PROJECT NO.: NT22012 February 24, 2022

Ambria (First-Welland) Limited
c/o
Ambria Communities Limited
400 Creditstone Road, Suite 9
Vaughan, Ontario
L4K 3Z3

Attention: Mr. Vince Baffa

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL TOWNHOUSE DEVELOPMENT
744 FIRST AVENUE, WELLAND, ONTARIO

Dear Mr. Baffa,

We have completed the fieldwork, laboratory testing and the report preparation in connection with the above noted project. Our comments and recommendations, based on the findings at the eight borehole locations are presented in the following paragraphs.

1. INTRODUCTION

We understand that the project will consist of the construction of a twenty-block residential townhouse development with four asphaltic concrete paved roadways. Construction will include the installation of the associated underground services, concrete curbs, and landscaped areas. The purpose of this geotechnical investigation was to determine the subsurface conditions at the eight borehole locations and to interpret these findings with respect to the design and construction of the underground services, foundations, roadways, and related earthworks for this project from a geotechnical point-of-view.

This report is based on the above summarised project description, and on the assumption that the design and construction will be performed in accordance with applicable codes and standards. Any significant deviations from the proposed project design may void the recommendations given in this report. If significant changes are made to the proposed design, then this office must be consulted to review the new design with respect to the results of this investigation. The information contained in this report does not reflect upon the environmental aspects of the site and therefore have not been addressed in this document.

2. PROCEDURE

A total of eight [8] sampled boreholes were advanced at the locations illustrated in the attached Drawing No. 1, Borehole Location Plan. The borings were put down uncased using solid stem continuous flight auger equipment on February 18, 2022, under the direction and supervision of a staff member of Niagara Testing & Inspection Ltd. The boreholes were advanced to depths of between about 5.2 and 6.7 metres below the existing grade. On completion of drilling the boreholes were backfilled in general accordance with Ontario Regulation 903.

Representative samples of the subsoils were recovered from the borings at selected depth intervals using split barrel sampling equipment driven in accordance with the requirements of Standard Penetration Resistance Testing. After undergoing a general field examination, the soil samples were preserved and transported to the soil laboratory for visual, tactile, and olfactory classifications. Routine moisture content tests were performed on the soil samples recovered from the borings, with hand penetrometer testing and unit weight determinations on select cohesive samples.

The boreholes were located in the field by a representative of Niagara Testing & Inspection Ltd. The ground surface elevations at the borehole locations were referenced to a temporary benchmark by representatives of Niagara Testing & Inspection Ltd. The temporary benchmark is described as the top of the concrete door sill of the existing single-family dwelling. The temporary benchmark was assigned Elevation 100.00 metres.

Details of the conditions encountered in the boreholes, together with the results of the field and laboratory tests, are presented in Borehole Log Nos. 1 to 8, inclusive following the text of this report. It is noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design and therefore should not be construed as the exact plans of geological change.

3. SITE DESCRIPTION AND SUBSURFACE CONDITIONS

The subject site is located at 744 First Avenue in Welland, Ontario. The southern portion of the subject site is presently occupied with a single-family dwelling, with an unilock type block driveway and small barn to the southeast of the main structure. There is a pond located east of the single-family dwelling, which appears to be in process of being removed. The remainder of the property surrounding the existing structure is covered with grass landscaping, mature trees, and a small vegetable garden east of the barn building. Rows of trees on the north and south sides of the main building have recently been

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removed along with some site grading/topsoil removal in the open area south of the main building. The northern portion of the site is currently a vacant parcel of land, formerly this area was used as a golf driving range, with a gravel parking area located adjacent to First Avenue. A chain-linked fenced area remains on the property to the northwest of the single-family dwelling, this area used to be used as a miniature-golf putting course attached to the driving range. The property is bordered to the west by First Avenue and to the north, east and south by vacant lands. At the time of the field investigation, the site was snow covered and any other site features if present were covered by snow.

The subsurface conditions encountered at the borehole locations are summarised as follows:

Topsoil

A surficial veneer of topsoil, approximately 100 to 150 millimetres, in thickness was encountered at the borehole locations, except for Borehole Nos. 5, 7 and 8. It should be noted that the depth of topsoil must be expected to vary across this area and from the depths encountered at the borehole locations. It should also be noted that the term 'topsoil' has been used from a geotechnical point of view and does not necessary reflect its nutrient content or ability to support plant growth.

Silty Clay/Clayey Silt

A brown silty clay/clayey silt was found to underlie the topsoil in Borehole Nos. 1, 2, 3, 4 and 6 and at grade in Borehole Nos. 5, 7 and 8. The upper level of the brown silty clay/clayey silt have been described as having a 'reworked' appearance and trace of rootlets. This is expected to be from past agricultural ploughing and yearly freeze/thaw cycles. The 'reworked' silty clay/clayey silt was found to be soft to firm in consistency. The silty clay/clayey silt, below this upper level, was found to contain occasional thin silt seams and to be very stiff to stiff in consistency. Unit weight determination yielded a value of 19.8 kN/m^3 for the silty clay/clayey silt deposit from a depth of 1.5 – 2.1 mbgs in BH-2. It should be noted that unit weights for various soil deposits may vary between borehole locations and beyond.

Silty Clay

A grey silty clay was encountered beneath the brown silty clay/clayey silt in the boreholes at a depth of about 4.1 metres. The grey silty clay was found to be soft to stiff in consistency. Shear vane strength tests undertaken in Borehole No. 6 in the silty clay found intact strengths of 100 and 140 kPa, with remoulded test results of 60 and 80 kPa, resulting in a sensitivity of 1.7 and 1.8, respectively. The grey silty clay was proven to the

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termination at the borehole locations. Unit weight determination yielded a value of 20.2 kN/m^3 for the silty clay deposit from a depth of 4.6 – 5.2 mbgs in BH-7. It should be noted that unit weights for various soil deposits may vary between borehole locations and beyond.

Groundwater Observations

All the boreholes were recorded to be 'dry' and 'open' on completion of drilling, with the exception of Borehole No. 6 which recorded groundwater at a depth of about 5.9 metres on completion. Given the low permeability of the brown silty clay/clayey silt and grey silty clay soils, insufficient time would have passed for water to infiltrate into the open boreholes during drilling. Based on the observed soil conditions, natural moisture contents, etc., the static water level is estimated to be below the maximum depth of excavation. Nevertheless, some minor infiltration of groundwater through the fill materials and more permeable seams and from surface runoff should be anticipated.

4. FOUNDATION CONSIDERATIONS

The native silty clay/clayey silt soils are capable of supporting the loads typically associated with residential townhouse construction. All aspects of construction must comply with the current Ontario Building Code. Should the site grading works require engineered fill below founding elevations, the general recommendations presented in the Backfill Considerations below should be strictly adhered to, with compaction to 100 percent standard Proctor maximum dry density, verified by monitoring and testing by a representative of Niagara Testing & Inspection Ltd. present of a full-time basis.

All basement foundation walls should be suitable damp proofed [with a 'dimple' drainage blanket] and provided with a perimeter drainage tile system. The perimeter weeping tile should consist of a 100-millimetre diameter perforated plastic pipe, encased in a geofabric sock, covered with a minimum of 200 millimetres of 20-millimetre clear crushed stone, in turn encased in a heavy geofabric. The weeping tile system would ideally outlet to a gravity sewer connection. This would eliminate the potential for frequently operating sump pumps for lots at lower founding elevations relative to the static groundwater level. Where a sump pit system is required, it is recommended that an 'over-sized' sump pit be provided to reduce the frequency of pump operation. The outlet should be fitted with suitable back-flow prevention valves.

It is noted that the support conditions afforded by the founding soils are not typically uniform across the site, nor are the loads on the various foundation elements. In this regard it is recommended that all footings and foundation walls be provided with nominal

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steel reinforcement. Such nominal reinforcement would typically consist of two continuous 15M bars in the footings and a similar two 15M bars approximately 300 millimetres from the top of the foundation walls. The reinforcing bars should be bent to reinforce around corners and window openings, provided with sufficient overlap and tied at splice locations. The provision of such nominal reinforcing steel is considered good practice as it will work to limit any cracking of foundation walls, reducing the potential need for costly post construction repairs. The reinforcement will also aid the foundation walls in resisting the lateral forces associated with the often early backfill typical in residential construction.

The founding soils should be in an undisturbed state, and the footing bases should be hand cleaned of any loose or disturbed material immediately before the placement of concrete. All footings exposed to the environment must be provided with a minimum of 1.2 metres of earth cover or equivalent insulation to protect against frost penetration. This frost protection would also be required if construction were undertaken during the winter months.

It is imperative that a soils engineer be retained from this office to provide geotechnical engineering services during the excavation and foundation construction phases of the project. This is to observe compliance with the design concepts and recommendations of this geotechnical investigation report, and to allow changes to be made if subsurface conditions differ from the conditions identified at the borehole locations.

5. EXCAVATIONS

It is anticipated that the excavations for the proposed foundations, sewers and other underground services will extend to depths of up to 4.0 metres below the present grade into the native silty clay/clayey silt. The side slope in the upper 'reworked' native soils should remain stable at slopes of 45 degrees. The side slopes of excavations into the native cohesive soils should remain stable for the short period of construction at slopes of up to 60 degrees to the horizontal, or steeper. Nevertheless, all excavations must comply with the current Occupations Health and Safety Act and Regulations for Construction Projects. Excavations slopes steeper than those required in the Safety Act must be supported or a trench box must be provided, and a senior Geotechnical Engineer from this office should supervise the work. Any excess soil will need to be managed in accordance with Ontario Regulation 406/19.

Some infiltration of groundwater from more permeable seams in the native soils and surface runoff should be anticipated. Any water that may seep into the excavations could be removed using conventional construction 'dewatering' techniques, such as pumping

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from sumps and ditches. More water should be expected when connections are made with existing services. Surface water should be directed away from the excavations.

The base of the excavations in the native silty clay/clayey silt soils encountered in the boreholes should remain firm and stable. Therefore, standard pipe bedding, as typically specified by the City of Welland, should suffice. The bedding material should be uniformly compact to at least 95 percent standard Proctor density, with special attention paid to compaction under the pipe haunches.

6. BACKFILL CONSIDERATIONS

The majority of the excavated material will consist of the native silty clay/clayey silt, which is considered to be suitable for use as service trench backfill and as engineered fill provided that the moisture content can be controlled to within 3 percent of the standard Proctor optimum value. Some moisture content conditioning of the excavated material may be required, depending upon the weather conditions experienced at the time of construction to achieve acceptable compaction densities and minimise long-term settlements. Dusting could be a problem in the 'dry' summer months.

We note that where backfill material is placed near or slightly above its optimum content, the potential for long-term settlements due to the ingress of groundwater and collapse of the fill structure is reduced. Correspondingly, the shear strength of 'wet' backfill material is also lowered, thereby reducing its ability to support construction traffic, and therefore impacting roadway construction. If the soil is well 'dry' of its optimum value, it will appear to be very strong when compacted, but will tend to settle with time as the moisture content in the fill increases to equilibrium condition. The silty clay/clayey silt soils may require high compaction energy to achieve acceptable densities if the moisture content is not close to their standard Proctor optimum value. It is therefore very important that the placement moisture content of the backfill soils be within 3 percent of its standard Proctor optimum moisture content during placement and compaction.

The native silty clay/clayey silt encountered in the borings is sensitive to moisture absorption and will become practically impossible to compact using conventional compaction equipment if it becomes 'wet' during extended periods of precipitation. After a period of heavy precipitation, any near-surface softened material should be allowed to dry or be removed from the fill surface and discarded.

Any imported fill required in service trenches or to raise the subgrade elevation should have its moisture content within 3 percent of its optimum moisture content and meet the necessary environmental guidelines.

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The backfilling and compaction operations should be monitored by a representative of Niagara Testing & Inspection Ltd. to monitor uniform compaction of the backfill material to project specification requirements. Close supervision is prudent in areas that are not readily accessible to compaction equipment, for instance near the end of compaction 'runs', service trenches crossing the roadways and around the foundation walls. Any engineered fill should be compacted to 100 percent standard Proctor maximum dry density. A method should be developed to assess compaction efficiency employing the on-site compaction equipment and backfill materials during construction.

7. MANHOLES, CATCH BASINS AND THRUST BLOCKS

With the manholes, catch basins, valve chambers, etc. founded on the native silty clay/clayey silt, assuming all founding surfaces are carefully prepared to remove all loose and disturbed material, the bearing surfaces will be practically non-yielding under the anticipated loads. Proper preparation of the founding soils will therefore accentuate the protrusion of these structures above the pavement surface if compaction of the fill around these structures is not adequate, causing settlement of the surrounding paved surfaces. Conversely, the pavement surfaces may rise above the valve chambers under frost action. To alleviate the potential for these types of differential movements, free-draining, non-frost susceptible material should be provided as backfill around the structures located within any paved roadway limits and compacted to 100 percent of its standard Proctor maximum dry density. A geofabric separator should be provided between the free draining material and the on-site fine-grained soils to prevent to intrusion of fines.

The thrust blocks in the native silty clay/clayey silt may be sized as recommended by the applicable Ontario Provincial Standard Specification [OPSS]. A design allowable bearing pressure of 150 kPa [~3000 psf] may conservatively be used in the design of thrust blocks. Any backfill required behind the blocks should be granular and should be compacted to 100 percent of their standard Proctor density.

8. PAVEMENT CONSIDERATIONS

ROADWAYS

The roadway areas should be stripped of all unsuitable materials. The exposed subgrade should be proofrolled with 3 to 4 passes of a loaded tandem truck in the presence of a representative of Niagara Testing & Inspection Ltd., immediately prior to the placement of the sub-base material. Any areas of distress revealed by this, or any other means must be subexcavated and replaced with suitable backfill material. Alternatively, the soft areas

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may be repaired by the placement of coarse aggregate, such as 50-millimetre clear crushed stone. The need for sub-excavations of a softened subgrade will be reduced if construction is undertaken during periods of dry weather and careful attention is paid to the compaction operations. The fill placed over shallow utilities cuts into or across the street must also be compacted to 100 percent of its standard Proctor maximum dry density.

Good draining provisions will optimise the long-term performance of the pavement structure. The subgrade must be properly crowned and shaped to promote drainage to the subdrain system. Subdrains should be installed to intercept excess subsurface water and to prevent softening of the subgrade material. Surface water should not be allowed to pond adjacent to the outer limits of the paved area.

The most severe loading conditions on the subgrade typically occur during construction, therefore precautionary measures may have to be taken to ensure that the subgrade is not unduly disturbed by construction traffic. These measures would include minimising the amount of heavy traffic travelling over the subgrade, such as during the placement of granular base layers.

If construction is conducted under adverse weather conditions, additional subgrade preparation may be required. During wet weather conditions, such as typically experienced during the Fall and Spring months, it should be anticipated that the additional subgrade preparation would be required, such as the provision of an additional depth of Granular B sub-base coarse material. It is also important that the sub-base and base coarse granular layers of the pavement structure be placed as soon after exposure and preparation of the subgrade level as practical.

The proposed pavement structure would be required to adequately support light-duty cars and trucks and intermittent delivery and garbage trucks. For this project, we would recommend a minimum pavement structure of 450 millimetres of OPSS Granular A base course, 75 millimetres of HL8 binder coarse and 40 millimetres of HL3 surface course asphaltic concrete. This design is considered adequate, provided that the subgrade has been prepared as specified and is good and firm before the sub-base course material is placed. If the subgrade is soft, remedial measures as discussed above may have to be implemented and/or the sub-base thickness may have to be increased. The granular sub-base and base courses and asphaltic concrete layers should be compacted to OPSS or the City of Welland's requirements. A programme of in-place density testing must be carried out to monitor that compaction requirements are being met. If construction is conducted under adverse weather conditions, additional subgrade preparation may be

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required. We note that this pavement structure is not to be considered as a construction roadway design.

DRIVEWAYS

Asphaltic concrete paving of driveways should be consistent with the general recommendations provided above. Proper preparation of the subgrade soils is essential to good long-term performance of the pavement. Likewise, sufficient depth and performance, i.e., limit premature cracking, subgrade failure, rutting, etc. A recommended light duty pavement structure for residential driveways would consist of a minimum of 225 millimetres of OPSS Granular A base course, followed by 50 millimetres of HL8 binder course and 25 millimetres of HL3A surface course asphaltic concrete.

9. GENERAL COMMENTS

The comments provided in this document are intended only for the guidance of the design team. The subsoil descriptions and borehole information are only intended to describe conditions at the eight borehole locations. Contractors placing bids of undertaking this project should carry out due diligence to verify the results of this investigation and to determine how the subsurface conditions will affect their operations.

We trust that this geotechnical report is sufficient for your present requirements. Should you require any additional information or clarifications as to the contents of this document, then please do not hesitate to contact the undersigned.

Yours very truly,
Niagara Testing & Inspection Ltd.

Feb 24, 2022

John Monkman, P. Eng.
Project Engineer

Dwayne Neill, B. Eng.
Reviewer

Enclosures: Drawing No. 1, Borehole Location Plan
Borehole Log Nos. 1 to 8, inclusive

Distribution: Ambria (First-Welland) Limited
c/o Ambria Communities Limited [1 plus pdf copy]

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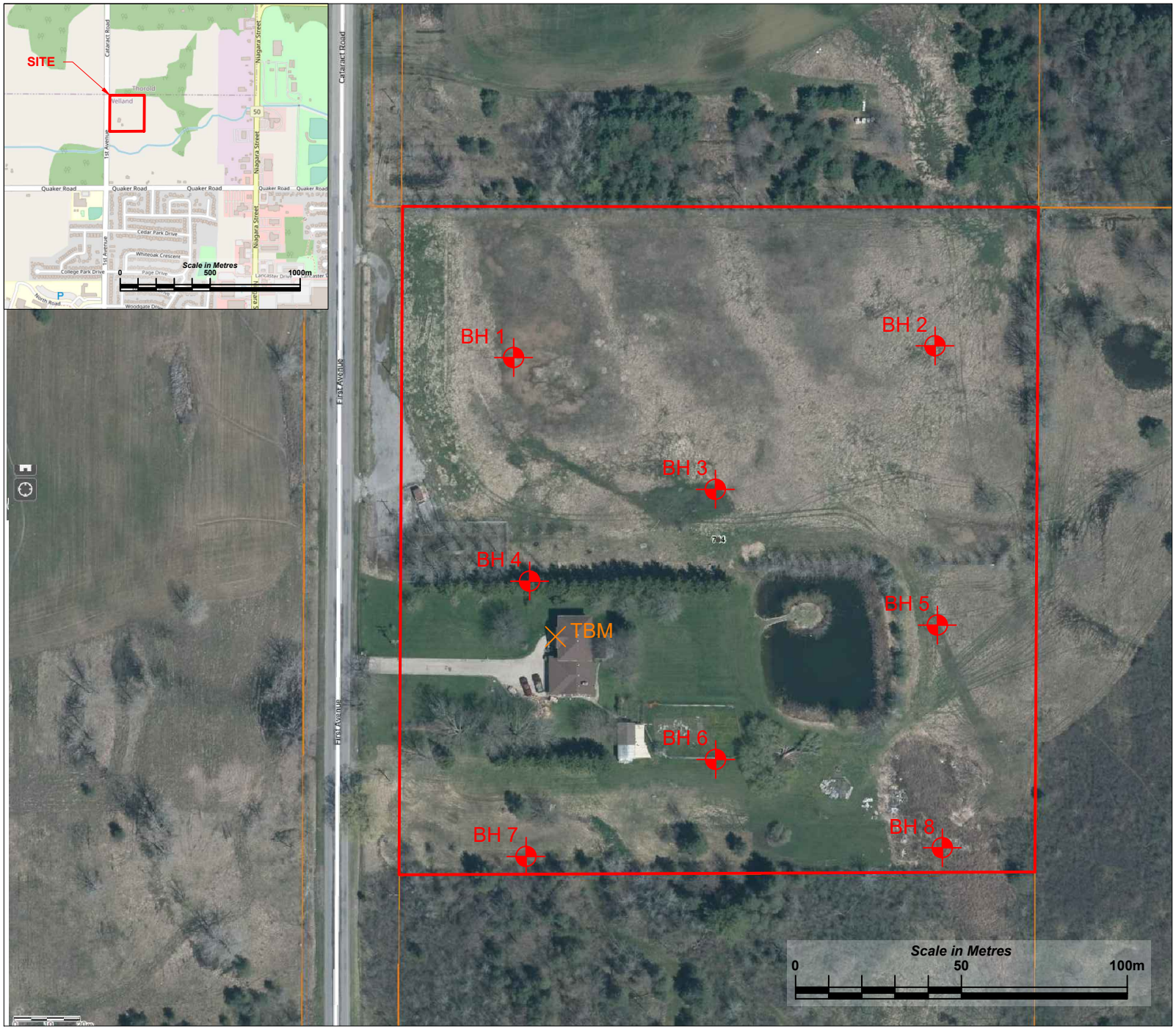

LEGEND

BH 1 — Borehole Location

TBM — Temporary Benchmark
Front Door Sill of #744

Site Boundary

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CLIENT:
AMBRIA COMMUNITIES LIMITED

PROJECT:
**GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
744 FIRST AVENUE
WELLAND, ONTARIO**

TITLE:
BOREHOLE LOCATION PLAN

DRAWN BY: DN

CHECKED BY: JM

DATE: FEBRUARY 2022

PROJECT NO: NT22012

SCALE: AS SHOWN

NO:

DRAWING 1

REFERENCE: BASE MAP PROVIDED BY NIAGARA NAVIGATOR, https://maps-beta.niagararegion.ca/Navigator/
NOTE: FOR ILLUSTRATION PURPOSES ONLY, ALL LOCATIONS APPROXIMATE.

RECORD OF BOREHOLE: BH-1

PROJECT NO.: NT22012
PROJECT: Proposed Residential Development
LOCATION: 744 First Avenue, Welland, Ontario
CLIENT: Ambria Communities Limited

DRILLING COMPANY: Elements GEO
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted Dietrich D-50
BOREHOLE COORDINATE (UTM): 641829 E, 4765214 N

SHEET 1 of 1
DATE STARTED: February 18, 2022
DATE COMPLETED: February 18, 2022
DATUM: TBM

SOIL PROFILE		SAMPLES						FIELD TESTING		LAB TESTING			
LITHOLOGY PLOT	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	ELEVATION (m)	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40		WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	Ground Surface					ft m	99.01						
	100 mm Topsoil					0.0 0.0							
	Brown **Silty Clay / Clayey Silt Reworked Native** trace rootlets soft	SS	1	3		1.0		3		29.1			
	Brown **Silty Clay / Clayey Silt** trace silt seams very stiff	SS	2	16		2.0 3.0 1.0	98.00	16 / 450		23.6			
		SS	3	25		4.0 5.0 6.0 2.0		25 / 450		22.9			
		SS	4	20		7.0 8.0 9.0	97.00	20 / 450		23.9			
		SS	5	17		10.0 3.0 11.0	96.00	17 / 300		26.8			
	Grey **Silty Clay** stiff	SS	6	11		12.0 13.0 4.0 14.0 15.0	95.00	11 / 200		24.2			
	End of Borehole					16.0 5.0 17.0	94.00						
						18.0 19.0 6.0 20.0	93.00						
						21.0 22.0 23.0 7.0 24.0	92.00						
						25.0							

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: N/A
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: February 18, 2022
SECONDARY WATER LEVEL DATE: N/A

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LOGGED: DN
COMPILED: DN
CHECKED: JM

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Note: This borehole log has been prepared for geotechnical purposes and does not necessarily contain information suitable for an environmental assessment of the subsurface conditions. Borehole details as presented, do not constitute a through understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer.

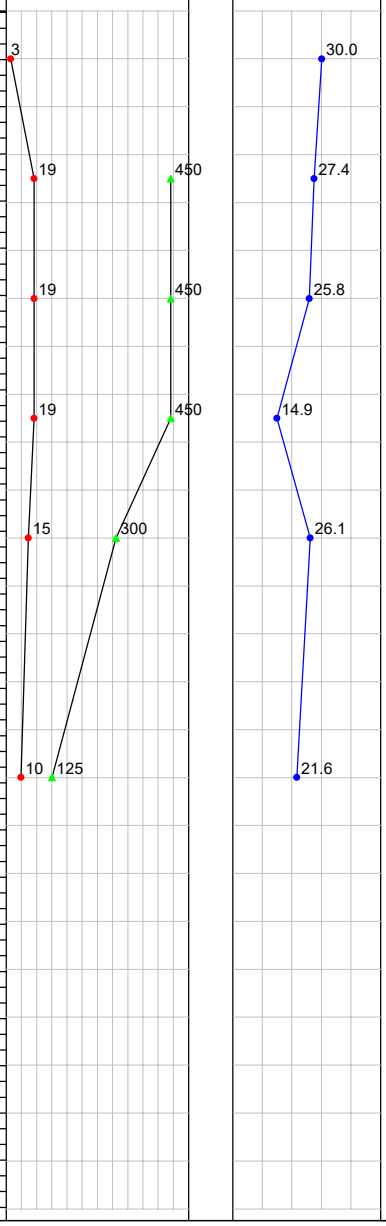
RECORD OF BOREHOLE: BH-2

PROJECT NO.: NT22012
PROJECT: Proposed Residential Development
LOCATION: 744 First Avenue, Welland, Ontario
CLIENT: Ambria Communities Limited

DRILLING COMPANY: Elements GEO
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted Dietrich D-50
BOREHOLE COORDINATE (UTM): 641959 E, 4765067 N

SHEET 1 of 1
DATE STARTED: February 18, 2022
DATE COMPLETED: February 18, 2022
DATUM: TBM

SOIL PROFILE		SAMPLES						FIELD TESTING		LAB TESTING			
LITHOLOGY PLOT	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	ELEVATION (m)	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40		WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	Ground Surface					ft m	99.31						
	150 mm Topsoil					0.0 0.0							
	Brown **Silty Clay / Clayey Silt Reworked Native** trace rootlets soft	SS	1	3		1.0							
	Brown **Silty Clay / Clayey Silt** trace silt seams very stiff	SS	2	19		3.0 1.0							
		SS	3	19		5.0 6.0 2.0							**Unit Weight Determination** BH-2 SS-3 19.8 kN/m³
		SS	4	19		8.0 9.0							
		SS	5	15		10.0 3.0 11.0							
	Grey **Silty Clay** stiff					12.0 13.0 4.0							
		SS	6	10		14.0 15.0 16.0 5.0							
	End of Borehole					17.0							



Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: N/A
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: February 18, 2022
SECONDARY WATER LEVEL DATE: N/A

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LOGGED: DN
COMPILED: DN
CHECKED: JM

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Thorold, Ontario, L2V 4Y6

Note: This borehole log has been prepared for geotechnical purposes and does not necessarily contain information suitable for an environmental assessment of the subsurface conditions. Borehole details as presented, do not constitute a through understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer.

RECORD OF BOREHOLE: BH-3

PROJECT NO.: NT22012
PROJECT: Proposed Residential Development
LOCATION: 744 First Avenue, Welland, Ontario
CLIENT: Ambria Communities Limited

DRILLING COMPANY: Elements GEO
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted Dietrich D-50
BOREHOLE COORDINATE (UTM): 641895 E, 4765195 N

SHEET 1 of 1
DATE STARTED: February 18, 2022
DATE COMPLETED: February 18, 2022
DATUM: TBM

SOIL PROFILE		SAMPLES				DEPTH SCALE ft / m	ELEVATION (m)	FIELD TESTING		LAB TESTING	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
LITHOLOGY PLOT	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)			SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40		
	Ground Surface					ft m	99.14					
	150 mm Topsoil					0.0 0.0						
	Brown **Silty Clay / Clayey Silt Reworked Native** trace rootlets soft	SS	1	1		1.0		1		29.3		
	Brown **Silty Clay / Clayey Silt** trace silt seams very stiff - stiff					2.0 3.0 4.0	98.00					
		SS	2	29		5.0 6.0 7.0 1.0		29 450		23.4		
		SS	3	11		8.0 9.0 10.0 11.0 2.0	97.00	11 300		30.7		
	Grey **Silty Clay** firm - stiff					12.0 13.0 14.0 3.0	96.00					
		SS	4	6		15.0 16.0 17.0 4.0	95.00	6		20.9		
		SS	5	9		18.0 19.0 20.0 5.0	94.00	9		27.8		
	End of Borehole					21.0 22.0 23.0 6.0	93.00					
						24.0 25.0 7.0	92.00					

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: N/A
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: February 18, 2022
SECONDARY WATER LEVEL DATE: N/A

NTiL NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
CHECKED: JM

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Note: This borehole log has been prepared for geotechnical purposes and does not necessarily contain information suitable for an environmental assessment of the subsurface conditions. Borehole details as presented, do not constitute a through understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer.

RECORD OF BOREHOLE: BH-4

PROJECT NO.: NT22012
PROJECT: Proposed Residential Development
LOCATION: 744 First Avenue, Welland, Ontario
CLIENT: Ambria Communities Limited

DRILLING COMPANY: Elements GEO
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted Dietrich D-50
BOREHOLE COORDINATE (UTM): 641834 E, 4765147 N

SHEET 1 of 1
DATE STARTED: February 18, 2022
DATE COMPLETED: February 18, 2022
DATUM: TBM

SOIL PROFILE		SAMPLES				DEPTH SCALE ft / m	ELEVATION (m)	FIELD TESTING		LAB TESTING	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
LITHOLOGY PLOT	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)			SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40		
	Ground Surface					ft m	99.39					
	100 mm Topsoil					0.0 0.0						
	Brown **Silty Clay / Clayey Silt Reworked Native** trace rootlets soft - firm	SS	1	4		1.0 2.0 3.0		4		31.9		
	Brown **Silty Clay / Clayey Silt** trace silt seams very stiff	SS	2	16		4.0 5.0 6.0 1.0 2.0	99.00 98.00	16 450		24.3		
		SS	3	22		7.0 8.0 9.0 10.0 3.0	97.00	22 450		20.7		
	Grey **Silty Clay** firm - stiff	SS	4	8		11.0 12.0 13.0 4.0 14.0 15.0	96.00 95.00	850		34.2		
	End of Borehole					16.0 17.0 5.0 18.0 19.0 20.0 6.0	94.00					
						21.0 22.0 23.0 7.0 24.0 25.0	93.00 92.00					

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: N/A
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: February 18, 2022
SECONDARY WATER LEVEL DATE: N/A

NTiL NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

Note: This borehole log has been prepared for geotechnical purposes and does not necessarily contain information suitable for an environmental assessment of the subsurface conditions. Borehole details as presented, do not constitute a through understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer.

RECORD OF BOREHOLE: BH-5

PROJECT NO.: NT22012
PROJECT: Proposed Residential Development
LOCATION: 744 First Avenue, Welland, Ontario
CLIENT: Ambria Communities Limited

DRILLING COMPANY: Elements GEO
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted Dietrich D-50
BOREHOLE COORDINATE (UTM): 641962 E, 4765131 N

SHEET 1 of 1
DATE STARTED: February 18, 2022
DATE COMPLETED: February 18, 2022
DATUM: TBM

SOIL PROFILE		SAMPLES				DEPTH SCALE ft / m	ELEVATION (m)	FIELD TESTING		LAB TESTING	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
LITHOLOGY PLOT	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)			SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40		
	Ground Surface					ft m 0.0 0.0	99.54					
	Brown **Silty Clay / Clayey Silt** **Reworked Native** trace rootlets soft	SS	1	3		1.0		3		48.4		
	Brown **Silty Clay / Clayey Silt** trace silt seams very stiff	SS	2	17		2.0 3.0 4.0 5.0 6.0 7.0	99.00 98.00	17 450		27.3		
		SS	3	18		8.0 9.0 10.0 11.0 12.0 13.0	97.00 96.00	18 450		26.8		
	Grey **Silty Clay** firm	SS	4	6		14.0 15.0 16.0	95.00	6		28.7		
	End of Borehole					17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0	94.00 93.00 92.00					

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: N/A
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: February 18, 2022
SECONDARY WATER LEVEL DATE: N/A

NTiL NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

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RECORD OF BOREHOLE: BH-6

PROJECT NO.: NT22012
PROJECT: Proposed Residential Development
LOCATION: 744 First Avenue, Welland, Ontario
CLIENT: Ambria Communities Limited

DRILLING COMPANY: Elements GEO
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted Dietrich D-50
BOREHOLE COORDINATE (UTM): 641890 E, 4765093 N

SHEET 1 of 1
DATE STARTED: February 18, 2022
DATE COMPLETED: February 18, 2022
DATUM: TBM

SOIL PROFILE		SAMPLES				DEPTH SCALE ft / m	ELEVATION (m)	FIELD TESTING		LAB TESTING	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
LITHOLOGY PLOT	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)			SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40		
	Ground Surface					ft m	98.89					
	100 mm Topsoil					0.0 0.0						
	Brown **Silty Clay / Clayey Silt Reworked Native** trace rootlets firm	SS	1	7		1.0		7		27.4		
	Brown **Silty Clay / Clayey Silt** trace silt seams very stiff - stiff					2.0 3.0 1.0 4.0	98.00					
		SS	2	19		5.0 6.0 2.0 7.0	97.00	19 450		28.1		
		SS	3	13		8.0 9.0 10.0 3.0	96.00	13 250		27.3		
	Grey **Silty Clay** soft - firm					11.0 12.0 13.0 4.0	95.00					
		SS	4	3		14.0 15.0 16.0 5.0	94.00	3		36.9		
	Shear Vane Test - 5.2 - 5.8 mbgs Intact - 100 kPa Remoulded - 60 kPa Sensitivity - 1.7	VA	1			17.0 18.0						
		SS	5	5		19.0 6.0 20.0 21.0	93.00	5		27.7		
	Shear Vane Test - 6.7 - 7.3 mbgs Intact - 140 kPa Remoulded - 80 kPa Sensitivity - 1.8	VA	2			22.0 23.0 7.0	92.00					
	End of Borehole					24.0 25.0						

5.94 mbgs - Upon Drilling Completion

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: 5.94 mbgs
SECONDARY WATER LEVEL: N/A
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: February 18, 2022
SECONDARY WATER LEVEL DATE: N/A

NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

RECORD OF BOREHOLE: BH-7

PROJECT NO.: NT22012
PROJECT: Proposed Residential Development
LOCATION: 744 First Avenue, Welland, Ontario
CLIENT: Ambria Communities Limited

DRILLING COMPANY: Elements GEO
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted Dietrich D-50
BOREHOLE COORDINATE (UTM): 641833 E, 4765064 N

SHEET 1 of 1
DATE STARTED: February 18, 2022
DATE COMPLETED: February 18, 2022
DATUM: TBM

SOIL PROFILE		SAMPLES						FIELD TESTING		LAB TESTING			
LITHOLOGY PLOT	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	ELEVATION (m)	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40		WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	Ground Surface					ft m	98.84						
	Brown **Silty Clay / Clayey Silt** **Reworked Native** trace rootlets firm	SS	1	5		0.0 0.0		5		31.8			
	Brown **Silty Clay / Clayey Silt** trace silt seams very stiff - stiff	SS	2	19		3.0 1.0	98.00	19 450		22.9			
		SS	3	19		6.0 2.0	97.00	19 450		26.0			
		SS	4	10		10.0 3.0	96.00	10 150		22.5			
	Grey **Silty Clay** firm	SS	5	6		15.0 4.0	95.00	650		25.6			**Unit Weight Determination** BH-7 SS-5 20.2 kN/m³
	End of Borehole					16.0 5.0	94.00						
						19.0 6.0	93.00						
						23.0 7.0	92.00						
						25.0							

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: N/A
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: February 18, 2022
SECONDARY WATER LEVEL DATE: N/A

NTiL NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

RECORD OF BOREHOLE: BH-8

PROJECT NO.: NT22012
PROJECT: Proposed Residential Development
LOCATION: 744 First Avenue, Welland, Ontario
CLIENT: Ambria Communities Limited

DRILLING COMPANY: Elements GEO
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted Dietrich D-50
BOREHOLE COORDINATE (UTM): 641960 E, 4765067 N

SHEET 1 of 1
DATE STARTED: February 18, 2022
DATE COMPLETED: February 18, 2022
DATUM: TBM

SOIL PROFILE		SAMPLES				DEPTH SCALE ft / m	ELEVATION (m)	FIELD TESTING		LAB TESTING	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
LITHOLOGY PLOT	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)			SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40		
	Ground Surface					ft m	98.07					
	Brown **Silty Clay / Clayey Silt** **Reworked Native** trace rootlets firm	SS	1	5		0.0 0.0		5		39.7		
	Brown **Silty Clay / Clayey Silt** trace silt seams very stiff - stiff	SS	2	24		1.0	97.00	24 / 450		21.9		
		SS	3	18		2.0	96.00	18 / 450		19.8		
		SS	4	15		3.0	95.00	15 / 300		26.3		
		SS	5	12		4.0	94.00	12 / 250		28.7		
	Grey **Silty Clay** firm - soft	SS	6	4		5.0	93.00	4		29.0		
	End of Borehole					6.0	92.00					
						7.0	91.00					

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: N/A
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: February 18, 2022
SECONDARY WATER LEVEL DATE: N/A

NTiL
NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
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