GEOTECHNICAL INVESTIGATION REPORT
PROPOSED HIGHRISE DEVELOPMENT
MAIN STREET SEATON PHASES 3 & 4
2675 TO 2725 BROCK ROAD
PICKERING, ONTARIO

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Prepared For:
AVERTON (BROCK) LIMITED

Prepared by:
Alston Associates
A division of Terrapex Environmental Ltd.

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APPENDICES

1 INTRODUCTION

Alston Associates (**AA**) has been retained by Averton (Brock) Limited ("Averton") to carry out a geotechnical investigation for a proposed development within Phases 3 & 4 of the Main Street Seaton Residential Subdivision located at 2675 to 2725 Brock Road in the City of Pickering, Ontario. Authorization to proceed with this study was given by Mr. Vince Baffa of Averton.

We understand that it is proposed to develop Phases 3 & 4 with high-rise buildings and stacked townhouses constructed over two basement levels. Drawings which show the proposed development scheme were provided to us in email on March 21, 2017.

The number and locations of the boreholes advanced at the site were determined by **AA** to provide general coverage of the site.

The purpose of this study was to determine the subsurface soil and groundwater conditions, determine the relevant geotechnical properties of encountered soils and provide recommendations on the geotechnical aspects for the design of the foundations, subsurface structures, shoring system and the implementation of the project as outlined above.

This report presents the results of the investigation performed in accordance with the general terms of reference outlined above and is intended for the guidance of the client and the design architects and engineers only. It is assumed that the design will be in accordance with the applicable building codes and standards.

2 FIELDWORK

The fieldwork for the geotechnical study was carried out during the period between May 12 and 23, 2017 and consisted of advancing nine (9) boreholes at the site. The boreholes are designated as BH1 through BH9.

Boreholes BH2, BH4, BH5, BH6, and BH7 were advanced to 15.7 m below ground surface (mbgs). Boreholes BH1 and BH3 were terminated upon auger refusal at 13.4 and 14.1 mbgs, respectively. Borehole BH9 was advanced through the soil stockpile in the Phase 4 area to 16.9 m below the top of the stockpile at this location. An additional borehole was proposed to be advanced through the soil stockpile to provide borehole coverage of the Phase 4 area but was inaccessible at the time of the investigation due to frequent rainfall events which prevented drill rig access.

Monitoring wells were installed in Boreholes BH1, BH3, BH5, BH7, and BH 9. The depths of the monitoring wells range from 7.1 to 10.7 mbgs.

Standard Penetration Tests (SPT) were carried out in the course of advancing the boreholes to take representative soil samples and to measure penetration index (N-values) to characterize the condition of the various soil materials. The number of blows of the striking hammer required to drive the split spoon sampler to 300 mm depth was recorded and these are presented on the borehole log sheets as penetration resistance N-values.

The locations of the boreholes are shown on the Borehole Location Plan as Drawing 1 in Appendix B of this report.

The groundwater levels in the monitoring wells were measured by **AA** following the drilling work on May 29, 2017. The results of the groundwater measurements are discussed in Section 4.6 of this report.

The ground surface elevations at the locations of the boreholes were referenced to local benchmarks shown on the development plans prepared by Sabourin Kimble & Associates Ltd.

The fieldwork for this project was supervised by experienced field technicians from **AA** who effected drilling; soil sampling and in situ testing; defined strata interface depths; observed groundwater conditions; and prepared field borehole log sheets.

3 LABORATORY TESTS

The soil samples recovered from the split spoon sampler were properly sealed, labelled, and brought to our laboratory. They were visually classified and water content tests were conducted on all soil samples retained from Boreholes BH1, BH5 and BH9. The results of the classification and water content tests are presented on the borehole logs attached in Appendix C.

Grain-size analyses were carried out on nine (9) soil samples. The results of the laboratory tests are presented in Appendix D as Figures D-1 through D-9.

In addition, four (4) soil samples were submitted to AGAT Laboratories for chemical analysis for pH and Sulfide tests in order to determine the soil corrosive characteristics and the water-soluble sulphate content. The results of these tests are enclosed in Appendix F; discussed in Sections 5.9.

4 SITE AND SUBSURFACE CONDITIONS

Details of the subsurface conditions contacted in the boreholes are given on the individual borehole logs enclosed in Appendix C. A brief description of the soil units and groundwater conditions are given in the following subsections.

It should be noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design, and therefore, should not be construed as exact planes of geological change.

4.1 Site Description

The property is located approximately 750 m south of Taunton Road; east of the intersection of Brock Road and Zents Drive in Pickering, Ontario. There are four addresses associated with the property: 2675, 2699, 2705, and 2725 Brock Road. The study area for this report is limited to the Phase 3 & 4 areas.

The Phase 3 area is rectangular in shape; approximately 50 m wide and 120 m long. The Phase 4 area is also rectangular in shape; approximately 50 m wide and 195 m long.

The Phase 3 & 4 areas are currently undeveloped and are being used as temporary staging areas for the construction of the townhouse block dwellings in Phases 1 & 2. The Phase 3 area consists of a temporary gravel parking area and the Averton Homes sales office building. The northern portion of the Phase 4 area consists of a fenced construction yard used for storing building materials and the construction site trailers. The southern portion consists of a soil stockpile generated from excess soil material excavated during the development of Phases 1 & 2.

The ground surface topography of the site is not level. It is slightly higher on the north and grades down to the south.

The locations of the development Phases and the approximate property boundaries are shown on Drawing 1 in Appendix ‘B’.

The subsurface stratigraphy as revealed in the boreholes generally comprises surficial earth fill underlain by a complex soil profile of native silty sand, silty sand till, sandy silt, sandy silt till, sand, clayey silt till, and silty clay till. A brief description of these materials is presented below.

4.2 Topsoil

A layer of topsoil with an approximate thickness of 200 mm is present at the ground surface in Borehole BH2.

4.3 Crusher run limestone

A layer of crusher run limestone, ranging in thickness from 50 to 600 mm in thickness, is present at the ground surface in Boreholes BH3, BH5, BH6, and BH7.

4.4 Earth Fill

Earth fill materials are present in all boreholes. The earth fill comprises the uppermost stratum of the soil profile in Boreholes BH1, BH3, BH4, BH8, and BH9. It is overlain by topsoil at BHBH2, and by a crusher run limestone layer at Boreholes BH5, BH6 and BH7. The earth fill soils consist of a layer of silty clay, gravelly sand, or silt and sand materials, with traces of gravel, and organic inclusions.

The fill materials at the borehole locations extends to depths ranging from 0.6 m at Boreholes BH1 and BH4, and 2.9 m at BH9 (at stockpile).

Penetration resistance in the fill materials measured N-values ranging from 4 to 30.

The water content of the tested fill soil samples ranges from approximately 5 to 13% by weight.

4.5 Native Soils

4.5.1 Silt and Sand Soils

Silt and sand soils with variable fractions of clay and gravel are present at all boreholes, with sand and / or silt comprising the dominant fractions of soils within these deposits. The thickness of the silt and sand deposits ranges from 0.4 m at BH2 to 10.5 m at BH6.

The depth range at which these soils are present at the borehole locations are tabulated below.

Borehole No.	Depth range below grade (m)	Elevation range below grade (m)
BH1	0.6 – 7.9 11.6 – 13.5	130.25 – 122.95 119.25 – 117.35
BH2	6.1 – 7.9	124.87 – 123.07
BH3	0.6 – 9.4	129.95 – 121.15
BH4	1.5 – 6.1	128.71 – 124.11
BH5	3.6 – 12.5	126.21 – 117.31
BH6	1.1 – 11.6	128.44 – 117.94
BH7	2.4 – 9.4	127.07 – 120.07
BH8	2.9 – 5.5	126.11 – 123.51
BH9	2.9 – 5.2 10.0 – 16.9	127.33 – 125.03 120.23 – 113.63

The sand component of the soil unit varies in size from fine to medium to coarse.

The upper layer of the silt and sand soil deposits is brown and generally has a moist locally wet appearance; changing to grey at depths when the soils become wet.

The measured N-values of this soil range from 16 to in excess of 100 blows per 300 mm penetration depth, their compactness condition ranges from compact to very dense, typically being dense to very dense below about 2 mbgs. The water content ranges from 2 to 21% by weight.

Sieve and hydrometer grain size analyses were carried out on seven (7) representative samples of the sand and silt soils. The test results are enclosed in Appendix D as Figures D-1 through D-7, and summarized below.

Borehole Location	Sample Depth (mbgs) and No.	Sample Description	Gravel %	Sand %	Silt %	Clay %	Coefficient of Permeability
BH1	4.5 (Sample 7)	Brown silt and fine sand with trace of clay	1	49	40	10	4x10^{-6} cm/s
BH3	4.5 (Sample 7)	Grey gravelly sand with traces of silt and clay	34	58	5	3	10^{-2} cm/s

BH4	4.5 (Sample 7A)	Brown sand with some silt and traces of gravel and clay	4	76	11	9	9×10^{-6} cm/s
BH5	7.5 (Sample 9)	Grey silty fine sand with traces of clay and gravel	0	61	28	11	3×10^{-6} cm/s
BH6	1.5 (Sample 3)	Brown silt and fine sand with trace clay	0	42	53	5	10^{-4} cm/s
BH6	4.0 (Sample 6)	Brown sand with traces of silt and clay	0	81	9	10	4×10^{-6} cm/s
BH6	7.5 (Sample 9)	Grey silty sand with traces of clay and gravel	3	70	20	7	3×10^{-3} cm/s

Using the grain size analysis results, the Coefficient of Permeability (k) of the sandy and silty soils is estimated to be in the range of 10^{-2} cm/s to 3×10^{-6} cm/s; high to low relative permeability.

4.5.2 Silty Sand and Sandy Silt (Till)

Silty sand and / or sandy silt till was encountered in Boreholes BH2, BH3, BH4, BH5, BH7, BH8 and BH9. The till is a glacial deposit and consists of a random mixture of soil particles ranging from clay to gravel, with the sand and silt being the predominant fractions.

The thickness of the silty sand till and sandy silt till deposits ranges from 1.6 m at BH5 to 4.9 m at BH9.

The depth range at which these soils are present at the borehole locations are tabulated below.

Borehole No.	Depth range below grade (m)	Elevation range below grade (m)
BH2	0.7 – 3.6 4.0 – 6.1	130.27 – 127.37 126.97 – 124.87
BH3	9.4 – 14.1	121.15 – 116.45
BH4	0.6 – 1.5 8.8 – 11.6	129.61 – 128.71 121.41 – 118.61
BH5	2.1 – 3.6	127.71 – 126.01
BH7	0.8 – 2.4	128.67 – 127.07
BH8	0.9 – 2.9 5.5 – 10.0	128.11 – 126.11 123.51 – 119.01
BH9	5.1 – 10.0	125.13 – 120.23

Below an approximate depth of 2 m below grade the till is generally grey in colour; brown above this depth.

The measured N-values in the till soil ranges from 12 to in excess of 100 blows, compact to very dense compactness condition, typically being dense to very dense, with the compact soil being limited to the soil within a depth of 2 mbgs. The water content ranges from 6 to 16% by weight.

4.5.3 Clayey Silt (Till)

Clayey silt till was encountered in Boreholes BH1 (7.9 to 11.6 mbgs), BH2 (7.9 to 12.2 mbgs), and in BH4 (6.4 to

8.8, and 11.6 to 13.1 mbgs). The thickness of the stratum ranges from 2.8 m to 4.3 m.

The till is a glacial deposit and consists of a random mixture of soil particles ranging from clay to gravel, with the silt being the predominant fraction.

The deposit is grey in colour and has a very moist appearance.

The measured N-values of this soil range from 47 to 84 blows for 250 mm of penetration; it possesses a hard consistency. The water content ranges from 8 to 12% by weight.

Sieve and hydrometer grain size analyses were carried out on one (1) clayey silt sample; obtained from Borehole BH4 at 8 mbgs (Sample 9B). The test revealed that the soil consists of 1% gravel, 31% sand, 50% silt and 18% clay. The test result is enclosed in Appendix D as Figure D-8. Based on the grain size analyses results, the Coefficient of Permeability (k) of the silty sand soil is estimated to be less than 10^{-7} cm/sec; very low relative permeability.

4.5.4 Silty Clay

Silty clay was encounter in all boreholes with the exception of Boreholes BH1, BH3, and BH9 at depths below 9.5 mbgs. The thickness of the stratum ranges from 2.6 m to 6.3 m.

The silty clay soil unit contains traces of sand. The deposit is grey in colour and has a moist appearance.

The measured N-values of this soil range from 39 to 91 blows for 275 mm of penetration; it possesses a hard consistency.

Sieve and hydrometer grain size analyses were carried out on one (1) silty clay sample; obtained from Borehole BH6 at 12.5 mbgs (Sample 12). The test revealed that the soil consists of 12% sand, 50% silt and 36% clay. The test result is enclosed in Appendix D as Figure D-9. Based on the grain size analyses results, the Coefficient of Permeability (k) of the silty sand soil is estimated to be less than 10^{-7} cm/sec; very low relative permeability.

4.6 Groundwater

Groundwater measurements were made in the monitoring wells installed in Boreholes BH1, BH3, BH5, BH7, and BH9 on May 29, 2017. The groundwater monitoring results are shown in the following table.

Borehole No.	Depth of Groundwater (mbgs)	Groundwater Elevation (m)
BH1	2.33	128.52
BH3	2.72	127.83

BH5	3.24	126.57
BH7	2.25	127.22
BH9	3.36	126.87

Using the groundwater level monitoring results, the indications are that the groundwater flow at the site is in an approximately north to south direction.

It should be noted that groundwater levels are subject to seasonal fluctuations. A higher groundwater level condition will likely develop in the spring and following significant rainfall events.

5 DISCUSSION AND RECOMMENDATIONS

The following discussions and recommendations are based on the factual data obtained from the boreholes advanced at the site and are intended for use by the client's architects and design engineers only.

Contractors bidding on this project or conducting work associated with this project should make their own interpretation of the factual data and/or carry out their own investigations.

The investigation has revealed that fill materials ranging to a depth of about 2.1 mbgs are present at the site. The native soil stratigraphy as revealed in the boreholes generally consists of a complex soil profile of silty sand, sandy silt, silty sand and sandy silt till, sand, clayey silt till, and silty clay. Groundwater is situated at shallow depths ranging from 2.3 to 3.4 mbgs. On the basis of our fieldwork, laboratory tests and other pertinent information supplied by the client, the following comments and recommendations are made.

5.1 Excavations, Groundwater Control and Backfill

Based on the borehole findings, excavation for basement and foundations is not expected to pose any difficulty. Excavation of the soils at this site can be carried out with heavy hydraulic excavators.

All excavations must be carried out in accordance with Occupational Health and Safety Act (OHSA). With respect to OHSA, the hard clayey silt / silty clay tills are classified as Type 1 soils. The fill and silty and sandy soils above the groundwater table can be classified as Type 3 soils. Sandy and silty soils that are situated below the groundwater table are classified as Type 4 soils.

Temporary excavations for slopes in Type 3 soil should not exceed 1.0 horizontal to 1.0 vertical. Locally, where loose or soft soil is encountered at shallow depths or within zones of persistent seepage, it may be necessary to flatten the side slopes as necessary to achieve stable conditions. Side slopes of excavations extending below the water table in the wet silty, sandy and gravelly soils (Type 4 soil) should not be any steeper than 3 horizontal to 1 vertical.

For excavations through multiple soil types, the side slope geometry is governed by the soil with the highest number designation. Excavation side-slopes should not be unduly left exposed to inclement weather. Sheeting the slopes with tarpaulins or other protective measures will assist in preserving the condition of the soils.

Where workers must enter excavations extending deeper than 1.2 m below grade, the excavation side-walls must be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects.

It should be noted that the native till soils are non-sorted sediments and therefore may contain boulders. Provisions must be made in the excavation/drilling contract for the removal of possible boulders.

Given that the basement walls of the proposed development will extend to the property limits, it will not be possible to slope the banks of the excavation. It will be necessary to shore the basement excavation walls.

Groundwater was encountered in all the boreholes. Water bearing silty/sandy soils as well as sand and gravel layers are present at various depths across the site. The groundwater levels measured on May 29, 2017 was positioned at about Elevation 128.6 m in Borehole BH1, 127.7 m in BH3, 126.7 m in BH5, 127.2 m in BH7 and 126.8 m in BH9.

Based on the proposed construction of two levels underground garage, groundwater seepage will occur during basement and foundation excavations. The seepage will occur from the silty and sandy soils. Either a secant pile wall (caisson wall) or a soldier-pile and wood lagging wall may be used as the shoring system.

In order to control seepage flow into the excavations as well as to prevent piping of the excavations below the groundwater table, the caisson wall should extend below the excavation level(s) with sufficient penetration into the dense sandy silt till or hard clayey soils. The embedment depth of the caisson wall for seepage control and basal stability should be designed by the shoring contractor, taking into consideration the excavation method to be used through the water bearing soils and the concreting technique for installing caissons below the groundwater table.

As an alternative, a temporary dewatering system may be installed prior to the drilling of the caissons, to depress the groundwater level to at least 1 m below the design bottom elevation(s) of the caisson wall.

In the event it is preferred to use soldier-piles and wood lagging, it will be necessary to depress the groundwater level to a sufficient depth below the design excavation bottom(s). Considerations should be given to the excavation method through the water bearing soils and the concreting technique for installing the soldier-piles below the groundwater table. It will also be necessary to install geotextile behind the lagging boards in the granular fill layer as well as in the silty and sandy soil strata; to prevent migration of such soils into the excavations. In addition, the silty and sandy soils are expected to have very short stand-up time. As such, the lagging boards should be installed in such a manner to prevent caving/movement of such soils into the excavations.

Given the subsurface conditions at the site it is recommended that a continuous caisson wall comprise the shoring system.

It will be necessary to determine the construction dewatering requirements and to collect the information required for the application for Permit to Take Water (PTTW).

Groundwater yield from the fill materials is not expected to be significant. Based on the results of grain size analyses and the estimated k values, the sand and silt soils are expected to have high to low permeability coefficients; the groundwater yield from these soils is expected to be small to moderate. The silty sand / sandy silt till, and clayey silt and silty clay soils have low permeability values. The groundwater yield from these soils is expected to be small to very small.

While dewatering will still be necessary, dewatering quantities are not expected to be sufficiently large to require a PTTW in the event dewatering is carried out from within the enclosure of a caisson wall which is embedded into till soils.

The contractor should make his own assessment for temporary control of groundwater seepage into the excavation, as well as to maintain basal stability of the subgrade during the foundation construction stage.

Assuming that the exterior basement walls of the proposed development will be poured up against the shored sides of the excavations, prefabricated drainage sheets (Terradrain 600 or equivalent) must be placed continuously against the walls. These should drain through drainage ports in the walls into a perimeter solid pipe and channel all the water into a sump pit in the building. The maximum spacing of the drainage ports must not exceed 6 m, subject to confirmation at the time of construction.

It will also be necessary to waterproof the basement walls at a minimum of 0.5 m above the highest steady groundwater level measured from the monitoring wells. In this regard, we recommend that waterproofing be installed from Elevation 129 m to the bottom of the basement wall in Phase 3 and from Elevation 127.5 m to the bottom of the basement wall in Phase 4.

Sub-floor weeping pipes 100 mm in diameter must be placed under the slab-on-grade at a maximum spacing of 6 m (subject to confirmation at the time of construction). The weeping tiles must be wrapped with filter fabric and covered with a minimum of 150 mm of clear stone. They should be placed a minimum depth of 0.5 m below the basement floor slab, above the founding level of the footings.

The perimeter and sub-floor drains must be connected to a positive frost-free outlet from which the water can be removed, or connected to a sump located in the lowest level of the basement. The water from the sump must be pumped out to a suitable discharge point.

Typical details of perimeter drainage systems are included in Appendix E of this report.

The installation of the perimeter and sub-floor drains as well as the outlet must conform to the applicable plumbing code requirements.

On-site excavated native soils which are above the groundwater table are considered suitable for reuse as backfill or engineered fill material, provided any topsoil, organic or unsuitable materials are excluded from the backfill, and that their water content is controlled to within 2% of its optimum water content as determined by Standard Proctor test, and the materials are effectively compacted with heavy vibratory pad-type rollers. The compactors must be of sufficient size and energy to break down the lumps and to knead the soil into a homogeneous mass as water and compaction effort is applied. If the equipment does not have sufficient energy to break down the lumps, there is a tendency to bridging and post construction settlements. In areas of narrow trenches or confined spaces such as around manholes, foundations, foundation walls, etc., the use of aggregate fill such as Granular 'B' (OPSS 1010) is required if there is to be post-construction grade integrity.

The on-site native soils below the groundwater table are excessively wetter than their optimum moisture contents. These materials may prove difficult to compact and should be dried sufficiently in order to achieve the specified degree of compaction.

5.2 Foundation Design

Based on two basement levels, the lowest parking garage (Level P2) will be positioned approximately 6 m below grade, and the foundations of the buildings about 7 to 7.5 m below grade.

Based on the borehole findings, the soil at the anticipated founding elevations will comprise of wet dense to very dense sandy silt and silty sand soils, and locally gravelly sand soil. These soil units are water bearing.

Based on the anticipated founding elevations for the proposed footings, the native soils are suitable for the support of strip and spread footing foundations for bearing resistances at Serviceability Limit States (SLS) of 550 kPa, and factored geotechnical bearing resistances at Ultimate Limit States (ULS) of 825 kPa. The recommended resistances would be subject to confirmation at the time of foundation construction.

It will be necessary to lower the groundwater table to a minimum of 0.5 m below the bases of the footings prior to the excavation of the footings.

At the locations where the bearing surface for the footings will consist of silty and sandy soils, a concrete mud slab should be placed immediately after exposure to prevent construction disturbance and the subsequent reduction in strength of the subgrade soils.

The geotechnical bearing resistance values recommended above are for vertical loads (no inclination) and no eccentricity. The total and differential settlements of spread footing foundations designed in accordance with the recommendations provided in this report should not exceed the conventional limits of 25 mm and 19 mm respectively.

Once the foundation design is finalized, the magnitude of foundation settlement should be reviewed by **AA** based on the applied loads and the dimensions of the footings in order to check if the total settlement under the foundation is within tolerable limits.

Due to variations in the compactness condition/consistency of the founding soils and/or loosening caused by excavating disturbance and/or seasonal frost effects, all footing subgrade must be evaluated by the Geotechnical Engineer prior to placing formwork and foundation concrete to ensure that the soil exposed at the excavation base is consistent with the design geotechnical bearing resistance.

It should be noted that the resistance values could be less than stated due to eccentric loading conditions. The foundation design must consider load inclinations and eccentricity as per the applicable principles presented in the latest version of the Canadian Foundation Engineering Manual (CFEM). **AA** would be pleased to provide detailed assistance in the required geotechnical calculations to satisfy these requirements.

Where necessary, the stepping of the footings at different elevations should be carried out at an angle no steeper than 2 horizontal (clear horizontal distance between footings) to 1 vertical (difference in elevation) and no individual footing step should be greater than 0.45 m.

The native soils are susceptible to disturbance and therefore construction scheduling should consider the amount of excavation left exposed to the elements, during foundation preparation. Rainwater or groundwater seepage entering the foundation excavation must be pumped away (not allowed to pond). The foundation subgrade soils should be protected from freezing, inundation, and equipment traffic at all times. It is recommended that footings placed on the exposed native soils be poured on the same day as they are excavated, after removal of all unsuitable materials and approval of the bearing surface.

There is no official rule governing the required founding depth for footings below unheated basement floors. Certainly it will not be greater than the 1.2 m required in southern Ontario for exterior footings. Unmonitored experience indicates that shallower depth of 1 m for interior footings and 0.8 m for exterior footings has been successful for two level basements. Alternatively, equivalent artificial thermal insulation should be installed for frost protection purposes. Adjacent to air shafts and entrance and exit doors, a footing depth of 1.2 m below floor surface level is required.

Exposed foundation subgrade soils should be protected against freezing at all times and surface water should be kept away from the foundation subgrade areas to prevent softening. If unstable subgrade conditions develop, our office should be contacted in order to assess the conditions and make appropriate recommendations.

If construction proceeds during freezing weather conditions, adequate temporary frost protection for the footing bases and concrete must be provided.

5.3 Concrete Slab-on-Grade

The boreholes revealed that below the lowest basement slab level, at an approximate depth of 6 m below grade the subgrade soils will generally comprise of wet dense to very dense sandy silt and silty sand soils, and locally gravelly sand soil. These soils are capable of supporting slab-on-grade construction.

Subgrade preparation should include the removal or compaction of any disturbed soils. The subgrade should then be proof-rolled with heavy equipment. The proof-rolling operation should be witnessed by the Geotechnical Engineer. Any subgrade areas which deflect significantly should be sub-excavated and replaced with suitable approved earth fill material compacted to at least 98% of Standard Proctor Maximum Dry Density (SPMDD).

Conventional lightly loaded concrete floor slabs should be placed on a 200 mm thick drainage layer consisting of 19 mm clear stone (OPSS 1004) compacted by vibration to a dense state, with filter fabric separating the clear stone and the subgrade soils.

Provided the subgrade, under-floor fill and granular base are prepared in accordance with the above recommendations, the Modulus of Subgrade Reaction (Ks) for floor slab design will be 30,000 kPa/m.

5.4 Elevator Pits

Elevator pit(s) in general are constructed at a minimum depth of 1.5 m below the lowest basement floor slab, approximately 7.5 below existing grade for two basement levels.

Given that groundwater will be encountered at the anticipated depths, it is recommended to waterproof the bases and the walls of the elevator pits, and design the pit for hydrostatic uplift and lateral pressures.

5.5 Lateral Earth Pressures

Parameters used in the determination of earth pressure acting on temporary shoring walls are defined below.

Soil Parameters

Parameter	Definition	Units
Φ'	angle of internal friction	degrees
γ	bulk unit weight of soil	kN/m^3
K_a	active earth pressure coefficient (Rankine)	dimensionless
K_o	at-rest earth pressure coefficient (Rankine)	dimensionless
K_p	passive earth pressure coefficient (Rankine)	dimensionless

The appropriate un-factored values for use in the design of structures subject to unbalanced earth pressures at this site are tabulated as follows:

Soil Parameter Values

Soil	Parameter				
	Φ'	γ	K_a	K_p	K_o
Compact Granular Fill (1) - Granular 'A' (OPSS 1010)	35°	23.0	0.27	3.65	0.43
Compact Granular Fill (1) - Granular 'B' (OPSS 1010)	32°	21.0	0.31	3.25	0.47
Existing Earth Fill / Disturbed Native Soil	28°	19.5	0.36	2.77	0.53
Clayey Silt / Silty Clay	30°	20.0	0.33	3.00	0.50
Sandy silt, silt and fine sand, silty sand and sandy silt till	compact - 32° dense - 36°	19.0 19.0	0.31 0.26	3.25 3.88	0.47 0.40

Notes:

1. Compacted to a minimum of 95% Standard Proctor Maximum Dry Density.

2. Passive and sliding resistance within the zone subject to frost action (i.e. within 1.2 m below finished grade) should be disregarded in the lateral resistance computations.
3. In the case of a structure below the groundwater table, the use of submerged soil weight should be considered along with the appropriate hydrostatic pressures.
4. Temporary and/or permanent surcharges at the ground surface should be considered in accordance with the applicable Soil Mechanics methods.

The design earth pressures in compacted backfill should be augmented with the dynamic effects of the compaction efforts, which typically are taken as a uniform 12 kPa pressure over the entire depth below grade where the calculated earth pressure based on the above earth pressure factors is less than 12 kPa.

The shoring walls or bracings subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following formula:

$$\mathbf{P = K [\gamma (h - h_w) + \gamma' h_w + q] + \gamma_w h_w}$$

where P = lateral pressure in kPa acting at a depth h (m) below ground surface

K = applicable lateral earth pressure coefficient (use Ko for design of basement wall)

H = height at any point along the interface (m)

h_w = depth below the groundwater level at point of interest (m)

γ = bulk unit weight of backfill (kN/m^3)

γ' = the submerged unit weight (kN/m^3) of exterior soil ($\gamma' = \gamma - \gamma_w$)

γ_w = unit weight of water, assume a value of 9.8 kN/m^3

q = the complete surcharge loading (kPa)

This equation does not assume that free-draining backfill and positive drainage is provided and can be used if conditions indicate the wall will be partially or fully submerged in conjunction with the earth pressure.

Resistance to sliding of earth retaining structures is developed by friction between the base of the footing and the soil. This friction (**R**) depends on the normal load on the soil contact (**N**) and the frictional resistance of the soil (**tan Φ'**) expressed as: **R = N tan Φ'**. This is an ultimate resistance value and does not contain a factor of safety.

5.6 Shoring Design

Either a caisson wall or a soldier pile and wood lagging wall system may be used as the shoring system, however given the subsurface soil and groundwater conditions, a continuous caisson wall is recommended.

The design of temporary shoring for the support of the excavation walls must account for the presence of structures and buried services on the adjacent properties, and the existing subsurface conditions at the site.

The lateral restraining force for the shoring system may be provided by employing either rakers or tieback anchors. The latter is favorable because they do not protrude into the excavations as is the case with rakers. The use of tieback anchors will depend on whether permission is obtained to extend the anchors to the required distance on to the neighboring properties.

To prevent possible caving of soils, the tie back anchors should be drilled with a hollow stem auger, and anchors installed and concrete/cement grout poured through the liner.

Temporary liners must be used for excavation of the pile holes. The shoring contractor should also provide construction method(s) to overcome any groundwater seepage into the pile holes during excavation and subsequent concreting of the drilled holes to comply with good construction practice.

The shoring design should be based on the procedure detailed in the latest edition of the CFEM.

The earth pressure coefficients applicable for the design of the shoring system are:

= K_a the active pressure coefficient,

= 0.3 - where adjacent building footings or buried services fall outside an envelope formed by a 60° line drawn from the base of the excavation wall to the ground surface

= 0.25 - where adjacent building footings or buried services are outside an envelope formed by a 45° line drawn from the base of the excavation wall to the ground surface

= K_o the 'at rest' earth pressure coefficient, applicable where no movement in the retained soil can be permitted, such as the presence of buried services or foundations close to the wall, = 0.45.

Where the wall backfill can be drained effectively to eliminate hydrostatic pressures on the wall, the shoring walls may be designed to resist a pressure that can be calculated based on the following formula:

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

The above expression assumes that the soil immediately behind the lagging boards is comprised of freely draining material at least to the level of the base of the excavation.

Based on the borehole findings, excavation for basement is anticipated to terminate in wet dense to very dense sandy silt and silty sand soils, and locally gravelly sand soil. The minimum depth of penetration (d) of soldier piles may be estimated from the following expression:

$$R = NB\ (\tfrac{1}{2}\gamma d^2 K_p)$$

where **R** = required toe resistance

K_p = passive earth pressure coefficient = 3.88

N = factor according to three dimensional effect around an isolated pile, use 2.0

B = diameter of concrete filled hole

d = required penetration depth

γ = bulk unit weight of soil = 19 kN/m^3

Raker footings should be designed in accordance with the design principals for shallow foundations subject to inclined loading. All raker footings should be located outside the zone of influence of the buried portion of soldier piles, and at a distance of no less than 1.5D from the piles, where D = Depth of penetration of the piles below the base of the excavation. No excavation should be made within two footings widths of the raker footings, on the side opposite the rakers.

The length providing effective anchorage for tie-back anchors is that extending beyond a line projected up at a 45° from the toe of excavation.

Anchors may be designed based on a soil/grout bond value of 60 kPa. This value depends on the anchor installation method and grouting procedures. Gravity poured concrete can result in low bond values, while pressure grouted anchors will give higher values and produce a more satisfactory anchor. It will be necessary to perform load tests on the tiebacks to confirm the bond stresses assumed in the design of anchors.

Movement of the shoring system is inevitable. Vertical movements will result from the vertical loads on the soldier piles resulting from the inclined tiebacks and inward horizontal movement will result from the earth and water pressures. The magnitude of this movement can be controlled by sound construction practices. The lateral and vertical movement of the shoring system must be monitored especially at locations in which settlement sensitive structures are present, to ensure that movements are kept within acceptable range.

5.7 Pavement Design

The pavement above the parking garage roof slab may be comprised of a minimum of 75 mm thick layer of granular 'A' topped with asphaltic concrete having a minimum thickness of 80 mm (40 mm HL8 and 40 mm HL3). The asphaltic concrete materials should be rolled and compacted in accordance with OPSS 310 requirements.

The gradation and physical properties of HL-3 and HL-8 asphaltic concrete, and Granular 'A' shall conform to the OPSS standards.

The critical section of pavement will be at the transition between the pavement on grade and the pavement above the garage roof slab. In order to alleviate the detrimental effects of dynamic loading / settlement / pavement depression in the backfill to the rigid garage roof structure, it is recommended that an approach type slab be constructed at the entrance/exit points, by extending the granular sub-base to greater depths along the exterior garage wall.

5.8 Earthquake Design Parameters

The 2012 Ontario Building Code (OBC) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.18.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification.

The parameters for determination of the Site Classification for Seismic Site Response are set out in Table 4.1.8.4.A of the 2012 OBC. The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (Vs) measurements have been taken. In the absence of such measurements, the classification is estimated on the basis of empirical analysis of undrained shear strength or penetration resistance. The applicable penetration resistance is that which has been corrected to a rod energy efficiency of 60% of the theoretical maximum or the N60 value.

Based on the borehole information, the subsurface stratigraphy as revealed in the boreholes generally comprises a thin layer of fill material underlain by dense to very dense sandy and silty soils and hard layey sit and silty clay. Based on boreholes advanced on vicinal properties, the hard silty clay is underlain by shale bedrock. Based on the above, the site has been classified as Class C for Seismic Site Response in accordance with table 4.1.8.4.A of the 2012 OBC.

The site specific 5% damped spectral acceleration coefficients, and the peak ground acceleration factors are provided in the 2012 OBC - Supplementary Standard SB-1 (September 14, 2012), Table 1.2, location Pickering, Ontario.

5.9 Chemical Characterization of Subsurface Soils

Four soil samples, obtained from Boreholes BH1 (Sample 8), BH3 (Sample 9), BH5 (Sample 8) and BH6 (Sample 9), were submitted to AGAT Laboratories for pH index test, and determination of water-soluble sulphate content and its potential of attacking the subsurface concrete. The test results are attached ion Appendix F.

The concentration of water-soluble sulphate of the tested samples ranges from 0.0012 and 0.0126 %; below the CSA Standard of 0.1% water-soluble sulphate (Table 12 of CSA A23.1, Requirements for Concrete Subjected to Sulphate Attack). Special concrete mixes against sulphate attack is therefore not required for the sub-surface concrete of the proposed development.

The pH of the tested samples range between 7.99 and 8.36; possessing a slight alkalinity.

The Certificate of Analysis provided by the analytical chemical testing laboratory is contained in Appendix E of this report.

The concentration of water-soluble sulphate of the tested samples is below the CSA Standard of 0.1% water-soluble sulphate (Table 12 of CSA A23.1, Requirements for Concrete Subjected to Sulphate Attack). Special concrete mixes against sulphate attack is therefore not required for the sub-surface concrete of the proposed development.

The sulphate test results are included in the Certificate of Analysis provided by AGAT Laboratories; contained in Appendix F of this report.

6 LIMITATIONS OF REPORT

The Limitations of Report, as quoted in Appendix 'A', are an integral part of this report.

Yours very truly,

alston associates
A division of Terrapex Environmental Ltd.

Kellen Campbell
Project Manager

Vic Nersesian, P. Eng.
Vice President, Geotechnical Services

APPENDIX A

LIMITATIONS OF REPORT

Limitations of Report

The conclusions and recommendations in this report are based on information determined at the inspection locations. Soil and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the soil investigation.

The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known to us, in our analysis certain assumptions had to be made as set out in this report. The actual conditions may, however, vary from those assumed, in which case changes and modifications may be required to our recommendations.

This report was prepared for Averton (Brock) Limited by Alston Associates. The material in it reflects Alston Associates judgement 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 which the Third Party may make based on it, are the sole responsibility of such Third Parties.

We recommend, therefore, that we be retained during the final design stage to review the design drawings and to verify that they are consistent with our recommendations or the assumptions made in our analysis. We recommend also that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the test holes. In cases where these recommendations are not followed, the company’s responsibility is limited to accurately interpreting the conditions encountered at the test holes, only.

The comments given in this report on potential construction problems and possible methods are intended for the guidance of the design engineer, only. The number of inspection locations may not be sufficient to determine all the factors that may affect construction methods and costs. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work.

APPENDIX B

BOREHOLE LOCATION PLAN

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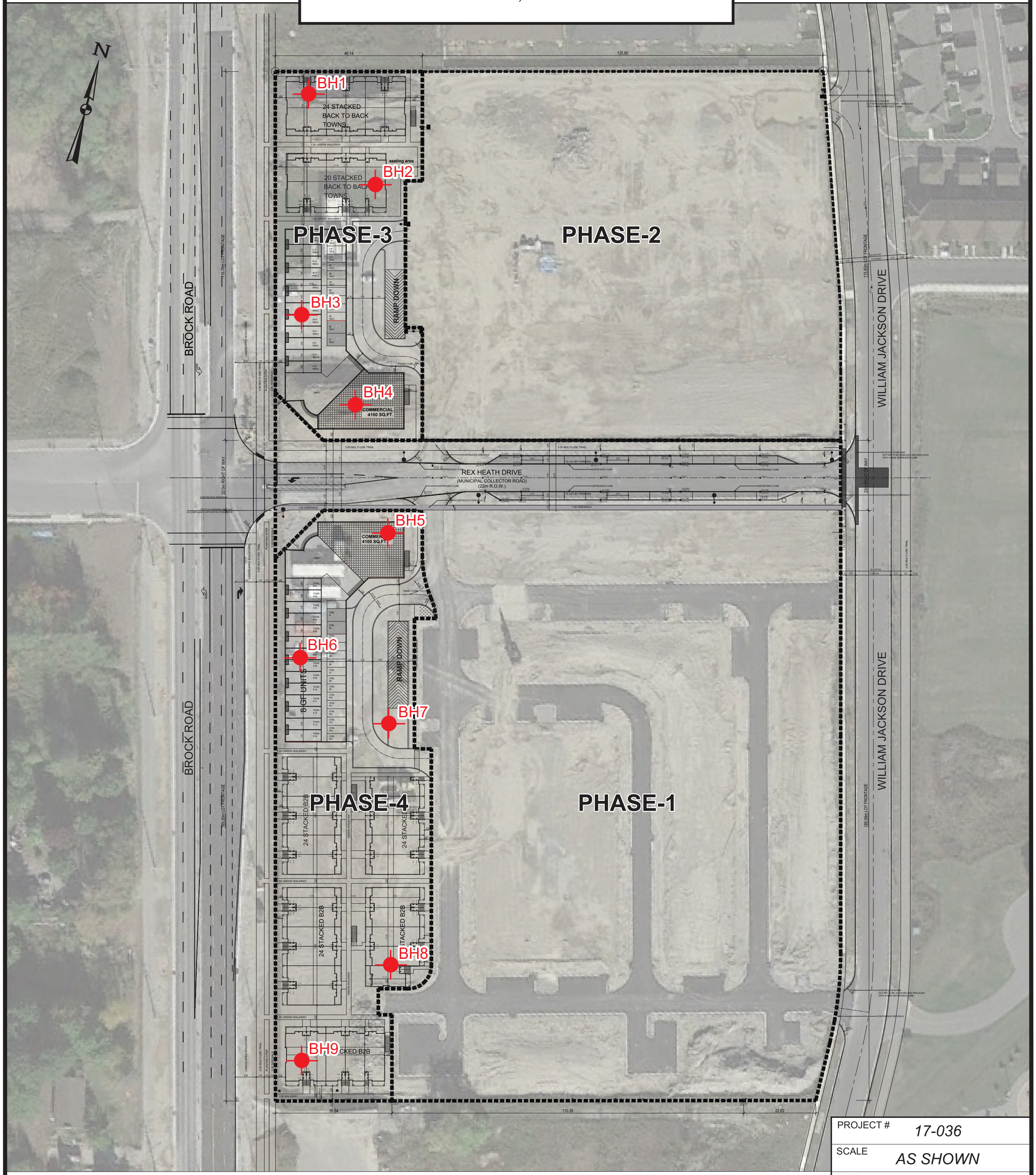
BOREHOLE LOCATION PLAN

2675 TO 2725 BROCK ROAD
PICKERING, ONTARIO

CLIENT



0 50m 100m

(APPROXIMATE)

SOURCE: GOOGLE EARTH, 2016 IMAGERY.

LEGEND

● BOREHOLE

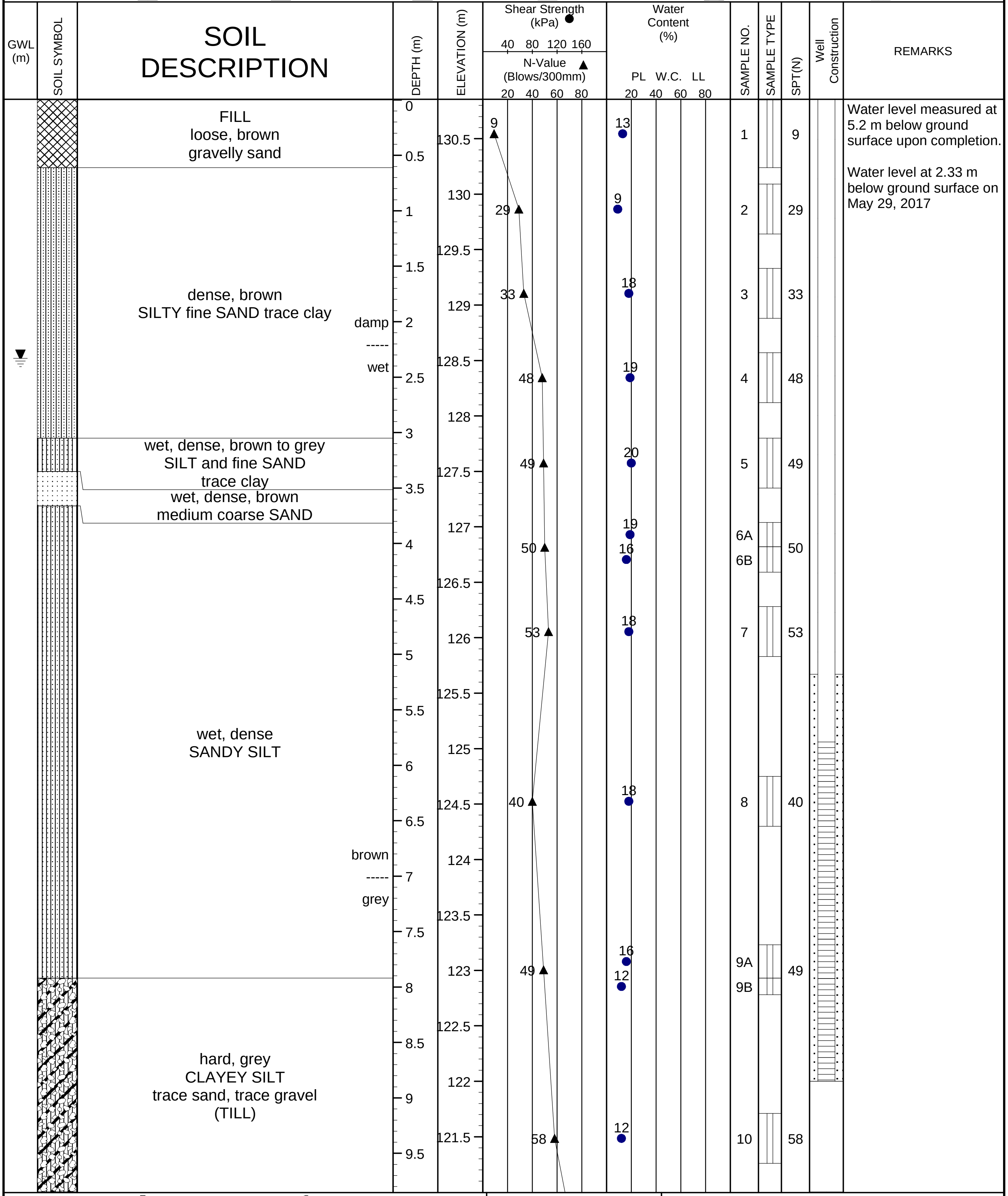
PROJECT #	*17-036*
SCALE	*AS SHOWN*
DATE	*APRIL 2017*
DRAWN *SF*	CHECKED
DRAWING #	*DRAWING 1*

APPENDIX C

BOREHOLE LOG SHEETS

CLIENT: Averton Developments	METHOD: Augering and Split Spoon Sampling	**BH No.: 1**
PROJECT: 2675 to 2725 Brock Road	PROJECT ENGINEER: VN ELEV. (m) 130.85	
LOCATION: Pickering, Ontario	NORTHING: 4860418 EASTING: 653605	PROJECT NO.: 17-036

SAMPLE TYPE ▯ AUGER ◩ DRIVEN ⧗ CORING ▀ DYNAMIC CONE ▮ SHELBY ⌶ SPLIT SPOON



SOIL DESCRIPTION	
FILL loose, brown gravelly sand	
dense, brown SILTY fine SAND trace clay	damp ----- wet
wet, dense, brown to grey SILT and fine SAND trace clay	
wet, dense, brown medium coarse SAND	
wet, dense SANDY SILT	brown ----- grey
hard, grey CLAYEY SILT trace sand, trace gravel (TILL)	

N-Value	Water Content	SAMPLE NO.	SPT(N)
9	13	1	9
29	9	2	29
33	18	3	33
48	19	4	48
49	20	5	49
50	19 16	6A 6B	50
53	18	7	53
40	18	8	40
49	16 12	9A 9B	49
58	12	10	58

REMARKS

Water level measured at 5.2 m below ground surface upon completion.

Water level at 2.33 m below ground surface on May 29, 2017

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	REVIEWED BY: VN	Page 1 of 2

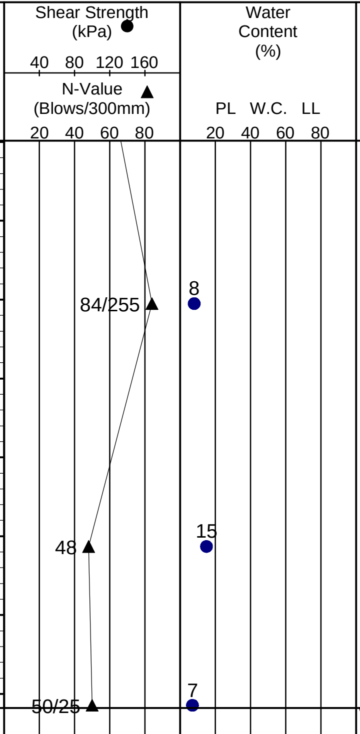
CLIENT: Averton Developments
METHOD: Augering and Split Spoon Sampling

BH No.: 1

PROJECT: 2675 to 2725 Brock Road
PROJECT ENGINEER: VN
ELEV. (m) 130.85
LOCATION: Pickering, Ontario
NORTHING: 4860418
EASTING: 653605
PROJECT NO.: 17-036

SAMPLE TYPE ◨ AUGER ◪ DRIVEN ⧓ CORING ⬒ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) ● / N-Value (Blows/300mm) ▲	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	▨	hard, grey CLAYEY SILT trace sand, trace gravel (TILL)	10 10.5 11 11.5	121 120.5 120 119.5	84/255	8	11	⌶	84/ 255		
	░	wet, grey, dense to very dense SAND trace gravel	12 12.5 13	119 118.5 118 117.5	48 50/25	15 7	12 13	⌶ ⌶	48 50/ 25		Auger refusal at 13.4 m below ground surface
		END OF BOREHOLE									



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REVIEWED BY: VN

CLIENT: Averton Developments
METHOD: Augering and Split Spoon Sampling

BH No.: 2

PROJECT: 2675 to 2725 Brock Road
PROJECT ENGINEER: VN
ELEV. (m) 130.97
LOCATION: Pickering, Ontario
NORTHING: 4860398
EASTING: 653633
PROJECT NO.: 17-036

SAMPLE TYPE: ◧ AUGER ◩ DRIVEN ⧓ CORING ▀ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON

GWL (m) | SOIL SYMBOL | SOIL DESCRIPTION | DEPTH (m) | ELEVATION (m) | SAMPLE NO. | SAMPLE TYPE | SPT(N) | Well Construction | REMARKS

SOIL DESCRIPTION

TOPSOIL 200 mm

FILL
brown silty clay
organic inclusions

compact
-----
dense

damp
SANDY SILT
trace clay, trace gravel
(TILL)
brown
-----
grey

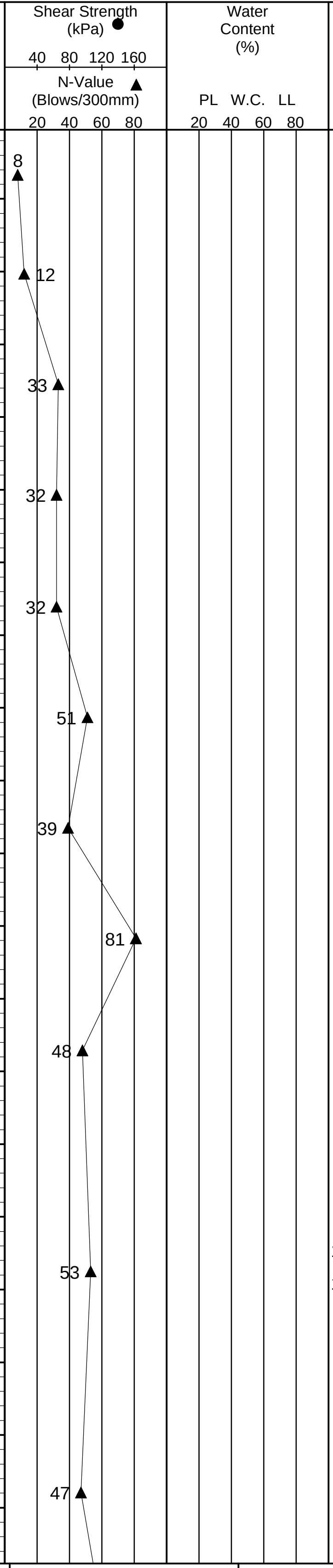
wet, very dense, brown
GRAVELLY SAND

wet, dense to very dense
SANDY SILT
occasional clay seams
(TILL)
brown
-----
grey

wet, dense, grey
SAND
with traces of
gravel, silt and clay

wet, dense to very dense, grey
CLAYEY SILT
trace sand, trace gravel
(TILL)

DEPTH (m)	ELEVATION (m)
0	
0.5	130.5
1	130
1.5	129.5
2	129
2.5	128.5
3	128
3.5	127.5
4	127
4.5	126.5
5	126
5.5	125.5
6	125
6.5	124.5
7	124
7.5	123.5
8	123
8.5	122.5
9	122
9.5	121.5



SAMPLE NO.	SPT(N)
1A 1B 1C	8
2	12
3	33
4	32
5	32
6A 6B	51
7	39
8	81
9	48
10A 10B	53
11	47

REMARKS: Borehole cave in measured at 4.9 m and water level at 4.3 m below ground surface upon completion.

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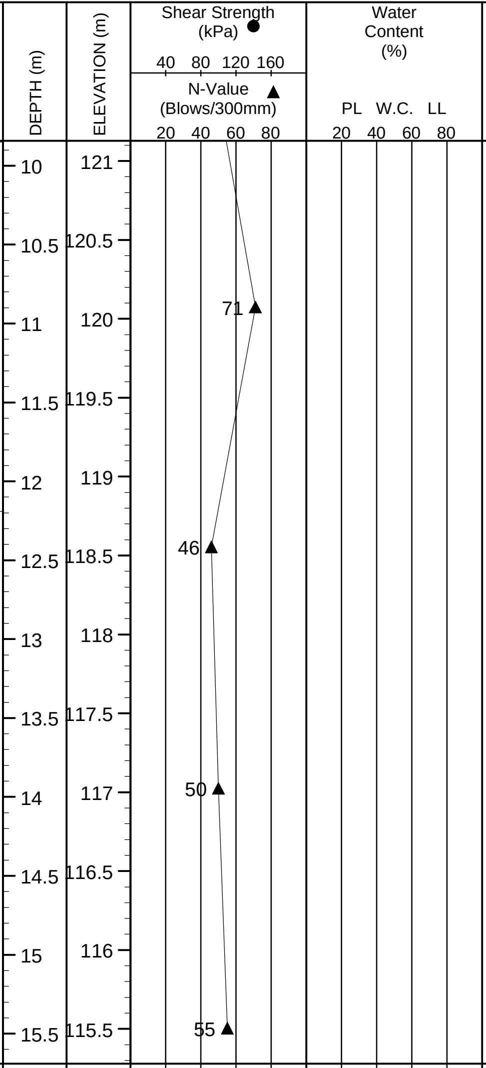
CLIENT: Averton Developments
METHOD: Augering and Split Spoon Sampling

BH No.: 2

PROJECT: 2675 to 2725 Brock Road
PROJECT ENGINEER: VN
ELEV. (m) 130.97
LOCATION: Pickering, Ontario
NORTHING: 4860398
EASTING: 653633
PROJECT NO.: 17-036

SAMPLE TYPE ▮ AUGER ◩ DRIVEN ⧗ CORING ▀ DYNAMIC CONE ▯ SHELBY Ⅱ SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	▨	wet, dense to very dense, grey CLAYEY SILT trace sand, trace gravel (TILL)	12	Ⅱ	71		
	▨	hard, grey SILTY CLAY trace sand, trace gravel	13	Ⅱ	46		
			14	Ⅱ	50		
			15	Ⅱ	55		
		END OF BOREHOLE					



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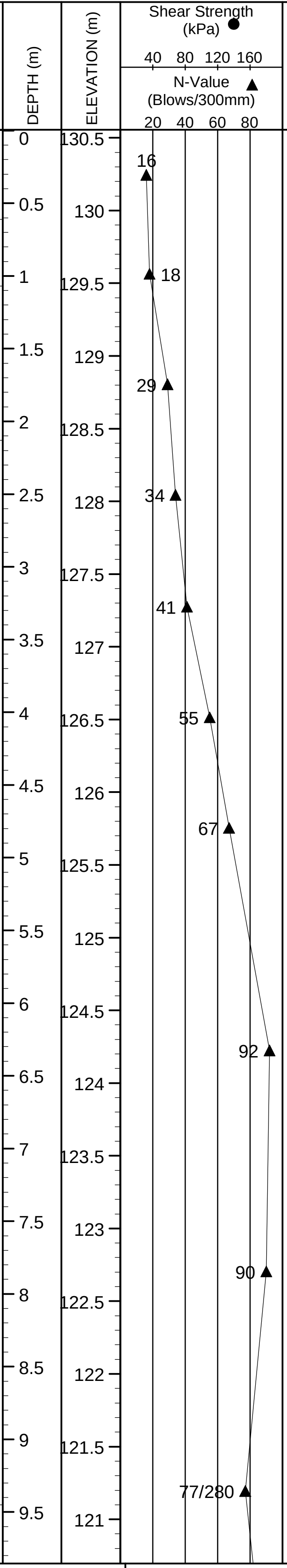
CLIENT: Averton Developments
METHOD: Augering and Split Spoon Sampling
PROJECT: 2675 to 2725 Brock Road
PROJECT ENGINEER: VN
ELEV. (m) 130.55
LOCATION: Pickering, Ontario
NORTHING: 4860352
EASTING: 653624

BH No.: 3

PROJECT NO.: 17-036

SAMPLE TYPE: ▮ AUGER ◪ DRIVEN ⧗ CORING ▀ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON

GWL (m)	SOIL DESCRIPTION
	FILL damp, compact, grey crusher run limestone
	damp, compact, brown SILTY fine SAND
	damp, compact, brown GRAVELLY SAND
▼	wet, dense to very dense SILTY SAND with traces of gravel and clay brown ----- grey ----- clay seams ----- gravelly ----- some gravel



Water Content (%)
PL W.C. LL
20 40 60 80

SAMPLE NO.	SPT(N)
1	16
2A	18
2B	
3	29
4	34
5	41
6	55
7	67
8	92
9	90
10A	77/ 280
10B	

REMARKS

Borehole cave in and water level measured at 3.0 m below ground surface upon completion.
Water level at 2.72 m below ground surface on May 29, 2017

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DRILLING DATE: May 15, 2017
REVIEWED BY: VN

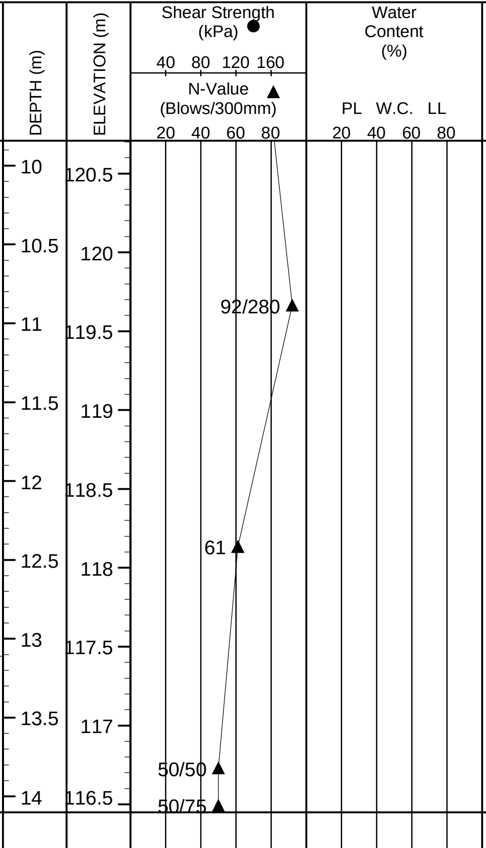
CLIENT: Averton Developments | METHOD: Augering and Split Spoon Sampling

PROJECT: 2675 to 2725 Brock Road | PROJECT ENGINEER: VN | ELEV. (m) 130.55

LOCATION: Pickering, Ontario | NORTHING: 4860352 | EASTING: 653624 | PROJECT NO.: 17-036

BH No.: 3

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



SOIL DESCRIPTION	SAMPLE NO.	SPT(N)	REMARKS
wet, very dense, grey SANDY SILT trace clay, trace gravel (TILL)	11	92/280	
	12	61	
wet, very dense, grey SILTY SAND trace clay, trace gravel (TILL)	13	50/50	Auger refusal at 14.1 m below ground surface
	14	50/75	

END OF BOREHOLE

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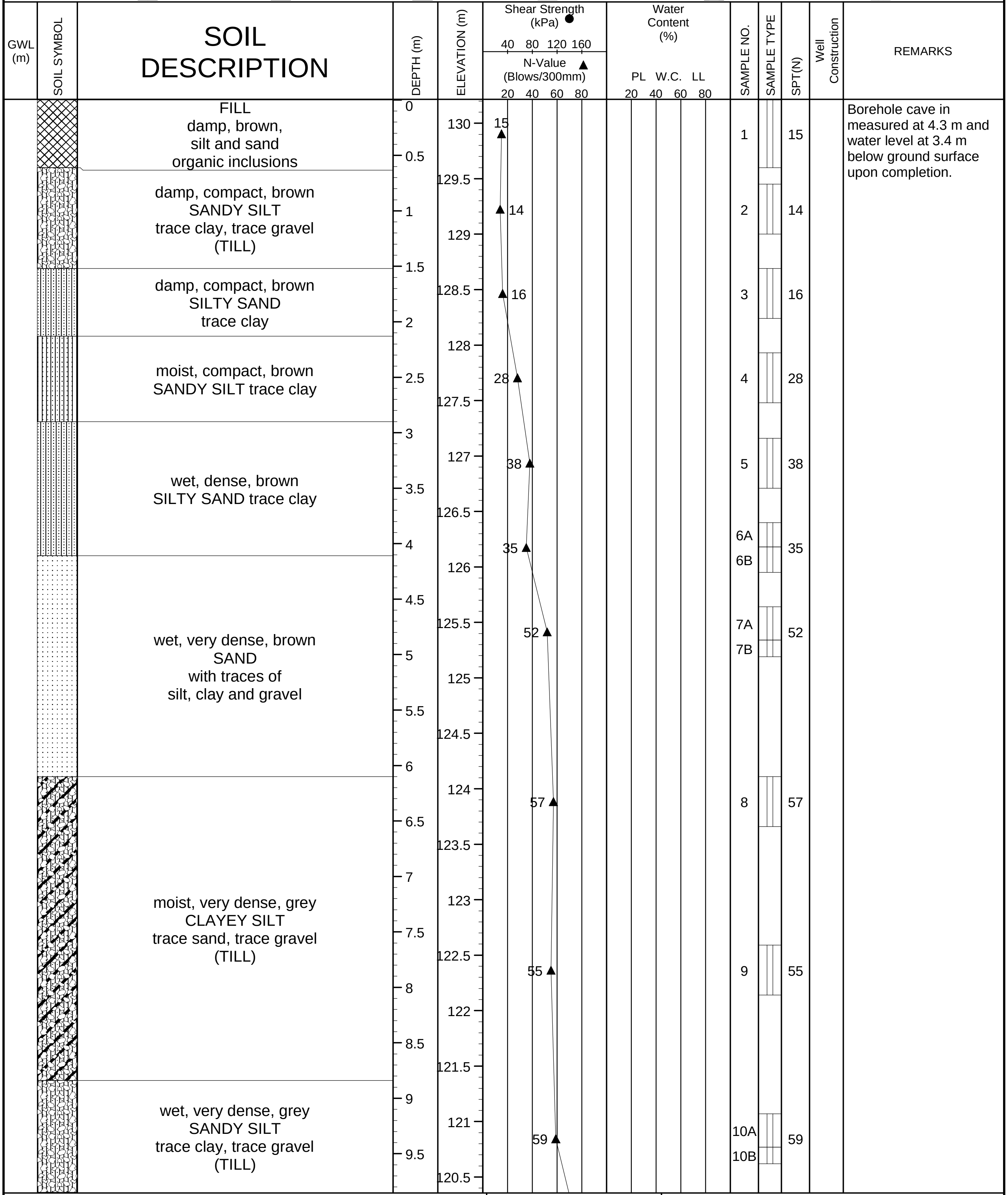
CLIENT: Averton Developments
PROJECT: 2675 to 2725 Brock Road
LOCATION: Pickering, Ontario

METHOD: Augering and Split Spoon Sampling
PROJECT ENGINEER: VN
ELEV. (m) 130.21
NORTHING: 4860331
EASTING: 653650

BH No.: 4

PROJECT NO.: 17-036

SAMPLE TYPE ▯ AUGER ◩ DRIVEN ⧗ CORING ▬ DYNAMIC CONE ▮ SHELBY ⌶ SPLIT SPOON



SOIL DESCRIPTION

FILL
damp, brown,
silt and sand
organic inclusions

damp, compact, brown
SANDY SILT
trace clay, trace gravel
(TILL)

damp, compact, brown
SILTY SAND
trace clay

moist, compact, brown
SANDY SILT trace clay

wet, dense, brown
SILTY SAND trace clay

wet, very dense, brown
SAND
with traces of
silt, clay and gravel

moist, very dense, grey
CLAYEY SILT
trace sand, trace gravel
(TILL)

wet, very dense, grey
SANDY SILT
trace clay, trace gravel
(TILL)

SAMPLE NO.	SPT(N)
1	15
2	14
3	16
4	28
5	38
6A 6B	35
7A 7B	52
8	57
9	55
10A 10B	59

REMARKS

Borehole cave in measured at 4.3 m and water level at 3.4 m below ground surface upon completion.

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DRILLING DATE: May 12, 2017
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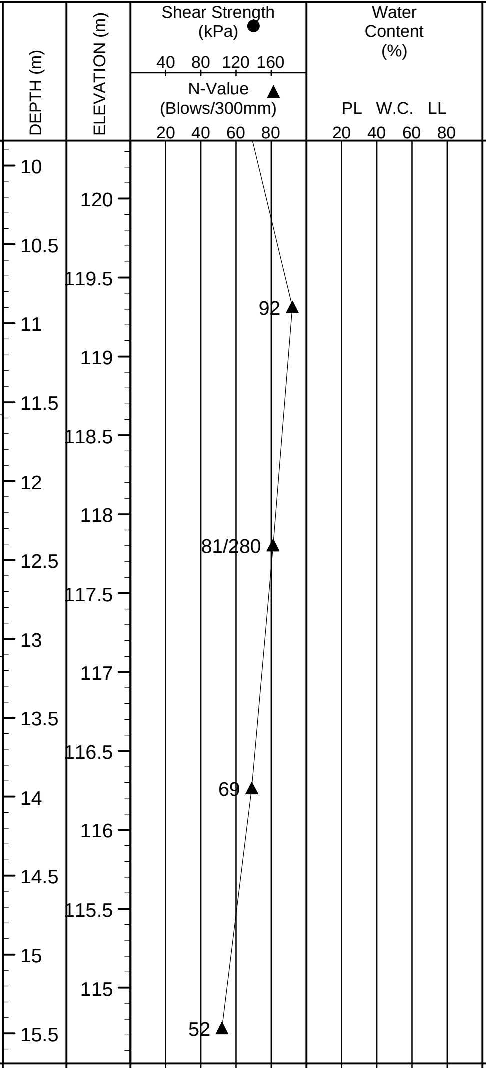
CLIENT: Averton Developments	METHOD: Augering and Split Spoon Sampling	**BH No.: 4**
PROJECT: 2675 to 2725 Brock Road	PROJECT ENGINEER: VN / ELEV. (m) 130.21	
LOCATION: Pickering, Ontario	NORTHING: 4860331 / EASTING: 653650	PROJECT NO.: 17-036

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		wet, very dense, grey SANDY SILT trace clay, trace gravel (TILL)	11	SPLIT SPOON	92		
		moist, very dense, grey CLAYEY SILT trace sand, trace gravel (TILL)	12	SPLIT SPOON	81/ 280		
		hard, grey SILTY CLAY trace sand, trace gravel	13	SPLIT SPOON	69		
			14	SPLIT SPOON	52		
		END OF BOREHOLE					



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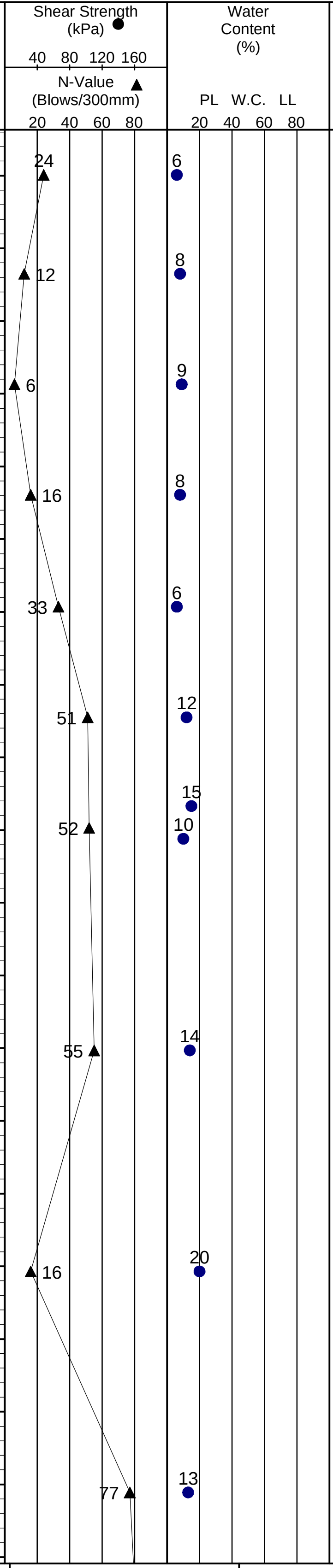
CLIENT: Averton Developments	METHOD: Augering and Split Spoon Sampling			
PROJECT: 2675 to 2725 Brock Road	PROJECT ENGINEER: VN	ELEV. (m) 129.81	**BH No.: 5**	
LOCATION: Pickering, Ontario	NORTHING: 4860296	EASTING: 653673	PROJECT NO.: 17-036	

SAMPLE TYPE: ▮ AUGER ◢ DRIVEN ⧗ CORING ▀ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)
	FILL damp, grey crusher run limestone	0 – 0.45
	FILL damp, brown and grey sandy silt some gravel, trace clay	0.45 – 2.1
▼ 3.24	compact ----- dense grey SANDY SILTY CLAY trace gravel (TILL)	2.1 – 3.65
	wet, very dense, grey SILTY SAND some gravel	3.65 – 4.7
	wet, very dense, grey SANDY SILT some clay, trace gravel	4.7 – 7.0
	wet, very dense, grey SILTY SAND trace clay, trace gravel	7.0 –



SAMPLE NO.	SPT(N)	Water Content (%)
1	24	6
2	12	8
3	6	9
4	16	8
5	33	6
6	51	12
7A		15
7B	52	10
8	55	14
9	16	20
10	77	13

DEPTH (m): 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5

ELEVATION (m): 129.5, 129, 128.5, 128, 127.5, 127, 126.5, 126, 125.5, 125, 124.5, 124, 123.5, 123, 122.5, 122, 121.5, 121, 120.5, 120

Well Construction

REMARKS: Water level at 3.24 m below ground surface on May 29, 2017

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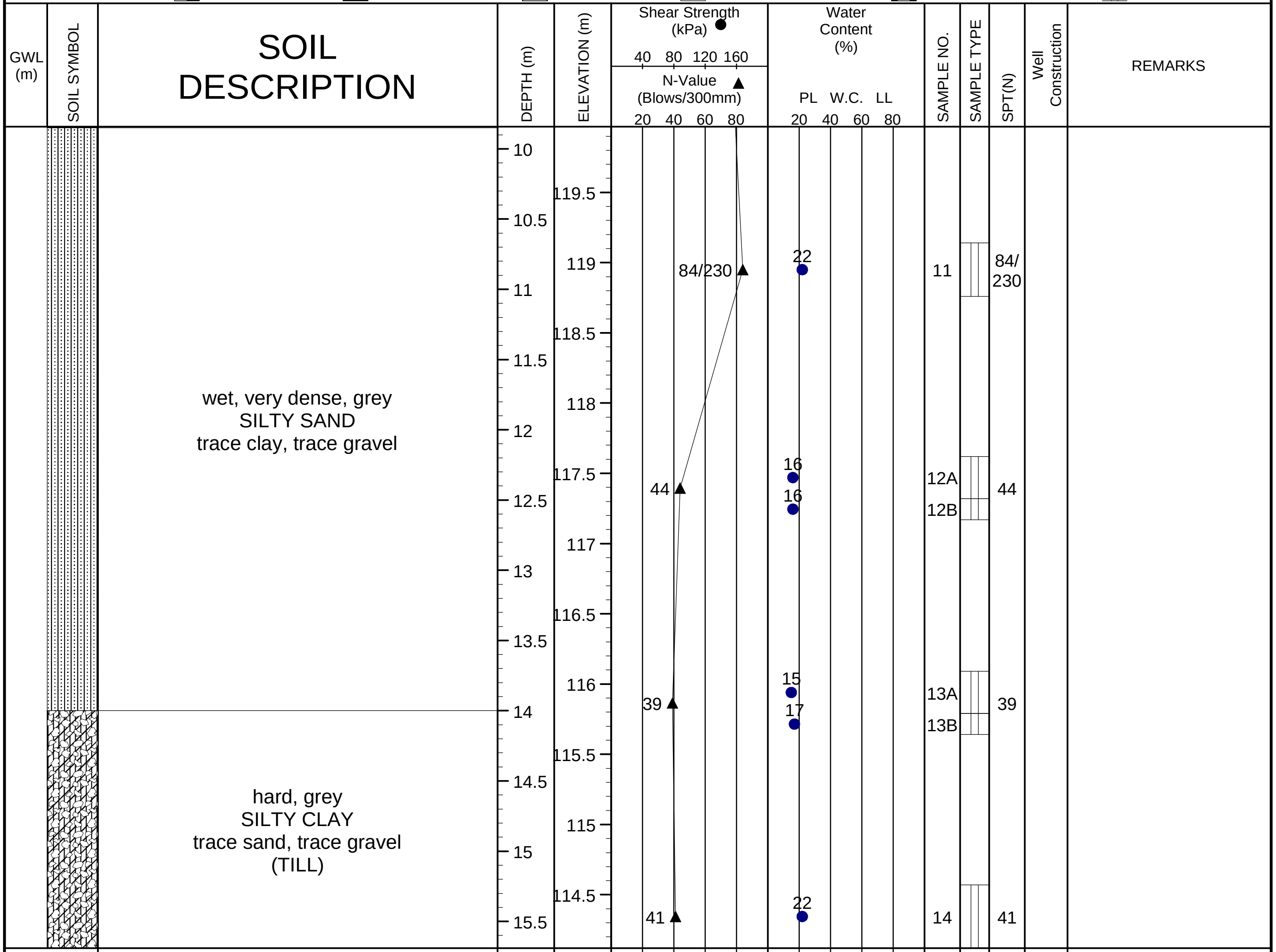
LOGGED BY: SA	DRILLING DATE: May 17, 2017
REVIEWED BY: VN	Page 1 of 2

CLIENT: Averton Developments	METHOD: Augering and Split Spoon Sampling	
PROJECT: 2675 to 2725 Brock Road	PROJECT ENGINEER: VN ELEV. (m) 129.81	**BH No.: 5**
LOCATION: Pickering, Ontario	NORTHING: 4860296 EASTING: 653673	PROJECT NO.: 17-036

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON



DEPTH (m)	SOIL DESCRIPTION
10 – 14	wet, very dense, grey SILTY SAND trace clay, trace gravel
14 – 15.7	hard, grey SILTY CLAY trace sand, trace gravel (TILL)
	END OF BOREHOLE

SAMPLE NO.	SPT(N)	Water Content (%)
11	84/ 230	22
12A	44	16
12B		16
13A	39	15
13B		17
14	41	22

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CLIENT: Averton Developments

METHOD: Augering and Split Spoon Sampling

BH No.: 6

PROJECT: 2675 to 2725 Brock Road

PROJECT ENGINEER: VN

ELEV. (m) 129.54

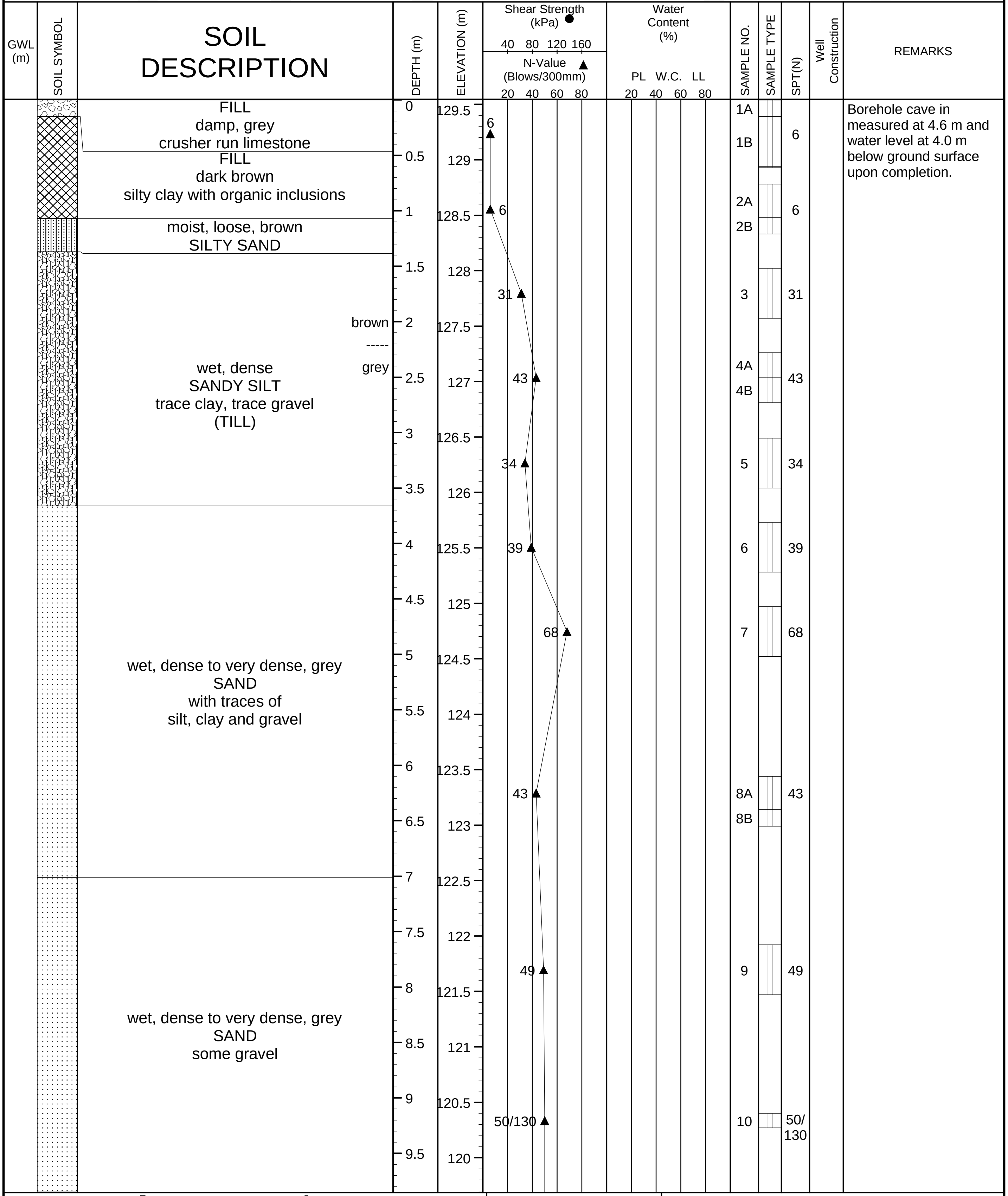
LOCATION: Pickering, Ontario

NORTHING: 4860250

EASTING: 653659

PROJECT NO.: 17-036

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON



FILL
damp, grey
crusher run limestone

FILL
dark brown
silty clay with organic inclusions

moist, loose, brown
SILTY SAND

wet, dense
SANDY SILT
trace clay, trace gravel
(TILL)

brown
-----
grey

wet, dense to very dense, grey
SAND
with traces of
silt, clay and gravel

wet, dense to very dense, grey
SAND
some gravel

SAMPLE NO.	SPT(N)
1A 1B	6
2A 2B	6
3	31
4A 4B	43
5	34
6	39
7	68
8A 8B	43
9	49
10	50/ 130

REMARKS: Borehole cave in measured at 4.6 m and water level at 4.0 m below ground surface upon completion.

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LOGGED BY: SA

DRILLING DATE: May 17, 2017

REVIEWED BY: VN

CLIENT: Averton Developments
METHOD: Augering and Split Spoon Sampling

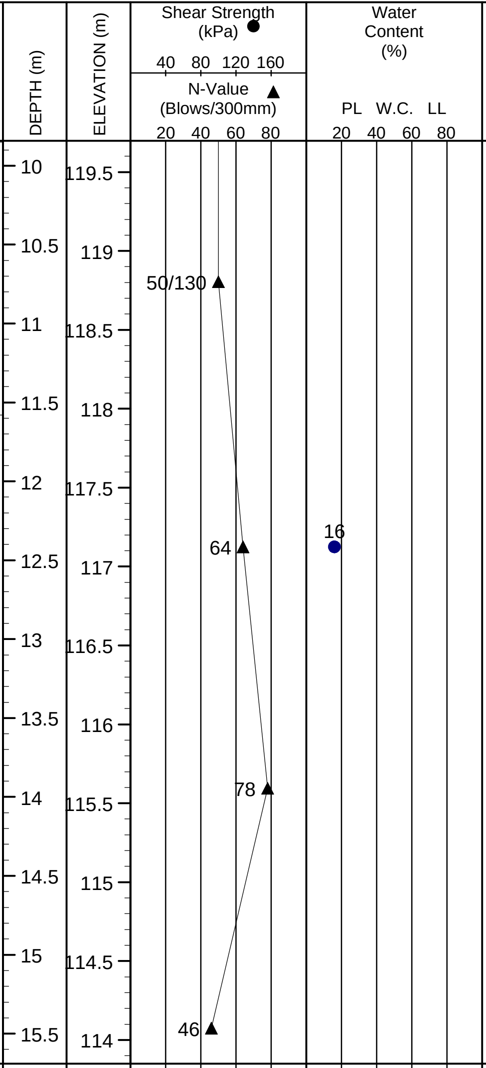
BH No.: 6

PROJECT: 2675 to 2725 Brock Road
PROJECT ENGINEER: VN
ELEV. (m) 129.54
LOCATION: Pickering, Ontario
NORTHING: 4860250
EASTING: 653659
PROJECT NO.: 17-036

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		wet, dense to very dense, grey SAND some gravel	11		50/ 130		
		damp, hard, grey SILTY CLAY trace sand, trace gravel	12		64		
			13		78		
			14		46		

END OF BOREHOLE



LOGGED BY: SA
DRILLING DATE: May 17, 2017
REVIEWED BY: VN

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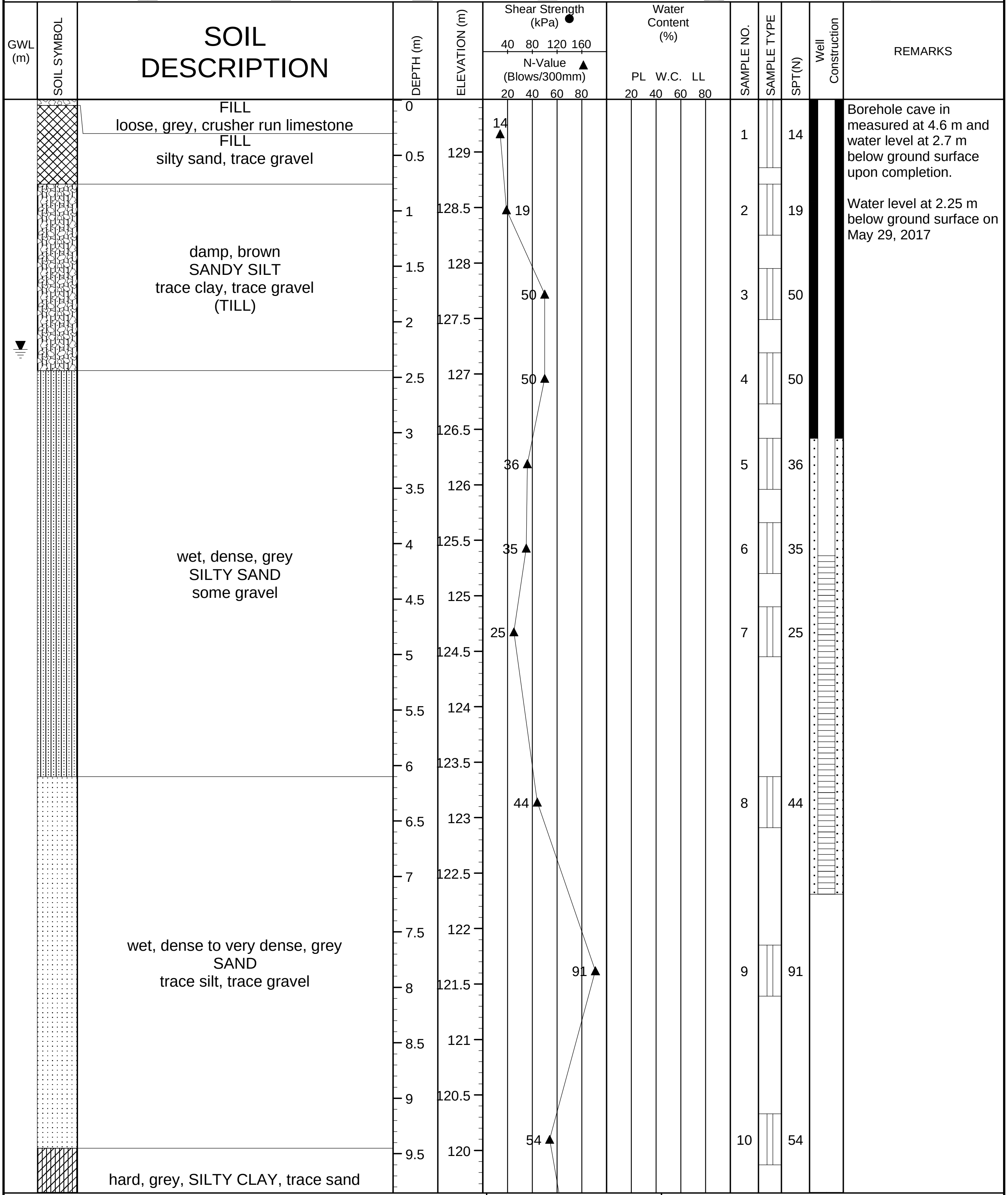
CLIENT: Averton Developments
METHOD: Augering and Split Spoon Sampling

BH No.: 7

PROJECT: 2675 to 2725 Brock Road
PROJECT ENGINEER: VN
ELEV. (m) 129.47
LOCATION: Pickering, Ontario
NORTHING: 4860239
EASTING: 653692
PROJECT NO.: 17-036

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



SOIL DESCRIPTION

FILL
loose, grey, crusher run limestone

FILL
silty sand, trace gravel

damp, brown
SANDY SILT
trace clay, trace gravel
(TILL)

wet, dense, grey
SILTY SAND
some gravel

wet, dense to very dense, grey
SAND
trace silt, trace gravel

hard, grey, SILTY CLAY, trace sand

SAMPLE NO.	SPT(N)
1	14
2	19
3	50
4	50
5	36
6	35
7	25
8	44
9	91
10	54

REMARKS

Borehole cave in measured at 4.6 m and water level at 2.7 m below ground surface upon completion.

Water level at 2.25 m below ground surface on May 29, 2017

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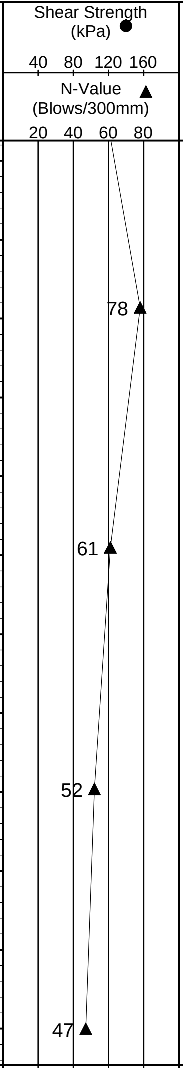
LOGGED BY: LP
DRILLING DATE: May 18, 2017
REVIEWED BY: VN

CLIENT: Averton Developments
METHOD: Augering and Split Spoon Sampling

BH No.: 7

PROJECT: 2675 to 2725 Brock Road
PROJECT ENGINEER: VN
ELEV. (m) 129.47
LOCATION: Pickering, Ontario
NORTHING: 4860239
EASTING: 653692
PROJECT NO.: 17-036

SAMPLE TYPE AUGER DRIVEN CORING DYNAMIC CONE SHELBY SPLIT SPOON



GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
			10	119.5						
		wet, very dense, grey SAND trace silt, trace gravel	10.5	119						
			11	118.5		11	SPLIT SPOON	78		
			11.5	118						
			12	117.5						
			12.5	117		12	SPLIT SPOON	61		
			13	116.5						
		hard, grey SILTY CLAY trace sand	13.5	116						
			14	115.5		13	SPLIT SPOON	52		
			14.5	115						
			15	114.5						
			15.5	114		14	SPLIT SPOON	47		
		END OF BOREHOLE								

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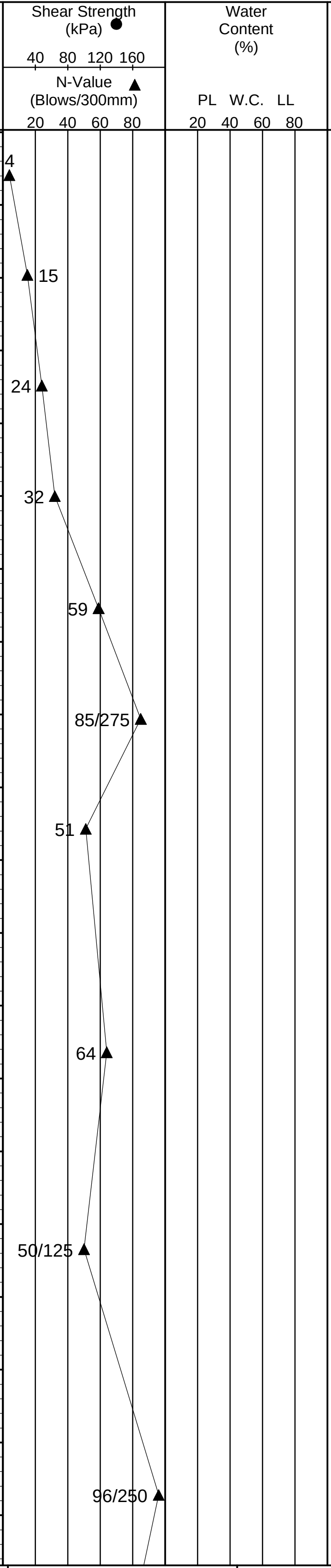
LOGGED BY: LP
DRILLING DATE: May 18, 2017
REVIEWED BY: VN
Page 2 of 2

CLIENT: Averton Developments	METHOD: Augering and Split Spoon Sampling	**BH No.: 8**
PROJECT: 2675 to 2725 Brock Road	PROJECT ENGINEER: VN ELEV. (m) 129.01	
LOCATION: Pickering, Ontario	NORTHING: 4860168 EASTING: 653718	PROJECT NO.: 17-036

SAMPLE TYPE ◨ AUGER ◩ DRIVEN ⧗ CORING ▀ DYNAMIC CONE ▯ SHELBY ⌶ SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION
	▩	FILL damp, brown silty clay, trace gravel
		damp, compact, brown SILTY SAND trace gravel (TILL)
		wet, dense, grey SANDY SILT trace clay, trace gravel (TILL)
	▤	wet, very dense, grey SILTY SAND trace gravel
		wet, very dense, grey SANDY SILT trace clay, trace gravel (TILL) ----- gravelly

DEPTH (m)	ELEVATION (m)
0	129
0.5	128.5
1	128
1.5	127.5
2	127
2.5	126.5
3	126
3.5	125.5
4	125
4.5	124.5
5	124
5.5	123.5
6	123
6.5	122.5
7	122
7.5	121.5
8	121
8.5	120.5
9	120
9.5	119.5



SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
1	⌶	4		
2	⌶	15		
3	⌶	24		
4	⌶	32		
5	⌶	59		
6	⌶	85/ 275		
7	⌶	51		
8	⌶	64		
9	⌶	50/ 125		
10	⌶	96/ 250		

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LOGGED BY: LP	DRILLING DATE: May 23, 2017
REVIEWED BY: VN	Page 1 of 2

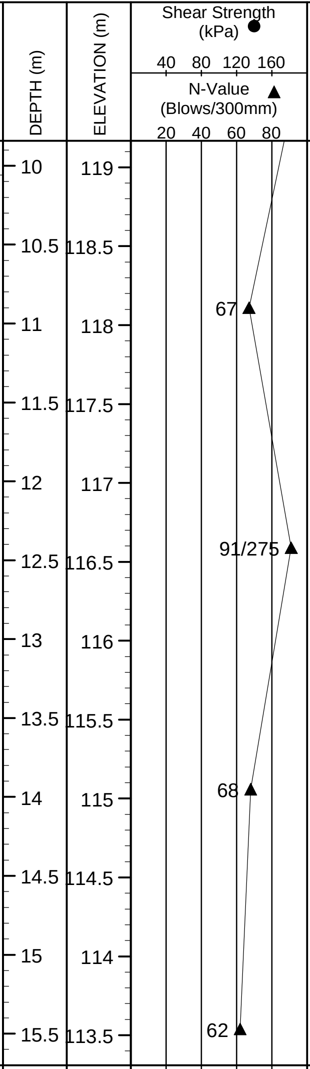
CLIENT: Averton Developments
PROJECT: 2675 to 2725 Brock Road
LOCATION: Pickering, Ontario
METHOD: Augering and Split Spoon Sampling
PROJECT ENGINEER: VN
ELEV. (m) 129.01
NORTHING: 4860168
EASTING: 653718

BH No.: 8

PROJECT NO.: 17-036

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	▨	hard, grey SILTY CLAY trace sand	11	SPLIT SPOON	67		
			12	SPLIT SPOON	91/ 275		
			13	SPLIT SPOON	68		
			14	SPLIT SPOON	62		
		END OF BOREHOLE					



Water Content (%)
PL W.C. LL
20 40 60 80

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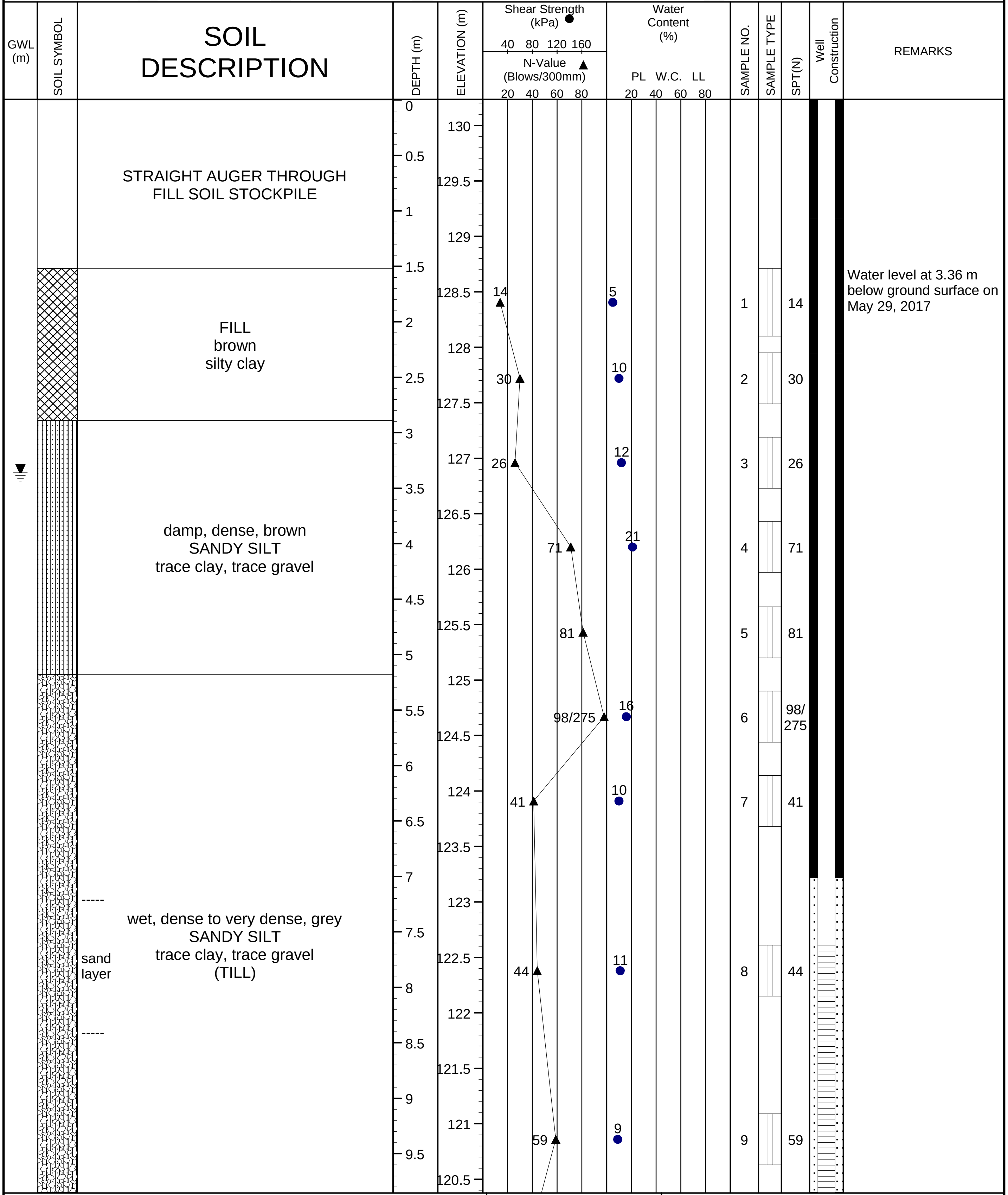
LOGGED BY: LP
DRILLING DATE: May 23, 2017
REVIEWED BY: VN
Page 2 of 2

CLIENT: Averton Developments
PROJECT: 2675 to 2725 Brock Road
LOCATION: Pickering, Ontario
METHOD: Augering and Split Spoon Sampling
PROJECT ENGINEER: VN
ELEV. (m) 130.23
NORTHING: 4860130
EASTING: 653701

BH No.: 9

PROJECT NO.: 17-036

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON



SOIL DESCRIPTION

STRAIGHT AUGER THROUGH
FILL SOIL STOCKPILE

FILL
brown
silty clay

damp, dense, brown
SANDY SILT
trace clay, trace gravel

wet, dense to very dense, grey
SANDY SILT
trace clay, trace gravel
(TILL)

----- sand layer -----

SAMPLE NO.	SPT(N)	Water Content (%)
1	14	5
2	30	10
3	26	12
4	71	21
5	81	
6	98/ 275	16
7	41	10
8	44	11
9	59	9

REMARKS

Water level at 3.36 m below ground surface on May 29, 2017

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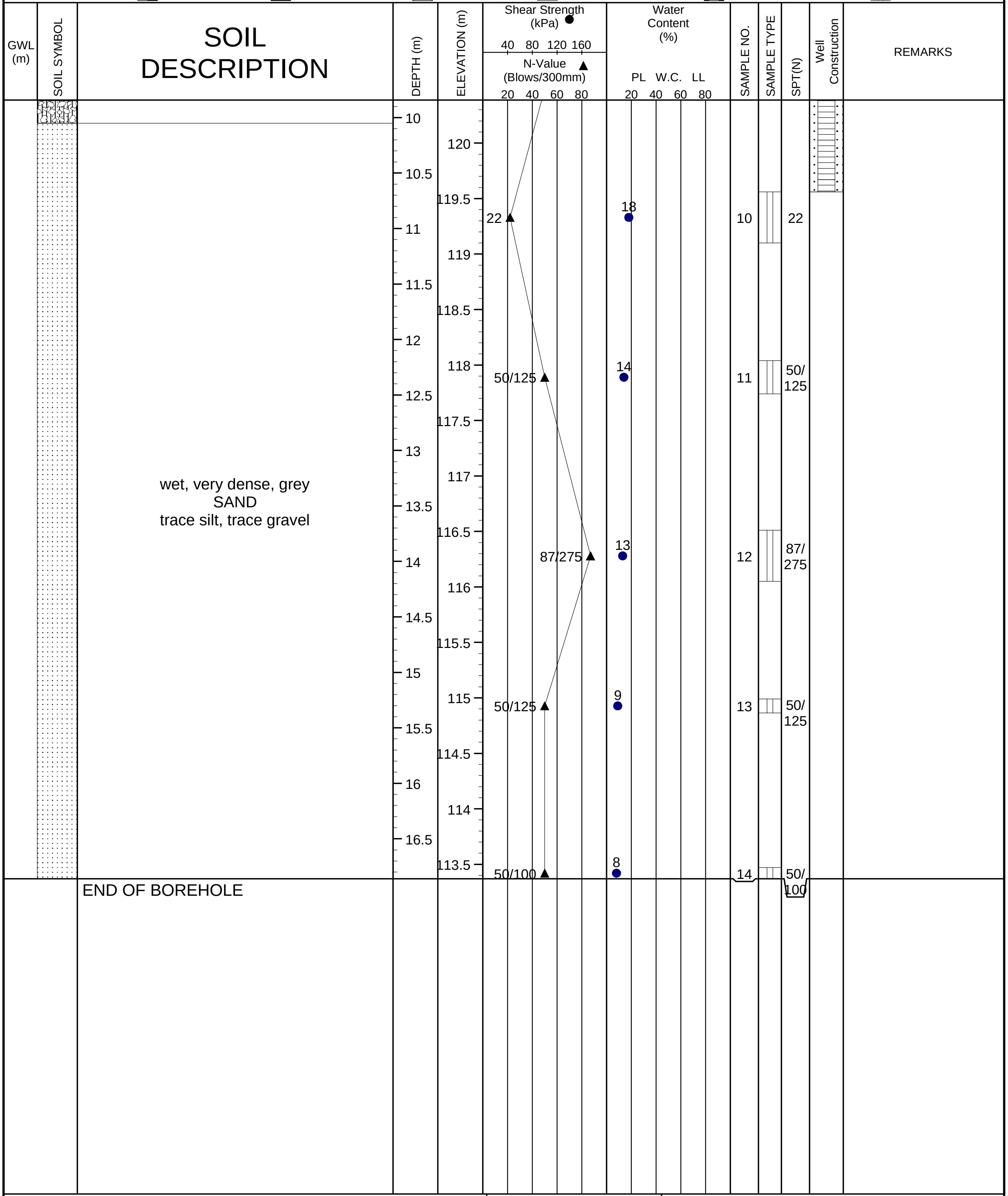
LOGGED BY: LP/SA
REVIEWED BY: VN
DRILLING DATE: May 18 and 19, 2017

CLIENT: Averton Developments
METHOD: Augering and Split Spoon Sampling

BH No.: 9

PROJECT: 2675 to 2725 Brock Road
PROJECT ENGINEER: VN
ELEV. (m) 130.23
LOCATION: Pickering, Ontario
NORTHING: 4860130
EASTING: 653701
PROJECT NO.: 17-036

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON



wet, very dense, grey
SAND
trace silt, trace gravel

SAMPLE NO.	SPT(N)	Water Content (%)
10	22	18
11	50/ 125	14
12	87/ 275	13
13	50/ 125	9
14	50/ 100	8

END OF BOREHOLE

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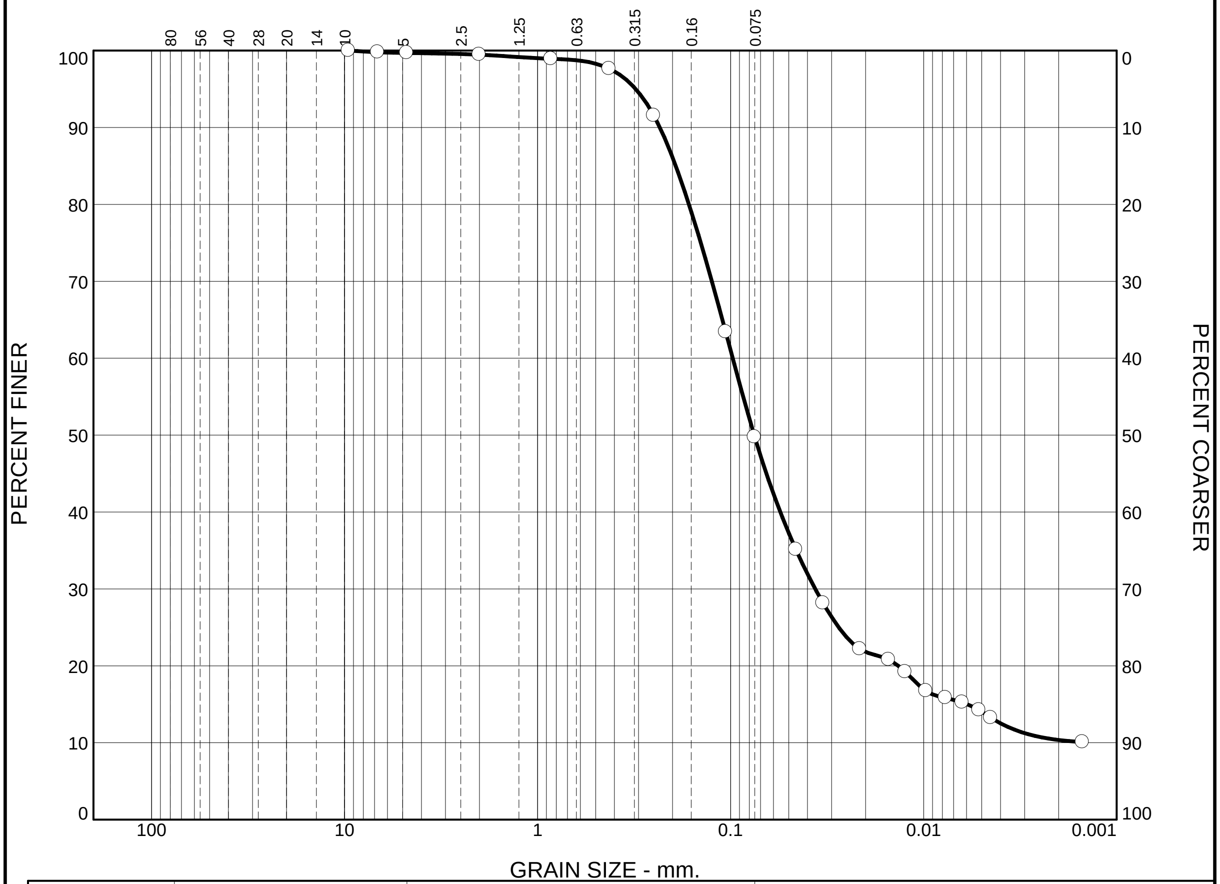
LOGGED BY: LP/SA
DRILLING DATE: May 18 and 19, 2017
REVIEWED BY: VN

APPENDIX D

LABORATORY TEST RESULTS

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	0	1	1	48	40	10

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1925	0.0975	0.0755	0.0365	0.0059			

Material Description	USCS	AASHTO
○ SILT and fien SAND, trace to some clay		

Project No. 17-036 **Client:** Averton Developments

Project: 2675 to 2725 Brock Road

○ **Sample Number:** BH 1, Sample 7

Remarks:

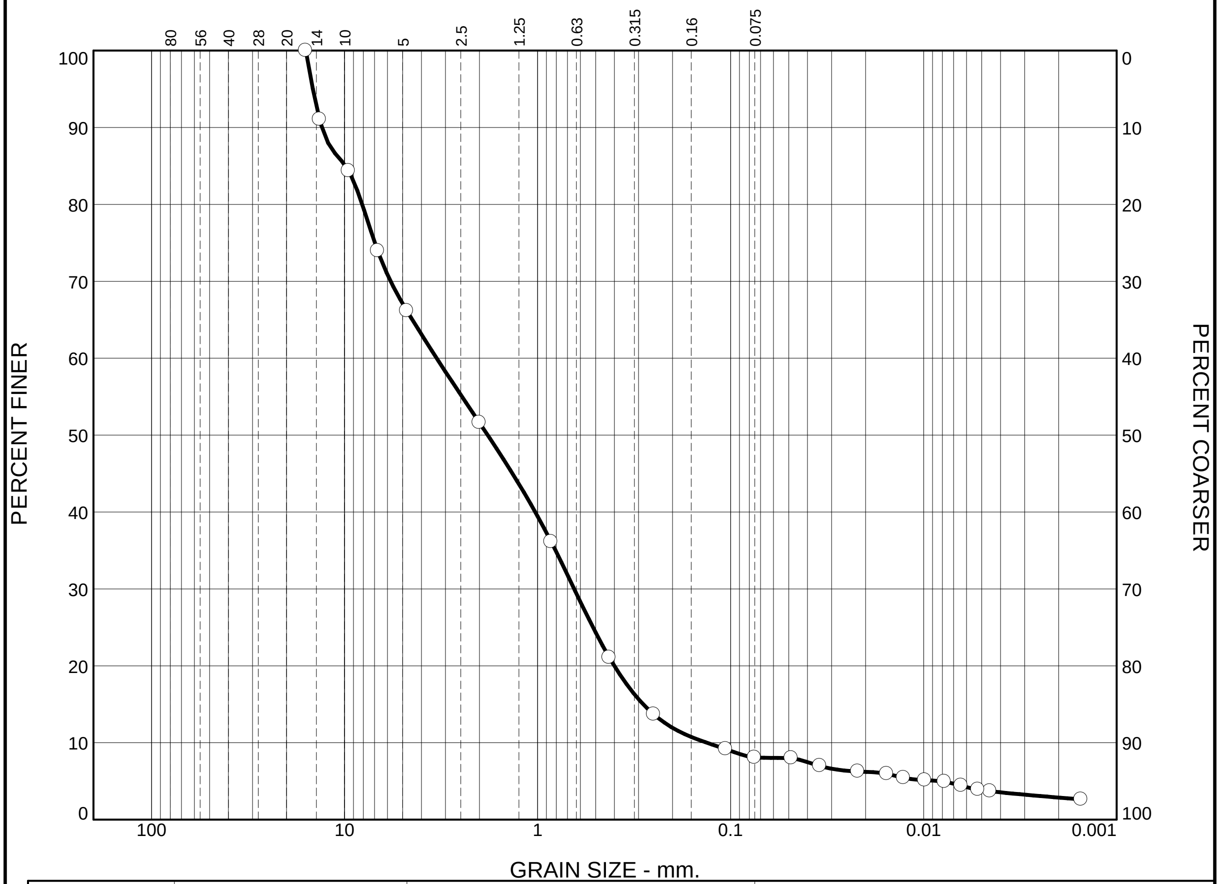
Alston Associates

Geotechnical Division of Terrapex

Figure D-1

Tested By: RG/JZ **Checked By:** JB

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	34	14	31	13	5	3

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			9.8937	3.3350	1.8139	0.6462	0.2837	0.1328	0.94	25.10

Material Description	USCS	AASHTO
○ GRAVELLY SAND, trace silt, trace clay		

Project No. 17-036 **Client:** Averton Developments

Project: 2675 to 2725 Brock Road

○ **Sample Number:** BH 3, Sample 7

Remarks:

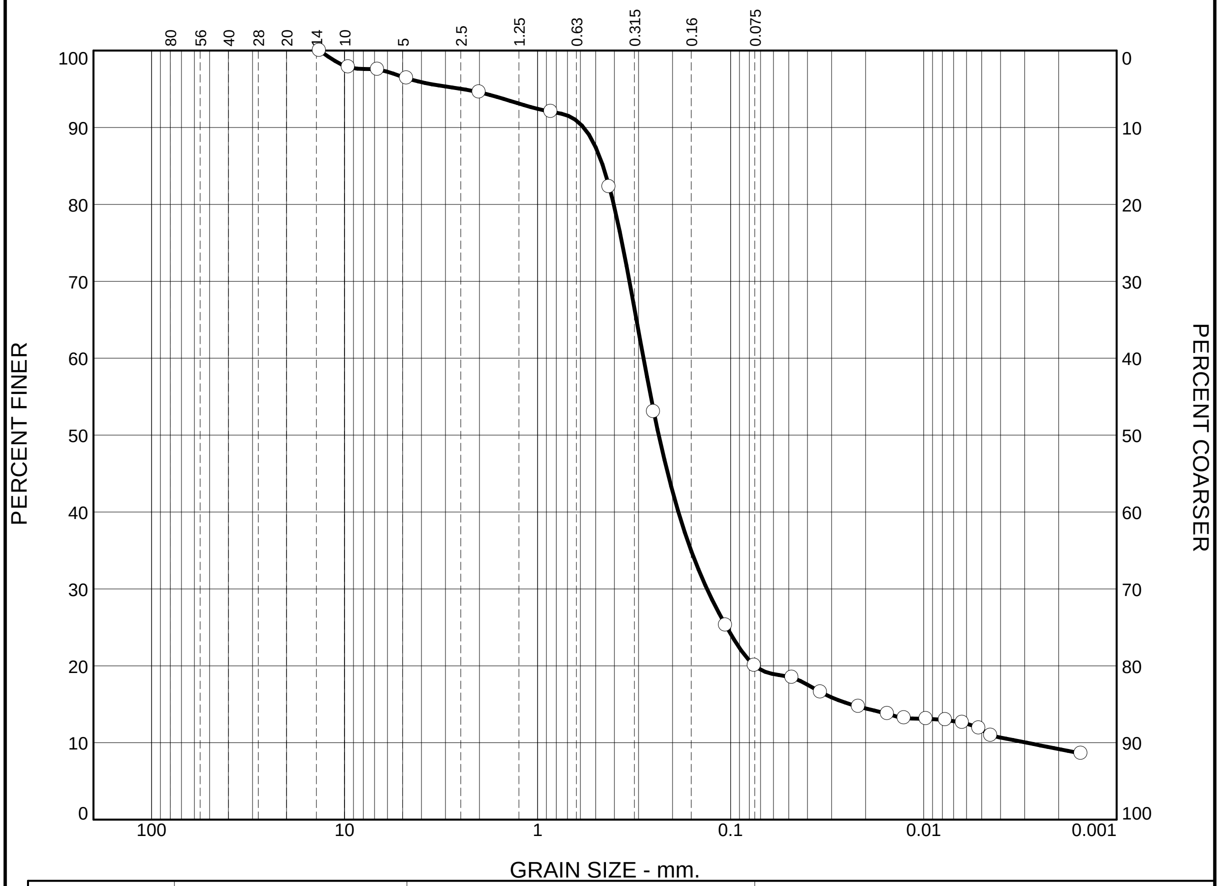
Alston Associates

Geotechnical Division of Terrapex

Figure D-2

Tested By: RG/JZ **Checked By:** JB

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	4	1	13	62	11	9

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.4585	0.2827	0.2358	0.1327	0.0240	0.0029	21.32	96.82

Material Description	USCS	AASHTO
○ SAND, some silt, trace clay, trace gravel		

Project No. 17-036 **Client:** Averton Developments

Project: 2675 to 2725 Brock Road

○ **Sample Number:** BH 4, Sample 7A

Remarks:

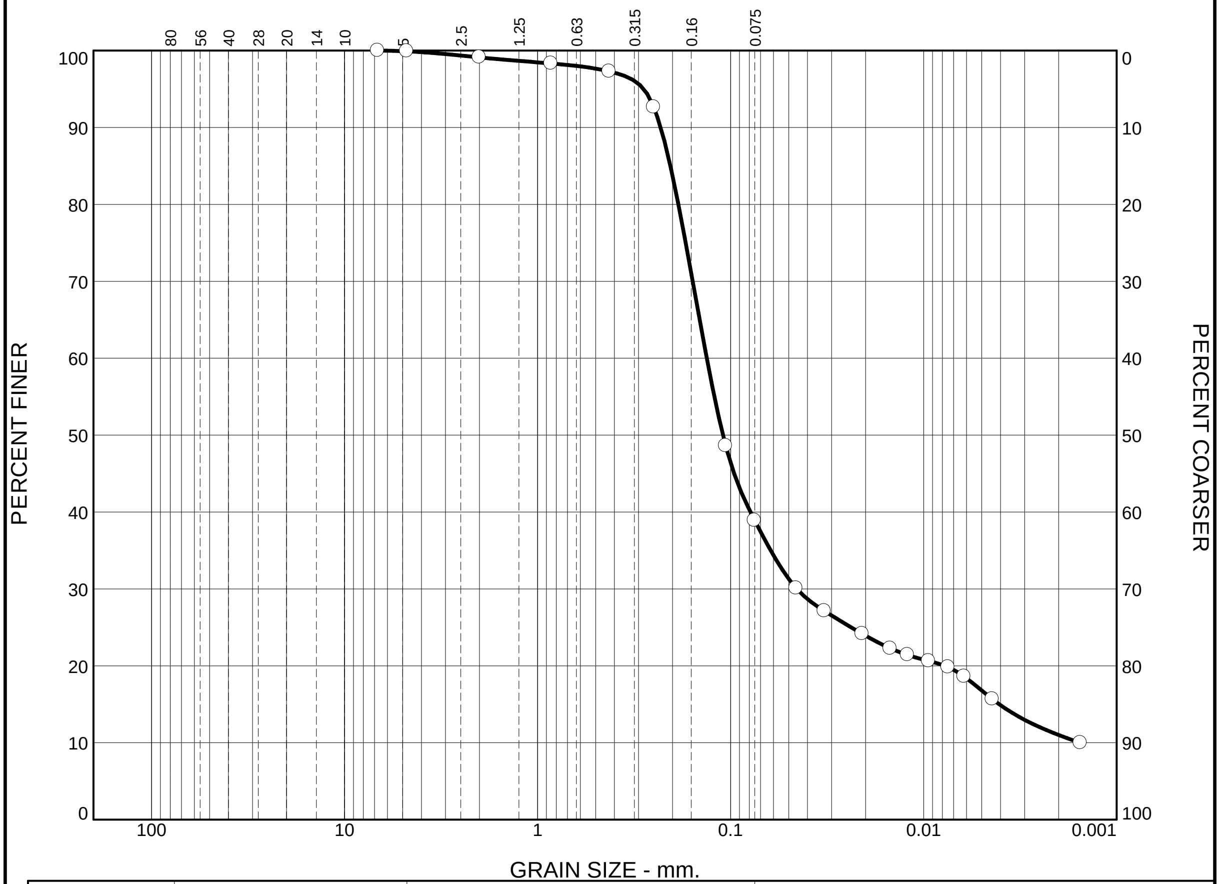
Alston Associates

Geotechnical Division of Terrapex

Figure D-3

Tested By: RG/JZ **Checked By:** JB

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	0	1	2	58	28	11

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2053	0.1330	0.1095	0.0454	0.0041	0.0016	9.99	85.72

Material Description	USCS	AASHTO
○ SILTY fine SAND, trace clay, trace gravel		

Project No. 17-036 **Client:** Averton Developments

Project: 2675 to 2725 Brock Road

○ **Sample Number:** BH 5, Sample 9

Remarks:

Alston Associates

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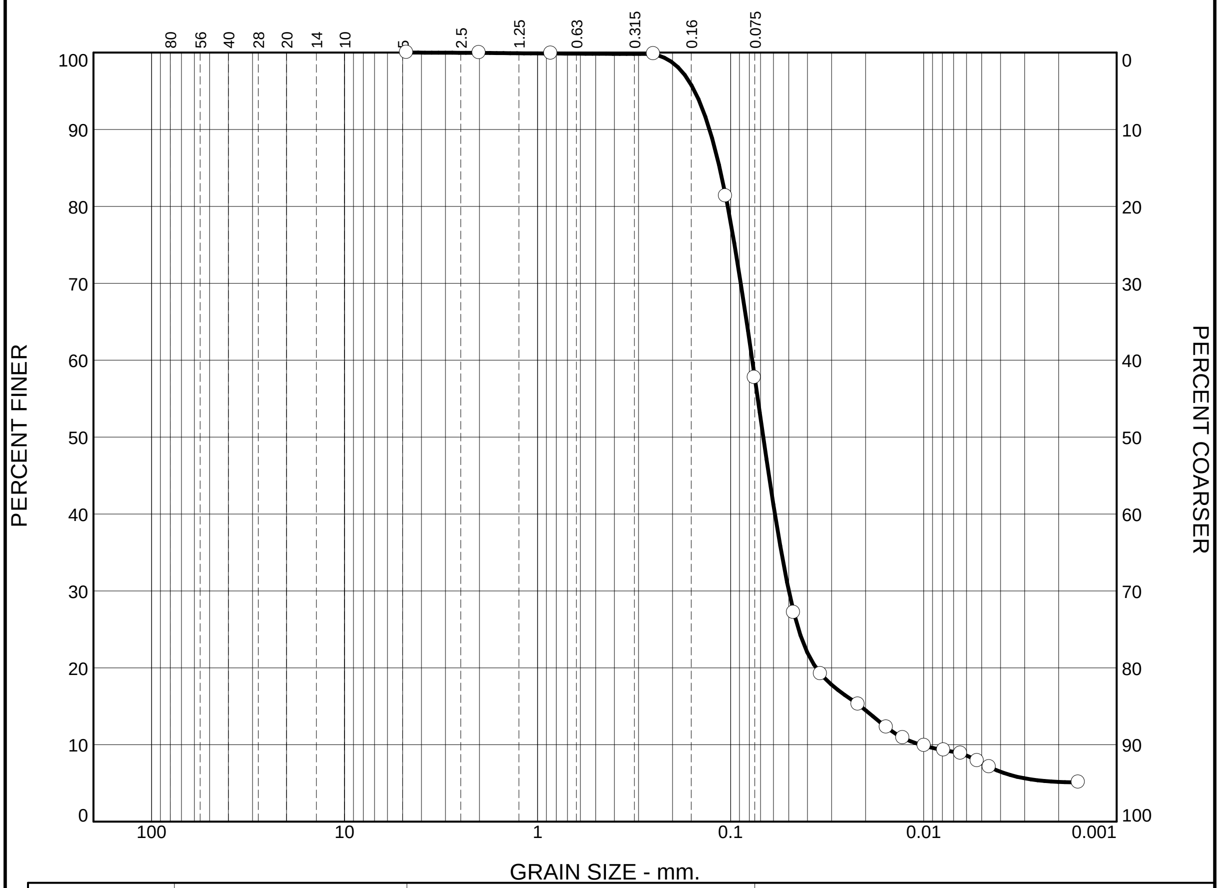
Figure D-4

Tested By: RG/JZ **Checked By:** JB

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	0	0	0	42	53	5

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1139	0.0773	0.0677	0.0500	0.0212	0.0103	3.12	7.48

Material Description	USCS	AASHTO
○ SILT and fine SAND, trcae clay		

Project No. 17-036 **Client:** Averton Developments

Project: 2675 to 2725 Brock Road

○ **Sample Number:** BH 6, Sample 3

Remarks:

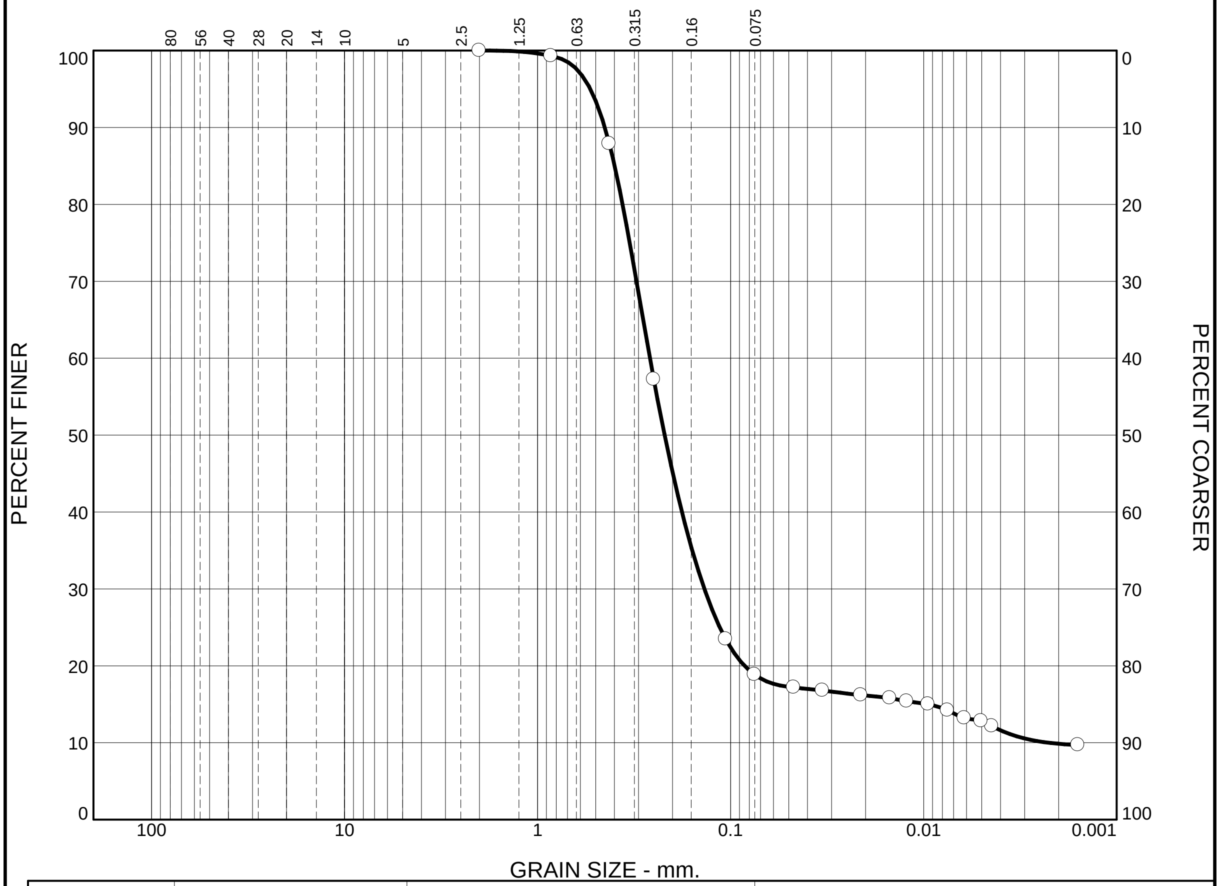
Alston Associates

Geotechnical Division of Terrapex

Figure D-5

Tested By: MC/JZ **Checked By:** JB

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	0	0	12	69	9	10

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.3991	0.2618	0.2198	0.1368	0.0095	0.0022	31.79	116.48

Material Description	USCS	AASHTO
○ SAND, trace to some clay, trace silt		

Project No. 17-036 **Client:** Averton Developments

Project: 2675 to 2725 Brock Road

○ **Sample Number:** BH 6, Sample 6

Remarks:

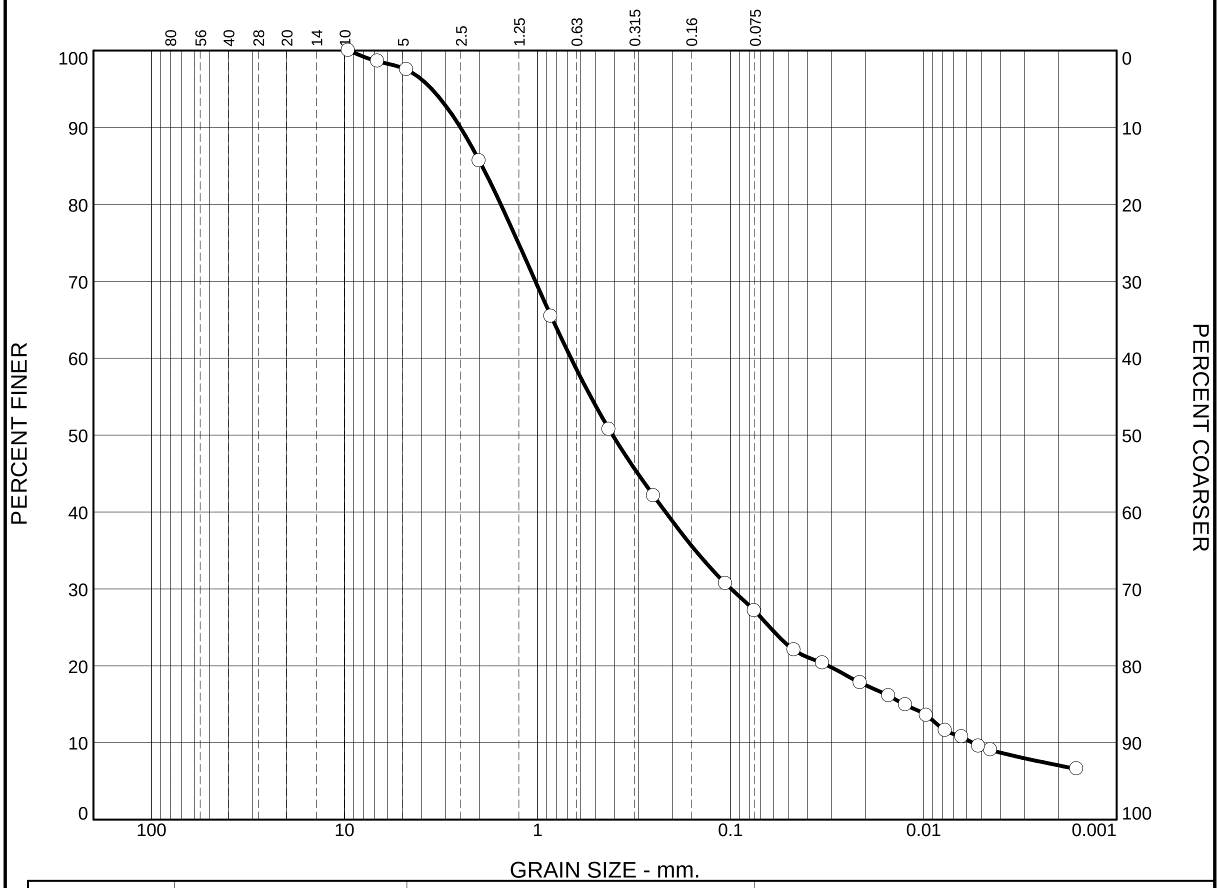
Alston Associates

Geotechnical Division of Terrapex

Figure D-6

Tested By: RG/JZ **Checked By:** JB

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	3	11	35	24	20	7

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.9405	0.6715	0.4085	0.0993	0.0127	0.0056	2.62	119.90

Material Description	USCS	AASHTO
○ SILTY SAND, trace clay, trace gravel		

Project No. 17-036 **Client:** Averton Developments

Project: 2675 to 2725 Brock Road

○ **Sample Number:** BH 6, Sample 9

Remarks:

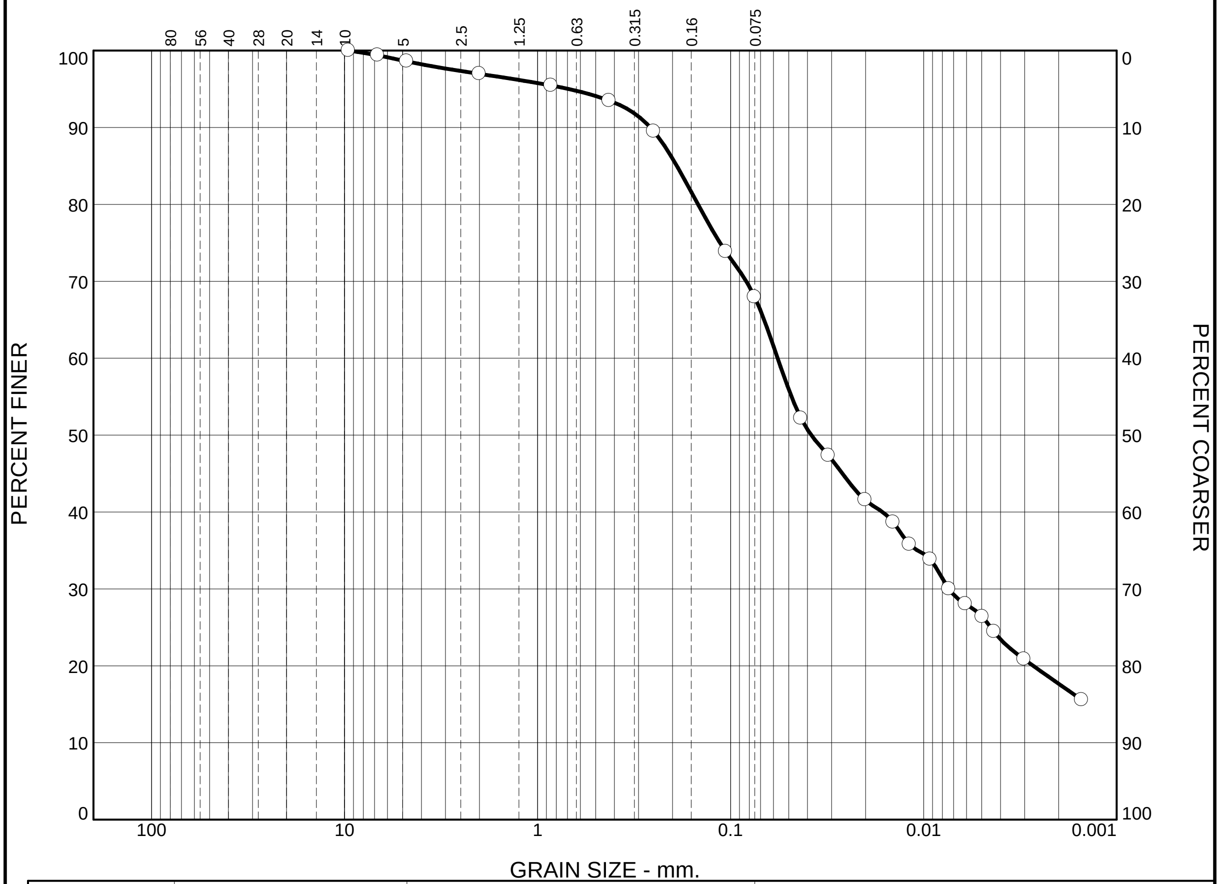
Alston Associates

Geotechnical Division of Terrapex

Figure D-7

Tested By: RG/JZ **Checked By:** JB

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	1	2	4	25	50	18

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1900	0.0571	0.0382	0.0074				

Material Description	USCS	AASHTO
○ SANDY CLAYEY SILT, trace gravel		

Project No. 17-036 **Client:** Averton Developments

Project: 2675 to 2725 Brock Road

○ **Sample Number:** BH 4, Sample 9

Remarks:

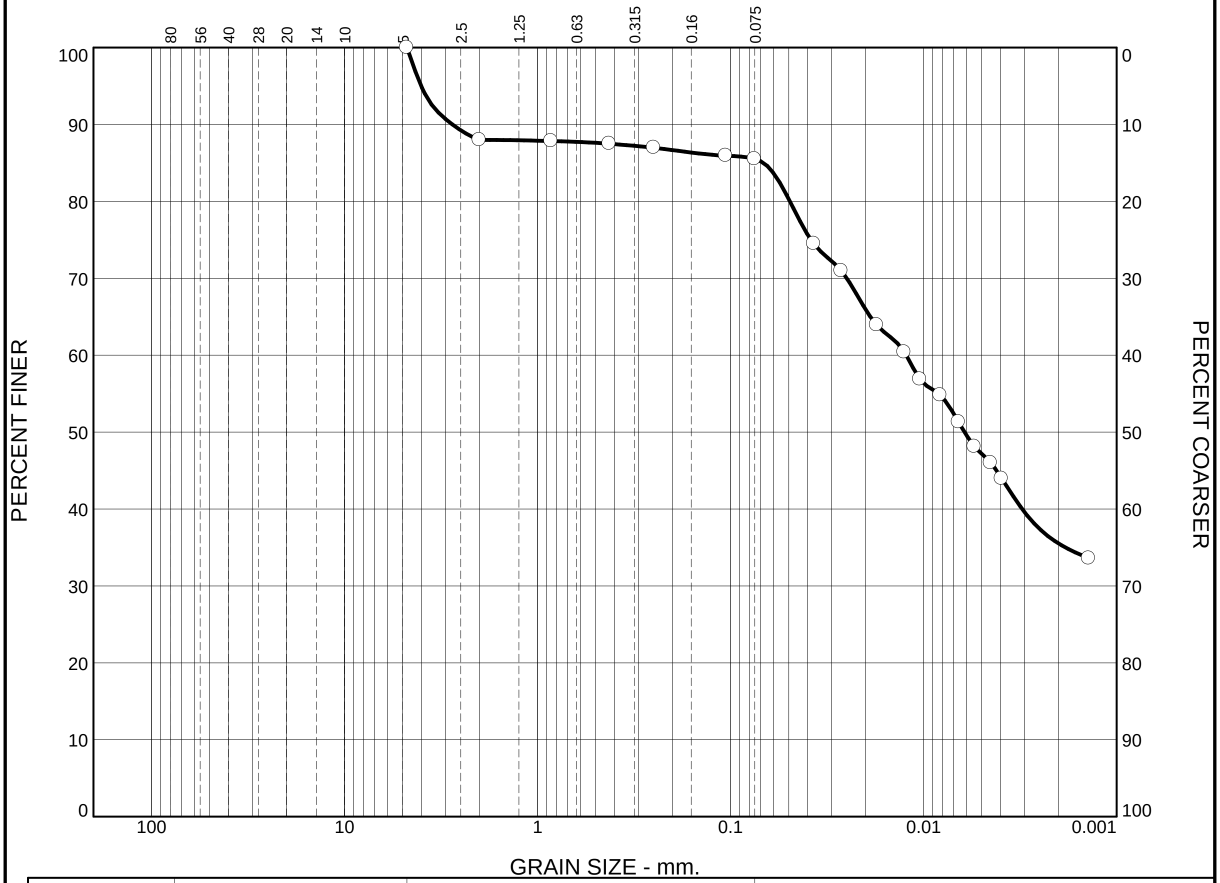
Alston Associates

Geotechnical Division of Terrapex

Figure D-8

Tested By: RG/JZ **Checked By:** JB

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	0	12	0	2	50	36

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.0676	0.0123	0.0061					

Material Description	USCS	AASHTO
○ SILTY CLAY, some sand		

Project No. 17-036 **Client:** Averton Developments

Project: 2675 to 2725 Brock Road

○ **Sample Number:** BH 6, Sample 12

Remarks:

Alston Associates

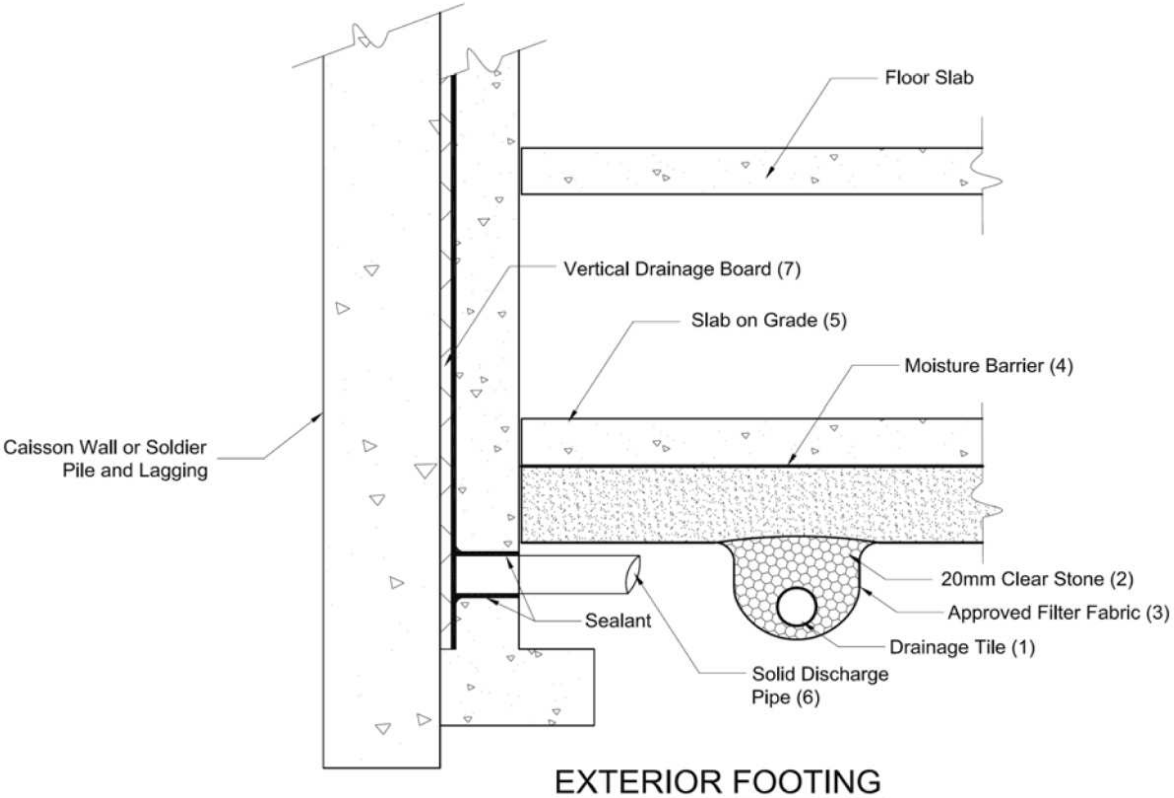
Geotechnical Division of Terrapex

Figure D-9

Tested By: MC/JZ **Checked By:** JB

APPENDIX E

RECOMMENDED PERIMETER DRAINAGE SYSTEM



EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4”) diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4”) Clear Stone – 150mm (6”) top and side of drain, 100 mm (4”) of stone below drain.
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8”) of compacted clear 20 mm (3/4”) stone or equivalent free draining material. A vapour barrier may be required for special floors.
5. Do not connect the underfloor drains to the perimeter drains.
6. Solid discharge pipe outletting into a solid pipe leading to a sump.
7. Vertical drainage board Terradrain 600 or equivalent with filter cloth should be continuous from bottom to 1.2 m below exterior finished grade.
8. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS

Shored Basement wall with Underfloor Drainage System

(Not to Scale)

alston associates
geotechnical division of TERRAPEX

APPENDIX E

CERTIFICATE OF CHEMICAL ANALYSES

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: **ALSTON ASSOCIATES**
90 SCARSDALE RD
TORONTO, ON M3B2R7
(905) 474-5265

ATTENTION TO: **VIC NERSESIAN**

PROJECT: **17-036**

AGAT WORK ORDER: **17T217787**

SOIL ANALYSIS REVIEWED BY: **Amanjot Bhela, Inorganic Coordinator**

DATE REPORTED: **May 30, 2017**

PAGES (INCLUDING COVER): **5**

VERSION*: **2**

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

NOTES

VERSION 2: Revised report issued on May 30th, 2017.

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

Certificate of Analysis

AGAT WORK ORDER: 17T217787

PROJECT: 17-036

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: ALSTON ASSOCIATES

ATTENTION TO: VIC NERSESIAN

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Soil)

DATE RECEIVED: 2017-05-18

DATE REPORTED: 2017-05-30

			SAMPLE DESCRIPTION:	BH1 / S8	BH3 / S9	BH5 / S8	BH6 / S9
			SAMPLE TYPE:	Soil	Soil	Soil	Soil
			DATE SAMPLED:	2017-05-16	2017-05-15	2017-05-17	2017-05-17
Parameter	**Unit**	**G / S**	**RDL**	**8413922**	**8413923**	**8413924**	**8413925**
Sulphate (2:1)	µg/g		2	12	126	78	85
pH (2:1)	pH Units		N/A	8.36	7.99	8.09	8.08

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8413922-8413925 pH and Sulphate was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil).

Certified By: Amanjot Bhela

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Quality Assurance

CLIENT NAME: ALSTON ASSOCIATES

PROJECT: 17-036

SAMPLING SITE:

AGAT WORK ORDER: 17T217787

ATTENTION TO: VIC NERSESIAN

SAMPLED BY:

Soil Analysis

RPT Date: May 30, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Soil)															
Sulphate (2:1)	8405924		1.53	1.47	NA	< 2	96%	70%	130%	99%	70%	130%	101%	70%	130%
pH (2:1)	8413922	8413922	8.36	8.42	0.7%	N/A	100%	90%	110%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

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Method Summary

CLIENT NAME: ALSTON ASSOCIATES
AGAT WORK ORDER: 17T217787
PROJECT: 17-036
ATTENTION TO: VIC NERSESIAN
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Sulphate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER

Results relate only to the items tested and to all the items tested

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 17T217787

Cooler Quantity: Small

Arrival Temperatures: 4.5 | 8.4 | 4.1
3.4 | 3.2 | 2.4

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Alston Associates (Terrapex Environmental Ltd)
Contact: Vic Nersesian
Address:
Phone: Fax:
Reports to be sent to:
1. Email: v.nersesian@alston.ca
2. Email:

Regulatory Requirements:

☒ No Regulatory Requirement

(Please check all applicable boxes)

☐ Regulation 153/04
Table ______ *Indicate One*
☐Ind/Com
☐Res/Park
☐Agriculture
Soil Texture *(Check One)*
☐Coarse
☐Fine

☐ Sewer Use
☐Sanitary
☐Storm
Region ______ *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
______ *Indicate One*

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 17-036
Site Location:
Sampled By:
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a Record of Site Condition?
☐ Yes ☒ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	**ORPs:** ☐B-HWS ☐Cl⁻ ☐CN⁻ ☐Cr⁶⁺ ☐EC ☐FOC ☐Hg ☐pH ☐SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐TP ☐NH$_3$ ☐TKN ☐NO$_3$ ☐NO$_2$ ☐NO$_3$+NO$_2$	**Volatiles:** ☐VOC ☐BTEX ☐THM	CCME Fractions 1 to 4	ABNs	PAHs	PCBs: ☐Total ☐Aroclors	Organochlorine Pesticides	TCLP: ☐M&I ☐VOCs ☐ABNs ☐B(a)P ☐PCBs	Sewer Use	pH	Soluble Sulphate
BH1/ S8	May 16		1	S																	✓	✓
BH3/ S9	May 15		1	S																	✓	✓
BH5/ S8	May 17		1	S																	✓	✓
BH6/ S9	May 17		1	S																	✓	✓

Samples Relinquished By (Print Name and Sign): Shabnam Azizinejad Azizinejad | Date May 18/17 | Time
Samples Relinquished By (Print Name and Sign): | Date 2017/5/18 | Time 9:25
Samples Relinquished By (Print Name and Sign): | Date | Time

Samples Received By (Print Name and Sign): | Date 2017/5/18 | Time 2:16
Samples Received By (Print Name and Sign): | Date | Time
Samples Received By (Print Name and Sign): | Date | Time

Page ____ of ____

Nº: T 049685

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Pink Copy - Client I Yellow Copy - AGAT I White Copy- AGAT

Date issued: February 22, 2017