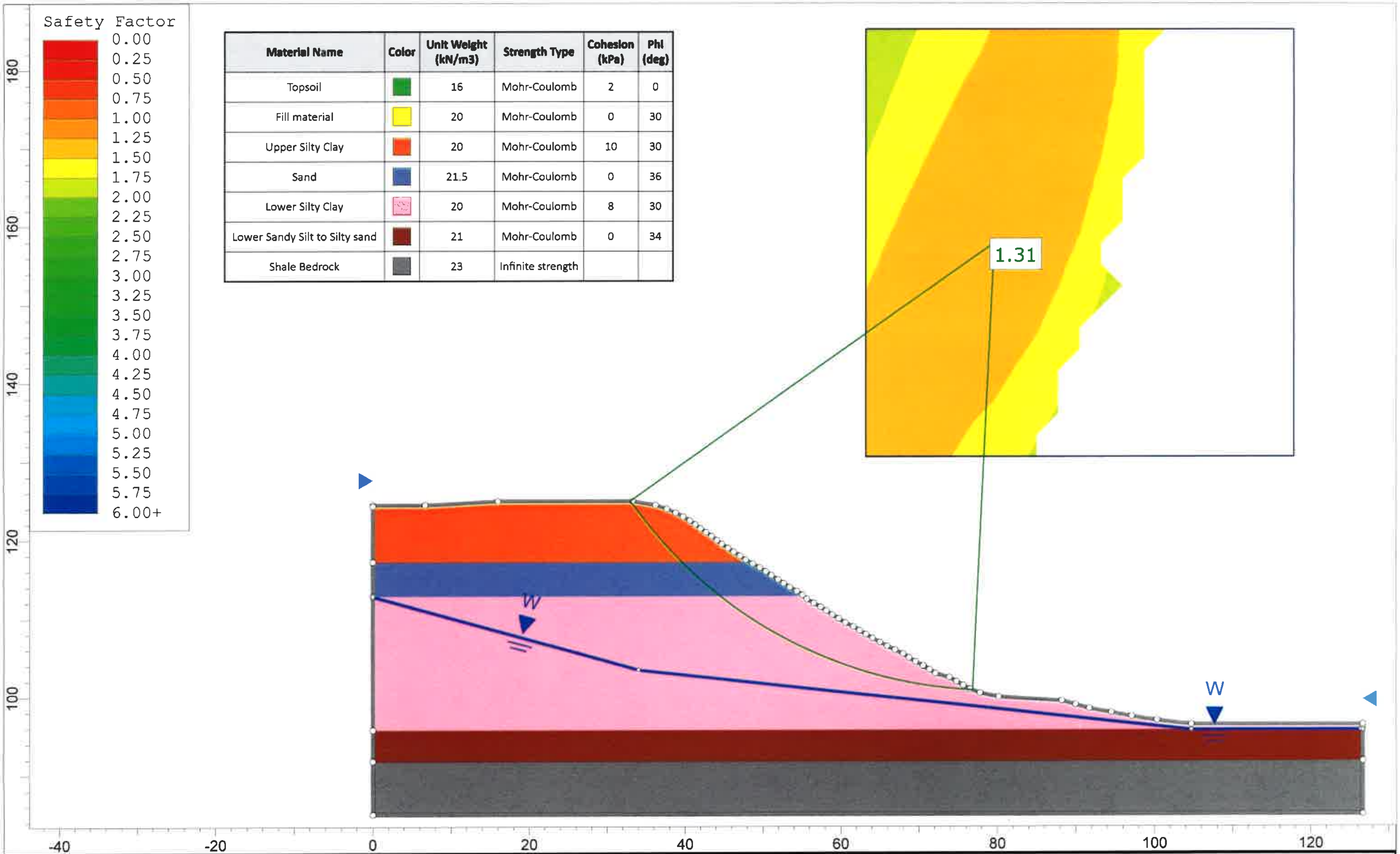
Project	SP16-146-10 Slope Stability Investigation-Eglinton Avenue & Don Mills Road, Toronto, ON
Analysis Description	Existing Slope at Section D-D
Drawn By	AS
Scale	1:686
Company	SPCL
Date	2016-09-23
File Name	Drawing C2.slim

SLIDEINTERPRET 7.017



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
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Fill material	🟨	20	Mohr-Coulomb	0	30
Upper Silty Clay	🟧	20	Mohr-Coulomb	10	30
Sand	🟦	21.5	Mohr-Coulomb	0	36
Lower Silty Clay	▨	20	Mohr-Coulomb	8	30
Lower Sandy Silt to Silty sand	🟫	21	Mohr-Coulomb	0	34
Shale Bedrock	⬛	23	Infinite strength		

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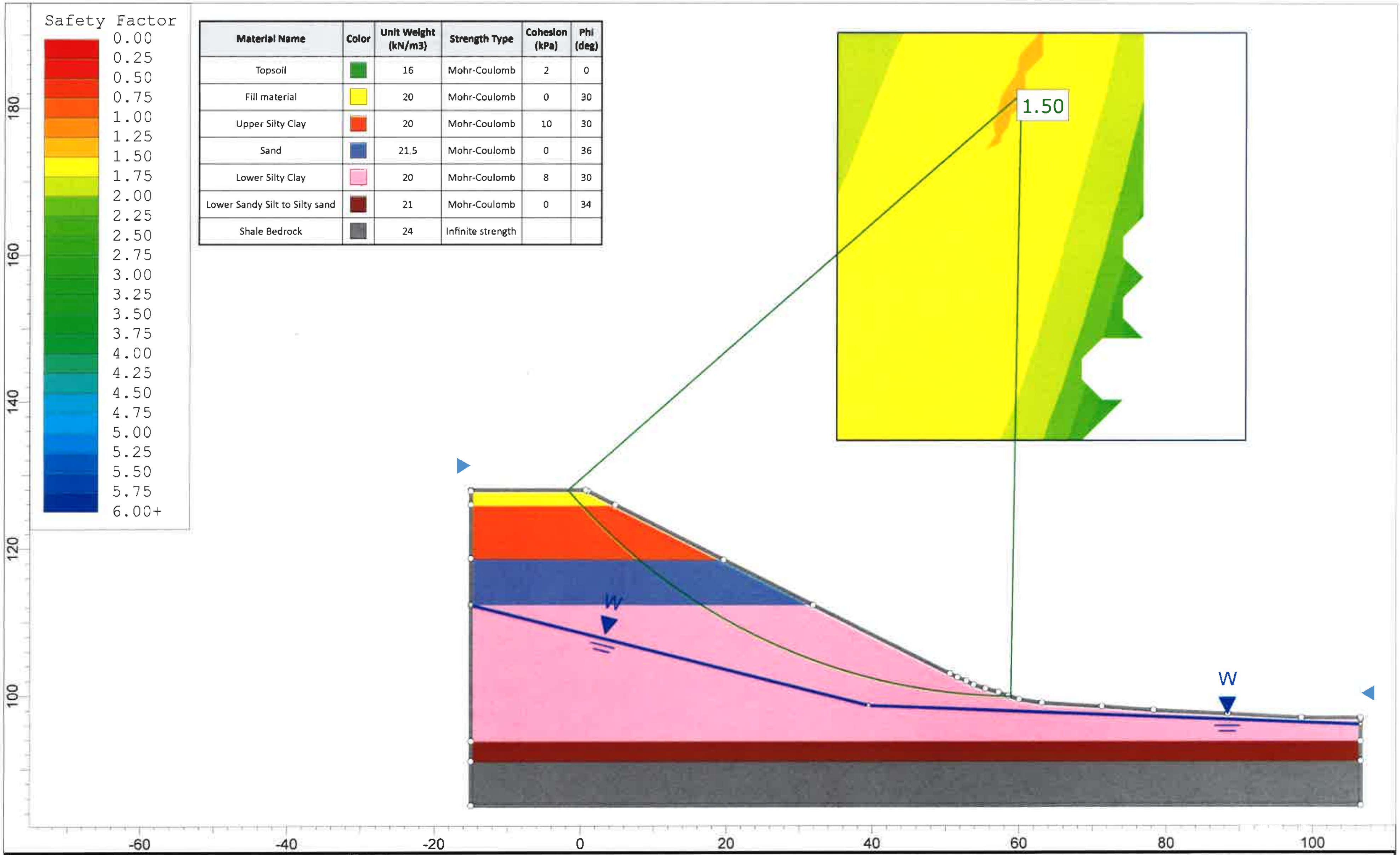
Project	SP16-146-10 Slope Stability Investigation-Eglinton Avenue & Don Mills Road, Toronto, ON
Analysis Description	Existing Slope at Section G-G
Drawn By	AS
Scale	1:687
Company	SPCL
Date	2016-09-23
File Name	Drawing C3.slim



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
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Fill material	🟨	20	Mohr-Coulomb	0	30
Upper Silty Clay	🟧	20	Mohr-Coulomb	10	30
Sand	🟦	21.5	Mohr-Coulomb	0	36
Lower Silty Clay	🟪	20	Mohr-Coulomb	8	30
Lower Sandy Silt to Silty sand	🟫	21	Mohr-Coulomb	0	34
Shale Bedrock	⬛	24	Infinite strength		

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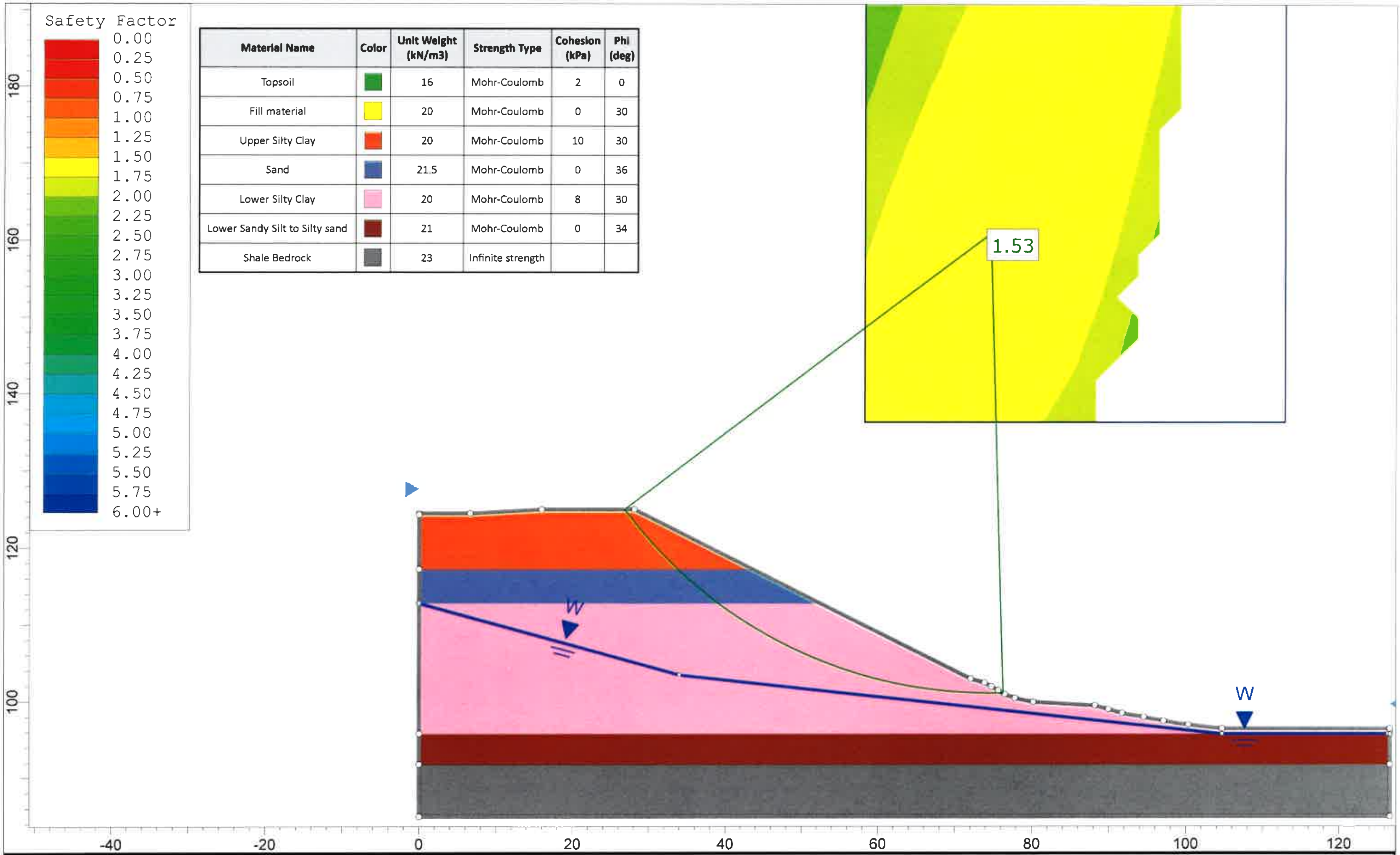
SLIDEINTERPRET 7.017

Project SP16-146-10 Slope Stability Investigation-Eglinton Avenue & Don Mills Road, Toronto, ON

Analysis Description 2H:1V Slope at Section D-D

Drawn By AS
Scale 1:733
Company SPCL

Date 2016-09-23
File Name Drawing C4.slim



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
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Fill material	🟨	20	Mohr-Coulomb	0	30
Upper Silty Clay	🟥	20	Mohr-Coulomb	10	30
Sand	🟦	21.5	Mohr-Coulomb	0	36
Lower Silty Clay	🟪	20	Mohr-Coulomb	8	30
Lower Sandy Silt to Silty sand	🟫	21	Mohr-Coulomb	0	34
Shale Bedrock	▨	23	Infinite strength		

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Engineering Solutions

Project	SP16-146-10 Slope Stability Investigation-Eglinton Avenue & Don Mills Road, Toronto, ON
Analysis Description	2H:1V Slope at Section G-G
Drawn By	AS
Scale	1:700
Company	SPCL
Date	2016-09-24
File Name	Drawing C5.slim

SLIDEINTERPRET 7.017

Appendix D: Limitations of 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 Sirati & Parners Consultants Limited (SPCL) at the time of preparation. Unless otherwise agreed in writing by Sirati & Parners Consultants Limited, 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 borehole 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 boreholes may differ from those encountered at the borehole 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 borehole 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 boreholes 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. Sirati & Parners Consultants Limited 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. Any user of this report specifically denies any right to claims against the Consultant, Sub-Consultants, their officers, agents and employees in excess of the fee paid for professional services.