TIL Toronto Inspection LTD.
GEO-ENVIRONMENTAL CONSULTANTS

REPORT ON
GEOTECHNICAL INVESTIGATION
ALEXANDRA PARK PHASE ONE
TORONTO, ONTARIO

REPORT NO.: 3552-12-G-TRI-A
REPORT DATE: MARCH 27, 2013

PREPARED FOR
TRIDEL C/O TORONTO COMMUNITY HOUSING
931 YONGE STREET, 6TH FLOOR
TORONTO, ONTARIO
M4W 2H2

110 KONRAD CRESCENT, UNIT 16, MARKHAM, ONTARIO L3R 9X2
TEL.: 905-940-8509 FAX: 905-940-8192

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APPENDIX A

1.0 INTRODUCTION

Toronto Inspection Ltd. was authorized by Toronto Community Housing to conduct a geotechnical investigation for the re-development at Alexandra Park Phase I in downtown Toronto, Ontario (hereinafter described as "the Site").

It is our understanding that the Site will be re-developed with the construction of two 14 storey buildings with two levels of underground parking and sixty-one 3 storey stacked townhouse units with a basement. The purpose of the investigation was to evaluate the subsoil and groundwater conditions at the Site in order to provide recommendations for the design and construction. In particular, geotechnical data was to be provided for:

- General founding conditions
- Foundation recommendations
- Construction recommendations
- Excavation recommendations

This report is provided on the basis of the above terms of reference and on an assumption that the design of the new building will be in accordance with the applicable building codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, our office should be consulted to review the design and to confirm the recommendations and comments provided in the report.

2.0 SITE CONDITIONS

The Site is located approximately 50m north of Queen Street West, between Cameron Street, Augusta Avenue, Vanauley Street and Carr Street extension (Street B) in Toronto, Ontario (Drawing No. 1), and is the south portion of the Alexandra Park Revitalization. The Site contained a number of low rise buildings and townhouses with open areas, consisting of landscaping, driveways and parking.

3.0 INVESTIGATION PROCEDURE

The field work was carried out between February 20 and March 7, 2013, and consisted of fifteen sampled boreholes (BH-1 to BH-15) drilled in the open areas at the Site, at the locations shown on the appended Borehole Location Plan (Drawing No. 1). Boreholes, BH-1 to BH-11, drilled within the proposed mid-rise and townhouse development areas, were terminated in the shale bedrock, at depths of 15.3m to 16.9m; except BH-4, which had to be terminated at a depth of 5.8m due to an underground obstruction. Boreholes, BH-12 to BH-15, located within proposed roadway areas, were terminated at shallower depths of 3.5m to 3.7m below the existing ground level. The boreholes were advanced using truck and track mounted drill rigs, equipped with continuous flight solid stem augers and sampling rods, supplied and operated by a drilling sub-contractor.

Soil samples were taken at 0.76 m intervals to depths of 3 m below the existing ground level. Below this depth, the sampling frequency was increased to 1.5 m. The samples were obtained using a split spoon sampler in conjunction with Standard Penetration Tests using a driving energy of 475 joules (350 ft. lbs.). Each sample was identified and logged in the field and was carefully bagged for later visual identification and laboratory testing, including moisture content determination.

Free water was recorded in the open boreholes during and on completion of drilling. Two of the boreholes, BH-1 and BH-7, were completed as observation wells, each contained a ten foot slotted screen with a silica sand filter, followed by a bentonite seal, for groundwater records.

The ground elevations, at the borehole locations, were established at the Site using "Top of CT1611 (Station: 1221974161l)", located on the east side of Augusta Avenue, opposite Carr Avenue, on multi-style apartment/building, 0.3m east from northwest corner, 0.6m above grade, as a temporary benchmark (TBM).

The geodetic elevation of 95.94m for the TBM was obtained from City of Toronto's data sheet, dated April 30, 2004.

4.0 SUMMARISED SUBSURFACE CONDITIONS

Reference is made to the appended Borehole Location Plan (Drawing Nos. 1 & 1a) and Logs of Boreholes (Drawing Nos. 2 and 16), for details of field work, including soil classification, inferred stratigraphy, and groundwater observations carried out during and on completion of borehole drilling.

Below the ground surface of pavement or topsoil at the borehole locations, the subsoil consisted of fill material, overlying a sandy silt till, silty clay till / clayey silt till, interlayers of sandy silt / silty sand and clay till deposits. Weathered shale was contacted below the clayey silt at BH-1 to BH-3 and BH-5 to BH-11 locations, at depths of 14.9m to 16.2m from grade. Brief descriptions of the subsoils, encountered at the borehole locations, are as follows:

4.1 Surface Course

Asphalt pavement, consisting of 50mm to 100mm of asphalt over granular base courses, extending to depths of of 0.2m to 0.9m from grade, was contacted at the ground surface at BH-2, BH-4, BH-5, BH-8 to BH-13 & BH-15.

At the remaining borehole locations, the ground surface consisted of topsoil, approximately 150mm to 460mm in thickness.

4.2 Fill

A layer of fill was contacted underlying the pavement structure or topsoil, at all the borehole locations. The fill consisted of a mixture of sandy silt to clayey silt, with gravel, occasional concrete rubble and brick pieces, pockets of topsoil and minor rootlets. The fill extended to depths of 0.8m and 2.7m from grade.

4.3 Sandy Silt Till

A sandy silt till deposit was contacted at all the borehole locations, underlying the fill, at depths of 0.8m to 2.7m from grade. The deposit consisted of a heterogeneous mixture of sand and silt with some gravel and clay.

Based on the Standard Penetration N-values of 14 to 54 blows for a penetration of 300 mm, the relative density of the deposit was compact to very dense, generally in compact to dense state.

Boreholes BH-12 to BH-15 were terminated in the sandy silt till deposit at depths of 3.5m to 3.7m from grade. At the remaining locations, the deposit extended to depths of 2.3m to 4.3m from grade.

The in-situ moisture content of the soil samples, retrieved from the sandy silt till deposit, ranged from 11% to 19%, indicating moist to damp conditions. Isolated higher moisture contents of more than 30% were recorded at some of the boreholes, indicating wet pockets.

4.4 Silty Clay Till / Clayey Silt Till

Underlying the sandy silt till deposit at the locations of BH-1 to BH-10, silty clayey till or clayey silt till deposits were contacted, at depths of 2.3m to 4.3m from grade. The deposit consisted of a mixture of silt and clay of low to medium plasticity, with some sand and gravel.

Based on the Standard Penetration N-values of 9 to 38 blows for a penetration of 300 mm, the consistency of the till strata was stiff to hard, generally in stiff to very stiff state.

Borehole BH-4 was terminated in the silty clay till deposit at a depth of 5.8m. At BH-1 to BH-3 and BH-5 to BH-10 locations, the deposits extended to depths of 5.5m to 8.5m from grade.

The in-situ moisture content of the soil samples from this deposit ranged from 10% to 23%, indicating moist to damp conditions.

4.5 Sandy Silt / Silty Sand

Underlying the silty clay till / clayey silt till deposits at BH-1, BH-3, BH-6, BH-7, BH-9 & BH-10 and underlying the clayey silt deposit at BH-2, BH-5, BH-8 & BH-11, at depths of 6.7m and 10.1m from grade, sandy silt / silty sand deposits were contacted. The deposit consisted of varying amounts of sand and silt with some clay and gravel.

Based on the Standard Penetration N-values of 26 to 73 blows for a penetration of 300 mm, the relative density of the deposit was compact to very dense, generally in dense to very dense state. The deposit extended to depths of 10.1m to 11.9m from grade.

The in-situ moisture content of the soil samples retrieved from the sandy silt / silty sand deposits ranged from 12% to 22%, indicating moist to damp conditions.

4.6 Clayey Silt

Underlying the silty clay till deposit, at the locations of BH-2, BH-5, BH-8 and underlying the sandy silt till at BH-11 location, a clayey silt deposit was contacted at depths of 2.9m to 7.0m from grade. The deposit consisted of a mixture of silt and clay, with thin layers of sandy silt or fine to medium sand.

Based on the Standard Penetration N-values of 9 to 50 blows for a penetration of 300 mm, the consistency of the deposit was stiff to hard, generally in very stiff state. The clayey silt deposit extended to depths of 6.7m to 10.1m from grade.

The in-situ moisture content of the soil samples from this deposit ranged from 8% to 22%, indicating moist to damp conditions.

A lower clayey silt deposit was contacted underlying the sandy silt / silty sand deposit, at the locations of BH-1 to BH-3, BH-5 to BH-11, at depths of 10.1m to 11.9m form grade. The deposit consisted of a mixture of silt and clay of low to medium plasticity, with thin layers of sandy silt.

Based on the Standard Penetration N-values of 40 to more than 100 blows for a penetration of 300 mm, the consistency of the deposit was hard. The clayey silt deposit extended to depths of 14.9m to 16.2m from grade.

The in-situ moisture content of the soil samples from this deposit ranged from 10% to 33%, indicating moist to damp conditions with some wet pockets.

4.7 Weathered Shale

Underlying the lower clayey silt deposit at the locations of BH-1 to BH-3, BH-5 to BH-11, at depths of 14.9m to 16.2mm from grade, stratified shale with seams of clayey silt was contacted. The shale could be easily penetrated by regular solid stem augers to depths of 15.3m to 16.9m from grade, indicating weathered shale. The borehole was terminated in the shale at depths of 15.3m to 16.9m from grade. The quality of the shale bedrock, however, was not established by coring into the shale bedrock.

4.8 Ground Water

Free water was recorded in the open boreholes at BH-1 to BH-3 & BH-6 to BH-11, at depths of 3.0m to 12.3m from grade, throughout the drilling and sampling process. During the groundwater monitoring round, conducted on March 26, 2013, the water levels were documented in the observation wells at BH-1 and BH-7, at depths of 6.71m (elevation of 88.05m) and 6.22m (elevation of 86.74m) from grade, respectively. Based on the field observations and the moisture content profiles of the soil samples obtained from the boreholes, it is our opinion that the documented water levels represent the a continuous groundwater table in the sandy silt and silty sand deposits at the elevations of 88.0m to 86.6m. The groundwater can vary and in subject to seasonal fluctuations. In addition, perched water may occur in the sand layers and/or saturated sand seams in the silt/clay deposits.

5.0 RECOMMENDATIONS

We understand that the re-developed of the Site, after demolition and removal of the existing structures, will consist of two 14 storey buildings with two levels of underground parking (Blocks 11 & 13) and five 3 storey stacked townhouse units with basements (Blocks 10, 14 & 15) and roadways (Blocks 20, 21 & 22).

Based on the information provided by the architects for the site, we understand that the slab-on-grade of the two levels of underground parking will be at elevation of 85.7m for Block 11 and 86.2m for Block 13. We have assumed that the founding level of the structures will be approximately 1.0m below the above slab-on-grade elevations, i.e., at or below elevations of 84.7m (Block 11) and 85.2 m (Block 13).

For the townhouse development, the slab-on-grade of the basements will be at elevations of 91.47m to 92.27m for Block 10, 92.68m for Block 14 and 93.08m for Block 15. We have assumed that the founding level of the structures, with basements, will be approximately 0.6m below the above slab-on-grade elevations, i.e. at or below elevations of 90.9m to 91.7m for Block 10, 92.1m for Block 14 and 92.5m for Block 15.

5.1 Foundations

The subsoils, at the assumed founding depths, vary considerably. Based on the subsoil conditions, encountered at the borehole locations, the recommended foundation design bearing pressures are tabulated below:

14 Storey Buildings

Block No.	Reference BH No.	Assumed Founding Elevation	Subsoil Condition at the Assumed Footing Elevation	Design Bearing Pressures
11	BH-5, BH-6, BH-7, BH-9, BH-10, BH-11	at or below an elevation of 84.7m	Silty Sand to Sandy Silt or Clayey Silt	400 kPa (SLS) 600 kPa (ULS)
13	BH-1, BH-2, BH-3, BH 4*, BH-8	at or below an elevation of 85.2m	Silty Sand to Sandy Silt or Clayey Silt	400 kPa (SLS) 600 kPa (ULS)

Note: BH-4* in Block 13 was terminated at a depth of 5.8m from grade, due to an underground obstruction. Based on the general subsoil stratigraphic units of the surrounding soil, the subsoil at this borehole is assumed to be similar.
SLS: Serviceability Limit State
ULS: Factored Ultimate Limit State

Alternatively, cast-in-place drilled caissons, founded approximately 1m in the shale bedrock, at or below the elevation of 77.5m, can be used to support the proposed mid-rise building in Blocks 11 and 13, designed for bearing pressures of 4 MPa at ULS. The bearing capacity of caissons at SLS need not be considered.

Higher design bearing pressures of up to 8MPa can used for drilled cast-in-place caisson, founded in the sound shale bedrock. To utilize this bearing pressure, the bedrock will have to be cored to determine the elevation of the sound shale.

The groundwater in the silty sand and sandy silt deposits appears to be under slight hydrostatic pressure. It will, therefore, be necessary to use temporary liners to prevent ingress of wet sand / silt and the groundwater into the caissons. The temporary liners can be withdrawn only after concrete of the caissons has been filled to the cut-off level.

There is no official rule governing the footing depth for a fully enclosed unheated garage. Unmonitored experience in the past has shown that footing depths of less than the frost penetration depths 1.2 m have been adequate. For the two levels of underground parking, the interior columns / walls and the perimeter wall footings can be founded at depths of 0.9m and 0.8m respectively below the top of the garage slab. However, footings adjacent to the fresh air ducts, the entrance of the garage and any other areas which may be exposed to the outside, a minimum frost cover of 1.2 m should be provided. In addition, a nominal 50 mm of Styrofoam insulation should be provided under the floor slab within the close proximity to the fresh air ducts.

Townhouses

Block No.	Reference BH No.	Assumed Founding Elevation	Subsoil Condition at the Assumed Footing Elevation	Design Bearing Pressures
10	BH-9, BH-10, BH-11	at or below an elevations of 90.9m to 91.7m	Sandy Silt Till or Silty Clay Till*	120 kPa (SLS) 180 kPa (ULS)
14 & 15	BH-3, BH-8,	at or below an elevations of 92.1m or 92.5m	Sandy Silt Till*	120 kPa (SLS) 180 kPa (ULS)

Note: * if fill is encountered at the founding level, the footings will have to be taken deeper and founded on the native undisturbed soil

Alternatively, cast-in-place drilled caissons, founded approximately 1m in the shale bedrock, at or below the elevation of 77.5m, can be used to support the proposed townhouse units in Blocks 10, 14 & 15, designed for bearing pressures of 4 MPa at ULS. The bearing capacity of caissons at SLS need not be considered.

The groundwater in the silty sand and sandy silt deposits appears to be under slight hydrostatic pressure. It will, therefore, be necessary to use temporary liners to prevent ingress of wet sand / silt and the groundwater into the caissons. The temporary liners can be withdrawn only after concrete of the caissons has been filled to the cut-off level.

The total and differential settlement of the footings, founded as recommended above, will not exceed 25mm and 20mm, respectively.

It should be noted that the recommendations for foundation have been analysed by ***Toronto Inspection Ltd.*** from the information obtained at the borehole location. Due to varying competence of the subsoils, the foundation design bearing pressures must be reviewed by Toronto Inspection Ltd., before finalisation.

5.2 Floor Slab Construction

The subsoil under the proposed slab-on-grade for the two levels of underground parking will consist of silty clay till or clayey silt deposits. The static water level in the silty sand and sandy silt is above the proposed slab-on-grade elevation of the mid-rise buildings at Blocks 11 and 13. We recommend that a network of subfloor drains should be installed to maintain the water level below the slab-on-grade. The subfloor drains should be installed in a grid pattern, less than 6 m on centres, at or below a depth of 600 mm from the top of slab-on-grade. The drains should be installed on a positive gradient, leading to the frost free sump from where the water can be removed by pumping.

The subsoil under the proposed slab-on-grade for the basement of townhouses will consist of sandy silt till, silty clay till or clayey silt deposits.

A minimum of 150 mm of OPSS Granular A or its equivalent should be used as a moisture barrier between the subsoil and the slab-on-grade.

Unless wet sand seams were encountered at the slab-on-grade elevation of the townhouses at Blocks 10, 14 and 15, it is our opinion that subfloor drains will not be required below the slab-on-grade.

5.3 Earthquake Consideration

The Ontario Building Code requires that all buildings be designed to resist earthquake forces. The Soil Classification for Seismic Site Response, in accordance with Table 4.1.8.1.A of the Ontario Building Code of Canada, is Class C (very dense soil) for Blocks 11 and 13 and Class D (stiff soil) for Blocks 10, 14 and 15.

The acceleration and velocity based site factors, Fa and Fv, should conform to Tables 4.1.8.4.B and 4.1.8.4.C. These values should be reviewed by the Structural Engineer.

5.4 Excavation and Backfilling

Based on the water level monitoring records in the observation wells, the current static groundwater at an average elevation of 87.5m. is above the slab-on-grade elevations for the two 14 storey buildings, indicating that the groundwater in the silty sand and sandy silt deposits appears to be under slight hydrostatic pressure.

No excavation can be carried out, below the current static groundwater table without dewatering the site.

All excavations should comply with the Ontario Occupational Health and Safety Act. Any excavation deeper than 1.2m should be sloped back to a safe angle of around 45°.

In areas where an open excavation slope cannot be used, a shoring system will have to be used to support the vertical faces of the excavation. The shoring design parameters and our recommendations on the installation and testing of the shoring system are provided in Appendix A of this report.

The on site excavated material, separated from topsoil and organics, can be reused for site grading and trench backfill. In order to achieve the specified degree of compaction, drying of the on-site material may be required prior to placement and compaction. Therefore, it is recommended that the excavation and backfilling process should be conducted in the dry and frost free season. Any unsuitable fill, such as topsoil and other compressible fill, may be reused in landscape areas, subject to the approval of the landscape architect.

Backfill around catch basins, manholes and narrow trenches should consist of imported granular material, and should be compacted using a medium or light vibratory equipment.

5.5 Groundwater Control

Based on the water level monitoring records in the observation wells, the current static groundwater at an average elevation of 87.5m, is above the slab-on-grade elevations for the two 14 storey buildings, indicating that the groundwater in the silty sand and sandy silt deposits appears to be under slight hydrostatic pressure. No excavation can be carried out, below the current static groundwater table without dewatering the site.

Due to the fine nature of the sandy silt / silty sand deposit, we recommend that vacuum well point system should be used for lowering of the water table. The dewatering system should be designed by an experienced dewatering contractor to lower the water table a minimum of 0.5m below the lowest footing elevation.

5.6 Lateral Earth Pressures

Where subsurface walls will retain unbalanced loads, the lateral earth pressure may be computed using the following equation:

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

where P = Lateral earth pressure kPa
K = Lateral earth pressure coefficient 0.4
γ = Bulk unit weight of the soil 21.0 kN/m^3
H = Depth of the wall below the finish grade m
q = Surcharge loads adjacent to the basement wall kPa

The equation assumes that a permanent free draining system will be provided to prevent the buildup of hydrostatic pressure next to the wall.

The slab-on-grade for the townhouses is higher than the slab-on-grade of the 14 storey buildings. Unless cast-in-place caissons are used as a foundation for the townhouses, the weight of the townhouses must be taken as a surcharge to estimate the lateral earth pressure for the design of the perimeter walls of the two level underground parking.

5.7 Permanent Perimeter Drainage

Permanent perimeter drains should be provided around the basement structure. At the shoring location, the permanent perimeter drain should consist of a prefabricated continuous blanket of Miradrain 6000 or its equivalent, as shown in Figure No. 1. The installation of this type of vertical drainage system and its connections should be carried out as per the manufacturer's specifications. At open cut excavation, details of the perimeter drains and backfill are shown in Figure No. 2.

5.8 Pavement Construction

The existing on-site material contains sandy silt to clayey silt. The following pavement design is recommended based on the assumption that perforated sub-drains will be installed to prevent buildup of water in the granular bases of the pavement:

		Light Duty Parking	Heavy Duty Fire Routes
Asphaltic Concrete	OPSS HL3 or equivalent	25mm	40mm
	OPSS HL8 or equivalent	40mm	60mm
Base:	OPSS Granular A or 20mm crusher-run	150mm	150mm
Sub-base:	OPSS Granular B or 50mm crusher-run	200mm	300mm

The above pavement thicknesses are based on the favourable site conditions and the construction being carried out during the drier time of the year and that the subgrade is stable, not heaving under construction traffic. If the subgrade is wet and unstable, additional thickness of sub-base material may be required.

The contractor must allow for removal of topsoil, tree and tree stumps / root system, any deleterious fill and material with high organic content at the proposed pavement area. Following site grading, the subgrade of the entire pavement should be proof-rolled using a heavy vibratory roller. Any soft spots revealed by the proof-rolling should be subexcavated and replaced with approved dry material and compacted to at least 95% of the Standard Proctor maximum dry density (SPMDD) to 300mm below the subgrade level. The upper 300mm of the subgrade should be compacted to 98% SPMDD.

Provision should be made for the water to drain out of and not collect in the granular base courses for the pavement to function properly. Perforated subdrain should be provided, extending to a distance of 3m in all directions of catch basins, and continuously in locations where a drop in the subgrade elevation is relevant, such as beside the ramp or concrete sidewalk. The subdrains should be at least 800mm below the road pavement level, and installed on a positive gradient to allow for a free flow of water. The backfill above the drains should comprise of free draining Granular B or its equivalent and should be continuous with the granular subbase of the pavement.

Catch basins and manholes should be backfilled with OPSS Granular B material. The catch basins should be perforated just above the drain level and the weep holes should be screened with a filtered fabric. This will help the pavement structure as well as alleviate the differential movement of the catch basins or the manholes due to the frost action.

6.0 GENERAL STATEMENT OF LIMITATION

The comments and recommendations presented in this report are based on the subsoil and ground water conditions encountered at the borehole locations, indicated in the Borehole Location Plan, and are intended for the guidance of the design engineer.

We consider this report to be representative of the subsurface conditions at the subject property. The soil and the ground water conditions between and beyond the borehole locations may differ from those encountered at the time of our investigation. Any contractor bidding on, or undertaking the works, should decide on their own investigations and interpretations of the ground water and the subsoil conditions between the borehole locations. Any use and / or the interpretation of the data presented in this report, and any decisions made on it by the third party are the responsibility of the third party. ***Toronto Inspection Ltd.'s*** responsibility is limited to the accurate interpretation of the soil and ground water conditions prevailing in the location investigated by us and accept no responsibility for the loss of time and damages, if any, suffered by the third party as a result of decisions or actions based on this report.

We trust that you will find this report complete within our terms of reference. Should you have any questions regarding the information provided, or when we may be of service to you during the construction phase, please contact this office.

Yours very truly
TORONTO INSPECTION LTD.

S. WANG
March 27, 2013

David S. Wang

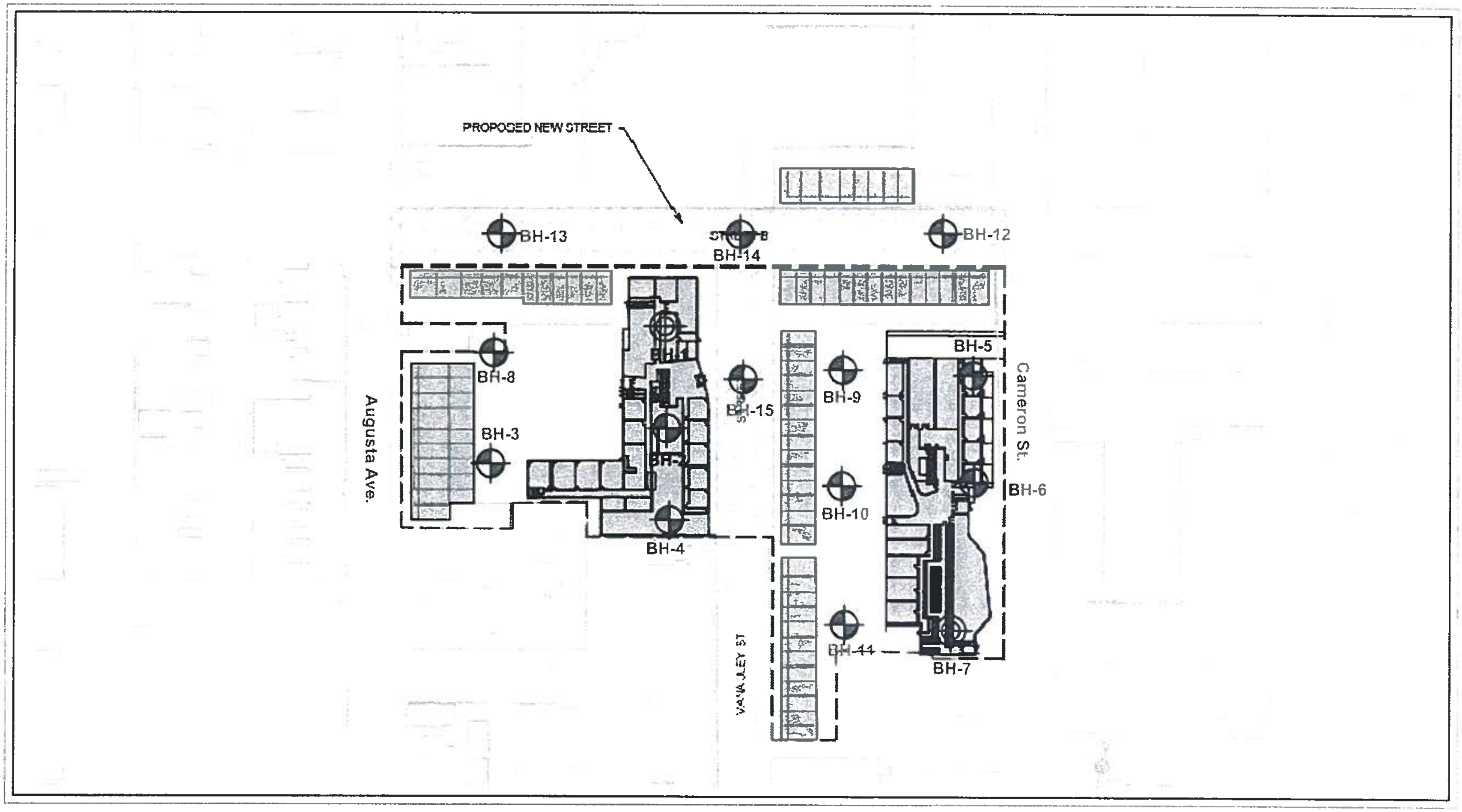
David S. Wang, P. Eng.
Project Engineer

U. S. SAPPAL
27/03/2013

Upkar S. Sappal, P. Eng.
Principal Engineer

Drawings

Borehole Location Plan, Borehole Logs, and Subsurface Stratigraphy



LEGEND:

⊕ Borehole

◎ Monitoring Well

TorontoInspection
GEO-ENVIRONMENTAL CONSULTANTS

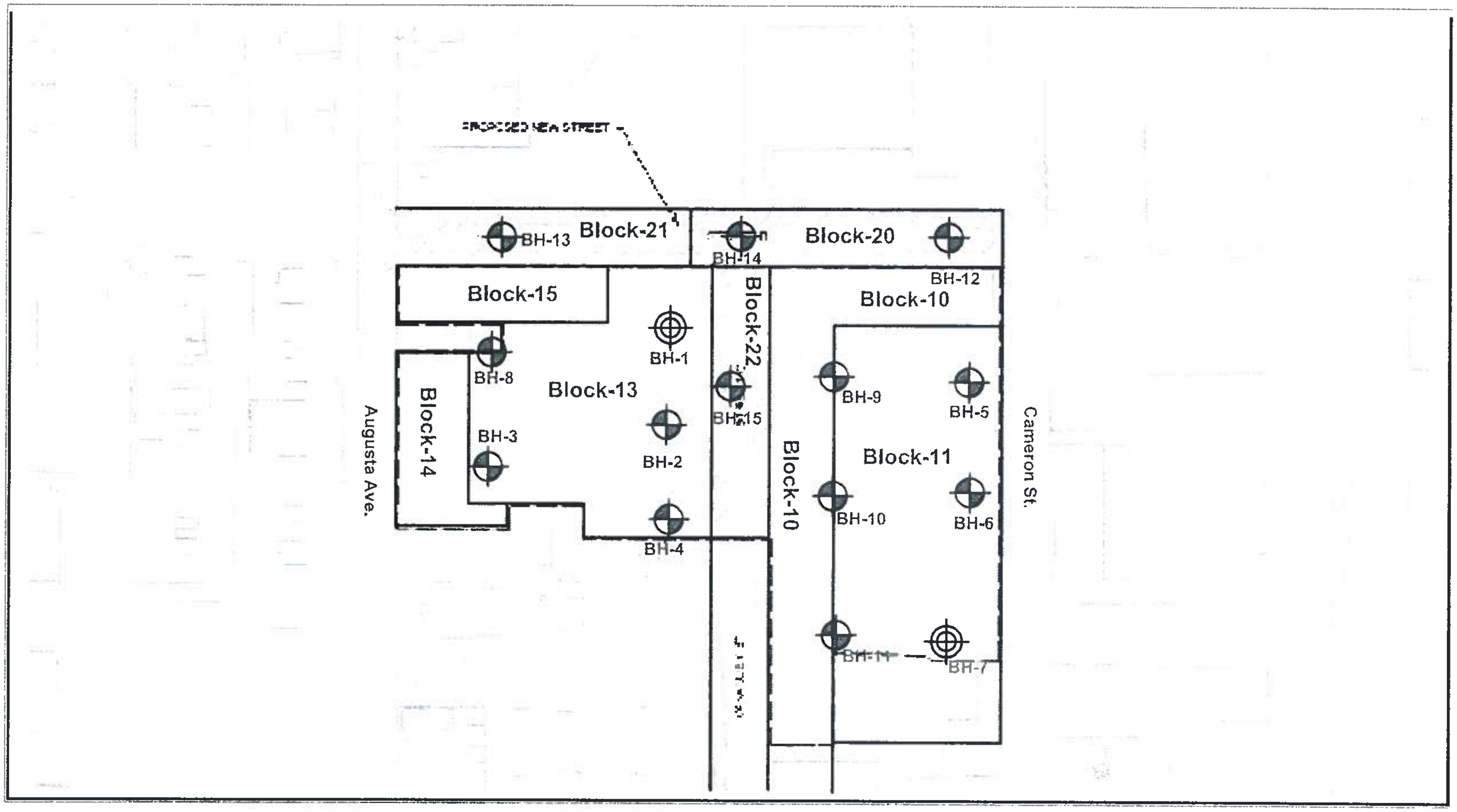
110 Konrad Cresent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
Borehole Location Plan

LOCATION:
Alexandra Park Context-Block 11 & 13

PROJECT NO:
3552-12-G-TRI-A

DRAWING NO:
1



LEGEND:

- ⊕ Borehole
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110 Konrad Cresent, Unit 16, Markham, On L3R 9X2
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TITLE:
Borehole Location Plan

LOCATION:
Alexandra Park Context-Block 11 & 13

PROJECT NO:
3552-12-G-TRI-A

DRAWING NO:
1a

Project No. 3552-12-G-TRI-A

Log of Borehole 1

Dwg No. 2

Project: Geotechnical Investigation

Sheet No. 1 of 1

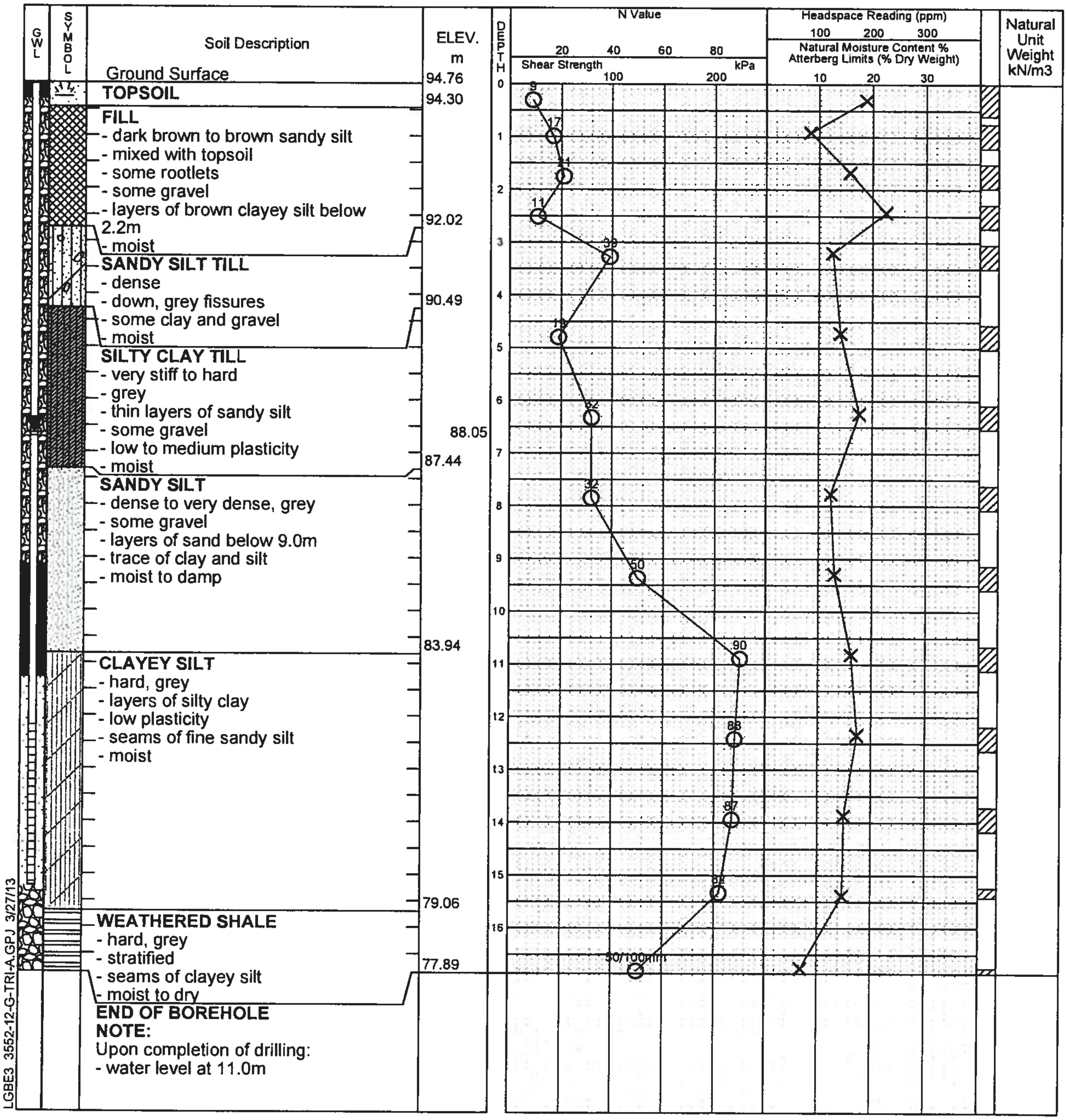
Location: Alexandra Park, Toronto, Ontario

Date Drilled: 3/6/13

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	⊠
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲



Ground Surface 94.76

TOPSOIL 94.30

FILL
- dark brown to brown sandy silt
- mixed with topsoil
- some rootlets
- some gravel
- layers of brown clayey silt below 2.2m
- moist

92.02

SANDY SILT TILL
- dense
- down, grey fissures
- some clay and gravel
- moist

90.49

SILTY CLAY TILL
- very stiff to hard
- grey
- thin layers of sandy silt
- some gravel
- low to medium plasticity
- moist

88.05

87.44

SANDY SILT
- dense to very dense, grey
- some gravel
- layers of sand below 9.0m
- trace of clay and silt
- moist to damp

83.94

CLAYEY SILT
- hard, grey
- layers of silty clay
- low plasticity
- seams of fine sandy silt
- moist

79.06

WEATHERED SHALE
- hard, grey
- stratified
- seams of clayey silt
- moist to dry

77.89

END OF BOREHOLE

NOTE:

Upon completion of drilling:
- water level at 11.0m

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 26, 2013	6.71m	

Project No. 3552-12-G-TRI-A

Log of Borehole 2

Dwg No. 3

Project: Geotechnical Investigation

Sheet No. 1 of 1

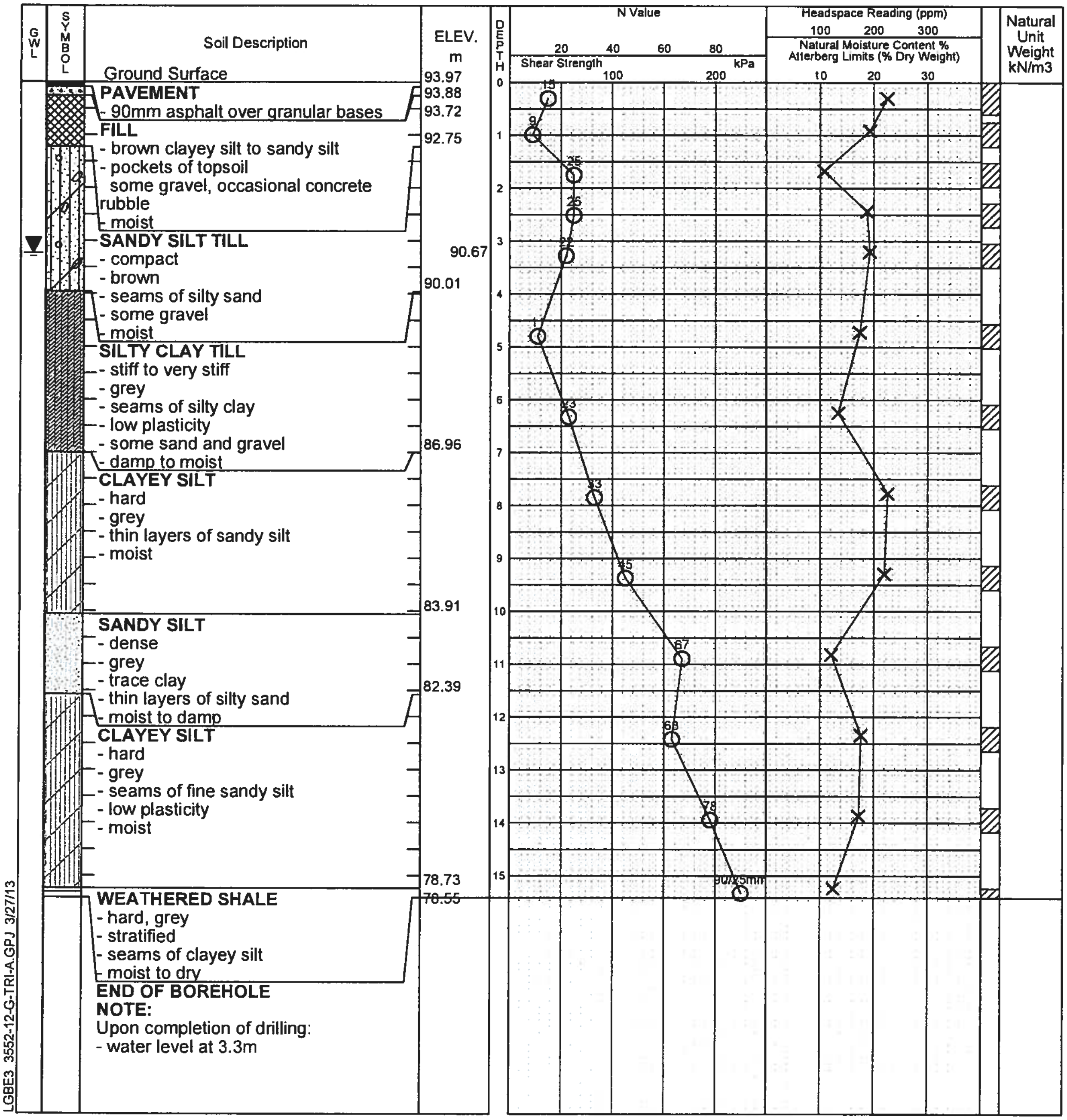
Location: Alexandra Park, Toronto, Ontario

Date Drilled: 2/27/13

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲



Soil Description	ELEV. m
Ground Surface	93.97
PAVEMENT - 90mm asphalt over granular bases	93.88 93.72
FILL - brown clayey silt to sandy silt - pockets of topsoil some gravel, occasional concrete rubble - moist	92.75
SANDY SILT TILL - compact - brown - seams of silty sand - some gravel - moist	90.67 90.01
SILTY CLAY TILL - stiff to very stiff - grey - seams of silty clay - low plasticity - some sand and gravel - damp to moist	86.96
CLAYEY SILT - hard - grey - thin layers of sandy silt - moist	83.91
SANDY SILT - dense - grey - trace clay - thin layers of silty sand - moist to damp	82.39
CLAYEY SILT - hard - grey - seams of fine sandy silt - low plasticity - moist	78.73
WEATHERED SHALE - hard, grey - stratified - seams of clayey silt - moist to dry	78.55

END OF BOREHOLE

NOTE:

Upon completion of drilling:

- water level at 3.3m

NOTE THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 3

Dwg No. 4

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Alexandra Park, Toronto, Ontario

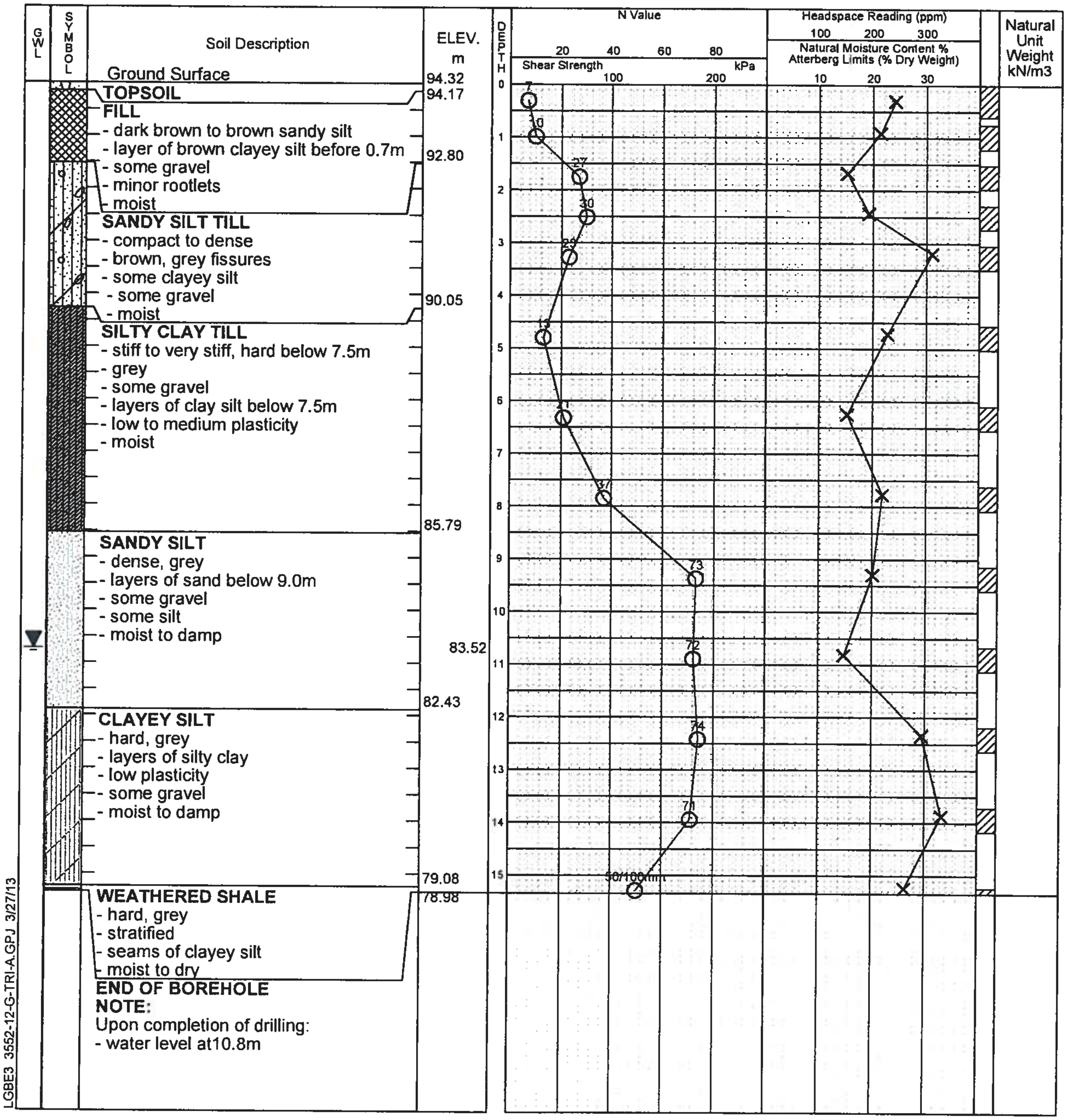
Date Drilled: 3/7/13

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	94.32
TOPSOIL	94.17
FILL - dark brown to brown sandy silt - layer of brown clayey silt before 0.7m - some gravel - minor rootlets - moist	92.80
SANDY SILT TILL - compact to dense - brown, grey fissures - some clayey silt - some gravel - moist	90.05
SILTY CLAY TILL - stiff to very stiff, hard below 7.5m - grey - some gravel - layers of clay silt below 7.5m - low to medium plasticity - moist	85.79
SANDY SILT - dense, grey - layers of sand below 9.0m - some gravel - some silt - moist to damp	83.52 82.43
CLAYEY SILT - hard, grey - layers of silty clay - low plasticity - some gravel - moist to damp	79.08
WEATHERED SHALE - hard, grey - stratified - seams of clayey silt - moist to dry	78.98
END OF BOREHOLE **NOTE:** Upon completion of drilling: - water level at10.8m	



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 4

Dwg No. 5

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Alexandra Park, Toronto, Ontario

Date Drilled: 3/4/13

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

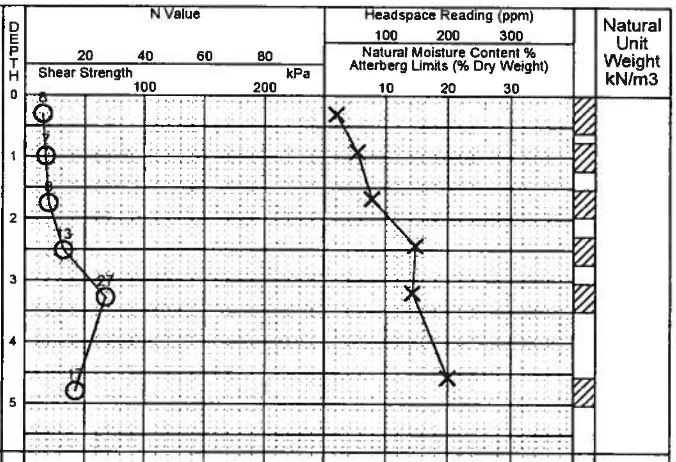
Auger Sample	☒	Headspace Reading (ppm)	•
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	93.15
		PAVEMENT - 90mm asphalt over granular bases	93.06 92.24
		FILL - brown sandy silt - trace of rootlets - layers of brown clayey silt below 2.0m - some gravel - moist to damp	90.41
		SANDY SILT TILL - compact - brown, grey fissures - moist	88.88
		SILTY CLAY TILL - very stiff - grey - low to medium plasticity - some gravel - moist	87.36

END OF BOREHOLE

NOTE:

Upon completion of drilling:
- refusal to augering at 5.7m on probable cobbles
- no free water



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Log of Borehole 5

Project No. 3552-12-G-TRI-A

Dwg No. 6

Sheet No. 1 of 1

Project: Geotechnical Investigation

Location: Alexandra Park, Toronto, Ontario

Date Drilled: 2/26/13

Drill Type: Truck Mounted Drill Rig

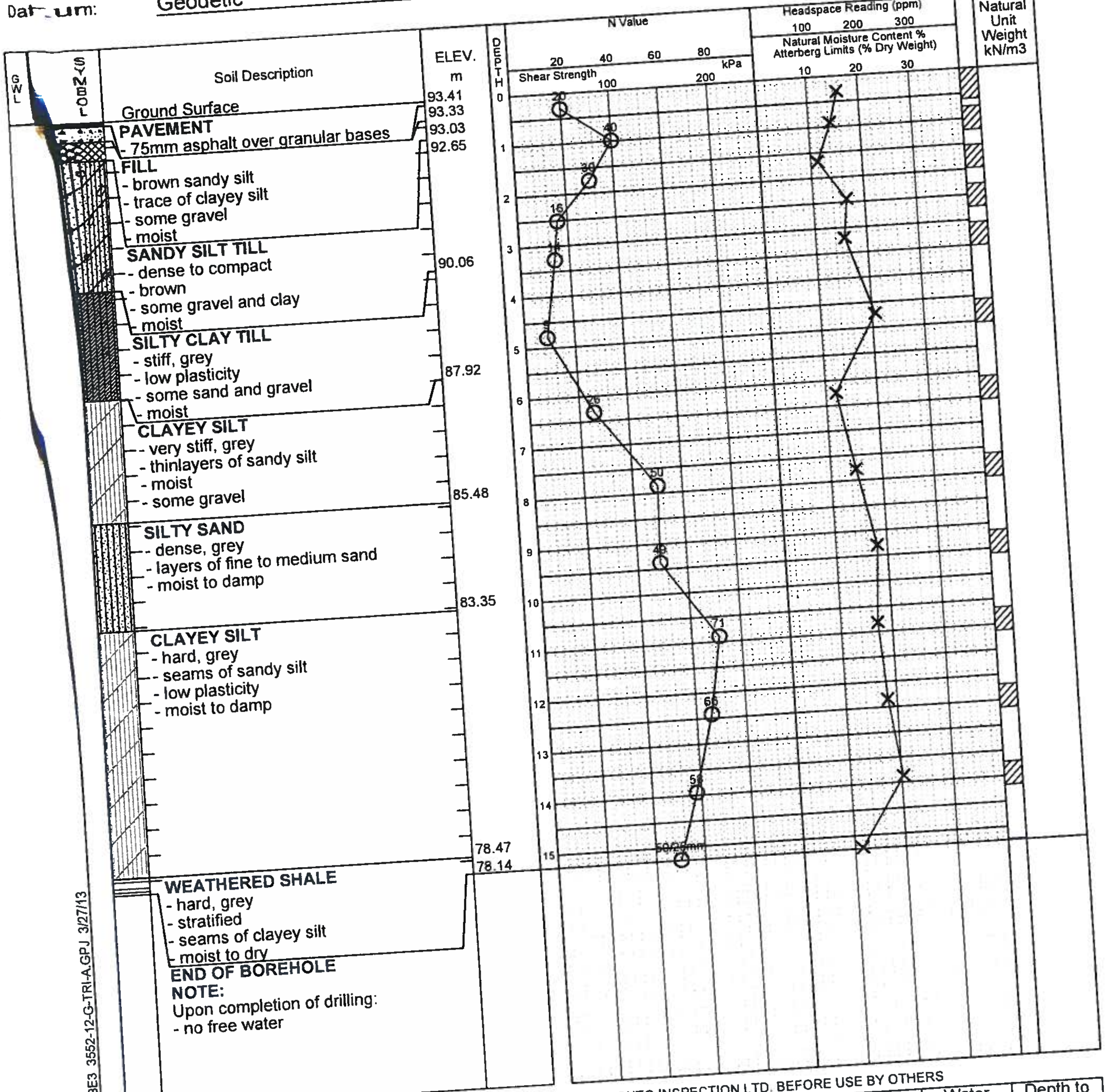
Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	⊢—⊣
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	93.41
PAVEMENT - 75mm asphalt over granular bases	93.33
	93.03
FILL - brown sandy silt - trace of clayey silt - some gravel - moist	92.65
SANDY SILT TILL - dense to compact - brown - some gravel and clay - moist	90.06
SILTY CLAY TILL - stiff, grey - low plasticity - some sand and gravel - moist	87.92
CLAYEY SILT - very stiff, grey - thinlayers of sandy silt - moist - some gravel	85.48
SILTY SAND - dense, grey - layers of fine to medium sand - moist to damp	83.35
CLAYEY SILT - hard, grey - seams of sandy silt - low plasticity - moist to damp	78.47
	78.14
WEATHERED SHALE - hard, grey - stratified - seams of clayey silt - moist to dry	

END OF BOREHOLE

NOTE:
Upon completion of drilling:
- no free water



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 6

Dwg No. 7

Sheet No. 1 of 1

Project: Geotechnical Investigation

Location: Alexandra Park, Toronto, Ontario

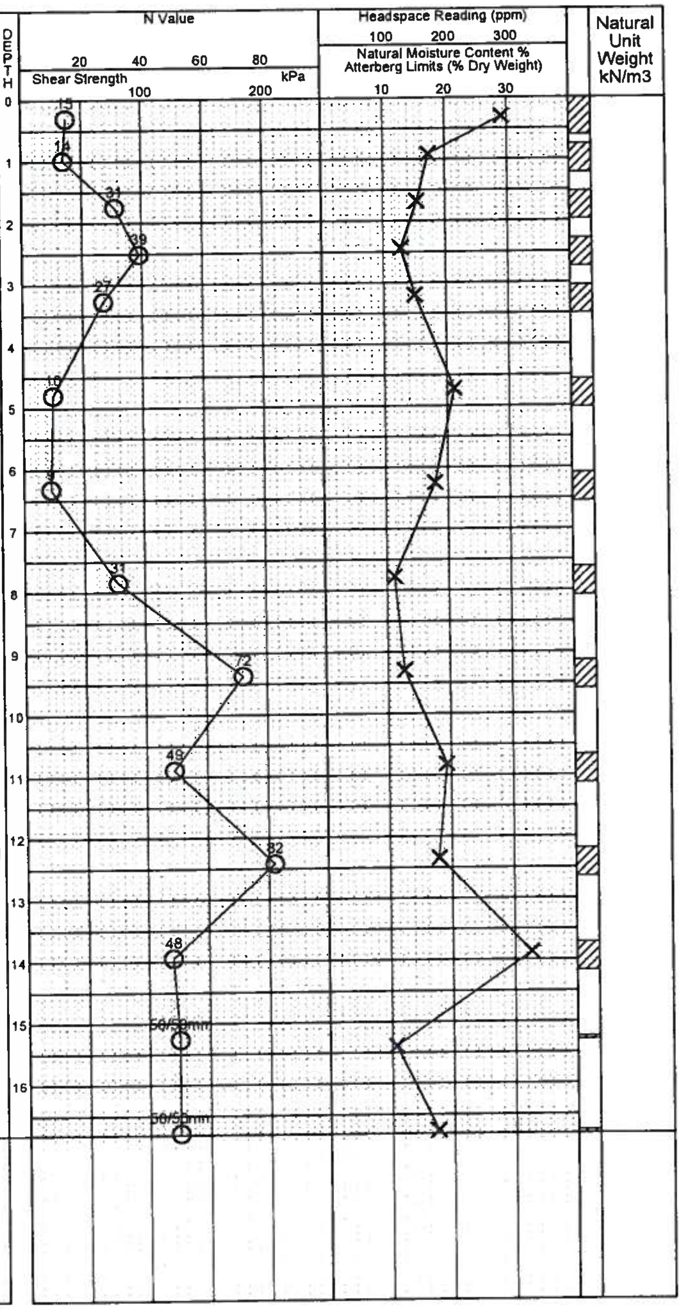
Date Drilled: 3/6/13

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	⊢—⊣
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	93.81
TOPSOIL	93.66
FILL - dark brown to brown clayey silt - some sandy silt - pcokets of topsoil - some rootlets - occasional brick pieces - some gravel - damp to moist	92.59
SANDY SILT TILL - compact to dense - brown, grey fissures - some clayey silt - some gravel - moist	89.85
SILTY CLAY TILL - stiff, grey - some gravel - low to medium plasticity - moist	86.80
CLAYEY SILT TILL - hard, grey - low plasticity - some gravel - thin layers of fine to medium sand - moist	85.28
SANDY SILT - very dense to dense - grey - layers of medium sand below 9.0m - some clayey silt - some gravel - moist to damp	82.23
CLAYEY SILT - hard, grey - layers of silty clay - low plasticity - seams of fine sandy silt - moist to damp	81.51
	77.66
WEATHERED SHALE - hard, grey - stratified - seams of clayey silt - moist to damp	77.00
END OF BOREHOLE **NOTE:** Upon completion of drilling: - water level at 12.3m	



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 7

Dwg No. 8

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Alexandra Park, Toronto, Ontario

Date Drilled: 3/6/13

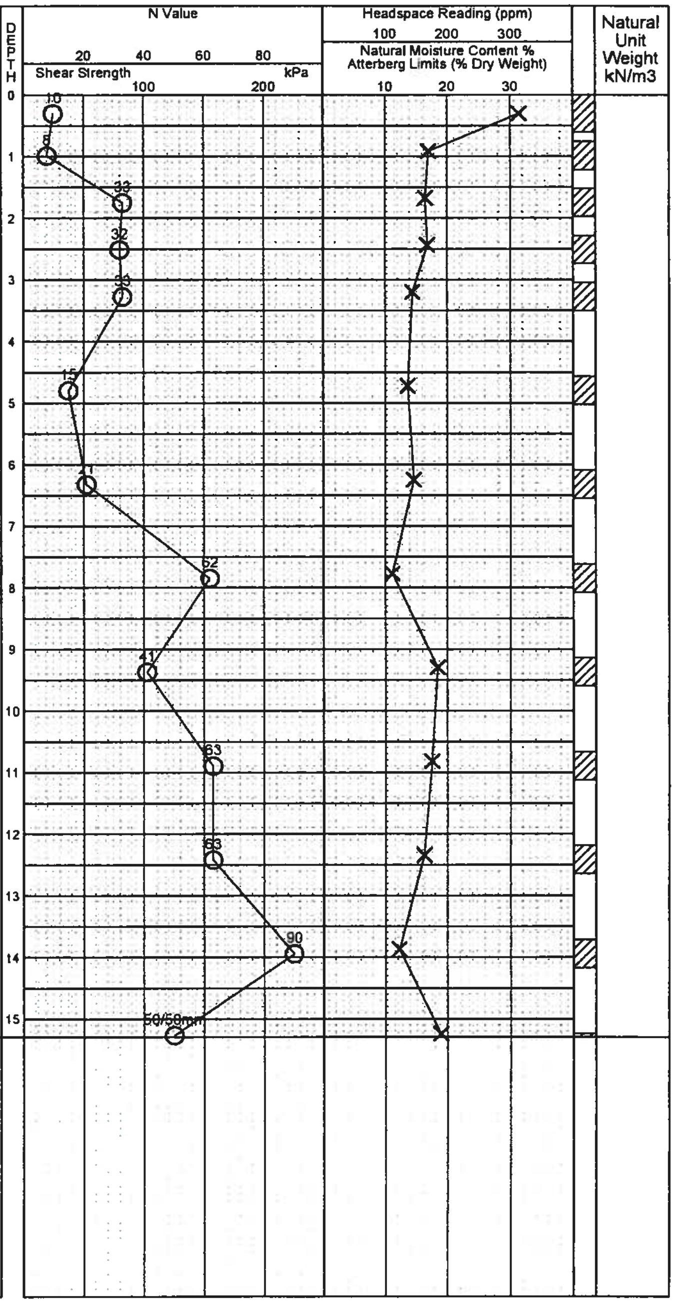
Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	⊢⊣
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	92.96
TOPSOIL	92.81
FILL - brown sandy silt - pockets of topsoil - some gravel, some brick pieces - damp to moist	91.74
SANDY SILT TILL - dense - brown, grey fissures - some clayey silt - some gravel - moist	89.00
CLAYEY SILT TILL - stiff, grey - low to medium plasticity - some sand and gravel - moist	87.17
	86.74
SILTY CLAY TILL - very stiff, grey - low to medium plasticity - some gravel - seams of sandy silt - moist	85.95
SANDY SILT - very dense to dense - grey - layers of medium sand below 7.5m - some clayey silt - some gravel - moist to damp	81.38
CLAYEY SILT - hard, grey - layers of silty clay - low plasticity - some sandy silt - moist	78.03
WEATHERED SHALE - hard, grey - stratified - seams of clayey silt - moist to dry	77.67

END OF BOREHOLE
NOTE:
Upon completion of drilling:
- water level at 10.8m



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 26, 2013	6.22m	

Project No. 3552-12-G-TRI-A

Log of Borehole 8

Dwg No. 9

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Alexandra Park, Toronto, Ontario

Date Drilled: 2/22/13

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

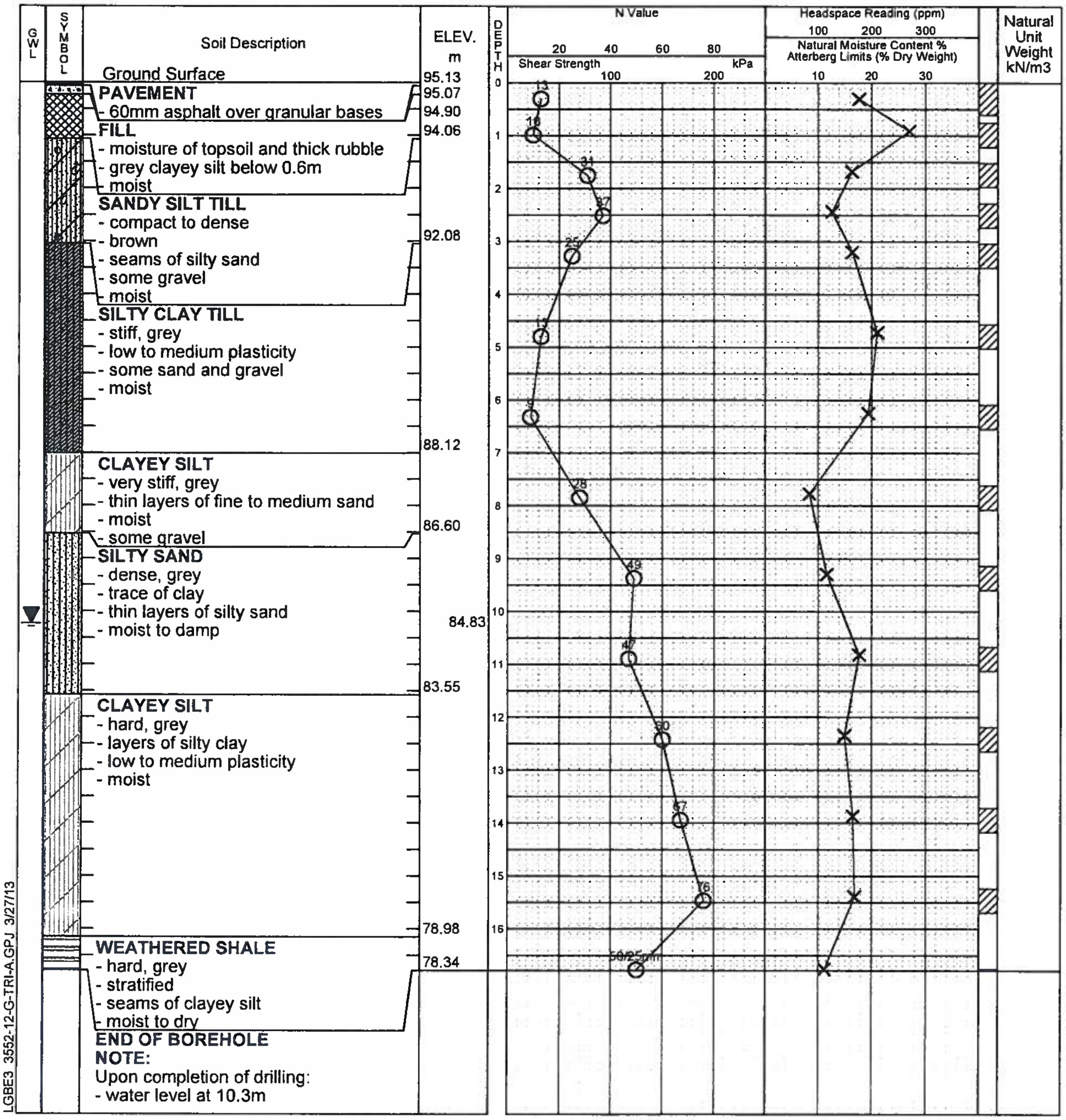
Soil Description	ELEV. m
Ground Surface	95.13
PAVEMENT - 60mm asphalt over granular bases	95.07 94.90
FILL - moisture of topsoil and thick rubble - grey clayey silt below 0.6m - moist	94.06
SANDY SILT TILL - compact to dense - brown - seams of silty sand - some gravel - moist	92.08
SILTY CLAY TILL - stiff, grey - low to medium plasticity - some sand and gravel - moist	88.12
CLAYEY SILT - very stiff, grey - thin layers of fine to medium sand - moist - some gravel	86.60
SILTY SAND - dense, grey - trace of clay - thin layers of silty sand - moist to damp	84.83 83.55
CLAYEY SILT - hard, grey - layers of silty clay - low to medium plasticity - moist	78.98
WEATHERED SHALE - hard, grey - stratified - seams of clayey silt - moist to dry	78.34

END OF BOREHOLE

NOTE:

Upon completion of drilling:

- water level at 10.3m



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 9

Dwg No. 10

Project: Geotechnical Investigation

Sheet No. 1 of 1

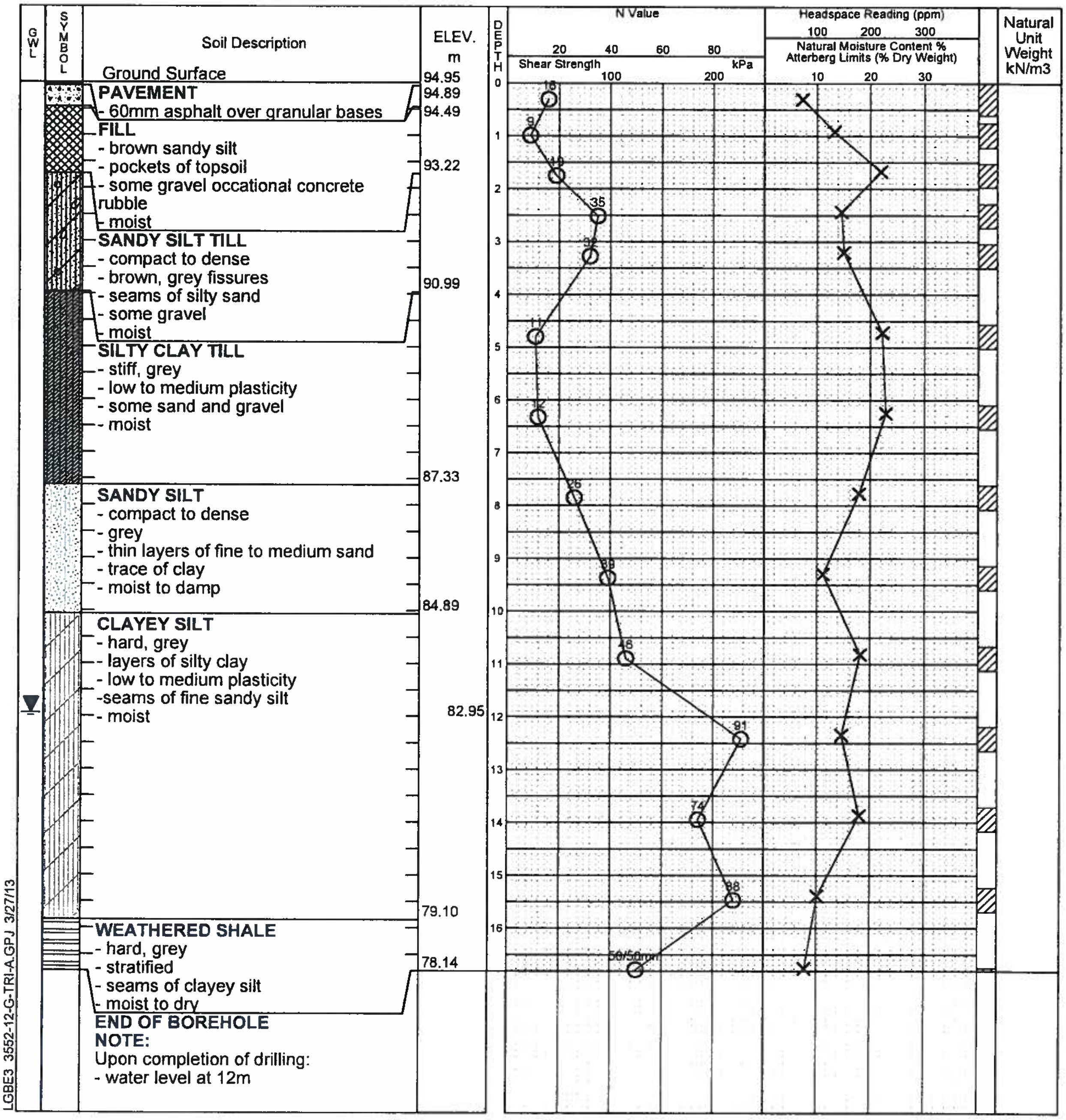
Location: Alexandra Park, Toronto, Ontario

Date Drilled: 2/21/13

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲



Ground Surface — 94.95

PAVEMENT — 94.89
- 60mm asphalt over granular bases — 94.49

FILL
- brown sandy silt
- pockets of topsoil — 93.22
- some gravel occational concrete rubble
- moist

SANDY SILT TILL
- compact to dense
- brown, grey fissures — 90.99
- seams of silty sand
- some gravel
- moist

SILTY CLAY TILL
- stiff, grey
- low to medium plasticity
- some sand and gravel
- moist

87.33

SANDY SILT
- compact to dense
- grey
- thin layers of fine to medium sand
- trace of clay
- moist to damp

84.89

CLAYEY SILT
- hard, grey
- layers of silty clay
- low to medium plasticity
-seams of fine sandy silt
- moist — 82.95

79.10

WEATHERED SHALE
- hard, grey
- stratified — 78.14
- seams of clayey silt
- moist to dry

END OF BOREHOLE

NOTE:
Upon completion of drilling:
- water level at 12m

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 10

Dwg No. 11

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Alexandra Park, Toronto, Ontario

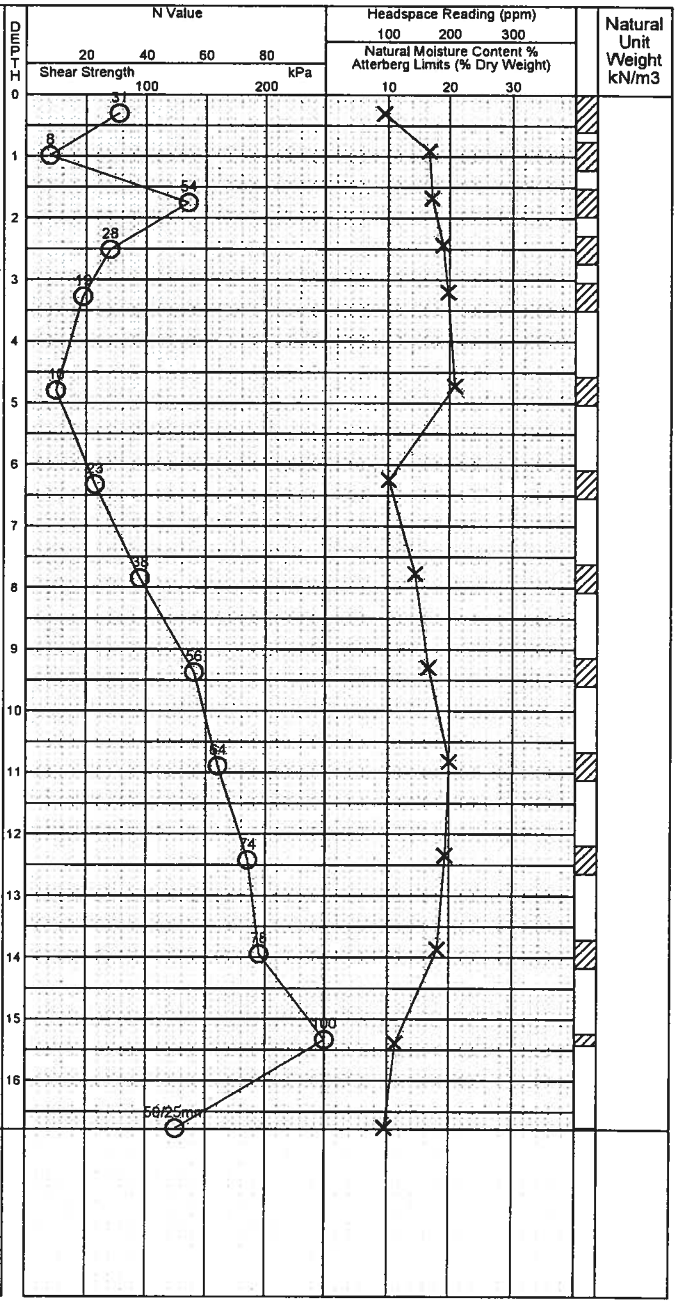
Date Drilled: 3/5/13

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	✕
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

GWL	Soil Description	ELEV. m
	Ground Surface	93.92
	PAVEMENT - 100mm asphalt over granular bases	93.82
	FILL - brown sandy silt - some clayey silt - occasional brick pieces - pockets of topsoil - moist	93.59
		92.24
		91.64
▼	**SANDY SILT TILL** - very dense - brown, grey fissures - some gravel - moist	90.92
	SILTY CLAY TILL - very stiff to stiff - brown, grey below 3.9m - low to medium plasticity - some gravel - seams of sandy silt - moist	88.13
	CLAYEY SILT TILL - very still to hard, grey - low plasticity - some gravel - moist	85.39
	SANDY SILT - very dense, grey - some clayey silt - layers of sand below 9.0m - moist to damp	82.34
	CLAYEY SILT - hard - grey - layers of silty clay - seams of fine sandy silt - low plasticity - damp to mosit	77.77
	WEATHERED SHALE - hard, grey - stratified - seams of clayey silt - moist to dry	77.13
	END OF BOREHOLE **NOTE:** Upon completion of drilling: - water level at 3.0m	



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 11

Dwg No. 12

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Alexandra Park, Toronto, Ontario

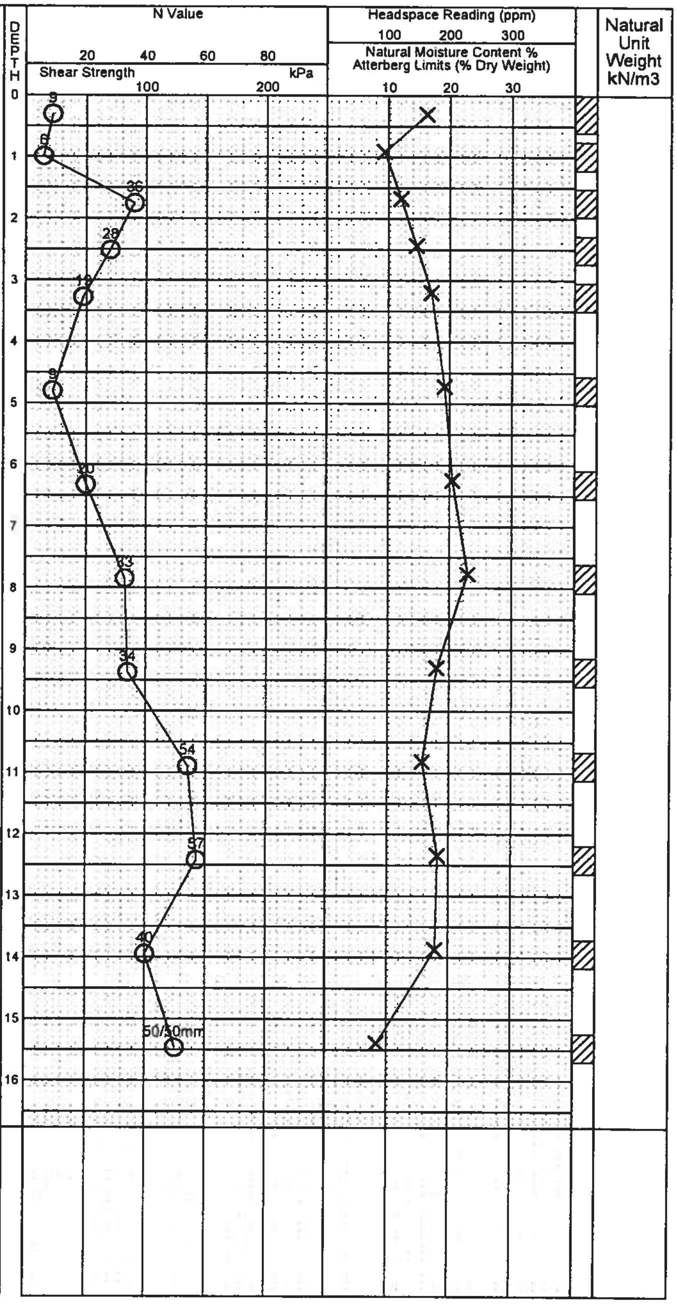
Date Drilled: 2/20/13

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

GWL	Soil Description	ELEV. m
	Ground Surface	92.86
	PAVEMENT - 60mm asphalt over granular bases	92.80 92.66
	FILL - brown sandy silt - pockets of topsoil - mixture of sand and gravel at 0.9m - moist	91.49
	SANDY SILT TILL - dense to compact - brown, grey fissures - seams of silty sand - some clay and gravel - moist	89.96
	CLAYEY SILT - stiff to very stiff - grey - seams of silty clay - thin layers of sandy silt - damp to moist	86.15
	SANDY SILT - dense - grey - trace clay - thin layers of silty sand - moist to damp	82.80
▼	**CLAYEY SILT** - hard, grey - layers of silty clay - low to medium plasticity - moist	80.96 77.93
	WEATHERED SHALE - hard, grey - stratified - seams of clayey silt - dry to moist	76.10
	END OF BOREHOLE **NOTE:** Upon completion of drilling: - water level at 11.9m	



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 12

Dwg No. 13

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Alexandra Park, Toronto, Ontario

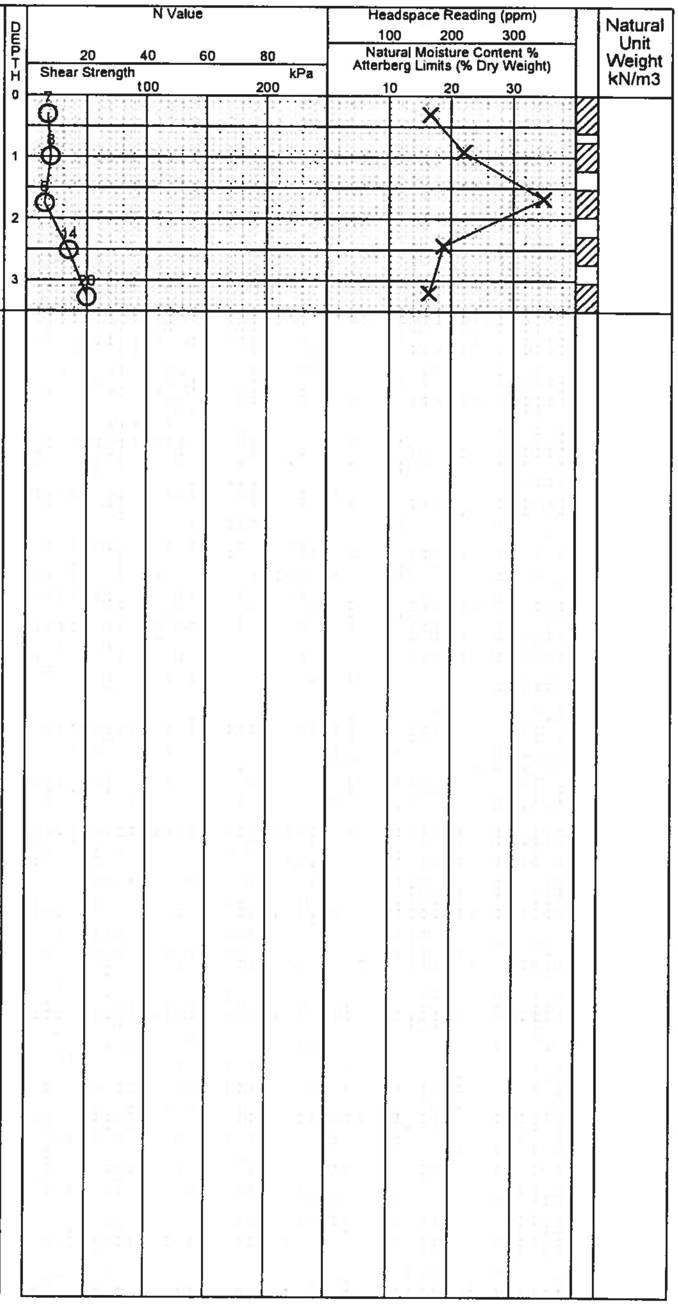
Date Drilled: 2/27/13

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	94.49
		PAVEMENT - 75mm asphalt over granular bases	94.41 94.21
		FILL - brown clayey silt - some sandy silt - pockets of topsoil - dark brown at 0.8m - some gravel, occasional brick rubble - damp to very moist	92.36
		SANDY SILT TILL - compact - brown - seams of silty sand - some clayey silt - moist	90.99
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 13

Dwg No. 14

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Alexandra Park, Toronto, Ontario

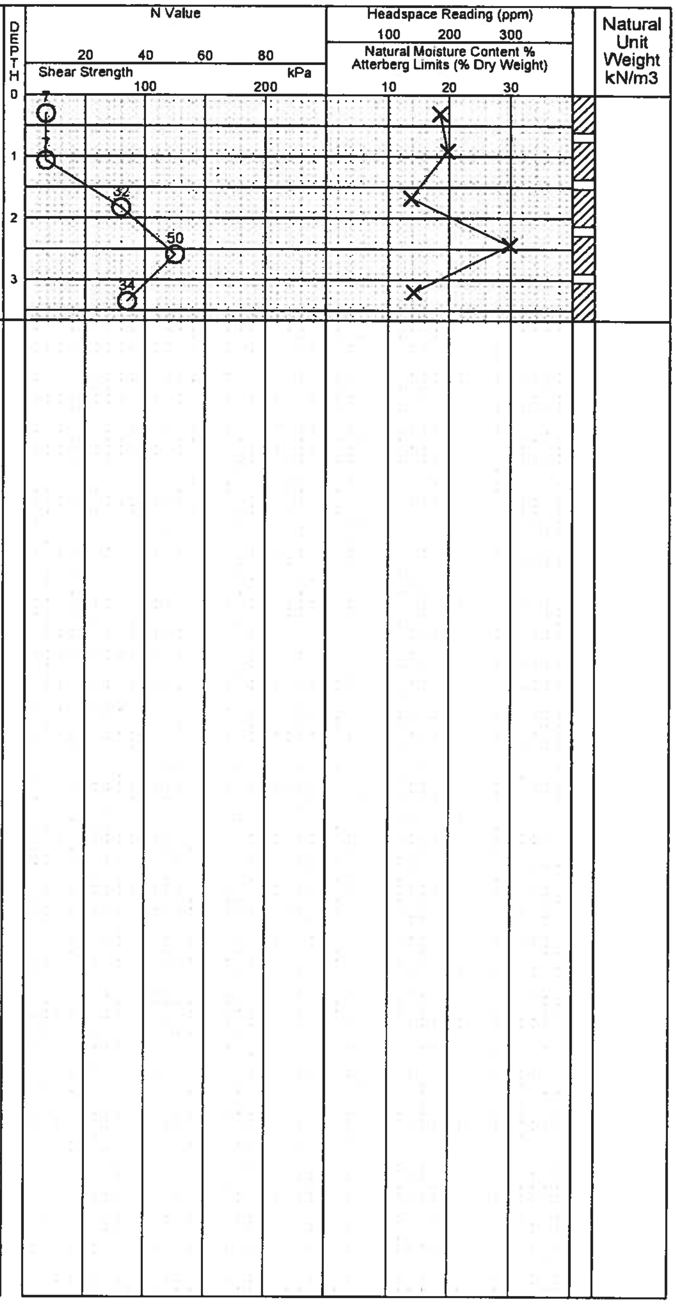
Date Drilled: 2/26/13

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

Auger Sample	⊠	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	94.88
		PAVEMENT	94.83
		- 50mm asphalt over granular bases	94.73
		FILL - grey clayey silt - some sandy silt - pockets of topsoil - some gravel - moist to damp	93.66
		SANDY SILT TILL - dense to very dense - grey fissures - seams of silty sand - some gravel - moist	91.22
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 14

Dwg No. 15

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Alexandra Park, Toronto, Ontario

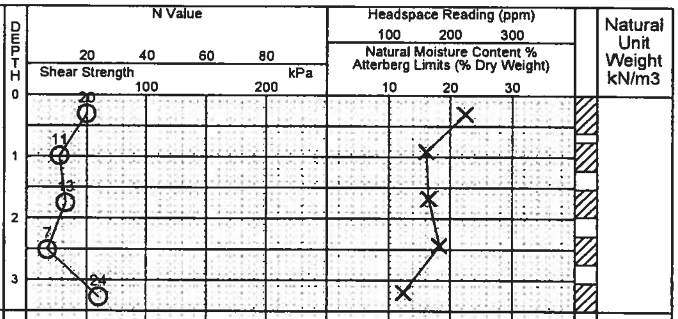
Date Drilled: 2/21/13

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	95.07
		TOPSOIL	94.61
		FILL - dark brown sandy silt mixed with topsoil - layers of brown clayey silt below 1.8m - some rootlets - moist	92.33
		SANDY SILT TILL - compact - grey fissures - seams of silty sand - some gravel - moist	91.56
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 3552-12-G-TRI-A

Log of Borehole 15

Dwg No. 16

Sheet No. 1 of 1

Project: Geotechnical Investigation

Location: Alexandra Park, Toronto, Ontario

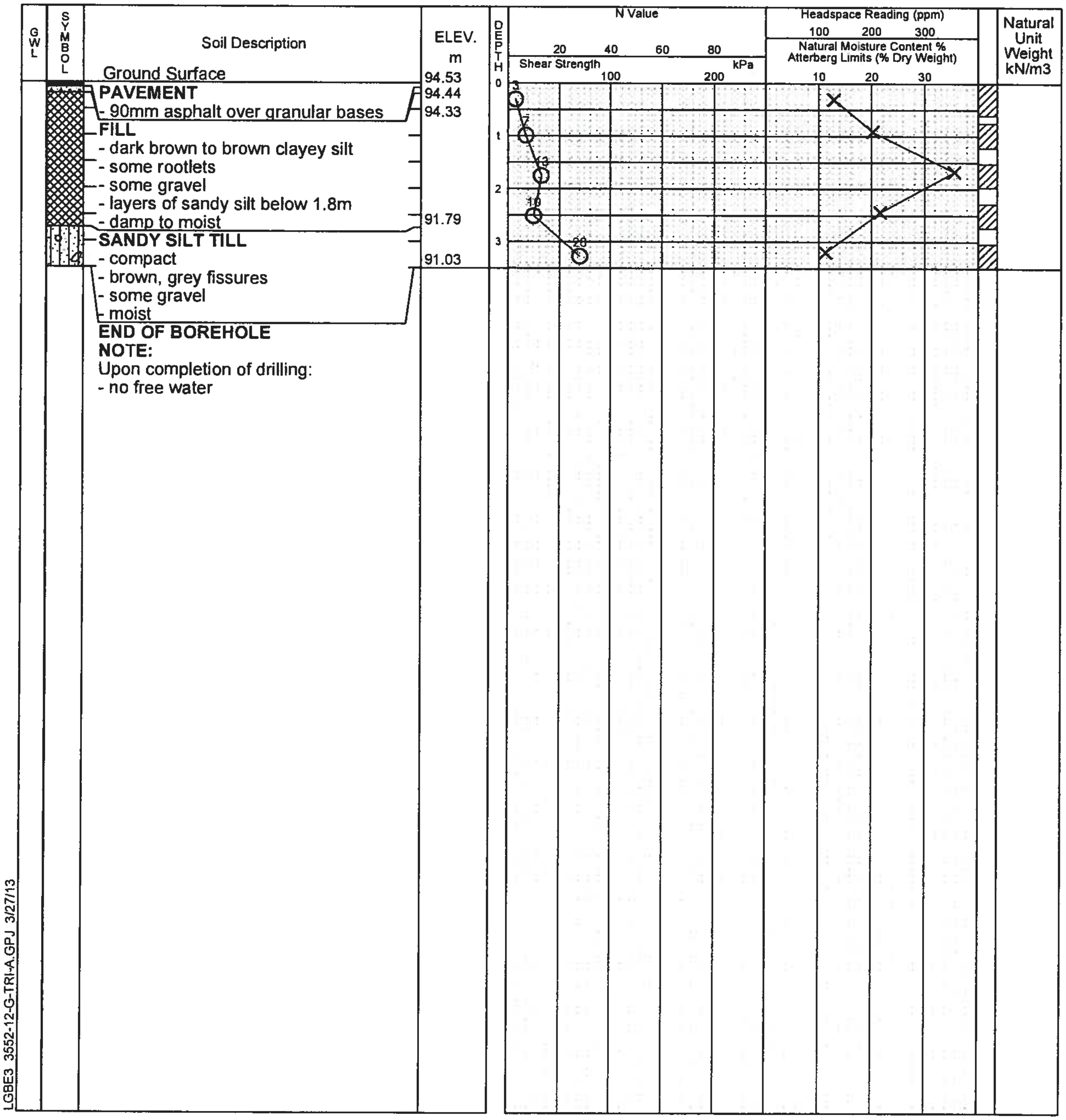
Date Drilled: 3/4/13

Drill Type: Truck Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	94.53
PAVEMENT	94.44
- 90mm asphalt over granular bases	94.33
FILL - dark brown to brown clayey silt - some rootlets - some gravel - layers of sandy silt below 1.8m - damp to moist	91.79
SANDY SILT TILL - compact - brown, grey fissures - some gravel - moist	91.03
END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



LGBE3 3552-12-G-TRI-A.GPJ 3/27/13

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

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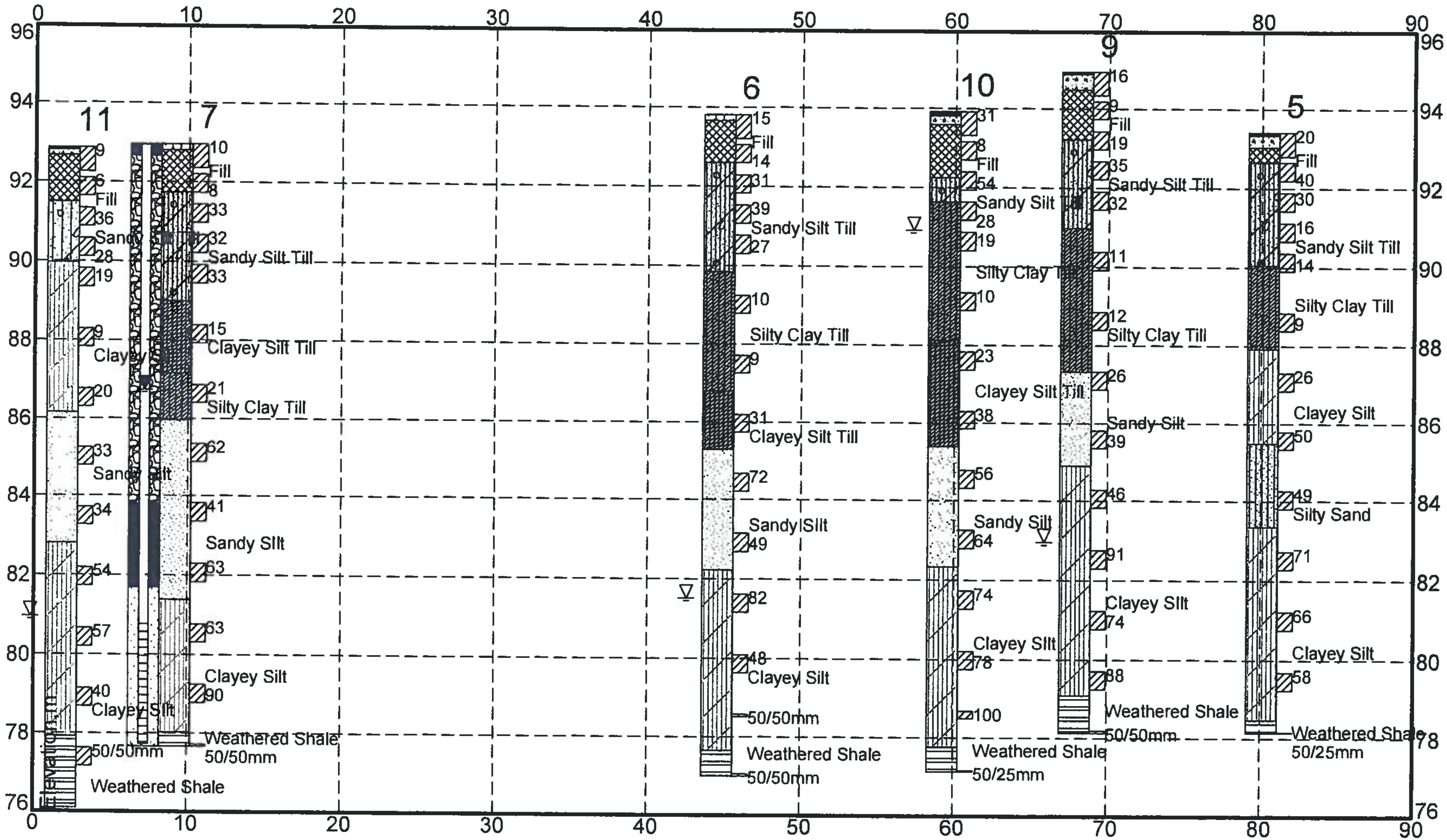
Time	Water Level (m)	Depth to Cave (m)



Borehole No	Elev.	Depth
5	93.4	15.3
6	93.8	16.8
7	93.0	15.3
9	95.0	16.8
10	93.9	16.8
11	92.9	16.8

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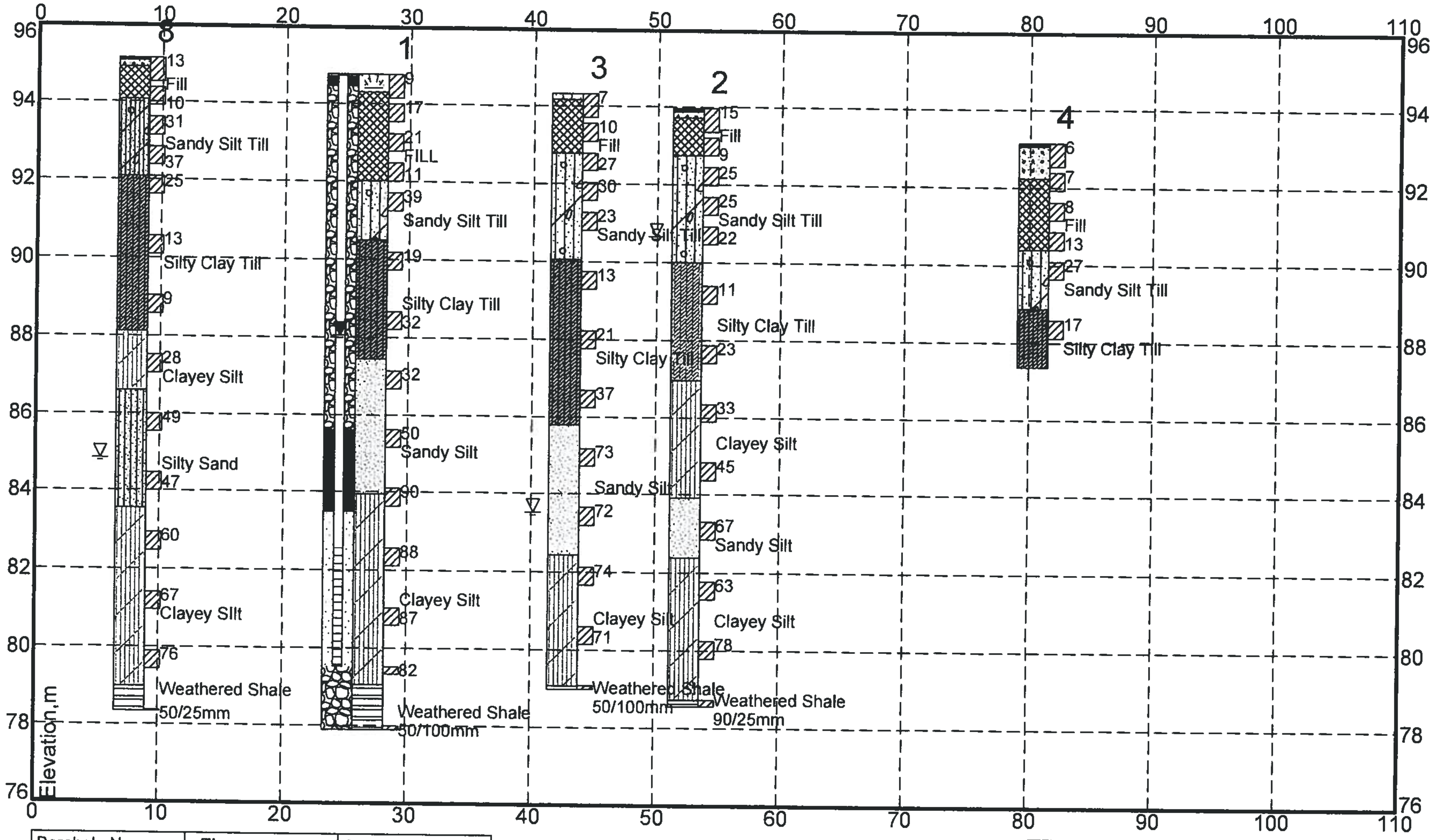
SUBSURFACE STRATIGRAPHY

Block 11

Geotechnical Investigation

Alexandra Park, Toronto, Ontario

PROJECT #	DATE	DRAWING
3552-12-G-TRI-A	Mar 13	17



Borehole No	Elev.	Depth
1	94.8	16.9
2	94.0	15.4
3	94.3	15.3
4	93.1	5.8
8	95.1	16.8

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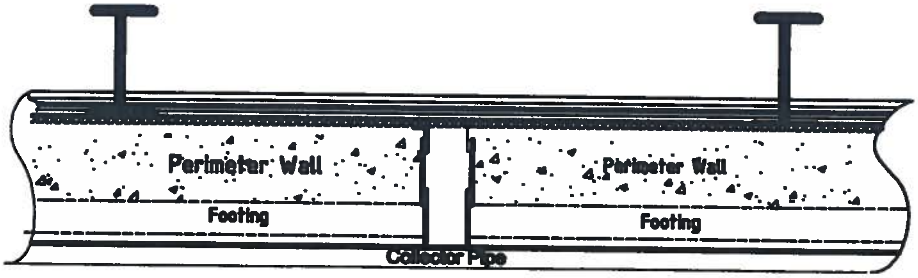
SUBSURFACE STRATIGRAPHY
Block 13

Geotechnical Investigation
Alexandra Park, Toronto, Ontario

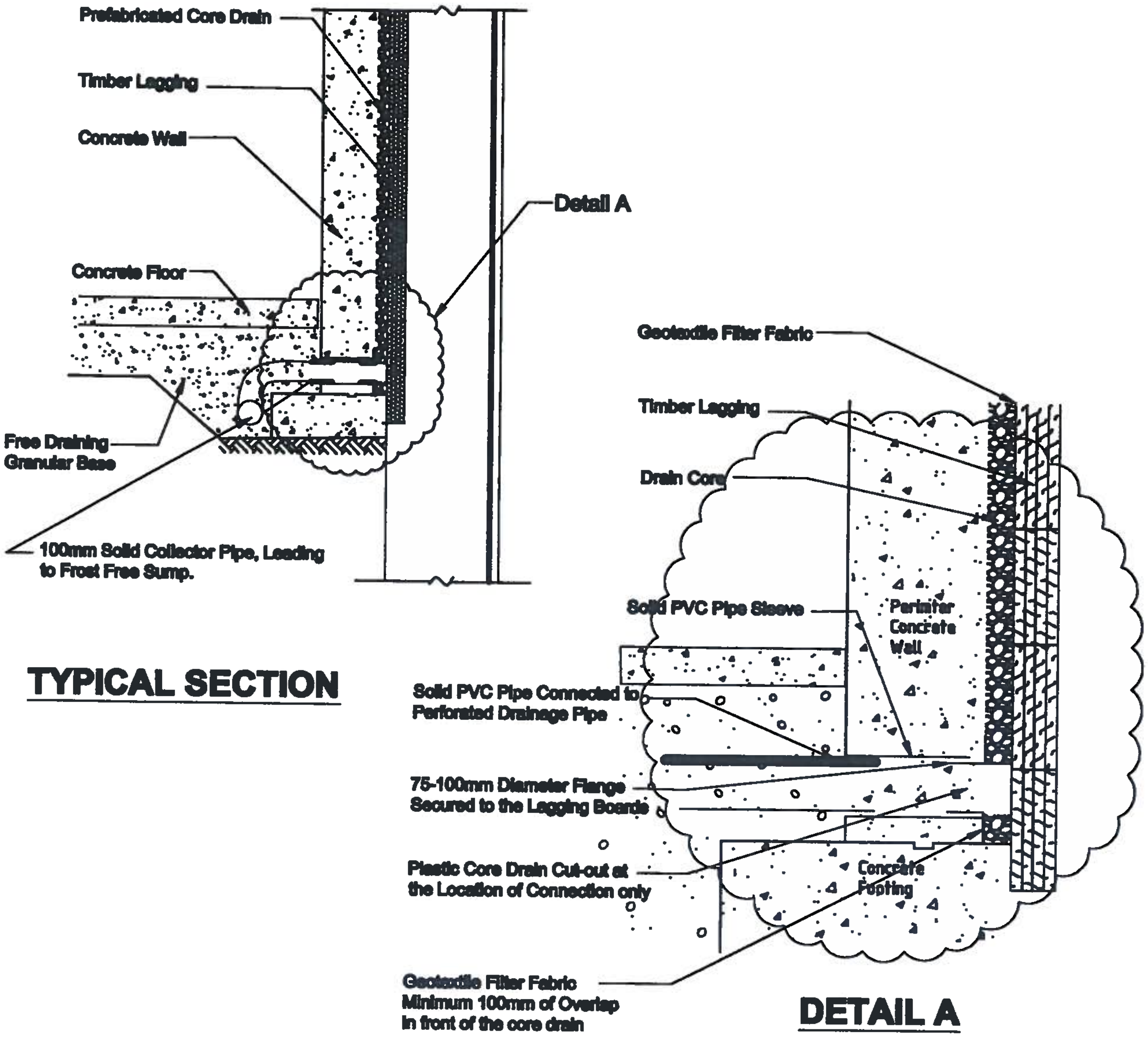
PROJECT #	DATE	DRAWING
3552-12-G-TRI-A	Mar 13	18

Figures

Permanent Perimeter Drainage System, and Details of Perimeter Subdrain and Basement Backfill



PLAN



Notes:

1. A continuous blanket of prefabricated drainage system, Miradrain 6000 or equivalant, should extend continously from the top of footings to the fround surface.
2. All joints of the Miradrain should be taped. All openingss,, including the exposed and above the footing, must be covered with filter fabric to prevent intrusion of concrete into the core of the drain.
3. The backfill behind the lagging must be free draining. Filter fabric or straw should be used to prevent loss of fines behind the lagging.
4. The perimeter drainage and subfloor drainage systems must be kept separate.

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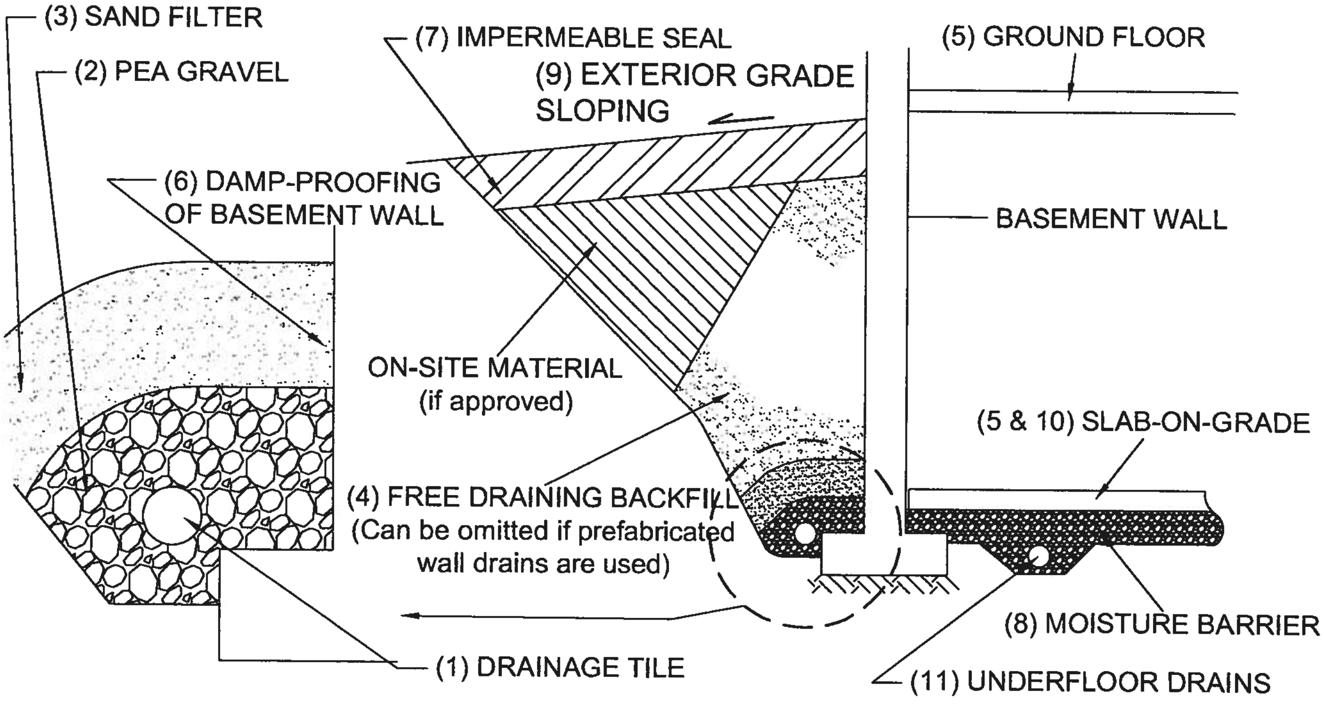
110 Konrad Cresent, Unit 16, Markham, Ontario L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE: PERMANENT PERIMETER DRAINAGE SYSTEM
LOCATION: Alexandra Park Phase I, Toronto, Ontario
PROJECT NO. 3552-12-G-TRI-A
DATE: March, 2013
FIGURE NO. 1



Notes:

1. **Drainage tile**: consist of 100mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. invert to be at minimum of 150mm (6") below underside of basement floor level.
2. **Pea gravel**: at 150mm (6") on the top and sides of drain. If drain is not placed on footing, provide 100mm (4") of pea gravel below drain. The pea gravel may be replaced by 20mm clear stone provided that the drain is covered by a porous geotextile membrane of Terrafix 270 R or equivalent.
3. **Filter material**: consists of C.S.A. fine concrete aggregate. A minimum of 300mm (12") on the top and sides of gravel. This may be replaced by an approved porous geotextile membrane of Terrafix 270R or equivalent.
4. **Free-draining backfill**: OPSS Granular B or equivalent, compacted to 93 to 95% (maximum) Standard Proctor Density. Do not compact closer than 1.8m (6ft.) from wall with heavy equipment. This may be replaced by on site material if prefabricated wall drains (Miradrain) extending from the finished grade to the bottom of the basement wall are used.
5. **Do not backfill** until the wall is supported by the basement floor slab and ground floor framing, or adequate bracing.
6. **Damp-proofing** of the basement wall is required before backfilling.
7. **Impermeable backfill seal** of compacted clay, clayey silt or equivalent. If the original soil in the vicinity is a free draining sand, the seal may be omitted.
8. **Moisture barrier**: consists of 20mm clear stone or compacted OPSS Granular A, or equivalent. The thickness of this layer to be 150mm (6") minimum.
9. **Exterior Grade**: slope away from basement wall on all the sides of the building.
10. **Slab-on-grade** should not be structurally connected to walls or foundations.
11. **Underfloor drains** * should be placed in parallel rows at 6-8m (20-25 ft.) centre, on 100mm (4") of pea gravel with 150mm (6") of pea gravel on top and sides. The invert should be at least 300mm (12") below the underside of the floor slab. The drains should be connected to positive sumps or outlets. Do not connect the underfloor drains to the perimeter drains.

* Underfloor drains can be deleted where not required.

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GEO-ENVIRONMENTAL
110 Konrad Cresent, Unit 16, Markham, Ontario L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE: Details of Perimeter Subdrain and Basement Backfill
LOCATION: Alexandra Park Phase I, Toronto, Ontario
PROJECT NO. 3552-12-G-TRI-A
DATE: March, 2013
FIGURE NO. 2

Appendix A

Shoring Design

TIL

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SHORING DESIGN

All specifications for the design of the shoring system are in accordance with Chapter 26 of the 4th Edition of the Canadian Foundation Engineering Manual (Manual).

Due to close proximity of adjacent structure and and the depth of the excavation, a caisson wall, embedded into the clayey silt deposit below the bottom of the excavation, will have to be used to prevent any movement in the adjacent properties. Shoring consisting of soldiers pile and lagging can be used on the other sides where slight movement in the ground surface can be tolerated.

The construction of the shoring system should be carried out by a contractor experienced in this type of construction.

1. Earth pressure

For a single and multiple level support systems, the recommended earth pressure distributions are shown on Drawing A1.

The lateral earth pressure expressions, recommended in the drawings, assume that there will be no build up of hydrostatic pressure behind the shoring.

2. Pile Penetration

The soldier piles should be installed in pre-augured holes which should be filled to excavation level with 20 MPa (3000 psi) concrete and above that with 1-1/2 bag mix.

The depth of pile penetration in the non-cohesive sandy silt / silty sand and the low to medium plasticity clayey silt deposit should be calculated from the following expressions:

$$R = 1.5\,D\,K_p\,L^2\gamma$$

where R = Ultimate Load to be restrained kN
D = Diameter of concrete filled hole m
Kp = Passive resistance in the clayey silt deposit 5.0
L = Embedment Depth of the pile m
γ = Unit weight of the soil - use 21 kN/m^3 for unsaturated soils

The shoring system should be designed for a factor of safety of F = 2. The overall factor of safety of the anchored block of soil must be considered.

3. Lagging Boards

The following thicknesses of lagging boards have been recommended in the Manual:

Thickness of lagging	Maximum Spacing of Soldier Piles
50 mm (2 in)	2.0 m (6.5 ft)
75 mm (3 in)	2.5 m (8.0 ft)
100 mm (4 in)	3.0 m (10 ft)

Local experience has indicated that the lagging thickness of 75 mm has been adequate for soldier pile spacing of 3 m for soil conditions similar to those encountered at the subject site. However, it is important to consider all local conditions, such as the duration of excavation, the weather likely to be encountered, seasonal variations in the ground water and ice lensing causing frost heave in determining the lagging thickness.

Lagging in the wet sand layer will be very difficult and flowing sand conditions might be encountered. We, therefore, recommend that the sand layer should be dewatered, prior to lagging.

An alternative would be to use interlocking fillers between the soldier piles, extending to a depth of 1m below the sand deposit.

All spaces behind the lagging must be filled with free draining granular fill. If wet conditions are encountered the space between boards should be packed with geotextile filter fabric or straw to prevent loss of ground.

4. Tie Backs

The minimum spacing and the depths of the soil anchors should be as recommended in the Manual.

The tie back anchor lengths, in the non-cohesive sandy silt till and the low to medium plasticity silty clayey till / clayey silt till deposits, can be estimated using an adhesion values of 50 kPa (1000 psf). At least two full scale load tests should be carried out on the tieback anchors in each of the above subsoils. These tests should be taken to 200% of the design load or until there is a significant increase in the pullout rate. In the latter case, the design load must be limited to 50% of the load at which the pullout increases. Based on the results of the pullout test, it may be necessary to modify the anchor design and place limits on the capacity.

In addition, each anchor must be proof loaded. This is done by loading the anchor to 133% of the design load, and the anchor must be capable of sustaining this load for a minimum of 10 minutes without creep. The load may then be relaxed to 100% of design and locked in. The higher the lock in loads, the less will be the outward movement after excavation.

The proposed design of the tie-back system and method of installation must be discussed with this office prior to the finalization. Systems involving high grout pressures should be avoided if working near other basements or buried services.

5. Rakers

An alternative to tie backs is to use rakers. Rakers founded in the sandy silt / silty sand or clayey silt deposits should be designed for allowable bearing pressures of 200 kPa (4.0 k.s.f.) for rakers inclined at an angle of 45 degrees.

The raker footings should be located outside the zone of influence of the buried portion of the soldier piles and at a distance of not less than 1.5 L from the piles, where L = the embedment of the pile. No excavation should be made within two footing width of the raker footings on the side opposite the rakers.

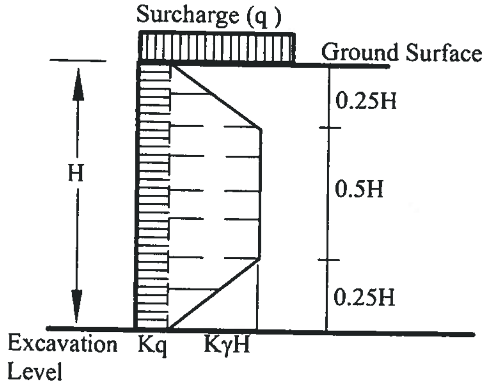
6. General Shoring Notes

It is recommended that close monitoring of vertical and lateral movement of the shoring system should be carried out at the site. If movements at the top of the piles are more than 12 mm (0.5 in), extra bracing may be required. In this regard, monitoring by inclinometers and by survey on targets should be instituted to ensure that the contractor maintains movements within design limit.

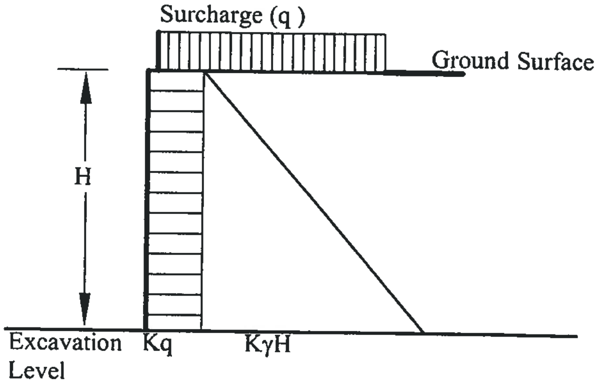
TEMPORARY SHORING

Lateral Pressure

I. Multiple Level Support



II. Single Level Support



Lateral Pressure P= K(γH + q)

where	H = Height of Shoring	m
	γ = Unit Weight of Retained Soil	21.0 kN/ m^3
	q = Surcharge	kPa
	K = Earth Pressure Coefficient	

If moderate ground and shoring movements are permissible then:
K = Ka = Active Earth Pressure Coeffiecient = 0.25

If there are building foundations within a distance of 0.5 H behind the shoring then:
K = Ko = Earth Pressure at rest = 0.4

If there are building foundations within a distance of between 0.5 H and H behind the shoring then:
K = 0.5 (Ka + Ko) = 0.33

Note:
The lateral pressure equation assumes effective drainage from behind the temporary shoring

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110 Konrad Cresent, Unit 16, Markham, Ontario L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE: Temporary Shoring Design
LOCATION: Alexandra Park Phase I, Toronto, Ontario
PROJECT NO.: 3552-12-G-TPI-A
DATE: March, 2013
DRAWING NO.: A1