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90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 721-7864	FAX: (905) 542-2769

April 24, 2025 Reference No. 2006-S167

Balbir Babra, Harvinder Babra & Harminder Kala
c/o King Consultants Inc.
31 Sherwood Crescent
Brampton, Ontario
L6X 2C9

Attention: Mr. Gursewak Singh

Re: A Slope Stability Assessment for
Proposed Residential Development
44-45 Longview Place
City of Mississauga

Dear Sir:

In accordance with the written authorization dated December 12, 2024 by Mr. Harvinder Babra, Soil Engineers Ltd. has completed a slope stability assessment for the proposed residential development at the captioned site. We herein present our findings and results of the slope stability assessment.

SITE DESCRIPTION

The subject site is situated at end of Longview Place Drive in the City of Mississauga. It is roughly triangular in shape and will be subdivided into multiple residential lots for the proposed development. At the time of investigation, the site is a relatively flat grass-covered open field.

The slope of concern, as shown on Drawing No. 1, is located along the north and east property boundaries. Based on the topographic survey, prepared by Tarasick McMillan Kubicki Limited dated December 11, 2024, the slope is approximately 7.5 to 10.0 m high with slope gradients ranging from 0.65 to 1.66 Horizontal (H):1 Vertical (V). Fletchers Creek can be observed immediately adjacent to the bottom of slope in multiple areas. In addition, flood plain can be observed between the creek and the bottom of slope.

SUBSURFACE FINDINGS

Based on the completed boreholes in the vicinity as part of the geotechnical investigation (Reference No. 2006-S167), the subsoil beneath the topsoil veneer consists of native silty clay till which beds onto shale bedrock at a depth of 2.9 m. No groundwater was encountered and all boreholes remained dry upon completion of field work. The referenced borehole logs are enclosed in Appendix, and the locations of the boreholes are shown on Drawing No. 1.

SLOPE INPECTION

A visual inspection of the slope was carried out on December 18, 2024. In general, the slope height and gradients, and the natural features appeared to be consistent with those presented on the topographic survey.

The slope has a good leaf cover, and is vegetated with shrubs and trees, most of which appeared to be in an upright position. Water seepage and other signs of instability were not evident on the slope at the time of inspection.

Fletchers Creek is observed in close proximity to the bottom of slope. In places, the creek runs immediately adjacent to the bottom of slope, while other areas, a flood plain is observed. Active toe erosion is observed along the bottom of slope near Fletchers Creek.

SLOPE STABILITY ANALYSIS

Three (3) slope sections, Cross-Sections A-A, B-B and C-C, were selected for the slope stability analyses. The locations of the cross sections are presented on Drawing No. 1.

The surface profile of the cross section was interpolated from the elevation contours shown on the above-mentioned topographic survey. The subsurface information was derived from the Geotechnical Investigation Report, Reference No. 2006-S167 dated August 2020. Details of the slope sections are shown on Drawing Nos. 2 to 4.

The slope stability analyses were carried out using “SLIDE,” developed by Rocscience Inc., using limit-equilibrium criteria of the Bishop Method. The following soil shear strength parameters are used for the analysis.

Soil Type	Unit Weight, γ (kN/m^3)	Effective Cohesion, c' (kPa)	Effective Angle of Internal Friction, ϕ'
Silty Clay Till	21.5	5	30˚
Shale	23.0	20	40˚

While groundwater was not evident within the borehole findings, a water level matching the water level at the creek will be used as phreatic surface for the analysis under 'normal' water condition. In addition, an elevated groundwater level, approximately 1.5 m below the existing grade, is also used to evaluate the slope stability under the elevated groundwater condition.

The resulting minimum factors of safety (FOS) for the existing condition of the slope are summarized in the following table.

Cross-Section	Existing Gradient (H:V)	Existing FOS	FOS under Elevated Groundwater Condition
A-A	0.97 to 1.66:1	2.04	1.53
B-B	0.65:1	1.67	1.31
C-C	1.15:1	1.97	1.48

The resulting FOS of the analyses at Cross-Sections A-A, B-B and C-C at existing conditions meet the Ontario Ministry of Natural Resources (OMNR) and the Credit Valley Conservation (CVC) guideline requirements (minimum FOS of 1.5). In addition, the resulting FOS for all cross-sections also meet the required FOS under elevated groundwater condition (minimum FOS of 1.3). The results are presented in Drawing Nos. 2 to 7.

However, given that the portions of the slopes are immediately adjacent to the water edge with signs of active toe erosions, a Toe Erosion Allowance (T.E.A.) for the creek must be incorporated to evaluate the Long-Term Stable Top of Slope (LTSTOS).

Based on the OMNR guideline requirement, a T.E.A. of 5.0 m will be required from the edge of water for the disclosed soil/rock types. After applying the T.E.A., the cross-sections were subsequently re-analysed using remodelled stable slope gradient of 1.4H:1V for both the shale bedrock and the silty clay till. The resulting FOS of Cross-Sections A-A, B-B and C-C meet the OMNR guideline requirement (min FOS of 1.5 and 1.3) under normal water condition and elevated groundwater condition, respectively. The analytical results for the geotechnically stable condition are presented on Drawing Nos. 8 to 13 and are summarized in the following table. The resulting LTSTOS is also illustrated on Drawing No. 1.

Cross-Sections	FOS (normal water condition)	FOS (elevated water condition)
A-A	2.15	1.63
B-B	2.28	1.73
C-C	2.13	1.58

Furthermore, a development setback for man-made and environmental degradation will be required from the LTSTOS; this is subject to the requirements of CVC.

GENERAL CONSIDERATIONS

In order to prevent disturbance of the existing slope and to enhance the stability of the slope for the proposed project, the following geotechnical constraints should be stipulated:

1. The prevailing vegetative cover must be maintained, since its extraction would deprive the slope of the rooting system that is reinforcement against soil erosion by weathering. If for any reason the vegetation cover is stripped during construction, it must be reinstated to its original, or better than its original, protective condition.
2. The topsoil cover on the slope face should not be disturbed, since this provides insulation and screen against frost wedging and rainwash erosion.
3. 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, as well as saturation of the crown of the slope, must not be permitted.
4. Where the construction is carried out near the top of the slope, dumping of loose fill over the slope from topsoil stripping or vegetation removal activities must be prohibited. Topsoil stripping and vegetation removal along the slope are also prohibited.

The above recommendations should be reviewed and are subject to the approval and requirements of 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.

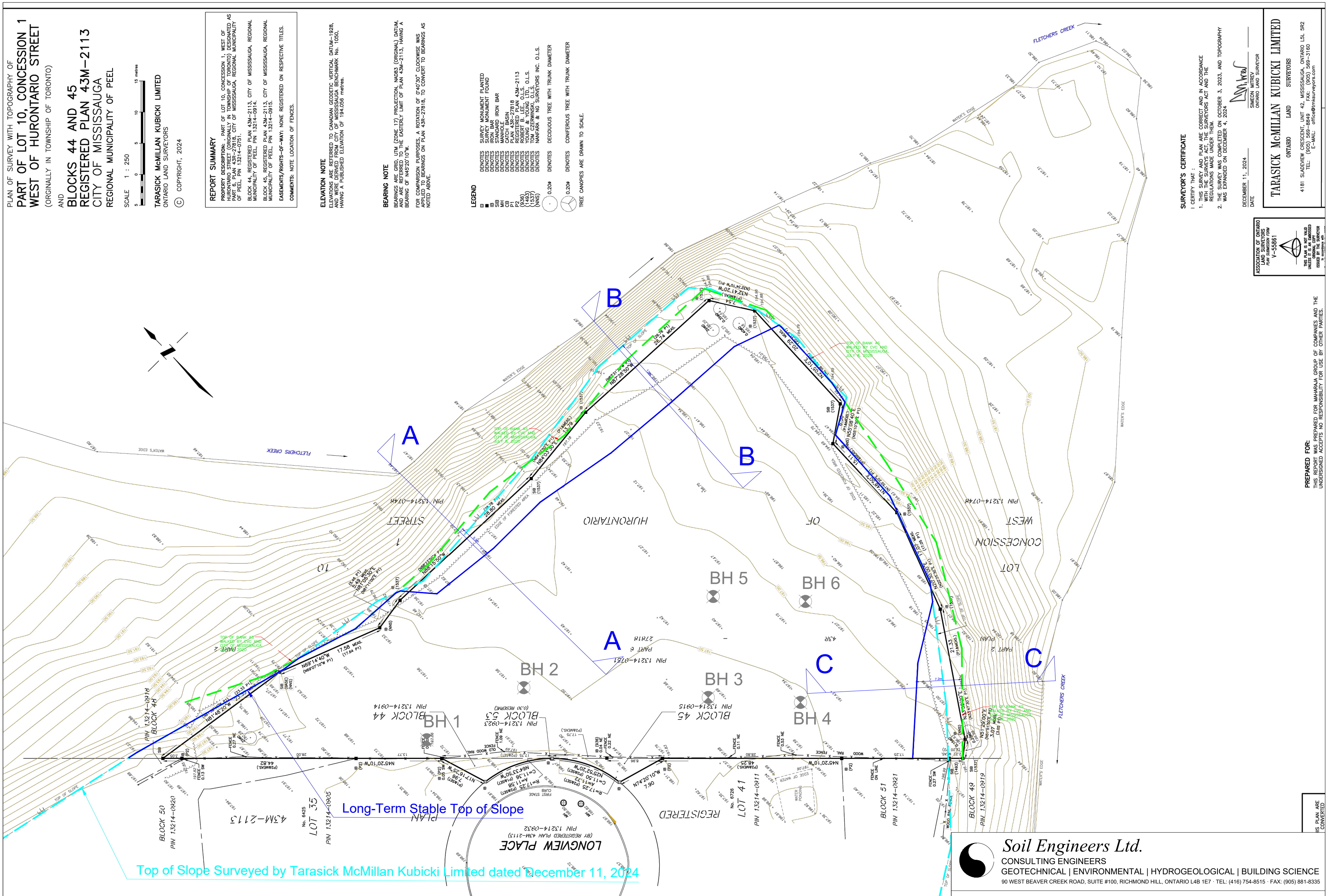
Poh Fung Kwok, M.Sc.

Kin Fung Li, P.Eng.
PK/KFL

LICENSED PROFESSIONAL ENGINEER
Apr 24, 2025
K. F. LI
100169280
PROVINCE OF ONTARIO

ENCLOSURES

Cross-Section Location Plan	Drawing No. 1
Cross-Sections (Existing Condition – Normal Water Condition)	Drawing Nos. 2 to 4
Cross-Sections (Existing Condition – Elevated Water Condition)	Drawing Nos. 5 to 7
Cross-Sections (Stable Condition – Normal Water Condition)	Drawing Nos. 8 to 10
Cross-Sections (Stable Condition – Elevated Water Condition)	Drawing Nos. 11 to 13
Logs of Borehole	Appendix



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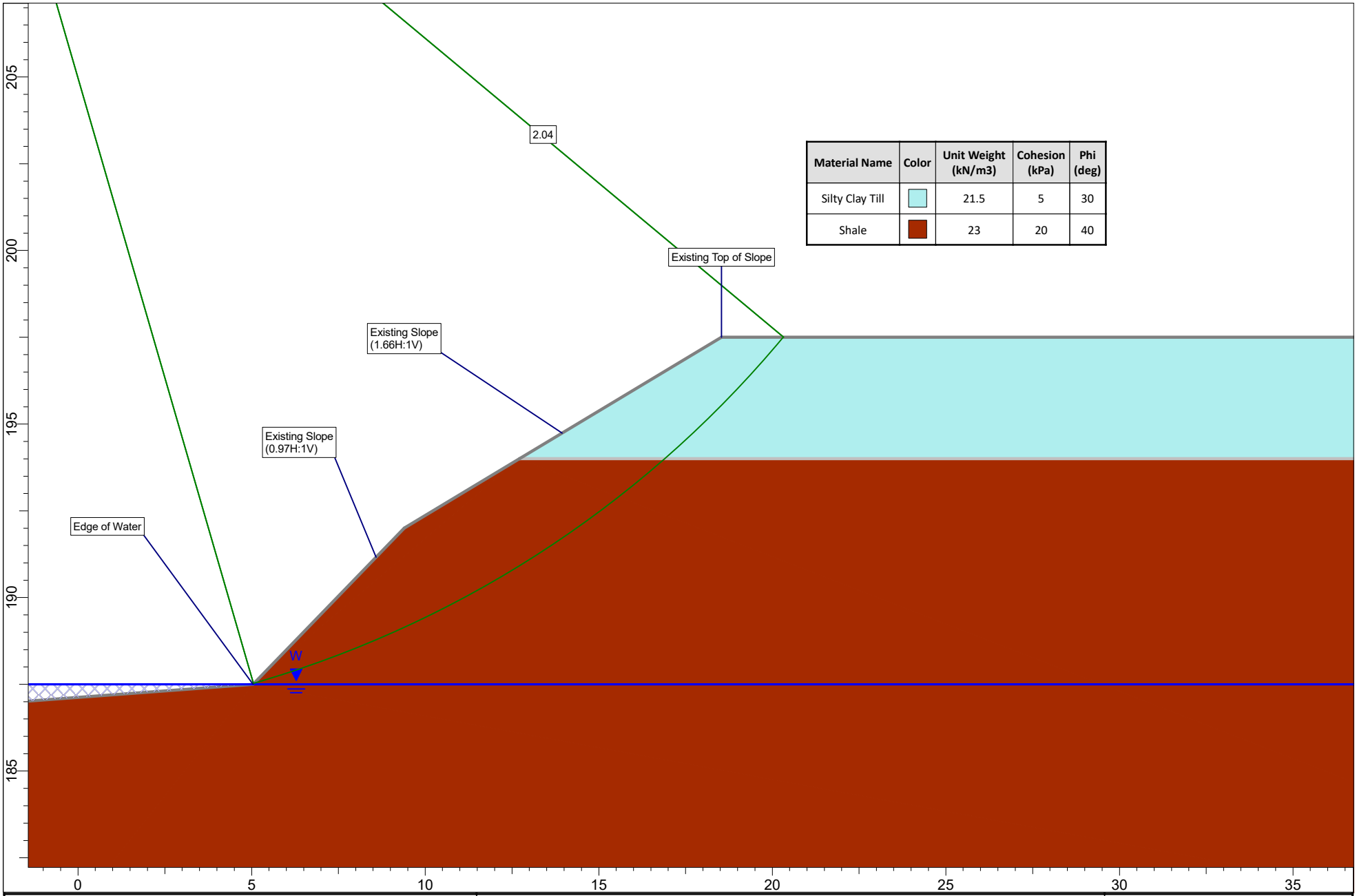
Cross Section Location Plan

SITE: 44-45 Longview Place, City of Mississauga					
DESIGNED BY: P.K.		**CHECKED BY:** K.L.		**DWG NO.:** 1	
SCALE: 1:800	**REF. NO.:** 2006-S167		**DATE:** June 2025		**REV** -



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Silty Clay Till		21.5	5	30
Shale		23	20	40

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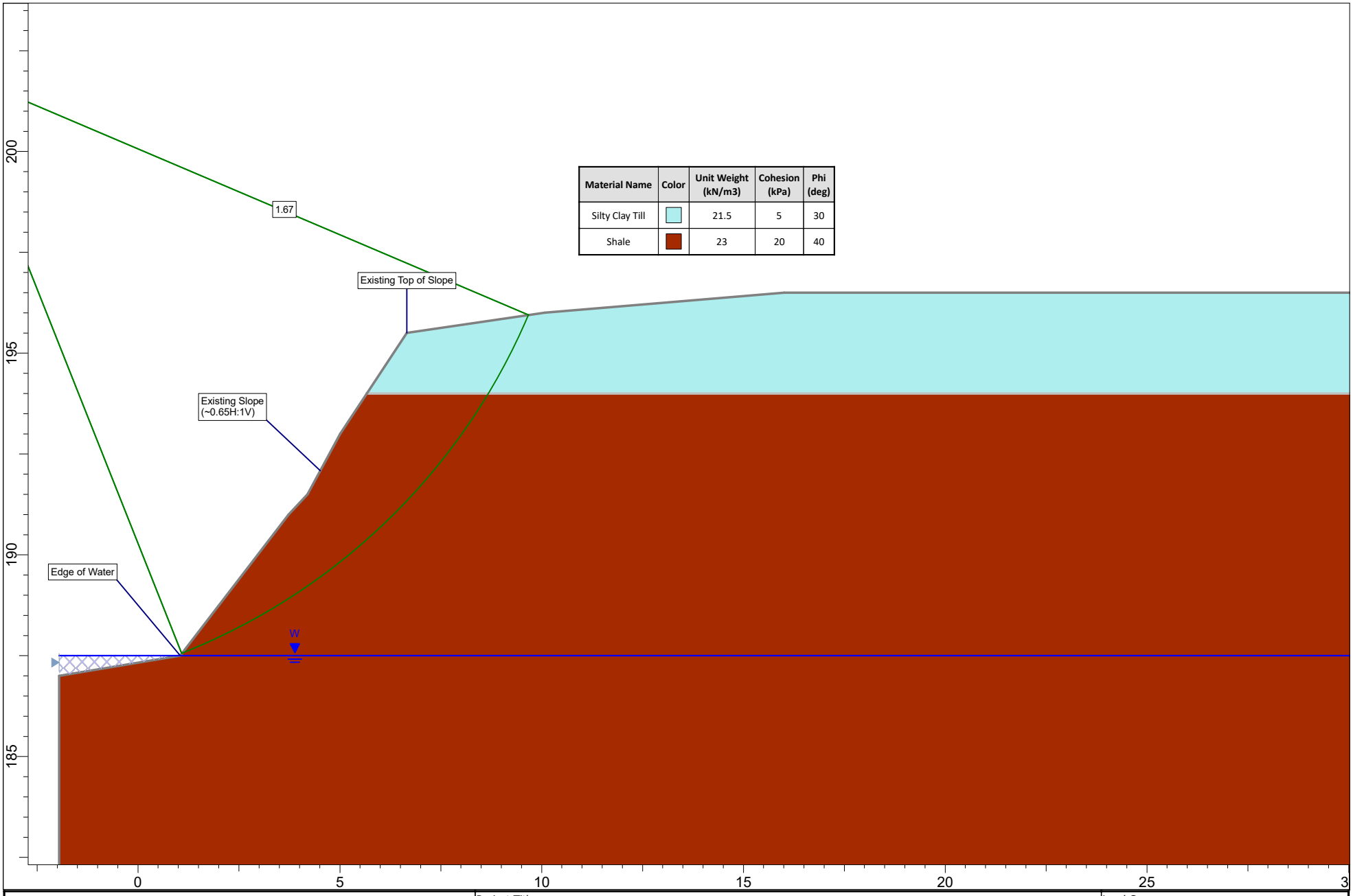
Project Title: Slope Stability Assessment - Cross Section A-A				Load Case: Existing Condition
Location: 44-45 Longview Place, City of Mississauga				
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150		Revision: -
Date: April 2025		Reference No.: 2006-S167		Drawing No.: 2



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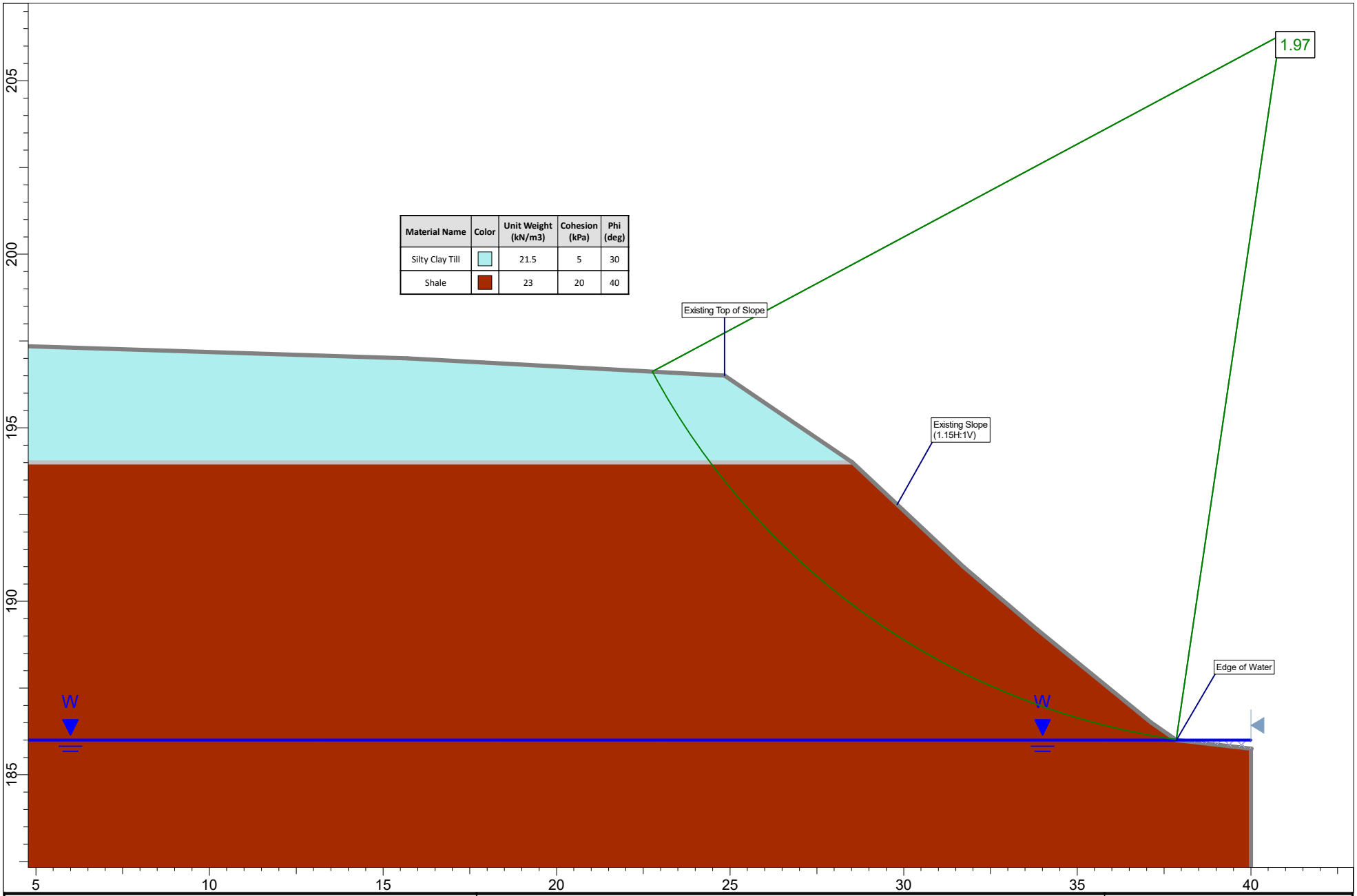
Project Title: Slope Stability Assessment - Cross Section B-B			Load Case: Existing Condition
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:129	Revision: -
Date: January 2025		Reference No.: 2006-S167	Drawing No.: 3



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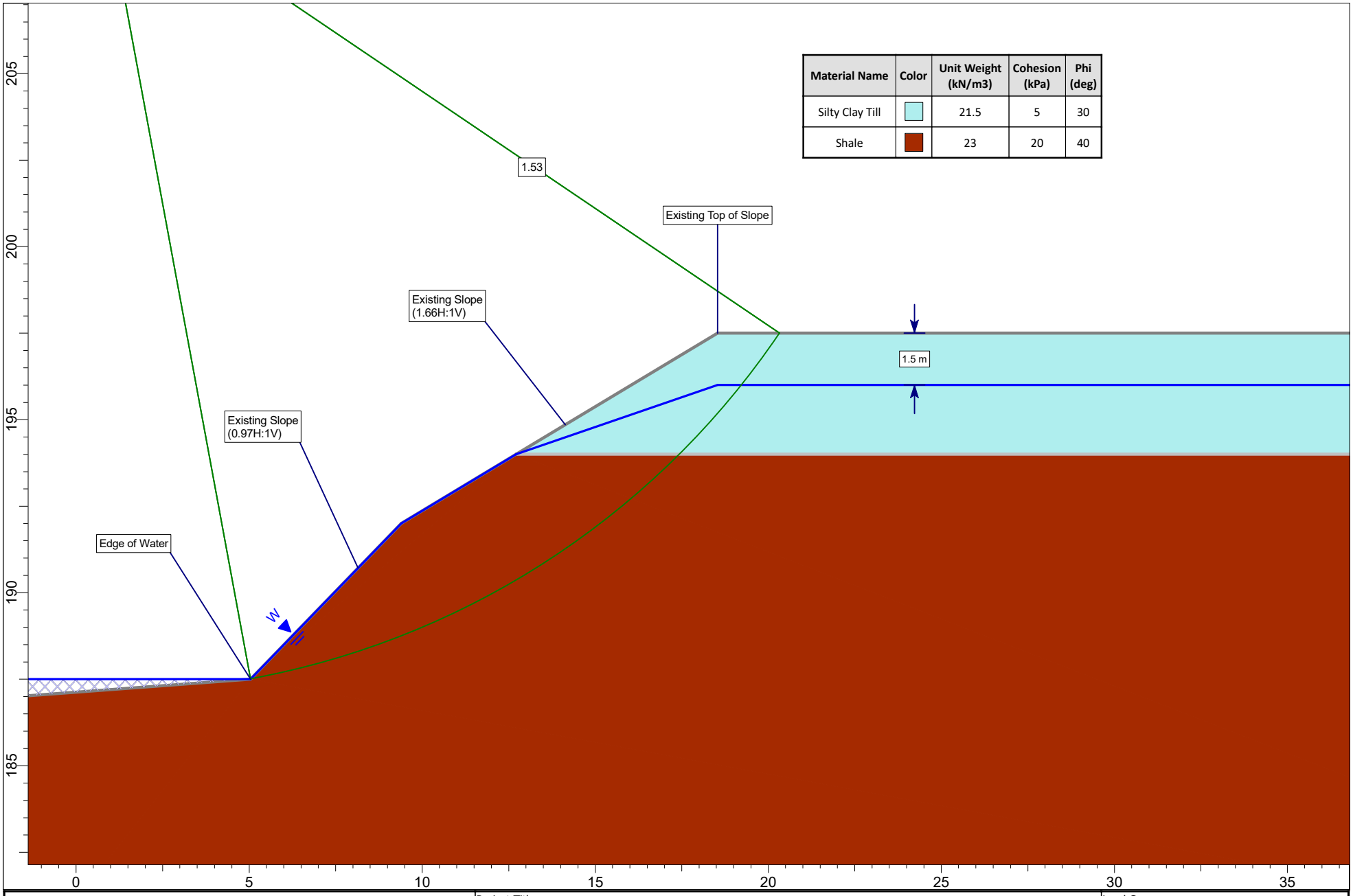
Project Title: Slope Stability Assessment - Cross Section C-C			Load Case: Existing Condition
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150	Revision: -
Date: April 2025		Reference No.: 2006-S167	Drawing No.: 4



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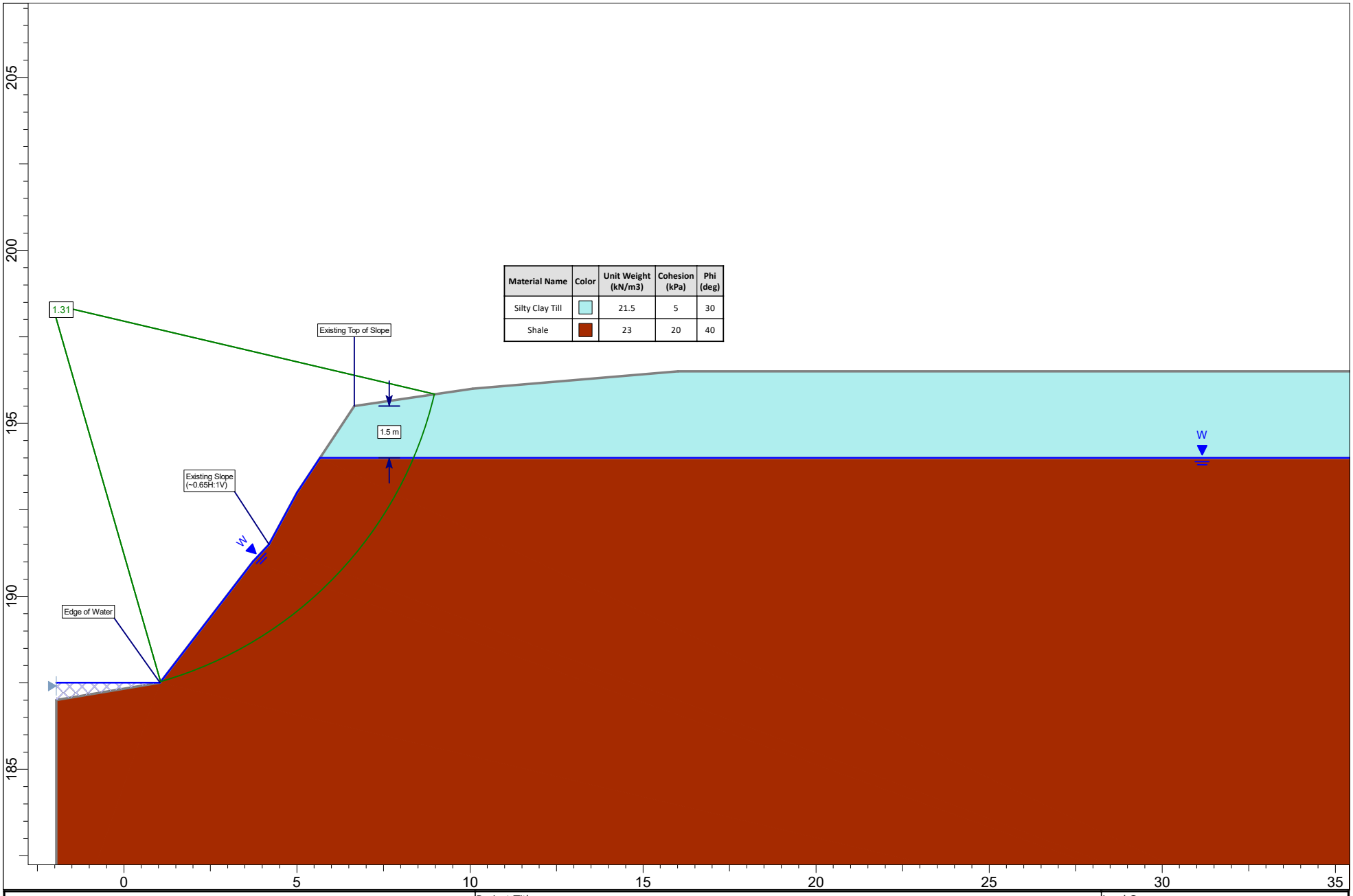
Project Title: Slope Stability Assessment - Cross Section A-A			Load Case: Existing Condition - Elevated Water Level
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150	Revision: -
Date: April 2025		Reference No.: 2006-S167	Drawing No.: 5



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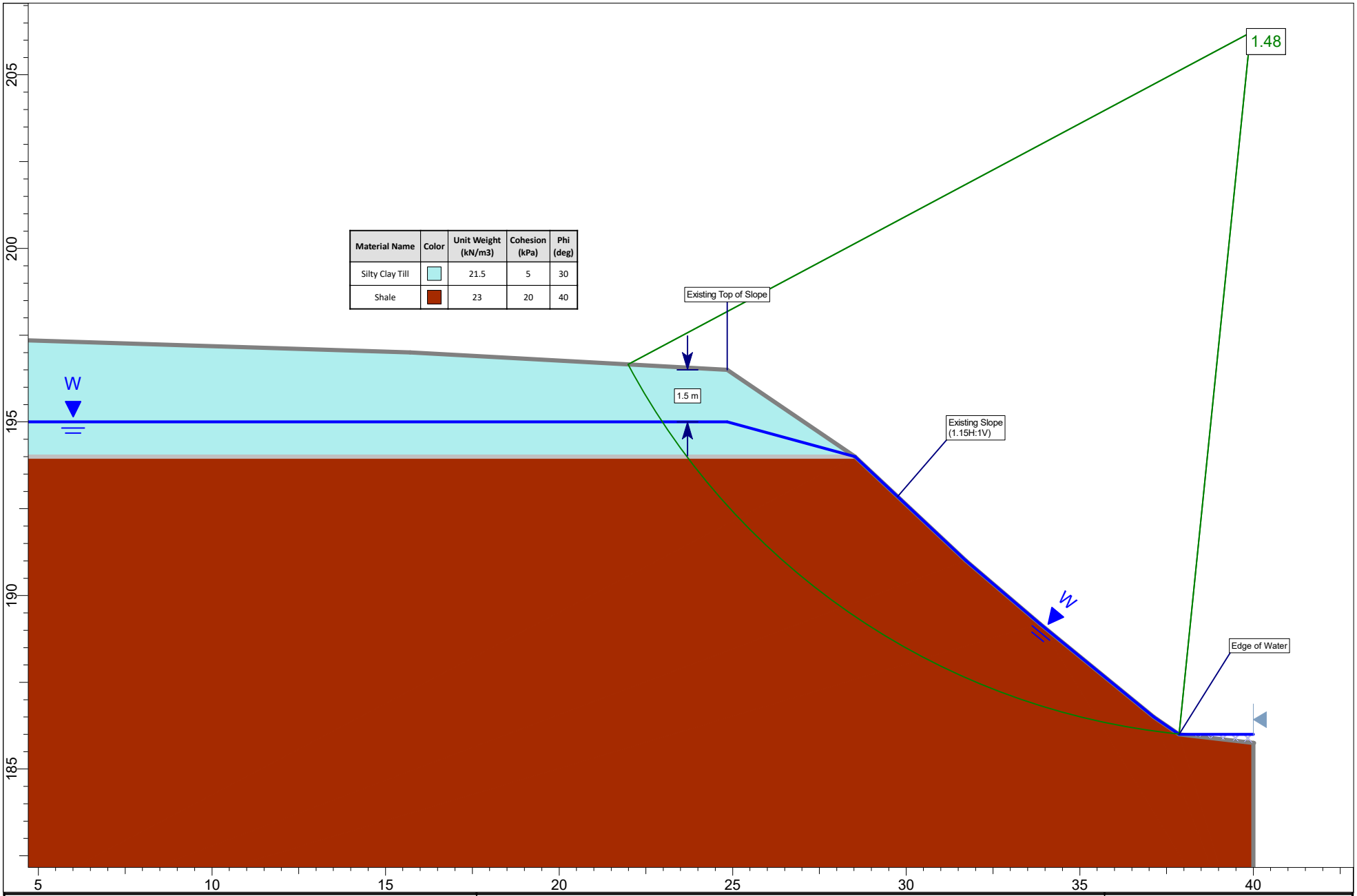
Project Title: Slope Stability Assessment - Cross Section B-B			Load Case: Existing Condition - Elevated Water Level
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150	Revision: -
Date: April 2025		Reference No.: 2006-S167	Drawing No.: 6



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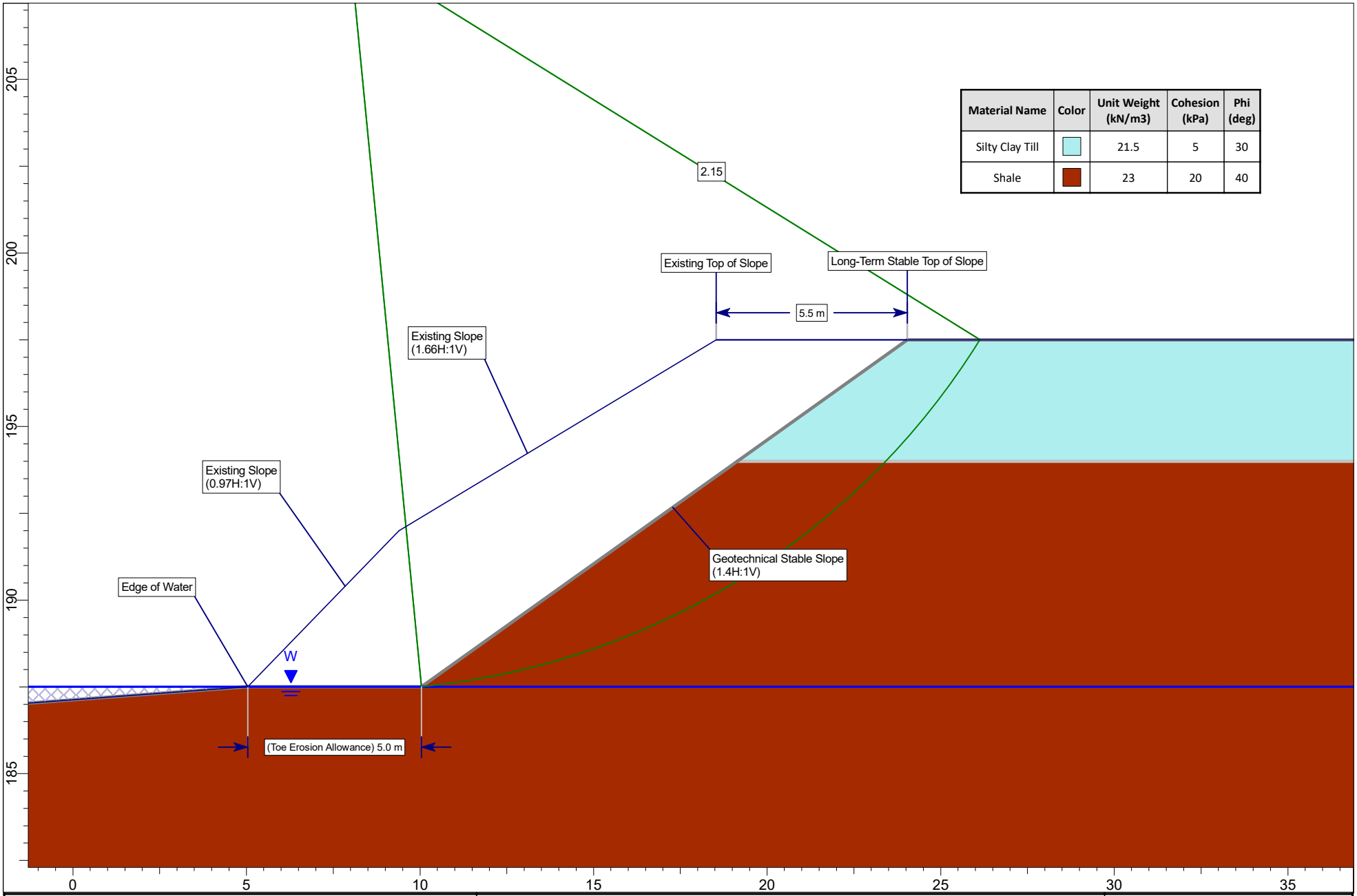
Project Title: Slope Stability Assessment - Cross Section C-C			Load Case: Existing Condition - Elevated Water Level
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150	Revision: -
Date: April 2025		Reference No.: 2006-S167	Drawing No.: 7



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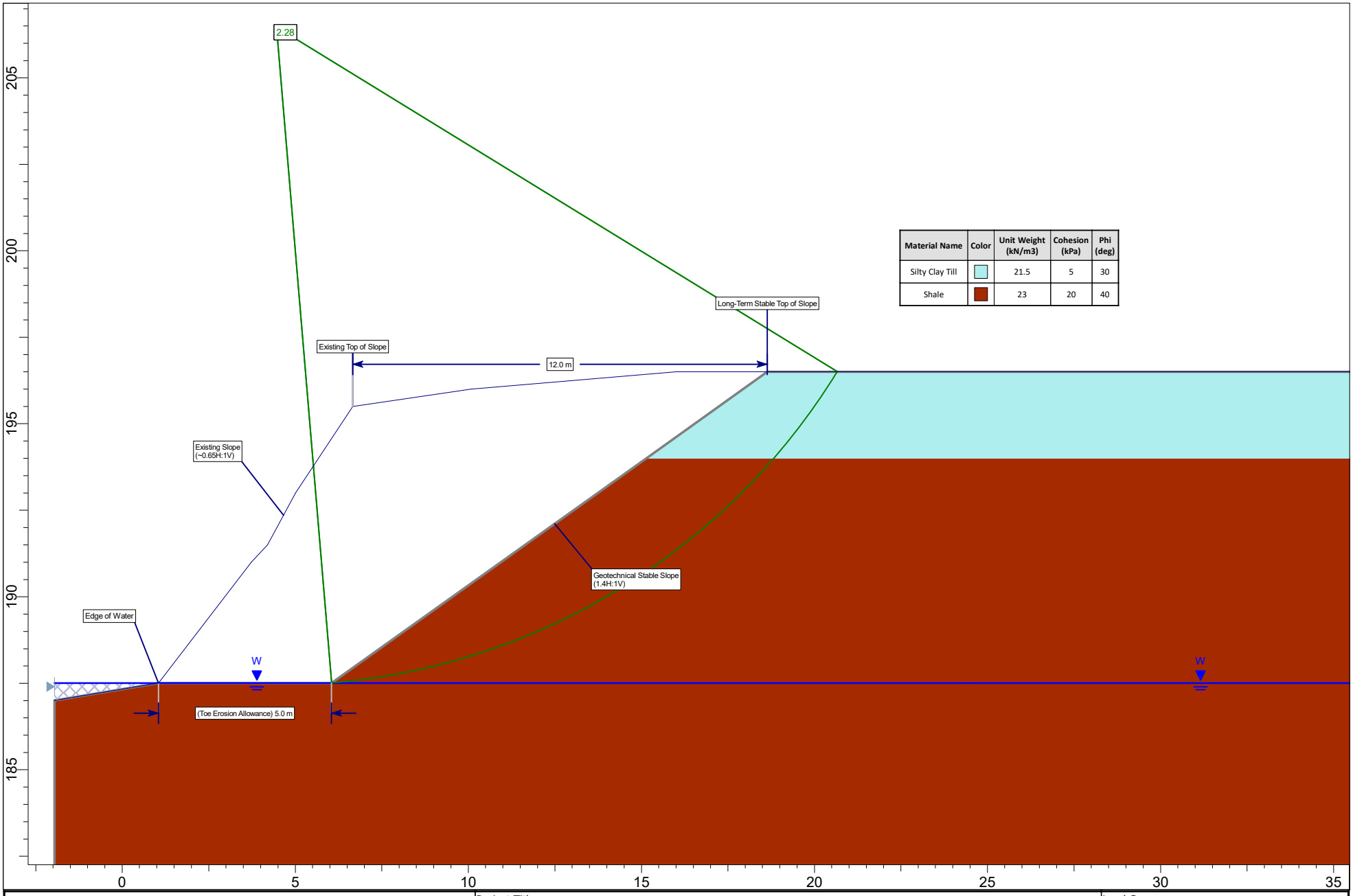
Project Title: Slope Stability Assessment - Cross Section A-A			Load Case: Stable Condition
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150	Revision: -
Date: April 2025		Reference No.: 2006-S167	Drawing No.: 8



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Silty Clay Till		21.5	5	30
Shale		23	20	40

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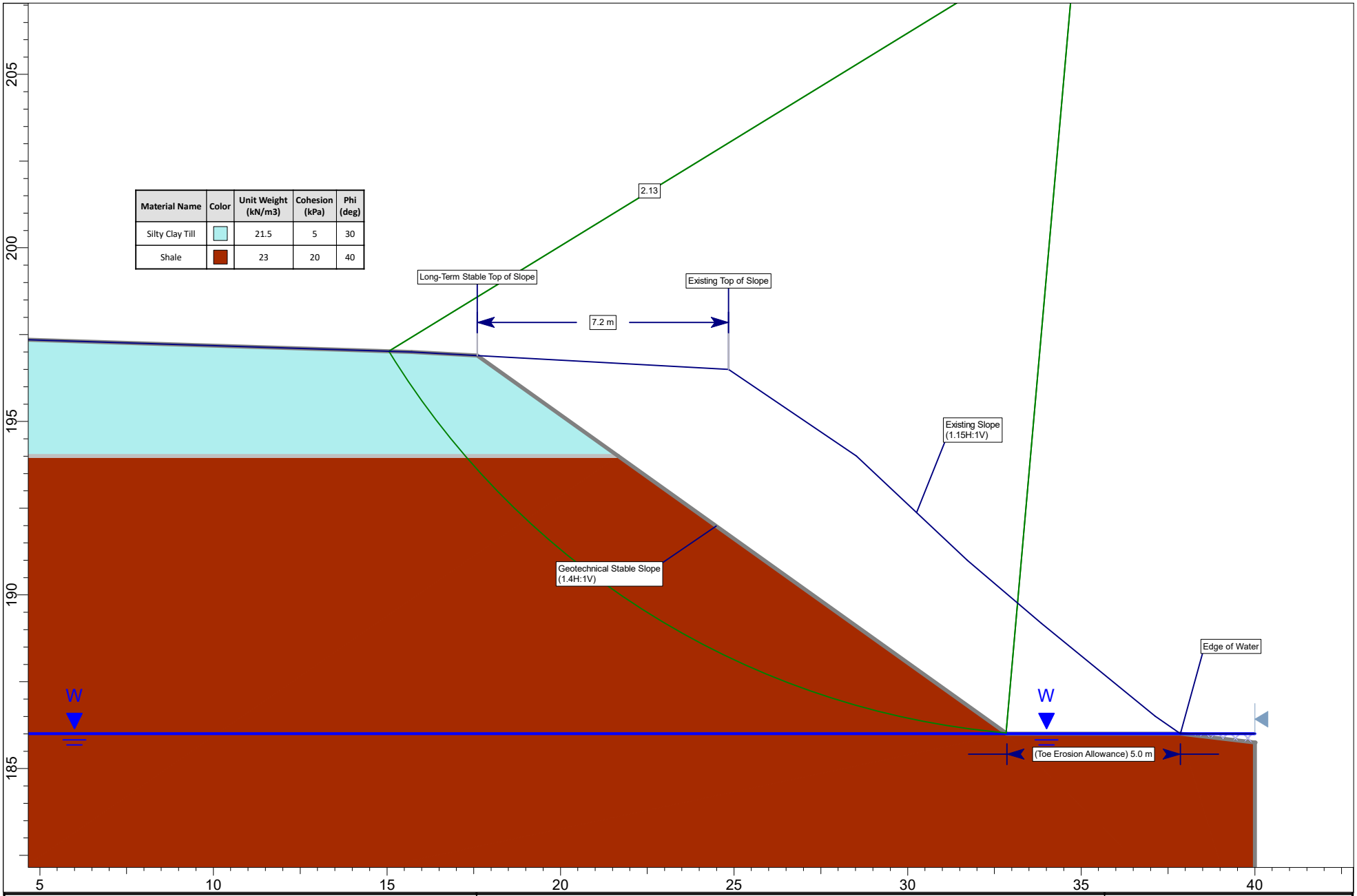
Project Title: Slope Stability Assessment - Cross Section B-B			Load Case: Stable Condition
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150	Revision: -
Date: April 2025		Reference No.: 2006-S167	Drawing No.: 9



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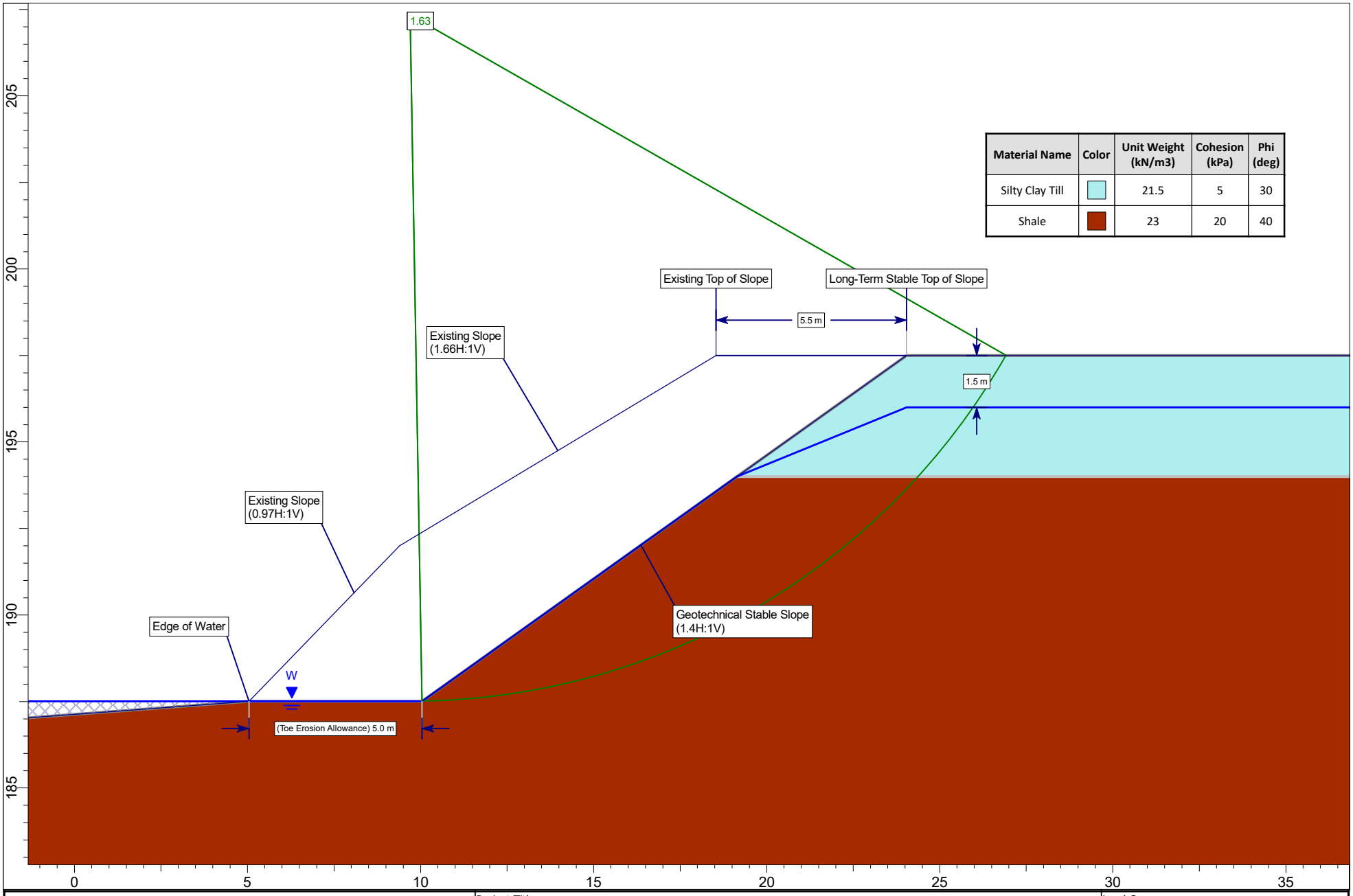
Project Title: Slope Stable Assessment - Cross Section C-C			Load Case: Stable Condition
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150	Revision: -
Date: April 2025		Reference No.: 2006-S167	Drawing No.: 10



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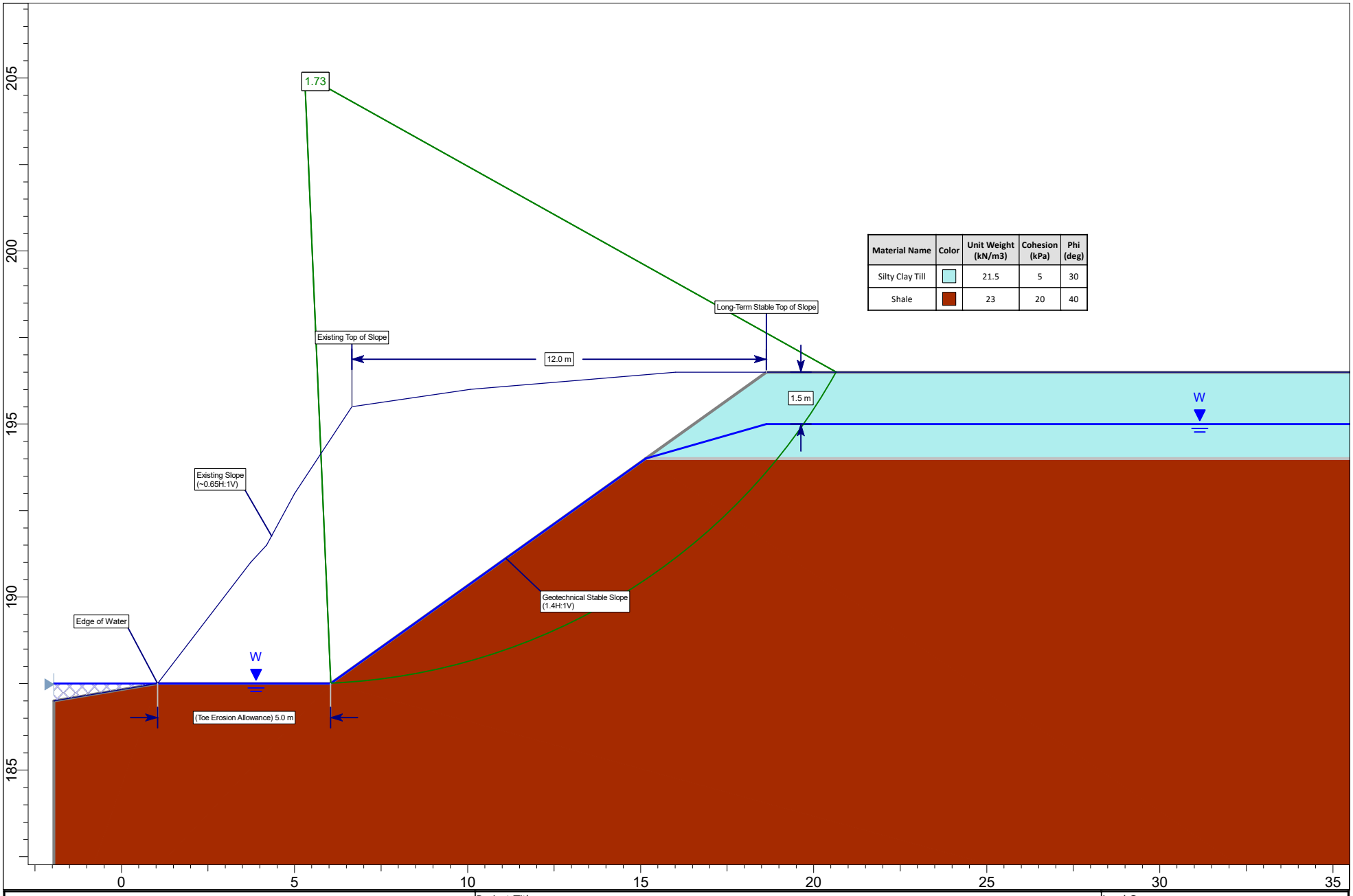
Project Title: Slope Stability Assessment - Cross Section A-A			Load Case: Stable Condition - Elevated Water Level
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150	Revision: -
Date: April 2025		Reference No.: 2006-S167	Drawing No.: 11



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Silty Clay Till		21.5	5	30
Shale		23	20	40

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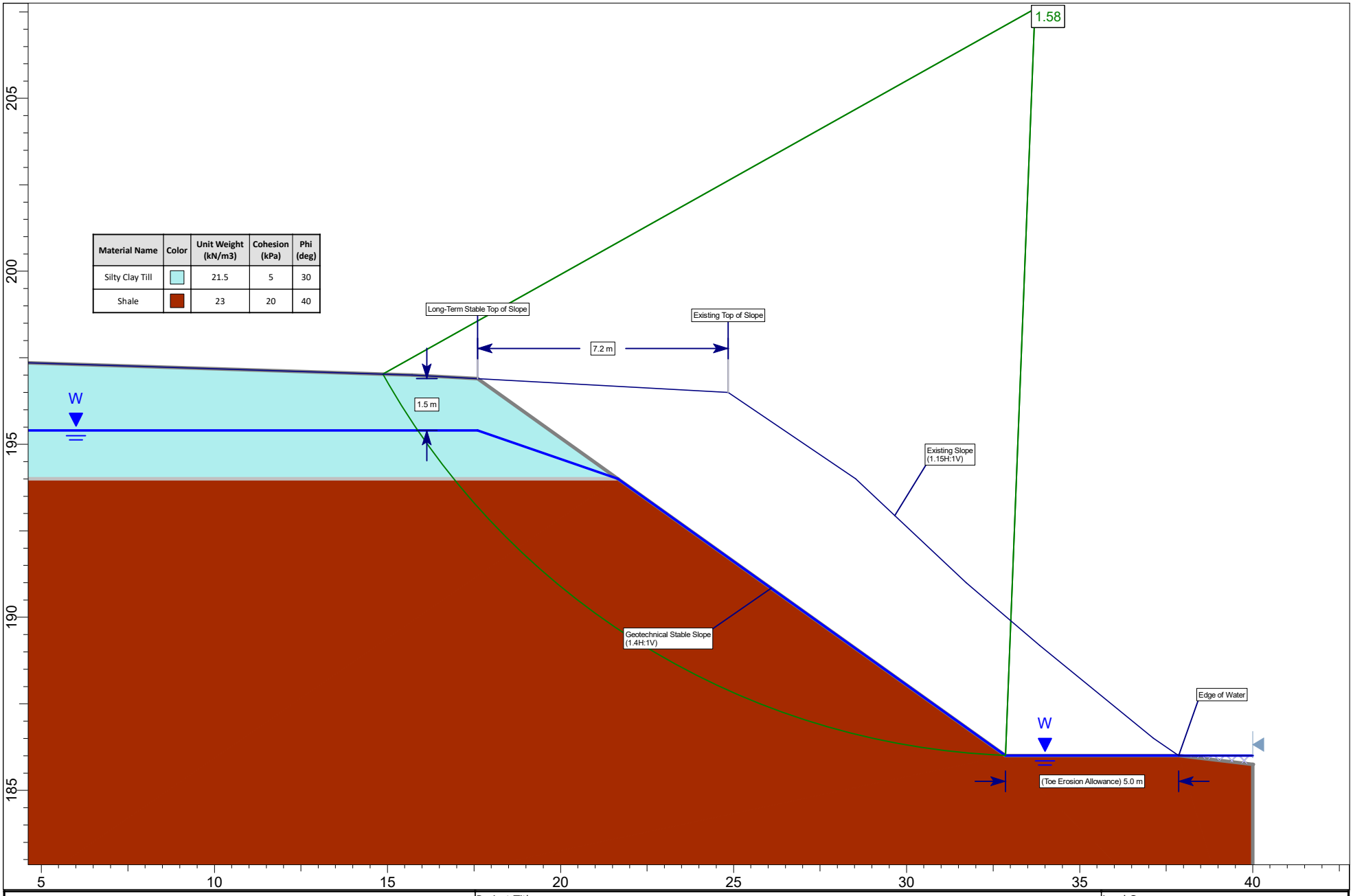
Project Title: Slope Stability Assessment - Cross Section B-B			Load Case: Stable Condition - Elevated Water Level
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150	Revision: -
Date: April 2025		Reference No.: 2006-S167	Drawing No.: 12



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Project Title: Slope Stable Assessment - Cross Section C-C			Load Case: Stable Condition - Elevated Water Level
Location: 44-45 Longview Place, City of Mississauga			
Drawn By: P.K.	Checked By: K.L.	Scale: 1:150	Revision: -
Date: April 2025		Reference No.: 2006-S167	Drawing No.: 13

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 721-7864	FAX: (905) 542-2769

APPENDIX

LOGS OF BOREHOLE

REFERENCE NO. 2006-S167

JOB NO.: 2006-S167

LOG OF BOREHOLE NO.: 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: 44-45 Longview Place
City of Mississauga

DRILLING DATE: July 8, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
197.6	Ground Surface							
0.0	**13 cm TOPSOIL**	1	DO	11	0		13	Dry on completion
	Brown, stiff to very stiff weathered	2	DO	26	1		11	
	SILTY CLAY TILL occ. wet sand and silt seams and layers cobbles and boulders	3	DO	20	2		13	
		4	DO	27			12	
194.7								
2.9	Reddish-brown	5	DO	77/23	3		9	
	SHALE BEDROCK (WEATHERED)	6	DO	50/5	4		8	
					5			
191.3		7	DO	50/5	6		6	Cave-In @ El.192.1 m on completion
6.3	**END OF BOREHOLE**				7			
					8			
					9			
					10			

Soil Engineers Ltd.

JOB NO.: 2006-S167

LOG OF BOREHOLE NO.: 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: 44-45 Longview Place
City of Mississauga

DRILLING DATE: July 8, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
197.5 / 0.0	Ground Surface							
	18 cm TOPSOIL	1	DO	9	0		16	
	Brown, stiff to very stiff weathered	2	DO	16	1		17	
	SILTY CLAY TILL occ. wet sand and silt seams and layers cobbles and boulders	3	DO	28	2		13	
		4	DO	23			12	
194.6 / 2.9	Reddish-brown	5	DO	78/20	3		8	
	SHALE BEDROCK (WEATHERED)	6	DO	50/5	4		9	
191.2 / 6.3	**END OF BOREHOLE**	7	DO	50/5	5 6 7 8 9 10		6	Dry on completion ▽ Cave-In @ El.191.7 m on completion

Soil Engineers Ltd.

JOB NO.: 2006-S167

LOG OF BOREHOLE NO.: 3

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: 44-45 Longview Place
City of Mississauga

DRILLING DATE: July 13, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
197.6	Ground Surface							
0.0	**13 cm TOPSOIL**	1	DO	9	0		24	Dry on completion
	Brown, stiff to very stiff weathered							
		2	DO	12	1		27	
	SILTY CLAY TILL							
	occ. wet sand and silt seams and layers cobbles and boulders	3	DO	27	2		13	
		4	DO	26			14	
194.7								
2.9	Reddish-brown	5	DO	50/8	3		10	
	SHALE BEDROCK (WEATHERED)	6	DO	50/8	4		7	
191.3		7	DO	50/8	5			
6.3	**END OF BOREHOLE**				6		6	
					7			
					8			
					9			
					10			

Soil Engineers Ltd.

JOB NO.: 2006-S167

LOG OF BOREHOLE NO.: 4

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: 44-45 Longview Place
City of Mississauga

DRILLING DATE: July 8, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
197.4	Ground Surface							
0.0	**18 cm TOPSOIL**	1	DO	9	0		12	Dry on completion
	Brown, stiff to very stiff weathered	2	DO	32	1		11	
	SILTY CLAY TILL occ. wet sand and silt seams and layers cobbles and boulders	3	DO	25	2		13	
		4	DO	31			12	
194.5								
2.9	Reddish-brown	5	DO	50/5	3		10	
	SHALE BEDROCK (WEATHERED)	6	DO	50/8	4		6	
191.1		7	DO	50/8	5			
6.3	**END OF BOREHOLE**				6		6	
					7			
					8			
					9			
					10			

Soil Engineers Ltd.

JOB NO.: 2006-S167

LOG OF BOREHOLE NO.: 5

FIGURE NO.: 5

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: 44-45 Longview Place
City of Mississauga

DRILLING DATE: July 13, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
197.2	Pavement Surface							
0.0	**8 cm TOPSOIL**	1	DO	12	0		12	Dry on completion
	Brown, stiff to very stiff							
	weathered	2	DO	19	1		12	
	SILTY CLAY TILL							
	occ. wet sand and silt seams and layers cobbles and boulders	3	DO	26	2		13	
		4	DO	23			13	
194.3								
2.9	Reddish-brown	5	DO	50/8	3		10	
	SHALE BEDROCK				4			
	(WEATHERED)	6	DO	50/5	5		8	
190.9		7	DO	50/5	6		22	
6.3	**END OF BOREHOLE**				7			
					8			
					9			
					10			

Soil Engineers Ltd.

JOB NO.: 2006-S167

LOG OF BOREHOLE NO.: 6

FIGURE NO.: 6

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: 44-45 Longview Place
City of Mississauga

DRILLING DATE: July 8, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
196.8	Ground Surface							
0.0	**18 cm TOPSOIL**	1	DO	11	0		10	Dry on completion
	Brown, stiff to very stiff weathered	2	DO	20	1		12	
	SILTY CLAY TILL occ. wet sand and silt seams and layers cobbles and boulders	3	DO	25	2		11	
		4	DO	29			12	
193.9								
2.9	Reddish-brown	5	DO	50/13	3		8	
	SHALE BEDROCK (WEATHERED)	6	DO	50/8	4		7	
190.5		7	DO	50/5	5			
6.3	**END OF BOREHOLE**				6		6	
					7			
					8			
					9			
					10			

Soil Engineers Ltd.