GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

Geotechnical Investigation

Slope Stability Analysis and Geotechnical Setback Study

Part of Lots 3 and 4, Concession 5, City of Pickering, Ontario

Prepared For:

869547 Ontario Inc.

GeoPro Project No.: 17-1780GHE3

Report Date: October 27, 2023

GeoPro Consulting Limited (905) 237-8336 office@geoproconsulting.ca

Unit 57, 40 Vogell Road, Richmond Hill, Ontario L4B 3N6

GeoPro CONSULTING LIMITED

Table of Contents

1. INTRODUCTION

GeoPro Consulting Limited (GeoPro) was retained by 869547 Ontario Inc.(the Client) to conduct a slope stability analysis and a geotechnical setback study for the slopes located at Part of Lots 3 and 4, Concession 5, in the City of Pickering, Regional Municipality of Durham, Ontario.

The purpose of this geotechnical investigation was to obtain information on the existing subsurface conditions by means of a limited number of boreholes, in-situ tests and laboratory tests of soil samples to provide required geotechnical design information. Based on GeoPro's interpretation of the data obtained, geotechnical comments and recommendations related to the project designs are provided.

The report is prepared with the condition that the design will be in accordance with all applicable standards and codes, regulations of authorities having jurisdiction, and good engineering practice. Further, the recommendations and opinions in this report are applicable only to the proposed project as described above. On-going liaison and communication with GeoPro during the design stage and construction phase of the project is strongly recommended to confirm that the recommendations in this report are applicable and/or correctly interpreted and implemented. Also, any queries concerning the geotechnical aspects of the proposed project shall be directed to GeoPro for further elaboration and/or clarification.

This report is provided on the basis of the terms of reference presented in our approved proposal and our understanding of the project. 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 report can be relied upon.

This report deals with geotechnical issues only. The geo-environmental (chemical) aspects of the subsurface conditions, including the consequences of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources, were not investigated and were beyond the scope of this assignment.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice in Ontario.

This report has been prepared for the Client only. Third party use of this report without GeoPro's consent is prohibited. The limitations to the report presented in this report form an integral part of the report and they must be considered in conjunction with this report.

2. GEOTECHNICAL INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT BY GEOPRO

Geotechnical investigations and supplementary geotechnical investigations were carried out for the proposed residential development at the site in 2017 and 2021. The geotechnical reports entitled "*Geotechnical Investigation – Proposed Residential Development"* dated May 31, 2017 and "*Supplementary Geotechnical Investigation – Proposed Residential Development"* dated December 5, 2022 were submitted to the Client. The borehole location plan and borehole logs of the geotechnical investigation and supplementary geotechnical investigation for the proposed residential development carried out by GeoPro were attached in Appendix A.

3. DISCUSSION AND RECOMMENDATIONS

This section of the report provides a slope stability assessment for the subject slope based on our interpretation of subsurface data from a limited number of boreholes, slope profiles obtained, our field observations and our understanding of the project requirements. The information in this portion of the report is provided for the guidance of the design engineers and professionals. The results of the slope stability assessment are subject to the review and approval of the relevant agencies.

Based on the borehole information, our visual slope inspection and slope profiles interpreted from the contour lines of the provided topographic drawings, a detailed slope stability study was carried out to evaluate the long-term global stability of the existing slope as well as the setback requirement. The assessment of the stability of the subject slope consisted of two components:

1. Visual field review of the current slope conditions from a slope stability perspective; and
2. Global stability analyses based on the subsurface conditions encountered in the boreholes carried out during the geotechnical investigation.

3.1 Existing Slope Conditions and Profile

The following section provides geotechnical comments related to the measured slope geometry based on the topographic plan provided by the Client, as well as observations made during a visual inspection of the existing slopes carried out by our geotechnical staff on April 10, 2017. Six (6) typical slope profiles (Sections A-A to F-F) were provided for the global stability analyses (See Drawing 1B for the locations).

Based on our site observations and the slope profiles measured, the slope conditions at the site are described as follows:

1. The subject slopes are situated on both sides of the Carruthers Creek. Within the study area, the inclinations of the slopes generally range from about 1.7 horizontal to 1 vertical (1.7H:1V) to 5.6 horizontal to 1 vertical (5.6 H:1V) with localized steeper or flatter areas; the heights of the slope are generally about 5.0 m to 7.0 m;

2. The slope surface are generally covered by trees or bushes with decayed leaves/branches;
3. No water seepage was noted at the slope surface within the study area;
4. Obvious Erosion caused by surface runoff was not noted at the time of the investigation. Minor active erosion of the slope toe was observed at a portion of the existing slopes during the site visit;
5. Indications of shallow slumping/sloughing at or near-surface slope were not observed along the slope during our field review;
6. Tension cracks and/or other indicators of deep seated movement of the slope were not observed at or beyond the crest of the slope.
7. Vegetation in the subject site was observed to be uniform and no previous soil disturbance was noted at the time of site visit.

3.2 Erosion Setback

The magnitude of the erosion component is typically the estimated recession of the slope toe due to erosion over a specified design period, and is measured as a horizontal distance from the existing creek channel. The toe erosion component is to be assessed using suggested guidelines for toe erosion allowances contained in "Technical Guide for River & Stream Systems: Erosion Hazard Limit (2002)" prepared by the Ontario Ministry of Natural Resources.

For the slope Cross-Sections B-B, C-C and E-E, a toe erosion component is typically not required for these sections where the valley floor is greater than 15 m from the toe of the slope.

For the slope Cross-Sections A-A, D-D and F-F, an erosion setback is required due to the presence of existing water course. Based on the soil conditions in the boreholes and the site observations, the soils at the slope toe generally consisted of fine sandy/silty soils at Cross-Sections A-A, F-F and clayey silt at Cross-Section D-D. Obvious evidence of active erosion of the slope toe was observed at a portion of the slope toe during the site visit. In accordance with "Technical Guide for River & Stream Systems: Erosion Hazard Limit (2002)", the design erosion setback allowance of 8.0 m is considered applicable for the exposed soils at Cross-Sections A-A and F-F, and the design erosion setback allowance of 5.0 m is considered applicable for the exposed soils at Cross-Section D-D. The erosion allowance of e = 8.0 m will be used to establish the long-term stable top of slope at Cross-Sections A-A and F-F; whereas the erosion allowance of e = 5.0 m will be used to establish the long-term stable top of slope at Cross-Section D-D.

3.3 Soil Parameters

Soil strength parameters selected for the soil strata have been estimated based on the boreholes drilled near the slope, previously published information and from our experience on similar

projects. A global slope stability analysis was carried out for the soil stratigraphy using effective stress/strength parameters as shown in the following Table:

Material Parameters for Slope Stability Analysis

Material Type	Unit Weight (kN/m^3)	Effective Friction Angle Φ'	Cohesion (kPa)
Surficial Vegetation	16	28°	1
Loose (Probable) Fill Materials	18	28°	0
Very Loose Silty Fine Sand	18	28°	0
Loose to Compact Silty (Fine) Sand	20	31°	0
Compact to Dense Silt and Fine Sandy Silt	20	30°	0
Compact to Very Dense Fine Sand and Silt to Fine Sandy Silt	20	31°	0
Dense Fine Sand and Silt to Silty Fine Sand	21	31°	0
Stiff to Hard Clayey Silt and Clayey Silt (Till Like)	19	30°	1
Hard Clayey Silt Till to Silty Clay Till	20	31°	2
Dense to Very Dense Sandy Silt Till to Sand and Silt Till	21	31°	1
Very Dense Silty Sand	21	32°	0
Very Dense Gravelly Sand	22	33°	0

3.4 Stability Analysis of Existing Slope

The *"Technical Guide, River & Stream Systems: Erosion Hazard Limit"* document published by the Ontario Ministry of Natural Resources in 2002 ("The Guide"), provides recommendations for minimum Factors of Safety (FOS) for the design of stable slopes on the basis of land-use above or below the slopes. A Design Minimum Factor of Safety of 1.30 to 1.50 is recommended in Table 4.3 of the Guide (Section 4.3.3.1 Design Minimum Factors of Safety) for Active Land Uses, such as those containing residential structures. A Factor of Safety greater than 1.5 should be used in consideration of the proposed residential development. Based on our previous experience, Factor of Safety of 1.5 is usually required by conservative authorities.

Long-term stability analysis of the existing slope at above noted section was carried out with the computer program SLIDE (Version 6.0) using the Simplified Bishop method. The analysis results for the existing slopes are presented in Drawings 2 to 7 and are summarized in the following table:

Long-term Stability Analysis Result of the Existing Slope

Slope Location/Drawing Number	Existing Slope Inclination	Existing Slope Height (m)	Calculated Factor of Safety	Note
Existing Slope, Cross-Section A-A / Drawing 2	2.00 H : 1V	6.0	1.03	Not Stable (FS<1.5)
Existing Slope, Cross-Section B-B / Drawing 3	2.21 H : 1V	6.0	1.10	Not Stable (FS<1.5)
Existing Slope Cross-Section C-C / Drawing 4	3.10 H : 1V	7.0	1.51	Stable (FS>1.5)
Existing Slope Cross-Section D-D / Drawing 5	3.29 H : 1V	6.0	1.37	Not Stable (FS<1.5)
Existing Slope Cross-Section E-E / Drawing 6	1.65 H : 1V	7.0	0.93	Not Stable (FS<1.5)
Existing Slope Section F-F / Drawing 7	5.57 H : 1V	5.0	2.33	Stable (FS>1.5)

The calculated FOS of the existing slope at Cross- Sections A-A to E-E ranged from 0.93 to 2.33, as shown on Drawings 2 to 7. The FOS of Cross-Sections C-C and F-F are greater than the minimum acceptable value of 1.5. The existing slope at Cross-Sections C-C and F-F are considered stable in terms of long term stability based on the requirements. However, the FOS of Cross-Sections A-A, B-B, D-D and E-E are less than the minimum acceptable value of 1.5. The existing slope at Cross-Sections A-A, B-B, D-D and E-E are considered not stable in terms of long term stability based on requirements.

3.5 Long Term Stable Top of Slope considering Erosion Setback

The long-term stable top of slope does not include a development/access setback component or a rear-yard allowance. The requirement for these additional setbacks, if any, are typically set by the Town/City, District or Provincial regulations and should be determined through consultation with the applicable regulatory bodies/agencies. Similarly, the setback required for safety against flood conditions or preservation of vegetation or wildlife is independent of the geotechnical setback criteria proposed.

A target minimum factor of safety of 1.5 is used to explore the slope failure surface. Since the toe erosion component is not required for section C-C and the existing slope is considered stable in terms of long term stability based on the requirements, the long term stable top of slope line stays at the existing crest of the slope at Section C-C. The slope stability analyses were carried out and the results indicate that the 4.17 H:1 V for slope at Cross-Section A-A, 3.17 H:1 V for slope at Cross-Section B-B, 3.96 H:1 V for slope at Cross-Section D-D and 3.71 H:1 V for slope at Cross-Section E-E have a factor of safety greater than 1.5. Drawing 8 represents the long term stable top of slope at Cross-Section A-A (20.98 m away from the existing top of the slope). Drawing 9 represents the long term stable top of slope at Cross-Section B-B (5.75 m away from the existing top of the slope). Drawing 10 represents the long term stable top of slope at Cross-Section D-D (9.00 m away from the existing top of the slope). Drawing 11 represents the long term stable top of slope at Cross-Section E-E (14.45 m away from the existing top of the slope). Drawing 12 represents the long term stable top of slope at Cross-Section F-F (stays at the existing crest of the slope).

Based on the long-term stable top of slope at Cross-Sections A-A to F-F, the topographic survey plan and our visual slope inspection, the recommended long-term stable top of slope line is plotted on the Drawing 1. This long-term stable top of slope line must be reviewed by the Conservation Authority for the approval.

3.6 Other Comments

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 on the existing slopes must be preserved.
- Surface water should be directed away from the slope surface using measures such as swale behind the crest of the slope, should any erosion be caused by surface runoff.
- Soils or other materials must not be placed on the existing slope surfaces or near the top of the slopes.

Any foundations near the slope should be founded below an imaginary 3H:1V line drawn up from the toe of the long term stable slope. Should this requirement be not meet, a geotechnical engineer from GeoPro should be consulted for further evaluation.

4. CLOSURE

We trust that the geotechnical information presented in the report is sufficient for your present requirements. If you have any questions regarding the contents of this report or require additional information, please do not hesitate to contact this office.

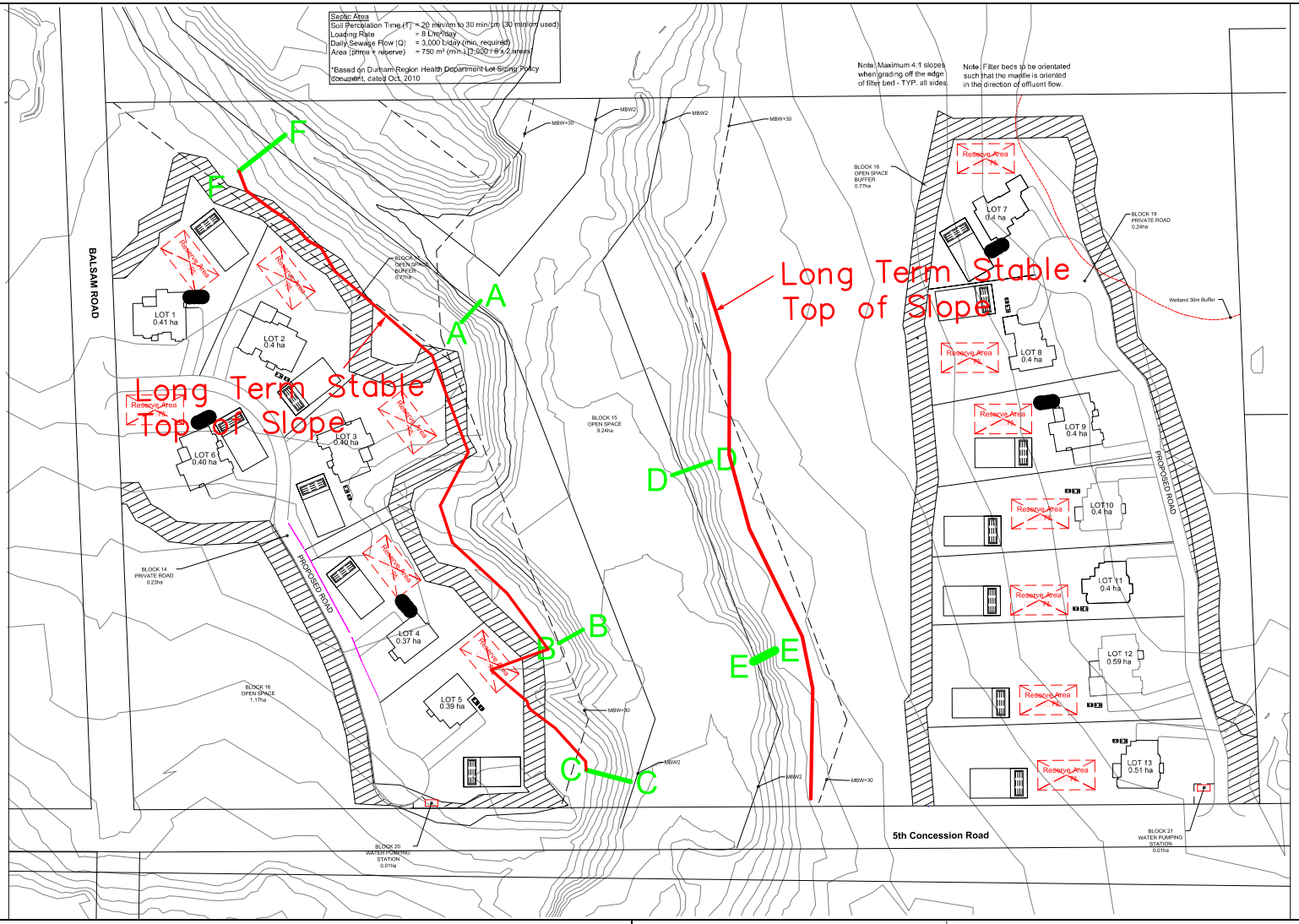
Yours very truly,

GEOPRO CONSULTING LIMITED

Niko C. Carrasco, B.Eng.
Geotechnical Group

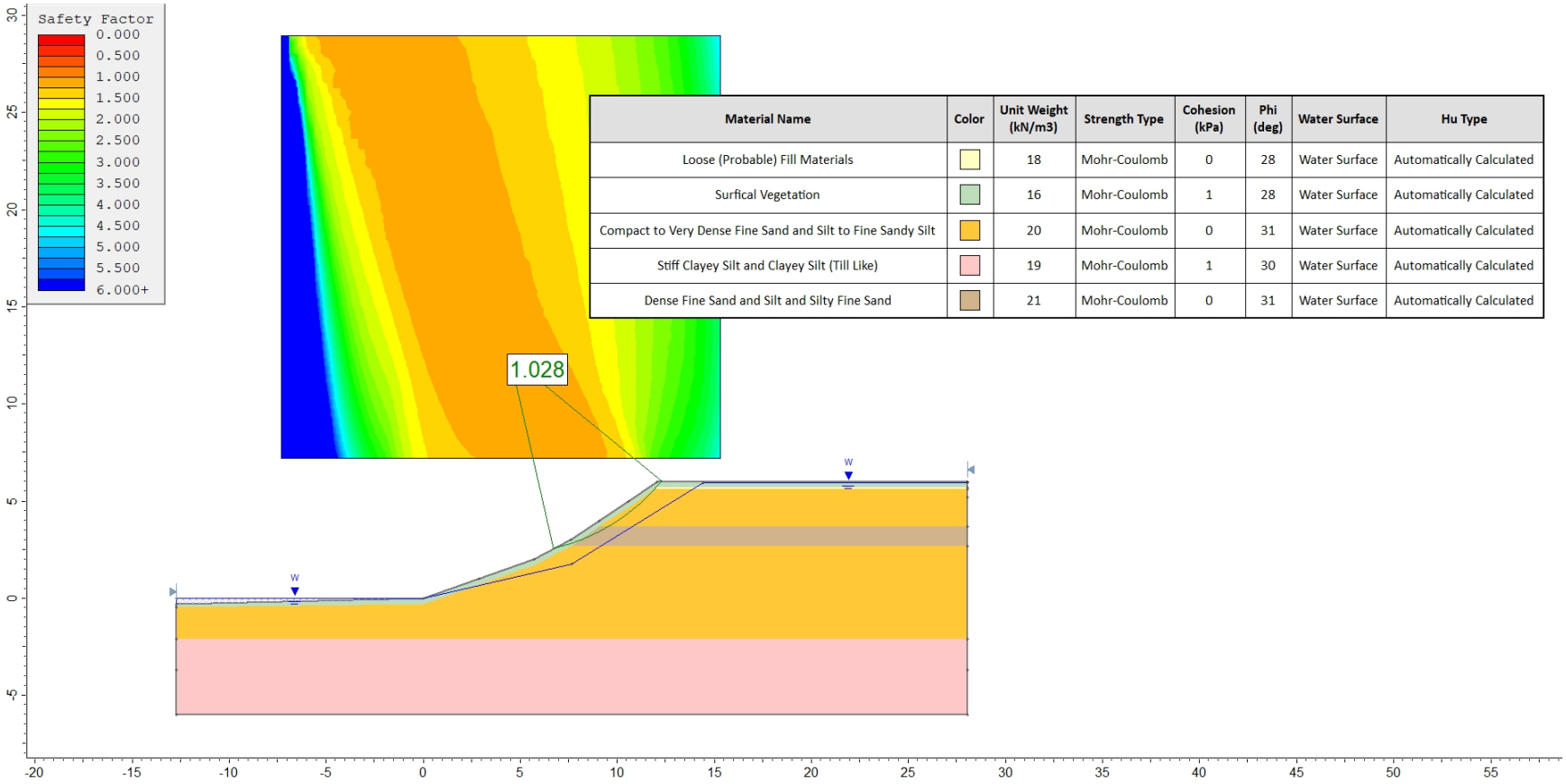
David B. Liu, P.Eng., Principal

DRAWINGS



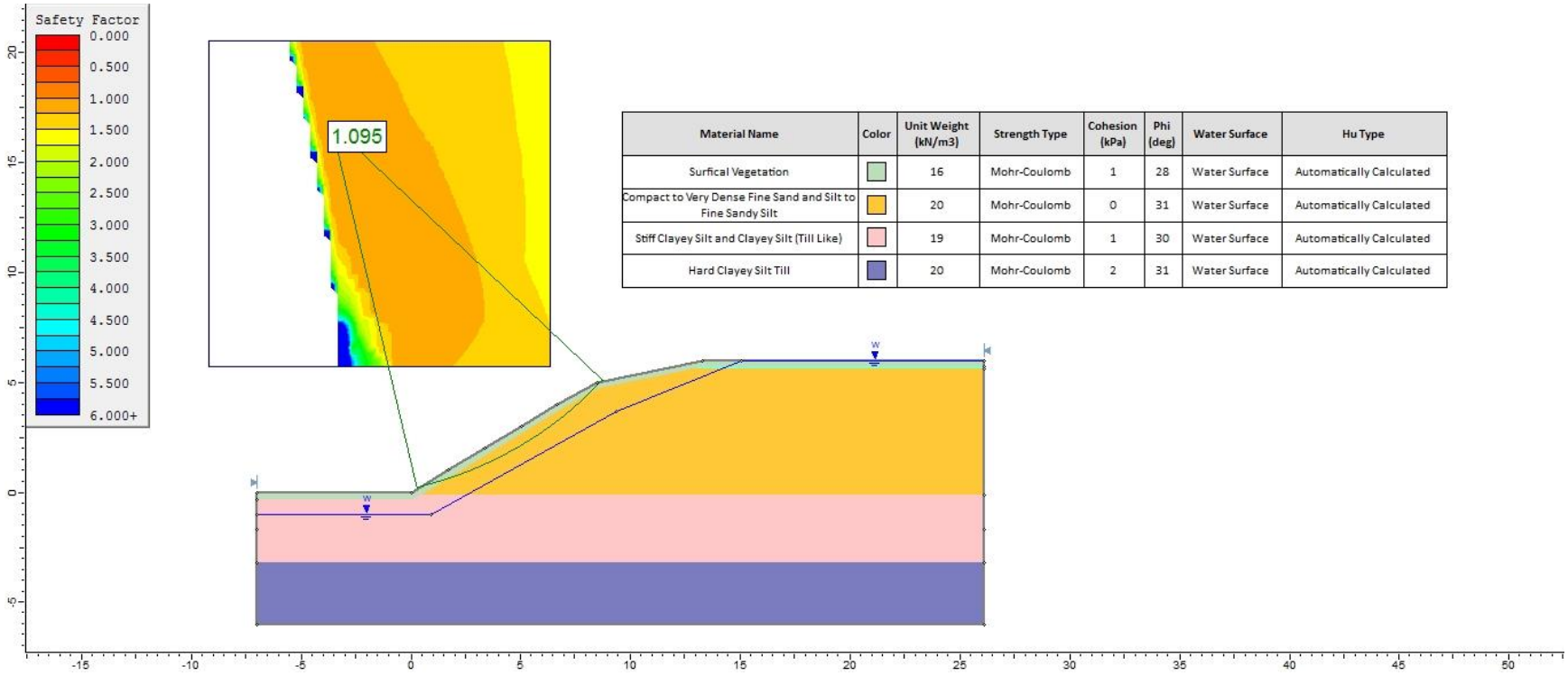
Client:	**869547 Ontario Inc.**		Project No.:	**17-1780GHE3**	Drawing No.: **1**
Drawn:	**JC**	Approved: **DL**	Title:	**Slope Profiles Location Plan**	
Date:	**Oct. 2023**	Scale: **N.T.S**	Project:	**Geotechnical Evaluation for Slope Stability Analysis and Geotechnical Setback Study Part of Lots 3 and 4, Concession 5, City of Pickering, Ontario**	
Original Size:	**Letter**	Rev: **CLL**		GeoPro Consulting Limited	

Slope Stability Analysis of Existing Slope, Cross-Section A-A



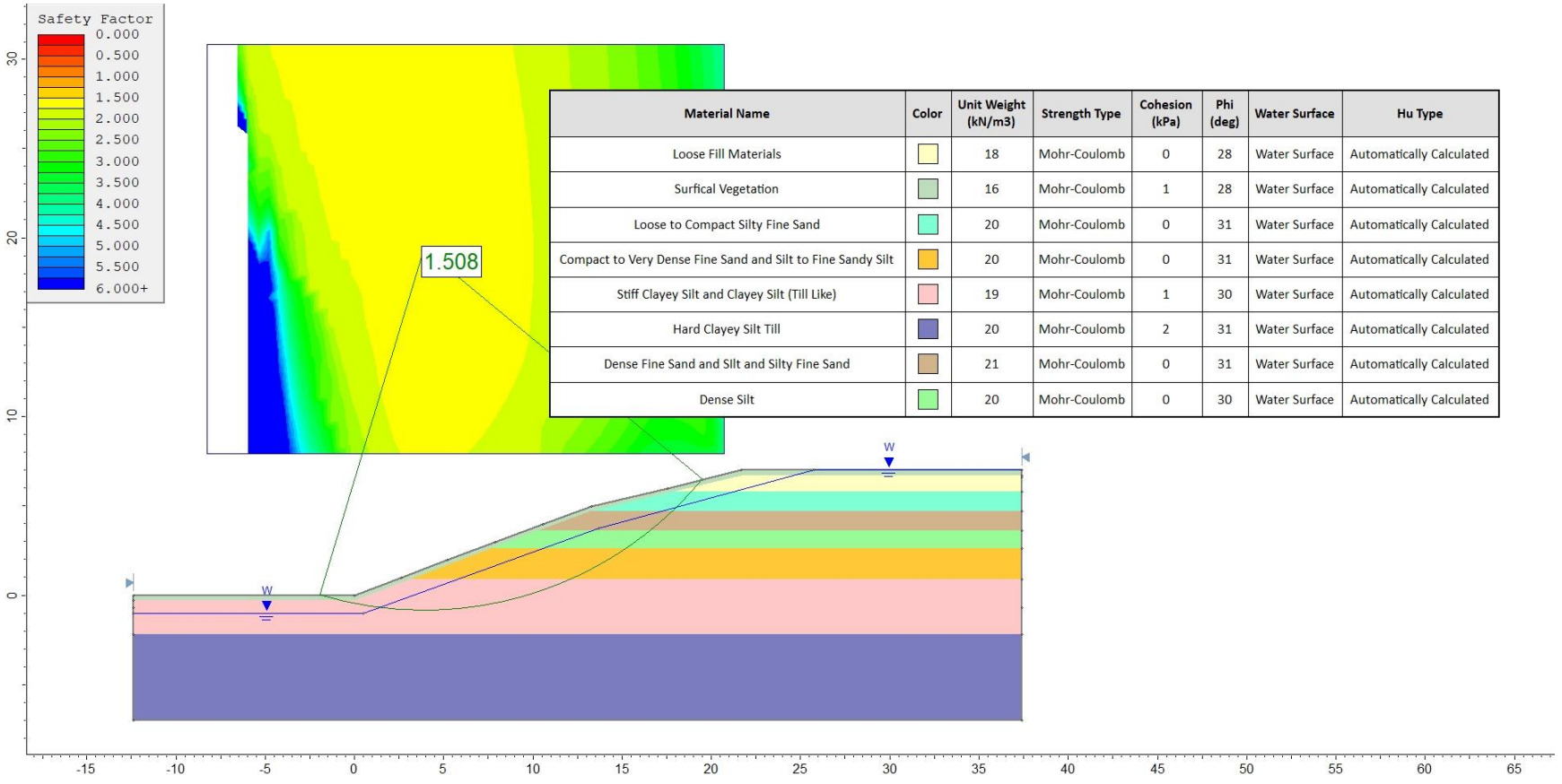
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Loose (Probable) Fill Materials		18	Mohr-Coulomb	0	28	Water Surface	Automatically Calculated
Surfical Vegetation		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Compact to Very Dense Fine Sand and Silt to Fine Sandy Silt		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Stiff Clayey Silt and Clayey Silt (Till Like)		19	Mohr-Coulomb	1	30	Water Surface	Automatically Calculated
Dense Fine Sand and Silt and Silty Fine Sand		21	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated

Slope Stability Analysis of Existing Slope, Cross-Section B-B



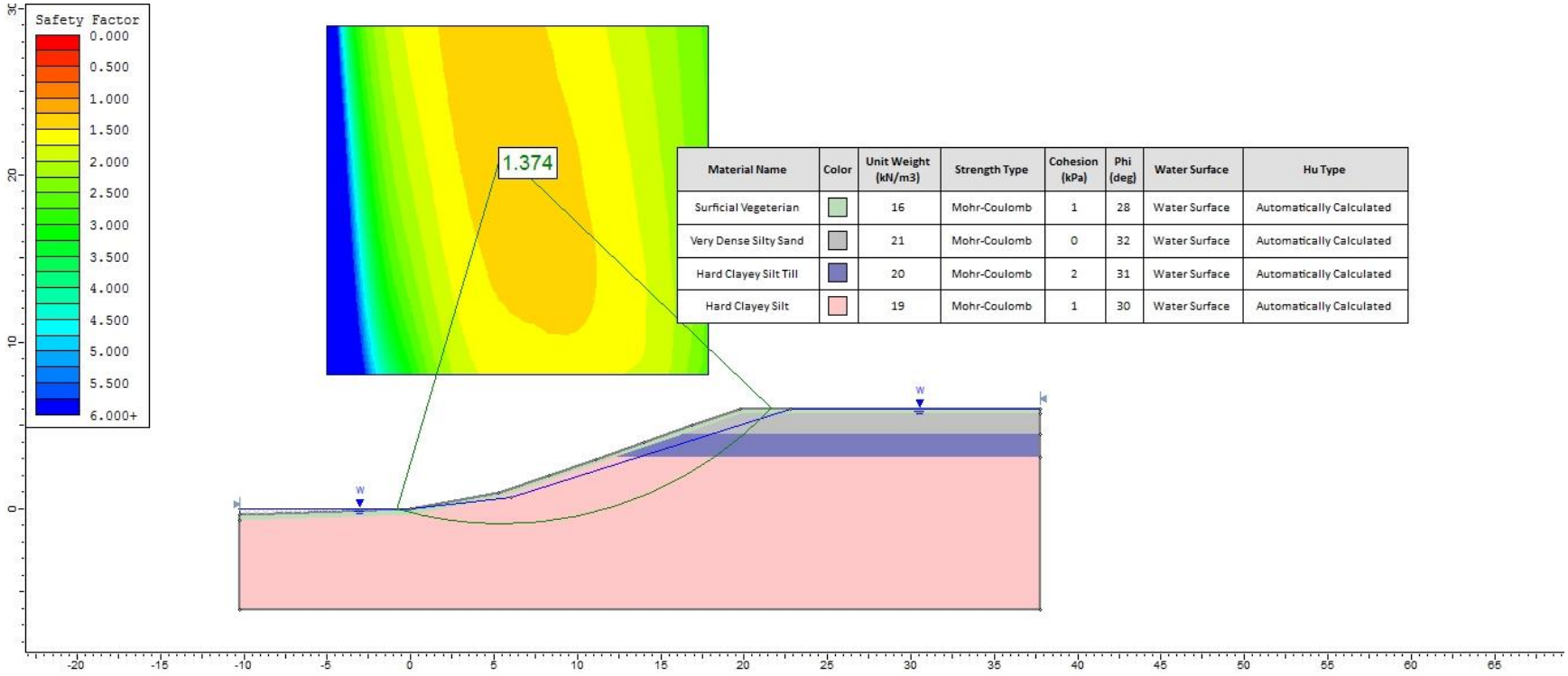
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Surfical Vegetation		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Compact to Very Dense Fine Sand and Silt to Fine Sandy Silt		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Stiff Clayey Silt and Clayey Silt (Till Like)		19	Mohr-Coulomb	1	30	Water Surface	Automatically Calculated
Hard Clayey Silt Till		20	Mohr-Coulomb	2	31	Water Surface	Automatically Calculated

Slope Stability Analysis of Existing Slope, Cross-Section C-C



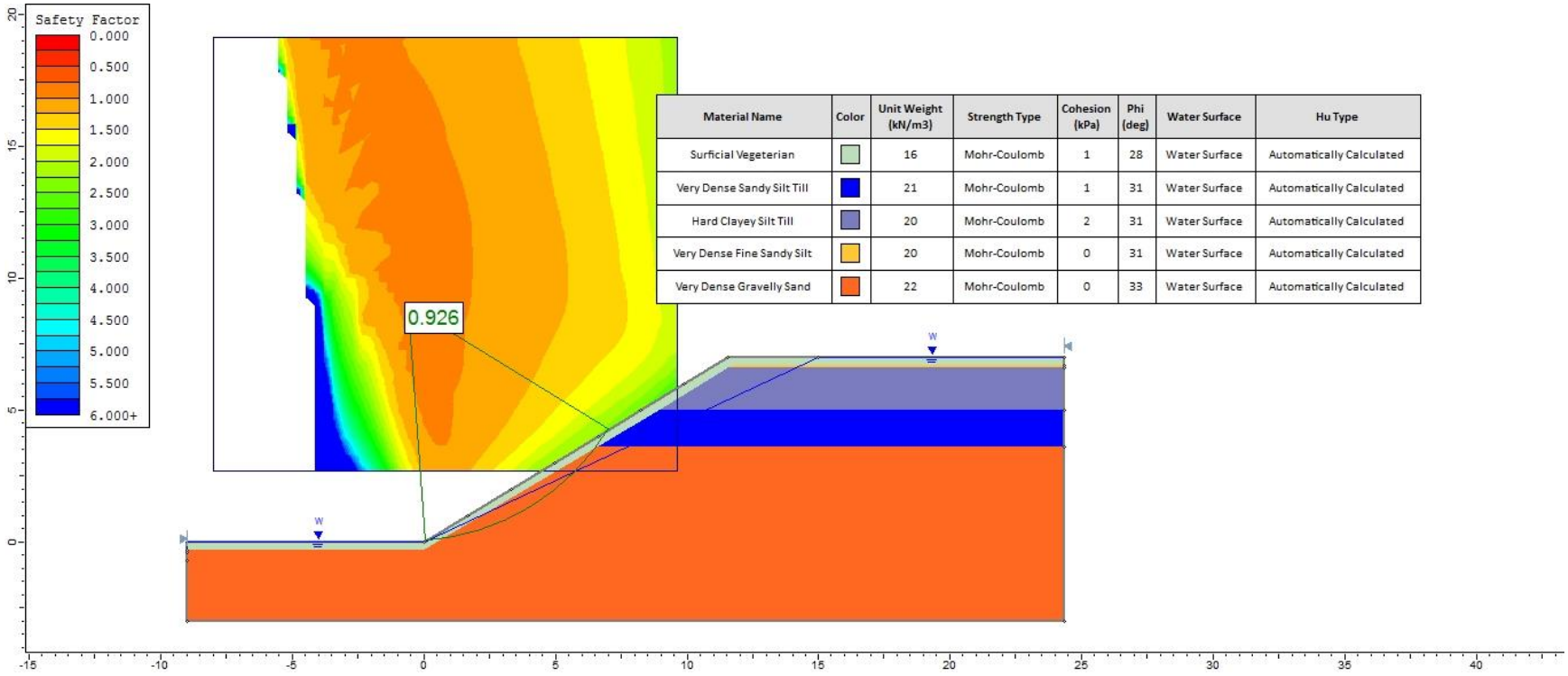
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Loose Fill Materials		18	Mohr-Coulomb	0	28	Water Surface	Automatically Calculated
Surfical Vegetation		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Loose to Compact Silty Fine Sand		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Compact to Very Dense Fine Sand and Silt to Fine Sandy Silt		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Stiff Clayey Silt and Clayey Silt (Till Like)		19	Mohr-Coulomb	1	30	Water Surface	Automatically Calculated
Hard Clayey Silt Till		20	Mohr-Coulomb	2	31	Water Surface	Automatically Calculated
Dense Fine Sand and Sllt and Silty Fine Sand		21	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Dense Silt		20	Mohr-Coulomb	0	30	Water Surface	Automatically Calculated

Slope Stability Analysis of Existing Slope, Cross-Section D-D



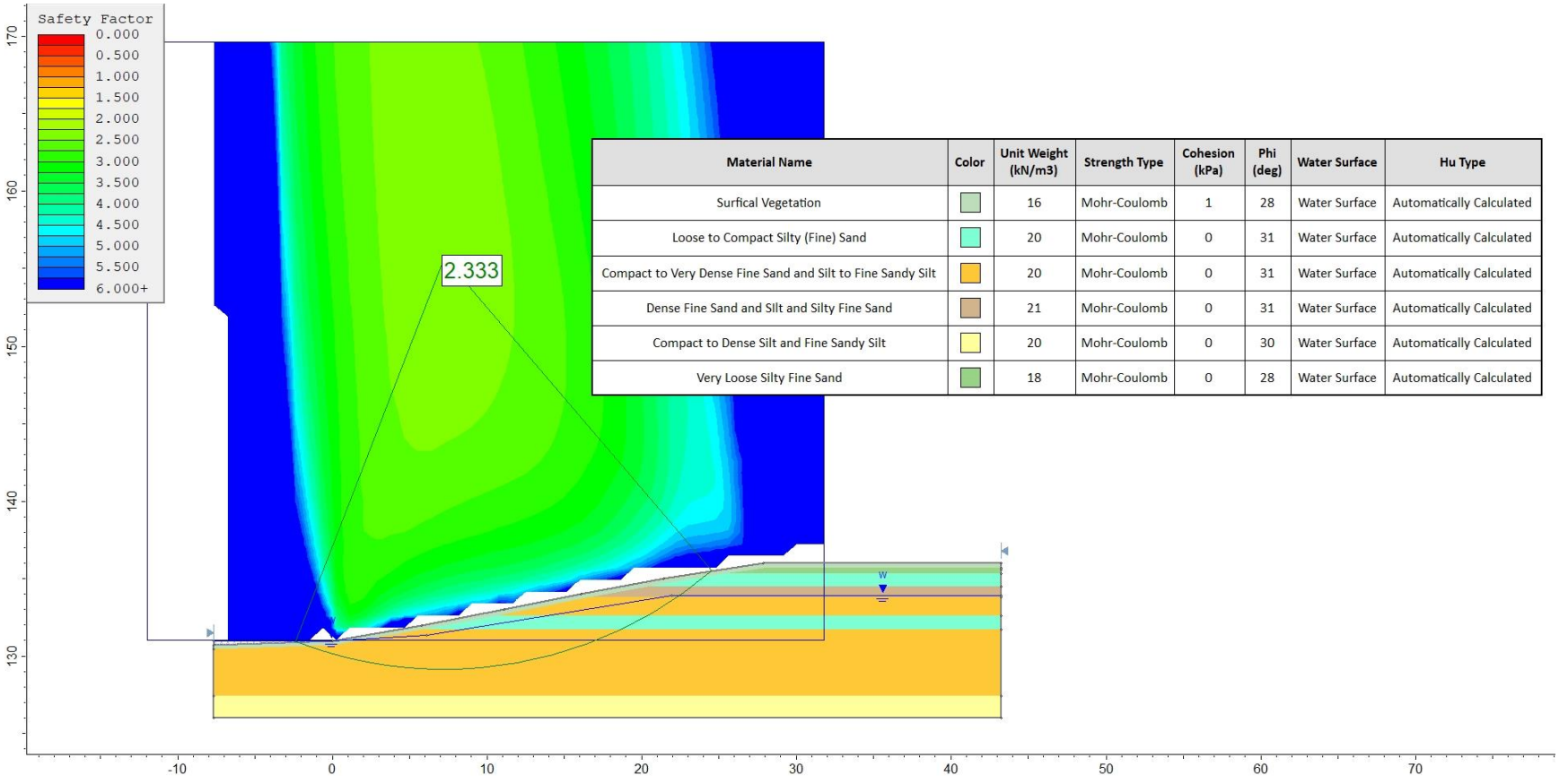
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Surficial Vegeterian		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Very Dense Silty Sand		21	Mohr-Coulomb	0	32	Water Surface	Automatically Calculated
Hard Clayey Silt Till		20	Mohr-Coulomb	2	31	Water Surface	Automatically Calculated
Hard Clayey Silt		19	Mohr-Coulomb	1	30	Water Surface	Automatically Calculated

Slope Stability Analysis of Existing Slope, Cross-Section E-E



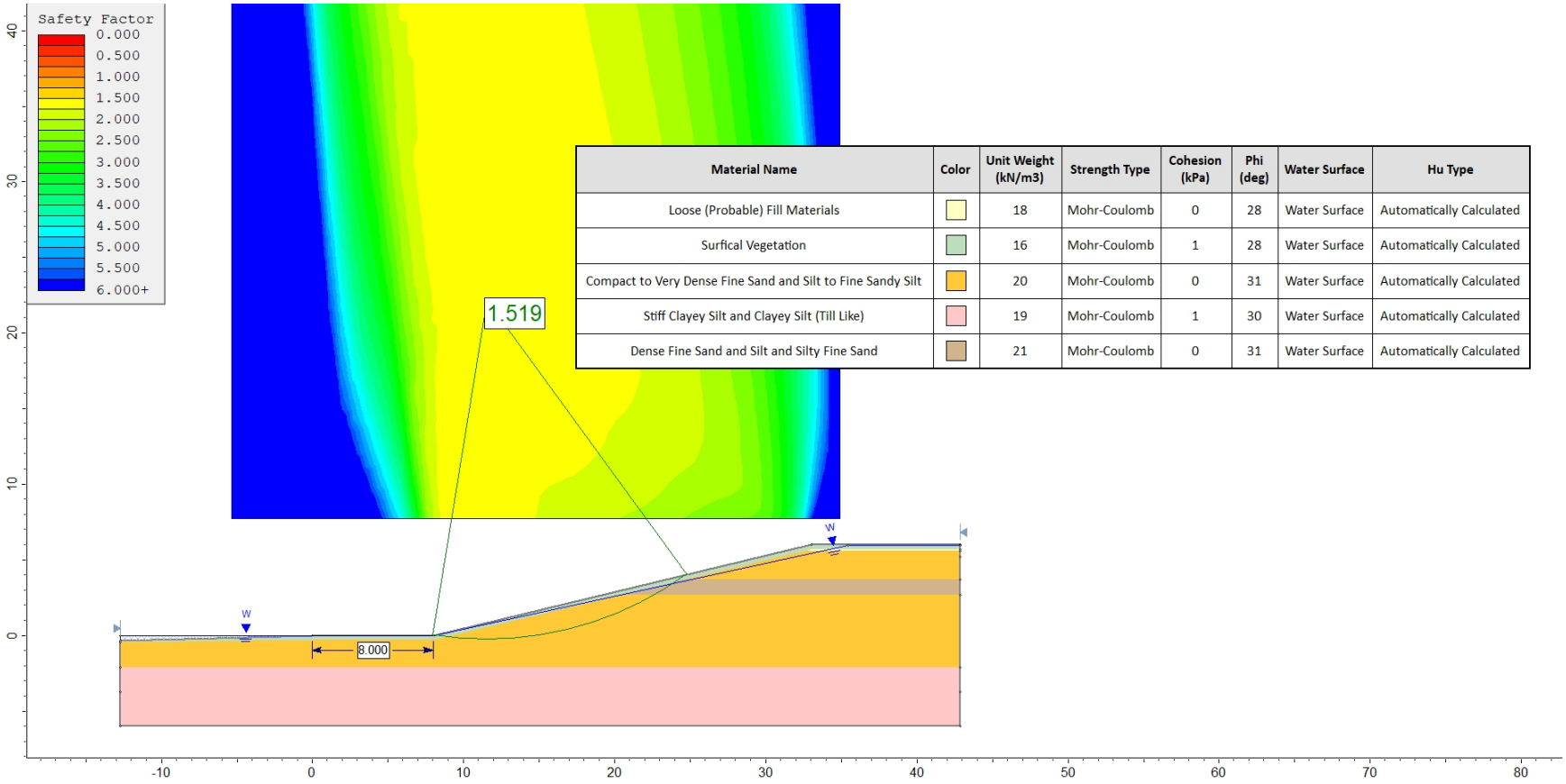
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Surficial Vegeterian		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Very Dense Sandy Silt Till		21	Mohr-Coulomb	1	31	Water Surface	Automatically Calculated
Hard Clayey Silt Till		20	Mohr-Coulomb	2	31	Water Surface	Automatically Calculated
Very Dense Fine Sandy Silt		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Very Dense Gravelly Sand		22	Mohr-Coulomb	0	33	Water Surface	Automatically Calculated

Slope Stability Analysis of Existing Slope, Cross-Section F-F



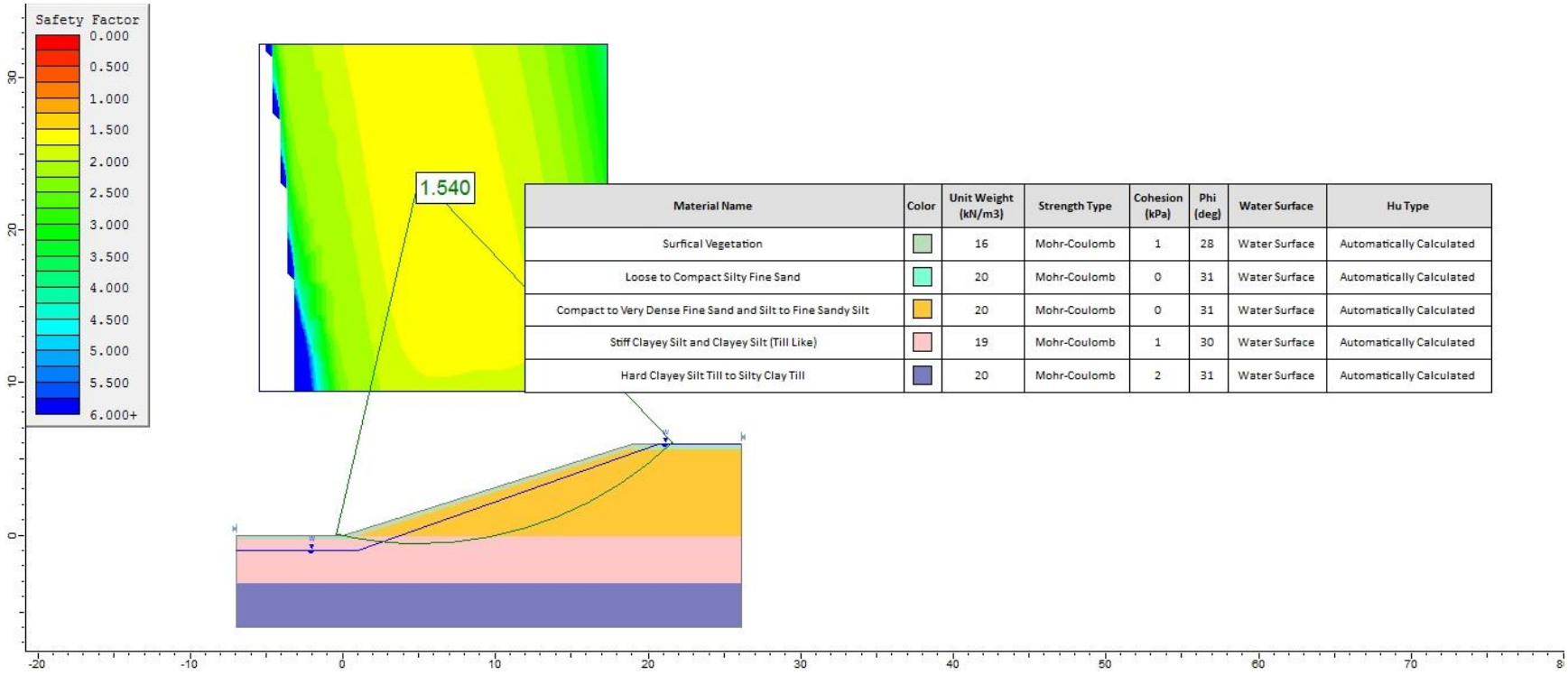
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Surfical Vegetation		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Loose to Compact Silty (Fine) Sand		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Compact to Very Dense Fine Sand and Silt to Fine Sandy Silt		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Dense Fine Sand and Sllt and Silty Fine Sand		21	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Compact to Dense Silt and Fine Sandy Silt		20	Mohr-Coulomb	0	30	Water Surface	Automatically Calculated
Very Loose Silty Fine Sand		18	Mohr-Coulomb	0	28	Water Surface	Automatically Calculated

Slope Stability Analysis of Long-Term Stable of Slope, Cross-Section A-A



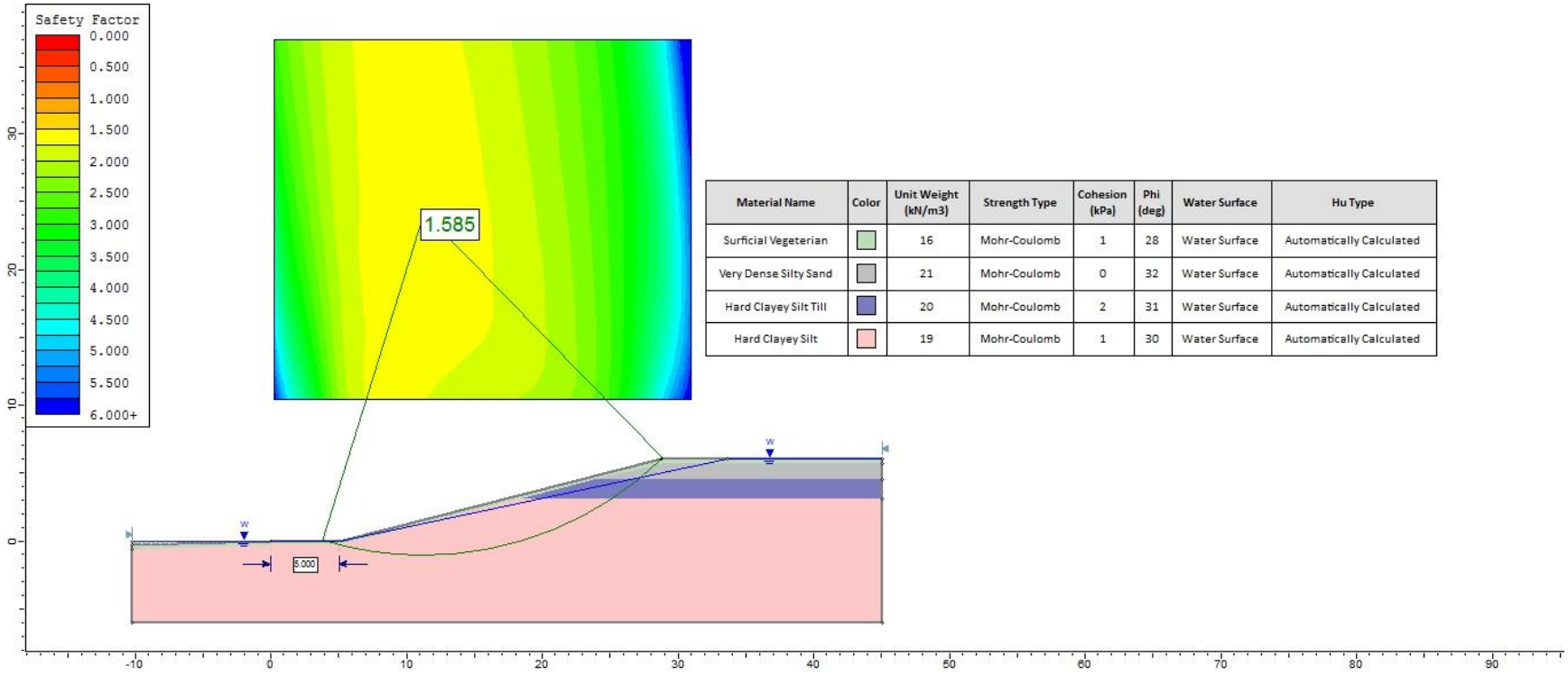
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Loose (Probable) Fill Materials		18	Mohr-Coulomb	0	28	Water Surface	Automatically Calculated
Surfical Vegetation		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Compact to Very Dense Fine Sand and Silt to Fine Sandy Silt		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Stiff Clayey Silt and Clayey Silt (Till Like)		19	Mohr-Coulomb	1	30	Water Surface	Automatically Calculated
Dense Fine Sand and Silt and Silty Fine Sand		21	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated

Slope Stability Analysis of Long-Term Stable of Slope, Cross-Section B-B



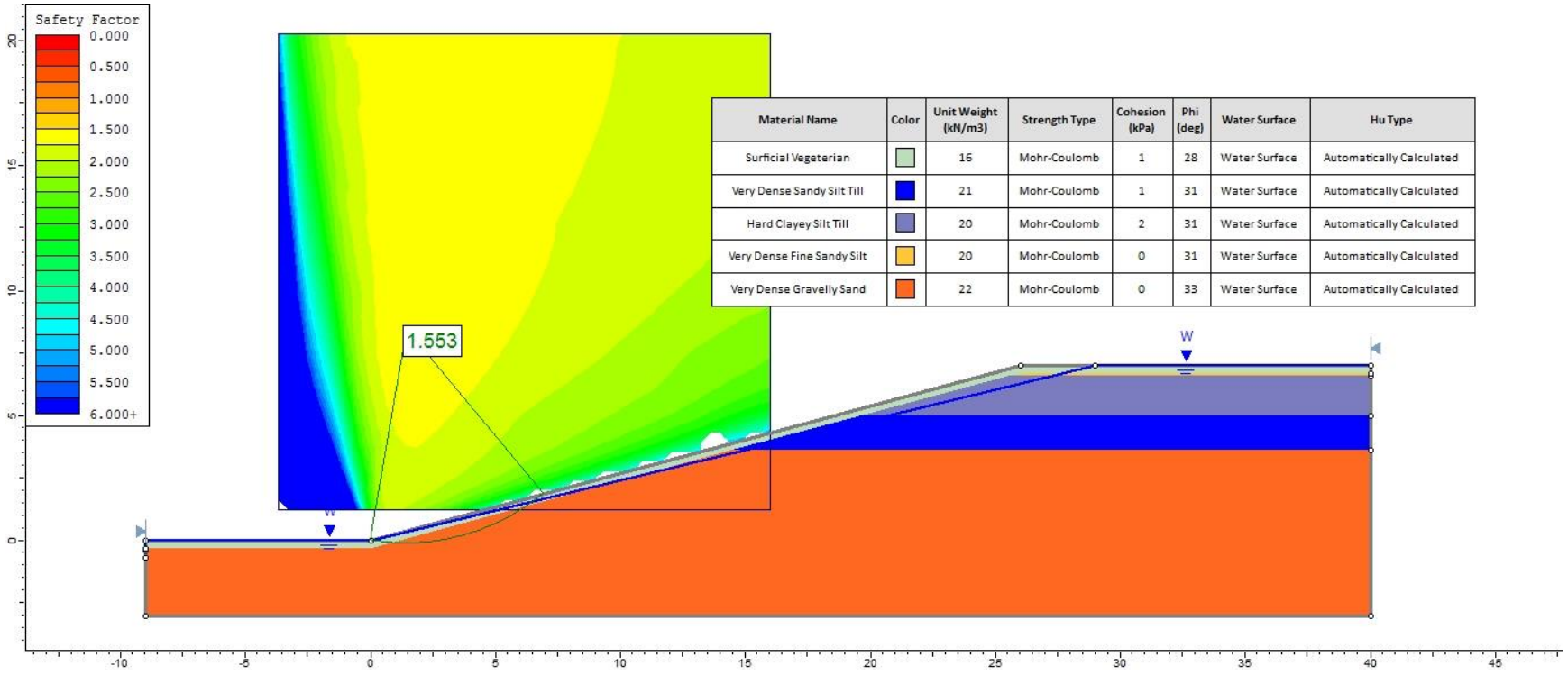
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Surfical Vegetation		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Loose to Compact Silty Fine Sand		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Compact to Very Dense Fine Sand and Silt to Fine Sandy Silt		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Stiff Clayey Silt and Clayey Silt (Till Like)		19	Mohr-Coulomb	1	30	Water Surface	Automatically Calculated
Hard Clayey Silt Till to Silty Clay Till		20	Mohr-Coulomb	2	31	Water Surface	Automatically Calculated

Slope Stability Analysis of Long-Term Stable of Slope, Cross-Section D-D



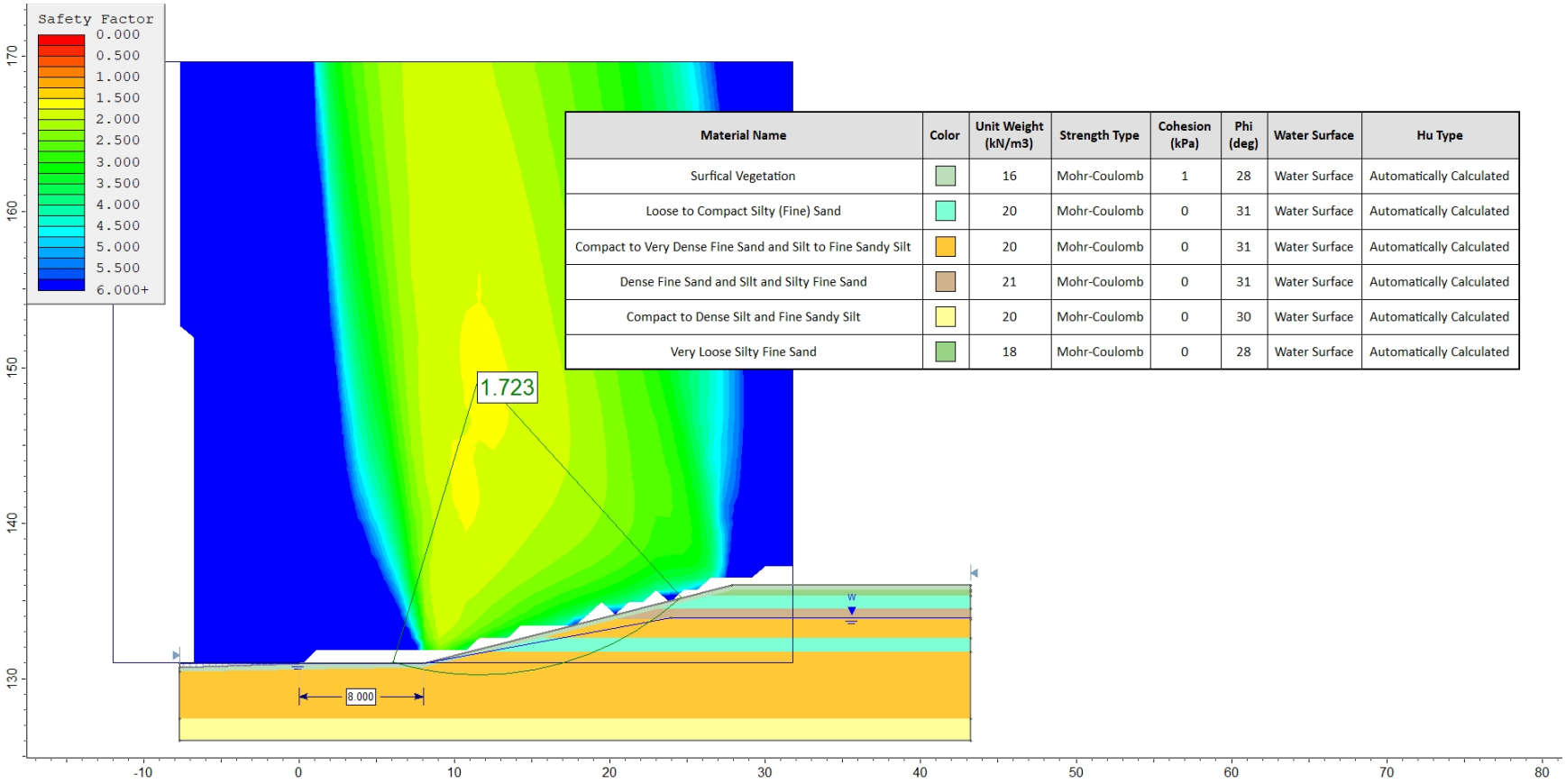
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Surficial Vegeterian		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Very Dense Silty Sand		21	Mohr-Coulomb	0	32	Water Surface	Automatically Calculated
Hard Clayey Silt Till		20	Mohr-Coulomb	2	31	Water Surface	Automatically Calculated
Hard Clayey Silt		19	Mohr-Coulomb	1	30	Water Surface	Automatically Calculated

Slope Stability Analysis of Long-Term Stable of Slope, Cross-Section E-E



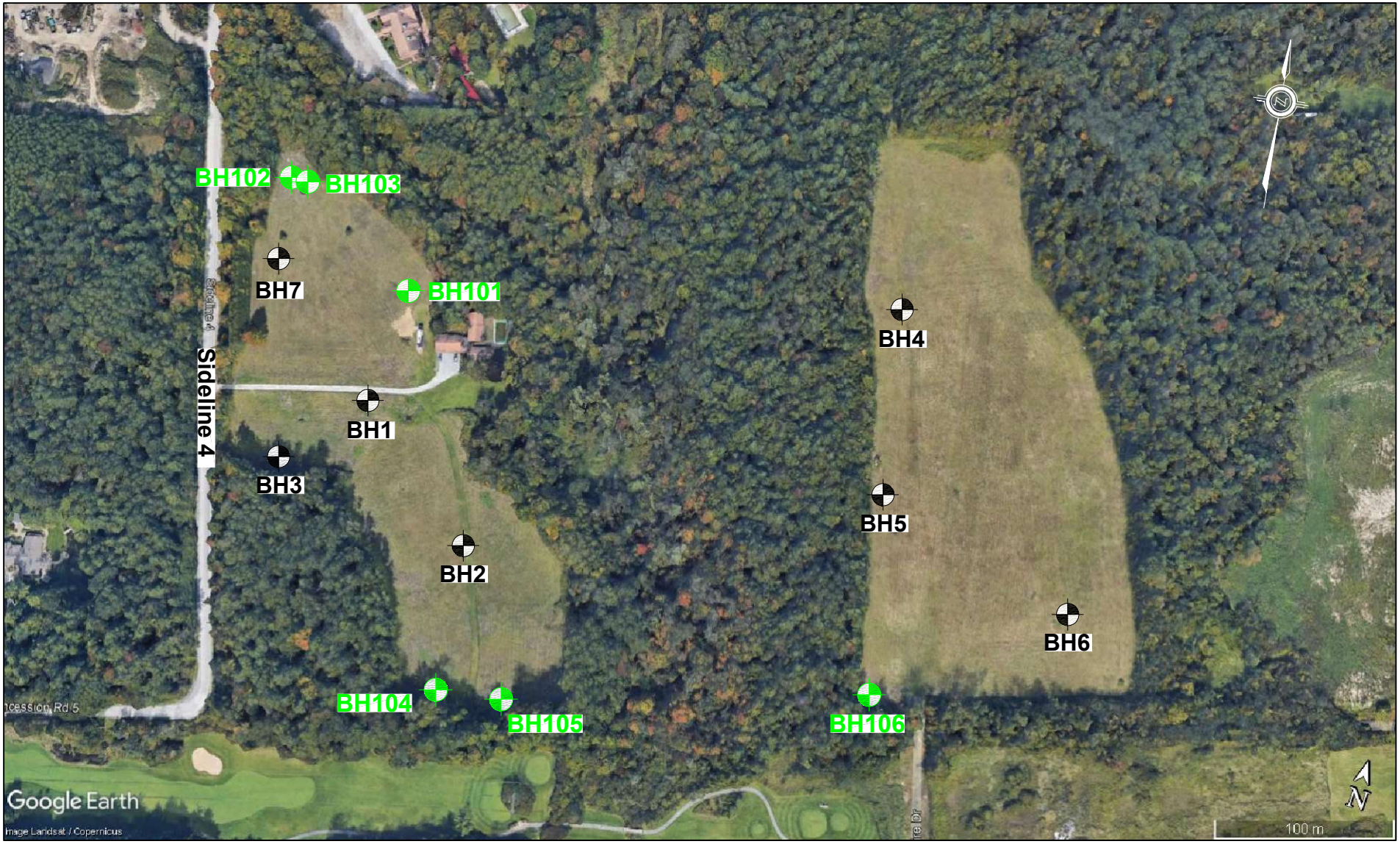
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Surficial Vegeterian		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Very Dense Sandy Silt Till		21	Mohr-Coulomb	1	31	Water Surface	Automatically Calculated
Hard Clayey Silt Till		20	Mohr-Coulomb	2	31	Water Surface	Automatically Calculated
Very Dense Fine Sandy Silt		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Very Dense Gravelly Sand		22	Mohr-Coulomb	0	33	Water Surface	Automatically Calculated

Slope Stability Analysis of Long-Term Stable of Slope, Cross-Section F-F



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
Surfical Vegetation		16	Mohr-Coulomb	1	28	Water Surface	Automatically Calculated
Loose to Compact Silty (Fine) Sand		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Compact to Very Dense Fine Sand and Silt to Fine Sandy Silt		20	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Dense Fine Sand and Sllt and Silty Fine Sand		21	Mohr-Coulomb	0	31	Water Surface	Automatically Calculated
Compact to Dense Silt and Fine Sandy Silt		20	Mohr-Coulomb	0	30	Water Surface	Automatically Calculated
Very Loose Silty Fine Sand		18	Mohr-Coulomb	0	28	Water Surface	Automatically Calculated

APPENDIX A



Legend:

- Borehole Location
- Previous Borehole Location

Client:	869547 Ontario Inc.			Project No.: 17-1780GHE3	Drawing No.: 1
Drawn:	RF	Approved:	DL	Title:	Borehole Location Plan
Date:	Nov. 2022	Scale:	N.T.S	Project:	Geotechnical Investigation for Proposed Residential Development Parts of Lots 3 and 4, Pickering, Ontario
Original Size:	Letter	Rev:	DX		GeoPro Consulting Limited

LOG OF BOREHOLE BH1

PROJECT: Geotechnical Investigation for Proposed Residential Development

CLIENT: JFC Developments Ltd.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, Ontario

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

DRILLING DATA

Method: Continuous Flight Auger- Auto Hammer

Diameter: 155/205 mm

Date: Apr/10/2017

REF. NO.: 17-1780GHE

ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
135.3							
135.0 / 0.0	**TOPSOIL:** (180 mm)					Concrete	135
0.2	**REWORKED SILTY FINE SAND:** trace organics, trace rootlets, brown, moist, loose		1	SS	4		
134.2			2	SS	4		134
1.1	**SILTY FINE SAND:** trace organics, trace rootlets, brown, wet, loose to compact		3	SS	23	W. L. 133.9 m May 09, 2017 W. L. 133.6 m Apr 28, 2017	
133.2							133
2.1	**FINE SAND AND SILT TO FINE SANDY SILT:** trace clay, brown to grey, wet, dense to very dense		4	SS	37	Bentonite	
			5	SS	55		132
	--- grey		6	SS	82		131
							130
						Sand	
						Screen	
			7	SS	50 / 150 mm		129
						Natural Pack	
127.4			8	SS	50 / 150 mm		
7.9	**END OF BOREHOLE**						

Notes:
1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 3.0 mBGS upon completion of drilling.
3) Borehole caved at a depth of 3.0 mBGS upon completion of drilling.
4) 51 mm dia. Monitoring Well was installed in borehole upon completion of drilling.

Water Level Reading

Date	W.L. Depth (mBGS)
April 28, 2017	1.72
May 9, 2017	1.35

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

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

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

LOG OF BOREHOLE BH2

PROJECT: Geotechnical Investigation for Proposed Residential Development

CLIENT: JFC Developments Ltd.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, Ontario

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

DRILLING DATA

Method: Continuous Flight Auger- Auto Hammer

Diameter: 155/205 mm

Date: Apr/10/2017

REF. NO.: 17-1780GHE

ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
133.0							
0.0 / 132.7	**TOPSOIL:** (250 mm)		1	SS	5	Concrete	
0.3 / 132.3	**REWORKED SILTY FINE SAND:** trace clay, trace organics, trace rootlets, brown, moist, loose						
0.7 / 131.6	**NO RECOVERY:** likely silty fine sand, loose		2	NR	6	W. L. 132.3 m May 09, 2017 W. L. 131.9 m Apr 28, 2017	
1.4	**FINE SAND AND SILT:** trace clay, trace organics, seams of clayey silt, brown to grey, wet, compact to very dense		3	SS	18		131
	--- grey		4	SS	30	Sand Screen	
			5	SS	32		
			6	SS	46		129
			7	SS	53		128
125.9							127
7.1	**CLAYEY SILT:** some fine sand, seams of sand, grey, wet, stiff		8	SS	10		126
124.3							125
8.6	**CLAYEY SILT (TILL LIKE):** trace to some sand, trace gravel, containing cobbles and boulders, grey, wet, stiff					Natural Pack	
			9	SS	10		124
122.8							123
10.1	**CLAYEY SILT TILL TO SILTY CLAY TILL:** trace sand, trace gravel, containing cobbles and boulders, grey, moist, hard		10	SS	80		122

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

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

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH2

PROJECT: Geotechnical Investigation for Proposed Residential Development

CLIENT: JFC Developments Ltd.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, Ontario

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

DRILLING DATA

Method: Continuous Flight Auger- Auto Hammer

Diameter: 155/205 mm

Date: Apr/10/2017

REF. NO.: 17-1780GHE

ENCL NO.: 3

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
120.3			11	SS	90/280 mm				○		
12.6	**END OF BOREHOLE** Notes: 1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 2.1 mBGS upon completion of drilling. 3) Borehole caved at a depth of 2.1 mBGS upon completion of drilling. 4) 51 mm dia. Monitoring Well was installed in borehole upon completion of drilling. Water Level Reading Date W.L. Depth (mBGS) April 28, 2017 1.05 May 9, 2017 0.70										

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

GeoPro CONSULTING LIMITED

LOG OF BOREHOLE BH3

PROJECT: Geotechnical Investigation for Proposed Residential Development

CLIENT: JFC Developments Ltd.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, Ontario

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

DRILLING DATA

Method: Continuous Flight Auger- Auto Hammer

Diameter: 155/205 mm

Date: Apr/10/2017

REF. NO.: 17-1780GHE

ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
133.6							
133.4 0.2	**TOPSOIL:** (180 mm) **REWORKED SILTY FINE SAND:** trace organics, trace rootlets, dark brown to brown, wet, loose to compact		1	SS	4	Concrete Bentonite	
132.5 1.1			2	SS	23	W. L. 133.0 m W. L. 132.8 m Apr 28, 2017	
132.2 1.4	**SILTY FINE SAND:** trace clay, trace rootlets, brown, wet, compact						
2	**FINE SAND AND SILT TO FINE SANDY SILT:** trace clay, brown to grey, wet, compact to dense		3	SS	26	Sand Screen	132
			4	SS	48		131
3	--- grey		5	SS	43		
129.5 4.0	**SILT:** some fine sand, trace clay, layers of fine sand and silt, grey, wet, dense						130
5			6	SS	39		129
128.0 5.6	**FINE SAND AND SILT:** trace clay, grey, wet, very dense					Natural Pack	128
6			7	SS	50/ 150 mm		
126.6 7.0	**SILT:** some fine sand, trace to some clay, seams of fine sand, grey, wet, compact						127
8			8	SS	30		126
125.5 8.1	**END OF BOREHOLE**						

Notes:
1) Water encountered at a depth of 0.8 m below ground surface (mBGS) during drilling.
2) Borehole caved at a depth of 1.8 mBGS upon completion of drilling.
3) 51 mm dia. Monitoring Well was installed in borehole upon completion of drilling.

Water Level Reading

Date W.L.	Depth (mBGS)
April 28, 2017	0.76
May 9, 2017	0.57

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

LOG OF BOREHOLE BH4

PROJECT: Geotechnical Investigation for Proposed Residential Development

CLIENT: JFC Developments Ltd.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, Ontario

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

DRILLING DATA

Method: Continuous Flight Auger- Auto Hammer

Diameter: 155/205 mm

Date: Apr/05/2017

REF. NO.: 17-1780GHE

ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"
136.1 / 0.0	**TOPSOIL:** (200 mm)			
0.2	**REWORKED SAND AND SILT:** some clay, some gravel, trace organics, trace rootlets, brown, wet, very loose to dense	1	SS	3
135.0 / 1.1	**SANDY SILT TILL TO SAND AND SILT TILL:** some clay, trace gravel, layers of silty sand, containing cobbles and boulders, brown to grey, moist to wet, dense to very dense ---cobbles and boulders --- grey	2	SS	40
		3	SS	50/ 150 mm
		4	SS	67
		5	SS	73
132.1 / 4.0	**SILTY SAND:** some gravel, containing cobbles and boulders, grey, wet, very dense	6	SS	68
130.5 / 5.6	**CLAYEY SILT TILL:** some sand to sandy, trace gravel, containing cobbles and boulders, grey, moist, hard	7	SS	50 / 150 mm
129.1 / 7.0	**CLAYEY SILT:** trace sand, trace gravel, grey, moist, hard	8	SS	50 / 130 mm
128.3 / 7.8	**END OF BOREHOLE**			

Notes:
1) Water encountered at a depth of 1.8 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 1.5 mBGS upon completion of drilling.
3) 51 mm dia. Monitoring Well was installed in borehole upon completion of drilling.

Water Level Reading

Date	W.L. Depth (mBGS)
April 28, 2017	0.39
May 9, 2017	0.27

Concrete

W. L. 135.8 m
W. L. 135.7 m
Apr 28, 2017

Bentonite

Sand

Screen

Natural Pack

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

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

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

LOG OF BOREHOLE BH5

PROJECT: Geotechnical Investigation for Proposed Residential Development

CLIENT: JFC Developments Ltd.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, Ontario

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

DRILLING DATA

Method: Continuous Flight Auger- Auto Hammer

Diameter: 155/205 mm

Date: Apr/05/2017

REF. NO.: 17-1780GHE

ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
135.5						
135.3 0.0	**TOPSOIL:** (200 mm)					
0.2 134.8	**FILL:** silty fine sand, trace organics, trace rootlets, dark brown to brown, wet, loose	1	SS	4		
0.7	**SANDY SILT TILL:** trace to some clay, trace gravel, pockets of sand, containing cobbles and boulders, brown to grey, moist, very dense	2	SS	76 / 280 mm		
		3	SS	87		
	--- grey	4	SS	94		
132.6						
2.9	**FINE SANDY SILT:** trace clay, trace gravel, grey, wet, very dense	5	SS	50 / 80 mm		
131.6						
3.9	**CLAYEY SILT TILL:** some sand to sandy, trace gravel, containing cobbles and boulders, grey, moist, hard	6	SS	50 / 130 mm		
130.0						
5.5	**SANDY SILT TILL:** trace to some clay, trace gravel, containing cobbles and boulders, grey, moist, very dense	7	SS	50 / 80 mm		
	---cobbles and boulders					
128.6						
6.9	**GRAVELLY SAND:** trace silt, pockets of silt, containing cobbles and boulders, grey, wet, very dense	8	SS	59		
127.4						
8.1	**END OF BOREHOLE**					

Notes:
1) Water encountered at a depth of 0.8 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 0.3 mBGS upon completion of drilling.
3) Borehole caved at a depth of 6.7 mBGS upon completion of drilling.
4) 51 mm dia. Monitoring Well was installed in borehole upon completion of drilling.

Water Level Reading

Date	W.L. Depth (mBGS)
April 28, 2017	0.76
May 9, 2017	0.49

Concrete

W. L. 135.0 m May 09, 2017

W. L. 134.7 m Apr 28, 2017

Bentonite

Sand

Screen

Natural Pack

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

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

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

LOG OF BOREHOLE BH6

PROJECT: Geotechnical Investigation for Proposed Residential Development

CLIENT: JFC Developments Ltd.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, Ontario

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

DRILLING DATA

Method: Continuous Flight Auger- Auto Hammer

Diameter: 155/205 mm

Date: Apr/05/2017

REF. NO.: 17-1780GHE

ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
136.7					
0.0 / 136.1	**TOPSOIL:** (530 mm)	1	SS	4	Concrete
136.0	**REWORKED SAND AND SILT:**				
0.7	trace to some clay, trace organics, trace rootlets, dark brown, wet, very loose	2	SS	14	136
1	**SANDY SILT TILL:** trace clay, trace gravel, pockets of sand, layers of silty sand, containing cobbles and boulders, brown to grey, moist to wet, compact to very dense				W. L. 135.4 m May 09, 2017
		3	SS	44	W. L. 135.0 m Apr 28, 2017
2		4	SS	68	134
3	--- grey	5	SS	45	133
4					Sand
	--- containing shale fragments				Screen
		6	SS	45	132
5					
131.1					131
5.6 / 130.1	**SILTY SAND TILL:** some gravel, trace clay, layers of silty sand, containing cobbles and boulders, grey, moist to wet, very dense	7	SS	91/ 280 mm	Natural Pack
6.5	**END OF BOREHOLE**				

Notes:
1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling.
2) 51 mm dia. Monitoring Well was installed in borehole upon completion of drilling.

Water Level Reading

Date	W.L. Depth (mBGS)
April 28, 2017	1.62
May 9, 2017	1.31

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

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

LOG OF BOREHOLE BH7

PROJECT: Geotechnical Investigation for Proposed Residential Development

CLIENT: JFC Developments Ltd.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, Ontario

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

DRILLING DATA

Method: Continuous Flight Auger- Auto Hammer

Diameter: 155/205 mm

Date: Apr/13/2017

REF. NO.: 17-1780GHE

ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUNDWATER CONDITIONS	ELEVATION
136.1							
135.9 0.0	**TOPSOIL:** (220 mm)						Concrete
0.2	**REWORKED SILTY FINE SAND:** trace organics, trace rootlets, brown, moist, very loose		1	SS	2		
135.1			2	SS	3		135
1.1	**SILTY FINE SAND:** trace organics, trace rootlets, brown, moist to wet, very loose to dense		3	SS	14		
133.4			4	SS	40		134
2.7	**FINE SAND AND SILT:** trace clay, grey, wet to saturated, very dense		5	SS	52		133
132.1							
4.0	**SILTY FINE SAND:** trace clay, grey, wet to saturated, dense		6	SS	46		132
130.6							
5.6	**FINE SAND AND SILT:** trace clay, layers of silty fine sand, seams of clayey silt, grey, wet, very dense		7	SS	55		131
129.0							
7.1	**SILTY FINE SAND:** trace clay, grey, wet, very dense		8	SS	50 / 100 mm		130
127.5							
8.6	**SILT TO FINE SANDY SILT:** trace to some clay, grey, wet, compact		9	SS	12		129
124.5			10	SS	28		128
11.7							127
							126
							125

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

SHEAR STRENGTH (kPa) (20 40 60 80 100)

W. L. 136.8 m Apr 28, 2017

UNCONFINED + FIELD VANE & Sensitivity

QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH7

PROJECT: Geotechnical Investigation for Proposed Residential Development

CLIENT: JFC Developments Ltd.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, Ontario

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

DRILLING DATA

Method: Continuous Flight Auger- Auto Hammer

Diameter: 155/205 mm

Date: Apr/13/2017

REF. NO.: 17-1780GHE

ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
	SILTY CLAY TILL: trace to some sand, trace gravel, grey, moist to wet, very stiff(Continued)		11	SS	20		124
13 122.9							
13.2	**SANDY SILT TILL:** trace clay, trace gravel, containing cobbles and boulders, grey, moist to wet, very dense						123
122.3			12	SS	50 / 80 mm		
14 13.9	---cobbles and boulders					Bentonite	
	SAND AND SILT TILL: some clay, trace to some gravel, zones of silty sand, containing cobbles and boulders, grey, wet, dense to very dense						122
15	--- auger grinding						
			13	SS	50		121
16							
							120
	---cobbles and boulders		14	SS	50/ 100 mm		
17							119
118.4							
17.8	**CLAYEY SILT TILL:** some sand to sandy, trace gravel, grey, moist, hard						118
18			15	SS	100 / 250 mm		
19							117
20			16	SS	78		
115.3							116
20.8	**SANDY SILT TILL:** trace to some clay, trace gravel, grey, moist to wet, very dense						
21							115
			17	SS	71		
22							114
23			18	SS	61		
							113
24							

SAMPLES

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

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

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH7

PROJECT: Geotechnical Investigation for Proposed Residential Development

CLIENT: JFC Developments Ltd.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, Ontario

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan

DRILLING DATA

Method: Continuous Flight Auger- Auto Hammer

Diameter: 155/205 mm

Date: Apr/13/2017

REF. NO.: 17-1780GHE

ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SANDY SILT TILL: trace to some clay, trace gravel, grey, moist to wet, very dense(Continued)						112					
			19	SS	66				○			
25							111					
26			20	SS	58		110		○			
27							109					
28			21	SS	53		108		○			
107.8												
28.4	**PROBABLE WEATHERED SHALE:** grey, moist						Sand					
29			22	SS	50/ 100 mm		Screen 107		○			
106.6												
29.6	**END OF BOREHOLE**											

Notes:
1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling.
2) 51 mm dia. Monitoring Well was installed in borehole upon completion of drilling.

Water Level Reading

Date W.L.	Depth (mBGS)
April 28, 2017	-0.65
May 9, 2017	-0.63

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH101

PROJECT: Supplementray Geotechnical Investigation for Proposed Residential Development

CLIENT: 869547 Ontario Inc.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, ON

DATUM: N/A

BH LOCATION: See Borehole Plan Location

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: JF | DATE: 2021-08-27

SAMPLE REVIEW: CL | REF. NO.: 17-1780GHE3

CHECKED: DX | ENCL. NO.: 2

ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3m	GROUND WATER ELEVATION
0.0	**TOPSOIL:** (120 mm)					
0.1	**FILL:** silty fine sand, organic inclusions, rootlet inclusions, brown, moist, compact		1	SS	11	
0.7	**PROBABLE FILL:** silty fine sand, brown, moist, loose		2	SS	6	
			3	SS	6	
2.1	**FINE SANDY SILT:** trace clay, containing cobbles and boulders, brown, moist to wet, very dense		4	SS	65	
	--- auger grinding		5	SS	70	
4.0	**SILTY FINE SAND:** grey, wet, dense		6	SS	43	
5.0	**END OF BOREHOLE**					

Notes:

1) Water encountered at a depth of 3.0 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 3.2 mBGS upon completion of drilling.
3) Borehole caved at a depth of 4.2 mBGS upon completion of drilling.

DYNAMIC PENETRATION TEST
○ SPT ~ Cone blows/0.3m
20 40 60 80

SHEAR STRENGTH (kPa)
● Unconfined ✕ Field Vane & Sensitivity
▲ Quick Triaxial ⊠ Penetrometer + Lab Vane
20 40 60 80

Plastic Limit | Natural Moisture Content | Liquid Limit
w_P w w_L
WATER CONTENT (%)
10 20 30 40

UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

01 - GEOPRO SOIL LOG GEOPRO 17-1780GHE3 BH LOG 20211118 - NT - NG - DX.GPJ 2022-11-18 10:34

LOG OF BOREHOLE BH102

PROJECT: Supplementray Geotechnical Investigation for Proposed Residential Development

CLIENT: 869547 Ontario Inc.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, ON

DATUM: N/A

BH LOCATION: See Borehole Plan Location

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: JF | DATE: 2021-08-29

SAMPLE REVIEW: CL | REF. NO.: 17-1780GHE3

CHECKED: DX | ENCL. NO.: 3

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m
0.0	**TOPSOIL:** (300 mm)			
0.3	**REWORKED SILTY FINE SAND:** rootlet inclusions, brown, moist, very loose to loose	1	SS	4
1		2A	SS	4
		2B	SS	
1.1	**SILTY FINE SAND:** pockets of sandy silt, brown, moist, very loose to dense	3	SS	21
2		4	SS	45
3	--- layers of fine sandy silt	5	SS	46
4.0	**SILTY SAND:** brown, wet, compact	6	SS	28
5				
5.0	**END OF BOREHOLE**			

Notes:

1) Water encountered at a depth of 4.6 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 4.4 mBGS upon completion of drilling.
3) Borehole caved at a depth of 4.6 mBGS upon completion of drilling.

GROUND WATER ELEVATION

DYNAMIC PENETRATION TEST
○ SPT ≈ Cone blows/0.3m
20 40 60 80

SHEAR STRENGTH (kPa)
● Unconfined ✕ Field Vane & Sensitivity
▲ Quick Triaxial ⊠ Penetrometer + Lab Vane
20 40 60 80

Plastic Limit | Natural Moisture Content | Liquid Limit
w_P w w_L
WATER CONTENT (%)
10 20 30 40

UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

LOG OF BOREHOLE BH103

PROJECT: Supplementray Geotechnical Investigation for Proposed Residential Development

CLIENT: 869547 Ontario Inc.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, ON

DATUM: N/A

BH LOCATION: See Borehole Plan Location

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: JF | DATE: 2021-08-27

SAMPLE REVIEW: CL | REF. NO.: 17-1780GHE3

CHECKED: DX | ENCL. NO.: 4

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m
0.0	**TOPSOIL:** (300 mm)			
0.3	**REWORKED SILTY FINE SAND:** organic inclusions, rootlet inclusions, brown, moist, very loose	1	SS	2
1		2A	SS	2
		2B	SS	
1.1	**SILTY FINE SAND:** containing cobbles and boulders, brown, moist, very loose to dense	3	SS	11
2	--- auger grinding	4	SS	32
2.9	**FINE SAND AND SILT TO FINE SANDY SILT:** layers of silt, layers of silty sand, brown, moist to wet, compact	5	SS	25
4				
4.0	**SILTY SAND:** trace gravel, layers of sandy silt, brown, wet, compact	6	SS	27
5				
5.0	**END OF BOREHOLE**			

Notes:

1) Water encountered at a depth of 3.0 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 3.2 mBGS upon completion of drilling.
3) Borehole caved at a depth of 4.3 mBGS upon completion of drilling.

DYNAMIC PENETRATION TEST: ○ SPT, ≈ Cone, blows/0.3m; 20 40 60 80

SHEAR STRENGTH (kPa): ● Unconfined, ▲ Quick Triaxial, × Field Vane & Sensitivity, ⊠ Penetrometer, + Lab Vane; 20 40 60 80

Plastic Limit (w_P) | Natural Moisture Content (w) | Liquid Limit (w_L)

WATER CONTENT (%): 10 20 30 40

UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS

Measurement: 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

LOG OF BOREHOLE BH104

PROJECT: Supplementray Geotechnical Investigation for Proposed Residential Development

CLIENT: 869547 Ontario Inc.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, ON

DATUM: N/A

BH LOCATION: See Borehole Plan Location

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: JF | DATE: 2021-08-27

SAMPLE REVIEW: CL | REF. NO.: 17-1780GHE3

CHECKED: DX | ENCL. NO.: 5

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m
0.0	**TOPSOIL:** (250 mm)			
0.3	**REWORKED SILTY FINE SAND:** some silt, organic inclusions, rootlet inclusions, brown, moist, loose	1	SS	7
		2A	SS	5
		2B	SS	
1.1	**SILTY FINE SAND:** brown, moist to wet, loose to compact	3	SS	20
2.1	**FINE SANDY SILT:** trace clay, grey, moist to wet, dense	4	SS	31
2.9	**SILT:** trace clay, some sand, grey, wet, dense	5	SS	43
4.0	**FINE SANDY SILT:** some clay, grey, wet, very dense	6	SS	58
5.0	**END OF BOREHOLE**			

Notes:

1) Water encountered at a depth of 1.4 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 2.0 mBGS upon completion of drilling.
3) Borehole caved at a depth of 3.2 mBGS upon completion of drilling.

DYNAMIC PENETRATION TEST: ○ SPT, ≈ Cone, blows/0.3m; 20 40 60 80

SHEAR STRENGTH (kPa): ● Unconfined, ▲ Quick Triaxial, ✕ Field Vane & Sensitivity, ⊠ Penetrometer, + Lab Vane; 20 40 60 80

Plastic Limit (w_P) | Natural Moisture Content (w) | Liquid Limit (w_L)

WATER CONTENT (%): 10 20 30 40

UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS

Measurement: 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

01 - GEOPRO SOIL LOG GEOPRO 17-1780GHE3 BH LOG 20211118 - NT - NG - DX.GPJ 2022-11-18 10:34

LOG OF BOREHOLE BH105

PROJECT: Supplementray Geotechnical Investigation for Proposed Residential Development

CLIENT: 869547 Ontario Inc.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, ON

DATUM: N/A

BH LOCATION: See Borehole Plan Location

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: JF | DATE: 2021-08-27

SAMPLE REVIEW: CL | REF. NO.: 17-1780GHE3

CHECKED: DX | ENCL. NO.: 6

ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3m	GROUND WATER ELEVATION
0.0	**TOPSOIL:** (250 mm)					
0.3	**FILL:** silty fine sand, trace gravel, organic inclusions, rootlet inclusions, containing rock fragments, brown, moist, loose to compact		1	SS	13	
			2	SS	6	
			3A	SS	5	
			3B	SS		
1.8	**SILTY FINE SAND:** layers of silt, containing cobbles and boulders, brown, wet, loose to compact --- auger grinding		4	SS	26	
2.9	**FINE SAND AND SILT TO SILTY FINE SAND:** grey, moist to wet, dense		5	SS	43	
4.0	**SILT:** trace to some clay, trace sand, interlayers of clayey silt, grey, moist to wet, dense		6	SS	33	
5.0	**END OF BOREHOLE** Notes: 1) Water encountered at a depth of 1.8 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 2.2 mBGS upon completion of drilling. 3) Borehole caved at a depth of 3.4 mBGS upon completion of drilling.					

DYNAMIC PENETRATION TEST
○ SPT ≈ Cone blows/0.3m
20 40 60 80

SHEAR STRENGTH (kPa)
● Unconfined ✕ Field Vane & Sensitivity
▲ Quick Triaxial ⊠ Penetrometer + Lab Vane
20 40 60 80

Plastic Limit | Natural Moisture Content | Liquid Limit
w_P w w_L
WATER CONTENT (%)
10 20 30 40

UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

LOG OF BOREHOLE BH106

PROJECT: Supplementray Geotechnical Investigation for Proposed Residential Development

CLIENT: 869547 Ontario Inc.

PROJECT LOCATION: Parts of Lots 3 and 4, Concession 5, Pickering, ON

DATUM: N/A

BH LOCATION: See Borehole Plan Location

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: JF | DATE: 2021-08-27

SAMPLE REVIEW: CL | REF. NO.: 17-1780GHE3

CHECKED: DX | ENCL. NO.: 7

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3m	GROUND WATER ELEVATION
0.0	**TOPSOIL:** (350 mm)		1	SS	3	
0.4	**FILL:** silty fine sand, organic matters, rootlet inclusions, dark brown, moist, very loose					
0.7	**CLAYEY SILT:** some sand, trace gravel, interlayers of silt, layers of fine sand and silt, seams of sand, brown, moist, very stiff		2	SS	22	
1.4	**SANDY SILT:** some clay, trace gravel, layers of clayey silt, brown, moist, compact		3	SS	22	
			4	SS	20	
2.9	**SANDY SILT TILL:** some clay, trace gravel, layers of sandy silt, containing cobbles and boulders, grey, moist, dense		5	SS	33	
	--- auger grinding					
			6	SS	50	
5.0	**END OF BOREHOLE**					

Note:

1) Borehole caved at a depth of 4.5 m below ground surface (mBGS) upon completion of drilling.

DYNAMIC PENETRATION TEST
○ SPT ≈ Cone blows/0.3m
20 40 60 80

SHEAR STRENGTH (kPa)
● Unconfined ✕ Field Vane & Sensitivity
▲ Quick Triaxial ⊠ Penetrometer + Lab Vane
20 40 60 80

Plastic Limit | Natural Moisture Content | Liquid Limit
w_P | w | w_L
WATER CONTENT (%)
10 20 30 40

UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

01 - GEOPRO SOIL LOG GEOPRO 17-1780GHE3 BH LOG 20211118 - NT - NG - DX.GPJ 2022-11-18 10:34

LIMITATIONS TO THE REPORT

This report is intended solely for the Client named. The report is prepared based on the work has been undertaken in accordance with normally accepted geotechnical engineering practices in Ontario.

The comments and recommendations given in this report are based on information determined at the limited number of the test hole and test pit locations. The boundaries between the various strata as shown on the borehole logs are based on non-continuous sampling and represent an inferred transition between the various strata and their lateral continuation rather than a precise plane of geological change. Subsurface and groundwater conditions between and beyond the test holes and test pits may differ significantly from those encountered at the test hole and test pit locations. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole and test pit locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

It should be noted that the results of the designated substance and chemical analysis refer only to the sample analyzed which was obtained from specific sampling location and sampling depth, and the presence of designated substance and soil chemistry may vary between and beyond the location and depth of the sample taken. Please note that the level of chemical testing outlined herein is meant to provide a broad indication of soil quality based on the limited soil samples tested. The analytical results contained in this report should not be considered a warranty with respect to the soil quality or the use of the soil for any specific purpose or the acceptability of the soils for any excess soil receiving sites.

The report reflects our best judgment based on the information available to GeoPro Consulting Limited at the time of preparation. Unless otherwise agreed in writing by GeoPro Consulting Limited, it shall not be used to express or imply warranty as to any other purposes. No portion of this report shall be used as a separate entity, it is written to be read in its entirety. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated.

The design recommendations given in this report are applicable only to the project designed and constructed completely in accordance with the details stated in this report. Otherwise, our responsibility is limited to interpreting the subsurface information at the borehole or test pit locations.

Should any comments and recommendations provided in this report be made on any construction related issues, they are intended only for the guidance of the designers. The number of test holes and test pits may not be sufficient to determine all the factors that may affect construction activities, methods and costs. Such as, the thickness of surficial topsoil or fill layers may vary significantly and unpredictably; the amount of the cobbles and boulders may vary significantly than what described in the report; unexpected water bearing zones/layers with various thickness and extent may be encountered in the fill and native soils. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and make their own conclusions as to how the subsurface conditions may affect their work and determine the proper construction methods.

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. GeoPro Consulting 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.