re: **Slope Stability Analysis – Western Property Boundary**
Proposed Commercial Building
480 & 486 Citigate Drive – Ottawa, Ontario
to: RF Ottawa Limited Partnership – Mr. Julian Nini – juliann@rosefellow.com
date: October 10, 2023
file: PG6514-MEMO.01 Revision 1

As requested, Paterson Group (Paterson) prepared the current memorandum to provide geotechnical recommendations for the proposed steep slopes to be located along the western property boundary at the aforementioned site. It should be noted that the slope stability analysis for the retaining walls at the remaining locations and within the property will be completed at detailed design stage. This memorandum should be read in conjunction with Paterson's geotechnical Report PG6514-1 Revision 2 dated October 10, 2023.

1.0 Background Information

It is our understanding that due to the proposed parking area along the west property line, a steep slope is proposed to be excavated (steeper than the recommended 3H:1V). Therefore, Paterson was approached by Rosefellow to analyze the *potential* to build slopes with a maximum inclination of 1H:1V or 2H:1V and provide recommendations to ensure that the slope is achieved while maintaining slope stability in the long term.

As part of our assessment of the subject slope, the following drawings were reviewed to retrieve proposed grading and the existing topography of the area:

❑ Grading Plan – Project No. 119123 – Drawing No. 119123-GR1 – Revision 2 dated October 6, 2023.
❑ Grading Plan – Project No. 119123 – Drawing No. 119123-GR2 – Revision 2 dated October 6, 2023.

The following provides our assessment of the proposed slope and our recommendations during and post construction.

2.0 Slope Stability Assessment

Subsurface Conditions

Based on our geotechnical investigation findings, the subsurface profile across the western side of the subject site generally consists of topsoil underlain by a thin layer of silty sand fill.

The above noted layers are followed by dense to very dense glacial till or a stiff to very stiff grey silty clay and followed by a layer of glacial till. The glacial till layer consists of brown to grey silty sand with gravel, cobbles, and boulders with some clay which are underlain by bedrock.

Generally, based on the measured groundwater levels at each borehole location along with the colouring, consistency and moisture levels of the recovered samples, the groundwater table is expected to range between 2 to 4 m below existing grade. Reference should be made to the latest revision of the geotechnical Report PG6514-1 Revision 1 dated March 8, 2023.

Slope Stability Analysis methodology

The slope stability analysis for the **_"proposed sloping scenarios"_** was modeled in SLIDE, a computer program which permits a two-dimensional slope stability analysis calculating several limit equilibrium analysis methods, including but not limited, the Bishop's and Morgenstern-Price methods, which are widely accepted slope analyses methods. The program calculates a factor of safety, which represents the ratio of the forces resisting failure to forces favoring failure. The factor of safety displayed represents the lowest value calculated from the analysis results. Theoretically, a factor of safety of 1.0 represents a condition where the slope is stable. However, due to intrinsic limitations of the calculation methods and the variability of the subsurface soil and groundwater conditions, a factor of safety greater than 1.0 is generally required for the failure risk to be considered acceptable.

A minimum factor of safety of 1.5 is generally recommended for conditions where the slope failure would comprise permanent structures. An analysis considering seismic loading was also completed. A horizontal acceleration of 0.16 g was considered for the sections for the seismic loading condition. A factor of safety of 1.1 is considered to be satisfactory for stability analyses including seismic loading. It should be noted that only the figures with the lowest factor of safety are presented and considered the governing factors.

Two (2) slope scenarios (Sections A and B) were studied with the potential proposed inclination of 1H:1V or 2H:1V, respectively, for the proposed slopes to be located along the west side of the site. Conservatively, the subsurface layers were assumed to be fully saturated in order to achieve a factor of safety of 1.5 or higher while in the worst case scenario.

The cross-section locations are presented on Drawing PG6514-1 - Test Hole Location Plan attached to the end of this memorandum. It should be noted that details of the slope height and slope angle at the cross-section locations are presented in Figures 1A through 3B attached to the end of this report based on the proposed grading.

The parameters in Table 1 and 2 were used for the slope stability analysis under static and seismic conditions:

Table 1 - Soil Parameters – Static Conditions

Soil Layer	Unit Weight (kN/m³)	Friction Angle (degrees)	Cohesion (kPa)
Silty Sand Fill	19	35	
Silty Clay with Sand and Gravel	18	33	10
Glacial Till	20	38	5
Bedrock	24	-	-

Table 2 - Soil Parameters – Seismic Loading

Soil Layer	Unit Weight (kN/m³)	Friction Angle (degrees)	Cohesion (kPa)
Silty Sand Fill	19	35	
Silty Clay with Sand and Gravel	18	33	80
Glacial Till	20	38	5
Bedrock	24	-	-

Slope Stability Sections

Section A

Section A was drawn to form a slope with a maximum slope inclination of 1H:1V and an approximate horizontal distance of 6.5 m between the toe of the slope and the edge of the proposed curb. A 1 m wide swale was assumed to be located along the bottom of the slope at a depth of approximately 1 m below finished grade.

Two separate scenarios were analyzed to determine whether a 1H:1V slope is achievable given the available tight spacing present on site and are summarized as follows:

❑ The first Scenario (Figures 1A and 1B) assumed that the slope face will be covered by a geosynthetic system that would provide erosion control along the slope face.
❑ The second Scenario (Figures 2A and 2B) assumed that a 3.8 m deep geogrid wrapped, compacted granular fill layers placed in a tapered fashion along the face of the slope and separated vertically at 750 mm vertical spacing, would be built to support the 1H:1V slope face. The geogrid wrapped granular fill will contain a biaxial geogrid liner such as Terrafix TBX2500 or equivalent, wrapped around a minimum 750 mm thick layers of OPSS Granular B Type II compacted to 98% of the material's SPMDD. Reference should be made to the sketch presented below for this system.
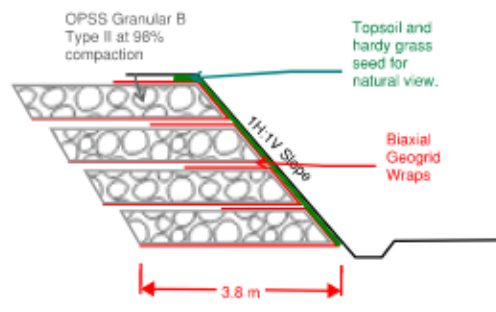

Figure 1- Sketch of the proposed geogrid reinforced slope face

Section B

Section B was drawn with a maximum slope inclination of 2H:1V with an approximate horizontal distance of 3 m between the toe of the slope to the edge of the proposed curb. A 1 m wide swale was assumed to be located along the bottom of the slope at a depth of approximately 1 m below finished grade.

The analysis was completed with the assumption that the slope face will be supported by an erosion control system such as the use of GeoWeb cells penetrated into the slope face by a minimum of 150 mm below the slope face and backfilled with topsoil and hardy grass seed.

The results of the slope stability sections are summarized in the following section.

Slope Stability Analysis Results

The static analysis results for slope sections A and B are presented in Figures 1A, 2A, and 3A and attached to the end of this report. The factor of safety for both slope scenarios of Section A was less than the minimum acceptable factor of safety of 1.5 (Figures 1A and 2A). Whereas the factor of safety for Section B (Figure 3A) was found to be greater than 1.5 without the need to complete excessive work on the slope face beyond providing an erosion control system along the slope face.

Similarly, the slope stability analysis under seismic loading for Section A were less than the desired factor of safety of 1.1 while the analysis results for Section B indicate a safe slope under seismic conditions. Reference should be made to Figures 1B, 2B and 3B showing the results of the slope stability under seismic loading.

3.0   Conclusion and Recommendations

Based on the above analysis results, it is recommended that the slope be shaped to a minimum of 2H:1V or shallower. If a shallower slope of 1H:1V is required, the extent of the geogrid will be required to encroach into the City property. Provided that the client receives a written approval from the City to encroach, this option will not be viable.

It is highly recommended that an erosion control system be installed along the 2H:1V slope face consisting of the following:

- ❑ The slope face should be shaped to a minimum 2H:1V with the top of slope at an approximate elevation of 109 m down to an approximate elevation of 104 m.
- ❑ A swale should be excavated along the slope face with a positive outlet to ensure that the accumulated surface water runoff is drained away from the bottom of the slope.
- ❑ The swale should be backfilled with granular material consisting of OPSS Granular B Type II or rip-rap with a maximum particle size of 150 mm to allow for drainage and provide a sufficient toe protection against active erosion.
- ❑ The slope face should be covered with GeoWeb system by Presto, or equivalent, with a minimum cell depth of 150 mm penetrated into the slope face.

- ❑ The GeoWeb Cells should be backfilled with a minimum of 300 mm thick layer of topsoil followed by applying hardy grass seed to establish vegetation. Reference should be made to the attached GeoWeb data sheets.
- ❑ It is important to note that the placement of the topsoil layer and the application of the hardy grass seed should be completed during the fall season or after the spring thaw, away from freezing temperatures, to ensure a fast growth of roots into the slope face.
- ❑ Any existing trees located within the proposed slope alignment should remain in place as tree roots reinforce the stability of the slope face.
- ❑ Based on the preliminary grading plan for the roads which was provided by the client, and on the current site topography, it is anticipated that the proposed development will include terracing and retaining walls within and along the site boundaries. Paterson will complete a slope stability review and a design for the retaining walls, as per City Guidelines, at the detailed design stage of the project.

4.0 Field Inspections

All slope related field work should be overseen and approved by Paterson at the time of construction. It is recommended to contact Paterson if different soils than described in this report are encountered along the slope faces to provide additional recommendations, where required.

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Yashar Ziaeimehr, M.A.Sc.

LICENSED PROFESSIONAL ENGINEER
Oct.10, 2023
M. SALEH
100507739
PROVINCE OF ONTARIO

Maha Saleh, P.Eng.

<u>**Attachments:**</u>
- ❑ Presto Geoweb Data Sheets
- ❑ Slope Stability Analysis Figures 1A through 3B
- ❑ Drawing PG6514-1 – Test Hole Location Plan
- ❑ Grading Plan, Revision 2 dated October 6, 2023, prepared by Novatech.

Ottawa Head Office
9 Auriga Drive
Ottawa – Ontario – K2E 7T9
Tel: (613) 226-7381

Ottawa Laboratory
28 Concourse Gate
Ottawa – Ontario – K2E 7T7
Tel: (613) 226-7381

List of Services
Geotechnical Engineering ◊ Environmental Engineering ◊ Hydrogeology
Materials Testing ◊ Retaining Wall Design ◊ Rural Development Design
Temporary Shoring Design ◊ Building Science ◊ Noise and Vibration Studies

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PRESTO GEOSYSTEMS®

Perforated GEOWEB® System
Performance & Material Specification Summary

Base Material

Property	Value		Test Method
Material Composition	Polymer – Polyethylene with density of 58.4 - 60.2 lb/ft³ (0.935 – 0.965 g/cm³)		ASTM D 1505
Color	Black - from Carbon Black	Tan, Green, Other colors with no heavy metal content	N/A
Stabilizer	Carbon black content 1.5% - 2% by weight	Hindered amine light stabilizer (HALS) 1.0% by weight of carrier	N/A
Minimum ESCR	5000 hr		ASTM D 1693

Strip Properties

Property	Value	Test Method
Sheet Thickness	50 mil –5% +10%(1.27 mm -5% +10%)	ASTM D 5199
Surface Treatment	**Performance:** The polyethylene strips shall be textured and perforated such that the peak friction angle between the surface of the textured / perforated plastic and #40 silica sand at 100% relative density shall be no less than 85% of the peak friction angle of the silica sand in isolation when tested by the direct shear method per ASTM D 5321. **Material:** The polyethylene strips shall be textured with a multitude of rhomboidal (diamond shape) indentations. The rhomboidal indentations shall have a surface density of 140 – 200 per in² (22 – 31 per cm²). In addition, the strips shall be perforated with horizontal rows of 0.4 in (10 mm) diameter holes. Perforations within each row shall be 0.75 in (19 mm) on-center. Horizontal rows shall be staggered and separated 0.50 in (12 mm) relative to the hole centers. The edge of strip to the nearest edge of perforation shall be 0.3 in (8 mm) minimum and the centerline of the weld to the nearest edge of perforation shall be 0.7 in (18 mm) minimum. A slot with a dimension of 3/8 in x 1 3/8 in (10 mm x 35 mm) is standard in the center of the non-perforated areas and at the center of each weld.	

Cell & Seam Properties

Cell Details	Percent Cell Wall Open Area	Nominal Dimensions ±10%		Density per yd² (m²)	Nominal Area ±1%
		Length	Width		
GW20V	21.2% ± 1.0%	8.8 in (224 mm)	10.2 in (259 mm)	28.9 yd² (34.6 m²)	44.8 in² (289 cm²)
GW30V	16.8% ± 1.0%	11.3 in (287 mm)	12.6 in (320 mm)	18.2 yd² (21.7 m²)	71.3 in² (460 cm²)
GW40V	19.89% ± 1.0%	18.7 in (475 mm)	20.0 in (508 mm)	6.9 yd² (8.3 m²)	187.0 in² (1,206 cm²)

Short-term Seam Peel Strength	Cell Depth	Minimum Certified Cell Seam Strength
	3 in (75 mm)	240 lbf (1060 N)
	4 in (100 mm)	320 lbf (1420 N)
	6 in (150 mm)	480 lbf (2130 N)
	8 in (200 mm)	640 lbf (2840 N)

Property	Value
Long-term Seam Peel Strength	Long term seam peel-strength test shall be performed on all resin or pre-manufactured sheet or strips. A 4.0 in (100 mm) wide seam sample shall support a 160 lb (72.5 kg) load for a period of 168 hours (7 days) minimum in a temperature-controlled environment undergoing a temperature change on a 1-hour cycle from ambient room to 130ºF (54ºC). Ambient room temperature is per ASTM E 41.
10,000 hour Seam Peel Strength Certification	Presto shall provide data showing that the high-density polyethylene resin used to produce the GEOWEB® sections has been tested using an appropriate number of seam samples and varying loads to generate data indicating that the seam peel strength shall survive a loading of at least 209 lbf (95 kg) for a minimum of 10,000 hours.

Section Properties

Section Dimension	Section Width	Section Length Range (Cells Long: 18, 21, 25, 29, 34)	
	Variable	Minimum	Maximum
GW20V	7.7 ft (2.3 m) to 9.2 ft (2.8 m)	12.0 ft (3.7 m)	27.3 ft (8.3 m)
GW30V		15.4 ft (4.7 m)	35.1 ft (10.7 m)
GW40V		25.4 ft (7.7 m)	58.2 ft (17.8 m)

GW/G000(M)-Oct 2013 AP-3639 R7 ©Oct 2013

The GEOWEB® Cell Dimensions

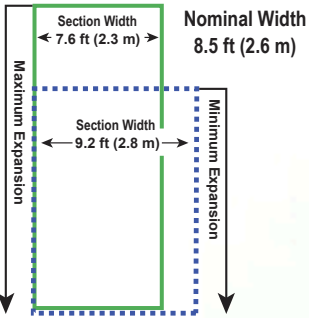| Relative Size[1]	GW20V	GW30V		GW40V
Name	**GW20V (small cell)**	**GW30V (mid cell)** **For all other Applications**	**For Earth Retention[4]**	**GW40V (large cell)**
Nominal Length x Width[2]	8.8 x 10.2 in (224 x 259 mm)	11.3 x 12.6 in (287 x 320 mm)	10.5 x 13.0 in (267 x 330 mm)	18.7 x 20.0 in (475 x 508 mm)
Nominal Area[3]	44.8 in² (289 cm²)	71.3 in² (460 cm²)	68.3 in² (440 cm²)	187.0 in² (1206 cm²)
Cells per yd² (m²)	28.9 (34.6)	18.2 (21.7)	NA	6.9 (8.3)
Nominal Depths	3 in (75 mm), 4 in (100 mm), 6 in (150 mm), and 8 in (200 mm) for all cells			

1 All details and dimensions are nominal and subject to manufacturing tolerances.
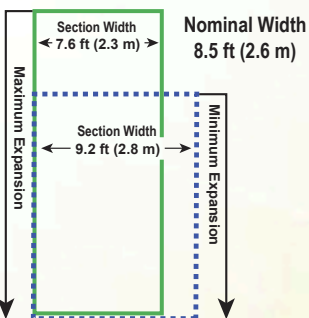2 Cell length and width will vary approximately ±10% through the recommended expansion range.
3 Cell area will vary only ±1% through the recommended section expansion range.
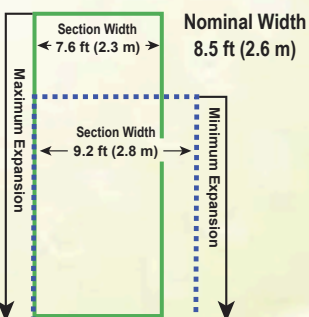4 Cell dimensions for Earth Retention sections are fixed and NOT variable or nominal.
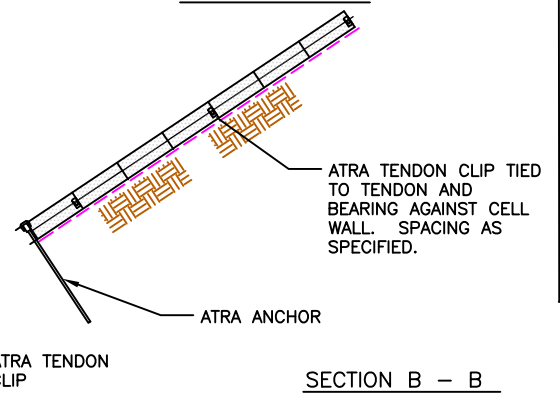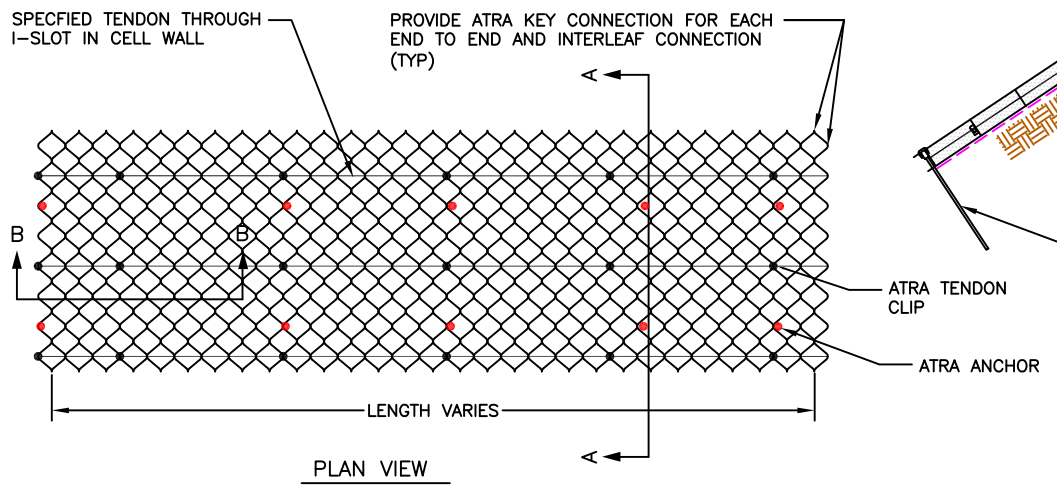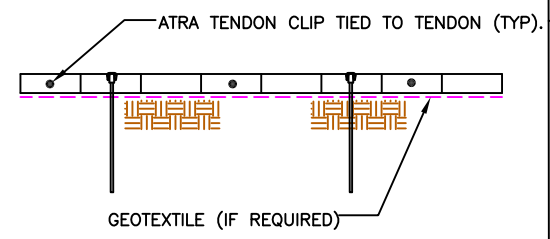
The GW20V Section Dimensions

Section Width 7.6 ft (2.3 m) — Nominal Width 8.5 ft (2.6 m) — Section Width 9.2 ft (2.8 m) — Maximum Expansion — Minimum Expansion

Cells Long	Length Minimum Expansion	Nominal Length	Length Maximum Expansion	Nominal Area
18	12.0 ft (3.7 m)	13 ft (4.0 m)	14.5 ft (4.4 m)	112 ft² (10.4 m²)
21	4.0 ft (4.3 m)	15 ft (4.7 m)	16.9 ft (5.1 m)	131 ft² (12.1 m²)
25	6.7 ft (5.1 m)	18 ft (5.6 m)	20.1 ft (6.1 m)	156 ft² (14.5 m²)
29	9.4 ft (5.9 m)	21ft (6.5 m)	23.3 ft (7.1 m)	181 ft² (16.8 m²)
34	22.7 ft (6.9 m)	25 ft (7.6 m)	27.3 ft (8.3 m)	212 ft² (19.7 m²)

The GW30V Section Dimensions

Section Width 7.6 ft (2.3 m) — Nominal Width 8.5 ft (2.6 m) — Section Width 9.2 ft (2.8 m) — Maximum Expansion — Minimum Expansion

| Cells Long	Length Minimum Expansion	Nominal Length	Length Maximum Expansion	Nominal Area
18	15.4 ft (4.7 m)	17 ft (5.1 m)	18.6 ft (5.7 m)	143 ft² (13.3 m²)
21	18.0 ft (5.5 m)	20 ft (6.0 m)	21.7 ft (6.6 m)	167 ft² (15.5 m²)
25	21.4 ft (6.5 m)	23 ft (7.1 m)	25.8 ft (7.9 m)	198 ft² (18.4 m²)
29	24.8 ft (7.6 m)	27 ft (8.2 m)	30.0 ft (9.1 m)	230 ft² (21.4 m²)
34	29.1 ft (8.9 m)	32 ft (9.6 m)	35.1 ft (10.7 m)	270 ft² (25.0 m²)

The GW40V Section Dimensions

Section Width 7.6 ft (2.3 m) — Nominal Width 8.5 ft (2.6 m) — Section Width 9.2 ft (2.8 m) — Maximum Expansion — Minimum Expansion

Cells Long	Length Minimum Expansion	Nominal Length	Length Maximum Expansion	Nominal Area
18	25.4 ft (7.7 m)	28 ft (8.3 m)	30.8 ft (9.4 m)	234 ft² (21.7 m²)
21	29.6 ft (9.0 m)	32 ft (9.7 m)	36.0 ft (11.0 m)	273 ft² (25.3 m²)
25	35.2 ft (10.7 m)	38 ft (11.6 m)	42.8 ft (13.1 m)	325 ft² (30.2 m²)
29	40.9 ft (12.5 m)	44 ft (13.5 m)	49.7 ft (15.1 m)	377 ft² (35.0 m²)
34	47.9 ft (14.6 m)	52 ft (15.8 m)	58.2 ft (17.8 m)	441 ft² (41.0 m²)

GENUINE GEOWEB SLOPE PROTECTION
SYSTEM WITH SPECIFIED INFILL.

REFER TO CREST ANCHOR DETAILS

ATRA ANCHOR

VARIES
1

IF SPEC'D, GEOTEXTILE

VEGETATION, IF DESIRED.
REFER TO NOTES.

TENDON THROUGH I-SLOT IN CELL
WALL (TYP). AS SPECIFIED.

ATRA TENDON CLIP TIED TO TENDON
(TYP). SPACING AS SPECIFIED.

TYPICAL TENDON ANCHOR SYSTEM

ATRA TENDON CLIP TIED TO TENDON (TYP).

GEOTEXTILE (IF REQUIRED)

SECTION A – A

ATRA TENDON CLIP TIED
TO TENDON AND
BEARING AGAINST CELL
WALL. SPACING AS
SPECIFIED.

ATRA ANCHOR

SECTION B – B

SPECFIED TENDON THROUGH
I-SLOT IN CELL WALL

PROVIDE ATRA KEY CONNECTION FOR EACH
END TO END AND INTERLEAF CONNECTION
(TYP)

ATRA TENDON
CLIP

ATRA ANCHOR

LENGTH VARIES

PLAN VIEW

NOTES:
1. THE TYPE AND QUANTITY OF TENDONS AND ATRA
   ANCHORS SHALL BE AS SPECIFIED.
2. THE GEOWEB SHALL BE FILLED WITH THE
   SPECIFIED MATERIAL (TOPSOIL, STONE, OR
   CONCRETE) AND SHALL BE SUITABLE TO
   WITHSTAND THE APPLICABLE HYDRAULIC
   CONDITIONS.
3. THE GEOWEB SECTIONS SHALL BE ANCHORED TO
   RESIST SLIDING DUE TO DRIVING AND HYDRAULIC
   FORCES.
4. IF VEGETATION IS DESIRED, PROVIDE AN EROSION
   CONTROL BLANKET OR TURF REINFORCEMENT MAT
   IF THERE IS A POTENTIAL FOR WASH-OUT PRIOR
   TO ESTABLISHING VEGETATION.
5. THE GEOWEB PANELS SHALL BE CONNECTED WITH
   ATRA KEYS AT EACH INTERLEAF AND END TO END
   CONNECTION.
6. REFER TO THE GENERAL DETAIL DRAWINGS FOR
   ANCHOR DETAILS.

TENDON DATA		
TENDON TYPE	WIDTH, IN(MM)	BREAK STRENGTH, LBF (KN)
POLYESTER		
TP-31	0.50 (13)	700 (3.11)
TP-67	0.75 (19)	1506 (6.70)
TP-93	0.75 (19)	2090 (9.30)
KEVLAR		
TK-89	0.375 (10)	2000 (8.90)
TK-133	0.625 (16)	3000 (13.34)
TK-189	0.75 (19)	4000 (17.8)
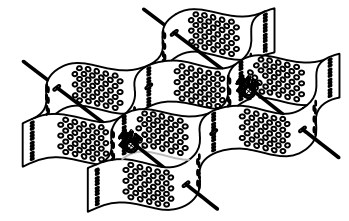
GEOSYSTEMS

PRESTO® PRODUCTS CO.
670 NORTH PERKINS STREET
APPLETON, WI 54914
920-738-1328
WWW.PRESTOGEO.COM

GENUINE GEOWEB®
SLOPE – TENDON/ATRA ANCHORAGE

PRESTO, GEOWEB, AND ATRA ARE REGISTERED TRADEMARKS® OF
PRESTO PRODUCTS.

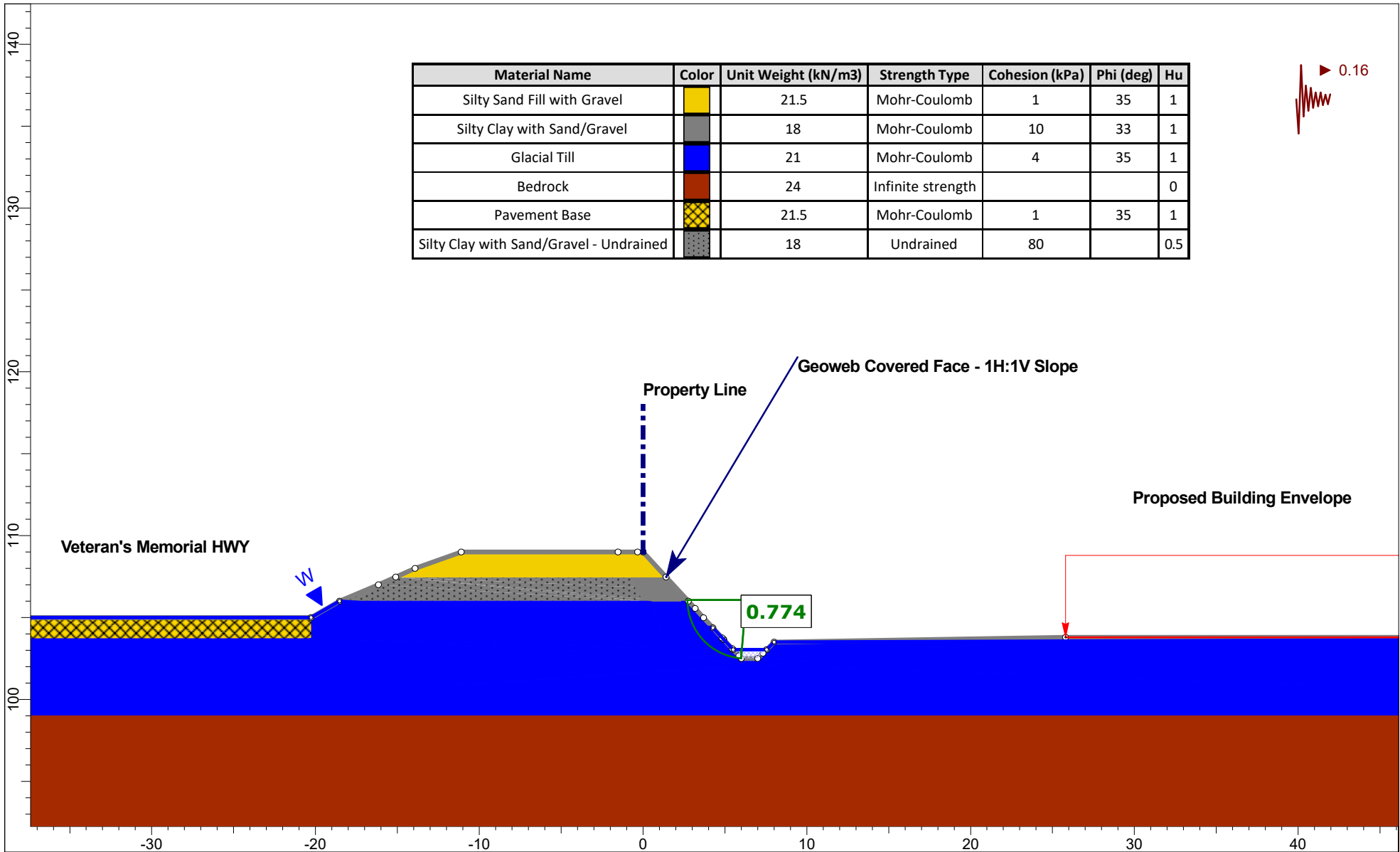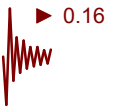| DATE	JUNE 2013	FILE NAME	GWSL6F.DWG
SCALE	NTS	SHEET	1	© 2010 PRESTO GEOSYSTEMS
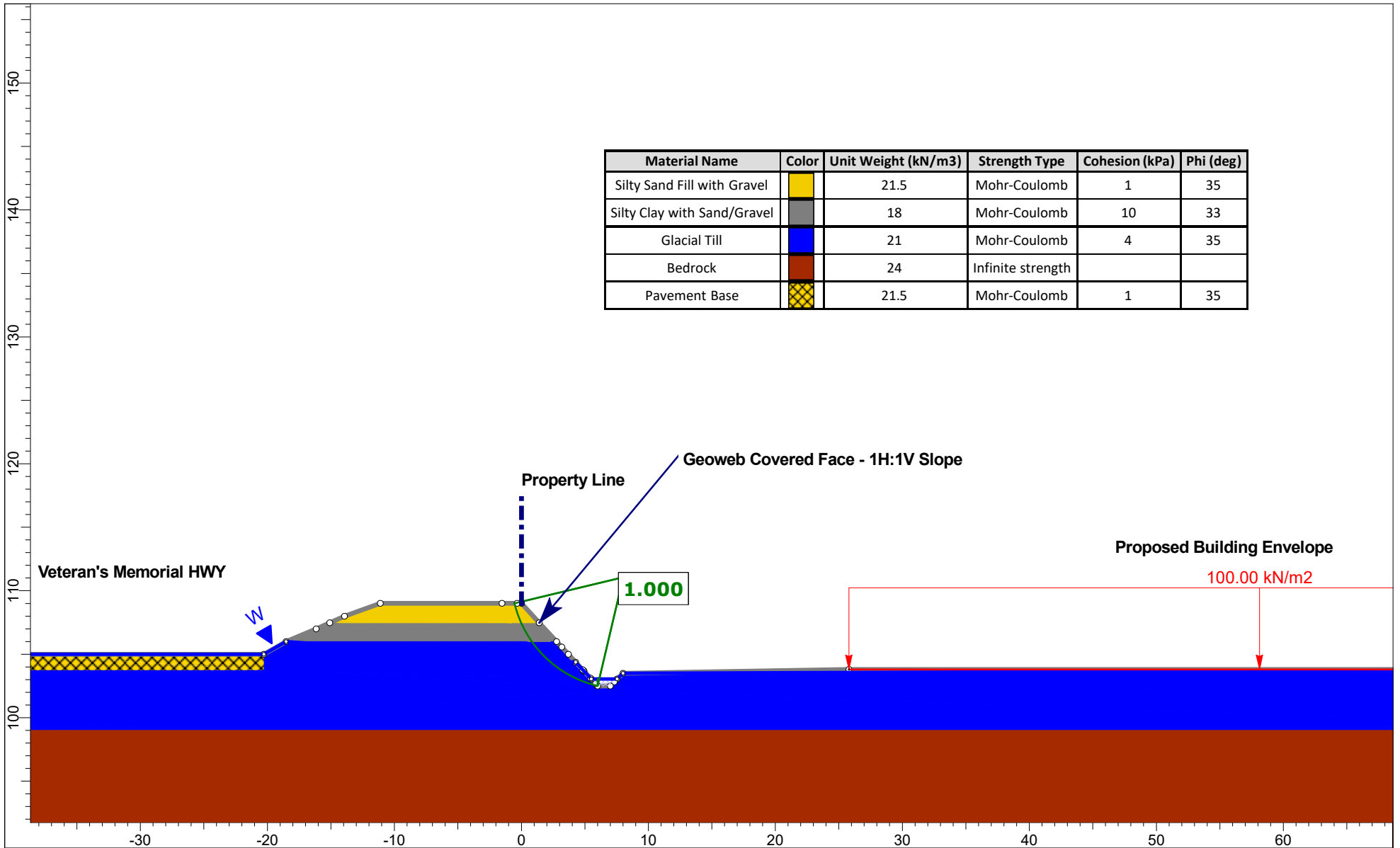
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Silty Sand Fill with Gravel		21.5	Mohr-Coulomb	1	35
Silty Clay with Sand/Gravel		18	Mohr-Coulomb	10	33
Glacial Till		21	Mohr-Coulomb	4	35
Bedrock		24	Infinite strength		
Pavement Base		21.5	Mohr-Coulomb	1	35

Geoweb Covered Face - 1H:1V Slope

Property Line

1.000

Proposed Building Envelope

100.00 kN/m2

Veteran's Memorial HWY

W

PATERSON GROUP

Project	**Proposed Commercial Development**		
Figure No.	**Figure 1A - Section A - No Support - Static Conditions**		
Drawn By	Faisal I. Abou-Seido, P.Eng.	Company	Paterson Group
Date	Thu, 2023-03-09, 12:34:08 PM	File Name	Section A - 1H to 1V Slopes.slmd

| Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Hu
Silty Sand Fill with Gravel		21.5	Mohr-Coulomb	1	35	1
Silty Clay with Sand/Gravel		18	Mohr-Coulomb	10	33	1
Glacial Till		21	Mohr-Coulomb	4	35	1
Bedrock		24	Infinite strength			0
Pavement Base		21.5	Mohr-Coulomb	1	35	1
Silty Clay with Sand/Gravel - Undrained		18	Undrained	80		0.5

► 0.16

Geoweb Covered Face - 1H:1V Slope

Property Line

Proposed Building Envelope

Veteran's Memorial HWY

W

0.774

PATERSON GROUP

Project	Proposed Commercial Development		
Figure No.	Figure 1B - Section A - No Support - Seismic Loading		
Drawn By	Faisal I. Abou-Seido, P.Eng.	Company	Paterson Group
Date	Thu, 2023-03-09, 12:34:08 PM	File Name	Section A - 1H to 1V Slopes.slmd

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Ru
Silty Sand Fill with Gravel		21.5	Mohr-Coulomb	1	35	0
Silty Clay with Sand/Gravel		18	Mohr-Coulomb	10	33	
Glacial Till		21	Mohr-Coulomb	4	35	
Bedrock		24	Infinite strength			
Pavement Base		21.5	Mohr-Coulomb	1	35	
Granular B Type II		21.5	Mohr-Coulomb	1	38	0
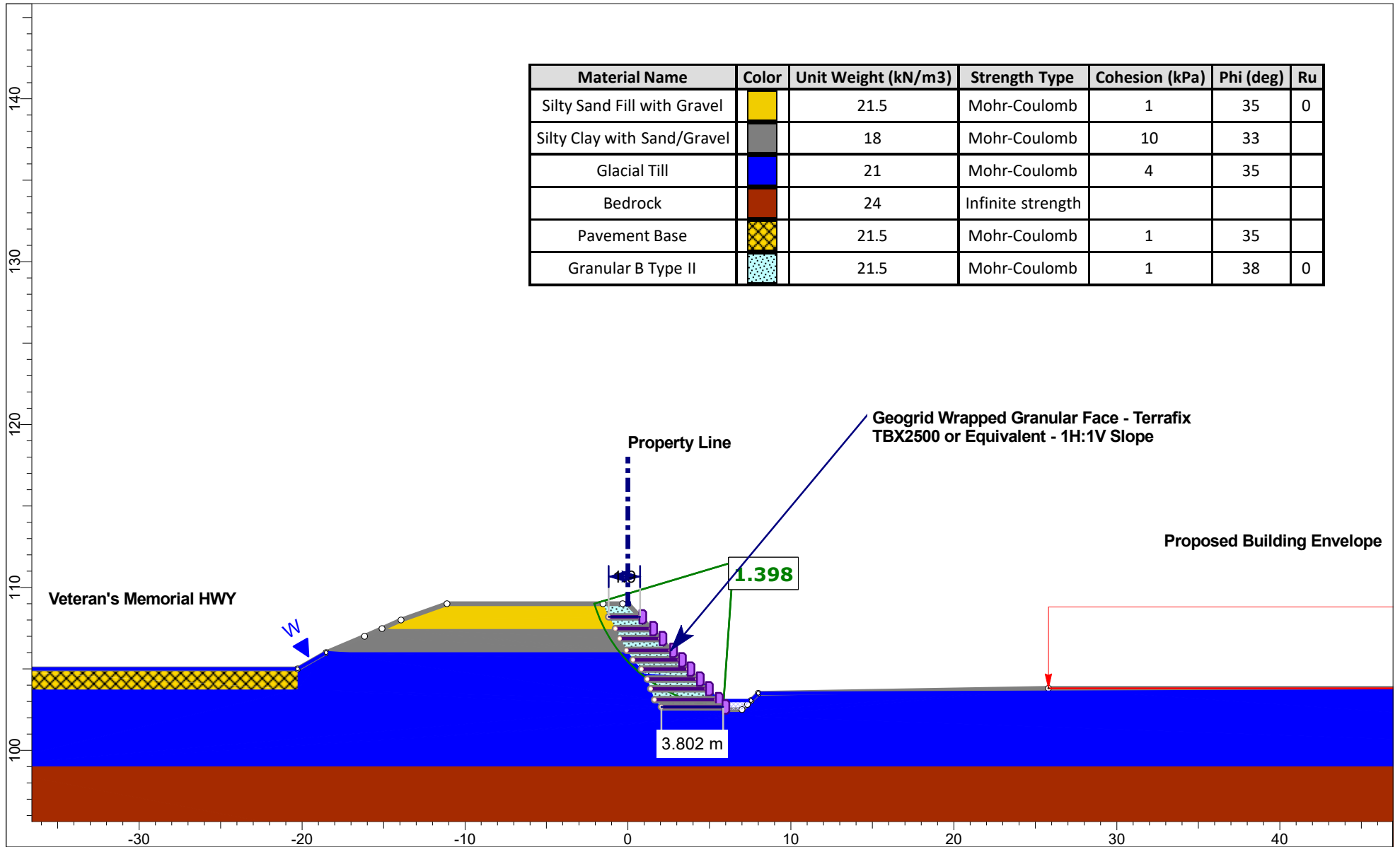
Geogrid Wrapped Granular Face - Terrafix
TBX2500 or Equivalent - 1H:1V Slope

Property Line

1.398

Proposed Building Envelope

Veteran's Memorial HWY

W

3.802 m

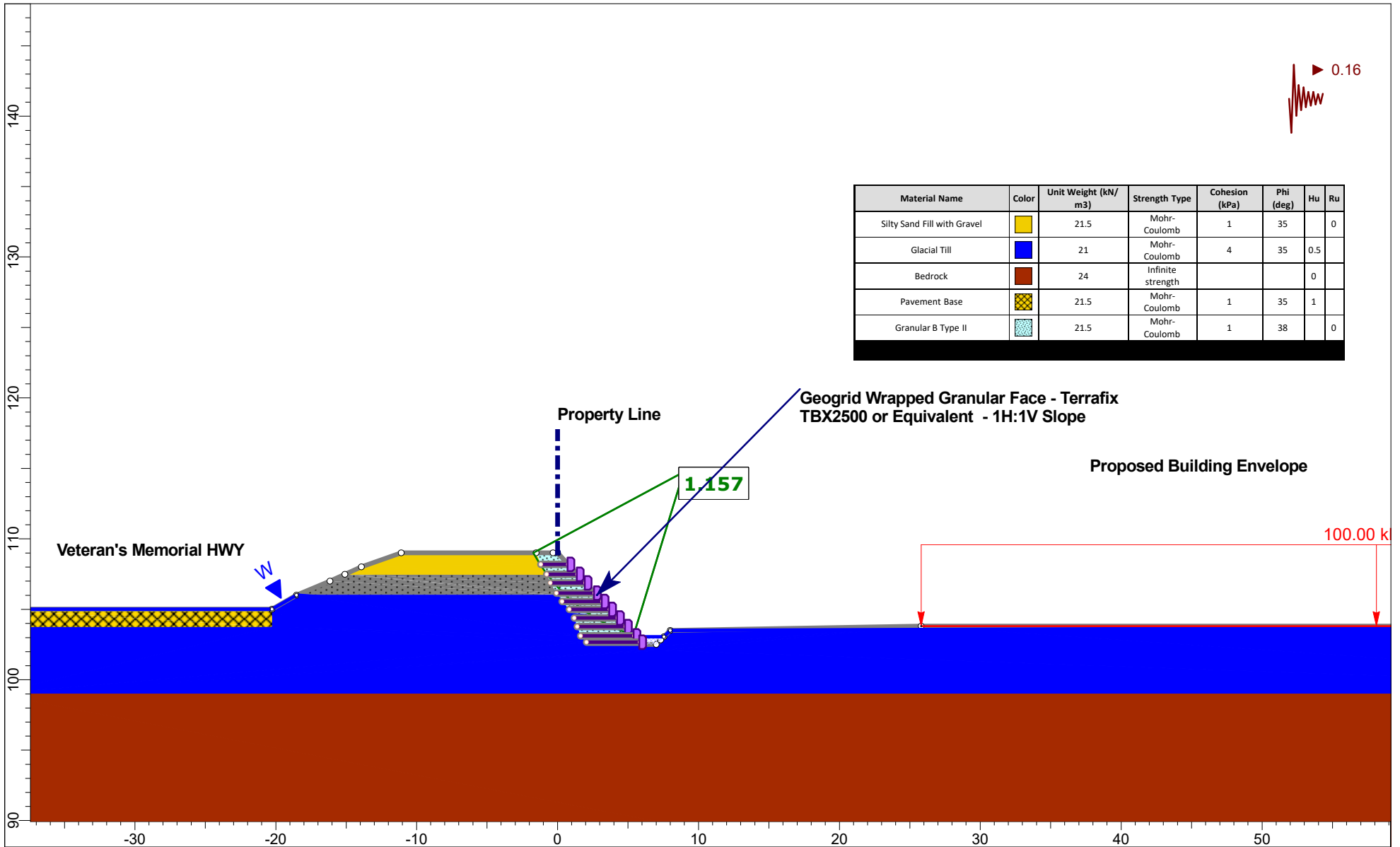|		
Project	**Proposed Commercial Development**	
Figure No.	**Figure 2A - Section A -Geogrid Raps Along Slope Face - Static Conditions**	
Drawn By	Faisal I. Abou-Seido, P.Eng.	**Company** Paterson Group
Date	Thu, 2023-03-09, 12:34:08 PM	**File Name** Section A - 1H to 1V Slopes.slmd

PATERSON GROUP

SLIDEINTERPRET 9.025

► 0.16

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Hu	Ru
Silty Sand Fill with Gravel		21.5	Mohr-Coulomb	1	35		0
Glacial Till		21	Mohr-Coulomb	4	35	0.5	
Bedrock		24	Infinite strength			0	
Pavement Base		21.5	Mohr-Coulomb	1	35	1	
Granular B Type II		21.5	Mohr-Coulomb	1	38		0

Property Line

Geogrid Wrapped Granular Face - Terrafix TBX2500 or Equivalent - 1H:1V Slope

Proposed Building Envelope

1.157

Veteran's Memorial HWY

W

100.00 k

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Ru
Silty Sand Fill with Gravel		21.5	Mohr-Coulomb	1	35	0
Silty Clay with Sand/Gravel		18	Mohr-Coulomb	10	33	
Glacial Till		21	Mohr-Coulomb	4	35	
Bedrock		24	Infinite strength			
Pavement Base		21.5	Mohr-Coulomb	1	35	

Geoweb Covered Face - 2H:1V Slope

Property Line

1.616

Proposed Building Envelope

100.00 kN/m2

Veteran's Memorial HWY

Project

Proposed Commercial Development

Figure No.

Figure 3A - Section B - GeoWeb on Slope Face - Static Conditions

Drawn By — Faisal I. Abou-Seido, P.Eng.

Company — Paterson Group

Date — Thu, 2023-03-09, 12:34:08 PM
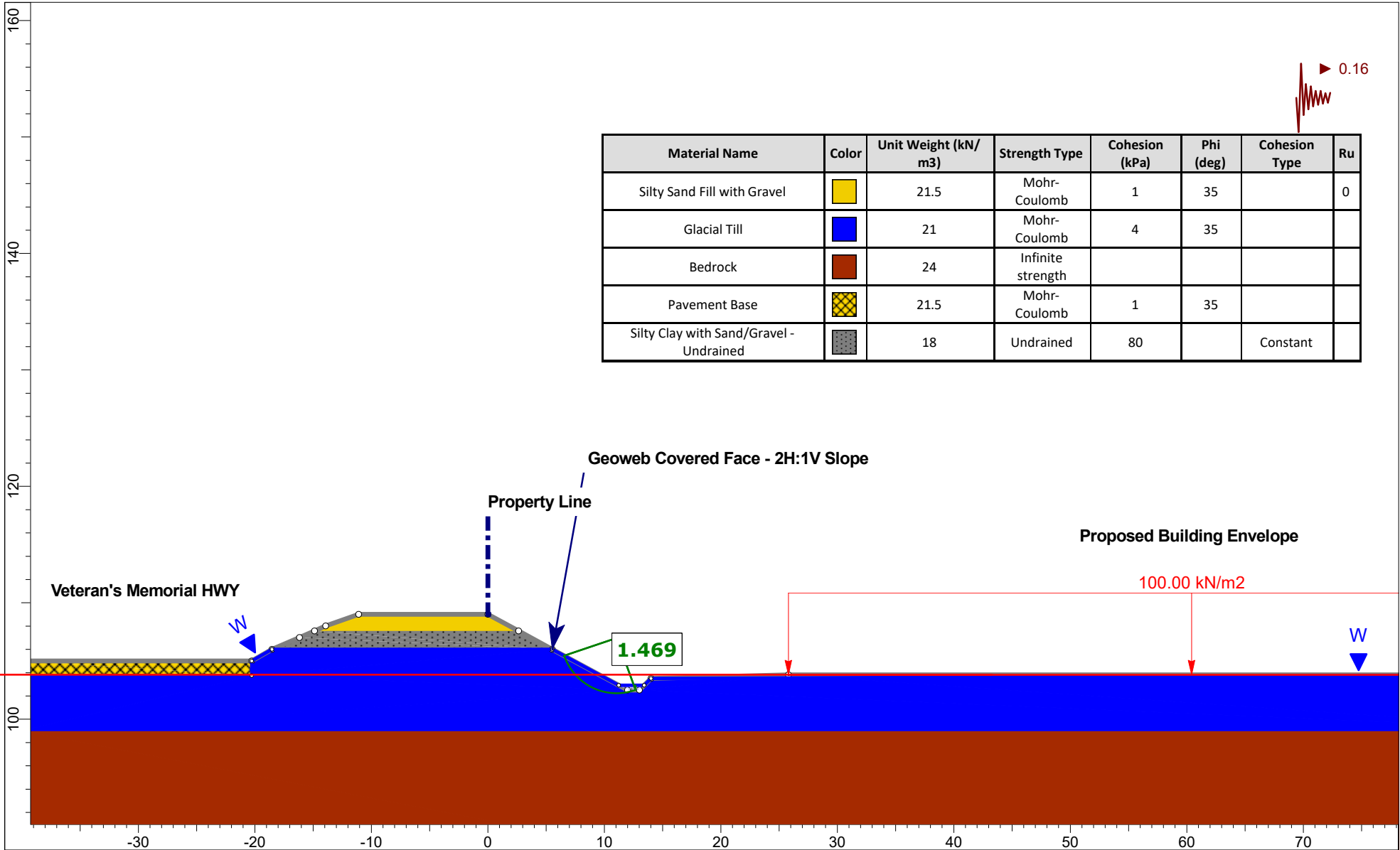
File Name — Section A - 1H to 1V Slopes.slmd

PATERSON GROUP

SLIDEINTERPRET 9.025

Figure 3B - Section B - GeoWeb on Slope Face - Seismic Loading

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Ru
Silty Sand Fill with Gravel		21.5	Mohr-Coulomb	1	35		0
Glacial Till		21	Mohr-Coulomb	4	35		
Bedrock		24	Infinite strength				
Pavement Base		21.5	Mohr-Coulomb	1	35		
Silty Clay with Sand/Gravel - Undrained		18	Undrained	80		Constant	

Geoweb Covered Face - 2H:1V Slope

Property Line

Proposed Building Envelope

Veteran's Memorial HWY

100.00 kN/m2

1.469

► 0.16

444 CITIGATE DRIVE

VETERAN'S MEMORIAL HWY

VETERAN'S MEMORIAL HWY

GRASSED

GRASSED

GRAVEL

BH 14-22
108.89
(103.23)

BH 14A-22
108.89
(103.66)

TP 3-21
108.49
(105.49)

BH 16-22
107.32

TP 4-21
106.08

BH 15-22
103.63

TP 9-21
101.93

TP 10-21
98.74

CB1
T/G=96.35

CB2
T/G=96.38

BH 8-22
102.11
{94.26}

TP 3
99.59

BH 6-22
108.02
{98.62}

TP 1
107.67
(105.02)

BH 5-22
105.58
{96.13}

TP 2
103.91
(101.11)

BH 12-22
98.85
{90.57}

BH 17-22
109.38

BUILDING 'B'
PROPOSED
INDUSTRIAL BUILDING

TP 8-21
100.60

BUILDING 'A'
PROPOSED
INDUSTRIAL BUILDING

FH2
T/S=97.68

555 DEALERSHIP DRIVE

TP 2-21
107.79
(104.54)

BH 4-22
106.66
{99.23}

TP 4
105.51
(102.71)

BH 7-22
104.82
{96.61}

BH 9-22
100.87
{91.52}

TP 5
99.65

BH 11-22
97.75
{90.69}

TP 11-21
97.07

BH 3A-22
106.26
{99.83}

TP 5-21
101.89

BH 3-22
106.08

TP 7-21
98.22

TP 12-21
96.91

BH 13A-22
108.66
(103.48)

BH 13B-22
108.66
(100.51)

TP 6
106.99
(104.79)

BH 2-22
103.68

BH 1-22
99.57
{92.58}

BH 10-22
97.12
{89.17}

BH 13-22
108.66
(107.04)

TP 1-21
108.34

TP 7
99.77

TP 6-21
102.49

TP 8
96.93
(93.63)

FH1
T/S=96.22 m

FH

MH-ST
T/G=96.26 m

MH-S
T/G=96.24 m

FH

DEALERSHIP DRIVE

560 DEALERSHIP DRIVE

LEGEND:

⊕   BOREHOLE LOCATION

⊞   TEST PIT LOCATION

↑   SLOPE STABILITY ANALYSIS LOCATION

110.47   GROUND SURFACE ELEVATION (m)

(104.54)   PRACTICAL REFUSAL TO EXCAVATION /
           AUGERING ELEVATION (m)

{99.83}   PRACTICAL REFUSAL TO DCPT ELEVATION (m)

GROUND SURFACE ELEVATIONS AT 2022 BOREHOLE LOCATIONS AND
PATERSON 2021 TEST PITS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:1500

0   25   50   75   100m

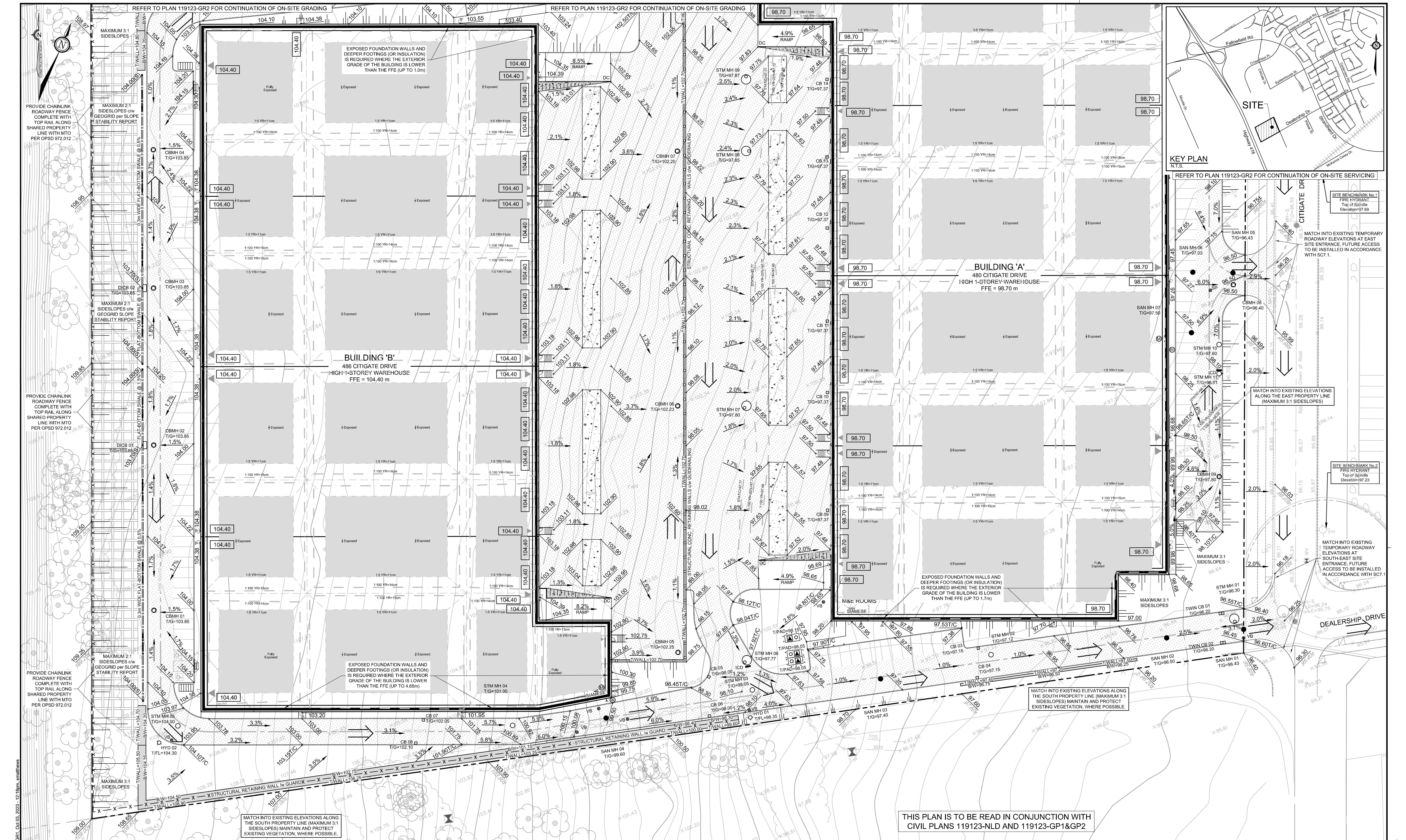| NO.	REVISIONS	DATE	INITIAL
2	UPDATED BUILDING FOOTPRINT	10/10/2023	YZ
1	BH 13-22 - BH 17-22 ADDED TO PLAN	05/01/2023	MS

RF OTTAWA LIMITED PARTNERSHIP C/O ROSEFELLOW DEVELOPMENTS

GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
480 AND 486 CITIGATE DRIVE

OTTAWA,   ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale:	1:1500	Date:	12/2022
Drawn by:	YA	Report No.:	PG6514-1
Checked by:	MS	Dwg. No.:	PG6514-1
Approved by:	DJG	Revision No.:	2

11x17

p:\autocad drawings\geotechnical\pg65xx\pg6514-1 test hole location plan rev 2.dwg

REFER TO PLAN 119123-GR2 FOR CONTINUATION OF ON-SITE GRADING

REFER TO PLAN 119123-GR2 FOR CONTINUATION OF ON-SITE GRADING

REFER TO PLAN 119123-GR2 FOR CONTINUATION OF ON-SITE SERVICING

BUILDING 'A'
480 CITIGATE DRIVE
HIGH 1-STOREY WAREHOUSE
FFE = 98.70 m

BUILDING 'B'
486 CITIGATE DRIVE
HIGH 1-STOREY WAREHOUSE
FFE = 104.40 m

EXPOSED FOUNDATION WALLS AND DEEPER FOOTINGS (OR INSULATION) IS REQUIRED WHERE THE EXTERIOR GRADE OF THE BUILDING IS LOWER THAN THE FFE (UP TO 1.0m)

EXPOSED FOUNDATION WALLS AND DEEPER FOOTINGS (OR INSULATION) IS REQUIRED WHERE THE EXTERIOR GRADE OF THE BUILDING IS LOWER THAN THE FFE (UP TO 1.7m)

EXPOSED FOUNDATION WALLS AND DEEPER FOOTINGS (OR INSULATION) IS REQUIRED WHERE THE EXTERIOR GRADE OF THE BUILDING IS LOWER THAN THE FFE (UP TO 4.65m)

PROVIDE CHAINLINK ROADWAY FENCE COMPLETE WITH TOP RAIL ALONG SHARED PROPERTY LINE WITH MTO PER OPSD 972.012

MAXIMUM 2:1 SIDESLOPES

MAXIMUM 2:1 SIDESLOPES c/w GEOGRID per SLOPE STABILITY REPORT

MAXIMUM 3:1 SIDESLOPES

MATCH INTO EXISTING TEMPORARY ROADWAY ELEVATIONS AT EAST SITE ENTRANCE. FUTURE ACCESS TO BE INSTALLED IN ACCORDANCE WITH SC7.1.

MATCH INTO EXISTING ELEVATIONS ALONG THE EAST PROPERTY LINE (MAXIMUM 3:1 SIDESLOPES)

MATCH INTO EXISTING TEMPORARY ROADWAY ELEVATIONS AT SOUTH-EAST SITE ENTRANCE. FUTURE ACCESS TO BE INSTALLED IN ACCORDANCE WITH SC7.1

MATCH INTO EXISTING ELEVATIONS ALONG THE SOUTH PROPERTY LINE (MAXIMUM 3:1 SIDESLOPES) MAINTAIN AND PROTECT EXISTING VEGETATION, WHERE POSSIBLE.

THIS PLAN IS TO BE READ IN CONJUNCTION WITH CIVIL PLANS 119123-NLD AND 119123-GP1&GP2

CITIGATE DR

DEALERSHIP DRIVE

SITE BENCHMARK No.1
FIRE HYDRANT
Top of Spindle
Elevation 97.69

SITE BENCHMARK No.2
FIRE HYDRANT
Top of Spindle
Elevation 97.23

FOR REVIEW ONLY

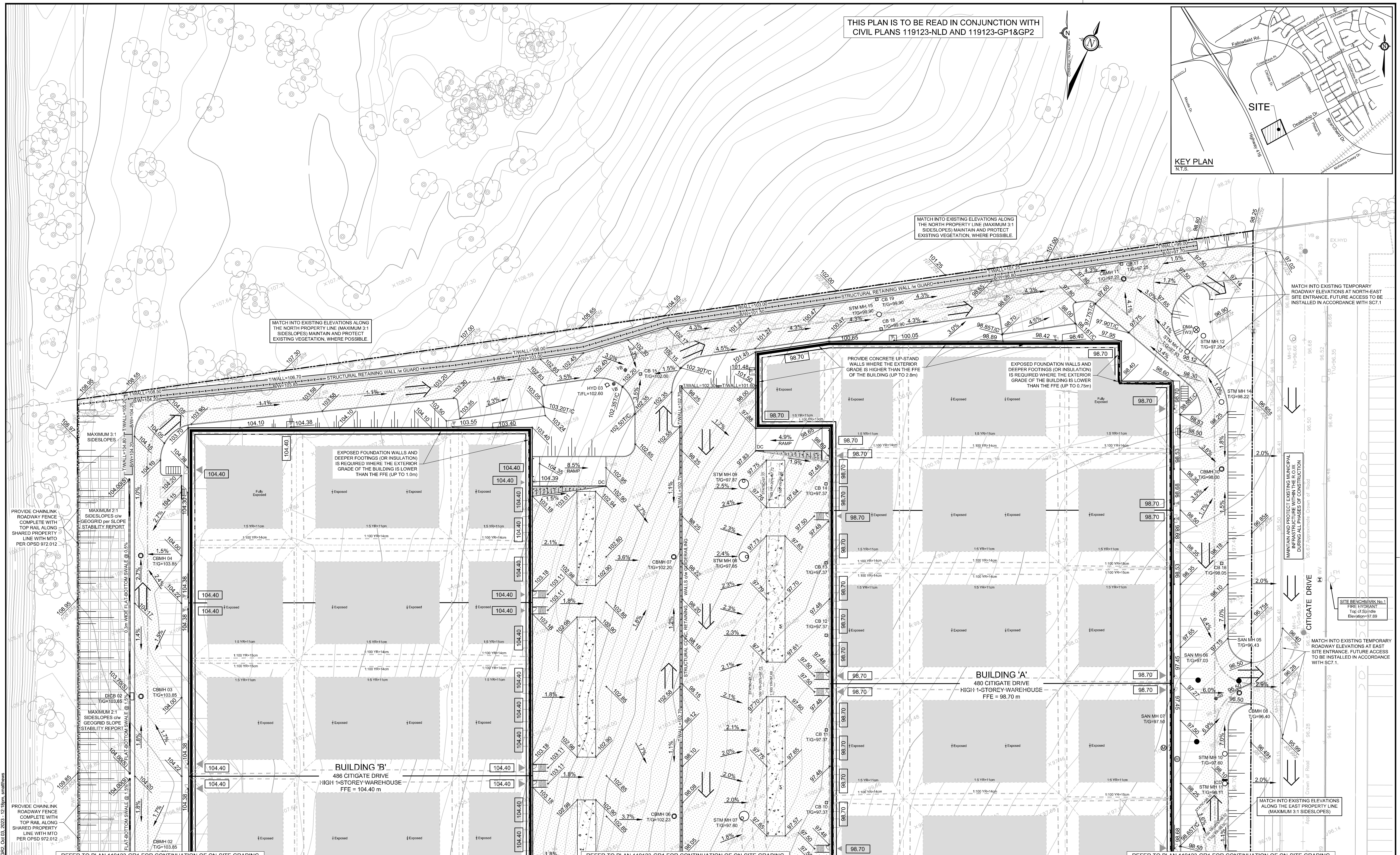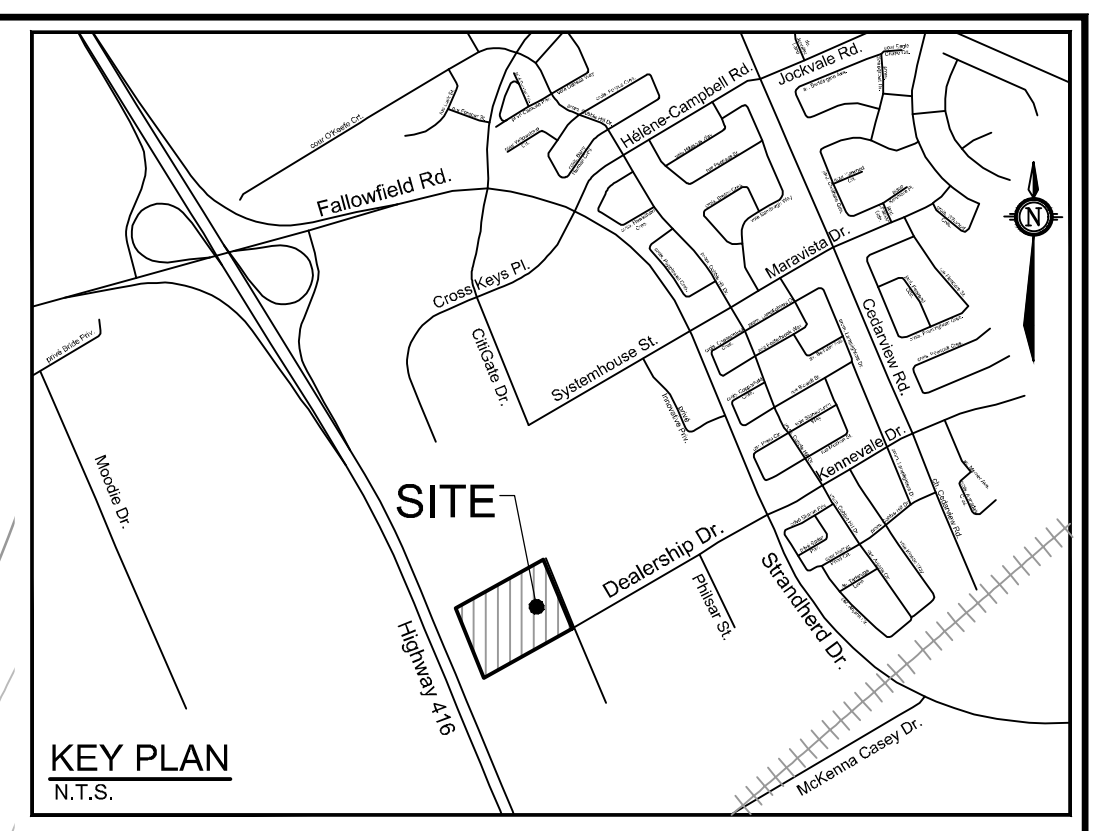|	SCALE	DESIGN	
		SM / BM / DDB	
	1:400	CHECKED DDB	
		DRAWN SM	
2	REVISED PER CITY COMMENTS	OCT 6/23	DDB
1	ISSUED FOR CITY OF OTTAWA REVIEW	MAY 3/23	DDB
No.	REVISION	DATE	BY

1:400
0 4 8 12 16

LOCATION
CITY of OTTAWA
480 & 486 CITIGATE DRIVE - PROPOSED WAREHOUSES

DRAWING NAME
GRADING PLAN

PROJECT No. 119123
REV. REV # 2
DRAWING No. 119123-GR1

D07-12-23-0064

plan # __

THIS PLAN IS TO BE READ IN CONJUNCTION WITH
CIVIL PLANS 119123-NLD AND 119123-GP1&GP2

MATCH INTO EXISTING ELEVATIONS ALONG
THE NORTH PROPERTY LINE (MAXIMUM 3:1
SIDESLOPES) MAINTAIN AND PROTECT
EXISTING VEGETATION, WHERE POSSIBLE.

MATCH INTO EXISTING TEMPORARY
ROADWAY ELEVATIONS AT NORTH-EAST
SITE ENTRANCE, FUTURE ACCESS TO BE
INSTALLED IN ACCORDANCE WITH SC7.1

MATCH INTO EXISTING ELEVATIONS ALONG
THE NORTH PROPERTY LINE (MAXIMUM 3:1
SIDESLOPES) MAINTAIN AND PROTECT
EXISTING VEGETATION, WHERE POSSIBLE.

STRUCTURAL RETAINING WALL lw GUARD

PROVIDE CONCRETE UP-STAND
WALLS WHERE THE EXTERIOR
GRADE IS HIGHER THAN THE FFE
OF THE BUILDING (UP TO 2.8m)

EXPOSED FOUNDATION WALLS AND
DEEPER FOOTINGS (OR INSULATION)
IS REQUIRED WHERE THE EXTERIOR
GRADE OF THE BUILDING IS LOWER
THAN THE FFE (UP TO 0.75m)

EXPOSED FOUNDATION WALLS AND
DEEPER FOOTINGS (OR INSULATION)
IS REQUIRED WHERE THE EXTERIOR
GRADE OF THE BUILDING IS LOWER
THAN THE FFE (UP TO 1.0m)

MAXIMUM 3:1
SIDESLOPES

PROVIDE CHAINLINK
ROADWAY FENCE
COMPLETE WITH
TOP RAIL ALONG
SHARED PROPERTY
LINE WITH MTO
PER OPSD 972.012

MAXIMUM 2:1
SIDESLOPES c/w
GEOGRID per SLOPE
STABILITY REPORT

MAXIMUM 2:1
SIDESLOPES c/w
GEOGRID SLOPE
STABILITY REPORT

BUILDING 'B'
486 CITIGATE DRIVE
HIGH 1-STOREY WAREHOUSE
FFE = 104.40 m

BUILDING 'A'
480 CITIGATE DRIVE
HIGH 1-STOREY WAREHOUSE
FFE = 98.70 m

CITIGATE DRIVE

SITE BENCHMARK No.1
FIRE HYDRANT
Top of Spindle
Elevation=97.89

MATCH INTO EXISTING TEMPORARY
ROADWAY ELEVATIONS AT EAST
SITE ENTRANCE, FUTURE ACCESS TO
BE INSTALLED IN ACCORDANCE
WITH SC7.1.

MATCH INTO EXISTING ELEVATIONS
ALONG THE EAST PROPERTY LINE
(MAXIMUM 3:1 SIDESLOPES)

REFER TO PLAN 119123-GR1 FOR CONTINUATION OF ON-SITE GRADING

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS,
WATERMAINS, SEWERS AND OTHER
UNDERGROUND AND OVERGROUND UTILITIES AND
STRUCTURES IS NOT NECESSARILY SHOWN ON
THE CONTRACT DRAWINGS, AND WHERE SHOWN,
THE ACCURACY OF THE POSITION OF SUCH
UTILITIES AND STRUCTURES IS NOT GUARANTEED.
BEFORE STARTING WORK, DETERMINE THE EXACT
LOCATION OF ALL SUCH UTILITIES AND
STRUCTURES AND ASSUME ALL LIABILITY FOR
DAMAGE TO THEM.

No.	REVISION	DATE	BY
2	REVISED PER CITY COMMENTS	OCT 6/23	DDB
1	ISSUED FOR CITY OF OTTAWA REVIEW	MAY 3/23	DDB

SCALE
1:400

0 4 8 12 16
1:400
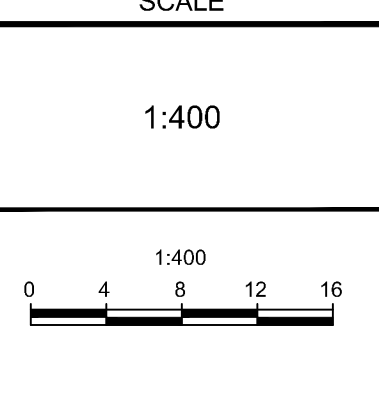
FOR REVIEW ONLY

DESIGN	SM / BM / DDB
CHECKED	DDB
DRAWN	SM
CHECKED	BM / DDB
APPROVED	DDB

LOCATION
CITY of OTTAWA
480 & 486 CITIGATE DRIVE - PROPOSED WAREHOUSES

DRAWING NAME
GRADING PLAN

PROJECT No. 119123
REV REV # 2
DRAWING No. 119123-GR2

D07-12-23-0064

plan # __