



ADDENDUM No 1

2025/05/09

SMYRNA SCHOOL DISTRICT

Sunnyside Intermediate School – New School
BID NO. SSD22004-NC_NEWIS

ADDENDUM No: **1**
2025/05/09

ARCHITECT'S PROJECT No: 22019

Smyrna School District
Sunnyside Intermediate School
70 Graceville Drive, Smyrna, DE 19977

Fearn-Clendaniel Architects, Inc.
6 Larch Avenue Suite 398
Wilmington, Delaware, 19804
Phone: (302) 998-7615

BIDS DUE: **2:00 p.m. on Thursday June 05, 2025**

LOCATION: **Smyrna School District Administrative Office**
82 Monrovia Avenue
Smyrna, DE 19977

1.0 NOTICE TO ALL BIDDERS

- 1.1 Bidders are hereby notified that this Addendum shall be and hereby becomes part of their Contract Documents, and shall be attached to the Project Manual for this project.
- 1.2 The following items are intended to revise and clarify the Contract Documents, and shall be included by the Bidder in their proposal.
- 1.3 Bidders shall verify that their sub-bidders are in full receipt of the information contained herein. Bidders shall acknowledge receipt of each addendum on their Bid Form.

2.0 CLARIFICATIONS

- 2.1 Drawings and specifications provided on the State of Delaware procurement website for advertisement purposes should not be used for bidding. Only the documents issued at the Pre-bid Meeting or purchased directly from FC Architects should be used for bidding purposes.



2.2 This and all future addenda will be emailed to all planholders at the addresses given on the sign-in sheet.

2.3 Please see attached Pre-bid Meeting Minutes, Attendee Sign-In Sheet dated 2025/05/08, and Planholders list, as of this document's issuance. These documents are incorporated into this Addendum.

2.4 Bidders are reminded that the subcontractors they list on the Bid Form must be the subcontractors who perform the work. Bidders listing themselves as performing any portion of the work must be qualified, licensed, and manufacturer-certified to do so.

3.0 QUESTIONS

3.1 Questions have been received and are being reviewed. This first Addendum is to provide information from the Pre-Bid Meeting.

4.0 SUBSTITUTIONS

4.1 There are no substitution Requests at this time.

5.0 CHANGES TO THE DRAWINGS

5.1 There are no changes to the drawings at this time.

6.0 CHANGES TO THE PROJECT MANUAL

6.1 The Bid Form Subcontractor Listing was reviewed and approved by all in attendance at the Pre-Bid Meeting. See revised Bid Form Subcontractor Listed attached.

7.0 ATTACHMENTS

7.1 Pre-Bid Meeting Minutes

7.2 Pre-Bid Sign-In Sheet

7.3 Planholders List

7.4 Specification Section 00 41 13 – Bid Form

7.5 NEWIS Geotechnical Report – Dated Feb 15, 2023 by Geo-Technology Associates, Inc.

END OF ADDENDUM No 1



PREBID MEETING MINUTES

2025/05/09

SMYRNA SCHOOL DISTRICT

**SSD22004-NC_NEWIS
SUNNYSIDE INTERMEDIATE SCHOOL –
NEW SCHOOL**

MTG DATE: Thursday, 08 May
TIME: 10:00 A
LOCATION: Smyrna School District Administrative Office
FCA PROJECT: 22019

ATTENDEES: SSD Nick Marvel (NM)
Steven Gott (SG)

FCA Mark Ballintyn (MB)
Ken Fearn (KF)
GA Dan Booze (DB)
CDA Michael Loftus (ML)

BIDDERS See attached Sign-in Sheet(s)

1.0 NOTES

- 1.1 The project is State of Delaware funded and is subject to Delaware bidding requirements. See bid documents.
- 1.2 Attendance at this meeting was mandatory for General Contractors bidding the project. Every GC bidder is responsible for the entire scope of work contained within the Contract Documents. Please see attached Sign-In Sheets for attendee information.
- 1.3 Contract documents must be obtained from Fearn-Clendaniel Architects. State of DE My Marketplace documents are for reference only and are not to be used for bidding. FCA distributed USB Drives of the bidding documents to those wishing to purchase them. Bidding documents are still available for purchase at FCA's office in Wilmington, DE, at a cost of \$25.00 via cash or check made out to Fearn-Clendaniel Architects. For those purchasing documents after the pre-bid, they are available in USB Drive format or via email.



- 1.4 Only registered planholders of the bidding documents will receive addenda beyond Addendum 1, which will be sent to all Pre-Bid Attendees. Addenda will be emailed to the address provided by the bidder.
- 1.5 Prevailing wage rates and reporting are required. Prevailing wage rates are included in the Project Manual.
- 1.6 Bids must include Bid Bond of 10%, Addenda and Allowance acknowledgement, Subcontractor Listing, Non-Collusion statement, Drug Testing Program and Contractor Qualifications Affidavits.
The successful bidder will be required to submit, prior to contract execution, Performance / Payment Bond for 100% of the contract amount Craft Training Affidavits, and Subcontractor Drug Testing Program Affidavits.
- 1.7 Bid due date was announced as identified in advertisement:
2:00 PM local time on Thursday, June 5th, 2025.
Please note that bids are to be delivered to:
Smyrna School District Administrative Office
82 Monrovia Avenue, Smyrna, DE 19977
The address is listed in the specifications. One hard copy of the bid documents will be sufficient. Faxed or emailed bids will not be accepted.
- 1.8 The contractor will be responsible for obtaining permits. FCA will provide PDF files signed and stamped in electronic format by the architect and engineer of record for use in obtaining permits. GC is responsible for reproduction of permit sets. The Smyrna School District will pay for General Contract impact fees. Subcontractors are responsible for obtaining and paying for their trade's permits, if any. The Contractor will be responsible for any other permitting fee including those associated with re-inspections.
- 1.9 Scope of work was outlined. Work includes, but not limited to:
 - The project involves construction of a new 600 student Intermediate School for grades 4-5. The building is approximately 66,195 sf with 1&2 story construction with low slope and sloped roofing and elevator. Primary Building Materials – structural steel frame, metal roof decking, cmu and metal stud/ gypsum walls, brick veneer, metal siding, metal and epdm roofing systems.
 - The school will contain classrooms, student support spaces, administrative spaces, kitchen, cafeteria, recreational areas, and related utility and staff support spaces. There is also a detached generator and dumpster enclosure.
 - Site improvements on the 13.60 Acre Lot include drive lanes, parking, bus and parent circulation for loading/ unloading, recreational areas, utility distribution systems, and storm water management.
 - Civil Engineer (ML) as indicated a fill site to coordinate with developers road elevations.
 - MPE Engineer (DB) provided an general overview of the mechanical and electrical requirements for the new school.
- 1.10 Contract award is expected on or about **June 13th, 2025**. Work is expected to start on or about **June 15th, 2025** and be substantially completed by **August 10th, 2027**.



- 1.11 GC will be responsible for protecting site and building conditions during work. The GC is responsible for maintaining weathertight conditions throughout construction.
- 1.12 Contractor to coordinate with water and power utilities for use during construction, since this is a new site. The Smyrna School District is in talks with the Developer of the adjacent site, but is unclear of their construction schedule and when utilities will be brought to the site.
Contractor is responsible for connections and disconnections. Contractor must supply sanitary facilities for the duration of the work.
- 1.13 Contractors will be required to coordinate with Owner contractors (Advantech & Assurance Media) for IT: security cameras and alarm, structured cabling, AV (smartboards/ stage projector) and telecom systems.
Contractors to provide pathways (conduit and backboxes) to accessible ceiling or as indicated, and blocking for devices (smartboards) and plywood backing panels in IT closets.
Contractor has been made aware that coordination with Developer on their concurrent construction sequence/ and schedule. Coordination work to occur at the building site entry road and perimeter roads (Easy Street, Graceville Drive, and West Deer Run)
- 1.14 Hazardous materials are not known to be present in the area of work. If hazardous materials are suspected or encountered, Contractor is to stop work, leave the area, and notify the Owner for abatement.
- 1.15 State of Delaware mandates a minimum of 2 years comprehensive warranty on all work in the project. Specific items may have longer warranty terms as indicated in the project manual.
- 1.16 Allowances were described and are indicated in the contract documents. Allowance 1 is set at **\$250,000.00** for unforeseen conditions and Owner-requested additional work. Owner approval will be required before any allowance money is applied to the contract. Any unused allowance money will be returned to the Owner as a credit.
- 1.17 **Alternates:**
- Alternate **No 1: Extended Parking Area**
 - Base Bid: Existing to remain.
 - Alternate: Delete 26 parking spaces at the north edge of the site
 - Alternate **No 2: Atrium Skylight**
 - Base Bid: Existing to remain.
 - Alternate: Delete skylight in Area A. Infill opening with structure and roofing and ceiling as indicated.
- 1.18 No Unit Prices are requested at this time.



- 1.19 Liquidated Damages are waived for this project. The Owner reserves the right to have any work unfinished by the due date completed by others, and to recoup any associated costs via backcharge to the defaulting contractor.
- 1.20 The Subcontractor List was reviewed, discussed, and approved with revisions. Revised Bid Form will be issued in Addendum 1.
- 1.21 All substitution requests and questions should be submitted to Project Architect **Mark Ballintyn** at FCA's Wilmington office, in writing, or via email to **mark@fcarchitects.net**.
- 1.22 The deadline for substitution requests is 10 days before the bid due date. Substitution requests will only be accepted via General Contract / Prime Contract bidders, not directly from subcontractors or suppliers.
- 1.23 The deadline for questions is 7 days before the bid due date. Bidder questions will only be accepted from or through contract document holders on the planholder's letterhead or email.
- 1.24 The final addendum will be issued no later than 2 days prior to the bid due date. Exceptions: withdrawal of solicitation, extension of due date, or change of opening location.
- 1.25 Access to site: Bidders who wish to visit the site before the bid due date must contact **Nick Marvel, Supervisor of Buildings & Grounds, at 302-653-3132**

Fearn-Clendaniel Architects, Inc prepared these minutes for the purpose of recording significant information covered during the meeting. Should anyone object to the statements or interpretations contained herein, please advise within two weeks of the date of this report.

Submitted by:
Mark Ballintyn, RA
FC Architects, Inc

Copy to: Attendees

Attached: Pre-Bid Sign In Sheet
Pre-Bid Planholders List



Pre-bid Sign In Sheet

Contract: SSD22004-NC NEWIS

Date: 2025/05/08

Project: Sunnyside Intermediate School – New School

Please print legibly – we must be able to read your information.

Name / Company:	Taylor Cyr / Radius Systems LLC	G C: yes / ☒ no
Address (no POBs):	201 Pauls Edge Dr, Cheelets Ford, PA	
Phone:	302-498-1591	Email: tcy@radiussystemsllc.com
Name / Company:	BOB BLYMAN / RICHARD Y JOHNSON & SON	G C: ☒ yes / no
Address (no POBs):		
Phone:	302-218-8467	Email: bblyman@ryjson.com
Name / Company:	Michelle Clements / Keller Brothers Inc	G C: ☒ yes / no
Address (no POBs):	1012 Rising Ridge Road Mt Airy MD 21771	
Phone:	301-607-9300	Email: bids@kellerbrothers.com
Name / Company:	Morrison Geothermal / Mike Rash	G C: ☒ yes / no
Address (no POBs):	63 Gambers Corner Rd, Duncannon PA 17020	
Phone:	717-648-9127	Email: MRASH@MORRISONGEOTHERMAL.COM
Name / Company:	MICHAEL J. BOSATO / Common Worth Const	G C: ☒ yes / no
Address (no POBs):	230 PENNSYLVANIA AVE 100018 WILM. DE 19806	
Phone:	302-654-6611	Email: mbosato@commonworth.com
Name / Company:	Fidelity Power Systems / Lisa Nichols	G C: yes / ☒ no
Address (no POBs):	25 Loveten Circle Sparks MD	
Phone:	410-300-5171	Email: lnichols@fidelity-ps.com
Name / Company:	Brandor McClintock	G C: yes / no
Address (no POBs):	GEO Technology Ass. 302 300-0162	
Phone:		Email: BMcClintock@GTAENG.COM
Name / Company:	Jamie Biscoe - Superior Electric	G C: yes / ☒ no
Address (no POBs):	36 Germany Drive Wilmington DE 19804	
Phone:	802-658-5949	Email: jamie@superiorelectric.biz
Name / Company:	EDWIN WILLIAMS CONRADO	G C: yes / ☒ no
Address (no POBs):	200 MANDU LANE NEW CASTLE DE 19720	
Phone:	302-379-7659	Email: Ewilliams@conrado.com



Pre-bid Sign In Sheet

Contract: SSD22004-NC NEWIS

Date: 2025/05/08

Project: Sunnyside Intermediate School – New School

Please print legibly – we must be able to read your information.

Name / Company:	Tony Reynolds Kent Construction	G C: yes / no
Address (no POBs):	2 Big Oak Rd Smyrna DE 19777	
Phone:	302-382-5116	Email: Tony@kentconstructionco.com
Name / Company:	Joe Morilli	G C: yes / <u>no</u>
Address (no POBs):	590 Century Blvd Suite B Wilmington DE 19808	
Phone:	302-870-5041	Email: jmorilli@assurancemedia.net
Name / Company:	MATT Greenlee	G C: yes / <u>no</u>
Address (no POBs):	Assurance MEDIA ↑ SAME	
Phone:	302-882-3540	Email: mgreenlee@assurancemedia.net
Name / Company:	DXI	G C: yes / <u>no</u>
Address (no POBs):	266 Idemere Rd Glenview IL 60026	
Phone:	943-981-9517	Email: MYNENE@DXICONSTRUCTION.COM
Name / Company:	JOSH GEORGE Whiting-Turner	G C: <u>yes</u> / no
Address (no POBs):	131 Continental Dr Suite 404 Newark DE 19703	
Phone:	302-276-7118	Email: joshua.george@whiting-turner.com
Name / Company:	TIM JACKSON / CH+N SITE CONSTRUCTION	G C: yes / <u>no</u>
Address (no POBs):	322 N. Arch St. Lancaster, PA 17603	
Phone:	717-391-7357	Email: TJACKSON@CHNSITE.COM
Name / Company:	Marcel Fene / Munford and Miller Concrete, Inc.	G C: yes / <u>no</u>
Address (no POBs):	1005 Industrial Drive, Middletown, DE 19709	
Phone:	302-943-8347	Email: mfene@munfordandmiller.com
Name / Company:	Mark Agada - Kimball Construct	G C: yes / no
Address (no POBs):	9615 Philadelphia Rd. Baltimore MD	
Phone:	410-574-0800	Email: magada@kimballcc.com
Name / Company:	Corporate Interiors Inter Whitaker	G C: yes / <u>no</u>
Address (no POBs):	223 List Drive New Castle DE 19720	
Phone:	302-561-8855	Email: jwhitaker@corporate-interiors.com



Pre-bid Sign In Sheet

Contract: SSD22004-NC NEWIS

Date: 2025/05/08

Project: Sunnyside Intermediate School – New School

Please print legibly – we must be able to read your information.

Name / Company:	FRANK LERZO / WOHLSEN CONST.	G C: ☒ yes / ☐ no
Address (no POBs):	501 CAER ROAD, SUITE 101, WILM. DE 19809	
Phone:	302-650-9226	Email: FLERZO@WOHLSEN.COM
Name / Company:	DWAYNE ROSLEY / KENT CONSTRUCTION CO.	G C: ☐ yes / ☐ no
Address (no POBs):	2 BIG OAK RD / SMYRNA, DE. 19977	
Phone:	307-258-8661	Email: DWAYNE@KENTCONSTRUCTIONCO.COM
Name / Company:	Edward Barrar Exterior Building Solutions	G C: ☐ yes / ☒ no
Address (no POBs):	914 Shiloh Rd West Chester PA 19382	
Phone:	267-666-8870	Email: ed@ebsreps.com
Name / Company:	JESSE Dixon / Richard Y. Johnson & Son	G C: ☒ yes / ☐ no
Address (no POBs):	18404 Johnson Rd Lincoln DE 19960	
Phone:	302-422-3732	Email: jolixon@ryjson.com
Name / Company:	EDDY DOUGHERTY / REYBOLD CONSTRUCTION	G C: ☐ yes / ☒ no
Address (no POBs):	116 E SCOTLAND DR BEAR DE 19701 (Site)	
Phone:	302 898 1282	Email: EDougherty@reybold.com
Name / Company:	John Hudecheck ACP LLC	G C: ☐ yes / ☒ no
Address (no POBs):	5 Great Valley Parkway Melvern PA	
Phone:	484 883 8852	Email: johnh@acpllc.com
Name / Company:	BILL BOOTH COMMONWEALTH CONST. CO. INC.	G C: ☒ yes / ☐ no
Address (no POBs):	2312 PENNSYLVANIA AVE WILM. DE 19806	
Phone:	302-654-6011	Email: bbooth@billscommonwealth.com
Name / Company:	Greg Robertson Diamond Mech	G C: ☐ yes / ☒ no
Address (no POBs):	3588 Peachtree Run Blvd Dover, DE 19901	
Phone:	302 677 7694	Email: grobertson@dianondmechanical.net
Name / Company:	Alpha Omega Construction Group	G C: ☐ yes / ☒ no
Address (no POBs):	243 Old Churchmans Rd New Castle DE 19720	
Phone:	917-453-0838	Email: michael@AOCGI.com



Pre-bid Sign In Sheet

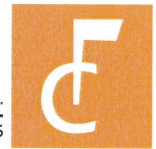
Contract: SSD22004-NC NEWIS

Date: 2025/05/08

Project: Sunnyside Intermediate School – New School

Please print legibly – we must be able to read your information.

Name / Company:	Healy Construction	G C: ☒ yes / no
Address (no POBs):	7940 Queenair Dr Gathersburg Md 20879	
Phone:	301-417-1006	Email: <u>estimating@healyconstruction.com</u>
Name / Company:	MIKE WALKER / DELAWARE BRICK CO.	G C: yes / no
Address (no POBs):	492 W. WEBBS LANE, DOVER, DE 19904	
Phone:	302-420-1227	Email: <u>MWALKER@DELAWAREBRICK.COM</u>
Name / Company:	Scheibel Const.	G C: ☒ yes / no
Address (no POBs):	115 PROSPECT DRIVE HUNTINGTON MA 20639	
Phone:	301-855-7900	Email: <u>Bids@ScheibelConstruction.com</u>
Name / Company:	Katya LaVallee Ventresca Bros.	G C: ☒ yes / no
Address (no POBs):	2300 N. DuPont Hwy New Castle DE 19720	
Phone:	302.658.6434	Email: <u>Tony@ventrescabros.com</u>
Name / Company:	TOM GILL FIDELITY POWER	G C: yes / no
Address (no POBs):	25 Lovell Circle Sparks, MD 21152	
Phone:		Email: <u>Tomg@fidelity-ps.com</u>
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:		Email:
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:		Email:
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:		Email:
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:		Email:



Pre-bid Sign In Sheet

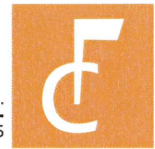
Contract: SSD22004-NC NEWIS

Date: 2025/05/08

Project: Sunnyside Intermediate School – New School

Please print legibly – we must be able to read your information.

Name / Company: <u>JD BARRY / EDIS</u>		G C: <u>yes</u> / no
Address (no POBs):		
Phone: <u>302-672-7998</u>	Email: <u>tbosch@ediscompany.com</u>	
Name / Company: <u>TODD BOSCH E-DIS COMPANY</u>		G C: yes / no
Address (no POBs):		
Phone: <u>302.421.2935</u>	Email: <u>tbosch@ediscompany.com</u>	
Name / Company: <u>Brian Schmidt / Precast Concrete</u>		G C: yes / no
Address (no POBs):		
Phone: <u>302-420 4491</u>	Email: <u>bschmidt@precast-concrete.com</u>	
Name / Company: <u>AMAKOR Inc. Kim Lombardi</u>		G C: <u>yes</u> / no
Address (no POBs): <u>72 Clinton Street P.O. Box 636 Del City DE 19706</u>		
Phone: <u>302-834-8664</u>	Email: <u>AMAKOR@AOL.COM</u>	
Name / Company: <u>David Roberts Bandcroft Construction</u>		G C: <u>yes</u> / no
Address (no POBs): <u>1800 N. Grant Ave Wilmington, DE 19806</u>		
Phone: <u>(302) 299-5331</u>	Email: <u>d.roberts@bandcroft-usa.com</u>	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	



Pre-bid Sign In Sheet

Contract: SSD22004-NC NEWIS

Date: 2025/05/08

Project: Sunnyside Intermediate School – New School

Please print legibly – we must be able to read your information.

Name / Company: Ryne Johnson		G C: yes / <u>no</u>
Address (no POBs): 151 Harrison Oak Drive, Dover DE 19901		
Phone: 302-747-3203	Email: ryne.johnson@advantachsecurity.net	
Name / Company: Worth + Co Ken Releson Jr		G C: yes / <u>no</u>
Address (no POBs):		
Phone: 267 362 1100	Email: ESTIMATING@WORTHANDCOMPANY.COM	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	
Name / Company:		G C: yes / no
Address (no POBs):		
Phone:	Email:	



Bid Set Registry - Plan Holders

Contract: SSD22004-NC NEWIS

Date: 2025/05/08

Project: Sunnyside Intermediate School – New School

Please make sure you sign in before receiving documents / USB.

1. Name / Company: FRANK LERRO / WOHLSEN Date: 5/8/25
2. Name / Company: Michelle Clements / Keller Brothers Date: 5/8/25
3. Name / Company: BILL BOOTH / COMMUNWEALTH CONST. CO Date: 5/8/25
4. Name / Company: MATT TREN DYI Date: 5/8/25
5. Name / Company: Mark Agada / Kimball Date: 5/8/25
6. Name / Company: Mike Kistaki / Alpha Omega Constr. Date: 5/8/25
7. Name / Company: BOB PERMANN / RICHARD / JOHNSON Date: 5/8/25
8. Name / Company: Julie Whitaker Corporate Interiors Date: 5/8/25
9. Name / Company: David Robert Bando construction Date: 5/8/25
10. Name / Company: _____ Date: _____
11. Name / Company: _____ Date: _____
12. Name / Company: _____ Date: _____
13. Name / Company: _____ Date: _____
14. Name / Company: _____ Date: _____
15. Name / Company: _____ Date: _____
16. Name / Company: _____ Date: _____
17. Name / Company: _____ Date: _____
18. Name / Company: _____ Date: _____
19. Name / Company: _____ Date: _____
20. Name / Company: _____ Date: _____

BID FORM

**To: Smyrna School District
Administrative Office
82 Monrovia Avenue
Smyrna, DE 19977**

**SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS**

ALLOWANCE ACKNOWLEDGEMENTS

ALLOWANCE No. 1

Include a Lump Sum Allowance equal to **Two Hundred Fifty Thousand dollars (\$250,000.00)** for costs associated with any unforeseen or concealed conditions and/or Owner requested revisions during the construction period. Upon Owner/Architect approval, a Credit or Add Change Order will be applied to the Allowance. I/We have reviewed and familiarized ourselves with the requirements contained in Specification Section 012100 Allowances.

Acknowledged by: _____

**SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS**

BID FORM

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for thirty (30) days from the date of opening of bids (60 days for School Districts and Department of Education), and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _____ calendar days of the Notice to Proceed.

The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

(State of Corporation)

Business Address: _____

Witness: _____ **By:** _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Bid Security
(Others as Required by Project Manuals)

SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS

BID FORM

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>	<u>Subcontractors tax-payer ID # or Delaware Business license #</u>
1. Sitework			
A.			
B.			
C.			
2. Concrete			
A.			
B.			
C.			

**SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS**

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>	<u>Subcontractors tax-payer ID # or Delaware Business license #</u>
3. Masonry			
A.			
B.			
C.			
4. Structural Steel			
A.			
B.			
C.			
5. Framing and Drywall			
A.			
B.			
C.			
6. Windows and Storefront			
A.			
B.			
C.			

SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>	<u>Subcontractors tax-payer ID # or Delaware Business license #</u>
7. Doors and Hardware Installer			
A.			
B.			
C.			
8. Painting			
A.			
B.			
C.			
9. Flooring			
A.			
B.			
C.			
10. Ceramic Tile			
A.			
B.			
C.			

**SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS**

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>	<u>Subcontractors tax-payer ID # or Delaware Business license #</u>
11. Ceilings			
A.			
B.			
C.			
12. Casework			
A.			
B.			
C.			
13. Roofing			
A.			
B.			
C.			
14. Mechanical			
A.			
B.			
C.			

**SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS**

15.	Plumbing			
	A.			
	B.			
	C.			
16.	Electrical			
	A.			
	B.			
	C.			
17.	Fire Protection			
	A.			
	B.			
	C.			
18.	Exterior Metal Panel Installer			
	A.			
	B.			
	C.			

SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS

BID FORM
NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date the **Smyrna School District**.

All the terms and conditions of **Smyrna School District - Bid No. SSD22004-NC_NEWIS** have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

**SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS**

**AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM**

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

**SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS**

**AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS**

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____ day of _____, 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

**SMYRNA SCHOOL DISTRICT
SUNNYSIDE INTERMEDIATE SCHOOL – NEW SCHOOL
70 Graceville Drive, Smyrna, DE 19977
BID No. SSD22004-NC_NEWIS**

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GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm



February 15, 2023

Fearn-Clendaniel Architects, Inc.
6 Larch Avenue, Suite 398
Wilmington, DE 19804

Attn: Mr. Kenneth B. Fearn, AIA, LEED AP

Re: Preliminary Geotechnical Exploration
Smyrna School District New Intermediate School
Kent County, Delaware

Dear Ken:

In accordance with our agreement dated January 10, 2023, Geo-Technology Associates, Inc. (GTA) has performed a preliminary geotechnical exploration for the proposed Smyrna School District New Intermediate School to be located off Rabbit Chase Lane in Kent County, Delaware. The exploration consisted of performing Cone Penetrometer Test soundings within the proposed building area and test pit excavations and infiltration testing within proposed stormwater management facilities. The results of the field exploration and preliminary recommendations regarding design and construction of the proposed school and additional site improvements are included in this report.

GTA appreciates the opportunity to have been of assistance to you on this project. Should you have questions or require additional information, please contact our office at (302) 326-2100.

Very truly yours,
GEO-TECHNOLOGY ASSOCIATES, INC.

Alison R. Schoch, P.E.
Senior Geotechnical Engineer

Meghan McDonough, P.E.
Principal



ARS/MM/mt
230120

18 Boulden Circle, Suite 36, New Castle, Delaware 19720

(302) 326-2100

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REPORT OF PRELIMINARY GEOTECHNICAL EXPLORATION

SMYRNA SCHOOL DISTRICT NEW INTERMEDIATE SCHOOL Kent County, Delaware

February 2023

Prepared For:

FEARN-CLENDANIEL ARCHITECTS, INC.
6 Larch Avenue, Suite 398
Wilmington, DE 19804

Attn: Mr. Kenneth B. Fearn, AIA, LEED AP

Prepared By:

GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
18 Boulden Circle, Suite 36
New Castle, Delaware 19720
(302) 326-2100

GTA Job No: 230120

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REPORT OF PRELIMINARY GEOTECHNICAL EXPLORATION
SMYRNA SCHOOL DISTRICT NEW INTERMEDIATE SCHOOL
KENT COUNTY, DELAWARE
FEBRUARY 2023

INTRODUCTION

This report presents the results of the preliminary geotechnical exploration performed for the proposed Smyrna School District New Intermediate School to be located off Rabbit Chase Lane in Kent County, Delaware. To assist with our exploration, Geo-Technology Associates, Inc. (GTA) was provided with the following:

- A document titled *Smyrna School District New Intermediate School Schematic Design Construction Narrative*, prepared by Fearn-Clendaniel Architects, Inc., dated October 18, 2022;
- A set of architectural concept plans titled *Smyrna School District Construction of New Intermediate School, Site Plan – Schedule C*, prepared by Fearn-Clendaniel Architects, Inc., dated October 28, 2022; and
- A civil drawing titled *Concept Site Plan*, prepared by Fearn-Clendaniel Architects, Inc., dated October 28, 2022.

The referenced drawings indicate the proposed site layout as well as preliminary architectural information related to the proposed school.

Cone Penetrometer Test (CPT) soundings were performed within the proposed building area, and test pit excavations and infiltration testing within proposed stormwater management (SWM) facility areas. Based on the results of the field exploration, preliminary conclusions and recommendations regarding design and construction of the proposed buildings were derived from engineering analysis of field work, and review of the referenced project information.

SITE CONDITIONS

The site is located off Rabbit Chase Lane as shown on the *Site Location Map, Figure 1*, included in Appendix A. The site is currently an open approximately 13.65-acre agriculture field. The topography of the site is gently sloping downward from east to west. The existing grades range

between approximate elevation (EL) 50 to EL 43. Within the building area, existing grades range from approximate EL 48 to EL 45.

PROPOSED CONSTRUCTION

The referenced plans indicate that site development will include a new 2-story school with a footprint on the order of 66,000 square-feet. The school will be constructed at-grade (i.e., no basement level is proposed) and will have a finished floor elevation of EL 50.25. The referenced concept information indicates that the school will consist of steel framing with interior and exterior masonry and metal stud framing systems. At this time, structural loading information was not provided. We have assumed maximum wall loads of 6 kips per foot and maximum column loads of 200 kips for our analysis.

Additional site improvements will include a 4,000 square-foot pole barn, parking lot and access drives, stormwater management facilities, sidewalks, and athletic multi-purpose and baseball fields.

SITE GEOLOGY

According to the *Geologic Map of Kent County, Delaware*, prepared by the Delaware Geological Survey, dated 2007, the site is situated within the Coastal Plain Physiographic Province. The Coastal Plain is characterized by undifferentiated and interlayered sedimentary deposits derived from eroded and transported rock formations to the north and west. Specifically, the map indicates that the site is underlain by the middle Pleistocene Columbia Formation. The Columbia Formation consists of yellowish to reddish-brown fine to coarse feldspathic quartz sand with varying amounts of gravel. Scattered beds of tan to reddish gray clayey silt are common. Refer to the publication for additional details.

According to the U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) Web Soils Survey, the site is mapped within several units including the Downer sandy loam, Woodstown loam, Greenwich loam, Pineyneck loam, and Carmichael loam. The Downer sandy is described as well-drained with a depth to restrictive feature of greater than 80 inches. The typical soil profile consists of interlayered sandy loam and loamy sands to 48 inches,

underlain by sand to 80 inches. The Woodstown sandy loam is described as moderately well-drained. A typical soil profile consists of loam to 7 inches, sandy loam to 45 inches, and loamy sand to 80 inches. The Greenwich loam complexes are described as well-drained with a depth to restrictive feature of greater than 80 inches. The typical soil profile consists of loam to 22 inches underlain by sandy loam to 29 inches, loamy sand to 46 inches, and coarse sand to 80 inches. The Pineyneck loam complex is described as moderately well-drained. The typical soil profile consists of loam to 9 inches, silt loam to 20 inches, loam to 27 inches, fine sandy loam to 32 inches, loamy fine sand to 47 inches, and loam to 70 inches. The Carmichael loam, located in a small portion of the southeast corner of the site is described as poorly-drained with a typical soil profile consisting of loam to 19 inches, silt loam to 33 inches, and sandy loam to 80 inches.

SUBSURFACE EXPLORATION

The subsurface exploration included 10 Cone Penetrometer Test (CPT) soundings performed within the building area, identified as CPT-1 through CPT-10. In addition, GTA performed 8 test pit excavations and infiltration tests within the proposed stormwater management areas, designated as TP-1 through TP-6. The explorations were field located by GTA via hand-held GPS and measuring from existing site features, with the approximate locations indicated on *Figure 2: Exploration Location Plan*, included in Appendix B.

The CPT soundings were performed on January 18, 2023 to depths of approximately 22 to 32 feet below existing grades using a 20-ton, 15 cm² single-element cone capable of measuring pore pressures at the u_2 position. The soundings were performed by pushing an electronically instrumented cone shaped probe into the soil with the hydraulic system of a track-mounted reaction device. The cone is equipped with an instrumented tip and friction sleeve that measures tip resistance and soil-to-steel friction, respectively, as the cone is being pushed. In addition, the pore water pressure response to cone penetration is measured. Measurements of tip resistance, sleeve friction, and pore pressure were taken at approximately 1-inch depth intervals. This data was transmitted to recording devices at the ground surface. Graphical cone sounding logs were constructed to show the variations of tip resistance, local friction, friction ratio, and pore pressure with depth. These values can be correlated to soil strength, compressibility, and classification. The tip resistance profile graphically presents the relative strength of the soil strata. The friction ratio,

the numerical ratio of the local friction to the tip resistance, was computed for each depth interval. This ratio is an indicator of the material type, i.e. sand, silt, or clay. The friction, friction ratio, and pore pressure profiles are used primarily to interpret soil type. Refer to the attached CPT sounding logs for detailed graphical interpretation of the subsurface conditions.

The test pits were performed on January 10, 2023 by Cavan Construction to depths ranging between 9 and 16 feet below grade. Descriptions provided on the test pit logs are based on visual classifications by GTA personnel using the Unified Soil Classification System in accordance with ASTM D2488 (Visual-Manual Procedure) supplemented by the laboratory test results. The classification system is summarized in the *Notes for Explorations Logs* included in Appendix B.

It should be noted that an instrument survey for elevation was not performed at the exploration locations and the elevations indicated within this report were interpolated from the referenced drawing set, which included existing grading plans. Therefore, it should be understood that all elevations, as well as transitions in soil strata indicated on the boring logs, are approximate.

SUBSURFACE CONDITIONS

Beneath the topsoil, the CPT sounding encountered a surface layer of fine-grained soils underlain by granular soils to the extent of the CPT soundings. During performance of the CPT soundings, cone tip resistances were observed to generally range between 5 and 25 tons per square foot (tsf) in the fine-grained strata. Cone tip resistance were less than 5 tsf which indicate very soft to soft consistency conditions at the ground surface. Cone tip resistances ranged between 25 to 150 tons per square foot (tsf) throughout the depths of the soundings. These resistances indicate loose to medium dense soil conditions. In isolated areas, tip resistances between 150 and 300 tsf were observed which indicate medium to dense soil conditions. Refer to the CPT sounding and test pit excavation logs included in Appendix B for additional information.

In the SWM areas, beneath the topsoil, the subsurface conditions in the test pits generally consisted of a layer of fine-grained soil underlain by granular materials to the extent of the test pits. Topsoil was observed to have thicknesses ranging between 9 to 15 inches. The fine-grained soil visually classified as lean clay with lesser percentages of sand. This stratum was observed to depths

ranging between approximately 1½ to 4 feet below grade. The underlying granular materials consisted of clayey sand, silty sand, and poorly-graded sand with silt.

Groundwater was encountered in the CPT soundings at depths ranging from approximately 12½ to 14½ feet below existing grade, corresponding to EL 30 to EL 35. Groundwater was observed in Test Pits TP-1A, TP-4, and TP-6A at depths ranging between 8½ feet and 15½ feet below grade, corresponding to elevating ranging between EL 33 and EL 35. It should be anticipated that groundwater elevations may fluctuate several feet seasonally, due to variations in precipitation, run-off, and evaporation.

Based on regional groundwater mapping provided by the Delaware Geologic Information Resource (DGIR), the groundwater levels at the site are variable. During wet and normal seasonal conditions, the site is anticipated to have groundwater levels generally of 6 to 9 feet below grade. In the northern most corner of the site, groundwater levels during wet season may be between 9 to 16 feet below grade. Along the southwest approximate third of the site, groundwater levels are anticipated to be within 3 to 6 feet below grade. During dry seasonal conditions, groundwater levels at the site are expected to be between 9 to 16 feet in the approximately north half of the site, 6 to 9 feet in the approximate south-half of the site within isolated areas where groundwater will be 3 to 6 feet below grade.

INFILTRATION TESTING

After observing the soil conditions to evaluate any limiting zones within the soil profile, six single-ring infiltration tests were performed in excavations offset from the exploratory test pits. The testing was performed in general accordance with the procedures outlined in ASTM D5126, *Standard Guide for Comparison of Field Methods for Determining Hydraulic Conductivity in Vadose Zone*. The test consisted of seating a single-ring about 2 to 4 inches into the subgrade. The testing procedure consisted of a saturation period of one-hour or 12 inches of head drop. A falling head test was performed with water added in no more than 6-inch increments. Water level measurements were taken at approximately maximum 15-minute intervals.

After the pre-soak period, water was added in up to 6-inch increments, and water level measurements were taken at approximately 15 minute intervals over a period of two-hours or until steady state rates were achieved. The unfactored field infiltration rates at each location are provided in the table below.

UNFACTORED FIELD INFILTRATION RATES

Location	Test Depth/ Approx. Elevation	Unfactored Field Infiltration Rate	USCS Soil Classification
TP-1	6.0 feet/ EL 43	4 inches per hour	Silty SAND (SM)
TP-2	6.0 feet/ EL 43	9.2 inches per hour	Silty SAND (SM)
TP-3	4.5 feet/ EL 38.5	No discernable rate	Clayey SAND (SC)
TP-4	5.0 feet/ EL 38	3 inches per hour	Silty SAND (SM)
TP-5	6.0 feet/ EL 39	10 inches per hour	Silty SAND (SM)
TP-6	7.0 feet/ EL 38	3 inches per hour	Silty SAND (SM)

It should be noted that infiltration rates can vary widely with variations in soil texture and gradation. The density and plasticity of the soils affected the infiltration potential

LABORATORY ANALYSIS

Selected samples obtained from the test pits were tested for moisture content, grain-size analysis, and moisture-density relationships using the Standard Proctor Method. The grain-size analysis and the Standard Proctor testing were performed on a composite sample from Test Pit TP-1A, at depths ranging from about 4 to 6 feet below existing grade. The Unified Soil Classification System (USCS) designation of the composite sample is silty sand (SM), the maximum dry density is 124.3 pounds per cubic foot, and the optimum moisture content is 10.7 percent. Natural moisture contents were measured from samples obtained from Test Pits TP-1 through TP-6, at depths ranging from about 4 to 7 feet below existing grades. Natural moisture contents ranged from 8.8 to 17.4 percent. Refer to the reports included in Appendix C for additional information.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of this exploration, it is our opinion that construction of the proposed building is generally feasible, given that the geotechnical recommendations are followed, and that the standard level of care is maintained during construction. The primary geotechnical issues related to site development will be related to the moisture sensitive, fine-grained, surficial soils. Discussions of these issues as well as general foundation design parameters are included in the following paragraphs.

Site Preparation and Site Grading

Initial site preparation should include the stripping of all topsoil or vegetation from within and a minimum of 10 feet beyond the proposed construction limits. Topsoil thicknesses from approximately 9 to 15 inches in the explorations performed for this study; however, the actual stripping thickness will be dependent on local topsoil development, soil moisture, construction traffic disturbance, and contractor care. Following stripping of topsoil, the area should be proof-rolled with a loaded tri-axle or off-road dump truck to locate any soft or loose areas on the fill subgrade prior to fill placement. Areas that exhibit instability during proofrolling should be vertically over-excavated to suitable natural soils; dried and recompacted in place; or stabilized as appropriate. The stripping of organics, proofrolling, undercutting of unsuitable material, and placement of structural fill should be observed by a Geotechnical Engineer or their qualified representative.

At the time this report was prepared, proposed grading was not provided with the exception of the proposed finished floor elevation for the school, which is anticipated to be EL 50.25. Based on the existing grades within the building area, the building pad will require approximately 2 to 5 feet of fill to reach finished pad grades.

Upon satisfactory evaluation of the subgrade, structural fill should be placed in lifts and compacted in accordance with the specifications included in this report. The fill materials will typically need to be within 2 to 3 percentage points of the optimum moisture content before compactive effort is applied. Structural fill should meet USCS designation SM, SC, SP-SM, GP, GM, GW, and with some limitations ML and CL and be approved by the Geotechnical Engineer

prior to use. Moisture conditioning of the on-site soils will likely be required to attain the recommended degree of compaction, depending on the prevailing weather conditions at the time the earthwork is performed.

The shallow fine-grained soils are susceptible to moisture-related compaction problems and as such are considered less desirable for reuse as controlled compacted fill. Depending on the depths of cut, these soils may represent the bulk of the material to be used as fill on the site. If the fine-grained soils must be used as fill in building or pavement areas, they should be compacted at moisture contents slightly above the optimum moisture content suitable for compaction purposes. Even if the soils are successfully compacted to the required densities, they can easily become unstable from excess moisture and construction equipment traffic and subsequent over-excavation of unstable soils should be expected. Proper moisture-conditioning of these soils require time and warm, dry weather.

All structural fill should be constructed in maximum 8-inch thick, loose lifts and be compacted 95 percent of the standard proctor maximum dry density: Backfill placed in confined areas, such as foundation and utility excavations, should be spread in thinner layers and compacted to the same degree using manually operated compaction equipment. All compactive effort should be verified by in-place density testing by a representative of GTA. The 2018/2021 IBC requires that fill subgrades and each lift of fill be observed and tested.

Foundations

Assuming maximum wall loads of 6 kips per linear foot and interior column loads of 200 kips, the proposed structure may be supported on shallow spread footings designed for a maximum net allowable bearing pressure of 3,000 pounds per square foot (psf). Minimum widths for wall footings of 24 inches and column footings of 36 inches are recommended when design based on 3,000 psf results in a narrower footing. Settlement on the order of 1-inch total and ½-inch differential can be anticipated, based on the assumed loads. Exterior footings should be founded a minimum of 32 inches below the final exterior grades to provide protection from frost action.

Footings should be supported on medium stiff or stiffer or medium dense or denser natural soils or new compacted structural fill. If loose or soft natural soils are encountered at the footing subgrade elevation, these soils should be undercut to suitable materials. The undercut volume should be backfilled with AASHTO No. 57 aggregate or additional concrete. The aggregate should be placed in 1- to 2-foot thick layers and be tamped with the equipment bucket with the last lift compacted with a small walk behind vibratory roller or large vibra-plate. Footing excavations should be filled with concrete the same day the excavations are performed to prevent destabilization and softening of the subgrade soils.

Detailed foundation excavation evaluations should be performed in each footing excavation prior to the placement of crushed stone, reinforcing steel, or concrete. These evaluations should be performed by a representative of the registered Geotechnical Engineer to confirm that the design allowable soil bearing pressure is available. The foundation bearing surface evaluations should be performed using a combination of visual observation, hand-rod probing, comparison with the borings, and Dynamic Cone Penetrometer (DCP) testing, as applicable.

Seismic Information

Based on the CPT data, and the site geologic profile, the site should be assigned to Site Class D, in accordance with *Chapter 20 of the American Society of Civil Engineers (ASCE) Standard 7-16 Minimum Design Loads for Buildings and Other Structures* and *2018/2021 International Building Code*. This categorization is based on the near surface CPT sounding results, general geologic information for the region, and the information contained in the standard.

Floor Slabs

Where floor slab loads are 100 psf or less, the floor slab can be designed as a concrete slab on-grade using a design modulus of subgrade reaction (k) of 75 to 100 pounds per cubic inch (pci). A higher modulus can be achieved with the on-site granular soils or cement treated fine-grained soils. This modulus value is considered feasible provided that newly placed fill is compacted in general accordance with the recommendations above. Concrete floor slabs supported on-grade should be founded on a 4-inch (minimum) thickness coarse granular layer. A polyethylene vapor retarder should also be used in office spaces and where moisture-sensitive floor finished will be used

to interrupt the rise of capillary moisture through the slab. Crushed stone or washed gravel meeting the gradation of AASHTO Size No. 57 or dense-graded aggregate can be used for the granular layer. The slabs may bear on footing projections; however, they should be jointed so that the foundations can settle without affecting the slab.

Utility and footing backfill below floor slabs should meet the compaction requirements specified herein. Construction activities and exposure to weather often cause deterioration of slab subgrades. The contractor should exercise care during floor slab preparation to limit disturbance to exposed subgrades. We recommend that the slab subgrade soils be evaluated by a representative of the Geotechnical Engineer immediately prior to stone and concrete placement. This evaluation may include a combination of visual observations, hand-rod probing, and field density tests to verify that the subgrade soils have been prepared properly. It is unlikely that proofrolling will be possible across the majority of the pad due to plumbing stick-ups and interior bearing walls, and therefore observation will be mostly visual methods. If soft or loose soils, ice, or muddy conditions are encountered, recommendations for remedial measures should be provided by the Geotechnical Engineer at the time construction is performed prior to placement of stone.

Stormwater Management Facilities

The guidelines established in the Delaware Sediment and Stormwater program technical Document Article 3.06, Appendix 3.06.2. *A-1 Soil Investigation Procedures* indicate that the minimum infiltration rate for all runoff reduction and infiltration practices is 1-inch per hour. Also, a vertical separation of two (2) feet from a limiting layer, such as clay or the seasonal high groundwater elevation is required for all infiltration practices unless an underdrain is provided.

The lean clay and clayey sand soils observed in the test pit excavations are not considered suitable for infiltration. The lean clay stratum, was observed in the test pit excavations to depths ranging between 1½ to 4 feet below existing grade, corresponding to approximate EL 47 to EL 48 in the eastern SWM facility and EL 39 to EL 43 in the western SWM facility. The underlying clayey sand was observed to depths ranging between 2 to 5 feet in the eastern SWM facility, corresponding to approximate EL 44 to EL 47. In the western SWM facility, clayey sand was observed in Test Pits TP-5 and TP-6A to depths of approximately 4 and 7 feet, respectively, corresponding to EL 37 to EL

41.

Therefore, it is recommended that the base of the facilities be designed at depths deeper than these elevations. If these strata are observed in the facility subgrade at deeper elevations than anticipated, they should be over-excavated and backfilled with a poorly-graded stone material with a high void ratio when placed (i.e., AASHTO No. 57 Stone) or ASTM C-33 sand.

Unfactored field infiltration rates were measured to be between 3 and 10 inches per hour in the silty sand soils encountered at the test elevations, with the exception of in TP-3, where no discernable rate was observed. Based on the observed rates, we recommend that a design infiltration rate of 1½ inches per hour be used for the final design of the facilities. Based on the depths of lean clay and clayey sand, and groundwater, the eastern facility should be designed with a base between EL 44 and EL 41. The western facility should be designed with a base between EL 39 to EL 38. Because clayey sand was observed in Test Pit TP-6A to approximate EL 37, it should be anticipated that some undercutting and replacement of the material as described above will be required. Based on the groundwater levels observed in the explorations and regional groundwater data, we recommend a seasonal high water table (SHWT) of EL 36 for the facilities.

General Construction Recommendations

To preserve the infiltration capability, GTA recommends that the facilities be excavated using a track-mounted excavator, which will generally eliminate the need to operate equipment directly on the subgrade. This recommendation is based on the inherent problems associated with these systems as they become less permeable due to densification during construction and partial clogging or siltation occurring over time. The inverts of the facilities subgrade should be in natural granular soils, and should be hand cleaned to remove any disturbed soil prior to placing the fabric and/or stone.

Once the design of the facilities has been completed, GTA should be provided the opportunity to review the plans to evaluate if the geotechnical issues have been addressed. Also, GTA should be provided the opportunity to review the facility subgrade during construction and perform additional field-testing. This is to observe compliance with the design concepts,

specifications, or recommendations, and to allow for field changes in the event that the soils conditions differ from that anticipated prior to that start of construction.

Subsurface Utilities

Water and sanitary service connections to the facility, conduit for electric and communication, and storm drainage will need to be installed. The natural soils are considered suitable for support of the subsurface utilities. However, if loose/soft soils are encountered, it may be necessary to undercut the subgrade and provide a minimum 6-inch-thick granular bedding to provide uniform support, as dictated by site conditions. Backfill for the new structures should be free of organic material, rubble, and other deleterious materials. New subsurface utilities that run parallel to foundations should be set so that they fall outside of the zone of influence of the foundations (1H:1V) and conform to the plumbing code specifications.

Groundwater was encountered at depths ranging between 8½ and 15½ feet below grade in the explorations throughout the site. It is not likely that groundwater will be encountered during shallow excavations for foundations or utilities, however due to the interlayered nature of fine- and coarse-grained soils, it is possible that perched water will be encountered during construction. Dewatering through the use of “sump and pump” techniques may be required in some areas to remove groundwater or perched or trapped water seepage, especially if utility installation is performed during the wet season or after prolonged periods of wet weather. Problems associated with water seepage into the excavation include, partial loss of stability, and sloughing of soils. The contractors should be prepared to provide adequate earth support and dewatering systems for deeper utilities depending on the final design grades. Although sump and pump techniques may work in fine-grained soils or during temporary excavations, well points may be required if excavations need to extend more than a few feet below the water table in granular soils.

All construction excavations should be sloped and shored in accordance with OSHA excavation regulations or stricter local governing safety codes. It is our opinion that the undisturbed natural fine-grained soils would generally be classified as “Type B” soils under the OSHA excavation regulations, and the granular sand soils would be classified as “Type C” soils. Significantly flatter excavation side-slopes will be required where groundwater seepage occurs.

Utility pipe systems below pavement and other structural areas should be backfilled using controlled fill compacted in accordance with the *Site Grading* section of this report.

Lateral Earth Pressure

Site retaining walls and loading dock walls will need to be designed to resist the earth pressures from the retained soils. Assuming the use of granular non-plastic to slightly plastic soils ($PI < 15$) placed and compacted as structural fill, we recommend these walls be designed using the values tabulated below. Fine-grained soils (ML or CL) will exert higher earth pressures and should not be used for wall backfill where possible. Hydrostatic pressure is not included in the above values since it is assumed that adequate drainage will be provided as described below.

LATERAL EARTH PRESSURE SUMMARY

Soil Property	Recommended Values
Unit Weight, γ	130 pcf
Angle of Internal Friction, Φ	34°
Coefficient of Active Earth Pressure (K_a)	0.28
Coefficient of Passive Earth Pressure (K_p)	3.5
Coefficient of Earth Pressure at Rest (K_o)	0.44
Base Friction, $\tan \delta$	0.6
Equivalent Fluid Pressure (Unrestrained Top of Wall)	37 psf/ft
Equivalent Fluid Pressure (Restrained Top of Wall)	57 psf/ft

Wall backfill should be free of organic matter, rocks greater than 3 inches in diameter, and construction debris. Backfill should be placed and compacted in lifts in a manner that does not damage the foundation. Additionally, foundation wall backfill should not be placed until the concrete has achieved adequate strength and the structure is braced per the design requirements.

At a minimum, we recommend that commercial composite drainage panels and a perimeter drain be provided behind below grade walls to carry away any infiltrating surface water so that hydrostatic pressures do not develop. The perimeter drain should consist of a 4-inch-diameter

slotted or perforated pipe encased in a minimum of 6 inches of crushed stone and be wrapped by a geotextile filter. The crushed stone should meet the gradational requirements of AASHTO Size No. 57 or 78 aggregate. The perimeter drain should tie into weep holes, a sump pit, adjacent storm sewer, or off-site drainage system. All below-grade walls adjacent to occupied spaces should be waterproofed.

Pavements

GTA recommends that the upper 12 to 18 inches of roadway subgrade be constructed with the following characteristics:

PAVEMENT SUBGRADE SPECIFICATIONS

Liquid Limit	35 percent or less
Plasticity Index	15 percent or less
Maximum Dry Density	115 pcf or greater
California Bearing Ratio	5 or greater

The fine-grained soils will likely require moisture conditioning and reworking, or replacement with approved materials prior to placement of the base course stone. The subgrade soils may become disturbed and softened from excess moisture and construction equipment traffic. It is possible that the fine-grained clay soils will not meet the above pavement subgrade specifications., which may require placement of granular soils for the upper subgrade material and using fine-grained material deeper, if required or using chemical stabilization.

The subgrades Contractors should anticipate that remedial work could be required to achieve a stable subgrade prior to paving, even if the subgrade soils had previously been compacted to the required densities. Prudent planning and earthwork procedures will reduce the potential necessity for remedial work. Road fills should be placed and compacted in accordance with the recommendations outlined in the *Site Preparation and Site Grading* section of this report.

Fill supporting pavements should be placed and compacted in accordance with the recommendations outlined in the *Site Grading* section of this report. Heavy construction traffic

should not be allowed on partial pavement sections since such traffic can damage the pavement. The paving contractor should be advised that they must control construction traffic to limit disturbance of previously approved subgrade, stone base course, or completed asphalt. Some patching and repair may be necessary prior to placement of the final wearing surface layer of asphalt due to construction traffic.

The flexible pavement sections provided herein were designed in accordance with the AASHTO Design Guide. The following minimum pavement design sections are considered appropriate provided the pavement section is constructed on properly prepared and compacted subgrades. The pavement section should be reviewed for structural adequacy if the traffic projections are higher than those assumed for the 15-year design life.

Heavy Duty Pavement Section (100,000 ESAL's)

Asphalt Concrete Top Course (DelDOT Type C Surface)	=	2.0 inches
Asphalt Concrete Base Course (DelDOT Type B Base)	=	4.0 inches
Crushed Stone Subbase Course (DelDOT Type B)	=	10 inches

Light Duty Pavement Section (<20,000 ESAL's)

Asphalt Concrete Top Course (DelDOT Type C Surface)	=	1.5 inches
Asphalt Concrete Base Course (DelDOT Type B Base)	=	2.5 inches
Crushed Stone Subbase Course (DelDOT Type B)	=	8 inches

Proper drainage will be an important consideration for the overall performance of the pavement designs recommended above. We have assumed that proper grading to provide suitable runoff from the pavement surface and beyond the limits of the paved areas will be provided. Underdrains should be considered in fine-grained soils and at local sumps to extend the life of the pavements.

ADDITIONAL SERVICES

We recommend that during final design and construction of the subject project, a geotechnical engineer be retained to provide services for the following items.

- Perform addition subsurface exploration for final design and stormwater management facility design

- Review final site and structural plans to evaluate if they conform with the intent of this report.
- Provide observation and testing services during fill placement to evaluate if the work is being performed in accordance with the project specifications and intent of this report.
- Observe the proof-rolling of subgrades prior to placing fill or base course to evaluate stability.
- Review excavated footings for compliance with the project drawings and the intent of this geotechnical report.
- Provide other Special Inspections as required by the project specifications, and the 2018/2021 IBC.

LIMITATIONS

This report, including all supporting exploration logs, field data, field notes, calculations, estimates, and other documents prepared by GTA in connection with this Project have been prepared for the exclusive use of Fearn-Clendaniel Architects, Inc. (Client) pursuant to agreements between GTA and Client in accordance with generally accepted engineering practice. All terms and conditions set forth in the Agreement and the General Provisions attached thereto are incorporated herein by reference. No warranty, express or implied, is made herein. Use and reproduction of this report by any other person without the expressed written permission of GTA and Client is unauthorized and such use is at the sole risk of the user.

The analysis and recommendations contained in this report are based on the data obtained from limited observation and testing of the encountered materials. CPT soundings, test pit excavations, and infiltration tests indicate soil conditions only at specific locations and times, and only at the depths penetrated. They do not necessarily reflect strata or variations that may exist between exploration locations. Consequently, the analysis and recommendations must be considered preliminary until the subsurface conditions can be verified by direct observation at the time of construction. If variations of subsurface conditions from those described in this report are noted during construction, recommendations in this report may need to be re-evaluated.

In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report are verified in writing. Geo-Technology Associates, Inc. is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of Geo-Technology Associates, Inc.

The scope of our services for this geotechnical exploration did not include any environmental assessment or investigation for the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the logs regarding odors or unusual or suspicious items or conditions observed are strictly for the information of our Client.

This report and the attached logs are instruments of service. The subject matter of this report is limited to the facts and matters stated herein. Absence of a reference to any other conditions or subject matter shall not be construed by the reader to imply approval by the writer.

230120

GEO-TECHNOLOGY ASSOCIATES, INC.

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual site-wide subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



**GEOPROFESSIONAL
BUSINESS
ASSOCIATION**

Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX A



Notes:

- 1) Base map obtained from Google Earth Imagery, Inc. from July 3, 2022.
- 2) Site Location Map should be reviewed in conjunction with GTA Report, Job No. 230120.



GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
 18 Boulden Circle, Suite 36
 New Castle, Delaware 19720
 (302) 326-2100

SITE LOCATION MAP

SMYRNA SCHOOL DISTRICT
 NEW INTERMEDIATE SCHOOL

KENT COUNTY, DELAWARE

SCALE
 NTS

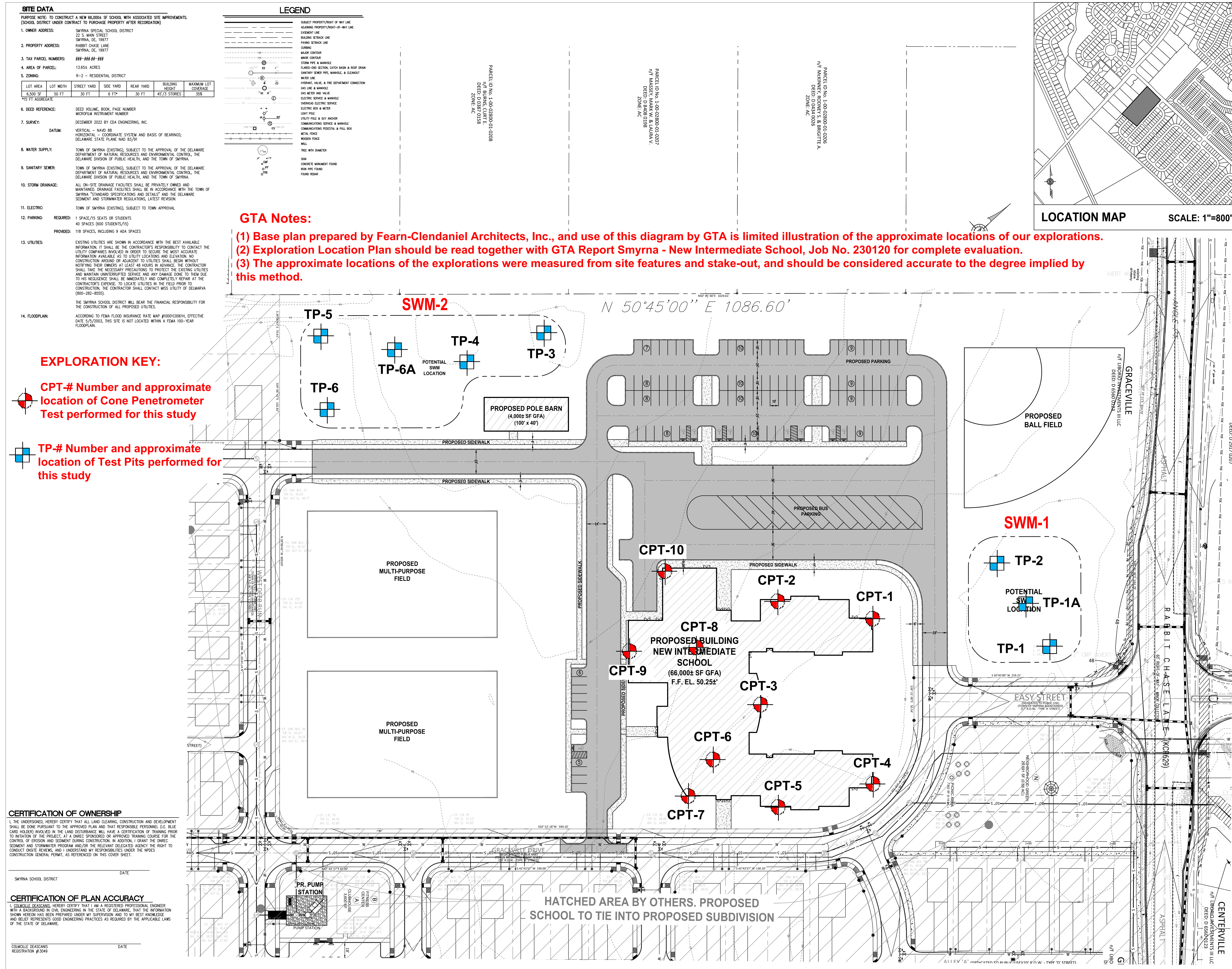
DATE
 FEB 2023

DRAWN BY
 GOOGLE

REVIEW BY
 MM

JOB NO.
 230120

FIGURE NO.
 1



FOOD SERVICE CONSULTANT:
CORSI ASSOCIATES
-SPRINGFIELD, PENNSYLVANIA
-866-267-7447

APPENDIX B

NOTES FOR EXPLORATION LOGS

KEY TO USCS TERMINOLOGY AND GRAPHIC SYMBOLS

MAJOR DIVISIONS (BASED UPON ASTM D 2488)			SYMBOLS	
			GRAPHIC	LETTER
COARSE - GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% PASSING THE NO. 200 SIEVE)		GW
		GRAVELS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		GP
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% PASSING THE NO. 200 SIEVE)		GM
				GC
		SANDS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		SW
				SP
FINE - GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50	SILT OR CLAY ($<15\%$ RETAINED THE NO. 200 SIEVE)		SM
		SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED THE NO. 200 SIEVE)		SC
		SANDY OR GRAVELY SILT OR CLAY ($>30\%$ RETAINED THE NO. 200 SIEVE)		ML
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50	SILT OR CLAY ($<15\%$ RETAINED THE NO. 200 SIEVE)		CL
		SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED THE NO. 200 SIEVE)		OL
		SANDY OR GRAVELY SILT OR CLAY ($>30\%$ RETAINED THE NO. 200 SIEVE)		MH
HIGHLY ORGANIC SOILS				CH
				OH
				PT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE COARSE-GRAINED SOILS CONTAINING AN ESTIMATED 10% FINES BY VISUAL CLASSIFICATION OR WHEN THE SOIL HAS BETWEEN 5 AND 12 PERCENT FINES FROM LABORATORY TESTS; AND FOR FINE-GRAINED SOILS WHEN THE PLOT OF LIQUID LIMIT & PLASTICITY INDEX VALUES FALLS IN THE PLASTICITY CHART'S CROSSHATCHED AREA. RESULTS OF LABORATORY TESTING ARE USED TO SUPPLEMENT THE CLASSIFICATION OF THE SOILS BASED ON THE VISUAL-MANUAL PROCEDURES OF ASTM D2488.

ADDITIONAL TERMINOLOGY AND GRAPHIC SYMBOLS

ADDITIONAL DESIGNATION	DESCRIPTION		GRAPHIC SYMBOLS
	TOPSOIL		
	MAN-MADE FILL		
	GLACIAL TILL		
	COBBLES AND BOULDERS		
RESIDUAL SOIL DESIGNATION	DESCRIPTION	"N" VALUE	
	HIGHLY WEATHERED ROCK	50 TO 50/1"	
	PARTIALLY WEATHERED ROCK	MORE THAN 50 BLOWS FOR 1" PENETRATION, AUGER PENETRABLE	

COARSE-GRAINED SOILS (GRAVEL AND SAND)

DESIGNATION	BLOWS PER FOOT (BPF) "N"
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	>50

NOTE: "N" VALUE DETERMINED AS PER ASTM D1586

FINE-GRAINED SOILS (SILT AND CLAY)

CONSISTENCY	BPF "N"
VERY SOFT	<2
SOFT	2 - 4
MEDIUM STIFF	5 - 8
STIFF	9 - 15
VERY STIFF	16 - 30
HARD	>30

NOTE: ADDITIONAL DESIGNATIONS TO ADVANCE SAMPLER INDICATED IN BLOW COUNT COLUMN:
WOH = WEIGHT OF HAMMER
WOR = WEIGHT OF ROD(S)

SAMPLE TYPE

DESIGNATION	SYMBOL
SPLIT-SPOON	S-
SHELBY TUBE	U-
ROCK CORE	R-

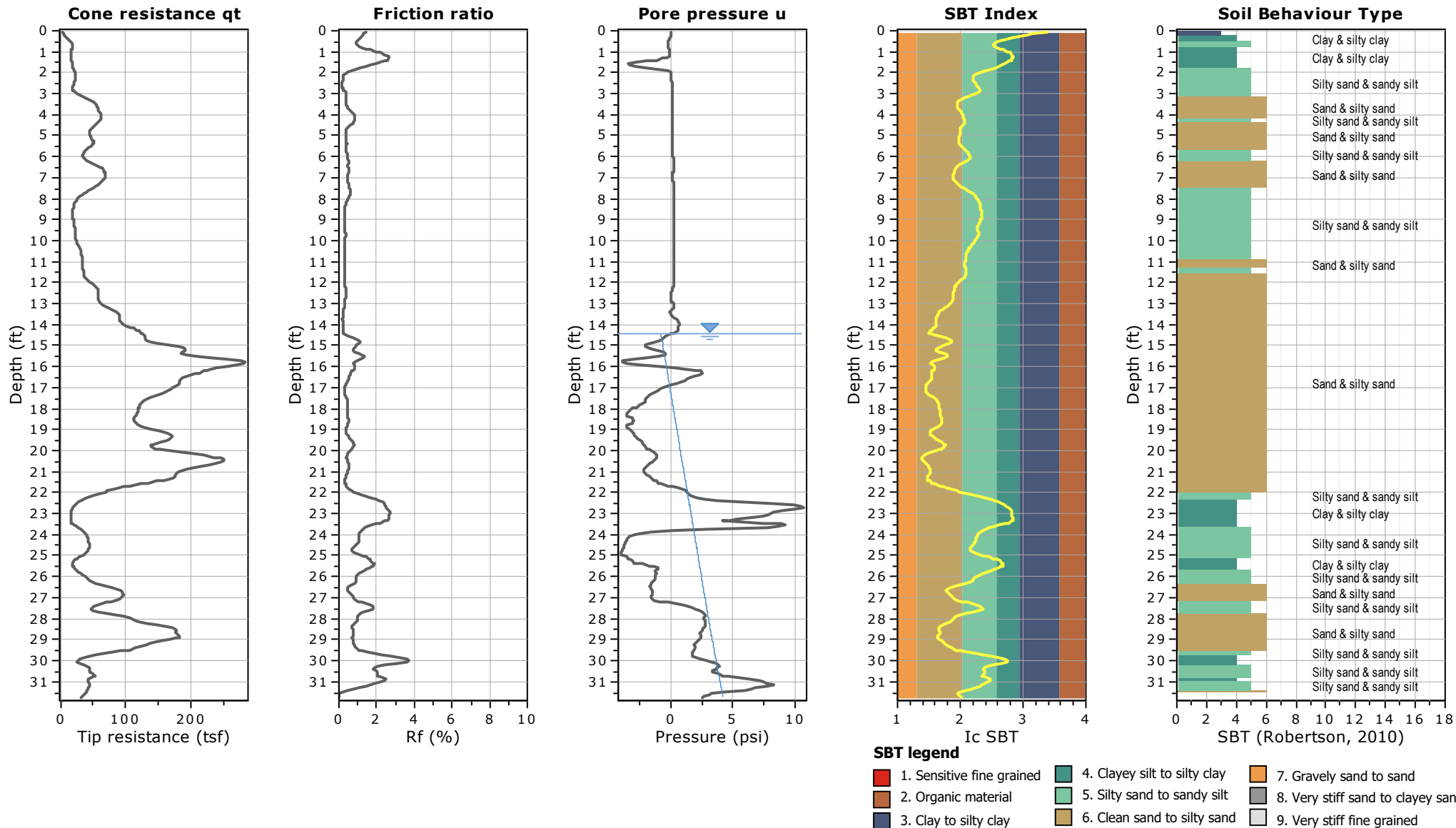
WATER DESIGNATION

DESCRIPTION	SYMBOL
ENCOUNTERED DURING DRILLING	
UPON COMPLETION OF DRILLING	
24 HOURS AFTER COMPLETION	

NOTE: WATER OBSERVATIONS WERE MADE AT THE TIME INDICATED. POROSITY OF SOIL STRATA, WEATHER CONDITIONS, SITE TOPOGRAPHY, ETC. MAY CAUSE WATER LEVEL CHANGES.

Project: New Intermediate School

Location: Smyrna, Delaware

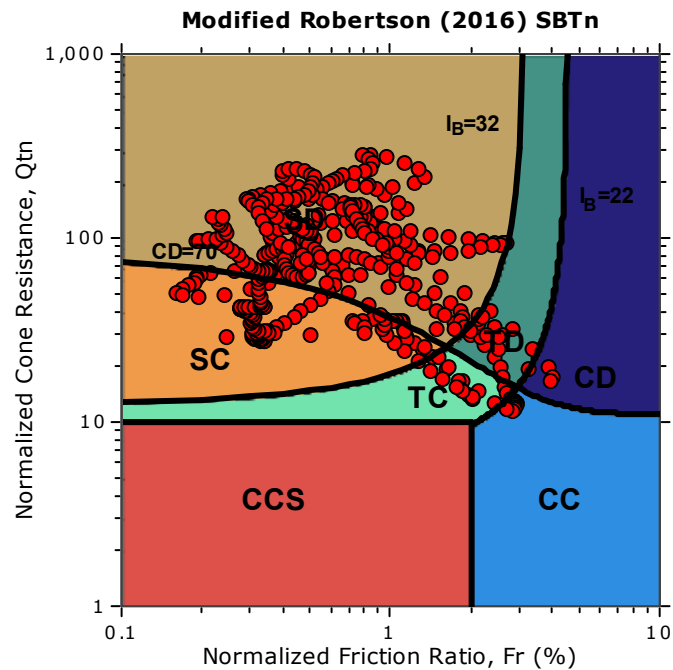




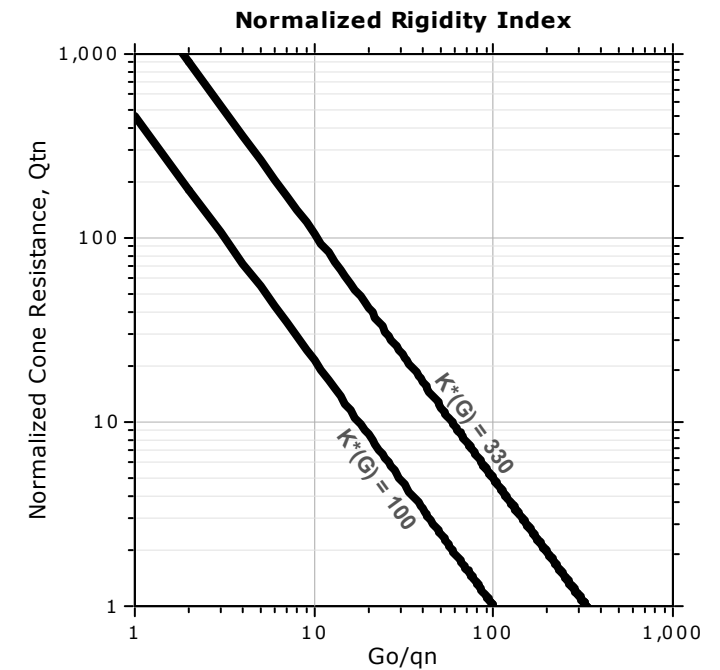
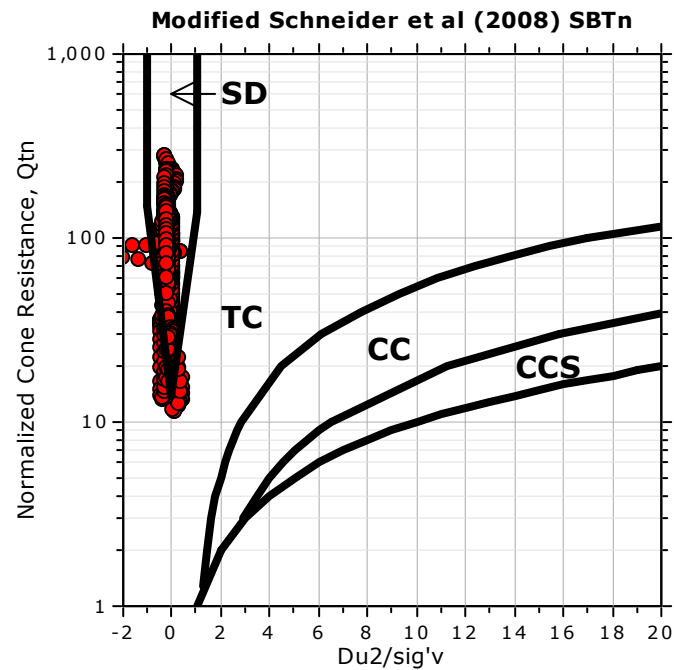
Project: New Intermediate School

Location: Smyrna, Delaware

Updated SBTn plots



CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

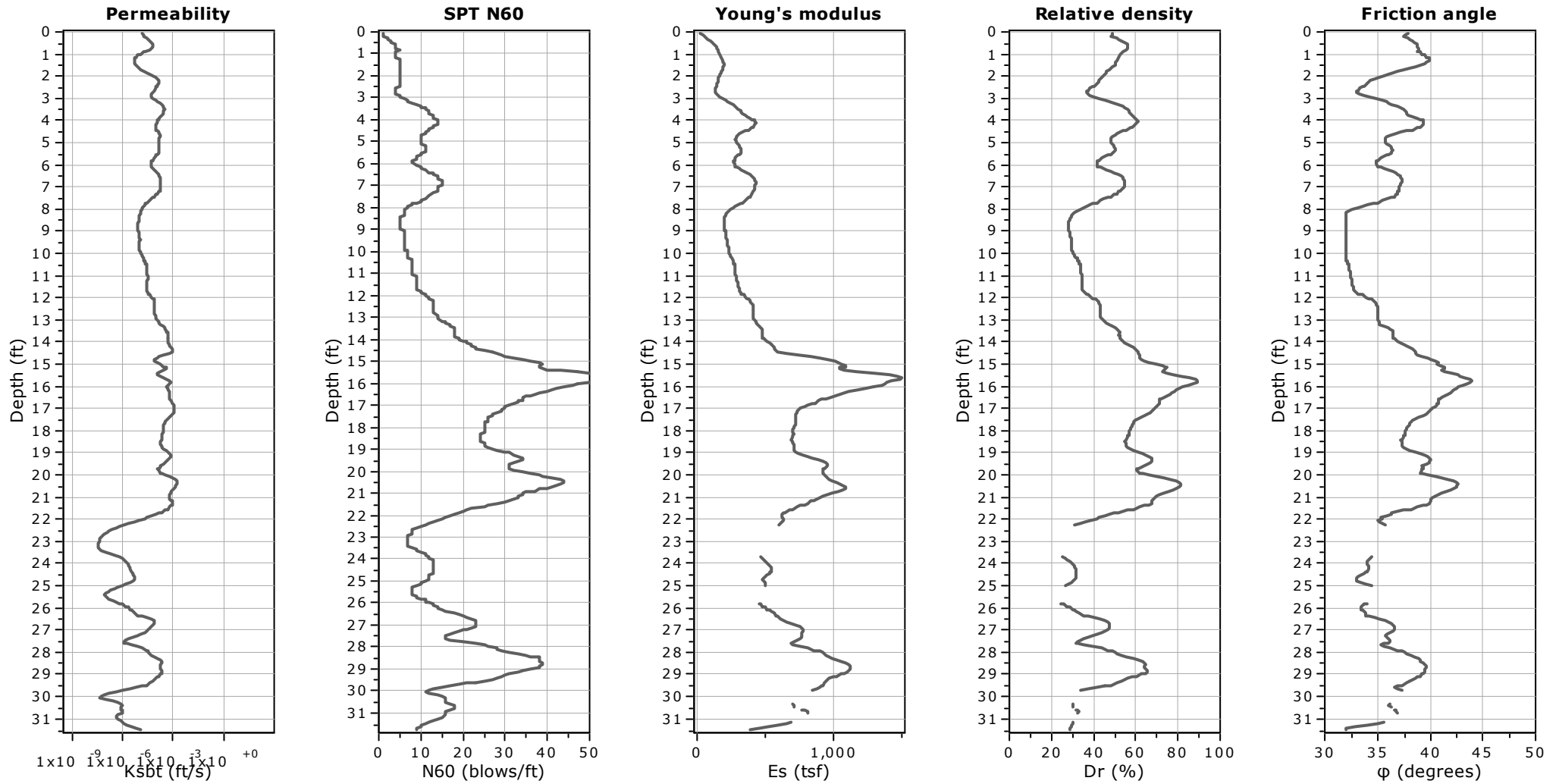


$K(G) > 330$: Soils with significant microstructure
(e.g. age/cementation)



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr} : 350.0

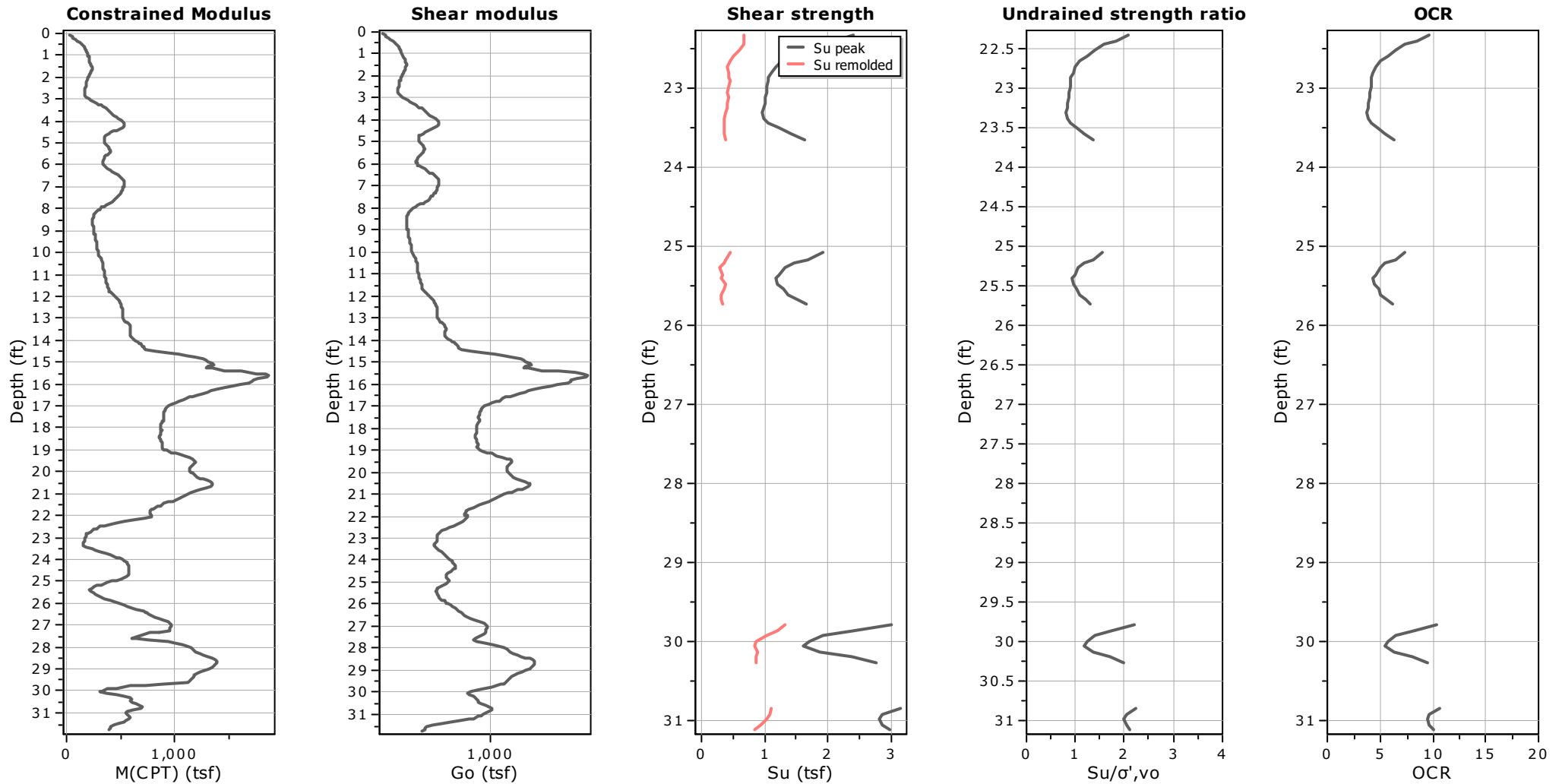
Phi: Based on Kulhawy & Mayne (1990)

● User defined estimation data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

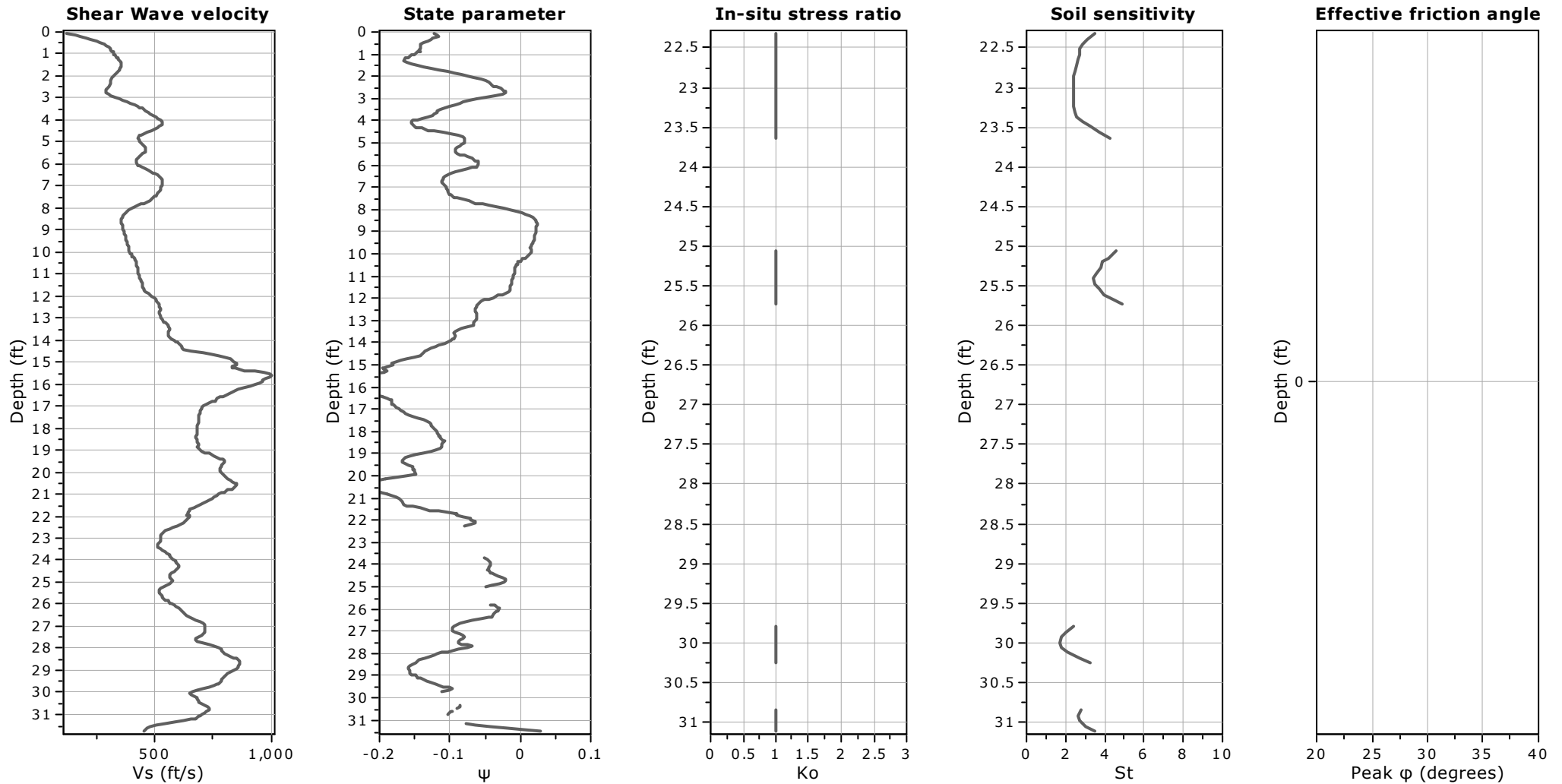
—●— User defined estimation data

—●— Flat Dilatometer Test data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Soil Sensitivity factor, N_s : 7.00

—●— User defined estimation data

Project: New Intermediate School
Location: Smyrna, Delaware

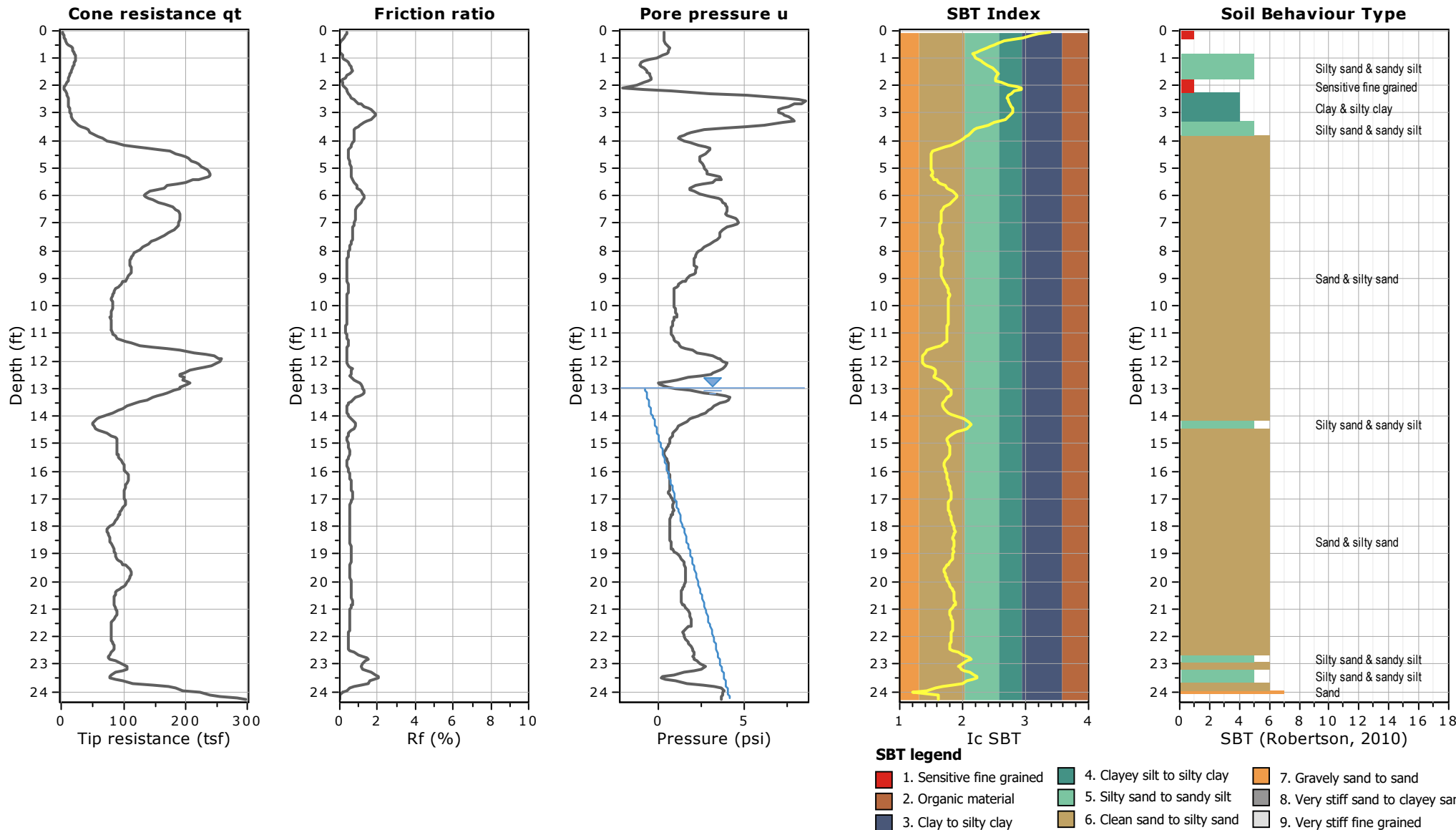
CPT-02

Total depth: 24.28 ft, Date: 1/18/2023

Surface Elevation: 47.50 ft

Cone Type: Vertek

Cone Operator: D. Hans



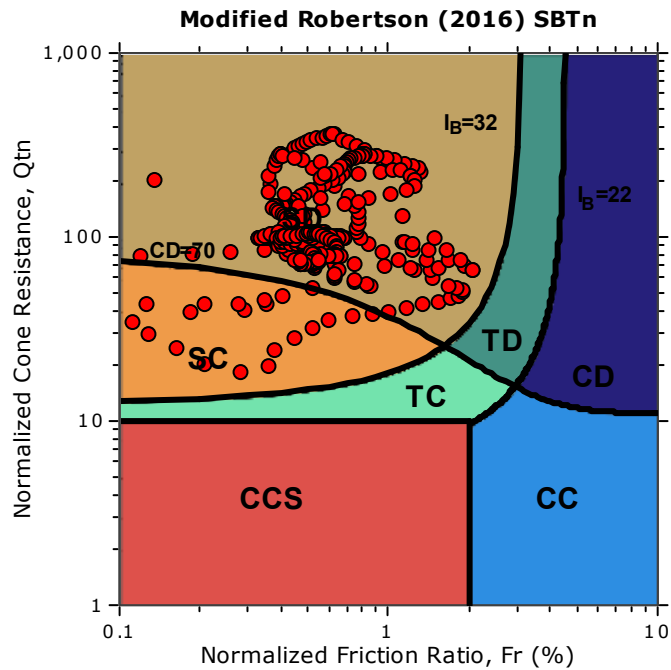


Project: New Intermediate School
Location: Smyrna, Delaware

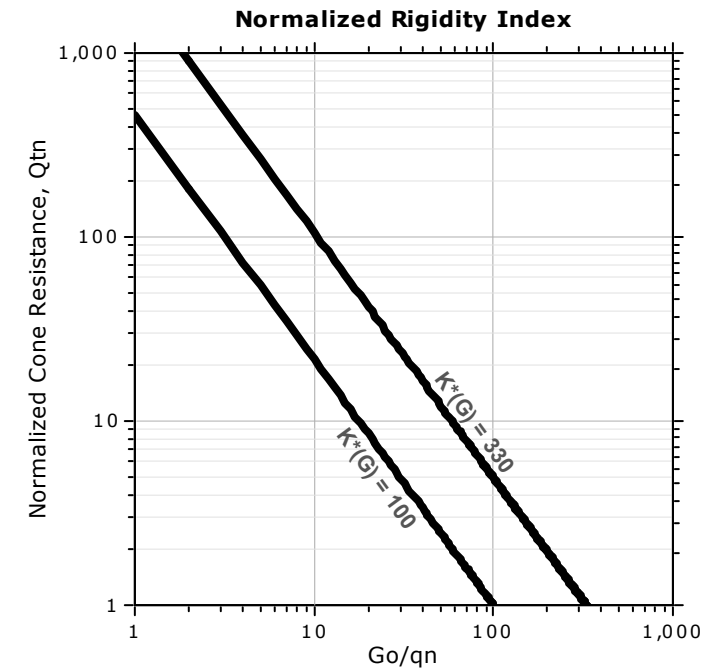
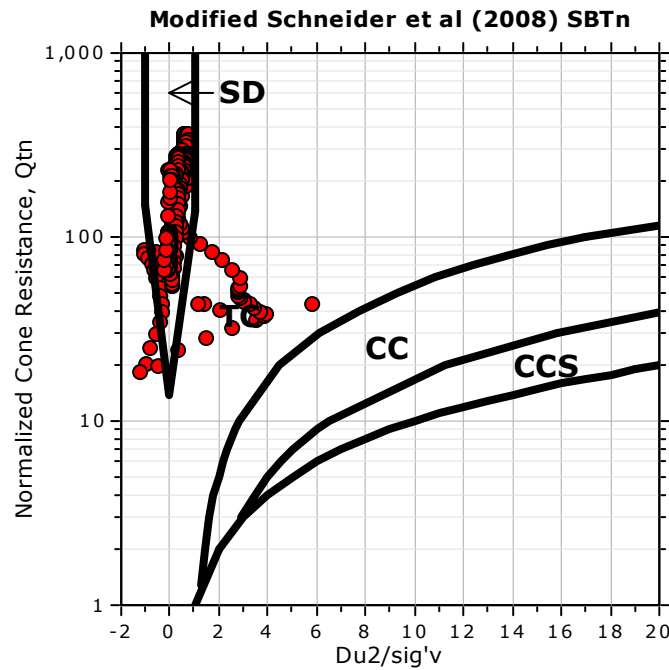
CPT-02

Total depth: 24.28 ft, Date: 1/18/2023
Surface Elevation: 47.50 ft
Cone Type: Vertek
Cone Operator: D. Hans

Updated SBTn plots



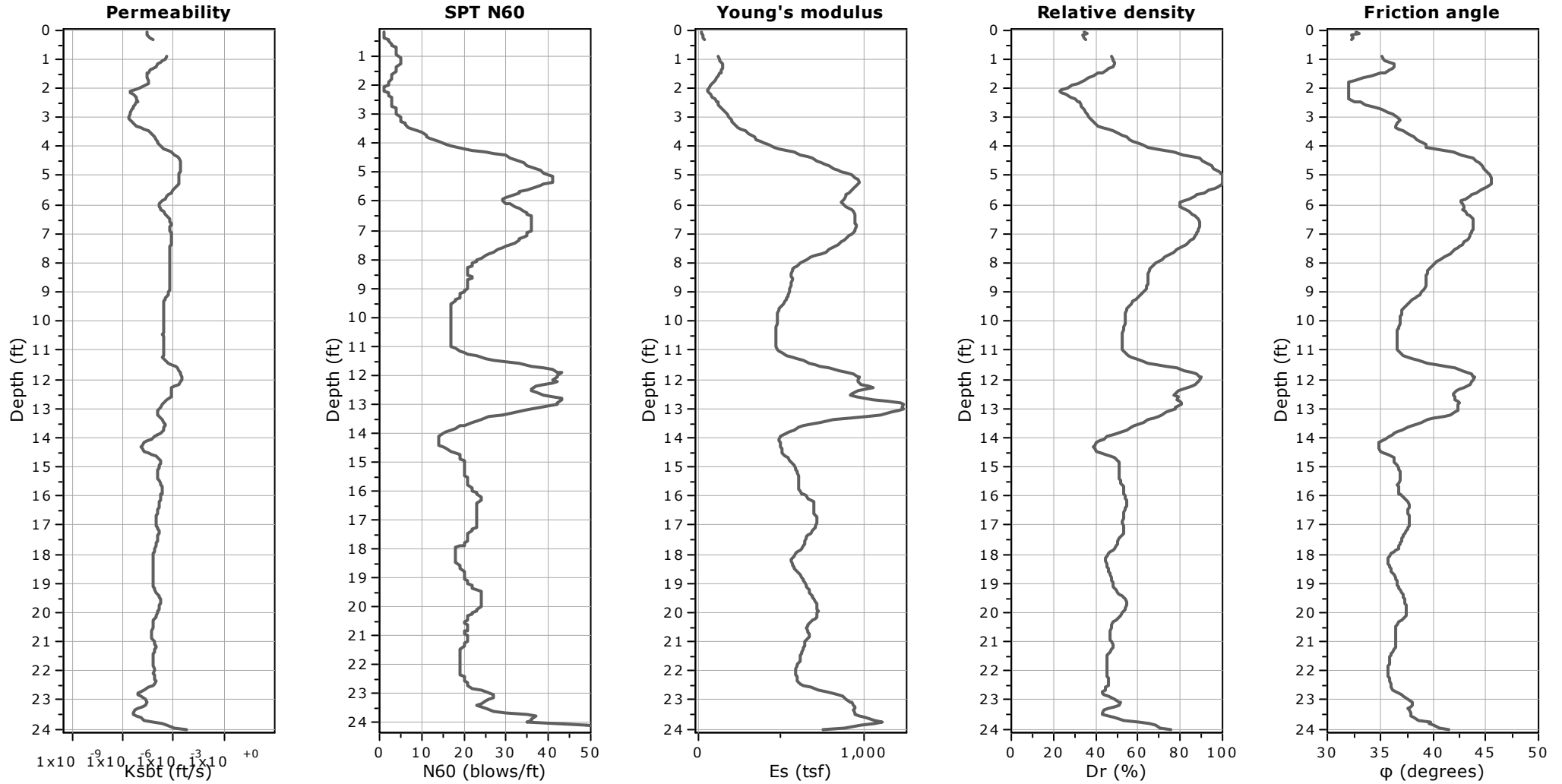
CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative



$K(G) > 330$: Soils with significant microstructure
(e.g. age/cementation)



Project: New Intermediate School
Location: Smyrna, Delaware



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr} : 350.0

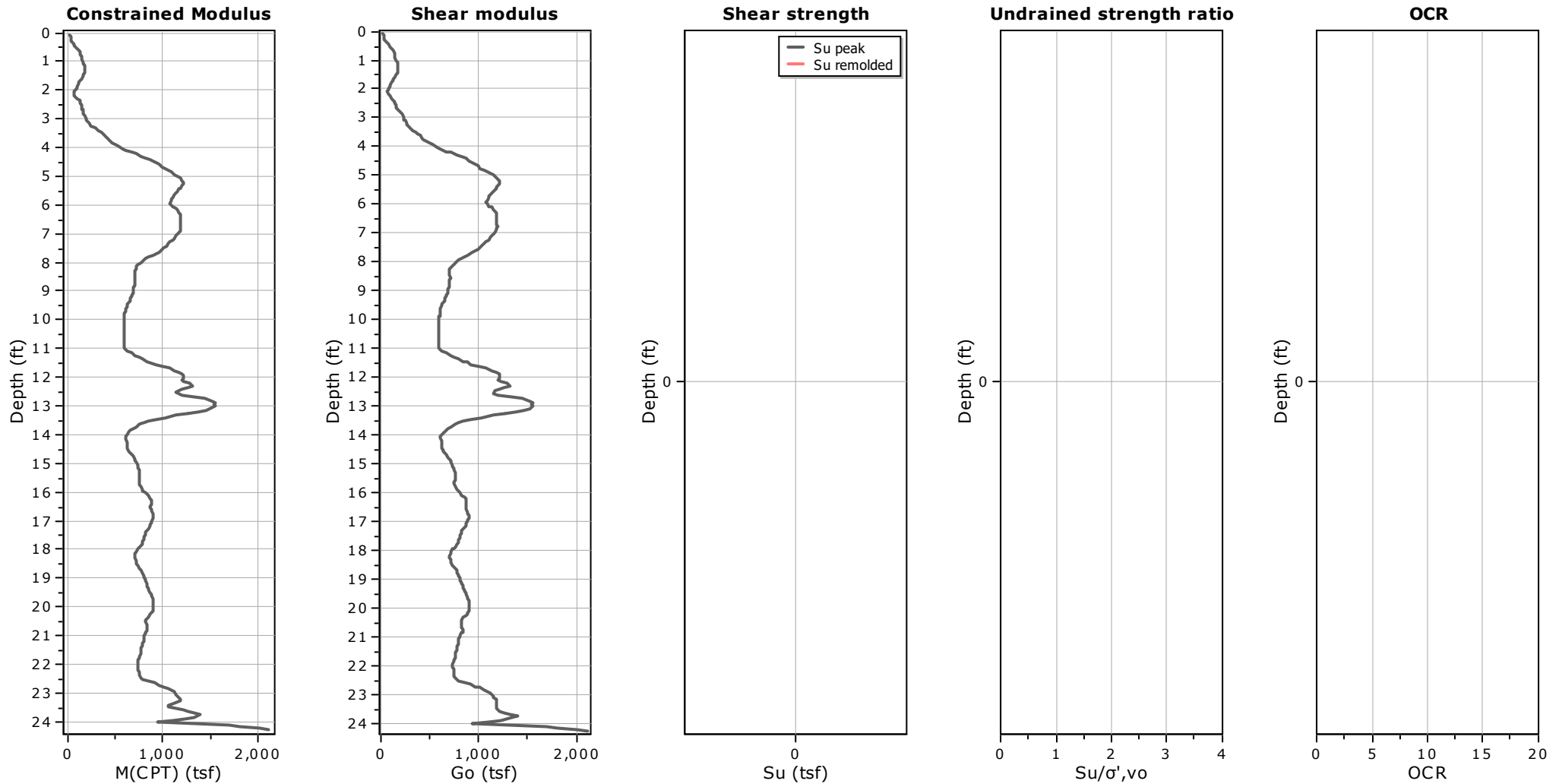
Phi: Based on Kulhawy & Mayne (1990)

● — User defined estimation data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

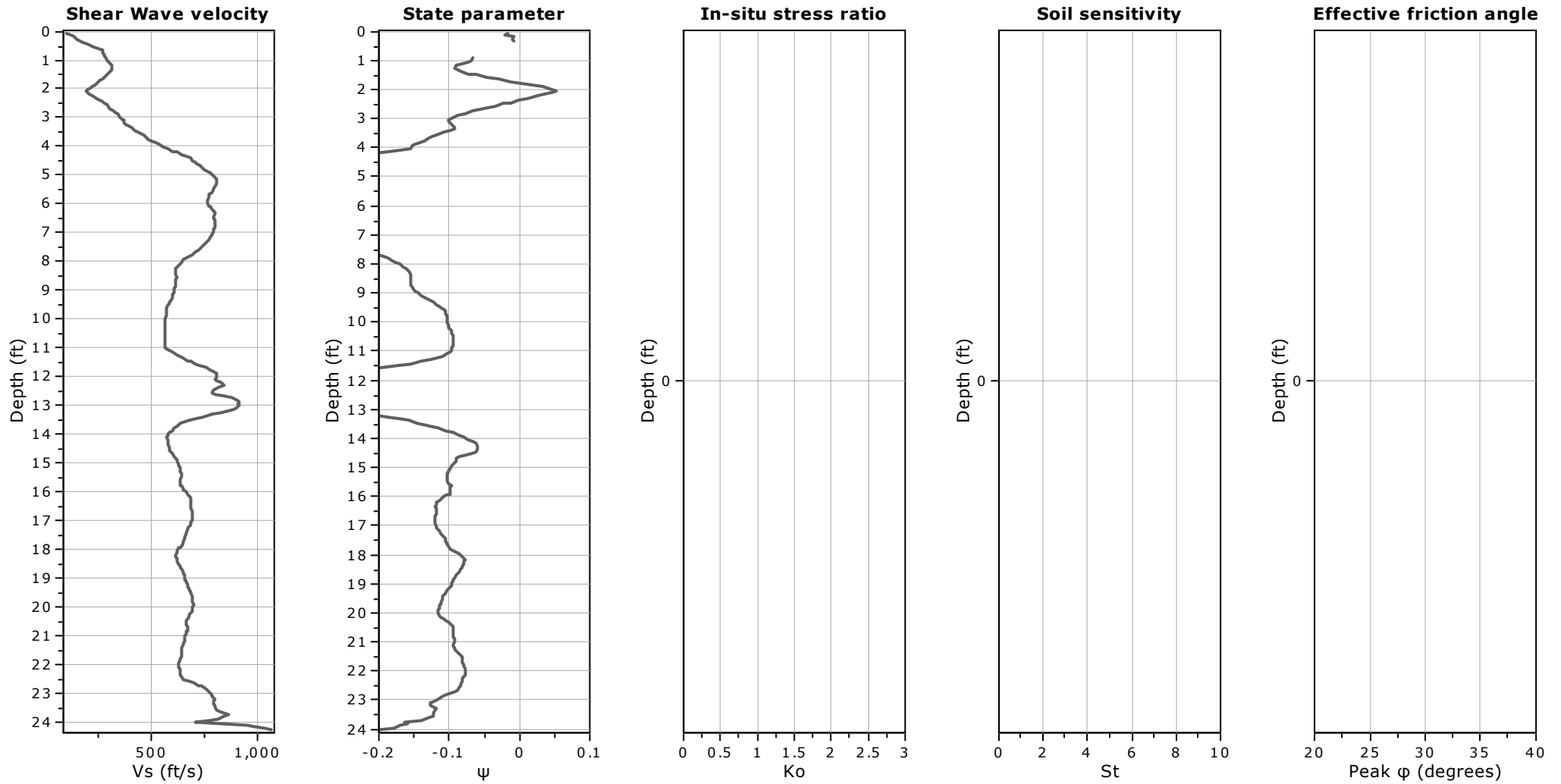
—●— User defined estimation data

—●— Flat Dilatometer Test data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Soil Sensitivity factor, N_s : 7.00

—●— User defined estimation data

Total depth: 26.53 ft, Date: 1/18/2023

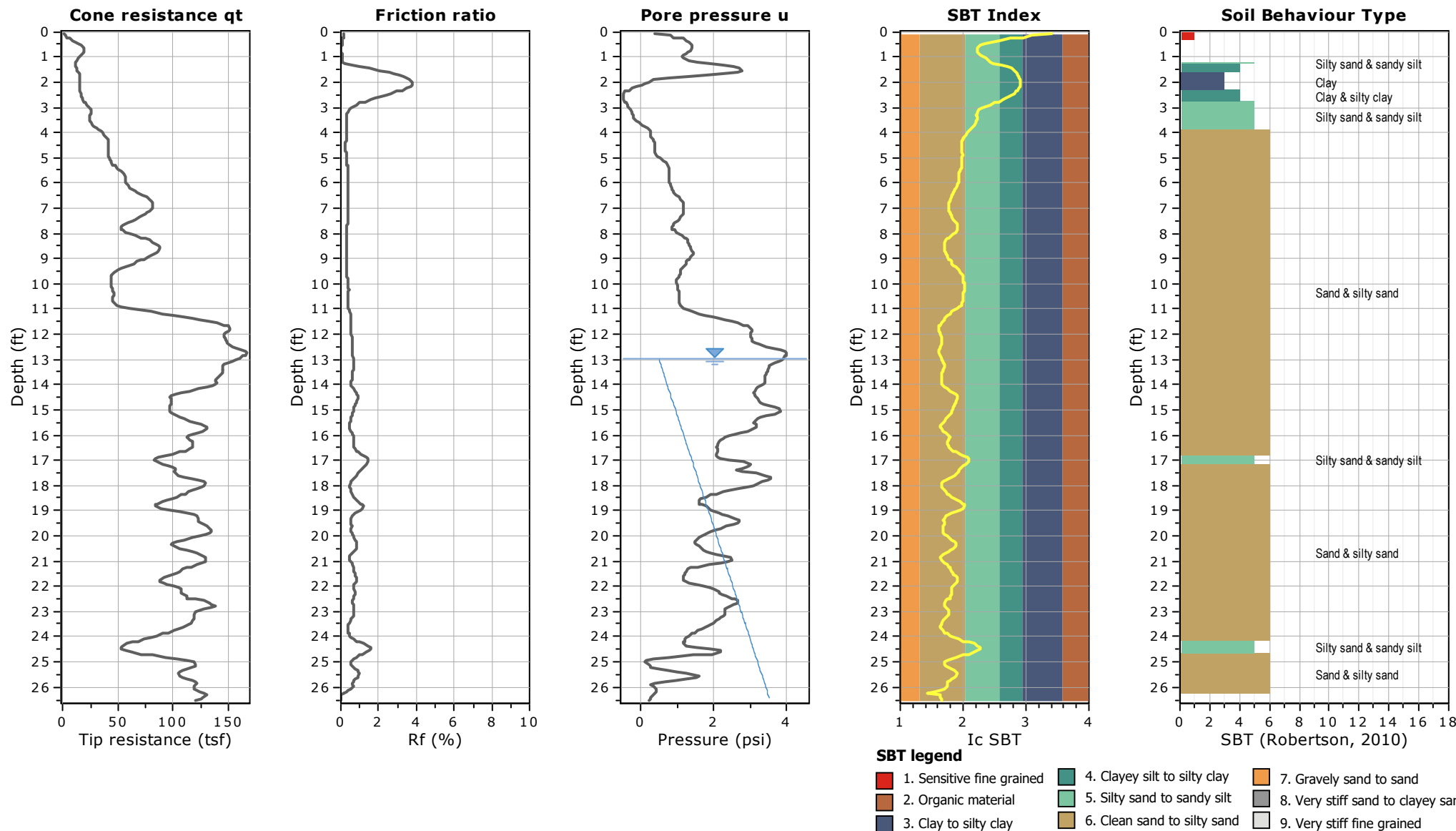
Surface Elevation: 47.00 ft

Cone Type: Vertek

Cone Operator: D. Hans

Project: New Intermediate School

Location: Smyrna, Delaware



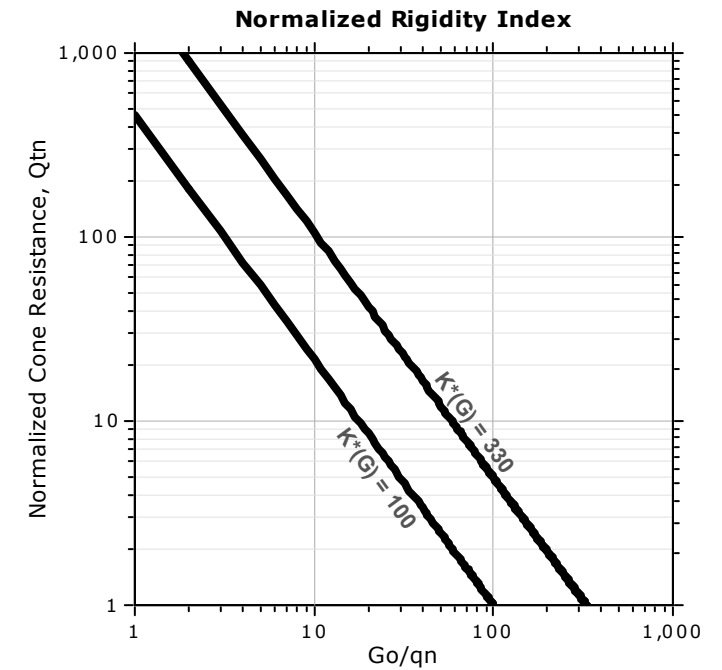
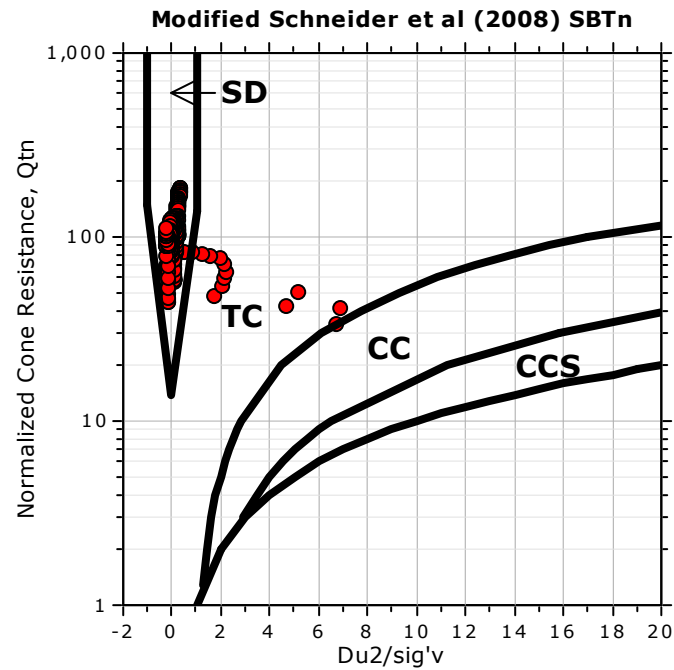
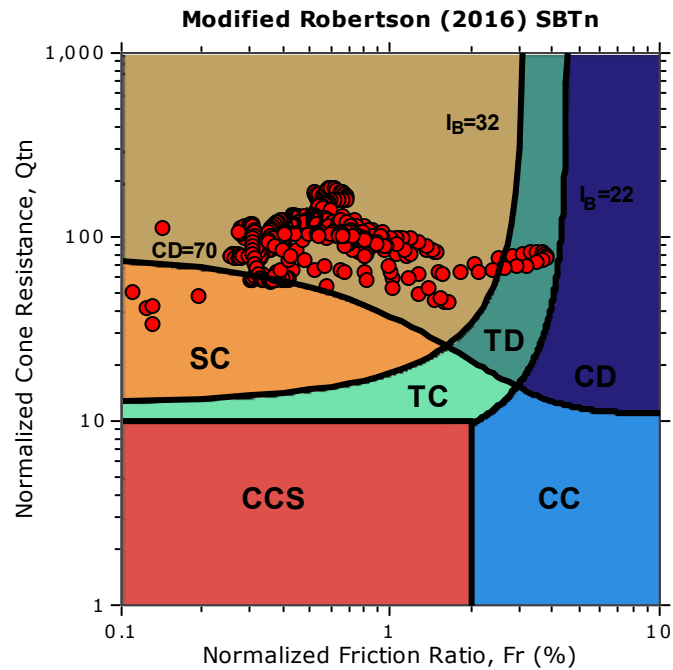


Project: New Intermediate School
Location: Smyrna, Delaware

CPT-03

Total depth: 26.53 ft, Date: 1/18/2023
Surface Elevation: 47.00 ft
Cone Type: Vertek
Cone Operator: D. Hans

Updated SBTn plots

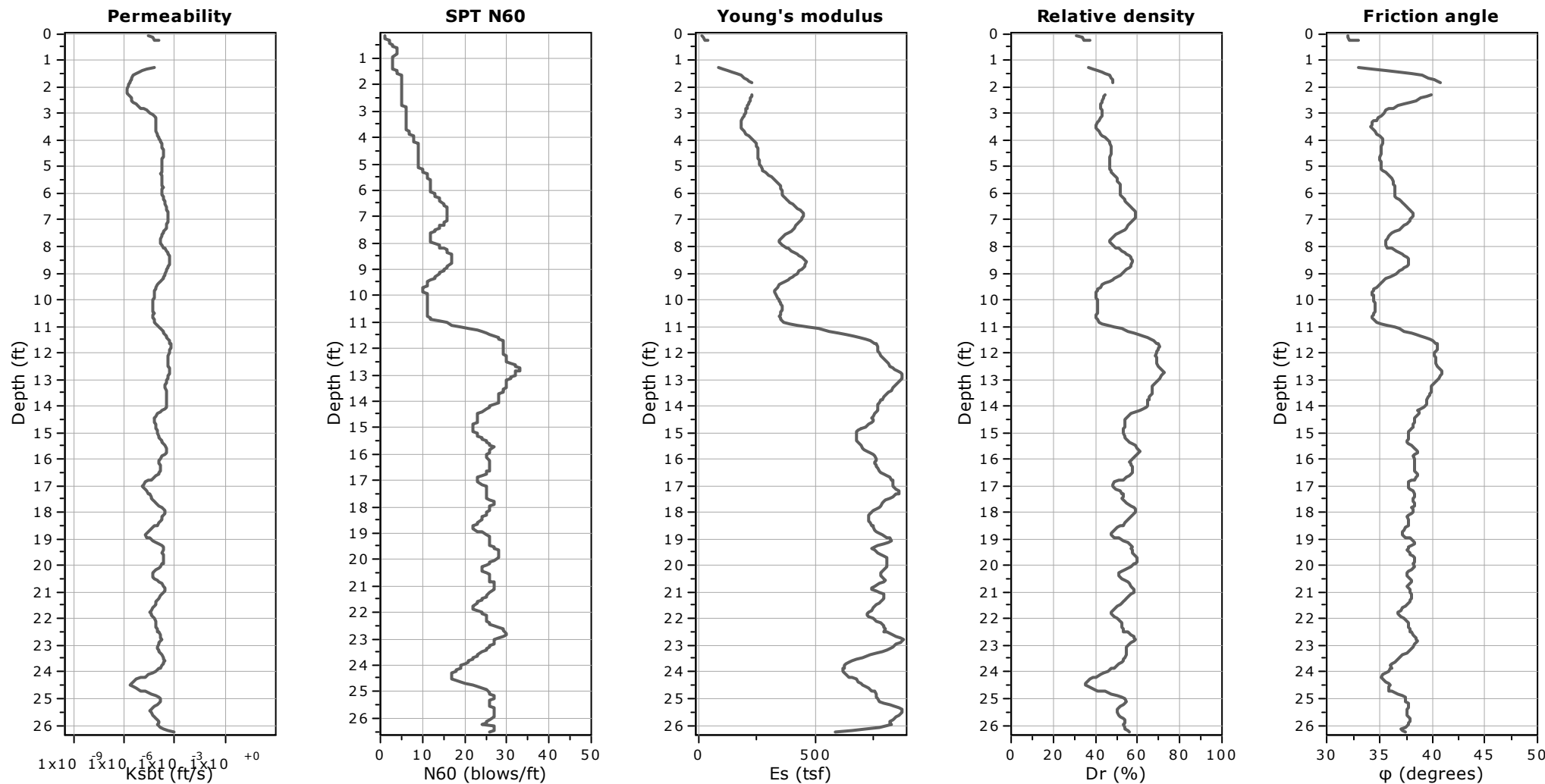


CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

$K^*(G) > 330$: Soils with significant microstructure
(e.g. age/cementation)

Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr} : 350.0

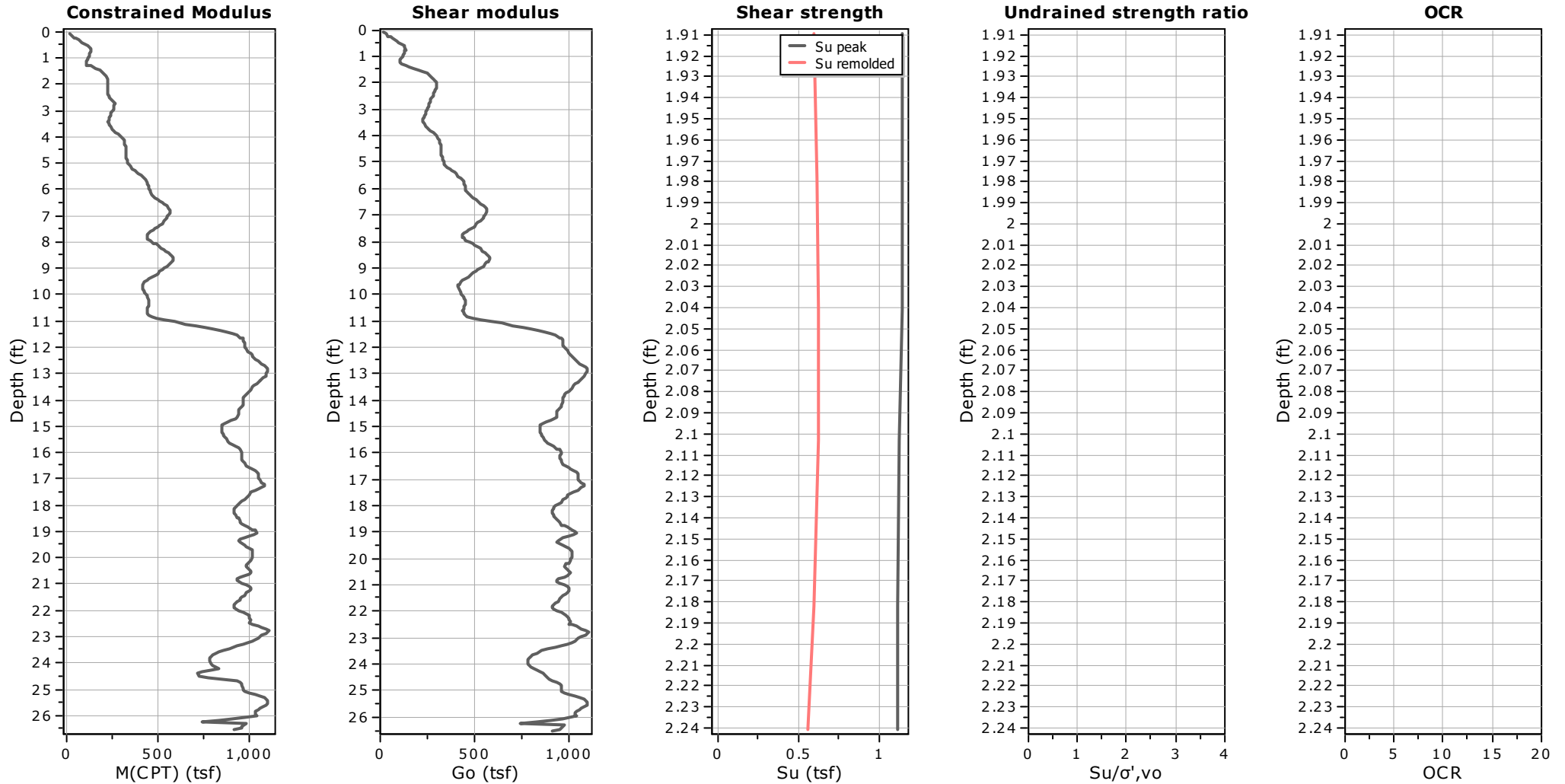
Phi: Based on Kulhawy & Mayne (1990)

● User defined estimation data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

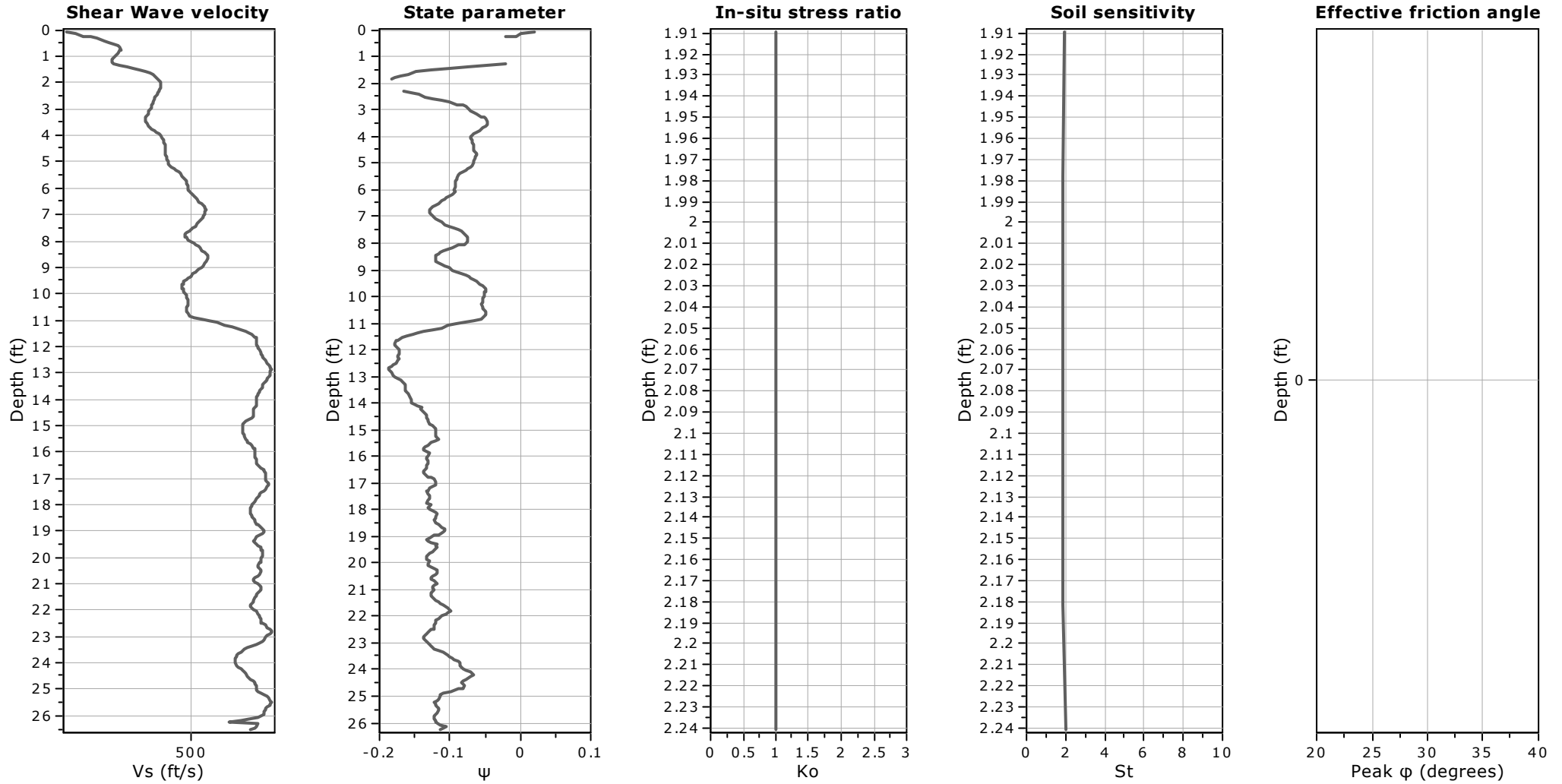
● User defined estimation data

● Flat Dilatometer Test data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Soil Sensitivity factor, N_s : 7.00

—●— User defined estimation data

Total depth: 26.19 ft, Date: 1/18/2023

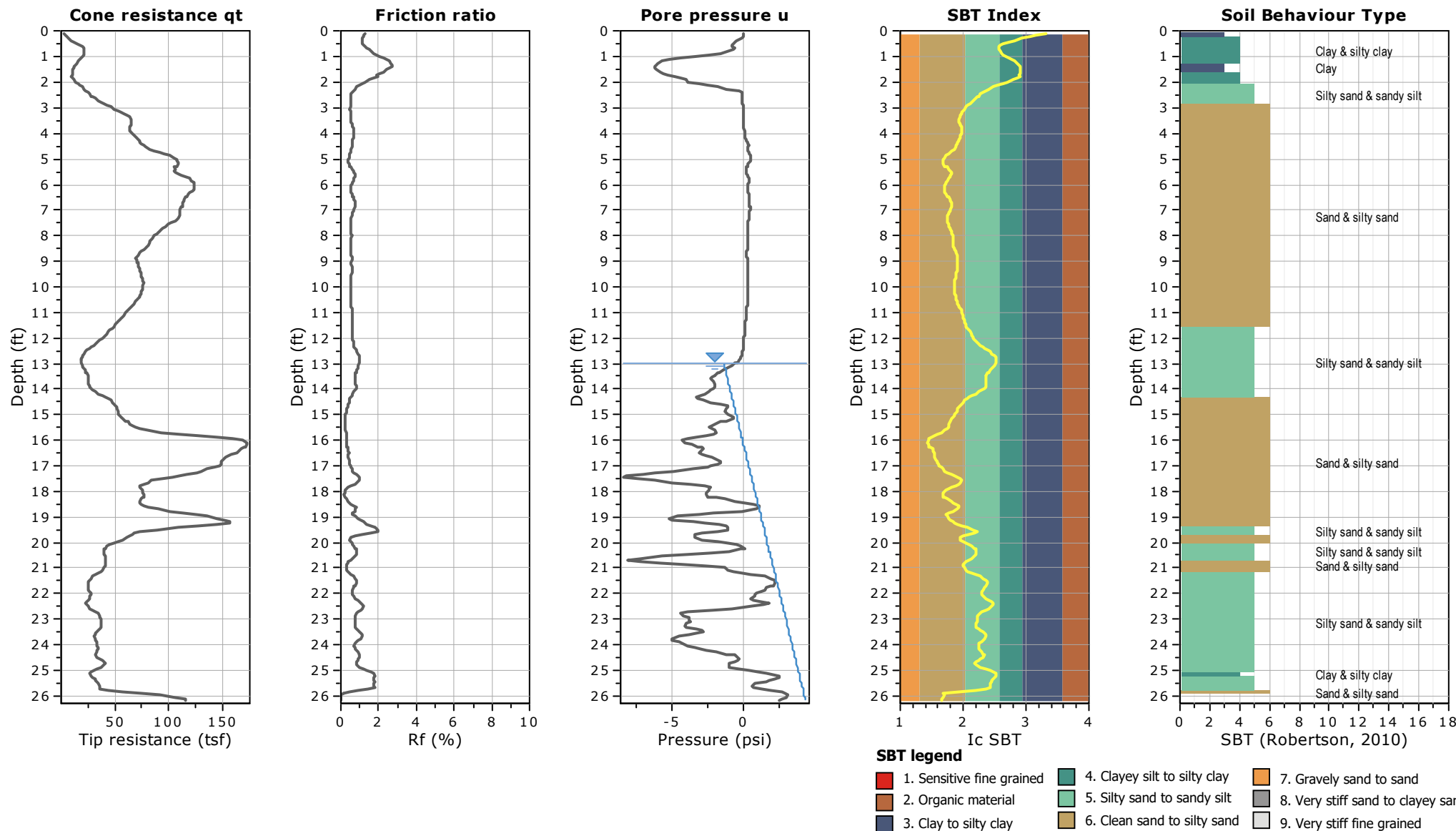
Surface Elevation: 48.00 ft

Cone Type: Vertek

Cone Operator: D. Hans

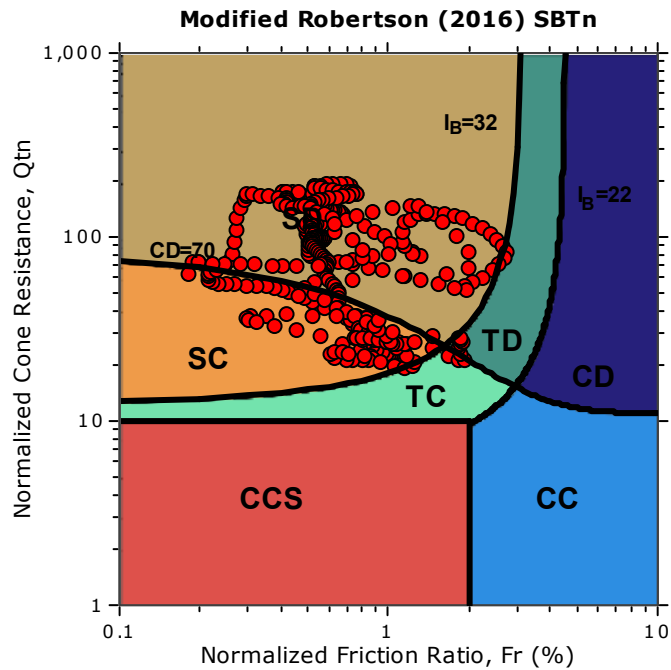
Project: New Intermediate School

Location: Smyrna, Delaware

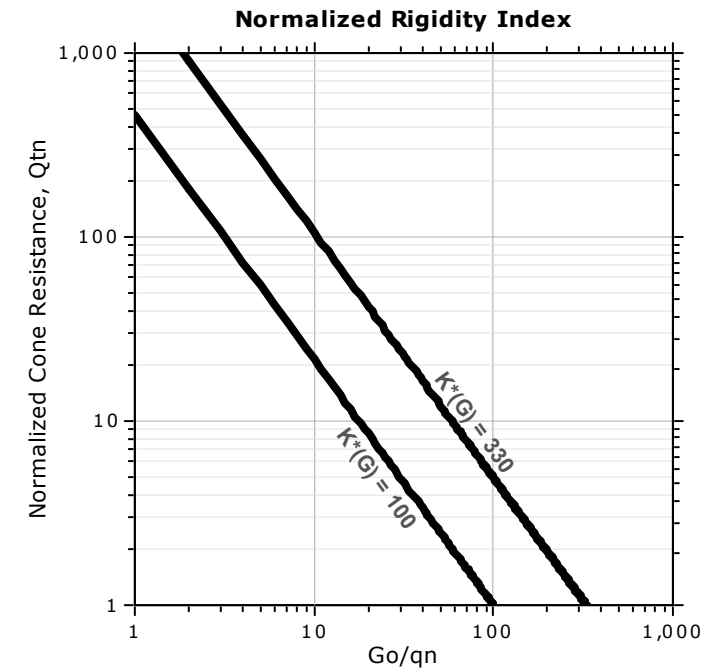
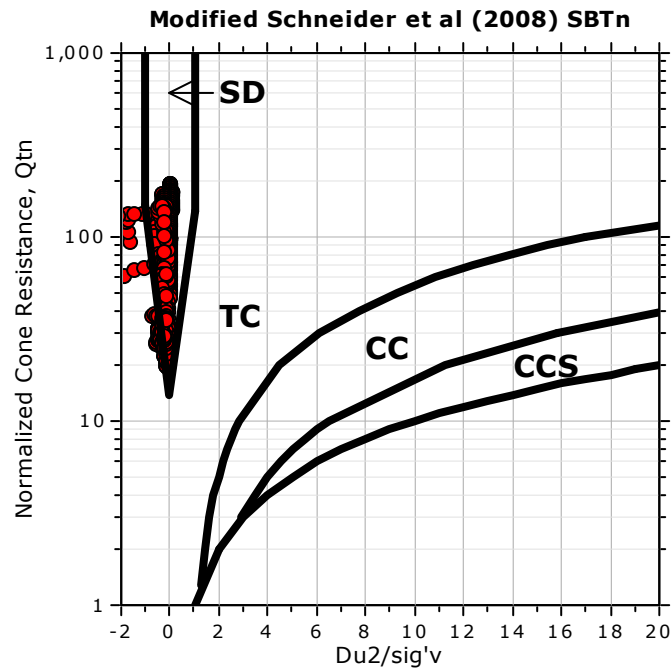




Updated SBTn plots



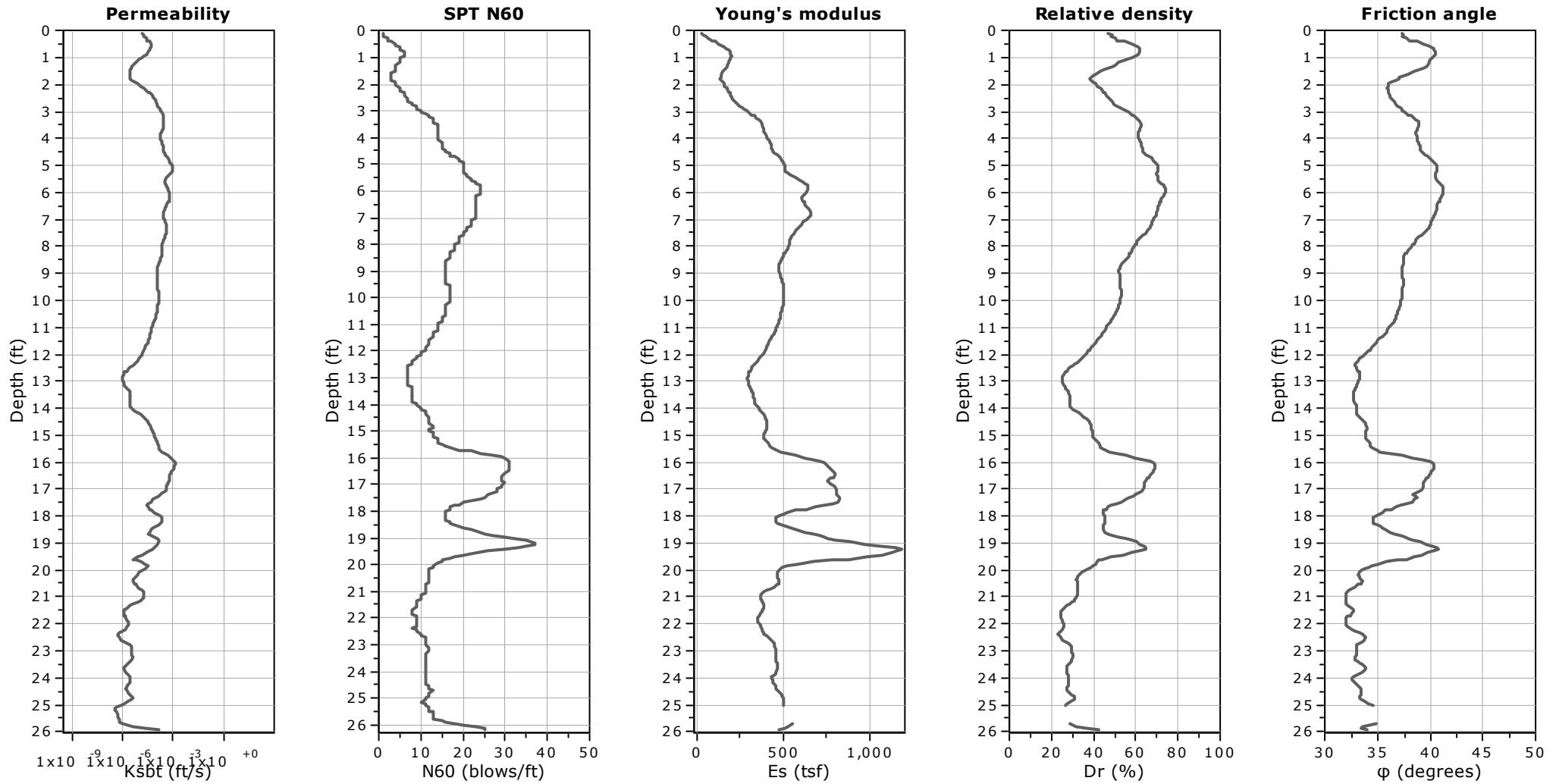
CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative



$K(G) > 330$: Soils with significant microstructure
(e.g. age/cementation)



Project: New Intermediate School
Location: Smyrna, Delaware



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr} : 350.0

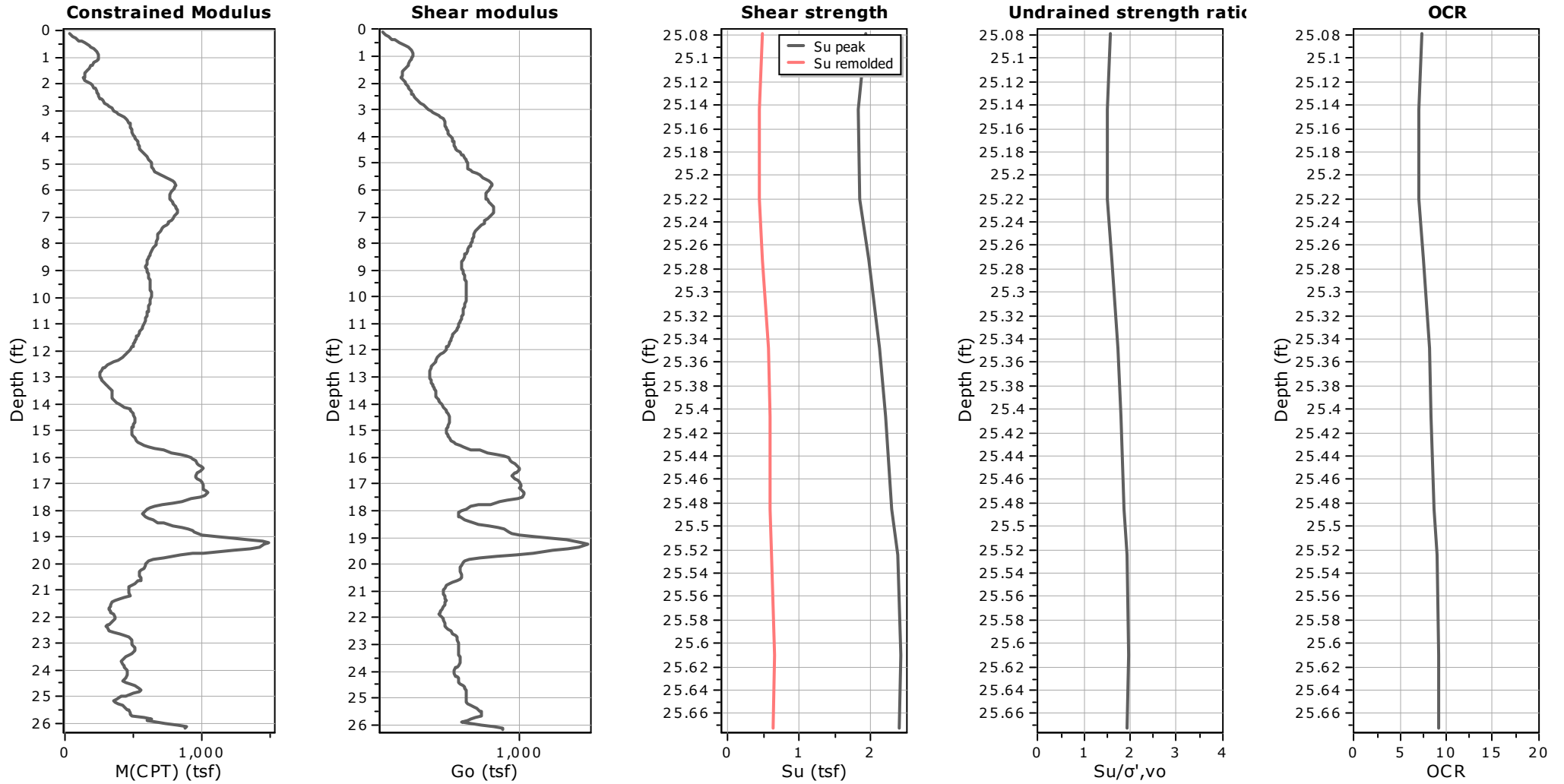
Phi: Based on Kulhawy & Mayne (1990)

● User defined estimation data



Total depth: 26.19 ft, Date: 1/18/2023
Surface Elevation: 48.00 ft
Cone Type: Vertek
Cone Operator: D. Hans

Project: New Intermediate School
Location: Smyrna, Delaware



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

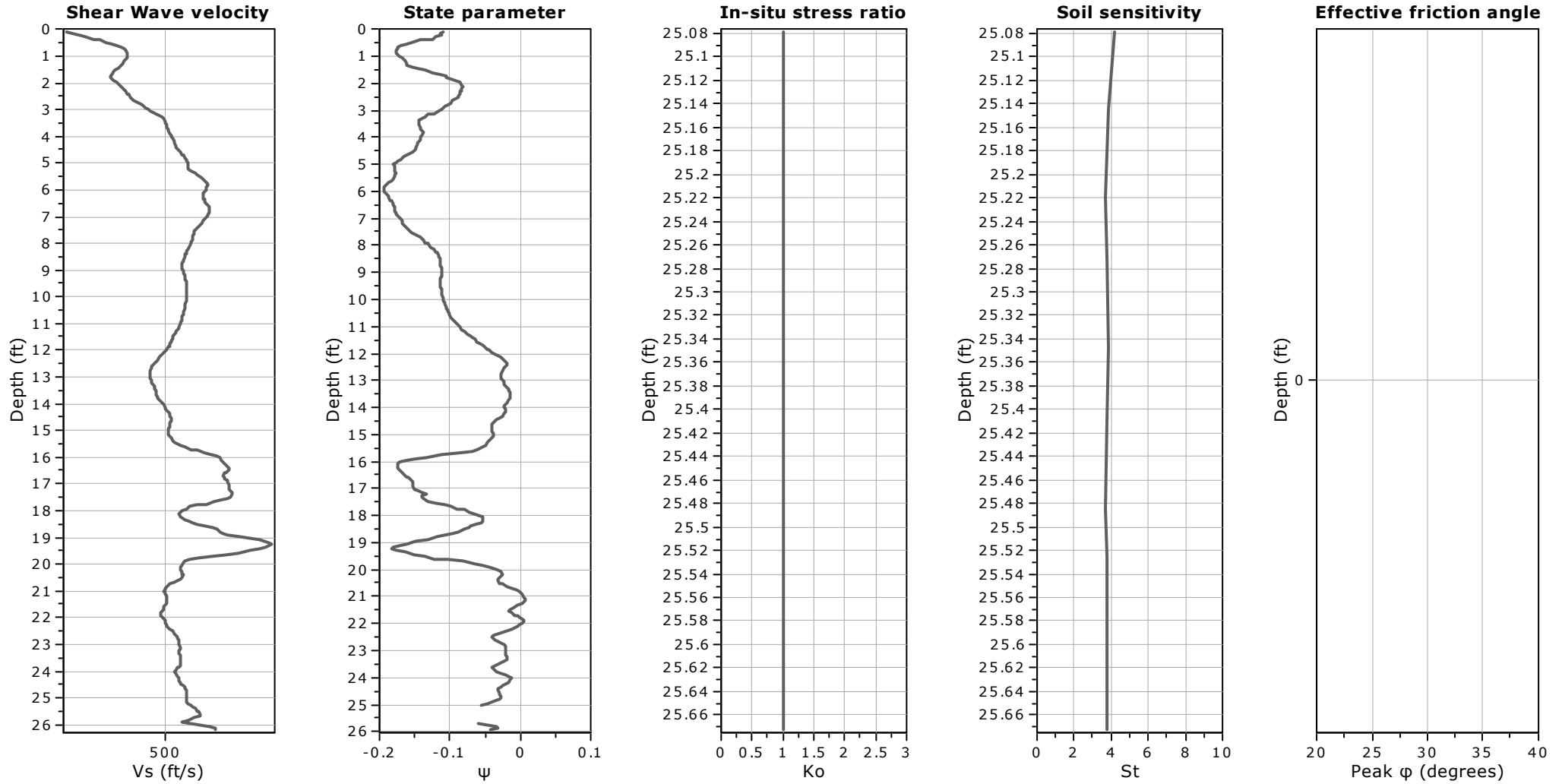
—●— User defined estimation data

—●— Flat Dilatometer Test data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Soil Sensitivity factor, N_s : 7.00

—●— User defined estimation data

Project: New Intermediate School
Location: Smyrna, Delaware

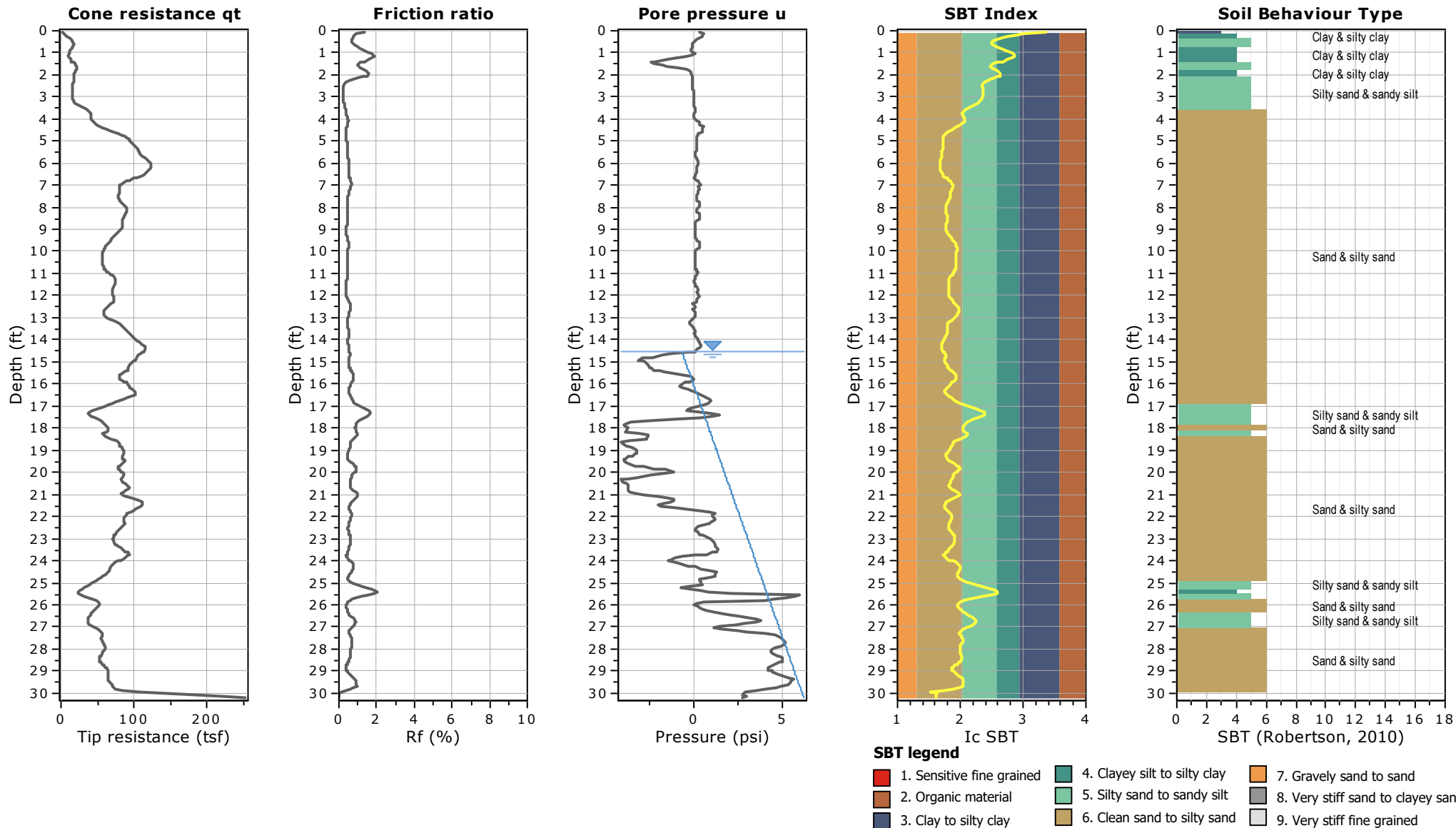
CPT-05

Total depth: 30.20 ft, Date: 1/18/2023

Surface Elevation: 48.00 ft

Cone Type: Vertek

Cone Operator: D. Hans



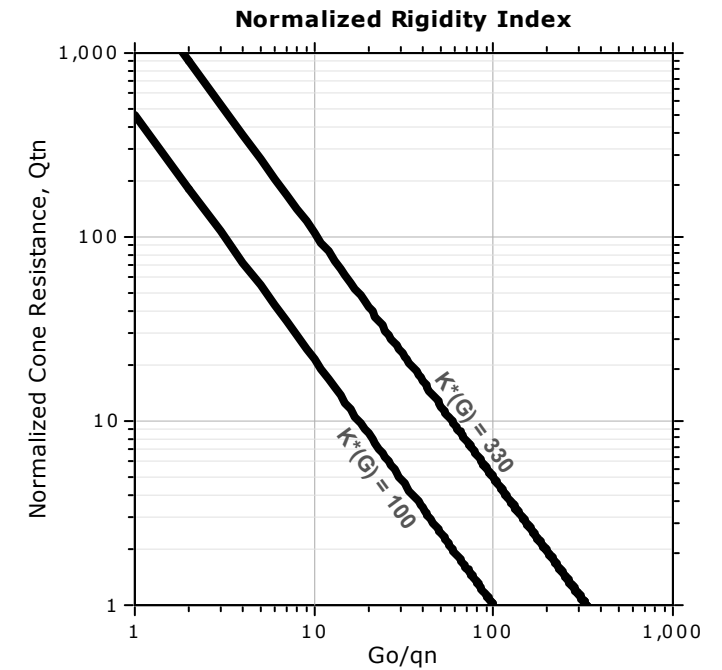
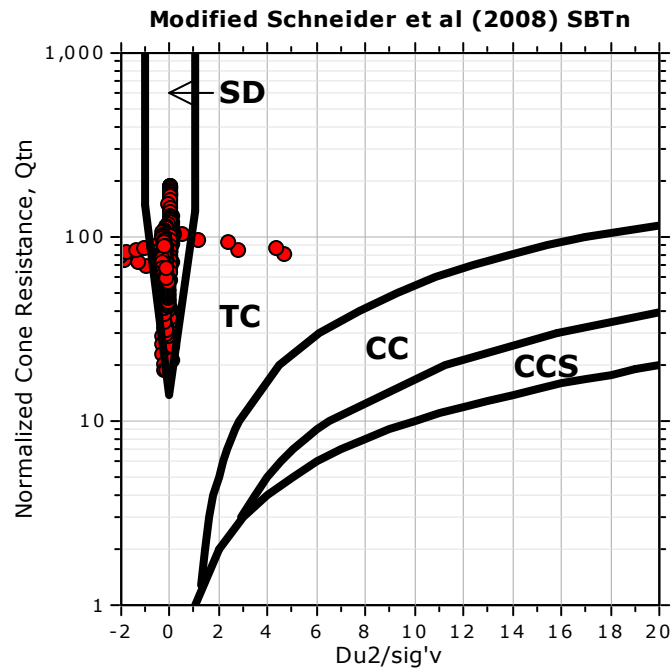
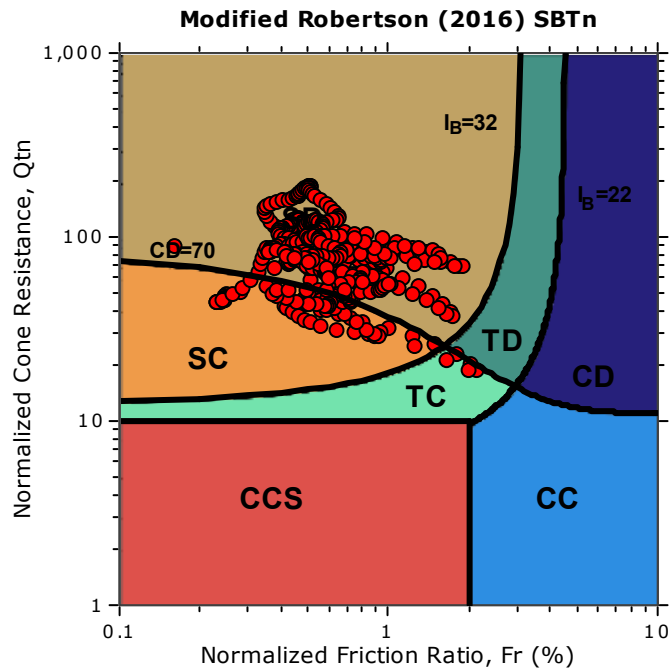


Project: New Intermediate School
Location: Smyrna, Delaware

CPT-05

Total depth: 30.20 ft, Date: 1/18/2023
Surface Elevation: 48.00 ft
Cone Type: Vertek
Cone Operator: D. Hans

Updated SBTn plots



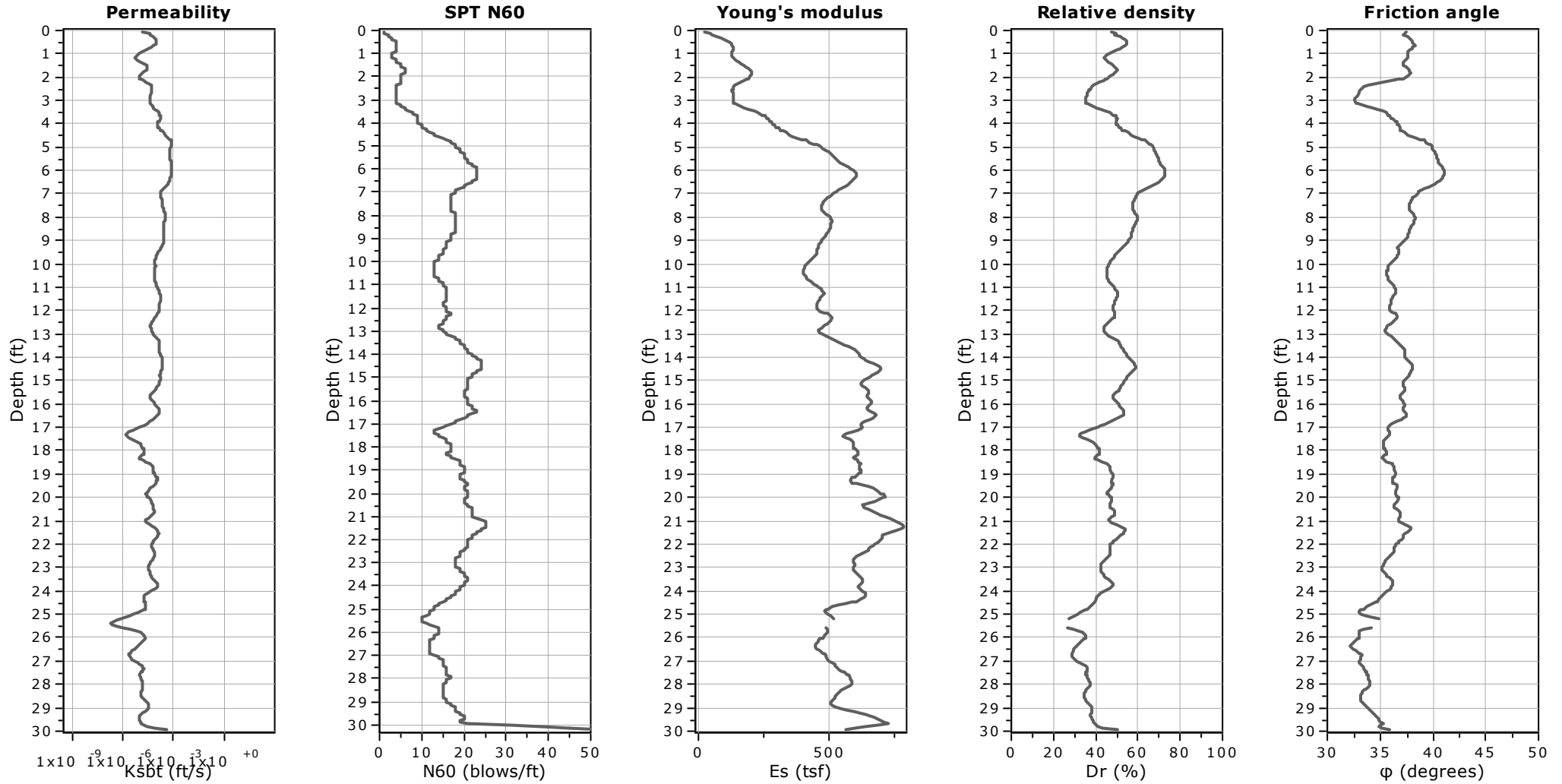
CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

$K^*(G) > 330$: Soils with significant microstructure
(e.g. age/cementation)



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

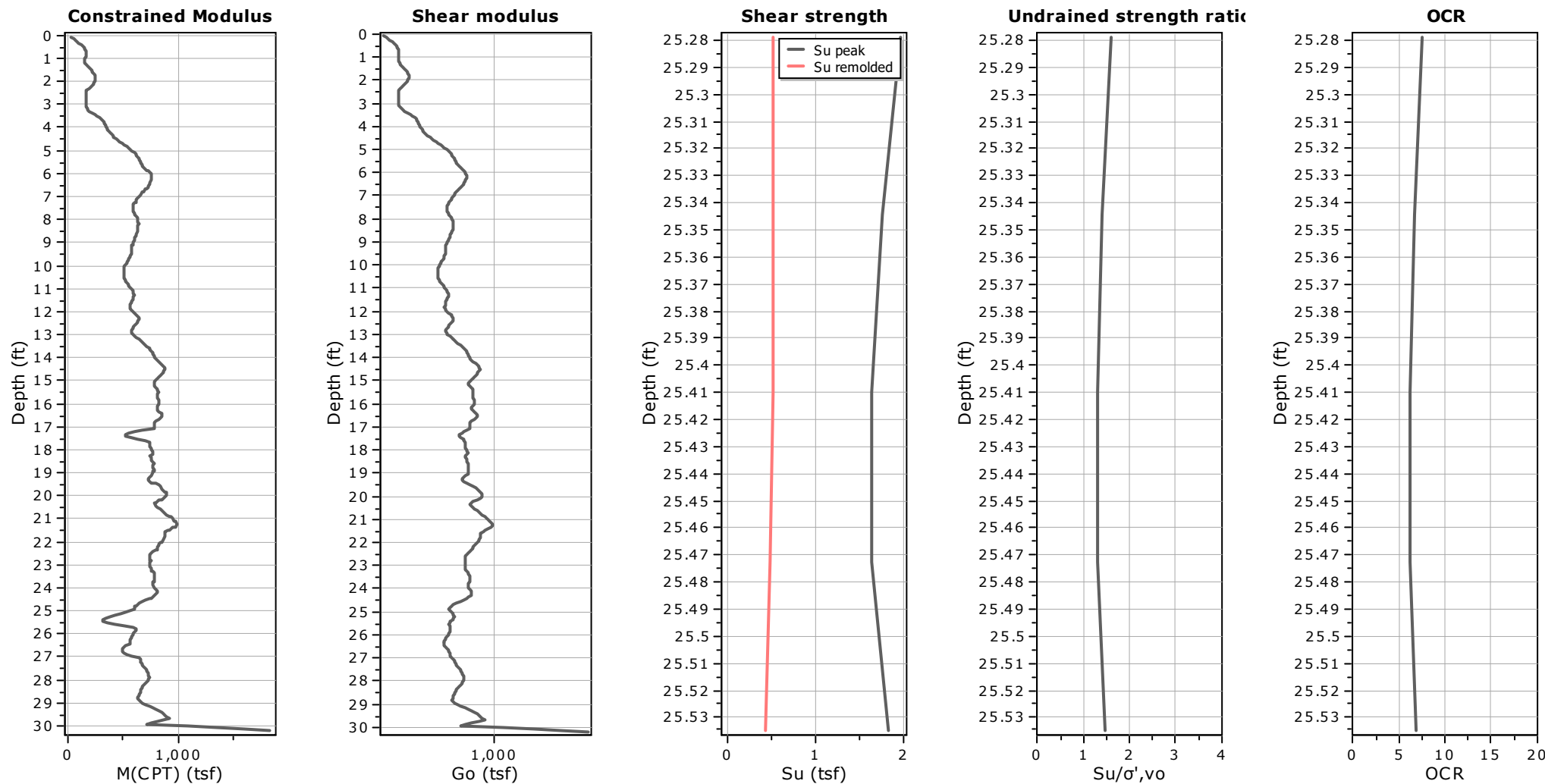
Relative density constant, C_{Dr} : 350.0

Phi: Based on Kulhawy & Mayne (1990)

● User defined estimation data

Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

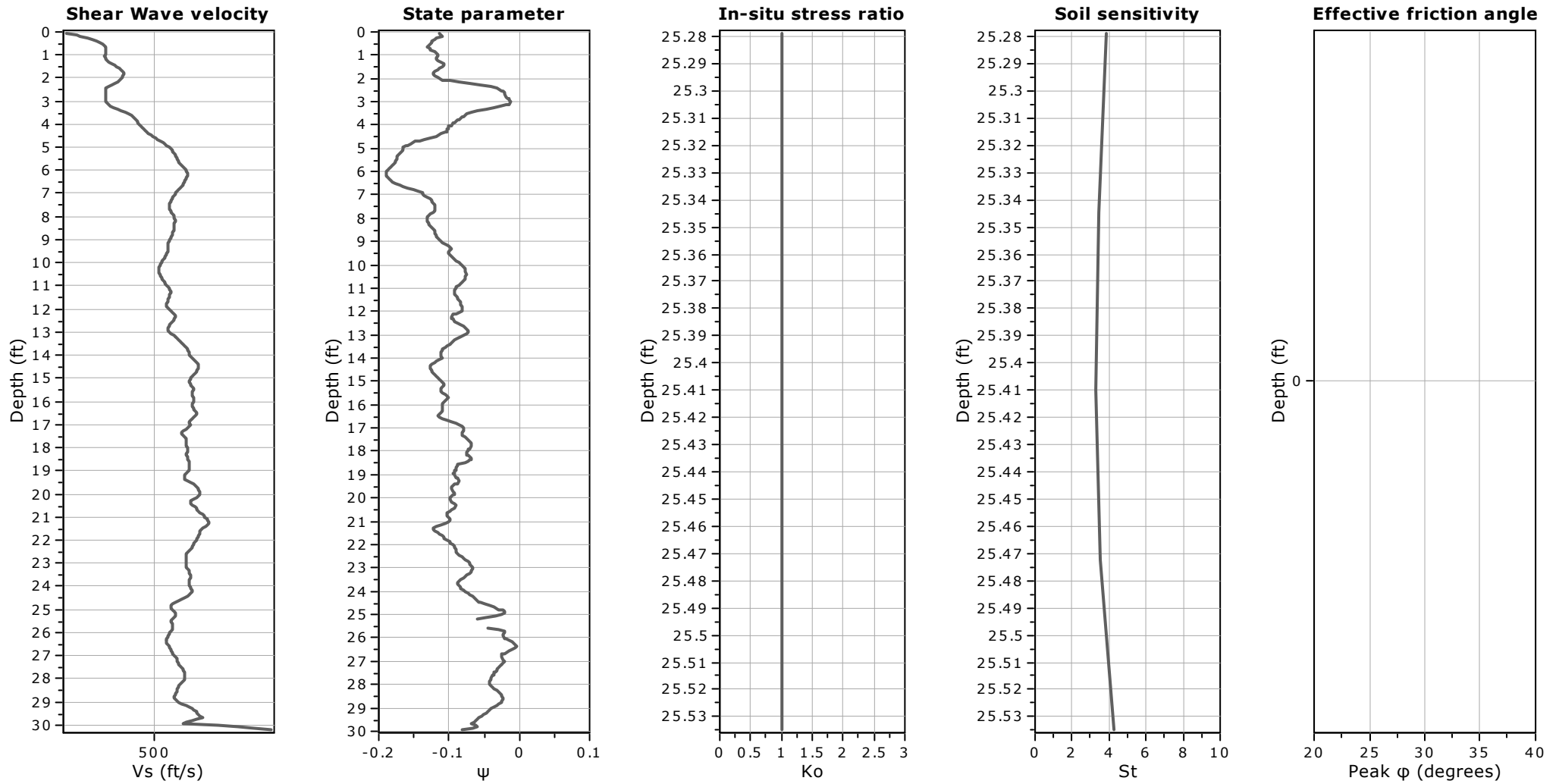
—●— User defined estimation data

—●— Flat Dilatometer Test data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Soil Sensitivity factor, N_s : 7.00

—●— User defined estimation data

Total depth: 32.16 ft, Date: 1/18/2023

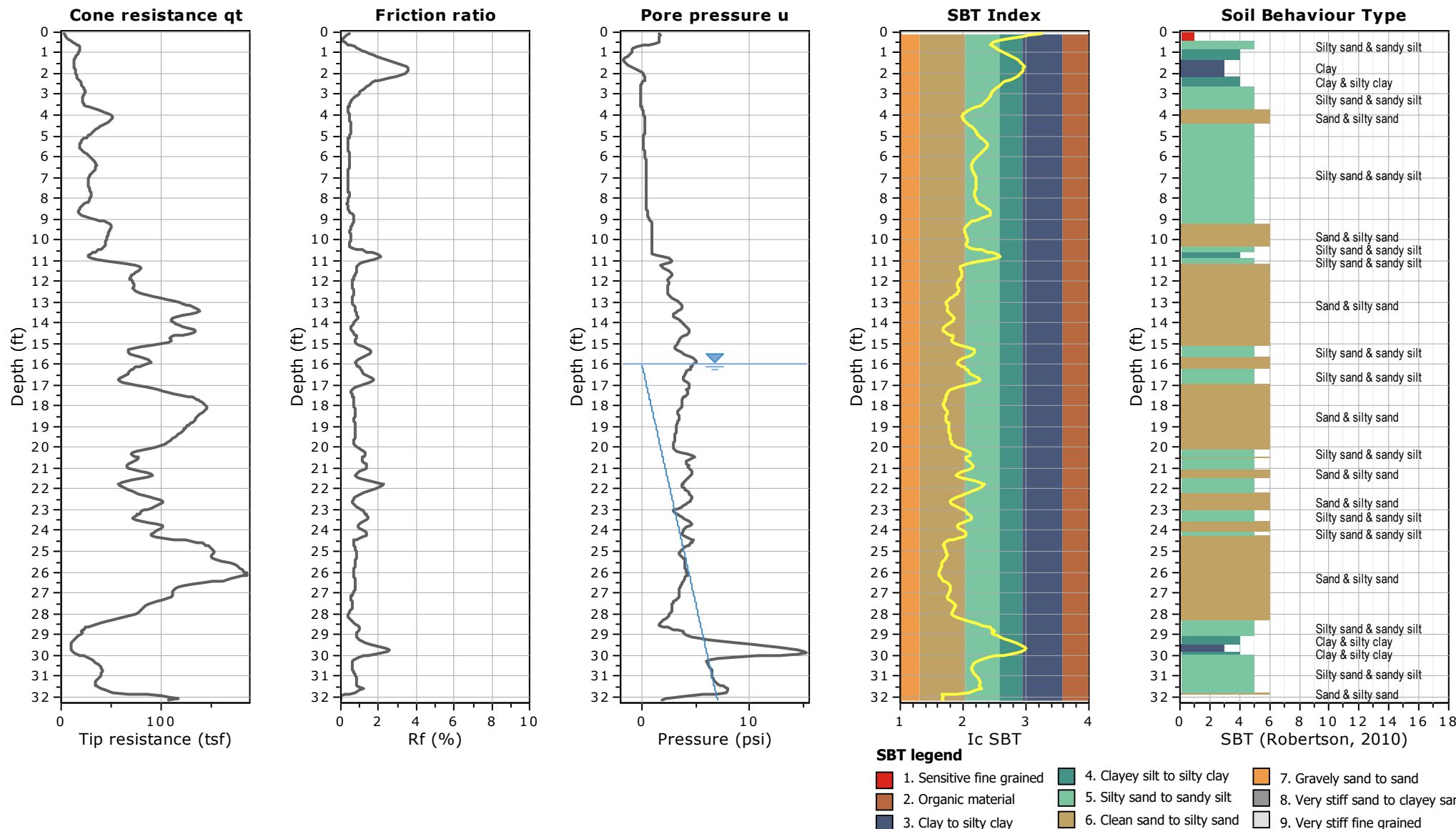
Surface Elevation: 47.00 ft

Cone Type: Vertek

Cone Operator: D. Hans

Project: New Intermediate School

Location: Smyrna, Delaware



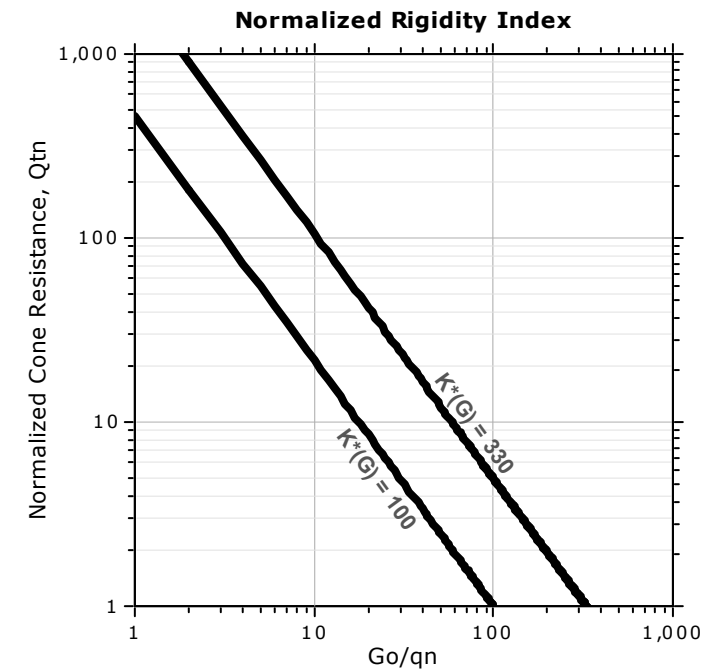
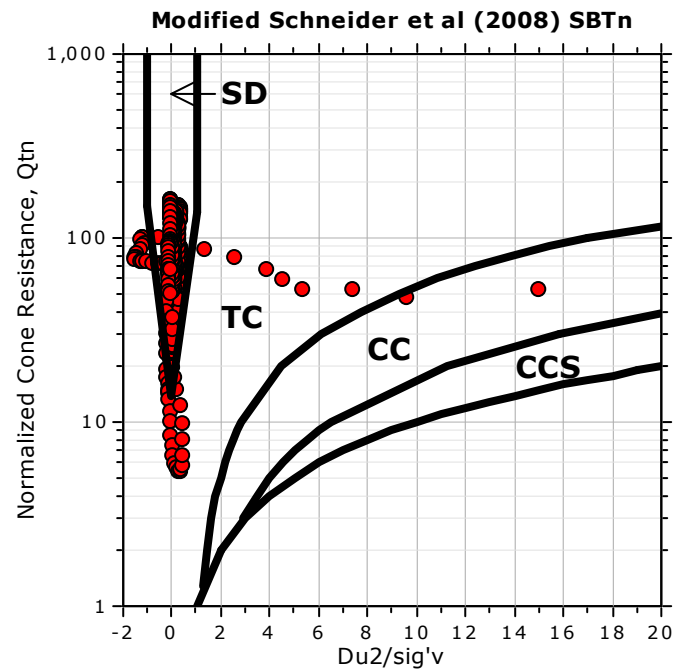
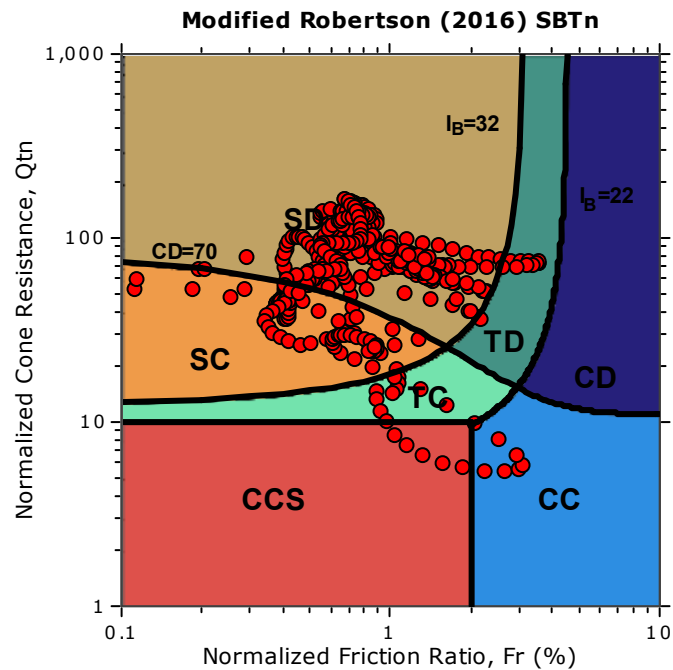


Project: New Intermediate School
Location: Smyrna, Delaware

CPT-06

Total depth: 32.16 ft, Date: 1/18/2023
Surface Elevation: 47.00 ft
Cone Type: Vertek
Cone Operator: D. Hans

Updated SBTn plots



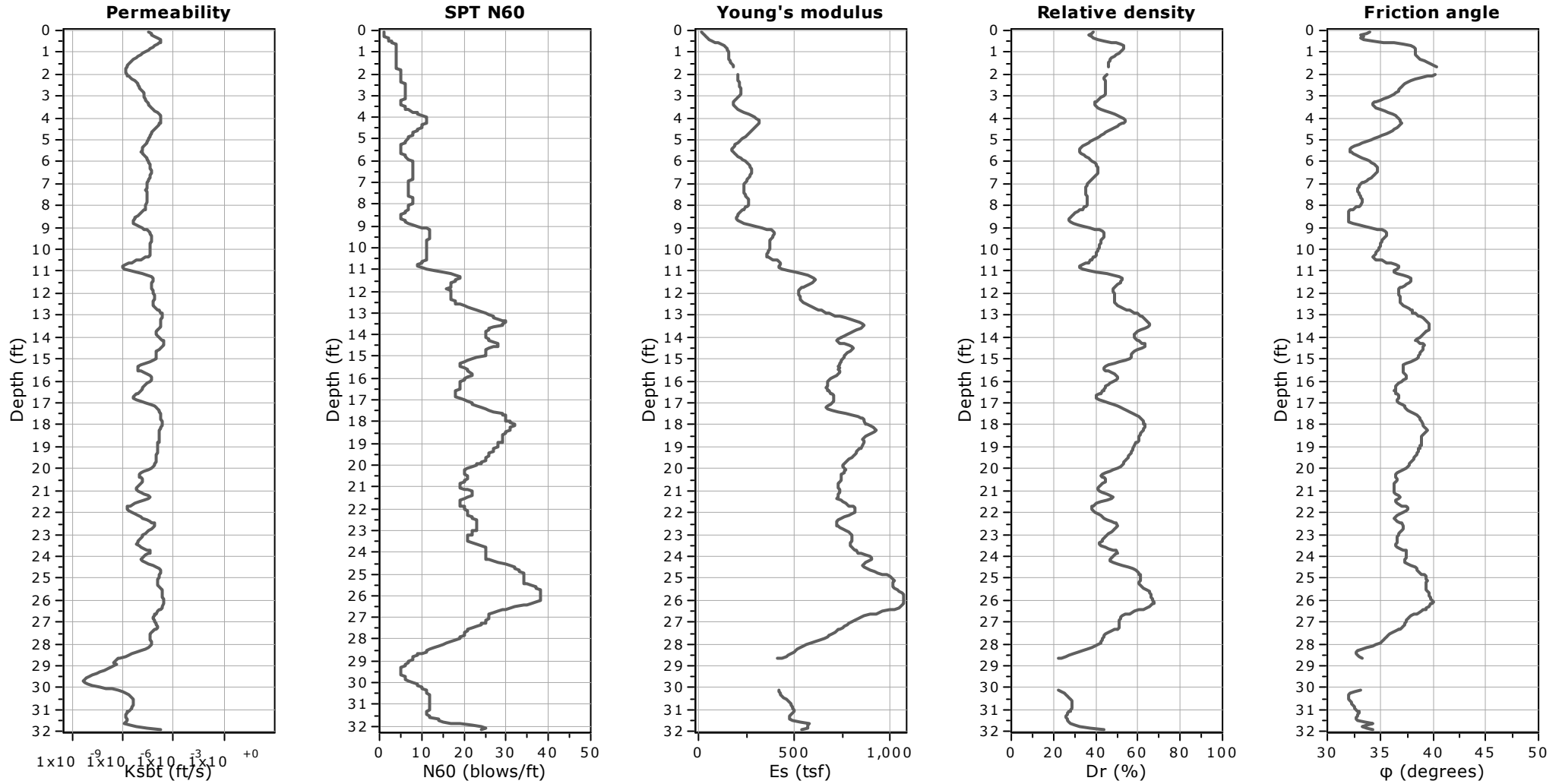
CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

$K^*(G) > 330$: Soils with significant microstructure
(e.g. age/cementation)



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

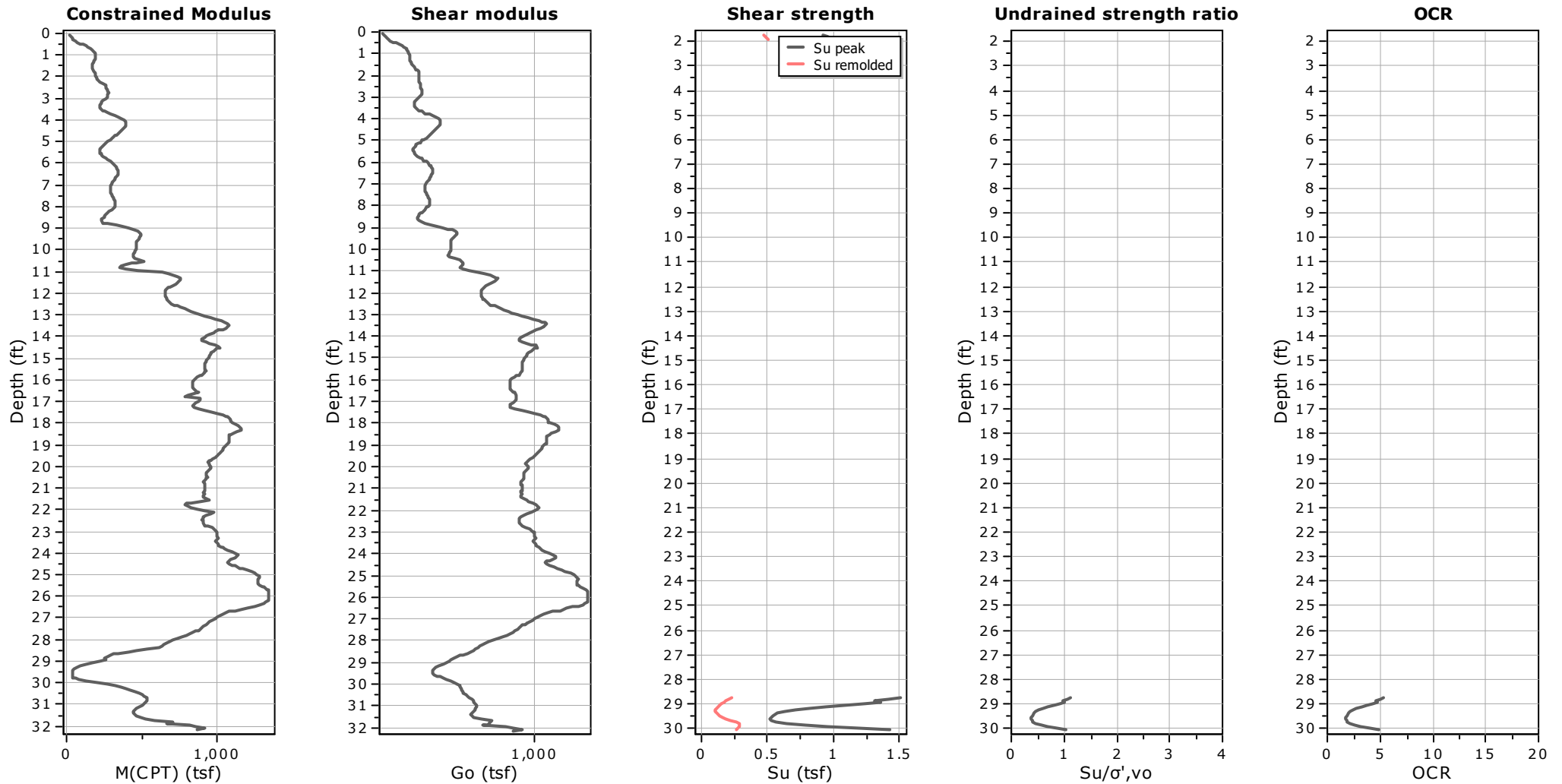
Relative density constant, C_{Dr} : 350.0

Phi: Based on Kulhawy & Mayne (1990)

● User defined estimation data



Project: New Intermediate School
Location: Smyrna, Delaware



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

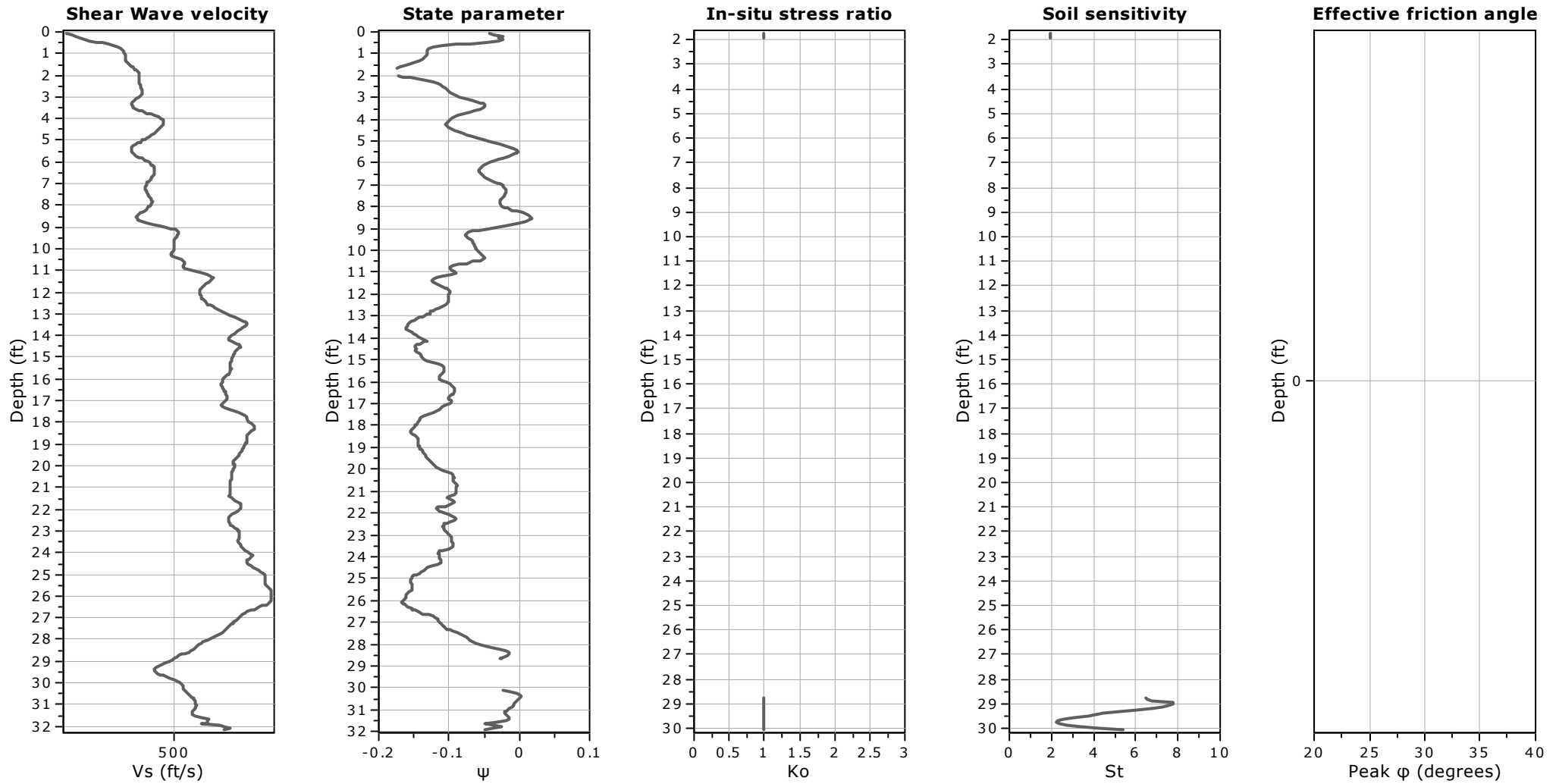
—●— User defined estimation data

—●— Flat Dilatometer Test data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

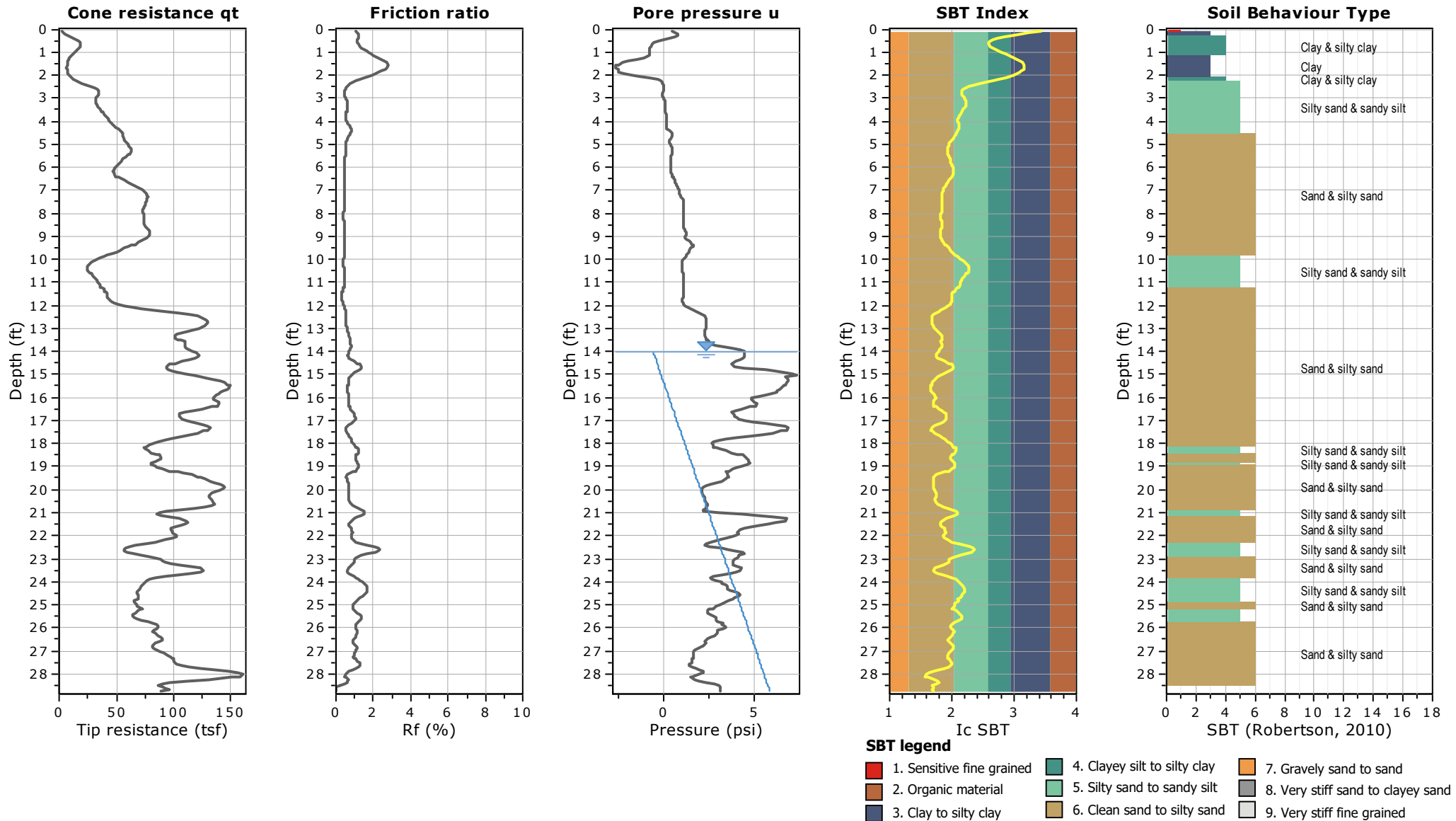
Soil Sensitivity factor, N_s : 7.00

—●— User defined estimation data



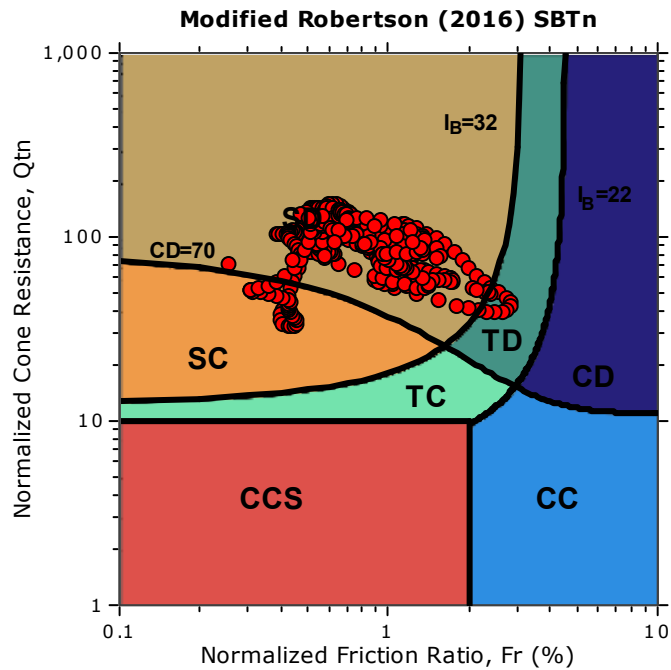
Project: New Intermediate School

Location: Smyrna, Delaware

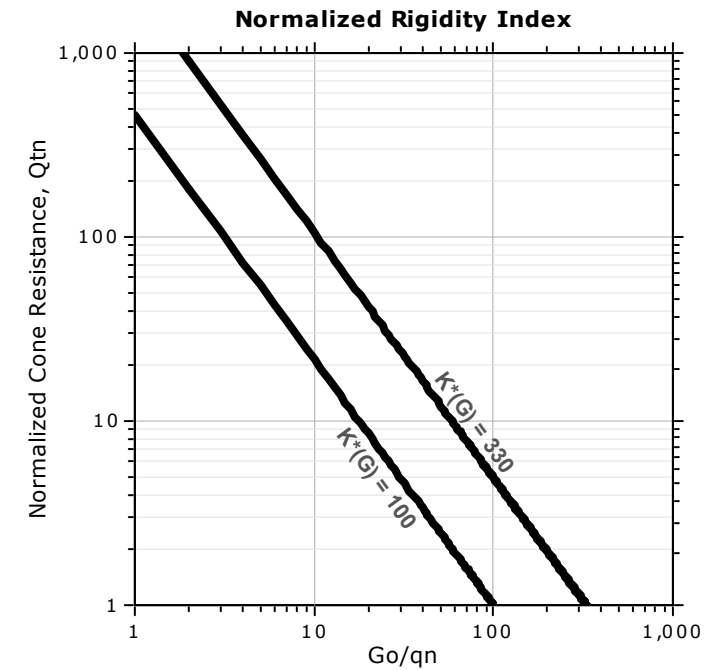
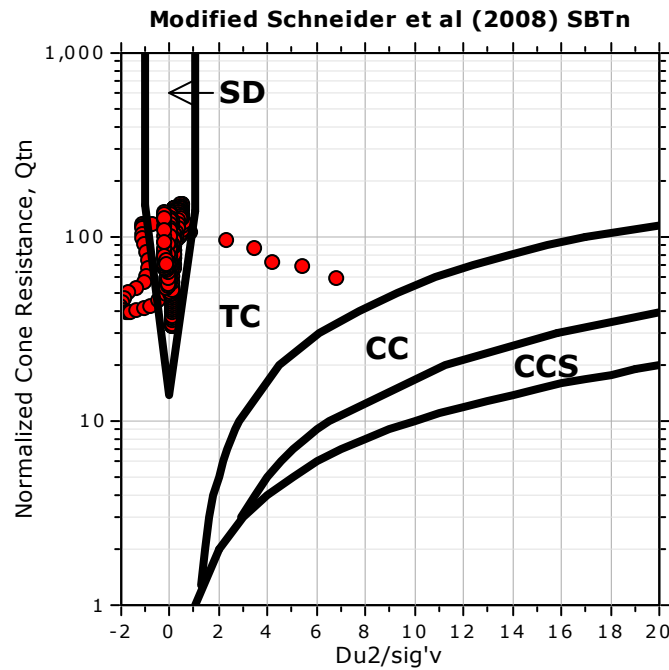




Updated SBTn plots



CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

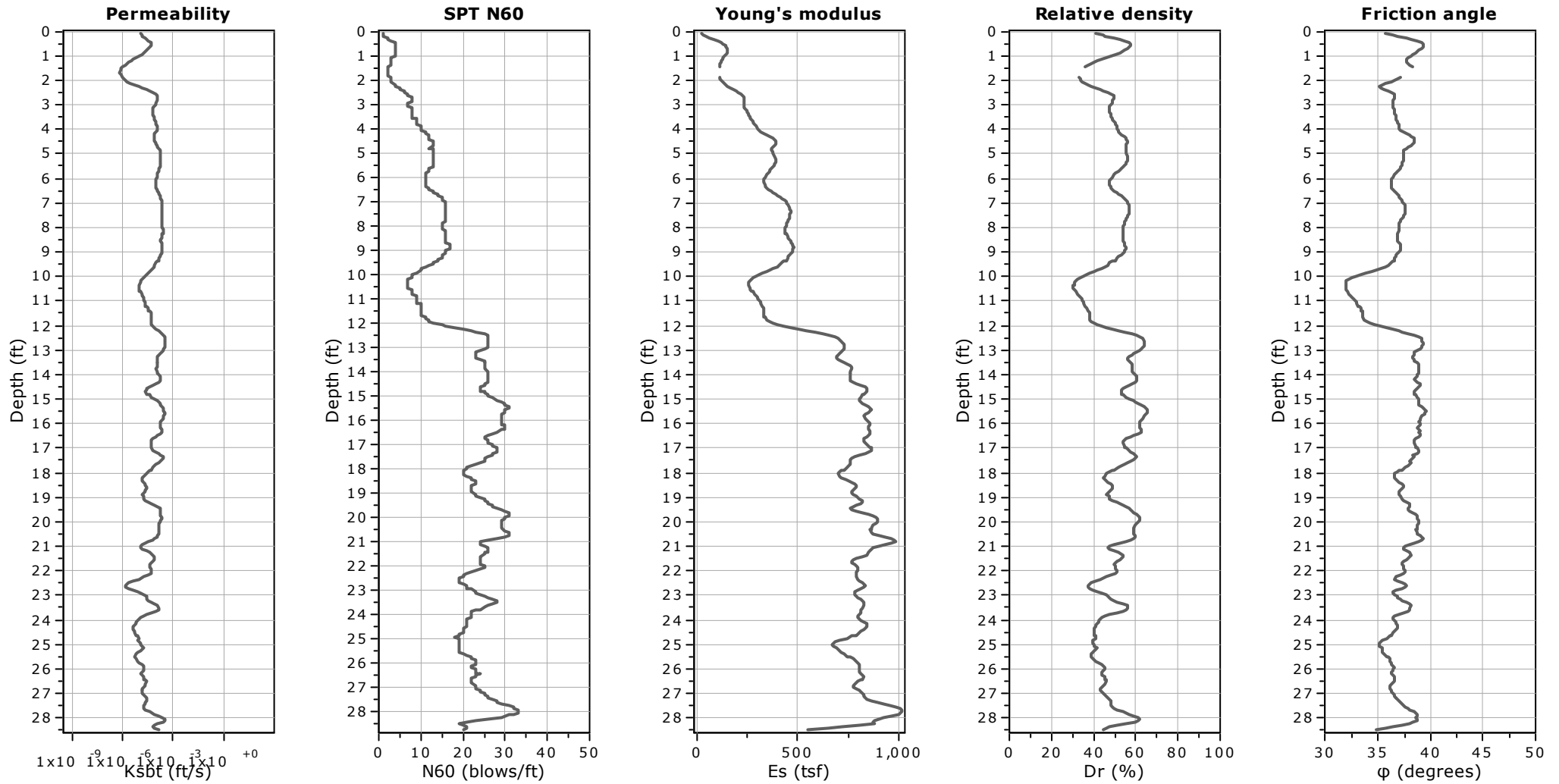


$K(G) > 330$: Soils with significant microstructure
(e.g. age/cementation)



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr} : 350.0

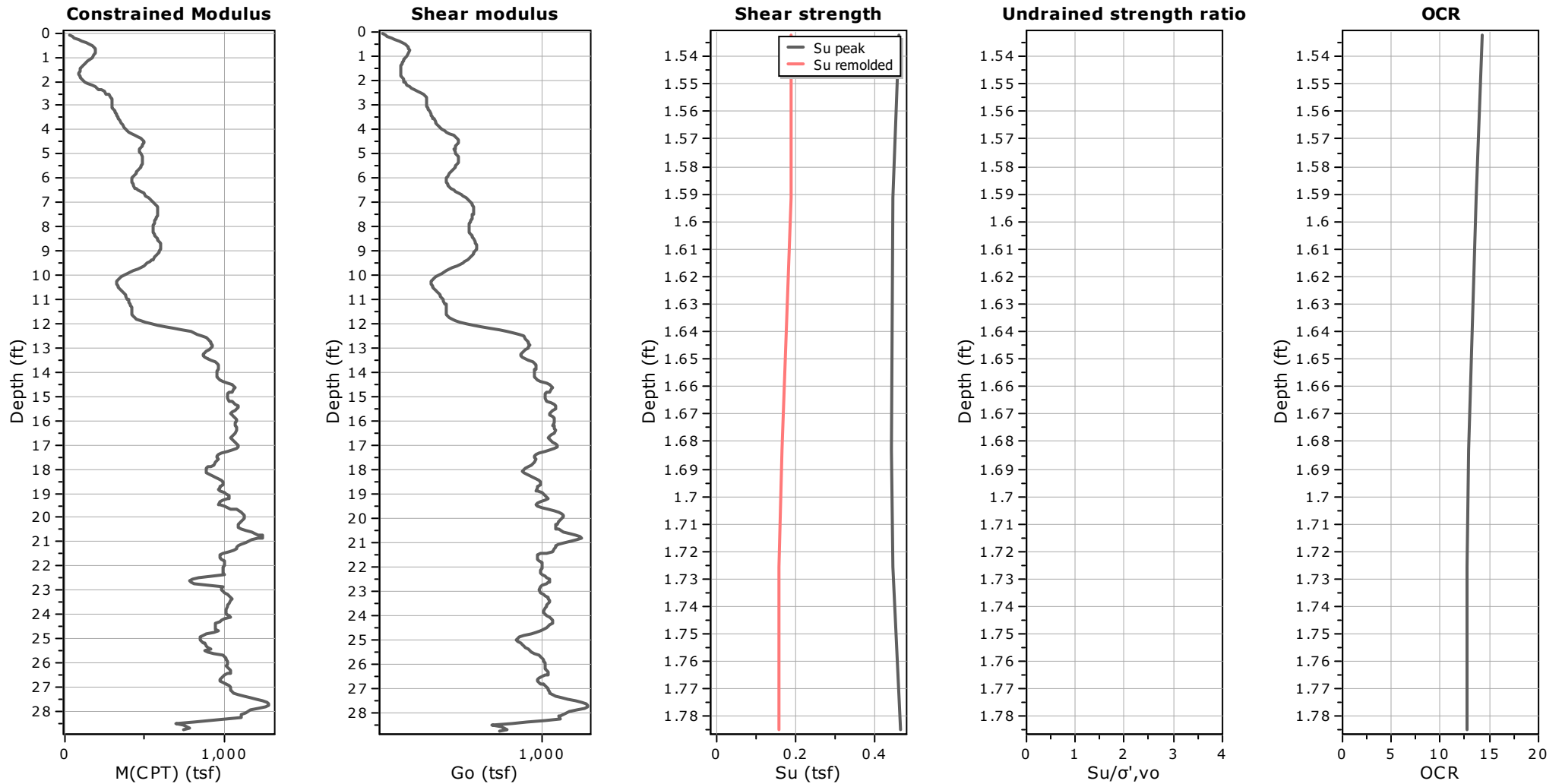
Phi: Based on Kulhawy & Mayne (1990)

● User defined estimation data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

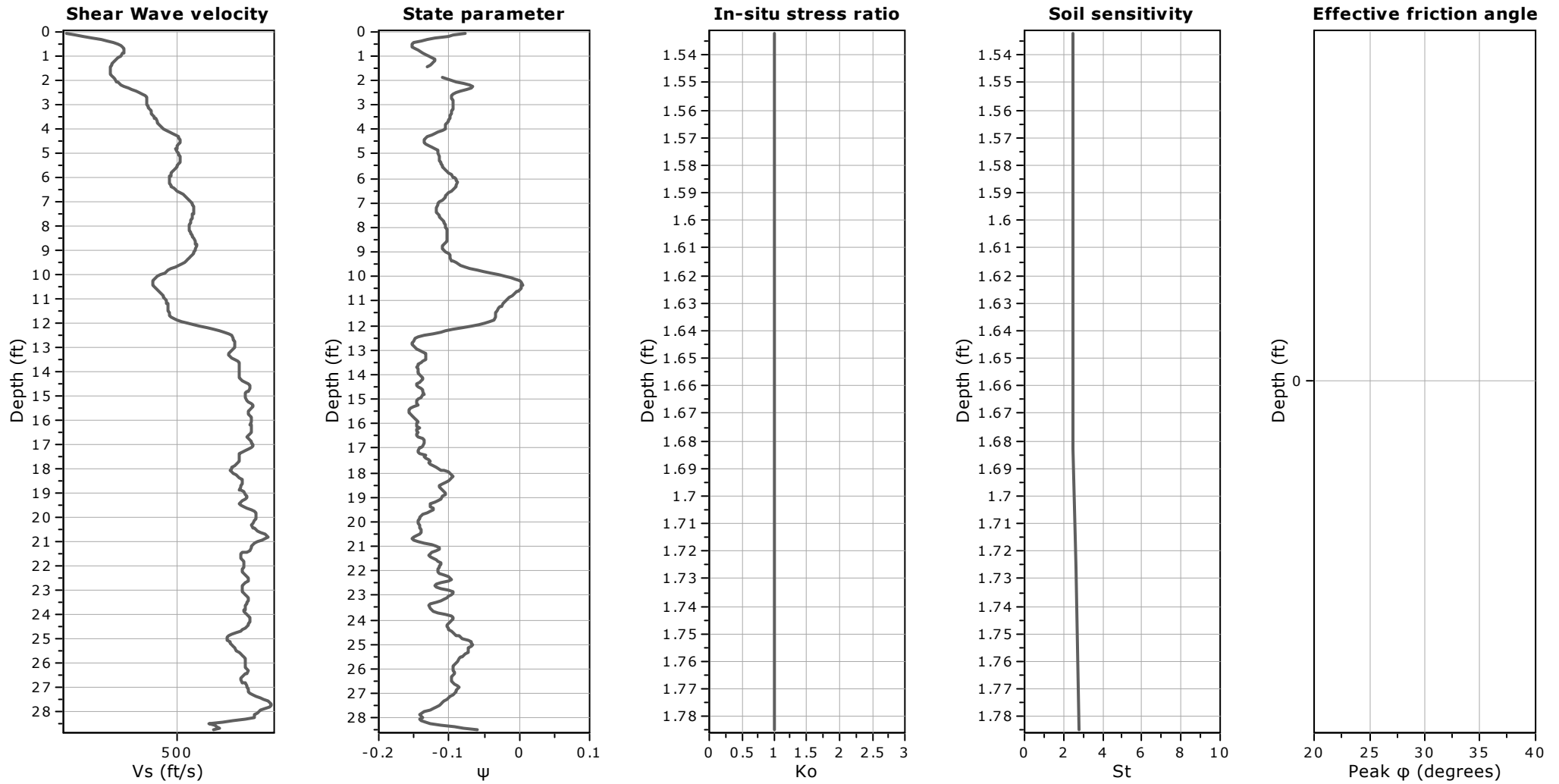
—●— User defined estimation data

—●— Flat Dilatometer Test data



Project: New Intermediate School

Location: Smyrna, Delaware



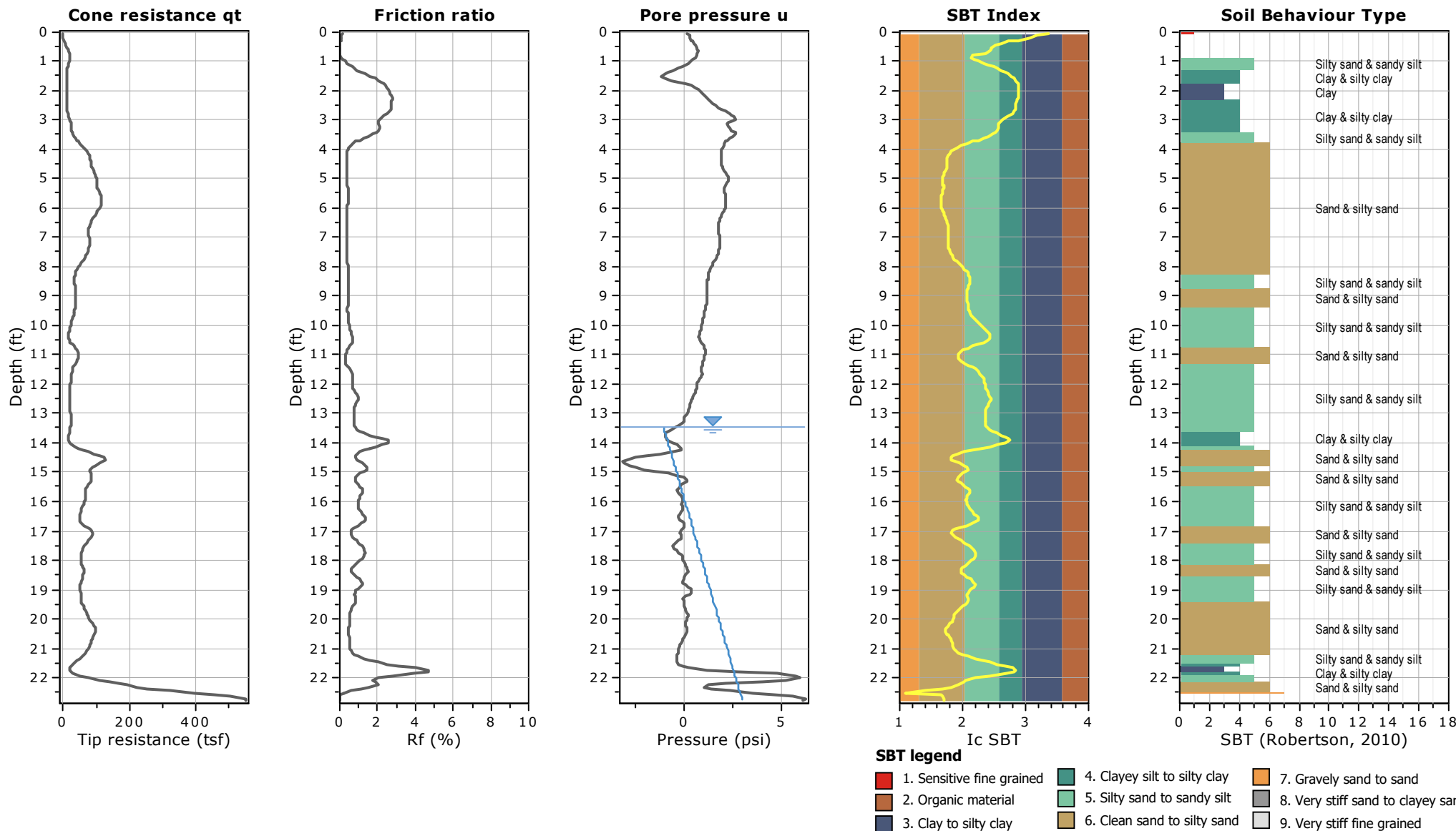
Calculation parameters

Soil Sensitivity factor, N_s : 7.00

—●— User defined estimation data

Project: New Intermediate School

Location: Smyrna, Delaware



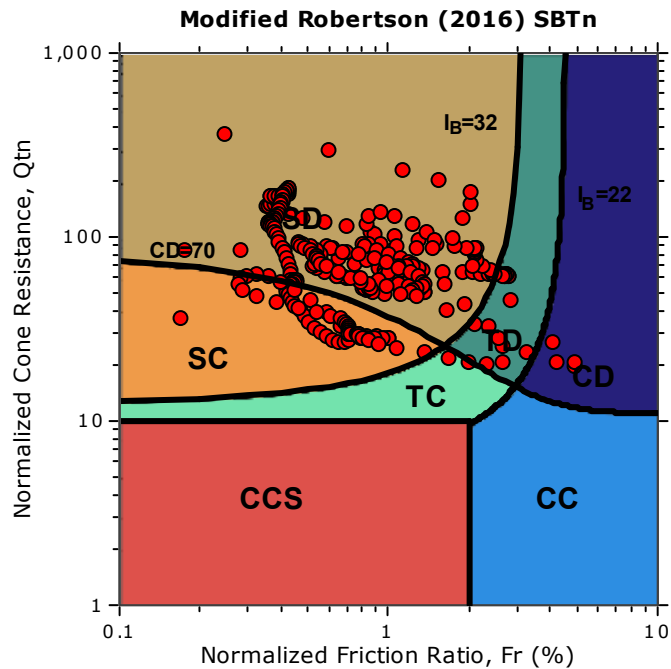


Project: New Intermediate School
Location: Smyrna, Delaware

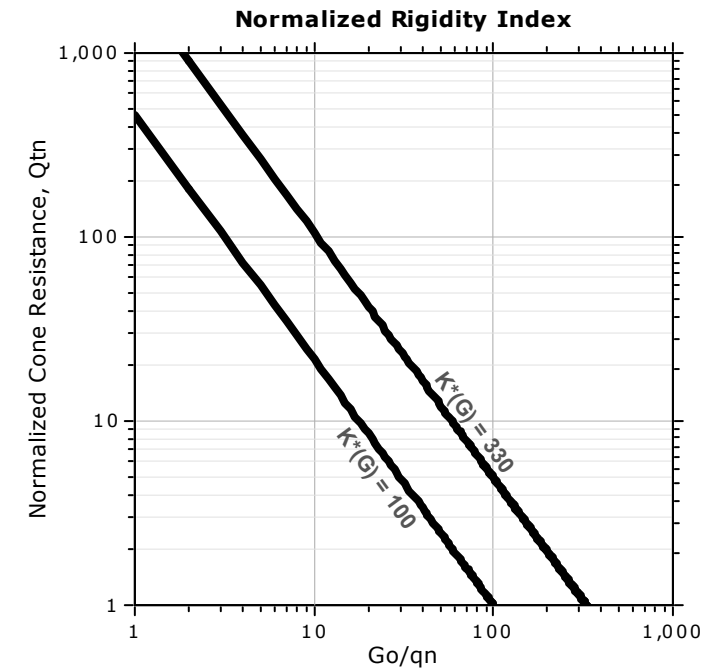
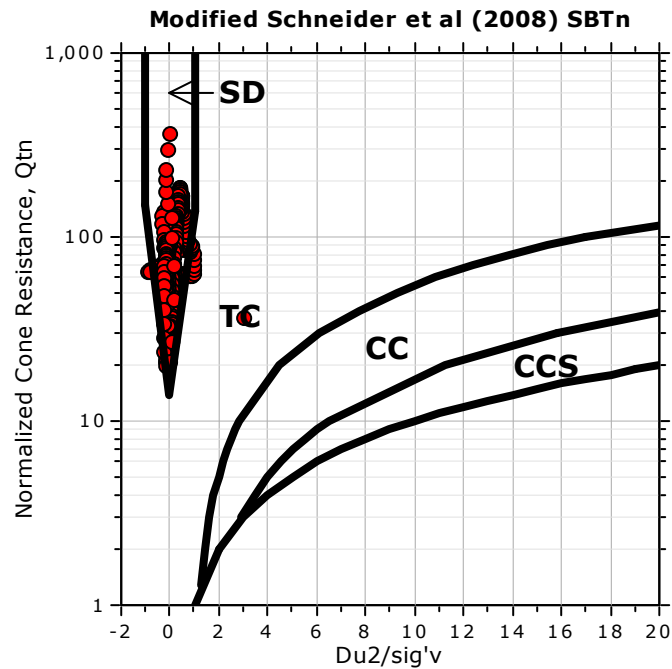
CPT-08

Total depth: 22.77 ft, Date: 1/18/2023
Surface Elevation: 46.00 ft
Cone Type: Vertek
Cone Operator: D. Hans

Updated SBTn plots



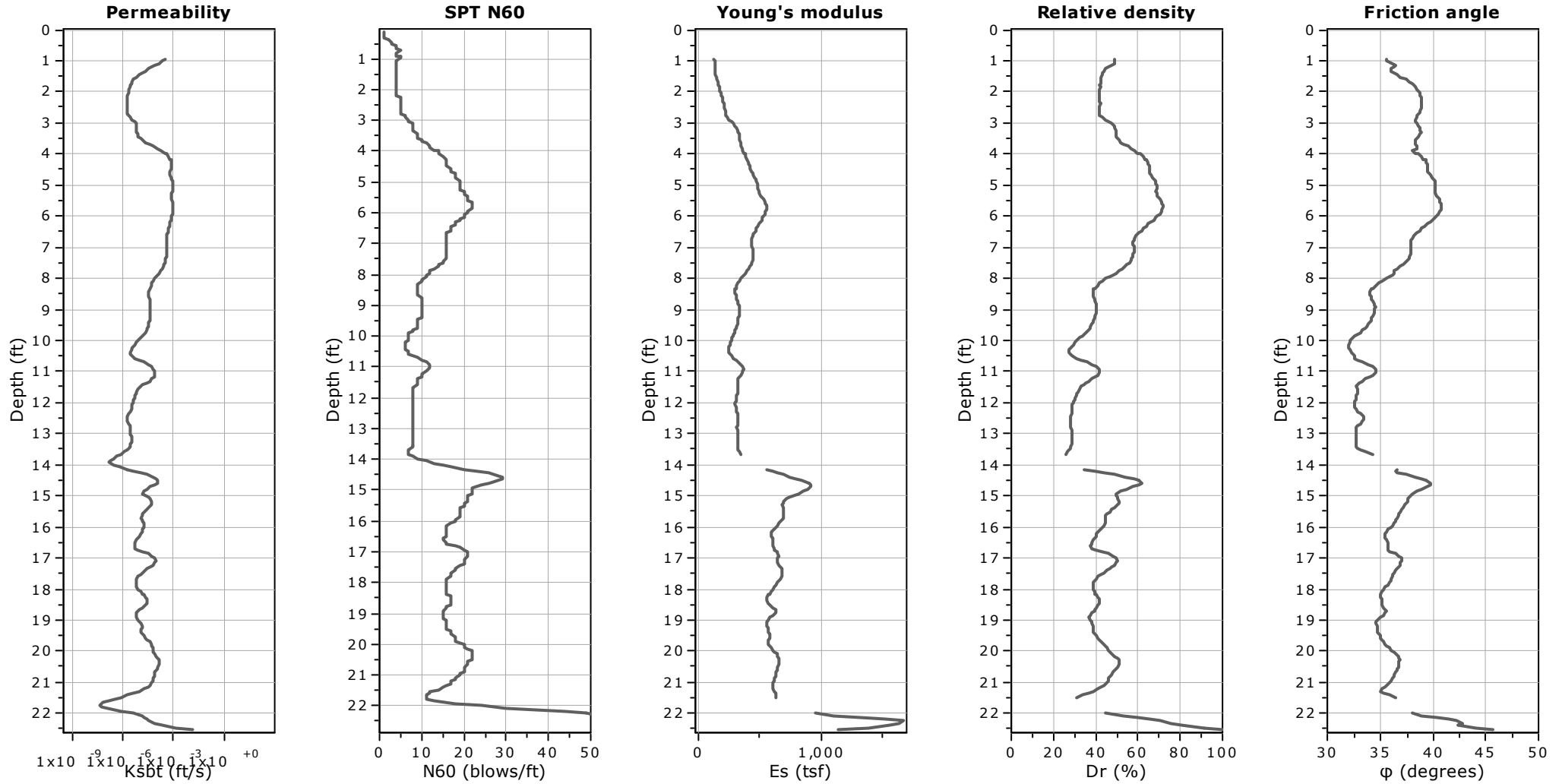
CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative



$K(G) > 330$: Soils with significant microstructure
(e.g. age/cementation)



Project: New Intermediate School
Location: Smyrna, Delaware



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

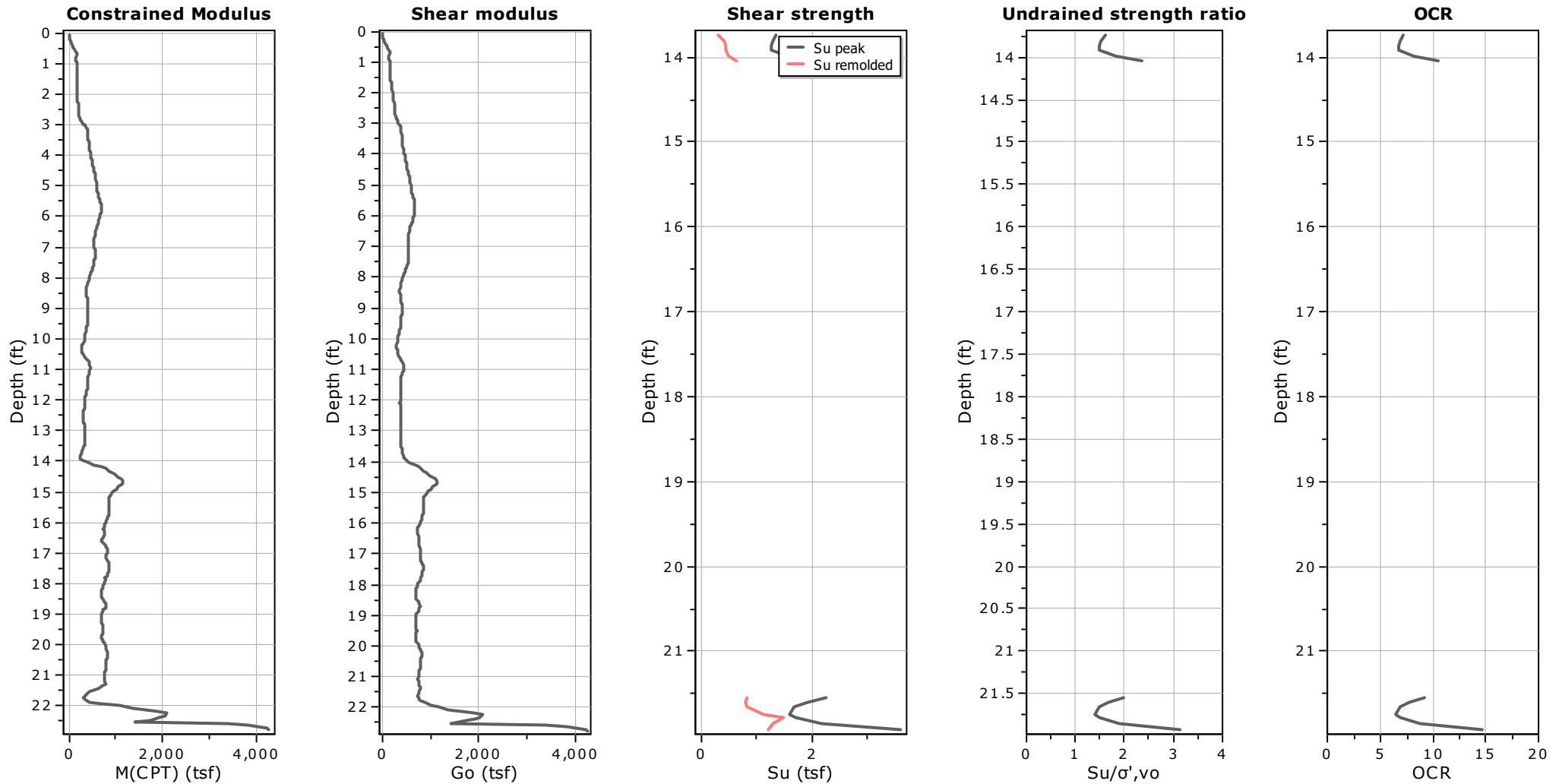
Relative density constant, C_{Dr} : 350.0

Phi: Based on Kulhawy & Mayne (1990)

● User defined estimation data



Project: New Intermediate School
Location: Smyrna, Delaware



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

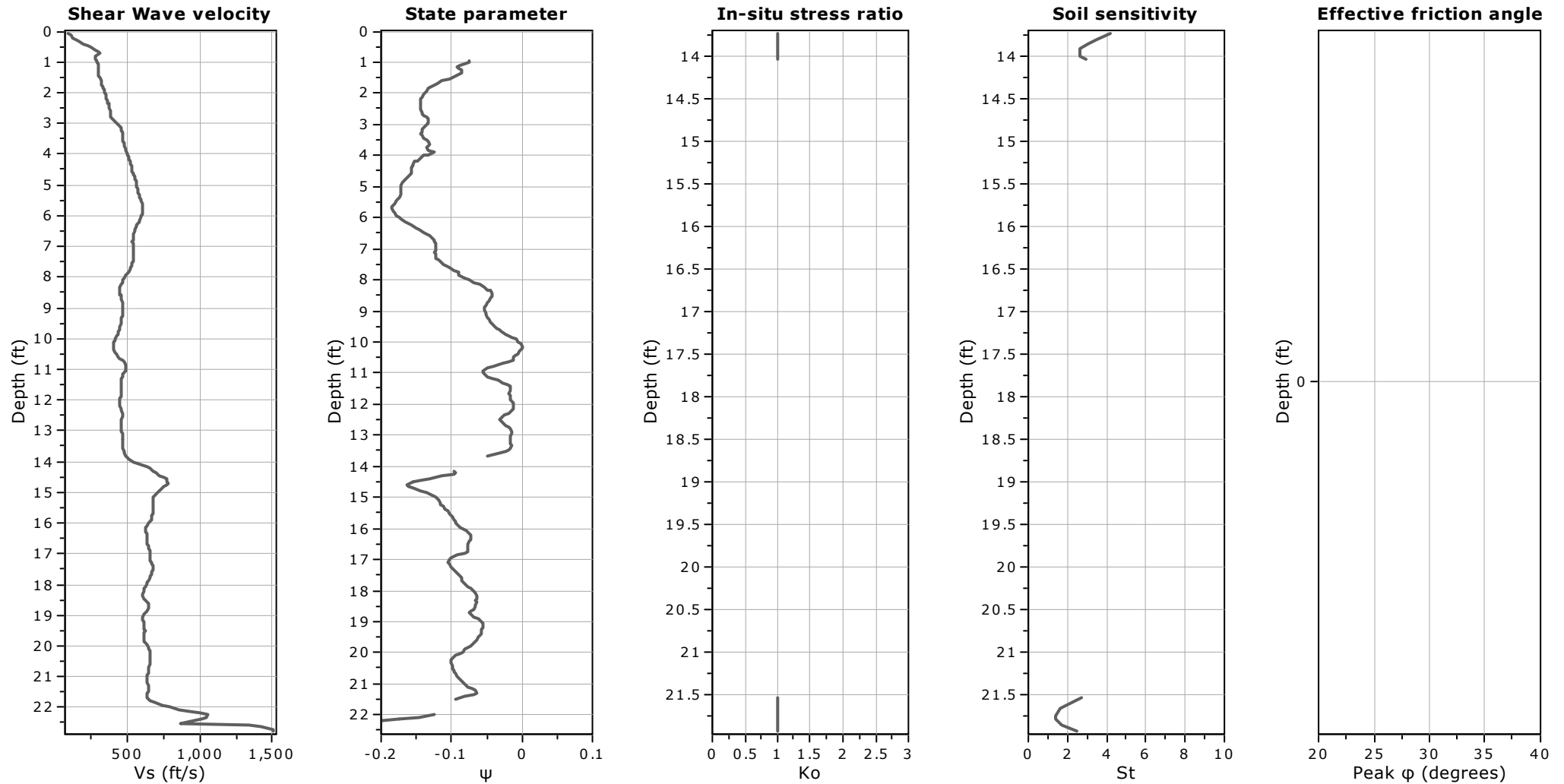
—●— User defined estimation data

—●— Flat Dilatometer Test data



Project: New Intermediate School

Location: Smyrna, Delaware



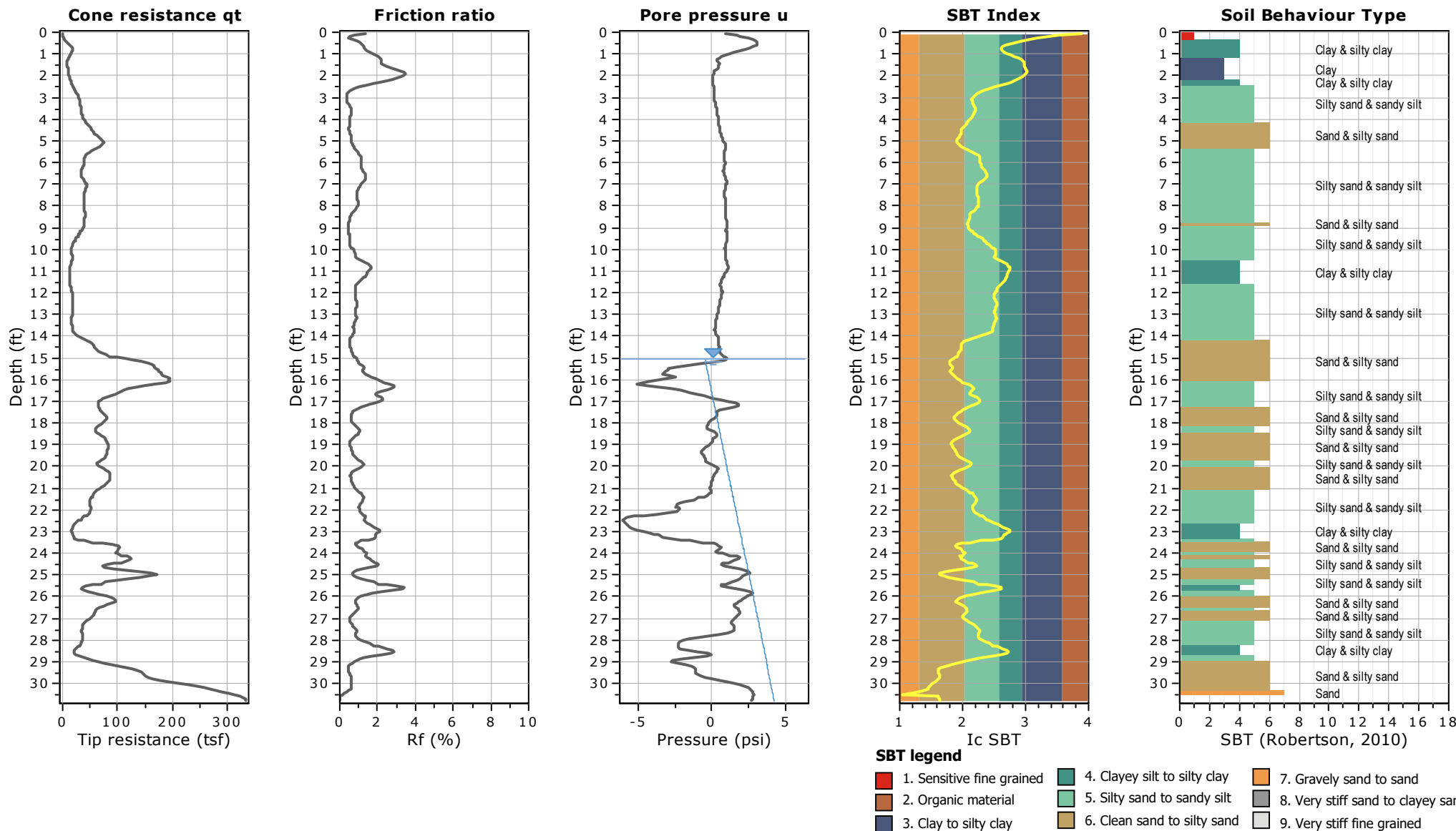
Calculation parameters

Soil Sensitivity factor, N_s : 7.00

—●— User defined estimation data

Project: New Intermediate School

Location: Smyrna, Delaware



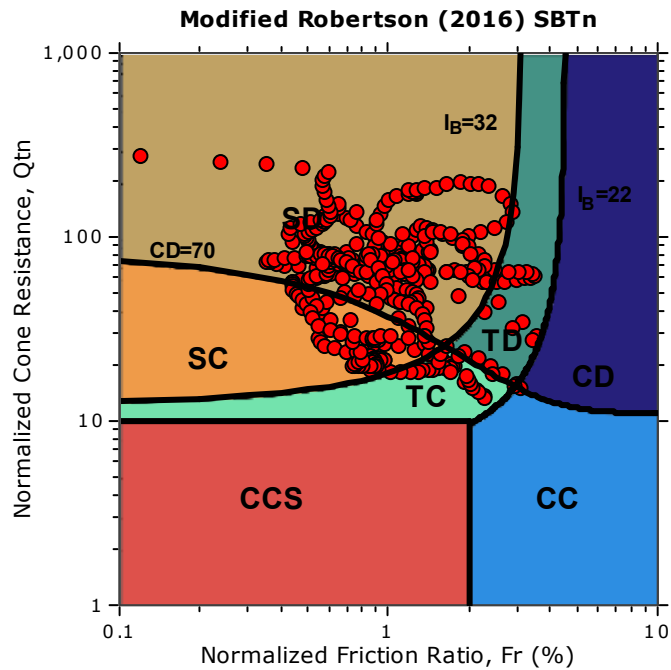


Project: New Intermediate School
Location: Smyrna, Delaware

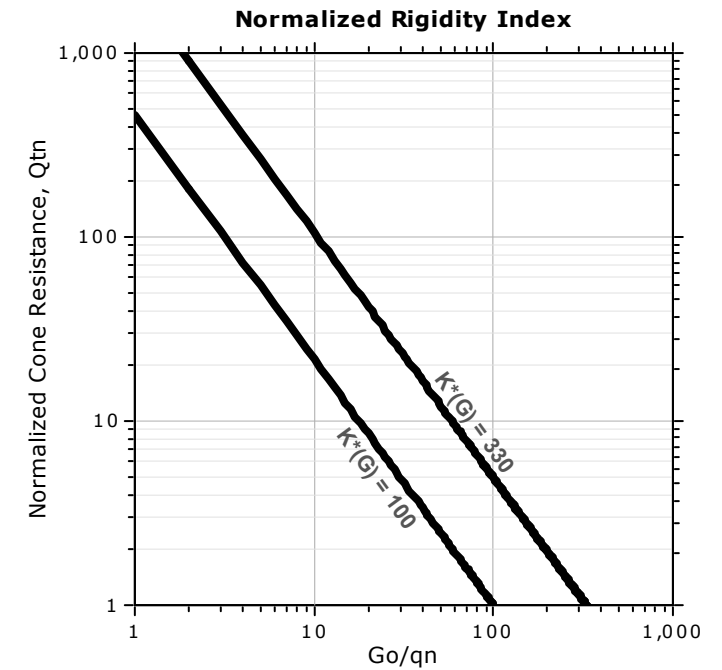
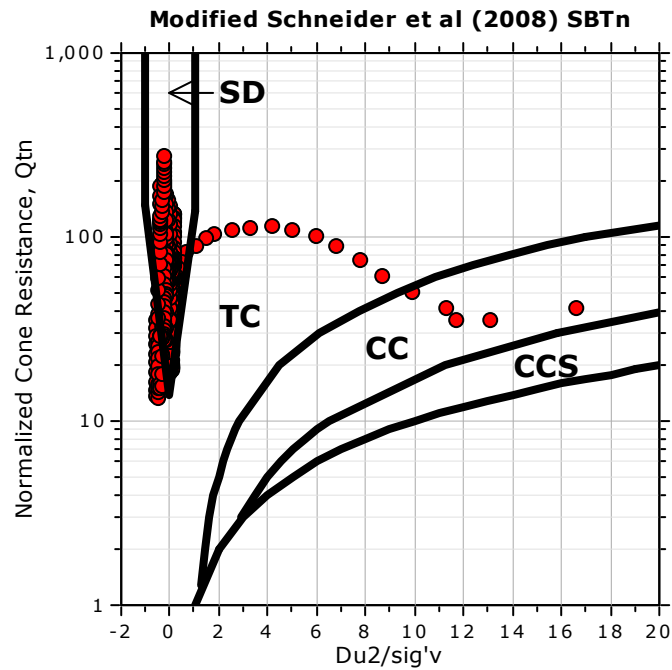
CPT-09

Total depth: 30.79 ft, Date: 1/18/2023
Surface Elevation: 45.50 ft
Cone Type: Vertek
Cone Operator: D. Hans

Updated SBTn plots



CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

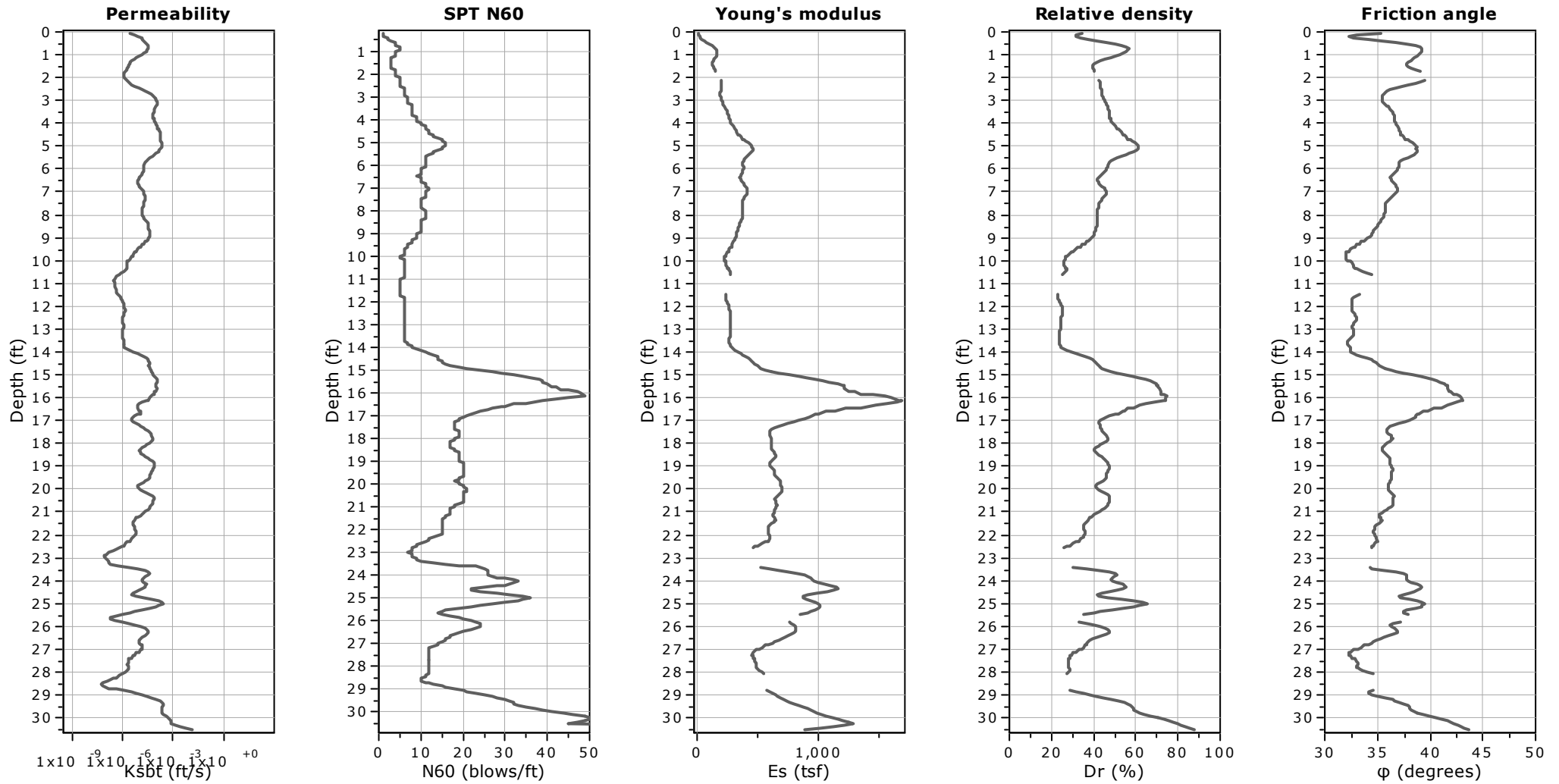


$K(G) > 330$: Soils with significant microstructure
(e.g. age/cementation)



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr} : 350.0

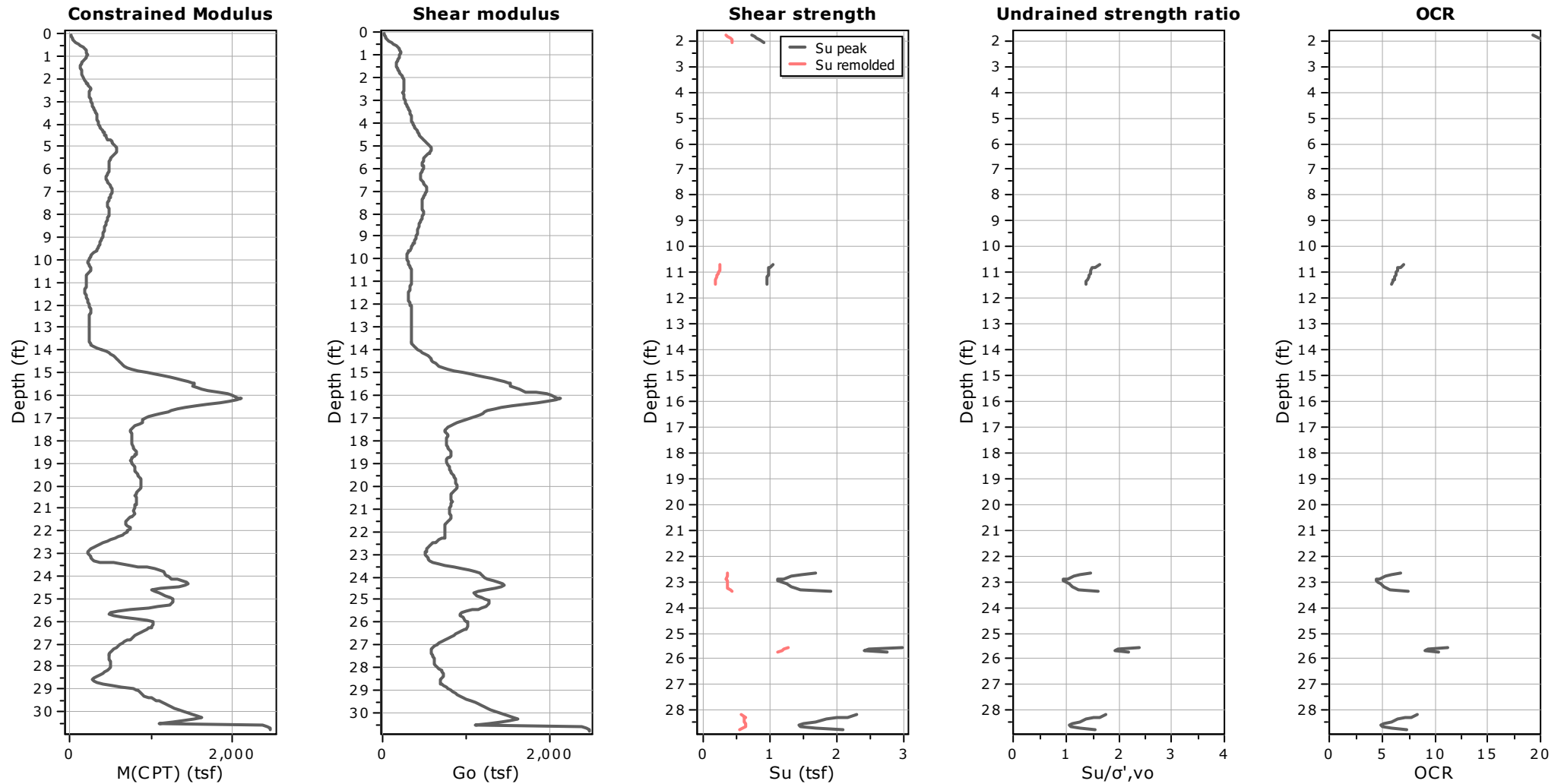
Phi: Based on Kulhawy & Mayne (1990)

—●— User defined estimation data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

OCR factor for clays, N_{kt} : 0.33

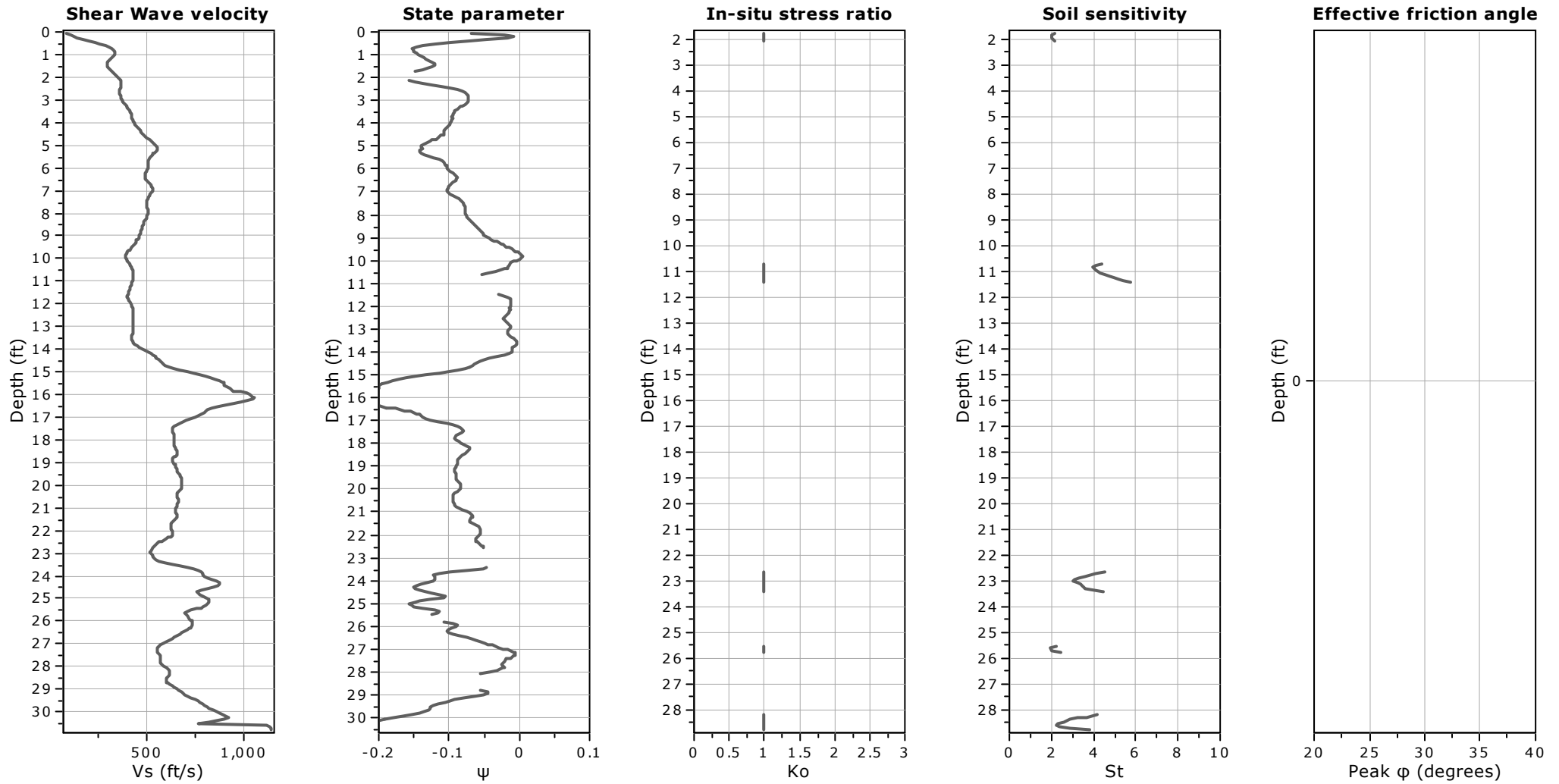
● User defined estimation data

● Flat Dilatometer Test data



Project: New Intermediate School

Location: Smyrna, Delaware



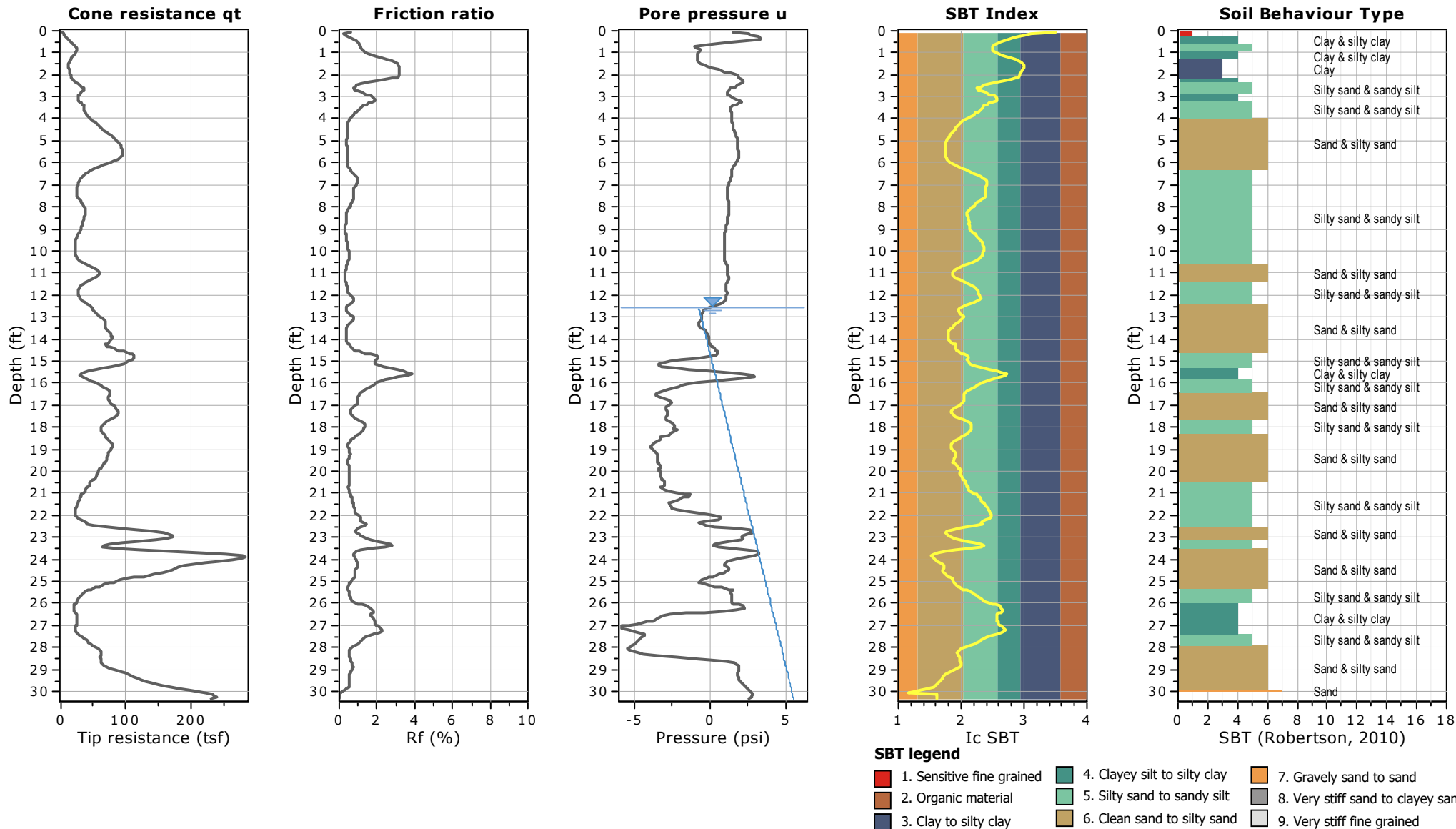
Calculation parameters

Soil Sensitivity factor, N_s : 7.00

—●— User defined estimation data

Project: New Intermediate School

Location: Smyrna, Delaware

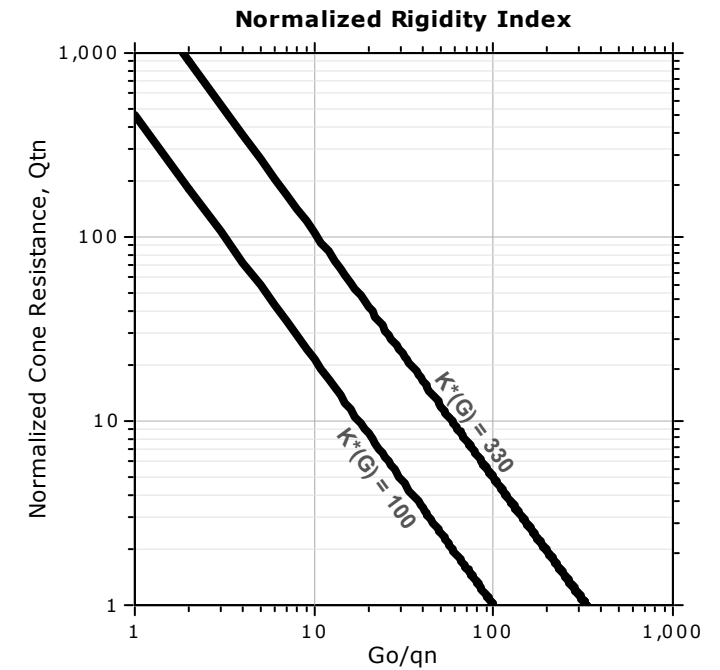
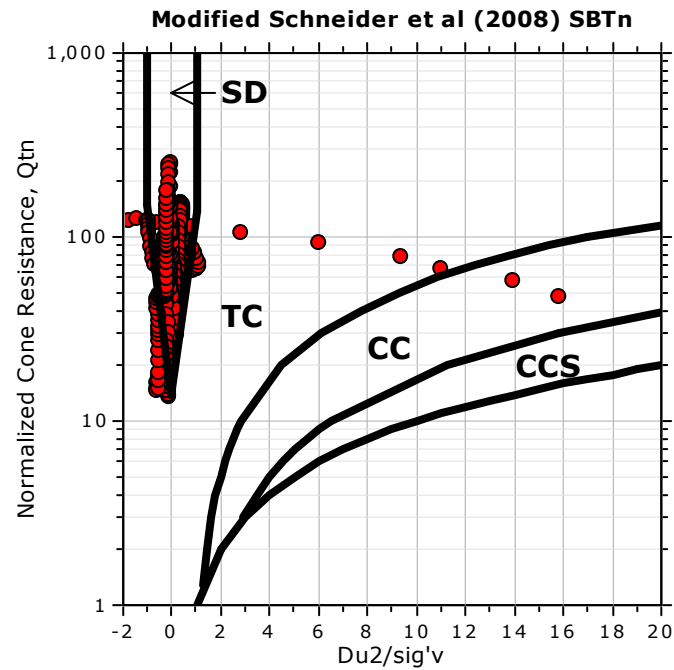
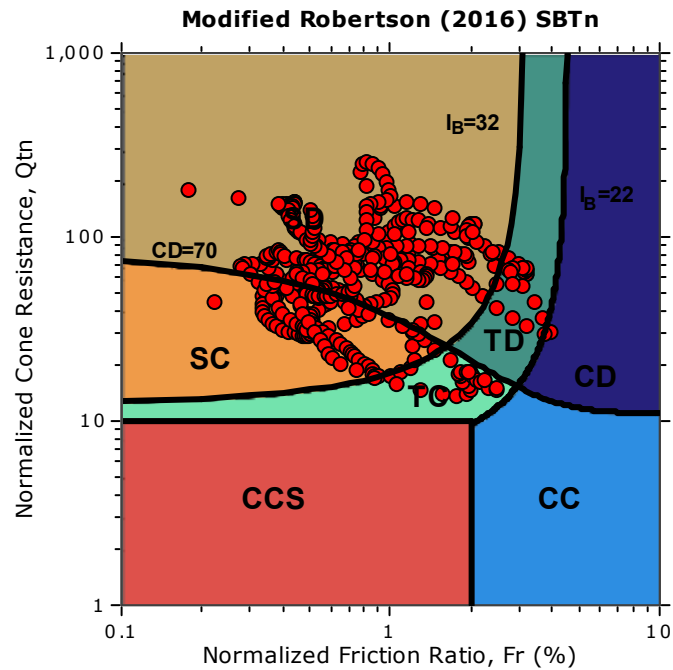




Project: New Intermediate School

Location: Smyrna, Delaware

Updated SBTn plots

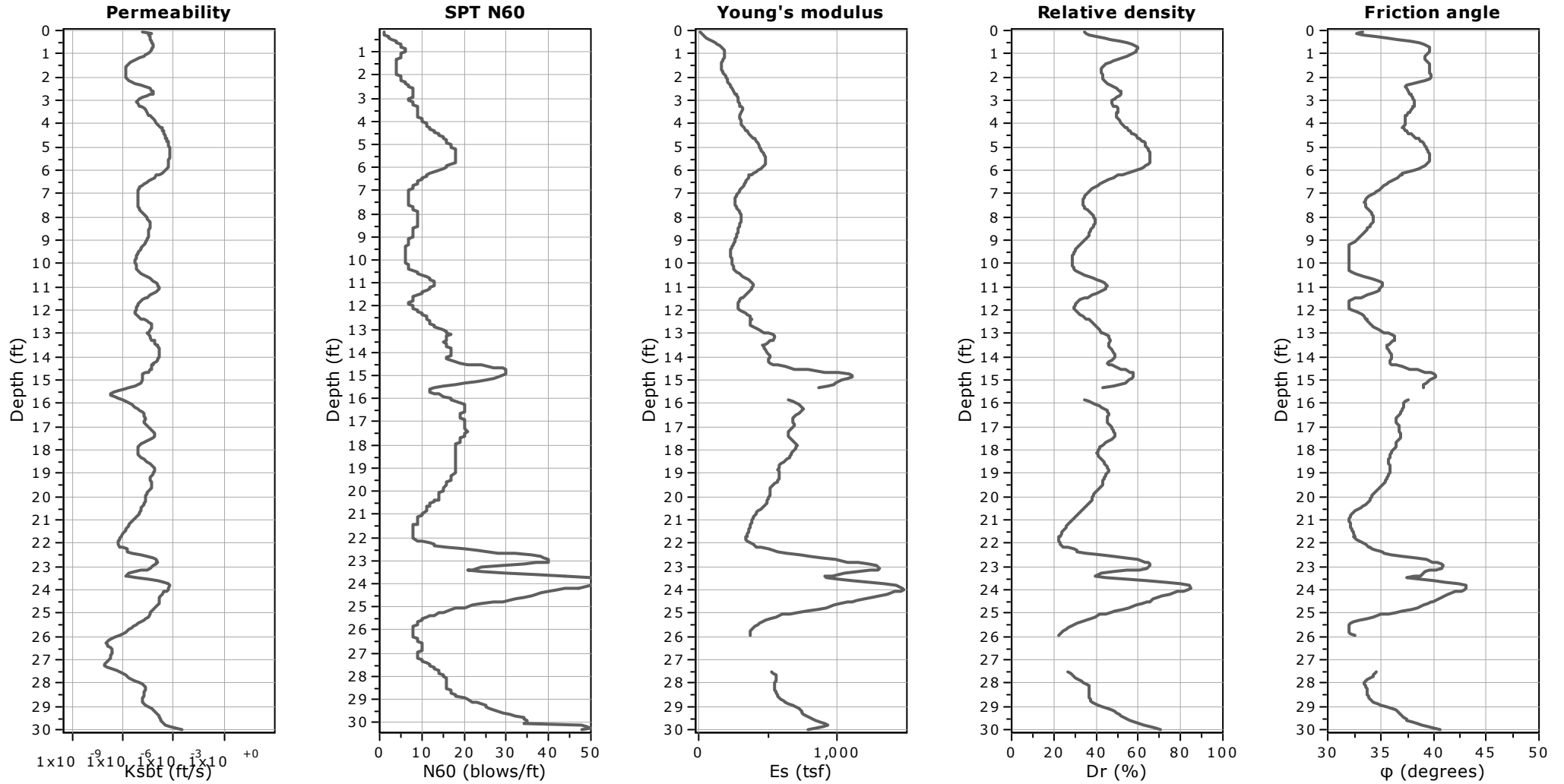


CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

$K^*(G) > 330$: Soils with significant microstructure
(e.g. age/cementation)



Project: New Intermediate School
Location: Smyrna, Delaware



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60} : Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr} : 350.0

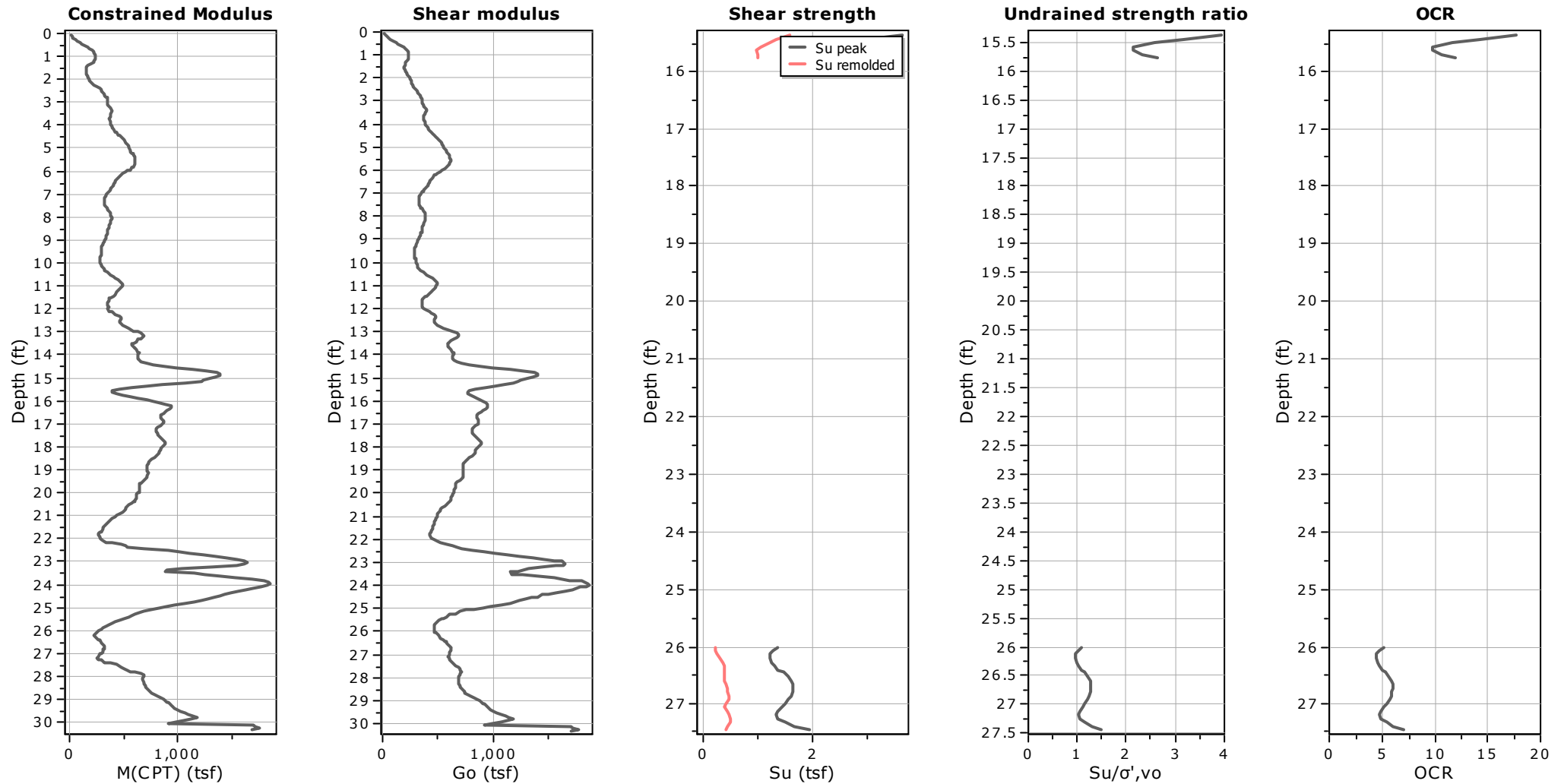
Phi: Based on Kulhawy & Mayne (1990)

● User defined estimation data



Project: New Intermediate School

Location: Smyrna, Delaware



Calculation parameters

Constrained modulus: Based on variable α using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable α using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt} : 14

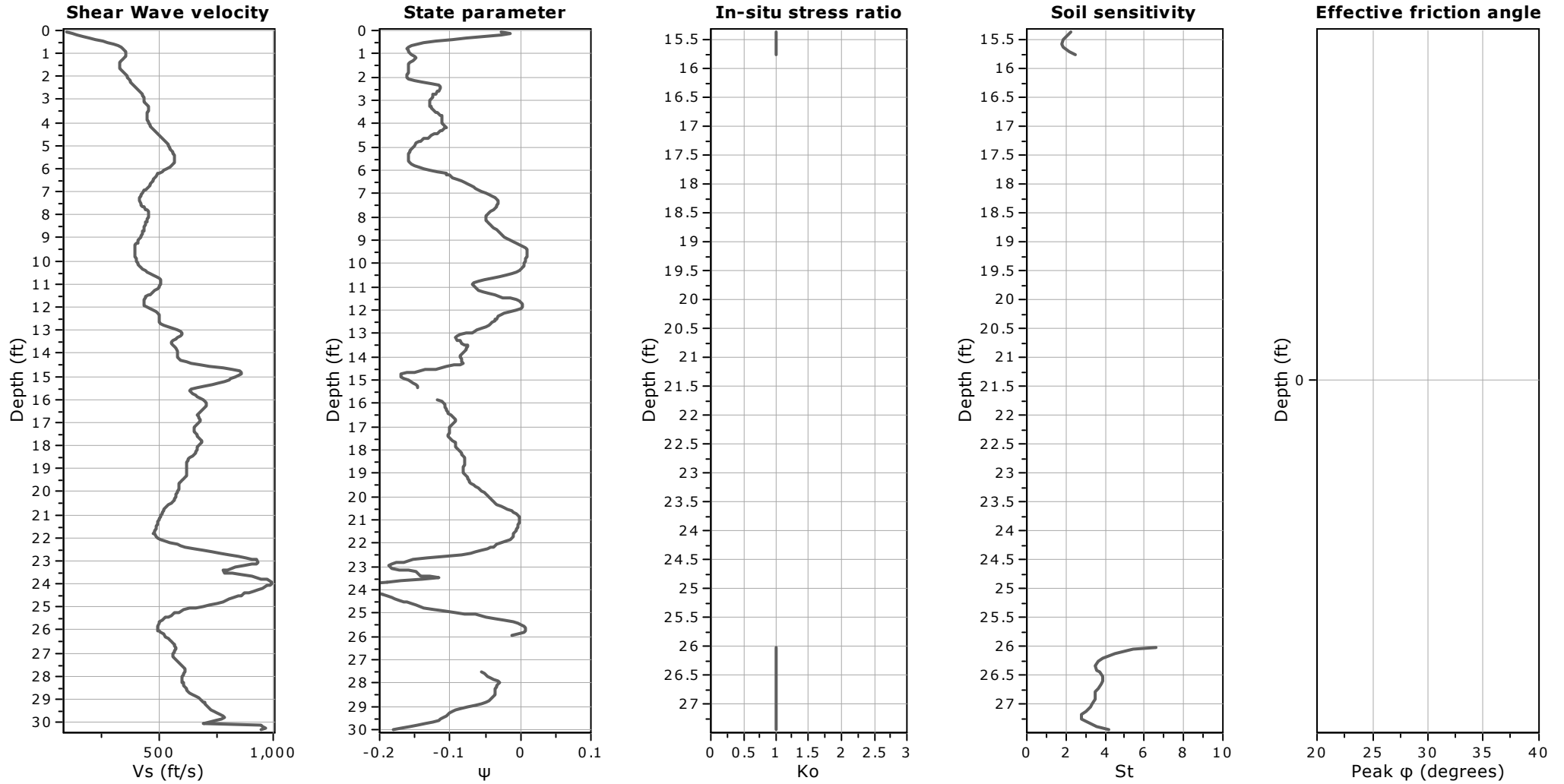
OCR factor for clays, N_{kt} : 0.33

—●— User defined estimation data

—●— Flat Dilatometer Test data



Project: New Intermediate School
Location: Smyrna, Delaware



Calculation parameters

Soil Sensitivity factor, N_s : 7.00

—●— User defined estimation data

LOG OF TEST PIT NO. TP-1

Sheet 1 of 1

PROJECT: **Smyrna New Intermediate Elementary School**
 PROJECT LOCATION: **Kent County, Delaware**
 CLIENT: **Fearn-Clendaniel Architects, Inc.**

PROJECT NO.: **230120**

DATE STARTED: **1/10/23**
 DATE COMPLETED: **1/10/23**
 CONTRACTOR: **Cavan Construction**
 EQUIPMENT: **John Deere Extendahoe 310SL HL**

GROUNDWATER ENCOUNTERED: **Dry**
 GROUND SURFACE ELEVATION: **49**
 DATUM: **Topo**
 LOGGED BY: **M.DiBartolomeo**
 CHECKED BY: **M.McDonough**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
				DESCRIPTION	REMARKS
	0			Topsoil +/- 9 Inches	
48.2		CL		Brown, moist, Lean CLAY with sand, contains gravel	
46.7		SC		Orange-brown, moist, Clayey SAND, contains gravel	
3					
44.0		SM		Tan and orange, moist, Silty SAND, contains gravel	
6					
9					
38.5				Test pit terminated at 10.5 feet.	
12					
15					
18					

NOTES: **Elevation and location should be considered approximate.**



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LOG OF TEST PIT NO. TP-1

Sheet 1 of 1

LOG OF TEST PIT NO. TP-1A

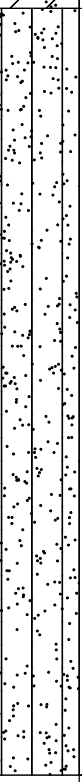
Sheet 1 of 1

PROJECT: **Smyrna New Intermediate Elementary School**
 PROJECT LOCATION: **Kent County, Delaware**
 CLIENT: **Fearn-Clendaniel Architects, Inc.**

PROJECT NO.: **230120**

DATE STARTED: **1/10/23**
 DATE COMPLETED: **1/10/23**
 CONTRACTOR: **Cavan Construction**
 EQUIPMENT: **John Deere Extendahoe 310SL HL**

GROUNDWATER ENCOUNTERED: **15.5**
 GROUND SURFACE ELEVATION: **49**
 DATUM: **Topo**
 LOGGED BY: **M.DiBartolomeo**
 CHECKED BY: **M.McDonough**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 12 Inches	
48.0		CL		Brown, moist, Sandy Lean CLAY	
47.0		SC		Brown, moist, Clayey SAND	
3					
45.0		SM		Gray and orange, moist, Silty SAND, contains gravel	
6					
9					
12				Same, orange	
15					
33.0				Test pit terminated at 16.0 feet. Groundwater encountered at 15.5 feet.	
18					

NOTES: **Elevation and location should be considered approximate.**



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LOG OF TEST PIT NO. TP-1A

Sheet 1 of 1

LOG OF TEST PIT NO. TP-2

Sheet 1 of 1

PROJECT: **Smyrna New Intermediate Elementary School**
 PROJECT LOCATION: **Kent County, Delaware**
 CLIENT: **Fearn-Clendaniel Architects, Inc.**

PROJECT NO.: **230120**

DATE STARTED: **1/10/23**
 DATE COMPLETED: **1/10/23**
 CONTRACTOR: **Cavan Construction**
 EQUIPMENT: **John Deere Extendahoe 310SL HL**

GROUNDWATER ENCOUNTERED: **Dry**
 GROUND SURFACE ELEVATION: **49**
 DATUM: **Topo**
 LOGGED BY: **M.DiBartolomeo**
 CHECKED BY: **M.McDonough**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
				DESCRIPTION	REMARKS
	0			Topsoil +/- 9 Inches	
48.2		CL		Brown, moist, Sandy Lean CLAY	
47.5		SC		Brown, moist, Clayey SAND	
47.0		SM		Light brown, moist, Silty SAND, contains gravel	
	3			Same, tan	
	6			Same, orange	
	9				
39.0				Test pit terminated at 10.0 feet.	
	12				
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**



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LOG OF TEST PIT NO. TP-2

Sheet 1 of 1

LOG OF TEST PIT NO. TP-3

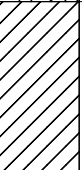
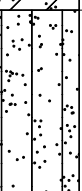
Sheet 1 of 1

PROJECT: **Smyrna New Intermediate Elementary School**
 PROJECT LOCATION: **Kent County, Delaware**
 CLIENT: **Fearn-Clendaniel Architects, Inc.**

PROJECT NO.: **230120**

DATE STARTED: **1/10/23**
 DATE COMPLETED: **1/10/23**
 CONTRACTOR: **Cavan Construction**
 EQUIPMENT: **John Deere Extendahoe 310SL HL**

GROUNDWATER ENCOUNTERED: **Dry**
 GROUND SURFACE ELEVATION: **43**
 DATUM: **Topo**
 LOGGED BY: **M.DiBartolomeo**
 CHECKED BY: **M.McDonough**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
				DESCRIPTION	REMARKS
	0			Topsoil +/- 15 Inches	
41.8		CL		Brown, moist, Lean CLAY with sand	
3					
39.0		SC		Gray and orange, mottled, moist, Clayey SAND, contains gravel	
37.0	6	SM		Gray, moist, Silty SAND	
34.0	9			Test pit terminated at 9.0 feet.	
	12				
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**



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LOG OF TEST PIT NO. TP-3

Sheet 1 of 1

LOG OF TEST PIT NO. TP-4

Sheet 1 of 1

PROJECT: **Smyrna New Intermediate Elementary School**
 PROJECT LOCATION: **Kent County, Delaware**
 CLIENT: **Fearn-Clendaniel Architects, Inc.**

PROJECT NO.: **230120**

DATE STARTED: **1/10/23**
 DATE COMPLETED: **1/10/23**
 CONTRACTOR: **Cavan Construction**
 EQUIPMENT: **John Deere Extendahoe 310SL HL**

GROUNDWATER ENCOUNTERED: **8.5**
 GROUND SURFACE ELEVATION: **43**
 DATUM: **Topo**
 LOGGED BY: **M.DiBartolomeo**
 CHECKED BY: **M.McDonough**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
				DESCRIPTION	REMARKS
	0			Topsoil +/- 14 Inches	
41.8		CL		Brown, moist, Sandy Lean CLAY	
40.0	3	SM		Orange-brown, moist, Silty SAND	
				Light gray and orange, moist, Silty SAND	
	6				
	9			Test pit terminated at 9.0 feet. Groundwater encountered at 8.5 feet.	
34.0					
	12				
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**



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 New Castle, DE 19720

LOG OF TEST PIT NO. TP-4

Sheet 1 of 1

LOG OF TEST PIT NO. TP-5

Sheet 1 of 1

PROJECT: **Smyrna New Intermediate Elementary School**
 PROJECT LOCATION: **Kent County, Delaware**
 CLIENT: **Fearn-Clendaniel Architects, Inc.**

PROJECT NO.: **230120**

DATE STARTED: **1/10/23**
 DATE COMPLETED: **1/10/23**
 CONTRACTOR: **Cavan Construction**
 EQUIPMENT: **John Deere Extendahoe 310SL HL**

GROUNDWATER ENCOUNTERED: **Dry**
 GROUND SURFACE ELEVATION: **45**
 DATUM: **Topo**
 LOGGED BY: **M.DiBartolomeo**
 CHECKED BY: **M.McDonough**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 10 Inches	
44.1		CL		Orange-brown, moist, Sandy Lean CLAY, contains gravel and organic material	
42.7		SC		Light brown, moist, Clayey SAND contains gravel	
41.0	3	SM		Tan, moist, Silty SAND, contains gravel	
	6				
	9			Orange, moist, Silty SAND	
34.5				Test pit terminated at 10.5 feet.	
	12				
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**



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LOG OF TEST PIT NO. TP-5

Sheet 1 of 1

LOG OF TEST PIT NO. TP-6

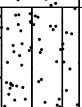
Sheet 1 of 1

PROJECT: **Smyrna New Intermediate Elementary School**
 PROJECT LOCATION: **Kent County, Delaware**
 CLIENT: **Fearn-Clendaniel Architects, Inc.**

PROJECT NO.: **230120**

DATE STARTED: **1/10/23**
 DATE COMPLETED: **1/10/23**
 CONTRACTOR: **Cavan Construction**
 EQUIPMENT: **John Deere Extendahoe 310SL HL**

GROUNDWATER ENCOUNTERED: **Dry**
 GROUND SURFACE ELEVATION: **45**
 DATUM: **Topo**
 LOGGED BY: **M.DiBartolomeo**
 CHECKED BY: **M.McDonough**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
				DESCRIPTION	REMARKS
	0			Topsoil +/- 10 Inches	
44.1		CL		Brown, moist, Sandy Lean CLAY, contains gravel and organic material	
43.0		SM		Orange-brown, moist, Silty SAND	
42.2	3	SP-SM		Brown, moist, Poorly-graded SAND with silt, contains gravel	
39.7		SM		Tan, moist, Silty SAND, contains gravel	
36.0	9			Same, orange Test pit terminated at 9.0 feet.	
	12				
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**



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 New Castle, DE 19720

LOG OF TEST PIT NO. TP-6

Sheet 1 of 1

LOG OF TEST PIT NO. TP-6A

Sheet 1 of 1

PROJECT: **Smyrna New Intermediate Elementary School**
 PROJECT LOCATION: **Kent County, Delaware**
 CLIENT: **Fearn-Clendaniel Architects, Inc.**

PROJECT NO.: **230120**

DATE STARTED: **1/10/23**
 DATE COMPLETED: **1/10/23**
 CONTRACTOR: **Cavan Construction**
 EQUIPMENT: **John Deere Extendahoe 310SL HL**

GROUNDWATER ENCOUNTERED: **9.0**
 GROUND SURFACE ELEVATION: **44**
 DATUM: **Topo**
 LOGGED BY: **M.DiBartolomeo**
 CHECKED BY: **M.McDonough**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			Topsoil +/- 12 Inches	
43.0		CL		Brown, moist, Sandy Lean CLAY	
41.5	3	SM		Tan and orange, moist, Silty SAND	
39.5		SC		Orange, moist, Clayey SAND, contains gravel	
37.2	6				
		SM		Tan and orange, moist, Silty SAND	
	9				
	12				
31.2				Test pit terminated at 12.8 feet. Water seepage encountered at 11.0 feet. Groundwater observed at 9.0 feet at end of day.	
	15				
	18				

NOTES: **Elevation and location should be considered approximate.**



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LOG OF TEST PIT NO. TP-6A

Sheet 1 of 1

Soil Description: Silty SAND (SM)



Date: 1/10/2023

Weather: Sunny/40

Site Location: Kent County, Delaware

[illegible]

Silty SAND (SM)

[illegible]

Silty SAND (SM)



Date: 1/10/2023

Weather: Sunny/40

Site Location: Kent County, Delaware

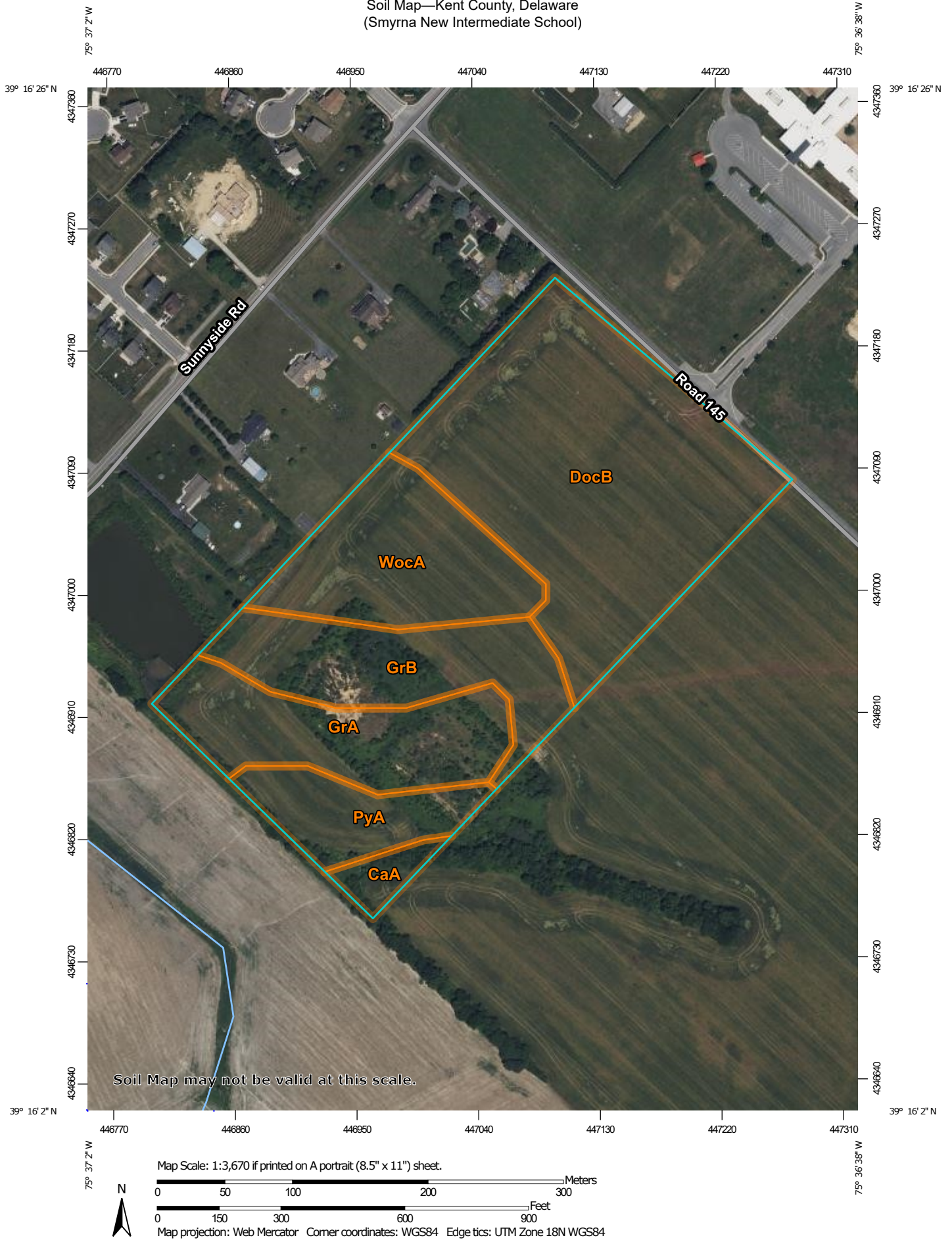
[illegible]

Silty SAND (SM)

[illegible]

Silty SAND (SM)

Soil Map—Kent County, Delaware
(Smyrna New Intermediate School)



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kent County, Delaware

Survey Area Data: Version 19, Sep 14, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 5, 2022—Jul 4, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CaA	Carmichael loam, 0 to 2 percent slopes	0.6	2.2%
DocB	Downer sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	10.7	42.7%
GrA	Greenwich loam, 0 to 2 percent slopes	3.8	15.4%
GrB	Greenwich loam, 2 to 5 percent slopes	3.9	15.6%
PyA	Pineyneck loam, 0 to 2 percent slopes	2.0	8.1%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.0	16.1%
Totals for Area of Interest		25.0	100.0%



Soil Investigation Report Submittal Checklist

DATE RECEIVED: _____ **PROJECT NUMBER:** 230120

PROJECT NAME: Smyrna School District - New Intermediate School

The items contained on this checklist are necessary to properly evaluate and determine the completeness of any Soil Investigation Report submitted under subsection 12.1 of the Delaware Sediment and Stormwater Regulations. Complete all items. It is understood not all items will be applicable to all projects and as such marking an item "N/A" is acceptable.

- I. ✓ **General Soil Investigation Reports.** The following information, as applicable, should be submitted for all projects.
- 1) ✓ The signature, seal and date of a professional engineer or professional geologist experienced in soils licensed in the State of Delaware.
 - 2) ✓ General description of the project, project elements, and project background.
 - 3) ✓ Project site surface conditions and current use.
 - 4) ✓ Regional and site geology. An initial screening of readily available data to determine feasibility of infiltration practices, if applicable, including:
 - a) ✓ Site topography
 - b) ✓ Soil characteristics as defined in the USDA NRCS Web Soil Survey
 - c) ✓ Depth to groundwater and seasonal high water table
 - d) ✓ Historical groundwater level data from the nearest Delaware Geological Survey (DGS) monitoring well or wells
 - 5) ✓ Minimum number of borings or test pits conducted in accordance with the following:
 - a) ✓ Surface area BMPs:
 - i) n/a Two (2) borings or pits for the first 8,000 square feet
 - ii) ✓ Three (3) borings or pits for up to 16,000 square feet
 - iii) ✓ Four (4) borings or pits for up to 25,000 square feet
 - iv) ✓ One (1) additional boring or pit for each additional 25,000 square feet beyond the first 25,000 square feet
 - v) ✓ Boring or pit locations distributed within the facility and sufficient to determine soil variability
 - b) n/a Linear BMPs:
 - i) n/a Two (2) borings or pits up to 500 linear feet, and
 - ii) n/a One (1) additional boring or pit per additional 500 linear feet of trench
 - iii) n/a Boring or pit locations distributed and sufficient to determine soil variability

Soil Investigation Report Submittal Checklist

- 6) √ Borings or test pits advanced to the depth of the limiting layer or a minimum of three (3) feet below bottom of the proposed facility, whichever is encountered first.
- 7) √ Borehole or test pit logs including the following information:
- a) √ Project name
 - b) √ Name of individual collecting the field data
 - c) √ Date field data was collected
 - d) √ Type of boring or test pit excavation method and equipment used
 - e) √ Air temperature and precipitation, including significant precipitation prior to investigation
 - f) √ Elevation of ground at boring location based on site benchmark
 - g) √ Visual description of soil profile layers, and depths below grade encountered
 - h) √ Sample numbers
 - i) √ Depths to any indications of instability such as cave in, sloughing, flowing sands, or obstructions
 - j) n/a Blow counts if Standard Penetration Test (SPT) borings are performed
 - k) √ Depth of seasonal high water table indicators such as mottling
 - l) √ Depth of encountered free water during and after excavation
 - m) n/a Depth to bedrock if encountered
 - n) √ General observations
 - o) √ Testing standards
- 8) √ Depth and type of field testing performed. A summary of the laboratory testing conducted, if applicable.
- 9) √ Project soil and rock conditions including a description of the soil and rock units encountered, and how the units tie into the site geology.
- 10) √ Description of groundwater conditions, including the identification of any of the following:
- a) n/a Confined aquifers
 - b) n/a Artesian pressures
 - c) n/a Perched water tables
 - d) √ Potential seasonal variations, if known
 - e) n/a Any influences on the ground water levels observed
 - f) n/a Direction and gradient of groundwater, if known
- 11) n/a Discussion of rock structure, if applicable, including but not limited to:
- a) n/a The results of any field structure mapping using photographs as needed,
 - b) n/a Joint condition

Soil Investigation Report Submittal Checklist

- c) n/a Rock strength
- d) n/a Potential for seepage.
- 12) n/a Summary of geological hazards identified and their impact on the project design, if any.
Description of the location and extent of the geological hazard.
- 13) n/a For analysis of unstable slopes including existing settlement areas, cuts, and fills, include background regarding the analysis approach, assessment of failure mechanisms, and determination of design parameters. Include a description of any back-analyses conducted, the results of those analyses, comparison of those results to any laboratory test data obtained, and the conclusions made regarding the parameters to be used for final design.
- 14) n/a Geotechnical recommendations for structural earthwork including:
 - a) n/a Embankment design recommendations, as applicable, including but not limited to the following:
 - i) n/a Slope required for stability
 - ii) n/a Need and extent of removal of any unsuitable materials beneath the proposed fills
 - iii) n/a Any other measures that need to be taken to provide a stable embankment
 - iv) n/a Embankment settlement magnitude and rate
 - b) n/a Cut design recommendations, as applicable, including but not limited to the following:
 - i) n/a Slope required for stability
 - ii) n/a Seepage and piping control
 - iii) n/a Erosion control measures
 - iv) n/a Any special measures required to provide a stable slope
 - c) n/a Determination of adequacy of excavated material for use as structural fill or spoil
 - d) n/a Data for structural designs of BMP outlet works
- 15) n/a Long-term or construction monitoring needs, if applicable.
 - a) n/a Recommendation for types of instrumentation needed to evaluate long-term performance or to control construction
 - b) n/a Specify the reading schedule required
 - c) n/a Specify how the data should be used to control construction or to evaluate long-term performance
 - d) n/a Specify the zone of influence for each instrument.
- 16) n/a Address issues of construction staging, shoring needs and potential installation difficulties, temporary slopes, potential foundation installation problems, earthwork constructability issues, and dewatering, as applicable.
- 17) n/a Appendices to support geotechnical recommendations.

Soil Investigation Report Submittal Checklist

II. ☒ **Infiltration Test Reports.** The following information, as applicable, should be submitted for all stormwater management BMPs that rely upon infiltration.

18) ☒ Description of approved infiltration testing method.

a) ☒ Field Permeability Testing conducted in accordance with ASTM-D5126 "Comparison of Field Methods for Determining Hydraulic Conductivity in the Vadose Zone".

b) ☒ Single Ring or Double Ring Infiltrometer test method

c) ☐ n/a Cased Borehole Permeameter test method

i) ☐ Department or Delegated Agency approval granted prior to conducting the test

ii) ☐ Minimum four (4) inch diameter casing used

d) ☐ n/a Any deviation from infiltration testing procedures approved by the Department or Delegated Agency noted in the report.

19) ☒ Summary table of location of test, depth of test, elevation of test if available and field verified infiltration rate.

20) ☒ The minimum number of field measured infiltration tests are based on the proposed facility's dimensions as follows:

a) ☐ n/a For an infiltration trench with less than 10,000 square feet of impervious drainage area:

i) ☐ One (1) test up to 500 linear feet, and

ii) ☐ One (1) additional test per 250 linear feet of trench, and

iii) ☐ Sufficient to determine variability.

b) ☐ n/a For an infiltration trench with greater than 10,000 square feet of impervious drainage area:

i) ☐ One (1) test up to 250 linear feet, and

ii) ☐ One (1) additional test per 250 linear feet of trench, and

iii) ☐ Sufficient to determine variability.

c) ☐ n/a For an infiltration trench used with roadway perforated pipe layouts:

i) ☐ One (1) test up to 500 linear feet, and

ii) ☐ One (1) additional test per 500 linear feet of trench, and

iii) ☐ Sufficient to determine variability.

d) ☒ For an infiltrating bioretention system:

i) ☐ n/a One (1) test for the first 8,000 square feet

ii) ☐ n/a Two (2) tests for up to 16,000 square feet

iii) ☒ Three (3) tests for up to 25,000 square feet

iv) ☐ n/a One (1) additional test for each additional 25,000 square feet beyond the first 25,000 square feet

Soil Investigation Report Submittal Checklist

- v) ☒ Test locations distributed within the facility and sufficient to determine variability.
- e) ☒ For a surface infiltration basin:
 - i) ☐ One (1) test for the first 8,000 square feet
 - ii) ☐ Two (2) tests for up to 16,000 square feet
 - iii) ☒ Three (3) tests for up to 25,000 square feet
 - iv) ☐ One (1) additional test for each additional 25,000 square feet beyond the first 25,000 square feet.
 - v) ☒ Test locations distributed within the facility and sufficient to determine variability.
- f) ☐ For a subsurface infiltrating practice:
 - i) ☐ One (1) test per infiltration area
 - ii) ☐ One (1) additional test for every 8,000 square feet of infiltration area
 - iii) ☐ Test locations distributed within the facility and Sufficient to determine variability
- 21) ☒ Infiltration test log, including:
 - a) ☒ Name and license number of individual performing test. Individuals in responsible charge of infiltration testing possesses a Class D On-Site License issued by DNREC Division of Water Groundwater Discharges Section or be licensed in the State of Delaware as a Professional Engineer or Professional Geologist.
 - b) ☒ Date test was performed
 - c) ☒ Type of test method
 - d) ☒ Air temperature and precipitation
 - e) ☒ Depth of test below ground surface and elevation. Separation to a limiting layer such as bedrock or groundwater of at least two (2) feet maintained.
 - f) ☒ Diameters of boring and casing
 - g) ☒ Depth of casing penetration
 - h) ☒ Time and depth from reference point for each time increment.
 - i) ☒ A saturation period of one hour or a drop of 12 inches or 30.5 centimeters achieved. Saturation period not used in determining field verified infiltration rate.
 - ii) ☒ After the saturation period, a minimum of two (2) test periods completed or until at least two (2) consecutive test periods are consistent and achieve a stabilized infiltration rate. Each test period has a maximum reading interval of 15 minutes and meets one (1) of the following criteria:
 - (1) ☒ A minimum of one hour as determined by the sum of the interval times
 - (2) ☒ A drop of at least 12 inches in 15 minutes or less for a minimum of 30 minutes as determined by the sum of the interval times

Soil Investigation Report Submittal Checklist

- iii) ✓ Stabilized infiltration rate met as defined as one of the following:
- (1) ✓ A difference of 0.25 inches or less of drop between the highest and lowest reading of four (4) consecutive readings for infiltration rates greater than two (2.0) inches per hour
 - (2) ✓ A difference of 0.125 inches or less of drop between the highest and lowest reading of four (4) consecutive readings for infiltration rates equal to or less than two (2.0) inches per hour.
- iv) n/a When using the constant head test method, water level inside the casing maintained at a constant level or refilled to the starting level after each reading throughout the test period at no more than 15 minute intervals.
- v) ✓ When using the falling head test method each test period starts with the same initial head.
- 22) ✓ Infiltration rate graph for each test charting the field verified infiltration rate versus elapsed time of test. Append to each graph a table of the testing results. The field verified infiltration rate is the final steady state reading of the test performed.
- 23) ✓ Geotechnical recommendations for each stormwater management facility, including the following:
- a) ✓ Recommended design infiltration rate based on the following:
 - i) ✓ Apply a minimum factor of safety of 2.0 to field results from Single Ring or Double Ring Infiltrometer testing
 - ii) n/a Apply a minimum factor of safety of 2.5 to field results from Cased Borehole Permeameter testing.
 - iii) ✓ Provide an elevation range over which the recommended design rates are applicable.
 - iv) ✓ The maximum design infiltration rate is less than or equal to 15 inches per hour.
 - b) n/a Impact of infiltration on adjacent facilities
 - c) n/a Effect of infiltration on slope stability
 - d) n/a If the facility is located on a slope, stability of slopes within the facility
 - e) n/a Foundation bearing resistance
 - f) n/a If steady state conditions for a given test are not achieved, provide an explanation as to why steady state could not be achieved and the professional's opinion regarding the use of the results for design purposes. If steady state is not achieved for a given test and a reasonable professional opinion is not provided, the Department or Delegated Agency may require additional testing.

Soil Investigation Report Submittal Checklist

III. ^{n/a} **Geotechnical Reports for Embankments.** The following information, as applicable, should be submitted for all stormwater management BMPs containing an embankment.

24) ___ The signature, seal and date of a professional engineer licensed in the State of Delaware.

25) ___ Subsurface Exploration

a) ___ Explorations every 200 feet on center along the length of the embankment.

b) ___ Unless bedrock is encountered at a shallower depth, explorations at a depth twice the proposed height from bottom of pond to top of embankment.

c) ___ If bedrock is encountered, a minimum five (5) foot rock core performed. If organic, plastic, or soils with an actual or estimated N-value less than four (4) are encountered, extended exploration to a depth of four (4) times the proposed embankment height.

d) ___ If there is a potential for a significant groundwater gradient beneath an embankment or surface water levels are significantly higher on one side of the embankment than the other, the effect of reduced soil strength caused by water seepage has been evaluated.

e) ___ Seepage effects considered when an embankment is placed on or near the top of a slope that has known or potential seepage through it.

26) ___ Summary of design analyses, which provide the project description and basis of the design recommendations.

27) ___ Summary of stability analyses, which provide the results of the stability analyses performed for the given embankment dimensions.

28) ___ Summary of settlement analyses, including design assumptions and settlement results for above-grade embankments.

29) ___ Design recommendations for embankment construction identifying the following actions:

a) ___ Construction procedures for placement of material in embankment widening areas

b) ___ Embankment cut-off and core trench materials for above-grade embankments

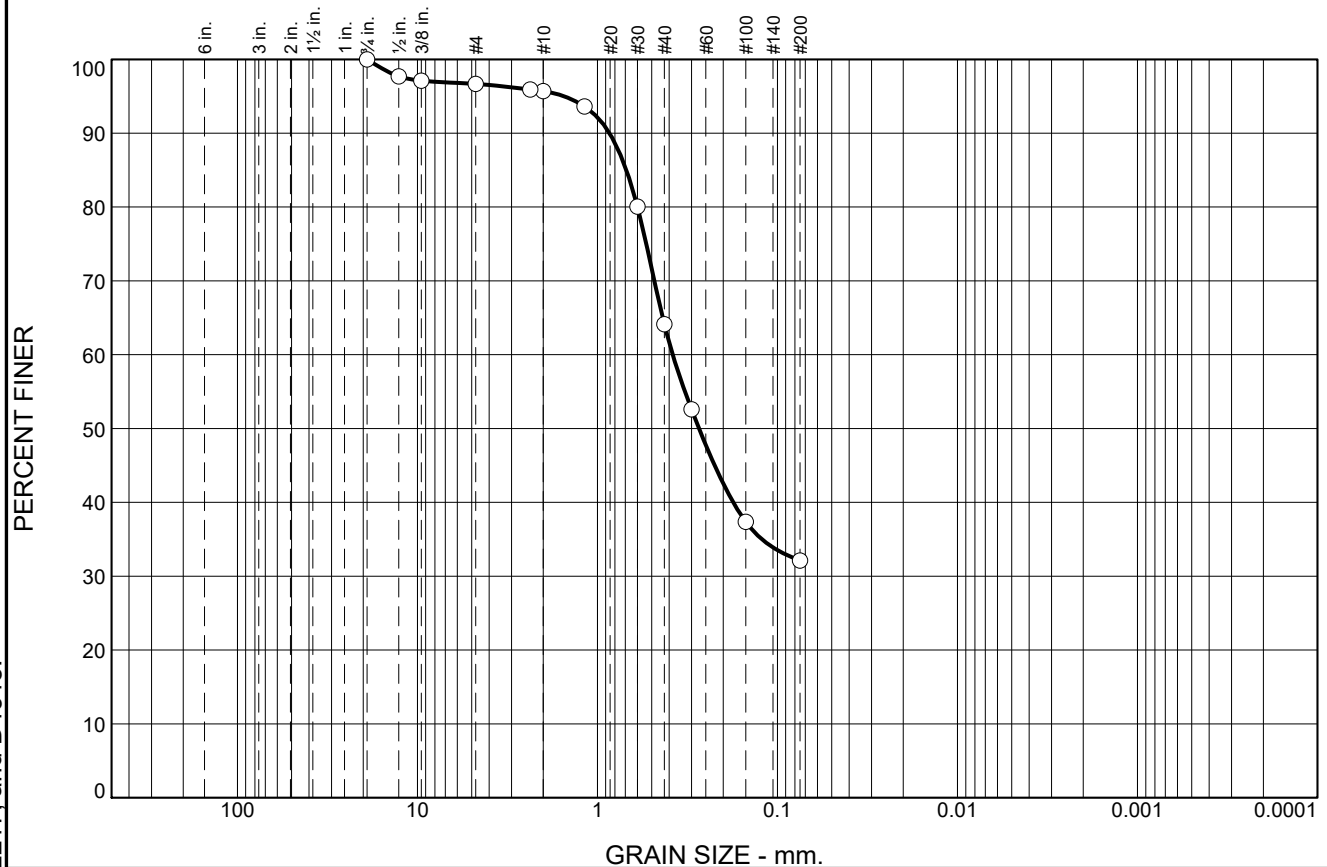
c) ___ Special notes for excavation of unsuitable material, with specific backfill requirements

d) ___ Specific measures required prior to placing embankment material

e) ___ Installation of appropriate erosion control and vegetative cover

APPENDIX C

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.3	1.0	31.6	32.0		32.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	97.7		
.375	97.1		
#4	96.7		
#8	95.9		
#10	95.7		
#16	93.6		
#30	80.0		
#40	64.1		
#50	52.6		
#100	37.4		
#200	32.1		

* (no specification provided)

Soil Description

Brown, Silty SAND

Atterberg Limits

PL= 16 LL= 19 PI= 3 NM= 13.3

Coefficients

D₉₀= 0.8569 D₈₅= 0.6906 D₆₀= 0.3821
D₅₀= 0.2727 D₃₀= C_u=
D₁₀= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Source of Sample: SWM Facilities Bulk

Date: 02/10/2023



GEO-TECHNOLOGY ASSOCIATES, INC.

18 Boulden Circle, Suite 36
New Castle, DE 19720

Client: Fearn-Clendaniel Architects, Inc.

Project: Smyrna New Intermediate Elementary School

Project No: 230120

Figure: 3

Tested By: A. Veith

Checked By: M. McDonough

ASTM Specifications performed may include D422, D421, D6913, D2216, D2217, and D4318.

MOISTURE DENSITY RELATIONSHIP REPORT

ASTM D 698 Method B Standard

Project No.: 230120

Date: 02/10/2023

Project: Smyrna New Intermediate Elementary School

Client: Fearn-Clendaniel Architects, Inc.

Source of Sample: SWM Facilities Bulk

Remarks:

MATERIAL DESCRIPTION

Description: Brown, Silty SAND

Classifications -

USCS: SM

AASHTO: A-2-4(0)

Nat. Moist. = 13.3 %

Sp.G. = 2.6

Liquid Limit = 19

Plasticity Index = 3

% < No.200 = 32.1 %

TEST RESULTS

Maximum dry density = 124.3 pcf

Optimum moisture = 10.7 %

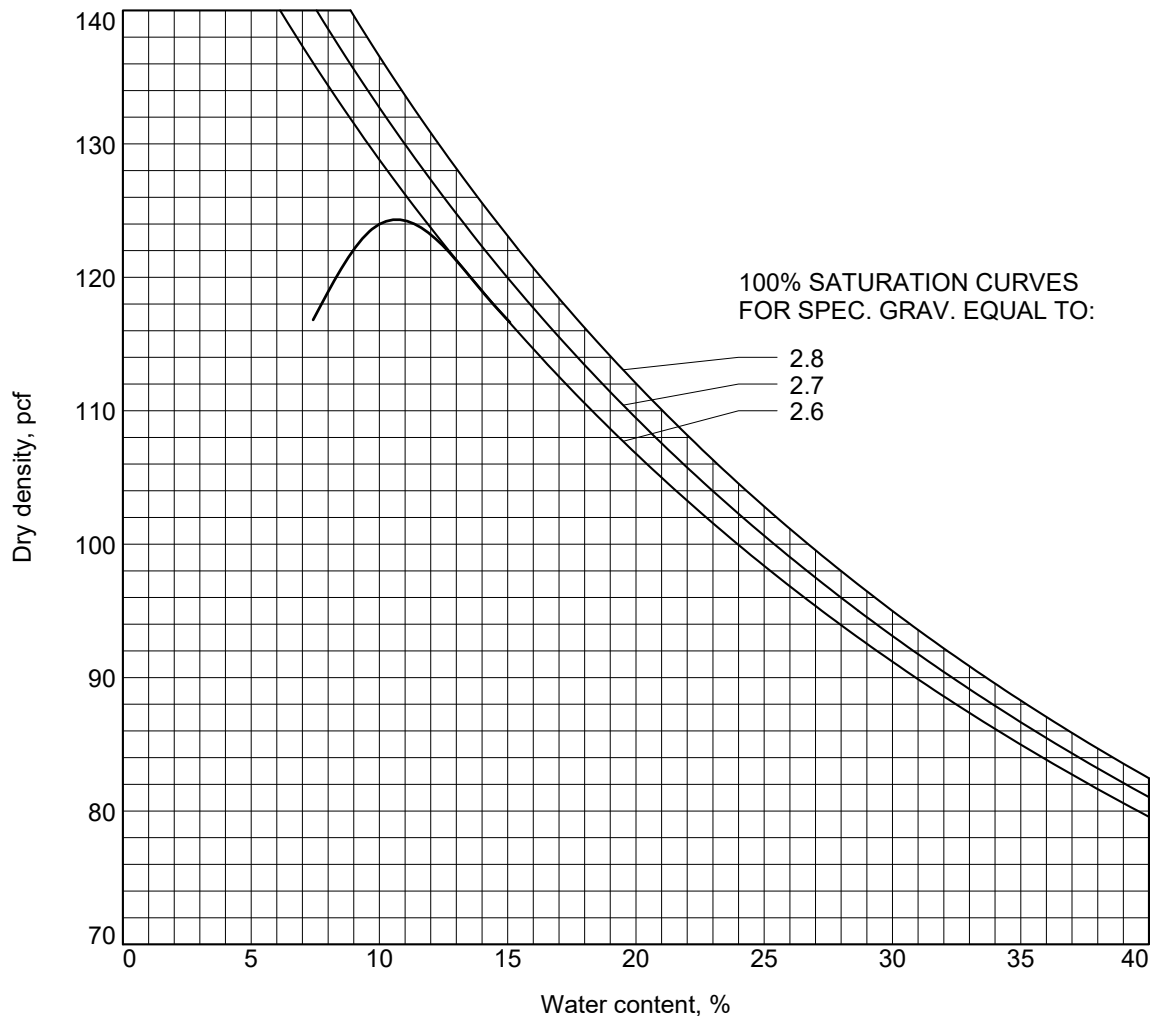


Figure: 4

Geo-Technology Associates, Inc.

Tested By: A. Veith

Checked By: M. McDonough

ASTM Specifications performed may include D422, D421, D6913, D2216, D2217, and D4318.

FIGURE NO. 5 - SUMMARY OF NATURAL MOISTURE CONTENTS

LOCATION	DEPTH (feet)	NMC (%)
TP-1	6.0	9.7
TP-1A	4.0-6.0	16.9
TP-2	6.0	8.9
TP-3	4.0	17.4
TP-4	5.0	13.5
TP-5	6.0	9.0
TP-6	7.0	8.8