STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0160	1	57

REFERENCE: BR-0160

PROJECT: 67160

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY BRUNSWICK

PROJECT DESCRIPTION REPLACE BRIDGE ON NC 179B OVER CALABASH RIVER BETWEEN SR 1810 AND NC 179

SITE DESCRIPTION BRIDGE 15 AT -L- STATION 21+77.5

CONTENTS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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PERSONNEL

P. GRAINGER

C. BENHOFF

P. MCCAIN

T. PARL

INVESTIGATED BY *P. GRAINGER*

DRAWN BY *P. GRAINGER*

CHECKED BY *K. BUSSEY*

SUBMITTED BY *HDR*

DATE *03/02/2022*

NORTH CAROLINA PROFESSIONAL SEAL 039763 ENGINEER MICHAEL G. BATTEN

DocuSigned by:

F85D9455EC5740A...

3/21/2023

SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
BR-0160	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [X] CME-55
- [X] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] DIEDRICH D-50
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [X] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [X] TRICONE 2 15/16" TUNG.-CARB.
- [X] CORE BIT
- [X] MUD ROTARY

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #1

ELEVATION: 11.88 FEET

NOTES:

BORING COORDINATES OBTAINED FROM TRIMBLE R12 GNSS RECEIVER CERTIFIED WITH FCC PART 15 (CLASS B DEVICE), 24, 32; RCM; PTCRB; BT SIG

FIAD - FILLED IMMEDIATELY AFTER DRILLING

MTL - MEAN TIDE LEVEL

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
BR-0160	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

STRUCTURE

- INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities
- BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets
- VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets
- BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity
- DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces
- LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

DECREASING INTERLOCKING OF ROCK PIECES ⇩

SURFACE CONDITIONS

DECREASING SURFACE QUALITY ⇨

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very rough, fresh unweathered surfaces	Rough, slightly weathered, iron stained surfaces	Smooth, moderately weathered and altered surfaces	Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	Slickensided, highly weathered surfaces with soft clay coatings or fillings
90	80	70	60	50	40	30	20	10
				N/A	N/A
N/A	N/A							

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE

A. *Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.*

B. *Sandstone with thin interlayers of siltstone*

C. *Sandstone and siltstone in similar amounts*

D. *Siltstone or silty shale with sandstone layers*

E. *Weak siltstone or clayey shale with sandstone layers*

C, D, E, and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H.**

F. *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*

G. *Undisturbed silty or clayey shale with or without a few very thin sandstone layers* → **H.** *Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.*

→ Means deformation after tectonic disturbance

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings
70	60	50	40	30	20	10
A	B	C	D	E	F	G	H

DATE: 8-19-16

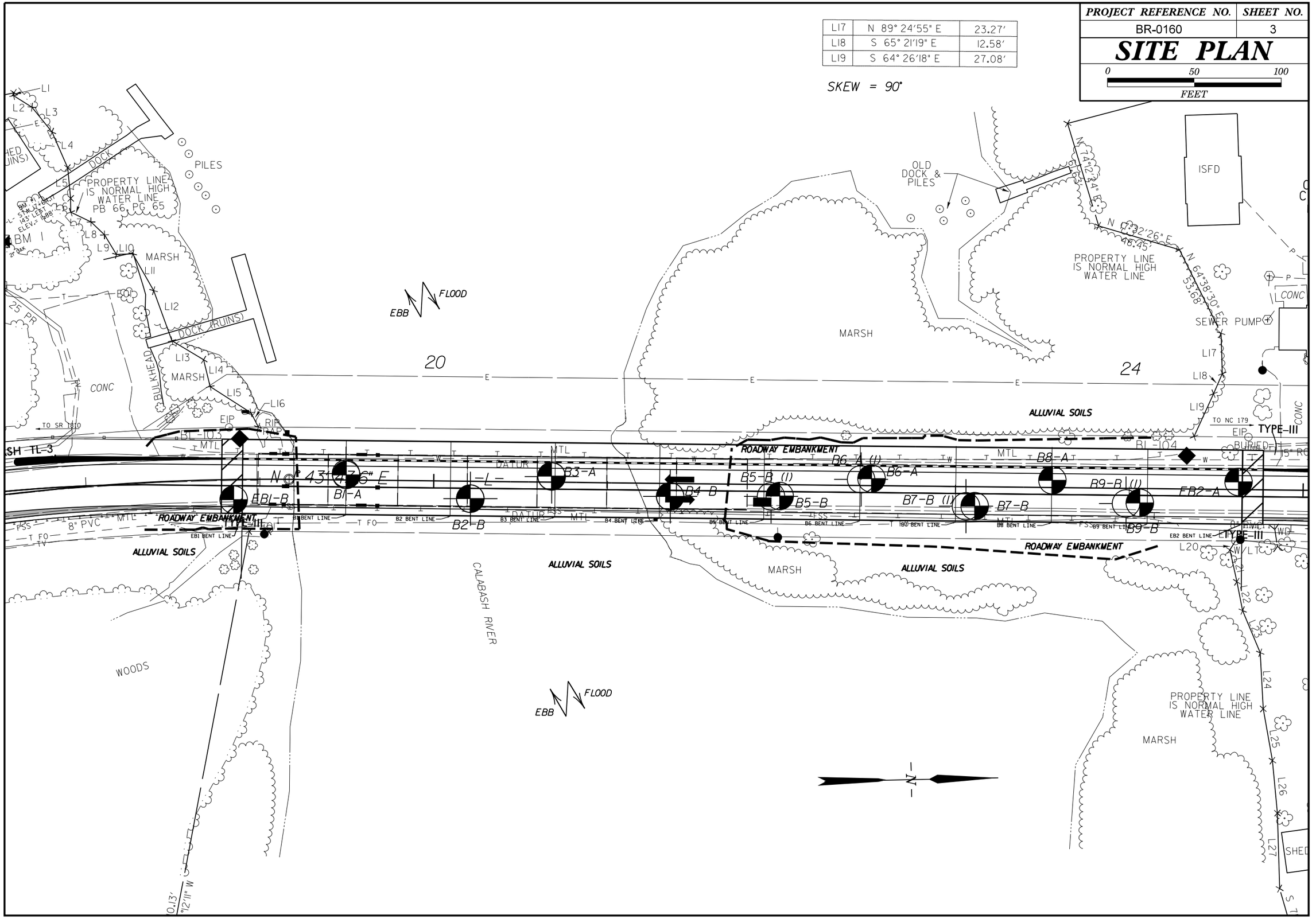
PROJECT REFERENCE NO.	SHEET NO.
BR-0160	3

SITE PLAN

0 50 100
FEET

L17	N 89° 24'55" E	23.27'
L18	S 65° 21'19" E	12.58'
L19	S 64° 26'18" E	27.08'

SKEW = 90°



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	% BY WEIGHT F.SAND	% BY WEIGHT SILT	% BY WEIGHT CLAY	% PASSING (SIEVES) 10	% PASSING (SIEVES) 40	% PASSING (SIEVES) 200	% MOISTURE	% ORGANIC
SS-22	7' LT	19+50	6.0' - 7.5'	A-2-6	31	18	5.8	74.5	3.3	16.4	100	99.6	21.0	36	-
SS-143	8' LT	22+52	13.5' - 15.0'	A-3	0	0	23.6	69.3	1.3	5.8	100	90.13	7.7	-	-
S-2	8' LT	23+56	0.5' - 4.8'	A-2-4	21	5	6.0	67.4	5.5	21.1	100	99.5	28.3	17	-
SS-189	8' LT	23+56	6.0' - 7.5'	A-6	40	23	4.5	46.8	16.8	31.9	96.7	94.0	55.3	28	-
SS-239	8' LT	24+63	13.1' - 14.6'	A-2-6	40	20	54.4	14.8	7.6	23.2	100	65.3	32.2	-	-
ST-1	8' LT	24+58	19.6' - 21.6'	A-6	35	17	1.7	50.8	14.8	32.7	100	99.1	56.7	27	-

0 100 200
FEET
VE = 5

PROJECT REFERENCE NO.	SHEET NO.
BR-0160	4

BR-0160 LT PROFILE ALONG -L-

(A) **ROADWAY EMBANKMENT** Loose to medium dense, brown and tan, silty and clayey SAND (A-2-4, A-2-6), little clay, moist to wet

(B) **ROADWAY EMBANKMENT** Medium stiff, blue-gray, sandy CLAY (A-6), moist

(C) **ALLUVIAL** Very loose to loose, black, brown, and tan, silty and clayey SAND (A-2-4, A-2-6), shell hash, trace clay, moist to wet

(D) **ALLUVIAL** Soft, black, CLAY (A-6), shell hash, wet

(E) **COASTAL PLAIN** Very loose to medium dense, dark brown, black, and gray, silty and clayey SAND (A-2-4, A-3, A-2-6), shell hash, fibrous roots, little silt and clay, wet (WACCAMAW FORMATION)

(F) **COASTAL PLAIN** Very soft, blue-gray, sandy CLAY (A-6), moist to wet (WACCAMAW FORMATION)

(G) **COASTAL PLAIN** Very soft to hard, brown, black, green, blue-gray, and dark gray, sandy and silty CLAY (A-6, A-7-6), carbonate-rich, trace sand, trace limestone fragments, moist to wet (PEEDEE FORMATION)

(H) **COASTAL PLAIN SEDIMENTARY ROCK** Medium Hard, Gray, White And Black, LIMESTONE

EXISTING GROUND

FEMA 100YR ELEV. = 12.0'

B1-A 7' LT SS-22

MTL ELEV. = -0.36'

B3-A 7' LT

B6-A 8' LT SS-143

0.6' PAVEMENT

B8-A 8' LT S-2 SS-189

0.5' PAVEMENT

EB2-A 8' LT SS-239 ST-1

0.7' PAVEMENT

ST-1

BT

BT FIAD

BT FIAD

BT FIAD

NOTE: INFERRED STRATIGRAPHY IS DRAWN AT THE PROFILE OFFSET WITH THE BORINGS PROJECTED ONTO THE PROFILE

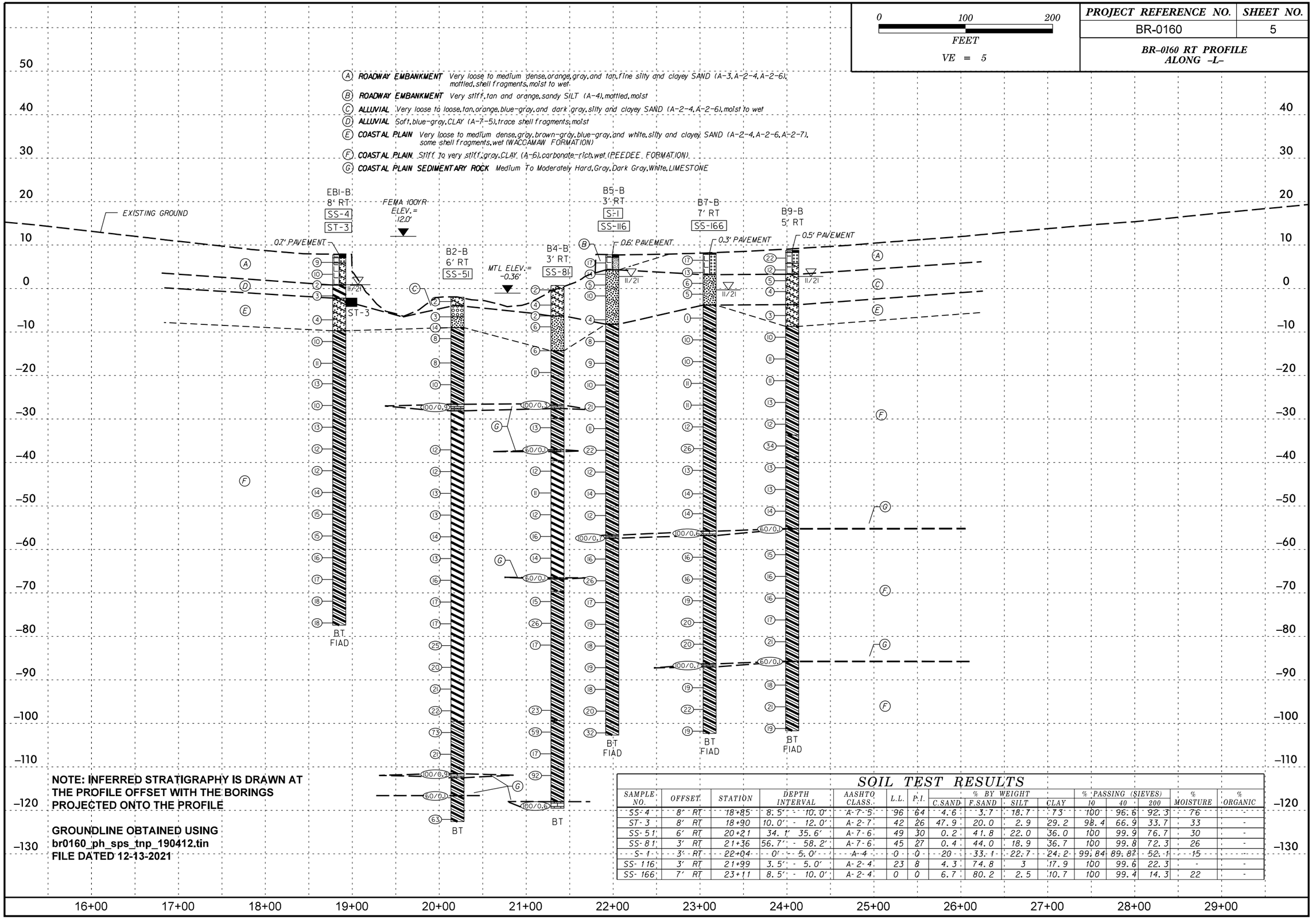
GROUNDLINE OBTAINED USING br0160_ph_sps_tnp_190412.tin FILE DATED 12-13-2021

16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00 29+00

PROJECT REFERENCE NO.	SHEET NO.
BR-0160	5

BR-0160 RT PROFILE ALONG -L-

0 100 200
FEET
VE = 5



NOTE: INFERRED STRATIGRAPHY IS DRAWN AT THE PROFILE OFFSET WITH THE BORINGS PROJECTED ONTO THE PROFILE

GROUNDLINE OBTAINED USING br0160_ph_sps_tnp_190412.tin FILE DATED 12-13-2021

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	% BY WEIGHT F.SAND	% BY WEIGHT SILT	% BY WEIGHT CLAY	% PASSING (SIEVES) #10	% PASSING (SIEVES) #40	% PASSING (SIEVES) #200	% MOISTURE	% ORGANIC
SS-4	8' RT	18+85	8.5' - 10.0'	A-7-5	96	64	4.6	3.7	18.7	73	100	96.6	92.3	76	-
ST-3	8' RT	18+90	10.0' - 12.0'	A-2-7	42	26	47.9	20.0	2.9	29.2	98.4	66.9	33.7	33	-
SS-51	6' RT	20+21	34.1' 35.6'	A-7-6	49	30	0.2	41.8	22.0	36.0	100	99.9	76.7	30	-
SS-81	3' RT	21+36	56.7' - 58.2'	A-7-6	45	27	0.4	44.0	18.9	36.7	100	99.8	72.3	26	-
S-1	3' RT	22+04	0' - 5.0'	A-4	0	0	20	33.1	22.7	24.2	99.84	89.87	52.1	15	-
SS-116	3' RT	21+99	3.5' - 5.0'	A-2-4	23	8	4.3	74.8	3	17.9	100	99.6	22.3	-	-
SS-166	7' RT	23+11	8.5' - 10.0'	A-2-4	0	0	6.7	80.2	2.5	10.7	100	99.4	14.3	22	-

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 18+85	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** 6.9
COLLAR ELEV. 7.8 ft	**TOTAL DEPTH** 85.2 ft	**NORTHING** 50,959	**EASTING** 2,136,769	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT0071 DIEDRICH D-50 95% 01/22/2021		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 11/12/21	**COMP. DATE** 11/15/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
10										
										7.8 GROUND SURFACE 0.0
	7.0	0.8	6	5	4	9				7.1 **ROADWAY EMBANKMENT** 0.7 5.9 0.7' PAVEMENT 1.9
5	4.3	3.5	2	4	6	10		M		**ROADWAY EMBANKMENT** Loose, tan, fine SAND (A-3)
	1.8	6.0	1	1	1	2		M		**ROADWAY EMBANKMENT**
0	-0.7	8.5						M		Very loose to loose, tan clayey SAND (A-2-6) with shell fragments 0.8 7.0
			1	1	2	3	SS-4	76%		**ALLUVIAL** -2.2 Soft, blue, gray, CLAY (A-7-5), with trace shell fragments 10.0
-5	-6.2	14.0						33%		**COASTAL PLAIN**
			1	1	3	4		W		Very loose, white, clayey SAND (A-2-7), with some shell fragments (WACCAMAW FORMATION)
-10	-11.2	19.0								-9.7 17.5
			3	5	5	10		W		Stiff to very stiff, gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-15	-16.2	24.0								
			3	4	7	11		W		
-20	-20.9	28.7								
			3	6	7	13		W		
-25	-25.9	33.7								
			4	4	6	10		W		
-30	-30.9	38.7								
			4	6	7	13		W		
-35	-35.9	43.7								
			4	5	7	12		W		
-40	-40.9	48.7								
			5	5	7	12		W		
-45	-45.9	53.7								
			5	6	8	14		W		
-50	-50.9	58.7								
			5	7	8	15		W		
-55	-55.9	63.7								
			5	7	8	15		W		
-60	-60.9	68.7								
			5	7	9	16		W		
-65	-65.9	73.7								
			5	7	10	17		W		
-70										

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 18+85	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** 6.9
COLLAR ELEV. 7.8 ft	**TOTAL DEPTH** 85.2 ft	**NORTHING** 50,959	**EASTING** 2,136,769	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT0071 DIEDRICH D-50 95% 01/22/2021		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 11/12/21	**COMP. DATE** 11/15/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70						Match Line				
	-70.9	78.7	5	9	9	18		W		Stiff to very stiff, gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION) *(continued)*
-75	-75.9	83.7	6	8	10	18		W		-77.4 85.2
										Boring Terminated at Elevation -77.4 ft in Clay (Peedee Formation)
										NOTES ST-3 was classified as loose, white, clayey SAND (A-2-7)(3) in offset hole Sta. 18+90, 8' RT
										Other Samples: ST-3 (10.0 - 12.0)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 19+50	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. -5.4 ft	**TOTAL DEPTH** 119.0 ft	**NORTHING** 51,024	**EASTING** 2,136,756	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT4425 CME-55 87% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic	
DRILLER Edmondson, J. M.	**START DATE** 11/16/21	**COMP. DATE** 11/17/21	**SURFACE WATER DEPTH** 5.4ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
5										
0										WATER SURFACE (11/16/21)
-5	-5.4	0.0								-5.4 / 0.0 GROUND SURFACE
			0	1	3	4		W		**ALLUVIAL** Very loose to loose, black clayey SAND (A-2-6) with shell hash, trace clay
-10	-8.9	3.5	2	1	2	3		W		-9.9 / 4.5
	-11.4	6.0	3	5	7	12	SS-22	36% W		**COASTAL PLAIN** Medium dense, gray,clayey SAND (A-2-6) with fibrous roots (WACCAMAW FORMATION)
-15	-15.9	10.5								-14.4 / 9.0 Stiff to very stiff, gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
			3	4	6	10		W		
-20	-20.9	15.5	3	5	5	10		W		
	-25.9	20.5	4	4	6	10		W		
-30	-30.9	25.5	3	6	6	12		W		
	-35.9	30.5	3	6	7	13		W		
-40	-40.9	35.5	4	5	7	12		W		
	-45.9	40.5	4	6	9	15		W		
-50	-50.9	45.5	60/0.0			60/0.0		W		-50.9 / 45.5 **COASTAL PLAIN SEDIMENTARY ROCK** No recovery
-55										-51.9 / 46.5 **COASTAL PLAIN** Very stiff, gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-60	-60.9	55.5	5	7	8	15		W		-57.9 / 52.5
-65	-65.9	60.5	4	7	9	16		W		
-70	-70.9	65.5	5	7	9	16		W		
-75										

Match Line

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-75										
	-75.9	70.5	6	8	9	17		W		-79.4 / 74.0 Very stiff to hard, gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-80	-80.9	75.5	6	29	22	51		W		
-85	-85.9	80.5	6	9	11	20		W		
-90	-90.9	85.5	27	15	23	38		W		
-95	-95.9	90.5	6	9	11	20		W		
-100	-100.9	95.5	7	10	14	24		W		
-105	-105.9	100.5	7	9	12	21		W		-110.9 / 105.5 -111.1 / 105.7 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE **COASTAL PLAIN** Very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION) -116.4 / 111.0 -117.0 / 111.6 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE **COASTAL PLAIN** Very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-110	-110.9	105.5	100/0.3			100/0.3		W		
-115	-115.9	110.5	9	31	69/0.1	100/0.6		W		
-120	-122.9	117.5	6	11	14	25		W		-124.4 / 119.0 Boring Terminated at Elevation -124.4 ft in Clay (Peedee Formation)

Bridge deck: Asphalt 0.4', Concrete 1.9'.

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 19+50	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. -5.4 ft	**TOTAL DEPTH** 119.0 ft	**NORTHING** 51,024	**EASTING** 2,136,756	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT4425 CME-55 87% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core		**HAMMER TYPE** Automatic
DRILLER Edmondson, J. M.	**START DATE** 11/16/21	**COMP. DATE** 11/17/21	**SURFACE WATER DEPTH** 5.4ft	
CORE SIZE NQ	**TOTAL RUN** 7.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) / DEPTH (ft)
-50.9											Begin Coring @ 45.5 ft
	-50.9	45.5	2.0	01:40/1.0	(0.4)	(0.0)		(0.4)	(0.0)		-50.9 / 45.5 **COASTAL PLAIN SEDIMENTARY ROCK**
	-52.9	47.5		N=60/0.0	20%	0%		40%	0%		-51.9 / 46.5 Dark gray, LIMESTONE, opaque, medium hard, indurated (PEEDEE FORMATION)
				01:40/1.0							**COASTAL PLAIN**
-55			5.0	0:18/1.0	(5.0)	(0.0)		(5.0)	(0.0)		Dark gray, CLAY (A-6), carbonate-rich, little recovery (PEEDEE FORMATION)
				0:16/1.0	100%	0%		83%	0%		
				0:14/1.0							
	-57.9	52.5		0:25/1.0							-57.9 / 52.5
				0:18/1.0							
-60				0:24/1.0							
				N=15							
-65											
				N=16							
-70											
				N=16							
-75											
				N=17							
-80											-79.4 / 74.0
				N=51							
-85											
				N=20							
-90											
				N=38							
-95											
				N=20							
-100											
				N=24							
-105											
				N=21							
-110											-110.9 / 105.5 **COASTAL PLAIN SEDIMENTARY ROCK**
				N=100/0.3							-111.1 / 105.7 **COASTAL PLAIN**
-115											-116.4 / 111.0 **COASTAL PLAIN SEDIMENTARY ROCK**
				N=100/0.6							-117.0 / 111.6 **COASTAL PLAIN**
-120											
				N=25							-124.4 / 119.0
											Boring Terminated at Elevation -124.4 ft in Clay (Peedee Formation)
											Bridge deck: Asphalt 0.4', Concrete 1.9'.

NCDOT CORE DOUBLE_CALABASH BR-0160 BRIDGE REPLACEMENT_NC179B.GPJ NC_DOT.GDT 2/21/22

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 20+21	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. -1.7 ft	**TOTAL DEPTH** 120.6 ft	**NORTHING** 51,095	**EASTING** 2,136,771	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT4425 CME-55 87% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic	
DRILLER Edmondson, J. M.	**START DATE** 11/17/21	**COMP. DATE** 11/18/21	**SURFACE WATER DEPTH** 0.2ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
0										
	-1.7	0.0	2	1	1	2		W		-1.7 0.0 WATER SURFACE (11/17/21)
-5	-5.2	3.5	2	1	2	3		W		-3.7 2.0 **ALLUVIAL** Very loose, gray, white, clayey SAND (A-2-6) with shell hash
	-7.7	6.0	2	11	3	14		W		-6.2 4.5 **COASTAL PLAIN** Very loose, gray, white shell fragments (A-1-b) (WACCAMAW FORMATION)
-10	-10.2	8.5	2	4	4	8		W		-8.7 7.0 Medium dense, gray, clayey SAND (A-2-6)
-15	-15.8	14.1	3	3	5	8		W		Medium stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-20	-20.8	19.1	3	3	7	10		W		
-25	-25.8	24.1	3	4	96/0.4	100/0.9		W		-26.8 25.1 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE (PEEDEE FORMATION) -27.2 25.5 -27.8 26.1 **COASTAL PLAIN**
-30										
-35	-35.8	34.1	4	5	7	12	SS-51	30% W		-32.2 30.5 Stiff to very stiff, gray, CLAY (A-7-6)(23), carbonate-rich (PEEDEE FORMATION)
-40	-40.8	39.1	4	5	7	12		W		
-45	-45.8	44.1	4	5	8	13		W		
-50	-50.8	49.1	4	6	7	13		W		
-55	-55.8	54.1	4	6	8	14		W		
-60	-60.8	59.1	4	5	8	13		W		
-65	-65.8	64.1	5	5	11	16		W		
-70	-70.8	69.1	5	7	10	17		W		
-75	-75.8	74.1	5	8	9	17		W		
-80										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-80						Match Line				
	-80.8	79.1	8	12	13	25		W		
-85	-85.8	84.1	6	8	12	20		W		
-90	-90.8	89.1	6	9	12	21		W		
-95	-95.8	94.1	7	8	14	22		W		
-100	-100.8	99.1	6	9	64	73		W		-99.2 97.5 Very stiff to hard, gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-105	-105.8	104.1	8	10	11	21 1		W		
-110	-110.8	109.1	66	30	70/0.4	100/0.9				-111.3 109.6 -112.2 110.5 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE **COASTAL PLAIN** (PEEDEE FORMATION)
-115	-115.8	114.1	45	60/0.1		60/0.1				-116.3 114.6 -116.4 114.7 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE **COASTAL PLAIN** Hard, gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-120	-120.8	119.1	29	31	32	63		W		-122.3 120.6 Boring Terminated at Elevation -122.3 ft in Clay (Peedee Formation)

Bridge deck: Asphalt 0.5', Concrete 1.5'.

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 20+21	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. -1.7 ft	**TOTAL DEPTH** 120.6 ft	**NORTHING** 51,095	**EASTING** 2,136,771	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT4425 CME-55 87% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic	
DRILLER Edmondson, J. M.	**START DATE** 11/17/21	**COMP. DATE** 11/18/21	**SURFACE WATER DEPTH** 0.2ft	
CORE SIZE NQ	**TOTAL RUN** 5.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-27.2											Begin Coring @ 25.5 ft
	-27.2	25.5	5.0	02:55	(3.0)	(0.6)		(0.6)	(0.6)		-27.2 Gray, LIMESTONE, fresh, moderately indurated, medium hard, thinly bedded (PEEDEE FORMATION). Top of rock encountered at 24.6'. 25.5
-30				0:21	60%	12%		100%	100%		-27.8 26.1
	-32.2	30.5		0:21				(2.4)	(0.0)		**COASTAL PLAIN**
				0:32				55%	0%		-32.2 Gray, CLAY (A-7-6), carbonate-rich (PEEDEE FORMATION) 30.5
-35				0:25							
				N=12			SS-51				
-40				N=12							
-45				N=13							
-50				N=13							
-55				N=14							
-60				N=13							
-65				N=16							
-70				N=17							
-75				N=17							
-80				N=25							
-85				N=20							
-90				N=21							
-95				N=22							
-100				N=73							-99.2 97.5
-105				N=21							

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 20+21	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. -1.7 ft	**TOTAL DEPTH** 120.6 ft	**NORTHING** 51,095	**EASTING** 2,136,771	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT4425 CME-55 87% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic	
DRILLER Edmondson, J. M.	**START DATE** 11/17/21	**COMP. DATE** 11/18/21	**SURFACE WATER DEPTH** 0.2ft	
CORE SIZE NQ	**TOTAL RUN** 5.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-107.2											Begin Coring @ 105.5 ft
-110				N=100/0.9							-111.3 109.6 -112.2 **COASTAL PLAIN SEDIMENTARY ROCK** 110.5 **COASTAL PLAIN**
-115				N=60/0.1							-116.3 114.6 -116.4 **COASTAL PLAIN SEDIMENTARY ROCK** 114.7 **COASTAL PLAIN**
-120				N=63							-122.3 120.6 Boring Terminated at Elevation -122.3 ft in Clay (Peedee Formation)
											Bridge deck: Asphalt 0.5', Concrete 1.5'.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 20+68	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. -2.3 ft	**TOTAL DEPTH** 120.0 ft	**NORTHING** 51,142	**EASTING** 2,136,759	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 10/26/21	**COMP. DATE** 11/02/21	**SURFACE WATER DEPTH** 8.0ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
5										WATER SURFACE (10/26/21)
0	-2.3	0.0	4	1	1	2				-2.3 0.0 GROUND SURFACE **ALLUVIAL** Soft, black CLAY, (A-6) with shell hash
-5										-6.8 4.5
-10	-8.3	6.0	1	0	1	1				**COASTAL PLAIN** -9.3 7.0 Very loose, dark brown, silty SAND (A-2-4) with shell hash (WACCAMAW FORMATION) Loose, dark brown, clayey SAND (A-2-6)
	-10.8	8.5	WOH	1	5	6				
-15	-15.9	13.6	2	3	5	8				-14.3 12.0 Medium stiff to very stiff, dark brown, sandy CLAY (A-6)
-20	-20.9	18.6	7	8	10	18				
-25	-25.9	23.6	3	9	60/0.1	60/0.1				-26.9 24.6 -27.0 24.7 **COASTAL PLAIN SEDIMENTARY ROCK** Dark gray, LIMESTONE (PEEDEE FORMATION) -29.7 27.4 -30.8 28.5 **COASTAL PLAIN** Dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-30										**COASTAL PLAIN SEDIMENTARY ROCK** Dark gray, LIMESTONE **COASTAL PLAIN** Dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-35										
-40										-39.7 37.4 -41.2 38.9 **COASTAL PLAIN SEDIMENTARY ROCK** Dark gray, LIMESTONE **COASTAL PLAIN** (PEEDEE FORMATION)
-45										
-50	-50.9	48.6	5	6	7	13				-50.0 47.7 Stiff, dark gray, CLAY (A-6), carbonate-rich
-55	-55.9	53.6	5	6	8	14				
-60	-60.9	58.6	5	5	8	13				
-65	-65.9	63.6	5	7	60/0.1	60/0.1				-66.9 64.6 -67.3 65.0 **COASTAL PLAIN SEDIMENTARY ROCK** Dark gray, white LIMESTONE **COASTAL PLAIN** (PEEDEE FORMATION)
-70										-72.3 70.0 Very stiff to hard, dark gray, CLAY (A-6), carbonate-rich
-75										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-75						Match Line				
	-75.8	73.5	5	7	8	15				Very stiff to hard, dark gray, CLAY (A-6), carbonate-rich *(continued)*
-80	-80.8	78.5	7	8	10	18				
-85	-85.8	83.5	6	7	10	17				
-90	-90.8	88.5	6	7	9	16				
-95	-95.8	93.5	6	8	9	17				
-100	-100.8	98.5	7	8	13	21				
-105	-105.8	103.5	7	7	10	17				
-110	-110.8	108.5	60/0.4			60/0.4				-110.8 108.5 -111.2 108.9 **COASTAL PLAIN SEDIMENTARY ROCK** Dark gray, LIMESTONE **COASTAL PLAIN** Hard, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-115	-115.8	113.5	25	75/0.2		100/0.7				-115.8 113.5 -116.5 114.2 **COASTAL PLAIN SEDIMENTARY ROCK** Dark gray, LIMESTONE Hard, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-120	-120.8	118.5	26	18	15	33				-122.3 120.0 Boring Terminated at Elevation -122.3 ft in Clay (Peedee Formation) Bridge deck: Asphalt 0.5', Concrete 1.8'.

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)			**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 20+68	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. -2.3 ft	**TOTAL DEPTH** 120.0 ft	**NORTHING** 51,142	**EASTING** 2,136,759	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 10/26/21	**COMP. DATE** 11/02/21	**SURFACE WATER DEPTH** 8.0ft
CORE SIZE NQ	**TOTAL RUN** 28.4 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-27											Begin Coring @ 24.7 ft
	-27.0	24.7	3.0	00:30	(1.2)	(0.3)		(0.9)	(0.0)		-27.0 **COASTAL PLAIN** 24.7
				00:32	40%	10%		33%	0%		Dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-30	-30.0	27.7		01:35							-29.7 27.4
			5.0	01:55	(2.9)	(1.6)		(1.1)	(1.1)		-30.8 **COASTAL PLAIN SEDIMENTARY ROCK** 28.5
				00:15	58%	32%		100%	100%		Dark gray, LIMESTONE, friable to moderately indurated, thinly bedded
				00:20				(7.2)	(0.0)		**COASTAL PLAIN**
				00:23				81%	0%		Dark gray, CLAY (A-7-6), carbonate-rich (PEEDEE FORMATION)
-35	-35.0	32.7		00:23							
			5.0	00:34	(5.2)	(0.3)					
				00:23	104%	6%					
				00:24							
				00:25							
-40	-40.0	37.7		00:55							-39.7 37.4
			5.0	01:19	(3.5)	(0.4)		(1.1)	(0.8)		-41.2 **COASTAL PLAIN SEDIMENTARY ROCK** 38.9
				01:19	70%	8%		73%	53%		Dark gray, LIMESTONE
				00:12				(7.6)	(0.0)		**COASTAL PLAIN**
				00:14				86%	0%		Dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-45	-45.0	42.7		00:20							
			5.0	00:15	(4.6)	(0.0)					
				00:15	92%	0%					
				00:15							
				00:30							
-50	-50.0	47.7		00:30							-50.0 47.7
				N=13							
-55				*N=14*							
-60				*N=13*							
-65											
	-66.9	64.6		*N=60/0.1*							-66.9 64.6
	-67.3	65.0	0.4	01:15	(0.4)	(0.4)		(0.4)	(0.4)		-67.3 **COASTAL PLAIN SEDIMENTARY ROCK** 65.0
			5.0	03:15	100%	100%		100%	100%		Dark gray, white, LIMESTONE, medium hard, indurated, fresh
				02:03							**COASTAL PLAIN**
-70				00:29	(3.8)	(0.0)		(3.8)	(0.0)		Dark gray, CLAY (A-6), carbonate-rich
	-72.3	70.0		00:20	76%	0%		76%	0%		
				00:30							-72.3 70.0
-75				*N=15*							
-80				*N=18*							
-85				*N=17*							
-90				*N=16*							
-95				*N=17*							
-100				*N=21*							
-105				*N=17*							

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)			**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 20+68	**OFFSET** 7 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. -2.3 ft	**TOTAL DEPTH** 120.0 ft	**NORTHING** 51,142	**EASTING** 2,136,759	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 10/26/21	**COMP. DATE** 11/02/21	**SURFACE WATER DEPTH** 8.0ft
CORE SIZE NQ	**TOTAL RUN** 28.4 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-107											Begin Coring @ 104.7 ft
-110											-110.8 108.5
				N=60/0.4							-111.2 **COASTAL PLAIN SEDIMENTARY ROCK** 108.9
											COASTAL PLAIN
-115				*N=100/0.7*							-115.8 113.5
											-116.5 **COASTAL PLAIN SEDIMENTARY ROCK** 114.2
											COASTAL PLAIN
-120				*N=33*							-122.3 120.0
											Boring Terminated at Elevation -122.3 ft in Clay (Peedee Formation)
											Bridge deck: Asphalt 0.5', Concrete 1.8'.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** M. English	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B4-B	**STATION** 21+36	**OFFSET** 3 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 0.7 ft	**TOTAL DEPTH** 119.3 ft	**NORTHING** 51,210	**EASTING** 2,136,772	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 11/18/21	**COMP. DATE** 11/22/21	**SURFACE WATER DEPTH** 1.2ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
5										
										WATER SURFACE (11/18/21)
0	0.7	0.0								0.7 0.0 GROUND SURFACE
			1	1	1	2		W		**ALLUVIAL** Very loose to loose, dark gray, clayey SAND (A-2-6)
	-2.8	3.5								
-5			2	2	2	4		W		
	-5.3	6.0								
			1	1	1	2		W		
	-7.8	8.5								-7.3 8.0
-10			2	2	4	6		W		**COASTAL PLAIN** Loose, brown, gray, silty SAND (A-2-4) (WACCAMAW FORMATION)
	-13.3	14.0								
-15			3	3	3	6		W		-14.3 15.0 Medium stiff to stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
	-18.3	19.0								
-20			2	5	6	11		W		
	-26.0	26.7	3	100/0.3		100/0.3				
-25										-26.8 27.5
										-27.6 28.3 COASTAL PLAIN SEDIMENTARY ROCK Gray, LIMESTONE (PEEDEE FORMATION)
-30	-31.0	31.7	3	6	7	13		W		-29.8 30.5 **COASTAL PLAIN** Stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
	-36.0	36.7	4	20	60/0.1	60/0.1				
-35										-37.1 37.8
										-37.5 38.2 COASTAL PLAIN SEDIMENTARY ROCK Gray, LIMESTONE (PEEDEE FORMATION)
-40	-41.0	41.7	4	5	7	12		W		-39.6 40.3 **COASTAL PLAIN** Stiff to very stiff, dark gray, CLAY (A-7-6)(18), carbonate-rich (PEEDEE FORMATION)
	-46.0	46.7	4	5	6	11		W		
-45										
	-51.0	51.7	4	6	6	12		W		
-50										
	-56.0	56.7	5	5	11	16	SS-81	26% W		
-55										
	-61.0	61.7	4	6	8	14		W		
-60										
	-66.0	66.7	24	60/0.1		60/0.1				-66.5 67.2
-65										-66.8 67.5 COASTAL PLAIN SEDIMENTARY ROCK Gray, white, LIMESTONE (PEEDEE FORMATION)
	-71.0	71.7	5	7	8	15		W		-69.6 70.3 **COASTAL PLAIN** Stiff to very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-70										
-75										

NCDOT BORE DOUBLE CALABASH BR-0160 BRIDGE REPLACEMENT_NC179B.GPJ NC_DOT.GDT 2/28/22

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** M. English	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B4-B	**STATION** 21+36	**OFFSET** 3 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 0.7 ft	**TOTAL DEPTH** 119.3 ft	**NORTHING** 51,210	**EASTING** 2,136,772	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 11/18/21	**COMP. DATE** 11/22/21	**SURFACE WATER DEPTH** 1.2ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-75						Match Line				
	-76.0	76.7	14	14	12	26		W		Stiff to very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION) *(continued)*
-80										
	-81.0	81.7	5	7	10	17		W		
-85										
-90										
-95	-96.0	96.7	6	10	13	23		W		
										-99.3 100.0 Very stiff to hard, dark gray, CLAY (A-6), carbonate-rich
-100										
	-101.0	101.7	6	27	32	59		W		
-105										
	-106.0	106.7	7	8	9	17		W		
-110										
	-111.0	111.7	7	63	29	92		W		
-115										
	-118.0	118.7	10	90/0.1		100/0.6				-118.0 118.7 -118.6 119.3 COASTAL PLAIN SEDIMENTARY ROCK Gray, LIMESTONE (PEEDEE FORMATION) Boring Terminated at Elevation -118.6 ft in Limestone (Peedee Formation)

Bridge deck: Asphalt 0.5', Concrete 1.5'.

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** M. English	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B4-B	**STATION** 21+36	**OFFSET** 3 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 0.7 ft	**TOTAL DEPTH** 119.3 ft	**NORTHING** 51,210	**EASTING** 2,136,772	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 11/18/21	**COMP. DATE** 11/22/21	**SURFACE WATER DEPTH** 1.2ft	
CORE SIZE NQ	**TOTAL RUN** 8.5 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-26.8											Begin Coring @ 27.5 ft
	-26.8	27.5	3.0	03:21 0:28 0:26	(2.9) 97%	(0.8) 27%		(0.8) 100% (2.1) 95%	(0.8) 100% (0.0) 0%		ELEV. (ft) DEPTH (ft) -26.8 27.5 -27.6 28.3 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE, fresh, moderately indurated, medium hard, thinly bedded (PEEDEE FORMATION) -29.8 30.5 **COASTAL PLAIN** Dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-30	-29.8	30.5		N=13							
-35											
	-37.1	37.8		N=60/0.1							-37.1 37.8 -37.5 38.2
			2.5	3:42 0:37 0:27/0.5	(1.9) 76%	(0.5) 20%		(0.4) 100% (1.5) 71%	(0.4) 100% (0.0) 0%		**COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE, fresh, moderately indurated, medium hard, thinly bedded (PEEDEE FORMATION) -39.6 40.3 **COASTAL PLAIN** Dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-40	-39.6	40.3									
				N=12							
-45											
				N=11							
-50											
				N=12							
-55											
				N=16			SS-81				
-60											
				N=14							
-65											
	-66.6	67.3		N=60/0.1							-66.5 67.2 -66.8 67.5
			3.0	5:27 0:49 0:42	(3.0) 100%	(0.3) 10%		(0.3) 100% (2.7) 96%	(0.3) 100% (0.0) 0%		**COASTAL PLAIN SEDIMENTARY ROCK** Gray, white, LIMESTONE, thinly bedded, moderately indurated, fresh, medium hard, (PEEDEE FORMATION) -69.6 70.3 **COASTAL PLAIN** Dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-70	-69.6	70.3									
				N=15							
-75											
				N=26							
-80											
				N=17							
-85											
-90											
-95											
				N=23							
-100											-99.3 100.0
				N=59							
-105											

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** M. English	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B4-B	**STATION** 21+36	**OFFSET** 3 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 0.7 ft	**TOTAL DEPTH** 119.3 ft	**NORTHING** 51,210	**EASTING** 2,136,772	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary w/ Core	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 11/18/21	**COMP. DATE** 11/22/21	**SURFACE WATER DEPTH** 1.2ft	
CORE SIZE NQ	**TOTAL RUN** 8.5 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-106.8											Begin Coring @ 107.5 ft
				N=17							
-110											
				N=92							
-115											
				N=100/0.6							-118.0 118.7 -118.6 119.3 **COASTAL PLAIN SEDIMENTARY ROCK** Boring Terminated at Elevation -118.6 ft in Limestone (Peedee Formation) Bridge deck: Asphalt 0.5', Concrete 1.5'.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B5-B	**STATION** 21+99	**OFFSET** 3 ft RT	**ALIGNMENT** -L-	**0 HR.** 5.0
COLLAR ELEV. 7.8 ft	**TOTAL DEPTH** 110.5 ft	**NORTHING** 51,273	**EASTING** 2,136,773	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT0071 DIEDRICH D-50 95% 01/22/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 11/09/21	**COMP. DATE** 11/10/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
10										
										7.8 0.0 GROUND SURFACE
	6.9	0.9	7	9	8	17		M		7.2 0.6 **ROADWAY EMBANKMENT** 0.6' PAVEMENT
5	4.3	3.5	9	8	6	14	S-1	15%		**ROADWAY EMBANKMENT**
	1.8	6.0	3	2	3	5	SS-116	M		4.3 3.5 Very stiff, tan, orange, sandy SILT (A-4)(0), mottled
0	-0.7	8.5	5	5	5	10		W		**ALLUVIAL**
								W		Loose, tan, orange, and dark gray, silty SAND (A-2-4)(0)
-5	-6.2	14.0	3	2	2	4		W		
										-8.2 16.0 **COASTAL PLAIN**
-10	-11.2	19.0	2	3	5	8		W		Medium stiff to very stiff, dark gray, sandy CLAY (A-6), with trace shell fragments (PEEDEE FORMATION)
-15										
	-16.2	24.0	3	4	5	9		W		
-20	-21.2	29.0	3	4	6	10		W		
-25	-26.2	34.0	18	10	11	21		W		
-30	-31.2	39.0	4	4	7	11		W		
-35	-36.2	44.0	51	9	13	22		W		
-40	-41.2	49.0	4	5	7	12		W		
-45	-46.2	54.0	5	6	8	14		W		
-50	-51.2	59.0	5	5	7	12		W		
-55	-56.2	64.0	5	16	84/0.2	100/0.7				-56.7 64.5 -57.4 65.2 **COASTAL PLAIN SEDIMENTARY ROCK** Dark gray, LIMESTONE (PEEDEE FORMATION)
-60	-61.2	69.0	6	6	10	16		W		**COASTAL PLAIN** Very stiff to hard, dark gray, sandy CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-65	-66.2	74.0	15	11	15	26		W		
-70										-23.7 31.5 Stiff to very stiff, dark gray, sandy CLAY (A-6), carbonate-rich

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B5-B	**STATION** 21+99	**OFFSET** 3 ft RT	**ALIGNMENT** -L-	**0 HR.** 5.0
COLLAR ELEV. 7.8 ft	**TOTAL DEPTH** 110.5 ft	**NORTHING** 51,273	**EASTING** 2,136,773	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT0071 DIEDRICH D-50 95% 01/22/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 11/09/21	**COMP. DATE** 11/10/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70						Match Line				
	-71.2	79.0	5	7	10	17		W		**COASTAL PLAIN** Very stiff to hard, dark gray, sandy CLAY (A-6), carbonate-rich (PEEDEE FORMATION) *(continued)*
-75	-76.2	84.0	5	7	12	19		W		
-80	-81.2	89.0	6	8	10	18		W		
-85	-86.2	94.0	6	9	10	19		W		
-90	-91.2	99.0	6	8	10	18		W		
-95	-96.2	104.0	7	9	11	20		W		
-100	-101.2	109.0	34	16	16	32		W		-102.7 110.5 Boring Terminated at Elevation -102.7 ft in Clay (Peedee Formation) Hard drilling 56.3-58.0' Hard drilling 71.6-72.0' Note: S-1 collected at Sta 22+04 and 3' RT from 0-5 feet but shown on this boring

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B5-B (1)	**STATION** 21+94	**OFFSET** 3 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 7.8 ft	**TOTAL DEPTH** 67.2 ft	**NORTHING** 51,268	**EASTING** 2,136,773	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Core Boring		**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 11/23/21	**COMP. DATE** 11/23/21	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 10.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-20.94											Begin Coring @ 28.7 ft
	-20.9	28.7	1.5	0:08/0.5	(0.0) 0%	(0.0) 0%		(0.0) 0%	(0.0) 0%		**COASTAL PLAIN**
	-22.4	30.2	5.0	0:21							-22.4 No recovery 30.2
				0:39	(3.4) 68%	(0.5) 10%		(1.3) 100%	(0.0) 0%		-23.7 Dark gray, clayey SAND (A-2-6) (WACCAMAW FORMATION) 31.5
-25				0:21							-25.7 Dark gray, carbonate-rich, Silty CLAY (A-7-6) (PEEDEE FORMATION) 33.5
				0:18							**COASTAL PLAIN SEDIMENTARY ROCK**
	-27.4	35.2		2:14				(2.0) 100%	(0.0) 0%		-27.4 Dark gray, LIMESTONE (0.5'), fresh, medium indurated, medium hard, thinly bedded 35.2
				2:03							
-30								(0.5) 29%	(0.5) 29%		
-35											
-40											
-45											
-50											
-55											
	-55.9	63.7	3.5	0:30	(2.2) 63%	(1.1) 31%		(1.1) 100%	(0.0) 0%		-55.9 63.7
				4:40							-57.0 **COASTAL PLAIN** 64.8
				1:31							Dark gray, carbonate-rich, CLAY (A-6) (PEEDEE FORMATION)
	-59.4	67.2		0:26/0.5				(1.1) 79%	(1.1) 79%		-58.4 66.2
								(0.0) 0%	(0.0) 0%		-59.4 **COASTAL PLAIN SEDIMENTARY ROCK** 67.2
											Dark gray, LIMESTONE (1.1'), fresh, medium indurated, medium hard, thinly bedded
											COASTAL PLAIN
											Dark gray, carbonate-rich, CLAY (A-6) (PEEDEE FORMATION)
											Boring Terminated at Elevation -59.4 ft in Clay (Peedee Formation)

Offset core boring 5' south of SPT boring B-5B
Additional 2.8' recovery at top of Run 3 discarded due to trip in operation.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** C. Benhoff	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B6-A	**STATION** 22+52	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 7.7 ft	**TOTAL DEPTH** 110.0 ft	**NORTHING** 51,326	**EASTING** 2,136,764	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 10/20/21	**COMP. DATE** 10/21/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) — DEPTH (ft)
10										
	7.1	0.6	6	8	7	15		M		7.7 — 0.0 GROUND SURFACE 7.1 — 0.6 **ROADWAY EMBANKMENT** 0.6' PAVEMENT
5	4.2	3.5	9	7	6	13		M		**ROADWAY EMBANKMENT** Medium dense, brown and tan, silty SAND (A-2-4), with little clay
	1.7	6.0	4	5	8	13		W		
0	-0.8	8.5	2	2	2	4		W		-0.3 — 8.0 **ALLUVIAL** Loose, brown and tan, silty SAND (A-2-4)
-5	-5.8	13.5	1	1	2	3	SS-143	W		-5.3 — 13.0 **COASTAL PLAIN** Very loose, brown and black, fine to coarse SAND (A-3)(1), with little silt, clay, shell fragments (WACCAMAW FORMATION)
-10	-10.8	18.5	2	3	4	7		W		-10.3 — 18.0 Medium stiff to stiff, brown, black, and green, silty CLAY (A-7-6), carbonate-rich (PEEDEE FORMATION)
-15	-15.8	23.5	3	3	3	6		W		
-20	-20.8	28.5	3	3	5	8		W		
-25	-25.8	33.5	3	4	5	9		W		-27.3 — 35.0 -28.3 — 36.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray and black, LIMESTONE **COASTAL PLAIN** Brown and black, silty CLAY (A-7-6), carbonate-rich (PEEDEE FORMATION)
-30	-30.8	38.5	3	5	4	9		W		
-35	-35.8	43.5	100/0.1			100/0.1				-35.8 — 43.5 -36.3 — 44.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, white, and black, LIMESTONE **COASTAL PLAIN** Stiff, brown and black, silty CLAY (A-7-6), carbonate-rich, with trace sand (PEEDEE FORMATION)
-40	-40.8	48.5	4	4	5	9		W		
-45	-45.8	53.5	4	5	5	10		W		
-50	-50.8	58.5	5	10	11	21		W		-52.3 — 60.0 -52.5 — 60.2 **COASTAL PLAIN SEDIMENTARY ROCK** Brown and black, LIMESTONE **COASTAL PLAIN**
-55	-55.8	63.5	15	85/0.2		100/0.7				-55.8 — 63.5 Silty CLAY (A-7-6), carbonate-rich -57.3 — 65.0 **COASTAL PLAIN SEDIMENTARY ROCK** Brown and black, LIMESTONE **COASTAL PLAIN** Stiff to hard, brown and black, silty CLAY (A-7-6), carbonate-rich, with trace limestone fragments (PEEDEE FORMATION)
-60	-60.8	68.5	4	6	7	13		W		
-65	-65.8	73.5	5	5	6	11		W		
-70										

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** C. Benhoff	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B6-A	**STATION** 22+52	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 7.7 ft	**TOTAL DEPTH** 110.0 ft	**NORTHING** 51,326	**EASTING** 2,136,764	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 10/20/21	**COMP. DATE** 10/21/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70						Match Line				
	-70.8	78.5	5	6	8	14		W		**COASTAL PLAIN** Stiff to hard, brown and black, silty CLAY (A-7-6), carbonate-rich, with trace limestone fragments (PEEDEE FORMATION) *(continued)*
-75	-75.8	83.5	5	7	43	50		W		
-80	-80.8	88.5	5	8	9	17		W		
-85	-85.8	93.5	6	7	9	16		W		
-90	-90.8	98.5	7	7	8	15		W		
-95	-95.8	103.5	11	10	12	22		W		
-100	-100.8	108.5	21	16	20	36		W		-102.3 — 110.0 Boring Terminated at Elevation -102.3 ft in Silty Clay (Peedee Formation) 95.2 - 96.0': Hard drilling, possible Limestone lens

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** C. Benhoff	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B6-A (1)	**STATION** 22+46	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 7.7 ft	**TOTAL DEPTH** 46.1 ft	**NORTHING** 51,320	**EASTING** 2,136,764	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Core Boring		**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 10/21/21	**COMP. DATE** 11/03/21	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 10.4 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-27.26											Begin Coring @ 35.0 ft
	-27.3	35.0	2.4	0:49	(1.0)	(1.0)		(1.0)	(1.0)		**COASTAL PLAIN SEDIMENTARY ROCK**
-30	-29.7	37.4		0:56	42%	42%		42%	42%		Gray and black, clayey, LIMESTONE, fresh, medium indurated, thinly bedded (PEEDEE FORMATION) -29.7 / 37.4
			4.0	0:23/0.4	(0.0)	(0.0)		(0.0)	(0.0)		**COASTAL PLAIN**
				0:46	0%	0%		0%	0%		Dark gray, CLAY (A-7-6), carbonate-rich (PEEDEE FORMATION)
				0:36							
	-33.7	41.4		0:32							
	-34.4	42.1		1:17							-34.4 / 42.1
-35			4.0	0:11	(4.0)	(0.6)		(3.4)	(0.0)		Interpreted as dark gray, CLAY (A-7-6), carbonate-rich
				0:41	100%	15%		100%	0%		
				0:53							-37.8 / 45.5
	-38.4	46.1		0:18							-38.4 / 46.1 **COASTAL PLAIN SEDIMENTARY ROCK**
								(0.6)	(0.6)		Gray, white and black, LIMESTONE, fresh, medium hard
								100%	100%		Boring Terminated at Elevation -38.4 ft in Clay (Peedee Formation)

Offset core boring 5' north of SPT boring B-6A
Run 3 start depth at 42.1' instead of bottom of previous run (41.4') See soil description interpretation.
Additional 0.3' recovery at top of Run 3 discarded due to trip in operation.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B7-B	**STATION** 23+11	**OFFSET** 7 ft RT	**ALIGNMENT** -L-	**0 HR.** 8.5
COLLAR ELEV. 8.2 ft	**TOTAL DEPTH** 110.5 ft	**NORTHING** 51,385	**EASTING** 2,136,781	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT0071 DIEDRICH D-50 95% 01/22/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 11/10/21	**COMP. DATE** 11/11/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
10										
	7.5	0.7	7	8	9	17		M		8.2 GROUND SURFACE 0.0 7.9 **ROADWAY EMBANKMENT** 0.3 0.3' PAVEMENT **ROADWAY EMBANKMENT** Medium dense, orange, tan, and gray, fine SAND (A-3), mottled
5	4.7	3.5	7	6	7	13		W		3.2 5.0 **ALLUVIAL** Loose, gray and tan, silty SAND (A-2-4)
	2.2	6.0	WOH	1	5	6		W		
0	-0.3	8.5	1	2	3	5	SS-166	22%		
-5	-5.8	14.0	1	0	1	1		W		-3.8 12.0 **COASTAL PLAIN** Very soft to stiff, dark gray, sandy CLAY (A-6), with little shell hash (PEEDEE FORMATION)
-10	-10.8	19.0	2	4	6	10		W		-9.3 17.5 Stiff to very stiff, dark gray, CLAY (A-6), carbonate-rich
-15	-15.8	24.0	2	4	6	10		W		
-20	-20.8	29.0	3	5	6	11		W		
-25	-25.8	34.0	3	5	6	11		W		
-30	-30.8	39.0	4	5	7	12		W		
-35	-35.8	44.0	35	13	13	26		W		
-40	-40.8	49.0	3	7	6	13		W		
-45	-45.8	54.0	4	5	9	14		W		
-50	-50.8	59.0	5	6	8	14		W		
-55	-55.8	64.0	70	30/0.1		100/0.6		W		-55.8 64.0 -56.8 65.0 **COASTAL PLAIN SEDIMENTARY ROCK** Dark gray, Limestone lenses **COASTAL PLAIN** Very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-60	-60.8	69.0	5	7	9	16		W		
-65	-65.8	74.0	5	8	8	16		W		
-70										

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B7-B	**STATION** 23+11	**OFFSET** 7 ft RT	**ALIGNMENT** -L-	**0 HR.** 8.5
COLLAR ELEV. 8.2 ft	**TOTAL DEPTH** 110.5 ft	**NORTHING** 51,385	**EASTING** 2,136,781	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT0071 DIEDRICH D-50 95% 01/22/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER P. McCain	**START DATE** 11/10/21	**COMP. DATE** 11/11/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70						Match Line				
	-70.8	79.0	6	8	11	19		W		**COASTAL PLAIN** Very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION) *(continued)*
-75	-75.8	84.0	7	10	10	20		W		
-80	-80.8	89.0	6	10	10	20		W		
-85	-85.8	94.0	7	10	90/0.2	100/0.7		W		-86.3 94.5 -87.0 95.2 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE **COASTAL PLAIN** Very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-90	-90.8	99.0	6	8	11	19		W		
-95	-95.8	104.0	6	10	12	22		W		
-100	-100.8	109.0	7	8	11	19		W		-102.3 110.5 Boring Terminated at Elevation -102.3 ft in Clay (Peedee Formation) 73.0 - 74.0': Hard drilling, possible limestone lens

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B7-B (1)	**STATION** 23+06	**OFFSET** 7 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 8.0 ft	**TOTAL DEPTH** 46.3 ft	**NORTHING** 51,380	**EASTING** 2,136,781	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Core Boring		**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 11/11/21	**COMP. DATE** 11/12/21	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 5.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-33.3											Begin Coring @ 41.3 ft
-35	-33.3	41.3	5.0	0:21/0.5 0:58 1:33 0:46 1:02	(3.9) 78%	(0.0) 0%		(2.5) 100%	(0.0) 0%		**COASTAL PLAIN** Dark gray, CLAY (A-7-6), carbonate- rich (PEEDEE FORMATION) ELEV. (ft) -35.8 — DEPTH (ft) 43.8
								(0.2) 100%	(0.0) 0%		ELEV. (ft) -36.0 — DEPTH (ft) 44.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, white, LIMESTONE, fresh, medium indurated, medium hard, thinly bedded ELEV. (ft) -36.8 — DEPTH (ft) 44.8
	-38.3	46.3						(0.8) 100%	(0.0) 0%		ELEV. (ft) -36.9 — DEPTH (ft) 44.9 **COASTAL PLAIN** Dark gray, CLAY (A-7-6), carbonate- rich (PEEDEE FORMATION) ELEV. (ft) -38.3 — DEPTH (ft) 46.3
								(0.1) 100%	(0.0) 0%		**COASTAL PLAIN SEDIMENTARY ROCK** Gray, white, LIMESTONE, fresh, medium indurated, medium hard, thinly bedded
								(0.3) 21%	(0.0) 0%		**COASTAL PLAIN** Dark gray, CLAY (A-7-6), carbonate- rich (PEEDEE FORMATION). Last 0.5' of core run had very fast drilling rate, mostly washed out Boring Terminated at Elevation -38.3 ft in Clay (Peedee Formation) Offset core boring 5' north of SPT boring B-7B

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)			**GROUND WTR (ft)**
BORING NO. B8-A	**STATION** 23+56	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** 6.0
COLLAR ELEV. 8.5 ft	**TOTAL DEPTH** 110.5 ft	**NORTHING** 51,430	**EASTING** 2,136,767	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 95% 01/22/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 11/04/21	**COMP. DATE** 11/04/21	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
10										
	7.7	0.8								8.5 / 0.0 GROUND SURFACE
			5	11	10	21				8.0 / 0.5 **ROADWAY EMBANKMENT** 0.5' PAVEMENT
5	5.0	3.5								**ROADWAY EMBANKMENT** Medium dense, tan, silty SAND (A-2-4)
			5	5	3	8	S-2	M 17%		3.7 / 4.8
	2.5	6.0								3.0 / 5.5 **ROADWAY EMBANKMENT** Medium stiff, blue-gray, sandy CLAY (A-6)
			1	1	0	1	SS-189	28%		**COASTAL PLAIN** Very soft, blue-gray sandy CLAY(A-6)(9) (WACCAMAW FORMATION)
0	0.0	8.5								
			WOH	1	0	1		M		
-5	-5.5	14.0								
			1	1	1	2		W		
-10	-10.5	19.0								-8.5 / 17.0 Stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
			3	5	4	9		W		
-15	-15.5	24.0								
			3	4	5	9		W		
-20	-20.5	29.0								
			3	4	5	9		W		
-25	-25.5	34.0								
			3	5	6	11		W		
-30	-30.5	39.0								
			3	6	6	12		W		
-35	-35.5	44.0								
			4	5	7	12		W		
-40	-40.5	49.0								
			5	5	8	13		W		
-45	-45.5	54.0								
			4	5	95/0.4	100/0.9				-46.0 / 54.5 -46.9 / 55.4 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE **COASTAL PLAIN** Stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-50	-50.5	59.0								
			5	6	8	14		W		
-55	-55.5	64.0								
			6	94/0.0		100/0.5				-56.0 / 64.5 -56.5 / 65.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE **COASTAL PLAIN** Very stiff to hard, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-60	-60.5	69.0								
			4	7	9	16		W		
-65	-65.5	74.0								
			6	7	8	15		W		
-70										

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)			**GROUND WTR (ft)**
BORING NO. B8-A	**STATION** 23+56	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** 6.0
COLLAR ELEV. 8.5 ft	**TOTAL DEPTH** 110.5 ft	**NORTHING** 51,430	**EASTING** 2,136,767	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 95% 01/22/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 11/04/21	**COMP. DATE** 11/04/21	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70	-70.5	79.0	6	12	12	Match Line / 24		W		**COASTAL PLAIN** Very stiff to hard, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION) *(continued)*
-75	-75.5	84.0	26	20	20	40		W		
-80	-80.5	89.0	6	7	10	17		W		
-85	-85.5	94.0	7	93/0.4		100/0.9				-86.2 / 94.7 -86.4 / 94.9 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE **COASTAL PLAIN** Very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-90	-90.5	99.0	7	8	9	17		W		
-95	-95.5	104.0	6	11	12	23		W		
-100	-100.5	109.0	7	10	11	21		W		-102.0 / 110.5 Boring Terminated at Elevation -102.0 ft in Clay (Peedee Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)			**GROUND WTR (ft)**
BORING NO. B9-B	**STATION** 24+06	**OFFSET** 5 ft RT	**ALIGNMENT** -L-	**0 HR.** 6.0
COLLAR ELEV. 8.8 ft	**TOTAL DEPTH** 110.5 ft	**NORTHING** 51,480	**EASTING** 2,136,781	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 95% 01/22/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 11/05/21	**COMP. DATE** 11/05/21	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) — DEPTH (ft)
10										
	8.8	0.0								GROUND SURFACE
	8.0	0.8	7	13	9	22		W		0.8 — **ROADWAY EMBANKMENT** 0.5' PAVEMENT
5	5.3	3.5	6	6	6	12		W		5.8 — 3.0 — **ROADWAY EMBANKMENT** Medium dense, tan, fine SAND (A-3)
	2.8	6.0	2	2	3	5		W		3.3 — 5.5 — **ROADWAY EMBANKMENT** Medium dense, tan, clayey SAND (A-2-6)
0	0.3	8.5	2	2	2	4		W		**ALLUVIAL** Loose, blue-gray, clayey SAND (A-2-6)
-5	-5.2	14.0	2	1	2	3		W		-3.7 — 12.5 — **COASTAL PLAIN** Very loose, blue-gray, clayey SAND (A-2-6) (WACCAMAW FORMATION)
-10	-10.2	19.0	3	4	6	10		W		-8.7 — 17.5 — Stiff, dark gray, sandy lean CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-15	-15.2	24.0	3	4	7	11		W		
-20	-20.2	29.0	3	5	6	11		W		
-25	-25.2	34.0	4	5	8	13		W		
-30	-30.2	39.0	3	6	6	12		W		
-35	-35.2	44.0	53	17	17	34		W		-33.7 — 42.5 — Hard, dark gray, sandy lean CLAY (A-6), with trace limestone lenses (<0.1' thick) (PEEDEE FORMATION)
-40	-40.2	49.0	4	6	7	13		W		-38.7 — 47.5 — Stiff, dark gray, sandy lean CLAY (A-6), carbonate-rich
-45	-45.2	54.0	4	6	7	13		W		
-50	-50.2	59.0	5	6	8	14		W		
-55	-55.2	64.0	60/0.1			60/0.1				-55.2 — 64.0 — **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE (no recovery)
-60	-60.2	69.0	5	6	9	15		W		**COASTAL PLAIN** Very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-65	-65.2	74.0	5	6	10	16		W		
-70										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70						Match Line				
	-70.2	79.0	6	7	9	16		W		**COASTAL PLAIN** Very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION) *(continued)*
-75	-75.2	84.0	5	8	9	17		W		
-80	-80.2	89.0	6	10	11	21		W		
-85	-85.2	94.0	7	60/0.1		60/0.1				-85.7 — 94.5 — -85.8 — 94.6 — **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE (no recovery)
-90	-90.2	99.0	6	9	9	18		W		**COASTAL PLAIN** Very stiff, dark gray, CLAY (A-6), carbonate-rich (PEEDEE FORMATION)
-95	-95.2	104.0	7	8	13	21		W		
-100	-100.2	109.0	7	6	13	19		W		-101.7 — 110.5 — Boring Terminated at Elevation -101.7 ft in Clay (Peedee Formation)

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** P. Grainger	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. B9-B (1)	**STATION** 23+98	**OFFSET** 5 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 9.0 ft	**TOTAL DEPTH** 67.3 ft	**NORTHING** 51,472	**EASTING** 2,136,781	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Core Boring		**HAMMER TYPE** Automatic
DRILLER P. McCain	**START DATE** 11/23/21	**COMP. DATE** 11/29/21	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 8.8 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-19.7											Begin Coring @ 28.7 ft
-20	-19.7	28.7	2.2	0:26	(2.2)	(0.0)		(2.2)	(0.0)		**COASTAL PLAIN**
	-21.9	30.9		0:26	100%	0%		81%	0%		Dark gray, carbonate-rich CLAY (A-7-6) (PEEDEE FORMATION)
											-22.4 / 31.4
			3.0	2:31	(1.2)	(0.4)		(0.5)	(0.4)		-22.9 / 31.9 **COASTAL PLAIN SEDIMENTARY ROCK**
-25	-24.9	33.9		0:29	40%	13%		100%	80%		Dark gray, LIMESTONE, fresh, moderately indurated, moderately hard, thinly bedded
				0:39				(0.0)	(0.0)		-24.9 / 33.9
								0%	0%		**COASTAL PLAIN**
-30											No recovery (interpreted as CLAY (A-7-6) (PEEDEE FORMATION) based on quick drill rate)
-35											
-40											
-45											
-50											
-55	-54.7	63.7	3.6	3:47	(1.4)	(1.1)		(1.1)	(1.1)		-54.7 / 63.7
				1:52	39%	31%		100%	100%		-55.8 / 64.8 **COASTAL PLAIN SEDIMENTARY ROCK**
	-58.3	67.3		0:52				(0.3)	(0.0)		Dark gray, LIMESTONE, fresh, moderately indurated, moderately hard, thinly bedded
				0:34/0.6				12%	0%		-58.3 / 67.3
											COASTAL PLAIN
											Dark gray, carbonate-rich, CLAY (A-7-6) (PEEDEE FORMATION)
											Boring Terminated at Elevation -58.3 ft in Clay (Peedee Formation)

Offset core boring 5' south of SPT boring B-9B

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** C. Benhoff	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 24+63	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** 7.1
COLLAR ELEV. 9.7 ft	**TOTAL DEPTH** 84.6 ft	**NORTHING** 51,537	**EASTING** 2,136,770	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Thelmer	**START DATE** 10/19/21	**COMP. DATE** 10/19/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
10											
	9.2	0.5	10	10	10	20		M		9.7 GROUND SURFACE	0.0
										9.2 **ROADWAY EMBANKMENT** 0.7' PAVEMENT	0.5
5	6.2	3.5	3	2	3	5		M		7.7 **ROADWAY EMBANKMENT** Medium dense, brown, tan, silty SAND (A-2-4)	2.0
	3.7	6.0	4	2	2	4		M		**ROADWAY EMBANKMENT**	
	1.2	8.5	WOH	1	1	2		M		1.7 Loose, brown, tan, clayey SAND (A-2-6)	8.0
0										**ALLUVIAL** Very loose, brown, tan, clayey SAND (A-2-6)	
	-3.4	13.1	WOH	1	1	2	SS-239	M		-2.3 **COASTAL PLAIN** Medium dense, gray, clayey fine to coarse SAND (A-2-6)(1) (WACCAMAW FORMATION)	12.0
-5											
	-8.4	18.1	9	3	2	5		W		-7.3 Medium stiff, gray, carbonate-rich, CLAY (A-6)(7) (PEEDEE FORMATION)	17.0
-10								27%			
	-13.4	23.1	3	3	4	7		W			
-15											
	-18.4	28.1	3	3	4	7		W			
-20											
	-23.4	33.1	100/0.2			100/0.2		W		-23.4 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE	33.1
-25										-23.6 **COASTAL PLAIN** Stiff to hard, gray, CLAY (A-7-6), carbonate-rich (PEEDEE FORMATION)	33.3
	-28.4	38.1	4	3	6	9		W			
-30											
	-33.4	43.1	19	8	22	30		W			
-35											
	-38.4	48.1	4	4	5	9		W			
-40											
	-43.4	53.1	4	4	11	15		W			
-45											
	-48.4	58.1	4	5	6	11		W			
-50											
	-53.4	63.1	100/0.3			100/0.3		W		-53.4 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, LIMESTONE	63.1
-55										-53.7 Stiff, gray, CLAY (A-7-6), carbonate-rich (PEEDEE FORMATION)	63.4
	-58.4	68.1	5	5	7	12		W			
-60											
	-63.4	73.1	4	6	7	13		W			
-65											
	-68.4	78.1	5	8	7	15		W			
-70											

WBS 67160.1.1	**TIP** BR-0160	**COUNTY** BRUNSWICK	**GEOLOGIST** C. Benhoff	
SITE DESCRIPTION Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 24+63	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** 7.1
COLLAR ELEV. 9.7 ft	**TOTAL DEPTH** 84.6 ft	**NORTHING** 51,537	**EASTING** 2,136,770	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 94% 03/10/2021		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Thelmer	**START DATE** 10/19/21	**COMP. DATE** 10/19/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-70						Match Line				
	-73.4	83.1	5	6	8	14		W		Stiff, gray, CLAY (A-7-6), carbonate-rich (PEEDEE FORMATION) *(continued)*
										-74.9 Boring Terminated at Elevation -74.9 ft in Clay (Peedee Formation) 84.6

NOTES
ST-1 was classified as gray, carbonate-rich, CLAY (A-6)(7) in offset hole Sta. 24+58, 8' LT

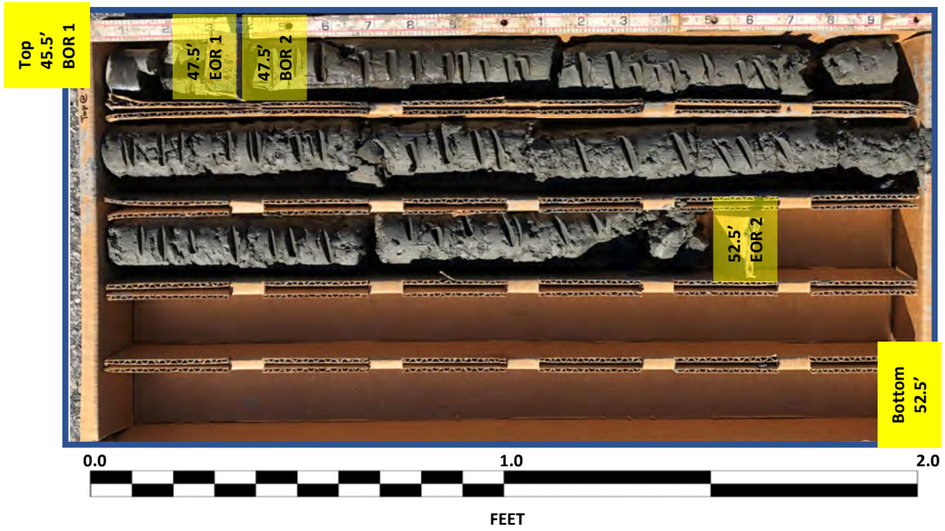
Other Samples:
ST-1 (19.6 - 21.6)

CORE PHOTOGRAPHIC RECORD

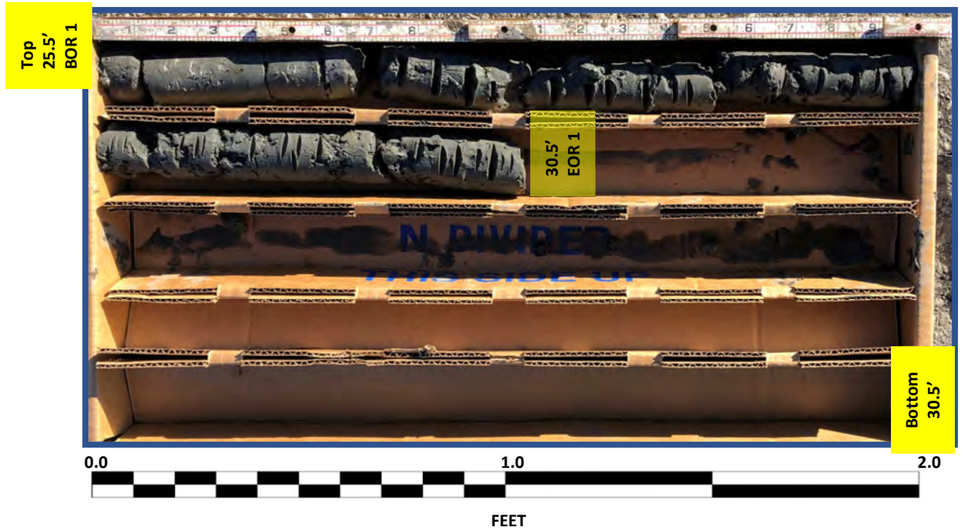
67160.1.1 (BR-0160)

Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)

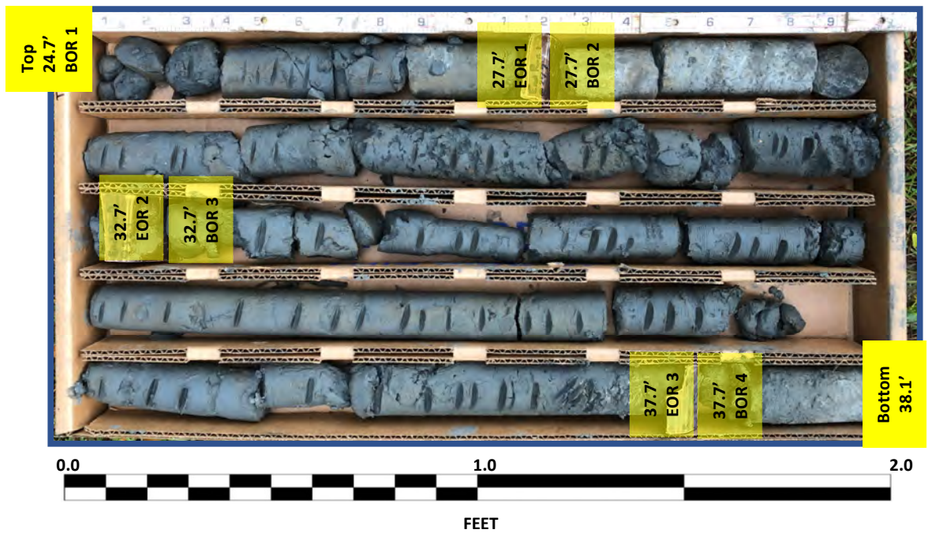
B1-A
Box 1 of 1: 45.5 – 52.5 FEET
DRY



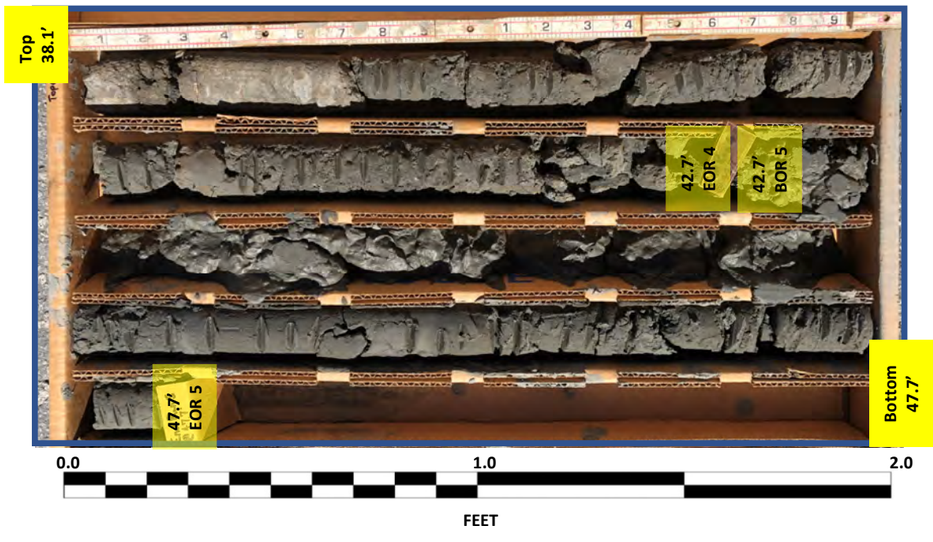
B2-B
Box 1 of 1: 25.5 – 30.5 FEET
DRY



B-3A
Box 1 of 3: 24.7 – 38.1 FEET
DRY



B-3A
Box 2 of 3: 38.1 – 47.7 FEET
DRY

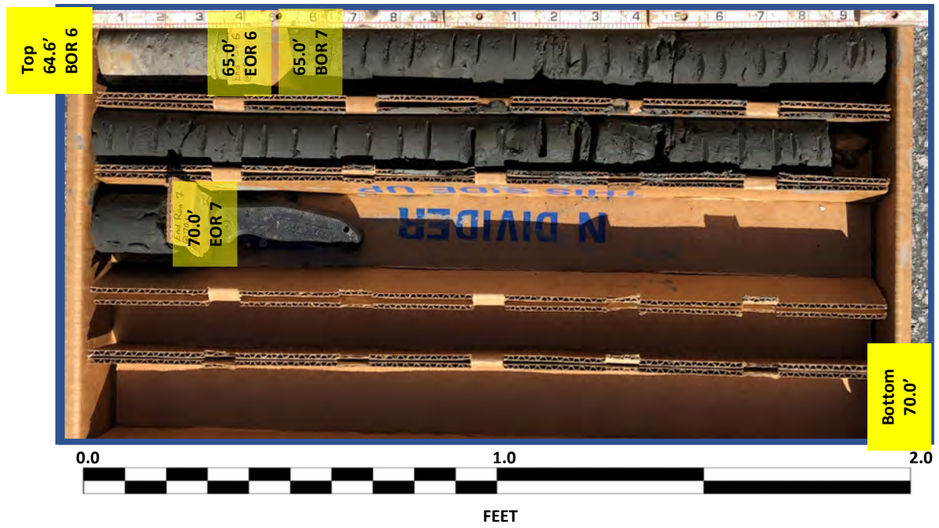


CORE PHOTOGRAPHIC RECORD

67160.1.1 (BR-0160)

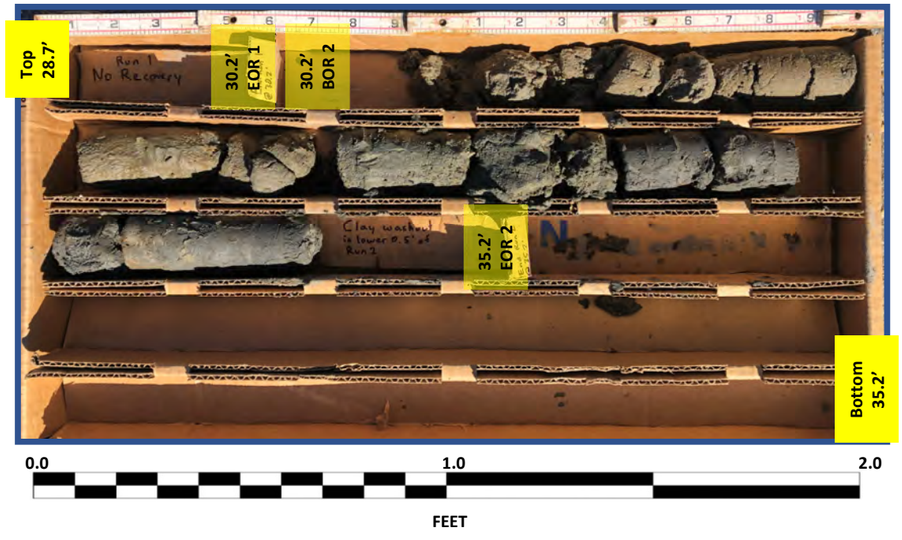
Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)

B-3A
Box 3 of 3: 64.6 – 70.0 FEET
DRY

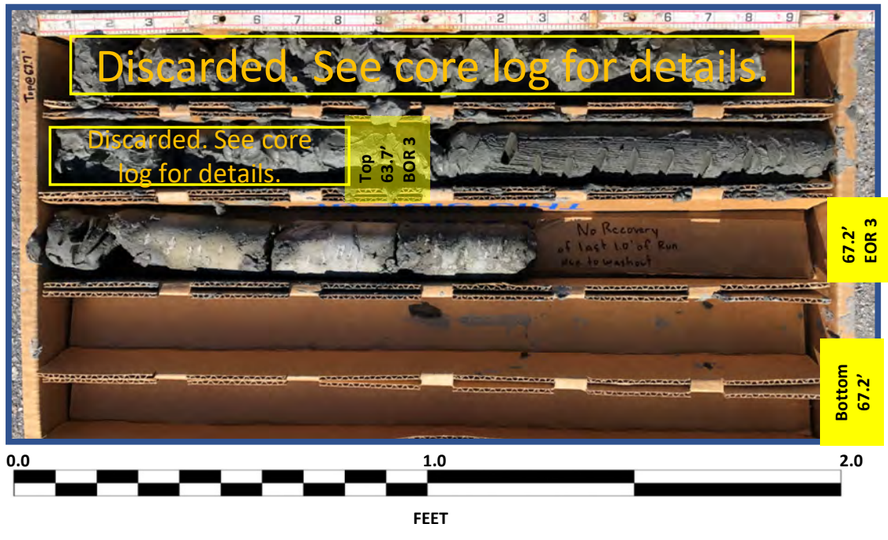


B4-B
Box 1 of 1: 27.5 – 70.3 FEET
DRY

B5-B (1)
Box 1 of 2: 28.7 – 35.2 FEET
DRY



B5-B (1)
Box 2 of 2: 63.7 – 67.2 FEET
DRY



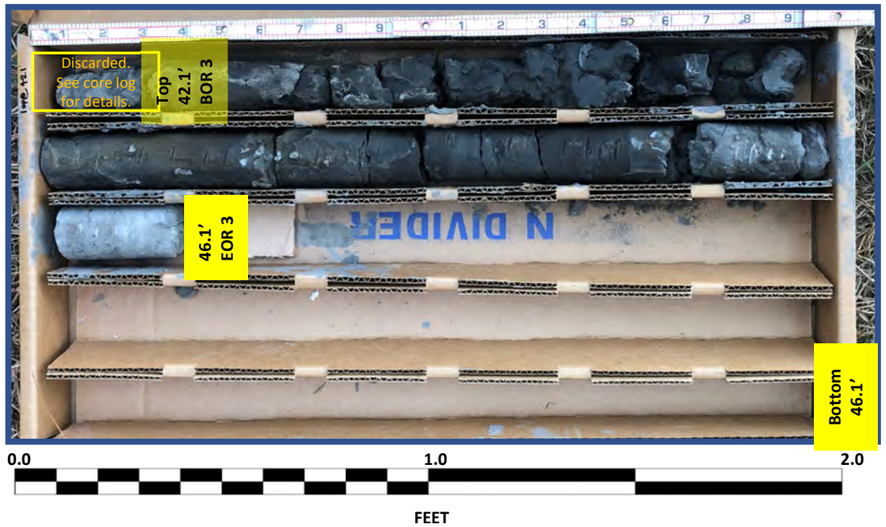
CORE PHOTOGRAPHIC RECORD

67160.1.1 (BR-0160)

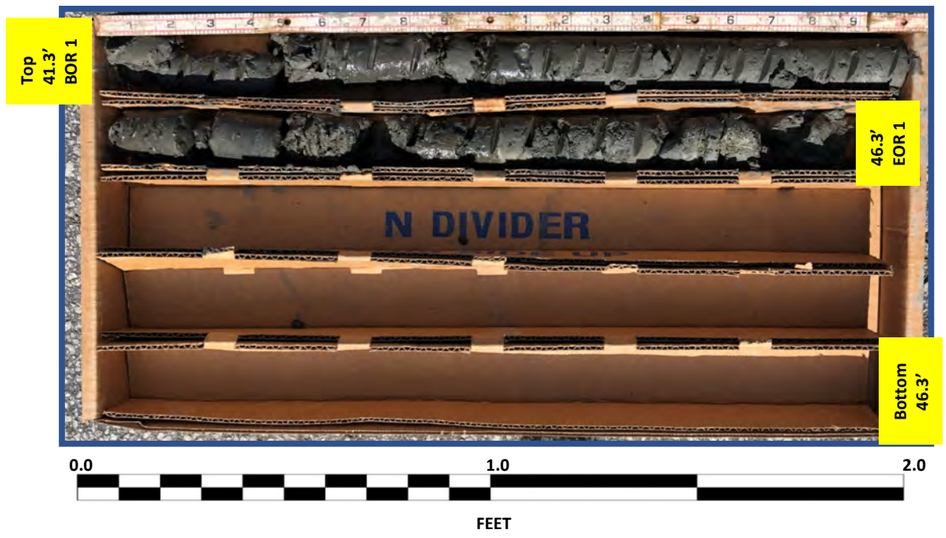
Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)

B6-A (1)
Box 1 of 2: 35.0 – 41.4 FEET
DRY

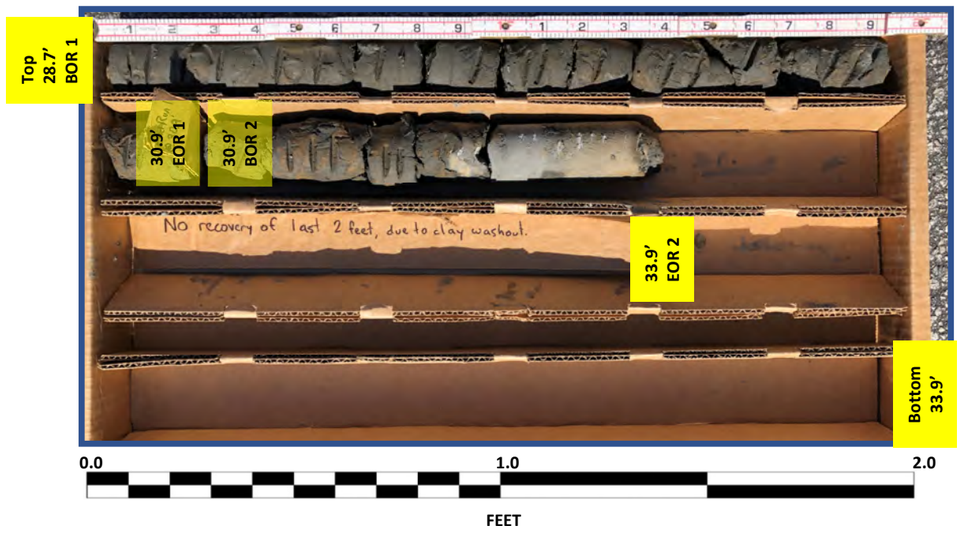
B6-A (1)
Box 2 of 2: 42.1 – 46.1 FEET
DRY



B7-B (1)
Box 1 of 1: 41.3 – 46.3 FEET
DRY



B9-B (1)
Box 1 of 2: 28.7 – 33.9 FEET
DRY

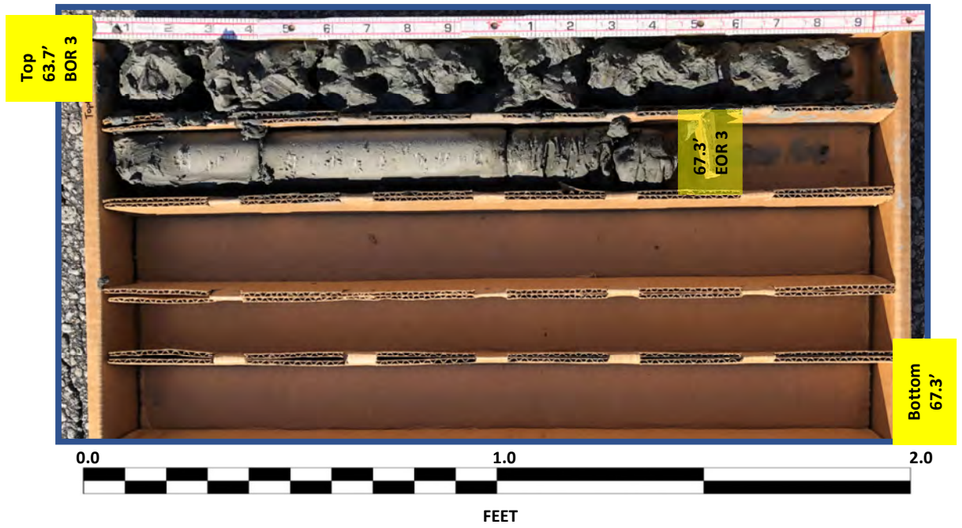


CORE PHOTOGRAPHIC RECORD

67160.1.1 (BR-0160)

Bridge 15 Over Calabash River On NC 179B (Beach Drive SW)

B9-B (1)
Box 2 of 2: 63.7 – 67.3 FEET
DRY



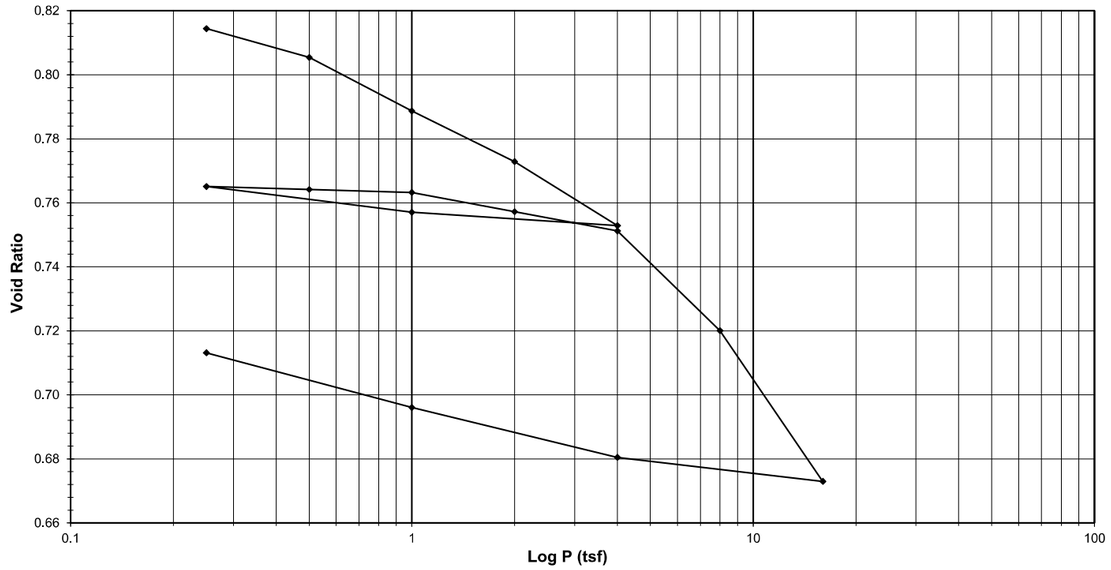
Consolidation and Strength Test Results

ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Reference	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-07-0411 *Date* 12/9/2021 *Approved By* MPS *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 6

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Reference	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED
Consolidometer No. R470
1 Division = 0.0001 (in.)

Sample Properties	**Initial**	**Final**
Water Content		
Tare Number	491	714
Wt. Tare & WS (g)	469.62	239.22
Wt. Tare & DS (g)	390.17	209.01
Wt. Water (g)	79.45	30.21
Wt. Tare (g)	100.37	87.34
Wt. DS (g)	289.80	121.67
Water Content (%)	27.42	24.83
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.0000	0.9428
Sample Volume (cc)	80.44	75.84
Wt. Wet Sample + Ring (g)	366.99	363.89
Wt. of Ring (g)	214.13	214.13
Wt. of Wet Sample (g)	152.86	149.76
Wet Density (pcf)	118.58	123.22
Wet Density (g/cc)	1.90	1.97
Water Content (%)	27.42	24.83
Wt. of Dry Sample (g)	119.97	119.97
Dry Density (pcf)	93.06	98.71
Dry Density (g/cc)	1.49	1.58
Void Ratio	0.8171	0.7131
Saturation (%)	90.93	94.36
Specific Gravity	2.71	*Measured*

Test Data Summary

Applied Pressure (tsf)	**Final Dial Reading** (div)	**Machine Deflection** (div)	**Corrected Reading** (div)	**Height of Sample** (mm)	**Volume** (cc)	**Dry Density** (g/cc)	**Void Ratio**
Seating	0	0	0	25.400	80.440	1.49142	**0.81706**
0.25	59.7	45.2	14.5	25.363	80.323	1.49359	**0.81442**
0.5	128.7	64.6	64.1	25.237	79.924	1.50104	**0.80542**
1	246.1	90.0	156.1	25.003	79.184	1.51508	**0.78869**
2	365.9	122.6	243.2	24.782	78.483	1.52861	**0.77286**
4	510.5	157.2	353.3	24.503	77.598	1.54605	**0.75286**
1	449.2	118.9	330.3	24.561	77.783	1.54237	**0.75704**
0.25	368.3	82.3	285.9	24.674	78.140	1.53532	**0.76510**
0.5	380.7	89.8	290.9	24.661	78.100	1.53611	**0.76420**
1	400.3	104.4	295.9	24.648	78.059	1.53690	**0.76329**
2	457.0	127.9	329.1	24.564	77.792	1.54218	**0.75725**
4	520.9	158.5	362.4	24.479	77.524	1.54751	**0.75120**
8	729.6	195.7	533.9	24.044	76.145	1.57553	**0.72005**
16	1037.1	244.2	792.9	23.386	74.062	1.61986	**0.67298**
4	932.4	180.9	751.5	23.491	74.394	1.61262	**0.68050**
1	801.3	135.2	666.1	23.708	75.082	1.59786	**0.69602**
0.25	671.0	99.0	571.9	23.947	75.839	1.58190	**0.71313**

Tested By 129-07-0411 *Date* 12/9/2021 *Input Checked By* GEM *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 6

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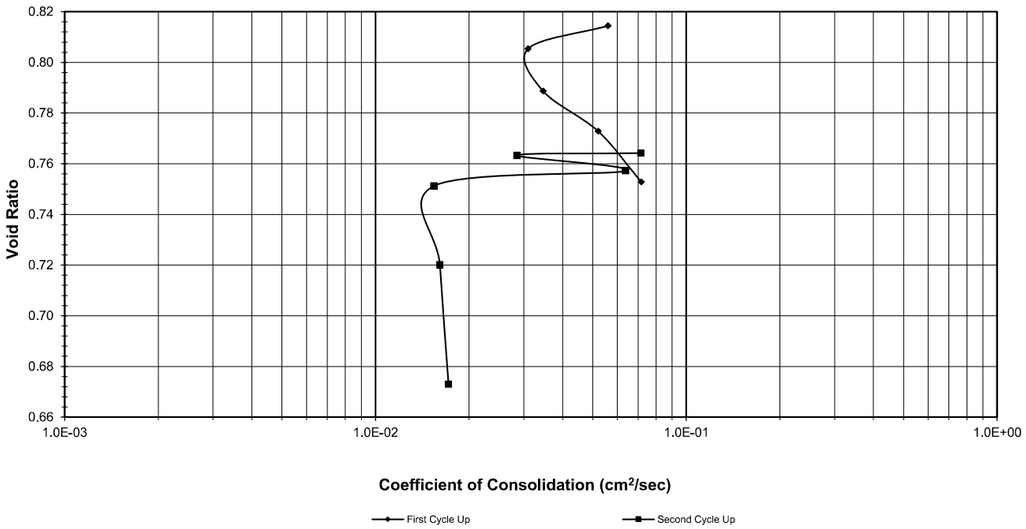
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Reference	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-07-0411 *Date* 12/9/2021 *Input Checked By* GEM *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 6 *Y:\2021 PROJECTS\HDR\2021-312 - BR-0160 Calabash\[2021-312-001-003 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT*

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Reference	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED

Consolidometer No. R470

1 Division = 0.0001 (in.)

Sample Properties	Initial	Final
Water Content		
Tare Number	491	714
Wt. Tare & WS (g)	469.62	239.22
Wt. Tare & DS (g)	390.17	209.01
Wt. Water (g)	79.45	30.21
Wt. Tare (g)	100.37	87.34
Wt. DS (g)	289.80	121.67
Water Content (%)	27.42	24.83
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.000	0.943
Sample Volume (cc)	80.44	75.84
Wt. Wet Sample + Ring (g)	366.99	363.89
Wt. of Ring (g)	214.13	214.13
Wt. of Wet Sample (g)	152.86	149.76
Wet Density (pcf)	118.58	123.22
Wet Density (g/cc)	1.90	1.97
Water Content (%)	27.42	24.83
Wt. of Dry Sample (g)	119.97	119.97
Dry Density (pcf)	93.06	98.71
Dry Density (g/cc)	1.49	1.58
Void Ratio	0.8171	0.7131
Saturation (%)	90.93	94.36
Specific Gravity	*2.71*	*Measured*

C_v Test Data Summary

Load Increment (tsf)	Dial Reading @ t_{50} (div)	Machine Deflection (div)	Corrected Dial Reading @ t_{50} (div)	Sample Height @ t_{50} (cm)	Time t_{50} (min.)	C_v (cm²/sec)
0 - 0.25	26.5	45.2	-18.7	2.545	**0.10**	**0.05595**
0.25 - 0.5	94.5	64.6	29.9	2.532	**0.17**	**0.03097**
0.5 - 1.0	188.9	90.0	98.9	2.515	**0.15**	**0.03461**
1.0 - 2.0	308.4	122.6	185.8	2.493	**0.10**	**0.05205**
2.0 - 4.0	423.0	157.2	265.8	2.472	**0.07**	**0.07168**
4.0 - 1.0	NA	118.9	NA	NA	**NA**	**NA**
1.0 - 0.25	NA	82.3	NA	NA	**NA**	**NA**
0.25 - 0.5	373.4	89.8	283.6	2.468	**0.07**	**0.07142**
0.5 - 1.0	389.9	104.4	285.4	2.467	**0.18**	**0.02856**
1.0 - 2.0	430.6	127.9	302.7	2.463	**0.08**	**0.06384**
2.0 - 4.0	504.5	158.5	346.0	2.452	**0.32**	**0.01542**
4.0 - 8.0	640.6	195.7	444.8	2.427	**0.30**	**0.01612**
8.0 - 16.0	888.1	244.2	643.8	2.376	**0.27**	**0.01717**
16.0 - 4.0	NA	180.9	NA	NA	**NA**	**NA**
4.0 - 1.0	NA	135.2	NA	NA	**NA**	**NA**
1.0 - 0.25	NA	99.0	NA	NA	**NA**	**NA**

Tested By 129-07-0411 *Date* 12/9/2021 *Input Checked By* GEM *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 6 *Y:\2021 PROJECTS\HDR\2021-312 - BR-0160 Calabash\[2021-312-001-003 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT*

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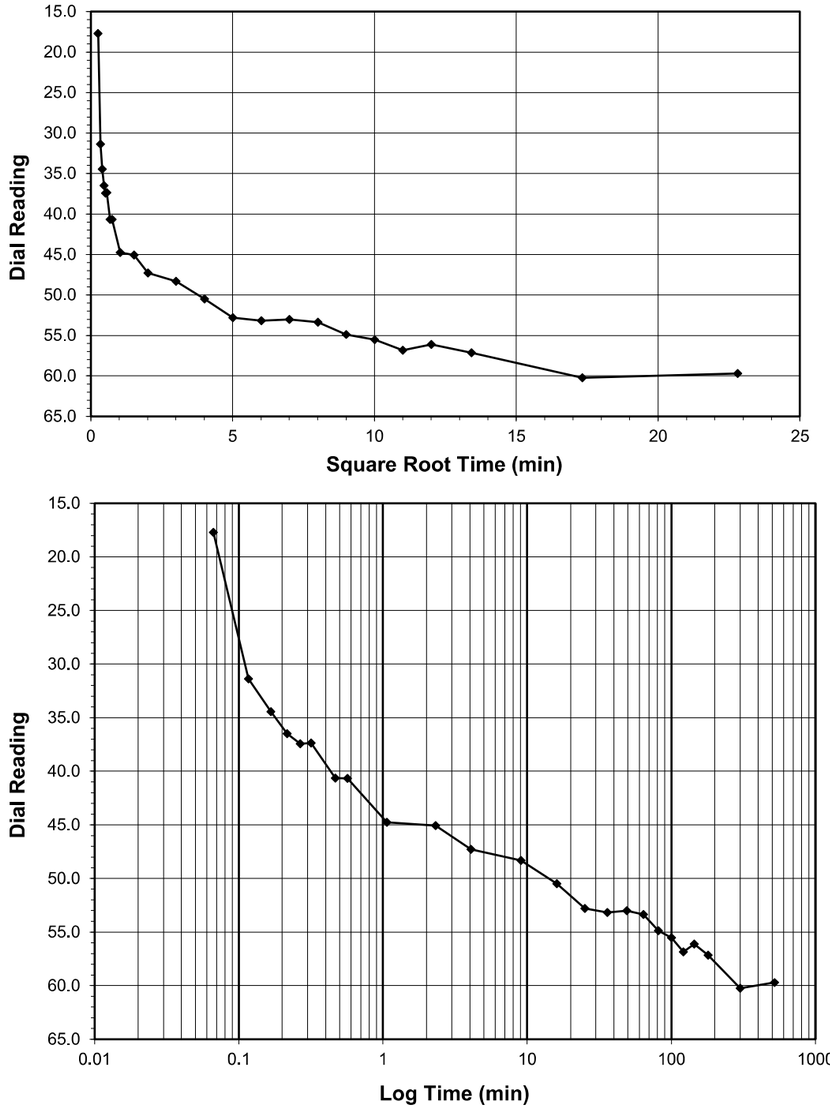
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.0-0.25**
Final Reading	**(div)**	**59.7**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/9/2021
Start Time		11:53:53

Elapsed Time (min)	Dial Reading (div)
Initial	**0.0**
0.07	17.7
0.12	31.4
0.17	34.4
0.22	36.5
0.27	37.4
0.32	37.3
0.47	40.6
0.57	40.7
1.07	44.8
2.32	45.1
4.07	47.3
9.07	48.3
16.07	50.5
25.07	52.8
36.07	53.2
49.07	53.0
64.07	53.4
81.07	54.9
100.07	55.5
121.07	56.8
144.07	56.1
180.07	57.1
300.07	60.2
520.07	59.7

Tested By 129-07-0411 *Date* 12/9/2021 *Checked By* GEM *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

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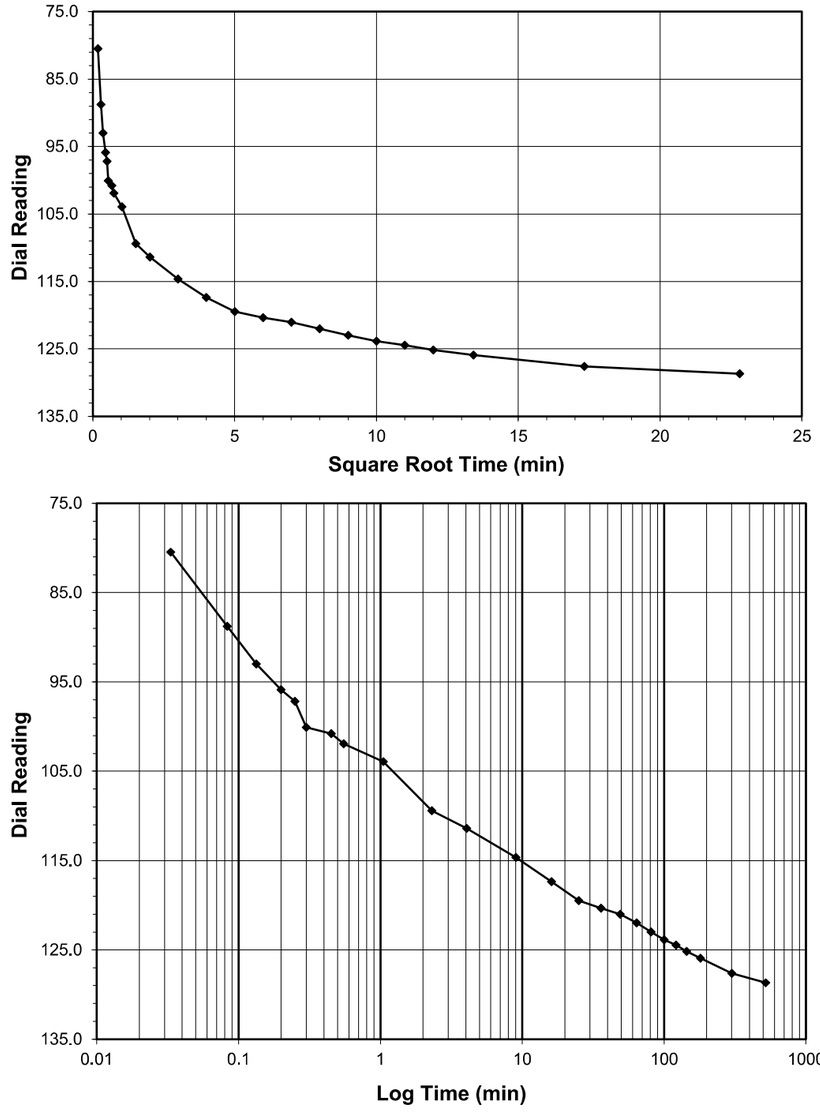
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**128.7**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/9/2021
Start Time		21:54:11

Elapsed Time (min)	Dial Reading (div)
Initial	**59.7**
0.03	80.5
0.08	88.8
0.13	93.0
0.20	95.9
0.25	97.2
0.30	100.1
0.45	100.8
0.55	101.9
1.05	103.9
2.30	109.4
4.05	111.4
9.05	114.6
16.05	117.4
25.05	119.5
36.05	120.3
49.05	121.0
64.05	122.0
81.05	123.0
100.05	123.9
121.05	124.4
144.05	125.2
180.05	125.9
300.05	127.6
520.05	128.7

Tested By 129-07-0411 *Date* 12/9/2021 *Checked By* GEM *Date* 12/30/2021

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DCN: CT-24E Date: 5/3/12 Revision: 3

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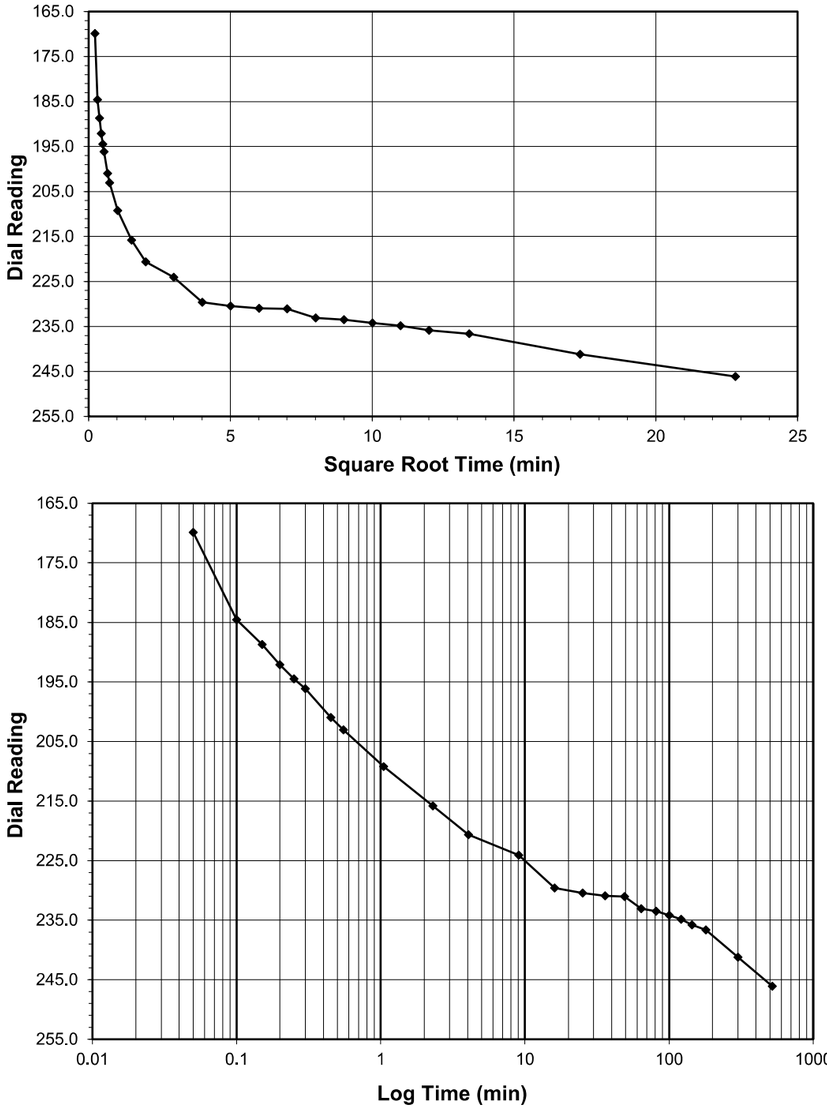
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**246.1**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/10/2021
Start Time		7:54:32

Elapsed Time (min)	Dial Reading (div)
Initial	**128.7**
0.05	169.9
0.10	184.5
0.15	188.7
0.20	192.1
0.25	194.5
0.30	196.1
0.45	201.0
0.55	203.1
1.05	209.2
2.30	215.8
4.05	220.6
9.07	224.1
16.07	229.6
25.07	230.5
36.07	230.9
49.07	231.0
64.07	233.1
81.07	233.5
100.07	234.2
121.07	234.8
144.07	235.8
180.07	236.6
300.07	241.2
520.07	246.1

Tested By *129-07-0411* *Date* 12/10/2021 *Checked By* *GEM* *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

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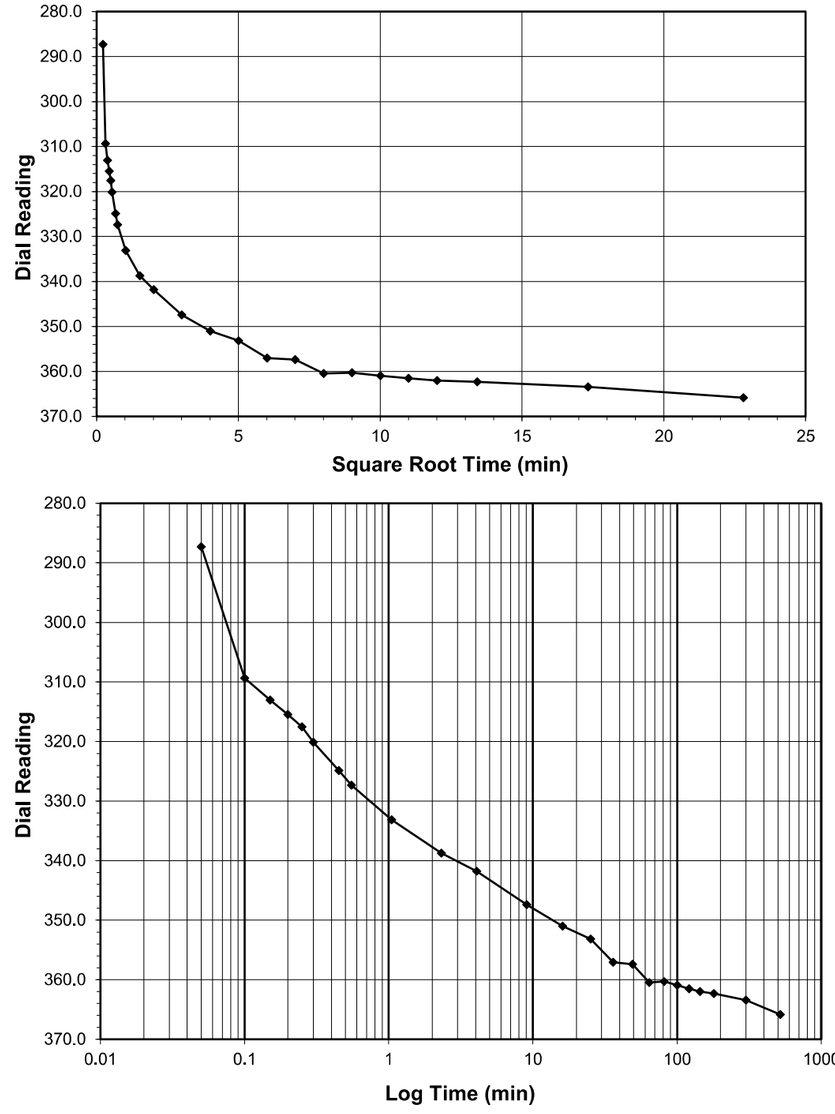
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**365.9**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/10/2021
Start Time		17:54:56

Elapsed Time (min)	Dial Reading (div)
Initial	**246.1**
0.05	287.3
0.10	309.3
0.15	313.1
0.20	315.4
0.25	317.5
0.30	320.1
0.45	324.9
0.55	327.4
1.05	333.1
2.32	338.7
4.07	341.8
9.07	347.4
16.07	351.0
25.07	353.2
36.07	357.1
49.07	357.4
64.07	360.5
81.07	360.3
100.07	361.0
121.07	361.5
144.07	362.0
180.07	362.3
300.07	363.4
520.07	365.9

Tested By *129-07-0411* *Date* 12/10/2021 *Checked By* *GEM* *Date* 12/30/2021

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DCN: CT-24E Date: 5/3/12 Revision: 3

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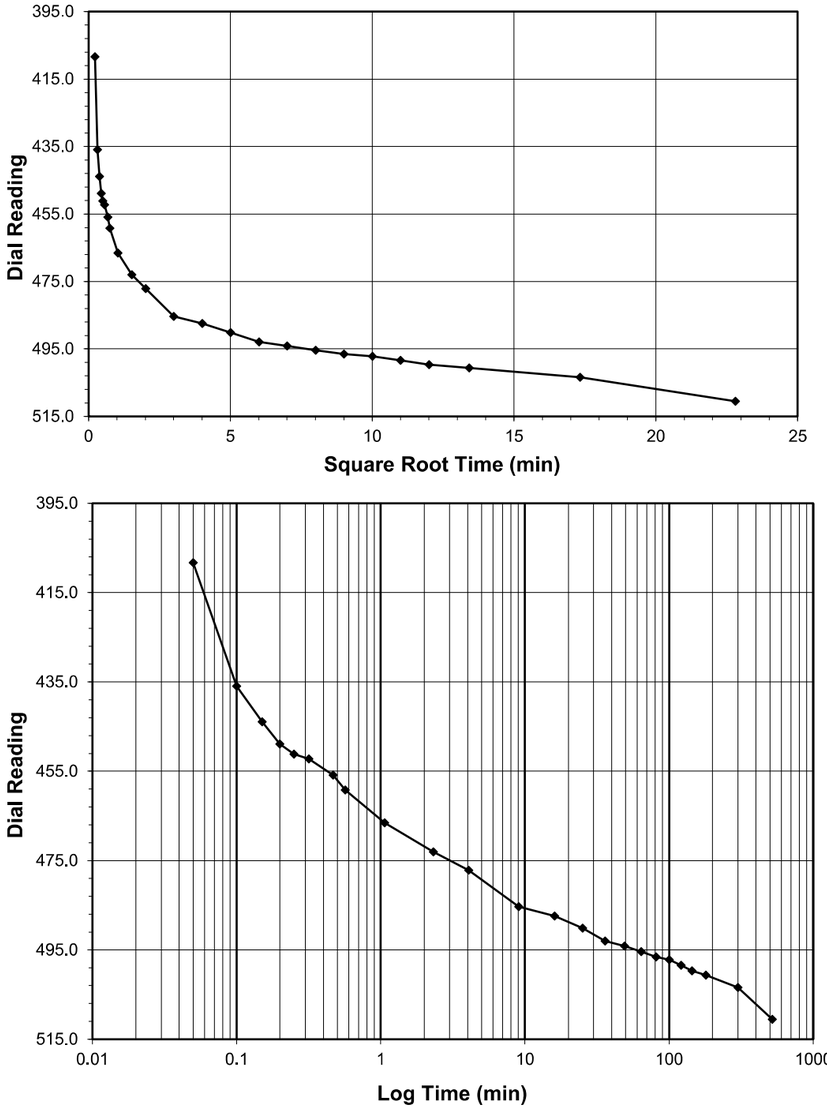
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**510.5**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/11/2021
Start Time		3:54:56

Elapsed Time (min)	Dial Reading (div)
Initial	**365.9**
0.05	408.3
0.10	436.0
0.15	443.9
0.20	448.9
0.25	451.1
0.32	452.2
0.47	455.9
0.57	459.2
1.07	466.6
2.32	473.0
4.07	477.1
9.07	485.3
16.07	487.4
25.07	490.1
36.07	493.0
49.07	494.2
64.07	495.4
81.07	496.5
100.07	497.2
121.07	498.4
144.07	499.7
180.07	500.6
300.07	503.4
520.07	510.5

Tested By 129-07-0411 *Date* 12/11/2021 *Checked By* GEM *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

Y:\2021 PROJECTS\HDR\2021-312 - BR-0160 Calabash\[2021-312-001-003 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

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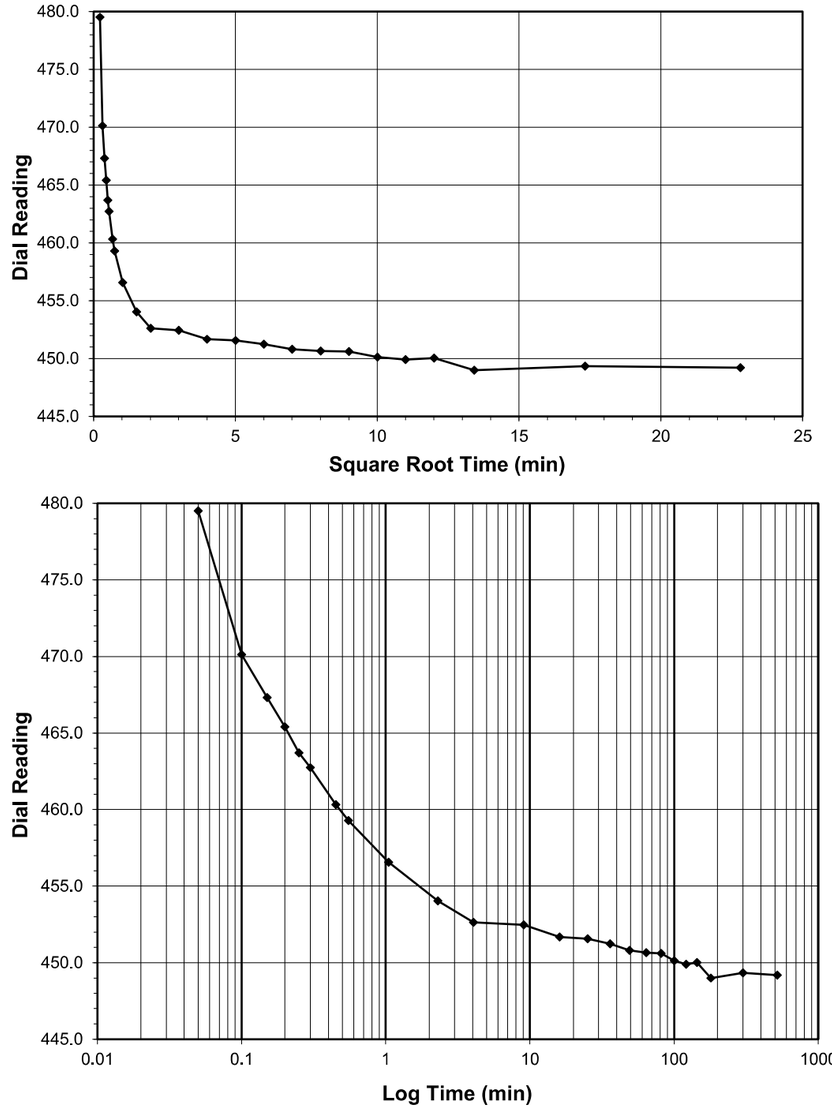
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-1.0**
Final Reading	**(div)**	**449.2**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/11/2021
Start Time		13:55:25

Elapsed Time (min)	Dial Reading (div)
Initial	**510.5**
0.05	479.5
0.10	470.1
0.15	467.3
0.20	465.4
0.25	463.7
0.30	462.7
0.45	460.3
0.55	459.3
1.05	456.6
2.30	454.0
4.05	452.6
9.05	452.5
16.05	451.7
25.05	451.6
36.05	451.2
49.07	450.8
64.07	450.7
81.07	450.6
100.07	450.1
121.07	449.9
144.07	450.0
180.07	449.0
300.07	449.3
520.07	449.2

Tested By 129-07-0411 *Date* 12/11/2021 *Checked By* GEM *Date* 12/30/2021

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DCN: CT-24E Date: 5/3/12 Revision: 3

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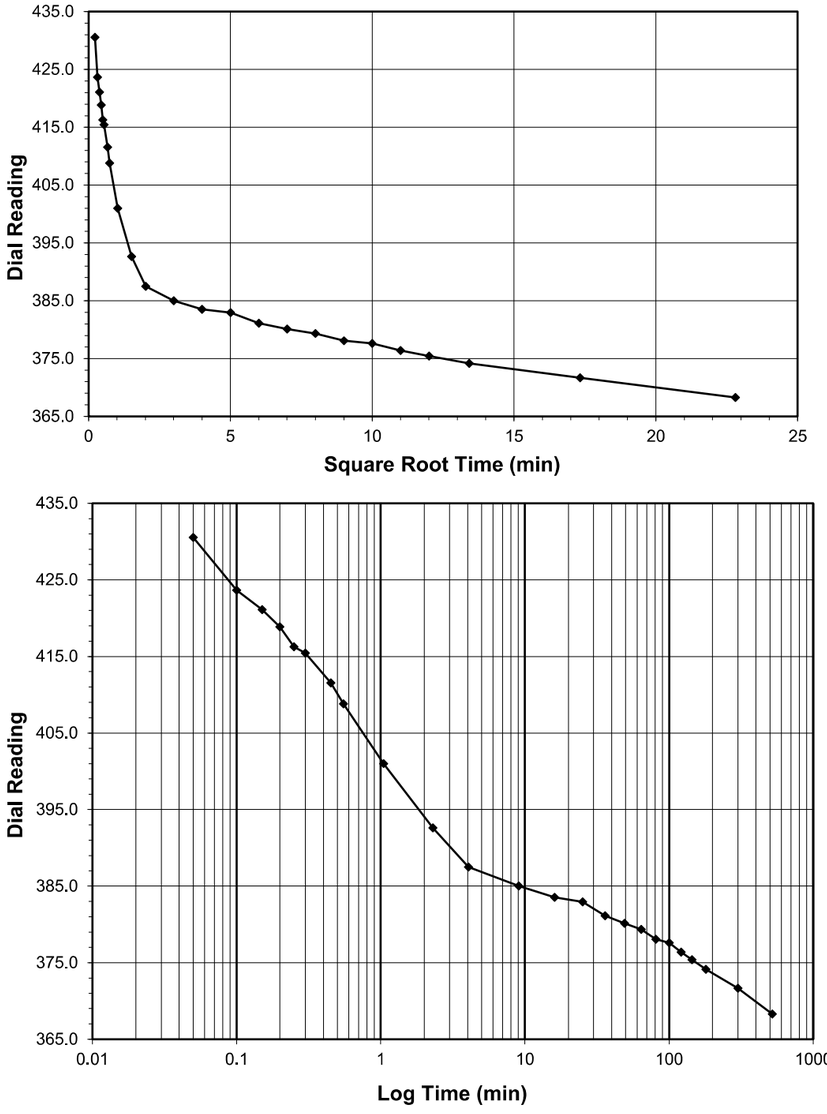
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-0.25**
Final Reading	**(div)**	**368.3**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/11/2021
Start Time		23:55:45

Elapsed Time (min)	Dial Reading (div)
Initial	**449.2**
0.05	430.6
0.10	423.7
0.15	421.1
0.20	418.9
0.25	416.3
0.30	415.4
0.45	411.5
0.55	408.8
1.05	401.0
2.30	392.6
4.05	387.5
9.05	385.0
16.05	383.5
25.05	382.9
36.05	381.1
49.05	380.1
64.05	379.3
81.05	378.1
100.05	377.6
121.05	376.4
144.05	375.4
180.05	374.1
300.05	371.7
520.07	368.3

Tested By *129-07-0411* *Date* 12/11/2021 *Checked By* *GEM* *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

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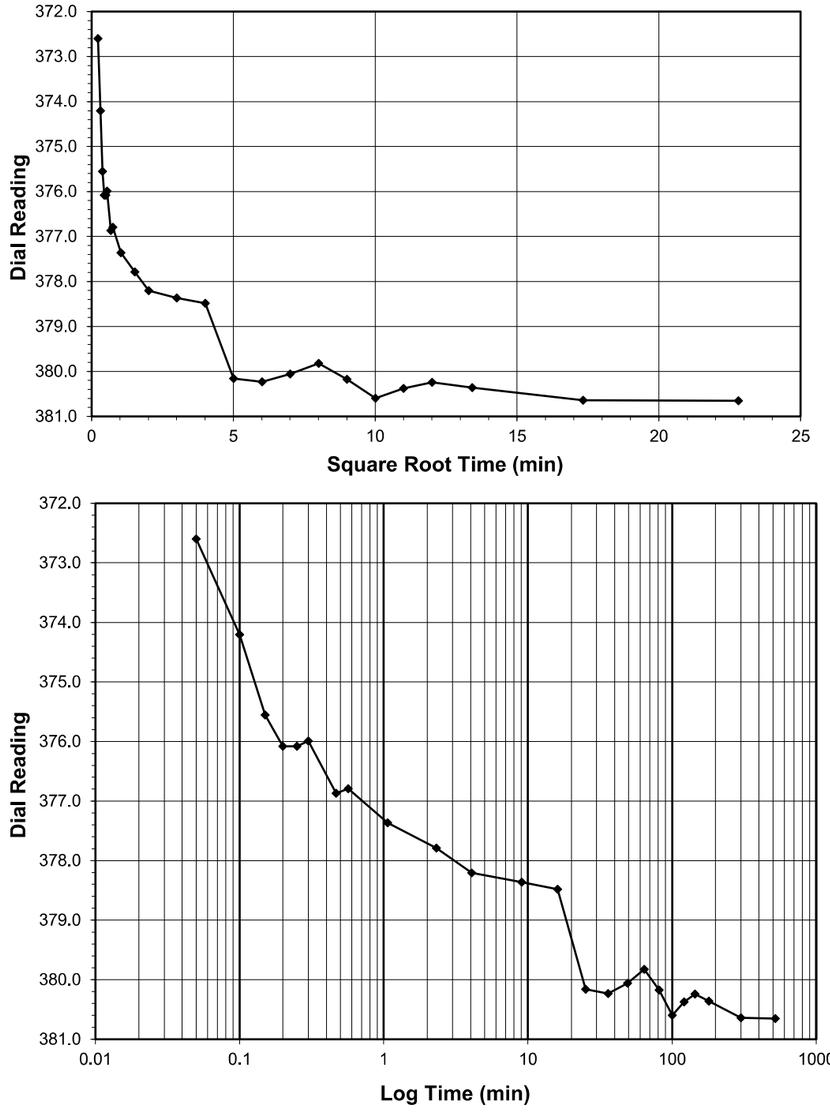
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**380.7**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/12/2021
Start Time		9:56:12

Elapsed Time (min)	Dial Reading (div)
Initial	**368.3**
0.05	372.6
0.10	374.2
0.15	375.6
0.20	376.1
0.25	376.1
0.30	376.0
0.47	376.9
0.57	376.8
1.07	377.4
2.32	377.8
4.07	378.2
9.07	378.4
16.07	378.5
25.07	380.2
36.07	380.2
49.07	380.1
64.07	379.8
81.07	380.2
100.07	380.6
121.07	380.4
144.07	380.2
180.07	380.4
300.07	380.6
520.07	380.7

Tested By *129-07-0411* *Date* 12/12/2021 *Checked By* *GEM* *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

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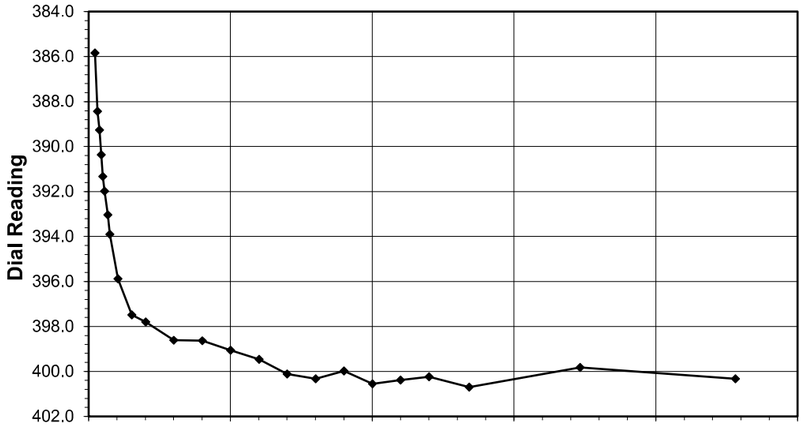
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**400.3**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/12/2021
Start Time		19:56:36

Elapsed Time (min)	Dial Reading (div)
Initial	**380.7**
0.05	385.8
0.10	388.4
0.15	389.3
0.20	390.4
0.25	391.3
0.32	392.0
0.47	393.0
0.57	393.9
1.07	395.9
2.32	397.5
4.07	397.8
9.07	398.6
16.07	398.6
25.07	399.1
36.07	399.5
49.07	400.1
64.07	400.3
81.07	400.0
100.07	400.5
121.07	400.4
144.07	400.2
180.07	400.7
300.07	399.8
520.07	400.3

Tested By *129-07-0411* *Date* 12/12/2021 *Checked By* *GEM* *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

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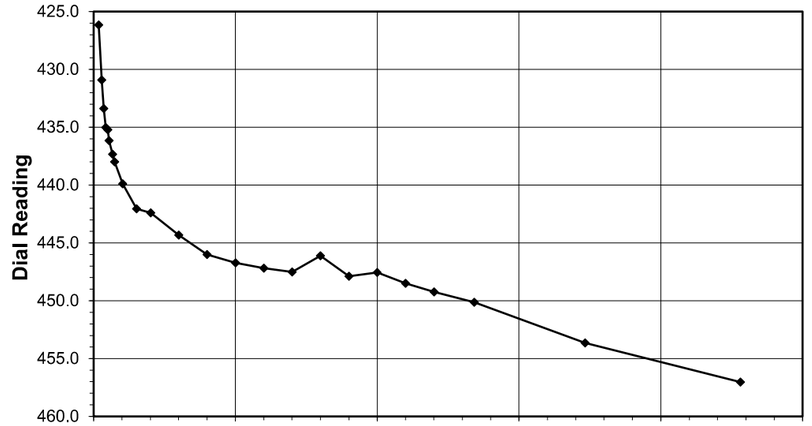
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**457.0**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/13/2021
Start Time		5:56:37

Elapsed Time (min)	Dial Reading (div)
Initial	**400.3**
0.03	426.2
0.08	430.9
0.13	433.4
0.18	435.0
0.25	435.2
0.30	436.1
0.45	437.3
0.55	438.0
1.05	439.9
2.30	442.0
4.05	442.4
9.05	444.3
16.05	446.0
25.05	446.7
36.05	447.2
49.05	447.5
64.05	446.1
81.05	447.9
100.05	447.5
121.05	448.5
144.05	449.2
180.05	450.1
300.05	453.7
520.05	457.0

Tested By *129-07-0411* *Date* 12/13/2021 *Checked By* *GEM* *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

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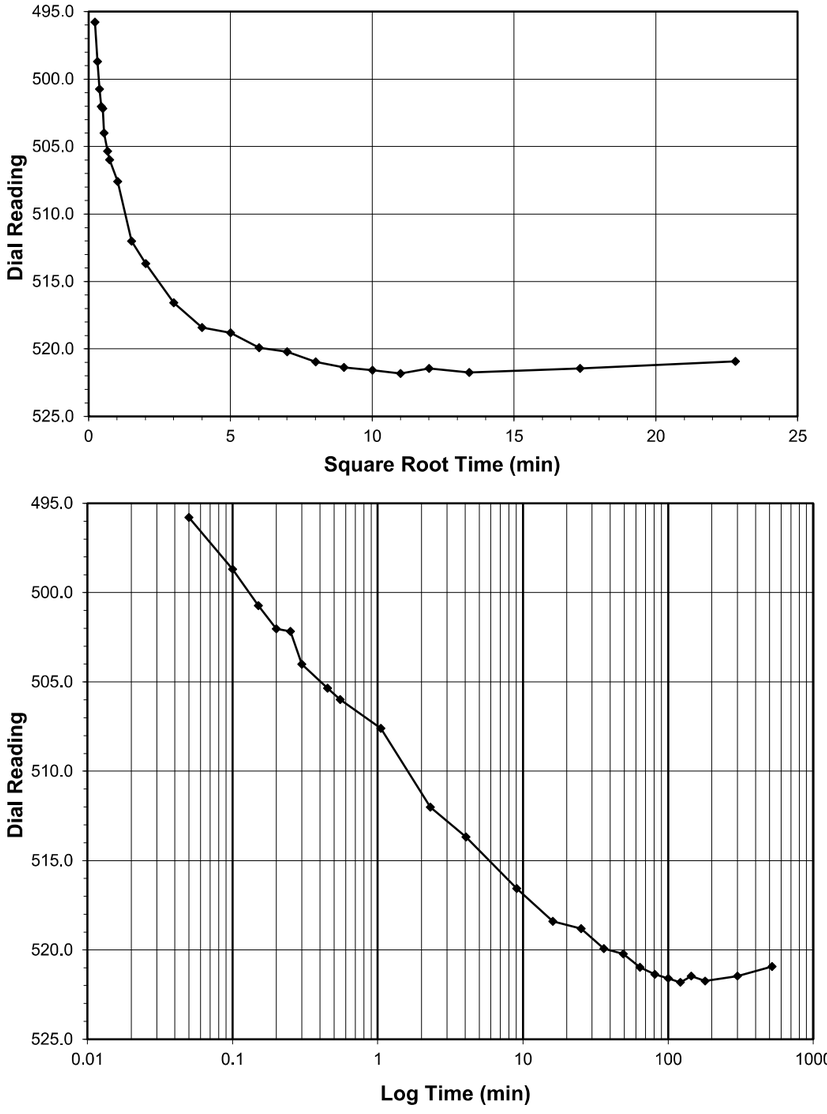
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**520.9**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/13/2021
Start Time		15:57:04

Elapsed Time (min)	Dial Reading (div)
Initial	**457.0**
0.05	495.8
0.10	498.7
0.15	500.7
0.20	502.0
0.25	502.2
0.30	504.0
0.45	505.4
0.55	506.0
1.05	507.6
2.30	512.0
4.05	513.7
9.05	516.6
16.05	518.4
25.07	518.8
36.07	519.9
49.07	520.2
64.07	521.0
81.07	521.4
100.07	521.6
121.07	521.8
144.07	521.5
180.07	521.7
300.07	521.5
520.07	520.9

Tested By *129-07-0411* *Date* 12/13/2021 *Checked By* *GEM* *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

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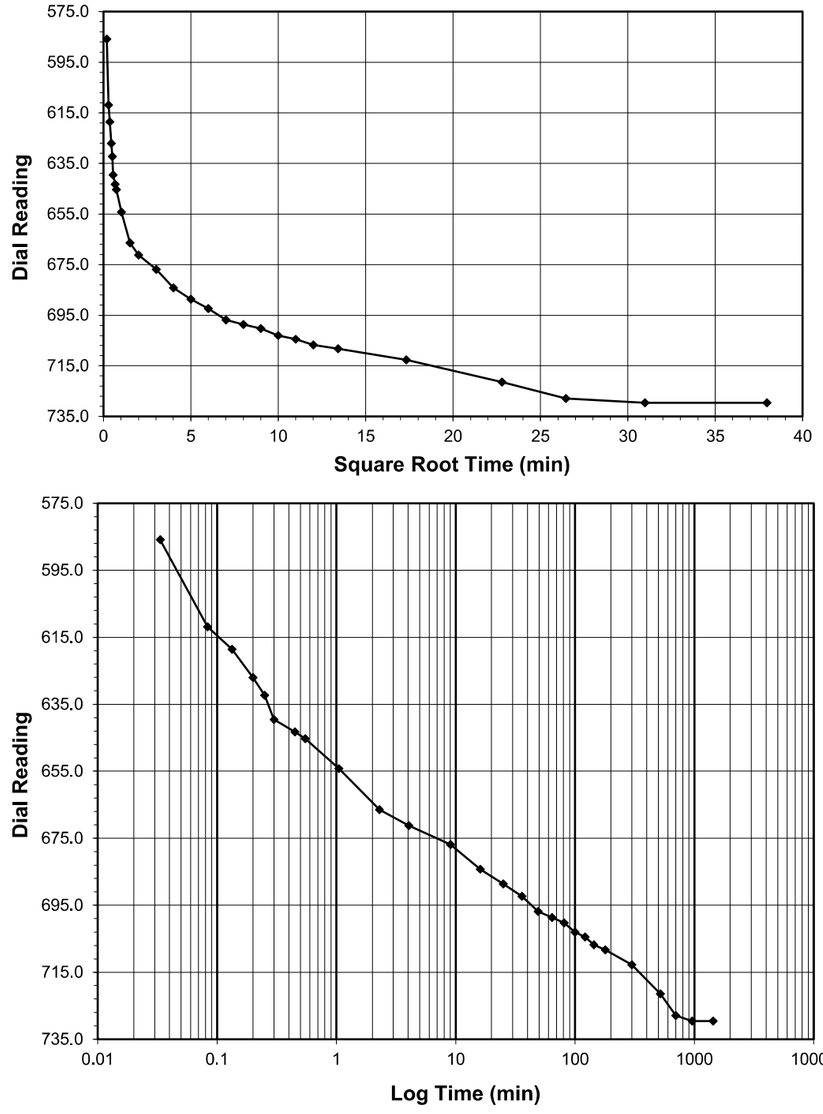
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-8.0**
Final Reading	**(div)**	**729.6**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/14/2021
Start Time		1:57:31

Elapsed Time (min)	Dial Reading (div)
Initial	**520.9**
0.03	585.8
0.08	611.8
0.13	618.5
0.20	627.1
0.25	632.3
0.30	639.5
0.45	643.2
0.55	645.3
1.05	654.2
2.30	666.5
4.05	671.2
9.05	676.9
16.05	684.2
25.05	688.7
36.05	692.4
49.05	696.9
64.05	698.7
81.07	700.3
100.07	703.1
121.07	704.5
144.07	706.8
180.07	708.3
300.07	712.7
520.07	721.5
700.07	727.9
960.07	729.6
1440.00	729.6

Tested By *129-07-0411* *Date* 12/14/2021 *Checked By* *GEM* *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

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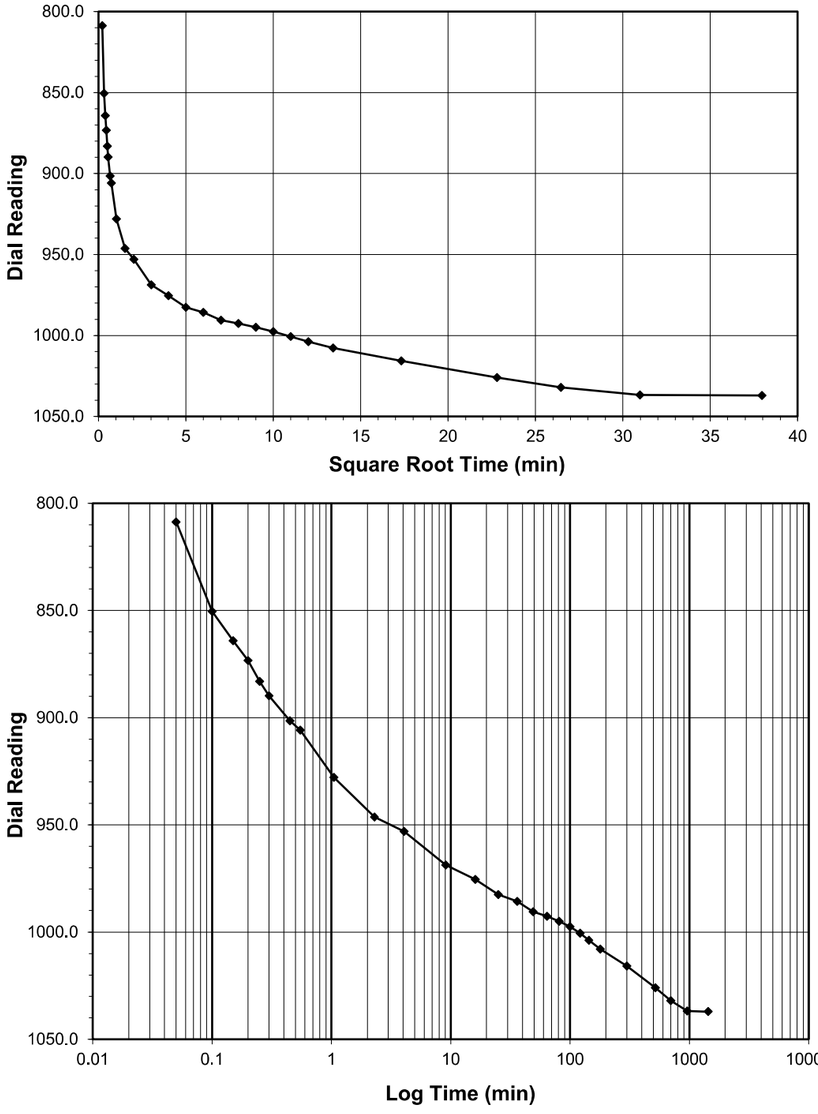
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**8.0-16.0**
Final Reading	**(div)**	**1037.1**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/15/2021
Start Time		1:57:32

Elapsed Time (min)	Dial Reading (div)
Initial	**729.6**
0.05	808.7
0.10	850.4
0.15	864.1
0.20	873.3
0.25	883.1
0.30	889.8
0.45	901.4
0.55	905.8
1.05	927.9
2.30	946.3
4.07	953.0
9.07	968.7
16.07	975.5
25.07	982.6
36.07	985.8
49.07	990.5
64.07	992.6
81.07	995.0
100.07	997.5
121.07	1000.6
144.07	1003.9
180.07	1007.9
300.07	1015.8
520.07	1026.0
700.07	1032.1
960.07	1036.8
1440.05	1037.1

Tested By 129-07-0411 *Date* 12/15/2021 *Checked By* GEM *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

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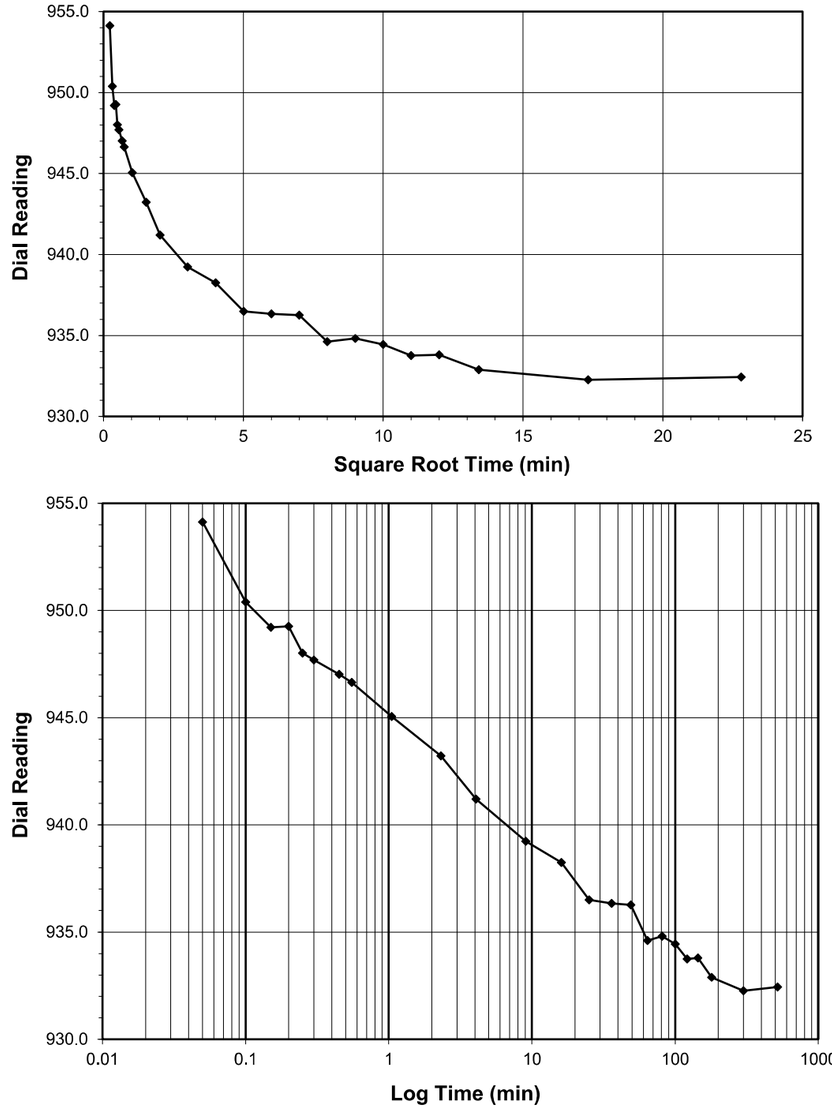
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**16.0-4.0**
Final Reading	**(div)**	**932.4**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/16/2021
Start Time		1:57:35

Elapsed Time (min)	Dial Reading (div)
Initial	**1037.1**
0.05	954.1
0.10	950.4
0.15	949.2
0.20	949.3
0.25	948.0
0.30	947.7
0.45	947.0
0.55	946.6
1.05	945.1
2.32	943.2
4.07	941.2
9.07	939.2
16.07	938.2
25.07	936.5
36.07	936.3
49.07	936.3
64.07	934.6
81.07	934.8
100.07	934.4
121.07	933.7
144.07	933.8
180.07	932.9
300.08	932.3
520.08	932.4

Tested By 129-07-0411 *Date* 12/16/2021 *Checked By* GEM *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

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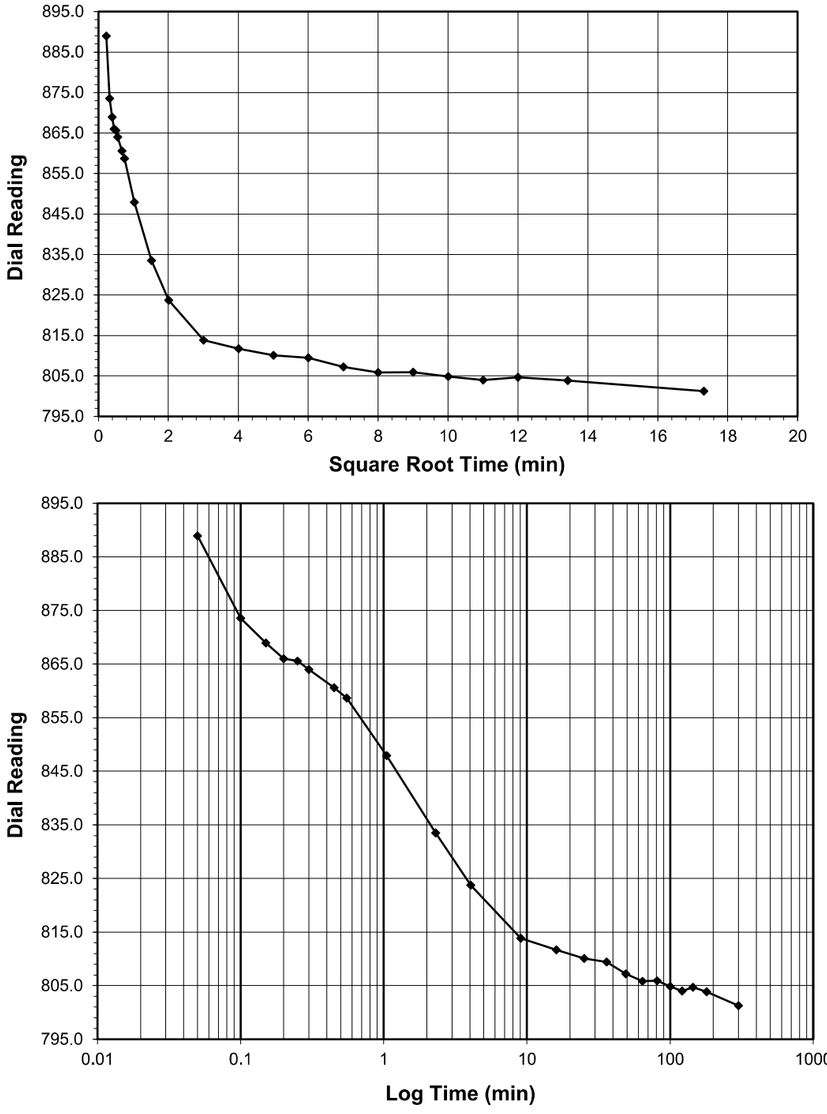
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-1.0**
Final Reading	**(div)**	**801.3**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/16/2021
Start Time		11:57:56

Elapsed Time (min)	Dial Reading (div)
Initial	**932.4**
0.05	889.0
0.10	873.5
0.15	869.0
0.20	866.0
0.25	865.6
0.30	864.0
0.45	860.6
0.55	858.7
1.05	847.9
2.30	833.5
4.05	823.7
9.05	813.8
16.05	811.7
25.07	810.1
36.07	809.4
49.07	807.2
64.07	805.8
81.07	805.9
100.07	804.8
121.07	804.0
144.07	804.7
180.07	803.9
300.07	801.3

Tested By *129-07-0411* *Date* 12/16/2021 *Checked By* *GEM* *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

Y:\2021 PROJECTS\HDR\2021-312 - BR-0160 Calabash\[2021-312-001-003 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

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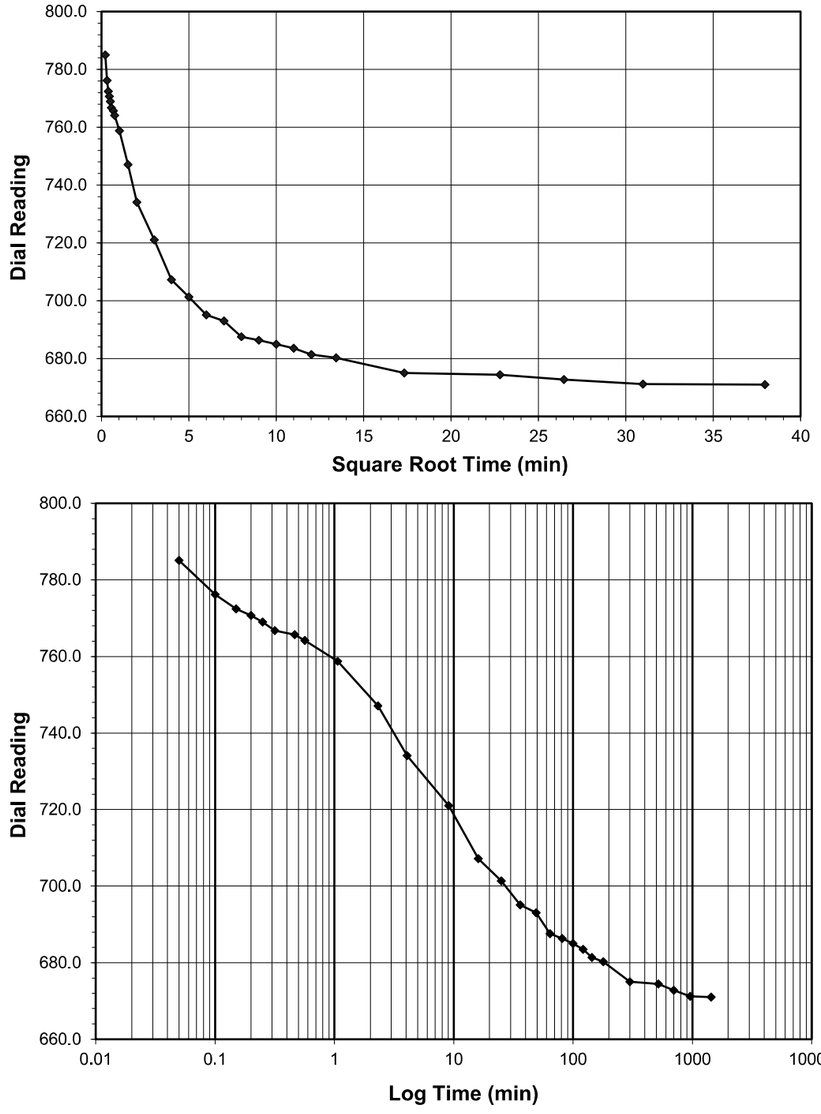
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB2-A
Client Project	BR-0160 Calabash	Depth (ft)	19.6-21.6
Project No.	R-2021-312-001	Sample No.	ST-1
Lab ID	R-2021-312-001-003	Visual Description	Gray Sandy Lean Clay

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-0.25**
Final Reading	**(div)**	**671.0**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		12/16/2021
Start Time		16:58:06

Elapsed Time (min)	Dial Reading (div)
Initial	**801.3**
0.05	785.0
0.10	776.2
0.15	772.4
0.20	770.7
0.25	769.0
0.32	766.8
0.47	765.7
0.57	764.2
1.07	758.7
2.32	747.1
4.07	734.1
9.07	721.0
16.07	707.2
25.07	701.3
36.07	695.1
49.07	693.1
64.07	687.6
81.07	686.3
100.07	685.0
121.07	683.5
144.07	681.4
180.07	680.2
300.08	675.0
520.08	674.4
700.08	672.8
960.08	671.2
1440.08	671.0

Tested By *129-07-0411* *Date* 12/16/2021 *Checked By* *GEM* *Date* 12/30/2021

DCN: CT-24E Date: 5/3/12 Revision: 3

Y:\2021 PROJECTS\HDR\2021-312 - BR-0160 Calabash\[2021-312-001-003 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

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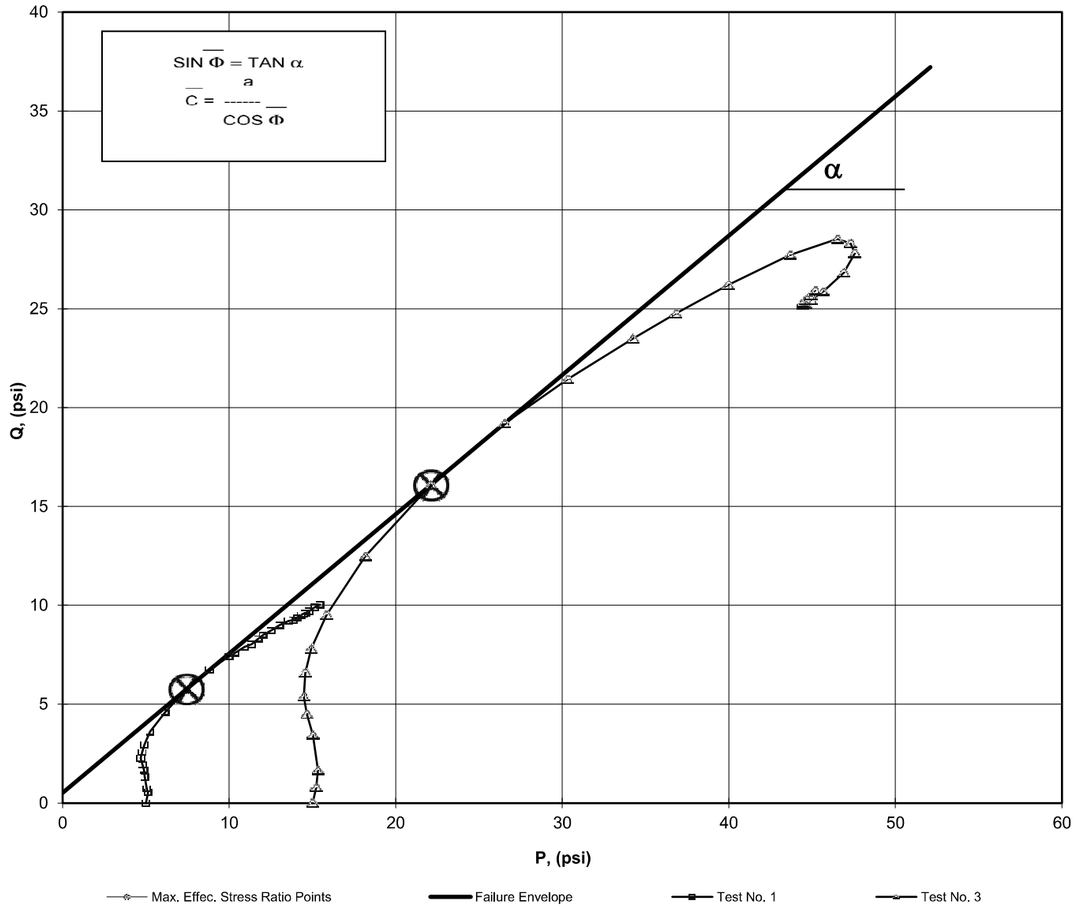
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

AASHTO T-297

Client:	HDR engineering, Inc.	Boring No.:	EB2-A
Client Reference:	BR-0160 Calabash	Depth (ft):	19.6-21.6
Project No.:	R-2021-312-001	Sample No.:	ST-1
Lab ID:	R-2021-312-001-003		

Consolidated Undrained Triaxial Test with Pore Pressure



a =	**0.52**	**$\bar{C}$ =**	**0.73**
α =	**35.2**	**$\bar{\Phi}$ =**	**44.79**

Tested By: 129-07-0411 Date: 12/8/21 Approved By: MPS Date: 12/29/21

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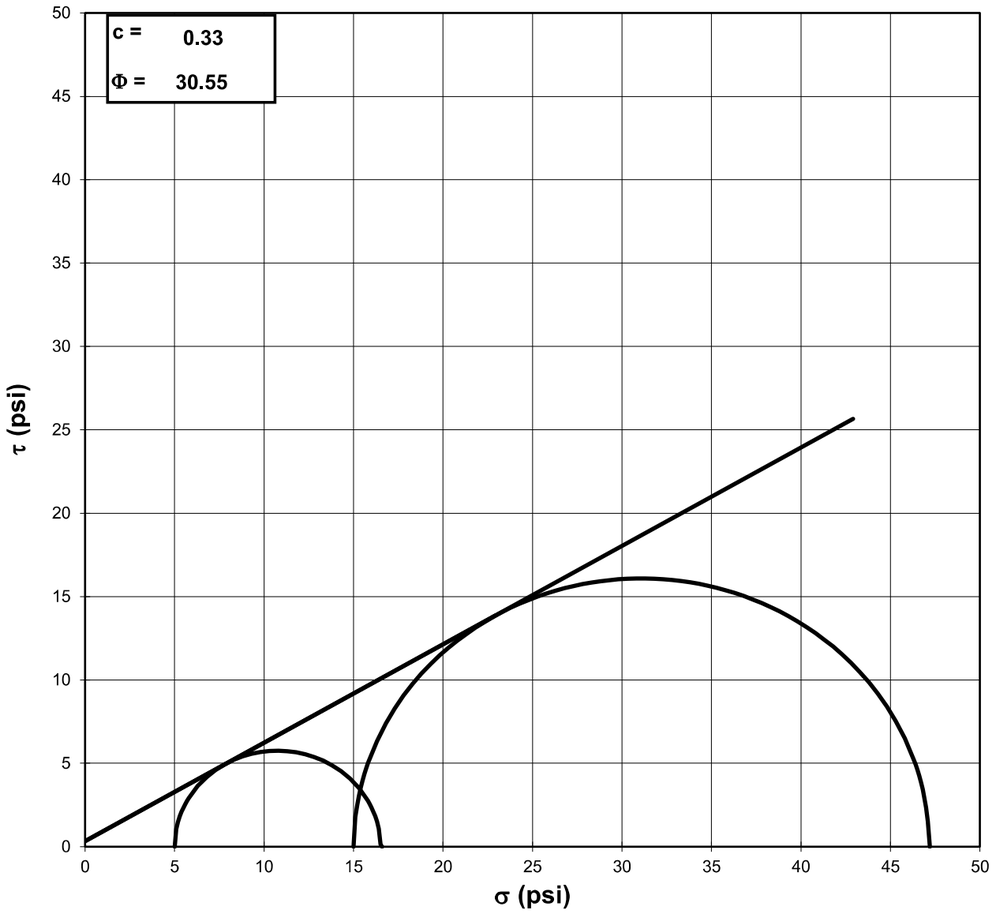
MOHR TOTAL STRENGTH ENVELOPE

AASHTO T-297

Client:	HDR engineering, Inc.	Boring No.:	EB2-A
Client Reference:	BR-0160 Calabash	Depth (ft):	19.6-21.6
Project No.:	R-2021-312-001	Sample No.:	ST-1
Lab ID:	R-2021-312-001-003		
Visual Description:	Gray Sandy Silt (Undisturbed)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: 129-07-041 *Date:* 12/8/21 *Approved By:* MPS *Date:* 12/29/21

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

AASHTO T-297

Client:	HDR engineering, Inc.	Boring No.:	EB2-A
Client Reference:	BR-0160 Calabash	Depth (ft):	19.6-21.6
Project No.:	R-2021-312-001	Sample No.:	ST-1
Lab ID:	R-2021-312-001-003		

Visual Description: Gray Sandy Silt (Undisturbed)

Stage No.	0
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	55.0
Back Pressure (psi)	50.0
Eff. Conf. Pressure (psi)	5.0
Response (%)	99

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	7.43
Q	=	5.75

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.802	Diameter 1:	2.831
Length 2:	5.786	Diameter 2:	2.865
Length 3:	5.756	Diameter 3:	2.855
Length 4:	5.800	Diameter 4:	2.854
Avg. Length:	5.786	*Avg. Diam.:*	2.851

VOLUME CHANGE

Initial Burette Reading (ml)	24.0
Final Burette Reading (ml)	16.1
Final Change (ml)	7.9
Initial Dial Reading (mil)	395
Dial Reading After Saturation (mil)	390
Dial Reading After Consolidation (mil)	418

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
13.5	0.000	50.0
20.2	0.002	50.4
23.0	0.003	50.7
30.3	0.009	51.4
34.9	0.014	51.8
38.3	0.020	52.2
42.5	0.029	52.6
46.4	0.038	52.8
51.4	0.049	53.0
59.8	0.070	53.4
72.7	0.099	53.4
88.2	0.133	53.3
101.8	0.168	52.9
111.2	0.208	52.4
114.0	0.237	52.2
118.8	0.278	52.0
121.7	0.333	51.7
126.7	0.392	51.6
130.2	0.435	51.5
134.6	0.494	51.2
139.4	0.538	51.0
143.3	0.581	50.6
145.2	0.626	50.4
147.8	0.655	50.3
150.3	0.684	50.2
152.2	0.712	50.1
153.1	0.741	50.0
156.2	0.784	49.9
160.2	0.828	49.8
163.1	0.857	49.6
165.1	0.887	49.5

Tested By: 129-07-0411 Date: 12/8/21 Input Checked By: GEM Date: 12/29/21

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

AASHTO T-297

Client:	HDR engineering, Inc.	Boring No.:	EB2-A
Client Reference:	BR-0160 Calabash	Depth (ft):	19.6-21.6
Project No.:	R-2021-312-001	Sample No.:	ST-1
Lab ID:	R-2021-312-001-003		

Visual Description: Gray Sandy Silt (Undisturbed)

Effective Confining Pressure (psi)	5.0	*Stage No.*	0
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	5.79
Initial Sample Diameter (in)	2.85
Initial Sample Area (in^2)	6.38
Initial Sample Volume (in^3)	36.94

VOLUME CHANGE

Volume After Consolidation (in^3)	36.56
Length After Consolidation (in)	5.76
Area After Consolidation (in^2)	6.343

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.03	1.06	0.40	5.66	4.6	1.230	0.38	5.13	0.53
0.05	1.49	0.69	5.80	4.3	1.346	0.47	5.06	0.75
0.15	2.64	1.39	6.25	3.6	1.732	0.53	4.93	1.32
0.25	3.37	1.81	6.57	3.2	2.056	0.54	4.88	1.69
0.35	3.90	2.16	6.74	2.8	2.372	0.56	4.79	1.95
0.51	4.55	2.58	6.96	2.4	2.882	0.57	4.69	2.27
0.66	5.15	2.80	7.35	2.2	3.339	0.55	4.78	2.58
0.86	5.92	3.05	7.88	2.0	4.032	0.52	4.91	2.96
1.21	7.22	3.36	8.86	1.6	5.401	0.47	5.25	3.61
1.71	9.18	3.43	10.75	1.6	6.856	0.38	6.16	4.59
2.31	11.50	3.32	13.18	1.7	7.850	0.29	7.43	5.75
2.91	13.51	2.93	15.58	2.1	7.542	0.22	8.82	6.76
3.61	14.84	2.42	17.42	2.6	6.744	0.16	10.00	7.42
4.12	15.19	2.23	17.97	2.8	6.479	0.15	10.37	7.60
4.82	15.80	1.96	18.84	3.0	6.203	0.13	10.94	7.90
5.78	16.07	1.69	19.37	3.3	5.862	0.11	11.34	8.03
6.80	16.63	1.55	20.08	3.4	5.827	0.09	11.76	8.32
7.55	17.01	1.46	20.56	3.5	5.803	0.09	12.05	8.51
8.57	17.45	1.20	21.26	3.8	5.587	0.07	12.53	8.73
9.33	18.00	0.97	22.03	4.0	5.465	0.05	13.03	9.00
10.08	18.40	0.64	22.76	4.4	5.221	0.04	13.56	9.20
10.86	18.51	0.42	23.10	4.6	5.040	0.02	13.84	9.26
11.36	18.77	0.30	23.47	4.7	4.990	0.02	14.09	9.39
11.86	19.01	0.17	23.84	4.8	4.936	0.01	14.33	9.50
12.36	19.16	0.10	24.06	4.9	4.910	0.01	14.48	9.58
12.86	19.18	0.01	24.17	5.0	4.845	0.00	14.58	9.59
13.61	19.44	-0.07	24.51	5.1	4.833	0.00	14.79	9.72
14.37	19.80	-0.24	25.04	5.2	4.782	-0.01	15.14	9.90
14.88	20.07	-0.42	25.49	5.4	4.704	-0.02	15.45	10.03
15.39	20.23	-0.47	25.70	5.5	4.697	-0.02	15.59	10.11

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

AASHTO T-297

Client:	HDR engineering, Inc.	Boring No.:	EB2-A
Client Reference:	BR-0160 Calabash	Depth (ft):	19.6-21.6
Project No.:	R-2021-312-001	Sample No.:	ST-1
Lab ID:	R-2021-312-001-003		

Visual Description: Gray Sandy Silt (Undisturbed)

Stage No.	0
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	65.0
Back Pressure (psi)	50.0
Eff. Conf. Pressure (psi)	15.0
Pore Pressure Response (%)	99

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	22.10
Q	=	16.09

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.170	Diameter 1:	2.885
Length 2:	6.172	Diameter 2:	2.890
Length 3:	6.186	Diameter 3:	2.887
Length 4:	6.184	Diameter 4:	2.859
Avg. Length:	6.178	*Avg. Diam.:*	2.880

VOLUME CHANGE

Initial Burette Reading (ml)	24.0
Final Burette Reading (ml)	11.2
Final Change (ml)	12.8
Initial Dial Reading (mil)	195
Dial Reading After Saturation (mil)	187
Dial Reading After Consolidation (mil)	242

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
15.4	0.000	50.0
25.7	0.001	50.6
36.9	0.002	51.3
60.0	0.008	53.4
73.7	0.014	54.8
85.2	0.020	55.9
101.0	0.030	57.0
117.0	0.039	57.9
139.4	0.052	58.7
178.7	0.073	59.3
226.9	0.103	59.0
269.3	0.141	57.7
300.7	0.178	56.1
330.5	0.220	54.3
349.1	0.252	53.0
371.2	0.295	51.2
395.7	0.354	49.1
411.1	0.416	47.0
411.1	0.462	46.0
408.6	0.524	45.2
397.7	0.571	44.9
387.3	0.617	45.2
384.4	0.664	45.5
383.5	0.695	45.6
385.1	0.726	45.8
388.5	0.757	45.8
390.8	0.788	45.9
396.0	0.835	45.8
403.3	0.881	45.8
409.1	0.912	45.7
415.1	0.943	45.6

Tested By: 129-07-0411 Date: 12/8/2021 Input Checked By: GEM Date: 12/29/2021

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

AASHTO T-297

Client:	HDR engineering, Inc.	Boring No.:	EB2-A
Client Reference:	BR-0160 Calabash	Depth (ft):	19.6-21.6
Project No.:	R-2021-312-001	Sample No.:	ST-1
Lab ID:	R-2021-312-001-003		

Visual Description: Gray Sandy Silt (Undisturbed)

Effective Confining Pressure (psi)	15.0	*Stage No.*	0
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	6.18
Initial Sample Diameter (in)	2.88
Initial Sample Area (in^2)	6.52
Initial Sample Volume (in^3)	40.25

VOLUME CHANGE

Volume After Consolidation (in^3)	39.63
Length After Consolidation (in)	6.13
Area After Consolidation (in^2)	6.464

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.01	1.58	0.57	16.01	14.4	1.110	0.37	15.22	0.79
0.03	3.31	1.33	16.99	13.7	1.242	0.40	15.33	1.66
0.13	6.89	3.43	18.46	11.6	1.595	0.50	15.02	3.44
0.24	9.00	4.85	19.15	10.2	1.886	0.54	14.65	4.50
0.33	10.76	5.89	19.87	9.1	2.182	0.55	14.49	5.38
0.49	13.17	7.02	21.15	8.0	2.650	0.54	14.57	6.58
0.64	15.61	7.89	22.72	7.1	3.195	0.51	14.91	7.80
0.84	19.02	8.67	25.35	6.3	4.004	0.46	15.84	9.51
1.19	24.95	9.31	30.65	5.7	5.382	0.38	18.17	12.48
1.68	32.17	8.99	38.18	6.0	6.351	0.28	22.10	16.09
2.29	38.38	7.67	45.71	7.3	6.236	0.20	26.52	19.19
2.90	42.85	6.11	51.74	8.9	5.819	0.14	30.32	21.42
3.60	46.98	4.25	57.73	10.7	5.373	0.09	34.24	23.49
4.10	49.50	2.95	61.55	12.0	5.108	0.06	36.80	24.75
4.81	52.40	1.23	66.17	13.8	4.805	0.02	39.97	26.20
5.77	55.44	-0.95	71.39	15.9	4.476	-0.02	43.67	27.72
6.78	57.06	-2.99	75.05	18.0	4.172	-0.05	46.52	28.53
7.53	56.60	-4.00	75.60	19.0	3.979	-0.07	47.30	28.30
8.55	55.63	-4.76	75.39	19.8	3.816	-0.09	47.57	27.81
9.31	53.63	-5.09	73.72	20.1	3.670	-0.10	46.90	26.82
10.07	51.74	-4.81	71.55	19.8	3.612	-0.09	45.68	25.87
10.84	50.90	-4.50	70.40	19.5	3.610	-0.09	44.95	25.45
11.34	50.49	-4.37	69.86	19.4	3.607	-0.09	44.61	25.24
11.83	50.42	-4.24	69.66	19.2	3.621	-0.08	44.45	25.21
12.35	50.59	-4.17	69.75	19.2	3.639	-0.08	44.46	25.29
12.85	50.61	-4.14	69.76	19.1	3.644	-0.08	44.45	25.31
13.62	50.86	-4.16	70.01	19.2	3.655	-0.08	44.59	25.43
14.38	51.38	-4.24	70.62	19.2	3.671	-0.08	44.93	25.69
14.88	51.84	-4.27	71.11	19.3	3.691	-0.08	45.19	25.92
15.38	52.32	-4.40	71.72	19.4	3.696	-0.09	45.56	26.16

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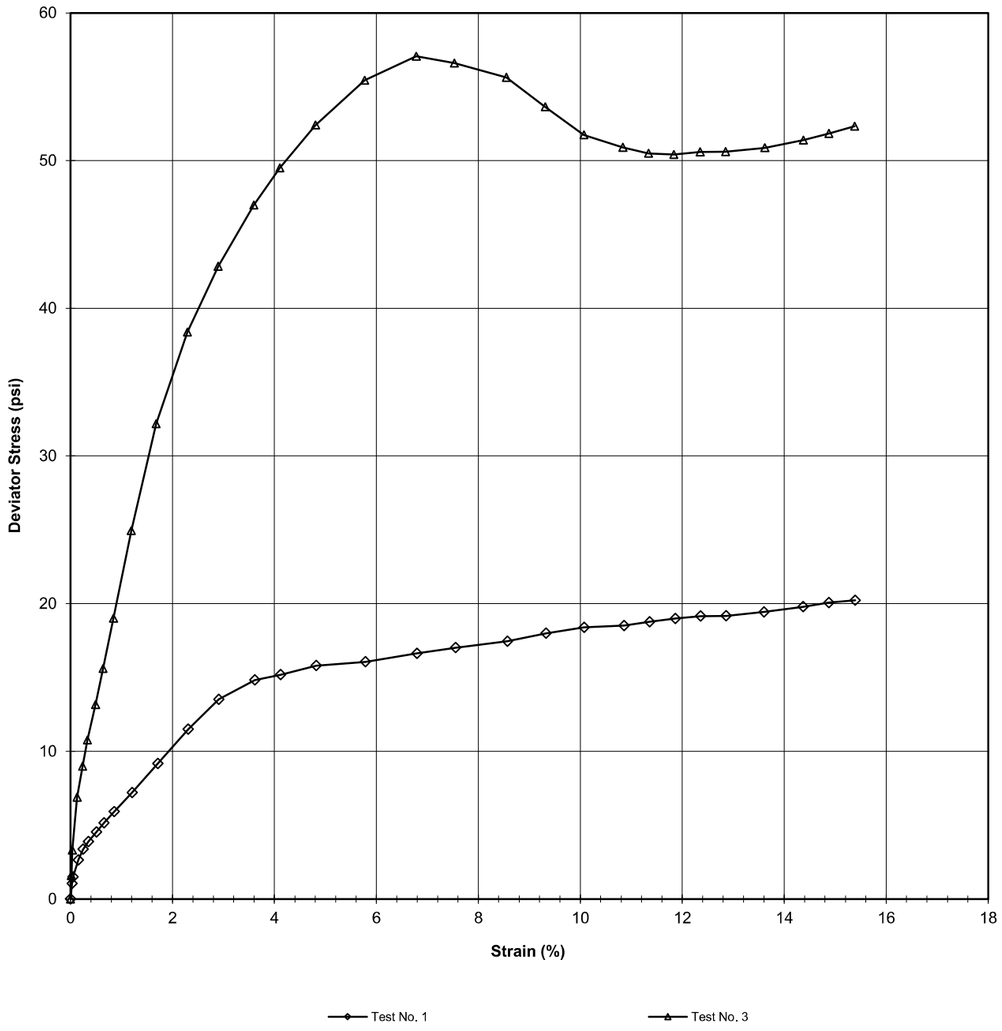
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

Client:	HDR engineering, Inc.	Boring No.:	EB2-A
Client Reference:	BR-0160 Calabash	Depth (ft):	19.6-21.6
Project No.:	R-2021-312-001	Sample No.:	ST-1
Lab ID:	R-2021-312-001-003		
Visual Description:	Gray Sandy Silt (Undisturbed)		



Tested By: 129-07-0411 Date: 12/8/2021 Approved By: MPS Date: 12/29/2021

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	HDR engineering, Inc.		
Client Reference:	BR-0160 Calabash		
Project No.:	R-2021-312-001		
Lab ID:	R-2021-312-001-003	Specific Gravity (measured)	2.71
Visual Description:	Gray Sandy Silt (Undisturbed)		

SAMPLE CONDITION SUMMARY

Boring No.:	EB2-A	EB2-A
Depth (ft):	19.6-21.6	19.6-21.6
Sample No.:	ST-1	ST-1
Test No.	T1	T3
Deformation Rate (in/min)	0.002	0.002
Back Pressure (psi)	50.0	50.0
Consolidation Time (days)	1	1
Moisture Content (%) (INITIAL)	27.4	27.4
Total Unit Weight (pcf)	119.6	121.4
Dry Unit Weight (pcf)	93.9	95.3
Moisture Content (%) (FINAL)	30.3	26.4
Initial State Void Ratio,e	0.802	0.776
Void Ratio at Shear, e	0.784	0.748

Tested By: 129-07-041 Date: 12/8/21 Input Checked By: GEM Date: 12/29/21

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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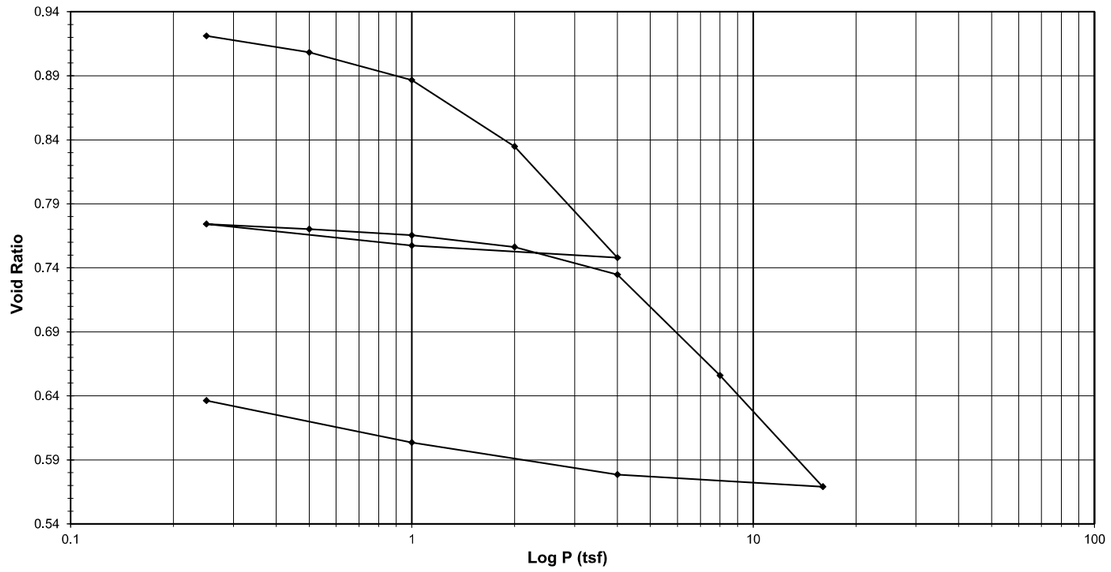
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Reference	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-07-0411 *Date* 12/17/2021 *Approved By* MPS *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 6

Y:\2021 PROJECTS\HDR\2021-312 - BR-0160 Calabash\[2021-312-001-004 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Reference	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED

Consolidometer No. R554

1 Division = 0.0001 (in.)

Sample Properties	**Initial**	**Final**
Water Content		
Tare Number	424	714
Wt. Tare & WS (g)	455.09	226.81
Wt. Tare & DS (g)	365.94	200.82
Wt. Water (g)	89.15	25.99
Wt. Tare (g)	98.44	87.30
Wt. DS (g)	267.50	113.52
Water Content (%)	33.33	22.89
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.0000	0.8453
Sample Volume (cc)	80.44	67.99
Wt. Wet Sample + Ring (g)	253.90	242.20
Wt. of Ring (g)	104.32	104.32
Wt. of Wet Sample (g)	149.58	137.88
Wet Density (pcf)	116.03	126.53
Wet Density (g/cc)	1.86	2.03
Water Content (%)	33.33	22.89
Wt. of Dry Sample (g)	112.19	112.19
Dry Density (pcf)	87.03	102.96
Dry Density (g/cc)	1.39	1.65
Void Ratio	0.9359	0.6364
Saturation (%)	96.15	97.14
Specific Gravity	2.70	*Measured*

Test Data Summary

Applied Pressure (tsf)	**Final Dial Reading** (div)	**Machine Deflection** (div)	**Corrected Reading** (div)	**Height of Sample** (mm)	**Volume** (cc)	**Dry Density** (g/cc)	**Void Ratio**
Seating	0	0	0	25.400	80.440	1.39471	**0.93589**
0.25	88.5	12.9	75.7	25.208	79.831	1.40535	**0.92123**
0.5	162.3	19.7	142.6	25.038	79.293	1.41488	**0.90829**
1	282.9	28.5	254.4	24.754	78.393	1.43112	**0.88663**
2	573.9	51.5	522.4	24.073	76.238	1.47158	**0.83476**
4	1042.1	71.6	970.5	22.935	72.633	1.54462	**0.74800**
1	968.9	46.6	922.2	23.057	73.021	1.53640	**0.75735**
0.25	857.5	22.5	835.1	23.279	73.722	1.52179	**0.77422**
0.5	879.2	23.9	855.4	23.227	73.559	1.52517	**0.77029**
1	913.1	32.9	880.1	23.164	73.360	1.52931	**0.76550**
2	979.4	51.6	927.8	23.043	72.976	1.53735	**0.75627**
4	1110.2	70.8	1039.5	22.760	72.078	1.55650	**0.73466**
8	1545.2	98.8	1446.4	21.726	68.805	1.63055	**0.65588**
16	2040.6	145.7	1894.9	20.587	65.197	1.72078	**0.56906**
4	1933.1	87.2	1845.9	20.711	65.591	1.71045	**0.57853**
1	1768.8	52.2	1716.6	21.040	66.631	1.68375	**0.60357**
0.25	1572.9	25.7	1547.2	21.470	67.994	1.65000	**0.63636**

Tested By 129-07-0411 *Date* 12/17/2021 *Input Checked By* GEM *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 6

Y:\2021 PROJECTS\HDR\2021-312 - BR-0160 Calabash\[2021-312-001-004 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

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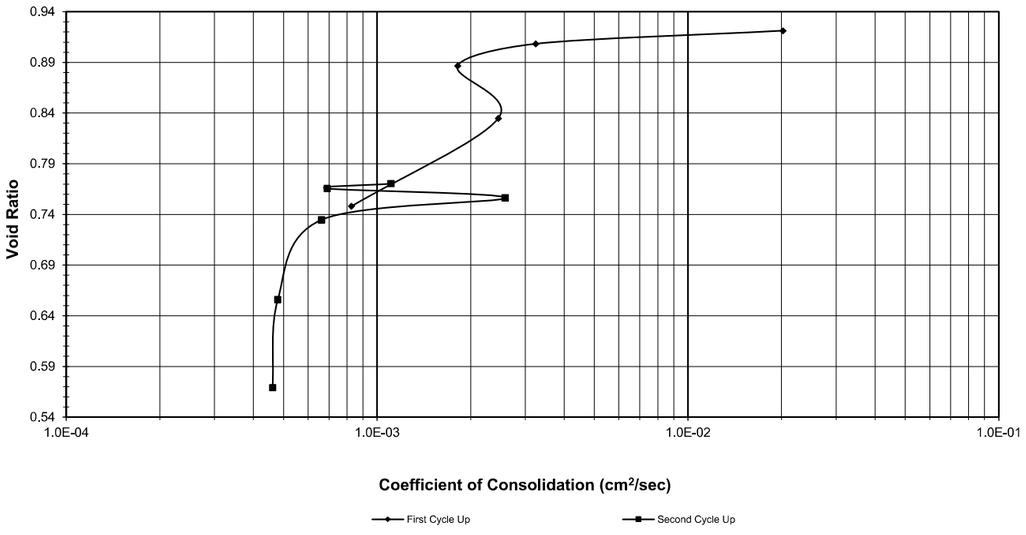
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Reference	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-07-0411 *Date* 12/17/2021 *Input Checked By* GEM *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 6

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Reference	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED

Consolidometer No. R554

1 Division = 0.0001 (in.)

Sample Properties	Initial	Final
Water Content		
Tare Number	424	714
Wt. Tare & WS (g)	455.09	226.81
Wt. Tare & DS (g)	365.94	200.82
Wt. Water (g)	89.15	25.99
Wt. Tare (g)	98.44	87.30
Wt. DS (g)	267.50	113.52
Water Content (%)	33.33	22.89
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.000	0.845
Sample Volume (cc)	80.44	67.99
Wt. Wet Sample + Ring (g)	253.90	242.20
Wt. of Ring (g)	104.32	104.32
Wt. of Wet Sample (g)	149.58	137.88
Wet Density (pcf)	116.03	126.53
Wet Density (g/cc)	1.86	2.03
Water Content (%)	33.33	22.89
Wt. of Dry Sample (g)	112.19	112.19
Dry Density (pcf)	87.03	102.96
Dry Density (g/cc)	1.39	1.65
Void Ratio	0.9359	0.6364
Saturation (%)	96.15	97.14
Specific Gravity	*2.70*	*Measured*

C_v Test Data Summary

Load Increment	Dial Reading @ t_{50}	Machine Deflection	Corrected Dial Reading @ t_{50}	Sample Height @ t_{50}	Time t_{50}	C_v
(tsf)	(div)	(div)	(div)	(cm)	(min.)	**(cm²/sec)**
0 - 0.25	48.2	12.9	35.3	2.531	**0.26**	**0.02022**
0.25 - 0.5	126.8	19.7	107.0	2.513	**1.60**	**0.00324**
0.5 - 1.0	227.8	28.5	199.3	2.489	**2.80**	**0.00182**
1.0 - 2.0	422.6	51.5	371.0	2.446	**2.00**	**0.00246**
2.0 - 4.0	809.2	71.6	737.6	2.353	**5.50**	**0.00083**
4.0 - 1.0	NA	46.6	NA	NA	**NA**	**NA**
1.0 - 0.25	NA	22.5	NA	NA	**NA**	**NA**
0.25 - 0.5	867.7	23.9	843.8	2.326	**4.00**	**0.00111**
0.5 - 1.0	891.7	32.9	858.8	2.322	**6.40**	**0.00069**
1.0 - 2.0	946.4	51.6	894.8	2.313	**1.70**	**0.00258**
2.0 - 4.0	1050.2	70.8	979.4	2.291	**6.50**	**0.00066**
4.0 - 8.0	1326.8	98.8	1228.0	2.228	**8.50**	**0.00048**
8.0 - 16.0	1798.5	145.7	1652.8	2.120	**8.00**	**0.00046**
16.0 - 4.0	NA	87.2	NA	NA	**NA**	**NA**
4.0 - 1.0	NA	52.2	NA	NA	**NA**	**NA**
1.0 - 0.25	NA	25.7	NA	NA	**NA**	**NA**

Tested By 129-07-0411 *Date* 12/17/2021 *Input Checked By* GEM *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 6

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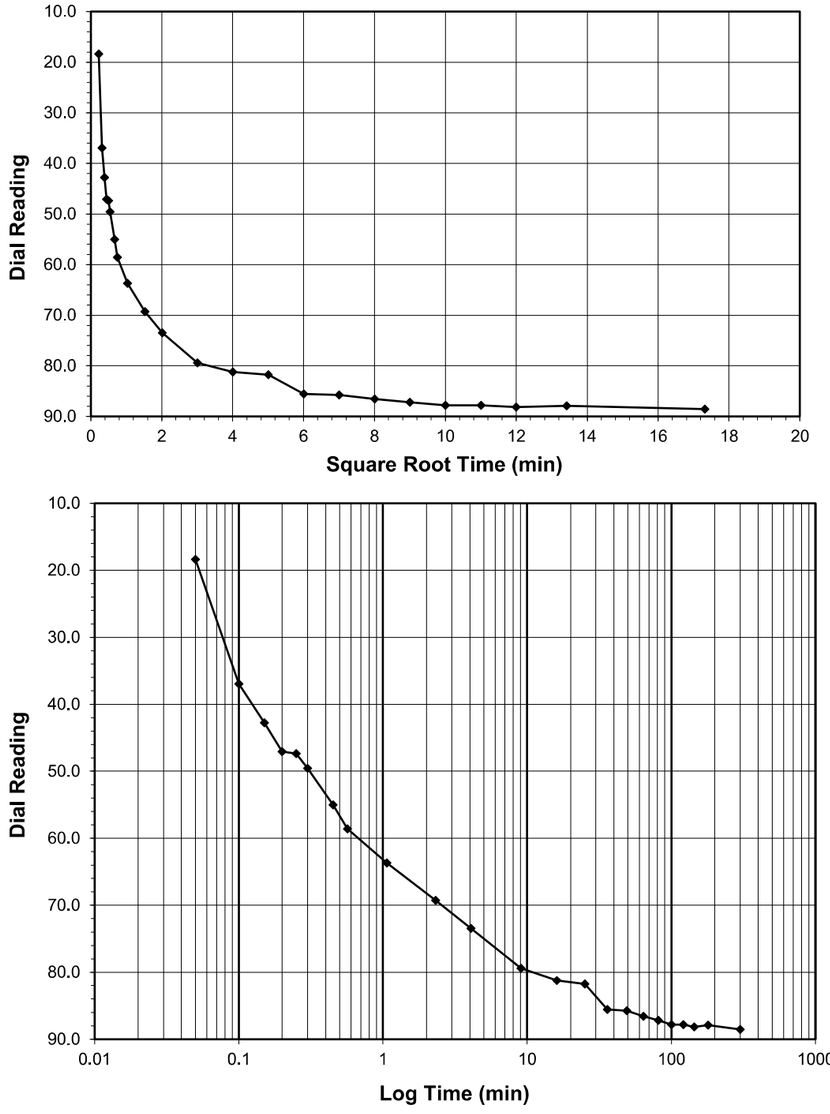
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.0-0.25**
Final Reading	**(div)**	**88.5**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/17/2021
Start Time		11:59:05

Elapsed Time (min)	Dial Reading (div)
Initial	**0.0**
0.05	18.4
0.10	37.0
0.15	42.8
0.20	47.1
0.25	47.4
0.30	49.6
0.45	55.0
0.57	58.6
1.07	63.7
2.32	69.3
4.07	73.5
9.07	79.4
16.07	81.2
25.07	81.8
36.07	85.6
49.07	85.7
64.07	86.6
81.07	87.2
100.07	87.8
121.07	87.8
144.07	88.1
180.07	87.9
300.07	88.5

Tested By 129-07-0411 *Date* 12/17/2021 *Checked By* GEM *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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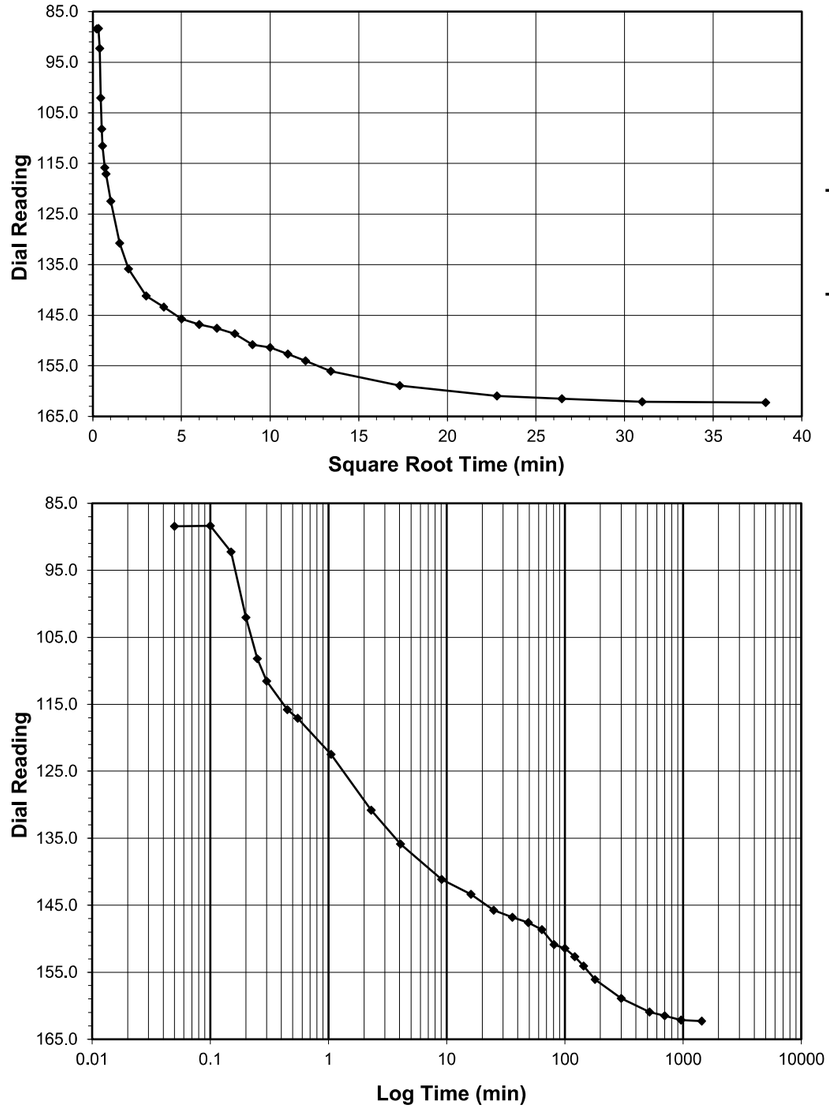
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**162.3**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/17/2021
Start Time		16:59:28

Elapsed Time (min)	Dial Reading (div)
Initial	**88.5**
0.05	88.4
0.10	88.4
0.15	92.3
0.20	102.0
0.25	108.2
0.30	111.6
0.45	115.8
0.55	117.1
1.05	122.5
2.30	130.8
4.07	135.8
9.07	141.2
16.07	143.4
25.07	145.7
36.07	146.8
49.07	147.6
64.07	148.6
81.07	150.8
100.07	151.4
121.07	152.7
144.07	154.1
180.07	156.1
300.07	158.9
520.07	160.9
700.07	161.5
960.08	162.1
1440.08	162.3

Tested By 129-07-0411 *Date* 12/17/2021 *Checked By* GEM *Date* 1/4/2022

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DCN: CT-24E Date: 5/3/12 Revision: 3

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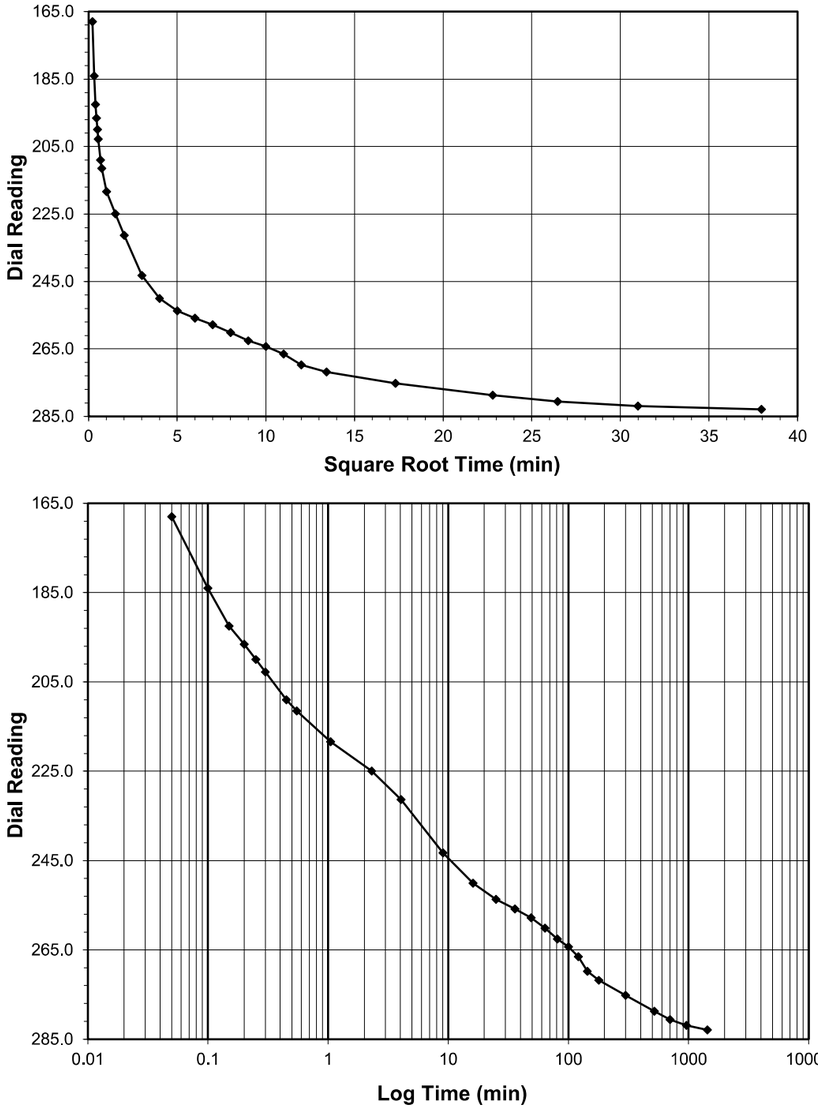
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**282.9**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/18/2021
Start Time		16:59:33

Elapsed Time (min)	Dial Reading (div)
Initial	**162.3**
0.05	168.0
0.10	184.0
0.15	192.5
0.20	196.5
0.25	200.0
0.30	202.8
0.45	209.0
0.55	211.5
1.05	218.4
2.30	225.0
4.05	231.4
9.05	243.2
16.05	250.1
25.05	253.7
36.05	255.8
49.05	257.8
64.05	260.1
81.05	262.6
100.05	264.3
121.05	266.5
144.05	269.8
180.05	271.8
300.05	275.2
520.05	278.8
700.05	280.6
960.07	281.9
1440.07	282.9

Tested By *129-07-0411* *Date* 12/18/2021 *Checked By* *GEM* *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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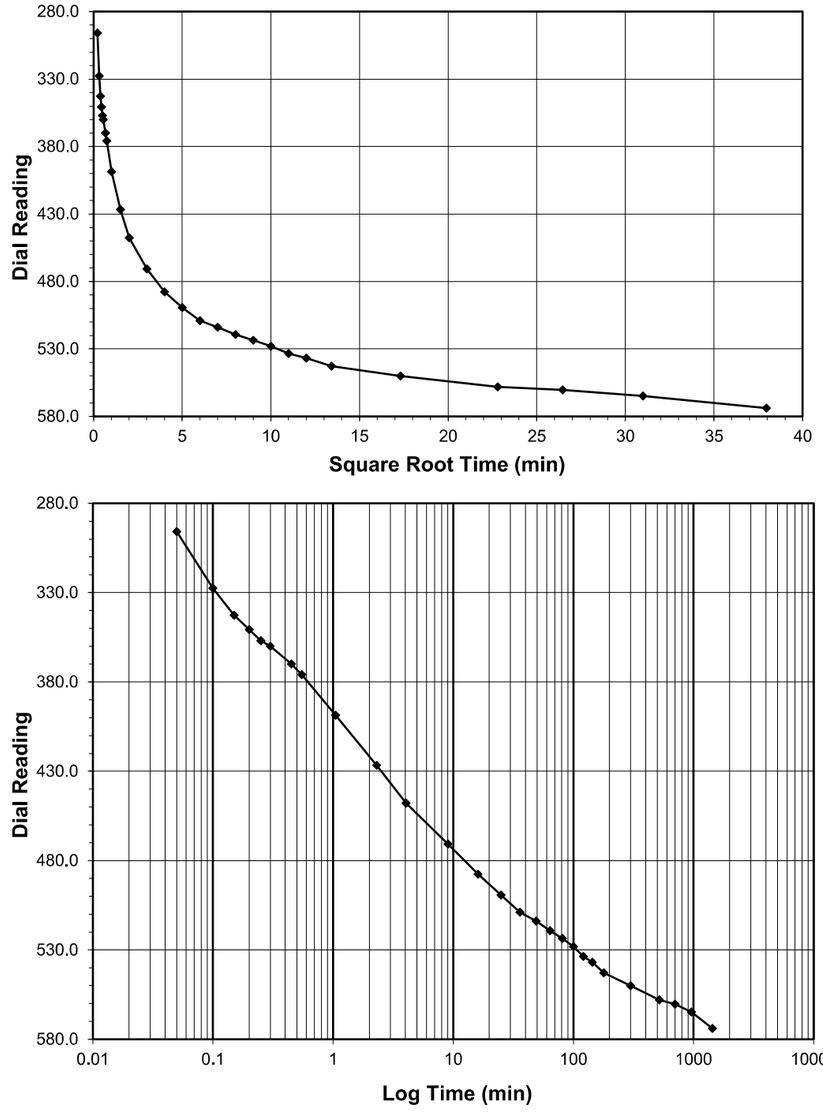
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**573.9**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/19/2021
Start Time		17:00:00

Elapsed Time (min)	Dial Reading (div)
Initial	**282.9**
0.05	295.8
0.10	327.6
0.15	342.6
0.20	350.6
0.25	356.9
0.30	360.0
0.45	370.0
0.55	375.9
1.05	398.6
2.30	426.7
4.05	447.8
9.05	470.8
16.05	487.6
25.05	499.3
36.05	509.0
49.05	513.9
64.05	519.3
81.05	523.7
100.07	528.1
121.07	533.5
144.07	536.9
180.07	542.8
300.07	550.1
520.07	558.1
700.07	560.4
960.07	564.8
1440.08	573.9

Tested By *129-07-0411* *Date* 12/19/2021 *Checked By* *GEM* *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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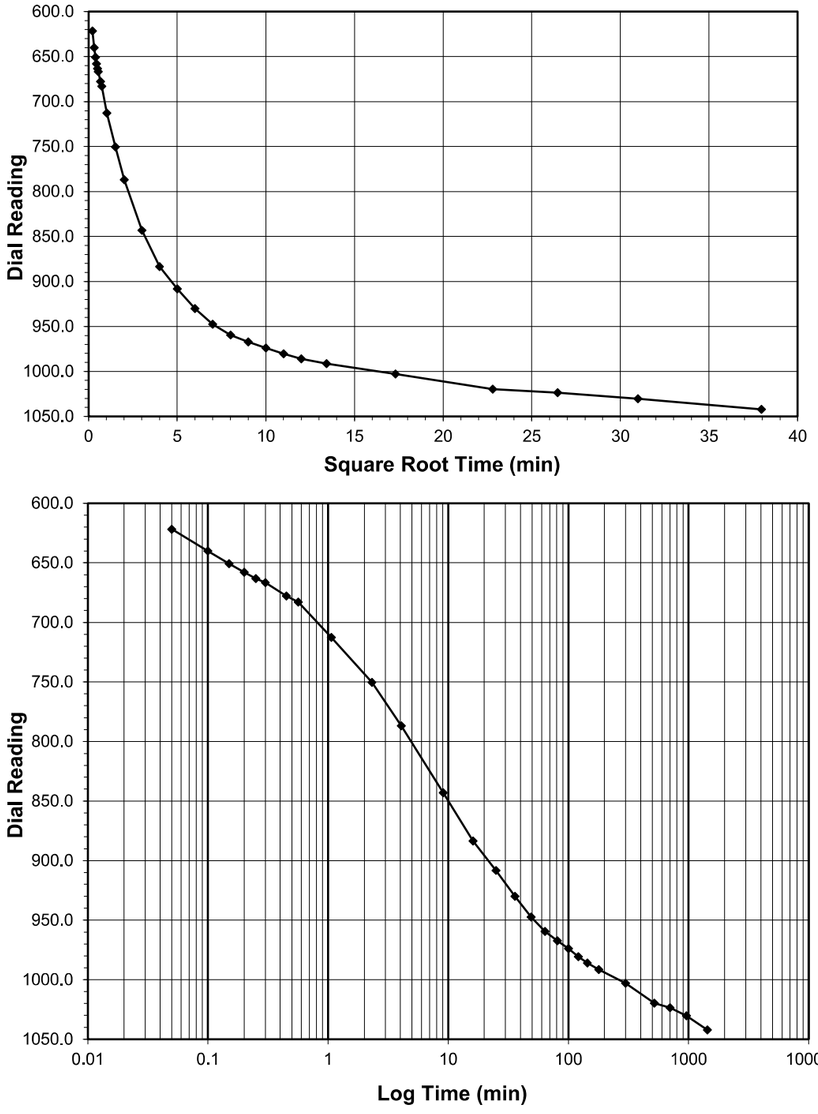
AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**1042.1**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/20/2021
Start Time		17:00:27

Elapsed Time (min)	Dial Reading (div)
Initial	**573.9**
0.05	621.7
0.10	640.0
0.15	650.8
0.20	658.0
0.25	663.3
0.30	666.7
0.45	677.8
0.57	682.9
1.07	712.6
2.32	750.4
4.07	786.8
9.07	843.2
16.07	883.6
25.07	908.2
36.07	930.1
49.07	947.4
64.07	959.5
81.07	967.4
100.07	973.9
121.07	980.6
144.08	986.0
180.08	991.4
300.08	1003.0
520.08	1019.7
700.08	1023.7
960.08	1030.2
1440.08	1042.1

Tested By 129-07-0411 *Date* 12/20/2021 *Checked By* GEM *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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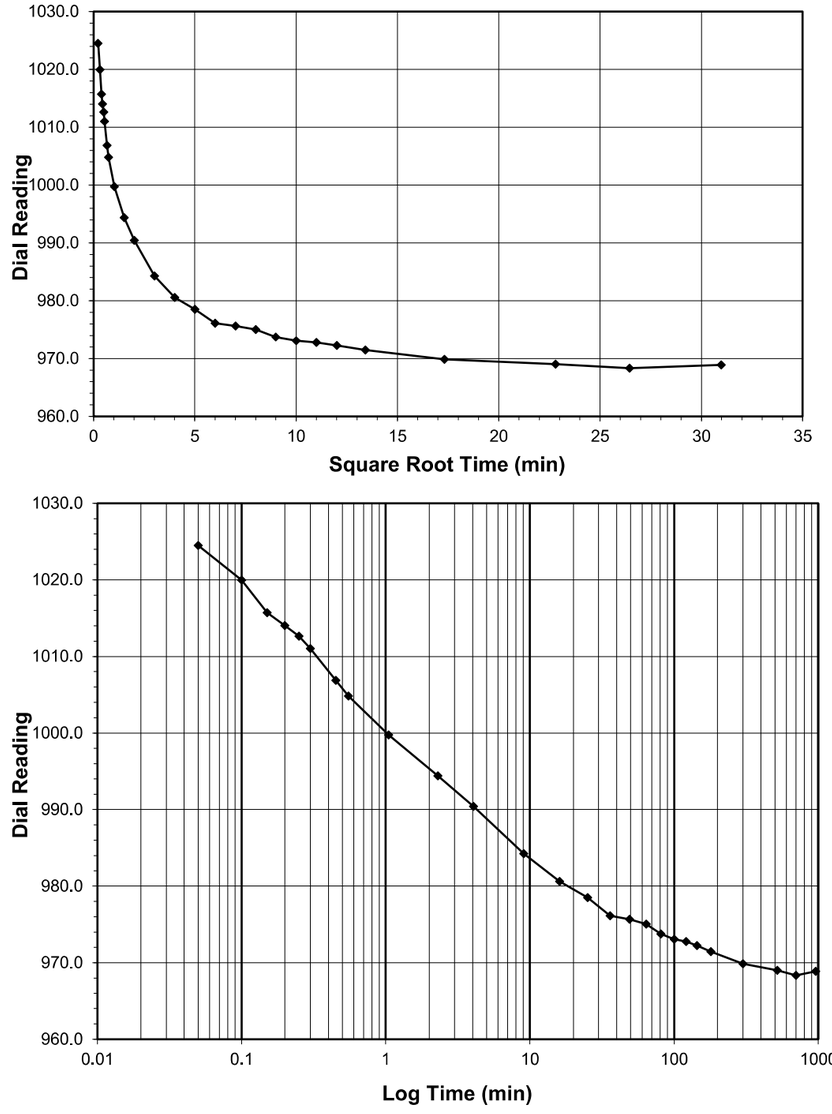
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-1.0**
Final Reading	**(div)**	**968.9**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/21/2021
Start Time		17:00:52

Elapsed Time (min)	Dial Reading (div)
Initial	**1042.1**
0.05	1024.5
0.10	1020.0
0.15	1015.7
0.20	1014.1
0.25	1012.6
0.30	1011.0
0.45	1006.9
0.55	1004.8
1.05	999.7
2.30	994.4
4.05	990.4
9.05	984.3
16.05	980.6
25.05	978.5
36.05	976.1
49.05	975.7
64.05	975.0
81.05	973.7
100.07	973.1
121.07	972.8
144.07	972.2
180.07	971.5
300.07	969.9
520.07	969.0
700.07	968.3
960.07	968.9

Tested By 129-07-0411 *Date* 12/21/2021 *Checked By* GEM *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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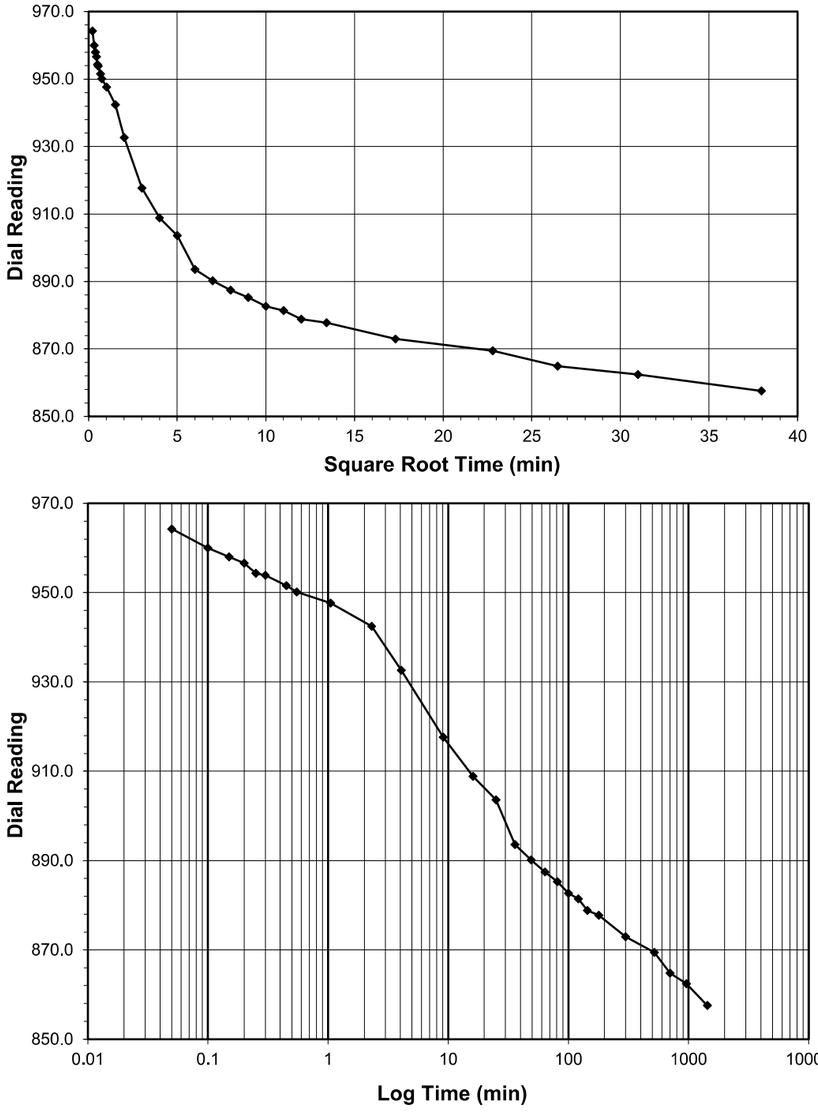
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-0.25**
Final Reading	**(div)**	**857.5**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/22/2021
Start Time		9:15:45

Elapsed Time (min)	Dial Reading (div)
Initial	**968.9**
0.05	964.3
0.10	960.0
0.15	958.0
0.20	956.6
0.25	954.3
0.30	953.8
0.45	951.5
0.55	950.1
1.05	947.7
2.30	942.5
4.07	932.6
9.07	917.7
16.07	908.9
25.07	903.6
36.07	893.6
49.07	890.2
64.07	887.5
81.07	885.2
100.07	882.7
121.08	881.4
144.08	878.8
180.08	877.8
300.08	872.9
520.08	869.4
700.08	864.8
960.08	862.4
1440.08	857.5

Tested By *129-07-0411* *Date* 12/22/2021 *Checked By* *GEM* *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

Y:\2021 PROJECTS\HDR\2021-312 - BR-0160 Calabash\[2021-312-001-004 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

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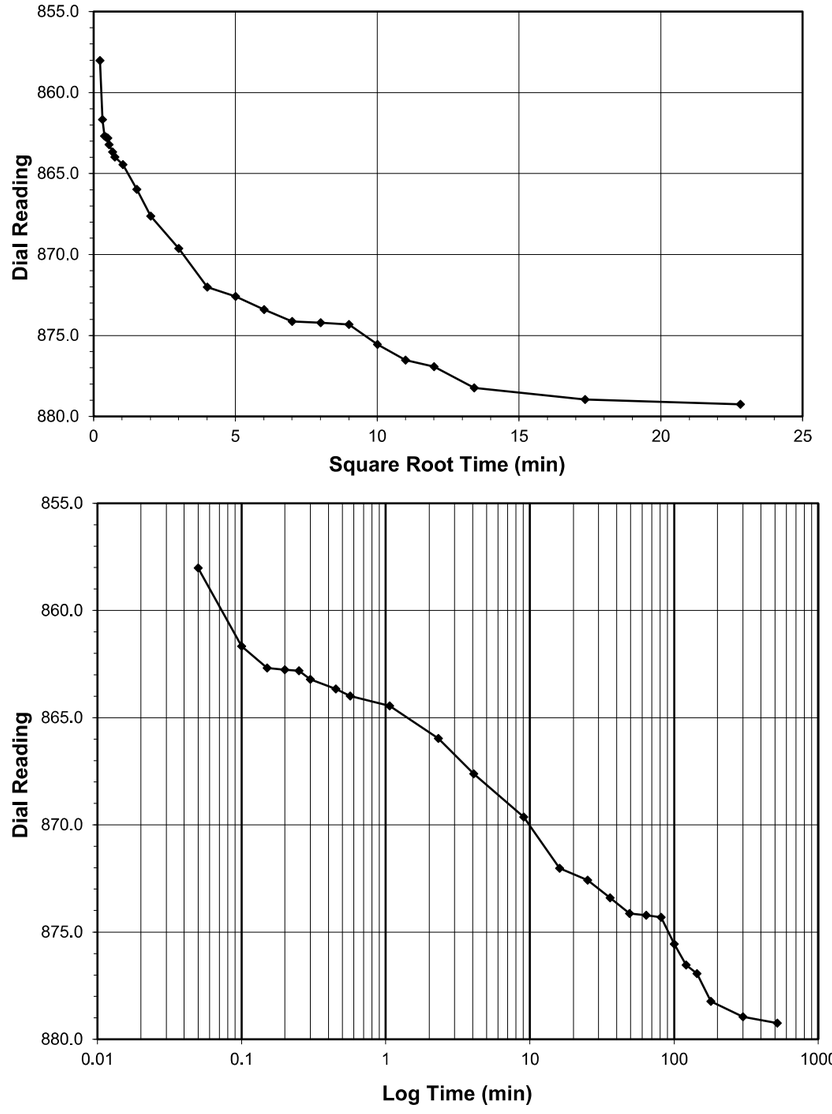
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**879.2**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/23/2021
Start Time		9:16:02

Elapsed Time (min)	Dial Reading (div)
Initial	**857.5**
0.05	858.0
0.10	861.7
0.15	862.7
0.20	862.8
0.25	862.8
0.30	863.2
0.45	863.7
0.57	864.0
1.07	864.5
2.32	866.0
4.07	867.6
9.07	869.6
16.07	872.0
25.07	872.6
36.07	873.4
49.07	874.1
64.07	874.2
81.07	874.3
100.07	875.6
121.08	876.5
144.08	876.9
180.08	878.2
300.08	879.0
520.08	879.2

Tested By *129-07-0411* *Date* 12/23/2021 *Checked By* *GEM* *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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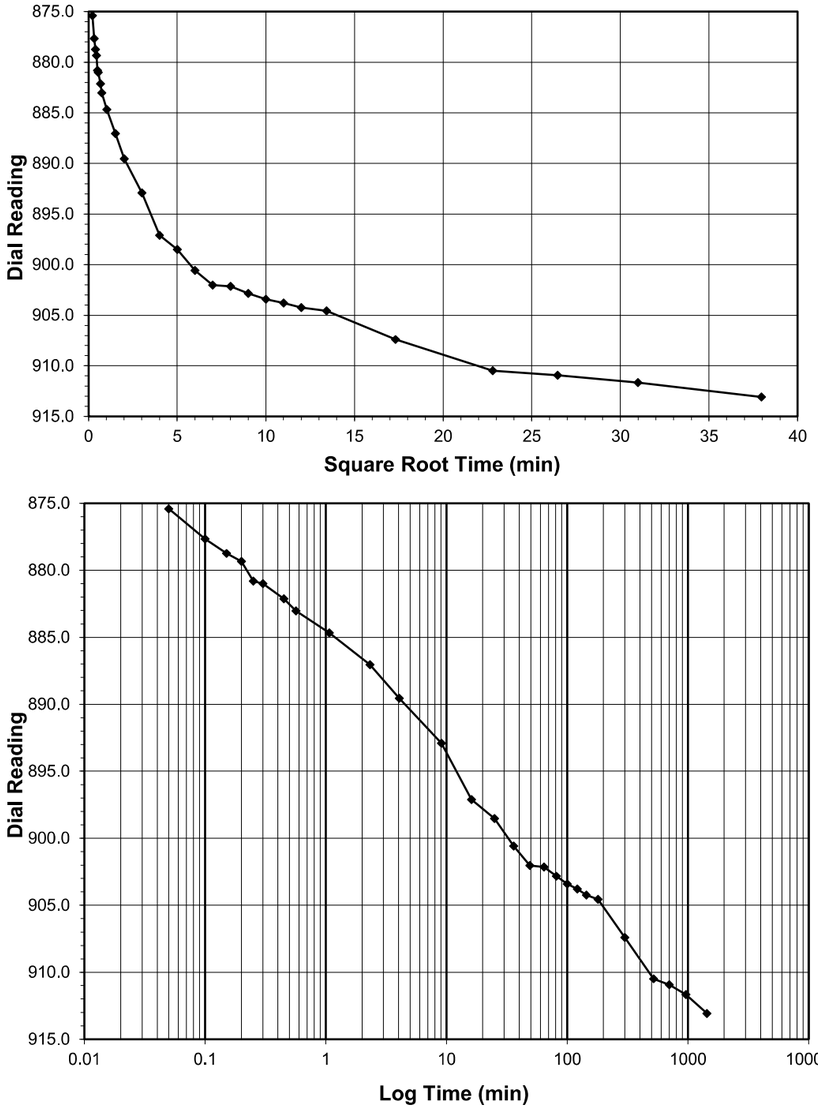
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**913.1**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/24/2021
Start Time		9:16:12

Elapsed Time (min)	Dial Reading (div)
Initial	**879.2**
0.05	875.4
0.10	877.7
0.15	878.7
0.20	879.3
0.25	880.8
0.30	881.0
0.45	882.1
0.57	883.0
1.07	884.7
2.32	887.1
4.07	889.5
9.07	892.9
16.07	897.1
25.07	898.5
36.07	900.6
49.07	902.0
64.07	902.1
81.07	902.8
100.07	903.4
121.08	903.8
144.08	904.2
180.08	904.6
300.08	907.4
520.08	910.5
700.08	910.9
960.10	911.7
1440.02	913.1

Tested By 129-07-0411 *Date* 12/24/2021 *Checked By* GEM *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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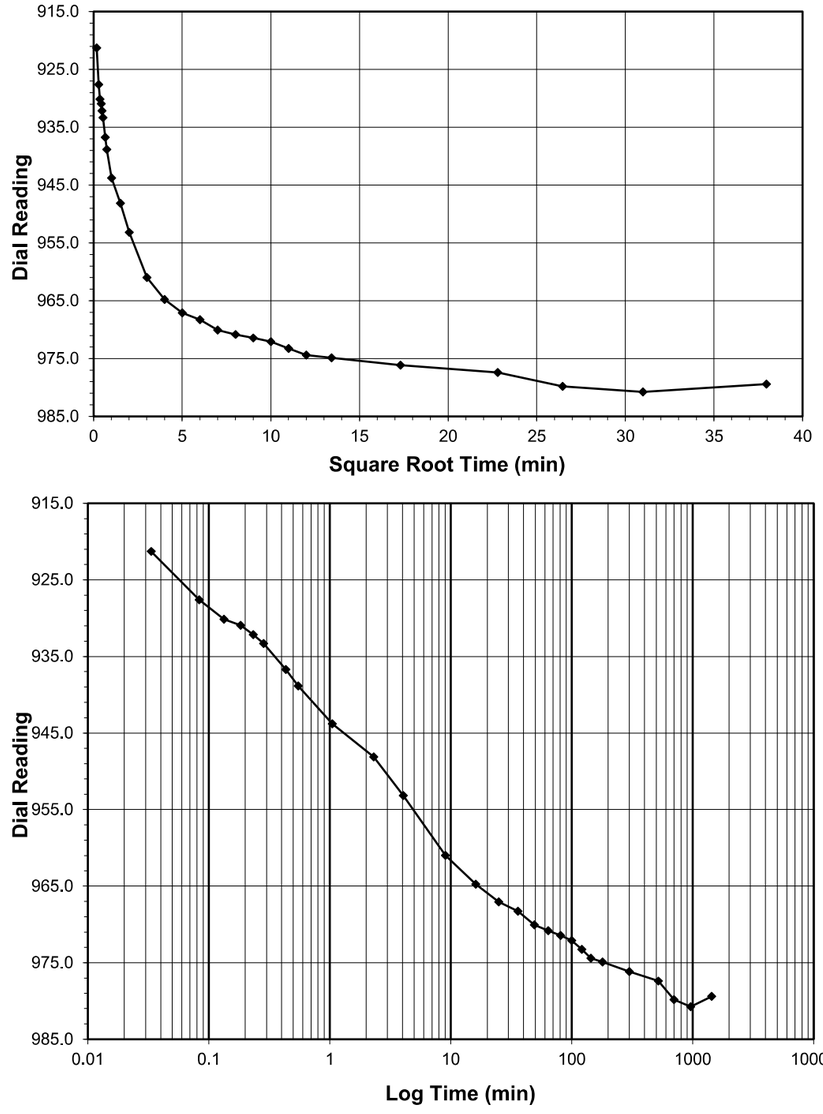
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**979.4**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/25/2021
Start Time		9:16:13

Elapsed Time (min)	Dial Reading (div)
Initial	**913.1**
0.03	921.3
0.08	927.6
0.13	930.1
0.18	930.9
0.23	932.1
0.28	933.3
0.43	936.7
0.55	938.8
1.05	943.8
2.30	948.1
4.05	953.2
9.05	961.0
16.05	964.8
25.05	967.1
36.05	968.3
49.05	970.1
64.05	970.8
81.05	971.4
100.05	972.1
121.05	973.3
144.05	974.4
180.07	974.9
300.07	976.1
520.07	977.4
700.07	979.8
960.07	980.8
1440.03	979.4

Tested By 129-07-0411 *Date* 12/25/2021 *Checked By* GEM *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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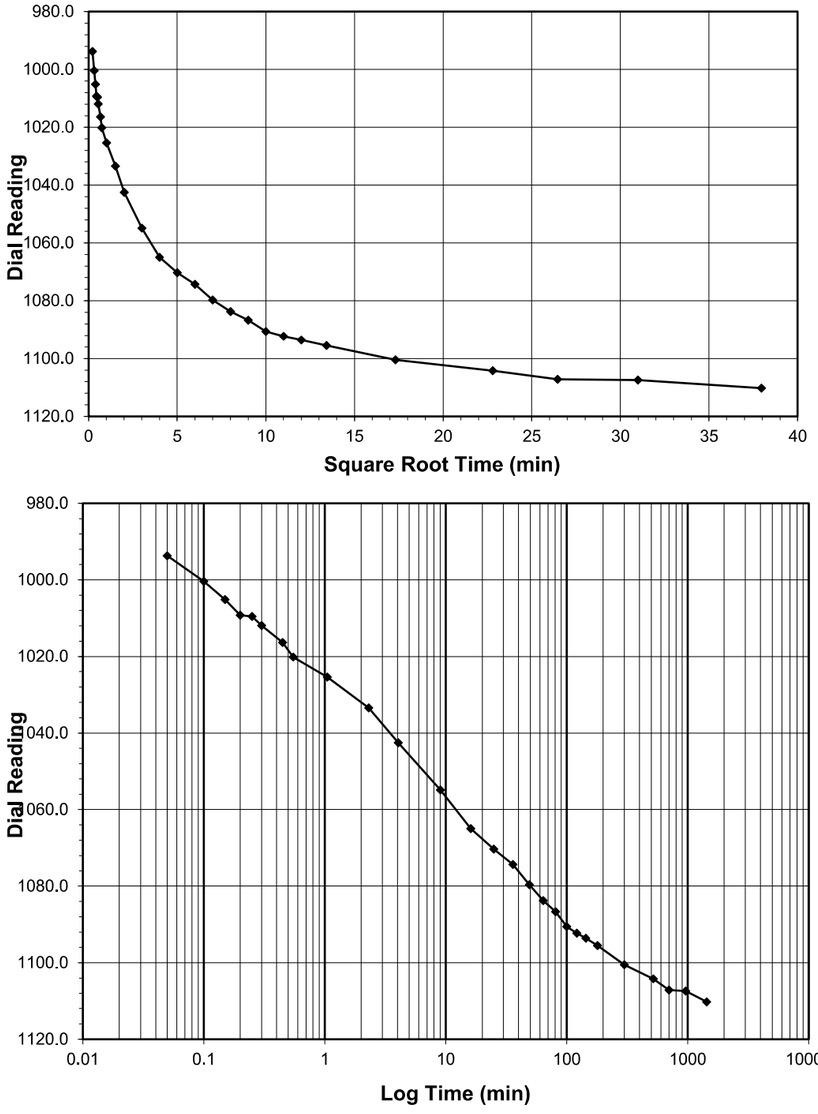
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**1110.2**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/26/2021
Start Time		9:16:16

Elapsed Time (min)	Dial Reading (div)
Initial	**979.4**
0.05	993.7
0.10	1000.4
0.15	1005.1
0.20	1009.2
0.25	1009.5
0.30	1011.9
0.45	1016.4
0.55	1020.2
1.05	1025.4
2.30	1033.5
4.05	1042.5
9.05	1054.9
16.05	1065.0
25.05	1070.3
36.05	1074.3
49.05	1079.7
64.05	1083.8
81.05	1086.7
100.05	1090.6
121.05	1092.3
144.05	1093.6
180.05	1095.5
300.07	1100.5
520.07	1104.2
700.07	1107.2
960.07	1107.5
1440.07	1110.2

Tested By *129-07-0411* *Date* 12/26/2021 *Checked By* *GEM* *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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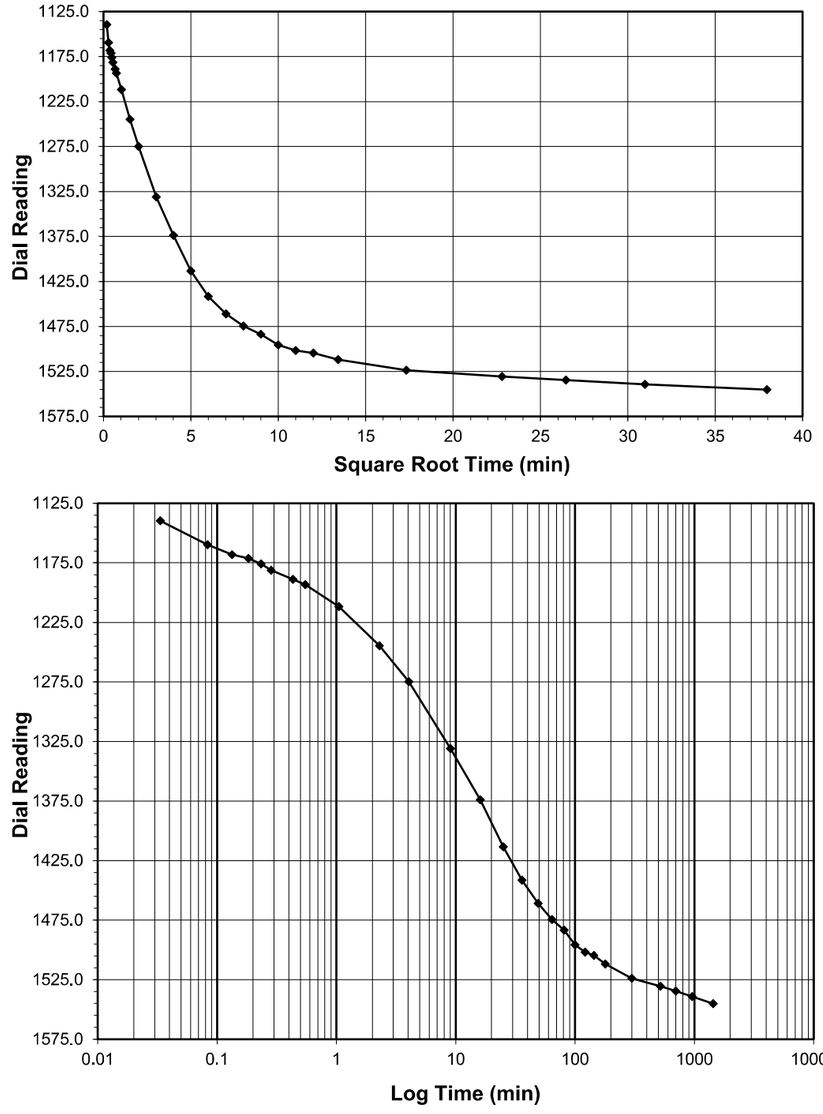
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-8.0**
Final Reading	**(div)**	**1545.2**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/27/2021
Start Time		9:16:23

Elapsed Time (min)	Dial Reading (div)
Initial	**1110.2**
0.03	1139.7
0.08	1159.6
0.13	1168.2
0.18	1171.3
0.23	1175.9
0.28	1181.2
0.43	1188.9
0.55	1193.4
1.05	1211.7
2.30	1244.6
4.05	1274.8
9.05	1330.8
16.05	1373.9
25.05	1413.3
36.05	1441.5
49.05	1461.0
64.05	1474.5
81.05	1483.5
100.05	1495.7
121.05	1501.9
144.05	1504.7
180.05	1511.8
300.07	1523.8
520.07	1530.7
700.07	1534.5
960.07	1539.3
1440.07	1545.2

Tested By *129-07-0411* *Date* 12/27/2021 *Checked By* *GEM* *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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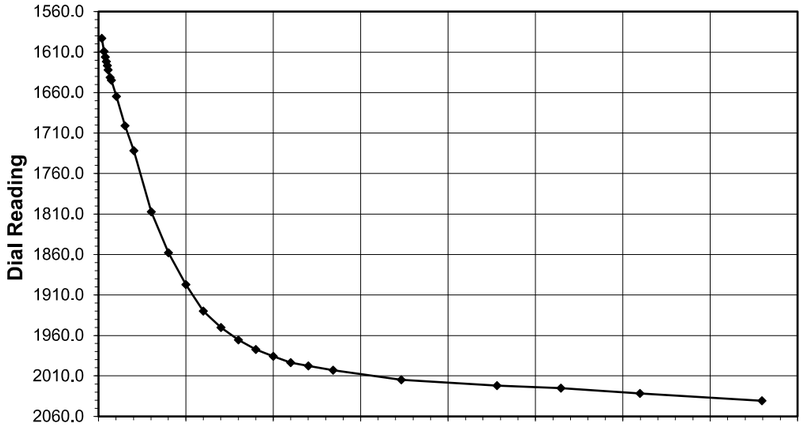
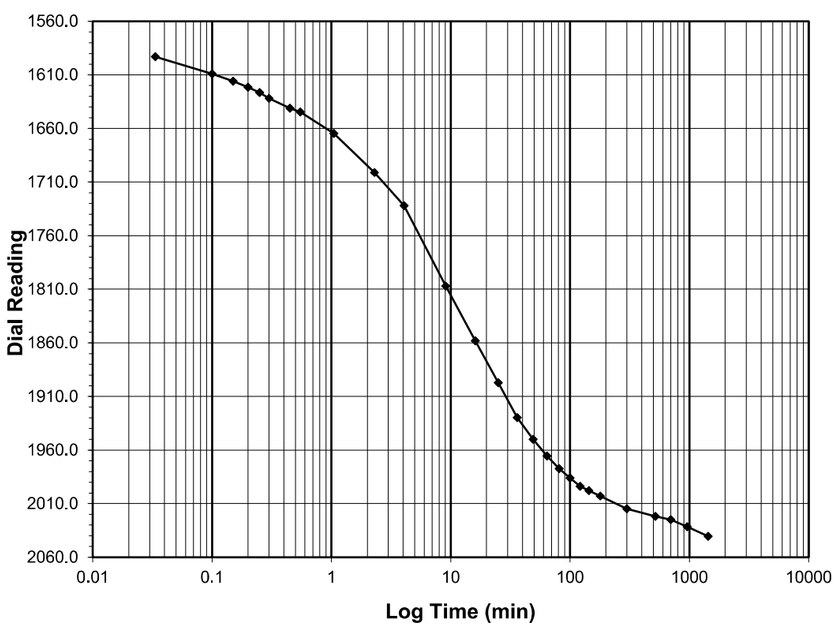
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**8.0-16.0**
Final Reading	**(div)**	**2040.6**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/28/2021
Start Time		9:16:34

Elapsed Time (min)	Dial Reading (div)
Initial	**1545.2**
0.03	1592.9
0.10	1609.1
0.15	1615.9
0.20	1621.7
0.25	1626.7
0.30	1631.9
0.45	1641.1
0.55	1644.6
1.05	1664.5
2.30	1701.1
4.07	1732.0
9.07	1807.1
16.07	1858.0
25.07	1897.1
36.07	1929.9
49.07	1949.9
64.07	1965.5
81.07	1977.4
100.07	1986.0
121.07	1993.6
144.07	1997.6
180.07	2002.9
300.08	2014.9
520.08	2022.0
700.08	2025.1
960.08	2031.6
1440.08	2040.6

Tested By *129-07-0411* *Date* 12/28/2021 *Checked By* *GEM* *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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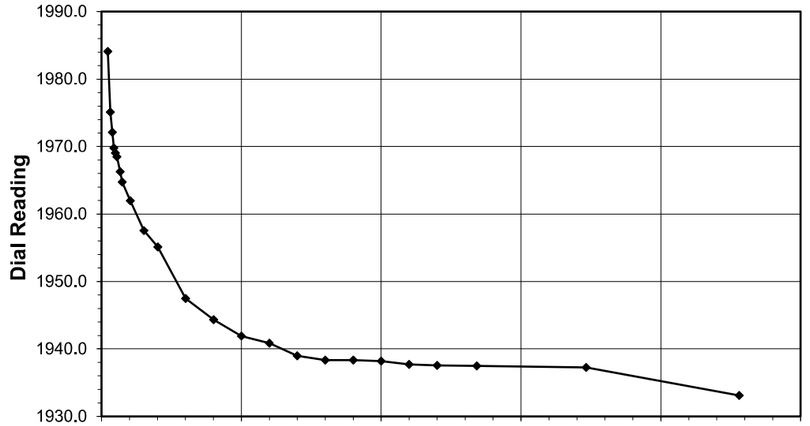
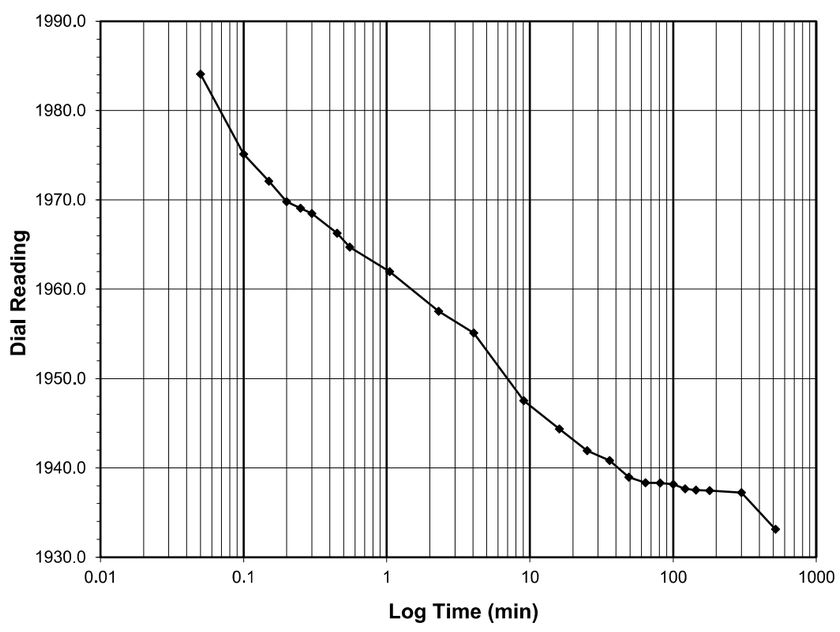
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**16.0-4.0**
Final Reading	**(div)**	**1933.1**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/29/2021
Start Time		9:16:52

Elapsed Time (min)	Dial Reading (div)
Initial	**2040.6**
0.05	1984.1
0.10	1975.1
0.15	1972.1
0.20	1969.8
0.25	1969.1
0.30	1968.5
0.45	1966.3
0.55	1964.7
1.05	1962.0
2.30	1957.5
4.05	1955.1
9.05	1947.5
16.05	1944.4
25.05	1941.9
36.07	1940.8
49.07	1939.0
64.07	1938.3
81.07	1938.3
100.07	1938.2
121.07	1937.7
144.07	1937.5
180.07	1937.5
300.07	1937.2
520.07	1933.1

Tested By *129-07-0411* *Date* 12/29/2021 *Checked By* *GEM* *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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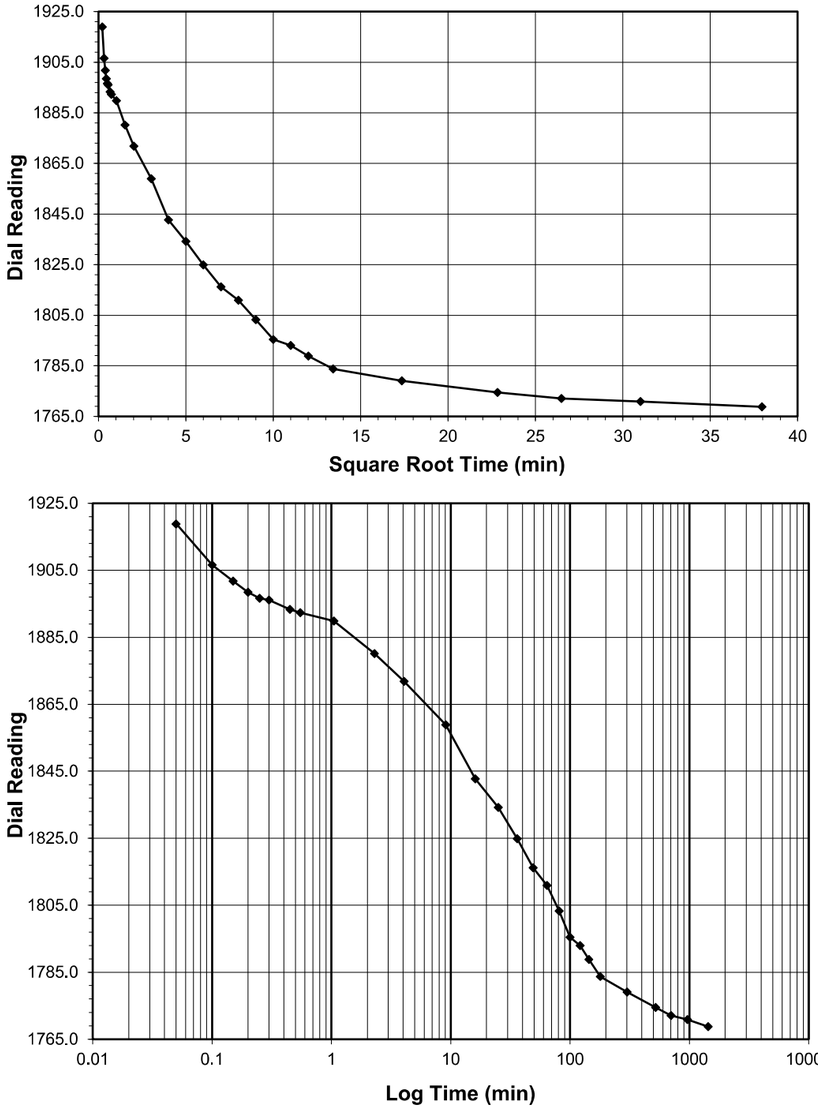
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-1.0**
Final Reading	**(div)**	**1768.8**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/29/2021
Start Time		17:57:00

Elapsed Time (min)	Dial Reading (div)
Initial	**1933.1**
0.05	1918.9
0.10	1906.6
0.15	1901.8
0.20	1898.5
0.25	1896.6
0.30	1896.1
0.45	1893.3
0.55	1892.3
1.05	1889.9
2.30	1880.2
4.07	1871.8
9.07	1858.9
16.07	1842.7
25.07	1834.2
36.07	1824.9
49.07	1816.2
64.07	1810.9
81.07	1803.3
100.08	1795.4
121.08	1793.0
144.08	1788.8
180.08	1783.7
301.08	1779.0
521.08	1774.5
701.08	1772.0
961.08	1770.8
1440.25	1768.8

Tested By *129-07-0411* *Date* 12/29/2021 *Checked By* *GEM* *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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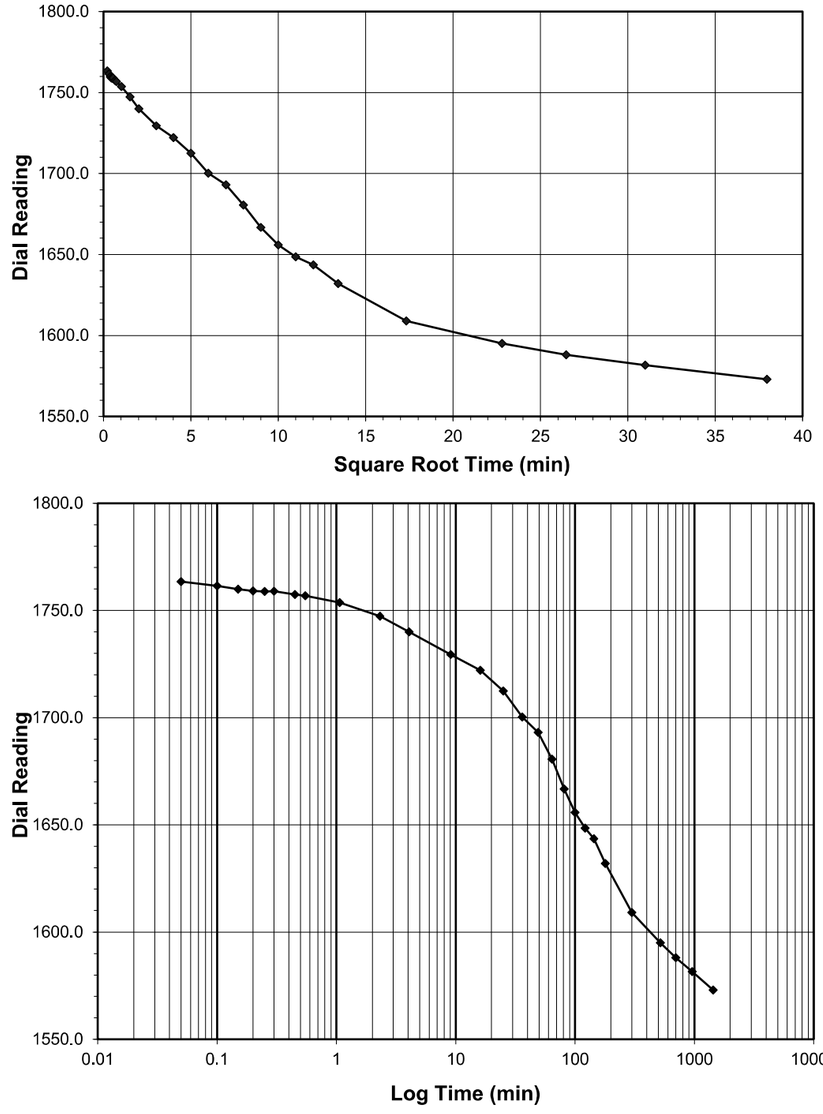
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	HDR Engineering, Inc.	Boring No.	EB1-B
Client Project	BR-0160 Calabash	Depth (ft)	10-12
Project No.	R-2021-312-001	Sample No.	ST-3
Lab ID	R-2021-312-001-004	Visual Description	Black Clayey Sand

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-0.25**
Final Reading	**(div)**	**1572.9**
Consolidometer No.		**R554**
1 Division	(in)	0.0001
Start Date		12/30/2021
Start Time		17:57:15

Elapsed Time (min)	Dial Reading (div)
Initial	**1768.8**
0.05	1763.4
0.10	1761.5
0.15	1759.9
0.20	1759.1
0.25	1758.9
0.30	1759.0
0.45	1757.4
0.55	1756.9
1.07	1753.7
2.32	1747.4
4.07	1740.1
9.07	1729.5
16.07	1722.1
25.07	1712.4
36.07	1700.3
49.07	1693.1
64.07	1680.7
81.07	1666.7
100.08	1655.8
121.08	1648.5
144.08	1643.5
180.08	1632.1
300.08	1609.1
520.08	1595.0
700.10	1588.0
960.10	1581.6
1440.10	1572.9

Tested By *129-07-0411* *Date* 12/30/2021 *Checked By* *GEM* *Date* 1/4/2022

DCN: CT-24E Date: 5/3/12 Revision: 3

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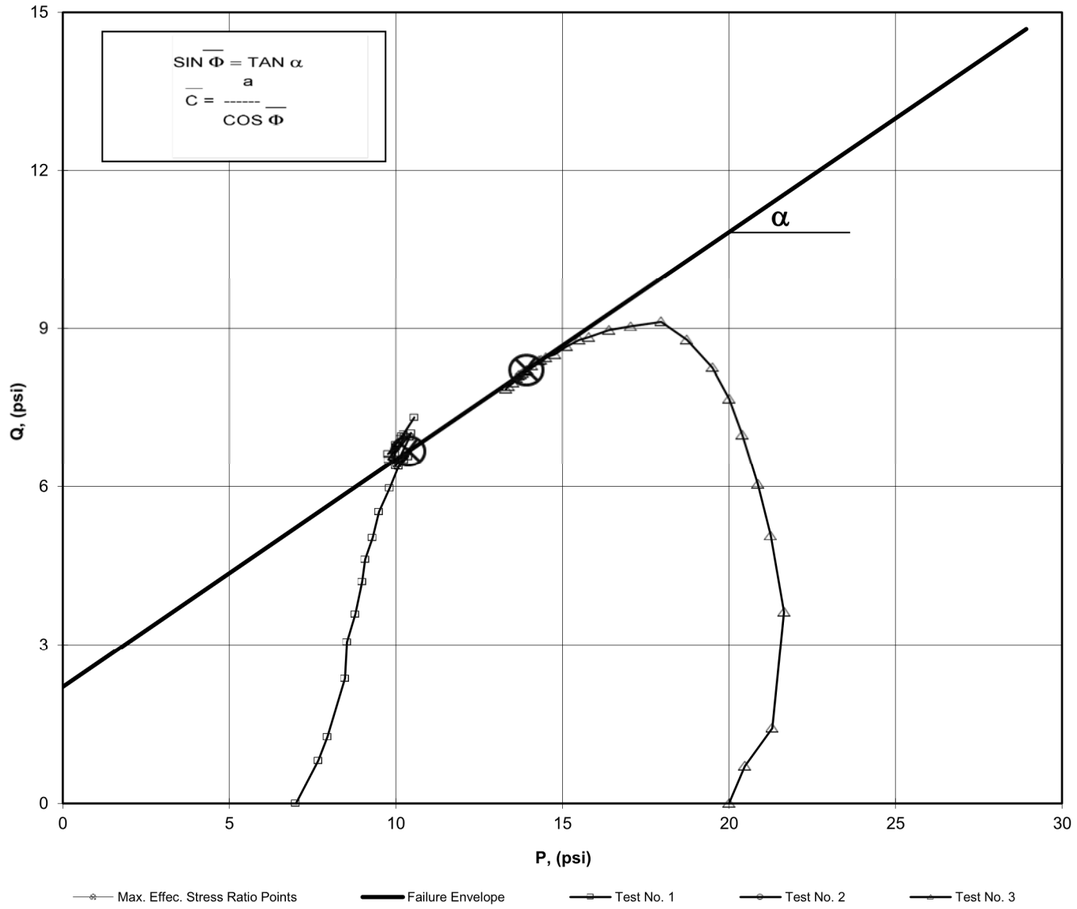
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

AASHTO T-297

Client:	HDR Engineering, Inc.	Boring No.:	EB1-B
Client Reference:	BR-0160 Calabash	Depth (ft):	10-12
Project No.:	R-2021-312-001	Sample No.:	ST-3
Lab ID:	R-2021-312-001-004		

Consolidated Undrained Triaxial Test with Pore Pressure



a =	2.20	$\overline{C}$ =	2.44
α =	23.3	$\overline{\Phi}$ =	25.56

Tested By: 129-07-0411 Date: 12/20/21 Approved By: MPS Date: 12/29/21

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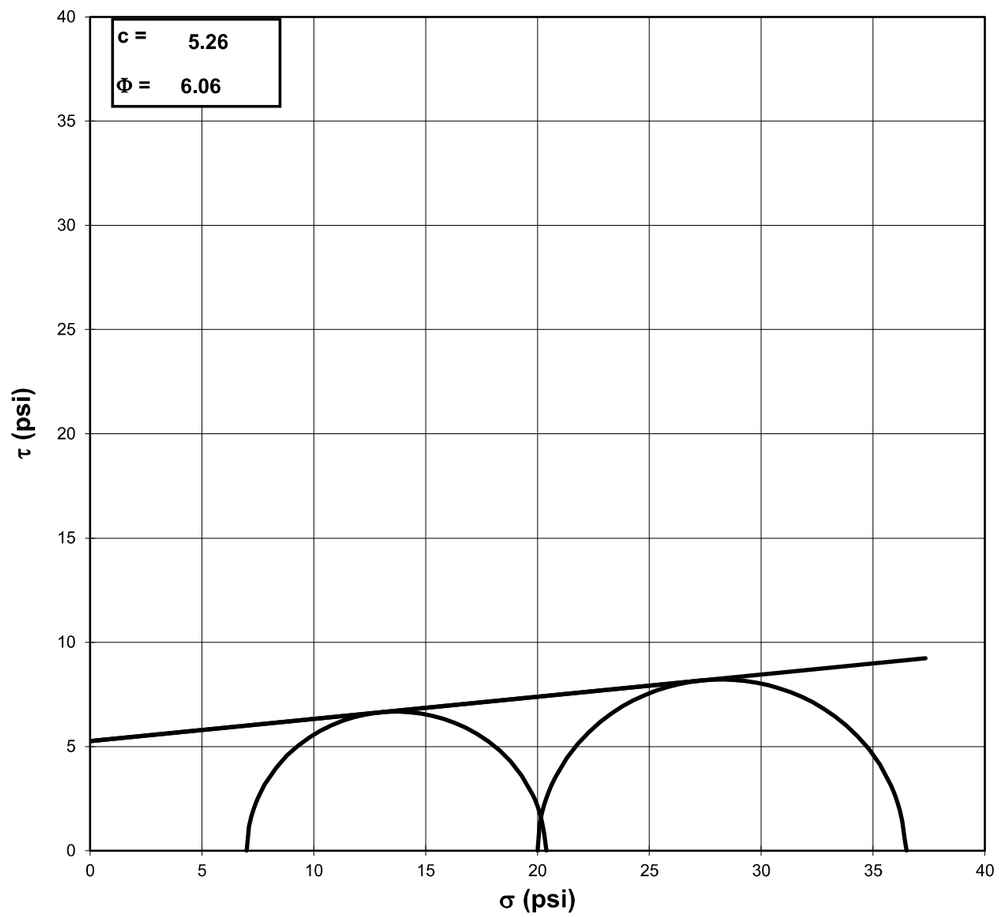
MOHR TOTAL STRENGTH ENVELOPE

AASHTO T-297

Client:	HDR Engineering, Inc.	Boring No.:	EB1-B
Client Reference:	BR-0160 Calabash	Depth (ft):	10-12
Project No.:	R-2021-312-001	Sample No.:	ST-3
Lab ID:	R-2021-312-001-004		
Visual Description:	Black Clay (Undisturbed)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: 129-07-041 *Date:* 12/20/21 *Approved By:* MPS *Date:* 12/29/21

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

AASHTO T-297

Client:	HDR Engineering, Inc.	Boring No.:	EB1-B
Client Reference:	BR-0160 Calabash	Depth (ft):	10-12
Project No.:	R-2021-312-001	Sample No.:	ST-3
Lab ID:	R-2021-312-001-004		

Visual Description: Black Clay (Undisturbed)

Stage No.	0
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	57.0
Back Pressure (psi)	50.0
Eff. Conf. Pressure (psi)	7.0
Pore Pressure Response (%)	99

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	10.37
Q	=	6.68

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.138	Diameter 1:	2.831
Length 2:	6.151	Diameter 2:	2.835
Length 3:	6.126	Diameter 3:	2.840
Length 4:	6.140	Diameter 4:	2.839
Avg. Length:	6.139	*Avg. Diam.:*	2.836

VOLUME CHANGE

Initial Burette Reading (ml)	24.0
Final Burette Reading (ml)	13.1
Final Change (ml)	10.9
Initial Dial Reading (mil)	277
Dial Reading After Saturation (mil)	278
Dial Reading After Consolidation (mil)	289

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
20.9	0.000	50.0
30.9	0.001	50.1
36.4	0.003	50.3
50.3	0.008	50.9
59.0	0.014	51.5
65.6	0.020	51.8
73.3	0.029	52.2
78.7	0.038	52.5
84.0	0.051	52.7
90.3	0.072	53.0
96.5	0.103	53.2
102.2	0.140	53.3
105.1	0.177	53.2
107.0	0.219	53.3
105.3	0.249	53.3
104.9	0.292	53.4
105.3	0.351	53.4
113.6	0.414	53.5
115.4	0.459	53.6
111.2	0.519	53.7
109.8	0.565	53.6
111.0	0.612	53.7
117.8	0.658	53.7
119.0	0.688	53.8
124.1	0.719	53.8
118.9	0.749	53.8
117.9	0.779	53.8
118.1	0.825	53.8
117.0	0.872	53.9
122.4	0.903	53.8
122.0	0.933	53.8

Tested By: 129-07-0411 Date: 12/20/21 Input Checked By: GEM Date: 12/29/21

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

AASHTO T-297

Client:	HDR Engineering, Inc.	Boring No.:	EB1-B
Client Reference:	BR-0160 Calabash	Depth (ft):	10-12
Project No.:	R-2021-312-001	Sample No.:	ST-3
Lab ID:	R-2021-312-001-004		

Visual Description: Black Clay (Undisturbed)

Effective Confining Pressure (psi)	7.0	*Stage No.*	0
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	6.14
Initial Sample Diameter (in)	2.84
Initial Sample Area (in^2)	6.32
Initial Sample Volume (in^3)	38.78

VOLUME CHANGE

Volume After Consolidation (in^3)	38.10
Length After Consolidation (in)	6.13
Area After Consolidation (in^2)	6.219

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio $\overline{A}$	$\overline{P}$	Q
0.02	1.61	0.13	8.48	6.9	1.235	0.08	7.67	0.81
0.05	2.50	0.31	9.20	6.7	1.374	0.12	7.94	1.25
0.13	4.73	0.89	10.83	6.1	1.774	0.19	8.47	2.36
0.23	6.12	1.53	11.59	5.5	2.118	0.25	8.53	3.06
0.33	7.17	1.80	12.37	5.2	2.378	0.25	8.79	3.58
0.47	8.40	2.21	13.18	4.8	2.753	0.27	8.99	4.20
0.62	9.25	2.54	13.70	4.5	3.075	0.28	9.08	4.62
0.82	10.07	2.73	14.34	4.3	3.356	0.27	9.31	5.03
1.18	11.04	3.02	15.01	4.0	3.777	0.28	9.49	5.52
1.69	11.95	3.16	15.79	3.8	4.108	0.27	9.82	5.97
2.29	12.77	3.30	16.47	3.7	4.451	0.26	10.09	6.39
2.89	13.15	3.21	16.94	3.8	4.470	0.25	10.37	6.58
3.57	13.35	3.31	17.04	3.7	4.616	0.25	10.37	6.68
4.07	13.03	3.27	16.75	3.7	4.494	0.25	10.24	6.51
4.76	12.87	3.40	16.47	3.6	4.570	0.27	10.04	6.43
5.73	12.80	3.41	16.40	3.6	4.565	0.27	9.99	6.40
6.76	13.90	3.54	17.36	3.5	5.023	0.26	10.41	6.95
7.49	14.06	3.57	17.49	3.4	5.104	0.26	10.46	7.03
8.48	13.29	3.67	16.62	3.3	4.991	0.28	9.97	6.64
9.22	12.98	3.56	16.42	3.4	4.770	0.28	9.93	6.49
9.99	13.05	3.75	16.30	3.3	5.013	0.29	9.77	6.52
10.74	13.92	3.69	17.23	3.3	5.202	0.27	10.27	6.96
11.23	14.00	3.78	17.23	3.2	5.346	0.27	10.22	7.00
11.73	14.65	3.77	17.88	3.2	5.536	0.26	10.55	7.32
12.23	13.84	3.79	17.05	3.2	5.307	0.28	10.13	6.92
12.72	13.61	3.81	16.80	3.2	5.274	0.28	9.99	6.81
13.47	13.53	3.76	16.78	3.2	5.172	0.28	10.01	6.77
14.23	13.26	3.86	16.40	3.1	5.227	0.29	9.77	6.63
14.74	13.93	3.78	17.14	3.2	5.327	0.27	10.18	6.96
15.22	13.79	3.79	17.00	3.2	5.295	0.28	10.11	6.90

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

Client:	HDR Engineering, Inc.	Boring No.:	EB1-B
Client Reference:	BR-0160 Calabash	Depth (ft):	10-12
Project No.:	R-2021-312-001	Sample No.:	ST-3
Lab ID:	R-2021-312-001-004		

Visual Description: Black Clay (Undisturbed)

Stage No.	0
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	70.0
Back Pressure (psi)	50.0
Eff. Conf. Pressure (psi)	20.0
Pore Pressure Response (%)	100

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	13.93
Q	=	8.21

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.075	Diameter 1:	2.839
Length 2:	6.116	Diameter 2:	2.834
Length 3:	6.096	Diameter 3:	2.846
Length 4:	6.072	Diameter 4:	2.849
Avg. Length:	6.090	*Avg. Diam.:*	2.842

VOLUME CHANGE

Initial Burette Reading (ml)	48.9
Final Burette Reading (ml)	16.2
Final Change (ml)	32.7
Initial Dial Reading (mil)	323
Dial Reading After Saturation (mil)	320
Dial Reading After Consolidation (mil)	351

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
17.5	0.000	50.0
26.0	0.001	50.2
34.7	0.002	50.1
61.4	0.009	52.0
79.0	0.014	53.8
90.8	0.020	55.2
102.5	0.029	56.6
110.9	0.038	57.7
118.3	0.051	58.8
125.1	0.072	60.1
129.8	0.103	61.2
129.4	0.139	62.0
129.2	0.176	62.6
128.4	0.218	63.0
128.3	0.249	63.3
127.5	0.292	63.5
126.8	0.350	63.7
127.2	0.411	63.9
127.4	0.456	64.0
128.5	0.517	64.1
128.1	0.564	64.2
128.0	0.610	64.3
128.7	0.655	64.3
128.8	0.686	64.4
129.0	0.716	64.4
129.4	0.747	64.4
129.4	0.777	64.4
129.1	0.823	64.5
129.2	0.869	64.5
129.2	0.900	64.6
129.1	0.931	64.6

Tested By: 129-07-0411 Date: 12/20/2021 Input Checked By: GEM Date: 12/29/2021

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

Client:	HDR Engineering, Inc.	Boring No.:	EB1-B
Client Reference:	BR-0160 Calabash	Depth (ft):	10-12
Project No.:	R-2021-312-001	Sample No.:	ST-3
Lab ID:	R-2021-312-001-004		

Visual Description: Black Clay (Undisturbed)

Effective Confining Pressure (psi)	20.0	*Stage No.*	0
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	6.09
Initial Sample Diameter (in)	2.84
Initial Sample Area (in^2)	6.34
Initial Sample Volume (in^3)	38.63

VOLUME CHANGE

Volume After Consolidation (in^3)	36.69
Length After Consolidation (in)	6.06
Area After Consolidation (in^2)	6.053

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	1.41	0.23	21.18	19.8	1.071	0.16	20.48	0.70
0.04	2.84	0.12	22.73	19.9	1.143	0.04	21.30	1.42
0.14	7.25	1.97	25.28	18.0	1.402	0.27	21.65	3.63
0.23	10.14	3.82	26.33	16.2	1.627	0.38	21.25	5.07
0.33	12.07	5.16	26.91	14.8	1.814	0.43	20.87	6.03
0.48	13.98	6.59	27.39	13.4	2.043	0.47	20.40	6.99
0.63	15.34	7.66	27.68	12.3	2.244	0.50	20.01	7.67
0.84	16.52	8.76	27.76	11.2	2.469	0.53	19.50	8.26
1.18	17.57	10.05	27.52	9.9	2.766	0.57	18.73	8.78
1.69	18.24	11.16	27.09	8.8	3.063	0.61	17.97	9.12
2.29	18.08	12.00	26.08	8.0	3.259	0.66	17.04	9.04
2.90	17.93	12.57	25.36	7.4	3.414	0.70	16.39	8.96
3.60	17.66	13.04	24.62	7.0	3.539	0.74	15.79	8.83
4.10	17.56	13.28	24.28	6.7	3.615	0.76	15.50	8.78
4.81	17.31	13.53	23.78	6.5	3.677	0.78	15.12	8.66
5.77	17.02	13.74	23.28	6.3	3.719	0.81	14.77	8.51
6.78	16.90	13.95	22.96	6.1	3.793	0.83	14.50	8.45
7.52	16.80	14.05	22.76	6.0	3.822	0.84	14.36	8.40
8.53	16.78	14.09	22.69	5.9	3.840	0.84	14.30	8.39
9.30	16.59	14.21	22.37	5.8	3.867	0.86	14.08	8.29
10.06	16.42	14.28	22.14	5.7	3.873	0.87	13.93	8.21
10.81	16.39	14.28	22.11	5.7	3.866	0.87	13.92	8.20
11.32	16.31	14.35	21.96	5.6	3.887	0.88	13.80	8.16
11.81	16.25	14.38	21.87	5.6	3.892	0.89	13.74	8.12
12.32	16.21	14.43	21.78	5.6	3.909	0.89	13.68	8.10
12.83	16.13	14.44	21.68	5.6	3.903	0.90	13.62	8.06
13.57	15.95	14.45	21.50	5.5	3.875	0.91	13.52	7.97
14.34	15.82	14.54	21.28	5.5	3.897	0.92	13.37	7.91
14.85	15.72	14.56	21.16	5.4	3.888	0.93	13.30	7.86
15.35	15.62	14.56	21.06	5.4	3.871	0.93	13.25	7.81

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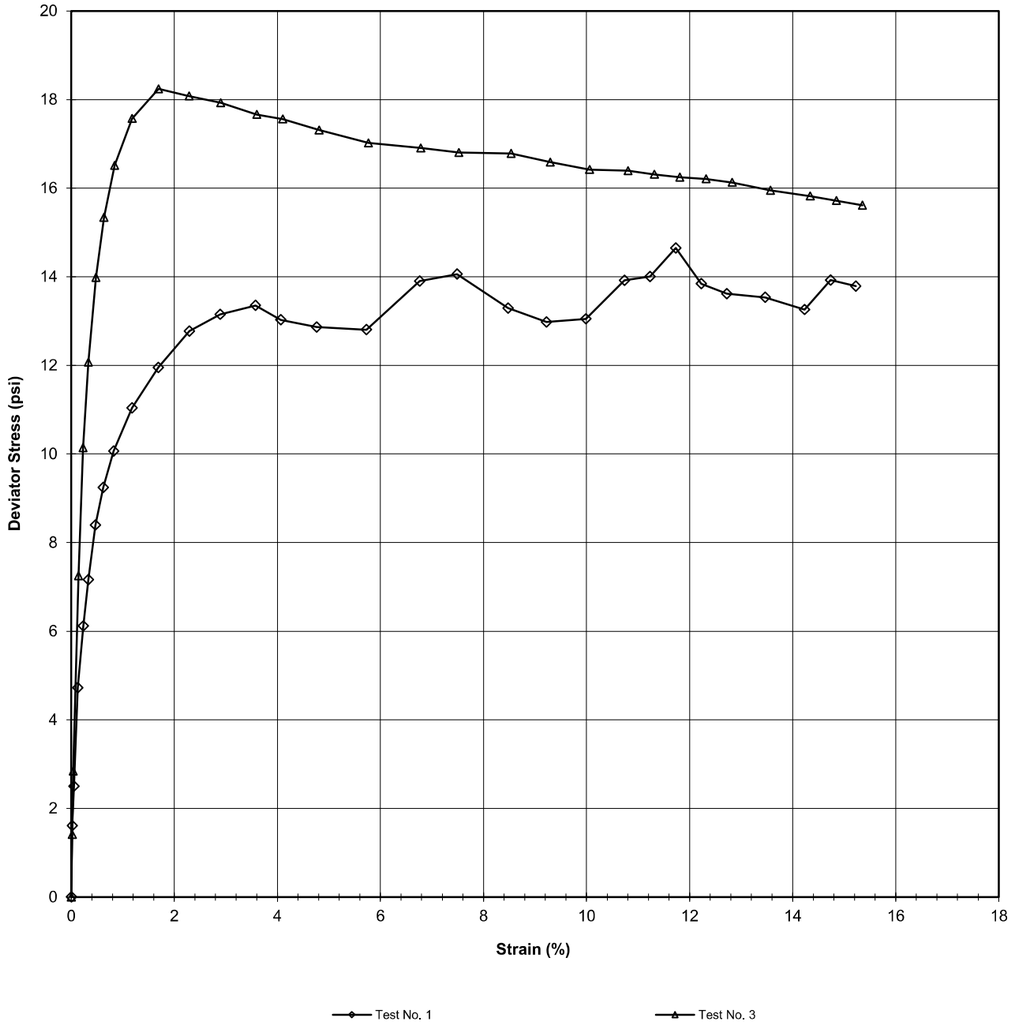
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

Client:	HDR Engineering, Inc.	Boring No.:	EB1-B
Client Reference:	BR-0160 Calabash	Depth (ft):	10-12
Project No.:	R-2021-312-001	Sample No.:	ST-3
Lab ID:	R-2021-312-001-004		
Visual Description:	Black Clay (Undisturbed)		



Tested By: 129-07-0411 Date: 12/20/2021 Approved By: MPS Date: 12/29/2021

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	HDR Engineering, Inc.		
Client Reference:	BR-0160 Calabash		
Project No.:	R-2021-312-001		
Lab ID:	R-2021-312-001-004	Specific Gravity (measured)	2.7
Visual Description:	Black Clay (Undisturbed)		

SAMPLE CONDITION SUMMARY

Boring No.:	EB1-B	EB1-B
Depth (ft):	10-12	10-12
Sample No.:	ST-3	ST-3
Test No.	T1	T3
Deformation Rate (in/min)	0.002	0.002
Back Pressure (psi)	50.0	50.0
Consolidation Time (days)	1	1
Moisture Content (%) (INITIAL)	33.3	27.9
Total Unit Weight (pcf)	114.2	119.3
Dry Unit Weight (pcf)	85.6	93.3
Moisture Content (%) (FINAL)	28.5	36.8
Initial State Void Ratio,e	0.968	0.807
Void Ratio at Shear, e	0.934	0.717

Tested By: 129-07-0411 Date: 12/20/21 Input Checked By: GEM Date: 12/29/21

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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