June 24, 2026 Project No. 260052-G1

Angil Development Group Inc.
2710 14th Avenue
Markham, Ontario
L3R 0J1

Attention: **Mr. Yuanda Li**

GEOTECHNICAL INVESTIGATION UPDATE FOR PROPOSED FOUR-STOREY SLAB-ON-GRADE RESIDENTIAL DEVELOPMENT AT 12717 NINTH LINE, STOUFFVILLE, ONTARIO

Prepared for:

Angil Development Group Inc.

CANADA ENGINEERING SERVICES INC.
39 Davisbrook Blvd., Scarborough,
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Tel 416 492 4000
Email: cesi@cesi.ca

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EXECUTIVE SUMMARY

Re: GEOTECHNICAL INVESTIGATION FOR PROPOSED FOUR-STOREY SLAB-ON-GRADE RESIDENTIAL DEVELOPMENT AT 12717 NINTH LINE, STOUFFVILLE, ONTARIO

We have completed the geotechnical investigation update you requested for the above-named site and our report is enclosed. Previously we completed a geotechnical investigation report for the subject site (Geotechnical Investigation for the Townhouse Development, Report Number: 200015-G1, dated July 21, 2020).

Five boreholes were put down at the site to depths of 6.55 m. The soils found were quite consistent in all the boreholes, consisting of a surficial topsoil, followed by a layer of silty sand fill material down to approximately 0.6 m to 1.1 m. A layer of native mottled grey-brown silt and sand till, trace clay and gravel was found below the fill layer. This layer was moist and in a compact to dense state down to a depth of 4.6 m, 4.6 m, 4.7 m, 4.6 m, and 4.9 m in Borehole Numbers 1, 2, 3, 4 and 5 respectively. The till layer was underlain by a grey silt and fine sand layer which extended down to the bottoms of all the boreholes down at a depth of 6.55 m.

Footings can be founded on the compact to dense native silt and sand till at a depth of 1.2 m to 2.0 m below the existing ground surface, capable of supporting a serviceability limit states (SLS) and a factored ultimate limit states (ULS) bearing pressure of 150 kPa (3000 psf) and of 225 kPa (4500 psf) respectively.

Water seepage was generally encountered within the lower grey silt and fine sand layer at depth of 4.5 m in Borehole Numbers 2 to 5. In Borehole Number 1 seepage was observed in the till material at a depth of 3.0 m. Generally till materials contain water bearing sand seams which could pose a problem during excavation at the site.

Stabilized water levels were taken on July 7, 2020 and were as follows for the boreholes where wells were installed: In Borehole Numbers 1, 3, and 5 the water levels were 2.8 m, 3.76 m, and 4.0 m respectively. It is noted that all of these water levels extend up into the relatively moist and less permeable till. This means that the water in the lower silt and fine sand aquifer is likely under a hydraulic head and it is preferable that the excavation be maintained at least a meter above this aquifer to avoid a blow out condition. It may be possible to pump trapped water from sand seams by sumped from sump pits, but if such sand seams are interconnected with the lower aquifer, then de-watering may be needed.

The Seismic Site Response Classification for this site has been evaluated as Type D.

INTRODUCTION

Canada Engineering Services Inc., was authorized by Mr. Yuanda Li of Angil Development Group Inc., to carry out a geotechnical investigation update for the proposed four-storey slab-on-grade residential building at 12717 Ninth Line, Stouffville, Ontario.

The purpose of this investigation was to:

(a) determine the subsoil and water table conditions by placing five boreholes at selected locations representing the site and installing three 50 mm diameter monitoring wells.

(b) provide pertinent recommendations for excavation, de-watering and backfilling during the installation of the proposed foundations for the construction.

(c) make recommendations for allowable soil bearing pressures for the proposed townhouse development.

GEOLOGY

The surficial geology at the site, as published in the Ontario Geological Survey, Surficial Geology of Southern Ontario, consists of: Till - Clay to silt-textured till (derived from glaciolacustrine deposits or shale).

SITE DESCRIPTION

The site is located at 12717 Ninth Line, in Stouffville, Ontario. There has an existing one-storey house on the property which is scheduled to be demolished in the near future. The property is located within a residential area. The site is relatively flat with a gentle slope towards the west.

The subject property is bounded by Ninth Line on the west side, a builder sales office on the north side, a residential subdivision on the south side and vacant lands on the east side. Further north beyond the sales office are vacant lands that are proposed to be a residential subdivision. Beyond Ninth Line on the west side is also a recently developed residential subdivision.

GEOTECHNICAL PROCEDURE

The field work for the boreholes was carried out with a track-mounted drill rig with continuous flight solid stem auger equipment on June 4 and 5, 2020 and was supervised by a staff personnel from our office.

Soil samples were taken at 760 mm (2.5 feet) intervals between ground surface and 3.0 m below the surface, and then at 1.5 m intervals thereafter, by means of a split-spoon sampler, in accordance with the requirements of the Standard Penetration Test, (CSA test specifications A119.1).

Drawing Number 1 shows the locations of the boreholes and monitoring wells which were established by staff from CESI. The ground surface elevation of the boreholes were referenced to the northwest corner of the property with an elevation of 278.5 m. The elevations were obtained from the survey plan prepared by Henry Chiu Architect Limited and was provided to us to plot the borehole and monitoring well locations. The geotechnical terms and symbols used in this report are shown in Appendix "A."

Field penetrometer readings were taken on the cohesive samples from the boreholes with a pocket penetrometer and these are recorded on the borehole logs in kilopascals.

The samples taken from boreholes were brought back to our laboratory for further visual observations, moisture content tests and grain size analyses. The results of these tests were plotted on the Borehole Log Numbers 1 to 5.

All soil samples taken were brought back to our laboratory where moisture content tests, grain size analyses, hydrometer testing and further visual observations were carried out. Our field and laboratory findings are plotted on the Borehole Log Numbers 1 to 5. Grain size curves are shown on Figure Number 1.

SOIL DESCRIPTION

Topsoil

A layer of grey to brown silty sand, with some organics was found at the surfaces of all the boreholes. This layer was moist, in a compact state and was generally 300 mm thick.

Silty Sand Fill

A layer of silty sand fill was found below the topsoil layer in all the boreholes. This layer was grey to brown, was moist and in a compact state down to depths of 1.1 m, 0.6 m, 0.8 m, 0.6 m and 0.6 m in Borehole Numbers 1, 2, 3, 4 and 5 respectively.

Fine Sand

A layer of grey fine sand with trace silt was found immediately below the fill layer in Borehole Numbers 2, 3, 4 and 5. This layer was grey in colour, was moist and in a compact state down to depths between 0.9 m to 1.1 m.

Silt and Sand Till

A layer of compact to dense silt and sand till was found immediately below the fine sand in Borehole Numbers 2, 3, 4 and 5 and below the fill layer in Borehole Number 1. It was moist and mottled grey-brown in colour and contained a trace of clay and gravel down to a depth of 4.6 m, 4.6 m, 4.7 m, 4.6 m, and 4.9 m in Borehole Numbers 1, 2, 3, 4 and 5 respectively. Pocket penetrometer readings taken within this layer were approximately 150 kPa to 450 kPa.

Silt and Fine Sand

A layer of silt and fine sand, trace sand was found immediately below the silt and sand till layer in all the boreholes. It was moist to wet, grey in colour and in a compact to dense state. This layer extended down to the bottoms of all the boreholes at a depth of 6.5 m.

GROUNDWATER

Water seepage was encountered in the sand seam within the silt and sand till layer at a depth of 3.0 m, 3.6 m, 3.0 m, 3.6 m and 3.1 m in Borehole Numbers 1, 2, 3, 4 and 5 respectively. Generally till materials contain water bearing sand seams which are not likely to pose a problem during excavation at the site. Stabilized water levels were taken on July 7, 2020 and were as follows for the boreholes where wells were installed: In Borehole Numbers 1, 3, and 5 the water levels were 2.8 m, 3.76 m and 4.0 m respectively. It is noted that all of these water levels extend up into the relatively moist and less permeable till. This means that the water in the lower silt and fine sand aquifer is likely under a hydraulic head and it is preferable that the excavation be maintained at least a meter above this aquifer to avoid a blow out condition. It may be possible to pump trapped water from sand seams by sump pumps from sump pits, but if such sand seams are interconnected with the lower aquifer, then de-watering may be needed.

EXCAVATION FOR SEWERS AND WATERMAIN

Sewers are expected to be installed between 3.0 m to 4.0 m below the final ground surface level. It is expected that all the excavations for the sewers will be within the fill, native sand and till layers. Care should be taken than the excavation is not taken beyond the till layer.
If this occurs, de-watering of the underlying silt and fine sand layer may become necessary, as this material is under a hydrostatic head. Minor seepage from silt and sand seams may be collected in sump pits and handled by sump pumps.

All temporary slopes of the excavations should conform with the Occupational Health and Safety Act (OHSA) and all local regulations.

BACKFILLING

The excavated soils at this site are expected to be predominantly the silty sand and the reworked silt and fine sand till. These can be used to backfill the sewer trenches, and footings. If additional fill is required, then it is recommended that an imported fill such as granular "B" be used for backfilling. For backfilling around manholes, and confined spaces, especially the footings inside the building, granular "B" should be used.

Pipe bedding placed on stiff soils should be a minimum of 150 mm thick compacted OPSS Granular "A", or as required by the Town of Stouffville and it should be compacted to 95% of the standard proctor maximum dry density. If wet sands, silts and clays are encountered, the thickness should be increased and 20 mm HL6 clear stone or 50 mm crusher-run limestone should be used instead to compensate for the unstable conditions. Further, if clear stone is used in wet areas, it should be wrapped in a geotechnical filter fabric to prevent transport of fines into the clear stones and loss of soil from outside.

The sewer pipes should also be backfilled up to 300 mm above the top, with a granular material to aide compaction in tight spaces without damaging the pipes. The excavated materials can then be used to backfill the rest of the trenches to the subgrade level.

The fill should be compacted in maximum lift thicknesses of 200 mm, with a heavy vibratory compactor, to 98% of the standard proctor maximum dry density. The fill operations should be monitored by a geotechnical engineer/technician to ensure that all areas are adequately compacted. All backfilling operations within the building should be supervised on a full time basis by qualified geotechnical personnel.

FOUNDATIONS AND EARTHQUAKE DESIGN

Conventional strip and spread footings for the proposed four-storey slab-on-grade building at this site may be placed on the compact to dense silt and sand till with a design bearing capacity of 150 kPa (3000 psf) for serviceability limit state (SLS) and 225 kPa (4500 psf) for Factored Ultimate Limit State (ULS) bearing pressures. This native soil is expected to be found at a depth of 1.2 m to 4.0 m below the existing concrete surface.

The Seismic Site Response Classification for strip and pad foundations at this site has been evaluated as Type D.

Footings which are to be constructed next to each other at different elevations should be located far enough away, such that the slope from the bases of the adjacent sides of the footings is at least 10 horizontal to 7 vertical.

All footings exposed to frost action should be covered with at least 1200 mm of earth cover or an

equivalent value of insulation.

The total and differential settlements from footings designed as per our recommendations above are expected to be less than 25 mm and 19 mm respectively.

All footings must be inspected by Canada Engineering Services Inc., staff to verify the recommended bearing pressures in this report.

FLOOR SLAB CONSTRUCTION AND DRAINAGE

The floor slab of the proposed four-storey residential building may be constructed as slab on grade on the underlying native soils and the compacted fill materials, providing all deleterious material such as topsoil and organics are removed and any soft areas replaced with an approved fill, compacted to 98% of the SPMDD. The subgrade should be proof rolled to determine if there are any weak areas that would need to be sub-excavated and replaced with an approved fill material, before placing the granular base material. A 100 mm thick layer of granular A or pea gravel should be placed below the concrete floor to serve as a base material and a moisture barrier.

LATERAL EARTH PRESSURES ON BASEMENT WALLS

The basement walls should be designed for an earth pressure P, as given by:

$$P = 0.65\ K\ (\gamma H + q)$$

where P = Earth pressure at depth H
K = Applicable Coefficient of earth pressure
Ko = Coefficient of earth pressure at rest
Kp = Coefficient of Passive earth pressure
Ka = Coefficient of active earth pressure
γ = Unit weight of the soil behind the wall
H = depth of excavation
q = Any surcharge load

The above expression assumes that free draining conditions exist behind the wall.
For this site the following values may be used:

	FILL	NATIVE UNDISTURBED SOIL
Wet unit weight (γ) kN/cu. m	20.0	21.5
Soil weight above water table kN/cu. m	18.0	18.5
Coefficient of active earth pressure (Ko)	0.5	0.5
Coefficient of active earth pressure (Ka)	0.3	0.28
Coefficient of passive earth pressure (Kp)	3.0	3.5

All temporary excavations should conform with the Ontario Occupational Health and Safety Act.

PAVEMENT DESIGN

The subgrade for pavement construction along trenched areas at this site is expected to be primarily compacted reworked silt and sand till.

The following pavement structure thicknesses are recommended. Please also note that some municipalities will not permit the use of burrowed granular "A" and granular "B." For these municipalities a crushed quarry material should to be used.

Minimum Pavement Design Thickness		
Pavement Layer	**Car/Light Duty**	**Driveway/Medium Duty**
Asphaltic Concrete	40 mm HL 3 (OPSS Form 310)	40 mm HL3 50 mm HL8 (OPSS Form 310)
Granular "A" Base	150 mm	150 mm
Granular "B"Subbase	150 mm	300 mm

The above pavement thicknesses assume adequate positive drainage of the subbase, and that dry condition prevails during the construction phase. The granular subbase thicknesses may require adjustments depending upon the subgrade soil conditions, weather conditions during construction and the use by heavy construction traffic. If wet weather conditions and heaving and rolling of the subgrade occur, the subbase thicknesses may have to be increased substantially to obtain a stable pavement.

The upper 600 mm of the subgrade should be compacted to at least 98% SPMDD, and below, the compaction should be to 95% of the SPMDD. The granular subbase and base materials should be compacted to at least 100% SPMDD. Asphaltic concrete should be compacted to 97% of their Marshall bulk densities.

It is essential that the subgrade be properly crowned and graded to avoid ponding of water along its lengths and sides so as to drain towards catch basins, or shoulders. In preparing the final subgrade levels, it should be fine graded, free from depressions, with the final compaction carried out by a smooth drum roller. All runoff water from the asphalt surface should also be channelled away from the edges of the pavements to catch basins or side drains.

GENERAL COMMENTS

It is possible that the soil and water conditions between boreholes are quite different from those found at the borehole locations. Any interpretation of data for areas between boreholes should be viewed with this in mind. The accuracy of our report is limited to the findings at specific borehole locations.

The inspections and reviews of data described above were carried out based on the terms of reference as outlined earlier in this report. It was prepared specifically for the use for the construction of the four-storey residential development.

Contractors bidding on the site services should carry out their own investigations to determine how the soil conditions at this site will affect their performance.

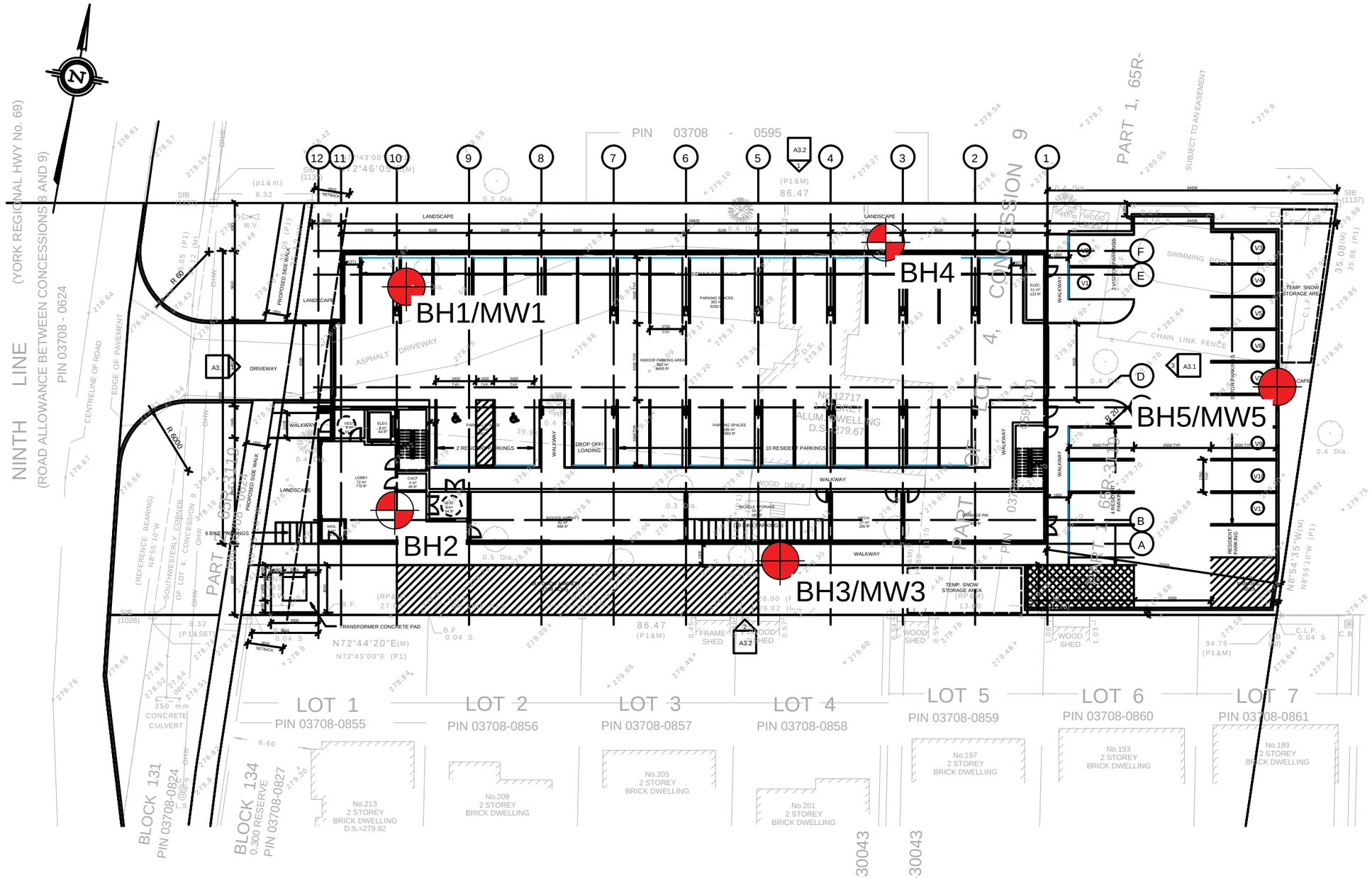
This report was prepared from limited data. Should there be any design or construction changes that would require a review of the geotechnical analyses or any questions regarding the geotechnical aspects of any codes or standards, then this office should be consulted. This may necessitate a supplementary investigation and report for our recommendations to be reliable.

Sincerely,
CANADA ENGINEERING SERVICES INC.

Lawrence Yu, P. Eng.
Senior Geotechnical Engineer

Ram Jagdat. P. Eng.
Consulting Engineer.
Principal





LEGEND:

- BOREHOLE LOCATION
- BOREHOLE/ MONITORING WELL LOCATION

DRAWING REFERENCED TO THE SITE PLAN PREPARED BY ZSQUARE CONSULTING INC., DATED JUNE 5, 2026.

CLIENT:
ANGIL DEVELOPMENT GROUP INC.
2710 14TH AVENUE
MARKHAM, ONTARIO
L3R 0J1

PROJECT:
GEOTECHNICAL INVESTIGATION
12717 NINTH LINE
STOUFFVILLE, ONTARIO
L4A 7X3

TITLE:
SURVEY PLAN SHOWING BOREHOLE/MONITORING WELL LOCATIONS

SCALE:	DATE:
AS SHOWN	JUNE/ 2026
DRAWING NO:	PROJECT No:
1	260052

CANADA ENGINEERING SERVICES INC.
39 DAVISBROOK BOULEVARD
SCARBOROUGH, ONTARIO M1T 2H6
Ph: 416 492 4000 Fax: 416 492 4001
E-mail address: cesi@cesi.ca

Project No: 200015

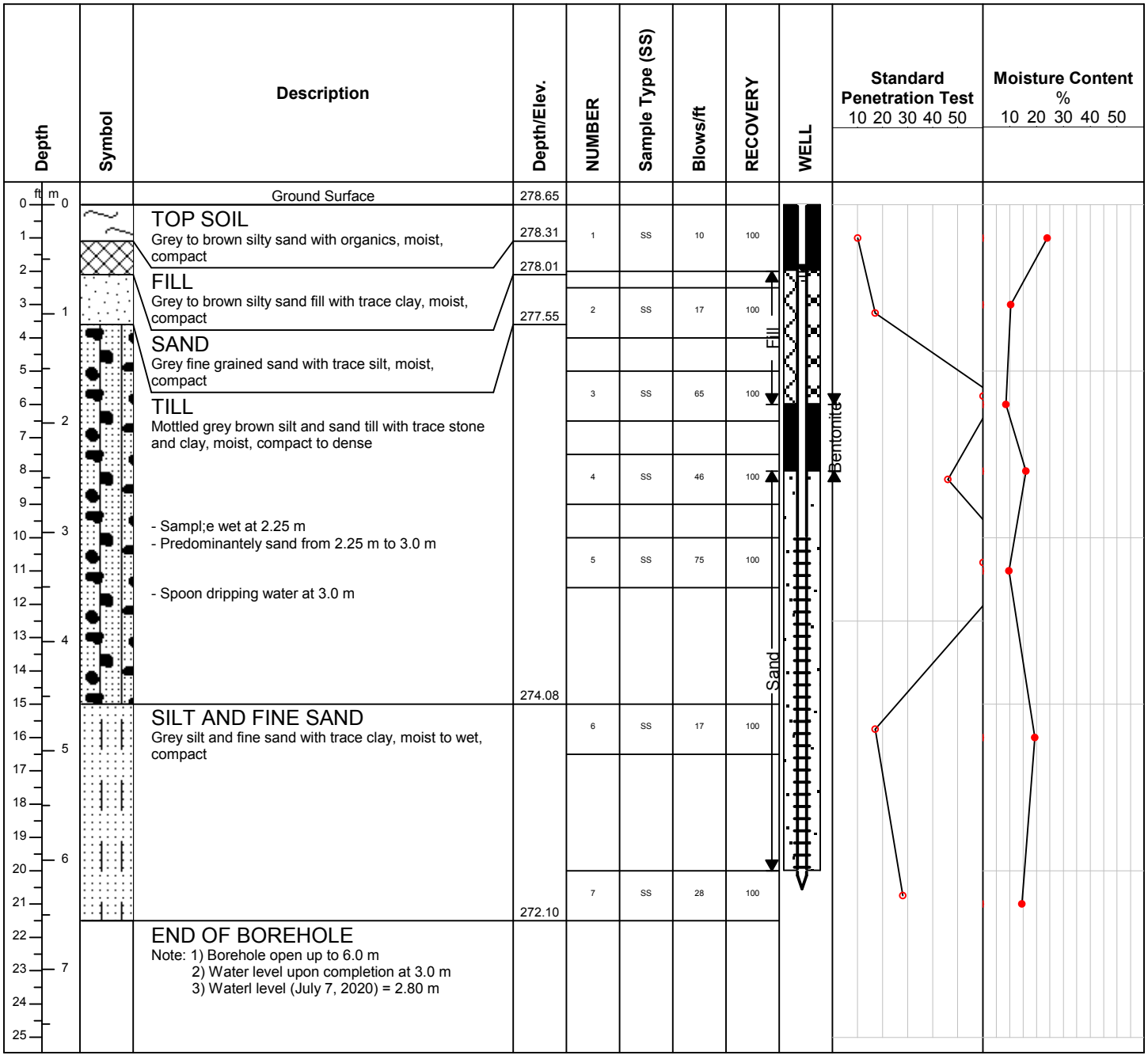
Log of Borehole No. 1

Project: Proposed Residential Development

Client: Angil Development Group Inc.

Technologist: Y.G.

Location: 12717 Ninth Line, Stouffville, Ontario



Drill Method: Track Mounted Drill Rig

Drill Date: 4th June, 2020

Hole Size: 150 mm diameter

Canada Engineering Services Inc.
39 Davisbrook Blvd.
Scarborough, Ontario
M1T 2H6

Checked By: R.J.

Datum: Referenced to the northwest corner of the property line with elevation of 278.5 m

Project No: 200015

Log of Borehole No. 2

Project: Proposed Residential Development

Client: Angil Development Group Inc.

Technologist: Y.G.

Location: 12717 Ninth Line, Stouffville, Ontario

Depth (ft / m)	Description	Depth/Elev.	NUMBER	Sample Type (SS)	Blows/ft	RECOVERY
0 / 0	Ground Surface	278.60				
0–2 / 0–0.6	**TOP SOIL** Grey to brown silty sand with organics, moist, compact	278.26	1	SS	7	100
2–3 / 0.6–1	**FILL** Grey to brown silty sand fill with trace clay, moist, compact	277.96				
3–6 / 1–2	**SAND** Grey fine grained sand with trace silt, moist, compact	277.69	2	SS	15	100
6–15 / 2–4.5	**TILL** Mottled grey brown silt and sand till with trace stone and clay, moist, compact to very dense - Pocket Penetrometer Reading at 1.5 m = 250 kPa - Sand seam observed from 1.3 to 1.4 m - Pocket Penetrometer Reading at 2.2 m > 450 kPa - Pocket Penetrometer Reading at 3.0 m = 450 kPa - Wet sand seam observed at 4.5 m	274.03	3	SS	32	100
			4	SS	62	100
			5	SS	58	100
15–21 / 4.5–6.4	**SILT AND FINE SAND** Grey silt and fine sand with trace clay, moist to wet, dense to loose	272.05	6	SS	34	100
			7	SS	9	100
22–23 / 6.7–7	**END OF BOREHOLE** Note: 1) Borehole open up to 4.5 m 2) Water level upon completion at 3.6 m					

SPT: 10 20 30 40 50 60 70

Moisture Content: % 10 20 30 40 50 60 70

Moisture Content values: 27, 16.9, 10.7, 10.4, 6.8, 20.5, 12.8

Drill Method: Track Mounted Drill Rig

Drill Date: 5th June, 2020

Hole Size: 150 mm diameter

Canada Engineering Services Inc.
39 Davisbrook Blvd.
Scarborough, Ontario
M1T 2H6

Checked By: R.J.

Datum: Referenced to the northwest corner of the property line with elevation of 278.5 m

Project No: 200015

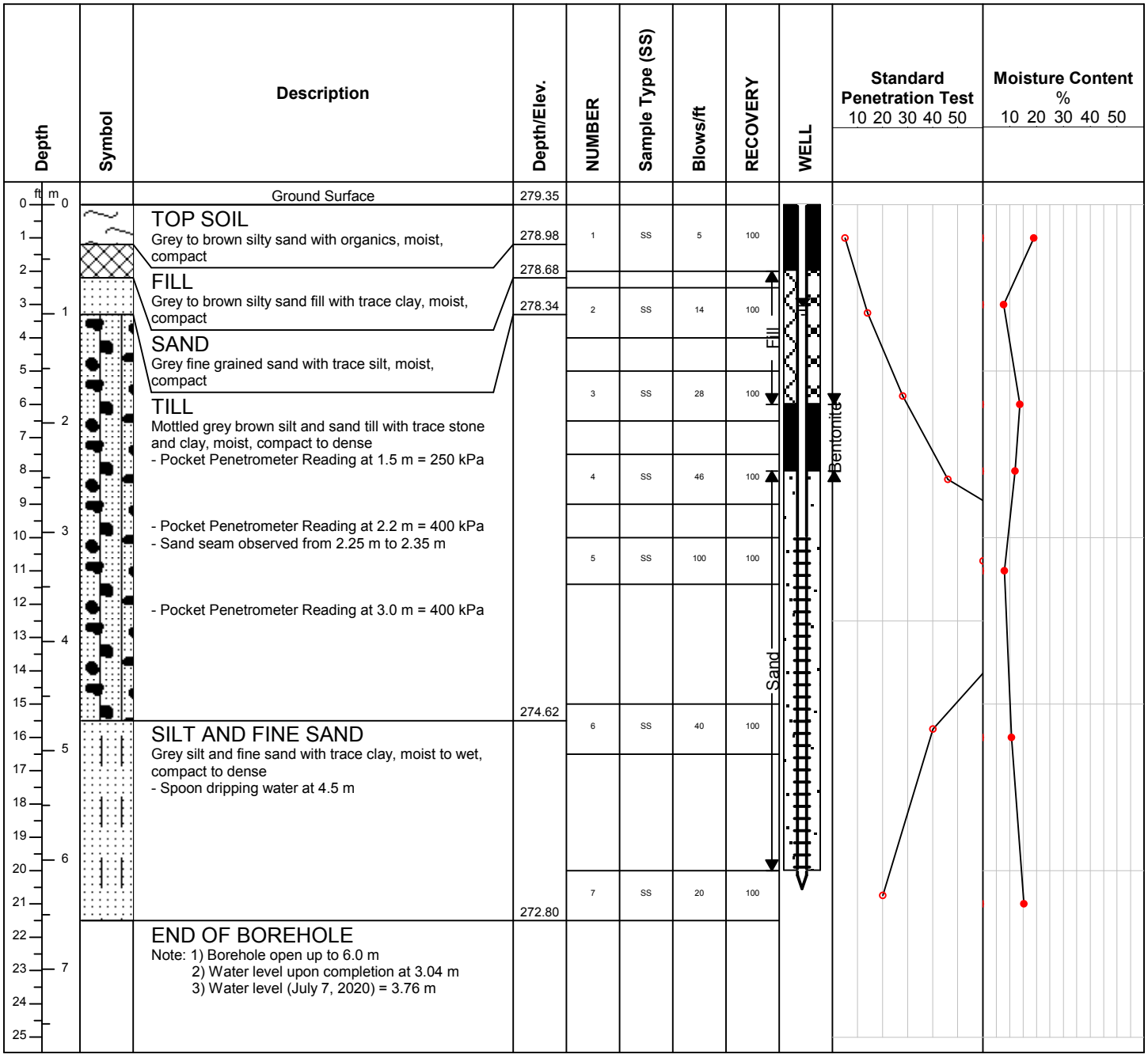
Log of Borehole No. 3

Project: Proposed Residential Development

Client: Angil Development Group Inc.

Technologist: Y.G.

Location: 12717 Ninth Line, Stouffville, Ontario



Drill Method: Track Mounted Drill Rig

Drill Date: 5th June, 2020

Hole Size: 150 mm diameter

Canada Engineering Services Inc.
39 Davisbrook Blvd.
Scarborough, Ontario
M1T 2H6

Checked By: R.J.

Datum: Referenced to the northwest corner of the property line with elevation of 278.5 m

Project No: 200015

Log of Borehole No. 4

Project: Proposed Residential Development

Client: Angil Development Group Inc.

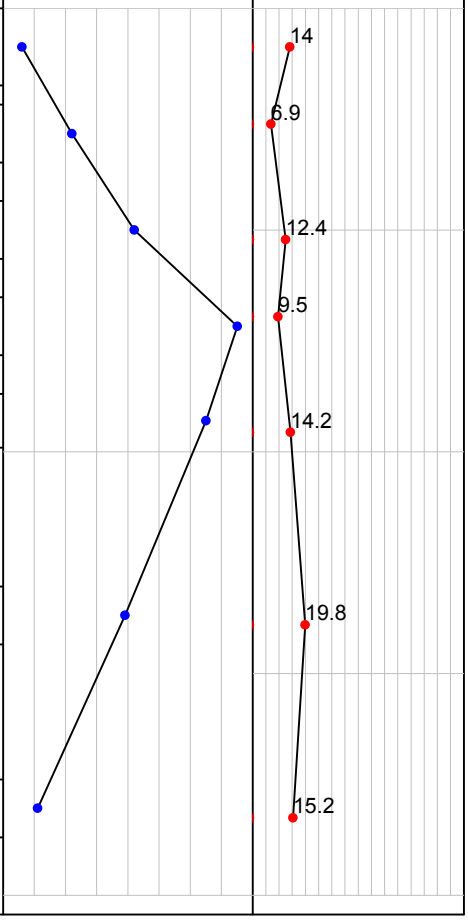
Technologist: Y.G.

Location: 12717 Ninth Line, Stouffville, Ontario

Depth (ft / m)	Description	Depth/Elev.	NUMBER	Sample Type (SS)	Blows/ft	RECOVERY
0 / 0	Ground Surface	279.48				
0–2 / 0	**TOP SOIL** Grey to brown silty sand with organics, moist, compact	279.17 278.87	1	SS	6	100
3–4 / 1	**FILL** Grey to brown silty sand fill with trace clay, moist, compact	278.41	2	SS	22	100
4–6 / 1–2	**SAND** Grey fine grained sand with trace silt, moist, compact		3	SS	42	100
6–15 / 2–4	**TILL** Mottled grey brown silt and sand till with trace stone and clay, moist, compact to very dense - Pocket Penetrometer Reading at 1.5 m = 400 kPa - Pocket Penetrometer Reading at 2.2 m > 450 kPa - Predominantely sand from 2.2 m - Pocket Penetrometer Reading at 3.0 m = 450 kPa	274.91	4 5	SS SS	75 65	100 100
15–21 / 4–6	**SILT AND FINE SAND** Grey silt and fine sand with trace clay, moist to wet, dense to compact - Spoon dripping water at 4.5 m	272.92	6 7	SS SS	39 11	100 100
22–23 / 7	**END OF BOREHOLE** Note: 1) Borehole open up to 4.8 m 2) Water level upon completion at 3.6 m					

SPT (10 20 30 40 50 60 70)

Moisture Content (% — 10 20 30 40 50 60 70)



Drill Method: Track Mounted Drill Rig

Drill Date: 4th June, 2020

Hole Size: 150 mm diameter

Canada Engineering Services Inc.
39 Davisbrook Blvd.
Scarborough, Ontario
M1T 2H6

Checked By: R.J.

Datum: Referenced to the northwest corner of the property line with elevation of 278.5 m

Project No: 200015

Log of Borehole No. 5

Project: Proposed Residential Development

Client: Angil Development Group Inc.

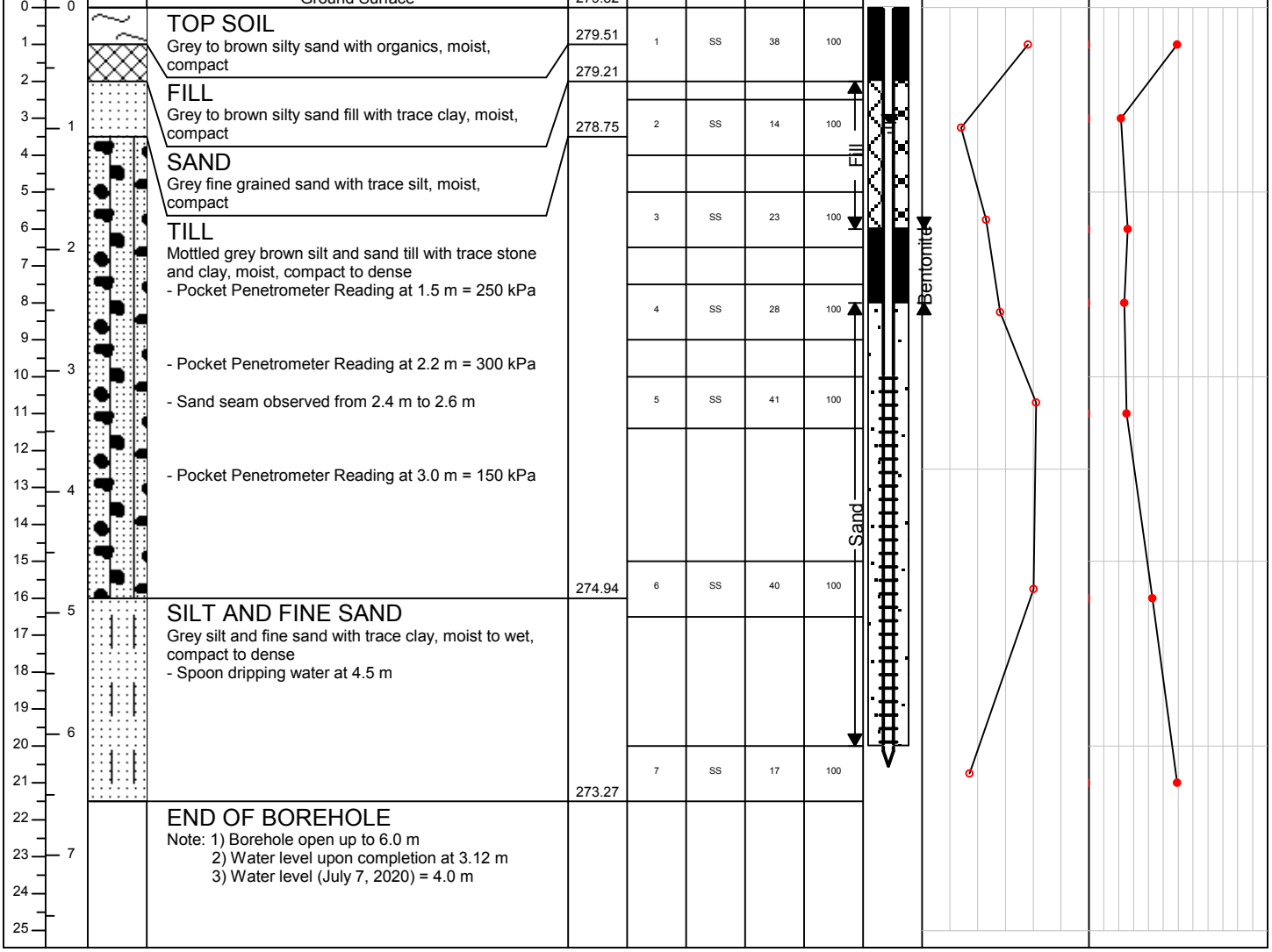
Technologist: Y.G.

Location: 12717 Ninth Line, Stouffville, Ontario

Depth (ft / m)	Description	Depth/Elev.	NUMBER	Sample Type (SS)	Blows/ft	RECOVERY	WELL
	Ground Surface	279.82					
0–1 / 0	**TOP SOIL** Grey to brown silty sand with organics, moist, compact	279.51	1	SS	38	100	
1–3 / 0–1	**FILL** Grey to brown silty sand fill with trace clay, moist, compact	279.21	2	SS	14	100	Fill
3–4 / 1	**SAND** Grey fine grained sand with trace silt, moist, compact	278.75					
4–16 / 1–5	**TILL** Mottled grey brown silt and sand till with trace stone and clay, moist, compact to dense - Pocket Penetrometer Reading at 1.5 m = 250 kPa - Pocket Penetrometer Reading at 2.2 m = 300 kPa - Sand seam observed from 2.4 m to 2.6 m - Pocket Penetrometer Reading at 3.0 m = 150 kPa	274.94	3 4 5 6	SS SS SS SS	23 28 41 40	100 100 100 100	Bentonite Sand
16–21 / 5–6	**SILT AND FINE SAND** Grey silt and fine sand with trace clay, moist to wet, compact to dense - Spoon dripping water at 4.5 m	273.27	7	SS	17	100	
21–25 / 6–7	**END OF BOREHOLE** Note: 1) Borehole open up to 6.0 m 2) Water level upon completion at 3.12 m 3) Water level (July 7, 2020) = 4.0 m						

Standard Penetration Test (10 20 30 40 50)

Moisture Content % (10 20 30 40 50)



Drill Method: Track Mounted Drill Rig

Drill Date: 4th June, 2020

Hole Size: 150 mm diameter

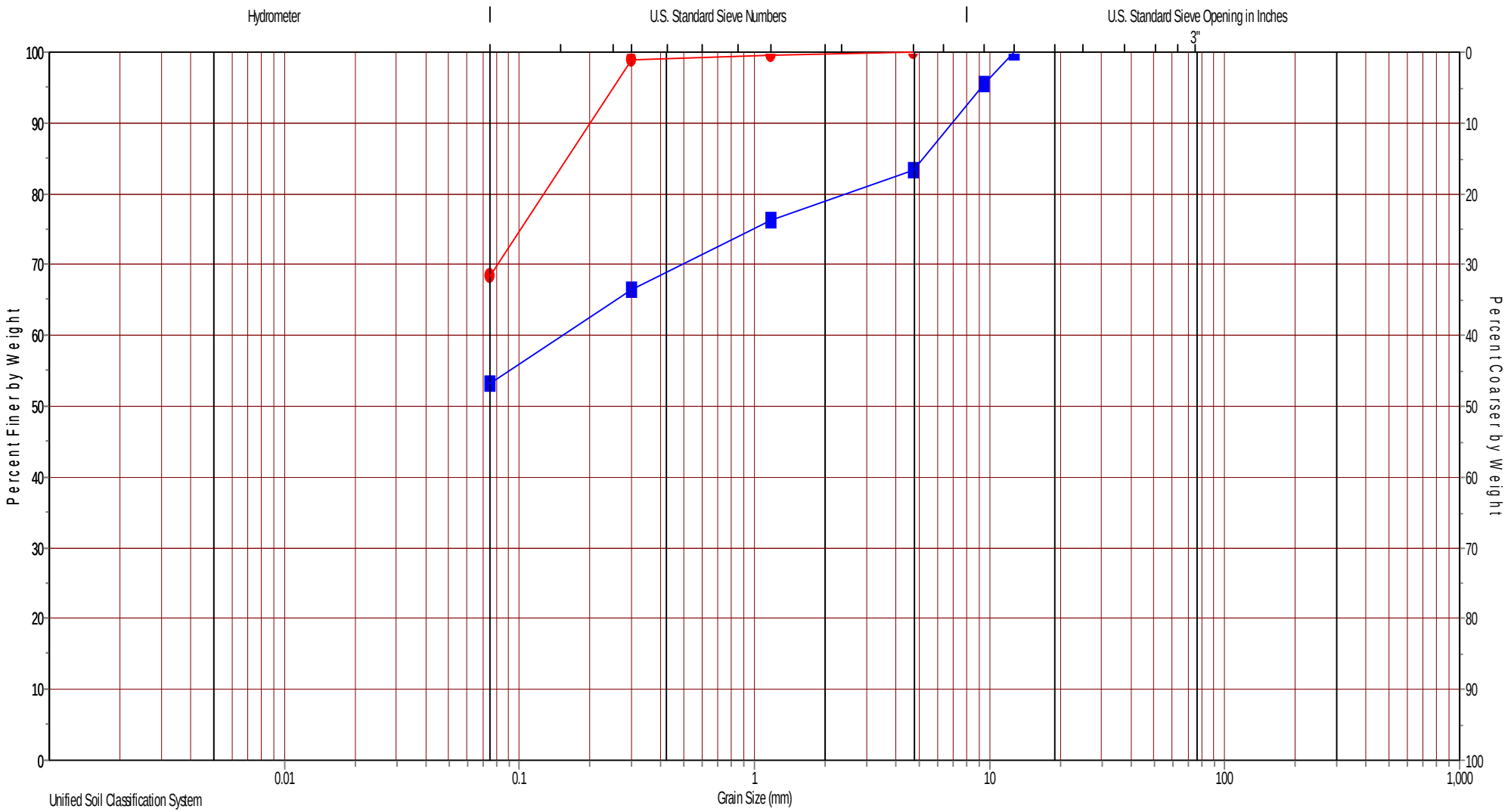
Canada Engineering Services Inc.
39 Davisbrook Blvd.
Scarborough, Ontario
M1T 2H6

Checked By: R.J.

Datum: Referenced to the northwest corner of the property line with elevation of 278.5 m

Figure 1	Project No.: 260052	GRAINSIZE DISTRIBUTION GRAPH
	Location: 12717 Ninth Line, Stouffville, Ontario	Tested By: YG
	Client: Angil Development Group Inc.	Test Date: 6/9/2020

Symbol	Sample No.	% Clay	% Silt	% Fine Sand	% Medium Sand	% Coarse Sand	% Fine Gravel	% Coarse Gravel	% Cobbles
■	BH2SA3-5ft	<53.2	<53.2	13.3	9.9	7.3	16.7	0.0	0.0
●	BH5SA6-15ft	<68.4	<68.4	30.5	0.8	0.4	0.0	0.0	0.0



Unified Soil Classification System

SILT or CLAY		SAND			GRAVEL		COBBLES	BOULDERS
Clay	Silt	fine	medium	coarse	fine	coarse		

APPENDIX A

GEOTECHNICAL SYMBOLS AND TERMS USED IN BOREHOLE/TEST PIT LOGS

Soil Description

Terminology describing soil types:

Topsoil	-	Mixture of soil and humus capable of supporting good vegetative growth
Peat	-	Fibrous fragments of visible and invisible decayed organic matter
Till	-	Unstratified and unsorted glacial deposit which may include any particle sizes Such as clay, silt, sand, stone, cobbles and boulders
Fill	-	Materials not identified as deposited by natural geological processes

Terminology describing soil structure:

Desiccated	-	Having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	-	Material breaks along plane of fracture
Varved	-	Composed of regular alternating layers of silt and clay
Laminated	-	Alternating layers of beds less than 6 mm thick
Stratified	-	Alternating layers of beds greater than 6 mm thick
Blocky	-	Material can be broken into small and hard angular lumps
Lensed	-	Irregular shaped pockets of soil having different particle size, texture, or colour from materials above and below
Well Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded		Predominantly one grain size

Soil descriptions and classification are based on the Unified Soil Classification System (USCS) (ASTM D-2488), which classifies soils on the basis of engineering properties. The system divides soils into three major categories: (1) coarse grained, (2) fine-grained, and (3) highly organic. The soil is then subdivided based on either gradation or plasticity characteristics. This system provides a group symbol (eg. SM) and group name (eg. silty sand) for identification. The classification excludes particles larger than 76 mm.

Terminology describing materials outside the USCS, (eg. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

Trace	- Trace sand, trace silt, etc.	Less than 10%
Some	- Some sand, some silt, etc.	10 - 20%
Adjective	- Gravelly, sandy, silty, clayey, etc.	20 - 30%
“And”	- and gravel, and silt, etc.	> 35%
Noun	- Gravel, Sand, Silt, Clay	> 35% and main fraction

The standard terminology to describe cohesionless soils includes the compactness as determined by the Standard Penetration Test “N” -value.

Compactness	**“N” Value**
Very Loose	< 4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	> 50

GEOTECHNICAL SYMBOLS AND TERMS USED IN BOREHOLE/TEST PIT LOGS

The standard terminology to describe cohesive soils includes consistency, which is based on undrained shear strength as measured by in-situ vane tests, penetrometer tests, unconfined compression tests or similar field and laboratory analysis. Standard Penetration Test "N" values can also be used to provide an approximate indication of the consistency and shear strength of fine grained, cohesive soils.

Consistency	Undrained Shear Strength (kPa)	"N" Value	Field Identification
Very Soft	< 12.5	< 2	Easily penetrated several cm by the fist
Soft	12.5 - 25	2 - 4	Easily penetrated several cm by the thumb
Firm	25 - 50	4 - 8	Can be penetrated several cm by the thumb with moderate effort
Stiff	50 - 100	8 - 15	Readily indented by the thumb but penetrated only with great effort
Very Stiff	100 - 200	15 - 30	Readily indented by the thumb nail
Hard	> 200	> 30	Indented with difficulty by the thumbnail

Note: "N" Value - The Standard Penetration Test records the number of blows of a 140 lb (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler 1 foot (305 mm). For split spoon samples where full penetration is not achieved, the number of blows is reported over the sampler penetration in millimeters (eg. 50/75).

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



Asphalt Concrete Topsoil Fill Peat Clay Silt Sand Gravel

WATER LEVEL MEASUREMENTS



Open Borehole or Test Pit



Monitoring Well, Piezometer or Standpipe

SAMPLE TYPE



SS Split spoon sample (obtained from the Standard Penetration Test)



AS Auger sample

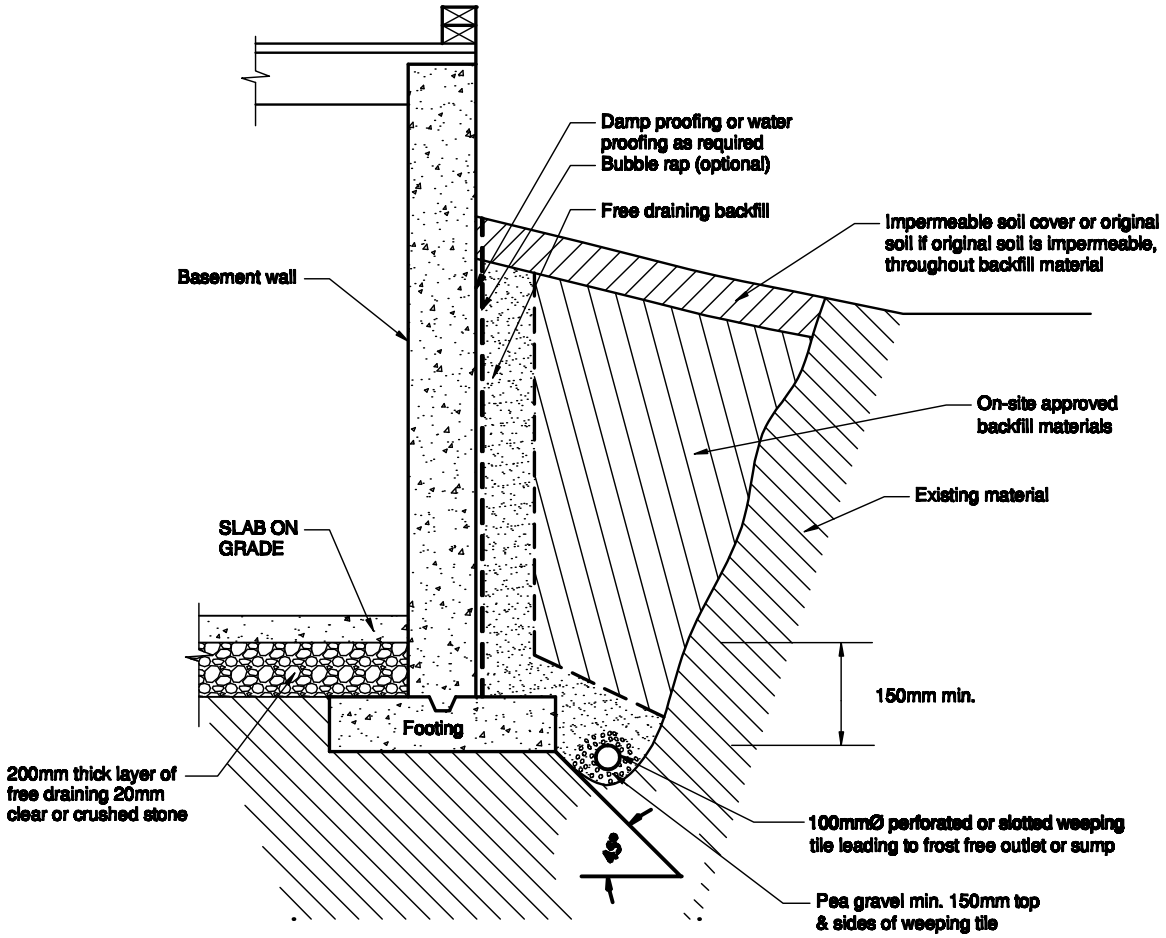


ST Thin Wall Sample or Shelby Tube



VS Shovel sample

Appendix “B”



NOTES:

1. Drainage tiles to consist of 100mm (4") dia. weeping tile or equivalent perforated pipe leading to a postive sump or outlet. Invert to be minimum of 150mm (6") below underside of floor slab.
2. Pea gravel 150mm (6") top and sides of drain. If drain is not on footing, 100mm (4") of pea gravel below drain. 20mm (3/4") clear or crushed stone may be used provided it is covered by an approved porous membrane (Terrafix 270R or equivalent)
3. C.S.A fine concrete aggreegate to act as filler material. Minimum 300mm (12") top and sides of tile drain. This may be replaced by an approved porous membrane as indicated in 2.
4. Free-draining backfill - Class B pit-run gravel or equivalent compacted to 93-95% Standard Proctor density. Do not exceed 95% Standard Proctor density. Do not compact closer than 1.8m (6') from wall with heavy equipment. Use hand controlled light compaction equipment within 1.8m (6') of wall.
5. Impermeable backfill seal - compacted clay, clay silt or equivalent. If original soil is free-draining materials seal may be omitted.
6. Do not backfill until wall is supported by basement and floor or adequate bracing.
7. Moisture barrier to consist of 20mm (3/4") compacted crushed stone or equivalent free-draining material. Layer to be 200mm (8") thick.
8. Basement wall to be damp-proofed.
9. Exterior grade to slope away from wall.
10. Slab on grade should not be structually connected to wall or footing.
11. Underfloor drain invert to be at least 300mm (1') below underside of floor slab. Tile placed in parallel rows 6-8m (20'-25') on centres one way.
12. Do not connect the underfloor drain to perimeter drains.
13. If the 20mm (3/4") stone requires surface blinding, use 6mm (1/4") stone chips.

APPENDIX -B

DRAINAGE AND BACKFILL RECOMMENDATIONS

CANADA ENGINEERING SERVICES INC.