Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

A REPORT TO
HOT POND ENTERPRISES CORP.

A GEOTECHNICAL INVESTIGATION FOR PROPOSED APARTMENT BUILDINGS

MAPLE AVENUE AND VICTORIA STREET

MUNICIPALITY OF DYSART ET AL

REFERENCE NO. 2106-S205

OCTOBER 2021

DISTRIBUTION

3 Copies - Hot Pond Enterprises Corp.
1 Copy - Soil Engineers Ltd. (Barrie)
1 Copy - Soil Engineers Ltd. (Richmond Hill)

TABLE OF CONTENTS

TABLES

DIAGRAM

ENCLOSURES

1.0 INTRODUCTION

In accordance with a written authorization from Mr. Richard Carson of Hot Pond Enterprises Corp., a geotechnical investigation was conducted on a parcel of land located at the northwest corner of Maple Avenue and Victoria Street in the Municipality of Dysart at al.

The purpose of the investigation was to reveal the subsurface conditions and determine the engineering properties of the disclosed soils for the design and construction of three apartment buildings. The geotechnical findings and resulting recommendations are presented in this Report.

2.0 SITE AND PROJECT DESCRIPTION

The Municipality of Dysart et al is situated in a physiographic region known as the Algonquin Highlands where sandy soil and glacial till overlies hard granitic Precambrian bedrock. In places, it has been filled with lacustrine silt and clay, with swamps and bogs in low-lying areas.

The site of investigation, encompassing an approximate area of 0.29 hectare, is located at the northwest corner of Victoria Street and Maple Avenue in the Municipality of Dysart et al. It is in close proximity of Drag River and approximately 200 m from the east shore of Head Lake. At the time of investigation, the site consisted of a single storey dwelling, with detached garage and sheds in the southern portion. Remnants of a previous driveway and structure were evident at the central portion. The balance of the property was vegetated with grass, weeds trees and bushes. The existing site gradient drops slightly towards the southeast.

The latest Site Development Plan, prepared by Greg Bishop Surveying and Consulting Ltd. dated April 9, 2021, indicates that the property will be developed into three apartment buildings with on-grade parking.

3.0 FIELD WORK

The field work, consisting of six (6) sampled boreholes, was performed on August 4 and 5, 2021, at the locations shown on the Borehole and Monitoring Well Location Plan, Drawing No. 1.

The boreholes were advanced at intervals to the sampling depths by a track-mounted, continuous-flight power-auger machine equipped for soil sampling. Standard Penetration Tests, using the procedures described on the enclosed "List of Abbreviations and Terms", were performed at the sampling depths to 2 m or 6.6 m. The results are recorded as the Standard Penetration Resistance (or 'N' values) of the subsoil. The relative density of the non-cohesive strata and the consistency of the cohesive strata are inferred from the 'N' values. Split-spoon samples were recovered for soil classification and laboratory testing.

Relatively weak soil deposit was contacted in the boreholes. Field vane shear tests were performed in the weak clay layer in Borehole 4 to determine the undrained shear strength. In addition, Dynamic Cone penetration tests were conducted beyond the sampling depth in the deeper boreholes to evaluate the competent soil stratum. The dynamic cone penetration tests were terminated at a depth ranging from 13.0 and 24.0 m, where virtual refusal was contacted, having blow counts of more than 100 blows per 30 cm of cone penetration.

Monitoring wells, 50 mm in diameter, were installed in three (3) borehole locations to facilitate a hydrogeological assessment by others. The depth and details of monitoring wells are shown on the corresponding Borehole Logs.

The ground elevation at each borehole location was determined with reference to a temporary benchmark (Top of Catch Basin) located on Maple Street. It has a geodetic elevation of 319.16 m, as shown in the Site Development Plan, prepared by Greg Bishop Surveying and Consulting Ltd.

4.0 SUBSURFACE CONDITIONS

The site is mostly vegetated, with existing structures and remnants of a previous driveway. The investigation has revealed that beneath the topsoil and earth fill, the site is underlain by an alluvial deposit and a silt stratum with occasional sand and clay layers within the investigated depths.

Detailed descriptions of the encountered subsurface conditions are presented on the Borehole Logs, comprising Figures 1 to 6, inclusive. The revealed stratigraphy is plotted on the Subsurface Profile, Drawing No. 2. The engineering properties of the disclosed soils are discussed herein.

4.1 **Topsoil** (Boreholes 1, 4 and 6)

Topsoil of 8 to 20 cm in thickness was contacted at the ground surface of 3 boreholes. Thicker topsoil layer may be contacted beyond the borehole locations, especially in the area of trees and bushes.

4.2 **Earth Fill** (Boreholes 1, 2, 3, 5 and 6)

A layer of earth fill was encountered at most of the borehole locations. It is a silty sand fill with pockets of clay and topsoil inclusions. Boreholes 5 and 6 were terminated in the earth fill at a depth of 2.0 m from grade. In the other boreholes, the earth fill extends to a depth of 1.4 to 2.6 m from the prevailing ground surface.

The obtained ‘N’ values range from 0 to 16, with a median of 4 blows per 30 cm of penetration, indicating the fill is generally loose, probably placed without compaction control. It is unsuitable for supporting any structure sensitive to settlement.

One must be aware that the samples retrieved from boreholes may not be truly representative of the geotechnical quality of the fill, and do not indicate whether the topsoil beneath the earth fill was completely stripped. This should be further assessed by test pits.

4.3 **Alluvium** (Boreholes 1, 2 and 3)

The alluvium consists of silt and sand with shells and organics. It could have been deposited on historical flood plain or wetland in the past. The boreholes were terminated with soil sampling in the alluvium at 6.6 m and 6.7 m from grade and Dynamic Cone penetration tests were conducted beyond the sampled depth until the soil resistance virtually increases.

The alluvium is compressible and unstable under loading conditions. The organic content may generate volatile gases under anaerobic conditions.

4.4 **Silt and Clay**

Native silt and clay deposits were encountered in Borehole 4. The deposits are fine grained, with variable amount of sand. Grain size analyses on three representative samples were performed with Atterberg Limits obtained on one of the samples. The results are plotted on Figures 7 and 8; the Atterberg Limits are presented below:

Liquid Limit	28%
Plastic Limit	17%

The natural water content of the soil samples range from 7% to 30%, with a median of 26%, indicating soil saturation below 0.8 m from grade.
The obtained 'N' values ranged from weight of hammer (i.e. 0 blows) to 4 blows per 30 cm penetration. Field vane shear tests were performed in the clay stratum; the undrained shear strength was obtained at 24 kPa ('N' value of 3) and 60 kPa ('N' value of 4), having the sensitivity values of 2.5 and 4.0, respectively.

Based on the above findings, the following engineering properties of the clay and silt deposits are deduced:

- High frost susceptibility and high soil-adfreezing potential.
- The silt is erodible; it is susceptible to migration through small openings under seepage pressure.
- Relatively low to low permeability, depending on the clay content, with an estimated coefficient of permeability of 10^{-5} to 10^{-7} cm/sec.
- The soil will consolidate under foundation and surcharge loads.
- In excavation, the saturated silt and clay may slough and subject to base heaving.
- A poor pavement-supportive material, with an estimated California Bearing Ratio (CBR) value of 3% or less.
- Moderately high to moderately low corrosivity to buried metal, with an estimated electrical resistivity of 3000 to 4000 ohm·cm.

4.5 **Interpretation of Dynamic Cone Penetration Test Results** (Boreholes 1, 2, 3 and 4)

Dynamic cone penetration tests were performed beyond 6.6 m or 6.7 m in Boreholes 1, 2, 3 and 4. The test results are plotted on the Logs of Boreholes, Figures 1 to 4, inclusive.

The tests extended to a depth of 13.0 to 24.0 m where virtual refusal of over 100 blows per 30 cm of penetration was encountered at the depth of termination. It is inferred that more competent soil can be found below these depths.

5.0 GROUNDWATER CONDITION

The boreholes were checked for the presence of groundwater or the occurrence of cave-in upon their completion. The data are plotted on the Borehole Logs and summarized in Table 1.

Table 1 - Groundwater Levels

Borehole No.	Ground Elevation (m)	Monitoring Well Depth (m)	Seepage Encountered During Augering		Groundwater/Cave-in* Level On Completion	
			Depth (m)	Amount	Depth (m)	Elevation (m)
1	319.7	5.5	0.6	Appreciable	1.5	318.2
2	319.8	5.5	1.4	Appreciable	1.1	318.7
3	320.0	No well	0.9	Appreciable	0.9	319.1
4	319.9	5.5	0.8	Appreciable	0.8	319.1
5	319.0	No well	0.8	Appreciable	1.1	317.9
6	319.5	No well	0.8	Appreciable	1.2*	318.3*

Groundwater or wet cave-in was detected in the boreholes at 0.8 to 1.5 m from the prevailing ground surface, representing the groundwater regime between El. 319.1 to 317.9 m. The groundwater level will be subject to seasonal fluctuation and affected by the water level of Head Lake and Drag River, in close vicinity of the property.

Monitoring wells were installed in three boreholes. The water level in the monitoring wells will be recorded by others.

6.0 DISCUSSION AND RECOMMENDATIONS

The investigation has revealed that beneath the topsoil and earth fill, the site is underlain by an alluvial deposit and a loose silt stratum with occasional sand and clay layers.
The soil strength is relatively weak with low 'N' values. Dynamic cone penetration tests were performed in some boreholes to evaluate the depth of competent ground. The tests extended to a depth of 13.0 to 24.0 m, where virtual refusal was encountered at the depth of termination, showing more competent below these depths.

Groundwater or wet cave-in was detected in the boreholes at 0.8 to 1.5 m from the prevailing ground surface, representing the groundwater regime between El. 319.1 to

317.9 m. It will be subject to seasonal fluctuation and affected by the water level of Head Lake and Drag River, in close vicinity of the property.

The geotechnical findings which warrant special consideration are presented below:

1. The vegetation and topsoil must be removed for site development.
2. After demolition of the existing structures and foundations, the debris must be removed and disposed of off-site. The cavities must be inspected by the geotechnical engineer before backfilling with inorganic earth fill.
3. The existing earth fill and alluvium are not suitable for supporting any structure sensitive to settlement. The alluvium will also undergo long-term settlement and generate volatile gases.
4. If the site will be regraded with additional earth filling for development, the area can be pre-graded and preloaded with the settlement monitored before the construction of site services. However, long-term settlement is still anticipated in the alluvium due to continuous decomposition of organics in the deposit.
5. The alluvium will also generate volatile (methane) gas. A passive venting system must be provided in the building subgrade.
6. Due to the presence of alluvium and the extent of weak subsoils, deep foundation is recommended for the proposed development. Additional boreholes are necessary for the design of deep foundations.
7. In excavation into the saturated soils, the groundwater yield will be appreciable and persistent. Any excavation will have to be de-pressurized by a dewatering system. The appropriate dewatering method should be assessed by test pumping prior to construction.
8. Where basement is contemplated, it must be at least 1.0 m above the floodline and the highest seasonal groundwater level. Otherwise, the basement must be designed for submerge condition with waterproofing and to resist the hydrostatic uplift forces.
9. It is in the Zoning Bylaw that any opening in the buildings must be above El. 320.2 m.

The recommendations appropriate for the project are presented herein. One must be aware that the subsurface conditions may vary between boreholes. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

6.1 Site Preparation

The existing topsoil must be removed for site development.

The existing structures and foundations will be demolished. The debris must be removed and disposed of off-site. The cavity must be inspected by the geotechnical engineer before backfilling for building construction. Any disturbed soils should also be removed. It may be stockpiled on site for reuse.

The backfill in cavities must be inorganic soil free of topsoil or deleterious material, placed and properly compacted in layers.

If the site will be re-graded with earth filling, excessive settlement can be anticipated. The site can be pre-graded and preloaded with additional earth fill to speed up the settlement and the settlement must be monitored from settlement plates. No construction of site services and pavement can be commenced until the settlement has reached a pre-determined level. The site grading plan must be reviewed by the geotechnical engineer to establish the process of pre-grading and preloading.

Long-term settlement is still anticipated in the alluvium due to continuous decomposition of organics in the deposit.

6.2 Foundations

At the time of the report preparation, the detailed designs of the proposed development are not available. It is understood that there will be 3 apartment buildings with on-grade parking. Due to the presence of weak soils, deep foundation and structural slab are recommended for the proposed buildings. The following foundation options can be considered:

Helical Piers/Micropiles

The proposed building foundations can be supported on helical piers, extending into the hard stratum below 13 to 24 m from the prevailing ground surface. The founding elevation and the pile capacity, however, should be determined by the prospective Helical pier contractor since the axial load capacity is directly related to the installation torque of the pile anchor into the soil stratum. Full scale pile load tests will be required to confirm the pile capacity before the production piles are installed.

In case bedrock is encountered at the refusal depths, micropiles installed into the bedrock can be a viable option.

Additional borehole investigation, extending into the hard stratum, will be necessary to provide geotechnical information for the design and installation of Helical piers and Micropiles.

The foundation design must be reviewed by the geotechnical engineer. They must meet the requirements specified in the latest Ontario Building Code and the structures can be designed to resist an earthquake force using Site Classification 'C' (very dense soil or rock). Where the foundation is founded into the bedrock.

Soil Improvement

Geopiers or Menard's controlled modulus column (CMC) can be considered for the building foundation. Once completed, the proposed structures can be constructed on conventional footings and slab-on-grade. A specialist contractor can be consulted for this alternative.

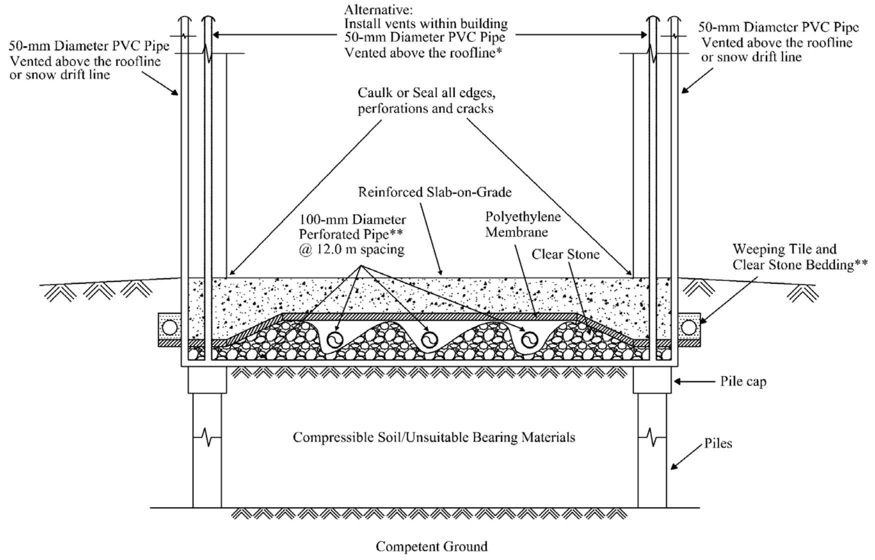
The structures supported on CMC can be designed to resist an earthquake force using Site Classification 'D' (stiff soil).

Exterior footings, grade beams and pile caps located in unheated areas should have a minimum soil cover of 1.8 m for frost protection.

Other Recommendations

With the alluvium in place, a passive venting system will be required beneath the building structures to prevent any volatile gas migration into the structures. Details of the passive venting system are presented in Diagram 1:

Diagram 1 - Passive Ventilation Beneath Building



* Similar to a plumbing stack

** All weeping tiles should be connected to a water/gas separator where the water can be removed to a positive outlet and the gas can be discharged through the vent pipes

6.3 Basement Construction

Where basement is contemplated, it must be above the regional floodline and at least 1.0 m above the highest seasonal groundwater level. Furthermore, any opening in the building structure must be above El. 320.2 m, as per the Zoning By-law of the municipality.

The basement walls should be designed to sustain a lateral earth pressure using the soil parameters in Section 6.8. Any applicable surcharge loads adjacent to the proposed buildings must also be considered in the design of the underground structures. The submerged portion of basement beneath the saturation level or floodline should be waterproofed and designed for the hydrostatic pressure.

6.4 Slab Construction

The building slab should be structurally supported on grade beams and foundations.

If there is a basement under submerged condition, the basement floor should be structurally supported and waterproofed. A concrete floor can be constructed separately on a granular fill, where the utilities and service pipes will be laid above the structurally slab.

6.5 **Underground Services**

The alluvium and weak soils will undergo long term settlement. If the site will be re-graded with earth filling, excessive settlement can be anticipated. The site can be pre-graded and preloaded with additional earth fill to speed up the settlement and the settlement must be monitored from settlement plates. No construction of site services and pavement can be commenced until the settlement has reached a pre-determined level.

Flexible pipe joints should also be considered in the service pipes.

The site grading plan must be reviewed by the geotechnical engineer to establish the process of pre-grading and preloading.

A Class ‘B’ bedding, consisting of compacted 19-mm Crusher-Run Limestone, or equivalent, is recommended for the service pipes. The bedding should be compacted to 95% Standard proctor dry density (SPDD).

In water-bearing soils where dewatering is required, a Class ‘A’ concrete bedding will be required. Alternatively, any use of pea gravel or clear stone bedding must be wrapped around by a geofabric filter to prevent the migration of finer particles into the bedding.

The pipe joints extending into manholes or catch basins should be leak-proof or wrapped with waterproof membrane to prevent any soil migration. Openings to subdrains and catch basins should be shielded with geofabric filter to prevent blockage by silting.

In order to prevent pipe floatation when the sewer trench is deluged with water, a soil cover of not less than two times the diameter of the pipe should be in place at all times after completion of the pipe installation.

6.6 **Backfilling in Trenches and Excavated Areas**

Following the construction of service pipes and foundations, backfill of excavation should consist of selected on-site organic free material, compacted to 95% SPDD in 20 cm lifts, or a suitable thickness as assessed by test strips performed by the equipment which will be used at the time of construction.

The obtainable degree of compaction is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied. As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table 2:

Table 2 - Estimated Water Content for Compaction

Soil Type	Determined Natural Water Content (%)	Water Content (%) for Standard Proctor Compaction	
		100% (optimum)	**Range for 95% or +**
Existing Earth Fill	4 to 39 (median 25)	11	7 to 14
Silt/Silty Clay	7 to 31 (median 27)	15	11 to 20

A majority of the on-site excavated material is too wet for compaction. It will require aeration prior to structural compaction. The existing earth fill should be screened to segregate any topsoil and deleterious material for aeration, prior to reuse for structural backfill. The alluvium is generally unsuitable for reuse for structural backfill.

The compaction of fill must be inspected by a geotechnical technician under the supervision of a geotechnical engineer.

6.7 Pavement Design

Following the completion of site grading and preloading, the recommended pavement for the parking lot and access driveway is given in Table 3.

Table 3 - Pavement Design

Course	Thickness (mm)	OPS Specifications
Asphalt Surface	35	HL4
Asphalt Binder		HL8
Light-Duty Parking	45	
Heavy-Duty and Fire Route	65	
Granular Base	150	OPSS Granular ‘A’ or equivalent
Granular Sub-base		OPSS Granular ‘B’ or equivalent
Light-Duty Parking	250	
Heavy-Duty and Fire Route	400	

In preparation of the pavement subgrade, topsoil and compressible material should be removed. The subgrade must be proof-rolled using a heavy roller or loaded dump truck.

Any soft spot as identified must be rectified by subexcavation and replacing with selected inorganic material, compacted to the specified density.

In the zone within 1.0 m below the pavement subgrade, the backfill should be compacted to at least 98% SPDD, with the water content controlled on the dry side of the optimum. In the lower zone, compaction to 95% SPDD should be achieved.

All the granular bases should be compacted to 100% SPDD.

If the pavement is to be constructed during the wet seasons and extensively soft subgrade occurs, the granular sub-base may require thickening. This can be assessed during construction.

With the presence of alluvium, the pavement subgrade will subject to long term settlement. It is recommended that Biaxial Geogrid (Terrafix TBX-2000 or equivalent) should be used between the subgrade and the granular sub-base to allow uniform settlement in the pavement. Additional asphalt may be placed after a few years after the ground becomes stable.

Along the perimeter where surface runoff may drain onto the pavement, the areas should be properly graded. Subdrains consisting of filter-wrapped weepers, should be provided at low spots and be connected to the catch basins or storm manholes in the paved areas. The invert of the subdrains should be at least 0.4 m beneath the underside of the granular sub-base and backfilled with free-draining granular material.

6.8 Soil Parameters

The recommended soil parameters for the project design are given in Table 4.

Table 4 - Soil Parameters

Unit Weight and Bulk Factor	**Unit Weight (kN/m^3)**		**Estimated Bulk Factor**	
	Bulk	**Submerged**	**Loose**	**Compacted**
Earth Fill/Alluvium	20.5	10.5	1.20	0.98
Native Silt/Silty Clay	21.0	11.0	1.25	1.00

Table 4 - Soil Parameters (cont'd)

Lateral Earth Pressure Coefficients	**Active** **K_a**	**At Rest** **K_o**	**Passive** **K_p**
Compacted Earth Fill and Native Soil	0.40	0.60	2.50
Maximum Allowable Soil Pressure (SLS) For Thrust Block Design			
Compacted Earth Fill and Native Soil		25 kPa	

6.9 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91. The types of soils are classified in Table 5.

Table 5 - Classification of Soils for Excavation

Material	Type
Drained Soils	3
Saturated Soils and Alluvium	4

In excavation, the groundwater yield will be appreciable and persistent. Any excavation will have to be de-pressurized by a dewatering system. The appropriate dewatering method should be assessed by test pumping at the site.

6.10 Caution for Excavation and Dewatering

Vibration monitoring due to heavy machinery and equipment for construction should be carried out to aid in setting baseline levels and to confirm that vibrations are within tolerances. A pre-construction survey should also be completed for structures within the potential zone of influence prior to dewatering.

The vibration monitoring, together with the pre-construction survey, can be used to assess any damage claims which may arise during construction.

7.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of Hot Pond Enterprises Corp. and for review by the designated consultants, contractors, financial institutions, and government agencies. The material in the report reflects the judgment of Kelvin Hung, P.Eng., and Bernard Lee, P.Eng., in light of the information available to it at the time of preparation.

Use of the report is subject to the conditions and limitations of the contractual agreement. Any use which a Third Party makes of this report, and/or any reliance on decisions to be made based on it are the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL ENGINEERS LTD.

LICENSED PROFESSIONAL ENGINEER
10/29/2021
K. W. K. HUNG
100124295
KH
PROVINCE OF ONTARIO

Kelvin Hung, P.Eng.
KH/BL:dd

LICENSED PROFESSIONAL ENGINEER
Oct 29, 2021
B. P. Y. LEE
100104568
PROVINCE OF ONTARIO

Bernard Lee, P.Eng.

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open (split spoon)
DS	Denison type sample
FS	Foil sample
RC	Rock core (with size and percentage recovery)
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0	Field vane test in borehole; the number denotes the sensitivity to remoulding
△	Laboratory vane test
☐	Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres

1lb = 0.454 kg

1 inch = 25.4 mm

1ksf = 47.88 kPa

JOB NO.: 2106-S205

LOG OF BOREHOLE NO.: 1

FIGURE NO.: 1

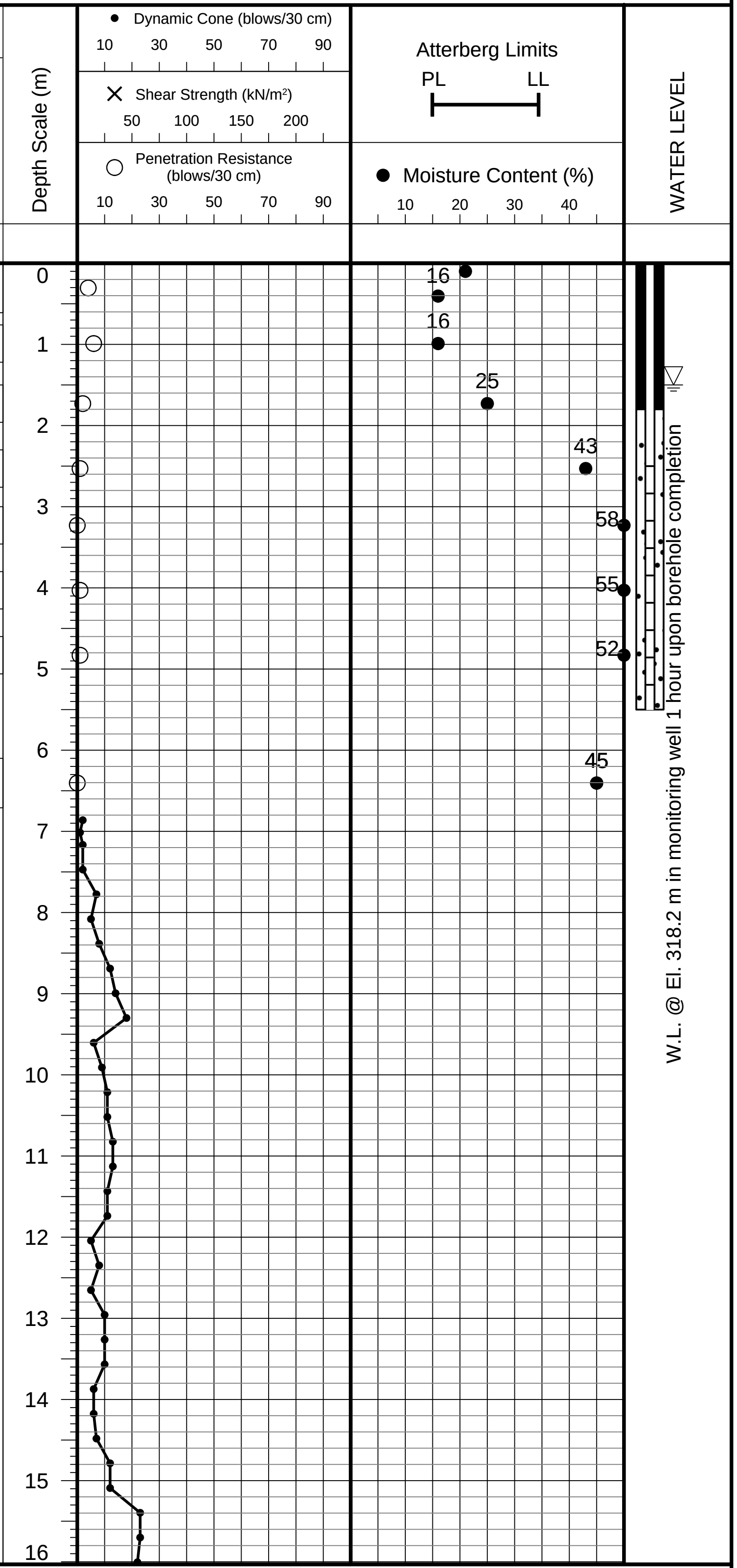
PROJECT DESCRIPTION: Proposed Apartment Buildings

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Northwest Corner of Maple Avenue and Victoria Street
Municipality of Dysart et al.

DRILLING DATE: August 5, 2021

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
319.7	Ground Surface			
0.0	**20 cm TOPSOIL**	1A	DO	4
	Brown	1B		
	EARTH FILL silty sand wet below 0.6 m	2	DO	6
		3	DO	2
317.6 2.1	Dark grey/grey	4	DO	1
		5	DO	0
	ALLUVIUM	6	DO	1
	sand and silt occ. shells, peat, fibres and wood wet	7	DO	1
313.0 6.7		8	DO	0
	END OF BOREHOLE **START OF DYNAMIC CONE TEST**			
	CONE PENETRATION TESTS			
303.7	*Cont'd on next page*			



W.L. @ El. 318.2 m in monitoring well 1 hour upon borehole completion

Soil Engineers Ltd.

JOB NO.: 2106-S205

LOG OF BOREHOLE NO.: 1

FIGURE NO.: 1

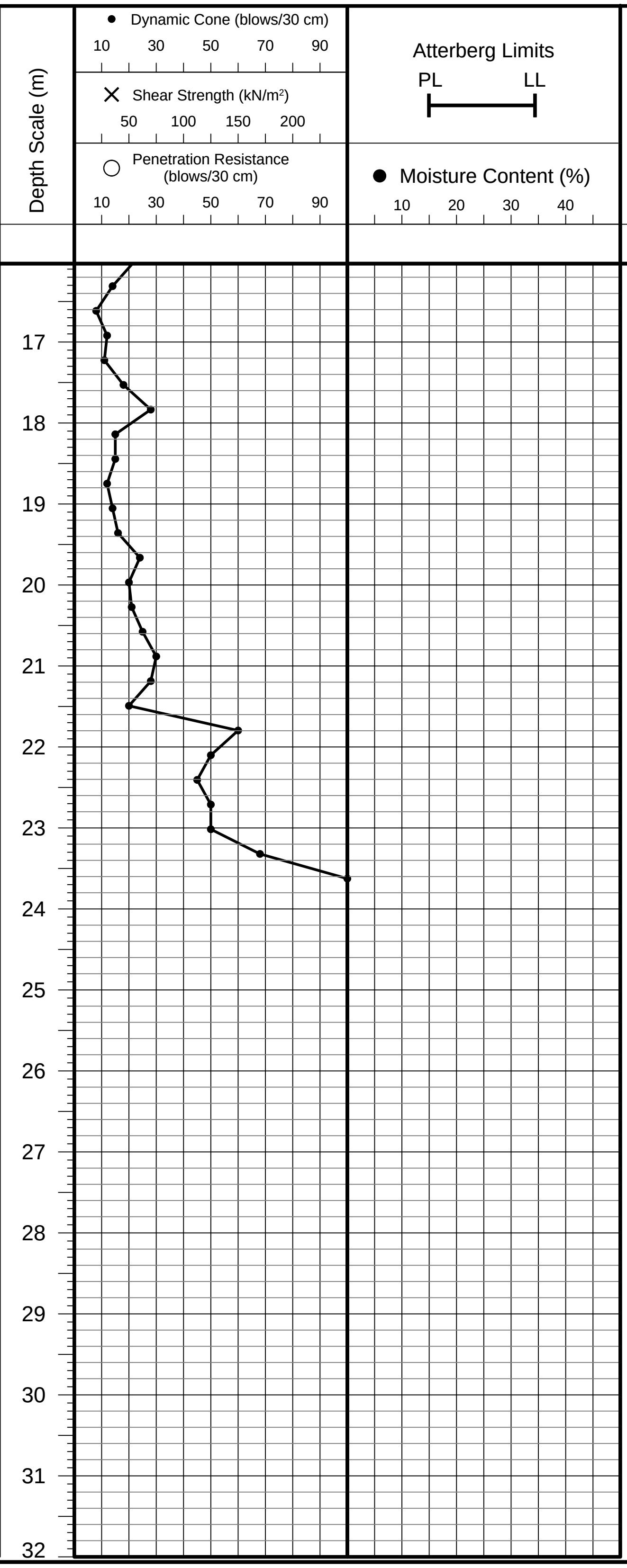
PROJECT DESCRIPTION: Proposed Apartment Buildings

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Northwest Corner of Maple Avenue and Victoria Street
Municipality of Dysart et al.

DRILLING DATE: August 5, 2021

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
16.0	**CONE PENETRATION TESTS**			
295.7 24.0	**END OF CONE PENETRATION TESTS** Installed 51 mm Ø monitoring well to 5.5 m Completed with 3.0 m screen Sand backfill from 1.8 m to 5.5 m Bentonite seal from 0.0 m to 1.8 m. Provided with a protective steel casing.			



WATER LEVEL

Soil Engineers Ltd.

JOB NO.: 2106-S205

LOG OF BOREHOLE NO.: 2

FIGURE NO.: 2

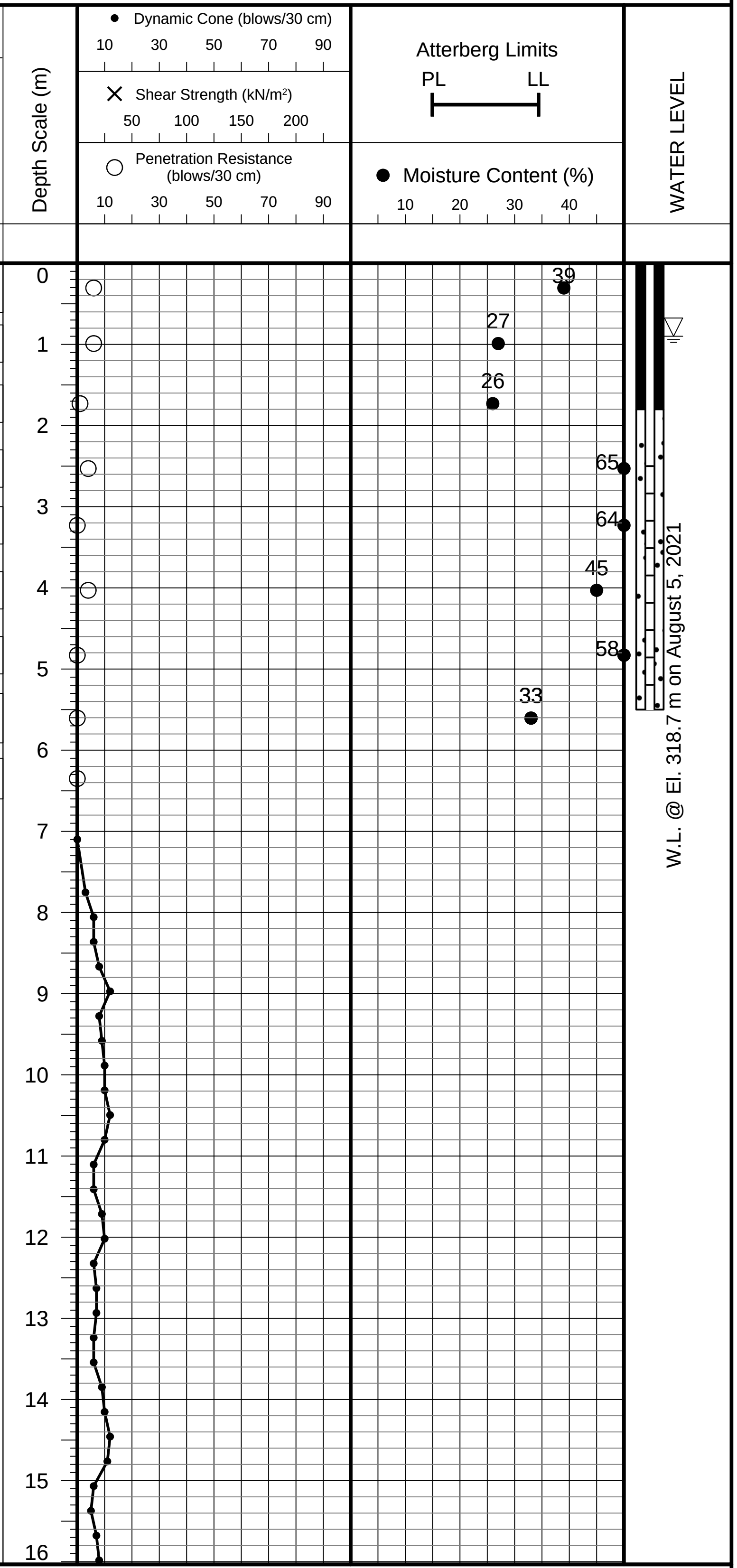
PROJECT DESCRIPTION: Proposed Apartment Buildings

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Northwest Corner of Maple Avenue and Victoria Street
Municipality of Dysart et al.

DRILLING DATE: August 4, 2021

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
319.8	Ground Surface			
0.0	Brown/dark brown **EARTH FILL** silty sand with clay layer occasional topsoil inclusions and gravel	1	AS	6
		2	DO	6
318.4 1.4	Dark brown/grey	3	DO	1
		4	DO	4
	ALLUVIUM	5	DO	0
		6	DO	4
	sand and silt occ. shells, peat, fibres and wood wet	7	DO	0
		8	DO	0
		9	DO	0
313.2 6.6	**END OF BOREHOLE** **START OF DYNAMIC CONE TEST**			
	CONE PENETRATION TESTS			
303.8	*Cont'd on next page*			



Soil Engineers Ltd.

JOB NO.: 2106-S205

LOG OF BOREHOLE NO.: 2

FIGURE NO.: 2

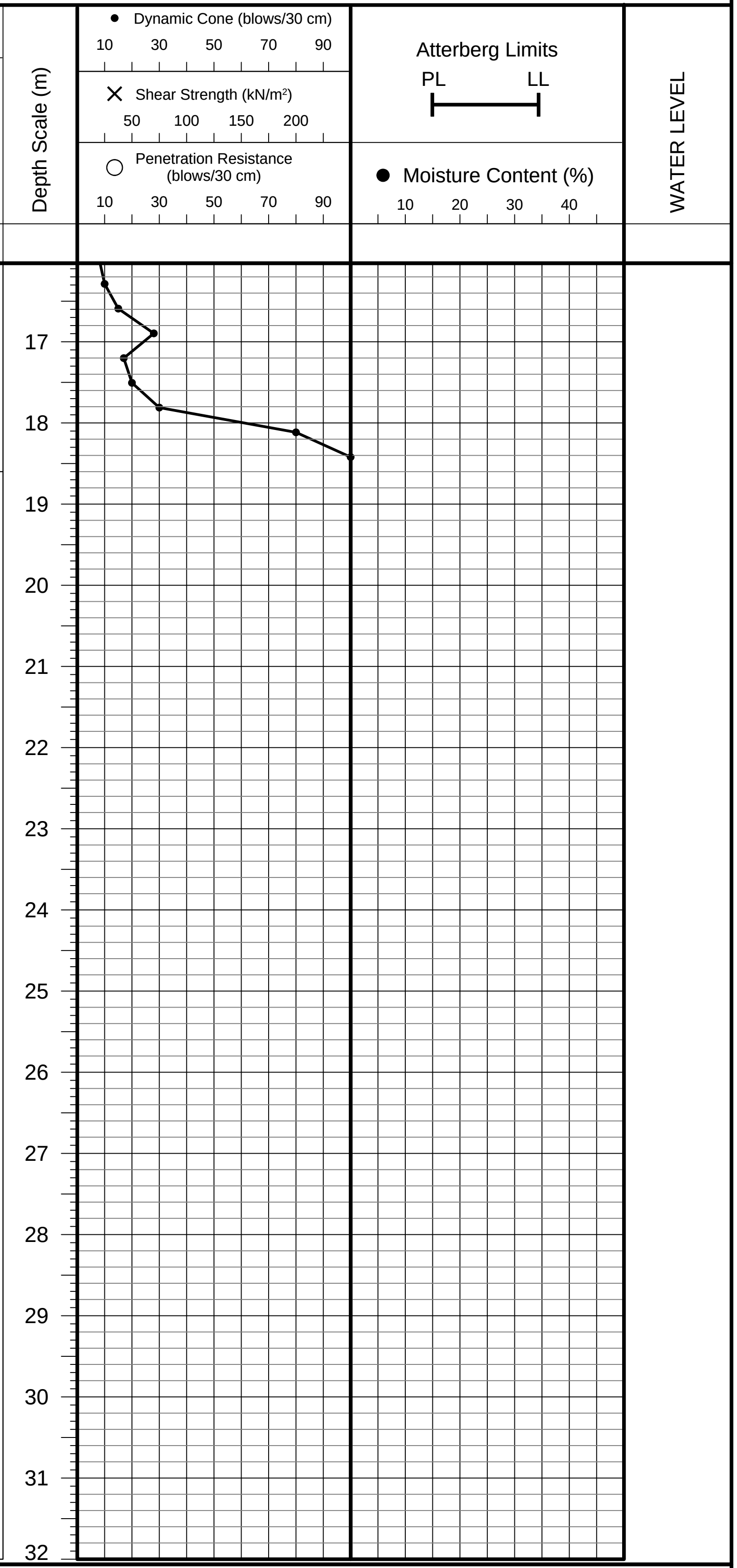
PROJECT DESCRIPTION: Proposed Apartment Buildings

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Northwest Corner of Maple Avenue and Victoria Street
Municipality of Dysart et al.

DRILLING DATE: August 4, 2021

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
16.0	**CONE PENETRATION TESTS**			
301.2 18.6	**END OF CONE PENETREATION TESTS** Installed 51 mm Ø monitoring well to 5.5 m Completed with 3.0 m screen Sand backfill from 1.8 m to 5.5 m Bentonite seal from 0.0 m to 1.8 m. Provided with a protective steel casing.			



Soil Engineers Ltd.

JOB NO.: 2106-S205

LOG OF BOREHOLE NO.: 3

FIGURE NO.: 3

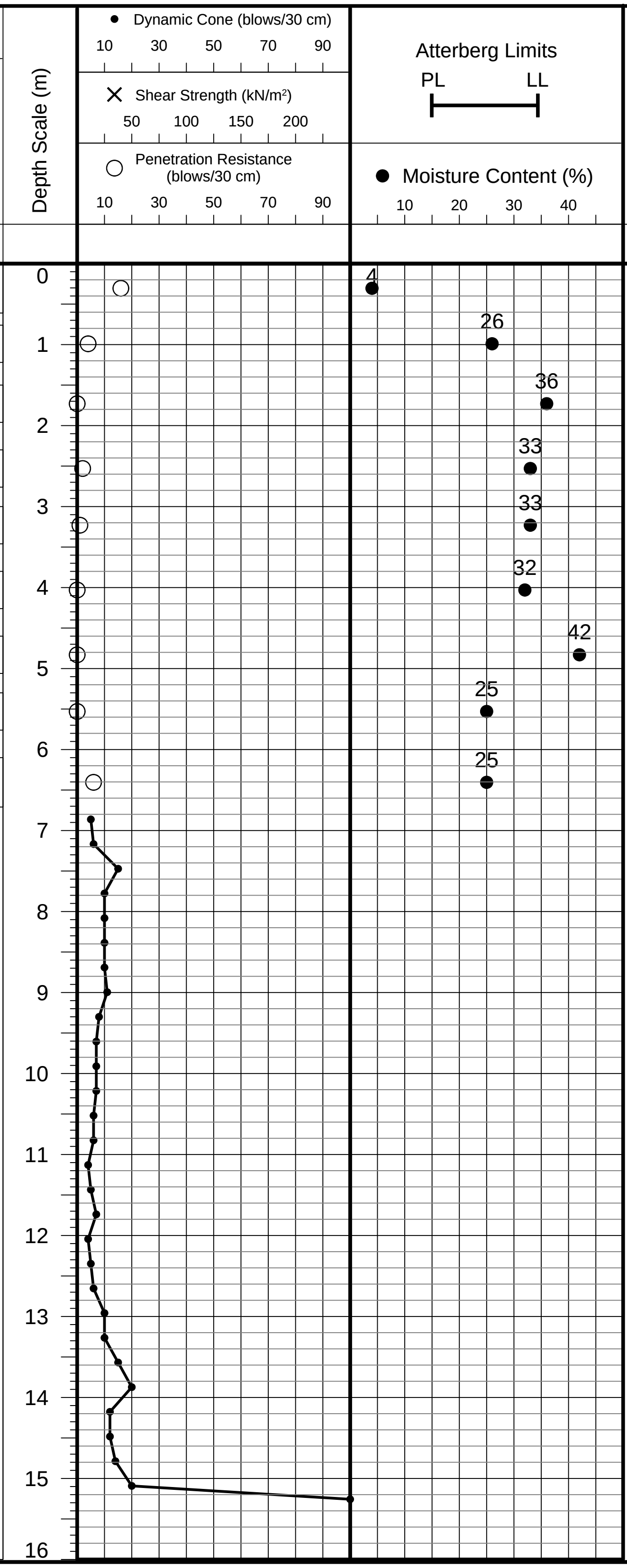
PROJECT DESCRIPTION: Proposed Apartment Buildings

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Northwest Corner of Maple Avenue and Victoria Street
Municipality of Dysart et al.

DRILLING DATE: August 4, 2021

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Moisture Content (%)
320.0	Ground Surface				
0.0	Brown/dark brown **EARTH FILL** silty sand with topsoil inclusions and layers	1	DO	16	4
		2	DO	4	26
		3	DO	0	36
317.4 2.6	Dark grey **ALLUVIUM** sand and silt occ. shells, peat, fibres and wood wet	4	DO	2	33
		5	DO	1	33
		6	DO	0	32
		7	DO	0	42
		8	DO	0	25
		9	DO	6	25
313.3 6.7	**END OF BOREHOLE** **START OF DYNAMIC CONE TEST**				
	CONE PENETRATION TESTS				
304.7 15.3	**END OF CONE PENETREATION TESTS**				



WATER LEVEL

∇

W.L. @ El. 319.1 m on August 5, 2021

Soil Engineers Ltd.

JOB NO.: 2106-S205

LOG OF BOREHOLE NO.: 4

FIGURE NO.: 4

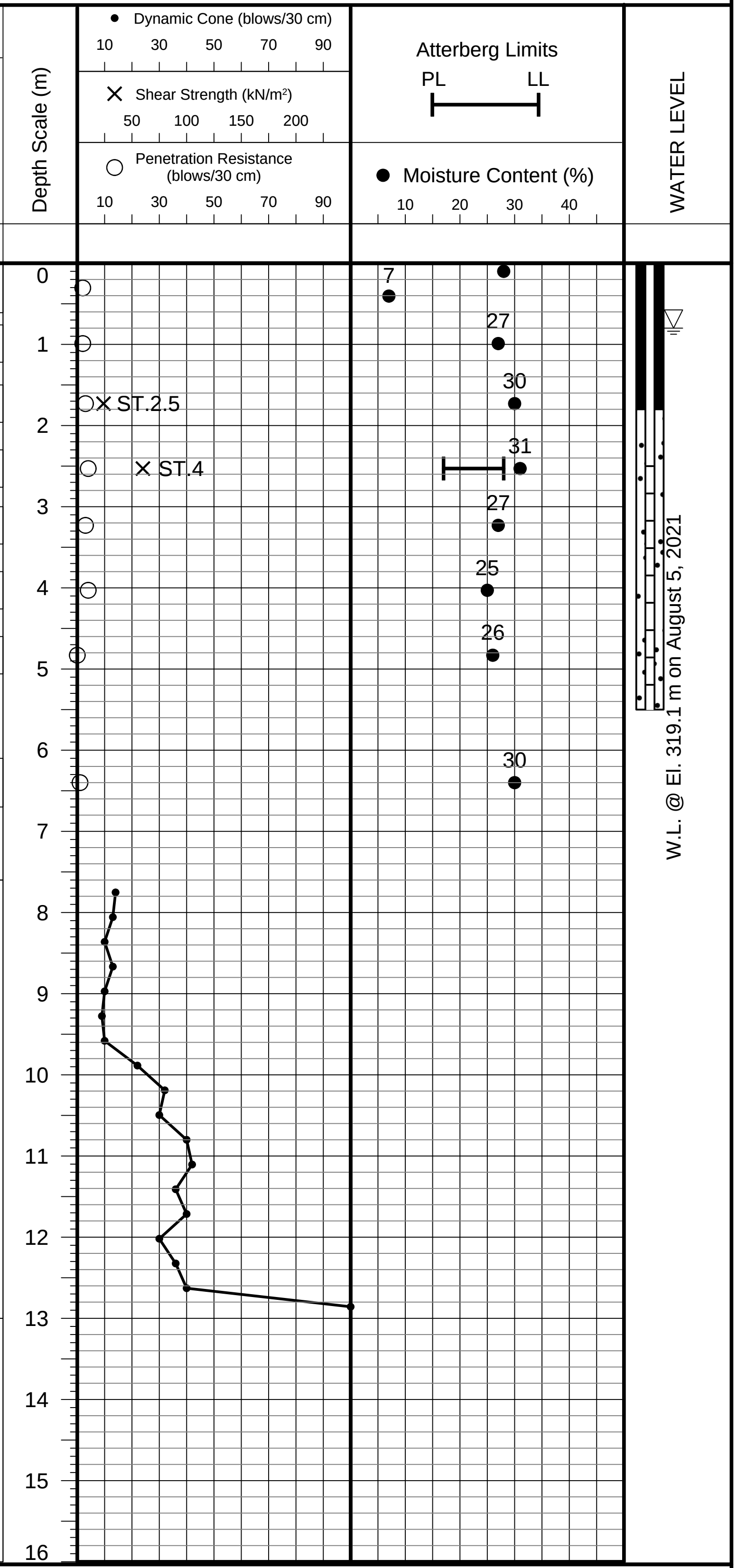
PROJECT DESCRIPTION: Proposed Apartment Buildings

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Northwest Corner of Maple Avenue and Victoria Street
Municipality of Dysart et al.

DRILLING DATE: August 4/5, 2021

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
319.9	Ground Surface			
0.0	**20 cm TOPSOIL**	1A		
	Brown, loose **SILT** sandy, a trace of clay	1B	DO	2
		2	DO	2
318.7 1.2	Brown, soft to firm **SILTY CLAY** some sand occ. silt layers	3	DO	3
		4	DO	4
317.0 2.9	Brown, very loose to loose **SILT** some sand, a trace of clay	5	DO	3
		6	DO	4
		7	DO	0
		8	DO	1
313.2 6.7	**END OF BOREHOLE**			
312.3 7.6	**START OF CONE PENETRATION TESTS** **CONE PENETRATION TESTS**			
306.9 13.0	**END OF CONE PENETREATION TESTS** Installed 51 mm Ø monitoring well to 5.5 m Completed with 3.0 m screen Sand backfill from 1.8 m to 5.5 m Bentonite seal from 0.0 m to 1.8 m. Provided with a protective steel casing.			



JOB NO.: 2106-S205

LOG OF BOREHOLE NO.: 5

FIGURE NO.: 5

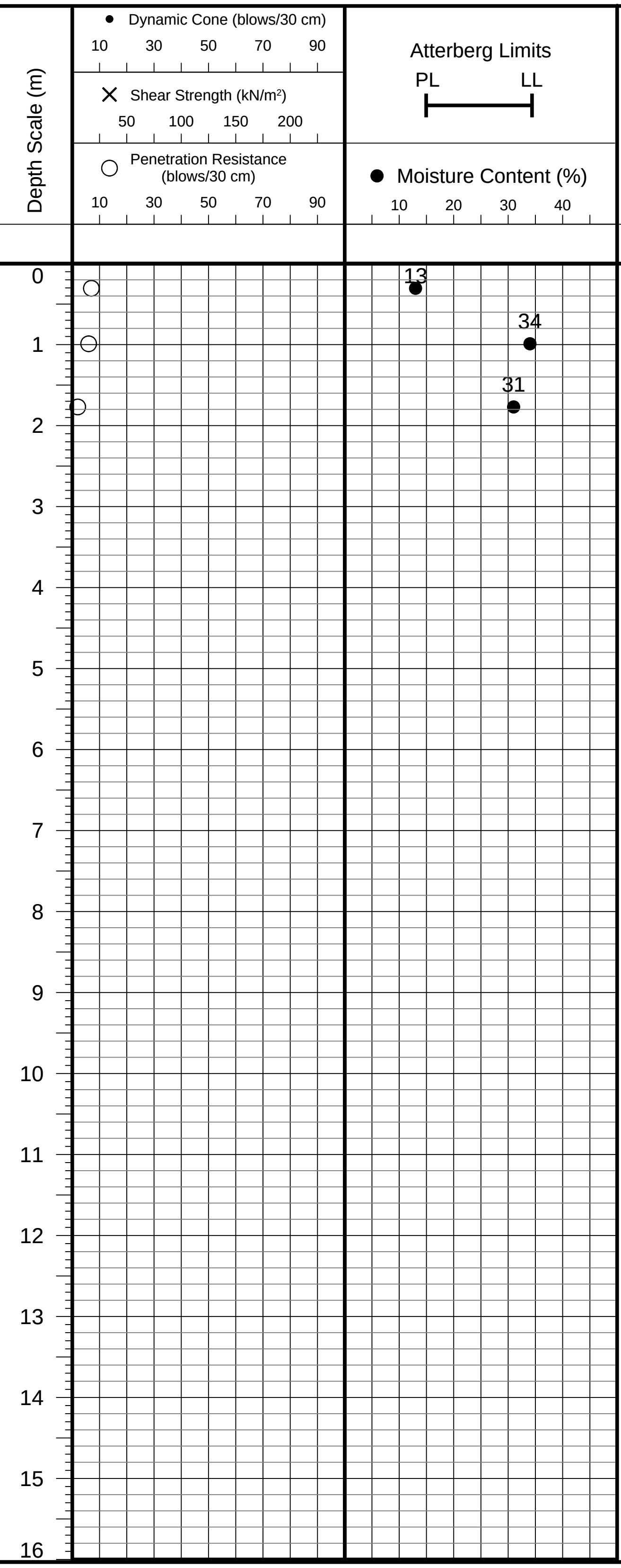
PROJECT DESCRIPTION: Proposed Apartment Buildings

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Northwest Corner of Maple Avenue and Victoria Street
Municipality of Dysart et al.

DRILLING DATE: August 4, 2021

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
319.0	Ground Surface			
0.0	Dark brown/brown **EARTH FILL** sand mixed with topsoil	1	DO	7
		2	DO	6
317.0		3	DO	2
2.0	**END OF BOREHOLE**			



WATER LEVEL

∇

W.L. @ El. 317.9 m in monitoring well 1 hour upon borehole completion

JOB NO.: 2106-S205

LOG OF BOREHOLE NO.: 6

FIGURE NO.: 6

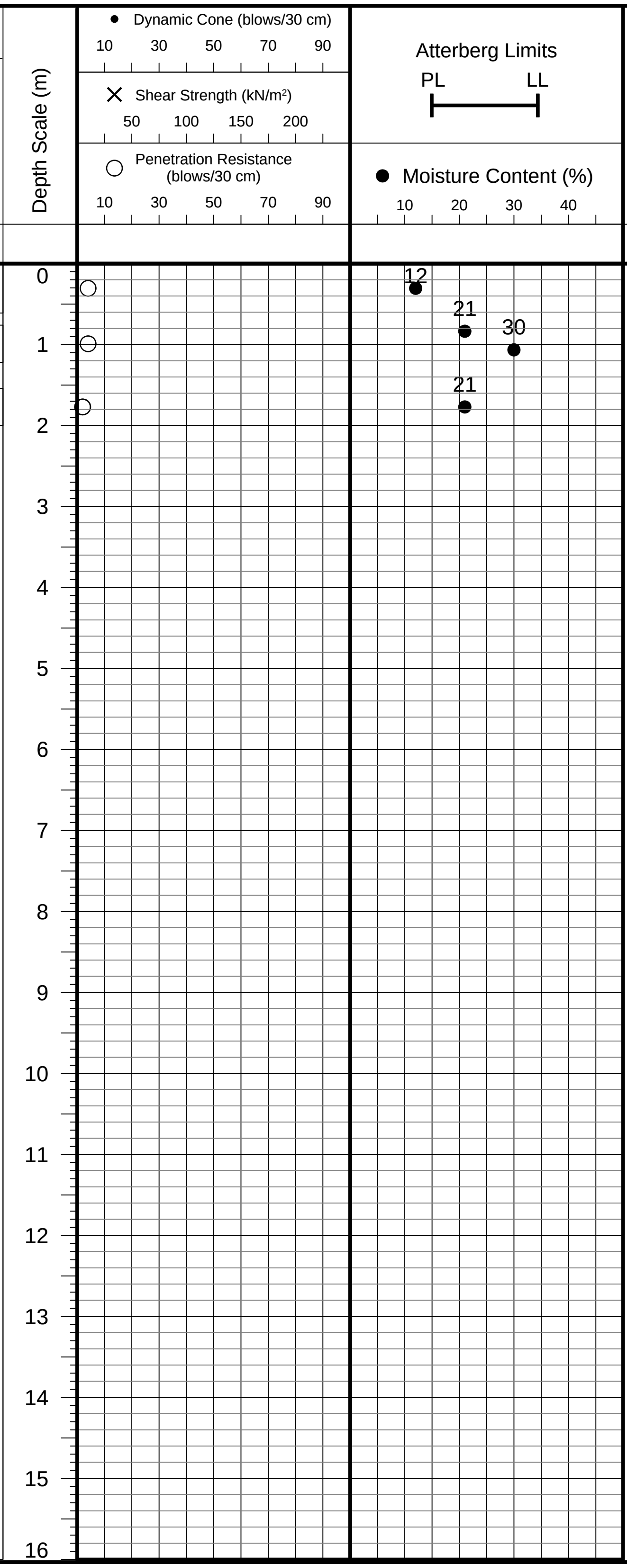
PROJECT DESCRIPTION: Proposed Apartment Buildings

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Northwest Corner of Maple Avenue and Victoria Street
Municipality of Dysart et al.

DRILLING DATE: August 5, 2021

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)
319.5	Ground Surface				
0.0	**8 cm TOPSOIL**	1	DO	4	0
	Brown to dark brown				
	topsoil layer	2A			
	EARTH FILL sand mixed with topsoil	2B	DO	4	1
317.5 2.0		3	DO	2	
	END OF BOREHOLE				2



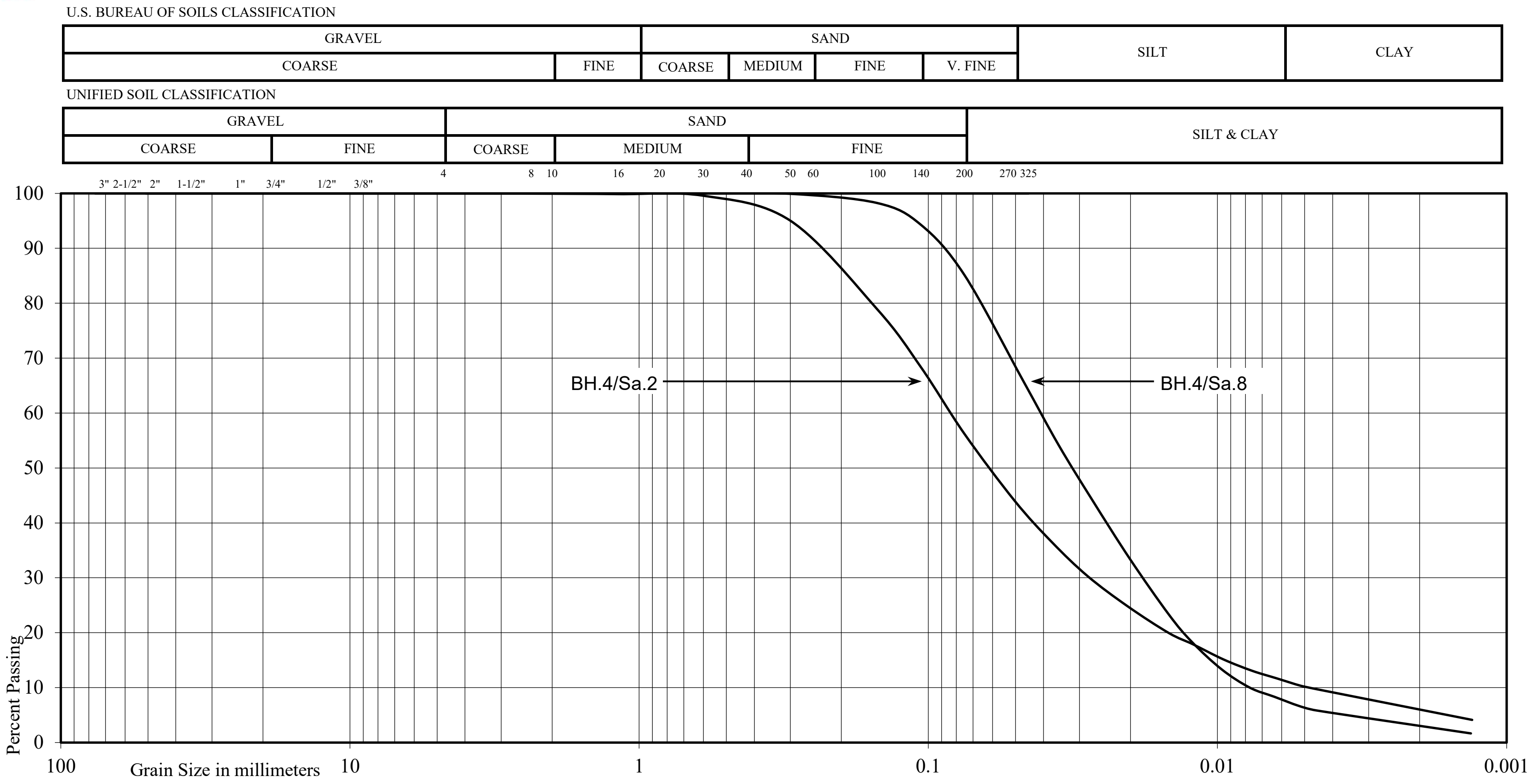
WATER LEVEL

Cave-in @ El. 318.3 m on completion

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2106-S205



Project: Proposed Apartment Buildings
Location: Northwest Corner of Maple Avenue and Victoria Street
Municipality of Dysart et al
Borehole No: 4 4
Sample No: 2 8
Depth (m): 1.0 6.4
Elevation (m): 318.9 313.5

BH./Sa.	4/2	4/8
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	27	30
Estimated Permeability (cm./sec.) =	10^{-5}	10^{-4}

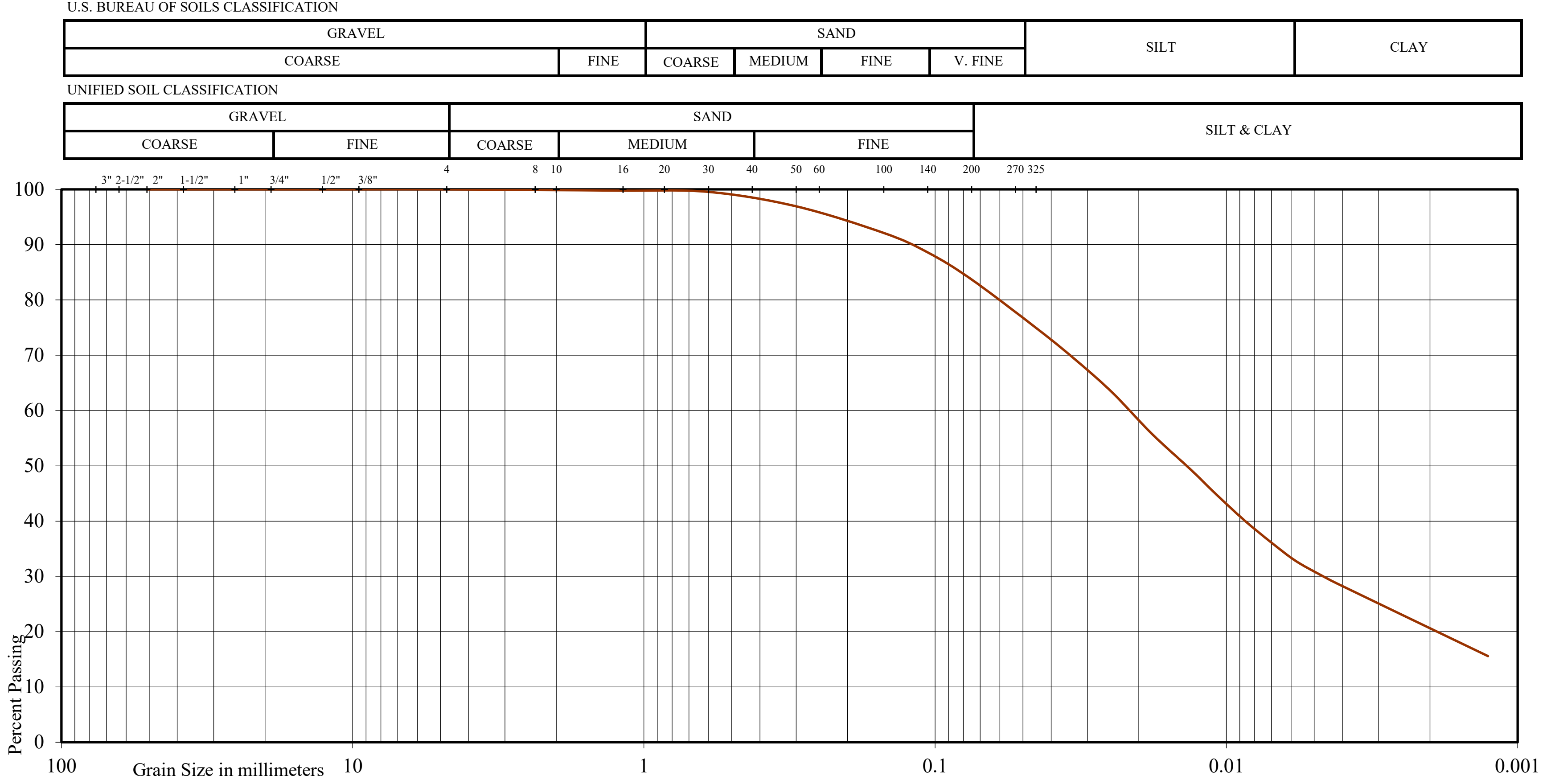
Classification of Sample [& Group Symbol]: SILT
some sand to sandy, a trace of clay

Figure: 7

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2106-S205



Project:	Proposed Apartment Buildings		
Location:	Northwest Corner of Maple Avenue and Victoria Street	Liquid Limit (%) =	28
	Municipality of Dysart et al	Plastic Limit (%) =	17
Borehole No:	4	Plasticity Index (%) =	11
Sample No:	4	Moisture Content (%) =	31
Depth (m):	2.6	Estimated Permeability	
Elevation (m):	317.3	(cm./sec.) =	10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY
some sand

Figure: 8

LEGEND

- Borehole with monitoring well
- Borehole

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BOREHOLE AND MONITORING WELL LOCATION PLAN

SITE: Northwest corner of Maple Avenue and Victoria Street, County of Haliburton (Dysart)

DESIGNED BY: -	**CHECKED BY:** -	**DWG NO.:** 1	
SCALE: 1:400	**REF. NO.:** 2106-S205	**DATE:** October 2021	**REV** 2

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE

SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.:	2106-S205
REPORT DATE:	October 2021
PROJECT DESCRIPTION:	Proposed Apartment Buildings
PROJECT LOCATION:	Northwest Corner of Maple Avenue and Victoria Street Municipality of Dysart et al.

LEGEND

▨ TOPSOIL 🟩 SILT ▨ SILTY CLAY ▨ ALLUVIUM
▨ FILL

▽ WATER LEVEL (END OF DRILLING) ≡ CAVE-IN