



**Soil-Eng
Limited**

CONSULTING SOIL, FOUNDATION & ENVIRONMENTAL ENGINEERS

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May 11, 2001

Reference No. 0003-S19A

Yee Hong Centre for Geriatric Care
2311 McNicoll Avenue
Scarborough, Ontario
M1V 5L3

Attention: Ms. Florence Wong

**Re: Supplementary Geotechnical Investigation
Proposed Geriatric Care Centre
Mavis Road and Preston Manor Drive
City of Mississauga**

Dear Sir:

As requested, we conducted a supplementary geotechnical investigation at the captioned site.

The purpose of this investigation was to reveal the subsurface conditions and to determine the engineering properties of the occurring soils for the design and construction of the proposed five-storey and penthouse long-term care building which has been relocated since our previous investigation.

The findings of the previous investigation, consisting of 8 boreholes which were drilled on March 21, 2000, were presented in Soil-Eng Limited's Report, Reference No. 0003-S19, dated July 2000. The information and recommendations contained in that report have been incorporated with the findings revealed by the current investigation, and the resulting geotechnical recommendations are presented in this report.



FIELD WORK

The field work, consisting of 6 boreholes to depths ranging from 7.6 to 8.1 m, was performed on May 2 and 3, 2001, at the locations shown on the Borehole Location Plan, Drawing No. 1A, attached.

The boreholes have been numbered in the 100 series to avoid confusion with the boreholes drilled for our previous investigation. The borehole locations of our previous investigation are also shown on Drawing No. 1A.

The holes were advanced 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 frequent intervals of depth. 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 elevation at each of the borehole locations was determined with reference to the site bench mark shown on Drawing No. 1A. It has a geodetic elevation of 180.27 m.

SUBSURFACE CONDITIONS

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



Beneath a layer of topsoil, 23 to 35 cm in thickness, the site is underlain predominantly by a stratum of firm to hard silty clay till. The 'N' values for the clay till increase with depth. In places, the clay till is underlain by strata of very dense silty sand till and fine sand in places.

The surficial zone of the silty clay till has been fractured by the weathering process and contains traces of roots and humus. The badly weathered till extends to a depth of $0.8 \pm$ m from the prevailing ground surface. The firm to stiff clay till is restricted within the badly weathered zone.

All the boreholes remained dry upon completion of the field work. The soil colour of the revealed soils is brown for 5 of the 6 boreholes, indicating that the soils have been oxidized. In Borehole 101 the soil colour changes from brown to grey at a depth of 4.2 m; therefore, the permanent groundwater regime lies at a depth over 4.2 m, or below the maximum investigated depth.

The yield of groundwater from the tills, if any, will be limited; however, the yield from the sand deposit may be moderate and persistent.

DISCUSSION AND RECOMMENDATIONS

Foundations

According to the borehole findings, the footings for the proposed long-term care building should be placed below the weathered soils and extended onto the sound natural soils. The recommended Maximum Allowable Soil Pressures and their corresponding founding levels are presented below:



Founding Levels

BH No.	Recommended Maximum Allowable Soil Pressures and Corresponding Founding Levels					
	250 kPa		350 kPa		500 kPa	
	Depth (m)	El. (m)	Depth (m)	El. (m)	Depth (m)	El. (m)
1	1.0 or +	177.2 or -	1.5 or +	176.7 or -	2.0 or +	176.2 or -
2	0.9 or +	177.9 or -	1.5 or +	177.3 or -	4.2 or +	174.6 or -
3	0.9 or +	178.8 or -	1.5 or +	178.2 or -	1.8 or +	177.9 or -
4	-	-	1.5 or +	178.6 or -	-	-
101	-	-	1.2 or +	177.7 or -	1.5 or +	177.4 or -
102	-	-	1.2 or +	178.2 or -	1.5 or +	177.9 or -
103	-	-	1.2 or +	178.6 or -	1.6 or +	178.2 or -
104	-	-	1.2 or +	176.6 or -	1.5 or +	176.3 or -
105	1.0 or +	179.2 or -	1.6 or +	178.6 or -	4.2 or +	176.0 or -
106	-	-	1.2 or +	177.8 or -	4.2 or +	174.8 or -

The recommended soil pressures incorporate a factor of safety 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.

The site is also suitable for caisson construction. The suitable embedded level is at a depth of 5.0 or + m below the prevailing ground surface and at least 1.0 m into the hard or very dense tills with 'N' values over 50. A Maximum Allowable Soil Pressure of 1000 kPa can be used for the design of the caissons. The ratio of the embedded soil depth to the diameter of the caisson should be at least 2:1. The centre-to-centre spacing between the caissons must be at least twice the diameter of the largest adjacent caisson base.



The footing and caisson subgrade must be examined by either a building inspector with geotechnical knowledge or by a geotechnical engineer to ensure that the condition of the footing subgrade is compatible with the designed soil-bearing pressure and requirements.

In caisson construction, the excavation must be temporarily lined for subgrade cleaning and inspection. This indicates that the size of the caissons must be at least 80 cm in diameter.

Foundations should meet the requirements specified by the Ontario Building Code, and the structure should be designed to resist a minimum earthquake force calculated using the following:

F - Foundation Factor	1.0
v- Zonal Velocity Ratio	0.05

Foundations exposed to weathering must be protected against frost action by a minimum earth cover of 1.2 m.

When the new location of the Seniors' Apartment Building is determined, further soil investigation with additional boreholes is recommended.

The other recommendations stated in our previous report are still applicable.



Yee Hong Centre for Geriatric Care
May 11, 2001

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LIMITATIONS OF REPORT

It should be noted that a Phase I Environmental Assessment has been completed and given under separate cover, Reference No. 0003-S19E, dated March, 2000. Therefore, this report deals only with a study of the geotechnical aspects of the proposed project.

This report was prepared by Soil-Eng Limited for the account of Yee Hong Centre for Geriatric Care, and for review by its designated consultants and government agencies. The material in it reflects the judgement of Ho-Yin Chiu, P.Eng., and Daniel Man, 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-Eng Limited accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL-ENG LIMITED

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Daniel Man, P.Eng.
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c Mekinda Snyder Partnership - Attention: Mr. Rollick Sweetman
C & V Engineering - Attention: Mr. Wai Cheng

ENCLOSURES

Borehole Logs
Borehole Location Plan
Subsurface Profile

Figures 1 to 6
Drawing No. 1A
Drawing No. 2A

LIST OF ABBREVIATIONS & 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" 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)	Consistency
Less than 0.25	very soft
0.25 to 0.50	soft
0.50 to 1.0	firm
1.0 to 2.0	stiff
2.0 to 4.0	very stiff
over 4.0	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

$$1 \text{ ft.} = 0.3048 \text{ metres}$$

$$1 \text{ lb.} = 0.453 \text{ kg}$$

$$1 \text{ inch} = 25.4 \text{ mm}$$

$$1 \text{ ksf} = 47.88 \text{ kN/m}^2$$



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LOG OF BOREHOLE No. 101

Mavis Rd. & Preston Manor Dr.

JOB No.: 0003-S19A

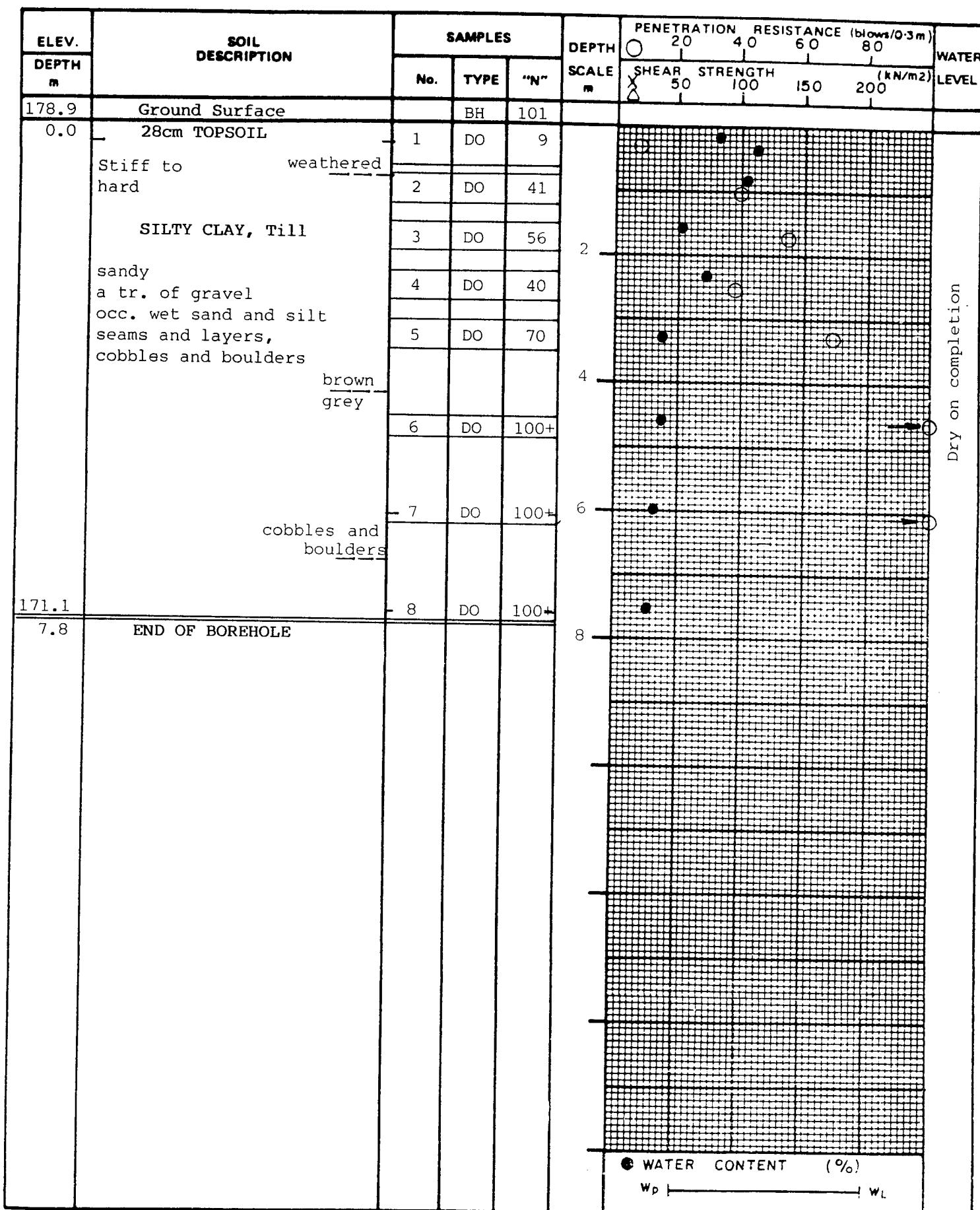
LOCATION: City of Mississauga

FIG. No.: 1

JOB DESCRIPTION: Proposed Geriatric Care Centre

METHOD OF BORING: Flight-Auger

DATE: May 3, 2001



LOG OF BOREHOLE No. 102

JOB No.: 0003-S19A

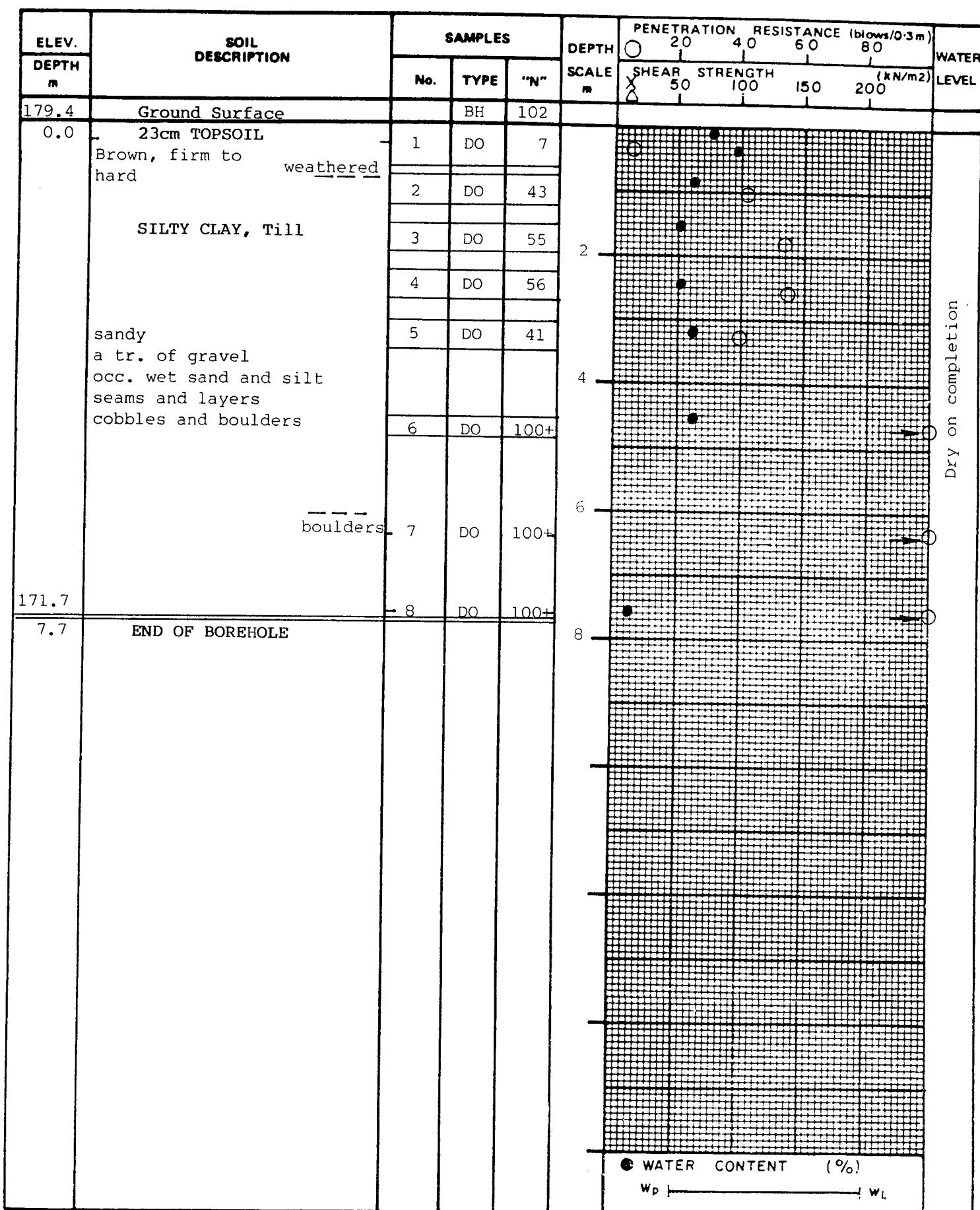
LOCATION: City of Mississauga

FIG. No.: 2

JOB DESCRIPTION: Proposed Geriatric Care Centre

METHOD OF BORING: Flight-Auger

DATE: May 3, 2001



LOG OF BOREHOLE No. 103

JOB No.: 0003-S19A

Mavis Rd. & Preston Manor Dr.

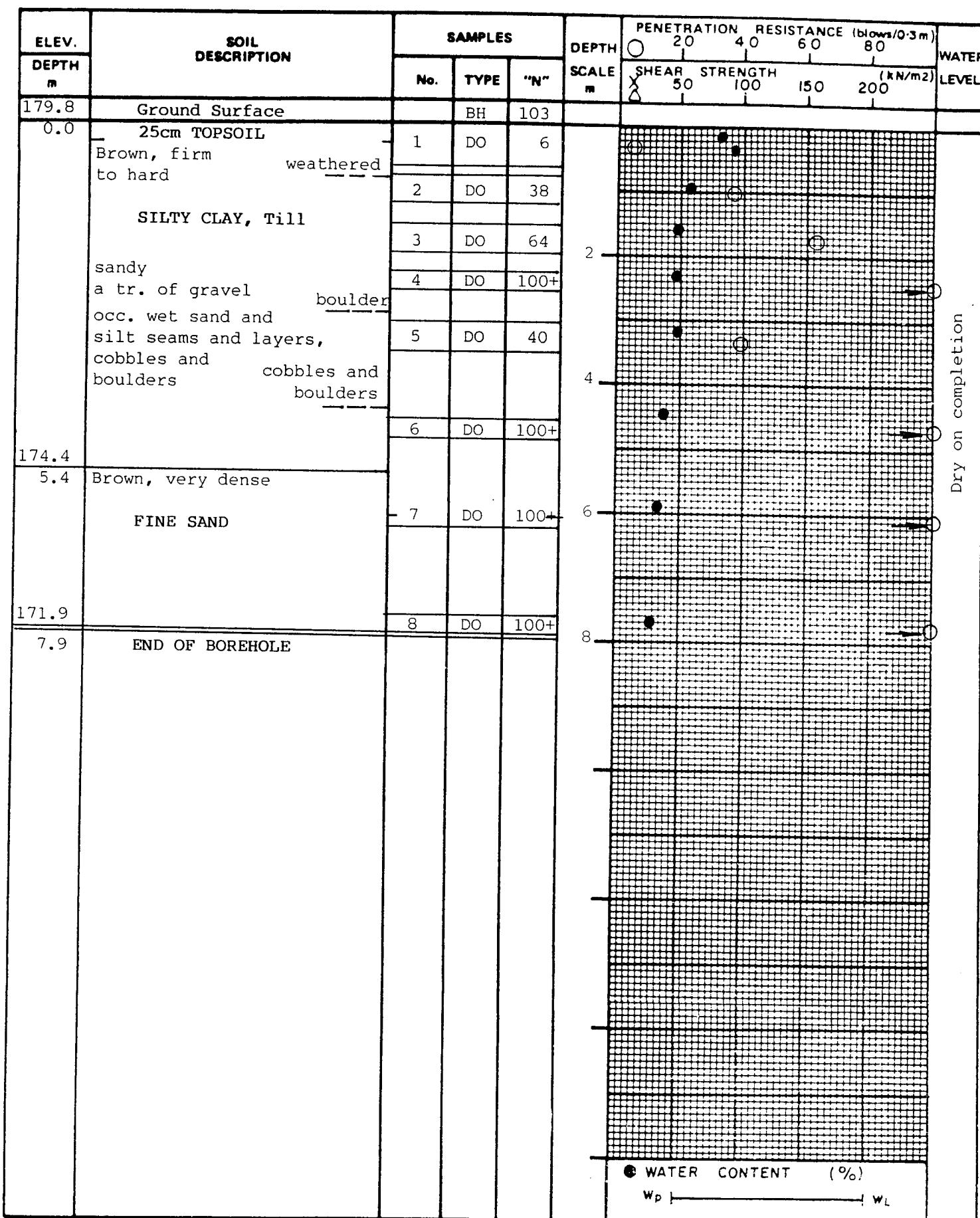
LOCATION: City of Mississauga

FIG. No. 3

JOB DESCRIPTION: Proposed Geriatric Care Centre

METHOD OF BORING: Flight-Auger

DATE: May 3, 2001



LOG OF BOREHOLE No. 104

JOB No.: 0003-S19A

Mavis Rd. & Preston Manor Dr.

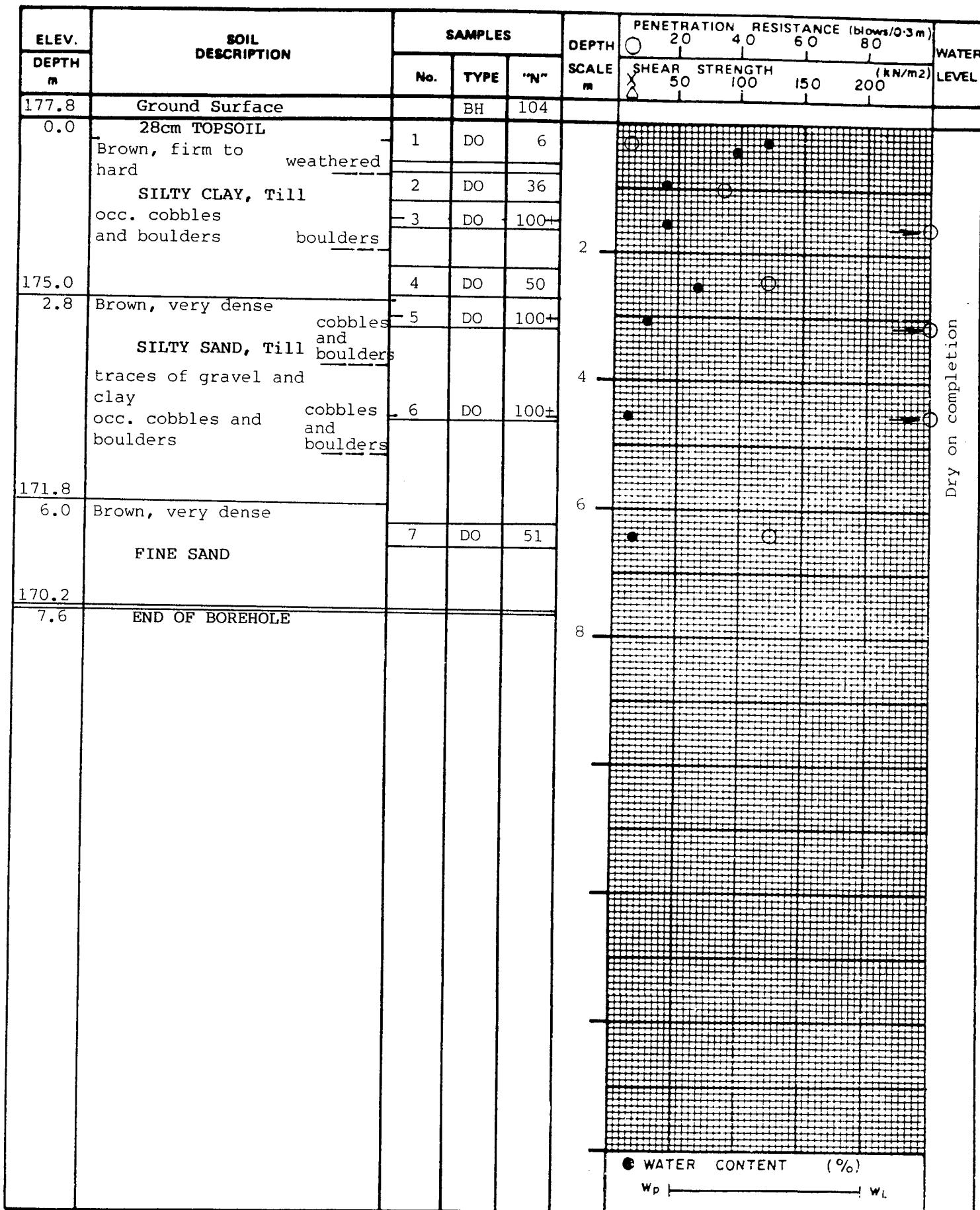
FIG. No.: 4

LOCATION: City of Mississauga

JOB DESCRIPTION: Proposed Geriatric Care Centre

METHOD OF BORING: Flight-Auger

DATE: May 2, 2001



LOG OF BOREHOLE No. 105

Mavis Rd. & Preston Manor Dr.

JOB No.: 0003-S19A

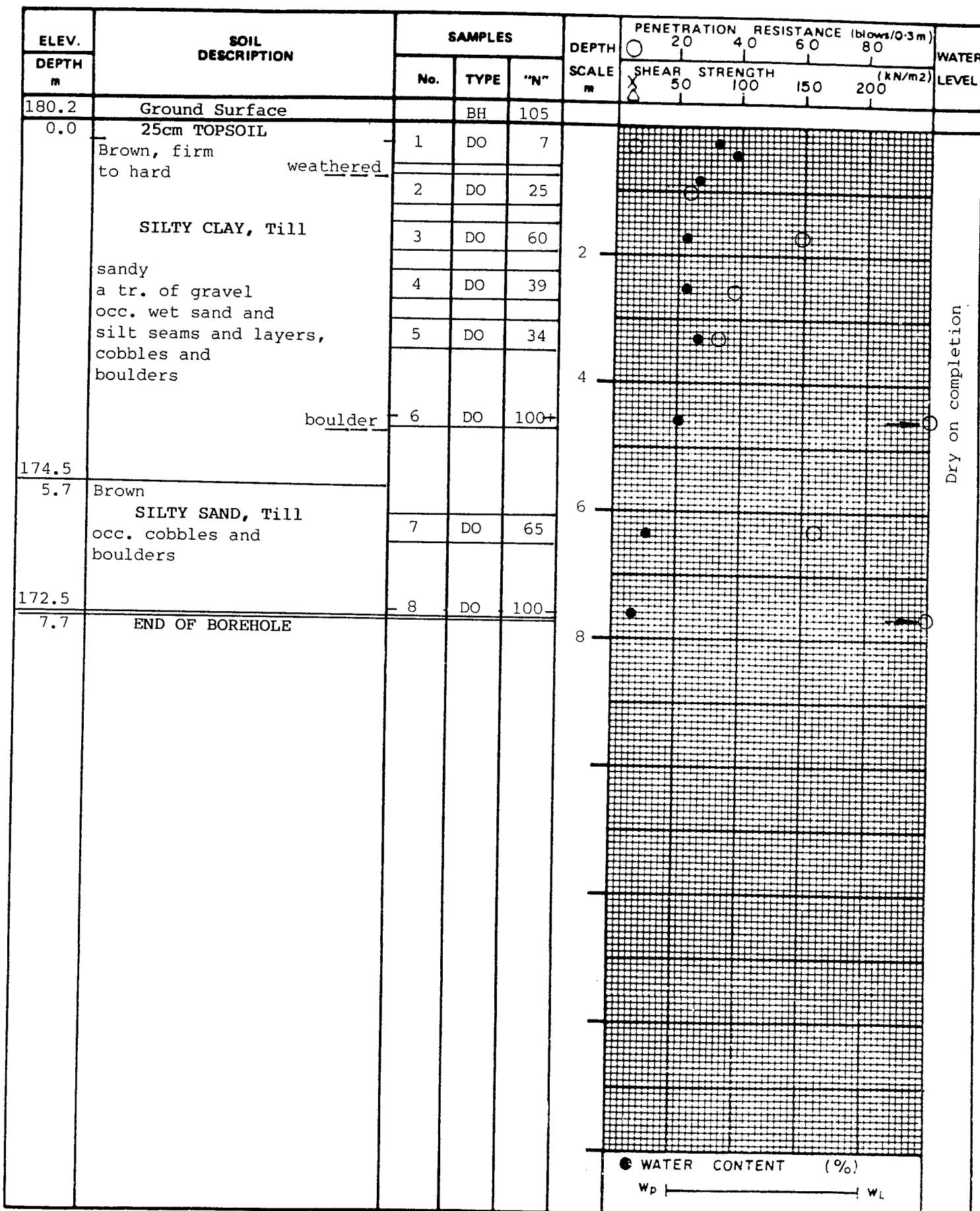
LOCATION: City of Mississauga

FIG. No.: 5

JOB DESCRIPTION: Proposed Geriatric Care Centre

METHOD OF BORING: Flight-Auger

DATE: May 2, 2001



LOG OF BOREHOLE No. 106

Mavis Rd. & Preston Manor Dr.

JOB No.: 0003-S19A

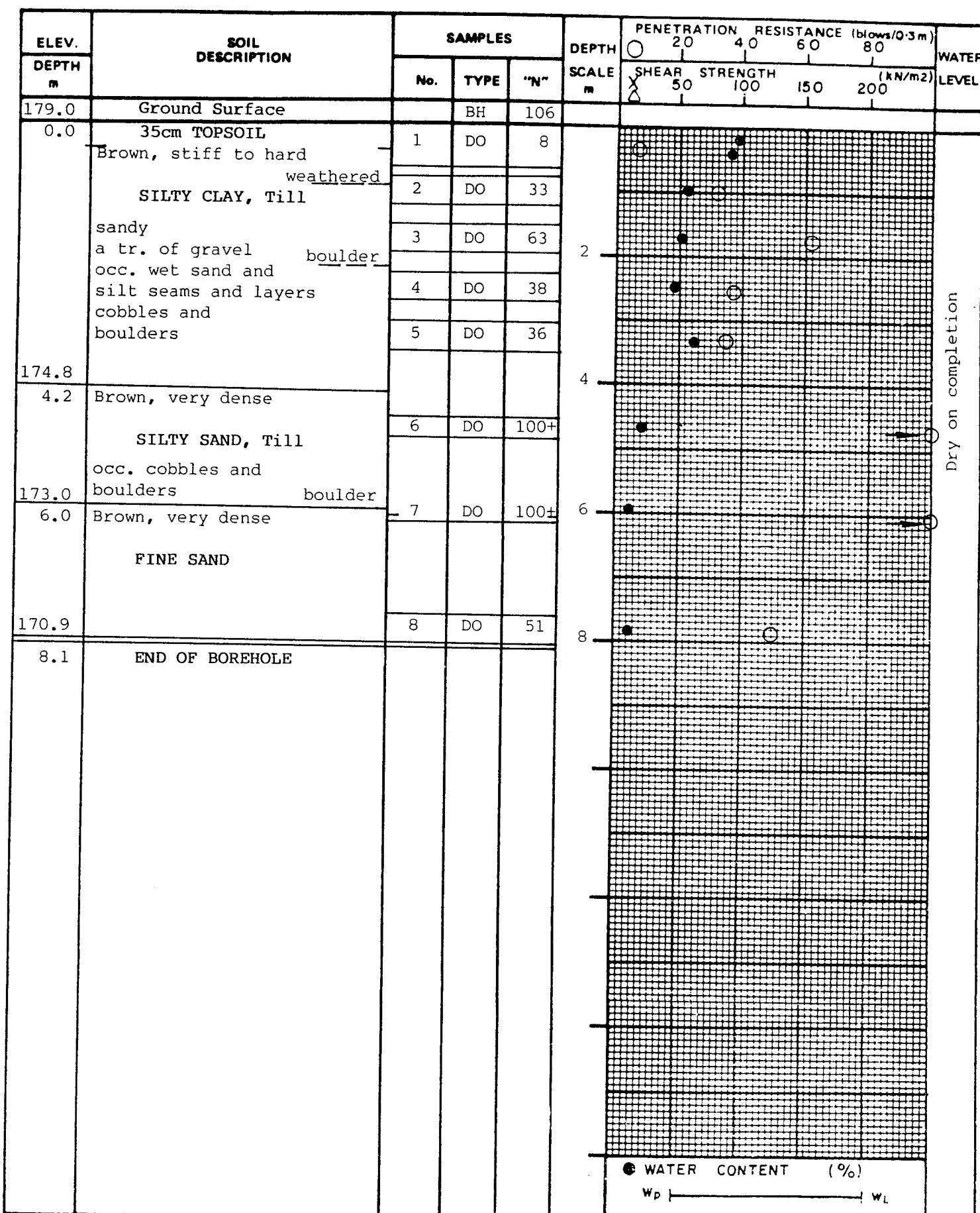
LOCATION: City of Mississauga

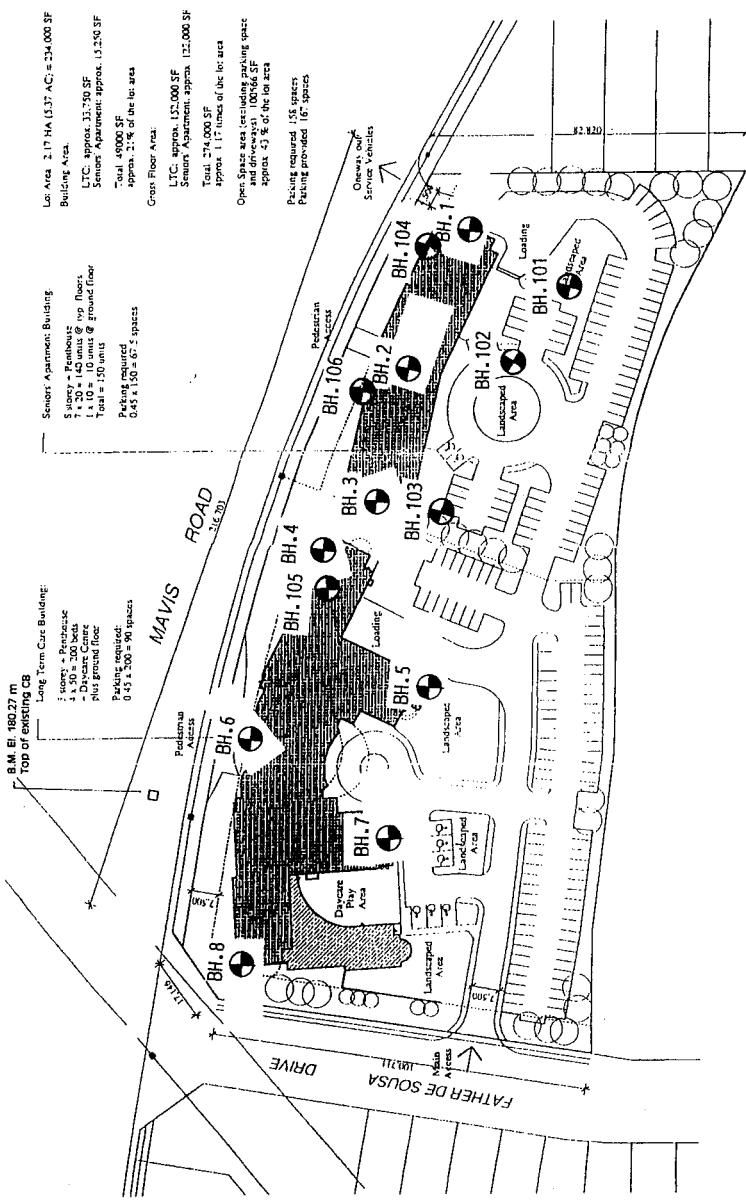
FIG. No.: 6

JOB DESCRIPTION: Proposed Geriatric Care Centre

METHOD OF BORING: Flight-Auger

DATE: May 2, 2001





BOREHOLE LOCATION PLAN



YEE HONG CENTRE FOR GERIATRIC CARE • MISSISSAUGA

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Scale - 1:1000

Drawing No. 1A

Date: May 2001.

Ref. No. 0003-S19A

1/4

6' 10"

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