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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-1015	1	33

REFERENCE: R-1015

PROJECT: 34360

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CRAVEN*

PROJECT DESCRIPTION *US 70 (Havelock Bypass) from North of Pine Grove to North of Cateret County*

SITE DESCRIPTION *Site #5 – Bridge on SR 1756 over US 70 (Havelock Bypass) Between SR 1125 and SR 1763*

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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.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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PERSONNEL

C.R. PASTRANA

M. RADFORD

INVESTIGATED BY *ESP Associates, P.A.*

DRAWN BY *T.T. WALKER*

CHECKED BY *P. WEAVER*

SUBMITTED BY *ESP Associates, P.A.*

DATE *JULY 2016*

NORTH CAROLINA LICENSED SEAL 1500 GEOLOGIST PAUL M. WEAVER

DocuSigned by:
Paul Weaver
01847D3739AD49C...
SIGNATURE

10/10/2016
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
34360 (R–1015)	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	< 4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	> 50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	< 2	< 0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	> 30	> 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		
	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PLASTIC RANGE (PI)		
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-45D
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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-12: RR SPIKE IN TREE STA. 228+71.00 -L- 243' LEFT

ELEVATION: 28.81 FEET

NOTES:

F.I.A.D. = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-1015	3

SITE PLAN

0 60 120

FEET

SKEW = 66° 20' 58"

NAD 83

50

-YDET-

246

50

WOODS

SR 1756 (Lake Rd.)

-Y3-

-L-

55

-Y3- POT STA.52+32.96 =
-L- POC STA.244+55.76

B1-A

EB1-B

B1-B

BEGIN BRIDGE

EB2-B

243

END BRIDGE

WOODS

55

WOODS

PROJECT REFERENCE NO.	SHEET NO.
R-1015	4

PROFILE BORINGS PROJECTED ALONG –Y3–

0 20 40
FEET
VE = 1:1

EB1–B
51+57
13' RT

B1–B
52+22
12' RT

EB2–B
53+26
13' RT

50
30
10
-10
-30
-50
-70
-90
-110

Existing Ground

Soft to Medium Stiff Grayish Brown to Dark Gray Sandy CLAY, Wet (ALLUVIAL)

Loose to Medium Dense Gray to Dark Gray SAND, Clayey SAND, and Silty SAND, Saturated (UNDIVIDED COASTAL PLAIN)

Loose to Dense Brown to Gray to Dark Gray SAND, Clayey SAND, and Silty SAND with Shell Fragments, Saturated (DUPLIN FORMATION)

Soft to Very Hard Gray and White LIMESTONE (RIVER BEND FORMATION)

05/16
ST-1

BT
FIAD

BT
FIAD

BT

(A) Loose Tan Brown SAND, Clayey SAND, and Silty SAND, and Medium Stiff Tan Brown Sandy CLAY, Moist (ROADWAY EMBANKMENT)

GROUNDLINE TAKEN FROM .TIN FILE PROVIDED BY NCDOT DATED 7/1/2016.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE PROFILE

51+00 52+00 53+00

PROJECT REFERENCE NO.	SHEET NO.
R-1015	5

SECTION THROUGH BENT 1
STA. 52+32.96
SKEW=66°20'58" DEGREES

0 10 20
FEET
VE = 1:1

*B1-A
52+25
18' LT

℄

B1-B
52+22 -Y3-
12' RT

Existing Ground

(A) 9 7 13 15 6 15 13 8 9 23 66 47 30 19 20

08/01

Medium Stiff Dark Gray Sandy CLAY, Wet (ALLUVIAL)

Loose to Medium Dense Gray SAND, Saturated (UNDIVIDED COASTAL PLAIN)

Loose to Dense Gray to Dark Gray SAND, Clayey SAND, and Silty SAND with Shell Fragments, Saturated (DUPLIN FORMATION)

BT

7 5 9 7 21 9 9 7 13 11 13 15 30 23 11 9 5 11

BT FIAD

(C)

30 20 10 0 -10 -20 -30 -40 -50 -60

40 30 20 10 0 10 20 30 40

(A) Loose to Medium Dense Tan to Tan Brown SAND, Clayey SAND, and Silty SAND, Moist (ROADWAY EMBANKMENT)

(B) Soft to Moderately Hard Gray and White LIMESTONE (RIVERBEND FORMATION)

GROUNDLINE TAKEN FROM .TIN FILE PROVIDED BY NCDOT DATED 7/1/2016.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE CROSS SECTION

*B1-A Boring provided by NCDOT

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site # 5 - Bridge on SR 1756 over US 70 (Havelock Bypass) Between SR 1125 and SR 1763				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 51+57	**OFFSET** 13 ft RT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 25.1 ft	**TOTAL DEPTH** 90.2 ft	**NORTHING** 413,201	**EASTING** 2,618,999	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE BRI2296 CME-45D 81% 06/03/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Radford, M.	**START DATE** 05/24/16	**COMP. DATE** 05/24/16	**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)
30										
25	25.1	0.0	3	4	5	9		M		25.1 / 0.0 GROUND SURFACE
										23.9 / 1.2 **ROADWAY EMBANKMENT** Loose, Tan Brown to Dark Brown, Slightly Clayey, Silty SAND
	21.4	3.7								23.1 / 2.0 **ROADWAY EMBANKMENT** Loose, Tan Brown, SAND
20			1	2	3	5	SS-1	30%		18.1 / 7.0 **ALLUVIAL** Medium Stiff, Grayish Brown, Sandy CLAY
	16.4	8.7								**UNDIVIDED COASTAL PLAIN** Loose, Gray, SAND and Clayey SAND, Saturated
15			1	1	4	5		W		13.1 / 12.0
	11.4	13.7								
10			2	2	3	5		Sat.		
	6.4	18.7								
5			2	3	4	7		Sat.		
	1.4	23.7								
0			2	3	5	8		Sat.		
	-3.6	28.7								
-5			3	3	2	5		Sat.		
	-8.6	33.7								
-10			4	2	3	5		Sat.		
	-13.6	38.7								
-15			3	3	4	7		Sat.		
	-18.6	43.7								
-20			2	4	5	9		Sat.		
	-23.6	48.7								
-25			4	6	5	11		Sat.		
	-28.6	53.7								
-30			11	14	19	33		Sat.		
	-33.6	58.7								
-35			12	17	22	39		Sat.		
	-38.6	63.7								
-40			11	17	19	36	SS-2	Sat.		
	-43.6	68.7								
-45			11	14	19	33		Sat.		
	-48.6	73.7								-46.9 / 72.0
-50			6	6	5	11		Sat.		**COASTAL PLAIN** Loose to Dense, Gray to Dark Gray, SAND, Silty SAND, and Clayey SAND, with Shell Fragments, Saturated (Duplin Formation)

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site # 5 - Bridge on SR 1756 over US 70 (Havelock Bypass) Between SR 1125 and SR 1763				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 51+57	**OFFSET** 13 ft RT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 25.1 ft	**TOTAL DEPTH** 90.2 ft	**NORTHING** 413,201	**EASTING** 2,618,999	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE BRI2296 CME-45D 81% 06/03/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Radford, M.	**START DATE** 05/24/16	**COMP. DATE** 05/24/16	**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
-50						Match Line				
	-53.6	78.7	8	14	16	30		Sat.		-51.9 / 77.0
-55										
	-58.6	83.7	5	9	9	18		Sat.		-56.9 / 82.0
-60										
	-63.6	88.7	4	8	11	19		Sat.		-65.1 / 90.2
-65										Boring Terminated at Elevation -65.1 ft In Coastal Plain: SILTY SAND (Duplin Formation)
										Other Samples: ST-2 (5.2 - 7.7)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** F. Westcott-NCDOT	
SITE DESCRIPTION Site # 5 - Bridge on SR 1756 over US 70 (Havelock Bypass) Between SR 1125 and SR 1763				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 52+25	**OFFSET** 18 ft LT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 23.5 ft	**TOTAL DEPTH** 74.9 ft	**NORTHING** 413,260	**EASTING** 2,619,045	**24 HR.** 3.3
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER NCDOT Driller	**START DATE** 08/13/01	**COMP. DATE** 08/13/01	**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)
25										
	23.5	0.0	4	4	5	9				23.5 0.0 GROUND SURFACE
20	19.5	4.0	3	3	4	7				**ROADWAY EMBANKMENT** Medium Dense, Tan, Slightly Clayey, Silty SAND 20.9 2.6
15	15.1	8.4	5	5	8	13				**UNDIVIDED COASTAL PLAIN** Loose to Medium Dense, Gray, Coarse to Fine SAND, Saturated
10	10.1	13.4	3	8	7	15				
5	5.1	18.4	9	4	2	6				
0	0.1	23.4	4	8	7	15				
-5	-4.9	28.4	5	6	7	13				-3.5 27.0 **COASTAL PLAIN** Medium Dense to Loose, Gray, Coarse to Fine SAND with Shell Fragments, Saturated (Duplin Formation)
-10	-9.9	33.4	6	9	8	17				
-15	-14.9	38.4	3	3	5	8				
-20	-19.9	43.4	3	5	4	9				
-25	-24.9	48.4	9	10	13	23				
-30	-29.9	53.4	13	27	39	66				
-35	-34.9	58.4	14	20	27	47				
-40	-39.9	63.4	12	14	16	30				
-45	-44.9	68.4	8	11	8	19				
-50	-49.9	73.4	4	9	11	20				-51.4 74.9 Boring Terminated at Elevation -51.4 ft In Coastal Plain: SAND (Duplin Formation)

NCDOT BORE DOUBLE R1015_GEO_BRDG_SITE5_GINT LOGS.GPJ NC_DOT.GDT 7/28/16

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site # 5 - Bridge on SR 1756 over US 70 (Havelock Bypass) Between SR 1125 and SR 1763				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 52+22	**OFFSET** 12 ft RT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 25.0 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 413,232	**EASTING** 2,619,056	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE BRI2296 CME-45D 81% 06/03/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Radford, M.	**START DATE** 05/24/16	**COMP. DATE** 05/24/16	**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)
25										
	25.0	0.0	2	3	4	7		M		25.0 / 0.0 GROUND SURFACE
										24.0 / 1.0 **ROADWAY EMBANKMENT**
										23.0 / 2.0 Loose, Tan Brown, Clayey SAND
	21.3	3.7								**ROADWAY EMBANKMENT**
20			1	2	3	5		W		Loose, Tan Brown, SAND
										ALLUVIAL
	16.3	8.7								18.0 / 7.0 Medium Stiff, Dark Gray, Sandy CLAY
15			2	2	7	9	SS-3	Sat.		**UNDIVIDED COASTAL PLAIN**
										Loose to Medium Dense, Gray, SAND and
	11.3	13.7								Slightly Clayey SAND, Saturated
10			2	4	3	7		Sat.		
	6.3	18.7								
5			4	9	12	21		Sat.		
	1.3	23.7								
0			2	4	5	9		Sat.		
	-3.7	28.7								
-5			5	4	5	9		Sat.		
	-8.7	33.7								-7.0 / 32.0 **COASTAL PLAIN**
-10			3	3	4	7		Sat.		Loose to Dense, Gray to Dark Gray, SAND,
	-13.7	38.7								Silty SAND, and Clayey SAND, with Shell
-15			2	7	6	13		Sat.		Fragments, Saturated
	-18.7	43.7								(Duplin Formation)
-20			3	3	8	11		Sat.		-17.0 / 42.0
	-23.7	48.7								-22.0 / 47.0
-25			3	5	8	13		Sat.		
	-28.7	53.7								
-30			4	5	10	15		Sat.		
	-33.7	58.7								
-35			11	13	17	30		Sat.		
	-38.7	63.7								
-40			8	11	12	23		Sat.		
	-43.7	68.7								
-45			6	6	5	11	SS-4	Sat.		
	-48.7	73.7								
-50			4	4	5	9		Sat.		-52.0 / 77.0
	-53.7	78.7								
-55			3	2	3	5		Sat.		

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site # 5 - Bridge on SR 1756 over US 70 (Havelock Bypass) Between SR 1125 and SR 1763				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 52+22	**OFFSET** 12 ft RT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 25.0 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 413,232	**EASTING** 2,619,056	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE BRI2296 CME-45D 81% 06/03/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Radford, M.	**START DATE** 05/24/16	**COMP. DATE** 05/24/16	**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
-55						Match Line				
	-58.7	83.7	5	5	6	11		Sat.		-63.7 / 88.7 **COASTAL PLAIN SEDIMENTARY ROCK**
-60										-65.0 / 90.0 LIMESTONE
-65										(Riverbend Formation)
										Boring Terminated at Elevation -65.0 ft In
										Coastal Plain Sedimentary Rock:
										LIMESTONE (Riverbend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site # 5 - Bridge on SR 1756 over US 70 (Havelock Bypass) Between SR 1125 and SR 1763				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 53+26	**OFFSET** 13 ft RT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 24.6 ft	**TOTAL DEPTH** 104.1 ft	**NORTHING** 413,278	**EASTING** 2,619,148	**24 HR.** 3.9
DRILL RIG/HAMMER EFF./DATE BRI2296 CME-45D 81% 06/03/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Radford, M.	**START DATE** 05/23/16	**COMP. DATE** 05/23/16	**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)
25										
	24.6	0.0	3	3	4	7		M		24.6 GROUND SURFACE 0.0 **ROADWAY EMBANKMENT** 23.6 1.0 Medium Stiff, Tan Brown, Fine Sandy CLAY 22.6 2.0
20	20.9	3.7	WOH	1	1	2		W		**ROADWAY EMBANKMENT** Loose, Tan Brown, Fine SAND **ALLUVIAL** Soft, Grayish Brown, Sandy CLAY 17.6 7.0
15	15.9	8.7	4	4	1	5		Sat.		**UNDIVIDED COASTAL PLAIN** Loose to Medium Dense, Gray to Dark Gray, SAND and Silty SAND, Saturated
10	10.9	13.7	3	3	2	5	SS-5	Sat.		
5	5.9	18.7	4	4	3	7		Sat.		2.6 22.0
0	0.9	23.7	5	5	6	11		Sat.		-2.4 27.0 **COASTAL PLAIN** Loose to Medium Dense, Gray and Brown, SAND and Silty SAND, Saturated (Duplin Formation)
-5	-4.1	28.7	3	3	4	7		Sat.		
-10	-9.1	33.7	2	3	3	6		Sat.		
-15	-14.1	38.7	4	3	5	8		Sat.		
-20	-19.1	43.7	2	4	8	12		Sat.		
-25	-24.1	48.7	5	8	9	17		Sat.		
-30	-29.1	53.7	6	6	7	13		Sat.		
-35	-34.1	58.7	7	7	9	16		Sat.		
-40	-39.1	63.7	5	5	8	13		Sat.		
-45	-44.1	68.7	3	4	3	7		Sat.		
-50	-49.1	73.7	2	4	4	8	SS-6	Sat.		-47.4 72.0
-55	-54.1	78.7	3	3	4					

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site # 5 - Bridge on SR 1756 over US 70 (Havelock Bypass) Between SR 1125 and SR 1763				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 53+26	**OFFSET** 13 ft RT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 24.6 ft	**TOTAL DEPTH** 104.1 ft	**NORTHING** 413,278	**EASTING** 2,619,148	**24 HR.** 3.9
DRILL RIG/HAMMER EFF./DATE BRI2296 CME-45D 81% 06/03/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Radford, M.	**START DATE** 05/23/16	**COMP. DATE** 05/23/16	**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
-55						Match Line				
-60	-59.1	83.7	2	8	26	34		Sat.		-59.6 84.2 **COASTAL PLAIN SEDIMENTARY ROCK** Gray and White Soft to Very Hard LIMESTONE (Riverbend Formation)
-65	-64.1	88.7	100/0.4			100/0.4		Sat.		
-70	-69.1	93.7	46	24	13	37		Sat.		
-75	-74.1	98.7	24	25	74	99		Sat.		-79.5 104.1 Boring Terminated at Elevation -79.5 ft In Coastal Plain Sedimentary Rock: LIMESTONE (Riverbend Formation) Note: ST-1 collected at -Y3- Station 53+31, 13 feet right
	-79.1	103.7	100/0.4			100/0.4				

SOILS LABORATORY TESTS RESULTS

WBS NO.: 34360.1.1

TIP NO.: R-1015

COUNTY: Craven

SITE DESCRIPTION: Site #5 - Bridge on SR 1756 over US 70 (Havelock Bypass) Between SR 1125 and SR 1763

SAMPLE NO.	Boring	DEPTH INTERVAL	AASHTO CLASS	N	L.L	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE
							CSE. SAND	F. SAND	SILT	CLAY	10	40	200	
SS-1	EB1-B	3.7-5.2	A-6 (6)	5	36	20	9	43	15	33	100	98	49	30.1
SS-2	EB1-B	63.7-65.2	A-3 (0)	36	19	NP	76	19	4	1	98	55	6	
SS-3	B1-B	8.7-10.2	A-3 (0)	9	13	NP	1	90	4	5	100	100	10	
SS-4	B1-B	68.7-70.2	A-1-b (0)	11	11	1	86	11	2	1	95	37	4	
SS-5	EB2-B	13.7-15.2	A-3 (0)	5	19	NP	9	83	4	4	100	99	8	
SS-6	EB2-B	73.7-75.2	A-2-4 (0)	8	22	1	1	76	19	4	100	99	27	
ST-1	EB2-B	3.7-5.7	A-6 (6)	2	32	16	9	38	13	40	100	98	55	30.9

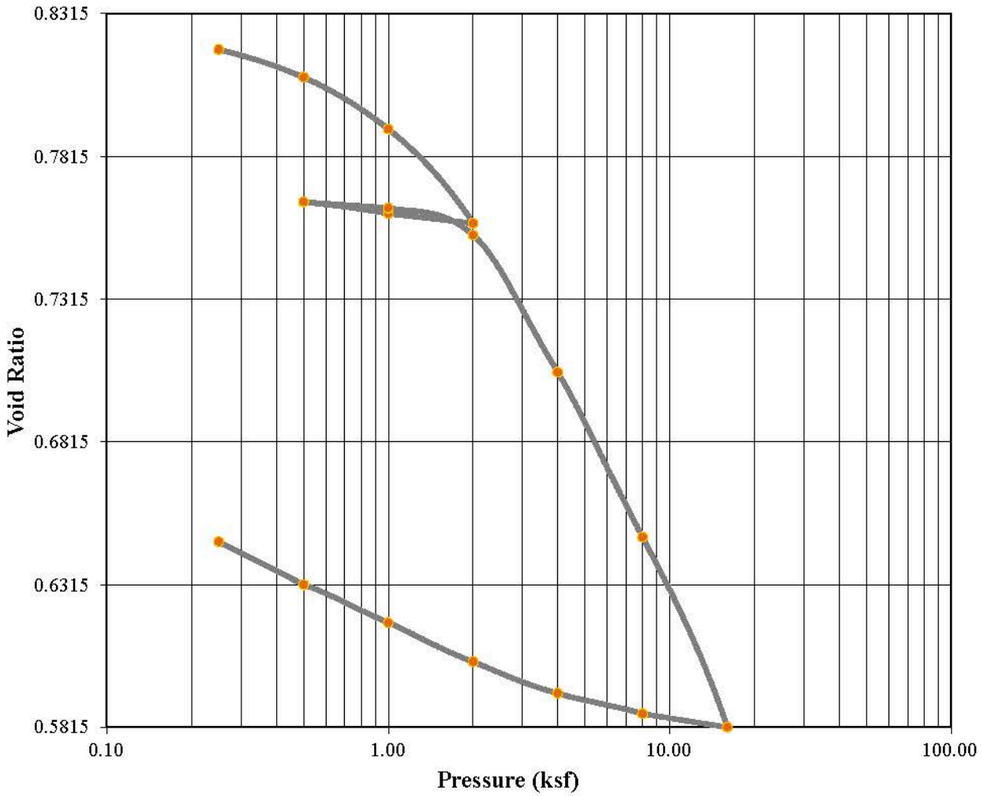
Tony Summers

Tony Summers

Certification No. 121-01-1108

Consolidation Test
Test Results

ESP Associates, P.A.



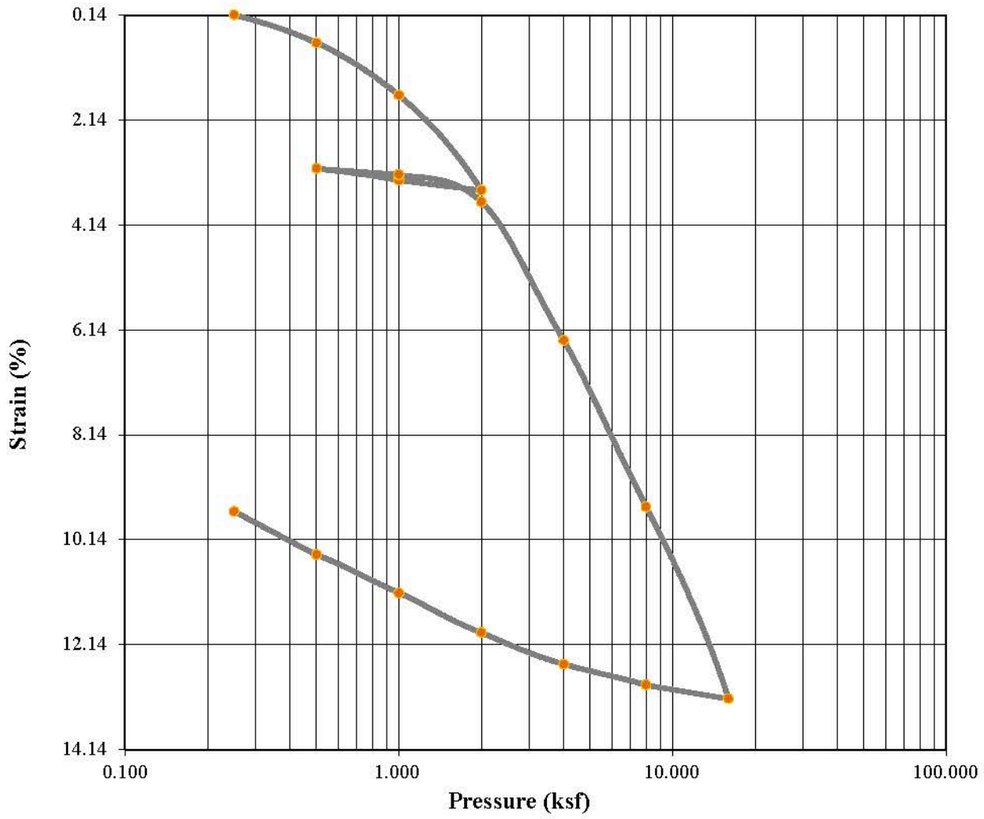
	Before	After	Liquid Limits:	32	Test Date:	6/24/2016
Moisture (%):	30.90	23.53	Plastic Limits:	16		
Dry Density (pcf):	90.67	102.79	Plasticity Index (%):	16		
Saturation (%):	99.31	102.31				
Void Ratio:	0.8225	0.6475	Specific Gravity:	2.650	Assumed	

Soil Description:

Project Number:	CS34.325	Depth: 3.7'-5.7'	Remarks:	
Sample Number:	ST-1	Boring Number: EB2-B		
Project:	R-1015 (site #5)			
Client:				
Location:	EB2-B ST-1(3.7'-5.7')			

Consolidation Test
Test Results

ESP Associates, P.A.

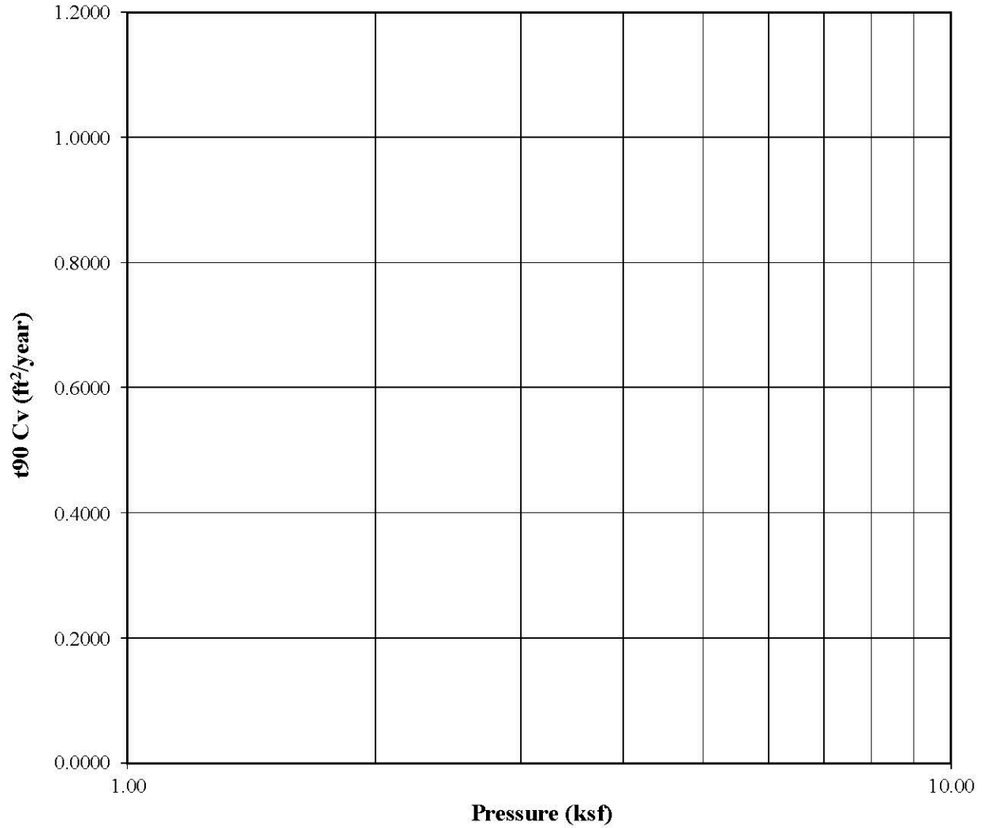


	Before	After	Liquid Limits:	32	Test Date:	6/24/2016
Moisture (%):	30.90	23.53	Plastic Limits:	16		
Dry Density (pcf):	90.67	102.79	Plasticity Index (%):	16		
Saturation (%):	99.31	102.31				
Void Ratio:	0.8225	0.6475	Specific Gravity:	2.650	Assumed	

Sample Description:

Project Number:	CS34.325	Depth: 3.7'-5.7'	Remarks:	
Sample Number:	ST-1	Boring Number: EB2-B		
Project:	R-1015 (site #5)			
Client:				
Location:	EB2-B ST-1(3.7'-5.7')			

Consolidation Test
Test Results

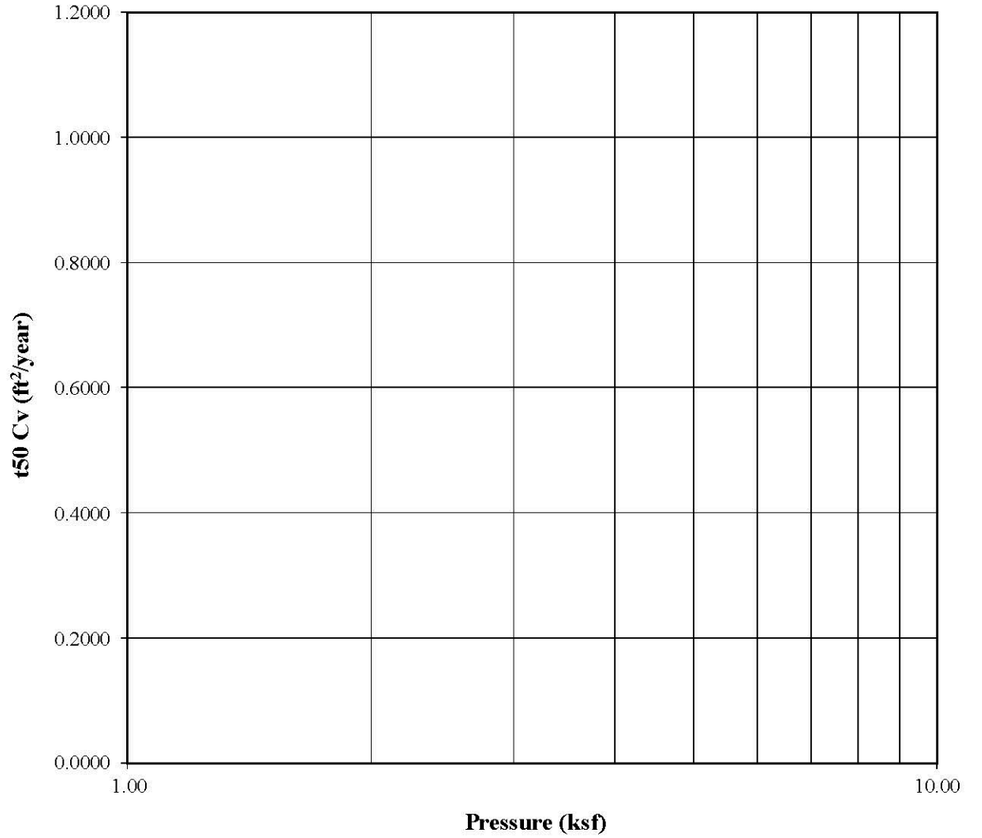


	Before	After				
Moisture (%):	30.90	23.53	**Liquid Limits:**	32	**Test Date:**	6/24/2016
Dry Density (pcf):	90.67	102.79	**Plastic Limits:**	16		
Saturation (%):	99.31	102.31	**Plasticity Index (%):**	16		
Void Ratio:	0.8225	0.6475	**Specific Gravity:**	2.650	Assumed	

Soil Description:

Project Number:	CS34.325	**Depth:**	3.7'-5.7'	**Remarks:**
Sample Number:	ST-1	**Boring Number:**	EB2-B	
Project:	R-1015 (site #5)			
Client:				
Location:	EB2-B ST-1(3.7'-5.7')			

Consolidation Test
Test Results

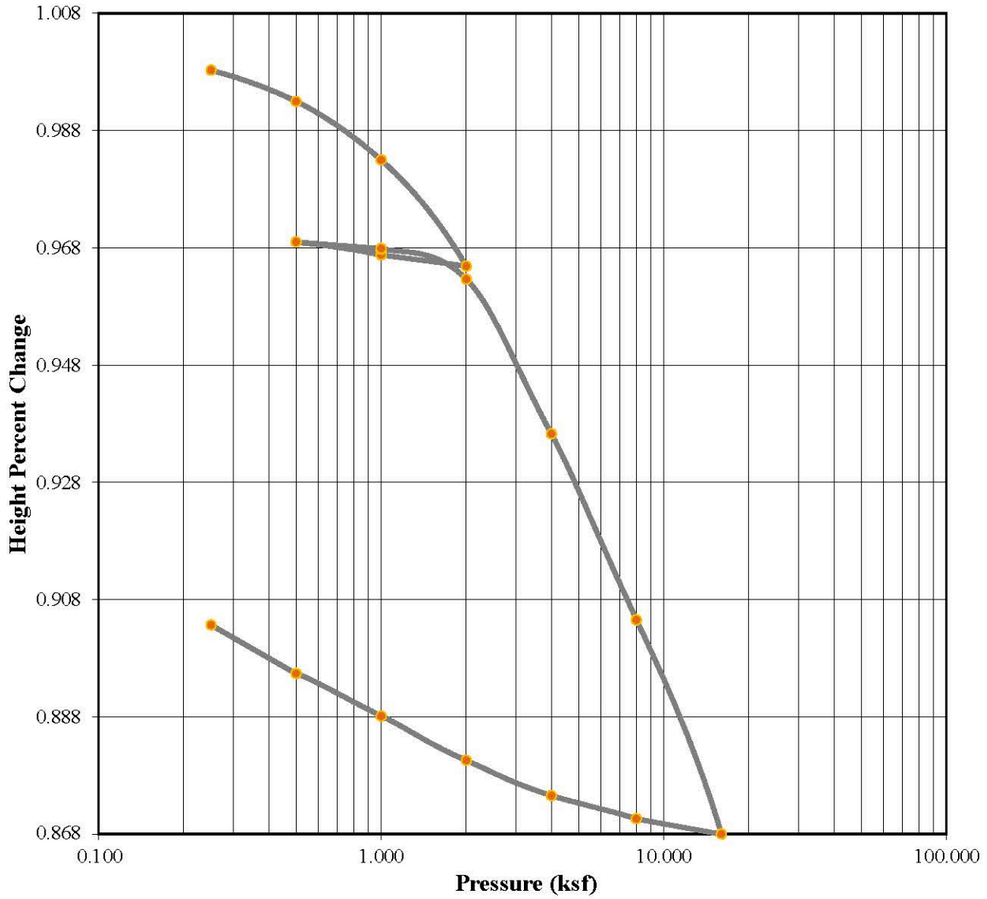


	Before	After				
Moisture (%):	30.90	23.53	**Liquid Limits:**	32	**Test Date:**	6/24/2016
Dry Density (pcf):	90.67	102.79	**Plastic Limits:**	16		
Saturation (%):	99.31	102.31	**Plasticity Index (%):**	16		
Void Ratio:	0.8225	0.6475	**Specific Gravity:**	2.650	Assumed	

Soil Description:

Project Number:	CS34.325	**Depth:**	3.7'-5.7'	**Remarks:**
Sample Number:	ST-1	**Boring Number:**	EB2-B	
Project:	R-1015 (site #5)			
Client:				
Location:	EB2-B ST-1(3.7'-5.7')			

Consolidation Test
Test Results



	Before	After				
Moisture (%):	30.90	23.53	**Liquid Limits:**	32	**Test Date:**	6/24/2016
Dry Density (pcf):	90.67	102.79	**Plastic Limits:**	16		
Saturation (%):	99.31	102.31	**Plasticity Index (%):**	16		
Void Ratio:	0.8225	0.6475	**Specific Gravity:**	2.650	Assumed	

Soil Description:

Project Number: CS34.325 **Depth:** 3.7'-5.7' **Remarks:**
Sample Number: ST-1 **Boring Number:** EB2-B

Project: R-1015 (site #5)
Client:
Location: EB2-B ST-1(3.7'-5.7')

Consolidation Test Results
Summary

Project: R-1015 (site #5) **Project Number:** CS34.325
Location: EB2-B ST-1(3.7'-5.7')
WBS No.: **34360.1.1**

Sample Number: ST-1 **Sample Description:** Gray to Dark Gray Sandy CLAY (A-6)
Boring Number: EB2-B
Depth: 3.7'-5.7' **Remarks:** **Test Number:**
Sample Type: Undisturbed **Test Date:** 6/24/2016

Index	Load Sequence (ksf)	Cummulative Change in Height (in)	Specimen Height (in)	Height of Void (in)	Vertical Strain (%)	Void Ratio	t90 Fitting Time (min)	t50 Fitting Time (min)	t90 Cv (ft2/year)	t50 Cv (ft2/year)
0	0.000	0.0000	1.0000	0.4510	0.00	0.8213	0.000	0.000	0.000	0.000
1	0.250	0.0014	0.9986	0.4496	0.14	0.8188	0.000	0.000	0.000	0.000
2	0.500	0.0067	0.9933	0.4443	0.67	0.8091	0.000	0.000	0.000	0.000
3	1.000	0.0167	0.9833	0.4343	1.67	0.7910	0.000	0.000	0.000	0.000
4	2.000	0.0348	0.9652	0.4162	3.48	0.7580	0.000	0.000	0.000	0.000
5	1.000	0.0329	0.9671	0.4181	3.29	0.7614	0.000	0.000	0.000	0.000
6	0.500	0.0307	0.9693	0.4203	3.07	0.7654	0.000	0.000	0.000	0.000
7	1.000	0.0319	0.9681	0.4190	3.19	0.7632	0.000	0.000	0.000	0.000
8	0.500	0.0307	0.9693	0.4203	3.07	0.7655	0.000	0.000	0.000	0.000
9	1.000	0.0318	0.9682	0.4192	3.18	0.7634	0.000	0.000	0.000	0.000
10	2.000	0.0370	0.9630	0.4139	3.70	0.7539	0.000	0.000	0.000	0.000
11	4.000	0.0634	0.9366	0.3875	6.34	0.7058	0.000	0.000	0.000	0.000
12	8.000	0.0951	0.9049	0.3558	9.51	0.6481	0.000	0.000	0.000	0.000
13	16.000	0.1317	0.8683	0.3193	13.17	0.5815	0.000	0.000	0.000	0.000
14	8.000	0.1291	0.8709	0.3219	12.91	0.5863	0.000	0.000	0.000	0.000
15	4.000	0.1251	0.8749	0.3258	12.51	0.5934	0.000	0.000	0.000	0.000
16	2.000	0.1191	0.8809	0.3319	11.91	0.6045	0.000	0.000	0.000	0.000
17	1.000	0.1115	0.8885	0.3394	11.15	0.6182	0.000	0.000	0.000	0.000
18	0.500	0.1043	0.8957	0.3467	10.43	0.6315	0.000	0.000	0.000	0.000
19	0.250	0.0960	0.9040	0.3550	9.60	0.6465	0.000	0.000	0.000	0.000

Predicted value indicated with *

Tested By: Tony Summers **Checked By:** Andrew Burton

Consolidation Test
Consolidation Specimen Information

Project: R-1015 (site #5) **Project Number:** CS34.325
Location: EB2-B ST-1(3.7'-5.7')
WBS No.: **34360.1.1** **Test Date:** 6/24/2016

Sample Number: ST-1 **Sample Description:** Gray to Dark Gray Sandy CLAY (A-6)
Boring Number: EB2-B
Depth: 3.7'-5.7' **Remarks:**
Sample Type: Undisturbed

Test Number:
Liquid Limit: 32.0000 **Initial Void Ratio:** 0.8225 **Initial Height (in):** 1.0000
Plastic Limit: 16.0000 **Plasticity Index (%):** 16.0000 **Initial Diameter (in):** 2.5000
Specific Gravity: 2.6500 Assumed **Weight of Ring (g):** 111.2000

Parameters	Initial Specimen	Final Specimen
Moist Weight + Container (g)	150.99	195.90
Dry Soil + Container (g)	127.08	168.12
Weight of Container (g)	49.95	50.04
Moisture Content (%)	30.90	23.53
Void Ratio	0.8225	0.6475
Saturation (%)	99.31	102.31
Dry Density (pcf)	90.67	102.79

Tested By: Tony Summers **Checked By:** Andrew Burton

Consolidation Test Results
(Sequence 1) Load 0.250 ksf

Project: R-1015 (site #5) **Project Number:** CS34.325
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: 34360.1.1 **Test Date:** 6/24/2016
Test Number:

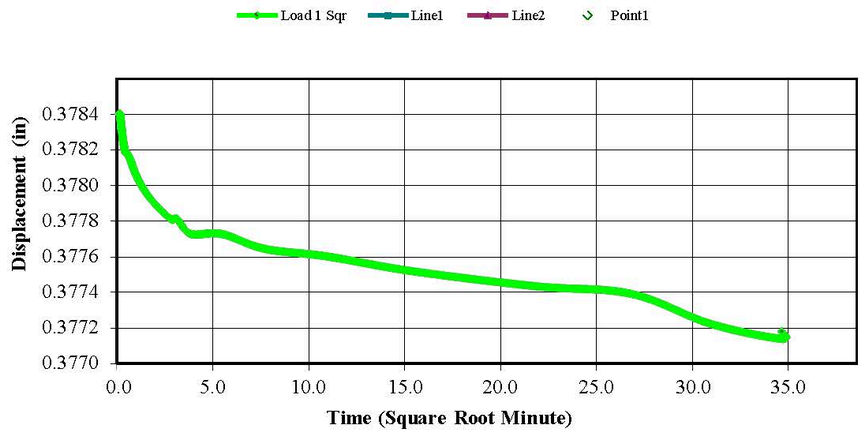
Sample Number: ST-1 **Soil Description:** Gray to Dark Gray Sandy CLAY (A-6)
Boring Number: EB2-B
Depth: 3.7'-5.7' **Remarks:**
Sample Type: Undisturbed

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3786	0.0000	0.0000	0.8225
1	00:00:01	0.3784	0.0002	0.0168	0.8222
2	00:00:02	0.3784	0.0002	0.0168	0.8222
3	00:00:03	0.3784	0.0002	0.0211	0.8221
4	00:00:04	0.3783	0.0003	0.0253	0.8220
5	00:00:05	0.3783	0.0003	0.0253	0.8220
6	00:00:06	0.3783	0.0003	0.0295	0.8220
7	00:00:12	0.3782	0.0004	0.0379	0.8218
8	00:00:15	0.3782	0.0004	0.0379	0.8218
9	00:00:30	0.3781	0.0004	0.0421	0.8217
10	00:01:00	0.3781	0.0005	0.0505	0.8216
11	00:02:00	0.3780	0.0006	0.0589	0.8214
12	00:04:01	0.3779	0.0007	0.0674	0.8213
13	00:08:01	0.3778	0.0008	0.0758	0.8211
14	00:10:01	0.3778	0.0008	0.0758	0.8211
15	00:15:01	0.3777	0.0008	0.0842	0.8210
16	00:30:02	0.3777	0.0008	0.0842	0.8210
17	01:00:04	0.3776	0.0009	0.0926	0.8208
18	02:00:07	0.3776	0.0010	0.0968	0.8207
19	04:00:14	0.3775	0.0011	0.1053	0.8206
20	08:00:27	0.3774	0.0011	0.1137	0.8204
21	12:00:40	0.3774	0.0012	0.1179	0.8203
22	16:00:53	0.3772	0.0013	0.1347	0.8200
23	20:01:07	0.3771	0.0014	0.1432	0.8199
24	20:05:24	0.3772	0.0014	0.1389	0.8200

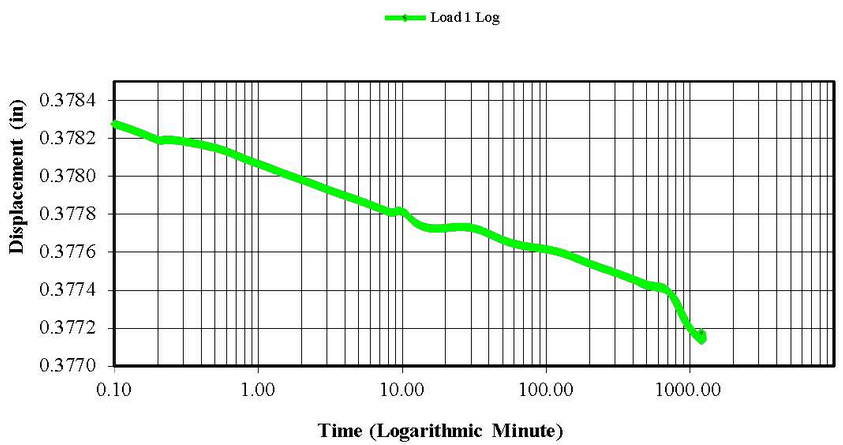
Tested By: Tony Summers **Checked By:** Andrew Burton

Consolidation Test Results
(Sequence 1) Load 0.250 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 2) Load 0.500 ksf

Project: R-1015 (site #5) **Project Number:** CS34.325
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: 34360.1.1 **Test Date:** 6/24/2016
Test Number:

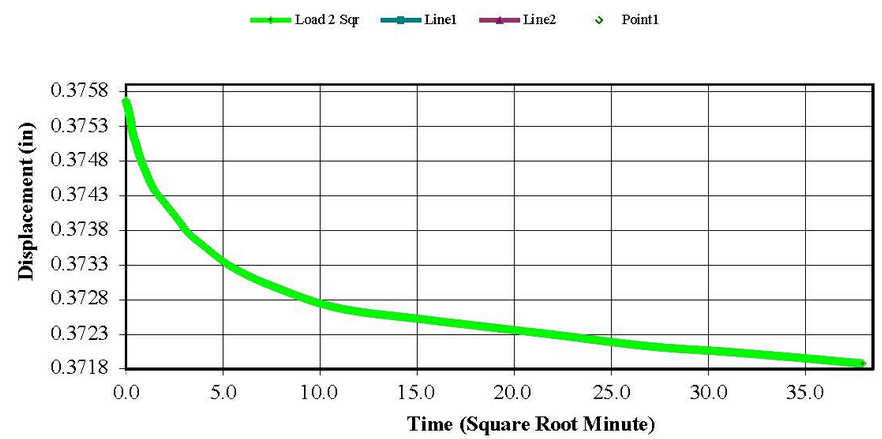
Sample Number: ST-1 **Soil Description:** Gray to Dark Gray Sandy CLAY (A-6)
Boring Number: EB2-B
Depth: 3.7'-5.7' **Remarks:**
Sample Type: Undisturbed

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3772	0.0014	0.1389	0.8200
1	00:00:00	0.3757	0.0029	0.2905	0.8172
2	00:00:01	0.3755	0.0030	0.3032	0.8170
3	00:00:02	0.3755	0.0031	0.3116	0.8168
4	00:00:03	0.3754	0.0032	0.3158	0.8167
5	00:00:04	0.3754	0.0032	0.3200	0.8167
6	00:00:05	0.3753	0.0033	0.3284	0.8165
7	00:00:11	0.3751	0.0035	0.3453	0.8162
8	00:00:14	0.3751	0.0035	0.3495	0.8161
9	00:00:30	0.3749	0.0037	0.3705	0.8157
10	00:01:00	0.3747	0.0039	0.3916	0.8154
11	00:02:00	0.3744	0.0042	0.4168	0.8149
12	00:04:00	0.3742	0.0044	0.4379	0.8145
13	00:08:00	0.3739	0.0047	0.4674	0.8140
14	00:10:00	0.3738	0.0048	0.4800	0.8137
15	00:15:00	0.3736	0.0050	0.4968	0.8134
16	00:30:01	0.3733	0.0053	0.5305	0.8128
17	01:00:03	0.3730	0.0056	0.5600	0.8123
18	02:00:06	0.3727	0.0059	0.5895	0.8117
19	04:00:13	0.3725	0.0061	0.6063	0.8114
20	08:00:26	0.3723	0.0063	0.6274	0.8111
21	12:00:39	0.3721	0.0064	0.6442	0.8107
22	16:00:53	0.3720	0.0065	0.6526	0.8106
23	20:01:06	0.3720	0.0066	0.6611	0.8104
24	23:59:57	0.3719	0.0067	0.6695	0.8103

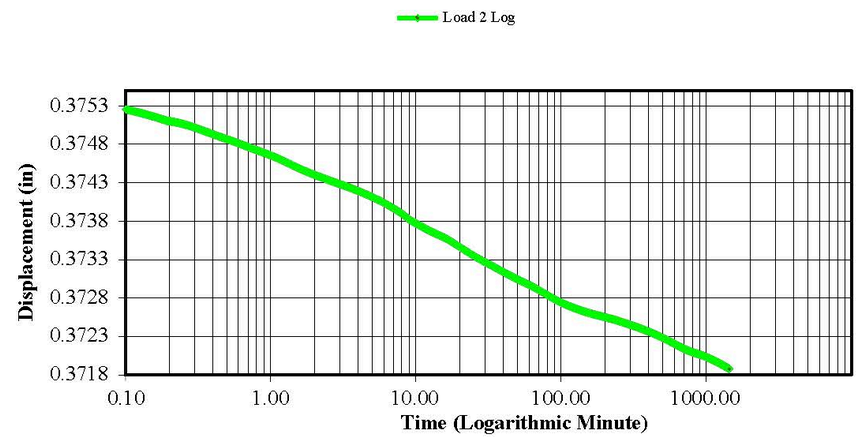
Tested By: Tony Summers **Checked By:** Andrew Burton

Consolidation Test Results
(Sequence 2) Load 0.500 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 3) Load 1.000 ksf

Project: R-1015 (site #5) **Project Number:** CS34.325
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: 34360.1.1 **Test Date:** 6/24/2016
Test Number:

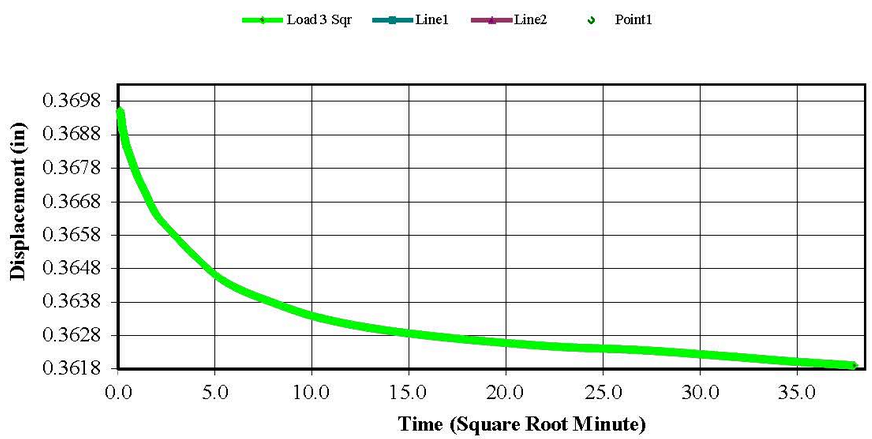
Sample Number: ST-1 **Soil Description:** Gray to Dark Gray Sandy CLAY (A-6)
Boring Number: EB2-B
Depth: 3.7'-5.7' **Remarks:**
Sample Type: Undisturbed

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3719	0.0067	0.6695	0.8103
1	00:00:01	0.3695	0.0091	0.9053	0.8060
2	00:00:02	0.3693	0.0093	0.9305	0.8055
3	00:00:03	0.3691	0.0095	0.9516	0.8051
4	00:00:04	0.3689	0.0096	0.9642	0.8049
5	00:00:05	0.3689	0.0097	0.9684	0.8048
6	00:00:06	0.3688	0.0098	0.9768	0.8047
7	00:00:12	0.3685	0.0101	1.0105	0.8041
8	00:00:15	0.3684	0.0102	1.0189	0.8039
9	00:00:30	0.3680	0.0105	1.0526	0.8033
10	00:01:00	0.3676	0.0110	1.0989	0.8025
11	00:02:00	0.3671	0.0115	1.1495	0.8015
12	00:04:00	0.3664	0.0122	1.2168	0.8003
13	00:08:01	0.3659	0.0127	1.2716	0.7993
14	00:10:01	0.3656	0.0129	1.2926	0.7989
15	00:15:01	0.3652	0.0133	1.3347	0.7982
16	00:30:02	0.3644	0.0141	1.4147	0.7967
17	01:00:04	0.3638	0.0147	1.4737	0.7956
18	02:00:07	0.3632	0.0153	1.5326	0.7946
19	04:00:14	0.3628	0.0157	1.5747	0.7938
20	08:00:27	0.3625	0.0161	1.6084	0.7932
21	12:00:40	0.3624	0.0162	1.6211	0.7929
22	16:00:53	0.3622	0.0164	1.6379	0.7926
23	20:01:07	0.3620	0.0165	1.6547	0.7923
24	23:59:58	0.3619	0.0167	1.6674	0.7921

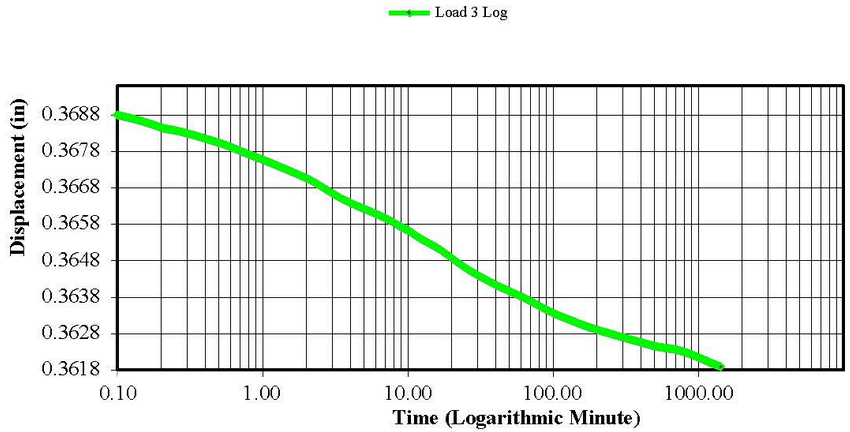
Tested By: Tony Summers **Checked By:** Andrew Burton

Consolidation Test Results
(Sequence 3) Load 1.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 4) Load 2.000 ksf

Project: R-1015 (site #5) **Project Number:** CS34.325
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: 34360.1.1 **Test Date:** 6/24/2016
Test Number:

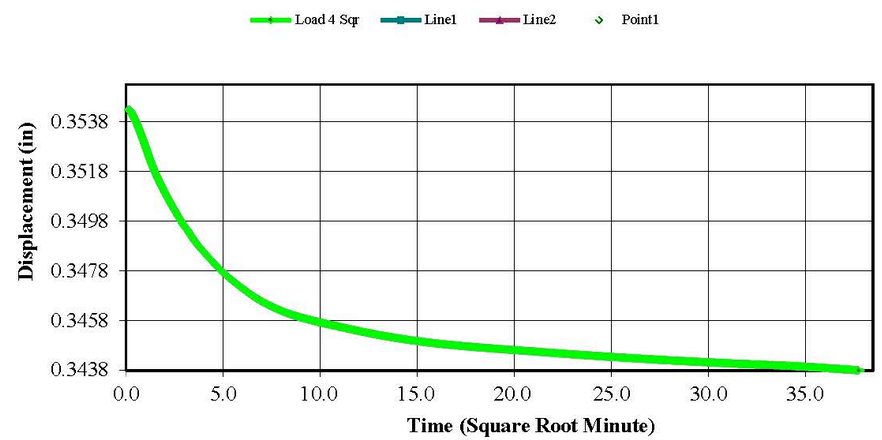
Sample Number: ST-1 **Soil Description:** Gray to Dark Gray Sandy CLAY (A-6)
Boring Number: EB2-B
Depth: 3.7'-5.7' **Remarks:**
Sample Type: Undisturbed

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3619	0.0167	1.6674	0.7921
1	00:00:01	0.3543	0.0243	2.4295	0.7782
2	00:00:02	0.3543	0.0243	2.4295	0.7782
3	00:00:03	0.3542	0.0243	2.4337	0.7781
4	00:00:04	0.3542	0.0244	2.4379	0.7781
5	00:00:05	0.3541	0.0244	2.4421	0.7780
6	00:00:06	0.3541	0.0245	2.4463	0.7779
7	00:00:12	0.3539	0.0247	2.4674	0.7775
8	00:00:15	0.3538	0.0248	2.4758	0.7774
9	00:00:30	0.3534	0.0251	2.5137	0.7767
10	00:01:00	0.3528	0.0258	2.5768	0.7755
11	00:02:00	0.3519	0.0267	2.6653	0.7739
12	00:04:00	0.3509	0.0276	2.7621	0.7722
13	00:08:00	0.3498	0.0288	2.8758	0.7701
14	00:10:01	0.3494	0.0291	2.9137	0.7694
15	00:15:01	0.3487	0.0299	2.9895	0.7680
16	00:30:02	0.3474	0.0312	3.1158	0.7657
17	01:00:03	0.3463	0.0323	3.2295	0.7636
18	02:00:07	0.3456	0.0330	3.3011	0.7623
19	04:00:13	0.3449	0.0336	3.3642	0.7612
20	08:00:26	0.3445	0.0341	3.4063	0.7604
21	12:00:40	0.3443	0.0343	3.4316	0.7599
22	16:00:53	0.3441	0.0345	3.4484	0.7596
23	20:01:06	0.3440	0.0346	3.4611	0.7594
24	23:59:56	0.3438	0.0348	3.4779	0.7591

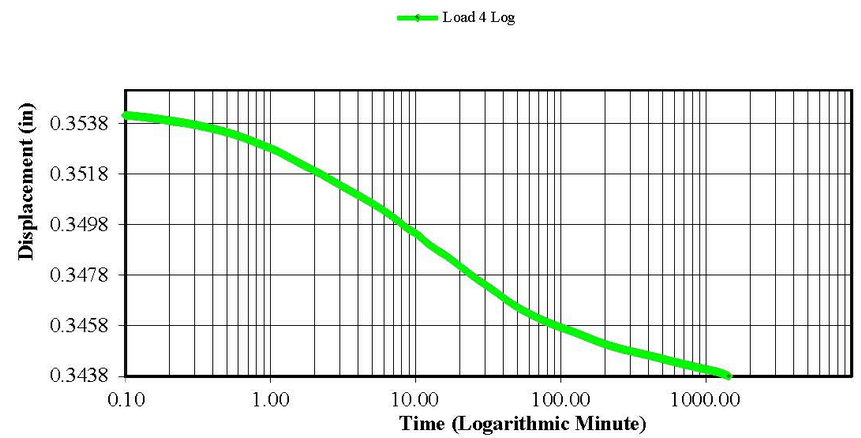
Tested By: Tony Summers **Checked By:** Andrew Burton

Consolidation Test Results
(Sequence 4) Load 2.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 5) Rebound 1.000 ksf

Project: R-1015 (site #5) **Project Number:** CS34.325
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: 34360.1.1 **Test Date:** 6/24/2016
Test Number:

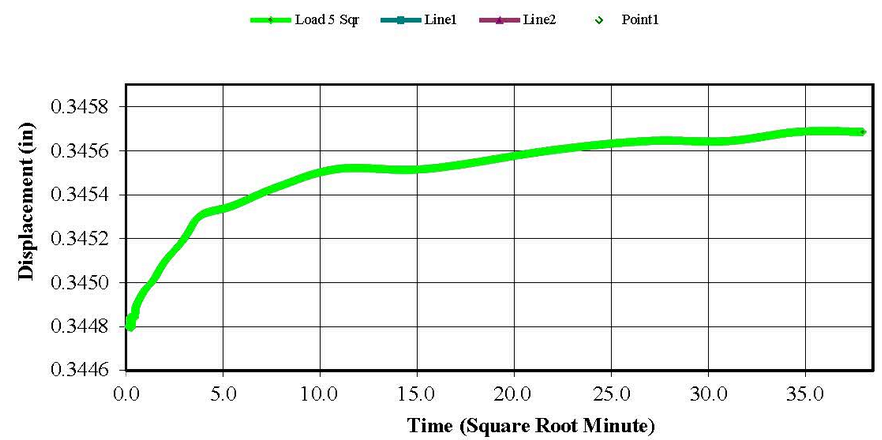
Sample Number: ST-1 **Soil Description:** Gray to Dark Gray Sandy CLAY (A-6)
Boring Number: EB2-B
Depth: 3.7'-5.7' **Remarks:**
Sample Type: Undisturbed

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3438	0.0348	3.4779	0.7591
1	00:00:01	0.3448	0.0338	3.3768	0.7609
2	00:00:02	0.3448	0.0338	3.3768	0.7609
3	00:00:03	0.3448	0.0337	3.3726	0.7610
4	00:00:04	0.3448	0.0338	3.3768	0.7609
5	00:00:05	0.3448	0.0338	3.3768	0.7609
6	00:00:06	0.3448	0.0337	3.3726	0.7610
7	00:00:12	0.3448	0.0337	3.3726	0.7610
8	00:00:15	0.3449	0.0337	3.3684	0.7611
9	00:00:30	0.3449	0.0336	3.3642	0.7612
10	00:01:00	0.3450	0.0336	3.3600	0.7613
11	00:02:00	0.3450	0.0336	3.3558	0.7613
12	00:04:00	0.3451	0.0335	3.3474	0.7615
13	00:08:01	0.3452	0.0334	3.3389	0.7616
14	00:10:01	0.3452	0.0333	3.3347	0.7617
15	00:15:01	0.3453	0.0333	3.3263	0.7619
16	00:30:02	0.3453	0.0332	3.3221	0.7619
17	01:00:04	0.3454	0.0331	3.3137	0.7621
18	02:00:07	0.3455	0.0331	3.3053	0.7623
19	04:00:14	0.3455	0.0331	3.3053	0.7623
20	08:00:27	0.3456	0.0330	3.2968	0.7624
21	12:00:40	0.3456	0.0329	3.2926	0.7625
22	16:00:53	0.3456	0.0329	3.2926	0.7625
23	20:01:07	0.3457	0.0329	3.2884	0.7626
24	23:59:57	0.3457	0.0329	3.2884	0.7626

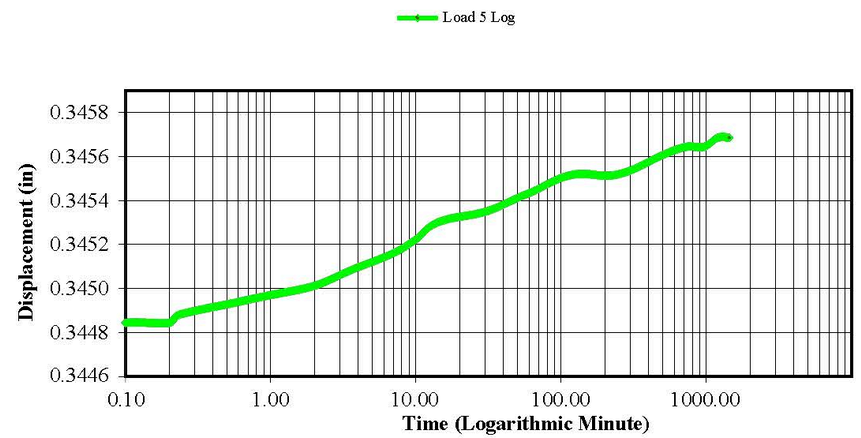
Tested By: Tony Summers **Checked By:** Andrew Burton

Consolidation Test Results
(Sequence 5) Rebound 1.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 6) Rebound 0.500 ksf

Project: R-1015 (site #5) **Project Number:** CS34.325
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: 34360.1.1 **Test Date:** 6/24/2016
Test Number:

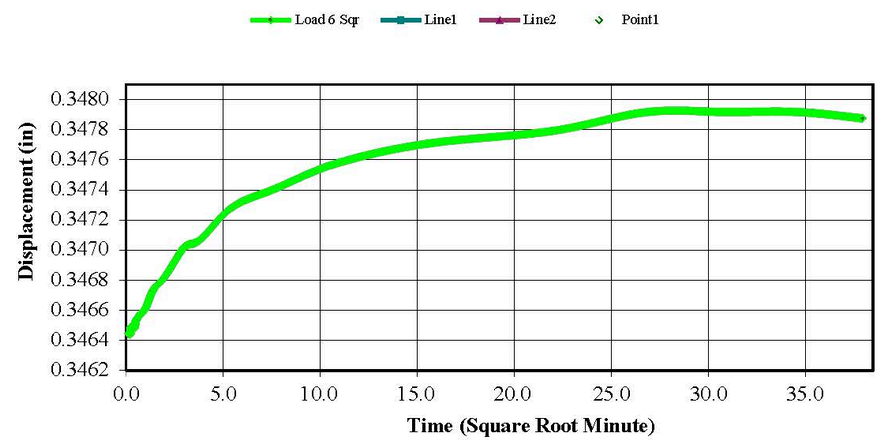
Sample Number: ST-1 **Soil Description:** Gray to Dark Gray Sandy CLAY (A-6)
Boring Number: EB2-B
Depth: 3.7'-5.7' **Remarks:**
Sample Type: Undisturbed

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3457	0.0329	3.2884	0.7626
1	00:00:01	0.3464	0.0321	3.2126	0.7639
2	00:00:02	0.3464	0.0321	3.2126	0.7639
3	00:00:03	0.3464	0.0321	3.2126	0.7639
4	00:00:04	0.3465	0.0321	3.2084	0.7640
5	00:00:05	0.3465	0.0321	3.2084	0.7640
6	00:00:06	0.3465	0.0321	3.2084	0.7640
7	00:00:12	0.3465	0.0321	3.2084	0.7640
8	00:00:15	0.3465	0.0320	3.2042	0.7641
9	00:00:30	0.3466	0.0320	3.2000	0.7642
10	00:01:00	0.3466	0.0320	3.1958	0.7642
11	00:02:00	0.3467	0.0318	3.1832	0.7645
12	00:04:00	0.3468	0.0317	3.1747	0.7646
13	00:08:00	0.3470	0.0316	3.1579	0.7649
14	00:10:01	0.3470	0.0315	3.1537	0.7650
15	00:15:01	0.3471	0.0315	3.1495	0.7651
16	00:30:02	0.3473	0.0313	3.1284	0.7655
17	01:00:03	0.3474	0.0312	3.1158	0.7657
18	02:00:07	0.3476	0.0310	3.0989	0.7660
19	04:00:13	0.3477	0.0309	3.0863	0.7662
20	08:00:26	0.3478	0.0308	3.0779	0.7664
21	12:00:40	0.3479	0.0307	3.0653	0.7666
22	16:00:53	0.3479	0.0307	3.0653	0.7666
23	20:01:06	0.3479	0.0307	3.0653	0.7666
24	23:59:57	0.3479	0.0307	3.0695	0.7665

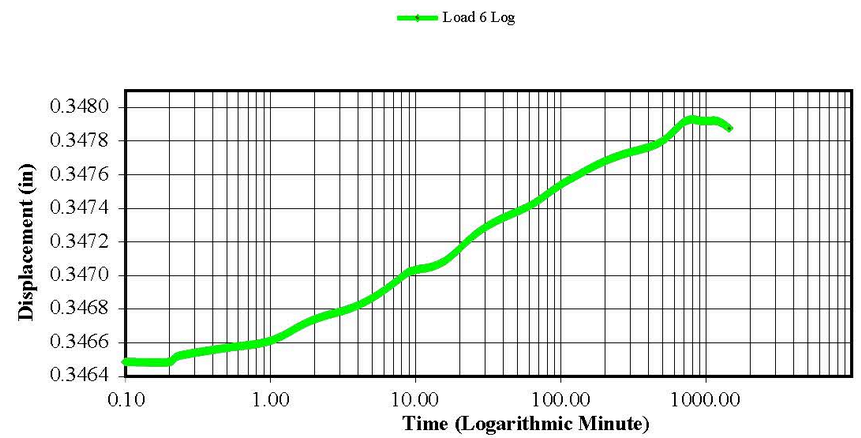
Tested By: Tony Summers **Checked By:** Andrew Burton

Consolidation Test Results
(Sequence 6) Rebound 0.500 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 7) Load 1.000 ksf

Project: R-1015 (site #5) **Project Number:** CS34.325
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: 34360.1.1 **Test Date:** 6/24/2016
Test Number:

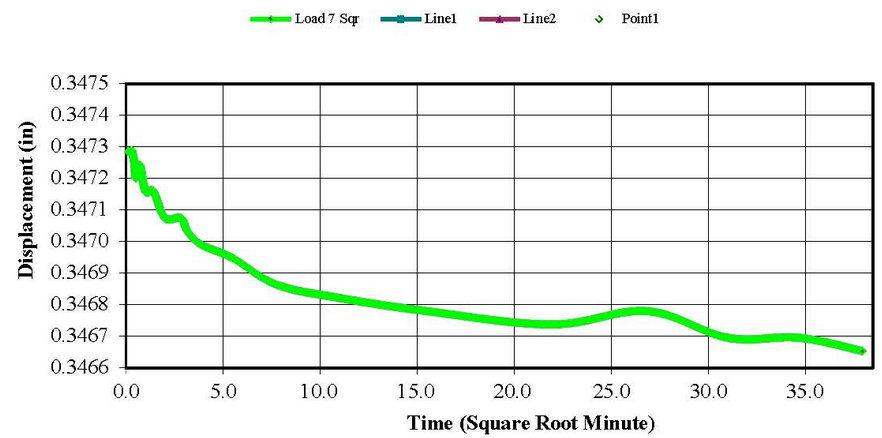
Sample Number: ST-1 **Soil Description:** Gray to Dark Gray Sandy CLAY (A-6)
Boring Number: EB2-B
Depth: 3.7'-5.7' **Remarks:**
Sample Type: Undisturbed

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3479	0.0307	3.0695	0.7665
1	00:00:01	0.3473	0.0313	3.1284	0.7655
2	00:00:02	0.3473	0.0313	3.1284	0.7655
3	00:00:03	0.3473	0.0313	3.1284	0.7655
4	00:00:04	0.3473	0.0313	3.1284	0.7655
5	00:00:05	0.3473	0.0313	3.1284	0.7655
6	00:00:06	0.3473	0.0313	3.1284	0.7655
7	00:00:12	0.3472	0.0313	3.1326	0.7654
8	00:00:15	0.3472	0.0314	3.1368	0.7653
9	00:00:30	0.3472	0.0313	3.1326	0.7654
10	00:01:00	0.3472	0.0314	3.1411	0.7652
11	00:02:00	0.3472	0.0314	3.1411	0.7652
12	00:04:00	0.3471	0.0315	3.1495	0.7651
13	00:08:00	0.3471	0.0315	3.1495	0.7651
14	00:10:00	0.3470	0.0315	3.1537	0.7650
15	00:15:01	0.3470	0.0316	3.1579	0.7649
16	00:30:02	0.3469	0.0316	3.1621	0.7649
17	01:00:03	0.3469	0.0317	3.1705	0.7647
18	02:00:07	0.3468	0.0317	3.1747	0.7646
19	04:00:13	0.3468	0.0318	3.1789	0.7646
20	08:00:26	0.3467	0.0318	3.1832	0.7645
21	12:00:40	0.3468	0.0318	3.1789	0.7646
22	16:00:53	0.3467	0.0319	3.1874	0.7644
23	20:01:06	0.3467	0.0319	3.1874	0.7644
24	23:59:58	0.3467	0.0319	3.1916	0.7643

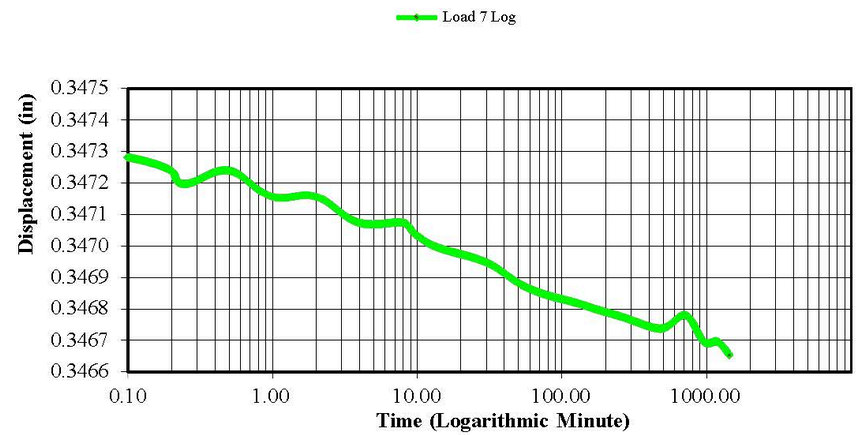
Tested By: Tony Summers **Checked By:** Andrew Burton

Consolidation Test Results
(Sequence 7) Load 1.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 8) Rebound 0.500 ksf

Project: R-1015 (site #5) **Project Number:** CS34.325
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: **34360.1.1** **Test Date:** 6/24/2016
Test Number:

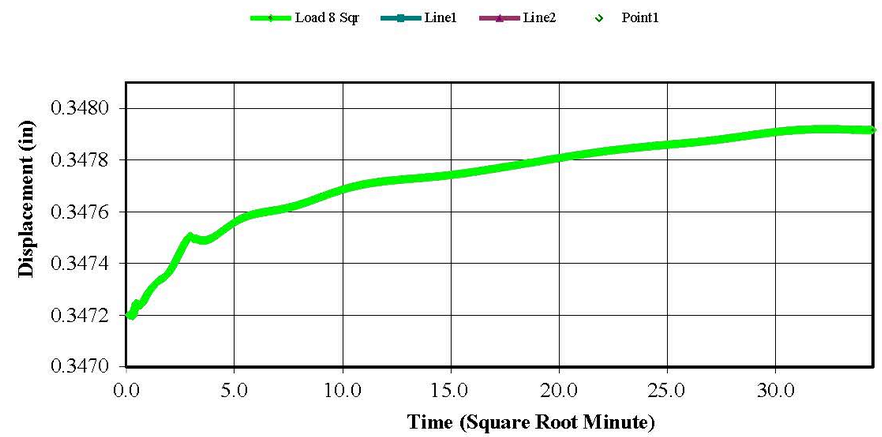
Sample Number: ST-1 **Soil Description:** Gray to Dark Gray Sandy CLAY (A-6)
Boring Number: EB2-B
Depth: 3.7'-5.7' **Remarks:**
Sample Type: Undisturbed

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3467	0.0319	3.1916	0.7643
1	00:00:01	0.3472	0.0314	3.1368	0.7653
2	00:00:02	0.3472	0.0314	3.1368	0.7653
3	00:00:03	0.3472	0.0314	3.1368	0.7653
4	00:00:04	0.3472	0.0314	3.1368	0.7653
5	00:00:05	0.3472	0.0314	3.1368	0.7653
6	00:00:06	0.3472	0.0314	3.1368	0.7653
7	00:00:12	0.3472	0.0313	3.1326	0.7654
8	00:00:15	0.3472	0.0313	3.1326	0.7654
9	00:00:30	0.3472	0.0313	3.1326	0.7654
10	00:01:00	0.3473	0.0313	3.1284	0.7655
11	00:02:00	0.3473	0.0312	3.1242	0.7656
12	00:04:00	0.3474	0.0312	3.1200	0.7656
13	00:08:00	0.3475	0.0311	3.1074	0.7659
14	00:10:00	0.3475	0.0311	3.1074	0.7659
15	00:15:01	0.3475	0.0311	3.1074	0.7659
16	00:30:01	0.3476	0.0310	3.0989	0.7660
17	01:00:03	0.3476	0.0309	3.0947	0.7661
18	02:00:06	0.3477	0.0309	3.0863	0.7662
19	04:00:13	0.3477	0.0308	3.0821	0.7663
20	08:00:26	0.3478	0.0307	3.0737	0.7665
21	12:00:40	0.3479	0.0307	3.0695	0.7665
22	16:00:53	0.3479	0.0307	3.0653	0.7666
23	20:01:06	0.3479	0.0307	3.0653	0.7666
24	23:59:57	0.3479	0.0307	3.0653	0.7666

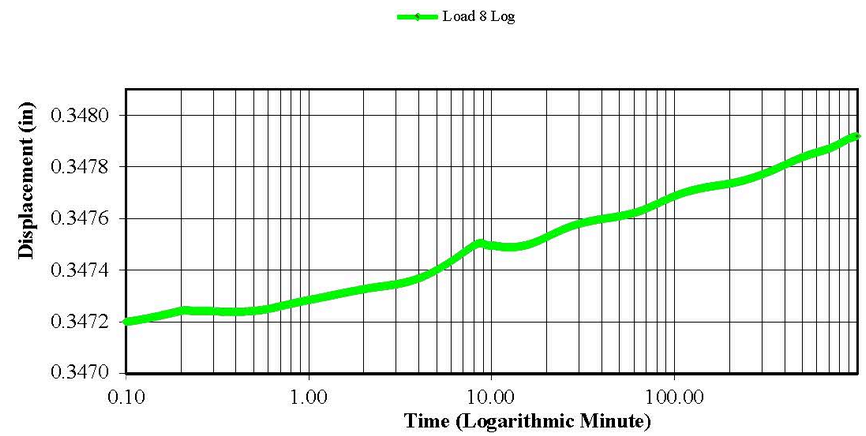
Tested By: Tony Summers **Checked By:** Andrew Burton

Consolidation Test Results
(Sequence 8) Rebound 0.500 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 9) Load 1.000 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: **34360.1.1**

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

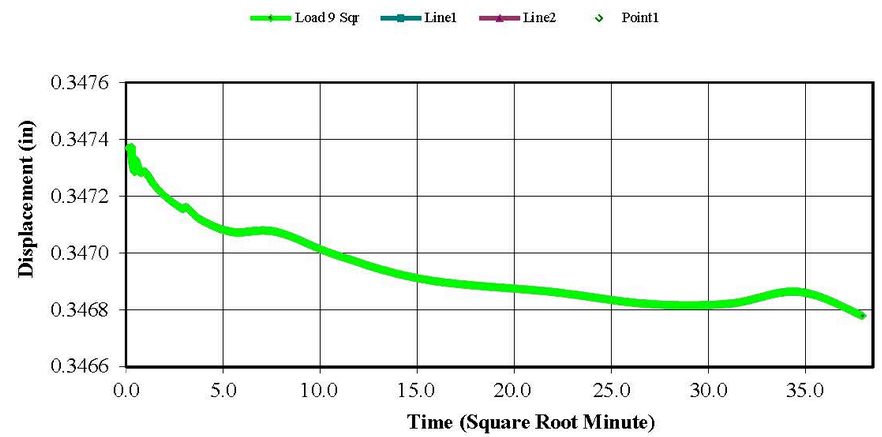
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3479	0.0307	3.0653	0.7666
1	00:00:01	0.3474	0.0312	3.1200	0.7656
2	00:00:02	0.3474	0.0312	3.1200	0.7656
3	00:00:03	0.3474	0.0312	3.1200	0.7656
4	00:00:04	0.3474	0.0312	3.1200	0.7656
5	00:00:05	0.3474	0.0312	3.1200	0.7656
6	00:00:06	0.3473	0.0312	3.1242	0.7656
7	00:00:12	0.3473	0.0313	3.1284	0.7655
8	00:00:15	0.3473	0.0312	3.1242	0.7656
9	00:00:30	0.3473	0.0313	3.1284	0.7655
10	00:01:00	0.3473	0.0313	3.1284	0.7655
11	00:02:00	0.3472	0.0313	3.1326	0.7654
12	00:04:01	0.3472	0.0314	3.1368	0.7653
13	00:08:01	0.3472	0.0314	3.1411	0.7652
14	00:10:01	0.3472	0.0314	3.1411	0.7652
15	00:15:01	0.3471	0.0315	3.1453	0.7652
16	00:30:02	0.3471	0.0315	3.1495	0.7651
17	01:00:04	0.3471	0.0315	3.1495	0.7651
18	02:00:07	0.3470	0.0316	3.1579	0.7649
19	04:00:14	0.3469	0.0317	3.1663	0.7648
20	08:00:27	0.3469	0.0317	3.1705	0.7647
21	12:00:40	0.3468	0.0317	3.1747	0.7646
22	16:00:53	0.3468	0.0317	3.1747	0.7646
23	20:01:07	0.3469	0.0317	3.1705	0.7647
24	23:59:58	0.3468	0.0318	3.1789	0.7646

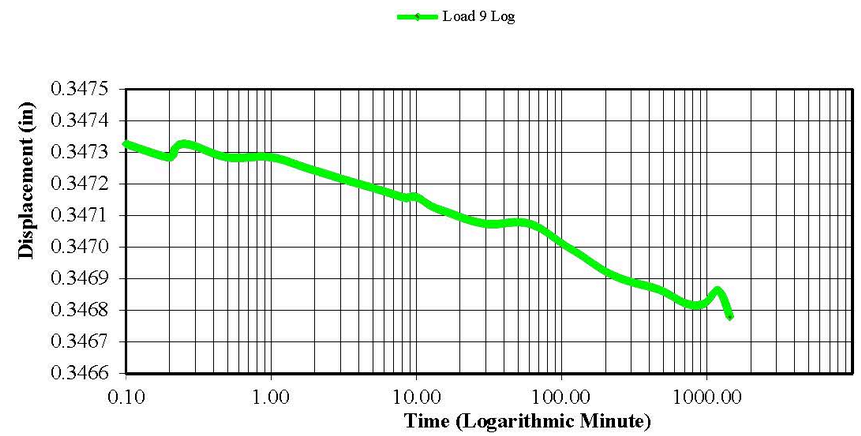
Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 9) Load 1.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 10) Load 2.000 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: **34360.1.1**

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

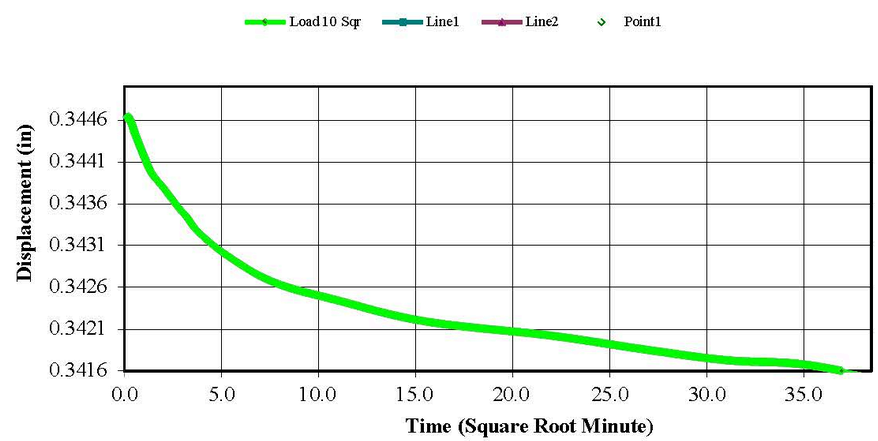
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3468	0.0318	3.1789	0.7646
1	00:00:01	0.3446	0.0339	3.3937	0.7606
2	00:00:02	0.3446	0.0339	3.3937	0.7606
3	00:00:03	0.3446	0.0339	3.3937	0.7606
4	00:00:04	0.3446	0.0340	3.3979	0.7606
5	00:00:05	0.3446	0.0340	3.3979	0.7606
6	00:00:06	0.3446	0.0340	3.3979	0.7606
7	00:00:12	0.3445	0.0341	3.4063	0.7604
8	00:00:15	0.3445	0.0341	3.4105	0.7603
9	00:00:30	0.3443	0.0342	3.4232	0.7601
10	00:01:00	0.3442	0.0344	3.4400	0.7598
11	00:02:00	0.3440	0.0346	3.4611	0.7594
12	00:04:00	0.3438	0.0348	3.4779	0.7591
13	00:08:01	0.3435	0.0350	3.5032	0.7586
14	00:10:01	0.3435	0.0351	3.5116	0.7585
15	00:15:01	0.3432	0.0353	3.5326	0.7581
16	00:30:02	0.3429	0.0356	3.5621	0.7576
17	01:00:03	0.3427	0.0359	3.5916	0.7570
18	02:00:07	0.3424	0.0361	3.6126	0.7566
19	04:00:13	0.3422	0.0364	3.6379	0.7562
20	08:00:27	0.3420	0.0365	3.6547	0.7559
21	12:00:40	0.3419	0.0367	3.6716	0.7556
22	16:00:53	0.3417	0.0368	3.6842	0.7553
23	20:01:06	0.3417	0.0369	3.6884	0.7553
24	23:59:58	0.3416	0.0370	3.7011	0.7550

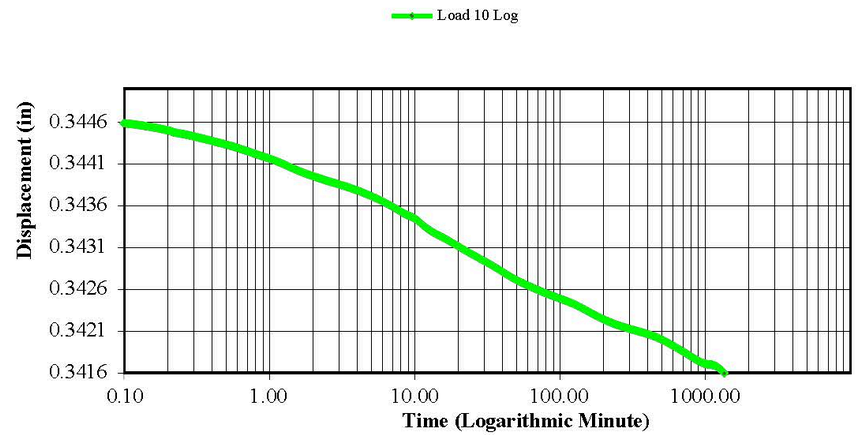
Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 10) Load 2.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 11) Load 4.000 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: **34360.1.1**

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

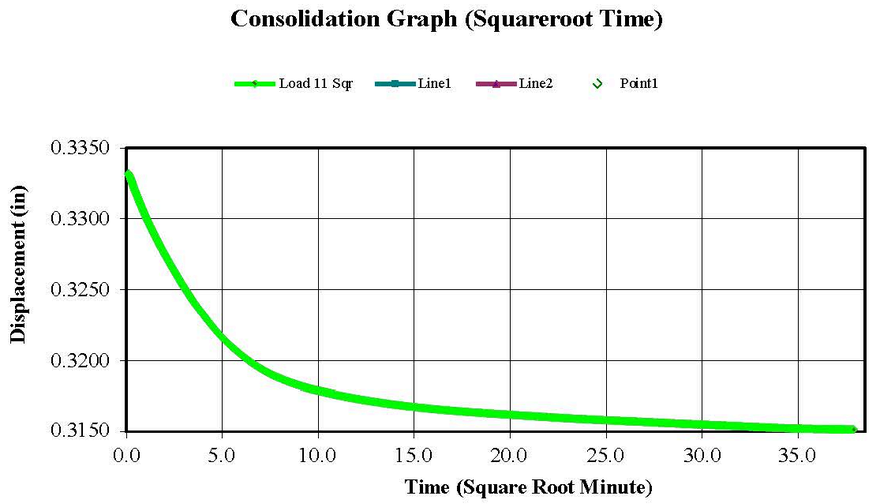
Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

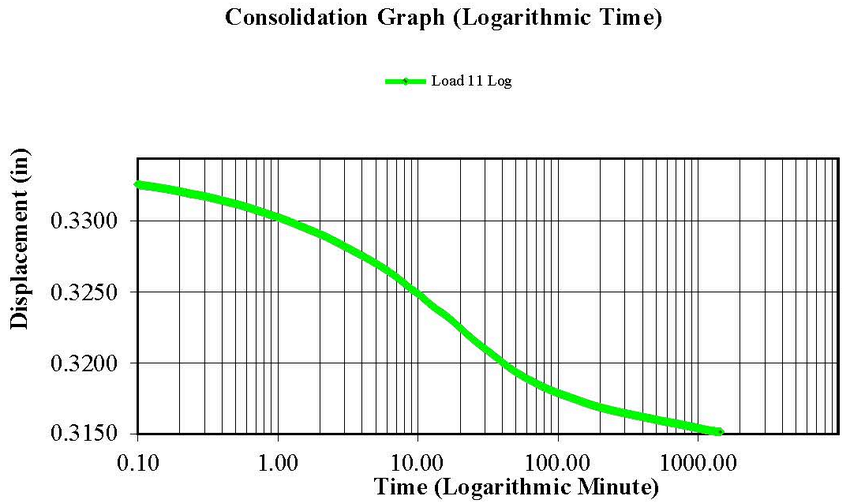
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3416	0.0370	3.7011	0.7550
1	00:00:01	0.3332	0.0454	4.5389	0.7398
2	00:00:03	0.3329	0.0456	4.5642	0.7393
3	00:00:04	0.3328	0.0458	4.5768	0.7391
4	00:00:05	0.3327	0.0459	4.5895	0.7388
5	00:00:06	0.3326	0.0460	4.5979	0.7387
6	00:00:07	0.3325	0.0461	4.6105	0.7385
7	00:00:13	0.3320	0.0466	4.6568	0.7376
8	00:00:16	0.3318	0.0467	4.6737	0.7373
9	00:00:31	0.3312	0.0474	4.7411	0.7361
10	00:01:01	0.3302	0.0483	4.8337	0.7344
11	00:02:01	0.3291	0.0495	4.9516	0.7322
12	00:04:01	0.3275	0.0510	5.1032	0.7295
13	00:08:01	0.3256	0.0530	5.2968	0.7260
14	00:10:01	0.3249	0.0537	5.3684	0.7247
15	00:15:02	0.3235	0.0551	5.5074	0.7221
16	00:30:02	0.3210	0.0576	5.7558	0.7176
17	01:00:04	0.3189	0.0597	5.9663	0.7138
18	02:00:07	0.3176	0.0610	6.0968	0.7114
19	04:00:14	0.3167	0.0619	6.1895	0.7097
20	08:00:27	0.3160	0.0625	6.2526	0.7085
21	12:00:41	0.3157	0.0629	6.2863	0.7079
22	16:00:54	0.3155	0.0631	6.3116	0.7075
23	20:01:07	0.3152	0.0633	6.3326	0.7071
24	23:59:59	0.3152	0.0634	6.3411	0.7069

Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 11) Load 4.000 ksf





Consolidation Test Results
(Sequence 12) Load 8.000 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: **34360.1.1**

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

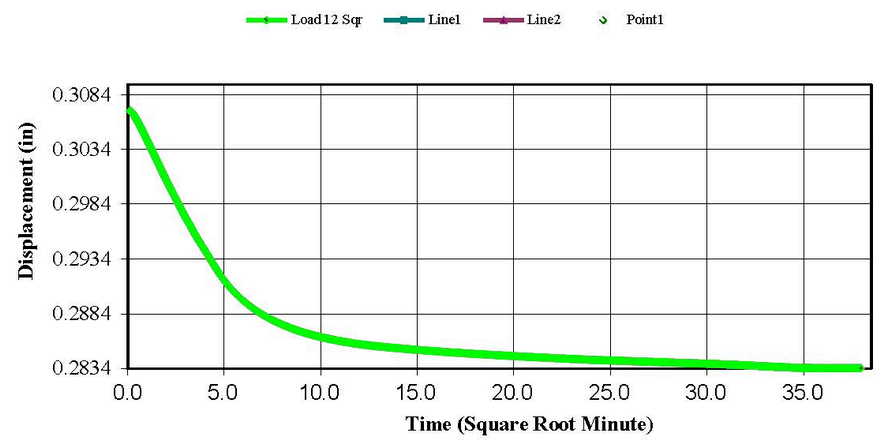
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.3152	0.0634	6.3411	0.7069
1	00:00:01	0.3069	0.0717	7.1663	0.6919
2	00:00:02	0.3068	0.0717	7.1747	0.6917
3	00:00:03	0.3067	0.0718	7.1832	0.6916
4	00:00:04	0.3067	0.0719	7.1874	0.6915
5	00:00:05	0.3066	0.0720	7.1958	0.6913
6	00:00:06	0.3065	0.0720	7.2042	0.6912
7	00:00:12	0.3061	0.0724	7.2421	0.6905
8	00:00:15	0.3060	0.0726	7.2589	0.6902
9	00:00:30	0.3053	0.0733	7.3263	0.6890
10	00:01:00	0.3043	0.0743	7.4316	0.6870
11	00:02:00	0.3027	0.0758	7.5832	0.6843
12	00:04:00	0.3006	0.0780	7.7979	0.6804
13	00:08:01	0.2977	0.0808	8.0842	0.6752
14	00:10:01	0.2967	0.0819	8.1895	0.6732
15	00:15:01	0.2945	0.0840	8.4042	0.6693
16	00:30:02	0.2904	0.0881	8.8126	0.6619
17	01:00:03	0.2876	0.0909	9.0947	0.6567
18	02:00:07	0.2859	0.0926	9.2632	0.6537
19	04:00:13	0.2851	0.0935	9.3516	0.6521
20	08:00:27	0.2844	0.0942	9.4189	0.6508
21	12:00:40	0.2840	0.0945	9.4526	0.6502
22	16:00:53	0.2838	0.0948	9.4779	0.6498
23	20:01:06	0.2835	0.0951	9.5074	0.6492
24	23:59:57	0.2835	0.0951	9.5116	0.6491

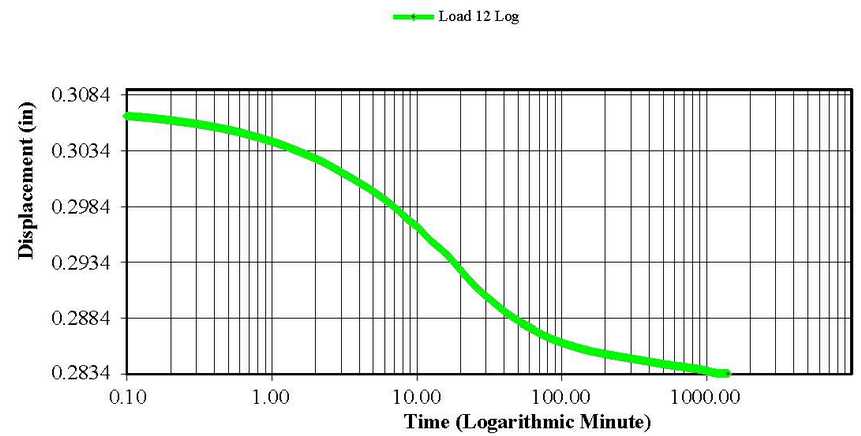
Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 12) Load 8.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 13) Load 16.000 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: 34360.1.1

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

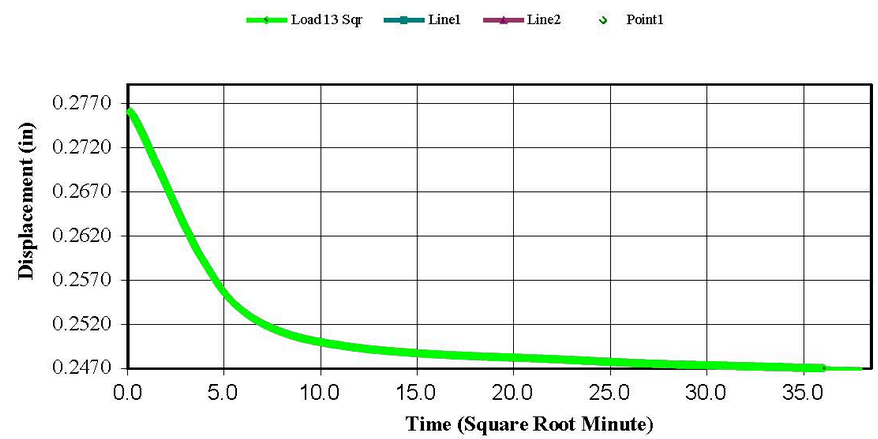
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.2835	0.0951	9.5116	0.6491
1	00:00:01	0.2761	0.1025	10.2484	0.6357
2	00:00:02	0.2759	0.1027	10.2653	0.6354
3	00:00:03	0.2758	0.1027	10.2737	0.6353
4	00:00:04	0.2757	0.1029	10.2863	0.6350
5	00:00:05	0.2756	0.1029	10.2947	0.6349
6	00:00:06	0.2755	0.1031	10.3074	0.6346
7	00:00:12	0.2750	0.1035	10.3537	0.6338
8	00:00:15	0.2748	0.1038	10.3789	0.6333
9	00:00:30	0.2739	0.1047	10.4674	0.6317
10	00:01:00	0.2725	0.1060	10.6021	0.6293
11	00:02:00	0.2705	0.1080	10.8042	0.6256
12	00:04:01	0.2677	0.1109	11.0905	0.6204
13	00:08:01	0.2637	0.1149	11.4905	0.6131
14	00:10:01	0.2622	0.1163	11.6337	0.6105
15	00:15:01	0.2593	0.1192	11.9242	0.6052
16	00:30:02	0.2544	0.1242	12.4168	0.5962
17	01:00:04	0.2513	0.1273	12.7284	0.5905
18	02:00:07	0.2496	0.1290	12.8968	0.5874
19	04:00:14	0.2486	0.1299	12.9937	0.5857
20	08:00:27	0.2480	0.1305	13.0526	0.5846
21	12:00:40	0.2475	0.1310	13.1032	0.5837
22	16:00:53	0.2473	0.1313	13.1284	0.5832
23	20:01:07	0.2471	0.1315	13.1495	0.5828
24	23:59:58	0.2469	0.1317	13.1663	0.5825

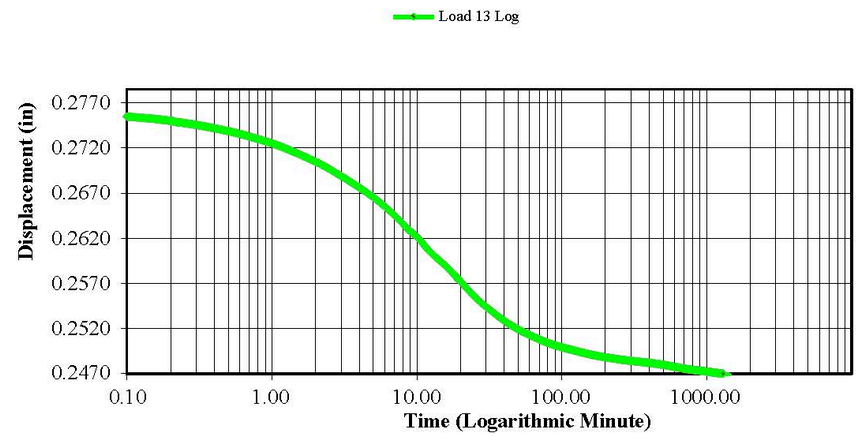
Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 13) Load 16.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 14) Rebound 8.000 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: **34360.1.1**

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

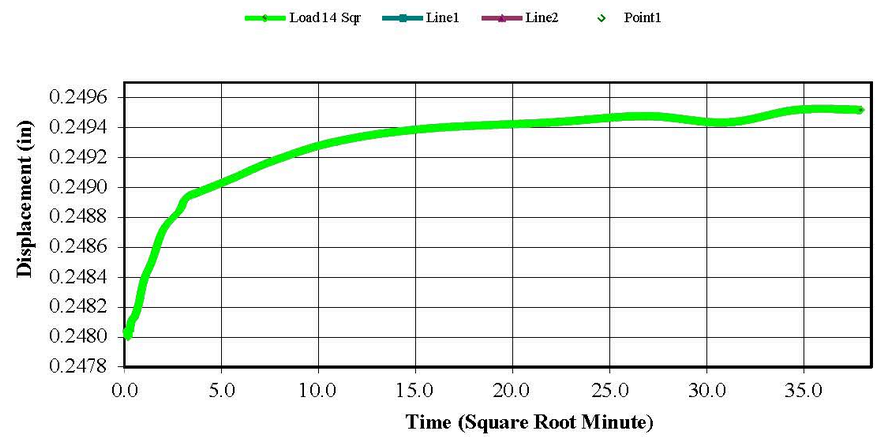
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.2469	0.1317	13.1663	0.5825
1	00:00:01	0.2480	0.1305	13.0526	0.5846
2	00:00:02	0.2480	0.1306	13.0568	0.5845
3	00:00:03	0.2480	0.1305	13.0526	0.5846
4	00:00:04	0.2480	0.1305	13.0526	0.5846
5	00:00:05	0.2480	0.1305	13.0526	0.5846
6	00:00:06	0.2481	0.1305	13.0484	0.5847
7	00:00:12	0.2481	0.1304	13.0442	0.5848
8	00:00:15	0.2481	0.1304	13.0442	0.5848
9	00:00:31	0.2482	0.1304	13.0358	0.5849
10	00:01:01	0.2484	0.1302	13.0189	0.5852
11	00:02:01	0.2485	0.1301	13.0063	0.5855
12	00:04:01	0.2487	0.1299	12.9853	0.5858
13	00:08:01	0.2488	0.1297	12.9726	0.5861
14	00:10:01	0.2489	0.1296	12.9642	0.5862
15	00:15:01	0.2490	0.1296	12.9600	0.5863
16	00:30:02	0.2491	0.1295	12.9516	0.5864
17	01:00:04	0.2492	0.1294	12.9389	0.5867
18	02:00:07	0.2493	0.1293	12.9263	0.5869
19	04:00:14	0.2494	0.1292	12.9179	0.5871
20	08:00:27	0.2494	0.1291	12.9137	0.5871
21	12:00:40	0.2495	0.1291	12.9095	0.5872
22	16:00:53	0.2494	0.1291	12.9137	0.5871
23	20:01:07	0.2495	0.1291	12.9053	0.5873
24	23:59:58	0.2495	0.1291	12.9053	0.5873

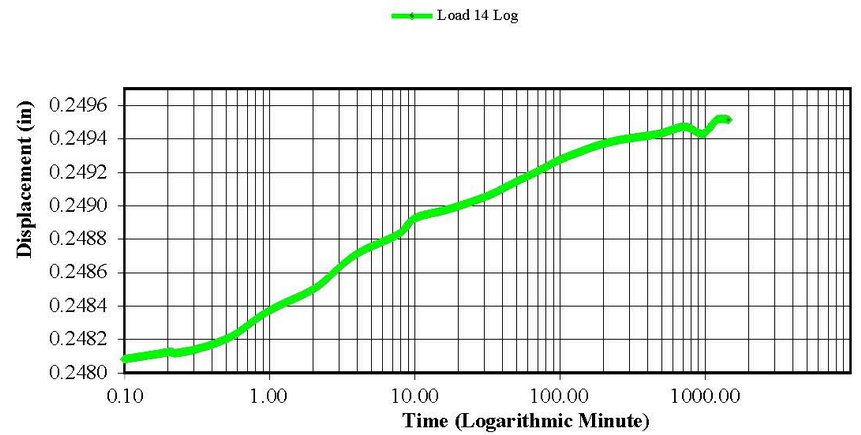
Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 14) Rebound 8.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 15) Rebound 4.000 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: **34360.1.1**

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

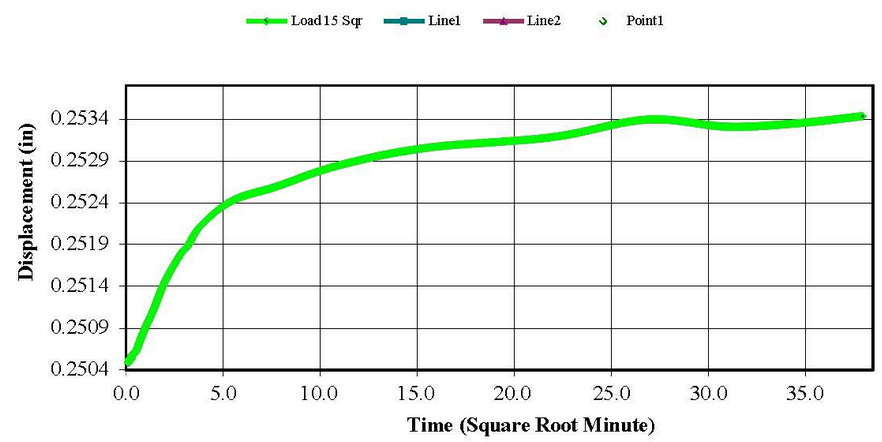
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.2495	0.1291	12.9053	0.5873
1	00:00:01	0.2505	0.1281	12.8084	0.5891
2	00:00:02	0.2505	0.1280	12.8042	0.5891
3	00:00:03	0.2505	0.1280	12.8042	0.5891
4	00:00:04	0.2505	0.1280	12.8042	0.5891
5	00:00:05	0.2506	0.1280	12.8000	0.5892
6	00:00:06	0.2506	0.1280	12.8000	0.5892
7	00:00:12	0.2506	0.1280	12.7958	0.5893
8	00:00:15	0.2506	0.1280	12.7958	0.5893
9	00:00:30	0.2507	0.1278	12.7832	0.5895
10	00:01:00	0.2509	0.1277	12.7663	0.5898
11	00:02:00	0.2511	0.1275	12.7453	0.5902
12	00:04:01	0.2515	0.1271	12.7116	0.5908
13	00:08:01	0.2518	0.1268	12.6779	0.5914
14	00:10:01	0.2519	0.1267	12.6695	0.5916
15	00:15:01	0.2521	0.1264	12.6442	0.5921
16	00:30:02	0.2524	0.1261	12.6147	0.5926
17	01:00:04	0.2526	0.1260	12.5979	0.5929
18	02:00:07	0.2528	0.1257	12.5726	0.5934
19	04:00:14	0.2531	0.1255	12.5516	0.5937
20	08:00:27	0.2532	0.1254	12.5389	0.5940
21	12:00:40	0.2534	0.1252	12.5179	0.5944
22	16:00:53	0.2533	0.1253	12.5263	0.5942
23	20:01:07	0.2533	0.1252	12.5221	0.5943
24	23:59:57	0.2534	0.1251	12.5137	0.5944

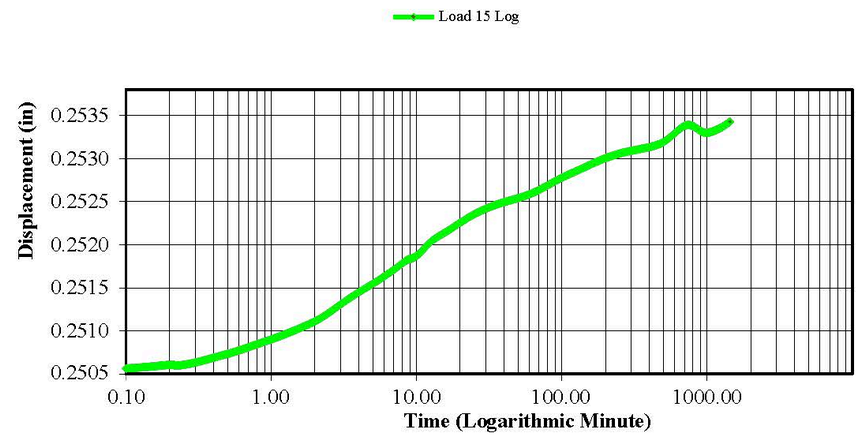
Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 15) Rebound 4.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 16) Rebound 2.000 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: **34360.1.1**

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

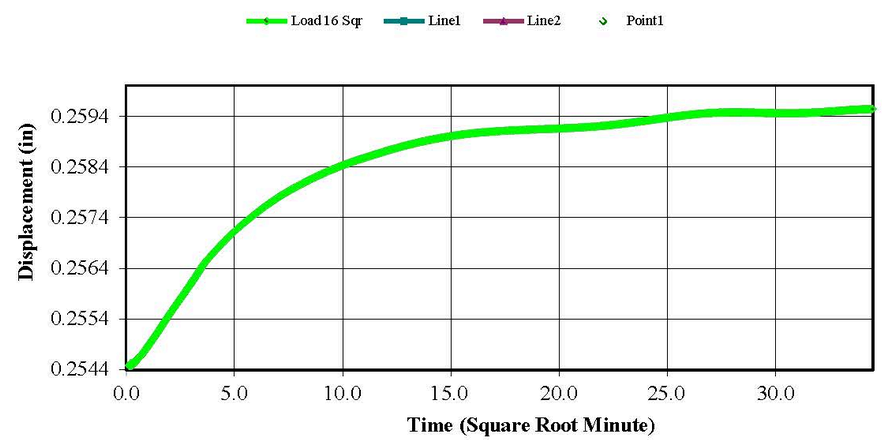
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.2534	0.1251	12.5137	0.5944
1	00:00:01	0.2545	0.1241	12.4084	0.5963
2	00:00:02	0.2545	0.1241	12.4084	0.5963
3	00:00:03	0.2545	0.1240	12.4042	0.5964
4	00:00:04	0.2545	0.1241	12.4084	0.5963
5	00:00:05	0.2545	0.1240	12.4042	0.5964
6	00:00:06	0.2545	0.1240	12.4042	0.5964
7	00:00:12	0.2546	0.1240	12.4000	0.5965
8	00:00:15	0.2546	0.1240	12.3958	0.5966
9	00:00:30	0.2547	0.1239	12.3874	0.5967
10	00:01:00	0.2549	0.1237	12.3705	0.5970
11	00:02:00	0.2551	0.1235	12.3453	0.5975
12	00:04:00	0.2555	0.1231	12.3074	0.5982
13	00:08:01	0.2560	0.1226	12.2568	0.5991
14	00:10:01	0.2562	0.1224	12.2358	0.5995
15	00:15:01	0.2566	0.1219	12.1937	0.6003
16	00:30:02	0.2573	0.1213	12.1263	0.6015
17	01:00:03	0.2580	0.1206	12.0589	0.6027
18	02:00:07	0.2586	0.1200	12.0000	0.6038
19	04:00:13	0.2590	0.1195	11.9537	0.6046
20	08:00:27	0.2592	0.1194	11.9368	0.6049
21	12:00:40	0.2595	0.1191	11.9116	0.6054
22	16:00:53	0.2595	0.1191	11.9116	0.6054
23	20:01:06	0.2595	0.1190	11.9032	0.6056
24	23:59:58	0.2595	0.1191	11.9074	0.6055

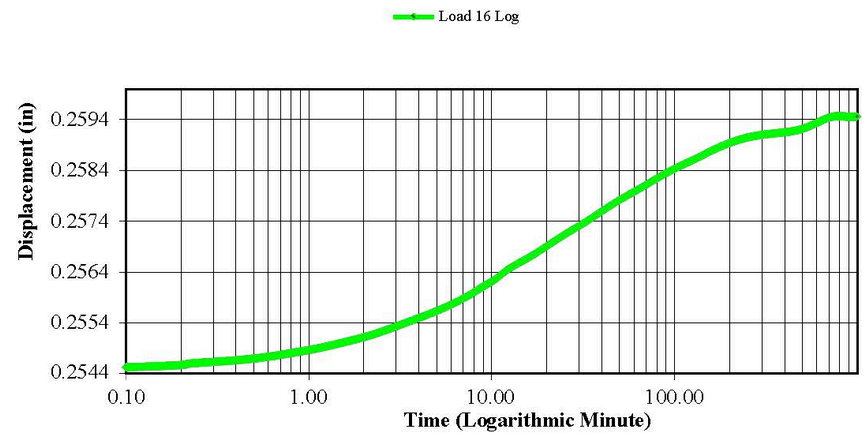
Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 16) Rebound 2.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 17) Rebound 1.000 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: **34360.1.1**

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

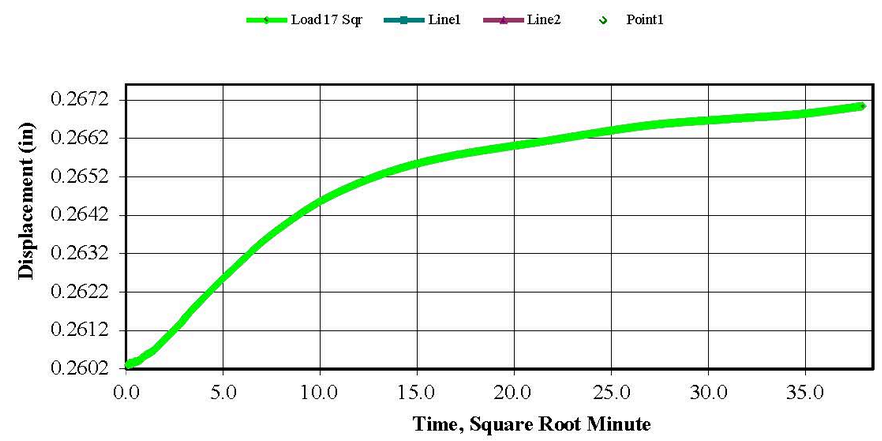
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.2595	0.1191	11.9074	0.6055
1	00:00:01	0.2603	0.1183	11.8274	0.6069
2	00:00:02	0.2603	0.1182	11.8232	0.6070
3	00:00:03	0.2603	0.1182	11.8232	0.6070
4	00:00:04	0.2603	0.1182	11.8232	0.6070
5	00:00:05	0.2603	0.1182	11.8232	0.6070
6	00:00:06	0.2603	0.1182	11.8232	0.6070
7	00:00:12	0.2604	0.1182	11.8189	0.6071
8	00:00:15	0.2604	0.1182	11.8189	0.6071
9	00:00:30	0.2604	0.1181	11.8147	0.6072
10	00:01:00	0.2605	0.1180	11.8021	0.6074
11	00:02:00	0.2607	0.1179	11.7895	0.6076
12	00:04:01	0.2610	0.1176	11.7600	0.6082
13	00:08:01	0.2614	0.1172	11.7179	0.6089
14	00:10:01	0.2616	0.1170	11.6968	0.6093
15	00:15:01	0.2620	0.1166	11.6589	0.6100
16	00:30:02	0.2628	0.1158	11.5789	0.6115
17	01:00:04	0.2638	0.1148	11.4779	0.6133
18	02:00:07	0.2648	0.1138	11.3768	0.6151
19	04:00:14	0.2656	0.1130	11.2968	0.6166
20	08:00:27	0.2661	0.1124	11.2421	0.6176
21	12:00:40	0.2665	0.1120	11.2042	0.6183
22	16:00:53	0.2667	0.1119	11.1874	0.6186
23	20:01:07	0.2668	0.1117	11.1747	0.6188
24	23:59:58	0.2670	0.1115	11.1537	0.6192

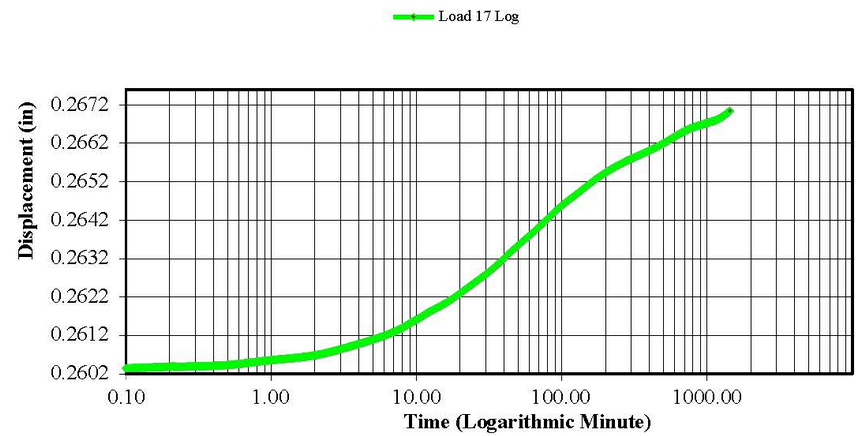
Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 17) Rebound 1.000 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 18) Rebound 0.500 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: 34360.1.1

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

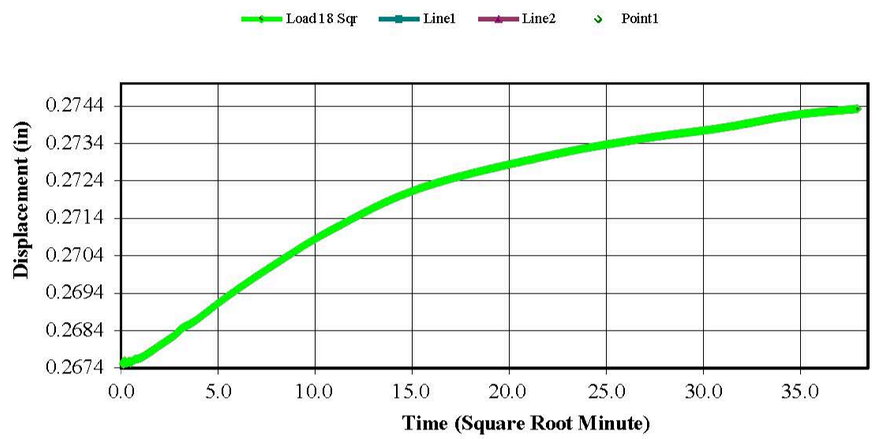
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.2670	0.1115	11.1537	0.6192
1	00:00:01	0.2675	0.1111	11.1074	0.6201
2	00:00:02	0.2676	0.1110	11.0989	0.6202
3	00:00:03	0.2675	0.1110	11.1032	0.6201
4	00:00:04	0.2675	0.1110	11.1032	0.6201
5	00:00:05	0.2675	0.1110	11.1032	0.6201
6	00:00:06	0.2675	0.1110	11.1032	0.6201
7	00:00:12	0.2676	0.1110	11.0989	0.6202
8	00:00:15	0.2675	0.1110	11.1032	0.6201
9	00:00:30	0.2676	0.1109	11.0947	0.6203
10	00:01:00	0.2677	0.1109	11.0905	0.6204
11	00:02:00	0.2678	0.1108	11.0779	0.6206
12	00:04:00	0.2680	0.1106	11.0568	0.6210
13	00:08:00	0.2683	0.1103	11.0274	0.6215
14	00:10:00	0.2685	0.1101	11.0105	0.6218
15	00:15:01	0.2687	0.1099	10.9895	0.6222
16	00:30:01	0.2693	0.1093	10.9263	0.6234
17	01:00:03	0.2701	0.1085	10.8463	0.6248
18	02:00:06	0.2711	0.1075	10.7453	0.6267
19	04:00:13	0.2722	0.1064	10.6358	0.6287
20	08:00:26	0.2731	0.1055	10.5516	0.6302
21	12:00:40	0.2735	0.1051	10.5053	0.6310
22	16:00:53	0.2738	0.1048	10.4758	0.6316
23	20:01:06	0.2741	0.1044	10.4421	0.6322
24	23:59:58	0.2743	0.1043	10.4253	0.6325

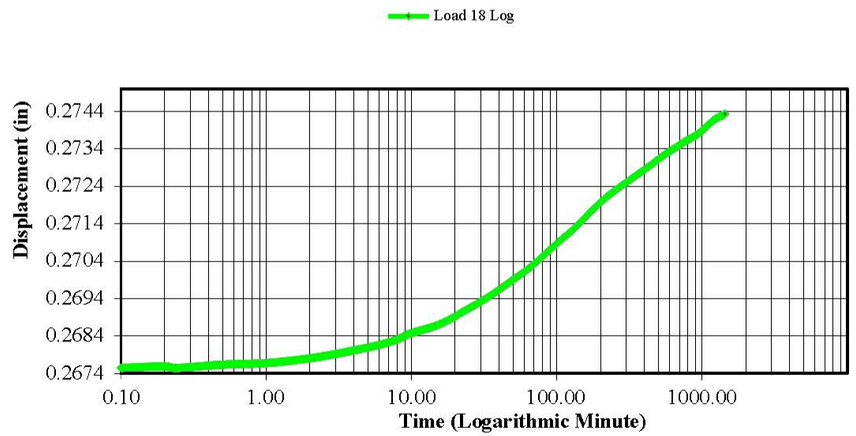
Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 18) Rebound 0.500 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



Consolidation Test Results
(Sequence 19) Rebound 0.250 ksf

Project: R-1015 (site #5)
Location: EB2-B-ST-1 (3.7'-5.7')
WBS No.: 34360.1.1

Project Number: CS34.325
Test Date: 6/24/2016
Test Number:

Sample Number: ST-1
Boring Number: EB2-B
Depth: 3.7'-5.7'
Sample Type: Undisturbed

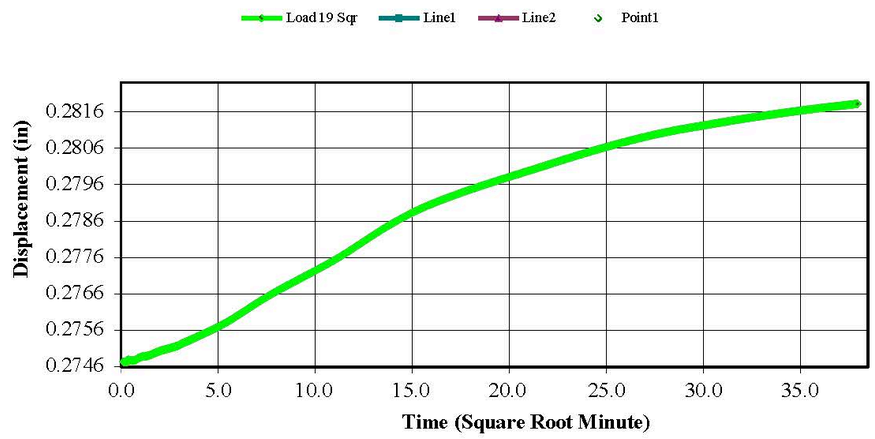
Soil Description: Gray to Dark Gray Sandy CLAY (A-6)
Remarks:

Index	Time	Displacement (in)	Settlement (in)	Axial Strain (%)	Void Ratio
0	00:00:00	0.2743	0.1043	10.4253	0.6325
L 1	00:00:01	0.2747	0.1038	10.3832	0.6333
2	00:00:03	0.2747	0.1038	10.3832	0.6333
L 3	00:00:04	0.2747	0.1038	10.3832	0.6333
4	00:00:05	0.2747	0.1038	10.3832	0.6333
L 5	00:00:06	0.2747	0.1038	10.3832	0.6333
6	00:00:07	0.2748	0.1038	10.3789	0.6333
L 7	00:00:13	0.2748	0.1038	10.3789	0.6333
8	00:00:16	0.2748	0.1038	10.3789	0.6333
L 9	00:00:31	0.2748	0.1038	10.3789	0.6333
10	00:01:01	0.2749	0.1037	10.3705	0.6335
L 11	00:02:01	0.2749	0.1037	10.3663	0.6336
12	00:04:02	0.2750	0.1035	10.3537	0.6338
L 13	00:08:02	0.2752	0.1034	10.3411	0.6340
14	00:10:02	0.2752	0.1033	10.3326	0.6342
L 15	00:15:02	0.2754	0.1032	10.3158	0.6345
16	00:30:03	0.2758	0.1027	10.2737	0.6353
L 17	01:00:05	0.2766	0.1020	10.1979	0.6366
18	02:00:08	0.2775	0.1011	10.1053	0.6383
L 19	04:00:15	0.2789	0.0996	9.9621	0.6409
20	08:00:28	0.2801	0.0984	9.8442	0.6431
L 21	12:00:41	0.2809	0.0977	9.7684	0.6445
22	16:00:54	0.2813	0.0973	9.7263	0.6452
L 23	20:01:08	0.2816	0.0970	9.6968	0.6458
24	23:59:59	0.2818	0.0968	9.6758	0.6461

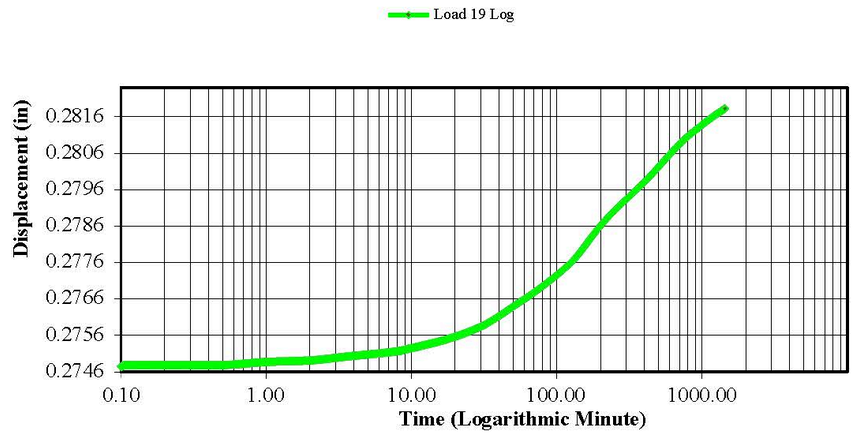
Tested By: Tony Summers
Checked By: Andrew Burton

Consolidation Test Results
(Sequence 19) Rebound 0.250 ksf

Consolidation Graph (Squareroot Time)



Consolidation Graph (Logarithmic Time)



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-1015	1	33

REFERENCE: R-1015

PROJECT: 34360

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CRAVEN*

PROJECT DESCRIPTION *US 70 (Havelock Bypass) from North of Pine Grove to North of Carteret County Line*

SITE DESCRIPTION *Site No. 9 – Dual Bridges on US 70 over 70 Business between SR 1747 and SR 1176*

Station 516+87.37 –L– / 69+02.79 –RP2AC–

CONTENTS

APPENDICES

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

P.M. WEAVER

C.R. PASTRANA

Trigon Exploration

INVESTIGATED BY *ESP Associates, INC.*

DRAWN BY *C.R. PASTRANA*

CHECKED BY *P.M. WEAVER*

SUBMITTED BY *ESP Associates, INC.*

DATE *MAY 2018*

ESP ASSOCIATES, INC.
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NORTH CAROLINA LICENSED SEAL 1500 GEOLOGIST PAUL M. WEAVER

DocuSigned by:
Paul M. Weaver 6/4/2018
01847D3739AD486... SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-1015	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
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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-26: RR SPIKE IN TREE STA. 520+57.00 -L- 308' LEFT

ELEVATION: 26.38 FEET

NOTES:

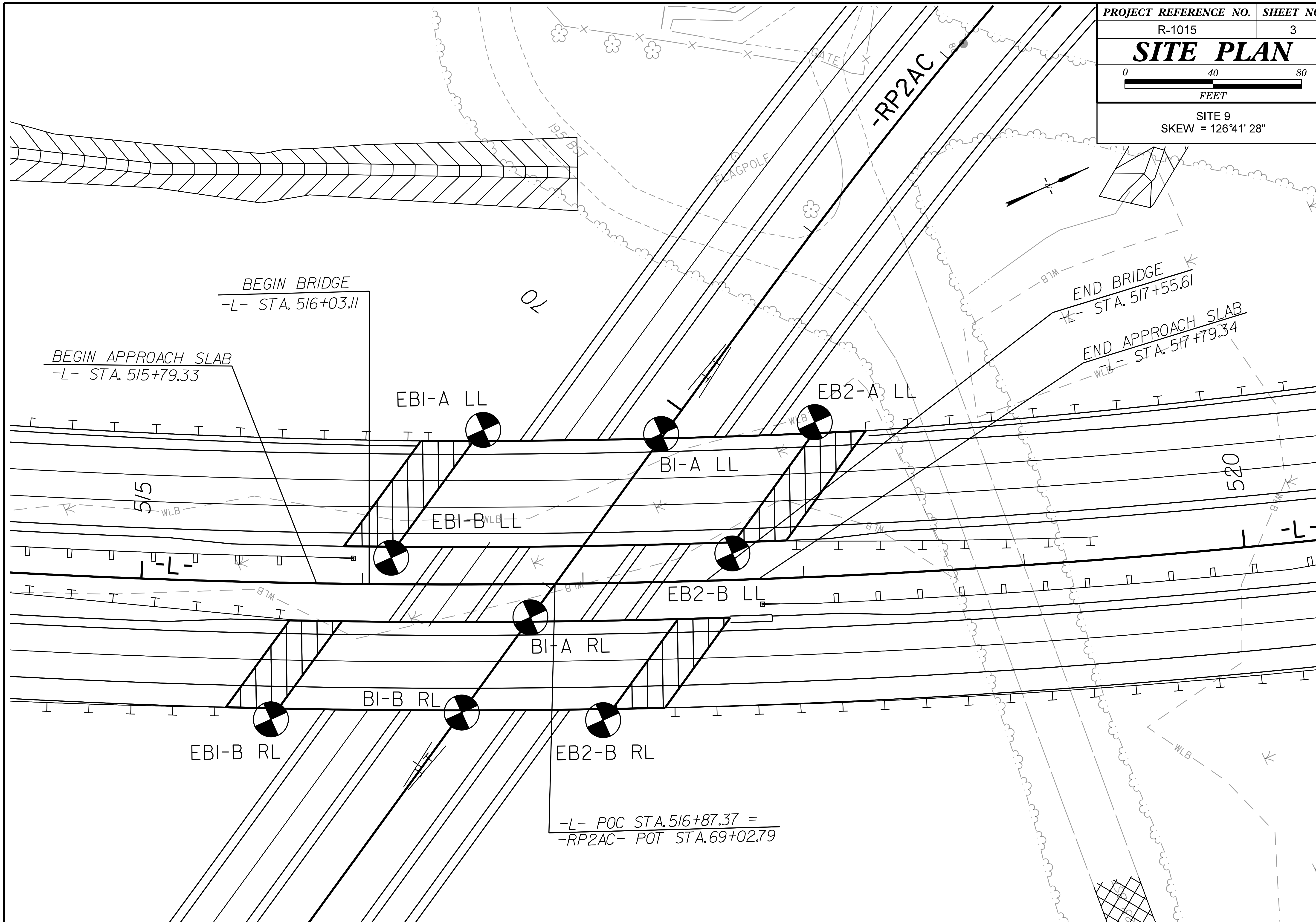
F.I.A.D. = FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-1015	3

SITE PLAN

SITE 9
SKEW = 126°41' 28"



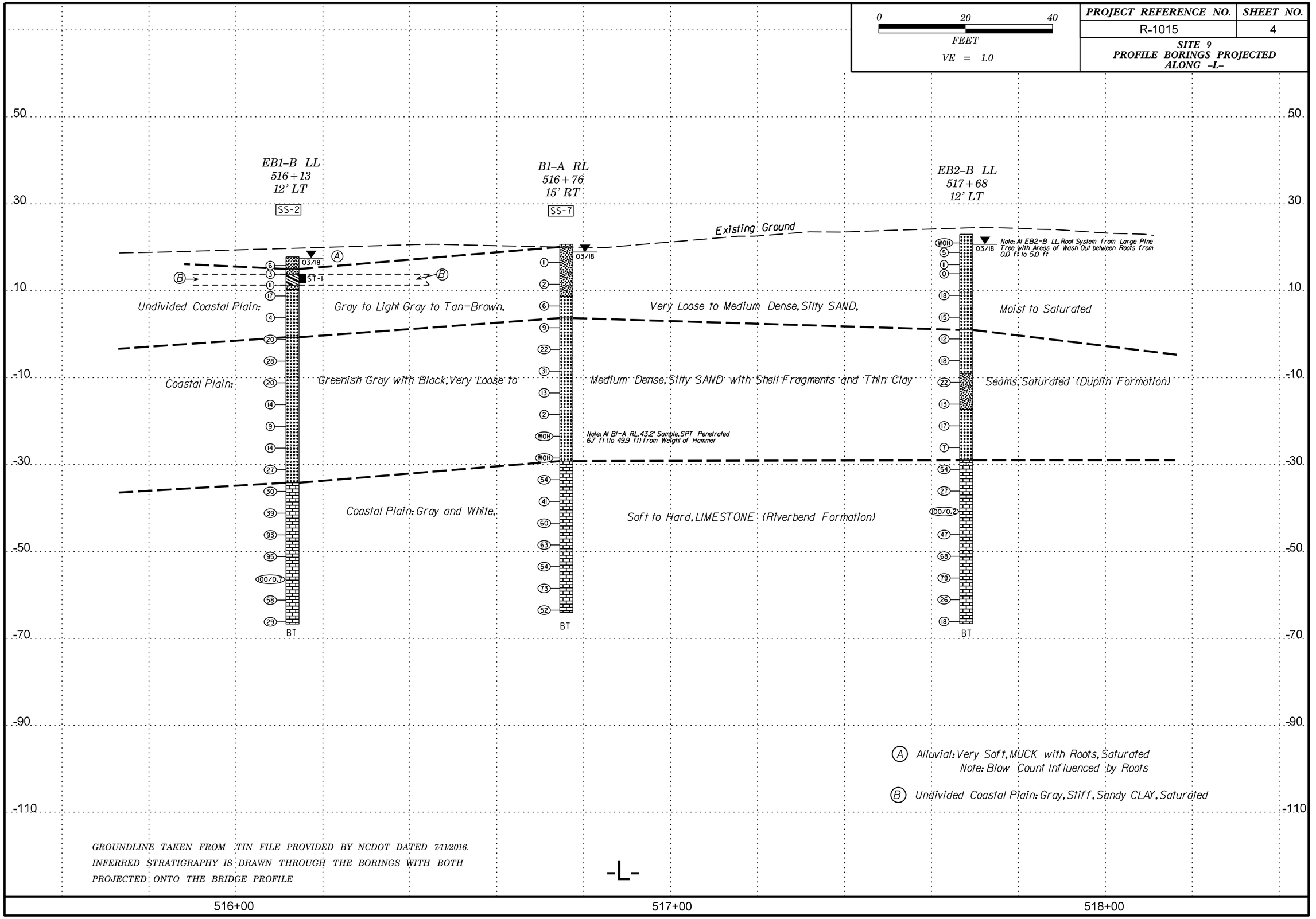
0	20	40

FEET

VE = 1.0

PROJECT REFERENCE NO.	SHEET NO.
R-1015	4

SITE 9
PROFILE BORINGS PROJECTED ALONG -L-



PROJECT REFERENCE NO.	SHEET NO.
R-1015	5

SITE 9
SECTION THROUGH END BENT 1
SKEW = 126°41'28"

0 20 40
FEET
VE = 1.0

-L- STA. 516+03.10

℄

EB1-A LL
516+55
70' LT
SS-1

EB1-B LL
516+13
12' LT
SS-2

EB1-B RL
515+60
62' RT
SS-3
SS-4

Undivided Coastal Plain: Tan-Brown to Orange to Gray, Loose

Undivided Coastal Plain: Tan-Brown to Gray, Soft to Medium Stiff,

Undivided Coastal Plain: Tan-Brown to Orange to Gray, Loose

to Medium Dense, Silty SAND, Moist to Saturated

Sandy CLAY, Saturated

to Medium Dense, Silty SAND, Saturated

Coastal Plain: Greenish Gray with Black, Very Loose to Medium Dense, Silty SAND with Shell Fragments and Thin Clay Seams, Saturated (Duplin Formation)

Coastal Plain: Greenish Gray to Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation)

Coastal Plain: Green, Very Stiff, Sandy SILT, Trace Shell Fragments, Saturated (Riverbend Formation)

Coastal Plain: Green, Very Stiff, Sandy SILT with Shell Fragments, Saturated (Riverbend Formation)

Ⓐ Alluvial: Very Soft, MUCK with Roots, Saturated
Note: Blow Count Influenced by Roots

GROUNDLINE TAKEN FROM .TIN FILE PROVIDED BY NCDOT DATED 7/11/2016.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE CROSS SECTION

PROJECT REFERENCE NO.	SHEET NO.
R-1015	6

SITE 9
SECTION THROUGH BENT 1
SKEW = 126°41'28"

0 20 40
FEET
VE = 1.0

-L- STA. 516+87.32

℄

B1-A LL
517+37
67' LT
SS-5
SS-6

B1-A RL
516+76
15' RT
SS-7

B1-B RL
516+45
58' RT
SS-8

03/18

Undivided Coastal Plain: (5) (WOH) (22) (20) (26) (21) (26) (18) (13) (9) (7) (39) (50) (29) (100/0.3) (52) BT

Tan-Brown to Gray to Light Gray, Very Loose to Medium Dense, Gray, Very Soft, Silty CLAY, Saturated

Undivided Coastal Plain: (20)

Tan-Brown to Gray to Light Gray, Loose to Medium Dense,

Coastal Plain: Greenish Gray with Black, Very Loose to Dense, Silty SAND with Shell Fragments and Thin Clay Seams, Saturated

Coastal Plain: Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation)

03/18
Note: Blow Count Influenced by Roots

(11) (2) (6) (9) (22) (31) (13) (2) (WOH) (WOH) (54) (41) (60) (63) (54) (73) (52) BT

Silty SAND, Undivided Coastal Silty SAND, Saturated

Note: At B1-C, 43.2' Sample SPT Penetrated 6.7 ft (to 49.9 ft) from Weight of Hammer

03/18
Moist to Saturated
Plain: Gray, Very Soft, Silty CLAY, Saturated

(8) (WOH) (5) (14) (20) (6) (23) (14) (14) (21) (42) (100/1.0) (100/0.2) (58) (24) (66) BT

(Duplin Formation)

GROUNDLINE TAKEN FROM .TIN FILE PROVIDED BY NCDOT DATED 7/11/2016.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE CROSS SECTION

40 20 0 -20 -40 -60 -80 -100

120 100 80 60 40 20 0 20 40 60 80 100 120

0	20	40

FEET

VE = 1.0

PROJECT REFERENCE NO.	SHEET NO.
R-1015	7

SITE 9
SECTION THROUGH END BENT 2
SKEW = 126°41'28"

-L- STA. 517+55.61

℄

EB2-A LL
518+08
70' LT
SS-9

EB2-B LL
517+68
12' LT

EB2-B RL
517+08
62' RT
SS-10

Alluvial: Black to Brown, Soft, Sandy CLAY, Moderately Organic, Wet

Undivided Coastal Plain: Brown to Gray, Soft, Sandy CLAY, Wet

Undivided Coastal Plain: Gray to Tan-Brown, Very Loose to Medium Dense, Silty SAND, Moist to Saturated

Note: At EB2-C, Root System from Large Pine Tree with Areas of Wash Out between Roots from 0.0 ft to 5.0 ft

Coastal Plain: Green to Greenish Gray with Black, Loose to Dense, Silty SAND with Shell Fragments and Thin Clay Seams, Saturated (Duplin Formation)

Coastal Plain: Green to Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation)

Coastal Plain: Green, Very Stiff, Sandy SILT with Shell Fragments, Saturated (Riverbend Formation)

BT

GROUNDLINE TAKEN FROM .TIN FILE PROVIDED BY NCDOT DATED 7/11/2016.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE BRIDGE CROSS SECTION

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. EB1-A LL	**STATION** 516+55	**OFFSET** 70 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 24.5 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 437,963	**EASTING** 2,614,119	**24 HR.** 6.7
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/20/18	**COMP. DATE** 03/21/18	**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)
25										24.5 GROUND SURFACE 0.0
	21.5	3.0	3	3	5	8				**UNDIVIDED COASTAL PLAIN** Tan-Brown, Silty SAND, Moist
20										18.3 6.2
	16.5	8.0	3	1	1	2				Tan-Brown to Gray, Sandy CLAY, Saturated
15										12.4 12.1
	11.5	13.0	1	3	4	7				Tan-Brown to Orange, Silty SAND, Saturated
10										
	6.5	18.0	4	4	5	9				
5										2.5 22.0
	1.5	23.0	5	10	6	16				**COASTAL PLAIN** Greenish Gray with Black, Silty SAND with Shell Fragments and Thin Clay Seams, Saturated (Duplin Formation)
0										
	-3.5	28.0	7	6	9	15				
-5										
	-8.5	33.0	7	10	10	20				
-10										
	-13.5	38.0	6	9	10	19				
-15										
	-18.5	43.0	6	5	3	8				
-20										
	-23.5	48.0	4	4	4	8				
-25										
	-28.5	53.0	3	3	6	9	SS-1	31%		
-30										
	-33.5	58.0	28	37	15	52				
-35										
	-38.5	63.0	6	7	10	17				
-40										
	-43.5	68.0	9	11	16	27				
-45										
	-48.5	73.0	18	9	29	38				
-50										
	-53.5	78.0	14	17	11	28				
-55										-32.5 57.0
										COASTAL PLAIN SEDIMENTARY ROCK Greenish Gray to Gray and White, Soft to Medium Hard, LIMESTONE (Riverbend Formation)

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. EB1-A LL	**STATION** 516+55	**OFFSET** 70 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 24.5 ft	**TOTAL DEPTH** 94.5 ft	**NORTHING** 437,963	**EASTING** 2,614,119	**24 HR.** 6.7
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/20/18	**COMP. DATE** 03/21/18	**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
-55						Match Line				
	-58.5	83.0	34	27	20	47				
-60										
	-63.5	88.0	10	5	15	20				
-65										
	-68.5	93.0	7	8	16	24				
-70										-62.5 87.0
										COASTAL PLAIN Green, Sandy SILT, Trace Shell Fragments, Saturated (Riverbend Formation)
										-70.0 94.5
										Boring Terminated at Elevation -70.0 ft in Coastal Plain Soil: Sandy SILT (Riverbend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. EB1-B LL	**STATION** 516+13	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 17.8 ft	**TOTAL DEPTH** 84.5 ft	**NORTHING** 437,901	**EASTING** 2,614,154	**24 HR.** 0.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/21/18	**COMP. DATE** 03/21/18	**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)
20										
										17.8 GROUND SURFACE 0.0
	16.8	1.0								**ALLUVIAL**
15	14.8	3.0	1	3	3	6				MUCK with Roots, Saturated
	12.3	5.5	3	2	1	3				Note: Blow count influenced by roots 15.0 2.8
			2	4	7	11				**UNDIVIDED COASTAL PLAIN** 13.8 4.0
10	9.8	8.0						35%		Gray, Silty SAND, Saturated
			5	5	12	17				Gray, Sandy CLAY, Saturated 11.3 6.5
5	4.8	13.0								Gray to Tan-Brown, Silty SAND, Saturated 10.3 7.5
			5	2	2	4	SS-2			
0	-0.2	18.0								-0.7 18.5
			8	5	15	20				**COASTAL PLAIN**
-5	-5.2	23.0								Greenish Gray, Silty SAND with Shell Fragments and Thin Clay Seams, Saturated (Duplin Formation)
			10	12	16	28				
-10	-10.2	28.0								
			7	7	13	20				
-15	-15.2	33.0								
			4	6	8	14				
-20	-20.2	38.0								
			4	5	4	9				
-25	-25.2	43.0								
			7	6	8	14				
-30	-30.2	48.0								
			9	11	16	27				
-35	-35.2	53.0								-34.2 52.0
			61	14	16	30				**COASTAL PLAIN SEDIMENTARY ROCK**
-40	-40.2	58.0								Gray and White, Soft to Hard, LIMESTONE
			15	10	29	39				(Riverbend Formation)
-45	-45.2	63.0								
			11	70	23	93				
-50	-50.2	68.0								
			13	43	52	95				
-55	-55.2	73.0								
			23	23	77/0.2	100/0.7				
-60										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. EB1-B LL	**STATION** 516+13	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 17.8 ft	**TOTAL DEPTH** 84.5 ft	**NORTHING** 437,901	**EASTING** 2,614,154	**24 HR.** 0.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/21/18	**COMP. DATE** 03/21/18	**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
-60						Match Line				
	-60.2	78.0	3	19	39	58				**COASTAL PLAIN SEDIMENTARY ROCK**
-65	-65.2	83.0								Gray and White, Soft to Hard, LIMESTONE
			15	15	14	29				(Riverbend Formation) *(continued)*
										-66.7 84.5
										Boring Terminated at Elevation -66.7 ft in Coastal Plain Sedimentary Rock: LIMESTONE (Riverbend Formation)
										Other Samples: ST-1 -L- 516+16 16' LT (4.0 - 6.0)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 515+60	**OFFSET** 62 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 26.7 ft	**TOTAL DEPTH** 94.7 ft	**NORTHING** 437,821	**EASTING** 2,614,198	**24 HR.** 8.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/22/18	**COMP. DATE** 03/22/18	**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)
30										
25										26.7 GROUND SURFACE 0.0
	23.5	3.2	4	4	4	8	SS-3			**UNDIVIDED COASTAL PLAIN** Tan-Brown to Orange to Gray, Silty SAND and Clayey SAND, Moist to Wet
20	18.5	8.2	2	6	5	11				
15	13.5	13.2	1	1	4	5				14.7 12.0 Gray, Sandy CLAY, Saturated
10	8.5	18.2	6	10	11	21				12.5 14.2 Gray, Silty SAND, Saturated
5	3.5	23.2	2	3	3	6				4.7 22.0 **COASTAL PLAIN** Greenish Gray with Black, Silty SAND with Thin Clay Seams, Saturated (Duplin Formation)
0	-1.5	28.2	10	13	13	26				
-5	-6.5	33.2	2	4	4	8				
-10	-11.5	38.2	4	3	4	7				
-15	-16.5	43.2	3	1	1	2				
-20	-21.5	48.2	WOH	WOH	WOH	0	SS-4	26%		-20.3 47.0
-25	-26.5	53.2	4	4	6	10				
-30	-31.5	58.2	88	100/0.4		100/0.4				-30.3 57.0 **COASTAL PLAIN SEDIMENTARY ROCK** Greenish Gray to Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation)
-35	-36.5	63.2	10	9	11	20				
-40	-41.5	68.2	9	12	15	27				
-45	-46.5	73.2	11	51	47	98				
-50										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 515+60	**OFFSET** 62 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 26.7 ft	**TOTAL DEPTH** 94.7 ft	**NORTHING** 437,821	**EASTING** 2,614,198	**24 HR.** 8.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/22/18	**COMP. DATE** 03/22/18	**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
-50						Match Line				
	-51.5	78.2	17	76	24/0.3	100/0.8				**COASTAL PLAIN SEDIMENTARY ROCK** Greenish Gray to Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation) *(continued)*
-55	-56.5	83.2	9	100/0.3		100/0.3				
-60	-61.5	88.2	42	33	30	63				
-65	-66.5	93.2	6	7	10	17				-65.3 92.0 **COASTAL PLAIN** Green, Sandy SILT with Shell Fragments, Saturated (Riverbend Formation) -68.0 94.7 Boring Terminated at Elevation -68.0 ft in Coastal Plain Soil: Sandy SILT (Riverbend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 517+37	**OFFSET** 67 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.8 ft	**TOTAL DEPTH** 79.6 ft	**NORTHING** 438,036	**EASTING** 2,614,154	**24 HR.** 2.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/19/18	**COMP. DATE** 03/20/18	**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)
25											
										21.8 GROUND SURFACE	0.0
20	18.7	3.1	2	3	2	5				**UNDIVIDED COASTAL PLAIN** Tan-Brown to Gray, Silty SAND, Moist to Saturated	
15	13.7	8.1	WOH	WOH	WOH	0	SS-5	54%		14.8	7.0
										Gray, Silty CLAY, Saturated	
10	8.7	13.1	4	10	12	22				9.8	12.0
5	3.7	18.1	7	10	10	20				Tan-Brown to Gray, Silty SAND, Saturated	
0	-1.3	23.1	8	11	15	26					
-5	-6.3	28.1	8	10	11	21				-5.8	27.6
-10	-11.3	33.1	6	13	13	26				**COASTAL PLAIN** Greenish Gray with Black, Silty SAND with Shell Fragments and Thin Clay Seams, Saturated (Duplin Formation)	
-15	-16.3	38.1	4	6	12	18					
-20	-21.3	43.1	2	2	11	13					
-25	-26.3	48.1	3	4	5	9	SS-6	32%		-25.2	47.0
-30	-31.3	53.1	4	3	4	7					
-35	-36.3	58.1	2	18	21	39				-36.8	58.6
-40	-41.3	63.1	14	35	15	50				**COASTAL PLAIN SEDIMENTARY ROCK** Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation)	
-45	-46.3	68.1	27	12	17	29					
-50	-51.3	73.1	32	100/0.3		100/0.3					
-55											

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 517+37	**OFFSET** 67 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.8 ft	**TOTAL DEPTH** 79.6 ft	**NORTHING** 438,036	**EASTING** 2,614,154	**24 HR.** 2.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/19/18	**COMP. DATE** 03/20/18	**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
-55						Match Line				
	-56.3	78.1	28	14	38	52				-57.8 79.6
										Boring Terminated at Elevation -57.8 ft in Coastal Plain Sedimentary Rock: LIMESTONE (Riverbend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. B1-A RL	**STATION** 516+76	**OFFSET** 15 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 20.7 ft	**TOTAL DEPTH** 84.7 ft	**NORTHING** 437,947	**EASTING** 2,614,205	**24 HR.** 1.8
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/26/18	**COMP. DATE** 03/27/18	**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)
25										
20										20.7 GROUND SURFACE 0.0
	17.5	3.2	3	2	9	11				**UNDIVIDED COASTAL PLAIN** Light Gray to Tan-Brown to Gray, Silty SAND, Moist Note: Blow counts influenced by roots
15										
	12.5	8.2	WOH	1	1	2				
10										8.7 12.0
	7.5	13.2	4	2	4	6				
5										3.7 17.0
	2.5	18.2	3	5	4	9				**COASTAL PLAIN** Greenish Gray with Black, Silty SAND with Thin Clay Seams, Saturated (Duplin Formation) Note: At 43.2' sample, the SPT penetrated 6.7' (to 49.9') from the weight of the hammer
0										
	-2.5	23.2	9	10	12	22				
-5										
	-7.5	28.2	3	14	17	31	SS-7			
-10										
	-12.5	33.2	4	6	7	13				
-15										
	-17.5	38.2	WOH	1	1	2				
-20										
	-22.5	43.2	WOH	WOH	WOH	0				
-25										
	-27.5	48.2	WOH	WOH	WOH	0				-29.2 49.9
-30										**COASTAL PLAIN SEDIMENTARY ROCK** Gray and White, Soft to Moderately Hard, LIMESTONE (Riverbend Formation)
	-32.5	53.2	46	20	34	54				
-35										
	-37.5	58.2	25	11	30	41				
-40										
	-42.5	63.2	16	18	42	60				
-45										
	-47.5	68.2	50	32	31	63				
-50										
	-52.5	73.2	64	25	29	54				
-55										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. B1-A RL	**STATION** 516+76	**OFFSET** 15 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 20.7 ft	**TOTAL DEPTH** 84.7 ft	**NORTHING** 437,947	**EASTING** 2,614,205	**24 HR.** 1.8
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/26/18	**COMP. DATE** 03/27/18	**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
-55						Match Line				
	-57.5	78.2	12	22	51	73				**COASTAL PLAIN SEDIMENTARY ROCK** Gray and White, Soft to Moderately Hard, LIMESTONE (Riverbend Formation) *(continued)*
-60										
	-62.5	83.2	14	26	26	52				-64.0 84.7
										Boring Terminated at Elevation -64.0 ft in Coastal Plain Sedimentary Rock: LIMESTONE (Riverbend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. B1-B RL	**STATION** 516+45	**OFFSET** 58 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 23.7 ft	**TOTAL DEPTH** 79.7 ft	**NORTHING** 437,901	**EASTING** 2,614,231	**24 HR.** 3.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/26/18	**COMP. DATE** 03/26/18	**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)
25										
										23.7 / 0.0 GROUND SURFACE
20	20.5	3.2	3	4	4	8	SS-8	18%		**UNDIVIDED COASTAL PLAIN** Tan-Brown to Gray, Silty SAND, Moist to Saturated
	15.5	8.2	WOH	WOH	WOH	0				16.7 / 7.0 Gray, Silty CLAY, Saturated
10	10.5	13.2	5	2	3	5				11.7 / 12.0 Gray, Silty SAND, Saturated
5	5.5	18.2	2	4	10	14				5.7 / 18.0
0	0.5	23.2	4	7	13	20				1.7 / 22.0 **COASTAL PLAIN** Green and Greenish Gray with Black, Silty SAND with Shell Fragments and Thin Clay Seams, Saturated (Duplin Formation)
-5	-4.5	28.2	5	2	4	6				
-10	-9.5	33.2	5	8	15	23				
-15	-14.5	38.2	5	9	5	14				
-20	-19.5	43.2	5	6	8	14				
-25	-24.5	48.2	5	10	11	21				
-30	-29.5	53.2	15	21	21	42				-30.5 / 54.2
-35	-34.5	58.2	43	77	23	100/1.0				-33.3 / 57.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation)
-40	-39.5	63.2	100/0.2			100/0.2				
-45	-44.5	68.2	22	44	14	58				
-50	-49.5	73.2	10	8	16	24				
-55	-54.5	78.2								

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. B1-B RL	**STATION** 516+45	**OFFSET** 58 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 23.7 ft	**TOTAL DEPTH** 79.7 ft	**NORTHING** 437,901	**EASTING** 2,614,231	**24 HR.** 3.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/26/18	**COMP. DATE** 03/26/18	**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
-55						Match Line				
			23	26	40	66				-56.0 / 79.7 Boring Terminated at Elevation -56.0 ft in Coastal Plain Sedimentary Rock: LIMESTONE (Riverbend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 518+08	**OFFSET** 70 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 19.6 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 438,101	**EASTING** 2,614,178	**24 HR.** 1.9
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/19/18	**COMP. DATE** 03/19/18	**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)
20										
	18.6	1.0	1	2	1	3				19.6 GROUND SURFACE 0.0
	16.1	3.5	3	1	1	2				**ALLUVIAL** Black to Brown, Sandy CLAY, Moderately Organic, Wet 17.8 1.8
15	13.6	6.0	4	3	1	4				**UNDIVIDED COASTAL PLAIN** Brown to Gray, Sandy CLAY, Wet Gray, Silty SAND, Saturated 14.1 5.5
	11.1	8.5	1	0	0	0				
10										
	6.1	13.5	18	7	6	13				7.6 12.0
5										
	1.1	18.5	3	5	5	10				
0										
	-3.9	23.5	8	10	6	16				-2.4 22.0
-5										**COASTAL PLAIN** Green and Greenish Gray, Silty SAND with Large Shell Fragments, Saturated (Duplin Formation)
	-8.9	28.5	4	4	10	14				
-10										
	-13.9	33.5	8	6	11	17				
-15										
	-18.9	38.5	2	2	2	4				
-20										
	-23.9	43.5	8	11	7	18				
-25										
	-28.9	48.5	3	3	6	9	SS-9	31%		
-30										
	-33.9	53.5	18	19	22	41				-32.4 52.0
-35										
	-38.9	58.5	8	7	10	17				
-40										-42.4 62.0
	-43.9	63.5	60	100/0.2		100/0.2				**COASTAL PLAIN SEDIMENTARY ROCK** Green to Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation)
-45										
	-48.9	68.5	15	21	13	34				
-50										
	-53.9	73.5	15	7	18	25				
-55										
	-58.9	78.5	100/0.3			100/0.3				
-60										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 518+08	**OFFSET** 70 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 19.6 ft	**TOTAL DEPTH** 90.0 ft	**NORTHING** 438,101	**EASTING** 2,614,178	**24 HR.** 1.9
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/19/18	**COMP. DATE** 03/19/18	**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
-60						Match Line				**COASTAL PLAIN SEDIMENTARY ROCK** Green to Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation) *(continued)*
	-63.9	83.5	8	67	24	91				
-65										
	-68.9	88.5	10	12	10	22				-70.4 90.0
-70										Boring Terminated at Elevation -70.4 ft in Coastal Plain Sedimentary Rock: LIMESTONE (Riverbend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business			**GROUND WTR (ft)**
BORING NO. EB2-B LL	**STATION** 517+68	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 23.0 ft	**TOTAL DEPTH** 89.6 ft	**NORTHING** 438,043	**EASTING** 2,614,216	**24 HR.** 2.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Toothman, R.	**START DATE** 03/15/18	**COMP. DATE** 03/16/18	**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)
25										23.0 0.0 GROUND SURFACE
	22.0	1.0	WOH	WOH	WOH	0				**UNDIVIDED COASTAL PLAIN** Gray, Silty SAND, Saturated
20	19.8	3.2	1	2	3	5				Note: Root system from large pine trees with areas of wash-out between roots from 0.0' to 5.5'
	17.0	6.0	6	6	5	11				
15	14.9	8.1	2	0	0	0				
10	9.9	13.1	12	10	8	18				6.0 17.0
5	4.9	18.1	5	10	5	15				1.0 22.0 **COASTAL PLAIN** Greenish Gray with Black, Silty SAND with Shell Fragments and Thin Clay Seams, Saturated (Duplin Formation)
0	-0.1	23.1	5	6	6	12				
-5	-5.1	28.1	3	5	13	18				
-10	-10.1	33.1	2	10	12	22				-9.0 32.0
-15	-15.1	38.1	3	6	7	13				-17.3 40.3
-20	-20.1	43.1	1	2	15	17				
-25	-25.1	48.1	11	3	4	7				
-30	-30.1	53.1	10	30	24	54				-29.0 52.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation)
-35	-35.1	58.1	20	12	15	27				
-40	-40.1	63.1	24	100/0.2		100/0.2				
-45	-45.1	68.1	20	21	26	47				
-50	-50.1	73.1	53	44	24	68				
-55										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business			**GROUND WTR (ft)**
BORING NO. EB2-B LL	**STATION** 517+68	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 23.0 ft	**TOTAL DEPTH** 89.6 ft	**NORTHING** 438,043	**EASTING** 2,614,216	**24 HR.** 2.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Toothman, R.	**START DATE** 03/15/18	**COMP. DATE** 03/16/18	**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
-55						Match Line				
	-55.1	78.1	39	49	30	79				**COASTAL PLAIN SEDIMENTARY ROCK** Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation) *(continued)*
-60	-60.1	83.1	28	6	20	26				
-65	-65.1	88.1	6	11	7	18				-66.6 89.6 Boring Terminated at Elevation -66.6 ft in Coastal Plain Sedimentary Rock: LIMESTONE (Riverbend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 517+08	**OFFSET** 62 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 23.0 ft	**TOTAL DEPTH** 105.0 ft	**NORTHING** 437,958	**EASTING** 2,614,261	**24 HR.** 7.9
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/21/18	**COMP. DATE** 03/22/18	**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)
25										
										23.0 / 0.0 GROUND SURFACE
										UNDIVIDED COASTAL PLAIN Tan-Brown to Gray, Silty SAND, Moist to Saturated
20	19.5	3.5	3	3	4	7				
15	14.5	8.5	WOH	WOH	WOH	0				
10	9.5	13.5	WOH	WOH	1	1		24%		
5	4.5	18.5	5	3	3	6	SS-10	31%		
0	-0.5	23.5	3	4	6	10				
-5	-5.5	28.5	3	6	10	16				
-10	-10.5	33.5	9	10	5	15				
-15	-15.5	38.5	6	8	11	19				
-20	-20.5	43.5	3	7	9	16				
-25	-25.5	48.5	6	8	10	18				
-30	-30.5	53.5	7	7	7	14				
-35	-35.5	58.5	8	4	4	8				
-40	-40.5	63.5	16	14	8	22				
-45	-45.5	68.5	13	18	20	38				
-50	-50.5	73.5	11	30	35	65				
-55										
										-4.0 / 27.0 **COASTAL PLAIN** Greenish Gray with Black, Silty SAND with Shell Fragments and Thin Clay Seams, Saturated (Duplin Formation)
										-14.0 / 37.0
										-19.0 / 42.0
										-34.0 / 57.0
										-44.0 / 67.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray and White, Soft to Medium Hard, LIMESTONE (Riverbend Formation)

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Pastrana, C.R.	
SITE DESCRIPTION Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 517+08	**OFFSET** 62 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 23.0 ft	**TOTAL DEPTH** 105.0 ft	**NORTHING** 437,958	**EASTING** 2,614,261	**24 HR.** 7.9
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/21/18	**COMP. DATE** 03/22/18	**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
-55	-55.5	78.5	37	14	26	Match Line				**COASTAL PLAIN SEDIMENTARY ROCK** Gray and White, Soft to Medium Hard, LIMESTONE (Riverbend Formation) *(continued)*
-60	-60.5	83.5	30	16	28	40				
-65	-65.5	88.5	39	38	30	44				
-70	-70.5	93.5	16	18	19	68				
-75	-75.5	98.5	21	7	9	37				
-80	-80.5	103.5	8	8	10	16				
						18				-74.0 / 97.0 **COASTAL PLAIN** Green, Sandy SILT with Shell Fragments, Saturated (Riverbend Formation)
										-82.0 / 105.0 Boring Terminated at Elevation -82.0 ft in Coastal Plain Soil: Sandy SILT (Riverbend Formation)

Other Samples:
ST-2 -L- 517+11 59' RT (11.0 - 13.0)

SOILS LABORATORY TESTS RESULTS

WBS NO.: 34360.1.1

TIP NO.: R-1015

COUNTY: Craven

SITE DESCRIPTION: Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business

BORING NO.	SAMPLE NO.	Boring Location	DEPTH INTERVAL (FT)	AASHTO	N	L.L	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
								CSE. SAND	F. SAND	SILT	CLAY	10	40	200		
EB1-A LL	SS-1	-L- 516+55, 70' LT	53.0-54.5	A-2-4 (0)		NP	NP	29	50	6	15	80	67	18	30.8	-
-	ST-1	-L- 516+16, 16' LT	4.0-6.0	A-6 (7)		31	18	6	39	20	35	100	98	57	34.6	-
EB1-B LL	SS-2	-L- 516+13, 12' LT	13.0-14.5	A-3 (1)		NP	NP	27	66	2	5	100	98	8	-	-
EB1-B RL	SS-3	-L- 515+60, 62' RT	3.2-4.7	A-2-4 (0)		NP	NP	36	50	2	12	100	79	15	-	-
EB1-B RL	SS-4	-L- 515+60, 62' RT	48.2-49.7	A-2-4 (0)		NP	NP	68	21	3	8	99	64	11	26.1	0.5
B1-A LL	SS-5	-L- 517+37, 67' LT	8.1-9.6	A-7-6 (30)		53	35	2	16	28	54	100	99	84	54.5	-
B1-A LL	SS-6	-L- 517+37, 67' LT	48.1-49.6	A-2-4 (0)		NP	NP	12	70	6	12	98	92	24	31.9	-
B1-A RL	SS-7	-L- 516+76, 15' RT	28.2-29.7	A-3 (1)		NP	NP	45	49	2	4	100	81	7	-	-
B1-B RL	SS-8	-L- 516+45, 58' RT	3.2-4.7	A-2-4 (0)		NP	NP	17	72	2	9	100	94	12	18.4	-
EB2-A LL	SS-9	-L- 518+08, 70' LT	48.5-50.0	A-2-4 (0)		NP	NP	12	67	7	14	100	93	27	31.0	-
-	ST-2	-L- 517+11, 59' RT	11.0-13.0	A-2-4 (0)		NP	NP	6	84	1	9	100	98	11	23.6	-
EB2-B RL	SS-10	-L- 517+08, 62' RT	18.5-20.0	A-2-4 (0)		NP	NP	7	79	5	9	100	97	17	31.1	-

Signed:

NCDOT Certification No. 129-04-0411

PROJECT REFERENCE NO.	SHEET NO.
R–1015	18

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX A
CONSOLIDATION TESTS RESULTS

REFERENCE: R–1015

PROJECT: 34360

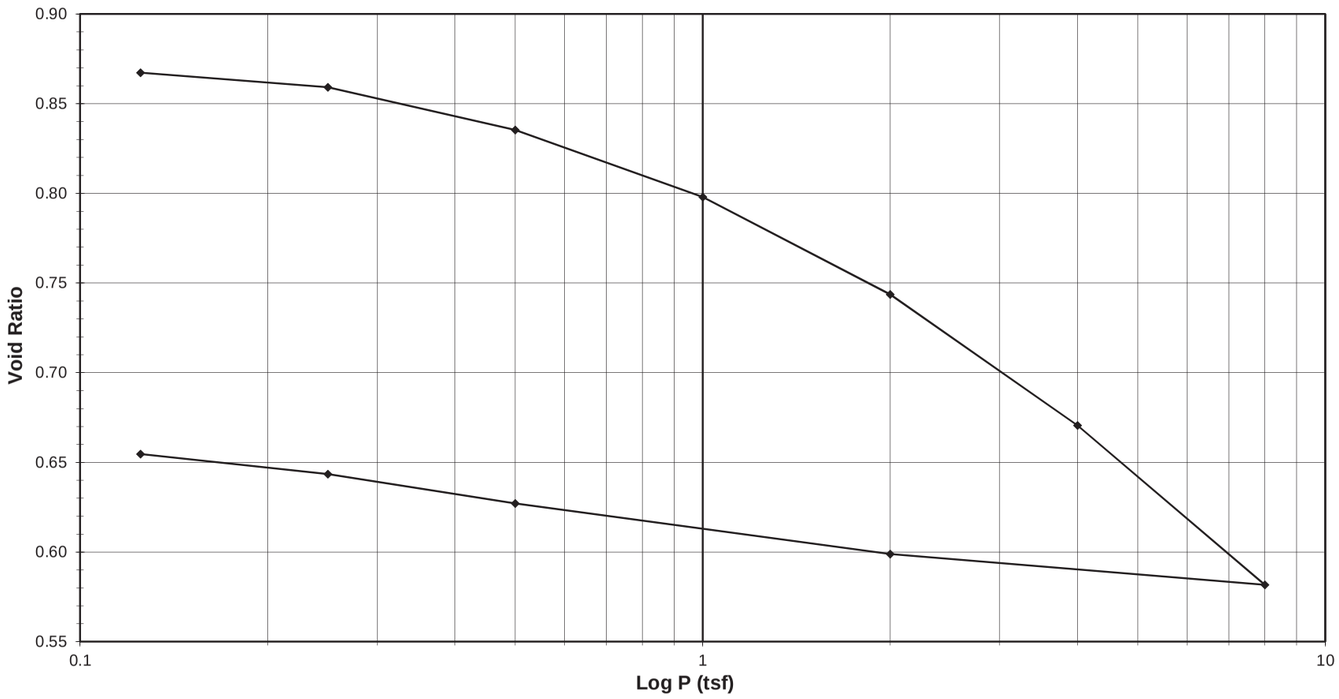
ESP
ESP ASSOCIATES, INC.
7011 ALBERT PICK RD
SUITE E
GREENSBORO, NC 27409
FIRM # C-0587
WWW.ESPASSOCIATES.COM

ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-04-0411 *Date* 4/10/18 *Approved By* MPS *Date* 5/15/18

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

Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-002 GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED
Consolidometer No. R409
1 Division = 0.0001 (in.)

Sample Properties	**Initial**	**Final**
Water Content		
Tare Number	SS-6	800
Wt. Tare & WS (g)	313.18	232.09
Wt. Tare & DS (g)	267.85	206.50
Wt. Water (g)	45.33	25.59
Wt. Tare (g)	100.77	103.09
Wt. DS (g)	167.08	103.41
Water Content (%)	27.13	24.75
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.0000	0.8822
Sample Volume (cc)	80.44	70.96
Wt. Wet Sample + Ring (g)	247.89	245.20
Wt. of Ring (g)	104.49	104.49
Wt. of Wet Sample (g)	143.40	140.71
Wet Density (pcf)	111.24	123.73
Wet Density (g/cc)	1.78	1.98
Water Content (%)	27.13	24.75
Wt. of Dry Sample (g)	112.80	112.80
Dry Density (pcf)	87.50	99.19
Dry Density (g/cc)	1.40	1.59
Void Ratio	0.8755	0.6546
Saturation (%)	81.50	99.42
Specific Gravity	2.63	*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	1.40226	**0.87555**
0.125	51.5	7.5	44.1	25.288	80.085	1.40846	**0.86728**
0.25	106.2	18.6	87.6	25.178	79.735	1.41465	**0.85912**
0.5	247.8	33.9	214.0	24.856	78.719	1.43292	**0.83541**
1	469.4	55.5	413.9	24.349	77.111	1.46280	**0.79793**
2	789.6	86.4	703.2	23.614	74.783	1.50832	**0.74366**
4	1218.3	125.8	1092.4	22.625	71.652	1.57423	**0.67066**
8	1734.8	168.6	1566.2	21.422	67.841	1.66267	**0.58179**
2	1584.7	109.7	1475.0	21.654	68.575	1.64487	**0.59891**
0.5	1391.9	67.4	1324.5	22.036	69.785	1.61634	**0.62713**
0.25	1297.5	60.3	1237.2	22.258	70.488	1.60024	**0.64351**
0.125	1238.4	60.3	1178.1	22.408	70.963	1.58951	**0.65459**

Tested By 129-04-0411 *Date* 4/10/18 *Input Checked By* GEM *Date* 5/15/18

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

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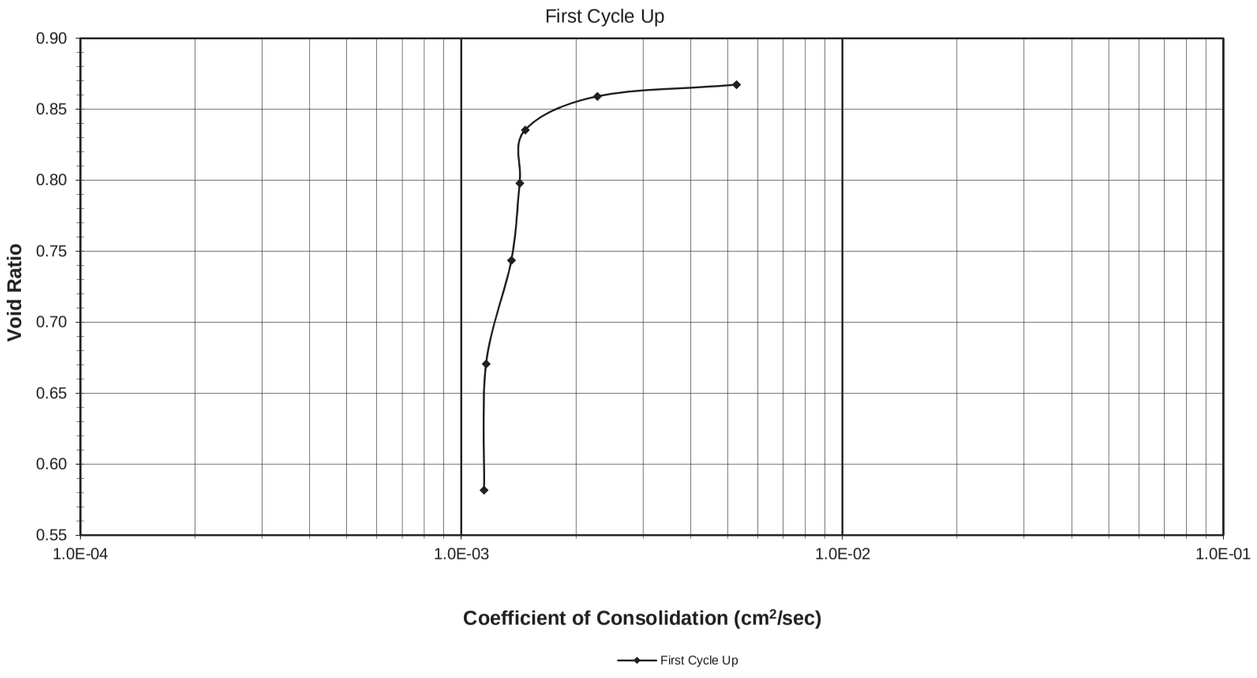
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-04-0411 *Date* 4/10/18 *Input Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 6 *Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-002 GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT*

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AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED
Consolidometer No. R409
1 Division = 0.0001 (in.)

Sample Properties	**Initial**	**Final**
Water Content		
Tare Number	SS-6	800
Wt. Tare & WS (g)	313.18	232.09
Wt. Tare & DS (g)	267.85	206.50
Wt. Water (g)	45.33	25.59
Wt. Tare (g)	100.77	103.09
Wt. DS (g)	167.08	103.41
Water Content (%)	27.13	24.75
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.000	0.882
Sample Volume (cc)	80.44	70.96
Wt. Wet Sample + Ring (g)	247.89	245.20
Wt. of Ring (g)	104.49	104.49
Wt. of Wet Sample (g)	143.40	140.71
Wet Density (pcf)	111.24	123.73
Wet Density (g/cc)	1.78	1.98
Water Content (%)	27.13	24.75
Wt. of Dry Sample (g)	112.80	112.80
Dry Density (pcf)	87.50	99.19
Dry Density (g/cc)	1.40	1.59
Void Ratio	0.8755	0.6546
Saturation (%)	81.50	99.42
Specific Gravity	*2.63*	*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 - 0.125	25.0	7.5	17.5	2.536	**1.00**	**0.00528**
0.125 - 0.25	75.4	18.6	56.8	2.526	**2.30**	**0.00228**
0.25 - 0.5	173.7	33.9	139.8	2.504	**3.50**	**0.00147**
0.5 - 1	358.5	55.5	303.0	2.463	**3.50**	**0.00142**
1 - 2	627.9	86.4	541.4	2.402	**3.50**	**0.00135**
2 - 4	995.3	125.8	869.4	2.319	**3.80**	**0.00116**
4 - 8	1462.1	168.6	1293.5	2.211	**3.50**	**0.00115**
8 - 2	NA	109.7	NA	NA	**NA**	**NA**
2 - 0.5	NA	67.4	NA	NA	**NA**	**NA**
0.5 - 0.25	NA	60.3	NA	NA	**NA**	**NA**
0.25 - 0.125	NA	60.3	NA	NA	**NA**	**NA**

Tested By 129-04-0411 *Date* 4/10/18 *Input Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 6 *Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-002 GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT*

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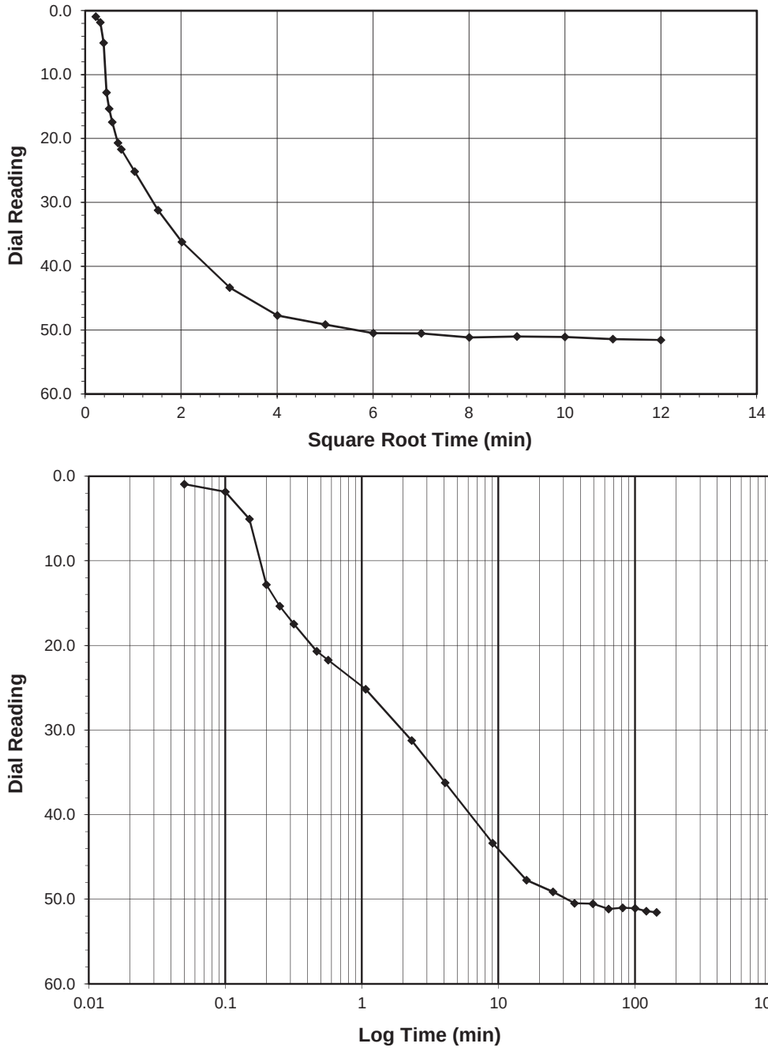
SHEET 20

ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.0-0.125**
Final Reading	**(div)**	**51.5**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/10/18
Start Time		17:10:38

Elapsed Time (min)	Dial Reading (div)
Initial	**0.0**
0.05	0.9
0.10	1.8
0.15	5.1
0.20	12.8
0.25	15.3
0.32	17.5
0.47	20.7
0.57	21.7
1.07	25.2
2.32	31.2
4.07	36.2
9.07	43.4
16.07	47.7
25.07	49.1
36.07	50.5
49.07	50.5
64.07	51.2
81.07	51.0
100.07	51.1
121.07	51.4
144.07	51.5

Tested By 129-04-0411 *Date* 4/10/18 *Checked By* GEM *Date* 5/15/18

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

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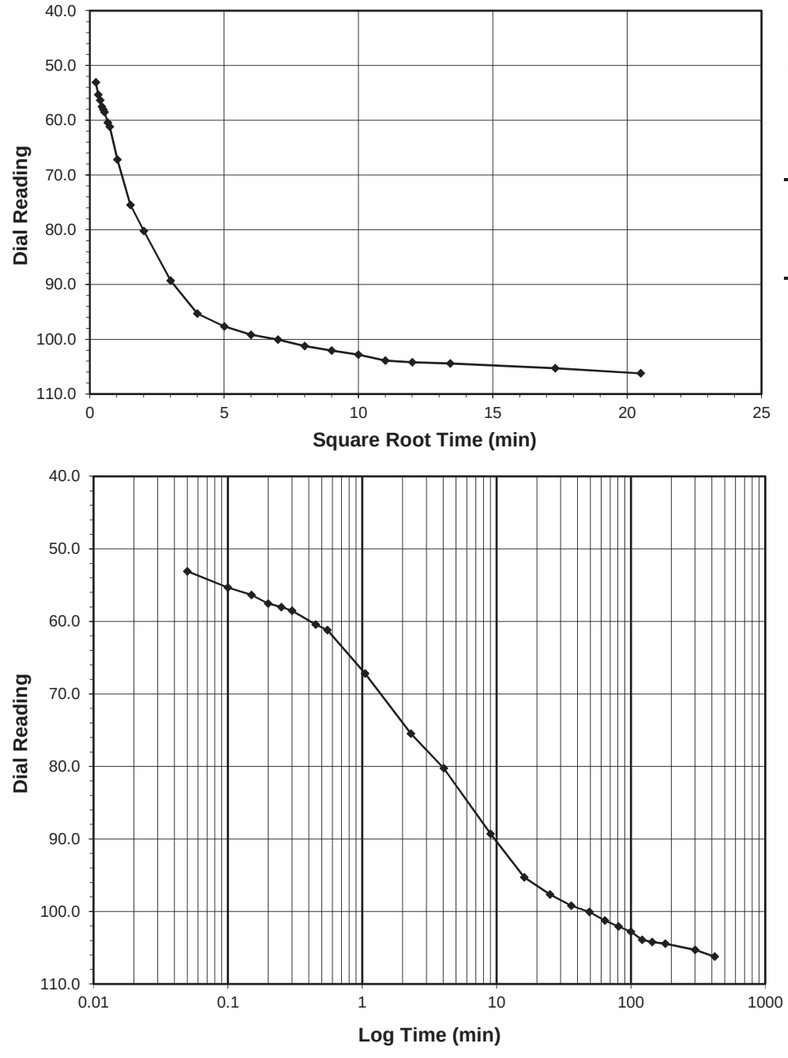
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.125-0.25**
Final Reading	**(div)**	**106.2**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/11/18
Start Time		0:11:01

Elapsed Time (min)	Dial Reading (div)
Initial	**51.5**
0.05	53.1
0.10	55.3
0.15	56.3
0.20	57.5
0.25	58.0
0.30	58.5
0.45	60.4
0.55	61.2
1.05	67.2
2.30	75.5
4.05	80.2
9.05	89.3
16.05	95.3
25.05	97.7
36.05	99.2
49.05	100.1
64.05	101.3
81.05	102.1
100.05	102.8
121.07	103.9
144.07	104.2
180.07	104.4
300.07	105.3
420.33	106.2

Tested By 129-04-0411 *Date* 4/11/18 *Checked By* GEM *Date* 5/15/18

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

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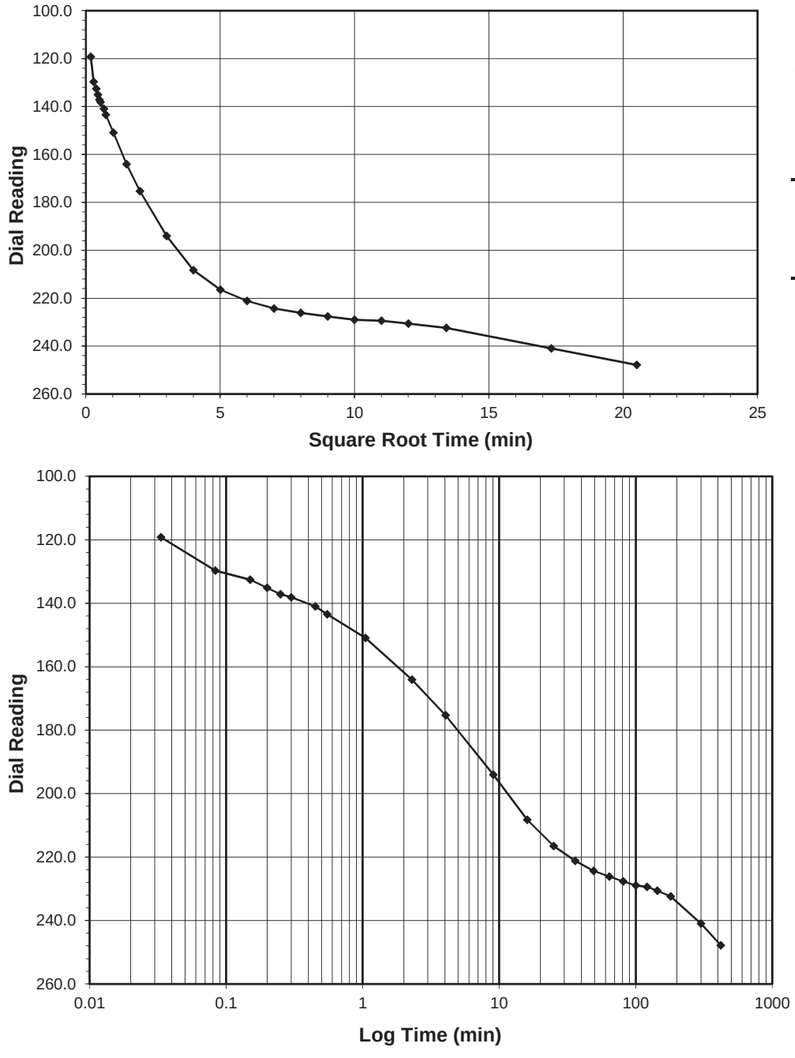
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**247.8**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/11/18
Start Time		7:11:21

Elapsed Time (min)	Dial Reading (div)
Initial	**106.2**
0.03	119.2
0.08	129.7
0.15	132.6
0.20	135.1
0.25	137.1
0.30	138.1
0.45	141.0
0.55	143.5
1.05	150.9
2.30	164.1
4.05	175.3
9.05	194.1
16.05	208.3
25.05	216.5
36.05	221.2
49.05	224.3
64.05	226.1
81.05	227.7
100.05	229.0
121.05	229.4
144.05	230.6
180.05	232.4
300.05	241.0
420.38	247.8

Tested By 129-04-0411 *Date* 4/11/18 *Checked By* GEM *Date* 5/15/18

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

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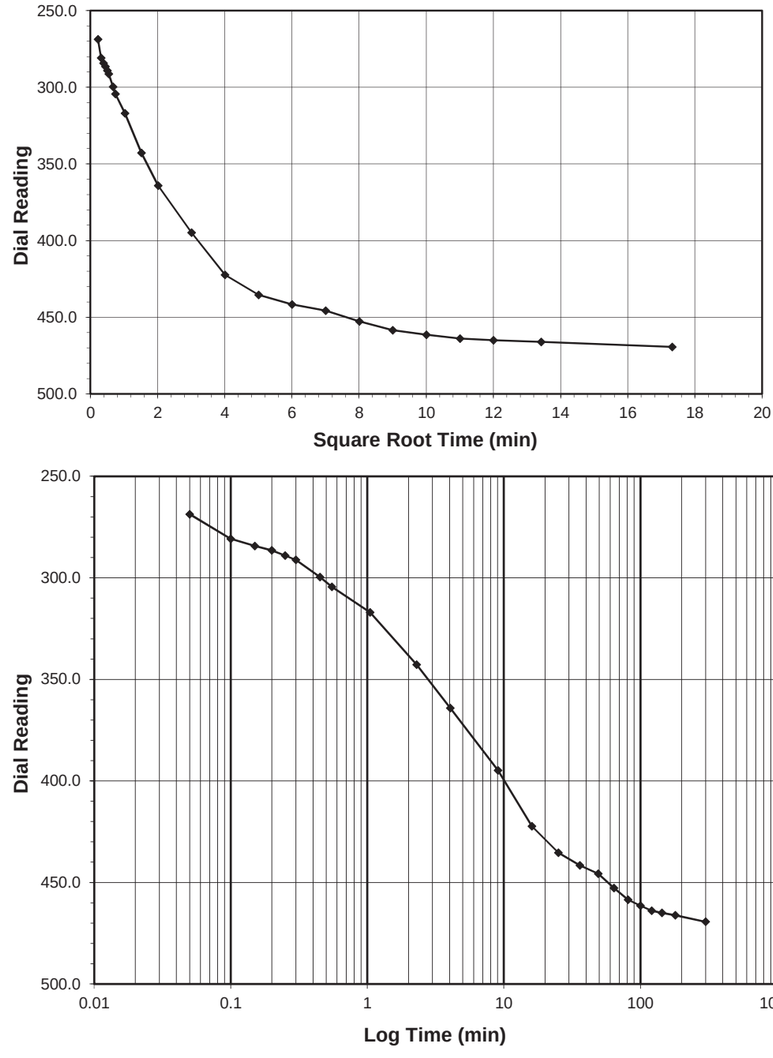
AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**469.4**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/11/18
Start Time		14:11:46

Elapsed Time (min)	Dial Reading (div)
Initial	**247.8**
0.05	268.6
0.10	280.8
0.15	284.3
0.20	286.4
0.25	289.0
0.30	291.2
0.45	299.6
0.55	304.4
1.05	317.0
2.30	342.7
4.05	364.2
9.05	394.8
16.05	422.3
25.05	435.3
36.05	441.5
49.05	445.7
64.07	452.7
81.07	458.5
100.07	461.5
121.07	463.9
144.07	465.0
180.07	466.1
300.07	469.4

Tested By 129-04-0411 *Date* 4/11/18 *Checked By* GEM *Date* 5/15/18

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

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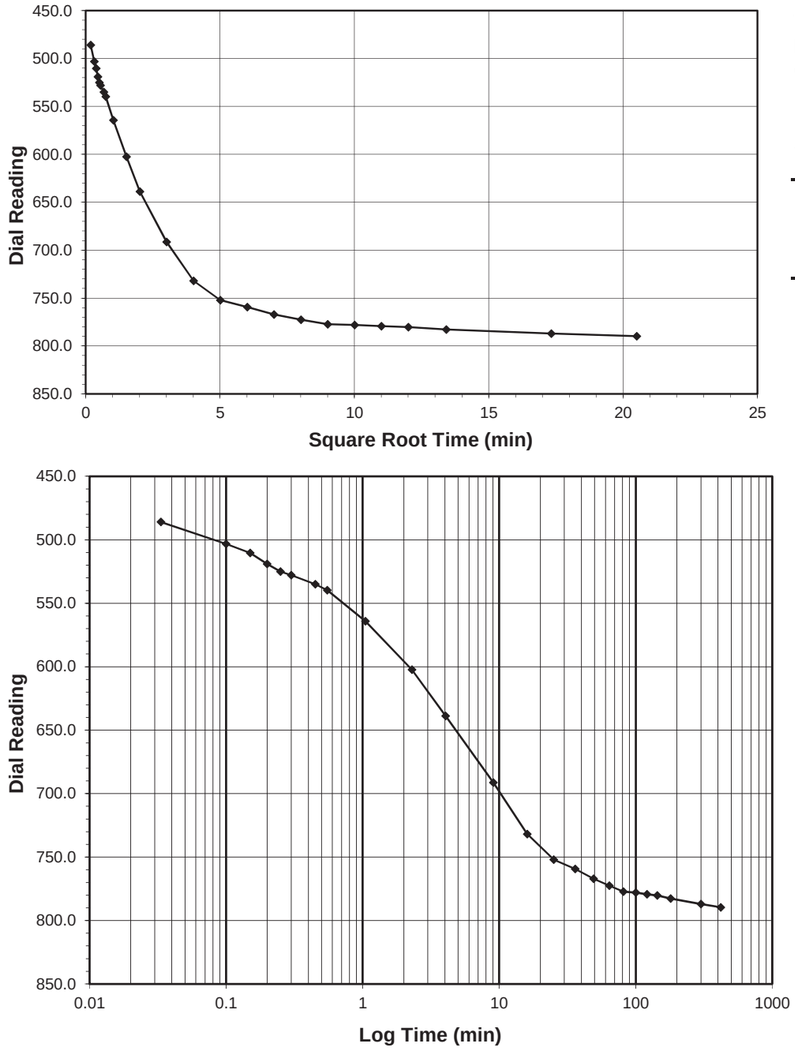
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**789.6**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/11/18
Start Time		21:12:10

Elapsed Time (min)	Dial Reading (div)
Initial	**469.4**
0.03	486.0
0.10	503.2
0.15	510.3
0.20	519.1
0.25	525.0
0.30	527.9
0.45	535.0
0.55	539.6
1.05	564.3
2.30	602.3
4.05	638.8
9.07	691.3
16.07	732.0
25.07	752.0
36.07	759.4
49.07	767.0
64.07	772.5
81.07	777.2
100.07	778.1
121.07	779.3
144.07	780.3
180.07	782.7
300.07	786.9
420.35	789.6

Tested By 129-04-0411 *Date* 4/11/18 *Checked By* GEM *Date* 5/15/18

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

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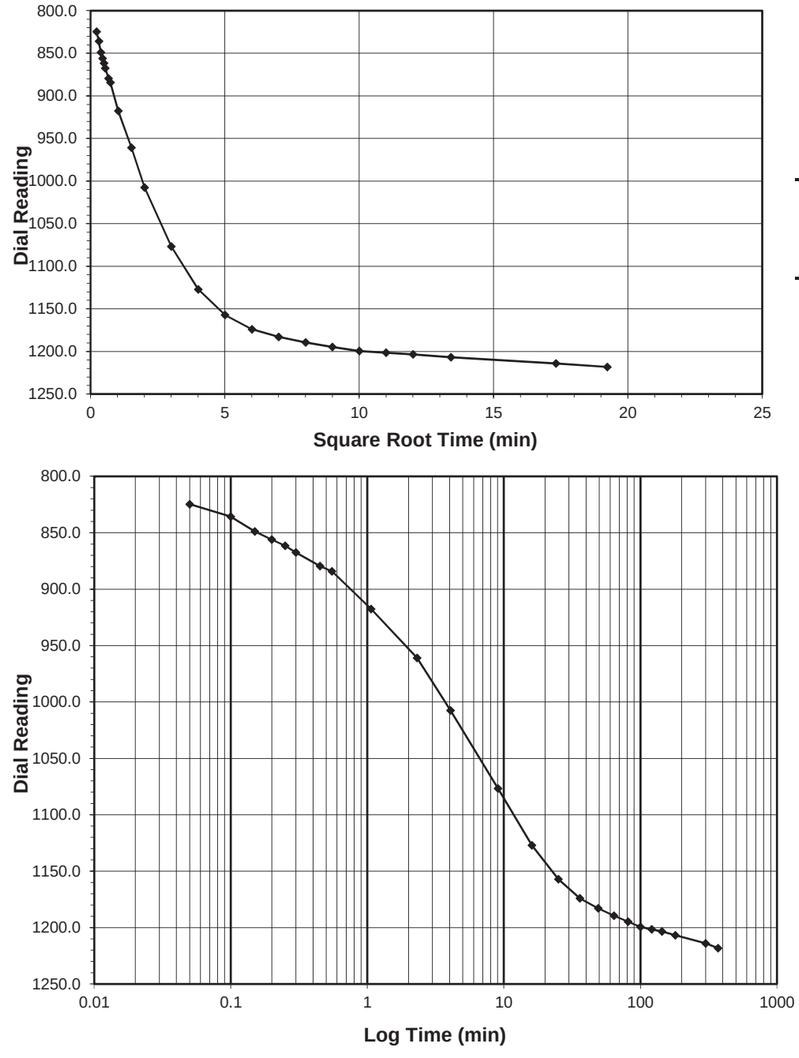
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**1218.3**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/12/18
Start Time		4:12:32

Elapsed Time (min)	Dial Reading (div)
Initial	**789.6**
0.05	824.7
0.10	835.9
0.15	849.0
0.20	856.1
0.25	861.6
0.30	867.5
0.45	879.6
0.55	884.3
1.07	917.7
2.32	960.9
4.07	1007.6
9.07	1076.8
16.07	1127.2
25.07	1157.1
36.07	1174.0
49.07	1183.0
64.07	1189.5
81.07	1194.8
100.07	1199.5
121.07	1201.6
144.07	1203.5
180.07	1206.8
300.07	1214.1
370.07	1218.3

Tested By 129-04-0411 *Date* 4/12/18 *Checked By* GEM *Date* 5/15/18

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

Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-002 GEOJAC-16TSF1 Cv.xlsm]STEP 6

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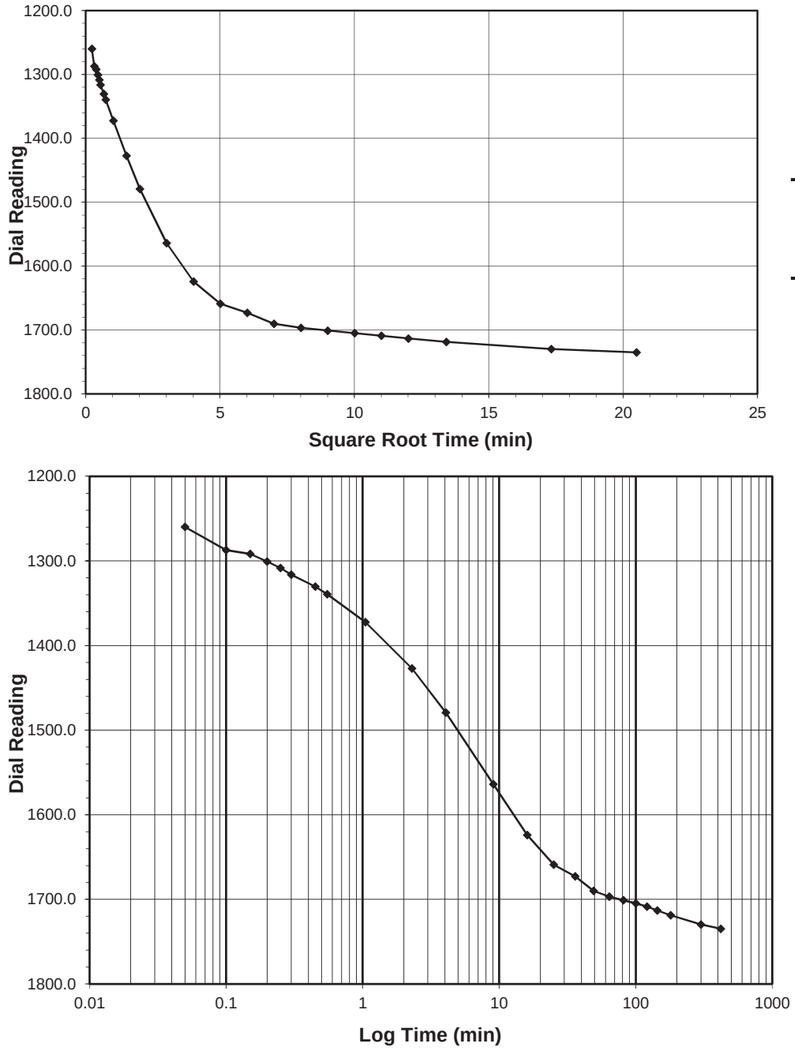
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-8.0**
Final Reading	**(div)**	**1734.8**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/12/18
Start Time		10:22:37

Elapsed Time (min)	Dial Reading (div)
Initial	**1218.3**
0.05	1259.8
0.10	1287.1
0.15	1291.8
0.20	1300.6
0.25	1308.3
0.30	1316.3
0.45	1330.3
0.55	1339.3
1.05	1372.4
2.30	1427.1
4.07	1479.2
9.07	1564.0
16.07	1624.1
25.07	1658.9
36.07	1672.8
49.07	1690.1
64.07	1696.7
81.07	1700.9
100.07	1704.6
121.07	1708.6
144.07	1713.2
180.07	1718.7
300.07	1729.9
420.22	1734.8

Tested By 129-04-0411 *Date* 4/12/18 *Checked By* GEM *Date* 5/15/18

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

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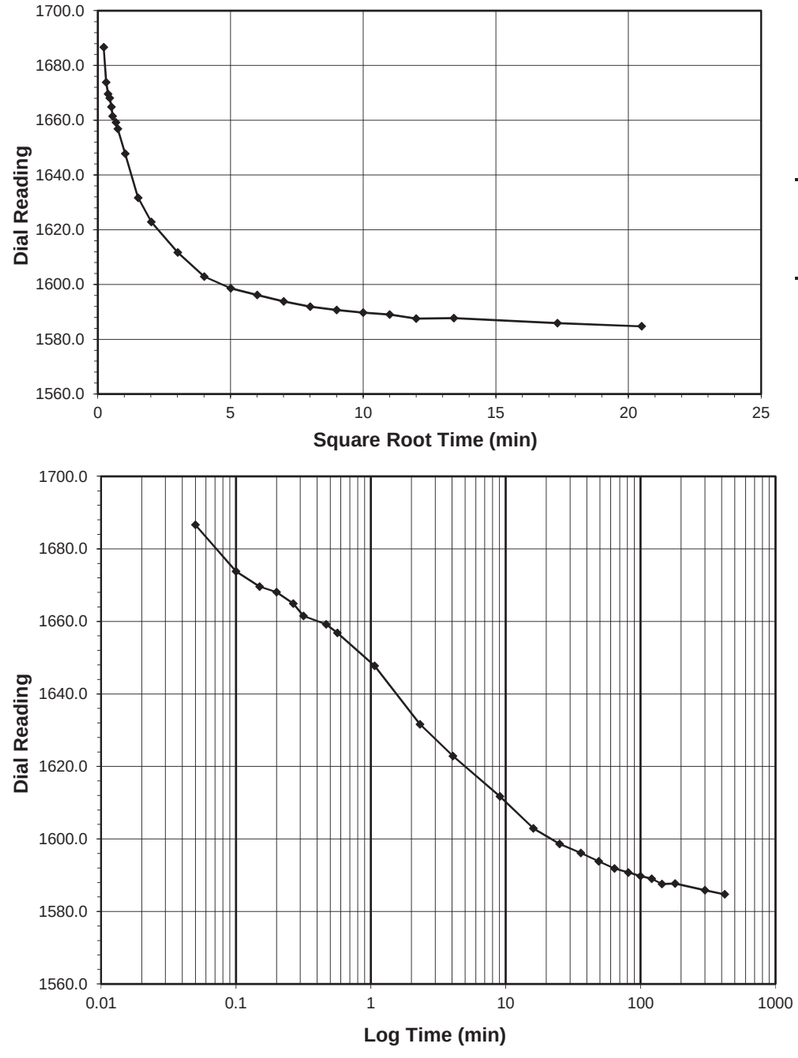
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**8.0-2.0**
Final Reading	**(div)**	**1584.7**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/12/18
Start Time		17:22:50

Elapsed Time (min)	Dial Reading (div)
Initial	**1734.8**
0.05	1686.6
0.10	1673.8
0.15	1669.6
0.20	1668.1
0.27	1664.9
0.32	1661.5
0.47	1659.2
0.57	1656.8
1.07	1647.8
2.32	1631.6
4.07	1622.9
9.07	1611.7
16.07	1602.9
25.07	1598.7
36.07	1596.2
49.07	1593.8
64.07	1591.9
81.07	1590.7
100.07	1589.7
121.07	1589.0
144.08	1587.6
180.08	1587.7
300.08	1585.9
420.20	1584.7

Tested By 129-04-0411 *Date* 4/12/18 *Checked By* GEM *Date* 5/15/18

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

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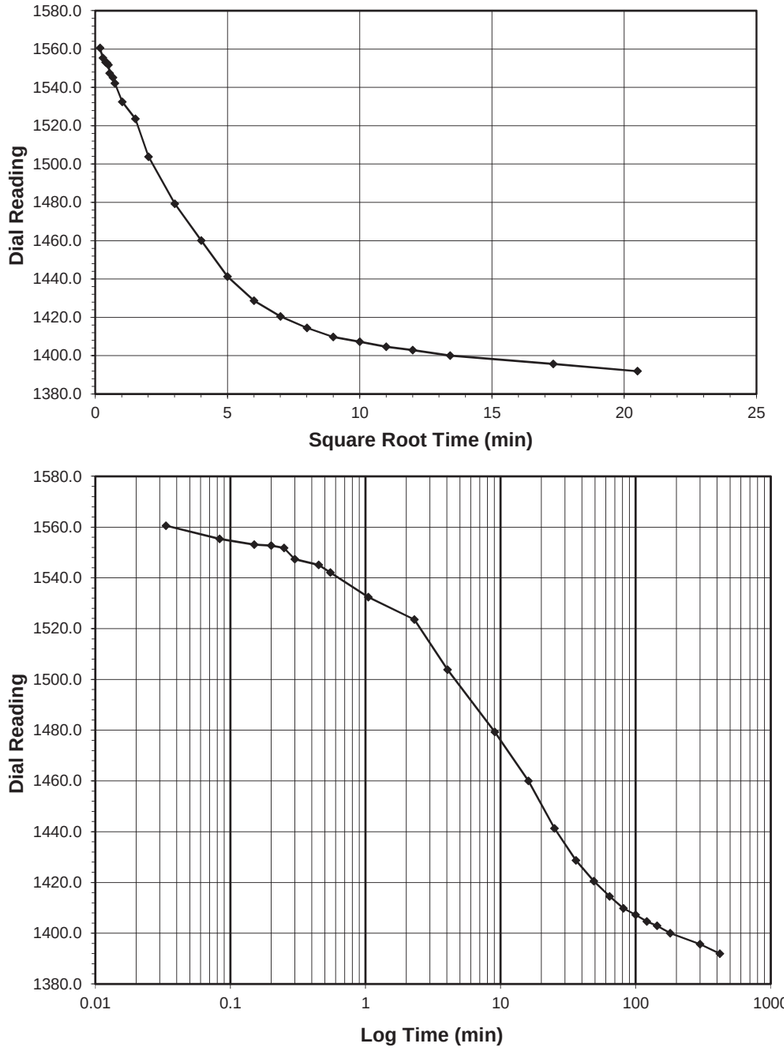
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-0.5**
Final Reading	**(div)**	**1391.9**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/13/18
Start Time		0:23:02

Elapsed Time (min)	Dial Reading (div)
Initial	**1584.7**
0.03	1560.5
0.08	1555.4
0.15	1553.1
0.20	1552.7
0.25	1551.8
0.30	1547.3
0.45	1545.1
0.55	1542.1
1.05	1532.5
2.30	1523.5
4.05	1503.8
9.05	1479.3
16.05	1460.0
25.05	1441.3
36.05	1428.7
49.05	1420.5
64.05	1414.5
81.05	1409.8
100.05	1407.3
121.05	1404.6
144.05	1402.9
180.05	1400.0
300.05	1395.7
420.33	1391.9

Tested By 129-04-0411 *Date* 4/13/18 *Checked By* GEM *Date* 5/15/18

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

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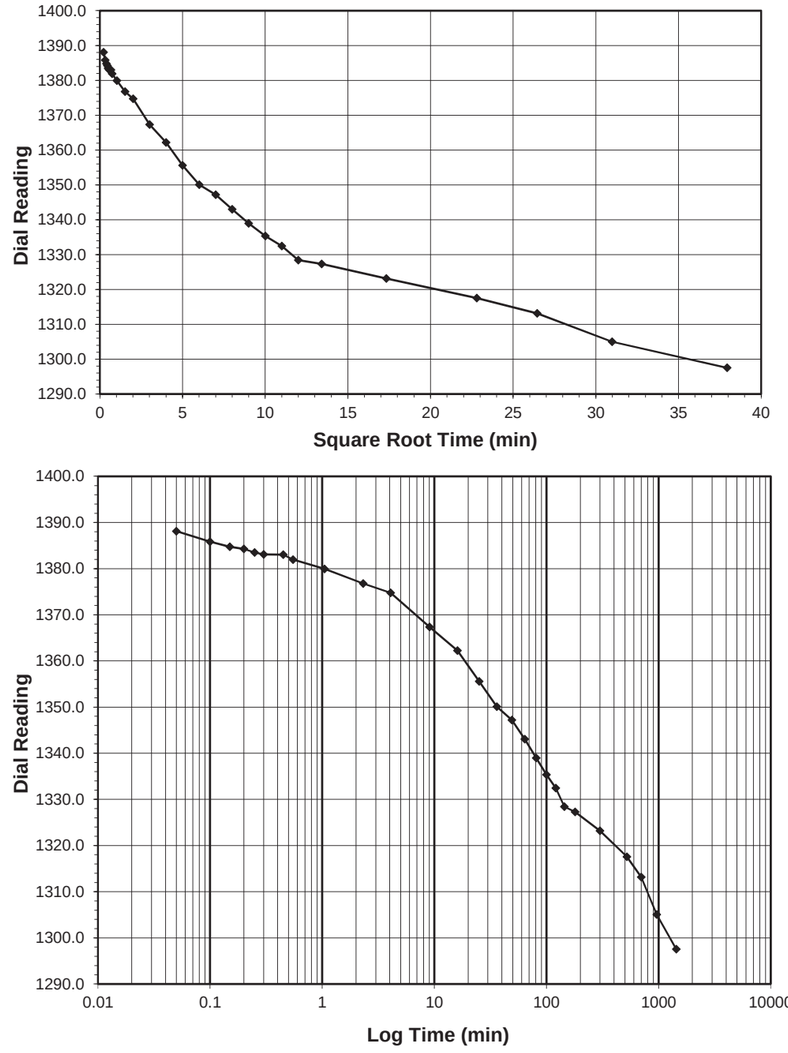
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-0.25**
Final Reading	**(div)**	**1297.5**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/13/18
Start Time		7:23:23

Elapsed Time (min)	Dial Reading (div)
Initial	**1391.9**
0.05	1388.1
0.10	1385.8
0.15	1384.8
0.20	1384.3
0.25	1383.5
0.30	1383.1
0.45	1383.0
0.55	1381.9
1.05	1379.9
2.32	1376.8
4.07	1374.7
9.07	1367.3
16.07	1362.2
25.07	1355.6
36.07	1350.1
49.07	1347.2
64.07	1343.0
81.07	1339.0
100.07	1335.3
121.07	1332.4
144.07	1328.4
180.07	1327.3
300.07	1323.2
520.07	1317.6
700.08	1313.2
960.08	1305.0
1440.02	1297.5

Tested By 129-04-0411 *Date* 4/13/18 *Checked By* GEM *Date* 5/15/18

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

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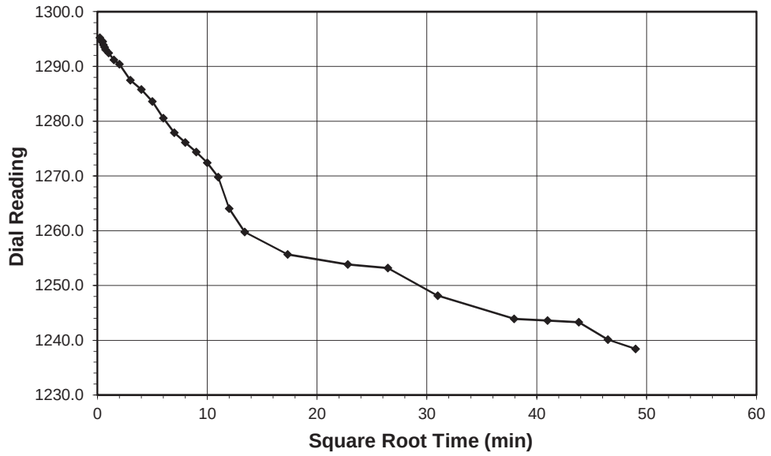
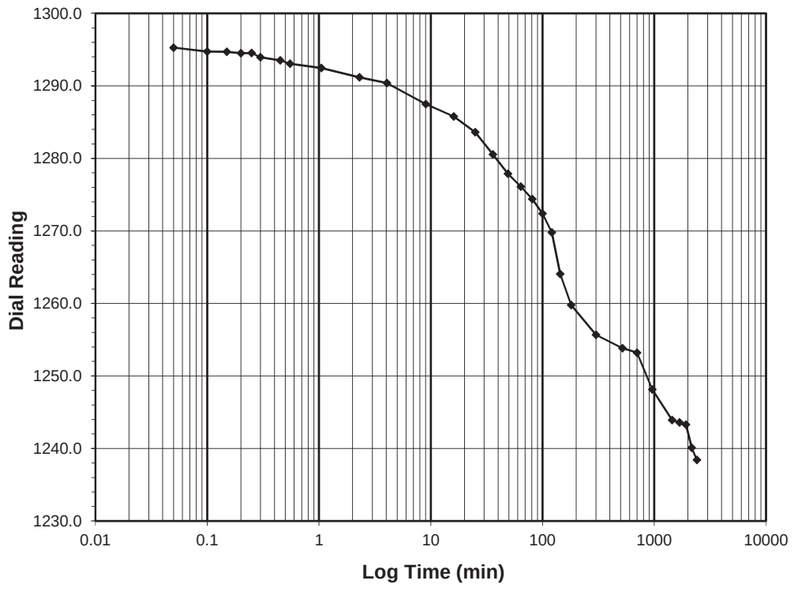
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load (tsf)	**0.25-0.125**
Final Reading (div)	**1238.4**
Consolidometer No.	**R409**
1 Division (in)	0.0001
Start Date	4/14/18
Start Time	7:23:25

Elapsed Time (min)	Dial Reading (div)
Initial	**1297.5**
0.05	1295.3
0.10	1294.7
0.15	1294.7
0.20	1294.5
0.25	1294.6
0.30	1294.0
0.45	1293.5
0.55	1293.1
1.05	1292.5
2.30	1291.2
4.05	1290.4
9.05	1287.5
16.05	1285.8
25.05	1283.6
36.05	1280.6
49.05	1277.9
64.05	1276.1
81.05	1274.4
100.05	1272.4
121.05	1269.8
144.05	1264.1
180.05	1259.8
300.05	1255.7
520.05	1253.8
700.05	1253.2
960.05	1248.1
1440.05	1243.9
1680.07	1243.6
1920.05	1243.3
2160.07	1240.1
2400.07	1238.4

Tested By 129-04-0411 *Date* 4/14/18 *Checked By* GEM *Date* 5/15/18

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

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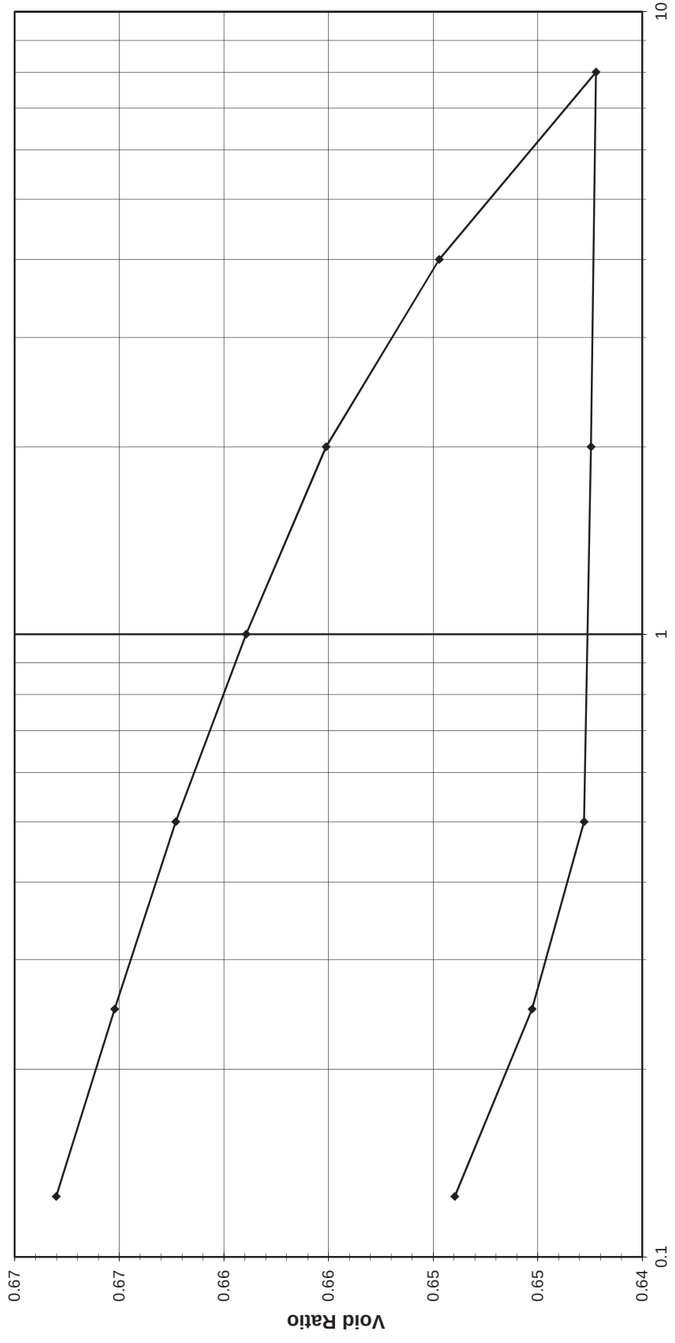
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-04-0411 *Date* 4/17/18 *Approved By* MPS *Date* 5/15/18

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

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

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

Sample Properties	**Initial**	**Final**
Water Content		
Tare Number	TB-08	815
Wt. Tare & WS (g)	485.43	287.95
Wt. Tare & DS (g)	418.64	259.52
Wt. Water (g)	66.79	28.43
Wt. Tare (g)	135.33	135.83
Wt. DS (g)	283.31	123.69
Water Content (%)	23.57	22.98
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.0000	0.9866
Sample Volume (cc)	80.44	79.36
Wt. Wet Sample + Ring (g)	371.31	370.56
Wt. of Ring (g)	214.30	214.30
Wt. of Wet Sample (g)	157.01	156.26
Wet Density (pcf)	121.80	122.87
Wet Density (g/cc)	1.95	1.97
Water Content (%)	23.57	22.98
Wt. of Dry Sample (g)	127.06	127.06
Dry Density (pcf)	98.56	99.90
Dry Density (g/cc)	1.58	1.60
Void Ratio	0.6714	0.6490
Saturation (%)	92.70	93.50
Specific Gravity	2.64	*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	1.57952	**0.67139**
0.125	24.4	4.2	20.2	25.349	80.278	1.58272	**0.66802**
0.25	49.9	13.1	36.9	25.306	80.143	1.58537	**0.66523**
0.5	81.7	27.4	54.3	25.262	80.003	1.58815	**0.66231**
1	125.6	51.0	74.5	25.211	79.840	1.59138	**0.65893**
2	184.5	87.1	97.4	25.153	79.656	1.59506	**0.65511**
4	254.4	124.7	129.7	25.071	79.396	1.60028	**0.64971**
8	337.6	163.1	174.5	24.957	79.036	1.60758	**0.64222**
2	276.1	103.0	173.1	24.960	79.047	1.60734	**0.64246**
0.5	227.0	55.9	171.1	24.965	79.063	1.60703	**0.64279**
0.25	204.7	48.4	156.3	25.003	79.183	1.60460	**0.64527**
0.125	182.6	48.4	134.2	25.059	79.361	1.60100	**0.64897**

Tested By 129-04-0411 *Date* 4/17/18 *Input Checked By* GEM *Date* 5/15/18

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

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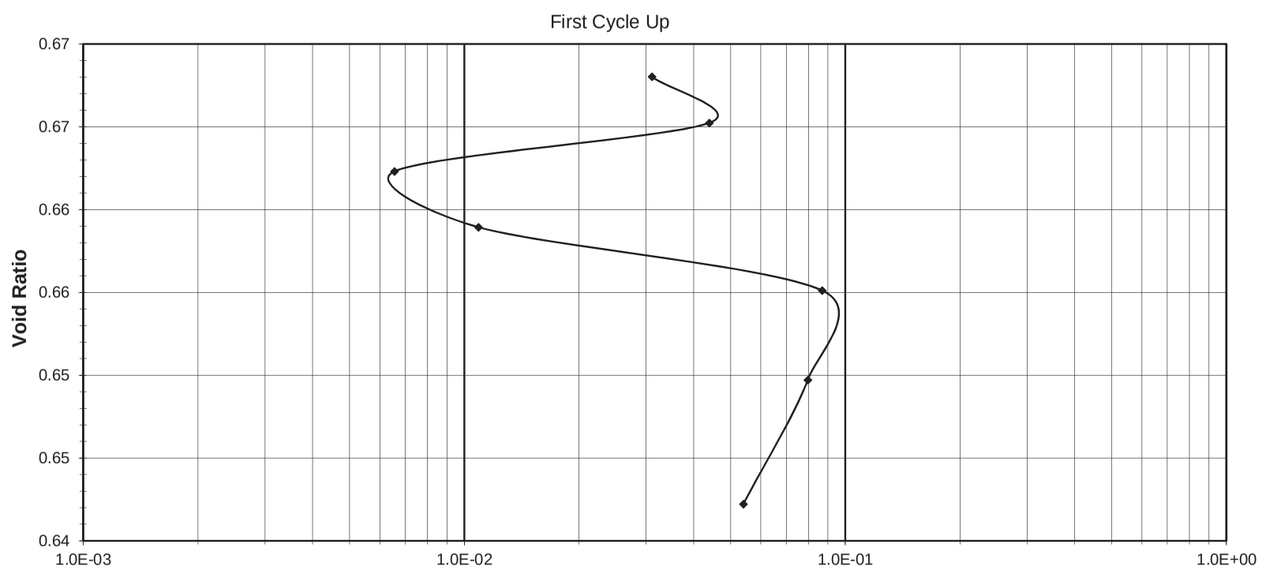
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-04-0411 *Date* 4/17/18 *Input Checked By* GEM *Date* 5/15/18

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

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

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

Sample Properties	Initial	Final
Water Content		
Tare Number	TB-08	815
Wt. Tare & WS (g)	485.43	287.95
Wt. Tare & DS (g)	418.64	259.52
Wt. Water (g)	66.79	28.43
Wt. Tare (g)	135.33	135.83
Wt. DS (g)	283.31	123.69
Water Content (%)	23.57	22.98
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.000	0.987
Sample Volume (cc)	80.44	79.36
Wt. Wet Sample + Ring (g)	371.31	370.56
Wt. of Ring (g)	214.30	214.30
Wt. of Wet Sample (g)	157.01	156.26
Wet Density (pcf)	121.80	122.87
Wet Density (g/cc)	1.95	1.97
Water Content (%)	23.57	22.98
Wt. of Dry Sample (g)	127.06	127.06
Dry Density (pcf)	98.56	99.90
Dry Density (g/cc)	1.58	1.60
Void Ratio	0.6714	0.6490
Saturation (%)	92.70	93.50
Specific Gravity	*2.64*	*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 - 0.125	12.2	4.2	8.0	2.538	**0.17**	**0.03110**
0.125 - 0.25	38.7	13.1	25.6	2.534	**0.12**	**0.04391**
0.25 - 0.5	74.2	27.4	46.8	2.528	**0.80**	**0.00656**
0.5 - 1	117.3	51.0	66.2	2.523	**0.48**	**0.01089**
1 - 2	164.8	87.1	77.6	2.520	**0.06**	**0.08690**
2 - 4	235.6	124.7	110.9	2.512	**0.07**	**0.07968**
4 - 8	321.7	163.1	158.6	2.500	**0.10**	**0.05399**
8 - 2	NA	103.0	NA	NA	**NA**	**NA**
2 - 0.5	NA	55.9	NA	NA	**NA**	**NA**
0.5 - 0.25	NA	48.4	NA	NA	**NA**	**NA**
0.25 - 0.125	NA	48.4	NA	NA	**NA**	**NA**

Tested By 129-04-0411 *Date* 4/17/18 *Input Checked By* GEM *Date* 5/15/18

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

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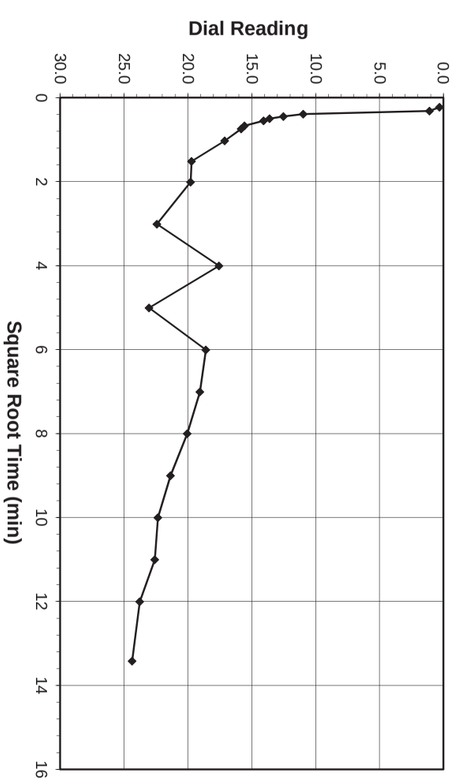
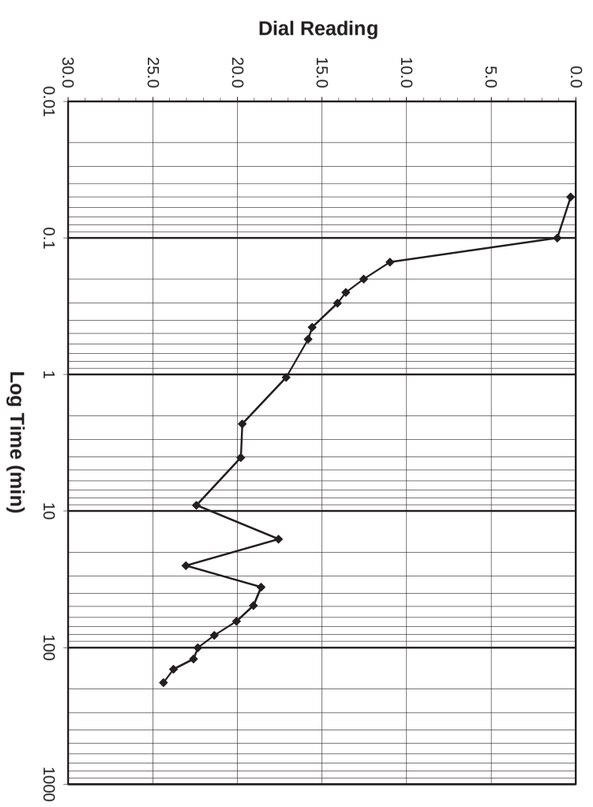
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load **0.0-0.125** (tsf)
Final Reading **24.4** (div)
Consolidometer No. **R470**
1 Division 0.0001 (in)
Start Date 4/17/18
Start Time 10:32:22

Elapsed Time (min)	Dial Reading (div)
Initial	**0.0**
0.05	0.3
0.10	1.1
0.15	11.0
0.20	12.5
0.25	13.6
0.30	14.1
0.45	15.6
0.55	15.8
1.05	17.1
2.30	19.7
4.05	19.8
9.05	22.4
16.05	17.6
25.05	23.0
36.05	18.6
49.07	19.0
64.07	20.0
81.07	21.4
100.07	22.3
121.07	22.6
144.07	23.8
180.07	24.4

Tested By 129-04-0411 *Date* 4/17/18 *Checked By* GEM *Date* 5/15/18

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

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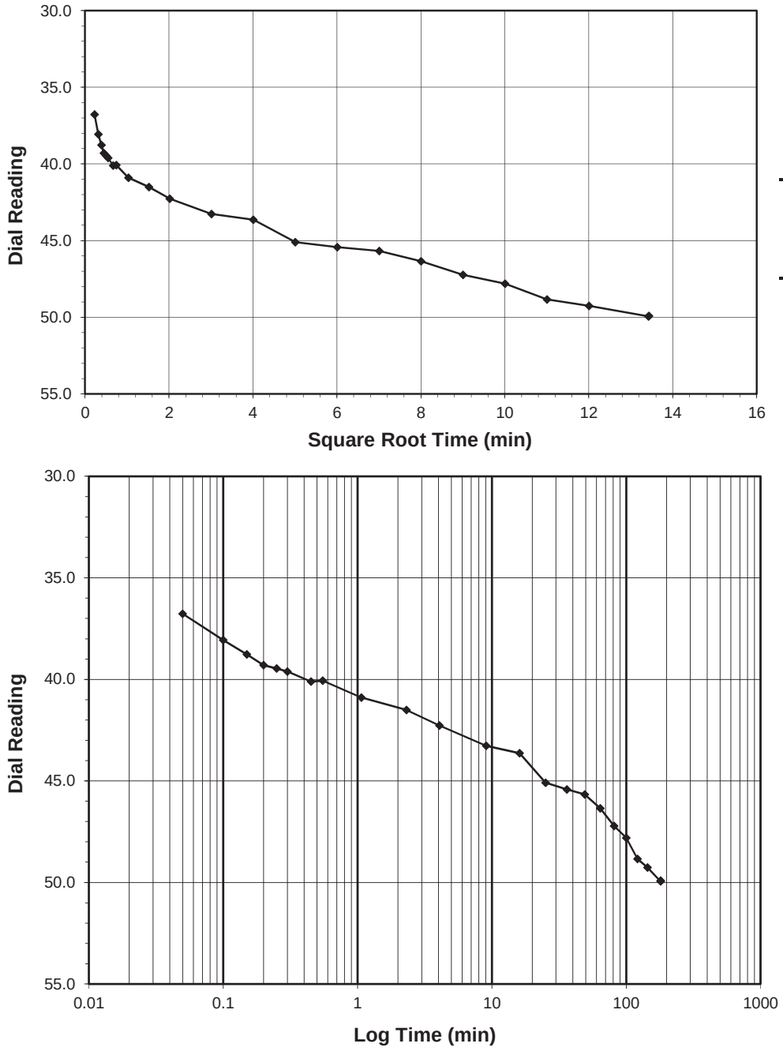
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.125-0.25**
Final Reading	**(div)**	**49.9**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/17/18
Start Time		13:32:46

Elapsed Time (min)	Dial Reading (div)
Initial	**24.4**
0.05	36.8
0.10	38.1
0.15	38.8
0.20	39.3
0.25	39.5
0.30	39.6
0.45	40.1
0.55	40.1
1.07	40.9
2.32	41.5
4.07	42.3
9.07	43.3
16.07	43.6
25.07	45.1
36.07	45.4
49.07	45.7
64.07	46.4
81.07	47.2
100.07	47.8
121.07	48.8
144.07	49.3
180.07	49.9
180.42	49.9

Tested By 129-04-0411 *Date* 4/17/18 *Checked By* GEM *Date* 5/15/18

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

Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-011 GEOJAC-16TSF1 Cv.xlsm]STEP 2

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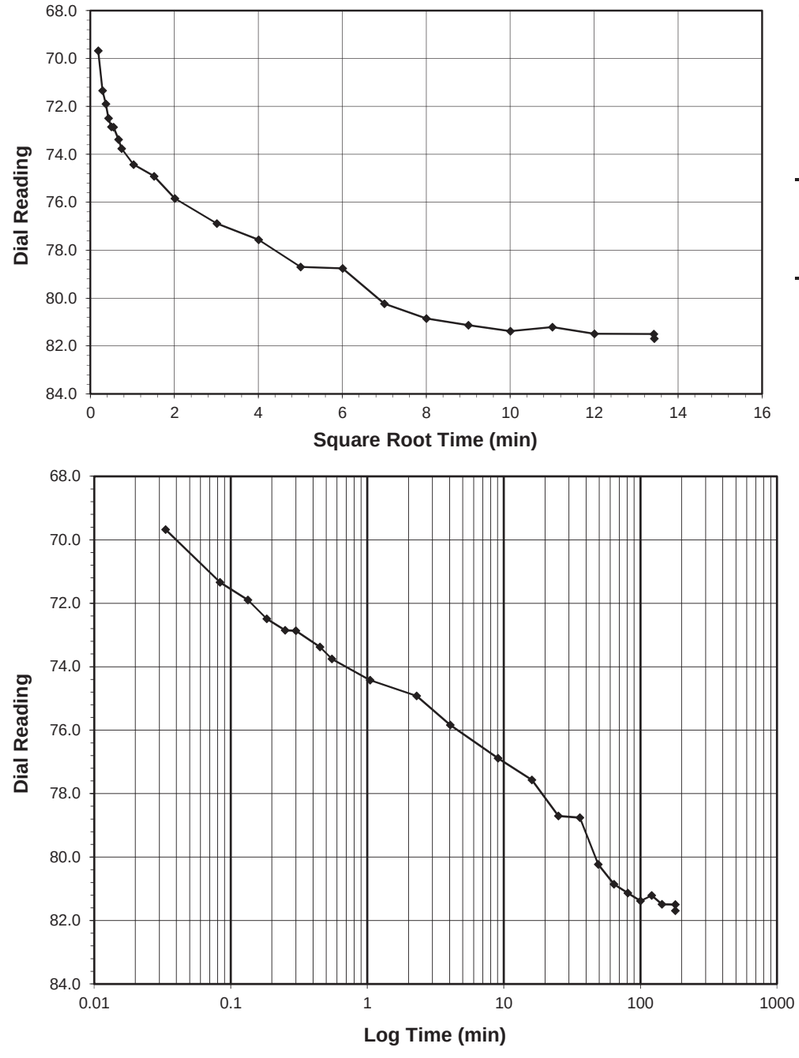
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**81.7**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/17/18
Start Time		16:33:11

Elapsed Time (min)	Dial Reading (div)
Initial	**49.9**
0.03	69.7
0.08	71.3
0.13	71.9
0.18	72.5
0.25	72.9
0.30	72.9
0.45	73.4
0.55	73.8
1.05	74.4
2.30	74.9
4.05	75.8
9.05	76.9
16.05	77.6
25.05	78.7
36.05	78.8
49.05	80.2
64.05	80.9
81.05	81.1
100.05	81.4
121.05	81.2
144.05	81.5
180.05	81.5
180.32	81.7

Tested By 129-04-0411 *Date* 4/17/18 *Checked By* GEM *Date* 5/15/18

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

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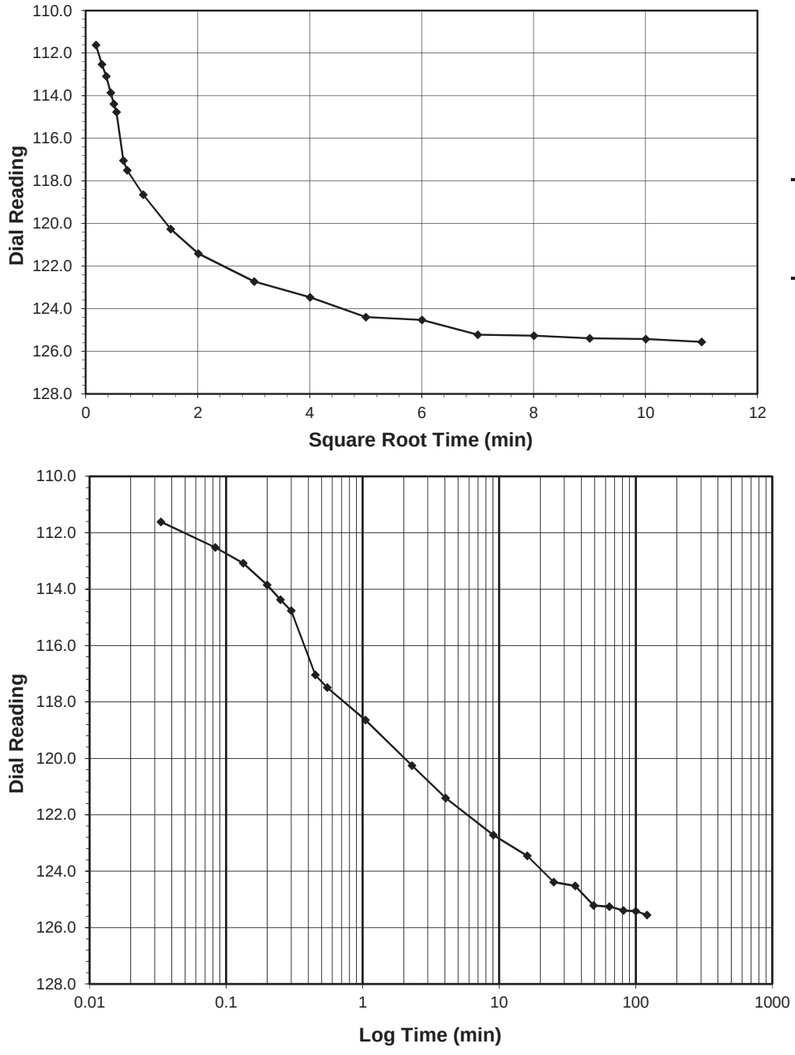
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**125.6**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/17/18
Start Time		19:33:31

Elapsed Time (min)	Dial Reading (div)
Initial	**81.7**
0.03	111.6
0.08	112.5
0.13	113.1
0.20	113.9
0.25	114.4
0.30	114.8
0.45	117.0
0.55	117.5
1.05	118.6
2.30	120.3
4.05	121.4
9.05	122.7
16.05	123.5
25.05	124.4
36.05	124.5
49.07	125.2
64.07	125.3
81.07	125.4
100.07	125.4
121.07	125.6

Tested By 129-04-0411 *Date* 4/17/18 *Checked By* GEM *Date* 5/15/18

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

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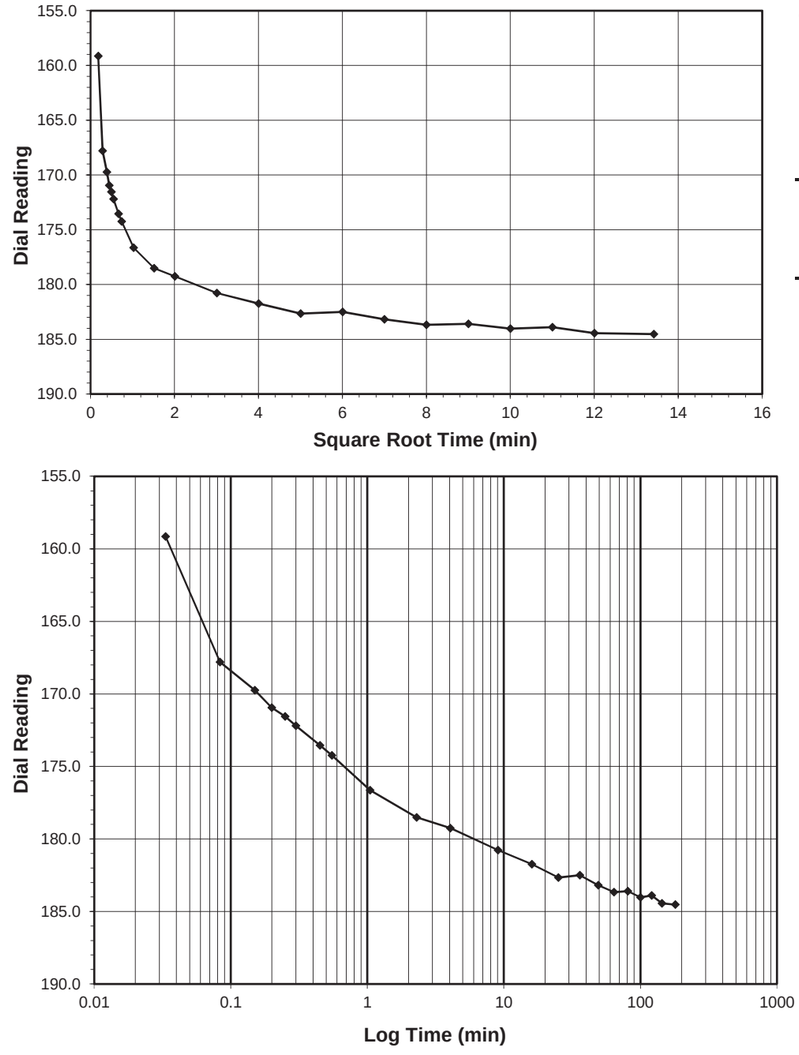
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**184.5**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/17/18
Start Time		22:33:55

Elapsed Time (min)	Dial Reading (div)
Initial	**125.6**
0.03	159.1
0.08	167.8
0.15	169.7
0.20	170.9
0.25	171.5
0.30	172.2
0.45	173.5
0.55	174.2
1.05	176.6
2.30	178.5
4.05	179.3
9.05	180.8
16.05	181.7
25.05	182.7
36.05	182.5
49.05	183.2
64.05	183.7
81.05	183.6
100.07	184.0
121.07	183.9
144.07	184.4
180.07	184.5

Tested By 129-04-0411 *Date* 4/17/18 *Checked By* GEM *Date* 5/15/18

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

Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-011 GEOJAC-16TSF1 Cv.xlsm]STEP 5

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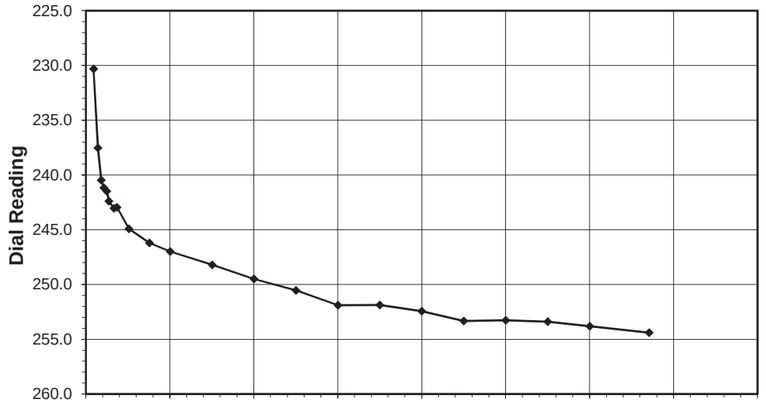
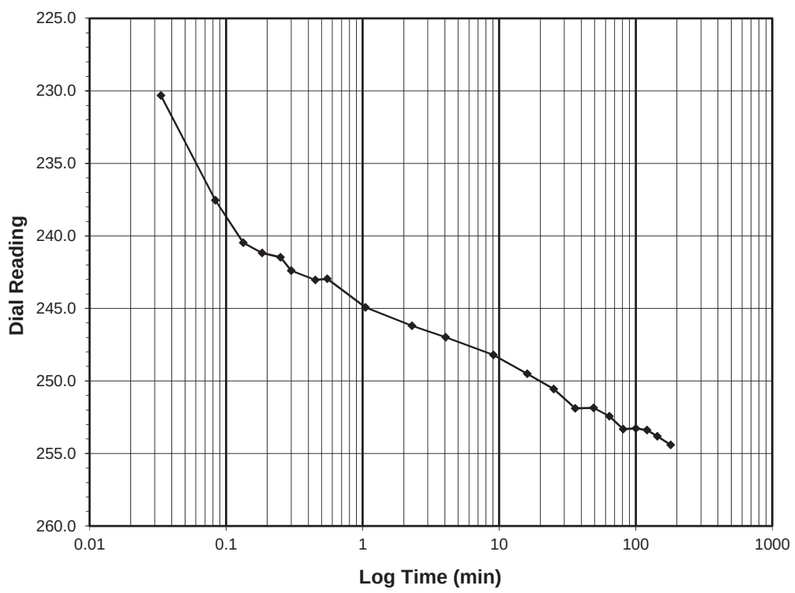
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**254.4**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		1:34:20

Elapsed Time (min)	Dial Reading (div)
Initial	**184.5**
0.03	230.3
0.08	237.5
0.13	240.5
0.18	241.2
0.25	241.5
0.30	242.4
0.45	243.0
0.55	242.9
1.05	244.9
2.30	246.2
4.05	247.0
9.05	248.2
16.05	249.5
25.05	250.5
36.05	251.9
49.05	251.9
64.05	252.4
81.05	253.3
100.05	253.3
121.05	253.4
144.05	253.8
180.05	254.4

Tested By 129-04-0411 *Date* 4/18/18 *Checked By* GEM *Date* 5/15/18

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

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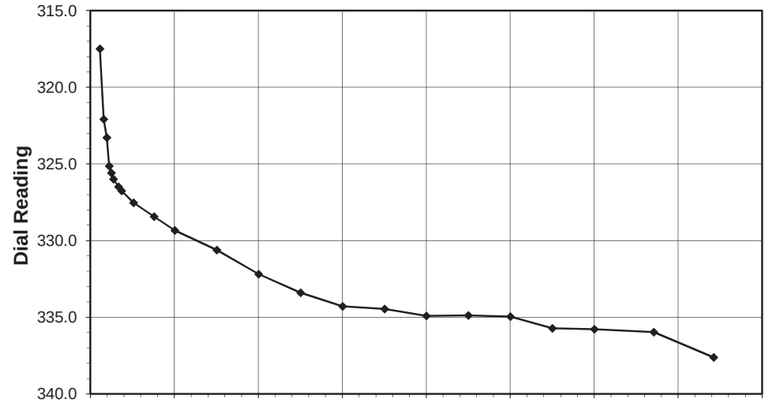
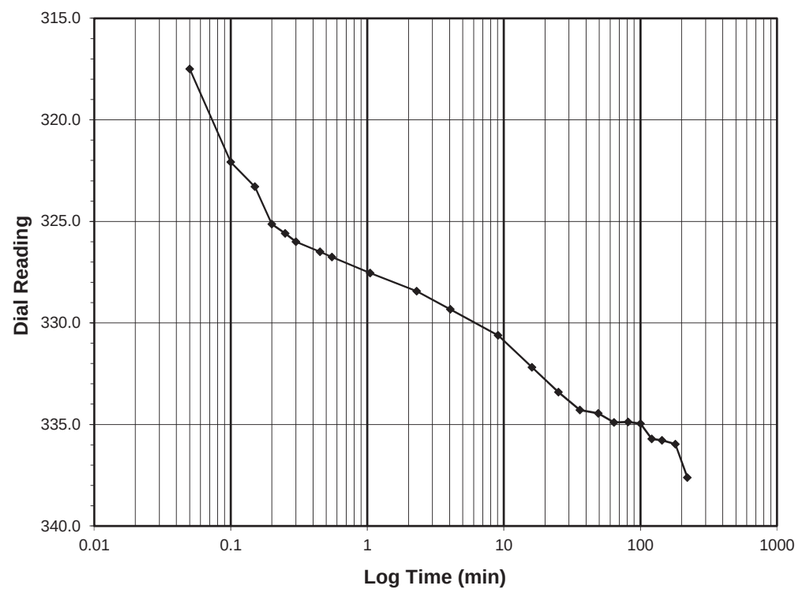
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**4.0-8.0**
Final Reading	**(div)**	**337.6**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		4:34:44

Elapsed Time (min)	Dial Reading (div)
Initial	**254.4**
0.05	317.5
0.10	322.1
0.15	323.3
0.20	325.1
0.25	325.6
0.30	326.0
0.45	326.5
0.55	326.8
1.05	327.5
2.30	328.4
4.05	329.3
9.07	330.6
16.07	332.2
25.07	333.4
36.07	334.3
49.07	334.5
64.07	334.9
81.07	334.9
100.07	335.0
121.07	335.7
144.07	335.8
180.07	336.0
220.47	337.6

Tested By 129-04-0411 *Date* 4/18/18 *Checked By* GEM *Date* 5/15/18

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

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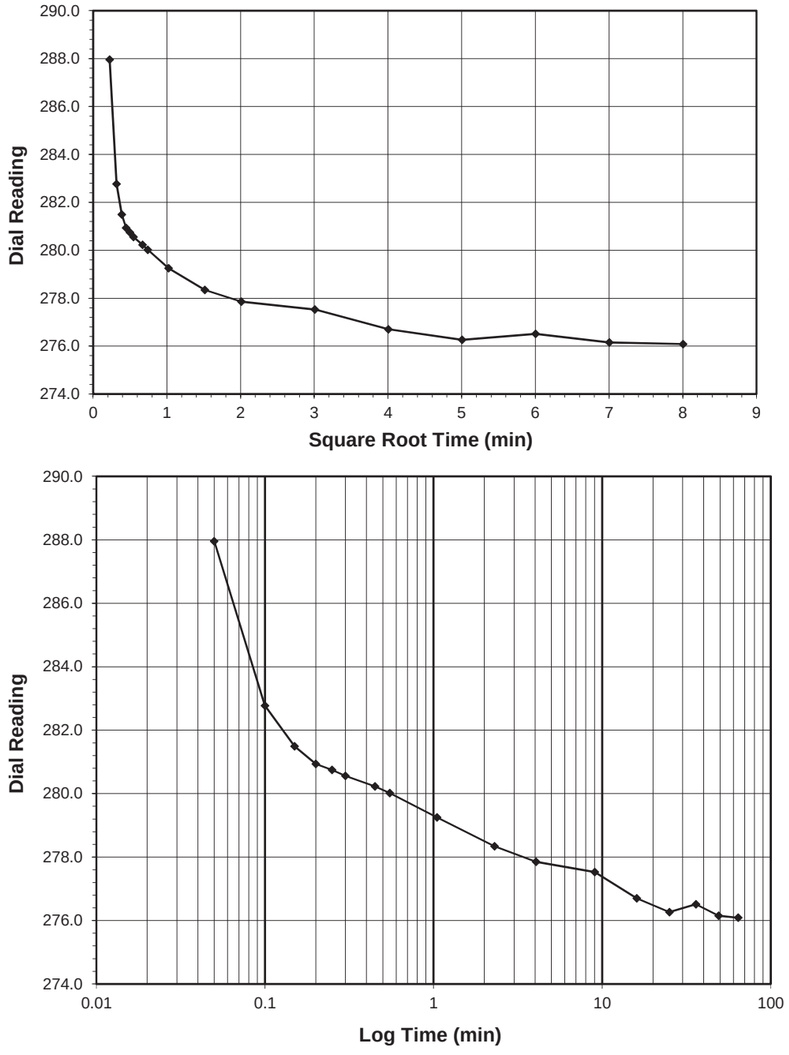
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**8.0-2.0**
Final Reading	**(div)**	**276.1**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		8:15:13

Elapsed Time (min)	Dial Reading (div)
Initial	**337.6**
0.05	288.0
0.10	282.8
0.15	281.5
0.20	280.9
0.25	280.7
0.30	280.6
0.45	280.2
0.55	280.0
1.05	279.3
2.30	278.3
4.05	277.9
9.05	277.5
16.05	276.7
25.05	276.3
36.05	276.5
49.05	276.1
64.05	276.1

Tested By 129-04-0411 *Date* 4/18/18 *Checked By* GEM *Date* 5/15/18

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

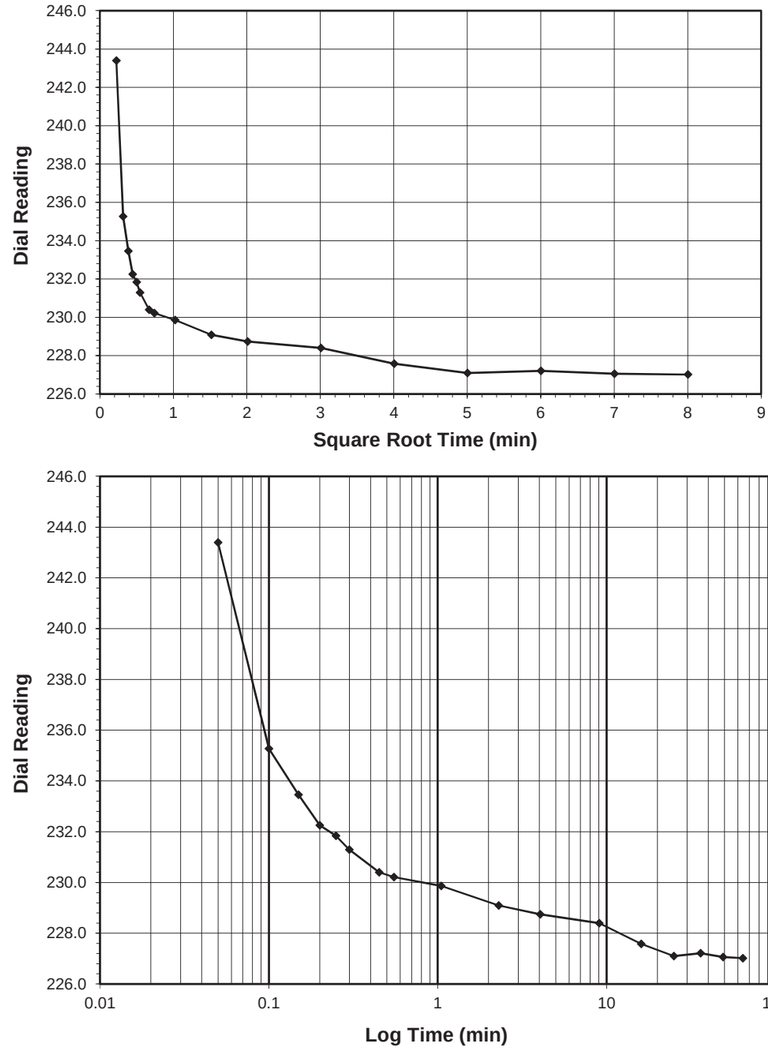
Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-011 GEOJAC-16TSF1 Cv.xlsm]STEP 8

ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-0.5**
Final Reading	**(div)**	**227.0**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		11:15:34

Elapsed Time (min)	Dial Reading (div)
Initial	**276.1**
0.05	243.4
0.10	235.3
0.15	233.5
0.20	232.3
0.25	231.8
0.30	231.3
0.45	230.4
0.55	230.2
1.05	229.9
2.30	229.1
4.05	228.7
9.05	228.4
16.05	227.6
25.05	227.1
36.05	227.2
49.05	227.1
64.07	227.0

Tested By 129-04-0411 *Date* 4/18/18 *Checked By* GEM *Date* 5/15/18

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

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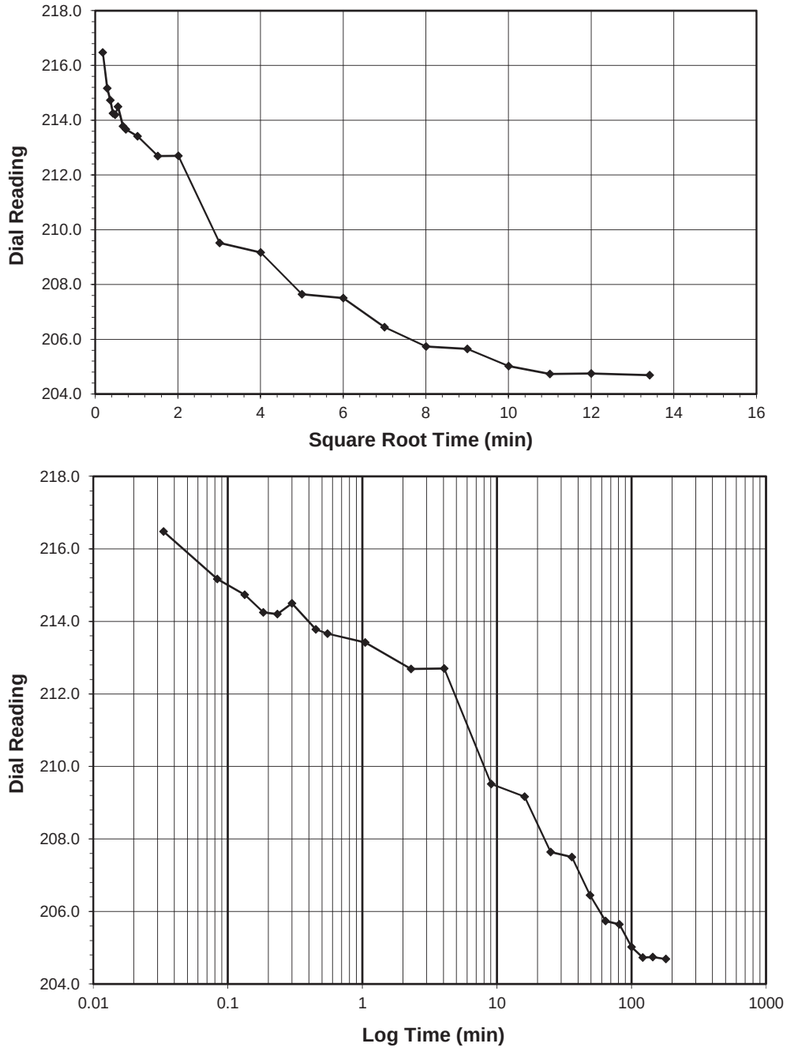
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-0.25**
Final Reading	**(div)**	**204.7**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		14:15:59

Elapsed Time (min)	Dial Reading (div)
Initial	**227.0**
0.03	216.5
0.08	215.2
0.13	214.7
0.18	214.3
0.23	214.2
0.30	214.5
0.45	213.8
0.55	213.7
1.05	213.4
2.30	212.7
4.05	212.7
9.05	209.5
16.05	209.2
25.05	207.6
36.05	207.5
49.05	206.4
64.05	205.7
81.05	205.6
100.05	205.0
121.05	204.7
144.07	204.7
180.07	204.7

Tested By 129-04-0411 *Date* 4/18/18 *Checked By* GEM *Date* 5/15/18

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

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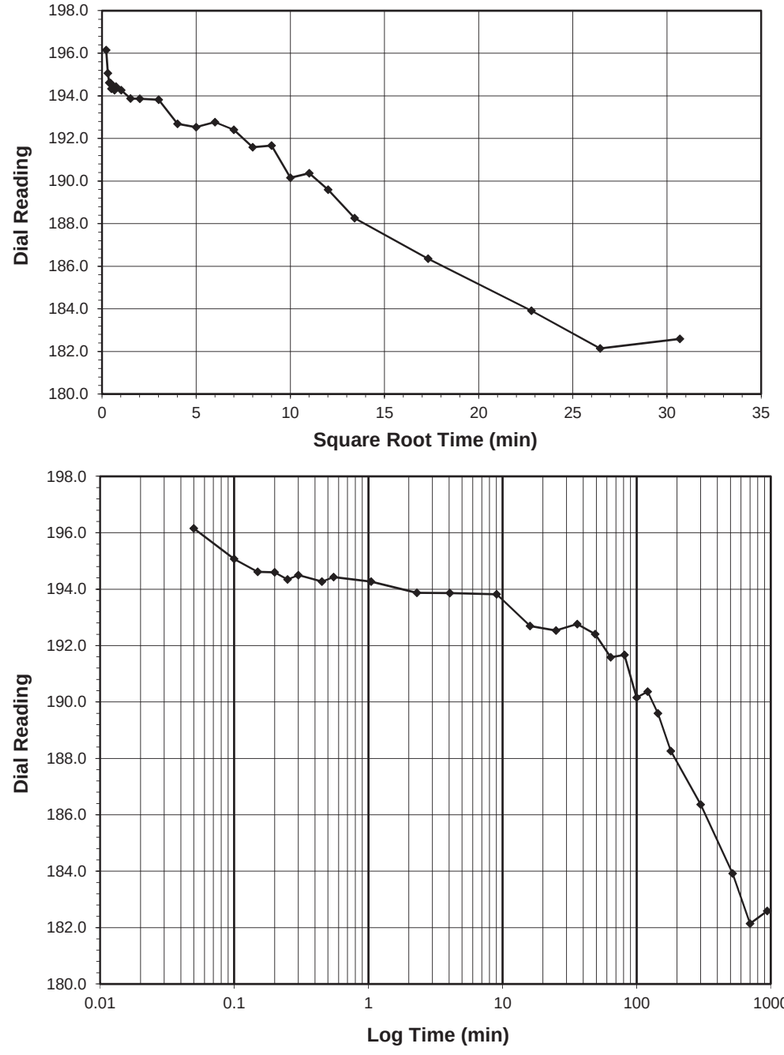
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.25-0.125**
Final Reading	**(div)**	**182.6**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		17:16:22

Elapsed Time (min)	Dial Reading (div)
Initial	**204.7**
0.05	196.2
0.10	195.1
0.15	194.6
0.20	194.6
0.25	194.3
0.30	194.5
0.45	194.3
0.55	194.4
1.05	194.3
2.30	193.9
4.05	193.9
9.05	193.8
16.05	192.7
25.05	192.5
36.05	192.8
49.05	192.4
64.07	191.6
81.07	191.7
100.07	190.2
121.07	190.4
144.07	189.6
180.07	188.3
300.07	186.4
520.07	183.9
700.07	182.1
941.73	182.6

Tested By 129-04-0411 *Date* 4/18/18 *Checked By* GEM *Date* 5/15/18

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

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PROJECT: 34360

REFERENCE: R-1015

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-1015	1	6

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CRAVEN*

PROJECT DESCRIPTION *US 70 (HAVELOCK BYPASS) FROM NORTH OF PINE GROVE TO NORTH OF CARTERET COUNTY LINE*

SITE DESCRIPTION *CULVERT NO. 90 ON US 70 OVER TUCKER CREEK AT -RP2AC- STA. 44+89*

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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THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:

1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

R.E. SMITH

A.A. MOORE

SUMMIT PERSONNEL

INVESTIGATED BY *J.L. STONE*

DRAWN BY *C.P. TURNER*

CHECKED BY *D.N. ARGENBRIGHT*

SUBMITTED BY *D.N. ARGENBRIGHT*

DATE *JULY 2014*

NORTH CAROLINA LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE

DocuSigned by:

Joseph L. Stone

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SIGNATURE

3/24/2015

DATE

PROJECT REFERENCE NO.	SHEET NO.
R-1015	2 OF 6

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 EXCAVATION
- 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
- [ ] CME-55
- [X] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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-27: RR SPIKE IN PP #57827 AT R-1015A -BY4- STA. 16+05, 278' RT (N 435536, E 2615246)
ELEVATION: 14.12 FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-1015	3 OF 6

SITE PLAN

0 50 100
FEET

SKEW = 120°

N

43 45 47

TUCKER CREEK

PROPOSED RCBC EXTENSION

WOODS

WOODS

EXISTING RCBC

B2

TO HAVELOCK

TO NEW BERN

US 70 EBL

US 70 24.5' BST

5.5' BST

-RP2AC-

4.5' BST

US 70 WBL

US 70 24.5' BST

120° SKEW

15

13

B1

17

SR 1162

SR 1162 6.0 M BST

WLB

WLB

WLB

WOODS

BTM

PROPOSED RCBC EXTENSION

GRAVEL PARKING

4.5 " CONC C&G

" CONC C&G

WOODS

SERMONS BLVD

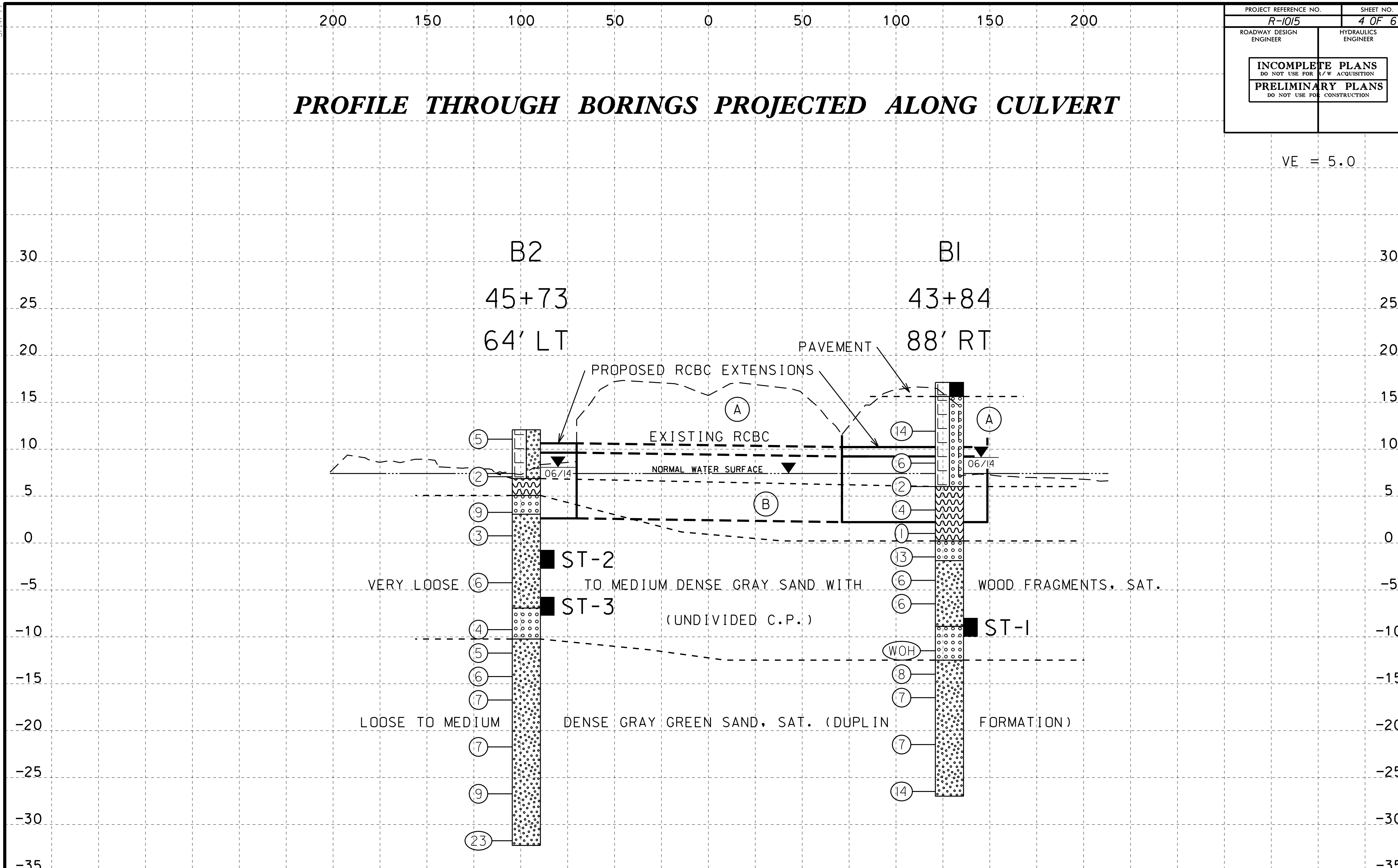
PROJECT REFERENCE NO.	SHEET NO.
R-1015	4 OF 6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PROFILE THROUGH BORINGS PROJECTED ALONG CULVERT

VE = 5.0



(A) VERY LOOSE TO MEDIUM DENSE TAN GRAY SAND, MOIST TO SAT. (ROADWAY EMBANKMENT)

(B) VERY SOFT BROWN BLACK MUCK, SAT. (ALLUVIAL)

44+89
-RP2AC-

NOTE: GROUNDLINE PROFILE ALONG CULVERT TAKEN FROM CULVERT SURVEY AND HYDRAULIC REPORT DATED 05/02/14.

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO PROFILE.

200 150 100 50 0 50 100 150 200

5/14/99

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION CULVERT C90 ON -RP2AC- (US 70) OVER TUCKER CREEK				**GROUND WTR (ft)**
BORING NO. B1	**STATION** 43+84	**OFFSET** 88 ft RT	**ALIGNMENT** -RP2AC-	**0 HR.** N/A
COLLAR ELEV. 17.1 ft	**TOTAL DEPTH** 44.1 ft	**NORTHING** 435,582	**EASTING** 2,614,951	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE GFO0057 CME-550X 82% 05/19/2014		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER N/A	**START DATE** 06/19/14	**COMP. DATE** 06/19/14	**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)
										17.1	0.0
										GROUND SURFACE	
										15.6	1.5
										PAVEMENT	
										ROADWAY EMBANKMENT	
										TAN GRAY SAND, MOIST TO SAT.	
	12.9	4.2	3	6	8	14	SS-1				
	9.5	7.6	3	3	3	6					
	7.0	10.1	1	1	1	2	SS-2				
	4.5	12.6	WOH	2	2	4	SS-3				
	2.0	15.1	WOH	WOH	1	1	SS-4				
	-0.5	17.6	5	5	8	13	SS-5				
	-3.0	20.1	2	3	3	6	SS-6				
	-5.5	22.6	1	2	4	6	SS-7				
	-8.0	25.1	WOH	WOH	WOH	0	SS-8				
	-10.5	27.6	3	4	4	8	SS-9				
	-13.0	30.1	2	3	4	7					
	-15.5	32.6	2	3	4	7					
	-18.0	35.1	5	6	8	14	SS-10				
	-20.5	37.6									
	-23.0	40.1									
	-25.5	42.6									
										-8.9	26.0
										-12.5	29.6
										COASTAL PLAIN	
										GRAY GREEN SAND, SAT. (DUPLIN FORMATION)	
										-27.0	44.1
										Boring Terminated at Elevation -27.0 ft IN MEDIUM DENSE SAND	
										Other Samples: ST-1 (25.1 - 27.1)	

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION CULVERT C90 ON -RP2AC- (US 70) OVER TUCKER CREEK				**GROUND WTR (ft)**
BORING NO. B2	**STATION** 45+73	**OFFSET** 64 ft LT	**ALIGNMENT** -RP2AC-	**0 HR.** N/A
COLLAR ELEV. 12.0 ft	**TOTAL DEPTH** 44.3 ft	**NORTHING** 435,727	**EASTING** 2,614,757	**24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE GFO0057 CME-550X 82% 05/19/2014		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER N/A	**START DATE** 06/19/14	**COMP. DATE** 06/20/14	**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
	12.0	0.0	1	2	3	5				12.0 GROUND SURFACE 0.0
	8.0	4.0	1	1	1	2				**ROADWAY EMBANKMENT**
	4.2	7.8	WOH	2	7	9				TAN GRAY SAND, MOIST TO SAT.
	1.7	10.3	4	2	1	3				6.8 5.2
	-3.3	15.3	3	3	3	6				**ALLUVIAL**
	-8.3	20.3	2	3	1	4				5.0 BROWN BLACK MUCK, SAT. 7.0
	-10.8	22.8	3	2	3	5				**UNDIVIDED COASTAL PLAIN**
	-13.3	25.3	2	3	3	6				3.0 GRAY SAND WITH WOOD FRAGMENTS, SAT. 9.0
	-15.8	27.8	2	3	4	7				
	-20.8	32.8	2	3	4	7				
	-25.8	37.8	3	4	5	9				
	-30.8	42.8	17	12	11	23				
							SS-11			-7.0 19.0
										-10.3 22.3
							SS-12			**COASTAL PLAIN**
										GRAY GREEN SAND, SAT. (DUPLIN FORMATION)
										-32.3 44.3
										Boring Terminated at Elevation -32.3 ft IN MEDIUM DENSE SAND
										Other Samples: ST-2 (12.8 - 14.8) ST-3 (17.8 - 19.8)

PROJECT REFERENCE NO.	SHEET
R–1015	6 OF 6

34360.1.1

R–1015

CULVERT NO. 90 ON US 70 OVER TUCKER CREEK AT –RP2AC– STA. 44+89

B1 SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS- 1	88 RT	43+84	4.2- 5.7	A- 3(0)	15	NP	18.3	74.6	0.2	6.8	97	89	8	-	-
SS- 2	88 RT	43+84	10.1- 11.1	A- 3(0)	14	NP	7.0	88.1	2.0	2.8	99	98	6	-	-
SS- 3	88 RT	43+84	11.1- 11.6	A- 2- 4(0)	22	1	11.1	62.2	15.9	10.9	100	97	29	-	-
SS- 4	88 RT	43+84	12.6- 14.1	A- 6(4)	37	18	10.1	49.1	23.9	16.9	100	93	43	-	-
SS- 5	88 RT	43+84	15.1- 16.6	A- 2- 4(0)	27	NP	5.8	75.3	10.1	8.9	100	96	23	-	-
SS- 6	88 RT	43+84	17.6- 19.1	A- 3(0)	19	NP	20.5	76.7	2.0	0.8	100	96	4	-	-
SS- 7	88 RT	43+84	20.1- 21.6	A- 2- 4(0)	28	NP	27.8	55.1	10.3	6.8	100	95	21	-	-
SS- 8	88 RT	43+84	27.6- 29.1	A- 3(0)	15	NP	27.0	68.2	2.0	2.8	99	92	6	-	-
SS- 9	88 RT	43+84	30.1- 31.6	A- 2- 4(0)	28	NP	17.3	61.0	12.9	8.9	100	95	27	-	-
SS- 10	88 RT	43+84	42.6- 44.1	A- 2- 4(0)	29	NP	16.1	66.2	10.9	6.8	97	87	27	-	-

B2 SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS- 11	64 LT	45+73	22.8- 24.3	A- 2- 4(0)	26	NP	36.2	44.3	10.7	8.9	87	74	20	-	-
SS- 12	64 LT	45+73	27.8- 29.3	A- 2- 4(0)	24	NP	15.5	73.6	3.2	7.6	100	95	14	-	-

REFERENCE: R-1015

PROJECT: 34360

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-1015	1	6

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

STRUCTURE SUBSURFACE INVESTIGATION

CONTENTS

COUNTY *CRAVEN*

PROJECT DESCRIPTION *US 70 (HAVELOCK BYPASS) FROM NORTH OF PINE GROVE TO NORTH OF CARTERET COUNTY LINE*

SITE DESCRIPTION *CULVERT ON US 70 OVER UT TO TUCKER CREEK AT -L- STA. 509+41*

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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NOTES:

1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

CATLIN PERSONNEL

INVESTIGATED BY *J.L. STONE*

DRAWN BY *C.P. TURNER*

CHECKED BY *D.N. ARGENBRIGHT*

SUBMITTED BY *D.N. ARGENBRIGHT*

DATE *FEBRUARY 2015*

NORTH CAROLINA LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE

DocuSigned by:

Joseph L. Stone

1330580A87A24F6

SIGNATURE

3/23/2015

DATE

PROJECT REFERENCE NO.	SHEET NO.
R-1015	2 OF 6

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 EXCAVATION
- 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
- [ ] CME-55
- [X] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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-26: RR SPIKE IN 8" OAK AT -BL- STA. 430+61, 326' LT
N 438405, E 2614036
ELEVATION: 26.38 FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-1015	3 OF 6

SITE PLAN

0 50 100

FEET

SKEW = 90°

N

PROPOSED 2@10'X8' RCBC

PROPOSED 2@10'X8' RCBC

ATLANTIC AND EAST CAROLINA RAILROAD

TO NEWPORT

TO NEW BERN

-L-

US-70 BYPASS

-RP2C-

508

510

512

B1

B2

B3

3

5

7

F

WLB

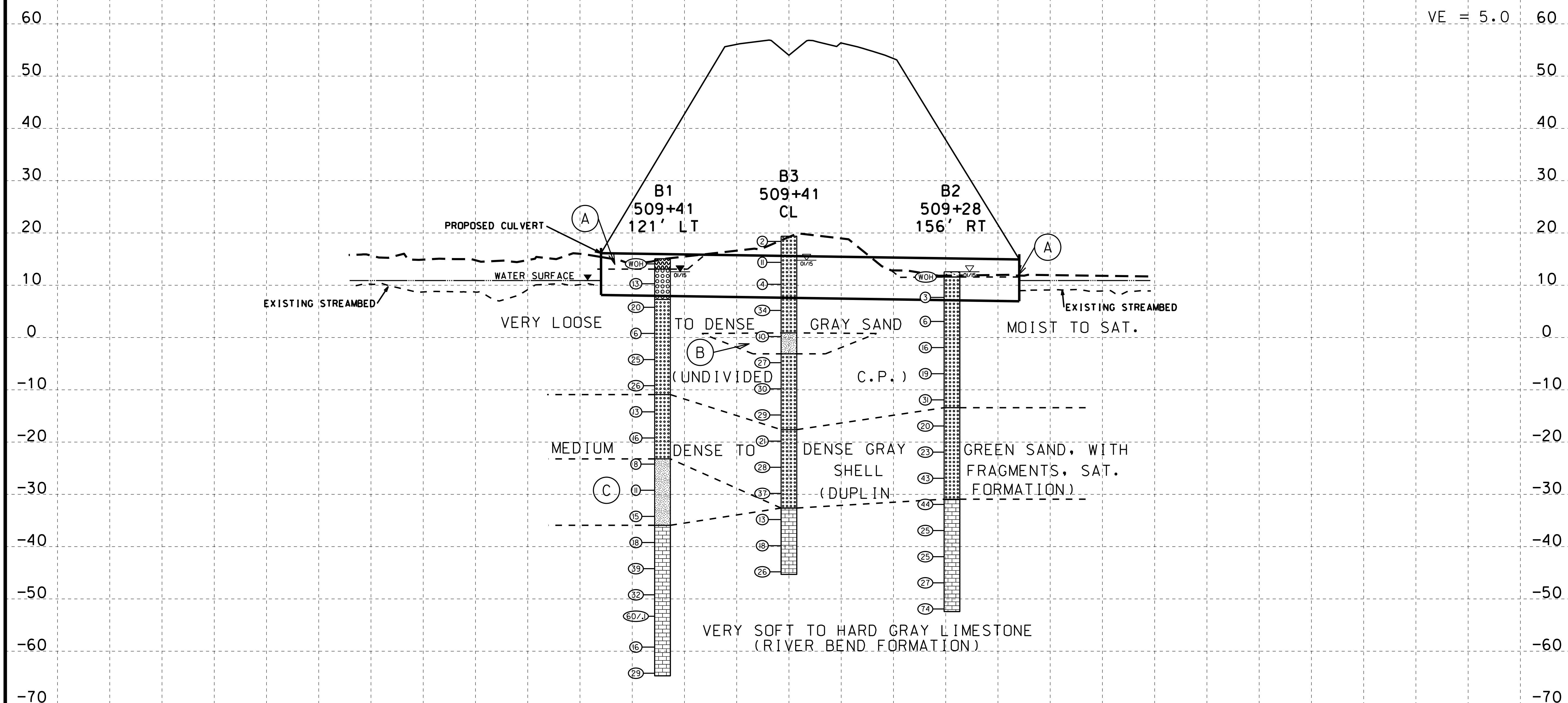
JS

PROFILE THROUGH BORINGS PROJECTED ALONG CULVERT

PROJECT REFERENCE NO.	SHEET NO.
R-1015	4 OF 6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



Ⓐ VERY SOFT BROWN MODERALTY ORGANIC SILT AND MUCK, MOIST TO SAT. (ALLUVIAL)

Ⓑ STIFF GRAY SANDY SILT, WET (UNDIVIDED C.P.)

Ⓒ MEDIUM STIFF TO STIFF GRAY GREEN SANDY SILT, WITH SHELL FRAGMENTS, WET (DUPLIN FORMATION)

509+41
-L-

NOTE: GROUNDLINE PROFILE ALONG CULVERT TAKEN FROM CULVERT SURVEY AND HYDRAULIC REPORT DATED 05/02/14.

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO PROFILE.

400 300 200 100 0 100 200 300 400

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION CULVERT ON -L- (US 70 BYPASS) OVER TOWN CREEK				**GROUND WTR (ft)**
BORING NO. B1	**STATION** 509+41	**OFFSET** 121 ft LT	**ALIGNMENT** L	**0 HR.** 2.5
COLLAR ELEV. 15.1 ft	**TOTAL DEPTH** 79.8 ft	**NORTHING** 437,375	**EASTING** 2,613,733	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 77.2% 01/09/2014		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Contract Driller	**START DATE** 01/20/15	**COMP. DATE** 01/20/15	**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)
	15.1	0.0	WOH	WOH	WOH	0				LAND SURFACE	15.1	0.0
	11.3	3.8	4	7	6	13				**ALLUVIAL** BROWN MUCK, MOIST TO SAT.	13.1	2.0
	6.8	8.3	3	10	10	20				**UNDIVIDED COASTAL PLAIN** GRAY SAND , SAT.	7.3	7.8
	1.8	13.3	2	3	3	6						
	-3.2	18.3	9	13	12	25						
	-8.2	23.3	4	11	15	26						
	-13.2	28.3	5	6	7	13						
	-18.2	33.3	5	7	9	16						
	-23.2	38.3	2	4	4	8						
	-28.2	43.3	4	3	8	11						
	-33.2	48.3	4	6	9	15						
	-38.2	53.3	6	6	12	18						
	-43.2	58.3	16	19	20	39						
	-48.2	63.3	14	16	16	32						
	-53.2	68.3	60/0.1			60/0.1						
	-58.2	73.3	8	8	8	16						
	-63.2	78.3	12	12	17	29				**COASTAL PLAIN** GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (DUPLIN FORMATION)	-10.9	26.0
										COASTAL PLAIN GRAY GREEN SANDY SILT WITH SHELL FRAGMENTS, (DUPLIN FORMATION)	-23.2	38.3
										COASTAL PLAIN GRAY LIMESTONE (RIVER BEND FORMATION)	-35.9	51.0
										COASTAL PLAIN GRAY LIMESTONE (RIVER BEND FORMATION) *(continued)*	-64.7	79.8
										Boring Terminated at Elevation -64.7 ft IN VERY SOFT LIMESTONE		

Match Line

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION CULVERT ON -L- (US 70 BYPASS) OVER TOWN CREEK			**GROUND WTR (ft)**
BORING NO. B1	**STATION** 509+41	**OFFSET** 121 ft LT	**ALIGNMENT** L	**0 HR.** 2.5
COLLAR ELEV. 15.1 ft	**TOTAL DEPTH** 79.8 ft	**NORTHING** 437,375	**EASTING** 2,613,733	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 77.2% 01/09/2014		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Contract Driller	**START DATE** 01/20/15	**COMP. DATE** 01/20/15	**SURFACE WATER DEPTH** N/A	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION CULVERT ON -L- (US 70 BYPASS) OVER TOWN CREEK				**GROUND WTR (ft)**
BORING NO. B2	**STATION** 509+28	**OFFSET** 156 ft RT	**ALIGNMENT** L	**0 HR.** 0.0
COLLAR ELEV. 12.6 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 437,217	**EASTING** 2,613,963	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 77.2% 01/09/2014		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Contract Driller	**START DATE** 01/21/15	**COMP. DATE** 01/21/15	**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)
15										
	12.6	0.0	WOH	WOH	WOH	0				12.6 0.0 LAND SURFACE
10										11.6 1.0 **ALLUVIAL** BROWN MODERATLEY ORGANIC SILT, MOIST TO WET
	8.7	3.9	WOH	2	1	3				**UNDIVIDED COASTAL PLAIN** GRAY SAND , SAT.
5	4.1	8.5	3	2	4	6				
0	-0.9	13.5	6	6	10	16				
-5	-5.9	18.5	9	11	8	19				
-10	-10.9	23.5	7	12	19	31				
-15	-15.9	28.5	6	9	11	20				
-20	-20.9	33.5	9	12	11	23				
-25	-25.9	38.5	9	17	26	43				
-30	-30.9	43.5	53	25	19	44				-13.4 26.0 **COASTAL PLAIN** GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (DUPLIN FORMATION)
-35	-35.9	48.5	15	12	13	25				
-40	-40.9	53.5	10	12	13	25				
-45	-45.9	58.5	12	9	18	27				
-50	-50.9	63.5	13	44	30	74				-30.9 43.5 **COASTAL PLAIN** GRAY LIMESTONE (RIVER BEND FORMATION)
										-52.4 65.0 Boring Terminated at Elevation -52.4 ft IN VERY SOFT LIMESTONE

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION CULVERT ON -L- (US 70 BYPASS) OVER TOWN CREEK				**GROUND WTR (ft)**
BORING NO. B3	**STATION** 509+41	**OFFSET** CL	**ALIGNMENT** L	**0 HR.** 4.6
COLLAR ELEV. 19.3 ft	**TOTAL DEPTH** 64.7 ft	**NORTHING** 437,311	**EASTING** 2,613,836	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 77.2% 01/09/2014		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Contract Driller	**START DATE** 01/21/15	**COMP. DATE** 01/21/15	**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
20										
	19.3	0.0	WOH	1	1	2				19.3 0.0 LAND SURFACE
15	15.3	4.0	4	6	5	11				**UNDIVIDED COASTAL PLAIN** GRAY SAND , SAT.
10	11.1	8.2	1	2	2	4				
5	6.1	13.2	13	18	16	34				
0	1.1	18.2	4	4	6	10				0.8 18.5 **UNDIVIDED COASTAL PLAIN** GRAY SANDY SILT, WET
-5	-3.9	23.2	13	17	10	27				-3.2 22.5 **UNDIVIDED COASTAL PLAIN** GRAY SAND , SAT.
-10	-8.9	28.2	13	16	14	30				
-15	-13.9	33.2	11	12	17	29				
-20	-18.9	38.2	5	10	11	21				-17.7 37.0 **COASTAL PLAIN** GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (DUPLIN FORMATION)
-25	-23.9	43.2	12	14	14	28				
-30	-28.9	48.2	18	17	20	37				
-35	-33.9	53.2	11	5	8	13				-32.7 52.0 **COASTAL PLAIN** GRAY LIMESTONE (RIVER BEND FORMATION)
-40	-38.9	58.2	10	7	11	18				
-45	-43.9	63.2	11	12	14	26				-45.4 64.7 Boring Terminated at Elevation -45.4 ft IN VERY SOFT LIMESTONE