Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline
Moffat, Ontario, L0P 1J0
Phone: (519) 826-0099 Fax: (519) 826-9099

Groundwater Studies

Geochemistry

Phase I / II

Regional Flow Studies

Contaminant Investigations

OMB Hearings

Water Quality Sampling

Monitoring

Groundwater Protection Studies

Groundwater Modelling

Groundwater Mapping

Our File: 2301

April 13, 2023

2709557 Ontario Inc
18 Erica Rd.
Thornhill ON, L4J 2G1

Attn: Mr. Gil Shcolyar

Re: Hydrogeology Study: 535 Bayfield Road, Barrie

1.0 Background

We are pleased to provide a scoped hydrogeology study for the proposed development at 535 Bayfield Road, Barrie. The proposed site plan is attached and shows that the development will include the addition of Buildings 3 and 4. No basements are proposed therefore the scope of work is limited to identifying the depth to the water table and providing input on Low Impact Development Strategies.

2.0 Monitoring Well Installation

Four groundwater monitoring wells were installed through the geotechnical study conducted by Soil Engineers Ltd on February 13, 2023. Monitoring wells are installed in BH2, BH5, BH8 and BH9 as shown on Figure 1. The monitoring wells are installed to a depth of 6.4 metres below ground surface (m bgs). The borehole logs for the monitoring wells show that the screened portion of the well is completed in a sand or silty sand layer. Each of the wells has a 1.5 m well screen installed at the bottom of the well.

Our observations during the drilling of BH2 are that the site is underlain by an unsaturated silty sand, sand or sand and gravel deposit.

3.0 Groundwater Conditions

When the wells were completed on February 13, 2023, the monitors were dry. Two additional water levels were obtained at the site as summarized in Table 1. The monitors were dry on each occasion.

Table 1: Groundwater Measurements

Monitor Location	February 13, 2023	February 26, 2023	April 13, 2023
BH2	Dry @ 6.34 mbgs	Dry @ 6.34 mbgs	Dry @ 6.34 mbgs
BH5	Dry @ 6.02 mbgs	Dry @ 6.02 mbgs	Dry @ 6.02 mbgs
BH8	Dry @ 6.37 mbgs	Dry @ 6.37 mbgs	Dry @ 6.37 mbgs
BH9	Dry @ 6.36 mbgs	Dry @ 6.36 mbgs	Dry @ 6.36 mbgs

mbgs – metres below ground surface

4.0 Groundwater and Source Water Protection

The new buildings will be constructed as slab-on-grade and any excavation at the site will not penetrate more than three metres for utilities. There will be no interaction with groundwater at the site and no aquifer will be disturbed during the excavation. No aquitard will be penetrated by the proposed excavations.

The following information is found on the Source Water Protection atlas.

Zoom in to confirm your location and results

Latitude: **44.41580** Longitude: **-79.71102**
UTM Zone: **17**
Easting: **602618.59** Northing: **4918864.57**
Upper Tier Municipality: **N/A**
Lower Tier Municipality: **CITY OF BARRIE**
Township Concession and Lot: **VESPRA CON 4 LOT 18**
Assessment Parcel Address: **535 BAYFIELD ST**
Assessment Roll #: **43420210300090000000**
MECP District: **Barrie**
MECP Region: **Central Region**

Source Protection Details for Location

Source Protection Area: **Nottawasaga Valley**
View Source Protection Plan
Wellhead Protection Area: **No**
Wellhead Protection Area (WHPA-E): **No**
Intake Protection Zone: **No**
Issue Contributing Area: **No**
Significant Groundwater Recharge Area: **No**
Highly Vulnerable Aquifer: **No**
Event Based Area: **No**
Wellhead Protection Area Q1: **Yes** Stress: **Low**
Wellhead Protection Area Q2: **Yes** Stress: **Low**
Intake Protection Zone Q: **No**
Information is current as of: **January 24, 2023**

The site is located in a WHPA-Q1 with a Low Stress designation. As such, recharge policies of the Source Water Protection Plan apply.

5.0 Potential Water Balance Changes

The water balance for the site prior to the proposed development have been determined using the basic formula of

$P = E + R + I$

Where;

P – precipitation (mm/year)

E - evapotranspiration (mm/year)

R – runoff (mm/year)

I – infiltration (mm/year)

Detailed calculations of the water balance are found in Appendix A.

Surplus water can either runoff of the Site or infiltrate. The amount of infiltration at the Site was estimated using the MECP Hydrogeological Technical Information Requirements for Land Development Applications. The partition of surplus water into infiltration and runoff is estimated using an infiltration factor. The infiltration factor is based on topography, soil type and vegetation and for this site is determined to be 0.8.

Table 2: Summary of Infiltration Factors

MOE Infiltration Factors			
Topo (Flat)	Open Sandy	Cultivated Cover	Total
0.3	0.4	0.1	0.8

The site plan is attached as Figure 3. Assuming that the gravel surface behind Building 1 is hardpacked and thus considered impervious, there will be a total of 12,300 m^2 of impervious surfaces post development in comparison with the existing 10.330 m^2 of hard

packed surfaces presently. For the purposes of this analysis, we are assuming the following breakdown of the annual precipitation (895 mm) for impermeable surfaces;

Evaporation	90 mm/year
Runoff	805 mm/year
Infiltration	0 mm/year

For pervious surfaces the conditions area as follows;

Evaporation	545 mm/year
Runoff	70 mm/year
Infiltration	280 mm/year

Table 3 summarizes the estimated changes to the on-site water balance.

Table 3 Summary of Water Balance Changes

	Existing	Proposed	Difference
Area (ha)	1.3955	1.3955	0
Evapotranspiration / Evaporation (m^3)	2902	2000	-902
Runoff (m^3)	8572	10028	1456
Infiltration (m^3)	1016	461	-554
Roof Water	0	3844	3844

It is estimated that runoff potential from the developed area will increase, and infiltration will decrease. There is a 554 m^3 deficit in infiltration that will have to be addressed in order to maintain similar infiltration volumes between pre and post development.

6.0 Infiltration Potential

There is great potential to infiltrate water at this site. The groundwater observations confirm that the water table occurs at a depth greater than six metres below grade. The observations at BH2 are that there are several metres of unsaturated sand and gravel beneath this site. Based on an estimated hydraulic conductivity of the sand at 1 x 10^{-5} m/s and a safety factor of 2.5, the design infiltration rate is 34 mm/hr (Table 4). The relationship

between saturated hydraulic conductivity and infiltration rate was determined as presented by the *Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to the Ontario Building Code 1997. SG-6 Percolation Time and Soil Descriptions. Toronto, Ontario*.

Table 4: Infiltration Rate

K Saturation in cm/s	Percolation Rate mm/hour	Safety Factor	Design Infiltration Rate mm/hr
1.00E-03	86	2.5	34

We have discussed infiltration strategy with Aplin Martin Consultants Ltd. and the site storm water system is designed to infiltrate the first 5 mm of rainfall from the entire site. This is a potential infiltration of 2,600 m^3. This would more than compensate for the 554 m^3 reduction predicted. Even if only roof water were to be infiltrated the annual recharge would be 980 m^3/year, again, more recharge than presently occurs.

7.0 Summary and Conclusions

The development at 535 Bayfield Road in Barrie will occur without any intrusion into the water table or any underlying aquifer. Any excavation at the site will not affect underlying aquifer vulnerability.

The water table occurs at a depth greater than six metres below grade and the proposed construction will not require any excavation of greater than three metres depth.

The addition of two buildings at the site will result in an increase in impervious surface area, increasing from 1.03 ha to 1.23 ha. The site is located in a local WHPA-Q1 and is thus subject to recharge policies in the local Source Water Protection Plan.

The greater impervious surface will result in a 554 m^3 deficit of groundwater recharge at the site.

The storm water management system has been designed to infiltrate the first 5 mm of each rainfall event. This amounts to a potential infiltration of 2600 m^3/year from the entire site or 980 m^3 from only the roof tops. In this way, the potential infiltration deficit will be eliminated.

Respectfully Submitted,

Harden Environmental Services Ltd.

Stan Denhoed, P.Eng., M.Sc.

Enclosed:

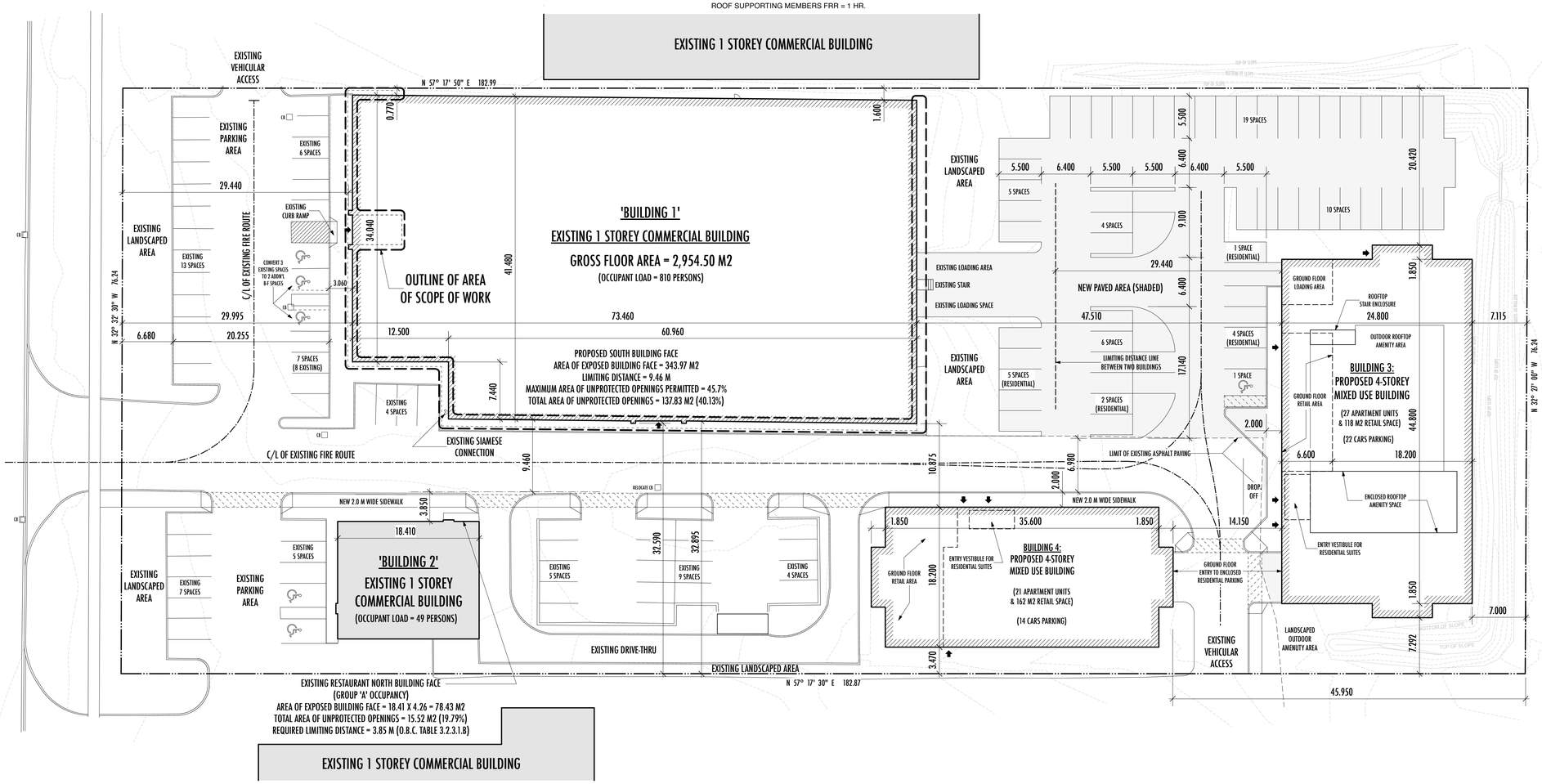
Site Plans

Borehole Map and Borehole Logs

Water Balance

ONTARIO BUILDING CODE DATA

1	**PROJECT DESCRIPTION:** NEW MIXED USE BUILDING BUILDING HEIGHT = 17.20 M (5 STOREYS)	**DIV. B PART 3**
2	**MAJOR OCCUPANCY:** RESIDENTIAL - GROUP C	**B 3.1.2.1(1)**
3	**BUILDING AREA:** EXISTING (0.0) + NEW (1,596.20) = TOTAL 1,596.20 SQ.M.	**A 1.4.1.2**
4	**GROSS AREA:** EXISTING (0.0) + NEW (6,295.20) = TOTAL 6,295.20 SQ.M.	**A 1.4.1.2**
5	**NUMBER OF STOREYS:** ABOVE GRADE = 4 STOREYS, BELOW GRADE = 0 STOREYS	**B 3.2.1.1 & A 1.4.1.2**
6	**NUMBER OF STREETS / FIRE FIGHTER ACCESS:** FACING 1 STREET	**B 3.2.2.10 & B 3.2.5**
7	**BUILDING CLASSIFICATION:** 3.2.2.43A, GROUP C, UP TO 6 STOREYS, SPRINKLERED	**B 3.2.2.20 - B 3.2.2.83**
8	**SPRINKLER SYSTEM PROPOSED:** FULLY SPRINKLERED	**B 3.2.2.43 & B 3.2.1.5**
9	**STANDPIPE REQUIRED:** YES	**B 3.2.9**
10	**FIRE ALARM REQUIRED:** YES	**B 3.2.4**
11	**WATER SERVICE / SUPPLY IS ADEQUATE:** YES	**B 3.2.5.7**
12	**HIGH BUILDING:** NO	**B 3.2.6**
13	**PERMITTED CONSTRUCTION:** COMBUSTIBLE OR NON-COMBUSTIBLE **ACTUAL CONSTRUCTION:** COMBUSTIBLE AND NON-COMBUSTIBLE	**B 3.2.2.20 - B 3.2.2.83**
14	**MEZZANINE AREA(S):** TOTAL = 0 SQ.M.	**B 3.2.1.1(3) - B 3.2.1.1(8)**
15	**OCCUPANT LOAD:** GROUND FLOOR (E): 250 M2 / 3.7 = 68 PERSONS GROUND FLOOR (F3): 1,086 M2 / 46 = 24 PERSONS SECOND FLOOR (C): 2 / BEDROOM = 52 PERSONS THIRD FLOOR (C): 2 / BEDROOM = 52 PERSONS FOURTH FLOOR (C): 2 / BEDROOM = 52 PERSONS ROOF (A2): 91 M2 / 1.85 = 50 PERSONS TOTAL = 298 PERSONS	**B 3.1.16** **B 3.8**
16	**BARRIER FREE DESIGN:** YES	**B 3.3.1.2 & B 3.3.1.19**
17	**HAZARDOUS SUBSTANCES:** NO	**B 3.2.2.43 & B 3.2.1.4**
18	**REQUIRED FIRE-RESISTANCE RATINGS:** SECOND FLOOR ASSEMBLY FRR = 2 HR. THIRD & FOURTH FLOOR ASSEMBLIES FRR = 1 HR. ROOF ASSEMBLY FRR = 1 HR. SECOND FLOOR SUPPORTING MEMBERS FRR = 2 HR. FLOOR SUPPORTING MEMBERS FRR = 1 HR. ROOF SUPPORTING MEMBERS FRR = 1 HR.	



SITE STATISTICS:

	REQUIRED	EXISTING	PROPOSED
OFFICIAL PLAN DESIGNATION:		GENERAL COMMERCIAL	GENERAL COMMERCIAL
ZONING CATEGORY:		GENERAL COMMERCIAL (C4)	GENERAL COMMERCIAL (C4)
ZONING USE:		RETAIL STORE	SHOPPING CENTRE
LOT AREA:	450 M2	13,935.46 M2	13,935.46 M2
LOT FRONTAGE:	15.0 M (MIN.)	76.20 M	76.20 M
BUILDING AREA:		3,236.70 M2	5,053.40 M2
BUILDING 1:		2,954.50 M2	2,954.50 M2
BUILDING 2:		282.20 M2	282.20 M2
BUILDING 3:		0.00 M2	1,139.90 M2
BUILDING 4:		0.00 M2	676.80 M2
LOT COVERAGE:	50% (MAX.)	23.3%	36.3%
BUILDING DENSITY:		2,322.64 M2/HA	7,419.56 M2/HA
GROSS FLOOR AREA:		3,236.70 M2	10,339.50 M2
BUILDING 1:		2,954.50 M2	2,954.50 M2
BUILDING 2:		282.20 M2	282.20 M2
BUILDING 3:		0.00 M2	4,539.60 M2
BUILDING 4:		0.00 M2	2,563.20 M2
FLOOR SPACE INDEX:		0.23	0.74
BUILDING HEIGHTS:	14.0 M (MAX.)		
BUILDING 1:		7.2 M	7.2 M
BUILDING 2:		1 STOREY	1 STOREY
BUILDING 3:			17.2 M
BUILDING 4:			17.2 M

	REQUIRED	EXISTING	PROPOSED
BUILDING 3 SETBACKS:			
FRONT:	6.0 M (MIN.)	N/A	29.440 M
REAR:	7.0 M (MIN.)	N/A	7.000 M
NORTH SIDE:	3.0 M (MIN.)	N/A	20.420 M
SOUTH SIDE:	3.0 M (MIN.)	N/A	7.292 M
BUILDING 4 SETBACKS:			
FRONT:	6.0 M (MIN.)	N/A	25.500 M
REAR:	7.0 M (MIN.)	N/A	45.950 M
NORTH SIDE:	3.0 M (MIN.)	N/A	54.500 M
SOUTH SIDE:	3.0 M (MIN.)	N/A	3.470 M
PARKING AREA:		4,620.86 M2	6,691.56 M2
BUILDINGS 1, 3 & 4:		3,792.17 M2	5,862.87 M2
BUILDING 2:		828.69 M2	828.69 M2
PARKING REQUIRED:		172 SPACES	194 SPACES
BUILDING 1:	2,954.5 M2 @ 1 PER 30 M2	99 SPACES	99 SPACES
BUILDING 2:	1 PER 4 PERSONS	13 SPACES	13 SPACES
BUILDINGS 3&4 (RETAIL):	280 M2 @ 1 PER 30 M2		10 SPACES
BUILDINGS 3&4 (APTMNT.):	48 @ 1.5 PER UNIT		72 SPACES
PARKING PROVIDED:		104 SPACES	154 SPACES
BUILDING 1:		91 SPACES	87 SPACES
BUILDING 2:		13 SPACES	13 SPACES
BUILDINGS 3&4 (RETAIL):			6 SPACES
BUILDINGS 3&4 (APTMNT.):			48 SPACES

NOTE:

INFORMATION ON THIS SITE PLAN TAKEN FROM:

PLAN OF SURVEY OF
PART OF LOT 18, CONCESSION 4
GEOGRAPHIC TOWNSHIP OF VESPRA
NOW IN THE CITY OF BARRIE
COUNTY OF SIMCOE

BY: J.D. BARNES LIMITED
MARCH 29, 2021

Key Plan

Issue	Date	Description	By
01	JUN 11/19	OWNER REVIEW	J.M.
02	AUG 21/19	OWNER REVIEW	J.M.
03	OCT 18/19	OWNER REVIEW	J.M.
04	JUL 21/20	OWNER REVIEW	J.M.
05	NOV 25/20	OWNER REVIEW	J.M.
06	APR 21/21	OWNER REVIEW	J.M.
07	SEP 24/21	OWNER REVIEW	J.M.
08	MAR 29/22	OWNER REVIEW & CONSULTATION	J.M.
09	JUL 13/22	REVIEW & CONSULTATION	J.M.
10	OCT 27/22	COORDINATION	J.M.

Rev	Date	Description	By
01	N/A	N/A	J.M.

ARCHITECT'S INSTRUCTIONS:

THE CONTRACTOR MUST CHECK AND VERIFY ALL DRAWING DIMENSIONS ON THE SITE BEFORE AND DURING CONSTRUCTION, AND REPORT TO THE ARCHITECT ANY DISCREPANCIES PRIOR TO COMMENCING WORK.

DRAWINGS ARE NOT TO BE SCALED FOR PURPOSES OF CONSTRUCTION.

keith loffler mcalpine architects
10 ST. MARY STREET, SUITE 402, TORONTO, ONTARIO, M4Y 1P9 T (416) 964 1902 F (416) 964 8345

klma
A PARTNERSHIP OF CORPORATIONS
KEITH LOFFLER DESIGN INC PARTNERS MCALPINE ARCHITECT INC

ONTARIO ASSOCIATION OF ARCHITECTS
JOHN WILLIAM MCALPINE
LICENCE
4397
Professional Certification

COORDINATION
Issued for

OCTOBER 27, 2022	1 : 300	
Issue date	Scale	
1935	J.M.	J.M.
Project no.	Drawn by	Checked by

Mixed Use Building
Building 3

535 Bayfield Street, Barrie, Ontario

OWNER: Petro Gold Ltd.
Project

Architectural Site Plan

Drawing Title

A001
Sheet no.

SOLA ENGINEERING	File No.: 10855A-S0476-GEO	**BH Location Plan**	The figure provided is for the intended purpose of presenting the approximate borehole locations. This figure should not be used for any other purposes including construction, architecture or for accuracy of dimensions and orientation of objects.	Enclosure No.: **1**
	Report Number: 2023-17792	**Propsed Mixed-Use Buildings**		
		535 Bayfield Street, Barrie, Ontario		
	Date: March 27, 2023	**2709557 Ontario Inc.**		Not to Scale

SOLA ENGINEERING

ENCLOSURE No. 2

RECORD OF BOREHOLE No. BH1

1 OF 1

METRIC

PROJECT NUMBER 10855A | LOCATION 535 Bayfield Street, Barrie, Ontario | ORIGINATED BY TS

NAME Proposed Mixed-Use Buildings | CLIENT 2709557 Ontario Inc. | METHOD Soild Stem Augers | COMPILED BY TS

DATUM | DATE 2023.02.14 - 2023.02.14 | NORTHING | EASTING | CHECKED BY SM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Topsoil TOPSOIL - 200 mm thick		1A	SS	7				○		
0.2	FILL - sand, trace gravel, brown, very moist		1B								
			2A	SS	7				○		
0.9	FILL - clayey silt, some sand, trace gravel, brown, very moist		2B								
			3	SS	16				○		
2.3	SILTY SAND TILL - trace gravel, brownish grey, very dense, moist		4	SS	50/ 13 cm				○		
			5	SS	50/ 13 cm				○		
4.6	SAND - some gravel, occasionally inferred cobbles and boulders, grey, very dense, moist		6	SS	50/ 10 cm				○		
4.8	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.										

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SOLA ENGINEERING

ENCLOSURE No. 3

RECORD OF BOREHOLE No. BH2 1 OF 1 METRIC

PROJECT NUMBER 10855A | LOCATION 535 Bayfield Street, Barrie, Ontario | ORIGINATED BY CC

NAME Proposed Mixed-Use Buildings | CLIENT 2709557 Ontario Inc. | METHOD Soild Stem Augers | COMPILED BY TS

DATUM | DATE 2023.02.13 - 2023.02.13 | NORTHING | EASTING | CHECKED BY SM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (20 40 60 80 100): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
Topsoil											
0.0	TOPSOIL - 100 mm thick		1A	SS	12						
0.1	FILL - sand and gravel, grey, moist to very moist		1B								
			2A	SS	37						
			2B								
1.1	SAND - trace gravel, brown to grey, dense to very dense, moist to very moist		3	SS	70						
	- pockets of sandy silt		4	SS	75/ 25 cm						
			5	SS	68						
			6	SS	63						
			7	SS	65						
6.6	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.										

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SOLA ENGINEERING

ENCLOSURE No. 4

RECORD OF BOREHOLE No. BH3 1 OF 1 METRIC

PROJECT NUMBER 10855A | LOCATION 535 Bayfield Street, Barrie, Ontario | ORIGINATED BY CC

NAME Proposed Mixed-Use Buildings | CLIENT 2709557 Ontario Inc. | METHOD Soild Stem Augers | COMPILED BY TS

DATUM | DATE 2023.02.13 - 2023.02.13 | NORTHING | EASTING | CHECKED BY SM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Topsoil TOPSOIL - 100 mm thick		1A								
0.1	FILL - sandy silt, trace gravel, containing asphalt fragments, brown, moist		1B	SS	12						
0.8	FILL - sand, trace gravel, brown, moist		2	SS	59/ 20 cm						
			3	SS	10						
2.3	SAND - trace gravel, occasionally inferred cobbles and boulders, very dense, moist		4	SS	50/ 13 cm						
3.0	SANDY SILT TILL - trace gravel, trace clay, grey, very dense, moist		5	SS	50/ 13 cm						
3.3	SAND - trace gravel, occasionally inferred cobbles and boulders, brown, very dense, moist		6	SS	50/ 13 cm						
4.9	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.										

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SOLA ENGINEERING

ENCLOSURE No. 5

RECORD OF BOREHOLE No. BH4 1 OF 1 METRIC

PROJECT NUMBER 10855A | LOCATION 535 Bayfield Street, Barrie, Ontario | ORIGINATED BY CC

NAME Proposed Mixed-Use Buildings | CLIENT 2709557 Ontario Inc. | METHOD Soild Stem Augers | COMPILED BY TS

DATUM | DATE 2023.02.13 - 2023.02.13 | NORTHING | EASTING | CHECKED BY SM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Topsoil TOPSOIL - 100 mm thick		1A								
0.1	FILL - sandy silt, trace gravel, containing asphalt fragments, dark brown, moist		1B	SS	10						
0.8	FILL - sand, brown, moist		2	SS	7						
	- pockets of sandy silt		3	SS	31						
2.3	SAND - trace gravel, brown, very dense, moist		4	SS	87/ 28 cm						
			5	SS	50/ 13 cm						
4.6	SILTY SAND - trace gravel, grey, very dense, very moist		6	SS	50/ 13 cm						
4.9	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.										

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SOLA ENGINEERING

ENCLOSURE No. 6

RECORD OF BOREHOLE No. BH5 1 OF 1 METRIC

PROJECT NUMBER 10855A | LOCATION 535 Bayfield Street, Barrie, Ontario | ORIGINATED BY CC

NAME Proposed Mixed-Use Buildings | CLIENT 2709557 Ontario Inc. | METHOD Soild Stem Augers | COMPILED BY TS

DATUM | DATE 2023.02.13 - 2023.02.13 | NORTHING | EASTING | CHECKED BY SM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (20 40 60 80 100): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Topsoil										
0.0	TOPSOIL - 100 mm thick		1A								
0.1	FILL - silty sand, trace gravel, brown, moist		1B	SS	14						
0.8	FILL - sand, trace gravel, brown, moist		2	SS	7						
1.5	SAND - trace to some gravel, brown, compact to very dense, moist		3	SS	14						
	- occasionally inferred cobbles and boulders		4	SS	70						
			5	SS	39						
			6	SS	54/ 28 cm						
			7	SS	61/ 28 cm						
6.5	End of Borehole at Targeted Depth; Borehole Caved at 5.7 m Below Existing Ground Surface and was Dry upon Completion of Drilling Period.										

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SOLA ENGINEERING

ENCLOSURE No. 7

RECORD OF BOREHOLE No. BH6 1 OF 1 METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS

NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS

DATUM _____ DATE 2023.02.14 - 2023.02.14 NORTHING _____ EASTING _____ CHECKED BY SM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
Asphaltic Concrete											
0.0	ASPHALTIC CONCRETE - 40 mm thick			AS					○		
			1A	SS	16						
0.4	GRANULAR BASE/SUBBASE (sand and gravel) - 340 mm thick		1B								
	FILL - sand, trace gravel, brown, moist		2	SS	9				○		
1.5	SILTY SAND - brown, dense, very moist		3	SS	30				○		
2.3	SILTY SAND TILL - trace gravel, occasionally inferred cobbles and boulders, brown, dense to very dense, moist		4	SS	48				○		
			5	SS	50/ 13 cm				○		
			6	SS	50/ 13 cm				○		
4.9	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.										

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SOLA ENGINEERING

ENCLOSURE No. 8

RECORD OF BOREHOLE No. BH7

1 OF 1

METRIC

PROJECT NUMBER 10855A | LOCATION 535 Bayfield Street, Barrie, Ontario | ORIGINATED BY TS

NAME Proposed Mixed-Use Buildings | CLIENT 2709557 Ontario Inc. | METHOD Soild Stem Augers | COMPILED BY TS

DATUM | DATE 2023.02.14 - 2023.02.14 | NORTHING | EASTING | CHECKED BY SM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Asphaltic Concrete ASPHALTIC CONCRETE - 40 mm thick			AS							
0.3	GRANULAR BASE/SUBBASE (sand and gravel) - 265 mm thick		1A 1B	SS	11				○		
0.8	FILL - sand, trace gravel, brown, moist SILTY SAND - trace gravel, trace clay, occasionally inferred cobbles and boulders, brownish grey, compact to dense, moist		2	SS	23				○		
			3	SS	37				○		
2.3	SILTY SAND TILL - trace gravel, greyish brown, very dense, moist to very moist		4	SS	97/ 28 cm				○		
			5	SS	50/ 13 cm				○		
	- trace clay		6	SS	59				○		
5.0	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.										

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SOLA ENGINEERING

ENCLOSURE No. 9

RECORD OF BOREHOLE No. BH8

1 OF 1

METRIC

PROJECT NUMBER 10855A | LOCATION 535 Bayfield Street, Barrie, Ontario | ORIGINATED BY TS

NAME Proposed Mixed-Use Buildings | CLIENT 2709557 Ontario Inc. | METHOD Soild Stem Augers | COMPILED BY TS

DATUM | DATE 2023.02.14 - 2023.02.14 | NORTHING | EASTING | CHECKED BY SM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (20 40 60 80 100): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
Asphaltic Concrete											
0.0	ASPHALTIC CONCRETE - 40 mm thick			AS							
0.3	GRANULAR BASE/SUBBASE (sand and gravel) - 265 mm thick		1A								
	FILL - sand, some gravel, dark brown, moist		1B	SS	32						
			2	SS	13						
1.5	SILTY SAND - trace gravel, brown, compact, moist		3	SS	15						
2.3	SILTY SAND TILL - trace gravel, brown, very dense, moist		4	SS	58						
			5	SS	50/ 10 cm						
			6	SS	50/ 13 cm						
6.1	SANDY SILT TILL - trace gravel, trace clay, grey, very dense, moist		7	SS	50/ 13 cm						
6.4	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.										

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

SOLA ENGINEERING

ENCLOSURE No. 10

RECORD OF BOREHOLE No. BH9 1 OF 1 METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS

NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS

DATUM _____ DATE 2023.02.14 - 2023.02.14 NORTHING _____ EASTING _____ CHECKED BY SM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Asphaltic Concrete										
0.0 / 0.1	ASPHALTIC CONCRETE - 50 mm thick			AS							
0.4	GRANULAR BASE/SUBBASE (sand and gravel) - 330 mm thick		1A / 1B	SS	14						
	FILL - silty sand, trace gravel, brown, moist		2A / 2B	SS	14						
1.1	SAND - trace gravel, brown, compact, moist										
1.5	SILTY SAND - trace gravel, trace clay, brown, compact to dense, very moist		3	SS	20						
			4	SS	41						
3.0	SILTY SAND TILL - trace gravel, greyish brown, very dense, moist		5	SS	96/ 25 cm						
			6	SS	50/ 15 cm						
			7	SS	77						
6.6	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.										

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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KEY TO SYMBOLS

Enclosure No.: 11

PROJECT NUMBER 10855A

PROJECT NAME Proposed Mixed-Use Buildings

LOCATION 535 Bayfield Street, Barrie, Ontario

CLIENT 2709557 Ontario Inc.

LITHOLOGIC SYMBOLS (Unified Soil Classification System)


ASPHALT: Asphalt


FILL: TTC Fill (made ground)


GRVYSAND: Gravelly Sand


SL-SN: silty sand


SL-SN-TL: silty sand till


SN: sand


SN-SL-TL: sandy silt till


TOPSOIL: Topsoil/peat/organics

SAMPLER SYMBOLS


Auger Sample


Split Spoon Sample

WELL CONSTRUCTION SYMBOLS


Bentonite Seal: 1 pipe group, 1 pipe


Concrete: 1 pipe group, 1 pipe


Filter Pack: 1 pipe group, 1 pipe


Slotted Pipe: 1 pipe group, 1 pipe


Slough at bottom of hole

Notes:

Terms describing RELATIVE DENSITY, based on Standard Penetration Test "N"-Value for COURSE GRAINED soils (major portion retained on No. 200 seive):

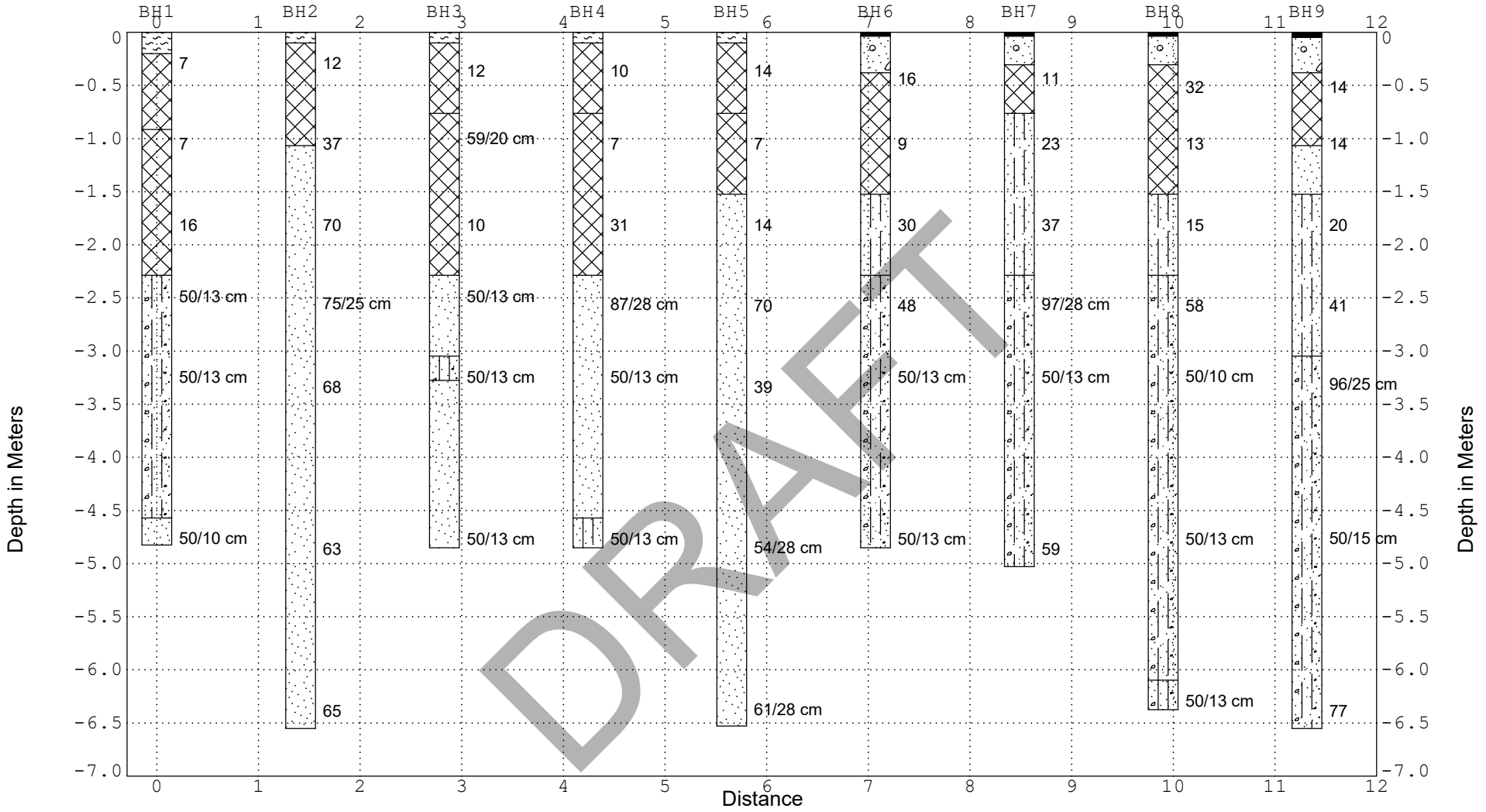
DESCRIPTIVE TERM ["N"-Value (blows/0.3m), Relative Density (%)]

- **Very Loose [less than 4, less than 15]**
- **Loose [4 to 10, 15 to 35]**
- **Compact or Medium [10 to 30, 35 to 65]**
- **Dense [30 to 50, 65 to 85]**
- **Very Dense [greater than 50, greater than 85]**

Terms describing CONSISTENCY, based on Standard Penetration Test "N"-Value for FINE GRAINED soils (major portion passing No. 200 sieve):

DESCRIPTIVE TERM [Unconfined Compressive Strength (kPa), "N"-Value (blows/0.3m)]

- **Very Soft [less than 25, less than 2]**
- **Soft [25 to 50, 2 to 4]**
- **Firm [50 to 100, 4 to 8]**
- **Stiff [100 to 200, 8 to 15]**
- **Very Stiff [200 to 400, 15 to 30]**
- **Hard [greater than 400, greater than 30]**



Plan View

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CONCEPTUAL SOIL PROFILE

Horizontal Scale:	Drawn By:	
Vertical Scale:	Approved By:	

Proposed Mixed-Use Buildings
535 Bayfield Street, Barrie, Ontario

Project Number: 10855A

Enclosure No.: 12

535 Bayfield Road Barrie

Water Balance Summary - Site

Precipitation (P) = Evapotranspiration (ET) + Direct Runoff (RO) + Infiltration (I)

Description	Flat	Open Sandy	Cultivated	
	MOE Infiltration Factors			
	Topo	Soil	Cover	Total
Site	0.3	0.4	0.1	0.8

Evapotranspiration from Impervious	10	%
Infiltration from Impervious	0	%
Roofwater Available for Infiltration	85	%

Feature	Description	Factor
Cover	Cultivated	0.1
Cover	Woodland	0.2
Soil	Medium	0.2
Soil	Open Sandy	0.4
Soil	Tight	0.1
Topo	Flat	0.3
Topo	Hilly	0.1
Topo	Rolling	0.2

		Pervious			Impervious	
(P)	Precipitation		895	mm/year	895	mm/year
(ET)	Evapotranspiration		545	mm/year	89.5	mm/year
(S) = (P)-(ET)	Surplus		350	mm/year	805.5	mm/year
(If)	Infiltration Factor		0.8		0	
(I) = (S) * If	Infitration	280		mm/year	0	mm/year
(R)=(S) - (I)	Runoff		70	mm/year	805.5	mm/year

Total Site Area	1.3955	ha			
Pre Development Impervious	74.0	%	1.033	ha	
Pre Development Open Space	26.0	%	0.3628	ha	1.39546
Post Development Impervious	88.190	%	1.23066	ha	
Post Development Open Space	11.81	%	0.165	ha	1.39546
Roof Area			0.5053	ha	

Existing Conditions

Pervious Area

Area	Precipitation		Evapotranspiration / Evaporation (m3)		Direct Runoff		Infiltration	
(ha)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)
0.3628196	895	3247	545	1977	70	254	280	1016

Impervious Areas (assume 10% evaporation)

Impervious Area	Precipitation		Evapotranspiration / Evaporation (m3)		Direct Runoff		Infiltration	
(ha)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)
1.0326	895	9242	90	924	806	8318	0	0

Proposed Conditions

Impervious Areas (assume 10% evaporation)

Impervious Area	Precipitation		Evapotranspiration / Evaporation (m3)		Direct Runoff		Infiltration	
(ha)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)
1.2307	895	11014	90	1101	806	9913	0	0

Pervious Areas

Pervious Area	Precipitation		Evapotranspiration / Evaporation (m3)		Direct Runoff		Infiltration	
(ha)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)
0.1648	895	1475	545	898	70	115	280	461

Site Area Summary

	Existing	Proposed	Difference
Area (ha)	1.3955	1.3955	0
Evapotranspiration / Evaporation (m^3)	2902	2000	-902
Runoff (m^3)	8572	10028	1456
Infiltration (m^3)	1016	461	-554
Roof Water	0	3844	3844