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April 13, 2020
(Revision of Report dated January 21, 2016)

Reference No. 0803-S002
Page 1 of 4

678604 Ontario Inc.
c/o James Lethbridge Planning Inc.
2030 Bristol Circle, Unit 201
Oakville, Ontario
L6H 0H2

Attention: Mr. James Lethbridge

**Re: Supplementary Slope Stability Study Letter Report
Proposed Employment Lands
Dezen Industrial – Phase 2
Southwest Quadrant of Highway 407 and Hurontario Street
City of Mississauga**

Dear Sir:

Further to the email request from Mr. James Lethbridge dated December 15, 2015, we have reviewed the comments issued by the Credit Valley Conservation (CVC) for the captioned site. Furthermore, we have received the toe erosion allowance and meander belt setbacks calculated and presented by GEO Morphix Ltd. In their Tributary of Fletcher's Creek Erosion Hazard Assessment. In response, we herein present our supplementary slope stability study findings and recommendations, incorporating the updated setbacks.

In 2008, a soil investigation consisting of 4 boreholes to depths ranging from 4.9 to 7.9 m was carried out onsite for a slope stability study. Subsequent to the 2008 report, an addendum was issued in 2012 to provide additional analyses and clarifications to address the CVC comments dated February 28, 2012. The topographic map for the site has since been updated. The previously analyzed cross-sections are therefore revised accordingly.

FINDINGS

Based on the 2008 borehole information, beneath a layer of topsoil, 15 to 30± cm thick, the site is underlain by a layer of generally hard silty clay till and very dense sandy silt till.



All boreholes remained dry upon completion of field work. However, a groundwater level of El. 195.0± m was included in the modeling at the request of CVC and was assumed to taper towards Fletcher's Creek. In the absence of well data, the use of this zone where the colour of the soil changes from brown to grey best represents the potential groundwater regime.

SLOPE STABILITY STUDY

The slope stability study focuses on the eastern bank of Fletcher's Creek, meandering along the western and southern limits of the subject site. The drainage feature downstream to the pond in the centre of the site has been identified as a watercourse by CVC and therefore has been added to the slope study. At the time of the 2008 inspection, the drainage ditch was dry.

Cross-Sections A-A to E-E, were selected to represent the most critical portions of the slope. The locations of the cross-sections are shown on Drawing No. 1. These sections have an overall slope height of 3.0± to 8.0± m, measured from the tableland to the toe of slope, with an overall gradient of 1V:1.9 ± to 3.4± H and a local gradient of 1V:0.9 H. The surface profiles of the cross-sections are interpreted from the contours on the topographic plan provided by James Lethbridge Planninc Inc.; the subsurface profiles are interpreted from the borehole logs. Cross-Sections A-A to E-E are shown on Drawing Nos. 2 to 8, inclusive.

As noted in the previous report and letter, visual inspection revealed that the slope is generally well-vegetated with dense grass- and weed-covers and sparse trees in the northern region where the slope is gentle. In the southern region where the slope is the steepest, tree growth was more prominent. No signs of seepage or major deep-seated failure were observed; however, minor channelization and surface creeping were noted in the proximity of Cross-Section B-B. In addition, active toe erosion was observed in the absence of a flood plain along the creek bank at Cross-Sections A-A and B-B (Boreholes 1 and 2). No active erosion was noted along the drainage/gulley features.

The slope stability was analyzed using force-moment-equilibrium criteria of the Bishop Method with the soil strength parameters shown in the table below.

<u>Strength Parameters for Slope Stability Analysis</u>			
	γ (kN/m³)	c (kPa)	ϕ (degrees)
Silty Clay Till	22.0	5	30
Sandy Silt Till	22.0	0	31



The result from the analysis indicates that the slope at Cross-Sections B-B to E-E has a factor of safety (FOS) ranging from 1.79 and 2.40, which satisfies the OMNR guideline requirements for infrastructure and public land uses (minimum FOS of 1.5). These existing slopes are therefore considered geotechnically stable. The results are presented on Drawing Nos. 4, 6, 7 and 8.

For Cross-Section A-A, the result shows that the existing slope has a FOS of 1.45, which fails to meet the OMNR requirements. The result is presented on Drawing No. 2. Therefore, the existing valley slope at this location is considered to be geotechnically unacceptable for the proposed development. A gradient of 1V:2.2H is recommended for use in sound native clay till. The remodelled slope, yielding a FOS of 1.54, which meets the OMNR requirements, is presented on Drawing No. 3.

In the absence of an adequate flood plain (less than 15 m in width), a toe erosion allowance of 5 m has been recommended by GEO Morphix Ltd. In their study. This is mainly applicable for Cross-Sections A-A, B-B and E-E and surrounding areas. For Cross-Sections B-B and E-E, a geotechnically stable gradient of 1V:1.9H to 1V:2H is used behind the toe erosion setback. The remodelled slopes, with FOS of 1.57 and 2.12, meets the OMNR requirements and is presented on Drawing Nos. 5 and 9.

The long-term stable slope line (LTSSL), incorporating the geotechnically stable gradients and toe erosion allowance (where applicable) is established on the Borehole and Cross-Section Location Plan, Drawing No. 1. For the most part, the LTSSL coincides with the Top of Bank (staked with CVC on November 9, 2001) or the Farm Pond Drainage Area (staked July 6, 2012). Where the valley feature is not well defined east/opposite of Cross-Section E-E, the LTSSL follows the meander belt setback.

Lastly, a development setback buffer for man-made and environmental degradation of the bank will be required. The distance of the buffer is subject to the discretion and approval of CVC.

In future development, should any alteration be carried out in the slope areas, it should either be restored to its original condition or better than its original condition.

In order to prevent the occurrence of localized surface slides in the future and to enhance the stability of the slope, the following geotechnical constraints should be stipulated:

The prevailing vegetative cover must be maintained, since its extraction would deprive the rooting system that is reinforcement against soil erosion by weathering. If for any reason the



vegetation cover is stripped, it must be reinstated to its original, or better than its original, protective condition. Restoration with selective native plantings including deep rooting systems which would penetrate the original buried topsoil shall be carried out to ensure bank stability.

1. Grading of the land adjacent to the slope must be such that concentrated runoff is not allowed to drain onto the slope face. Landscaping features which may cause runoff to pond at the top of the slope must not be permitted.
2. The leafy topsoil cover on the bank face should not be disturbed, since this provides insulation and a screen against frost wedging and rainwash erosion.
3. Where development is carried out near the top of the slope, there are other factors to be considered related to possible human environmental abuse. Soil saturation from maintenance of landscaping features, stripping of topsoil or vegetation, and dumping of loose fill over the bank must not be allowed.

The above recommendations are subject to the approval of the CVC.

We trust this letter satisfies your present requirements; however, should any queries arise, please feel free to contact this office.

Yours truly,
SOIL ENGINEERS LTD.

Hui Wing Yang, B.A.Sc.
HWY/BL

ENCLOSURES

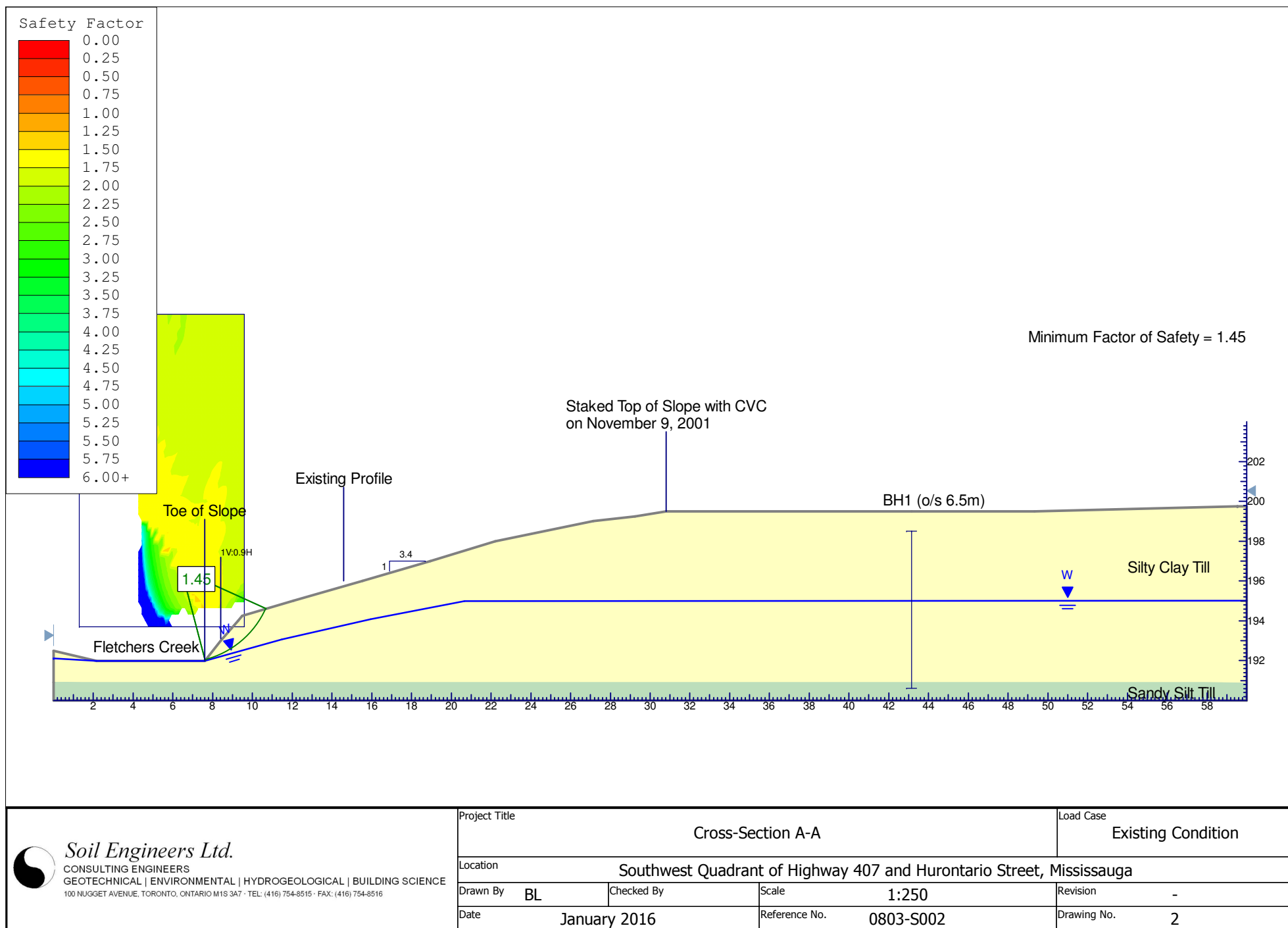
Bernard Lee, P.Eng.

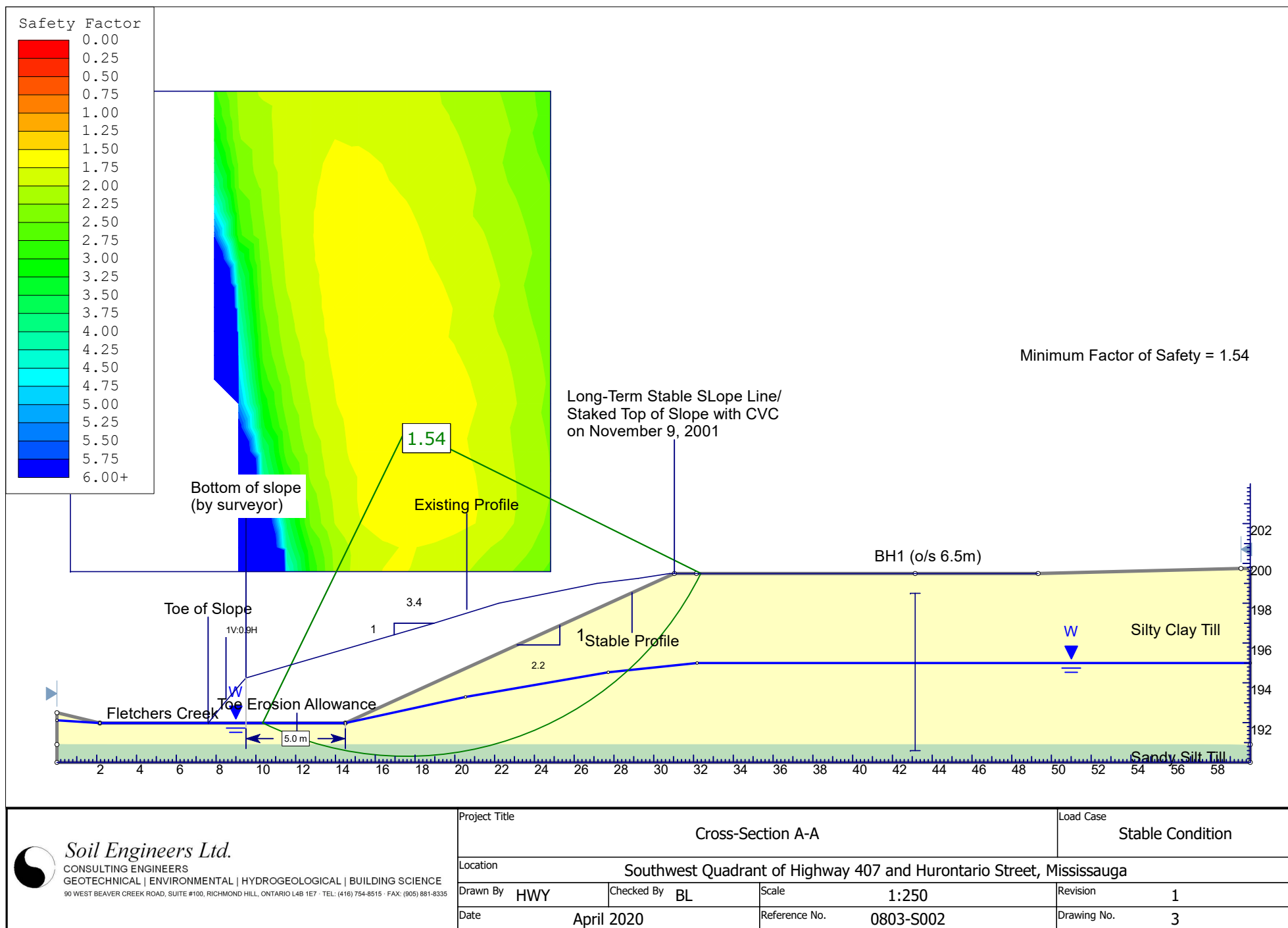


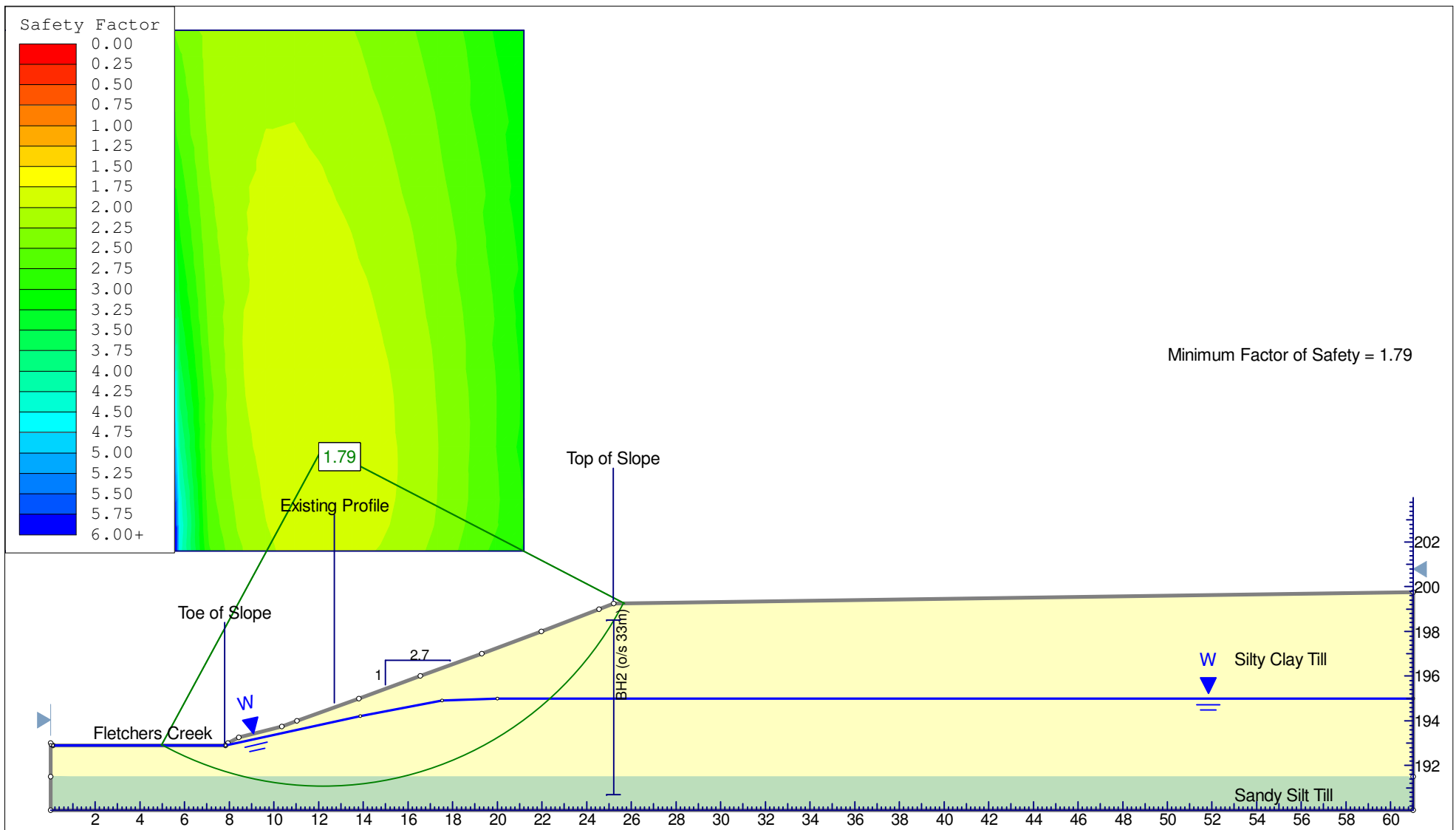
Borehole and Cross-Section Location Plan	Drawing No. 1
Cross-Section A-A (Existing Condition).....	Drawing No. 2
Cross-Section A-A (Stable Condition)	Drawing No. 3
Cross-Section B-B (Existing Condition)	Drawing No. 4
Cross-Section B-B (Stable Condition).....	Drawing No. 5
Cross-Section C-C (Existing Condition)	Drawing No. 6
Cross-Section D-D (Existing Condition).....	Drawing No. 7
Cross-Section E-E (Existing Condition).....	Drawing No. 8
Cross-Section E-E (Existing Condition with Toe Erosion Allowance).....	Drawing No. 9

c. Soil Engineers Ltd. (Mississauga)
Attn: Mr. Benjamin Lee, Branch Manager

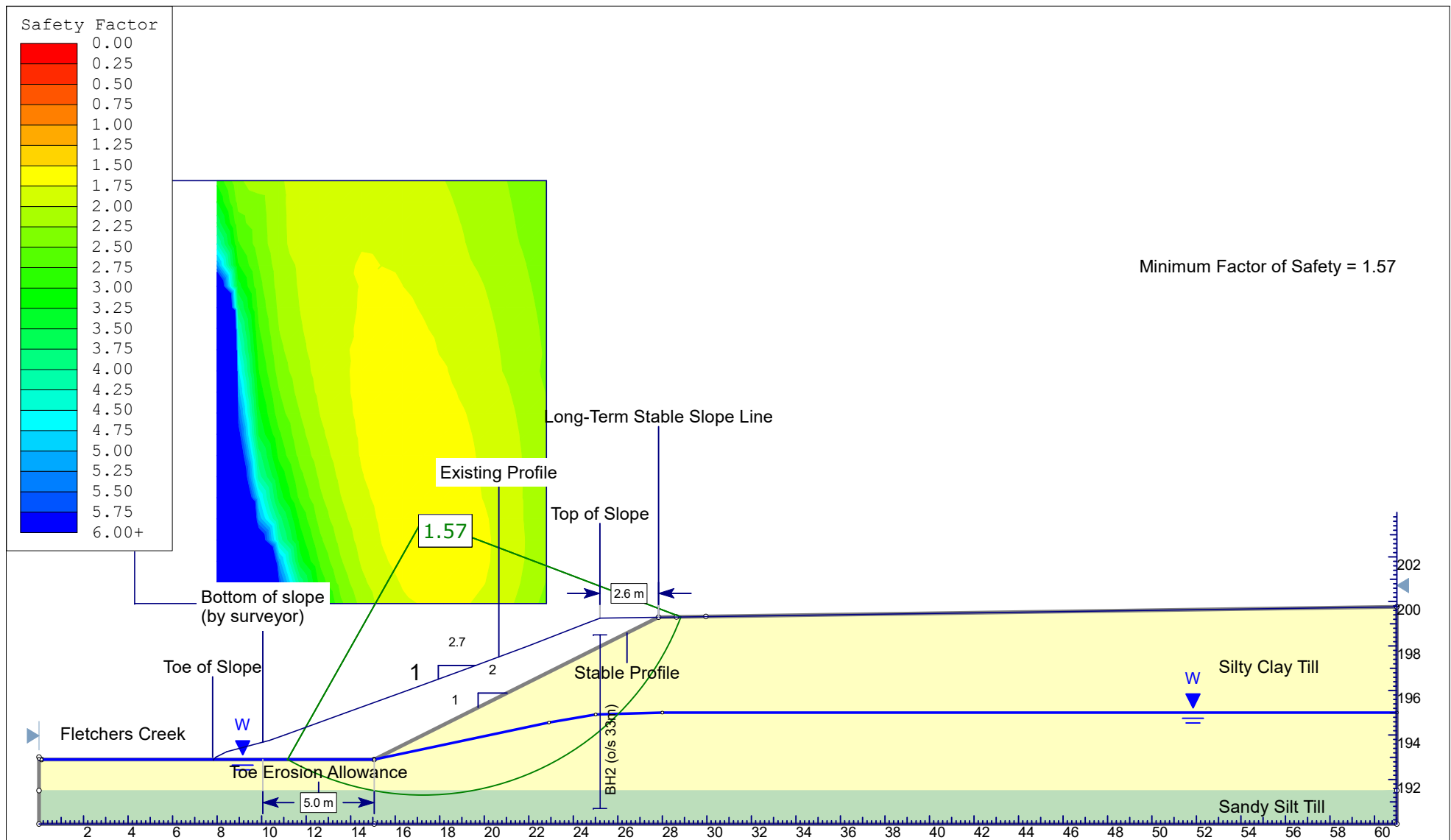
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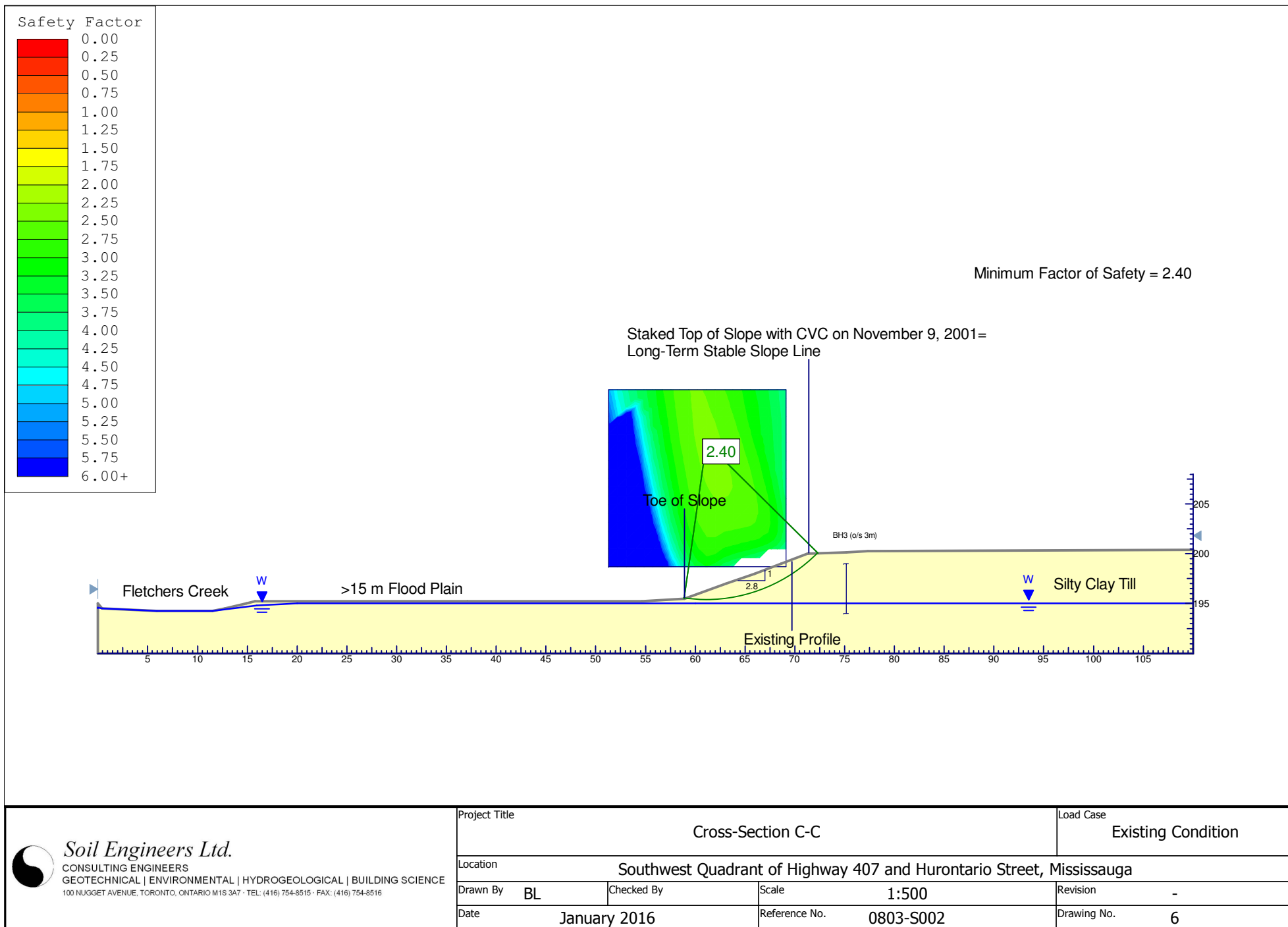




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	Location		Southwest Quadrant of Highway 407 and Hurontario Street, Mississauga		
	Drawn By	BL	Checked By	Scale	Revision
	Date	January 2016		Reference No.	Drawing No.
				0803-S002	4



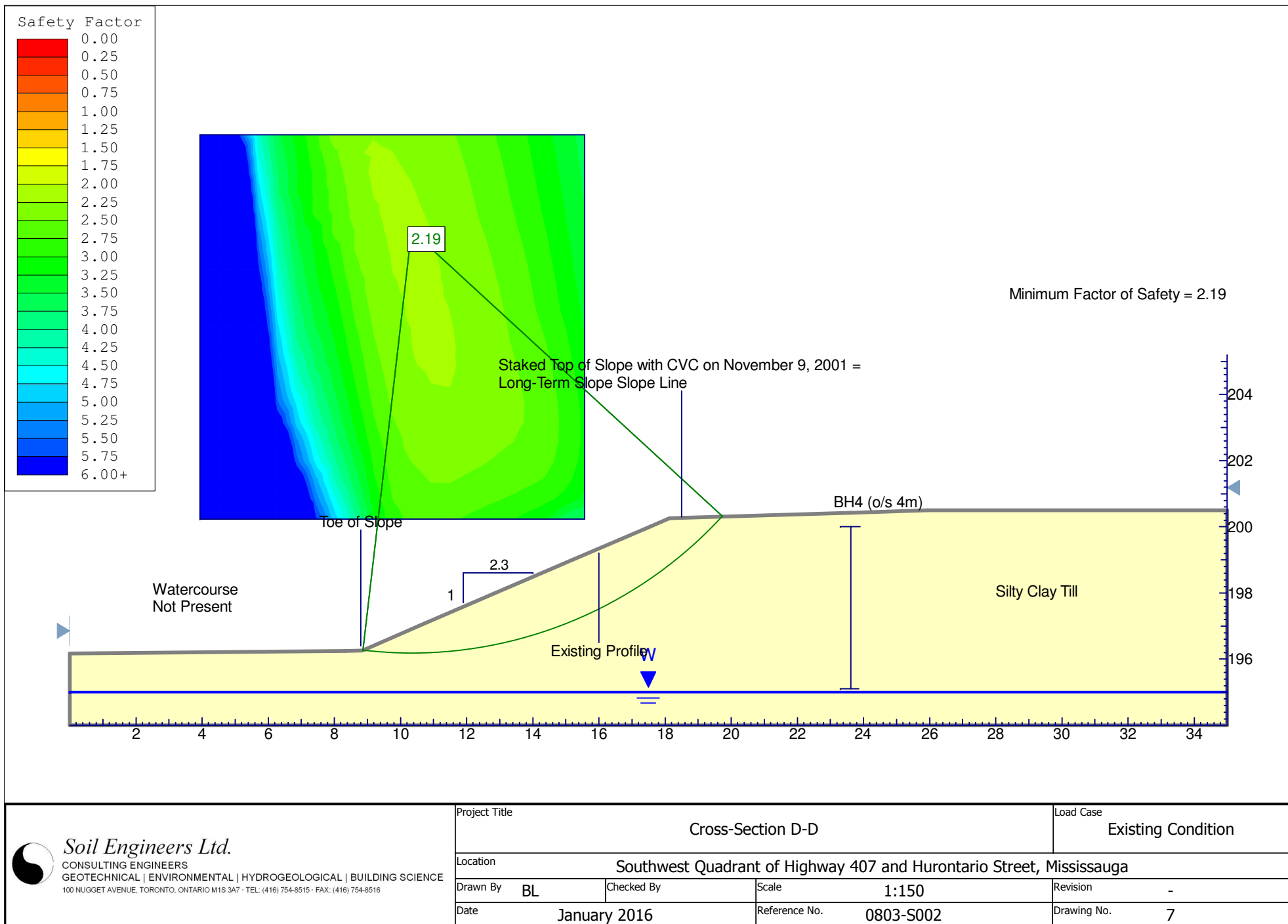
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	Location													
	Southwest Quadrant of Highway 407 and Hurontario Street, Mississauga													
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	Date		April 2020		Reference No.		0803-S002		Drawing No.		5			

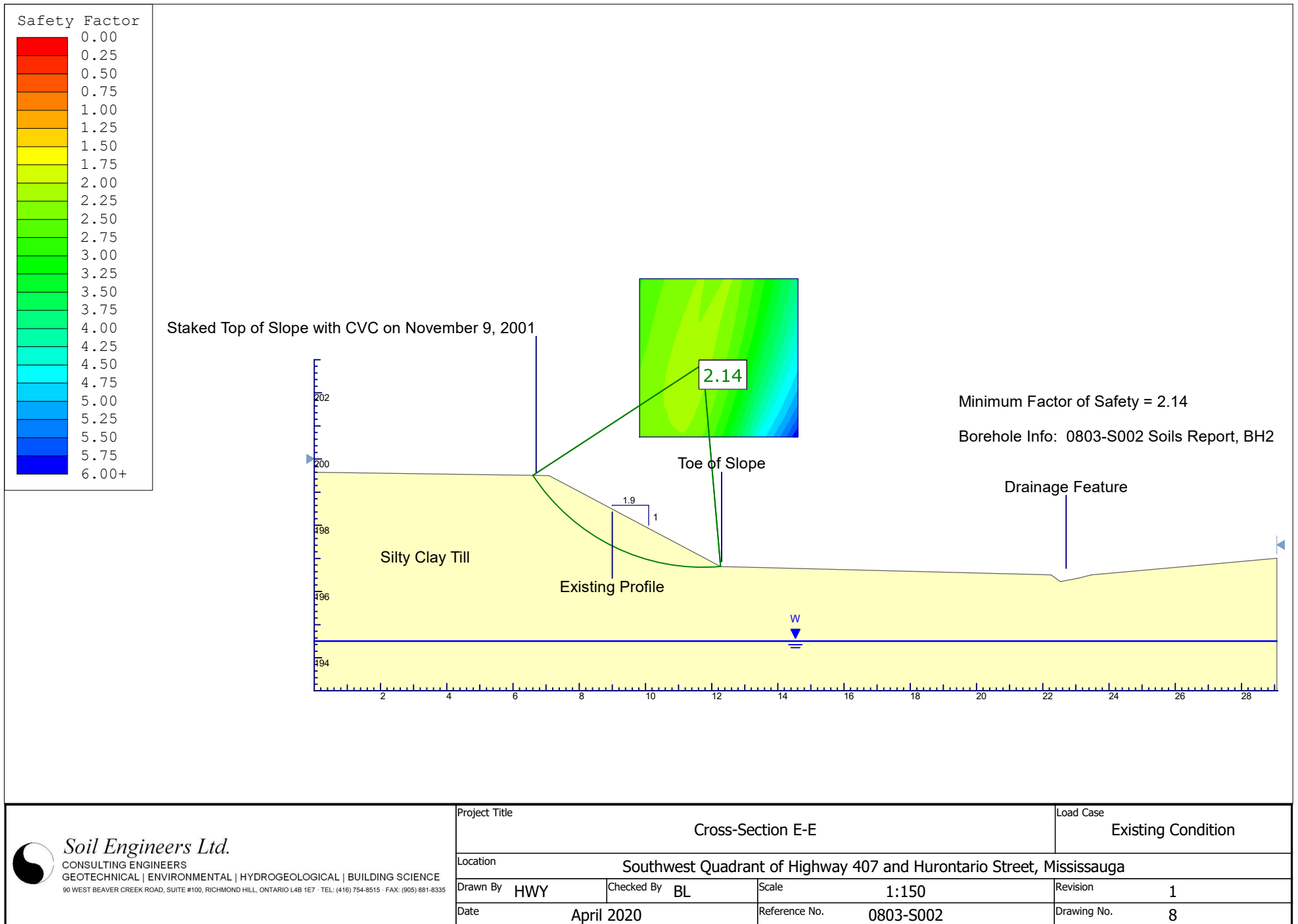


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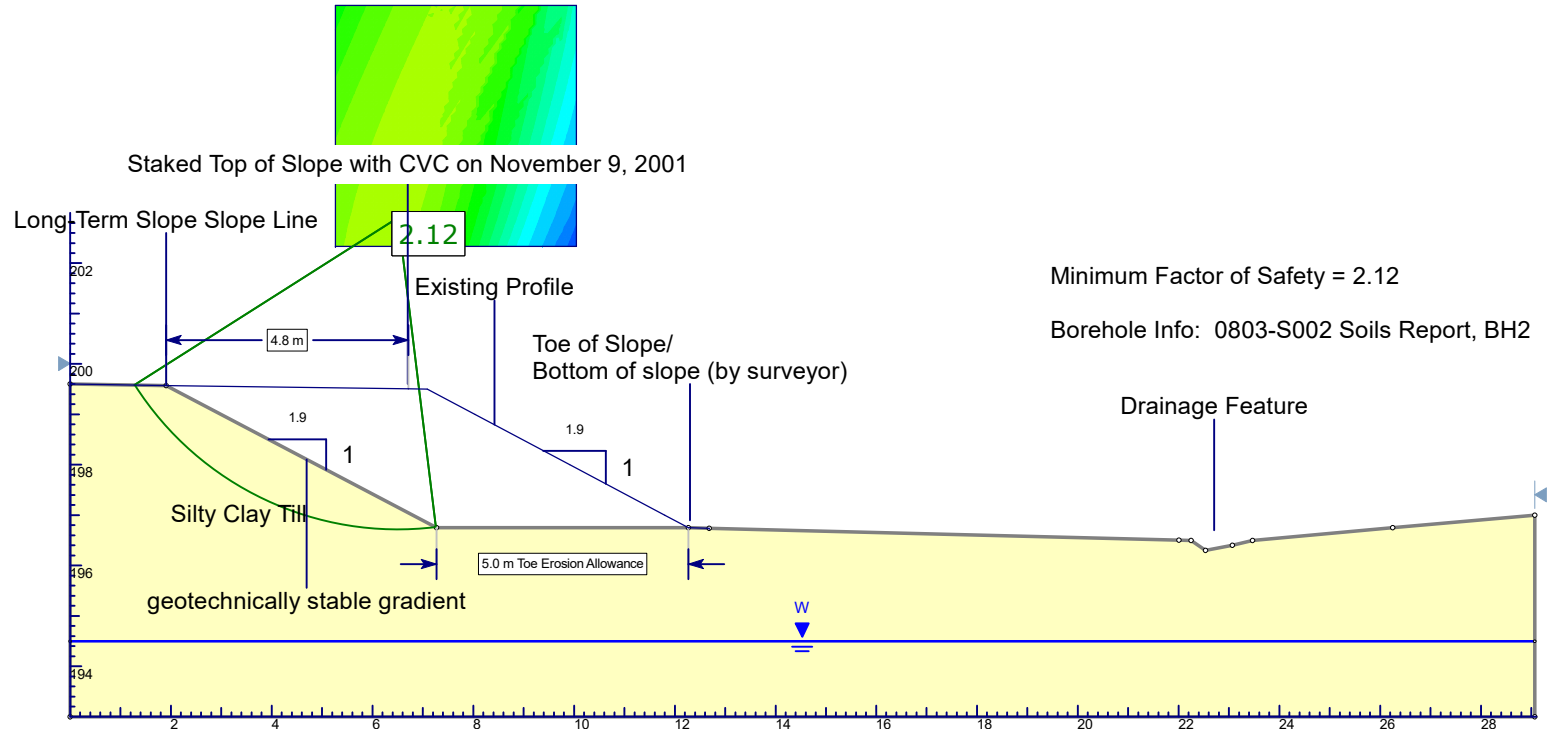
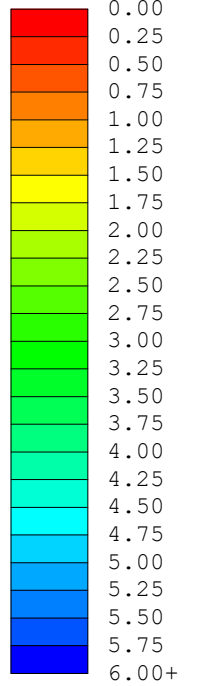
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					Existing Condition	
Location			Southwest Quadrant of Highway 407 and Hurontario Street, Mississauga			
Drawn By		BL	Checked By		Scale	1:500
					Revision	-
Date			January 2016		Reference No.	0803-S002
					Drawing No.	6





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	Location								Southwest Quadrant of Highway 407 and Hurontario Street, Mississauga										
	Drawn By		HWY		Checked By		BL		Scale		1:150		Revision		1				
	Date				April 2020				Reference No.				0803-S002				Drawing No.		8

Safety Factor



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Project Title			Cross-Section E-E		Load Case Existing Condition (with Toe Erosion Allowance)		
Location Southwest Quadrant of Highway 407 and Hurontario Street, Mississauga							
Drawn By HWY		Checked By BL		Scale 1:150		Revision -	
Date April 2020				Reference No. 0803-S002		Drawing No. 9	