APPENDIX I

Geotechnical Investigations Report

Soil Engineers Ltd.

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A REPORT TO
BLOCK 27 LANDOWNERS GROUP INC.

A SOIL INVESTIGATION FOR PROPOSED URBAN DEVELOPMENT

BLOCK 27
AREA BOUNDED BY KEELE STREET, TESTON ROAD,
JANE STREET AND KIRBY ROAD

CITY OF VAUGHAN

Reference No. 1007-S084

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TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SITE AND PROJECT DESCRIPTION 2

3.0 FIELD WORK 4

4.0 SUBSURFACE CONDITIONS 6

- 4.1 Topsoil 6
- 4.2 Silty Clay Till 7
- 4.3 Silty Clay 10
- 4.4 Sandy Silt Till 12
- 4.5 Silty Sand Till 14
- 4.6 Silt 16
- 4.7 Sandy Silt 17
- 4.8 Silty Fine Sand 19
- 4.9 Fine Sand 21
- 4.10 Fine to Medium Sand 23
- 4.11 Compaction Characteristics of the Revealed Soils 25

5.0 GROUNDWATER CONDITIONS 28

6.0 DISCUSSION AND RECOMMENDATIONS 35

- 6.1 Foundations 39
- 6.2 Engineered Fill 43
- 6.3 Underground Services 45
- 6.4 Backfilling in Trenches and Excavated Areas 46
- 6.5 Slab-On-Grade, Garages, Driveways and Landscaping 49
- 6.6 Pavement Design 50
- 6.7 Soil Corrosivity 52
- 6.8 Stormwater Management Facilities 52
- 6.9 Berm Construction and Geotechnically Stable Top of Slope 57
- 6.10 Soil Parameters 57
- 6.11 Excavation 58

7.0 LIMITATIONS OF REPORT 61

TABLES

Table 1 - Estimated Water Content for Compaction....................................25
Table 2 - Groundwater Levels..28
Table 3 - Groundwater Levels on October 22, 2010 32
Table 4 - 'N' Value and Soil Pressure 39
Table 5 - Pavement Design 50
Table 6 - Summary of Recommended Area for Water Retention Facilities.53
Table 7 - Summary of Recommended Area for Water Infiltration Facilities55
Table 8 - Soil Parameters 58
Table 9 - Classification of Soils for Excavation 59

DIAGRAMS

Diagram 1 - Frost Protection Measures (Foundations).................................42

ENCLOSURES

Borehole and Monitoring Well Logs	Figures 1 to 75
Grain Size Distribution Graphs..	Figures 76 to 92
Borehole and Monitoring Well Location Plan and Subsurface Profile	Drawing No. 1
Borehole and Monitoring Well Coordinates (NAD 83) ...	Appendix

1.0 INTRODUCTION

In accordance with written authorization dated July 27, 2010, from Mr. Tony Miele of Block 27 Landowners Group Inc., a soil investigation was carried out within a parcel of land bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan, for a proposed Urban Development, which has been designated as "Block 27".

The purpose of the investigation was to reveal the subsurface conditions and to determine the engineering properties of the disclosed soils for the design and construction of the proposed project.

The findings and resulting geotechnical recommendations are presented in this Report.

2.0 SITE AND PROJECT DESCRIPTION

The City of Vaughan is located on Markham-Peel till plain where drift dominates the soil stratigraphy. In places, interglacial lacustrine sands, silts, silty clay and reworked till have modified the soil stratigraphy.

The investigated area consists of various parcels of land belonging to the Block 27 Landowners Group Inc. located within an area bounded by Keele Street to the east, Teston Road to the south, Jane Street to the west, and Kirby Road to the north, in the City of Vaughan. The site consists predominantly of agricultural farm fields with scattered trees and wooded areas. The ground surface of the site is relatively undulated. The overall grading of the site generally slopes towards the south. In places, tributaries of the Don River were encountered within the site, running in an east-west or north-south direction. Drainage ditches were also encountered within the property, and they appeared to be dry at the time of the borehole investigation. An existing Canadian National (CN) railway track also crosses the property in a north-south direction in the eastern portion of the property and the TransCanada Pipeline is located in the northern portion of the property, running in an east-west direction.

Properties to the north and west of the site, across Kirby Road and Jane Street, generally consist of farm fields. To the east and south of the subject site are existing residential developments.

At the time of the report preparation, detailed design of the proposed development was not available; however, it is understood that the property will be subdivided into residential lots and blocks reserved for other land uses. The development will be provided with municipal services and roadways meeting urban standards. The impact of the tributaries and the bank slope within the development is outside the scope of this report.

3.0 FIELD WORK

The field work, consisting of 75 boreholes to depths ranging from 6.3 to 30.9 m, was performed during the period from August 12 to September 17, 2010. The borehole locations are shown on the Borehole and Monitoring Well Location Plan and Subsurface Profile, Drawing No. 1. For identification purposes, the boreholes carried out in this investigation are labelled with a prefix of 'BH10' and the boreholes with monitoring wells installed are labelled with a prefix of 'MW10' to denote 2010. The borehole locations and depths were specified by Cole Engineering Group Ltd. It should be noted that BH10-28, BH10-45 and BH10-48 were relocated due to access difficulties. As instructed by Cole Engineering Group Ltd., MW10-61, MW10-64, MW10-67, MW10-70 and MW10-73 were extended from a depth of 5.0 m to depths of over 6.0 m in order to determine if wet sand or silt deposits are encountered to this depth.

The holes 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. The test results are recorded as the Standard Penetration Resistance (or 'N' values) of the subsoil. The relative density of the granular 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.

The field work was supervised and the findings recorded by a geotechnical technician.

The elevation at each of the borehole locations was surveyed by Schaeffer Dzaldov Bennett Ltd. The elevation of each of the monitoring wells, MW10-61 to MW10-75, inclusive, was determined based on the average of 3 elevation points adjacent to the monitoring well casing.

The borehole and monitoring well coordinates in North American Datun of 1983 (NAD 83), as provided by Schaeffer Dzaldov Bennett Ltd., are presented in the Appendix.

In order to facilitate a Hydrogeological Study to be carried out by Cole Engineering Group Ltd., groundwater monitoring wells, 50 mm in diameter, were installed in MW10-61 to MW10-75, inclusive. The depths and details of the monitoring wells are shown on the borehole logs.

Due to an artesian condition encountered in MW10-64, the monitoring well has been decommissioned under the supervision of Cole Engineering Group Ltd.

4.0 SUBSURFACE CONDITIONS

Detailed descriptions of the encountered subsurface conditions are presented on the Borehole and Monitoring Well Logs, comprising Figures 1 to 75, inclusive. The revealed stratigraphy is plotted on the subsurface profile on Drawing No. 1, and the engineering properties of the disclosed soils are discussed herein.

This investigation has disclosed that beneath a veneer of topsoil, the site is generally underlain by a deposit of silty clay till to various depths. In places, deposits of silty clay, sandy silt till, silty sand till, silt, sandy silt, silty fine sand, fine sand and fine to medium sand were also encountered. Refusal to augering was encountered in 2 boreholes at depths of 7.0 m and 7.3 m from the prevailing ground surface, inferring the presence of boulders.

4.1 Topsoil (All Boreholes, except BH10-71)

The revealed topsoil veneer ranges in thickness from 13 to 90 cm, with a median of 30 cm. In BH10-10 and BH10-22, the encountered topsoil was mixed with silty clay material. BH10-07, BH10-09, BH10-10, BH10-45, BH10-51 and BH10-52 contain more than 60 cm of topsoil as disclosed by the borehole findings. The topsoil is dark brown to brown in colour, indicating that it contains an appreciable amount of roots and humus. These materials are unstable and compressible under loads; therefore, the topsoil is considered to be void of engineering value, but can be used for general landscaping purposes. A fertility analysis should be carried out to assess the suitability of the topsoil for use as a planting soil or sodding medium. Due to its humus content, the topsoil may produce volatile gases and will generate an offensive odour under anaerobic conditions. Therefore, the topsoil must not be buried close to any proposed structures deeper than 1.2 m below the exterior finished grade. This is to avoid imposing an adverse impact on the environmental well-being of the developed areas.

As noted, the property is agricultural land; past cultivation will invariably have filled the localized depressions. Therefore, topsoil thicker than that found in the boreholes is expected to occur in places, particularly in localized depressions where thick topsoil deposited by erosion from higher areas will likely occur. This indicates that the thickness of the topsoil varies randomly. Therefore, the topsoil stripping operation should be closely monitored to minimize overstripping.

4.2 Silty Clay Till (All Boreholes)

The clay till was encountered at various depths of the soil stratigraphy. It contains some sand to being sandy. It is heterogeneous in structure, and amorphous in places, indicating that it is a glacial deposit, part of which has been reworked by water action of the glacial lake. Occasionally, it contains sand, silt and sandy silt till layers which are generally wet and, in places, the layers are water-bearing.

The obtained 'N' values range from 4 to 100+, with a median of 39 blows per 30 cm of penetration. This indicates that the consistency of the till is soft to hard, being generally hard. In places, the obtained 'N' values fluctuate from a hard to a very stiff consistency (BH10-13, BH10-28, BH10-55, and BH10-59) either within the brown zone, or in the grey zone at the interface of the brown to grey zone. This indicates that part of the till may have been reworked by water action of the glacial lake.

Sample examinations indicated that the weathered till is fractured and permeated with fissures, and generally extends to depths ranging from 0.7± to 1.8± m from the prevailing ground surface. In BH10-08 and BH10-09, the weathered till extends to depths of 1.8± m and 1.4± m from the prevailing ground surface, respectively.

Hard resistance to augering and examination of the auger spoil indicated that occasional cobbles and boulders are embedded in the till. Refusal to augering was encountered in BH10-13 and BH10-15 at depths of 7.0 m and 7.3 m from the prevailing ground surface, inferring the presence of boulders.

The Atterberg Limits of 14 representative samples and the natural water content values of all the samples were determined; the results are plotted on the Borehole Logs and summarized below:

Liquid Limit	22% to 29%
Plastic Limit	15% to 17%
Natural Water Content	7% to 34% (median 12%)

The above results show that the till is a cohesive material with low plasticity. The natural water content values generally lie below its plastic limit, confirming the consistency of the till as determined by the 'N' values. The low 'N' values and high water content values were generally obtained in the badly weathered till where infiltrating precipitation has wetted the fissures, thus softening its consistency.

Grain size analyses were performed on 14 representative samples, and the results are plotted on Figures 76 to 80, inclusive.

It should be noted that in MW10-64, artesian condition was encountered. This condition is likely caused by the water-bearing sand and silt seams and layers within the silty clay till which are under artesian pressure.

According to the above findings, the soil engineering properties pertaining to the project are given below:

- Moderate frost susceptibility, with low frost-heave potential.
- Low water erodibility.
- Very low in permeability, with an estimated coefficient of permeability of 10^{-7} cm/sec, an estimated percolation time of 70 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.15
2% - 6%	0.20
6% +	0.28

- A cohesive-frictional soil, its shear strength is derived from consistency and is augmented by internal friction, thus being inversely moisture dependent and, to a lesser extent, dependent on soil density.
- In cuts, the clay will be stable with relatively steep slopes; however, prolonged exposure will allow infiltrating precipitation to saturate the fissures and sand layers in the till, and this may cause localized sloughing.
- A poor pavement-supportive material, with an estimated California Bearing Ratio (CBR) value of 3%.
- Moderate corrosivity to buried metal, with an estimated electrical resistivity of 4000 ohm·cm.

4.3 Silty Clay (BH10-06, BH10-17, BH10-25, BH10-26, BH 10-36, BH 10-44, BH10-45, BH10-48 and BH10-52, and MW10-61, MW10-62, MW10-63, MW10-68, MW10-69, MW10-71 and MW10-73)

The silty clay was encountered at various depths of the revealed soil stratigraphy in 16 of the 75 boreholes. It contains wet silt and sand layers and has a slightly varved structure, indicating that the clay is a lacustrine deposit. Occasional silty clay till layers are embedded within the silty clay.

The wet silt layers in the silty clay became highly dilatant when shaken. The overall strength of the clay was weakened when kneaded, showing its strength is susceptible to remoulding.

Sample examinations show that, in places, the consistency of the clay becomes softer with depth, either in the brown zone, grey zone or the transition zone between brown and grey. This condition was encountered in BH10-25, BH10-36 and BH10-52 and MW10-61 and MW10-69. The change in consistency in the brown to grey zone indicates that the upper layer of brown clay has stiffened by dessication. The top 1.0± m of the clay below the prevailing ground surface is fissured and is generally soft to firm in consistency. In BH10-71, the weathered clay extends to a depth of 1.5± m from the prevailing ground surface.

The obtained 'N' values range from 4 to 100+, with a median of 24, from which the consistency of the clay is inferred as firm to hard, being generally very stiff.

The Atterberg Limits of 2 representative samples and the natural water content of all the samples were determined. The results are plotted on the Borehole Logs and summarized below:

Liquid Limit	25% and 34%
Plastic Limit	16% and 20%
Natural Water Content	14% to 26% (median 20%)

The values show that the silty clay is low to medium in plasticity. The generally high water content values in the stiff to very stiff clay are due to wetness in the fissures of the weathered soil from infiltrating precipitation and the wetness in the silt and sand layers.

Grain size analyses were performed on 2 representative samples, the results are plotted on Figure 81.

According to the above findings, the following engineering properties are deduced:

- High frost susceptibility and due to the high silt content and the presence of the wet silt layers, high soil-adfreezing potential.
- Low to moderate water erodibility.
- The clay is virtually impervious. However, due to the sand and silt layers, the lateral permeability is higher than the vertical permeability. The estimated coefficient of permeability is 10^{-7} cm/sec, an estimated percolation time of 100 min/cm, with runoff coefficients of:

Slope	
0% - 2%	0.15
2% - 6%	0.20
6% +	0.28

- A cohesive soil, its shear strength is derived from consistency and is inversely dependent on soil moisture. It will be susceptible to some reduction in strength if remoulded; i.e., the silt and sand (layers) are frictional soils. Their strength is soil density dependent. The wet silt, due to its dilatancy, is susceptible to impact disturbance; i.e., the disturbance will induce a pore pressure build-up within the mantle, resulting in soil dilation and a reduction in shear strength.

- In excavation, the stiff to very stiff clay crust will be stable in a relatively steep cut for a short duration; however, as water seepage saturates the sand layers, the sides will slough, and sheet collapse may occur without warning.
- A very poor flexible pavement-supportive material, with an estimated CBR value of 3% or less.
- Moderately high corrosivity to buried metal, with an estimated electrical resistivity of 3000 to 3500 ohm·cm.

4.4 **Sandy Silt Till** (BH10-03, BH10-04, BH10-14, BH10-20, BH10-27, BH10-29, BH10-36, BH10-42 and BH10-50 and MW10-72, MW10-73 and MW10-74)

The sandy silt till deposit was generally encountered beneath or interstratified with the silty clay till deposit. It consists of a random mixture of particle sizes ranging from clay to gravel, with silt being the predominant fraction. The material is heterogeneous in structure, showing that it is a glacial till. Wet sand layers which are water-bearing are embedded, in places, in the till.

Sample examinations disclosed that the till is cemented and displayed slight cohesion when remoulded. The samples slaked readily when placed in water, and when shaken, the wet samples displayed a low dilatancy.

Hard resistance to augering was encountered, showing that occasional cobbles and boulders are embedded in the till mantle.

The obtained 'N' values of the sandy silt till range from 37 to 100+, with a median of 100+, indicating that the relative density of the sandy silt till is dense to very dense, generally being very dense.

The natural water content values of the sandy silt till samples were determined, and the results are plotted on the Borehole Logs. The values range from 8% to 22%, with a median of 12%, showing that the till is in a moist to wet, generally very moist condition. Wet sandy silt till which appears to be water-bearing was encountered 15.0± m below the prevailing ground surface in MW10-72.

Grain size analyses were performed on 2 representative samples of the sandy silt till, and the results are plotted on Figure 82.

According to the above findings, the engineering properties of the sandy silt till are listed below:

- High frost susceptibility and moderate water erodibility.
- Relatively low permeability, with an estimated coefficient of permeability of 10^{-5} to 10^{-6} cm/sec, an estimated percolation time of 20 to 50 min/cm and runoff coefficients of:

Slope	
0% - 2%	0.11 to 0.15
2% - 6%	0.16 to 0.20
6% +	0.23 to 0.28

- A frictional soil, its shear strength is primarily derived from internal friction and is augmented by cementation. Therefore, its strength is primarily soil-density dependent.
- It will be stable in steep cuts; however, under prolonged exposure, local sheet collapse will likely occur.
- A fair pavement-supportive material, with an estimated CBR value of 8%.
- Moderate corrosivity to buried metal, with an estimated electrical resistivity of 4500 ohm·cm.

4.5 <u>Silty Sand Till</u> (BH10-08, BH10-13, BH10-40, BH10-41, BH10-43 and BH10-53)

The sand till was encountered in 6 of the 75 boreholes of the site. It was found at various depths of the stratigraphy. It consists of a random mixture of particle sizes ranging from clay to gravel, with sand being the dominant fraction. Its structure is heterogeneous.

A tactile examination of the soil samples indicated that the till is slightly cemented, and it displayed some cohesion when wetted. The till is also laminated with wet sand layers which, in places, are water bearing.

The relative density of the till, as inferred from the 'N' values of 18 to 100+, with a median of 45, is compact to very dense, being generally dense. The compact silty sand till occurred within a shallow depth of 1.0± m from the prevailing ground surface in BH10-40 and BH10-53, where it has been loosened by weathering.

Intermittent hard resistance to augering was encountered, indicating the presence of cobbles and boulders in the stratum, particularly in the lower zone of the stratum.

The natural water content values of the samples range from 5% to 10%, with a median of 8%, showing that the till is damp to moist, being generally in a moist condition.

Grain size analyses were performed on 2 representative samples of the silty sand till; the gradations are plotted on Figure 83.

According to the above findings, the engineering properties are listed below:

- High frost susceptibility and moderate water erodibility.
- Low permeability, with an estimated coefficient of permeability of 10^{-5} to 10^{-6} cm/sec, an estimated percolation time of 25 to 50 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.11 to 0.15
2% - 6%	0.16 to 0.20
6% +	0.23 to 0.28

- A frictional soil, its shear strength is primarily derived from internal friction and is augmented by cementation. Therefore, its strength is soil density-dependent.
- It will be stable in steep cuts; however, under prolonged exposure, localized sheet collapse will likely occur.
- A poor pavement-supportive material, with an estimated CBR value of 5%.
- Moderately low corrosivity to buried metal, with an estimated electrical resistivity of 5500 ohm·cm.

4.6 **Silt** (BH10-15, BH10-53 and BH10-60 and MW10-65, MW10-69, MW10-71 and MW10-75)

The silt was generally encountered in the lower sector of the revealed stratigraphy. It contains some clay and sand, with occasional sandy silt, fine sand and silty clay layers. The laminated structure shows that it is an interglacial lacustrine deposit.

Sample examinations revealed that the silt is generally wet and it displayed appreciable dilatancy when shaken by hand.

Its natural water content values range from 14% to 23%, with a median of 19%, confirming that the silt is in a very moist to saturated, generally wet condition. The silt appears to be water-bearing at a depth below 7.4± to over 10.4± m from the prevailing ground surface, or El. 273.6± to below 238.9± m, depending on location.

The obtained 'N' values range from 10 to 100+, with a median of 100+, showing that the relative density of the silt is loose to very dense, being generally very dense. The loose silt was found in MW10-65, at a depth of 15.0± m; the loose condition is likely the result of hydrostatic uplift as well as suction effect during sampling which would have loosened the density of the sand.

A grain size analysis was performed on 1 representative sample of the silt, and the resulting gradation is plotted on Figure 84.

According to the above findings, the following engineering properties are deduced:

- High frost susceptibility, with high soil-adfreezing potential.
- High water erodibility.

- Low permeability due to the occurrence of silty clay layers, with an estimated coefficient of permeability of 10^{-6} cm/sec, an estimated percolation time of 50 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.15
2% - 6%	0.20
6% +	0.28

- A frictional-cohesive soil, its shear strength is largely derived from internal friction. Due to its dilatancy, the strength of the wet silt is susceptible to dynamic disturbance; i.e., the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and a reduction in shear strength.
- In steep cuts, the wet silt will slowly slump, and this may cause the sides to slough. It will boil under a piezometric head of 0.4 m.
- Will migrate through small openings, particularly under seepage pressure.
- A poor flexible pavement-supportive material, with an estimated CBR value of 5%.
- Moderate corrosivity to buried metal, with an estimated electrical resistivity of 4500 ohm·cm.

4.7 <u>Sandy Silt</u> (BH10-11, BH10-19, BH10-29, BH10-30, BH10-33, BH10-39, BH10-40 and BH10-46 and MW10-62, MW10-63, MW10-65, MW10-66, MW10-68, MW10-69, MW10-74 and MW10-75)

The sandy silt was found either in the upper or lower sector of the revealed stratigraphy. Sample examinations showed that the sandy silt is in a moist to saturated condition. It contains a trace to some clay and occasional traces of gravel.

The obtained 'N' values of the sandy silt varied from 5 to 100+, with a median of 88. The relative density of the silt is thus inferred as loose to very dense, being generally very dense. The loose condition is generally restricted to the weathered zone in BH10-11, which extends to a depth of 1.0± m from the prevailing ground surface.

The natural water content of the samples was determined to range from 7% to 21%, with a median of 17%; the values are plotted on the Borehole Logs. These values confirm that the silt is in a damp to saturated, generally wet condition. A review of the water content profile indicates that the sandy silt is saturated and water bearing at depths ranging from 6.0± to over 9.0± m from the prevailing ground surface, or El. 259.2± to below 235.8± m, depending on location. In places, the water-bearing sandy silt is under subterranean artesian pressure as seen in BH10-19, BH10-29, and BH10-30 and MW10-62, MW10-63, MW10-65 and MW10-66.

Grain size analyses were performed on 3 representative samples and the results are plotted on Figure 85.

According to the above findings, the engineering properties relating to the project are given below:

- Highly frost susceptible, with high soil-adfreezing potential.
- Highly water erodible; susceptible to migration through small openings under seepage pressure.
- Medium permeability, with an estimated coefficient of permeability of 10^{-4} to 10^{-5} cm/sec, an estimated percolation time of 16 to 24 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.07 to 0.11
2% - 6%	0.12 to 0.16
6% +	0.18 to 0.23

- A frictional soil, its shear strength is density dependent. Due to its dilatancy, the strength of the wet silt is susceptible to impact disturbance, i.e. the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and a reduction in shear strength.
- In excavation, the moist silt will be stable in relatively steep cuts, while the wet silt will slough and run slowly with seepage bleeding from the cut face. It will boil with a piezometric head of 0.4 m.
- A fair pavement-supportive material, with an estimated CBR value of 8%.
- Moderately low corrosivity to buried metal, with an estimated electrical resistivity of 5000 ohm·cm.

4.8 **Silty Fine Sand** (BH10-05, BH10-16, BH10-17, BH10-20, BH10-22, BH10-24, BH10-30, BH10-31, BH10-32, BH10-44, BH10-47, BH10-48, BH10-50, BH10-51, BH10-52, BH10-53, BH10-55 and BH10-56 and MW10-61, MW10-65, MW10-66, MW10-69, MW10-70, MW10-71, MW10-72, MW10-73, MW10-74, and MW10-75)

The silty fine sand deposit was generally encountered beneath the silty clay till deposit. It contains occasional sandy silt and fine sand layers. The sorted structure indicates that it is a glaciolacustrine deposit. The wet silty fine sand layers became dilatant when shaken.

The obtained 'N' values of the silty fine sand range from 14 to 100+, with a median of 57, indicating that the relative density of the deposit is compact to very dense, being generally very dense.

The obtained natural water content values range from 5% to 24%, with a median of 19%, showing that the sand is in a damp to saturated, generally saturated condition. The silty fine sand, as indicated by the water content values, is often water bearing at depths ranging from 4.6± to over 7.6± m from the prevailing ground surface, or El. 263.2± to El. 242.6 m and the water in the sand, in places is under subterranean artesian condition as shown in BH10-20, BH10-24, BH10-31, BH10-50, BH50-51, BH10-52, BH10-55 and BH10-56.

Grain size analyses were performed on 8 representative samples and the results are plotted on Figures 86 to 88.

According to the above findings, the soil engineering properties relating to the project are given below:

- A soil of high capillarity, with high water-retention capability.
- High frost susceptibility, with high soil-adfreezing potential.
- High water erodibility; it will migrate through small openings under low to moderate seepage pressure.
- Relatively pervious, with an estimated coefficient of permeability of 10^{-3} to 10^{-5} cm/sec, an estimated percolation time of 8 to 24 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.04 to 0.11
2% - 6%	0.09 to 0.16
6% +	0.13 to 0.23

- Its shear strength is derived from internal friction, thus being density dependent. Due to its dilatancy, dynamic loads imposed on the saturated soil will render a reduction of its shear strength.
- When excavated, the soil will run with seepage and the bottom will boil under a piezometric head of 0.4 m.
- A fair pavement-supportive material, with an estimated CBR value of 8%.
- Moderately low corrosivity to buried metal, with an estimated electrical resistivity of 5000 ohm·cm.

4.9 **<u>Fine Sand</u>** (BH10-01, BH10-04, BH10-05, BH10-06, BH10-07, BH10-09, BH10-10, BH10-23, BH10-30, BH10-32, BH10-33, BH10-36, BH10-37, BH10-38, BH10-39, BH10-40, BH10-42, BH10-43, BH10-46, BH10-48, BH10-49, BH10-54, BH10-55 and BH10-56 and MW10-63, MW10-65, MW10-66, MW10-68, MW10-71, MW10-74 and MW10-75)

The sand was encountered generally beneath the silty clay till in 31 of the 75 boreholes. It contains a trace to some silt and traces of gravel, with occasional silt and silty fine sand seams and layers. The layered structure shows that the sand is a lacustrine deposit.

Sample examinations showed that the sand is non-cohesive, and generally in a saturated condition. The wet samples displayed a slight dilatancy when shaken by hand. The saturated condition is confirmed by the determined water content values of the samples which was found to range from 3% to 22%, with a median of 17%, which indicates that the fine sand is in a damp to saturated, generally wet condition. The fine sand appears to be water bearing at depths ranging from 4.0± to over 7.8 m from the prevailing ground surface, or El. 291.1± to 236.6± m. In places, the groundwater in the sand is under subterranean artesian pressure as shown in BH10-01, BH10-04, BH10-07, BH10-10, BH10-30, BH10-32, BH10-36, BH10-42, BH10-54, BH10-55 and BH10-56.

The obtained 'N' values range from 5 to 100+, with a median of 52, indicating that the relative density of the sand is loose to very dense, being generally very dense. The loose condition was encountered in BH10-43 and MW10-66, in the surficial layers that have been loosened by the weathering process and extends to depths of 1.2± m and 1.0± m, respectively.

Grain size analyses were performed on 6 representative samples. The results are plotted on Figures 89 and 90.

According to the above findings, the following engineering properties of the sand are deduced:

- Moderately low frost susceptibility with high water erodibility.
- Susceptible to migration through small openings under seepage pressure.
- Pervious, with an estimated coefficient of permeability of 10^{-2} to 10^{-3} cm/sec, an estimated percolation time of 2 to 10 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.04
2% - 6%	0.09
6% +	0.13

- A frictional soil, its shear strength is dependent on its internal friction angle and soil density. Due to its dilatancy, its shear strength is susceptible to impact disturbance, i.e. the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and reduction of shear strength.
- In steep cuts, the sand will be stable in a damp to moist condition, but will slough if it is in a wet condition, run with seepage and boil with a piezometric head of about 0.4 m.
- A fair pavement-supportive material, with an estimated CBR value of 20%.
- Low corrosivity to buried metal, with an estimated electrical resistivity of 6500 ohm·cm.

4.10 <u>Fine to Medium Sand</u> (BH10-16, BH10-23, BH10-37, BH10-38 and BH10-53 and MW10-66, MW10-71, MW10-72 and MW10-75)

The fine to medium sand was encountered beneath the silty clay till deposit, generally in the lower sector of the revealed stratigraphy. It is often encountered within the fine sand deposit, or contains fine sand layers.

It is well graded with variable amounts of silt and gravel. Sample examinations show the particles are subangular in shape, and the deposit is non-cohesive and is generally in a damp to saturated condition.

The obtained 'N' values range from 19 to 100+, with a median of 70, indicating the relative density of the sand is compact to very dense, being generally very dense.

The natural water content values of the samples were found to range from 3% to 23%, with a median of 17%, showing the sand is in a damp to saturated, generally saturated condition. The fine to medium sand encountered is often water bearing at depths ranging from 4.6 to over 7.4 m from the prevailing ground surface, or El. 270.2± to 230.2 m.

Due to the pervious nature, some water drained during sampling; therefore, the determined water content may not represent the true value of the sand.

Grain size analyses were performed on 4 representative samples and the results are plotted on Figures 91 and 92.

According to the above findings, the following engineering properties are deduced:

- Low to high frost susceptibility depending on the silt content.
- Pervious, with an estimated coefficient of permeability of 10^{-2} cm/sec, an estimated percolation time of 2 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.04
2% - 6%	0.09
6% +	0.13

- A frictional soil, its shear strength is derived from its internal friction angle and is soil density dependent.
- In steep cuts, the dry and wet sand will slough to its angle of repose, run under seepage pressure and boil with a piezometric head of about 0.4 m.
- A good pavement-supportive material, with an estimated CBR value of 21%.
- Low corrosivity to buried metal, with an estimated electrical resistivity of 6500 ohm·cm.

4.11 Compaction Characteristics of the Revealed Soils

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 1.

Table 1 - Estimated Water Content for Compaction

Soil Type	**Determined Natural Water Content (%)**	**Water Content (%) for Standard Proctor Compaction**	
		100% (optimum)	**Range for 95% or +**
Silty Clay Till	7 to 34 (median 12)	15, 16 and 17	11 to 22
Silty Clay	14 to 26 (median 20)	15 and 19	11 to 24
Sandy Silt Till	8 to 22 (median 12)	11	7 to 16
Silty Sand Till	5 to 10 (median 8)	10 and 11	6 to 16
Silt	14 to 23 (median 19)	12 and 13	8 to 17
Sandy Silt	7 to 21 (median 17)	12	8 to 16
Silty Fine Sand	5 to 24 (median 19)	11	6 to 16
Fine Sand	3 to 22 (median 17)	11	5 to 16
Fine to Medium Sand	3 to 23 (median 17)	11	5 to 16

According to the above findings, portions of the in situ soils are generally suitable for a 95% or + Standard Proctor compaction. Portions of the tills are either too dry or on the dry side of the optimum and will require addition of water prior to structural compaction, particularly in dry, warm weather and in areas where compaction is best performed on the wet side of the optimum. The weathered soils and portions of the in situ soils are excessively wet and will require prior aeration. This should be carried out during the dry, warm weather by spreading them thinly on the ground. The soils having a low water content can be mixed with wetter soils, or can be wetted prior to or during structural compaction.

The occurring soils should be compacted using a heavy-weight, kneading-type roller. The silts and sands can be compacted by a smooth roller with or without vibration, depending on the water content of the soils being compacted. The lifts for compaction should be limited to 20 cm, or to a suitable thickness as assessed by test strips performed by the equipment which will be used at the time of construction.

One should be aware that with considerable effort a 90%± Standard Proctor compaction of the wet silts and silty fine sand is achievable. Further densification is prevented by the pore pressure induced by the compactive effort; however, large random voids will have been expelled, and with time the pore pressure will dissipate and the percentage of compaction will increase. There are many cases on record where after a few months of rest, the density of the compacted mantle has increased to over 95% of its maximum Standard Proctor dry density.

When compacting the very stiff to hard silty clay till and cemented dense to very dense silty sand till and sandy silt till on the dry side of the optimum, the compactive energy will frequently bridge over the chunks in the soil and be transmitted laterally into the soil mantle. Therefore, the lifts of these soils must be limited to 20 cm or less (before compaction). It is difficult to monitor the lifts of backfill placed in deep trenches; therefore, it is preferable that the compaction of backfill at depths over 1.0 m below the road subgrade be carried out on the wet side of the optimum. This would allow a wider latitude of lift thickness. As noted, wetting of some portions of the tills and the sandy silt will be necessary to achieve this requirement.

If the compaction of the soils is carried out with the water content within the range for 95% Standard Proctor dry density, but on the wet side of the optimum, the surface of the compacted soil mantle will roll under the dynamic compactive load. This is unsuitable for road construction since each component of the pavement structure is to be placed under dynamic conditions which will induce the rolling action of the subgrade surface and cause structural failure of the new pavement. On the other hand, the foundations or bedding of the sewer and slab-on-grade will be placed on a subgrade which will not be subjected to impact loads. Therefore, the structurally compacted soil mantle with the water content on the wet side or dry side of the optimum will provide an adequate subgrade for the construction.

The presence of boulders will prevent transmission of the compactive energy into the underlying material to be compacted. If an appreciable amount of boulders over 15 cm in size is mixed with the material, it must either be sorted, or must not be used for construction of engineered fill and/or structural backfill.

5.0 GROUNDWATER CONDITIONS

Groundwater seepage encountered during augering was recorded on the field logs. The boreholes were checked for the presence of groundwater and the occurrence of cave-in upon their completion. The levels are plotted on the Borehole Logs and listed in Table 2.

Table 2 - Groundwater Levels

	BH/MW	Soil Colour Changes Brown to Grey	Seepage Encountered During Augering		Measured Groundwater/ Cave-in* Level On Completion	
BH/MW No.	**Depth (m)**	**Depth (m)**	**Depth (m)**	**Amount**	**Depth (m)**	**El. (m)**
BH10-01	7.8	7.4	5.5	Appreciable	5.5	262.4
BH10-02	7.8	4.6	7.3	Slight	7.3	258.1
BH10-03	8.1	7.4	-	-	Dry	-
BH10-04	8.1	8.1+	5.8	Some	5.8/7.0*	264.9/263.7*
BH10-05	8.1	8.1+	4.6	Appreciable	4.6/6.0*	262.3/260.9*
BH10-06	8.1	8.1+	6.0	Appreciable	6.0/6.2*	264.6/264.4*
BH10-07	8.1	4.6	5.2	Slight	5.2	254.4
BH10-08	7.9	6.0	-	-	Dry	-
BH10-09	8.1	4.9	-	-	Dry	-
BH10-10	8.1	4.6	3.0	Slight	3.7	295.2
BH10-11	8.1	6.0	7.6	Slight	7.9	280.6
BH10-12	8.1	3.0	7.6	Slight	3.0	256.4
BH10-13	7.0	4.6	-	-	Dry	-

Table 2 - Groundwater Levels (Cont'd 1)

	BH/MW	Soil Colour Changes Brown to Grey	Seepage Encountered During Augering		Measured Groundwater/ Cave-in* Level On Completion	
BH/MW No.	Depth (m)	Depth (m)	Depth (m)	Amount	Depth (m)	El. (m)
BH10-14	7.9	6.0	-	-	Dry	-
BH10-15	7.3	6.0	-	-	Dry	-
BH10-16	8.1	8.1+	4.6	Appreciable	4.8*	263.0*
BH10-17	8.1	3.0	6.7	Some	6.7	262.1
BH10-18	8.1	8.1+	7.0	Slight	7.0	257.4
BH10-19	8.1	4.6	6.7	Slight	6.7	259.9
BH10-20	8.1	6.0	3.0	Slight	3.0	260.0
BH10-21	8.1	4.6	6.0	Slight	Dry	-
BH10-22	8.1	8.1+	6.0	Slight	6.0/7.8*	253.9/252.1 *
BH10-23	7.9	7.9+	-	-	Dry	-
BH10-24	8.1	6.0	5.8	Slight	5.8	258.4
BH10-25	8.1	7.1	-	-	Dry	-
BH10-26	8.1	4.6	1.5	Slight	7.2	249.0
BH10-27	8.1	2.3	4.6	Slight	5.2	248.6
BH10-28	7.7	4.6	2.4	Slight	2.4	248.0
BH10-29	8.1	4.6	3.7	Some	3.7	250.0
BH10-30	8.1	3.0	1.5	Some	1.8/6.0*	253.8/249.6*
BH10-31	7.4	4.6	4.3	Slight	4.3	262.1
BH10-32	8.1	3.0	4.0	Appreciable	4.0/4.3*	251.0/250.7*
BH10-33	8.1	7.4	5.5	Slight	5.5	259.6
BH10-34	7.9	7.9+	-	-	Dry	-

Table 2 - Groundwater Levels (Cont'd 2)

	BH/MW	Soil Colour Changes Brown to Grey	Seepage Encountered During Augering		Measured Groundwater/ Cave-in* Level on Completion	
BH/MW No.	**Depth (m)**	**Depth (m)**	**Depth (m)**	**Amount**	**Depth (m)**	**El. (m)**
BH10-35	8.1	6.0	4.6	Slight	5.8	254.5
BH10-36	8.1	7.4	3.7	Slight	3.7/6.2*	263.1/260.6*
BH10-37	8.1	8.1+	4.0	Appreciable	4.0/4.8*	266.6/265.8*
BH10-38	7.9	7.4	4.9	Appreciable	4.9/6.0*	269.9/268.8*
BH10-39	7.9	7.9+	4.6	Appreciable	5.5	270.8
BH10-40	7.8	7.8+	-	-	Dry	-
BH10-41	8.1	4.6	6.0	Slight	6.7	279.1
BH10-42	7.9	7.9+	6.7	Slight	6.7	268.9
BH10-43	8.1	8.1+	-	-	Dry	-
BH10-44	8.1	8.1	6.0	Some	6.4	262.2
BH10-45	7.9	7.9+	-	-	Dry	-
BH10-46	7.9	7.9+	7.4	Slight	Dry	-
BH10-47	8.1	4.6	-	-	Dry	-
BH10-48	8.1	8.1+	7.0	Appreciable	7.0*	266.7
BH10-49	8.1	8.1+	6.0	Appreciable	6.0*	265.0*
BH10-50	8.1	7.4	5.2	Some	5.2/6.2*	262.8/261.8*
BH10-51	8.1	8.1+	4.6	Slight	4.6/6.7*	262.2/260.1*
BH10-52	8.0	7.4	7.4	Slight	4.9	257.9
BH10-53	7.9	7.9+	7.8	Appreciable	7.8*	273.2*
BH10-54	7.9	7.9+	6.0	Appreciable	3.0	264.4
BH10-55	8.1	7.4	3.0	Slight	2.4/4.6*	261.6/259.4*

Table 2 - Groundwater Levels (Cont'd 3)

BH/MW No.	Borehole Depth (m)	Soil Colour Changes Brown to Grey Depth (m)	Seepage Encountered During Augering Depth (m)	Seepage Encountered During Augering Amount	Measured Groundwater/ Cave-in* Level on Completion Depth (m)	Measured Groundwater/ Cave-in* Level on Completion El. (m)
BH10-56	8.1	8.1+	4.6	Slight	3.7	257.6
BH10-57	8.1	3.0	-	-	Dry	-
BH10-58	8.1	4.6	7.3	Slight	7.3	250.7
BH10-59	8.1	4.6	7.3	Slight	7.3	247.7
BH10-60	8.1	4.6	-	-	Dry	-
MW10-61	6.7	6.7+	5.2	Slight	5.2	260.8
MW10-62	15.0	3.8	7.9	Slight	7.9	255.9
MW10-63	15.4	4.6	9.1	Slight	9.1	254.5
MW10-64	6.6	3.4	-	-	Dry	-
MW10-65	15.8	2.7	9.1	Appreciable	7.8	245.2
MW10-66	30.9	13.7	2.3	Appreciable	2.4	261.9
MW10-67	6.3	6.3+	5.8	Slight	5.8	277.3
MW10-68	15.7	13.7	4.6	Slight	Dry	-
MW10-69	30.9	19.8	10.8	Appreciable	10.8	273.9
MW10-70	6.5	6.5+	4.6	Slight	4.6	254.4
MW10-71	24.6	9.1	6.0	Appreciable	4.8	246.9
MW10-72	30.9	4.6	6.0	Appreciable	5.8	260.4
MW10-73	6.7	6.7+	4.6	Appreciable	3.7	258.8
MW10-74	15.7	9.1	6.0	Appreciable	6.0	259.5
MW10-75	30.9	6.0	6.0	Slight	6.0	258.8

*Cave in level (In wet sands and silts, the level generally represents the groundwater regime at the borehole location.)

Most of the boreholes and monitoring wells where water-bearing sands and silts were encountered under subterranean artesian condition within the investigated depth of 8.0± m were found in the south central and east sectors of the site.

A check of the groundwater levels in these boreholes and monitoring wells showed that in some it had risen to about 3.0 m above the depth of sands and silts revealed at the time of borehole completion.

A review of the subsurface condition revealed by deep monitoring wells showed that the sands and silts extend to considerable depths to over 30.9 m. The sands and silts, in places, are interstratified with hard silty clay, silty clay till and very dense silt. The groundwater level was monitored on October 22, 2010 which was about 1 to 2 months after installation of the wells. The measured groundwater levels are listed in Table 3.

Table 3 - Groundwater Levels on October 22, 2010

MW No.	**Measured Groundwater Level on October 22, 2010**	
	Depth from Ground (m)	**El. (m)**
MW10-61	3.3	262.7
MW10-62	3.1	260.7
MW10-63	4.9	258.7
MW10-64	Above Ground	252.9
MW10-65	Above Ground	253.9
MW10-66	4.6	259.7
MW10-67	4.3	278.8
MW10-68	Dry	-
MW10-69	23.1	261.6

Table 3 - Groundwater Levels on October 22, 2010 (Cont'd)

MW No.	Measured Groundwater Level on October 22, 2010	
	Depth (m)	**El. (m)**
MW10-70	2.5	256.5
MW10-71	2.0	249.7
MW10-72	6.9	259.3
MW10-73	2.4	260.1
MW10-74	8.5	257.0
MW10-75	8.3	256.5

As shown above, groundwater levels were detected in 52 of the 75 boreholes upon completion at depths ranging from 1.8± to 10.8± m below the prevailing ground surface, or at El. 295.2± to 245.2± m. Cave-in was encountered in 17 of the 75 boreholes, at depths ranging from 4.3± to 7.8± m, or El. 275.0± to 249.6± m. The groundwater and cave-in encountered at shallow depths are likely caused by infiltrated precipitation trapped in the fissures of the weathered soil and in the wet sand and silt seams and layers.

The strata of sands and silts dominate the lower sectors of the investigated depths and they are generally water bearing. This indicates that the sands and silts are likely part of the regional aquifer which, in places, is under artesian or subterranean artesian condition.

The soil colour changes from brown to grey at depths of 2.3± to 19.8± m below the ground surface. The brown colour shows that the soils have oxidized. This indicates that the groundwater level will fluctuate seasonally and is affected by the water level of the Don River tributaries.

The groundwater yield from the silty clay till and silty clay, due to their low permeability, is expected to be small and limited. The yield from the sand till and silt till will be some to moderate and the yield from the sands and silts will be appreciable and persistent.

6.0 DISCUSSION AND RECOMMENDATIONS

The investigation has disclosed that beneath a veneer of topsoil, the site is underlain by a complex stratigraphy of soft to hard, generally hard silty clay till; firm to hard, generally very stiff silty clay; dense to very dense, generally very dense sandy silt till; compact to very dense, generally dense silty sand till; loose to very dense, generally very dense silt; loose to very dense, generally very dense sandy silt; compact to very dense, generally very dense silty fine sand; loose to very dense, generally very dense fine sand; and compact to very dense, generally very dense fine to medium sand. The loose and firm deposits are generally restricted to the weathered zone extending to a depth of 1.8± m below the prevailing ground surface.

The groundwater regime at the time of the borehole investigation is inferred to lie at depths ranging from 1.8± to 10.8± m, or El. 295.2± to 245.2± m. Perched groundwater derived from infiltrated precipitation will likely occur at a shallower depth during wet seasons. This condition will often dissipate in dry seasons.

Groundwater detected in water-bearing sands and silts is generally under subterranean artesian condition. The head of groundwater, in places, has risen about 3.0 m above the water-bearing sand and silt revealed on borehole completion. Groundwater was monitored 1 to 2 months after completion of the monitoring well installation.

The groundwater yield from the silty clay till and silty clay, due to their low permeability, is expected to be small and limited. The yield from the sand till and silt till will be some to moderate and the yield from the water-bearing sands and silts will be appreciable and will be persistent, particularly when the groundwater is under subterranean artesian condition.

The revealed findings show that the following geotechnical considerations require special attention:

1. The revealed topsoil is 13 to 90 cm thick. Thicker topsoil is expected to occur in localized depressions, particularly in the farm fields and low-lying drainage areas. The topsoil is highly compressible and must be stripped as it is unsuitable for engineering applications. Due to its high humus content, it will generate volatile gases under anaerobic conditions and is unsuitable for engineering application. For the environmental as well as the geotechnical well-being of the future development, the topsoil should not be buried within the vicinity of any structures.
2. As noted, thicker topsoil may occur, in places, in low-lying areas deposited by erosion from higher areas. Diligent control of the stripping operation will be necessary to prevent overstripping and to ensure satisfactory removal.
3. The surficial soils are generally weathered in the zone extending to a depth of 1.8± m from the prevailing ground surface. These soils are weak and will consolidate under heavy surcharge loads.
4. Where cut and fill is required for site grading, substantial savings can be realized by placing the fill in an engineered manner suitable for foundation, underground services and road construction. This must, however, be properly planned and implemented during the site grading stage.
5. The sound natural soils are suitable for normal spread and strip footing construction. Due to the presence of topsoil and weathered soils, the footing subgrade must be inspected by a geotechnical engineer, or a geotechnical technician under the supervision of a geotechnical engineer, or a building inspector who has geotechnical background, to ensure that the condition of the subgrade is compatible with the design of the foundations. It should be

noted that where deep basements are contemplated, the footing must be placed at a level that has adequate till cover to prevent break-out of subterranean artesian groundwater from the water-bearing sands and silts that will cause settlement of the foundation.

6. In order to alleviate the problem of soil adfreezing, special measures should be implemented for the houses constructed in the areas where the silty clay, silts and silty fine sand occur within the founding depths.
7. Depending on the design grade of the basement, perimeter and floor subdrains and dampproofing of the foundation walls are required for basement construction. The subdrains should be shielded by a fabric filter to prevent blockage by silting. This can be further assessed at the time of basement excavation.
8. A Class 'B' bedding is recommended for the design of the underground services. The bedding material should consist of compacted 20-mm Crusher-Run-Limestone, or equivalent. Where the subgrade needs to be stabilized by well points, a Class 'A' bedding should be considered. In the silty clay and tills plagued with water-bearing sand and silt layers, the bedding material should consist of Crusher-Run Limestone.
9. Curb subdrains will be required by the City of Vaughan for road construction.
10. The hard and very dense tills contain occasional boulders. Extra effort and a properly equipped backhoe will be required for excavation. Boulders larger than 15 cm in size are not suitable for structural backfill.
11. The sides of the excavations in the wet silt and sand will run and the bottom will boil under a piezometric head of about 0.3 m. Excavation below groundwater must be stabilized by vigorous pumping from closely spaced sump-wells or, if necessary, by a well-point dewatering system. Where the

services are to be installed in water-bearing sands and silts which are affected by subterranean artesian conditions, deep dewatering wells should be installed to relieve the condition. The joints of services in water-bearing sands and silts and silty sand and sandy silt tills must be leak-proofed or wrapped with a waterproof membrane. The appropriate method of dewatering should be determined by a test pit programme carried out by the contractor prior to tendering and construction of the project when the intended bottom of excavation is determined.

12. For excavation below the groundwater level, pumping from sumps or, if necessary, a well-point dewatering system will be required. This should be assessed by test pits and test pumping prior to the project construction.
13. In areas not impacted by subterranean artesian groundwater conditions, a general lowering of the groundwater is expected once the underground services of the development have been constructed and the site has been properly graded.
14. A review of the encountered stratigraphy indicates that the sands and silts beneath the tills and silty clay at depths ranging from 2.3± to over 8.1 m from the prevailing ground surface, or El. 273.6± to El. 249.0± m, generally are under subterranean artesian pressure. Accordingly, it is recommended that the proposed grading of the site must be maintained and caution must be exercised if excavation is to be carried out beyond the till and silty clay mantle. Generally a fill cover of 1.0 m will prevent a breakout of sands and silts under 2.0 m of artesian groundwater. This must be confirmed by a qualified hydrogeologist in order to determine the safe excavation depth within the development.

The recommendations appropriate for the project described in Section 2.0 are presented herein. One must be aware that the subsurface conditions may vary between boreholes and monitoring wells, and the assessment given herein is general in nature based on the borehole and monitoring well findings. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

6.1 Foundations

At the time of the report preparation, detailed site plan for the proposed development was not available. Where the proposed development consists of blocks reserved for other uses such as school, park and/or commercial purposes, additional boreholes must be carried out to confirm and/or elaborate on these recommendations when the layout and plans of the blocks are determined.

As a general guide, Maximum Allowable Soil Pressure (SLS) and Factored Ultimate Soil Bearing Pressure (ULS) based on 'N' values on native soil below the weathered frost zone are presented for the design of spread and strip foundations in Table 4.

Table 4 - 'N' Value and Soil Pressure

	Recommended Maximum Allowable Soil Pressure (SLS)/ Factored Ultimate Soil Bearing Pressure (ULS)	
'N' Values	**kPa (SLS)**	**kPa (ULS)**
10	100	160
15	150	225
20	200	325

Table 4 - 'N' Value and Soil Pressure (Cont'd)

'N' Values	Recommended Maximum Allowable Soil Pressure (SLS)/ Factored Ultimate Soil Bearing Pressure (ULS)	
	kPa (SLS)	kPa (ULS)
25	250	375
30	300	475

One should be aware that the subsurface conditions often vary between boreholes. Groundwater condition profiles of 'N' values with depth and soil type will impact on soil bearing. Therefore, further investigations need to be carried out when detailed site plans of the building areas are finalized to confirm the above given bearing values.

The recommended soil pressures incorporate a safety factor of 3 against shear failure of the underlying soils. The total and differential settlements of the footings are estimated to be 25 mm and 15 mm, respectively.

Where the footing subgrade consists of wet sands or silts, it must be protected by a concrete mud-slab immediately after exposure and inspection. This will prevent construction disturbance and costly rectification.

Perimeter subdrains and dampproofing of the perimeter basement walls are required in order to provide a dry basement. The subdrains should be encased in fabric filter to protect them against blockage by silting.

The foundations exposed to weathering and in unheated areas should have at least 1.2 m of earth cover for protection against frost action, or must be properly insulated.

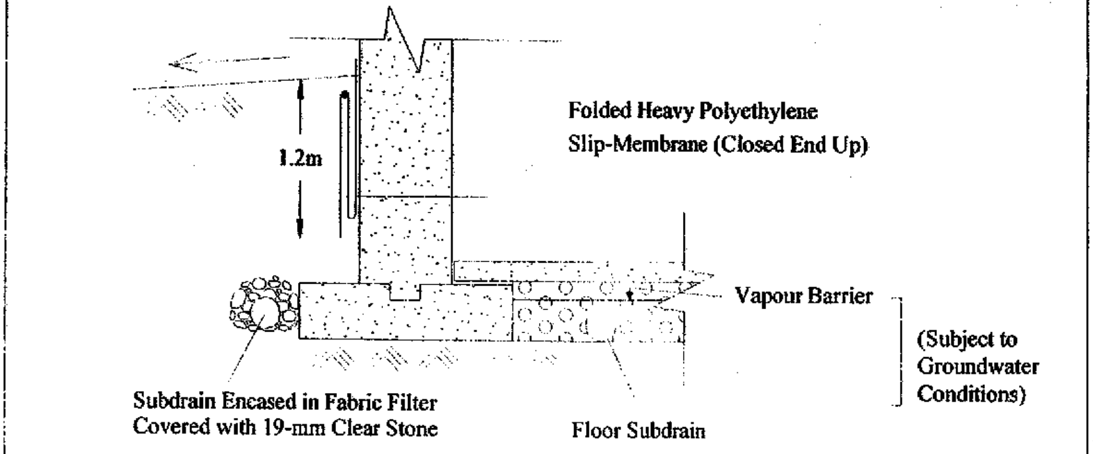
The foundations of buildings to be built in the area close to the CN railroad should be designed to tolerate the vibration emanating from the train traffic.

The footings should meet the requirements specified in the Ontario Building Code 2006, and the structure should be designed to resist an earthquake force using Site Classification 'D' (stiff soil).

Due to the presence of topsoil, weathered soils and wet sands and silts, the footing subgrade must be inspected by a geotechnical engineer, or a geotechnical technician under the supervision of a geotechnical engineer, or a building inspector who has geotechnical background, to assess its suitability for bearing the designed foundations.

As previously discussed, the in situ silty clay, silts and silty fine sand are high in frost heave and soil-adfreezing potential. In order to alleviate the risk of frost damage where these soils are encountered, the basement and foundation walls must be constructed of concrete and either backfilled with non-frost-susceptible pit-run granular, or shielded with a polyethylene slip-membrane. Where groundwater seepage is detected, floor subdrains must be installed and must be connected to sump-wells or to foundation drains which have a positive outlet. A vapour barrier should also be placed above the obvert of the subdrain to prevent upfiltrating moisture from dampening the floor surface. The recommended scheme is schematically illustrated in Diagram 1.

Diagram 1 - Frost Protection Measures (Foundations)



The membrane will allow vertical movement of the heaving soil (due to frost) without imposing structural distress on the foundations. The external grading should be such that runoff is directed away from the foundation.

The necessity to implement this scheme should be further assessed by a geotechnical consultant at the time of construction.

The weathered soils can be upgraded to engineered status suitable for normal footing construction. Where earth fill is required to raise the site or where cut and fill maybe required for lot grading, it is generally more practical and economical to place engineered fill suitable for a Maximum Allowable Soil Pressure (SLS) of 150 kPa for normal footing construction. The requirements and procedures for engineered fill construction are discussed in Section 6.2.

6.2 **Engineered Fill**

Where earth fill is required to raise the site, it is generally economical to place engineered fill for normal footings, sewer and road construction. The engineering requirements for a certifiable fill for road construction, municipal services, and footings designed with a Maximum Allowable Soil Pressure (SLS) of 150 kPa and a Factored Ultimate Soil Bearing Pressure (ULS) of 250 kPa are presented below:

1. All of the topsoil and organics must be removed, and the subgrade must be inspected and proof-rolled prior to any fill placement. Badly weathered soils must be subexcavated, aerated and property compacted.
2. Inorganic soils must be used, and they must be uniformly compacted in lifts 20 cm thick to 98% or + of their maximum Standard Proctor dry density up to the proposed finished lot grade and/or road subgrade. The soil moisture must be properly controlled on the wet side of the optimum.
   If the house foundations are to be built soon after the fill placement, the densification process for the engineered fill must be increased to 100% of the maximum Standard Proctor compaction.
3. If imported fill is to be used, the hauler is responsible for its environmental quality and must provide a document to certify that the material is free of hazardous contaminants.
4. If the engineered fill is to be left over the winter months, adequate earth cover, or equivalent, must be provided for protection against frost action.
5. The engineered fill must extend over the entire graded area, and the fill envelope must be clearly and accurately defined in the field and precisely documented by qualified surveyors. Foundations partially on engineered fill must be reinforced by two 15-mm steel reinforcing bars in the footings and

upper section of the foundation walls, or be designed by a structural engineer to properly distribute the stress induced by the differential settlement (about 15 mm) between the natural soil and engineered fill.

6. The engineered fill must not be placed during the period from late November to early April, when freezing ambient temperatures occur either persistently or intermittently. This is to ensure that the fill is free of frozen soils, ice and snow.
7. Where the ground is wet due to subsurface water seepage, an appropriate subdrain scheme must be implemented prior to the fill placement, particularly if it is to be carried out on sloping ground.
8. Where the fill is to be placed on a bank steeper than 1 vertical:3 horizontal, the face of the bank must be flattened to 3 + so that it is suitable for safe operation of the compactor and the required compaction can be obtained.
9. The fill operation must be inspected on a full-time basis by a technician under the direction of a geotechnical engineer.
10. The footing and underground services subgrade must be inspected by the geotechnical consulting firm that inspected the engineered fill placement. This is to ensure that the foundations are placed within the engineered fill envelope, and the integrity of the fill has not been compromised by interim construction, environmental degradation and/or disturbance by the footing excavation.
11. Any excavation carried out in certified engineered fill must be reported to the geotechnical consultant who inspected the fill placement, in order to document the locations of excavation and/or to inspect reinstatement of the excavated areas to engineered fill status. If construction on the engineered fill does not commence within a period of 2 years from the date of certification, the status must be assessed for re-certification.

12. Despite stringent control in the placement of engineered fill, variations in soil type and density may occur in the engineered fill. Therefore, the strip footings and the upper section of the foundation walls constructed on the engineered fill may require continuous reinforcement with steel bars, depending on the uniformity of the soils in the engineered fill and the thickness of the engineered fill underlying the foundations. Should the footings and/or walls require reinforcement, the required number and size of reinforcing bars must be assessed by considering the uniformity as well as the thickness of the engineered fill beneath the foundations. In sewer construction, the engineered fill is considered to have the same structural proficiency as a natural inorganic soil.

6.3 Underground Services

The subgrade for the underground services should consist of properly compacted inorganic earth fill or sound natural soils. In areas where the subgrade consists of topsoil, weathered soils and, soft to loose soils, they should be subexcavated and replaced with properly compacted bedding material compacted to at least 95% or + of its Standard Proctor compaction.

A Class 'B' bedding is generally recommended for construction of the underground services. The bedding material should consist of compacted 20-mm Crusher-Run Limestone, or equivalent, as approved by a geotechnical engineer. In water-bearing sands and silts, the bedding material for the underground services may need to be changed from 20-mm Crusher-Run Limestone to Class 'A' bedding. The joints of services must be leak-proof or wrapped with a waterproof membrane to prevent the sands and silts under hydrostatic pressure from seeping into the joints thus collapsing the services due to loss of ground.

In order to prevent pipe floatation when the sewer trench is deluged with water from infiltrated precipitation, a soil cover with a thickness equal to the diameter of the pipe should be in place at all times after completion of the pipe installation.

Where wet sand and silt seams, layers or deposits are encountered, the sewer joints should be leak-proof or wrapped with a waterproof membrane. This is to prevent the infiltration of fines. The necessity to implement these measures can best be determined during sewer construction.

Openings to subdrains and catch basins should be shielded with a fabric filter to prevent silting.

The excavation for open cut must be sloped at 1 vertical:1 or + horizontal for stability and the spoil should be placed at a distance away from the trench sides equal to 2 times the depth of excavation. These measures are to prevent sloughing of the sides due to surcharge of the excavated spoil. Alternatively, a trench box can also be used for the construction of the underground services. Deep relief wells and well points need to be installed to stabilize the water-bearing sands and silts under artesian conditions.

6.4 Backfilling in Trenches and Excavated Areas

The on-site inorganic soils are generally suitable for trench backfill. The backfill in the trenches and excavated areas should be compacted to at least 95% of its maximum Standard Proctor dry density. In the zone within 1.0 m below the road subgrade, the material should be compacted with the water content 2% to 3% drier than the optimum, and the compaction should be increased to at least 98% of the respective maximum Standard Proctor dry density. This is to provide the required stiffness for pavement construction. In the lower zone, the compaction should be carried out on the wet side of the optimum; this allows a wider latitude of lift thickness. Wetting of the sound tills will be necessary to achieve this requirement.

In normal sewer construction practice, the problem areas of road settlement largely occur adjacent to manholes, catch basins, services crossings, foundation walls and columns. In areas which are inaccessible to a heavy compactor, sand backfill should be used. Unless compaction of the backfill is carefully performed, the interface of the native soils and the sand backfill will have to be flooded for a period of at least 1 day.

The narrow trenches should be cut at 1 vertical:2 or + horizontal so that the backfill can be effectively compacted. Otherwise, soil arching will prevent the achievement of proper compaction. The lift of each backfill layer should either be limited to a thickness of 20 cm, or the thickness should be determined by test strips.

One must be aware of the possible consequences during trench backfilling and exercise caution as described below:

- When construction is carried out in freezing winter weather, allowance should be made for these following conditions. Despite stringent backfill monitoring, frozen soil layers may inadvertently be mixed with the structural trench backfill. Should the in situ soil have a water content on the dry side of the optimum, it would be impossible to wet the soil due to the freezing condition, rendering difficulties in obtaining uniform and proper compaction. Furthermore, the freezing condition will prevent flooding of the backfill when it is required, such as when the trench box is removed. The above will invariably cause backfill settlement that may become evident within 1 to several years, depending on the depth of the trench which has been backfilled.

- In areas where the underground services construction is carried out during winter months, prolonged exposure of the trench walls will result in frost heave within the soil mantle of the walls. This may result in some settlement as the frost recedes, and repair costs will be incurred prior to final surfacing of the new pavement.
- To backfill a deep trench, one must be aware that future settlement is to be expected, unless the side of the cut is flattened to at least 1 vertical: 1.5 + horizontal, and the lifts of the fill and its moisture content are stringently controlled; i.e., lifts should be no more than 20 cm (or less if the backfilling conditions dictate) and uniformly compacted to achieve at least 95% of the maximum Standard Proctor dry density, with the moisture content on the wet side of the optimum.
- It is often difficult to achieve uniform compaction of the backfill in the lower vertical section of a trench which is an open cut or is stabilized by a trench box, particularly in the sector close to the trench walls or the sides of the box. These sectors must be backfilled with sand. In a trench stabilized by a trench box, the void left after the removal of the box will be filled by the backfill. It is necessary to backfill this sector with sand, and the compacted backfill must be flooded for 1 day, prior to the placement of the backfill above this sector, i.e., in the upper sloped trench section. This measure is necessary in order to prevent consolidation of inadvertent voids and loose backfill which will compromise the compaction of the backfill in the upper section. In area where groundwater movement is expected in the sand fill mantle, seepage collars should be provided.

6.5 Slab-On-Grade, Garages, Driveways and Landscaping

As noted, the occurring silty clay, silts and silty fine sand are high in frost heave and soil-adfreezing potential; therefore, the ground can be expected to heave during cold weather.

The driveways at the entrances to the garages must be backfilled with non-frost-susceptible granular material, with a frost taper at a slope of 1 vertical:1 horizontal. In area where the silty fine sand and silts occurs beneath the garage floor slab and interior garage foundation walls, they must be insulated with 50-mm Styrofoam, or its thermal equivalent.

The slab-on-grade in open areas should be designed to tolerate frost heave. The grading around the slab-on-grade and house structures must be such that it directs runoff away from the structures.

The slab should be constructed on a granular base, 20 cm thick, consisting of 10-mm Crusher-Run Limestone, or equivalent, compacted to its maximum Standard Proctor dry density.

A Modulus of Subgrade Reaction of 25 to 35 MPa/m is recommended for the design of the floor slab, depending on the subgrade conditions.

In areas where ground movement due to frost heave cannot be tolerated, the slab-on-grade, sidewalks and interlocking stone pavement must be constructed on a free-draining granular base, 0.3 to 1.2 m thick, depending on the degree of tolerance for settlement. These measures, with proper drainage, will prevent water from accumulating in the granular base. Alternatively, the slab-on-grade, sidewalks and interlocking stone pavement should be insulated with 50-mm Styrofoam, or its thermal equivalent.

6.6 Pavement Design

Based on the borehole findings, the recommended pavement design for local and collector roads is presented in Table 5.

Table 5 - Pavement Design

Course	Thickness (mm)	OPS Specifications
Asphalt Surface		HL-3
Local	40	
Collector	50	
Asphalt Binder		HL-8
Local	50	
Collector	75	
Granular Base		20-mm Crusher-Run Limestone
Local	150	
Collector	125	
Granular Sub-base		50-mm Crusher-Run Limestone
Local	200	
Collector	350	

The pavement structure provided in Table 3 can be used for the design of the roadway for construction under ideal and non-ideal conditions:

Ideal Condition

Under ideal conditions, the zone of the subgrade within 1.0 m below the underside of the granular sub-base must be compacted to at least 95% of its maximum Standard Proctor dry density, with the water content 2% to3% drier than its optimum; in the upper 60 cm of the subgrade, the compaction should be increased to 98% of its maximum Standard Proctor dry density.

Non-ideal Condition

If the roads are to be constructed during the wet seasons and if the subgrade is unstable, either the top 1.0 m of the subgrade should be replaced with drier, compacted, selected subgrade material or the top 0.8 m of the subgrade should be replaced with granular material. This can be determined at the time of road construction.

In preparation of the subgrade prior to the placement of the granular sub-base and base materials, the subgrade must be proof-rolled to determine its stability and suitability for road construction.

The road subgrade will suffer a strength regression if water is allowed to saturate the mantle. The following measures should, therefore, be incorporated in the construction procedures and road design:

- If the road construction does not immediately follow the trench backfilling, the subgrade should be properly crowned and smooth-rolled to allow interim precipitation to be properly drained.

- Lot areas adjacent to the roads should be properly graded to prevent ponding of large amounts of water. Otherwise, the water will seep into the subgrade mantle and induce a regression of the subgrade strength, with costly consequences for the pavement construction.
- Fabric filter-encased curb subdrains may be required to meet City of Vaughan requirements.

6.7 Soil Corrosivity

For estimation purposes for the anode weight requirements, the electrical resistivity which has been determined for the disclosed soils can be used. This, however, should be confirmed by testing the soil along the water main alignment at the time of the sewer construction.

6.8 Stormwater Management Facilities

At the time of the report preparation, detail designs and the exact locations of the proposed stormwater management ponds were not determined; however, it is understood that stormwater retention and infiltration facilities will be provided at suitable areas for the proposed development.

Stormwater Retention Facilities

A review of the borehole findings indicates that the revealed stratigraphy within the property generally consists of a stratum of silty clay till overlying sands and silts to various depths. Based on the groundwater condition encountered at the time of the borehole investigation and the revealed soil stratigraphy, the recommended areas where stormwater retention facilities can be considered are presented in Table 6.

Table 6 - Summary of Recommended Area for Water Retention Facilities

BH No.	Surface Elevation	Revealed Silty Clay Till Deposit		Encountered Groundwater Level
	El. (m)	Thickness (m)	Bottom El. (m)	El. (m)
BH10-01	267.9	4.1	263.3	262.4
BH10-02	265.4	6.7	258.4	258.1
BH10-03	266.1	6.9	258.7	Dry
BH10-08	275.6	7.2	268.2	Dry
BH10-09	272.6	6.5	265.2	Dry
BH10-11	288.5	6.6	280.4*	280.6
BH10-13	262.2	4.2	257.6	Dry
BH10-14	265.6	5.8	259.6	Dry
BH10-18	264.4	7.6	256.3*	257.4
BH10-19	266.6	7.0	259.2	259.9
BH10-21	262.7	7.8	254.6*	Dry
BH10-22	259.9	7.1	252.5	253.9
BH10-23	280.7	4.3	276.1	Dry
BH10-24	264.2	7.2	256.8	258.4
BH10-25	264.2	6.8	257.2	Dry
BH10-26	256.2	7.9	248.1*	249.0
BH10-41	285.8	4.3	281.2	279.1
BH10-44	268.6	5.8	262.6	262.2
BH10-45	273.6	7.1	265.7*	Dry
BH10-49	271.0	5.8	265.0	265.0
BH10-51	266.8	5.4	260.8	262.2
BH10-59	255.0	7.8	246.9*	247.7
BH10-60	291.5	7.1	284.1	Dry

Thickness is based on revealed depth less encountered topsoil thickness.

*Deeper boreholes maybe required if invert of facility is below the maximum depth of borehole.

It should be noted, depending on the proposed normal water level of the stormwater retention facilities and the surrounding groundwater levels, the available capacity of the facilities may differ, due to the impact of the possible subterranean artesian condition on the underlying water-bearing sands and silts.

The silty clay till and silty clay are materials of low permeability and are suitable for construction of the stormwater management pond; the seepage of groundwater into the pond will likely be equal to or less than the amount of water lost through evaporation, and the impact on the storage volume of the pond will be minimal.

The estimated coefficient of permeability for use in the design of the pond is 10^{-7} cm/sec and the estimated percolation time ranges from 70 to 100 min/cm for the silty clay till and silty clay. It is generally recommended that the bottom of the pond should be at least 1.0 m above the interface of the sand deposit, due to the presence of sand and silt deposits which may have an impact on the subterranean artesian pressure.

The in situ silty clay and silty clay till are suitable for the construction of the pond berms. They must be compacted to 95% or + of their maximum Standard Proctor dry density. The pond cut into the ground should be sloped at least 1 vertical: 3 or + and 4 or + horizontal above and below the wet perimeter of the pond, respectively.

Where a berm is to be constructed for the stormwater management pond, the topsoil must be removed and the subgrade must be proof-rolled. Inorganic soil material consisting of silty clay or silty clay till must be used and compacted to at least 95% of its maximum Standard Proctor dry density. The fill berm must be designed to have a minimum gradient of 1 vertical:3 or + horizontal.

In case where the proposed stormwater retention facility is to be constructed in an area where soils with higher permeability soils are encountered (i.e., sands and silts), it is recommended that a clay liner, at least 1.0 m thick, should also be provided to prevent groundwater flow which will affect the designed capacity of the ponds. The on-site silty clay and silty clay till are suitable materials for use as a clay liner.

All the exposed side slopes must be vegetated and/or sodded to prevent erosion. A layer of rip-rap can be placed along the wet perimeter to protect against wave erosion.

Stormwater Infiltration Facilities

The revealed soil stratigraphy indicates that the upper stratum in most boreholes generally consists of either silty clay or silty clay till material, which is low in permeability and is unsuitable for infiltration purposes; however, a review of the borehole findings indicates that, in places, the sand and silt deposits either interstratified with or beneath the impermeable clay material may have some stormwater infiltration potentials. The potential infiltration zone is summarized in Table 7.

Table 7 - Summary of Recommended Area for Water Infiltration Facilities

	Surface Elevation	**Potential Infiltration Stratum**			**Encountered Groundwater Level**
BH No.	**El. (m)**	**Upper El. (m)**	**Bottom El. (m)**	**Soil Type**	**El. (m)**
BH10-09	272.6	265.2	264.5	Fine Sand	Dry
BH10-11	288.5	288.3	287.0	Sandy Silt	280.6

Table 7 - Summary of Recommended Area for Water Infiltration Facilities (Cont'd)

	Surface Elevation	**Potential Infiltration Stratum**			**Encountered Groundwater Level**
BH No.	**El. (m)**	**Upper El. (m)**	**Bottom El. (m)**	**Soil Type**	**El. (m)**
BH10-38	274.8	272.5	270.2	Fine Sand	269.9
BH10-40	279.6	276.6	273.6	Fine Sand	Dry
BH10-46	280.2	275.6	274.2	Fine Sand	Dry
BH10-47	291.7	290.2	289.4	Silty Fine Sand	Dry
BH10-53	281.0	278.7	275.0	Silty Fine Sand and Fine to Medium Sand	273.2

It must be emphasized that the above potential locations for water retention and infiltration are based on the revealed borehole findings, and the extent of the permeable/practically impermeable deposits will vary from borehole to borehole. Accordingly, detailed investigation will be required to confirm the suitability of the area for retention or infiltration. The revealed soils must be further assessed by a qualified hydrogeologist and hydraulic conductivity tests must be carried out for areas where infiltration is being considered.

The footings for all control structures for the stormwater management facilities must be placed onto the natural sound soil. The suitable Maximum Allowable Soil Pressure (SLS) of 150 kPa and the Factored Ultimate Soil Bearing Pressure (ULS) of 225 kPa can be used for the design of the proposed structures.

6.9 Berm Construction and Geotechnically Stable Top of Slope

Where a berm is to be constructed within the development, the topsoil must be removed and the subgrade must be proof-rolled. Inorganic soil material must be used and compacted to at least 95% of its maximum Standard Proctor dry density if loads are to be applied on the top of berm; otherwise, where no loading is to be applied, a berm consisting of topsoil material can also be considered acceptable. In order to maintain stability of the fill berm, the sides of the berm must be designed to have a minimum slope of 1 vertical:3 or + horizontal. The sides of the berm must be vegetated and/or sodded to prevent erosion.

As a general guide, in establishing the long-term stable top of slope, depending on soil type, a 1 vertical:2.5 to 3.0 horizontal stable slope allowance from the bottom of slope to the top of slope must be applied. If a steeper slope is considered, a detailed slope stability analysis must be carried out along the top of slope.

Depending on the location and surrounding features of the slope, additional setbacks will be required in accordance to the guidelines set up out by the Toronto and Region Conservation Authority (TRCA).

6.10 Soil Parameters

The recommended soil parameters for the project design are given in Table 8.

Table 8 - Soil Parameters

Unit Weight and Bulk Factor

	Unit Weight (kN/m^3)		Estimated Bulk Factor	
	Bulk	**Submerged**	**Loose**	**Compacted**
Sandy Silt and Silty Sand Tills	22.5	12.5	1.33	1.05
Silty Clay Till	22.0	12.5	1.33	1.05
Weathered Tills	21.0	11.5	1.20	1.00
Silts	21.0	10.5	1.20	1.00
Silty Clay	20.5	11.5	1.30	1.00
Sands	20.0	10.8	1.20	1.00

Lateral Earth Pressure Coefficients

	Active K_a	At Rest K_o	Passive K_p
Silty Clay and Silty Clay Till	0.40	0.50	2.86
Silts and Sandy Silt Till	0.33	0.43	3.00
Sands and Silty Sand Till	0.30	0.40	3.33

Maximum Allowable Soil Pressure (SLS) For Thrust Block Design

Engineered Fill and Sound Natural Soil	75 kPa

6.11 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91.

For excavation purposes, the types of soils are classified in Table 9.

Table 9 - Classification of Soils for Excavation

Material	Type
Sound Tills	2
Weathered Soils, Silty Clay, Sands and Silts above groundwater	3
Sands and Silts below groundwater	4

In the tills and clay which are plagued with fissures and saturated sand and silt seams and layers, the sides of excavations above groundwater may suffer localized sloughing or side collapse. Therefore, the sides must be sloped at 1 vertical: at least 1 horizontal for stability.

At depths below the groundwater level, seepage in the clay and till mantles during excavation is expected to be slow and controllable by normal pumping from sumps.

Excavation into the hard and very dense tills containing boulders will require extra effort and the use of a heavy, properly equipped backhoe.

In places, where excavations are to be carried out in the water-bearing sands and silts, the possibility of flowing sides and bottom boiling dictates that the ground be predrained, either by pumping from closely spaced sump-wells (excavations shallower than 0.5 m below the groundwater) or, if necessary, by the use of a well-point dewatering system (excavations deeper than 0.5 m into the groundwater table). In order to provide a stable subgrade for the services or foundation construction, the groundwater should be depressed to at least 0.5 m below the subgrade.

It must be further emphasised that subterranean artesian condition may occur for excavation beyond the silty clay till mantle into the sand deposit; therefore, caution should be exercised for any excavation into the sand deposit. Where the sands and silts are under strong artesian pressure, the excavation must be stabilized by well points and may need to be controlled by deep relief wells.

As previously discussed, the groundwater yield from the sands and silts will be appreciable and persistent; however, this should be confirmed by test pumping at the time of construction.

Caution

Where excavations are to be carried out in water-bearing sands and silts, particularly if they are under artesian condition, a suitable groundwater control scheme must be carried out to lower the groundwater to at least 0.5 m below the depth of trench. If the groundwater is not sufficiently lowered, subgrade heaving and loosening will occur. In this case, the excavation must be immediately backfilled to a level higher than the original ground level and relief-well pumping must be carried out until the heaved subgrade has settled. This should be determined at the time of the construction.

Prospective contractors must be asked to assess the in situ subsurface conditions for soil cuts by digging test pits to at least 0.5 m below the sewer subgrade. These test pits should be allowed to remain open for a period of at least 4 hours to assess the trenching conditions.

7.0 LIMITATIONS OF REPORT

It should be noted that no tests have been carried out to determine whether environmental contaminants are present in the soils. Therefore, this report deals only with a study of the geotechnical aspects of the proposed project.

This report was prepared by Soil Engineers Ltd. for the account of Block 27 Landowners Group Inc., and for review by its designated consultants and government agencies. The material in it reflects the judgement of 0Kelvin Hung, B.A.Sc., and Victor S. Chan, P.Eng., in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, 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.

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PROVINCE OF ONTARIO

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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:

1. SAMPLE TYPES

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

2. PENETRATION RESISTANCE/'N'

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 'O'

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

3. SOIL DESCRIPTION

a) 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

b) 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

c) 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
1 lb. = 0.453 kg
1 inch = 25.4 mm
1 ksf = 47.88 kN/m^2

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-01

FIGURE NO: 1

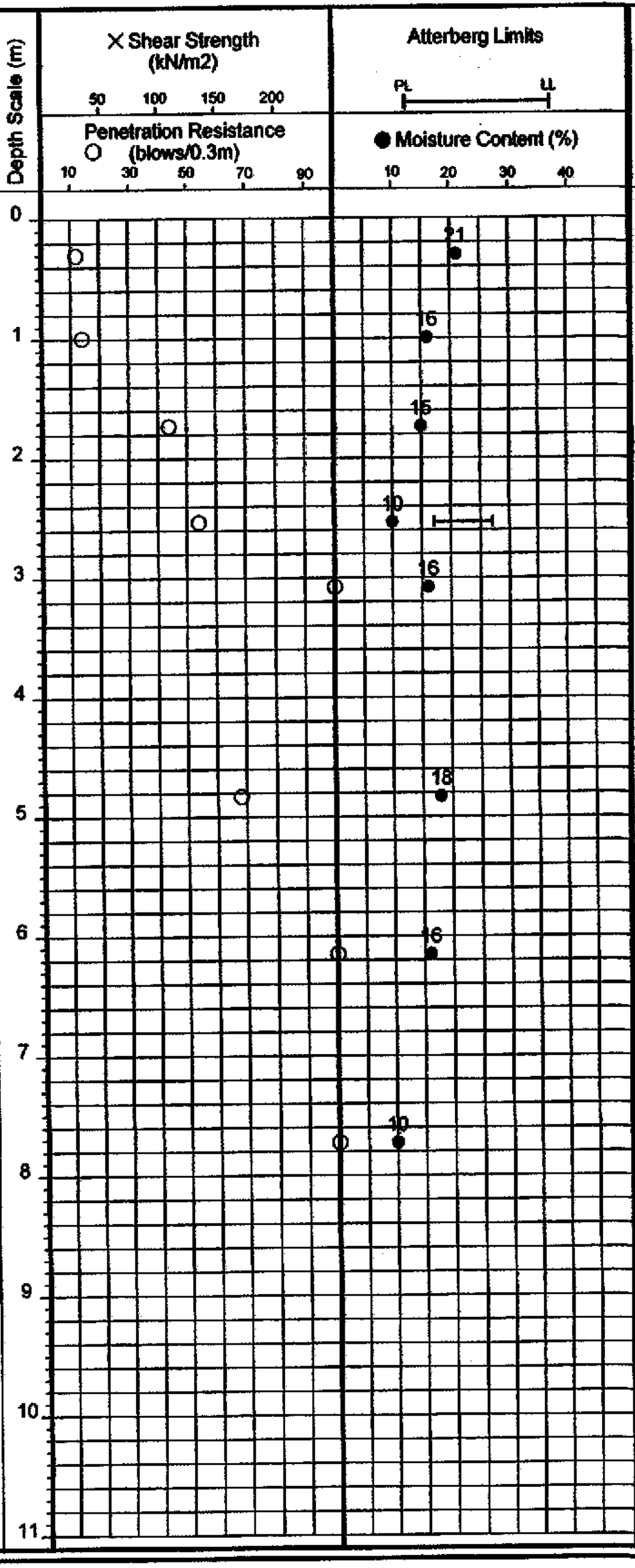
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 3, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
267.9	**46 cm TOPSOIL**	1	DO	12
	Brown, stiff to hard weathered	2	DO	14
		3	DO	44
	SILTY CLAY, Till	4	DO	54
	boulder	5	DO	100+
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
4.6 263.3	Brown, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	6	DO	68
6.0 261.9	Hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders brown grey	7	DO	100+
		8	DO	100+
7.8 260.1	**END OF BOREHOLE**			



WATER LEVEL

∇ W.L. @ El. 262.4 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-02

FIGURE NO: 2

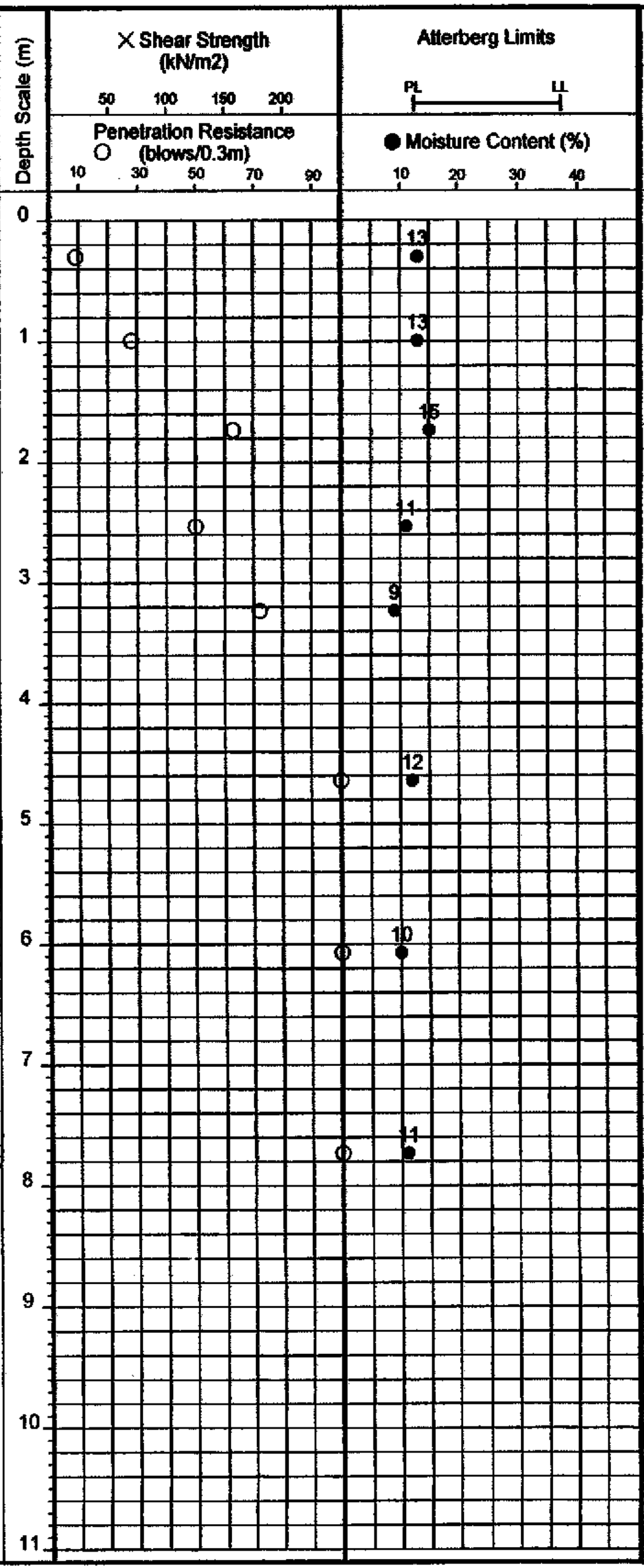
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 27, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 265.4	Ground Surface			
	30 cm TOPSOIL			
	Stiff to hard	1	DO	9
	weathered	2	DO	28
		3	DO	63
	SILTY CLAY, Till	4	DO	50
		5	DO	72
	brown grey sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	100+
		7	DO	100+
	sand layer	8	DO	100+
7.8 257.6	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 258.1 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-03

FIGURE NO: 3

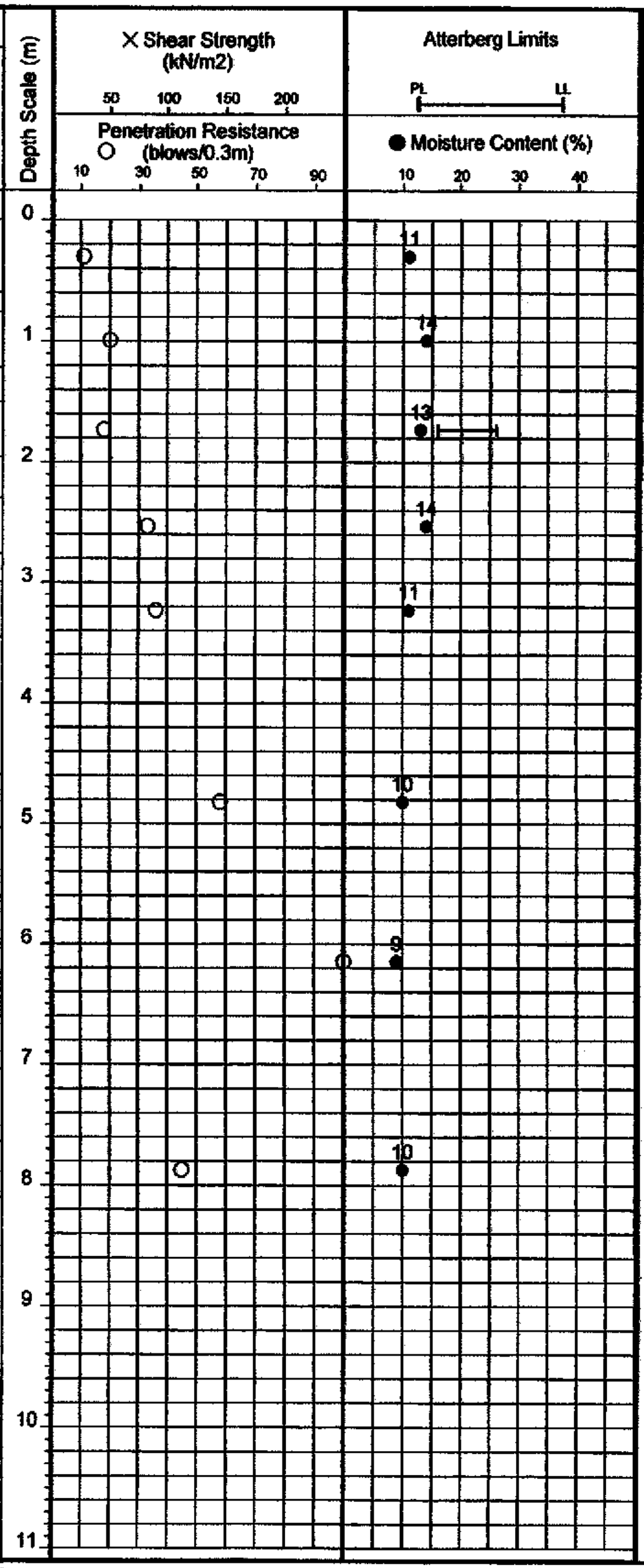
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 30, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 266.1	Ground Surface **46 cm TOPSOIL**			
	Brown, stiff to hard	1	DO	11
	weathered	2	DO	20
		3	DO	18
	SILTY CLAY, Till	4	DO	33
		5	DO	36
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	58
		7	DO	100+
7.4 258.7	Grey, dense **SANDY SILT, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	8	DO	45
8.1 258.0	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-04

FIGURE NO: 4

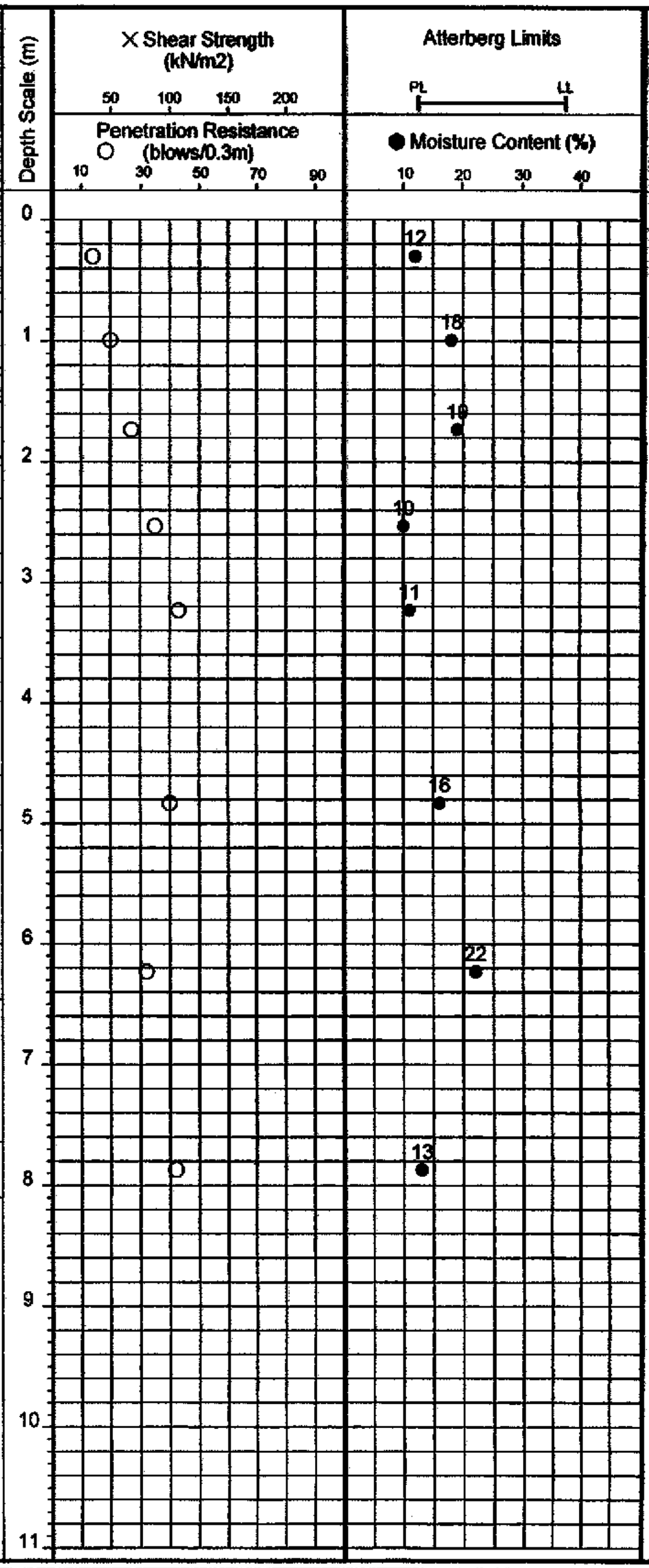
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 30, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
270.7	41 cm TOPSOIL			
	Brown, stiff to hard	1	DO	14
	weathered	2	DO	20
	SILTY CLAY, Till	3	DO	27
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	35
		5	DO	43
4.6 266.1	Grey, dense SANDY SILT, Till some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	6	DO	40
6.0 264.7	Brown, dense FINE SAND a trace to some silt a trace of gravel occ. silt seams and layers	7	DO	32
7.4 263.3	Brown, dense SANDY SILT, Till some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	8	DO	42
8.1 262.6	END OF BOREHOLE			



WATER LEVEL

W.L. @ El. 264.9 m on completion
Cave-in @ El. 263.7 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-05

FIGURE NO: 5

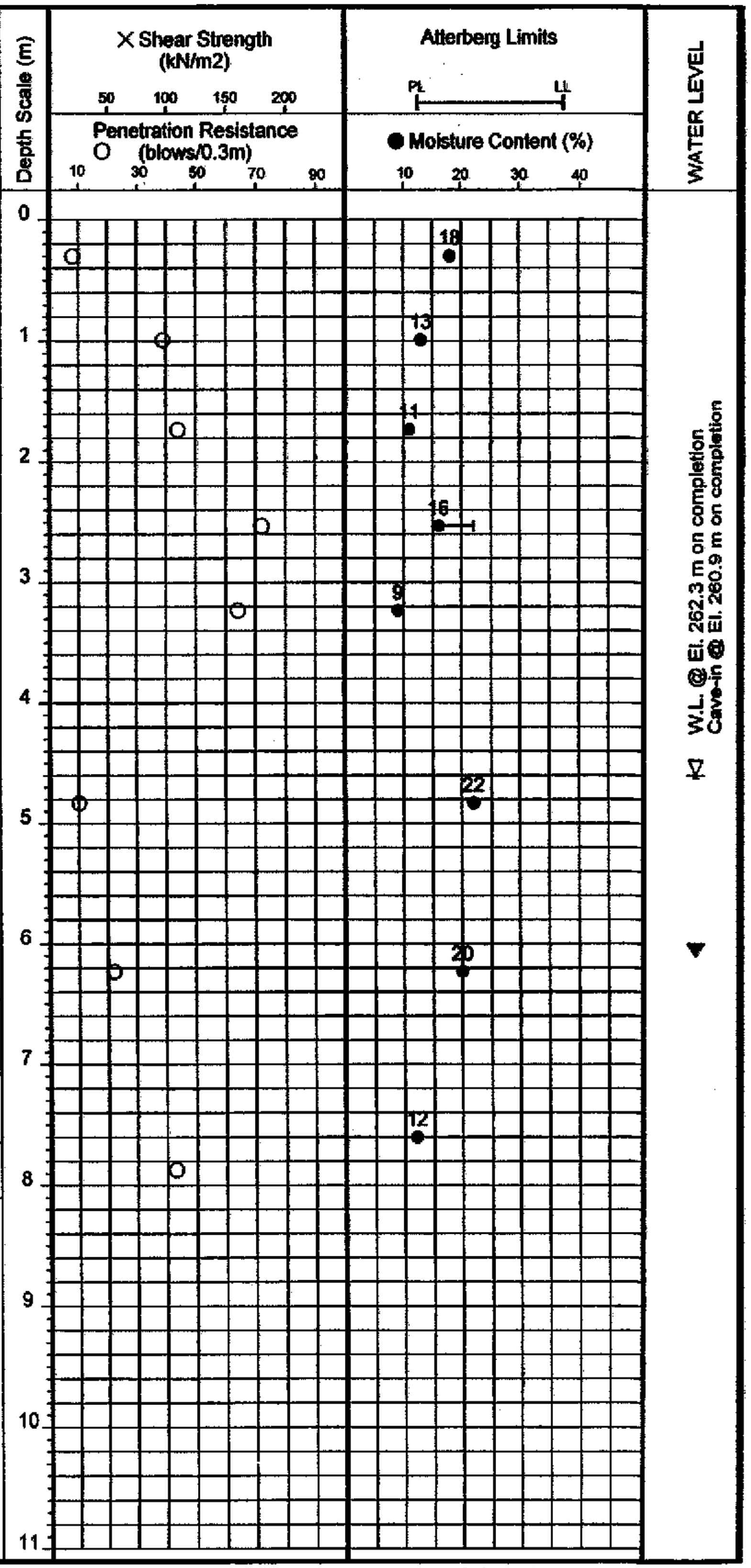
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 30, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
266.9	**30 cm TOPSOIL**			
	Brown, firm to hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders weathered	1	DO	8
		2	DO	39
1.5 265.4	Brown, dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	3	DO	44
2.3 264.6	Brown, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	72
		5	DO	64
4.6 262.3	Brown, loose to compact **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	6	DO	10
		7	DO	22
7.4 259.5	Brown, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	8	DO	43
8.1 258.8	**END OF BOREHOLE**			



W.L. @ El. 262.3 m on completion
Cave-in @ El. 260.9 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-06

FIGURE NO: 6

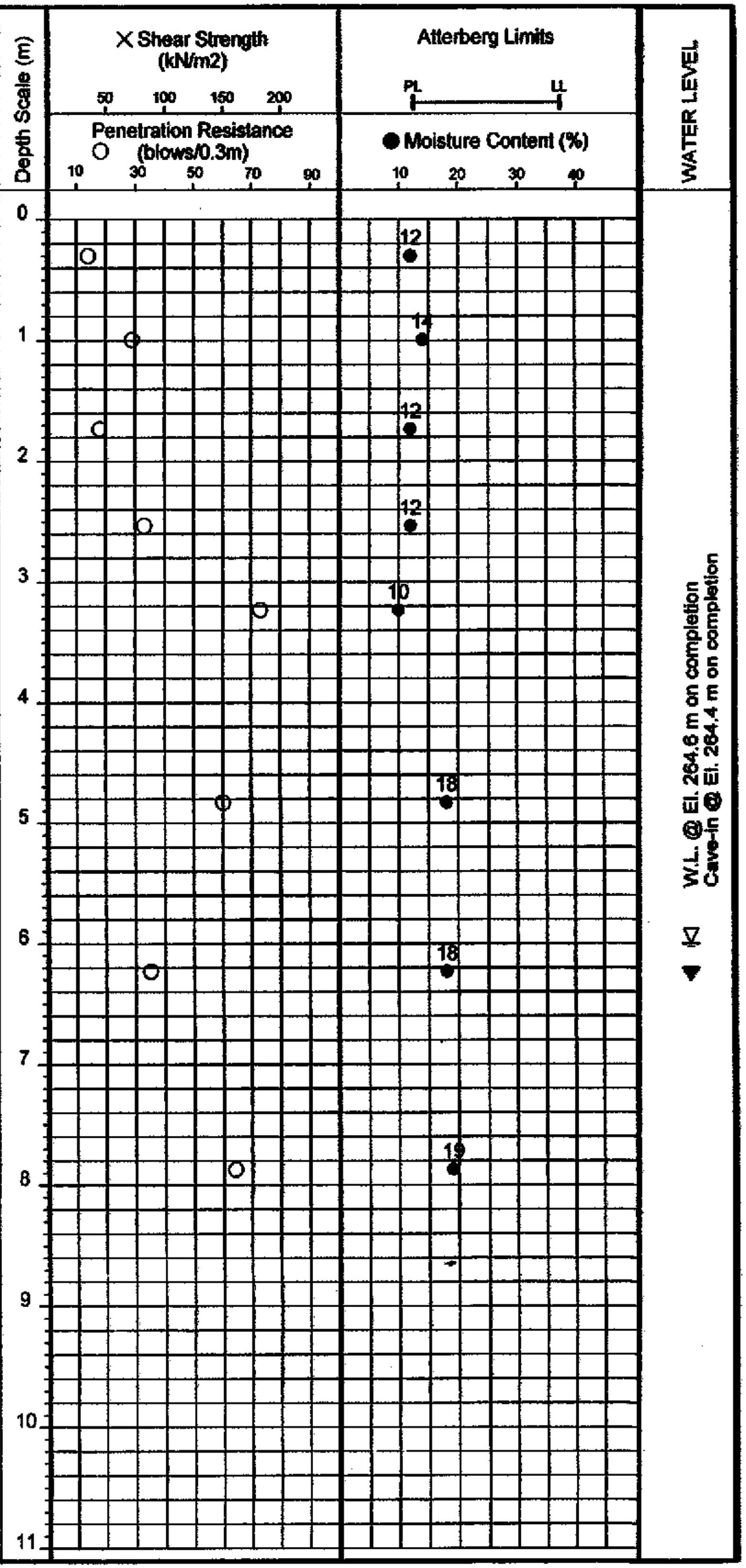
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 31, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
270.6	15 cm TOPSOIL			
	Brown, stiff to hard	1	DO	14
	weathered	2	DO	29
	SILTY CLAY, Till	3	DO	18
		4	DO	33
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	73
4.6 266.0	Brown, hard SILTY CLAY a trace to some sand occ. wet sand and silt seams and layers	6	DO	60
6.0 264.6	Brown, dense to very dense FINE SAND a trace to some silt a trace of gravel occ. silt seams and layers	7	DO	35
		8	DO	64
8.1 262.5	END OF BOREHOLE			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-07

FIGURE NO: 7

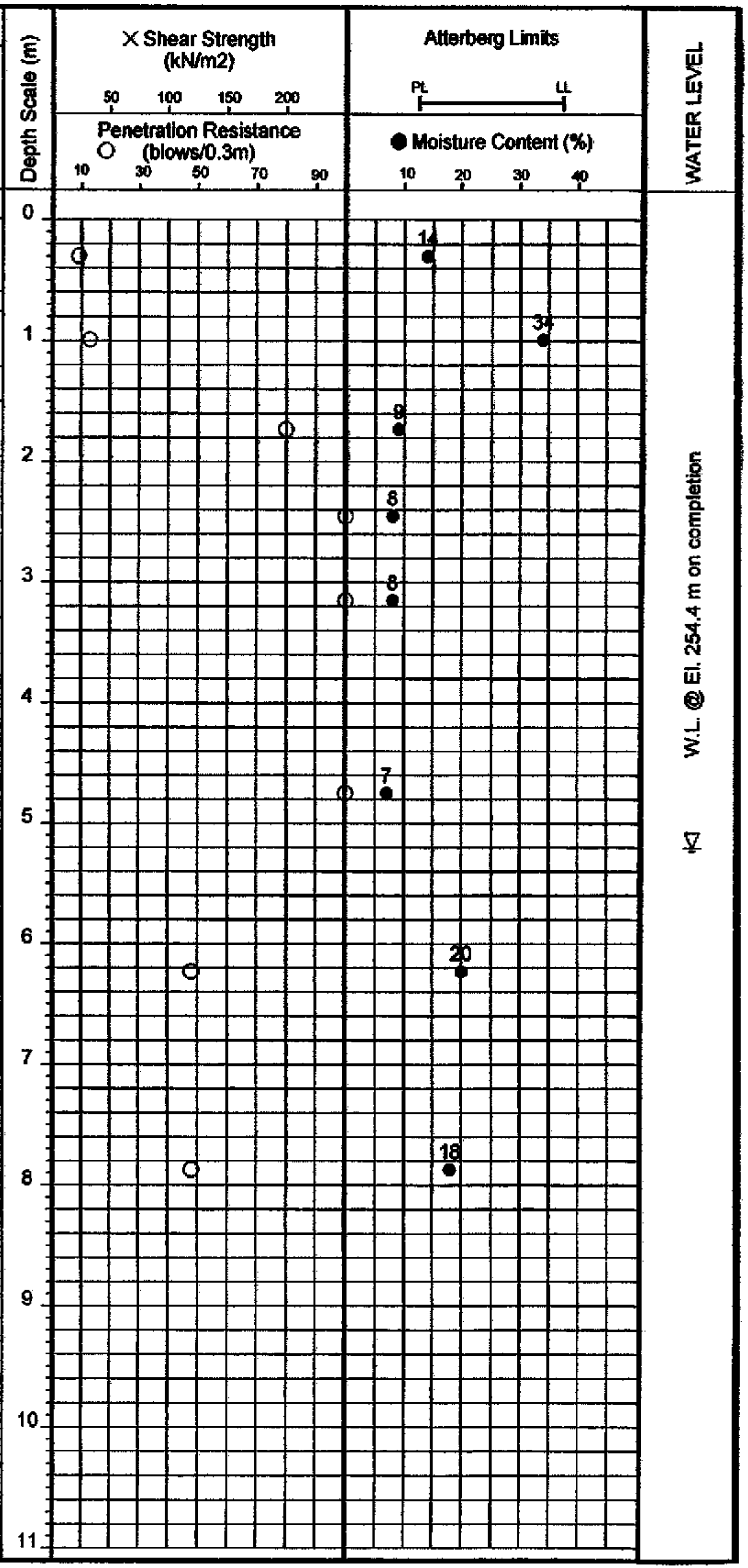
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 12, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 259.6	Ground Surface			
	66 cm TOPSOIL	1	DO	9
	Stiff to hard weathered	2	DO	13
		3	DO	80
	SILTY CLAY, Till	4	DO	100+
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	100+
	brown grey	6	DO	100+
6.0 253.6	Grey, dense	7	DO	48
	FINE SAND a trace to some silt a trace of gravel occ. silt seams and layers	8	DO	48
8.1 251.5	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-08

FIGURE NO: 8

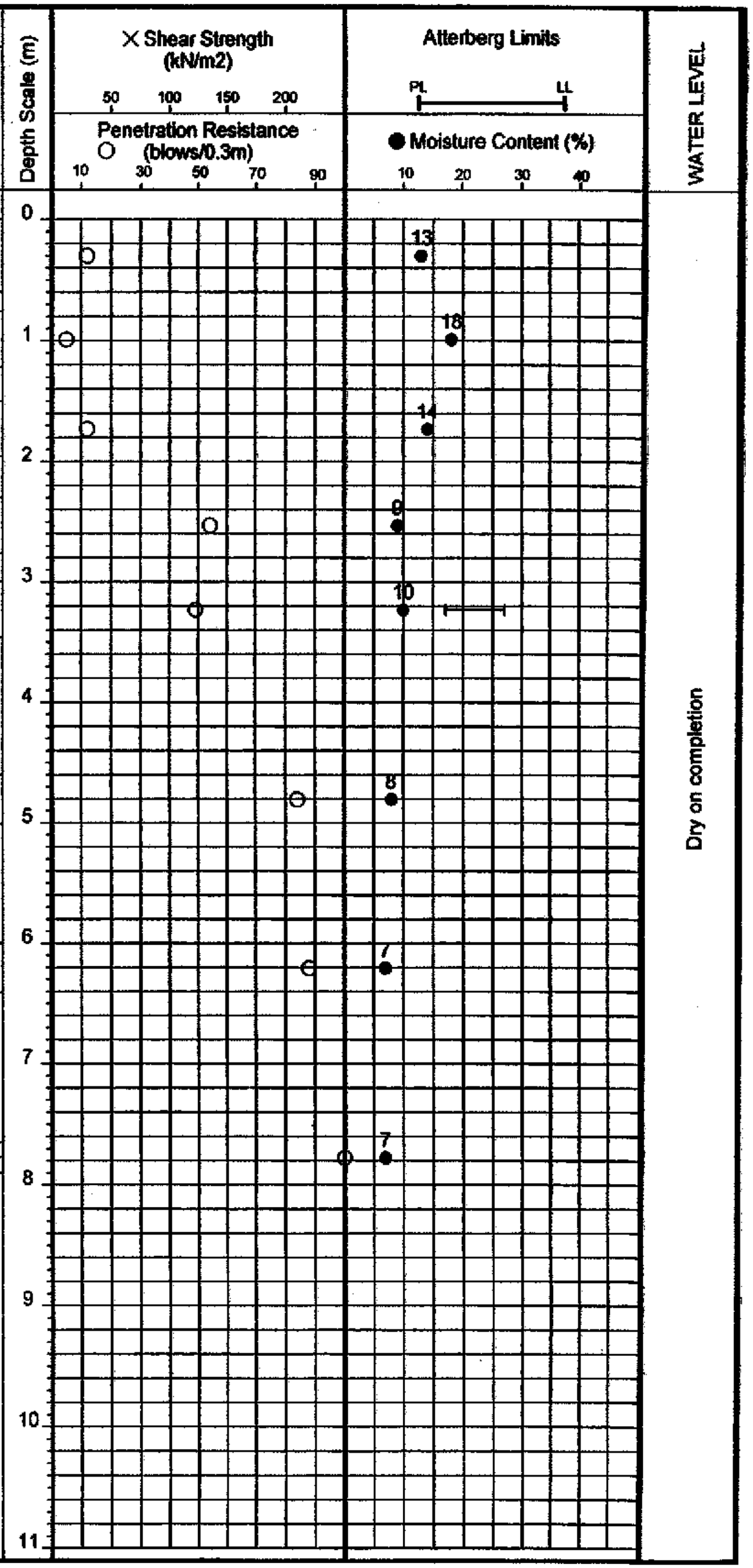
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 12, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 275.6	Ground Surface **20 cm TOPSOIL**			
	Firm to hard	1	DO	12
		2	DO	5
	weathered	3	DO	12
	SILTY CLAY, Till	4	DO	54
		5	DO	49
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
		6	DO	84
	brown grey	7	DO	88
7.4 268.2	Brown, very dense **SILTY SAND, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	8	DO	100+
7.9 267.7	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-09

FIGURE NO: 9

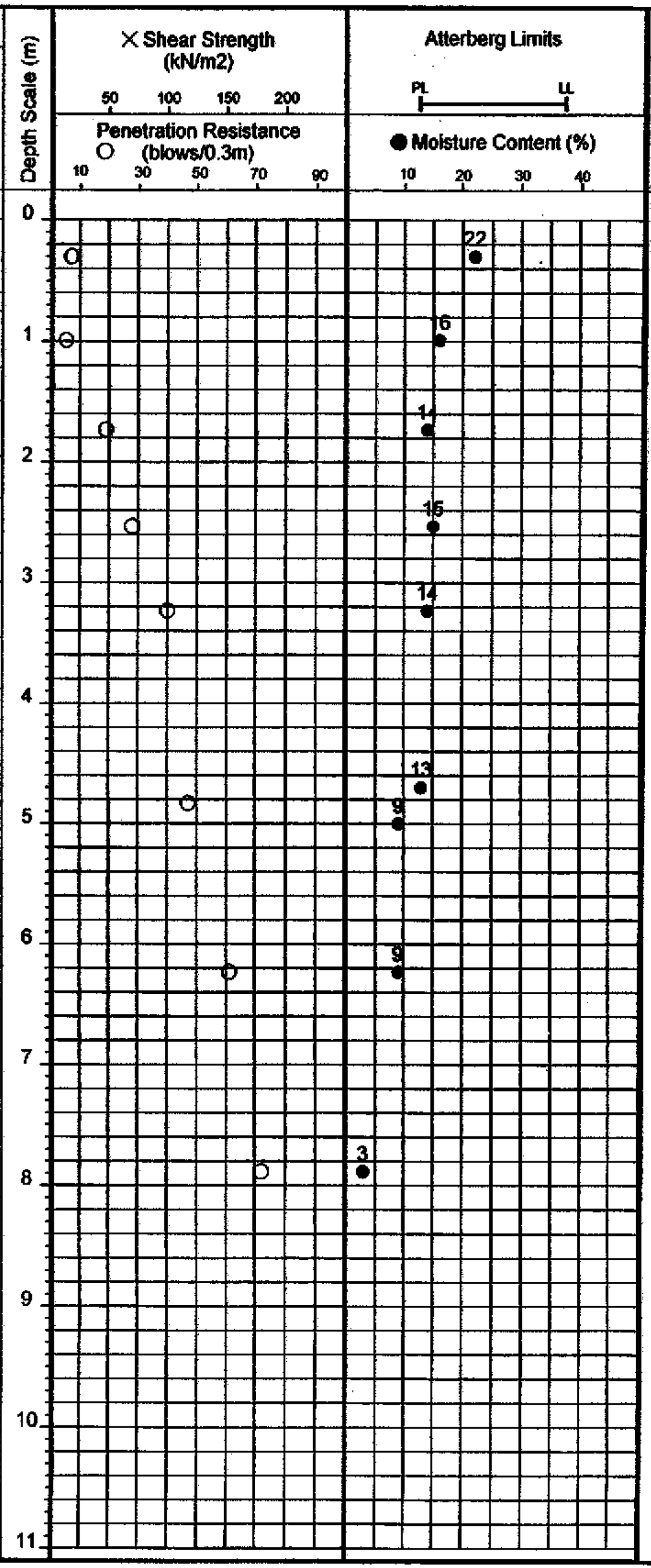
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 12, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 272.6	Ground Surface			
	90 cm TOPSOIL	1	DO	7
	Firm to hard	2	DO	5
	weathered			
		3	DO	19
	SILTY CLAY, Till	4	DO	28
		5	DO	40
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
	brown grey	6	DO	47
		7	DO	61
7.4 265.2	Brown, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	8	DO	72
8.1 264.5	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-10

FIGURE NO: 10

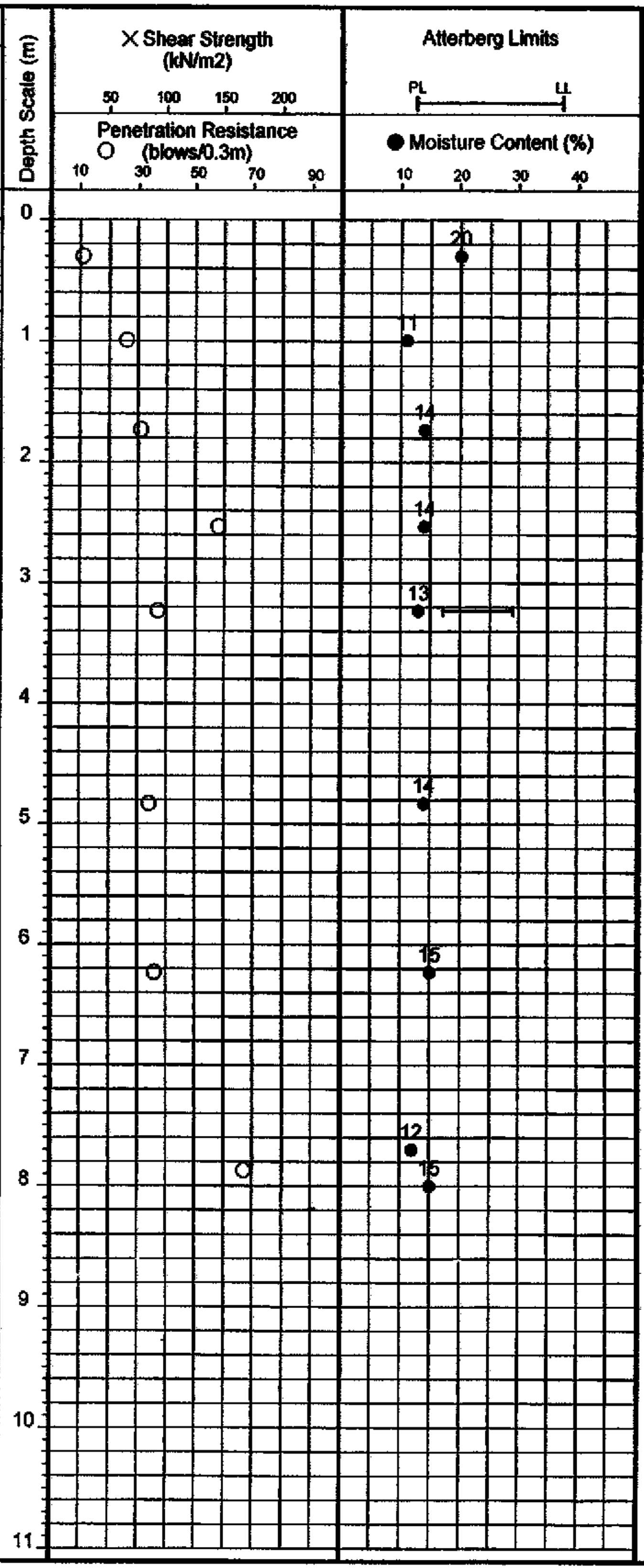
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 12, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
298.9	**60 cm TOPSOIL** (mixed with silty clay material)	1	DO	11
	Very stiff to hard weathered	2	DO	26
		3	DO	31
		4	DO	58
	SILTY CLAY, TIll	5	DO	37
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders brown grey	6	DO	34
		7	DO	36
7.8 291.1				
8.1 290.8	Grey, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	8	DO	67
	END OF BOREHOLE			



WATER LEVEL

W.L. @ El. 295.2 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-11

FIGURE NO: 11

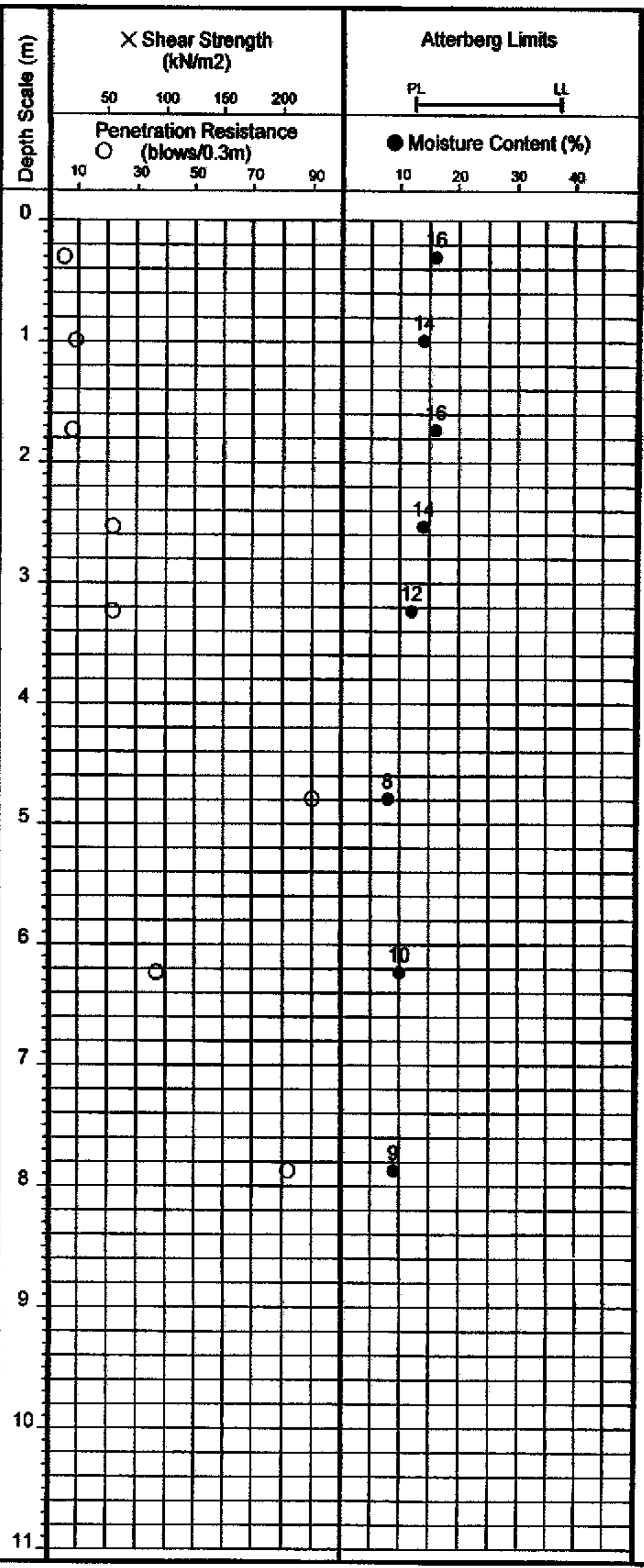
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 12, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
288.5	**13 cm TOPSOIL**			
	Brown, loose	1	DO	5
	SANDY SILT a trace to some clay a trace of gravel occ. silty fine sand layers weathered	2	DO	9
1.5 287.0	Firm to hard	3	DO	8
		4	DO	22
		5	DO	22
	SILTY CLAY, Till			
		6	DO	90
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders brown grey	7	DO	37
		8	DO	82
8.1 280.4	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 280.6 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-12

FIGURE NO: 12

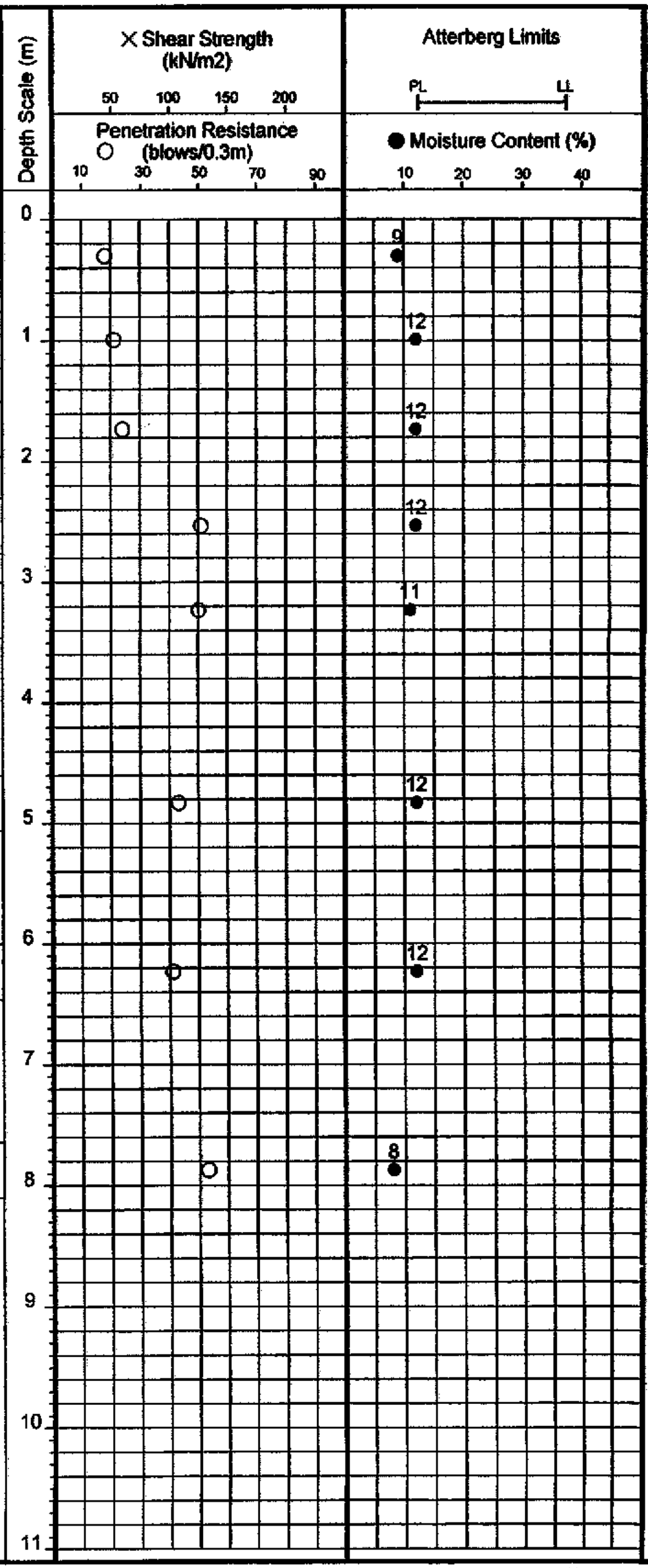
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 26, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
259.4	30 cm TOPSOIL			
	Very stiff to hard	1	DO	18
	weathered	2	DO	21
		3	DO	24
		4	DO	51
	brown grey			
	SILTY CLAY, Till	5	DO	50
		6	DO	43
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
	sand layer	7	DO	41
		8	DO	53
8.1 251.3	END OF BOREHOLE			



WATER LEVEL

∇

W.L. @ El. 256.4 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-13

FIGURE NO: 13

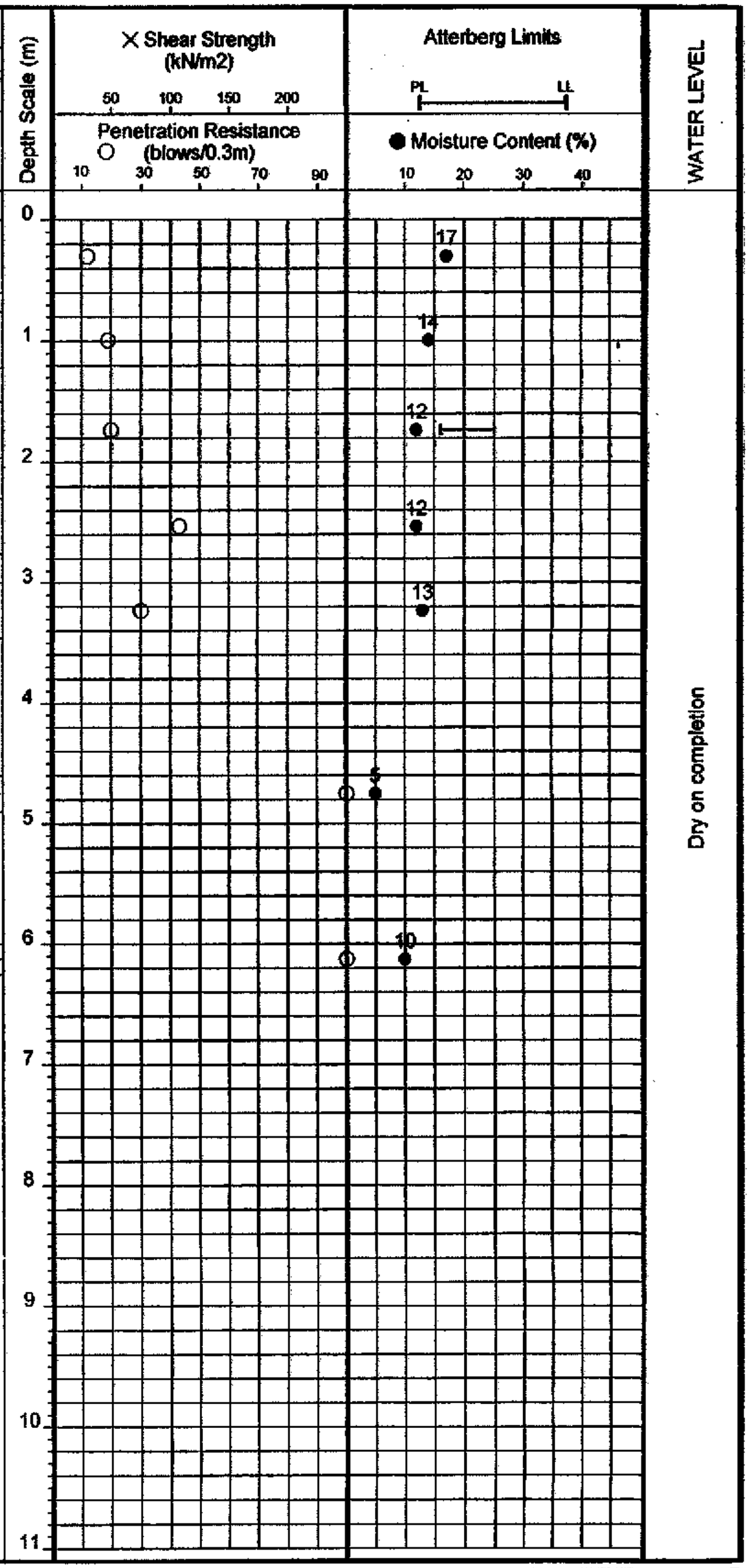
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 26, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 262.2	Ground Surface 33 cm TOPSOIL			
	Stiff to hard	1	DO	12
	weathered	2	DO	19
	SILTY CLAY, Till	3	DO	20
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	43
		5	DO	30
4.6 257.6	Grey, very dense SILTY SAND, Till some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	6	DO	100+
6.0 256.2	Grey, hard SILTY CLAY, Till sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders boulder	7	DO	100+
7.0 255.2	END OF BOREHOLE Refusal to augering, inferred boulder			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-14

FIGURE NO: 14

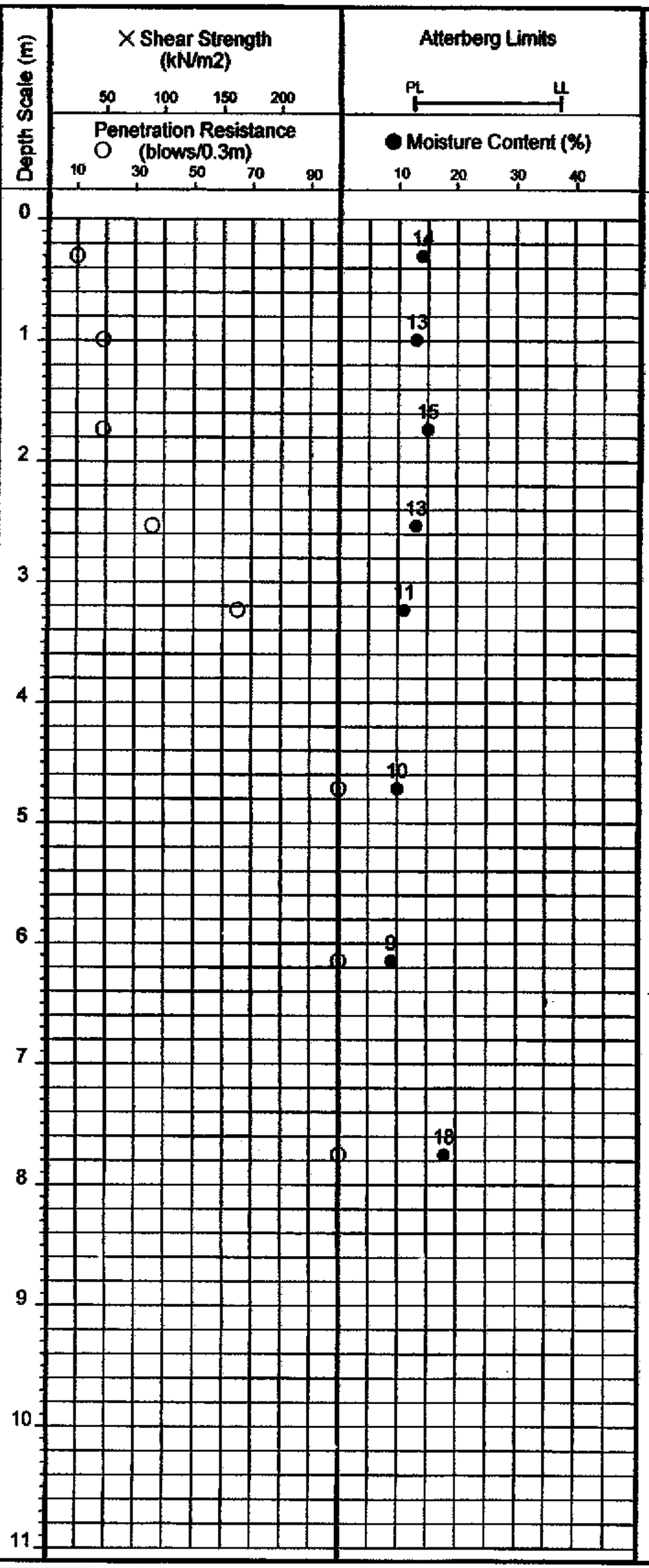
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 26, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 265.6	Ground Surface **18 cm TOPSOIL**			
	Brown, stiff to hard	1	DO	10
	weathered	2	DO	19
		3	DO	19
	SILTY CLAY, Till	4	DO	36
		5	DO	65
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	100+
6.0 259.6	Grey, very dense **SANDY SILT, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	7	DO	100+
7.4 258.2	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	8	DO	100+
7.9 257.7	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-15

FIGURE NO: 15

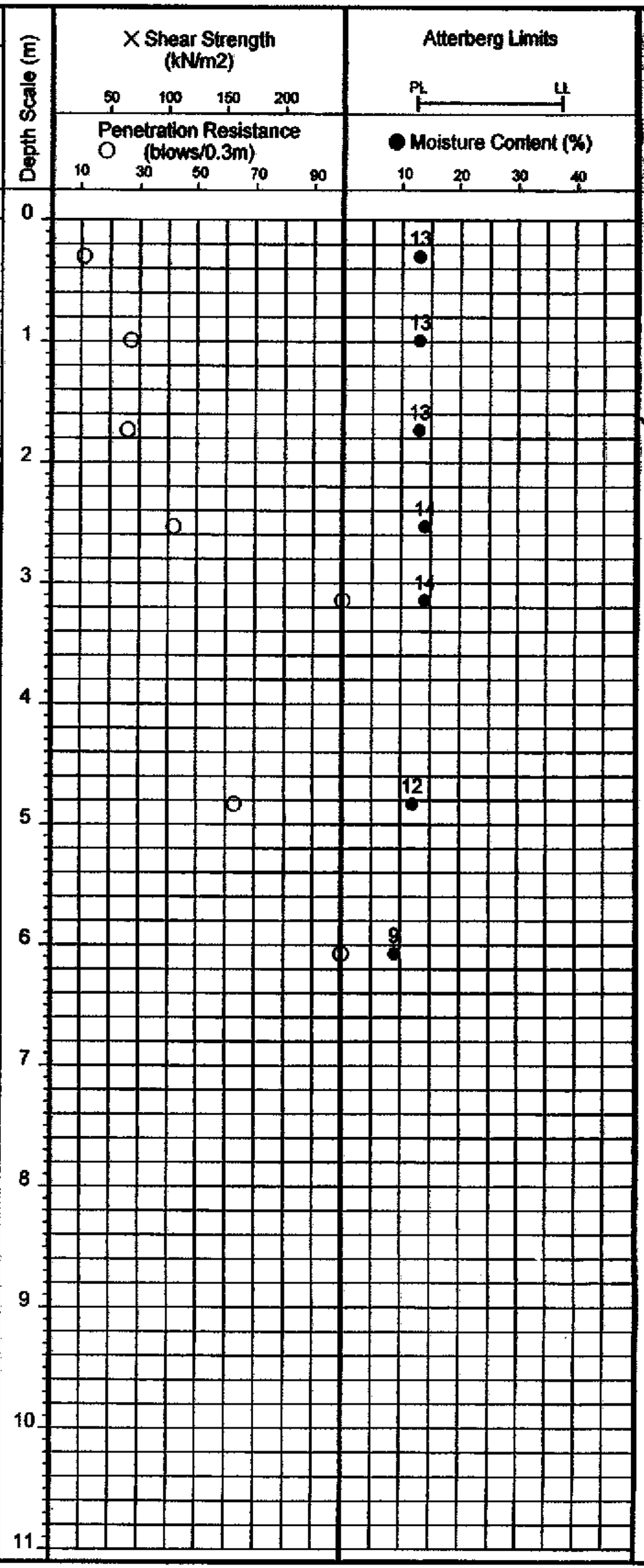
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 26, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
267.4	**18 cm TOPSOIL**			
	Brown, stiff to hard	1	DO	11
	SILTY CLAY, Till — weathered	2	DO	27
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	26
		4	DO	42
3.0 264.4	Brown, very dense **SILT** traces to some sand and clay a trace of gravel occ. sand seams and layers	5	DO	100+
4.6 262.8	Hard **SILTY CLAY, Till**	6	DO	63
	sandy, a trace of gravel — brown / grey occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	100+
7.3 260.1	boulder **END OF BOREHOLE** Refusal to augering, inferred boulder			



WATER LEVEL

Dry on completion

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-16

FIGURE NO: 16

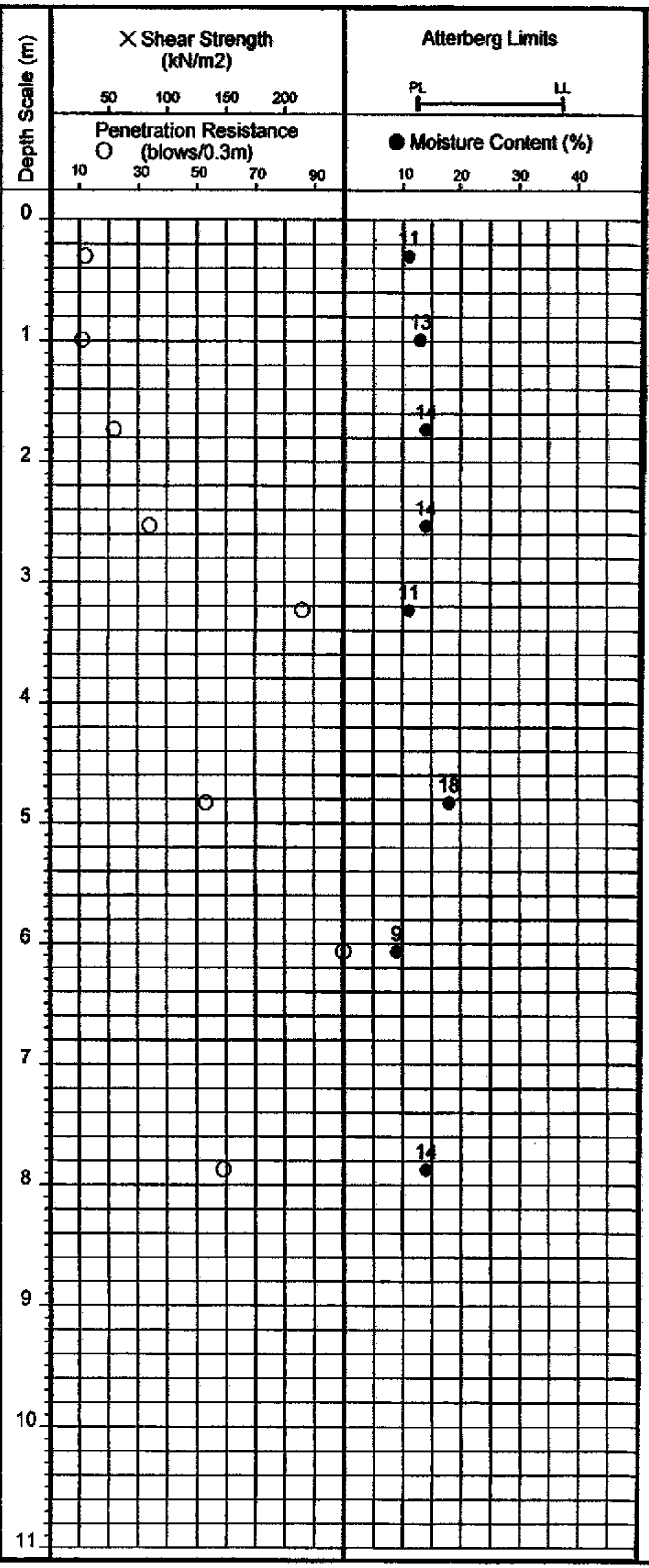
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 31, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 267.8	Ground Surface **33 cm TOPSOIL**			
	Brown, stiff to hard	1	DO	12
	weathered **SILTY CLAY, Till**	2	DO	11
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	22
		4	DO	34
3.0 264.8	Brown, very dense	5	DO	86
	SILTY FINE SAND			
	a trace of clay occ. silt seams and layers	6	DO	53
6.0 261.8	Brown, hard	7	DO	100+
	SILTY CLAY, Till sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
7.4 260.4	Brown, very dense **FINE TO MEDIUM SAND** traces of silt and gravel occ. silt seams and layers	8	DO	59
8.1 259.7	**END OF BOREHOLE**			



WATER LEVEL

Cave-in @ El. 263.0 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-17

FIGURE NO: 17

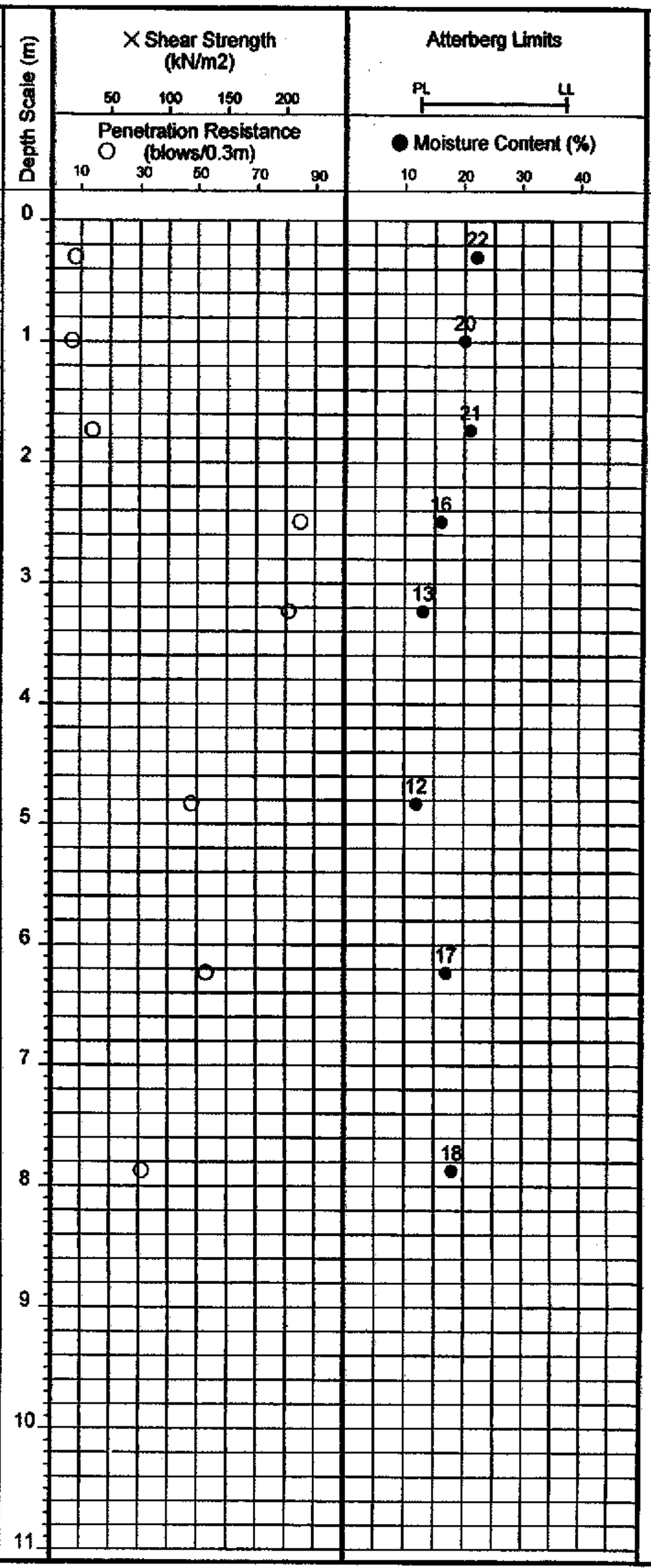
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 31, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 268.8	Ground Surface 30 cm TOPSOIL			
	Brown, firm to stiff SILTY CLAY a trace to some sand occ. wet sand and silt seams and layers	1	DO	8
	weathered	2	DO	7
		3	DO	14
2.3 266.5	Hard SILTY CLAY, Till sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	85
	brown grey	5	DO	81
		6	DO	48
6.0 262.8	Grey, hard SILTY CLAY a trace to some sand occ. wet sand and silt seams and layers	7	DO	53
7.4 261.4	Grey, dense SILTY FINE SAND a trace of clay occ. silt seams and layers	8	DO	31
8.1 260.7	END OF BOREHOLE			



WATER LEVEL

W.L. @ El. 262.1 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-18

FIGURE NO: 18

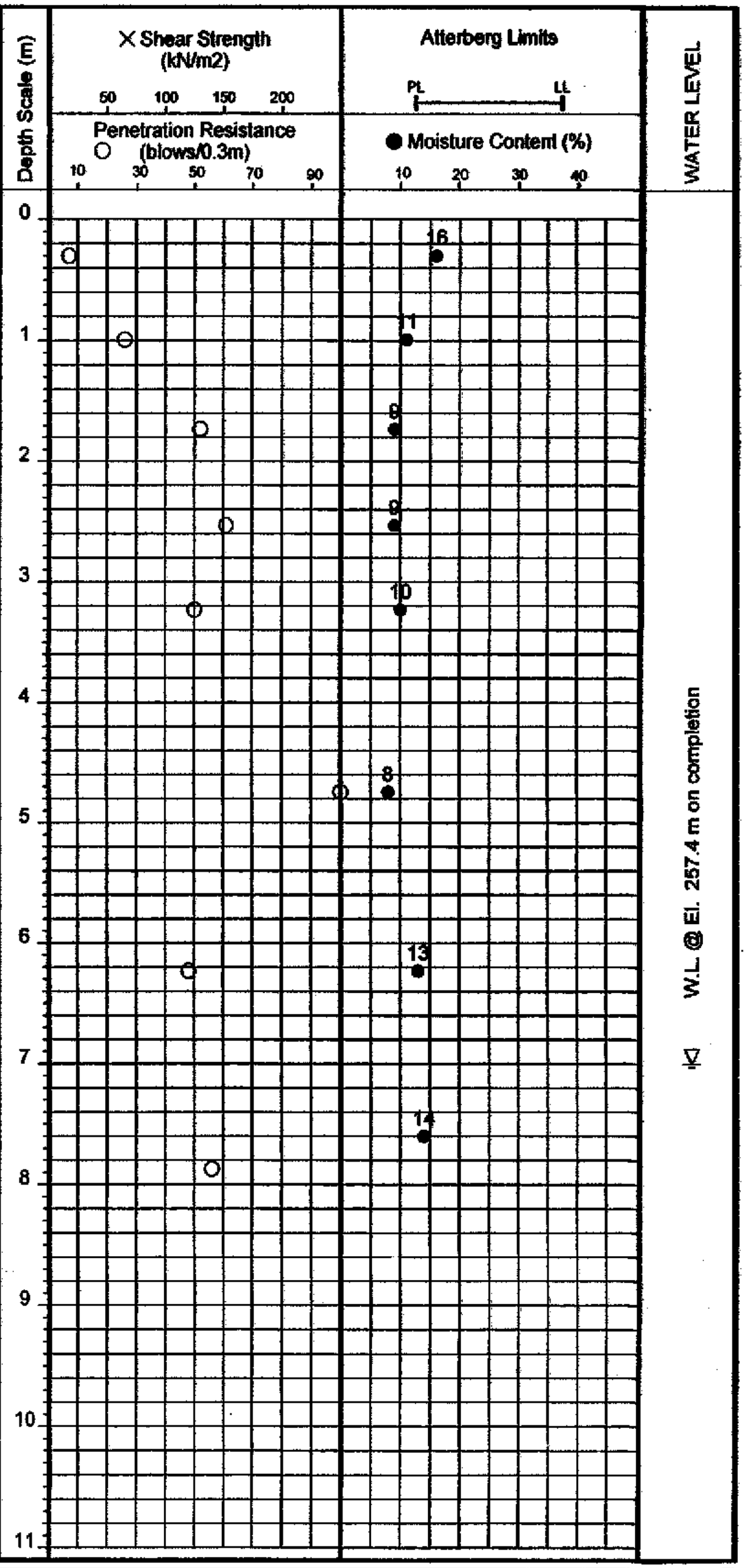
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 30, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
0.0 264.4	Ground Surface 46 cm TOPSOIL			
	Brown, firm to hard	1	DO	7
	weathered	2	DO	26
		3	DO	52
		4	DO	61
	SILTY CLAY, Till	5	DO	50
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	100+
		7	DO	48
		8	DO	56
8.1 256.3	END OF BOREHOLE			



W.L @ El. 257.4 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-19

FIGURE NO: 19

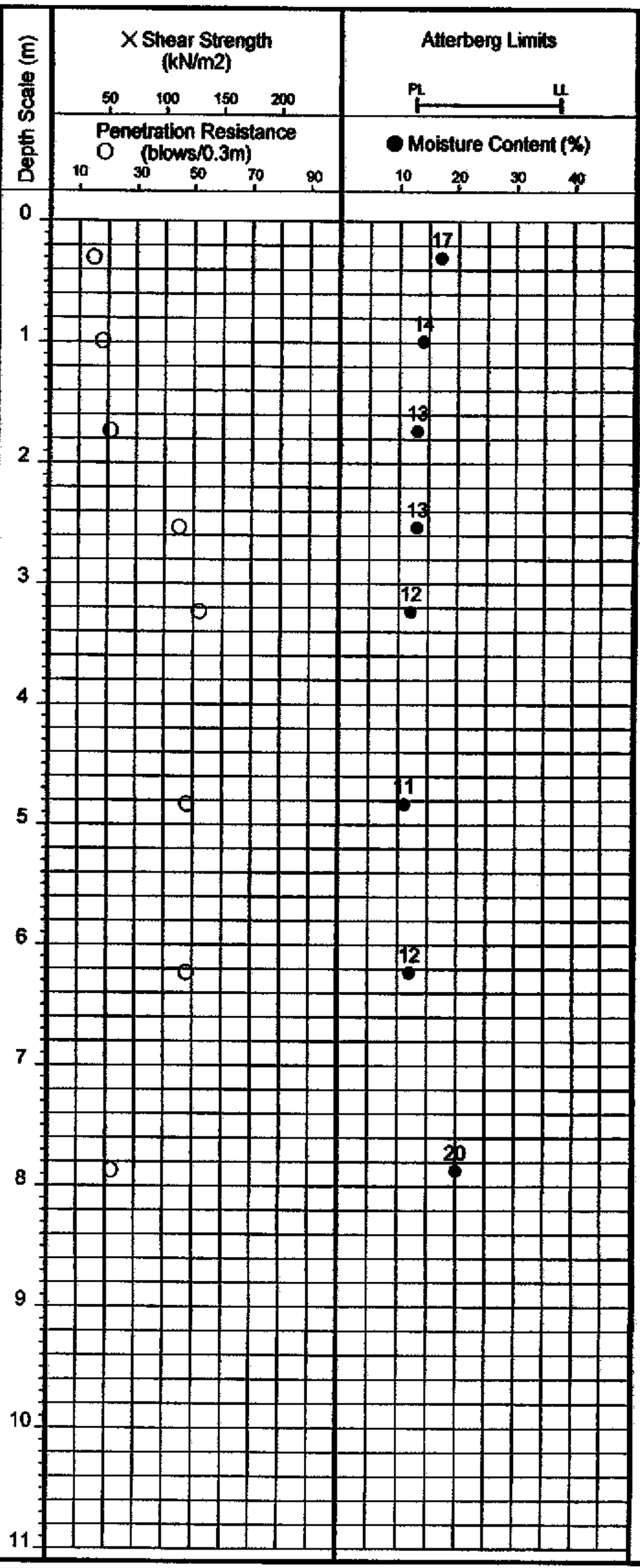
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 17, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
0.0 266.6	Ground Surface 36 cm TOPSOIL			
	Stiff to hard	1	DO	15
	weathered	2	DO	18
		3	DO	21
		4	DO	45
	SILTY CLAY, Till	5	DO	52
	brown grey sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	48
		7	DO	48
7.4 259.2	Grey, compact **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	8	DO	22
8.1 258.5	**END OF BOREHOLE**			



WATER LEVEL

▽ W.L. @ El. 259.9 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-20

FIGURE NO: 20

JOB DESCRIPTION: Proposed Urban Development

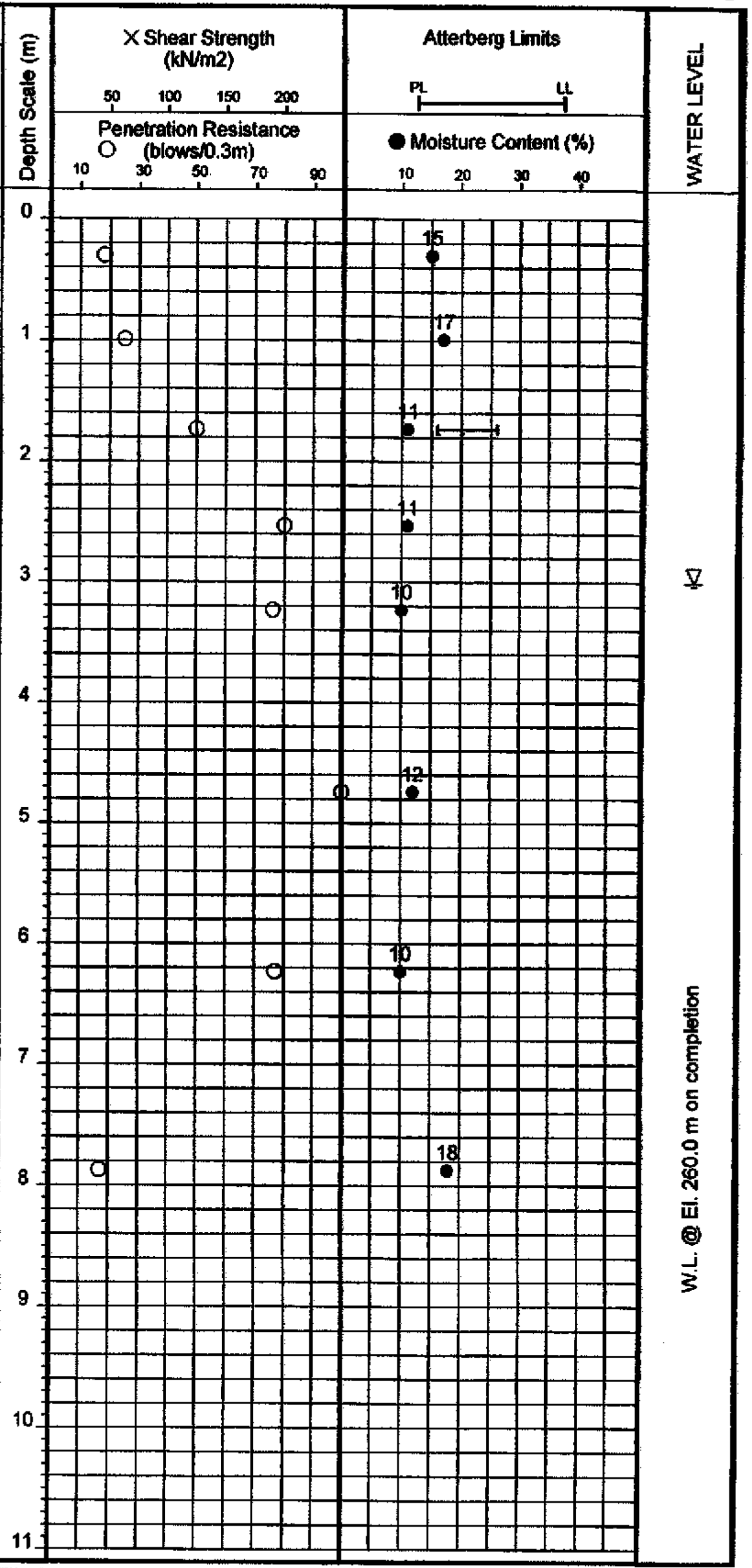
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 1, 2010

Depth Elev. (m)	SOIL DESCRIPTION
0.0 263.0	Ground Surface **20 cm TOPSOIL** Brown, very stiff to hard weathered **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders
4.6 258.4	Brown, very dense **SANDY SILT, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders
6.0 257.0	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders
7.4 255.6	Grey, compact **SILTY FINE SAND** a trace of clay occ. silt seams and layers
8.1 254.9	**END OF BOREHOLE**

SAMPLES		
Number	Type	N-Value
1	DO	18
2	DO	25
3	DO	50
4	DO	80
5	DO	76
6	DO	100+
7	DO	77
8	DO	17



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-21

FIGURE NO: 21

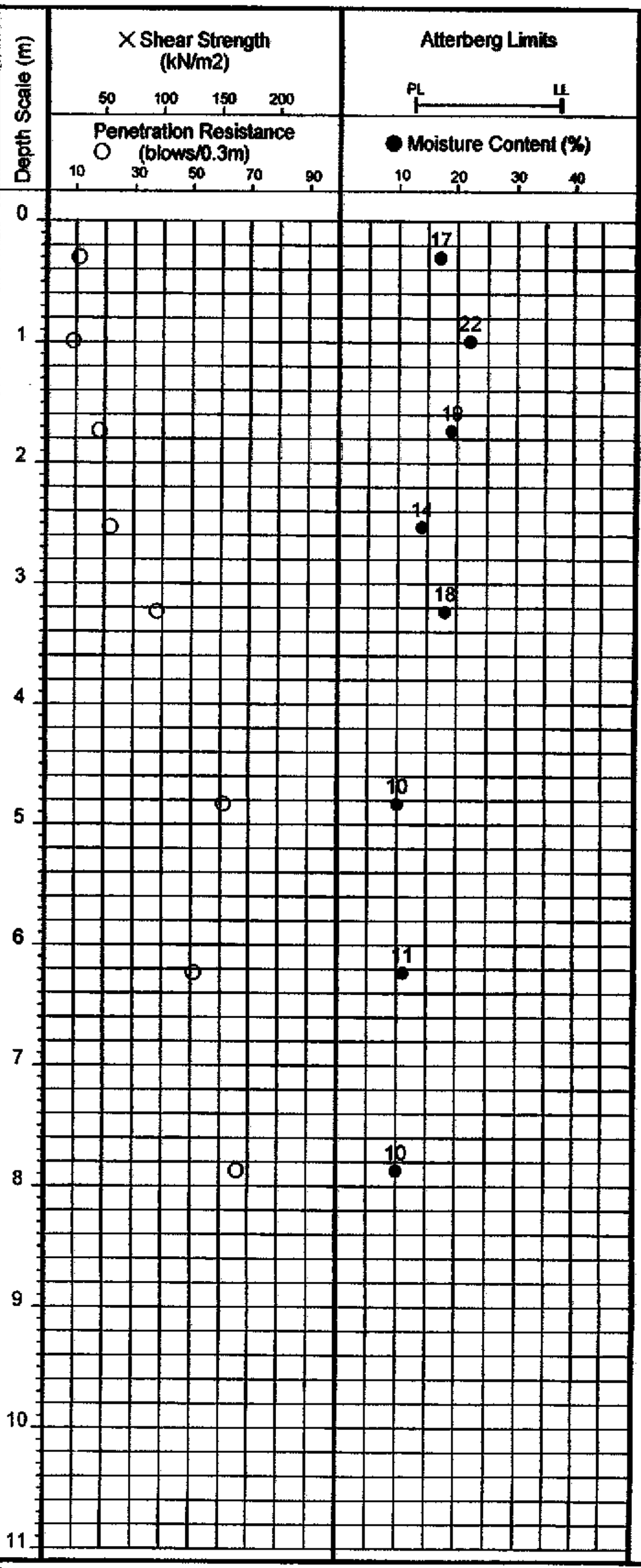
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 1, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
0.0 262.7	Ground Surface **30 cm TOPSOIL**			
	Stiff to hard	1	DO	11
	weathered	2	DO	9
		3	DO	18
	SILTY CLAY, Till	4	DO	22
		5	DO	38
	brown grey sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	61
		7	DO	51
		8	DO	66
8.1 254.6	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-22

FIGURE NO: 22

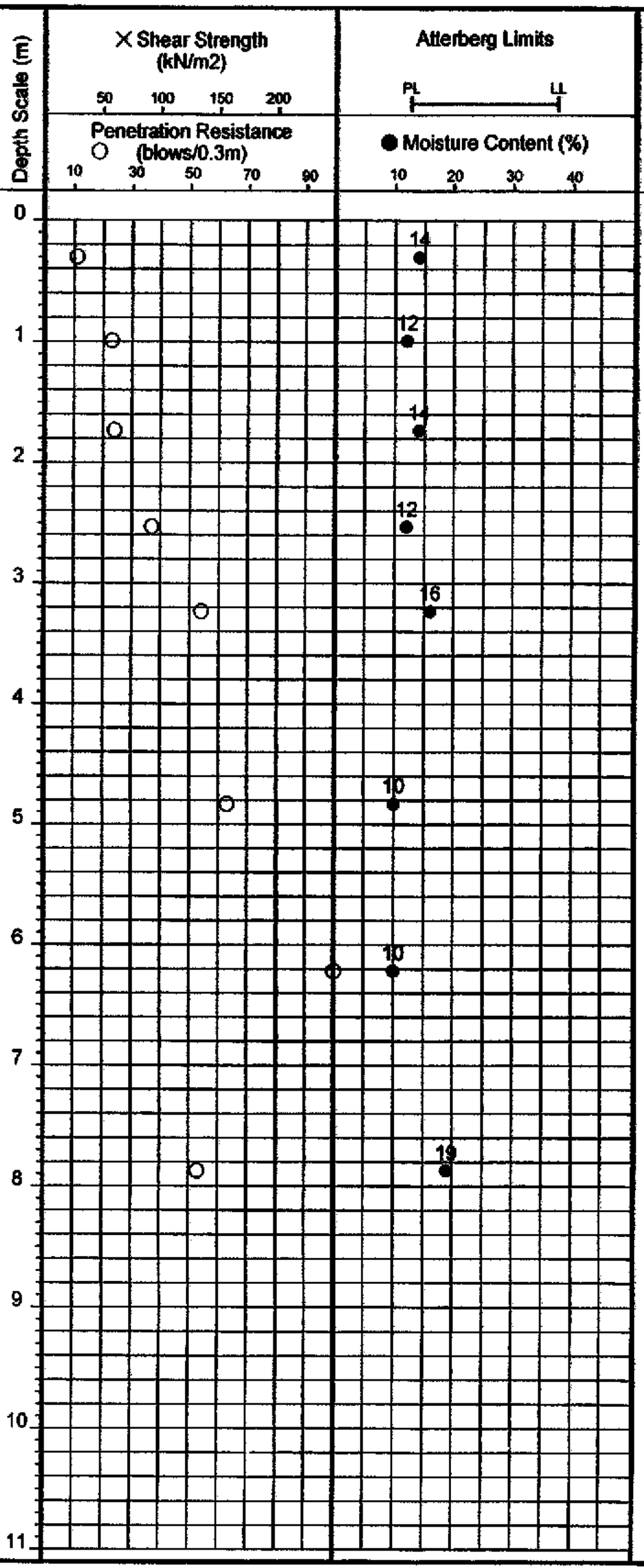
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 1, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
0.0	Ground Surface			
259.9	**30 cm TOPSOIL**			
	mixed with silty clay material Brown, stiff to hard	1	DO	11
	weathered	2	DO	23
		3	DO	24
	SILTY CLAY, Till	4	DO	37
		5	DO	54
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
		6	DO	63
		7	DO	100+
7.4 252.5	Brown/grey, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	8	DO	53
8.1 251.8	**END OF BOREHOLE**			



WATER LEVEL

▽ W.L. @ El. 253.9 m on completion

▼ Cave-in @ El. 252.1 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-23

FIGURE NO: 23

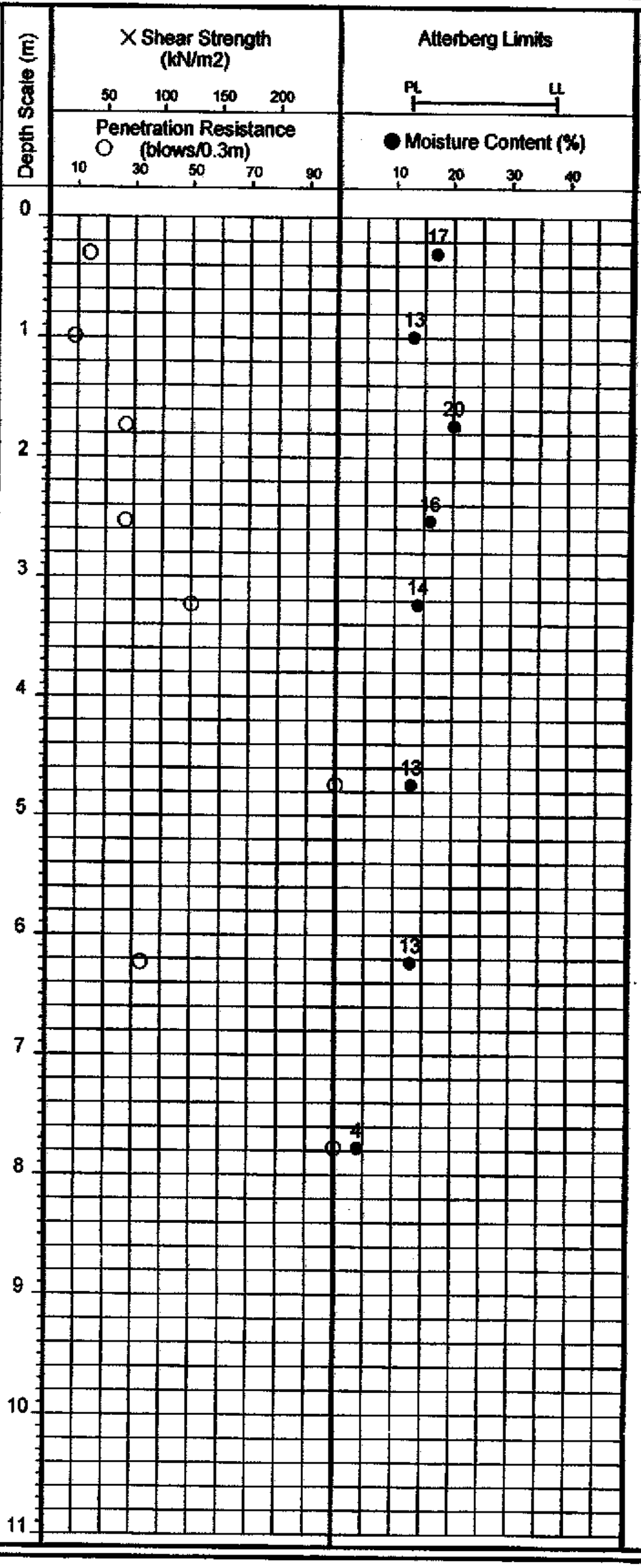
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 10, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	WATER LEVEL
0.0	Ground Surface				
280.7	**23 cm TOPSOIL**				
	Brown, stiff to hard	1	DO	14	
	weathered	2	DO	9	
	SILTY CLAY, Till				
		3	DO	27	
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	27	
		5	DO	50	
4.6 276.1	Brown, very dense	6	DO	100+	Dry on completion
	FINE SAND a trace to some silt a trace of gravel occ. silt seams and layers				
6.0 274.7	Brown, hard	7	DO	33	
	SILTY CLAY, Till sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders				
7.4 273.3	Brown, very dense **FINE TO MEDIUM SAND**				
7.9 272.8	traces of silt and gravel occ. silt seams and layers	8	DO	100+	
	END OF BOREHOLE				



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-24

FIGURE NO: 24

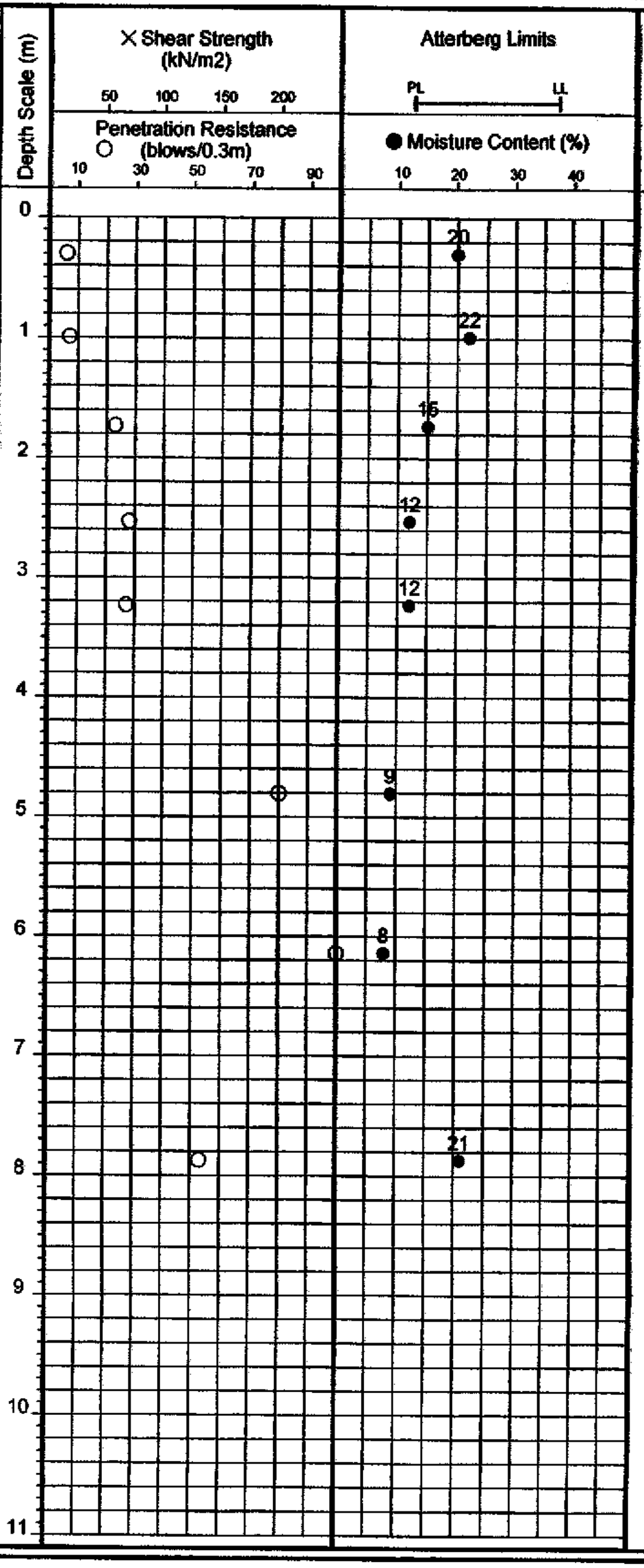
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 26, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 264.2	Ground Surface			
	20 cm TOPSOIL			
	Firm to hard	1	DO	6
	weathered	2	DO	7
		3	DO	23
	SILTY CLAY, Till	4	DO	28
		5	DO	27
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
		6	DO	80
	brown grey	7	DO	100+
7.4 256.8	Grey, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	8	DO	53
8.1 256.1	**END OF BOREHOLE**			



WATER LEVEL

⊻ W.L. @ El. 258.4 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-25

FIGURE NO: 25

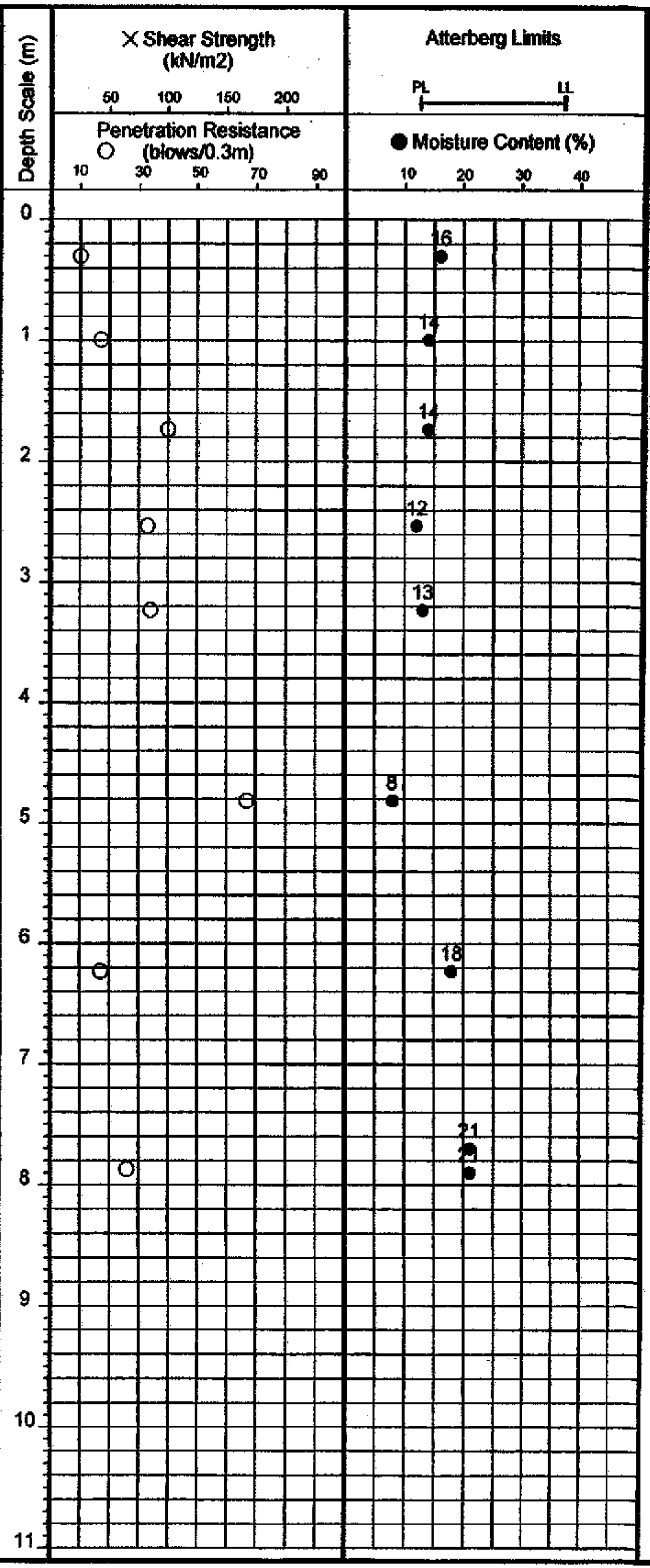
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 26, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
0.0	Ground Surface			
264.2	15 cm TOPSOIL			
	Brown, stiff to hard	1	DO	10
	weathered	2	DO	17
		3	DO	40
	SILTY CLAY, Till	4	DO	33
		5	DO	34
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
		6	DO	67
6.0 258.2	Very stiff	7	DO	17
	SILTY CLAY			
	a trace to some sand occ. wet sand and silt seams and layers brown grey			
	sand layer	8	DO	26
8.1 256.1	END OF BOREHOLE			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-26

FIGURE NO: 26

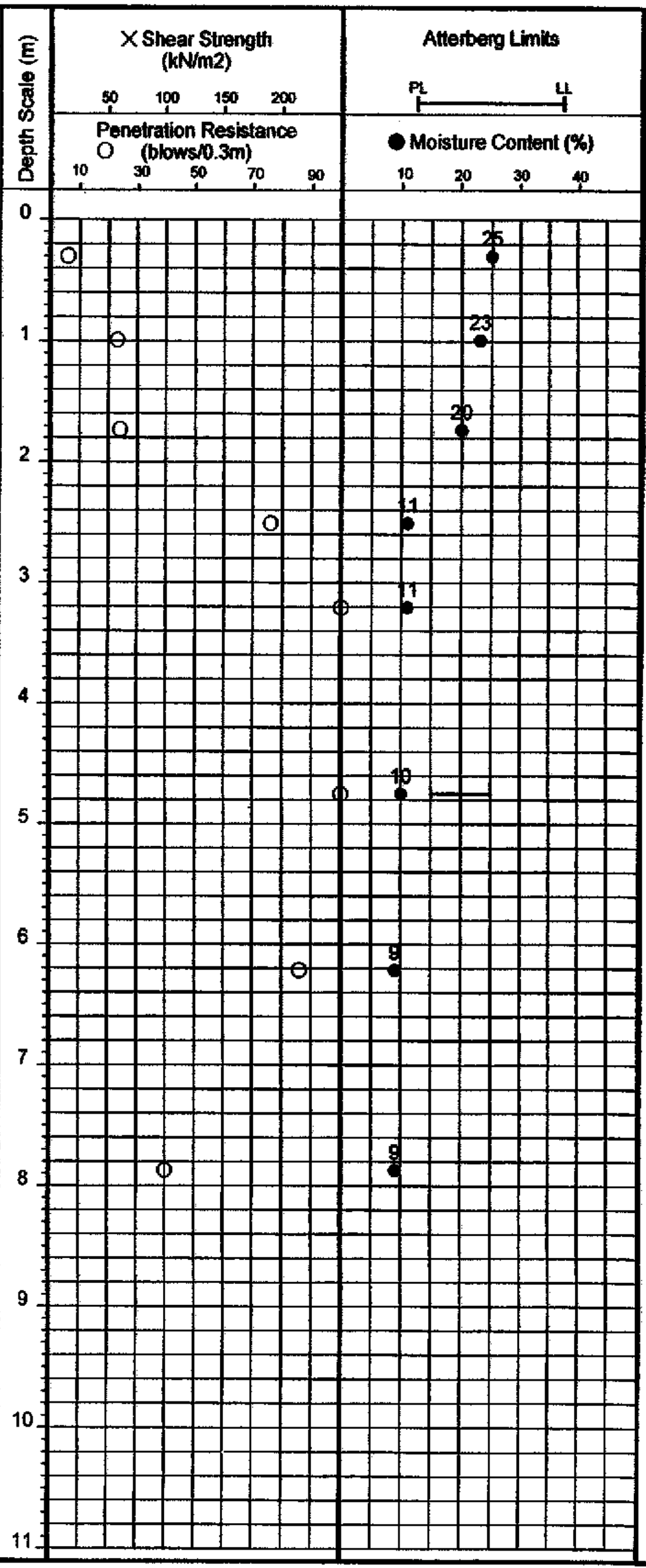
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 256.2	Ground Surface **13 cm TOPSOIL** Brown, firm to very stiff	1	DO	6
	SILTY CLAY weathered	2	DO	23
	a trace to some sand occ. wet sand and silt seams and layers	3	DO	24
2.3 253.9	Hard	4	DO	76
		5	DO	100+
	SILTY CLAY, TILL brown grey			
	some sand to sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	100+
		7	DO	86
		8	DO	40
8.1 248.1	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 249.0 m on completion

∇

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-27

FIGURE NO: 27

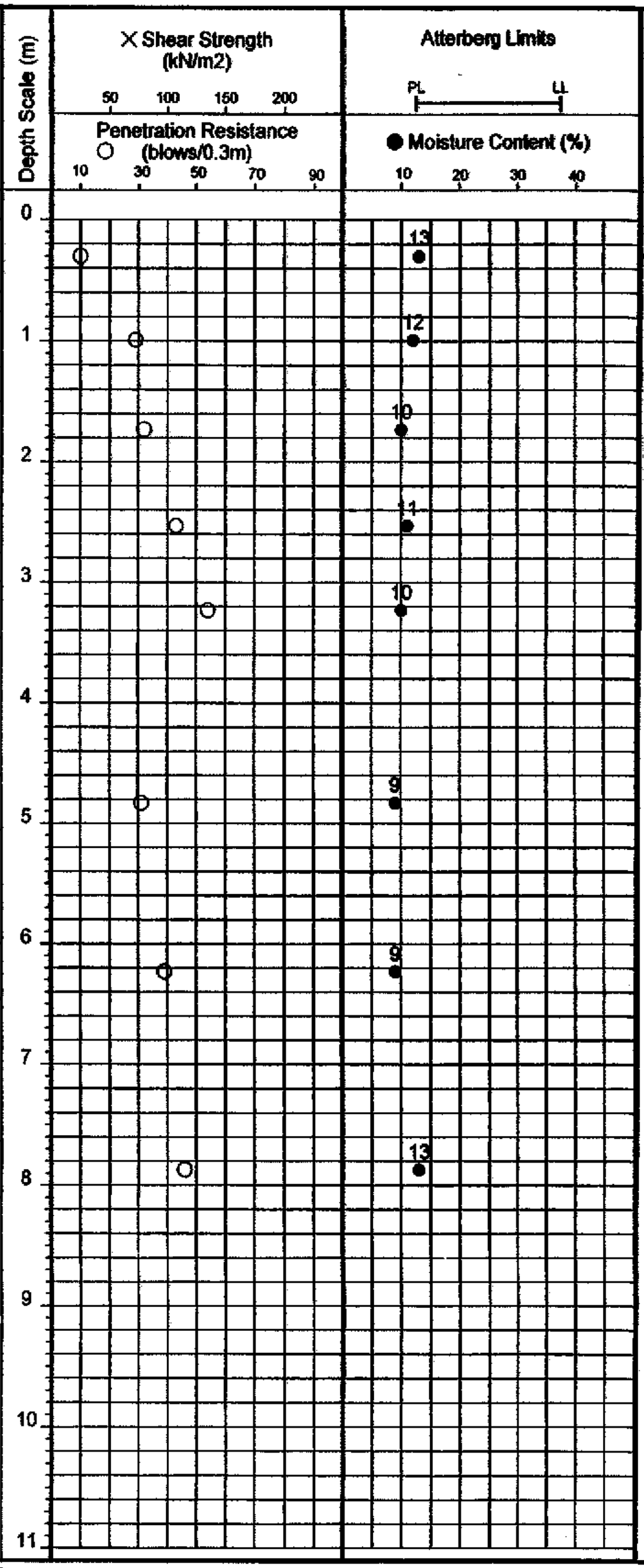
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 253.8	Ground Surface **25 cm TOPSOIL**			
	Stiff to hard	1	DO	10
	SILTY CLAY, Till (weathered)	2	DO	29
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	32
	brown grey	4	DO	43
3.0 250.8	Grey, very dense **SANDY SILT, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	5	DO	54
4.6 249.2	Grey, very stiff to hard	6	DO	31
	SILTY CLAY, Till	7	DO	39
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders sand layer	8	DO	46
8.1 245.7	**END OF BOREHOLE**			



WATER LEVEL

∇ W.L. @ El. 248.6 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-28

FIGURE NO: 28

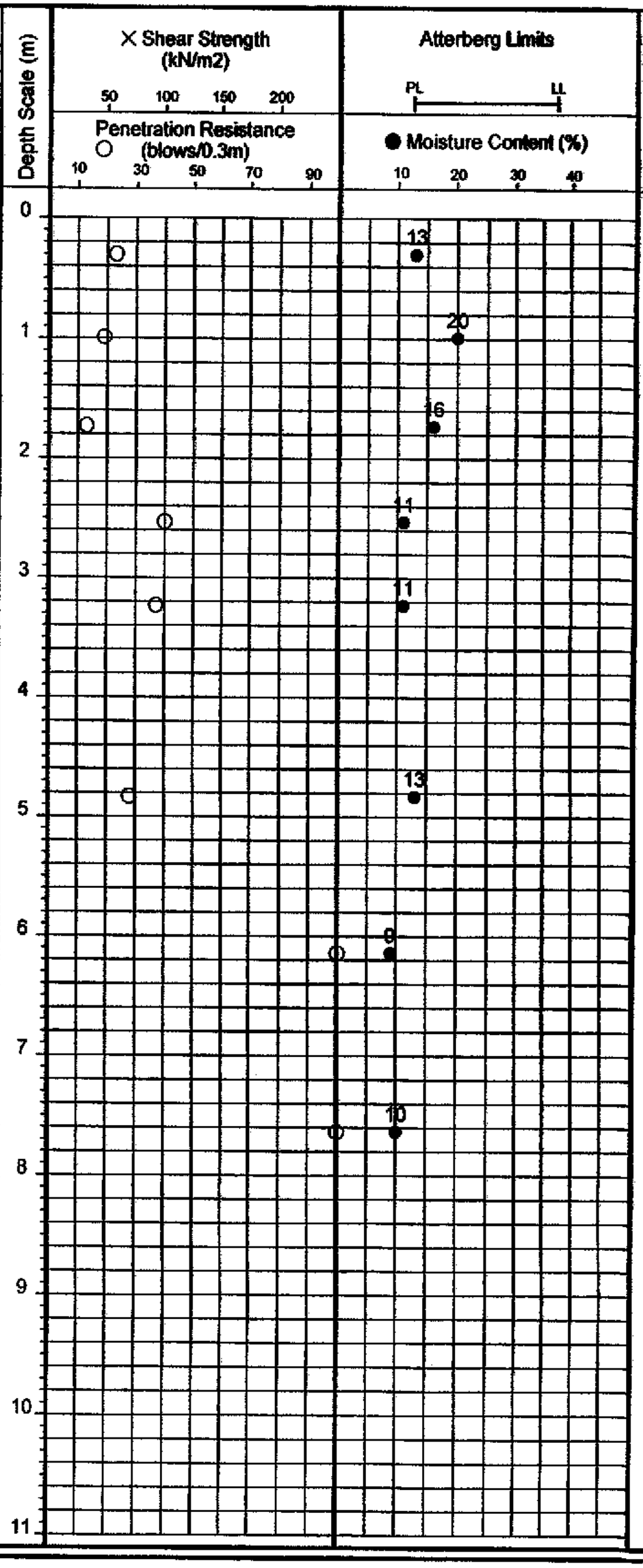
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 10, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 250.4	Ground Surface 23 cm TOPSOIL			
	Very stiff to hard	1	DO	23
	weathered	2	DO	19
		3	DO	13
	SILTY CLAY, Till	4	DO	40
		5	DO	37
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders brown grey	6	DO	28
		7	DO	100+
7.7 242.7	END OF BOREHOLE	8	DO	100+



WATER LEVEL

W.L. @ El. 248.0 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-29

FIGURE NO: 29

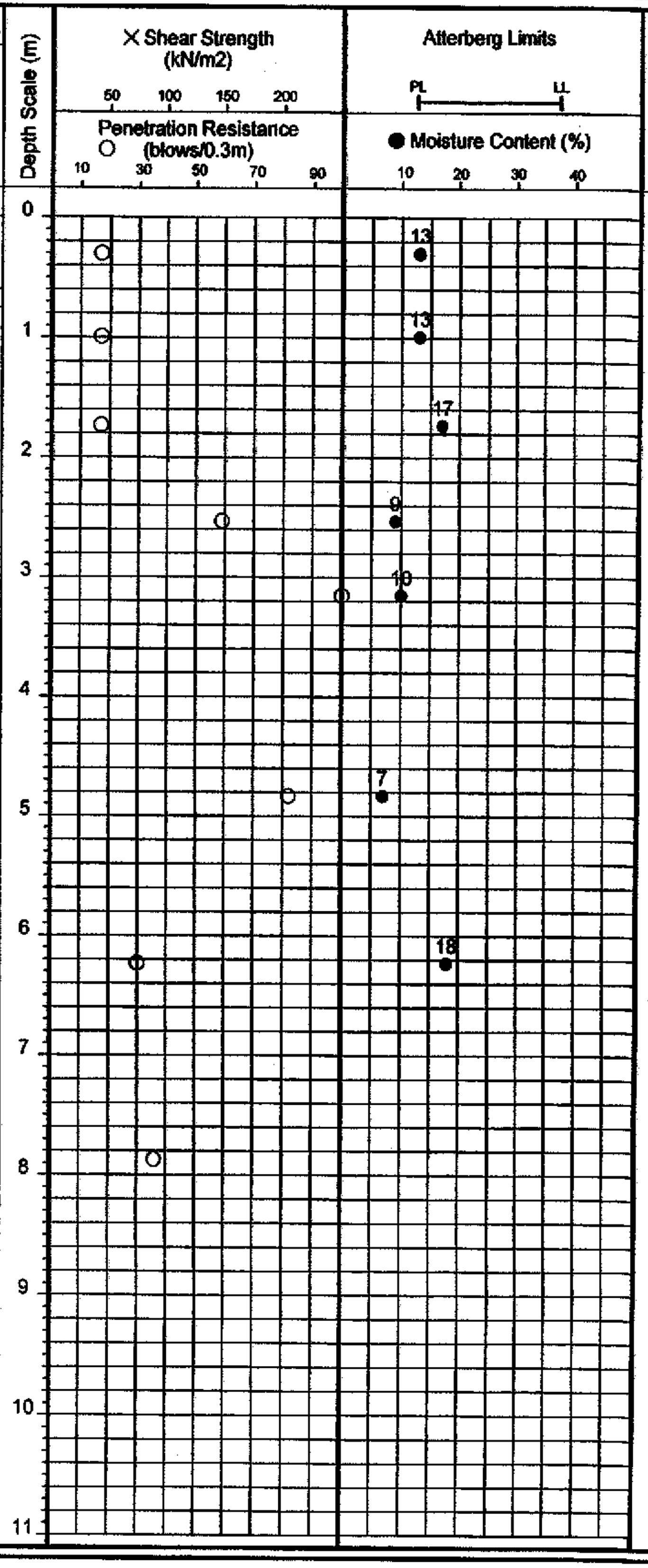
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 253.7	Ground Surface **30 cm TOPSOIL**			
	Brown, very stiff to hard weathered **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	1	DO	17
		2	DO	17
		3	DO	17
		4	DO	59
3.0 250.7	Brown, very dense **SANDY SILT, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	5	DO	100+
4.6 249.1	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	82
6.0 247.7	Grey, compact to dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	7	DO	30
		8	DO	36
8.1 245.6	**END OF BOREHOLE**			



WATER LEVEL

∇ W.L. @ El. 250.0 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-30

FIGURE NO: 30

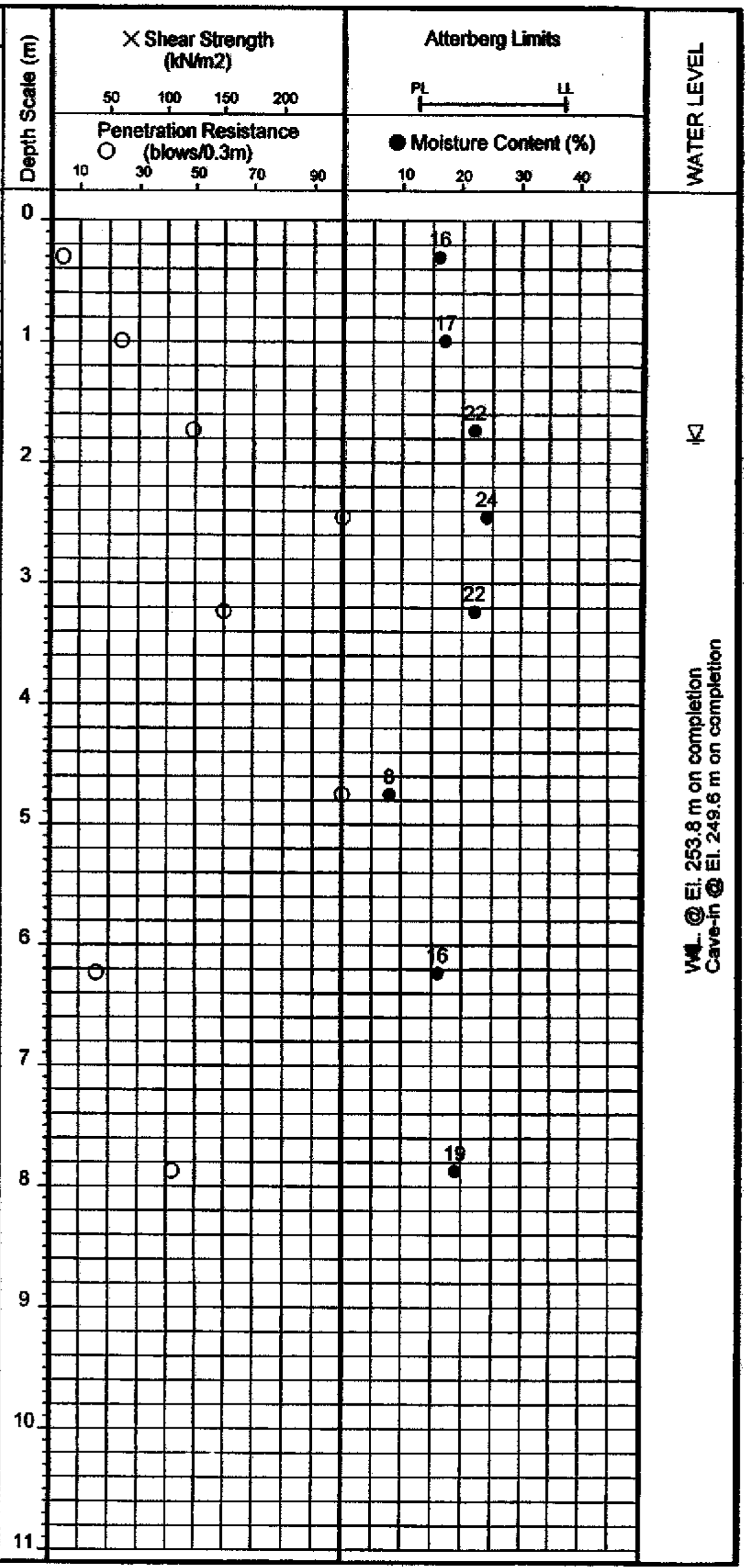
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
255.6	**38 cm TOPSOIL**			
	Brown, soft to very stiff **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	1	DO	4
	weathered	2	DO	24
1.5 254.1	Brown, dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	3	DO	49
2.3 253.3	Hard	4	DO	100+
	brown grey	5	DO	60
	SILTY CLAY, Till sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	100+
6.0 249.6	Grey, compact **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	7	DO	16
7.4 248.2	Grey, dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	8	DO	42
8.1 247.5	**END OF BOREHOLE**			



W.L. @ El. 253.8 m on completion
Cave-in @ El. 249.6 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-31

FIGURE NO: 31

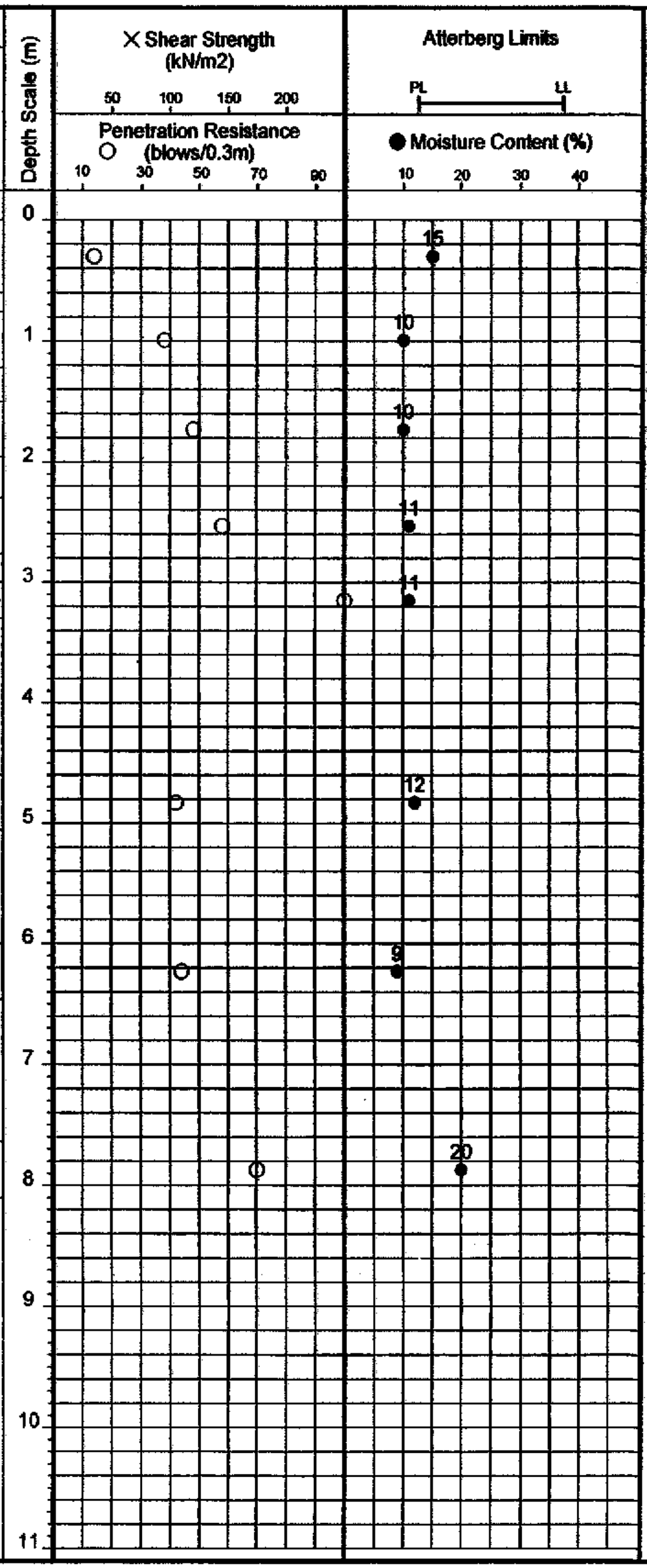
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
0.0 266.4	Ground Surface **30 cm TOPSOIL**			
	Stiff to hard	1	DO	14
	weathered	2	DO	38
		3	DO	48
	SILTY CLAY, Till	4	DO	58
		5	DO	100+
	brown grey **sandy, a trace of gravel** **occ. wet sand and silt seams** **and layers, cobbles and boulders**	6	DO	42
		7	DO	44
7.4 259.0	Brown, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	8	DO	70
8.1 258.3	**END OF BOREHOLE**			



WATER LEVEL

∇

W.L. @ El. 262.1 m on completion

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-32

FIGURE NO: 32

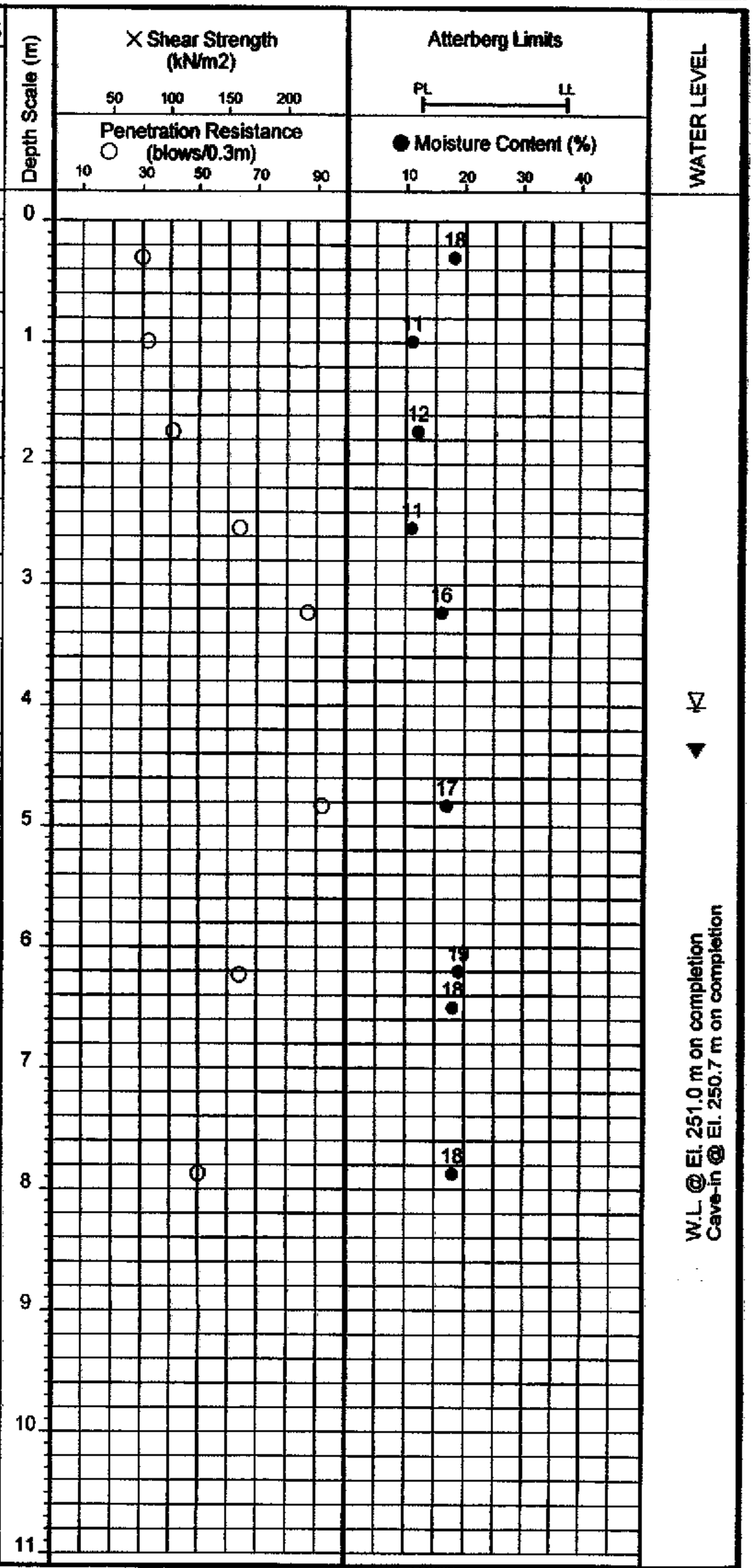
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 255.0	Ground Surface **25 cm TOPSOIL**			
	Brown, very stiff to hard	1	DO	30
	weathered **SILTY CLAY, Till**	2	DO	32
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	41
		4	DO	64
3.0 252.0	Grey, very dense	5	DO	87
	SILTY FINE SAND			
	a trace of clay occ. silt seams and layers	6	DO	92
		7	DO	64
6.4 248.6	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
7.4 247.6	Grey, dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	8	DO	50
8.1 246.9	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-33

FIGURE NO: 33

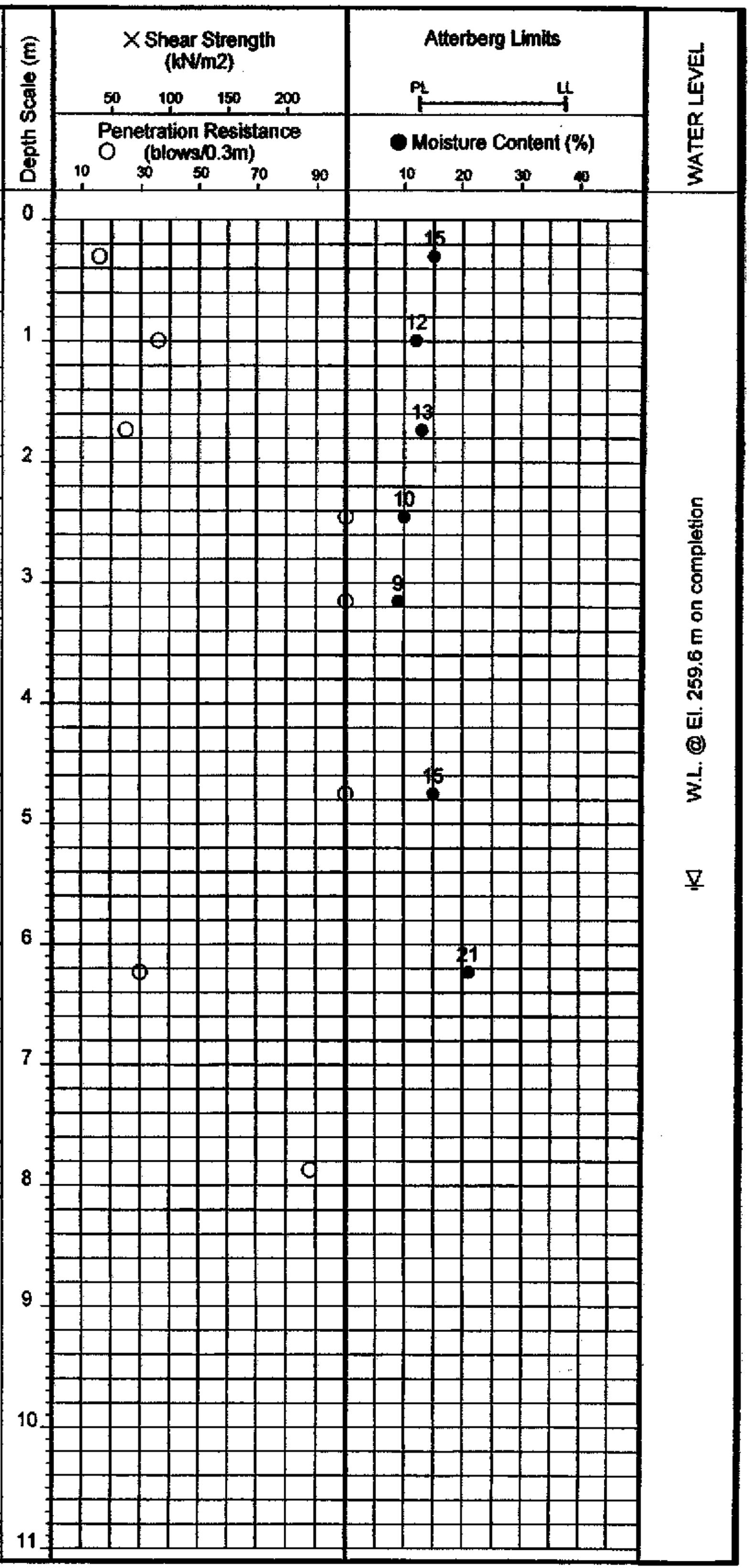
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 12, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
265.1	**25 cm TOPSOIL**			
	Stiff to hard	1	DO	16
	weathered	2	DO	36
		3	DO	25
	SILTY CLAY, Till	4	DO	100+
		5	DO	100+
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
	brown grey	6	DO	100+
6.0 259.1	Brown, compact **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	7	DO	30
7.4 257.7	Grey, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	8	DO	88
8.1 257.0	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-34

FIGURE NO: 34

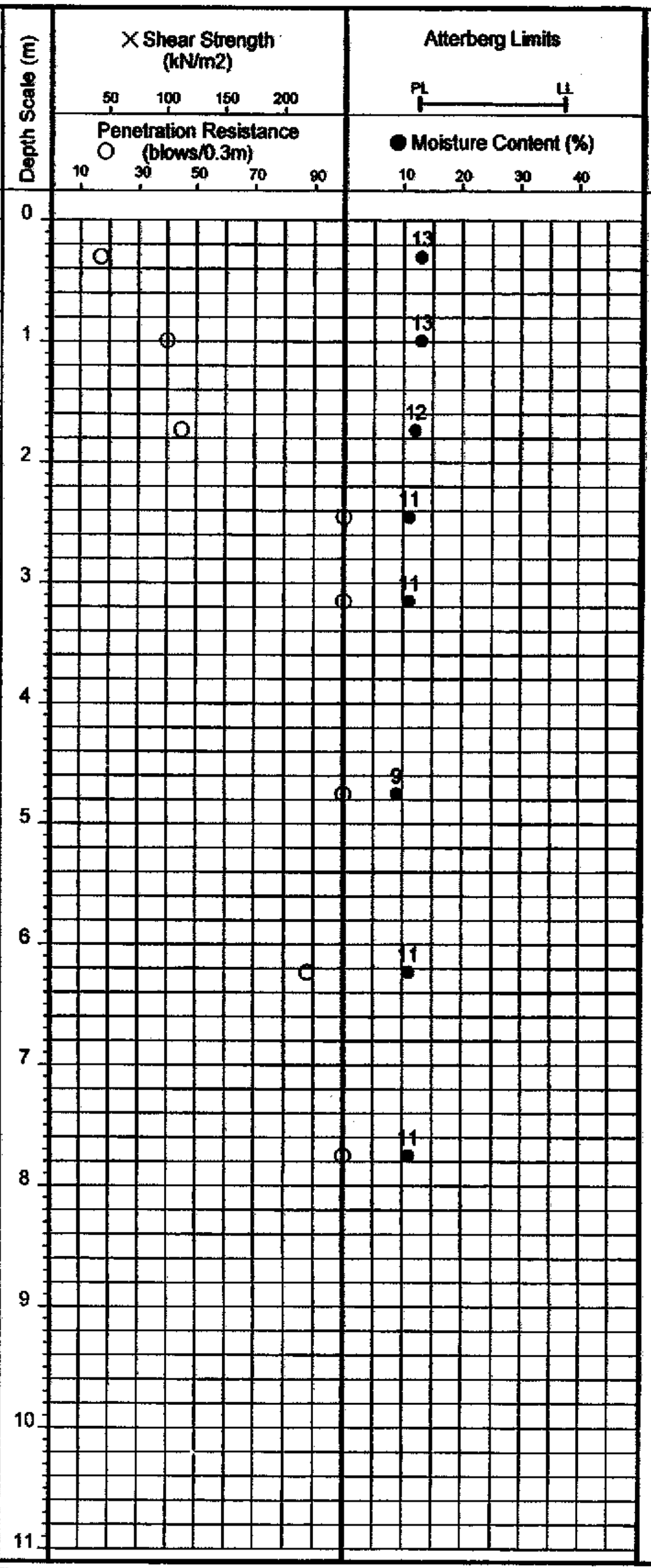
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 13, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
0.0	Ground Surface			
266.6	15 cm TOPSOIL			
	Firm to hard	1	DO	17
	weathered	2	DO	40
		3	DO	45
		4	DO	100+
	SILTY CLAY, Till			
		5	DO	100+
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	100+
	brown grey	7	DO	88
	grey brown	8	DO	100+
7.9 258.7	END OF BOREHOLE			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-35

FIGURE NO: 35

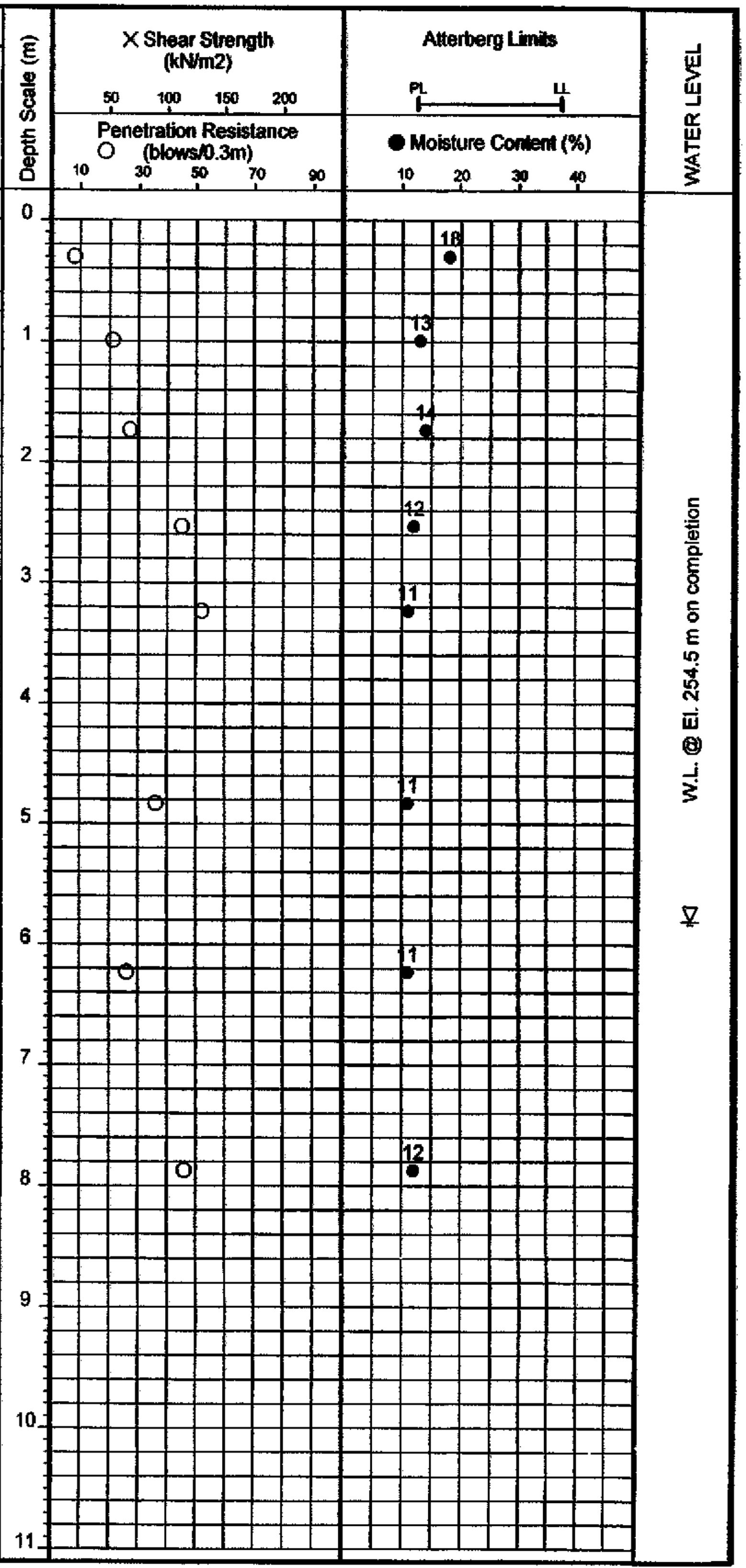
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auge r

DATE: August 13, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 260.3	Ground Surface **30 cm TOPSOIL**			
	Very stiff to hard	1	DO	8
	weathered	2	DO	21
		3	DO	27
		4	DO	45
	SILTY CLAY, Till	5	DO	52
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	36
	brown grey	7	DO	26
		8	DO	46
8.1 252.2	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-36

FIGURE NO: 36

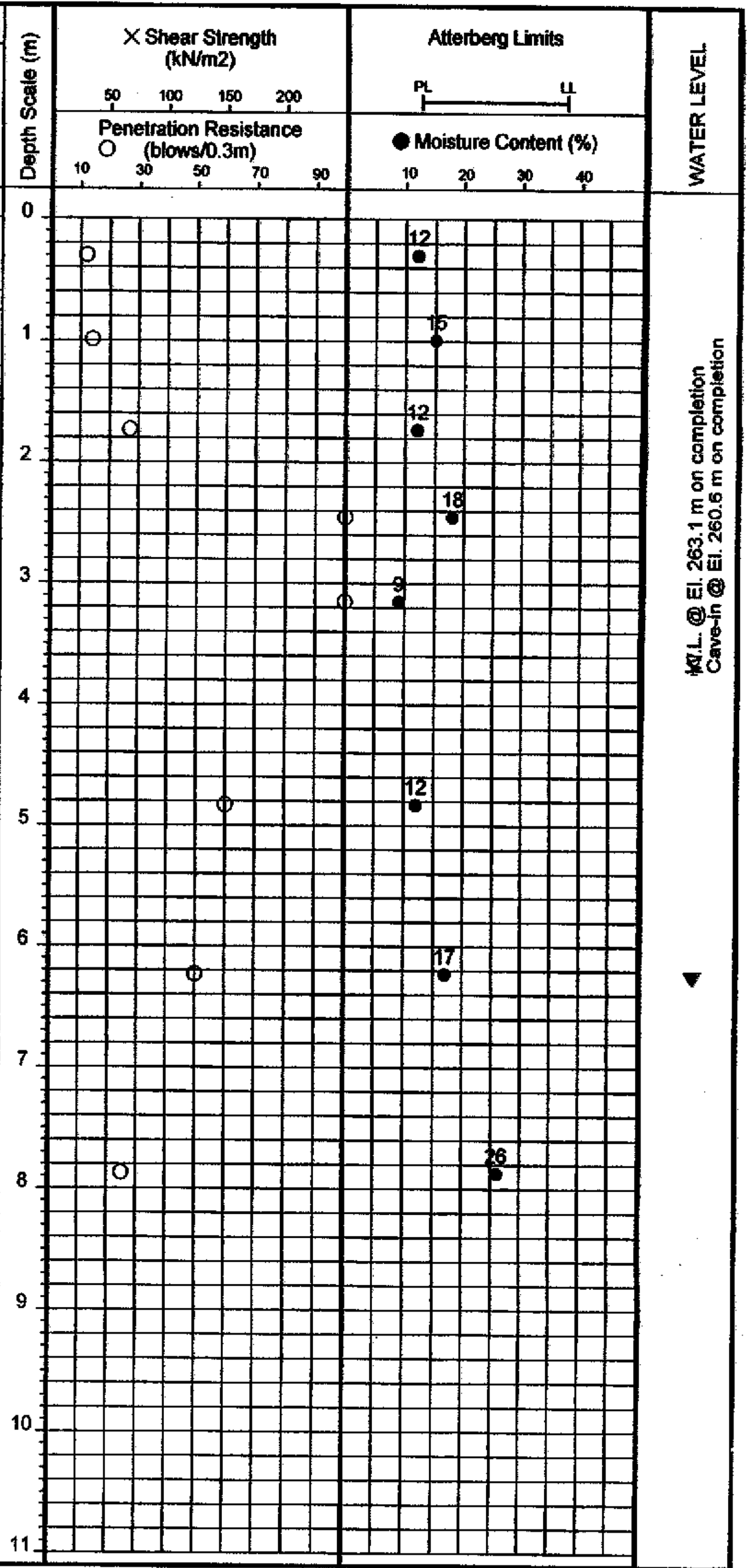
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 13, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
0.0	Ground Surface			
266.8	20 cm TOPSOIL			
	Brown, stiff to hard	1	DO	12
	weathered	2	DO	14
	SILTY CLAY, Till	3	DO	27
		4	DO	100+
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	100+
4.6 262.2	Brown, very dense SANDY SILT, Till some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	6	DO	60
6.0 260.8	Brown, dense FINE SAND a trace to some silt a trace of gravel occ. silt seams and layers	7	DO	50
7.4 259.4	Grey, very stiff SILTY CLAY a trace to some sand occ. wet sand and silt seams and layers	8	DO	25
8.1 258.7	END OF BOREHOLE			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-37

FIGURE NO: 37

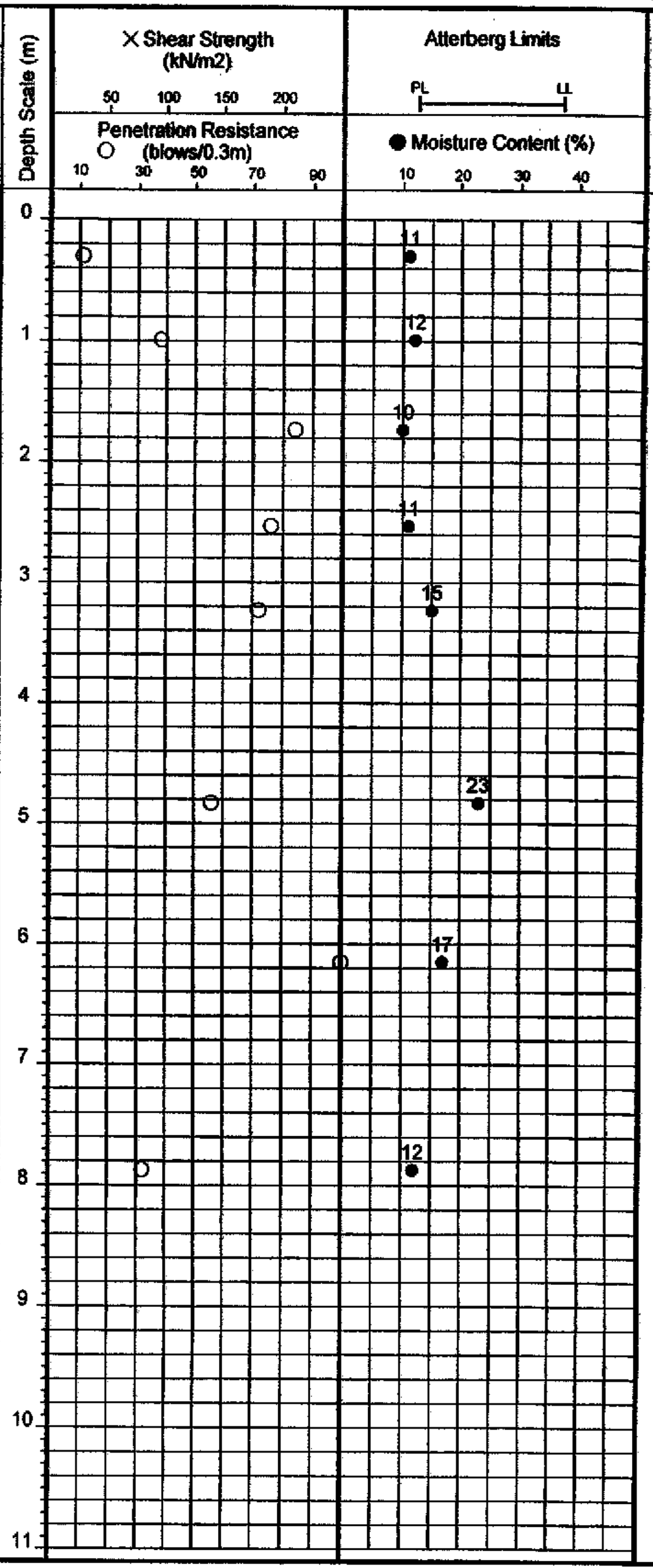
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 13, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
0.0 270.6	Ground Surface **20 cm TOPSOIL**			
	Brown, stiff to hard	1	DO	11
	SILTY CLAY, Till weathered	2	DO	38
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	84
2.3 268.3	Brown, very dense	4	DO	76
	FINE SAND	5	DO	72
	a trace to some silt a trace of gravel occ. silt seams and layers			
4.6 266.0	Brown, dense to very dense	6	DO	56
	FINE TO MEDIUM SAND			
		7	DO	100+
	traces of silt and gravel occ. silt seams and layers			
		8	DO	32
8.1 262.5	**END OF BOREHOLE**			



WATER LEVEL

∇ W.L. @ El. 266.6 m on completion

▼ Cave-in @ El. 265.8 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-38

FIGURE NO: 38

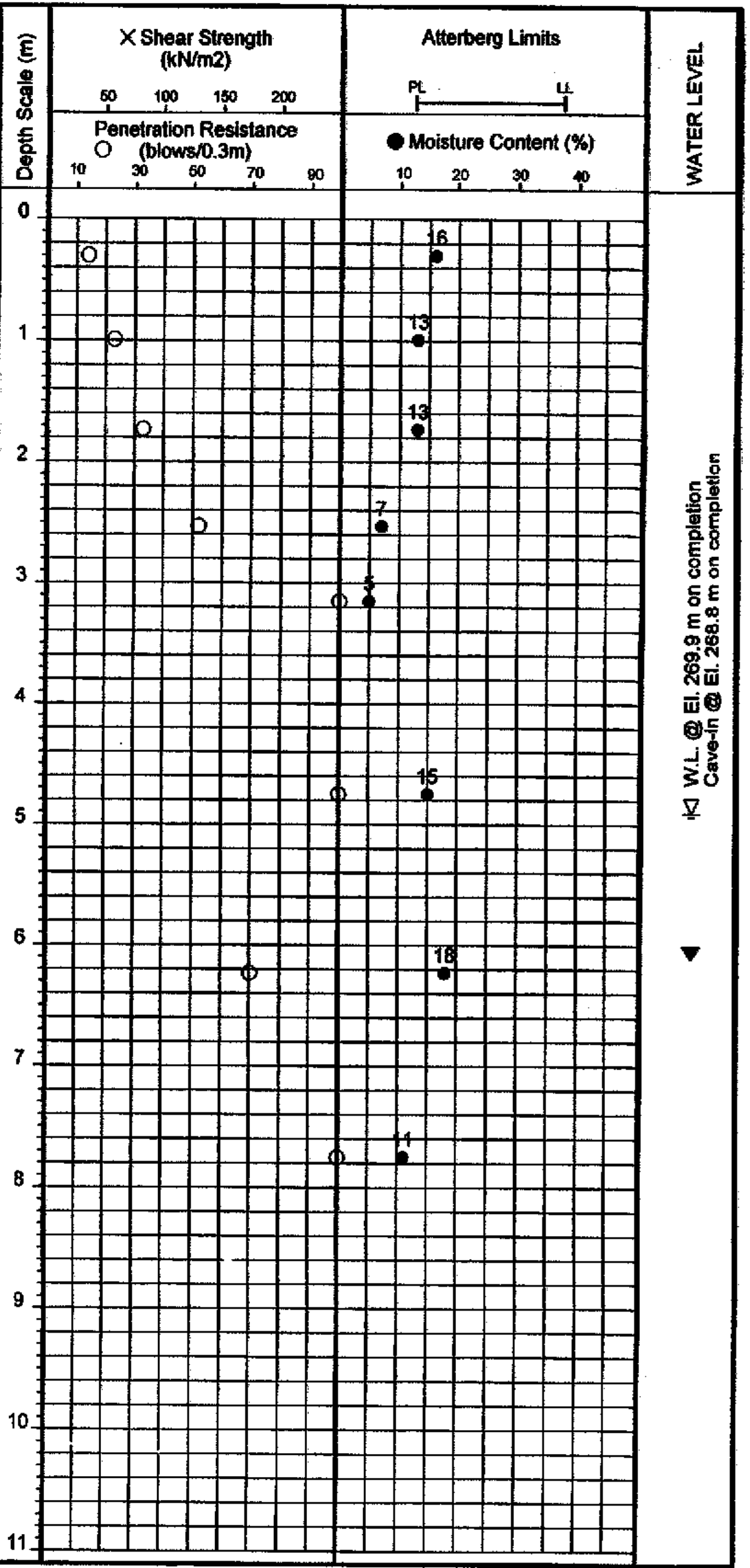
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 13, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 274.8	Ground Surface **30 cm TOPSOIL**			
	Brown, stiff to hard	1	DO	14
	SILTY CLAY, Till weathered	2	DO	23
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	33
2.3 272.5	Brown, very dense	4	DO	52
	FINE SAND	5	DO	100+
	a trace to some silt a trace of gravel occ. silt seams and layers			
4.6 270.2	Brown/grey, very dense	6	DO	100+
	FINE TO MEDIUM SAND			
	traces of silt and gravel occ. silt seams and layers	7	DO	70
7.4 267.4	Grey, hard **SILTY CLAY, Till**			
7.9 266.9	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	8	DO	100+
	END OF BOREHOLE			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-39

FIGURE NO: 39

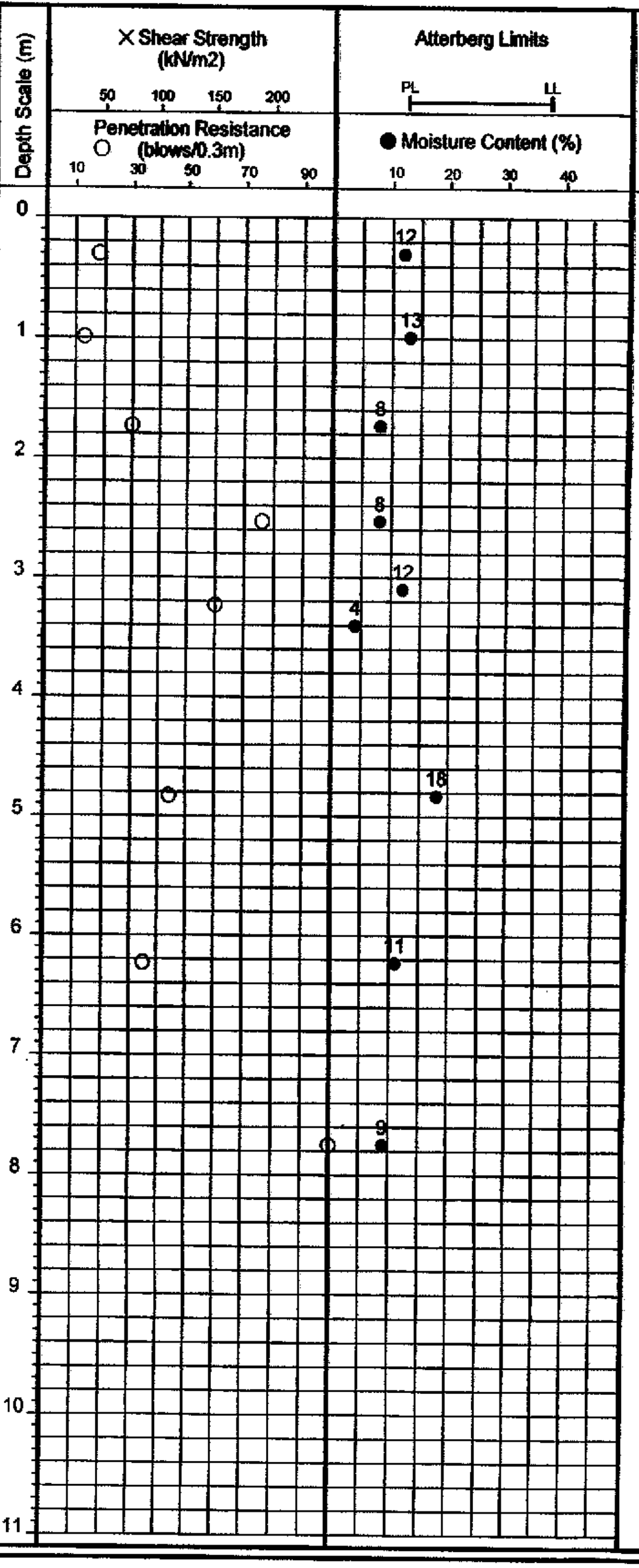
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 30, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 276.3	Ground Surface **30 cm TOPSOIL**			
	Brown, stiff to very stiff **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	1	DO	18
	weathered	2	DO	13
		3	DO	30
2.3 274.0	Brown, very dense **SANDY SILT**	4	DO	76
2.8 273.5	Brown, hard **SILTY CLAY, Till**			
3.3 273.0	Brown, dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	5	DO	60
		6	DO	44
6.0 270.3	Hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	35
	grey brown	8	DO	100+
7.9 268.4	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 270.8 m on completion ∇

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-40

FIGURE NO: 40

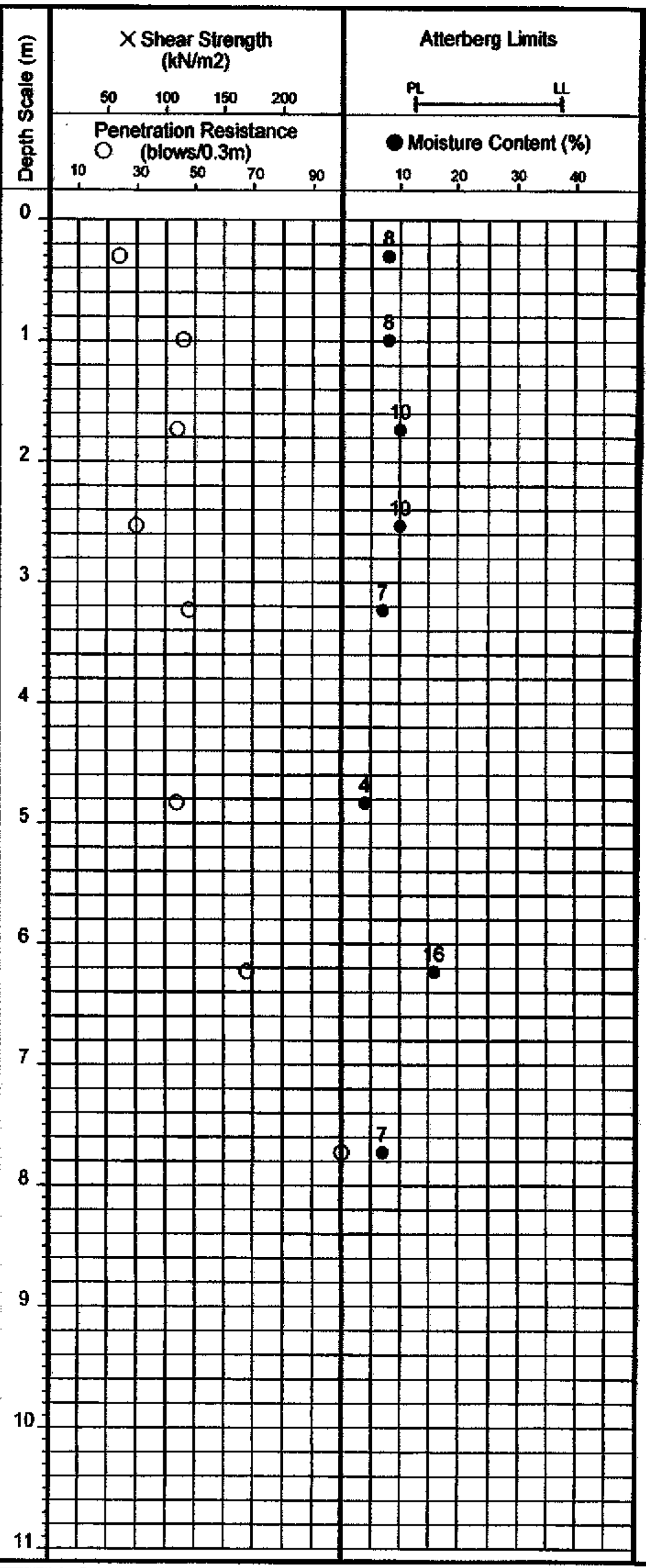
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 30, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 279.6	Ground Surface **25 cm TOPSOIL**			
	Brown, compact to dense	1	DO	24
	SILTY SAND, Till (weathered)	2	DO	46
	some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	3	DO	44
		4	DO	30
3.0 276.6	Brown, dense **FINE SAND**	5	DO	48
	a trace to some silt a trace of gravel occ. silt seams and layers	6	DO	44
6.0 273.6	Brown, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	68
7.4 272.2	Brown, very dense **SANDY SILT**			
7.8 271.8	a trace to some clay a trace of gravel occ. silty fine sand layers **END OF BOREHOLE**	8	DO	100+



WATER LEVEL

Dry on completion

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-41

FIGURE NO: 41

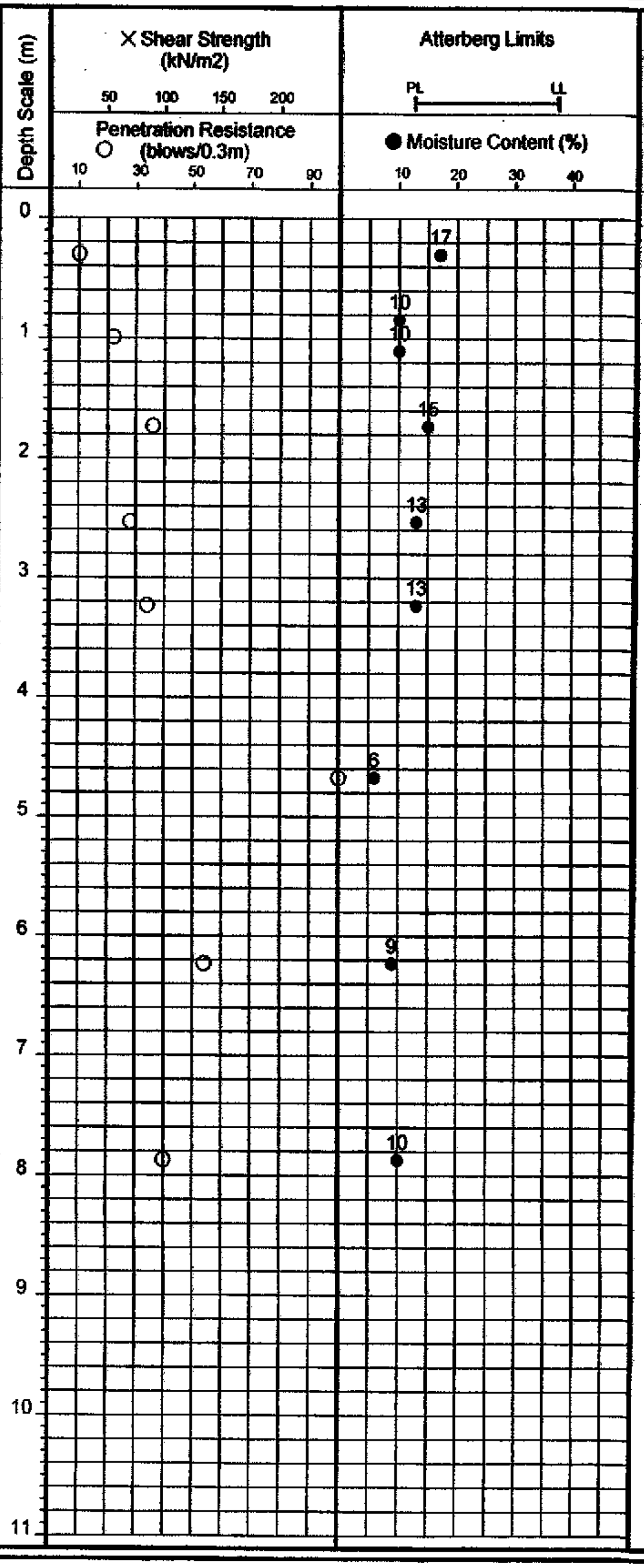
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 30, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 285.8	Ground Surface **30 cm TOPSOIL**			
	Brown, stiff to hard weathered	1	DO	10
	sand-layer	2	DO	22
	SILTY CLAY, Till	3	DO	36
		4	DO	28
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	34
4.6 281.2	Grey, very dense	6	DO	100+
	SILTY SAND, Till some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders			
6.0 279.8	Grey, hard	7	DO	54
	SILTY CLAY, Till sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
		8	DO	40
8.1 277.7	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 279.1 m on completion

∇

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-42

FIGURE NO: 42

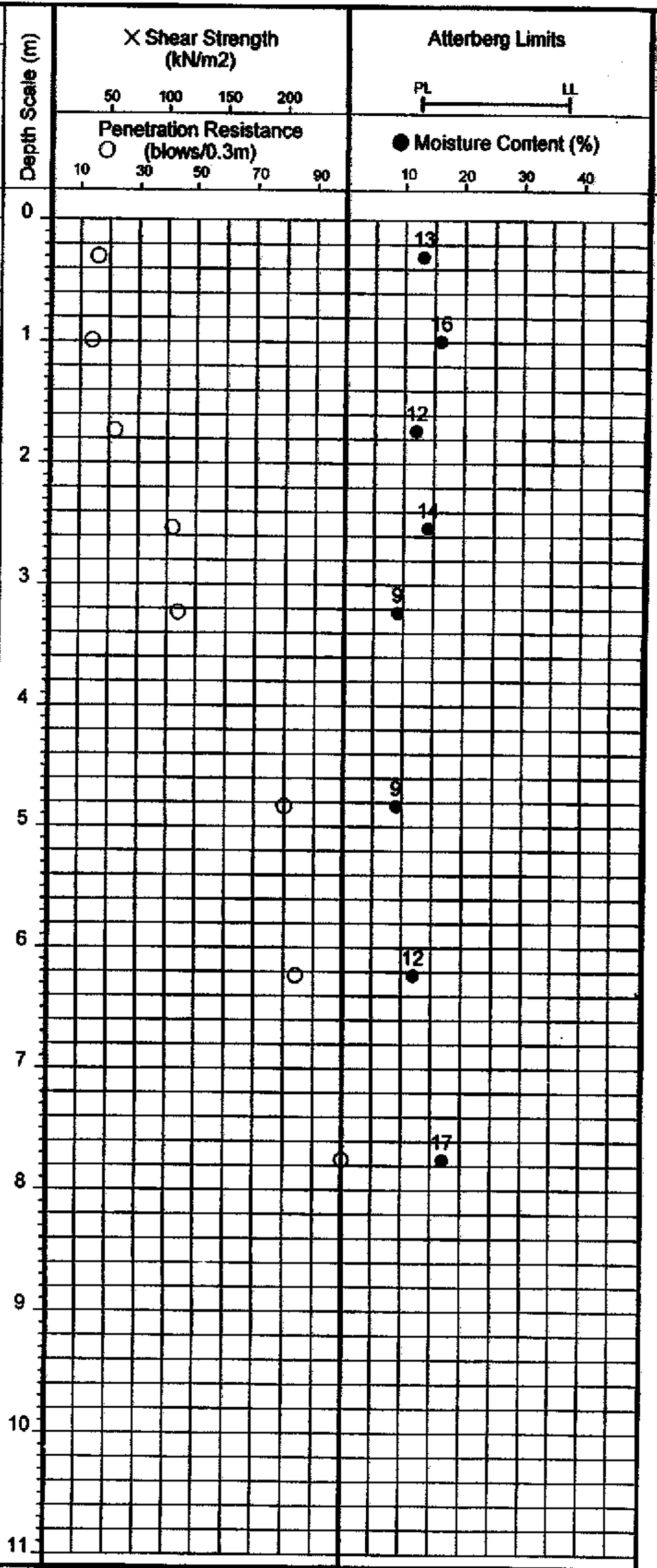
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 30, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 275.6	Ground Surface **20 cm TOPSOIL**			
	Brown, stiff to very stiff **SILTY CLAY, Till** weathered sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	1	DO	16
		2	DO	14
		3	DO	22
2.3 273.3	Brown, dense **SANDY SILT, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	4	DO	42
3.0 272.6	Hard **SILTY CLAY, Till** grey brown sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	44
		6	DO	80
		7	DO	84
7.4 268.2	Brown, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	8	DO	100+
7.9 267.7	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 268.9 m on completion

∇

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-43

FIGURE NO: 43

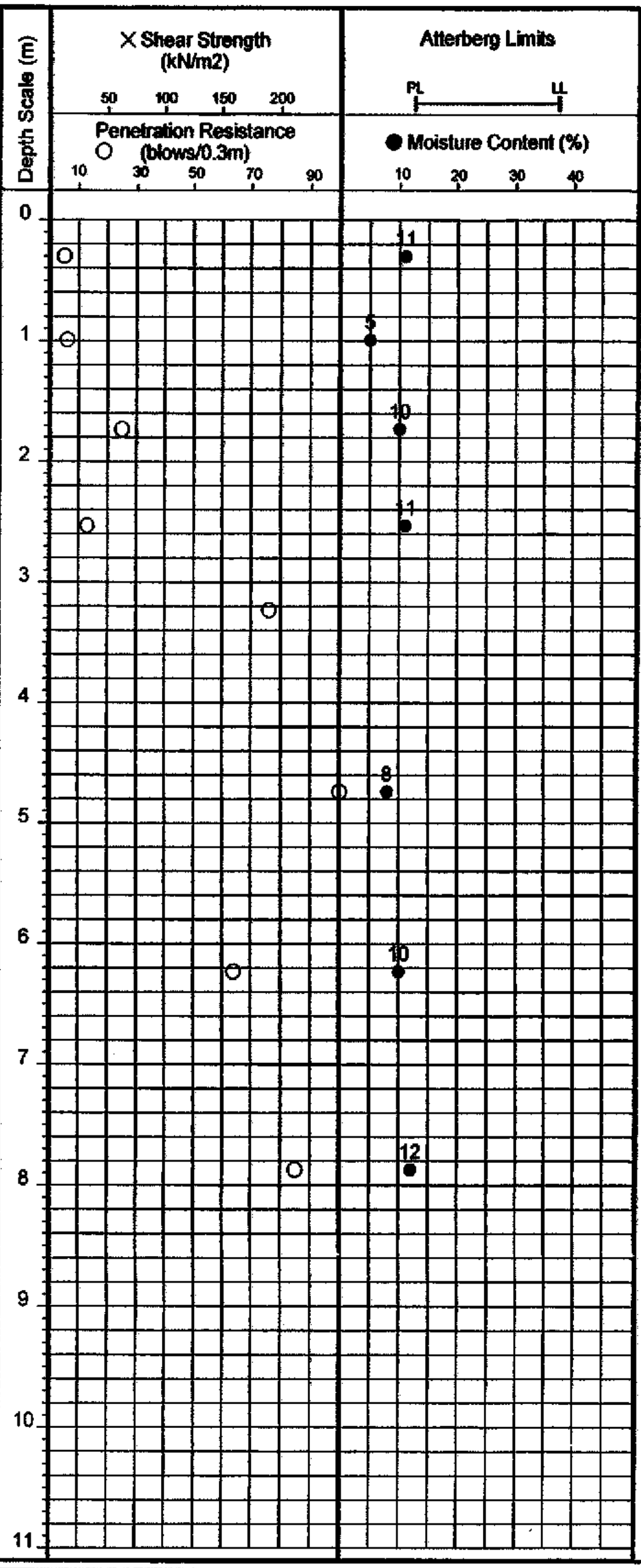
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 10, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
290.9	**23 cm TOPSOIL**			
	Brown, loose to compact **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	1	DO	5
	weathered	2	DO	6
		3	DO	25
2.3 288.6	Brown, stiff to hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	13
	boulder	5	DO	76
4.6 286.3	Brown, very dense **SILTY SAND, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	6	DO	100+
		7	DO	64
7.4 283.5	Brown, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	8	DO	85
8.1 282.8	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-44

FIGURE NO: 44

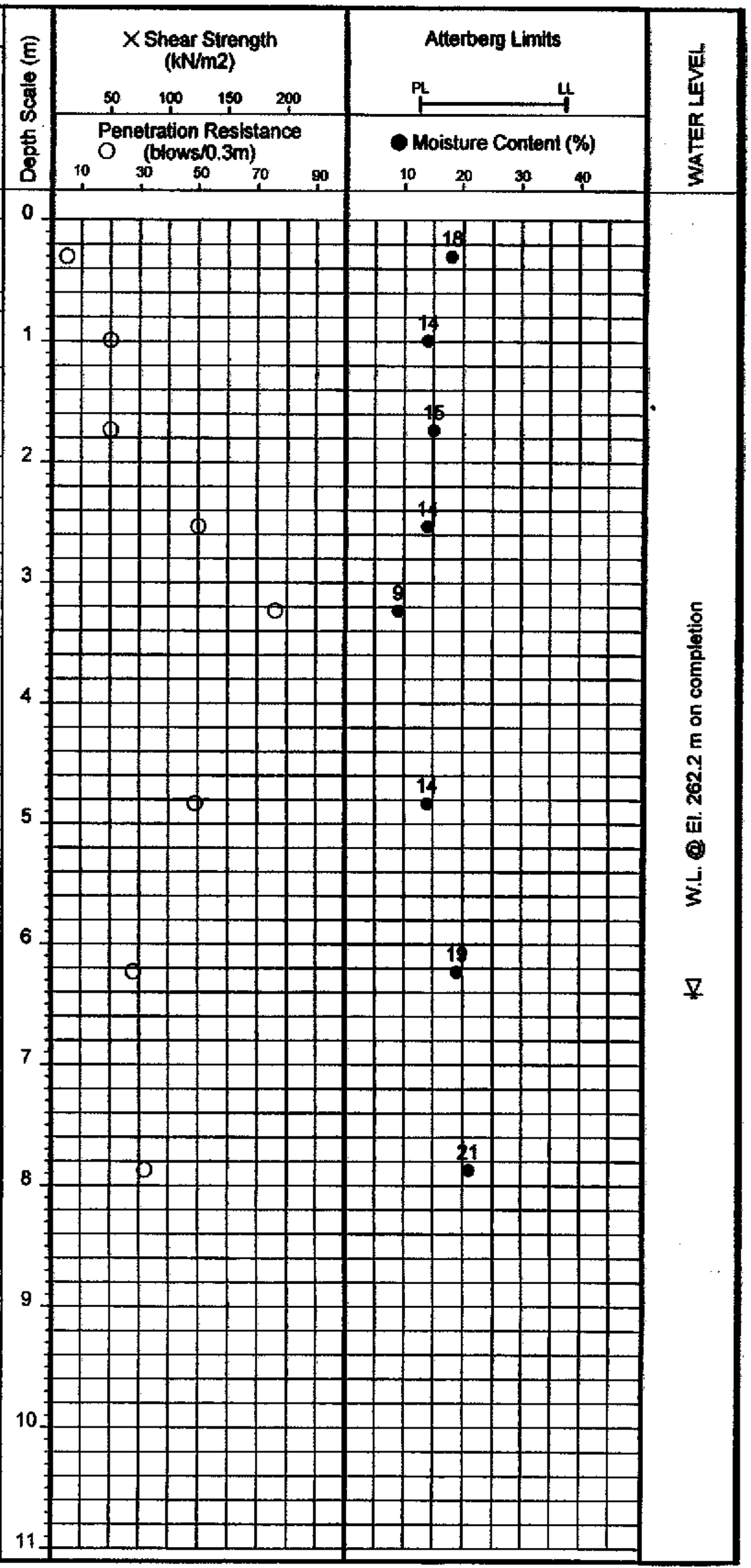
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 31, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 268.6	Ground Surface **15 cm TOPSOIL**			
	Brown, firm to hard	1	DO	5
	weathered	2	DO	20
	SILTY CLAY, Till			
		3	DO	20
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	50
		5	DO	76
	boulder			
4.6 264.0	Brown, hard **SILTY CLAY** a trace to some sand occ. wet sand and silt seams and layers	6	DO	49
6.0 262.6	Brown, compact **SILTY FINE SAND** a trace of clay occ. silt seams and layers	7	DO	28
7.4 261.2	Brown, hard **SILTY CLAY** a trace to some sand occ. wet sand and silt seams and layers	8	DO	32
8.1 260.5	**END OF BOREHOLE**			



W.L. @ El. 262.2 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-45

FIGURE NO: 45

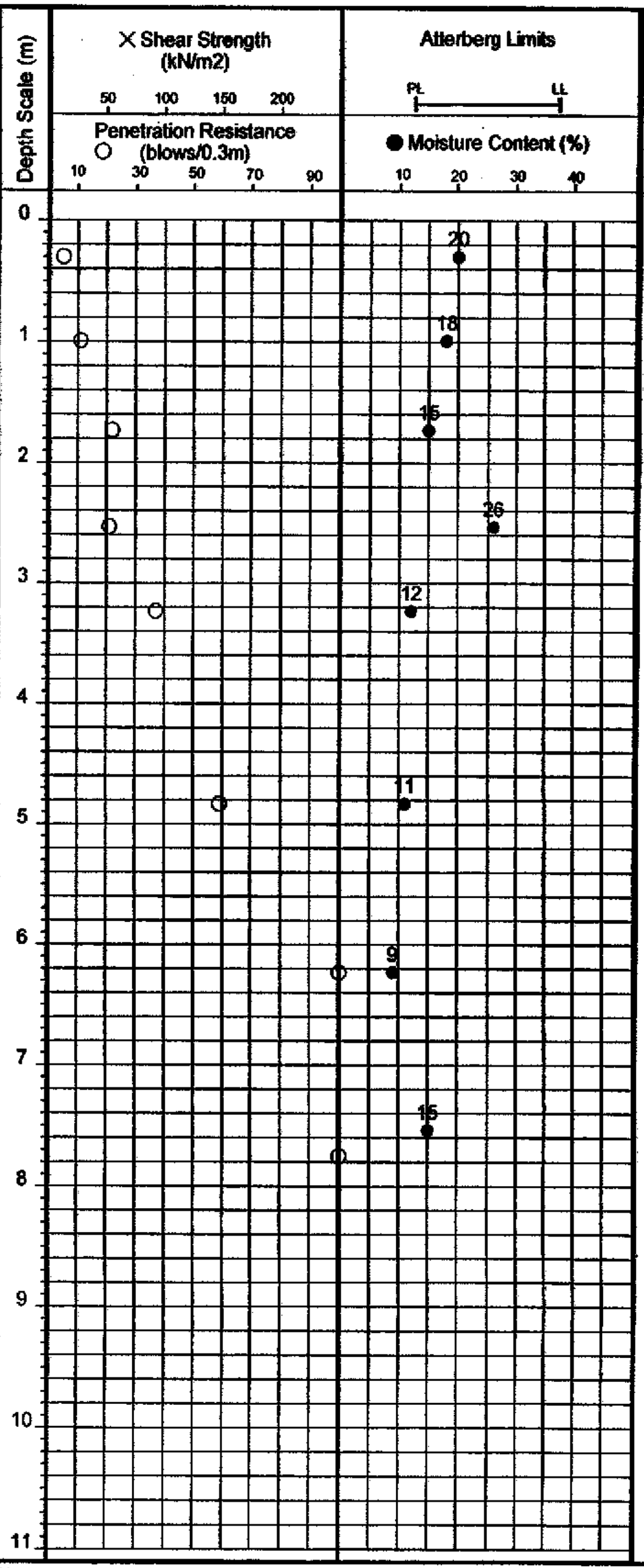
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 7, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 273.6	Ground Surface			
	76 cm TOPSOIL	1	DO	5
	Brown, stiff to very stiff weathered **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	2	DO	11
		3	DO	22
2.3 271.3	Brown, very stiff **SILTY CLAY** a trace to some sand occ. wet sand and silt seams and layers	4	DO	21
3.0 270.6	Brown, hard	5	DO	37
	SILTY CLAY, Till	6	DO	59
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	100+
		8	DO	100+
7.9 265.7	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-46

FIGURE NO: 46

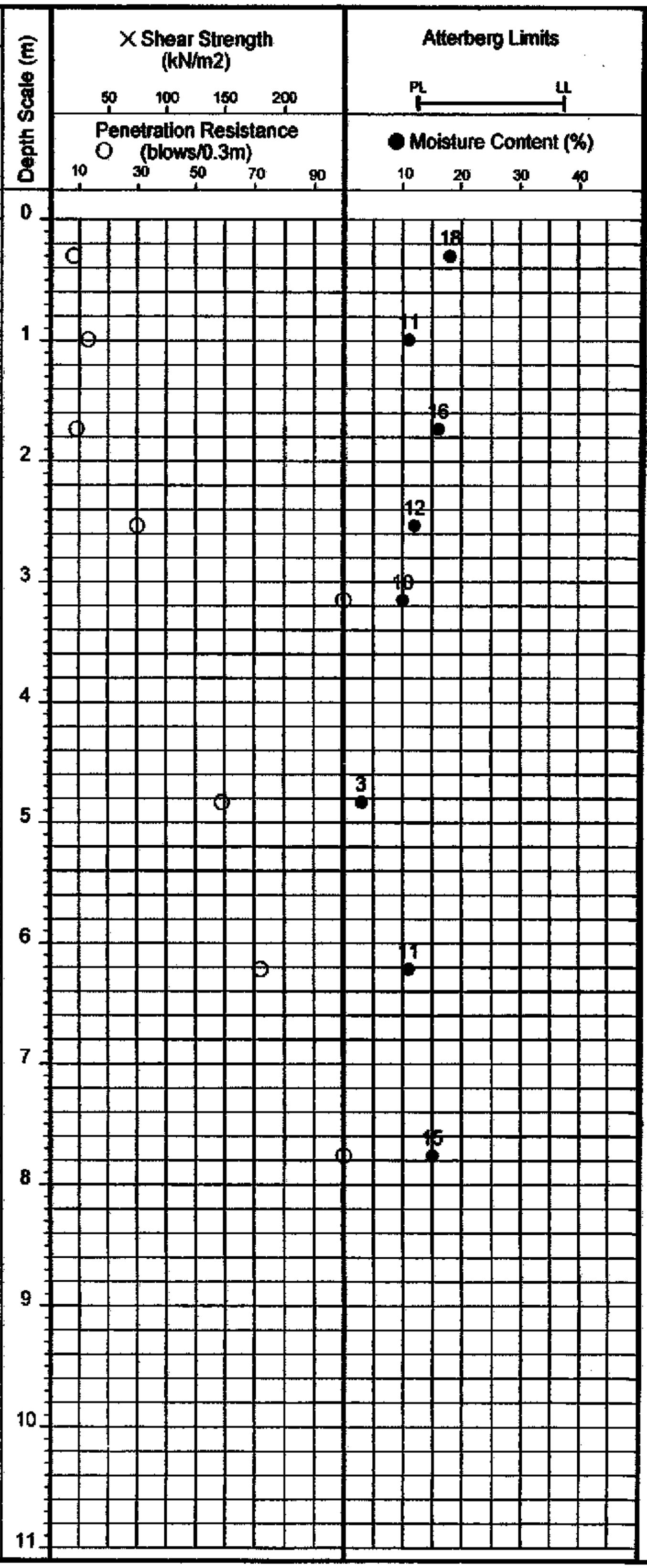
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 12, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
0.0 280.2	Ground Surface **30 cm TOPSOIL**			
	Brown, loose to compact **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers weathered	1	DO	8
		2	DO	13
1.5 278.7	Brown, stiff to hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	9
		4	DO	30
		5	DO	100+
4.6 275.6	Brown, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	6	DO	59
6.0 274.2	Brown, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	72
7.4 272.8	Brown, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	8	DO	100+
7.9 272.3	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-47

FIGURE NO: 47

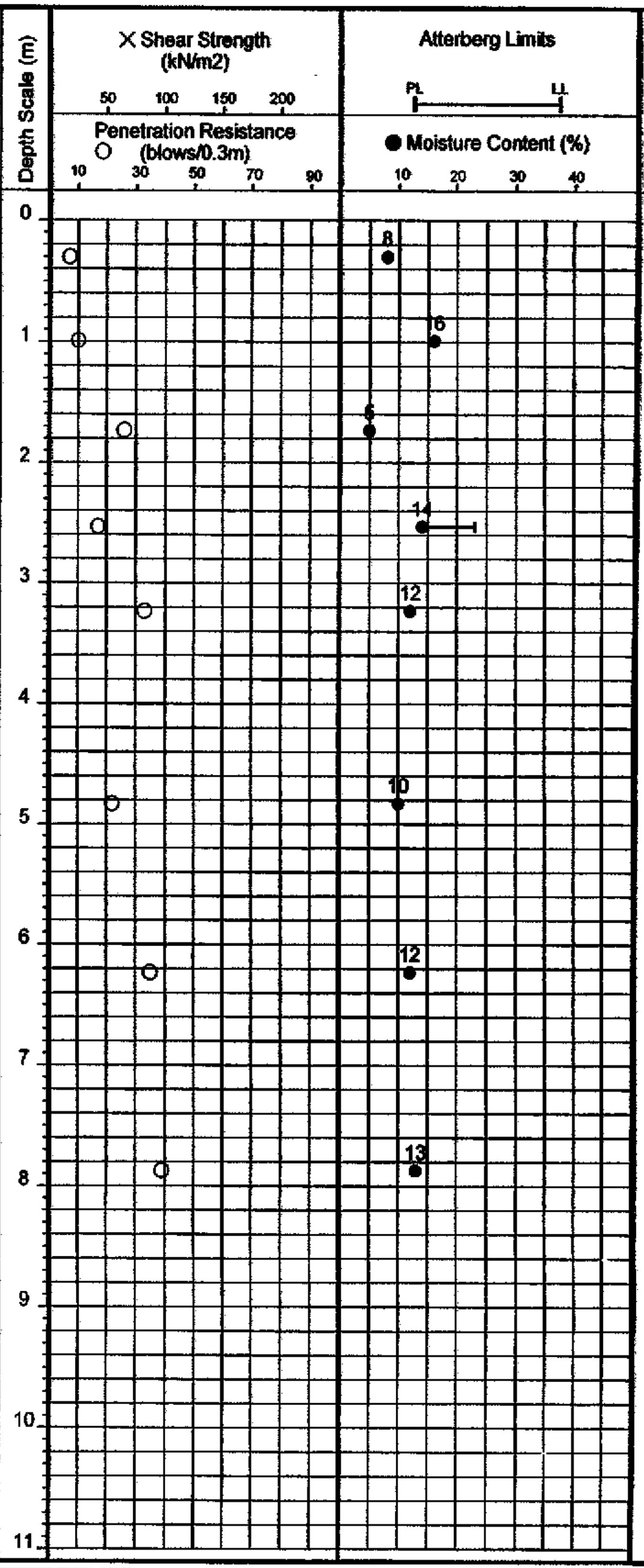
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 12, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	WATER LEVEL
0.0	Ground Surface				
291.7	**13 cm TOPSOIL**				
	Brown, firm to stiff **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders weathered	1 2	DO DO	7 10	
1.5 290.2	Brown, compact **SILTY FINE SAND** a trace of clay occ. silt seams and layers	3	DO	26	
2.3 289.4	Very stiff to hard **SILTY CLAY, Till** brown grey sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4 5 6 7 8	DO DO DO DO DO	17 33 22 35 39	Dry on completion
8.1 283.6	**END OF BOREHOLE**				



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-48

FIGURE NO: 48

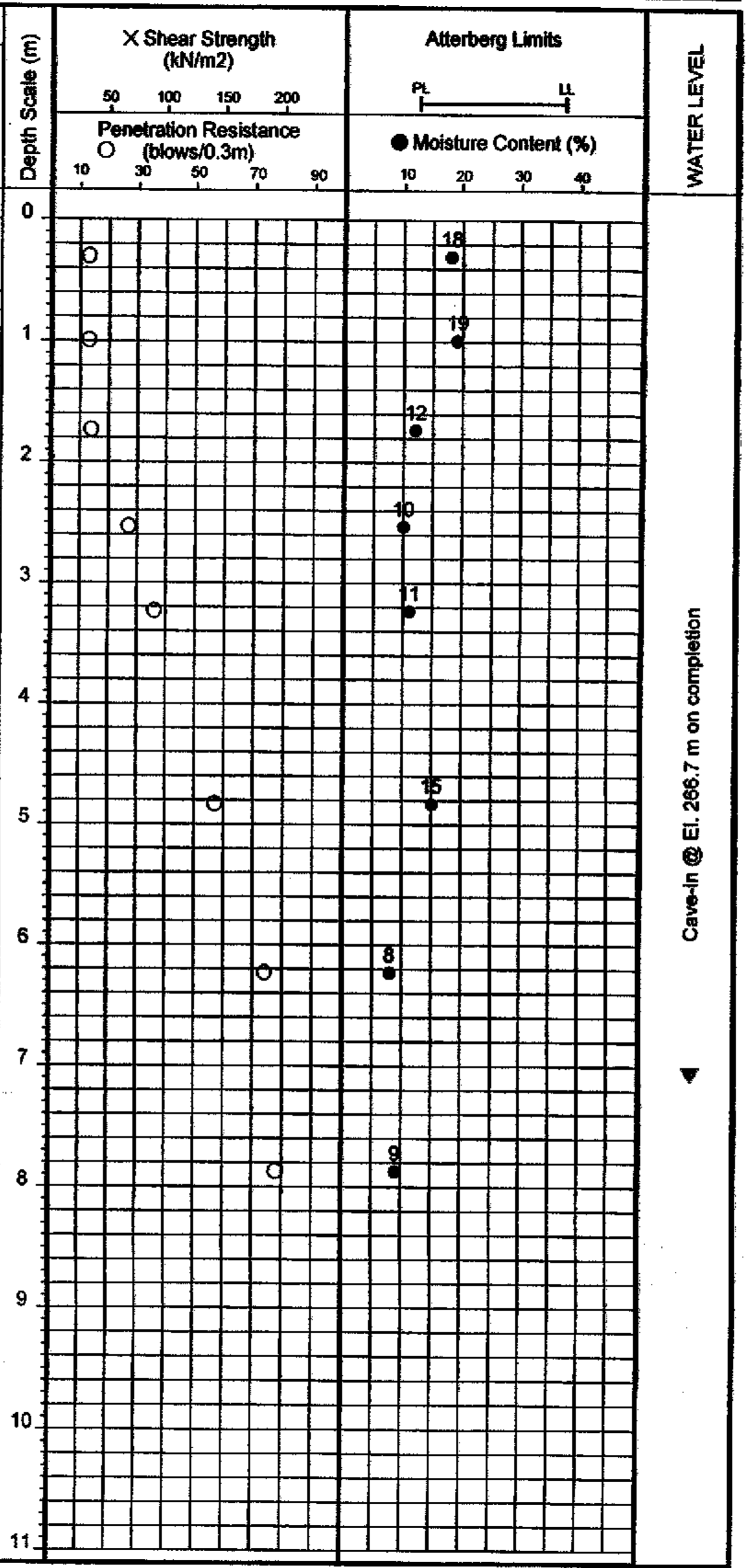
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 7, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 273.7	Ground Surface **46 cm TOPSOIL**	1	DO	13
	Brown, stiff **SILTY CLAY** a trace to some sand occ. wet sand and silt seams and layers weathered	2	DO	13
1.5 272.2	Brown, stiff to hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	3 4 5	DO DO DO	14 27 36
4.6 269.1	Brown, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	6	DO	57
6.0 267.7	Brown, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	74
7.0 266.7	Brown, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	8	DO	78
8.1 265.6	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-49

FIGURE NO: 49

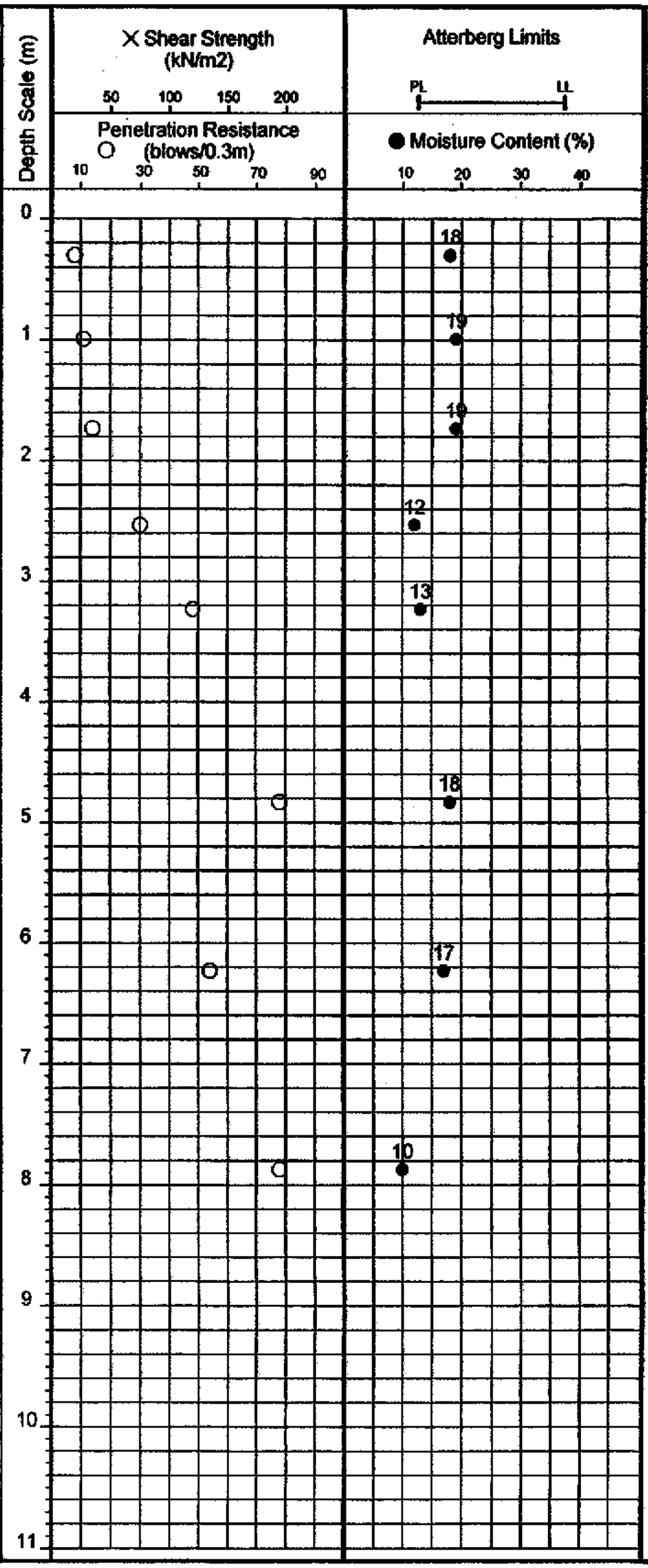
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 3, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
271.0	20 cm TOPSOIL Brown, firm to hard	1	DO	8
	weathered	2	DO	11
	SILTY CLAY, Till	3	DO	14
		4	DO	30
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	48
		6	DO	78
6.0 265.0	Brown, very dense FINE SAND a trace to some silt a trace of gravel occ. silt seams and layers	7	DO	54
7.4 263.6	Brown, hard SILTY CLAY, Till sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	8	DO	78
8.1 262.9	END OF BOREHOLE			



WATER LEVEL

Cave-in @ El. 265.0 m on completion ▼

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-50

FIGURE NO: 50

JOB DESCRIPTION: Proposed Urban Development

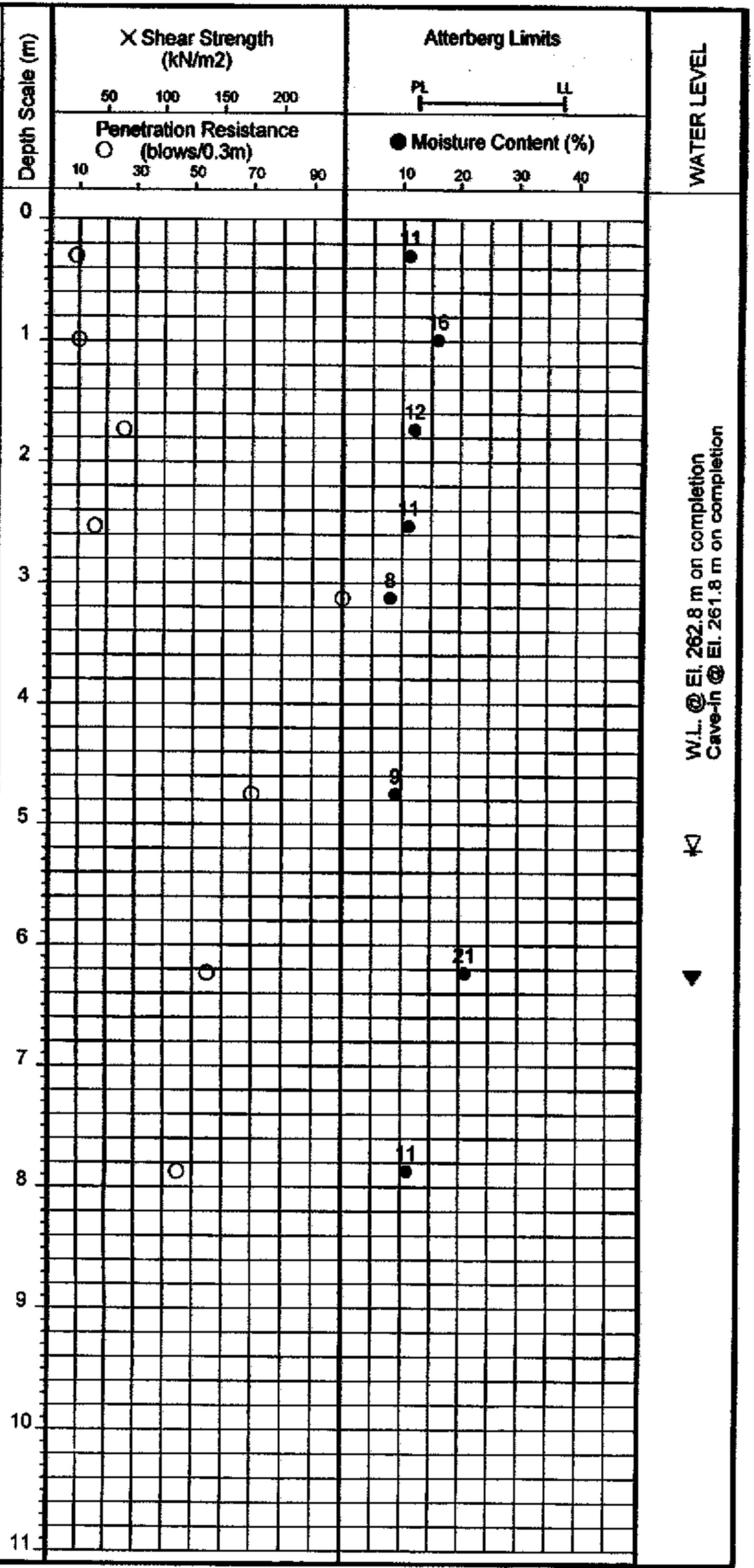
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 31, 2010

Depth Elev. (m)	SOIL DESCRIPTION
0.0 266.0	Ground Surface **46 cm TOPSOIL**
	Brown, stiff to very stiff weathered **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders
3.0 265.0	Brown, very dense **SANDY SILT, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders
6.0 262.0	Brown, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers
7.4 260.6	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders
8.1 259.9	**END OF BOREHOLE**

SAMPLES		
Number	Type	N-Value
1	DO	9
2	DO	10
3	DO	26
4	DO	16
5	DO	100+
6	DO	70
7	DO	55
8	DO	45



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-51

FIGURE NO: 51

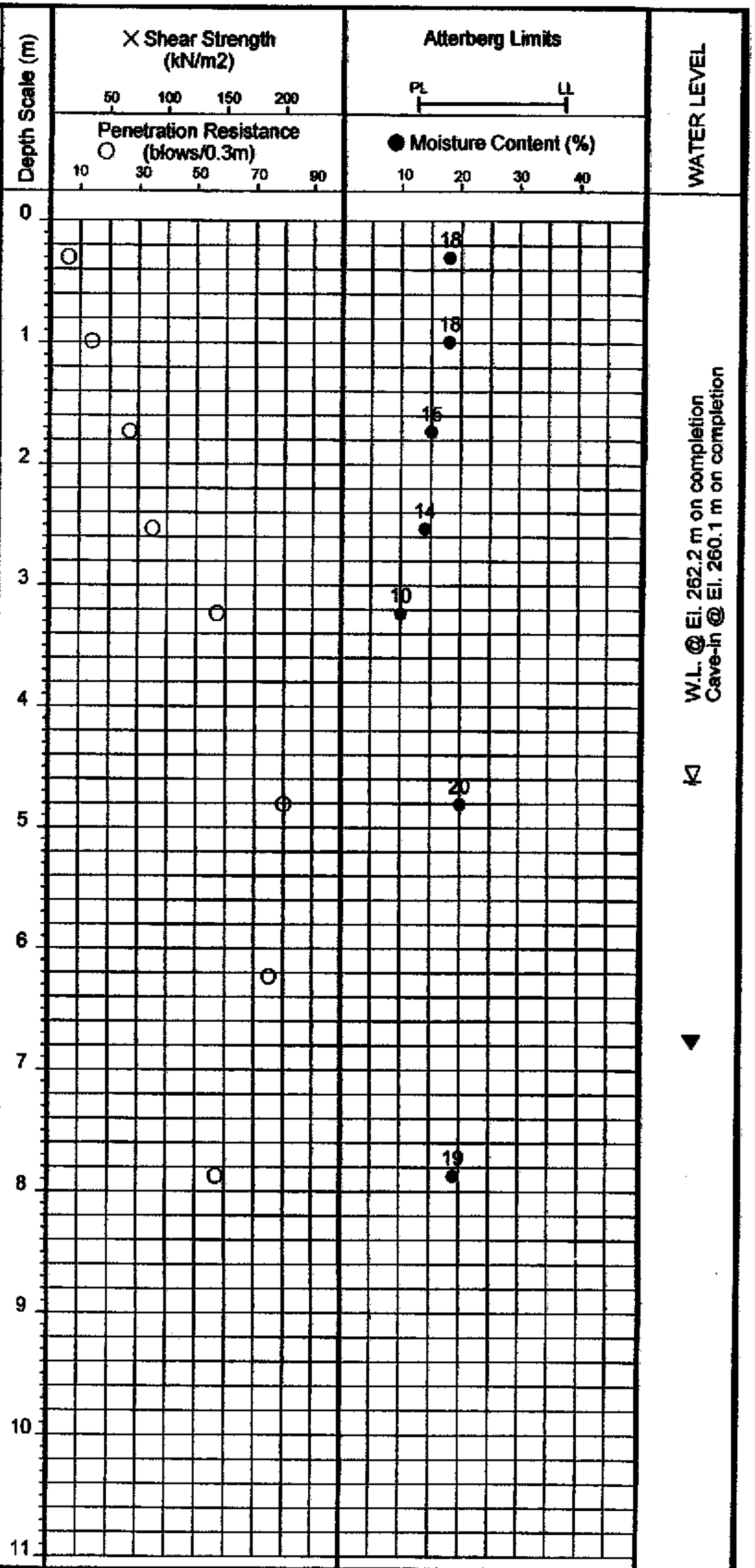
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 27, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 266.8	Ground Surface			
	60 cm TOPSOIL	1	DO	6
	Brown, stiff to hard weathered	2	DO	14
		3	DO	27
	SILTY CLAY, Till	4	DO	35
		5	DO	57
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
		6	DO	80
6.0 260.8	Brown, very dense	7	DO	75
	SILTY FINE SAND a trace of clay occ. silt seams and layers			
		8	DO	57
8.1 258.7	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-52

FIGURE NO: 52

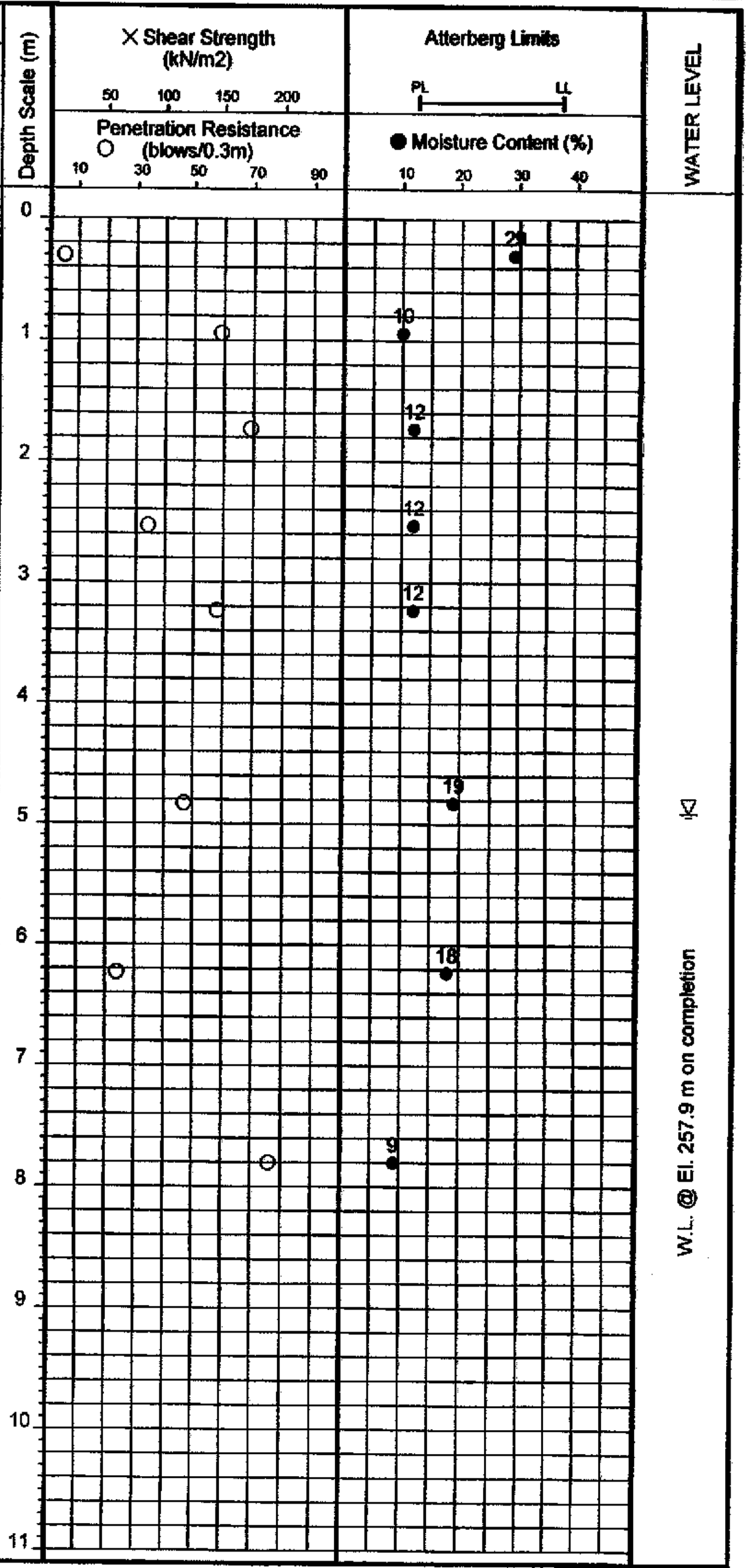
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 30, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
0.0 262.8	Ground Surface			
	75 cm TOPSOIL	1	DO	5
	Brown, hard weathered boulder	2	DO	59
	SILTY CLAY, Till	3	DO	69
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	34
		5	DO	58
4.6 258.2	Brown, dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	6	DO	47
6.0 256.6	Brown, very stiff **SILTY CLAY** a trace to some sand occ. wet sand and silt seams and layers	7	DO	24
7.4 255.4	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	8	DO	76
8.0 254.8	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-53

FIGURE NO: 53

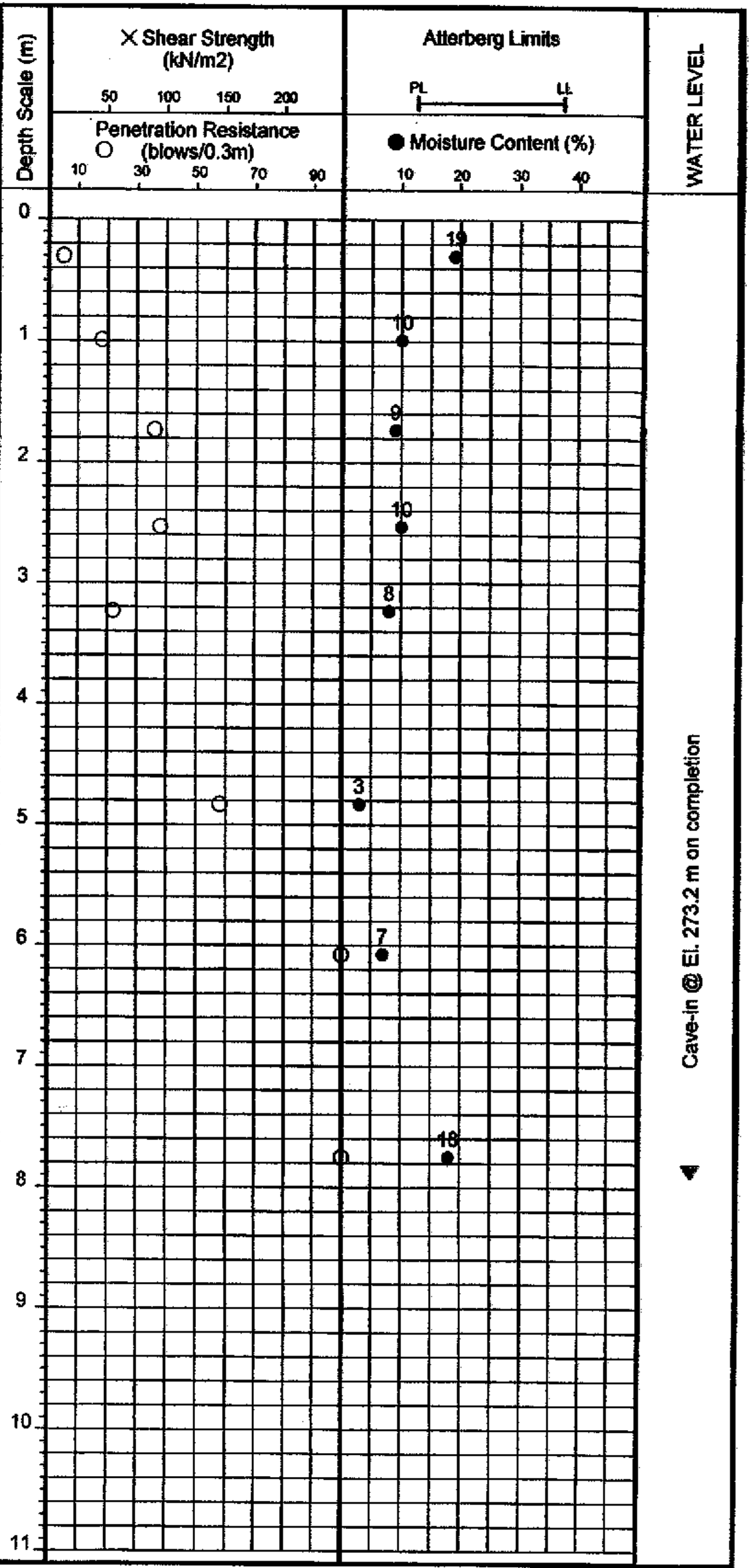
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 30, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
281.0	36 cm TOPSOIL			
	Brown, firm **SILTY CLAY, Till**	1	DO	5
0.8 280.2	Brown, compact to dense weathered **SILTY SAND, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	2	DO	18
		3	DO	36
2.3 278.7	Brown, compact to dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	4	DO	38
		5	DO	22
4.6 276.4	Brown, very dense **FINE TO MEDIUM SAND** traces of silt and gravel occ. silt seams and layers	6	DO	58
6.0 275.0	Brown, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	100+
7.4 273.6	Brown, very dense **SILT** traces to some sand and clay a trace of gravel occ. sand seams and layers	8	DO	100+
7.9 273.1	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-54

FIGURE NO: 54

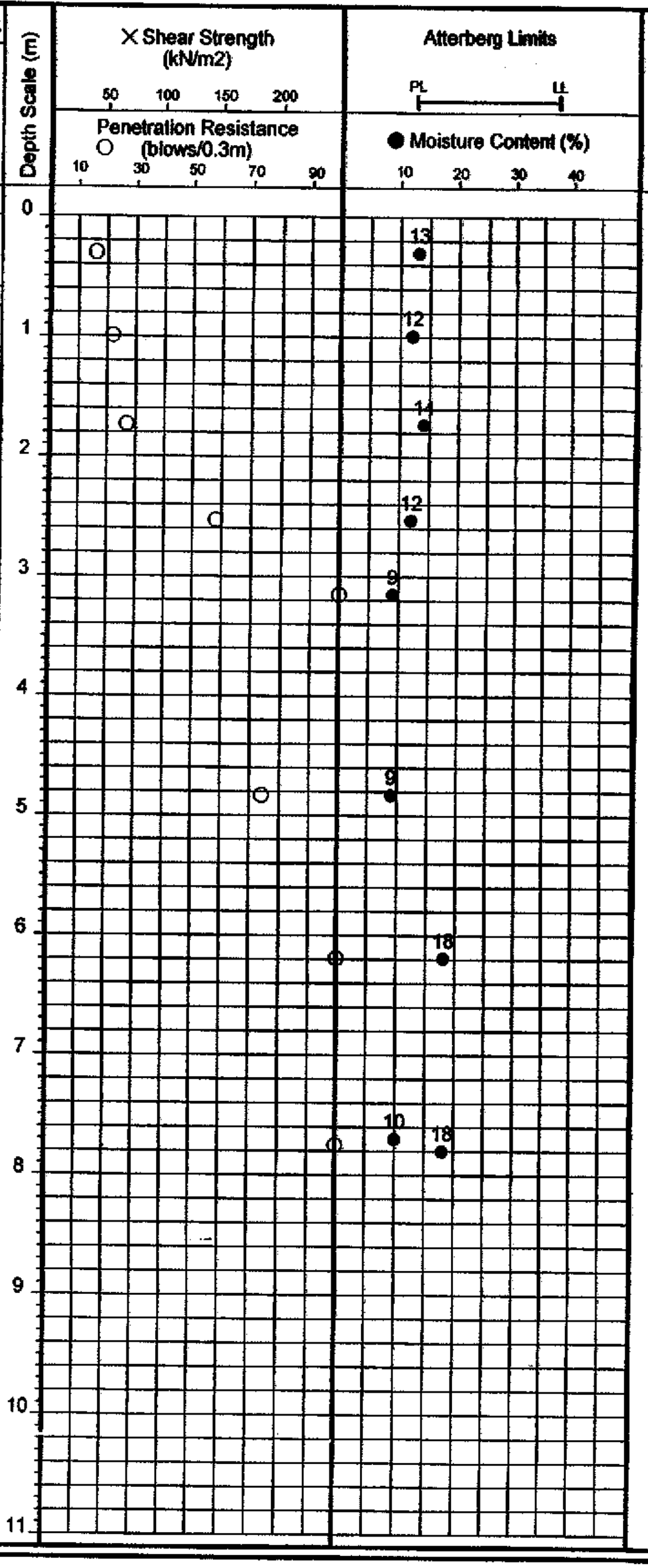
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 13, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 267.4	Ground Surface **30 cm TOPSOIL**			
	Stiff to hard	1	DO	16
	weathered	2	DO	22
	SILTY CLAY, Till	3	DO	27
		4	DO	58
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	100+
	brown grey	6	DO	74
6.0 261.4	Brown, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	7	DO	100+
	silty clay till layer	8	DO	100+
7.9 259.5	**END OF BOREHOLE**			



WATER LEVEL

∇

W.L. @ El. 264.4 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-55

FIGURE NO: 55

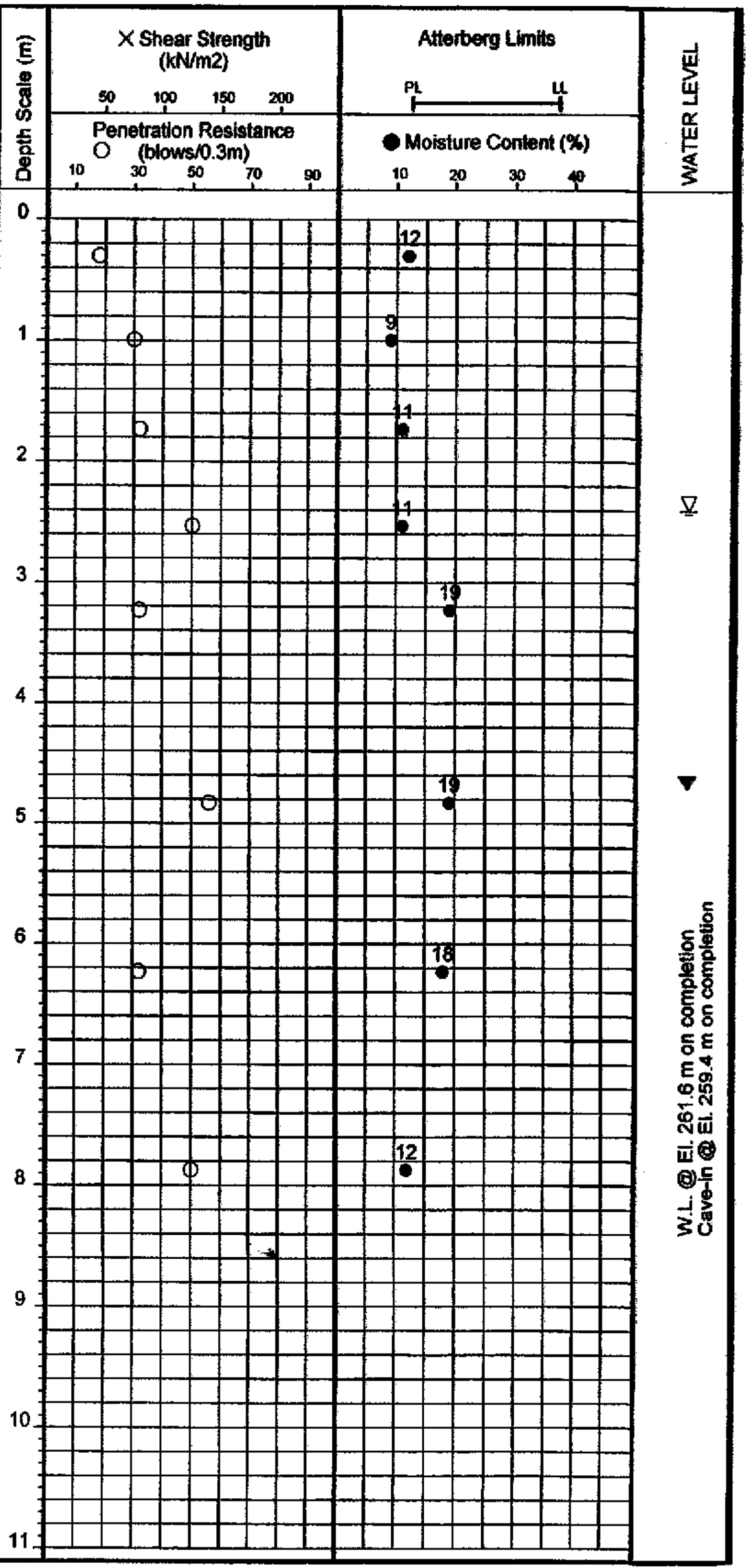
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 12, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 264.0	Ground Surface **30 cm TOPSOIL**			
	Brown, very stiff to hard	1	DO	18
	weathered	2	DO	30
	SILTY CLAY, Till	3	DO	32
		4	DO	50
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	32
4.6 259.4	Brown, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	6	DO	56
6.0 258.0	Brown, dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	7	DO	32
7.4 256.6	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	8	DO	50
8.1 255.9	**END OF BOREHOLE**			



W.L. @ El. 261.6 m on completion
Cave-in @ El. 259.4 m on completion

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-56

FIGURE NO: 56

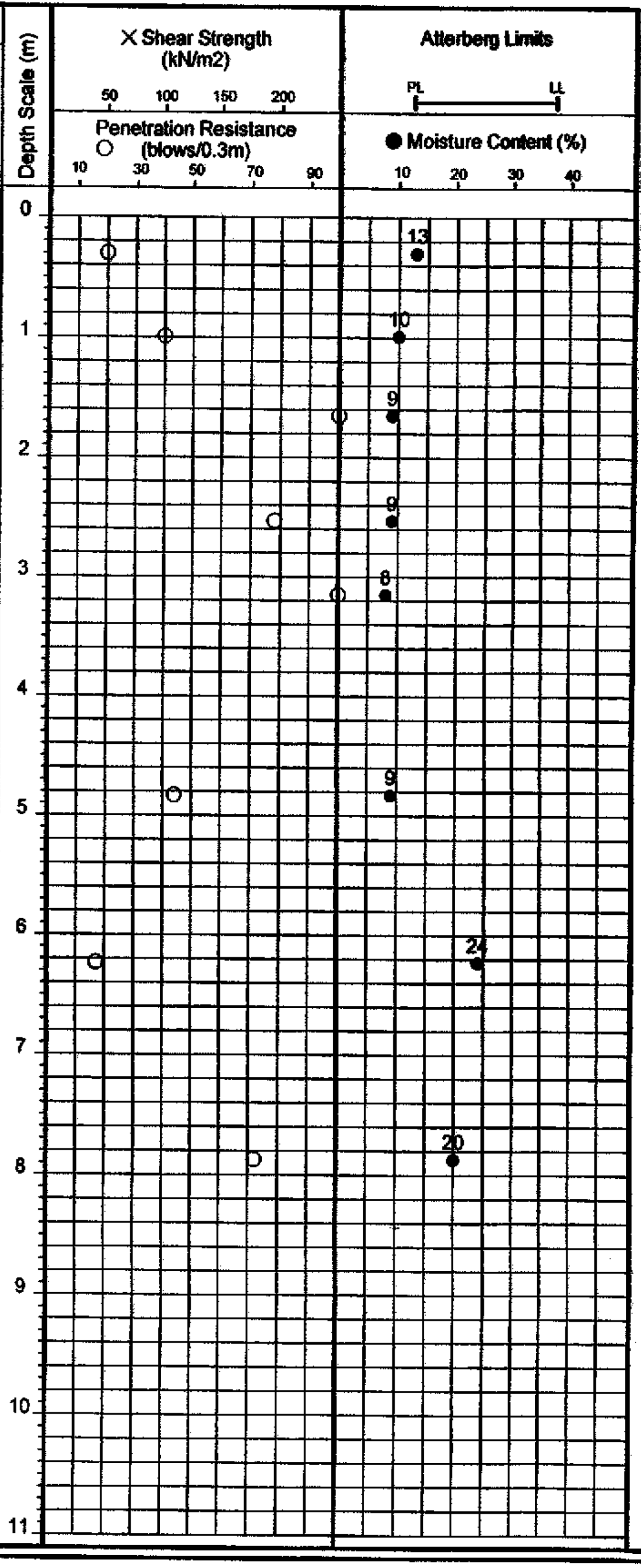
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 261.3	Ground Surface **25 cm TOPSOIL**			
	Very stiff to hard	1	DO	20
	weathered	2	DO	40
		3	DO	100+
	SILTY CLAY, Till			
		4	DO	78
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	100+
	brown grey	6	DO	44
6.0 255.3	Brown, compact **SILTY FINE SAND** a trace of clay occ. silt seams and layers	7	DO	17
7.4 253.9	Brown, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	8	DO	72
8.1 253.2	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 257.6 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-57

FIGURE NO: 57

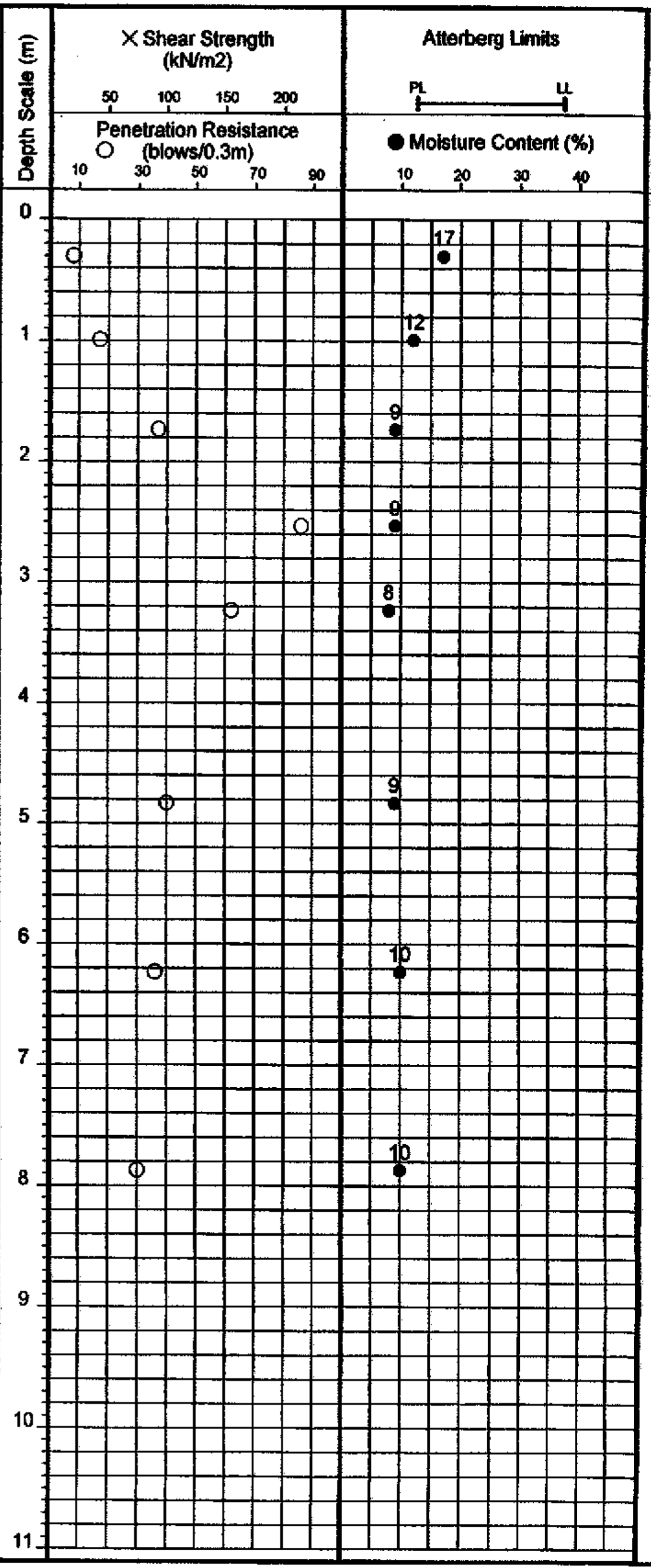
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
257.4	36 cm TOPSOIL			
	Firm to hard	1	DO	8
	weathered	2	DO	17
		3	DO	37
		4	DO	86
	SILTY CLAY, Till brown grey	5	DO	62
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	40
		7	DO	36
		8	DO	30
8.1 249.3	END OF BOREHOLE			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-58

FIGURE NO: 58

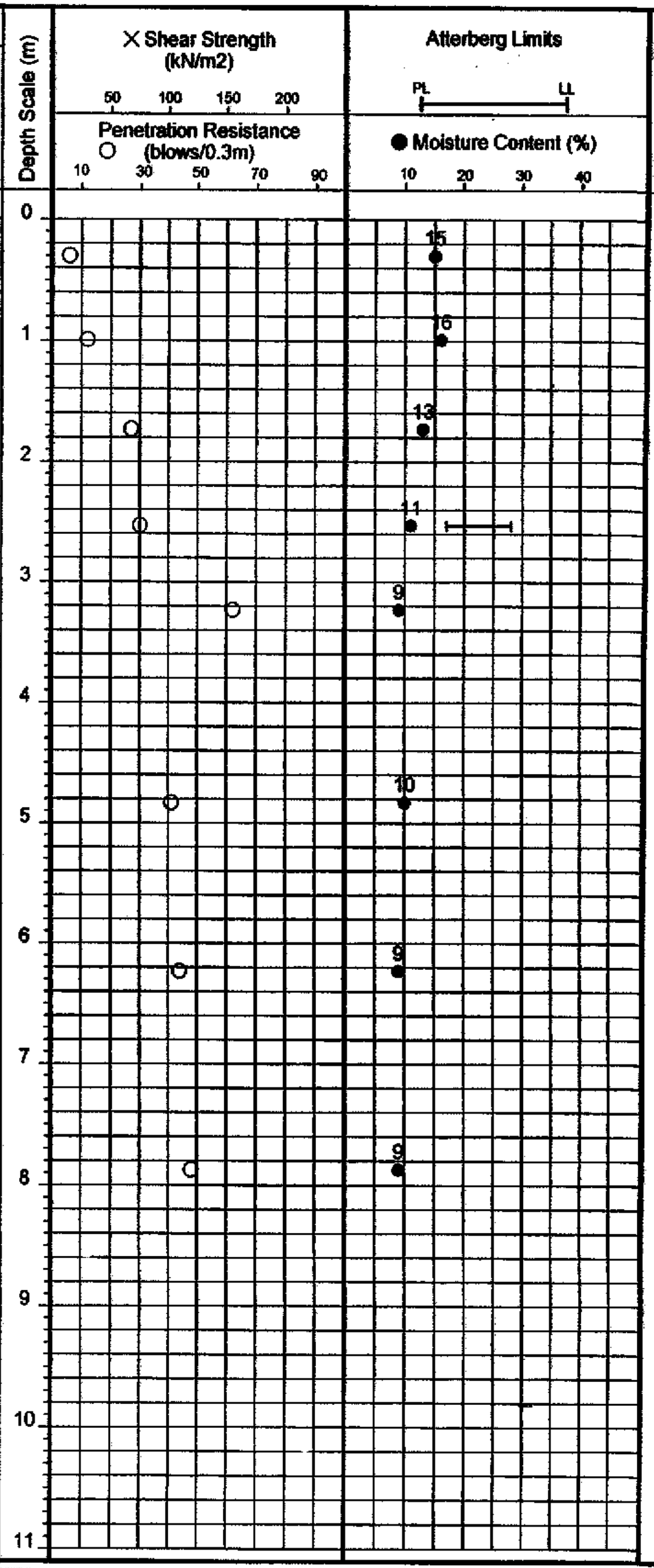
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 258.0	Ground Surface 25 cm TOPSOIL			
	Firm to hard	1	DO	6
	weathered	2	DO	12
		3	DO	27
		4	DO	30
	SILTY CLAY, Till			
		5	DO	62
	brown grey			
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	41
		7	DO	44
		8	DO	48
8.1 249.9	END OF BOREHOLE			



WATER LEVEL

W.L. @ El. 250.7 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-59

FIGURE NO: 59

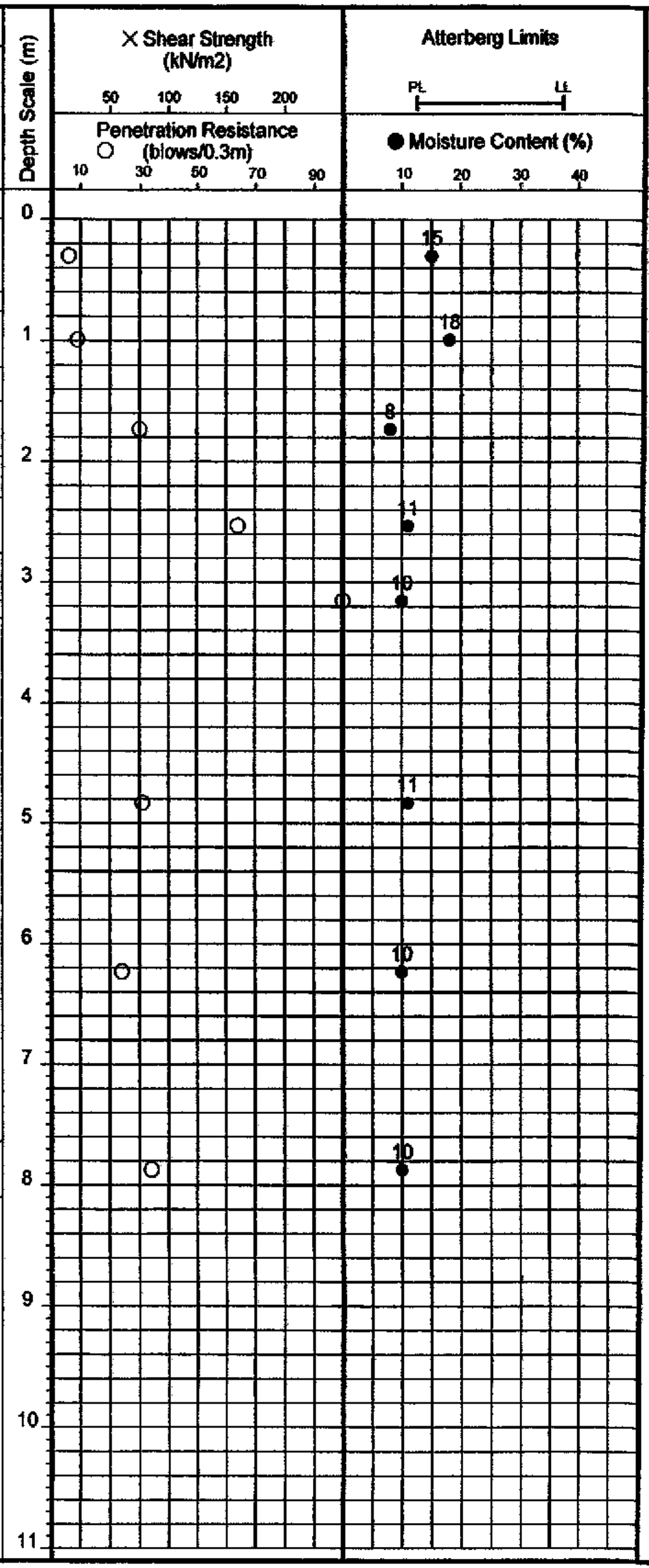
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 255.0	Ground Surface 23 cm TOPSOIL			
	Firm to hard	1	DO	6
	weathered	2	DO	9
		3	DO	30
	SILTY CLAY, Till	4	DO	64
		5	DO	100+
	brown grey sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	31
		7	DO	24
		8	DO	34
8.1 246.9	END OF BOREHOLE			



WATER LEVEL

W.L. @ El. 247.7 m on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF BOREHOLE NO: 10-60

FIGURE NO: 60

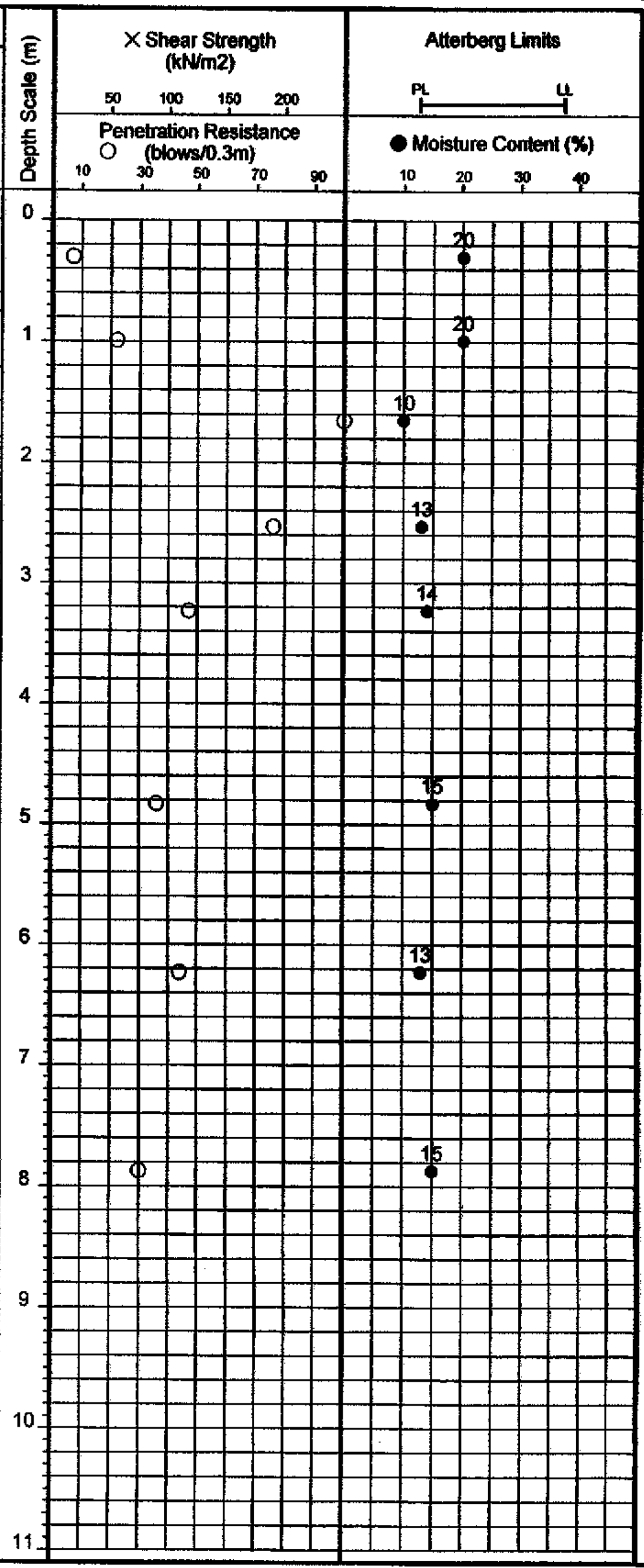
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 12, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 291.5	Ground Surface **30 cm TOPSOIL**			
	Firm to hard	1	DO	7
	weathered	2	DO	22
		3	DO	100+
	SILTY CLAY, Till	4	DO	76
		5	DO	47
	brown grey sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	36
		7	DO	44
7.4 284.1	Grey, compact **SILT** traces to some sand and clay a trace of gravel occ. sand seams and layers	8	DO	30
8.1 283.4	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-61

FIGURE NO: 61

JOB DESCRIPTION: Proposed Urban Development

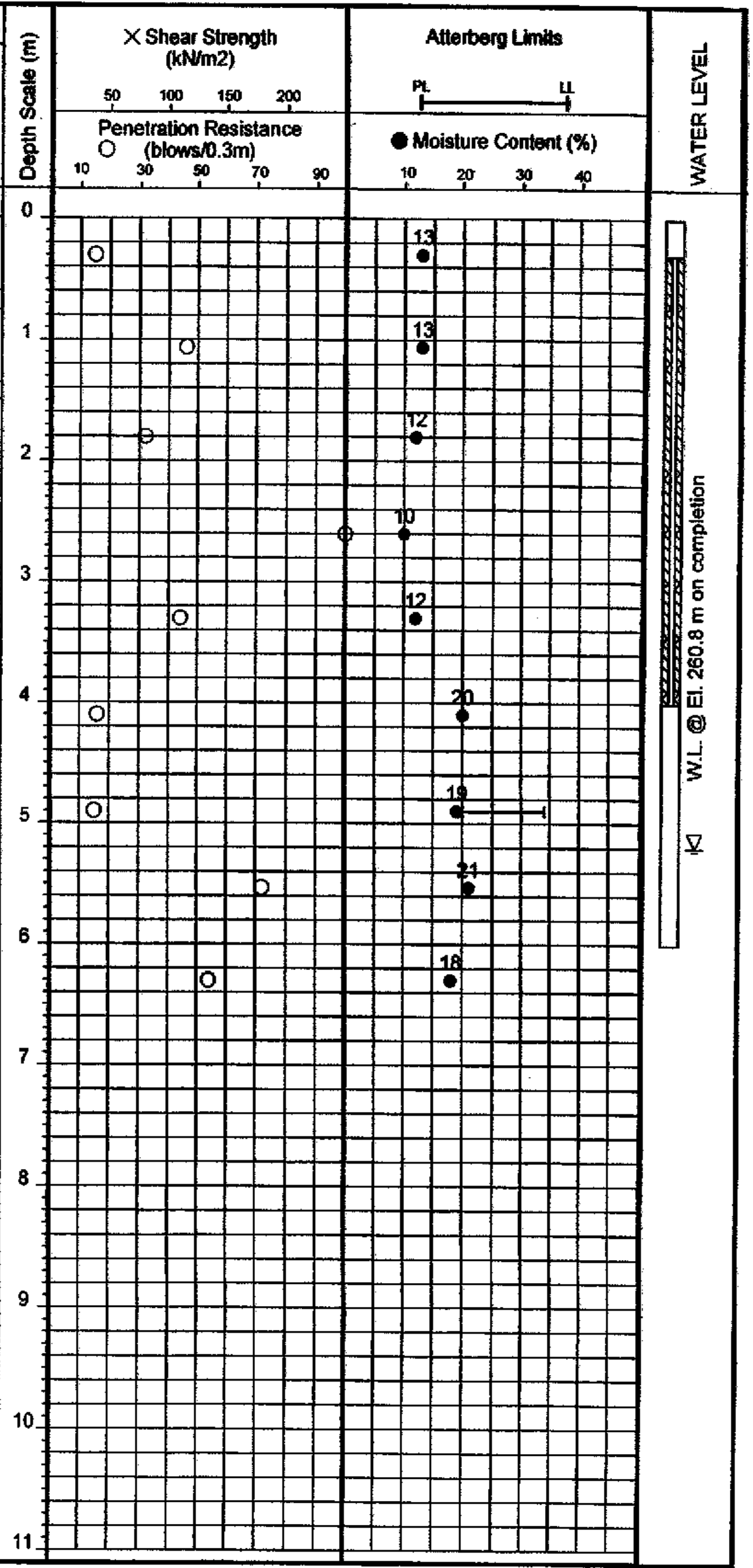
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: September 3, 2010

Depth Elev. (m)	SOIL DESCRIPTION
0.0 266.0	Ground Surface **30 cm TOPSOIL**
	Stiff to hard weathered **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders brown grey
3.8 262.2	Grey, stiff to hard **SILTY CLAY** traces of sand and gravel occ. wet sand and silt seams and layers
6.0 260.0	Brown, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers
6.7 259.3	**END OF BOREHOLE**

SAMPLES		
Number	Type	N-Value
1	DO	15
2	DO	46
3	DO	32
4	DO	100+
5	DO	44
6	DO	16
7	DO	15
8	DO	72
9	DO	54



Installed 50 mm Ø monitoring well to 6.0 m
1.5 m screen covered with geomembrane
Sand backfill from 4.0 to 6.0 m
Bentonite seal from 0.3 to 4.0 m
Provided with a steel protective casing

Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-62

FIGURE NO: 62A

JOB DESCRIPTION: Proposed Urban Development

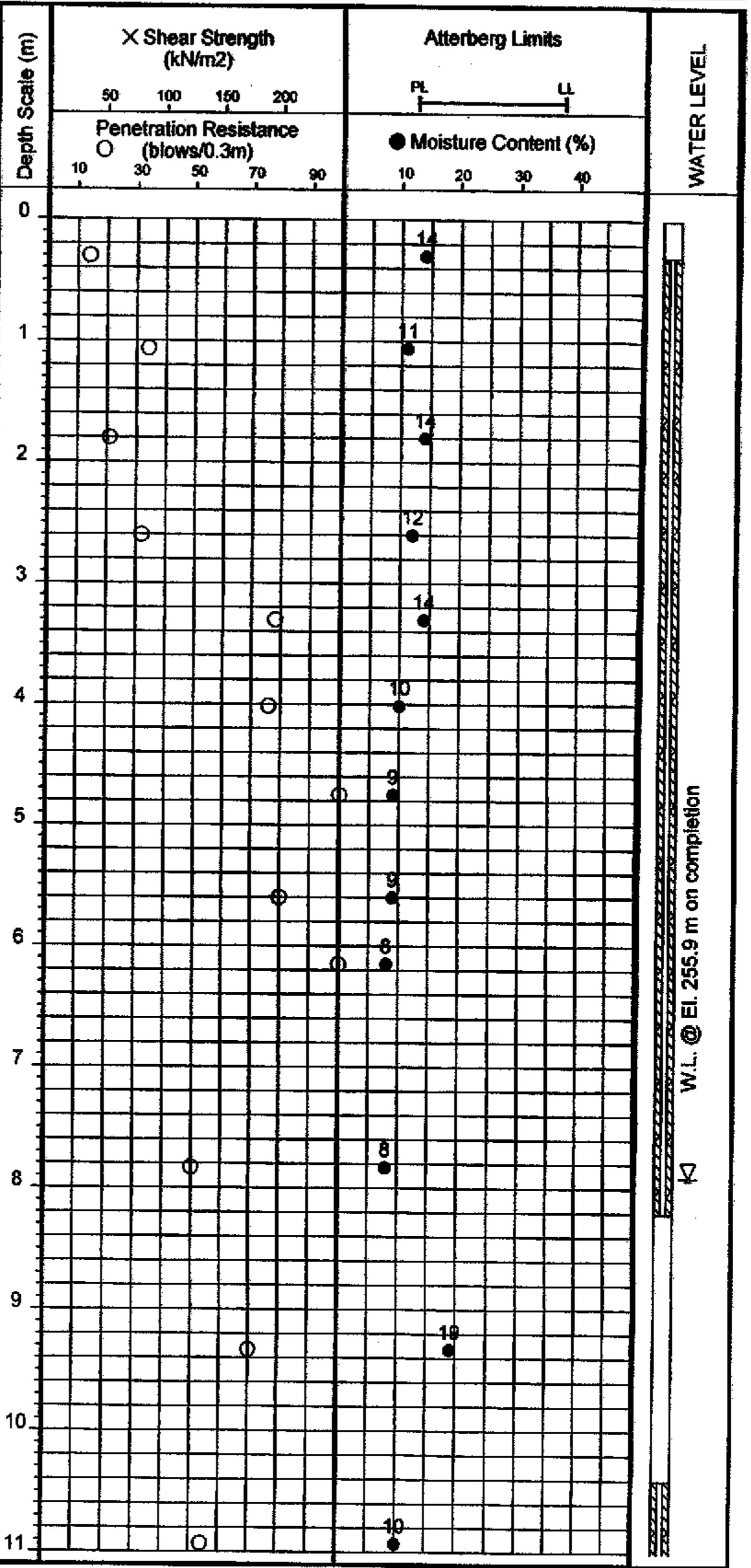
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 2, 2010

Depth Elev. (m)	SOIL DESCRIPTION
0.0 263.8	Ground Surface **36 cm TOPSOIL**
	Brown, stiff to hard weathered **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders
3.0 260.8	Brown, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers
3.8 260.0	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders
9.1 254.7	Grey, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers
10.4 253.4	Grey, hard **SILTY CLAY, Till** Cont'd on Fig. 62B
11.0	

SAMPLES		
Number	Type	N-Value
1	DO	14
2	DO	34
3	DO	21
4	DO	32
5	DO	78
6	DO	76
7	DO	100+
8	DO	80
9	DO	100+
10	DO	50
11	DO	70
12	DO	54



JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-62

FIGURE NO: 62B

JOB DESCRIPTION: Proposed Urban Development

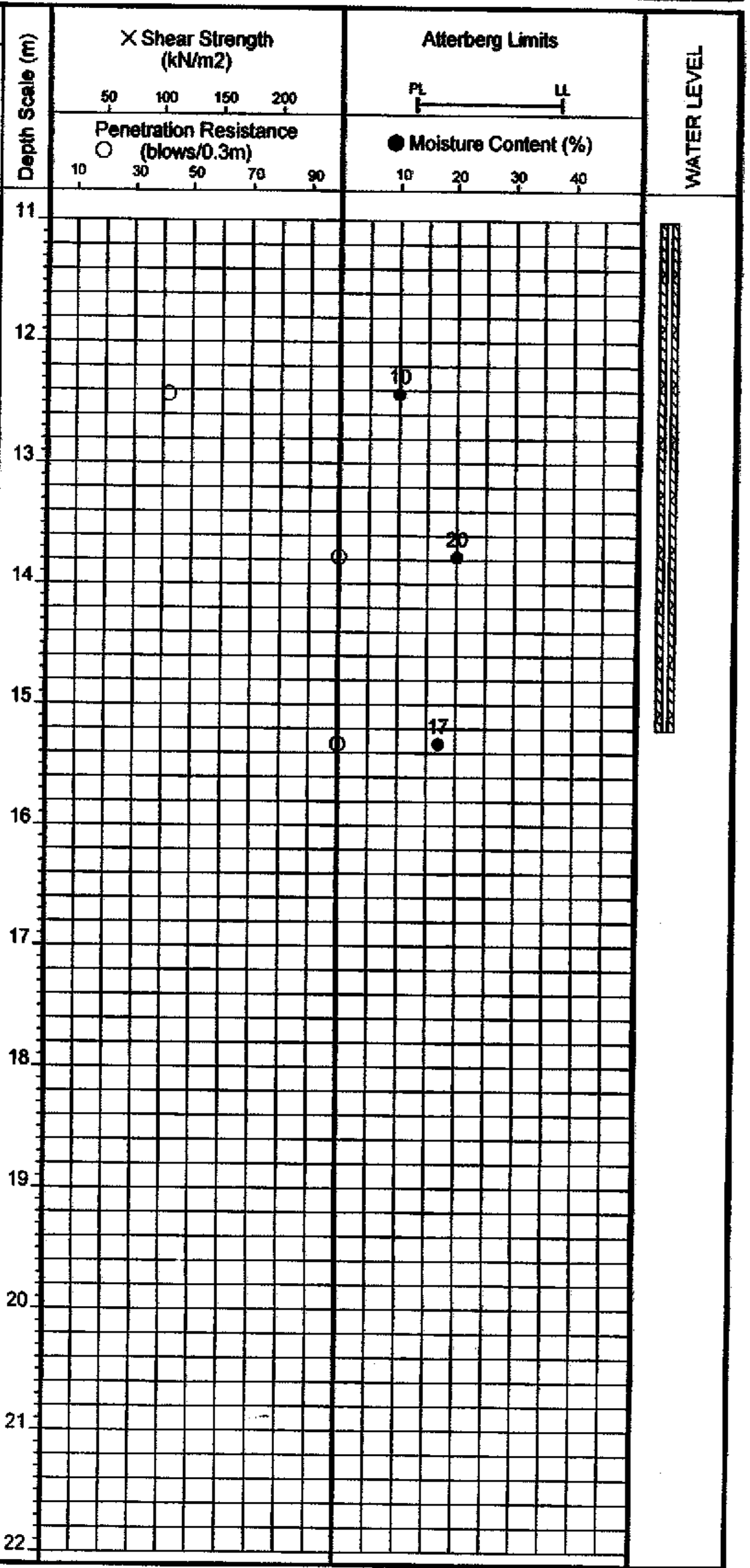
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 2, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
11.0 252.8	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	13	DO	42
13.7 250.1	Grey, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	14	DO	100+
15.0 248.8	Grey, hard **SILTY CLAY** a trace to some sand occ. wet sand and silt seams and layers	15	DO	100+
15.4 248.4	**END OF BOREHOLE**			

Installed 50 mm Ø monitoring well to 15.2 m
1.5 m screen covered with geomembrane
Sand backfill from 8.2 to 10.4 m
Bentonite seal from 0.3 to 8.2 m and 10.4 to 15.2 m
Provided with a steel protective casing



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-63

FIGURE NO: 63A

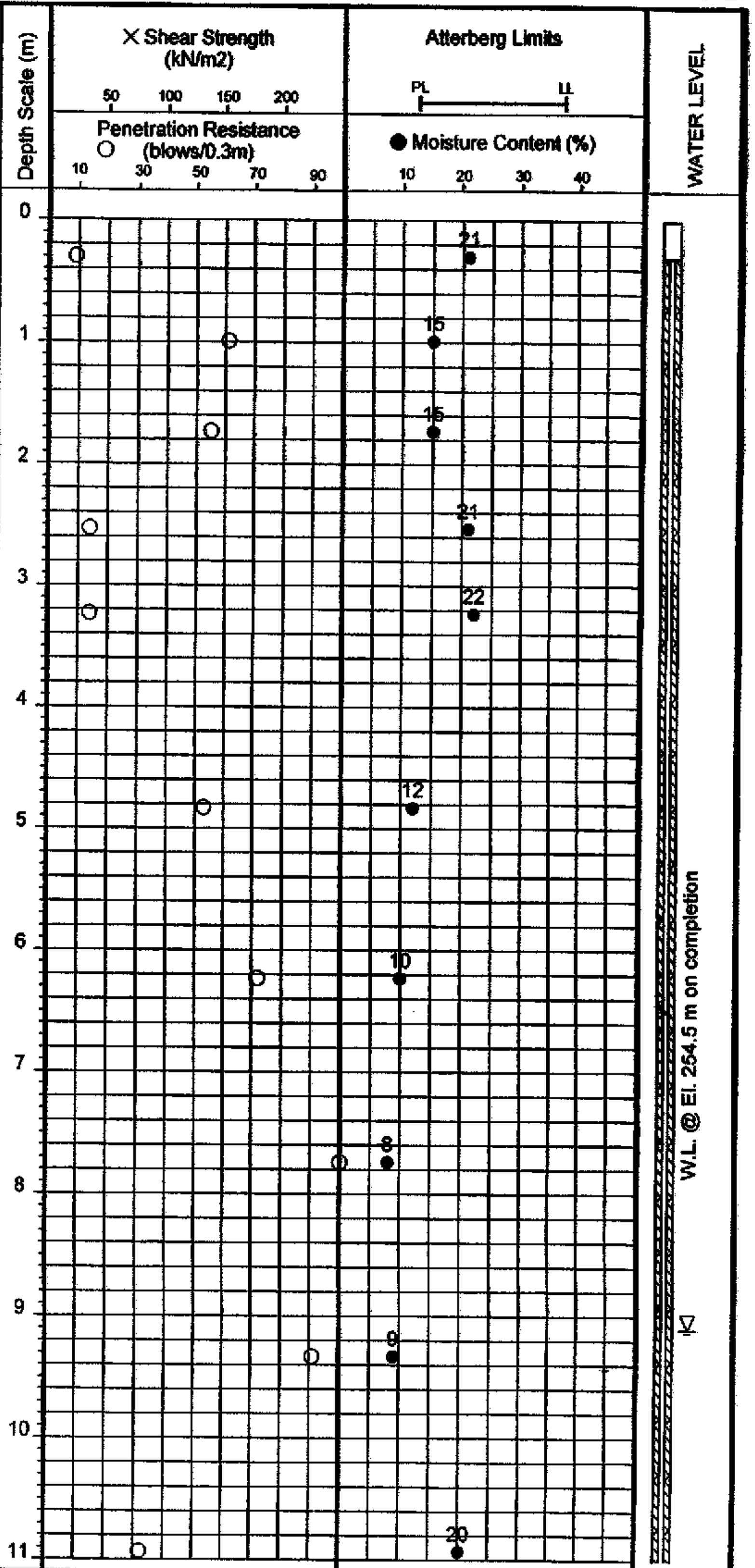
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 17, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
263.6	**20 cm TOPSOIL**			
	Brown, stiff to hard	1	DO	9
	SILTY CLAY, Till weathered	2	DO	61
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	55
2.3 261.3	Brown, stiff	4	DO	14
	SILTY CLAY	5	DO	14
	a trace to some sand occ. wet sand and silt seams and layers			
4.6 259.0	Grey, hard	6	DO	53
	SILTY CLAY, Till	7	DO	72
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	8	DO	100+
		9	DO	91
10.4 253.2	Grey, dense **FINE SAND**			
11.0	Cont'd on Fig. 63B	10	DO	32



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-63

FIGURE NO: 63B

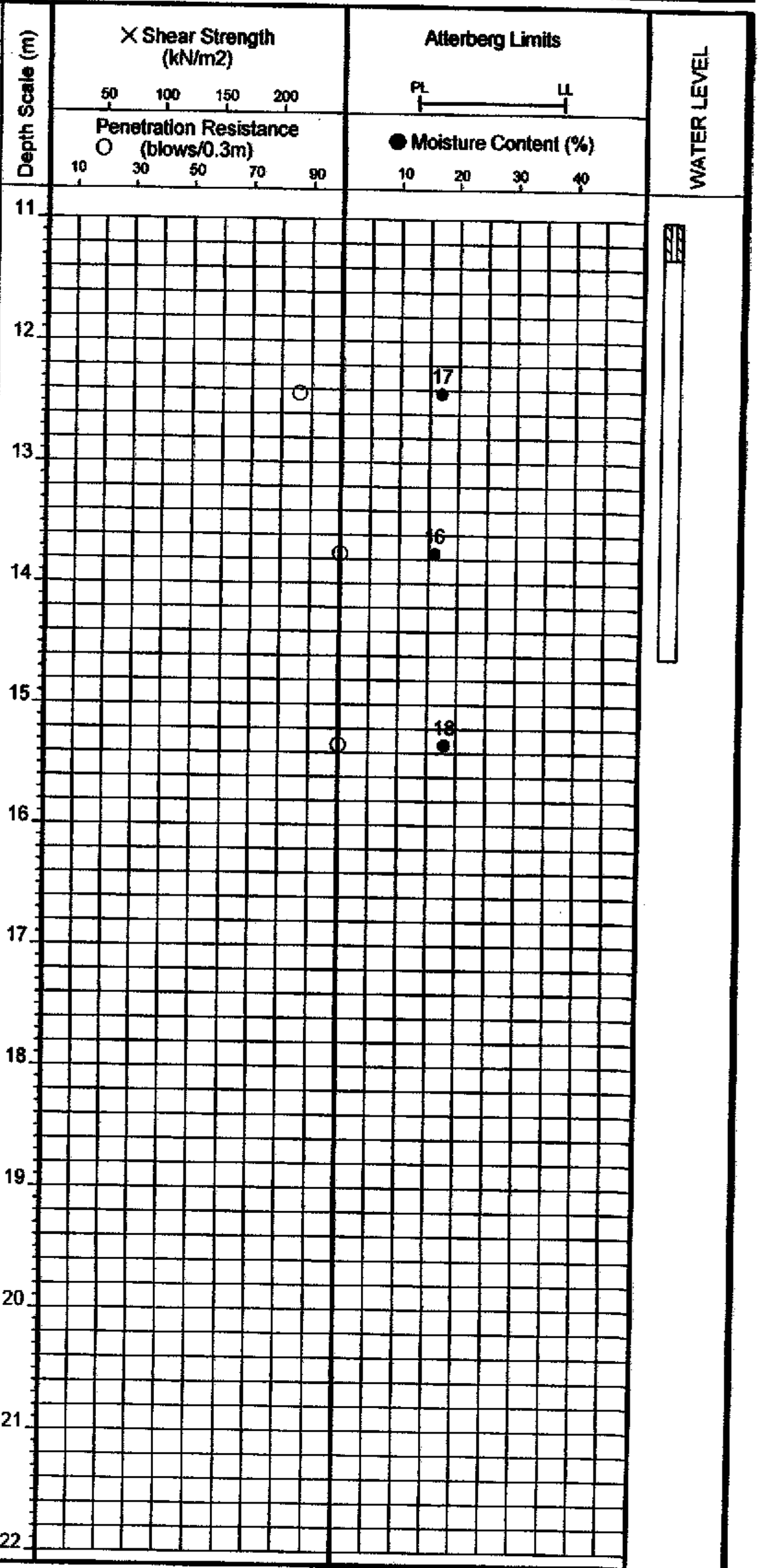
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 17, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
11.0 252.6	Grey, dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers			
12.2 251.4	Grey, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	11	DO	86
		12	DO	100+
15.4 248.2	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 14.6 m 3.0 m screen covered with geomembrane Sand backfill from 11.3 to 14.6 m Bentonite seal from 0.3 to 11.3 m Provided with a steel protective casing	13	DO	100+



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-64

FIGURE NO: 64

JOB DESCRIPTION: Proposed Urban Development

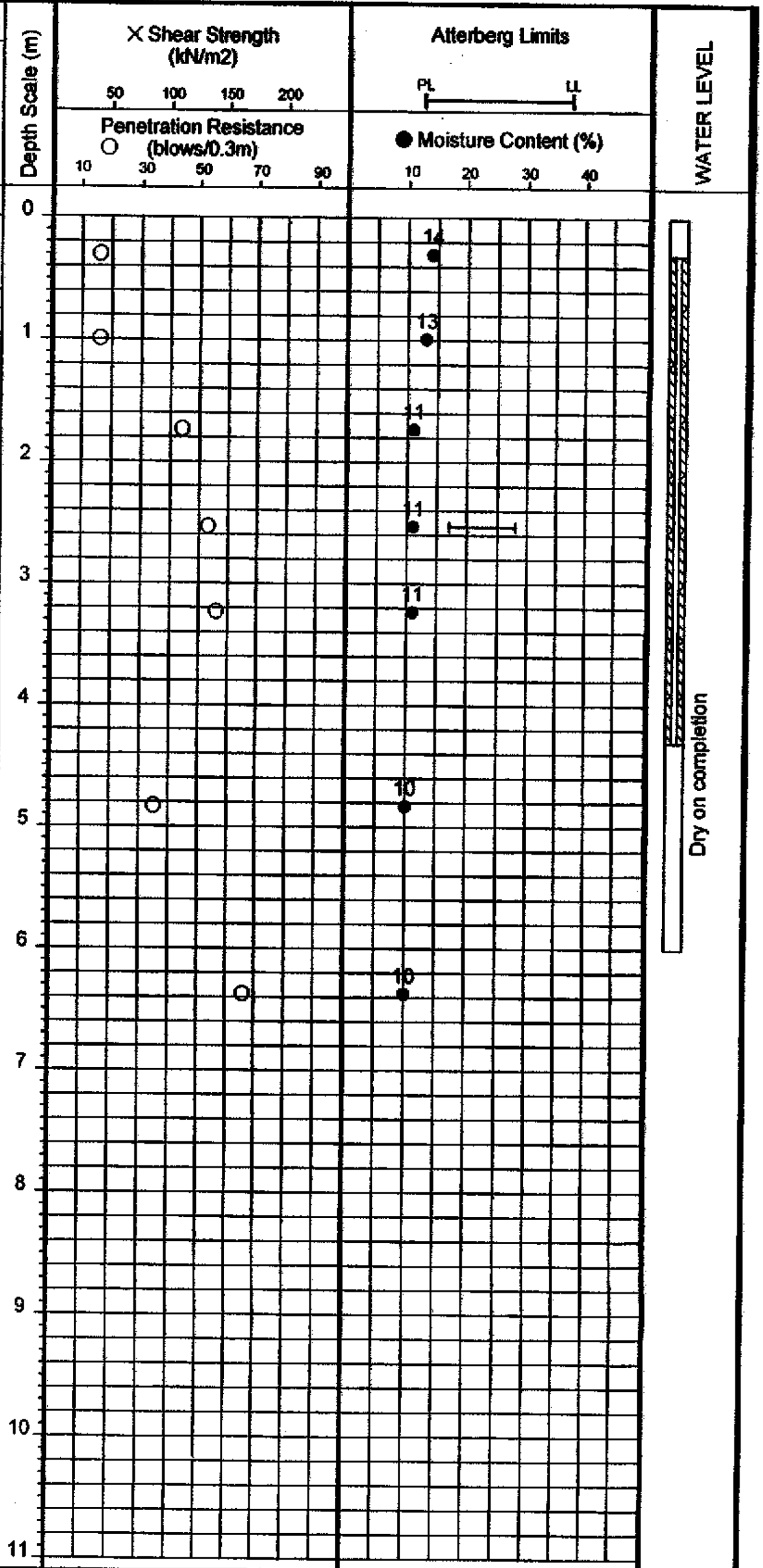
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: August 16, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 252.0	Ground Surface **30 cm TOPSOIL**			
	Stiff to hard	1	DO	16
	weathered	2	DO	16
		3	DO	44
	SILTY CLAY, Till	4	DO	53
	brown grey	5	DO	56
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
		6	DO	35
6.6 245.4		7	DO	66
	END OF BOREHOLE			

Installed 50 mm Ø monitoring well to 6.0 m
1.5 m screen covered with geomembrane
Sand backfill from 4.3 to 6.0 m
Bentonite seal from 0.3 to 4.3 m
Provided with a steel protective casing



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-65

FIGURE NO: 65A

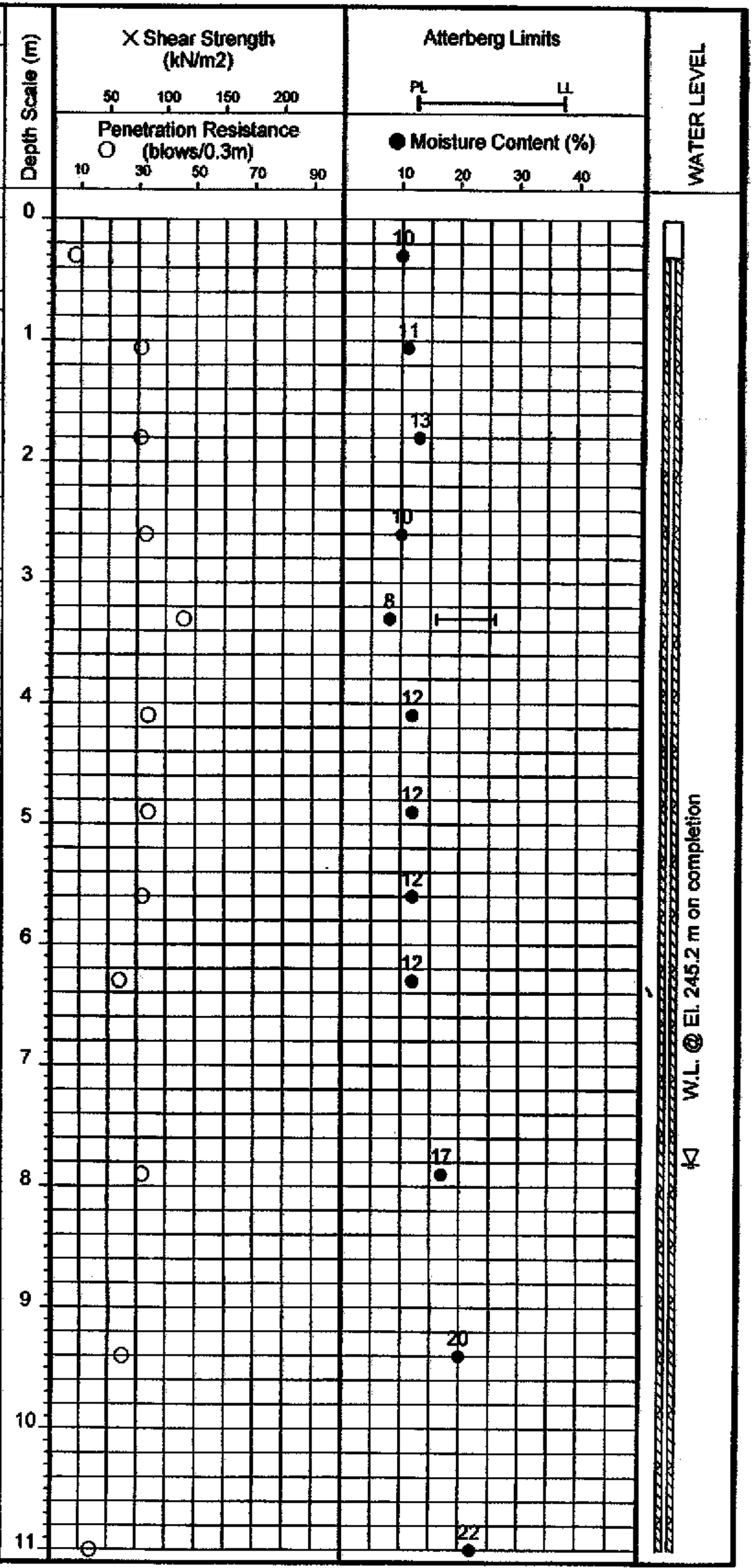
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: August 17, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
253.0	**18 cm TOPSOIL**			
	Firm to hard	1	DO	8
	weathered	2	DO	31
		3	DO	31
	brown grey	4	DO	33
	SILTY CLAY, Till	5	DO	46
		6	DO	34
		7	DO	34
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	8	DO	32
		9	DO	24
		10	DO	32
9.1 243.9	Grey, compact **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	11	DO	25
10.4 242.8	Grey, compact **SILTY FINE SAND**			
11.0	Cont'd on Fig. 65B			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-65

FIGURE NO: 65B

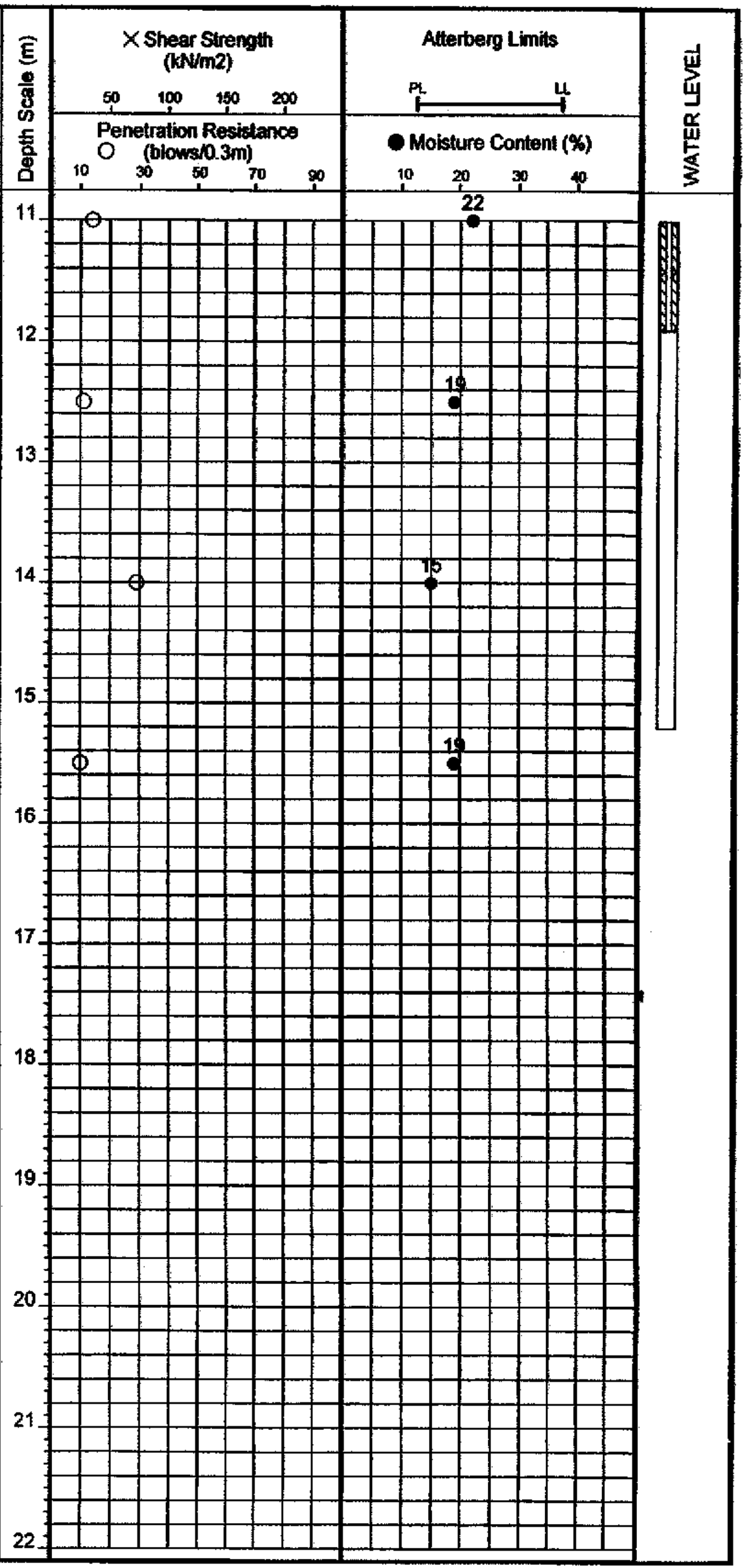
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: August 17, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
11.0 242.0	Grey, compact **SILTY FINE SAND** a trace of clay occ. silt seams and layers	12	DO	14
12.2 240.8	Grey, compact **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	13	DO	11
13.7 239.3	Grey, compact **SILT** traces to some sand and clay a trace of gravel occ. sand seams and layers	14	DO	29
		15	DO	10
15.8 237.2	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 15.2 m 3.0 m screen covered with geomembrane Sand backfill from 11.9 to 15.2 m Bentonite seal from 0.3 to 11.9 m Provided with a steel protective casing			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-66

FIGURE NO: 66A

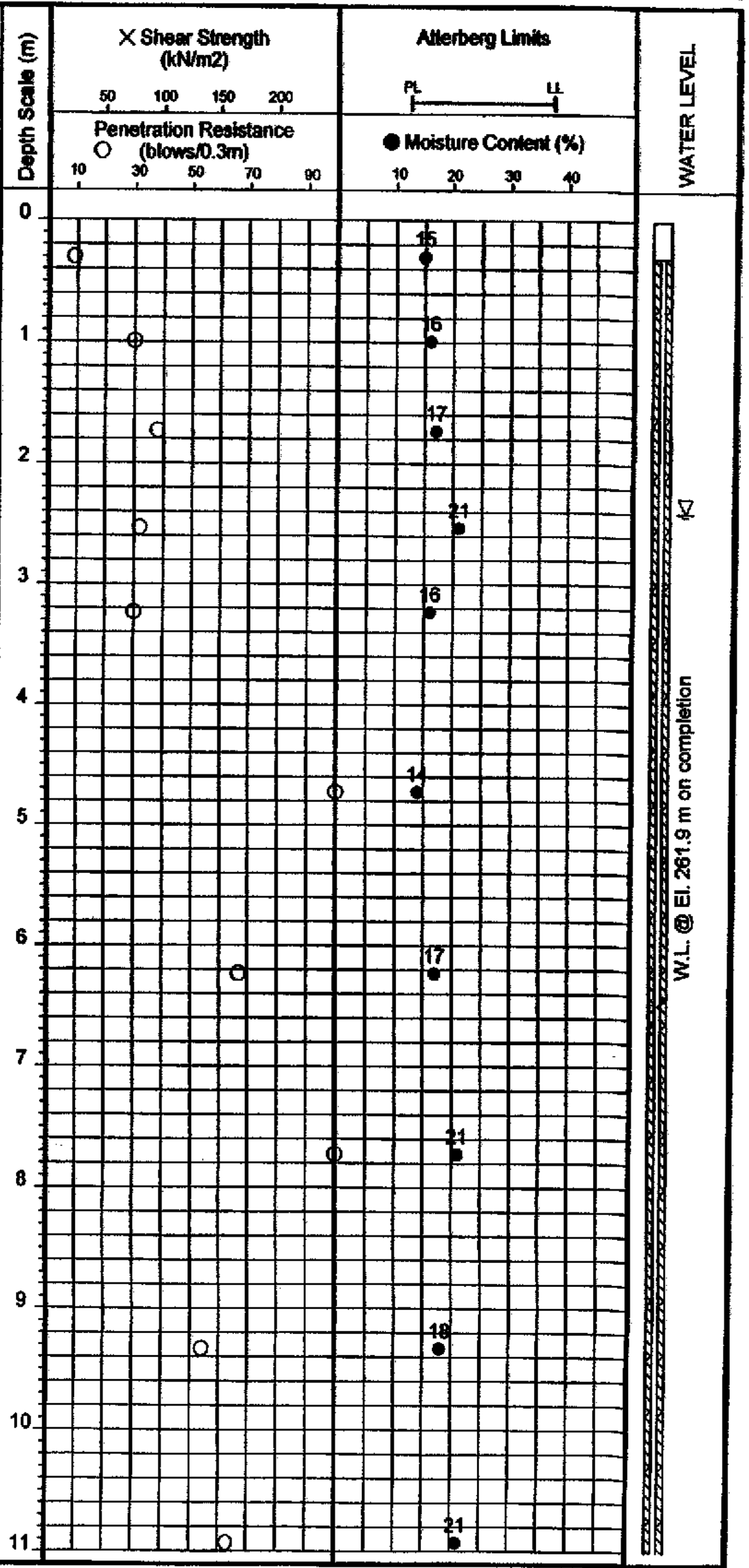
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 14, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 264.3	Ground Surface **20 cm TOPSOIL**			
	Brown, loose to dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers weathered	1 2 3 4	DO DO DO DO	9 30 38 32
3.0 261.3	Brown, very stiff **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	30
4.6 259.7	Brown, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	6	DO	100+
6.0 258.3	Brown, very dense **FINE TO MEDIUM SAND** traces of silt and gravel occ. silt seams and layers	7	DO	67
7.6 256.7	Brown, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	8	DO	100+
9.1 255.2	Brown, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	9	DO	54
10.4 253.9	Brown, very dense **FINE TO MEDIUM SAND**			
11.0	Cont'd on Fig. 66B	10	DO	63



JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-66

FIGURE NO: 66B

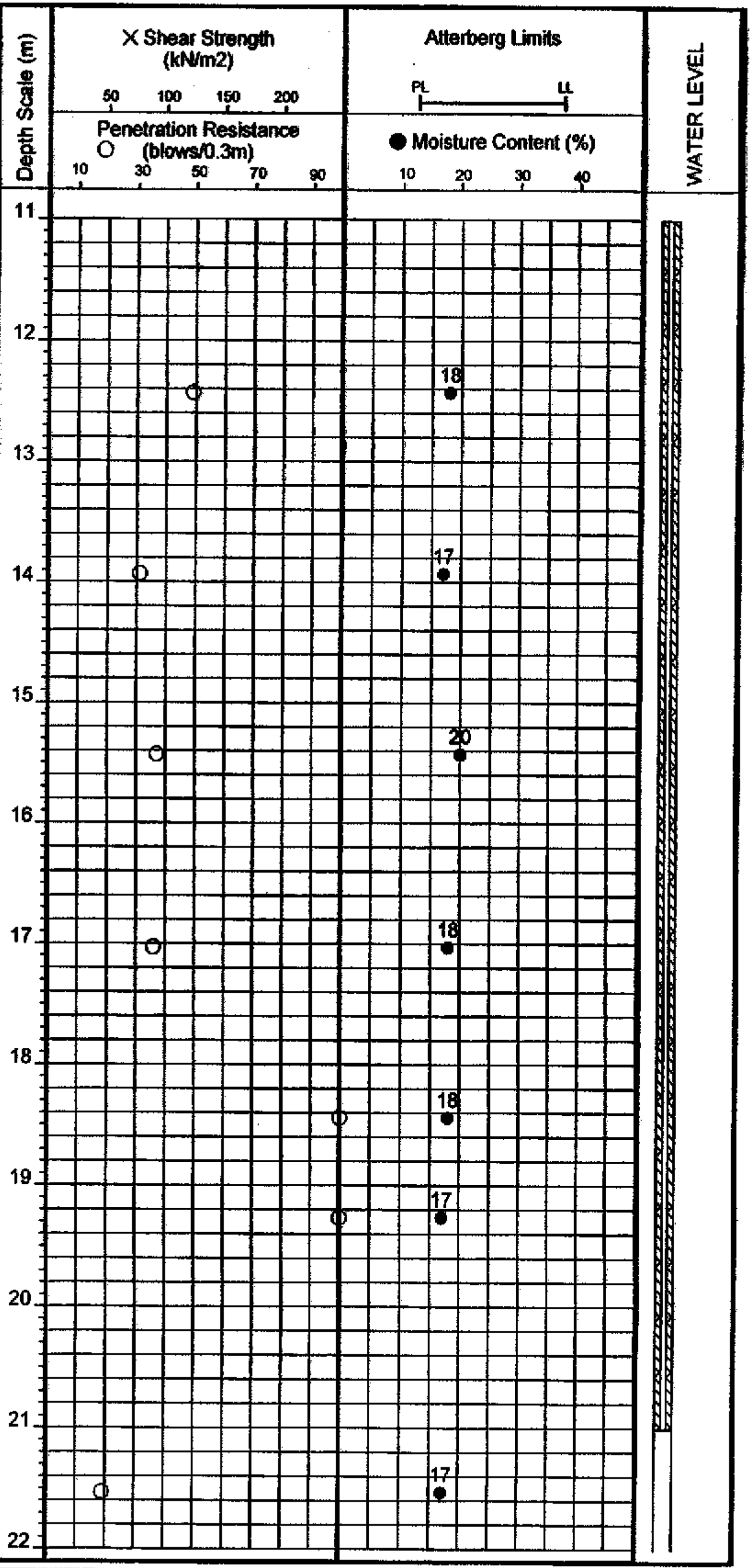
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 14, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
11.0				
253.3	Dense FINE TO MEDIUM SAND			
		11	DO	49
	brown / grey	12	DO	31
	traces of silt and gravel occ. silt seams and layers			
		13	DO	37
16.8 247.5	Grey, dense to very dense	14	DO	36
	FINE SAND a trace to some silt a trace of gravel occ. silt seams and layers	15	DO	100+
19.2 245.1	Grey, very dense	16	DO	100+
	FINE TO MEDIUM SAND traces of silt and gravel occ. silt seams and layers			
21.3 243.0	Grey, compact SILTY FINE SAND Cont'd on Fig. 66C	17	DO	19
22.0				



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-66

FIGURE NO: 66C

JOB DESCRIPTION: Proposed Urban Development

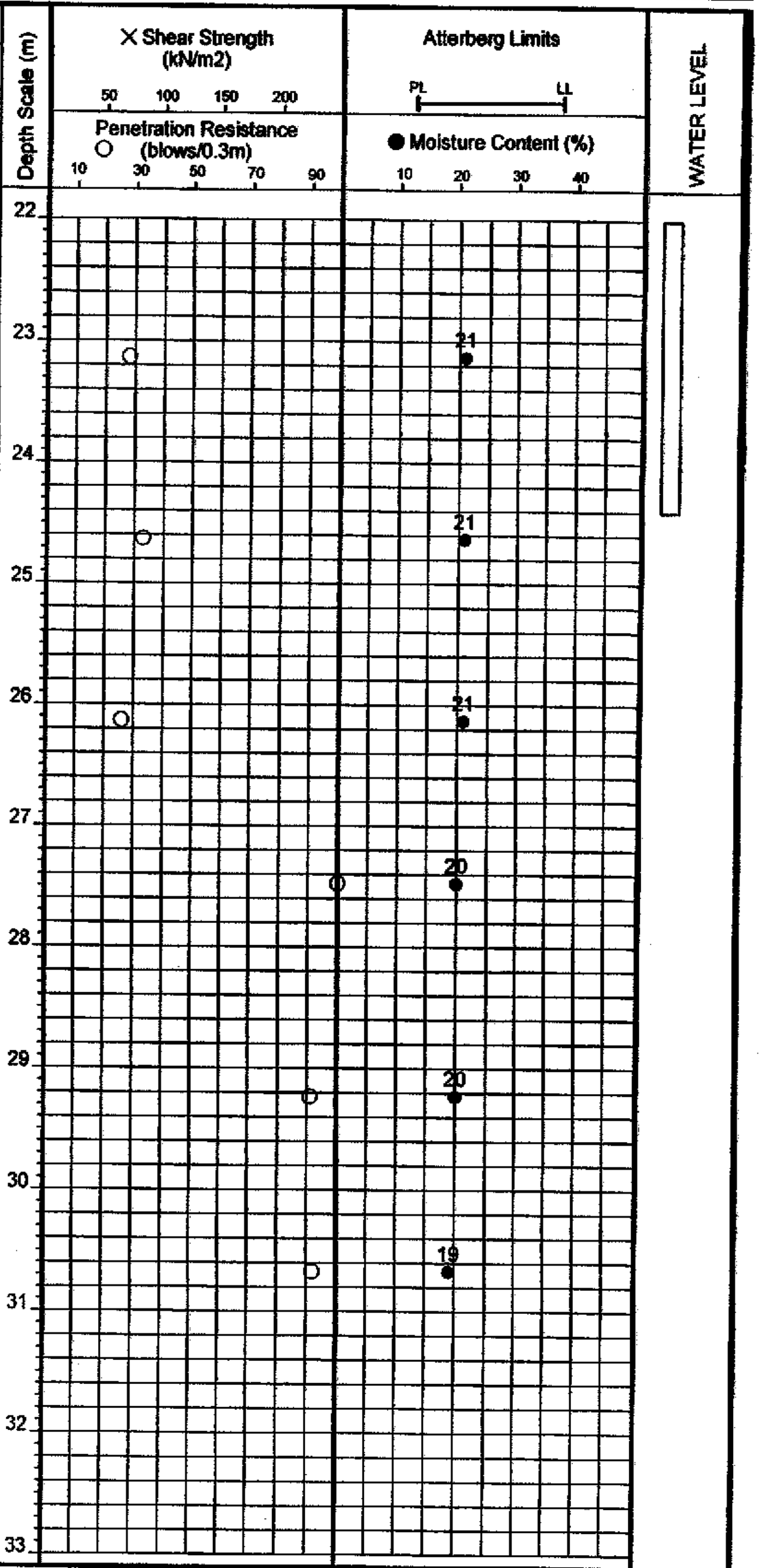
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 14, 2010

Depth Elev. (m)	SOIL DESCRIPTION
22.0 242.3	Grey, compact to very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers
30.0 234.3	Grey, very dense **FINE TO MEDIUM SAND** traces of silt and gravel occ. silt seams and layers
30.9 233.4	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 24.4 m 3.0 m screen covered with geomembrane Sand backfill from 21.0 to 24.4 m Bentonite seal from 0.3 to 21.0 m Provided with a steel protective casing

SAMPLES		
Number	Type	N-Value
18	DO	28
19	DO	33
20	DO	26
21	DO	100+
22	DO	91
23	DO	92



JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-67

FIGURE NO: 67

JOB DESCRIPTION: Proposed Urban Development

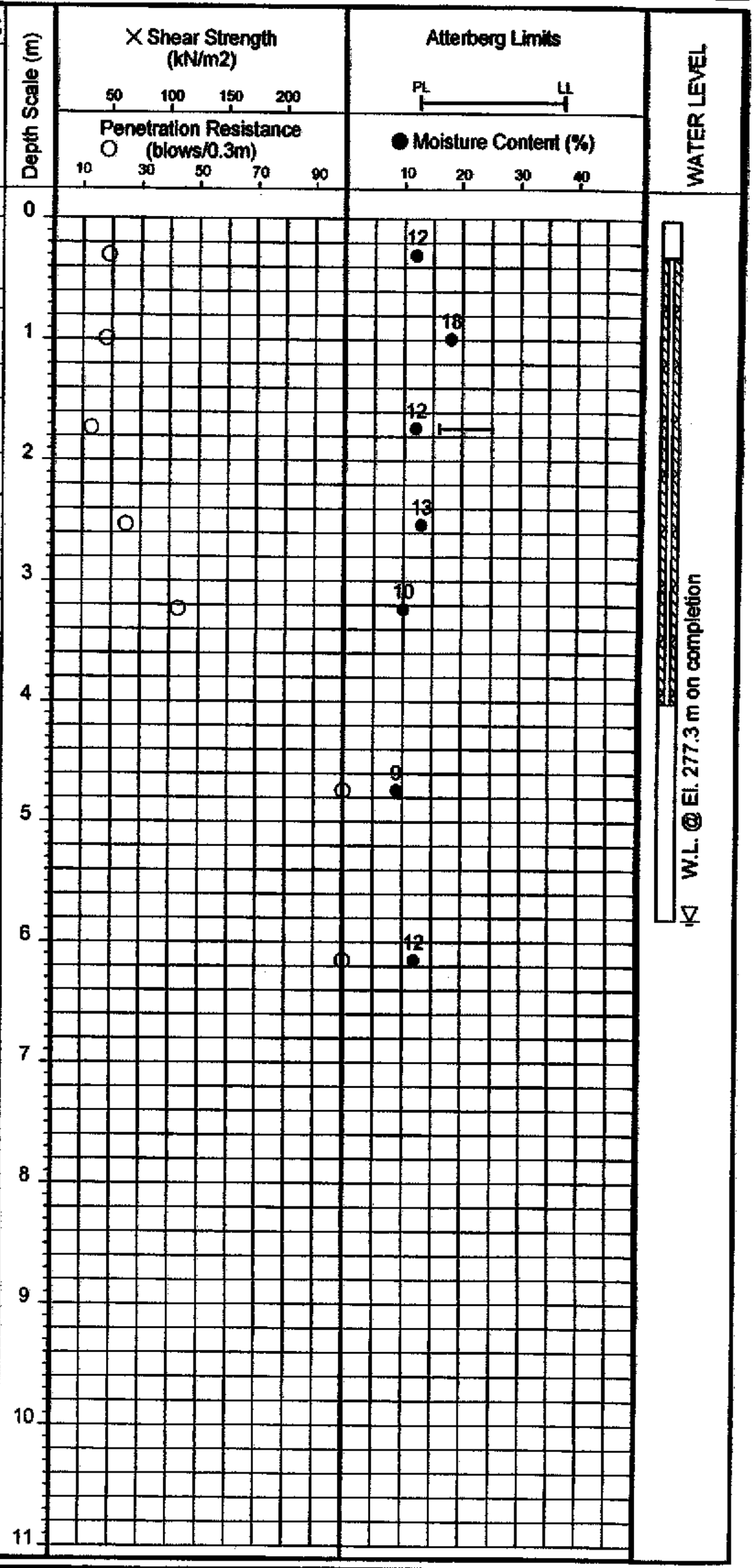
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 26, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 283.1	Ground Surface **30 cm TOPSOIL**			
	Brown, very stiff to hard	1	DO	19
	weathered	2	DO	18
		3	DO	13
	SILTY CLAY, Till	4	DO	25
		5	DO	43
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
		6	DO	100+
		7	DO	100+
6.3 276.8	**END OF BOREHOLE**			

Installed 50 mm Ø monitoring well to 5.8 m
1.5 m screen covered with geomembrane
Sand backfill from 4.0 to 5.8 m
Bentonite seal from 0.3 to 4.0 m
Provided with a steel protective casing



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-68

FIGURE NO: 68A

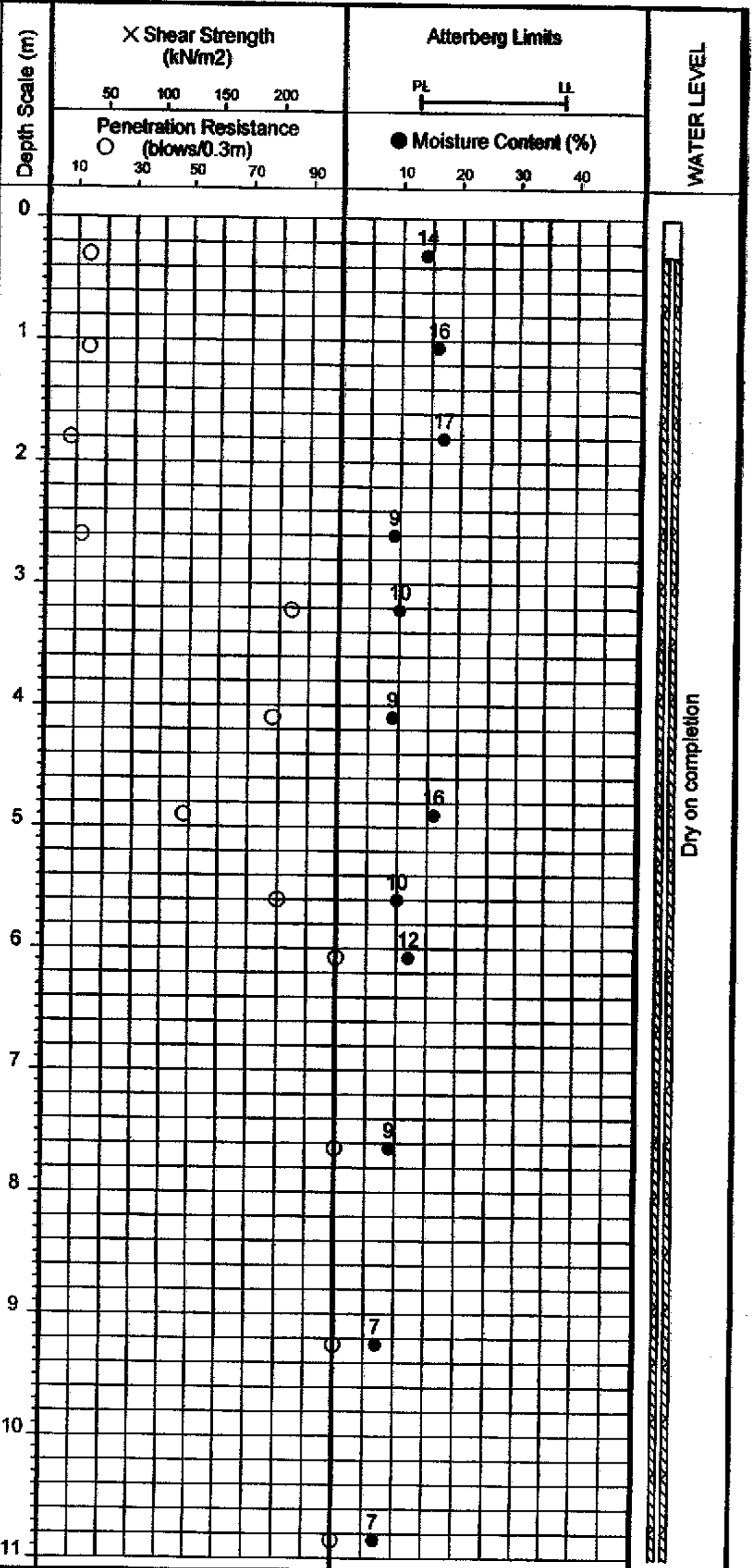
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: August 18, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
0.0	Ground Surface			
283.0	20 cm TOPSOIL			
	Brown, firm to hard	1	DO	14
	weathered	2	DO	14
		3	DO	8
		4	DO	12
	SILTY CLAY, Till	5	DO	84
		6	DO	78
		7	DO	48
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	8	DO	80
		9	DO	100+
		10	DO	100+
9.1 273.9	Brown, very dense	11	DO	100+
	FINE SAND a trace to some silt a trace of gravel occ. silt seams and layers			
11.0	Cont'd on Fig. 68B	12	DO	100+



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-68

FIGURE NO: 68B

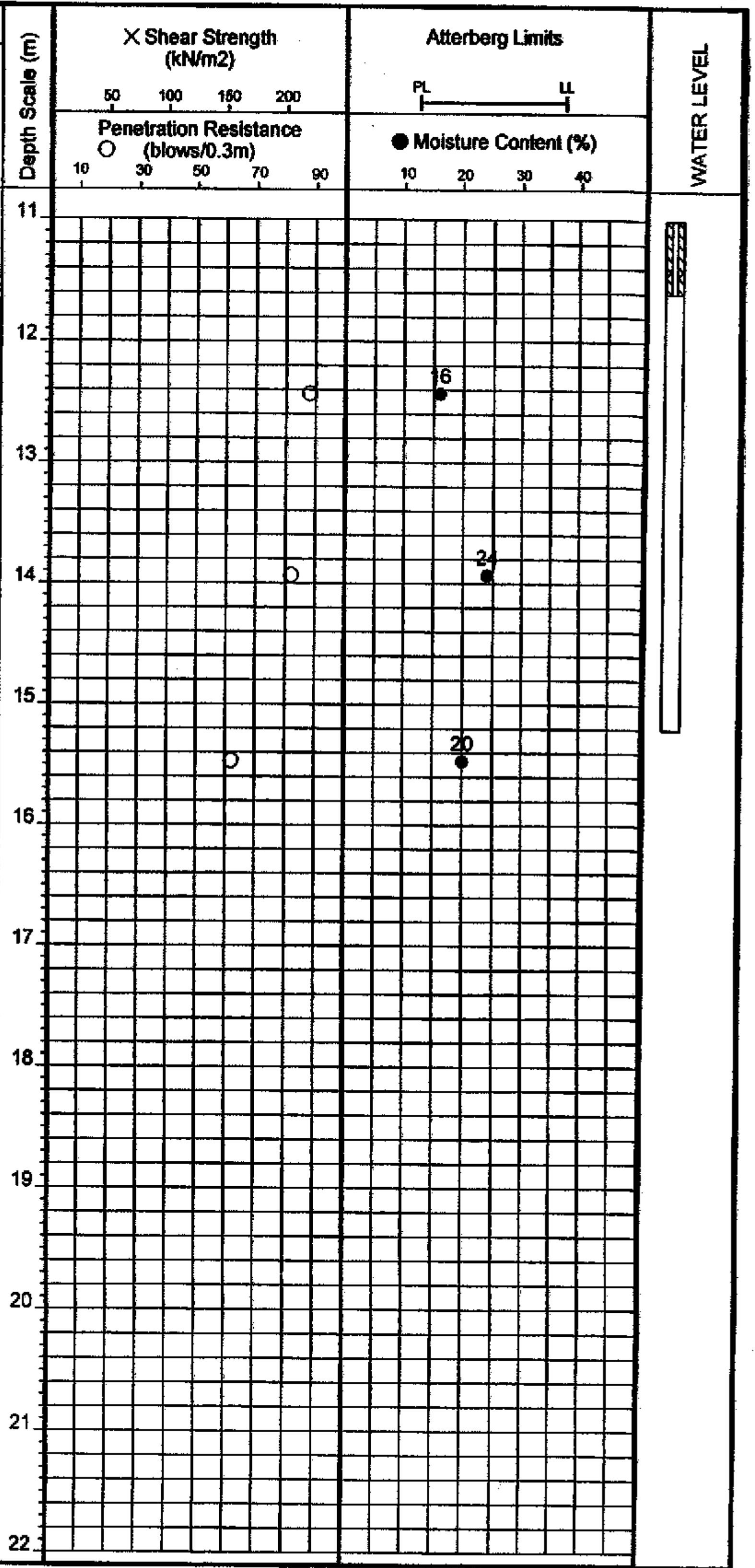
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: August 18, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
11.0 272.0	Brown, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers			
12.2 270.8	Brown, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	13	DO	88
13.7 269.3	Grey, hard **SILTY CLAY** a trace to some sand occ. wet sand and silt seams and layers	14	DO	82
		15	DO	62
15.7 267.3	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 15.2 m 3.0 m screen covered with geomembrane Sand backfill from 11.6 to 15.2 m Bentonite seal from 0.3 to 11.6 m Provided with a steel protective casing			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-69

FIGURE N O: 69A

JOB DESCRIPTION: Proposed Urban Development

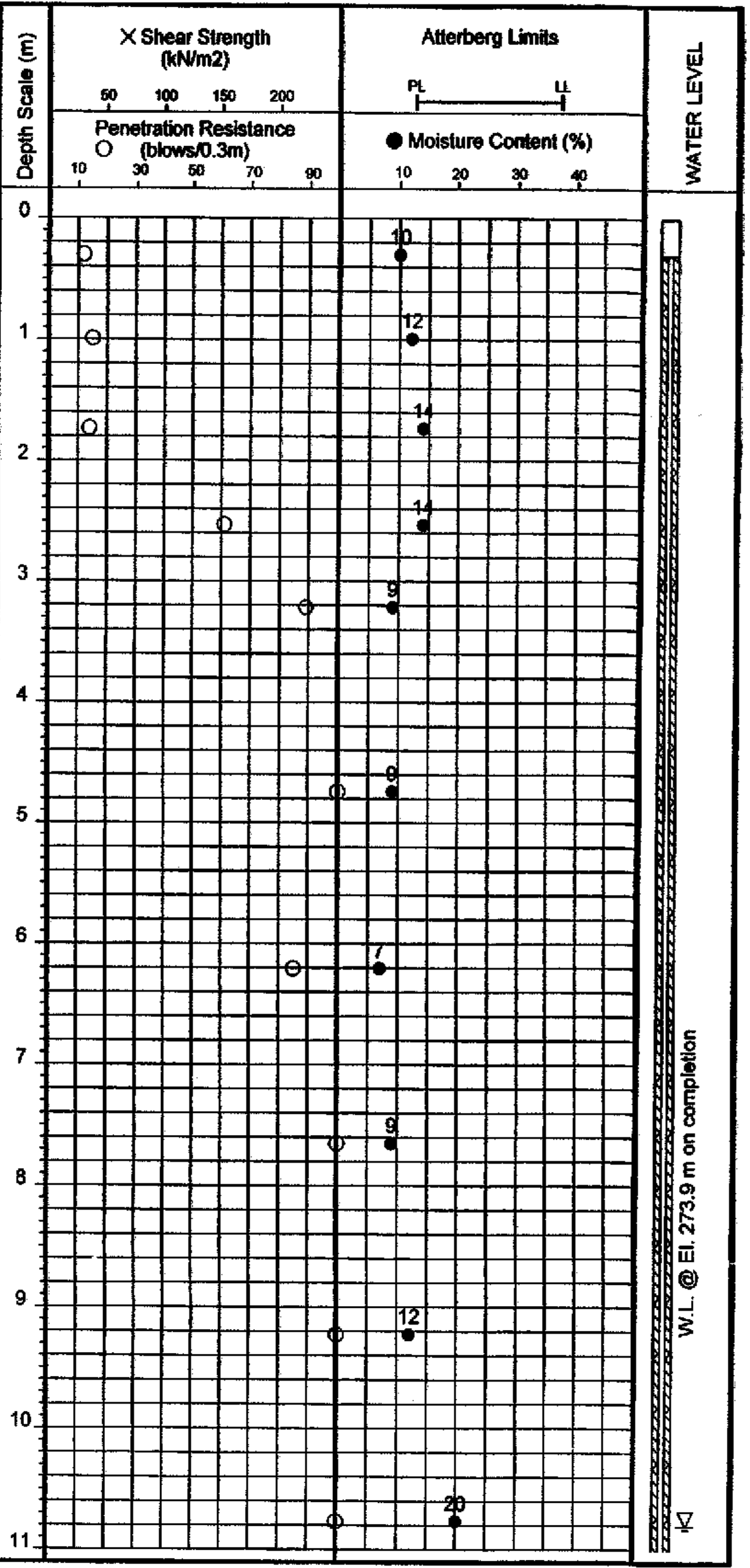
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 13, 2010

Depth Elev. (m)	SOIL DESCRIPTION
0.0 284.7	Ground Surface **23 cm TOPSOIL**
	Brown, stiff to hard weathered **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders
10.4 274.3	Brown, very dense **SANDY SILT**
11.0	Cont'd on Fig. 69B

SAMPLES		
Number	Type	N-Value
1	DO	12
2	DO	15
3	DO	14
4	DO	61
5	DO	89
6	DO	100+
7	DO	85
8	DO	100+
9	DO	100+
10	DO	100+



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-69

FIGURE NO: 69B

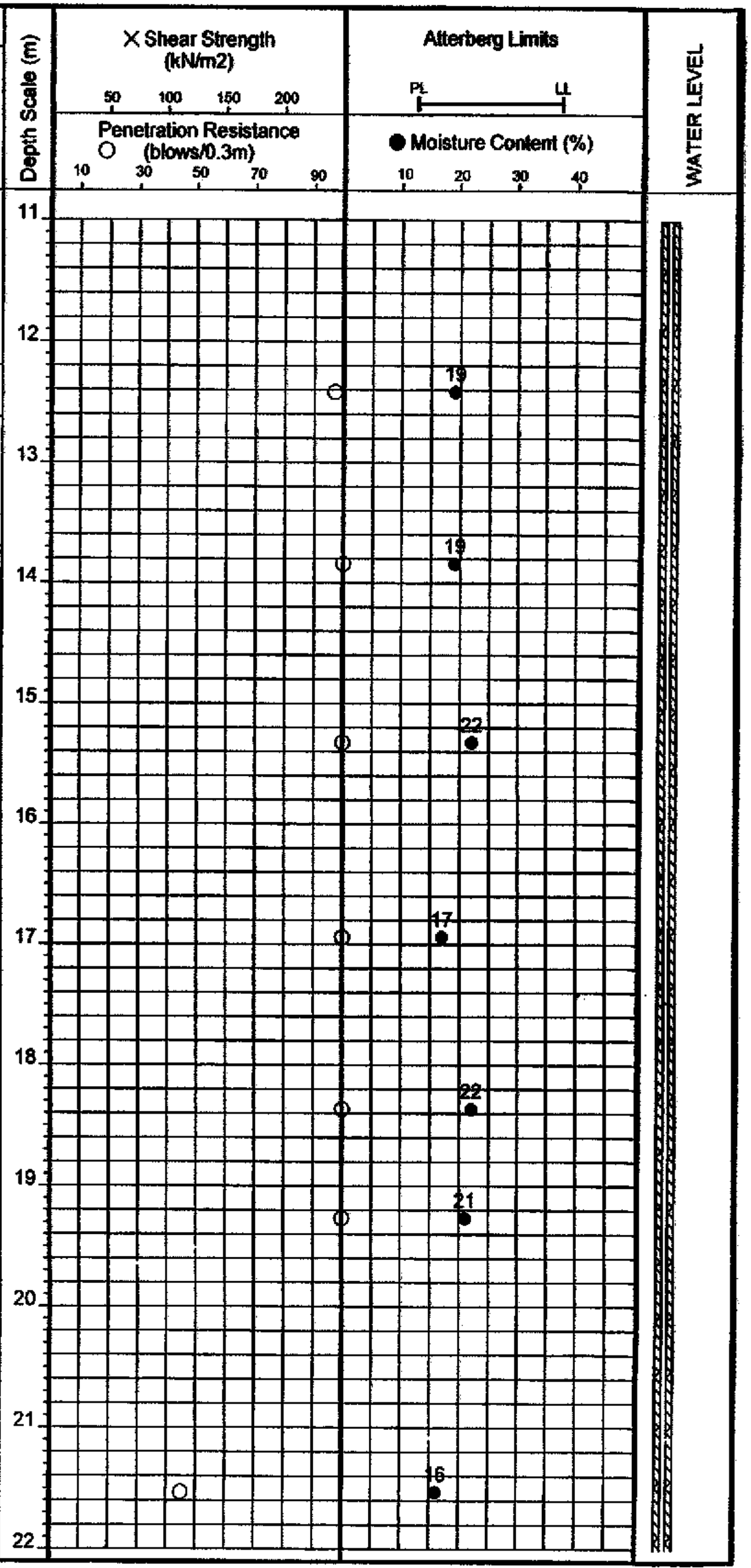
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 13, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
11.0 273.7	Brown, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	11	DO	97
		12	DO	100+
15.2 269.5	Brown, very dense **SILT** traces to some sand and clay a trace of gravel occ. sand seams and layers	13	DO	100+
16.8 267.9	Brown, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	14	DO	100+
18.3 266.4	Very dense **SILT** brown grey traces to some sand and clay a trace of gravel occ. sand seams and layers	15	DO	100+
		16	DO	100+
21.3 263.4	Grey, hard **SILTY CLAY** Cont'd on Fig. 69C	17	DO	45
22.0				



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-69

FIGURE NO: 69C

JOB DESCRIPTION: Proposed Urban Development

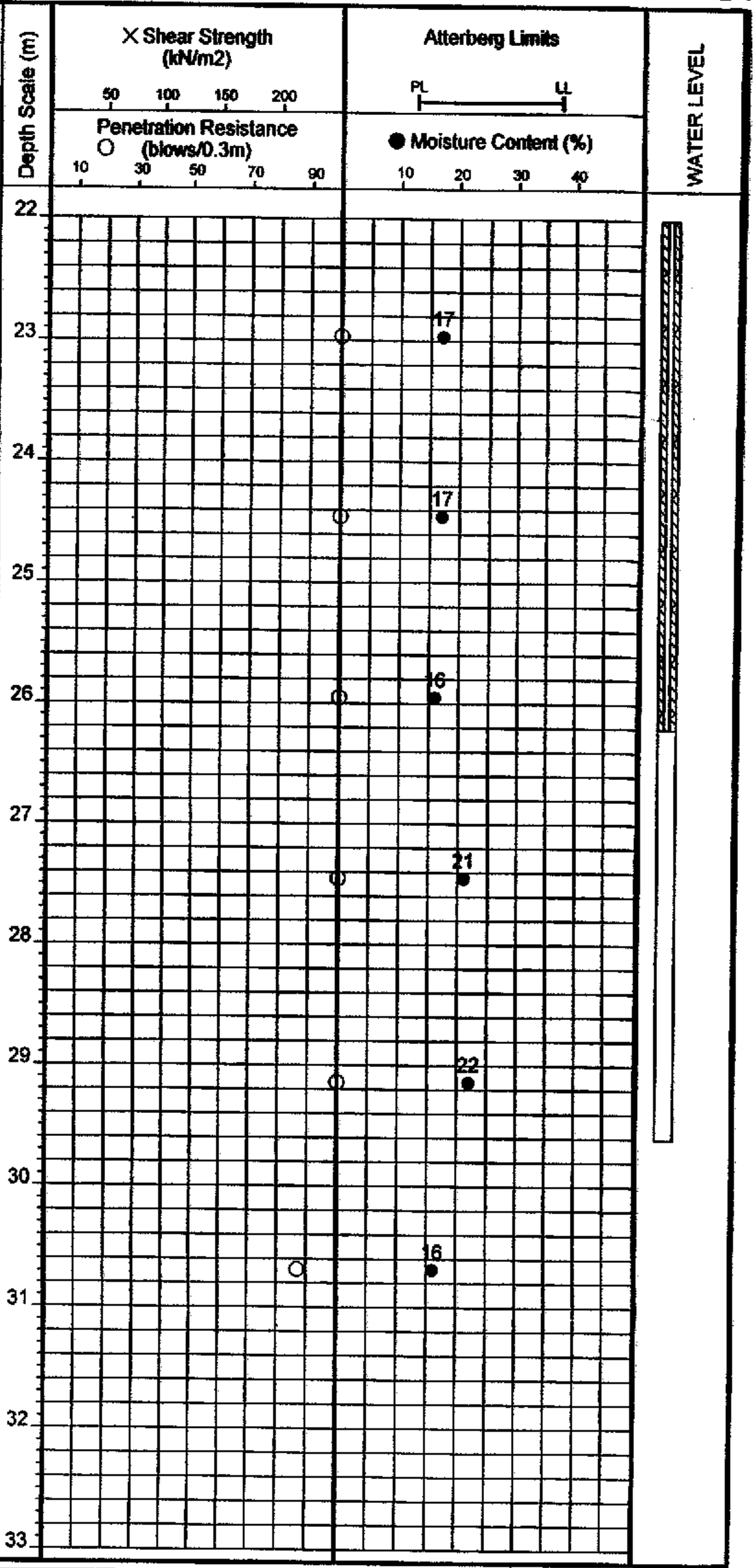
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 13, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
22.0 262.7	Grey, hard **SILTY CLAY** a trace to some sand occ. wet sand and silt seams and layers	18	DO	100+
24.4 260.3	Grey, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	19 20	DO DO	100+ 100+
27.4 257.3	Grey, very dense **SILT** traces to some sand and clay a trace of gravel occ. sand seams and layers	21	DO	100+
29.0 255.7	Grey, hard **SILTY CLAY** a trace to some sand occ. wet sand and silt seams and layers	22	DO	100+
30.3 254.4	Grey, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	23	DO	87
30.9 253.8	**END OF BOREHOLE**			

Installed 50 mm Ø monitoring well to 29.6 m
3.0 m screen covered with geomembrane
Sand backfill from 26.2 to 29.6 m
Bentonite seal from 0.3 to 26.2 m
Provided with a steel protective casing



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-70

FIGURE NO: 70

JOB DESCRIPTION: Proposed Urban Development

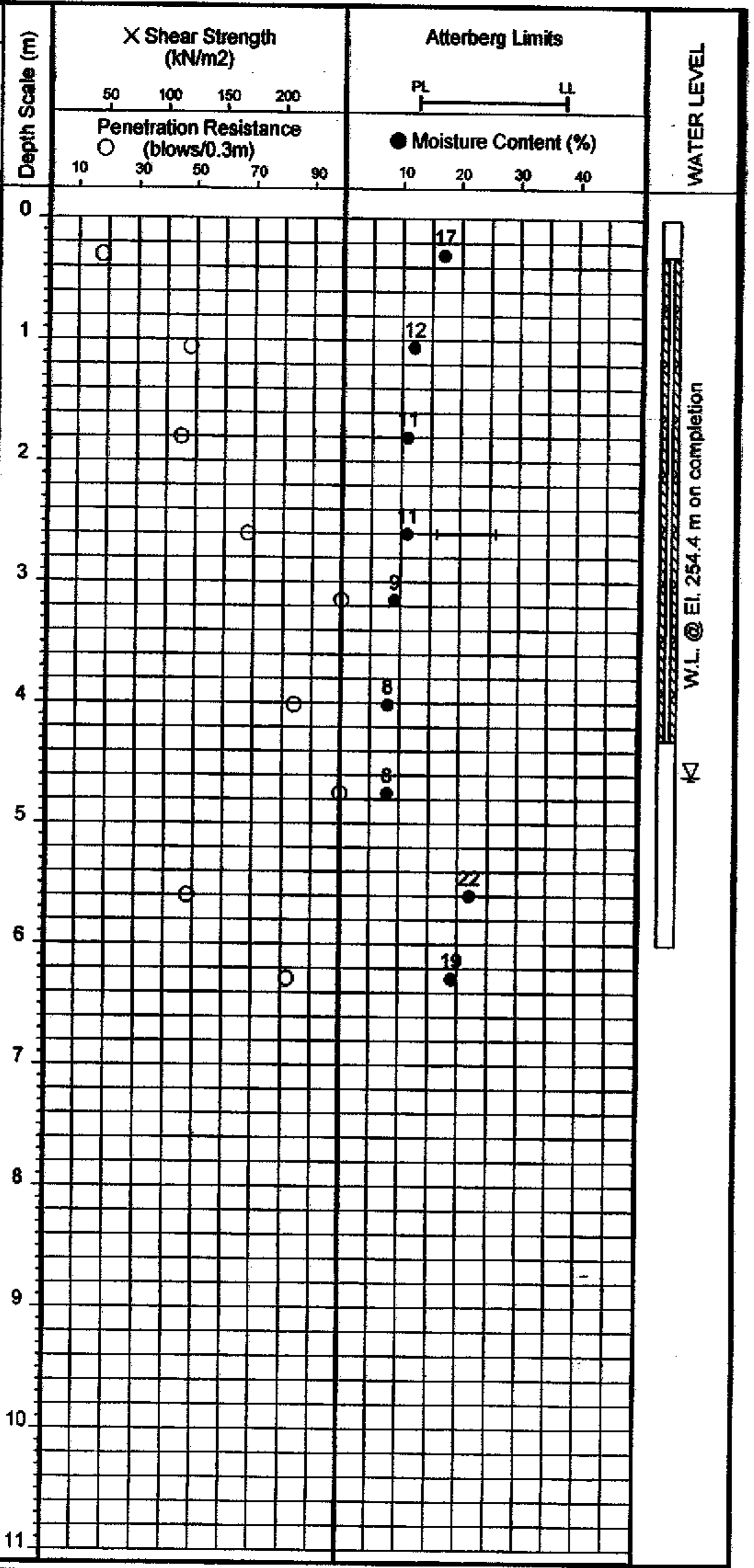
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 17, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
0.0 259.0	Ground Surface **20 cm TOPSOIL**			
	Very stiff to hard	1	DO	18
	weathered	2	DO	48
	SILTY CLAY, Till	3	DO	45
		4	DO	68
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	100+
		6	DO	84
	brown grey	7	DO	100+
5.3 253.7	Dense to very dense			
	SILTY FINE SAND a trace of clay	8	DO	48
	occ. silt seams and layers grey brown	7	DO	82
6.5 252.5	**END OF BOREHOLE**			

Installed 50 mm Ø monitoring well to 6.0 m
1.5 m screen covered with geomembrane
Sand backfill from 4.3 to 6.0 m
Bentonite seal from 0.3 to 4.3 m
Provided with a steel protective casing



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-71

FIGURE NO: 71A

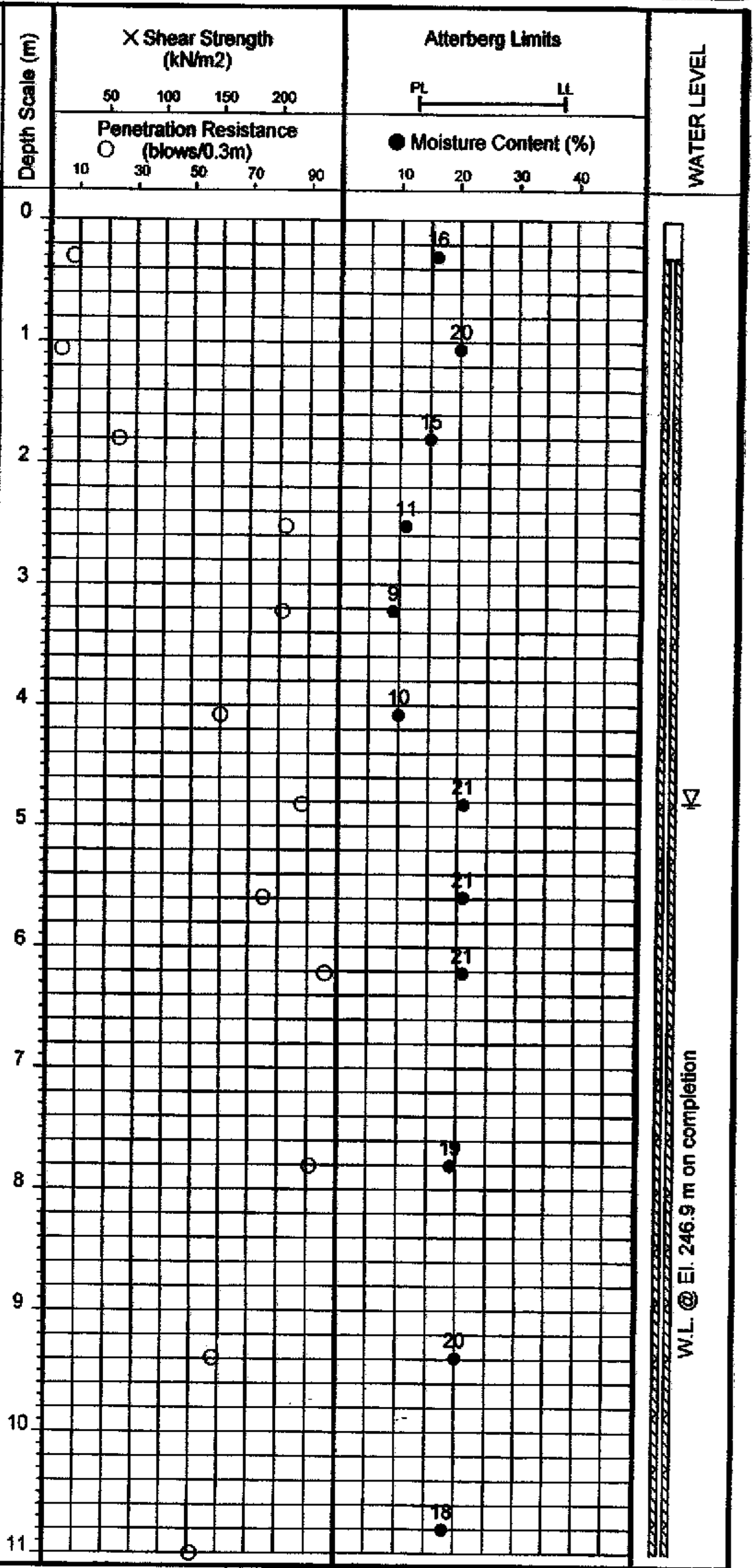
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem/ Wash-bore

DATE: August 18, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
251.7	Brown, soft to firm **SILTY CLAY** a trace to some sand occ. wet sand and silt seams and layers	1	DO	8
		2	DO	4
1.5	weathered			
250.2	Brown, very stiff to hard	3	DO	24
	SILTY CLAY, Till	4	DO	82
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	81
		6	DO	60
4.6				
247.1	Very dense	7	DO	88
		8	DO	75
		9	DO	96
	SILTY FINE SAND			
		10	DO	91
	a trace of clay occ. silt seams and layers			
	brown grey			
		11	DO	58
10.4				
241.3	Grey, very dense **SILT**			
11.0	Cont'd on Fig. 71B			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-71

FIGURE NO: 71B

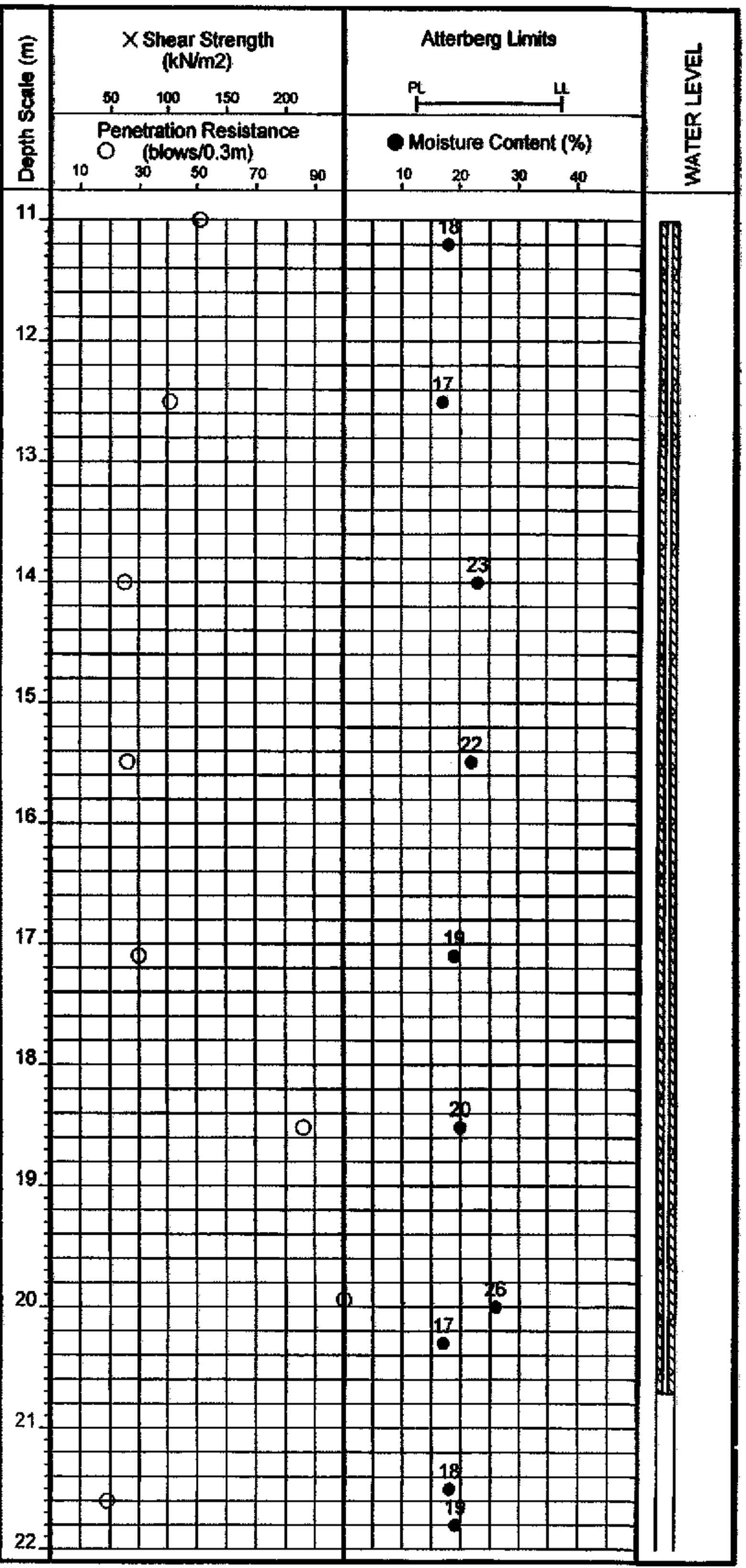
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem/ Wash-bore

DATE: August 18, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
11.0				
240.7	Grey, very dense **SILT** traces to some sand and clay a trace of gravel occ. sand seams and layers sand layer	12	DO	51
12.2 239.5	Grey, compact to dense	13	DO	41
	SILTY FINE SAND a trace of clay occ. silt seams and layers	14	DO	25
15.2 236.5	Grey, compact to very dense	15	DO	26
	FINE SAND	16	DO	30
	a trace to some silt a trace of gravel occ. silt seams and layers	17	DO	86
	silty-clay layer	18	DO	100+
21.6 230.1	Grey, compact **FINE TO MEDIUM SAND**	19	DO	19
22.0	Cont'd on Fig. 71C			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-71

FIGURE NO: 71C

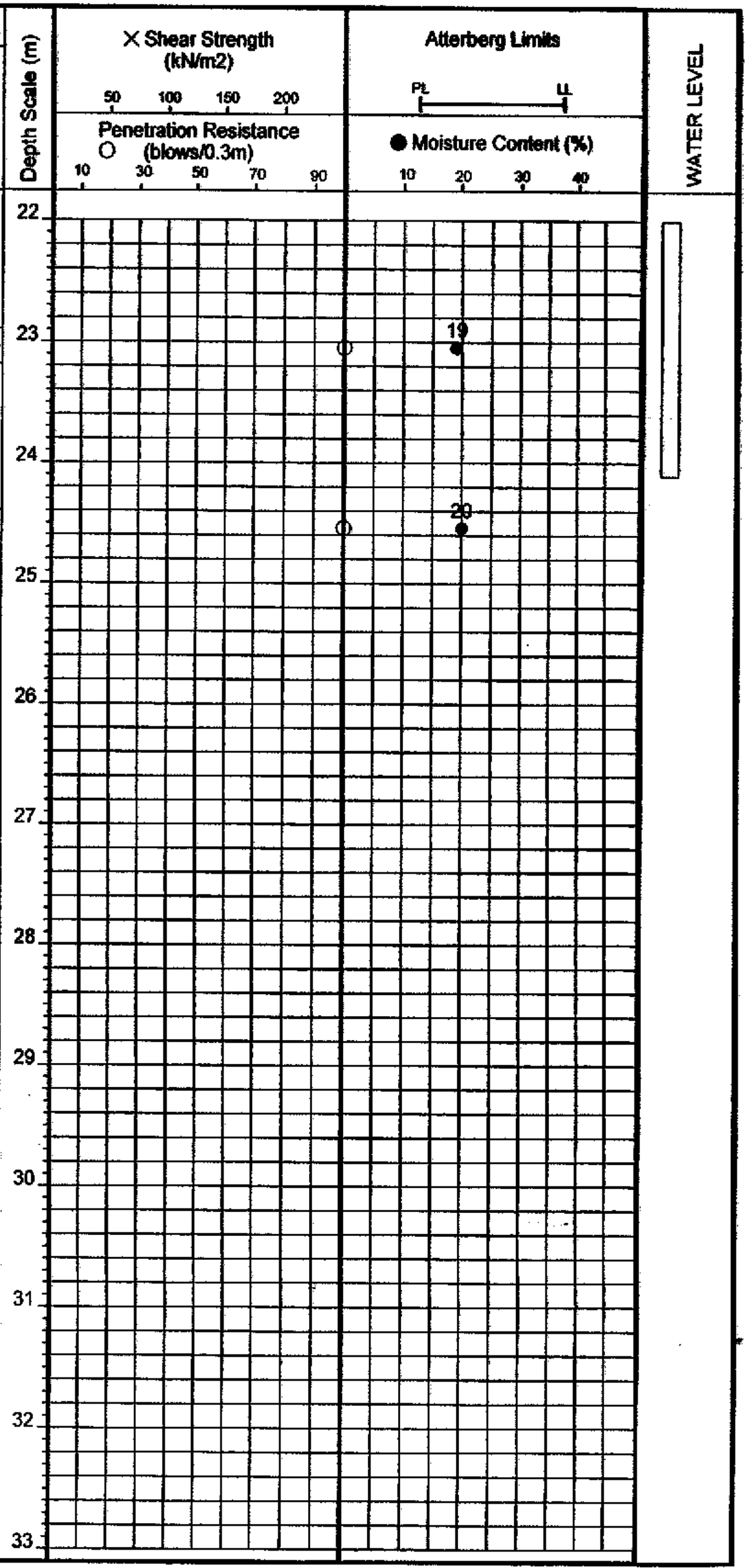
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem/ Wash-bore

DATE: August 18, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
22.0				
22.0 229.7	Grey, compact **FINE TO MEDIUM SAND** traces of silt and gravel occ. silt seams and layers			
22.9 228.8	Grey, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	20	DO	100+
		21	DO	100+
24.6 227.1	**END OF BOREHOLE** Refusal to augering due to wet sand condition Installed 50 mm Ø monitoring well to 24.1 m 3.0 m screen covered with geomembrane Sand backfill from 20.7 to 24.1 m Bentonite seal from 0.3 to 20.7 m Provided with a steel protective casing			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-72

FIGURE NO: 72A

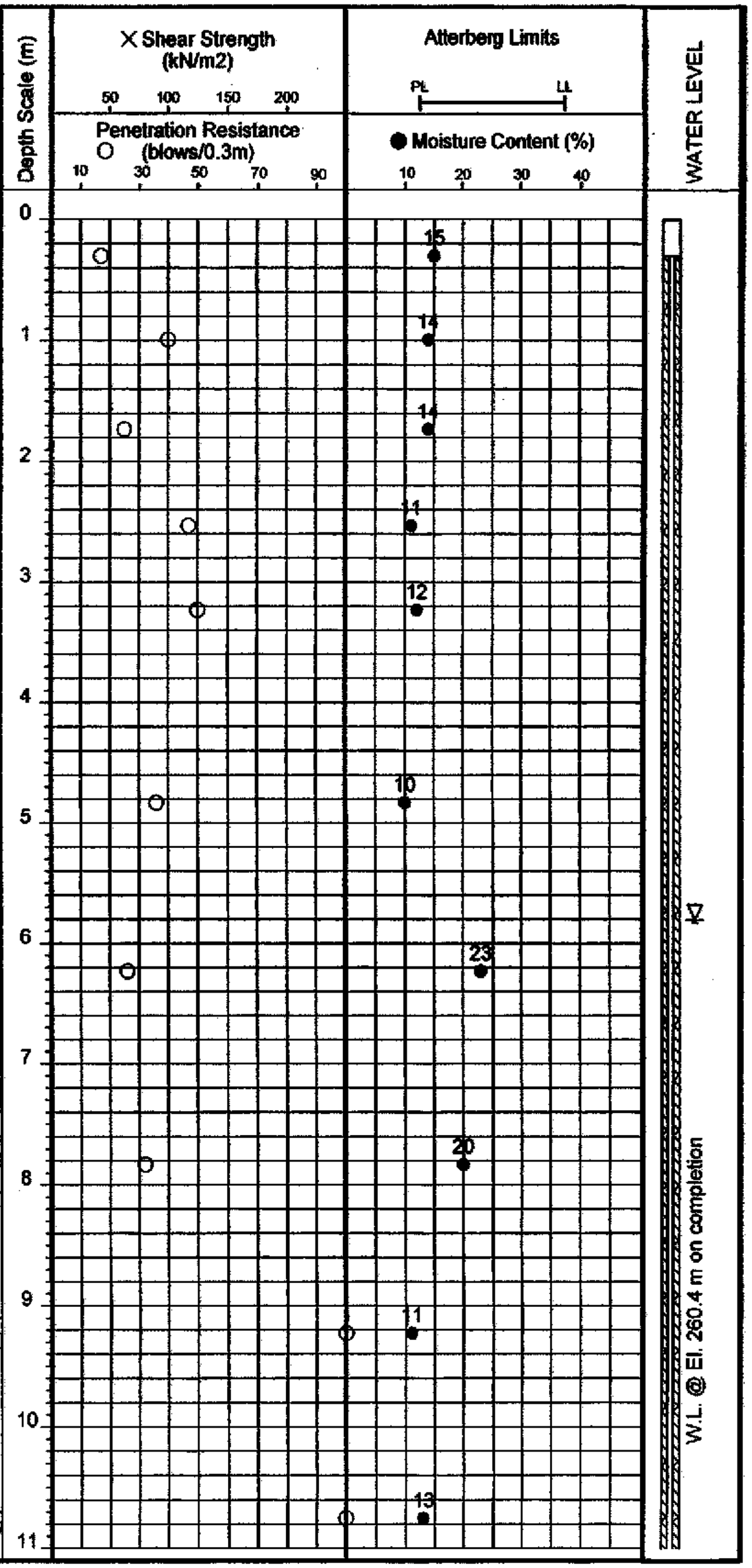
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 15, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
266.2	**18 cm TOPSOIL**			
	Brown, very stiff to hard	1	DO	17
	weathered	2	DO	40
	SILTY CLAY, Till	3	DO	25
		4	DO	47
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	5	DO	50
	brown grey	6	DO	36
6.0 260.2	Brown, compact to dense	7	DO	26
	SILTY FINE SAND			
	a trace of clay occ. silt seams and layers	8	DO	32
9.1 257.1	Grey, hard	9	DO	100+
	SILTY CLAY, Till sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
11.0	Cont'd on Fig. 72B	10	DO	100+



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-72

FIGURE NO: 72B

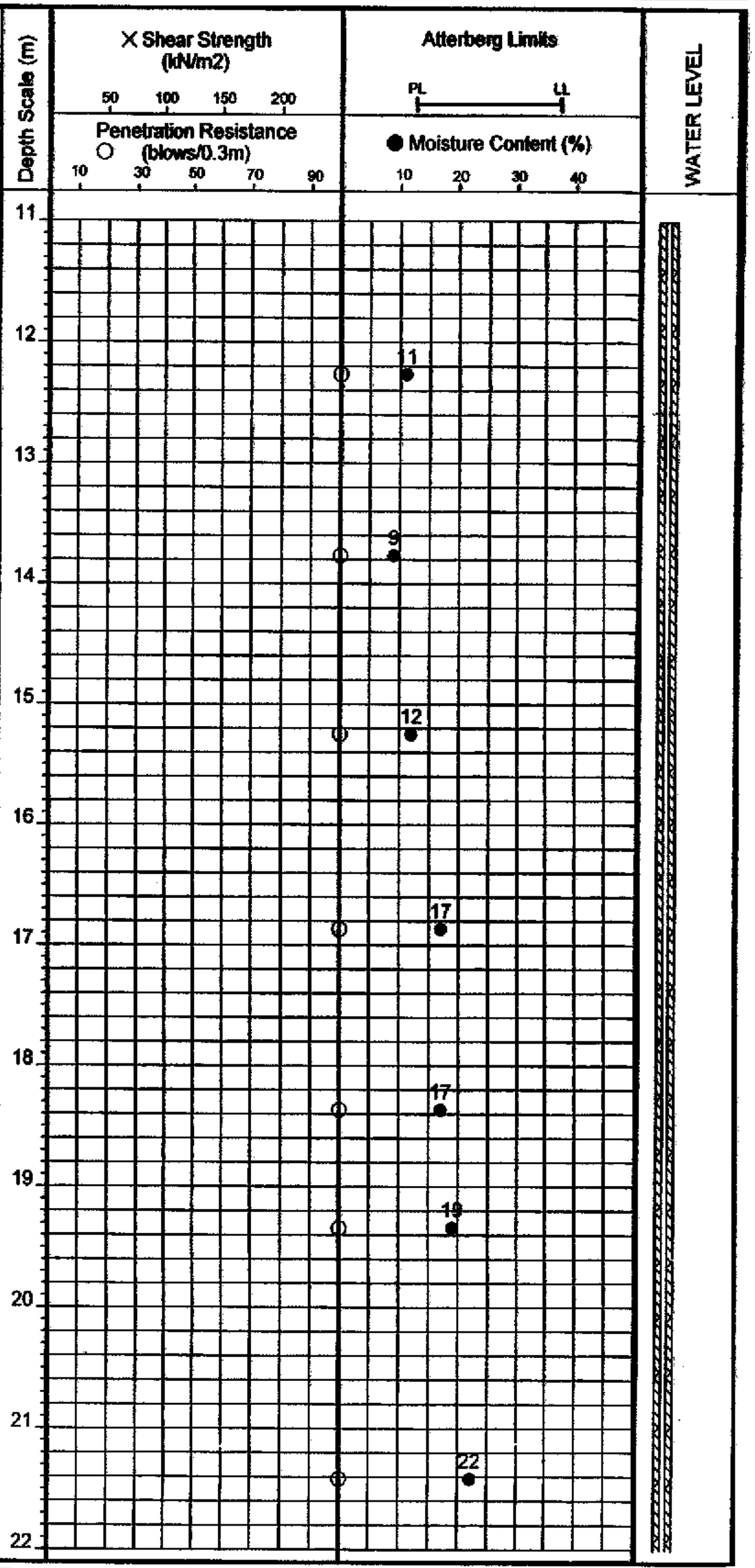
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 15, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
11.0				
255.2	Grey, hard			
	SILTY CLAY, Till	11	DO	100+
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	12	DO	100+
15.2 251.0	Grey, very dense	13	DO	100+
	SANDY SILT, Till	14	DO	100+
	some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	15	DO	100+
		16	DO	100+
		17	DO	100+
22.0	Cont'd on Fig. 72C			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-72

FIGURE NO: 72C

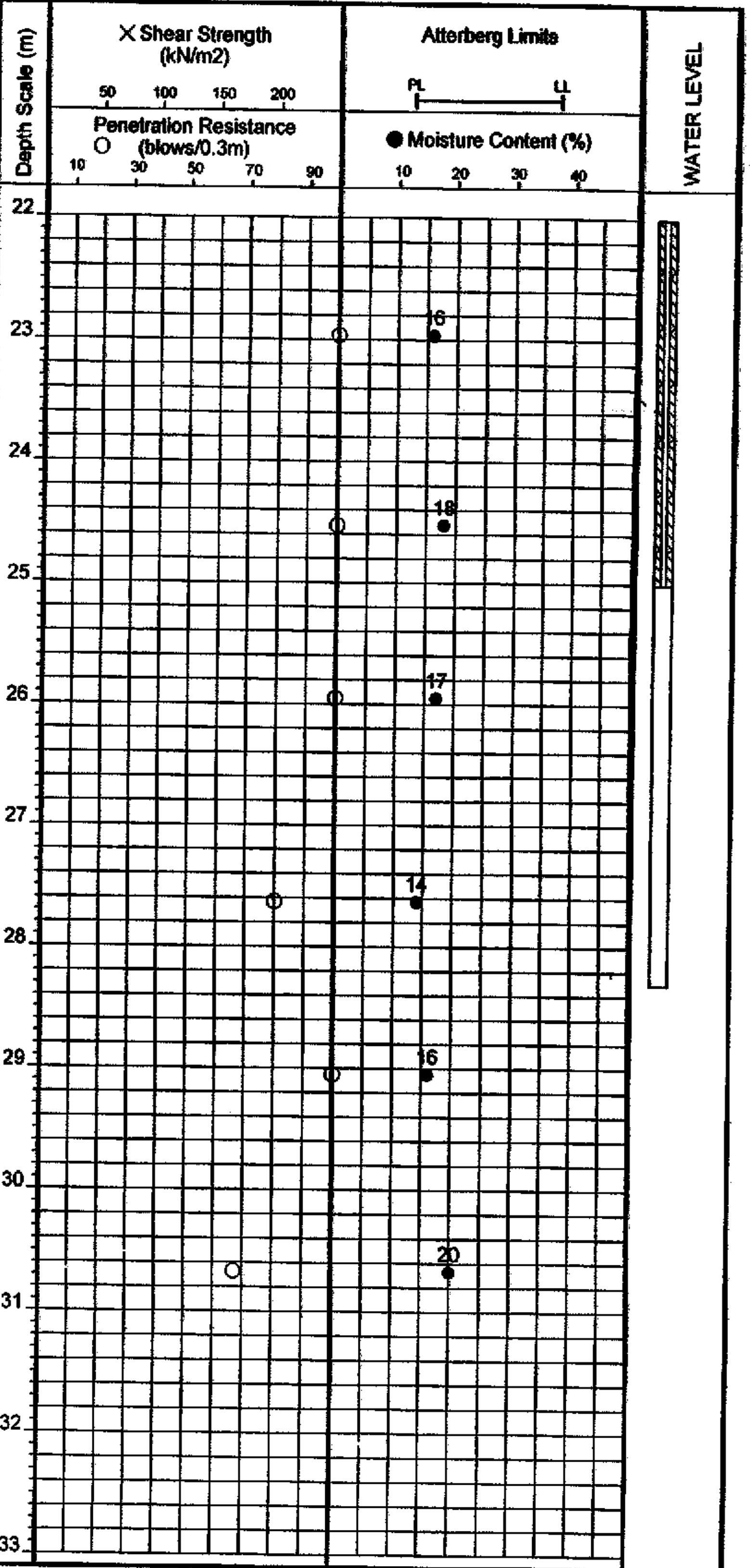
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 15, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
22.0 244.2	Brown, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	18	DO	100+	23
		19	DO	100+	24
25.9 240.3	Grey, very dense **FINE TO MEDIUM SAND** traces of silt and gravel occ. silt seams and layers	20	DO	100+	26
		21	DO	80	27
		22	DO	100+	29
		23	DO	67	30
30.9 235.3	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 28.3 m 3.0 m screen covered with geomembrane Sand backfill from 25.0 to 28.3 m Bentonite seal from 0.3 to 25.0 m Provided with a steel protective casing				31



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-73

FIGURE N O: 73

JOB DESCRIPTION: Proposed Urban Development

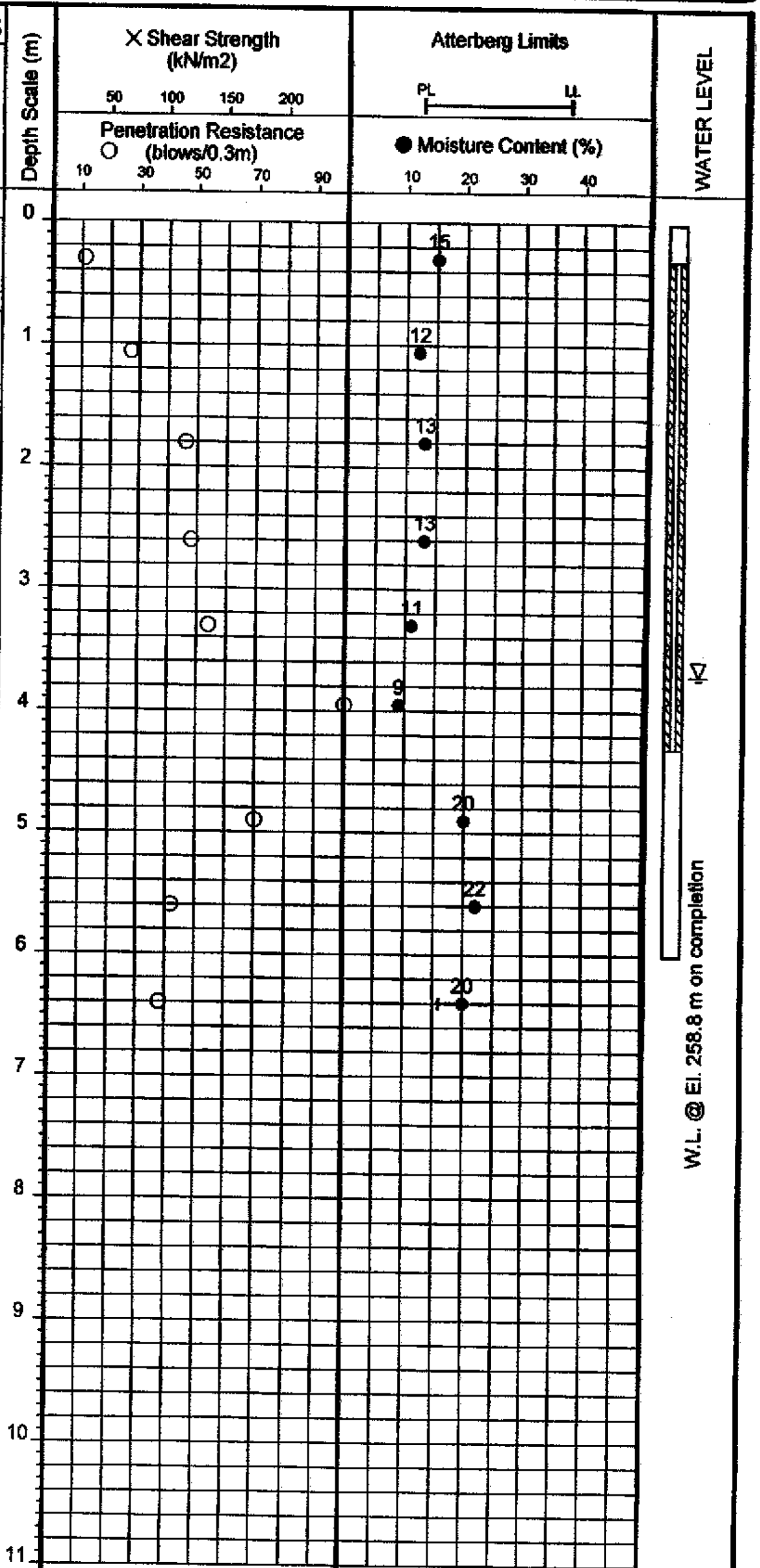
JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Flight-Auger

DATE: August 17, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 262.5	Ground Surface **25 cm TOPSOIL**			
	Brown, stiff to hard	1	DO	11
	weathered	2	DO	27
	SILTY CLAY, Till	3	DO	46
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	48
		5	DO	54
3.8 258.7	Brown, very dense **SANDY SILT, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	6	DO	100+
4.6 257.9	Brown, dense to very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	7	DO	70
		8	DO	42
6.0 256.5	Brown, hard **SILTY CLAY** some sand to sandy occ. wet sand and silt seams and layers	9	DO	38
6.7 255.8	**END OF BOREHOLE**			

Installed 50 mm Ø monitoring well to 6.0 m
1.5 m screen covered with geomembrane
Sand backfill from 4.3 to 6.0 m
Bentonite seal from 0.3 to 4.3 m
Provided with a steel protective casing



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-74

FIGURE NO: 74A

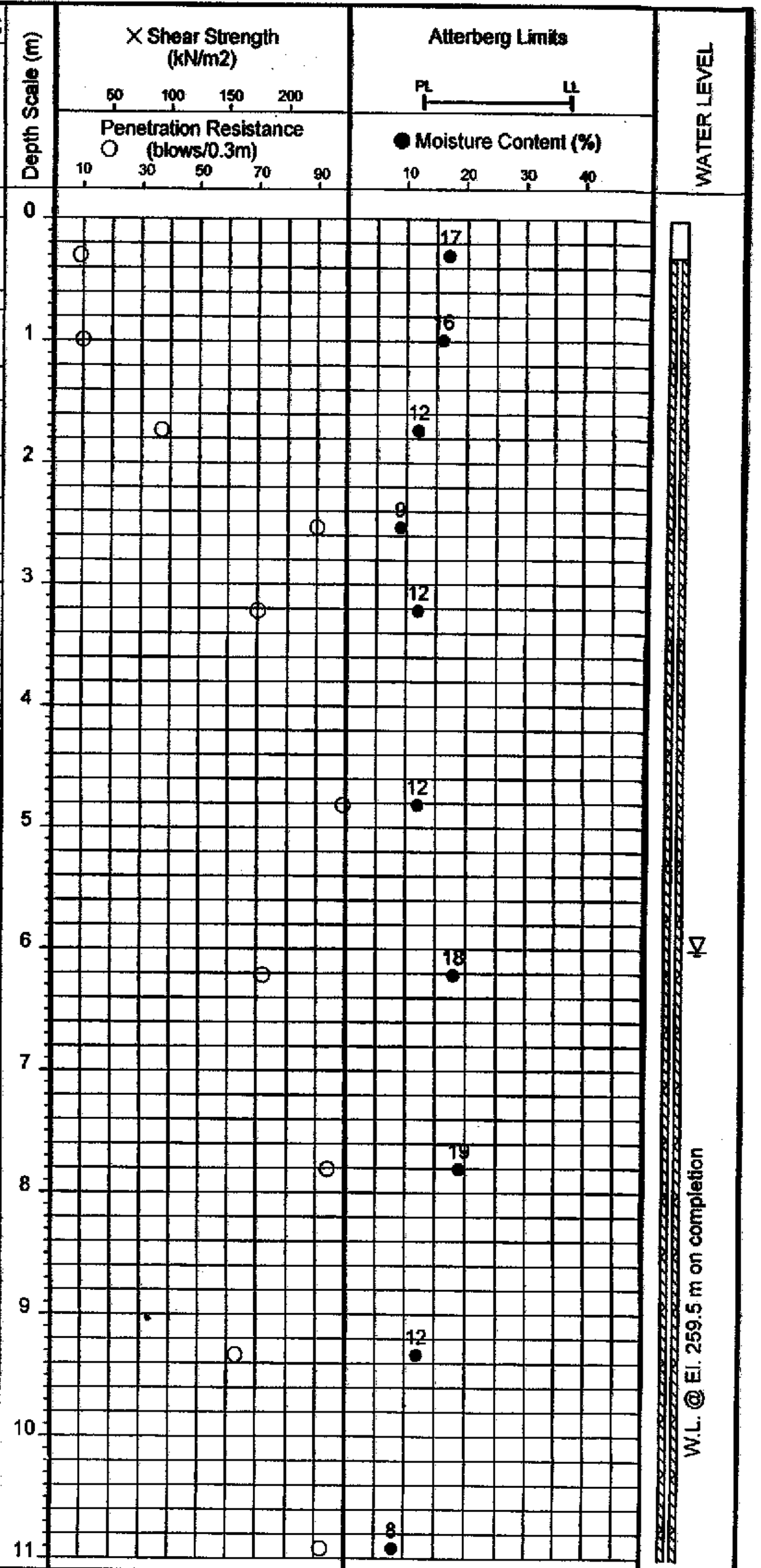
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 8, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 265.5	Ground Surface **25 cm TOPSOIL**			
	Brown, stiff **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders weathered	1	DO	9
		2	DO	10
1.5 264.0	Brown, dense **SANDY SILT, Till** some clay, a trace of gravel occ. wet sand and clay seams and layers, cobbles and boulders	3	DO	37
2.3 263.2	Brown, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	90
		5	DO	70
		6	DO	99
6.0 259.5	Brown, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	7	DO	72
		8	DO	94
9.1 256.4	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	9	DO	63
11.0	Cont'd on Fig. 74B	10	DO	92



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-74

FIGURE NO: 74B

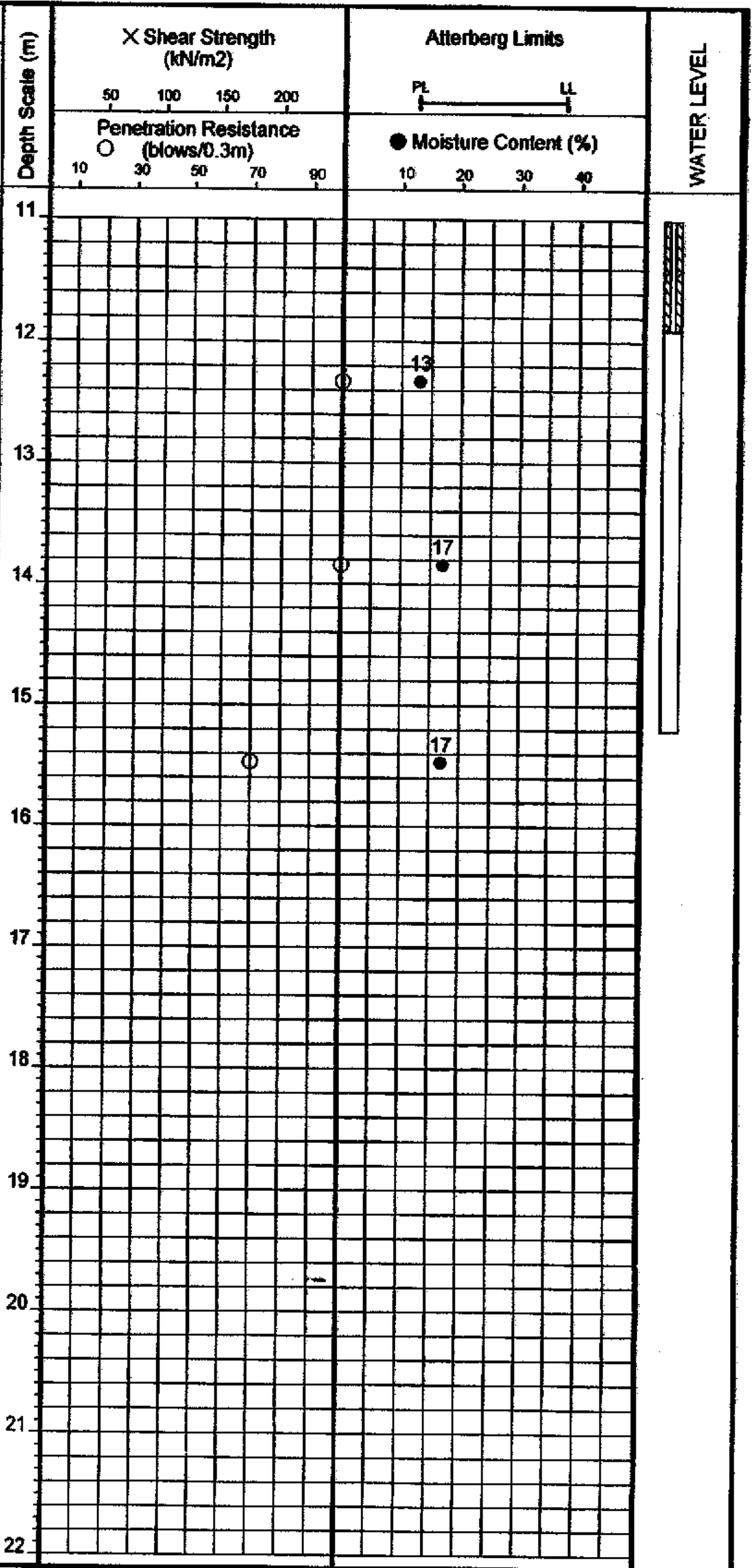
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 8, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
11.0 254.5	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
12.2 253.3	Grey, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	11	DO	100+
13.7 251.8	Grey, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	12	DO	100+
15.0 250.5	Grey, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	13	DO	70
15.7 249.8	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 15.2 m 3.0 m screen covered with geomembrane Sand backfill from 11.9 to 15.2 m Bentonite seal from 0.3 to 11.9 m Provided with a steel protective casing			



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-75

FIGURE N O: 75A

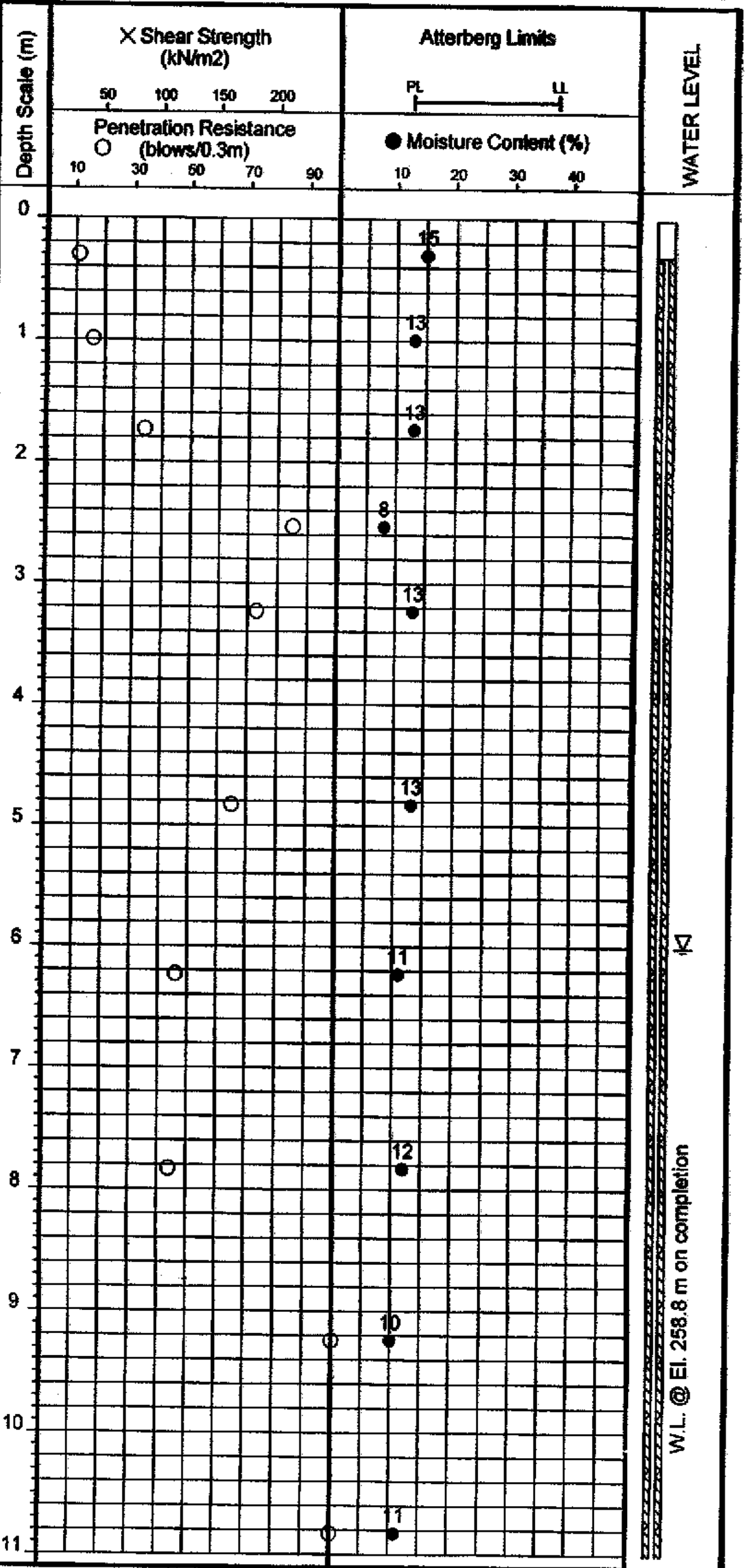
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 9, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 264.8	Ground Surface **25 cm TOPSOIL**			
	Brown, stiff to hard	1	DO	11
	SILTY CLAY, Till weathered	2	DO	16
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	34
		4	DO	85
3.0 261.8	Brown, very dense	5	DO	73
	SILTY FINE SAND a trace of clay occ. silt seams and layers			
4.6 260.2	Hard	6	DO	65
	brown grey	7	DO	46
	SILTY CLAY, Till			
		8	DO	44
	sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
		9	DO	100+
11.0	Cont'd on Fig. 75B	10	DO	100+



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-75

FIGURE NO: 75B

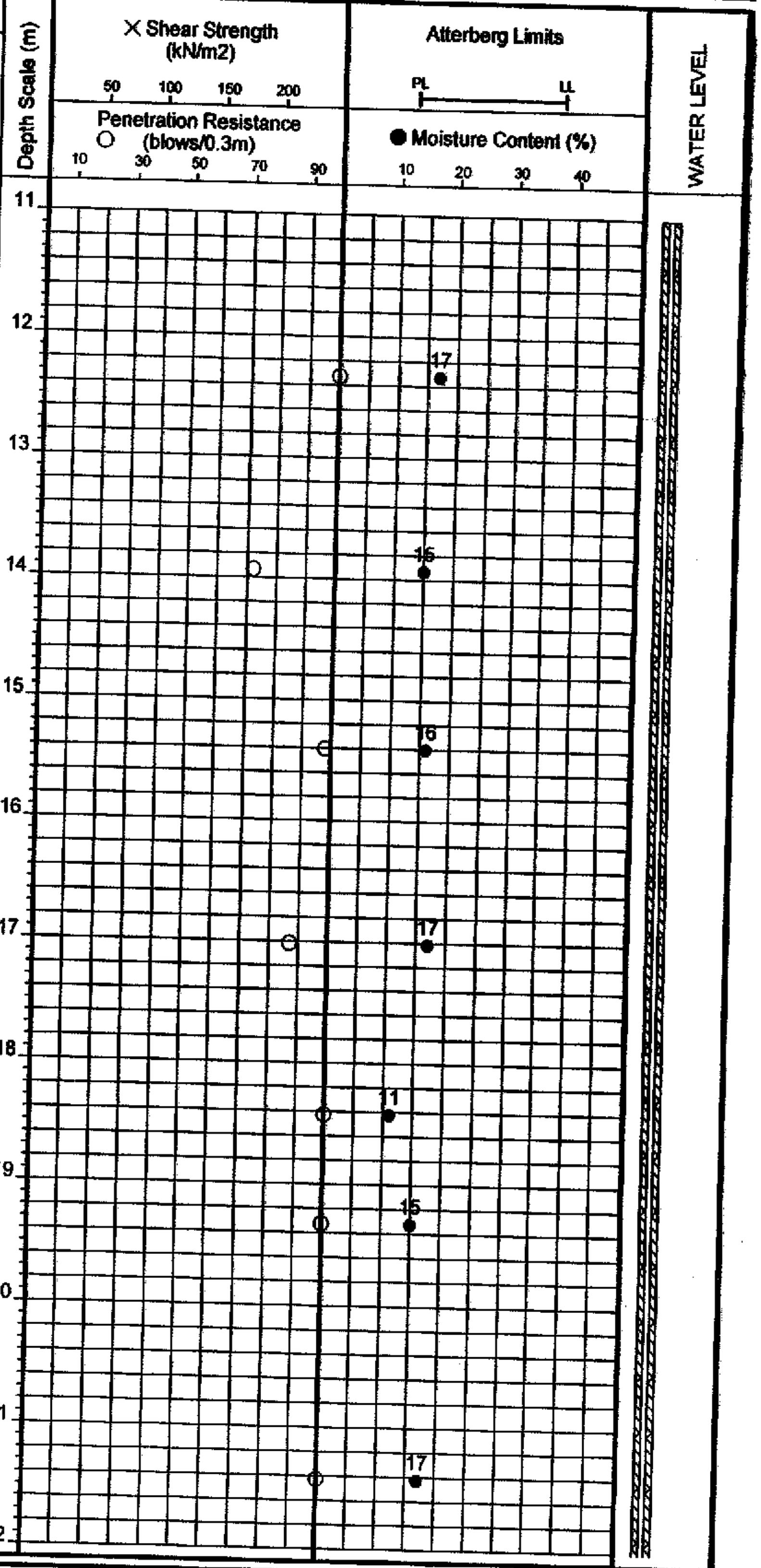
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road,
Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 9, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
11.0 253.8	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders			
12.2 252.6	Grey, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	11	DO	100+
13.7 251.1	Grey, very dense **SILTY FINE SAND** a trace of clay occ. silt seams and layers	12	DO	72
		13	DO	98
16.8 248.0	Grey, very dense **FINE TO MEDIUM SAND** traces of silt and gravel occ. silt seams and layers	14	DO	87
18.3 246.5	Grey, hard **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	15	DO	100+
		16	DO	100+
21.3 243.5	Grey, very dense **FINE TO MEDIUM SAND** Cont'd on Fig. 75C	17	DO	100+
22.0				



Soil Engineers Ltd.

JOB NO: 1007-S084

LOG OF MON. WELL NO: 10-75

FIGURE NO: 75C

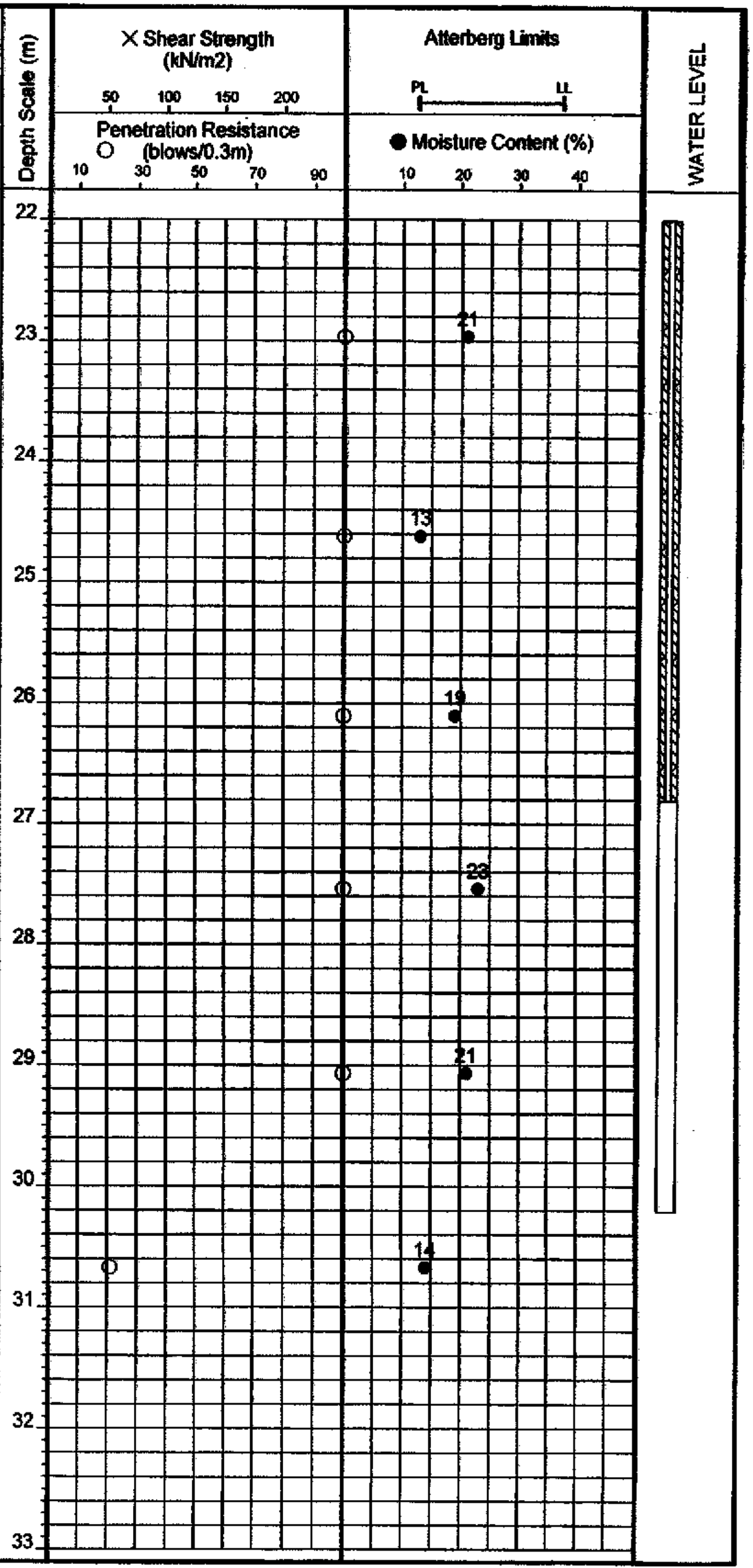
JOB DESCRIPTION: Proposed Urban Development

JOB LOCATION: Block 27, Area bounded by Keele Street, Teston Road, Jane Street, and Kirby Road, City of Vaughan

METHOD OF BORING: Hollow-Stem

DATE: September 9, 2010

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
22.0 242.8	Grey, very dense **FINE TO MEDIUM SAND** traces of silt and gravel occ. silt seams and layers			
22.9 241.9	Grey, very dense **FINE SAND** a trace to some silt a trace of gravel occ. silt seams and layers	18	DO	100+
24.4 240.4	Grey, very dense **FINE TO MEDIUM SAND** traces of silt and gravel occ. silt seams and layers	19	DO	100+
25.9 238.9	Grey, very dense **SILT** traces to some sand and clay a trace of gravel occ. sand seams and layers	20 21	DO DO	100+ 100+
29.0 235.8	Grey, very dense **SANDY SILT** a trace to some clay a trace of gravel occ. silty fine sand layers	22	DO	100+
30.0 234.8	Grey, very stiff **SILTY CLAY, Till** sandy, a trace of gravel occ. wet sand and silt seams and layers, cobbles and boulders	23	DO	21
30.9 233.9	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 30.2 m 3.0 m screen covered with geomembrane Sand backfill from 26.8 to 30.2 m Bentonite seal from 0.3 to 26.8 m Provided with a steel protective casing			



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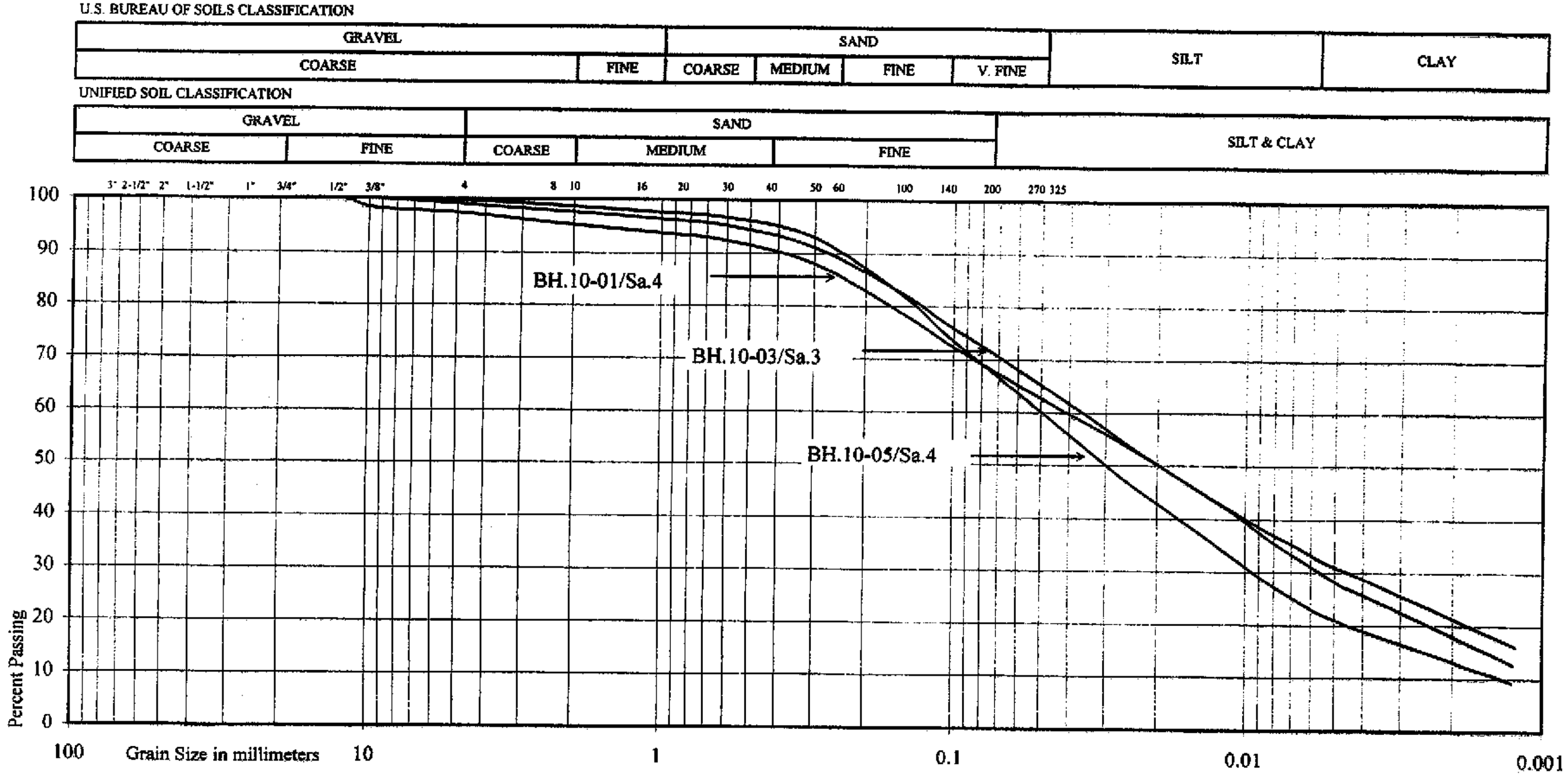
GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan

Borehole No:	10-01	10-03	10-05
Sample No:	4	3	4
Depth (m):	2.6	1.8	2.6
Elevation (m):	265.3	264.3	264.3

BH./Sa.	10-01/4	10-03/3	10-05/4
Liquid Limit (%) =	27	26	22
Plastic Limit (%) =	17	16	15
Plasticity Index (%) =	10	10	7
Moisture Content (%) =	10	13	16
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}	10^{-7}

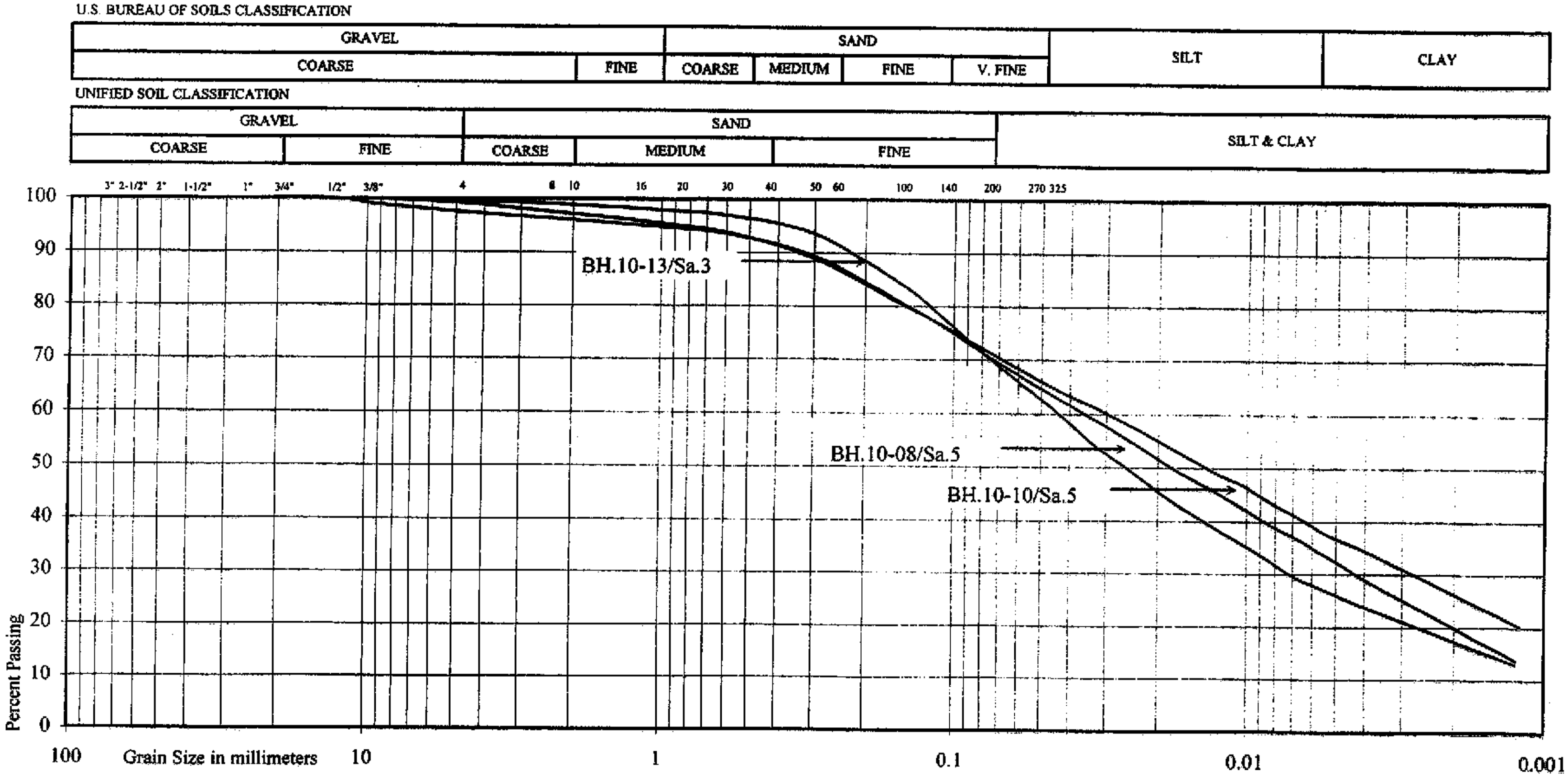
Classification of Sample [& Group Symbol]: SILTY CLAY, Till
sandy, a trace of gravel

Figure :- 76

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project:	Proposed Urban Development		
Location:	Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan		
Borehole No:	10-08	10-10	10-13
Sample No:	5	5	3
Depth (m):	3.3	3.3	1.8
Elevation (m):	272.3	295.6	260.4

BH./Sa.	10-08/5	10-10/5	10-13/3
Liquid Limit (%) =	27	29	25
Plastic Limit (%) =	17	17	16
Plasticity Index (%) =	10	12	9
Moisture Content (%) =	10	13	12
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}	10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY, Till

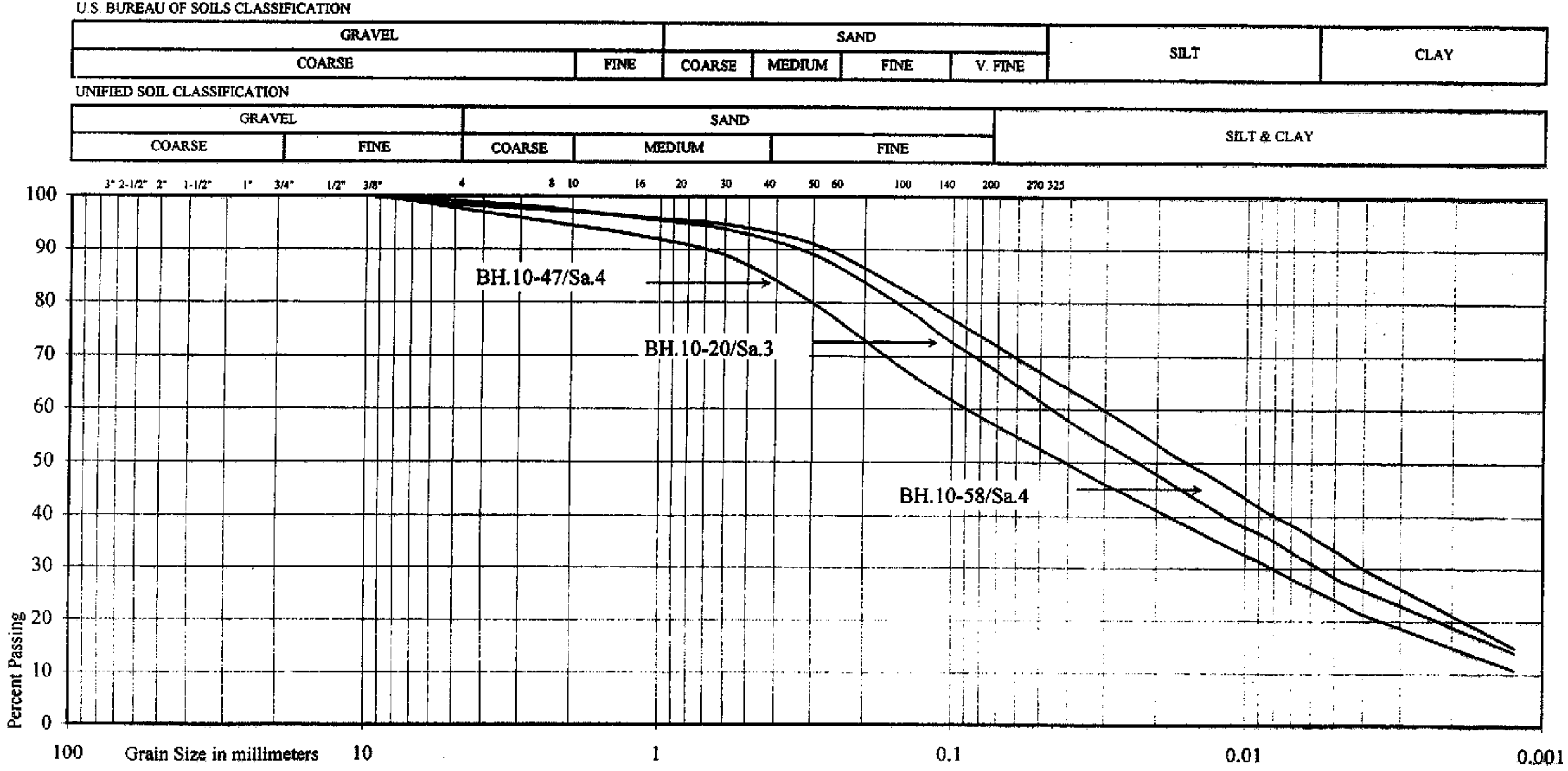
sandy, a trace of gravel

Figure: 77

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan

Borehole No:	10-20	10-47	10-58
Sample No:	3	4	4
Depth (m):	1.8	2.6	2.6
Elevation (m):	261.2	289.1	255.4

BH./Sa.	10-20/3	10-47/4	10-58/4
Liquid Limit (%) =	26	23	28
Plastic Limit (%) =	16	15	17
Plasticity Index (%) =	10	8	11
Moisture Content (%) =	11	14	11
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}	10^{-7}

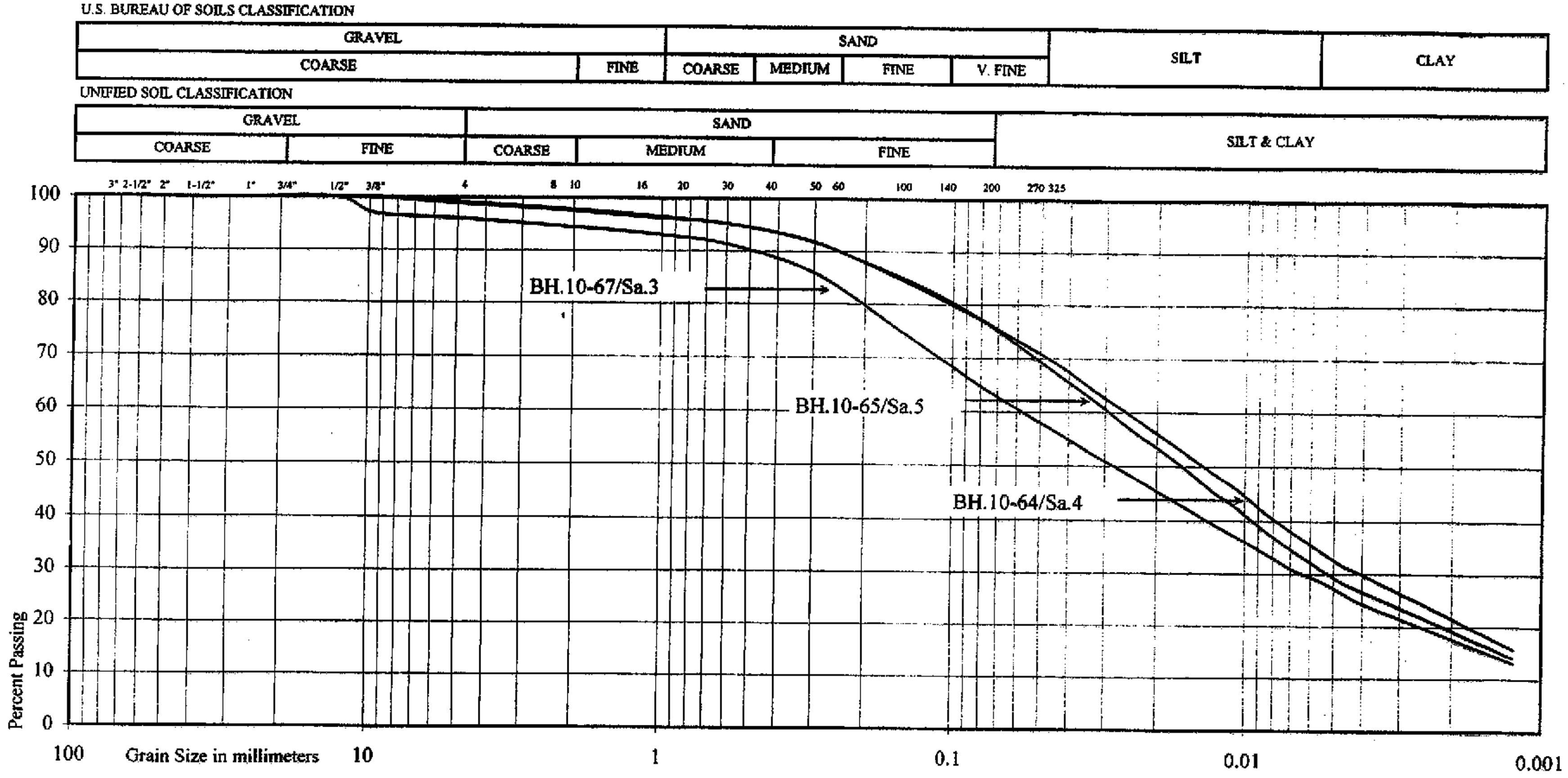
Classification of Sample [& Group Symbol]: SILTY CLAY, Till
sandy, a trace of gravel

Figure: 78

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan

Borehole No:	10-64	10-65	10-67
Sample No:	4	5	3
Depth (m):	2.6	3.3	1.8
Elevation (m):	249.4	249.7	281.3

BH./Sa.	10-64/4	10-65/5	10-67/3
Liquid Limit (%) =	28	26	25
Plastic Limit (%) =	17	16	16
Plasticity Index (%) =	11	10	9
Moisture Content (%) =	11	8	12
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}	10^{-7}

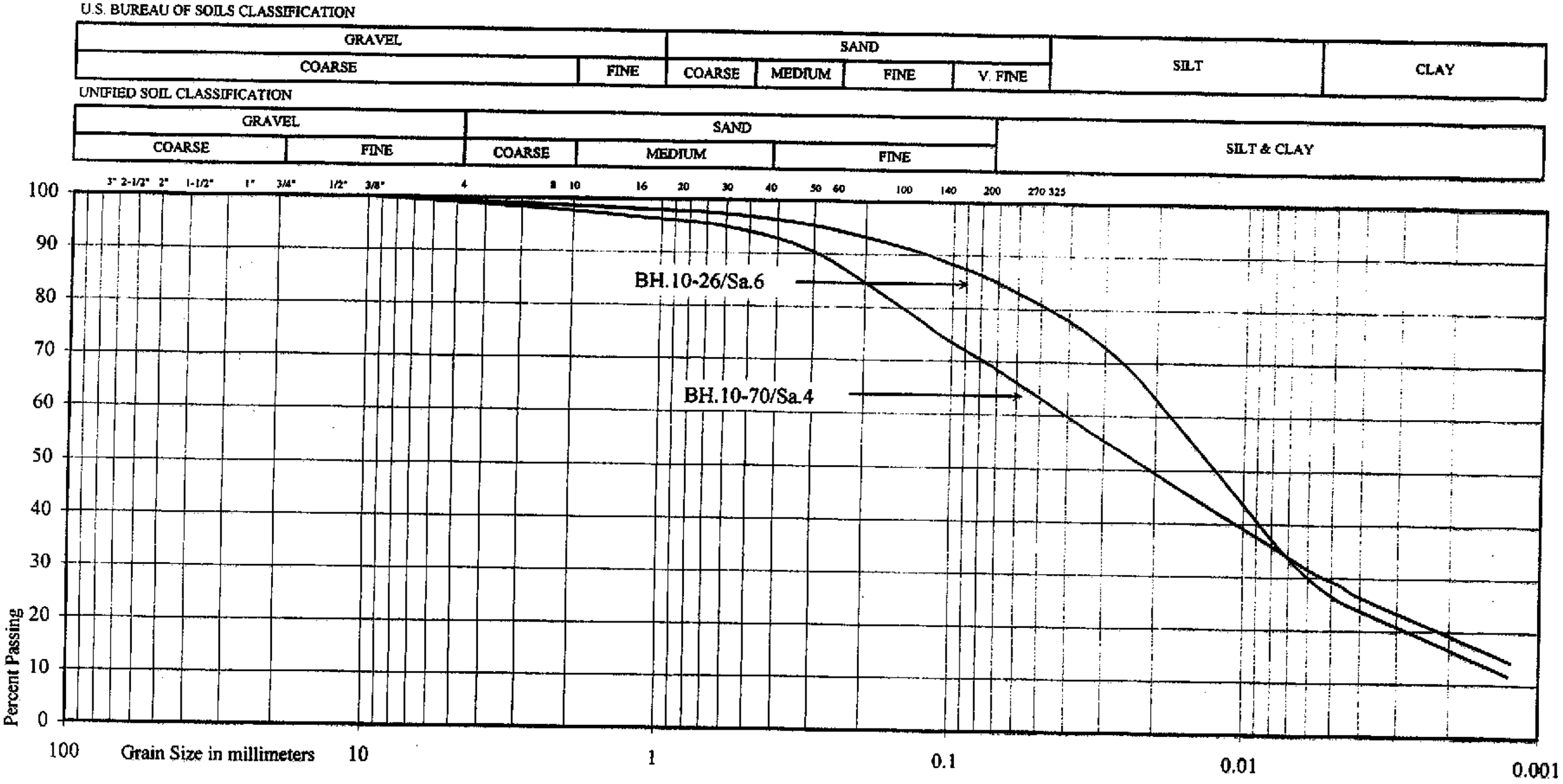
Classification of Sample [& Group Symbol]: SILTY CLAY, Till
sandy, a trace of gravel

Figure: 79

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan

Borehole No:	10-26	10-70
Sample No:	6	4
Depth (m):	4.8	2.6
Elevation (m):	251.4	256.4

BH./Sa.	10-26/6	10-70/4
Liquid Limit (%) =	25	26
Plastic Limit (%) =	15	16
Plasticity Index (%) =	10	10
Moisture Content (%) =	10	11
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}

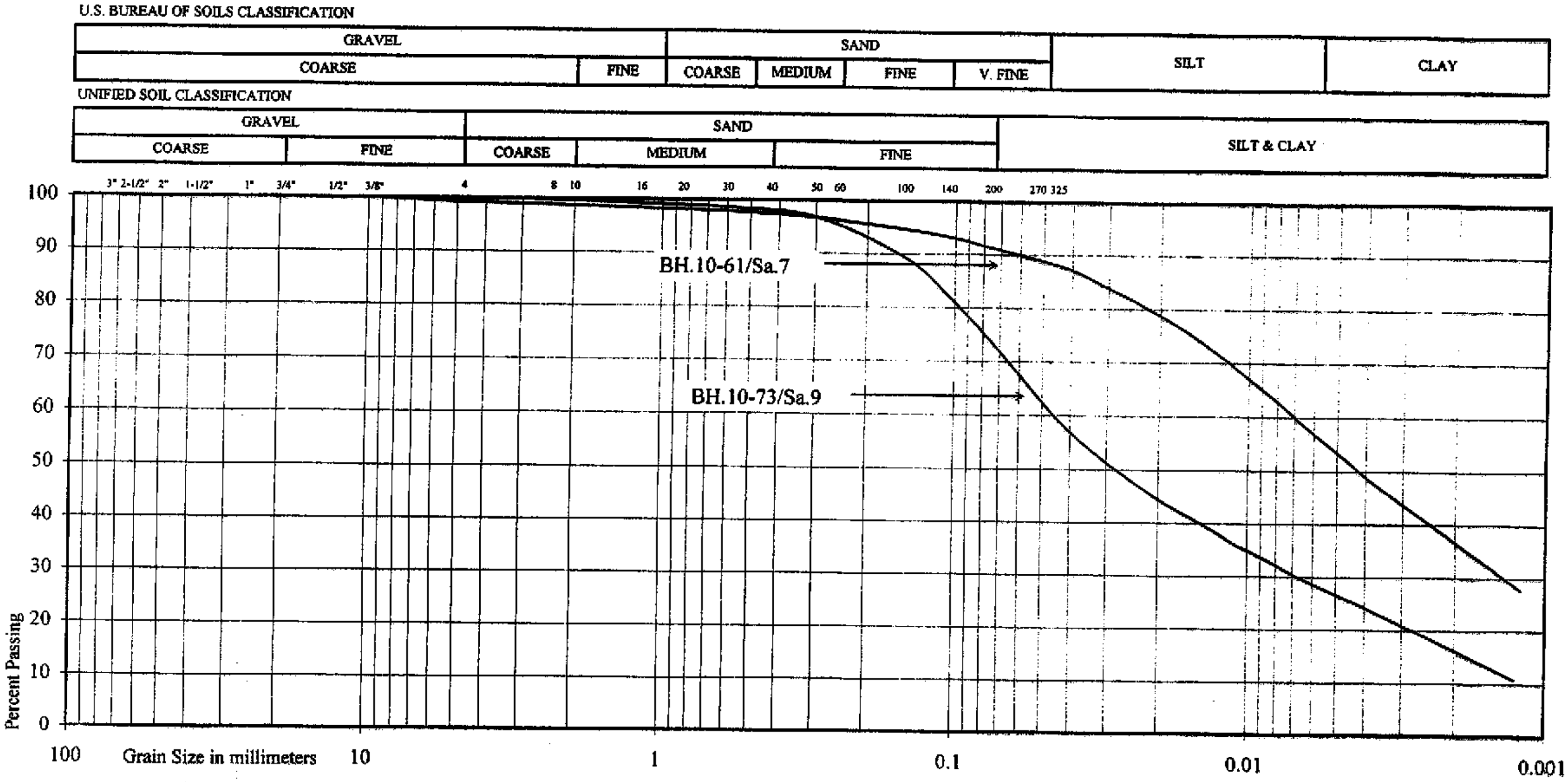
Classification of Sample [& Group Symbol]: SILTY CLAY, Till
some sand to sandy, a trace of gravel

Figure: 80

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project:	Proposed Urban Development	
Location:	Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan	
Borehole No:	10-61	10-73
Sample No:	7	9
Depth (m):	4.9	6.4
Elevation (m):	261.1	256.1

BH./Sa.	10-61/7	10-73/9
Liquid Limit (%) =	34	25
Plastic Limit (%) =	20	16
Plasticity Index (%) =	14	9
Moisture Content (%) =	19	20
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY

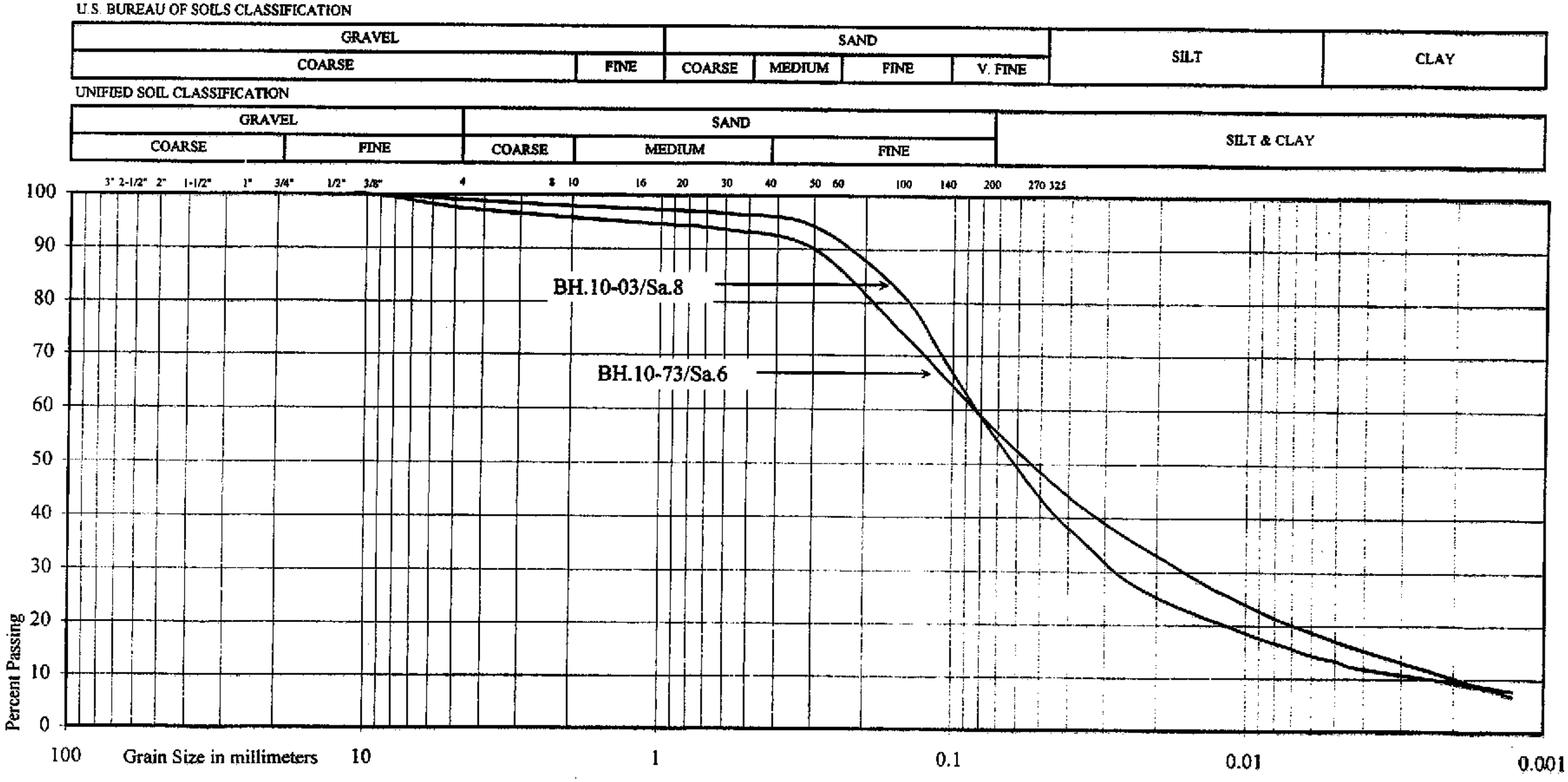
sandy, traces of sand and gravel

Figure: 81

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan

Borehole No:	10-03	10-73
Sample No:	8	6
Depth (m):	7.9	4.0
Elevation (m):	258.2	258.5

BH./Sa.	10-03/8	10-73/6
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	10	9
Estimated Permeability (cm./sec.) =	10^{-5}	10^{-6}

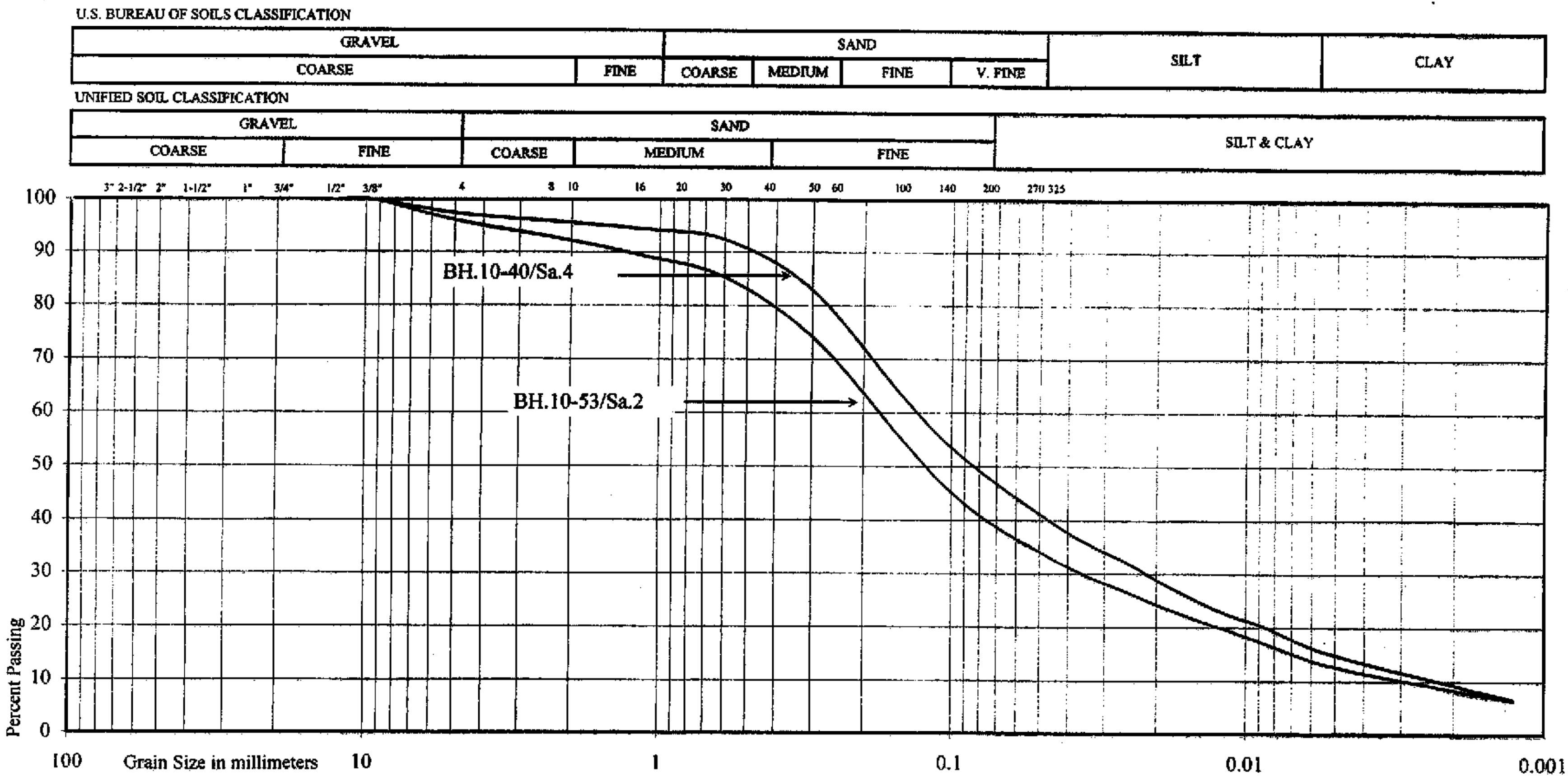
Classification of Sample [& Group Symbol]: SANDY SILT, Till
some clay, a trace of gravel

Figure: 82

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan

Borehole No:	10-40	10-53
Sample No:	4	2
Depth (m):	2.6	1.0
Elevation (m):	277.0	280.0

BH./Sa.	10-40/4	10-53/2
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	10	10
Estimated Permeability (cm./sec.) =	10^{-5}	10^{-6}

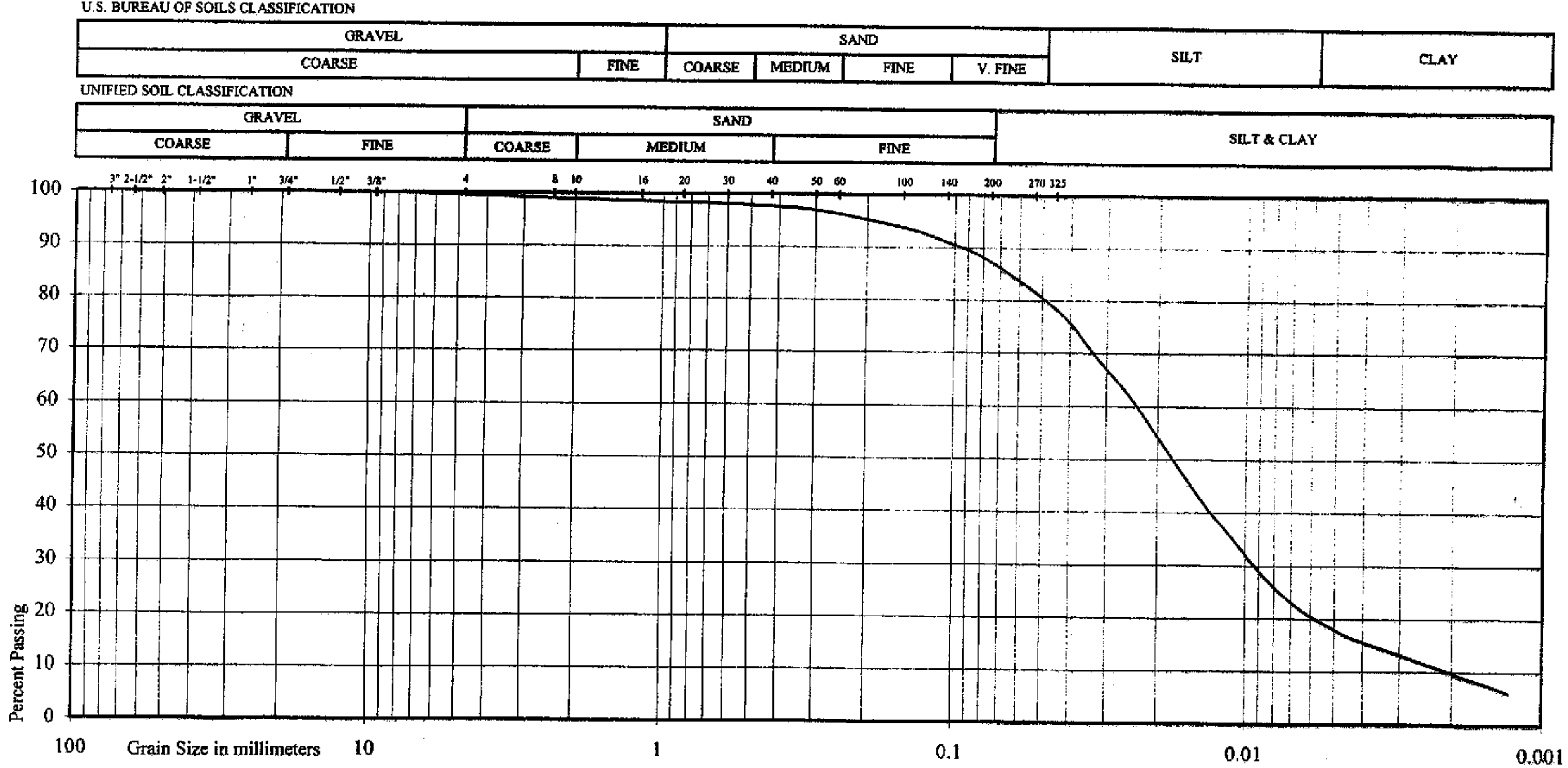
Classification of Sample [& Group Symbol]: SILTY SAND, Till
some clay, a trace of gravel

Figure : 83

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road,
City of Vaughan

Borehole No: 10-15

Sample No: 5

Depth (m): 3.2

Elevation (m): 264.2

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = 14

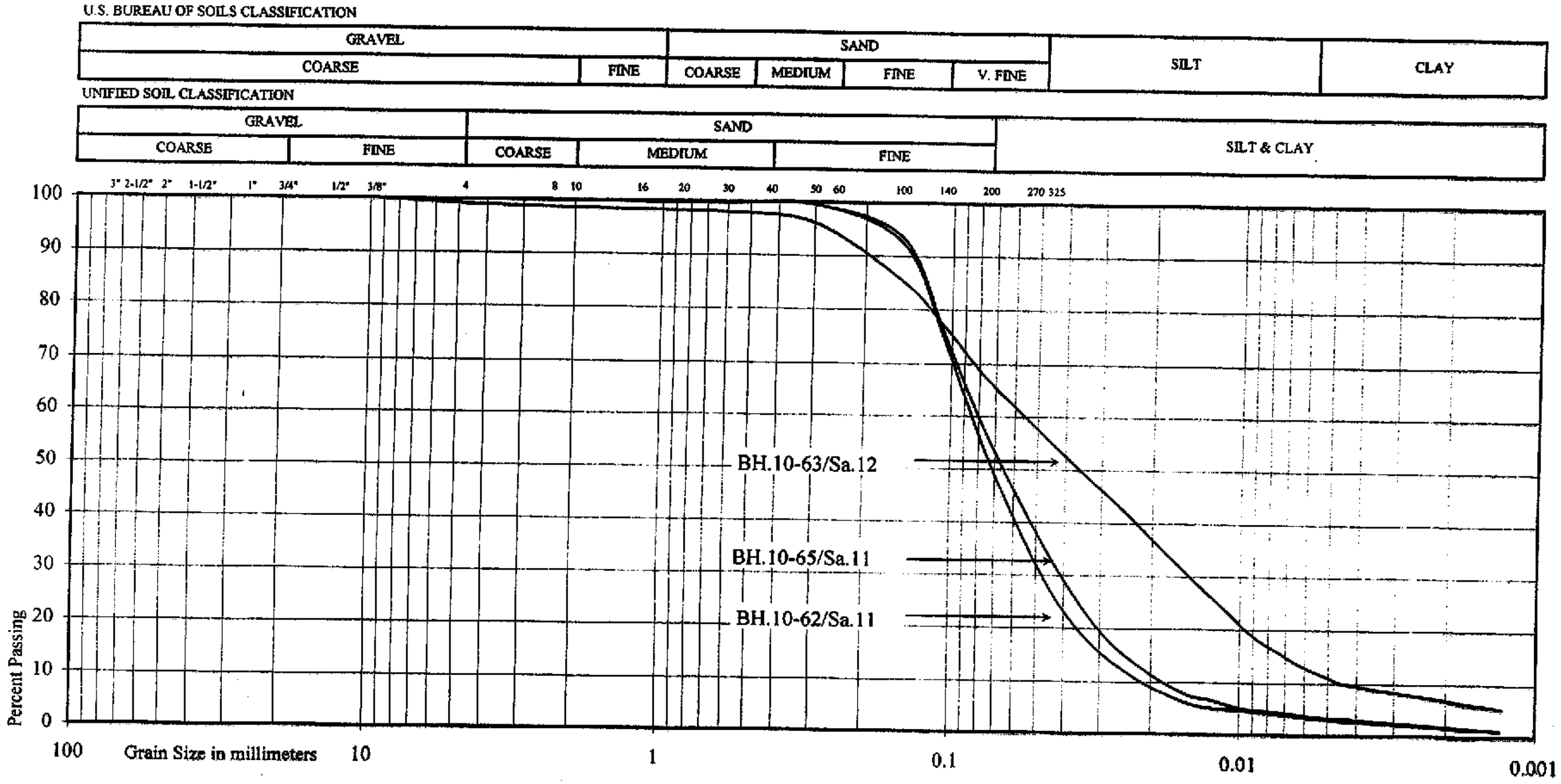
Estimated Permeability (cm./sec.) = 10^{-6}

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

Figure: 84

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan

Borehole No:	10-62	10-63	10-65
Sample No:	11	12	11
Depth (m):	9.4	13.8	9.4
Elevation (m):	254.4	249.8	243.6

BH./Sa.	10-62/11	10-63/12	10-65/11
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	19	16	20
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-5}	10^{-4}

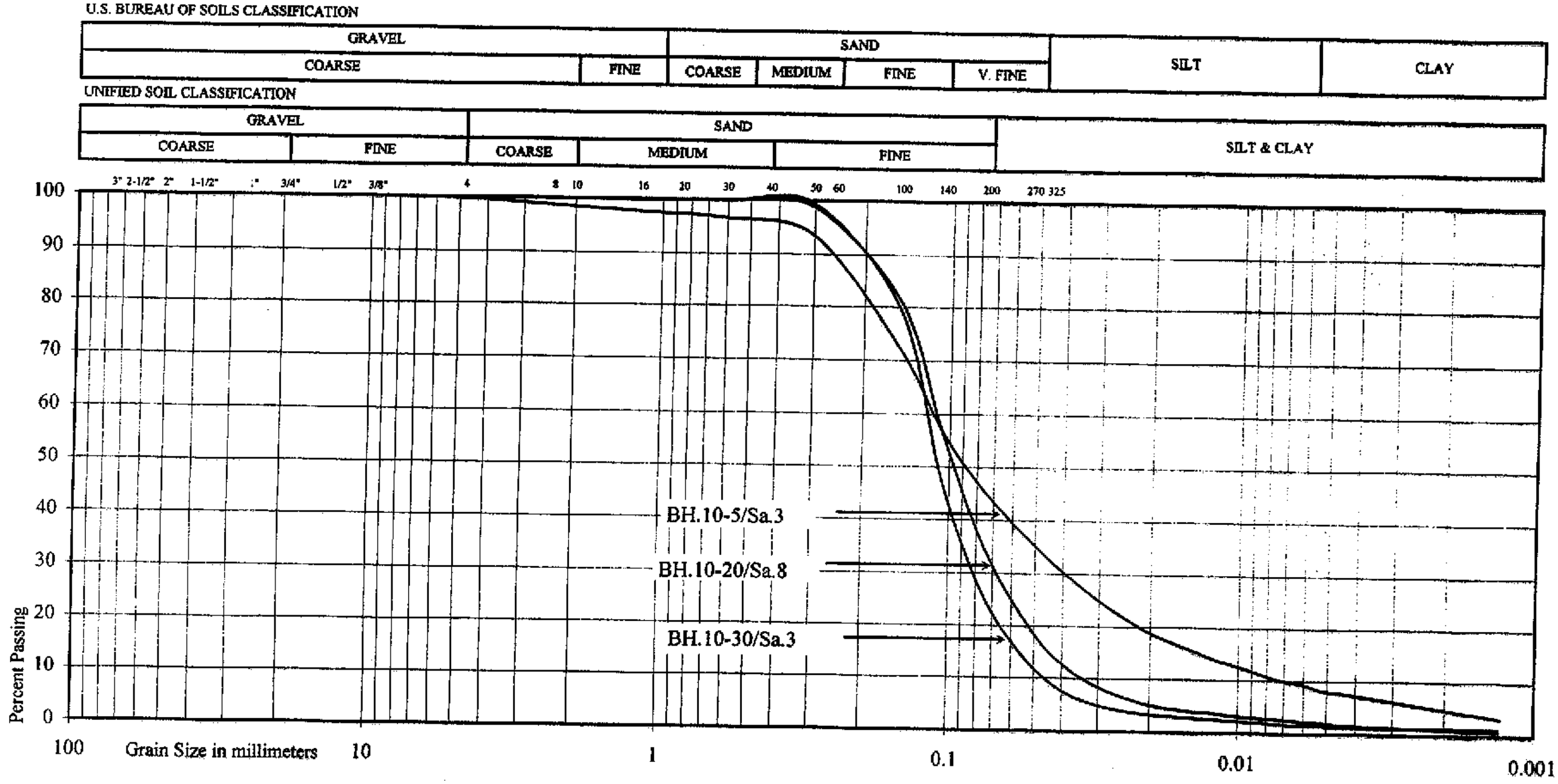
Classification of Sample [& Group Symbol]: SANDY SILT

a trace to some clay and gravel

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan

Borehole No:	10-5	10-20	10-30
Sample No:	3	8	3
Depth (m):	1.8	7.9	1.8
Elevation (m):	265.1	255.1	253.8

BH./Sa.	10-5/3	10-20/8	10-30/3
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	11	18	22
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-3}	10^{-3}

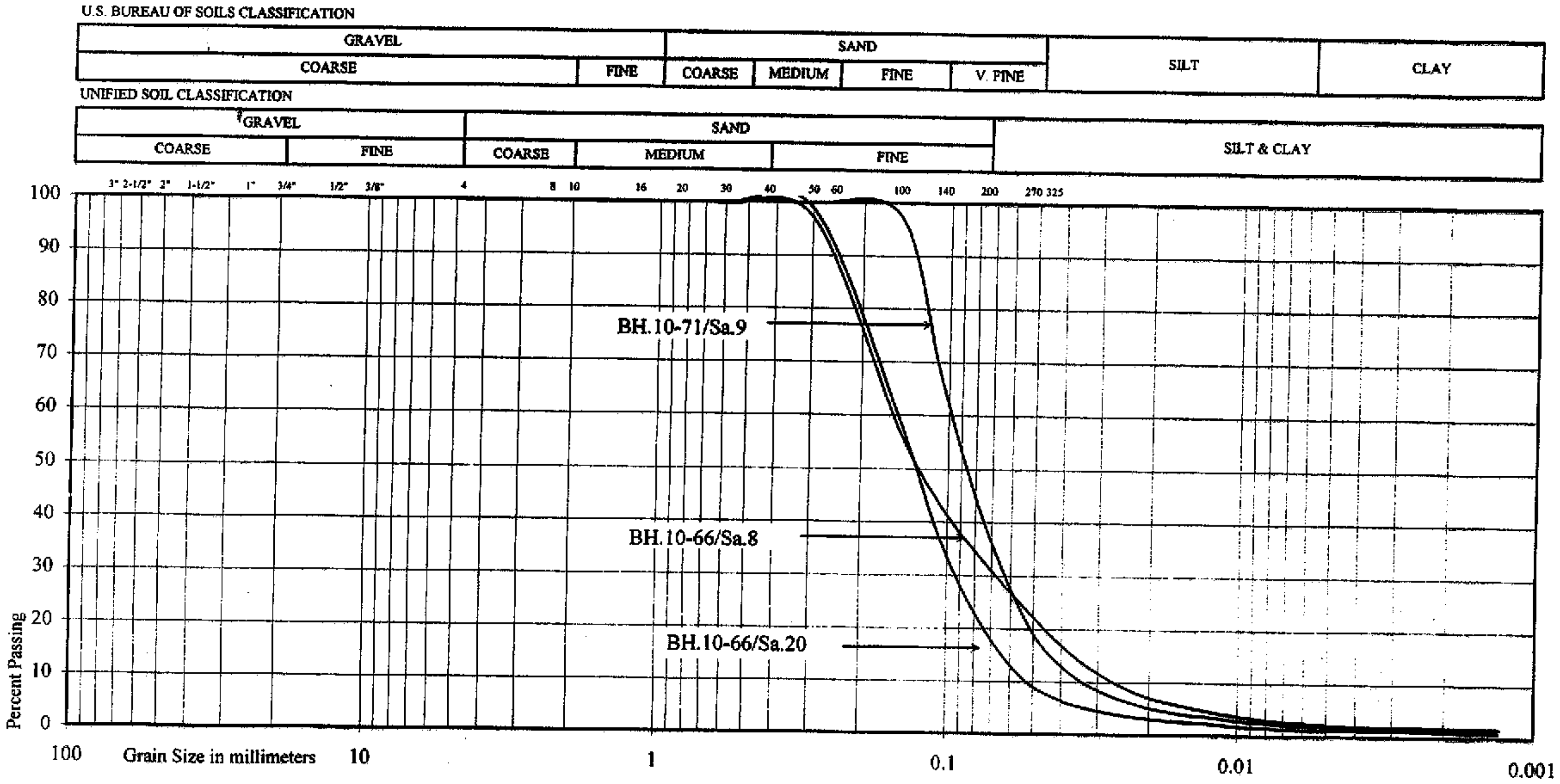
Classification of Sample [& Group Symbol]: SILTY FINE SAND
a trace of clay

Figure : 86

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan

Borehole No:	10-66	10-66	10-71
Sample No:	8	20	9
Depth (m):	7.8	26.2	6.2
Elevation (m):	256.5	238.1	245.5

BH./Sa.	10-66/8	10-66/20	10-71/9
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	21	21	21
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-3}	10^{-3}

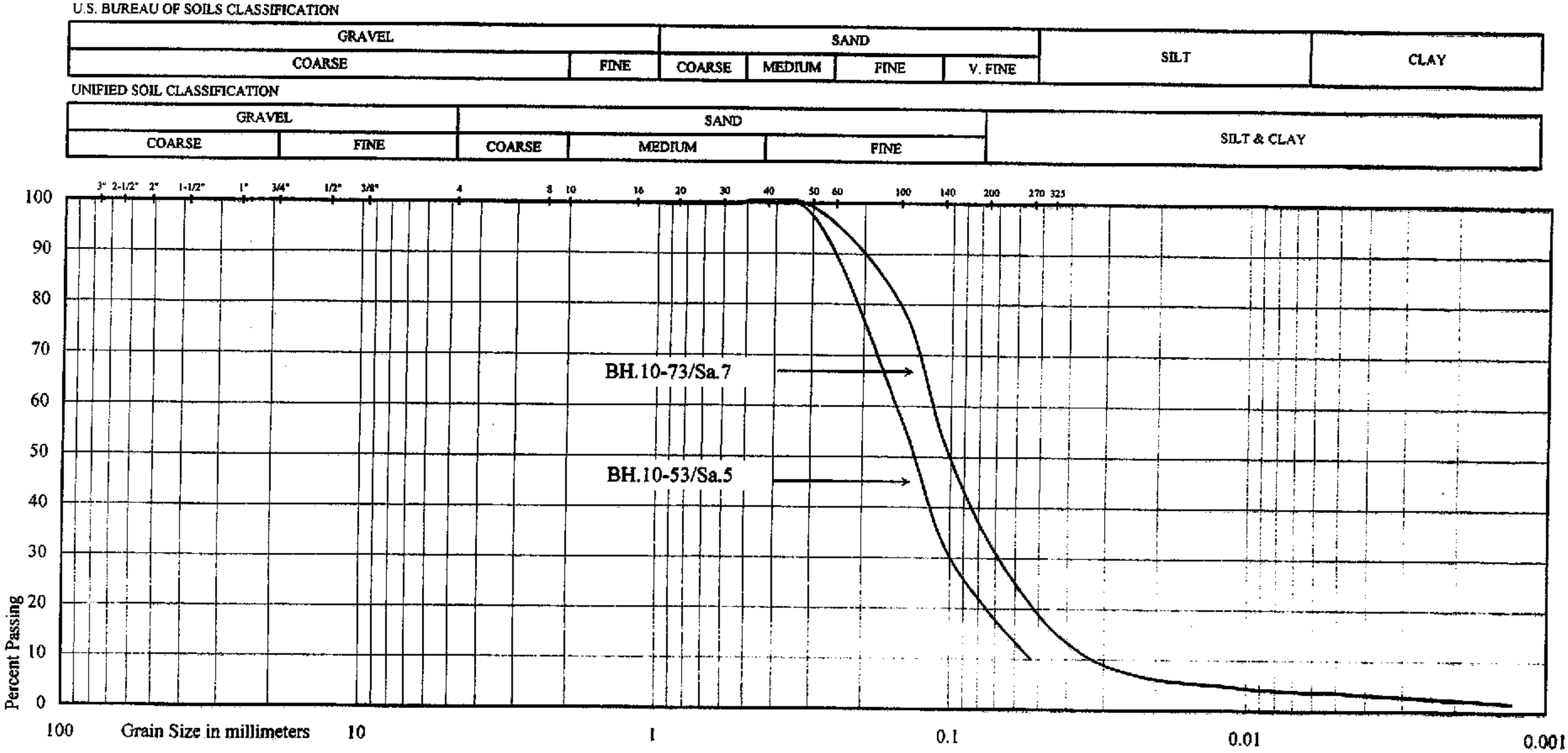
Classification of Sample [& Group Symbol]: SILTY FINE SAND
a trace of clay

Figure : 87

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project:	Proposed Urban Development	
Location:	Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan	
Borehole No:	10-53	10-73
Sample No:	5	7
Depth (m):	3.2	4.9
Elevation (m):	277.8	257.6

BH./Sa.	10-53/5	10-73/7
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	8	20
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-3}

Classification of Sample [& Group Symbol]: SILTY FINE SAND

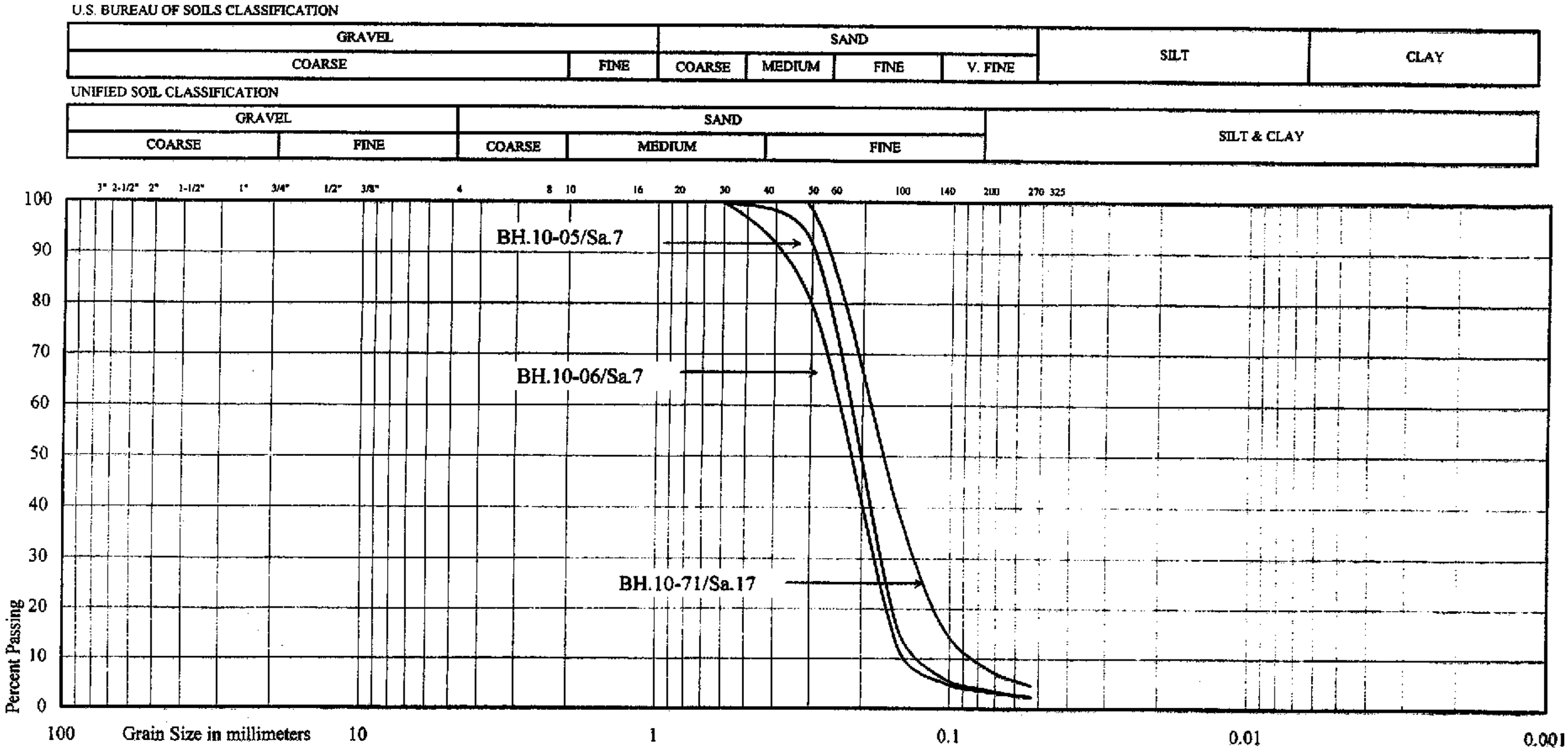
a trace of clay

Figure: 88

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project:	Proposed Urban Development		
Location:	Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan		
Borehole No:	10-05	10-06	10-71
Sample No:	7	7	17
Depth (m):	6.3	6.3	18.6
Elevation (m):	260.6	264.3	233.1

BH./Sa.	10-05/7	10-06/7	10-71/17
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	20	18	20
Estimated Permeability (cm./sec.) =	10^{-2}	10^{-2}	10^{-2}

Classification of Sample [& Group Symbol]: FINE SAND

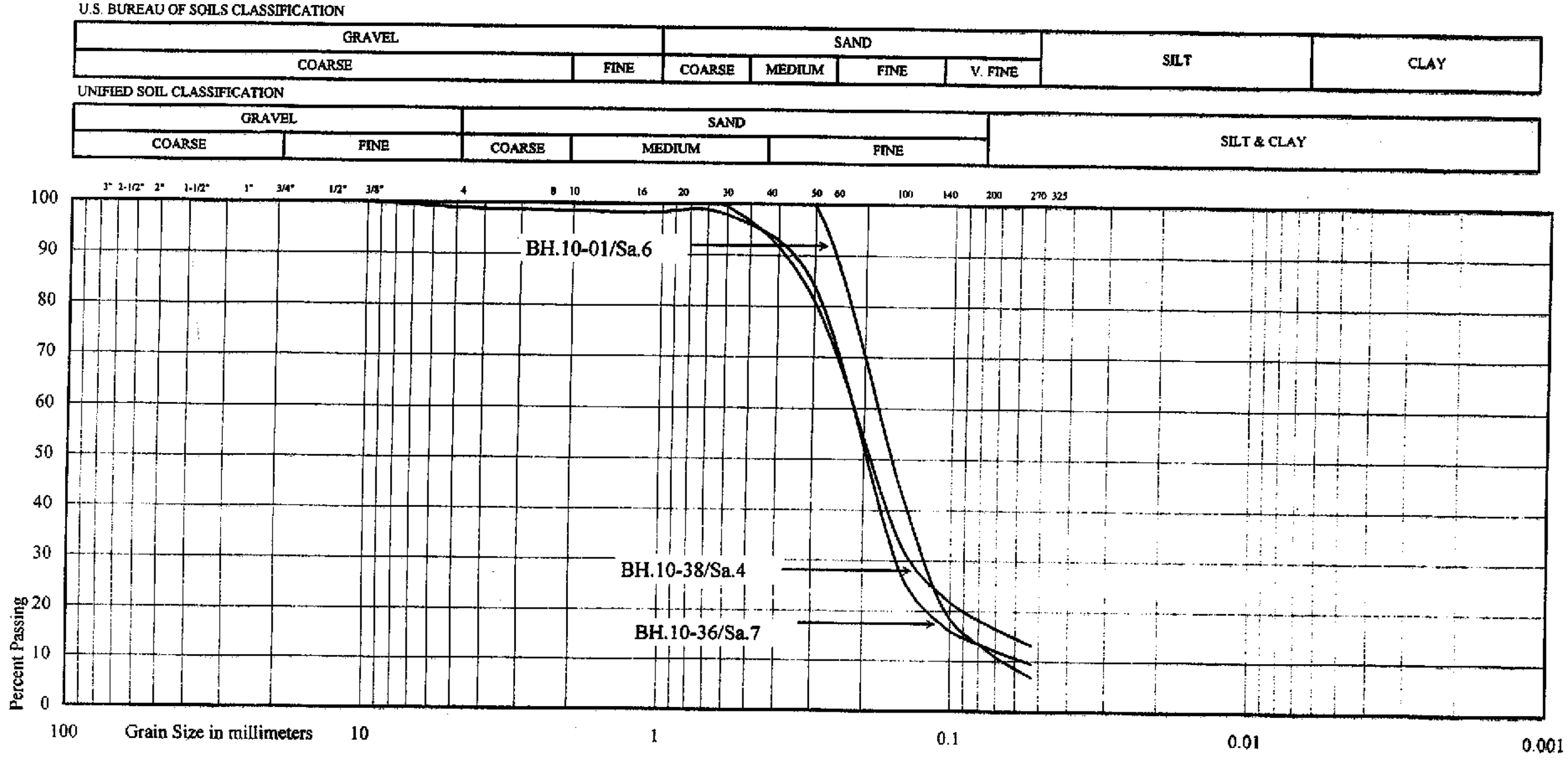
a trace of silt

Figure: 89

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project:	Proposed Urban Development		
Location:	Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan		
Borehole No:	10-01	10-36	10-38
Sample No:	6	7	4
Depth (m):	4.9	6.3	2.6
Elevation (m):	263.0	260.5	272.2

BH./Sa.	10-01/6	10-36/7	10-38/4
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	18	17	7
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-3}	10^{-3}

Classification of Sample [& Group Symbol]: FINE SAND

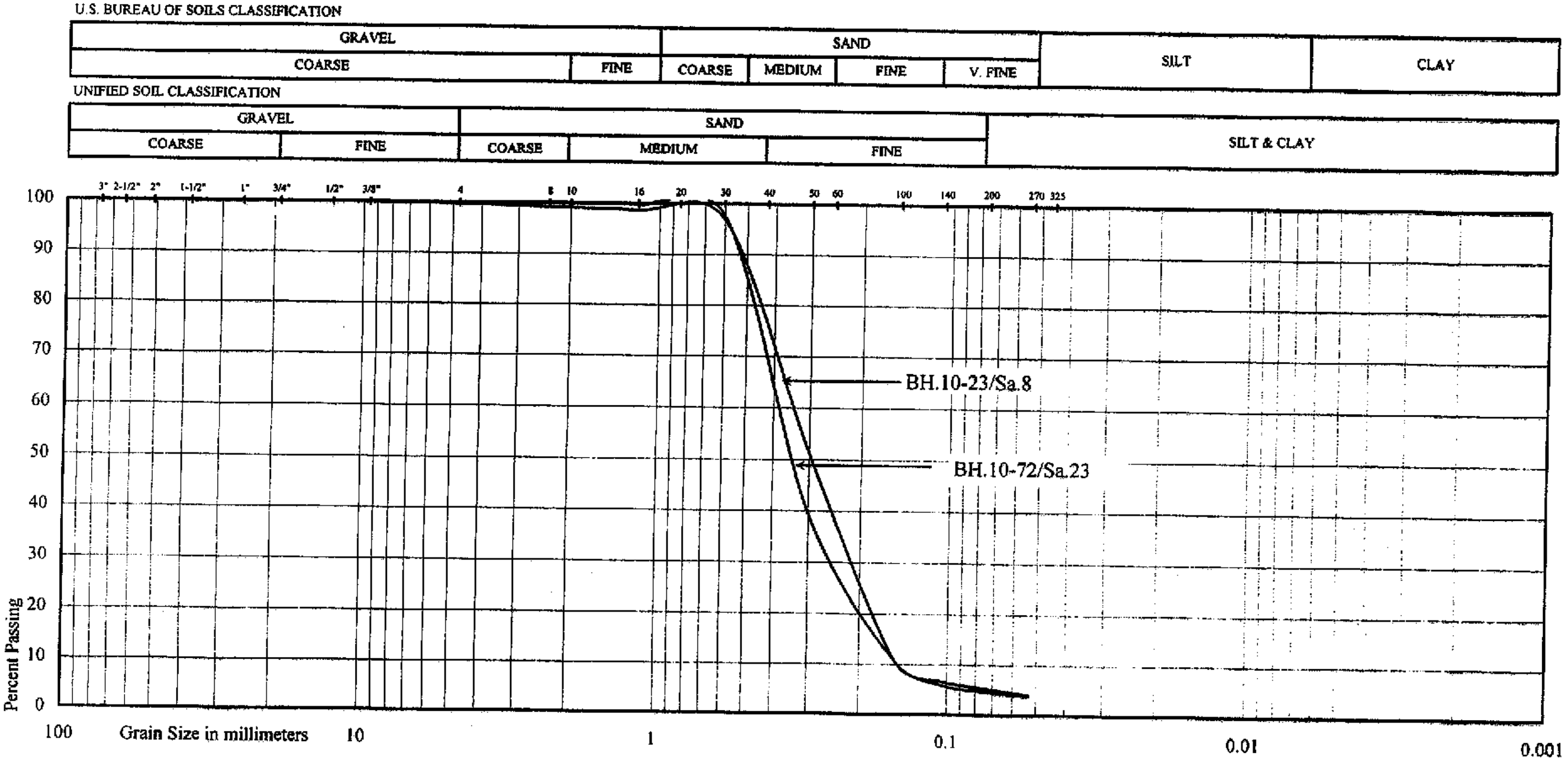
some silt and a trace of gravel

Figure: 90

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084



Project: Proposed Urban Development

Location: Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan

Borehole No:	10-23	10-72
Sample No:	8	23
Depth (m):	7.8	30.7
Elevation (m):	272.9	235.5

BH./Sa.	10-23/8	10-72/23
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	4	20
Estimated Permeability (cm./sec.) =	10^{-2}	10^{-2}

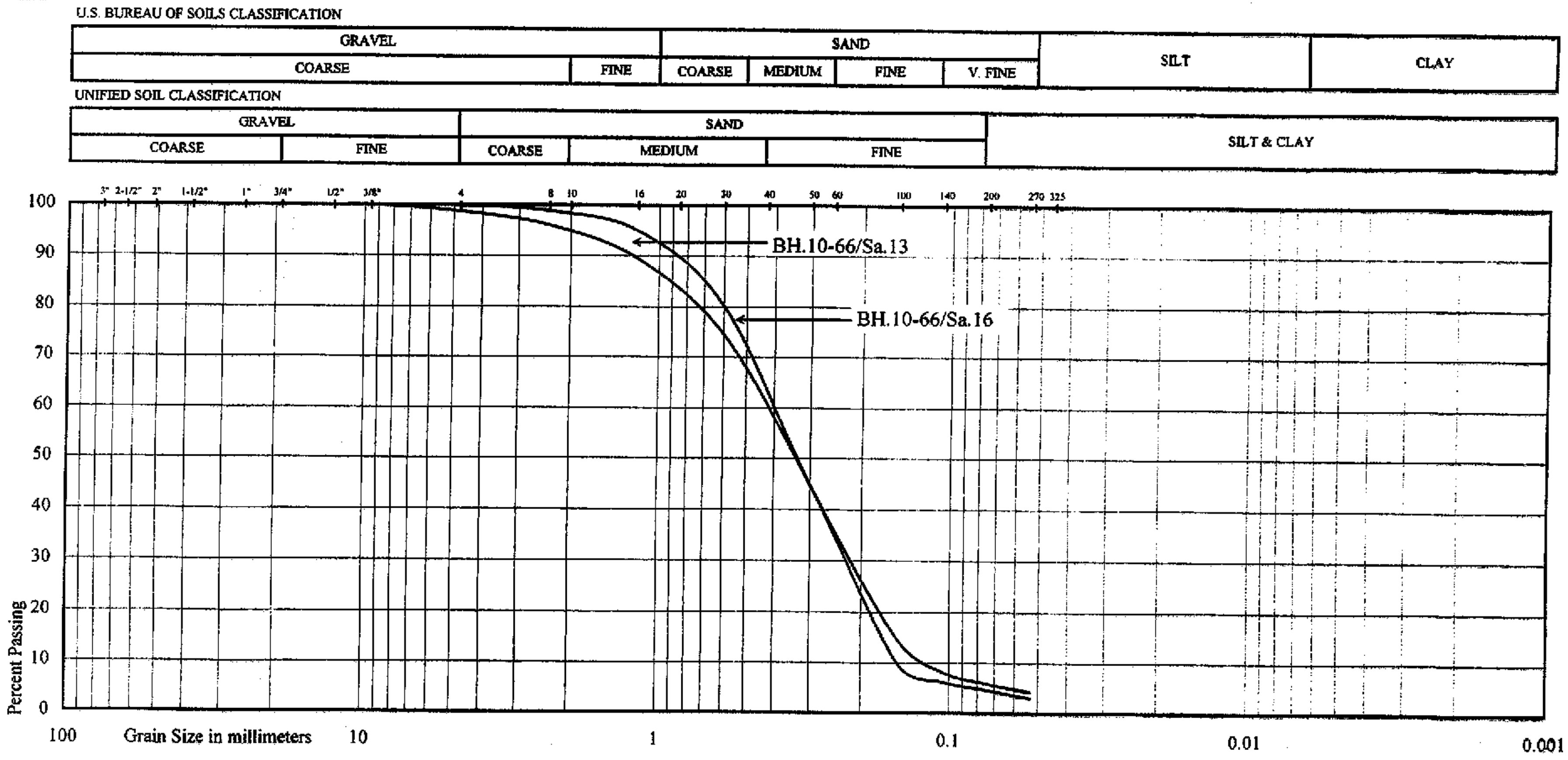
Classification of Sample [& Group Symbol]: FINE TO MEDIUM SAND
traces of silt and gravel

Figure: 91

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1007-S084

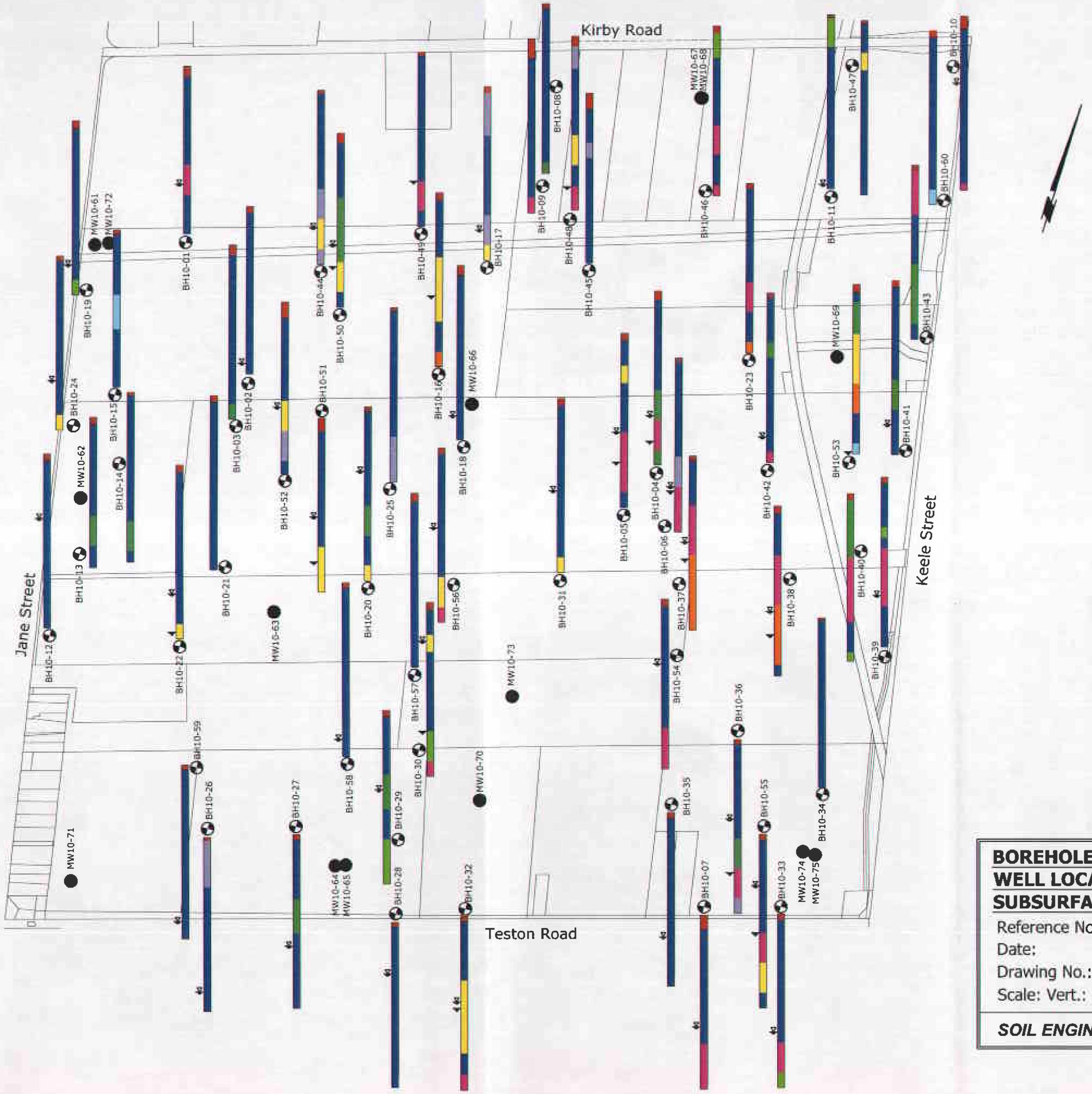


Project:	Proposed Urban Development	
Location:	Block 27, Area bounded by Keele Street, Teston Road, Jane Street and Kirby Road, City of Vaughan	
Borehole No:	10-66	10-66
Sample No:	13	16
Depth (m):	15.5	19.3
Elevation (m):	248.8	245.0

BH./Sa.	10-66/13	10-66/16
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	20	17
Estimated Permeability (cm./sec.) =	10^{-2}	10^{-2}

Classification of Sample [& Group Symbol]: FINE TO MEDIUM SAND
traces of silt and gravel

Figure: 92



LEGEND

- ● TOPSOIL/TOPSOIL FILL
- ● EARTH FILL
- ● SILTY CLAY TILL
- ● SANDY SILT TILL
- ● SILTY SAND TILL
- ● SILTY CLAY
- ● SILT
- ● SANDY SILT
- ● SILTY FINE SAND
- ● FINE SAND
- ● FINE TO MEDIUM SAND
- ▽ WATER LEVEL
- ▼ CAVE-IN

BOREHOLE AND MONITORING WELL LOCATION PLAN AND SUBSURFACE PROFILE

Reference No.:	1007-S084
Date:	January 2011
Drawing No.:	1
Scale: Vert.: 1:200	Horiz.:1:10000

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APPENDIX

BOREHOLE AND MONITORING WELL COORDINATES (NAD 83)

REFERENCE NO. 1007-S084

Borehole and Monitoring Well Coordinates (NAD 83)

Reference No. 1007-S084

Borehole	UTM (Easting)	UTM (Northing)
10-01	17T 617187.940	4859925.544
10-02	17T 617425.257	4859653.571
10-03	17T 617427.743	4859550.252
10-04	17T 618394.508	4859733.273
10-05	17T 618351.615	4859617.321
10-06	17T 618450.308	4859620.992
10-07	17T 618799.000	4858798.996
10-08	17T 617903.003	4860526.001
10-09	17T 617941.994	4860295.001
10-10	17T 618769.006	4860641.995
10-11	17T 618587.993	4860468.000
10-12	17T 617158.003	4858955.999
10-13	17T 617169.665	4859158.591
10-14	17T 617194.523	4859386.911
10-15	17T 617136.992	4859537.418
10-16	17T 617840.859	4859803.887
10-17	17T 617874.987	4860075.119
10-18	17T 617948.980	4859660.004
10-19	17T 617001.021	4859750.988
10-20	17T 617832.995	4859279.008
10-21	17T 617501.288	4859228.909
10-22	17T 617454.999	4859020.003
10-23	17T 618520.005	4860048.008
10-24	17T 617066.360	4859440.562
10-25	17T 617812.747	4859515.434
10-26	17T 617641.003	4858632.993
10-27	17T 617834.995	4858697.988
10-28	17T 618117.274	4858571.952
10-29	17T 618071.576	4858739.024
10-30	17T 618056.995	4858953.006
10-31	17T 618255.989	4859427.991
10-32	17T 618270.010	4858631.000
10-33	17T 618968.998	4858852.000
10-34	17T 618984.007	4859130.995
10-35	17T 618655.979	4859004.977
10-36	17T 618752.001	4859214.995
10-37	17T 618522.001	4859502.005
10-38	17T 618764.009	4859589.010
10-39	17T 619029.994	4859481.009
10-40	17T 618903.235	4859699.538
10-41	17T 618934.238	4859955.034
10-42	17T 618638.637	4859815.102
10-43	17T 618901.003	4860221.003
10-44	17T 617507.942	4859952.117
10-45	17T 618103.772	4860138.139
10-46	17T 618306.001	4860394.992
10-47	17T 618542.991	4860775.004
10-48	17T 618026.194	4860239.134
10-49	17T 617703.508	4860104.909
10-50	17T 617580.607	4859868.620
10-51	17T 617607.317	4859643.428
10-52	17T 617574.070	4859461.886
10-53	17T 618814.193	4859888.883
10-54	17T 618565.990	4859341.001
10-55	17T 618875.993	4859019.989
10-56	17T 618021.990	4859346.004
10-57	17T 617995.992	4859117.007
10-58	17T 617906.997	4858873.002
10-59	17T 617575.018	4858761.993
10-60	17T 618842.001	4860537.996

Monitoring Well

10-61	17T 616988.159	4859857.974
10-62	17T 617133.088	4859284.032
10-63	17T 617639.943	4859161.946
10-64	17T 617949.856	4858637.526
10-65	17T 617972.411	4858646.313
10-66	17T 617936.883	4859760.703
10-67	17T 618231.240	4860599.829
10-68	17T 618233.671	4860600.005
10-69	17T 618713.569	4860115.905
10-70	17T 618226.971	4858882.906
10-71	17T 617372.677	4858423.170
10-72	17T 617017.826	4859871.527
10-73	17T 618228.344	4859136.742
10-74	17T 618979.742	4858989.765
10-75	17T 619008.536	4858991.119