STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	41665.3H	1	28

REFERENCE: 180019

PROJECT: 41665.3H

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *CHATHAM / LEE*

PROJECT DESCRIPTION *BRIDGE NO 19 ON NC 42 OVER DEEP RIVER*

INVENTORY

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.

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

J.R. SWARTLEY

J.A. LITTLE

J.M. FLORES

INVESTIGATED BY *J.R. SWARTLEY*

DRAWN BY *J.R. SWARTLEY*

CHECKED BY *S.S. LANEY*

SUBMITTED BY *S.S. LANEY*

DATE *OCTOBER 2017*

3201 SPRING FOREST ROAD
RALEIGH, NC 27616
(919) 872-2660

NORTH CAROLINA LICENSED SEAL 2296 GEOLOGIST JARETT SWARTLEY

DocuSigned by:
Jarett R. Swartley, LG 10/26/2017
919459487BA347A... SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
41665.3H	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	50 MX													
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	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
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-550X
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: •see note

ELEVATION: FEET

NOTES:

•elevations derived from geopak and the .tin file '180019_ls_tnl.tin' dated 8/31/17

DATE: 8-15-14

09/08/06

TIP PROJECT: 41665.3H

CONTRACT:

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

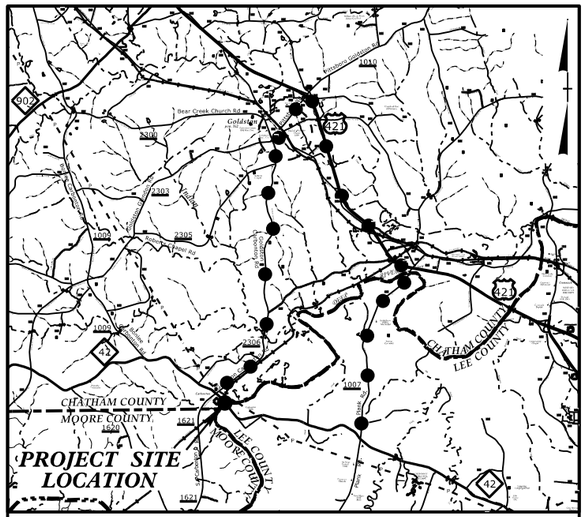
CHATHAM & LEE COUNTIES

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	41665.3H	3	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
41665.3H		P.E.

LOCATION: BRIDGE NO. 180019 ON NC 42 (CARBONTON ROAD) OVER DEEP RIVER

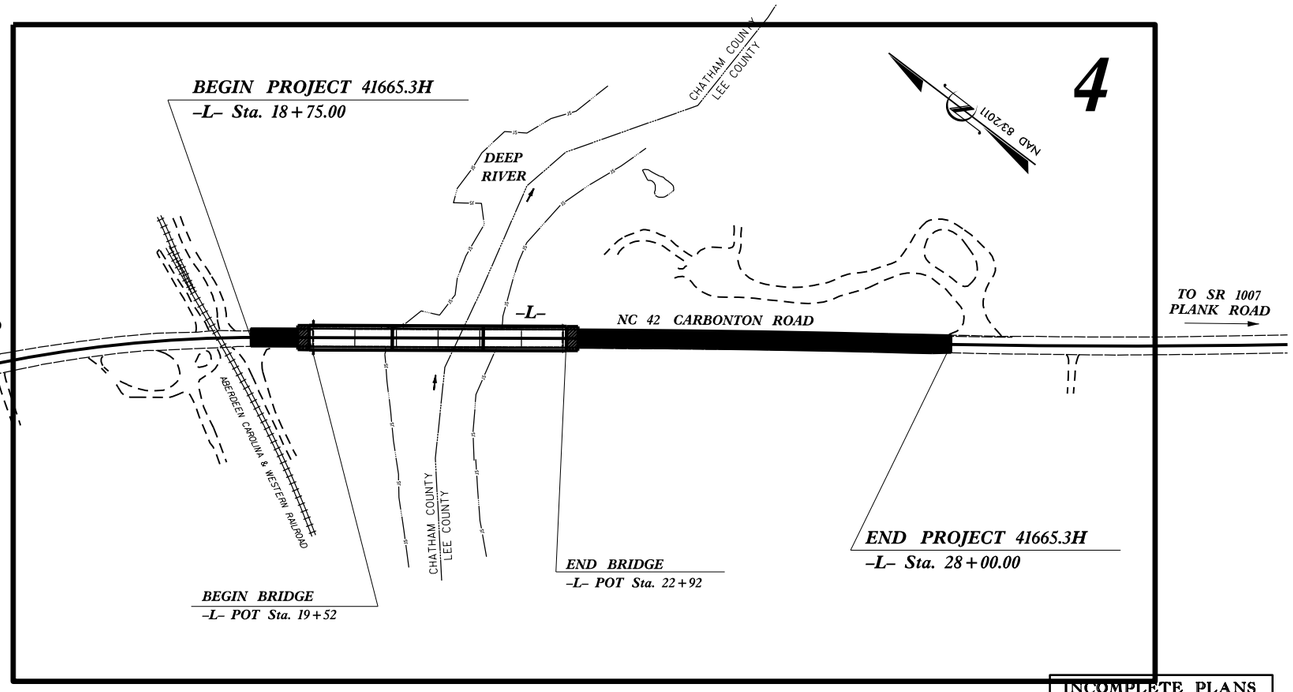
TYPE OF WORK: GRADING, DRIANGE, PAVING & STRUCTURE



VICINITY MAP

OFF-SITE DETOUR ROUTE N.T.S.

25% Plans 06/09/2017



INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

PLANS 50 0 50 100

PROFILE (HORIZONTAL) 50 0 50 100

PROFILE (VERTICAL) 10 0 10 20

DESIGN DATA

ADT 2012 = 1700
ADT 2025 = 3400
K = %
D = %
T = 7 % *
V = 60 MPH
* TTST = DUAL
FUNC CLASS =
MAJOR COLLECTOR
REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY PROJECT 41665.3H = 0.111 mi

LENGTH STRUCTURE PROJECT 41665.3H = 0.064 mi

TOTAL LENGTH OF PROJECT 41665.3H = 0.175 mi

PLANS PREPARED BY:

CH ENGINEERING
3220 GLEN ROYAL RD, RALEIGH, NC 27617
TELE 919.788.0224 FAX 919.788.0232
NC LICENSE #P-0189

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE:
DECEMBER 2017

PLANS PREPARED FOR:

DIVISION OF HIGHWAYS
DIVISION 8
902 N Sandhills Blvd
Aberdeen, NC 28315

BRIAN A. WILES, PE
PROJECT ENGINEER

TIM WELCH, PE
NCDOT CONTACT
DIV 8 BRIDGE PROGRAM MANAGER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION

$$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

October 24, 2017

STATE PROJECT: 41165.3H
FEDERAL PROJECT: N/A
COUNTY: Chatham \ Lee
DESCRIPTION: Replace Bridge No. 19 on NC 42 over Deep River

SUBJECT: Geotechnical Report – Inventory

Project Description

This project consists of widening NC 42 (Carbonton Rd) in Carbonton, NC. The project begins just north of Bridge 19 and extends to the south for approximately 0.18 miles. The type of work being performed consists of grading, paving, and widening to accommodate the new structure over Deep River.

Fieldwork was conducted in August of 2017 by S&ME, Inc. Standard Penetration Tests were performed at selected locations along the project. A CME-550 ATV mounted drill machine with an automatic hammer was used to perform the SPT borings. Seven SPT borings were performed at various offset locations along -L- alignment. Representative samples were collected for visual classification in the field and were submitted for laboratory analysis.

The following alignments were investigated. Subsurface profiles and selected cross sections of the following alignments are included in this report.

Line	Station (±)
-L-	18+75 to 28+00

Areas of Special Geotechnical Interest

1) The following sections were found to contain soft, cohesive soils which have the potential to cause embankment stability and/or long term settlement problems.

Line	Stations(±)
L	24+50 to 25+75

Physiography and Geology

The project corridor is located within the Piedmont Physiographic Province in Carbonton, NC. Topography along the project is flat to gently sloping except at the river. Natural ground elevations range from 209± to 255± feet above sea level. The project corridor is rural.

The area is underlain by roadway embankment, recent alluvial sediments and residual soils of the Triassic Basin. The Triassic soils are part of the Cumnock formation, consisting of siltstones, mudstones and carbonaceous shale. Cross-cutting these older sedimentary layers is a dipping, diabase sill.

Soil & Rock Properties

Soils encountered during this investigation are separated into 3 categories: Roadway Embankment, Alluvial and Residual soils.

Roadway Embankment soils generally consist of medium stiff to stiff, orange, gray and tan, silty clay (A-7-6) and loose to medium dense, clayey sand (A-2-6). PI of the silty clay (A-7-6) range from 29 to 35.

Alluvial soils consist of brown, green, tan, orange and gray, very soft to med. stiff, silty clay (A-7-6), sandy clay (A-6), sandy silt (A-4) and loose to dense, silty sand (A-2-4), clayey sand (A-2-6) and sand (A-3). PI of the alluvial cohesive soils ranges from 11 to 20.

Residual soils consist medium stiff to hard, orange, gray, tan and brown, sandy silt (A-4), sandy clay (A-6) and medium dense to very dense, clayey sand (A-2-6) and sand (A-3). The PI of the residual sandy clay (A-6) tested was 13.

Rocks encountered during the investigation are shale, carbonaceous shale and diabase. The non-crystalline, sedimentary rocks are gray, moderately to moderately severe weathering, soft to hard, with close fracture spacing. The crystalline diabase rock is gray and green, very slightly weathered, hard, with close fracture spacing. Elevations of weathered rock range from 210± to 217± feet. Elevations of non-crystalline rock range from 207± to 210± feet. Elevations of crystalline rock range from 207± to 208± feet.

Ground Water

Ground water measurements were taken in August of 2017 during average rainfall conditions. Ground water elevations range from ±214 to ±223 feet above sea level.

Respectfully Submitted,

DocuSigned by:
Jarett R. Swartley, LG
919459487BA3471...

Jarett Swartley, PG
Senior Geologist

8/17/99

REVISIONS

CH ENGINEERING

3220 GLEN ROYAL RD. RALEIGH, NC 27617
TELE 919.788.0224 FAX 919.788.0232
NC LICENSE #P-0189

PROJECT REFERENCE NO.	SHEET NO.
41665.3H	4

CHATHAM COUNTY BRIDGE 19

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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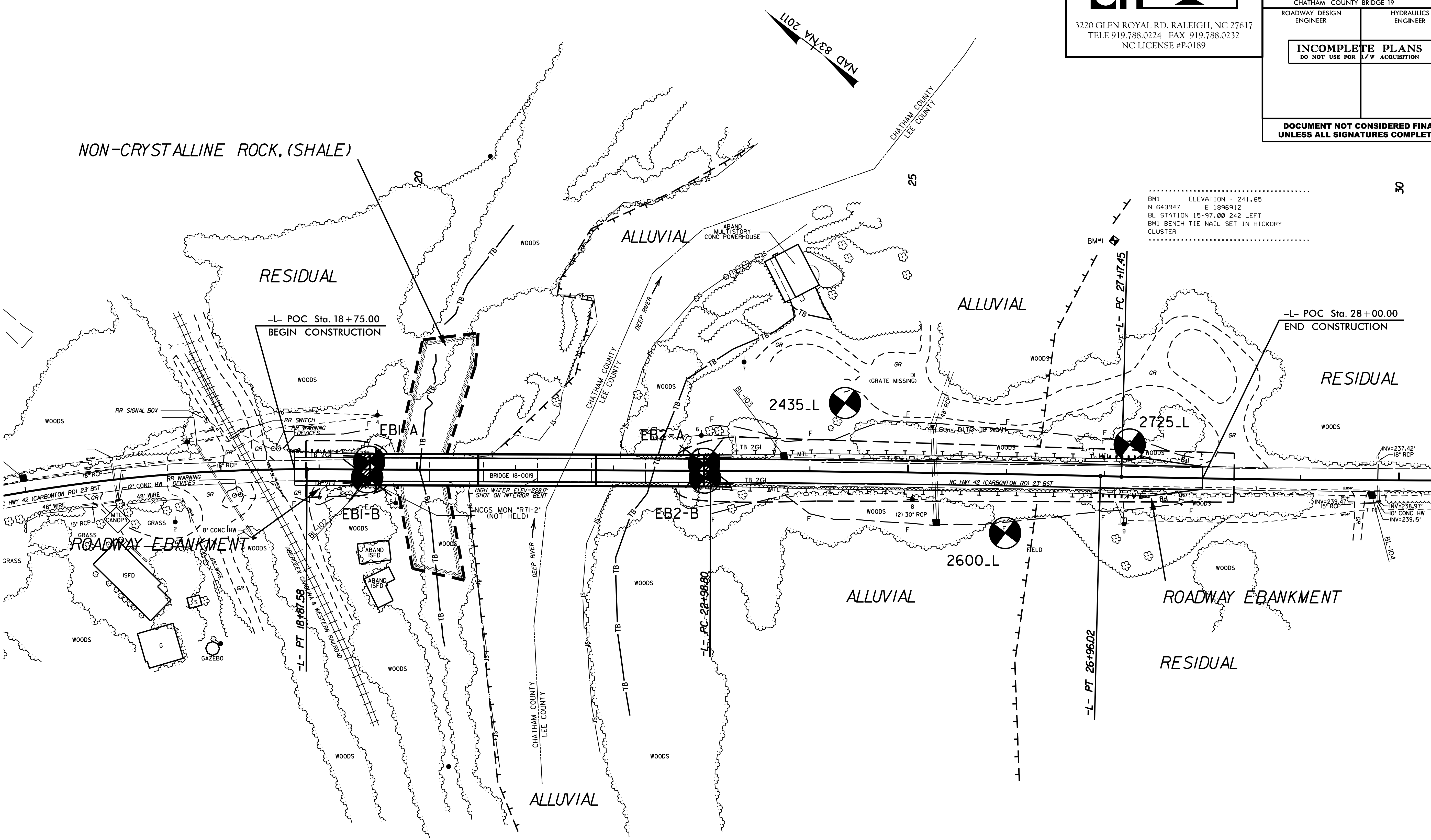
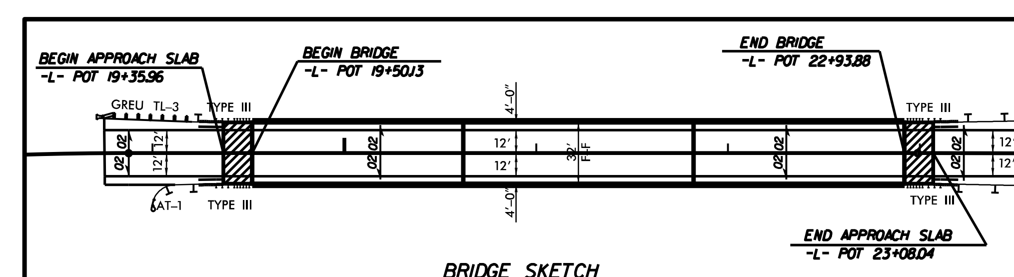
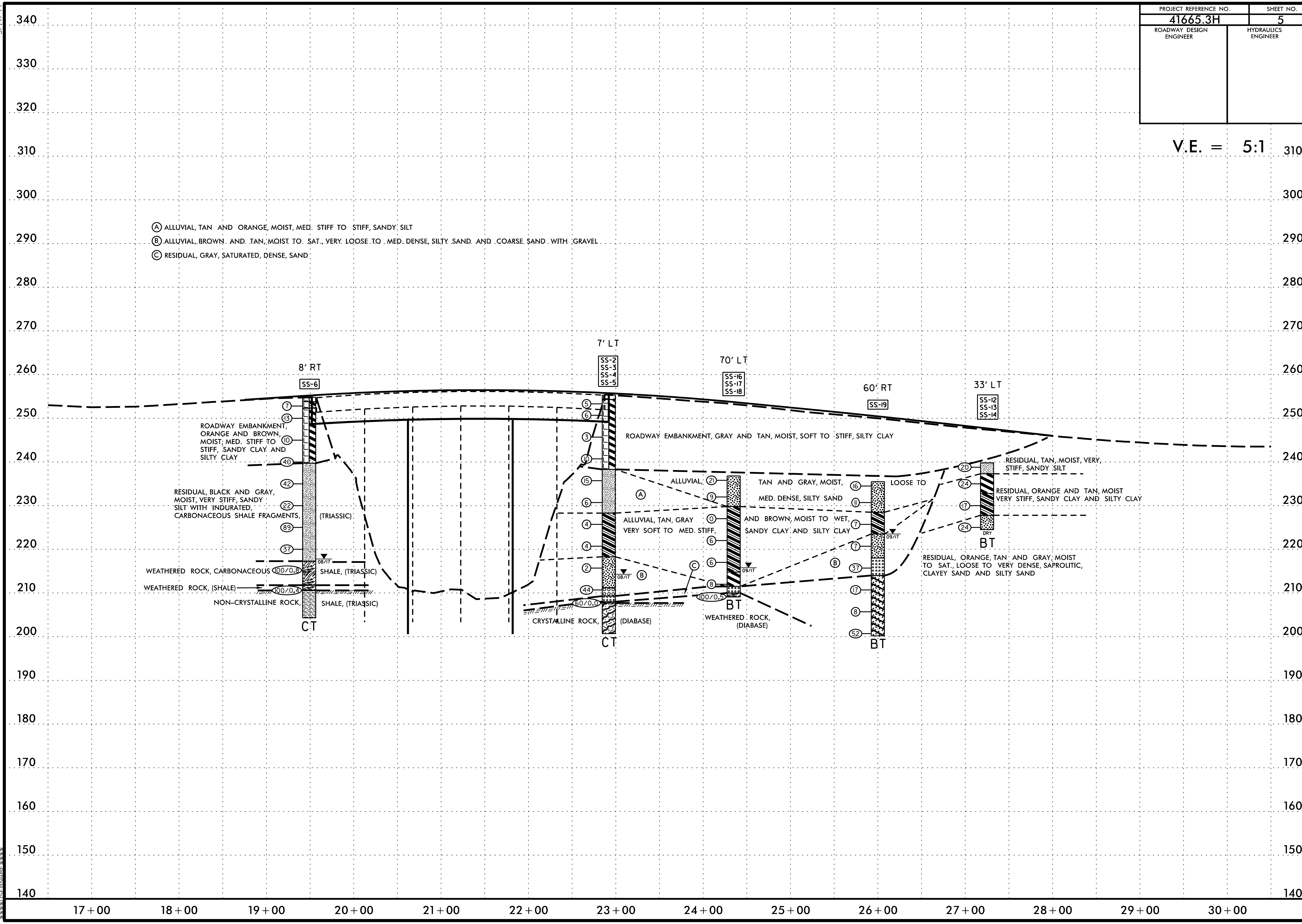




BRIDGE SKETCH

$$$$$SYSTIME$$$$$
$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

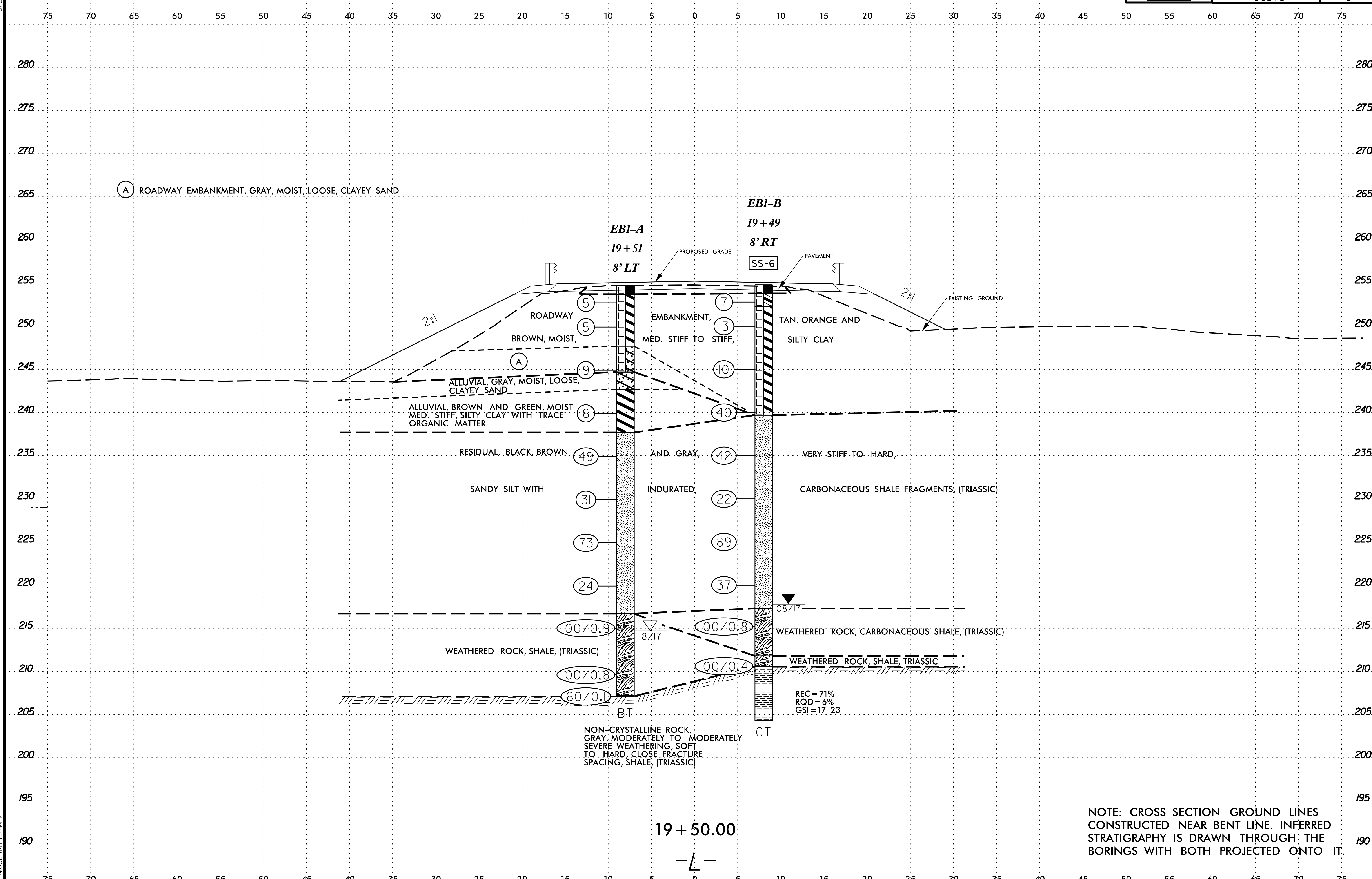
PROJECT REFERENCE NO.	SHEET NO.
41665.3H	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



5/14/99

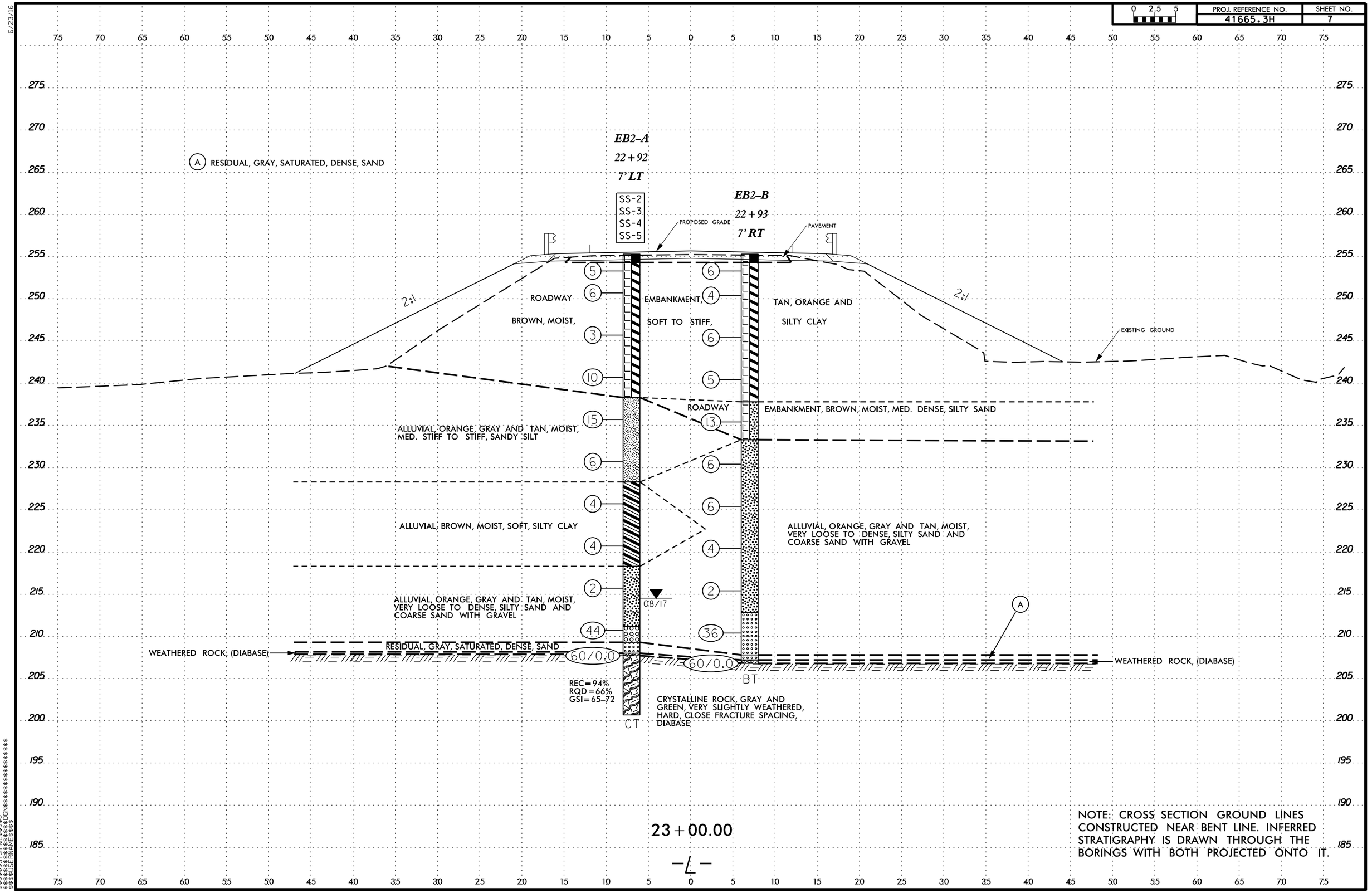
$$$$$SYSTIME$$$$$ $$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$ $$$$USERNAME$$$$

PROJ. REFERENCE NO.	SHEET NO.
41665.3H	6



6/23/16

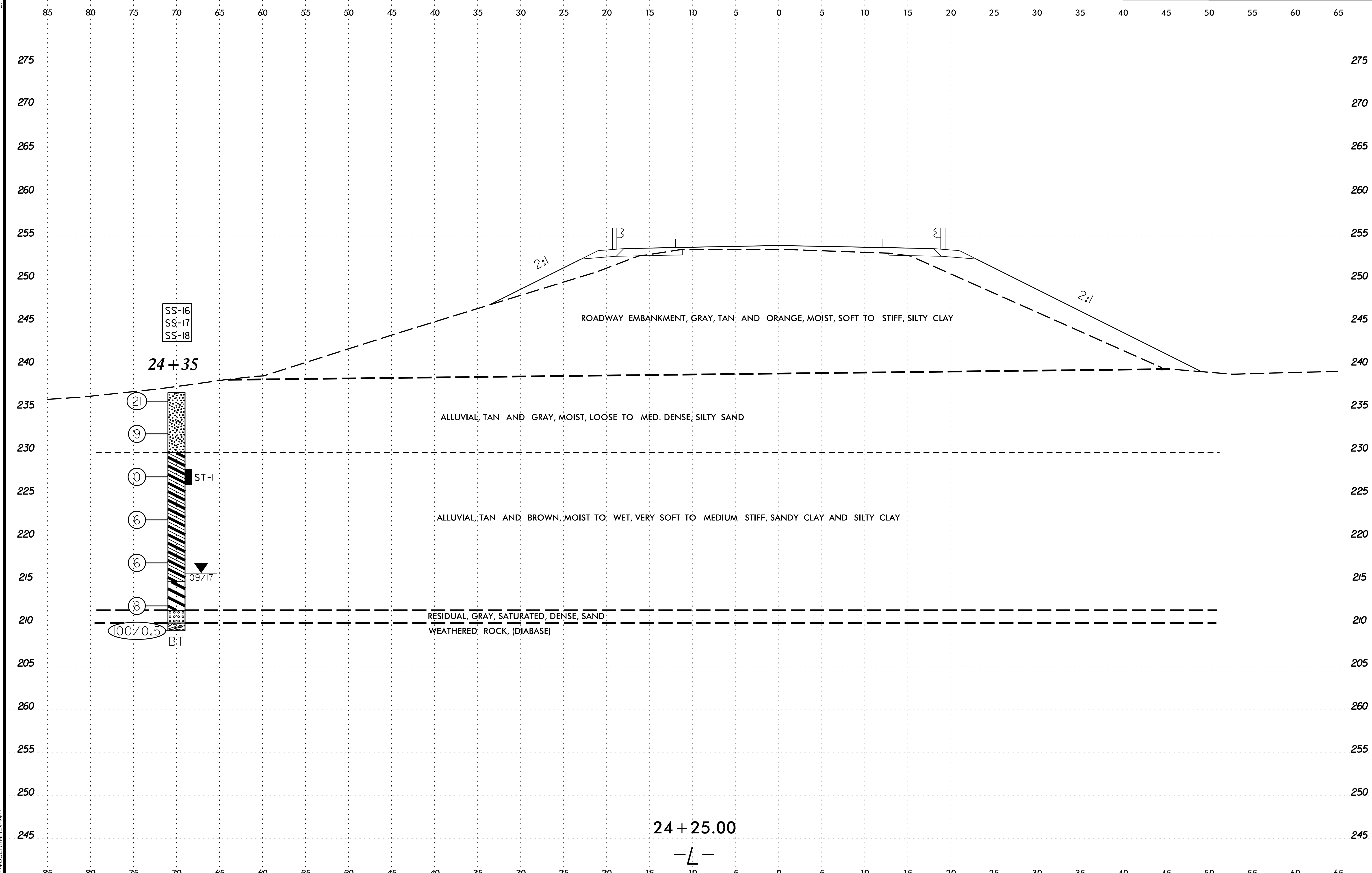
0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	41665.3H	7



$$$$$$$SYSTIME$$$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$$USERNAME$$$$

6/23/16

PROJ. REFERENCE NO.	SHEET NO.
41665.3H	8



$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	41665.3H	9

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

255 250 245 240 235 230 225 220

SS-12
SS-13
SS-14

2:1

2:1

ROADWAY EMBANKMENT, GRAY, TAN AND ORANGE, MOIST, SOFT TO STIFF, SILTY CLAY

20

RESIDUAL, TAN, MOIST, VERY STIFF, SANDY SILT

24

RESIDUAL, TAN AND ORANGE, MOIST, VERY STIFF, SILTY CLAY AND SANDY CLAY

17

RESIDUAL, ORANGE AND TAN, MOIST, MED. DENSE, SAPROLITIC, SILTY SAND

24

DRY

BT

27+25.00

250 245 240 235 230 225 220 215 210 205 200

2:1

2:1

ROADWAY EMBANKMENT, GRAY, TAN AND ORANGE, MOIST, SOFT TO STIFF, SILTY CLAY

ALLUVIAL, TAN, MOIST, MEDIUM DENSE, SILTY SAND

ALLUVIAL, TAN, MOIST, MEDIUM STIFF, SANDY CLAY

ALLUVIAL, TAN, SATURATED, LOOSE TO DENSE, SILTY SAND AND SAND

RESIDUAL, ORANGE, TAN AND GRAY, SATURATED, LOOSE TO VERY DENSE, SAPROLITIC, CLAYEY SAND

SS-19

16

11

7

09/17

7

37

17

8

52

BT

26+00.00

$$$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

APPENDIX A

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-17-032			Date Report:	9/30/2017
State Project No.:	41665.3H	County:	Chatham \ Lee	Date Tested:	9/18 - 9/28/17
Federal ID No.:	NHPP - 0095 (033) 74	TIP No.:	N\A		
Project Name:	Br. No. 19 on NC 42 over Deep River				
Client Name:	NCDOT Geotechnical Engineering Unit	Client Address:	3301 Jones Sausage Road, Garner, North Carolina		

Sample No.	Station #:	Offset	Alignment	Sample Depth (ft)	AASHTO Classification		Total % Passing Sieve # 10	40	60	200	270	Total Mortar Fraction (%) Coarse Sand	Fine Sand	Silt	Clay	LL	PL	PI	Organic Content %	Moist. %
SS-2	22+92	7 LT	L	8.6 - 10.1	A-7-6	(29)	100	100	99	90.7	85.3	1	14	41	44	51	22	29	ND	27.1
SS-3	22+92	7 LT	L	18.6 - 20.1	A-4	(0)	100	97	84	41.8	35.4	16	49	20	15	20	18	2	ND	15.2
SS-4	22+92	7 LT	L	28.6 - 30.1	A-6	(6)	100	99	90	65.3	59.2	10	31	33	26	30	17	13	ND	20.4
SS-5	22+92	7 LT	L	33.6 - 35.1	A-6	(6)	100	99	95	69.7	60.2	5	35	33	27	30	18	12	ND	21.5
SS-6	19+49	8 RT	L	8.8 - 10.3	A-7-6	(22)	96	82	77	66.5	63.1	20	14	18	48	58	23	35	ND	29.2
SS-8	20+51	7 LT	L	6.2 - 7.7	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1	27.3
SS-11	20+51	7 LT	L	24.3 - 25.8	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	13.0
SS-12	27+25	33 LT	L	0.0 - 1.5	A-4	(7)	100	98	94	79.3	71.2	6	23	45	26	30	20	10	ND	7.5
SS-13	27+25	33 LT	L	3.8 - 5.3	A-7-6	(16)	100	99	94	77.0	71.7	6	22	33	39	42	20	22	ND	17.1
SS-14	27+25	33 LT	L	8.8 - 10.3	A-6	(5)	100	99	88	60.5	53.6	12	34	27	27	30	17	13	ND	17.1
SS-16	24+35	70 LT	L	8.8 - 10.3	A-6	(8)	100	99	99	86.2	81.2	1	18	46	35	29	18	11	ND	25.3
SS-17	24+35	70 LT	L	13.8 - 15.3	A-6	(9)	100	94	91	80.1	75.2	9	16	40	35	31	18	13	ND	22.9
SS-18	24+35	70 LT	L	18.8 - 20.3	A-6	(5)	100	99	96	61.4	53.6	4	42	28	26	29	17	12	ND	23.6
SS-19	26+00	60 RT	L	8.8 - 10.3	A-6	(15)	100	99	91	80.3	74.8	9	16	36	39	38	18	20	ND	24.3
ST-1	24+35	73 LT	L	8.9 - 10.7	A-4	(5)	100	100	98	75.3	69.8	2	28	44	26	28	19	9	ND	33.9

References / Comments / Deviations: ND=Not Detemined.

AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T89: Determining the Liquid Limit of Soils

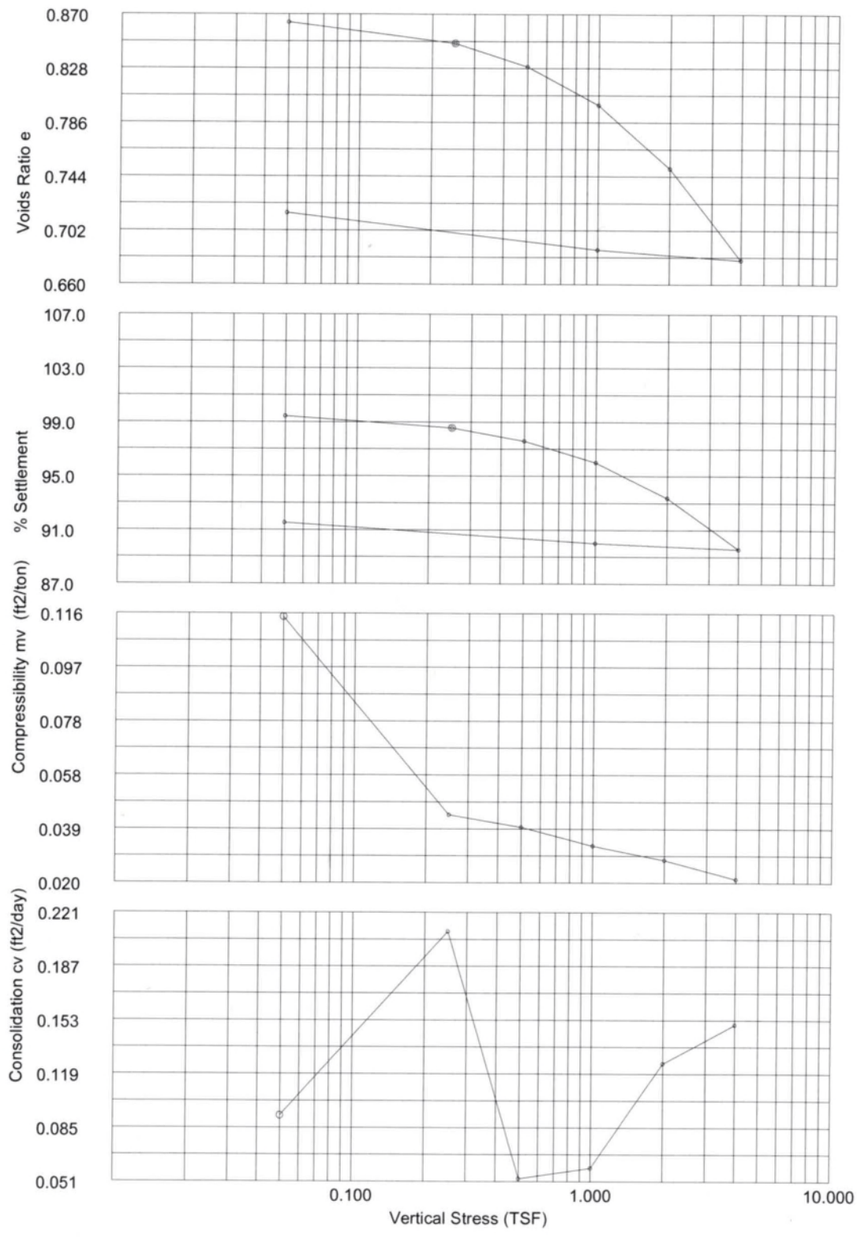
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO M145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Mal Krajan, ET		104-01-0703	J.R. Swartley	Project Manager
Technician Name:	Signature	Certification #	Technical Responsibility:	Position

Oedometer Settlement Tests



ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	Checked: MK	Approved:	

Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample

Depth	8.9 - 10.7 ft.
Description:	Dark Gray Coarse to Fine Sandy Clayey SILT (A-4) (5)
Type	Undisturbed
Height H_0 (in)	0.999
Diameter D_0 (in)	2.501
Weight W_0 (gr)	149.25
Bulk Density ρ (PCF)	115.85
Particle Density ρ_s	2.658 (measured)

Initial Conditions

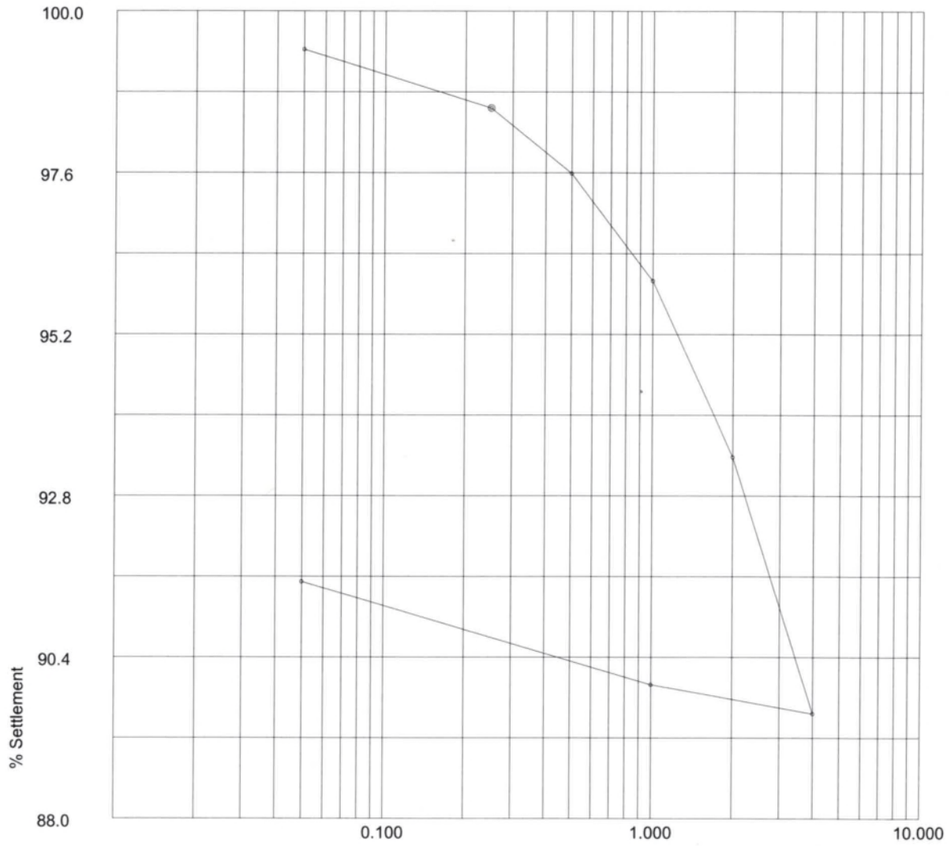
Settlement Channel	1001
Moisture Content w_0%	30.9
Dry Density ρ_d (PCF)	88.49
Voids Ratio e_0	0.8744
Deg of Saturation S_0%	94.0
Swelling Pressure Ss (TSF)	0.000

Final Conditions

Moisture Content w_f%	30.2
Dry Density ρ_d (PCF)	96.68
Voids Ratio e_f	0.7155
Deg of Saturation S_f%	100.00
Settlement: (in)	0.085
Compression Index C_c	0.269
Notes:	Test specimen taken from the middle portion of UD tube.

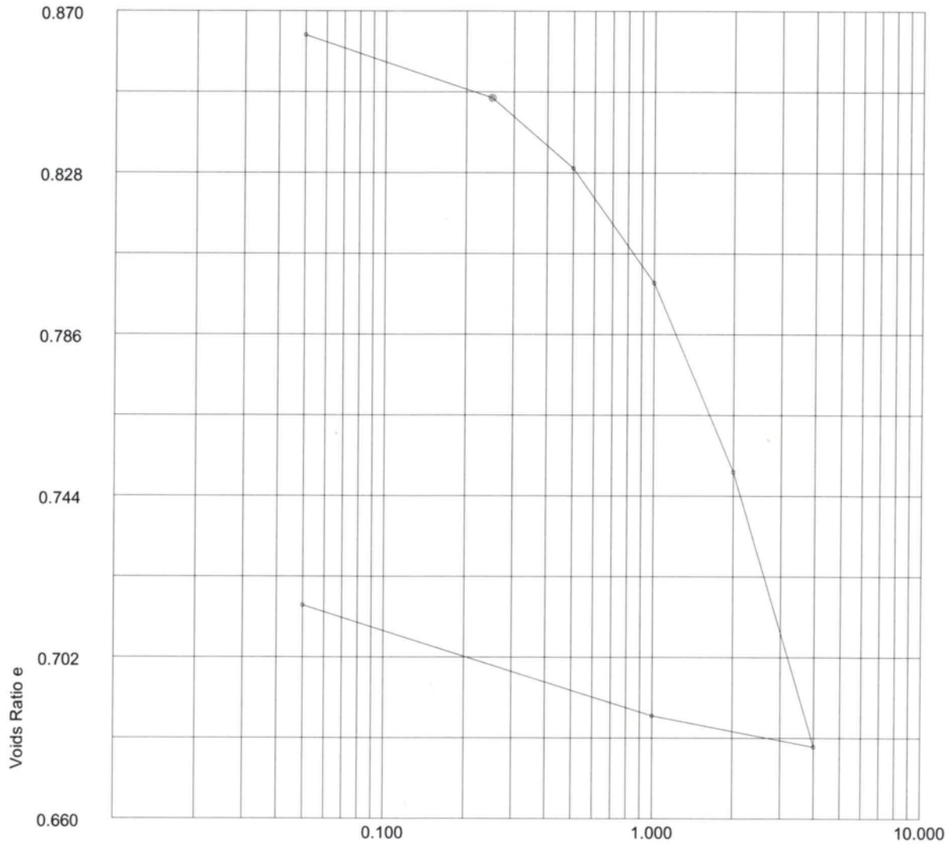
ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	Checked: MK	Approved:	

Oedometer Settlement Tests



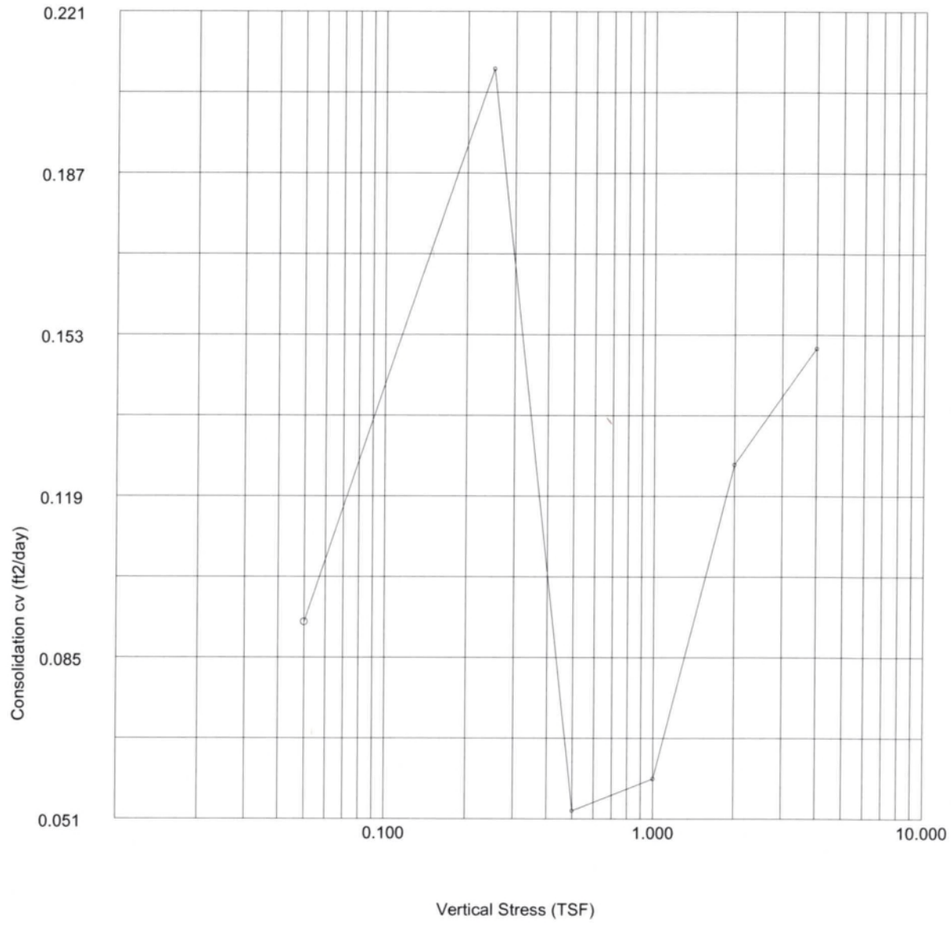
ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLK	*Checked:* MLK	*Approved:*	

Oedometer Settlement Tests



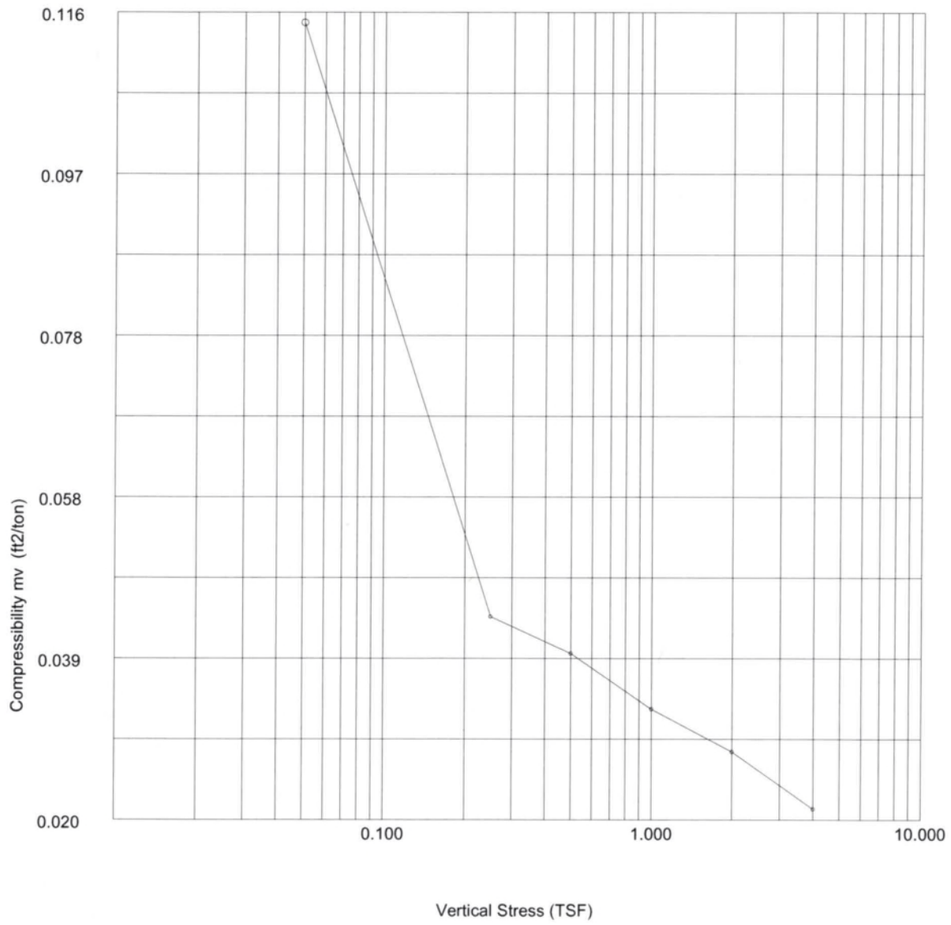
ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLK	*Checked:* MLK	*Approved:*	

Oedometer Settlement Tests



ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests



ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	0	0.0000	0.0000
2	0.017	1	0.0001	0.0001
3	0.033	6	0.0006	0.0006
4	0.050	6	0.0006	0.0006
5	0.067	6	0.0006	0.0006
6	0.083	7	0.0007	0.0007
7	0.100	7	0.0007	0.0007
8	0.200	8	0.0008	0.0008
9	0.400	10	0.0010	0.0010
10	0.800	13	0.0013	0.0013
11	1.000	14	0.0014	0.0014
12	2.000	18	0.0018	0.0018
13	4.000	23	0.0023	0.0023
14	8.000	31	0.0031	0.0031
15	10.000	33	0.0033	0.0033
16	20.000	39	0.0039	0.0039
17	40.000	44	0.0044	0.0044
18	80.000	48	0.0048	0.0048
19	100.000	49	0.0049	0.0049
20	200.000	52	0.0052	0.0052
21	400.000	54	0.0054	0.0054
22	800.000	56	0.0056	0.0056
23	1088.983	57	0.0057	0.0057

ASTM D2435-96		Test name	Consolidation Load: 0.050 (TSF)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests

Stress (TSF)	Initial Temp. oC	Settlement Total (in)	Cal Corr. (in)	Final Temp. oC	Voids Ratio e_f	t_{50} (mins)	Secondary Compr C_{sec}	c_v (ft2/day)	m_v (ft2/ton)
0.050	20.0	0.0057	0.0	20.0	0.8637	5.363	0.0007	0.093	0.115
0.250	20.0	0.0144	0.0	20.0	0.8474	2.340	0.0012	0.209	0.044
0.500	20.0	0.0241	0.0	20.0	0.8292	9.105	0.0025	0.053	0.040
1.000	20.0	0.0400	0.0	20.0	0.7994	7.867	0.0018	0.059	0.033
2.000	20.0	0.0662	0.0	20.0	0.7502	3.561	0.0043	0.126	0.028
4.000	20.0	0.1043	0.0	20.0	0.6787	2.781	0.0047	0.150	0.021
1.000	20.0	0.1000	0.0	20.0	0.6868				0.002
0.050	20.0	0.0847	0.0	20.0	0.7155				0.018

ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests

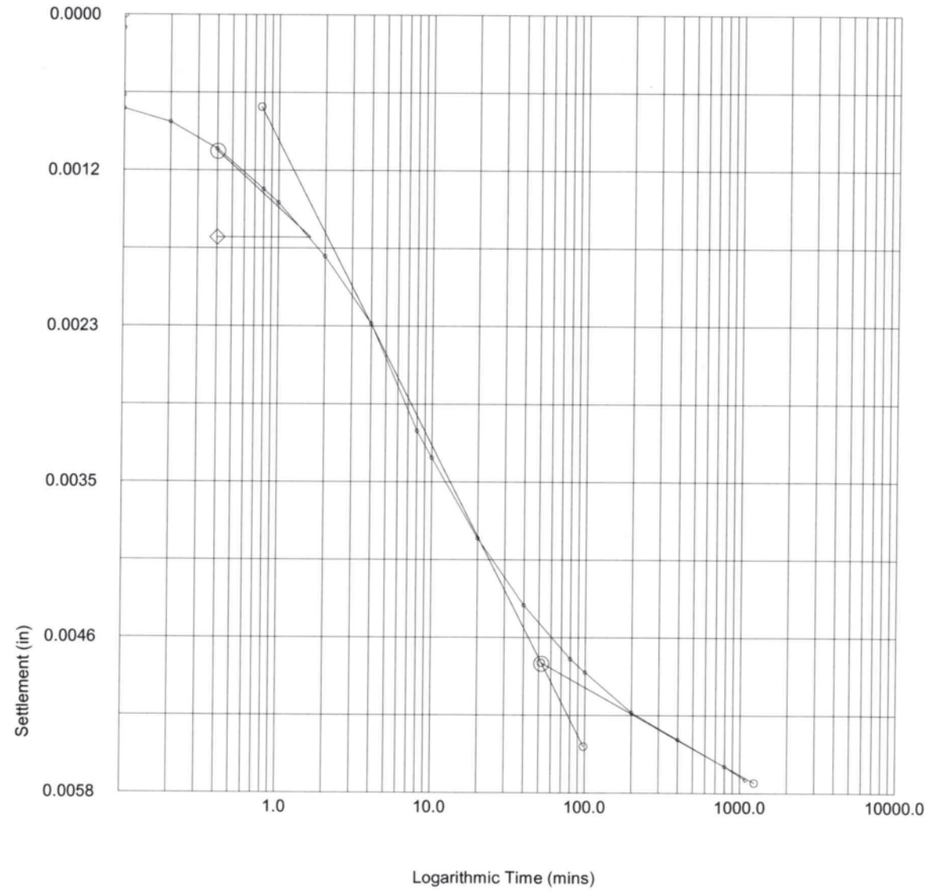
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	57	0.0057	0.0057
2	0.017	70	0.0070	0.0070
3	0.033	70	0.0070	0.0070
4	0.050	76	0.0076	0.0076
5	0.067	78	0.0078	0.0078
6	0.083	78	0.0078	0.0078
7	0.100	79	0.0079	0.0079
8	0.200	83	0.0083	0.0083
9	0.400	87	0.0087	0.0087
10	0.800	93	0.0093	0.0093
11	1.000	95	0.0095	0.0095
12	2.000	102	0.0102	0.0102
13	4.000	111	0.0111	0.0111
14	8.000	120	0.0120	0.0120
15	10.000	123	0.0123	0.0123
16	20.000	130	0.0130	0.0130
17	40.000	136	0.0136	0.0136
18	80.000	140	0.0140	0.0140
19	100.000	141	0.0141	0.0141
20	173.483	144	0.0144	0.0144

ASTM D2435-96		Test name	Consolidation Load: 0.250 (TSF)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0057
Voids Ratio e	0.8637
Final Temp oC	0.0
t_{50} (mins)	5.36
c_v (ft2/day)	0.093
m_v (ft2/ton)	0.115
Sec Compression C_{sec}	0.0007



ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

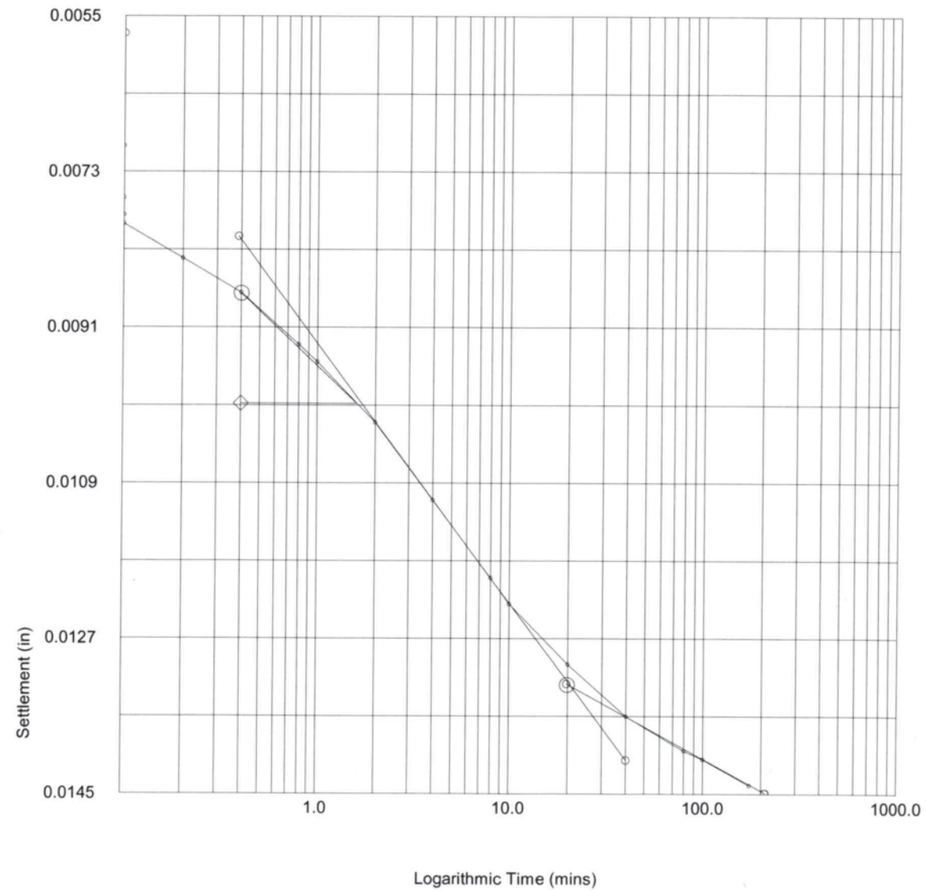
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	144	0.0144	0.0144
2	0.017	151	0.0151	0.0151
3	0.033	160	0.0160	0.0160
4	0.050	161	0.0161	0.0161
5	0.067	162	0.0162	0.0162
6	0.083	164	0.0164	0.0164
7	0.100	165	0.0165	0.0165
8	0.200	167	0.0167	0.0167
9	0.400	170	0.0170	0.0170
10	0.800	175	0.0175	0.0175
11	1.000	176	0.0176	0.0176
12	2.000	182	0.0182	0.0182
13	4.000	190	0.0190	0.0190
14	8.000	198	0.0198	0.0198
15	10.000	199	0.0199	0.0199
16	20.000	207	0.0207	0.0207
17	40.000	214	0.0214	0.0214
18	80.000	221	0.0221	0.0221
19	100.000	223	0.0223	0.0223
20	200.000	229	0.0229	0.0229
21	400.000	235	0.0235	0.0235
22	800.000	239	0.0239	0.0239
23	1200.000	240	0.0240	0.0240
24	1570.750	241	0.0241	0.0241

ASTM D2435-96		Test name	Consolidation Load: 0.500 (TSF)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.250
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0087
Voids Ratio e	0.8474
Final Temp oC	0.0
t_{50} (mins)	2.34
c_v (ft2/day)	0.209
m_v (ft2/ton)	0.044
Sec Compression C_{sec}	0.0012



ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

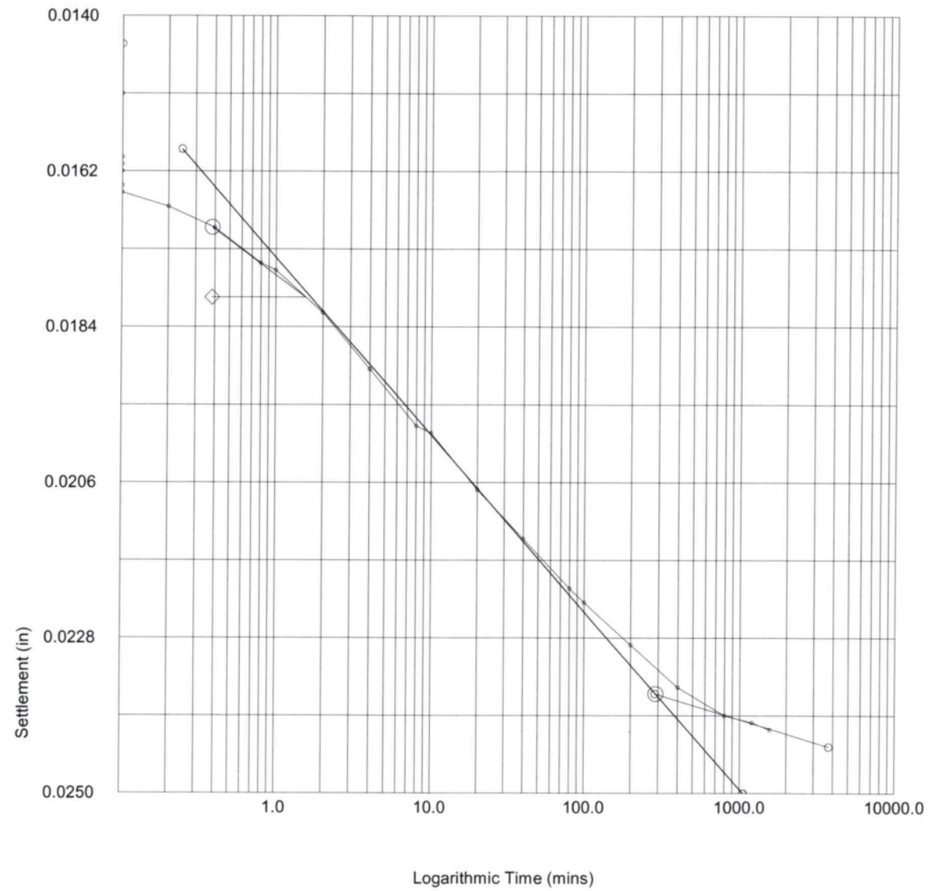
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	241	0.0241	0.0241
2	0.017	262	0.0262	0.0262
3	0.033	262	0.0262	0.0262
4	0.050	269	0.0269	0.0269
5	0.067	270	0.0270	0.0270
6	0.083	272	0.0272	0.0272
7	0.100	273	0.0273	0.0273
8	0.200	278	0.0278	0.0278
9	0.400	285	0.0285	0.0285
10	0.800	292	0.0292	0.0292
11	1.000	294	0.0294	0.0294
12	2.000	303	0.0303	0.0303
13	4.000	316	0.0316	0.0316
14	8.000	328	0.0328	0.0328
15	10.000	333	0.0333	0.0333
16	20.000	344	0.0344	0.0344
17	40.000	356	0.0356	0.0356
18	80.000	369	0.0369	0.0369
19	100.000	373	0.0373	0.0373
20	200.000	383	0.0383	0.0383
21	400.000	392	0.0392	0.0392
22	800.000	397	0.0397	0.0397
23	1074.367	400	0.0400	0.0400

ASTM D2435-96		Test name	Consolidation Load: 1.000 (TSF)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0097
Voids Ratio e	0.8292
Final Temp oC	0.0
t_{50} (mins)	9.10
c_v (ft2/day)	0.053
m_v (ft2/ton)	0.04
Sec Compression C_{sec}	0.0025



ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

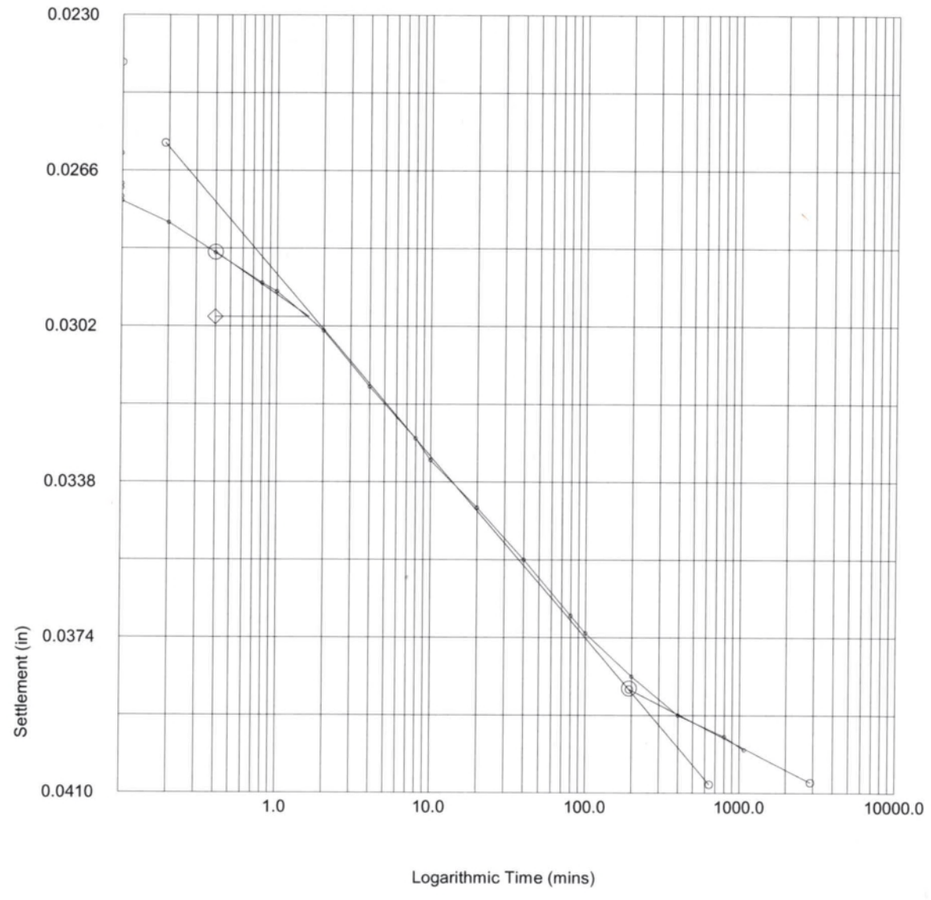
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	400	0.0400	0.0400
2	0.017	406	0.0406	0.0406
3	0.033	414	0.0414	0.0414
4	0.050	429	0.0429	0.0429
5	0.067	443	0.0443	0.0443
6	0.083	446	0.0446	0.0446
7	0.100	449	0.0449	0.0449
8	0.200	461	0.0461	0.0461
9	0.400	471	0.0471	0.0471
10	0.800	484	0.0484	0.0484
11	1.000	488	0.0488	0.0488
12	2.000	508	0.0508	0.0508
13	4.000	531	0.0531	0.0531
14	8.000	558	0.0558	0.0558
15	10.000	567	0.0567	0.0567
16	20.000	590	0.0590	0.0590
17	40.000	609	0.0609	0.0609
18	80.000	625	0.0625	0.0625
19	100.000	631	0.0631	0.0631
20	200.000	645	0.0645	0.0645
21	400.000	657	0.0657	0.0657
22	488.317	662	0.0662	0.0662

ASTM D2435-96		Test name	Consolidation Load: 2.000 (TSF)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	1.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0159
Voids Ratio e	0.7994
Final Temp oC	0.0
t_{50} (mins)	7.87
c_v (ft2/day)	0.059
m_v (ft2/ton)	0.033
Sec Compression C_{sec}	0.0018



ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

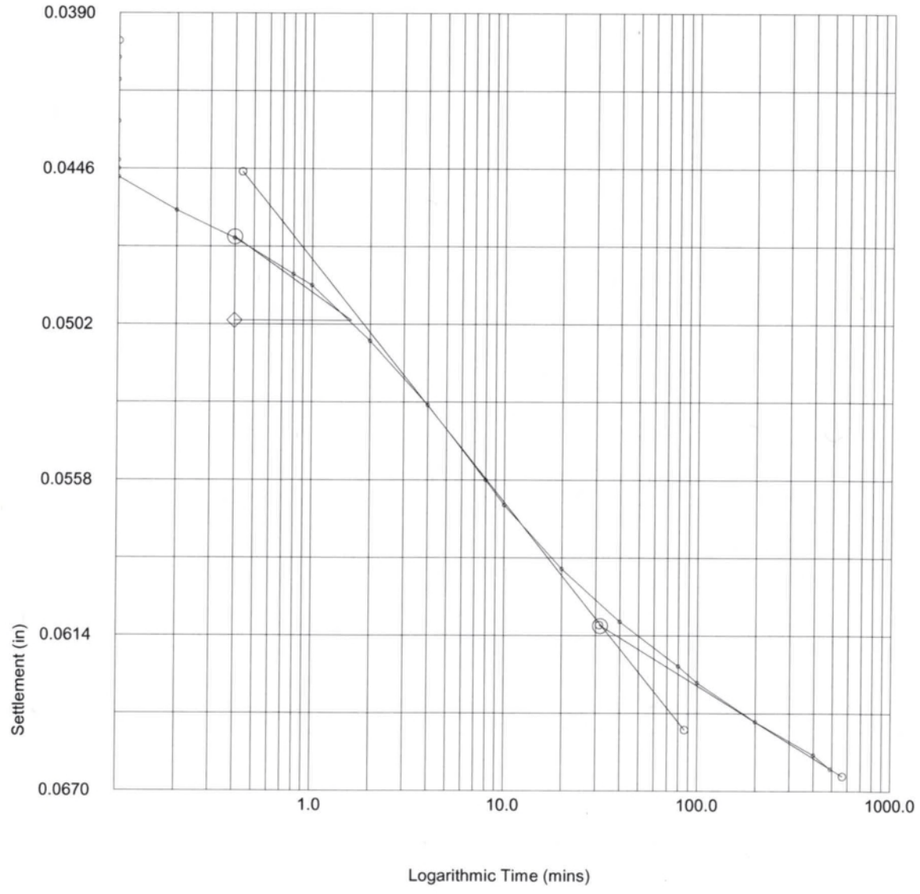
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	662	0.0662	0.0662
2	0.017	665	0.0665	0.0665
3	0.033	710	0.0710	0.0710
4	0.050	720	0.0720	0.0720
5	0.067	727	0.0727	0.0727
6	0.083	734	0.0734	0.0734
7	0.100	736	0.0736	0.0736
8	0.200	751	0.0751	0.0751
9	0.400	767	0.0767	0.0767
10	0.800	787	0.0787	0.0787
11	1.000	795	0.0795	0.0795
12	2.000	827	0.0827	0.0827
13	4.000	864	0.0864	0.0864
14	8.000	905	0.0905	0.0905
15	10.000	918	0.0918	0.0918
16	20.000	949	0.0949	0.0949
17	40.000	972	0.0972	0.0972
18	80.000	990	0.0990	0.0990
19	100.000	994	0.0994	0.0994
20	200.000	1011	0.1011	0.1011
21	400.000	1025	0.1025	0.1025
22	800.000	1039	0.1039	0.1039
23	956.517	1043	0.1043	0.1043

ASTM D2435-96		Test name	Consolidation Load: 4.000 (TSF)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: mlc	*Checked:* mlc		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0262
Voids Ratio e	0.7502
Final Temp oC	0.0
t_{50} (mins)	3.56
c_v (ft2/day)	0.126
m_v (ft2/ton)	0.028
Sec Compression C_{sec}	0.0043



ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: mlc	*Checked:* mlc		*Approved:*

Oedometer Settlement Tests

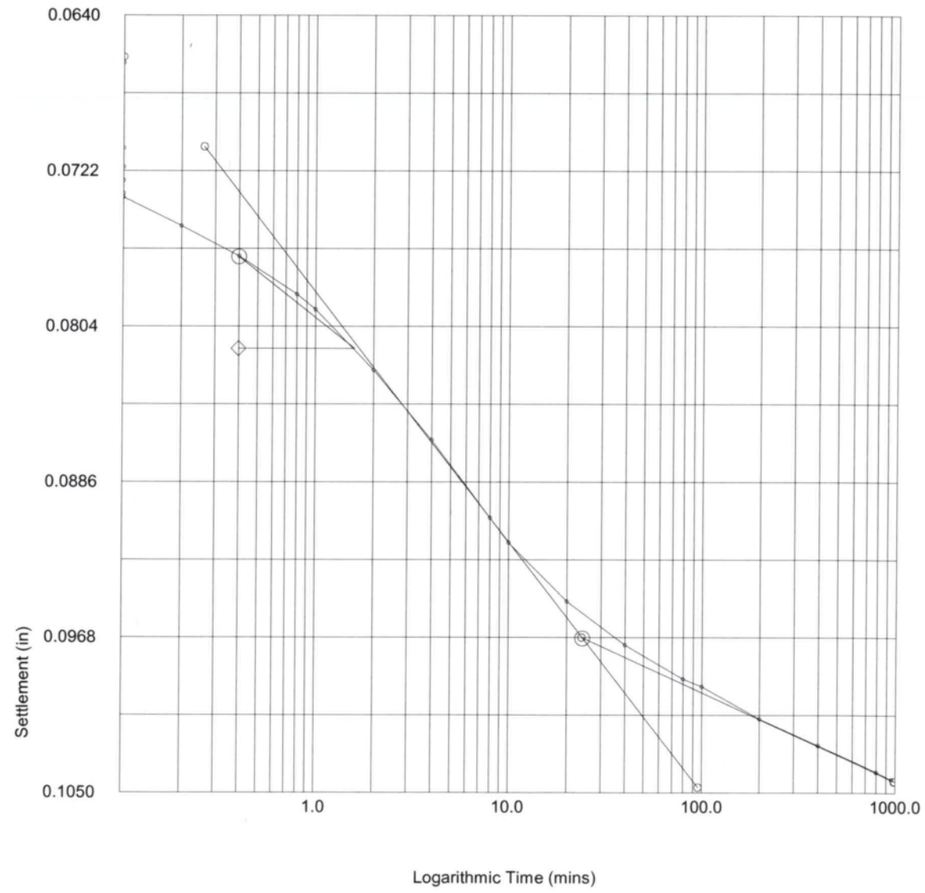
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	1043	0.1043	0.1043
2	0.017	1029	0.1029	0.1029
3	0.033	1022	0.1022	0.1022
4	0.050	1021	0.1021	0.1021
5	0.067	1020	0.1020	0.1020
6	0.083	1018	0.1018	0.1018
7	0.100	1018	0.1018	0.1018
8	0.200	1016	0.1016	0.1016
9	0.400	1014	0.1014	0.1014
10	0.800	1013	0.1013	0.1013
11	1.000	1012	0.1012	0.1012
12	2.000	1009	0.1009	0.1009
13	4.000	1007	0.1007	0.1007
14	8.000	1007	0.1007	0.1007
15	10.000	1006	0.1006	0.1006
16	20.000	1004	0.1004	0.1004
17	40.000	1002	0.1002	0.1002
18	80.000	1001	0.1001	0.1001
19	100.000	1001	0.1001	0.1001
20	191.450	1000	0.1000	0.1000

ASTM D2435-96		Test name	Consolidation Load: 1.000 (TSF)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	4.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0381
Voids Ratio e	0.6787
Final Temp oC	0.0
t_{50} (mins)	2.78
c_v (ft2/day)	0.15
m_v (ft2/ton)	0.021
Sec Compression C_{sec}	0.0047



ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

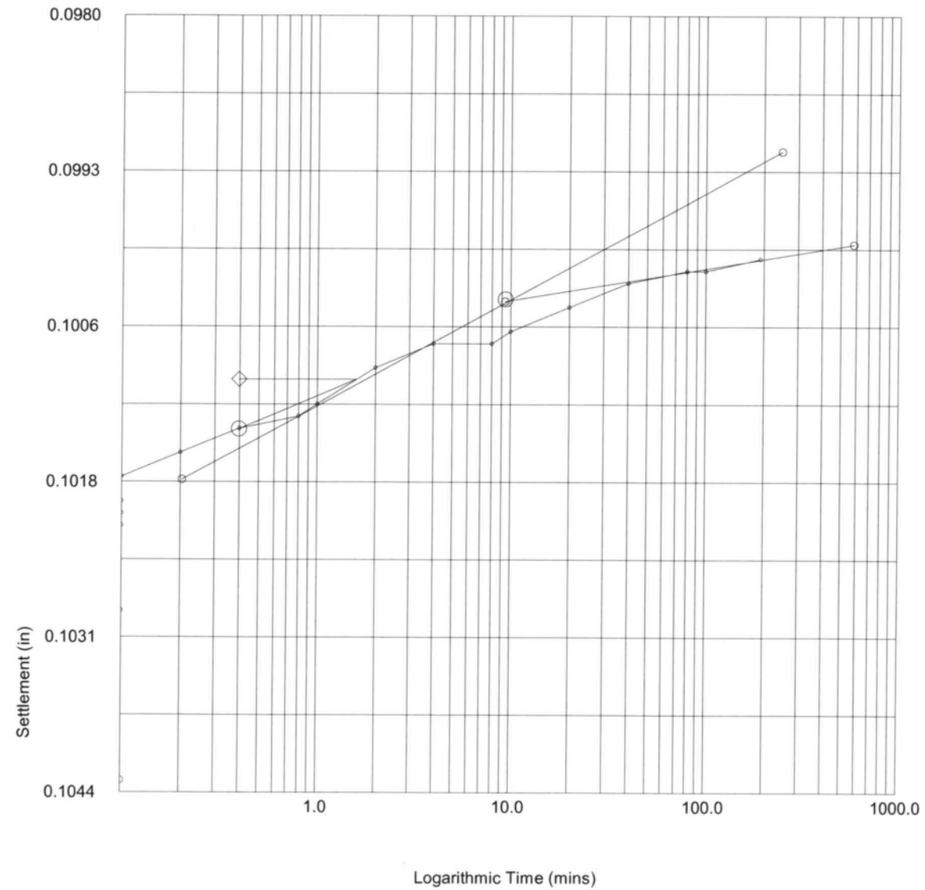
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	1000	0.1000	0.1000
2	0.017	993	0.0993	0.0993
3	0.033	983	0.0983	0.0983
4	0.050	981	0.0981	0.0981
5	0.067	979	0.0979	0.0979
6	0.083	977	0.0977	0.0977
7	0.100	976	0.0976	0.0976
8	0.200	973	0.0973	0.0973
9	0.400	968	0.0968	0.0968
10	0.800	962	0.0962	0.0962
11	1.000	959	0.0959	0.0959
12	2.000	950	0.0950	0.0950
13	4.000	936	0.0936	0.0936
14	8.000	921	0.0921	0.0921
15	10.000	916	0.0916	0.0916
16	20.000	897	0.0897	0.0897
17	40.000	884	0.0884	0.0884
18	80.000	871	0.0871	0.0871
19	100.000	869	0.0869	0.0869
20	200.000	863	0.0863	0.0863
21	400.000	856	0.0856	0.0856
22	800.000	849	0.0849	0.0849
23	1200.000	847	0.0847	0.0847
24	1244.533	847	0.0847	0.0847

ASTM D2435-96		Test name	Consolidation Load: 0.050 (TSF)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLC	*Checked:* MLC		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	1.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0043
Voids Ratio e	0.6868
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	

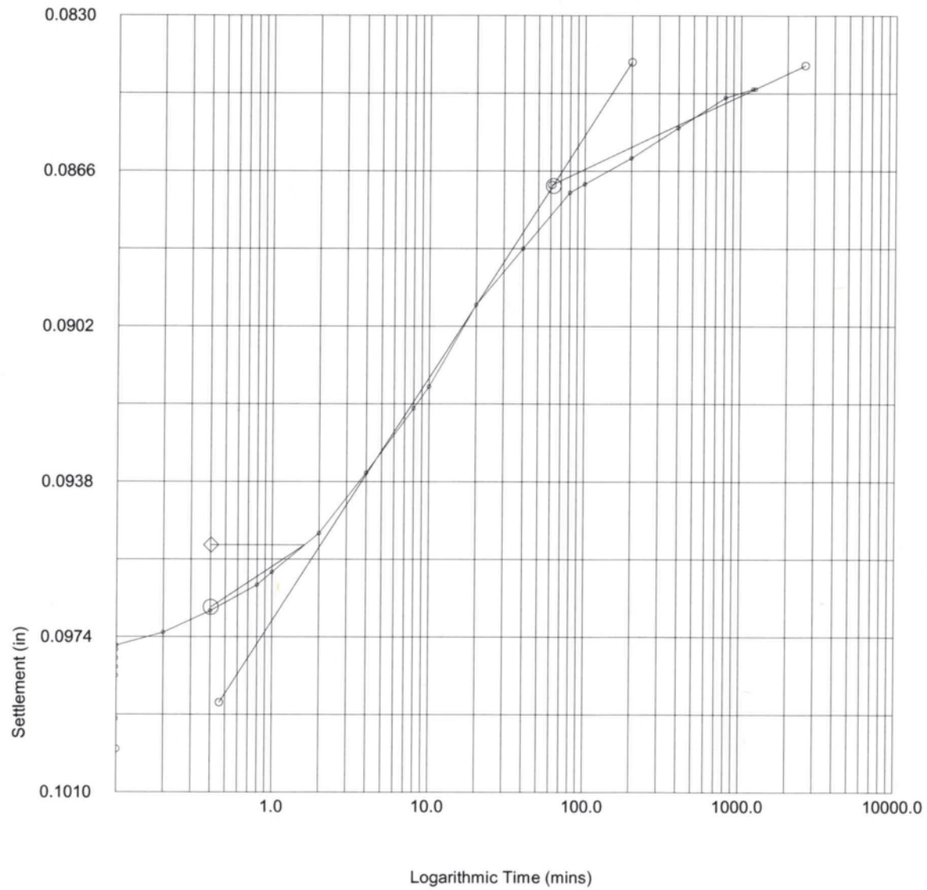


ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLC	*Checked:* MLC		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

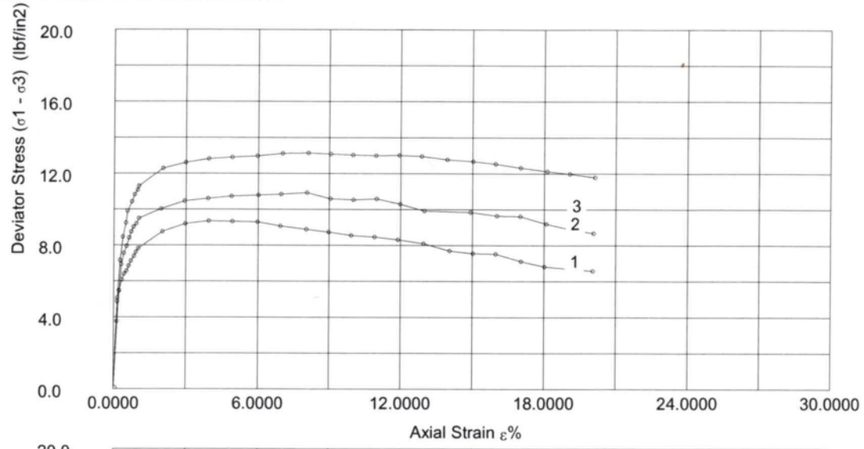
Vertical Stress (TSF)	0.050
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0153
Voids Ratio e	0.7155
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	

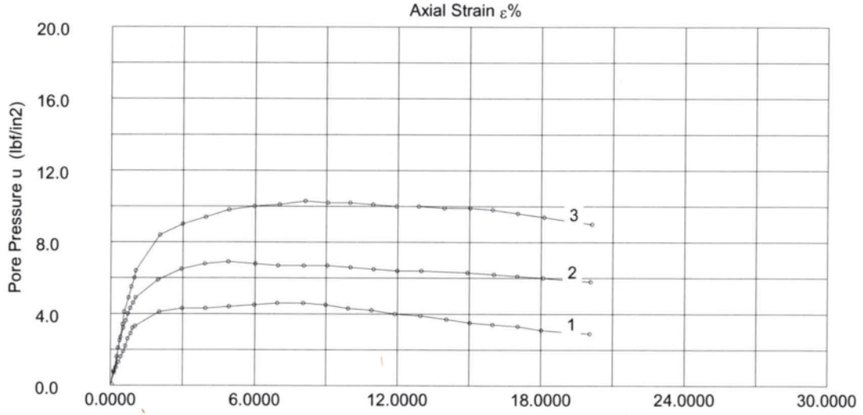


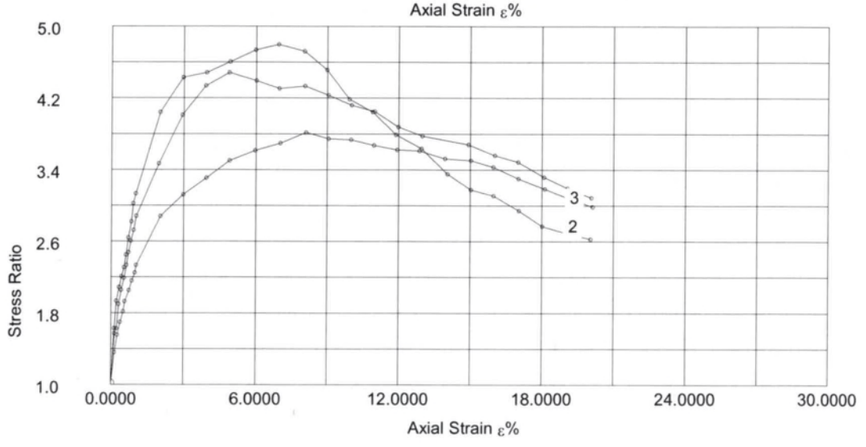
ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MK	*Checked:* MK	*Approved:*	

Effective Stress Triaxial Compression

Consolidated Undrained







Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLL	Checked: MLC	Approved:	

Effective Stress Triaxial Compression

Consolidated Undrained

Sample details

Sketch showing specimen location in original Sample

Depth 8.9 - 10.7 ft.
Description: Dark Gray Coarse to Fine Sandy Clayey SILT (A-4) (5)

	Specimen 1	Specimen 2	Specimen 3
Type	Undisturbed	Undisturbed	Undisturbed
Height H_0 (in)	5.832	5.761	5.934
Diameter D_0 (in)	2.863	2.863	2.861
Weight W_0 (gr)	1111.7	1123.6	1169.7
Bulk Density ρ (PCF)	112.80	115.41	116.81
Particle Density ρ_s	2.658 (measured)	2.658 (measured)	2.658 (measured)

Initial Conditions

	Specimen 1	Specimen 2	Specimen 3
Cell Pressure σ_3 (lbf/in2)	7.0	10.0	15.0
Pore Pressure u (lbf/in2)	0.0	0.0	0.0
Machine Speed d_ε(in/min)	0.009	0.011	0.009
No. of Membranes	1	1	1
Total Thickness (in)	0.012	0.012	0.012
Strain Channel	1798	1798	1798
Load Channel	1776	1776	1776
Pore P. Channel	1779	1779	1779
Volume Channel	Volume Chang	Volume Chang	Volume Chang
Moisture Content w_0%	29.4	31.0	29.9
Dry Density ρ_{d0} (PCF)	87.15	88.12	89.91
Voids Ratio e_0	0.90	0.88	0.84
Deg of Saturation S_0%	86.63	93.31	94.14
Final B Value	0.98	0.99	0.97

Final Conditions

	Specimen 1	Specimen 2	Specimen 3
Moisture Content w_f%	32.2	32.6	28.2
Dry Density ρ_d (PCF)	88.10	90.08	92.76
Voids Ratio e_f	0.88	0.84	0.79
Deg of Saturation S_f%	96.95	100.00	95.13
Failure Criteria	Mx Stress Ratio	Mx Stress Ratio	Mx Stress Ratio
Axial Strain ε_f%	6.9	4.9	8.1
Corr Dev Stress $(\sigma_1 - \sigma_3)$f (lbf/in2)	9.1	10.7	13.1
Minor Stress σ_{3f} (lbf/in2)	2.4	3.1	4.7
Major Stress σ_{1f} (lbf/in2)	11.5	13.8	17.8
Stress Ratio $(\sigma_1/\sigma_3)_f$	4.8	4.5	3.8

Notes:

Failure Sketch

Sp 1 Sp 2

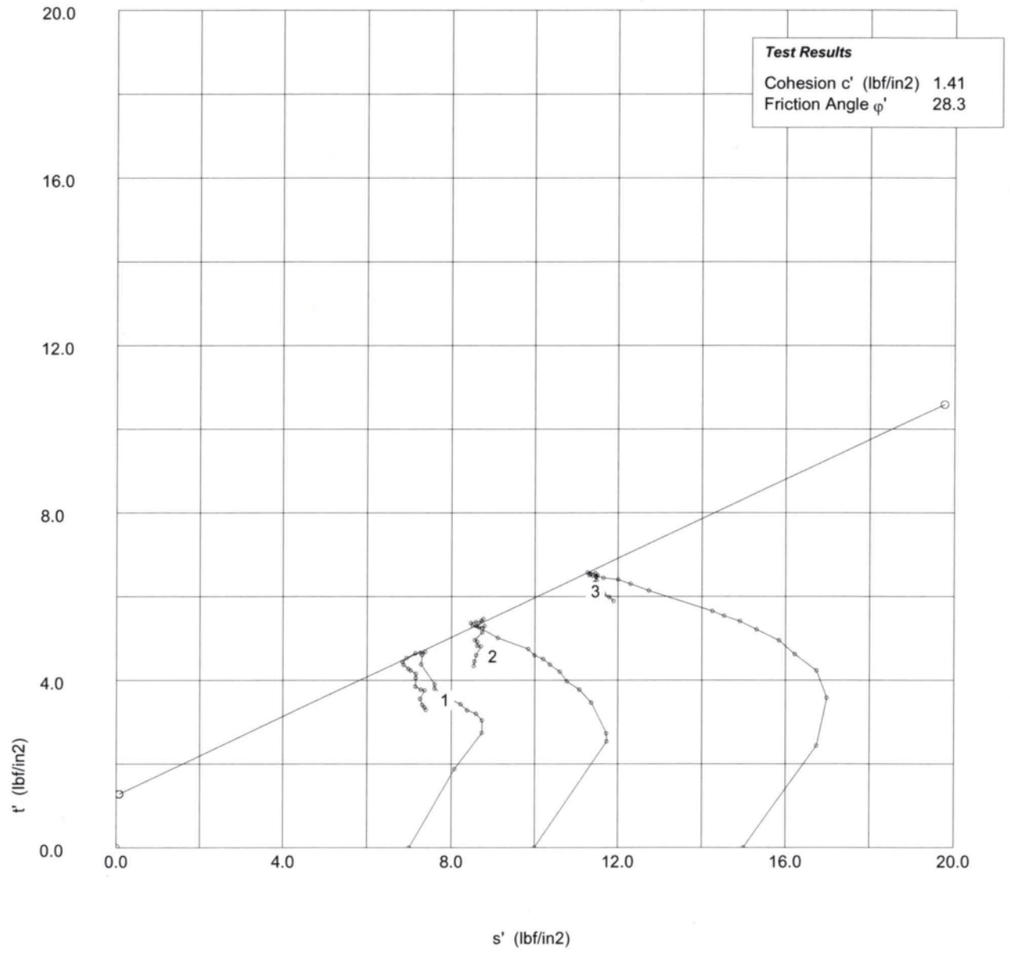
Sp 3

Surface Inclination

Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLL	Checked: MLC	Approved:	

Effective Stress Triaxial Compression

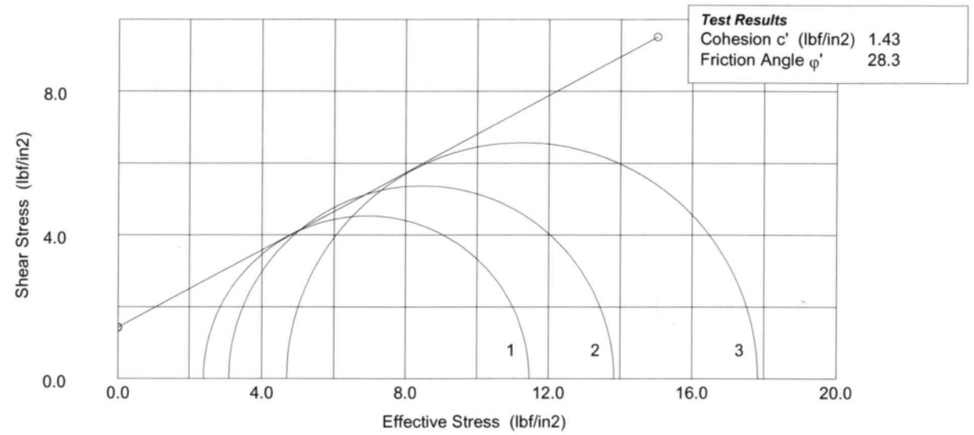
Consolidated Undrained

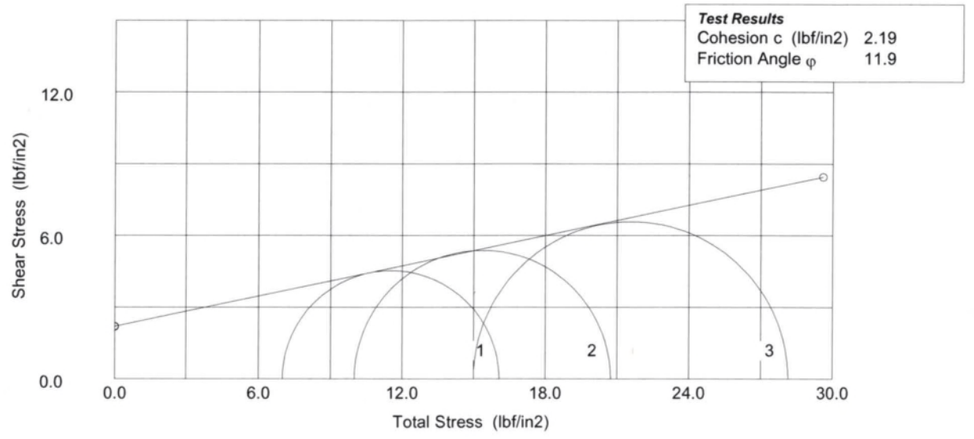


Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLL	Checked: MLL	Approved:	

Effective Stress Triaxial Compression

Consolidated Undrained





Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLL	Checked: MLL	Approved:	

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 2)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	0	0.00	602	0.0	0	0.0	0.0	0.0	10.00	10.00	1.00
2	82	0.14	924	32.2	8	0.8	5.1	5.1	9.20	14.27	1.55
3	133	0.23	949	34.7	10	1.0	5.5	5.5	9.00	14.46	1.61
4	184	0.32	1043	44.1	21	2.1	6.9	6.9	7.90	14.83	1.88
5	241	0.42	1083	48.1	27	2.7	7.6	7.6	7.30	14.85	2.03
6	308	0.54	1119	51.7	32	3.2	8.1	7.9	6.80	14.75	2.17
7	368	0.64	1149	54.7	36	3.6	8.6	8.4	6.40	14.81	2.31
8	418	0.73	1171	56.9	40	4.0	8.9	8.7	6.00	14.75	2.46
9	468	0.82	1189	58.7	43	4.3	9.2	9.0	5.70	14.72	2.58
10	537	0.94	1201	59.9	46	4.6	9.4	9.2	5.40	14.60	2.70
11	596	1.04	1221	61.9	49	4.9	9.7	9.5	5.10	14.60	2.86
12	1128	1.97	1269	66.7	59	5.9	10.3	10.0	4.10	14.13	3.45
13	1686	2.95	1309	70.7	65	6.5	10.8	10.5	3.50	13.96	3.99
14	2239	3.92	1334	73.2	68	6.8	11.1	10.6	3.20	13.81	4.32
15	2795	4.89	1355	75.3	69	6.9	11.3	10.7	3.10	13.83	4.46
16	3435	6.01	1373	77.1	68	6.8	11.4	10.8	3.20	13.99	4.37
17	3984	6.97	1390	78.8	67	6.7	11.6	10.8	3.30	14.14	4.29
18	4609	8.06	1411	80.9	67	6.7	11.7	10.9	3.30	14.23	4.31
19	5177	9.05	1402	80.0	67	6.7	11.5	10.6	3.30	13.90	4.21
20	5735	10.03	1412	81.0	66	6.6	11.5	10.5	3.40	13.93	4.10
21	6291	11.00	1431	82.9	65	6.5	11.6	10.6	3.50	14.10	4.03
22	6852	11.98	1424	82.2	64	6.4	11.4	10.3	3.60	13.89	3.86
23	7427	12.99	1411	80.9	64	6.4	11.1	9.9	3.60	13.52	3.76
24	8531	14.92	1434	83.2	63	6.3	11.2	9.8	3.70	13.55	3.66
25	9168	16.03	1435	83.3	62	6.2	11.0	9.7	3.80	13.45	3.54
26	9728	17.01	1448	84.6	61	6.1	11.1	9.6	3.90	13.52	3.47
27	10348	18.10	1431	82.9	60	6.0	10.7	9.2	4.00	13.19	3.30
28	10911	19.08	1422	82.0	59	5.9	10.5	8.9	4.10	13.01	3.17
29	11482	20.08	1417	81.5	58	5.8	10.3	8.7	4.20	12.88	3.07

Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS) Shear (Specimen 2)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLC	*Checked:* MLC		*Approved:*

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 1)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	6	0.00	536	0.0	0	0.0	0.0	0.0	7.00	7.00	1.00
2	85	0.14	777	24.1	8	0.8	3.8	3.8	6.20	9.96	1.61
3	133	0.22	887	35.1	10	1.0	5.5	5.5	6.00	11.48	1.91
4	204	0.34	926	39.0	13	1.3	6.1	6.1	5.70	11.78	2.07
5	257	0.43	947	41.1	16	1.6	6.4	6.4	5.40	11.80	2.19
6	318	0.54	968	43.2	19	1.9	6.7	6.6	5.10	11.66	2.29
7	368	0.62	987	45.1	22	2.2	7.0	6.9	4.80	11.65	2.43
8	422	0.72	1005	46.9	26	2.6	7.3	7.1	4.40	11.53	2.62
9	496	0.84	1022	48.6	29	2.9	7.5	7.4	4.10	11.48	2.80
10	537	0.91	1037	50.1	32	3.2	7.8	7.6	3.80	11.41	3.00
11	603	1.03	1051	51.5	33	3.3	8.0	7.8	3.70	11.51	3.11
12	1186	2.03	1126	59.0	41	4.1	9.0	8.8	2.90	11.66	4.02
13	1735	2.98	1166	63.0	43	4.3	9.6	9.2	2.70	11.90	4.41
14	2300	3.95	1190	65.4	43	4.3	9.8	9.3	2.70	12.05	4.46
15	2865	4.92	1200	66.4	44	4.4	9.9	9.3	2.60	11.92	4.58
16	3478	5.97	1211	67.5	45	4.5	9.9	9.3	2.50	11.79	4.72
17	4040	6.94	1208	67.2	46	4.6	9.8	9.1	2.40	11.47	4.78
18	4679	8.04	1209	67.3	46	4.6	9.7	8.9	2.40	11.29	4.70
19	5226	8.98	1211	67.5	45	4.5	9.6	8.7	2.50	11.23	4.49
20	5783	9.94	1211	67.5	43	4.3	9.5	8.6	2.70	11.25	4.17
21	6349	10.91	1218	68.2	42	4.2	9.5	8.5	2.80	11.27	4.02
22	6919	11.90	1220	68.4	40	4.0	9.4	8.3	3.00	11.31	3.77
23	7535	12.96	1218	68.2	39	3.9	9.3	8.1	3.10	11.21	3.62
24	8168	14.04	1202	66.6	37	3.7	9.0	7.7	3.30	11.00	3.33
25	8741	15.03	1203	66.7	35	3.5	8.9	7.6	3.50	11.05	3.16
26	9288	15.97	1213	67.7	34	3.4	8.9	7.5	3.60	11.12	3.09
27	9912	17.05	1196	66.0	33	3.3	8.6	7.1	3.70	10.82	2.92
28	10481	18.02	1186	65.0	31	3.1	8.3	6.8	3.90	10.72	2.75
29	11039	18.98	1188	65.2	30	3.0	8.3	6.7	4.00	10.71	2.68
30	11661	20.06	1190	65.4	29	2.9	8.2	6.6	4.10	10.69	2.61

Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS) Shear (Specimen 1)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLC	*Checked:* MLC		*Approved:*

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 3)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	2	0.00	664	0.0	0	0.0	0.0	0.0	15.00	15.00	1.00
2	87	0.14	971	30.7	7	0.7	4.9	4.9	14.30	19.17	1.34
3	158	0.27	1116	45.2	16	1.6	7.2	7.2	13.40	20.56	1.53
4	226	0.38	1199	53.5	25	2.5	8.5	8.5	12.50	20.97	1.68
5	297	0.50	1259	59.5	34	3.4	9.4	9.2	11.60	20.84	1.80
6	337	0.57	1301	63.7	41	4.1	10.1	9.9	10.90	20.80	1.91
7	440	0.75	1335	67.1	49	4.9	10.6	10.4	10.10	20.52	2.03
8	510	0.87	1361	69.7	55	5.5	11.0	10.8	9.50	20.32	2.14
9	582	0.99	1378	71.4	60	6.0	11.2	11.1	9.00	20.07	2.23
10	613	1.04	1393	72.9	64	6.4	11.5	11.3	8.60	19.90	2.31
11	1207	2.05	1471	80.7	84	8.4	12.6	12.3	6.60	18.88	2.86
12	1759	2.99	1505	84.1	90	9.0	13.0	12.6	6.00	18.60	3.10
13	2319	3.95	1535	87.1	94	9.4	13.3	12.8	5.60	18.41	3.29
14	2887	4.91	1555	89.1	98	9.8	13.5	12.9	5.20	18.10	3.48
15	3504	5.96	1575	91.1	100	10.0	13.6	13.0	5.00	17.97	3.59
16	4128	7.03	1600	93.6	101	10.1	13.8	13.1	4.90	18.01	3.67
17	4767	8.11	1619	95.5	103	10.3	13.9	13.1	4.70	17.84	3.80
18	5323	9.06	1630	96.6	102	10.2	14.0	13.1	4.80	17.88	3.72
19	5879	10.01	1642	97.8	102	10.2	14.0	13.0	4.80	17.82	3.71
20	6443	10.97	1656	99.2	101	10.1	14.0	13.0	4.90	17.89	3.65
21	7013	11.94	1674	101.0	100	10.0	14.1	13.0	5.00	18.01	3.60
22	7562	12.87	1685	102.1	100	10.0	14.1	13.0	5.00	17.95	3.59
23	8188	13.94	1690	102.6	99	9.9	14.0	12.8	5.10	17.87	3.50
24	8826	15.03	1700	103.6	99	9.9	14.0	12.7	5.10	17.77	3.48
25	9377	15.96	1706	104.2	98	9.8	13.9	12.5	5.20	17.73	3.41
26	10001	17.03	1709	104.5	96	9.6	13.8	12.3	5.40	17.72	3.28
27	10646	18.13	1713	104.9	94	9.4	13.6	12.1	5.60	17.73	3.17
28	11204	19.08	1717	105.3	92	9.2	13.5	12.0	5.80	17.78	3.07
29	11825	20.13	1719	105.5	90	9.0	13.4	11.8	6.00	17.79	2.97

Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS) Shear (Specimen 3)
		Date of Test:	9-29-17
Site Reference:	Br. No. 19 on NC 42 over Deep River	Sample:	ST-1
Jobfile:	E:\C17-032.JOB	Borehole:	L
Operator: MLC	*Checked:* MLC		*Approved:*