Addendum 1-March 24, 2025: WCNCC RFQ for Special Inspections and Material Testing

Questions:

1. Request for a Statement of Special Instructions: **Provided in attached email and document.**

2. Does your 10-page limit include resumes of key personnel. Normally, 1-page each resume is allowed as Appendix item outside the page limit. However, if they are all inclusive, we may be able to include staff matrix and/or paragraph resumes. Will that be OK? **Resumes can be included in the appendix.**

3. Local Preference: Kindly define `Local'. We are operating from RTP and working on several projects in the Piedmont-Triad market. Will you consider Triangle/RTP/Durham/Wake Counties as local. This will attract lot of talent for your projects. **Local preference is limited to only Guilford County per the appendix in the RFQ.**

4. Is double sided printing a requirement or preference or a recommendation. Sometimes double sided printing is inconvenient for readers. **Double sided is at the discretion of the firm.**

5. Where will we find your addendum addressing questions and updates. **Email and online**

6. Any change in closing date. **No**

1 **City of Greensboro – SPECIAL INSPECTION AND TESTING AGREEMENT & STATEMENT OF SPECIAL INSPECTIONS**
Submit with Permit Application **(7 pages)**

City Staff Enter: Plan Tracking Number: 20___-_____ Primary Bldg Permit Number _____

PROJECT NAME & ADDRESS:	Windsor Chavis Nocho Community Complex
REGISTERED DESIGN PROFESSIONAL OF RECORD:	Victor Vines, AIA, LEED AP, Principal Vines Architecture Architect #7223
SPECIAL INSPECTOR: (firm and registered professional in charge)	To Be Selected by City of Greensboro
PROJECT OWNER:	City of Greensboro Shawna Tillery
CONTRACTOR / PERMIT HOLDER:	Samet Corporation Scott Robinson

CODE REQUIREMENTS:

As a condition for permit issuance, the permit applicant shall submit a Statement of Special Inspections prepared by the Registered Design Professional in responsible charge in accordance with the North Carolina Administrative Code and Policies. This statement shall include a list of materials and work requiring special inspections, the inspections to be performed, and a list of the individuals, approved agencies or firms intended to be retained for conducting such inspections. (NCBC Section 1704.1.1)

The Owner shall employ one or more special inspectors to provide inspections during construction on the types of work listed in accordance with Section 1704.2 of the North Carolina Building Code and identify the approved agencies to the building official. These inspections are in addition to the inspections specified in the North Carolina Administrative Code and Policies. (NCBC Section 1704.2)

Special Inspections shall be performed by a North Carolina registered design professional or an inspector (field technician) under his responsible charge. (NCAC Section 107.5)

An approved special inspections agency shall be objective, competent and independent from the contractor responsible for the work being inspected. (NCBC Section 1703.1.1) The registered design professional in charge and engineers of record are permitted to act as the approved agency. (NCBC Section 1704.2.1)

Special Inspectors shall keep records of inspections, and shall furnish inspection reports to the Building Official and to the Registered Design Professional in responsible charge. Reports shall indicate whether work inspected was or was not completed in conformance to the approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If they are not corrected, the discrepancies shall be brought to the attention of the building official and the Registered Design Professional in responsible charge prior to completion of that phase of the work. (NCBC Section 1704.2.4)

A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted to the Building Official prior to approval of the final inspection and issuance of the Certificate of Occupancy. (NCBC Section 1704.2.4) The final report shall include a statement by the special inspector that the work so inspected is in compliance with the applicable code, as required by NC General Statute 160A-413.5.(a)(3).

ADDITIONAL REQUIREMENTS:

General: A pre-construction conference with the parties involved may be required in order to review the special inspections requirements and procedures. A list of all proposed inspectors and field technicians listing their qualifications shall be included in the attached Schedule of Special Inspections. Each special inspector may be subject to a personal interview for prequalification. Special inspectors and their staff shall display approved identification when performing special inspection duties.

Duties and Responsibilities of the Special Inspector:

Pre-Construction Design Review - The special inspector shall review all plans, specifications, and applicable code requirements for the project with the contractor and the architect/engineer of record. Any addendums, modifications, or changes to the plans or specifications shall be forwarded to the special inspector after Development Services approval and prior to the work beginning.

Inspect Work – The special inspector shall inspect the work for conformance with the Development Services Division approved design documents and applicable provisions of the NC Building Code. Architect/engineer reviewed shop drawings and/or erection drawings may be used only as an aid to inspection. Special inspections are to be performed on a continuous basis, meaning that the special inspector is on site in the general area at all times when the work requiring special inspections is in progress, except for items in the applicable inspection table that allow periodic inspections.

Furnish Daily Reports – On request, each special inspector shall complete and sign both the special inspection record and the daily report form for each day's inspections. These documents are to remain at the job site with the contractor for review by the Development Services Division inspector.

Furnish Weekly Reports – The special inspector or inspection agency shall furnish weekly reports of tests and inspections directly to the Development Services Division inspector, architect, and engineer of record, and others as designated. These reports must include the following:

- Description of daily inspections and tests made and locations;
- Listing of all non-conforming items;
- Report on how non-conforming items were resolved or unresolved as applicable; and
- Itemized changes authorized by the architect, engineer or Development Services inspector, if not included in non-conformance items.

Furnish a Final Report – as required by NC Building Code Section 1704.2.4 and NC General Statute 160A-413.5.(a)(3).

Contractor Responsibilities:

Notify the Special Inspector – The contractor is responsible for notifying the special inspector or agency regarding individual inspections listed on the attached schedule, or required by the Development Services Division inspector. Adequate notice shall be provided so that the special inspector has time to become familiar with the project.

Provide Access to Approved Construction Documents - The contractor is responsible for providing the special inspector access to approved construction documents at the site.

Retain Special Inspection Records – The contractor is responsible for retaining, at the job site, al special inspection records submitted by the special inspector and providing these records for review upon request of the Development Services Division inspector.

Development Services Division Responsibilities:

Approve Special Inspections – The Development Services Division shall approve all section inspection requirements.

Monitor Special Inspections - Work requiring special inspections and the performance of special inspections shall be monitored by the Development Services Division inspector. His or her approval must be obtained prior to the placement of concrete or similar covering activities, in addition to that of the special inspector.

Certificate of Occupancy – The development services Division may issue a Certificate of Occupancy after all special inspection reports and the final reports have been submitted and accepted, in accordance with NC Building Code Section 1704.1.3.

Owner Responsibilities:

The owner shall be responsible for employing special inspectors in accordance with NC Building Code Section 1704.1.

Engineer or Architect of Record responsibilities:

The Engineer or Architect of Record shall indicate special inspection requirements on the plan submittals and in the specifications.

City of Greensboro – SPECIAL INSPECTION AND TESTING AGREEMENT & STATEMENT OF SPECIAL INSPECTIONS

Submit with Permit Application **(7 pages)**

LIST OF SPECIAL INSPECTIONS, INSPECTORS, AGENCIES AND FIRMS: (COMPLETE ALL COLUMNS)

S.I. Req'd	Inspection Task (Code Reference / Standard)	Continuous Inspections	Periodic Inspections	S.I./Field Tech/Approved Fabricator/Lab (enter names of Special Inspectors and Field Technicians on site, fabricating company or lab, as applicable)	Qualification/Certification (enter qualification or certification of Special Inspector, Field Technician, fabricating company or lab)
☐	1704.2.5 Special inspection of fabricated items	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1704.2.5.1 Fabricator approval & certificate of compliance	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1704.6.1 Structural observations - Seismic	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1704.6.1 Structural observations - Wind	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.1.1 Special cases	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☒	1705.1.2 Specific elements: Foundation walls > 5 feet	☐	☒	1. 2. 3. 4.	1. 2. 3. 4.
☒	1705.2.1 Structural Steel	☐	☒	1. 2. 3. 4.	1. 2. 3. 4.
☒	1705.2.2 Cold-formed steel deck	☐	☒	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.2.3 Open-web steel joists and joist girders	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.

City of Greensboro – SPECIAL INSPECTION AND TESTING AGREEMENT & STATEMENT OF SPECIAL INSPECTIONS
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S.I. Req'd	Inspection Task (Code Reference / Standard)	Continuous	Periodic Inspection	S.I./Field Tech/Approved Fabricator/Lab (enter names of Special Inspectors and Field Technicians on site, fabricating company or lab, as applicable)	Qualification/Certification (enter qualification or certification of Special Inspector, Field Technician, fabricating company or lab)
☐	1705.2.4 Cold formed steel trusses	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☒	1705.3 Concrete construction	☐	☒	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.3.1 Welding of reinforcing bars	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.3.2 Material tests	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.4 Masonry construction	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.4.1 Empirically designed in Risk Category IV	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.5 Wood construction	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.5.1 High-load diaphrams	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.5.2 Metal-plate-connected wood trusses >/= 60 feet	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.

City of Greensboro – SPECIAL INSPECTION AND TESTING AGREEMENT & STATEMENT OF SPECIAL INSPECTIONS

Submit with Permit Application **(7 pages)**

S.I. Req'd	**Inspection Task (Code Reference / Standard)**	**Continuous Inspections**	**Periodic Inspections**	**S.I./Field Tech/Approved Fabricator/Lab** (enter names of Special Inspectors and Field Technicians on site, fabricating company or lab, as applicable)	**Qualification/Certification** (enter qualification or certification of Special Inspector, Field Technician, fabricating company or lab)
☒	1705.6 Soils	☐	☒	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.7 Driven deep foundations	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.8 CIP deep foundations	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.9 Helical pile foundations	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.10 Fabricated items	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.11 Special inspections for wind resistance	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.12 Special inspections for seismic resistance	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.13 Testing for seismic resistance	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.14 Sprayed fire-resistant materials	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.

City of Greensboro – SPECIAL INSPECTION AND TESTING AGREEMENT & STATEMENT OF SPECIAL INSPECTIONS
Submit with Permit Application **(7 pages)**

S.I. Req'd	Inspection Task (Code Reference / Standard)	Continuous Inspections	Periodic Inspections	S.I./Field Tech/Approved Fabricator/Lab (enter names of Special Inspectors and Field Technicians on site, fabricating company or lab, as applicable)	Qualification/Certification (enter qualification or certification of Special Inspector, Field Technician, fabricating company or lab)
☐	1705.15 Fire resistant coatings	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.16 EIFS	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.17 Fire resistant Penetrations and joints	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1705.18 Testing for smoke control	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1706 Design strength of materials	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1707 Alternative test procedure	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1708 In-situ load tests	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.
☐	1709 Preconstruction load tests	☐	☐	1. 2. 3. 4.	1. 2. 3. 4.

****

SPECIAL INSPECTIONS FIRM: _____

Special Inspector in Charge (sign over seal) _____
Date

Special Inspector in Charge (print): _____

****

REGISTERED DESIGN PROFESSIONAL OF RECORD: _____

Registered Design Professional (sign over seal) _____
Date

Registered Design Professional (print): _____

****

OWNER / OWNER'S REPRESENTATIVE:

Owner/Rep (print): _____ (sign): _____
Date

****

CONTRACTOR / PERMIT APPLICANT:

Permit Applicant (print): _____ (sign): _____
Date

****

CODE ENFORCEMENT OFFICIAL:

Code Official (print): _____ (sign): _____
Date

Geotechnical Engineering Report

Windsor Chavis Recreation Center and Park Development
Greensboro, North Carolina
November 3, 2020
Terracon Project No. 75205169

Prepared for:
Vines Architecture
Raleigh, NC

Prepared by:
Terracon Consultants, Inc.
Greensboro, NC

November 3, 2020

Vines Architecture
819 W Hargett Street
Raleigh, NC 27603

Attn: Mr. Adam Brakenbury, AIA
P: (919) 755-1975
E: abrakenbury@vinesarc.com

Re: Geotechnical Engineering Report
Windsor Chavis Recreation Center and Park Development
1601 East Gate City Blvd
Greensboro, North Carolina
Terracon Project No. 75205169

Dear Mr. Brakenbury:

We have completed Geotechnical Engineering services for the above-referenced project. This study was performed in general accordance with Terracon Proposal No. P75205169 dated August 18, 2020. This report presents the findings of the subsurface exploration and provides geotechnical recommendations as described in the above-referenced proposal for the project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Jordan A. Benson, E.I.
Field Engineer

Joseph N. Link, Jr., P.E.
Geotechnical Department Manager
NC PE: No. 041094

Terracon APR Review: James (Jim) D. Hoskins, III, P.E.
Office Manager / Principal

REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the ***GeoReport*** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents

REPORT SUMMARY

Topic [1]	Overview Statement [2]
Project Description	■ The project consists of demolishing the existing building and constructing a new recreation center with an associated parking lot and drive lanes in the northern portion of the site ■ The southern parcel improvements will consist of constructing new accessory structures, parking areas, and a soccer field ■ Improvements to and potential widening of the pedestrian tunnel connecting the northern and southern parcels under East Gate City Boulevard are also considered for this project ■ Maximum loads: Columns: 800 kips, Walls: 4 kips per linear foot, Floors: 200 pounds per square foot ■ Spot elevations in the building and surrounding parking and sidewalk areas indicated 15 feet of new fill and up to 10 feet of cut will be required to reach the planned grades north of East Gate City Boulevard ■ Expected traffic for pavement areas: o 150 autos/light trucks per day o Up to 15 medium-duty delivery/trash trucks per week o Tractor-trailer trucks/emergency vehicles for incidental use only
Geotechnical Characterization	■ Zones of existing fill were encountered in 11 of the 21 Soundings and Macro-cores performed. The fill extended to depths ranging between approximately 2 and 18 feet below the existing ground surface ■ Probable alluvial material was present in Soundings B-5 and B-7 from a stream historically running north to south across the eastern portion of the project site ■ Partially weathered rock (PWR) was encountered in Macro-core/Borings MC-1, MC-12 and B-20 starting at depths ranging between 1 ½ to 8 feet below the existing ground surface. ■ We encountered CPT probe tip, friction sleeve, refusal and/or resistance auger uplift in Soundings B-1 through B-4, B-12, B-14, B-14A, B-15, B-17, and B-18 at depths ranging between approximately 4 and 18 feet below the existing ground surface ■ Groundwater was observed in Soundings B-4 and B-10 at depths ranging between approximately 5 ½ and 8 feet below the existing ground surface. ■ Groundwater was estimated in Soundings B-5, B-6, and B-7 at depths ranging between approximately 4 to 11 feet below the ground surface based on the normalized CPT behavior
Earthwork	■ Areas of existing fill were apparent in the exploration locations within the proposed building and parking areas, particularly along the east side of the northern planned building. Limitations due to the existing site structures allowed only four exploration locations for the proposed building. These locations were placed from 15 feet to 75 feet from the limits of the structure.

Topic [1]	Overview Statement [2]
	We recommend performing further exploration in the planned building footprint to further evaluate the extent and content of the existing fill, once the existing site structures have been razed. ■ Effective site drainage should be established early and maintained throughout construction to minimize delays during construction due to elastic silt materials present near the planned grades ■ Existing onsite soils can be used for structural fill
Shallow Foundations	■ We recommend removing the existing fill from planned foundation subgrades in areas of existing fill is present prior to constructing foundations ■ Further evaluation should be completed at foundation locations where applied loads exceed 400 kips to evaluate feasible options for remediation to limit the likelihood of excessive differential settlement due to variable conditions at the exploration locations ■ Shallow foundations will be suitable to support the proposed structures based on the information currently available. The need for further remediation and/or deep foundations will depend on the results of further evaluation ■ Net allowable bearing pressure = 3,000 psf, for undisturbed residual soil or new, properly placed structural fill for loads less than 400 kips. This bearing pressure can be used provisionally for preliminary design of foundations ■ Provisional net allowable bearing pressure = 3,000 psf, for preliminary design of foundations with loads above 400 kips ■ Expected settlements: up to approximately 1-inch total, differential approximately ½ of total settlement based on our evaluation of available data ■ Detect and remove zones of soft/loose or unsuitable existing fill as noted in **Earthwork**
Below-Grade Structures / Earth Retaining Structures	■ Approximately 400 feet of cast-in-place walls are indicated on the SD plans available with maximum heights of 16 feet ■ The lowest level of the planned building will be a partial basement ■ Improvements to the existing pedestrian tunnel are included in the preliminary planning
Pavements	■ With subgrade prepared as noted in **Earthwork** ■ Concrete: ○ 5.0 inches Portland Cement Concrete (PCC) over 4.0 inches granular base for light-duty sections ○ 7.0 inches Portland Cement Concrete (PCC) over 4.0 inches granular base for dumpster pads Asphalt: ○ 3.0 inches Asphaltic Concrete (AC) over 6.0 inches granular base in light-duty areas

Topic [1]	Overview Statement [2]
	○ 1.5 inches Surface Asphalt over 2.5 inches Asphalt Binder (4.0 inches AC) over 8.0 inches granular base in heavy-duty areas ■ For pavement areas that are currently near planned grade, we recommend planning to stabilize the subgrade using a geosynthetic or geogrid and additional stone to increase pavement life
General Comments	■ This section contains important information about the limitations of this geotechnical engineering report

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Geotechnical Engineering Report

Windsor Chavis Recreation Center and Park Development
1601 East Gate City Blvd
Greensboro, North Carolina

Terracon Project No. 75205169
November 3, 2020

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Windsor Chavis Recreation Center and Park Development located at 1601 East Gate City Blvd in Greensboro, North Carolina. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Foundation design and construction
- Floor slab design and construction
- Seismic Site Classification per IBC
- Lateral earth pressures
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included advancing 27 test locations to depths ranging from approximately 2 to 25 feet below existing site grades.

Maps indicating the site and exploration locations are in the **Site Location** and **Exploration Plans** Section. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the exploration logs in the **Exploration Results** Section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly-available geologic and topographic maps.

Item	Description
Parcel Information	■ Located at 1601 East Gate City Blvd in Greensboro, North Carolina ■ The project area is identified by Guilford County Parcel Numbers 10709, 10710, and 10738 ■ The parcels have an approximate combined area of 12.9 acres ■ The parcels are divided by East Gate City Boulevard and connected with a pedestrian tunnel ■ Located at approximately 36.0648° N, 79.7703° W. See **Site Location**

Item	Description
Existing Improvements	■ North of East Gate City Boulevard ○ Two buildings (a single-story structure with a two-story building abutting the northeast side) ○ Concrete and asphalt paved parking ○ Basketball courts and swimming pool ○ Concrete sidewalks ■ South of East Gate City Boulevard ○ Existing baseball field with gravel parking lot and light poles ○ A covered picnic / bathroom building ■ Playground area ■ There is an existing pedestrian tunnel connecting the northern and southern parcels under East Gate City
Current Ground Cover	■ Concrete, asphalt, and grass-covered areas
Existing Topography (from Guilford County GIS)	■ North of East Gate City Boulevard ○ The site slopes downward from the north to the southeast ○ Elevations range from 812 to 794 feet ■ South of East Gate City Boulevard ○ The baseball field is relatively level at approximately Elevation 790 feet ○ The southern site slopes downward from the baseball field on the east and from East Side Drive from the west to form a valley along the western parcel boundary ○ South of the baseball field slopes downward Duke Street along the eastern parcel boundary ■ Elevations range from 794 to 776 feet
Geology	■ The project site is in the Piedmont Physiographic Province, an area underlain by ancient igneous and metamorphic rocks. The residual soils in this area are the product of in-place chemical weathering of rock. The typical residual soil profile consists of clayey soils near the surface where soil weathering is more advanced, underlain by sandy silts / silty sands that generally become harder / denser with depth to the top of parent bedrock. In residual materials the transition from soil to rock occurs gradually over a vertical distance ranging from a few feet to tens of feet. This transitional zone is termed “partially weathered rock” which is defined for engineering purposes as residual material that can be drilled with soil drilling methods and exhibits standard penetration test values above 100 blows per foot. According to the 1985 Geologic Map of North Carolina, the bedrock under the site is metamorphosed granitic rock of the Cambrian/Late Proterozoic period.

We collected photographs at the time of our field exploration program. Representative photos are provided in our **Photography Log**.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	■ Information was provided by Mr. Adam Brakenbury of Vines Architects in the email requesting this proposal on Wednesday, August 12 and during our phone conversation on August 17, 2020 ■ A preliminary exploration layout was also attached to the email ■ AutoCAD files S00312 WINDSOR-NACHO-CHAVIS TOPO_Property Combined_8-18-2020.dwg and 200910_Windsor Chavis Plan.dwg were forwarded to us in the email from Vines personnel on September 11, 2020 ■ We received a 75% SD Site Grading Plan dated September 30,2020 in an email from Vines personnel on October 23, 2020 ■ We understand portions of the plan are in the schematic design phase and there may be opportunities to refine the exploration plan prior to performing the work
Project Description	■ The project consists of demolishing the existing building and constructing a new recreation center with associated parking lot and drive lanes in the northern portion of the site ■ The new, four- to five-story structure will have a footprint area of approximately 31,300 square feet ■ The southern parcel improvements will consist of constructing new accessory structures, parking areas, and soccer field ■ Improvements to and potential widening of the pedestrian tunnel connecting the northern and southern parcels under East Gate City Boulevard are also considered for this project
Building Construction	■ Structures will consist of steel frame construction with joists and roof deck ■ We understand all floors will be concrete, slab-on-grade
Finished Floor and Grade Elevation	■ Unknown at the time of this report

Item	Description
Structural Loads (provided by SSMA)	■ Columns: Typical: 100 to 250 kips, Maximum: 800 kips ■ Walls: 4 kips per linear foot (klf) ■ Slabs: 200 pounds per square foot (psf)
Grading/Slopes	■ We understand considerable grading is being considered for this project, but a proposed grading plan was not available at the time of this report outside of the planned building area ■ Spot elevations in the building and surrounding parking and sidewalk areas indicated 15 feet of new fill and up to 10 feet of cut will be required to reach the planned grades north of East Gate City Boulevard
Below-Grade / Earth Retaining Structures	■ Improvements to the existing pedestrian tunnel are included in the preliminary planning ■ Multiple earth retaining structures are indicated on the SD plans ○ An approximately 270 feet-long wall along Gorrell Street with approximate heights of 7 feet to 12 feet ○ An approximately 115-foot long wall is indicated on the west side of the parking lot north of the facility with heights from approximately 3 feet to 16 feet ○ We understand the lowest level of the structure will be a partial basement with maximum wall heights of approximately 20 feet ○ An indoor pool with a maximum depth of approximately 8 feet will be constructed near the northwest corner of the facility
Pavements	■ We have provided recommendations for both rigid (concrete) and flexible (asphalt) pavement sections for a design period of 20 years ■ Anticipated traffic is as follows: ○ Autos/light trucks: 150 vehicles per day ○ Light delivery and trash collection vehicles: 15 vehicles per week ○ Tractor-trailer trucks/emergency vehicles: incidental use only (less than 1 vehicle per week)
Stormwater	■ We understand a stormwater retention area will likely be needed on one or both parcel areas ■ The location and type of stormwater retention were unknown at the time of this report

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface soil and groundwater conditions based on our review of the data and our understanding of the geologic setting and planned construction.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options and pavement options. As noted in **General Comments**, the characterization is based on widely-spaced exploration points across the site, and variations are likely.

Subsurface Profile

Macro-cores: Approximately 3 to 6 inches of topsoil or 3 inches of crushed stone was encountered across the site at the ground surface. Zones of existing fill overlying residual soils were encountered in Macro-core MC-15 underlying the surface material. The fill extended to a depth of approximately 2 feet below the existing ground surface and consisted of sandy lean clay.

Soundings: CPT correlative parameters in the soundings indicated clay, silt mixtures and sand materials from the existing ground surface to the maximum depths explored. These materials exhibited strength characteristics generally indicative of soft to stiff fine-grained materials and very loose to very dense granular soils based on the normalized CPT behaviors observed. Soundings B-2, DMT-2, B-4, B-5, B-6, DMT-6, B-8, B-9, B-11, and B-15 indicated probable fill extending to depths of 2 feet to 18 feet below existing grades based on the variable density/consistency of these soils. Probable alluvial material was present in Soundings B-5 and B-7 from a stream historically running north to south across the eastern portion of the project site. Please note the CPT behaviors may not be necessarily indicative of the piedmont residual soils present, particularly because the soundings were performed above the water table.

We encountered refusal conditions due to tip resistance, friction resistance, or resistance auger uplift in Soundings B-1, B-2, B-4, B-12, B-14, B-14A, B-15, B-17, and B-18. Refusal in Sounding B-4 was likely on material within the existing fill. The remaining soundings were performed to the planned depths.

General: The fill appeared to have been placed in an uncontrolled manner. Areas of more compressible or containing deleterious materials may be present at other locations and may require removal and replacement due to the unknown nature and extents of the fill.

Conditions encountered at each exploration location are indicated on the individual logs shown in the **Exploration Results** Section. Stratification boundaries on the logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater Conditions

The exploration locations were observed after completion for the presence and level of groundwater. The water levels observed in the boreholes can be found on the logs in **Exploration Results**.

Groundwater was observed in Soundings B-4 and B-10 at depths ranging between 5 ½ and 8 feet below the existing ground surface. Groundwater is estimated in Soundings B-5, B-6, and B-7 at depths ranging between approximately 4 to 11 feet below the ground surface, based on the normalized CPT behavior. Groundwater was not observed in the remaining locations.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time of our exploration. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Existing probable fill was encountered Soundings B-2, DMT-2, B-4, B-5, B-6, DMT-6, B-8, B-9, B-11, and B-15 and Macro-core MC-15 to depths ranging from approximately 3 feet to 18 feet below the existing ground surface. The fill appears to have be placed in an uncontrolled manner.

With undocumented fill, there is an inherent risk of structure settlement or localized subsidence from compressible fill or unsuitable material within or buried by the fill that may not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill within the building pad, parking and driveway areas. These risks can be reduced by performing adequate testing and evaluation during construction. Additional site preparation recommendations including subgrade improvement and fill placement are provided in the **Earthwork** Section.

Areas of existing fill were apparent in the exploration locations within the proposed building and parking areas, particularly along the mid-central side of the northern parcel. We could not perform more exploration locations for the planned building due to the existing site structures and pavements. The 70 percent SD plans indicate most of the existing fill will be removed during site grading. Existing fill not removed during grading is not adequate to support anticipated foundation loads in its current condition based on the information at the exploration locations completed at this time. It should be noted our exploration locations intended to represent soils in the planned building footprint were performed between 15 and 75 feet laterally from the building extents; therefore, the soil conditions are likely to differ in the existing building footprint. We recommend performing further exploration in the planned building footprint to explore the extents, conditions, and contents of the existing fill, once the existing site structures have been razed.

The building will likely be supported on a shallow foundation system extending to suitable residual soil. Suitable material was present at depths of between grade and 9 feet below existing grade in the representative exploration locations. The **Shallow Foundations** Section addresses supporting the building foundations bearing on residual soils or newly-placed, structural fill. The existing fill should be completely removed and replaced in areas to be supported on shallow foundations. Based on the variability of the site at the four exploration locations in the building area, we recommend performing additional exploration in areas of the structure where loads that exceed approximately 400 kips are located to reduce the risk of excess differential settlement. The need for deep foundations and/or further site remediation can be better identified after additional exploration has been performed.

Difficult excavation may be encountered over the southern part of the planned building area based on our understanding that a basement is planned in this area. Other areas of shallow difficult excavation and bedrock are not expected to effect mass grading; however, it may impact foundation/utility excavations across the site, particularly in the southern half of the planned development.

We recommend the foundation bearing condition be as uniform as possible. If abrupt consistency transitions occur, such as from soil to partially weathered rock (PWR) or rock, we recommend over-excavating the PWR or rock material by 12 inches and replacing with compacted soil fill.

The **Floor Slabs** Section addresses slab-on-grade support of the building.

Groundwater is not likely to impact mass grading; however, it may affect foundation/utility excavations, particularly near Soundings B-5 and B-7. Permanent and/or temporary groundwater control, such as a french drain system and/or sump areas and pumps could be necessary to achieve grading and excavation elevations

A seismic site class of D can be used for structural design. Please note the relatively shallow depths to dense materials and planned excavation in the building area lend themselves well to potential cost savings that can arise from further shear wave velocity in the structural areas. Shear wave velocities can allow for designing with a seismic site class C or site-specific seismic design parameters, reducing the structural components required for this project.

It is not desirable to have loose/soft soils at subgrade for pavements and the presence of these soils at subgrade would likely affect the pavement service life. Considering that loose/soft soils may be present at pavement subgrades, we recommend placing contingencies in the budget for stabilizing pavement subgrades for at least 50 percent of the pavement areas. Separation and stabilization will likely include up to 12 inches of additional ABC stone and a geogrid or geosynthetic such as Tensar BX-1100, Mirafi HP270 or similar depending on the conditions present. The **Pavements** Section addresses the design of pavement systems.

The **General Comments** Section provides an understanding of the report limitations.

EARTHWORK

Earthwork is expected to include razing the existing structures, clearing and grubbing, excavations, and fill placement. The following sections provide recommendations for preparing specifications for the work. Recommendations for providing suitable foundations, floor slabs, and pavements are based on our geotechnical engineering evaluation.

Site Preparation

Existing foundation elements, vegetation and root mat should be removed prior to placing fill. Topsoil should be completely stripped in the proposed building and parking/driveway areas. Any utilities associated with the previous on-site structures should be completely removed and backfilled with structural fill.

The subgrade should be proofrolled with an adequately-loaded vehicle such as a fully-loaded (20-ton minimum), tandem-axle dump truck. The Geotechnical Engineer should direct all proofrolling. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Material in such areas should be removed and replaced. Excessively wet or dry material should either be removed or moisture-conditioned and recompacted.

Existing Fill

As noted in **Geotechnical Characterization**, We encountered existing fill to depths ranging from about 3 feet and 18 feet Soundings B-2, DMT-2, B-4, B-5, B-6, DMT-6, B-8, B-9, B-11, and B-15 and Macro-core MC-15. The fill appeared to have been placed in an uncontrolled manner. Supporting floor slabs and pavements on or above existing fill soils, is discussed in this report. However, even with the recommended construction procedures, there is inherent risk for the Owner that compressible fill or unsuitable material, within or buried by the fill will, not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill but can be reduced by following the recommendations contained in this report.

Areas of existing fill were apparent in the exploration locations within the proposed building and parking areas, particularly along the east side of the northern planned building.

We could not perform more exploration locations for the planned building at the time of our exploration because of existing site structures and pavements. The 70 percent SD plans indicate most of the existing fill will be removed during site grading. Existing fill not removed during grading is not adequate to support anticipated foundation loads in its current condition based on the information at the exploration locations completed at this time. It should be noted our exploration locations intended to represent soils in the planned building footprint were performed between 15 and 75 feet laterally from the building extents; therefore, the soil conditions are likely to differ in the existing building footprint. We recommend performing further exploration in the planned building

footprint to explore the extents, conditions, and contents of the existing fill, once the existing site structures have been razed.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 10 feet of structures, pavements or constructed slopes. General fill is material used to achieve grade outside of these areas and should be selected and compacted to parameters mutually agreed-upon by the Owner and Design Team and with consideration of possible future development on the site. Earthen materials used for structural fill should meet the following material property requirements:

Soil Type [1]	USCS Classification	Acceptable Parameters
Import: Low-Plasticity	CL, CL-ML ML, SM, SC	All locations and elevations
Import: High-Plasticity	CH, MH	Not recommended
Sand / Gravel	GW/GP, SW/SP [2]	NCDOT ABC (aggregate base course) may be used beneath pavements and floor slabs NCDOT No. 57 (washed, crushed stone) may be used as a capillary break beneath floor slabs
On-Site Soils	ML, SC, SM, CL	Generally suitable when placed at appropriate moisture content
On-Site Soils	CH	Not recommended

1. Structural fill should consist of approved materials free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.
2. "Clean" sand (less than 15% silt and clay) should not be used as structural fill in building and pavement areas to reduce risk of perched water developing in the surface fill as water infiltrating the sand fill becomes trapped above the less permeable clay located near the ground surface.

Fill Compaction Requirements

Structural fill should meet the following compaction requirements.

Item	Structural Fill
Maximum Lift Thickness	■ 8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used ■ 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used

Item	Structural Fill
Minimum Compaction Requirements [1, 2]	■ Minimum of 95% of the materials maximum standard Proctor dry density (ASTM D698)
Water Content Range	■ Within the range of -3% to +3% of optimum moisture content as determined by the standard Proctor test at the time of placement and compaction

1. High-plasticity cohesive fill should not be compacted to more than 100% of standard Proctor maximum dry density
2. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254)

Utility Trench Backfill

Utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath the buildings should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below slabs and/or foundations. The trench plug should extend at least 5 feet behind the face of the building exterior. The plug material should consist of cementitious flowable fill or low-permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

Grading and Drainage

All grades must provide effective drainage away from the buildings during and after construction and should be maintained throughout the life of the structures. Water retained next to the building can result in settlements greater than those discussed in this report. Greater settlement can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum five percent away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. Final grades should be verified to document effective drainage has been achieved after building construction and landscaping have been completed. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

We expect the shallow excavations for the proposed structures will be accomplished with conventional construction equipment. Care should be taken to maintain the completed subgrades' water content prior to constructing grade slabs and foundations after completing filling and grading. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture-conditioned, and recompacted prior to foundation and grade slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documenting the adequate removal of existing foundations, utilities, vegetation and topsoil, existing fill in planned foundation areas, proofrolling, and areas delineated by the proofroll requiring mitigation.

Each lift of structural fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer prior to placing additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test should be performed for every 50 linear feet of compacted utility trench backfill.

The bearing subgrade should be evaluated under the direction of the Geotechnical Engineer in areas of foundation excavations. The Geotechnical Engineer should prescribe mitigation options if unexpected conditions are encountered. This will be a critical component of construction for this project based on the higher-loaded areas where loading exceeds 400 kips. Additional evaluation including depth to very dense residual soil and weather rock materials should be performed at the foundations. Evaluation techniques will depend on the nature and extent of additional geotechnical evaluation in the building area and may include performing machine and/or hand auger borings, in-situ testing (i.e. CPT/DMT), or dynamic cone penetrometer testing (DCP).

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork** and the existing fill has been removed and replaced, the following design parameters are applicable for shallow foundations.

Design Parameters – Compressive Loads

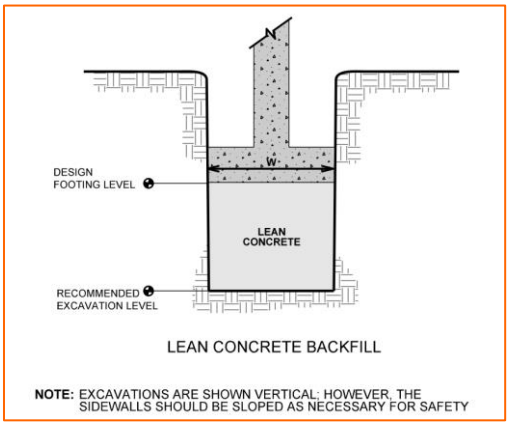
Item	Description
Maximum Net Allowable Bearing pressure [1, 2, 3]	3,000 psf [4]
Required Bearing Stratum [3]	Undisturbed residual soil or newly-placed, structural fill
Minimum Foundation Dimensions	16 inches
Minimum Embedment below Finished Grade [5]	18 inches
Ultimate Passive Resistance (equivalent fluid pressures) [7, 8]	300 pcf (granular backfill) 240 pcf (cohesive backfill)
Ultimate Coefficient of Sliding Friction [8]	0.35 (granular material) 0.30 (cohesive material)
Estimated Total Settlement from Structural Loads [2]	Less than 1 inch
Estimated Differential Settlement from Structural Loads [2, 6]	Up to approximately ½ of total settlement

Item	Description
1. The maximum net allowable bearing pressure is the pressure more than the minimum surrounding overburden pressure at the foundation base elevation. An appropriate factor of safety has been applied. These bearing pressures can be increased by 1/3 for transient loads unless those loads have been factored to account for transient conditions. Values assume that exterior grades are no steeper than 20% within 10 feet of structure. 2. Values provided are for maximum loads noted in **Project Description** 3. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the **Earthwork**. 4. Requires additional evaluation of the potential for differential settlement at foundation locations where loads exceed 400 kips prior to construction based on varying conditions and depth to very dense material 5. Embedment necessary to minimize the effects of frost and/or seasonal water content variation. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure. 6. Differential settlements are as measured from center of slab to the edge or over a span of 40 feet. 7. Use of passive earth pressures require the sides of the excavation for the spread footing foundation be nearly vertical and the concrete placed neat against these vertical faces or removing footing forms and compacting structural fill against the vertical face. 8. Backfill must meet minimum recommendations included in the Earthwork Section of our Geotechnical Engineering Report.	

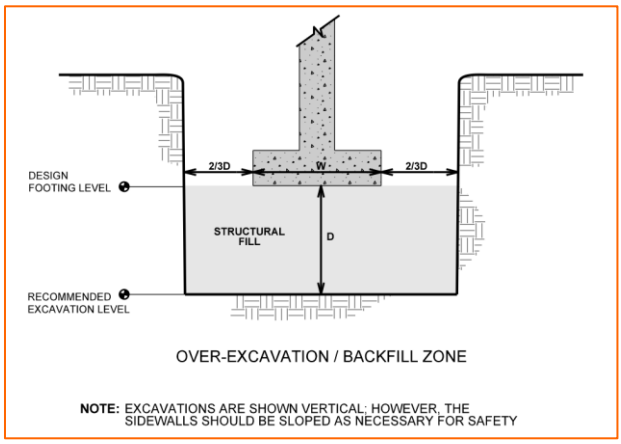
Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation, with structural fill, as recommended in the **Earthwork** Section.



SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our professional opinion that the **Seismic Site Classification is D**. Subsurface explorations at this site were extended to a maximum depth of 25 feet. The site properties below the maximum exploration depth were estimated based on our experience and knowledge of geologic conditions of the general area. We recommend considering further testing and/or analyses to improve the design parameters for seismic design on this site. Please contact us for more details regarding shear wave velocity testing and potential site-specific seismic analysis of the building area to reduce the structural elements for this project.

FLOOR SLABS

Unsuitable, weak, soft/loose soils may be encountered at the floor slab subgrade level. These soils should be replaced with structural fill so the floor slab is supported on at least 1 foot of suitable residual soils or structural fill.

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor Slab Support [1]	■ Minimum 4 inches of poorly-graded aggregate subbase (less than 13% passing the U.S. No 200 sieve) placed to 95% of ASTM D 698 [2, 3]
Estimated Modulus of Subgrade Reaction [2]	■ 100 pounds per square inch per inch (psi/in) for point loads

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based on our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

A vapor retarder should be used below concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy-duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Mitigation measures, as noted in **Existing Fill** in **Earthwork**, are critical to the performance of floor slabs. In addition to the mitigation measures, the floor slab can be stiffened by adding steel reinforcement, grade beams, and/or post-tensioned elements.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the

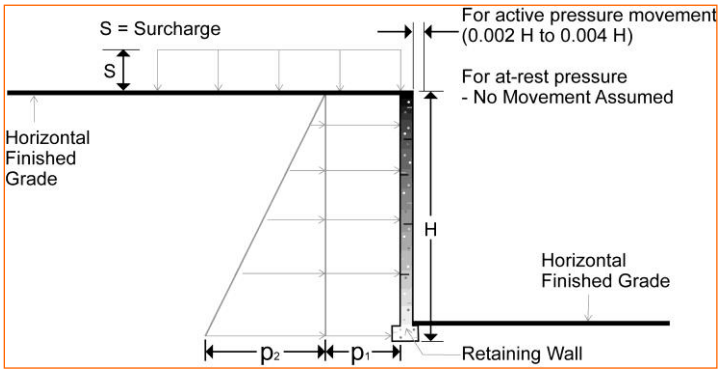
resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high-traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

LATERAL EARTH PRESSURES

Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



We understand the existing pedestrian tunnel will be replaced with a new, pre-cast concrete box culvert structure that will be installed using open cut trenching below the roadway. Please refer to the recommendations in Earthwork for the excavated trench. We recommend designing the pre-cast structures using the effective fluid pressures indicated below.

Lateral Earth Pressure Design Parameters – Pedestrian Tunnel		
At-Rest Coefficient	**Surcharge Pressure p1 (psf)**	**Unsaturated**
0.61	0.61S	(73)H

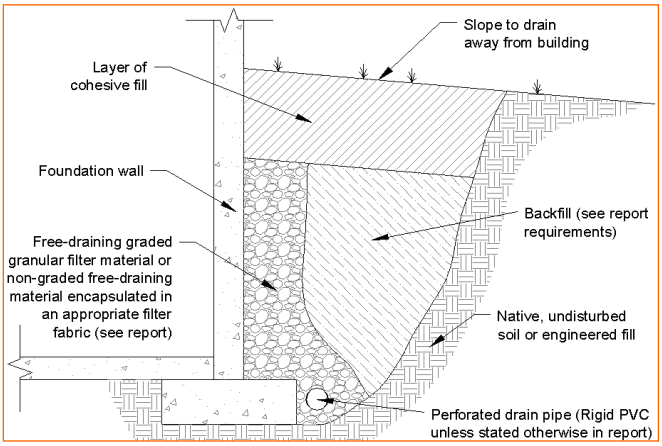
Lateral Earth Pressure Design Parameters – All Other Structures				
Earth Pressure Condition [1]	**Coefficient for Backfill Type** [2]	**Surcharge Pressure** [3, 4, 5] **p_1 (psf)**	**Effective Fluid Pressures (psf)** [2, 4, 5]	
			Unsaturated [6]	**Submerged** [6]
Active (K_a)	Granular - 0.33 Fine-Grained - 0.41	(0.33)S (0.44)S	(40)H (51)H	(80)H (86)H
At-Rest (K_o)	Granular - 0.50 Fine-Grained - 0.61	0.50)S (0.61)S	(58)H (70)H	(89)H (95)H
Passive (K_p)	Granular - 3.00 Fine-Grained - 2.28	--- ---	(360)H (260)H	(170)H (120)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 95% of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf
3. Uniform surcharge, where S is surcharge pressure
4. Loading from heavy compaction equipment is not included
5. No safety factor is included in these values
6. To achieve "Unsaturated" conditions, follow guidelines in **Subsurface Drainage for Below-Grade Walls** below. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design

Backfill placed against structures should consist of granular soils or low-plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. Please contact us for revised design parameters if sloping backfill is required against earth retaining structures.

Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5 percent passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion and is fastened to the wall prior to placing backfill.

PAVEMENTS

General Pavement Comments

Minimum pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Minimum pavement designs, noted in this section, must be applied to the site, which has been prepared as recommended in the **Earthwork** Section.

Pavement thickness can be determined using AASHTO, Asphalt Institute and/or other methods if specific wheel loads, axle configurations, frequencies, and desired pavement life are provided. Terracon can provide thickness recommendations for pavements subjected to loads other than personal vehicle and occasional delivery and trash removal truck traffic if this information is provided.

It is not desirable to have loose/soft soils at subgrade for pavements and the presence of these soils at subgrade would likely affect the pavement service life. Considering that loose/soft soils may be present at pavement subgrades, we recommend placing contingencies in the budget for stabilizing pavement subgrades for at least 50 percent of the pavement areas. Separation and stabilization will likely include up to 12 inches of additional ABC stone and a geogrid or geosynthetic such as Tensar BX-1100, Mirafi HP270 or similar depending on the conditions present.

Pavement Design Parameters

Design of Asphaltic Concrete (AC) pavements are based on the procedures outlined in the National Asphalt Pavement Association (NAPA) Information Series 109 (IS-109). Design of

Portland Cement Concrete (PCC) pavements are based on American Concrete Institute (ACI) 330; Guide for Design and Construction of Concrete Parking Lots.

Minimum Estimated Pavement Thickness

The following table provides the minimum pavement options for AC and PCC Sections. An actual pavement design has not been performed.

Pavement Type	Material	Layer Thickness (inches)	
		Light-Duty	Dumpster Pad
Rigid	Portland Cement Concrete (4,000 psi)	5.0	7.0
	Crushed Aggregate Base Course (NCDOT ABC) [1]	4.0	4.0
Flexible (Superpave)	Asphalt Surface (NCDOT S9.5B)	3.0 [3]	1.5
	Asphalt Binder (NCDOT I19.0C)	--	2.5
	Crushed Aggregate Base Course (NCDOT ABC) [1]	6.0	8.0

1. Compacted to a minimum of 98% of the materials modified Proctor maximum dry density (ASTM D1557)
2. Placed in two, 1.5-inch lifts

Allowing a partial pavement thickness for use during construction is not suggested without a detailed pavement analysis incorporating construction traffic. In addition, we should be contacted to confirm the traffic assumptions stated in Project Description. If the actual traffic varies from the assumptions outlined above, modification of the pavement section thickness will be required.

The recommendations for pavement construction presented depend on compliance with applicable material specifications. To assess compliance, observation and testing should be performed under the direction of the geotechnical engineer.

Asphalt concrete aggregates and base course materials should conform to the North Carolina Department of Transportation (NCDOT) "Standard Specifications for Roads and Structures." Concrete pavement should be air-entrained and have a minimum compressive strength of 4,000 psi after 28 days of laboratory curing per ASTM C-31.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

Based on the possibility of shallow and/or perched groundwater, we recommend installing a pavement subdrain system to control groundwater, improve stability, and improve long-term pavement performance.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be expected. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2 percent
- Subgrade and pavement surfaces should have a minimum 2 percent slope to promote proper surface drainage
- Install below-pavement drainage systems surrounding areas anticipated for frequent wetting
- Install joint sealant and seal cracks immediately
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils
- Place compacted, low-permeability backfill against the exterior side of curb and gutter
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials

GENERAL COMMENTS

Our analysis and opinions are based on our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the Owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration are intended for the sole benefit and exclusive use of our Client for specific application to the project discussed and are accomplished in accordance with generally-accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our Client. Reliance on the services and any work product is limited to our Client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Location Designation	Exploration Depth (feet) [1, 2]	Planned Location
B-01, B-02, B-06 and B-08	8 to 25	Planned building area
B-07	15	Planned plaza area
B-09 through B-12	5 to 15	Pedestrian tunnel
B-03, B-04, B-05, B-13 through B-20	2 to 10	Planned accessory structures, parking/driveway areas

1. Below ground surface

Exploration Location Layout and Elevations: Vines personnel selected the exploration locations and Terracon provided the layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±5 feet) and approximate elevations were obtained by interpolation from the preliminary site plans provided. If elevations and a more precise layout are desired, we recommend surveying the locations following completion of fieldwork.

Subsurface Exploration Procedures: We advanced soundings and macro-cores with track-mounted equipment in general accordance with local standard procedures for cone penetration tests (CPTs) and macro-cores. The CPT hydraulically pushes an instrumented cone through the soil while nearly continuous readings are recorded to a portable laptop. We observed and recorded groundwater levels during drilling and sampling. We used correlative soil parameters from computations using the in-situ measurements in addition to the data included on the CPT sounding logs. We can provide these parameters for others upon request.

The macro-core samples were collected by advancing an approximately 4-foot long macro-core sampling sleeve into the ground for the entire length of the sleeve. The sleeve was then removed, and the soils were classified onsite before disposing of the materials at the site. No site soils were removed for either further evaluation or laboratory testing based on the environmental constraints for this project.

At Macro-core B-1, B-12, B-15, and B-20 we utilized split-barrel sampling procedure. This method involved driving a standard 2-inch outer diameter split-barrel sampling spoon into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon 12 inches after a 6-inch seating interval was recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the macro-core logs at the test depths where performed. We observed and recorded groundwater levels after completing each exploration location.

The sampling depths, penetration distances, and other sampling information was recorded on the field logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by our Geotechnical Department Staff. Our exploration team prepared field logs as part of the exploration procedure. These field logs included visual classifications of the materials encountered. Final logs were prepared from the field logs. The final logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Soil testing for this project was selected and performed in generally accordance with the guidelines established based on our understanding of the standards below.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D1140 Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing

The laboratory testing program often included examination of soil samples by an engineer. Based on the material’s texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

PHOTOGRAPHY LOG

View facing southeast from near Sounding B-3

View facing south from near Sounding B-6

View facing west from east of Sounding B-1

View facing east from near Sounding B-1

View facing south from near Sounding B-7

View facing southwest from near Sounding B-7

View Facing north from near Sounding B-17

View facing southwest from between Soundings B-17 and B-18

View facing northwest from north of Sounding B-19

View facing southeast from north of Sounding B-19

View facing south from near Sounding B-15

View facing north from near Sounding B-15

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan
Exploration Plan

Note: All attachments are one page unless noted above

SITE LOCATION

Windsor Chavis Recreation Center and Park Development ■ Greensboro, North Carolina
November 3, 2020 ■ Terracon Project No. 75205169

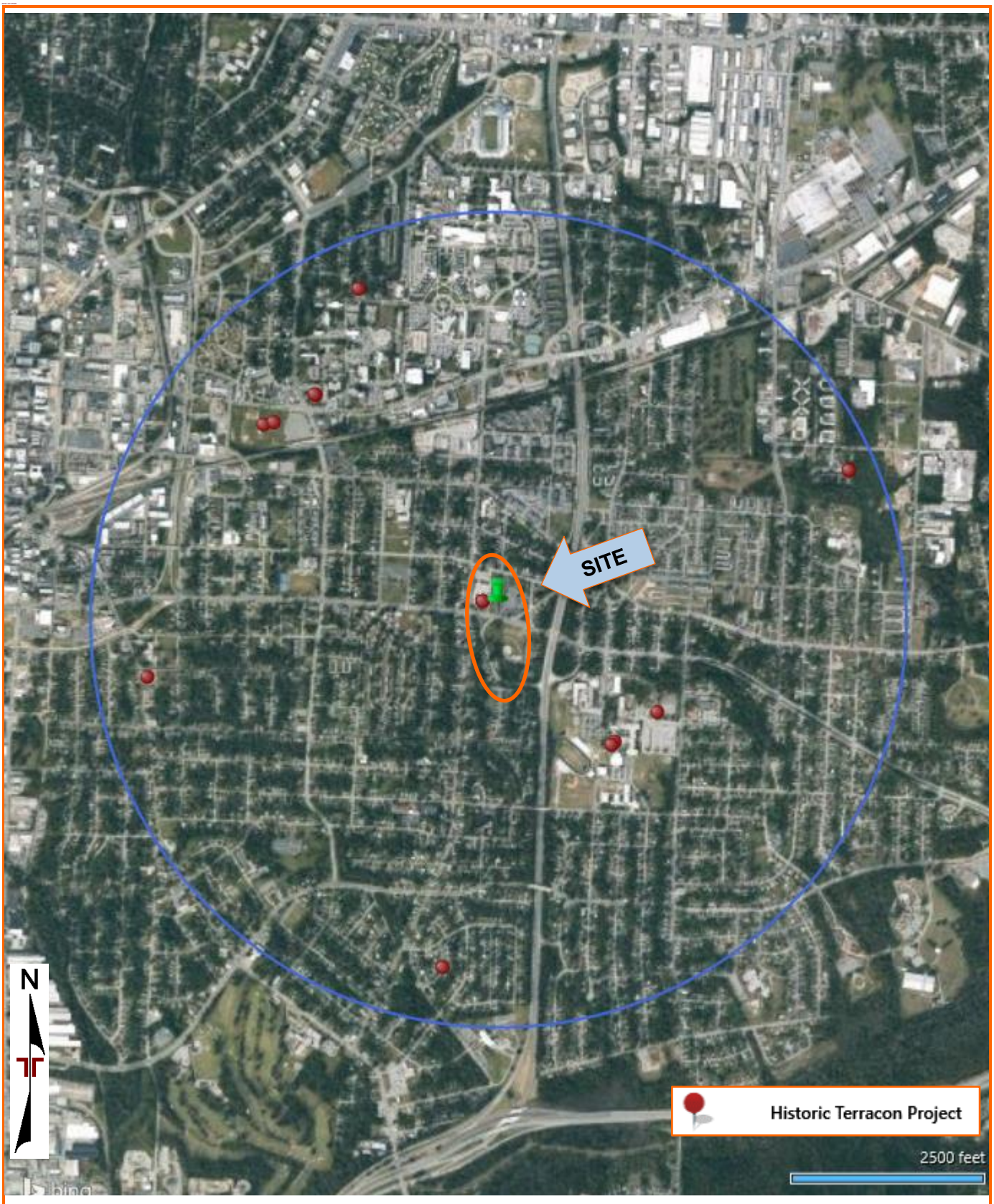


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

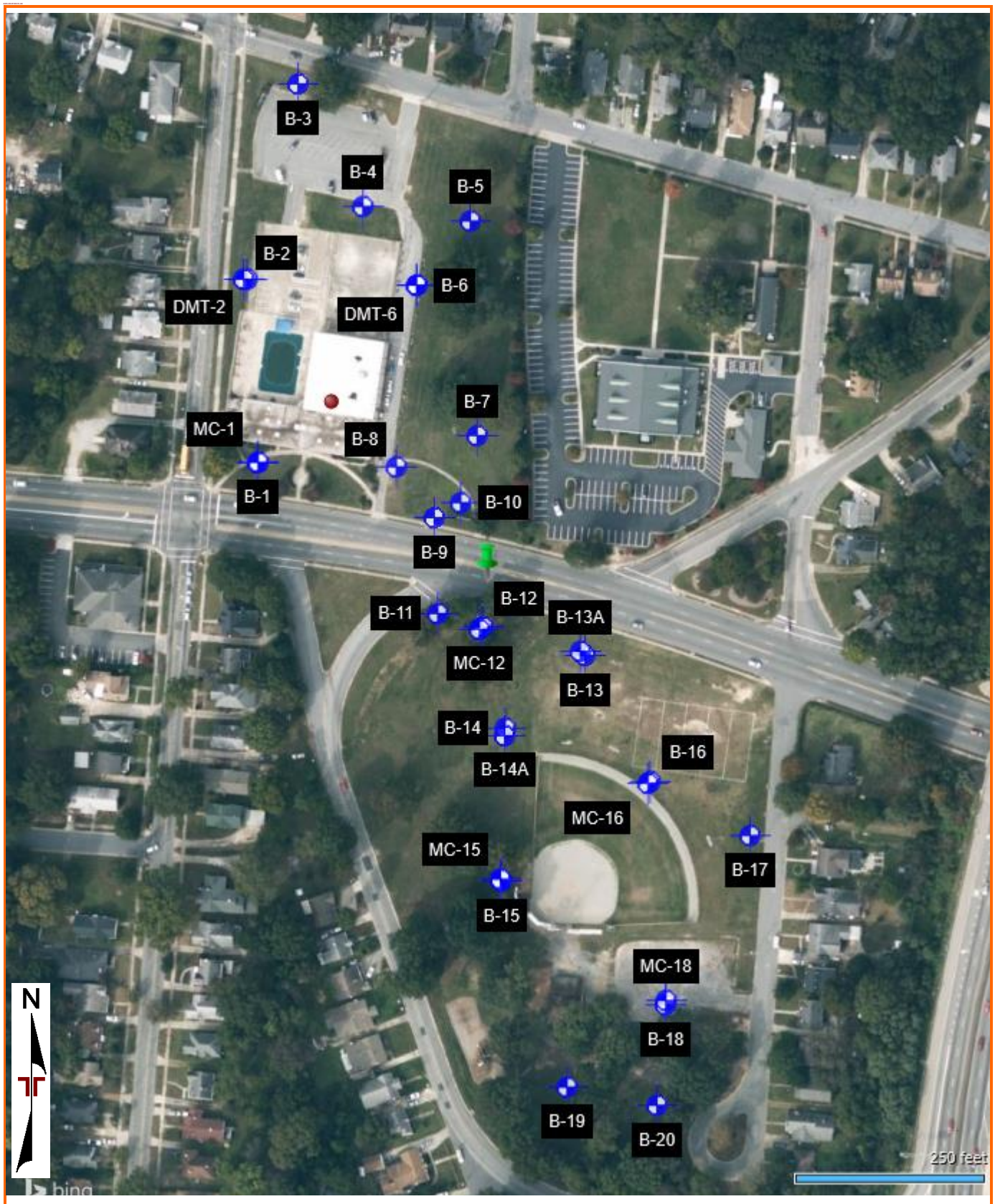


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Subsurface Profile
Exploration Logs (B-1 through B-20, DMT-2, DMT-6, MC-1, MC-12, MC-15, MC-16, MC-18)

Note: All attachments are one page unless noted above

Elevation

815 810 805 800 795 790 785 780 775

B-1
Tip Resistance, q_t (tsf) 0 100 200 300 400
Material Description
Normalized CPT Soil Behavior Type

B-2
Tip Resistance, q_t (tsf) 0 100 200 300 400
Material Description
Normalized CPT Soil Behavior Type

B-3
Tip Resistance, q_t (tsf) 0 100 200 300 400
Material Description
Normalized CPT Soil Behavior Type

B-4
Tip Resistance, q_t (tsf) 0 100 200 300 400
Material Description
Normalized CPT Soil Behavior Type

B-5
Tip Resistance, q_t (tsf) 0 100 200 300 400
Material Description
Normalized CPT Soil Behavior Type

B-6
Tip Resistance, q_t (tsf) 0 100 200 300 400
Material Description
Normalized CPT Soil Behavior Type

B-7
Tip Resistance, q_t (tsf) 0 100 200 300 400
Material Description
Normalized CPT Soil Behavior Type

Explanation

B-1 — Borehole Number
Moisture Content — %w
LL PL — Liquid and Plastic Limits
Sampling — Borehole Lithology
AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.
Water Level Reading after drilling.

NOTES:
See Exhibit for orientation of soil profile.
See General Notes in Appendix for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ.
AR - Auger Refusal
BT - Boring Termination

Project Manager: J. Benson	Project No.: 75205169
Drawn by: J. Benson	Scale: N.T.S. Horizontally
Approved by: J. Link	File Name: 75205169
Date: 10/15/2020	

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC
PH. 336-854-8135 FAX.

SUBSURFACE PROFILE

WINDSOR CHAVIS REC. CENTER & PARK DEVELOPMENT
1601 EAST GATE CITY BLVD
GREENSBORO, NC

EXHIBIT 1

Elevation

B-8 B-9 B-10 B-11 B-12 B-13 B-13A

Tip Resistance, q_t (tsf) 0 100 200 300 400

Material Description **Normalized CPT Soil Behavior Type**

802 800 798 796 794 792 790 788 786 784 782 780 778 776 774

Explanation

B-8 — Borehole Number

Moisture Content — %w

LL PL — Liquid and Plastic Limits

Sampling — Borehole Lithology

AR BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

NOTES:
See Exhibit for orientation of soil profile.
See General Notes in Appendix for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ.
AR - Auger Refusal
BT - Boring Termination

Project Manager: J. Benson	Project No.: 75205169
Drawn by: J. Benson	Scale: N.T.S. Horizontally
Approved by: J. Link	File Name: 75205169
Date: 10/15/2020	

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC
PH. 336-854-8135 FAX.

SUBSURFACE PROFILE

WINDSOR CHAVIS REC. CENTER & PARK DEVELOPMENT
1601 EAST GATE CITY BLVD
GREENSBORO, NC

EXHIBIT 2

Elevation

794 792 790 788 786 784 782 780 778 776 774 772 770 768

B-14

Tip Resistance, q_t (tsf) 0 100 200 300 400

Material Description **Normalized CPT Soil Behavior Type**

B-14A

Tip Resistance, q_t (tsf) 0 100 200 300 400

Material Description **Normalized CPT Soil Behavior Type**

B-15

Tip Resistance, q_t (tsf) 0 100 200 300 400

Material Description **Normalized CPT Soil Behavior Type**

B-16

Tip Resistance, q_t (tsf) 0 100 200 300 400

Material Description **Normalized CPT Soil Behavior Type**

B-17

Tip Resistance, q_t (tsf) 0 100 200 300 400

Material Description **Normalized CPT Soil Behavior Type**

B-18

Tip Resistance, q_t (tsf) 0 100 200 300 400

Material Description **Normalized CPT Soil Behavior Type**

B-19

Tip Resistance, q_t (tsf) 0 100 200 300 400

Material Description **Normalized CPT Soil Behavior Type**

Explanation

B-14 — Borehole Number

Moisture Content — %w

LL PL — Liquid and Plastic Limits

Sampling — Borehole Lithology

AR / BT — Borehole Termination Type

▽ Water Level Reading at time of drilling.

▼ Water Level Reading after drilling.

NOTES:

See Exhibit for orientation of soil profile.
See General Notes in Appendix for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ.
AR - Auger Refusal
BT - Boring Termination

Project Manager: J. Benson	Project No.: 75205169
Drawn by: J. Benson	Scale: N.T.S. Horizontally
Approved by: J. Link	File Name: 75205169
Date: 10/15/2020	

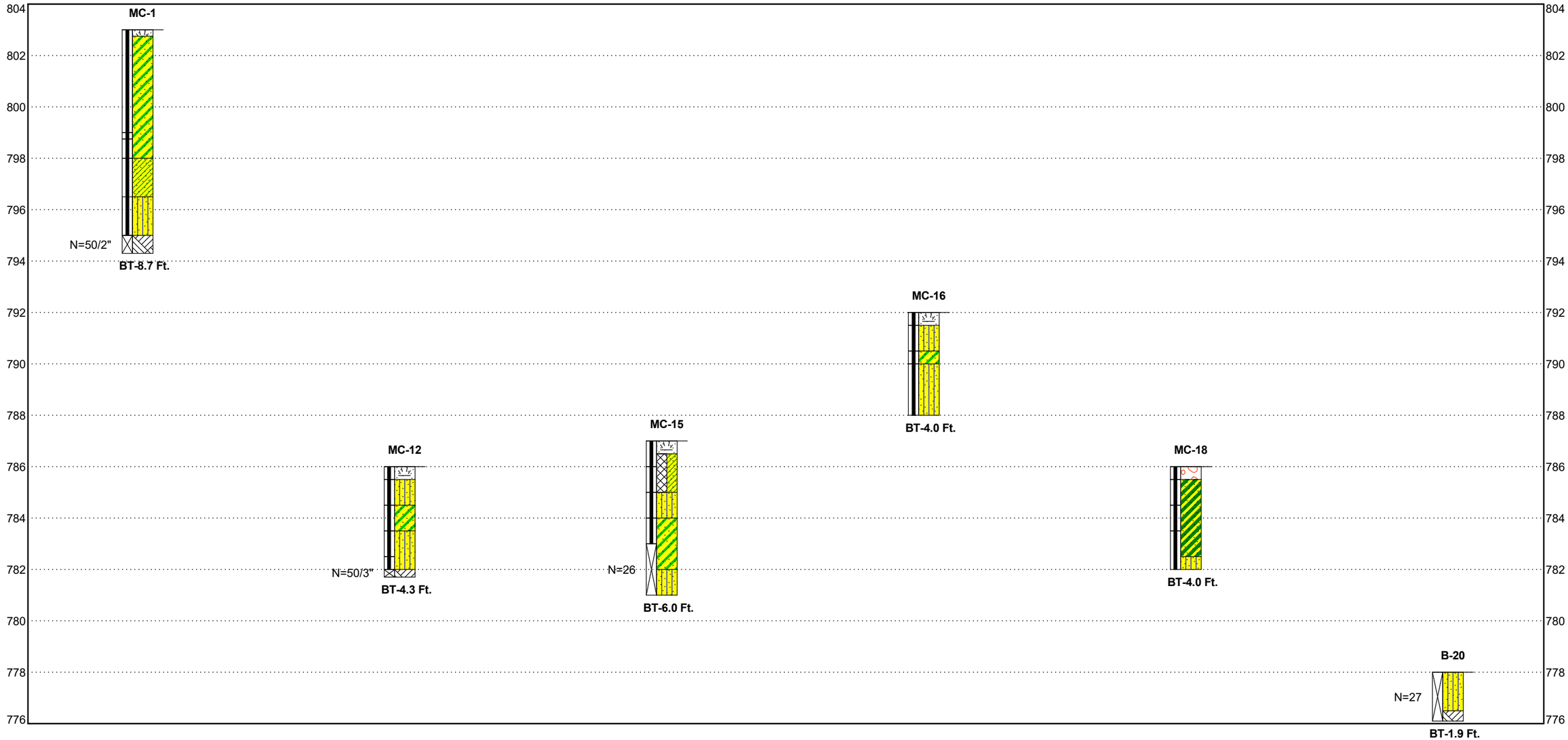
Terracon
7327 W Friendly Ave Ste G
Greensboro, NC
PH. 336-854-8135 FAX.

SUBSURFACE PROFILE

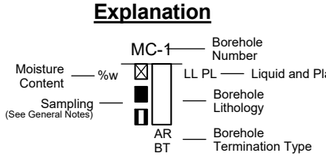
WINDSOR CHAVIS REC. CENTER & PARK DEVELOPMENT
1601 EAST GATE CITY BLVD
GREENSBORO, NC

EXHIBIT 3

Elevation - Feet



Explanation



Water Level Reading at time of drilling.

Water Level Reading after drilling.

Topsoil

Clayey Sand

Sandy Lean Clay

Silty Sand

Partially Weathered Rock

Aggregate Base Course

Sandy Fat Clay

NOTES:

See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project No.: 75205169	Terracon 7327 W Friendly Ave Ste G Greensboro, NC	**SUBSURFACE PROFILE** WINDSOR CHAVIS REC. CENTER & PARK DEVELOPMENT 1601 EAST GATE CITY BLVD GREENSBORO, NC
Date: 10/15/2020		
Scale: N.T.S. Horizontally		

CPT LOG NO. B-1

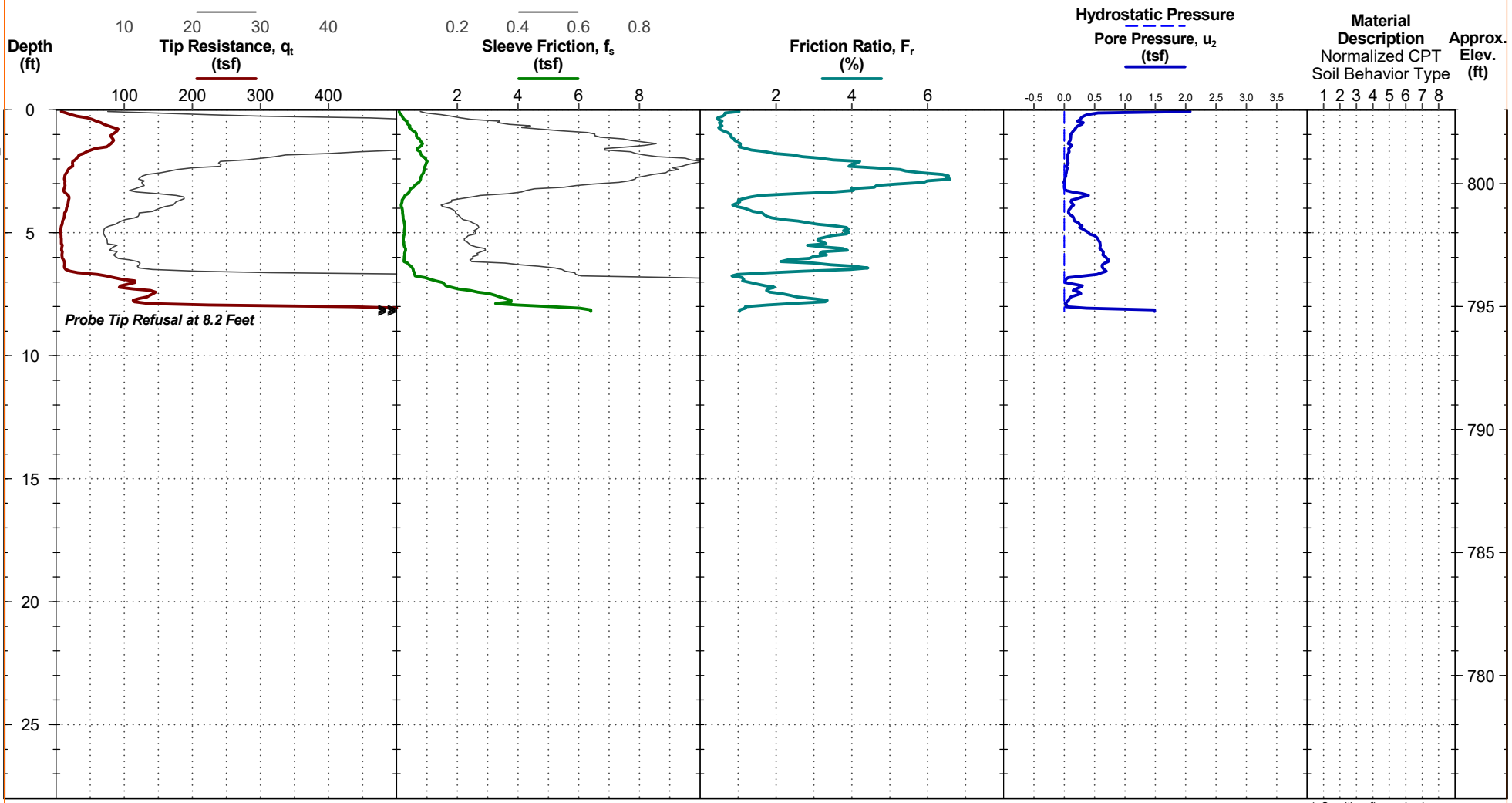
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 803 ft +/-
Latitude: 36.064554°
Longitude: -79.770814°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

6" rootmat and topsoil. Cave-in depth = 7.8'

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/16/2020
CPT Completed: 9/16/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

BORING LOG NO. MC-1

PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

LOCATION See Exploration Plan

Latitude: 36.0646° Longitude: -79.7708°

Approximate Surface Elev.: 803 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES	FIELD TEST RESULTS
0.3	803+/-					
TOPSOIL, 3"						
RESIDUAL - CLAYEY SAND (SC), fine to coarse grained, gray brown, moist		1				
		2				
		3				
		4	14.2	20-12-8	44	
5.0	798+/-	5				
SANDY LEAN CLAY (CL), gray brown, moist						
6.5	796.5+/-	6				
SILTY SAND (SM), fine to coarse grained, orange tan, moist		7	24.8			
8.0	795+/-	8				
PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND, fine to coarse grained, orange tan, moist			12.2			35-50/2" N=50/2"
8.7	794.5+/-					
Boring Terminated at 8.7 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Macro-Core Sampler / 140lb Auto Hammer

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

At completion of sampling, Dry

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

Boring Started: 09-16-2020 | Boring Completed: 09-16-2020

Drill Rig: Pagani TG73-200 | Driller: C. Storm

Project No.: 75205169

CPT LOG NO. B-2

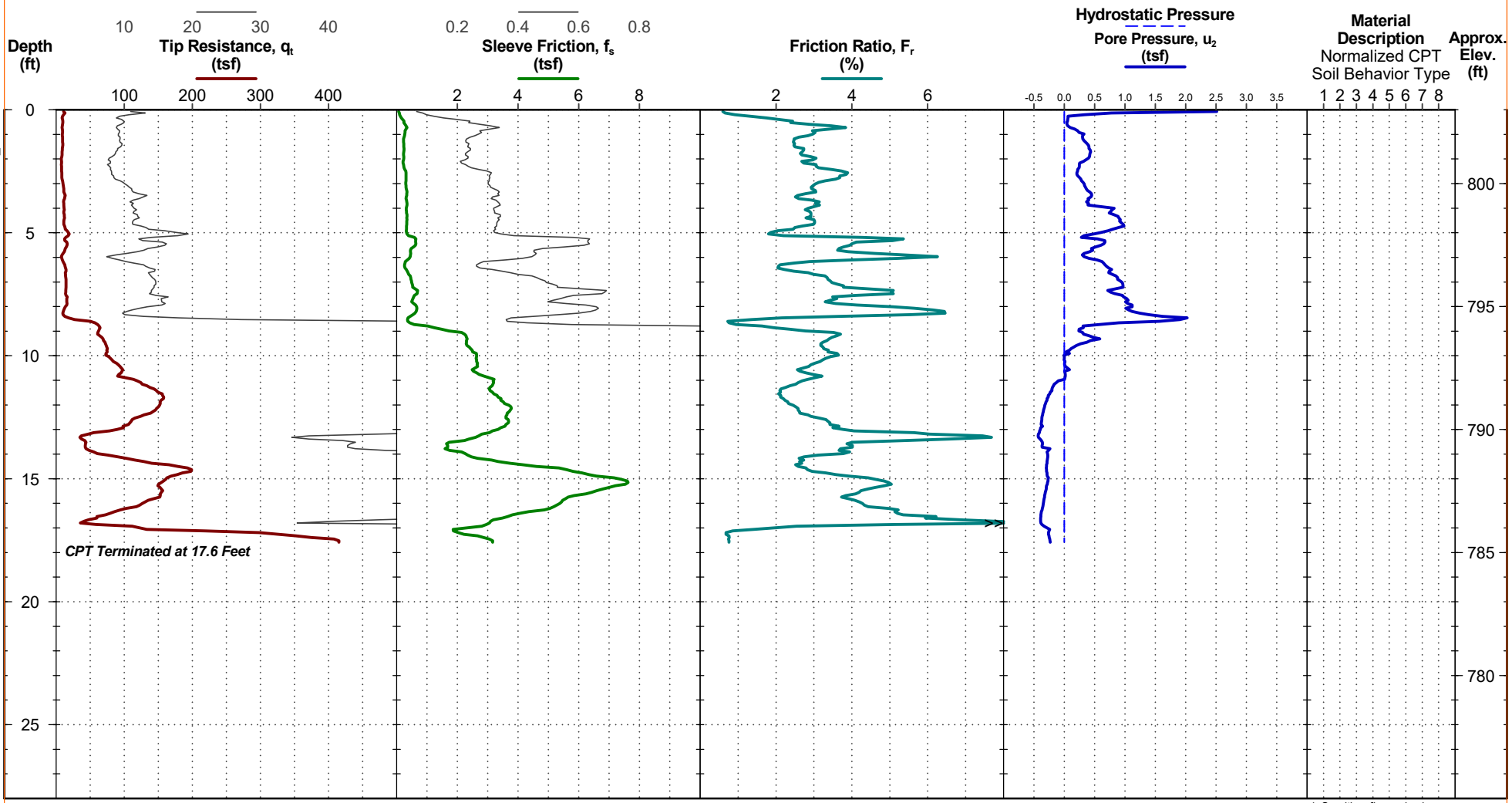
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 803 ft +/-
Latitude: 36.065214°
Longitude: -79.77086°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

6" rootmat and topsoil. Cave-in depth = 2.0'

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/23/2020
CPT Completed: 9/23/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

DMT LOG NO. DMT-2

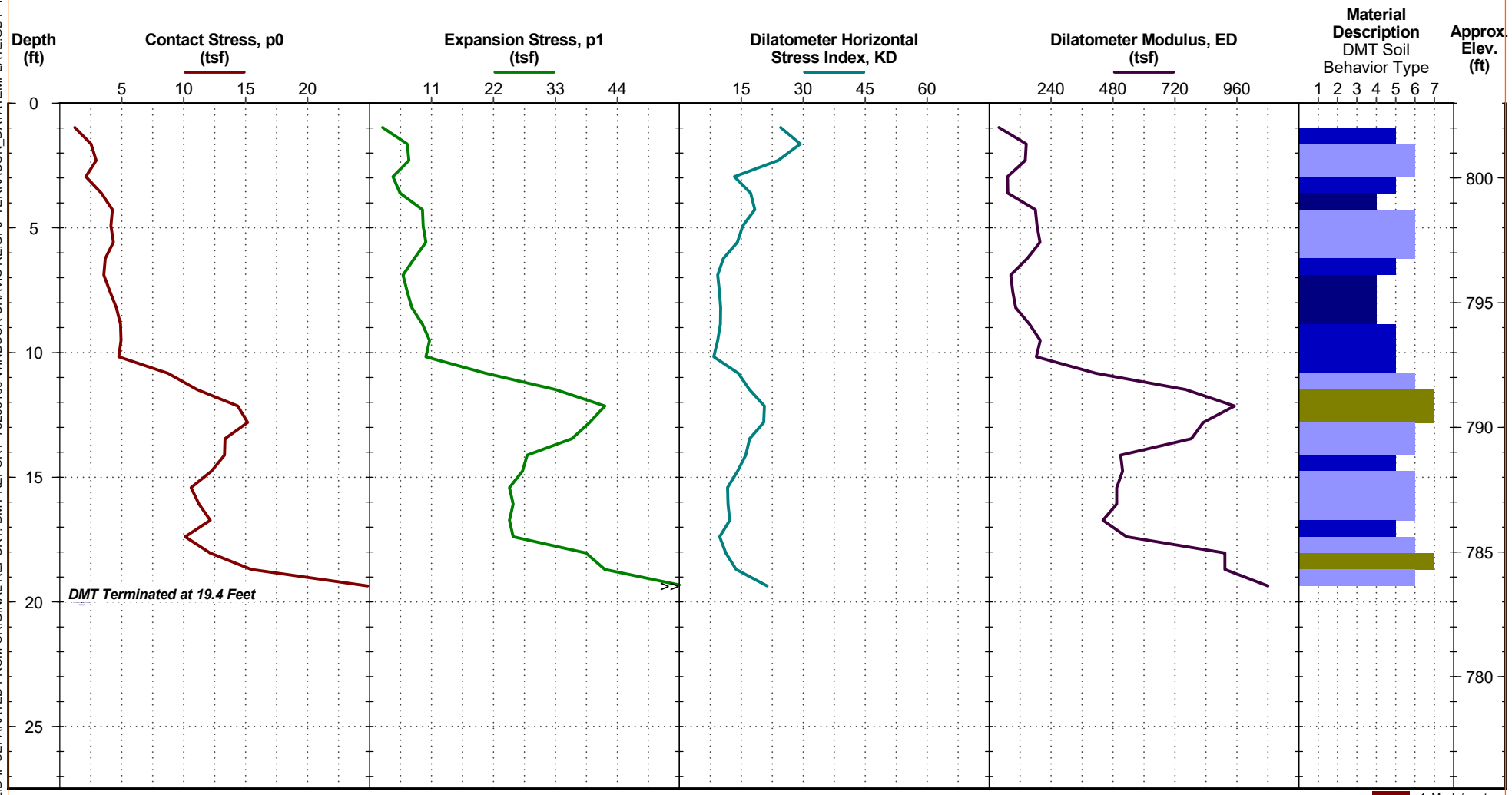
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 803 ft +/-
Latitude: 36.0652155°
Longitude: -79.770875°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 2.0'

DMT specification reports available upon request.

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; see Appendix C)

Calibrations: ΔA - 0.4 bar; ΔB - 0.3 bar; Zm - 0 bar
Blade no. 346

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

DMT Started: 9/23/2020
DMT Completed: 9/23/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-3

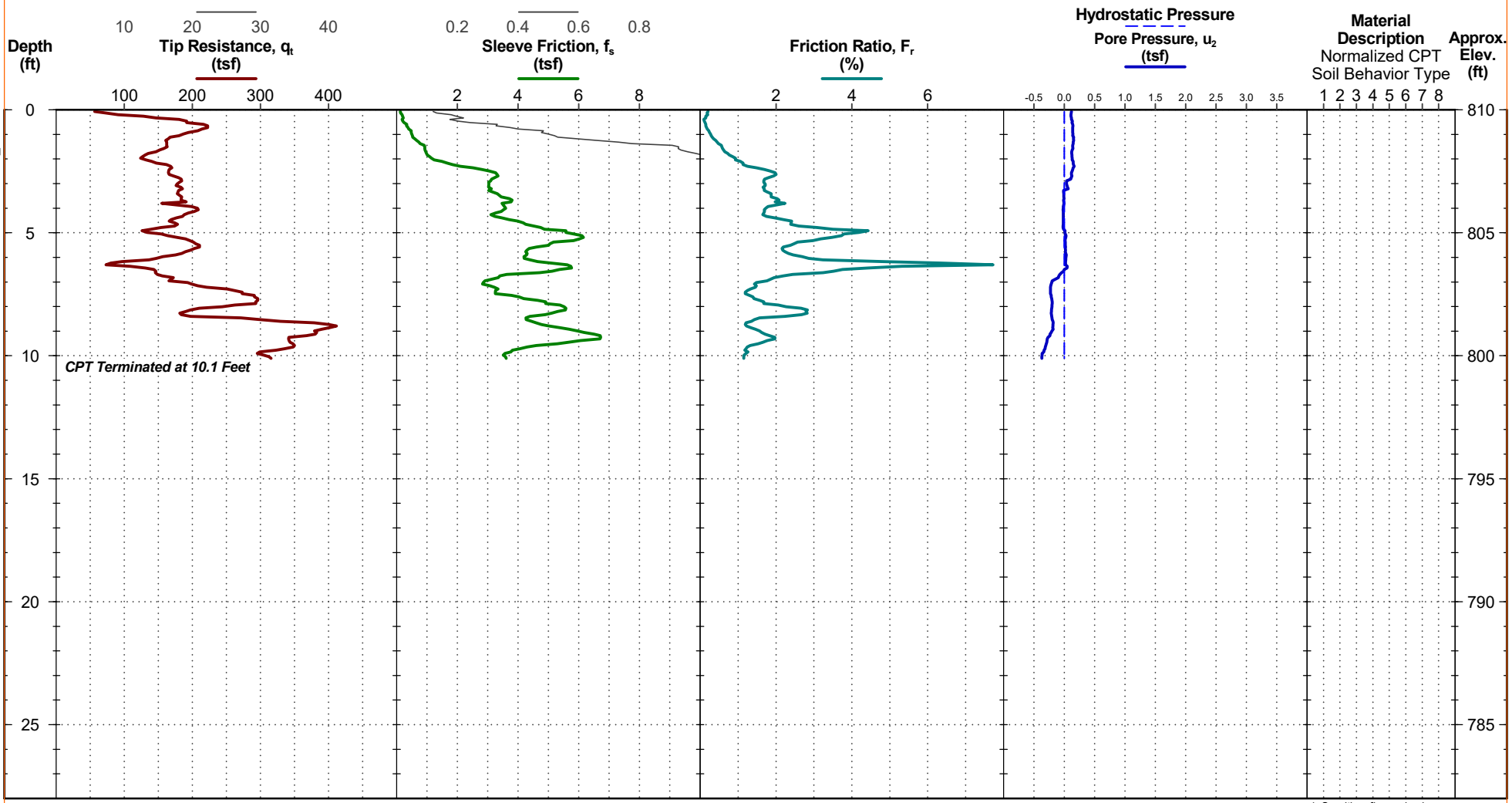
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 810 ft +/-
Latitude: 36.065919°
Longitude: -79.770632°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

1" rootmat and topsoil. Cave-in depth = 10.0'

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-4

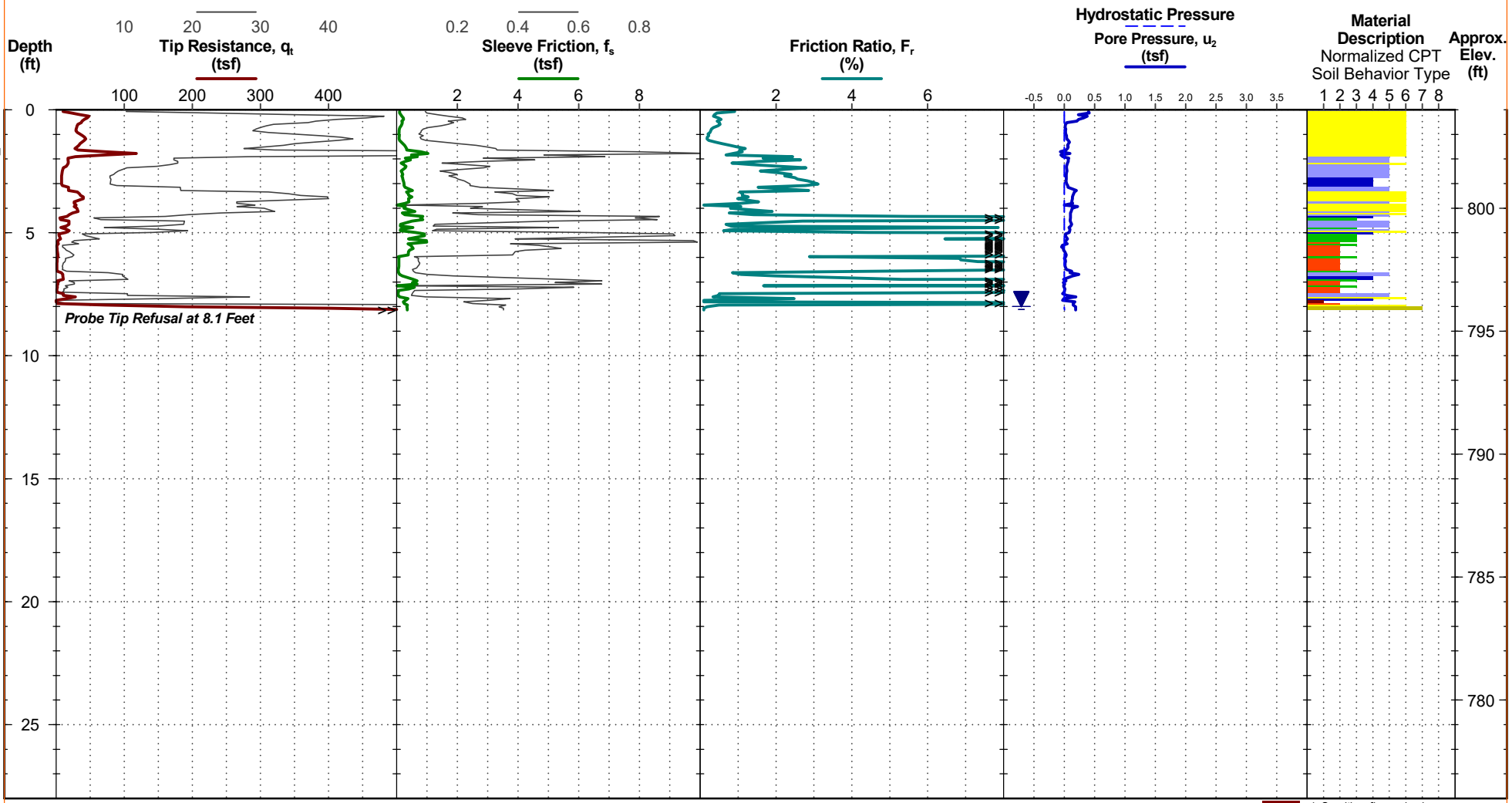
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 804 ft +/-
Latitude: 36.065477°
Longitude: -79.770343°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 8.0'

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

▼ 8 ft measured water depth
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-5

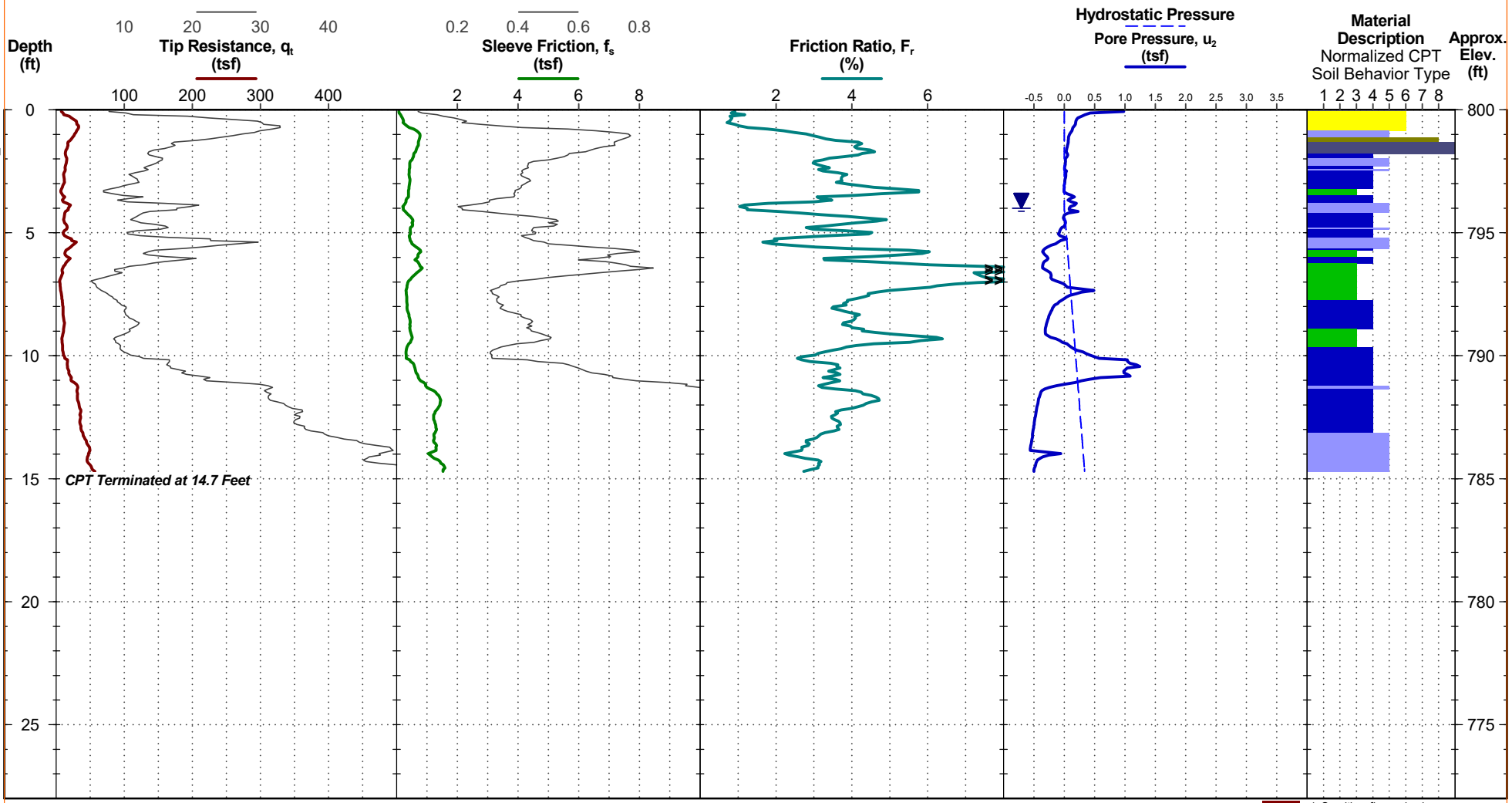
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 800 ft +/-
Latitude: 36.065425°
Longitude: -79.769864°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 4.0'

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

▼ 4 ft estimated water depth
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-6

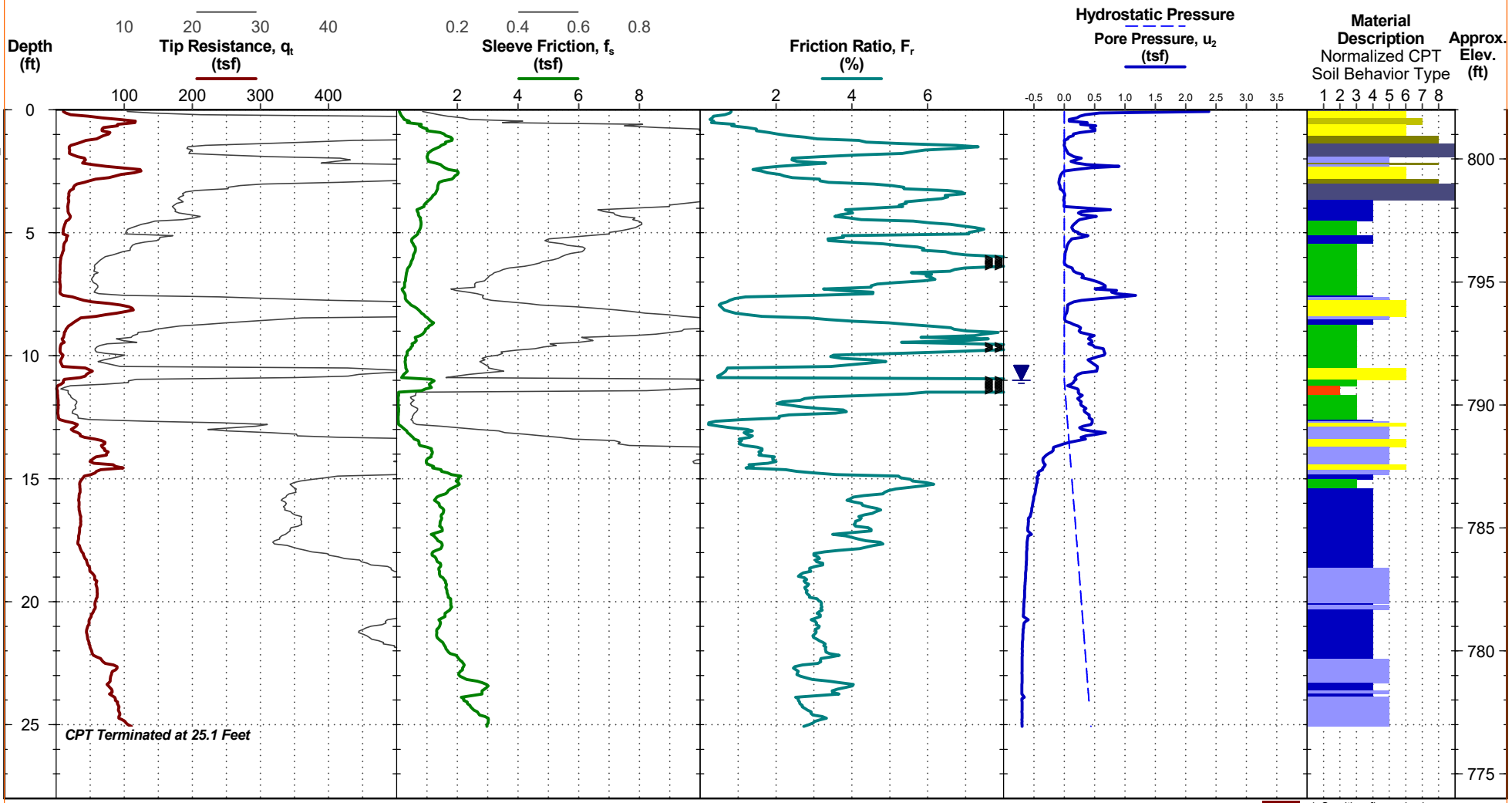
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 802 ft +/-
Latitude: 36.065193°
Longitude: -79.770103°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth =11.0'

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

▼ 11 ft estimated water depth
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/16/2020
CPT Completed: 9/16/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

DMT LOG NO. DMT-6

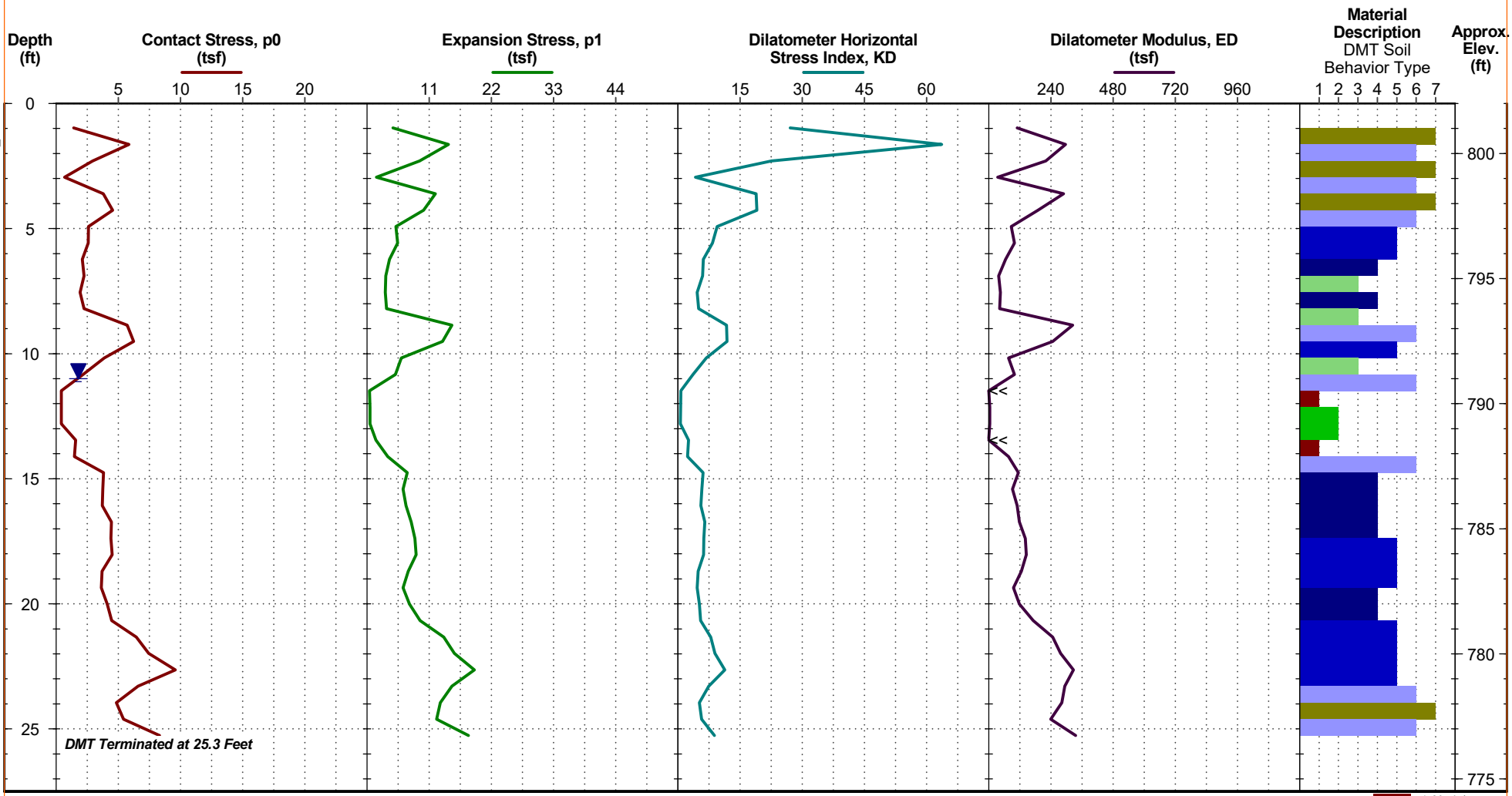
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 802 ft +/-
Latitude: 36.065194°
Longitude: -79.770104°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 11.0'

DMT specification reports available upon request.

WATER LEVEL OBSERVATION

▼ 11 ft measured water depth
(used in normalizations and correlations; See Supporting Information)

Calibrations: ΔA - 0.4 bar; ΔB - 0.3 bar; Zm - 0 bar
Blade no. 346

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

DMT Started: 9/16/2020
DMT Completed: 9/16/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-7

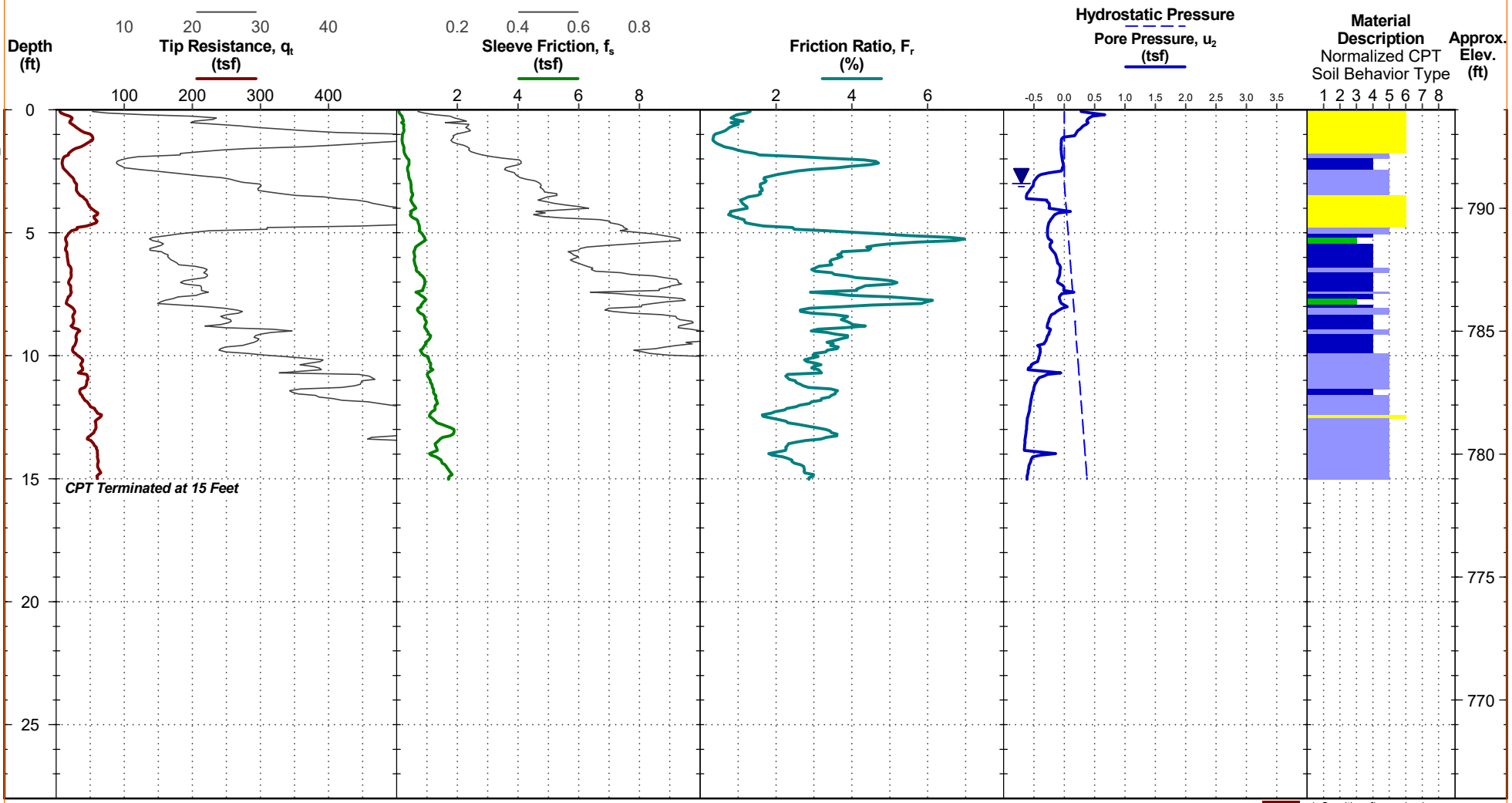
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 794 ft +/-
Latitude: 36.064652°
Longitude: -79.769834°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

4" rootmat and topsoil. Cave-in depth = 3.0'

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

▼ 3 ft estimated water depth
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-8

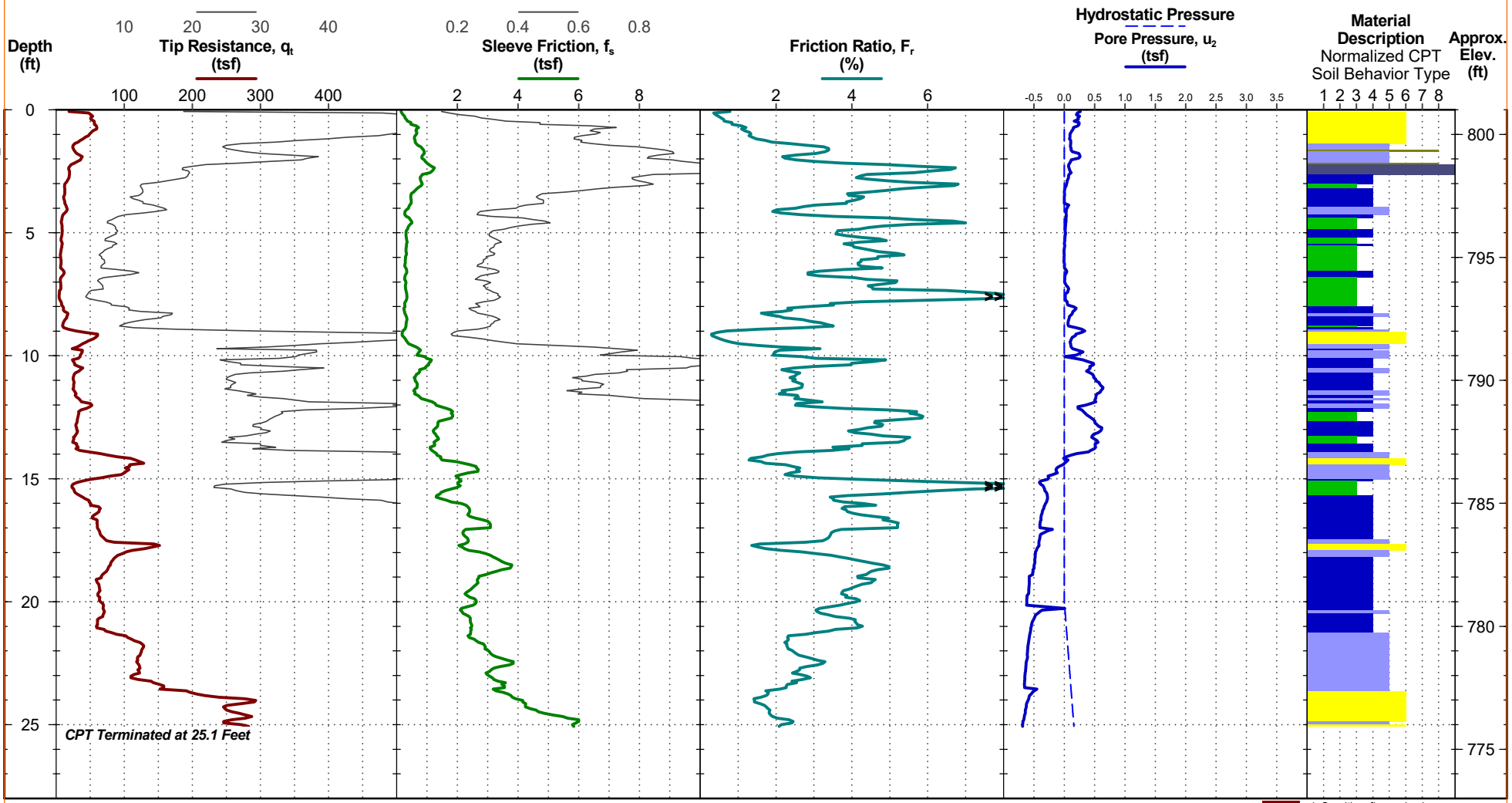
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 801 ft +/-
Latitude: 36.064539°
Longitude: -79.770194°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 16.0'

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-9

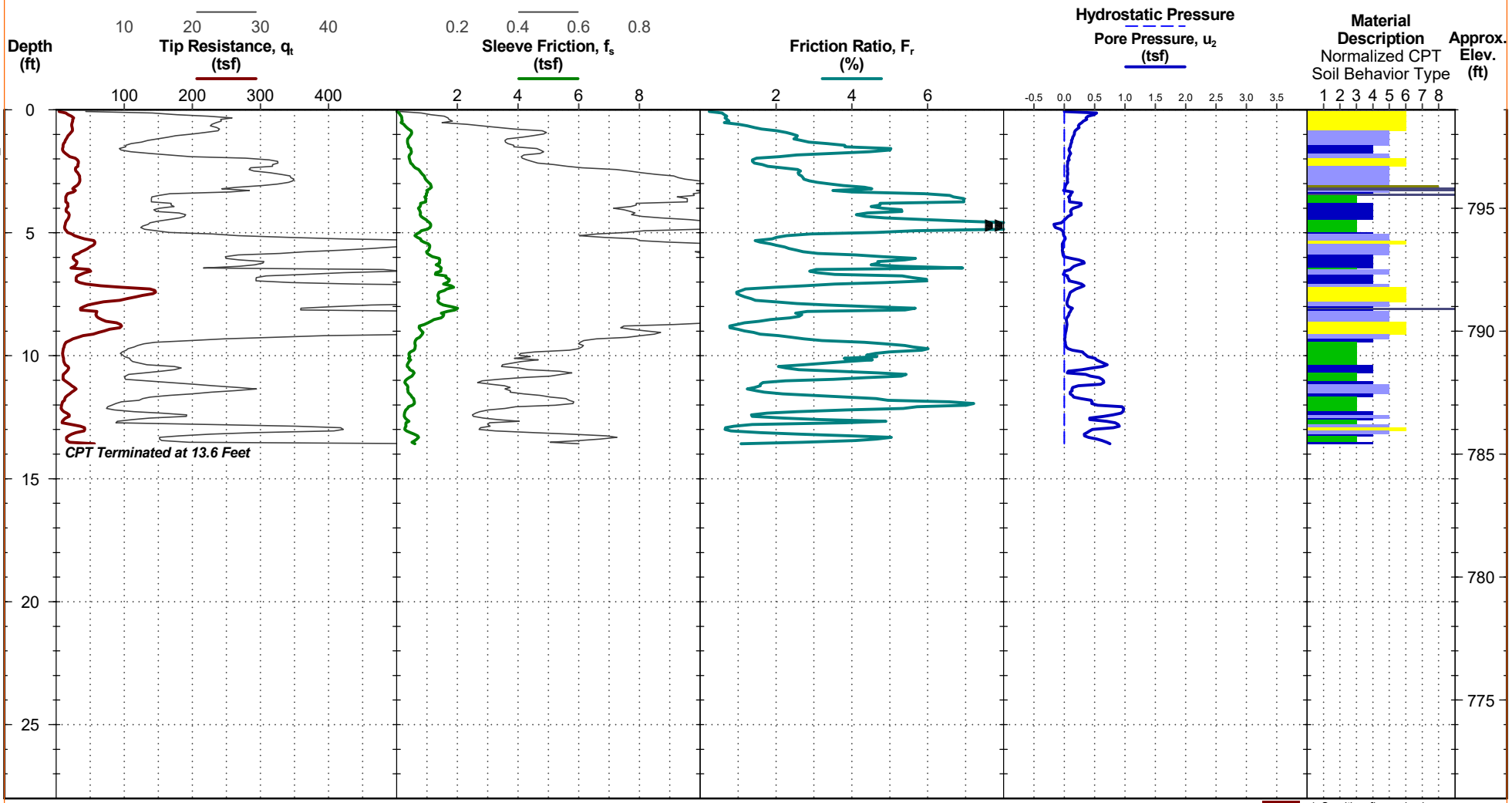
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 799 ft +/-
Latitude: 36.064356°
Longitude: -79.770025°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 11.0'

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-10

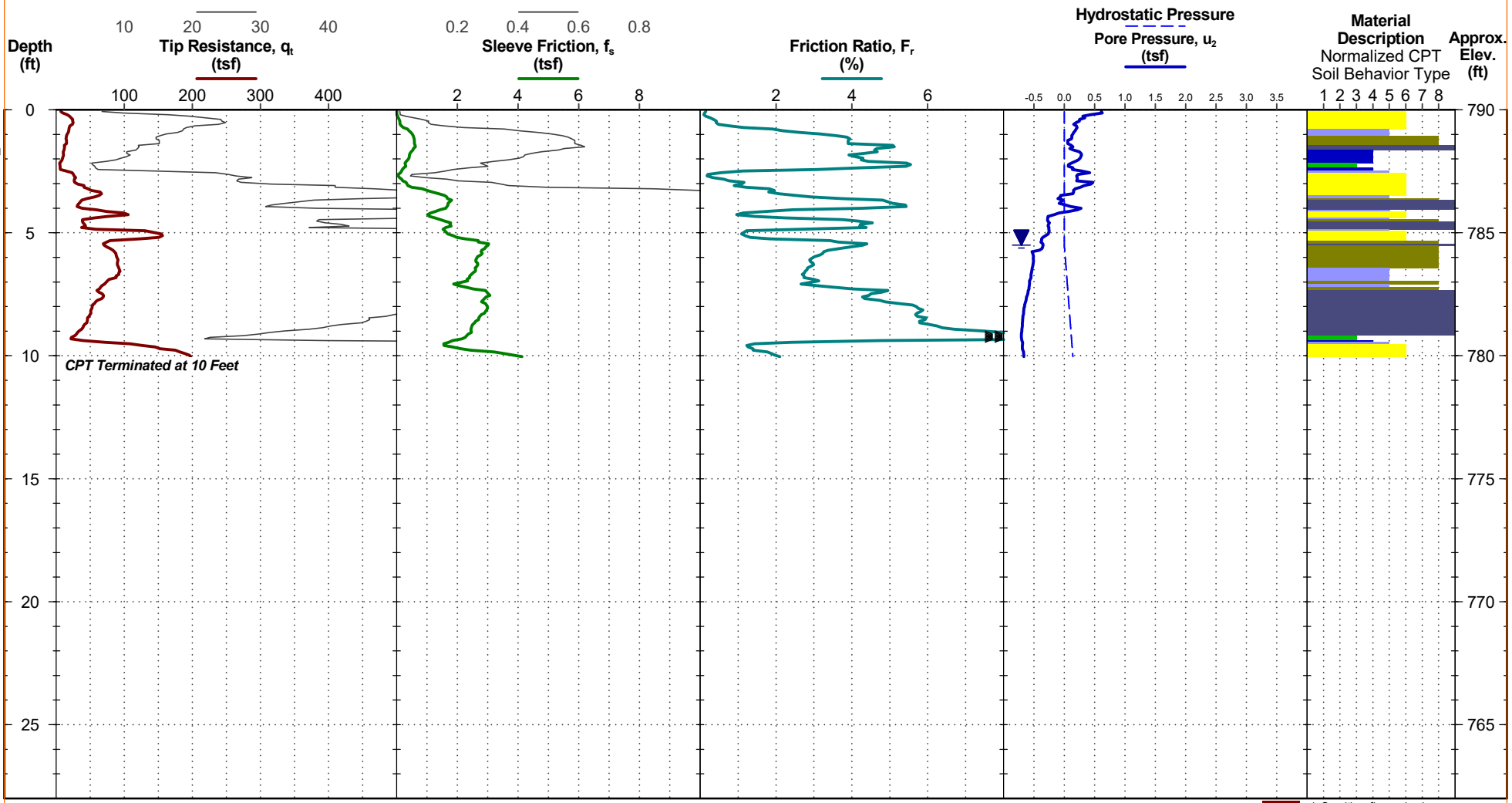
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 790 ft +/-
Latitude: 36.06441°
Longitude: -79.769907°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 6.0'

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

▼ 5.5 ft measured water depth
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-11

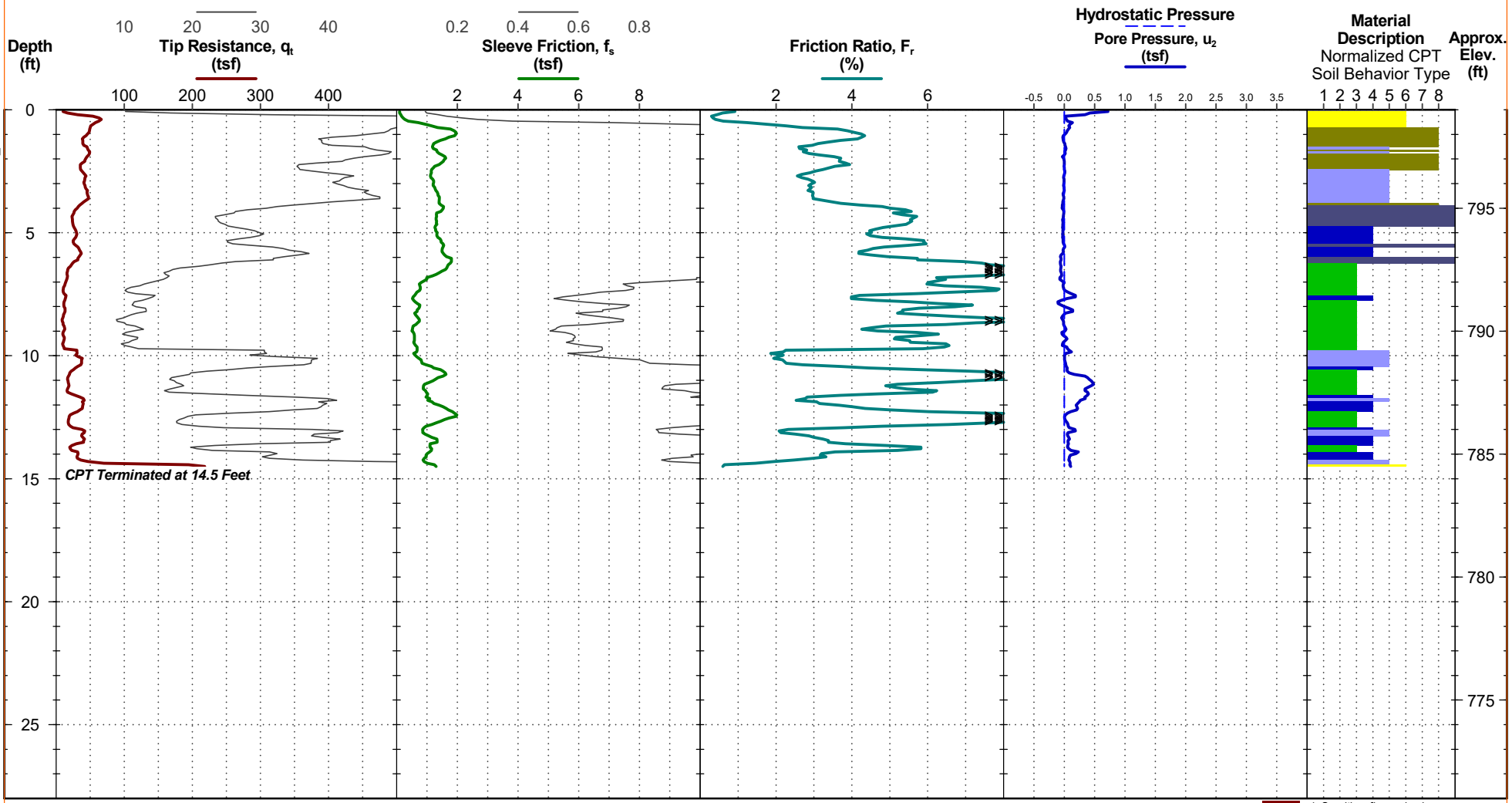
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 799 ft +/-
Latitude: 36.06401066°
Longitude: -79.77000935°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

2" rootmat and topsoil. Cave-in depth = 14.3'

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/16/2020
CPT Completed: 9/16/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-12

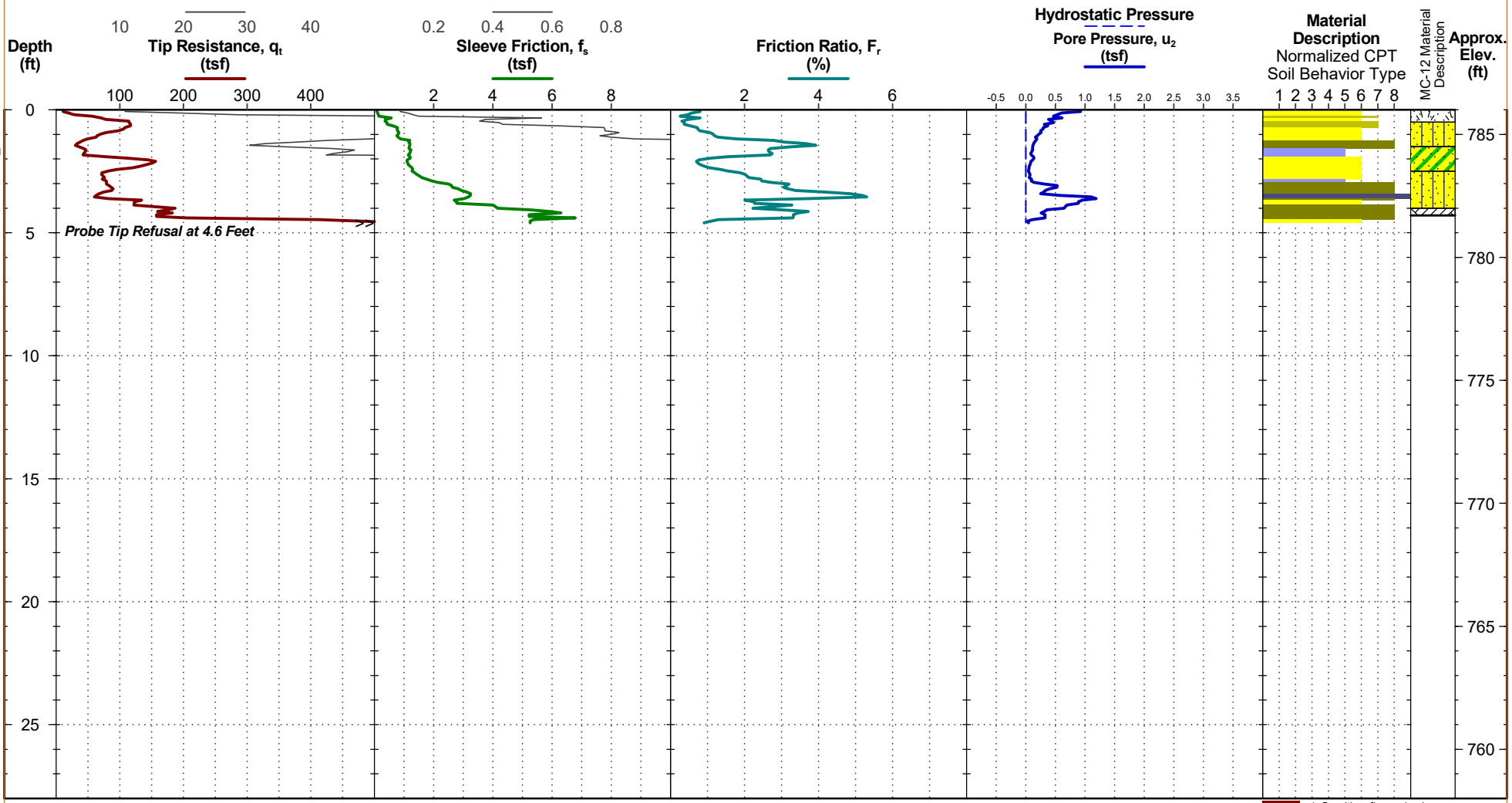
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 786 ft +/- Adjacent Test: MC-12
Latitude: 36.06396289°
Longitude: -79.76980924°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

4" rootmat and topsoil. Cave-in depth = 4.3'

See MC-12 for the adjacent test's full details.

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/16/2020
CPT Completed: 9/16/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

BORING LOG NO. MC-12

PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

LOCATION See Exploration Plan

Latitude: 36.064° Longitude: -79.7698°

Surface Elev.: 786 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER CONTENT (%)	FIELD TEST RESULTS
0.5	785.5			
TOPSOIL, 6"				
1.5	784.5	1	13.3	
RESIDUAL - SILTY SAND (SM), fine to coarse grained, brown, moist				
2.5	783.5	2	10.6	
CLAYEY SAND (SC), fine to coarse grained, gray brown, moist				
4.0	782	3	10.6	
SILTY SAND (SM), fine to coarse grained, gray red, moist				
4.3	781.5	4		50/4" N=50/3"
PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND, fine to coarse grained, white, moist				
Boring Terminated at 4.3 Feet				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Macro-Core Sampler / 140lb Auto Hammer

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

At completion of sampling, Dry

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

Boring Started: 09-16-2020 | Boring Completed: 09-16-2020

Drill Rig: Pagani TG73-200 | Driller: C. Storm

Project No.: 75205169

CPT LOG NO. B-13

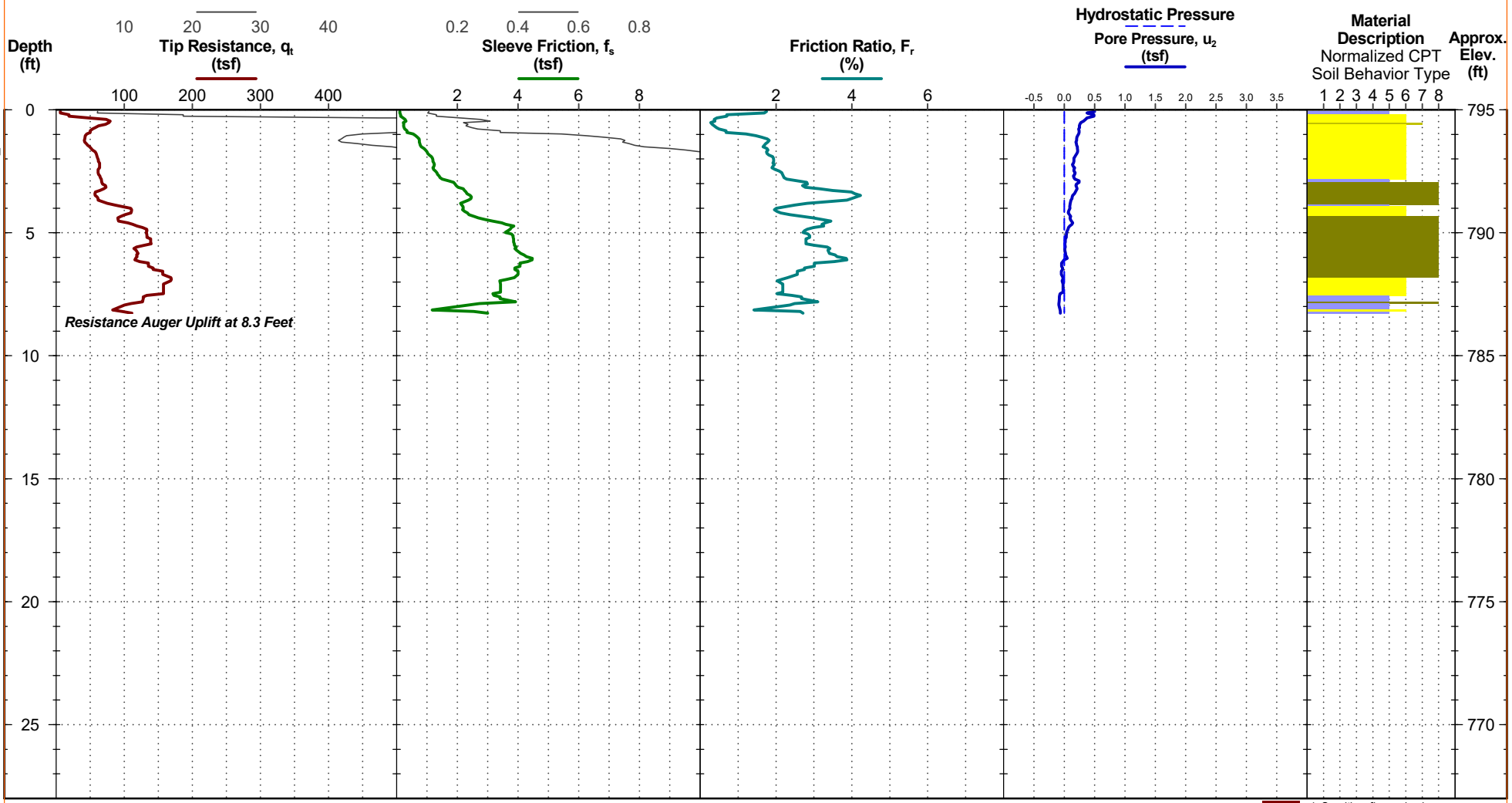
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 795 ft +/-
Latitude: 36.06385936°
Longitude: -79.76935291°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

4" rootmat and topsoil. Cave-in depth = 7.8'

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/16/2020
CPT Completed: 9/16/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-13A

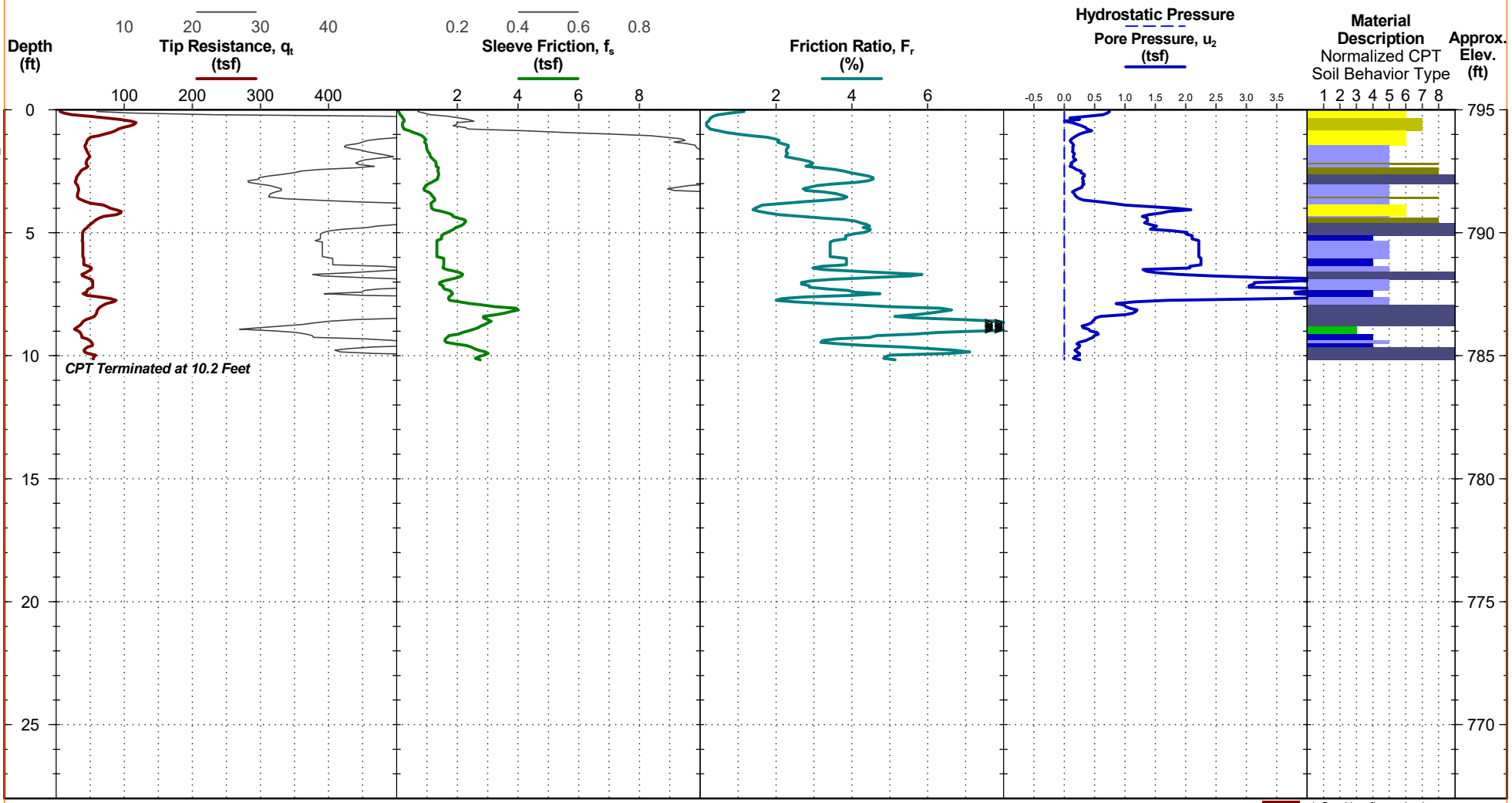
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 795 ft +/-
Latitude: 36.06387447°
Longitude: -79.76937422°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 10.0'

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/16/2020
CPT Completed: 9/16/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-14

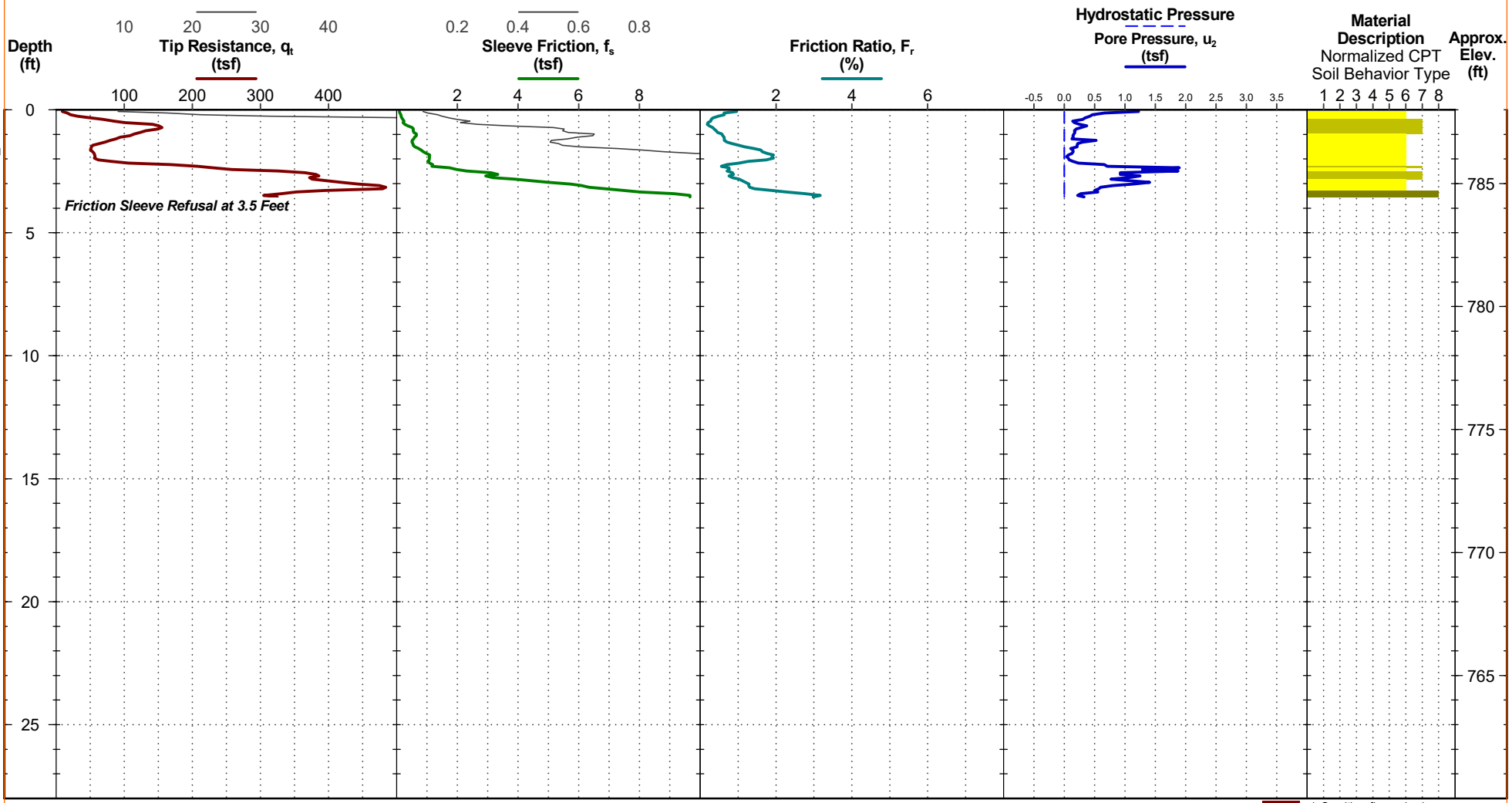
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 788 ft +/-
Latitude: 36.06359723°
Longitude: -79.76970847°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

CPT sensor calibration reports available upon request.

Elevations were interpolated from a topographic site plan.

4" rootmat and topsoil. Cave-in depth = 3.5'

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-14A

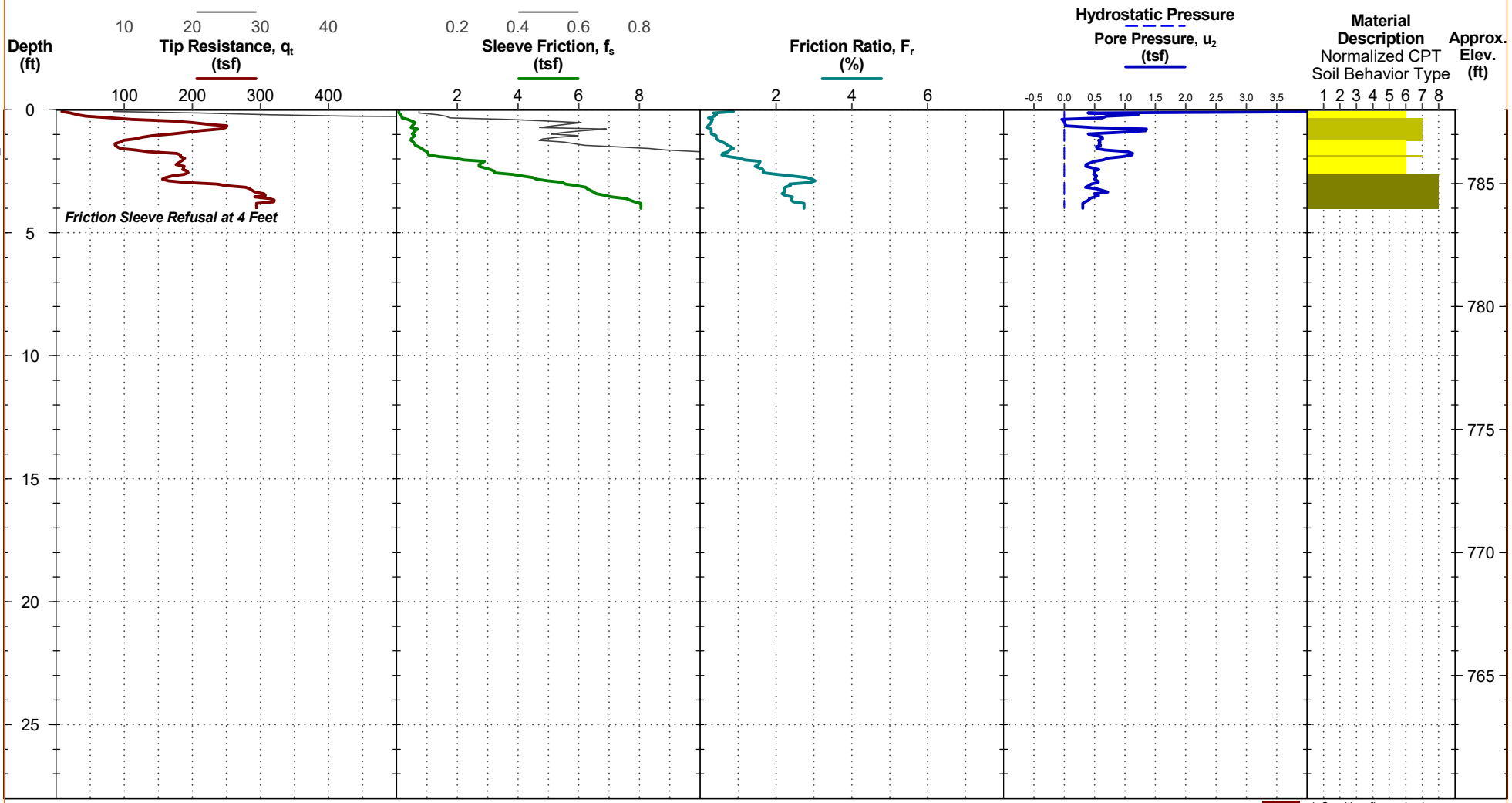
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 788 ft +/-
Latitude: 36.06357026°
Longitude: -79.76971096°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 3.8'

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-15

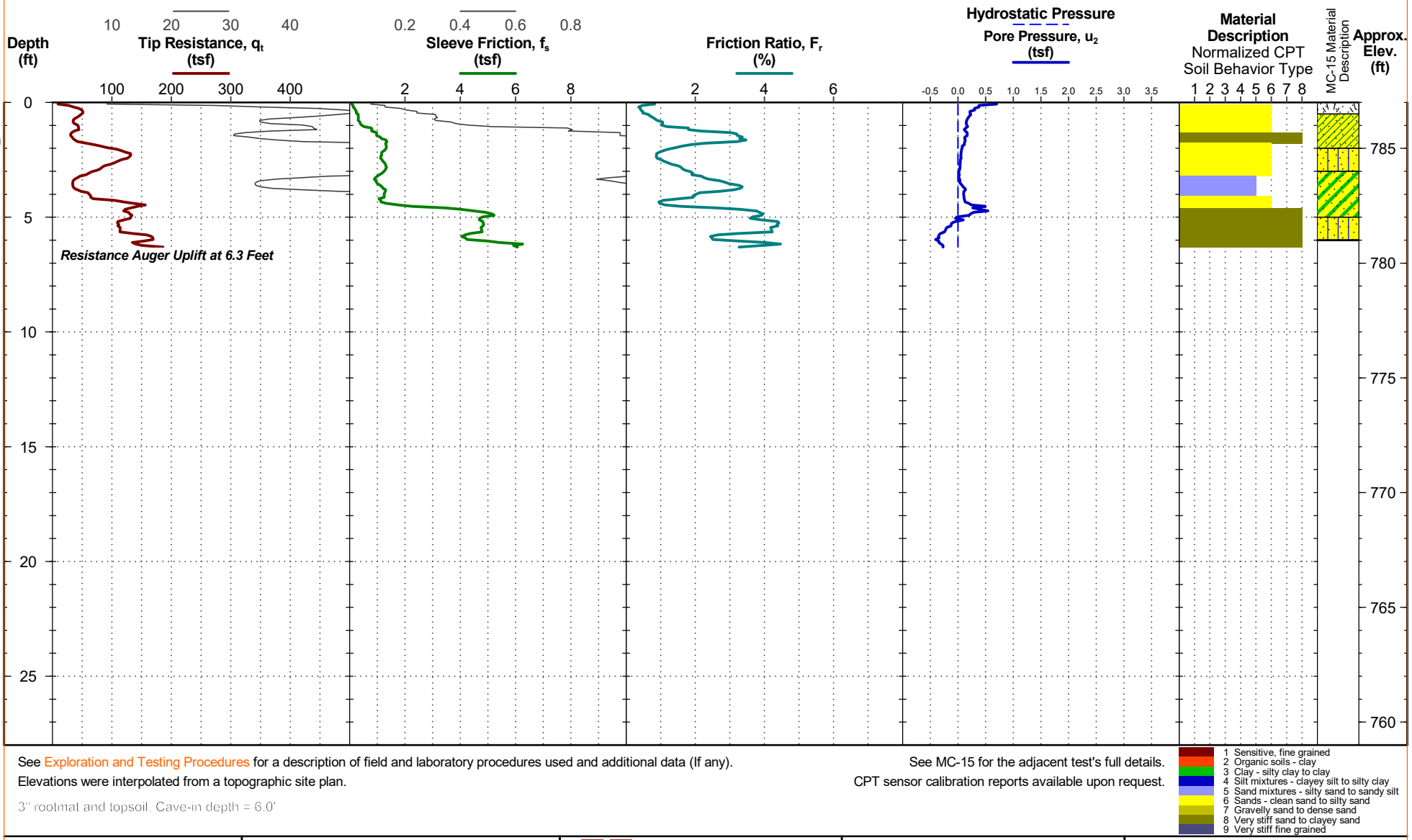
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 787 ft +/- Adjacent Test: MC-15
Latitude: 36.06304657°
Longitude: -79.7697247°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 6.0'

See MC-15 for the adjacent test's full details.

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/16/2020
CPT Completed: 9/16/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

BORING LOG NO. MC-15

PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

LOCATION See Exploration Plan

Latitude: 36.0631° Longitude: -79.7697°

Surface Elev.: 787 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.5	786.5	**TOPSOIL**, 6"
2.0	785	**FILL - SANDY LEAN CLAY**, gray tan, moist
3.0	784	**RESIDUAL - SILTY SAND (SM)**, fine to coarse grained, tan, moist
5.0	782	**CLAYEY SAND (SC)**, fine to coarse grained, white, moist
6.0	781	**SILTY SAND (SM)**, contains rock fragments, medium to coarse grained, white, moist, medium dense
		Boring Terminated at 6 Feet

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1			17.3		
2					
3			9.4		
4					
5		10-13-13-20 N=26			
6					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Macro-Core Sampler / 140lb Auto Hammer

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

At completion of sampling, Dry

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

Boring Started: 09-16-2020 | Boring Completed: 09-16-2020

Drill Rig: Pagani TG73-200 | Driller: C. Storm

Project No.: 75205169

CPT LOG NO. B-16

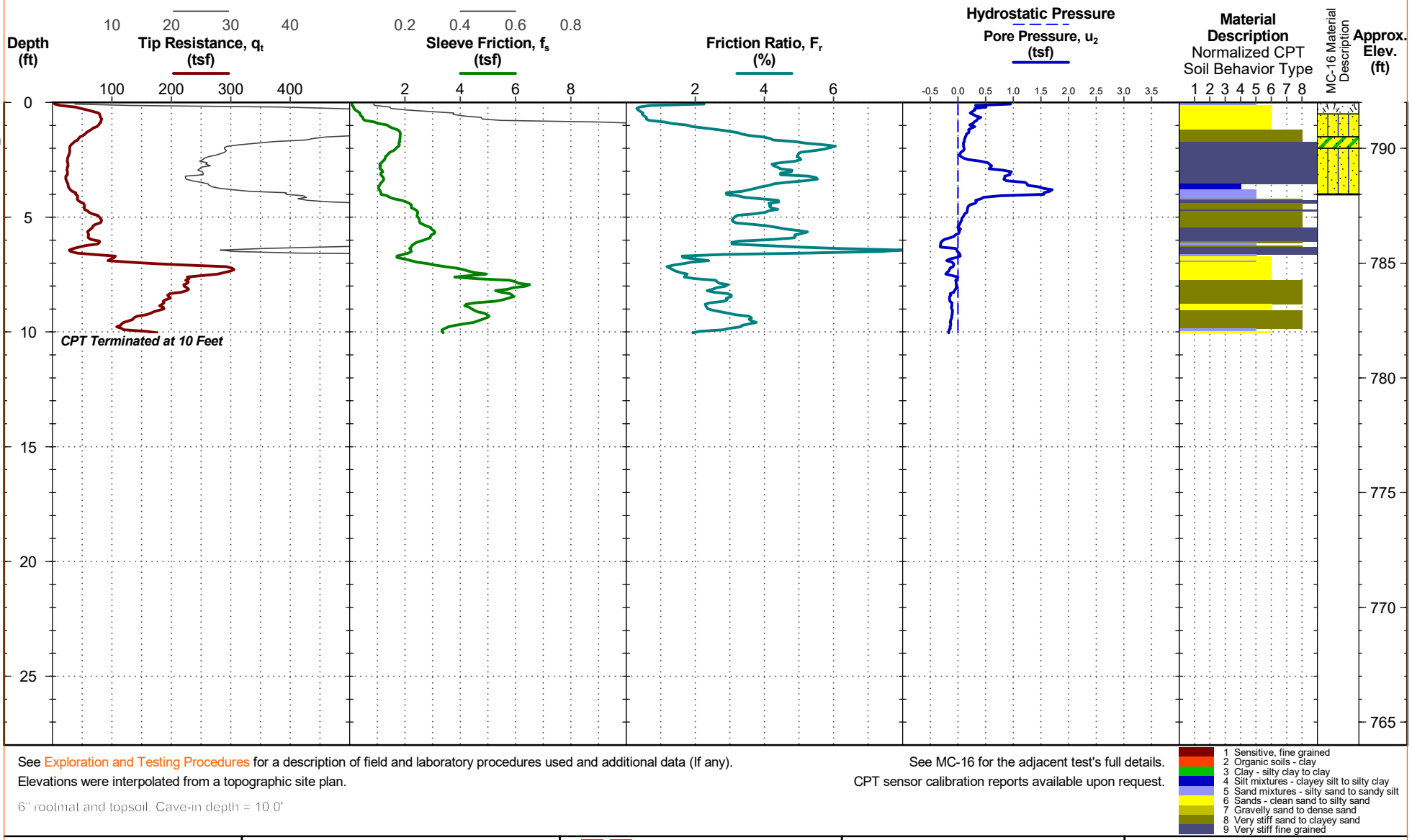
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 792 ft +/- Adjacent Test: MC-16
Latitude: 36.06340488°
Longitude: -79.76906257°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

6" rootmat and topsoil. Cave-in depth = 10.0'

See MC-16 for the adjacent test's full details.

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/16/2020
CPT Completed: 9/16/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

BORING LOG NO. MC-16

PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

LOCATION See Exploration Plan

Latitude: 36.0634° Longitude: -79.7691°

Surface Elev.: 792 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5	791.5				
TOPSOIL, 6"					
1.5	790.5	1	10.8		
RESIDUAL - SILTY SAND (SM), fine to coarse grained, gray orange, moist					
2.0	790	2	11.7	26-13-13	42
CLAYEY SAND (SC), fine to coarse grained, orange tan, moist					
4.0	788	3	15.3		
SILTY SAND (SM), fine to coarse grained, white to orange, moist					
Boring Terminated at 4 Feet		4			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Macro-Core Sampler / 140lb Auto Hammer

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

At completion of sampling, Dry

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

Boring Started: 09-16-2020 | Boring Completed: 09-16-2020

Drill Rig: Pagani TG73-200 | Driller: C. Storm

Project No.: 75205169

CPT LOG NO. B-17

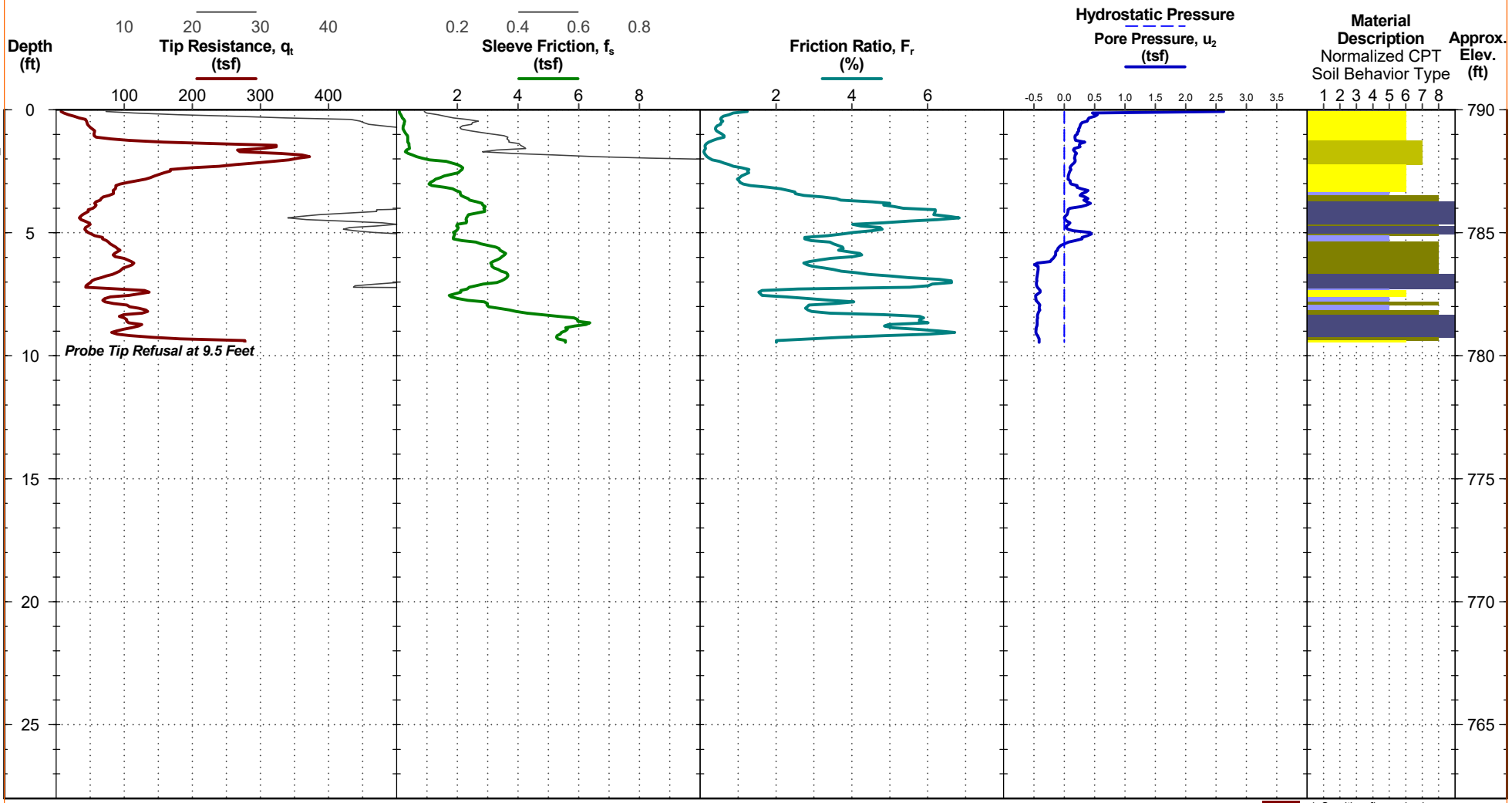
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 790 ft +/-
Latitude: 36.06321061°
Longitude: -79.76861733°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

CPT sensor calibration reports available upon request.

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 9.3'

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

CPT LOG NO. B-18

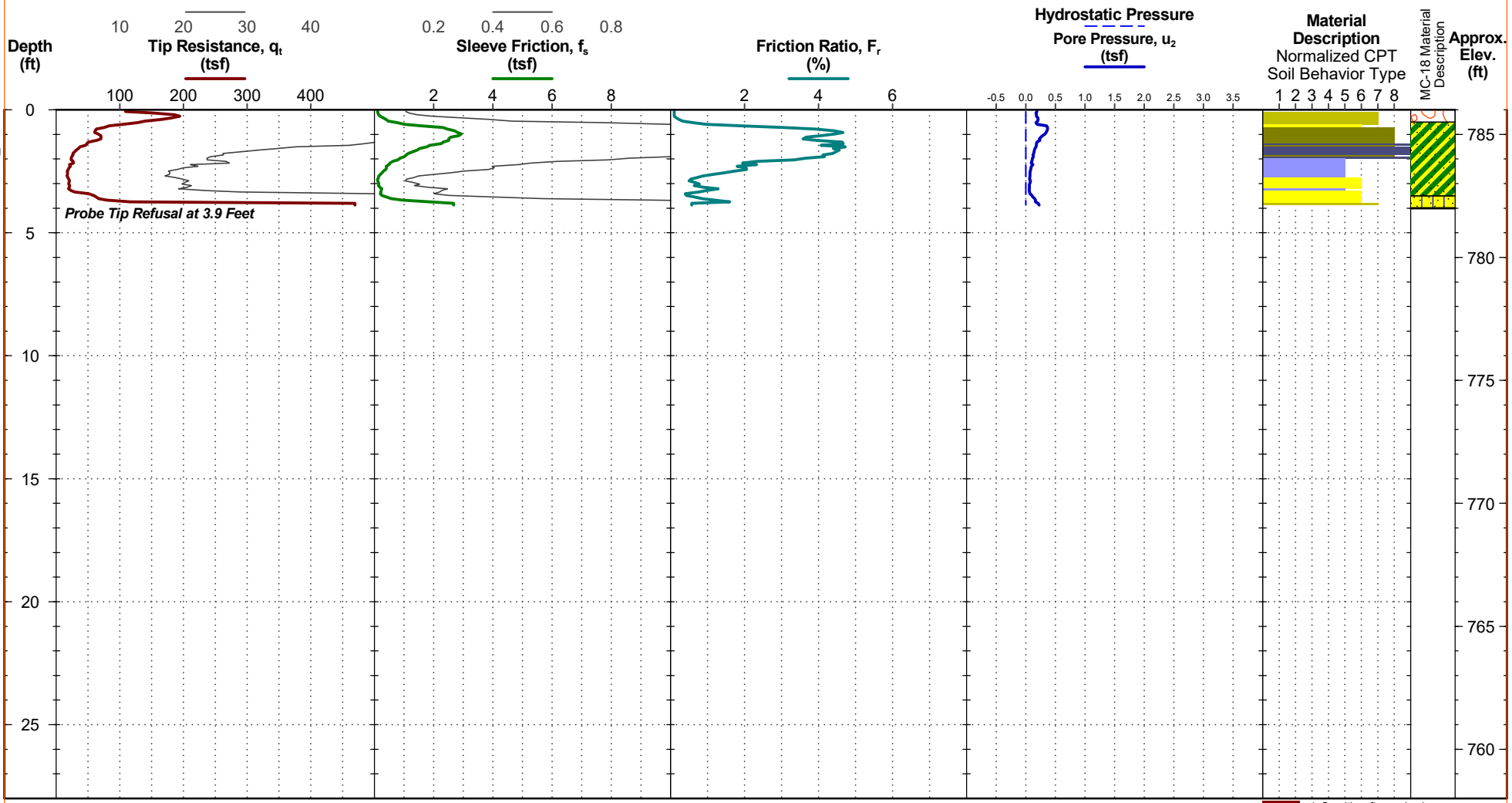
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 786 ft +/- Adjacent Test: MC-18
Latitude: 36.06260037°
Longitude: -79.7689936°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

3" rootmat and topsoil. Cave-in depth = 3.8'

See MC-18 for the adjacent test's full details.

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/16/2020
CPT Completed: 9/16/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

BORING LOG NO. MC-18

PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

LOCATION See Exploration Plan

Latitude: 36.0626° Longitude: -79.769°

Surface Elev.: 786 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5	785.5				
CRUSHED STONE, 3"					
3.5	782.5	1			
RESIDUAL - SANDY FAT CLAY (CH), fine to coarse grained, red tan, moist		2	23.3	67-30-37	64
		3			
4.0	782	4			
SILTY SAND (SM), fine to coarse grained, orange, moist					
Boring Terminated at 4 Feet					

GRAPHIC LOG | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Macro-Core Sampler

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

At completion of sampling, Dry

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

Boring Started: 09-16-2020 | Boring Completed: 09-16-2020

Drill Rig: Pagani TG73-200 | Driller: C. Storm

Project No.: 75205169

CPT LOG NO. B-19

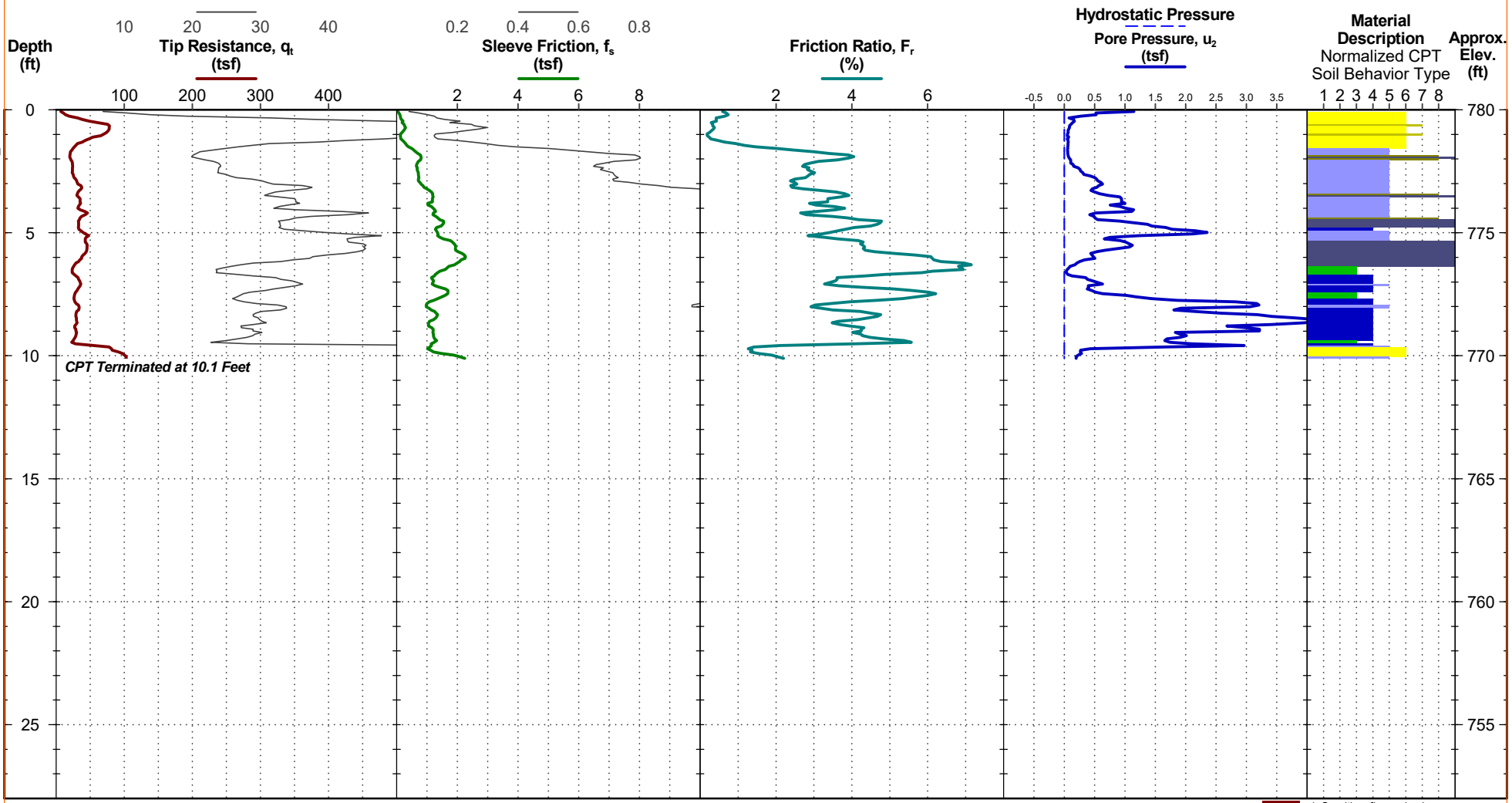
PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

TEST LOCATION: See Exploration Plan

Approx. Surface Elev: 780 ft +/-
Latitude: 36.06230415°
Longitude: -79.76943338°



See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Elevations were interpolated from a topographic site plan.

4" rootmat and topsoil. Cave-in depth = 10.0'

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

Groundwater not observed
(used in normalizations and correlations; See Supporting Information)

Probe no. 5369 with net area ratio of .854
U2 pore pressure transducer location
Manufactured by Nova Cone; calibrated 8/15/2019
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

CPT Started: 9/15/2020
CPT Completed: 9/15/2020
Rig: Pagani TG73-200
Operator: C. Storm
Project No.: 75205169

BORING LOG NO. B-20

PROJECT: Windsor Chavis Recreation Center and Park Development

CLIENT: Vines Architecture
Raleigh, NC

SITE: 1601 East Gate City Blvd
Greensboro, NC

LOCATION See Exploration Plan

Latitude: 36.0622° Longitude: -79.769°

Surface Elev.: 778 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		RESIDUAL - SILTY SAND (SM), contains rock fragments, fine to coarse grained, brown, moist, medium dense							
	1.5	776.5	1			4-11-16-50/5" N=27 N=50/5"	5.7		
	1.9	**PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND**, contains rock fragments, fine to coarse grained, tan, moist 776							
		Boring Terminated at 1.9 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
140lb Auto Hammer

Abandonment Method:

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

Could not perform sounding at location due to shallow resistance auger refusal

WATER LEVEL OBSERVATIONS

At completion of sampling, Dry

Terracon
7327 W Friendly Ave Ste G
Greensboro, NC

Boring Started: 09-15-2020 | Boring Completed: 09-15-2020

Drill Rig: Pagani TG73-200 | Driller: C. Storm

Project No.: 75205169

SUPPORTING INFORMATION

Contents:

Note: All attachments are one page unless noted above

GENERAL NOTES
DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

Terracon GeoReport

SAMPLING


Auger


Split Spoon


Shelby Tube


Macro Core


Ring Sampler


Rock Core


Grab Sample


No Recovery

WATER LEVEL


Water Initially Encountered


Water Level After a Specified Period of Time


Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	Standard Penetration Test Resistance (Blows/Ft.)
(HP)	Hand Penetrometer
(T)	Torvane
(DCP)	Dynamic Cone Penetrometer
UC	Unconfined Compressive Strength
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	5 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	9 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	16 - 30
		Hard	> 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL		RELATIVE PROPORTIONS OF FINES	
Descriptive Term(s) of other constituents	Percent of Dry Weight	**Descriptive Term(s) of other constituents**	**Percent of Dry Weight**
Trace	<15	Trace	<5
With	15-29	With	5-12
Modifier	>30	Modifier	>12

GRAIN SIZE TERMINOLOGY		PLASTICITY DESCRIPTION	
Major Component of Sample	**Particle Size**	**Term**	**Plasticity Index**
Boulders	Over 12 in. (300 mm)	Non-plastic	0
Cobbles	12 in. to 3 in. (300mm to 75mm)	Low	1 - 10
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)	Medium	11 - 30
Sand	#4 to #200 sieve (4.75mm to 0.075mm	High	> 30
Silt or Clay	Passing #200 sieve (0.075mm)		

CPT GENERAL NOTES

DESCRIPTION OF MEASUREMENTS AND CALIBRATIONS

To be reported per ASTM D5778:

Uncorrected Tip Resistance, q_c
Measured force acting on the cone divided by the cone's projected area

Corrected Tip Resistance, q_t
Cone resistance corrected for porewater and net area ratio effects
$q_t = q_c + u_2(1 - a)$
Where a is the net area ratio, a lab calibration of the cone typically between 0.70 and 0.85

Pore Pressure, u
Pore pressure measured during penetration
u_1 - sensor on the face of the cone
u_2 - sensor on the shoulder (more common)

Sleeve Friction, f_s
Frictional force acting on the sleeve divided by its surface area

Normalized Friction Ratio, F_r
The ratio as a percentage of f_s to q_t, accounting for overburden pressure

To be reported per ASTM D7400, if collected:

Shear Wave Velocity, V_s
Measured in a Seismic CPT and provides direct measure of soil stiffness

DESCRIPTION OF GEOTECHNICAL CORRELATIONS

Normalized Tip Resistance, Q_{tn}
$Q_{tn} = ((q_t - \sigma_{v0})/P_a)(P_a/\sigma'_{v0})^n$
$n = 0.381(I_c) + 0.05(\sigma'_{v0}/P_a) - 0.15$

Over Consolidation Ratio, OCR
$OCR\ (1) = 0.25(Q_{tn})^{1.25}$
$OCR\ (2) = 0.33(Q_{tn})$

Undrained Shear Strength, S_u
$S_u = Q_{tn} \times \sigma'_{v0}/N_{kt}$
N_{kt} is a soil-specific factor (shown on S_u plot)

Sensitivity, S_t
$S_t = (q_t - \sigma_{v0}/N_{kt}) \times (1/f_s)$

Effective Friction Angle, ϕ'
$\phi'\ (1) = \tan^{-1}(0.373[\log(q_t/\sigma'_{v0}) + 0.29])$
$\phi'\ (2) = 17.6 + 11[\log(Q_{tn})]$

Unit Weight, γ
$\gamma = (0.27[\log(F_r)]+0.36[\log(q_t/atm)]+1.236) \times \gamma_{water}$
σ_{v0} is taken as the incremental sum of the unit weights

Small Strain Shear Modulus, G_0
$G_0\ (1) = \rho V_s^2$
$G_0\ (2) = 0.015 \times 10^{(0.55Ic + 1.68)}(q_t - \sigma_{v0})$

Soil Behavior Type Index, I_c
$I_c = [(3.47 - \log(Q_{tn}))^2 + (\log(F_r) + 1.22)^2]^{0.5}$

SPT N_{60}
$N_{60} = (q_t/atm) / 10^{(1.1268 - 0.2817Ic)}$

Elastic Modulus, E_s (assumes $q/q_{ultimate} \sim 0.3$, i.e. FS = 3)
$E_s\ (1) = 2.6\psi G_0$ where $\psi = 0.56 - 0.33\log Q_{tn,clean\ sand}$
$E_s\ (2) = G_0$
$E_s\ (3) = 0.015 \times 10^{(0.55Ic + 1.68)}(q_t - \sigma_{v0})$
$E_s\ (4) = 2.5q_t$

Constrained Modulus, M
$M = \alpha_M(q_t - \sigma_{v0})$
For $I_c > 2.2$ (fine-grained soils)
$\alpha_M = Q_{tn}$ with maximum of 14
For $I_c < 2.2$ (coarse-grained soils)
$\alpha_M = 0.0188 \times 10^{(0.55Ic + 1.68)}$

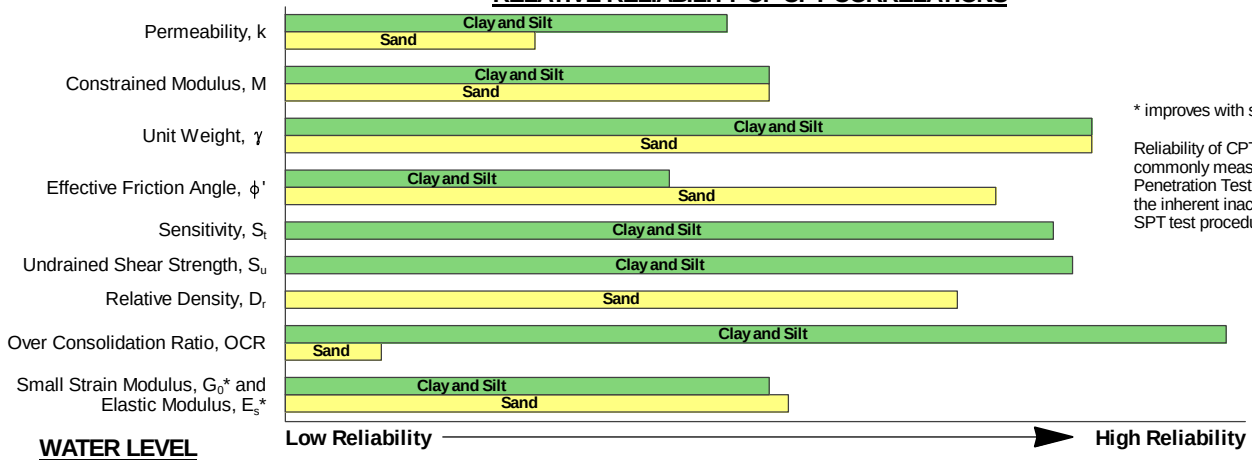
Hydraulic Conductivity, k
For $1.0 < I_c < 3.27$ $k = 10^{(0.952 - 3.04Ic)}$
For $3.27 < I_c < 4.0$ $k = 10^{(-4.52 - 1.37Ic)}$

Relative Density, D_r
$D_r = (Q_{tn} / 350)^{0.5} \times 100$

REPORTED PARAMETERS

CPT logs as provided, at a minimum, report the data as required by ASTM D5778 and ASTM D7400 (if applicable). This minimum data include q_t, f_s, and u. Other correlated parameters may also be provided. These other correlated parameters are interpretations of the measured data based upon published and reliable references, but they do not necessarily represent the actual values that would be derived from direct testing to determine the various parameters. To this end, more than one correlation to a given parameter may be provided. The following chart illustrates estimates of reliability associated with correlated parameters based upon the literature referenced below.

RELATIVE RELIABILITY OF CPT CORRELATIONS



* improves with seismic V_s measurements

Reliability of CPT-predicted N_{60} values as commonly measured by the Standard Penetration Test (SPT) is not provided due to the inherent inaccuracy associated with the SPT test procedure.

WATER LEVEL

The groundwater level at the CPT location is used to normalize the measurements for vertical overburden pressures and as a result influences the normalized soil behavior type classification and correlated soil parameters. The water level may either be "measured" or "estimated:"

Measured - Depth to water directly measured in the field

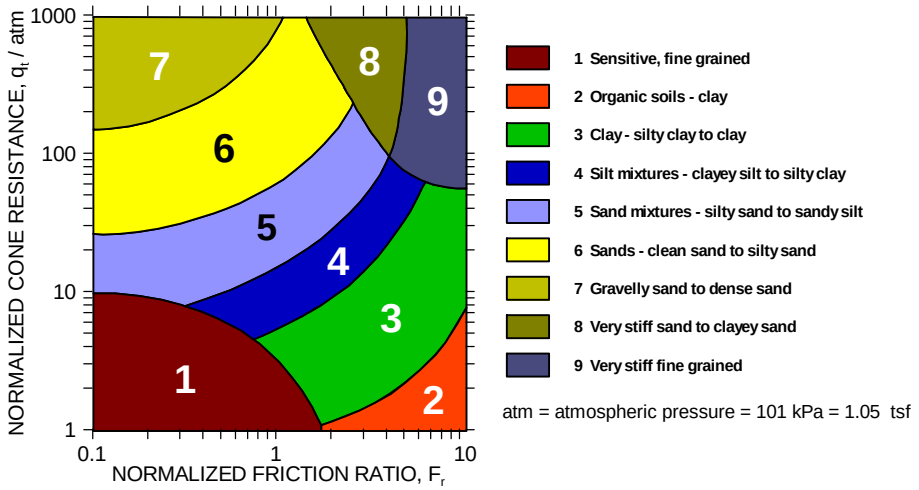
Estimated - Depth to water interpolated by the practitioner using pore pressure measurements in coarse grained soils and known site conditions

While groundwater levels displayed as "measured" more accurately represent site conditions at the time of testing than those "estimated," in either case the groundwater should be further defined prior to construction as groundwater level variations will occur over time.

CONE PENETRATION SOIL BEHAVIOR TYPE

The estimated stratigraphic profiles included in the CPT logs are based on relationships between corrected tip resistance (q_t), friction resistance (f_s), and porewater pressure (u_2). The normalized friction ratio (F_r) is used to classify the soil behavior type.

Typically, silts and clays have high F_r values and generate large excess penetration porewater pressures; sands have lower F_r's and do not generate excess penetration porewater pressures. The adjacent graph (Robertson *et al.*) presents the soil behavior type correlation used for the logs. This normalized SBT chart, generally considered the most reliable, does not use pore pressure to determine SBT due to its lack of repeatability in onshore CPTs.



atm = atmospheric pressure = 101 kPa = 1.05 tsf

REFERENCES

Kulhawy, F.H., Mayne, P.W., (1997). "Manual on Estimating Soil Properties for Foundation Design," Electric Power Research Institute, Palo Alto, CA.

Mayne, P.W., (2013). "Geotechnical Site Exploration in the Year 2013," Georgia Institue of Technology, Atlanta, GA.

Robertson, P.K., Cabal, K.L. (2012). "Guide to Cone Penetration Testing for Geotechnical Engineering," Signal Hill, CA.

Schmertmann, J.H., (1970). "Static Cone to Compute Static Settlement over Sand," *Journal of the Soil Mechanics and Foundations Division*, 96(SM3), 1011-1043.

Terracon

Exhibit: C-1

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or [Cc<1 or Cc>3.0] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or [Cc<1 or Cc>3.0] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.