PRELIMINARY SUBSURFACE INVESTIGATION REPORT
AAFE MIXED-USE BUILDING
FLUSHING, NEW YORK

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JCJ Architecture
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Attn: George Chin,

Re: Preliminary Subsurface Investigation
AAFE Mixed-Use Building
Flushing, Queens, New York
MRCE File 12629

Dear Mr. Chin,

In accordance with our revised proposal, dated January 14, 2016, we have completed our preliminary subsurface investigation for the referenced project comprising construction of a new, mixed-use building in Flushing, Queens, New York. This report summarizes the results of our preliminary boring program, including our interpretation of subsurface conditions, and provides recommendations for foundation design.

EXHIBITS

The following exhibits are attached:

Drawing No. S-1	Site Location Plan
Drawing No. B-1	Boring Location Plan
Drawing No. GS-1	Geologic Section A-A
Drawing No. GS-2	Geologic Section B-B
Drawing No. GS-R	Geotechnical Reference Standards
Table No. 1	Summary of Laboratory Test Data
Plate No. CRS-1	Consolidation Test – Boring MR-2U, Sample 15U
Plate No. CRS-2	Consolidation Test – Boring MR-3U, Sample 12U
Appendix A	MRCE Boring Logs
Appendix B	Prior Boring Logs
Appendix C	Cone Penetration Test Report
Appendix D	Executive Summary from Roux Remedial Investigation Report, dated September 2016 and associated Monitoring Well Records

PROJECT DATUM

Elevations herein are referenced to the North American Vertical Datum (NAVD 1988) where El. 0.0 is 1.625 feet below the Queens Borough Datum.

EXISTING SITE CONDITIONS

The project site is located at 133-04 39th Avenue in Flushing, Queens, New York, at the southeast corner of College Point Boulevard and 39th Avenue as shown on Drawing No. S-1. The site comprises Block 4973, Lot 6 with a total area of about 13,388 square feet (sq. ft.). An existing L-shaped, one-story building occupies the southern half of the lot with a square footage of approximately 6,240 sq. ft. A parking lot with asphalt pavement covers the north half of the site.

A 3-story commercial building with one cellar level abuts the east property line. The cellar level is estimated at a depth of about 15 feet below ground surface, or about El. + 30. A gas station with a one-story building exists in the adjacent lot to the south with the building set back about nine feet from the property line. A New York City Transit (NYCT) subway (7 line) traverses below Roosevelt Avenue to the south of the site. The subway is located approximately 100+/- feet south of the site with the subway bottom approximately 20 to 25 feet below ground surface.

The site is generally level at around El. +46. However, a grade drop of about 6 to 7 feet exists between the site lot and the gas station lot to the south. The west sidewalk also slopes down from north to south to accommodate this grade change with a retaining wall on the west side of the site to maintain fairly level site grades.

PROPOSED CONSTRUCTION

The proposed project will consist of construction of a new 8-story mixed-use commercial building with two (2) cellar levels for below-grade parking. We understand that the superstructure will have setbacks from the property line along 39th Avenue and College Point Boulevard, but, the below grade levels will occupy the entire site footprint. Top of slab in the lower level cellar (P2 parking level) is expected at a depth of about 30 feet below ground surface, or about El. +16.5. The new building will include three elevator shafts along the east property line. Elevator pits are anticipated to extend about 5.5 feet below the lower level cellar slab.

SITE GEOLOGY

Bedrock was not encountered in any of the borings at the site. According to published data, bedrock lies about 200 feet below ground surface. The oldest and lowest sediments overlying bedrock are of Cretaceous age followed by Pleistocene age glacial deposits.

The site is at the edge of a deep valley carved into the Cretaceous Raritan clay. During the Pleistocene, a series of glaciers flowed across the region. The glaciers scoured the valley deeper, reworked the clay, and redeposited it as glacial sediments. With each advance and retreat, the ice typically deposited in and along the valley layers of till that may contain large slabs of Raritan clay, outwash sand and glacial lake silt and clay derived in part from the Raritan. In the process, the ice glacially sheared and loaded the older sediments below, densifying them, before depositing less dense soil above. Surficial fills placed by man to level and develop the site and surrounding area overlie the natural soil formations.

SUBSURFACE INVESTIGATION

MRCE proposed a phased investigation consisting of six borings made in two phases (preliminary and final phase) to expedite the start of foundation design and satisfy NYC Building Code requirements for subsurface exploration. The preliminary investigation was intended to consist of five borings made in accessible areas (parking lot and sidewalk) and provide sufficient subsurface data to initiate foundation design. Subsurface data available from prior site investigations allowed reduction in the number of preliminary borings from five to three and addition of three Cone Penetration Test (CPT) soundings to assist in the preliminary investigation. CPT soundings provide a continuous record of soil strength and stiffness with depth and were added to facilitate a better evaluation of foundation performance during building design. A final subsurface investigation is planned following demolition of the existing building and will include an additional boring and at least one test pit to investigate the depth and condition of foundations supporting the neighboring building along the east property line.

Prior Investigation

Louis Berger & Associates (LBA) performed a limited site investigation in 2006 consisting of two soil borings made in the parking lot along the east property line. Locations of the borings are shown on Drawing No. B-1. The borings (SB-01 and SB-02) were both drilled and sampled continuously to a depth of 50 feet. Temporary well points (TWPs) were installed in each of the borings at completion for observation of groundwater levels. Logs of the LBA borings are provided in Appendix B.

MRCE Preliminary Investigation

A total of three borings (Borings M-1 through M-3U) and three CPT soundings (CPT-1 through CPT-3) were made at the site by Craig Test Boring, Inc. of Mays Landing, New Jersey between May 2nd and May 10th, 2016 under the continuous inspection of our Engineer, Mr. Andy Ong. As-built locations of the borings and CPT soundings were determined by our Engineer by measuring distances off of existing structural features and are shown on Drawing No. B-1.

All borings were hand augered to a depth of six (6) feet below grade to clear shallow utilities prior to drilling. Borings were advanced with truck mounted drill rigs using wash-rotary methods with casing and drilling mud to stabilize the borehole. Soil samples were collected continuously in each boring from the hand auger depth to 12 feet and at five foot intervals thereafter. Soil samples were obtained by performing Standard Penetration Tests (SPT), in which a standard, 2-inch O.D. split-spoon sampler is driven through four 6-inch intervals with a 140-pound hammer, free-falling 30 inches. The SPT resistance, also termed N-value and expressed in blows per foot (bpf), is an indication of the relative density of the material sampled and is calculated by summing the blows from the second and third 6-inch intervals. In some instances, where the sampler was unable to penetrate the full 24 inches due to the presence of dense soils, large gravel, cobbles, boulders, or other obstructions, the sampler was driven until refusal (i.e. 50 to 100 blows were administered) and the actual penetration of the sampler was measured and recorded. Recovered soil samples were classified in the field in accordance with the Unified Soil Classification System (USCS) and placed in jars for preservation and transport to our laboratory.

Three undisturbed samples were taken for laboratory testing of cohesive (clay) layers in Borings MR-2U and MR-3U. Undisturbed samples were obtained by mechanically pushing a 3-inch diameter tube using a Shelby tube sampler. The length of push and recovery of each tube sample is recorded in the boring logs in Appendix A. Upon recovery, all tube samples were sealed with hot wax and plastic end caps for sample preservation and transported to our laboratory.

Boring MR-1 was terminated at a depth of 100 feet while Borings MR-2U and MR-3U were stopped at 75 feet. Logs of the completed borings are provided in Appendix A.

Due to the asphalt surface pavement and underlying coarse fill, each CPT location was pre-drilled to a depth of 10 feet. The pre-drilled holes were backfilled with sand and then the CPT cone was pushed. The CPT soundings were advanced to final depths ranging from 47.1 feet to 56.6 feet. Pore water pressure dissipation tests were performed in each of the CPT soundings at various depths within the finer grained (silt and clay) deposits. CPT records are provided in Appendix C.

Roux Environmental Investigation

Roux Associates performed an environmental investigation at the site in June 2016 with the results of their investigation summarized in a Remedial Investigation Report, dated September 2016. We refer to the "Executive Summary" from the Remedial Investigation Report included in Appendix D for further detail on the scope and results of the Roux investigation. The Roux investigation included the installation of three (3) monitoring wells for observations of groundwater levels. Data from the monitoring wells was relied on in developing the groundwater levels reported herein. Monitoring well construction details and water level measurements reported by Roux are also provided in Appendix D.

LABORATORY TESTING PROGRAM

All soil samples were delivered to our soil mechanics laboratory in Manhattan. Samples were reviewed and field descriptions were revised as necessary for conformance with MRCE's Geotechnical Reference Standards, described on Drawing No. GS-R. Individual sample descriptions are provided on the final, typed boring logs in Appendix A.

Laboratory testing included soil index tests (natural water content and Atterberg Limits), unconsolidated undrained (UU) triaxial compression strength tests, and constant rate of strain consolidation tests (CRS). Tests were performed on the cohesive, fine-grained soils (Stratum C). All testing was performed in accordance with applicable ASTM standards.

Test Results: All test results are presented in tabular form on Table No. 1, Summary of Laboratory Test Data.

Index Testing: Natural water contents were determined on all fine-grained soil (silt and clay) samples. The results of the water content determinations are included on the boring logs and geologic sections. Water contents are expressed as a percentage of the sample dry weight.

Atterberg limits were performed on undisturbed samples and were used in classifying material types and evaluating soil plasticity and compressibility.

Triaxial Compression Tests: Triaxial testing consisted of UU tests to evaluate the shear strength of samples of the Stratum C clay. Samples were subjected to a uniform confining pressures equivalent to 80 percent of the estimated effective overburden stress were used in the testing at the sample depth and then sheared immediately without allowing drainage.

Consolidation Tests: Two CRS consolidation tests were performed on samples from Stratum C. Consolidation tests provide information on the maximum past loading conditions and the rates and magnitudes of settlements that may be expected under present and future loading conditions.

The results of individual consolidation tests are presented graphically on Plate Nos. CRS-1 and CRS-2. We estimated the present overburden pressures (P_0) at each sample depth using the estimated effective unit weight of soils above the sample depth and depth to groundwater indicated in the Roux monitoring wells. The maximum past pressures (P_C) were determined from the consolidation curves using the Casagrande method of construction. The compression index (C_C) was obtained from the virgin compression curve and the swell index (C_S) was obtained from the final rebound curve.

SUBSURFACE CONDITIONS

Our interpretation of subsurface conditions encountered in the borings and CPT soundings are illustrated on Geologic Sections A-A and B-B on Drawing Nos. GS-1 and GS-2. Boring data plotted on the sections include: sample number, designation and position, Standard Penetration Test (SPT) resistance (N-value), water content of fine-grained samples, and USCS soil group symbol. The USCS is described on Drawing No. GS-R.

We have grouped the subsurface soils into four generalized strata based on geologic origin and engineering characteristics. General descriptions of each of the strata, including material classification (Class) in accordance with the New York City Building Code (2014), are summarized below in order of their occurrence with depth.

Stratum F – Fill (NYC Class 7): The site is covered with fill comprised of natural soils reworked or transported by man. The fill is primarily a loose to medium compact, brown fine to coarse sand, some to trace silt, trace to some gravel. The three recent borings indicate a relatively uniform fill thickness of about 13.5 feet but actual fill thickness is expected to vary across the site. N-values range from 7 to refusal with an average of 17 bpf. The erratic sampling resistance indicates uncontrolled fill placement with the higher N-values typically the result of large gravel, cobbles, boulders or other obstructions within the fill. Remnant foundations are also expected within the fill from prior site construction and future demolition of the existing building.

Stratum S – Sand (NYC Class 3b): Sand underlies the fill in all the borings and, in Borings MR-1 and MR-3U, is interlayered with the fine-grained material below. Stratum S consists of loose to medium compact, brown fine to medium to fine to coarse sand, trace silt, and trace gravel. Thickness of the sand ranges between 35 feet in MR-2U and 2½ to 15 feet where the sand is interlayered with Stratum C clay in MR-1 and MR-3U. N-values range from 4 to 28 bpf with an average blow count of 19.

Stratum C – Silty Clay (NYC Class 4b): Stiff silty clay exists beneath Stratum S. Stratum C consists of stiff to hard brown, red-brown and gray silty clay, sometimes interlayered or varved with clayey silt, silt or fine to medium sand seams. In MR-2U, Stratum C is ten feet thick. In borings MR-1 and MR-3U, Stratum C is interlayered with Stratum S and ranges in thickness from five to 17½ feet. The top of Stratum varies from 48½ feet below grade in MR-2U to between 28½ and 23½ in MR-1 and MR-3U, respectively. N-values vary from 14 to 53 bpf with an average of 26 bpf. Natural water contents range from 25 to 40 percent, with an average value of 31 percent.

Slickensides are evident in many Stratum C samples. Slickensides in a soil are secondary structures that result from prior friction along a fault plane and are found in cohesive material that was disturbed or locally reworked after deposition. These slickensides then become irregular planes of weakness which affect the clay strength. Compression tests on undisturbed samples of Stratum C indicate a range in clay shear strength between 1.9 and 2.1 kips per square foot (ksf).

The consolidation tests indicate that the clay stratum is moderately to heavily over-consolidated with an over-consolidation ratio (OCR) greater than 4. The OCR is the ratio of the pre-consolidation pressure as determined from consolidation testing to the estimated existing overburden pressure at the sample depth.

Stratum T – Till (NYC Class 3a): Glacial till underlies the clay deposits. Stratum T consists of medium compact to very compact, brown to gray fine to coarse sand, trace to some silt with layers and pockets of clayey sand and trace gravel, lignite. The top of till is at 48½ feet, 58½ feet, and 51 feet below ground surface in MR-1, MR-2U, and MR-3U, respectively. N-values vary between 24 and 107 bpf with an average of 58 bpf. Three fine-grained till samples encountered in Borings MR-1 and MR-3 show an average water content of 21 percent.

Groundwater: Groundwater levels were typically measured in boreholes that remained open overnight and are shown in the boring logs and geologic sections. Borehole levels may not represent stabilized water levels and therefore may not be indicative of the groundwater regime.

Groundwater levels measured in the Roux monitoring wells are considered more indicative of true water levels than measurements in boreholes. Water levels in the monitoring wells range from a depth of 35 to 36.5 feet below ground surface, or between about El. +8.3 and El. +9.7. Water perched at the top of the Stratum C clay is anticipated and may result in groundwater encountered at higher elevation.

Groundwater levels are expected to vary seasonally throughout the year depending on precipitation levels and surface water infiltration. As such, the groundwater level at the time of construction may be different from levels observed during our field investigation.

RECOMMENDED SOIL & GROUNDWATER DESIGN PARAMETERS

Table No. 1 provides recommended soil parameters for the design of foundations and other below ground structures. Tabulated soil properties are average values based on project soil boring and laboratory testing data. In any situation, specific boring and laboratory testing information at the location of interest should be consulted in selecting appropriate values for design.

Table 1 – Soil Design Parameters

Parameter	Stratum			
	F	S	C	T
Total Unit Weight (pcf)	120	120	125	130
Buoyant or Effective Unit Weight (pcf)	58	58	63	68
Angle of Internal Friction, Ø (degrees)	30	32	25	36
Ultimate Friction Factor, S – soil to concrete	N/A	0.5	0.4	0.5
Allowable Bearing Pressure (tsf)	N/A	3	3	6

Groundwater and Flood Levels

The Roux monitoring wells indicate the groundwater level in June 2016 was between about El. + 8 and El. +10, or approximately 35 feet below site surface grades. We recommend a design groundwater level at El. +16 to account for seasonal variations and the presence of perched water at the top of the Stratum C clay.

The site is outside the 100-year and 500-year flood zones as indicated on the latest FEMA Flood Zone Maps released in December 2013.

SEISMIC DESIGN PARAMETERS

Structural design of the building foundations must comply with the 2014 NYC Building Code. The Code requires assessment of the potential hazard of soil liquefaction under the seismic event specified by the Code and an evaluation of the seismic Site Class to determine the seismic design parameters.

Liquefaction Potential

Soils below the groundwater level that are within 50 feet of ground surface, sufficiently free of fine grained binder (i.e. silt and clay sizes), and loose in consistency are susceptible to liquefaction during earthquake shaking. Site observation wells indicate that the average depth to groundwater is about 35 feet.

Liquefaction susceptibility was assessed using the Code's Liquefaction Assessment Diagram (Figure 1813.1), which compares field measured SPT N-values with specified liquefaction "screening lines". Soils with SPT N-values plotting to the left of the screening lines are considered potentially liquefiable, while those with values plotting to the right of the liquefaction screening lines are considered unlikely to liquefy. All measured N-values recorded for cohesionless soils below the groundwater plot to the liquefaction unlikely side of Structural Occupancy Category (OC) III and the fine-grained soils present at the site have a plasticity index greater than 20. Liquefaction therefore does not need to be considered in foundation design.

Site Class

Site classification is defined based on the characteristics of the soils below the anticipated foundation level as revealed by the borings and the Code guidelines relating Site Class with measured SPT N-values. On that basis, the site is classified as Site Class D. The seismic design parameters for Site Class D are:

Short period spectral acceleration S_{DS} = 0.294g
1-second period spectral acceleration S_{D1} = 0.117g

Assuming the proposed building is classified as Structural Occupancy Category (OC) III (to be confirmed by the structural engineer), corresponding to Seismic Use Group II, using S_{DS} = 0.294g and S_{D1} = 0.117g results in Seismic Design Category "B" per the Code's §1616.3, Table 1616.3(1) "Seismic Design Category Based on Short-Period Response Accelerations".

FOUNDATION RECOMMENDATIONS

Foundation recommendations are provided based on the results of the preliminary subsurface investigation and our understanding of the current building design. The recommendations are intended to satisfy the requirements of the NYC Building Code, and to provide information for foundation design. Our recommendations should be reviewed if the scope of the proposed construction changes significantly from that described herein.

We understand that the proposed project consists of construction of a new 8-story mixed-use commercial building with two (2) cellar levels for below-grade parking. Top of slab in the lower level cellar (P2 parking level) is expected at a depth of 30 feet below ground surface, or about El. +16.5. General foundation level (excavation subgrade) is expected three feet below the top of slab, or about El. +13.5 and is shown as a dashed line relative to the subsurface conditions revealed by the borings on Geologic Sections A-A and B-B on Drawing Nos. GS-1 and GS-2. The new building will include three elevator shafts along the east property line. Elevator pits are anticipated to extend about 5.5 feet below the lower level cellar slab.

Subsurface Exploration and Code Compliance

The cellar levels are expected to occupy the entire site footprint of roughly 13,400 sq. ft. For a structure of this size supported on shallow foundations, the Code requires a minimum of six borings. To date, a total of five borings (two from a prior site investigation and three in our preliminary investigation) have been made at the site. Although the Code allows substitution of CPT soundings for borings at a replacement ratio of 1.5:1, the CPT soundings made in the preliminary investigation were intended to confirm and supplement the results of the prior investigation and not a replacement to the required number of borings. The presence of the existing building also prevented exploration and adequate boring coverage in the southeast quarter of the site. A final subsurface investigation is therefore recommended following building demolition consisting of an additional boring in the southeast corner of the site and at least one test pit to investigate the depth and condition of foundations supporting the neighboring building along the east property line.

Building Foundations

The uncontrolled fill (Stratum F) is an unsatisfactory bearing material for building foundations. Foundations will have to derive their support in the underlying more competent natural sands and clays. As shown on the geologic sections on Drawing Nos. GS-1 and GS-2, soils at the anticipated foundation level are expected to consist of medium compact Stratum S sand and stiff Stratum C clay. The Stratum S sand and Stratum C clay in undisturbed condition are suitable for an allowable bearing pressure of 3 tons per square foot (tsf). Given that soils at foundation subgrade are variable and include sensitive clay soils, we recommend a mat foundation for building support to better distribute applied loads and accommodate the variable subgrade conditions.

The structural design of a mat is typically performed using Winkler springs to represent the load-deformation response of subgrade soils. Such springs are characterized by coefficients of subgrade reaction or subgrade modulus. The selected values of subgrade modulus used in the analysis of a mat must be compatible with the deformation characteristics of the subgrade including any time dependent soil response such as from consolidation. The use of a single constant subgrade modulus is usually not appropriate and can produce misleading results. Mat design therefore requires an iterative analysis wherein the computed mat deflections by the structural engineer are compared to the subgrade response (mat settlements) predicted by the geotechnical engineer for the range of loads and loading conditions applied to the mat. The effects of geometry and applied loads on the mat deformation must be carefully evaluated, and the subgrade modulus distribution modified accordingly for the structural analysis. Analysis is continued by adjusting the subgrade modulus based on mat contact pressures until computed mat deflections are reasonably compatible with predicted settlements.

To initiate mat design, we recommend using a variable subgrade modulus of 20 tons per cubic foot (tcf) in the mat center and 70 tcf along a strip around the mat perimeter equal to one-sixth of the least mat dimension. These values of subgrade modulus account for groundwater position and mat size assuming the mat will cover the entire site with a least dimension (east to west) of about 90 feet. Mat design should be performed in accordance with ACI 336.2R and the initial values of subgrade modulus refined using an iterative analysis between structural and geotechnical engineers as described above.

Cellar Slab and Uplift Protection

The top of the cellar slab is near the design groundwater level and therefore uplift pressures from hydrostatic pressure should not be significant. Deeper pits will experience higher uplift pressures. We recommend using a factor of safety of at least 1.2 in evaluating uplift resistance under the design water level. Uplift resistance should be calculated using only the dead weight of the structure in place. Live load within the structure should not be taken as a resisting force to counter uplift pressures. If the dead weight of the structure is not sufficient or the slab design cannot accommodate the full uplift pressure, tie-down anchors or other positive measures must be provided to resist the excess uplift pressures.

Cellar Walls

Permanent foundation walls must be designed to withstand long-term, at rest earth pressures, surcharge pressure, and water pressure, consistent with NYC Building Code requirements. We recommend calculating at-rest soil and water pressures as a triangular distribution using an equivalent fluid pressure of 60 pcf above the design groundwater level and 95 pcf below the groundwater level. Foundation walls must also accommodate surcharge pressures in accordance with the NYC Building Code or a temporary rise in groundwater level of five feet above the design groundwater level such as may occur due to a water main break. Lateral pressures from surcharge should be estimated as 50% of the vertical surcharge pressure applied at the ground surface. The use of elevated stress levels is appropriate in the design of foundation walls for these temporary load conditions.

Waterproofing

We understand that the cellar levels will be used primarily for parking. As the cellar slab is near the design groundwater level, we recommend the use of a membrane waterproofing system, such as Grace Bituthene and Preprufe products, beneath the slab with waterstops in all concrete joints. The membrane waterproofing should also be applied for the full height of foundation walls to prevent water infiltration from surface water runoff or leaking utilities. The waterproofing system must be carefully designed and detailed, and construction inspection is vital to provide proper quality control.

Where space allows the use of double-sided forms in wall construction, positive side waterproofing is recommended with drainage board applied to the exterior side of the foundation wall after the wall is completed and the forms removed. If excavation support systems are employed as the exterior forms, blind side waterproofing will be required.

Where blind side waterproofing is utilized, the contractor should provide details for sealing penetrations from form ties and/or excavation support system penetrations. Drainage or protection board, such as Hydroduct 200, should be placed along forms or adjacent to backfill to protect waterproofing where either blind side or positive side methods are used in waterproofing installation.

CONSTRUCTION CONSIDERATIONS

Cellar construction is expected to require to a depth of about 30 feet below ground surface at 39th Avenue and about 25 feet below the ground surface along the south end of the site, with local, deeper excavation in the area of the elevator pit(s) and sump pit(s). Temporary works including excavation support, construction dewatering, and monitoring systems are therefore expected to facilitate this construction.

Excavation

Cellar construction requires excavation in fill and natural soils. These materials can be excavated using conventional earth moving equipment. Existing intact foundations may require removal using pneumatic hammers. Care is necessary to avoid disturbing the soils beneath adjacent structures during demolition work.

Support of Excavation (SOE)

Temporary construction excavations should be sloped as necessary for safety and stability or supported by sheeting and bracing in accordance with OSHA regulations. Open-cut excavation is permissible for shallow excavations, such as for pits within the general cellar excavation, provided that such excavation is stable and does not undermine or cause damage to adjacent structures.

Where such conditions permit, the excavations sides in soil should be sloped no steeper than 1V:1.5H.

Soldier piles and lagging are considered suitable for excavation along the street exposures. Typically, these walls can be installed within the sidewalk assuming a sidewalk permit is obtained from the NYC DOT. The use of drilled soldier piles are recommended within 50 feet of existing structures to avoid pile driving and consequent potential for damage to nearby structures. A stiffer SOE system such as a soil mix wall or tangent pile wall is likely required along the south excavation face due to the existing retaining wall along the property line and proximity of the gas station building. We understand the cellar walls of the new building will be set back about two feet from the property line to provide space for SOE installation without encroaching into the neighboring property.

Inclined tiebacks are expected as the primary method of bracing the soldier piles and lagging as excavation proceeds. The use of tiebacks will require drilling under the adjacent streets and private properties. Plans showing the locations and depths of existing utilities in the streets surrounding the property should be prepared to evaluate and inform the contractor if utilities or other underground interferences exist that would restrict the use of tiebacks. Locations of tanks, foundations and other below-ground structures must be ascertained in the private property to the south and east. An easement from NYC DOT is required for placement of tiebacks into the streets. If tiebacks are installed below the adjacent properties, authorization from the property owners is required.

The SOE system must be carefully installed in advance of excavation and designed to have sufficient stiffness so that lateral movements do not lead to subsidence of sidewalks or damage to buried utilities. Soil parameters recommended for use in the design of temporary SOE structures are summarized in Table No. 1. Appropriate surface surcharge pressures per the Code must also be considered such as from adjacent roadways, sidewalks, and temporary construction loads.

The excavation shoring must be designed by a Professional Engineer licensed in the State of New York with the design submitted for review and approval of NYC Department of Buildings (NYC DOB) as part of the foundation permitting process. NYCT review of SOE and foundation plans is also required since the work is within 200 feet of NYCT structures.

Underpinning and Protection of Adjacent Structures

The adjacent building abutting the east property line has a single cellar level estimated at a depth of about 15 feet. In comparison, excavation for new building construction will require excavation to a depth of about 30 feet. Underpinning of the adjacent foundations is therefore necessary. Underpinning will require obtaining permission from adjacent property owners which must be negotiated in advance of construction.

Conventional concrete pit underpinning methods are viable for underpinning provided groundwater is properly controlled. Pit underpinning involves the sequenced excavation of small pits beneath the existing foundation. Individual pits are excavated and shored by hand to just below the new foundation depth. The pit is then filled with concrete leaving a 2 to 3-inch gap at the top for future load transfer using steel plates and wedges with drypack. Subsequent pits are excavated and constructed in a sequenced manner to prevent instability and form a continuous wall. Given the depth of underpinning, lateral bracing of underpinning pits is likely required. Bracing can consist of tiebacks or internal bracing such as inclined rakers, if permission to install tiebacks beneath adjacent properties is not obtained.

If underpinning is not permitted by the adjacent property owner, a relatively rigid wall, such as a secant pile wall, could be used for excavation support along the property line to limit movements of adjacent structures and avoid underpinning. Secant pile walls are formed by installing a series of overlapping concrete piles. The method consists of drilling and concreting primary piles at spacing slightly less than the nominal pile diameter. This is followed by drilling and concreting secondary piles that cut into and interlock with the adjacent primary piles to form a continuous wall. Steel reinforcement consisting of steel HP sections or reinforcing cages are installed in the secondary piles to provide the necessary bending strength and wall stiffness. Pile diameters typically range from 24 to 36 inches. Pile spacing typically varies between 0.7 and 0.9 of the nominal pile diameter and must be selected to obtain adequate overlap at depth taking into account pile installation verticality tolerances.

Use of the secant pile wall as the permanent cellar wall will minimize the loss of cellar space. Alternatively, the proposed building could be setback from the east property line to avoid underpinning and a braced wall used for excavation support. The braced wall plus the setback would need to be constructed on the project side of the property line and will result in significant loss of cellar space.

Construction Dewatering and Water Control

Based on water levels provided by Roux Associates, Inc., groundwater is generally expected to be below the bottom of the foundation mat. However, perched water is expected above the Stratum C clay layers and local dewatering may be necessary for the construction of the elevator pit(s). In addition, local dewatering should be expected to handle rainfall and surface water infiltration after storm events.

Trenches and sumps will be necessary to control the inflow of perched groundwater at interfaces between sand and clay layers and around the perimeter of the site. Wellpoints are anticipated for dewatering of the deeper elevator pits. We recommend that the groundwater level be lowered prior to excavation to at least 2 feet below excavation subgrade or no higher than one foot above the top of impermeable clay strata where such soils exist at excavation subgrade. The dewatering system must be designed by an experienced contractor and approved by the Owner's Engineer.

The NYC Department of Environmental Protection (NYC DEP) requires discharge permits for groundwater extracted from temporary, construction-related sources and disposed in City sewers.

Foundation Subgrade Preparation

Care must be exercised to prevent disturbing or loosening of the soil in the sides and bottom of excavations. Soils at foundation subgrade (Strata S and C) contain high fines contents and are susceptible to softening and disturbance by construction operations, particularly in the presence of water or freezing weather. Proper performance of the mat foundation requires support on undisturbed subgrade. Final subgrade exposure in soils must be made using a smooth edged excavating tool, such as a backhoe or bucket with the teeth shielded, and operating by reach of equipment and working on mats or at least two feet above subgrade. All water must be diverted away from and not allowed to pond in excavations.

All subgrades must be inspected and approved for foundation construction by a qualified geotechnical engineer in accordance with the Special Inspection requirements of the NYC Building Code. Mat construction should either proceed immediately after subgrade approval or subgrade promptly covered with a lean concrete mud to protect subgrade materials from subsequent deterioration from weather, surface water infiltration and construction traffic in the interim period until foundation construction. The mud mat will also provide a working surface for waterproofing installation and foundation construction.

Backfill and Reuse of Existing Material

Despite the large portion of granular soil on-site, the material that is expected to be excavated contains more than 10 percent material which passes a Number 200 sieve. This makes it sensitive to moisture content and difficult to control during compaction. Any backfill required on this site should consist of engineered controlled fill which meets or exceeds New York City Building Code requirements and comprise a clean, well-graded sand, or sand and gravel with a maximum of size particle of 2 inches.

Backfill should be placed in level lifts, a maximum of 12 inches thick, and compacted to at least 98 percent of Modified Proctor (ASTM D-1557) maximum dry density. On-site soils and sources of off-site borrow should be subjected to laboratory testing including grain size and moisture density tests prior to use to determine if they meet the specified backfill requirements.

Backfill placement is subject to special inspection. Typically, a soil testing laboratory is retained by the Owner to test the density of each lift at selected locations to confirm compaction is performed as specified.

Construction Monitoring

Pre-construction condition surveys have been performed and have documented existing conditions, including photographs of existing conditions. The New York City Building Code requires a program of monitoring vibration, noise and settlement of adjacent structures during construction. The program should include control points on each of the adjacent structures to measure both vertical and lateral movement. Control points should also be established at regular intervals along each side of the excavation support system for similar movement monitoring as well as installing crack gauges over existing cracks on the inside and outside of the structures on the adjacent properties.

Dewatering systems must include the installation of piezometers to monitor groundwater lowering and verify that the required drawdown is achieved in advance of excavation to avoid instability and softening in subgrade soils.

GEOTECHNICAL REVIEW OF FOUNDATION DESIGN & CONSTRUCTION

The borings disclose a complex subsurface profile with interlayered sands and clays expected at and below foundation subgrade. This variable profile may result in foundations bearing on soil of different character and thickness. Interaction between the geotechnical and structural engineer is therefore essential as foundation design progresses to optimize building foundations and provide adequate building performance under the range in service loading conditions. Geotechnical review and assistance in preparation of foundation plans and specifications for below grade work is also recommended so that foundation and construction recommendations provided herein are properly interpreted and implemented in the design.

Recommendations for foundation design and construction in this report are based on the information obtained from the borings and associated field and laboratory testing. However, conditions on the site may vary between discrete boring locations and observed at the time of our subsurface exploration. The nature and extent of variations between borings may not become evident until exposed in construction. Geotechnical observation of foundation construction and testing is recommended to provide an opportunity to observe soil conditions and behavior as exposed during construction, evaluate the applicability of the recommendations provided in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein. We recommend that all foundation construction be observed by a qualified geotechnical engineer in accordance with the requirements of the NYC Building Code.

CLOSURE

This report presents the results of our investigations and our recommendations for foundation design and construction for the proposed project. We will be pleased to answer questions regarding this report and further assist in design and construction of the project as you may request.

Very truly yours,

MUESER RUTLEDGE CONSULTING ENGINEERS

By: Walter E. Kaeck
Walter E. Kaeck

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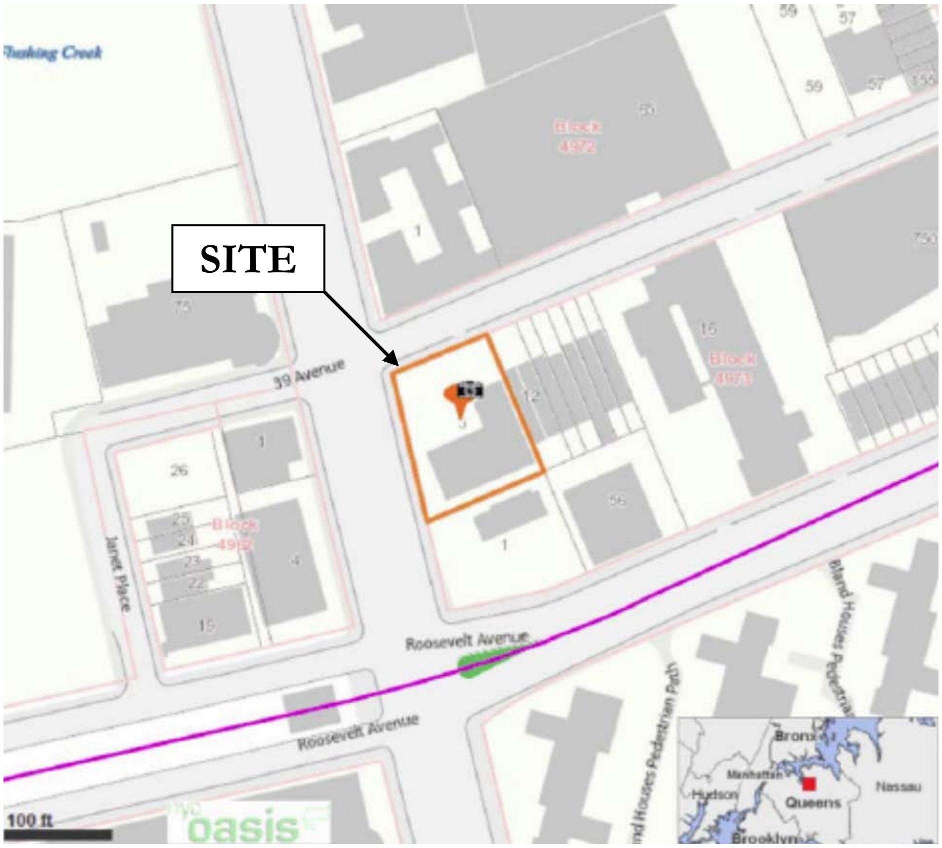
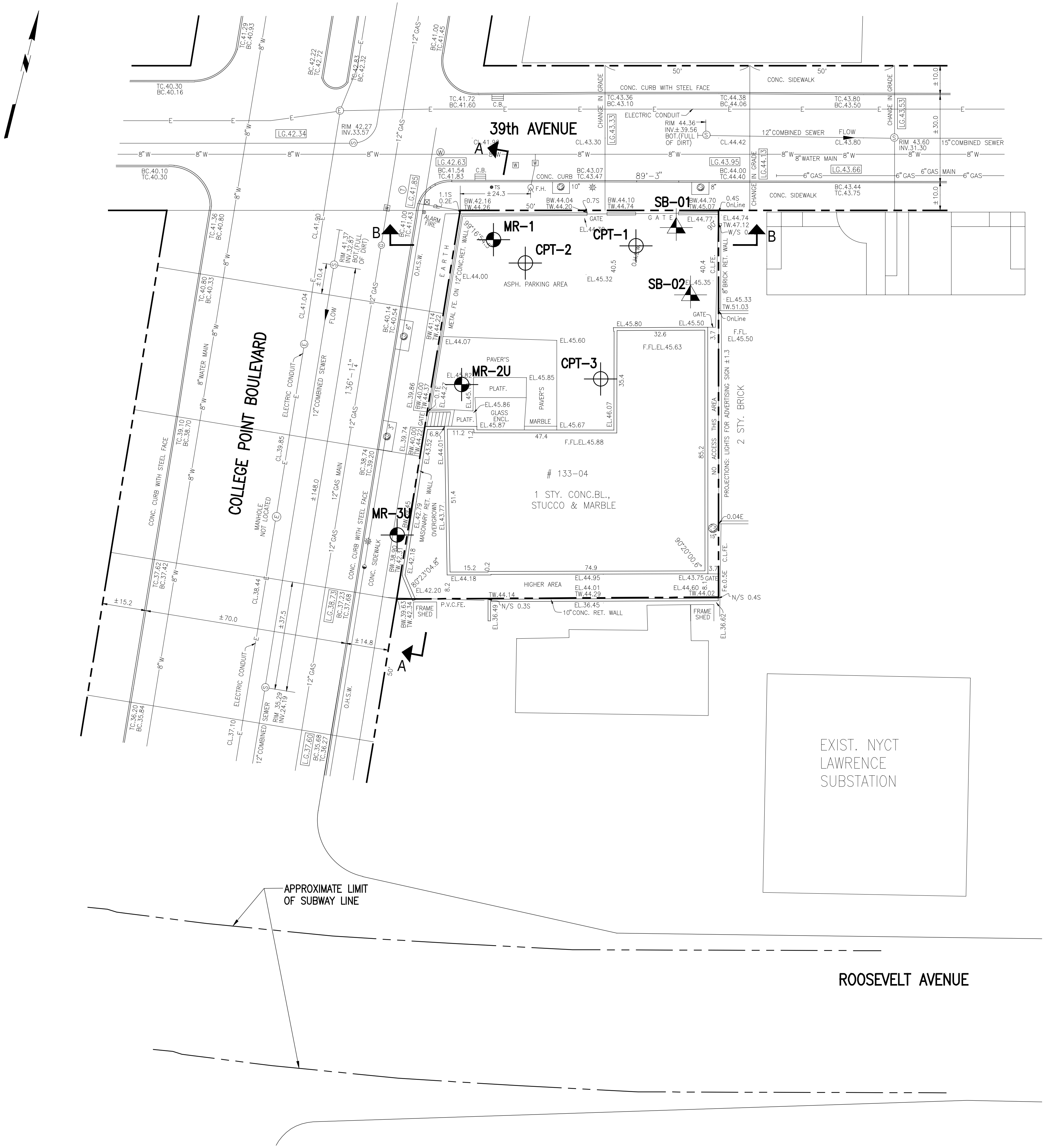
EXHIBITS



NOTE: Map from the Open Accessible Space Information System (OASIS) website, www.oasisnyc.net, retrieved on 6/30/2016

AAFE Mixed-Use Building, Queens, New York	
Mueser Rutledge Consulting Engineers **225 West 34th Street • New York, NY 10122**	06/30/16
Site Location Plan	MRCE 12629



NOTES:

1. THE BASE PLAN FOR THE PROJECT SITE IS FROM THE ARCHITECTURAL SITE SURVEY, DRAWING REFERENCE NO. Q4973-002, PREPARED BY JOSEPH NICOLETTI ASSOCIATES, 499 JERICHO TURNPIKE, SUITE 201, MINEOLA, NEW YORK, 11501, DATED MARCH 1, 2016.
2. THE OUTLINES OF ADJACENT BUILDINGS WERE TAKEN FROM THE NEW YORK CITY DEPARTMENT OF CITY PLANNING ZONING MAP.
3. THE LOCATION OF THE NYCT SUBWAY TUNNEL UNDER ROOSEVELT AVE WAS TAKEN FROM NYCT DRAWING ROUTE NO. 52 – SECTION NO.3, STA. 0 + 00 TO STA. 8 + 30, STRUCTURAL PLAN DWG NO. 28, DATED 4-02-1923.
4. THE LOCATION OF THE NYCT SUBWAY SUBSTATION WAS TAKEN FROM NYCT DRAWING ROUTE NO. 52 – SECTION NO. 3, LAWRENCE SUBSTATION STRUCTURAL PLANS, FIRST FLOOR PLAN. DWG NO. 306, DATED 9-19-1951.
5. THE NYCT STRUCTURES WERE LOCATED BY SCANNING THE REFERENCED DRAWINGS AND SCALING THEM TO FIT ON THE BASE PLAN. ALL LOCATIONS ARE APPROXIMATE.
6. BORINGS AND CPTS WERE MADE BY CRAIG TEST BORING, INC., OF MAYS LANDING, NEW JERSEY, BETWEEN MAY 2, THROUGH MAY 10, 2016, UNDER THE CONTINUOUS INSPECTION BY MUESER RUTLEDGE CONSULTING ENGINEERS.
7. BORINGS TWP-01/SB-01 AND TWP-02/SB-02 WERE MADE BY AQUIFER DRILLING AND TESTING, BETWEEN NOVEMBER 4 & 5, 2006, UNDER THE INSPECTION OF LOUIS BERGER AND ASSOCIATES, P.C.
8. ELEVATIONS AT THE BORING LOCATIONS WERE ESTIMATED IN REFERENCE TO NAVD88 BASED ON AVAILABLE SITE SURVEY INFORMATION.
9. BORING LOCATIONS WERE MEASURED IN THE FIELD OFF OF EXISTING STRUCTURAL FEATURES.
10. GEOLOGIC SECTION A-A IS SHOWN ON DRAWING GS-1 AND GEOLOGIC SECTION B-B IS SHOWN ON DWG. GS-2.

LEGEND:

MR-1 – PRELIMINARY PHASE BORING

CPT-1 – CPT BY CRAIG TEST

SB-01 – EXISTING BORING MADE BY AQUIFER DRILLING AND TESTING

GRAPHIC SCALE 20' 10' 0 20' 40'

REV.	DATE	BY	DESCRIPTION

AAFE MIXED USE BUILDING
QUEENS — NEW YORK

ASIAN AMERICANS FOR EQUALITY
NEW YORK — NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122

SCALE	MADE BY: E.C.	DATE: 06-07-2016	FILE NUMBER
GRAPHIC	CH'KD BY: S.O.H.J.	DATE: 06-07-2016	12629

BORING LOCATION PLAN — DRAWING NUMBER B-1

Printed by: Eugina Cherkasskaya
Printed on: Thursday, Jun 30, 2016 – 11:59:52 AM
Last saved by: echerkasskaya on Wednesday, Jun 29, 2016 – 12:25:35 PM
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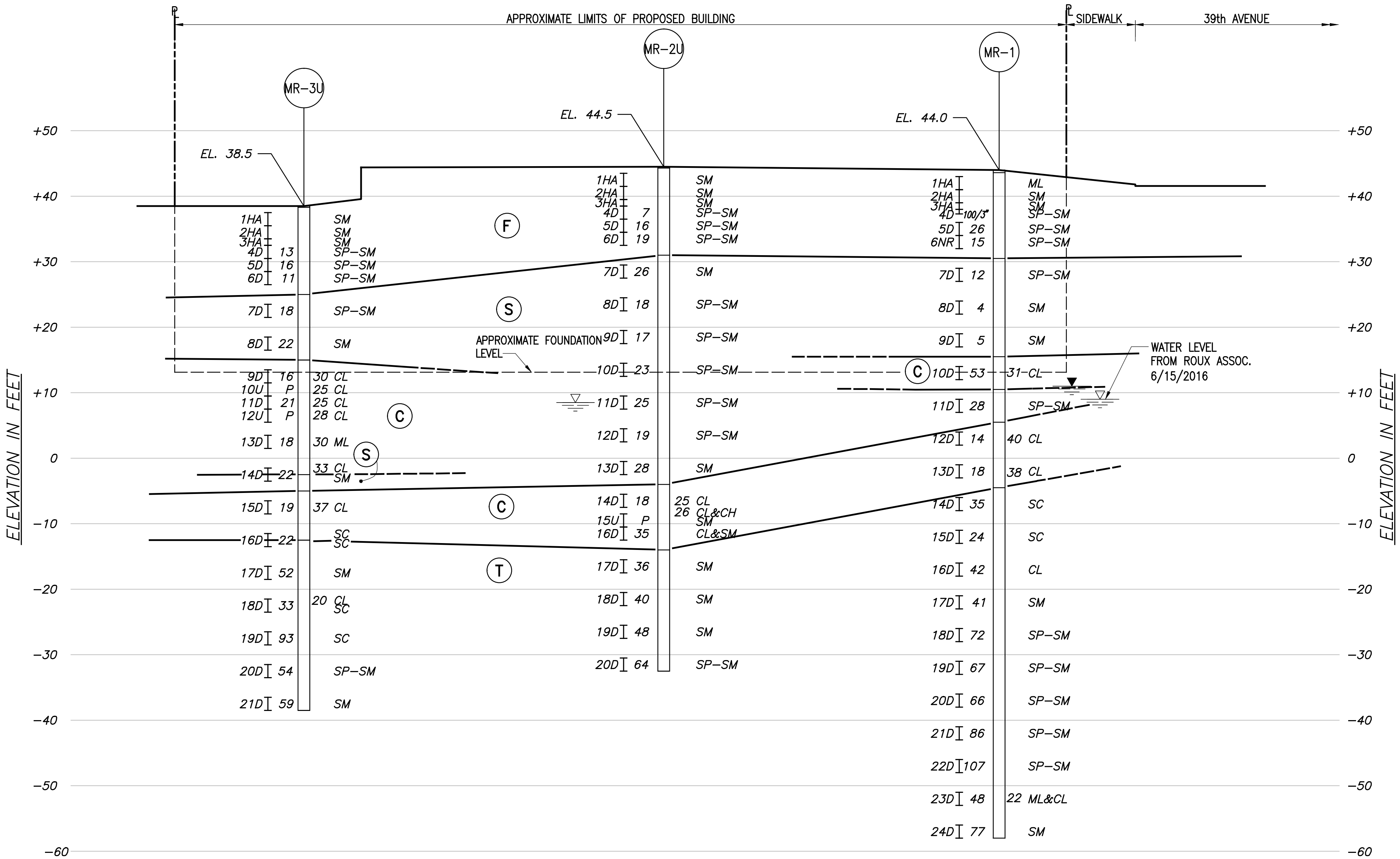


GEOLOGIC SECTION A-A

GENERAL STRATA DESCRIPTIONS:

(F) **FILL** – LOOSE TO MEDIUM COMPACT, BROWN FINE TO COARSE SAND, SOME TO TRACE SILT, TRACE TO SOME GRAVEL.

(S) **SAND** – LOOSE TO MEDIUM COMPACT, BROWN FINE TO COARSE SAND, TRACE SILT, TRACE GRAVEL.

(C) **SILTY CLAY** – STIFF TO HARD BROWN, RED-BROWN AND GRAY SILTY CLAY, SOMETIMES INTERLAYERED OR VARVED WITH CLAYEY SILT, SILT OR FINE TO MEDIUM SAND SEAMS.

(T) **TILL** – MEDIUM COMPACT TO VERY COMPACT, BROWN TO GRAY FINE TO COARSE SAND, TRACE TO SOME SILT WITH LAYERS AND POCKETS OF CLAYEY SAND, TRACE GRAVEL, LIGNITE.

GEOLOGIC SECTION NOTES:

1. FOR GENERAL NOTES AND LOCATIONS OF BORINGS AND GEOLOGIC SECTIONS, SEE BORING LOCATION PLAN, DRAWING NO. B-1.
2. FOR BORING LEGEND AND SOIL CLASSIFICATION SYSTEM, SEE GEOTECHNICAL REFERENCE STANDARDS, DRAWING NO. GS-R.
3. BORINGS ILLUSTRATED ON GEOLOGIC SECTIONS ARE IN SOME CASES PROJECTED TO THE SECTION OR OFFSET FOR CLARITY. STRATIFICATIONS SHOWN ON GEOLOGIC SECTIONS ARE NECESSARY INTERPOLATIONS BETWEEN AND BEYOND BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.
4. WATER LEVELS SHOWN ARE PRELIMINARY WATER LEVELS PROVIDED BY ROUX ASSOCIATES, INC. FROM THEIR ENVIRONMENTAL INVESTIGATION, JUNE, 2016.

GRAPHIC SCALE
10' 5' 0 10' 20'

REV.	DATE	BY	DESCRIPTION

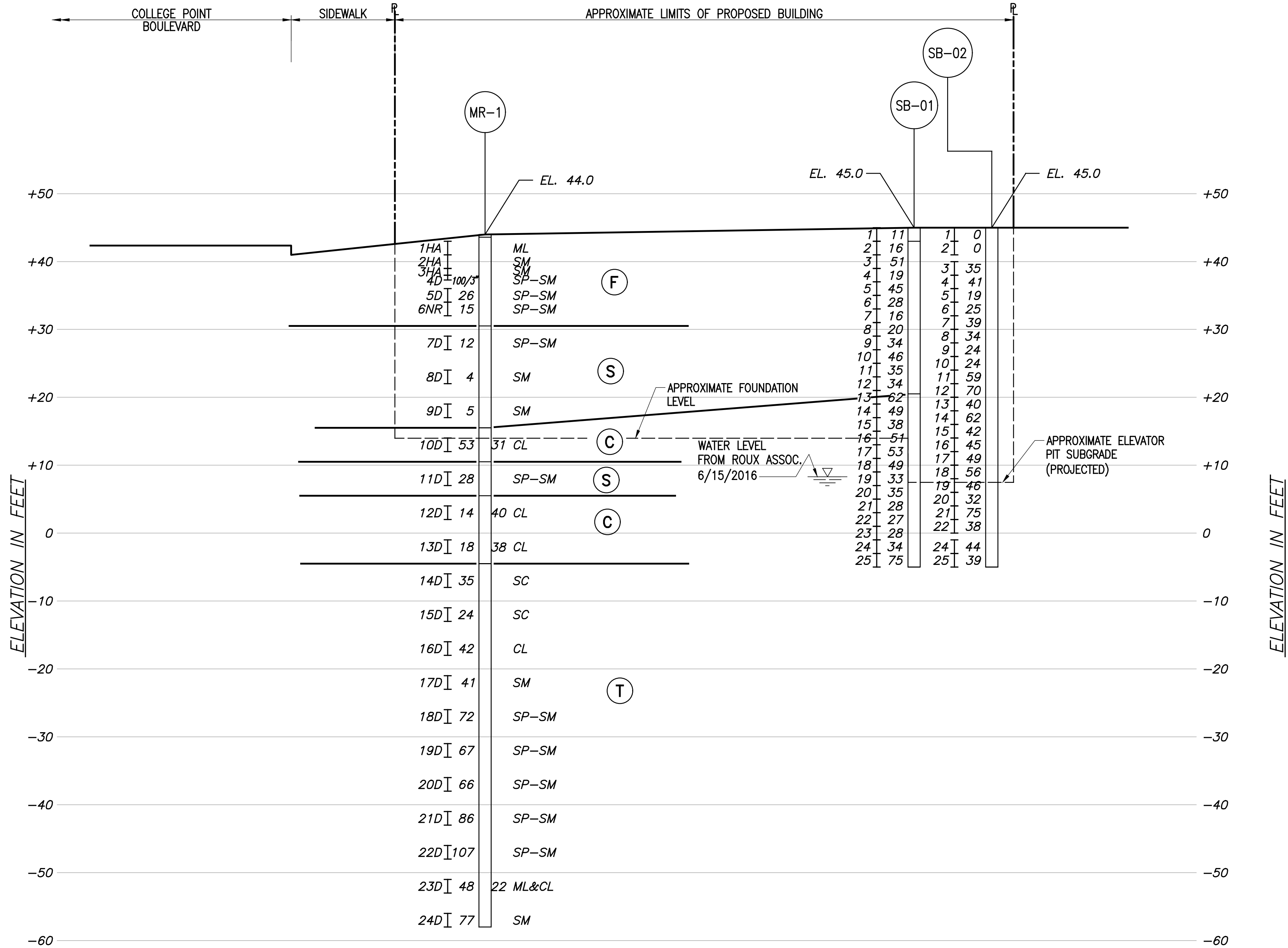
AAFE MIXED USE BUILDING
QUEENS — NEW YORK

ASIAN AMERICANS FOR EQUALITY
NEW YORK — NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122

SCALE	MADE BY: E.C.	DATE: 06-07-2016	FILE NUMBER
GRAPHIC	CH'KD BY: S.O.H.J.	DATE: 06-07-2016	12629

GEOLOGIC SECTION A-A — DRAWING NUMBER GS-1



GEOLOGIC SECTION B-B

GENERAL STRATA DESCRIPTIONS:

(F) **FILL** – LOOSE TO MEDIUM COMPACT, BROWN FINE TO COARSE SAND, SOME TO TRACE SILT, TRACE TO SOME GRAVEL.

(S) **SAND** – LOOSE TO MEDIUM COMPACT, BROWN FINE TO COARSE SAND, TRACE SILT, TRACE GRAVEL.

(C) **SILTY CLAY** – STIFF TO HARD BROWN, RED-BROWN AND GRAY SILTY CLAY, SOMETIMES INTERLAYERED OR VARVED WITH CLAYEY SILT, SILT OR FINE TO MEDIUM SAND SEAMS.

(T) **TILL** – MEDIUM COMPACT TO VERY COMPACT, BROWN TO GRAY FINE TO COARSE SAND, TRACE TO SOME SILT WITH LAYERS AND POCKETS OF CLAYEY SAND, TRACE GRAVEL, LIGNITE.

NOTES:

FOR NOTES, SEE DRAWING NO. GS-1.

GRAPHIC SCALE
10' 5' 0 10' 20'

REV.	DATE	BY	DESCRIPTION

AAFE MIXED USE BUILDING
QUEENS — NEW YORK

ASIAN AMERICANS FOR EQUALITY
NEW YORK — NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122

SCALE	MADE BY: E.C.	DATE: 06-07-2016	FILE NUMBER
GRAPHIC	CH'KD BY: S.O.H.J.	DATE: 06-07-2016	12629

GEOLOGIC SECTION B-B — DRAWING NUMBER GS-2

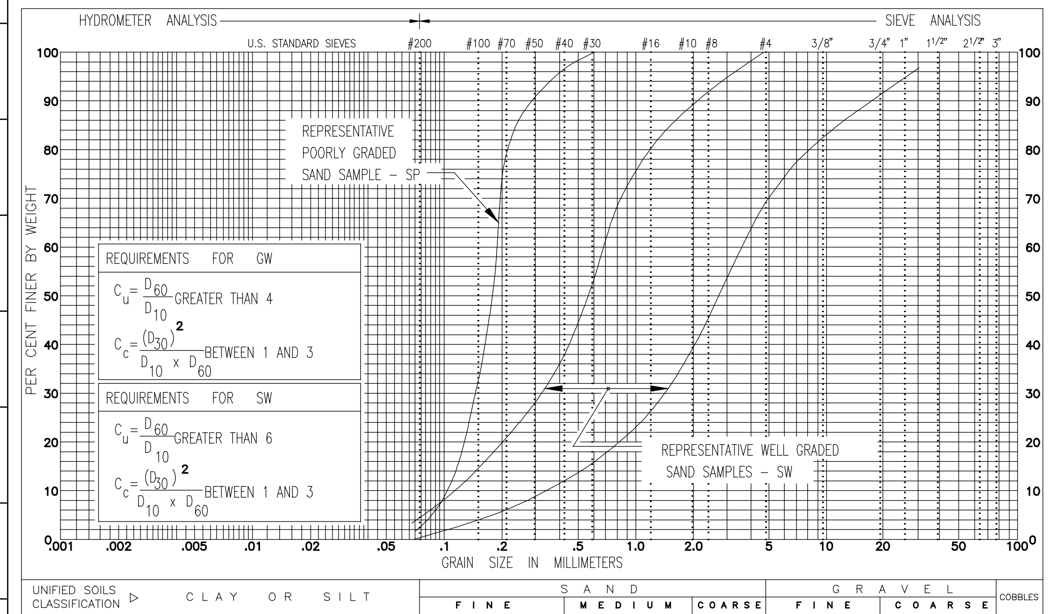
UNIFIED SOIL CLASSIFICATION (INCLUDING IDENTIFICATION AND DESCRIPTION)

MAJOR DIVISIONS (1)	(2)	(2)	GROUP SYMBOLS (3)	TYPICAL NAMES (4)	FIELD IDENTIFICATION PROCEDURES (EXCLUDING PARTICLES LARGER THAN 3 IN. AND BASING FRACTIONS ON ESTIMATED WEIGHTS) (5)
COARSE-GRAINED SOILS — MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE — THE NO. 200 SIEVE SIZE IS ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE	GRAVELS — MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE.	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.	WIDE RANGE IN GRAIN SIZES AND SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES.
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.	PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING.
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT-MIXTURES.	NONPLASTIC FINES OR FINES WITH LOW PLASTICITY (FOR IDENTIFICATION PROCEDURES SEE ML BELOW)
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES.	PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE CL BELOW)
	SANDS — MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE. (FOR VISUAL CLASSIFICATION, THE 1/4 -IN. SIZE MAY BE USED AS EQUIVALENT TO THE NO. 4 SIEVE SIZE)	CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.	WIDE RANGE IN GRAIN SIZES AND SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES.
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.	PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING.
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT-MIXTURES.	NONPLASTIC FINES OR FINES WITH LOW PLASTICITY (FOR IDENTIFICATION PROCEDURES SEE ML BELOW)
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES.	PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE CL BELOW)

MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE: DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PL)
FINE-GRAINED SOILS — MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE — THE NO. 200 SIEVE SIZE	SILTS AND CLAYS — LIQUID LIMIT IS LESS THAN 50	ML	INORGANIC SILTS, SANDY SILTS, ROCK FLOUR, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.	NONE TO SLIGHT	QUICK TO SLOW	NONE
		CL	INORGANIC CLAYS, OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.	MEDIUM TO HIGH	NONE TO VERY SLOW	MEDIUM
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.	SLIGHT TO MEDIUM	SLOW	SLIGHT
	SILTS AND CLAYS — LIQUID LIMIT IS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.	SLIGHT TO MEDIUM	SLOW TO NONE	SLIGHT TO MEDIUM
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.	HIGH TO VERY HIGH	NONE	HIGH
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.	MEDIUM TO HIGH	NONE TO VERY SLOW	SLIGHT TO MEDIUM
HIGHLY ORGANIC SOILS		Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS.	READILY IDENTIFIED BY COLOR, ODOR, SPONGY FEEL AND FREQUENTLY BY FIBROUS TEXTURE.		

BOUNDARY CLASSIFICATIONS: SOILS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS, I.E.: SP-SC POORLY GRADED SAND WITH CLAY BINDER.

LABORATORY CLASSIFICATION CRITERIA

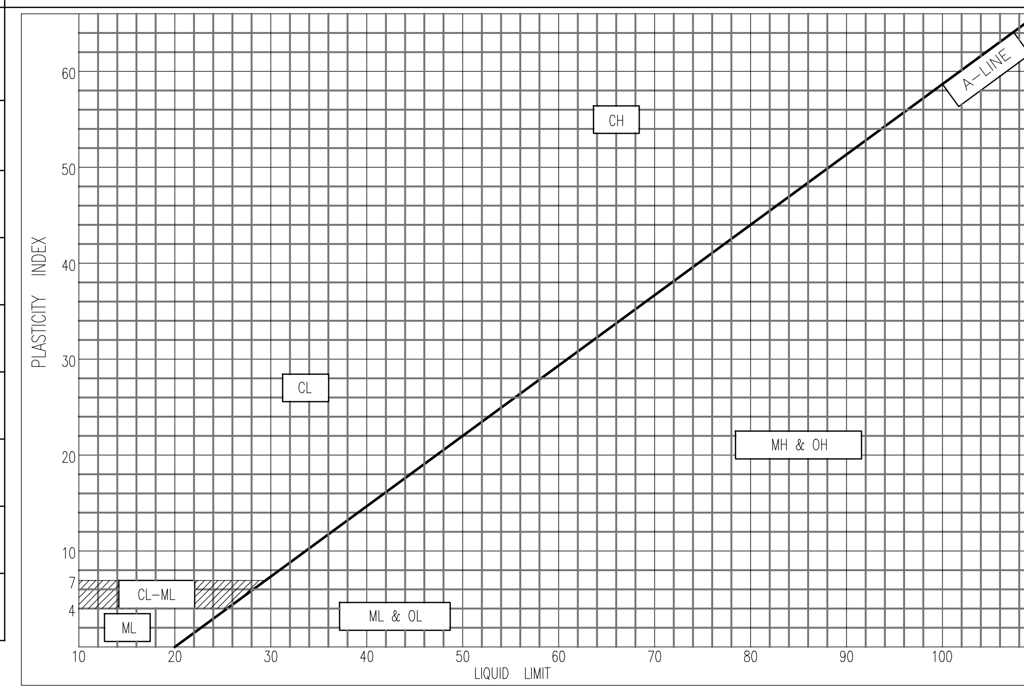


GRAIN SIZE PLOT

COBBLE 3-12"
BOULDER > 12"

DEPENDING ON PERCENTAGE OF FINES (FRACTION SMALLER THAN NO. 200 SIEVE SIZE) COARSE GRAINED SOILS ARE CLASSIFIED AS FOLLOWS:

LESS THAN 5%	GW, GP, SW, SP
MORE THAN 12%	GM, GC, SM, SC
5% TO 12%	BORDERLINE CASES REQUIRING USE OF DUAL SYMBOLS, I.E.: SP-SM, GP-GM.



PLASTICITY CHART FOR CLASSIFICATION OF FINE GRAINED SOILS

TERMINOLOGY USED IN MRCE SOIL DESCRIPTIONS

DEGREE OF COMPACTION FOR NON-PLASTIC SOIL

DEGREE OF COMPACTION	BLOWS* PER FOOT
LOOSE	0 TO 10
MEDIUM COMPACT	11 TO 29
COMPACT	30 TO 50
VERY COMPACT	GREATER THAN 50

* STANDARD PENETRATION RESISTANCE USING 140 LB. HAMMER FREE FALLING 30 INCHES TO DRIVE A 2 INCH O.D. SPLIT-SPOON SAMPLER.

CONSISTENCY OF CLAY AND CLAYEY SILT+

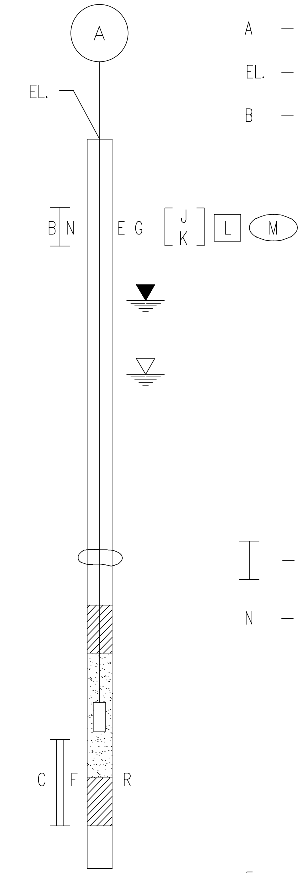
CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TSF)	IDENTIFICATION CHARACTERISTICS
SOFT	LESS THAN 0.5	EASILY REMOLDED WITH SLIGHT FINGER PRESSURE
MEDIUM	0.5 TO 1.0	REQUIRES SUBSTANTIAL PRESSURE FOR REMOLDING
STIFF	1.0 TO 4.0	DIFFICULT TO REMOLD WITH FINGERS
HARD	GREATER THAN 4.0	CANNOT BE REMOLDED WITH FINGERS

\+ NONPLASTIC SILTS ARE DESCRIBED USING DEGREE OF COMPACTION AS PRESENTED FOR NON-PLASTIC SOIL.

DESCRIPTION OF CONSTITUENT PERCENTAGES AS USED IN SOIL SAMPLE CLASSIFICATIONS

1% TO 12%	"TRACE"
13% TO 30%	"SOME"
31% TO 49%	ADJECTIVE FORM OF SOIL GROUP (EG. SANDY)
EQUAL AMOUNT	"AND" (EG. SAND AND GRAVEL)

BORING LEGEND



- A — NUMBER, TYPE AND LOCATION OF BORING
- EL. — GROUND SURFACE ELEVATION AT BORING
- B — NUMBER AND TYPE OF SAMPLE
  - HA - HAND AUGER SAMPLE
  - D - DRY SAMPLE TAKEN WITH 2 INCH O.D. SPLIT SPOON
  - U - UNDISTURBED SAMPLE TAKEN WITH 3 INCH O.D. FIXED PISTON TYPE SAMPLER
  - UD - UNDISTURBED SAMPLE EXTRUDED IN FIELD AND PLACED IN JAR DUE TO POOR RECOVERY OR DISTURBANCE
  - S - THIN TUBE SAMPLE TAKEN WITH SHELBY TUBE SAMPLER
  - N - THIN TUBE SAMPLE TAKEN WITH DENISON BARREL SAMPLER
  - P - THIN TUBE SAMPLE TAKEN WITH PITCHER BARREL SAMPLER
  - NR - NO RECOVERY
- (bar) — LENGTH OF SAMPLE ATTEMPT
- N — STANDARD PENETRATION RESISTANCE. NUMBER OF BLOWS FROM 140 LB. HAMMER FREE FALLING 30 INCHES REQUIRED TO DRIVE 2 INCH O.D. SPLIT SPOON SAMPLER ONE FOOT AFTER INITIAL PENETRATION OF 6 INCHES, UNLESS A SPECIFIC PENETRATION IS INDICATED.
  - P - PRESSED OR PUSH SAMPLE
  - WH - SAMPLE TAKEN UNDER WEIGHT OF HAMMER AND RODS
  - WR - SAMPLE TAKEN UNDER WEIGHT OF RODS
- E — AVERAGE NATURAL WATER CONTENT OF SAMPLE, IN PERCENT OF DRY WEIGHT
- G — UNIFIED SOIL CLASSIFICATON GROUP SYMBOL OF SAMPLE
- [J = ATTERBERG LIQUID LIMIT VALUE
- K] = ATTERBERG PLASTIC LIMIT VALUE
- L — COMPRESSIVE STRENGTH IN TSF DETERMINED FROM UNCONFINED COMPRESSION TEST
- M — COMPRESSIVE STRENGTH IN TSF DETERMINED FROM UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST
- (filled triangle) — GROUNDWATER LEVEL OBSERVED IN BORING; * - MUD LEVEL
- (open triangle) — GROUNDWATER LEVEL OBSERVED IN PIEZOMETER
- C — ROCK CORE NUMBER
- (double bar) — LENGTH OF CORE RUN
- F — LENGTH OF CORE RECOVERED EXPRESSED AS A PERCENT OF THE LENGTH OF CORE RUN
- R — ROCK QUALITY DESIGNATION-THE SUM OF THE LENGTHS OF PIECES OF RECOVERED CORE WHICH ARE EQUAL TO OR GREATER THAN FOUR INCHES IN LENGTH, EXPRESSED AS A PERCENTAGE OF THE TOTAL LENGTH OF CORE RUN. LENGTHS ARE MEASURED BETWEEN IN-SITU SEPARATIONS AND MECHANICAL BREAKS RESULTING FROM CORING ARE IGNORED.
- IMPERVIOUS SEAL
- SAND FILTER SURROUNDING PIEZOMETER INTAKE ELEMENT
- INTAKE ELEMENT
- COBBLE OR BOULDER

REVISED 10-25-2012

MUESER RUTLEDGE CONSULTING ENGINEERS
225 WEST 34th STREET - 14 PENN PLAZA
NEW YORK, NY 10122

GEOTECHNICAL REFERENCE STANDARDS — DRAWING NO. GS-R

TABLE NO. 1

SUMMARY OF LABORATORY TEST DATA

SAMPLE IDENTIFICATION					CLASSIFICATION PROPERTIES								PHYSICAL PROPERTIES												
										UNIFIED SOIL CLASSIFICATION SYSTEM			STRENGTH						CONSOLIDATION						
BORING NUMBER	SAMPLE NUMBER	ELEVATION , FT.	STRATUM DESIGNATION	IN-SITU UNIT WEIGHT, PCF	AVERAGE NATURAL WATER CONTENT, W_n , %	LIQUID LIMIT, W_L, %	PLASTICITY INDEX, I_P , %	NATURAL WATER CONTENT OF LIMIT SAMPLE, W_n , %	SPECIFIC GRAVITY OF SOILIDS, G_s	GROUP SYMBOL	% SAND (< #4 > #200 SIEVE)	% FINES (< #200 SIEVE)	TYPE OF TEST	COMPRESSIVE STRENGTH ($\sigma_1 - \sigma_3$) , TSF	CONFINING PRESSURE TSF	STRAIN AT FAILURE, %	NATURAL WATER CONTENT, W_n , %	WATER CONTENT AT END OF TEST, W_f , %	NATURAL WATER CONTENT, W_n , %	INITIAL VOID RATIO, e_o	EXISTING OVERBURDEN STRESS, P_o , TSF	ESTIMATED PRECONSOLIDATION STRESS, P_c , TSF	COMPRESSION INDEX, C_c	SWELL INDEX, C_S	TEST TYPE OR STRAIN RATE DURING LOADING, %HR
MR-2U	15U	-9.5	C	128	26	60	31	27.0	2.88	CH			UU	1.89	2.56	19.3	24.3	25.1	28.6	0.860	3.2	12.0	0.32	0.10	0.7
MR-3U	10U	10.5	C	128	25	47	23	25.0		CL			UU	2.07	1.31	7.1	24.9	25.0							
	12U	6.5	C		28	46	24	31.3	2.93	CL									24.8	0.800	1.9	22.0	0.32	0.11	0.4

STRATA DESIGNATIONS

C - Silty Clay

NOTES

1. All tests summarized were performed in the laboratory of Mueser Rutledge Consulting Engineers.
2. The sample elevation is the average of the sampling interval.
3. Ground surface elevations at borings are:

BORING NO.	BORING ELEVATION
MR-2U	44.5±
MR-3U	38.5±

4. "Average natural water content" is a weighted average of all material tested.
5. Strength tests performed were:

   UU - Unconsolidated Undrained Triaxial Compression

6. Strength tests were performed on specimens 2.8 inches in diameter with height to diameter ratio of approximately 2.
7. Confining pressure for UU compression tests is equivalent to 80 percent of estimated vertical effective overburden stress, unless otherwise noted.
8. UU Strength tests were performed at a rate of strain of approximately 1% per minute.
9. Compression Index, Cc = slope of the virgin compression portion of the e-log p curve.
10. Swelling Index, Cs = slope of the rebound portion of the e-log p curve.
11. Most probable preconsolidation stress, Pc is determined by the Casagrande method of construction.
12. Consolidation tests were performed using constant rate of strain (CRS) method at the strain rate indicated.

MRCE Form LT-1

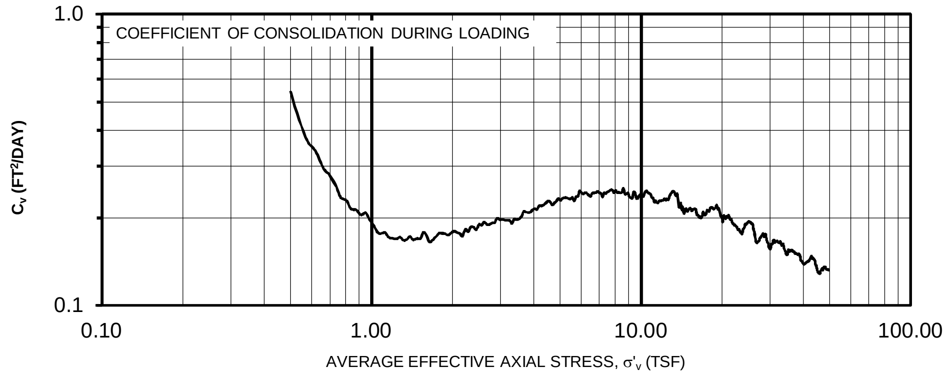
MUESER RUTLEDGE CONSULTING ENGINEERS

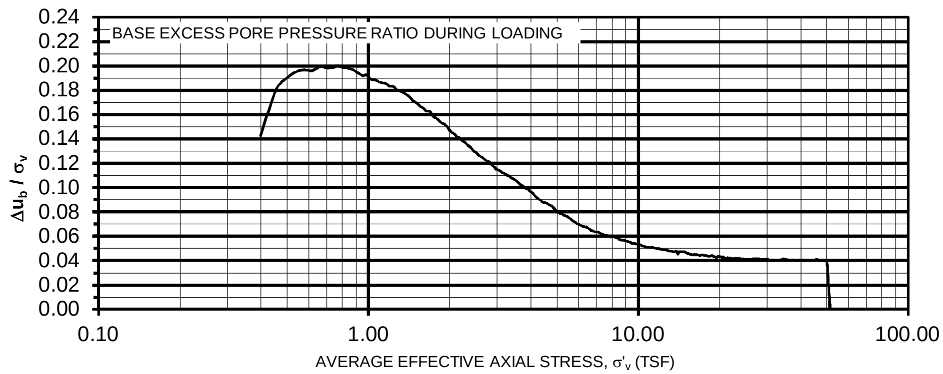
225 WEST 34th STREET, NEW YORK, N.Y. 10122

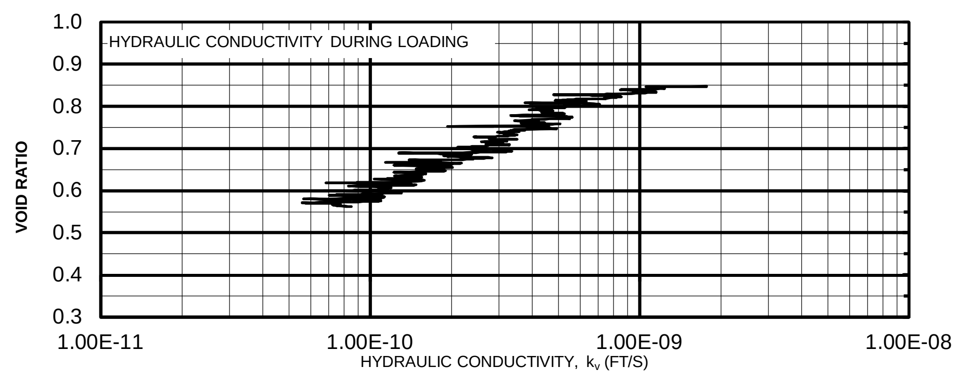
AAFE MIXED USE BUILDING

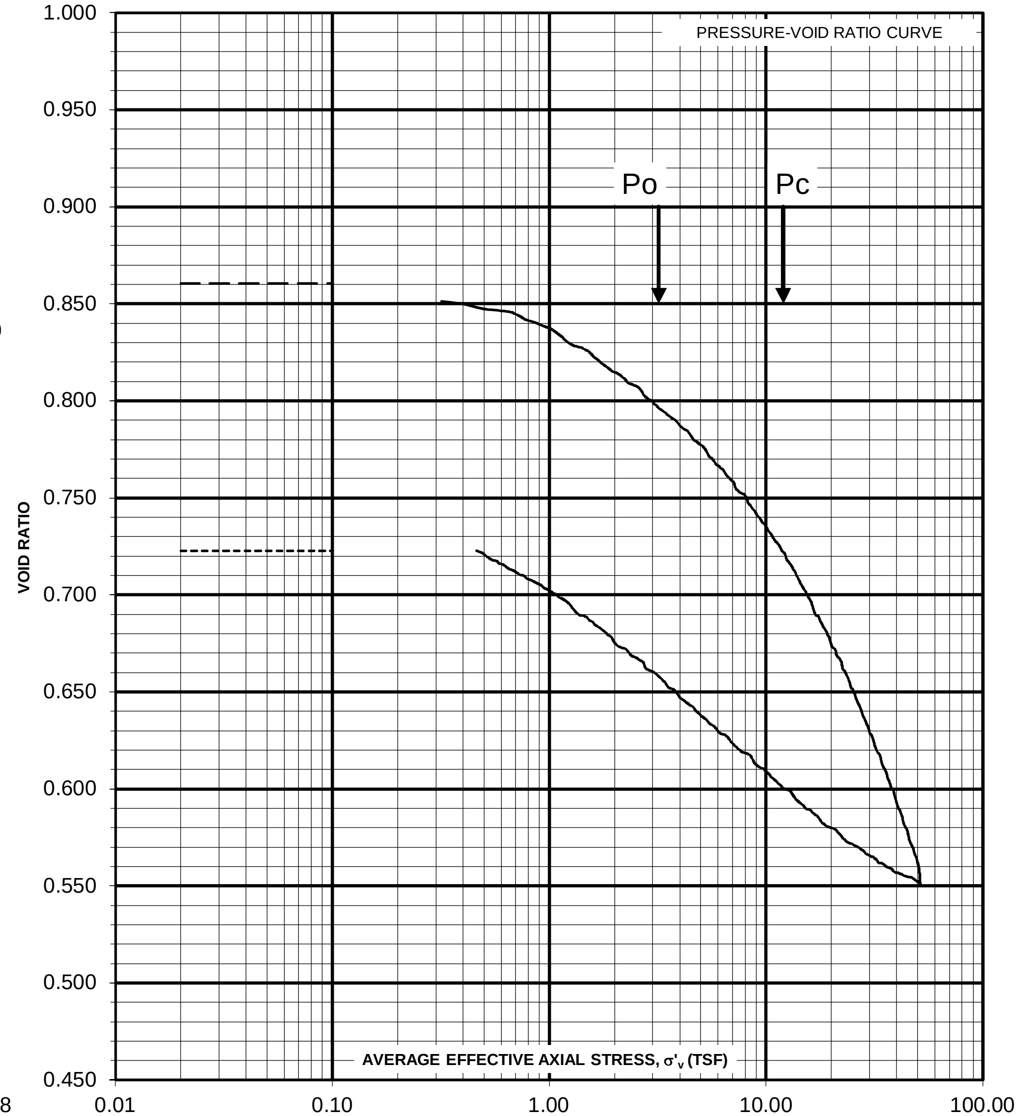
QUEENS **NEW YORK**

DATE: 6-21-2016 FILE NO. 12629 SHEET 1 OF 1 TABLE NO.1









SPECIMEN DESCRIPTION: STIFF GRAY BROWN CLAY — STRATUM C

PROPERTIES OF PLASTICITY LIMIT SPECIMEN

UNIFIED SOILS CLASSIFICATION = CH
LIQUID LIMIT, w_L = 60
PLASTIC LIMIT, w_P = 29
PLASTICITY INDEX, I_P = 31
NATURAL WATER CONT., W_n,% = 27.0
LIQUIDITY INDEX, $(w-w_P)/I_P$ = -0.08
SPECIFIC GRAVITY, G_s = 2.875

PROPERTIES OF CONSOLIDATION SPECIMEN

SAMPLE ELEVATION (FT) = -9.2
SAMPLE DEPTH (FT) = 53.7
TEST TEMPERATURE, °F = 75.2
INITIAL SPECIMEN MASS (g) = 155.7
INITIAL SPECIMEN HEIGHT (IN) = 0.976
SPECIMEN DIAMETER (IN) = 2.50
INITIAL TOTAL UNIT WEIGHT (PCF) = 123.8
INITIAL DRY UNIT WEIGHT (PCF) = 96.3

INITIAL WATER CONTENT, % = 28.6%
FINAL WATER CONTENT, % = 25.8%
INITIAL DEG. OF SATURATION, % = 95.5%
BACK PRESSURE, u_b (PSI) = 98.1
STRAIN AT END OF SAT. $\varepsilon'_{a,s}$, % = 0.5
SEATING PRESSURE, $\sigma'_{a,s}$ (TSF) = 0.319
STRAIN RATE - LOADING (%/HR) = 0.70
STRAIN RATE - UNLOAD (%/HR) = 0.32

FINAL PORE PRESSURE RATIO $R_{u,l}$ = 0.040
— — — INITIAL VOID RATIO, e_0 = 0.860
- - - - - - - FINAL VOID RATIO, e_f = 0.723
EST. PRECONSOL. STRESS (TSF) = 12.0
IN-SITU EFF. STRESS, Po (TSF) = 3.2
COMPRESSION INDEX, C_c = 0.318
SWELL INDEX, Cs = 0.099, FROM e = 0.551

AAFE MIXED USE BUILDING

QUEENS — NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS
225 WEST 34TH STREET, NEW YORK, N.Y. 10122

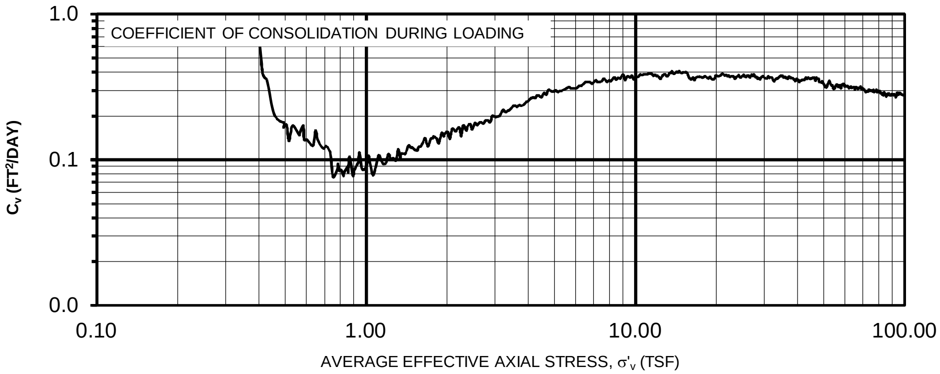
MADE BY: ALS/CJM — DATE: 6-12-2016 — FILE NO. **12629**
CH'KD BY: LL — DATE: 6-20-2016

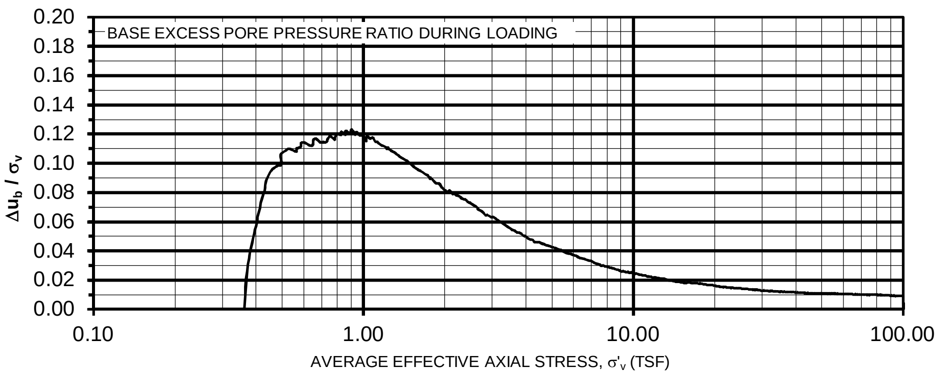
CRS CONSOLIDATION TEST
BORING NO. MR-2U SAMPLE NO. 15U

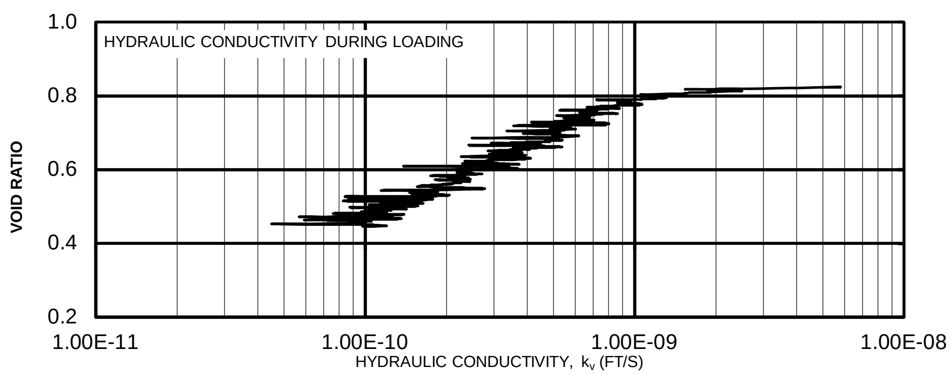
PLATE NO. CRS-1

PLATE NO. CRS-1

MRCE Form CRS-1







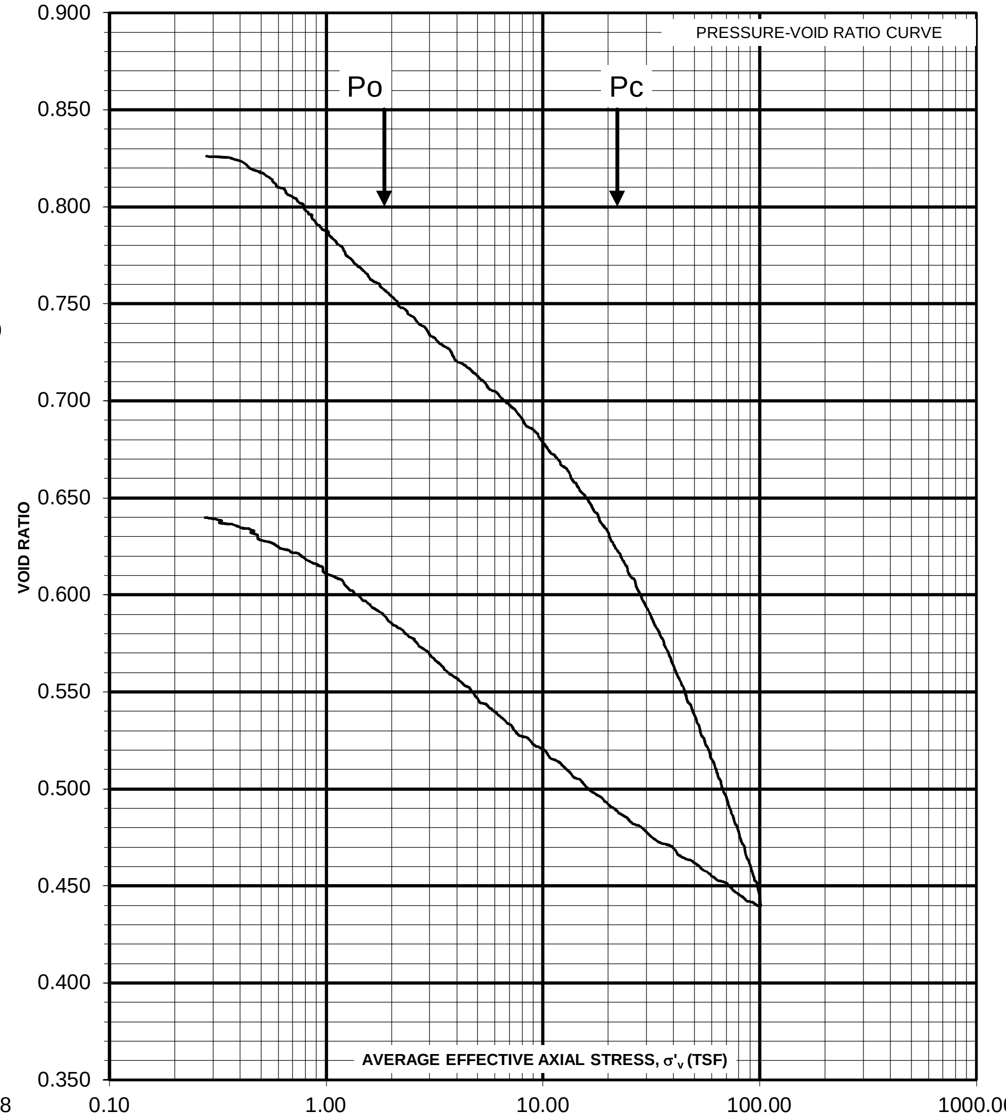


PLATE NO. CRS-2

SPECIMEN DESCRIPTION: STIFF BROWN SILTY CLAY — STRATUM C

PROPERTIES OF PLASTICITY LIMIT SPECIMEN

- UNIFIED SOILS CLASSIFICATION = CL
- LIQUID LIMIT, w_L = 46
- PLASTIC LIMIT, w_P = 22
- PLASTICITY INDEX, I_P = 24
- NATURAL WATER CONT., W_n,% = 31.3
- LIQUIDITY INDEX, $(w-w_P)/I_P$ = 0.38
- SPECIFIC GRAVITY, G_s = 2.931

PROPERTIES OF CONSOLIDATION SPECIMEN

- SAMPLE ELEVATION (FT) = 6.8
- SAMPLE DEPTH (FT) = 31.7
- TEST TEMPERATURE, °F = 0.0
- INITIAL SPECIMEN MASS (g) = 150.4
- INITIAL SPECIMEN HEIGHT (IN) = 0.921
- SPECIMEN DIAMETER (IN) = 2.50
- INITIAL TOTAL UNIT WEIGHT (PCF) = 126.7
- INITIAL DRY UNIT WEIGHT (PCF) = 101.5

- INITIAL WATER CONTENT, % = 24.8%
- FINAL WATER CONTENT, % = 23.1%
- INITIAL DEG. OF SATURATION, % = 91.1%
- BACK PRESSURE, u_b (PSI) = 98.3
- STRAIN AT END OF SAT. $\varepsilon'_{a,s}$, % = -1.5
- SEATING PRESSURE, $\sigma'_{a,s}$ (TSF) = 0.281
- STRAIN RATE - LOADING (%/HR) = 0.41
- STRAIN RATE - UNLOAD (%/HR) = 0.19

- FINAL PORE PRESSURE RATIO $R_{u,l}$ = 0.009
- — — — INITIAL VOID RATIO, e_i = 0.800
- - - - - - - - FINAL VOID RATIO, e_f = 0.640
- EST. PRECONSOL. STRESS (TSF) = 22.0
- IN-SITU EFF. STRESS, Po (TSF) = 1.9
- COMPRESSION INDEX, C_c = 0.317
- SWELL INDEX, Cs = 0.110, FROM e = 0.439

AAFE MIXED USE BUILDING

QUEENS — NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS

225 WEST 34TH STREET, NEW YORK, N.Y. 10122

MADE BY: CJM	DATE: 6-21-16	FILE NO.
CH'KD BY: ALS	DATE: 6-21-16	**12629**

CRS CONSOLIDATION TEST

BORING NO. MR-3U SAMPLE NO. 12U

PLATE NO. CRS-2

MRCE Form CRS-1

APPENDIX A

MRCE Boring Drawings

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: AAFE MIXED USE BUILDING
LOCATION: FLUSHING, QUEENS

BORING NO. MR-1
SHEET 1 OF 3
FILE NO. 12629
SURFACE ELEV. 44 (±)
RES. ENGR. ANDY ONG

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
09:00					**	**0.4**	DRILLED	**Asphalt & subbase
05-02-16	1HA	1.0	HAND	Brown silt, some fine to medium sand, trace			AHEAD	from 0' to 0.4'.
Monday		3.0	AUGER	gravel (ML)			4"	Hand auger from 0' to 6'.
Cloudy	2HA	3.0	HAND	Brown orange fine to medium sand, some silt,			↓	
50°F		5.0	AUGER	trace gravel (SM)		**5**	↓	
	3HA	5.0	HAND	Do 2HA (SM)			↓	Hard drilling from 6.5' to
		6.0	AUGER				↓	7.5'.
	4D	6.0	14-100/3"	Brown gravelly fine to coarse sand, trace silt	F		↓	REC=6"
		6.7		(SP-SM)			↓	
	5D	8.0	18-18	Brown fine to coarse sand, some gravel, trace		**10**	↓	REC=6"
		10.0	8-11	silt (SP-SM)				
	6NR	10.0	12-7	No recovery				
		12.0	8-9					
						13.5		
						15		
	7D	15.0	5-5	Brown fine to coarse sand, trace silt, gravel				
		17.0	7-6	(SP-SM)				
						20		
	8D	20.0	4-2	Brown-orange fine to medium sand, some silt				
		22.0	2-3	(SM)	S			
						25		
	9D	25.0	2-3	Brown-yellow fine to medium sand, some silt				
		27.0	2-6	(SM)				
						28.5		
						30		
	10D	30.0	29-24	Stiff brown-yellow silty clay, trace gravel (CL)	C			WC=31, pp=2.5
		32.0	29-33					REC=6"
						33.5		
						35		
	11D	35.0	8-14	Orange fine to coarse sand, trace silt, gravel	S			
		37.0	14-17	(SP-SM)				
						38.5		
						40		
	12D	40.0	6-6	Hard gray silty clay (CL)				WC=40, pp=4.25
		42.0	8-13					
					C			
						45		
	13D	45.0	6-9	Do 12D, trace vegetation (CL)				WC=38, pp>4.5
		47.0	9-21					
						48.5		
						50		
	14D	50.0	18-15	Brown-black clayey fine to coarse sand, trace	T			
		52.0	20-23	peat (SC)				

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO.	MR-1
SHEET 2 OF	3
FILE NO.	12629
SURFACE ELEV.	44 (±)
RES. ENGR.	ANDY ONG

PROJECT: AAFE MIXED USE BUILDING

LOCATION: FLUSHING, QUEENS

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	**SAMPLE DESCRIPTION**	STRATA	DEPTH	CASING BLOWS	**REMARKS**
Cont'd								
05-02-16								
Monday								
Cloudy								
50°F						**55**		
	15D	55.0	11-14	Brown-gray fine to coarse sand, some gravel,				
		57.0	10-16	clay (SC)				
								Rig chatter from 58' to
								59'.
						60		
	16D	60.0	16-21	Brown gravelly silty clay (CL)				REC=6"
		62.0	21-32					
						65		
	17D	65.0	24-21	Brown fine to coarse sand, some silt, trace				
		67.0	20-42	gravel (SM)				
						70		
	18D	70.0	30-35	Brown fine to medium sand, trace silt, coarse				
		72.0	37-46	sand (SP-SM)				
						75		
	19D	75.0	43-33	Brown fine to coarse sand, trace silt (SP-SM)	**T**			
		77.0	34-42					
						80		
	20D	80.0	43-33	Do 19D (SP-SM)				
		82.0	33-34					
						85		
	21D	85.0	36-46	Brown fine to coarse sand, trace silt, gravel				
		87.0	40-46	(SP-SM)				
						90		
	22D	90.0	44-54	Brown fine to coarse sand, trace silt, gravel				
		92.0	53-101	(SP-SM)				
								WC=Water Content
								in percent of dry
						95		weight.
	23D	95.0	16-21	Hard red brown interlayered silt & clayey silt,				WC=22
		97.0	27-41	some silty clay (ML&CL)				pp=Pocket
								Penetrometer
								Unconfined Compres-
						100		sive Strength in tsf.
	24D	100.0	17-32	Red brown silty fine sand (SM)				
13:30		102.0	45-50			**102**		End of Boring at 102'.

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. MR-1
SHEET 3 **OF** 3
PROJECT AAFE MIXED USE BUILDING
FILE NO. 12629
LOCATION FLUSHING, QUEENS
SURFACE ELEV. 44 (±)
BORING LOCATION SEE BORING LOCATION PLAN
DATUM NAVD 88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING							
				CASING USED	X YES	NO			
TRUCK	X	MECHANICAL		DIA., IN.	4	DEPTH, FT. FROM	0	TO	10
SKID		HYDRAULIC	X	DIA., IN.		DEPTH, FT. FROM		TO	
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO	
OTHER									

TYPE AND SIZE OF:

D-SAMPLER 2" O. D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS NWJ

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD QUIK GEL

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. AVERAGE FALL, IN.
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*USED AUTOMATIC HAMMER.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
05-04-16	07:15	102 FT.	10 FT.	33 FT.	MUD LEVEL READING.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE:	TYPE		ID, IN.		LENGTH, FT.		TOP ELEV.	
INTAKE ELEMENT:	TYPE		OD, IN.		LENGTH, FT.		TIP ELEV.	
FILTER:	MATERIAL		OD, IN.		LENGTH, FT.		BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	102	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR CRAIG TEST BORING
DRILLER KEITH PARENT HELPERS BRIAN GREGOR
REMARKS BOREHOLE BACKFILLED WITH CUTTINGS & SURFACE ASPHALT PATCH UPON COMPLETION.
RESIDENT ENGINEER ANDY ONG DATE 05-02-16
CLASSIFICATION CHECK: CHERYL J. MOSS TYPING CHECK: SARAH O. H. JOHNSON

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO.	MR-2U
SHEET 1 OF	3
FILE NO.	12629
SURFACE ELEV.	44.5 (±)
RES. ENGR.	ANDY ONG

PROJECT: AAFE MIXED USE BUILDING
LOCATION: FLUSHING, QUEENS

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
09:00					**	0.2	DRILLED	**Pavers from 0' to 0.2'
05-04-16	1HA	1.0	HAND	Brown fine to medium sand, some silt (SM)			AHEAD	& sand base from 0.2'
Wednesday		3.0	AUGER				4"	to 0.7'.
Overcast	2HA	3.0	HAND	Do 1HA, trace gravel (SM)			↓	Hand auger from 0' to 6'.
50°F		5.0	AUGER			5		
	3HA	5.0	HAND	Do 1HA, trace coarse sand (SM)				
		6.0	AUGER		F			
	4D	6.0	3-3	Brown-orange fine to medium sand, trace silt,				
		8.0	4-5	coarse sand, gravel (SP-SM)				
	5D	8.0	6-10	Do 4D (SP-SM)		10	↓	
		10.0	6-6					
	6D	10.0	6-10	Brown-orange fine to coarse sand, some gravel,				
		12.0	9-14	trace silt (SP-SM)				
						13.5		
						15		
	7D	15.0	14-14	Brown fine to coarse sand, some silt, trace				
		17.0	12-14	gravel (SM)				
						20		
	8D	20.0	9-9	Brown fine to medium sand, trace silt, coarse				
		22.0	9-13	sand (SP-SM)				
						25		
	9D	25.0	9-8	Do 8D (SP-SM)				
		27.0	9-11					
						30		
	10D	30.0	11-12	Do 8D (SP-SM)	S			
		32.0	11-14					
						35		
	11D	35.0	15-13	Black fine to coarse sand, trace silt (SP-SM)				Petroleum odor.
		37.0	12-16					Sheen in water.
						40		
	12D	40.0	17-9	Brown fine to medium sand, trace silt, coarse				
		42.0	10-12	sand (SP-SM)				
						45		
	13D	45.0	12-13	Brown fine to medium sand, some silt (SM)				
		47.0	15-21					
						48.5		
						50		
	14D	50.0	5-7	Stiff red brown silty clay (CL)	C			WC=25, pp=3.0
		52.0	11-18					

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. MR-2U
SHEET 2 OF 3
FILE NO. 12629
SURFACE ELEV. 44.5 (±)
RES. ENGR. ANDY ONG

PROJECT: AAFE MIXED USE BUILDING
LOCATION: FLUSHING, QUEENS

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
Cont'd								
05-04-16								
Wednesday								
Overcast	15U	53.0	PUSH=24"	Top 19": Stiff brn & gray silty clay & clay (CL&CH)				WC=26, pp=1.75, 3.5
50°F		55.0	REC=24"	Bot: Gray mic silty fine sand, tr brn clay pkts (SM)	C	55		TV=0.7
	16D	55.0	10-19	Interlayered red brown silty clay & gray silty fine				
		57.0	16-23	sand, trace mica (CL&SM)				
						58.5		
						60		
	17D	60.0	38-19	Gray brown fine to coarse sand, some silt, trace				
		62.0	17-27	gravel, lignite (SM)				
						65		
	18D	65.0	23-18	Brown fine to medium sand, some silt, trace				
		67.0	22-29	coarse sand, gravel (SM)	T			
						70		
	19D	70.0	24-24	Brown fine to medium sand, some silt, trace				
		72.0	24-35	coarse sand (SM)				
						75		
	20D	75.0	34-31	Brown fine to medium sand, trace silt, coarse				
13:00		77.0	33-37	sand (SP-SM)		77		End of Boring at 77'.
								WC=Water Content in percent of dry weight.
						80		
						85		pp=Pocket Penetrometer Unconfined Compressive Strength in tsf.
								TV=Torvane Shear Strength in tsf.
						90		
						95		
						100		

MRCE Form BL-1

BORING NO. MR-2U

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. MR-2U
SHEET 3 **OF** 3
PROJECT AAFE MIXED USE BUILDING
FILE NO. 12629
LOCATION FLUSHING, QUEENS
SURFACE ELEV. 44.5 (±)
BORING LOCATION SEE BORING LOCATION PLAN
DATUM NAVD 88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG: TRUCK X; SKID; BARGE; OTHER

TYPE OF FEED DURING CORING: MECHANICAL; HYDRAULIC X; OTHER

CASING USED: [X] YES [ ] NO
DIA., IN. 4 — DEPTH, FT. FROM 0 TO 10
DIA., IN. — DEPTH, FT. FROM TO
DIA., IN. — DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O. D. SPLIT SPOON
U-SAMPLER SHELBY
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS NWJ

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD QUIK GEL

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. — AVERAGE FALL, IN.
*SAMPLER HAMMER, LBS. 140 — AVERAGE FALL, IN. 30
*USED AUTOMATIC HAMMER.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
05-04-16	12:30	77	10	16	MUD LEVEL READING.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE — ID, IN. — LENGTH, FT. — TOP ELEV.
INTAKE ELEMENT: TYPE — OD, IN. — LENGTH, FT. — TIP ELEV.
FILTER: MATERIAL — OD, IN. — LENGTH, FT. — BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT. 77
3.5" DIA. U-SAMPLE BORING LIN. FT. 2
CORE DRILLING IN ROCK LIN. FT.
NO. OF 3" SHELBY TUBE SAMPLES 1
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR CRAIG TEST BORING
DRILLER KEITH PARENT
HELPERS BRIAN GREGOR
REMARKS BOREHOLE BACKFILLED WITH CUTTINGS & SURFACE ASPHALT PATCH UPON COMPLETION.
RESIDENT ENGINEER ANDY ONG
DATE 05-02-16
CLASSIFICATION CHECK: CHERYL J. MOSS
TYPING CHECK: SARAH O. H. JOHNSON

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO.	MR-3U
SHEET 1 OF	3
FILE NO.	12629
SURFACE ELEV.	38.5 (±)
RES. ENGR.	ANDY ONG

PROJECT: AAFE MIXED USE BUILDING

LOCATION: FLUSHING, QUEENS

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	**SAMPLE DESCRIPTION**	STRATA	DEPTH	CASING BLOWS	**REMARKS**
09:00					**	**0.2**	DRILLED	**Topsoil from 0' to 0.2'.
05-10-16	1HA	1.0	HAND	Brown fine to coarse sand, some silt, trace			AHEAD	Hand auger from 0' to 6'.
Tuesday		3.0	AUGER	gravel (SM)			4"	Boulders & cobbles
Clear	2HA	3.0	HAND	Do 1HA (SM)				encountered from 1' to
60°F		5.0	AUGER			**5**		5'.
	3HA	5.0	HAND	Red brown fine to medium sand, some silt,				
		6.0	AUGER	trace gravel (SM)	**F**			
	4D	6.0	5-6	Light brown fine to medium sand, trace silt,				
		8.0	7-7	coarse sand, gravel (SP-SM)				
	5D	8.0	7-10	Light brown fine to coarse sand, some gravel,		**10**		
		10.0	6-6	trace silt (SP-SM)				
	6D	10.0	5-5	Light brown fine to medium sand, trace silt,				
		12.0	6-7	coarse sand, gravel (SP-SM)				
						13.5		
						15		
	7D	15.0	7-9	Brown fine to medium sand, trace silt, coarse				
		17.0	9-9	sand (SP-SM)				
					S			
						20		
	8D	20.0	11-11	Brown fine to medium sand, some silt (SM)				
		22.0	11-13					
						23.5		
						25		
	9D	25.0	11-7	Stiff red brown silty clay (CL)				WC=30, pp=3.25
		27.0	9-11					Slickensided.
	10U	27.0	PUSH=24"	Stiff brown silty clay, trace gravel, fine sand				WC=25, pp=2.0, 2.5,
		29.0	REC=24"	pockets (CL)				TV=0.8, 0.9
	11D	29.0	5-10	Stiff brown silty clay (CL)		**30**		WC=25, pp=3.5
		31.0	11-19					
	12U	31.0	PUSH=24"	Stiff brown silty clay (CL)				WC=28, pp=4.25, 2.5,
		33.0	REC=22"		**C**			TV=0.35, 0.9
						35		
	13D	35.0	8-8	Gray clayey silt, trace micaceous fine sand (ML)				WC=30
		37.0	10-12					
						40		
	14D	40.0	6-10	Top: Brown silty clay, trace gray silt seams (CL)		**41**		14D Top: WC=33
		42.0	12-18	Bot: Gray fine to medium sand, some silt (SM)				Interlayered with clay.
					S			
						43.5		
						45		
	15D	45.0	5-8	Stiff gray & brown silty clay (CL)				WC=37, pp=2.0
		47.0	11-12					
					C			
						50		
	16D	50.0	5-5	Top: Red brown f-m sand, some clay (SC)		**51**		
		52.0	17-18	Bot: Brown clayey f-c sand, some gravel (SC)	**T**			

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. MR-3U
SHEET 2 OF 3
FILE NO. 12629
SURFACE ELEV. 38.5 (±)
RES. ENGR. ANDY ONG

PROJECT: AAFE MIXED USE BUILDING
LOCATION: FLUSHING, QUEENS

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
Cont'd					C	51		
05-10-16								Rig chatter from 52' to 55'.
Tuesday								
Clear								
60°F						55		
	17D	55.0	16-23	Brown fine to coarse sand, some silt, trace gravel, clay (SM)				
		57.0	29-24					Rig chatter from 57' to 60'.
						60		
	18D	60.0	16-15	Top: Stiff brown silty clay, trace fine to coarse sand (CL)				18D Top: WC=20
		62.0	18-26	Bot: Brown clayey fine to coarse sand, trace gravel (SC)				Rig chatter from 63' to 64'.
					T	65		
	19D	65.0	20-38	Light brown fine to coarse sand, some clay, gravel (SC)				REC=6"
		67.0	55-42					
						70		
	20D	70.0	21-27	Brown fine to medium sand, trace silt (SP-SM)				
		72.0	27-28					
						75		
	21D	75.0	25-29	Brown fine to medium sand, some silt (SM)				
13:00		77.0	30-31			77		End of Boring at 77'.
						80		WC=Water Content in percent of dry weight.
						85		pp=Pocket Penetrometer Unconfined Compressive Strength in tsf.
						90		TV=Torvane Shear Strength in tsf.
						95		
						100		

MRCE Form BL-1

BORING NO. MR-3U

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. MR-3U
SHEET 3 **OF** 3
PROJECT AAFE MIXED USE BUILDING
FILE NO. 12629
LOCATION FLUSHING, QUEENS
SURFACE ELEV. 38.5 (±)
BORING LOCATION SEE BORING LOCATION PLAN
DATUM NAVD 88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG: TRUCK ___ SKID ___ BARGE ___ OTHER TRACK

TYPE OF FEED DURING CORING: MECHANICAL ___ HYDRAULIC X OTHER ___

CASING USED [X] YES [ ] NO
DIA., IN. 4 DEPTH, FT. FROM 0 TO 8.5
DIA., IN. ___ DEPTH, FT. FROM ___ TO ___
DIA., IN. ___ DEPTH, FT. FROM ___ TO ___

TYPE AND SIZE OF:
D-SAMPLER 2" O. D. SPLIT SPOON
U-SAMPLER SHELBY
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS NWJ

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD QUIK GEL

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

CASING HAMMER, LBS. ___ AVERAGE FALL, IN. ___
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*USED AUTOMATIC HAMMER.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
05-10-16	13:00	77	8.5	15	POST BORING MUD LEVEL READING.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON ___

STANDPIPE: TYPE ___ ID, IN. ___ LENGTH, FT. ___ TOP ELEV. ___
INTAKE ELEMENT: TYPE ___ OD, IN. ___ LENGTH, FT. ___ TIP ELEV. ___
FILTER: MATERIAL ___ OD, IN. ___ LENGTH, FT. ___ BOT. ELEV. ___

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT. 77
3.5" DIA. U-SAMPLE BORING LIN. FT. 4
CORE DRILLING IN ROCK LIN. FT. ___
NO. OF 3" SHELBY TUBE SAMPLES 2
NO. OF 3" UNDISTURBED SAMPLES ___
OTHER: ___

BORING CONTRACTOR CRAIG TEST BORING
DRILLER ROB DOLLAR HELPERS LYLE DELMEIER
REMARKS BOREHOLE BACKFILLED WITH CUTTINGS UPON COMPLETION.
RESIDENT ENGINEER ANDY ONG DATE 05-10-16
CLASSIFICATION CHECK: CHERYL J. MOSS TYPING CHECK: SARAH O. H. JOHNSON

APPENDIX B

Prior Boring Logs

Louis Berger and Assoc., P.C.
199 Water Street, 23rd Floor
New York, NY 10038

Drilling Log

BORING NO.:	SB01
WELL NO.:	TWP-1

CLIENT: New York City School Construction Authority
PROJECT: AAFE
DRILLING CONTRACTOR: Aquifer Drilling and Testing
DRILLING METHOD: Hollow Stem Auger

PROJECT NO:	JG-3259
DATE STARTED:	11/5/2006
DATE FINISHED:	11/5/2006
DRILLER:	J.Kamenicek
INSPECTOR:	J.Kass
NORTHING:	N/A
EASTING:	N/A
GROUND ELEVATION:	N/A
TOC ELEVATION:	N/A

BOREHOLE DATA		**WELL DATA**	
Diameter (in):	8	**Completion:**	11/5/2006
Total Depth (ft):	50.00	**Total Depth (ft):**	50.00
Sampler:	Split Spoon	**Screen Length (ft) /Slot (in):**	20
Depth to Water (ft):	39.5	**Depth to Water (ft):**	39.5
Depth to Rock (ft):	N/A	**Permit No.:**	N/A

NOTES: Collected groundwater sample from 2" diameter temporary well

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0–2		GP			7, 6, 5, 5	0	Olive black (5Y2/1) medium to fine GRAVEL, trace medium to fine Sand; dry.	Gravel
	2–4		SP-SM			9, 5, 11, 20	0	Dark yellowish orange (10YR6/6) medium to fine SAND, little Silt, with 2-inch Gravel layer at 2.2 feet; dry.	Sand
	4–6		SP			11, 13, 38, 33	0	Dark yellowish orange (10YR6/6) medium to fine SAND, trace Silt; dry.	
	6–8		SP			6, 8, 11, 15	0	Dark yellowish orange (10YR6/6) medium to fine SAND, trace Silt; dry.	
	8–9		SP			31, 29, 16	0	Dark yellowish orange (10YR6/6) medium to fine SAND, trace Silt; dry.	

Louis Berger and Assoc., P.C. 199 Water Street, 23rd Floor New York, NY 10038	PROJECT NO.: JG-3259	BORING NO.: SB01
		WELL NO.: TWP-1

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
						14			
	10		SP			17	0	Dark yellowish orange (10YR6/6) medium to fine SAND, trace Silt; dry.	
						12			
	11					16			
						15			
	12		SP			8	0	Dark yellowish orange (10YR6/6) medium to fine SAND, trace Silt; dry.	
						8			
	13					8			
						8			
	14		SP			10	0	Dark yellowish orange (10YR6/6) medium to fine SAND, trace Silt; dry.	
						10			
	15					10			
						11			
	16		SP-SM			8	0	Dark yellowish orange (10YR6/6) medium to fine SAND, little Silt; moist.	**Sand**
						14			
	17					20			
						23			
	18		SP-SM			10	0	Grayish orange (10YR7/4) medium to fine SAND, little Silt; moist.	
						21			
	19					25			
						30			
	20		SP-SM			9	0	Grayish orange (10YR7/4) medium to fine SAND, little Silt; moist.	
						19			
	21					16			
						19			
	22		SP-SM			10	0	Dark yellowish orange (10YR6/6) medium to fine SAND, little Silt; moist.	
						15			
	23					19			

Louis Berger and Assoc., P.C. 199 Water Street, 23rd Floor New York, NY 10038	PROJECT NO.: JG-3259	BORING NO.: SB01
	Page 3 of 4	WELL NO.: TWP-1

Depth	USCS	Blows	PID	Description	Remarks
24	SP-SM	18, 15	0	Dark yellowish orange (10YR6/6) medium to fine SAND, little Silt; moist.	
25	ML	30, 32, 30	0	Moderate yellowish brown (10YR5/4) SILT; moist.	Silt
26	SP-SM	30	0	Grayish orange (10YR7/4) medium to fine SAND, little Silt; moist.	Sand
27	SP	23, 26, 29	0	Dark yellowish orange (10YR6/6) medium to fine SAND, trace Silt; moist.	
28–29	ML	33, 19, 19, 42	0	Light olive gray (5Y5/2) SILT; moist.	Silt
30	SP	40	0	Dark yellowish orange (10YR6/6) medium to fine SAND, trace Silt; moist.	Sand
31	ML	25, 26, 30	0	Light olive gray (5Y5/2) SILT; moist.	Silt
32–33	ML	11, 26, 27, 30	0	Light olive gray (5Y5/2) SILT; moist.	
34–35	SM	22, 24, 25, 30	0	Dark yellowish orange (10YR6/6) medium to fine SAND, some Silt; wet.	**Silty Sand, Collected SB01 from 34-35 ft bgs.**
36–37	ML	13, 15, 18	0	Dusky yellowish brown (10YR2/2) SILT; wet.	Silt

Louis Berger and Assoc., P.C.
199 Water Street, 23rd Floor
New York, NY 10038

PROJECT NO.: JG-3259

BORING NO.: SB01

WELL NO.: TWP-1

Depth	USCS	Blows	PID	Description	Remarks
38	ML	21, 17, 18	0	Dark yellowish brown (10YR4/2) SILT; wet.	
39	ML	17, 22	0	Light olive gray (5Y5/2) SILT; saturated.	**Water Level at 39.5 ft. bgs.**
40–41	ML	9, 13, 15, 19	0	Light olive gray (5Y5/2) SILT; saturated.	
42–43	SP	10, 12, 15, 17	0	Grayish brown (5YR3/2) medium to fine SAND, trace Silt; saturated.	**Sand**
44–45	ML	15, 14, 14, 20	0	Grayish orange pink (5YR7/2) SILT; saturated.	**Silt**
46–47	SP-SM	10, 20, 14, 14	0	Dark yellowish brown (10YR4/2) medium to fine SAND, little Silt; saturated.	**Sand**
48–49	SP	30, 35, 40, 42	0	Dark yellowish orange (10YR6/6) medium to fine SAND, trace Silt; saturated.	**End of Boring at 50 ft.**
50					

Louis Berger and Assoc., P.C. 199 Water Street, 23rd Floor New York, NY 10038	**Drilling Log** Page 1 of 4	**BORING NO.:** SB02 **WELL NO.:** TWP-2

CLIENT: New York City School Construction Authority	**PROJECT NO:** JG-3259
PROJECT: AAFE	**DATE STARTED:** 11/4/2006
DRILLING CONTRACTOR: Aquifer Drilling and Testing	**DATE FINISHED:** 11/4/2006
DRILLING METHOD: Hollow Stem Auger	**DRILLER:** J.Kamenicek

BOREHOLE DATA	**WELL DATA**	**INSPECTOR:** J. Kass
Diameter (in): 8	**Completion:** 11/4/2006	**NORTHING:** N/A
Total Depth (ft): 50.00	**Total Depth (ft):**	**EASTING:** N/A
Sampler: Split Spoon	**Screen Length (ft) /Slot (in):** 20	**GROUND ELEVATION:** N/A
Depth to Water (ft): 39	**Depth to Water (ft):** 39	**TOC ELEVATION:** N/A
Depth to Rock (ft): N/A	**Permit No.:** N/A	

NOTES: Collected groundwater sample from 2" diameter temporary well

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SP				0	Top 3 inches Asphalt. Dark yellowish brown (10YR4/2) coarse to fine SAND; dry.	Sand
	1								
	2		SP				0	Moderate yellowish brown (10YR5/4) medium to fine SAND; dry.	
	3								
	4								
	5		SP			5	0	Dark yellowish orange (10YR6/6) medium to fine SAND; dry.	
						11			
	6					24			
						28			
	7		SP			48	0	Dark yellowish orange (10YR6/6) medium to fine SAND; dry.	
						24			
	8					17			
						15			
	9								

Louis Berger and Assoc., P.C. 199 Water Street, 23rd Floor New York, NY 10038	PROJECT NO.: JG-3259	BORING NO.: SB02
	Page 2 of 4	WELL NO.: TWP-2

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
	10		SP			7 9 10 10	0	Dark yellowish orange (10YR6/6) medium to fine SAND; dry.	
	11 12		SP			20 12 13 14	0	Dark yellowish orange (10YR6/6) coarse to fine SAND; dry.	
	13 14		SP			15 18 21 24	0	Dark yellowish orange (10YR6/6) medium SAND; dry.	
	15 16		SP-SM			12 15 19 20	0	Moderate yellowish brown (10YR5/4) to dark yellowish orange (10YR6/6) medium to fine SAND, little Silt; dry.	
	17 18		SM			21 5 19 20	0	Moderate yellowish brown (10YR5/4) to dark yellowish orange (10YR6/6) medium to fine SAND, and Silt; moist.	**Silty Sand**
	19 20		SP			17 24 35 35	0	Moderate yellowish brown (10YR5/4) to pale yellowish orange (10YR8/6) medium to fine SAND; moist.	**Sand**
	21 22		SM			34 33 37 39	0	Dark yellowish orange (10YR6/6) medium to fine SAND, and Silt; moist.	**Silty Sand**

Louis Berger and Assoc., P.C. 199 Water Street, 23rd Floor New York, NY 10038	PROJECT NO.: JG-3259	BORING NO.: SB02
	Page 3 of 4	WELL NO.: TWP-2

Depth	USCS	Blows	PID	Description	Remarks
23	SM	15	0	Grayish orange (10YR7/4) medium to fine SAND, and Silt; moist.	**Silty Sand**
		19			
24		21			
		33			
25	SM	25	0	Grayish orange (10YR7/4) medium to fine SAND, and Silt, with a 2-inch layer of fine Sand at 25.3 feet; moist.	
	SM	29	0	Grayish orange (10YR7/4) medium to fine SAND, and Silt; moist.	
26		33			
		39			
27	ML	15	0	Dark yellowish orange (10YR6/6) SILT, some medium to fine Sand; moist.	**Sandy Silt**
		13			
28	SM	29	0	Very pale yellowish orange (10YR8/2) medium to fine SAND, some Silt; moist.	**Silty Sand**
		33			
29	SM	20	0	Grayish orange (10YR7/4) medium to fine SAND, some Silt; moist.	
		20			
30	ML	25	0	Dark yellowish brown (10YR4/2) to olive gray (5Y4/1) SILT; moist.	**Silt**
		48			
31	SM	15	0	Olive gray (5Y4/1) SILT; moist.	**Silty Sand**
		21			
32		28			
		30			
33	SM	16	0	Dark yellowish orange (10YR6/6) medium to fine SAND, some Silt; moist.	
		25			
34		31			
		40			
35	SM	15	0	Dark yellowish orange (10YR6/6) to light brown (5YR5/6) medium to fine SAND, some Silt, with a 2-inch layer of Silt at 35.25 feet; wet.	**Collected SB02 from 35-39 ft. bgs.**
		21			
36	ML	25	0	Dark greenish gray (5G4/1) SILT; wet.	**Silt**

Louis Berger and Assoc., P.C. 199 Water Street, 23rd Floor New York, NY 10038	**PROJECT NO.:** JG-3259	**BORING NO.:** SB02
	Page 4 of 4	**WELL NO.:** TWP-2

Depth	USCS	Blows	PID	Description	Remarks
		30			
37	ML	13	0	Dark greenish gray (5G4/1) SILT; wet.	
	SM	15	0	Dark yellowish orange (10YR6/6) medium to fine SAND, some Silt; wet.	**Silty Sand**
38	SM	17	0	Dark greenish gray (5G4/1) medium to fine SAND, some Silt; saturated.	**Water Level at 39 ft. bgs.**
		29			
39	ML	15	0	Greenish black (5GY2/1) SILT; saturated.	**Silt**
		35			
40		40			
		45			
41	ML	15	0	Greenish black (5GY2/1) SILT; saturated.	
	SP-SM	17	0	Light olive gray (5Y6/1) medium to fine SAND, little Silt; saturated.	**Sand**
42		21			
		17			
43	ML	17	0	Light olive gray (5Y6/1) SILT; saturated.	**Silt**
		21			
44		22			
		23			
45	ML	21	0	Greenish black (5GY2/1) SILT; saturated.	
		22			
46		30			
		35			
47	ML	25	0	Medium bluish gray (5B5/1) SILT; saturated.	
		32			
48		35			
		39			
49					**End of Boring at 50 ft.**
50					

APPENDIX C

Craig Geotechnical Drilling Cone Penetration Test Report

676A55 CRAIG GEOTECHNICAL DRILLING CO., INC.

5/3/2016 Job#: 165063 Client: Mueser Rutledge Location: Flushing

Date	CPT Sounding	File Name	Depth	Notes
5/3/2016	CPT-1	CPT-1	56.59	Predrill to 10'
5/3/2016	CPT-2	CPT-2	52.66	Predrill to 10'
5/3/2016	CPT-3	CPT-3	47.08	Predrill to 10'

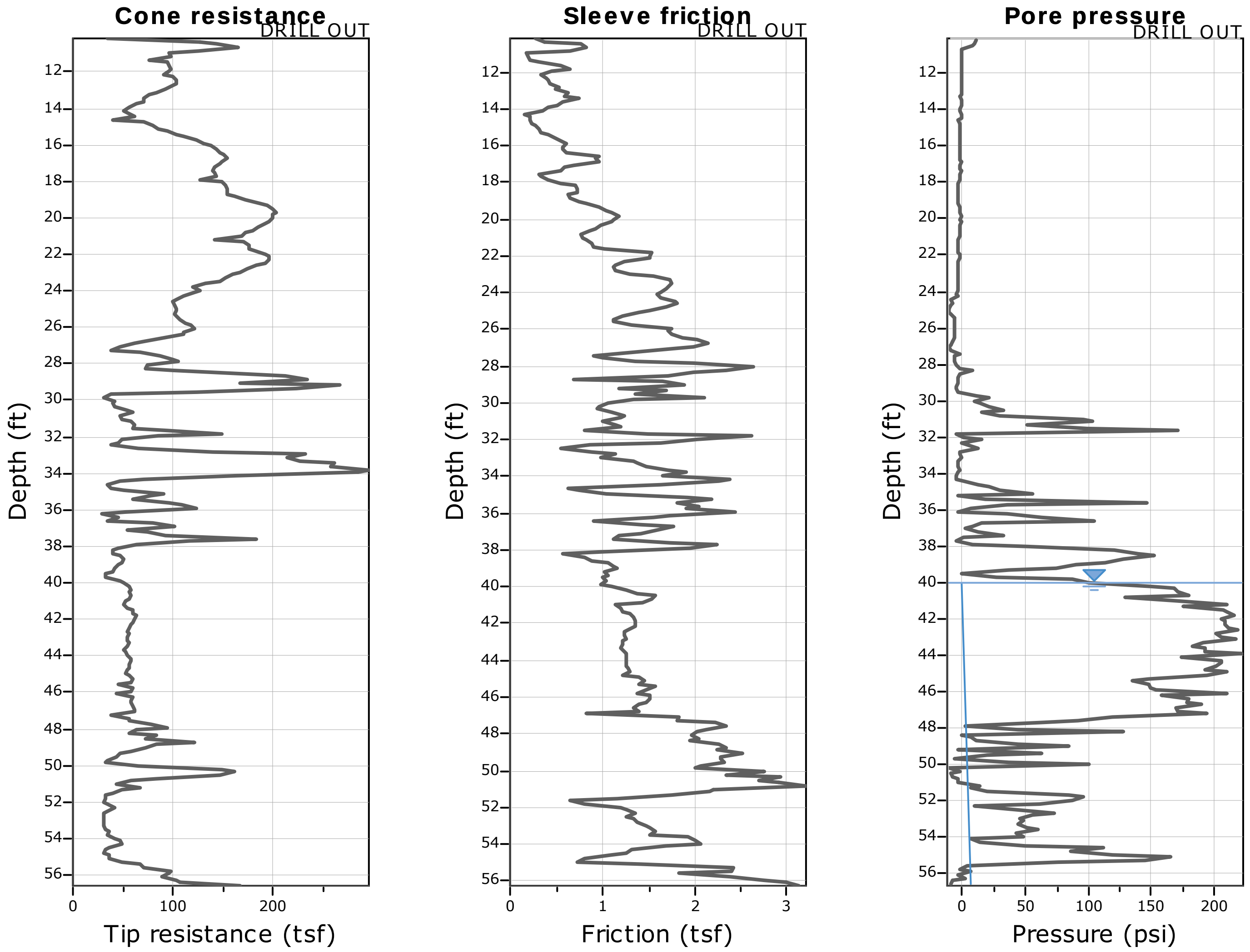
NOTES:

All CPTs Predrilled to 10ft

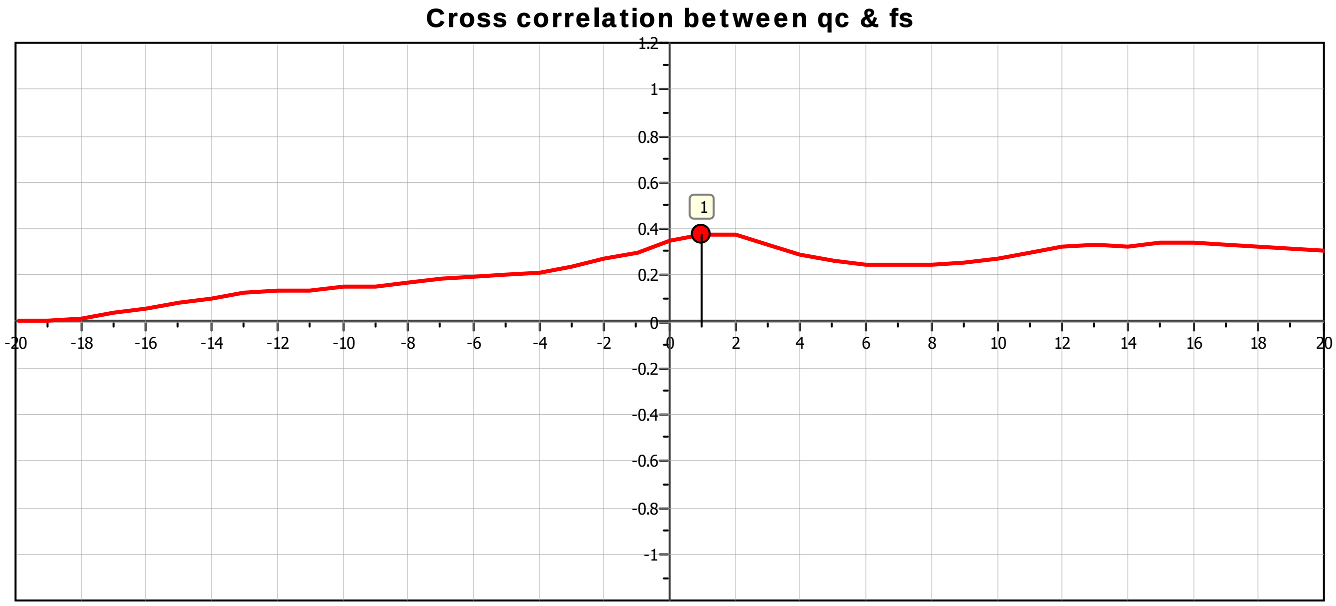
Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

Project:
Location:

CPT: CPT-1a
Total depth: 56.59 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



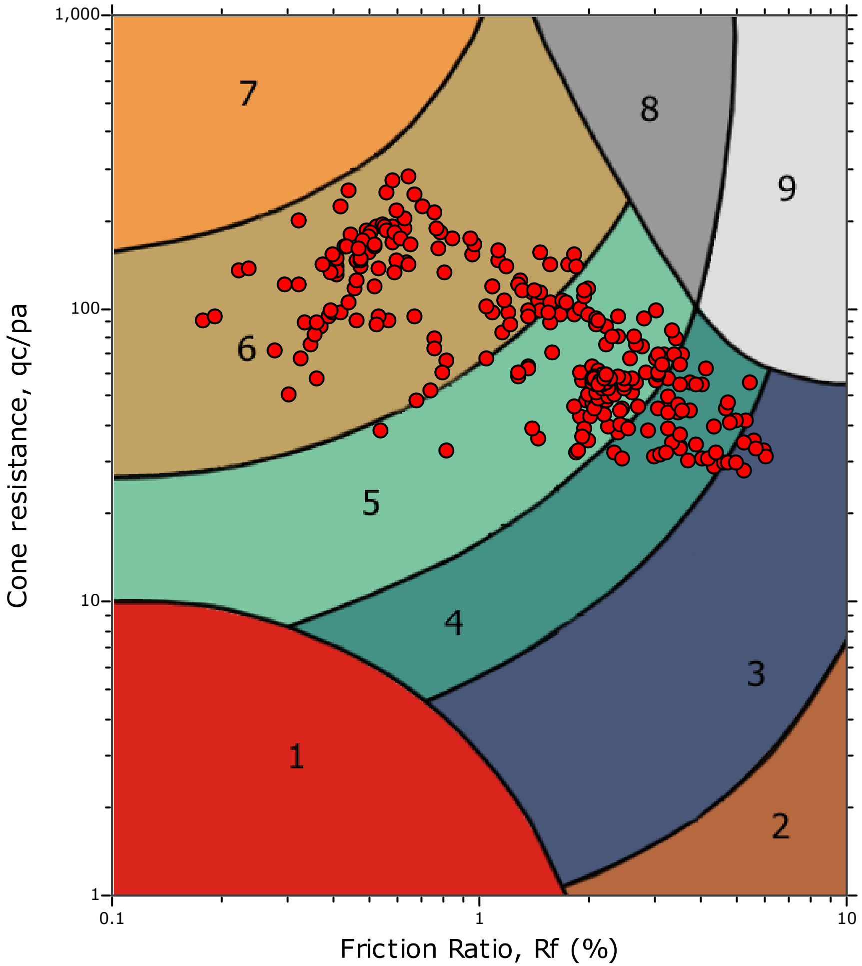
Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

Project:
Location:

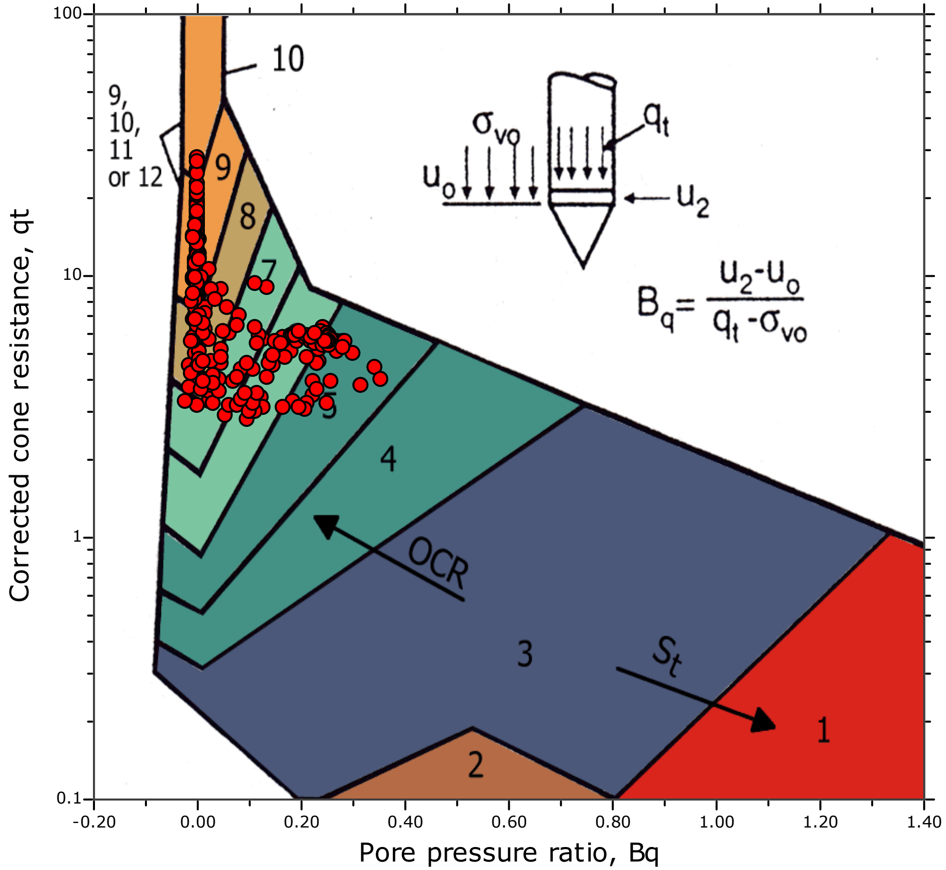
CPT: CPT-1a
Total depth: 56.59 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

SBT - Bq plots

SBT plot



Bq plot

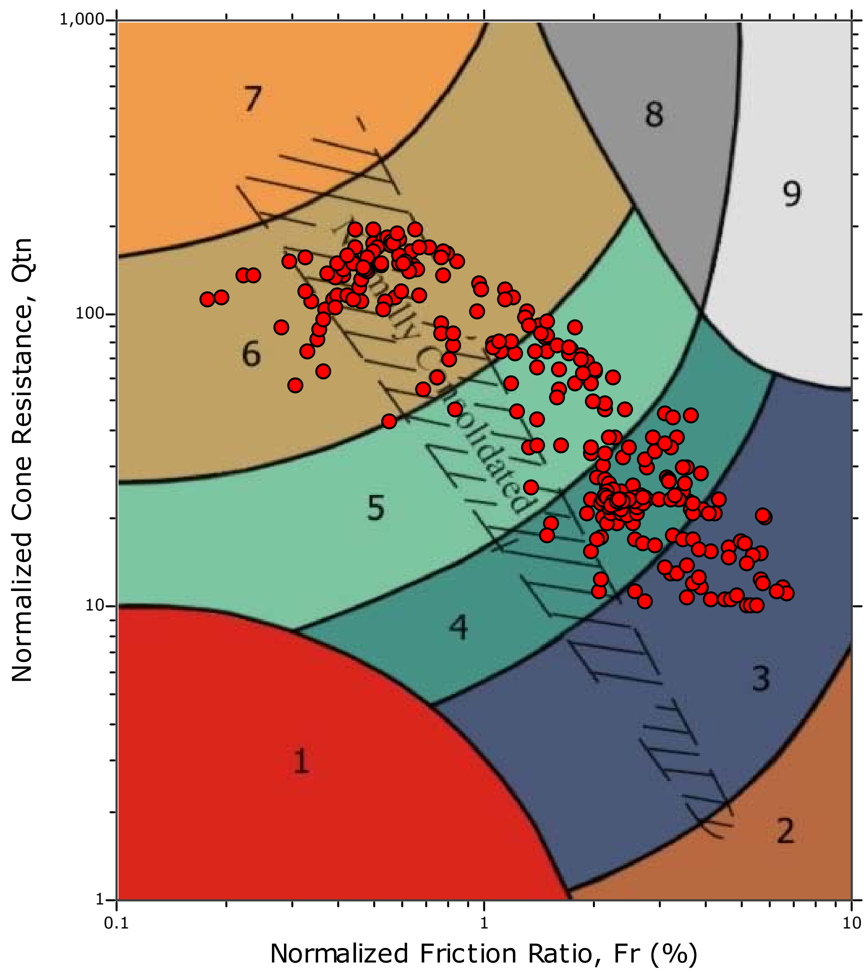


SBT legend

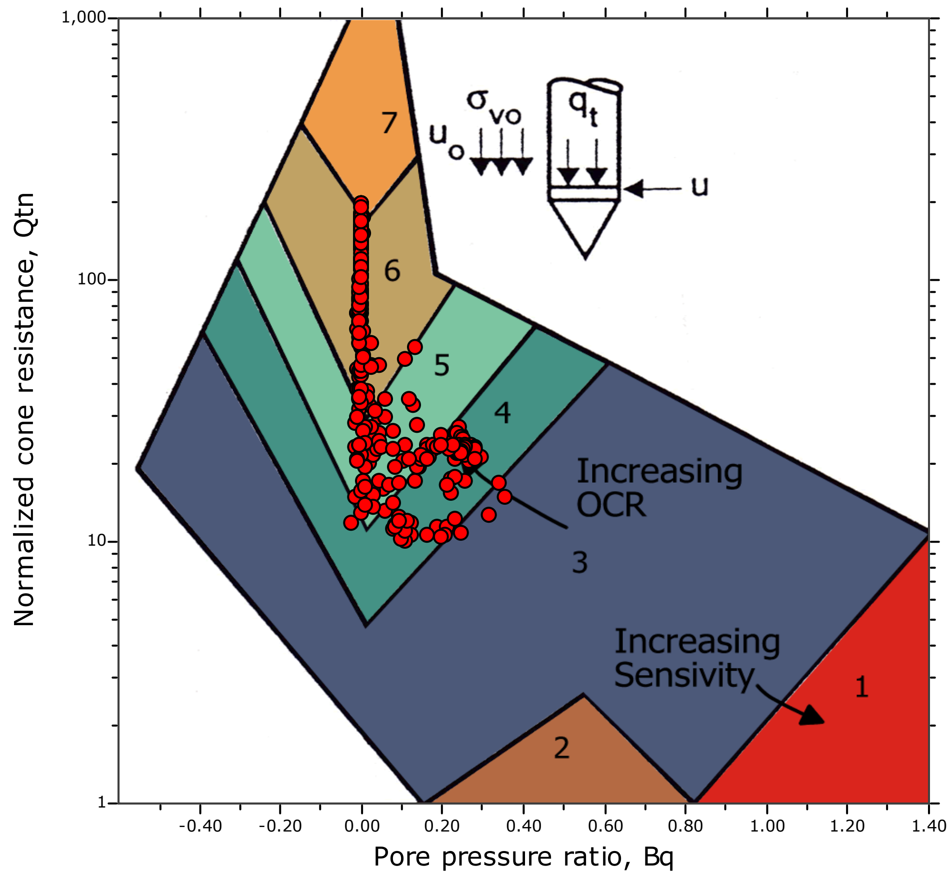
- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

SBT - Bq plots (normalized)

SBTn plot



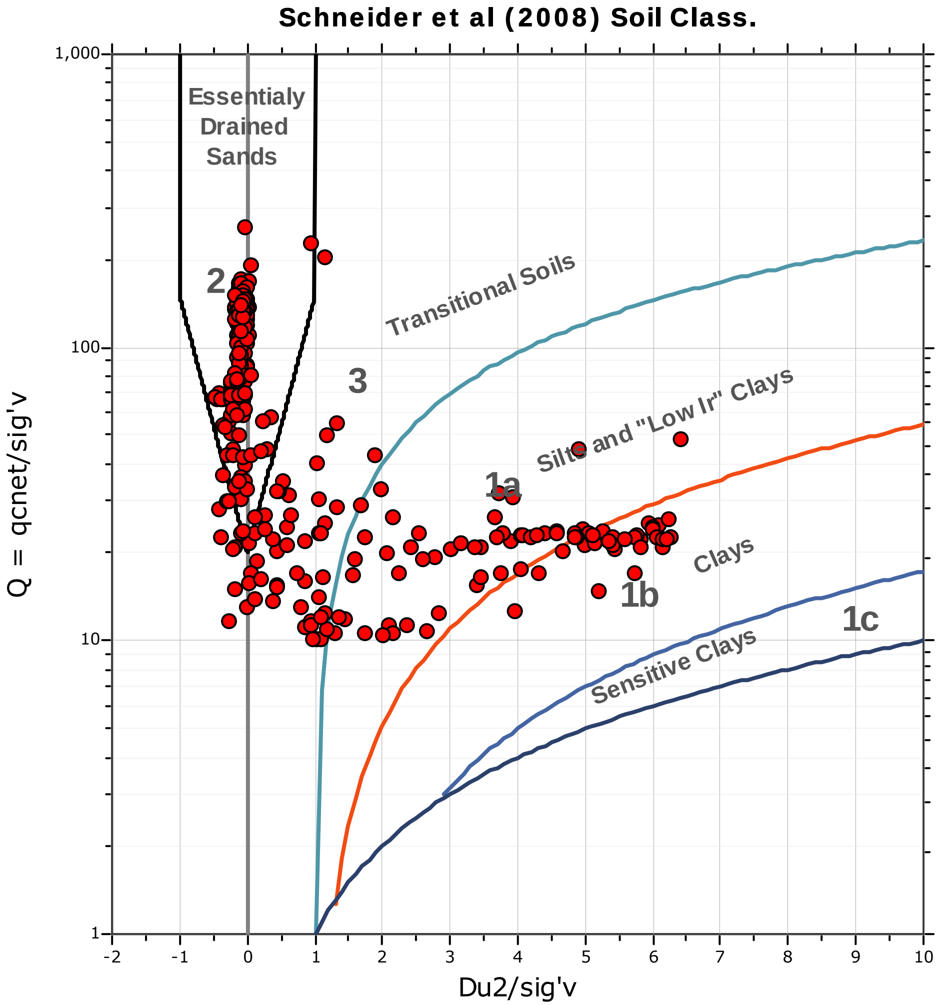
Normalized Bq plot

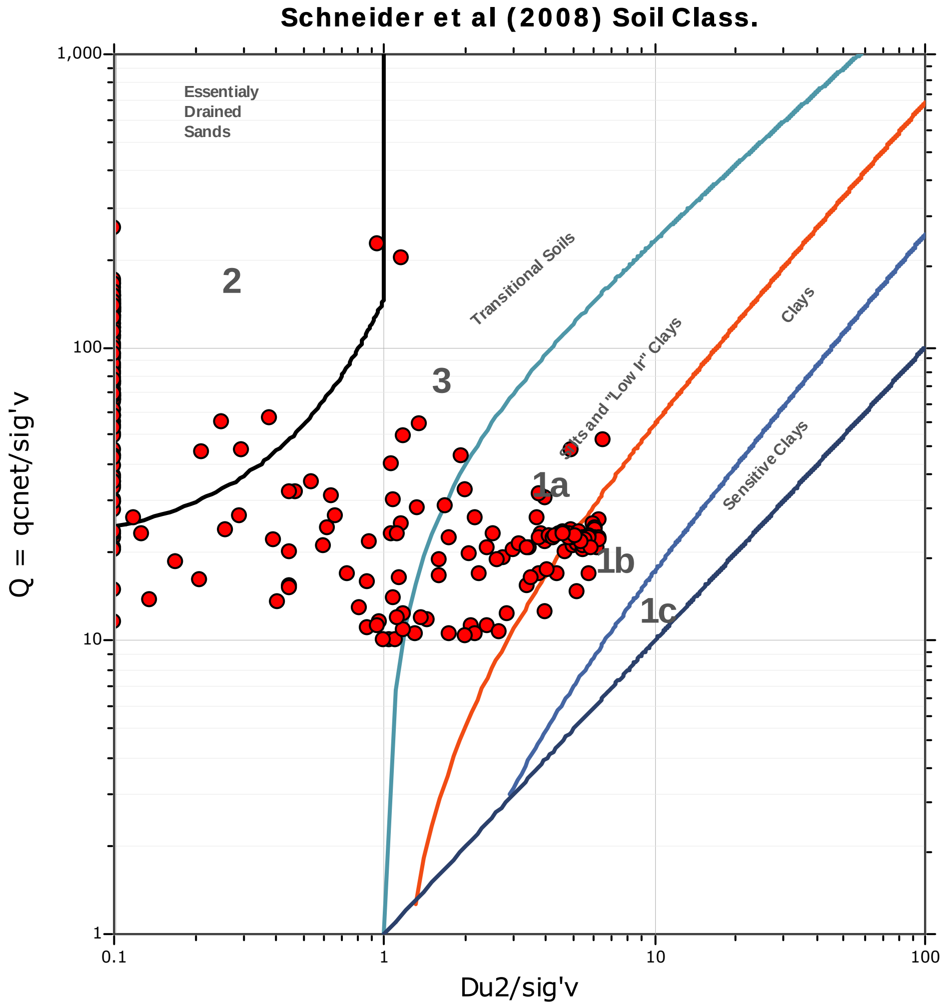


SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

Bq plots (Schneider)

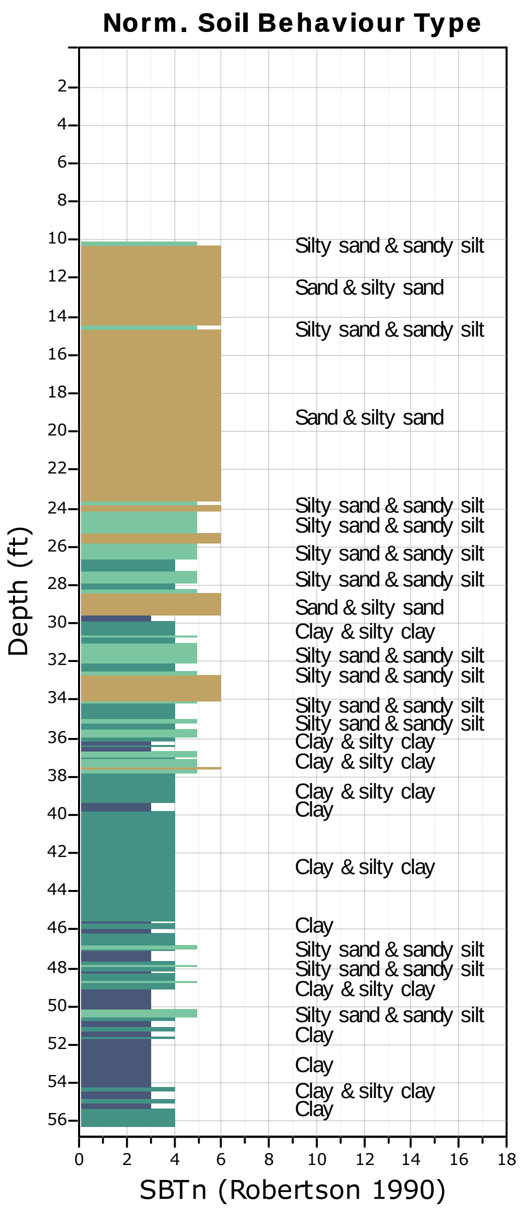


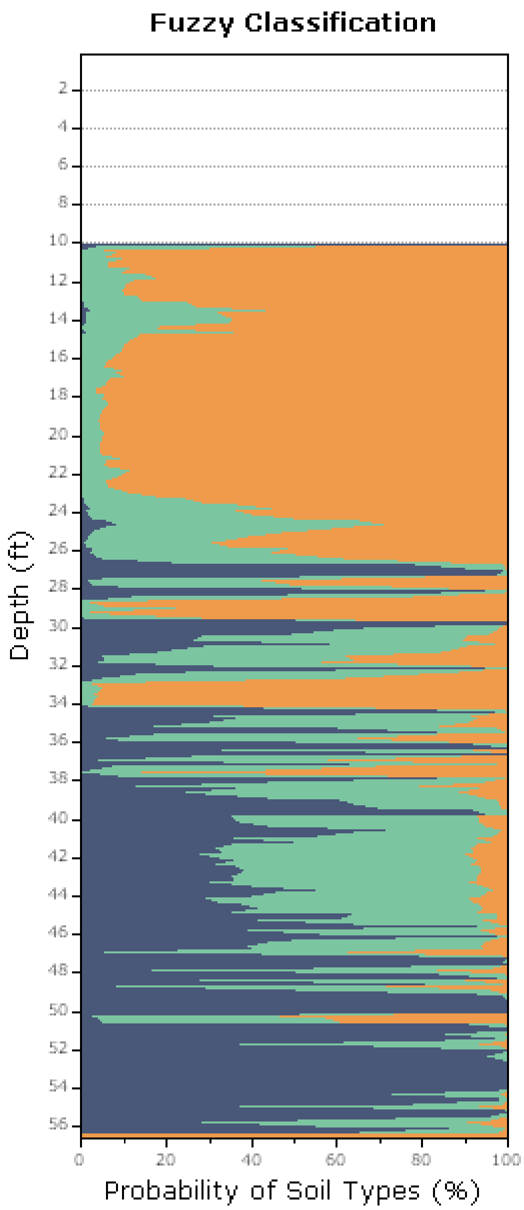


Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-1a
Total depth: 56.59 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:

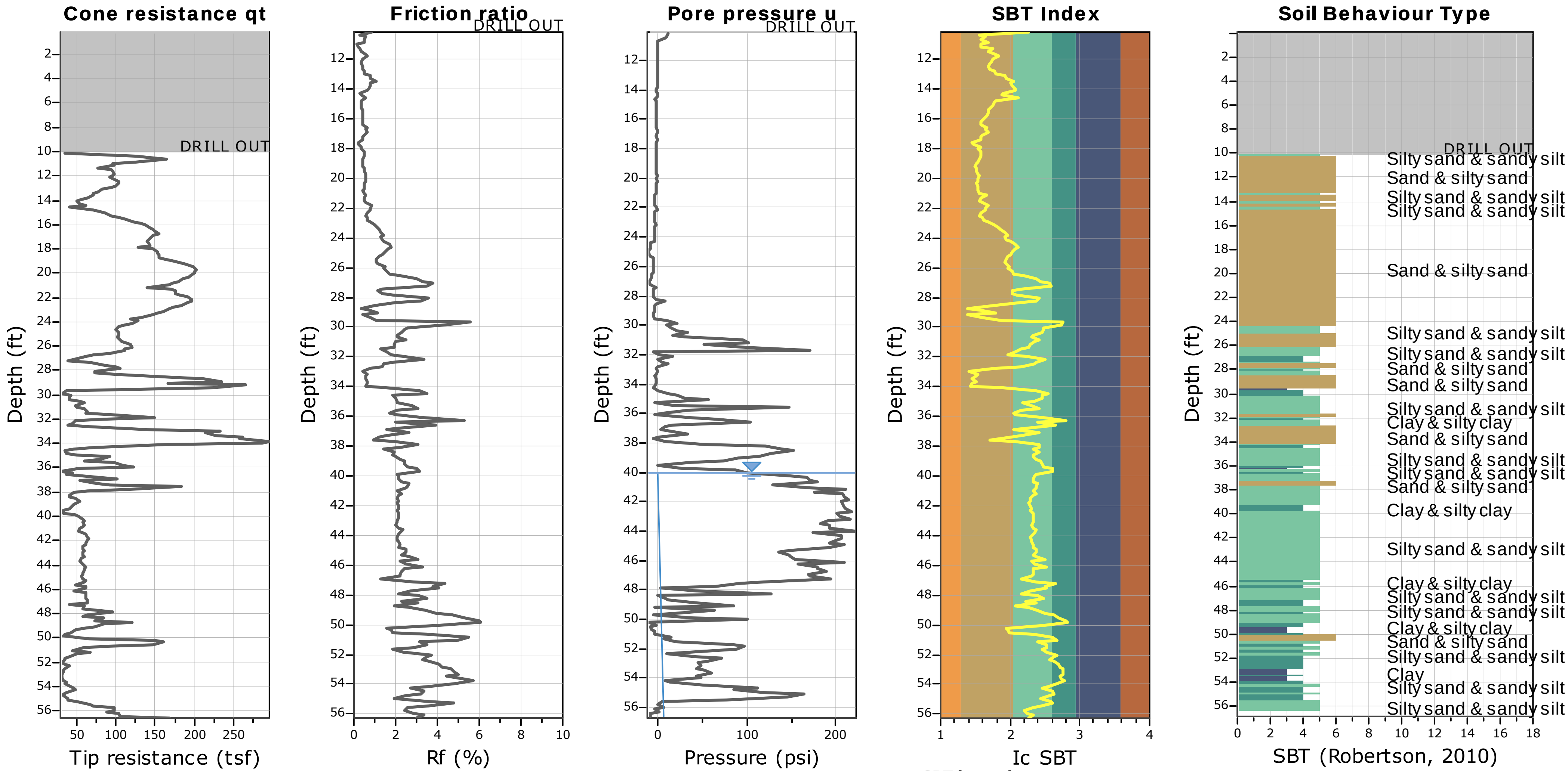




Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-1a
Total depth: 56.59 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



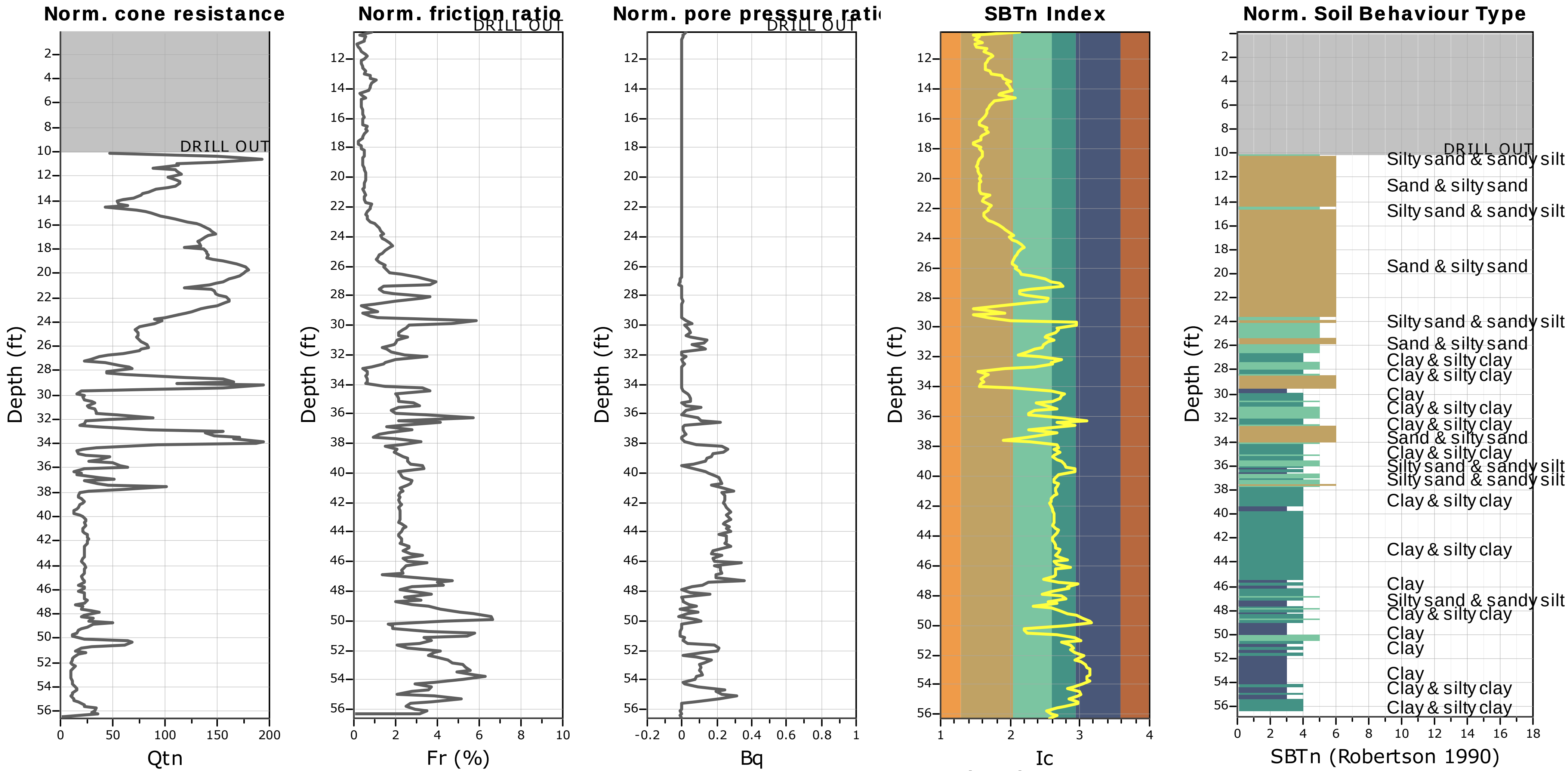
SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-1a
Total depth: 56.59 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

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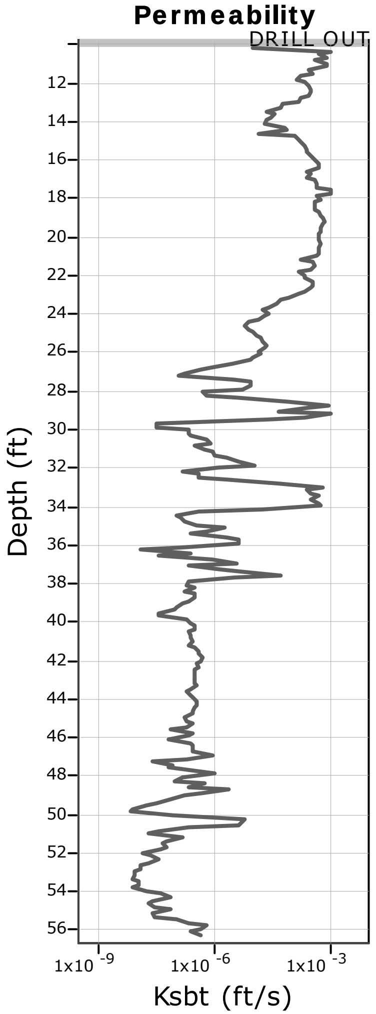
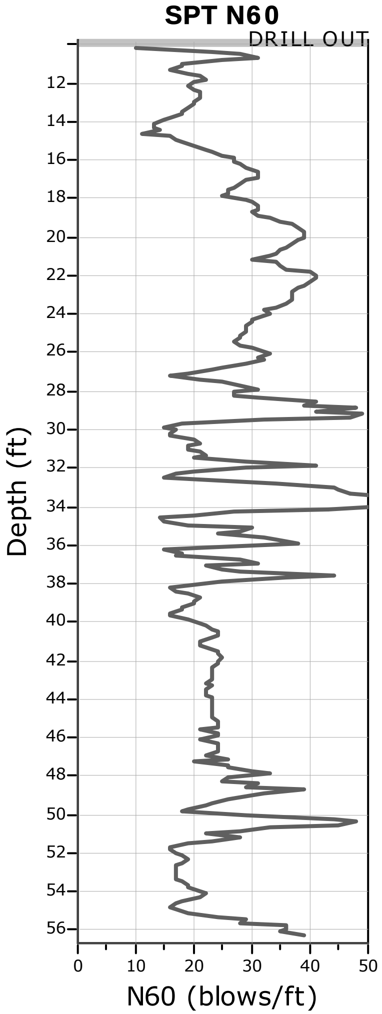
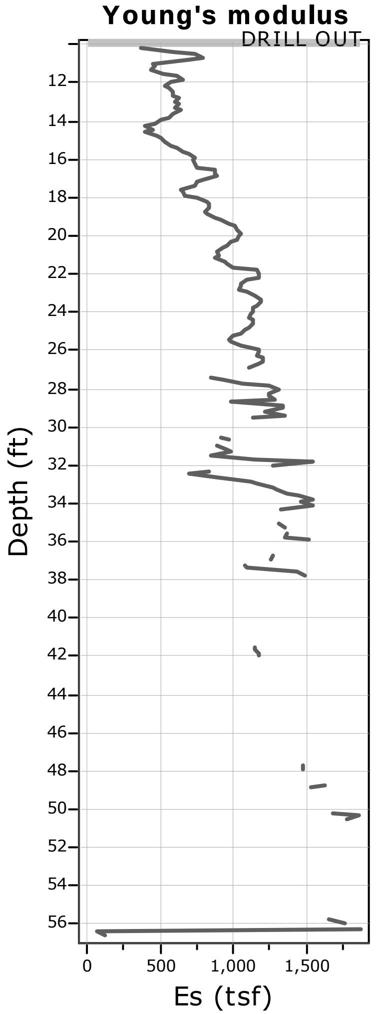
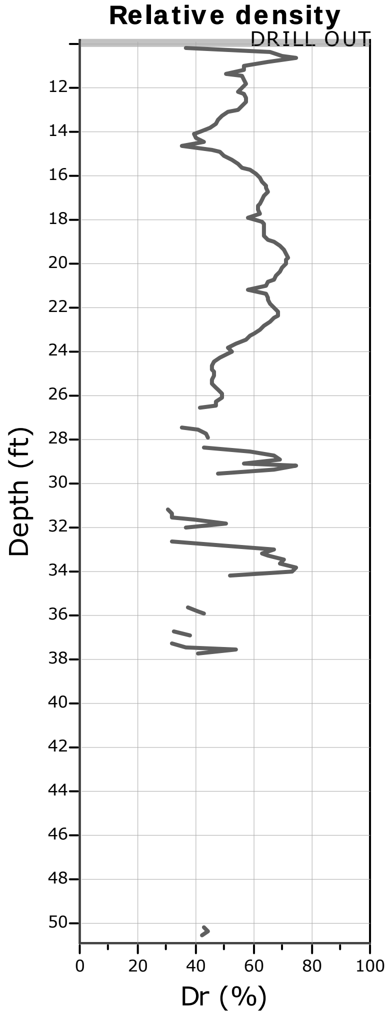
CPT: CPT-1a
Total depth: 56.59 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

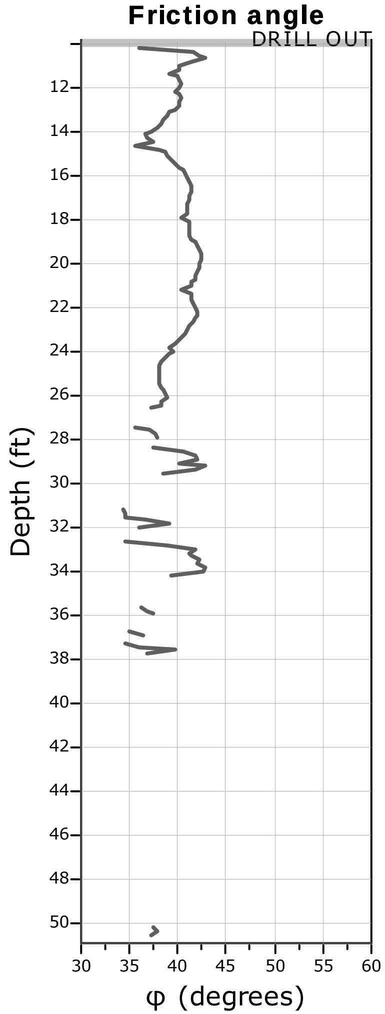
Project:
Location:









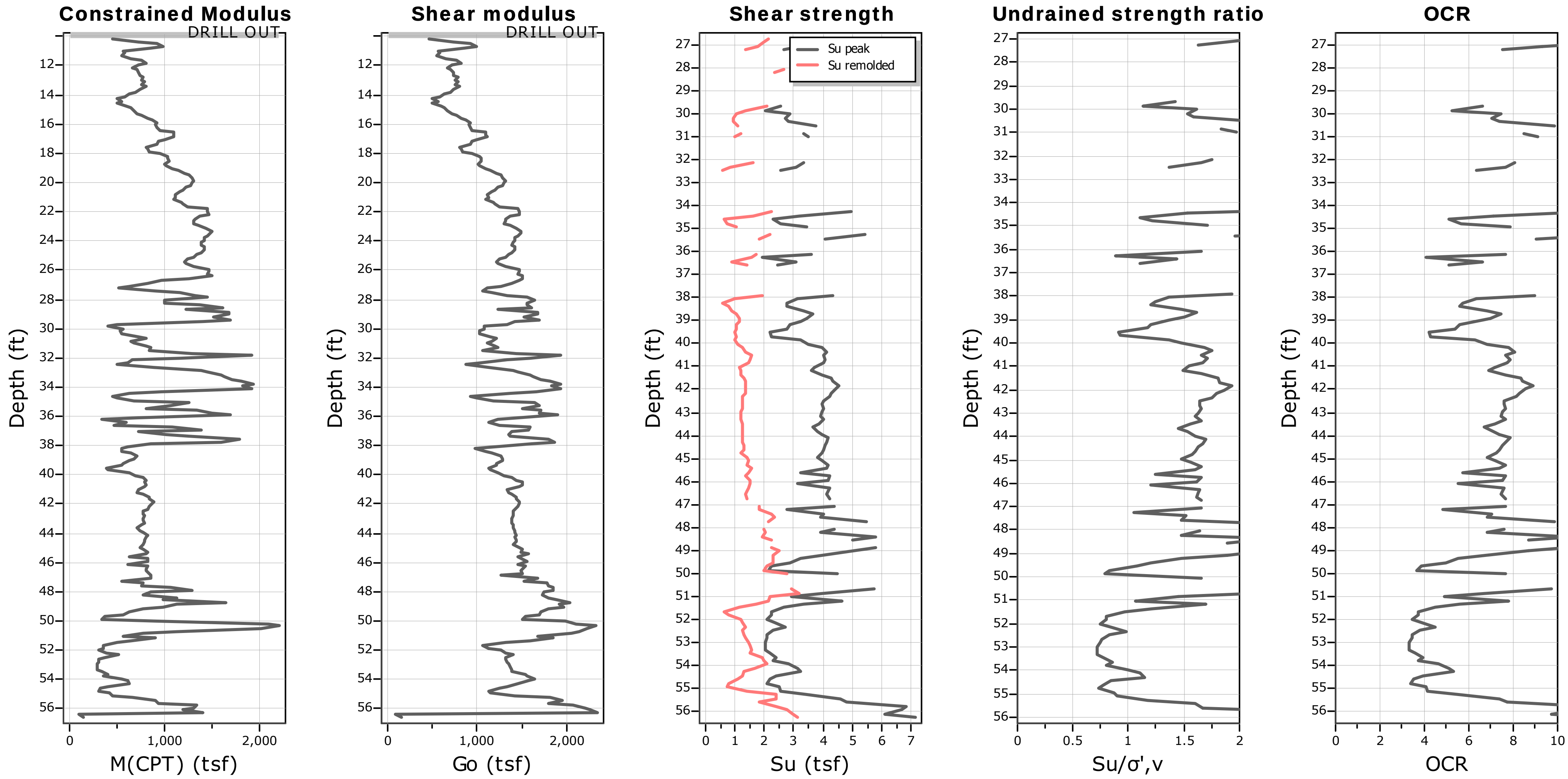


Calculation parameters
Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-1a
Total depth: 56.59 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



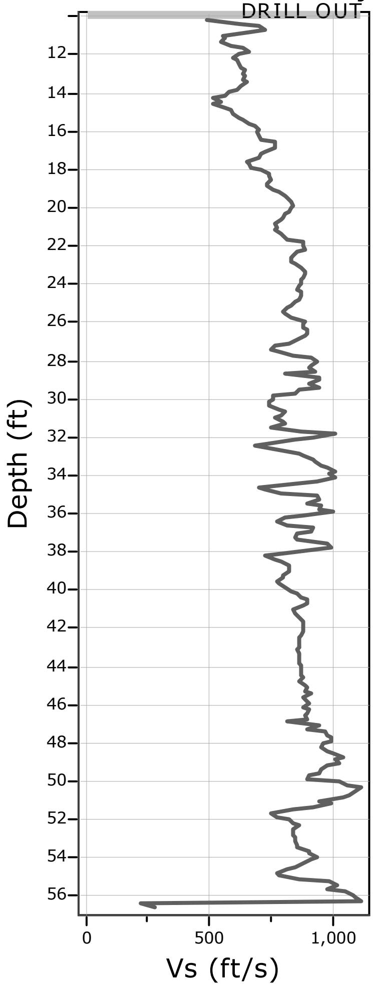
Calculation parameters
Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14
OCR factor for clays, N_{kt}: 0.33
User defined estimation data

Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

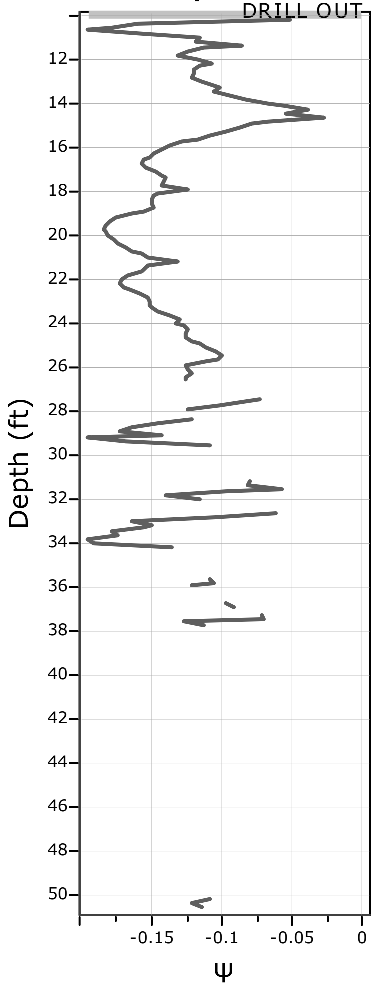
CPT: CPT-1a
Total depth: 56.59 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:

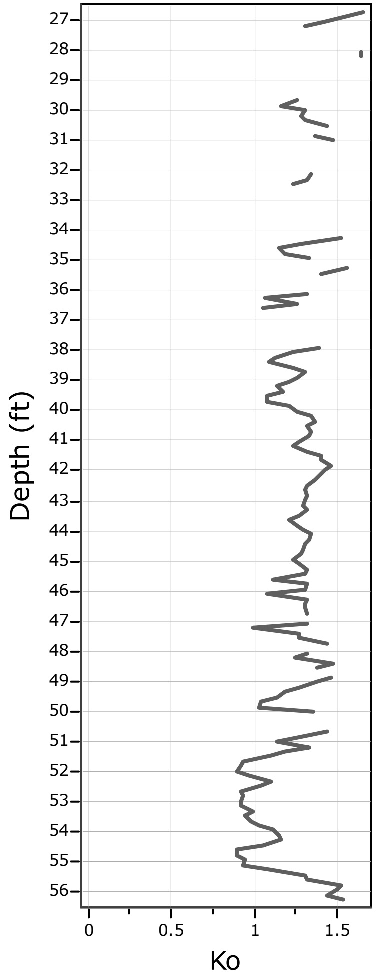
Shear Wave velocity



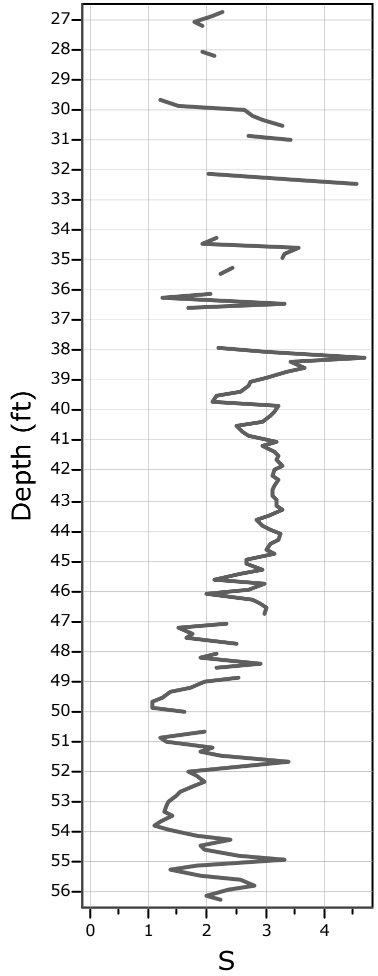
State parameter



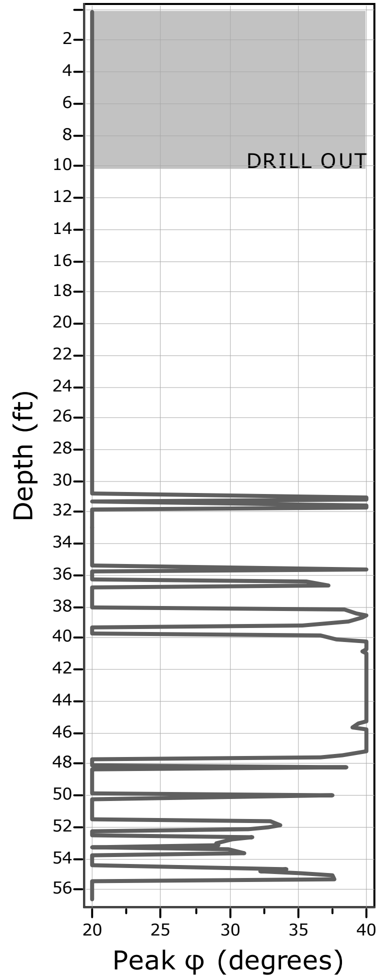
In-situ stress ratio



Soil sensitivity

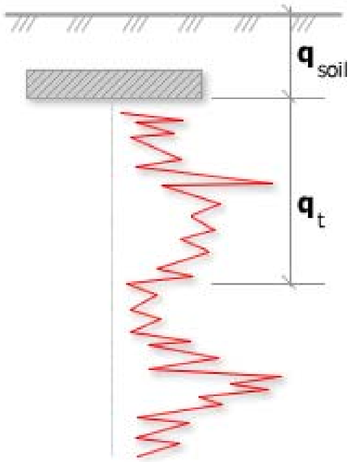


Effective friction angle



Calculation parameters

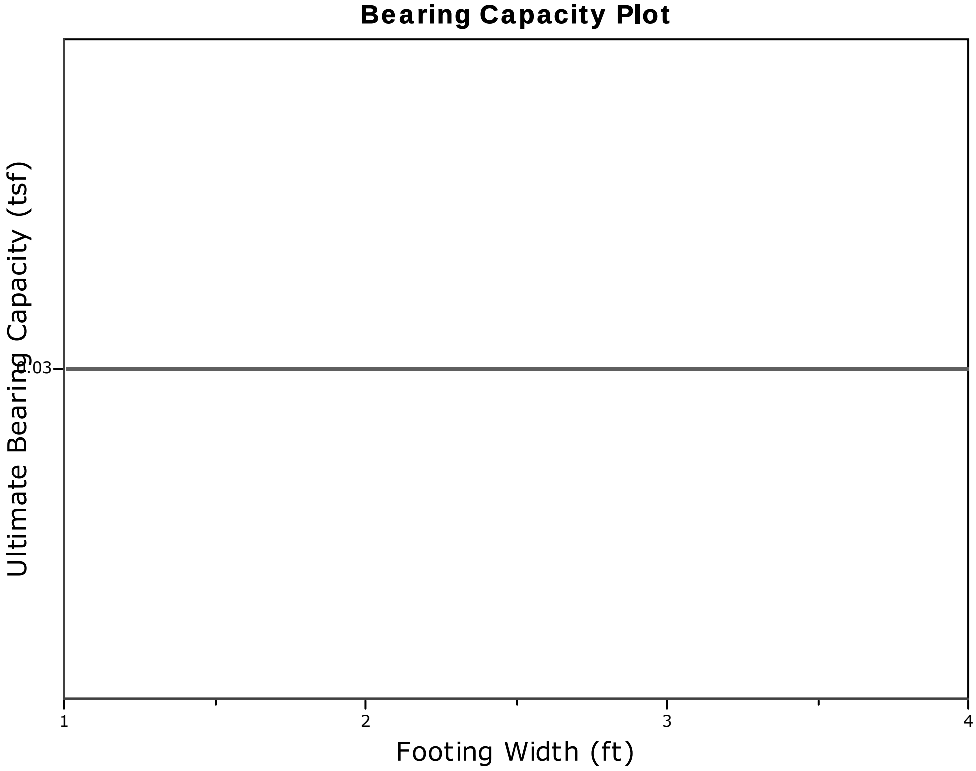
Soil Sensitivity factor, N_S: 7.00
User defined estimation data



Bearing Capacity calculation is perfromed based on the formula:

$$Q_{ult} = R_k \times q_t + q_{soil}$$

where:
R_k: Bearing capacity factor
q_t: Average corrected cone resistance over calculation depth
q_{soil}: Pressure applied by soil above footing



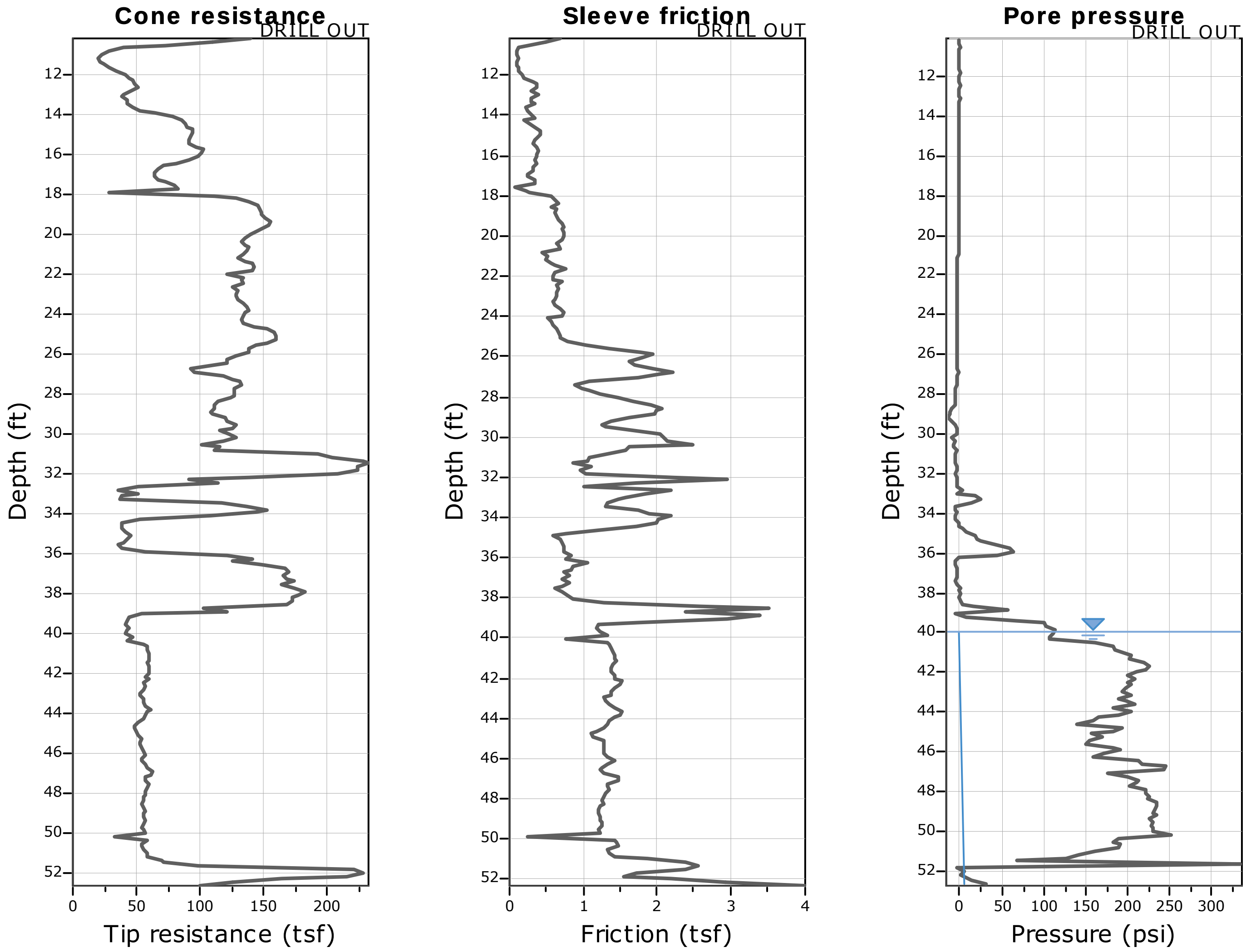
:: Tabular results ::

No	B (ft)	Start Depth (ft)	End Depth (ft)	Ave. q_t (tsf)	R_k	Soil Press. (tsf)	Ult. bearing cap. (tsf)
1	1.00	0.50	2.00	0.00	0.20	0.03	0.03
2	1.20	0.50	2.30	0.00	0.20	0.03	0.03
3	1.40	0.50	2.60	0.00	0.20	0.03	0.03
4	1.60	0.50	2.90	0.00	0.20	0.03	0.03
5	1.80	0.50	3.20	0.00	0.20	0.03	0.03
6	2.00	0.50	3.50	0.00	0.20	0.03	0.03
7	2.20	0.50	3.80	0.00	0.20	0.03	0.03
8	2.40	0.50	4.10	0.00	0.20	0.03	0.03
9	2.60	0.50	4.40	0.00	0.20	0.03	0.03
10	2.80	0.50	4.70	0.00	0.20	0.03	0.03
11	3.00	0.50	5.00	0.00	0.20	0.03	0.03
12	3.20	0.50	5.30	0.00	0.20	0.03	0.03
13	3.40	0.50	5.60	0.00	0.20	0.03	0.03
14	3.60	0.50	5.90	0.00	0.20	0.03	0.03
15	3.80	0.50	6.20	0.00	0.20	0.03	0.03
16	4.00	0.50	6.50	0.00	0.20	0.03	0.03

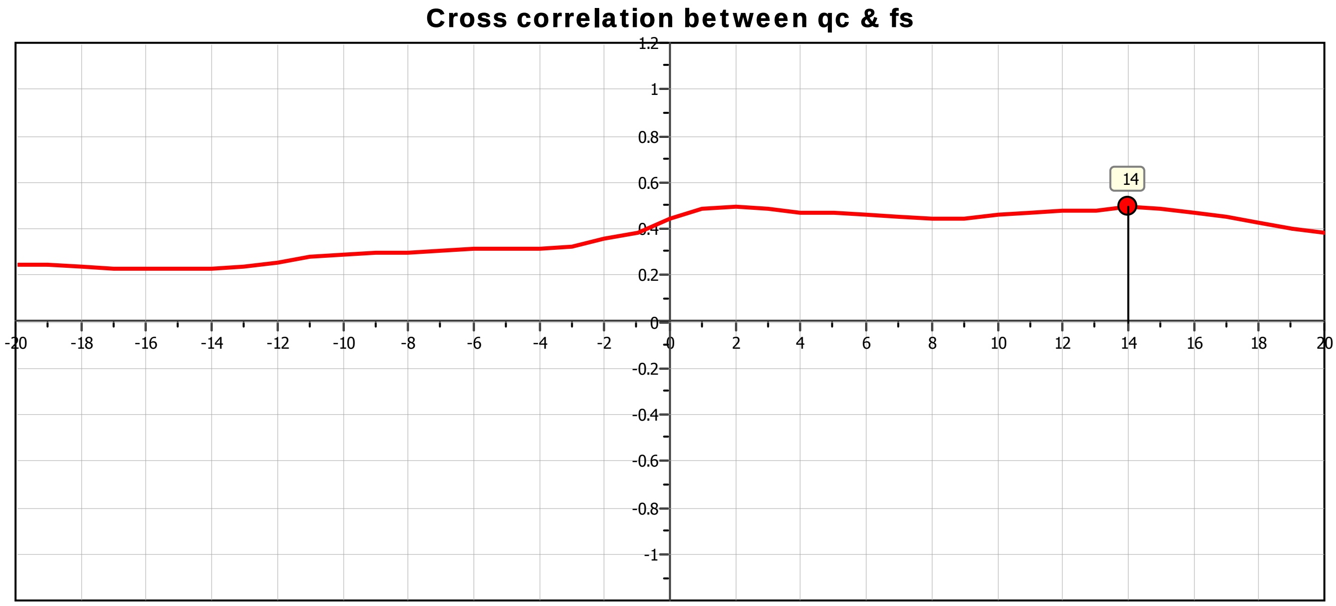
Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-2
Total depth: 52.66 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



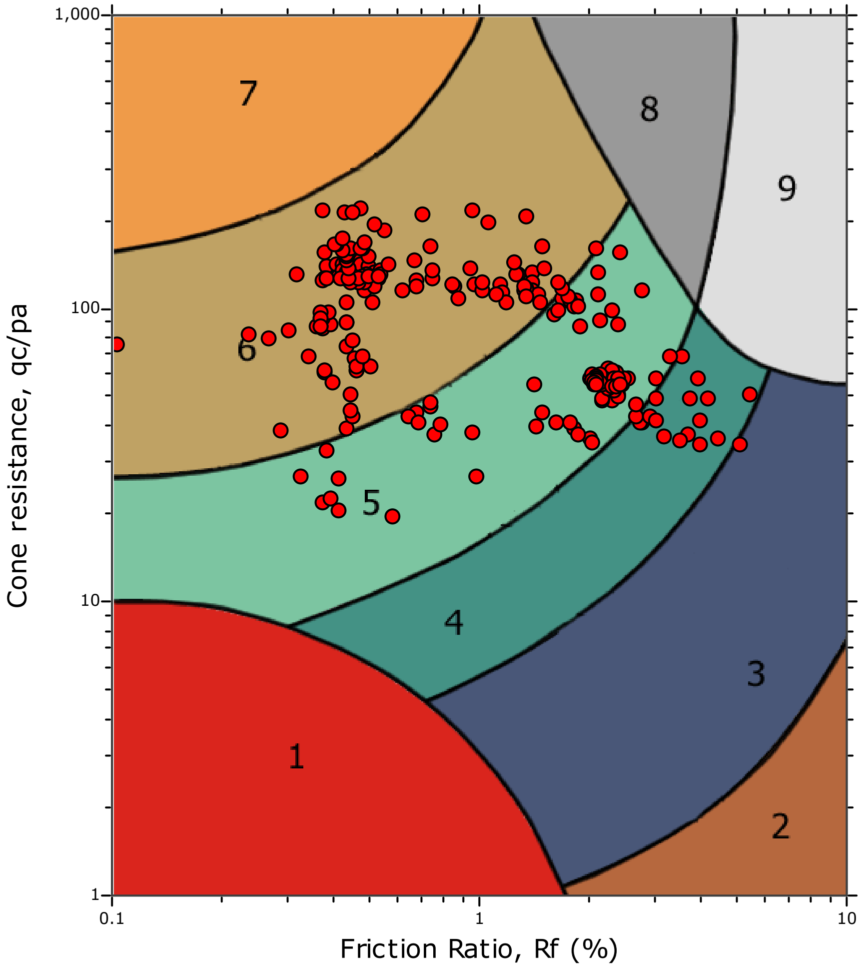
Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

Project:
Location:

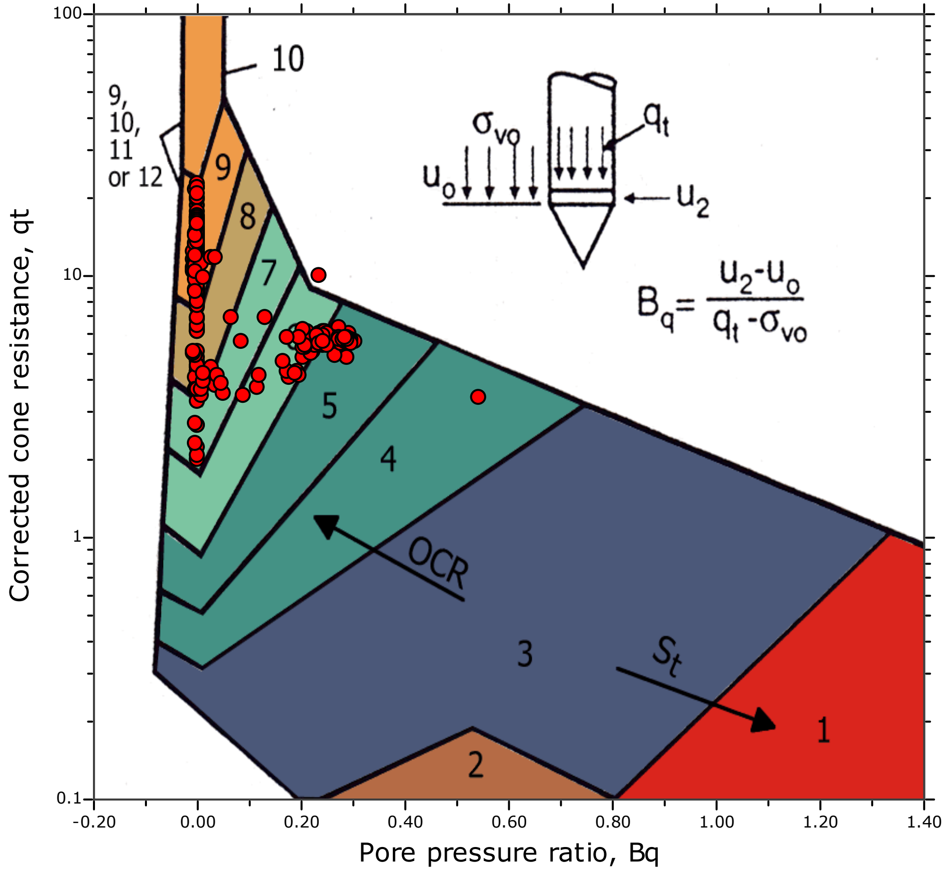
CPT: CPT-2
Total depth: 52.66 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

SBT - Bq plots

SBT plot



Bq plot

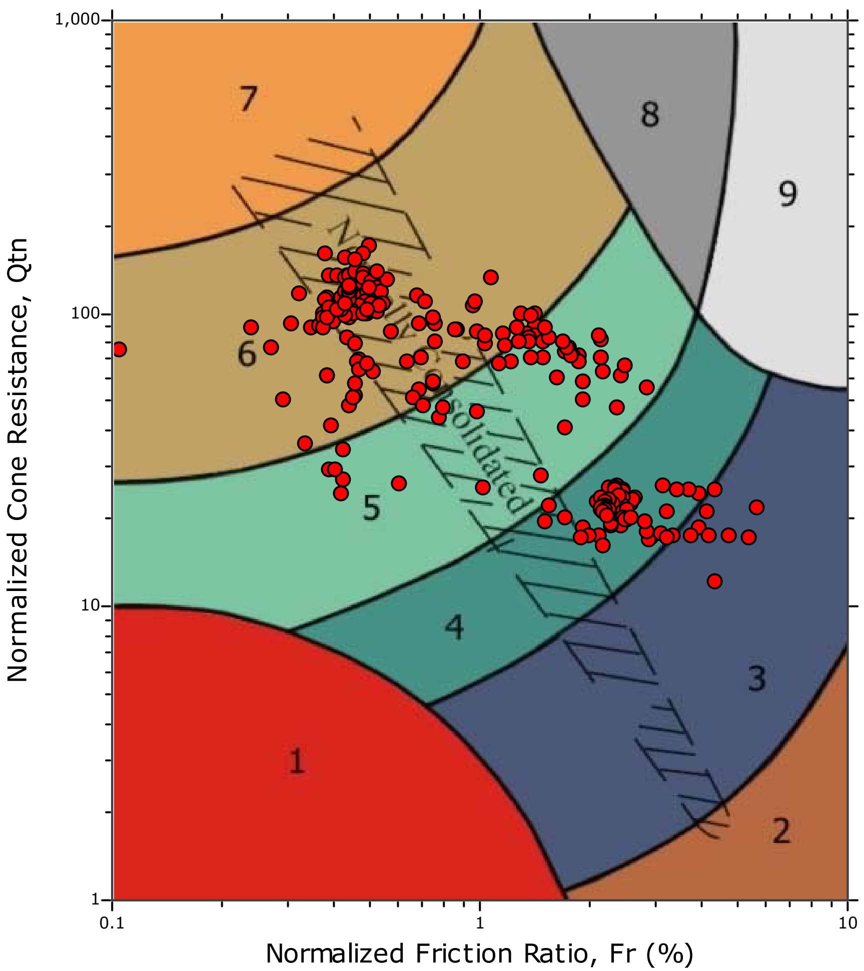


SBT legend

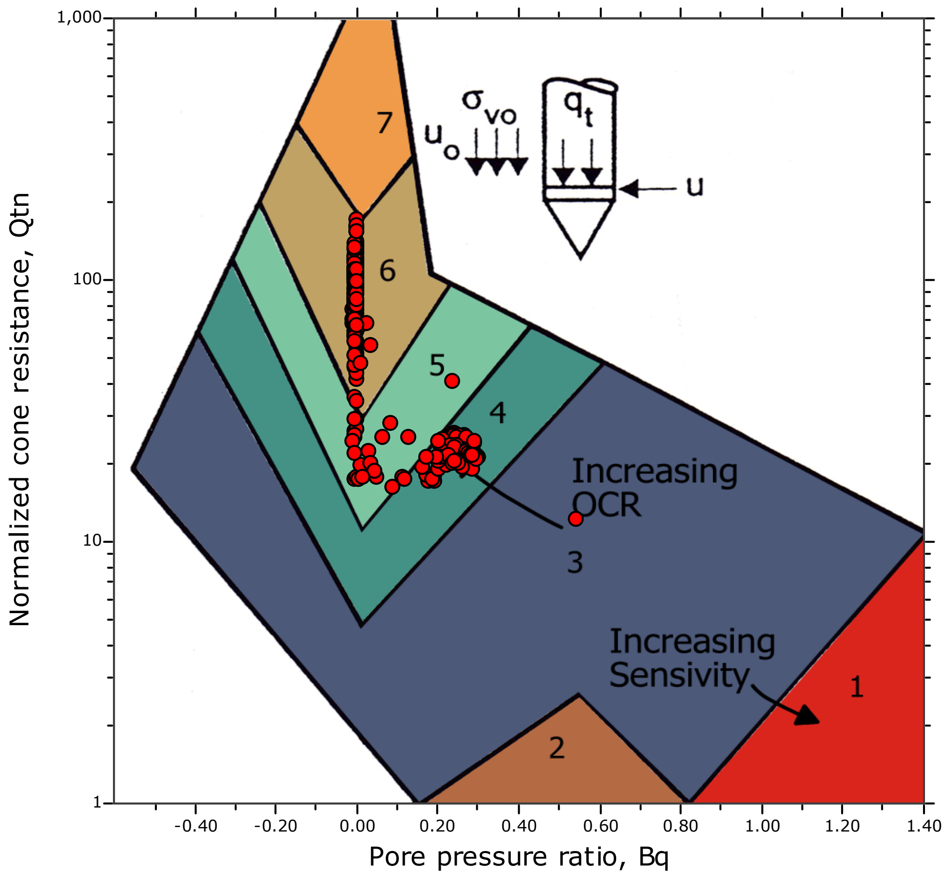
- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

SBT - Bq plots (normalized)

SBTn plot



Normalized Bq plot



SBTn legend

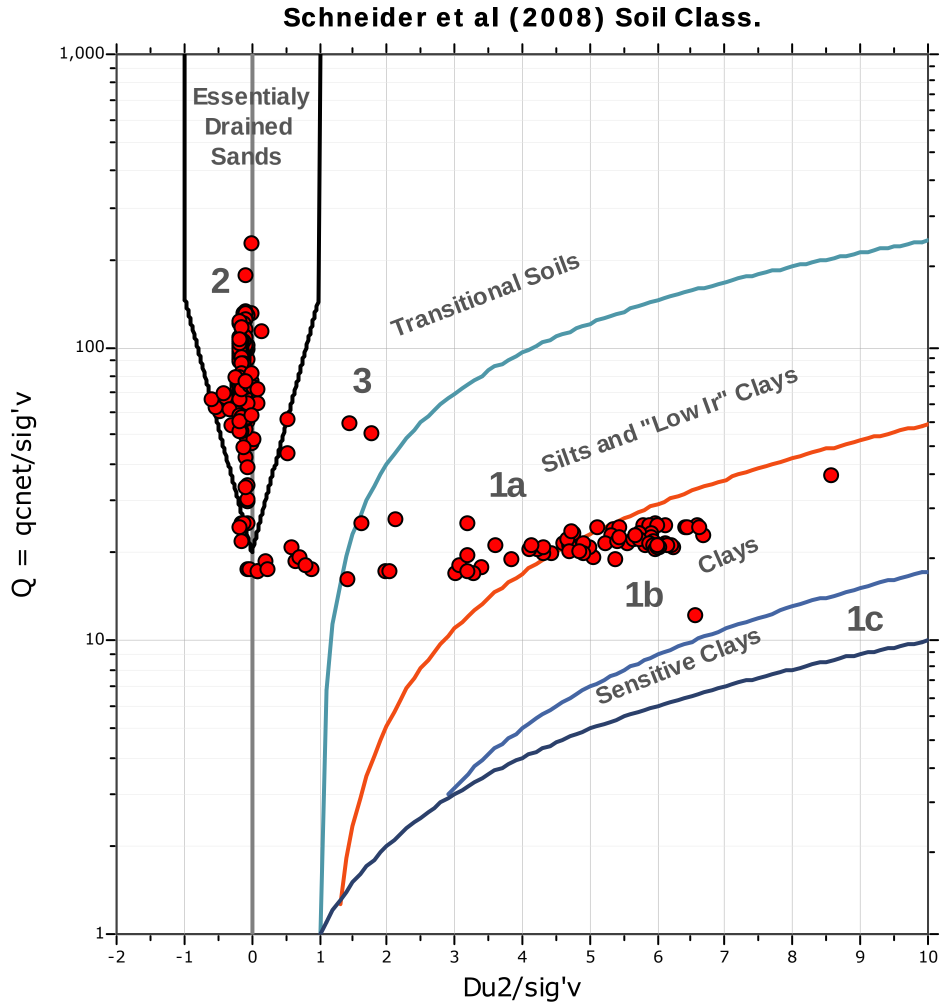
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

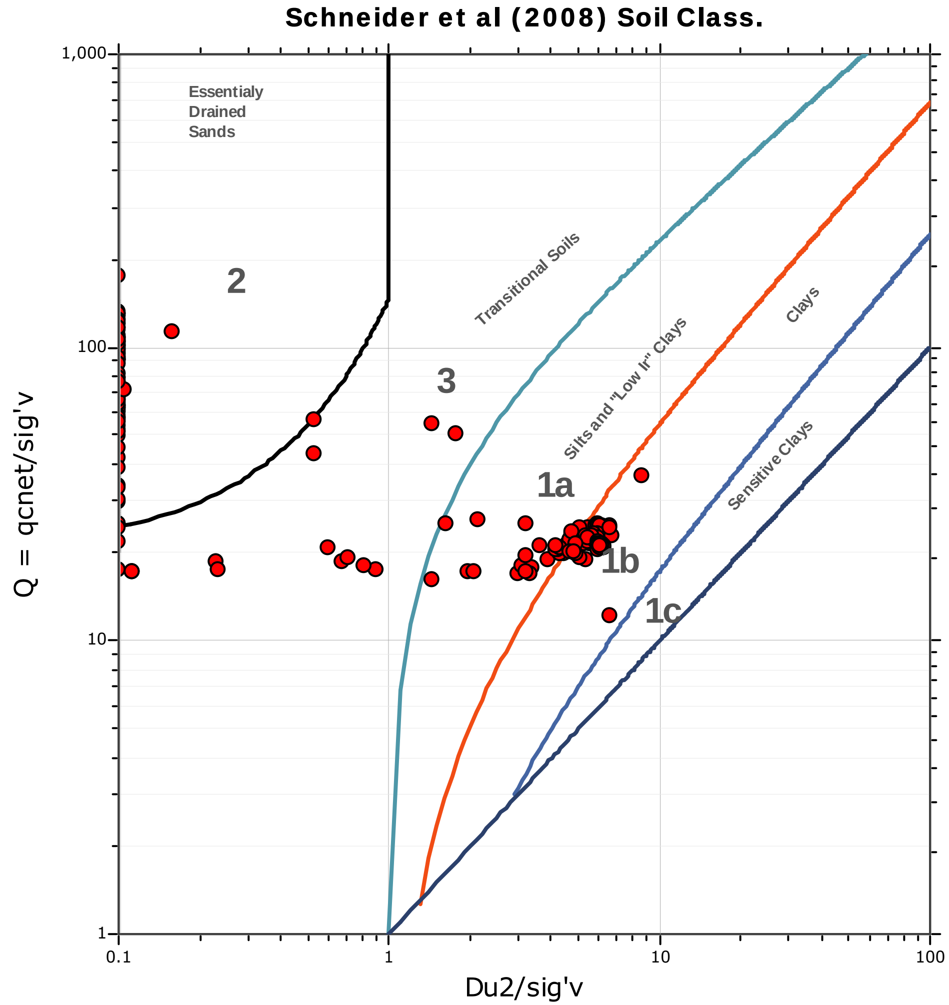
Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-2
Total depth: 52.66 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:

Bq plots (Schneider)





Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
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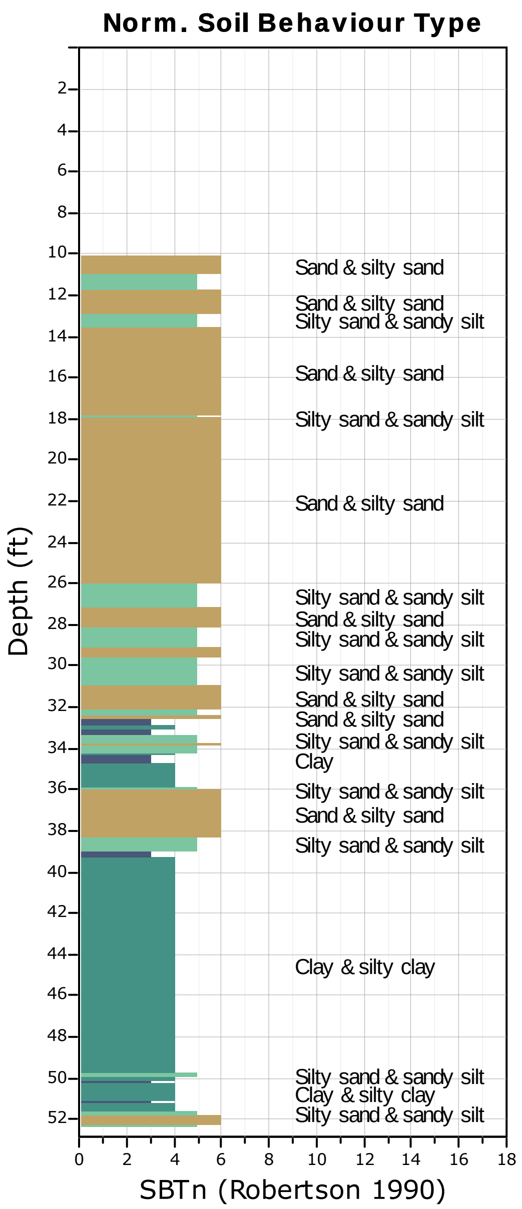
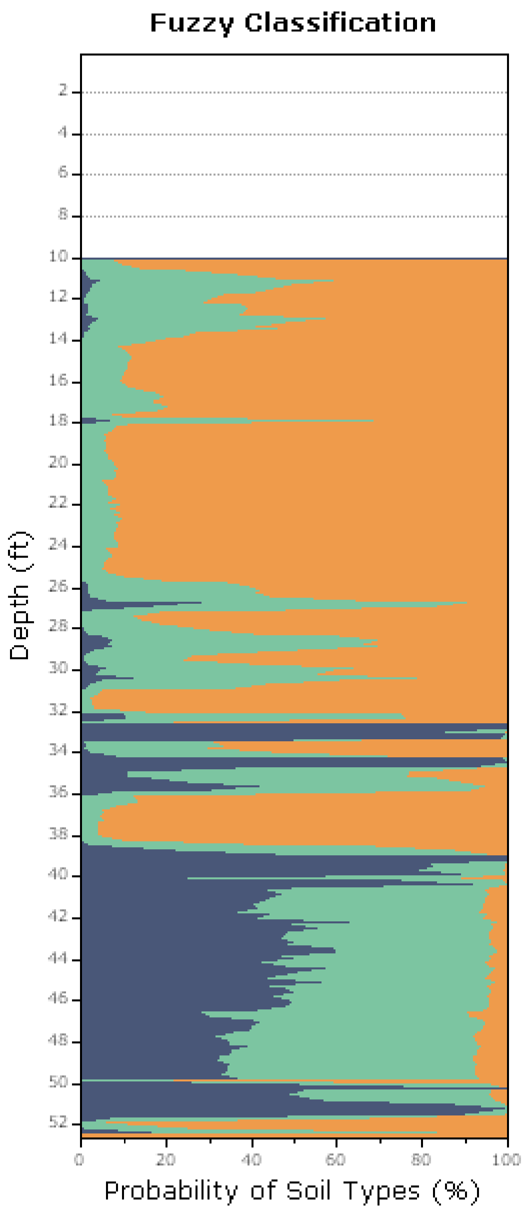
CPT: CPT-2
Total depth: 52.66 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:

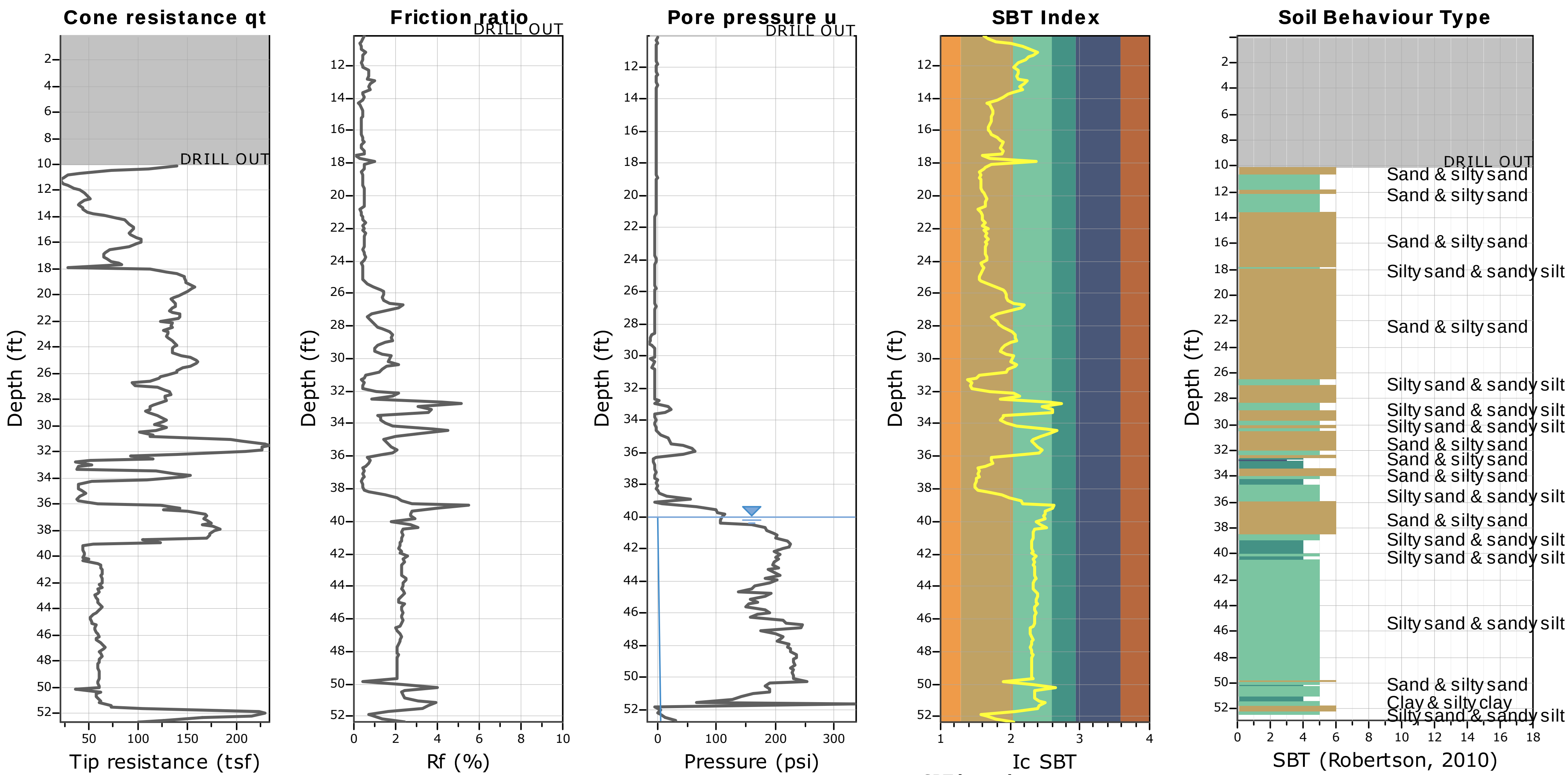




Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-2
Total depth: 52.66 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



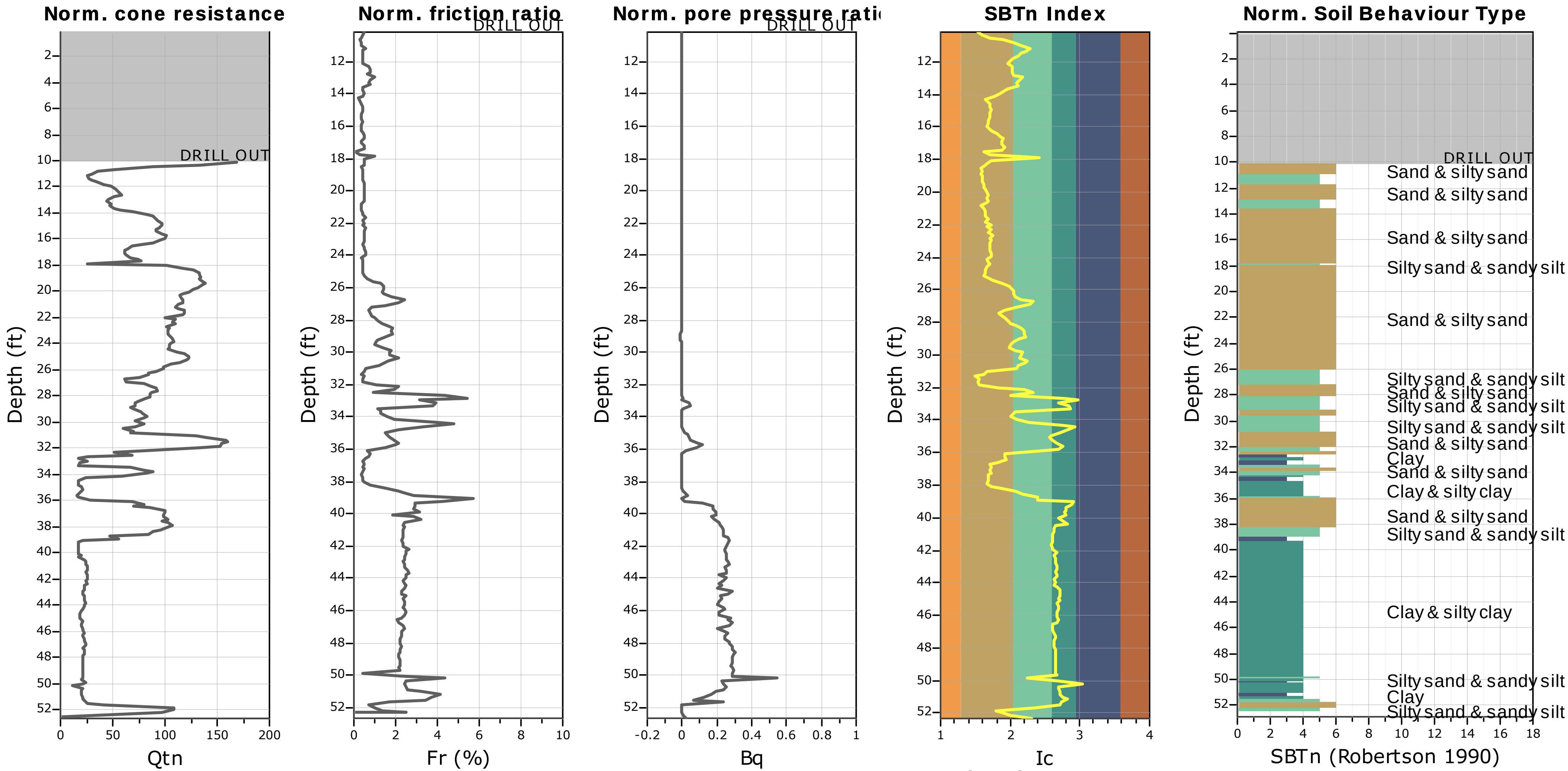
SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

Project:
Location:

CPT: CPT-2
Total depth: 52.66 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown



SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
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- 7. Gravely sand to sand
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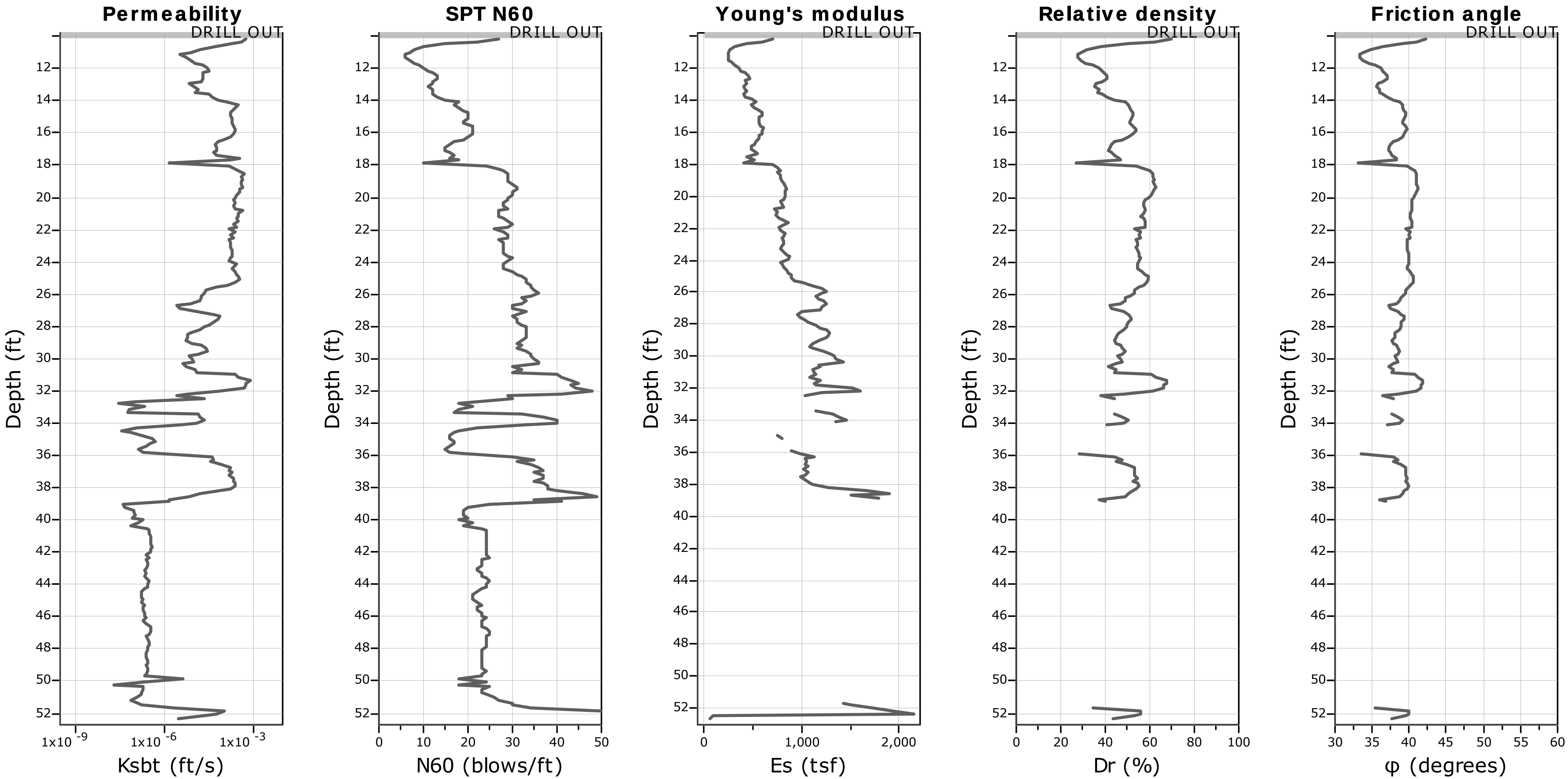
- 9. Very stiff fine grained

Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-2
Total depth: 52.66 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:

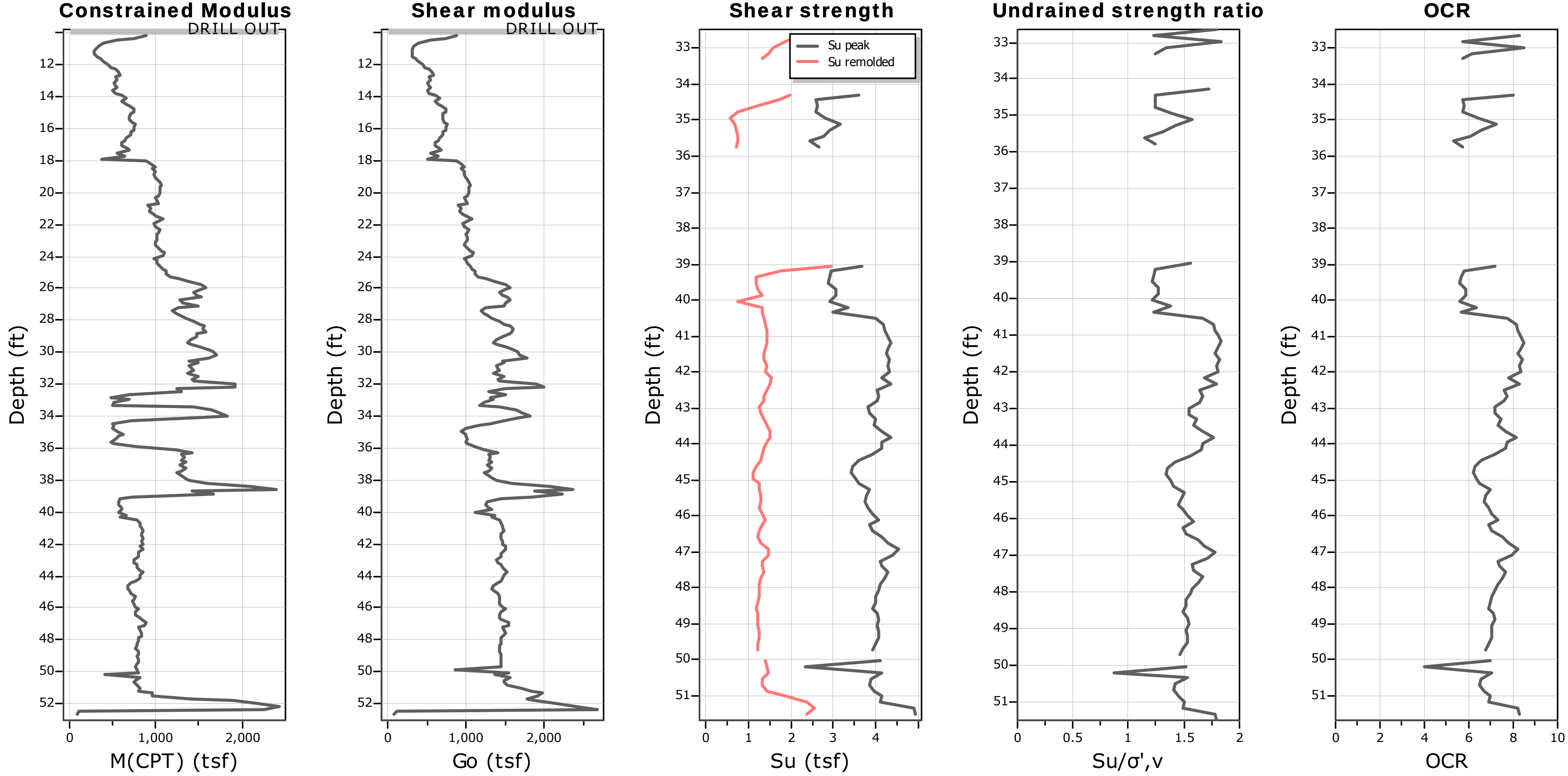


Calculation parameters
Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-2
Total depth: 52.66 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:

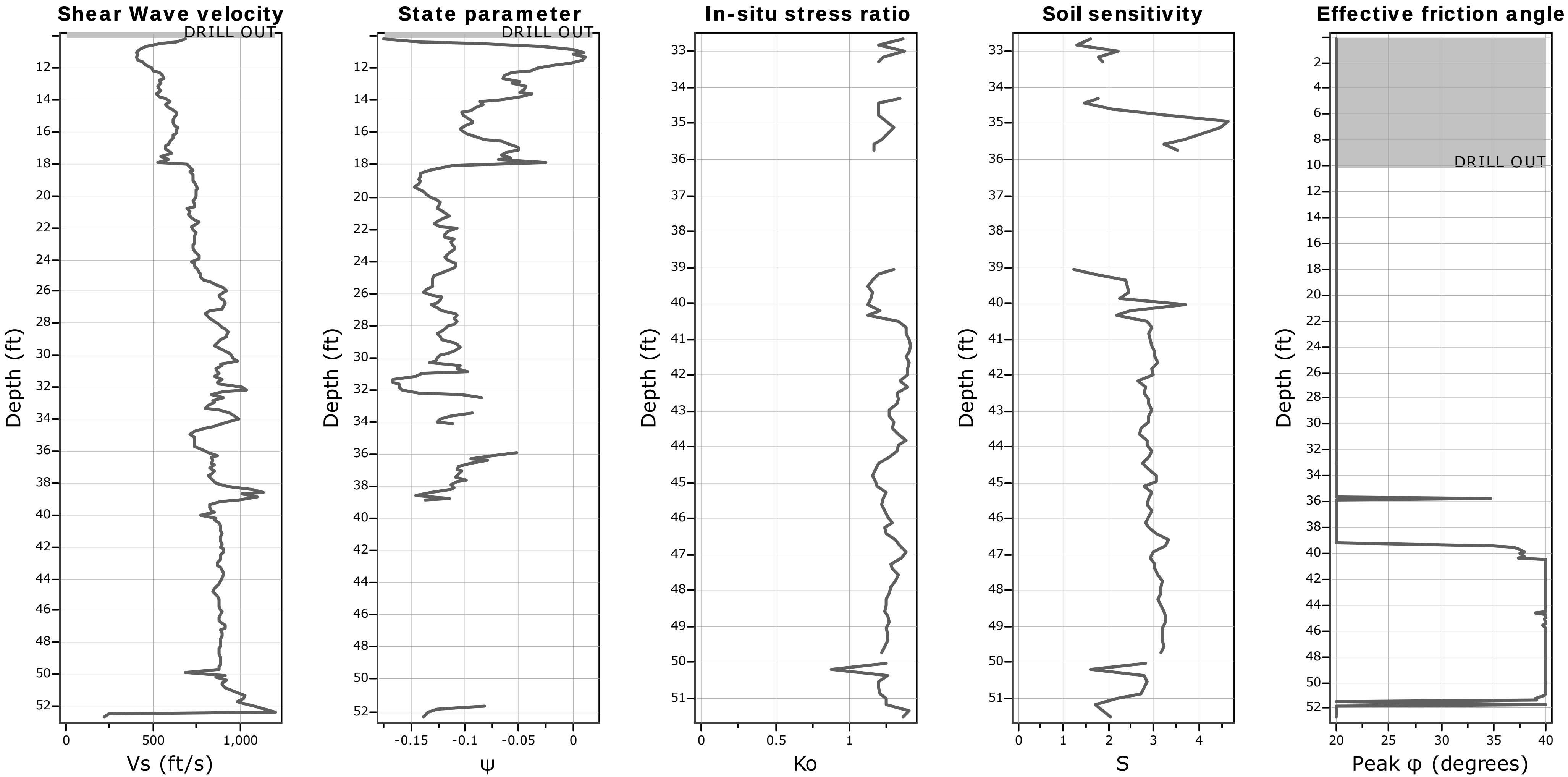


Calculation parameters
Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14
OCR factor for clays, N_{kt}: 0.33
User defined estimation data

Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

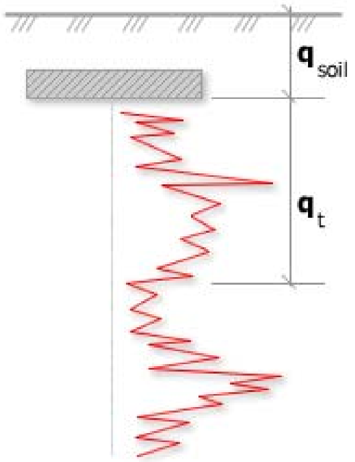
CPT: CPT-2
Total depth: 52.66 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

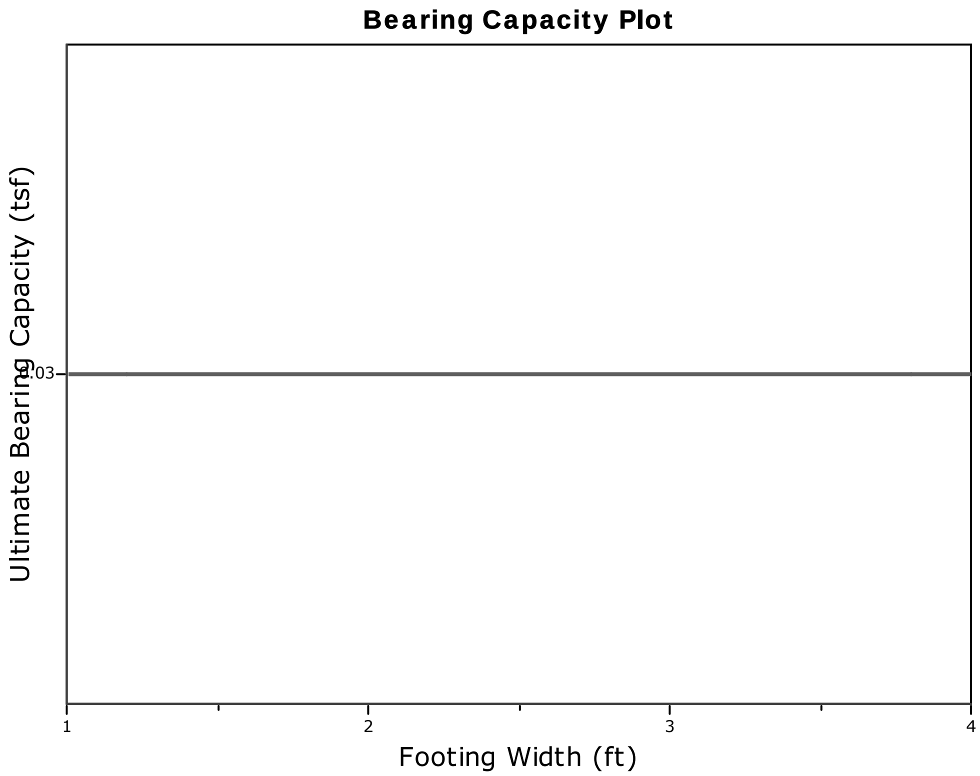
Project:
Location:



Calculation parameters

Soil Sensitivity factor, N_S: 7.00
User defined estimation data





Bearing Capacity calculation is perfromed based on the formula:

$$Q_{ult} = R_k \times q_t + q_{soil}$$

where:
R_k: Bearing capacity factor
q_t: Average corrected cone resistance over calculation depth
q_{soil}: Pressure applied by soil above footing

:: Tabular results ::

No	B (ft)	Start Depth (ft)	End Depth (ft)	Ave. q_t (tsf)	R_k	Soil Press. (tsf)	Ult. bearing cap. (tsf)
1	1.00	0.50	2.00	0.00	0.20	0.03	0.03
2	1.20	0.50	2.30	0.00	0.20	0.03	0.03
3	1.40	0.50	2.60	0.00	0.20	0.03	0.03
4	1.60	0.50	2.90	0.00	0.20	0.03	0.03
5	1.80	0.50	3.20	0.00	0.20	0.03	0.03
6	2.00	0.50	3.50	0.00	0.20	0.03	0.03
7	2.20	0.50	3.80	0.00	0.20	0.03	0.03
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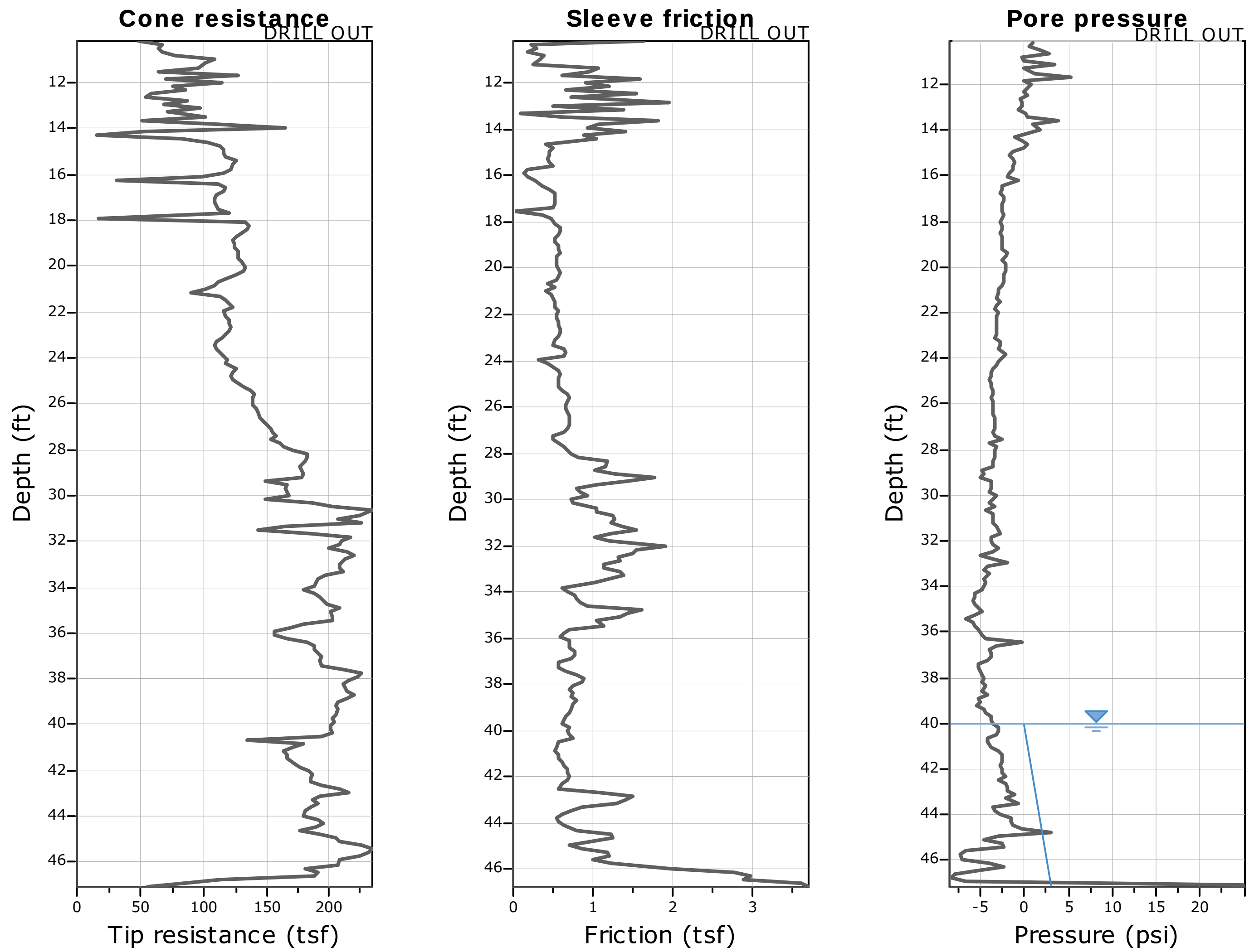
9	2.60	0.50	4.40	0.00	0.20	0.03	0.03
10	2.80	0.50	4.70	0.00	0.20	0.03	0.03
11	3.00	0.50	5.00	0.00	0.20	0.03	0.03
12	3.20	0.50	5.30	0.00	0.20	0.03	0.03
13	3.40	0.50	5.60	0.00	0.20	0.03	0.03
14	3.60	0.50	5.90	0.00	0.20	0.03	0.03
15	3.80	0.50	6.20	0.00	0.20	0.03	0.03
16	4.00	0.50	6.50	0.00	0.20	0.03	0.03

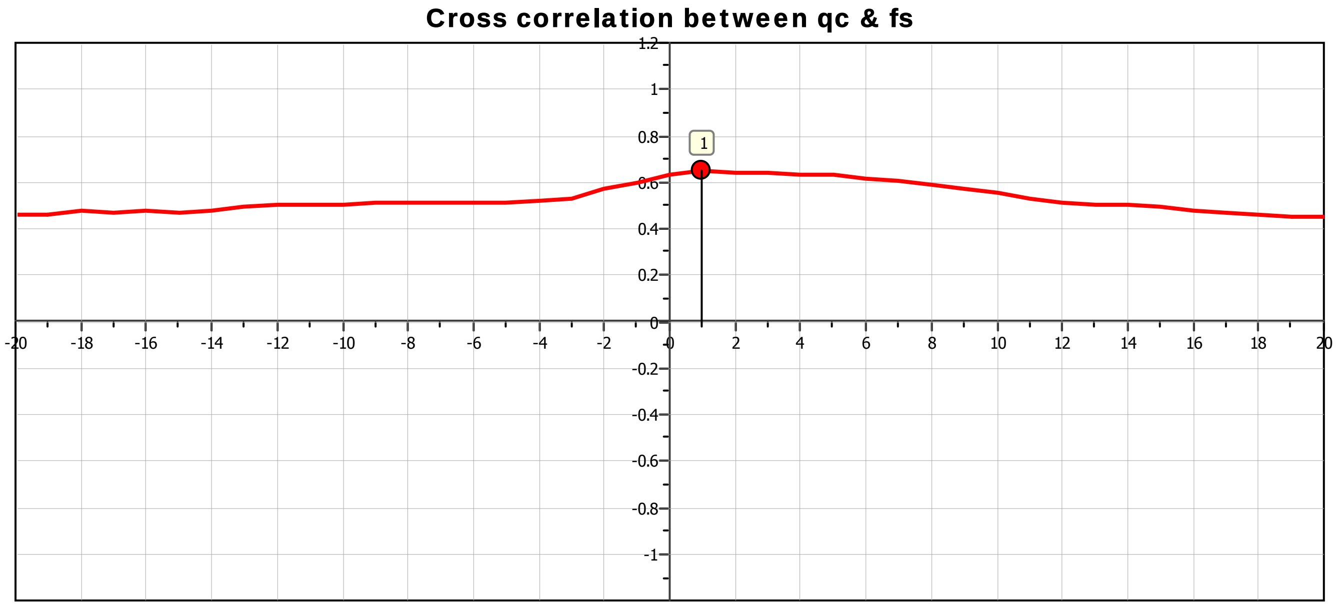
Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-3
Total depth: 47.08 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



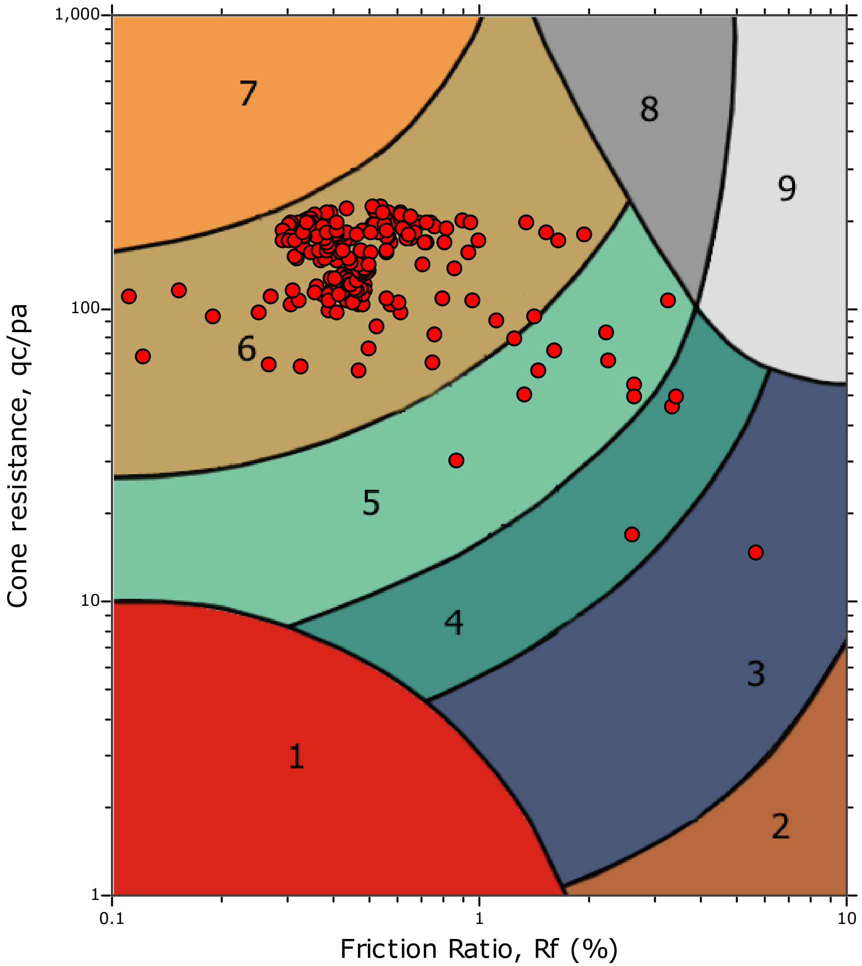
Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-3
Total depth: 47.08 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

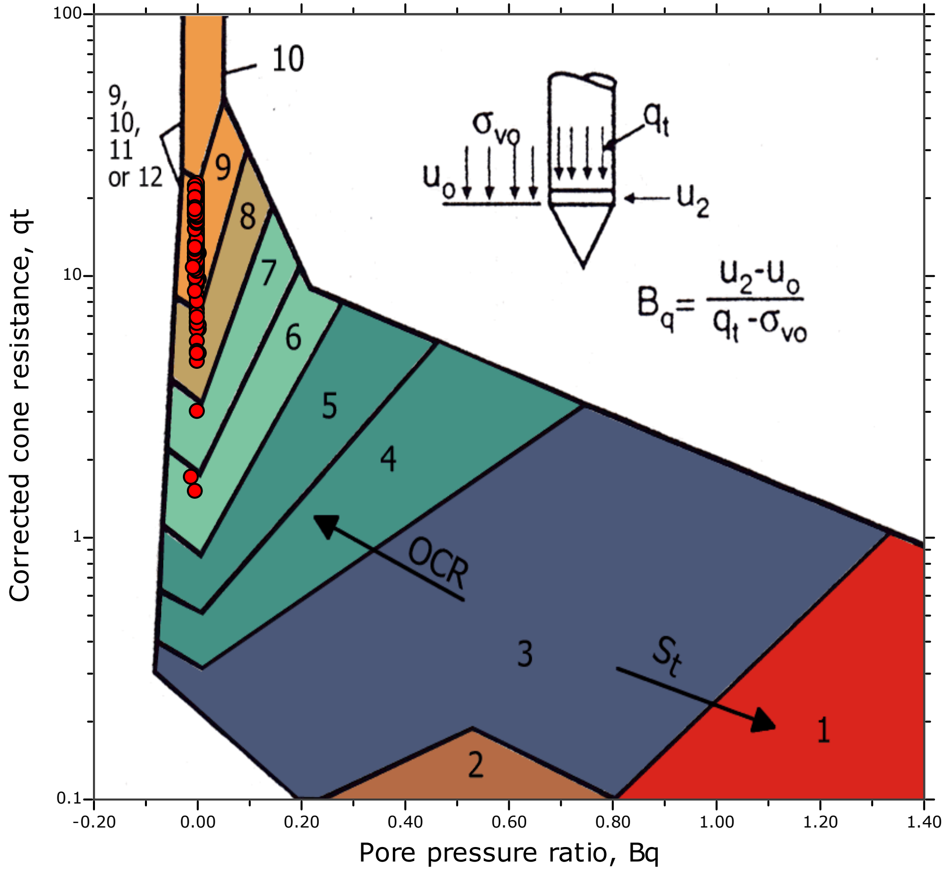
Project:
Location:

SBT - Bq plots

SBT plot



Bq plot



SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty clay
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to clayey sand
- 9. Very stiff fine grained

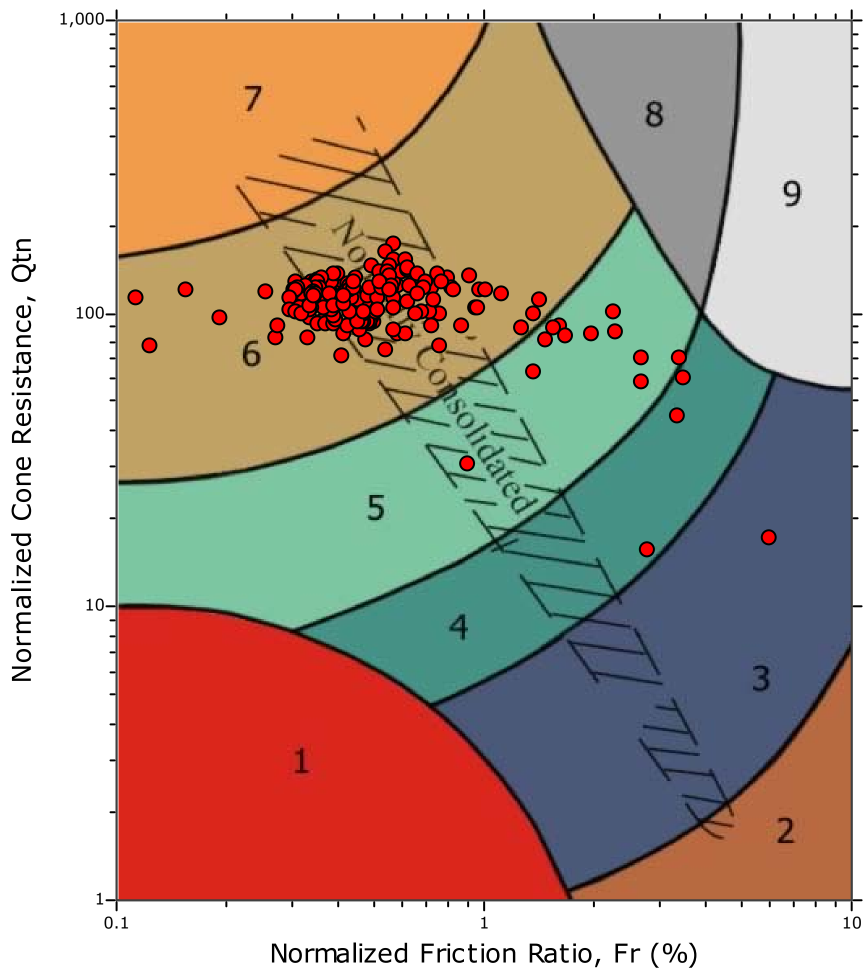
Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-3
Total depth: 47.08 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

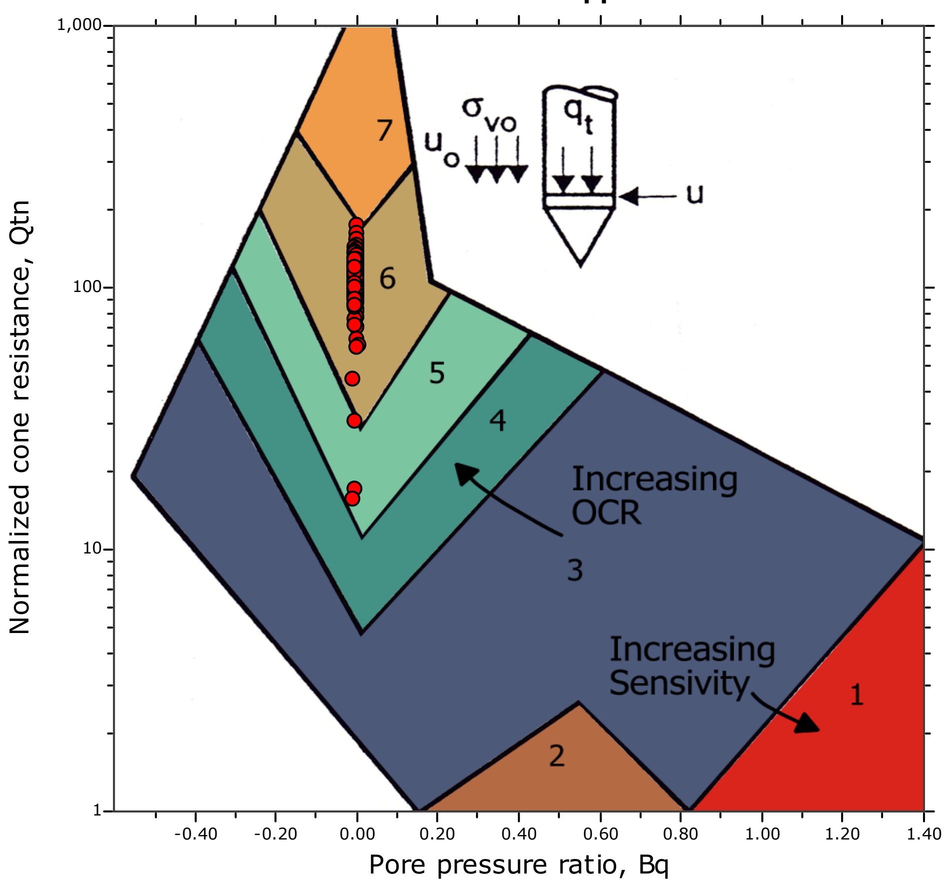
Project:
Location:

SBT - Bq plots (normalized)

SBTn plot



Normalized Bq plot



SBTn legend

- 1. Sensitive fine grained
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- 7. Gravely sand to sand
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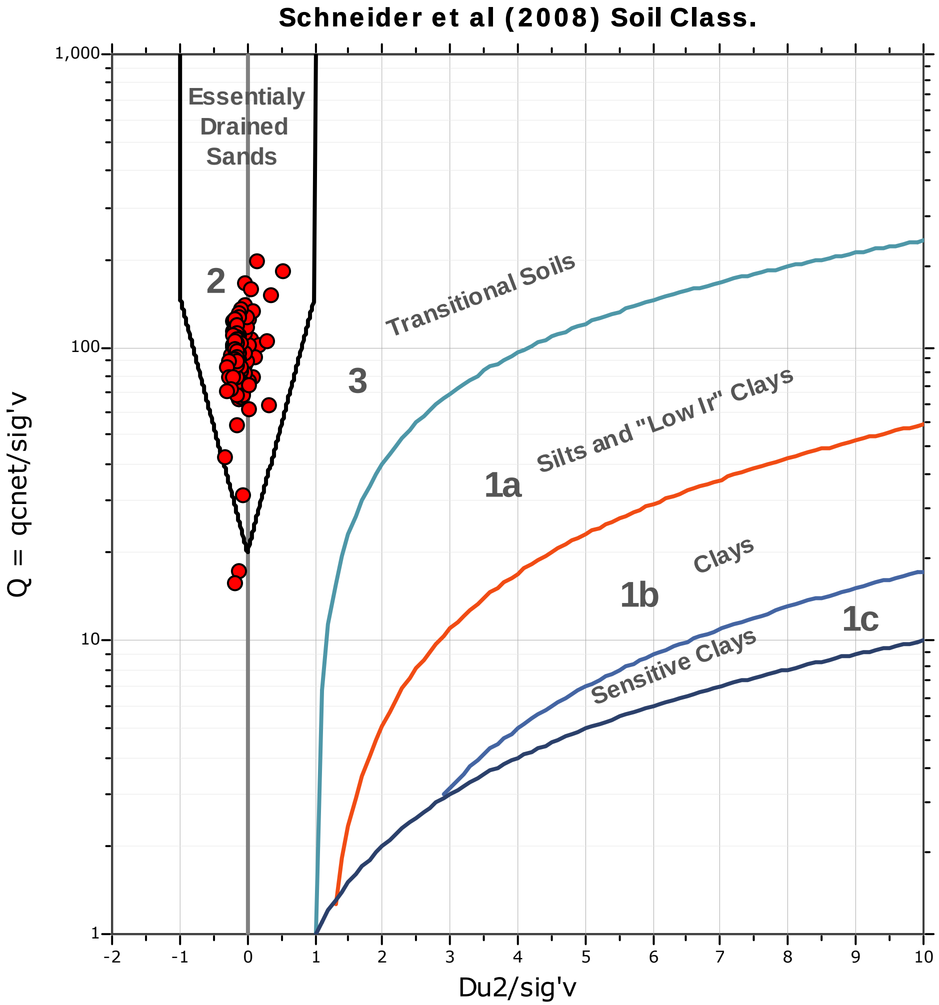
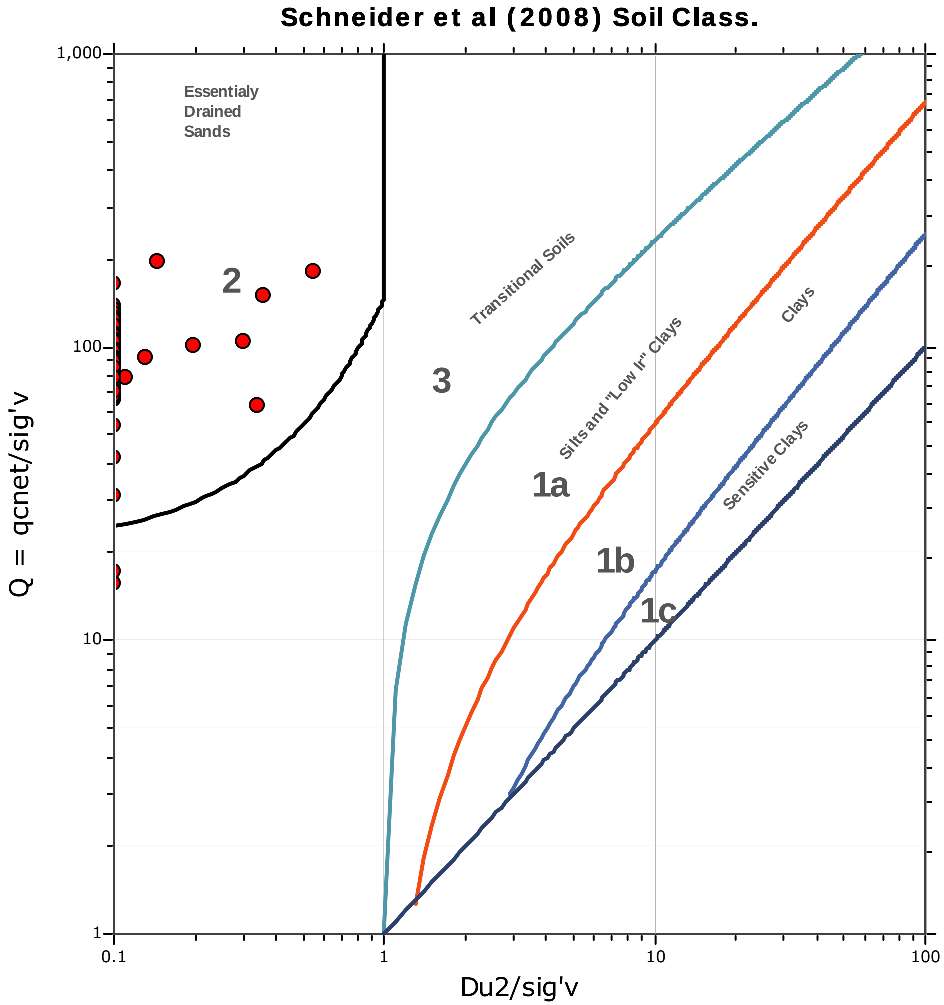
Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-3
Total depth: 47.08 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:

Bq plots (Schneider)

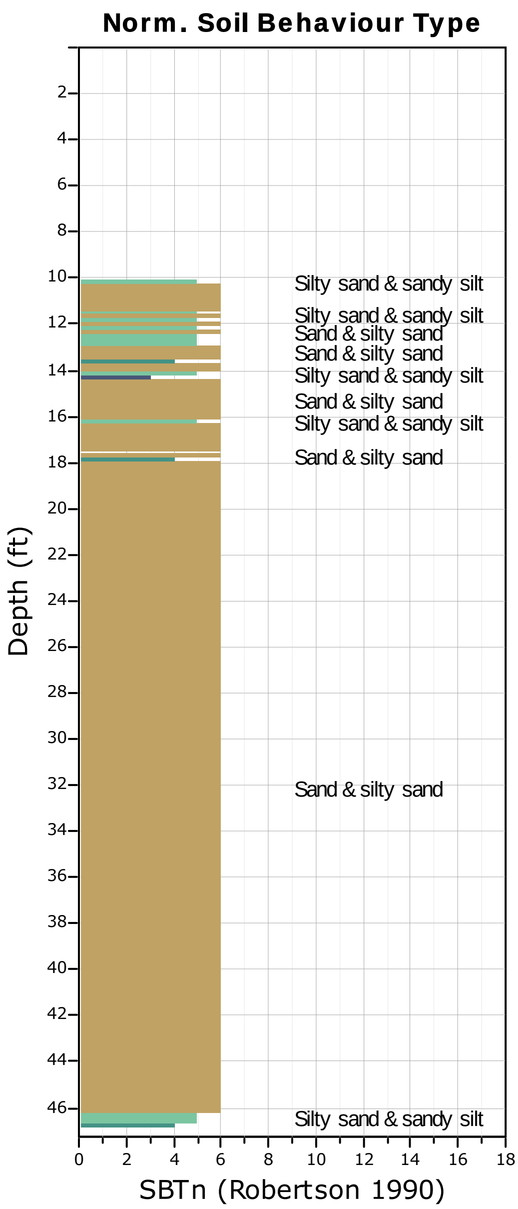


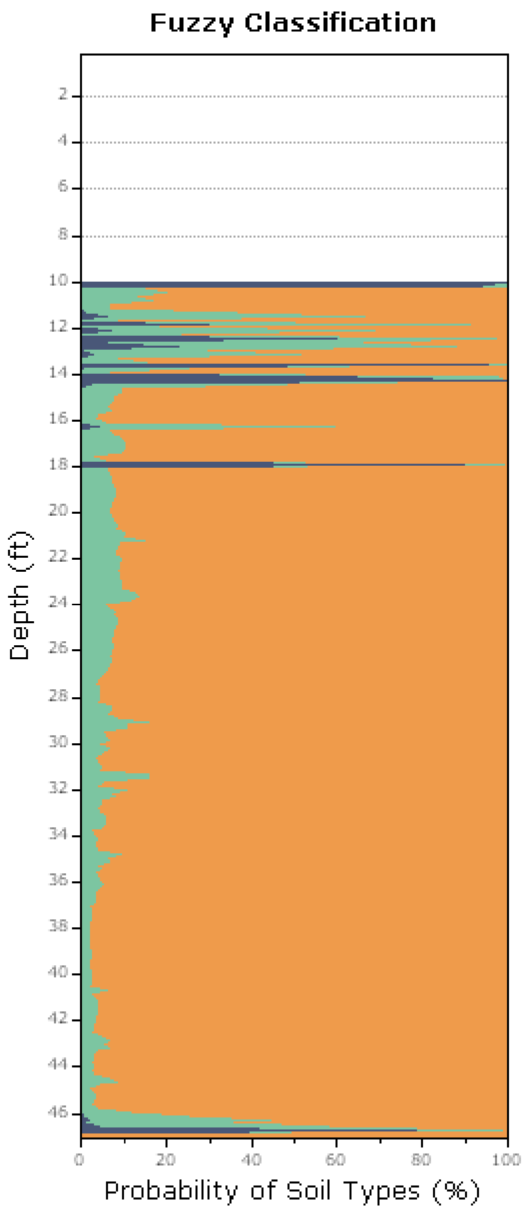


Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

Project:
Location:

CPT: CPT-3
Total depth: 47.08 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

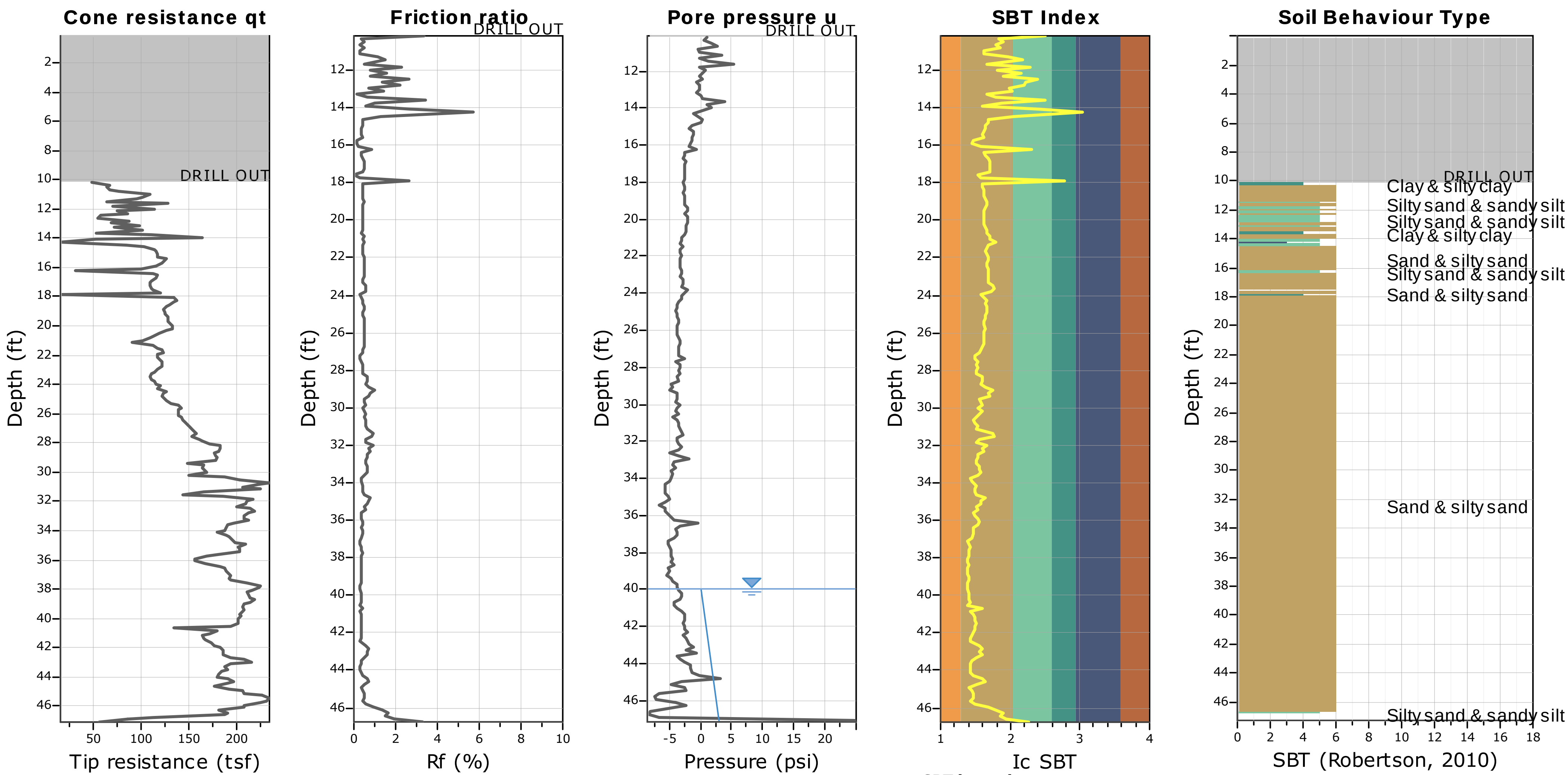




Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

Project:
Location:

CPT: CPT-3
Total depth: 47.08 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown



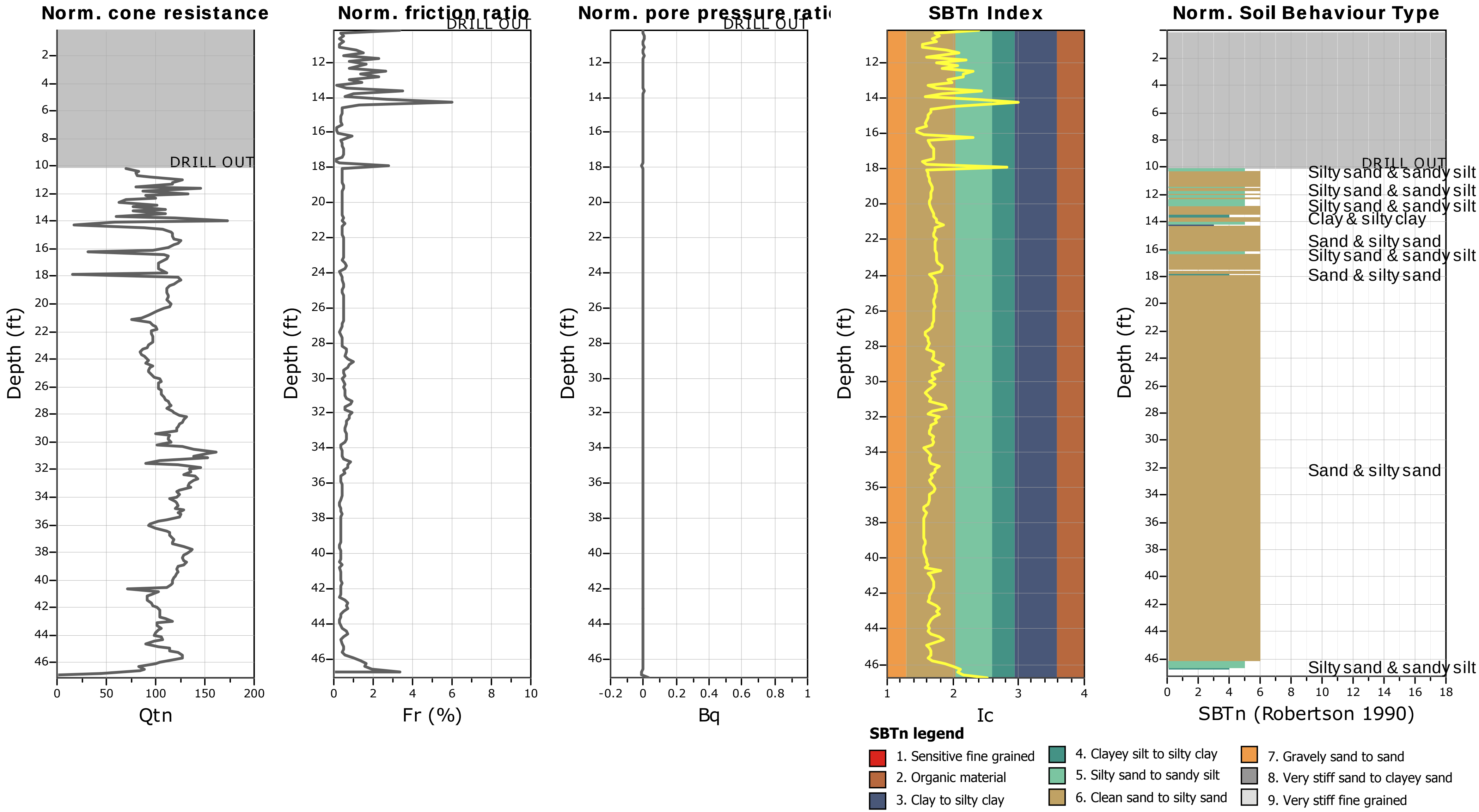
SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

Project:
Location:

CPT: CPT-3
Total depth: 47.08 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown



Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

CPT: CPT-3

Total depth: 47.08 ft, Date: 5/18/2016
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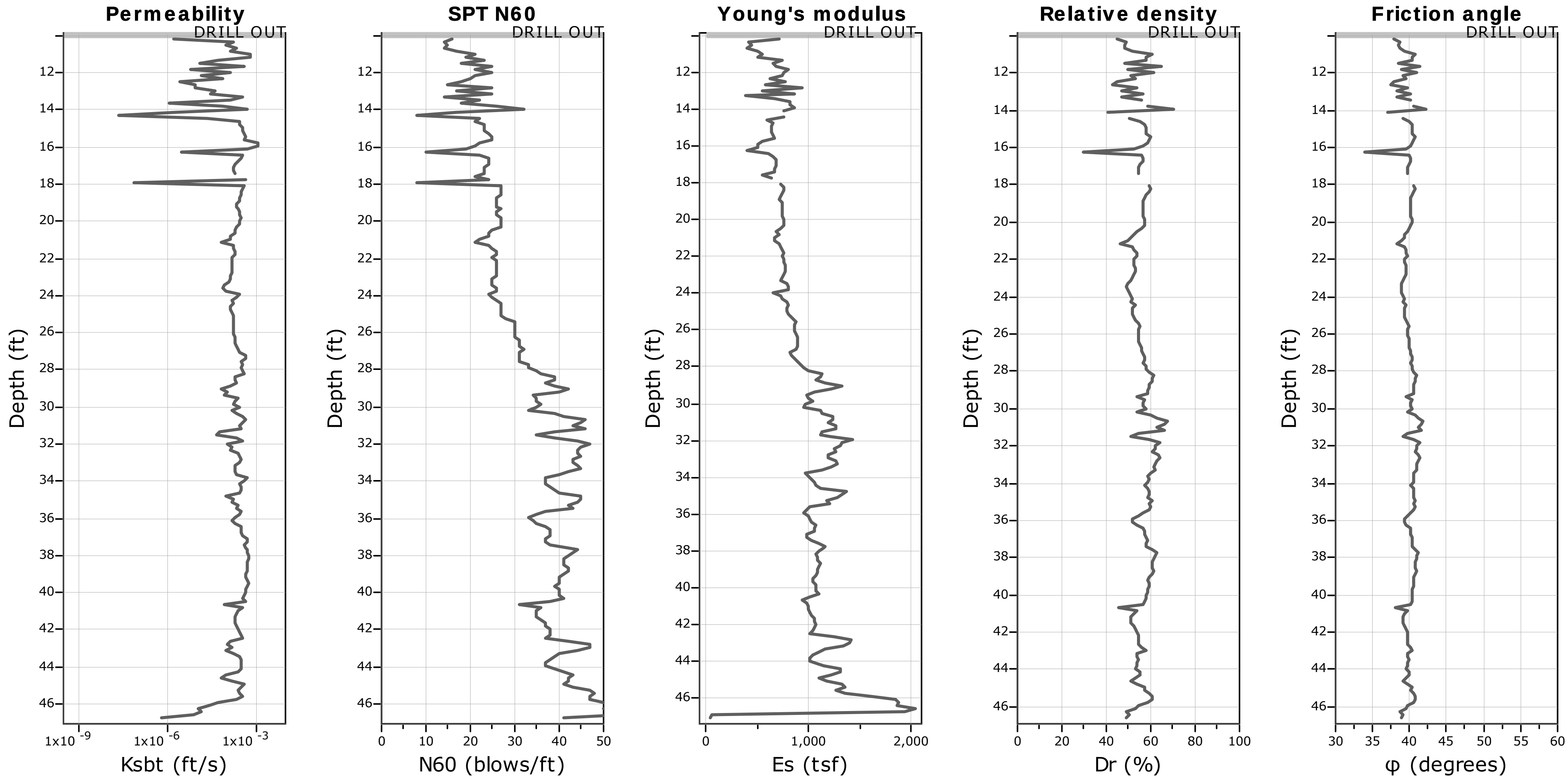
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:

Location:



Calculation parameters

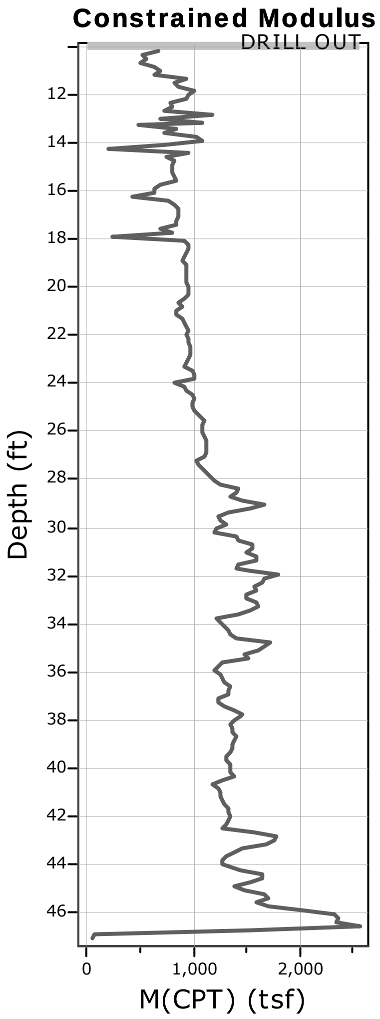
Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

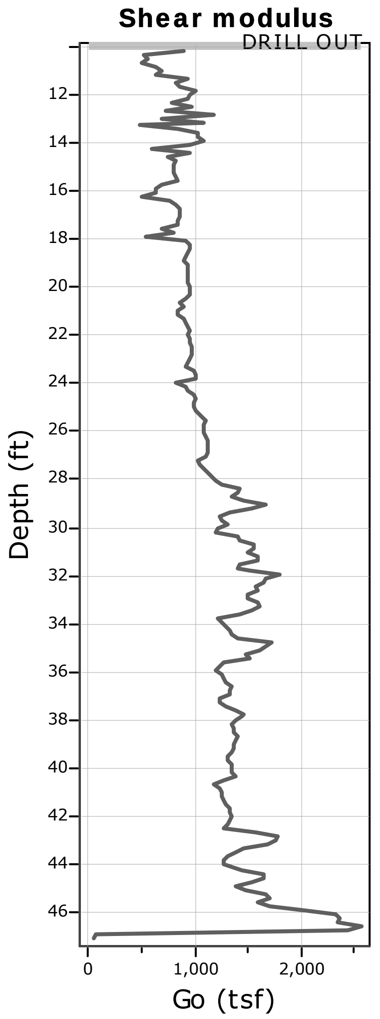
Relative desnisty constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
User defined estimation data

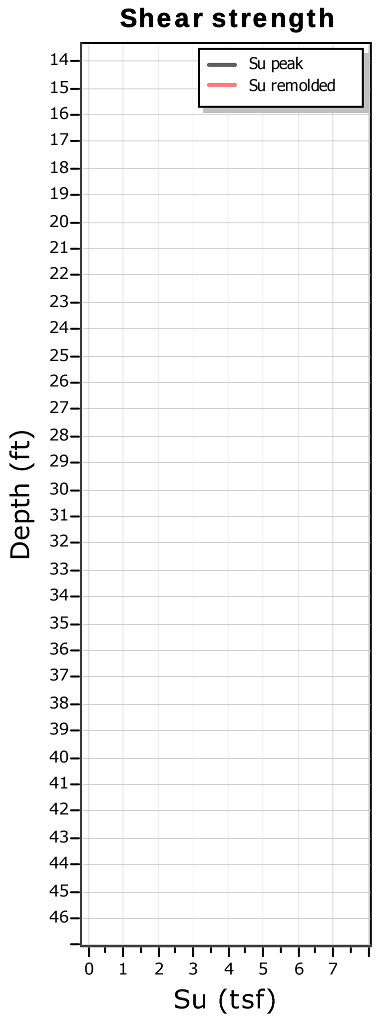
Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

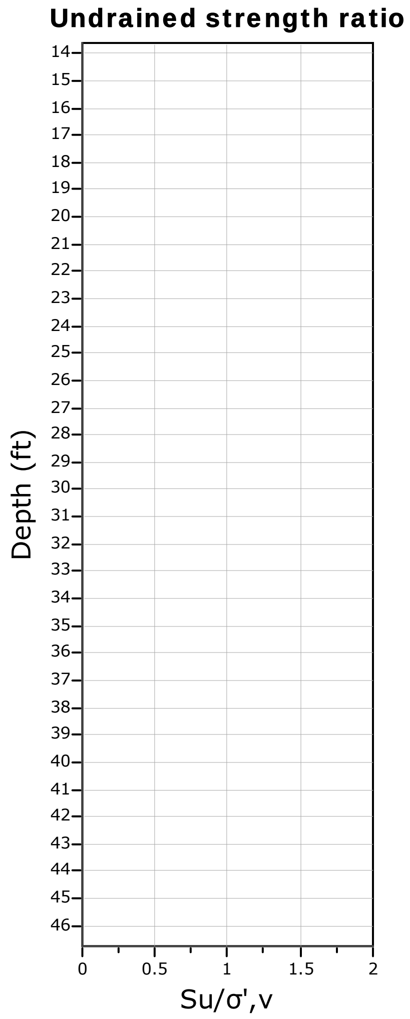
CPT: CPT-3
Total depth: 47.08 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

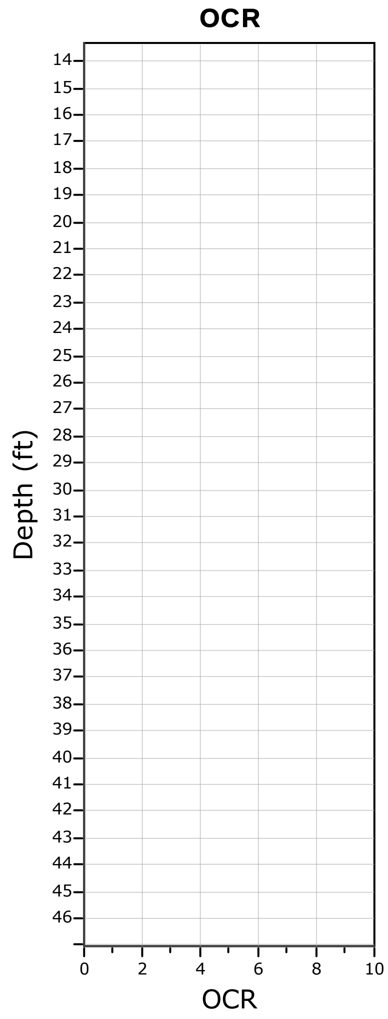
Project:
Location:











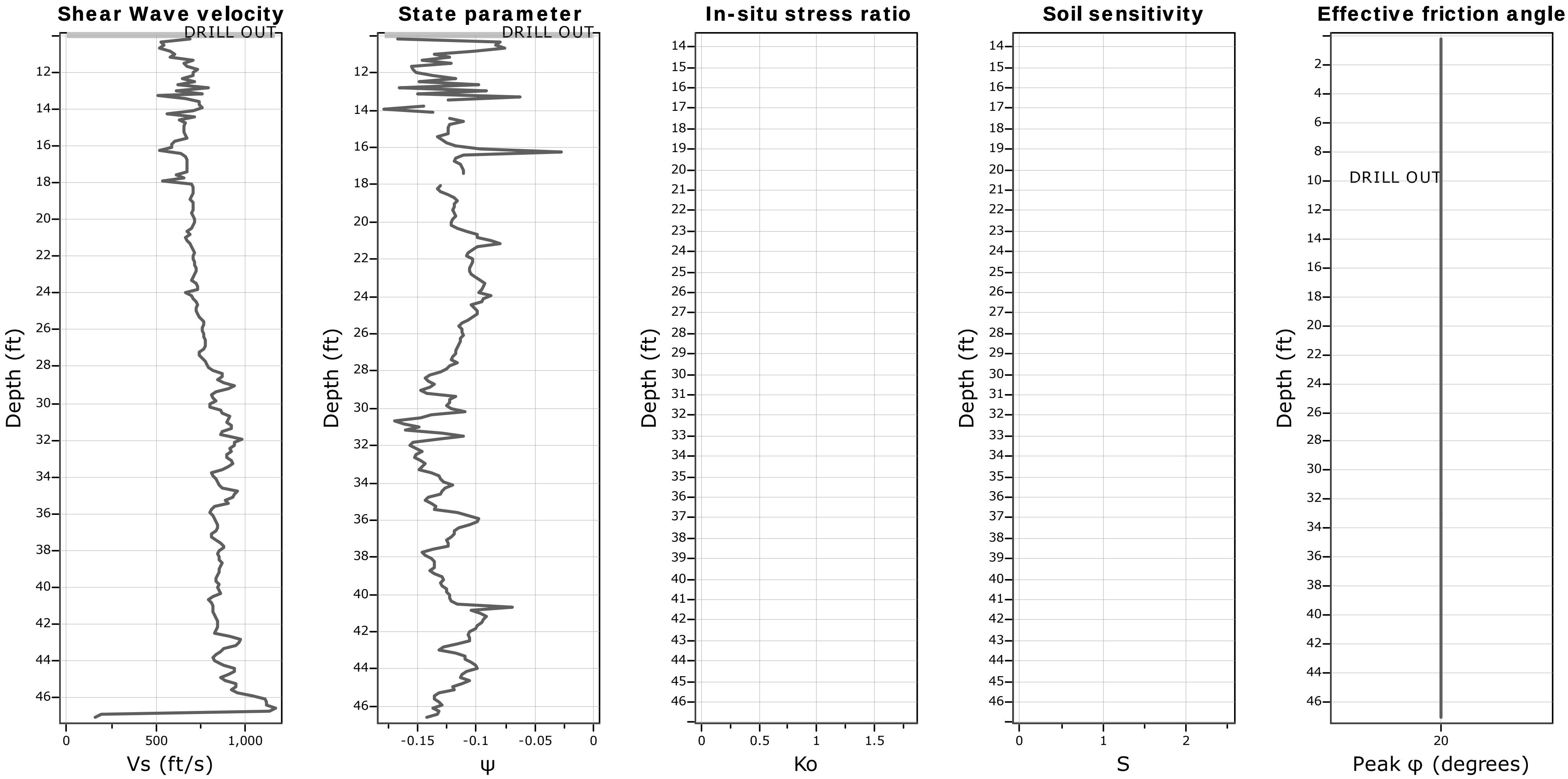
Calculation parameters
Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
User defined estimation data

Craig Geotechnical Drilling Co.,Inc.
5435 Harding Highway
Mays Landing NJ 08330

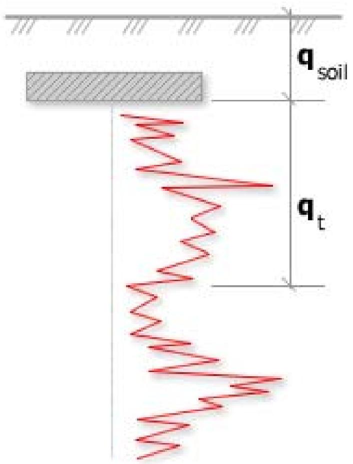
CPT: CPT-3
Total depth: 47.08 ft, Date: 5/18/2016
Surface Elevation: 0.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project:
Location:



Calculation parameters

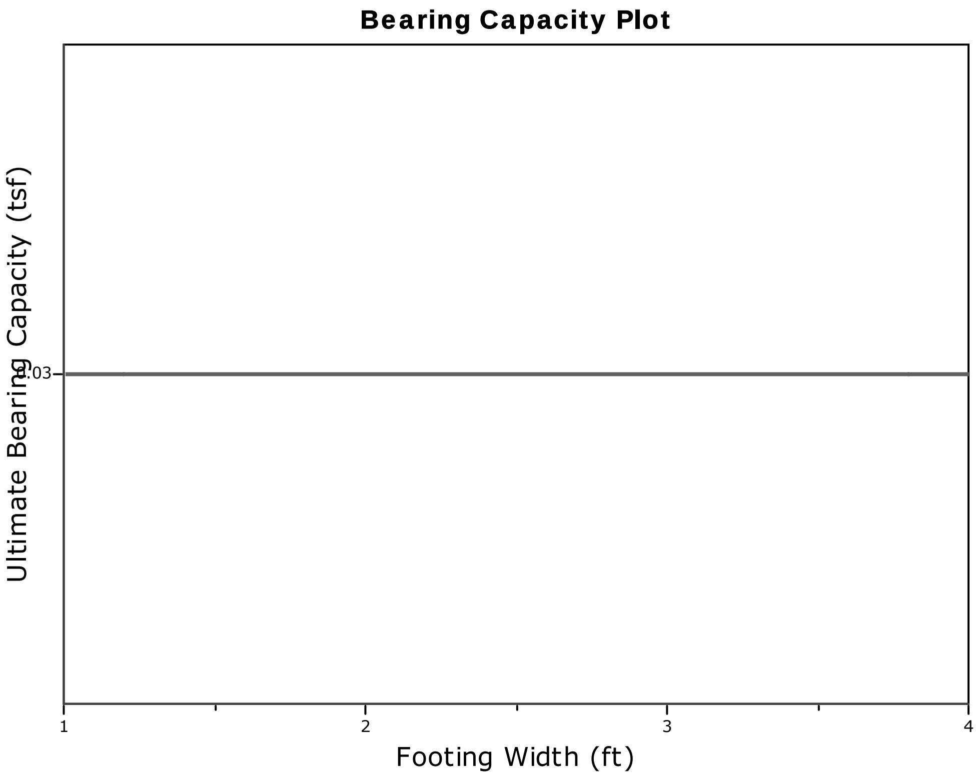
Soil Sensitivity factor, N_S: 7.00
User defined estimation data



Bearing Capacity calculation is perfromed based on the formula:

$$Q_{ult} = R_k \times q_t + q_{soil}$$

where:
R_k: Bearing capacity factor
q_t: Average corrected cone resistance over calculation depth
q_{soil}: Pressure applied by soil above footing



:: Tabular results ::

No	B (ft)	Start Depth (ft)	End Depth (ft)	Ave. q_t (tsf)	R_k	Soil Press. (tsf)	Ult. bearing cap. (tsf)
1	1.00	0.50	2.00	0.00	0.20	0.03	0.03
2	1.20	0.50	2.30	0.00	0.20	0.03	0.03
3	1.40	0.50	2.60	0.00	0.20	0.03	0.03
4	1.60	0.50	2.90	0.00	0.20	0.03	0.03
5	1.80	0.50	3.20	0.00	0.20	0.03	0.03
6	2.00	0.50	3.50	0.00	0.20	0.03	0.03
7	2.20	0.50	3.80	0.00	0.20	0.03	0.03
8	2.40	0.50	4.10	0.00	0.20	0.03	0.03
9	2.60	0.50	4.40	0.00	0.20	0.03	0.03
10	2.80	0.50	4.70	0.00	0.20	0.03	0.03
11	3.00	0.50	5.00	0.00	0.20	0.03	0.03
12	3.20	0.50	5.30	0.00	0.20	0.03	0.03
13	3.40	0.50	5.60	0.00	0.20	0.03	0.03
14	3.60	0.50	5.90	0.00	0.20	0.03	0.03
15	3.80	0.50	6.20	0.00	0.20	0.03	0.03
16	4.00	0.50	6.50	0.00	0.20	0.03	0.03

Presented below is a list of formulas used for the estimation of various soil properties. The formulas are presented in SI unit system and assume that all components are expressed in the same units.

:: Unit Weight, g (kN/m³) ::

$$g = g_w \cdot \left(0.27 \cdot \log(R_f) + 0.36 \cdot \log(\frac{q_t}{p_a}) + 1.236\right)$$

where g_w = water unit weight

:: Permeability, k (m/s) ::

$I_c < 3.27$ and $I_c > 1.00$ then $k = 10^{0.952-3.04 \cdot I_c}$

$I_c \leq 4.00$ and $I_c > 3.27$ then $k = 10^{-4.52-1.37 \cdot I_c}$

:: N_{SPT} (blows per 30 cm) ::

$$N_{60} = \left(\frac{q_c}{P_a}\right) \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

$$N_{1(60)} = Q_{tn} \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

:: Young's Modulus, Es (MPa) ::

$$(q_t - \sigma_v) \cdot 0.015 \cdot 10^{0.55 \cdot I_c + 1.68}$$

(applicable only to $I_c < I_{c\_cutoff}$)

:: Relative Density, Dr (%) ::

$$100 \cdot \sqrt{\frac{Q_{tn}}{k_{DR}}}$$

(applicable only to SBT_n: 5, 6, 7 and 8 or $I_c < I_{c\_cutoff}$)

:: State Parameter, ψ ::

$$\psi = 0.56 - 0.33 \cdot \log(Q_{tn,cs})$$

:: Peak drained friction angle, φ (°) ::

$$\varphi = 17.60 + 11 \cdot \log(Q_{tn})$$

(applicable only to SBT_n: 5, 6, 7 and 8)

:: 1-D constrained modulus, M (MPa) ::

If $I_c > 2.20$

$\alpha = 14$ for $Q_{tn} > 14$

$\alpha = Q_{tn}$ for $Q_{tn} \leq 14$

$M_{CPT} = \alpha \cdot (q_t - \sigma_v)$

If $I_c \leq 2.20$

$M_{CPT} = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$

:: Small strain shear Modulus, Go (MPa) ::

$$G_0 = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Shear Wave Velocity, Vs (m/s) ::

$$V_s = \left(\frac{G_0}{\rho}\right)^{0.50}$$

:: Undrained peak shear strength, Su (kPa) ::

$N_{kt} = 10.50 + 7 \cdot \log(F_r)$ or user defined

$$S_u = \frac{(q_t - \sigma_v)}{N_{kt}}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Remolded undrained shear strength, Su(rem) (kPa) ::

$S_{u(rem)} = f_s$ (applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Overconsolidation Ratio, OCR ::

$$k_{OCR} = \left[\frac{Q_{tn}^{0.20}}{0.25 \cdot (10.50 \cdot +7 \cdot \log(F_r))}\right]^{1.25}$$ or user defined

$$OCR = k_{OCR} \cdot Q_{tn}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: In situ Stress Ratio, Ko ::

$$K_O = (1 - \sin\varphi') \cdot OCR^{\sin\varphi'}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Soil Sensitivity, S_t ::

$$S_t = \frac{N_S}{F_r}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Effective Stress Friction Angle, φ' (°) ::

$$\varphi' = 29.5° \cdot B_q^{0.121} \cdot (0.256 + 0.336 \cdot B_q + \log Q_t)$$

(applicable for $0.10<B_q<1.00$)

References

• Robertson, P.K., Cabal K.L., Guide to Cone Penetration Testing for Geotechnical Engineering, Gregg Drilling & Testing, Inc., 5th Edition, November 2012

• Robertson, P.K., Interpretation of Cone Penetration Tests - a unified approach., Can. Geotech. J. 46(11): 1337–1355 (2009)

APPENDIX D

Executive Summary from Roux Remedial Investigation Report,
dated September 2016 and associated Monitoring Well Records

ASIAN AMERICANS FOR EQUALITY (AAFE)

QUEENS, NEW YORK

Remedial Investigation Report

OER Project Number: 16EH-N284Q

Prepared for:

Asian Americans for Equality (AAFE)

133-04 39th Avenue

Queens, New York 11368

Kamran@praxismanagementservices.com

Prepared by:

Roux Associates, Inc.

209 Shafter Street

Islandia, New York 11719

mroux@rouxinc.com

631-232-2600

September 2016

EXECUTIVE SUMMARY

The Remedial Investigation Report ("RIR") provides sufficient information for establishment of remedial action objectives, evaluation of remedial action alternatives, and selection of a remedy pursuant to RCNY§ 43-1407(f). The remedial investigation ("RI") described in this document is consistent with applicable guidance.

Site Location and Current Usage

The Site is located at 133-04 39th Ave in the Flushing section of Queens, New York and is identified as Block 4973 and Lot 6 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 13,399-square feet and is bounded by 39th Avenue to the north; a gasoline service station to the south; a three story mini-mall containing hair salons, accounting offices, an ink stamp and trophy store, and other offices to the east; and College Point Boulevard to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is vacant and scheduled for demolition, however, it was used for a community center and wedding studio as recently as the Spring of 2016. The Site is developed with an asphalt-paved parking lot and a one-story cinderblock structure on a concrete slab with a flat roof.

Summary of Proposed Redevelopment Plan

The proposed future use of the Site will consist of the demolition of all current structures and construction of a new, seven-story, mixed-use building that will include community space, office "incubators," and offices for Asian Americans for Equality ("AAFE"). The building footprint is almost the entire property dimensions. The remaining space will be a concrete apron in front of the building along 39th Street. The new building includes two levels of basement that are both underground parking. The basement will extend to a depth of 22 feet below ground surface ("bgs") resulting in approximately 16,000 tons of soil excavation. The basement levels will encompass the entire property dimensions. The basement will be above the groundwater table. Layout of the proposed site development is presented in Appendix A. The current zoning designation is C4-2.

Summary of Past Uses of Site and Areas of Concern

Based on information presented in a 2002 Phase I Environmental Site Assessment prepared by G.C. Environmental, Inc., the site was previously developed with a three-story residential building from years 1892-1951. As of 1951, the Site was developed with the current existing one-story building and was used as a furniture warehouse as well as an automotive garage. A copy of the Phase I is included in Appendix B. No specific areas of concern were observed during any of the inspections.

Summary of the Work Performed under the Remedial Investigation

Roux Associates, Inc., on behalf of AAFE performed the following scope of work:

1. Conducted a Site inspection to identify areas of concern ("AOCs") and physical obstructions (i.e. structures, buildings, etc.);

2. Installed eight soil borings across the entire project Site and collected sixteen soil samples for chemical analysis from the soil borings to evaluate soil quality;

3. Installed three groundwater monitoring wells throughout the Site to establish groundwater flow and collected three groundwater samples for chemical analysis to evaluate groundwater quality; and

4. Installed five soil vapor probes around Site perimeter and collected five samples for chemical analysis.

Summary of Environmental Findings

1. Elevation of the property ranges from approximately 40 to 45 feet above mean sea level.

2. Depth to groundwater ranges from 35 to 39 feet below ground surface at the Site.

3. Groundwater flow is generally from east/southeast to west/northwest beneath the Site.

4. Bedrock was not encountered at the Site.

5. The stratigraphy of the site, from the surface down, consists of 1 to 8 feet of fill underlain by sand and silt with lesser amounts of gravel, clay, and cobbles. Varying amounts of clay was observed with most of the northeast corner of the property below 20 feet being clay.

6. Analytical results were compared to NYSDEC 6NYCRR Part 375-6.8 Unrestricted Use Soil Cleanup Objectives (SCOs) and Restricted Commercial Use SCOs. Soil/fill samples collected during the RI showed one volatile organic compound, trichloroethylene (maximum concentration of 78,000 µg/kg), exceeding Unrestricted Use SCOs. SVOCs were not detected in any of the soil samples. Five metals, including chromium (max. 40 mg/kg), manganese (max. 1,700 mg/kg), mercury (max. 0.28 mg/kg), nickel (max. 95 mg/kg), and zinc (max. 3,100 mg/kg), were detected above Unrestricted Use SCOs. The metals arsenic (max. 22 mg/kg), copper (max. 640 mg/kg), and lead (max. 1,300 mg/kg) were detected above Restricted Commercial Use SCOs within two shallow soil samples. Several other metals were detected at trace concentrations. Two pesticides including 4,4-DDE (max. 4.75 µg/kg) and 4,4-DDT (max. 6.64 P µg/kg) were detected slightly exceeding Unrestricted Use SCOs. Soil boring location RXSB-2 is identified as a shallow

hotspot for TCE. Overall, soil chemistry is consistent with data found at sites with shallow urban fill material and does not indicate any disposal of hazardous materials.

7. Groundwater sample results were compared to New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). Groundwater samples collected during the RI showed one detection of trichloroethylene in the northeast corner of the site (14 micrograms per liter) that exceeded its respective GQS. In addition, and in comparison to 11 total metals in groundwater above standards, only one dissolved metal, manganese (max. 4,630 µg/L), was detected at the site above GQS. No other compounds were detected above standards.

8. Soil vapor samples collected during the RI were compared to the compounds listed in New York State Department of Health (NYSDOH) Vapor Intrusion Matrices. Soil vapor samples collected during the RI showed that 24 of 63 VOCs analyzed were detected in soil vapor including chlorinated solvents and petroleum related compounds. In comparison to NYSDOH Guidance, assessment of results can only definitively say that action could be required for locations primarily on the north side of the site, where the concentration of trichloroethylene (max. 147 $\mu g/m^3$) was within the monitoring level ranges established by the State DOH soil vapor guidance matrix. Elsewhere on the site, chlorinated VOCs including 1,1,1-trichoroethane (max. 1.25 $\mu g/m^3$), carbon tetrachloride (max. 4.83 $\mu g/m^3$), and tetrachloroethylene (max. 161 $\mu g/m^3$) were detected in soil vapor. Petroleum-related VOCs (BTEX) were detected at a maximum concentration of 135 $\mu g/m^3$.

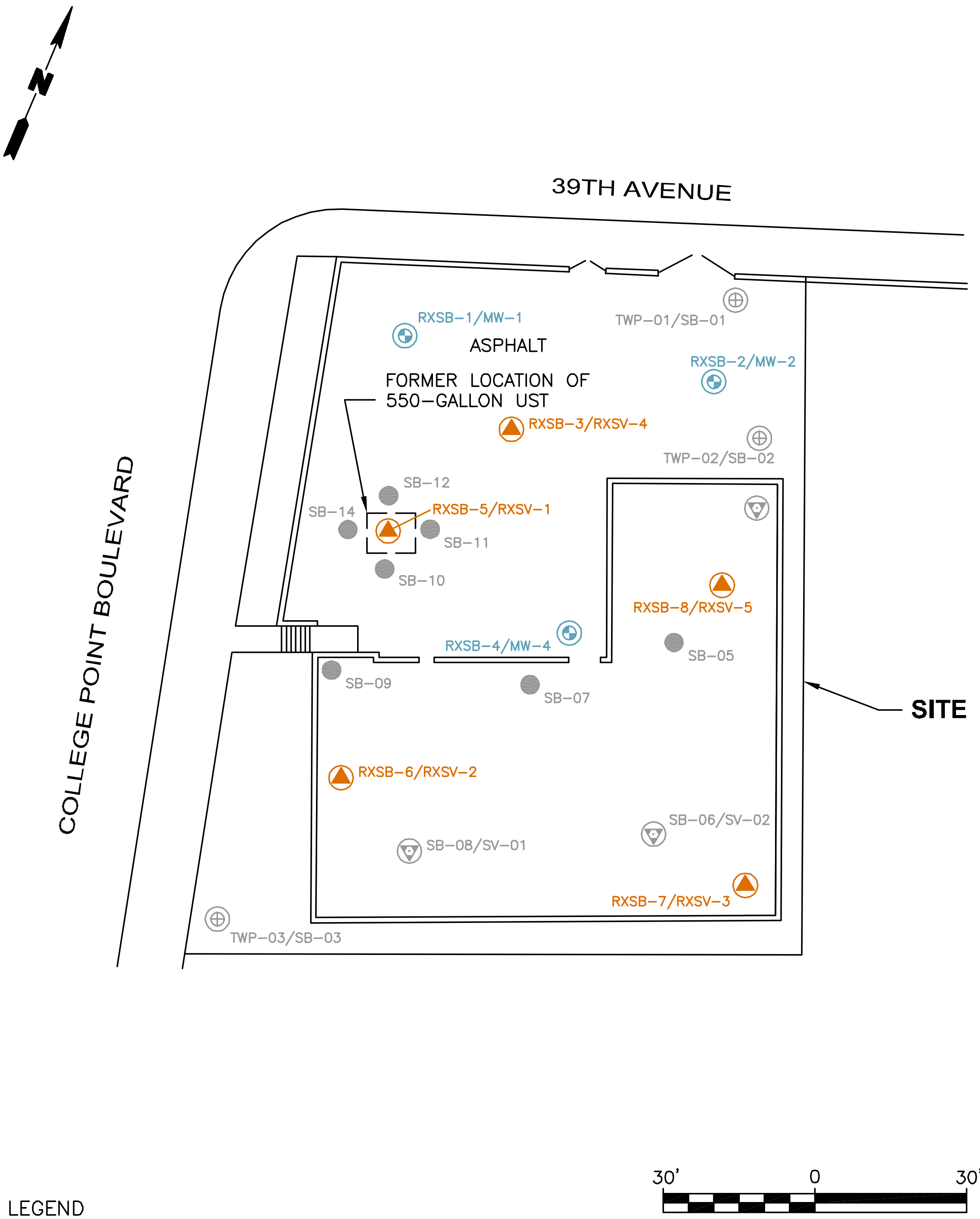
Table 1. Summary of Water Levels, AAFE Multi-Use Building, Queens, New York

Well Designation	Elevation of Measuring Point (ft amsl)		06/07/16 Depth To Water (ft bmp)	06/07/16 Water Table Elevation (ft amsl)	06/15/16 Depth To Water (ft bmp)	06/15/16 Water Table Elevation (ft amsl)
MW-1	44.09		-	-	35.06	9.03
MW-2	44.75		-	-	36.48	8.27
MW-4	45.50		-	-	35.80	9.70

Well Designation	Elevation of Ground Surface (ft amsl)	06/07/16 Depth To Water (ft bgs)	06/07/16 Water Table Elevation (ft amsl)	06/15/16 Depth To Water (ft bgs)	06/15/16 Water Table Elevation (ft amsl)
MW-1	44.37	34.95	9.42	-	-
MW-2	45.29	39.75	5.54	-	-
MW-4	45.81	36.10	9.71	-	-

NOTES:

- - Not measured
amsl - above mean sea level
bmp - below measuring point
bgs - below ground surface
ft - feet



LEGEND

◉	GROUNDWATER AND SOIL SAMPLING LOCATION AND DESIGNATION
▲	SOIL VAPOR AND SOIL SAMPLING LOCATION AND DESIGNATION
●	FORMER SOIL BORING SAMPLE LOCATION
⊕	FORMER SOIL BORING AND TEMPORARY WELL POINT SAMPLE LOCATION
▽	FORMER SOIL BORING AND SUB-SLAB VAPOR SAMPLE LOCATION

Title:

SAMPLING LOCATIONS

FLUSHING MIXED-USE BUILDING
133-04 39TH AVENUE
FLUSHING, NEW YORK 11354

Prepared For:

ASIAN AMERICANS FOR EQUALITY

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

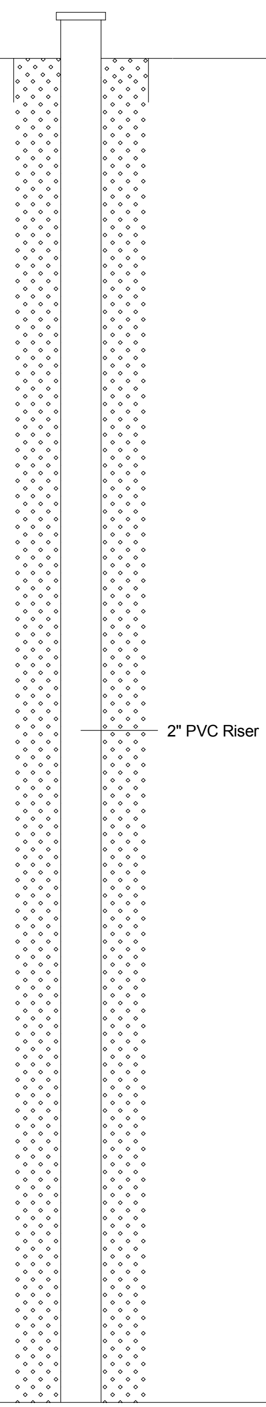
Compiled by: R.H.	Date: 20JUN16	FIGURE
Prepared by: J.A.D.	Scale: AS SHOWN	2
Project Mgr: M.R.	Project: 2741.0001Y000	
File: 2741.0001Y101.01.DWG		

V:\CAD\PROJECTS\2741Y\0001Y\101\2741.0001Y101.01.DWG

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management
209 Shafter Street
Islandia, NY 11749
Telephone: (631) 232-2600
Fax: (631) 232-9898

WELL CONSTRUCTION LOG

WELL NO. **RXSB-1/MW-1**	NORTHING **Not Measured**	EASTING **Not Measured**		
PROJECT NO./NAME **2741.0001Y / AAFE - Flushing MultiUse**		LOCATION **133-04 39th Ave Queens, NY**		
APPROVED BY **M. Roux**	LOGGED BY **M. Diggory**			
DRILLING CONTRACTOR/DRILLER **ADT / CM**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **/ Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **6/6/16-6/7/16**
CASING MAT./DIA. **PVC / 1-inch**	SCREEN: TYPE **Slotted**	MAT. **PVC**	TOTAL LENGTH **10.0**ft DIA. **1-inch**	SLOT SIZE **10-Slot**
ELEVATION OF: (Feet ABOVE Site Datum)	GROUND SURFACE **44.09**	TOP OF WELL CASING	TOP & BOTTOM SCREEN **14.1 / 4.1**	GRAVEL PACK SIZES **#1 Sand**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0	Asphalt.			Handcleared to 5 ft bls.; sample 'RXSB-1/0-2' collected
	Dark brown; fine SAND and SILT; some F-M Sand; little Gravel; trace Brick; moist (Fill)		3.1	
			2.0	
5	Brown; F-M SAND; little Silt; trace Gravel; moist (SP-SM)		1.2	3 foot recovery.
			1.7	
10	Brown; FMC SAND; little Silt, Gravel, Clay; moist (SW-SM)		1.1	3.5 foot recovery
			1.2	
			0.9	
15			2.0	4 foot recovery
			3.3	
			3.5	
			3.0	
20	Brown; FMC SAND; little Silt, Gravel, Clay; moist; broken large Gravel/small Cobble in top of sleeve; clumps of Clay observed; 1 to 2 inch thick red-brown layer near ~24ft (SW-SC)		3.5	2 foot recovery; sample 'RXSB-1/22-24' collected
			2.1	
25				

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WELL CONSTRUCTION LOG

WELL NO.	NORTHING	EASTING
RXSB-1/MW-1	**Not Measured**	**Not Measured**
PROJECT NO./NAME		LOCATION
2741.0001Y / AAFE - Flushing MultiUse		**133-04 39th Ave Queens, NY**
APPROVED BY	LOGGED BY	
M. Roux	**M. Diggory**	

Depth, feet	Well Construction	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
25–30	Bentonite Seal; 2" PVC Riser	Brown; FMC SAND; little Silt, Gravel, Clay; moist (SW-SM)		0	1.5 foot recovery
30–33.5	10 ft of 2" diameter, 0.10 slot PVC screen	Brown; FM SAND and SILT; little fine Gravel; trace broken Cobbles; moist; at 30.5 and 33.5 there were 0.3' layers of brown Clay; trace fine Gravel; moist (SM)		2.8, 3.3, 3.1	5 foot recovery
33.5–39	GROUND WATER LEVEL 6/7/16; GROUND WATER LEVEL 6/15/16 (at 35)	Brown; CMF SAND; little Silt; trace fine Gravel; wet (SW)		0, 0, 2.6, 3.3	5 foot recovery, set temporary well MW-1 at 40 ft bls (from 35)
39–40		gray; dense CLAY; moist (CH)		3.4	

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WELL CONSTRUCTION LOG

WELL NO. **RXSB-2/MW-2**	NORTHING **Not Measured**	EASTING **Not Measured**
PROJECT NO./NAME **2741.0001Y / AAFE - Flushing MultiUse**		LOCATION **133-04 39th Ave Queens, NY**
APPROVED BY **M. Roux**	LOGGED BY **M. Diggory**	
DRILLING CONTRACTOR/DRILLER **ADT / CM**		GEOGRAPHIC AREA
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **/ Geoprobe**
SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **6/7/16-6/7/16**	
CASING MAT./DIA. **PVC / 1-inch**	SCREEN: TYPE **Slotted** MAT. **PVC** TOTAL LENGTH **10.0**ft DIA. **1-inch** SLOT SIZE **10-Slot**	
ELEVATION OF: (Feet ABOVE Site Datum) GROUND SURFACE **44.75**	TOP OF WELL CASING	TOP & BOTTOM SCREEN **9.8 / -0.3**
GRAVEL PACK SIZES **#1 Sand**		

2" PVC Riser

Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0	Asphalt			Handcleared to 5 ft bls.; soil sample 'RXSB-2/0-2' collected
	gray; CMF SAND and sand-sized Slag; some fine Gravel, fine gravel-sized Slag; trace Silt; moist (Fill)		0.2	
5	Brown; fine SAND and SILT; little Clay; moist (SM)		1.2	4 foot recovery; soil sample 'RXSB-2/5-7' collected
	Brown; CMF SAND; little Silt, F-C Gravel; trace Clay; moist (SW-SM)		1.0	
10	Brown; F-M SAND; trace Silt, fine Gravel; moist (SP)		0.0 1.5 2.4	4 foot recovery
15	Brown; fine SAND and SILT; trace Clay, fine Gravel; moist (SP-SM)		2.8 1.6	4 foot recovery
	Brown; SILT and CLAY; moist (CL-ML)		1.8	
20	Brown; F-M SAND and SILT; trace Gravel; moist (SP-SM)			5 foot recovery; soil sample 'RXSB-2/22-24' collected
	Light brown; fine SAND and SILT; little Clay; moist (SP-SM)		3.8	
25	increasing amounts of Clay, at 25' grey CLAY (CL-ML)		0.0	

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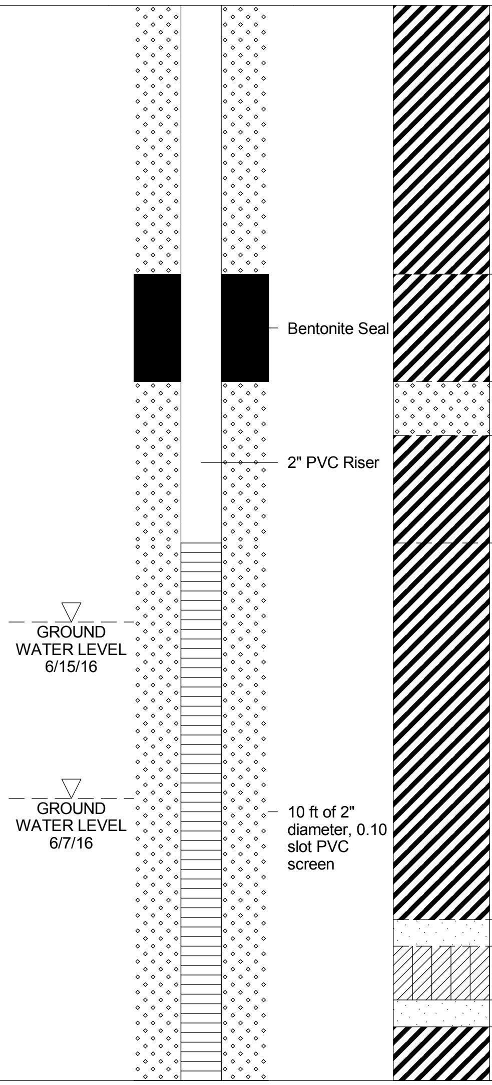
WELL CONSTRUCTION LOG

WELL NO.	NORTHING	EASTING
RXSB-2/MW-2	**Not Measured**	**Not Measured**
PROJECT NO./NAME: **2741.0001Y / AAFE - Flushing MultiUse**		LOCATION: **133-04 39th Ave Queens, NY**
APPROVED BY: **M. Roux**	LOGGED BY: **M. Diggory**	



Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
25–30	Grey-brown; CLAY; moist (CH)		2.5, 3.6, 3.4	5 foot recovery
30–32	Grey-brown; CLAY; moist (CH)		1.4	5 foot recovery
32–33	Orange; CMF SAND; trace Silt; moist (SW)		1.4	
33–35	Grey; CLAY; moist (CH)		0	
35–42	Dark grey; CLAY; moist (CH)		0.1, 1.2	5 foot recovery; 5 foot recovery; set bottom of well at 45 ft bls
42–42.5	Orange; F-M SAND; trace Gravel; moist (SP)		0.9	
42.5–43.5	Dark grey; CLAY with brown SILT; moist (CL-ML)			
43.5–44	Light brown; F-M SAND; trace fine Gravel; moist (SP)		2.2	
44–45	Dark grey; CLAY; moist (CH)			

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WELL CONSTRUCTION LOG

WELL NO. **RXSB-4/MW-4**	NORTHING **Not Measured**	EASTING **Not Measured**		
PROJECT NO./NAME **2741.0001Y / AAFE - Flushing MultiUse**		LOCATION **133-04 39th Ave Queens, NY**		
APPROVED BY **M. Roux**	LOGGED BY **M. Diggory**			
DRILLING CONTRACTOR/DRILLER **ADT / CM**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **/ Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **6/6/16-6/6/16**
CASING MAT./DIA. **PVC / 1-inch**	SCREEN: TYPE **Slotted**	MAT. **PVC**	TOTAL LENGTH **10.0**ft DIA. **1-inch**	SLOT SIZE **10-Slot**
ELEVATION OF: (Feet ABOVE Site Datum) GROUND SURFACE **45.50**	TOP OF WELL CASING	TOP & BOTTOM SCREEN **10.5 / 0.5**	GRAVEL PACK SIZES **#1 Sand**	

Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0	Dark brown; fine SAND and SILT, some MC Sand; little Gravel; trace Brick, asphalt, and cobble; moist (FILL)			Handcleared to 5 ft bls.; sample 'RXSB-4/0-2' collected
2	Dark brown, M-C SAND; some fine Sand and Silt, Gravel, and Cobble; little Brick; moist (FILL)		0	
4	Dark brown; M-C SAND; some fine Sand, Silt, Gravel, Cobble; little Brick; moist (FILL)			
5	Dark brown; F-M SAND; some fine Sand, Silt; little Gravel, Brick; moist (FILL)			4.5 foot recovery.
8	Light brown; fine SAND; some Silt; trace Clay; moist (SM)		0	
10	Dark brown; M-C SAND with GRAVEL; some F-M Sand; trace Silt; moist (SPG)		2.2	2 foot recovery
15	Light brown; F-M SAND; trace fine Sand, Gravel; moist (SP)		0	2 foot recovery
20	Light brown to light gray; Medium SAND; some fine Sand; little coarse Sand; trace Gravel; moist (SP)		2.2	4.5 foot recovery; sample 'RXSB-4/22-24' collected
25				

2" PVC Riser

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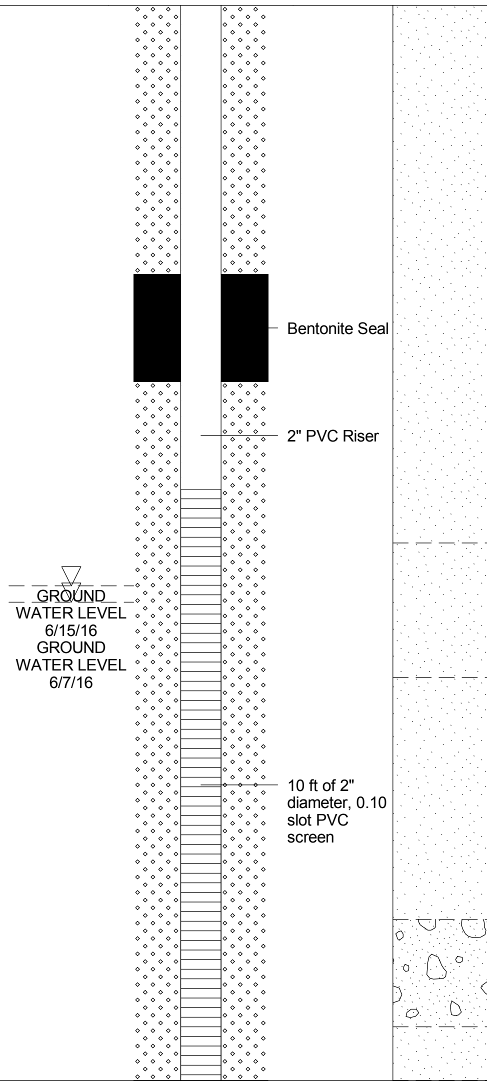
WELL CONSTRUCTION LOG

WELL NO.	NORTHING	EASTING
RXSB-4/MW-4	**Not Measured**	**Not Measured**
PROJECT NO./NAME **2741.0001Y / AAFE - Flushing MultiUse**		LOCATION **133-04 39th Ave** **Queens, NY**
APPROVED BY **M. Roux**	LOGGED BY **M. Diggory**	



Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Light brown to light gray; Medium SAND; some fine Sand; little coarse Sand; trace Gravel; moist (SP) *(continued)*		0	4 foot recovery
30			0	
35	Dark brown; F-M SAND; little coarse Sand; trace Gravel; wet (SP)		0	4 foot recovery; apparent water table at 37 ft bls; staining and odor from 37.5 ft bls
	Dark gray; F-M SAND; little coarse Sand; trace Gravel; wet; staining; odor (SP)		258	
40			162	4 foot recovery; staining and odor apparent through to 42 ft bls
	Dark brown; M-C SAND with GRAVEL; little fine Sand; wet (SPG)		0	
	Greyish brown; F-M SAND; trace Gravel; wet (SP)		17.4	
45				set temporary well MW-4 at 45 ft bls