ADDENDUM NUMBER ONE

DUPONT PUMP STATION AND BASIN IMPROVEMENTS – PHASE 2 (Contract A)
W-12-026-202

CITY OF CHATTANOOGA, TENNESSEE

The Bid Date shall be extended to Thursday, December 19, 2019 at 2:00 PM. The cutoff for questions shall be extended to December 12, 2019.

The following changes shall be made to the Contract Documents, Specifications, and Drawings:

I. CONTRACT DOCUMENT

- A copy of the sign-in sheet from the Pre-Bid meeting on November 21, 2019 is attached.
- Add attached Drawings C-17, C-18, C-19, C-20, and CD-8.
- Add attached Specification Section 13 60 13 Pre-Fabricated Restroom
- Replace Section 00 41 00 Bid Form with the attached.
- Drawing C-1: Revise Laydown Area Label “Contractor Laydown Area 60’x175’”
- Drawing C-4: Revise RCP Label “12” RCP” for both stormwater pipelines located between the new catch basins and new concrete headwall.
- Add Wilo and Ebara to the list of acceptable submersible solids handling pump manufacturers. Product shall meet the detailed requirements of the specifications.
- Add Lord and Company to the list of acceptable PCSS in Section 40 90 00.
- Replace paragraph 2.03.D in Section 43 21 39 with the following paragraph:

  The impeller shall be a rotodynamic semi-open, solids handling type capable of passing solids either due to internal clearances or other features to facilitate solids processing including a wear plate with groove. The wear plate to impeller clearance shall be easily adjustable without the need for disassembly of the pump or the need to add or remove shims. The impeller may include pump out vanes on the upper shroud to reduce axial thrust and minimize clogging due to debris accumulation around the mechanical seal. As an alternate, the impeller may be a rotodynamic enclosed, solids handling type, capable of passing fibrous material and three-inch (minimum) diameter solids with a Type 316 stainless steel wear ring fitted to the impeller front shroud. The impeller shall be two-plane dynamically balanced in accordance with ISO 1940-1 quality grade G2.5 standard to provide smooth, vibration free operation.

II. Q&A/COMMENTS

Note: Duplicate questions were provided by several potential bidders. While wording varied slightly, duplicates have been removed.

1. Can you provide the CAD/DWG files for the above referenced job?

   Response: CAD files will be made available to the successful bidder.

2. Invitation to Bid - Please provide bid date extension for this project.

   Response: The bid date has been revised.

3. Plan Sheet C-6, Note 3: Can you confirm that the 4" Gate Valve is to be Type GV400 per Spec Section 40 05 50-2.05-C-3.e.?

   Response: Confirmed

4. Plan Sheet M-7: Can you confirm that the 4" Gate Valve GV-2030 is to be Type GV401 per Spec Section 40 05 50-2.05-C.3.f.? Also is this electric actuator Open/Close or modulating? I did not find this valve on the P&ID drawings.

   Response: Confirmed. This valve shall have an Open/Close electric actuator as shown on I-5.

5. It was mentioned the Geotechnical Report will be included with Addendum 1. Is it possible to receive the Geotech Report on 11/26/2019? The cutoff for questions is 12/1/2019 and for most, the last working day before the question cutoff date is 11/27/2019. It is likely that more questions will arise upon receipt of the Geotech Report. Another option would be extending the question cutoff date.

   Response: The Geotechnical Report prepared by CDM Smith is attached. Contractors may rely on the data presented in this report. However, reliance on any interpretations of such data are at the Contractor's sole risk. The Bid Date has been revised in Addendum No. 1.

6. Will there be any City provided equipment?

   Response: No.

7. Are there any contaminated soils?

   Response: Not to our knowledge; however, no specific sampling or testing has taken place.

8. How will pipelines be abandoned?

   Response: Pipelines abandoned in place (not removed) will be filled with flowable fill per Specification Section 03 60 00 Grout.

9. Will the project have an inspector?

   Response: Yes, the project will have a CDM Smith inspector.

10. What are the noise limitations for the project?

    Response: Noise limitations are included in Section 01 13 10 Special Provisions.

11. Will this project have an escrow account?

    Response: Yes, per Section 00 86 00 Escrow Agreement.

12. Can the project have a Geotechnical Allowance?

    Response: The project does not currently have a Geotechnical Allowance but does have an allowance for materials testing.

13. The Bid Form text only refers to Bid Items 1 through 6, but includes 7 Bid Items; please advise.

    Response: A corrected Bid Form is included in Addendum No. 1.

14. C-1 calls for a 60'-150' Laydown area and C-3 calls for a 60'x175'. Which one is correct?

    Response: The laydown area is 60'x175'. See Addendum No. 1 revision.

15. C-4 calls for 15" RCP and C-6 calls for 12" RCP. Which one is correct?

    Response: 12" RCP is the correct size. See Addendum No. 1 revision.

16. Please confirm that MH 1 has a vent and a watertight lid.

    Response: Confirmed.

17. Can we close a portion of Dixie Drive (just north of the project site) for the duration of the construction project?

    Response: This is considered acceptable, provided emergency access is provided and all requirements in 01 12 16 Sequence of Construction are met.

The following questions were also received. Responses are still being developed and will be provided in a separate addendum.

1. If we are to provide a design as part of our scope, we request the loading information. If we are to bid to the stamped set of plans provided, then we'd request a more common Micropile diameter of 9.625" x 0.545" be utilized and request the rock bond diameter to be drilled.

2. A detailed Micropile geometry was provided in the form of 9.75" x 0.5" piles with a full length 1.5" GR 75 bar and topped with 10"x10"x1" plates with a 7' rock bond length for all piles. No mention of a hole diameter required per their design is provided.

3. The specifications say that we have to provide a stamped set of drawings and calculation package for the design of the piles. No loading information (compression, tension, nor lateral) was provided for the piles to be designed to.

4. Installation of Manhole MH-A. (Maximum bypass flow = 30 mgd),
   1. Can you please confirm that 30 MGD is the MANDATORY bypass pumping design for the 30" SS line?

5. Installation of 30" force main aerial crossing and associated connections. Bypass pumping is not required, but a 30" temporary HDPE bypass connection may be necessary depending on the amount of time the 30" force main is to be out of service.

1. What is the TDH' or PSI on the existing 30" FM
2. What MGD flows through this 30" FM?
3. Can the flows from 30" FM be discharged into existing 42" gravity line?

6. Installation of 42" Gravity Sewer Line West of the proposed aerial crossing will conflict with existing 18" Gravity Sewer. (Maximum bypass flow = 4 mgd)
   1. Can you please confirm that 4 MGD is the MANDATORY bypass pumping design for the 18" SS line?

7. Installation of Manhole M-7 (replacement of S11K005). (Maximum bypass flow = 4 mgd)
   1. Can you please confirm that 4 MGD is the MANDATORY bypass pumping design for the 15" SS line?

8. Reference drawing C-6. Concerning the tie in of the new 30" FM-DI into the existing 30" FM, what are the dry weather and wet weather flows in the existing 30" FM? Also, can the flows be controlled without the use of bypass pumps to make this tie in? When the 30" line is cut to make the tie in, how much sewer can be expected to flow into the tie in area?

December 3, 2019

_____
Justin C Holland, Administrator
City of Chattanooga

PRE-BID CONFERENCE MEETING MINUTES
Dupont Pump Station and Basin Improvements – Phase 2 (Contract A)
CONTRACT #W-12-026-202
November 21, 2019
Training Facility, Moccasin Bend Wastewater Treatment Plant

1. Introductions
    a. Owner – City of Chattanooga
    b. Program Manager – Jacobs
    c. Engineer – CDM Smith
    d. TDEC State Revolving Fund
    e. Southwest Tennessee Development District

2. Project Scope/Description
    a. The Project location is on Dixie Drive in Rivermont Park and immediately south of the Champions Tennis Club. The Project generally consists of constructing a diversion structure, 22 million gallon per day wet-weather pump station, electrical building, diesel generator, odor control systems for the new structures, yard piping, and related work.
    b. Via addendum, a precast restroom and floating dock repairs will be added to the project.

3. Pre-Bid Conference Agenda

4. Bid Documents
    a. Refer to Section 00 21 13 Instructions to Bidders
    b. Purchase Bids from 8:00 a.m. to 4:30 p.m., Monday through Friday, at the City of Chattanooga Purchasing Department, 101 East 11th Street, Suite G13, Chattanooga, TN 37402, phone (423) 643-7230, fax (423) 643-7244.
    c. Cost of Contract Documents is $100 per set. No part of the purchase will be refunded for any reason.
    d. Bid Bond in the amount of 5% of Bid with Surety licensed to do business in TN and listed in U.S. Treasury Circular 570.
    e. No Bid withdrawn within 120 calendar days of receipt of Bids.

5. Qualifications
    a. Refer to Section 00 21 13 Instructions to Bidders, and Section 00 45 13 Statement of Bidder's Qualifications
        i. Bidder shall maintain permanent place of business
        ii. Must be licensed by State of Tennessee to perform work under contract
        iii. Bidder shall demonstrate adequate construction experience and sufficient equipment resources to properly perform work.
        iv. Owner reserves the right to reject any bid if bidder fails to satisfy qualifications.

6. Bidding Requirements
    a. Bid Bond in the amount of 5% of Bid with Surety licensed to do business in TN and listed in U.S. Treasury Circular 570.
    b. No Bid withdrawn within 120 calendar days of receipt of Bids.

c. Section 00 45 77 – Contractor's Identification must be completed, with one copy attached to the outside of the bid package, and one copy inside the bid package.

7. Bidder Questions and Addenda
    a. Use Section 00 21 14 – Request for Bidder Information. Submit by fax, email or mail to City of Chattanooga Purchasing Department. bidinfo@chattanooga.gov.
    b. Questions received less than ten (10) days (December 1st, 2019) prior to the date for opening the Bids may not be answered. All questions about the meaning or intent of the Bidding Documents are to be submitted to Owner in writing. Questions and other inquiries shall be submitted to the City of Chattanooga Purchasing Department.
    c. Required to purchase set of plans and specifications to get on the plan holders list. Only bidders on plan holders list will receive addenda; which must be acknowledged in the Bid Form.

8. Bid Opening
    a. Date/Time – December 10th, 2019 at 2pm
    b. Location – City of Chattanooga Purchasing Department, 101 East 11th Street, Suite G13, Chattanooga, TN 37402

9. Contract Completion Time
    a. Substantial Completion within 300 Calendar Days of Notice to Proceed (Section 00 52 00 will be corrected via addendum to match Bid Advertisement)
    b. Final Completion within 330 calendar days of Notice to Proceed

10. Liquidated Damages
    a. $1,000 for each day after Substantial Completion if work is deemed to not be substantially complete, and $1,000 for each day after Final Completion if Contractor has not completed the work.

11. Project Specific Requirements
    a. Refer to Section 01 12 16 for Construction Constraints and Proposed Sequence of Construction.
    b. Landscape plan development and landscaping to be provided under Bid Allowance 5.
    c. Contractor to be aware that the Dupont Pump Station and Basin Improvements – Phase 2 (Contract B) project will be taking place at the same time.

12. Site Access
    a. All work to be completed shall be on the City of Chattanooga's property or easements.
    b. If needed, the Contractor is responsible for acquiring all required right of entry and temporary construction easements on private properties in order to access existing sewers and preform the required work.
    c. Emergency access shall always be maintained to the boat ramp and Champions Tennis Club.
    d. Golf cart shuttle service shall be provided for weekend tournaments (see additional requirements in Section 01 12 16)

13. Safety
    a. Refer to Section 00 72 00 and 00 73 00 General Conditions

14. Work Hours
    a. Work Hour Restrictions – Work hours shall be 7:00 a.m. to 6:00 p.m. Monday through Friday unless the City has more specific restrictions.

15. DAVIS-BACON Act
    a. This project is being funded by a State Revolving Fund loan on or after 2010 EPA Fiscal Year. The loan recipient must be in compliance with all applicable requirements of the Davis-Bacon Act. Gina Ogle – Administrative Assistant, Southeast Tennessee Development District gogle@sedev.org

16. Allowances
    a. The Contractor shall include in the Bid Total all allowances stated in the Contract Documents. These allowances shall cover the net cost of the services provided.

17. Other Items
    a. It is the Contractors responsibility to repair any existing utilities that are damaged during construction.
    b. The items discussed here today are not intended to be all-inclusive. It is the Contractor's responsibility to review the Contract Documents and comply with all provisions.

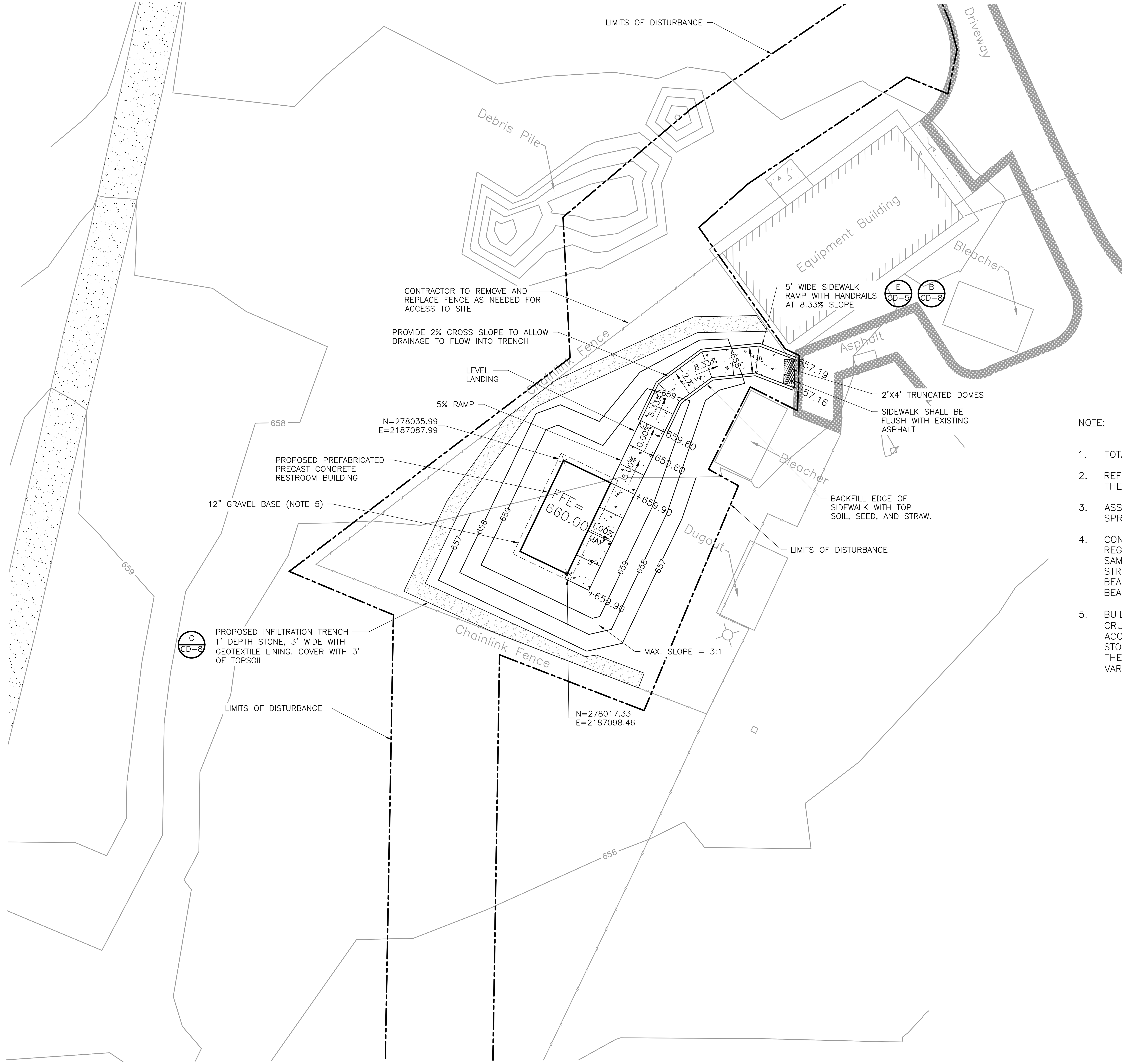
18. Questions

All questions included in Addendum No. 1.

SIGN IN SHEET

PRE-BID CONFERENCE
Dupont Pump Station and Basin Improvements – Phase 2 (Contract A)
CONTRACT #W-12-026-202
November 21, 2019
Training Facility, Moccasin Bend Wastewater Treatment Plant

NAME	COMPANY	E-Mail Address
Daniel Unger	CDM Smith	ungerdj@cdmsmith.com
Tanner Gore	Eco-Tech	tgore@eco-tech.net
Mark Dickson	Crowder Construction	mdickson@crowderusa.com
Cain Maynard	Sunbelt Pump Solutions	cain.maynard@sunbeltrentals.com
Chris Hobgood	TyBe Company	Chobgood@southcon.us
Mike Martin	Nixon Power	MMARTIN@NIXONPOWER.COM
Denny Brestle	Jacobs	denny.brestle@jacobs.com
Zach Humphrey	Reeves Young	zhumphrey@reevesyoung.com
Craig Haney	Brann & Whittemore	craig@brann-whittemore.com
Curtis Jenkins	NABCO electric	cjenkins@nabcoelectric.com
Robbie Beaden	Tri State Electric	robbieb@tristateec.com
Todd Thomasson	Tristate Electric	toddt@tristateec.com
Jimmy Spence	City	jspence@chattanooga.gov
Hank Craig	ACME	hcraig@acmeindustrialpiping.com
Jace Choffin	J. Cumby Construction	jchoffin@jcumbyconstruction.com
Tanner Dodd	WBCCI	tdodd@wbcci.com
Logan McDaniel	EntropyCoatingSolutions	Logan@entropycoatings.com
BONNIE MUMPOWER DOSEN	COC	BMUMPOWER@CHATTANOOGA.GOV
DEBBIE TALLEY	COC	DTALLEY@CHATTANOOGA.GOV
DENNIS MALONE	COC	DMALONE@CHATTANOOGA.GOV
KADIR AMEEN	COC	KAMEEN@CHATTANOOGA.GOV
BRUCE SPARROW	WBCCI	BSPARROW@WBCCI.COM
RANDY TAYLOR	CITY	rdtaylor@chattanooga.gov
CDM Smith Kadir Ameen	City	Kameen@chattanooga.gov
Robert Calhoun	Adman Electric	rcalhoun@admanelectric.com



1" = 10'

NOTE:

1. TOTAL DISTURBED AREA = 0.17 ACRE
2. REFER TO S-1 FOR APPLICABLE CODES AND LOADING REQUIREMENTS FOR THE PRECAST RESTROOM.
3. ASSUMED ALLOWABLE SOIL BEARING PRESSURE FOR PRECAST RESTROOM SPREAD FOOTINGS OVER PREPARED SUBGRADE : 1500 PSF.
4. CONTRACTOR SHALL RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF TENNESSEE TO PERFORM TESTING AND SAMPLING AS REQUIRED TO DETERMINE THE ALLOWABLE SOIL BEARING STRENGTH. NOTIFY THE ENGINEER IMMEDIATELY IF THE ALLOWABLE SOIL BEARING PRESSURE IS DETERMINED TO BE LESS THAN THE ASSUMED SOLID BEARING PRESSURE OF 1500 PSF.
5. BUILDING BASE SHALL CONSIST OF A MINIMUM OF 12" OF 3/4" MINUS CRUSHED ROCK COMPACTED TO 95% OF OPTIMUM DENSITY IN ACCORDANCE WITH ASTM D 1557. THE FINISHED SURFACE OF THE BASE STONE SHALL BE UNIFORMLY LEVEL AND SHALL EXTEND 2 FEET BEYOND THE EDGE OF THE PRECAST RESTROOM BUILDING. THE BASE SHALL NOT VARY MORE THAN 1/2" FROM A TRUE HORIZONTAL PLANE.

CDM Smith
CDM Smith Inc.
651 East 4th Street Suite 100
Chattanooga, TN 37403
Tel: (423) 771-4495

DUPONT PUMP STATION AND BASIN IMPROVEMENTS - PHASE 2 - CONTRACT A
CITY OF CHATTANOOGA, TN
CONSENT DECREE PROGRAM

REV	DATE	REVISION DESCRIPTION
1	12/19	ADDENDUM NO. 1

THIS LINE IS ONE INCH LONG WHEN PLOTTED FULL SCALE

THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE APPLICABLE OR GOVERNING TECHNICAL SPECIFICATIONS AND OTHER CONTRACT DOCUMENTS.

PROJECT NO: 129699-109746
DATE: NOVEMBER 2019

DISC. LEAD:	DESIGNER:	CHECKER:
DU	VF	CF/MT

SHEET TITLE
CIVIL

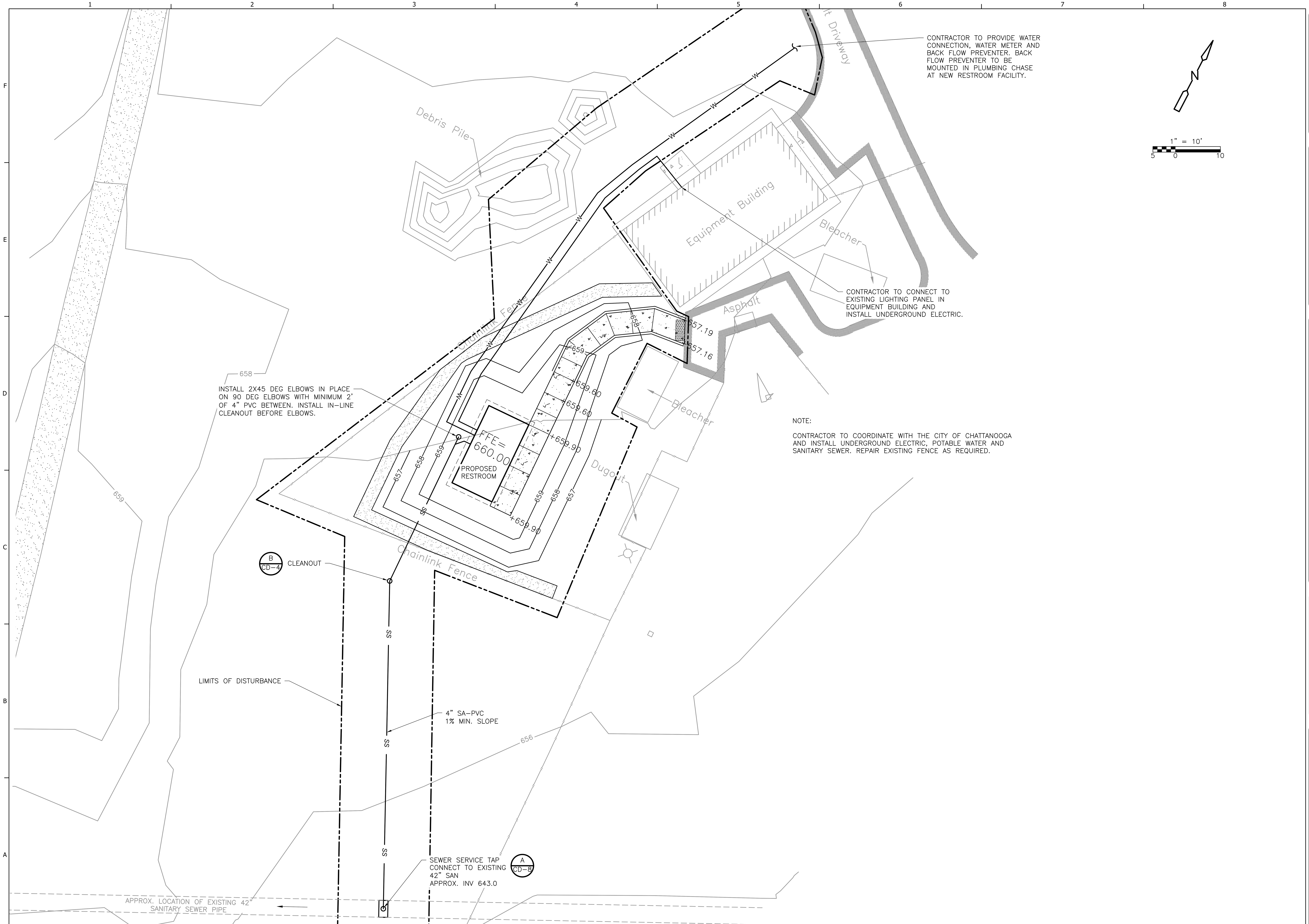
RESTROOM SITE LAYOUT AND GRADING PLAN

SHEET C-17

ISSUED FOR BID

CREATED: 12/2/2019 LAST SAVED: 12/3/2019 BY: BEELEREW PLOT DATE: 12/3/2019

PLOT DATE: 12/2/2019 BY: BEELEREW LAST SAVED: 12/2/2019 CREATED: 12/2/2019



CDM Smith
CDM Smith Inc.
651 East 4th Street Suite 100
Chattanooga, TN 37403
Tel: (423) 771-4495

DUPONT PUMP STATION AND BASIN IMPROVEMENTS - PHASE 2 - CONTRACT A
CITY OF CHATTANOOGA, TN
CONSENT DECREE PROGRAM

REV	DATE	REVISION DESCRIPTION
1	12/19	ADDENDUM NO. 1

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PROJECT NO: 129699-109746
DATE: NOVEMBER 2019

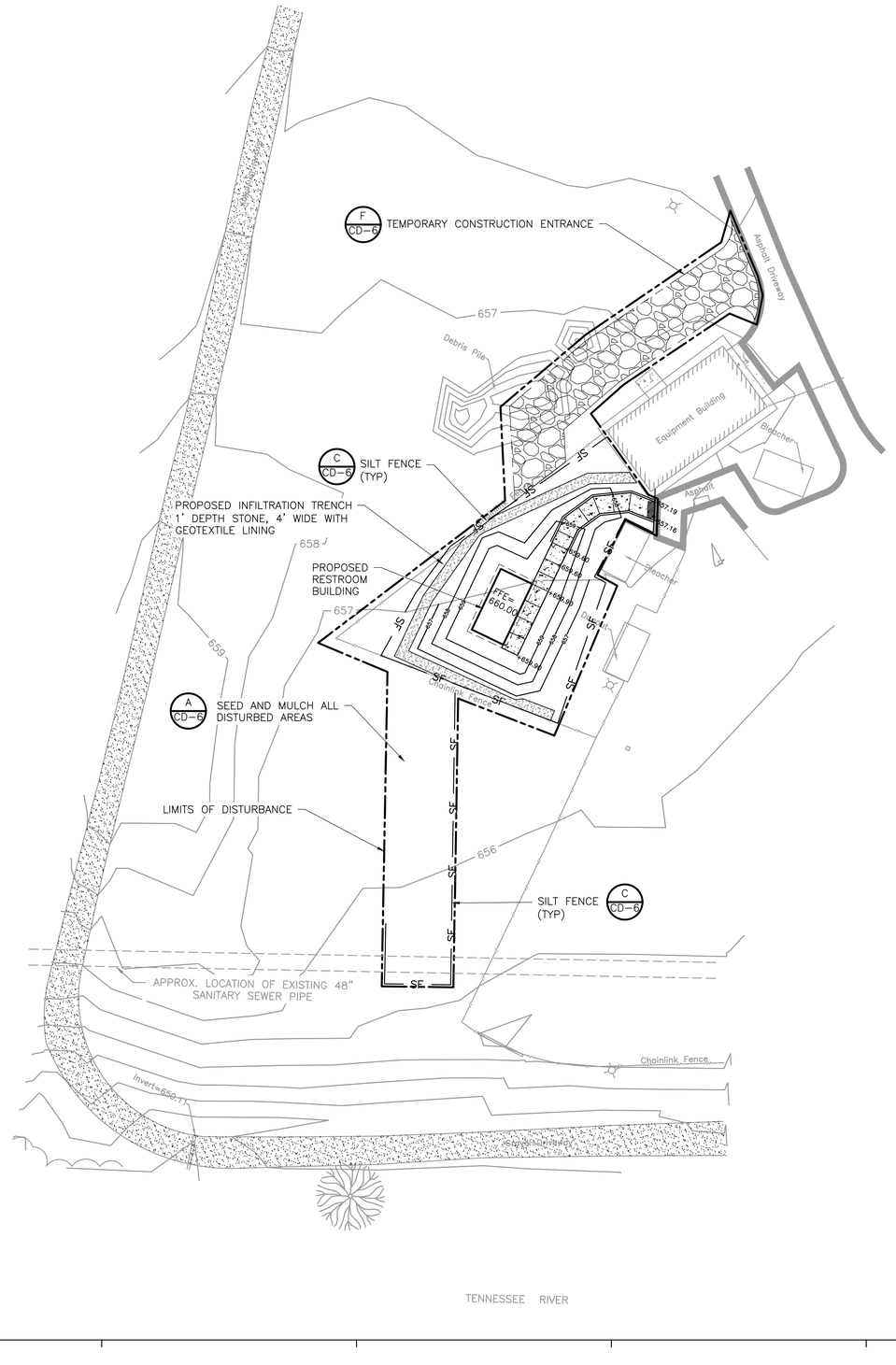
DISC. LEAD:	DESIGNER:	CHECKER:
DU	VF	CF/MT

SHEET TITLE
CIVIL
RESTROOM UTILITY PLAN

SHEET C-18

ISSUED FOR BID

CREATED: 12/2/2019 LAST SAVED: 12/2/2019 BY: BEELEREW PLOT DATE: 12/2/2019



1" = 20'
10 0 20

CDM Smith
CDM Smith Inc.
651 East 4th Street Suite 100
Chattanooga, TN 37403
Tel: (423) 771-4495

IAN M. FREEMAN
REGISTERED
LANDSCAPE
ARCHITECT
No. 1153
STATE OF TENNESSEE
12/2/19

DUPONT PUMP STATION AND
BASIN IMPROVEMENTS - PHASE 2 - CONTRACT A
CITY OF CHATTANOOGA, TN
CONSENT DECREE PROGRAM

REV	DATE	REVISION DESCRIPTION
1	12/19	ADDENDUM NO. 1

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PROJECT NO: 129699-109746

DATE: NOVEMBER 2019

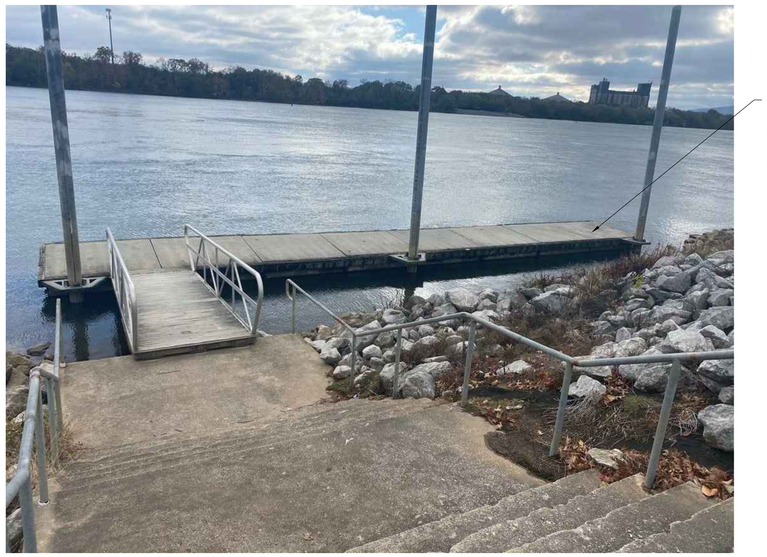
DISC. LEAD:	DESIGNER:	CHECKER:
DU	VF	CF/MT

SHEET TITLE
CIVIL

RESTROOM EROSION CONTROL PLAN

SHEET
C-19

ISSUED FOR BID



REPLACE EXISTING 8'x8' CONCRETE FLOATS AND ASSOCIATED TIMBER (TYP OF 8). CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO SUBMITTING SHOP DRAWINGS AND SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

CONCRETE FLOATING DOCK MODIFICATIONS

NOTES:

1. CONTRACTOR SHALL FURNISH ALL TOOLS, EQUIPMENT, MATERIALS, AND SUPPLIES AND SHALL PERFORM ALL LABOR, SUPERVISION, FABRICATION, ASSEMBLY, AND DELIVERY OF A COMPLETE CONCRETE FLOAT SYSTEM.
2. THE REPLACEMENT DOCK SYSTEM SHALL CONSIST OF MODULAR SECTIONS MATCHING THE DIMENSIONS OF THE EXISTING SYSTEM.
3. FLOATS SHALL BE CAPABLE OF SUPPORTING A LIVE LOAD OF 50 POUNDS PER SQUARE INCH WITH A MINIMUM FREEBOARD OF 8".
4. WALKING SURFACE OF CONCRETE FLOATS SHALL BE LEVEL AND FLUSH WITH RESPECT TO ADJACENT FLOATS.
5. FLOATS SHALL BE DESIGNED TO FLOAT LEVEL UNDER DEAD LOAD.
6. FLOAT AND ANCHORAGE SYSTEM SHALL BE DESIGNED FOR THE FOLLOWING LOAD CASES:
   - 6.1. WIND PRESSURE – 15 PSF (77 MPH AT 33 FEET STANDARD ELEVATION, EXPOSURE C, PER ASCE 7–93) ACTING ON THE PROJECT AREA.
   - 6.2. MINIMUM CURRENT PRESSURE OF 0.6 PSF.
   - 6.3. VERTICAL WAVE LOADS FROM A 1' HIGH 1.5 SECOND PERIOD WAVE.
7. PRIOR TO FABRICATION OR CONSTRUCTION, THE CONTRACTOR SHALL FURNISH SHOP DRAWINGS AND CALCULATIONS. CALCULATIONS SHALL BE PERFORMED BY A REGISTERED PROFESSIONAL ENGINEER (STATE OF TENNESSEE). SHOP DRAWINGS SHALL INCLUDE THE REPLACEMENT DOCK SYSTEM, LAYOUT OR MOORING/ACNHORING SYSTEM, DETAILS OF ALL CONNECTIONS, AND ALL OTHER DETAILS NECESSARY TO THE CONSTRUCTION OF THE REPLACEMENT FLOATING DOCK SYSTEM.
8. FLOAT MANUFACTURER SHALL HAVE A MINIMUM OF 10 YEARS EXPERIENCE IN THE DESIGN AND MANUFACTURING OF CONCRETE FLOATS.
9. FLOATS SHALL BE CAST MONOLITHICALLY IN A SINGLE POUR.
10. PRIOR TO THE MANUFACTURING OF FLOATS, THE CONCRETE MIX DESIGN SHALL BE APPROVED. THE CONCRETE MIX SHALL CONTAIN TYPE I OR TYPE II MODIFIED, LOW ALKALI PORTLAND CEMENT. CONCRETE FOR THE TOP SURFACE SHALL CONTAIN POLYPROPYLENE FIBROUS REINFORCEMENT. CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4,000 PSI PER ASTM C–94. COARSE AND FINE AGGREGATES SHALL CONFORM TO ASTM C–33–86M ASTM C–330 LIGHTWEIGHT AGGREGATES IN STRUCTURAL CONCRETE. ALL CONCRETE SHALL BE AIR–ENTRAINED FROM 5 TO 8 PERCENT AND SHALL BE TESTED IN ACCORDANCE WITH ASTM C–138, C–173, OR C–231. WATER CEMENT RATIO SHALL NOT EXCEED 0.45. SLUMP RANGE SHALL BE 3 TO 7 INCHES WHEN TESTED IN ACCORDANCE WITH ASTM C–143–78. THE CONCRETE UNIT WEIGHT SHALL NOT EXCEED 120 PCF.
11. GALVANIZED WELDED WIRE USED AS CONCRETE REINFORCEMENT SHALL BE A MINIMUM SIZE OF 2"X2" – 14/14 AND SHALL MEET ASTM A–185. REINFORCING SHALL BE GRADE 60, CONFIRM TO ASTM 615, AND SHALL BE EPOXY COATED IN ACCORDANCE WITH ASTM A775.
12. THE FLOATS SHALL CONTAIN AND EXPANDED POLYSTYRENE CORE (TYPE I) AND SHALL CONFORM TO ASTM C–578.
13. THE FLOAT DECK SURFACE SHALL BE TOWEL FINISHED AND SHALL HAVE A SLIP–RESISTANT FINISH APPLIED.
14. REPLACEMENT TIMBER SHALL BE PRESSURE TREATED WITH CCA, ACQ, OR ACZA TO 0.6 PCF RETENTION.
15. ALL HARDWARE SHALL BE 316 SS AND ALL STRUCTURAL STEEL REQUIRED FOR REPLACEMENT FLOAT INSTALLATION SHALL BE HOT DIPPED GALVANIZED.

CDM Smith
CDM Smith Inc.
651 East 4th Street Suite 100
Chattanooga, TN 37403
Tel: (423) 771-4495

IAN BEELEREW
REGISTERED ENGINEER
No. 115911
STATE OF TENNESSEE
12/19

DUPONT PUMP STATION AND
BASIN IMPROVEMENTS - PHASE 2 - CONTRACT B
CITY OF CHATTANOOGA, TN
CONSENT DECREE PROGRAM

REV	DATE	REVISION DESCRIPTION
1	12/19	ADDENDUM NO. 1

THIS LINE IS ONE INCH LONG WHEN PLOTTED FULL SCALE

THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE APPLICABLE OR GOVERNING TECHNICAL SPECIFICATIONS AND OTHER CONTRACT DOCUMENTS.

PROJECT NO: 129699-109746

DATE: NOVEMBER 2019

DISC. LEAD:	DESIGNER:	CHECKER:
DU	VF	CF/MT

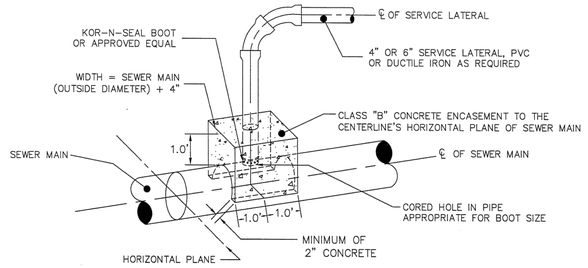
SHEET TITLE
CIVIL
DOCK MODIFICATION DETAILS

SHEET
C-20

ISSUED FOR BID

CREATED: 12/2/2019 LAST SAVED: 12/2/2019 BY: BEELEREW PLOT DATE: 12/2/2019

CREATED: 12/2/2019 LAST SAVED: 12/3/2019 BY: BEELEREW PLOT DATE: 12/3/2019



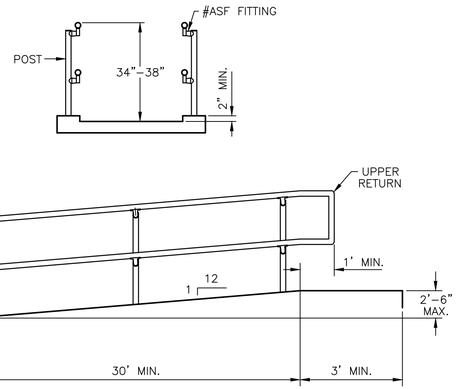
NOTE
ALL SUCH CONNECTIONS TO PIPES 15" OR LARGER MUST HAVE PRIOR APPROVAL BY CITY.

F:\STD\DWGS\Sewer Service Tap\Service Taps (15 inch).dwg

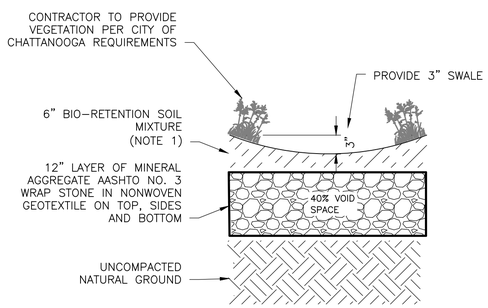
NO.	REVISION	DATE
0	INITIAL ISSUE	8/24/01

CITY OF CHATTANOOGA AND HAMILTON COUNTY
SEWER SERVICE TAP (15" OR LARGER SEWER MAIN)
DATE OF ORIGINAL ISSUE: *AUGUST 24, 2001*
STANDARD NUMBER: *SD-309.01*

SEWER SERVICE TAP
DETAIL A
NTS



HANDRAIL
DETAIL B
NTS



NOTE:

1. BIO-RETENTION SOIL MIXTURE SHALL BE 85% WASHED, COARSE SAND; 10% FINES; 5% ORGANICS FROM PINE BARK.
2. REFER TO CITY OF CHATTANOOGA RAIN RESOURCE GUIDE FOR MORE INFORMATION.

INFILTRATION TRENCH SECTION
DETAIL C
NTS

CDM Smith
CDM Smith Inc.
651 East 4th Street Suite 100
Chattanooga, TN 37403
Tel: (423) 771-4495

DUPONT PUMP STATION AND BASIN IMPROVEMENTS - PHASE 2 - CONTRACT A
CITY OF CHATTANOOGA, TN
CONSENT DECREE PROGRAM

REV	DATE	REVISION DESCRIPTION
1	12/19	ADDENDUM NO. 1

THIS LINE IS ONE INCH LONG WHEN PLOTTED FULL SCALE
THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE APPLICABLE OR GOVERNING TECHNICAL SPECIFICATIONS AND OTHER CONTRACT DOCUMENTS.

PROJECT NO: 129699-109746
DATE: NOVEMBER 2019

DISC. LEAD:	DESIGNER:	CHECKER:
DU	VF	CF/MT

SHEET TITLE
CIVIL

RESTROOM
CIVIL DETAILS

SHEET
CD-8

ISSUED FOR BID

PART 1 GENERAL

1.01 SCOPE:

A. Construction and onsite placement of a prefabricated precast concrete restroom building.

1.02 PERFORMANCE REQUIREMENTS

A. Manufacturer

1. Manufacturer shall be an NPCA Certified Plant or equal.

2. Manufacturer shall have a minimum of 10 years' experience producing, assembling and finishing buildings.

3. Acceptable Manufacturers include but are not limited to:
   a. Huffcutt Concrete, Inc.,4154 123rd Street, Chippewa Falls, Wl 54729 Phone (715) 723-7446, www.huffcutt.com
   b. CXT Concrete Buildings,901 N. Highway 77, Hillsboro, TX 76645 Phone (800) 696-5766 x3480, www.cxtinc.com
   c. Carr Concrete 362 Waverly Road, Williamstown, WV 26187 Phone (304) 464-4441, Fax (304) 464-4013, www.carrconcrete.com
   d. Or Equal.

B. Structural

1. Refer to Drawing S-1 for all applicable Codes and Design Loads.

C. Design

1. Building shall be designed to meet ADA requirements.

D. Concrete

1. Plants for mixing concrete shall conform to ASTM C94.

2. Cement conforming to ASTM C150 or C595.

3. Concrete mixes proportioned using ACI 211.1

4. Coarse and Fine Aggregates conform to ASTM C33.

5. Mixing water conforms to ASTM C1602.

6. Chemical Admixtures used in concrete conform to ASTM C260(Air Entraining), C494 (Mid and High range Water Reducers), C979 (Color Pigments).

7. Compressive strength of Concrete minimum 5000psi at 28 days.

8. Maximum water/cement ratio of .45.

9. Reinforcing Bars- Deformed Billet Steel meets ASTM 615.

10. Steel Bar mats and Welded Wire Reinforcement meets ASTM A184, A185, A497.

11. Cold Weather Concrete
    a. Cold weather concrete placement will be in accordance with ACI 306.
    b. Concrete will not be placed if ambient temperature is expected to be below 35 degrees Fahrenheit during the curing period unless heat is readily available to maintain the surface temperature of the concrete at least 45 degrees Fahrenheit.
    c. Materials containing frost or lumps of frozen materials will not be used.

12. Hot Weather Concrete
    a. The temperature of the concrete will not exceed 90 degrees at the time of placement. When the ambient temperature reaches 90 degrees the concrete will be protected with moist covering.

1.03 SUBMITTALS

A. Manufacturer shall provide shop drawings and engineering.

1.04 QUALITY ASSURANCE

A. Production shall be done in accordance with approved submittals.

B. Pre-pour and post pour checks shall be completed to insure proper dimensioning, component placement, rebar placement, and architectural finish.

C. Concrete batches shall be tested daily for:

1. Aggregate moisture

2. Air entrainment

3. Temperature

D. Yield test and compressive strength cylinders shall be taken at a minimum weekly.

PART 2 PRODUCTS

2.01 MATERIALS

A. Doors and Frames

1. Shall comply with the Steel Door Institute "Recommended Specifications for "Standard Steel Doors and Frames" (SDI-100) and as herein specified. The doors shall be insulated 18 gauge galvanized metal with 16 gauge galvanized

frames. Doors and frames shall include one coat of rust inhibitive primer and two finish coats of enamel paint.

B. Door Hardware

1. Door Closer: Norton CLP7500T or equal.

2. Sweep: Reese 962C Anodized Clear Aluminum, Door Sweep Weather strip Nylon Brush Insert or equal.

3. Hinges: 3 Hinges. Ives 3-BB-l-HW-4.5x4.5-US26D-NRP or equal.

4. Lockset: Key-in-lever cylindrical locksets shall be Falcon T Series or equal and meet the following requirements:
   a. All locks shall meet the new ANSI/BHMA A156.2, Series 4000, Grade 1 for key-in-lever locksets.
   b. Locksets shall be UL Listed (3 hour A Label).
   c. Locksets shall be provided standard with Pressure Release feature. When outside lever is locked, it is not rigid but will move freely without operating the latch bolt.
   d. Lever trim shall have individual heavy-duty compression springs behind rose for lever return and to prevent lever sag. Trim shall be through-bolted with two (2) 10-32 screws coated with thread sealant to provide strength and resistance to loosening. Inner and outer trim shall "bottom out" to prevent door collapse. Roses shall be minimum of 3-1/2" diameter.
   e. All lever designs shall be solid and meet the federal ADA and state disability requirements. Inside levers shall be attached by Allen-head set screw to prevent tampering or vandalism.
   f. Locksets shall adjust to fit door thickness from 1-3/4" to 2-1/8".
   g. All Locksets shall be non-handed and not require field disassembly for re-handling.
   h. Preparation for door must be non-handed.
   i. Acceptable manufacturer: Falcon Lock T571PD DAN 626 98535 5164 or equal.

C. Plumbing

1. Stools
   a. Porcelain wall mounted with flush valve.

2. Urinals
   a. Porcelain wall mounted with flush valve.

3. Lavatory
   a. Porcelain wall mounted with faucet.

4. Hot Water Heater
   a. One (1) Electric Instantaneous - minimum requirement- 3.2 kW, 110/115V 1 Phase 60 Hz with 1.5 GPM .

5. Piping
   a. Drain and vent piping shall be schedule 40 PVC.
   b. Potable water piping shall be PEX tubing,

6. Hose Bibb
   a. Hose Bibb to be installed in plumbing chase.

7. ADA Drinking Fountain with Bottle Refiller

D. Electrical

1. Interior - surface mounted fixtures and conduit.
   a. Kennel vandal proof light fixtures or equal.
   b. Motion sensors.
   c. GFI duplex outlets.
   d. Single pole switches.
   e. Water heater connection.
   f. 12 circuit breaker panel.
   g. Metallic conduit

2. Wall Chase Mounted Electric Hearters
   a. Fan forced upflow, ETL listed, factory rated at 120V, 208V and dual field rate 208V/240V.

3. Restroom Electrical Wall Heater
   a. Fan forced up flow, UL listed
   b. Factory rated 208V
   c. Dual field rate 208V/240V

4. Exterior
   a. 100 Wall HPS wall pack with photo eye control or equal.

5. Electric Wall Mounted Hand Dryers- Xlerator Model No. XL-SB

6. Exhaust Fan System

E. Floor Vents

1. Shall be 16” x 8” made from cast aluminum alloy louvered, with rodent proof screen riveted in.

F. Toilet Paper Dispensers

G. Frame shall be made from 18 gauge, type 304 stainless steel. Tube shall be 20 gauge, 11/8" diameter stainless steel equipped with a padlock. Toilet paper dispenser shall hold 3 rolls of paper. Acceptable manufacturer: Royce Rolls Ringer Company TP-3 or equal.

H. Grab Bars

1. Grab bars shall be 1½" O.D. heavy duty stainless steel with concealed mounting. Tubing shall be 18 gauge seamless construction with exposed surfaces in architectural satin finish. Flanges shall be 13 gauge stainless steel and escutcheons 22 gauge. Each ADA accessible stall shall have (1) 18" vertical, (1) 42" horizontal, and (1) 36" horizontal grab bar. Acceptable manufacturer: Bradley 8120-001 or equal.

I. Mirrors

1. Mirrors shall be durable, sturdy, type 304 stainless steel 18 gauge frame w/satin finish. The mirror shall be A float glass with electro-copper-plated silver back or polished stainless steel. Acceptable manufacturer: Royce Rolls Ringer Company TM1836 or equal.

J. Soap Dispenser

1. Soap dispenser shall be stainless steel. Acceptable manufacturer: Royce Rolls Ringer Company LSV or equal.

K. Paper Towel and Bin

1. Paper towel and bin shall be stainless steel. Acceptable manufacturer: Royce Rolls Ringer Company L-SYSTEM or equal.

L. Sealers

1. Floor shall be sealed using a deep penetrating, high alkali resistant, low volatility product. Acceptable manufacturer: TK Products 290 or equal.

M. Caulks and Grout

1. All joints between precast panels shall be caulked using a durable, flexible polyurethane sealant. Acceptable manufacturer: Tremco Dymonic FC or equal.

2. Grouts shall comply with ASTM C-387 and ASTM C-928 R2 and contain no calcium chloride or other added chlorides that contribute to reinforcement steel corrosion. Grout shall not contain any gypsum-based components.

N. Fold Down Changing Station

2.02 FINISHES

A. Interior

1. Smooth trowel finish.

B. Exterior

1. Wall panels shall be Ashlar Stone or equal on bottom 3' with Weathered Tongue & Groove or equal on top.

2. Roof shall be simulated cedar shake appearance.

C. Paint

1. Interior
   a. Wall panels shall be primed with premium quality water based acrylic multipurpose bonding primer moisture and alkali resistant up to 13.0 pH. ICI Paints or equal. Finish coat shall be high performance acrylic semi-gloss enamel. Acceptable manufacturer: Devoe High Performance Devflex Coating or equal.

2. Exterior
   a. Roof shall be covered with a quality 100% acrylic satin paint. Acceptable manufacturer: Hallman Lindsay Weatherguard 100% Acrylic Satin 172 or equal.
   b. Wall panels shall be covered with a quality concrete stain. Acceptable manufacturer: H&C Concrete Stain Water Based or equal.

3. Doors

4. Metal surfaces both interior and exterior shall be covered using a high performance 100% acrylic satin enamel. Acceptable manufacturer: Hallman Lindsay Duratech 100% Acrylic Satin Enamel or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Placement:

1. Building should be placed to accommodate ADA requirements for access.

2. Delivery and setting at the site and access to the site require clearance for a truck carrying pre-fabricated building and a crane. The access area must have a minimum height of 14' 6‘ and a minimum width of 14'. It must also be able to accommodate a 78' vehicle and its increased turning radius. The site must be able to have both the crane and the truck carrying the pre-fabricated building in it at the same time.

B. Excavation

1. Finished floor height shall be 6 inches above finished grade considering surrounding elevations, ADA accessibility, rain water runoff, and other site specific criteria.

END OF SECTION

DUPONT PUMP STATION AND BASIN IMPROVEMENTS – PHASE 2
(CONTRACT A)
CONTRACT NUMBER W-12-026-202

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

City of Chattanooga, Tennessee
Purchasing Department
101 E. 11th Street, Suite G13
Chattanooga, TN 37402

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for period of time after the Bid opening as stated in the Advertisement for Bids, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities)

that have been identified in SC-4.02 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06 as containing reliable "technical data."

E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

J. Where this Bid Form contains the provision for a bid based on a lump sum price, the Bidder shall be responsible for having prepared its own estimate of the quantities necessary for the satisfactory completion of the Work specified in these Contract Documents and for having based the lump sum price bid on its estimate of quantities.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. “corrupt practice” means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;

2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price
Mobilization / Demobilization					
1	Furnish all products, materials, and equipment and perform all labor necessary to complete and put into operation the DuPont Pump Station and Basin Improvements (Phase 2), including all work shown on the Drawings and per the requirements provided in the Specifications, but not including Bid Items 2 and 3.	Lump Sum			$
2	Furnish all products, materials, and equipment and perform all labor necessary to complete the ***precast restroom***, including all work shown on the Drawings and per the requirements provided in the Specifications.	Lump Sum			$
3	Furnish all products, materials, and equipment and perform all labor necessary to complete the ***dock repairs***, including all work shown on the Drawings and per the requirements provided in the Specifications,	Lump Sum			$
Cash Allowances					
4	Soil, Concrete and Materials Testing	Allowance			$ 40,000
5	Construction Verification Surveying	Allowance			$ 15,000
6	Permitting	Allowance			$ 15,000
7	Landscape Plan Development and Landscaping	Allowance			$ 50,000
8	Connection to Existing Waterline	Allowance			$ 30,000
9	Power Company Allowance	Allowance			$ 100,000
				Total Base Bid:	**$**

BID TOTAL, ITEMS 1 THROUGH 9, INCLUSIVE, THE AMOUNT OF _____

_____

_____ DOLLARS ($_____).

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Statement of Bidders Qualifications

B. Affidavit of No Collusion by Prime Bidder

C. Drug-Free Workplace Affidavit

D. Iran Divestment Act Compliance Certification

E. Attestation Regarding Personnel Used in Contract Performance

F. Certification By Proposed Prime or Subcontractor Regarding Equal Employment Opportunity

G. Certification Regarding Debarment, Suspension and Other Responsibility Matters

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid submitted by:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual's signature)

Doing business as: _____

Attest: _____
(Notary)

Name (typed or printed): _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner – attach evidence of authority to sign)

Name (typed or printed): _____

Attest: _____
(Signature of another Partner)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest: _____
(Signature of Corporate Secretary)

Name (typed or printed): _____

Date of Qualification to do business in Tennessee is _____

A Joint Venture

Name of Joint Venturer: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of second joint venture partner)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

All Bidders shall complete the following:

Bidder's Business address: _____

_____

Phone: _____ Facsimile: _____

Primary Contact: _____

E-mail: _____

Submitted on _____, 201___.

State Contractor License No. _____.

This document was prepared in part from material (EJCDC C-410 Suggested Bid Form for Construction Contracts) which is copyrighted as indicated below:

Appendix A

Geotechnical Data Report

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Terracon GeoReport

Geotechnical Data Report

DuPont Gravity Sewer and Pump Station
Chattanooga, Tennessee

October 26, 2018

Terracon Project No. E2175151

Prepared for:

CDM Smith

Knoxville, TN

Prepared by:

Terracon Consultants, Inc.

Chattanooga, Tennessee

October 26, 2018

CDM Smith
1100 Marion Street, Suite 300
Knoxville, TN 37921

Attn: Mr. Daniel Unger, P.E.
E: ungerdi@cdmsmith.com

Re: Geotechnical Data Report
DuPont Gravity Sewer and Pump Station
DuPont Parkway to Dixie Drive
Chattanooga, Tennessee
Terracon Project No. E2175151

Dear Mr. Unger:

This Geotechnical Data Report documents the results of field and laboratory programs described in the contract documents. Attached find:

- Boring logs with field and laboratory data (Boring Nos.B-101 through B-113; B-201-B-210; B-215 and B-216);
- Stratification based on visual soil and rock classification is included on the logs;
- Groundwater levels observed during and at completion of drilling;
- Site Location Plans and Boring Location Plans;
- Subsurface exploration conditions;
- Description of subsurface conditions; and
- Tabulated laboratory results and appendices of laboratory reports.

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

Sincerely,
Terracon Consultants, Inc.

John D. Cannon, P.E.
Senior Engineer

Frank Whitman, P.E.
Senior Engineer

Terracon Consultants, Inc. 51 Lost Mound Drive, Suite 135 Chattanooga, TN 37406
P 423 499 6111 F 423 499 8099 terracon.com

REPORT TOPICS

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS (Boring Logs and Laboratory Data)
SUPPORTING INFORMATION (General Notes, Unified Soil Classification System, and Description of Rock Properties)

Geotechnical Data Report

DuPont Gravity Sewer and Pump Station
DuPont Parkway to Dixie Drive
Chattanooga, Tennessee

Terracon Project No. E2175151

October 26, 2018

INTRODUCTION

This data report presents the results of our subsurface exploration for the proposed Gravity sewer and Pump Station project to be located at DuPont Parkway to Dixie Drive in Chattanooga, Tennessee.

The geotechnical engineering scope of services for this project included the advancement of 25 test borings to depths ranging from approximately 15 to 60 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section of this report.

SITE CONDITIONS

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

Item	Description
Parcel Information	The gravity sewer will extend from DuPont Parkway to Dixie Drive in Chattanooga, Tennessee. The pump station will be located at approximate GPS coordinates 35.0959, -85.2664.
Existing Improvements	The gravity sewer will follow an existing public easement. The planned alignment is mostly wooded. The pump station will be in an area that is currently partially asphalt-paved and partially grassed.
Existing Topography	The invert of the gravity sewer will start at approximate elevation 648.7 and end at 645.0.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed in the project planning stage and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Information was provided by Daniel Unger, P.E., with CDM Smith
Project Description	Gravity Sewer, about 7,000 LF, 48 inches in diameter, including 1 railroad crossing and 1 aerial creek crossing Pump station (20 to 22 feet deep) with an adjacent electrical building, emergency generator, and diversion structure
Estimated Start of Construction	2019

GEOTECHNICAL CHARACTERIZATION

Geology

The project site is in the Valley and Ridge, a geologic setting in which parallel valleys and ridges are oriented southwest–northeast. The area is characterized by ancient sedimentary rocks which have been subjected to thrust faulting, resulting in the formation of perpendicular joints – fractures along which there has been little if any movement – with one set oriented southwest-northeast and the other set southeast-northwest. The ridges tend to have a resistant cap of sandstone underlain by limestone, dolomite and shale sequences, similar to those found in the valleys. Limestone and dolomite are carbonate rocks which have an elevated potential to be impacted by weathering and solution activity, especially along joints and bedding planes. Solution activity can result in development of soft soil zones at the soil-rock interface, and weathering of bedrock along joints producing voids, slots (void or soil-filled) or caverns. Soil or rock overlying a void may remain stable due to arching, but when de-stabilized, can result in a surface breach, either a “drop out” or a sinkhole.

The rock formation underlying the site is the Chickamauga Group, a predominantly limestone sequence which may include greenish-gray calcareous shale, shaley limestone and dolomite.

Subsurface Profile

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting. The following table provides our geotechnical characterization. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/Density/Rock Strength
Surface	0.3 to 0.8	Topsoil or Asphalt pavement and aggregate base	N/A
Existing Fill [1]	3 to 6	Uncontrolled fill comprised of lean clay, gravelly lean clay, and sand and gravel.	Variable
Upper Soils	15 to 30 [2]	Lean clay, fat clay, sandy lean clay, clayey sand	Cohesive: Typically, stiff to hard with some zones of very soft to medium stiff Cohesionless: Lose to medium dense
Lower Soils	15 to 36.2 [3]	Sandy silt, silt, silty sand, sand, sand and gravel	Cohesive: Very soft to medium stiff Cohesionless: Typically, medium dense to dense
Bedrock	All other test borings terminated in this stratum	Limestone with some shale.	Medium strong

1. Only encountered at test borings B-108, B-205, B-206, B-208.
2. Test borings B-102, B-105, B-109 to B-113, B-201 to B-207, B-209, B-210, B-215, and B-216 terminated in this stratum.
3. Test borings B-103, B-106, and B-208 terminated in this stratum.

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed in the boreholes can be found on the boring logs in **Exploration Results** and are summarized below.

Boring Number	Approximate Depth to Groundwater while Drilling (feet) [1]	Approximate Depth to Groundwater after Drilling (feet) [1]
B-101	31 (el. 623)	Not encountered
B-106	27 (el.625)	Not encountered
B-107	27 (el.625)	Not encountered
B-108	26 (el.626)	Not encountered

1. Below ground surface

Groundwater was not observed in the remaining borings while drilling, or for the short duration the borings could remain open. However, this does not necessarily mean the borings terminated above groundwater, or the water levels summarized above are stable groundwater levels. A relatively long period may be necessary for a groundwater level to develop and stabilize in a borehole. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

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

The project site is located just downstream of the Chickamauga Dam on the Tennessee River. The pool elevation of the Tennessee River at the project site is heavily dependent upon TVA's management of the Tennessee River at the upstream dam and downstream Nickajack Dam. However, the Tennessee River pool elevation is generally between 630 and 640 feet, MSL under normal circumstances. According to NOAA, flood stage is at Elevation 651 feet.

GENERAL COMMENTS

As the project progresses, we address assumptions by incorporating information provided by the design team, if any. Revised project information that reflects actual conditions important to our services is reflected in the final report. The design team should collaborate with Terracon to confirm these assumptions and to prepare the final design plans and specifications. This facilitates the incorporation of our opinions related to implementation of our geotechnical recommendations. Any information conveyed prior to the final report is for informational purposes only and should not be considered or used for decision-making purposes.

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather.

The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

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

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

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

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ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

CDM Smith prescribed the following boring locations:

Number of Borings	Planned Boring Depth (feet) [1]	Planned Location
8 (B-101 to B-108)	30 to 60 feet	Pump Station, Diversion Structure, Electrical Building, and Generator
2 (B-109 and B-110)	20 feet	Manholes near Pump Station
3 (B-111 to B-113)	15 feet	Parking Area
14 (B-201 to B-210)	15 to 20 feet	Gravity Sewer Alignment (approximate 500-foot spacing)
2 (B-215 and B-216)	15 feet	Railroad crossing for gravity sewer

1. Feet below the ground surface

Boring Layout and Elevations: Borings were staked and surveyed by CDM Smith.

Subsurface Exploration Procedures: We advanced soil borings with a track- or truck-mounted drill rig using continuous flight hollow stem augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Soil sampling was performed using split-barrel or thin-walled sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample. A standard 2-inch outer diameter split barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. The samples were placed in appropriate containers, taken to our soil laboratory for testing, and classified by a geotechnical engineer.

Test borings B-101, B-104, and B-108 extended to auger refusal. Upon encountering bedrock or refusal-to-drilling conditions at these locations, rock coring (using NQ2 rock core barrel) was performed.

Our exploration team prepared field boring logs as part of standard drilling operations including sampling depths, penetration distances, and other relevant sampling information. Field logs include

visual classifications of materials encountered during drilling, and our interpretation of subsurface conditions between samples. Final boring logs, prepared from field logs, represent the geotechnical engineer's interpretation, and include modifications based on observations and laboratory tests.

Laboratory Testing

CDM Smith provided Terracon with the laboratory testing assignments for the sampled soil and rock strata. Procedural standards noted below are for reference to methodology in general. In some cases, local practices and professional judgement require method variations. Standards noted below include reference to other related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
- ASTM D2435/D2435M Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading
- ASTM D4767 Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils (3 point test)
- ASTM D7012 Standard Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperature – Method C

SITE LOCATION AND EXPLORATION PLANS

EXPLORATION PLAN

DuPont Additional Borings ■ Chattanooga, TN
October 19, 2018 ■ Terracon Project No. E2175151

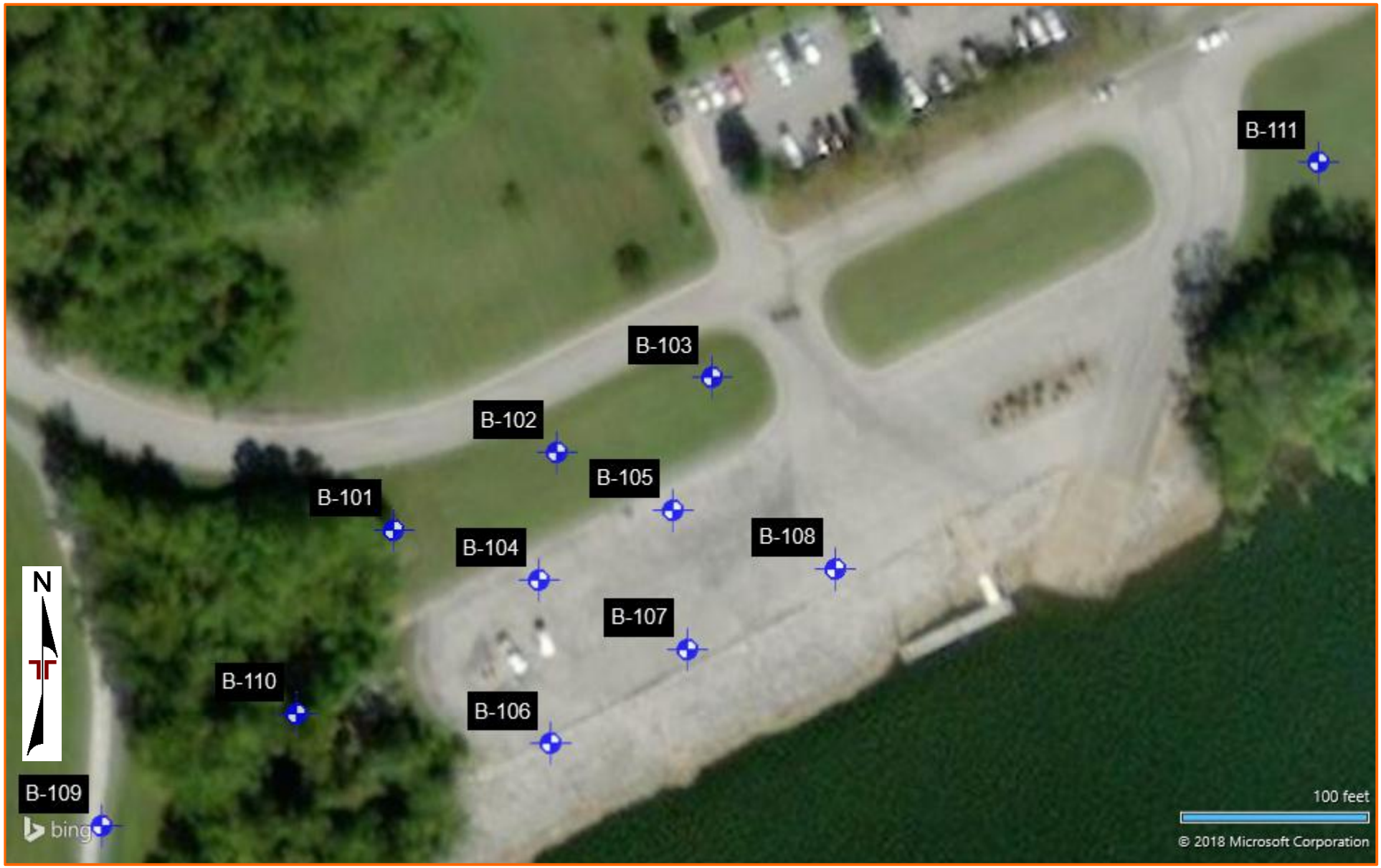


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

DuPont Additional Borings ■ Chattanooga, TN

October 19, 2018 ■ Terracon Project No. E2175151

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

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

DuPont Additional Borings ■ Chattanooga, TN
October 19, 2018 ■ Terracon Project No. E2175151

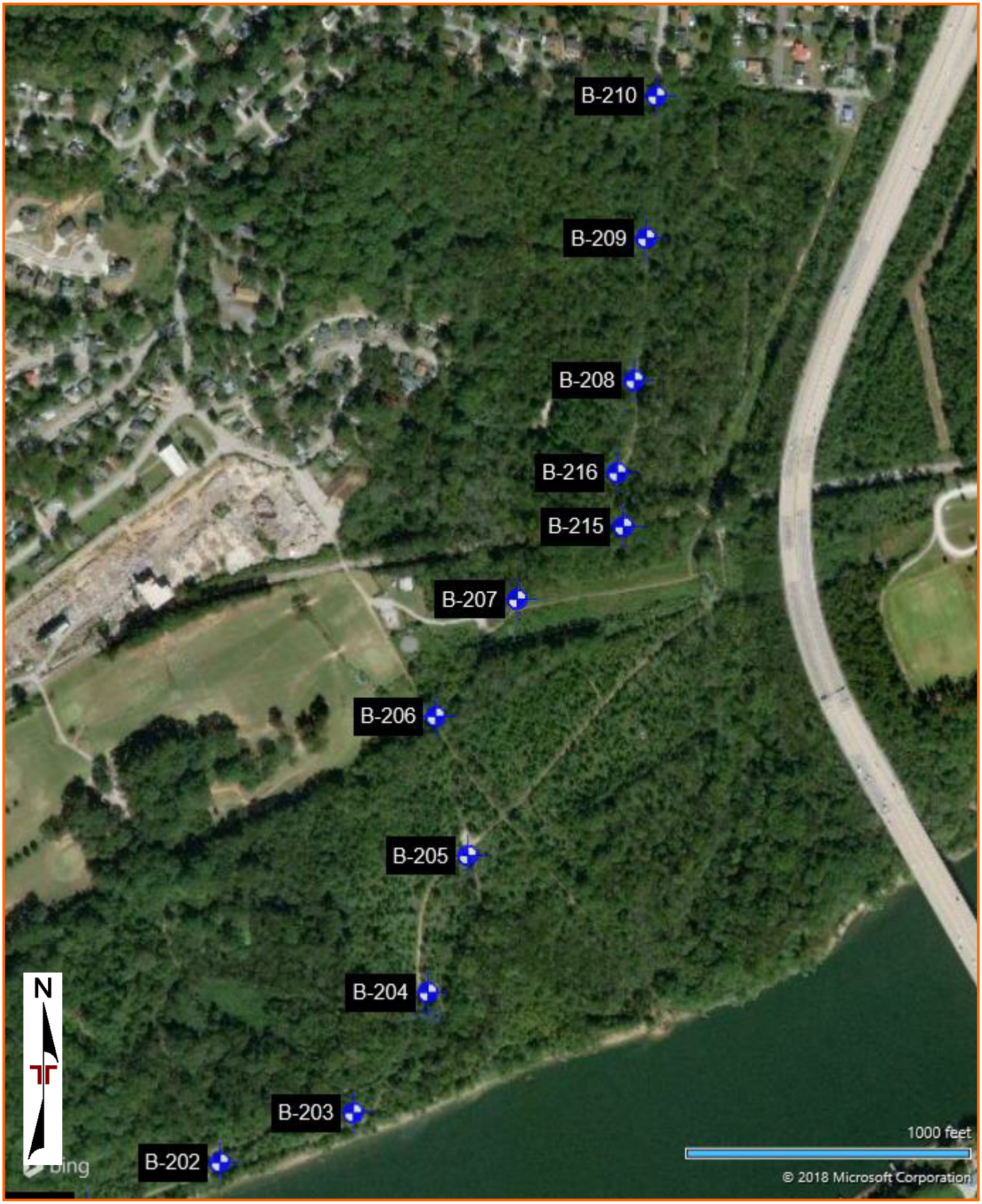


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

BORING LOG NO. B-101

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.096° Longitude: -85.2667°

Approximate Surface Elev: 654 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.3	653.5+/-													
ASPHALT														
0.5	653.5+/-													
AGGREGATE														
FAT CLAY (CH), trace mica, dark brown, very stiff				X	6-7-9 N=16	78		4.5 (HP)				19	54-25-29	97
				X	6-9-12 N=21	78		4.5 (HP)				20		
		5												
stiff				X	3-5-9 N=14	89		4.5 (HP)						
				X	3-4-7 N=11	83		4.25 (HP)				23		
		10												
				X	3-4-5 N=9	83		2.25 (HP)				25		
		15												
				X	3-4-5 N=9									
		20												
22.0	632+/-													
SANDY SILT (ML), trace mica, dark brown, medium stiff				X	2-2-2 N=4	100		1.0 (HP)				32		
		25												
soft				X	0-1-2 N=3	100		0.25 (HP)				41	NP	57
		30	▽											

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

Hammer Type: Automatic

Advancement Method:
0'-36.2' - Hollow Stem Auger
36.2'-51.2' - NQ2 Wireline Core

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 31' while drilling*

No water observed after drilling

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-27-2018 | Boring Completed: 07-27-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-101

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.096° Longitude: -85.2667°

Approximate Surface Elev: 654 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)
		SANDY SILT (ML), trace mica, dark brown, medium stiff *(continued)*	0-50/1"					
36.2	618+/-	***Auger Refusal at 36.1'***						
		Begin NQ2 Wireline Rock Core **SHALY LIMESTONE**, gray with dark red and green limestone partings	**RUN 1:** Depth: 36.2' - 41.2' Run Length: 5'	88	54	UC	18.2 (ksi)	
		-includes dark gray zones	**RUN 1:** Depth: 41.2' - 51.2' Run Length: 10'	79	62			
51.2	603+/-	***Coring Terminated at 51.2 Feet***						

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

Hammer Type: Automatic

Advancement Method:
0'-36.2' - Hollow Stem Auger
36.2'-51.2' - NQ2 Wireline Core

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

Water encountered at 31' while drilling

No water observed after drilling

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-27-2018 | Boring Completed: 07-27-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-102

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0961° Longitude: -85.2664°

Approximate Surface Elev: 657 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.5	656.5+/-										
TOPSOIL											
FAT CLAY (CH), with silt, with mica, brown, stiff			3-5-6 N=11	56	4.5 (HP)						
			3-4-6 N=10	67	4.5 (HP)						
		5	4-5-7 N=12	89	4.25 (HP)						
			3-3-6 N=9	78	3.5 (HP)						
		10									
			2-3-5 N=8	94	2.5 (HP)						
		15									
			4-5-18 N=23	100	1.5 (HP)				27		
		20									
22.0	635+/-										
LEAN CLAY (CL), gray, medium stiff			2-2-2 N=4	100	0.25 (HP)				30	41-21-20	87
		25									
			2-2-3 N=5	67	1.0 (HP)				42		77
30.0	627+/-	30									
Boring Terminated at 30 Feet											

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with grout upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-25-2018 | Boring Completed: 07-25-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-103

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0962° Longitude: -85.2661°

Approximate Surface Elev: 657 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DESCRIPTION	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5	656.5+/-	**TOPSOIL**						
		FAT CLAY (CH), with mica, yellow and brown, stiff	2-4-5 N=9	61	4.5 (HP)	20	52-24-28	97
			3-4-7 N=11	61	4.5 (HP)			
6.0	651+/-	**LEAN CLAY (CL)**, with mica, yellow and brown, stiff	3-5-6 N=11	100	3.75 (HP)	24	47-23-24	96
			3-4-5 N=9	89	3.0 (HP)	25		
			2-3-5 N=8	89	2.75 (HP)			
17.0	640+/-	**SANDY SILT (ML)**, with mica, gray and brown, medium stiff	2-3-4 N=7	100	1.5 (HP)	28		
			1-2-2 N=4	100	0.75 (HP)	29		
30.0	627+/-		2-2-3 N=5	100	0.5 (HP)	44	NP	61
		Boring Terminated at 30 Feet						

STRENGTH TEST: TEST TYPE | COMPRESSIVE STRENGTH (tsf) | STRAIN (%)

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with grout upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-25-2018 | Boring Completed: 07-25-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-104

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.096° Longitude: -85.2664°

Approximate Surface Elev: 652 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
				2-3-4 N=7	44		3.0 (HP)				18		53
				6-4-5 N=9	28		2.5 (HP)						
		5											
				2-3-4 N=7	67		2.25 (HP)						
				2-2-4 N=6	56		1.75 (HP)						
		10						UC	1.81	15	25		
				2-3-4 N=7	100		1.0 (HP)						
		15											
				W.O.H.	50		0.25 (HP)				27	33-22-11	71
		20						CU					
								UC	0.85	4.6	31		
				0-0-3 N=3	100		0.25 (HP)				33	30-25-5	63
		25											
				RUN 1: Depth: 28.2' - 30' Run Length: 1.8'	100	88		UC	18.9 (ksi)				
		30											

3.0 649+/- **LEAN CLAY (CL)**, with sand, yellow to red, medium stiff

LEAN CLAY (CL), dark gray, medium stiff to stiff

-Shelby tubes pushed from 6'-8', 8'-10', and 10'-12' at nearby offset location

8.0 644+/- **LEAN CLAY (CL)**, with sand, micaceous, brown, medium stiff to stiff

very soft

-Shelby tubes pushed from 20'-22' and 22'-24' at nearby offset location

22.0 630+/- **SANDY SILT (ML)**, brown, soft to medium stiff

28.2 624+/- ***Auger Refusal at 28.2'***

Begin NQ2 Wireline Rock Core
DOLOMITIC LIMESTONE WITH SHALE PARTINGS

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

Hammer Type: Automatic

Advancement Method:
0'-28.2' - Hollow Stem Auger
28.2'-45.0' - NQ2 Wireline Core

Abandonment Method:

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:
Shelby tube samples obtained from offset boring.

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-27-2018 | Boring Completed: 07-27-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-104

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.096° Longitude: -85.2664°

Approximate Surface Elev: 652 (Ft.) +/-

DEPTH ELEVATION (Ft.)

GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
DOLOMITIC LIMESTONE WITH SHALE PARTINGS *(continued)* -includes calcite infilling	35			**RUN 2:** Depth: 30' - 40' Run Length: 10'	58	28							
-includes red and green calcareous shale partings	40			**RUN 3:** Depth: 40' - 45' Run Length: 5'	58	30							
45.0 607+/-	45												
Coring Terminated at 45 Feet													

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

Hammer Type: Automatic

Advancement Method:
0'-28.2' - Hollow Stem Auger
28.2'-45.0' - NQ2 Wireline Core

Abandonment Method:

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-27-2018 | Boring Completed: 07-27-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-105

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0961° Longitude: -85.2662°

Approximate Surface Elev: 655 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3 **ASPHALT**	654.5+/-							
0.8 **AGGREGATE**	654+/-							
LEAN CLAY (CL), trace sand, yellow to red, medium stiff to stiff			2-4-3 N=7			26		86
			4-5-8 N=13	72	3.0 (HP)	17	45-21-24	
5.5	649.5+/-	5						
CLAYEY SAND (SC), with gravel, trace mica, brown, loose			2-2-3 N=5	67	1.25 (HP)	26		43
			2-3-4 N=7	33	1.75 (HP)			
		10						
			2-2-2 N=4	78	1.5 (HP)	25		
		15						
			2-3-3 N=6	100	0.75 (HP)			
20.0	635+/-	20						
LEAN CLAY (CL), with sand, gray, soft			0-1-2 N=3	100	0 (HP)	30	36-20-16	84
		25						
			1-5-13 N=18	100	0.25 (HP)	44		
30.0	625+/-	30						
Boring Terminated at 30 Feet								

STRENGTH TEST

TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with grout upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-30-2018 Boring Completed: 07-30-2018

Drill Rig: DR754 Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-106

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0957° Longitude: -85.2664°

Approximate Surface Elev: 652 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.3 **ASPHALT**	651.5+/-													
0.8 **AGGREGATE**	651+/-													
GRAVELLY LEAN CLAY (CL), yellow to red, medium stiff to stiff				X	3-3-3 N=6	61		3.0 (HP)				19		51
				X	2-3-3 N=6	67		2.0 (HP)				18		
		5		X	2-2-3 N=5	78		1.0 (HP)				27		
6.5	645.5+/-													
LEAN CLAY (CL), gray, medium stiff to stiff				X	2-4-6 N=10	83		3.75 (HP)				22		
		10												
brown				X	2-3-5 N=8	89		3.0 (HP)				23		
		15												
micaceous				X	2-3-4 N=7	100		0.75 (HP)				27	39-23-16	87
20.0	632+/-													
SILTY SAND (SM), dark gray, very loose		20												
				X	W.O.H.	100		0.25 (HP)				27		
		25	▽											
28.5	623.5+/-													
SILTY SAND (SM), with gravel, dark gray, dense				X	9-15-15 N=30	83		0.5 (HP)				35	31-29-2	23
30.0	622+/-	30												
Boring Terminated at 30 Feet														

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with grout upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 27' while drilling*

No water observed after drilling

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-25-2018 | Boring Completed: 07-25-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-107

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0958° Longitude: -85.2662°

Approximate Surface Elev: 652 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.3 **ASPHALT**	651.5+/-													
0.8 **AGGREGATE**	651+/-													
CLAYEY SAND (SC), with gravel, yellow to brown, loose, (probable fill)				X	3-2-3 N=5	61		2.0 (HP)				16		
				X	2-3-3 N=6	61		2.25 (HP)				16	43-19-24	50
6.5	645.5+/-	5		X	1-2-3 N=5	78		1.0 (HP)						
FAT CLAY (CH), with sand, trace mica, gray, soft to medium stiff				X	0-1-2 N=3	94		0.5 (HP)				36	50-24-26	79
brown		10		X	2-3-4 N=7	100		1.5 (HP)						
22.0	630+/-	15		X	2-3-4 N=7	21		1.25 (HP)				26		
SILT (ML), with sand, brown, very soft		20		X	1-1-1 N=2	20		0.25 (HP)				35	30-28-2	71
27.0	625+/-	25	▽											
SAND (SP), brown and gray, dense				X	16-23-15 N=38	89						15		13
30.0	622+/-	30												
Boring Terminated at 30 Feet														

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with grout upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 27' while drilling*

No water observed after drilling

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-25-2018 | Boring Completed: 07-25-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-108

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.096° Longitude: -85.2659°

Approximate Surface Elev: 652 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.3	651.5+/-													
ASPHALT														
FILL - LEAN CLAY (CL), with rock fragments, light brown and red					3-2-3 N=5	11		1.75 (HP)						
					2-3-3 N=6	22		2.0 (HP)				17	49-20-29	
6.0	646+/-	5												
LEAN CLAY (CL), dark gray, medium stiff to stiff					1-2-3 N=5	56		2.75 (HP)				27		
					0-1-2 N=3	56		1.25 (HP)	UC	1.42	6	35 35	48-25-23	94
12.0	640+/-	10												
LEAN CLAY (CL), dark brown with gray mottles, medium stiff					2-3-4 N=7	83		2.0 (HP)				26		
with mica, brown, stiff		15												
					2-3-4 N=7	83		2.5 (HP)				22	38-21-17	
22.0	630+/-	20												
LEAN CLAY (CL), with sand, micaceous, dark gray, soft					1-1-1 N=2	24		0.25 (HP)				38	37-24-13	84
27.0	625+/-	25	▽											
SAND WITH GRAVEL (SP), gray, dense					16-23-15 N=38	78						10		6
		30												

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

Hammer Type: Automatic

Advancement Method:
0'-33.6' - Hollow Stem Auger
33.6'-59.6' - NQ2 Wireline Core

Abandonment Method:

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:
Shelby tubes obtained from offset boring.

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 26' while drilling*

No water observed after drilling

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-24-2018 | Boring Completed: 07-24-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-108

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.096° Longitude: -85.2659°

Approximate Surface Elev: 652 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)
		SAND WITH GRAVEL (SP), gray, dense *(continued)*								
33.6	618.5+/-	***Auger Refusal at 33.6'***			50/1"	0				
		Begin NQ2 Wireline Rock Core								
35.0	617+/-	**LIMESTONE**, gray	35		**RUN 1:** Depth: 33.6' - 39.6' Run Length: 6'	82	57	UC	18.1 (ksi)	
36.0	616+/-	**CLAY**, red								
		LIMESTONE WITH SHALE PARTINGS, gray								
40.0	612+/-		40		**RUN 2:** Depth: 39.6' - 44.1' Run Length: 4.5'	82	69			
		LIMESTONE, gray, with greenish gray dolomitic zones								
44.1	608+/-									
		VOID	45							
					RUN 3: Depth: 44.1' - 53.7' Run Length: 9.6'	0	0			
53.7	598.5+/-		50							
		LIMESTONE WITH SHALE PARTINGS, gray, greenish gray dolomite zones	55		**RUN 4:** Depth: 53.7' - 59.6' Run Length: 5.9'	100	44			
59.6	592.5+/-									
		Coring Terminated at 59.6 Feet								

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

Hammer Type: Automatic

Advancement Method:
0'-33.6' - Hollow Stem Auger
33.6'-59.6' - NQ2 Wireline Core

Abandonment Method:

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

Water encountered at 26' while drilling

No water observed after drilling

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-24-2018 | Boring Completed: 07-24-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-109

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0956° Longitude: -85.2672°

Approximate Surface Elev: 660 (Ft.) +/-

DEPTH	ELEVATION (Ft.)
0.3	659.5+/-
20.0	640+/-

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)
0.3				
		4-5-7 N=12	44	4.5 (HP)
		4-5-7 N=12	61	4.5 (HP)
5		3-5-6 N=11	78	4.5 (HP)
		3-4-5 N=9	67	3.5 (HP)
10				
		2-3-4 N=7	83	1.75 (HP)
15				
		2-3-4 N=7	100	1.25 (HP)
20				

TOPSOIL

LEAN CLAY (CL), with silt, trace mica, dark brown, stiff

medium stiff

Boring Terminated at 20 Feet

STRENGTH TEST				WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI	

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-25-2018 | Boring Completed: 07-25-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-110

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0958° Longitude: -85.2669°

Approximate Surface Elev: 635 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.3 **ASPHALT**	634.5+/-										
0.8 **AGGREGATE**	634+/-										
SANDY LEAN CLAY (CL), yellow to red, stiff			3-5-7 N=12	33	3.5 (HP)				15		
			3-4-5 N=9	78	3.25 (HP)				19	40-21-19	64
6.0	629+/-	5									
LEAN CLAY (CL), brown, medium stiff			2-3-4 N=7	78	3.0 (HP)				24		
			2-3-4 N=7	100	1.5 (HP)				25		
		10									
			1-3-3 N=6	100	0.75 (HP)				26	41-20-21	86
		15									
			2-3-3 N=6	100	1.25 (HP)				28		
20.0	615+/-	20									
Boring Terminated at 20 Feet											

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with grout upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-25-2018 | Boring Completed: 07-25-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-111

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0966° Longitude: -85.265°

Approximate Surface Elev: 655 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)
0.3 **TOPSOIL**	654.5+/-					
LEAN CLAY (CL), brown, medium stiff				2-3-3 N=6	44	4.5 (HP)
				4-5-8 N=13	56	4.5 (HP)
stiff		5		3-4-6 N=10	67	3.75 (HP)
				3-4-6 N=10	17	3.5 (HP)
		10				
				2-3-5 N=8		
15.0	640+/-	15				
Boring Terminated at 15 Feet						

STRENGTH TEST				ATTERBERG LIMITS	
TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	LL-PL-PI	PERCENT FINES

RQD (%)

WATER LEVEL OBSERVATIONS

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-30-2018 | Boring Completed: 07-30-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-112

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0968° Longitude: -85.2645°

Approximate Surface Elev: 654 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.3	653.5+/-											
TOPSOIL												
LEAN CLAY (CL), trace mica, dark brown, stiff			3-6-4 N=10	56		4.0 (HP)				23	44-23-21	89
			4-5-7 N=12	22		3.5 (HP)				24		
		5	2-3-5 N=8									
8.0	646+/-											
FAT CLAY (CH), trace mica, dark brown, stiff			3-6-7 N=13	44		4.25 (HP)				24	51-25-26	98
		10										
15.0	639+/-		3-7-9 N=16	44		4.25 (HP)				25		
Boring Terminated at 15 Feet		15										

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-30-2018 | Boring Completed: 07-30-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-113

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0966° Longitude: -85.2646°

Approximate Surface Elev: 650 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3	649.5+/-							
TOPSOIL								
FAT CLAY (CH), trace silt, brown, medium stiff to stiff			2-2-3 N=5	44	4.5 (HP)			
			3-4-6 N=10	78	3.25 (HP)	23	50-26-24	98
		5	2-3-5 N=8	89	3.5 (HP)			
			2-4-5 N=9	33	3.25 (HP)			
		10						
			3-9-6 N=15	100	2.5 (HP)			
15.0	635+/-	15						
Boring Terminated at 15 Feet								

STRENGTH TEST: TEST TYPE | COMPRESSIVE STRENGTH (tsf) | STRAIN (%)

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 07-30-2018 | Boring Completed: 07-30-2018

Drill Rig: DR754 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-201

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0971° Longitude: -85.2632°

Approximate Surface Elev: 656 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)
0.3	655.5+/-				
TOPSOIL					
LEAN CLAY (CL), brown, medium stiff to stiff				2-4-3 N=7	56
		5		2-5-8 N=13	56
dark brown				2-5-7 N=12	44
		10		3-6-6 N=12	56
				4-7-8 N=15	56
15.0	641+/-	15			
Boring Terminated at 15 Feet					

RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-07-2018 | Boring Completed: 08-07-2018

Drill Rig: DR890 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-202

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0976° Longitude: -85.2617°

Approximate Surface Elev: 657 (Ft.) +/-

DEPTH	ELEVATION (Ft.)
0.3	656.5+/-
15.0	642+/-

TOPSOIL

LEAN CLAY (CL), brown, medium stiff to stiff

Boring Terminated at 15 Feet

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)
5		2-3-4 N=7	67
		3-5-8 N=13	67
		3-5-7 N=12	56
10		3-6-7 N=13	78
15		3-6-7 N=13	72

RQD (%) | LABORATORY HP (tsf) | STRENGTH TEST: TEST TYPE, COMPRESSIVE STRENGTH (tsf), STRAIN (%) | WATER CONTENT (%) | ATTERBERG LIMITS: LL-PL-PI | PERCENT FINES

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-07-2018 | Boring Completed: 08-07-2018

Drill Rig: DR890 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-203

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0981° Longitude: -85.2601°

Approximate Surface Elev: 661 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.3 **ASPHALT**	660.5+/-													
0.8 **AGGREGATE**	660+/-													
LEAN CLAY (CL), with gravel, yellow to red, medium stiff to stiff				X	2-4-2 N=6	67						24		
				X	3-4-5 N=9	44						17		
6.0	655+/-	5												
LEAN CLAY (CL), brown, stiff				X	1-5-6 N=11	44						19		
				X	3-4-6 N=10	67						22		
		10												
				X	3-4-6 N=10	56						24	39-21-18	89
		15												
				X	3-5-7 N=12	100						24		
20.0	641+/-	20												
Boring Terminated at 20 Feet														

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-07-2018 | Boring Completed: 08-07-2018

Drill Rig: DR890 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-204

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.0992° Longitude: -85.2592°

Approximate Surface Elev: 661 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)
0.3 **ASPHALT**	660.5+/-				
0.8 **AGGREGATE**	660+/-				
LEAN CLAY (CL), with gravel, yellow to red, very stiff to stiff				9-10-10 N=20	78
				3-5-7 N=12	78
		5			
6.0	655+/-			4-5-9 N=14	78
LEAN CLAY (CL), brown, stiff				4-5-7 N=12	89
		10			
				3-5-6 N=11	56
15.0	646+/-	15			
Boring Terminated at 15 Feet					

RQD (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-07-2018 | Boring Completed: 08-07-2018

Drill Rig: DR890 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-205

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.1006° Longitude: -85.2587°

Approximate Surface Elev: 662 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.3	661.5+/-										
ASPHALT											
FILL - LEAN CLAY (CL), with chert fragments			14-11-12 N=23	89	4.5 (HP)						
3.0	659+/-										
LEAN CLAY (CL), brown, stiff		5	3-4-4 N=8	33	4.5 (HP)						
			4-5-6 N=11	56	4.5 (HP)						
medium stiff		10	4-4-3 N=7	56	4.25 (HP)						
13.5	648.5+/-										
LEAN CLAY (CL), with sand, trace mica, gray, soft to medium stiff		15	1-1-2 N=3	22							
20.0	642+/-	20	2-2-3 N=5	78	0.75 (HP)				25	33-22-11	84
Boring Terminated at 20 Feet											

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-07-2018 | Boring Completed: 08-07-2018

Drill Rig: DR890 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-206

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.1019° Longitude: -85.2591°

Approximate Surface Elev: 655 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.5	654.5+/-										
TOPSOIL											
FILL - GRAVELLY LEAN CLAY (CL), dark brown			6-6-3 N=9	33	4.5 (HP)				9		56
3.0	652+/-										
SANDY LEAN CLAY (CL), gray, medium stiff			1-3-5 N=8	56	1.75 (HP)				20		
5.5	649.5+/-	5									
SANDY LEAN CLAY (CL), gray, soft to very soft			0-1-2 N=3	44	1.25 (HP)				21	32-20-12	67
			0-0-1 N=1	22	0.25 (HP)				23	36-21-15	
12.0	643+/-	10									
SANDY LEAN CLAY (CL), gray, stiff			4-7-8 N=15	78	4.5 (HP)				21		
15.0	640+/-	15									
Boring Terminated at 15 Feet											

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-06-2018 | Boring Completed: 08-06-2018

Drill Rig: | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-207

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.103° Longitude: -85.2582°

Approximate Surface Elev: 653 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	PERCENT FINES
0.6	652.5+/-							
TOPSOIL								
LEAN CLAY (CL), brown, stiff				3-4-5 N=9	89	3.0 (HP)		
				3-6-6 N=12	100	4.5 (HP)		
		5		3-4-5 N=9	100	2.25 (HP)		
				4-5-6 N=11	78	3.25 (HP)		
		10						
13.0	640+/-							
SANDY LEAN CLAY (CL), brown, very stiff				8-17-11 N=28	67	3.25 (HP)	14	41
15.0	638+/-	15						
Boring Terminated at 15 Feet								

STRENGTH TEST: TEST TYPE | COMPRESSIVE STRENGTH (tsf) | STRAIN (%)

ATTERBERG LIMITS: LL-PL-PI

RQD (%)

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-06-2018 | Boring Completed: 08-06-2018

Drill Rig: | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-208

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.1051° Longitude: -85.2568°

Approximate Surface Elev: 654 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.6	653.5+/-										
TOPSOIL											
FILL - SAND AND GRAVEL, with clay, brown			1-0-1 N=1	22							
			0-1-0 N=1	33					13		26
5.5	648.5+/-	5									
LEAN CLAY (CL), brown, medium stiff			4-2-2 N=4	89	1.0 (HP)				28		72
8.5	645.5+/-										
SILTY CLAYEY SAND WITH GRAVEL (SC-SM), brown and red, medium dense		10	10-12-14 N=26	44					11		17
			10-13-16 N=29	67							
15.0	639+/-	15									
Boring Terminated at 15 Feet											

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-08-2018 | Boring Completed: 08-08-2018

Drill Rig: DR890 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-209

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.1065° Longitude: -85.2566°

Approximate Surface Elev: 657 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	WATER CONTENT (%)
0.3	656.5+/-						
TOPSOIL							
LEAN CLAY (CL), brown, medium stiff			X	2-2-3 N=5	67	2.5 (HP)	
3.5	653.5+/-						
LEAN CLAY (CL), with gravel, brown, stiff to very stiff		5	X	3-3-9 N=12	89		
			X	13-13-10 N=23	78		
		10	X	5-9-17 N=26	100	4.5 (HP)	
hard		15	X	6-12-30 N=42	100	4.25 (HP)	
16.0	641+/-						
Boring Terminated at 16 Feet							

STRENGTH TEST: TEST TYPE | COMPRESSIVE STRENGTH (tsf) | STRAIN (%)

ATTERBERG LIMITS: LL-PL-PI

PERCENT FINES

RQD (%)

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-08-2018 | Boring Completed: 08-08-2018

Drill Rig: DR890 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-210

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.1079° Longitude: -85.2565°

Approximate Surface Elev: 661 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.3	660.5+/-										
TOPSOIL											
LEAN CLAY (CL), with gravel, with sand, brown, stiff			3-3-3 N=6	67	3.5 (HP)						
3.0	658+/-										
LEAN CLAY (CL), with gravel, yellowish brown and red, very stiff to hard		5	3-6-27 N=33	44							
			3-11-25 N=36	56	4.5 (HP)						
		10	10-15-11 N=26	78	4.5 (HP)						
			6-11-9 N=20	78	4.5 (HP)						
		15									
20.0	641+/-		4-9-14 N=23	78	4.5 (HP)						
Boring Terminated at 20 Feet		20									

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-08-2018 | Boring Completed: 08-08-2018

Drill Rig: DR890 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-215

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.1037° Longitude: -85.2569°

Approximate Surface Elev: 662 (Ft.) +/-

DEPTH	ELEVATION (Ft.)
0.5	661.5+/-
8.0	654+/-
15.0	647+/-

TOPSOIL

LEAN CLAY (CL), with sand, brown, stiff to very stiff

CLAYEY SAND (SC), with chert, red and yellowish brown, medium dense

Boring Terminated at 15 Feet

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5		2-3-5 N=8	67	2.75 (HP)			
		2-6-10 N=16	78	4.5 (HP)			
		2-10-16 N=26	100	4.25 (HP)	19	40-22-18	76
10		7-8-10 N=18	67	4.0 (HP)	14	38-20-18	21
15		7-8-10 N=18	67	4.5 (HP)			

STRENGTH TEST: TEST TYPE; COMPRESSIVE STRENGTH (tsf); STRAIN (%)

RQD (%)

WATER LEVEL OBSERVATIONS

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-08-2018 | Boring Completed: 08-08-2018

Drill Rig: DR890 | Driller: N. Dotson

Project No.: E2175151

BORING LOG NO. B-216

PROJECT: DuPont Additional Borings

CLIENT: CDM Smith Inc.
Knoxville, TN

SITE: DuPont Parkway
Chattanooga, Tennessee

LOCATION See Exploration Plan

Latitude: 35.1043° Longitude: -85.257°

Approximate Surface Elev: 654 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	LABORATORY HP (tsf)	WATER CONTENT (%)
0.5	653.5+/-						
TOPSOIL							
LEAN CLAY (CL), with trace fine gravel, brown, medium stiff to very s tiff			X	4-2-3 N=5	67	3.5 (HP)	
			X	4-5-8 N=13	67	4.25 (HP)	
		5	X	6-9-15 N=24	78	4.5 (HP)	
8.0	646+/-						
SANDY LEAN CLAY (CL), with fine gravel, brown and red, stiff			X	10-6-8 N=14	78	4.0 (HP)	
		10					
15.0	639+/-		X	10-6-6 N=12	78	4.5 (HP)	
Boring Terminated at 15 Feet		15					

STRENGTH TEST: TEST TYPE | COMPRESSIVE STRENGTH (tsf) | STRAIN (%)

ATTERBERG LIMITS: LL-PL-PI

PERCENT FINES

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

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Elevations interpolated from Google Earth Pro

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

Boring Started: 08-08-2018 | Boring Completed: 08-08-2018

Drill Rig: DR890 | Driller: N. Dotson

Project No.: E2175151

SUMMARY OF LABORATORY RESULTS

Borehole No.	Depth (ft.)	USCS Soil Class.	In-Situ Properties		Classification				Expansion Testing					Corrosivity			Remarks
			Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atterberg Limits			Dry Density (pcf)	Water Content (%)	Surcharge (psf)	Expansion (%)	Expansion Index EI_{50}	pH	Resistivity (ohm-cm)	Sulfates (ppm)	
						LL	PL	PI									
B-101	1	CH		19	97	54	25	29									
B-101	3.5			20													2
B-101	8.5			23													2
B-101	13.5			25													2
B-101	23.5			32													2
B-101	28.5	ML		41	57	NP	NP	NP									
B-102	20			27													2
B-102	25	CL		30	87	41	21	20									
B-102	30			42	77												2
B-103	2.5	CH		20	97	52	24	28									
B-103	6.5	CL		24	96	47	23	24									
B-103	10			25													2
B-103	20			28													2
B-103	25			29													2
B-103	30	ML		44	61	NP	NP	NP									
B-104	2.5			18	53												2
B-104	20	CL		28	71	32	21	11									
B-104	25	ML		33	63	30	25	5									
B-105	1				86												
B-105	5			17		45	21	24									
B-105	6.5			26	43												2
B-105	15			25													2
B-105	25	CL		30	84	36	20	16									
B-105	30			44													2
B-106	2.5			19	51												2

REMARKS

1. Dry Density and/or moisture determined from one or more rings of a multi-ring sample.
2. Visual Classification.
3. Submerged to approximate saturation.
4. Expansion Index in accordance with ASTM D4829-95.
5. Air-Dried Sample

PROJECT: DuPont Additional Borings

SITE: DuPont Parkway
Chattanooga, Tennessee

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN
PH. 423-499-6111 FAX. 423-499-8099

PROJECT NUMBER: E2175151

CLIENT: CDM Smith Inc.
Knoxville, TN

EXHIBIT: B-1

SUMMARY OF LABORATORY RESULTS

Borehole No.	Depth (ft.)	USCS Soil Class.	In-Situ Properties		Classification				Expansion Testing					Corrosivity			Remarks
			Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atterberg Limits			Dry Density (pcf)	Water Content (%)	Surcharge (psf)	Expansion (%)	Expansion Index EI_{50}	pH	Resistivity (ohm-cm)	Sulfates (ppm)	
						LL	PL	PI									
B-106	5			18													2
B-106	6.5	CH		27													2
B-106	10			22													2
B-106	15			23													2
B-106	20	CL		27	87	39	23	16									
B-106	25			27													2
B-106	30	SM		35	23	31	29	2									
B-107	2.5			16													2
B-107	5	SC		16	50	43	19	24									
B-107	10	CH		36	79	50	24	26									
B-107	20			26													2
B-107	25	ML		35	71	30	28	2									
B-107	30			15	13												2
B-108	3.5			17		49	20	29									
B-108	6	CH		27													2
B-108	8.5	CL		35	94	48	25	23									
B-108	13.5			26													2
B-108	18.5			22		38	21	17									
B-108	23.5	CL		38	84	37	24	13									
B-108	28.5			10	6												2
B-110	2.5			15													2
B-110	5	CL		19	64	40	21	19									
B-110	6.5			24													2
B-110	10			25													2
B-110	15	CL		26	86	41	20	21									

REMARKS

1. Dry Density and/or moisture determined from one or more rings of a multi-ring sample.
2. Visual Classification.
3. Submerged to approximate saturation.
4. Expansion Index in accordance with ASTM D4829-95.
5. Air-Dried Sample

PROJECT: DuPont Additional Borings

SITE: DuPont Parkway
Chattanooga, Tennessee

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN
PH. 423-499-6111 FAX. 423-499-8099

PROJECT NUMBER: E2175151

CLIENT: CDM Smith Inc.
Knoxville, TN

EXHIBIT: B-2

SUMMARY OF LABORATORY RESULTS

Borehole No.	Depth (ft.)	USCS Soil Class.	In-Situ Properties		Classification				Expansion Testing					Corrosivity			Remarks
			Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atterberg Limits			Dry Density (pcf)	Water Content (%)	Surcharge (psf)	Expansion (%)	Expansion Index EI_{50}	pH	Resistivity (ohm-cm)	Sulfates (ppm)	
						LL	PL	PI									
B-110	20			28													2
B-112	2.5	CL		23	89	44	23	21									
B-112	5			24													2
B-112	10	CH		24	98	51	25	26									
B-112	15			25													2
B-113	5	CH		23	98	50	26	24									
B-203	2.5			24													2
B-203	5			17													2
B-203	7.5			19													2
B-203	10			22													2
B-203	15	CL		24	89	39	21	18									
B-203	20			24													2
B-205	20	CL		25	84	33	22	11									
B-206	2.5			9	56												2
B-206	5			20													2
B-206	7.5	CL		21	67	32	20	12									
B-206	10			23		36	21	15									
B-206	18.5			21													2
B-207	15			14	41												2
B-208	5			13	26												2
B-208	6.5			28	72												2
B-208	10			11	17												2
B-215	6.5	CL		19	76	40	22	18									
B-215	10	SC		14	21	38	20	18									

REMARKS

1. Dry Density and/or moisture determined from one or more rings of a multi-ring sample.
2. Visual Classification.
3. Submerged to approximate saturation.
4. Expansion Index in accordance with ASTM D4829-95.
5. Air-Dried Sample

PROJECT: DuPont Additional Borings

SITE: DuPont Parkway
Chattanooga, Tennessee

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN
PH. 423-499-6111 FAX. 423-499-8099

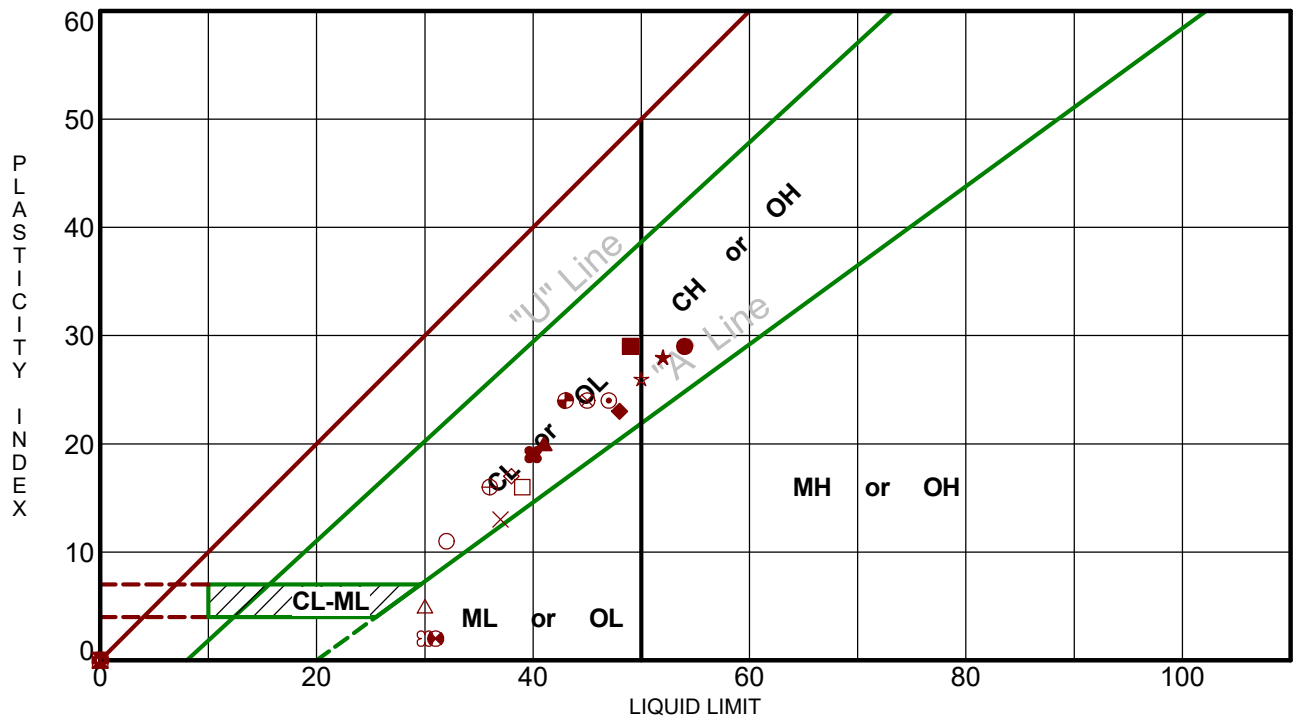
PROJECT NUMBER: E2175151

CLIENT: CDM Smith Inc.
Knoxville, TN

EXHIBIT: B-3

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth	LL	PL	PI	Fines	USCS	Description
●	B-101	1 - 2.5	54	25	29	97	CH	FAT CLAY
⊠	B-101	28.5 - 30	NP	NP	NP	57	ML	SANDY SILT
▲	B-102	25	41	21	20	87	CL	LEAN CLAY
★	B-103	2.5	52	24	28	97	CH	FAT CLAY
⊙	B-103	6.5	47	23	24	96	CL	LEAN CLAY
✿	B-103	30	NP	NP	NP	61	ML	SANDY SILT
○	B-104	20 - 22	32	21	11	71	CL	LEAN CLAY with SAND
△	B-104	25	30	25	5	63	ML	SANDY SILT
⊗	B-105	5	45	21	24			
⊕	B-105	25	36	20	16	84	CL	LEAN CLAY with SAND
□	B-106	20	39	23	16	87	CL	LEAN CLAY
⊠	B-106	30	31	29	2	23	SM	SILTY SAND with GRAVEL
◕	B-107	5	43	19	24	50	SC	CLAYEY SAND with GRAVEL
☆	B-107	10	50	24	26	79	CH	FAT CLAY with SAND
✿	B-107	25	30	28	2	71	ML	SILT with SAND
■	B-108	3.5 - 5	49	20	29			
◆	B-108	8.5 - 10	48	25	23	94	CL	LEAN CLAY
◇	B-108	18.5 - 20	38	21	17			
×	B-108	23.5 - 25	37	24	13	84	CL	LEAN CLAY with SAND
✖	B-110	5	40	21	19	64	CL	SANDY LEAN CLAY

PROJECT: DuPont Additional Borings

PROJECT NUMBER: E2175151

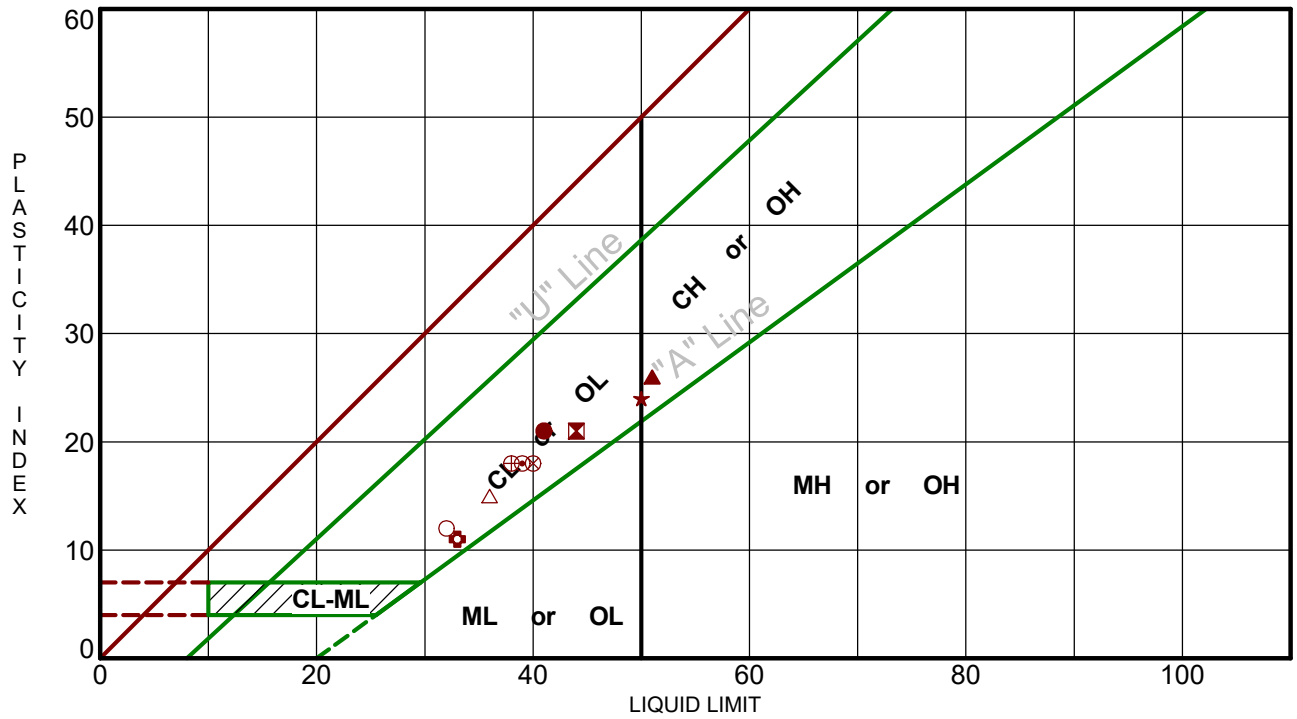
SITE: DuPont Parkway
Chattanooga, Tennessee

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: CDM Smith Inc.
Knoxville, TN

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth	LL	PL	PI	Fines	USCS	Description
●	B-110	15	41	20	21	86	CL	LEAN CLAY
⊠	B-112	2.5	44	23	21	89	CL	LEAN CLAY
▲	B-112	10	51	25	26	98	CH	FAT CLAY
★	B-113	5	50	26	24	98	CH	FAT CLAY
⊙	B-203	15	39	21	18	89	CL	LEAN CLAY
✿	B-205	20	33	22	11	84	CL	LEAN CLAY with SAND
○	B-206	7.5	32	20	12	67	CL	SANDY LEAN CLAY
△	B-206	10	36	21	15			
⊗	B-215	6.5	40	22	18	76	CL	LEAN CLAY with SAND
⊕	B-215	10	38	20	18	21	SC	CLAYEY SAND with GRAVEL

PROJECT: DuPont Additional Borings

PROJECT NUMBER: E2175151

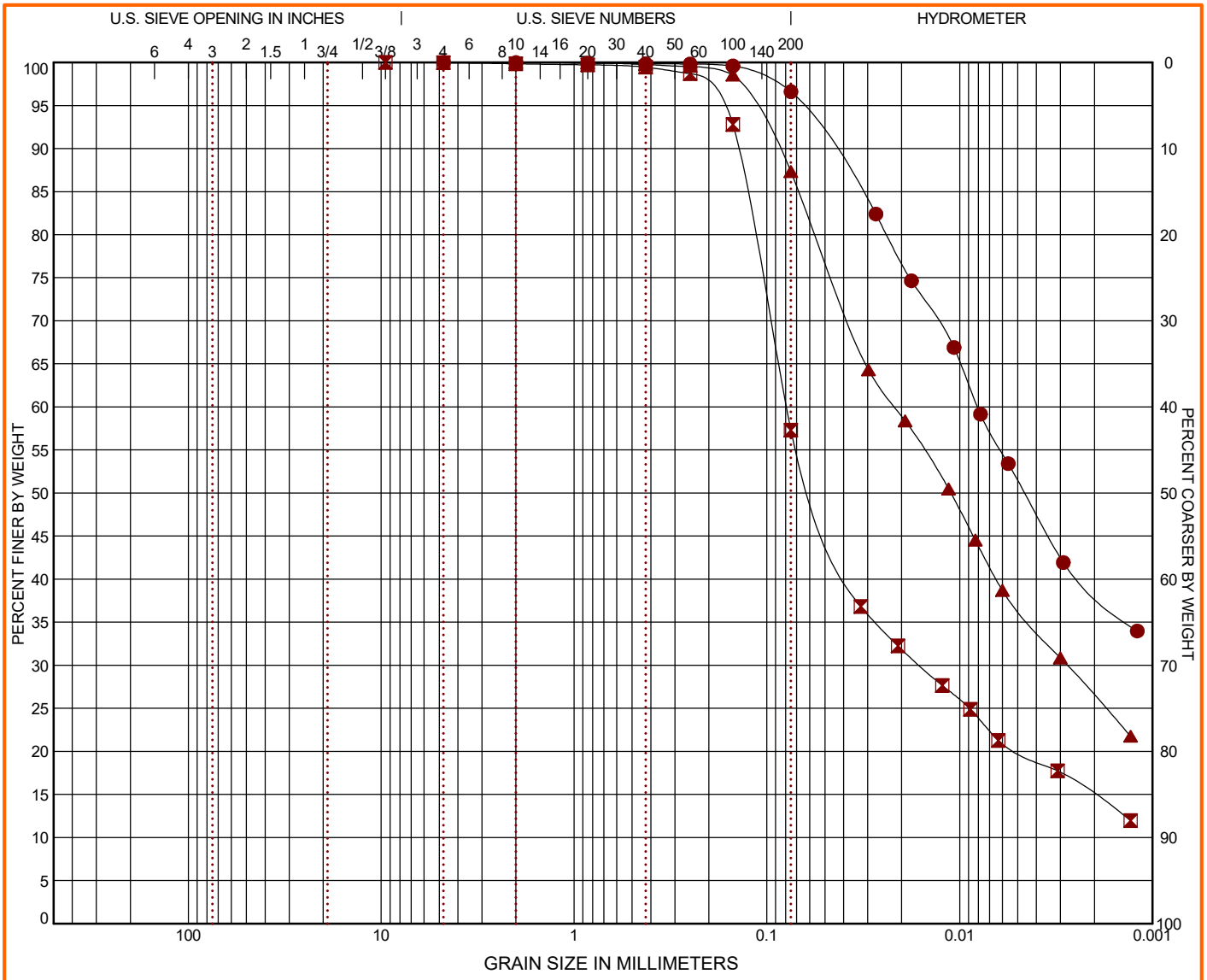
SITE: DuPont Parkway
Chattanooga, Tennessee

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: CDM Smith Inc.
Knoxville, TN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-101	1 - 2.5	0.0	0.0	3.4	45.2		51.4	CH
⊠	B-101	28.5 - 30	0.0	0.0	42.7	37.2		20.1	ML
▲	B-102	25	0.0	0.0	12.7	50.7		36.6	CL

GRAIN SIZE	●	⊠	▲
D_{60}	0.008	0.079	0.022
D_{30}		0.016	0.003
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	100.0	3/8"	100.0	#10	100.0
#10	99.99	#4	99.95	#20	99.93
#20	99.92	#10	99.84	#40	99.76
#40	99.84	#20	99.72	#60	99.55
#60	99.82	#40	99.44	#100	98.54
#100	99.59	#60	98.69	#200	87.32
#200	96.6	#100	92.79		
		#200	57.3		

SOIL DESCRIPTION	
●	FAT CLAY (CH)
⊠	SANDY SILT (ML)
▲	LEAN CLAY (CL)

REMARKS	
●	
⊠	
▲	

PROJECT: DuPont Additional Borings

PROJECT NUMBER: E2175151

SITE: DuPont Parkway
Chattanooga, Tennessee

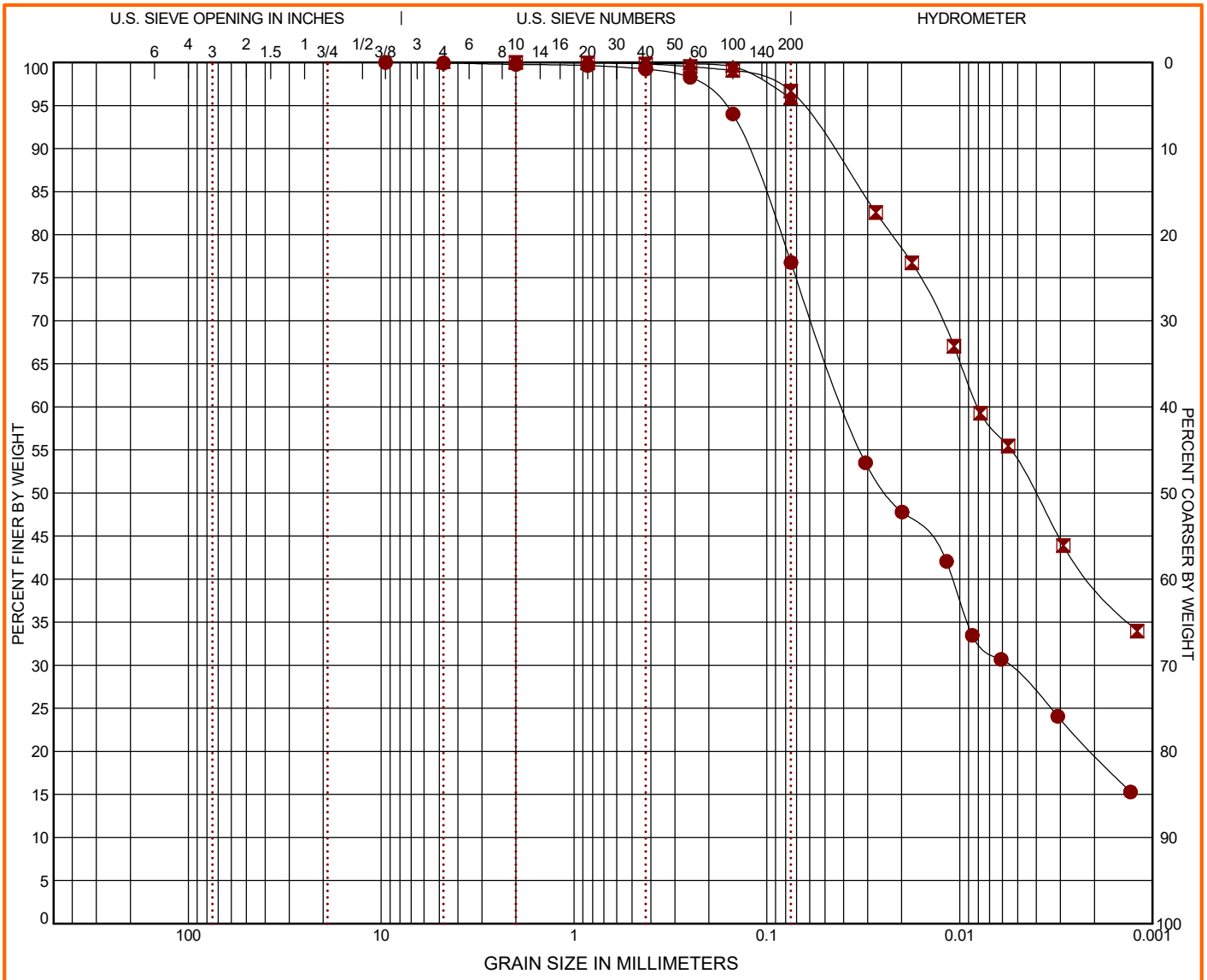
Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: CDM Smith Inc.
Knoxville, TN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 E2175151 DUPONT ADDITIONAL.GPJ TERRACON_DATATEMPLATE.GDT 8/20/18

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-102	30	0.0	0.1	23.2	48.0		28.7	
⊠	B-103	2.5	0.0	0.0	3.3	43.2		53.5	CH
▲	B-103	6.5	0.0	0.0	4.2		95.8		CL

GRAIN SIZE	●	⊠	▲
D_{60}	0.039	0.008	
D_{30}	0.006		
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
3/8"	100.0	#10	100.0	#4	100.0
#4	99.93	#20	99.95	#10	99.97
#10	99.77	#40	99.82	#20	99.94
#20	99.64	#60	99.52	#40	99.9
#40	99.23	#100	99.06	#60	99.84
#60	98.27	#200	96.67	#100	99.54
#100	94.01			#200	95.81
#200	76.77				

SOIL DESCRIPTION	
●	
⊠	FAT CLAY (CH)
▲	LEAN CLAY (CL)

REMARKS	
●	
⊠	
▲	

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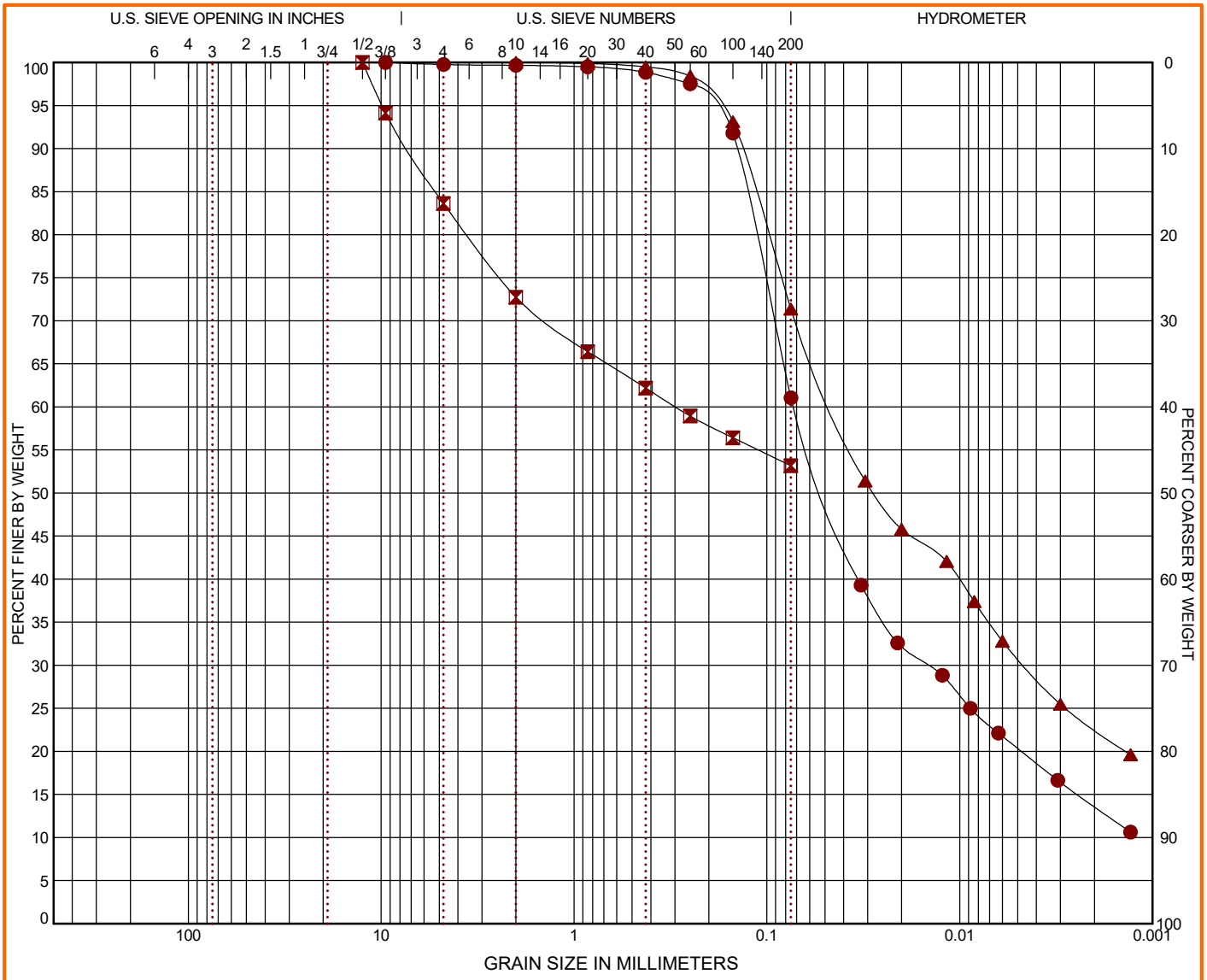

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-103	30	0.0	0.2	38.7	40.7		20.3	ML
⊠	B-104	2.5	0.0	16.4	30.5		53.2		
▲	B-104	20 - 22	0.0	0.0	28.6	40.5		30.9	CL

GRAIN SIZE	●	⊠	▲
D_{60}	0.072	0.297	0.045
D_{30}	0.015		0.005
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
3/8"	100.0	1/2"	100.0	#10	100.0
#4	99.76	3/8"	94.13	#20	99.88
#10	99.66	#4	83.62	#40	99.49
#20	99.49	#10	72.74	#60	98.43
#40	98.85	#20	66.43	#100	93.13
#60	97.53	#40	62.2	#200	71.36
#100	91.79	#60	58.94		
#200	61.06	#100	56.42		
		#200	53.17		

SOIL DESCRIPTION	
●	SANDY SILT (ML)
⊠	
▲	LEAN CLAY with SAND (CL)

REMARKS	
●	
⊠	
▲	

PROJECT: DuPont Additional Borings

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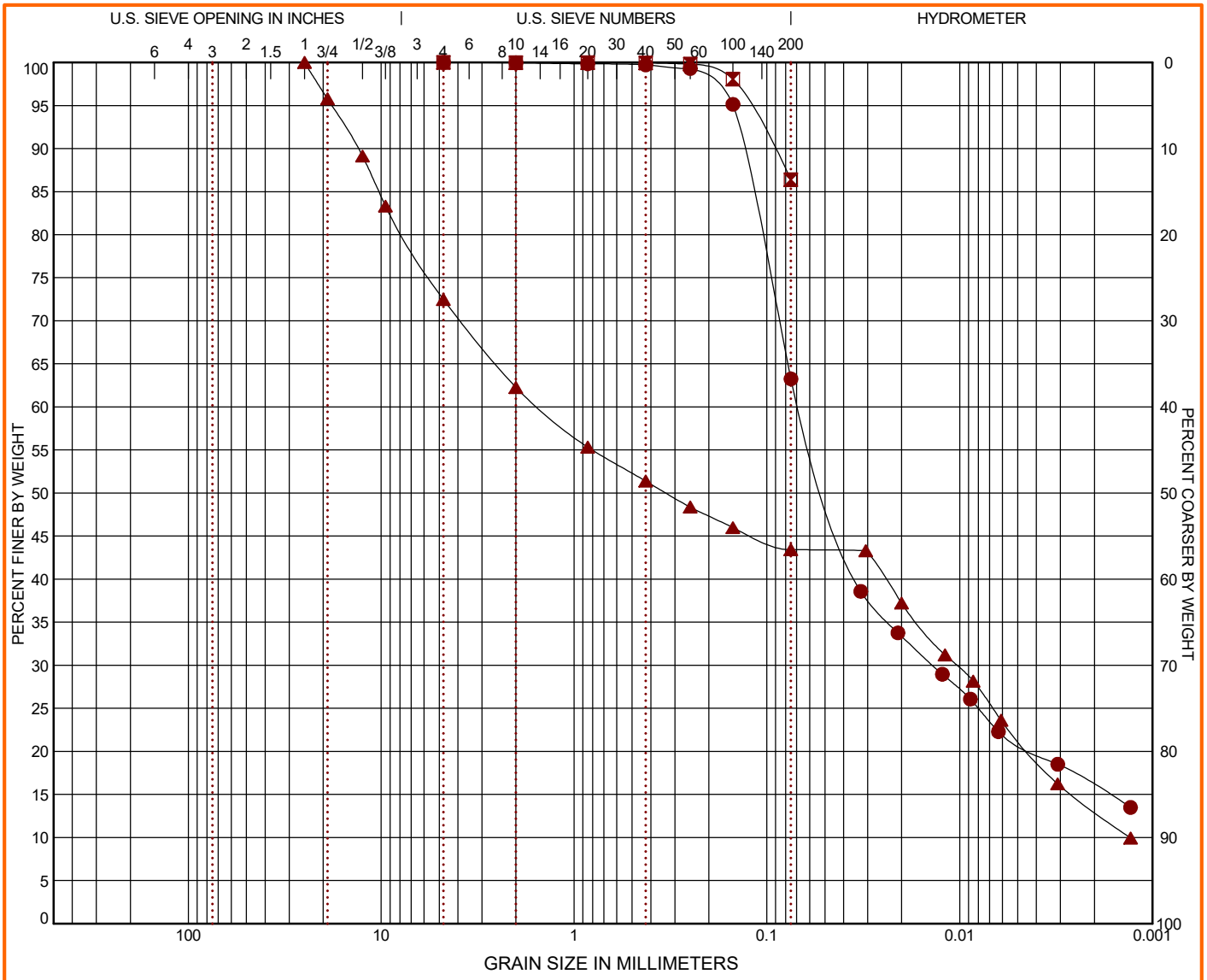

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-104	25	0.0	0.0	36.8	42.2		21.1	ML
⊠	B-105	1 - 2.5	0.0	0.0	13.6		86.4		
▲	B-105	6.5	0.0	27.5	29.0	22.0		21.4	

GRAIN SIZE	●	⊠	▲
D_{60}	0.067		1.513
D_{30}	0.014		0.01
D_{10}			0.001

COEFFICIENTS	●	⊠	▲
C_C			0.05
C_U			1154.77

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	100.0	#4	100.0	1"	100.0
#10	99.96	#10	99.98	3/4"	95.77
#20	99.84	#20	99.96	1/2"	89.13
#40	99.72	#40	99.94	3/8"	83.32
#60	99.29	#60	99.8	#4	72.48
#100	95.14	#100	98.05	#10	62.26
#200	63.25	#200	86.4	#20	55.34
				#40	51.39
				#60	48.38
				#100	45.98
				#200	43.43

SOIL DESCRIPTION	
●	SANDY SILT (ML)
⊠	
▲	

REMARKS	
●	
⊠	
▲	

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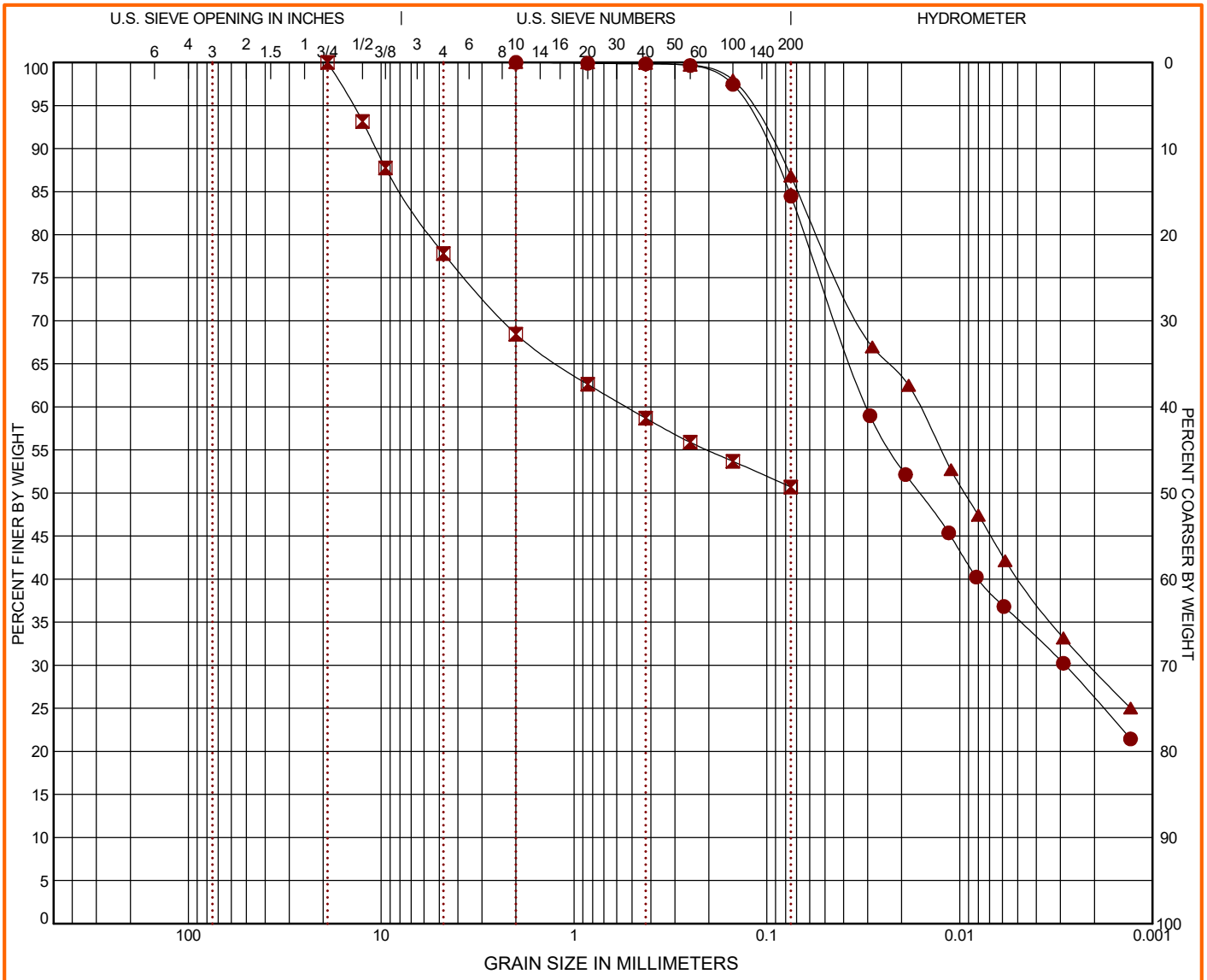

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-105	25	0.0	0.0	15.5	49.2		35.3	CL
⊠	B-106	2.5	0.0	22.2	27.1		50.7		
▲	B-106	20	0.0	0.0	13.2	46.6		40.2	CL

GRAIN SIZE	●	⊠	▲
D_{60}	0.03	0.536	0.016
D_{30}	0.003		0.002
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#10	100.0	3/4"	100.0	#10	100.0
#20	99.9	1/2"	93.14	#20	99.97
#40	99.83	3/8"	87.73	#40	99.91
#60	99.65	#4	77.81	#60	99.68
#100	97.45	#10	68.46	#100	97.96
#200	84.47	#20	62.62	#200	86.81
		#40	58.69		
		#60	55.89		
		#100	53.68		
		#200	50.68		

SOIL DESCRIPTION	
●	LEAN CLAY with SAND (CL)
⊠	
▲	LEAN CLAY (CL)

REMARKS	
●	
⊠	
▲	

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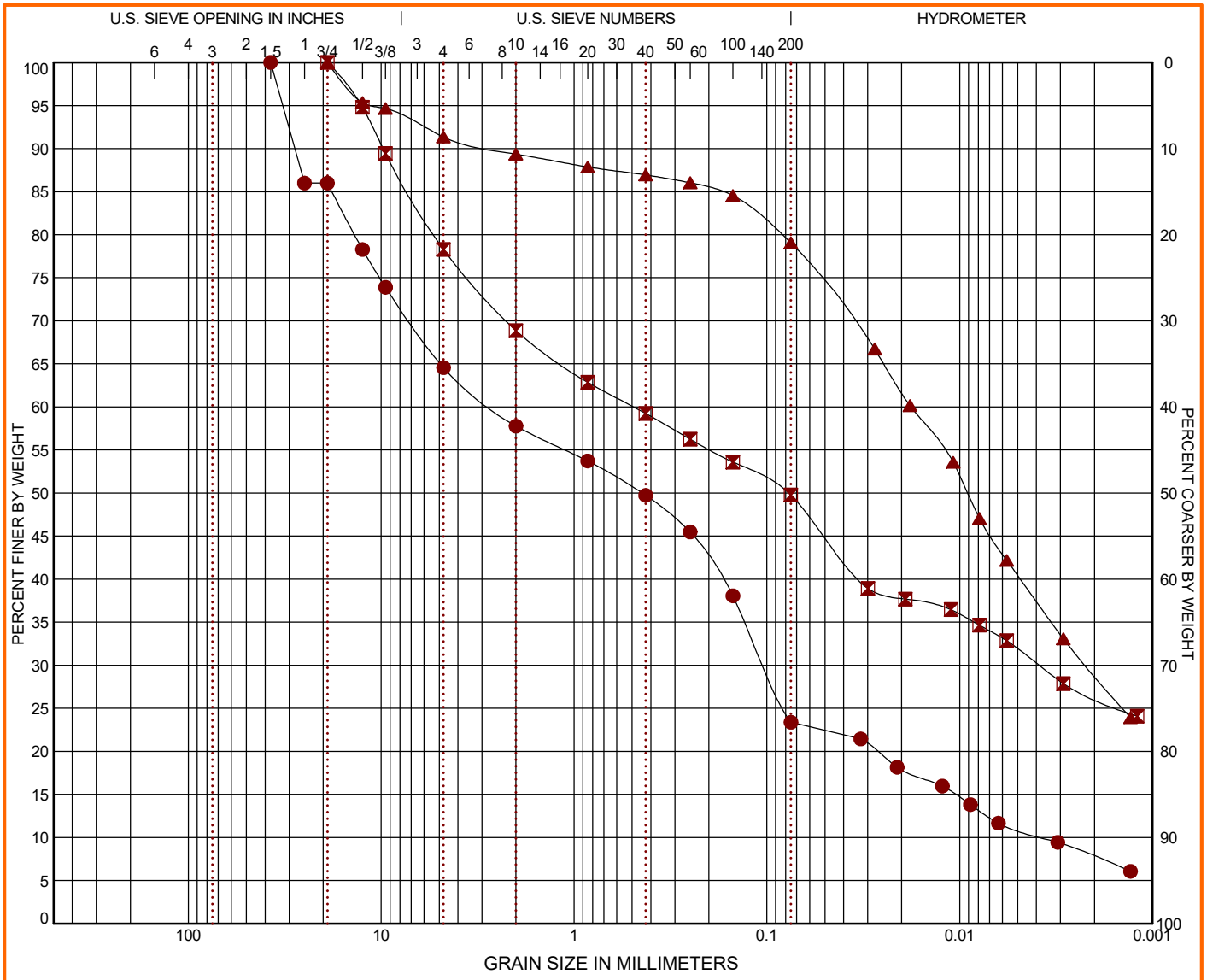

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-106	30	0.0	35.4	41.2	12.4		10.9	SM
⊠	B-107	5	0.0	21.7	28.5	17.9		31.9	SC
▲	B-107	10	0.0	8.7	12.3	38.6		40.4	CH

GRAIN SIZE

	●	⊠	▲
D_{60}	2.657	0.491	0.018
D_{30}	0.103	0.004	0.002
D_{10}	0.004		

COEFFICIENTS

	●	⊠	▲
C_C	1.07		
C_U	717.12		

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
1 1/2"	100.0	3/4"	100.0	3/4"	100.0
1"	85.99	1/2"	94.79	1/2"	95.34
3/4"	85.99	3/8"	89.42	3/8"	94.65
1/2"	78.28	#4	78.29	#4	91.34
3/8"	73.89	#10	68.87	#10	89.35
#4	64.56	#20	62.86	#20	87.86
#10	57.77	#40	59.24	#40	86.93
#20	53.73	#60	56.26	#60	86.04
#40	49.73	#100	53.6	#100	84.55
#60	45.48	#200	49.76	#200	79.05
#100	38.07				
#200	23.38				

SOIL DESCRIPTION

●	SILTY SAND with GRAVEL (SM)
⊠	CLAYEY SAND with GRAVEL (SC)
▲	FAT CLAY with SAND (CH)

REMARKS

●	
⊠	
▲	

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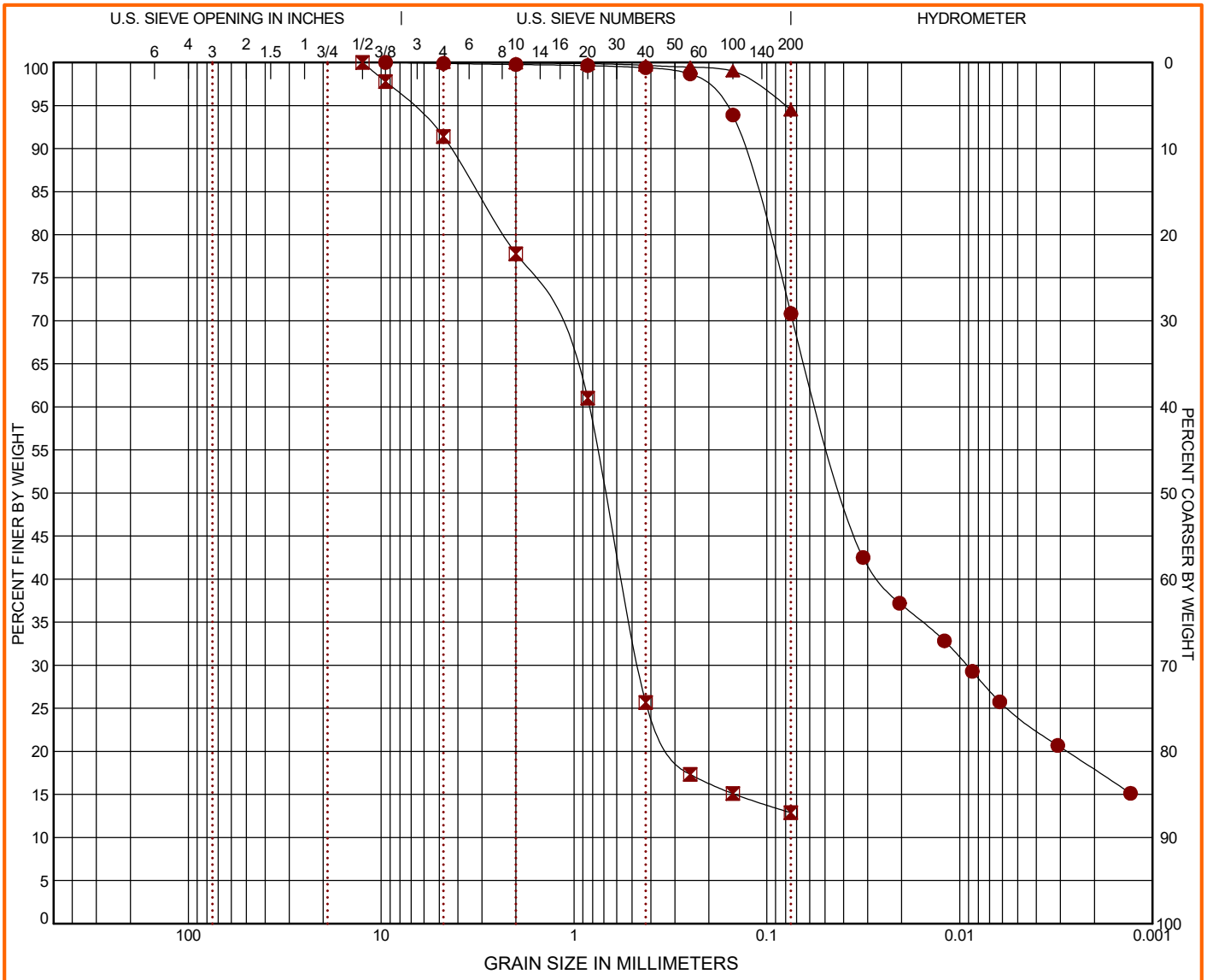

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-107	25	0.0	0.1	29.1	46.6		24.2	ML
⊠	B-107	30	0.0	8.6	78.5		12.9		
▲	B-108	8.5 - 10	0.0	0.0	5.5		94.5		CL

GRAIN SIZE	●	⊠	▲
D_{60}	0.054	0.833	
D_{30}	0.009	0.463	
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
3/8"	100.0	1/2"	100.0	#4	100.0
#4	99.88	3/8"	97.77	#10	99.92
#10	99.75	#4	91.39	#20	99.85
#20	99.63	#10	77.78	#40	99.66
#40	99.38	#20	61.02	#60	99.47
#60	98.67	#40	25.67	#100	99.01
#100	93.89	#60	17.33	#200	94.48
#200	70.83	#100	15.1		
		#200	12.88		

SOIL DESCRIPTION	
●	SILT with SAND (ML)
⊠	
▲	LEAN CLAY (CL)

REMARKS	
●	
⊠	
▲	

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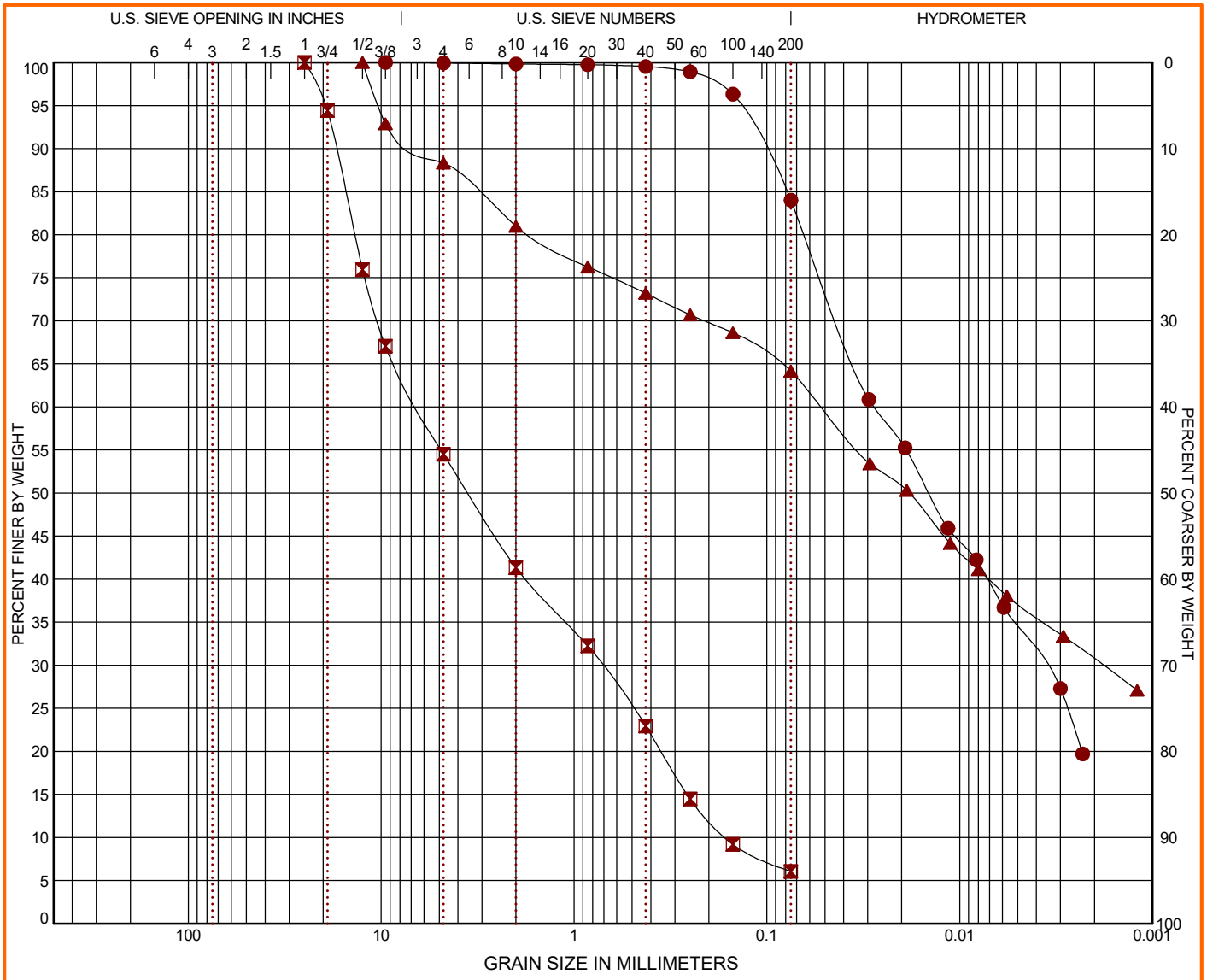

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-108	23.5 - 25	0.0	0.1	15.9	49.6		34.4	CL
⊠	B-108	28.5 - 30	0.0	45.5	48.4		6.1		
▲	B-110	5	0.0	11.7	24.2	27.0		37.2	CL

GRAIN SIZE	●	⊠	▲
D_{60}	0.028	6.435	0.052
D_{30}	0.004	0.718	0.002
D_{10}		0.162	

COEFFICIENTS	●	⊠	▲
C_C		0.49	
C_U		39.69	

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
3/8"	100.0	1"	100.0	1/2"	100.0
#4	99.93	3/4"	94.41	3/8"	92.87
#10	99.82	1/2"	75.95	#4	88.32
#20	99.73	3/8"	67.03	#10	80.97
#40	99.52	#4	54.52	#20	76.26
#60	98.91	#10	41.32	#40	73.19
#100	96.32	#20	32.26	#60	70.7
#200	84.0	#40	22.96	#100	68.62
		#60	14.47	#200	64.15
		#100	9.2		
		#200	6.08		

SOIL DESCRIPTION	
●	LEAN CLAY with SAND (CL)
⊠	
▲	SANDY LEAN CLAY (CL)

REMARKS	
●	
⊠	
▲	

PROJECT: DuPont Additional Borings

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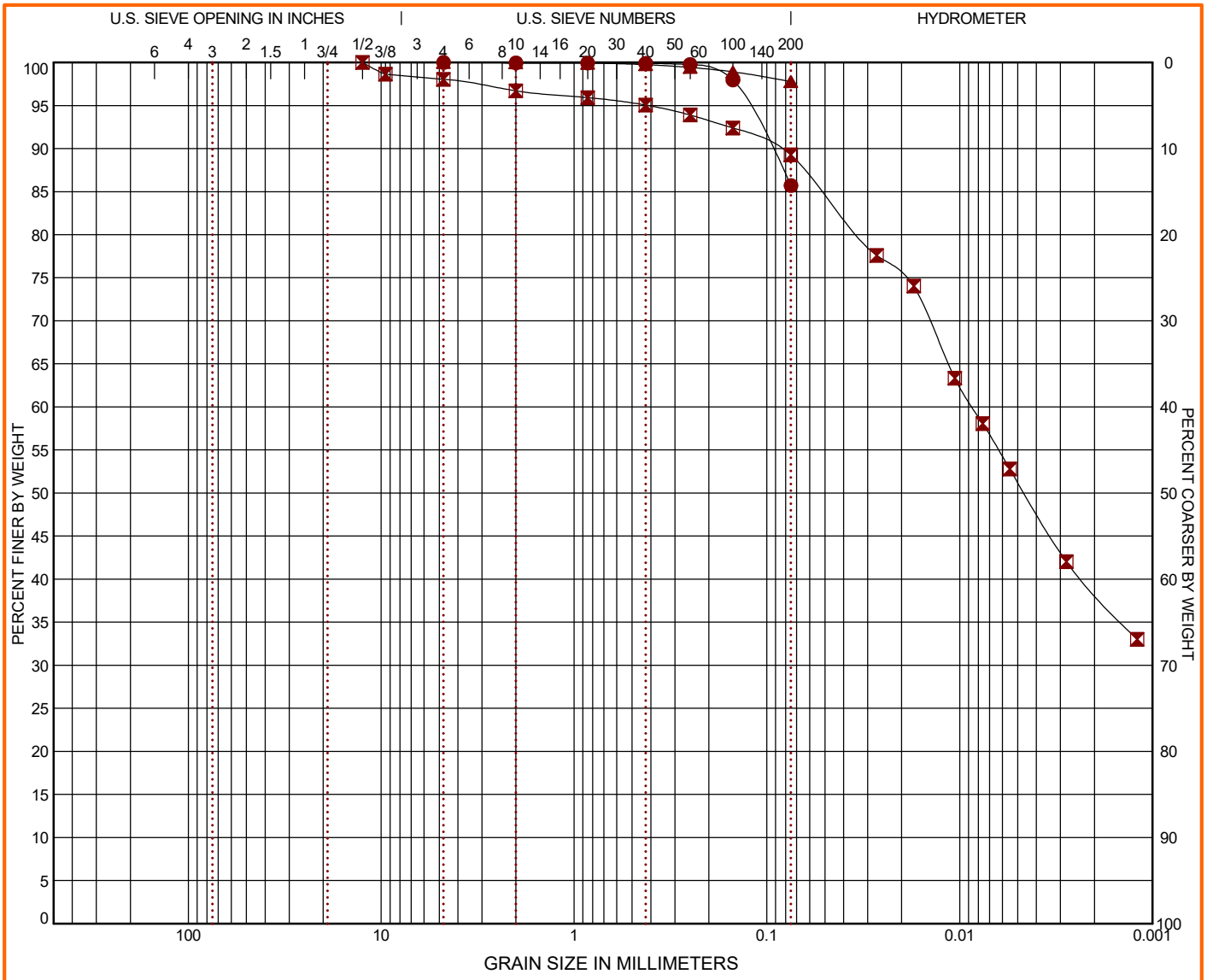

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-110	15	0.0	0.0	14.3		85.7		CL
⊠	B-112	2.5	0.0	2.0	8.8	38.0		51.3	CL
▲	B-112	10	0.0	0.0	2.2		97.8		CH

GRAIN SIZE	●	⊠	▲
D_{60}		0.009	
D_{30}			
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	100.0	1/2"	100.0	#4	100.0
#10	99.94	3/8"	98.63	#10	99.95
#20	99.93	#4	98.03	#20	99.91
#40	99.89	#10	96.7	#40	99.74
#60	99.76	#20	95.91	#60	99.42
#100	97.96	#40	95.05	#100	98.9
#200	85.71	#60	93.9	#200	97.78
		#100	92.39		
		#200	89.26		

SOIL DESCRIPTION	
●	LEAN CLAY (CL)
⊠	LEAN CLAY (CL)
▲	FAT CLAY (CH)

REMARKS	
●	
⊠	
▲	

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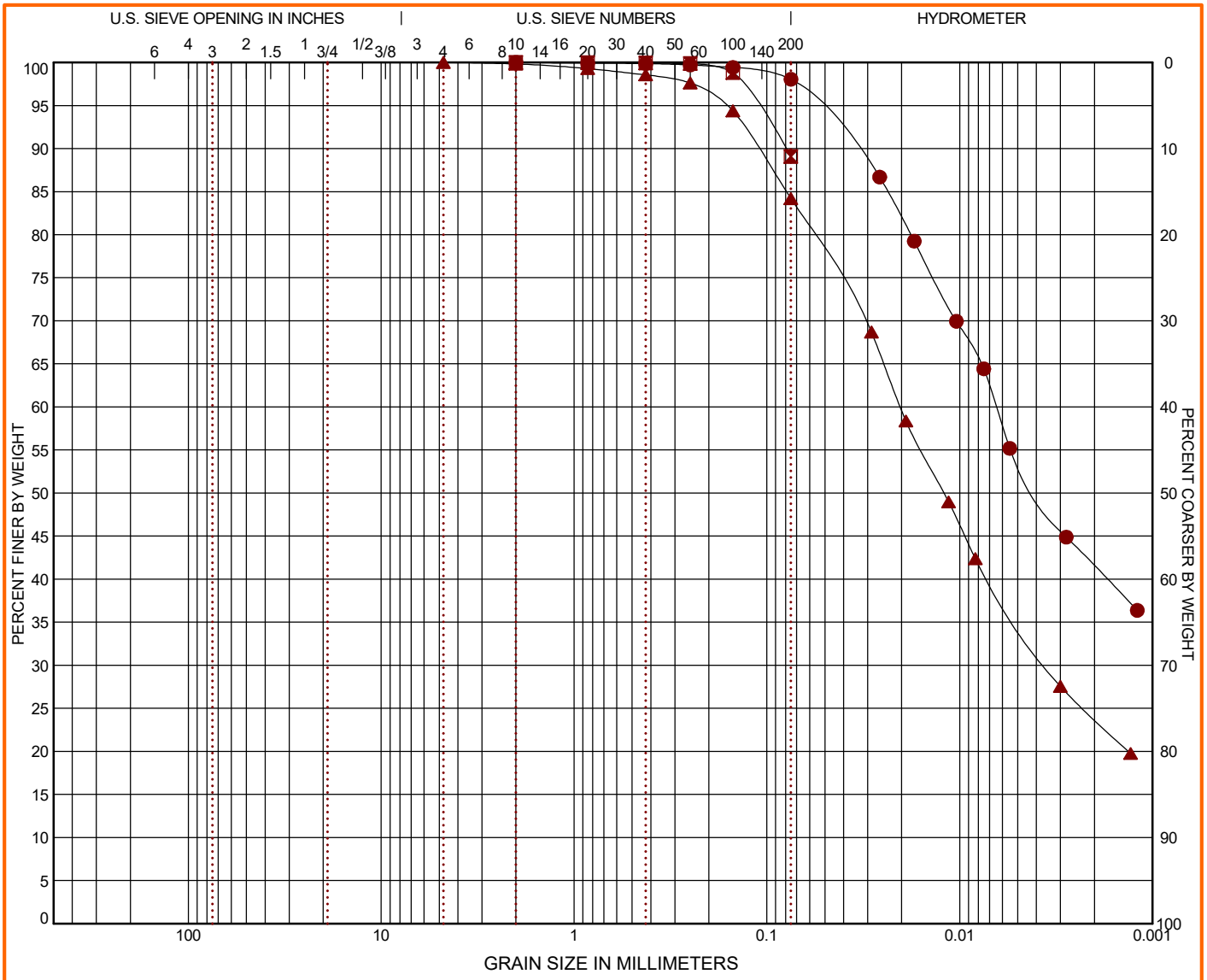

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-113	5	0.0	0.0	2.0	44.3		53.7	CH
⊠	B-203	15	0.0	0.0	10.9		89.1		CL
▲	B-205	20	0.0	0.0	15.8	49.2		35.0	CL

GRAIN SIZE	●	⊠	▲
D_{60}	0.006		0.02
D_{30}			0.004
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
#10	100.0	#10	100.0	#4	100.0
#20	99.92	#20	99.98	#10	99.82
#40	99.86	#40	99.94	#20	99.29
#60	99.71	#60	99.87	#40	98.55
#100	99.42	#100	98.84	#60	97.63
#200	98.04	#200	89.08	#100	94.37
				#200	84.2

SOIL DESCRIPTION	
●	FAT CLAY (CH)
⊠	LEAN CLAY (CL)
▲	LEAN CLAY with SAND (CL)

REMARKS	
●	
⊠	
▲	

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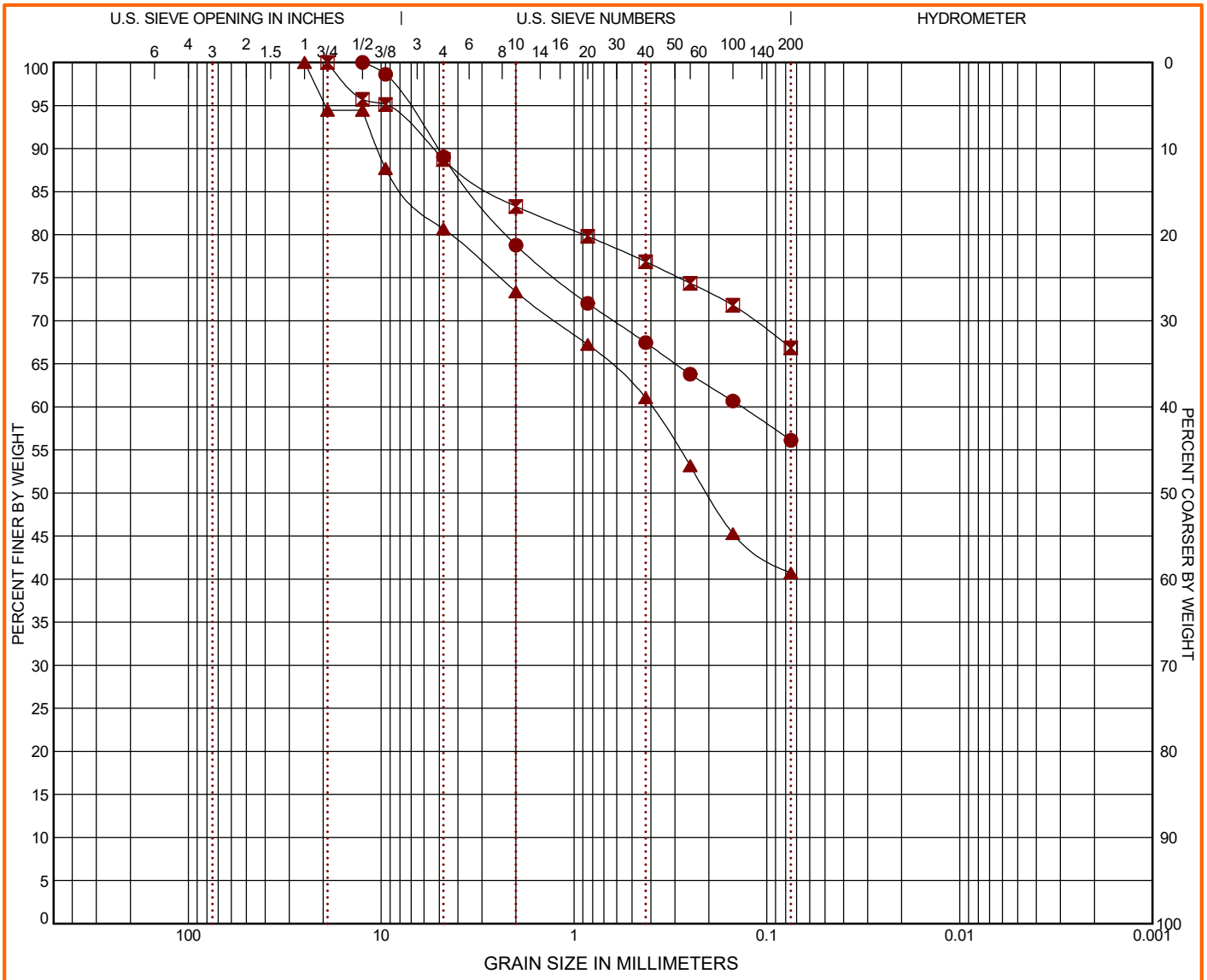
GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-206	2.5	0.0	11.0	32.9		56.1		
⊠	B-206	7.5	0.0	11.3	21.9		66.8		CL
▲	B-207	15	0.0	19.3	40.0		40.7		

GRAIN SIZE	●	⊠	▲
D_{60}	0.135		0.395
D_{30}			
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
1/2"	100.0	3/4"	100.0	1"	100.0
3/8"	98.62	1/2"	95.71	3/4"	94.44
#4	89.03	3/8"	95.12	1/2"	94.44
#10	78.77	#4	88.74	3/8"	87.68
#20	72.03	#10	83.28	#4	80.67
#40	67.47	#20	79.81	#10	73.36
#60	63.8	#40	76.86	#20	67.25
#100	60.68	#60	74.36	#40	61.07
#200	56.12	#100	71.8	#60	53.18
		#200	66.85	#100	45.28
				#200	40.71

SOIL DESCRIPTION	
●	
⊠	SANDY LEAN CLAY (CL)
▲	

REMARKS	
●	
⊠	
▲	

PROJECT: DuPont Additional Borings

PROJECT NUMBER: E2175151

SITE: DuPont Parkway
Chattanooga, Tennessee

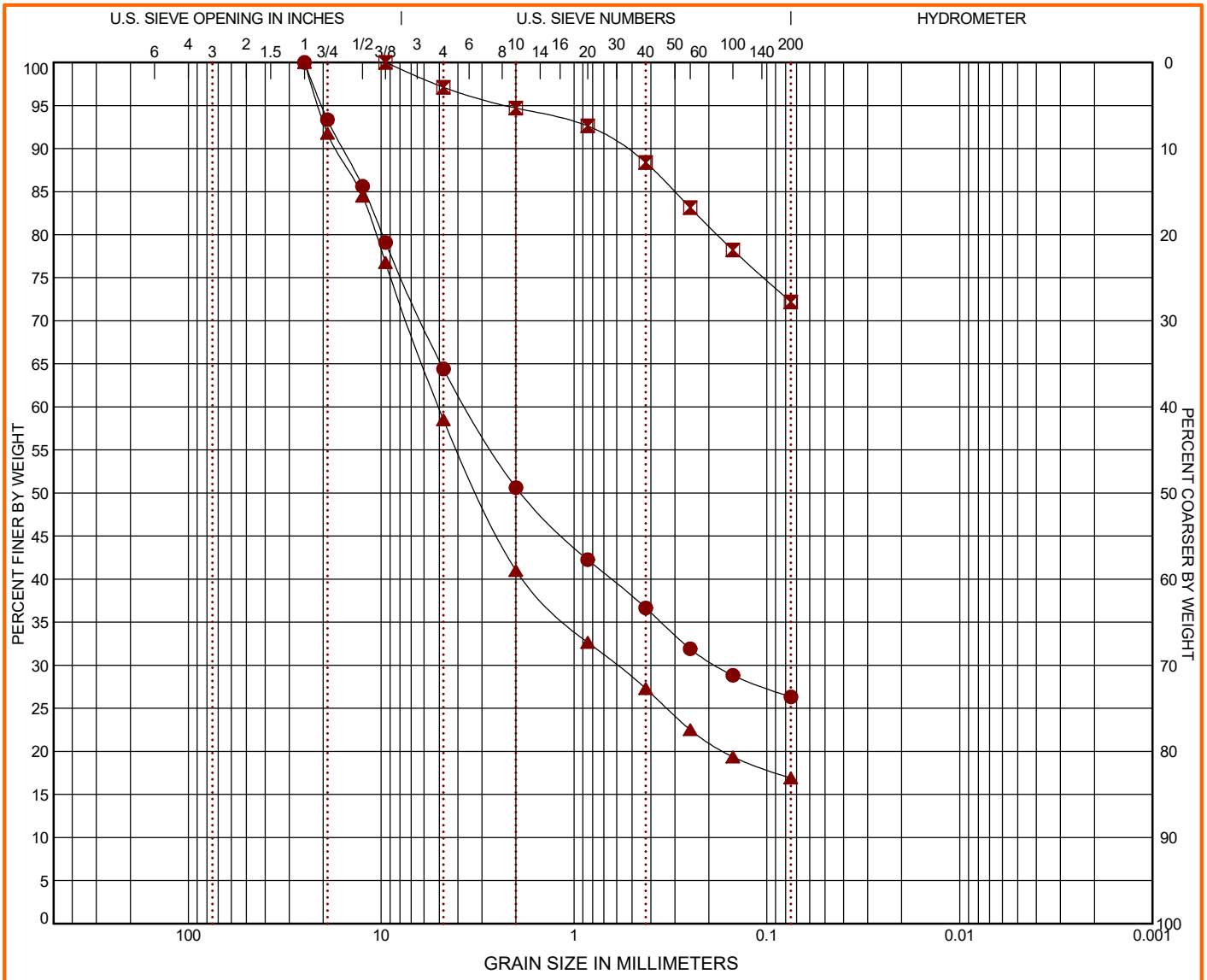
Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: CDM Smith Inc.
Knoxville, TN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 E2175151 DUPONT ADDITIONAL.GPJ TERRACON_DATATEMPLATE.GDT 8/20/18

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-208	5	0.0	35.6	38.1		26.3		
⊠	B-208	6.5	0.0	2.9	24.9		72.2		
▲	B-208	10	0.0	41.5	41.6		16.9		

GRAIN SIZE	●	⊠	▲
D_{60}	3.601		5.027
D_{30}	0.182		0.602
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
1"	100.0	3/8"	100.0	1"	100.0
3/4"	93.35	#4	97.12	3/4"	91.77
1/2"	85.62	#10	94.69	1/2"	84.47
3/8"	79.1	#20	92.62	3/8"	76.76
#4	64.41	#40	88.39	#4	58.51
#10	50.63	#60	83.14	#10	41.01
#20	42.27	#100	78.22	#20	32.66
#40	36.66	#200	72.19	#40	27.31
#60	31.92			#60	22.52
#100	28.83			#100	19.37
#200	26.33			#200	16.9

SOIL DESCRIPTION	
●	
⊠	
▲	

REMARKS	
●	
⊠	
▲	

PROJECT: DuPont Additional Borings

PROJECT NUMBER: E2175151

SITE: DuPont Parkway
Chattanooga, Tennessee

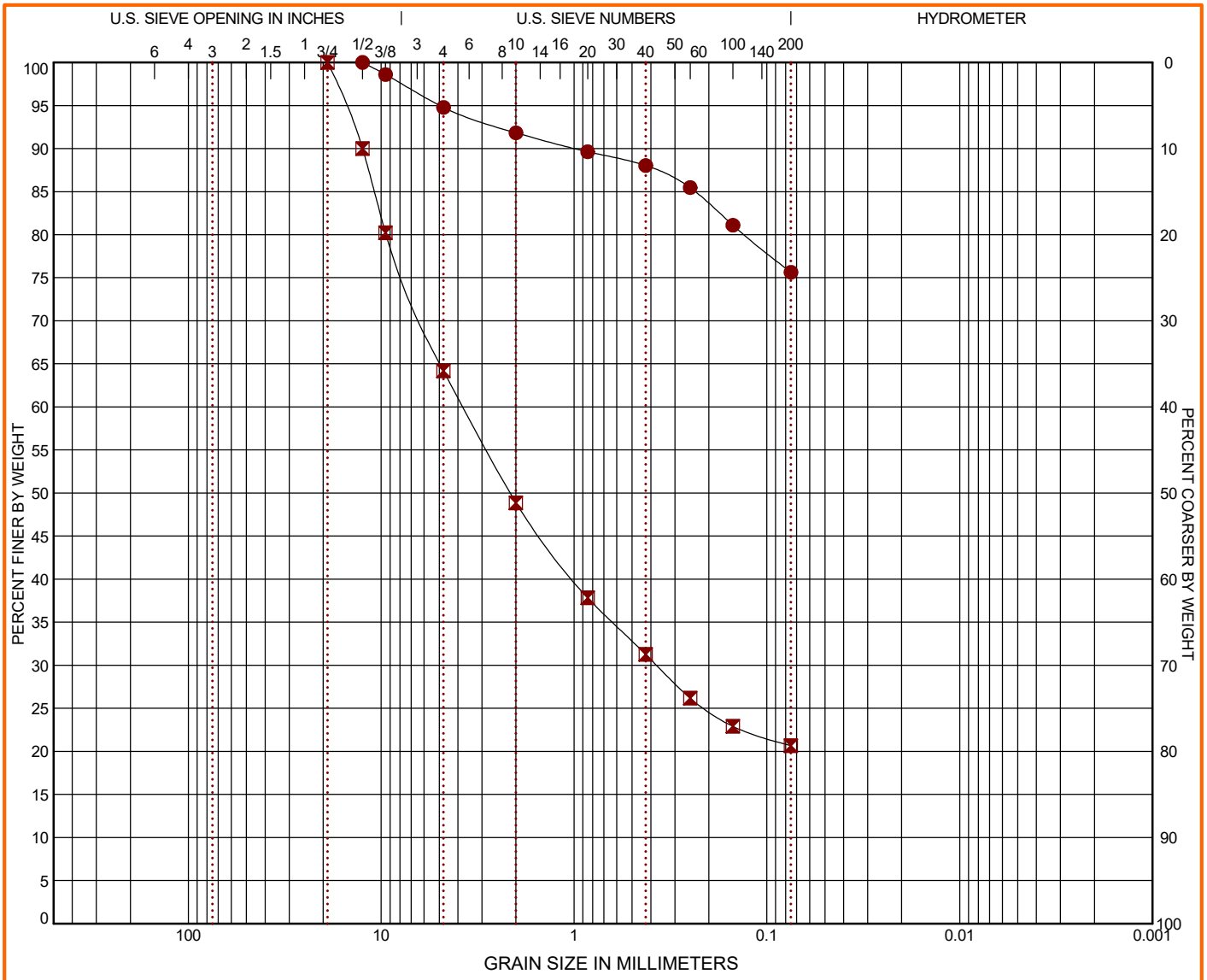
Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: CDM Smith Inc.
Knoxville, TN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 E2175151 DUPONT ADDITIONAL.GPJ TERRACON_DATATEMPLATE.GDT 8/20/18

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	B-215	6.5	0.0	5.2	19.1		75.6		CL
⊠	B-215	10	0.0	35.8	43.5		20.7		SC

GRAIN SIZE	●	⊠
D_{60}		3.751
D_{30}		0.372
D_{10}		

COEFFICIENTS	●	⊠
C_C		
C_U		

●		⊠			
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
1/2"	100.0	3/4"	100.0		
3/8"	98.6	1/2"	89.99		
#4	94.77	3/8"	80.21		
#10	91.82	#4	64.18		
#20	89.63	#10	48.87		
#40	88.03	#20	37.84		
#60	85.47	#40	31.26		
#100	81.1	#60	26.19		
#200	75.63	#100	22.9		
		#200	20.68		

SOIL DESCRIPTION	
●	LEAN CLAY with SAND (CL)
⊠	CLAYEY SAND with GRAVEL (SC)

REMARKS	
●	
⊠	

PROJECT: DuPont Additional Borings

PROJECT NUMBER: E2175151

SITE: DuPont Parkway
Chattanooga, Tennessee

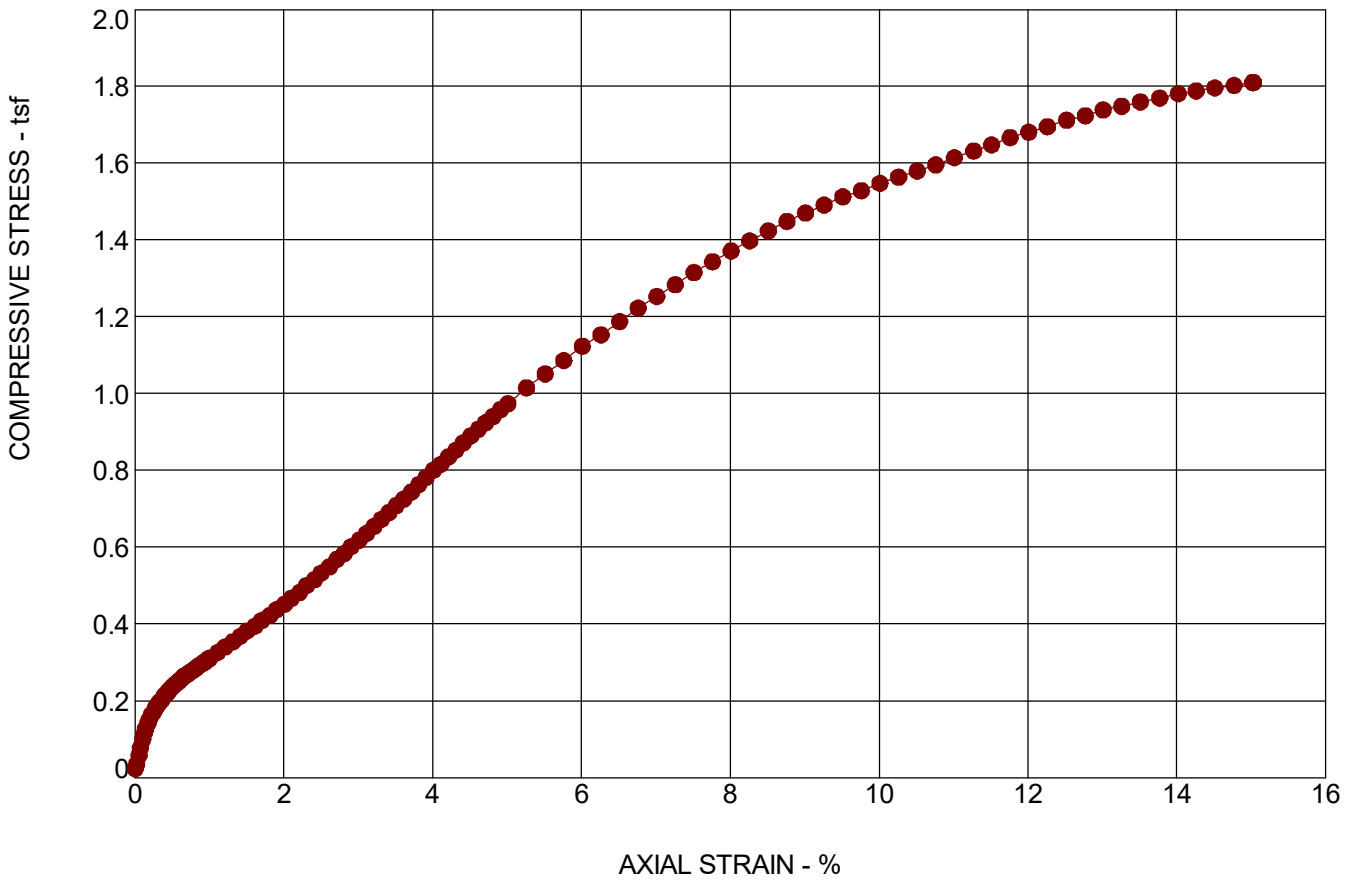
Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

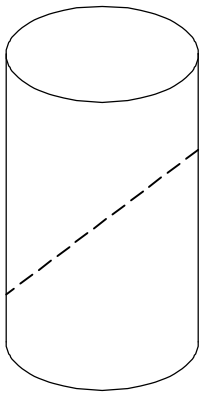
CLIENT: CDM Smith Inc.
Knoxville, TN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 E2175151 DUPONT ADDITIONAL.GPJ TERRACON_DATATEMPLATE.GDT 8/20/18

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE MODE	SPECIMEN TEST DATA		
	Moisture Content:	%	25
	Dry Density:	pcf	105
	Diameter:	in.	2.80
	Height:	in.	5.68
	Height / Diameter Ratio:		2.03
	Calculated Saturation:	%	110.70
	Calculated Void Ratio:		0.61
	Assumed Specific Gravity:		2.7
	Failure Strain:	%	15.00
	Unconfined Compressive Strength	(tsf)	1.81
	Undrained Shear Strength:	(tsf)	0.90
	Strain Rate:	in/min	0.0560
	Remarks:		

Failure Mode: Shear (dashed)

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-104 @ 10 - 12 feet			
DESCRIPTION:	LL	PL	PI	Percent < #200 Sieve

PROJECT: DuPont Additional Borings

PROJECT NUMBER: E2175151

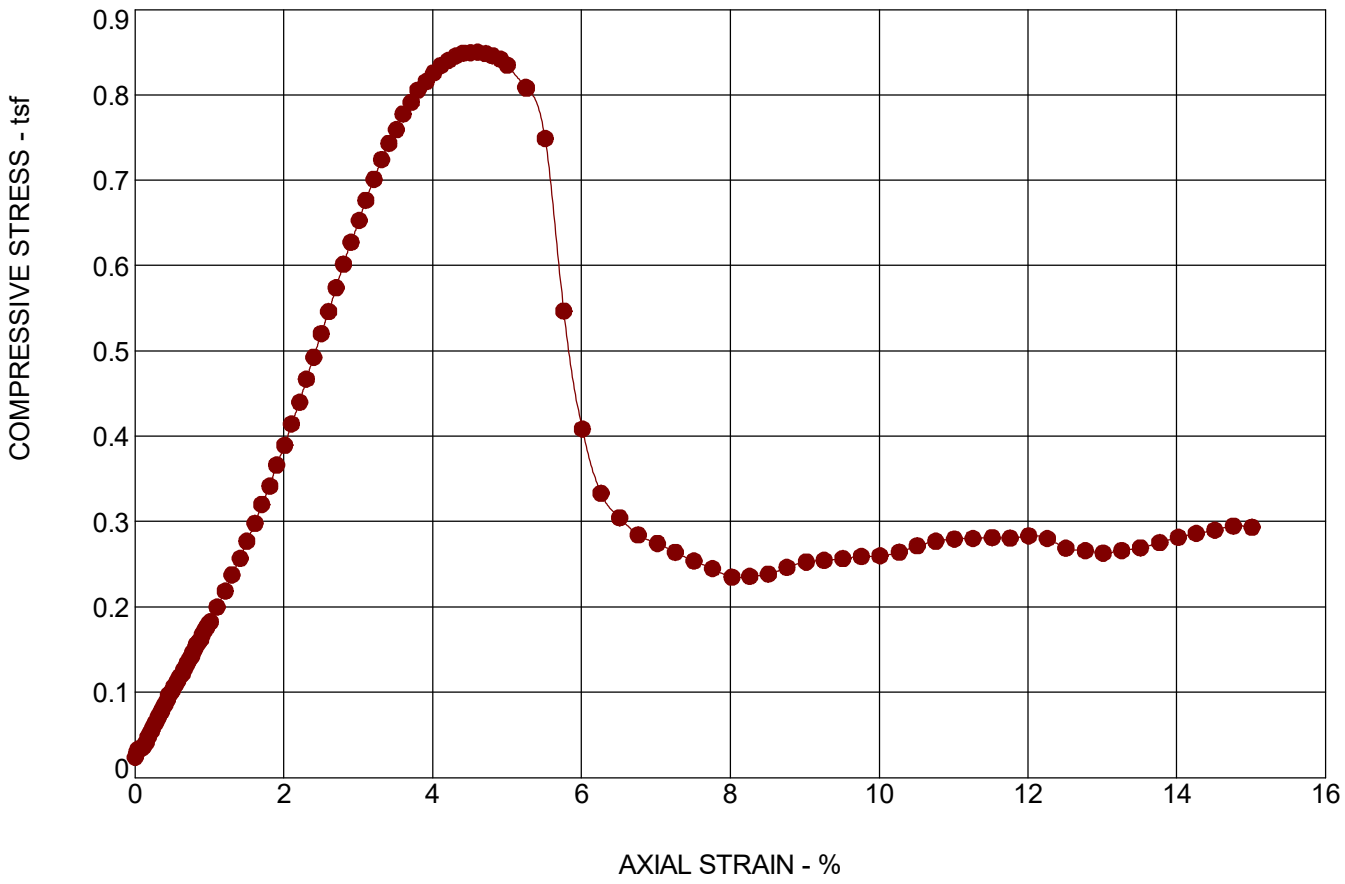
SITE: DuPont Parkway
Chattanooga, Tennessee

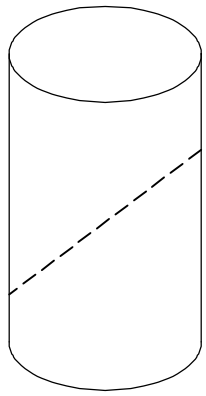
Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: CDM Smith Inc.
Knoxville, TN

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE MODE	SPECIMEN TEST DATA		
	Moisture Content:	%	31
	Dry Density:	pcf	88
	Diameter:	in.	2.84
	Height:	in.	5.66
	Height / Diameter Ratio:		1.99
	Calculated Saturation:	%	92.51
	Calculated Void Ratio:		0.91
	Assumed Specific Gravity:		2.7
	Failure Strain:	%	4.60
	Unconfined Compressive Strength	(tsf)	0.85
	Undrained Shear Strength:	(tsf)	0.43
	Strain Rate:	in/min	0.0560
	Remarks:		

Failure Mode: Shear (dashed)

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-104 @ 22 - 24 feet			
DESCRIPTION:	LL	PL	PI	Percent < #200 Sieve

PROJECT: DuPont Additional Borings

PROJECT NUMBER: E2175151

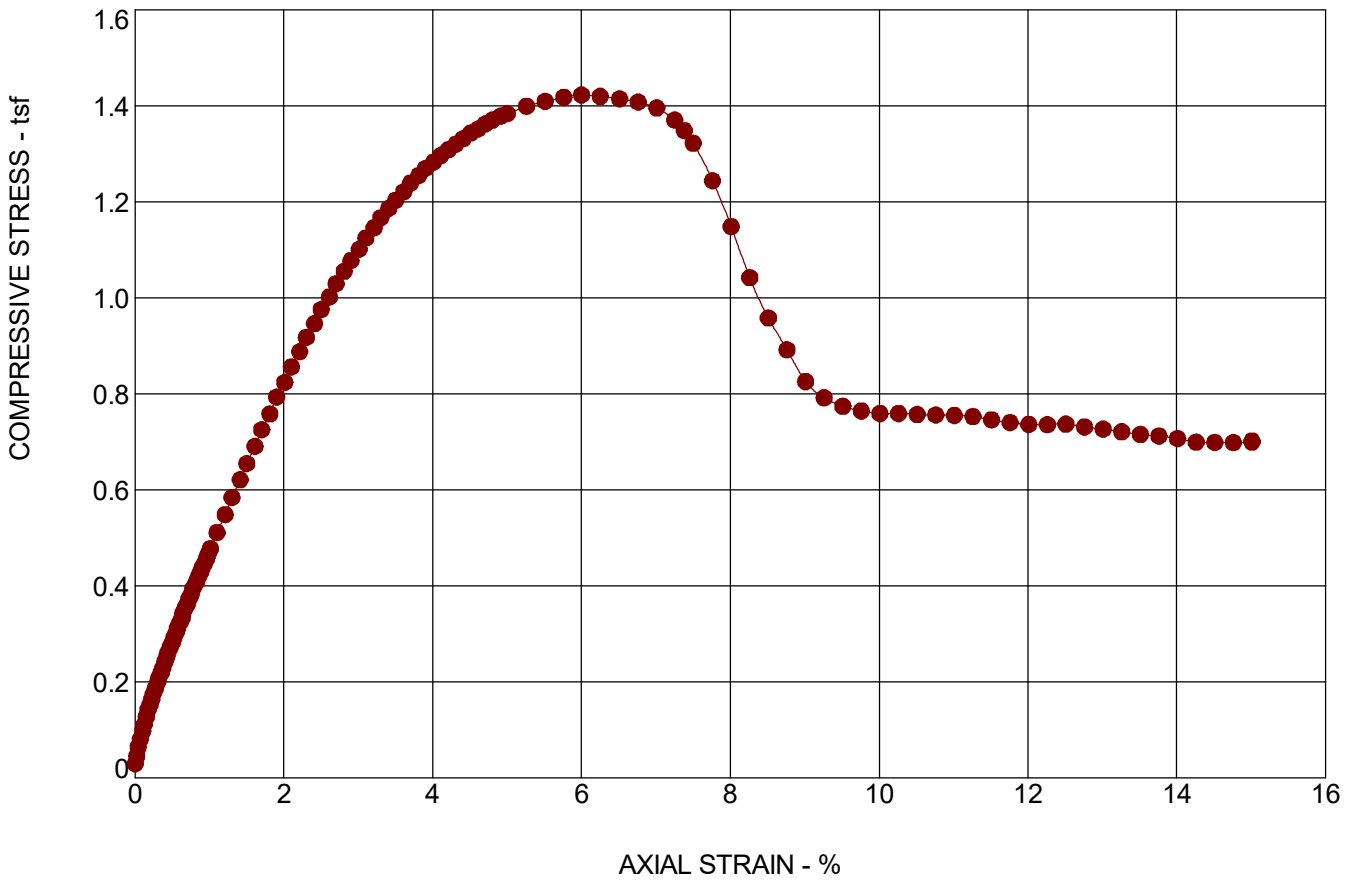
SITE: DuPont Parkway
Chattanooga, Tennessee

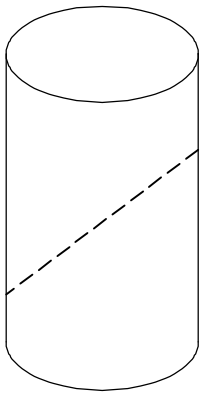
Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: CDM Smith Inc.
Knoxville, TN

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE MODE	SPECIMEN TEST DATA		
	Moisture Content:	%	35
	Dry Density:	pcf	87
	Diameter:	in.	2.83
	Height:	in.	5.69
	Height / Diameter Ratio:		2.01
	Calculated Saturation:	%	100.09
	Calculated Void Ratio:		0.95
	Assumed Specific Gravity:		2.7
	Failure Strain:	%	6.00
	Unconfined Compressive Strength	(tsf)	1.42
	Undrained Shear Strength:	(tsf)	0.71
	Strain Rate:	in/min	0.0560
	Remarks:		

Failure Mode: Shear (dashed)

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-108 @ 8 - 10 feet			
DESCRIPTION:	LL	PL	PI	Percent < #200 Sieve

PROJECT: DuPont Additional Borings

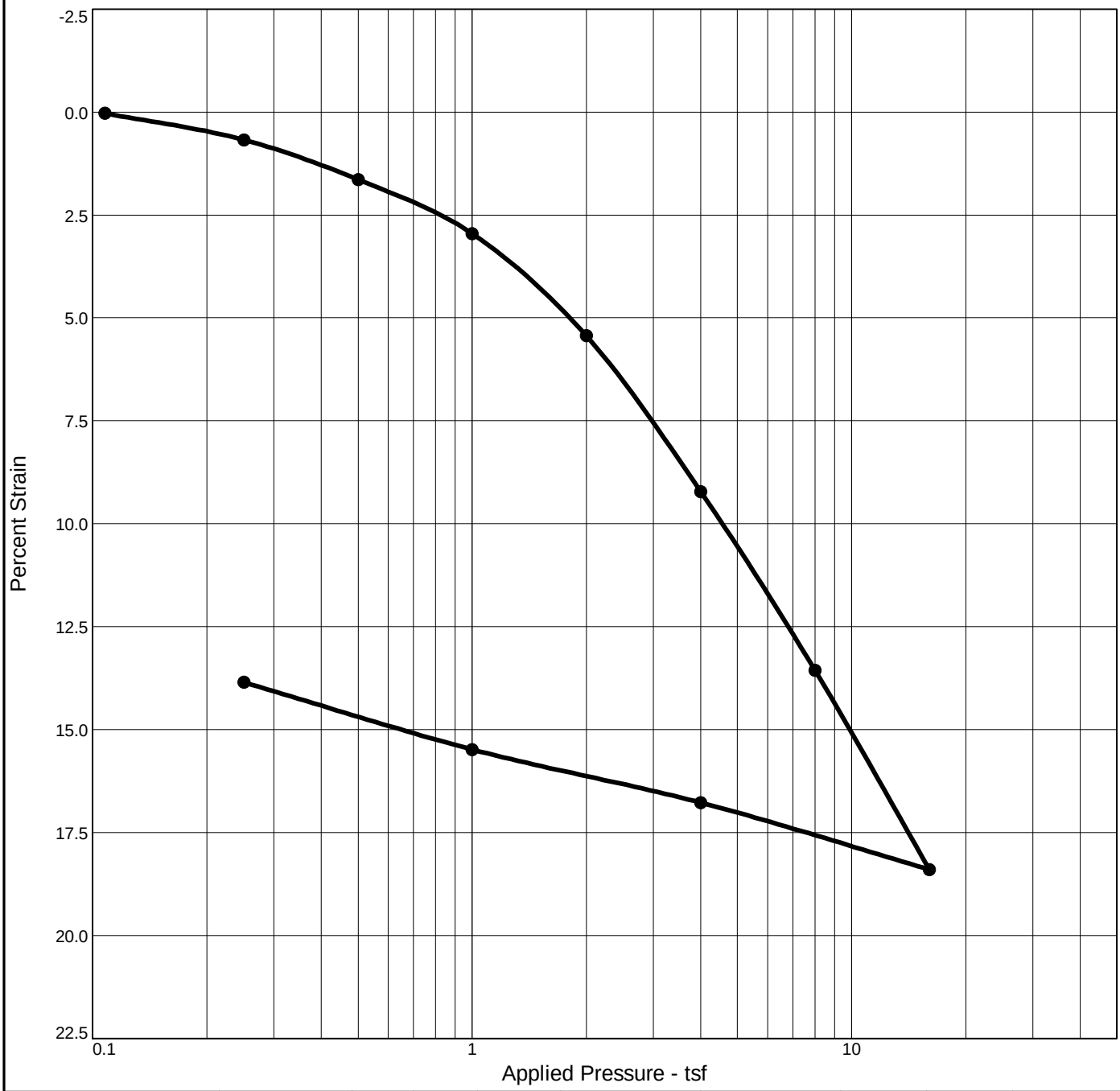
PROJECT NUMBER: E2175151

SITE: DuPont Parkway
Chattanooga, Tennessee

Terracon
51 Lost Mound Dr, Ste 135
Chattanooga, TN

CLIENT: CDM Smith Inc.
Knoxville, TN

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
87.4 %	29.4 %	89.3	X	X	2.7	1.07	2.4	0.31	0.04	0.908

MATERIAL DESCRIPTION	USCS	AASHTO
blue-gray sandy clay	X	X

Project No. E2175151 **Client:** CDM Smith, Inc

Project: DuPont Additional Borings

Source of Sample: B-104 **Depth:** 22.0-24.0 ft **Sample Number:** N/A

Remarks:
Swell pressure of 215.32 psf.

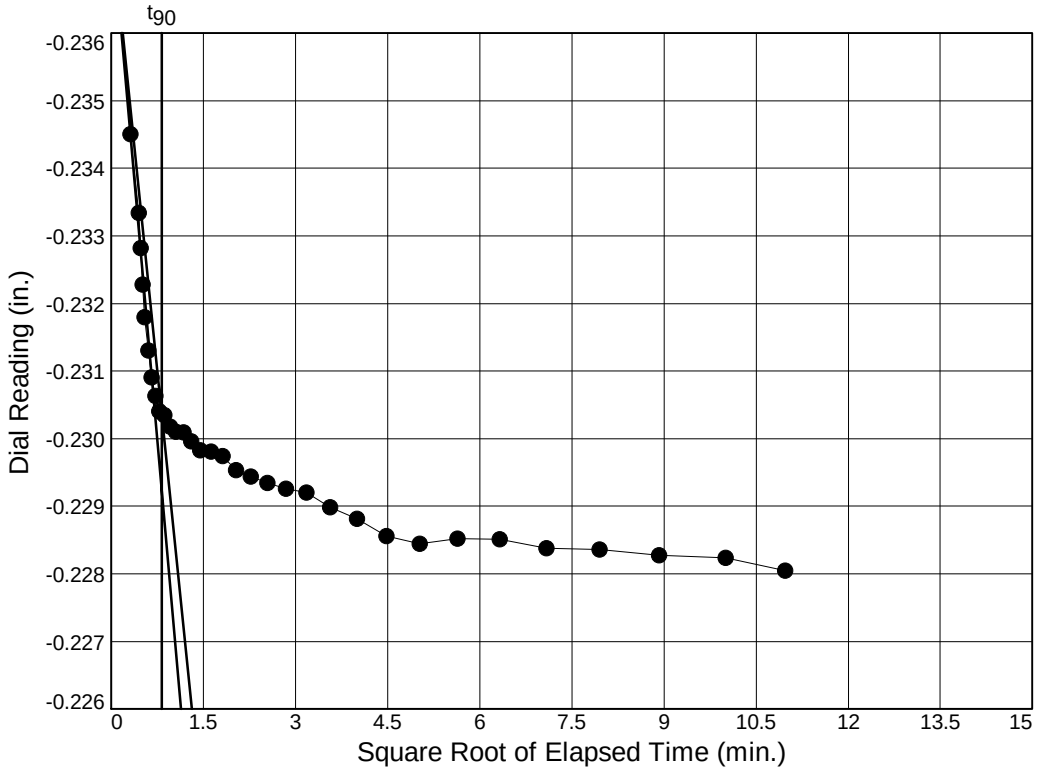
Terracon Consultants, Inc.

Chattanooga, TN

Dial Reading vs. Time

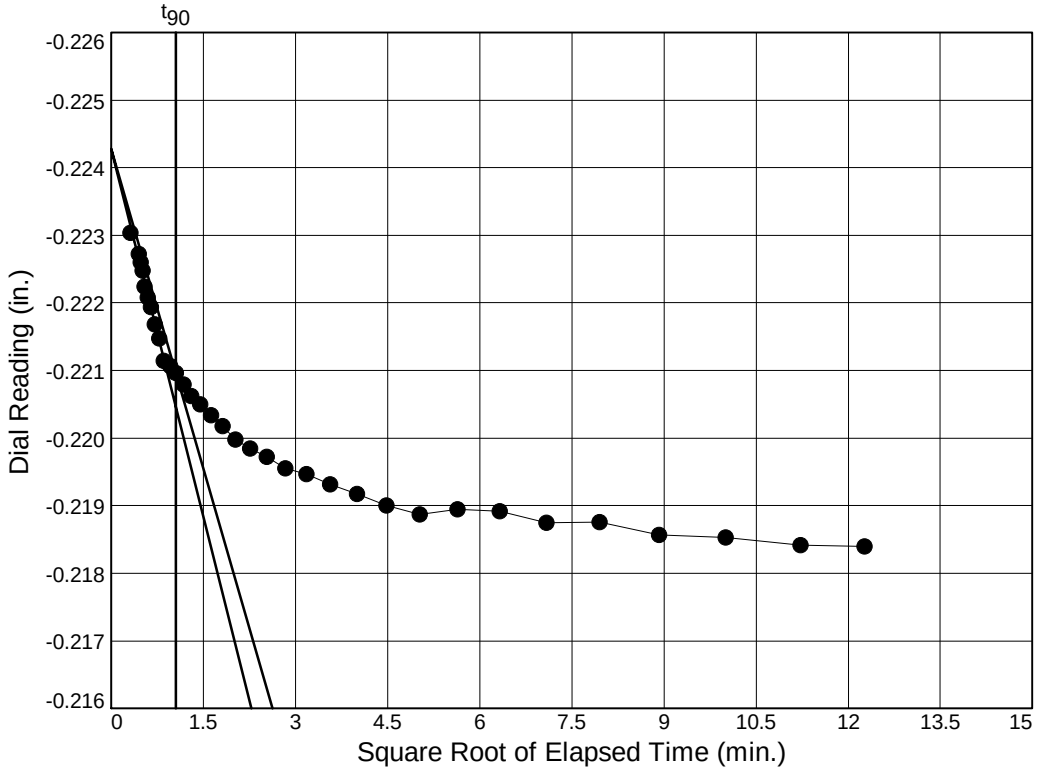
Project No.: E2175151
Project: DuPont Additional Borings

Source of Sample: B-104 Depth: 22.0-24.0 ft Sample Number: N/A



Load No.= 2
Load= 0.25 tsf
D_0 = -0.2377
D_{90} = -0.2304
D_{100} = -0.2296
T_{90} = 0.67 min.

C_v @ T_{90}
3.122 ft.^{2}/day



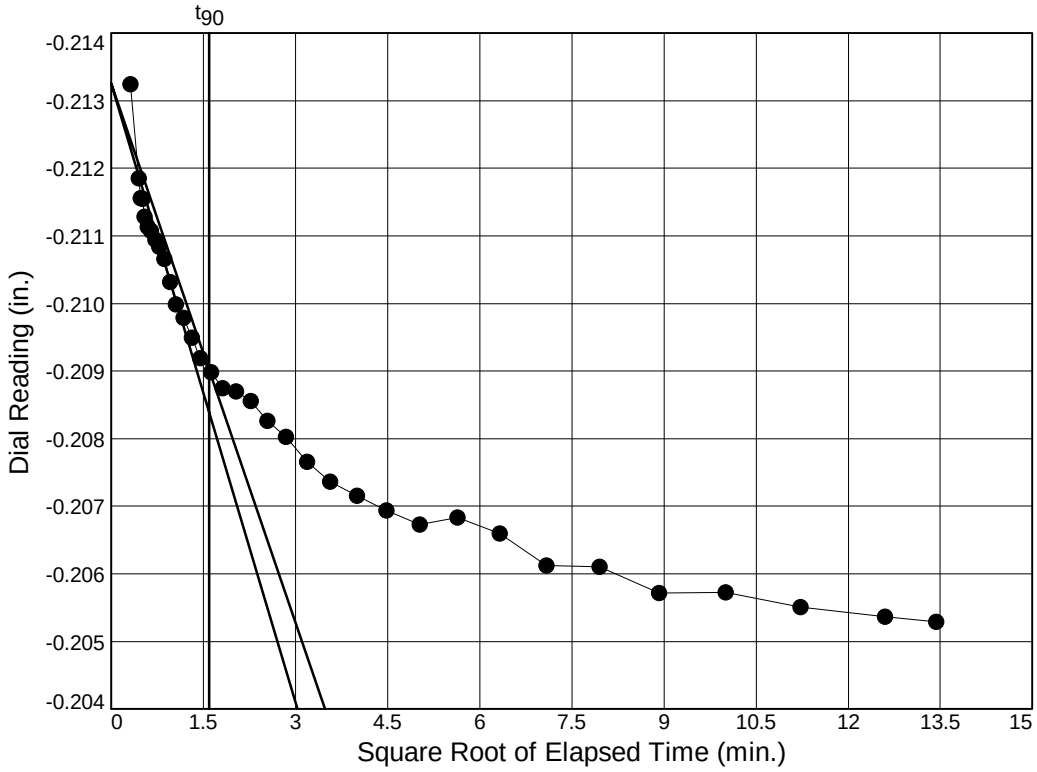
Load No.= 3
Load= 0.50 tsf
D_0 = -0.2243
D_{90} = -0.2210
D_{100} = -0.2206
T_{90} = 1.10 min.

C_v @ T_{90}
1.881 ft.^{2}/day

Dial Reading vs. Time

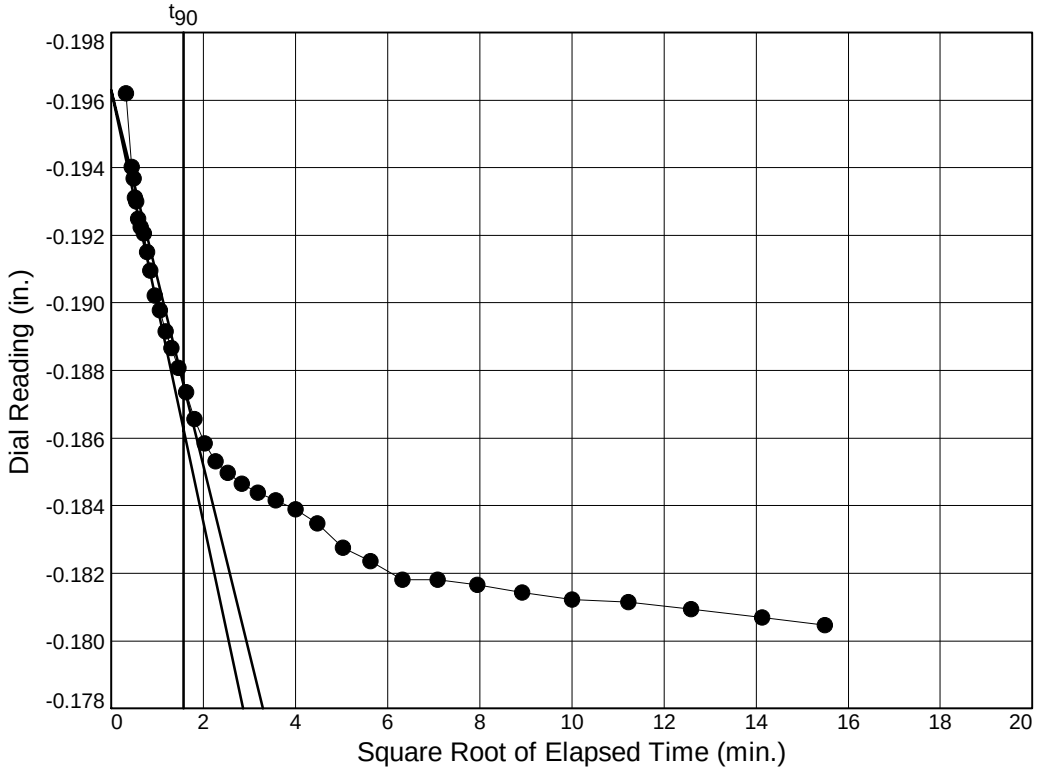
Project No.: E2175151
Project: DuPont Additional Borings

Source of Sample: B-104 Depth: 22.0-24.0 ft Sample Number: N/A



Load No.= 4
Load= 1.00 tsf
D_0 = -0.2132
D_{90} = -0.2090
D_{100} = -0.2085
T_{90} = 2.55 min.

C_v @ T_{90}
0.792 ft.^{2}/day



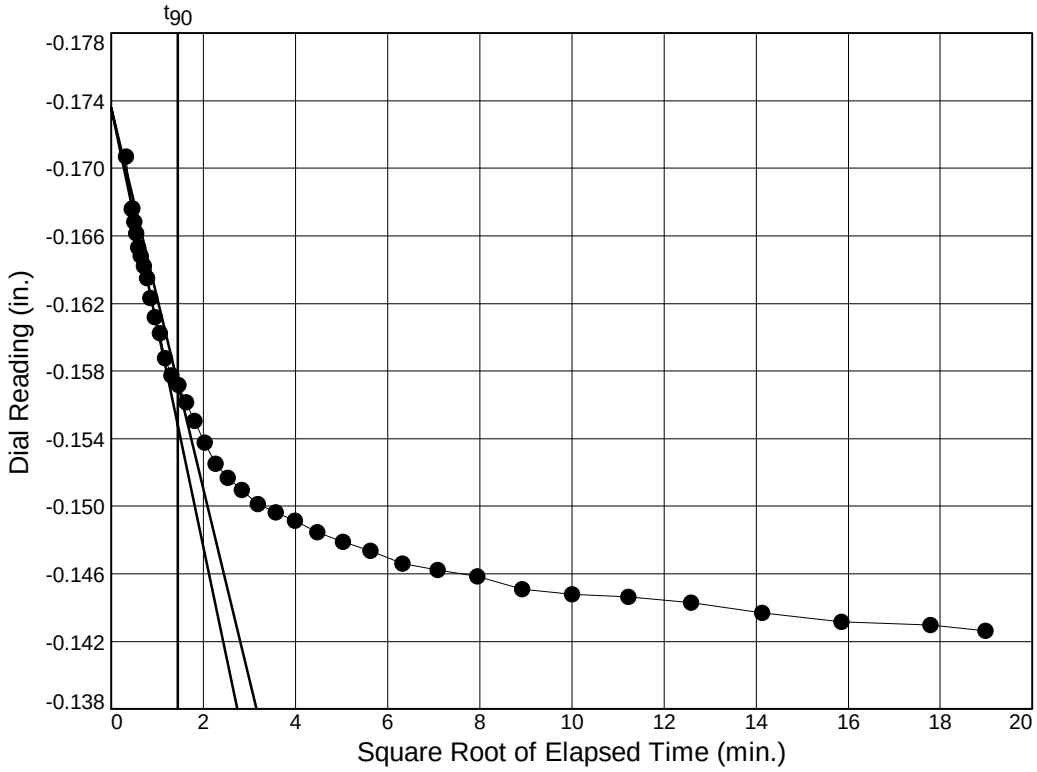
Load No.= 5
Load= 2.00 tsf
D_0 = -0.1963
D_{90} = -0.1876
D_{100} = -0.1866
T_{90} = 2.46 min.

C_v @ T_{90}
0.791 ft.^{2}/day

Dial Reading vs. Time

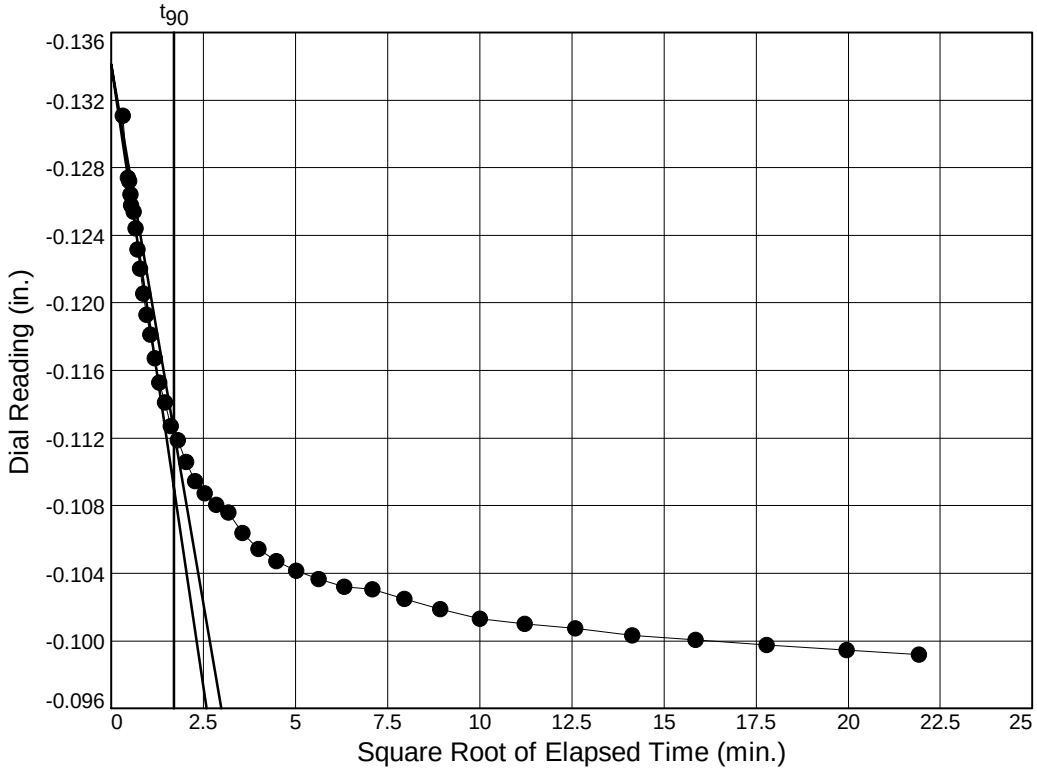
Project No.: E2175151
Project: DuPont Additional Borings

Source of Sample: B-104 Depth: 22.0-24.0 ft Sample Number: N/A



Load No.= 6
Load= 4.00 tsf
D_0 = -0.1736
D_{90} = -0.1572
D_{100} = -0.1554
T_{90} = 2.11 min.

C_v @ T_{90}
0.863 ft.^{2}/day



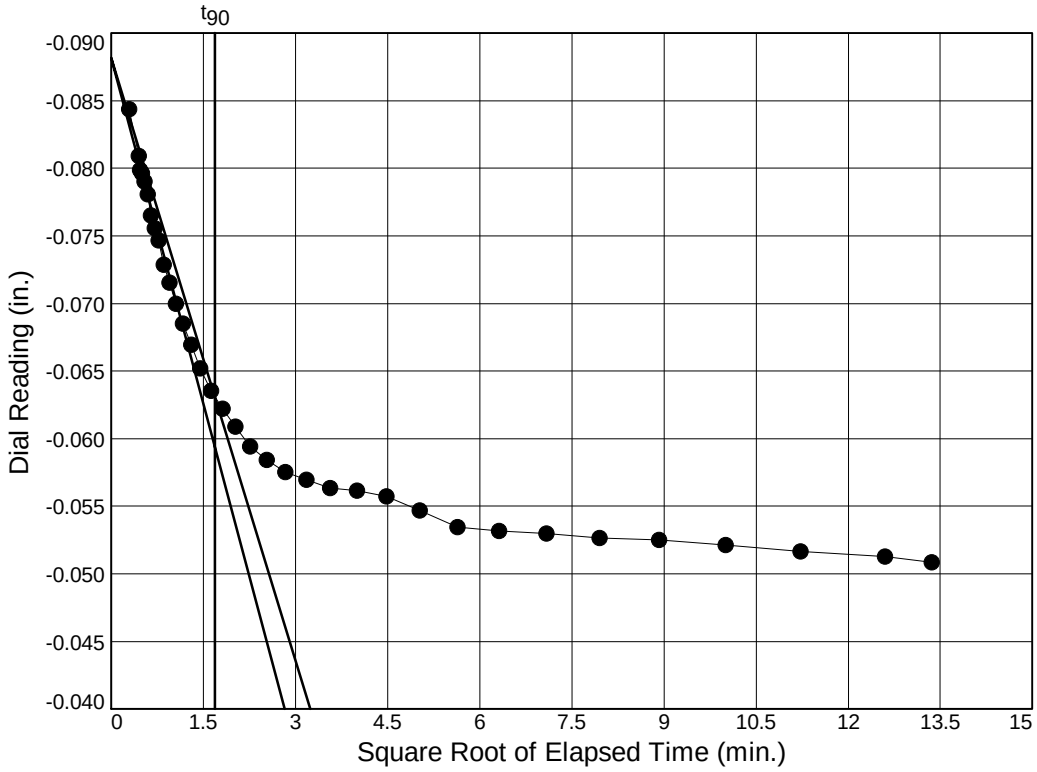
Load No.= 7
Load= 8.00 tsf
D_0 = -0.1341
D_{90} = -0.1123
D_{100} = -0.1099
T_{90} = 2.91 min.

C_v @ T_{90}
0.572 ft.^{2}/day

Dial Reading vs. Time

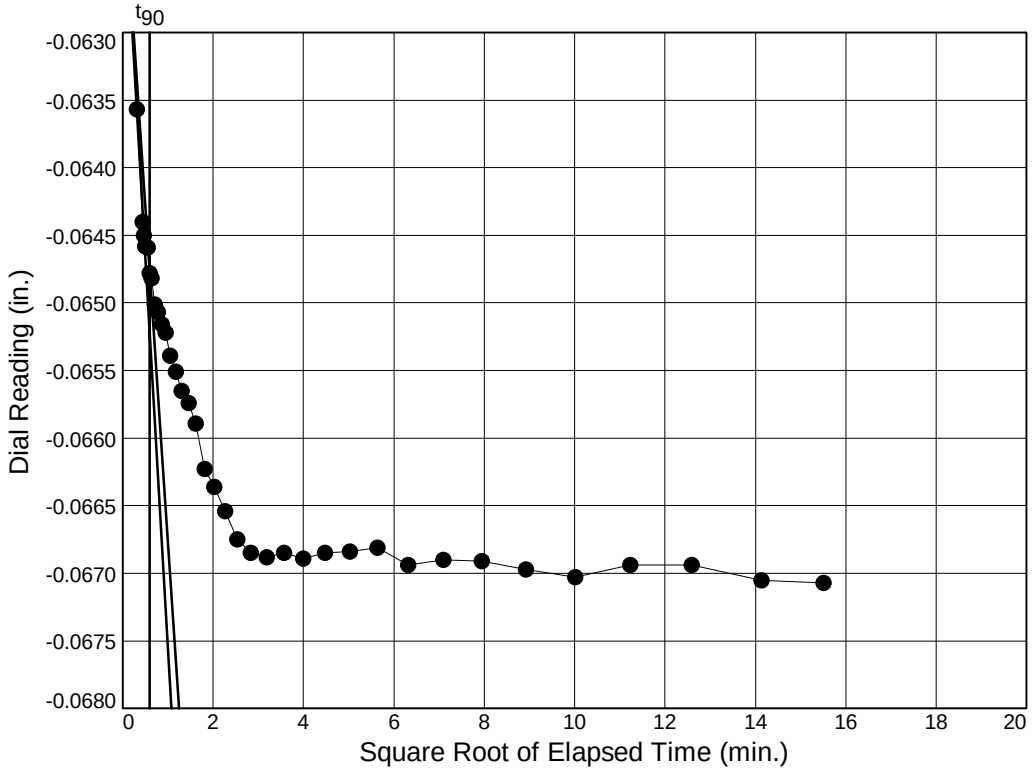
Project No.: E2175151
Project: DuPont Additional Borings

Source of Sample: B-104 Depth: 22.0-24.0 ft Sample Number: N/A



Load No.= 8
Load= 16.00 tsf
D_0 = -0.0882
D_{90} = -0.0630
D_{100} = -0.0603
T_{90} = 2.86 min.

C_v @ T_{90}
0.523 ft.^{2}/day



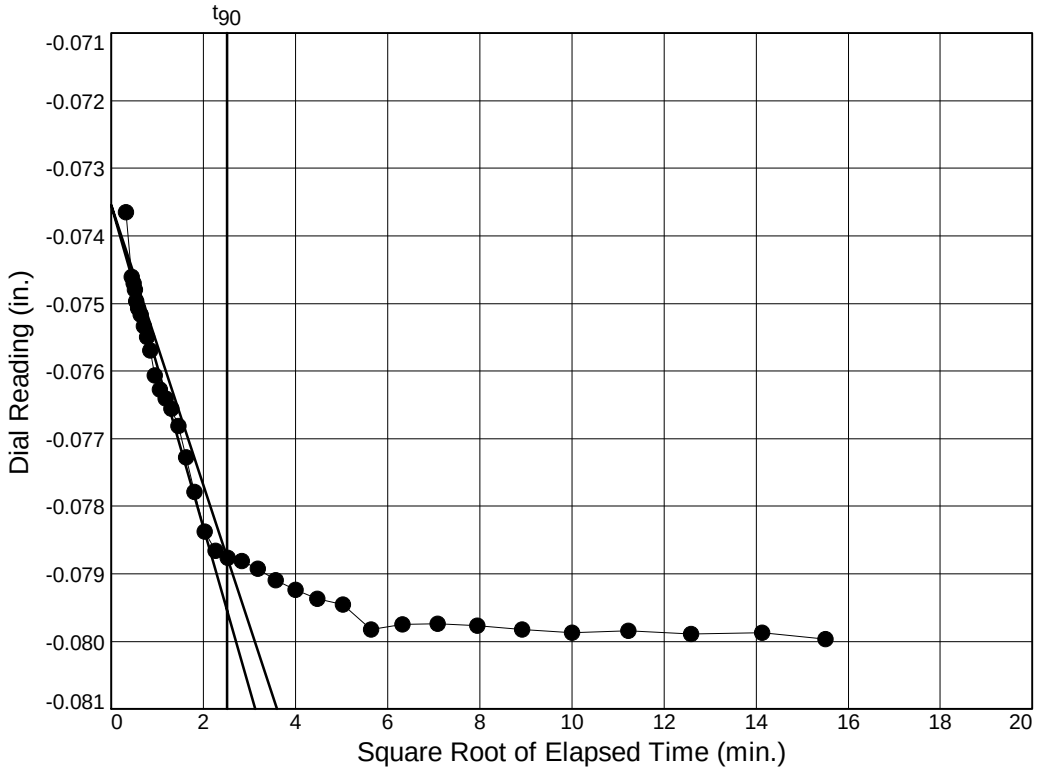
Load No.= 9
Load= 4.00 tsf
D_0 = -0.0618
D_{90} = -0.0648
D_{100} = -0.0651
T_{90} = 0.36 min.

C_v @ T_{90}
3.978 ft.^{2}/day

Dial Reading vs. Time

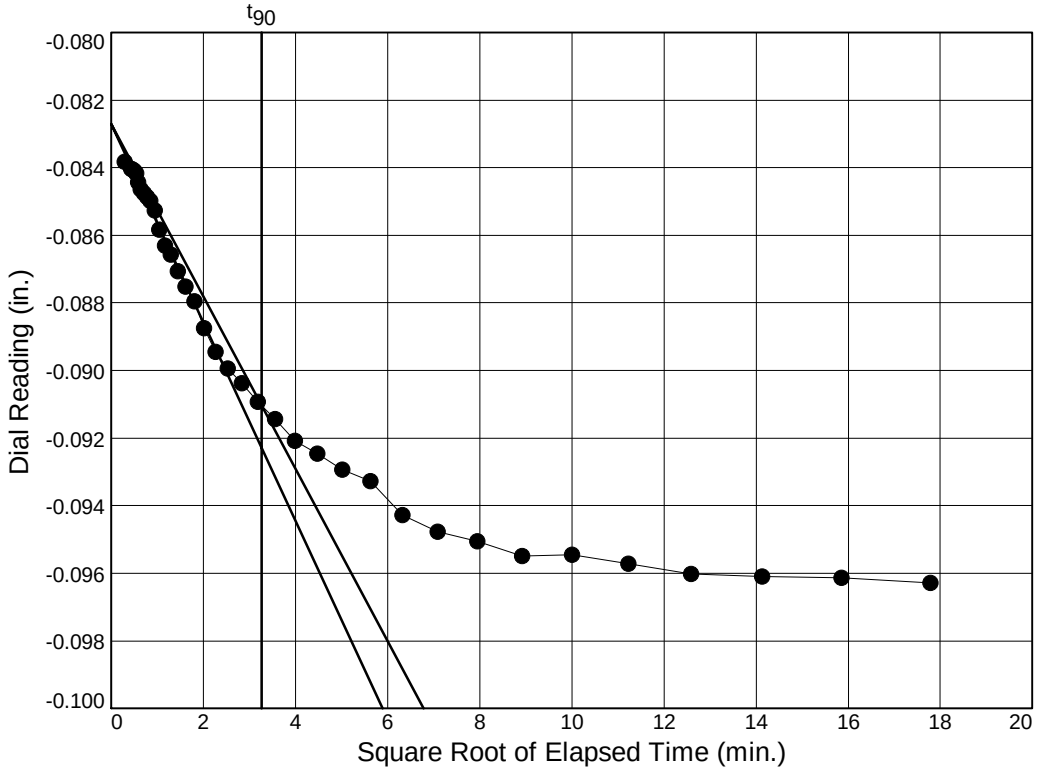
Project No.: E2175151
Project: DuPont Additional Borings

Source of Sample: B-104 Depth: 22.0-24.0 ft Sample Number: N/A



Load No.= 10
Load= 1.00 tsf
D_0 = -0.0736
D_{90} = -0.0788
D_{100} = -0.0793
T_{90} = 6.32 min.

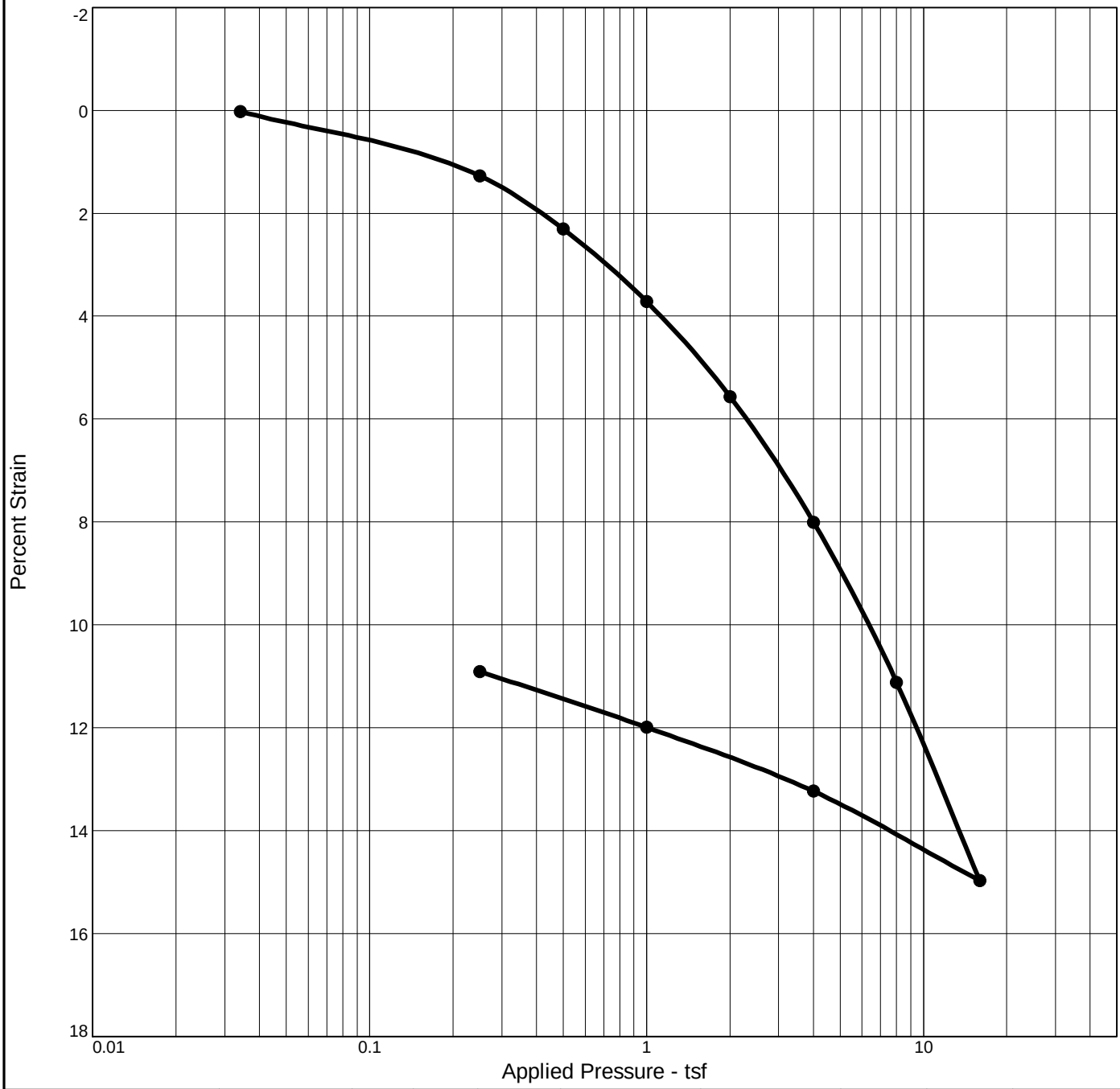
C_v @ T_{90}
0.236 ft.^{2}/day



Load No.= 11
Load= 0.25 tsf
D_0 = -0.0827
D_{90} = -0.0910
D_{100} = -0.0920
T_{90} = 10.66 min.

C_v @ T_{90}
0.145 ft.^{2}/day

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
90.0 %	26.2 %	95.9	33	11	2.7	1.05	3.0	0.23	0.04	0.784

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay with sand (CL)	CL	A-6(6)

Project No. E2175151 **Client:** CDM Smith, Inc

Project: DuPont Additional Borings

Source of Sample: B-104 **Depth:** 20.0-22.0 ft **Sample Number:** N/A

Terracon Consultants, Inc.

Chattanooga, TN

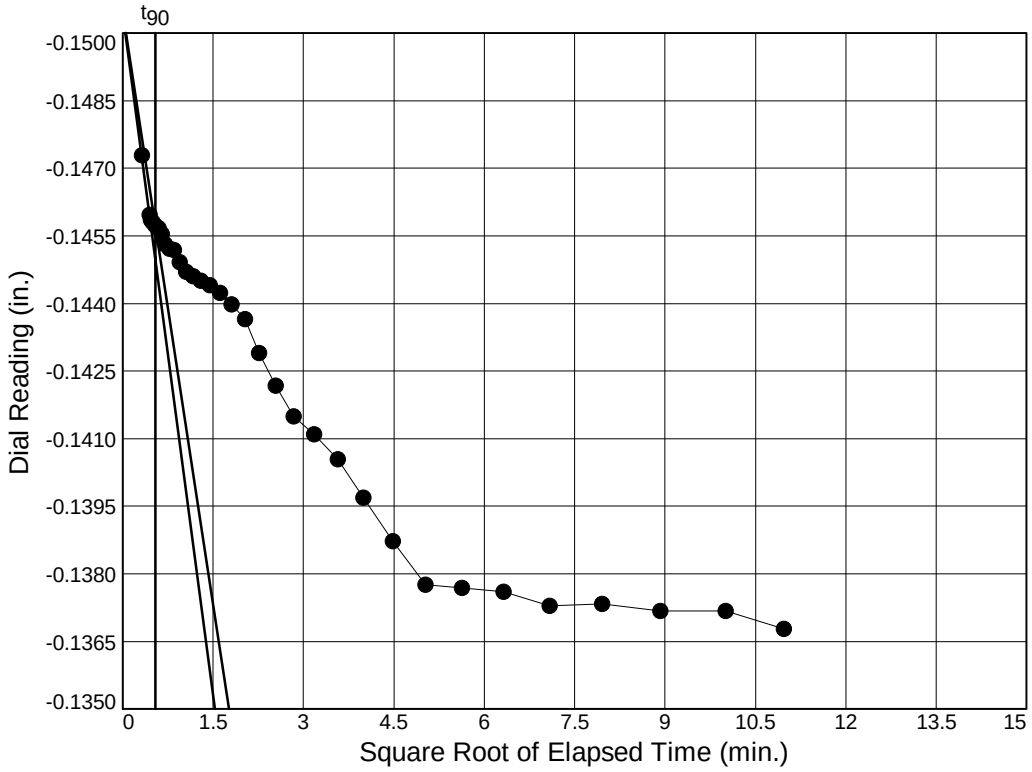
Remarks:

Swell pressure of 68.24 psf

Dial Reading vs. Time

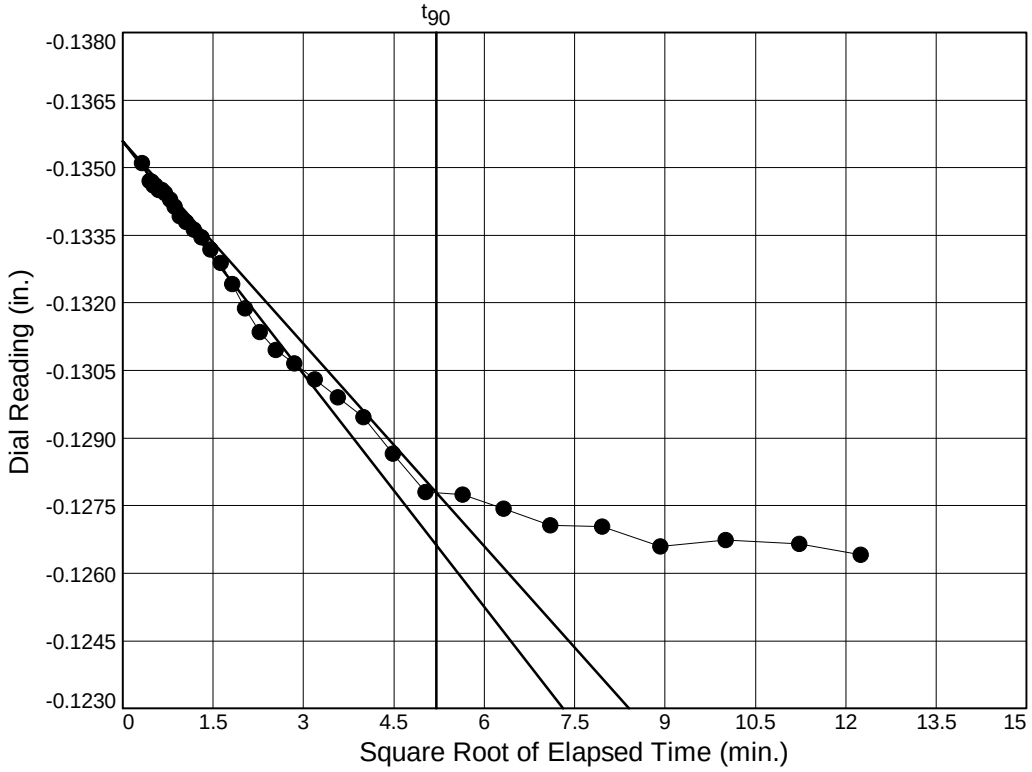
Project No.: E2175151
Project: DuPont Additional Borings

Source of Sample: B-104 Depth: 20.0-22.0 ft Sample Number: N/A



Load No.= 2
Load= 0.25 tsf
D_0 = -0.1505
D_{90} = -0.1457
D_{100} = -0.1452
T_{90} = 0.29 min.

C_v @ T_{90}
7.162 ft.^{2}/day



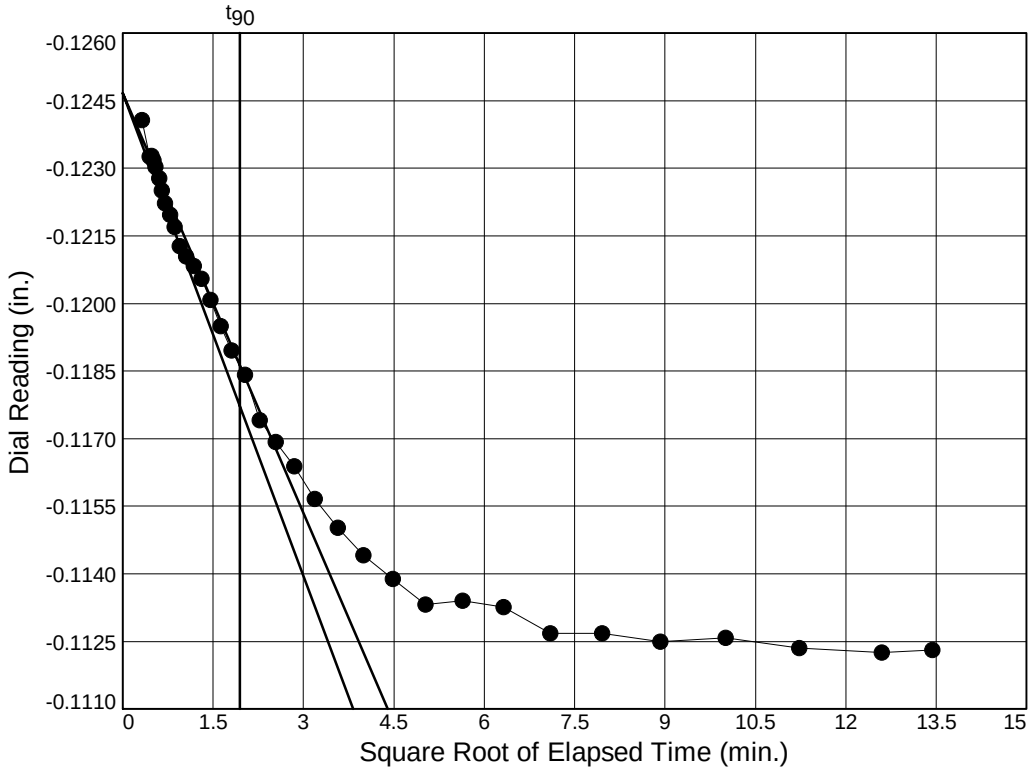
Load No.= 3
Load= 0.50 tsf
D_0 = -0.1356
D_{90} = -0.1278
D_{100} = -0.1269
T_{90} = 27.07 min.

C_v @ T_{90}
0.076 ft.^{2}/day

Dial Reading vs. Time

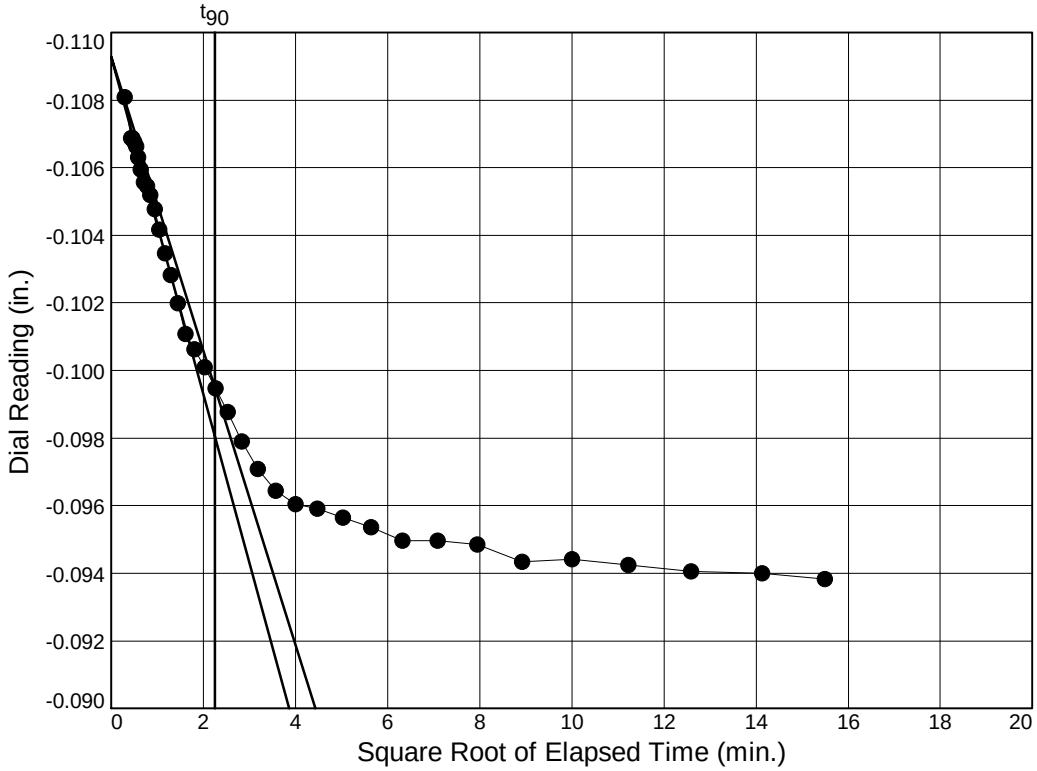
Project No.: E2175151
Project: DuPont Additional Borings

Source of Sample: B-104 Depth: 20.0-22.0 ft Sample Number: N/A



Load No.= 4
Load= 1.00 tsf
D_0 = -0.1247
D_{90} = -0.1186
D_{100} = -0.1179
T_{90} = 3.79 min.

C_v @ T_{90}
0.526 ft.^{2}/day



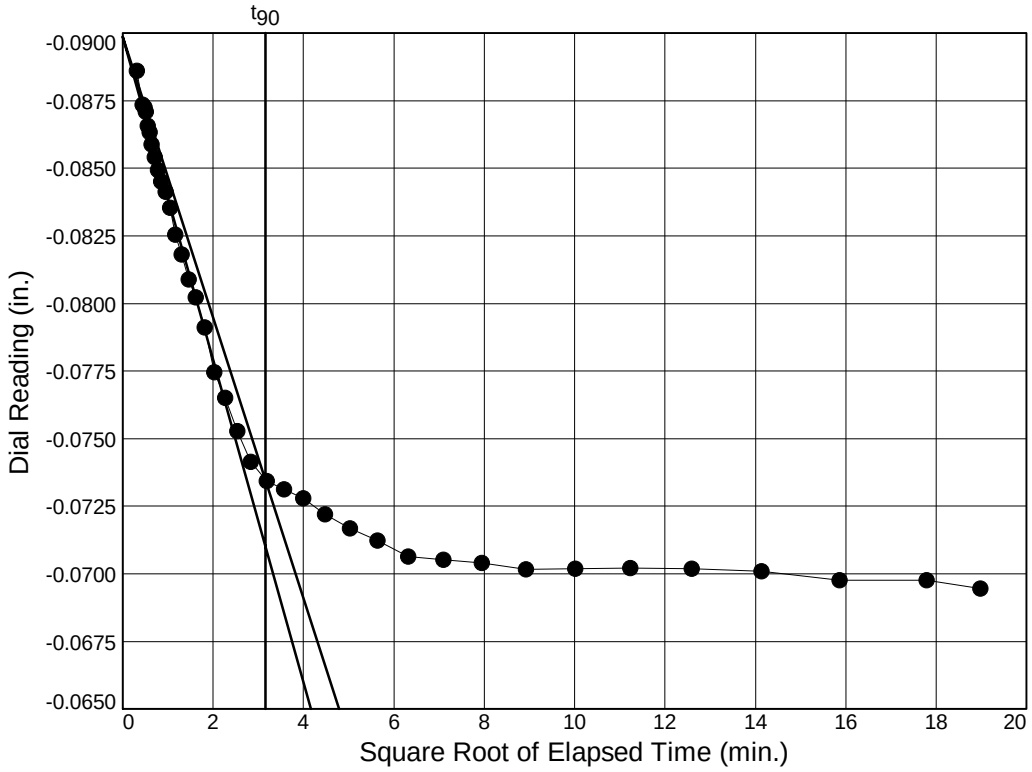
Load No.= 5
Load= 2.00 tsf
D_0 = -0.1093
D_{90} = -0.0995
D_{100} = -0.0984
T_{90} = 5.07 min.

C_v @ T_{90}
0.380 ft.^{2}/day

Dial Reading vs. Time

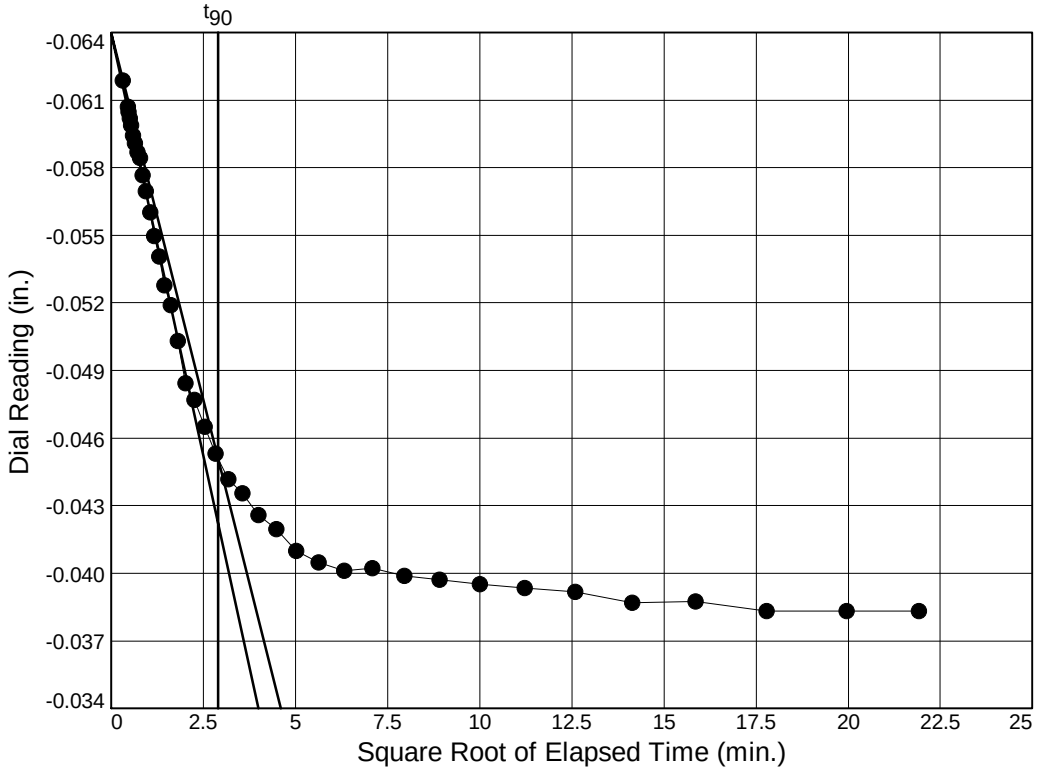
Project No.: E2175151
Project: DuPont Additional Borings

Source of Sample: B-104 Depth: 20.0-22.0 ft Sample Number: N/A



Load No.= 6
Load= 4.00 tsf
D_0 = -0.0899
D_{90} = -0.0735
D_{100} = -0.0717
T_{90} = 9.95 min.

C_v @ T_{90}
0.185 ft.^{2}/day



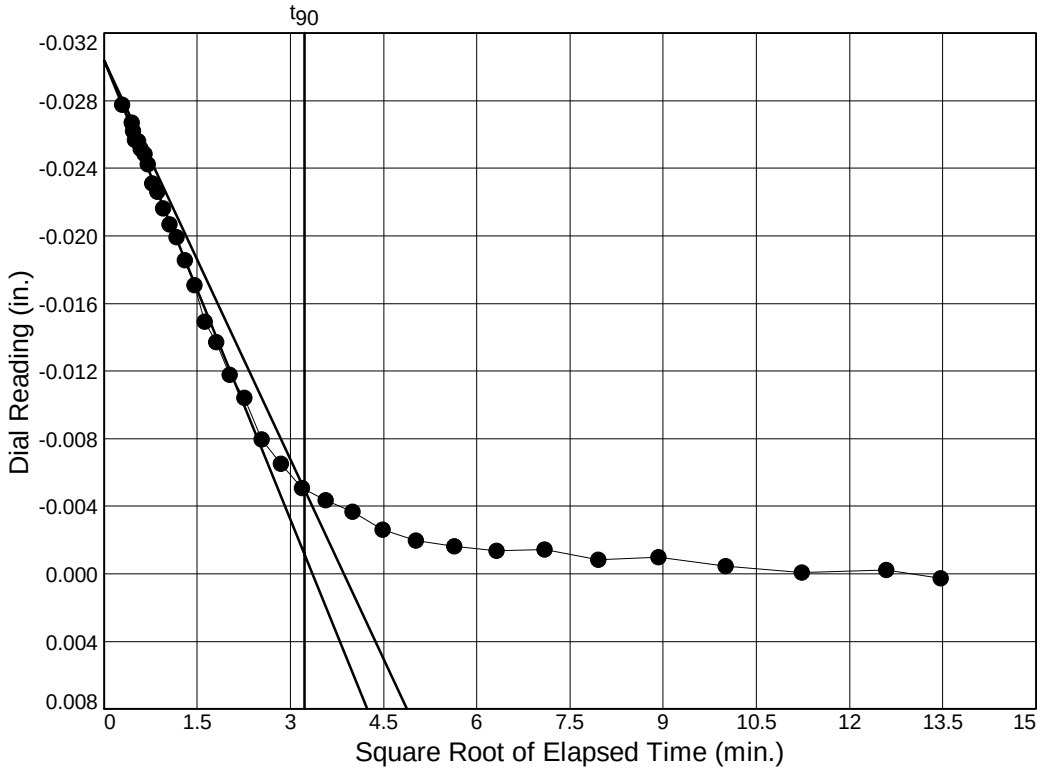
Load No.= 7
Load= 8.00 tsf
D_0 = -0.0640
D_{90} = -0.0451
D_{100} = -0.0430
T_{90} = 8.40 min.

C_v @ T_{90}
0.206 ft.^{2}/day

Dial Reading vs. Time

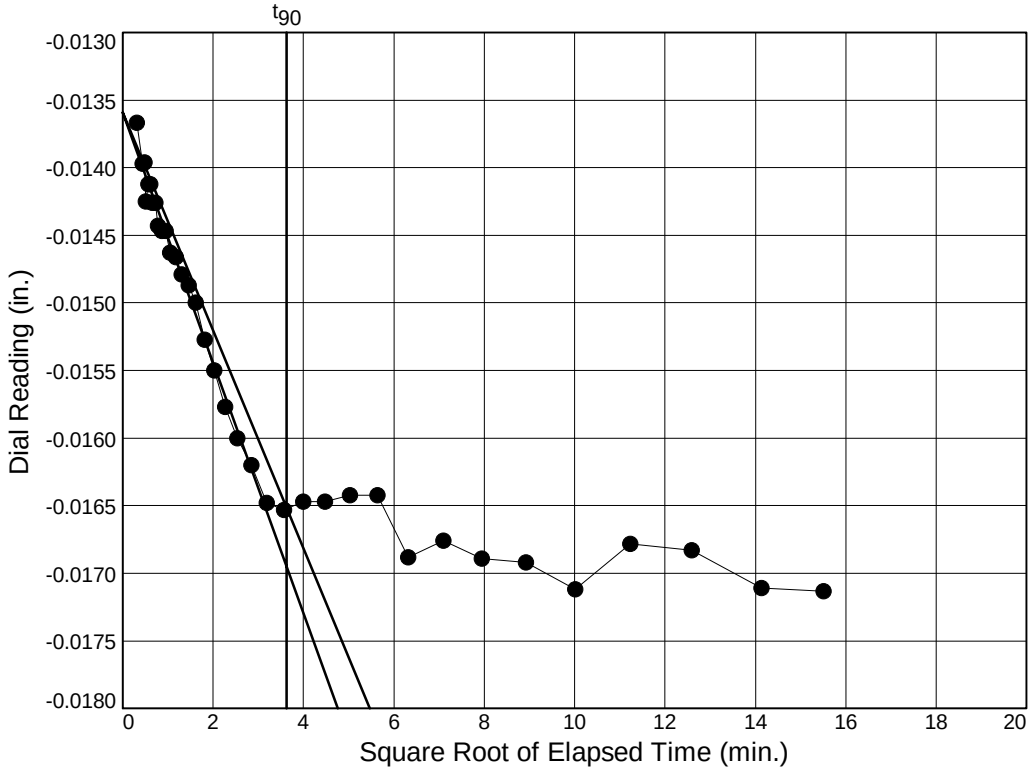
Project No.: E2175151
Project: DuPont Additional Borings

Source of Sample: B-104 Depth: 20.0-22.0 ft Sample Number: N/A



Load No.= 8
Load= 16.00 tsf
D_0 = -0.0304
D_{90} = -0.0050
D_{100} = -0.0022
T_{90} = 10.39 min.

C_v @ T_{90}
0.154 $ft.^2$/day



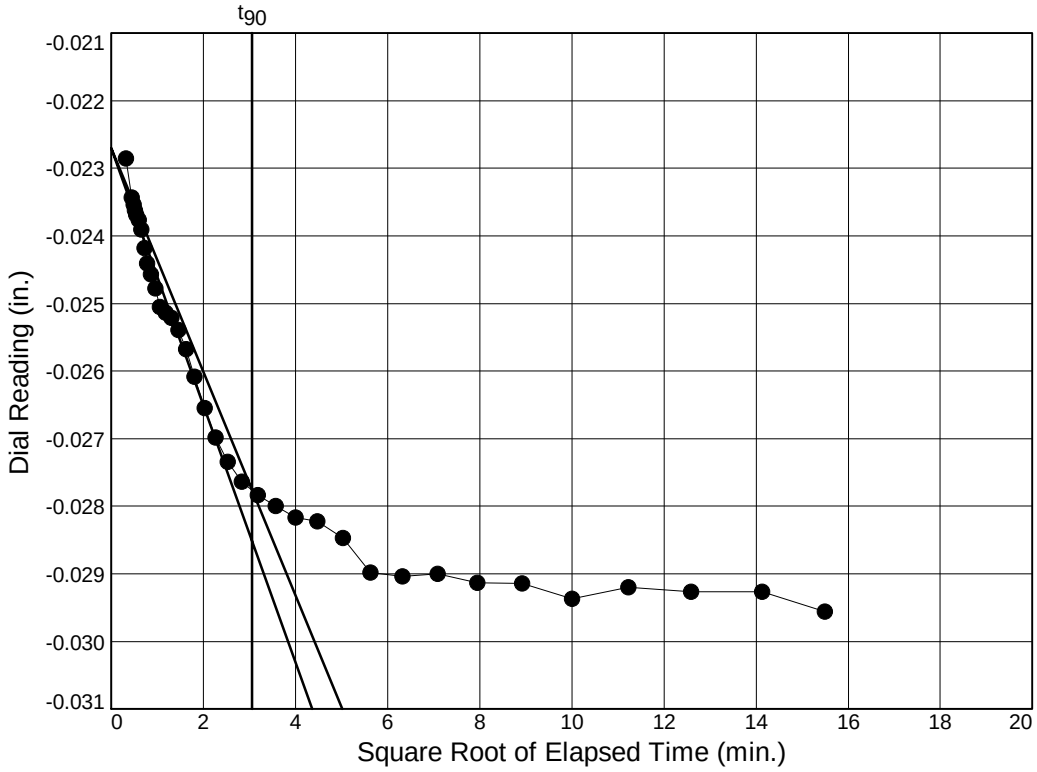
Load No.= 9
Load= 4.00 tsf
D_0 = -0.0136
D_{90} = -0.0165
D_{100} = -0.0168
T_{90} = 13.20 min.

C_v @ T_{90}
0.118 $ft.^2$/day

Dial Reading vs. Time

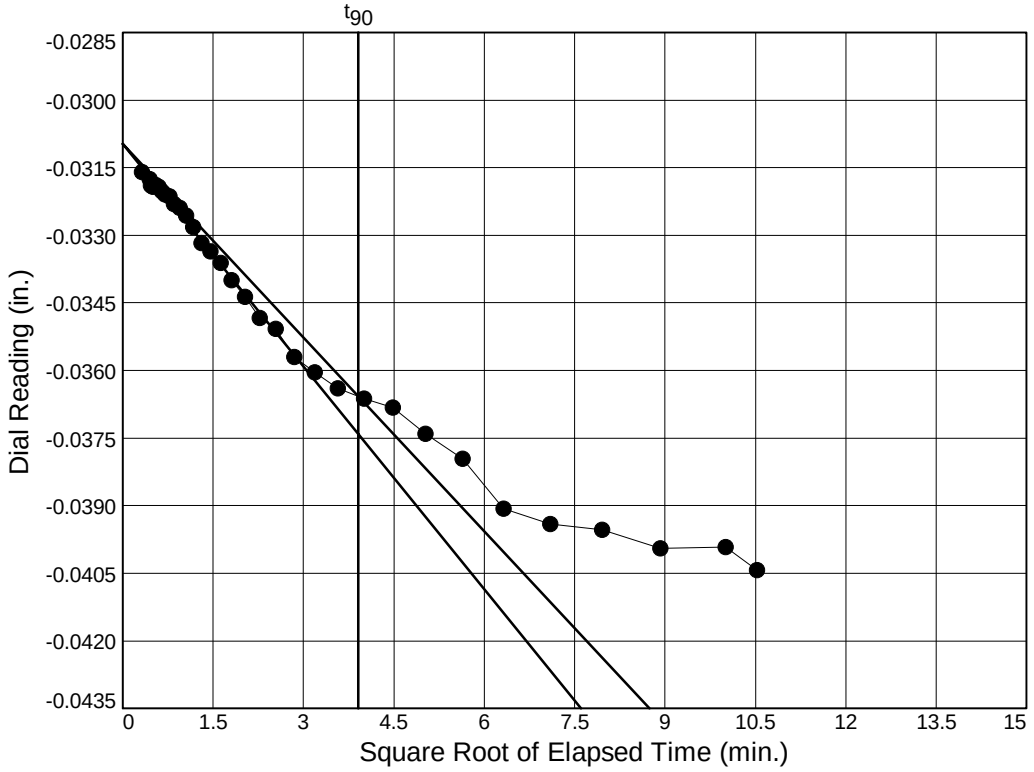
Project No.: E2175151
Project: DuPont Additional Borings

Source of Sample: B-104 Depth: 20.0-22.0 ft Sample Number: N/A



Load No.= 10
Load= 1.00 tsf
D_0 = -0.0227
D_{90} = -0.0278
D_{100} = -0.0283
T_{90} = 9.38 min.

C_v @ T_{90}
0.173 ft.^{2}/day



Load No.= 11
Load= 0.25 tsf
D_0 = -0.0310
D_{90} = -0.0366
D_{100} = -0.0372
T_{90} = 15.30 min.

C_v @ T_{90}
0.109 ft.^{2}/day

Terracon
51 Lost Mound Dr. Suite 135
Chattanooga, TN 37406
423-499-6111

Report of Compressive Strength of Rock Core Specimens

Project: DuPont Additional Borings **Date:** 8/31/2018

Project No.: E2175151

Specimen ID	Wet PCF	% Moisture	Dry PCF	Total Load (lbs)	Correction Factor	Compressive Strength (lbs./in.^{2})
B-101	145.0	0.0	145.0	55,700	1.000	18,200
B-104	156.0	0.0	156.0	57,860	1.000	18,925
B-108	160.7	0.0	160.7	55,690	1.000	18,105

Remarks:

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HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project :	DuPont Additional Borings							
Date:	9/4/2018			Panel Number :	P-1			
Project No. :	E2175151					Permometer Data		
Boring No.:	B-101	a_p =	0.031416	cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.6	cm^3
Sample:	N/A	a_a =	0.767120	cm^2		Pipet **Rp**	**12.3**	cm^3
Depth (ft):	36.1-41.1	M_1 =	0.030180	C = 0.000612		Annulus **Ra**	1.2	cm^3
Other Location:	N/A	M_2 =	1.040953	T = 0.0931418				
Material Description :	Rock Core							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			266.71	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			266.71	g	Tare No.:	X	Tare No.:	
Diameter :	1.97	in	5.01	cm^2	Wet Wt.+tare:	1.00	Wet Wt.+tare:	
Length :	1.98	in	5.03	cm	Dry Wt.+tare:	1.00	Dry Wt.+tare:	
Area:	3.05	in^2	19.68	cm^2	Tare Wt:	0.00	Tare Wt:	
Volume :	6.04	in^3	99.00	cm^3	Dry Wt.:	1	Dry Wt.:	
Unit Wt.(wet):	**168.11**	pcf	**2.69**	$g/cm^{\wedge 3}$	Water Wt.:	0	Water Wt.:	
Unit Wt.(dry):	**168.11**	pcf	**2.69**	$g/cm^{\wedge 3}$	% moist.:	**0.0**	% moist.:	

Assumed Specific Gravity: **2.70** Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: Void ratio (e) = Porosity (n)=

Test Pressures During Hydraulic Conductivity Test

Cell Pressure (psi) = 55.00 Back Pressure (psi) = 50.00 Confining Pressure = 5.00 psi

Note: The above value is Effective Confining Pressure

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 11.2 cm Hydraulic Gradient = 28.00

Date	elapsed t (seconds)	Z (pipet @ t)	DZp (cm)	temp (deg C)	a (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
9/4/2018	600	12.25	0.086314	21	0.977	8.04E-09	2.28E-05	
9/4/2018	1200	12.2	0.136314	21	0.977	6.36E-09	1.80E-05	
9/4/2018	1800	12.15	0.186314	21	0.977	5.81E-09	1.65E-05	
9/4/2018	2400	12.1	0.236314	21	0.977	5.54E-09	1.57E-05	

SUMMARY

k_a =	6.44E-09	cm/sec		Acceptance criteria =	95 %
ki			Vm		
k1 =	8.04E-09	cm/sec	24.9	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	6.36E-09	cm/sec	1.2	%	
k3 =	5.81E-09	cm/sec	9.7	%	
k4 =	5.54E-09	cm/sec	13.9	%	

Hydraulic conductivity	k =	**6.44E-09**	cm/sec	**1.83E-05**	ft/day
Void Ratio	e =				
Porosity	n =				
Bulk Density	g =	**2.69**	g/cm^3	**168.1**	pcf
Water Content	W =	**0.00**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**6.60E-14**	cm^2	(at 20 deg C)	

Terracon

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : DuPont Additional Borings
Date: 9/4/2018 Panel Number : P-1
Project No. : E2175151 Permometer Data

Boring No.:	B-104	a_p =	0.031416	cm^2	**Set Mercury to Pipet Rp at beginning**	Equilibrium	1.6	cm^3
Sample:	N/A	a_a =	0.767120	cm^2		Pipet **Rp**	**12.5**	cm^3
Depth (ft):	28.2-30.0	M_1 =	0.030180	C = 0.00062		Annulus **Ra**	1.2	cm^3
Other Location:	N/A	M_2 =	1.040953	T = 0.0919346				

Material Description : Rock Core

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			273.13	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			273.13	g	Tare No.:	X	Tare No.:	
Diameter :	1.97	in	5.01	cm^2	Wet Wt.+tare:	1.00	Wet Wt.+tare:	
Length :	2.01	in	5.10	cm	Dry Wt.+tare:	1.00	Dry Wt.+tare:	
Area:	3.05	in^2	19.68	cm^2	Tare Wt:	0.00	Tare Wt:	
Volume :	6.12	in^3	100.30	cm^3	Dry Wt.:	1	Dry Wt.:	
Unit Wt.(wet):	**169.93**	pcf	**2.72**	$g/cm^{\wedge 3}$	Water Wt.:	0	Water Wt.:	
Unit Wt.(dry):	**169.93**	pcf	**2.72**	$g/cm^{\wedge 3}$	% moist.:	**0.0**	% moist.:	

Assumed Specific Gravity: **2.70** Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: Void ratio (e) = Porosity (n)=

Test Pressures During Hydraulic Conductivity Test

Cell Pressure (psi) = 55.00 Back Pressure (psi) = 50.00 Confining Pressure = 5.00 psi

Note: The above value is Effective Confining Pressure

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 11.3 cm Hydraulic Gradient = 28.00

Date	elapsed t (seconds)	Z (pipet @ t)	DZp (cm)	temp (deg C)	a (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
9/4/2018	600	12.35	0.127296	21	0.977	1.19E-08	3.37E-05	
9/4/2018	1200	12.3	0.177296	21	0.977	8.29E-09	2.35E-05	
9/4/2018	1800	12.25	0.227296	21	0.977	7.10E-09	2.01E-05	
9/4/2018	2400	12.2	0.277296	21	0.977	6.52E-09	1.85E-05	

SUMMARY

k_a =	8.45E-09	cm/sec		Acceptance criteria =	95 %
ki			Vm		
k1 =	1.19E-08	cm/sec	40.6	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	8.29E-09	cm/sec	1.8	%	
k3 =	7.10E-09	cm/sec	15.9	%	
k4 =	6.52E-09	cm/sec	22.9	%	

Hydraulic conductivity	k =	**8.45E-09**	cm/sec	**2.39E-05**	ft/day
Void Ratio	e =				
Porosity	n =				
Bulk Density	g =	**2.72**	g/cm^3	**169.9**	pcf
Water Content	W =	**0.00**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**8.66E-14**	cm^2	(at 20 deg C)	

Terracon

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : DuPont Additional Borings
Date: 9/4/2018 Panel Number : P-1
Project No. : E2175151 Permometer Data

Boring No.:	B-108	a_p =	0.031416	cm^2	**Set Mercury to Pipet Rp at beginning**	Equilibrium	1.6	cm^3
Sample:	N/A	a_a =	0.767120	cm^2		Pipet **Rp**	**12.4**	cm^3
Depth (ft):	33.6-39.6	M_1 =	0.030180	C = 0.0006129		Annulus **Ra**	1.2	cm^3
Other Location:	N/A	M_2 =	1.040953	T = 0.0930009				

Material Description : Rock Core

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			267.89	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			267.89	g	Tare No.:	X	Tare No.:	
Diameter :	1.97	in	5.01	cm^2	Wet Wt.+tare:	1.00	Wet Wt.+tare:	
Length :	1.98	in	5.04	cm	Dry Wt.+tare:	1.00	Dry Wt.+tare:	
Area:	3.05	in^2	19.68	cm^2	Tare Wt:	0.00	Tare Wt:	
Volume :	6.05	in^3	99.15	cm^3	Dry Wt.:	1	Dry Wt.:	
Unit Wt.(wet):	**168.60**	pcf	**2.70**	g/cm^3	Water Wt.:	0	Water Wt.:	
Unit Wt.(dry):	**168.60**	pcf	**2.70**	g/cm^3	% moist.:	**0.0**	% moist.:	

Assumed Specific Gravity: **2.70** Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: Void ratio (e) = Porosity (n)=

Test Pressures During Hydraulic Conductivity Test

Cell Pressure (psi) = 55.00 Back Pressure (psi) = 50.00 Confining Pressure = 5.00 psi

Note: The above value is Effective Confining Pressure

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 11.2 cm Hydraulic Gradient = 28.00

Date	elapsed t (seconds)	Z (pipet @ t)	DZp (cm)	temp (deg C)	a (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
9/4/2018	600	12.35	0.002581	21	0.977	2.40E-10	6.79E-07	
9/4/2018	1200	12.3	0.052581	21	0.977	2.45E-09	6.93E-06	
9/4/2018	1800	12.25	0.102581	21	0.977	3.19E-09	9.04E-06	
9/4/2018	2400	12.2	0.152581	21	0.977	3.56E-09	1.01E-05	

SUMMARY

k_a =	2.36E-09	cm/sec		Acceptance criteria =	95 %
ki			Vm		
k1 =	2.40E-10	cm/sec	89.8	%	Vm = $\frac{\lvert k_a - k_i \rvert}{k_a} \times 100$
k2 =	2.45E-09	cm/sec	3.6	%	
k3 =	3.19E-09	cm/sec	35.1	%	
k4 =	3.56E-09	cm/sec	51.1	%	

Hydraulic conductivity	k =	**2.36E-09**	cm/sec	**6.69E-06**	ft/day
Void Ratio	e =				
Porosity	n =				
Bulk Density	g =	**2.70**	g/cm^3	**168.6**	pcf
Water Content	W =	**0.00**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**2.42E-14**	cm^2	(at 20 deg C)	

SUPPORTING INFORMATION

GENERAL NOTES

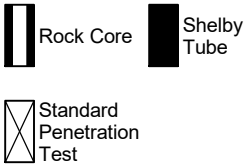
DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

DuPont Additional Borings ■ Chattanooga, Tennessee

October 26, 2018 ■ Terracon Project No. E2175151

Terracon GeoReport

SAMPLING



WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

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

FIELD TESTS

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

DESCRIPTIVE SOIL CLASSIFICATION

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

LOCATION AND ELEVATION NOTES

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

STRENGTH TERMS

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

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

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

UNIFIED SOIL CLASSIFICATION SYSTEM

DuPont Gravity Sewer and Pump Station ■ Chattanooga, Tennessee

October 26, 2018 ■ Terracon Project No. E2175151

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

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

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

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

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

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

[F] If soil contains ³ 15% sand, add “with sand” to group name.

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

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

[I] If soil contains ³ 15% gravel, add “with gravel” to group name.

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

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

[L] If soil contains ³ 30% plus No. 200 predominantly sand, add “sandy” to group name.

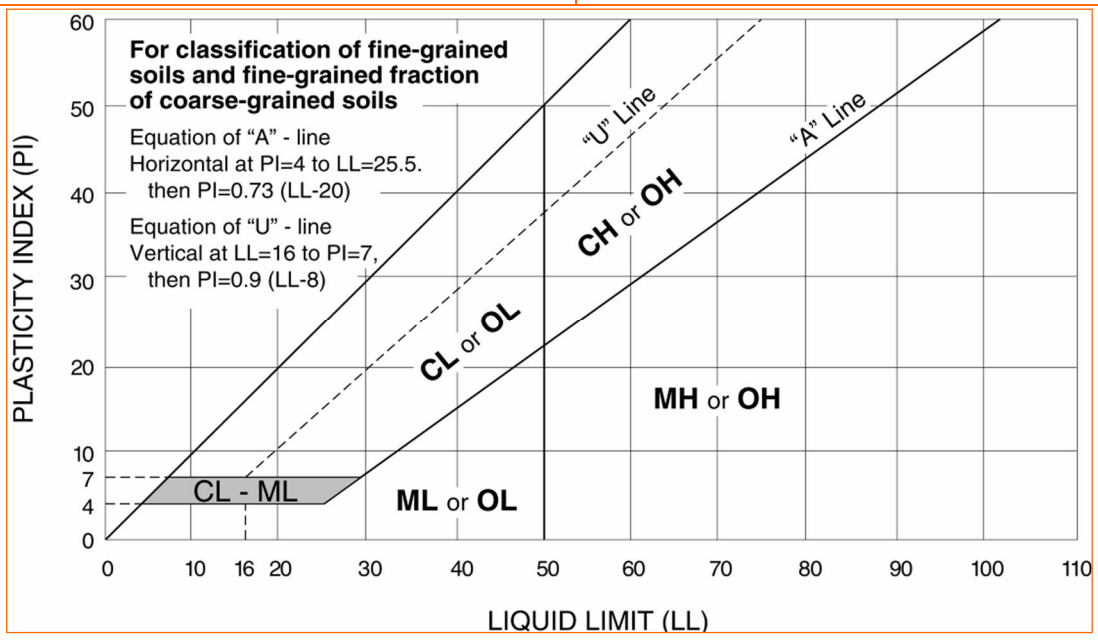
[M] If soil contains ³ 30% plus No. 200, predominantly gravel, add “gravelly” to group name.

[N] PI ³ 4 and plots on or above “A” line.

[O] PI < 4 or plots below “A” line.

[P] PI plots on or above “A” line.

[Q] PI plots below “A” line.



DESCRIPTION OF ROCK PROPERTIES

DuPont Gravity Sewer and Pump Station ■ Chattanooga, Tennessee

October 26, 2018 ■ Terracon Project No. E2175151

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, psi (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft. (50 – 300 mm)
Moderate	8 in – 2 ft. (200 – 600 mm)	**Medium**	1 ft. – 3 ft. (300 – 900 mm)
Wide	2 ft. – 6 ft. (600 mm – 2.0 m)	**Thick**	3 ft. – 10 ft. (900 mm – 3 m)
Very Wide	6 ft. – 20 ft. (2.0 – 6 m)	**Massive**	> 10 ft. (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) [1]	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009
Technical Manual for Design and Construction of Road Tunnels – Civil Elements

Appendix B

Report for Geophysical Services

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October 12, 2018

CDM Smith
4600 Park Rd #240
Charlotte, North Carolina 28209

Attention: Mr. Erdem Onur Tastan, Ph.D., P.E.

Reference: **Report for Geophysical Services**
DuPont Pump Station and Basin Improvements Phase 2
Chattanooga, Tennessee
S&ME Project No. 1281-18-061

Dear Mr. Tastan:

S&ME, Inc. (S&ME) has performed geophysical services at the above referenced site located in Chattanooga, Tennessee. These services were performed in general accordance with S&ME Proposal No. 121800346 dated August 15, 2018.

♦ Project Information

CDM Smith is performing consulting services for a proposed new pump station facility within the existing boat ramp area located on Dixie Drive in Chattanooga, Tennessee (**Figure 1**). During the test boring program conducted by CDM Smith for the proposed facility, an approximate 11-foot vertical void was encountered in one of the borings (B-108). Depth to the top of rock at B-108 is about 33 feet below ground surface (bgs) with the encountered top of the void at about 45 feet bgs. The water table is just above the soil/rock interface, so the void is anticipated to be water-filled. The site is mostly covered by asphalt pavement with two sewer utilities (30 inch and 36 inches in diameter) running east-west across the site at about 5 feet bgs and electrical lines for the existing light poles. CDM Smith requested S&ME provide geophysical services within the areas of the proposed facility in an effort to identify potential karst features such as voids, bedrock joints/fractures, etc.

♦ Methodology and Field Services

On October 3 and 4, 2018, S&ME completed an Electrical Resistivity Tomography (ERT) survey within the accessible portions of the site. ERT is an active geophysical technique that involves the introduction of a known amount of current into the ground and measuring the response in order to identify variations in subsurface electrical potentials. By introducing a known amount of current into the ground, the measured voltage potential at the surface is used to calculate the resistivity of a particular volume of subsurface media.

In general, clayey and moist soils result in lower resistivity (higher conductivity) readings, while dry sands, gravels, chert, and competent limestone/dolomite exhibit higher resistivity values. The resistivity of materials also partially depends on the substance filling its pore or void space. If a cavity or fracture is air-filled, a highly resistive anomaly within the limestone/dolomite unit is expected. If it is water- or clay-filled, an anomaly more conductive than the surrounding limestone/dolomite unit is expected. Natural variations in porosity and grain size

distribution can also cause such anomalies. It is important to note that actual ground resistivity is not collected during a resistivity survey. The survey is used to collect the apparent resistivity of a volume of material that is dependent upon electrode spacing. Actual resistivities are later determined through a data inversion process.

The ERT method requires that a series of small current and potential stainless-steel electrodes be inserted into the ground and data collected using various array configurations (Dipole-Dipole, Wenner, etc.). The electrodes are connected to a transmitter/recording instrument (resistivity meter) that generates the induced current and stores the resulting measurements for later processing and analysis. The configuration of the collected data (array) is dependent on the objectives of the investigation (e.g., vertical soil and bedrock profiling, cavity detection, fracture mapping, etc.). ERT measurements are acquired from the voltage potential difference measured between two electrodes and are dependent upon the distance between the electrodes. Material included between the electrodes is essentially averaged. Therefore, limitations of this method exist dependent upon the resolution of data acquisition needed versus the depth of a target.

We used an AGI SuperSting™ R8/IP resistivity system configured with 56 electrodes in general accordance with ASTM D6431-99 (2010) "*Using DC Resistivity for Subsurface Investigations*". A total of three ERT profiles at 275 feet in length were collected at the site using the Dipole-Dipole array configuration (**Figure 2**). Line locations were generally based site access and to avoid potential influence from the existing buried utilities. However, the beginnings of Lines 2 and 3 were slightly shortened due to shallow interference identified during data processing which may be related to the buried electrical lines. Electrodes for each profile were spaced at 5 feet. Due to the presence of asphalt pavements, 1/2 inch diameter holes were required at each electrode location in order for the electrodes to be inserted directly into the underlying soils. Each hole was backfilled with a flowable asphalt sealant at the end of the survey. The ERT data was processed using AGI's EarthImager 2D software and Golden Software's Surfer® was used to grid and plot the data. Elevations used for our models were based on provided plans and not actual field survey measurements performed by S&ME and should be considered approximate. ERT data profiles are presented in **Figure 2**.

♦ Results

The ERT results depicted in **Figure 2** indicate a varying resistivity contrast across the surveyed area that range from approximately 10 ohm-meters (ohm/m) to 200 ohm/m. Presented depths of the ERT profiles are at about 60 feet below ground surface (bgs).

- In general, the ERT profiles exhibit two layers (Layer 1 and 2). The upper Layer 1 is primarily characterized by conductive material less than about 50 ohm/m and the lower. Layer 2 generally consists of material greater than about 50 ohm/m with the interpreted upper surface about 5 to 15 feet bgs. Based on the provided borings, Layer 1 is related to the soil overburden and Layer 2 is related to limestone bedrock.
- Two anomalous subsurface features were also identified in the ERT data sets (Anomalies A and B).
- Anomaly A is characterized by a conductive area within the interpreted bedrock (Layer 2) and was identified along each of the three profiles. The east-west trending anomaly is consistent with possible water/clay-filled voids, joints, and/or fractures within the bedrock.
- Anomaly B appears to be generally characterized by a topographic low along the surface of the interpreted bedrock along Line 2. However, the interpreted bedrock within this feature also exhibits relatively lower resistivity values that may be related to water/clay-filled voids, joints, and/or fractures.

♦ Limitations

The geophysical method used for this survey has inherent limitations. Buried site metallic features (e.g., utilities, etc.) and overhead transmission lines can produce excessive noise and/or false responses in ERT data. As such, ERT profile locations are generally positioned where possible influence is limited. Depth of exploration for an ERT survey is limited by the allowable length of the collected data profile. Limiting factors due to site constraints such as property boundaries, surficial obstructions, utilities, etc. can reduce profile lengths. Regardless of the thoroughness of a geophysical study, there is always a possibility that actual conditions may not match the interpretations. The results should be considered accurate only to the degree implied by the methods used and the method's limitations and data coverage. Accordingly, the possibility exists that not all features at a project site will be located due to either subsurface soil conditions or the occurrence of features outside the lateral limits and below the depth of penetration of the methods used. As with most surface geophysical methods, resolution of the subsurface will also decrease with depth. As such, the size and/or contrast of subsurface features compared to the imaged subsurface media must be significant enough to produce the anticipated response. The location and/or determination (or the lack thereof) of subsurface features was based on our review of provided information and of the geophysical survey. Under no circumstances will S&ME assume any responsibility for damages resulting from the presence of subsurface features that may exist but were not identified by our survey.

♦ Closure

S&ME appreciates the opportunity to assist you during this phase of the project. If you should have any questions concerning this report or if we may be of further assistance, please contact us.

Sincerely,

S&ME, Inc.

Jason B. Cox, PG (GA)
Project Geophysicist

Kevin D. Hon, PG
Geophysical Group Leader

Attachments: Site Vicinity Map, Figure 1
Geophysical Data Profiles – ERT Lines 1 through 3, Figure 2

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Attachments

REFERENCE:
GOOGLE EARTH PRO AERIAL PHOTOGRAPH
(DATED OCTOBER 11, 2016)

DRAWING / PLAN FOR ILLUSTRATION PURPOSES ONLY

SITE VICINITY MAP

DUPONT PUMP STATION AND BASIN IMPROVEMENTS PHASE 2
CHATTANOOGA,, TENNESSEE

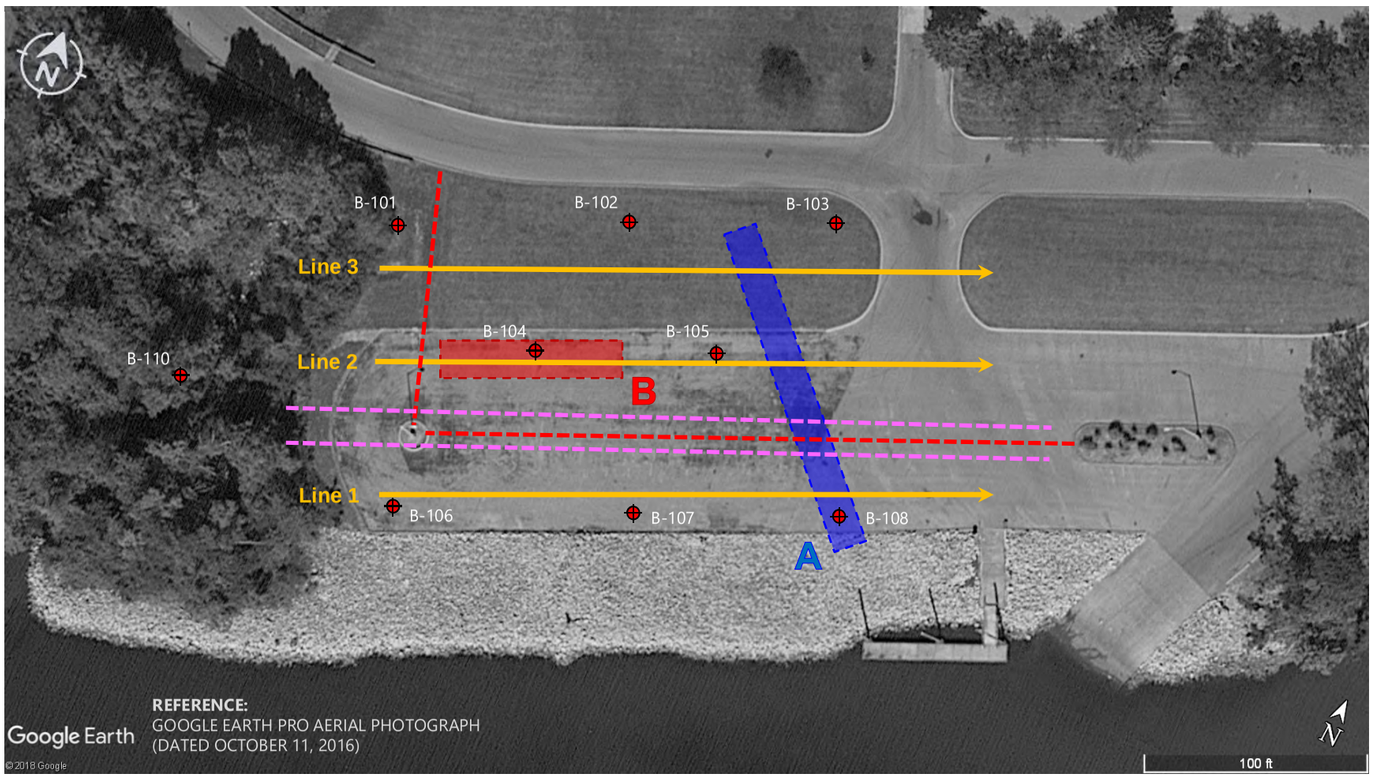
SCALE:
NOT TO SCALE

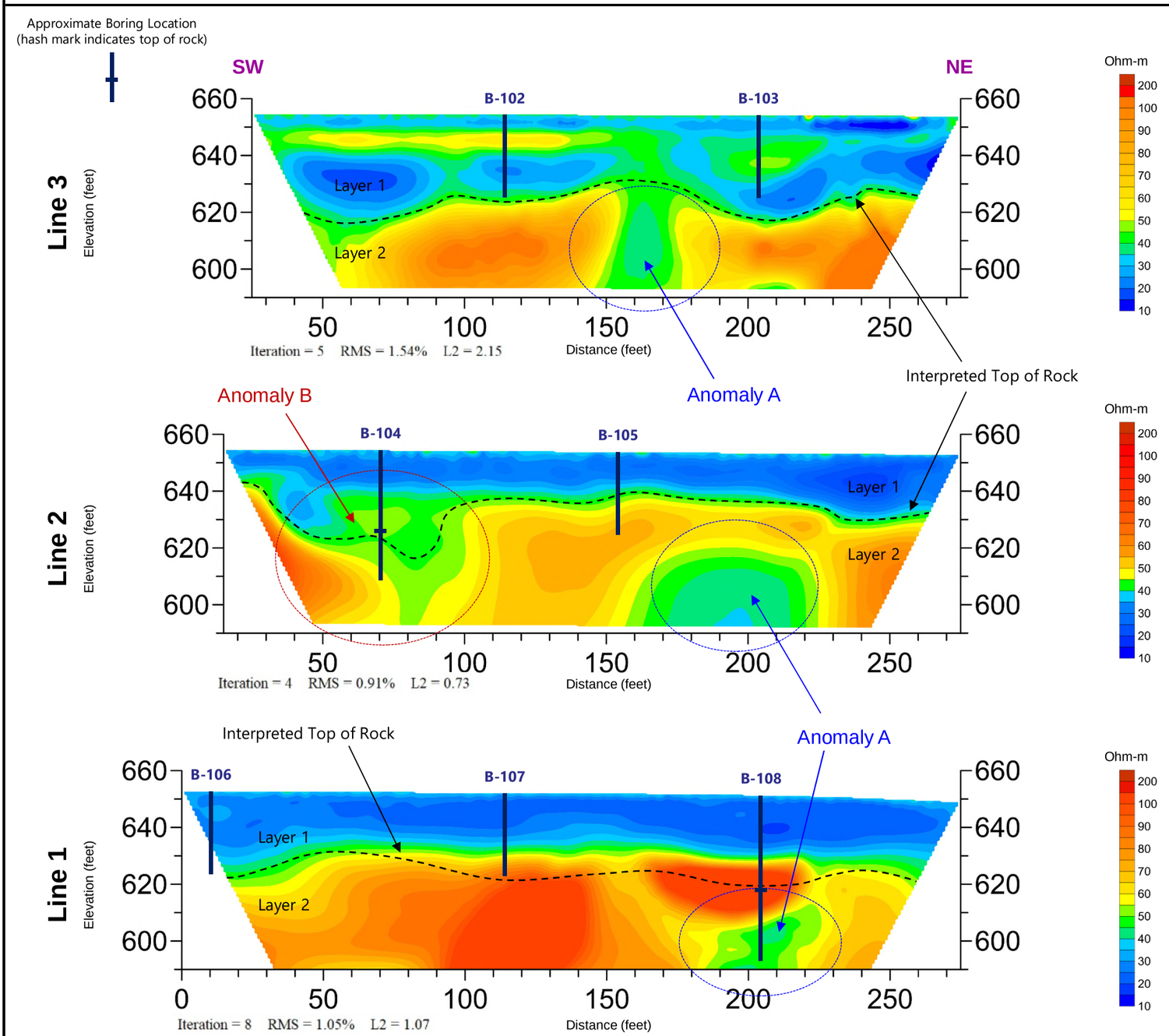
DATE:
10/12/2018

PROJECT NUMBER
1281-18-061

FIGURE NO.
1

DRAWING / PLAN FOR ILLUSTRATION PURPOSES ONLY





	GEOPHYSICAL DATA PROFILES – ERT LINES 1 THROUGH 3	SCALE: AS SHOWN	FIGURE NO. 2
	DUPONT PUMP STATION AND BASIN IMPROVEMENTS PHASE 2 CHATTANOOGA,, TENNESSEE	DATE: 10/12/2018 PROJECT NUMBER 1281-18-061	

January 30, 2019

CDM Smith
4600 Park Rd #240
Charlotte, North Carolina 28209

Attention: Mr. Erdem Onur Tastan, Ph.D., P.E.

Reference: **Revised Report for Geophysical Services**
DuPont Pump Station and Basin Improvements Phase 2
Chattanooga, Tennessee
S&ME Project No. 1281-18-061R2

Dear Mr. Tastan:

S&ME, Inc. (S&ME) has performed geophysical services at the above referenced site located in Chattanooga, Tennessee. These services were performed in general accordance with S&ME Proposal No. 121800346CO1 dated January 9, 2019. This report has been revised based on comments in an email from CDM Smith on January 30, 2019.

♦ Project Information

CDM Smith is performing consulting services for a proposed new pump station facility located near Dixie Drive in Chattanooga, Tennessee (**Figure 1**). During the test boring program conducted by CDM Smith for the original location of the proposed facility, an approximate 11-foot vertical void was encountered in one of the borings (B-108). Depth to the top of rock at B-108 is about 33 feet below ground surface (bgs) with the encountered top of the void at about 45 feet bgs. The water table is just above the soil/rock interface so the encountered void is likely water-filled. S&ME previously performed geophysical services within the original proposed area and identified potential karst features such as voids and bedrock joints/fractures. CDM Smith requested S&ME provide additional geophysical services at three alternative sites for the proposed facility (Sites A, B, and D).

♦ Methodology and Field Services

Between October 3, 2018 and January 17, 2018, S&ME completed Electrical Resistivity Tomography (ERT) surveys within the accessible portions of the original site and Sites A, B, and D (**Figure 2**). ERT is an active geophysical technique that involves the introduction of a known amount of current into the ground and measuring the response in order to identify varying electrical potentials in subsurface material. By introducing a known amount of current into the ground, the measured voltage potential at the surface is used to calculate the resistivity of a particular volume of subsurface media.

In general, clayey and moist soils result in lower resistivity (higher conductivity) readings, while dry sands, gravels, chert, and competent limestone/dolomite exhibit higher resistivity values. The resistivity of materials also partially depends on the substance filling its pore or void space. If a cavity or fracture is air-filled, a highly resistive anomaly within the limestone/dolomite unit is expected. If it is water- or clay-filled, an anomaly more conductive

than the surrounding limestone/dolomite unit is expected. Natural variations in porosity and grain size distribution can also cause such anomalies. It is important to note that actual ground resistivity is not collected during a resistivity survey. The survey is used to collect the apparent resistivity of a volume of material that is dependent upon electrode spacing. Actual resistivities are later determined through a data inversion process.

The ERT method requires that a series of small current and potential stainless-steel electrodes be inserted into the ground and data collected using various array configurations (Dipole-Dipole, Wenner, etc.). The electrodes are connected to a transmitter/recording instrument (resistivity meter) that generates the induced current and stores the resulting measurements for later processing and analysis. The configuration of the collected data (array) is dependent on the objectives of the investigation (e.g., vertical soil and bedrock profiling, cavity detection, fracture mapping, etc.). ERT measurements are acquired from the voltage potential difference measured between two electrodes and are dependent upon the distance between the electrodes. Material included between the electrodes is essentially averaged. Therefore, limitations of this method exist dependent upon the resolution of data acquisition needed versus the depth of a target.

An AGI SuperSting™ R8/IP resistivity system configured with 56 electrodes was used in general accordance with ASTM D6431-99 (2010) "*Using DC Resistivity for Subsurface Investigations*". A total of twelve (12) ERT profiles ranging between about 275 and 330 feet in length were collected using the Dipole-Dipole array configuration; Lines 1, 2, and 3 at the original site, Lines 4, 5, and 6 at Site B, Lines 7, 8, and 9 at Site D, and Lines 10, 11, and 12 at Site A (**Figure 2**). Line locations were generally based on site access and, if possible, to avoid potential influence from existing buried utilities. However, the beginnings of Lines 2 and 3, and the end of Line 12, were slightly shortened due to shallow interference identified during data processing which are likely related to buried electrical lines and/or structures within those areas. Electrodes for each profile were spaced at 5 feet. Where asphalt pavements were encountered, 1/2 inch diameter holes were required in order for the electrodes to be inserted directly into the underlying soils. Each drilled hole was backfilled with a flowable asphalt sealant at the end of the survey.

ERT data was processed using AGI's EarthImager 2D software and Golden Software's Surfer® was used to grid and plot the data. Elevations used for our models were based on provided plans from CDM Smith and/or from the Hamilton County GIS website rather than actual field survey measurements performed by S&ME and should be considered approximate. ERT data profiles are presented in **Figures 3 through 6**.

♦ Results

The ERT results depicted in **Figure 3 through 6** indicate a varying resistivity contrast across the surveyed areas that generally range from approximately 10 ohm-meters (ohm-m) to 200 ohm-m. Presented depths of the ERT profiles are at about 40 to 60 feet below ground surface (bgs).

- In general, the ERT profiles exhibit two layers (Layer 1 and 2). The upper Layer 1 is primarily characterized by relatively conductive material less than about 50 ohm-m and the underlying Layer 2 generally consists of material greater than about 50 ohm-m. Based on the provided borings, Layer 1 is interpreted to be related to the soil overburden and Layer 2 is interpreted to be related to the limestone bedrock.

- Eight anomalous subsurface features were also identified in the ERT data sets (Anomalies A through H); Anomalies A and B at the original site, Anomaly C at Site B, Anomalies D and E at Site D, and Anomalies F, G, and H at Site A.
- Anomalies A, F, and G are characterized by conductive areas within the interpreted bedrock (Layer 2) and are consistent with possible water/clay-filled voids (A and F) and/or joints/fractures within the bedrock (G).
- Anomalies B, C, D, E, and H appear to be generally characterized by a topographic low along the surface of the interpreted bedrock. However, the interpreted bedrock within several of these features also exhibit relatively lower resistivity values that may be related to water/clay-filled voids, joints, and/or fractures (B and C).
- In addition, the buried structures located at the end of Line 11 and south of Line 6 may have influenced the ERT data sets. As such, Anomaly H may instead be associated with a buried structure and the higher conductivity values exhibited in Line 6 may have masked the actual subsurface conditions so potential features along Line 6 were not interpreted.
- Interpreted anomalies are also summarized in the table below.

Anomaly	Site	ERT Line	Description
A	Original	1, 2 and 3	Possible water/clay-filled voids within the bedrock
B	Original	2	Topographic low along bedrock surface with possible joints/fractures
C	B	4 and 5	Topographic low along bedrock surface with possible joints/fractures
D	D	7	Topographic low along bedrock surface
E	D	7	Topographic low along bedrock surface
F	A	12	Possible water/clay-filled voids within the bedrock
G	A	12	Possible joints/fractures within the bedrock
H	A	11	Topographic low along bedrock surface (possibly influenced by buried structure)

♦ Limitations

The geophysical method used for this survey has inherent limitations. Buried site metallic features (e.g., utilities, etc.) and overhead transmission lines can produce excessive noise and/or false responses in ERT data. As such, ERT profile locations are generally positioned where possible influence is limited. Depth of exploration for an ERT survey is limited by the allowable length of the collected data profile. Limiting factors due to site constraints such as property boundaries, surficial obstructions, utilities, etc. can reduce profile lengths. Regardless of the thoroughness of a geophysical study, there is always a possibility that actual conditions may not match the interpretations. The results should be considered accurate only to the degree implied by the methods used and the method's limitations and data coverage. Accordingly, the possibility exists that not all features at a project site will be located due to either subsurface soil conditions or the occurrence of features outside the lateral limits and below the depth of penetration of the methods used. As with most surface geophysical methods, resolution of the subsurface will also decrease with depth. As such, the size and/or contrast of subsurface features compared to the imaged subsurface media must be significant enough to produce the anticipated response. The location and/or determination (or the lack thereof) of subsurface features was based on our review of provided information and of the geophysical survey. Under no circumstances will S&ME assume any responsibility for damages resulting from the presence of subsurface features that may exist but were not identified by our survey.

♦ Closure

S&ME appreciates the opportunity to assist you during this phase of the project. If you should have any questions concerning this report or if we may be of further assistance, please contact us.

Sincerely,

S&ME, Inc.

Jason B. Cox, PG (GA)
Project Geophysicist

Kevin D. Hon, PG
Geophysical Group Leader

Attachments: Site Vicinity Plan, Figure 1
Geophysical Location Plan, Figure 2
Geophysical Data Profiles – ERT Lines 1 through 3 (Original Site), Figure 3
Geophysical Data Profiles, ERT Lines 4 through 6 (Alternative Site B), Figure 4
Geophysical Data Profiles, ERT Lines 7 through 9 (Alternative Site D), Figure 5
Geophysical Data Profiles, ERT Lines 10 through 12 (Alternative Site A), Figure 6

Attachments

REFERENCE:
GOOGLE EARTH PRO AERIAL PHOTOGRAPH
(DATED OCTOBER 11, 2016)

SITE VICINITY PLAN

DUPONT PUMP STATION AND BASIN IMPROVEMENTS PHASE 2
CHATTANOOGA, HAMILTON COUNTY, TENNESSEE

SCALE:
NOT TO SCALE

DATE:
1/30/2019

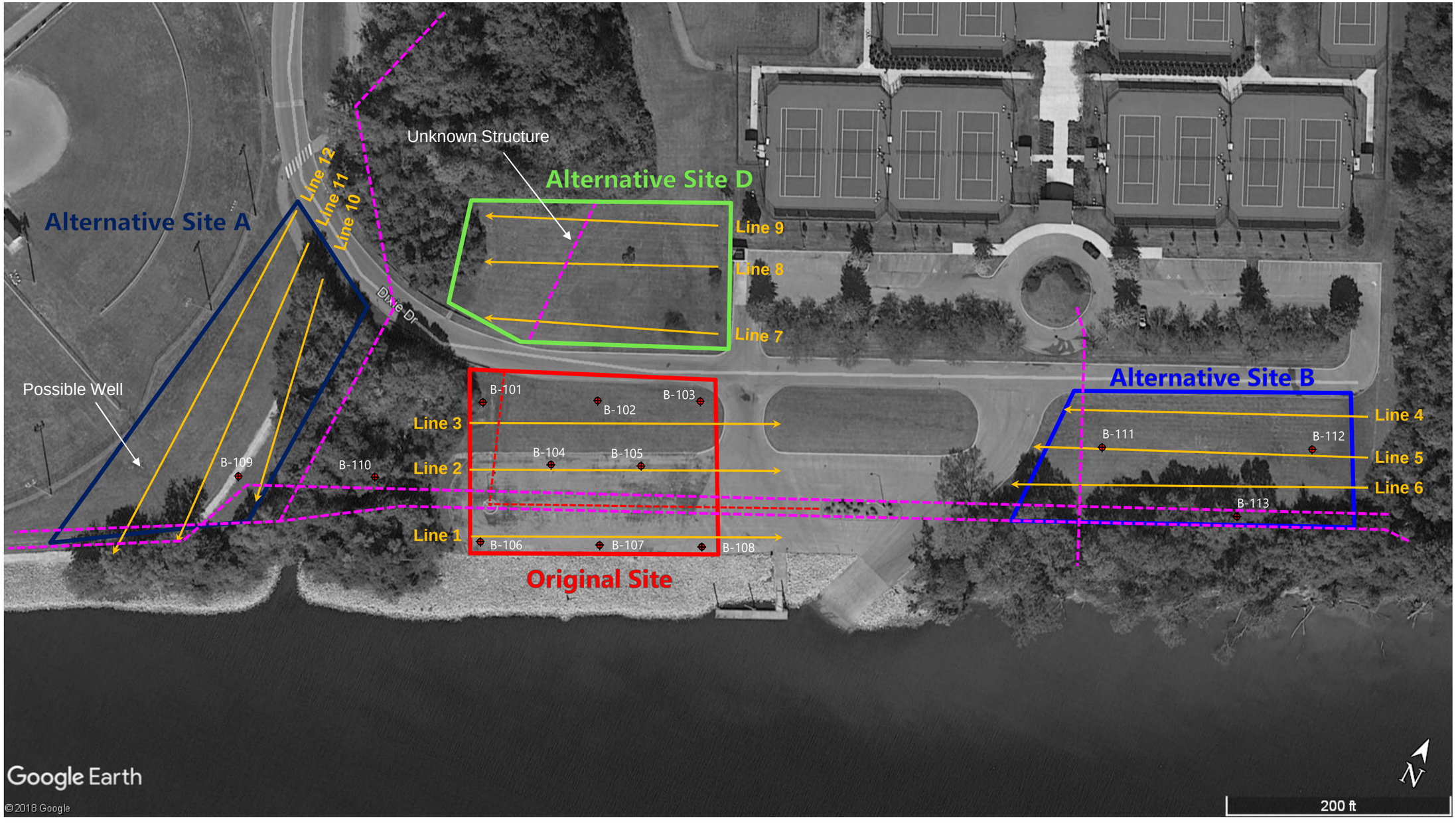
PROJECT NUMBER
1281-18-061R2

FIGURE NO.
1

DRAWING / PLAN FOR ILLUSTRATION PURPOSES ONLY

REFERENCE:
GOOGLE EARTH PRO AERIAL PHOTOGRAPH
(DATED OCTOBER 11, 2016)

DRAWING / PLAN FOR ILLUSTRATION PURPOSES ONLY



LEGEND

- Approximate ERT Profile Location
- Approximate Location of Electrical
- Approximate Location of Buried Structure
- Approximate Boring Location

GEOPHYSICAL LOCATION PLAN

DUPONT PUMP STATION AND BASIN IMPROVEMENTS PHASE 2
CHATTANOOGA, HAMILTON COUNTY, TENNESSEE

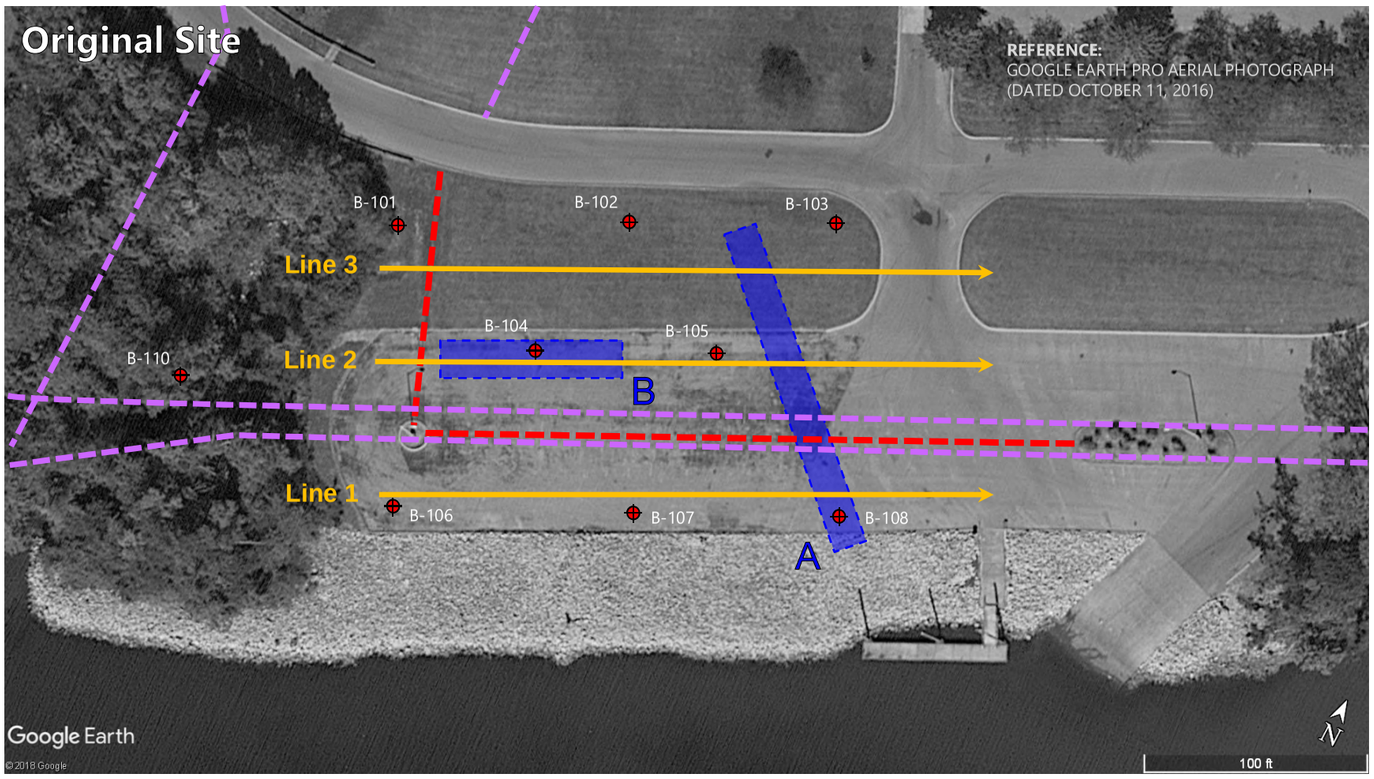
SCALE:
NOT TO SCALE

DATE:
1/30/2019

PROJECT NUMBER
1281-18-061R2

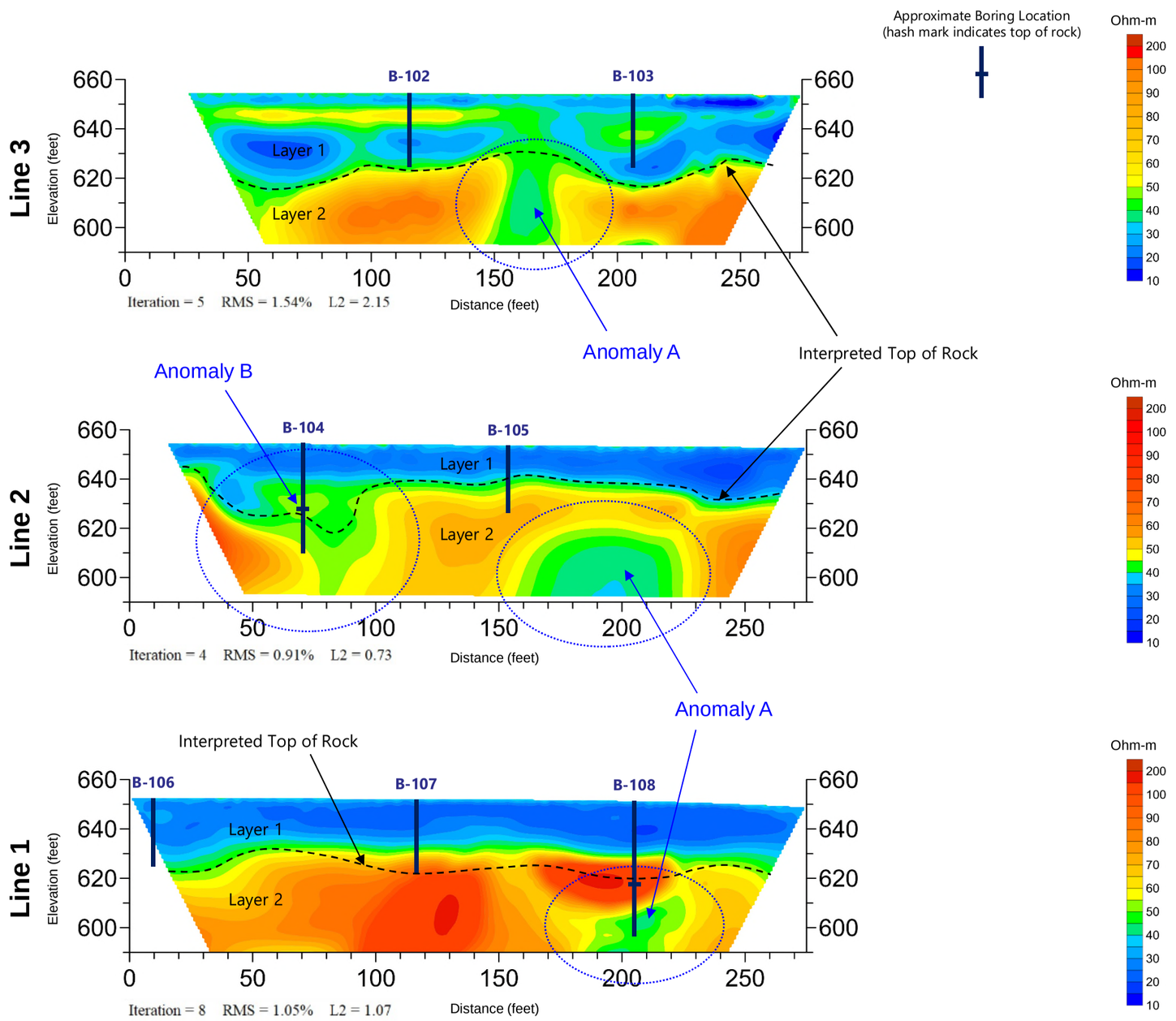
FIGURE NO.
2

DRAWING / PLAN FOR ILLUSTRATION PURPOSES ONLY



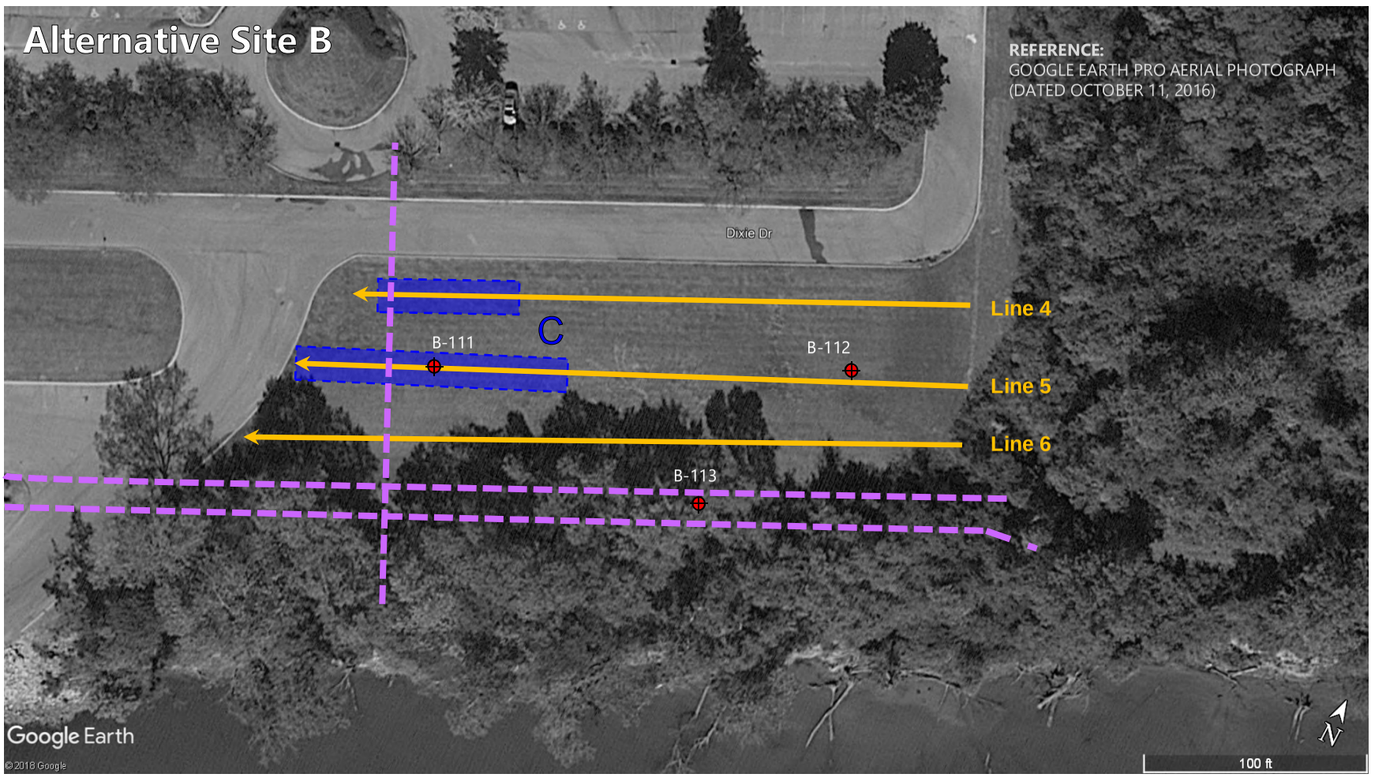
Approximate ERT Profile Location | Approximate Location of Electrical | Approximate Location of Buried Structure | Approximate Boring Location

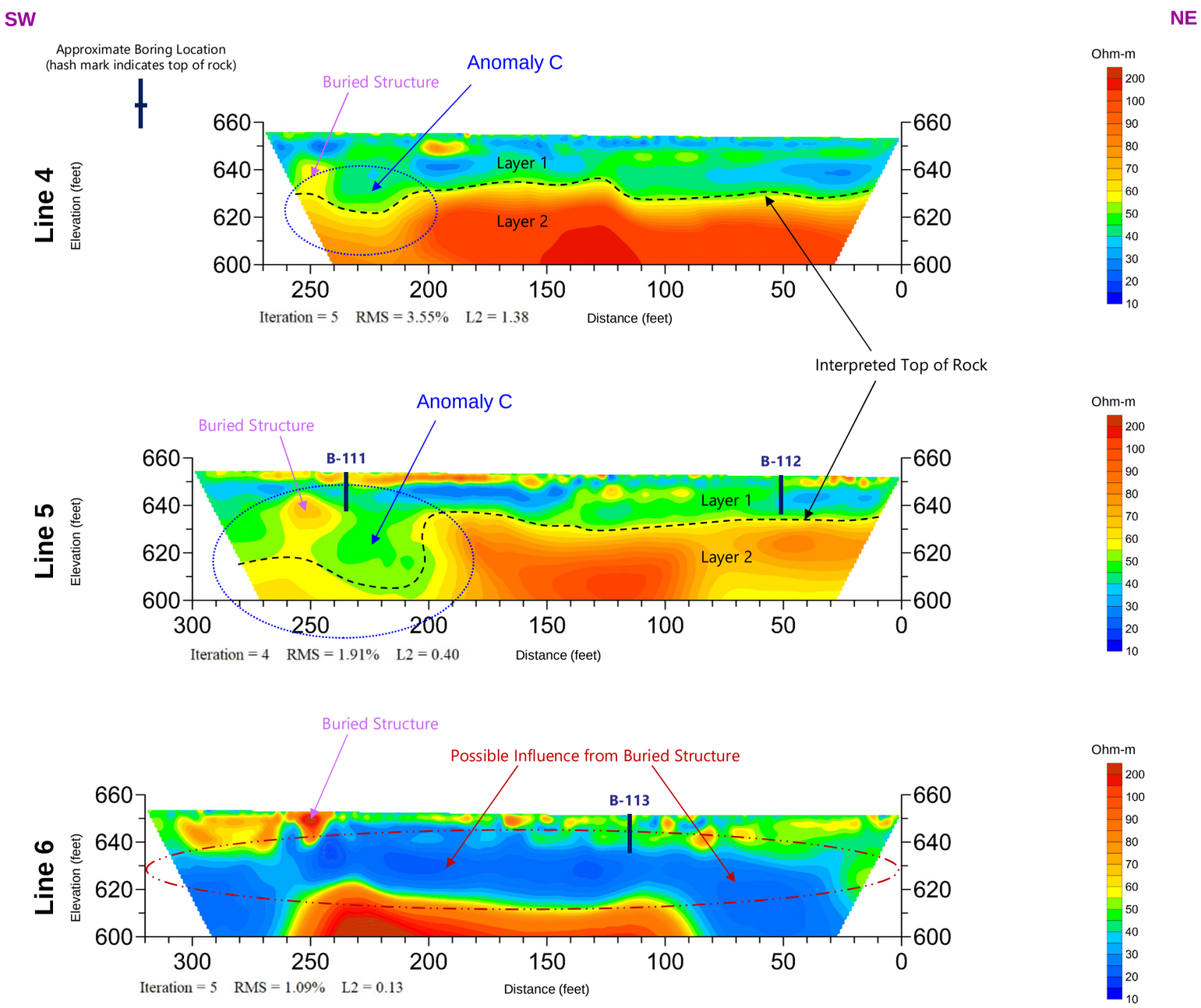
SW NE



	GEOPHYSICAL DATA PROFILES – ERT LINES 1 THROUGH 3 (ORIGINAL SITE)	SCALE: AS SHOWN	FIGURE NO. 3
	DUPONT PUMP STATION AND BASIN IMPROVEMENTS PHASE 2 CHATTANOOGA, HAMILTON COUNTY, TENNESSEE	DATE: 1/30/2019 PROJECT NUMBER 1281-18-061R2	

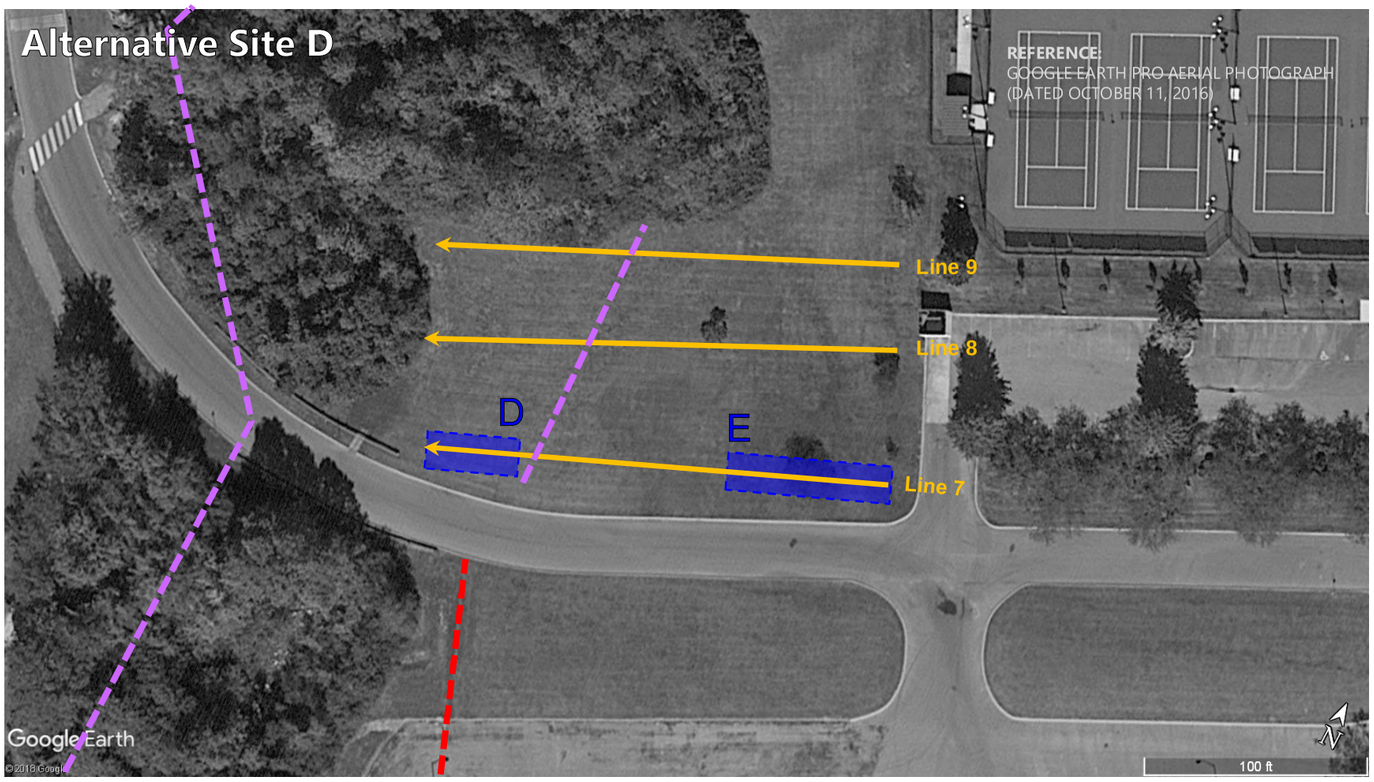
DRAWING / PLAN FOR ILLUSTRATION PURPOSES ONLY





	GEOPHYSICAL DATA PROFILES – ERT LINES 4 THROUGH 6 (ALTERNATIVE SITE B)	SCALE: AS SHOWN	FIGURE NO.
	DUPONT PUMP STATION AND BASIN IMPROVEMENTS PHASE 2 CHATTANOOGA, HAMILTON COUNTY, TENNESSEE	DATE: 1/30/2019 PROJECT NUMBER 1281-18-061R2	4

DRAWING / PLAN FOR ILLUSTRATION PURPOSES ONLY



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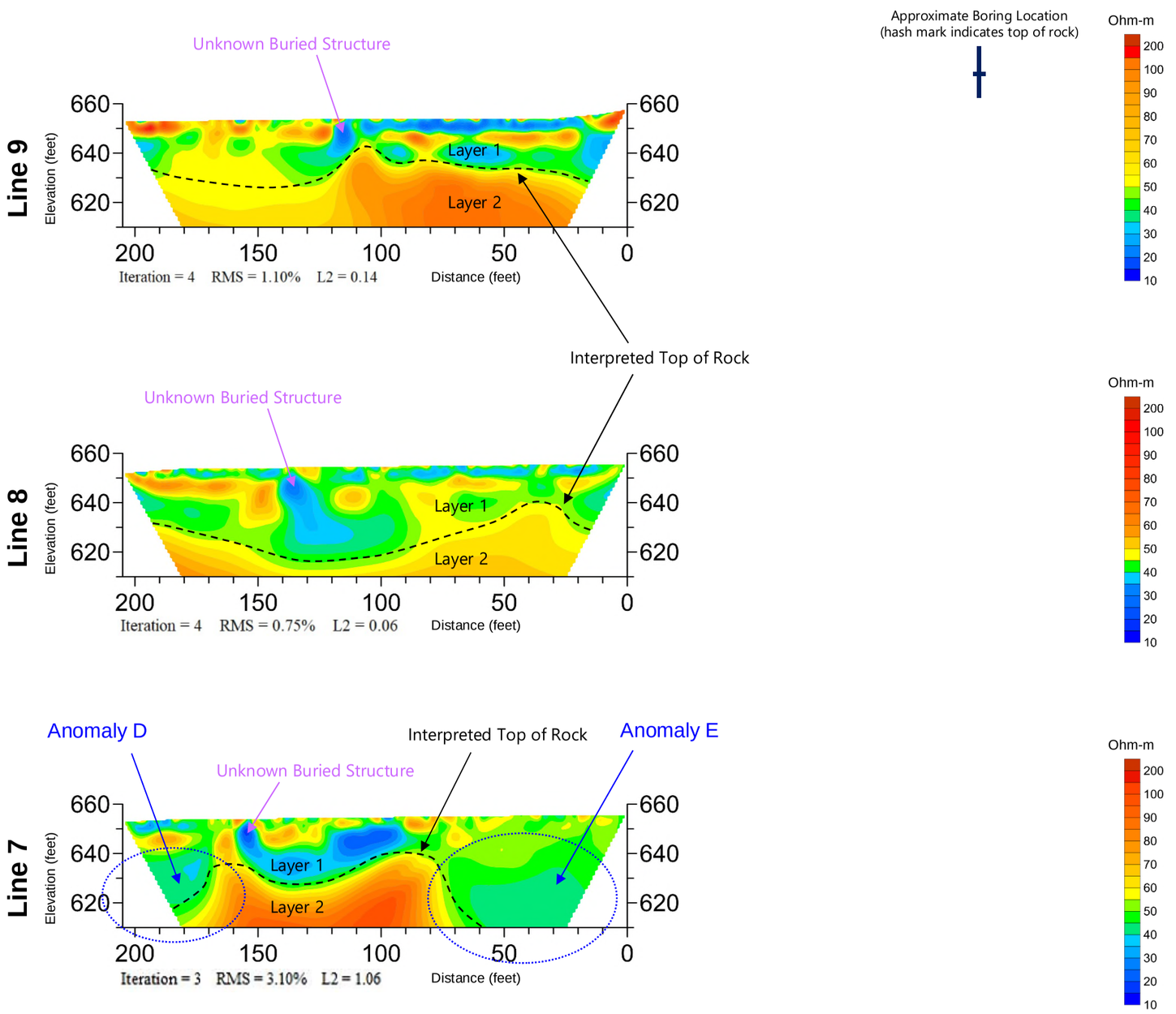
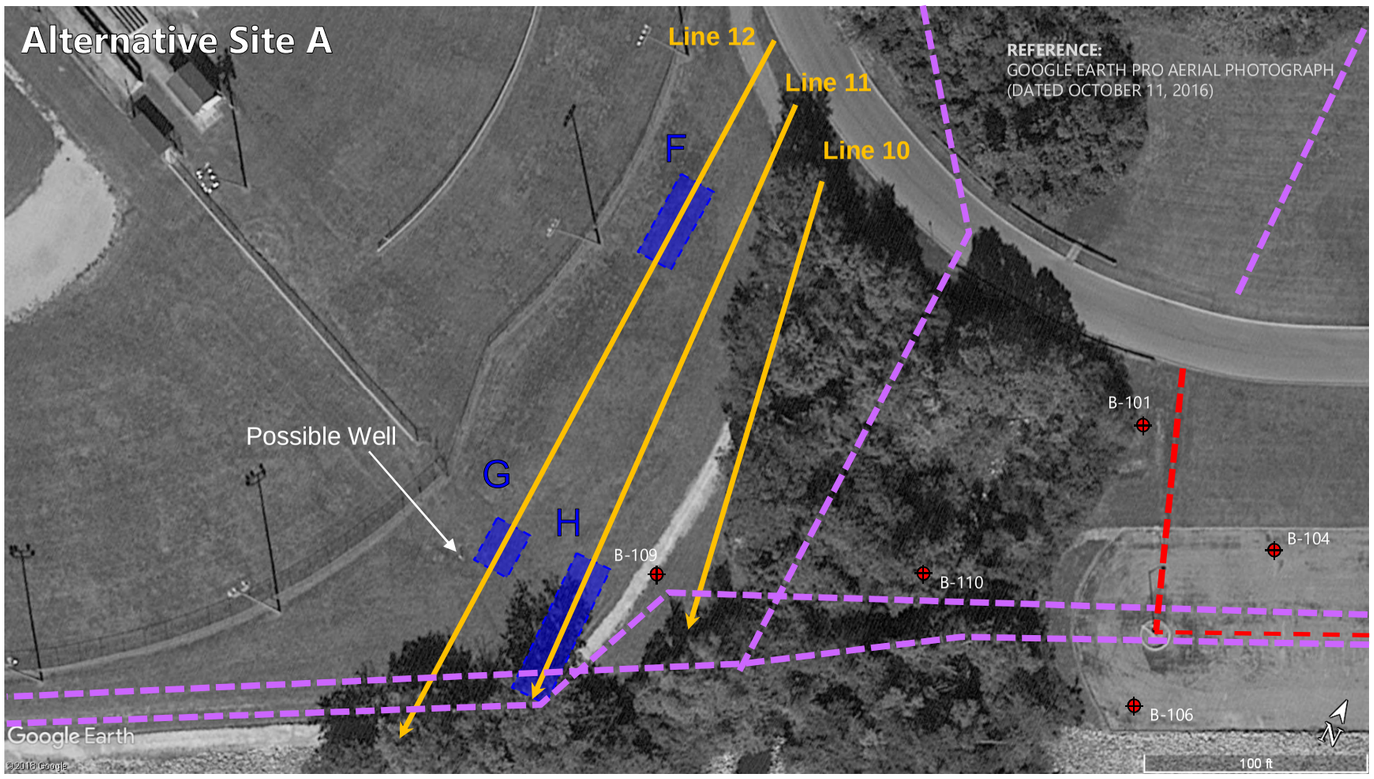


	GEOPHYSICAL DATA PROFILES – ERT LINES 7 THROUGH 9 (ALTERNATIVE SITE D)	SCALE: AS SHOWN	FIGURE NO. 5
	DUPONT PUMP STATION AND BASIN IMPROVEMENTS PHASE 2 CHATTANOOGA, HAMILTON COUNTY, TENNESSEE	DATE: 1/30/2019 PROJECT NUMBER 1281-18-061R2	

DRAWING / PLAN FOR ILLUSTRATION PURPOSES ONLY



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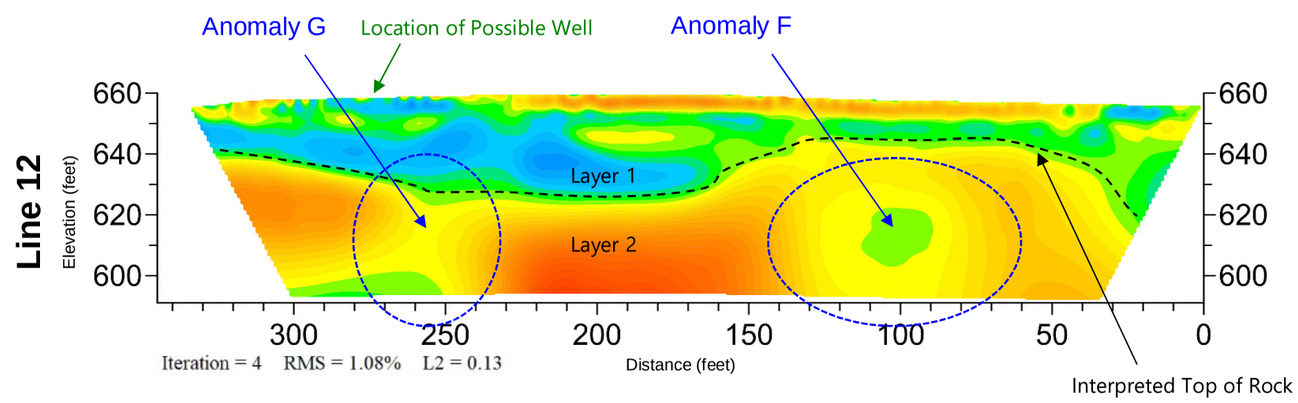

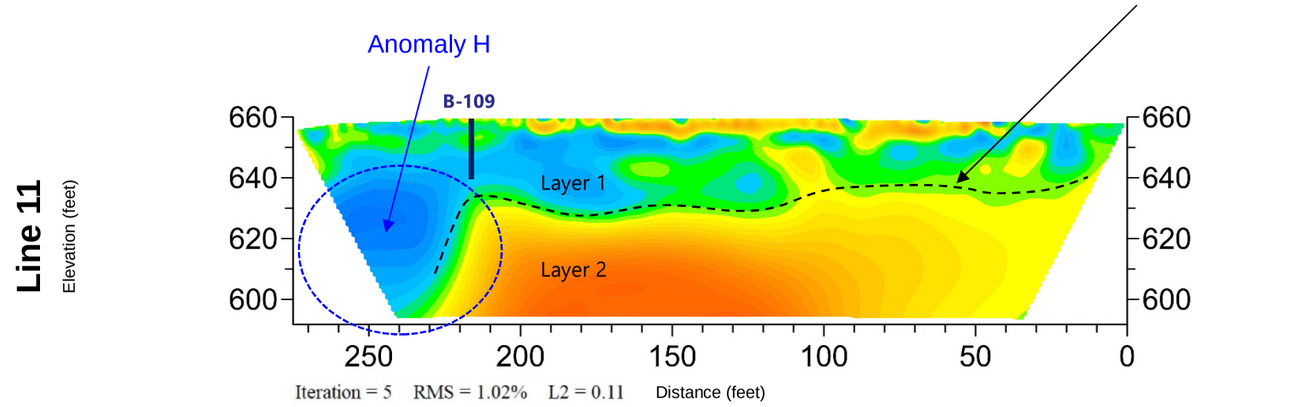

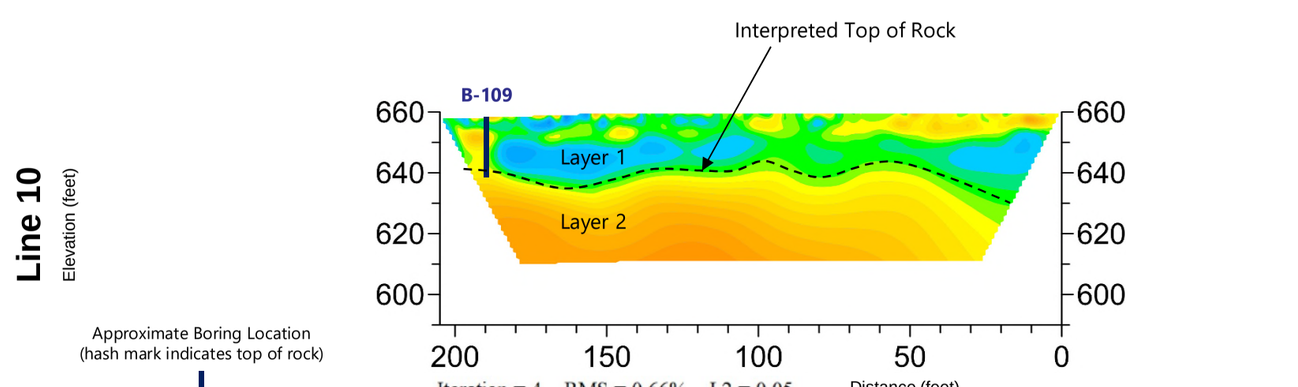

Approximate Boring Location
(hash mark indicates top of rock)

GEOPHYSICAL DATA PROFILES – ERT LINES 10 THROUGH 12 (ALTERNATIVE SITE A)		SCALE: AS SHOWN	FIGURE NO. 6
DUPONT PUMP STATION AND BASIN IMPROVEMENTS PHASE 2 CHATTANOOGA, HAMILTON COUNTY, TENNESSEE		DATE: 1/30/2019	
		PROJECT NUMBER 1281-18-061R2	

Appendix C

CDM Smith Test Boring Logs

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CDM Smith

BOREHOLE LOG
CDM-204

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Drilling Contractor: Terracon, Inc.
Surface Elevation (ft.): 655.5
Drilling Method/Rig: HSA/Acker
Total Depth (ft.): 66.3
Drillers: Richard
Depth to Initial Water Level (ft-bgs): 24.0
Drilling Date: Start: 11/20/2018 **End:** 11/20/2018
Abandonment Method: Backfilled with grout.
Borehole Coordinates: See Boring Location Plan
Logged By: KNA

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			655.5					
			0		0		TOPSOIL	6" of Topsoil.
SS	S-1	24/20		6	3 3 5		CL	Moist, medium stiff, brown and dark brown, lean **CLAY**, trace roots.
SS	S-2	24/24		10	4 5 5 8			Moist, stiff, brown, lean **CLAY**, trace roots.
SS	S-3	24/24	650.5 5	11	2 4 7 9			Moist, stiff, brown, lean **CLAY**, trace roots.
SS	S-4	24/22		10	2 4 6 6			Moist, stiff, brown with gray, lean **CLAY**.
SS	S-5	24/18		10	2 4 6 7			Moist, stiff, brown, lean **CLAY**.
			645.5 10					
SS	S-6	24/18		8	WOH 4 4 7			Moist, stiff, brown, lean **CLAY**.
SS	S-7	24/18		9	1 4 5 7			Moist, stiff, brown, lean **CLAY**.
			640.5 15					

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- HA - Hand Auger
- AR - Air Rotary
- DTR - Dual Tube Rotary
- FR - Foam Rotary
- MR - Mud Rotary
- RC - Reverse Circulation
- CT - Cable Tool
- JET - Jetting
- D - Driving
- DTC - Drill Through Casing

SAMPLING TYPES:
- AS - Auger/Grab Sample
- CS - California Sampler
- BX - 1.5" Rock Core
- NX - 2.1" Rock Core
- GP - Geoprobe
- HP - Hydro Punch
- SS - Split Spoon
- ST - Shelby Tube
- WS - Wash Sample

OTHER:
- AGS - Above Ground Surface
- PWR - Partially Weathered Rock

REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
WOH = Weight of hammer
REC = Recovery
RQD = Rock Quality Designation
24-hour water level reading for depth to initial water level

Reviewed by: EOT **Date:** 3-11-19

CDM Smith

BOREHOLE LOG
CDM-204

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
							CL	
SS	S-8	24/18	635.5	11	3 5 6 9			Moist, stiff, brown, black and gray, lean **CLAY**, trace fine sand.
			20					
SS	S-9	24/18	630.5	2	WOH WOH 2 4		CH	Moist to wet, very soft, gray, fat **CLAY**. (Black, decayed wood from 23' to 24')
			25					
SS	S-10	24/18	625.5	2	WOH WOH 2 3			Wet, very soft, dark gray, fat **CLAY**, trace sand.
			30					
							SW	Wet, dense, gray, fine to medium **SAND**. (Gravel in tip)
SS	S-11	24/18	620.5	31	3 10 21 16			
			35				CL	Wet, very soft, tan, **CLAY**, some gravel.
SS	S-12	24/18	615.5	2	1 1 1 1			
			40					

CDM Smith

BOREHOLE LOG
CDM-204

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
							CL	
			610.5 / 45					Wet, severe weathering, extremely fractured, light gray, **LIMESTONE**.
							VOID	Water filled **VOID** from 45.1 feet to 47.1 feet bgs.
NQ2	C-1	96/16					VOID	Wet, severe weathering, extremely fractured, light gray, **LIMESTONE**. Water filled **VOID** from 47.5 feet to 63.2 feet bgs.
			605.5 / 50					
			600.5 / 55					
NQ2	C-2	120/0						
			595.5 / 60					
NQ2	C-3	57.6/26.5					VOID	Wet, hard, moderately weathered, slightly fractured, gray **LIMESTONE**. **REC=46%; RQD=21%**
			590.5					Water filled **VOID** from 63.4 feet to 64.4 feet bgs.

CDM Smith

BOREHOLE LOG
CDM-204

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
								Wet, hard, moderately weathered, slightly fractured, gray **LIMESTONE**.
			585.5 / 70					Boring terminated at 66.3 feet bgs.
			580.5 / 75					
			575.5 / 80					
			570.5 / 85					

CDM Smith

BOREHOLE LOG
B-501

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Drilling Contractor: S&ME/Tri-State
Surface Elevation (ft.): 651.9
Drilling Method/Rig: HSA/CME-550X
Total Depth (ft.): 65.2
Drillers: Freeman
Depth to Initial Water Level (ft-bgs): 0.0
Drilling Date: Start: 2/28/2019 **End:** 3/1/2019
Abandonment Method: Backfilled with grout.
Borehole Coordinates: See Boring Location Plan
Logged By: KNA

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			651.9 0				CL	
SS	S-1	18/18	646.9 5	14	5 6 8			Moist, stiff, brown, **CLAY**
SS	S-2	18/16	641.9 10	10	4 4 6			Moist, stiff, brown, **CLAY**, trace mica
SS	S-3	18/18	636.9 15	9	3 4 5			Moist, stiff, brown, **CLAY**, trace mica - Pockets of wet, light gray/tan, CLAY.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- HA - Hand Auger
- AR - Air Rotary
- DTR - Dual Tube Rotary
- FR - Foam Rotary
- MR - Mud Rotary
- RC - Reverse Circulation
- CT - Cable Tool
- JET - Jetting
- D - Driving
- DTC - Drill Through Casing

SAMPLING TYPES:
- AS - Auger/Grab Sample
- CS - California Sampler
- BX - 1.5" Rock Core
- NX - 2.1" Rock Core
- GP - Geoprobe
- HP - Hydro Punch
- SS - Split Spoon
- ST - Shelby Tube
- WS - Wash Sample

OTHER:
- AGS - Above Ground Surface
- PWR - Partially Weathered Rock

REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
WOH = Weight of hammer
REC = Recovery
RQD = Rock Quality Designation
24-hour water level reading for depth to initial water level

Reviewed by: EOT **Date:** 3-11-19

BOREHOLE GINT_DUPONT BORING LOGS.GPJ CDM_CORP.GDT 3/19/19

CDM Smith

BOREHOLE LOG
B-501

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
							CL	
SS	S-4	18/18	631.9	6	2 3 3			Moist to wet, medium stiff, **CLAY**, trace mica - Pockets of wet, tan, CLAY.
SS	S-5	24/24	20	9	3 4 5 6			Wet, stiff, brown, orange and gray, **CLAY**, trace mica
SS	S-6	24/24		0	WOH WOR WOH 2			Wet, very soft, dark gray, **CLAY**, some fine to coarse sand
							SC	
ST	ST-1	24/22	626.9 25	--	P U S H			Wet, dark gray, **CLAY**, some fine to coarse sand
SS	S-7	24/24		3	2 1 2 3			Wet, very loose, dark gray, fine to coarse **SAND**, some clay - 2" wood fragments in spoon tip.
SS	S-8	10/6		>50	9 50/4"			Wet, very dense, dark gray, fine to coarse **SAND** - Rock fragments in tip. Auger refusal encountered at 28.8 ft bgs. Begin rock coring.
NQ	C-1	17/13	621.9 30					Hard, fresh, blue-gray, fine grained, **LIMESTONE**; primary joint set horizontal, close, rough, stepped, fresh, tight; secondary joint set vertical, rough, planar, discolored, tight. **REC = 76%**
NQ	C-2	60/48						Hard to very hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set shallow, moderately close, rough, stepped, fresh, partly open. **REC = 80%, RQD = 72%**
							VOID	Water-filled **VOID** from 33.7 to 34.2 ft bgs.
NQ	C-3	60/56	616.9 35					Hard to very hard, fresh, blue-gray and white, fine grained **LIMESTONE**; primary joint set horizontal, moderately close, rough, stepped, fresh to discolored, partly open; secondary joint set steep, wide, rough, stepped, discolored, open. **REC = 93%, RQD = 93%**
			611.9 40					

CDM Smith

BOREHOLE LOG
B-501

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
NQ	C-4	60/49						Hard to very hard, fresh, blue-gray and white, fine grained**LIMESTONE**; primary joint set shallow, moderately close, rough, planar, fresh, tight. **REC = 82%, RQD = 63%** - Becomes highly fractured near void
							VOID	Water-filled **VOID** from 43.7 to 44.5 ft bgs.
			606.9					
NQ	C-5	60/59	45					2" Flint 45.1 to 45.3 ft bgs. Hard, fresh, blue-gray, fine grained**LIMESTONE**; primary joint set horizontal, wide, rough, stepped, fresh, partly open; secondary joint set steep, very wide, rough, planar, discolored, tight. **REC = 99%, RQD = 99%**
			601.9					
NQ	C-6	60/56.5	50					Hard to very hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set horizontal, wide, rough, stepped, fresh, open; secondary joint set steep, very wide, rough, planar, discolored, partly open. **REC = 94%, RQD = 94%**
			596.9					
NQ	C-7	60/63	55					Hard, fresh, blue-gray, black and white, fine grained **LIMESTONE**; primary joint set shallow, close, rough, planar, fresh, open to partly open. **REC = 100%, RQD = 92%** - Flint seams 55.1 to 56 ft bgs and 57.2 to 58 ft bgs.
			591.9					
NQ	C-8	60/57	60					Hard to very hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set shallow, moderately close, rough stepped, partly open. **REC = 95%, RQD = 95%**
			586.9					

CDM Smith

BOREHOLE LOG
B-501

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
								Boring terminated at 65.2 ft bgs.
			581.9 70					
			576.9 75					
			571.9 80					
			566.9 85					

CDM Smith

BOREHOLE LOG
B-502

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Drilling Contractor: S&ME/Tri-State
Surface Elevation (ft.): 653.7
Drilling Method/Rig: HSA/CME-550X
Total Depth (ft.): 54.9
Drillers: Freeman
Depth to Initial Water Level (ft-bgs): 0.2
Drilling Date: Start: 2/26/2019 **End:** 2/27/2019
Abandonment Method: Backfilled with grout.
Borehole Coordinates: See Boring Location Plan
Logged By: KNA

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			653.7 0				CL	
SS	S-1	18/18		15	5 6 9			Moist, stiff, brown and gray, **CLAY**, trace roots
			648.7 5					
SS	S-2	18/18		14	6 6 8			Moist, stiff, brown, tan and gray, **CLAY**
			643.7 10					
SS	S-3	18/18		12	5 5 7			Moist, stiff, brown, **CLAY**, trace mica - Wet, gray, vertical seams.
			638.7 15					

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- HA - Hand Auger
- AR - Air Rotary
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- MR - Mud Rotary
- RC - Reverse Circulation
- CT - Cable Tool
- JET - Jetting
- D - Driving
- DTC - Drill Through Casing

SAMPLING TYPES:
- AS - Auger/Grab Sample
- CS - California Sampler
- BX - 1.5" Rock Core
- NX - 2.1" Rock Core
- GP - Geoprobe
- HP - Hydro Punch
- SS - Split Spoon
- ST - Shelby Tube
- WS - Wash Sample

OTHER:
- AGS - Above Ground Surface
- PWR - Partially Weathered Rock

REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
WOH = Weight of hammer
REC = Recovery
RQD = Rock Quality Designation
24-hour water level reading for depth to initial water level

Reviewed by: EOT **Date:** 3-11-19

CDM Smith

BOREHOLE LOG
B-502

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
							CL	
SS	S-4	18/18		7	2 3 4			Moist, medium stiff, brown and tan, **CLAY**, trace mica - Gray seams.
ST	ST-1	24/24	633.7 20	--	P U S H			
SS	S-5	24/24		9	4 3 6 4			Wet, stiff, brown and gray-black, **CLAY**, little fine to coarse sand, trace mica
SS	S-6	24/24	628.7 25	2	WOH WOR 2 3			Wet, very soft, brown and gray-black, **CLAY**, little fine to coarse sand, trace mica
							SC	Wet, very loose, dark gray, fine to coarse SAND, some clay, trace mica
SS	S-7	24/24		2	1 1 1 2			Wet, very loose, dark gray, fine to coarse SAND, some clay, little wood, trace mica
SS	S-8	3/0		>50	50/3"			No Recovery. Begin rock coring at 28.6 ft bgs.
NQ	C-1	16/15	623.7 30					Moderately hard, slightly weathered, gray and white, dolomitic **LIMESTONE**; primary joint set shallow, close, rough, stepped, discolored, open. **REC = 94%, RQD = 94%**
NQ	C-2	60/60						Moderately hard to hard, slightly weathered, blue-gray, dolomitic **LIMESTONE**; primary joint set horizontal, close to moderately close, rough, stepped, discolored, open; secondary joint set steep, wide, rough, planar, discolored, partly open. **REC = 100%, RQD = 77%**
NQ	C-3	60/59.5	618.7 35					Moderately hard to hard, fresh, blue and gray, fine grained **LIMESTONE**; primary joint set horizontal to shallow, close to moderately close, rough, planar, fresh, tight to partly open. **REC = 99%, RQD = 84%** - Clayey sand infilling.
			613.7 40					Hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set

CDM Smith

BOREHOLE LOG
B-502

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
								horizontal, close, rough, stepped, fresh, tight to open. **REC = 99%, RQD = 93%**
NQ	C-4	60/59						Very hard flint seam 43.1 to 43.3 ft bgs.
			608.7 / 45					Hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set horizontal, close, rough, stepped, fresh to discolored, partly open to open. **REC = 99%, RQD = 74%** -Very hard, fresh, dark gray and white, aphanitic FLINT; primary joint set shallow, close, rough, stepped, fresh, open encountered from 45.0 to 46.3 ft bgs and from 47.5 to 48 ft bgs.
NQ	C-5	60/59						
			603.7 / 50					Moderately hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set horizontal to shallow, moderately close, rough, stepped, fresh, tight to partly open. **REC = 98%, RQD = 98%**
NQ	C-6	60/58.5						
			598.7 / 55					Boring terminated at 54.9 ft bgs.
			593.7 / 60					
			588.7					

CDM Smith

BOREHOLE LOG
B-503

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Drilling Contractor: S&ME/Tri-State
Surface Elevation (ft.): 652.8
Drilling Method/Rig: HSA/CME-550X
Total Depth (ft.): 60.3
Drillers: Freeman
Depth to Initial Water Level (ft-bgs): NR
Drilling Date: Start: 3/1/2019 **End:** 3/2/2019
Abandonment Method: Backfilled with grout.
Borehole Coordinates: See Boring Location Plan
Logged By: KNA

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			652.8					
SS	S-1	24/22	0	5	4 3 2 2		CL	Moist, medium stiff, brown, **CLAY** and fine to coarse **GRAVEL**, trace roots
SS	S-2	24/23		7	3 2 5 5			Moist, medium stiff, brown-gray, **CLAY**, trace fine to coarse gravel, trace roots
SS	S-3	24/24	647.8 5	12	5 5 7 8			Moist, stiff, brown, **CLAY**
SS	S-4	24/24		11	4 5 6 8			Moist, stiff, brown, **CLAY** - Pockets of wet, gray clay
SS	ST-1	24/3		--	P U S H			Moist, brown **CLAY** - 3" recovery, sample abandoned
			642.8					
ST	ST-2	24/12	10	--	P U S H			12" Recovery (estimated 10 to 11 ft bgs), water drained from bottom of tube when extracted.
SS	S-5	24/12		5	3 3 2 4		CH	Moist to wet, medium stiff, orange-brown, **CLAY**
SS	S-6	24/24	637.8 15	9	4 4 5			Moist to wet, stiff, orange-brown, **CLAY**, trace mica

EXPLANATION OF ABBREVIATIONS

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- SSA - Solid Stem Auger
- HA - Hand Auger
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- DTR - Dual Tube Rotary
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- MR - Mud Rotary
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- BX - 1.5" Rock Core
- NX - 2.1" Rock Core
- GP - Geoprobe
- HP - Hydro Punch
- SS - Split Spoon
- ST - Shelby Tube
- WS - Wash Sample

OTHER:
- AGS - Above Ground Surface
- PWR - Partially Weathered Rock

REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
WOH = Weight of hammer
REC = Recovery
RQD = Rock Quality Designation
24-hour water level reading for depth to initial water level

Reviewed by: EOT **Date:** 3-11-19

CDM Smith

BOREHOLE LOG
B-503

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
					6		CH	
SS	S-7	24/24		10	3 4 6 5			Moist to wet, stiff, orange-brown, **CLAY** - Pockets of wet, gray/tan clay
SS	S-8	24/24		9	3 3 6 5			Moist to wet, stiff, brown, tan and black, **CLAY** - Pockets of wet, gray/tan clay
			632.8 20					
SS	S-9	18/18		4	1 2 2			Wet, soft, dark gray, **CLAY**, some fine to coarse sand, little mica
			627.8 25					
SS	S-10	5.5/2		>50	50/5.5"			Wet, hard, dark gray, **CLAY**, some fine to coarse sand, little mica - Wood chips in tip. Auger refusal at 29.3 ft bgs.
			622.8 30				SP	Sand encountered to 35.9 ft bgs. Casing flushed until competent rock was reached. Solid material observed 33.1 to 33.5 ft bgs.
			617.8 35					
NQ	C-1	52/33					VOID	Medium hard to hard, slightly weathered, blue-gray, fine grained **LIMESTONE**; primary joint set steep, close, rough, stepped, discolored, open. **REC = 63%, RQD = 52%** 4" **VOID** encountered 37.6 to 37.9 ft bgs.
			612.8 40					

CDM Smith

BOREHOLE LOG
B-503

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
NQ	C-2	60/56	607.8 45					Medium hard to hard, slightly weathered, blue-gray, fine grained **LIMESTONE**; primary joint set shallow, close, rough, stepped, fresh, open. **REC = 93%, RQD = 72%** - Very hard, highly fractured to slightly fractured, dark gray, FLINT encountered from 42.5 to 43.4 ft bgs and from 44.7 to 45.2 ft bgs.
NQ	C-3	60/59.5	602.8 50					Hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set horizontal, close, rough, stepped, fresh, open. **REC = 94%, RQD = 75%** - Several core pieces were approximately 3.5" in length.
NQ	C-4	60/60	597.8 55					Hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set horizontal, moderately close, rough, stepped, fresh to slightly discolored, partly open. **REC = 100%, RQD = 98%**
NQ	C-5	60/60	592.8 60					Hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set horizontal, moderately closerough, planar, partly open. **REC = 94%, RQD = 87%** - Quartz inclusions 55.2 to 55.5 ft bgs.
			587.8					Boring terminated at 60.3 ft bgs.

CDM Smith

BOREHOLE LOG
B-504

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Drilling Contractor: S&ME/Tri-State
Surface Elevation (ft.): 654.6
Drilling Method/Rig: HSA/CME-550X
Total Depth (ft.): 55
Drillers: Freeman
Depth to Initial Water Level (ft-bgs): 3.0
Drilling Date: Start: 2/25/2019 **End:** 2/26/2019
Abandonment Method: Backfilled with grout.
Borehole Coordinates: See Boring Location Plan
Logged By: KNA

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
			654.6					
			0		2		CL	Moist, soft, dark brown, **CLAY** & **SILT**, trace roots
SS	S-1	24/20		4	2			
					2			
					3			
					2			Moist, medium stiff, dark brown, **CLAY** & **SILT**, trace roots
SS	S-2	24/16		6	2			
					4			
					3			Moist, medium stiff, orange and white, **CLAY**, some fine to coarse gravel
					1		CH	
SS	S-3	24/24	649.6 5	13	5			Moist, stiff, dark brown and dark gray, **CLAY**
					8			
					10			
					4			Moist, stiff, dark brown and dark gray, **CLAY**
SS	S-4	24/20		15	7			
					8			
					9			
					3			Moist, stiff, brown, **CLAY**
SS	S-5	24/22		13	7			
					6			
			644.6		7			
			10		4		CL	Moist, stiff, orange-brown, **CLAY**
SS	S-6	24/24		13	6			
					7			
					8			
					3			Moist, stiff, brown, **CLAY**
SS	S-7	24/24		12	5			- Wet, gray vertical seams
					7			
					8			
					3			Moist, stiff, brown and black, **CLAY**, trace mica
SS	S-8	24/24	639.6 15	13	6			
					7			

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- HA - Hand Auger
- AR - Air Rotary
- DTR - Dual Tube Rotary
- FR - Foam Rotary
- MR - Mud Rotary
- RC - Reverse Circulation
- CT - Cable Tool
- JET - Jetting
- D - Driving
- DTC - Drill Through Casing

SAMPLING TYPES:
- AS - Auger/Grab Sample
- CS - California Sampler
- BX - 1.5" Rock Core
- NX - 2.1" Rock Core
- GP - Geoprobe
- HP - Hydro Punch
- SS - Split Spoon
- ST - Shelby Tube
- WS - Wash Sample

OTHER:
- AGS - Above Ground Surface
- PWR - Partially Weathered Rock

REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
WOH = Weight of hammer
REC = Recovery
RQD = Rock Quality Designation
24-hour water level reading for depth to initial water level

Reviewed by: EOT **Date:** 3-11-19

BOREHOLE GINT_DUPONT BORING LOGS.GPJ CDM_CORP.GDT 3/19/19

CDM Smith

BOREHOLE LOG
B-504

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
					7		CL	
SS	S-9	24/24		10	4 4 6 7			Moist, stiff, brown, **CLAY**
ST	ST-1	24/24		--	P U S H			Moist, brown, **CLAY**
			634.6 20					
SS	S-10	18/18		6	2 2 4		SC	Moist, medium stiff, brown, tan and gray, **CLAY** Wet, loose, dark gray, fine to coarse **SAND**, some clay - Water in S-11 spoon.
			629.6 25					
SS	S-11	18/18		25	1 13 12		GP	Wet, loose, dark gray, fine to coarse **SAND**, some clay Wet, medium dense, white and gray, fine to coarse **GRAVEL** - Gravel is angular rock fragments. Auger refusal encountered at 30.4 ft bgs. Begin rock coring.
			624.6 30					
NQ	C-1	56/32					VOID	Medium hard, moderately weathered, blue-gray, fine grained **LIMESTONE**; primary joint set moderately dipping to steep, very close, rough, stepped, discolored to decomposed, open. **REC = 57%, RQD = 21%** **VOID** encountered 30.9 to 31.1 ft bgs. Appears to be filled with clayey sand.
							VOID	**VOID** encountered 33.4 to 33.5 ft bgs. Appears to be filled with clayey sand.
			619.6 35					
NQ	C-2	60/59						Hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set horizontal, close to moderately close, rough, stepped, discolored to fresh, open. **REC = 98%, RQD = 80%** - Flint observed 39.5 to 39.7 ft bgs and 39.9 to 40.1 ft bgs.
			614.6 40					

CDM Smith

BOREHOLE LOG
B-504

Client: City of Chattanooga, TN
Project Name: Dupont Pump Station and Basin Improvements
Project Location: Chattanooga, TN
Project Number: 109746

Sample Type	Sample Number	Sample Adv/Rec (inches)	Elev. Depth (ft.)	N-Value	Blows per 6-in or Drilling Rate (min/ft)	Graphic Log	USCS Designation	Material Description
NQ	C-3	60/60	609.6 45					Hard, fresh, blue gray, fine grained **LIMESTONE**, primary joint set horizontal to shallow, moderately close, rough, planar and stepped, fresh, slightly open. **REC = 100%, RQD = 100%** - 6" seam of very hard, dark gray and white, FLINT encountered 41.6 to 42.1 ft bgs.
NQ	C-4	60/58.5	604.6 50					Hard, fresh, blue gray, fine grained **LIMESTONE**, primary joint set horizontal to shallow, moderately close, rough, planar and undulating, fresh, slightly open to tight. **REC = 98%, RQD = 98%**
NQ	C-5	58/60	599.6 55					Medium hard to hard, fresh, blue-gray, fine grained **LIMESTONE**; primary joint set horizontal, close to moderately close, rough, undulating, fresh, partly open to tight. **REC = 100%, RQD = 100%**
			594.6 60					Boring terminated at 55.0 ft bgs.
			589.6					

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Appendix D

S&ME Geotechnical Laboratory Testing Report

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April 22, 2019

CDM Smith
4600 Park Road #240
Charlotte, North Carolina 28209

Attention: Mr. Erdem Onur Tastan, Ph.D., P.E.

Reference: Laboratory Testing Services Report
DuPont WTP
Chattanooga, Tennessee
S&ME Project No. 1281-18-061

Dear Mr. Tastan:

S&ME, Inc. provided drilling and laboratory testing services at the above referenced project. Services were performed in general accordance with the scope of services outlined in the Standard Form of Agreement between Engineer and Subcontractor for Drilling Services dated February 18, 2019. Attached you will find laboratory reports documenting the laboratory testing services performed.

Should you have any questions regarding this information, or if we can be of any further assistance, please contact us at your convenience.

Sincerely,

S&ME, Inc.

David Grass, PE
Project Engineer

Attachments: Laboratory Testing Reports

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

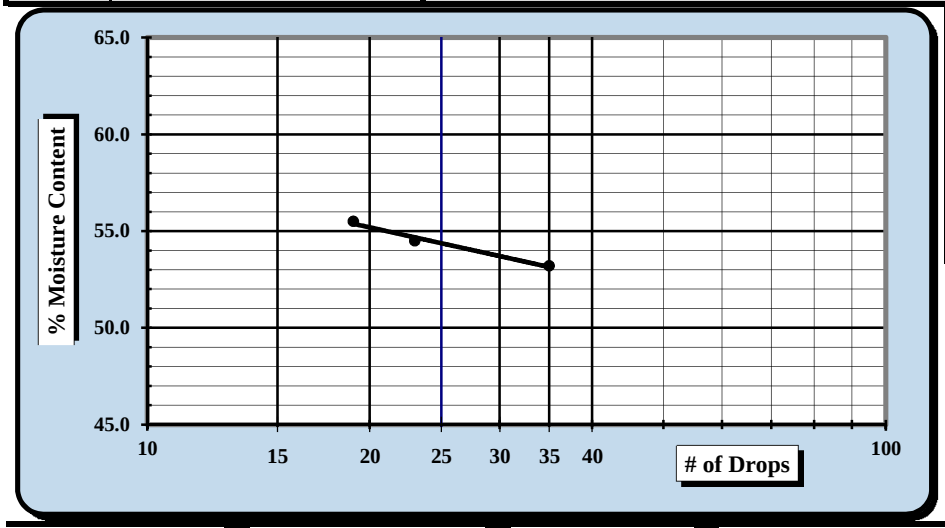
ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	*Log #: 19-066*	Report Date: 3/27/2019
Project Name:	Dupont WTP		Test Date(s) 3/26/2019
Client Name:	CDM Smith		
Client Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-501	Sample #: S-1	Sample Date: 2/28/2019
Location:	Onsite Boring	Offset: N/A	Depth: 3.5'-5'
Sample Description:	Strong Brown Fat Clay		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	22533	9/17/2018	Grooving tool	33327	2/12/2019
LL Apparatus	22738	4/24/2018	Grooving tool		
Oven	22617	9/26/2018	Grooving tool		

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	97	21	11				D	I	
A	Tare Weight	15.40	15.13	13.60				80.57	80.61	
B	Wet Soil Weight + A	27.04	27.20	25.15				91.39	91.46	
C	Dry Soil Weight + A	23.00	22.94	21.03				89.42	89.48	
D	Water Weight (B-C)	4.04	4.26	4.12				1.97	1.98	
E	Dry Soil Weight (C-A)	7.60	7.81	7.43				8.85	8.87	
F	% Moisture (D/E)*100	53.2%	54.5%	55.5%				22.3%	22.3%	
N	# OF DROPS	35	23	19				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**22.3%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**54**
Plastic Limit	**22**
Plastic Index	**32**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☐

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Rick Setzer	3/26/2019	David Grass, PE	3/27/2019
Technician Name	*Date*	*Technical Responsibility*	*Date*

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

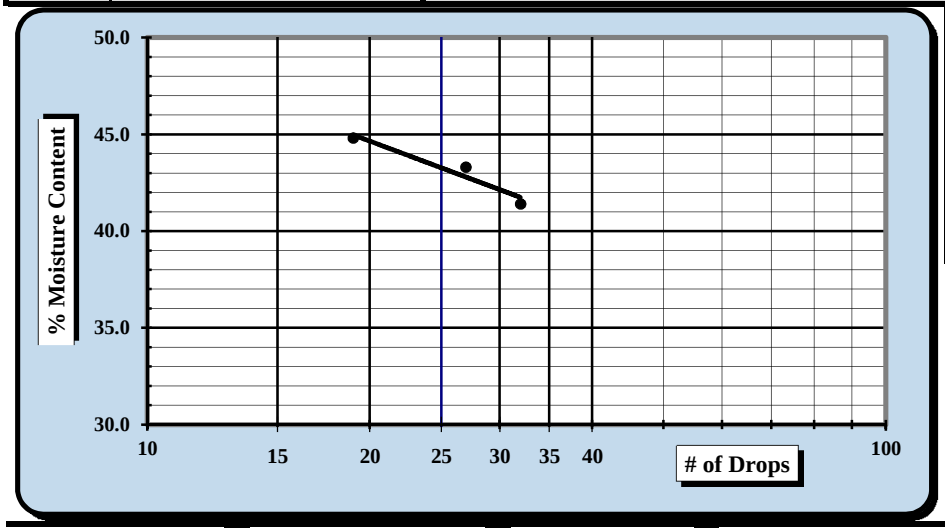
ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	*Log #: 19-066*	Report Date: 3/29/2019
Project Name:	Dupont WTP		Test Date(s) 3/25/2019
Client Name:	CDM Smith		
Client Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-501	Sample #: S-3	Sample Date: 2/28/2019
Location:	Onsite Boring	Offset: N/A	Depth: 13.5'-15'
Sample Description:	Yellowish Brown Clay		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	22533	9/17/2018	Grooving tool	33327	2/12/2019
LL Apparatus	22738	4/24/2018	Grooving tool		
Oven	22617	9/26/2018	Grooving tool		

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	48	97	44				C	X	
A	Tare Weight	13.75	15.41	13.68				81.65	81.65	
B	Wet Soil Weight + A	20.20	19.78	18.46				92.92	92.96	
C	Dry Soil Weight + A	18.31	18.46	16.98				91.12	91.13	
D	Water Weight (B-C)	1.89	1.32	1.48				1.80	1.83	
E	Dry Soil Weight (C-A)	4.56	3.05	3.30				9.47	9.48	
F	% Moisture (D/E)*100	41.4%	43.3%	44.8%				19.0%	19.3%	
N	# OF DROPS	32	27	19				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**19.2%**		



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**43**
Plastic Limit	**19**
Plastic Index	**24**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☐

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Rick Setzer	3/25/2019	David Grass, PE	3/29/2019
Technician Name	*Date*	*Technical Responsibility*	*Date*

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

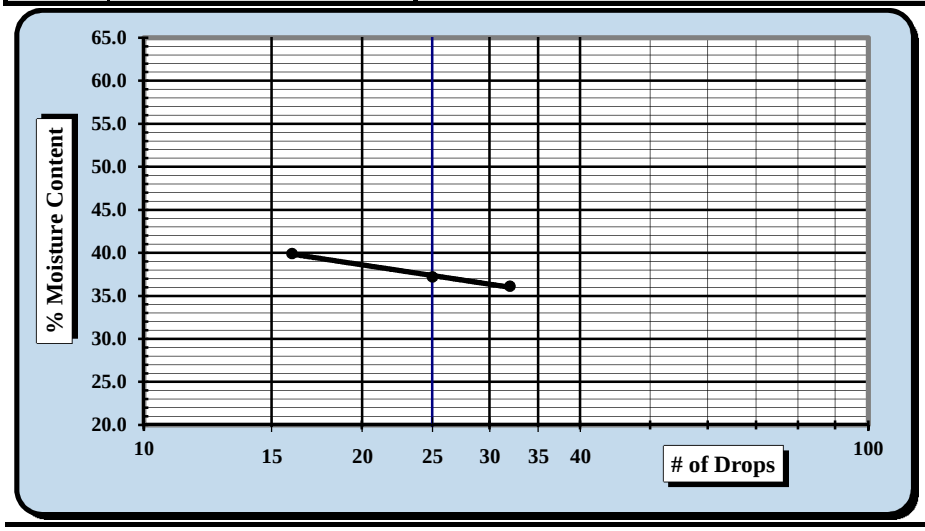
S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1281-18-061	Report Date:	3/29/19
Project Name:	Dupont WTP	Test Date(s)	3/27-3/29/19
Client Name:	CDM Smith		
Client Address:	4600 Park Road, #240, Charlotte, NC 28209		

Boring #:	B-502	Sample #: ST-1		Sample Date: N/A	
Location:	N/A	Offset: N/A		Elevation: 19.5'-21.5'	
Sample Description:	Dark yellowish brown clay with some sand and a trace of mica				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	4/4/2018	Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019	Grooving tool		
Oven	31332	2/21/2019	Grooving tool		

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3	4	5	6	7	8	9
A	Tare Weight	14.95	15.19	15.41				15.71	16.00	
B	Wet Soil Weight + A	28.98	30.38	29.02				23.52	23.13	
C	Dry Soil Weight + A	25.26	26.26	25.14				22.24	21.97	
D	Water Weight (B-C)	3.72	4.12	3.88				1.28	1.16	
E	Dry Soil Weight (C-A)	10.31	11.07	9.73				6.53	5.97	
F	% Moisture (D/E)*100	36.1%	37.2%	39.9%				19.6%	19.4%	
N	# OF DROPS	32	25	16				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**19.5%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**37**
Plastic Limit	**20**
Plastic Index	**17**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☐ Air Dried ☑

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Jimmy Hanson — *Technician Name*
3/29/2019 — *Date*
Technical Responsibility
Date

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

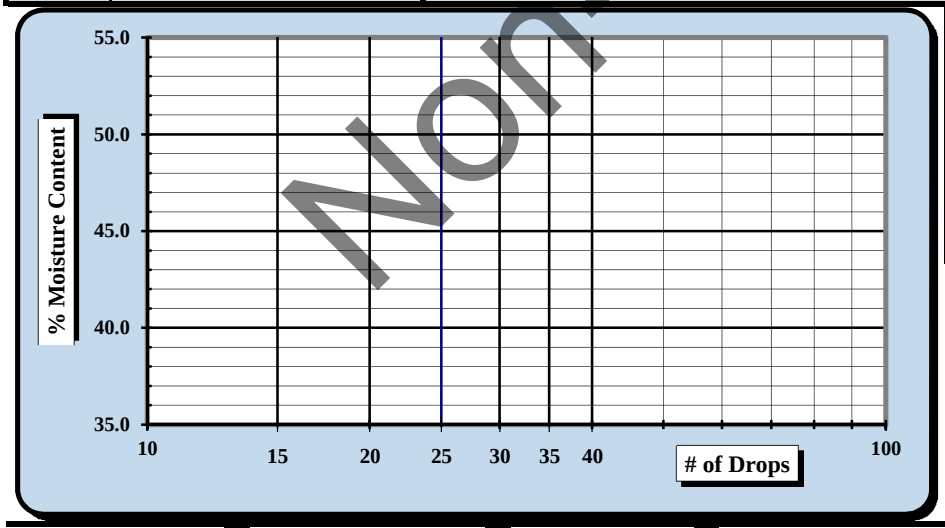
ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	*Log #: 19-066*	Report Date: 4/2/2019
Project Name:	Dupont WTP		Test Date(s) 3/29/2019
Client Name:	CDM Smith		
Client Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-502	Sample #: S-7	Sample Date: 2/26/2019
Location:	Onsite Boring	Offset: N/A	Depth: 25.5'-27.5'
Sample Description:	Dark Gray Sandy Silt		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	22533	9/17/2018	Grooving tool	33327	2/12/2019
LL Apparatus	22738	4/24/2018	Grooving tool		
Oven	22617	9/26/2018	Grooving tool		

Pan #		Liquid Limit						Plastic Limit		
	Tare #:									
A	Tare Weight									
B	Wet Soil Weight + A									
C	Dry Soil Weight + A									
D	Water Weight (B-C)									
E	Dry Soil Weight (C-A)									
F	% Moisture (D/E)*100									
N	# OF DROPS							*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*									



Non-Plastic

One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit	
Plastic Limit	
Plastic Index	
Group Symbol	

Multipoint Method ☐
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☐

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Rick Setzer	3/29/2019	David Grass, PE	4/3/2019
Technician Name	*Date*	*Technical Responsibility*	*Date*

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

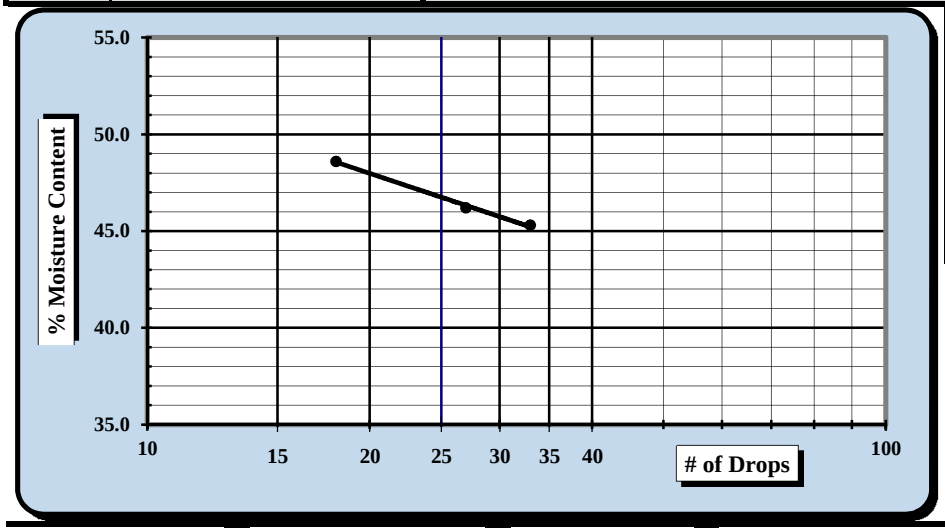
ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	*Log #: 19-066*	Report Date: 3/29/2019
Project Name:	Dupont WTP		Test Date(s) 3/27/2019
Client Name:	CDM Smith		
Client Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-503	Sample #: S-2	Sample Date: 3/1/2019
Location:	Onsite Boring	Offset: N/A	Depth: 2'-4'
Sample Description:	Yellowish Brown Lean Clay		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	22533	9/17/2018	Grooving tool	33327	2/12/2019
LL Apparatus	22738	4/24/2018	Grooving tool		
Oven	22617	9/26/2018	Grooving tool		

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	9	48	21				D	I	
A	Tare Weight	15.05	13.75	15.13				80.57	80.61	
B	Wet Soil Weight + A	26.32	25.42	27.27				91.56	91.43	
C	Dry Soil Weight + A	22.76	21.78	23.30				89.64	89.54	
D	Water Weight (B-C)	3.56	3.64	3.97				1.92	1.89	
E	Dry Soil Weight (C-A)	7.71	8.03	8.17				9.07	8.93	
F	% Moisture (D/E)*100	46.2%	45.3%	48.6%				21.2%	21.2%	
N	# OF DROPS	27	33	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**21.2%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**47**
Plastic Limit	**21**
Plastic Index	**26**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☐

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Rick Setzer	3/27/2019	David Grass, PE	3/29/2019
Technician Name	*Date*	*Technical Responsibility*	*Date*

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

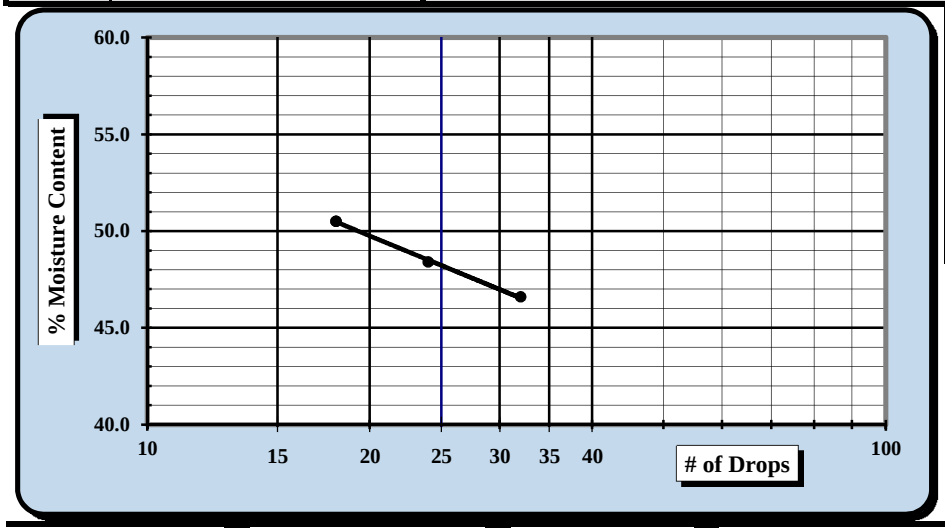
ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	*Log #: 19-066*	Report Date: 4/3/2019
Project Name:	Dupont WTP		Test Date(s) 4/1/2019
Client Name:	CDM Smith		
Client Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-503	Sample #: ST-2	Sample Date: 3/1/2019
Location:	Onsite Boring	Offset: N/A	Depth: 10'-11'
Sample Description:	Yellowish Brown Lean Clay		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	22533	9/17/2018	Grooving tool	33327	2/12/2019
LL Apparatus	22738	4/24/2018	Grooving tool		
Oven	22617	9/26/2018	Grooving tool		

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	6	14	89				C	X	
A	Tare Weight	15.31	13.69	15.25				81.66	81.65	
B	Wet Soil Weight + A	27.24	24.42	25.17				92.89	92.71	
C	Dry Soil Weight + A	23.45	20.92	21.84				90.89	90.78	
D	Water Weight (B-C)	3.79	3.50	3.33				2.00	1.93	
E	Dry Soil Weight (C-A)	8.14	7.23	6.59				9.23	9.13	
F	% Moisture (D/E)*100	46.6%	48.4%	50.5%				21.7%	21.1%	
N	# OF DROPS	32	24	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**21.4%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**48**
Plastic Limit	**21**
Plastic Index	**27**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☐

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Rick Setzer	3/24/2019	David Grass, PE	3/27/2019
Technician Name	*Date*	*Technical Responsibility*	*Date*

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

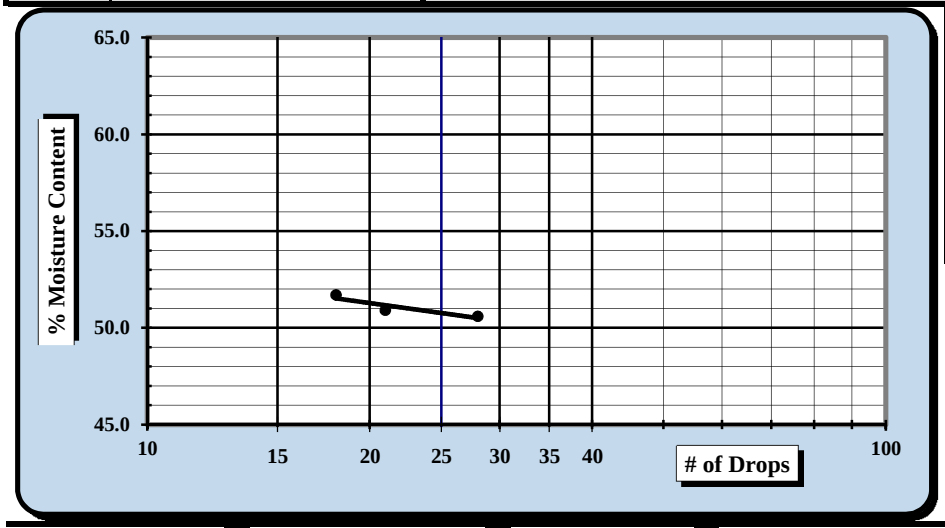
ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	*Log #: 19-066*	Report Date: 3/27/2019
Project Name:	Dupont WTP		Test Date(s) 3/24/2019
Client Name:	CDM Smith		
Client Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-504	Sample #: S-5	Sample Date: 2/25/2019
Location:	Onsite Boring	Offset: N/A	Depth: 8'-10'
Sample Description:	Yellowish Brown Fat Clay		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	22533	9/17/2018	Grooving tool	33327	2/12/2019
LL Apparatus	22738	4/24/2018	Grooving tool		
Oven	22617	9/26/2018	Grooving tool		

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	13	21	91				L	M	
A	Tare Weight	13.51	15.13	13.09				81.35	81.35	
B	Wet Soil Weight + A	22.85	25.39	24.27				92.47	92.40	
C	Dry Soil Weight + A	19.71	21.93	20.46				90.49	90.48	
D	Water Weight (B-C)	3.14	3.46	3.81				1.98	1.92	
E	Dry Soil Weight (C-A)	6.20	6.80	7.37				9.14	9.13	
F	% Moisture (D/E)*100	50.6%	50.9%	51.7%				21.7%	21.0%	
N	# OF DROPS	28	21	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**21.4%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**51**
Plastic Limit	**21**
Plastic Index	**30**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☐

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Rick Setzer	3/24/2019	David Grass, PE	3/27/2019
Technician Name	*Date*	*Technical Responsibility*	*Date*

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

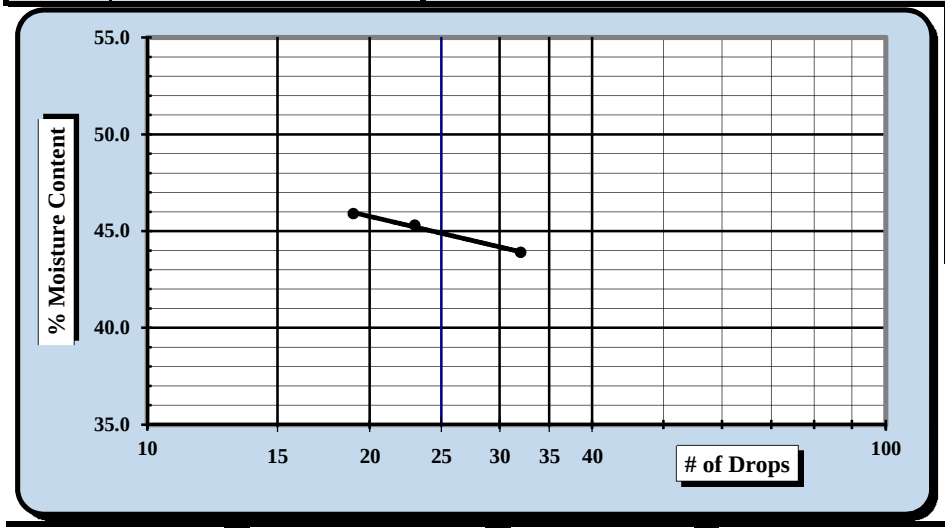
ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	*Log #: 19-066*	Report Date: 3/29/2019
Project Name:	Dupont WTP		Test Date(s) 3/28/2019
Client Name:	CDM Smith		
Client Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-504	Sample #: S-9	Sample Date: 2/25/2019
Location:	Onsite Boring	Offset: N/A	Depth: 16'-18'
Sample Description:	Dark Brown Lean Clay		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	22533	9/17/2018	Grooving tool	33327	2/12/2019
LL Apparatus	22738	4/24/2018	Grooving tool		
Oven	22617	9/26/2018	Grooving tool		

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	94	24	89				M	L	
A	Tare Weight	15.59	15.33	15.23				81.35	81.35	
B	Wet Soil Weight + A	26.86	29.93	28.81				88.73	87.61	
C	Dry Soil Weight + A	23.42	25.38	24.54				87.37	86.48	
D	Water Weight (B-C)	3.44	4.55	4.27				1.36	1.13	
E	Dry Soil Weight (C-A)	7.83	10.05	9.31				6.02	5.13	
F	% Moisture (D/E)*100	43.9%	45.3%	45.9%				22.6%	22.0%	
N	# OF DROPS	32	23	19				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**22.3%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**45**
Plastic Limit	**22**
Plastic Index	**23**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☐

Notes / Deviations / References:

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Tyler Thompson	3/28/2019	David Grass, PE	3/29/2019
Technician Name	*Date*	*Technical Responsibility*	*Date*

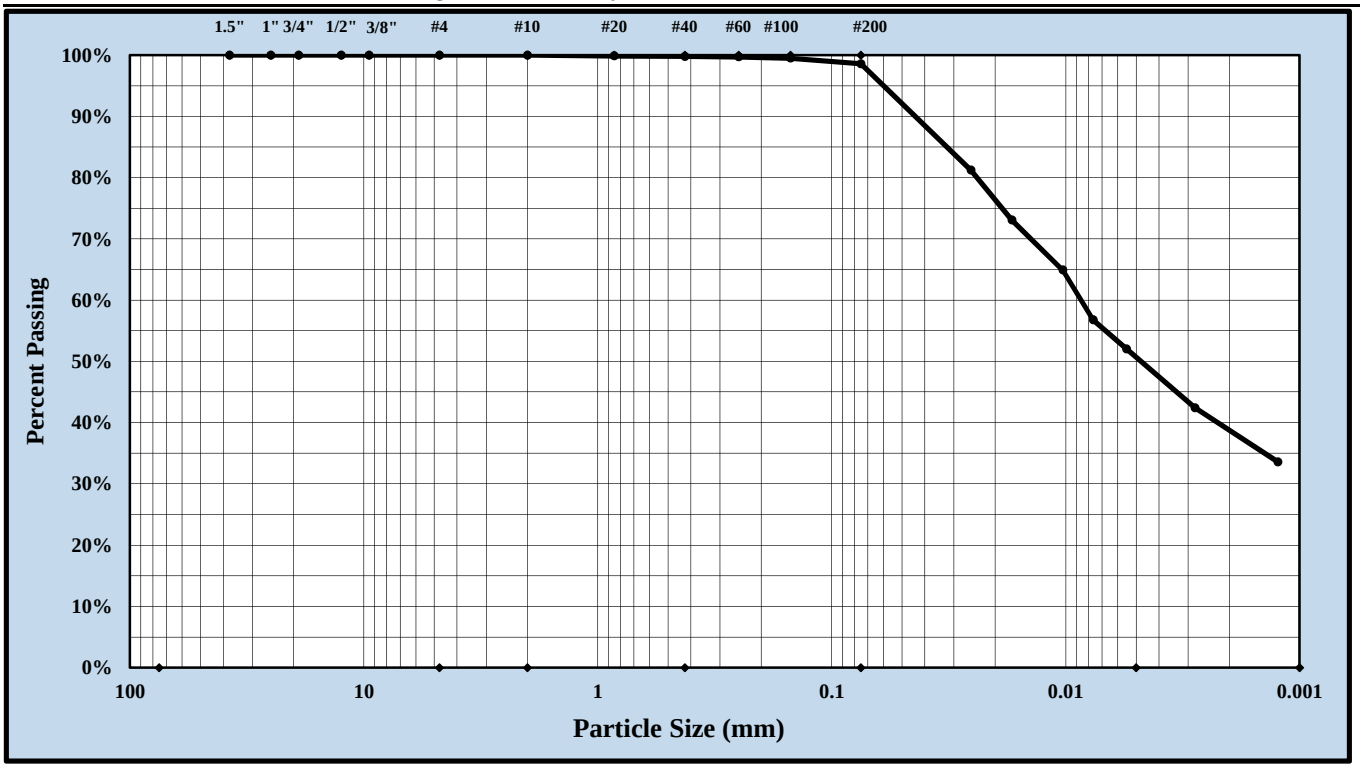
Form No. TR-D422-3
Revision No. 2
Revision Date: 08/29/17

PARTICLE SIZE ANALYSIS OF SOIL

ASTM D 6913 & D 7928

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

S&ME Project #:	1281-18-061	Report Date:	4/2/2019
Project Name:	Dupont WTP	Test Date(s):	3/28 - 4/1/2019
Client Name:	CDM Smith		
Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-501 Sample #: S-1	Sample Date:	2/28/2019
Location:	Onsite Boring Offset: N/A	Depth:	3.5'-5'
Sample Description:	Strong Brown Fat Clay		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#100	Gravel:	0.0%	Silt	48.0%
Silt & Clay (% Passing #200):	98.6%	Total Sand:	1.4%	Clay	50.6%
Apparent Relative Density	2.650				
Liquid Limit	54	Plastic Limit	22	Plastic Index	32
Coarse Sand:	0.0%	Medium Sand:	0.2%	Fine Sand:	1.2%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus A — Dispersion Period: 1 min. — Dispersing Agent: Sodium Hexametaphosphate: 5.04g

References / Comments / Deviations: AASTM D 4318, D 2487

Apparent Relative Density is assumed.

David Grass, PE		Project Engineer	4/2/2019
Technical Responsibility	*Signature*	*Position*	*Date*

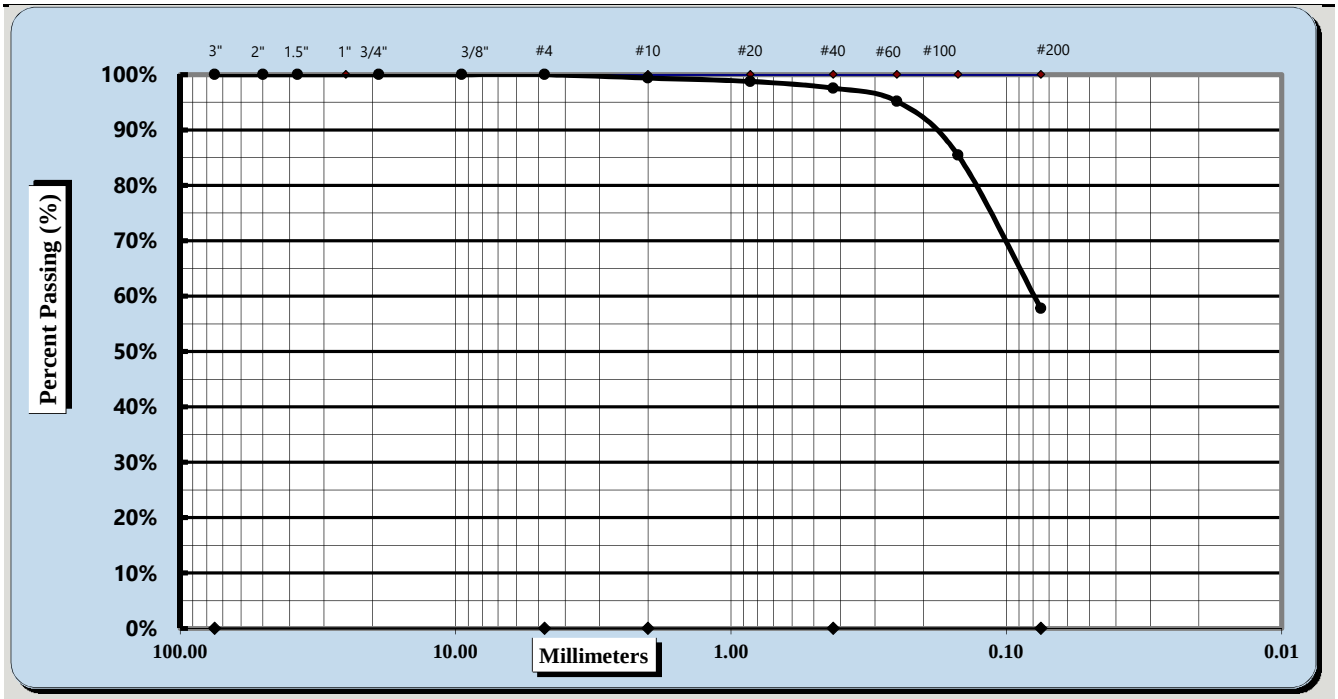
Form No TR-D6913-GR-01
Revision No. 1
Revision Date: 9/5/17

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	Log #: 19-066		Record Date:	3/29/2019
Project Name:	Dupont WTP				
Client Name:	CDM Smith				
Received By:	D. Grass	Sampled by:	Drillers	Date Sampled:	2/28/2019
Location:	Onsite Boring				
Boring/Sample Id.	B-501 / S-7	Type:	SS	Depth:	26'-28'
Sample Description:	Brownish Gray Sandy Clay				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Method: A Procedure for obtaining Specimen: Moist Dispersion Process: Agitation

Maximum Particle Size	#10	Coarse Sand	1%	Fine Sand	40%
Gravel	0%	Medium Sand	2%	Silt & Clay	58%
Liquid Limit	50	Plastic Limit	TNP	Plastic Index	TNP
Maximum Dry Density	TNP	Bulk Gravity (C127)	TNP	% Absorption	TNP
Optimum Moisture	TNP	Natural Moisture	TNP	CBR	TNP

Notes / Deviations / References:

David Grass, PE		Project Engineer	4/1/2019
Technical Responsibility	*Signature*	*Position*	*Date*

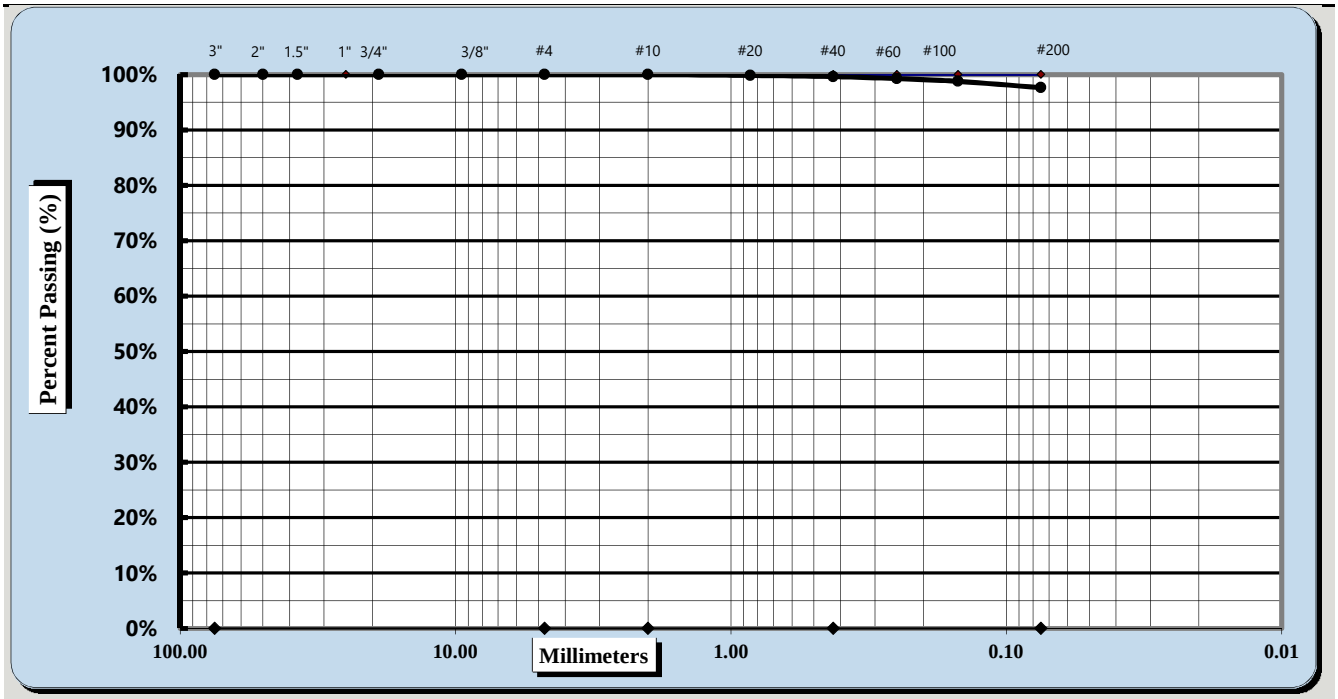
Form No TR-D6913-GR-01
Revision No. 1
Revision Date: 9/5/17

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	Log #: 19-066		Record Date:	3/29/2019
Project Name:	Dupont WTP				
Client Name:	CDM Smith				
Received By:	D. Grass	Sampled by:	Drillers	Date Sampled:	2/26/2019
Location:	Onsite Boring				
Boring/Sample Id.	B-502/S-2	Type:	SS	Depth:	8'-9.5'
Sample Description:	Yellowish Brown Fat Clay				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Method: A Procedure for obtaining Specimen: Moist Dispersion Process: Agitation

Maximum Particle Size	#10	Coarse Sand	0%	Fine Sand	2%
Gravel	0%	Medium Sand	0%	Silt & Clay	98%
Liquid Limit	51	Plastic Limit	21	Plastic Index	30
Maximum Dry Density	TNP	Bulk Gravity (C127)	TNP	% Absorption	TNP
Optimum Moisture	TNP	Natural Moisture	TNP	CBR	TNP

Notes / Deviations / References:

TNP - Test Not Performed

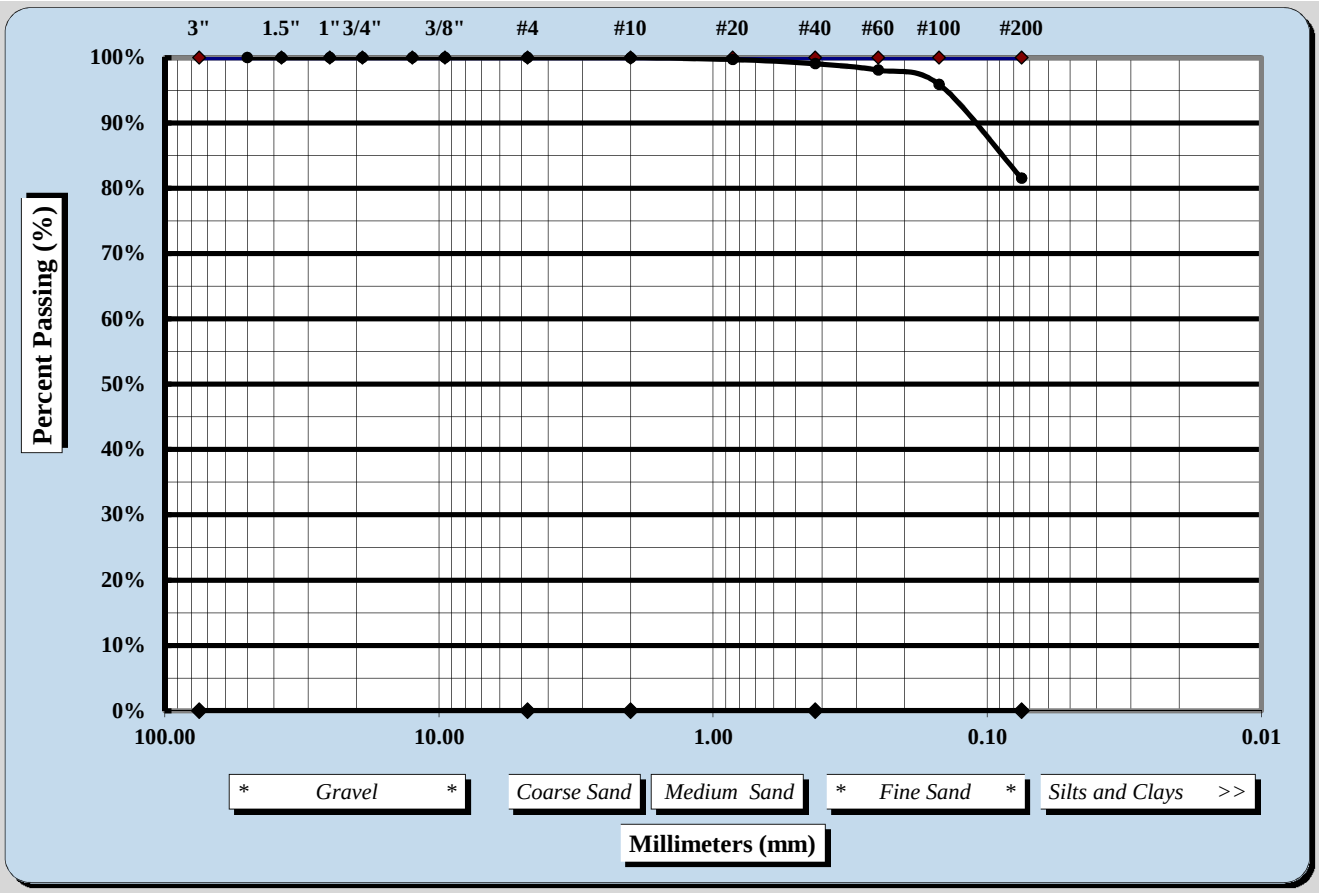
David Grass, PE		Project Engineer	4/1/2019
Technical Responsibility	*Signature*	*Position*	*Date*

SIEVE ANALYSIS OF SOILS

ASTM D 6913

S&ME, Inc. - Atlanta:	4350 River Green Parkway, Suite 200, Duluth, GA 30096		
Project #:	1281-18-061	Report Date:	3/29/19
Project Name:	Dupont WTP	Test Date(s):	3/27-3/29/19
Client Name:	CDM Smith		
Client Address:	4600 Park Road, #240, Charlotte, NC 28209		
Sample Id.	B-502	Type: U.D.	Sample Date: N/A
Location:	N/A	Sample: ST-1	Elevation: 19.5'-21.5'

Sample Description: Dark yellowish brown clay with some sand and a trace of mica



Maximum Particle Size	2mm	Coarse Sand	0.0%	Fine Sand	17.5%
Gravel	0.0%	Medium Sand	0.9%	Silt & Clay	81.5%
Liquid Limit	37	Plastic Limit	20	Plastic Index	17

Coarse Sand	0.0%	Medium Sand	0.9%	Fine Sand	17.5%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐
Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Notes / Deviations / References:

Jacob T. David — *Technical Responsibility* | *Signature* | Staff Professional II — *Position* | 4/17/2019 — *Date*

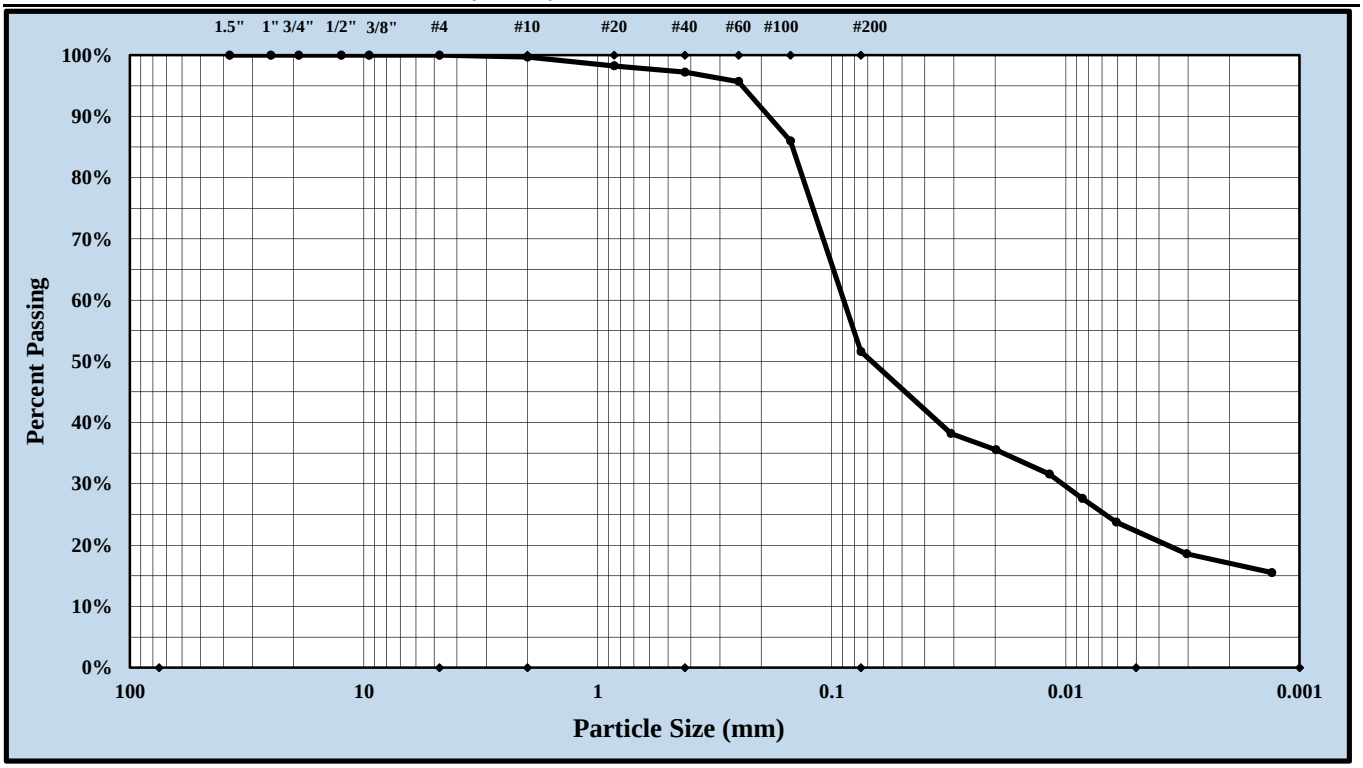
Form No. TR-D422-3
Revision No. 2
Revision Date: 08/29/17

PARTICLE SIZE ANALYSIS OF SOIL

ASTM D 6913 & D 7928

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

S&ME Project #:	1281-18-061	Report Date:	4/3/2019
Project Name:	Dupont WTP	Test Date(s):	3/28 - 4/1/2019
Client Name:	CDM Smith		
Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-502 Sample #: S-7	Sample Date:	2/26/2019
Location:	Onsite Boring Offset: N/A	Depth:	25.5'-27.5'
Sample Description:	Dark Gray Sandy Silt		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#10	Gravel:	0.0%	Silt	29.4%
Silt & Clay (% Passing #200):	51.6%	Total Sand:	48.4%	Clay	22.2%
Apparent Relative Density	2.650				
Liquid Limit	NP	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.3%	Medium Sand:	2.4%	Fine Sand:	45.6%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus A — Dispersion Period: 1 min. — Dispersing Agent: Sodium Hexametaphosphate: 5.01

References / Comments / Deviations: AASTM D 4318, D 2487

Apparent Relative Density is assumed.

David Grass, PE		Project Engineer	4/3/2019
Technical Responsibility	*Signature*	*Position*	*Date*

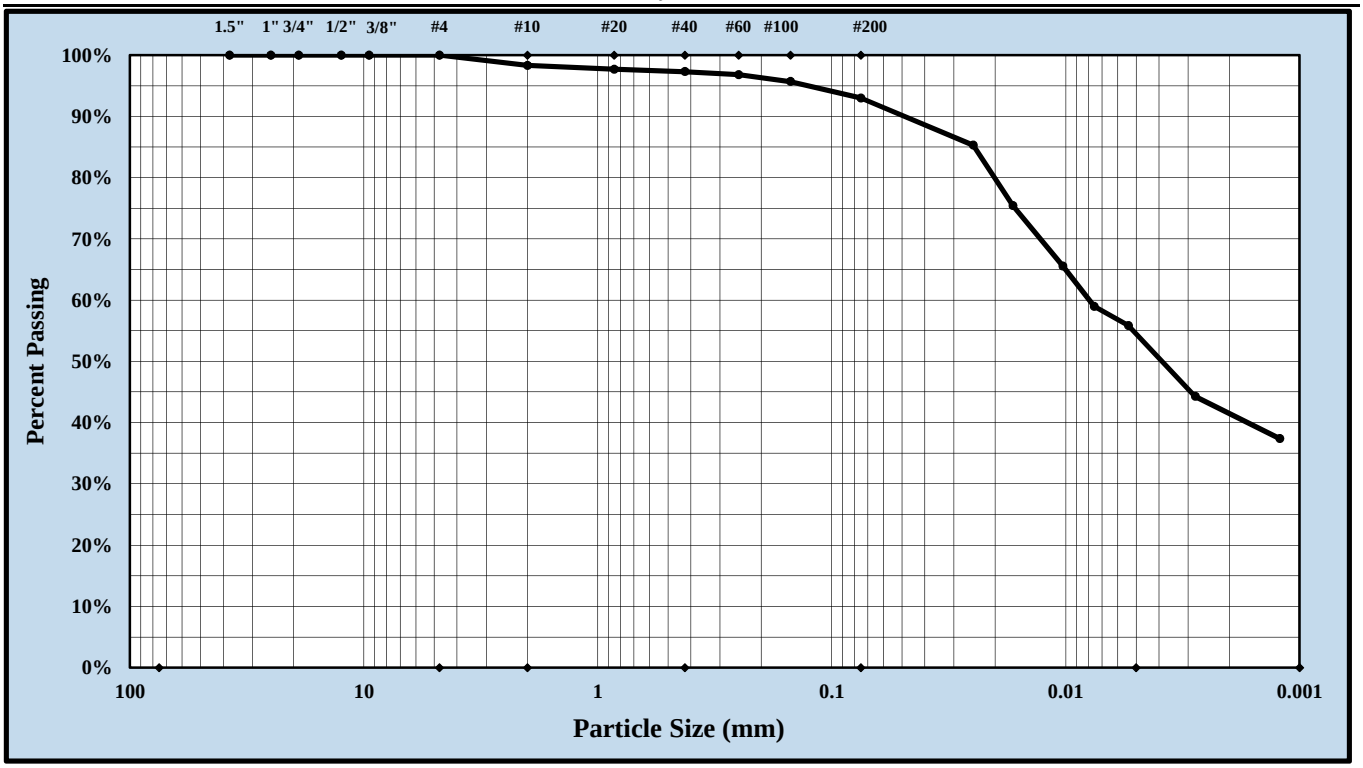
Form No. TR-D422-3
Revision No. 2
Revision Date: 08/29/17

PARTICLE SIZE ANALYSIS OF SOIL

ASTM D 6913 & D 7928

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

S&ME Project #:	1281-18-061	Report Date:	4/3/2019
Project Name:	Dupont WTP	Test Date(s):	3/28 - 4/1/2019
Client Name:	CDM Smith		
Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-503 Sample #: S-2	Sample Date:	3/1/2019
Location:	Onsite Boring Offset: N/A	Depth:	2'-4'
Sample Description:	Yellowish Brown Lean Clay		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#20	Gravel:	0.0%	Silt	38.5%
Silt & Clay (% Passing #200):	93.0%	Total Sand:	7.0%	Clay	54.5%
Apparent Relative Density	2.650				
Liquid Limit	47	Plastic Limit	21	Plastic Index	26
Coarse Sand:	1.7%	Medium Sand:	1.0%	Fine Sand:	4.3%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus A — Dispersion Period: 1 min. — Dispersing Agent: Sodium Hexametaphosphate: 5.06

References / Comments / Deviations: AASTM D 4318, D 2487

Apparent Relative Density is assumed.

David Grass, PE		Project Engineer	4/2/2019
Technical Responsibility	*Signature*	*Position*	*Date*

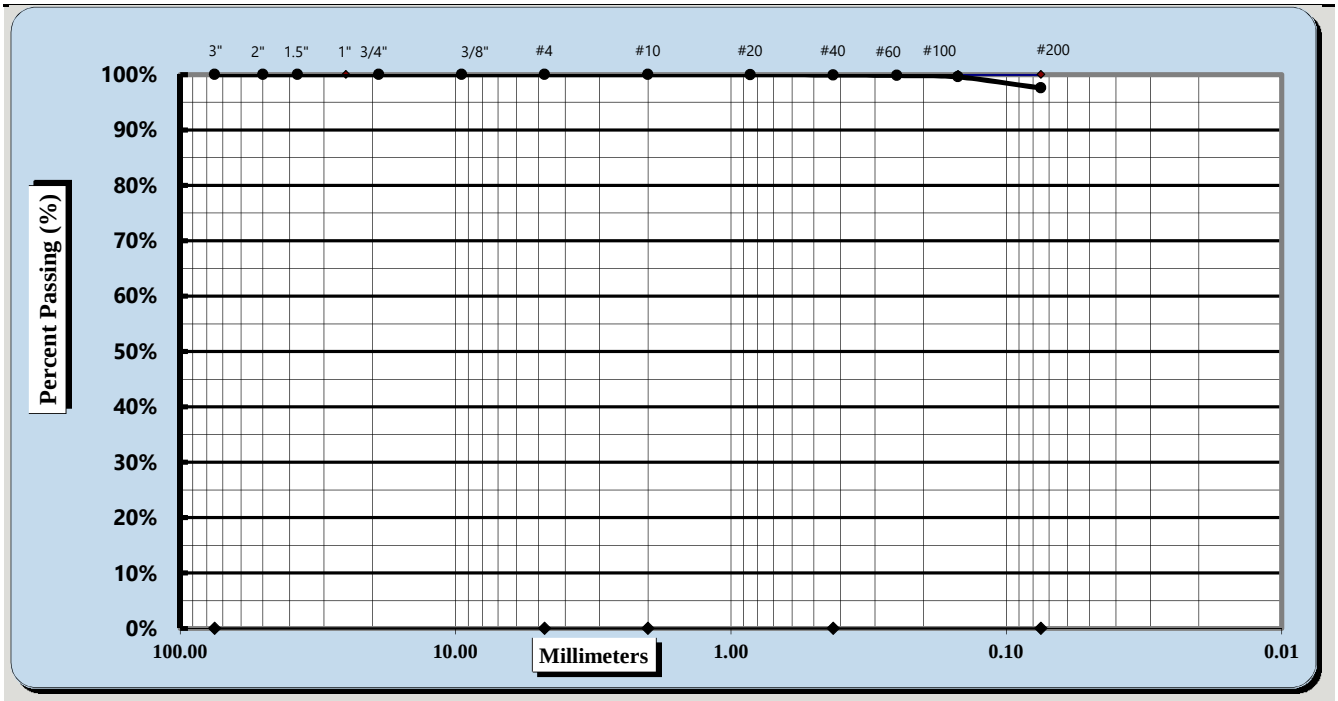
Form No TR-D6913-GR-01
Revision No. 1
Revision Date: 9/5/17

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	Log #: 19-066		Record Date:	4/3/2019
Project Name:	Dupont WTP				
Client Name:	CDM Smith				
Received By:	D. Grass	Sampled by:	Drillers	Date Sampled:	3/1/2019
Location:	Onsite Boring				
Boring/Sample Id.	B-503 / ST-2	Type:	UD	Depth:	10'-11'
Sample Description:	Yellowish Brown Lean Clay				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Method: A Procedure for obtaining Specimen: Moist Dispersion Process: Agitation

Maximum Particle Size	#100	Coarse Sand	0%	Fine Sand	2%
Gravel	0%	Medium Sand	0%	Silt & Clay	98%
Liquid Limit	48	Plastic Limit	21	Plastic Index	27
Maximum Dry Density	TNP	Bulk Gravity (C127)	TNP	% Absorption	TNP
Optimum Moisture	TNP	Natural Moisture	TNP	CBR	TNP

Notes / Deviations / References:

TNP - Test Not Performed

David Grass, PE		Project Engineer	4/1/2019
Technical Responsibility	*Signature*	*Position*	*Date*

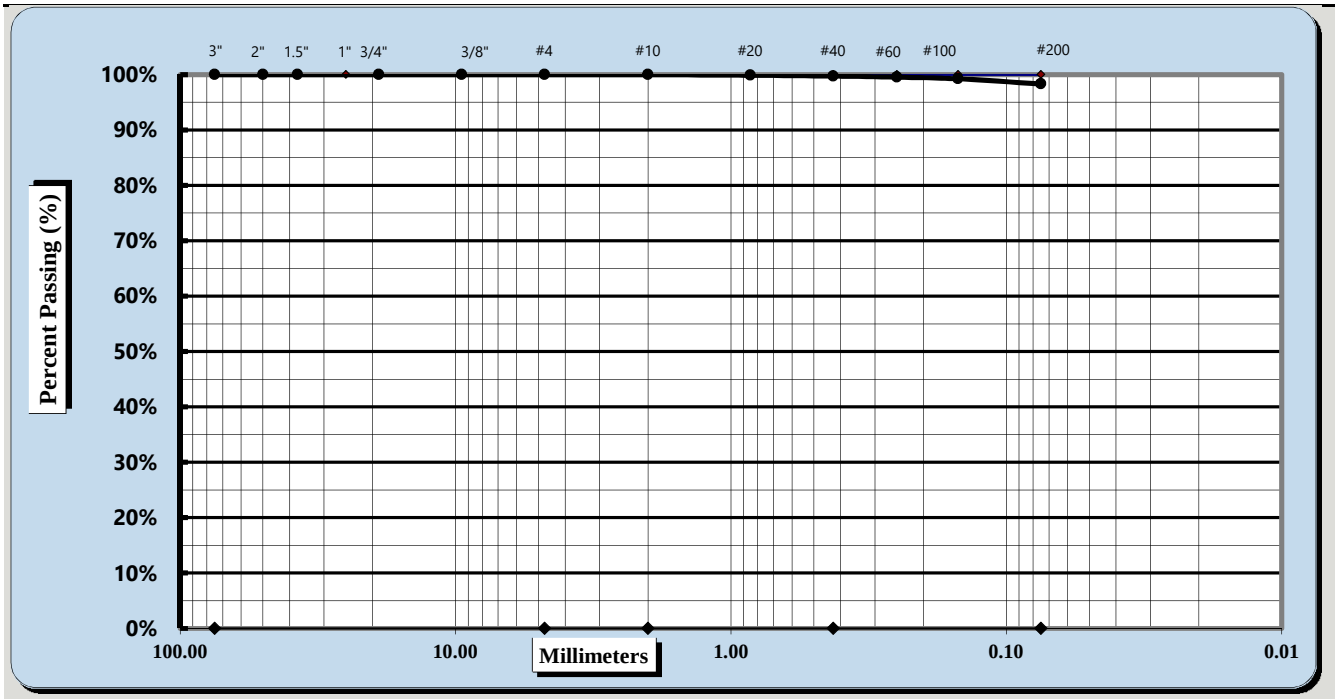
Form No TR-D6913-GR-01
Revision No. 1
Revision Date: 9/5/17

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

Project #:	1281-18-061	Log #: 19-066		Record Date:	3/29/2019
Project Name:	Dupont WTP				
Client Name:	CDM Smith				
Received By:	D. Grass	Sampled by:	Drillers	Date Sampled:	2/25/2019
Location:	Onsite Boring				
Boring/Sample Id.	B-504 / S-5	Type:	SS	Depth:	8'-10'
Sample Description:	Yellowish Brown Fat Clay				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Method: A Procedure for obtaining Specimen: Moist Dispersion Process: Agitation

Maximum Particle Size	#10	Coarse Sand	0%	Fine Sand	1%
Gravel	0%	Medium Sand	0%	Silt & Clay	98%
Liquid Limit	51	Plastic Limit	21	Plastic Index	30
Maximum Dry Density	TNP	Bulk Gravity (C127)	TNP	% Absorption	TNP
Optimum Moisture	TNP	Natural Moisture	TNP	CBR	TNP

Notes / Deviations / References:

TNP - Test Not Performed

David Grass, PE		Project Engineer	4/1/2019
Technical Responsibility	*Signature*	*Position*	*Date*

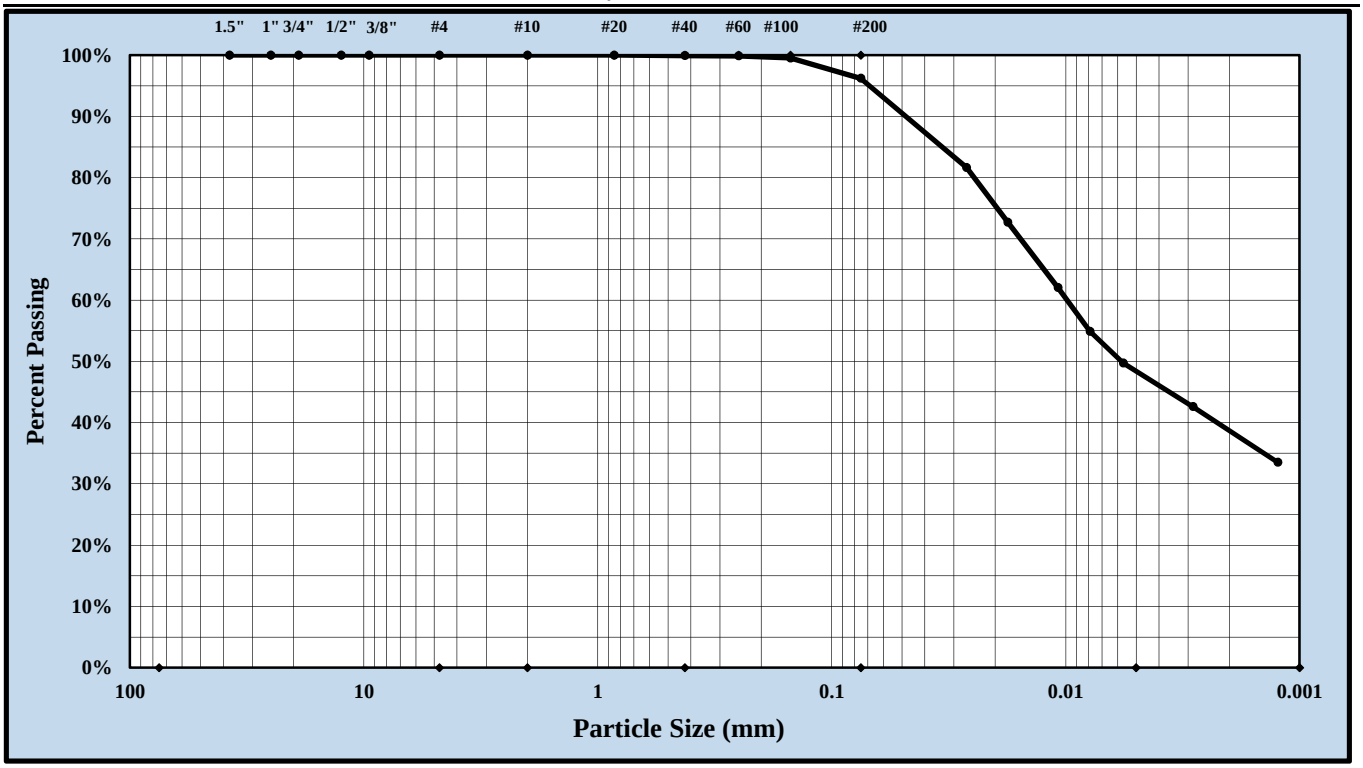
Form No. TR-D422-3
Revision No. 2
Revision Date: 08/29/17

PARTICLE SIZE ANALYSIS OF SOIL

ASTM D 6913 & D 7928

S&ME, Inc. - Chattanooga: 4291 Highway 58, Suite 101, Chattanooga, TN 37416

S&ME Project #:	1281-18-061	Report Date:	4/2/2019
Project Name:	Dupont WTP	Test Date(s):	3/28 - 4/1/2019
Client Name:	CDM Smith		
Address:	4600 Park Rd #240 Charlotte, NC 28209		
Boring #:	B-504 Sample #: S-9	Sample Date:	2/25/2019
Location:	Onsite Boring Offset: N/A	Depth:	16'-18'
Sample Description:	Dark Brown Lean Clay		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	#20	Gravel:	0.0%	Silt	47.7%
Silt & Clay (% Passing #200):	96.2%	Total Sand:	3.8%	Clay	48.5%
Apparent Relative Density	2.650				
Liquid Limit	45	Plastic Limit	22	Plastic Index	23
Coarse Sand:	0.0%	Medium Sand:	0.1%	Fine Sand:	3.7%

Description of Sand and Gravel	Rounded	☐	Angular	☒	Hard & Durable	☒	Soft	☐	Weathered & Friable ☐

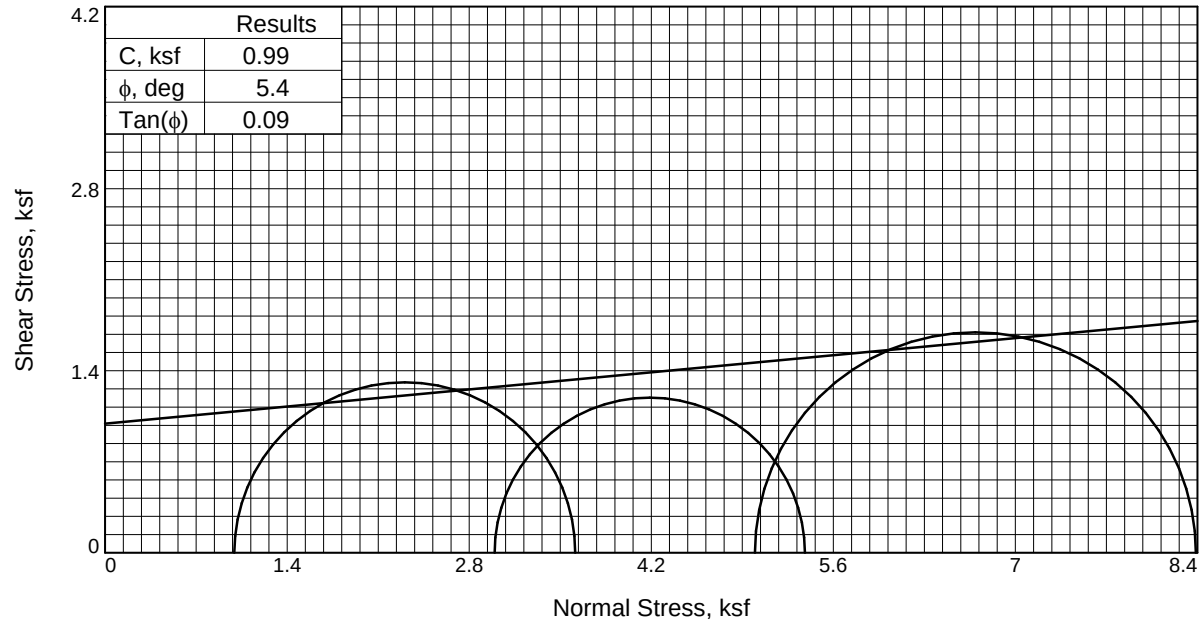
Mechanical Stirring Apparatus A	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate: 5.09

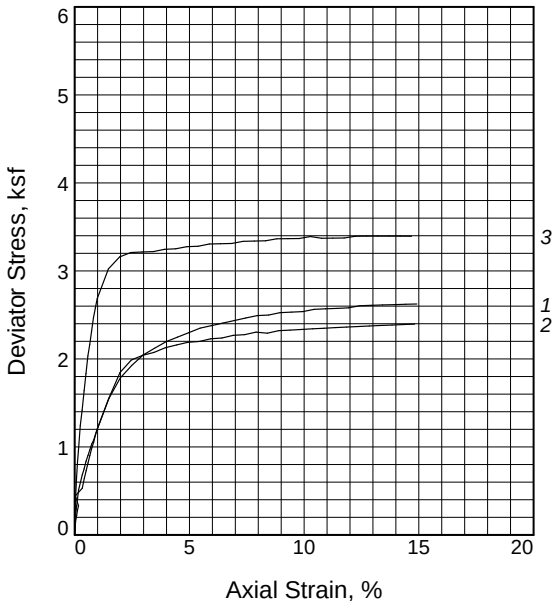
References / Comments / Deviations: AASTM D 4318, D 2487

Apparent Relative Density is assumed.

David Grass, PE		Project Engineer	4/2/2019
Technical Responsibility	*Signature*	*Position*	*Date*

C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.





Sample No.		1	2	3
Initial	Water Content, %	26.1	27.5	26.4
	Dry Density, pcf	98.7	97.3	98.0
	Saturation, %	97.1	99.0	96.6
	Void Ratio	0.7386	0.7645	0.7510
	Diameter, in.	2.874	2.877	2.872
	Height, in.	6.035	6.073	6.132
At Test	Water Content, %	26.1	27.5	26.4
	Dry Density, pcf	98.7	97.3	98.0
	Saturation, %	97.1	99.0	96.6
	Void Ratio	0.7386	0.7645	0.7510
	Diameter, in.	2.874	2.877	2.872
	Height, in.	6.035	6.073	6.132
Strain rate, %/min.		1.00	1.00	1.00
Back Pressure, psi		0.00	0.00	0.00
Cell Pressure, psi		6.90	20.80	34.70
Fail. Stress, ksf		2.62	2.39	3.39
Ult. Stress, ksf		2.63	2.40	3.40
σ_1 Failure, ksf		3.62	5.38	8.39
σ_3 Failure, ksf		0.99	3.00	5.00

Type of Test:
Unconsolidated Undrained

Sample Type: Intact

Description: Dark yellowish brown clay with some sand and a trace of mica

LL= 37 **PL=** 20 **PI=** 17

Assumed Specific Gravity= 2.75

Remarks: Trimmed specimens to length.

Figure 1

Client: CDM Smith 4600 Park Road, #240, Charlotte, NC 28209

Project: Dupont WTP

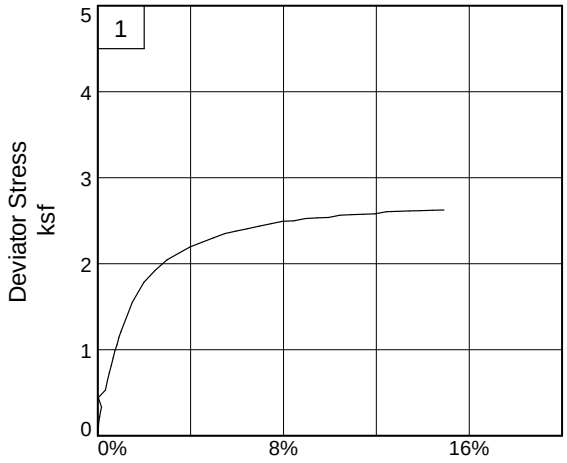
Location: B-502

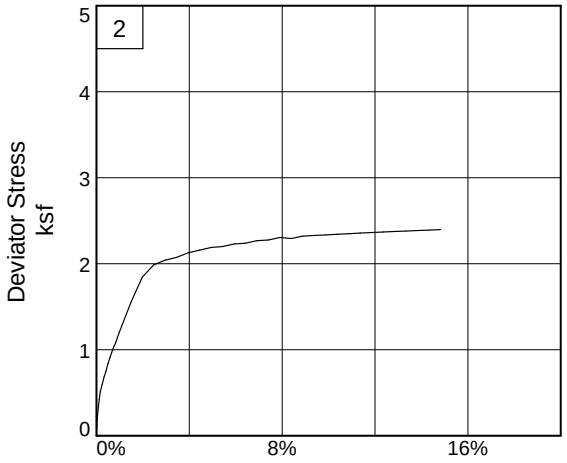
Sample Number: ST-1 **Depth:** 19.5'-21.5'

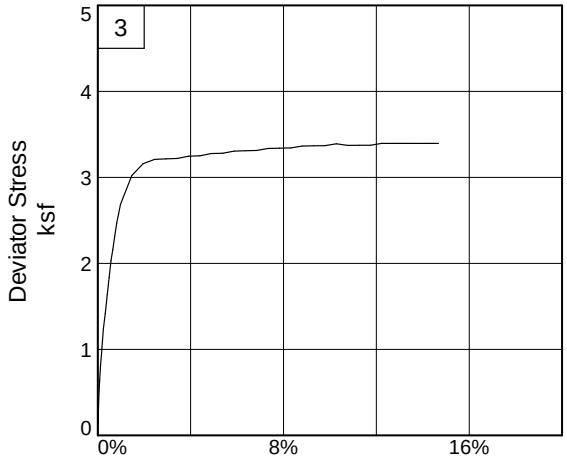
Proj. No.: 1281-18-061 **Date Sampled:** 3/4/19

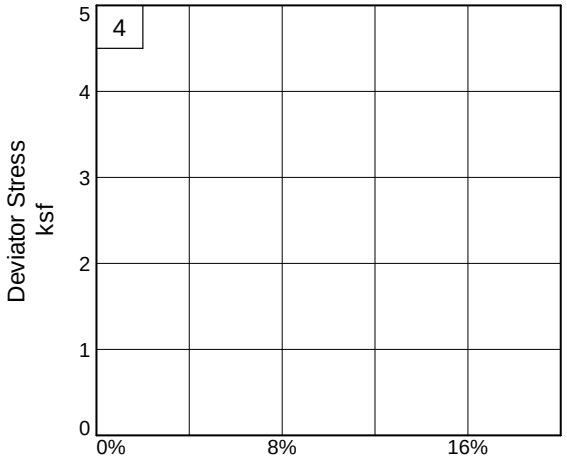
TRIAXIAL SHEAR TEST REPORT
S&ME, Inc.
Duluth, Georgia

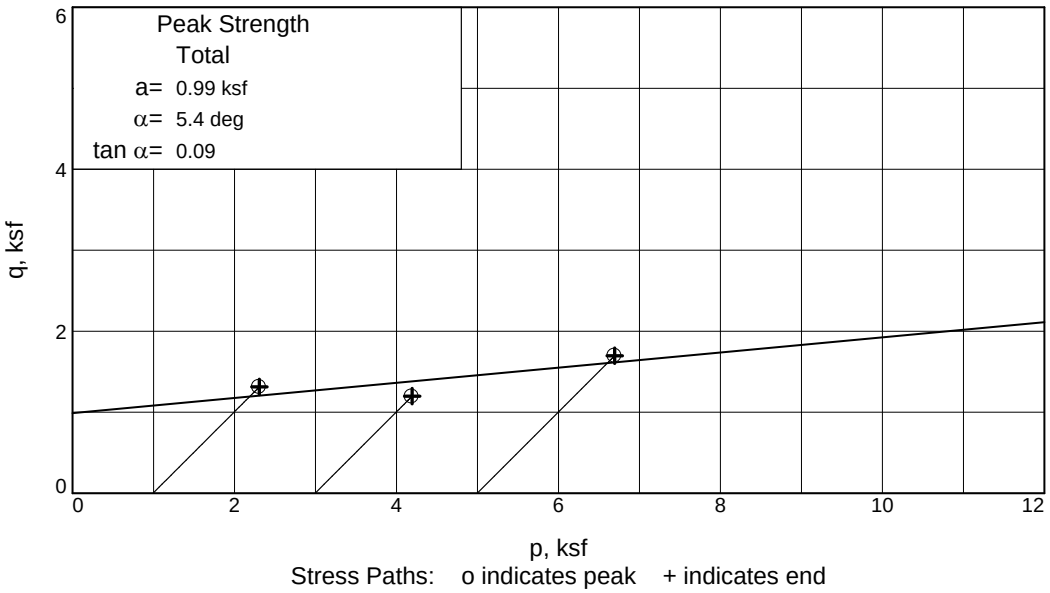
Tested By: Jimmy Hanson











Stress Paths: o indicates peak + indicates end

Client: CDM Smith 4600 Park Road, #240, Charlotte, NC 28209

Project: Dupont WTP

Location: B-502 **Depth:** 19.5'-21.5' **Sample Number:** ST-1

Project No.: 1281-18-061 **Figure** 2

S&ME, Inc.

Tested By: Jimmy Hanson

C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.

pH of Soil

Sample Log No.: 43-2830 *AASHTO T 289* ***Quality Assurance***

S&ME, Inc., 1413 Topside Road, Louisville, TN 37777

Project #:	**1281-18-061**	Report Date:	4/10/2019
Project Name:	Dupont WTP	Test Date(s):	4/9/2019
Client Name:	CDM Smith		
Client Address:	4600 Park Road #240, Charlotte, NC 28209		
Sample ID:	B-501	Sample No: S-4	
		Depth:	18.5 - 20.5 ft

Sample Description: Light yellowish brown clay

Equipment:

Balance		*S&ME ID#*	*18435*	*Cal. Date:*	*4/2/2019*	*Due:*	*4/2/2020*
Sieve:	*#10*	*S&ME ID#*	*2481*	*Cal. Date:*	*1/29/2019*	*Due:*	*7/29/2019*
pH Meter:		*S&ME ID#*	*16576*	*Cal. Date:*	*4/9/2019*		

pH Meter Calibration

Buffer Solution	*Results*
pH buffer 4.0	***4.01***
pH buffer 7.0	***7.00***
pH buffer 10.0	***10.10***
Buffer Temperature ^{0}C	***23.6°C***

Measuring pH of Soil

Beaker #: 6

Measurements	
Weight of Air Dry Soil (g)	***30.0***
Distilled Water (ml)	***30.0***
Temperature ^{0}C	***23.5°C***
pH Reading	***4.6***

Notes / Deviations / References: AASHTO T 289 Determining pH of Soil for Use in Corrosion Testing

Tori Igoe — *Technician Name*
4/9/2019 — *Date*

Michael D. Kelso, E.I. — *Technical Responsibility*
Signature
Staff Professional — *Position*
4/10/2019 — *Date*

pH of Soil

AASHTO T 289

Quality Assurance

S&ME, Inc., 1413 Topside Road, Louisville, TN 37777

Project #:	**1281-18-061**	Report Date:	4/10/2019
Project Name:	Dupont WTP	Test Date(s):	4/9/2019
Client Name:	CDM Smith		
Client Address:	4600 Park Road #240, Charlotte, NC 28209		
Sample ID:	B-504	Sample No: S-3	
		Depth:	4 - 6 ft
Sample Description:	Light yellowish brown clay		

Equipment:

Balance		*S&ME ID#*	*18435*	*Cal. Date:*	*4/2/2019*	*Due:*	*4/2/2020*
Sieve:	*#10*	*S&ME ID#*	*2481*	*Cal. Date:*	*1/29/2019*	*Due:*	*7/29/2019*
pH Meter:		*S&ME ID#*	*16576*	*Cal. Date:*	*4/9/2019*		

pH Meter Calibration

Buffer Solution	***Results***
pH buffer 4.0	***4.01***
pH buffer 7.0	***7.00***
pH buffer 10.0	***10.10***
Buffer Temperature ^{0}C	***23.6°C***

Measuring pH of Soil

Beaker #: 6

Measurements	
Weight of Air Dry Soil (g)	***30.0***
Distilled Water (ml)	***30.0***
Temperature ^{0}C	***23.5°C***
pH Reading	***4.8***

Notes / Deviations / References: AASHTO T 289 Determining pH of Soil for Use in Corrosion Testing

Tori Igoe — *Technician Name*

4/9/2019 — *Date*

Michael D. Kelso, E.I. — *Technical Responsibility*

Signature

Staff Professional — *Position*

4/10/2019 — *Date*

MICROBAC®

Microbac Laboratories, Inc., Maryville

CERTIFICATE OF ANALYSIS

1904972

S & ME, Inc.

Michael Kelso
1413 Topside Rd.
Louisville, TN 37777

Project Name: 1281-18-061

Project / PO Number: N/A
Received: 04/02/2019
Reported: 04/09/2019

Analytical Testing Parameters

Client Sample ID: B-501
Sample Matrix: Soil
Lab Sample ID: 1904972-01
Collected By: Client
Collection Date: 02/28/2019 12:00

Analyses Subcontracted to: TestAmerica Nashville

Anions, Ion Chromatography Soluble	Result	RL	Units	Note	Prepared	Analyzed	Analyst
Method: 9056							
Chloride	<10.1	10.1	mg/Kg	**H**		04/05/19 1759	SW1
Sulfate	**10.3**	10.1	mg/Kg	**H**		04/05/19 1759	SW1

Client Sample ID: B-504
Sample Matrix: Soil
Lab Sample ID: 1904972-02
Collected By: Client
Collection Date: 02/25/2019 12:00

Analyses Subcontracted to: TestAmerica Nashville

Anions, Ion Chromatography Soluble	Result	RL	Units	Note	Prepared	Analyzed	Analyst
Method: 9056							
Chloride	<9.85	9.85	mg/Kg	**H**		04/05/19 1815	SW1
Sulfate	**15.1**	9.85	mg/Kg	**H**		04/05/19 1815	SW1

Definitions

H: Sample was prepped or analyzed beyond the specified holding time
MDL: Minimum Detection Limit
RL: Reporting Limit

UNCONFINED COMPRESSION
(ASTM D7012 Method C)

S&ME, Inc. - Knoxville 1413 Topside Road, Louisville, TN 37777

Project Name: Dupont WTP
Project Number: 1281-18-061

Report Date: April 5, 2019
Reviewed By: Jason B. Burgess

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in^2)	Unit Weight (lbs/ft^3)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
B-501	RC	36.25 - 36.60	4.21	1.87	A	2.75	171.5	111	96,333	35,030	0.1
B-501	RC	47.00 - 47.40	4.16	1.87	A	2.75	174.9	108	94,426	34,337	0.1
B-502	RC	31.85 - 32.20	4.07	1.87	A	2.75	166.8	105	68,489	24,905	0.3
B-502	RC	38.80 - 39.15	4.19	1.87	A	2.75	170.1	102	78,679	28,611	0.1
B-503	RC	37.35 - 37.70	4.26	1.86	A	2.72	175.2	112	113,293	41,652	0.1

NOTES: Effective (as received) unit weight as determined by RTH 109-93.
Loading rates were selected to target reaching failure between 2 and 15 minutes.
Test results for specimens not meeting the requirements of ASTM D4543-08$^{\epsilon 1}$ may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-08$^{\epsilon 1}$ *Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance* Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For these and other rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."

A Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)

B Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness & parallelism, and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness. Specimen prepared to closest tolerances practicable.

C Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness & parallelism. Specimen did not meet the desired tolerances for side straightness and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.

D Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness. Specimen did not meet the desired tolerances for side straightness, parallelism and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.

E Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness and parallelism. Specimen prepared to closest tolerances practicable.

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

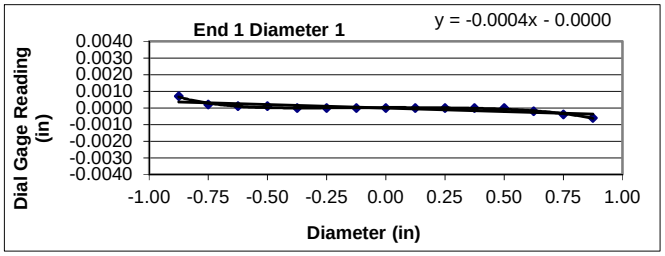
Project:	Dupont WTP	**Diameter (in):**	1.87	**Date:**	4/3/2019
Project No.:	1281-18-061	**Length (in):**	4.21	**Tested by:**	VLI
Boring Id:	B-501	**Unit Weight (pcf):**	171.5	**Reviewed by:**	BKP
Sample No.:	RC	**Moisture Content (%):**	0.1		
Depth (ft):	36.25 - 36.60				

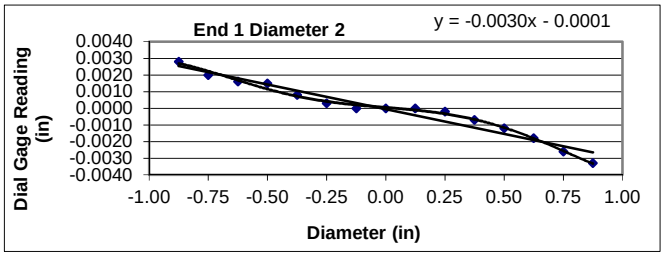
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

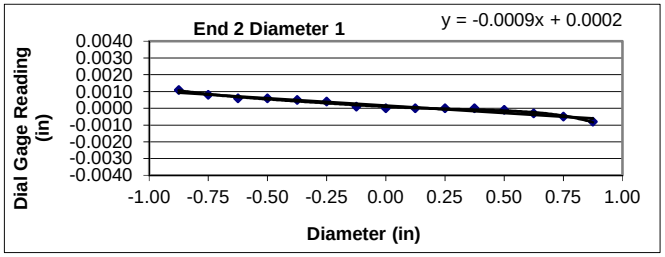
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0007	0.0028	0.0011	0.0011
- 6/8	0.0002	0.0020	0.0008	0.0006
- 5/8	0.0001	0.0016	0.0006	0.0004
- 4/8	0.0001	0.0015	0.0006	0.0002
- 3/8	0.0000	0.0008	0.0005	0.0000
- 2/8	0.0000	0.0003	0.0004	0.0000
- 1/8	0.0000	0.0000	0.0001	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	-0.0002	0.0000	0.0000
3/8	0.0000	-0.0007	0.0000	0.0000
4/8	0.0000	-0.0012	-0.0001	-0.0004
5/8	-0.0002	-0.0018	-0.0003	-0.0007
6/8	-0.0004	-0.0026	-0.0005	-0.0010
7/8	-0.0006	-0.0033	-0.0008	-0.0013

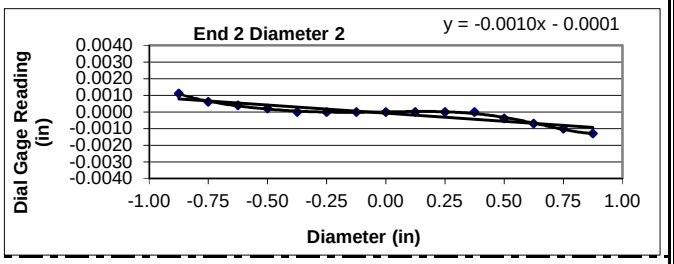




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00042
	Angle of Best Fit Line:	-0.02390
End 2:	Slope of Best Fit Line:	-0.00088
	Angle of Best Fit Line:	-0.05042
	Max Angular Difference:	**0.03**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00296
	Angle of Best Fit Line:	-0.16960
End 2:	Slope of Best Fit Line:	-0.00098
	Angle of Best Fit Line:	-0.05615
	Max Angular Difference:	**-0.11**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0013	0.0007	**YES**
End 1 Diam 2	0.0061	0.0033	**YES**
End 2 Diam 1	0.0019	0.0010	**YES**
End 2 Diam 2	0.0024	0.0013	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

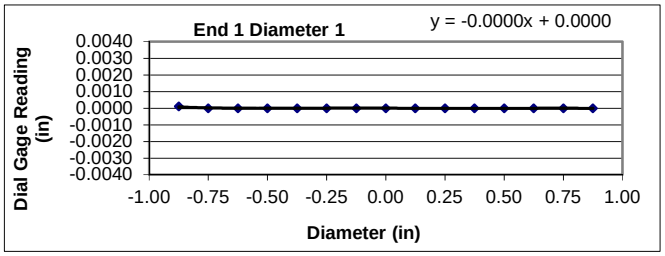
Project:	Dupont WTP	**Diameter (in):**	1.87	**Date:**	4/3/2019
Project No.:	1281-18-061	**Length (in):**	4.16	**Tested by:**	VLI
Boring Id:	B-501	**Unit Weight (pcf):**	174.9	**Reviewed by:**	BKP
Sample No.:	RC	**Moisture Content (%):**	0.1		
Depth (ft):	47.00 - 47.40				

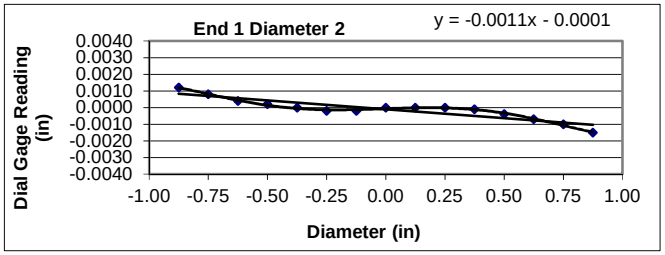
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

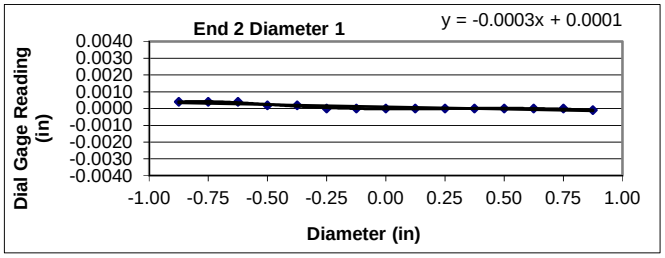
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0001	0.0012	0.0004	0.0025
- 6/8	0.0000	0.0008	0.0004	0.0021
- 5/8	0.0000	0.0004	0.0004	0.0015
- 4/8	0.0000	0.0002	0.0002	0.0012
- 3/8	0.0000	0.0000	0.0002	0.0007
- 2/8	0.0000	-0.0002	0.0000	0.0003
- 1/8	0.0000	-0.0002	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	0.0000	0.0000	-0.0002
3/8	0.0000	-0.0001	0.0000	-0.0005
4/8	0.0000	-0.0004	0.0000	-0.0009
5/8	0.0000	-0.0007	0.0000	-0.0017
6/8	0.0000	-0.0010	0.0000	-0.0022
7/8	0.0000	-0.0015	-0.0001	-0.0025

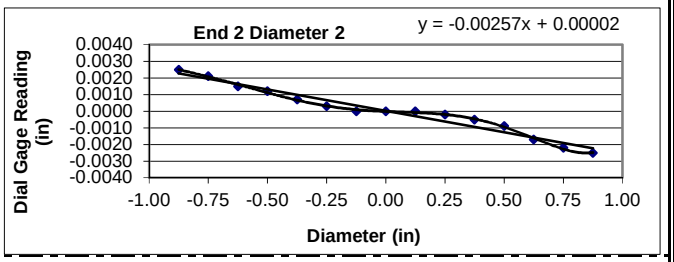




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00002
	Angle of Best Fit Line:	-0.00115
End 2:	Slope of Best Fit Line:	-0.00027
	Angle of Best Fit Line:	-0.01522
	Max Angular Difference:	**0.01**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00107
	Angle of Best Fit Line:	-0.06106
End 2:	Slope of Best Fit Line:	-0.00257
	Angle of Best Fit Line:	-0.14700
	Max Angular Difference:	**0.09**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0001	0.0001	**YES**
End 1 Diam 2	0.0027	0.0014	**YES**
End 2 Diam 1	0.0005	0.0003	**YES**
End 2 Diam 2	0.0050	0.0027	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

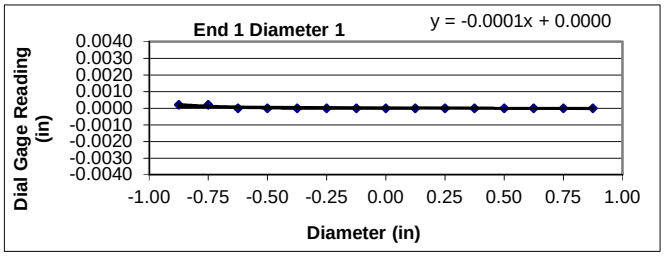
Project:	Dupont WTP	**Diameter (in):**	1.87	**Date:**	4/3/2019
Project No.:	1281-18-061	**Length (in):**	4.07	**Tested by:**	VLI
Boring Id:	B-502	**Unit Weight (pcf):**	166.8	**Reviewed by:**	BKP
Sample No.:	RC	**Moisture Content (%):**	0.3		
Depth (ft):	31.85 - 32.20				

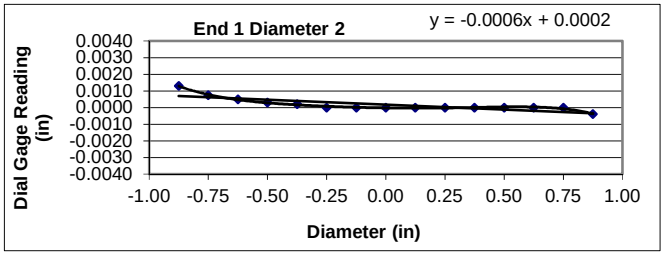
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

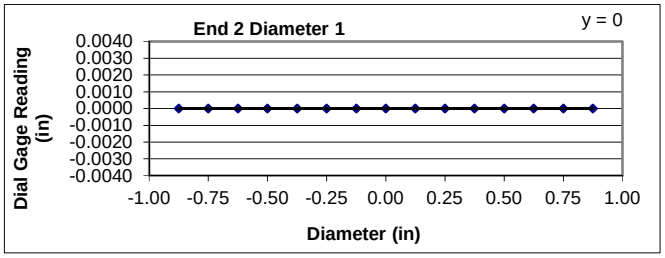
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0002	0.0013	0.0000	0.0018
- 6/8	0.0002	0.0007	0.0000	0.0014
- 5/8	0.0000	0.0005	0.0000	0.0013
- 4/8	0.0000	0.0003	0.0000	0.0010
- 3/8	0.0000	0.0002	0.0000	0.0007
- 2/8	0.0000	0.0000	0.0000	0.0001
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	0.0000	0.0000	-0.0003
3/8	0.0000	0.0000	0.0000	-0.0006
4/8	0.0000	0.0000	0.0000	-0.0012
5/8	0.0000	0.0000	0.0000	-0.0017
6/8	0.0000	0.0000	0.0000	-0.0019
7/8	0.0000	-0.0004	0.0000	-0.0022

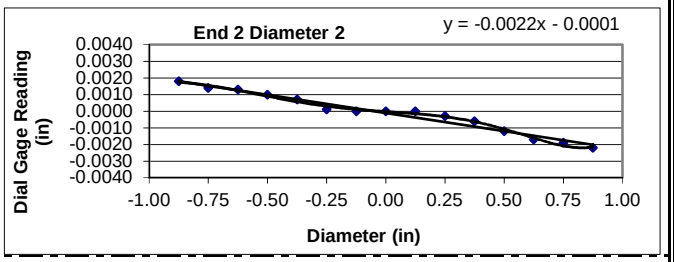




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00007
	Angle of Best Fit Line:	-0.00426
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	**0.00**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00059
	Angle of Best Fit Line:	-0.03379
End 2:	Slope of Best Fit Line:	-0.00218
	Angle of Best Fit Line:	-0.12490
	Max Angular Difference:	**0.09**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0002	0.0001	**YES**
End 1 Diam 2	0.0017	0.0009	**YES**
End 2 Diam 1	0.0000	0.0000	**YES**
End 2 Diam 2	0.0040	0.0021	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

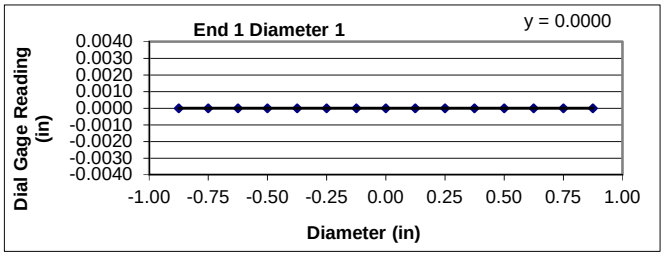
Project:	Dupont WTP	**Diameter (in):**	1.87	**Date:**	4/3/2019
Project No.:	1281-18-061	**Length (in):**	4.19	**Tested by:**	VLI
Boring Id:	B-502	**Unit Weight (pcf):**	170.1	**Reviewed by:**	BKP
Sample No.:	RC	**Moisture Content (%):**	0.1		
Depth (ft):	38.80 - 39.15				

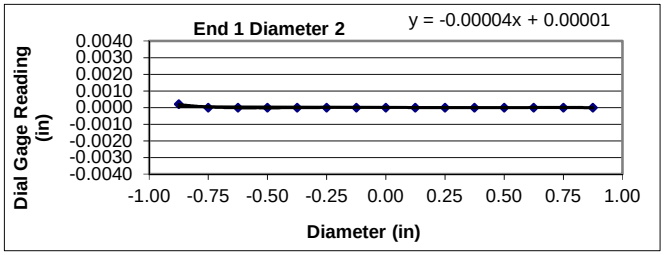
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

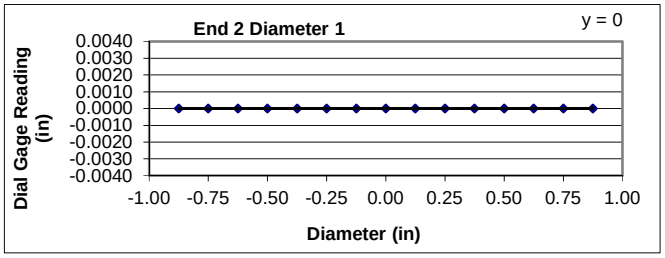
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0002	0.0000	0.0011
- 6/8	0.0000	0.0000	0.0000	0.0009
- 5/8	0.0000	0.0000	0.0000	0.0005
- 4/8	0.0000	0.0000	0.0000	0.0003
- 3/8	0.0000	0.0000	0.0000	0.0002
- 2/8	0.0000	0.0000	0.0000	0.0001
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	0.0000	0.0000	-0.0001
3/8	0.0000	0.0000	0.0000	-0.0001
4/8	0.0000	0.0000	0.0000	-0.0001
5/8	0.0000	0.0000	0.0000	-0.0001
6/8	0.0000	0.0000	0.0000	-0.0001
7/8	0.0000	0.0000	0.0000	-0.0003

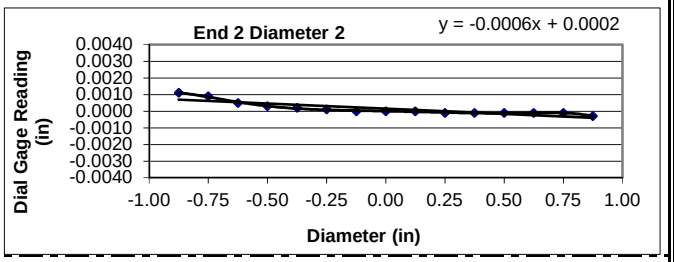




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	**0.00**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00004
	Angle of Best Fit Line:	-0.00229
End 2:	Slope of Best Fit Line:	-0.00062
	Angle of Best Fit Line:	-0.03552
	Max Angular Difference:	**0.03**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0000	0.0000	**YES**
End 1 Diam 2	0.0002	0.0001	**YES**
End 2 Diam 1	0.0000	0.0000	**YES**
End 2 Diam 2	0.0014	0.0007	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

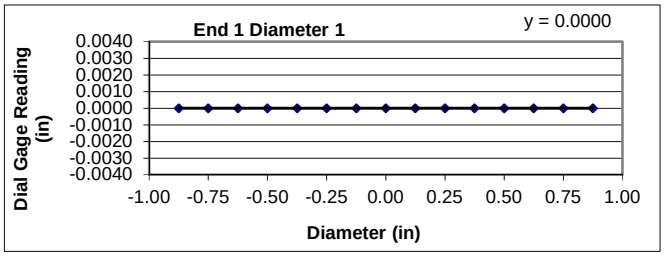
Project:	Dupont WTP	**Diameter (in):**	1.86	**Date:**	4/3/2019
Project No.:	1281-18-062	**Length (in):**	4.26	**Tested by:**	VLI
Boring Id:	B-503	**Unit Weight (pcf):**	175.2	**Reviewed by:**	BKP
Sample No.:	RC	**Moisture Content (%):**	0.1		
Depth (ft):	37.35 - 37.40				

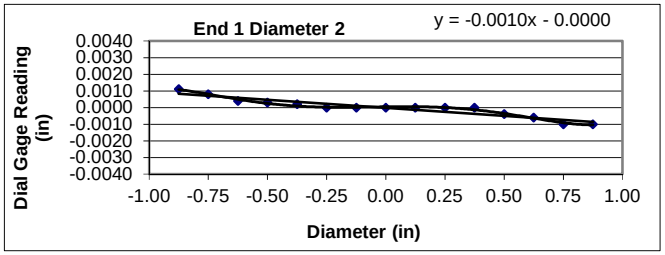
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

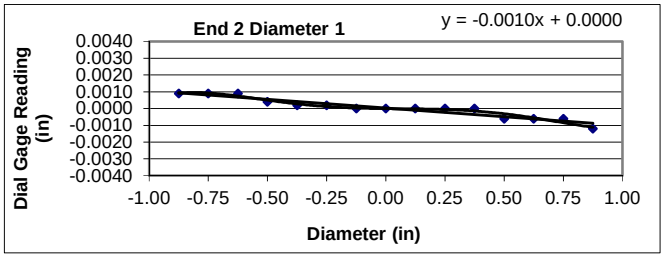
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0011	0.0009	0.0033
- 6/8	0.0000	0.0008	0.0009	0.0026
- 5/8	0.0000	0.0004	0.0009	0.0025
- 4/8	0.0000	0.0003	0.0004	0.0018
- 3/8	0.0000	0.0002	0.0002	0.0009
- 2/8	0.0000	0.0000	0.0002	0.0002
- 1/8	0.0000	0.0000	0.0000	0.0001
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	0.0000	0.0000	-0.0002
3/8	0.0000	0.0000	0.0000	-0.0011
4/8	0.0000	-0.0004	-0.0006	-0.0015
5/8	0.0000	-0.0006	-0.0006	-0.0025
6/8	0.0000	-0.0010	-0.0006	-0.0033
7/8	0.0000	-0.0010	-0.0012	-0.0040

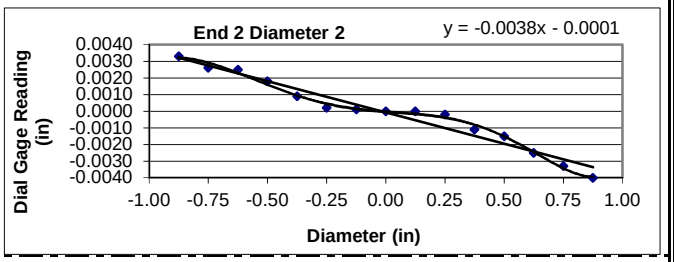




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	-0.00103
	Angle of Best Fit Line:	-0.05926
	Max Angular Difference:	**0.06**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00097
	Angle of Best Fit Line:	-0.05550
End 2:	Slope of Best Fit Line:	-0.00376
	Angle of Best Fit Line:	-0.21543
	Max Angular Difference:	**0.16**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0000	0.0000	**YES**
End 1 Diam 2	0.0021	0.0011	**YES**
End 2 Diam 1	0.0021	0.0011	**YES**
End 2 Diam 2	0.0073	0.0039	**YES**

Perpendicularity Tolerance Met? **YES**

Date: 4/4/2019

Photographer: Ben Painter

1	**Location / Orientation**	B-501 (36.25' – 36.60')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method C)

Date: 4/4/2019

Photographer: Ben Painter

2	**Location / Orientation**	B-501 (47.00' – 47.40')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method C)

Date: 4/4/2019

Photographer: Ben Painter

3	**Location / Orientation**	B-502 (31.85' – 32.20')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method C)

Date: 4/4/2019

Photographer: Ben Painter

4	**Location / Orientation**	B-502 (38.80' – 39.15')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method C)

Date: 4/4/2019

Photographer: Ben Painter

5	**Location / Orientation**	B-503 (37.35' – 37.70')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method C)

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