STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519CB)	1	7

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34817.1.2 (U-2519CB)* F.A. PROJ. *NHF-DPR-0100(001)*

COUNTY *CUMBERLAND*

PROJECT DESCRIPTION *FAYETTEVILLE OUTER LOOP FROM SOUTH OF SR 1400 (CLIFFDALE RD.) TO EAST OF SR 1415 (YADKIN RD.)*

SITE DESCRIPTION *STRUCTURE NO. 12 ON -Y3- (SR 1415) OVER -L- (FAYETTEVILLE OUTER LOOP)*

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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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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PERSONNEL

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SUBMITTED BY *D.N. ARGENBRIGHT*

DATE *JUNE 2013*

NORTH CAROLINA LICENSED GEOLOGIST SEAL 1050 D.N. ARGENBRIGHT

6-19-13

DRAWN BY: *C.P. TURNER*

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

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ID: U-2519CB

PROJECT: 34817.1.2

PROJECT REFERENCE NO.	SHEET NO.
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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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
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 A 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 0.50
	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		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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
- SOUNDING ROD
- SPT, CPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS

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

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] CME-45B
- [ ] _____

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_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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: BL-64 AT -L- STA. 991+21.58 50.93 RT

ELEVATION: 281.48 FT.

NOTES:

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519CB)	3 OF 7

SITE PLAN

0 50 100
FEET

STRUCTURE NO.12

18+00

20+00

22+00

993+00

TO ALL AMERICAN FREEWAY

991+28.13 -L-
19+89.51 -Y3-

EB1-A

EB2-A

PROP. SIDEWALK

TO FORT BRAGG

-Y3-

SR 1415

TO FAYETTEVILLE

120° 28' 22"

B1-B

990+00

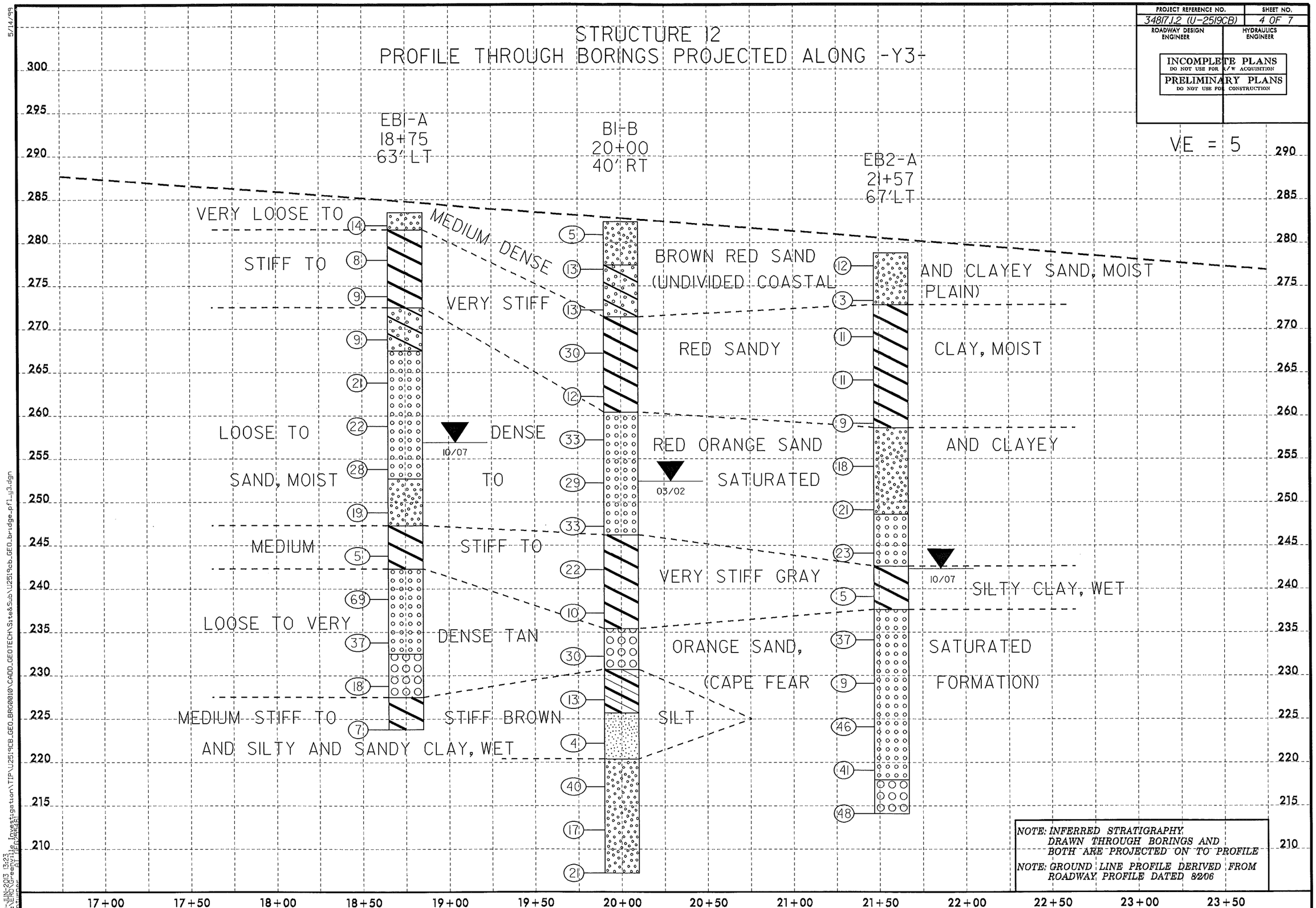
-L-

END BENT 1 BENT LINE

BENT 1 BENT LINE

END BENT 2 BENT LINE

TO US 401



PROJECT REFERENCE NO.
34817.1.2 (U-2519CB)
SHEET NO.
4 OF 7
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
STRUCTURE 12
PROFILE THROUGH BORINGS PROJECTED ALONG -Y3-
VE = 5
EB1-A
18+75
63' LT
B1-B
20+00
40' RT
EB2-A
21+57
67' LT
VERY LOOSE TO
STIFF TO
MEDIUM DENSE
VERY STIFF
BROWN RED SAND
(UNDIVIDED COASTAL
AND CLAYEY SAND, MOIST
PLAIN)
RED SANDY
CLAY, MOIST
LOOSE TO
SAND, MOIST
DENSE
TO
10/07
RED ORANGE SAND
SATURATED
03/02
AND CLAYEY
MEDIUM
STIFF TO
VERY STIFF GRAY
10/07
SILTY CLAY, WET
LOOSE TO VERY
DENSE TAN
ORANGE SAND,
(CAPE FEAR
SATURATED
FORMATION)
MEDIUM STIFF TO
STIFF BROWN
SILT
AND SILTY AND SANDY CLAY, WET
NOTE: INFERRED STRATIGRAPHY DRAWN THROUGH BORINGS AND BOTH ARE PROJECTED ON TO PROFILE
NOTE: GROUND LINE PROFILE DERIVED FROM ROADWAY PROFILE DATED 8/2/06
17+00
17+50
18+00
18+50
19+00
19+50
20+00
20+50
21+00
21+50
22+00
22+50
23+00
23+50

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Wrike, C. M.	
SITE DESCRIPTION STRUCTURE 12 ON -Y3- (SR 1415) OVER -L- (FAYETTEVILLE OUTER LOOP)				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 18+75	**OFFSET** 63 ft LT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 283.5 ft	**TOTAL DEPTH** 59.7 ft	**NORTHING** 494,073	**EASTING** 2,000,908	**24 HR.** 26.6
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Cherry, W. N.	**START DATE** 10/17/07	**COMP. DATE** 10/18/07	**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)
285											
	283.5	0.0	4	6	8	14	SS-28			283.5 GROUND SURFACE	0.0
280	279.5	4.0	2	3	5	8	SS-29	26%		281.5 BROWN SAND, MOIST (UNDIVIDED COASTAL PLAIN)	2.0
275	275.3	8.2	4	5	4	9				RED SANDY CLAY, MOIST	
270	270.3	13.2	4	4	5	9	SS-30			272.5 RED ORANGE CLAYEY SAND AND SAND, MOIST	11.0
265	265.3	18.2	8	9	12	21	SS-31			267.5	16.0
260	260.3	23.2	9	10	12	22					
255	255.3	28.2	9	12	16	28	SS-32			252.7	30.8
250	250.3	33.2	8	9	10	19	SS-33			247.3 GRAY SILTY CLAY, WET	36.2
245	245.3	38.2	2	2	3	5	SS-34	28%		242.3 TAN SAND, SATURATED (CAPE FEAR FORMATION)	41.2
240	240.3	43.2	16	30	39	69	SS-35				
235	235.3	48.2	7	16	21	37				232.5	51.0
230	230.3	53.2	10	12	6	18	SS-36			227.5 BROWN SILTY CLAY, WET	56.0
225	225.3	58.2	2	3	4	7	SS-37			223.8 Boring Terminated at Elevation 223.8 ft in medium stiff silty clay	59.7

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Edwards, R.L.	
SITE DESCRIPTION STRUCTURE 12 ON -Y3- (SR 1415) OVER -L- (FAYETTEVILLE OUTER LOOP)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 20+00	**OFFSET** 40 ft RT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 282.4 ft	**TOTAL DEPTH** 75.2 ft	**NORTHING** 493,911	**EASTING** 2,000,910	**24 HR.** 30.0
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Dail, L. W.	**START DATE** 03/07/02	**COMP. DATE** 03/08/02	**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
285										
	282.4	0.0	2	2	3	5				282.4 GROUND SURFACE 0.0
280	278.4	4.0	5	6	7	13	SS-174			BROWN SAND, MOIST (UNDIVIDED COASTAL PLAIN)
275	273.7	8.7	4	6	7	13	SS-175			277.4 5.0 RED CLAYEY SAND, MOIST
270	268.7	13.7	9	13	17	30	SS-176			271.4 11.0 RED SANDY CLAY, MOIST
265	263.7	18.7	4	5	7	12	SS-177			
260	258.7	23.7	9	15	18	33	SS-178			260.4 22.0 ORANGE SAND, MOIST TO SATURATED
255	253.7	28.7	8	13	16	29				
250	248.7	33.7	10	16	17	33	SS-179			
245	243.7	38.7	7	7	15	22	SS-180			246.2 36.2 GRAY SILTY CLAY, WET
240	238.7	43.7	2	4	6	10	SS-181			235.4 47.0 TAN SAND, SATURATED (CAPE FEAR FORMATION)
235	233.7	48.7	18	18	12	30	SS-182			230.7 51.7 BROWN SANDY CLAY AND SILT, WET
230	228.7	53.7	5	6	7	13	SS-183			225.7 56.7
225	223.7	58.7	WOH	1	3	4	SS-184			220.4 62.0 ORANGE SAND, SATURATED
220	218.7	63.7	15	18	22	40	SS-185			
215	213.7	68.7	7	8	9	17				
210	208.7	73.7	8	9	12	21				207.2 75.2 Boring Terminated at Elevation 207.2 ft in medium dense sand

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 6/19/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION STRUCTURE 12 ON -Y3- (SR 1415) OVER -L- (FAYETTEVILLE OUTER LOOP)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 21+57	**OFFSET** 67 ft LT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 278.8 ft	**TOTAL DEPTH** 64.7 ft	**NORTHING** 493,860	**EASTING** 2,001,093	**24 HR.** 36.5
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Cherry, W. N.	**START DATE** 10/17/07	**COMP. DATE** 10/17/07	**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)
280											
	278.8	0.0	1	5	7	12	SS-19			278.8 GROUND SURFACE	0.0
275	274.8	4.0	2	2	1	3				BROWN SAND, MOIST (UNDIVIDED COASTAL PLAIN)	
270	270.6	8.2	4	5	6	11	SS-20			272.8 RED SANDY CLAY, MOIST	6.0
265	265.6	13.2	3	5	6	11					
260	260.6	18.2	4	4	5	9	SS-21			258.6 ORANGE SAND, MOIST	20.2
255	255.6	23.2	8	9	9	18	SS-22				
250	250.6	28.2	7	10	11	21				248.6	30.2
245	245.6	33.2	8	11	12	23	SS-23			242.6 GRAY SILTY CLAY, MOIST TO WET	36.2
240	240.6	38.2	WOH	WOH	5	5	SS-24	34%			
235	235.6	43.2	13	16	21	37	SS-25			237.6 TAN SAND, SATURATED (CAPE FEAR FORMATION)	41.2
230	230.6	48.2	4	3	6	9					
225	225.6	53.2	19	23	23	46	SS-26				
220	220.6	58.2	17	20	21	41				218.0	60.8
215	215.6	63.2	16	20	28	48	SS-27			214.1 Boring Terminated at Elevation 214.1 ft in dense sand	64.7

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 6/19/13

U-2519CB
STRUCTURE NO. 12 ON -Y3- (SR 1415) OVER -L-(FAYETTEVILE OUTER LOOP)

HOLE #	SAMPLE #	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
EB2-A	SS-19	97	74	17	50.8	34.4	4.7	10.1	16	NP	A-2-4(0)	1.0-1.5		
	SS-20	98	79	43	35.8	23.1	2.6	38.5	60	30	A-7-5(8)	8.2-9.7		
	SS-21	100	77	39	37.7	27.3	6.7	28.3	42	20	A-7-6(3)	18.2-19.7		
	SS-22	100	67	12	71.2	18.7	3.0	7.1	24	NP	A-2-4(0)	23.2-24.7		
	SS-23	100	53	9	82.5	9.2	0.2	8.1	25	NP	A-3(0)	33.2-34.7		
	SS-24	100	82	47	33.2	22.3	8.1	36.4	54	31	A-7-6(10)	38.2-39.7	33.7	
	SS-25	100	65	6	56.4	38.7	0.9	4.0	23	NP	A-3(0)	43.2-44.7		
	SS-26	95	58	7	65.3	29.5	2.2	3.0	22	NP	A-3(0)	53.2-54.7		
	SS-27	100	49	8	76.4	17.4	2.1	4.0	22	NP	A-1-b(0)	63.2-64.7		
EB1-A	SS-28	95	73	17	53.2	32.3	5.4	9.1	17	NP	A-2-4(0)	1.0-1.5		
	SS-29	97	85	49	25.3	26.5	1.6	46.6	54	29	A-7-6(10)	4.0-5.5	25.9	
	SS-30	98	76	35	37.2	31.8	2.6	28.3	43	22	A-2-7(2)	13.2-14.7		
	SS-31	100	57	6	83.4	11.3	0.2	5.1	24	NP	A-3(0)	18.2-19.7		
	SS-32	100	60	5	85.1	11.1	0.7	3.0	23	NP	A-3(0)	28.2-29.7		
	SS-33	100	66	13	76.1	12.6	0.2	11.1	23	NP	A-2-4(0)	33.2-34.7		
	SS-34	100	86	53	28.9	20.0	10.5	40.5	42	24	A-7-6(9)	38.2-39.7	27.7	
	SS-35	100	60	8	74.1	19.8	1.0	5.1	22	NP	A-3(0)	43.2-44.7		
	SS-36	91	38	8	79.3	13.0	1.7	6.1	24	NP	A-1-b(0)	53.2-54.7		
	SS-37	100	98	93	3.2	6.3	31.8	58.7	49	25	A-7-6(26)	58.2-59.7		
B1-B	SS-174	87	72	13	43.8	45.4	5.7	5.0	16	NP	A-2-4(0)	4.0-5.0		
	SS-175	100	80	31	39.1	33.3	1.5	26.1	39	17	A-2-6(1)	8.7-10.2		
	SS-176	100	86	51	27.3	25.7	4.9	42.4	57	30	A-7-6(12)	13.7-15.2		
	SS-177	100	87	42	28.3	32.7	4.9	34.1	43	19	A-7-6(4)	18.7-20.2		
	SS-178	100	64	8	78.8	14.9	1.2	5.0	21	NP	A-3(0)	23.7-25.2		
	SS-179			NOT ENOUGH SAMPLE								33.7-35.2		
	SS-180	100	91	79	24.5	6.0	3.3	66.2	85	56	A-7-6(40)	38.7-40.2		
	SS-181	100	87	59	26.5	15.8	7.5	50.2	64	37	A-7-6(20)	43.7-45.2		
	SS-182	100	42	7	79.6	14.3	2.0	4.0	26	NP	A-1-b(0)	48.7-50.2		
	SS-183	100	70	40	43.5	23.3	11.1	23.1	34	16	A-6(2)	53.7-55.2		
	SS-184	100	94	40	11.8	59.8	8.3	20.1	29	9	A-4(0)	58.7-60.2		
	SS-185	99	62	11	69.7	21.0	2.3	7.0	21	NP	A-2-4(0)	63.7-65.2		

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519CB)	1	19

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34817.1.2 (U-2519CB)* F.A. PROJ. *DPR-0100(001)*

COUNTY *CUMBERLAND*

PROJECT DESCRIPTION *FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO WEST OF NC 24 (BRAGG BOULEVARD)*

SITE DESCRIPTION *STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2- AND -LP1B-*

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4, 5	PROFILE(S)
6-16	BORE LOGS
17-19	SOIL TEST RESULTS

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. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

PERSONNEL

J. GERNER

D. GOODNIGHT

J. HOWARD

INVESTIGATED BY *N.D. MOHS*

CHECKED BY *N.T. ROBERSON*

SUBMITTED BY *N.T. ROBERSON*

DATE *SEPTEMBER, 2013*

NORTH CAROLINA LICENSED SEAL 2124 GEOLOGIST NATHAN DANIEL MOHS

9/24/13

PROJECT: 34817.1.2

ID: U-2519CB

DRAWN BY: *N.D. MOHS, W.D. FIELDS*

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519DA)	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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
# 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			
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
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 A 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 0.50
	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		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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 W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [X] CME-850
- [X] CME-45B

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

HAMMER TYPE:
- [X] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B____
- [ ] -N____
- [ ] -H____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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 ROCK.

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: BL-12: N: 495550.2; E: 2006994.7; ELEV. 185.39'
BL-14: N: 495615.4; E: 2007537.8; ELEV. 212.54
ELEVATION: FT.

NOTES:

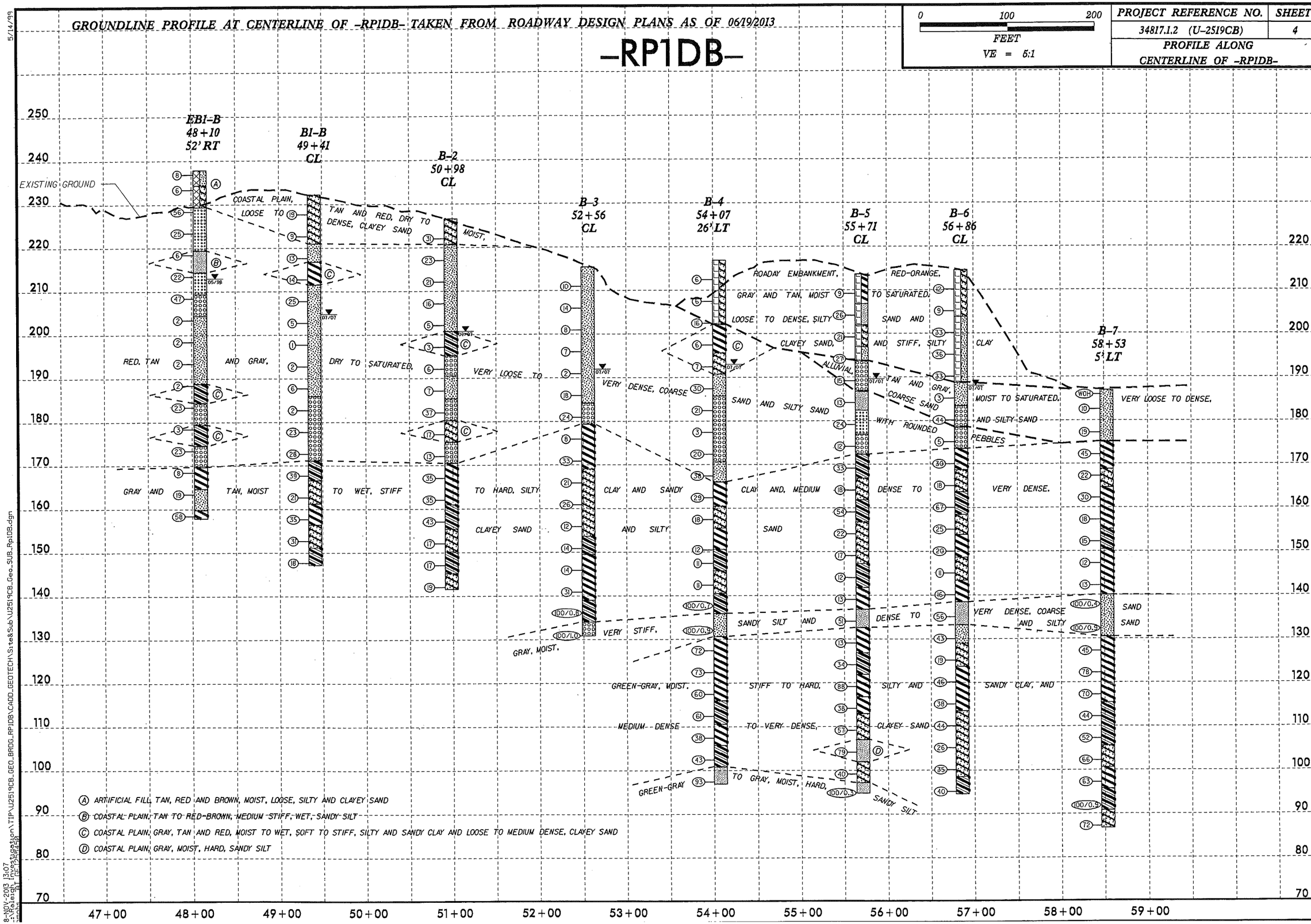
REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519CB)	3

SITE PLAN

0 100 200
FEET

EB2
B-9
BL-12
B-8
B-7
B-6
B-5
B-4
B-3
B-2
B1-B
EB1-B
BL-14
-RPIDB-
-COL2- POT 89+12.67
END PAVING
-COL1- TS Sta. 98+62.10
-COL1- POT 96+39.06 =
-LPID- ST 32+80.83 (11.81' RT)
-LPID- ST Sta. 48+18.91
-LPID- SC Sta. 36+74.53
-LPID- POT 45+65.11
END 2'-6" CURB & GUTTER
END PAVING
-LPID- CS Sta. 45+23.64
215.4000
B-3
RPIDB
52+5% RT
0.0000
95 (-COL2-)
95 (-L-)
65 (-Y1-)
55 (-RPIDB-)
70 (-Y1-)
50 (-RPIDB-)
45 (-LPID-)
35 (-LPID-)
45 (-RPIC-)
90 (-RPIC-)
90 (-COL1-)
95 (-L-)
100 (-L-)
40 (-L-)
1500 mm CML
1200 mm CML
600 mm CML
600 mm CMP
150 mm CMP
1200 mm CONC
900 mm CONC
CONC
SOIL
RIPRAP
SOIL EROSION FENCE
ISFD
2SFD
2SFD
2SFD
1NSFD
PATIO
POOL
SR 6122 SHORTRIDGE RD EST
SR 1007 ALL AMERICAN FREEWAY NBL EST
SR 1007 ALL AMERICAN FREEWAY SBL EST
BEAVER CR
L5 CONC WWS
OVERHEAD SIGN


GROUNDLINE PROFILE AT CENTERLINE OF -RP1DB- TAKEN FROM ROADWAY DESIGN PLANS AS OF 06/19/2013
-RP1DB-
0 100 200
FEET
VE = 5:1
PROJECT REFERENCE NO.
34817.1.2 (U-2519CB)
SHEET
4
PROFILE ALONG
CENTERLINE OF -RP1DB-
EB1-B
48+10
52' RT
B1-B
49+41
CL
B-2
50+98
CL
B-3
52+56
CL
B-4
54+07
26' LT
B-5
55+71
CL
B-6
56+86
CL
B-7
58+53
5' LT
EXISTING GROUND
COASTAL PLAIN, LOOSE TO TAN AND RED, DRY TO DENSE, CLAYEY SAND
MOIST,
RED, TAN AND GRAY, DRY TO SATURATED, VERY LOOSE TO VERY DENSE, COARSE
GRAY AND TAN, MOIST TO WET, STIFF TO HARD, SILTY CLAYEY SAND
CLAY AND SANDY AND SILTY SAND
ROADAY EMBANKMENT, GRAY AND TAN, MOIST LOOSE TO DENSE, SILTY CLAYEY SAND, ALLUVIAL,
RED-ORANGE, TO SATURATED, SAND AND AND STIFF, SILTY CLAY
TAN AND GRAY, COARSE SAND WITH ROUNDED PEBBLES
MOIST TO SATURATED, AND SILTY SAND
VERY LOOSE TO DENSE,
CLAY AND, MEDIUM SAND
DENSE TO VERY DENSE.
VERY STIFF, GRAY, MOIST,
SANDY SILT AND
DENSE TO VERY DENSE, COARSE AND SILTY SAND
SAND
GREEN-GRAY, MOIST, MEDIUM DENSE
STIFF TO HARD, TO VERY DENSE,
SILTY AND CLAYEY SAND
SANDY CLAY, AND
GREEN-GRAY TO GRAY, MOIST, HARD, SANDY SILT
Ⓐ ARTIFICIAL FILL, TAN, RED AND BROWN, MOIST, LOOSE, SILTY AND CLAYEY SAND
Ⓑ COASTAL PLAIN, TAN TO RED-BROWN, MEDIUM STIFF, WET, SANDY SILT
Ⓒ COASTAL PLAIN, GRAY, TAN AND RED, MOIST TO WET, SOFT TO STIFF, SILTY AND SANDY CLAY AND LOOSE TO MEDIUM DENSE, CLAYEY SAND
Ⓓ COASTAL PLAIN, GRAY, MOIST, HARD, SANDY SILT
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
47+00
48+00
49+00
50+00
51+00
52+00
53+00
54+00
55+00
56+00
57+00
58+00
59+00

5/14/99

GROUNDLINE PROFILE AT CENTERLINE OF -RP1DB- TAKEN FROM ROADWAY DESIGN PLANS AS OF 06/19/2013

-RP1DB-

0 100 200
FEET
VE = 5:1

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519CB)	5
PROFILE ALONG CENTERLINE OF -RP1DB-	

250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70

220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70

59+00 60+00 61+00 62+00 63+00 64+00 65+00 66+00 67+00 68+00 69+00 70+00

EXISTING GROUND

B-8
60+43
17' RT

B-9
62+14
CL

EB2
63+65
CL

BEAVER CREEK

12 6 9 14 17 16.2 28 65 41 35 25 26 41 86 68 83 81 85 76 31 100/0.9

07/07

12 5 9 31 11 31 18 19 31 22 17 20 17 100/0.8 57 37 63 62 52 62

07/07

8 5 8 16 17 4 2 18 29 19 23 18 19

06/98

COASTAL PLAIN, RED, TAN, AND GRAY, TO DENSE, COARSE GRAY AND TAN, MOIST TO WET, STIFF TO HARD, SILTY AND AND MEDIUM DENSE TO VERY DENSE, CLAYEY SAND SANDY CLAY, GRAY, MOIST, VERY STIFF, SANDY SILT AND DENSE TO VERY DENSE, COARSE SAND AND SILTY SAND GREEN-GRAY, MOIST STIFF TO VERY STIFF. SILTY AND SANDY CLAY, AND MEDIUM DENSE TO VERY DENSE, CLAYEY SAND GRAY, MOIST, HARD, SANDY SILT

DRY TO SATURATED, VERY LOOSE TO DENSE, COARSE SAND AND SILTY SAND WITH ROUNDED PEBBLES

(A) ALLUVIAL, TAN AND GRAY, MOIST TO SATURATED, VERY LOOSE TO DENSE, COARSE SAND AND SILTY SAND

08-NOV-2013 13:04
-\Raleigh_Projects\Division\TIP\U2519CB_GEO_BRDG_RP1DB\CADD_GEOTECH\Site&Sub\U2519CB_Geo_SUB_Rp1DB.dgn

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 48+10	**OFFSET** 52 ft RT	**ALIGNMENT** -RP1DB-	**0 HR.** 27.7
COLLAR ELEV. 237.9 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 494,859	**EASTING** 2,008,136	**24 HR.** 25.0
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Contract Driller	**START DATE** 05/14/98	**COMP. DATE** 05/14/98	**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
240										
	237.9	0.0	4	4	4	8	SS-1	M		237.9 GROUND SURFACE 0.0 **ARTIFICIAL FILL** TAN TO RED-BROWN, SILTY SAND
235	234.4	3.5	4	3	3	6	SS-2	18% M		234.4 3.5 RED-BROWN, CLAYEY SAND
230	229.4	8.5	21	25	31	56	SS-3	M		229.4 8.5 **COASTAL PLAIN** TAN TO RED-BROWN, SAND
225	224.4	13.5	8	11	14	25	SS-4	M		
220	219.4	18.5	3	3	3	6	SS-5	24% W		219.4 18.5 GRAY-TAN, TO RED-BROWN, SANDY SILT
215	214.4	23.5	11	11	11	22	SS-6	M		214.4 23.5 TAN TO RED-BROWN, SAND
210	209.4	28.5	13	21	26	47	SS-7	25% M		209.4 28.5 TAN TO RED-BROWN, COARSE SAND
205	204.4	33.5	1	1	1	2	SS-8	W		204.4 33.5 TAN TO GRAY, SILTY SAND
200	199.4	38.5	0	1	1	2	SS-9	22% W		
195	194.4	43.5	1	1	1	2	SS-10	25% W		
190	189.4	48.5	2	1	1	2	SS-11	29% W		188.8 49.1 RED, GRAY, SANDY CLAY
185	184.4	53.5	5	9	14	23	SS-12	Sat.		184.4 53.5 TAN, SAND
180	179.4	58.5	1	1	2	3	SS-13	30% M		179.4 58.5 RED, GRAY, SANDY CLAY
175	174.4	63.5	6	10	13	23	SS-14	W		174.6 63.3 TAN, SAND
170	169.4	68.5	5	2	6	8	SS-15	27% M		169.7 68.2 TAN, SILTY CLAY
165	164.4	73.5	6	8	11	19	SS-16	24% M		164.7 73.2 TAN, SILTY SAND
160										159.8 78.1

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 48+10	**OFFSET** 52 ft RT	**ALIGNMENT** -RP1DB-	**0 HR.** 27.7
COLLAR ELEV. 237.9 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 494,859	**EASTING** 2,008,136	**24 HR.** 25.0
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Contract Driller	**START DATE** 05/14/98	**COMP. DATE** 05/14/98	**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
160	159.4	78.5	16	26	32	Match Line 58	SS-17	17% M		157.9 TAN-GRAY, SILTY CLAY 80.0 Boring Terminated at Elevation 157.9 ft IN SILTY CLAY

NCDOT BORE DOUBLE U2519CB_GEO_BH_RP1DB.GPJ NC_DOT.GDT 9/18/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 49+41	**OFFSET** CL	**ALIGNMENT** -RP1DB-	**0 HR.** 28.5
COLLAR ELEV. 232.2 ft	**TOTAL DEPTH** 85.0 ft	**NORTHING** 494,945	**EASTING** 2,008,021	**24 HR.** 27.5
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/24/07	**COMP. DATE** 07/24/07	**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)
235												
										GROUND SURFACE	232.2	0.0
230										**COASTAL PLAIN** TAN AND RED, CLAYEY SAND		
	228.7	3.5	6	7	12	19	SS-103	D				
225	223.7	8.5	4	4	5	9	SS-104	M				
										WHITE AND TAN, SILTY SAND	221.0	11.2
220	218.7	13.5	4	6	7	13	SS-105	M				
										WHITE AND TAN, SILTY CLAY	216.8	15.4
215	213.7	18.5	2	4	10	14	SS-106	M				
										WHITE AND TAN, SILTY SAND	211.5	20.7
210	208.7	23.5	14	13	12	25	SS-107	M				
205	203.7	28.5	2	2	3	5	SS-108	M				
200	198.7	33.5	1	0	1	1	SS-109	M				
195	193.7	38.5	WOH	1	1	2	SS-110	M				
190	188.7	43.5	1	2	4	6	SS-111	M			185.9	46.3
										RED AND TAN, COARSE SAND AND ROUNDED GRAVEL		
185	183.7	48.5	1	1	1	2	SS-112	M				
180	178.7	53.5	8	10	13	23	SS-113	M				
175	173.7	58.5	5	12	16	28	SS-114	M			171.2	61.0
										TAN AND GRAY, SANDY CLAY		
170	168.7	63.5	9	17	22	39	SS-115	M			166.6	65.6
										TAN, CLAYEY SAND		
165	163.7	68.5	7	10	11	21	SS-116	M			161.3	70.9
										GRAY, SILTY CLAY		
160	158.7	73.5	10	14	21	35	SS-117	M			156.4	75.8
155										GRAY, CLAYEY SAND		

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 49+41	**OFFSET** CL	**ALIGNMENT** -RP1DB-	**0 HR.** 28.5
COLLAR ELEV. 232.2 ft	**TOTAL DEPTH** 85.0 ft	**NORTHING** 494,945	**EASTING** 2,008,021	**24 HR.** 27.5
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/24/07	**COMP. DATE** 07/24/07	**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
155						Match Line				GRAY, CLAYEY SAND *(continued)*
	153.7	78.5	8	14	17	31	SS-118	M		151.2 81.0
150	148.7	83.5	5	8	10	18	SS-119	M		GRAY, SANDY CLAY 147.2 85.0
										Boring Terminated at Elevation 147.2 ft IN SANDY CLAY

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-			**GROUND WTR (ft)**
BORING NO. B-2	**STATION** 50+98	**OFFSET** CL	**ALIGNMENT** -RP1DB- — **0 HR.** 25.9
COLLAR ELEV. 226.6 ft	**TOTAL DEPTH** 85.0 ft	**NORTHING** 495,069	**EASTING** 2,007,926 — **24 HR.** 25.9
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/20/07	**COMP. DATE** 07/24/07	**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))
230										
										226.6 / 0.0 GROUND SURFACE
225										COASTAL PLAIN RED, CLAYEY SAND
	223.1	3.5	7	13	18	31	SS-86	D		
220										220.7 / 5.9 RED, TAN, BROWN AND WHITE, SILTY SAND
	218.1	8.5	6	13	10	23	SS-87	D		
215										
	213.1	13.5	2	8	13	21	SS-88	M		
210										
	208.1	18.5	6	10	6	16	SS-89	M		
205										
	203.1	23.5	2	2	3	5	SS-90	M		
200										200.7 / 25.9 RED AND TAN, SANDY CLAY
	198.1	28.5	1	1	2	3	SS-91	W		
195										195.1 / 31.5 TAN, COARSE SAND
	193.1	33.5	1	2	4	6	SS-92	W		
190										190.5 / 36.1 RED AND TAN, SILTY SAND
	188.1	38.5	WOH	3	4	7	SS-93	W		
185										185.3 / 41.3 TAN, COARSE SAND
	183.1	43.5	9	16	21	37	SS-94	W		
180										180.3 / 46.3 TAN, CLAYEY SAND
	178.1	48.5	5	7	10	17	SS-95	M		
175										175.4 / 51.2 TAN AND RED, COARSE SAND
	173.1	53.5	3	9	4	13	SS-96	M		
170										170.5 / 56.1 GRAY, TAN AND BROWN, SILTY CLAY
	168.1	58.5	9	14	21	35	SS-97	M		
165										
	163.1	63.5	7	11	24	35	SS-98	M		
160										161.0 / 65.6 GRAY, SANDY CLAY
	158.1	68.5	9	20	23	43	SS-99	M		
155										155.4 / 71.2 GRAY, CLAYEY SAND
	153.1	73.5	6	8	9	17	SS-100	M		
150										150.2 / 76.4

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-			**GROUND WTR (ft)**
BORING NO. B-2	**STATION** 50+98	**OFFSET** CL	**ALIGNMENT** -RP1DB- — **0 HR.** 25.9
COLLAR ELEV. 226.6 ft	**TOTAL DEPTH** 85.0 ft	**NORTHING** 495,069	**EASTING** 2,007,926 — **24 HR.** 25.9
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/20/07	**COMP. DATE** 07/24/07	**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
150						Match Line				
	148.1	78.5	6	9	8	17	SS-101	M		GRAY, SANDY CLAY *(continued)*
145										145.2 / 81.4 GRAY, CLAYEY SAND
	143.1	83.5	4	8	11	19	SS-102	M		141.6 / 85.0 Boring Terminated at Elevation 141.6 ft IN CLAYEY SAND

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. B-3	**STATION** 52+56	**OFFSET** CL	**ALIGNMENT** -RP1DB-	**0 HR.** 23.5
COLLAR ELEV. 215.4 ft	**TOTAL DEPTH** 84.5 ft	**NORTHING** 495,183	**EASTING** 2,007,816	**24 HR.** 23.5
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/19/07	**COMP. DATE** 07/20/07	**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)
220										
215										215.4 GROUND SURFACE 0.0
										COASTAL PLAIN
	211.9	3.5	3	4	6	10	SS-69	D		TAN, BROWN AND ORANGE, SILTY SAND
210										
	206.9	8.5	4	6	8	14	SS-70	M		
205										
	201.9	13.5	3	4	4	8	SS-71	W		
200										
	196.9	18.5	2	3	4	7	SS-72	M		
195										
	191.9	23.5	1	1	1	2	SS-73	M		
190										
	186.9	28.5	1	6	12	18	SS-74	W		
185										
	181.9	33.5	8	12	12	24	SS-75	W		
180										
	176.9	38.5	2	4	4	8	SS-76	M		
175										
	171.9	43.5	7	15	18	33	SS-77	M		
170										
	166.9	48.5	6	8	13	21	SS-78	M		
165										
	161.9	53.5	7	12	14	26	SS-79	M		
160										
	156.9	58.5	4	5	7	12	SS-80	M		
155										
	151.9	63.5	5	6	8	14	SS-81	M		
150										
	146.9	68.5	4	5	9	14	SS-82	M		
145										
	141.9	73.5	7	13	18	31	SS-83	M		
140										
										184.2 31.2
										RED-TAN, COARSE SAND
										179.3 36.1
										TAN AND BROWN, SILTY CLAY
										169.1 46.3
										TAN AND GRAY, CLAYEY SAND
										153.7 61.7
										GRAY, SANDY CLAY
										149.5 65.9
										GRAY AND BROWN, SILTY CLAY

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. B-3	**STATION** 52+56	**OFFSET** CL	**ALIGNMENT** -RP1DB-	**0 HR.** 23.5
COLLAR ELEV. 215.4 ft	**TOTAL DEPTH** 84.5 ft	**NORTHING** 495,183	**EASTING** 2,007,816	**24 HR.** 23.5
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/19/07	**COMP. DATE** 07/20/07	**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
140						Match Line				139.0 76.4
										GRAY, SANDY CLAY
	136.9	78.5	20	80/.3		100/0.8	SS-84	M		
135										134.0 81.4
										GRAY, COARSE SAND
	131.9	83.5	50	50/0.5		100/1.0	SS-85	M		130.9 84.5
										Boring Terminated at Elevation 130.9 ft IN COARSE SAND

NCDOT BORE DOUBLE U2519CB_GEO_BH_RP1DB.GPJ NC_DOT.GDT 9/18/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-			**GROUND WTR (ft)**
BORING NO. B-4	**STATION** 54+07	**OFFSET** 26 ft LT	**ALIGNMENT** -RP1DB- — **0 HR.** 24.5
COLLAR ELEV. 216.9 ft	**TOTAL DEPTH** 120.0 ft	**NORTHING** 495,259	**EASTING** 2,007,685 — **24 HR.** 24.0
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/17/07	**COMP. DATE** 07/18/07	**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)
										216.9 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT RED-ORANGE AND GRAY-TAN, CLAYEY SAND	
	213.4	3.5	3	3	3	6	SS-21	M			
	208.4	8.5	3	3	3	6	SS-22	M			
	203.4	13.5	2	4	12	16	SS-23	M		202.1	14.8
										COASTAL PLAIN GRAY-TAN, SILTY CLAY	
	198.4	18.5	2	2	4	6	SS-24	M		195.6	21.3
	193.4	23.5	3	3	4	7	SS-25	W		TAN, CLAYEY SAND	
	188.4	28.5	9	13	17	30	SS-26	W		190.7	26.2
	183.4	33.5	12	11	10	21	SS-27	W		RED AND TAN, COARSE SAND	
	178.4	38.5	1	2	1	3	SS-28	W		185.7	31.2
	173.4	43.5	7	10	10	20	SS-29	W		RED AND TAN, COARSE SAND	
	168.4	48.5	20	21	17	38	SS-30	M		170.6	46.3
	163.4	53.5	5	10	19	29	SS-31	M		TAN, SILTY SAND	
	158.4	58.5	4	8	10	18	SS-32	M		166.0	50.9
	151.5	65.4	4	5	7	12	SS-33	M		TAN, SILTY CLAY	
	148.4	68.5	4	5	6	11	SS-34	M		160.5	56.4
	143.4	73.5	4	5	6	11	SS-35	M		TAN, CLAYEY SAND	
										155.5	61.4
										GRAY, SILTY CLAY	
										150.6	66.3
										GRAY, SANDY CLAY	
										145.7	71.2
										GRAY, CLAYEY SAND	
										140.5	76.4

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-			**GROUND WTR (ft)**
BORING NO. B-4	**STATION** 54+07	**OFFSET** 26 ft LT	**ALIGNMENT** -RP1DB- — **0 HR.** 24.5
COLLAR ELEV. 216.9 ft	**TOTAL DEPTH** 120.0 ft	**NORTHING** 495,259	**EASTING** 2,007,685 — **24 HR.** 24.0
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/17/07	**COMP. DATE** 07/18/07	**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)
						Match Line				GRAY, SANDY CLAY *(continued)*	
	138.4	78.5	70	30/0.2		100/0.7	SS-36	M		135.9	81.0
	133.4	83.5	40	60/0.4		100/0.9	SS-37	M		GRAY, SILTY SAND	
	128.4	88.5	16	30	42	72	SS-38	M		130.6	86.3
	123.4	93.5	20	31	42	73	SS-39	M		GRAY AND RED-BROWN, SILTY CLAY	
	118.4	98.5	18	28	32	60	SS-40	M		115.9	101.0
	113.4	103.5	13	28	33	61	SS-41	M		GREEN-GRAY SANDY CLAY	
	108.4	108.5	11	17	21	38	SS-42	M		110.6	106.3
	103.4	113.5	13	18	25	43	SS-43	M		GRAY AND RED, SILTY CLAY	
	98.4	118.5	17	45	48	93	SS-44	M		105.7	111.2
										GREEN-GRAY, SANDY CLAY	
										100.8	116.1
										GREEN-GRAY, SANDY SILT	
										96.9	120.0
										Boring Terminated at Elevation 96.9 ft IN SANDY SILT	

NCDOT BORE DOUBLE U2519CB_GEO_BH_RP1DB.GPJ NC_DOT.GDT 9/18/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. B-5	**STATION** 55+71	**OFFSET** CL	**ALIGNMENT** -RP1DB-	**0 HR.** 26.0
COLLAR ELEV. 213.6 ft	**TOTAL DEPTH** 118.8 ft	**NORTHING** 495,371	**EASTING** 2,007,564	**24 HR.** 24.0
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/18/07	**COMP. DATE** 07/19/07	**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
215										ELEV. (ft) DEPTH (ft)
										213.6 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT RED-ORANGE, SILTY CLAY
210	210.1	3.5	3	4	5	9	SS-45	M		206.8 6.8
										RED-TAN, SILTY SAND
205	205.1	8.5	2	10	16	26	SS-46	M		201.9 11.7
										TAN, CLAYEY SAND
200	200.1	13.5	5	10	11	21	SS-47	M		196.9 16.7
										TAN, SILTY SAND
195	195.1	18.5	9	13	14	27	SS-48	M		193.7 19.9
										ALLUVIAL TAN, COARSE SAND WITH TRACE GRAVEL
190	190.1	23.5	13	10	5	15	SS-49	W		186.7 26.9
										COASTAL PLAIN LIGHT GRAY, SANDY SILT WITH LAYERS OF SILTY CLAY AND TRACE ORGANICS (MIDDENDORF FORMATION)
185	185.1	28.5	1	2	11	13	SS-50	W		182.4 31.2
										TAN, COARSE SAND
180	180.1	33.5	9	12	12	24	SS-51	W		176.9 36.7
										TAN, COARSE SAND
175	175.1	38.5	3	4	8	12	SS-52	M		172.3 41.3
										LIGHT GRAY, SANDY CLAY
170	170.1	43.5	6	12	21	33	SS-53	M		166.8 46.8
										TAN-GRAY, CLAYEY SAND
165	165.1	48.5	4	8	10	18	SS-54	M		161.9 51.7
										TAN AND GRAY, SANDY CLAY
160	160.1	53.5	14	25	29	54	SS-55	M		156.8 56.8
										TAN AND GRAY, CLAYEY SAND
155	155.1	58.5	7	9	13	22	SS-56	M		
150	150.1	63.5	5	8	9	17	SS-57	M		147.3 66.3
										GRAY, SANDY CLAY WITH TRACE MICA
145	145.1	68.5	4	5	7	12	SS-58	M		141.8 71.8
										RED AND GRAY, SILTY CLAY
140	140.1	73.5	4	5	8	13	SS-59	M		136.8 76.8
135	135.1	78.5								GRAY, SANDY SILT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. B-5	**STATION** 55+71	**OFFSET** CL	**ALIGNMENT** -RP1DB-	**0 HR.** 26.0
COLLAR ELEV. 213.6 ft	**TOTAL DEPTH** 118.8 ft	**NORTHING** 495,371	**EASTING** 2,007,564	**24 HR.** 24.0
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/18/07	**COMP. DATE** 07/19/07	**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
135						Match Line				
			37	29	22	51	SS-60	M		GRAY, SANDY SILT *(continued)*
130	130.1	83.5	11	6	7	13	SS-61	M		132.6 81.0
										GRAY, SILTY CLAY, HIGHLY PLASTIC
125	125.1	88.5	6	14	20	34	SS-62	M		126.9 86.7
										BROWN, SANDY CLAY
120	120.1	93.5	21	36	52	88	SS-63	M		121.9 91.7
										BROWN TO GRAY, SILTY CLAY
115	115.1	98.5	13	16	22	38	SS-64	M		116.8 96.8
										GRAY TO BROWN, SILTY CLAY, HIGHLY PLASTIC
110	110.1	103.5	21	26	31	57	SS-65	M		112.9 100.7
										GRAY, CLAYEY SAND
105	105.1	108.5	21	32	47	79	SS-66	M		107.0 106.6
										GRAY, SANDY SILT
100	100.1	113.5	12	19	21	40	SS-67	M		101.9 111.7
										GREEN-GRAY, CLAYEY SAND
95	95.1	118.5	100/0.3			100/0.3	SS-68	M		97.1 116.5
										GRAY, SANDY SILT
										94.8 118.8
										Boring Terminated at Elevation 94.8 ft IN SANDY SILT

NCDOT BORE DOUBLE U2519CB_GEO_BH_RP1DB.GPJ NC_DOT.GDT 9/18/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. B-6	**STATION** 56+86	**OFFSET** CL	**ALIGNMENT** -RP1DB-	**0 HR.** 26.0
COLLAR ELEV. 214.6 ft	**TOTAL DEPTH** 120.0 ft	**NORTHING** 495,425	**EASTING** 2,007,463	**24 HR.** 26.6
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Contract Driller	**START DATE** 07/26/07	**COMP. DATE** 07/26/07	**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)
215										GROUND SURFACE	214.6	0.0
										ROADWAY EMBANKMENT RED AND BROWN, CLAYEY SAND		
210	211.1	3.5	4	5	7	12	SS-140	D				
205	206.1	8.5	4	3	6	9	SS-141	D			203.8	10.8
										TAN AND BROWN, SILTY SAND		
200	201.1	13.5	8	16	17	33	SS-142	M				
195	196.1	18.5	11	15	21	36	SS-143	M				
190	191.1	23.5	13	14	19	33	SS-144	M			188.7	25.9
										ALLUVIAL GRAY, SILTY SAND		
185	186.1	28.5	1	2	1	3	SS-145	M			183.4	31.2
										TAN, COARSE SAND AND ROUNDED PEBBLES (no sign of Bam Bam)		
180	181.1	33.5	10	19	25	44	SS-146	M			178.5	36.1
										COASTAL PLAIN TAN, COARSE SAND		
175	176.1	38.5	2	3	2	5	SS-147	M			173.6	41.0
										GRAY, SILTY CLAY		
170	171.1	43.5	6	11	19	30	SS-148	M			168.7	45.9
										TAN, CLAYEY SAND		
165	166.1	48.5	5	9	9	18	SS-149	M			163.7	50.9
										TAN AND GRAY, SANDY CLAY		
160	161.1	53.5	11	24	43	67	SS-150	M			158.5	56.1
										TAN, CLAYEY SAND		
155	156.1	58.5	6	10	15	25	SS-151	M			153.9	60.7
										GRAY, SILTY CLAY		
150	151.1	63.5	5	8	12	20	SS-152	M			148.7	65.9
										GRAY, CLAYEY SAND		
145	146.1	68.5	4	5	6	11	SS-153	M			143.4	71.2
										GRAY AND RED, SILTY CLAY		
140	141.1	73.5	4	7	9	16	SS-154	M			138.5	76.1
										GRAY, SANDY SILT		
135	136.1	78.5	13	22	34	56	SS-155	M				

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)
135						Match Line				GRAY, SANDY SILT *(continued)*	133.2	81.4
130	131.1	83.5	19	29	14	43	SS-156	M		GRAY, SILTY SAND	129.0	85.6
125	126.1	88.5	8	9	10	19	SS-157	M		GRAY, CLAYEY SAND	123.7	90.9
120	121.1	93.5	12	18	28	46	SS-158	M		GRAY AND RED, SILTY CLAY		
115	116.1	98.5	10	18	20	38	SS-159	M			113.6	101.0
110	111.1	103.5	13	21	23	44	SS-160	M		GRAY, CLAYEY SAND		
105	106.1	108.5	7	10	16	26	SS-161	M			98.5	116.1
100	101.1	113.5	15	15	20	35	SS-162	M		GRAY, SANDY CLAY	94.6	120.0
95	96.1	118.5	12	17	23	40	SS-163	M		Boring Terminated at Elevation 94.6 ft IN SANDY CLAY		

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NCDOT GEOTECHNICAL ENGINEERING UNIT
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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. B-7	**STATION** 58+53	**OFFSET** 5 ft LT	**ALIGNMENT** -RP1DB-	**0 HR.** N/A
COLLAR ELEV. 186.9 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 495,485	**EASTING** 2,007,307	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual	
DRILLER Contract Driller	**START DATE** 07/27/07	**COMP. DATE** 07/31/07	**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))
190										
	186.9	0.0	WOH	WOH	WOH	0	SS-1	W		186.9 / 0.0 GROUND SURFACE
185	183.5	3.4	4	6	4	10	SS-2	W		ALLUVIAL TAN, WHITE AND ORANGE, SILTY SAND
180	178.2	8.7	7	9	10	19	SS-3	Sat.		175.1 / 11.8
175	173.2	13.7	9	24	21	45	SS-4	M		COASTAL PLAIN GRAY, SILTY CLAY
170	168.2	18.7	7	10	12	22	SS-5	M		168.8 / 18.1
165	163.2	23.7	7	11	19	30	SS-6	M		ORANGE, CLAYEY SAND
160	158.2	28.7	7	8	10	18	SS-7	M		164.6 / 22.3
155	153.2	33.7	9	8	7	15	SS-8	M		GRAY, SILTY CLAY
150	148.2	38.7	4	6	6	12	SS-9	M		155.1 / 31.8
145	143.2	43.7	4	5	8	13	SS-10	M		GRAY, SANDY CLAY
140	138.2	48.7	100/0.4			100/0.4	SS-11	M		150.5 / 36.4
135	133.2	53.7	40	60/0.4		100/0.9	SS-12	M		GRAY, SILTY CLAY
130	128.2	58.7	13	20	25	45	SS-13	M		140.0 / 46.9
125	123.2	63.7	23	31	47	78	SS-14	M		GRAY, SILTY SAND
120	118.2	68.7	27	32	38	70	SS-15	M		130.5 / 56.4
115	113.2	73.7	16	17	27	44	SS-16	M		GRAY, SILTY CLAY
110										115.4 / 71.5 GRAY SANDY CLAY

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-				**GROUND WTR (ft)**
BORING NO. B-7	**STATION** 58+53	**OFFSET** 5 ft LT	**ALIGNMENT** -RP1DB-	**0 HR.** N/A
COLLAR ELEV. 186.9 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 495,485	**EASTING** 2,007,307	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual	
DRILLER Contract Driller	**START DATE** 07/27/07	**COMP. DATE** 07/31/07	**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))
110						Match Line				
	108.2	78.7	9	19	33	52	SS-17	M		GRAY SANDY CLAY *(continued)*
105	103.2	83.7	23	33	33	66	SS-18	M		105.5 / 81.4 GRAY, CLAYEY SAND
100	98.2	88.7	24	25	38	63	SS-19	M		100.6 / 86.3 GRAY, SILTY CLAY
95	93.2	93.7	37	63/0.4		100/0.9	SS-20	M		95.7 / 91.2 GRAY, SANDY CLAY
90	88.2	98.7	29	39	33	72	SS-21	M		90.8 / 96.1 GREEN, CLAYEY SAND
										86.7 / 100.2 Boring Terminated at Elevation 86.7 ft IN CLAYEY SAND

NCDOT BORE DOUBLE U2519CB_GEO_BH_RP1DB.GPJ NC_DOT.GDT 9/18/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-			**GROUND WTR (ft)**
BORING NO. B-8	**STATION** 60+43	**OFFSET** 17 ft RT	**ALIGNMENT** -RP1DB- — **0 HR.** 0.5
COLLAR ELEV. 194.5 ft	**TOTAL DEPTH** 100.5 ft	**NORTHING** 495,557	**EASTING** 2,007,129 — **24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual
DRILLER Contract Driller	**START DATE** 07/18/07	**COMP. DATE** 07/19/07	**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)
195										194.5	0.0
	194.5	0.0	5	6	6	12	SS-1	M		GROUND SURFACE ALLUVIAL TAN, SILTY SAND	
190	190.2	4.3	4	3	3	6	SS-2	Sat.			
185	184.9	9.6	2	4	5	9	SS-3	Sat.		184.5	10.0
										GRAY, COARSE SAND	
180	179.9	14.6	6	7	7	14	SS-4	Sat.		181.4 COASTAL PLAIN GRAY, SILTY SAND	13.1
175	174.9	19.6	6	7	10	17	SS-5	Sat.		177.1 ORANGE-TAN, SAND	17.4
170	169.9	24.6	10	16	20	16.2	SS-6	M		172.2 GRAY, SILTY CLAY	22.3
165	164.9	29.6	10	14	14	28	SS-7	M		166.9 ORANGE, CLAYEY SAND	27.6
160	159.9	34.6	15	28	37	65	SS-8	M		162.0 GRAY, SANDY CLAY	32.5
155	154.9	39.6	12	18	23	41	SS-9	M		156.8 GRAY. CLAYEY SAND	37.7
150	149.9	44.6	9	16	19	35	SS-10	M		152.2 GRAY, SANDY CLAY	42.3
145	144.9	49.6	7	12	13	25	SS-11	M		147.3 GRAY, CLAYEY SAND	47.2
140	139.9	54.6	7	11	15	26	SS-12	M		142.0 GRAY, SILTY CLAY	52.5
135	134.9	59.6	10	16	25	41	SS-13	M		137.1 GRAY, SANDY SILT	57.4
130	129.9	64.6	41	46	40	86	SS-14	M		132.2 GRAY, CLAYEY SAND	62.3
125	124.9	69.6	20	27	41	68	SS-15	M		126.3 GRAY, SILTY CLAY	68.2
120	119.9	74.6	29	37	46	83	SS-16	M		117.4 GRAY, SANDY CLAY	77.1
115											

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-			**GROUND WTR (ft)**
BORING NO. B-8	**STATION** 60+43	**OFFSET** 17 ft RT	**ALIGNMENT** -RP1DB- — **0 HR.** 0.5
COLLAR ELEV. 194.5 ft	**TOTAL DEPTH** 100.5 ft	**NORTHING** 495,557	**EASTING** 2,007,129 — **24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual
DRILLER Contract Driller	**START DATE** 07/18/07	**COMP. DATE** 07/19/07	**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)
115						Match Line				GRAY, SANDY CLAY *(continued)*	
	114.9	79.6	24	30	51	81	SS-17	M		112.5	82.0
110	109.9	84.6	23	26	59	85	SS-18	M		GREEN, CLAYEY SAND	
105	104.9	89.6	20	27	49	76	SS-19	M		107.9 GREEN, SANDY CLAY	86.6
100	99.9	94.6	12	17	14	31	SS-20	M		102.0 GREEN, CLAYEY SAND	92.5
95	94.9	99.6	30	70/0.4		100/0.9	SS-21	M		97.1 GRAY, SANDY SILT	97.4
										94.0 Boring Terminated at Elevation 94.0 ft IN SANDY SILT	100.5

NCDOT BORE DOUBLE U2519CB_GEO_BH_RP1DB.GPJ NC_DOT.GDT 9/18/13

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-			**GROUND WTR (ft)**
BORING NO. B-9	**STATION** 62+14	**OFFSET** CL	**ALIGNMENT** -RP1DB- — **0 HR.** 9.0
COLLAR ELEV. 203.0 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 495,565	**EASTING** 2,006,956 — **24 HR.** 9.0
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/05/07	**COMP. DATE** 07/06/07	**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)
205										203.0 GROUND SURFACE	0.0
										ALLUVIAL ORANGE-TAN, CLAYEY SAND	
200	199.5	3.5	4	6	6	12	SS-1	M			
195	194.5	8.5	2	2	3	5	SS-2	W		196.8	6.2
										ORANGE-TAN, COARSE SAND AND ROUNDED GRAVEL	
190	189.5	13.5	4	4	5	9	SS-3	W			
185	184.5	18.5	11	15	16	31	SS-4	W		187.3	15.7
										RED AND TAN, SILTY SAND	
180	179.5	23.5	4	6	5	11	SS-5	W		181.7	21.3
										TAN, SAND	
175	174.5	28.5	7	14	17	31	SS-6	W		176.8	26.2
										RED AND TAN, COARSE SAND	
170	169.5	33.5	5	7	11	18	SS-7	M		171.8	31.2
										GRAY-TAN, SANDY CLAY	
165	164.5	38.5	7	8	11	19	SS-8	M		166.9	36.1
										TAN, CLAYEY SAND	
160	159.5	43.5	10	15	16	31	SS-9	M		161.3	41.7
										GRAY-TAN, SANDY CLAY	
155	154.5	48.5	7	10	12	22	SS-10	M		156.7	46.3
										TAN, CLAYEY SAND	
150	149.5	53.5	9	8	9	17	SS-11	W		151.5	51.5
										GRAY, SANDY CLAY	
145	144.5	58.5	4	8	12	20	SS-12	M			
140	139.5	63.5	5	7	10	17	SS-13	M		141.3	61.7
										GRAY, SANDY SILT	
135	134.5	68.5	35	65/0.3		100/0.8	SS-14	M			
130	129.5	73.5	15	28	29	57	SS-15	M		131.8	71.2
										GRAY, CLAYEY SAND	
125										126.9	76.1
										GRAY, SILTY CLAY	

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-			**GROUND WTR (ft)**
BORING NO. B-9	**STATION** 62+14	**OFFSET** CL	**ALIGNMENT** -RP1DB- — **0 HR.** 9.0
COLLAR ELEV. 203.0 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 495,565	**EASTING** 2,006,956 — **24 HR.** 9.0
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/05/07	**COMP. DATE** 07/06/07	**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
125	124.5	78.5	11	16	21	Match Line 37	SS-16	M		GRAY, SILTY CLAY *(continued)*
120	119.5	83.5	19	28	35	63	SS-17	M		
115	114.5	88.5	19	28	34	62	SS-18	M		115.1 87.9 GRAY AND RED, SANDY CLAY
110	109.5	93.5	19	28	24	52	SS-19	M		111.8 91.2 GREEN AND GRAY, CLAYEY SAND
105	104.5	98.5	19	28	34	62	SS-20	M		103.0 100.0 Boring Terminated at Elevation 103.0 ft IN CLAYEY SAND

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION STRUCTURE NO. 13 ON -RP1DB- OVER BEAVER CREEK, -LP1D-, -Y1-, -COL1-, -L-, -COL2-, AND -LP1B-			**GROUND WTR (ft)**
BORING NO. EB2	**STATION** 63+65	**OFFSET** CL	**ALIGNMENT** -RP1DB- / **0 HR.** 23.5
COLLAR ELEV. 217.0 ft	**TOTAL DEPTH** 75.0 ft	**NORTHING** 495,570	**EASTING** 2,006,806 / **24 HR.** 25.3
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 06/11/98	**COMP. DATE** 06/11/98	**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
										217.0 GROUND SURFACE 0.0
										COASTAL PLAIN
	213.5	3.5	11	4	5	9	SS-2	M		RED-BROWN, TAN AND GRAY, SILTY SAND AND COARSE SAND WITH THIN LENSES OF GRAVEL AND QUARTZ PEBBLES 213.5 3.5
	208.5	8.5	5	7	8	15	SS-3	9% M		208.5 8.5
	203.5	13.5	3	4	4	8	SS-4	19% W		
	198.5	18.5	2	2	3	5	SS-5	16% W		
	193.5	23.5	2	3	5	8	SS-6	14% W		
	188.5	28.5	6	7	9	16	SS-7	W		188.5 28.5
	183.5	33.5	5	8	9	17	SS-8	W		
	178.5	38.5	9	2	2	4	SS-9	19% W		177.8 39.2
	173.5	43.5	1	1	1	2	SS-10	W		173.5 43.5
	168.5	48.5	11	10	8	18	SS-11	W		168.5 48.5
	163.5	53.5	5	11	18	29	SS-12	17% W		163.5 53.5
	158.5	58.5	6	7	12	19	SS-13	18% W		GRAY TO GREEN-GRAY, MOIST, MEDIUM STIFF TO HARD, SANDY AND SILTY CLAY AND LOOSE TO MEDIUM DENSE, CLAYEY SAND
	153.5	63.5	6	10	13	23	SS-14	15% W		157.6 59.4
	148.5	68.5	9	7	11	18	SS-15	12% W		153.5 63.5
	143.5	73.5	4	7	12	19	SS-16	19% W		143.5 73.5
										142.0 75.0
										Boring Terminated at Elevation 142.0 ft IN CLAYEY SAND

EB1-B

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-2	52' RT	48+10	3.5-5.0	A-2-6(0)	31	12	43.5	29.6	3.1	23.8	93	67	28	18.0	-
SS-3	52' RT	48+10	8.5-10.0	A-3(0)	22	NP	66.5	26.7	2.9	3.9	100	55	8	-	-
SS-4	52' RT	48+10	13.5-15.0	A-3(0)	25	NP	54.0	42.6	1.5	1.9	100	54	4	-	-
SS-5	52' RT	48+10	18.5-20.0	A-4(0)	24	2	16.3	54.5	12.8	16.47	98	89	36	23.9	-
SS-6	52' RT	48+10	23.5-25.0	A-3(0)	24	NP	26.9	68.9	1.1	3.1	100	92	12	-	-
SS-7	52' RT	48+10	28.5-30.0	A-1-b(0)	22	NP	75.8	16.9	4.5	2.8	99	45	8	-	-
SS-8	52' RT	48+10	33.5-35.0	A-2-4(0)	22	NP	44.2	41.4	2.9	11.5	100	81	16	24.5	-
SS-9	52' RT	48+10	38.5-40.0	A-2-4(0)	23	NP	46.0	35.8	5.5	127	95	75	20	21.9	-
SS-10	52' RT	48+10	43.5-45.0	A-2-4(0)	22	1	61.7	21.3	4.0	13.0	99	68	18	24.9	-
SS-11	52' RT	48+10	49.1-50.6	A-6(3)	29	13	11.9	43.3	8.1	36.7	100	95	48	29.1	-
SS-12	52' RT	48+10	53.5-55.0	A-1-b(0)	24	NP	86.7	8.1	2.1	3.1	100	38	6	-	-
SS-13	52' RT	48+10	58.5-60.0	A-6(14)	35	15	1.5	18.3	37.4	42.8	100	99	91	29.9	-
SS-14	52' RT	48+10	63.5-65.0	A-1-b(0)	27	NP	83.3	9.8	0.8	6.1	100	35	8	-	-
SS-15	52' RT	48+10	68.5-70.0	A-7-6(26)	51	29	4.7	13.9	15.2	66.2	100	98	84	27.0	-
SS-16	52' RT	48+10	73.5-75.0	A-2-4(0)	20	10	44.0	267	1.7	27.6	100	82	31	24.2	-
SS-17	52' RT	48+10	78.5-80.0	A-7-6(17)	51	30	23.4	15.8	7.6	53.2	100	87	63	16.8	-

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-103	CL	49+41	3.5-5.0	A-2-6(0)	34	14	50.8	24.7	2.0	22.4	91	55	25	-	-
SS-104	CL	49+41	8.5-10.0	A-2-6(1)	33	17	25.7	42.4	3.3	28.6	94	78	31	-	-
SS-105	CL	49+41	13.5-15.0	A-2-4(0)	21	NP	39.2	42.2	10.4	8.2	100	77	28	-	-
SS-106	CL	49+41	18.5-20.0	A-7-6(22)	66	41	30.2	*12.2*	*8.6*	49.0	99	78	59	-	-
SS-107	CL	49+41	23.5-25.0	A-2-4(0)	24	NP	46.8	45.1	4.0	4.1	10	70	14	-	-
SS-108	CL	49+41	28.5-30.0	A-2-4(0)	23	NP	35.5	51.8	2.4	10.2	100	81	14	-	-
SS-109	CL	49+41	33.5-35.0	A-2-4(0)	25	6	28.2	42.9	10.6	18.4	97	83	34	-	-
SS-110	CL	49+41	38.5-40.0	A-2-4(0)	22	4	63.3	19.4	5.1	12.2	99	56	19	-	-
SS-111	CL	49+41	43.5-45.0	A-2-4(0)	23	7	88.3	5.4	0.2	6.1	94	22	6	-	-
SS-112	CL	49+41	48.5-50.0	A-1-b(0)	23	NP	86.1	8.3	0.5	5.1	91	22	6	-	-
SS-113	CL	49+41	53.5-55.0	A-1-b(0)	19	NP	88.8	7.4	0.7	3.1	99	30	5	-	-
SS-114	CL	49+41	58.5-60.0	A-1-b(0)	22	NP	90.1	7.4	0.4	2.0	100	32	3	-	-
SS-115	CL	49+41	63.5-65.0	A-6(16)	39	19	2.8	14.2	57.6	25.5	100	99	86	-	-
SS-116	CL	49+41	68.5-70.0	A-2-7(1)	42	24	64.0	11.7	1.8	22.4	93	46	24	-	-
SS-117	CL	49+41	73.5-75.0	A-7-6(21)	57	37	28.6	8.6	3.7	59.2	100	84	64	-	-
SS-118	CL	49+41	78.5-80.0	A-2-7(2)	48	31	68.6	7.4	0.5	23.5	99	67	25	-	-
SS-119	CL	49+41	83.5-85.0	A-6(10)	33	17	11.0	23.5	24.7	*100.0*	100	95	71	-	-

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-86	CL	50+98	3.5-5.0	A-2-6(0)	34	13	40.9	31.5	0.9	26.6	98	77	28	-	-
SS-87	CL	50+98	8.5-10.0	A-2-4(0)	24	8	48.6	34.2	1.8	15.4	100	83	20	-	-
SS-88	CL	50+98	13.5-15.0	A-2-4(0)	19	NP	63.1	28.7	0.1	8.2	100	64	11	-	-
SS-89	CL	50+98	18.5-20.0	A-2-4(0)	29	NP	22.7	*69.4*	*1.7*	6.1	100	90	17	-	-
SS-90	CL	50+98	23.5-25.0	A-2-4(0)	23	NP	42.4	46.8	0.6	10.2	99	77	22	-	-
SS-91	CL	50+98	28.5-30.0	A-6(10)	36	15	3.7	39.9	23.6	32.8	100	98	72	.	.
SS-92	CL	50+98	33.5-35.0	A.1-b(0)	23	3	73.8	18.3	0.7	7.2	95	32	8	-	-
SS-93	CL	50+98	38.5-40.0	A-2.4(0)	25	10	36.2	36.2	5.0	22.5	90	65	27	-	-
SS-94	CL	50+98	43.5-45.0	A-1-b(0)	18	3	7&9	11.8	2.0	10.2	94	36	13	-	-
SS-95	CL	50+98	48.5-50.0	A-2-6(1)	36	19	58.8	13.5	9.3	18.4	71	34	22	-	-
SS-96	CL	50+98	53.5-55.0	A-1-b(0)	19	NP	94.6	3.2	0.2	2.0	96	10	2	-	-
SS-97	CL	50+98	58.5-60.0	A-7-6(6)	45	25	41.1	17.4	4.6	36.8	99	75	43	-	-
SS-98	CL	50+98	63.5-65.0	A-7-6(29)	54	33	8.8	11.5	18.3	61.4	100	95	83	.	.
SS-99	CL	50+98	68.5-70.0	A-6(5)	40	22	40.3	18.0	1.7	39.9	100	77	4.3	-	-
SS-100	CL	50+98	73.5-75.0	A-2-6(0)	32	17	65.8	11.9	1.8	20.5	97	65	22	-	-
SS-101	CL	50+98	78.5-80.0	A-6(3)	36	22	49.5	16.5	7.4	26.6	100	72	36	-	-
SS-102	CL	50+98	83.5-85.0	A-2-7(1)	42	25	63.5	13.4	6.8	*16.4*	97	53	23	-	-

B3

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-69	CL	52+56	3.5-5.0	A-2-4(0)	16	NP	51.5	35.2	5.1	8.2	98	63	17	-	-
SS-70	CL	52+56	8.5-10.0	A-2-4(0)	31	9	33.3	42.1	3.2	21.5	98	77	30	-	-
SS-71	CL	52+56	13.5-15.0	A-2-4(0)	28	6	51.0	32.3	3.4	13.3	93	67	18	-	-
SS-72	CL	52+56	18.5-20.0	A-2-4(0)	24	8	66.5	16.5	2.7	14.3	95	59	17	-	-
SS-73	CL	52+56	23.5-25.0	A-2-4(0)	27	9	85.5	6.0	0.3	8.2	95	26	8	-	-
SS-74	CL	52+56	28.5-30.0	A-2-4(0)	22	3	47	35.7	0.1	17.4	100	77	18	.	.
SS-75	CL	52+56	33.5-35.0	A-1-b(0)	18	2	79.2	12.6	1.0	7.2	89	30	8	-	-
SS-76	CL	52+56	38.5-40.0	47-6(19)	45	24	8.0	16.2	12.4	63.5	100	95	79	-	-
SS-77	CL	52+56	43.5-45.0	A-7-6(13)	46	26	25.6	16.0	15.5	43.0	98	81	61	-	-
SS-78	CL	52+56	48.5-50.0	A-2-6(2)	40	23	52.0	18.0	1.3	28.7	97	65	30	-	-
SS-79	CL	52+56	53.5-55.0	#2-6(1)	28	13	45.2	21.9	12.4	20.5	100	78	35	-	-
SS-80	CL	52+56	58.5-60.0	A-2-6(0)	28	13	61.0	18.3	0.2	20.5	97	63	21	-	-
SS-81	CL	52+56	63.5-65.0	46(14)	38	21	13.5	16.8	18.5	51.2	100	91	74	.	.
SS-82	CL	52+56	68.5-70.0	A-7-6(6)	47	30	46.7	17.2	12.6	23.5	99	67	40	-	-
SS-83	CL	52+56	73.5-75.0	A-7-6(46)	71	44	2.9	9.6	26.1	61.4	100	99	92	-	-
SS-84	CL	52+56	78.5-79.3	A-6(5)	31	18	32.3	26.2	18.9	22.5	99	74	48	-	-
SS-85	CL	52+56	83.5-84.4	A-1-b(0)	21	4	66.1	22.1	3.6	8.2	97	48	14	-	-

B4

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-21	26' LT	54+07	3.5-5.0	A-2-6(0)	33	13	48.6	23.7	3.4	24.3	94	64	29	-	-
SS-22	26' LT	54+07	8.4-9.9	A-2-6(1)	34	15	42.5	28.3	4.9	24.3	95	69	31	-	-
SS-23	26' LT	54+07	13.5-15.0	A-2-6(0)	28	13	4.3.9	30.0	3.8	22.3	93	69	28	-	-
SS-24	26' LT	54+07	18.5-20.0	A-7-6(3)	41	18	39.3	24.5	7.9	28.3	100	74	39	-	-
SS-25	26' LT	54+07	23.5-25.0	A-2-6(0)	32	12	81.6	5.7	0.6	12.1	91	24	12	-	-
SS-26	26' LT	54+07	28.5-30.0	A-2-4(0)	27	6	27.9	49.2	0.6	22.3	100	91	23	-	-
SS-27	26' LT	54+07	33.5-35.0	A-1-b(0)	21	3	17.1	12.1	0.6	10.1	90	32	11	-	-
SS-28	26' LT	54+07	38.5-40.0	A-1-b(0)	22	3	89.7	6.1	0.2	4.0	91	11	4	-	-
SS-29	26' LT	54+07	43.5-45.5	A-1-b(0)	18	3	14.1	12.6	1.2	12.1	98	48	16	-	-
SS-30	26' LT	54+07	48.5-50.0	A-2-4(0)	27	9	45.5	27.7	2.4	24.3	99	75	28	-	-
SS-31	26' LT	54+07	53.5-55.0	A-7-6(11)	43	25	26.7	18.6	8.0	46.6	99	84	57	-	-
SS-32	26' LT	54+07	58.5-60.0	A-2-7(2)	41	24	55.0	15.2	0.4	29.4	96	60	30	-	-
SS-33	26' LT	54+07	65.4-66.9	A-7-6(14)	43	27	27.0	12.6	9.8	50.7	100	81	63	-	-
SS-34	26' LT	54+07	68.5-70.0	A-6(3)	33	19	44.8	20.0	7.9	27.4	99	72	38	-	-
SS-35	26' LT	54+07	73.5-75.0	A-2-6(1)	40	23	60.2	16.2	4.4	19.3	98	63	24	-	-
SS-36	26' LT	54+07	78.5-79.2	A-6(4)	31	15	33.0	23.3	19.4	24.3	100	78	50	-	-
SS-37	26' LT	54+07	83.5-84.4	A-2-4(0)	22	5	29.0	46.8	12.1	12.2	100	84	32	-	-
SS-38	26' LT	54+07	88.5-90.0	A-7-6(17)	49	25	13.0	23.1	214.0	42.6	100	93	70	-	-
SS-39	26' LT	54+07	93.5-95.0	A-7-5(23)	54	24	6.7	14.2	42.7	36.5	100	96	84	-	-
SS-40	26' LT	54+07	98.5-100.0	A-7-6(21)	50	25	9.7	15.0	34.8	40.5	100	94	79	-	-
SS-41	26' LT	54+07	103.5-105.0	A-6(3)	37	19	40.5	24.1	19.1	16.2	99	76	38	-	-
SS-42	26' LT	54+07	108.5-109.0	A-7-6(6)	41	14	15.8	35.7	30.3	18.2	99	93	56	-	-
SS-43	26' LT	54+07	113.5-115.0	A-6(2)	37	17	28.2	38.7	21.0	12.2	99	85	38	-	-
SS-44	26' LT	54+07	118.5-120.0	A-4(l)	23	9	25.1	34.4	22.2	18.2	100	87	47	-	-

B5

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-45	CL	55+71	3.5-5.0	A-7-6(3)	43	21	35.1	31.0	5.6	28.4	98	78	38	-	-
SS-46	CL	55+71	8.5-10.0	A-2-4(0)	25	9	52.1	24.7	2.9	20.3	97	66	25	-	-
SS-47	CL	55+71	13.5-15.0	A-2-6(0)	32	14	56.7	21.7	1.3	20.3	94	63	22	-	-
SS-48	CL	55+71	18.5-20.0	A-2-4(0)	21	3	63.6	21.9	1.3	13.2	97	60	16	-	-
SS-49	CL	55+71	23.5-25.0	A-1-b(0)	17	NP	63.8	24.5	3.5	81.0	91	49	13	-	-
SS-50	CL	55+71	28.5-30.0	A-4(0)	21	4	8.3	53.1	14.3	24.3	100	98	51	-	-
SS-51	CL	55+71	33.5-35.0	A-3(0)	22	NP	70.1	21.7	1.1	1.1	97	55	9	-	-
SS-52	CL	55+71	38.5-40.0	A-1-b(O)	23	NP	90.6	3.3	0.0	6.1	100	23	6	-	-
SS-53	CL	55+71	43.5-45.0	A-6(6)	31	16	10.1	40.9	14.5	34.4	100	95	55	-	-
SS-54	CL	55+71	48.5-50.0	A-2-6(1)	30	15	45.4	23.5	1.7	29.4	99	86	32	-	-
SS-55	CL	55+71	53.5-55.0	A-6(4)	30	17	37.1	19.0	11.4	32.4	100	78	48	-	-
SS-56	CL	55+71	58.5-60.0	A-2-6(2)	35	22	50.4	18.8	0.4	30.4	97	68	31	-	-
SS-57	CL	55+71	63.5-65.0	A-2-6(1)	31	15	61.4	11.6	4.8	22.3	99	60	26	-	-
SS-58	CL	55+71	68.5-70.0	A-6(1)	28	14	24.0	42.2	8.4	25.3	99	91	36	-	-
SS-59	CL	55+71	73.5-75.0	A-7-6(26)	53	36	12.8	15.8	20.8	50.7	100	93	74	-	-
SS-60	CL	55+71	78.5-80.0	A-4(0)	20	7	22.9	48.6	18.3	10.1	100	90	36	-	-
SS-61	CL	55+71	83.5-85.0	A-7-6(26)	54	36	4.3	30.6	30.7	34.4	100	97	74	-	-
SS-62	CL	55+71	88.5-90.0	A-6(11)	35	21	16.8	22.5	26.2	34.4	100	91	67	-	-
SS-63	CL	55+71	93.5-95.0	A-7-6(4)	42	19	43.0	16.4	18.3	22.3	98	70	42	-	-
SS-64	CL	55+71	98.5-100.0	A-7-6(16)	46	26	13.8	25.7	34.1	26.3	100	92	65	-	-
SS-65	CL	55+71	103.5-105.0	A-2-7(1)	48	22	62.2	10.7	13.9	13.2	95	49	27	-	-
SS-66	CL	55+71	108.5-110.0	A-4(0)	32	10	45.6	20.6	19.7	14.2	98	68	37	-	-
SS-67	CL	55+71	113.5-115.0	A-2-6(0)	39	17	62.1	27.1	6.7	4.1	96	59	14	-	-
SS-68	CL	55+71	118.5-118.8	A-4(0)	23	8	39.9	27.4	22.4	10.2	100	76	37	-	-

B6

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-140	CL	56+86	3.5-5.0	A-2-6(0)	28	12	43.1	30.6	4.9	21.4	96	70	29	-	-
SS-141	CL	56+86	8.5-10.0	A-2-6(1)	38	18	40.0	27.3	4.1	28.6	89	64	33	-	-
SS-142	CL	56+86	13.5-15.0	A-2-4(0)	27	8	68.3	16.6	2.9	12.2	99	55	16	-	-
SS-143	CL	56+86	18.5-20.0	A-2.4(0)	17	NP	59.8	28.1	4.0	8.2	99	64	15	-	-
SS-144	CL	56+86	23.6-25.1	A-2-4(0)	20	NP	66.9	19.0	1.8	12.2	99	55	15	-	-
SS-145	CL	56+86	28.5-30.0	A-2-4(0)	25	10	59.9	18.3	4.5	17.3	100	60	25	-	-
SS-146	CL	56+86	33.5-35.0	A-1-b(0)	18	NP	71.6	22.2	2.0	4.1	79	38	6	-	-
SS-147	CL	56+86	38.5-40.0	A-1-b(0)	17	NP	85.9	5.6	1.3	7.1	86	29	8	-	-
SS-148	CL	56+86	43.5-45.0	A-7-6(20)	42	25	2.0	21.2	25.7	51.0	100	99	83	-	-
SS-149	CL	56+86	48.5-50.0	A-2-6(1)	39	22	53.4	18.8	2.4	25.3	93	61	27	-	-
SS-150	CL	56+86	53.5-55.0	A-6(9)	37	21	28.2	14.7	14.3	42.9	100	81	59	-	-
SS-151	CL	56+86	58.5-60.0	A-2-7(3)	43	26	50.6	13.3	0.4	35.7	96	64	35	-	-
SS-152	CL	56+86	63.5-65.0	A-7-6(28)	51	27	2.7	5.3	28.8	63.3	100	99	94	-	-
SS-153	CL	56+86	68.5-70.0	A-2-6(1)	37	24	68.0	10.3	1.3	20.4	95	46	22	-	-
SS-154	CL	56+86	73.5-75.0	A-7-6(23)	51	38	16.1	18.2	16.7	49.0	98	90	61	-	-
SS-155	CL	56+86	78.5-80.0	A-4(0)	17	1	30.1	40.8	17.9	11.2	99	82	37	-	-
SS-156	CL	56+86	83.5-85.0	A-2-4(0)	20	4	34.6	39.1	19.2	7.0	99	80	34	-	-
SS-157	CL	56+86	88.5-90.0	A-2-6(0)	34	15	58.6	27.4	9.0	5.0	99	60	16	-	-
SS-158	CL	56+86	93.5-95.0	A-7-6(22)	52	25	5.2	20.3	50.3	24.2	100	97	81	-	-
SS-159	CL	56+86	98.5-100.0	A-7-6(4)	41	19	38.9	20.1	28.9	12.1	91	72	44	-	-
SS-160	CL	56+86	103.5-105.0	A-2-7(0)	42	11	63.3	16.4	11.2	9.1	95	51	22	-	-
SS-161	CL	56+86	108.5-110.0	A-2-6(1)	31	15	40.6	29.9	22.5	7.0	100	81	35	-	-
SS-162	CL	56+86	113.5-115.0	A-2-6(1)	35	19	60.8	20.0	12.1	7.0	96	54	21	-	-
SS-163	CL	56+86	118.5-120.0	A-6(1)	27	11	25.2	40.5	28.3	6.0	100	87	43	-	-

B7

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	5' LT	58+53	0.0-1.5	NOT ENOUGH MATERIAL TO TEST										-	17.9
SS-2	5' LT	58+53	3.4-4.9	A-2-4(0)	20	1	43.1	39.9	7.9	9.1	97	74	21	-	-
SS-3	5' LT	58+53	8.7-10.2	A-2-4(0)	16	NP	23.1	63.3	7.5	6.1	96	89	19	-	-
SS-4	5' LT	58+53	13.7-15.2	A-7-6(14)	42	21	9.7	20.3	13.3	56.7	100	95	72	-	-
SS-5	5' LT	58+53	18.7-20.2	A-2-6(2)	38	23	57.5	12.6	3.5	26.3	95	61	29	-	-
SS-6	5' LT	58+53	23.7-25.2	A-7-6(23)	45	24	3.7	10.5	22.9	62.9	100	98	90	-	-
SS-7	5' LT	58+53	25.4-26.9	A-7-6(16)	43	23	19.0	9.9	14.3	56.7	100	89	73	-	-
SS-8	5' LT	58+53	33.7-35.2	A.6(9)	40	22	35.3	10.5	13.7	40.5	98	69	56	-	-
SS-9	5' LT	58+53	38.7-40.2	A-7-6(7)	44	25	41.5	14.0	8.0	36.5	100	72	46	-	-
SS-10	5' LT	58+53	43.7-45.2	A-7-6(30)	59	42	10.5	18.2	18.5	52.7	100	95	74	-	-
SS-11	5' LT	58+53	48.7-49.1	A-2-4(0)	24	4	46.6	28.4	16.9	8.1	100	67	30	-	-
SS-12	5' LT	58+53	53.7-54.6	A-2-4(0)	23	7	35.8	40.4	11.8	12.1	100	82	28	-	-
SS-13	5' LT	58+53	58.7-60.2	A-7-6(14)	41	25	13.7	26.3	1.7	58.3	100	92	67		
SS-14	5' LT	58+53	63.7-65.2	A-7-6(23)	45	26	3.8	14.3	41.7	40.2	100	98	87	-	-
SS-15	5' LT	58+53	68.7-70.2	A-7-6(11)	45	20	18.5	20.3	23.0	38.2	99	86	64	-	-
SS-16	5' LT	58+53	73.7-75.2	A-6(3)	34	16	36.1	25.8	24.0	14.1	99	78	42	-	-
SS-17	5' LT	58+53	78.7-80.2	A-6(2)	33	15	48.0	15.1	12.8	24.1	98	66	38	-	-
SS-18	5' LT	58+53	83.7-85.2	A-2-6(0)	32	13	60.5	18.7	4.7	16.1	99	67	21	-	-
SS-19	5' LT	58+53	88.7-90.2	A-7-5(16)	52	19	7.6	16.1	54.2	22.1	100	96	81	-	-
SS-20	5' LT	58+53	93.7-95.2	A-6(9)	35	20	25.5	19.3	39.1	16.1	100	85	60	-	-
SS-21	5' LT	58+53	98.7-100.2	A-2-6(1)	34	14	33.5	38.1	19.4	9.0	100	88	33	-	-

B8

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	5' LT	58+53	0.0-1.5	A-2-4(0)	17	NP	45.2	36.4	6.3	12.1	100	75	25	-	-
SS-2	5' LT	58+53	3.4-4.9	A-2-4(0)	18	NP	55.9	35.0	3.1	6.0	90	55	12	-	-
SS-3	5' LT	58+53	8.7-10.2	A-1-b(0)	17	NP	62.3	25.0	4.6	8.0	93	48	15	-	-
SS-4	5' LT	58+53	13.7-15.2	A-2-4(0)	20	NP	36.0	48.1	5.8	10.1	99	82	20	-	-
SS-5	5' LT	58+53	18.7-20.2	A-3(0)	24	NP	66.2	31.0	0.8	2.0	96	59	4	-	-
SS-6	5' LT	58+53	23.7-25.2	A-7-6(19)	50	31	9.8	25.9	9.9	54.3	100	94	67	-	-
SS-7	5' LT	58+53	25.4-26.9	A-2-7(3)	49	34	60.7	11.0	4.2	24.1	93	4.5	27	-	-
SS-8	5' LT	58+53	33.7-35.2	A-6(13)	38	24	203	16.5	19.0	44.2	100	88	67	-	-
SS-9	5' LT	58+53	38.7-40.2	A-2-6(1)	31	16	55.6	13.6	1.7	29.1	97	62	31	-	-
SS-10	5' LT	58+53	43.7-45.2	A-6(12)	38	20	15.5	17.7	22.6	44.2	100	91	70	-	-
SS-11	5' LT	58+53	48.7-49.1	A-2-6(1)	33	18	57.4	15.2	4.1	23.3	99	63	28	-	-
SS-12	5' LT	58+53	53.7-54.6	A-7-6(38)	60	46	6.3	14.4	18.5	60.8	100	91	82	-	-
SS-13	5' LT	58+53	58.7-60.2	A-4(0)	20	8	25.5	41.3	16.9	18.2	100	86	39	-	-
SS-14	5' LT	58+53	63.7-65.2	A-2-7(1)	42	25	60.8	15.1	8.9	15.2	84	44	22	-	-
SS-15	5' LT	58+53	68.7-70.2	A-7-6(17)	51	26	12.4	25.9	29.3	32.4	100	93	68	-	-
SS-16	5' LT	58+53	73.7-75.2	A-7-8(11)	44	23	1.6	45.8	30.2	22.3	100	99	58	-	-
SS-17	5' LT	58+53	78.7-80.2	A-6(5)	38	13	22.9	30.6	34.3	12.2	100	88	53	-	-
SS-18	5' LT	58+53	83.7-85.2	A-2-6(0)	30	13	45.0	31.8	14.1	9.1	96	72	25	-	-
SS-19	5' LT	58+53	88.7-90.2	A.6(2)	40	13	31.0	36.3	26.6	6.1	100	82	40	-	-
SS-20	5' LT	58+53	93.7-95.2	A-2-6(1)	38	22	67.4	13.6	10.9	8.1	97	49	20	-	-
SS-21	5' LT	58+53	98.7-100.2	A.4(0)	21	7	33.8	31.2	28.9	6.1	100	80	40	-	-

EB2

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-2	CL	63+65	3.5-5.0	A-1-b(0)	20	NP	86.3	7.1	4.9	1.7	98	26	7	-	-
SS-3	CL	63+65	8.5-10.0	A-2-4(0)	24	2	58.2	24.1	8.2	9.5	98	61	27	9.4	-
SS-4	CL	63+65	13.5-15.0	A-2-4(0)	24	NP	23.8	66.1	2.3	1.8	100	92	12	19.0	-
SS-5	CL	63+65	18.5-20.0	A-2-4(0)	22	3	65.9	16.0	7.7	10.4	96	53	20	16.1	-
SS-6	CL	63+65	23.5-25.0	42-4(0)	24	4	64.1	17.3	8.8	9.8	97	54	21	14.3	-
SS-7	CL	63+65	28.5-30.0	A-1-b(0)	19	NP	88.6	6.6	2.8	2.0	96	23	6	-	-
SS-8	CL	63+65	33.5-35.0	A-1-b(0)	23	NP	85.0	8.0	1.6	5.4	83	18	6	-	-
SS-9	CL	63+65	39.2-40.7	A-2-4(0)	21	NP	5.9	81.4	1.1	11.6	100	99	14	16.9	-
SS-10	CL	63+65	43.5-45.0	A-3(0)	23	NP	69.0	25.2	3.8	2.0	99	66	6	-	-
SS-11	CL	63+65	48.5-50.0	A-1-b(0)	25	NP	89.1	5.8	3.1	2.0	99	21	6	-	-
SS-12	CL	63+65	53.5-55.0	A-2-7(3)	4.3	23	50.4	14.2	1.2	34.2	98	66	35	16.6	-
SS-13	CL	63+65	59.4-60.9	A-7-6(23)	47	25	4.7	10.2	22.8	62.3	100	97	88	17.9	-
SS-14	CL	63+65	63.5-65.0	A-6(3)	36	20	53.9	9.5	4.3	32.3	100	73	38	14.6	-
SS-15	CL	63+65	68.5-70.0	A-6(2)	31	18	32.5	30.9	10.4	26.2	100	83	39	12.4	-
SS-16	CL	63+65	73.5-75.0	A-2-6(0)	36	19	68.2	9.9	3.4	18.5	98	54	22	18.7	-

B9

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	CL	62+14	3.5-5.0	A-2-6(0)	30	13	52.6	37.7	1.6	8.1	71	43	19	-	-
SS-2	CL	62+14	8.5-10.0	A-1-b(0)	24	5	81.0	8.7	4.3	6.1	90	28	10	-	-
SS-3	CL	62+14	13.5-15.0	A-1-b(0)	19	NP	82.4	12.8	0.8	4.0	94	30	5	-	-
SS-4	CL	62+14	18.5-20.0	A-2-4(0)	18	NP	76.1	13.2	0.6	10.1	100	57	11	-	-
SS-5	CL	62+14	23.5-25.0	A-3(a)	18	NP	71.5	19.4	1.0	8.1	97	57	9	-	-
SS-6	CL	62+14	28.5-30.0	A-1-b(0)	18	NP	87.2	8.5	0.2	4.0	100	36	5	-	-
SS-7	CL	62+14	33.5-35.0	A-6(1)	30	14	30.0	32.6	3.0	34.4	100	84	38	-	-
SS-8	CL	62+14	38.5-40.0	A-2-6(1)	38	22	60.3	12.1	3.2	24.3	90	51	25	-	-
SS-9	CL	62+14	43.5-45.0	A-6(11)	35	19	21.7	14.2	19.6	44.5	100	87	68	-	-
SS-10	CL	62+14	48.5-50.0	A-2-6(1)	34	15	53.6	19.2	0.8	26.3	98	65	27	-	-
SS-11	CL	62+14	53.5-55.0	A-6(7)	31	20	28.1	22.9	12.6	36.4	100	86	53	-	-
SS-12	CL	62+14	58.5-60.0	A-B(S)	38	23	37.2	24.3	24.3	14.2	100	79	43	-	-
SS-13	CL	62+14	63.5-65.0	A-7-6(28)	55	37	8.7	19.6	19.0	52.6	100	95	77	-	-
SS-14	CL	62+14	68.5-69.3	A-4(0)	17	NP	20.9	48.4	20.6	10.1	100	88	41	-	-
SS-15	CL	62+14	73.5-75.0	A-2-7(O)	44	23	77.3	6.3	2.2	12.1	94	33	14	-	-
SS-16	CL	62+14	78.5-80.0	A-7-6(25)	52	29	5.1	20.9	45.7	28.3	100	97	81	-	-
SS-17	CL	62+14	83.5-85.0	A-7-6(22)	54	26	10.1	15.4	48.2	28.3	100	94	79	-	-
SS-18	CL	62+14	88.5-90.0	A-6(2)	37	14	31.6	35.8	24.5	8.1	100	82	39	-	-
SS-19	CL	62+14	93.5-95.0	A-2-6(1)	38	14	56.1	17.4	20.4	6.1	100	64	31	-	-
SS-20	CL	62+14	98.5-100.0	A-2-6(0)	38	13	52.8	28.5	12.6	6.1	100	65	23	-	-

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519CB)	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34817.1.2 (U-2519CB)* F.A. PROJ. *DPR-0100(001)*

COUNTY *CUMBERLAND*

PROJECT DESCRIPTION *FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO WEST OF NC 24 (BRAGG BOULEVARD)*

SITE DESCRIPTION *STRUCTURE NO. 14 ON -COLI- OVER BEAVER CREEK AND -YI- (ALL AMERICAN FREEWAY)*

ID: U-2519CB

PROJECT: 34817.1.2

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2	LEGEND
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4	PROFILE(S)
5-11	BORE LOG & CORE REPORT(S)
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MACTEC PERSONNEL

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INVESTIGATED BY *N. D. MOHS*

CHECKED BY *N. T. ROBERSON*

SUBMITTED BY *N. T. ROBERSON*

DATE *SEPTEMBER 2013*

NORTH CAROLINA LICENSED SEAL 2124 GEOLOGIST NATHAN DANIEL MOHS 9/6/13

DRAWN BY: *N.D. MOHS, W.D. FIELDS*

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PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519CB)	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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MN	11 MX	11 MN	10 MX	10 MN	11 MX	11 MN			
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 A 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	
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	N/A
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	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		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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, CPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45B
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] CME-850
- [ ] _____

ADVANCING TOOLS:
- [X] 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
- [ ] _____

HAMMER TYPE:
[X] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. 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 SL.)	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 (SL.)	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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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: BL-14: N:2007537.8 E: 495615.4

ELEVATION: 212.54 FT.

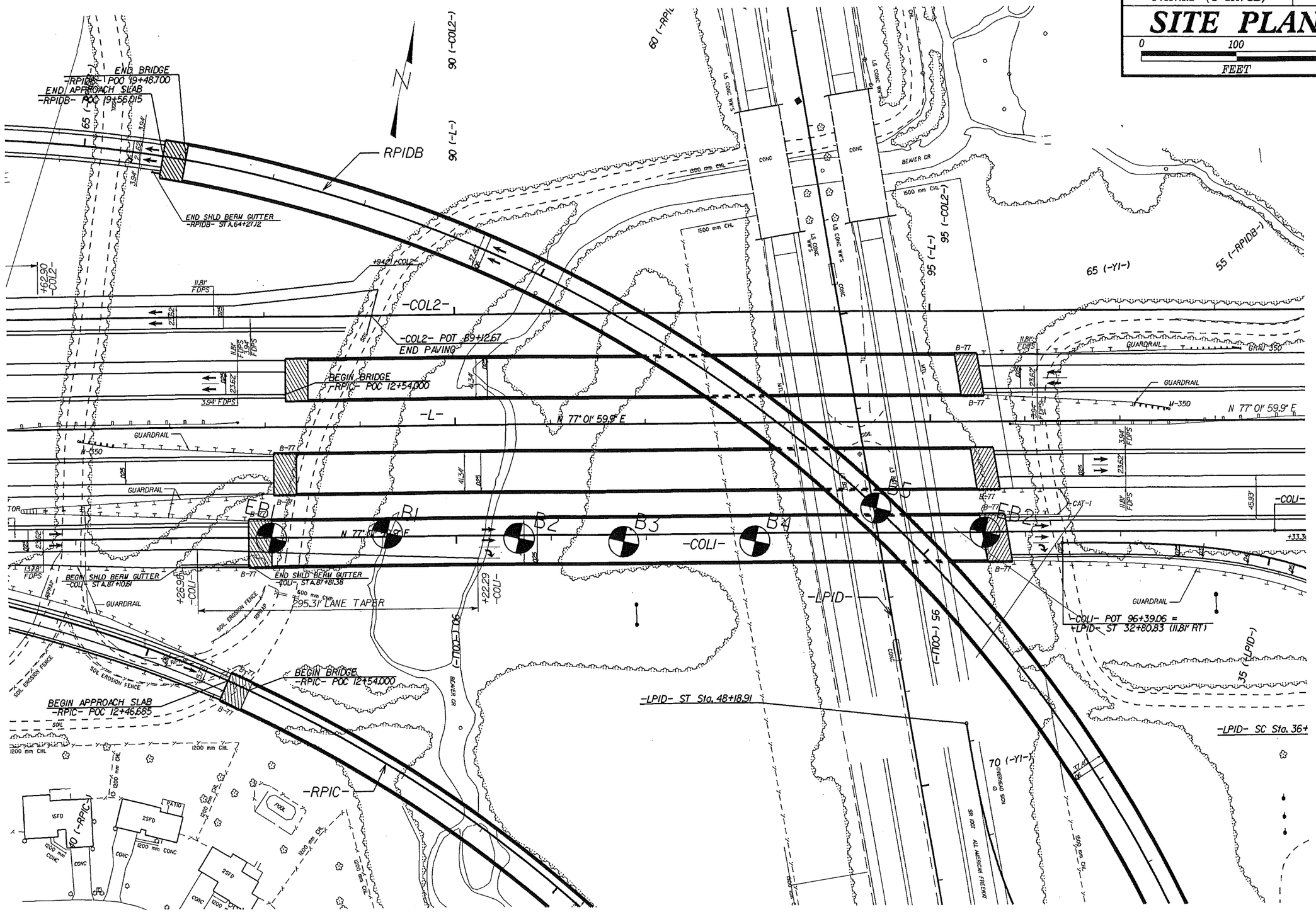
NOTES:

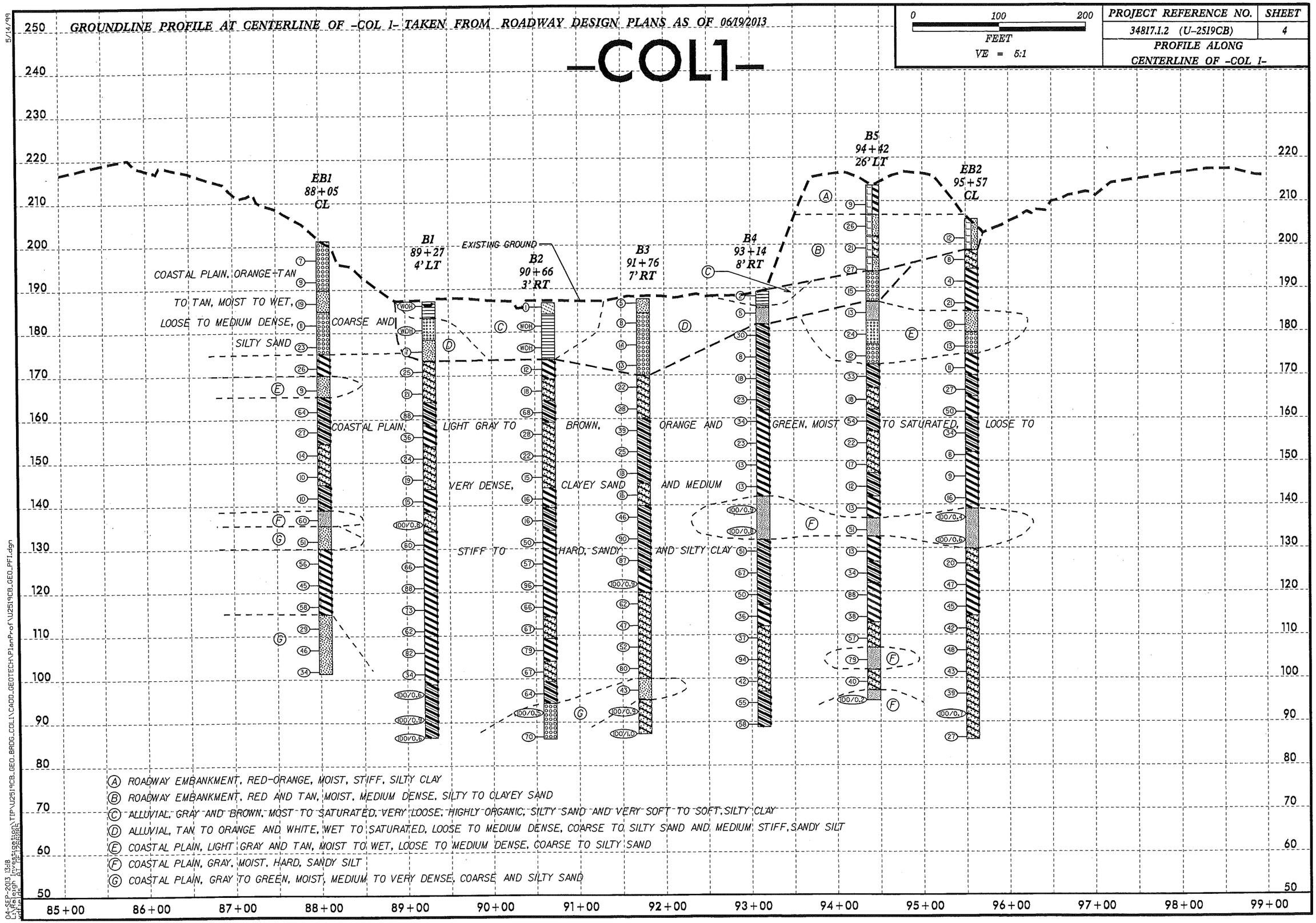
REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519CB)	3

SITE PLAN

0 100 200
FEET




GROUNDLINE PROFILE AT CENTERLINE OF -COL 1- TAKEN FROM ROADWAY DESIGN PLANS AS OF 06/19/2013
-COL1-
0 100 200
FEET
VE = 5:1
PROJECT REFERENCE NO.
34817.1.2 (U-2519CB)
SHEET
4
PROFILE ALONG
CENTERLINE OF -COL 1-
EB1
88+05
CL
B1
89+27
4' LT
EXISTING GROUND
B2
90+66
3' RT
B3
91+76
7' RT
B4
93+14
8' RT
B5
94+42
26' LT
EB2
95+57
CL
COASTAL PLAIN, ORANGE-TAN
TO TAN, MOIST TO WET,
LOOSE TO MEDIUM DENSE, COARSE AND
SILTY SAND
COASTAL PLAIN, LIGHT GRAY TO BROWN, ORANGE AND GREEN, MOIST TO SATURATED, LOOSE TO
VERY DENSE, CLAYEY SAND AND MEDIUM
STIFF TO HARD, SANDY AND SILTY CLAY
Ⓐ ROADWAY EMBANKMENT, RED-ORANGE, MOIST, STIFF, SILTY CLAY
Ⓑ ROADWAY EMBANKMENT, RED AND TAN, MOIST, MEDIUM DENSE, SILTY TO CLAYEY SAND
Ⓒ ALLUVIAL, GRAY AND BROWN, MOST TO SATURATED, VERY LOOSE, HIGHLY ORGANIC, SILTY SAND AND VERY SOFT TO SOFT, SILTY CLAY
Ⓓ ALLUVIAL, TAN TO ORANGE AND WHITE, WET TO SATURATED, LOOSE TO MEDIUM DENSE, COARSE TO SILTY SAND AND MEDIUM STIFF, SANDY SILT
Ⓔ COASTAL PLAIN, LIGHT GRAY AND TAN, MOIST TO WET, LOOSE TO MEDIUM DENSE, COARSE TO SILTY SAND
Ⓕ COASTAL PLAIN, GRAY, MOIST, HARD, SANDY SILT
Ⓖ COASTAL PLAIN, GRAY TO GREEN, MOIST, MEDIUM TO VERY DENSE, COARSE AND SILTY SAND
85+00 86+00 87+00 88+00 89+00 90+00 91+00 92+00 93+00 94+00 95+00 96+00 97+00 98+00 99+00

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. EB1	**STATION** 88+05	**OFFSET** CL	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 201.3 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 495,203	**EASTING** 2,006,954	**24 HR.** 10.5
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/09/07	**COMP. DATE** 07/10/07	**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
205										201.3 GROUND SURFACE 0.0
200	197.8	3.5	5	4	3	7				**COASTAL PLAIN** Orange-Tan, Coarse Sand
195	192.8	8.5	3	4	5	9	SS-1	M		
190	187.8	13.5	8	11	8	19	SS-3	W		189.8 11.5 Tan, Silty Sand
185	182.8	18.5	5	5	6	11	SS-4	W		184.9 16.4 Tan, Coarse Sand
180	177.8	23.5	7	10	13	23		W		
175	172.8	28.5	5	11	15	26	SS-6	M		175.1 26.2 Tan, Silty Clay
170	167.8	33.5	4	4	5	9	SS-7	M		170.1 31.2 Tan, Silty Sand
165	162.8	38.5	11	23	41	64	SS-8	M		165.2 36.1 Tan-Gray, Sandy Clay
160	158.1	43.2	7	9	18	27		M		
155	152.8	48.5	5	7	7	14	SS-10	W		154.4 46.9 Gray, Clayey Sand
150	147.8	53.5	3	4	6	10	SS-11	M		
145	142.8	58.5	3	4	6	10	SS-12	M		144.9 56.4 Gray, Sandy Clay
140	137.8	63.5	10	20	40	60	SS-13	M		139.0 62.3 Gray, Sandy Silt
135	132.8	68.5	17	22	29	51	SS-14	W		135.4 65.9 Gray, Silty Sand
130	127.8	73.5	13	24	32	56	SS-15	M		130.1 71.2 Gray and Red-Tan, Silty Clay
125										

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. EB1	**STATION** 88+05	**OFFSET** CL	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 201.3 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 495,203	**EASTING** 2,006,954	**24 HR.** 10.5
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/09/07	**COMP. DATE** 07/10/07	**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
125						Match Line				Gray and Red-Tan, Silty Clay *(continued)*
120	122.8	78.5	16	20	25	45		M		
115	117.8	83.5	14	23	35	58		M		115.0 86.3 Green-Gray, Silty Sand
110	112.8	88.5	8	11	18	29	SS-18	M		
105	107.8	93.5	18	20	26	46		M		
	102.8	98.5	11	13	21	34		M		101.3 100.0 Boring Terminated at Elevation 101.3 ft in Silty Sand

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. B1	**STATION** 89+27	**OFFSET** 4 ft LT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 187.2 ft	**TOTAL DEPTH** 100.7 ft	**NORTHING** 495,234	**EASTING** 2,007,072	**24 HR.** 1.3
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
DRILLER Contract Driller	**START DATE** 07/24/07	**COMP. DATE** 07/24/07	**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)
190												
	187.2	0.0	WOH	WOH	WOH	0	SS-70	Sat.		GROUND SURFACE	187.2	0.0
185										**ALLUVIAL** Gray, Highly Organic, Silty Clay		
	183.3	3.9								Brown, Organic, Fine Sand	183.3	3.9
180	181.5	5.7	1	1	WOH	1	SS-71	Sat.				
	178.3	8.9								Tan, Silty Sand	178.3	8.9
175	176.6	10.6	4	4	3	7	SS-72	Sat.				
	173.4	13.8								**COASTAL PLAIN** Light Gray, Clayey Sand	173.4	13.8
170	171.9	15.3	6	11	14	25	SS-73	M				
	166.9	20.3	6	10	11	21		M				
165	163.9	23.3								Gray, Sandy Clay	163.9	23.3
	161.9	25.3	21	31	57	88	SS-75	M				
160	158.6	28.6								Gray, Silty Clay	158.6	28.6
	156.9	30.3	10	15	21	36	SS-76	M				
155	153.7	33.5								Light to Dark Gray, Clayey Sand	153.7	33.5
	151.9	35.3	11	13	11	24	SS-77	Sat.				
150	147.0	40.2	6	8	11	19	SS-78	Sat.				
	143.9	43.3								Gray, Silty Clay	143.9	43.3
145	142.0	45.2	4	7	8	15	SS-79	M				
	138.7	48.5								Gray, Clayey Sand	138.7	48.5
140	137.0	50.2	25	50	50/0.3	100/0.8	SS-80	M				
	134.1	53.1								Gray to Dark Gray and Green, Silty Clay	134.1	53.1
135	132.0	55.2	15	25	35	60	SS-81	M				
130	127.0	60.2	18	27	39	66	SS-82	M				
125	122.0	65.2	24	43	45	88	SS-83	M				
120	117.0	70.2	28	30	43	73		M				
115	112.1	75.1	22	28	34	62		M				
110												

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. B1	**STATION** 89+27	**OFFSET** 4 ft LT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 187.2 ft	**TOTAL DEPTH** 100.7 ft	**NORTHING** 495,234	**EASTING** 2,007,072	**24 HR.** 1.3
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
DRILLER Contract Driller	**START DATE** 07/24/07	**COMP. DATE** 07/24/07	**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
110						Match Line				
	107.1	80.1	20	30	52	82		M		Gray to Dark Gray and Green, Silty Clay *(continued)*
105	102.1	85.1	16	14	20	34		M		
	98.8	88.4								Gray to Green-Gray, Sandy Clay
100	97.1	90.1	75	25/0.1		100/0.6	SS-88	M		
95	92.1	95.1	31	41	59/0.4	100/0.9		M		
	86.5	100.7								Boring Terminated at Elevation 86.5 ft in Sandy Clay
90	87.1	100.1	69	31/0.1		100/0.6		M		

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. B2	**STATION** 90+66	**OFFSET** 3 ft RT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 186.7 ft	**TOTAL DEPTH** 100.6 ft	**NORTHING** 495,258	**EASTING** 2,007,208	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
DRILLER Contract Driller	**START DATE** 07/25/07	**COMP. DATE** 07/25/07	**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)
										186.7	0.0
										GROUND SURFACE	
										ALLUVIAL	
										Brown, Highly Organic, Silty Sand	
										184.1	2.6
										Brown, Highly Organic, Silty Clay	
										173.6	13.1
										COASTAL PLAIN	
										Gray, Silty Clay	
										169.1	17.6
										Gray, Clayey Sand	
										164.1	22.6
										Brown, Sandy Clay	
										159.1	27.6
										Dark Gray to Gray, Clayey Sand	
										144.0	42.7
										Gray, Silty Clay	
										139.5	47.2
										Dark Gray, Sandy Clay	
										134.2	52.5
										Gray to Dark Gray, Silty Clay	
										114.3	72.4
										Green, Clayey Sand	

190											
185	186.7	0.0	1	WOH	1	1			W		
180	182.3	4.4	WOH	WOH	WOH	0	SS-92	Sat.			
175	177.3	9.4	WOH	WOH	WOH	0		Sat.			
170	172.3	14.4	2	5	7	12	SS-94	M			
165	167.3	19.4	7	8	10	18	SS-95				
160	162.4	24.3	8	29	39	68	SS-96	M			
155	157.4	29.3	8	12	16	28		M			
150	152.4	34.3	12	12	10	22	SS-98	W			
145	147.4	39.3	5	6	9	15	SS-99	M			
140	142.4	44.3	5	6	10	16	SS-100	M			
135	137.4	49.3	6	7	9	16	SS-101	M			
130	132.4	54.3	16	20	30	50		M			
125	127.5	59.2	19	22	35	57	SS-103	M			
120	122.5	64.2	22	31	65	96					
115	117.5	69.2	23	29	37	65		M			
110	112.5	74.2	24	34	33	67	SS-106	M			

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. B2	**STATION** 90+66	**OFFSET** 3 ft RT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 186.7 ft	**TOTAL DEPTH** 100.6 ft	**NORTHING** 495,258	**EASTING** 2,007,208	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
DRILLER Contract Driller	**START DATE** 07/25/07	**COMP. DATE** 07/25/07	**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
110						Match Line				109.3 77.4 Green, Silty Clay
105	107.5	79.2	20	47	32	79	SS-107	M		104.0 82.7 Green, Clayey Sand
100	102.5	84.2	37	37	30	67	SS-108	M		99.3 87.4 Green, Sandy Clay
95	97.5	89.2	23	30	34	64	SS-109	M		94.3 92.4 Gray and Green, Coarse Sand
90	92.6	94.1	100				SS-110	M		86.1 100.6
	87.6	99.1	34	33	37	70		M		Boring Terminated at Elevation 86.1 ft in Coarse Sand

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. B3	**STATION** 91+76	**OFFSET** 7 ft RT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 187.6 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 495,279	**EASTING** 2,007,317	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual	
DRILLER Contract Driller	**START DATE** 08/08/07	**COMP. DATE** 08/09/07	**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)
										187.6	0.0
	187.6	0.0	3	1	4	5	SS-112	W		**GROUND SURFACE**	
										ALLUVIAL Tan, Silty Sand	
	183.0	4.6	2	3	5	8	SS-113	Sat.		184.3	3.3
										Tan to Orange, Coarse Sand	
	177.9	9.7	6	8	6	14		Sat.			
	173.2	14.4	6	6	7	13		Sat.			
	168.2	19.4	4	8	14	22	SS-116	M		169.9	17.7
										COASTAL PLAIN Orange, Clayey Sand	
	163.2	24.4	6	11	17	28		M			
	158.2	29.4	13	17	22	39	SS-118	M			
	153.3	34.3	11	12	13	25		M			
	148.3	39.3	7	9	9	18	SS-120	M			
	143.3	44.3	6	9	7	16	SS-121	M			
	138.2	49.4	22	18	28	46	SS-122	M			
	133.2	54.4	29	45	45	90		M			
	128.2	59.4	17	32	55	87		M			
	123.2	64.4	21	43	57/0.4	100/0.9	SS-125	M			
	118.2	69.4	17	22	40	62	SS-126	M			
	113.2	74.4	19	23	24	47		M		160.0	27.6
										Dark Gray, Sandy Clay	
										145.0	42.6
										Gray, Clayey Sand	
										139.9	47.7
										Gray, Sandy Clay	
										125.0	62.6
										Dark Gray, Silty Clay	
										119.9	67.7
										Gray and Green, Clayey Sand	

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. B3	**STATION** 91+76	**OFFSET** 7 ft RT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 187.6 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 495,279	**EASTING** 2,007,317	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual	
DRILLER Contract Driller	**START DATE** 08/08/07	**COMP. DATE** 08/09/07	**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
						Match Line				
	108.3	79.3	15	24	28	52	SS-128	M		Gray and Green, Clayey Sand *(continued)*
	103.3	84.3	39	36	44	80		M		100.0 87.6
	98.3	89.3	20	22	21	43	SS-130	M		Green, Silty Sand
	93.3	94.3	42	58/0.4		100/0.9	SS-131	M		95.1 92.5
	88.3	99.3	50	50				M		Gray and Green, Clayey Sand
										87.3 100.3
										Boring Terminated at Elevation 87.3 ft in Clayey Sand

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. B4	**STATION** 93+14	**OFFSET** 8 ft RT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 189.1 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 495,309	**EASTING** 2,007,452	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
DRILLER Contract Driller	**START DATE** 08/08/07	**COMP. DATE** 08/13/07	**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)
190											
	189.1	0.0	1	1	1	2		M		189.1 GROUND SURFACE	0.0
185	185.1	4.0	1	2	3	5	SS-134	M		ALLUVIAL Brown, Highly Organic, Sandy Silt	
	185.8	3.3									
	185.3	3.8								White, Sandy Silt	
180	180.0	9.1	4	12	18	30	SS-135			181.6	7.5
										Orange, Silty Sand	
175	175.0	14.1	1	2	6	8	SS-136			COASTAL PLAIN Orange to Brown and Gray, Sandy Clay	
170	170.0	19.1	5	7	11	18					
165	165.1	24.0	6	9	14	23		M			
160	160.1	29.0	8	14	20	34	SS-139	M			
155	155.1	34.0	9	13	10	23		M			
150	150.1	39.0	5	6	7	13		M			
145	145.1	44.0	5	7	6	13		M			
140	140.1	49.0	27	34	66/0.4	100/0.9	SS-143	M			
135	135.1	54.0	25	64	36/0.3	100/0.8		M			
130	130.2	58.9	13	22	29	51	SS-145	M			
125	125.2	63.9	13	21	46	67		M			
120	120.2	68.9	18	21	29	50		M			
115	115.2	73.9	12	17	19	36	SS-148	M			
110	110.2	78.9									

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Howard, J.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. B4	**STATION** 93+14	**OFFSET** 8 ft RT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 189.1 ft	**TOTAL DEPTH** 100.3 ft	**NORTHING** 495,309	**EASTING** 2,007,452	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
DRILLER Contract Driller	**START DATE** 08/08/07	**COMP. DATE** 08/13/07	**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
110						Match Line				
	105.2	83.9	15	17	20	37	SS-149	M		Green and Gray, Clayey Sand *(continued)*
105	100.2	88.9	20	41	53	94		M		
100	95.3	93.8	20	23	19	42		M		97.0 92.1
95	90.3	98.8	13	20	35	55	SS-152	M		Green, Sandy Clay
90			22	27	31	58		M		88.8 100.3
										Boring Terminated at Elevation 88.8 ft in Sandy Clay

161.8 27.3 Dark to Light Gray, Silty Clay

141.9 47.2 Gray, Sandy Silt

131.9 57.2 Dark Gray to Gray, Sandy Clay

117.0 72.1 Gray, Silty Clay

112.0 77.1 Green and Gray, Clayey Sand

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. B5	**STATION** 94+42	**OFFSET** 26 ft LT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 213.6 ft	**TOTAL DEPTH** 118.7 ft	**NORTHING** 495,372	**EASTING** 2,007,568	**24 HR.** 24.0
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/18/07	**COMP. DATE** 07/19/07	**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)
215										GROUND SURFACE	213.6	0.0
										ROADWAY EMBANKMENT Red-Orange, Silty Clay		
210	210.1	3.5	3	4	5	9	SS-45	M			206.8	6.8
										Red-Tan, Silty Sand		
205	205.1	8.5	2	10	16	26	SS-46	M			201.9	11.7
										Tan, Clayey Sand		
200	200.1	13.5	5	10	11	21	SS-47	M			196.9	16.7
										Tan, Silty Sand		
195	195.1	18.5	9	13	14	27	SS-48	M			193.7	19.9
										ALLUVIAL Tan, Coarse Sand with Trace Gravel		
190	190.1	23.5	13	10	5	15	SS-49	W			186.7	26.9
										COASTAL PLAIN Light Gray, Sandy Silt		
185	185.1	28.5	1	2	11	13	SS-50	W			182.4	31.2
										Tan, Fine Sand		
180	180.1	33.5	9	12	12	24	SS-51	W			176.9	36.7
										Tan, Coarse Sand		
175	175.1	38.5	3	4	8	12	SS-52	W			172.3	41.3
										Light Gray, Sandy Silt		
170	170.4	43.2	6	12	21	33	SS-53	M			166.9	46.7
										Tand-Gray, Clayey Sand		
165	165.1	48.5	4	8	10	18	SS-54	M			161.9	51.7
										Tan and Gray, Sandy Clay		
160	160.1	53.5	14	25	29	54	SS-55	M			156.9	56.7
										Tand and Gray, Clayey Sand		
155	155.1	58.5	7	9	13	22	SS-56	M			147.3	66.3
										Gray, Sandy Clay		
150	150.1	63.5	5	8	9	17	SS-57	M			141.9	71.7
										Red and Gray, Silty Clay		
145	145.1	68.5	4	5	7	12	SS-58	M			136.8	76.8
										Gray, Sandy Silt		
140	140.1	73.5	4	5	8	13	SS-59	M				
135	135.1	78.5										

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. B5	**STATION** 94+42	**OFFSET** 26 ft LT	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 213.6 ft	**TOTAL DEPTH** 118.7 ft	**NORTHING** 495,372	**EASTING** 2,007,568	**24 HR.** 24.0
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/18/07	**COMP. DATE** 07/19/07	**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
135						Match Line				
			37	29	22	51	SS-60	M		Gray, Sandy Silt *(continued)*
130	130.1	83.5	11	6	7	13	SS-61	M		Gray, Silty Clay
125	125.1	88.5	6	14	20	34	SS-62	M		Brown, Sandy Clay
120	120.1	93.5	21	36	52	88	SS-63	M		Brown to Gray, Silty Clay
115	115.1	98.5	13	16	22	38	SS-64	M		Gray, Clayey Sand
110	110.1	103.5	21	26	31	57	SS-65	M		Gray, Sandy Silt
105	105.1	108.5	21	32	47	79	SS-66	M		Green-Gray, Sandy Silt
100	100.1	113.5	12	19	21	40	SS-67	M		Gray, Sandy Silt
95	95.1	118.5	100/0.2			100/0.2	SS-68	M		Boring Terminated at Elevation 94.9 ft in Sandy Silt

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. EB2	**STATION** 95+57	**OFFSET** CL	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 205.9 ft	**TOTAL DEPTH** 120.0 ft	**NORTHING** 495,371	**EASTING** 2,007,686	**24 HR.** 14.7
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/12/07	**COMP. DATE** 07/16/07	**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)
210										205.9 GROUND SURFACE	0.0
205	202.4	3.5	4	4	8	12	SS-21	M		**ROADWAY EMBANKMENT** Tan and Red, Silty Sand	
200	197.4	8.5	3	3	5	8	SS-22	M		198.7 **COASTAL PLAIN** Tan and Red, Clayey Sand	7.2
195	192.4	13.5	2	2	2	4	SS-23	W		194.4 Gray, Silty Clay	11.5
190	187.4	18.5	3	7	14	21		M		184.6 Orange-Tan, Silty Sand	21.3
185	182.4	23.5	5	5	5	10	SS-25	W		179.7 Tan, Coarse Sand	26.2
180	177.4	28.5	3	6	7	13	SS-26	W		174.7 Gray and Tan, Silty Clay	31.2
175	172.4	33.5	2	3	8	11		M		169.8 Tan and Gray, Sandy Clay	36.1
170	167.4	38.5	7	13	14	27	SS-28	M		164.9 Tan and Gray, Silty Clay	41.0
165	162.4	43.5	9	19	31	50		M		160.0 Tan and Gray, Sandy Clay	45.9
160	157.4	48.5	9	14	20	34	SS-30	M		152.1 Gray, Tan and Red, Silty Clay	53.8
155	152.4	53.5	4	3	5	8		M			
150	147.4	58.5	3	4	5	9	SS-32	M			
145	142.4	63.5	3	6	10	16	SS-33	M		139.0 Gray, Sandy Silt	66.9
140	137.4	68.5	100/0.4			100/0.4	SS-34	M			
135	132.4	73.5	65	35/0.1		100/0.6		M		129.8	76.1
130											

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Goodnight, D.	
SITE DESCRIPTION Structure No. 14 on -COL1- Over Beaver Creek and -Y1- (All American Freeway)				**GROUND WTR (ft)**
BORING NO. EB2	**STATION** 95+57	**OFFSET** CL	**ALIGNMENT** -COL1-	**0 HR.** N/A
COLLAR ELEV. 205.9 ft	**TOTAL DEPTH** 120.0 ft	**NORTHING** 495,371	**EASTING** 2,007,686	**24 HR.** 14.7
DRILL RIG/HAMMER EFF./DATE CME-850		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 07/12/07	**COMP. DATE** 07/16/07	**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
130						Match Line				
125	127.4	78.5	10	9	11	20	SS-36	M		Green-Gray, Clayey Sand
120	122.4	83.5	12	19	28	47	SS-37	M		124.6 81.3 Gray, Tan and Red, Silty Clay
115	117.4	88.5	11	19	26	45		M		114.4 Green-Gray, Clayey Sand 91.5
110	112.4	93.5	13	18	24	42	SS-39	M		
105	107.4	98.5	14	22	26	48		M		
100	102.4	103.5	13	20	23	43		M		
95	97.4	108.5	8	11	28	39		M		
90	92.4	113.5	60	40/0.2		100/0.7		M		
	87.4	118.5	11	13	14	27		M		85.9 120.0 Boring Terminated at Elevation 85.9 ft in Clayey Sand

NCDOT BORE DOUBLE U2519DA_GEO_BH_COL1_ENGLISH.GPJ NC_DOT.GDT 9/4/13

PROJ. NO. - 34817.1.2
ID NO. - U-2519CB

EB1

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	CL	88+05	3.5-5.0	A-1-b(0)	21	6	68.1	13.7	4.0	14.1	94	42	19	-	-
SS-3	CL	88+05	13.5-15.0	A-2-4(0)	20	5	58.2	26.9	2.8	12.1	98	58	17	-	-
SS-4	CL	88+05	18.5-20.0	A-1-b(0)	22	NP	88.2	6.1	0.7	5.1	97	29	16	-	-
SS-6	CL	88+05	28.5-30.0	A-7-6(32)	57	33	1.0	17.6	22.8	58.6	100	100	88	-	-
SS-7	CL	88+05	33.5-35.0	A-2-4(0)	26	9	50.3	23.6	1.8	24.2	99	78	27	-	-
SS-8	CL	88+05	38.5-40.5	A-6(5)	31	19	33.3	21.0	11.3	34.3	100	80	49	-	-
SS-10	CL	88+05	48.5-60.0	A-2-6(0)	31	15	67.5	10.3	2.0	20.2	90	40	21	-	-
SS-11	CL	88+05	53.5-55.0	A-2-6(2)	34	20	56.0	13.3	2.4	28.3	99	69	32	-	-
SS-12	CL	88+05	58.5-60.0	A-7-6(30)	58	42	4.6	24.0	14.7	56.6	100	98	74	-	-
SS-13	CL	88+05	63.5-65.0	A-4(0)	19	5	20.8	36.2	24.8	18.2	100	86	55	-	-
SS-14	CL	88+05	68.5-70.0	A-2-4(0)	28	NP	71.1	18.4	2.4	8.1	98	56	11	-	-
SS-15	CL	88+05	73.5-75.0	A-7-6(21)	47	32	14.7	19.4	21.4	44.4	100	92	71	-	-
SS-18	CL	88+05	88.5-90.0	A-2-4(0)	38	NP	53.5	26.3	12.1	8.1	96	66	22	-	-

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-71	4' LT	89+27	5.7-7.2	A-3(0)	21	NP	81.6	12.1	4.3	2.0	100	57	7	-	-
SS-72	4' LT	89+27	10.6-12.1	A-2-4(0)	22	8	60.4	19.9	5.5	14.1	93	62	21	-	-
SS-73	4' LT	89+27	15.3.-16.8	A-2-6(1)	36	22	58.2	16.2	3.4	22.2	99	63	27	-	-
SS-75	4' LT	89+27	25.3-26.8	A-6(7)	30	18	27.8	18.3	21.7	32.2	100	82	58	-	-
SS-76	4' LT	89+27	30.3-31.8	A-7-6(6)	44	29	50.4	7.8	6.6	35.2	96	60	41	-	-
SS-77	4' LT	89+27	35.3-36.8	A-2-6(0)	34	19	76.7	6.4	4.7	12.1	91	29	16	-	-
SS-78	4' LT	89+27	40.2-41.7	A-2-7(3)	44	28	62.1	7.9	7.9	22.2	95	43	29	-	-
SS-79	4' LT	89+27	45.2-46.7	A-7-6(32)	55	37	3.8	15.9	21.9	58.4	100	98	83	-	-
SS-80	4' LT	89+27	50.2-51.5	A-2-7(2)	48	20	57.4	10.2	4.2	28.2	95	56	32	-	-
SS-81	4' LT	89+27	55.2-56.7	A-7-6(48)	71	43	2.6	3.2	37.8	56.4	100	98	96	-	-
SS-82	4' LT	89+27	60.2-61.7	A-7-6(10)	41	15	13.7	20.9	37.2	28.2	100	92	72	-	-
SS-83	4' LT	89+27	65.2-66.7	A-7-6(7)	43	22	20.9	35.0	31.9	12.1	100	90	49	-	-
SS-88	4' LT	89+27	90.1-90.7	A-6(1)	24	11	34.2	25.0	32.7	8.1	100	82	42	-	-

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-92	3' RT	90+66	4.4-5.9	A-7-5(38)	72	34	5.5	2.4	29.4	62.7	98	93	91	-	-
SS-94	3' RT	90+66	14.4-15.9	A-7-6(11)	44	25	24.9	19.8	12.8	42.5	95	78	56	-	-
SS-95	3' RT	90+66	19.4-20.9	A-2-6(3)	34	27	41.1	27.7	2.9	28.3	97	71	31	-	-
SS-96	3' RT	90+66	24.3-25.8	A-6(10)	37	21	26.3	17.8	17.5	38.4	100	83	60	-	-
SS-98	3' RT	90+66	34.3-35.8	A-2-7(1)	45	30	72.1	6.8	2.9	18.2	97	38	21	-	-
SS-99	3' RT	90+66	39.3-40.8	A-2-6(3)	39	24	56.0	12.4	5.3	26.3	100	60	33	-	-
SS-100	3' RT	90+66	44.3-45.8	A-7-6(34)	60	39	5.5	13.5	22.3	58.6	100	98	83	-	-
SS-101	3' RT	90+66	49.3-50.8	A-6(2)	24	12	37.1	24.7	17.0	21.2	100	77	44	-	-
SS-103	3' RT	90+66	59.2-60.7	A-7-6(20)	50	28	13.5	19.2	32.9	34.4	100	92	72	-	-
SS-106	3' RT	90+66	74.2-75.7	A-2-6(1)	35	18	43.2	31.0	16.7	9.1	99	79	30	-	-
SS-107	3' RT	90+66	79.2-80.7	A-7-6(10)	41	18	14.2	33.2	40.5	12.1	100	94	63	-	-
SS-108	3' RT	90+66	84.2-85.7	A-2-6(1)	35	17	45.7	24.7	17.5	12.1	95	66	32	-	-
SS-109	3' RT	90+66	89.2-90.7	A-6(11)	40	19	3.8	43.7	40.3	12.1	100	98	65	-	-
SS-110	3' RT	90+66	94.1-94.6	A-1-b(0)	41	2	75.4	15.9	5.7	3.0	96	37	10	-	-

B3

SOIL TEST RESULTS

SAMPLE NO.			DEPTH INTERVAL	AASHTO CLASS.			% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-112	7' RT	91+76	0.0-1.5	A-2-4(0)	23	NP	54.4	26.3	11.2	8.1	96	62	21	-	-
SS-113	7' RT	91+76	4.6-6.1	A-1-b(0)	20	NP	90.0	5.5	0.5	4.0	98	24	15	-	-
SS-116	7' RT	91+76	19.4-20.9	A-2-6(2)	36	19	42.2	25.2	4.3	28.3	99	72	34	-	-
SS-118	7' RT	91+76	29.4-30.9	A-6(6)	38	24	44.5	12.3	6.8	36.4	99	69	44	-	-
SS-120	7' RT	91+76	39.3-40.8	A-6(4)	30	17	34.6	21.6	15.5	28.3	100	80	47	-	-
SS-121	7' RT	91+76	44.3-45.8	A-2-7(1)	41	27	67.7	11.7	8.4	12.1	97	48	21	-	-
SS-122	7' RT	91+76	49.4-50.9	A-6(8)	32	19	20.2	26.1	27.4	26.3	100	88	60	-	-
SS-125	7' RT	91+76	64.4-65.9	A-7-6(6)	42	19	28.1	26.3	23.4	22.2	100	81	50	-	-
SS-126	7' RT	91+76	69.4-70.9	A-2-7(2)	44	22	46.1	22.6	21.1	10.1	97	67	35	-	-
SS-128	7' RT	91+76	79.3-80.8	A-2-6(0)	36	14	52.8	28.7	14.5	4.0	98	60	22	-	-
SS-130	7' RT	91+76	89.3-90.8	A-2-5(0)	68	NP	54.8	32.8	4.3	8.1	97	70	15	-	-
SS-131	7' RT	91+76	94.3-95.2	A-2-6(1)	37	15	56.8	19.7	16.4	7.1	100	68	27	-	-

B4

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-134	8' RT	93+14	4-5.5	A-4(2)	26	8	24.5	27.5	23.7	24.3	100	84	55	-	-
SS-135	8' RT	93+14	9.1-10.6	A-2-4(0)	16	NP	33.6	47.8	12.6	6.1	74	56	20	-	-
SS-136	8' RT	93+14	14.1-15.6	A-6(7)	31	14	9.5	27.9	26.1	36.4	100	97	68	-	-
SS-139	8' RT	93+14	29-30.5	A-7-6(13)	53	35	40.9	9.1	5.5	44.5	99	72	50	-	-
SS-143	8' RT	93+14	49.0-50.4	A-4(0)	24	2	32.0	30.8	21.1	16.2	100	82	44	-	-
SS-145	8' RT	93+14	58.9-60.4	A-6(7)	31	13	13.6	26.1	40.1	20.2	100	92	69	-	-
SS-148	8' RT	93+14	73.9-75.4	A-7-6(7)	45	20	19.8	38.3	29.8	12.1	100	88	50	-	-
SS-149	8' RT	93+14	78.9-81.4	A-2-6(0)	33	13	57.5	22.5	11.9	8.1	97	62	23	-	-
SS-152	8' RT	93+14	93.8-95.3	A-6(1)	37	16	43.7	24.5	21.7	10.1	99	71	36	-	-

PROJ. NO. - 34817.1.2
ID NO. - U-2519CB

B5

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-45	26' LT	94+42	3.5-5.0	A-7-6(3)	43	21	35.1	31.0	5.6	28.4	98	78	38	-	-
SS-46	26' LT	94+42	8.5-10.0	A-2-4(0)	25	9	52.1	24.7	2.9	20.3	97	66	25	-	-
SS-47	26' LT	94+42	13.5-15.0	A-2-6(0)	32	14	56.7	21.7	1.3	20.3	94	63	22	-	-
SS-48	26' LT	94+42	18.5-20.0	A-2-4(0)	21	3	63.6	21.9	1.3	13.2	97	60	16	-	-
SS-49	26' LT	94+42	23.5-25.0	A-1-b(0)	17	NP	63.8	24.5	3.5	8.1	91	49	13	-	-
SS-50	26' LT	94+42	28.5-30.0	A-4(0)	21	4	8.3	53.1	14.3	24.3	100	98	51	-	-
SS-51	26' LT	94+42	33.5-35.0	A-3(0)	22	NP	70.1	21.7	1.1	7.1	97	55	9	-	-
SS-52	26' LT	94+42	38.5-40.0	A-1-b(0)	23	NP	90.6	3.3	0.0	6.1	100	23	6	-	-
SS-53	26' LT	94+42	43.2-44.7	A-6(6)	31	16	10.1	40.9	14.5	34.4	100	95	55	-	-
SS-54	26' LT	94+42	48.5-50.0	A-2-6(1)	30	15	45.4	23.5	1.7	29.4	99	86	32	-	-
SS-55	26' LT	94+42	53.5-55.0	A-6(4)	30	17	37.1	19.0	11.4	32.4	100	77	48	-	-
SS-56	26' LT	94+42	58.5-60.0	A-2-6(2)	35	22	50.4	18.8	0.4	30.4	97	68	31	-	-
SS-57	26' LT	94+42	63.5-65.0	A-2-6(1)	31	15	61.4	11.6	4.8	22.3	99	60	28	-	-
SS-58	26' LT	94+42	68.5-70.0	A-6(1)	28	14	24.0	42.2	8.4	25.3	99	91	36	-	-
SS-59	26' LT	94+42	73.5-75.0	A-7-6(26)	53	36	12.8	15.8	20.8	50.7	100	93	74	-	-
SS-60	26' LT	94+42	78.5-80.0	A-4(0)	20	7	22.9	48.6	18.3	10.1	100	90	36	-	-
SS-61	26' LT	94+42	83.5-85.0	A-7-6(26)	54	36	4.3	30.6	30.7	34.4	100	97	74	-	-
SS-62	26' LT	94+42	88.5-90.0	A-6(11)	35	21	16.8	22.5	26.2	34.4	100	91	67	-	-
SS-63	26' LT	94+42	93.5-95.0	A-7-6(4)	42	19	43.0	16.4	18.3	22.3	98	70	42	-	-
SS-64	26' LT	94+42	98.5-100.0	A-7-6(16)	46	26	13.8	25.7	34.1	26.3	100	92	68	-	-
SS-65	26' LT	94+42	103.5-105.0	A-2-7(1)	48	22	62.2	10.7	13.9	13.2	95	49	27	-	-
SS-66	26' LT	94+42	108.5-110.0	A-4(0)	32	10	45.6	20.6	19.7	14.2	98	68	37	-	-
SS-67	26' LT	94+42	113.5-115.0	A-2-6(0)	39	17	62.1	27.1	6.7	4.1	96	59	14	-	-
SS-68	26' LT	94+42	118.5-118.7	A-4(0)	17	8	39.9	27.4	22.4	10.2	100	76	37	-	-

EB2

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-21	CL	95+57	3.5-5.0	A-2-4(0)	21	4	49.3	29.1	6.5	15.2	98	68	26	-	-
SS-22	CL	95+57	8.5-10.0	A-2-6(1)	35	15	47.1	25.5	3.2	24.2	93	63	28	-	-
SS-23	CL	95+57	13.5-15.0	A-7-6(27)	53	29	11.7	2.2	33.5	52.5	98	88	85	-	-
SS-25	CL	95+57	23.5-25.0	A-2-4(0)	20	NP	59.5	23.4	1.9	15.2	100	75	18	-	-
SS-26	CL	95+57	28.5-30.0	A-1-b(0)	20	NP	91.5	3.0	1.4	4.0	99	16	5	-	-
SS-28	CL	95+57	38.5-40.0	A-6(3)	35	18	47.3	12.5	1.8	38.4	99	72	41	-	-
SS-30	CL	95+57	48.5-50.0	A-6(2)	31	15	49.1	13.5	7.1	30.3	96	63	38	-	-
SS-32	CL	95+57	58.5-60.0	A-7-6(25)	56	35	17.0	14.5	18.0	50.5	100	90	73	-	-
SS-33	CL	95+57	63.5-65.0	A-7-6(48)	72	51	4.8	10.7	19.8	64.6	100	98	87	-	-
SS-34	CL	95+57	68.5-68.9	A-4(1)	31	9	33.7	30.5	19.6	16.2	100	79	42	-	-
SS-36	CL	95+57	78.5-80.0	A-2-6(0)	34	13	46.3	25.6	18.1	10.1	99	66	29	-	-
SS-37	CL	95+57	83.5-85.0	A-7-6(25)	54	31	9.3	17.0	41.4	32.3	100	95	78	-	-
SS-39	CL	95+57	93.5-95.0	A-2-6(1)	37	17	50.2	20.4	14.2	15.2	96	64	30	-	-

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519CB)	1	9

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34817.1.2 (U-2519CB)* F.A. PROJ. *NHF-DPR-0100(1)*

COUNTY *CUMBERLAND*

PROJECT DESCRIPTION *FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO WEST OF NC 24*

SITE DESCRIPTION *STRUCTURE NO. 15 ON -RP1B- OVER -TT3-*

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CAUTION NOTICE

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PERSONNEL

SUMMIT CONSULTING

INVESTIGATED BY *N.D. MOHS*

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SUBMITTED BY *N.T. ROBERSON*

DATE *SEPTEMBER 2013*

NORTH CAROLINA LICENSED GEOLOGIST SEAL 2124 NATHAN DANIEL MOHS

9/17/13

PROJECT: 34817.1.2

ID: U-2519CB

DRAWN BY: *T.T. WALKER*

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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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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-4, A-5	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6	A-3	A-6, A-7	
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#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			
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MN	11 MX	11 MN	10 MX	10 MX	11 MN	11 MN			
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 A 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/FT²)
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 0.50
	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 (PLASTIC RANGE (PI))	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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 W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [ ] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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 IN 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: BL-11: N: 495487.0 E: 2006748.3

ELEVATION: 207.61 FT.

NOTES:

REVISED 09/23/09

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SITE PLAN

0 50 100

FEET

N

40

-TT3-

EB1-B

B1-B

B2-B

EB2-B

-TT4-

BUFFER ZONE

-RPIB-

45

-LPIB-

FORT BRAGG TANK TRAIL

12

GROUNDLINE PROFILE AT CENTERLINE OF -RP1B- TAKEN FROM ROADWAY DESIGN PLANS AS OF 06/19/2013

PROJECT REFERENCE NO.	SHEET
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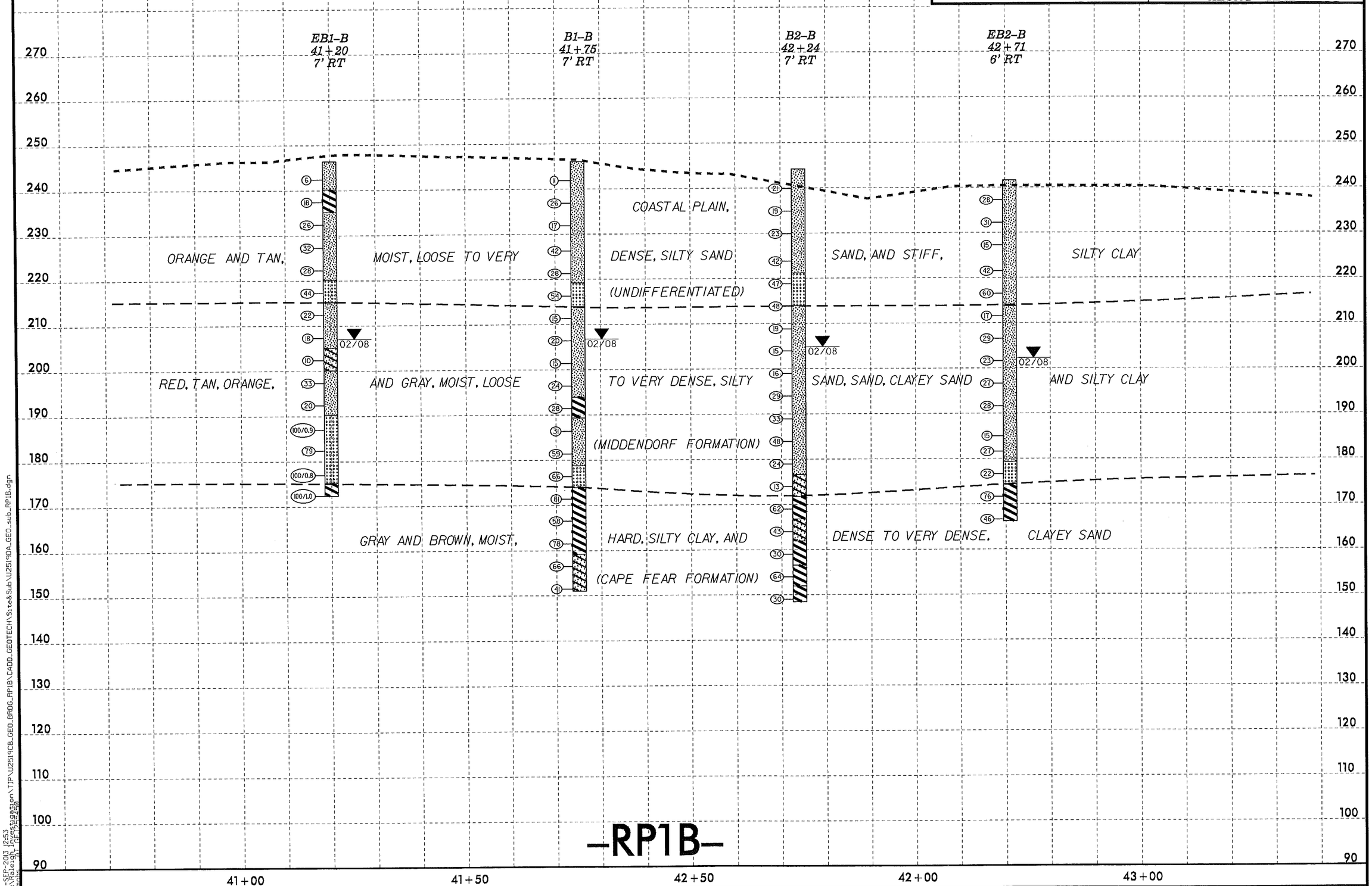
PROFILE BORINGS PROJECTED ALONG -RP1B-



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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Nash
SITE DESCRIPTION STRUCTURE NO. 15 ON -RP1B- OVER -TT3-			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 41+20	**OFFSET** 7 ft RT	**ALIGNMENT** -RP1B- — **0 HR.** N/A
COLLAR ELEV. 246.4 ft	**TOTAL DEPTH** 74.0 ft	**NORTHING** 495,935	**EASTING** 2,006,613 — **24 HR.** 39.4
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual
DRILLER S. Gower	**START DATE** 02/08/08	**COMP. DATE** 02/08/08	**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
										246.4 GROUND SURFACE 0.0
	243.4	3.0	4	3	3	6	SS-1	M		**COASTAL PLAIN** ORANGE, SILTY SAND (UNDIFFERENTIATED)
	238.4	8.0	6	8	10	18		M		240.2 6.2 ORANGE, SILTY CLAY
	233.4	13.0	9	13	13	26		M		235.2 11.2 TAN, RED, AND ORANGE, SILTY SAND
	228.4	18.0	20	17	15	32		M		
	223.4	23.0	11	12	16	28	SS-2	M		220.2 26.2 ORANGE, SAND
	218.4	28.0	10	18	26	44		M		215.2 31.2 LIGHT GRAY, TAN, AND ORANGE, SILTY SAND (MIDDENDORF FORMATION)
	213.4	33.0	8	9	13	22		M		
	208.4	38.0	6	8	10	18		M		
	203.4	43.0	4	4	6	10		M		205.1 41.3 ORANGE, CLAYEY SAND
	198.4	48.0	7	17	16	33		M		200.1 46.3 TAN AND RED, SILTY SAND
	193.4	53.0	6	10	10	20		M		
	188.4	58.0	24	50	50/0.4	100/0.9		M		190.3 56.1 TAN, SAND (CAPE FEAR FORMATION)
	183.4	63.0	26	37	42	79		M		
	178.4	68.0	34	55	45/0.3	100/0.8		M		175.2 71.2 TAN AND GRAY, SILTY CLAY
	173.4	73.0	25	75/0.5		100/1.0		M		172.4 74.0 Boring Terminated at Elevation 172.4 ft SANDY CLAY (CAPE FEAR FORMATION)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Nash	
SITE DESCRIPTION STRUCTURE NO. 15 ON -RP1B- OVER -TT3-				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 41+75	**OFFSET** 7 ft RT	**ALIGNMENT** -RP1B-	**0 HR.** N/A
COLLAR ELEV. 246.1 ft	**TOTAL DEPTH** 95.3 ft	**NORTHING** 495,886	**EASTING** 2,006,588	**24 HR.** 39.4
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
DRILLER S. Gower	**START DATE** 02/06/08	**COMP. DATE** 02/07/08	**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)
250										246.1 GROUND SURFACE 0.0
										COASTAL PLAIN
245	242.9	3.2	4	5	6	11		M		ORANGE AND TAN, SILTY SAND (UNDIFFERENTIATED)
240	237.9	8.2	9	13	13	26		M		
235	232.9	13.2	9	8	9	17		M		
230	227.3	18.8	20	20	22	42		M		
225	222.3	23.8	12	14	14	28		M		
220	217.3	28.8	24	26	28	54		M		219.2 26.9 TAN, SAND
215	212.3	33.8	6	7	8	15		M		213.9 32.2 RED, TAN, AND ORANGE, SILTY SAND (MIDDENDORF FORMATION)
210	207.3	38.8	7	8	12	20		M		
205	202.3	43.8	6	7	8	15		M		
200	197.3	48.8	8	10	14	24		M		
195	192.3	53.8	8	12	16	28	SS-3	M		193.9 52.2 RED AND GRAY, SILTY CLAY
190	187.3	58.8	9	15	16	31		M		189.3 56.8 TAN AND ORANGE, SILTY SAND
185	182.3	63.8	12	23	36	59		M		
180	177.3	68.8	23	30	36	66		M		178.8 67.3 TAN, SAND
175	172.3	73.8	8	21	60	81		M		173.9 72.2 LIGHT GRAY AND TAN, SILTY CLAY (CAPE FEAR FORMATION)
170										

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Nash	
SITE DESCRIPTION STRUCTURE NO. 15 ON -RP1B- OVER -TT3-				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 41+75	**OFFSET** 7 ft RT	**ALIGNMENT** -RP1B-	**0 HR.** N/A
COLLAR ELEV. 246.1 ft	**TOTAL DEPTH** 95.3 ft	**NORTHING** 495,886	**EASTING** 2,006,588	**24 HR.** 39.4
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
DRILLER S. Gower	**START DATE** 02/06/08	**COMP. DATE** 02/07/08	**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
170						Match Line				
	167.3	78.8	16	26	32	58		M		LIGHT GRAY AND TAN, SILTY CLAY (CAPE FEAR FORMATION) *(continued)*
165	162.3	83.8	25	33	45	78		M		
160	157.3	88.8	17	27	39	66		M		159.2 86.9 GRAY, CLAYEY SAND
155	152.3	93.8	16	20	21	41	SS-4	20%		150.8 95.3 Boring Terminated at Elevation 150.8 ft SANDY CLAY (CAPE FEAR FORMATION)

NCDOT BORE DOUBLE U2519CB_GEO_BH_RP1B.GPJ NC_DOT.GDT 9/16/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Nash
SITE DESCRIPTION STRUCTURE NO. 15 ON -RP1B- OVER -TT3-			**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 42+24	**OFFSET** 7 ft RT	**ALIGNMENT** -RP1B- — **0 HR.** N/A
COLLAR ELEV. 244.2 ft	**TOTAL DEPTH** 95.8 ft	**NORTHING** 495,844	**EASTING** 2,006,563 — **24 HR.** 39.4
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual
DRILLER S. Gower	**START DATE** 02/11/08	**COMP. DATE** 02/12/08	**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)
245										244.2 GROUND SURFACE	0.0
										COASTAL PLAIN TAN, ORANGE, AND PINK, SILTY SAND (UNDIFFERENTIATED)	
240	240.9	3.3	13	9	12	21	SS-5	M			
235	235.9	8.3	6	9	10	19		M			
230	230.9	13.3	8	11	12	23		M			
225	224.9	19.3	16	19	23	42		M			
220	219.9	24.3	13	19	28	47		W		221.2 TAN, SAND	23.0
215	214.9	29.3	19	25	23	48		W		213.9 TAN, ORANGE, AND RED, SILTY SAND (MIDDENDORF FORMATION)	30.3
210	209.9	34.3	7	9	10	19		M			
205	204.9	39.3	9	7	8	15		M			
200	199.9	44.3	6	7	9	16		W			
195	194.9	49.3	13	13	16	29		W			
190	189.9	54.3	10	15	18	33		W			
185	184.9	59.3	19	21	27	48		M			
180	179.9	64.3	16	12	12	24		M			
175	174.9	69.3	7	6	7	13		W		176.6 LIGHT TAN, CLAYEY SAND	67.6
170	169.9	74.3	16	28	34	62		W		171.7 TAN, HIGHLY PLASTIC, SILTY CLAY (CAPE FEAR FORMATION)	72.5
165								W		166.8 TAN, CLAYEY SAND	77.4

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Nash
SITE DESCRIPTION STRUCTURE NO. 15 ON -RP1B- OVER -TT3-			**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 42+24	**OFFSET** 7 ft RT	**ALIGNMENT** -RP1B- — **0 HR.** N/A
COLLAR ELEV. 244.2 ft	**TOTAL DEPTH** 95.8 ft	**NORTHING** 495,844	**EASTING** 2,006,563 — **24 HR.** 39.4
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual
DRILLER S. Gower	**START DATE** 02/11/08	**COMP. DATE** 02/12/08	**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
165	164.9	79.3	14	19	24	Match Line 43		W		TAN, CLAYEY SAND *(continued)*
160	159.9	84.3	8	13	17	30	SS-6	20%		161.9 GRAY AND BROWN, HIGHLY PLASTIC, SILTY CLAY	82.3
155	154.9	89.3	19	29	35	64		W		
150	149.9	94.3	11	15	15	30		W		148.4 Boring Terminated at Elevation 148.4 ft SAND (CAPE FEAR FORMATION)	95.8

NCDOT BORE DOUBLE U2519CB_GEO_BH_RP1B.GPJ NC_DOT.GDT 9/16/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Nash
SITE DESCRIPTION STRUCTURE NO. 15 ON -RP1B- OVER -TT3-			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 42+71	**OFFSET** 6 ft RT	**ALIGNMENT** -RP1B- — **0 HR.** N/A
COLLAR ELEV. 241.6 ft	**TOTAL DEPTH** 75.5 ft	**NORTHING** 495,804	**EASTING** 2,006,504 — **24 HR.** 39.4
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual
DRILLER S. Gower	**START DATE** 02/13/08	**COMP. DATE** 02/13/08	**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)
250										
245										
240										241.6 GROUND SURFACE 0.0
										COASTAL PLAIN
										ORANGE, TAN, AND PINK, SILTY SAND (UNDIFFERENTIATED)
235	238.2	3.4	10	14	14	28		M		
	233.2	8.4	7	15	16	31		M		
230	228.2	13.4	7	8	7	15	SS-7	M		
225	222.5	19.1	15	21	21	42		M		
220	217.5	24.1	15	27	33	60		M		
215	212.5	29.1	7	8	9	17		W		
210	207.5	34.1	8	11	18	29		W		
205	202.5	39.1	4	11	12	23		W	▼	
200	197.5	44.1	8	11	16	27		W		
195	192.5	49.1	8	13	15	28		M		
190	186.0	55.6	4	5	10	15		M		213.7 27.9
185	182.6	59.0	12	13	14	27		W		TAN, SILTY SAND (MIDDENDORF FORMATION)
180	177.6	64.0	15	13	9	22	SS-8	Sat.		179.3 62.3
175	172.6	69.0	19	32	44	76		W		TAN, SAND (CAPE FEAR FORMATION)
170										174.3 67.3
										TAN AND GRAY, SILTY CLAY

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Nash
SITE DESCRIPTION STRUCTURE NO. 15 ON -RP1B- OVER -TT3-			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 42+71	**OFFSET** 6 ft RT	**ALIGNMENT** -RP1B- — **0 HR.** N/A
COLLAR ELEV. 241.6 ft	**TOTAL DEPTH** 75.5 ft	**NORTHING** 495,804	**EASTING** 2,006,504 — **24 HR.** 39.4
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Manual
DRILLER S. Gower	**START DATE** 02/13/08	**COMP. DATE** 02/13/08	**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
170						Match Line				TAN AND GRAY, SILTY CLAY *(continued)*
	167.6	74.0	12	20	26	46		M		166.2 75.4
										Boring Terminated at Elevation 166.1 ft SILTY CLAY (CAPE FEAR FORMATION)

NCDOT BORE DOUBLE_U2519CB_GEO_BH_RP1B.GPJ NC_DOT.GDT 9/16/13

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519CB)	9

SUMMARY OF LABORATORY RESULTS

BORING NO.	SAMPLE NO.	DEPTH INTERVAL	% PASS #10	% PASS #40	% PASS #200	COARSE	FINE SAND	SILT	CLAY	LL	PI	% MOIST.	AASHTO
EB1-B	SS-1	3.0-4.5	98	80	28	35	41	6	18	30	–	–	A-2-4 (0)
EB1-B	SS-2	23.0-24.5	100	99	25	11	66	5	18	28	–	–	A-2-4 (0)
B1-B	SS-3	53.8-55.3	93	78	61	21	19	1	59	57	33	20	A-7-6 (18)
B1-B	SS-4	93.8-95.3	99	64	28	56	17	2	25	33	15	–	A-2-6 (1)
B2-B	SS-5	3.3-4.8	100	84	31	34	40	8	18	24	2	–	A-2-4 (0)
B2-B	SS-6	84.3-85.8	100	90	72	17	15	7	61	42	22	20	A-7-6 (15)
EB2-B	SS-7	13.4-14.9	100	75	24	40	44	9	7	26	–	–	A-2-4 (0)
EB2-B	SS-8	64.0-65.5	98	52	9	59	34	3	4	27	–	–	A-3 (0)

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519CB)	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34817.1.2 (U-2519CB) F.A. PROJ. DPR-0100(001)

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 TO WEST OF NC 24 (BRAGG BOULEVARD)

SITE DESCRIPTION STRUCTURE NO. 16 ON -RPIC- OVER BEAVER CREEK

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE
5-11	BORE LOGS
12, 13	SOIL TEST RESULTS

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. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

TRIGON PERSONNEL

D. GOODNIGHT

W. WHICHARD

R. BOYKIN

J. GERNER

MACTEC PERSONNEL

J. HOWARD

D. RHODES

E. BURKETT

INVESTIGATED BY N. D. MOHS

CHECKED BY N. T. ROBERSON

SUBMITTED BY N. T. ROBERSON

DATE SEPTEMBER 2013

NORTH CAROLINA LICENSED SEAL 2124 GEOLOGIST NATHAN DANIEL MOHS

9/11/13

PROJECT: 34817.1.2

ID: U-2519CB

DRAWN BY: N.D. MOHS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519CB)	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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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
LIQUID LIMIT PLASTIC INDEX	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 A 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 0.50
	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		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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 W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45B
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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: TBM-4

ELEVATION: 189.82 FT.

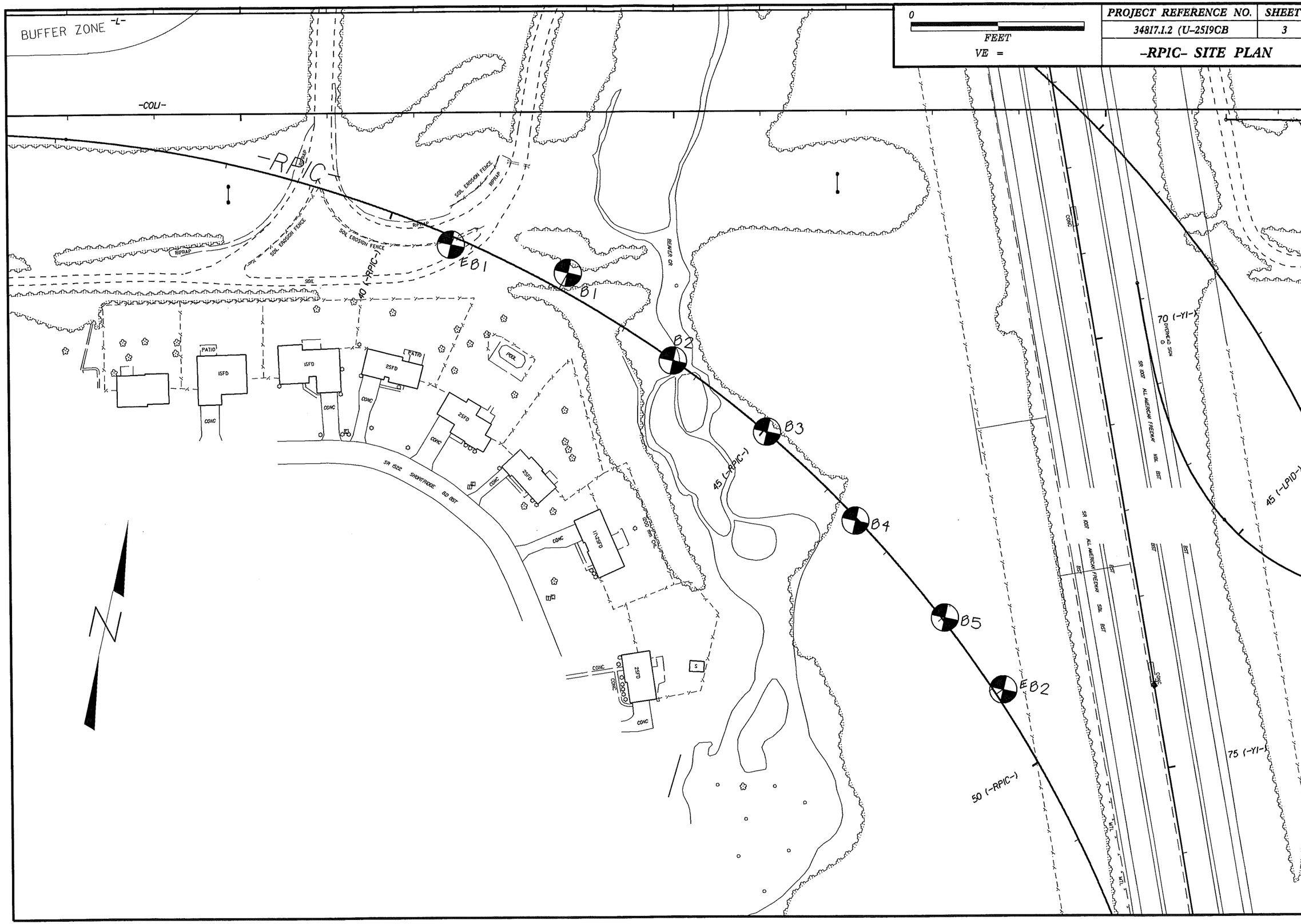
NOTES:

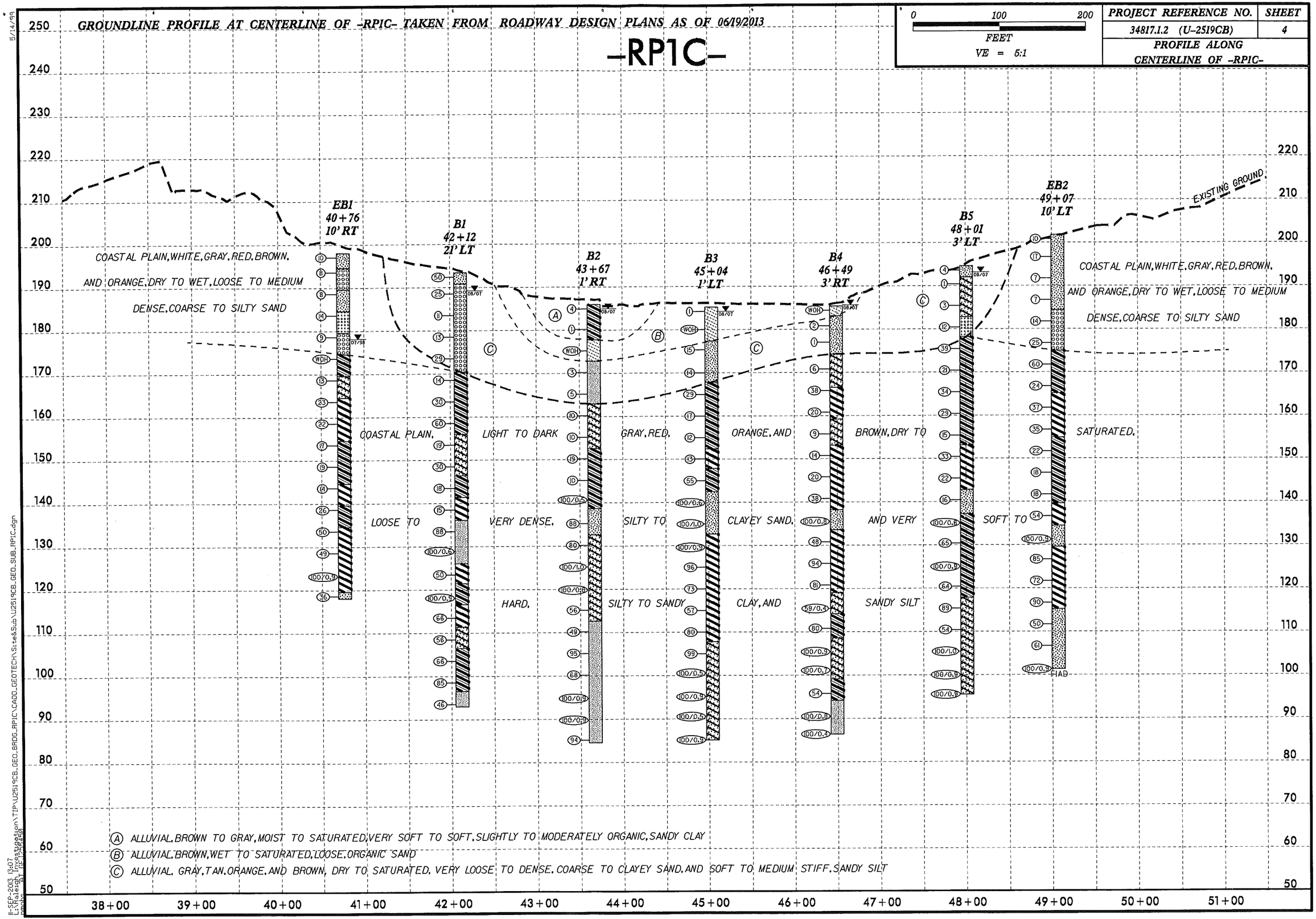
REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519CB	3

-RPIC- SITE PLAN

0 FEET
VE =




GROUNDLINE PROFILE AT CENTERLINE OF -RPIC- TAKEN FROM ROADWAY DESIGN PLANS AS OF 06/19/2013
-RP1C-
0 100 200
FEET
VE = 5:1
PROJECT REFERENCE NO.
34817.1.2 (U-2519CB)
SHEET
4
PROFILE ALONG
CENTERLINE OF -RPIC-
EB1
40+76
10' RT
B1
42+12
21' LT
B2
43+67
1' RT
B3
45+04
1' LT
B4
46+49
3' RT
B5
48+01
3' LT
EB2
49+07
10' LT
EXISTING GROUND
COASTAL PLAIN, WHITE, GRAY, RED, BROWN, AND ORANGE, DRY TO WET, LOOSE TO MEDIUM DENSE, COARSE TO SILTY SAND
COASTAL PLAIN, LIGHT TO DARK GRAY, RED, ORANGE, AND BROWN, DRY TO SATURATED,
LOOSE TO VERY DENSE, SILTY TO CLAYEY SAND, AND VERY SOFT TO
HARD, SILTY TO SANDY CLAY, AND SANDY SILT
COASTAL PLAIN, WHITE, GRAY, RED, BROWN, AND ORANGE, DRY TO WET, LOOSE TO MEDIUM DENSE, COARSE TO SILTY SAND
(A) ALLUVIAL, BROWN TO GRAY, MOIST TO SATURATED, VERY SOFT TO SOFT, SLIGHTLY TO MODERATELY ORGANIC, SANDY CLAY
(B) ALLUVIAL, BROWN, WET TO SATURATED, LOOSE, ORGANIC SAND
(C) ALLUVIAL, GRAY, TAN, ORANGE, AND BROWN, DRY TO SATURATED, VERY LOOSE TO DENSE, COARSE TO CLAYEY SAND, AND SOFT TO MEDIUM STIFF, SANDY SILT
38+00
39+00
40+00
41+00
42+00
43+00
44+00
45+00
46+00
47+00
48+00
49+00
50+00
51+00

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Youngblood, C. A.	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. EB1	**STATION** 40+76	**OFFSET** 10 ft RT	**ALIGNMENT** -RP1C-	**0 HR.** 9.8
COLLAR ELEV. 198.1 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 495,039	**EASTING** 2,006,922	**24 HR.** 20.0
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Contract Driller	**START DATE** 07/23/98	**COMP. DATE** 07/24/98	**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)
200										198.1 GROUND SURFACE	0.0
	198.1	0.0	2	5	5	10		D		**COASTAL PLAIN** TAN TO BROWN, SILTY SAND	
195	194.6	3.5	3	3	5	8	SS-2	D		194.6 TAN, COARSE SAND	3.5
190	189.6	8.5	4	3	5	8	SS-3	21%		189.6 GRAY, TAN, AND RED, SILTY SAND	8.5
185	184.6	13.5	6	7	7	14	SS-4	M		184.6 TAN, FINE SAND	13.5
180	179.6	18.5	4	4	5	9	SS-5	W		179.6 GRAY, TAN, AND RED, COARSE SAND	18.5
175	174.6	23.5	WOH	WOH	WOH	0	SS-6	20%		174.6 TAN, SANDY CLAY	23.5
170	169.6	28.5	5	6	7	13	SS-7	18%		169.6 GRAY, CLAYEY SAND	28.5
165	164.6	33.5	5	8	15	23	SS-8	23%		164.5 GRAY AND TAN, SILTY CLAY	33.6
160	159.6	38.5	5	8	14	22	SS-9	15%			
155	154.6	43.5	6	8	9	17	SS-10	15%		154.6 GRAY, SANDY CLAY	43.5
150	149.6	48.5	4	8	11	19	SS-11	14%			
145	144.6	53.5	4	6	8	14	SS-12	26%		144.6 GRAY, RED, AND TAN, SILTY CLAY	53.5
140	139.6	58.5	7	10	16	26	SS-13	11%		139.6 GRAY, RED, AND TAN, SANDY CLAY	58.5
135	134.6	63.5	11	20	30	50	SS-14	14%		134.6 GRAY, RED, AND TAN, SILTY CLAY	63.5
130	129.6	68.5	14	19	30	49	SS-15	22%			
125	124.6	73.5	22	46	54/0.4	100/0.9	SS-16	14%			
120											

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Youngblood, C. A.	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. EB1	**STATION** 40+76	**OFFSET** 10 ft RT	**ALIGNMENT** -RP1C-	**0 HR.** 9.8
COLLAR ELEV. 198.1 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 495,039	**EASTING** 2,006,922	**24 HR.** 20.0
DRILL RIG/HAMMER EFF./DATE CME-550		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Contract Driller	**START DATE** 07/23/98	**COMP. DATE** 07/24/98	**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
120	119.6	78.5	10	16	20	Match Line 36	SS-17	23%		119.6 GRAY AND YELLOW-BROWN, SILTY SAND 78.5 118.1 Boring Terminated at Elevation 118.1 ft IN SILTY SAND 80.0

NCDOT BORE DOUBLE U2519CB_GEO_BH_RP1C_ENGLISH.GPJ NC_DOT.GDT 9/10/13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. B1	**STATION** 42+12	**OFFSET** 21 ft LT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 193.4 ft	**TOTAL DEPTH** 100.4 ft	**NORTHING** 495,037	**EASTING** 2,007,061	**24 HR.** 4.2
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/15/07	**COMP. DATE** 08/16/07	**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)
										GROUND SURFACE	193.4	0.0
	193.4	0.0	5	18	32	50	SS-18	D		ALLUVIAL ORANGE, SILTY SAND	190.8	2.6
	189.5	3.9	12	12	13	25	SS-19	W		ORANGE, TAN, AND BROWN, COARSE SAND		
	184.5	8.9	4	6	5	11	SS-20	Sat.				
	179.5	13.9	7	6	7	13		Sat.				
	174.5	18.9	10	13	16	29	SS-21	Sat.			170.4	23.0
	169.5	23.9	5	7	7	14	SS-22	M		COASTAL PLAIN LIGHT GRAY TO GRAY, SANDY CLAY		
	164.5	28.9	6	9	21	30	SS-23	M				
	159.5	33.9	17	26	34	60		M			156.0	37.4
	154.5	38.9	5	8	11	19	SS-24	W		TAN, AND GRAY, CLAYEY SAND		
	149.5	43.9	11	15	15	30	SS-25	M			146.4	47.0
	144.5	48.9	9	9	9	18	SS-26	M		DARK GRAY, SANDY CLAY		
	139.5	53.9	5	7	8	15	SS-27	M			141.4	52.0
	134.5	58.9	21	36	52	88	SS-28	M		DARK GRAY, SILTY CLAY		
	129.5	63.9	65	35/0.1		100/0.6		M			136.1	57.3
	124.5	68.9	17	22	28	50	SS-29	M		GRAY, SANDY SILT		
	119.5	73.9	27	35	65/0.4	100/0.9	SS-30	M			126.1	67.3
										DARK GRAY, SILTY CLAY		
											121.5	71.9
										GRAY, SANDY CLAY		
											116.6	76.8
										GRAY, SILTY CLAY		

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. B1	**STATION** 42+12	**OFFSET** 21 ft LT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 193.4 ft	**TOTAL DEPTH** 100.4 ft	**NORTHING** 495,037	**EASTING** 2,007,061	**24 HR.** 4.2
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/15/07	**COMP. DATE** 08/16/07	**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
						Match Line				
	114.5	78.9	23	28	38	66	SS-31	M		GRAY, SILTY CLAY *(continued)*
	109.5	83.9	20	28	28	56	SS-32	M		111.4 82.0 GRAY, CLAYEY SAND
	104.5	88.9	19	30	36	66	SS-33	M		106.5 86.9 GRAY AND GREEN, SANDY CLAY
	99.5	93.9	41	42	43	85		M		96.5 96.9
	94.5	98.9	16	23	23	46	SS-34	M		GREEN, SANDY SILT 93.0 100.4 Boring Terminated at Elevation 93.0 ft IN SANDY SILT

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. B2	**STATION** 43+67	**OFFSET** 1 ft RT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 185.9 ft	**TOTAL DEPTH** 101.3 ft	**NORTHING** 494,965	**EASTING** 2,007,202	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/17/07	**COMP. DATE** 08/21/07	**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))
190										
185	185.9	0.0	WOH	1	3	4		M		185.9 GROUND SURFACE 0.0
										ALLUVIAL BROWN TO GRAY, SLIGHTLY TO MODERATELY ORGANIC, SANDY CLAY
180	181.2	4.7	1	WOH	1	1	SS-35	Sat.		
175	176.2	9.7	1	WOH	WOH	0	SS-36	Sat.		177.7 8.2 DARK BROWN, ORGANIC SAND
170	171.2	14.7	3	2	1	3	SS-37	Sat.		172.8 13.1 BROWN TO GRAY, SLIGHTLY ORGANIC, SANDY SILT
165	166.2	19.7	WOH	2	3	5		W		162.9 23.0 **COASTAL PLAIN** GRAY TO DARK GRAY, CLAYEY SAND
160	161.2	24.7	3	4	6	10	SS-38	M		
155	156.2	29.7	6	5	5	10		M		152.6 33.3 GRAY TO DARK GRAY, SANDY CLAY
150	151.2	34.7	7	8	11	19	SS-39	M		
145	146.2	39.7	4	4	6	10		M		
140	141.2	44.7	100/0.5			100/0.5		D		138.7 47.2 GRAY, SILTY SAND
135	136.2	49.7	21	28	60	88	SS-40	Sat.		132.6 53.3 LIGHT GRAY TO DARK GRAY, CLAYEY SAND
130	131.2	54.7	21	36	44	80	SS-41	D		
125	126.2	59.7	23	77/0.5		100/1.0	SS-42	M		
120	121.2	64.7	23	51	49/0.3	100/0.8	SS-43	M		
115	116.2	69.7	22	24	32	56		M		112.7 73.2 GREEN, SANDY SILT
110	111.2	74.7	20	24	25	49	SS-44	M		

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. B2	**STATION** 43+67	**OFFSET** 1 ft RT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 185.9 ft	**TOTAL DEPTH** 101.3 ft	**NORTHING** 494,965	**EASTING** 2,007,202	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/17/07	**COMP. DATE** 08/21/07	**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
110						Match Line				GREEN, SANDY SILT *(continued)*
105	106.2	79.7	28	40	55	95		M		
100	101.2	84.7	23	25	43	68		M		
95	96.2	89.7	31	37	63/0.4	100/0.9		M		
90	91.2	94.7	49	51/0.4		100/0.9		M		
85	86.2	99.7	27	40	54	94		M		84.6 101.3 Boring Terminated at Elevation 84.6 ft IN SANDY SILT

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. B3	**STATION** 45+04	**OFFSET** 1 ft LT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 185.2 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 494,909	**EASTING** 2,007,326	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/21/07	**COMP. DATE** 08/22/07	**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))
185	185.2	0.0	1	WOH	1	1				185.2 / 0.0 GROUND SURFACE
										ALLUVIAL BROWN, ORGANIC, SAND
180	181.0	4.2	WOH	WOH	WOH	0				177.3 / 7.9 TAN AND ORANGE, SILTY SAND
175	176.3	8.9	7	8	7	15	SS-45			
170	171.0	14.2	7	7	7	14				167.8 / 17.4 **COASTAL PLAIN** GRAY TO DARK GRAY, SANDY CLAY
165	166.0	19.2	7	11	18	29	SS-46			
160	161.0	24.2	6	8	9	17				
155	156.0	29.2	4	5	7	12	SS-47			
150	151.0	34.2	4	5	8	13	SS-48			
145	146.0	39.2	19	25	30	55				
140	141.0	44.2	70	30/0.1		100/0.6	SS-49			
135	136.0	49.2	39	61/0.5		100/1.0				
130	131.0	54.2	22	58	42/0.4	100/0.9	SS-50			
125	126.0	59.2	21	49	47	96				
120	121.0	64.2	23	31	42	73				
115	116.0	69.2	14	23	34	57				
110	111.0	74.2	25	32	48					152.4 / 32.8 DARK GRAY, SILTY CLAY
										147.8 / 37.4 LIGHT GRAY, SANDY CLAY
										142.5 / 42.7 GRAY, SILTY SAND
										132.7 / 52.5 GRAY TO DARK GRAY, AND GREEN, SILTY CLAY

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. B3	**STATION** 45+04	**OFFSET** 1 ft LT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 185.2 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 494,909	**EASTING** 2,007,326	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/21/07	**COMP. DATE** 08/22/07	**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
110						Match Line				107.8 / 77.4 GRAY AND GREEN, CLAYEY SAND
105	106.0	79.2	28	34	65	80 99	SS-51			
100	101.0	84.2	100/0.5			100/0.5				
95	96.0	89.2	34	66/0.4		100/0.9				
90	91.0	94.2	100/0.5			100/0.5				
	86.0	99.2	35	65/0.4		100/0.9				85.1 / 100.1 Boring Terminated at Elevation 85.1 ft IN CLAYEY SAND

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. B4	**STATION** 46+49	**OFFSET** 3 ft RT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 185.4 ft	**TOTAL DEPTH** 99.0 ft	**NORTHING** 494,832	**EASTING** 2,007,449	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/23/07	**COMP. DATE** 08/24/07	**SURFACE WATER DEPTH** 0.2ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
185	185.4	0.0	WOH	WOH	WOH	0				185.4 WATER SURFACE (08/23/07) 0.0
	183.1	2.3								**ALLUVIAL** BROWN, ORGANIC SAND
180	181.8	3.6	1	1	1	2	SS-52	Sat.		GRAY TO DARK GRAY, SILTY TO MODERATELY ORGANIC, SILTY SAND
	178.0	7.4	1	0	1	1		Sat.		
175	174.2	11.2								**COASTAL PLAIN** LIGHT GRAY, CLAYEY SAND
	171.8	13.6	4	3	3	6	SS-53	W		
170	166.5	18.9								TAN-BROWN AND GRAY, SILTY CLAY
	166.8	18.6	5	13	25	38	SS-54	M		
165	161.8	23.6	5	8	12	20		M		
160	159.2	26.2								GRAY, CLAYEY SAND
	156.8	28.6	8	4	5	9	SS-55	W		
155	153.2	32.2								GRAY TO DARK GRAY, SILTY CLAY
	151.8	33.6	6	5	9	14	SS-56	M		
150	146.8	38.6	6	8	12	20		M		
145	141.8	43.6	13	18	20	38		M		
140	138.2	47.2								GRAY, SILTY SAND
	136.8	48.6	48	52/0.3		100/0.8	SS-57	M		
135	133.6	51.8								DARK GRAY, SILTY CLAY
	131.8	53.6	18	22	26	48	SS-58	M		
130	126.8	58.6	32	42	52	94		M		
125	121.8	63.6	22	33	48	81		M		
120	119.1	66.3								GRAY-GREEN, CLAYEY SAND
	116.8	68.6	28	41	59/0.4		SS-59	M		
115	114.2	71.2								GRAY-GREEN, SANDY CLAY
	111.8	73.6	25	38	42	80	SS-60	M		
110										

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. B4	**STATION** 46+49	**OFFSET** 3 ft RT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 185.4 ft	**TOTAL DEPTH** 99.0 ft	**NORTHING** 494,832	**EASTING** 2,007,449	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/23/07	**COMP. DATE** 08/24/07	**SURFACE WATER DEPTH** 0.2ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
110						Match Line				
	108.6	76.8								GRAY-GREEN, SANDY CLAY *(continued)*
105	106.8	78.6	37	48	52/0.4	100/0.9	SS-61	M		GRAY-GREEN, CLAYEY SAND
	101.8	83.6	70	30/0.2		100/0.7		M		
100	99.1	86.3								GRAY-GREEN, SANDY CLAY
	96.8	88.6	24	26	28	54	SS-62	M		
95	94.2	91.2								GRAY-GREEN, SANDY SILT
	91.8	93.6	29	46	54/0.3	100/0.8	SS-63			
90	86.8	98.6	100/0.4			100/0.4				
	86.4	99.0								Boring Terminated at Elevation 86.4 ft IN SANDY SILT

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. B5	**STATION** 48+01	**OFFSET** 3 ft LT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 194.6 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 494,746	**EASTING** 2,007,575	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/27/07	**COMP. DATE** 08/28/07	**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))
195	194.6	0.0	3	2	2	4	SS-64	M		194.6 GROUND SURFACE 0.0
	191.4	3.2	1	WOH	1	1	SS-65	Sat.		**ALLUVIAL** 192.0 2.6
190										BROWN, SILTY SAND
	186.4	8.2	1	1	2	3		Sat.		TAN TO GRAY, SLIGHTY ORGANIC, CLAYEY SAND
185										182.8 11.8
	181.4	13.2	6	4	8	12	SS-66	Sat.		TAN, FINE SAND
180										178.2 16.4
	176.4	18.2	11	18	21	39	SS-67	M		**COASTAL PLAIN**
175										LIGHT GRAY TO GRAY AND ORANGE, SANDY CLAY
	171.4	23.2	6	9	12	21		M		
170										
	166.4	28.2	9	15	19	34	SS-68	M		
165										
	161.4	33.2	7	12	17	29		M		
160										
	156.4	38.2	6	6	9	15	SS-69	M		
155										
	151.4	43.2	11	14	19	33		M		
150										
	146.4	48.2	8	10	12	22	SS-70	M		
145										
	141.4	53.2	6	7	9	16		M		
140										
	136.4	58.2	12	24	76/0.3	100/0.3	SS-71	D		
135										
	131.4	63.2	20	28	37	65		M		
130										
	126.4	68.2	27	47	53/0.4	100/0.9		M		
125										
	121.4	73.2	24	28	36	64		M		
120										
	116.4	78.2	19	34	55	89	SS-72	M		
115										153.1 41.5 GRAY TO DARK GRAY, SILTY CLAY
										142.8 51.8 GRAY, SILTY SAND
										137.2 57.4 GRAY TO DARK GRAY, SANDY CLAY
										117.9 76.7 GREEN AND GRAY, CLAYEY SAND

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. B5	**STATION** 48+01	**OFFSET** 3 ft LT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 194.6 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 494,746	**EASTING** 2,007,575	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/27/07	**COMP. DATE** 08/28/07	**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
115						Match Line				GREEN AND GRAY, CLAYEY SAND *(continued)*
	111.4	83.2	22	25	29	54		M		
110										
	106.4	88.2	39	61/0.5		100/1.0	SS-73	M		
105										
	101.4	93.2	32	53	47/0.4	100/0.9		M		
100										
	96.4	98.2	63	37/0.4		100/0.9		M		95.5 99.1 Boring Terminated at Elevation 95.5 ft IN CLAYEY SAND

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WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. EB2	**STATION** 49+07	**OFFSET** 10 ft LT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 201.8 ft	**TOTAL DEPTH** 100.5 ft	**NORTHING** 494,680	**EASTING** 2,007,659	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/28/07	**COMP. DATE** 08/29/07	**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))
205										
	201.8	0.0	1	4	6	10	SS-74	D		201.8 / 0.0 GROUND SURFACE
200										**COASTAL PLAIN** TAN TO ORANGE, SILTY SAND
	197.7	4.1	6	9	8	17		W		
195										
	192.7	9.1	3	3	4	7	SS-75	W		
190										
	187.7	14.1	2	3	4	7		W		
185										184.4 / 17.4 GRAY AND WHITE, COARSE SAND
	182.7	19.1	5	6	8	14	SS-76	W		
180										
	177.7	24.1	6	9	16	25		W		174.9 / 26.9 GRAY AND ORANGE-BROWN, SANDY CLAY
175										
	172.7	29.1	15	27	33	60	SS-77	W		
170										
	167.7	34.1	7	11	13	24		M		165.1 / 36.7 GRAY AND BROWN, SILTY CLAY
165										
	162.7	39.1	10	16	21	37	SS-78	M		
160										
	157.7	44.1	10	15	20	35		M		154.9 / 46.9 GRAY, SANDY CLAY
155										
	152.7	49.1	6	9	13	22	SS-79	M		
150										
	147.7	54.1	7	7	11	18		M		
145										
	142.7	59.1	6	7	11	18		M		139.6 / 62.2 GRAY, SILTY CLAY
140										
	137.7	64.1	19	24	30	54	SS-80	M		
135										134.5 / 67.3 DARK GRAY, SILTY SAND
	132.7	69.1	39	58	42/0.4	100/0.9	SS-81	M		
130										129.6 / 72.2 GRAY TO DARK GRAY, SILTY CLAY
	127.7	74.1	22	38	47	85	SS-82	M		
125										

WBS 34817.1.2	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE NO. 16 ON -RP1C- OVER BEAVER CREEK				**GROUND WTR (ft)**
BORING NO. EB2	**STATION** 49+07	**OFFSET** 10 ft LT	**ALIGNMENT** -RP1C-	**0 HR.** N/A
COLLAR ELEV. 201.8 ft	**TOTAL DEPTH** 100.5 ft	**NORTHING** 494,680	**EASTING** 2,007,659	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CME-45B		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 08/28/07	**COMP. DATE** 08/29/07	**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
125						Match Line				
	122.7	79.1	29	32	40	72		M		GRAY TO DARK GRAY, SILTY CLAY *(continued)*
120										
	117.7	84.1	31	38	52	90		M		115.2 / 86.6
115										GRAY-GREEN, SILTY SAND
	112.7	89.1	14	22	28	50	SS-83	M		
110										
	107.7	94.1	20	26	35	61		M		
105										
	102.7	99.1	21	33	67/0.4	100/0.9	SS-84	M		101.3 / 100.5 Boring Terminated at Elevation 101.3 ft IN SILTY SAND

NCDOT BORE DOUBLE U2519CB_GEO_BH_RP1C_ENGLISH.GPJ NC_DOT.GDT 9/10/13

PROJ. NO. - 34817.1.2
ID NO. - U-2519DA
COUNTY - Cumberland

EB1

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-2	10' LT	40+76	3.5-5.0	A-1-b(0)	20	NP	74.5	16.3	3.6	5.6	96	50	10	-	-
SS-3	10' LT	40+76	8.5-10.0	A-2-4(0)	21	NP	59.7	28.4	1.8	10.1	100	86	12	20.8	-
SS-4	10' LT	40+76	13.5-15.0	A-3(0)	23	NP	71.8	24.8	0.5	2.9	99	70	4	-	-
SS-5	10' LT	40+76	18.5-20.0	A-1-b(0)	24	4	74.4	6.5	1.4	17.7	84	31	17	-	-
SS-6	10' LT	40+76	23.5-25.0	A-6(11)	38	20	12.3	25.3	17.8	44.6	100	93	67	20.4	-
SS-7	10' LT	40+76	28.5-30.0	A-2-6(1)	33	17	22.6	43.2	2.6	31.6	100	94	35	18.1	-
SS-8	10' LT	40+76	33.5-35.0	A-7-6(38)	62	37	3.7	5.9	13.0	77.4	100	98	92	22.7	-
SS-9	10' LT	40+76	38.5-40.0	A-7-6(7)	43	26	36.8	18.7	0.7	43.8	100	92	45	14.8	-
SS-10	10' LT	40+76	43.2-44.7	A-6(13)	37	26	13.2	29.8	13.6	43.4	100	93	62	15.1	-
SS-11	10' LT	40+76	48.5-50.0	A-6(4)	28	17	33.5	22.8	11.9	31.8	99	78	46	13.9	-
SS-12	10' LT	40+76	53.5-55.0	A-7-6(50)	72	51	2.8	9.3	14.9	73.0	100	99	90	25.8	-
SS-13	10' LT	40+76	58.5-60.0	A-6(4)	31	15	26.0	30.8	12.3	30.9	100	86	48	10.8	-
SS-14	10' LT	40+76	63.5-65.0	A-7-6(4)	48	23	49.4	13.2	14.1	23.3	100	65	39	14.2	-
SS-15	10' LT	40+76	68.5-70.0	A-7-6(22)	60	31	14.2	20.4	23.2	42.2	100	92	69	21.6	-
SS-16	10' LT	40+76	73.5-75.0	A-7-6(5)	45	23	43.5	16.8	11.3	28.4	100	74	42	14.2	-
SS-17	10' LT	40+76	78.5-80.0	A-2-4(0)	40	9	20.0	53.7	12.6	13.7	100	98	31	22.9	-

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-18	21' LT	42+12	0.0-1.5	A-2-4(0)	19	4	50.4	27.8	9.6	12.2	97	62	25	-	-
SS-19	21' LT	42+12	3.9-5.4	A-1-b(0)	18	NP	64.8	22.0	3.0	10.2	87	41	15	-	-
SS-20	21' LT	42+12	8.9-10.4	A-1-b(0)	21	NP	82.9	11.8	3.3	2.0	92	24	7	-	-
SS-21	21' LT	42+12	18.9-20.4	A-1-b(0)	18	NP	67.5	26.4	4.1	2.0	90	45	8	-	-
SS-22	21' LT	42+12	23.9-25.4	A-6(6)	36	17	20.7	27.6	15.0	36.6	100	84	54	-	-
SS-23	21' LT	42+12	28.9-30.4	A-6(7)	36	22	36.4	17.7	11.4	34.6	100	77	49	-	-
SS-24	21' LT	42+12	38.9-40.4	A-2-6(0)	25	13	70.9	10.8	4.1	14.2	97	40	19	-	-
SS-25	21' LT	42+12	43.9-45.4	A-2-6(1)	36	21	68.5	8.9	2.2	20.3	98	50	23	-	-
SS-26	21' LT	42+12	48.9-50.4	A-6(6)	33	22	36.0	21.1	14.4	28.5	100	78	46	-	-
SS-27	21' LT	42+12	53.9-55.4	A-7-6(40)	63	45	7.3	12.2	25.6	54.9	100	97	84	-	-
SS-28	21' LT	42+12	58.9-60.4	A-4(0)	17	3	38.6	30.7	20.5	10.2	99	78	36	-	-
SS-29	21' LT	42+12	68.9-70.4	A-7-6(15)	42	24	17.1	17.1	31.3	34.6	100	88	70	-	-
SS-30	21' LT	42+12	73.9-75.3	A-6(4)	40	21	37.8	23.2	24.8	14.2	100	81	42	-	-
SS-31	21' LT	42+12	78.9-80.4	A-7-6(19)	47	24	9.8	14.4	55.5	20.3	100	95	79	-	-
SS-32	21' LT	42+12	83.9-85.4	A-2-6(0)	33	13	53.9	23.4	18.7	4.1	100	68	27	-	-
SS-33	21' LT	42+12	88.9-90.4	A-6(6)	40	18	25.6	29.5	36.8	8.1	100	84	51	-	-
SS-34	21' LT	42+12	98-.9-100.4	A-4(2)	36	8	4.1	53.0	34.8	8.1	100	99	51	-	-

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-35	1' RT	43+67	4.7-6.2	A-6(2)	31	12	21.5	39.0	17.1	22.4	97	84	43	-	-
SS-36	1' RT	43+67	9.7-11.2	Not Enough Material			36.6	17.9	37.4	8.1	97	68	49	-	-
SS-37	1' RT	43+67	14.7-16.2	A-4(0)	24	2	9.1	55.7	20.9	14.2	99	96	43	-	-
SS-38	1' RT	43+67	24.7-26.2	A-2-6(2)	38	24	58.7	11.2	5.7	24.4	98	60	30	-	-
SS-39	1' RT	43+67	34.7-36.2	A-6(8)	31	19	20.9	26.0	44.9	8.1	100	87	60	-	-
SS-40	1' RT	43+67	48.7-51.2	A-2-4(0)	26	5	66.5	21.1	6.3	6.1	100	67	13	-	-
SS-41	1' RT	43+67	54.7-56.2	A-2-6(0)	38	23	73.8	10.5	4.6	11.2	88	35	15	-	-
SS-42	1' RT	43+67	59.7-60.7	A-2-6(0)	30	11	49.3	23.1	13.4	14.1	99	65	30	-	-
SS-43	1' RT	43+67	64.7-66.0	A-2-6(0)	32	13	44.8	29.5	19.6	6.1	100	74	31	-	-
SS-44	1' RT	43+67	74.7-76.2	A-4(0)	35	8	12.9	54.7	26.3	6.1	100	95	39	-	-

B3

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-45	1' LT	45+04	8.9-10.4	A-2-4(0)	18	NP	64.6	26.7	3.6	5.1	97	51	11	-	-
SS-46	1' LT	45+04	19.2-20.7	A-6(6)	33	17	28.9	17.0	11.7	42.4	100	82	56	-	-
SS-47	1' LT	45+04	29.2-30.7	A-6(4)	32	19	39.0	22.3	9.4	29.3	100	79	43	-	-
SS-48	1' LT	45+04	34.2-35.7	A-7-6(40)	62	43	3.4	12.7	15.2	68.7	100	98	87	-	-
SS-49	1' LT	45+04	44.2-44.8	A-2-4(0)	19	1	54.3	28.1	10.5	7.1	98	61	21	-	-
SS-50	1' LT	45+04	54.2-55.6	A-7-6(21)	51	27	8.3	19.0	34.3	38.4	98	93	77	-	-
SS-51	1' LT	45+04	79.2-80.7	A-2-7(0)	43	11	63.3	20.0	10.6	6.1	100	52	20	-	-

B4

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-52	3' RT	46+49	3.6-5.1	A-2-4(0)	25	3	56.6	26.7	8.7	8.1	97	51	19	-	-
SS-53	3' RT	46+49	13.6-15.1	A-2-6(0)	26	13	58.5	19.1	2.2	20.2	100	63	23	-	-
SS-54	3' RT	46+49	18.6-20.1	A-7-6(11)	44	29	30.6	21.7	13.3	34.3	100	81	52	-	-
SS-55	3' RT	46+49	28.6-30.1	A-2-6(1)	26	14	39.4	26.1	9.3	25.3	86	65	33	-	-
SS-56	3' RT	46+49	33.6-35.1	A-7-6(22)	47	28	9.9	14.1	27.5	48.5	100	95	79	-	-
SS-57	3' RT	46+49	48.6-50.1	A-2-4(0)	24	NP	60.8	30.3	4.8	4.0	98	62	11	-	-
SS-58	3' RT	46+49	53.6-55.1	A-7-6(21)	46	27	8.5	18.6	32.5	40.4	100	96	78	-	-
SS-59	3' RT	46+49	68.6-70.1	A-2-6(0)	36	12	56.6	15.2	15.2	13.1	95	59	29	-	-
SS-60	3' RT	46+49	73.6-75.1	A-6(1)	36	12	27.5	41.6	24.8	6.1	100	87	38	-	-
SS-61	3' RT	46+49	78.6-80.1	A-2-6(0)	39	12	59.1	21.9	11.9	7.1	97	58	22	-	-
SS-62	3' RT	46+49	88.6-90.1	A-6(1)	35	12	12.1	57.1	21.7	9.1	100	95	40	-	-
SS-63	3' RT	46+49	93.6-95.1	A-4(0)	24	7	26.7	41.8	24.4	7.1	100	86	39	-	-

PROJ. NO. - 34817.1.2
ID NO. - U-2519DA
COUNTY - Cumberland

B5

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-64	3' LT	48+01	0.0-1.5	A-2-4(0)	23	9	47.3	29.4	4.1	19.2	97	68	25	-	-
SS-65	3' LT	48+01	3.2-4.7	A-2-6(0)	24	11	48.5	27.9	5.5	18.2	93	59	25	-	-
SS-66	3' LT	48+01	13.2-14.7	A-3(0)	17	NP	62.7	29.3	3.9	4.0	99	55	10	-	-
SS-67	3' LT	48+01	18.2-19.7	A-6(12)	32	16	1.2	23.8	32.5	42.4	100	99	83	-	-
SS-68	3' LT	48+01	332.-34.7	A-6(3)	32	18	47.1	14.1	2.4	36.4	99	73	39	-	-
SS-69	3' LT	48+01	43.2-44.7	A-7-6(25)	52	39	16.2	19.4	20.0	44.4	100	90	69	-	-
SS-70	3' LT	48+01	53.2-54.7	A-2-4(0)	27	NP	1.0	76.3	14.6	8.1	100	99	30	-	-
SS-71	3' LT	48+01	58.2-59.5	A-6(7)	34	15	17.6	28.5	32.7	21.2	100	90	62	-	-
SS-72	3' LT	48+01	78.2-79.7	A-2-6(0)	32	14	61.4	18.1	12.4	8.1	98	58	23	-	-
SS-73	3' LT	48+01	88.2-89.2	A-2-6(0)	35	12	53.3	26.3	16.4	4.0	98	64	25	-	-

EB2

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-74	10' LT	49+07	0.0-1.5	A-2-4(0)	20	NP	42.8	47.0	6.2	4.0	99	75	14	-	-
SS-75	10' LT	49+07	9.1-10.6	A-2-4(0)	22	NP	51.7	35.4	1.8	11.1	95	62	14	-	-
SS-76	10' LT	49+07	19.1-20.6	A-1-b(0)	17	NP	85.2	9.4	1.4	4.0	100	42	6	-	-
SS-77	10' LT	49+07	29.1-30.6	A-6(8)	31	20	18.0	27.1	14.5	40.4	100	89	60	-	-
SS-78	10' LT	49+07	39.1-40.6	A-7-6(17)	48	36	32.3	9.5	5.8	52.5	100	79	59	-	-
SS-79	10' LT	49+07	49.1-50.6	A-6(10)	34	18	12.5	25.8	21.3	40.4	100	92	69	-	-
SS-80	10' LT	49+07	64.1-65.6	A-7-6(36)	63	35	1.6	11.3	24.5	62.6	100	99	90	-	-
SS-81	10' LT	49+07	69.1-70.6	A-2-4(0)	20	2	45.6	33.7	14.6	6.1	100	74	26	-	-
SS-82	10' LT	49+07	74.1-75.6	A-7-6(11)	45	24	20.8	25.6	25.3	28.3	100	90	58	-	-
SS-83	10' LT	49+07	89.1-90.6	A-2-4(0)	32	4	59.2	24.3	10.4	6.1	97	61	20	-	-
SS-84	10' LT	49+07	99.1-100.6	A-2-4(0)	28	7	48.9	27.5	15.4	8.1	99	70	27	-	-

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.2.8 (U-2519CB)	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34817.2.8 (U-2519CB)* F.A. PROJ. *N/A*

COUNTY *CUMBERLAND*

PROJECT DESCRIPTION *FAYETTEVILLE OUTER LOOP (FOL) – FROM SOUTH OF SR1400 (CLIFFDALE RD) TO EAST OF ALL AMERICAN FREEWAY*

SITE DESCRIPTION *BRIDGE ON –PXROAD– OVER –YI– (CANOPY LN)*

INVENTORY

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4 - 5	CROSS SECTIONS
6 - 9	BORE LOGS
10	SOIL TEST RESULTS
11	SITE PHOTOS

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. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

PERSONNEL

N. Page

J. Williamson

F. Wright

K. Parton (ConeTec)

D. White (ConeTec)

INVESTIGATED BY *S&ME, INC.*

CHECKED BY *A.F. Riggs Jr. P.E.*

SUBMITTED BY *S&ME, INC.*

DATE *MAY 2014*

NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER ALBERT F. RIGGS, JR. 5/16/14

DRAWN BY: *B. Ratti*

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

PROJECT: 34817.2.8

ID: U-2519CB

PROJECT REFERENCE NO.	SHEET NO.
34817.2.8 (U-2519CB)	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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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
LIQUID LIMIT PLASTIC INDEX	6 MX		NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MN	41 MN 10 MN	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 A 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	
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	N/A
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	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
GRAIN SIZE 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	- 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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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
- 25/825 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / CPT / DMT / VST / PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- WCR — SPT REFUSAL

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] CME-55LC
- [X] CME-45 TRACK

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 3-7/8" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B____
- [ ] -N____
- [ ] -H____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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.

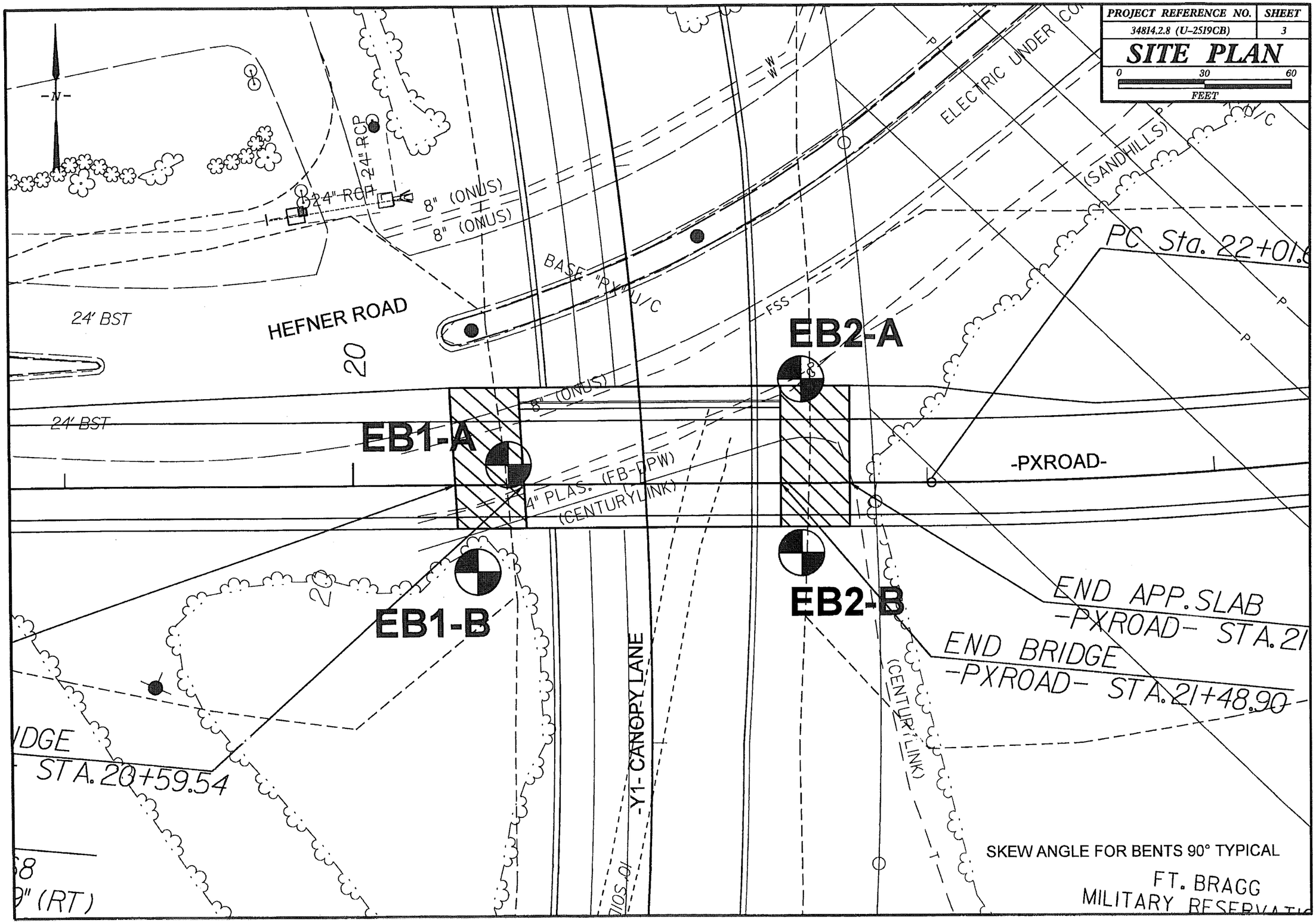
TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BYI-107 E: 1,997,456.73 N: 493,205.54

ELEVATION: 279.43 FT.

NOTES:
FIAD - FILLED IN AFTER DRILLING
ST-1 SHELBY TUBE

REVISED 09/23/09


PROJECT REFERENCE NO.
34814.2.8 (U-2519CB)
SHEET
3
SITE PLAN
0
30
60
FEET
N
24" RCP
24" RCP
8" (ONUS)
8" (ONUS)
BASE "PX" U/C
ELECTRIC UNDER CO
(SANDHILLS)
PC Sta. 22+01.6
24' BST
HEFNER ROAD
20
FSS
EB2-A
8" (ONUS)
24' BST
EB1-A
4" PLAS. (FB-DPW)
(CENTURYLINK)
-PXROAD-
EB1-B
EB2-B
END APP. SLAB
-PXROAD- STA. 21
END BRIDGE
-PXROAD- STA. 21+48.90
-Y1- CANOPY LANE
(CENTURYLINK)
IDGE
STA. 20+59.54
SKEW ANGLE FOR BENTS 90° TYPICAL
FT. BRAGG
MILITARY RESERVATI
9" (RT)

PROJ. REFERENCE NO.	SHEET NO.
34817.2.8 (U-2519CB)	4

CROSS SECTION THROUGH END BENT 1 (STA 20+51.12)

CL -PXROAD-

EBI-A
STA 20+54
7' LT -PXROAD-

EBI-B
STA 20+43
30' RT -PXROAD-

ASPHALT PAVEMENT

GROUND SURFACE

ROADWAY EMBANKMENT FILL:
BROWN, DRY, MEDIUM DENSE TO LOOSE, SILTY FINE SAND

RED TAN, MOIST, STIFF, CLAYEY SILT

RED TAN AND GRAY, MOIST, STIFF, SILTY CLAY

ST-1

ST-2

COASTAL PLAIN:
GRAY-ORANGE, MOIST, VERY STIFF TO HARD, SILTY CLAY WITH TRACE OF FINE TO COARSE SAND (CAPE FEAR FORMATION)

RED-TAN ORANGE AND WHITE, WET, LOOSE TO MEDIUM DENSE, SILTY FINE TO COARSE SAND

ORANGE TAN, WHITE AND GRAY, WET TO MOIST, MEDIUM DENSE, SILTY FINE TO COARSE SAND WITH TRACE OF CLAY LENSES

COASTAL PLAIN:
RED ORANGE, GRAY TAN AND BROWN, DRY TO WET, LOOSE TO MEDIUM DENSE, CLAYEY TO SILTY FINE TO COARSE SAND (UNDIVIDED COASTAL PLAIN DEPOSITS)

GRAY, MOIST, HARD, SILTY CLAY

GRAY, MOIST, HARD, SILTY CLAY

04/14

100/0.9

BT

FIAD

VERTICAL 20 10 0

HORIZONTAL 0 10

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE CROSS SECTION GROUND LINE TAKEN FROM TIN FILE: u2519cb_ls_tin.tin

305 300 295 290 285 280 275 270 265 260 255 250 245 240 235 230 225 220 215

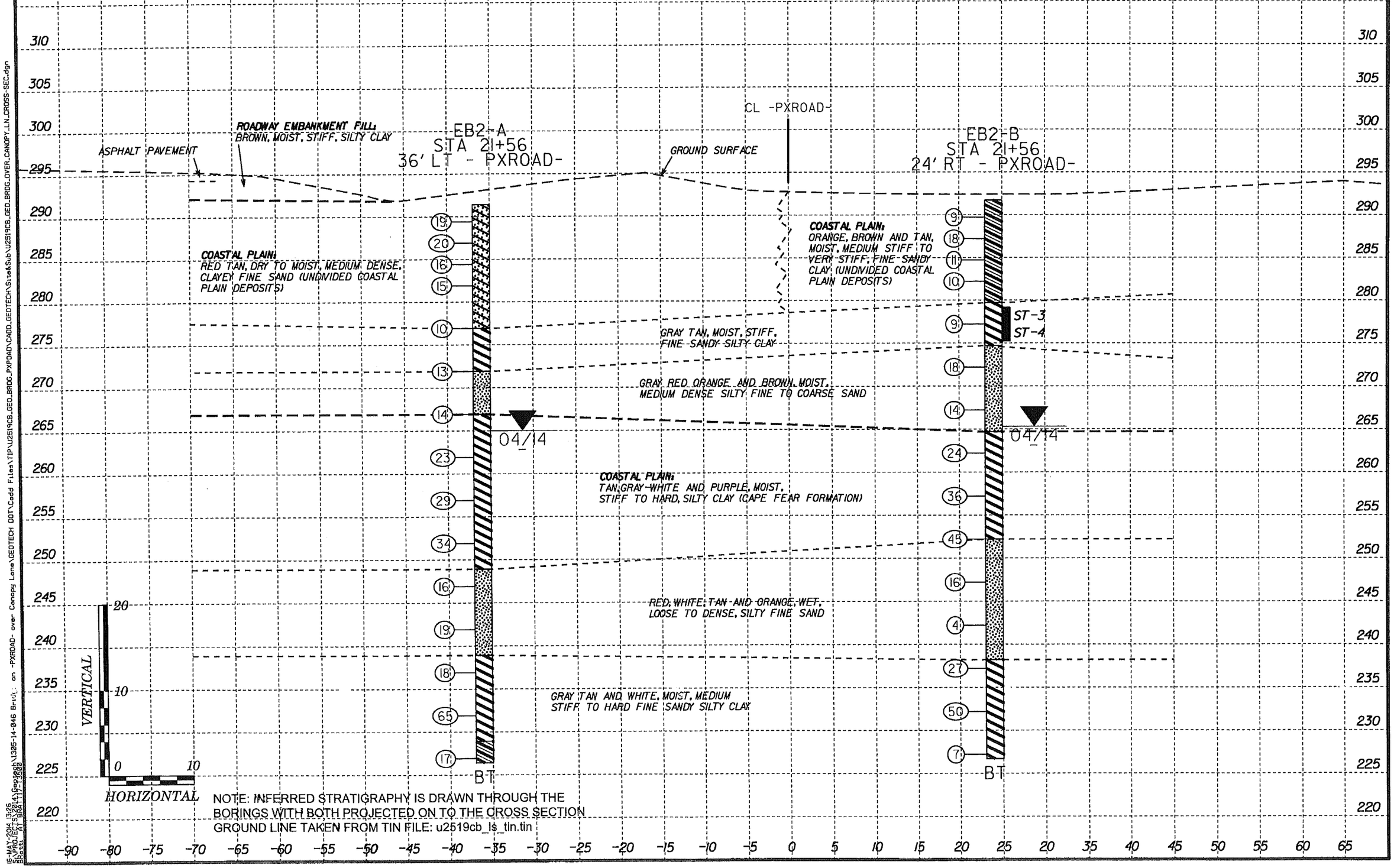
-80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70

8/23/99

16-MAY-2014 14:40
C:\Program Files (x86)\Bentley\MicroStation V8 XM Edition\WorkSpace\projects\1305-14-846 Bridge on -PXROAD- over Canopy Lane\GEOTECH DOT\Cadd Files\TIP\U2519CB_GEO_BRDG_OVER_CANOPY_LN_CROSS-SEC.dgn
Brett Hall
AT BRETT-PC

PROJ. REFERENCE NO.	SHEET NO.
34817.2.8 (U-2519CB)	5

CROSS SECTION THROUGH END BENT 2 (STA 21+50.37)



NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE CROSS SECTION
GROUND LINE TAKEN FROM TIN FILE: u2519cb_ls_tin.tin

8/23/99
16-MAY-2014 13:26
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Bratti AT BRATTI7-13500

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Bridge on -PXROAD- over -Y1- (Canopy Lane)				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 20+54	**OFFSET** 7 ft LT	**ALIGNMENT** -PXROAD-	**0 HR.** N/A
COLLAR ELEV. 292.3 ft	**TOTAL DEPTH** 75.0 ft	**NORTHING** 493,082	**EASTING** 1,996,655	**24 HR.** 30.0
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER K. Parton	**START DATE** 04/17/14	**COMP. DATE** 04/22/14	**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)
295										292.3 GROUND SURFACE	0.0
	291.3	1.0								**UNDIVIDED COASTAL PLAIN** Orange Clayey Fine SAND	
290	288.8	3.5	3	3	2	5		M			
	286.3	6.0	3	2	4	6		M		286.8 Red Tan Clayey SILT	5.5
285	283.8	8.5	3	5	7	12		M		284.3 Red Tan Gray Silty CLAY	8.0
			5	6	8	14		M			
280	278.8	13.5	5	5	4	9		W		279.8 Red Clayey Fine SAND	12.5
275	273.8	18.5	5	4	4	8		M			
270	268.8	23.5	9	9	6	15		M		269.8 Red White Tan Silty Fine to Coarse SAND	22.5
265	263.8	28.5	5	6	5	11		M		264.8 Gray Tan Clayey Fine to Coarse SAND	27.5
260	258.8	33.5	7	11	16	27		M		260.3 **COASTAL PLAIN** Gray Silty CLAY (CAPE FEAR FORMATION)	32.0
255	253.8	38.5	8	12	18	30		M			
250	248.8	43.5	15	12	9	21		W		249.8 Red Tan White Silty Fine to Coarse SAND	42.5
245	243.8	48.5	6	8	10	18		W			
240	238.8	53.5	4	4	5	9		W			
235	233.8	58.5	8	16	24	40		M		234.8 Gray Silty CLAY	57.5
230	228.8	63.5	14	12	17	29		W		228.3 Orange Tan White Silty Fine to Coarse SAND with Trace of Clay Lenses	64.0
225	223.8	68.5	5	8	10	18		M		224.8 Gray Silty Fine SAND	67.5
220	218.8	73.5	5	7	11	18		M		217.3 Boring Terminated at Elevation 217.3 ft in Silty Fine SAND (CAPE FEAR FORMATION)	75.0

1) Advanced 2-15/16 Inch Tricone Bit to 73.5 Feet
2) Set 7.5 Feet of NW Casing
3) Fresh Water Used as Drilling Fluid
4) Some Drilling Fluid Loss Observed

Other Samples:
ST-1 (8.0 - 10.0)
ST-2 (10.0 - 12.0)

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Bridge on -PXROAD- over -Y1- (Canopy Lane)				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 20+54	**OFFSET** 7 ft LT	**ALIGNMENT** -PXROAD-	**0 HR.** N/A
COLLAR ELEV. 292.3 ft	**TOTAL DEPTH** 75.0 ft	**NORTHING** 493,082	**EASTING** 1,996,655	**24 HR.** 30.0
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER K. Parton	**START DATE** 04/17/14	**COMP. DATE** 04/22/14	**SURFACE WATER DEPTH** N/A	

215 Match Line

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page
SITE DESCRIPTION Bridge on -PXROAD- over -Y1- (Canopy Lane)			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 20+43	**OFFSET** 30 ft RT	**ALIGNMENT** -PXROAD- — **0 HR.** N/A
COLLAR ELEV. 294.1 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 493,044	**EASTING** 1,996,660 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CONETEC 331145 CME-55 LC 78.8% 04/02/2013	**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER D. White	**START DATE** 04/24/14	**COMP. DATE** 04/25/14	**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
295										ELEV. (ft) / DEPTH (ft)
										294.1 — 0.0 — GROUND SURFACE
	293.1	1.0	3	2	3	5		D		UNDIVIDED COASTAL PLAIN Orange Silty Fine SAND
290	290.6	3.5	7	4	4	8		M		291.1 — 3.0 — Orange Clayey Fine to Coarse SAND
	288.1	6.0	5	4	6	10		M		
285	285.6	8.5	6	8	7	15		M		
										281.6 — 12.5 — Red Orange Silty Fine SAND
280	280.6	13.5	5	7	5	12		M		
										276.6 — 17.5 — Orange Clayey Fine SAND
275	275.6	18.5	5	4	7	11		M		
270	270.6	23.5	4	8	12	20		M		
										266.6 — 27.5 — COASTAL PLAIN Gray Orange Silty CLAY with Trace of Fine to Coarse Sand (CAPE FEAR FORMATION)
265	265.6	28.5	10	16	21	37		M		
260	260.6	33.5	5	13	19	32		M		261.6 — 32.5 — Gray White Silty CLAY
255	255.6	38.5	10	16	23	39		M		
250	250.6	43.5	8	9	14	23		W		251.6 — 42.5 — Orange White Silty Fine to Coarse SAND
245	245.6	48.5	7	6	8	14		W		
240	240.6	53.5	5	6	2	8		W		
										236.6 — 57.5 — Gray Silty CLAY
235	235.6	58.5	11	13	24	37		M		
230	230.6	63.5	20	30	31	61		M		
										226.6 — 67.5 — White Orange and Gray Silty Fine SAND
225	225.6	68.5	3	5	7	12		W		
220	220.6	73.5	4	6	8	14		W		
										216.6 — 77.5 — Gray Silty CLAY
215	215.6	78.5								

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page
SITE DESCRIPTION Bridge on -PXROAD- over -Y1- (Canopy Lane)			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 20+43	**OFFSET** 30 ft RT	**ALIGNMENT** -PXROAD- — **0 HR.** N/A
COLLAR ELEV. 294.1 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 493,044	**EASTING** 1,996,660 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CONETEC 331145 CME-55 LC 78.8% 04/02/2013	**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER D. White	**START DATE** 04/24/14	**COMP. DATE** 04/25/14	**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
215			27	43	57/0.4	Match Line 100/0.9		M		214.2 — 79.9 — Boring Terminated at Elevation 214.2 ft in Silty CLAY (CAPE FEAR FORMATION)

1) Advanced 2-15/16 inch Tricone Bit to 78.5 Feet
2) Set 3.5 Feet of NW Casing
3) Fresh Water Used as Drilling Fluid
4) Some Drilling Fluid Loss Observed

NCDOT BORE DOUBLE U2519CB_GEO_BRDG_PXROAD GINT.GPJ NC_DOT.GDT 5/16/14

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page
SITE DESCRIPTION Bridge on -PXROAD- over -Y1- (Canopy Lane)			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 21+56	**OFFSET** 36 ft LT	**ALIGNMENT** -PXROAD- — **0 HR.** N/A
COLLAR ELEV. 291.4 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 493,149	**EASTING** 1,996,737 — **24 HR.** 26.4
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER K. Parton	**START DATE** 04/16/14	**COMP. DATE** 04/17/14	**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
295										
										291.4 GROUND SURFACE 0.0
290	290.4	1.0	6	9	10	19		M		UNDIVIDED COASTAL PLAIN Tan Red Clayey Fine SAND
	287.9	3.5	13	9	11	20		M		
285	285.4	6.0	8	7	9	16		M		
	282.9	8.5	5	5	10	15		M		
280										
	277.9	13.5	3	4	6	10		M		276.9 14.5 Tan Silty CLAY
275										
	272.9	18.5	4	5	8	13		M		271.9 19.5 Gray Red Silty Fine SAND
270										
	267.9	23.5	4	4	10	14		M		266.9 24.5 COASTAL PLAIN Tan Gray Silty CLAY (CAPE FEAR FORMATION)
265										
	262.9	28.5	8	10	13	23		M		
260										
	257.9	33.5	8	13	16	29		M		
255										
	252.9	38.5	10	14	20	34		M		
250										
	247.9	43.5	6	8	8	16		W		248.9 42.5 Red White Tan Silty Fine SAND
245										
	242.9	48.5	6	9	10	19		W		
240										238.9 52.5
	237.9	53.5	6	8	10	18		M		Gray Silty CLAY
235										
	232.9	58.5	16	23	42	65		M		
230										228.9 62.5 Tan White Fine Sandy CLAY
	227.9	63.5	4	7	10	17		M		226.4 65.0 Boring Terminated at Elevation 226.4 ft in Fine Sandy CLAY (CAPE FEAR FORMATION)

1) Advanced 2-15/16 inch Tricone Bit to 63.5 Feet
2) Set 3.5 Feet of NW Casing
3) Fresh Water Used as Drilling Fluid
4) Some Drilling Fluid Loss Observed

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Bridge on -PXROAD- over -Y1- (Canopy Lane)				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 21+56	**OFFSET** 24 ft RT	**ALIGNMENT** -PXROAD-	**0 HR.** N/A
COLLAR ELEV. 291.7 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 493,094	**EASTING** 1,996,761	**24 HR.** 26.1
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER K. Parton	**START DATE** 04/15/14	**COMP. DATE** 04/16/14	**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)
295											
	290.7	1.0	4	3	6	9		M		291.7 GROUND SURFACE	0.0
290										**UNDIVIDED COASTAL PLAIN**	
	288.2	3.5	8	9	9	18		M		Orange Brown Fine Sandy CLAY	
285	285.7	6.0	5	5	6	11		M			
	283.2	8.5	4	4	6	10		M			
280										279.7	12.0
	278.2	13.5	3	3	6	9		M		Tan Fine Sandy Silty CLAY	
275										274.7	17.0
	273.2	18.5	8	7	11	18		M		Orange Brown Silty Fine to Coarse SAND	
270											
	268.2	23.5	5	6	8	14		M			
265									▼		
	263.2	28.5	6	7	17	24		M		264.7	27.0
260										**COASTAL PLAIN**	
	258.2	33.5	9	12	24	36		M		Gray-White and Purple Silty CLAY	
255										(CAPE FEAR FORMATION)	
	253.2	38.5	12	17	28	45		W		252.2	39.5
250										Orange Silty Fine to Coarse SAND	
	248.2	43.5	8	7	9	16		W			
245											
	243.2	48.5	3	2	2	4		W			
240										239.2	52.5
	238.2	53.5	6	9	18	27		M		Gray Silty CLAY	
235											
	233.2	58.5	14	17	33	50		M			
230											
	228.2	63.5	4	4	3	7		M		226.7	65.0
										Boring Terminated at Elevation 226.7 ft in Silty CLAY (CAPE FEAR FORMATION)	

1) Advanced 2-15/16 inch Tricone Bit to 63.5 Feet
2) Set 3.5 Feet of NW Casing
3) Fresh Water Used as Drilling Fluid
4) Some Drilling Fluid Loss Observed

Other Samples:
ST-3 (12.5 - 14.5)

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Bridge on -PXROAD- over -Y1- (Canopy Lane)				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 21+56	**OFFSET** 24 ft RT	**ALIGNMENT** -PXROAD-	**0 HR.** N/A
COLLAR ELEV. 291.7 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 493,094	**EASTING** 1,996,761	**24 HR.** 26.1
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER K. Parton	**START DATE** 04/15/14	**COMP. DATE** 04/16/14	**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
215						Match Line				ST-4 (14.5 - 16.5)

NCDOT BORE DOUBLE U2519CB GEO_BRDG_PXROAD GINT.GPJ NC_DOT.GDT 5/14/14

SUMMARY OF LABORATOTY TEST DATA

Soil Classification and Gradation

S&ME

Quality Assurance

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

S&ME Project #:	1305-14-046	Date Report	5/5/2014
State Project No.:	34817.2.8	County: Cumberland	Date Tested 5/2 - 5/5/14
Federal ID No.:	NA	TIP No. U-2519CB	
Project Name:	Bridge on -PXROAD- over -Y1- (Canopy Lane)		
Client Name:	NCDOT	Client Address: Raleigh, North Carolina	

Boring No.	Sample No.	Sample Depth (ft)	AASHTO Classification		Total % Passing Sieve #					Total Mortar Fraction (%)				LL	PL	PI	Organic Content %	Moisture Content %
					10	40	60	200	270	Coarse Sand	Fine Sand	Silt	Clay					
EB1-A	ST-1	8 - 10	A-7-6	(29)	100	94	91	81.1	75.4	9	16	21	54	62	29	33	0.5	22.9
EB2-B	ST-3	12.5 - 14.5	A-7-6	(10)	100	69	56	44.1	41.5	43	15	12	30	63	29	34	0.7	19.1

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	Abner F. Riggs, Jr., P.E.	Senior Engineer
Technician Name:	*Signature*	*Certification #*	*Technical Responsibility:*	*Position*

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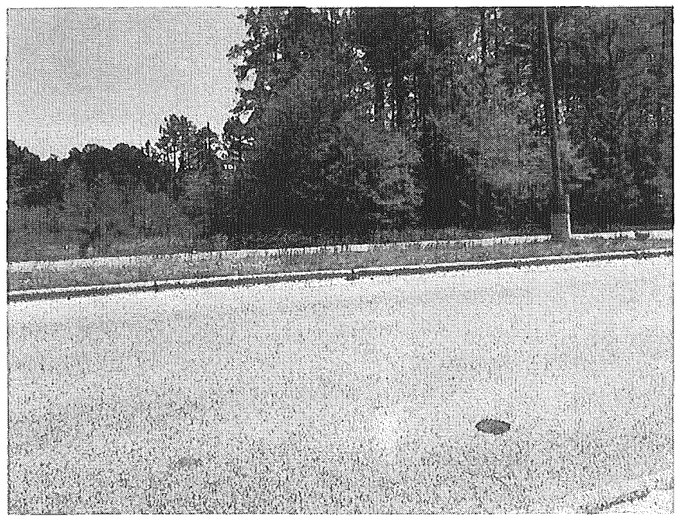


Photograph No. 1: This photograph was taken from the left side of the -PXROAD- alignment, looking south across proposed End Bent No. 1

Photograph No. 2: This photograph was taken from the right side of the –PXROAD- alignment, looking north across proposed End Bent No. 1

Photograph No. 3: This photograph was taken from the left side of the -PXROAD- alignment, looking south across proposed End Bent No. 2

Photograph No. 4: This photograph was taken from the right side of the –PXROAD- alignment, looking north across proposed End Bent No. 2

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519CB)	1	6

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34817.1.2 (U-2519CB) F.A. PROJ. NHF-DPR-0100(001)

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE – OUTER LOOP FROM SOUTH OF SR 1400 (CLIFFDALE RD.) TO EAST OF SR 1415 (YADKIN RD.)

SITE DESCRIPTION RET. WALL 1 AT -RPC2- STA. 11+50, 26 FEET RIGHT AND RET. WALL 2 AT -TT5- STA. 22+50, 10 FEET RIGHT

WALL INVENTORY

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3-4	SITE PLAN
5-6	PROFILE(S)

CAUTION NOTICE

THE SUBSURFACE EXPLORATION 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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIMS 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 BY THE SUBSURFACE INFORMATION.

PERSONNEL

KBQ

JNJ

WNC

RES

LWD

INVESTIGATED BY K. B. MILLER

CHECKED BY D. N. ARGENBRIGHT

SUBMITTED BY D. N. ARGENBRIGHT

DATE SEPTEMBER, 2006

NORTH CAROLINA LICENSED SEAL 2029 GEOLOGIST KEVIN BENNETT MILLER 09/15/2006

PROJECT: 34817.1.2

ID: U-2519CB

DRAWN BY: W. D. FIELDS AND K. B. MILLER

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519CB)	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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

VERY STIFF, BROWN, 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	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	
CLASS.	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
LIQUID LIMIT				40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX	6 MX		NP	10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
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 A 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/FT²)
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 0.50
	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)	4.75	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	- 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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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	6 - 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
- SOUNDING ROD
- SPT CPT DPT CMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

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

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45C
- [ ] CME-550
- [ ] 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 13/16 " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 PIECES 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 FEET
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 THE 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, 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:

ELEVATION: FT.

NOTES:

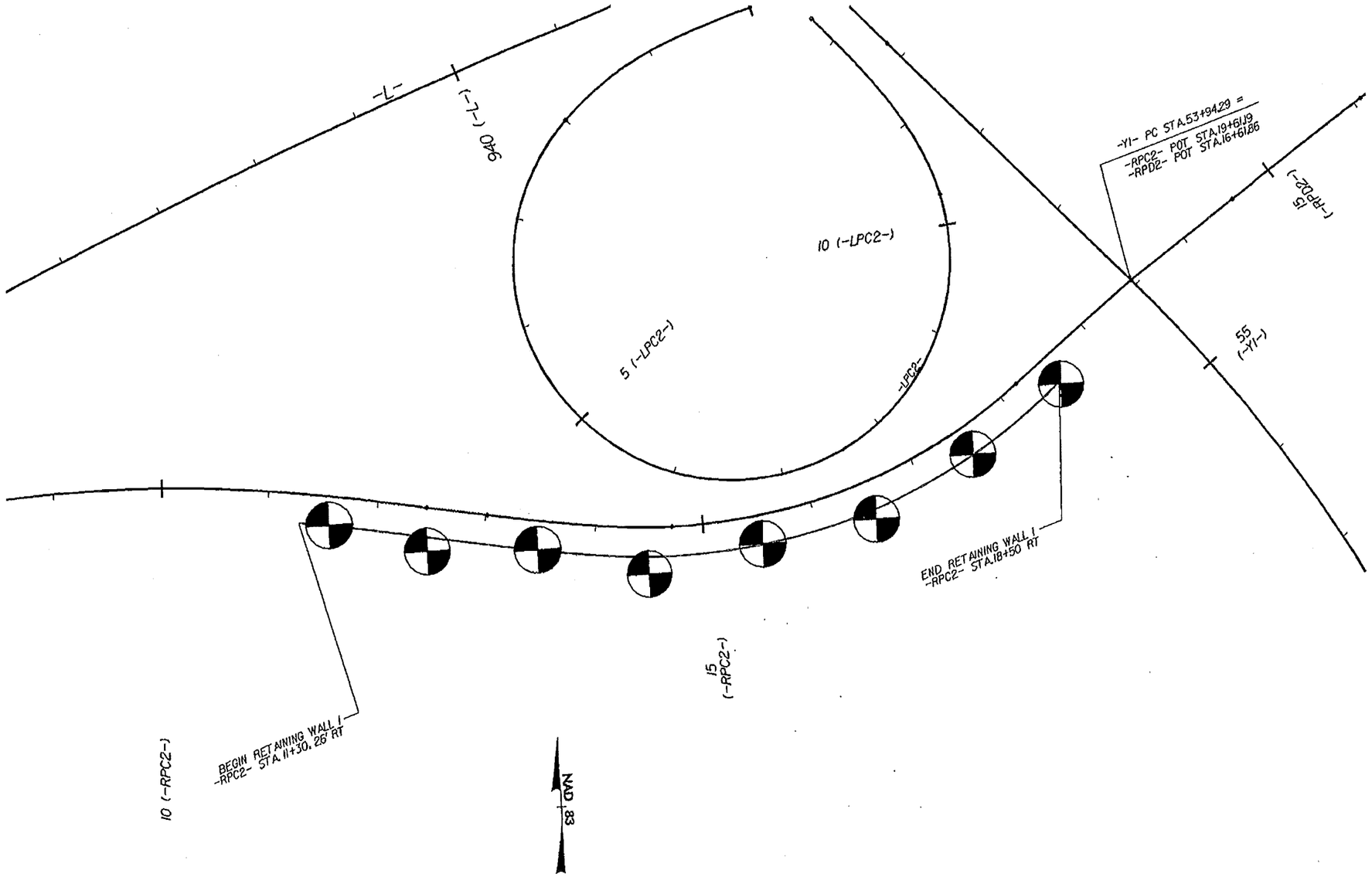
REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519CB)	3

WALL 1 SITE PLAN

0 100 200

FEET

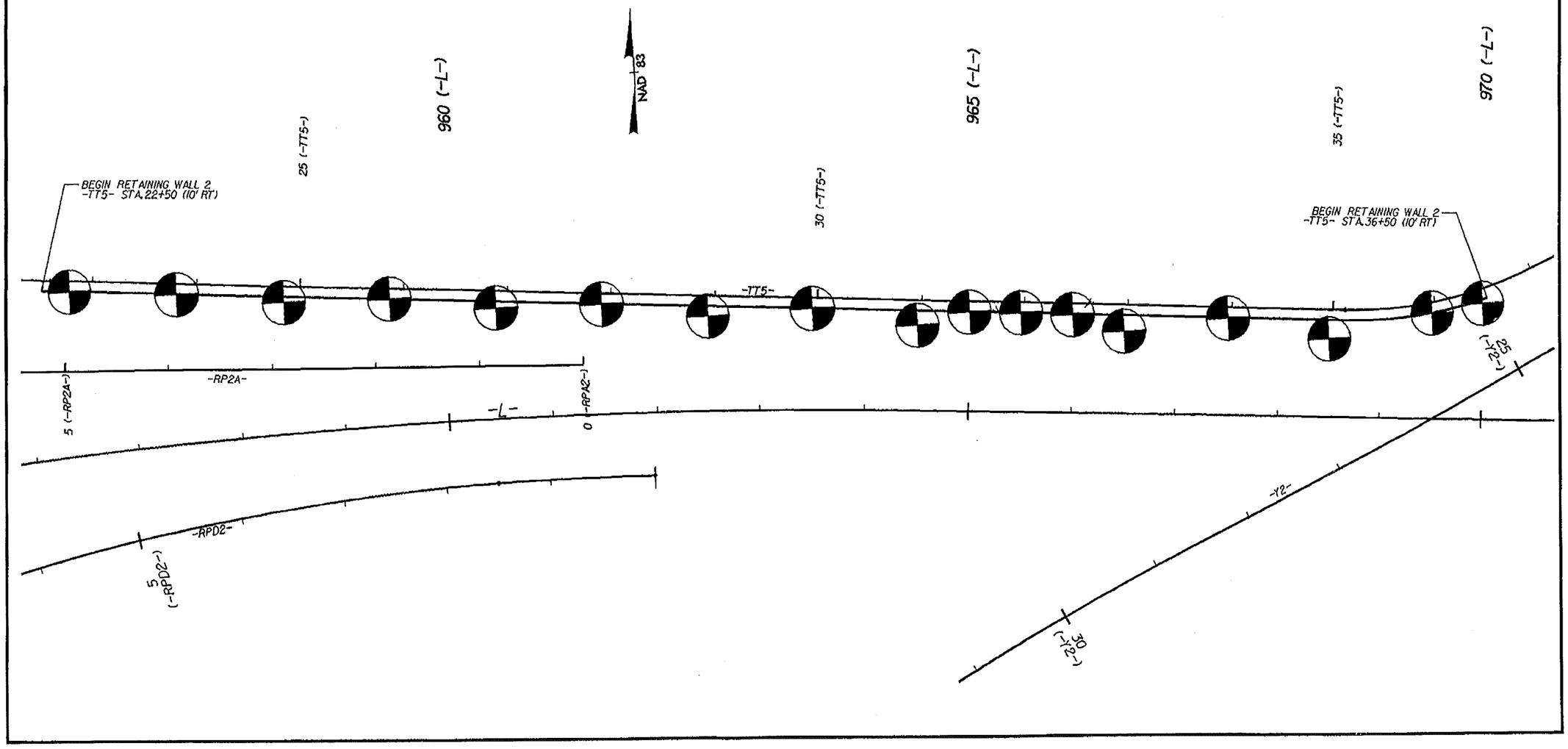


PROJECT REFERENCE NO.	SHEET
34817.1.2 (U-2519CB)	4

WALL 2 SITE PLAN

0 100 200

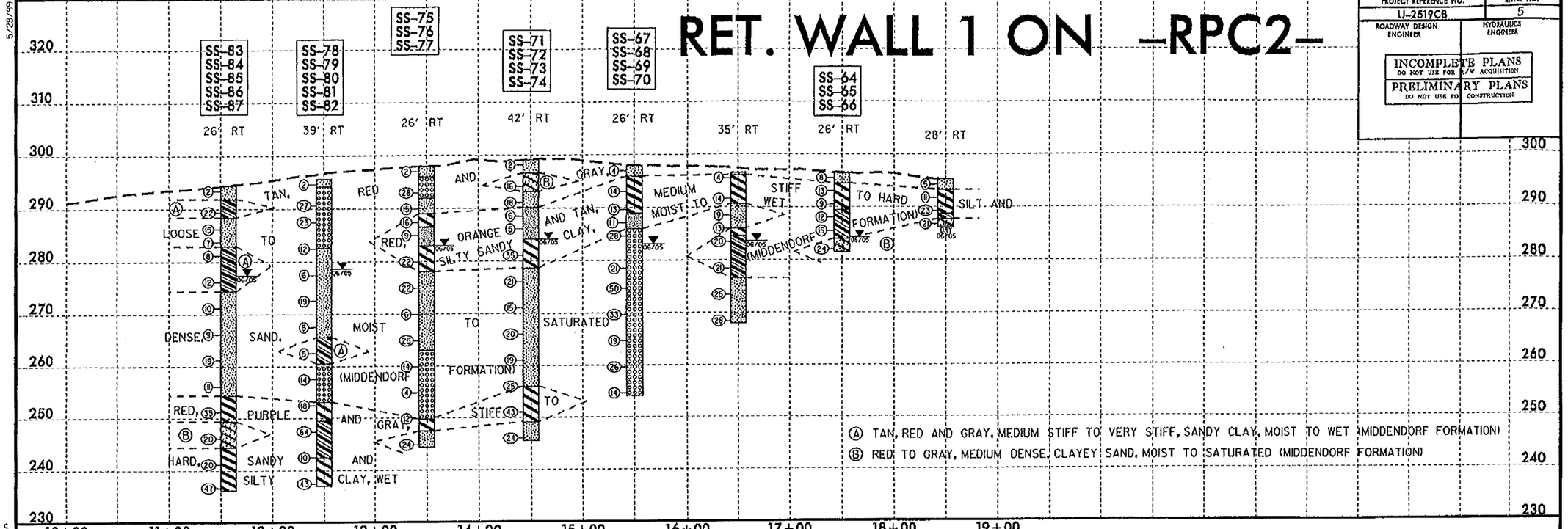
FEET



RET. WALL 1 ON –RPC2–

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



SOIL TEST RESULTS

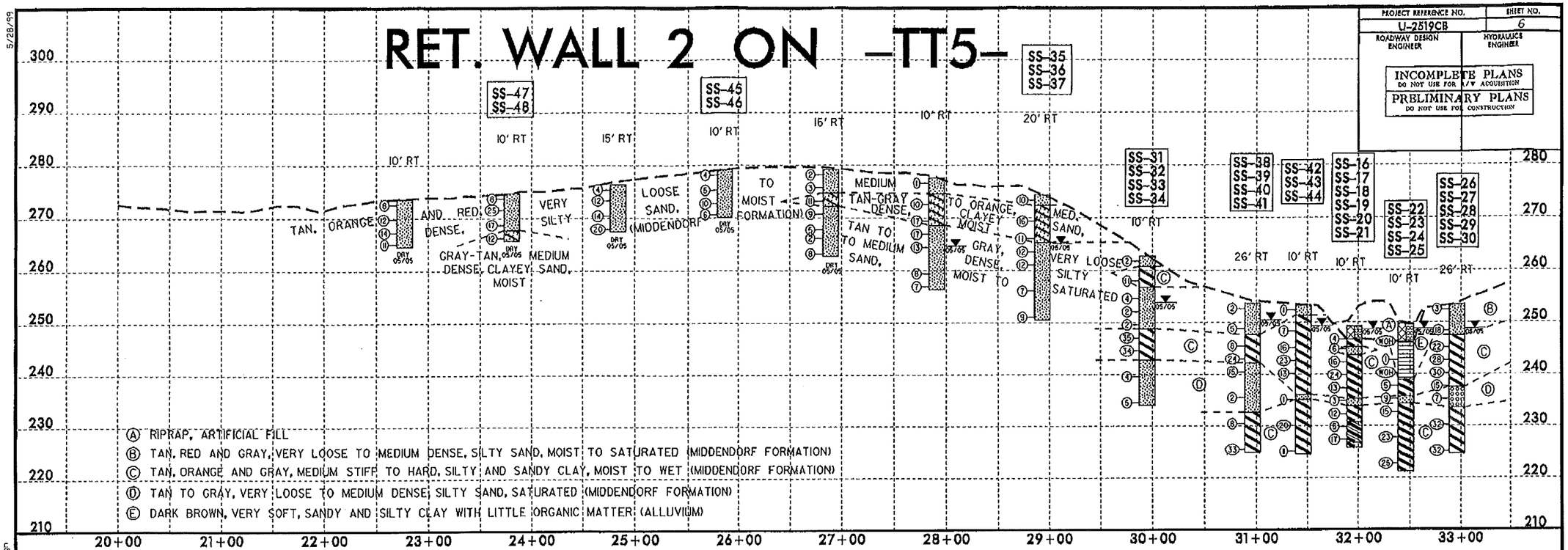
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-83	26 RT	11+57	12.2- 13.7	A-6(2)	35	16	33.5	34.3	8.1	24.2	100	82	39	-	-
SS-84	26 RT	11+57	27.2- 28.7	A-2-4(0)	22	NP	57.6	30.4	2.9	9.1	90	58	13	-	-
SS-85	26 RT	11+57	42.2- 43.7	A-7-6(33)	61	39	4.8	17.3	17.3	60.5	100	98	81	-	-
SS-86	26 RT	11+57	47.2- 48.7	A-2-6(0)	30	14	57.6	21.5	4.8	16.1	100	67	23	-	-
SS-87	26 RT	11+57	56.7- 58.2	A-7-6(30)	51	28	2.8	3.4	33.3	60.5	100	98	96	-	-
SS-78	39 RT	12+50	7.1- 0.6	A- 1-b(0)	27	NP	62.3	21.8	2.8	13.1	84	50	15	-	-
SS-79	39 RT	12+50	17.1- 18.6	A-2-4(0)	25	3	14.4	61.4	7.1	17.1	100	97	35	-	-
SS-80	39 RT	12+50	32.1- 33.6	A-6(2)	35	18	32.9	31.7	10.3	25.2	93	75	37	20.3	-
SS-81	39 RT	12+50	37.1- 38.6	A- 1-b(0)	22	NP	65.8	22.4	1.7	10.1	89	42	12	-	-
SS-82	39 RT	12+50	47.1- 48.6	A-6(11)	40	22	17.5	27.8	20.4	34.3	100	90	63	18.4	-
SS-75	26 RT	13+50	9.6- 11.1	A-7-6(5)	45	21	34.7	6.9	51.4	7.1	71	48	42	-	-
SS-76	26 RT	13+50	27.1- 28.6	A-2-4(0)	28	10	50.3	28.1	4.4	17.1	100	71	23	-	-
SS-77	26 RT	13+50	37.1- 38.6	A- 1-b(0)	23	NP	73.6	13.3	3.0	10.1	83	39	12	-	-
SS-71	42 RT	14+50	9.6- 11.1	A-4(4)	26	10	8.3	42.1	25.4	24.2	100	96	63	18.0	-
SS-72	42 RT	14+50	17.1- 18.6	A-7-6(39)	61	39	3.4	8.9	23.2	64.5	100	98	91	23.0	-
SS-73	42 RT	14+50	47.1- 48.6	A-7-6(54)	77	49	2.2	5.0	14.1	78.6	100	99	95	28.6	-
SS-74	42 RT	14+50	52.1- 53.6	A-2-4(0)	23	NP	66.7	21.9	1.3	10.1	100	75	12	-	-
SS-67	26 RT	15+50	3.9- 5.4	A-7-6(3)	44	23	38.5	29.6	5.6	26.2	100	76	36	-	-
SS-68	26 RT	15+50	12.3- 13.8	A- 1-b(0)	24	NP	73.9	16.5	0.5	9.1	93	42	10	-	-
SS-69	26 RT	15+50	22.3- 23.8	A- 1-b(0)	22	NP	77.9	16.4	0.6	5.0	96	50	6	-	-
SS-70	26 RT	15+50	37.3- 38.8	A- 1-b(0)	26	NP	75.5	13.3	3.1	8.1	82	30	10	-	-
SS-64	26 RT	17+50	2.5- 4.0	A-7-6(13)	52	28	16.9	32.1	6.7	44.4	100	92	57	-	-
SS-65	26 RT	17+50	7.5- 9.0	A-6(3)	35	16	22.8	41.7	9.3	26.2	100	90	42	-	-
SS-66	26 RT	17+50	13.5- 15.0	A-2-6(0)	27	12	38.1	38.3	3.4	20.2	100	85	26	-	-

5/29/99
13.2.dgn
15-SEP-2006 08:30
USER: Investigation\TIP\U2519CB_GEO_RWAL_wall 1 & wall 2\CADD_GEOTECH\Sites&Sub\u2519cb_geo_pfi_walls 13.2.dgn

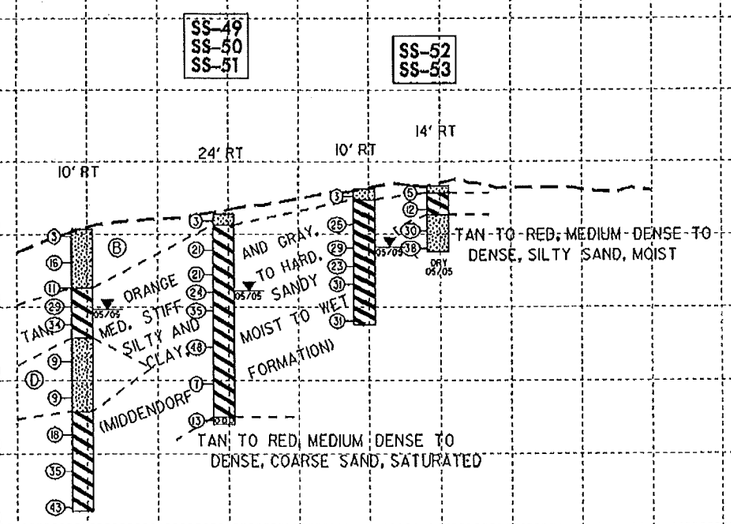
RET. WALL 2 ON -TT5-

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



Ⓐ RIPRAP, ARTIFICIAL FILL
Ⓑ TAN, RED AND GRAY, VERY LOOSE TO MEDIUM DENSE, SILTY SAND, MOIST TO SATURATED (MIDDENDORF FORMATION)
Ⓒ TAN, ORANGE AND GRAY, MEDIUM STIFF TO HARD, SILTY AND SANDY CLAY, MOIST TO WET (MIDDENDORF FORMATION)
Ⓓ TAN TO GRAY, VERY LOOSE TO MEDIUM DENSE, SILTY SAND, SATURATED (MIDDENDORF FORMATION)
Ⓔ DARK BROWN, VERY SOFT, SANDY AND SILTY CLAY WITH LITTLE ORGANIC MATTER (ALLUVIUM)



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) #10	#40	#200	% MOISTURE	% ORGANIC
SS-47	10' RT	23+80	2.1-3.6	A-2-4(0)	31	7	70.5	12.7	0.4	16.4	98	57	17	-	-
SS-48	10' RT	23+80	7.5-9.0	A-2-6(0)	33	12	53.9	23.0	0.6	22.5	100	76	24	-	-
SS-45	10' RT	25+86	2.9-4.4	A-2-4(0)	19	NP	65.2	21.3	1.2	12.3	96	54	15	-	-
SS-46	10' RT	25+86	7.5-9.0	A-2-4(0)	24	NP	61.1	23.6	1.0	14.3	100	73	16	-	-
SS-35	20' RT	28+93	4.0-5.5	A-2-7(2)	51	31	62.2	12.5	5.1	20.2	96	57	25	-	-
SS-36	20' RT	28+93	12.3-13.8	A-2-4(0)	27	6	64.0	20.6	5.3	10.1	100	58	16	-	-
SS-37	20' RT	28+93	17.3-18.8	A-2-4(0)	32	8	9.8	60.2	5.3	24.6	100	95	35	-	-
SS-31	10' RT	29+94	7.2-8.7	A-2-4(0)	27	4	53.3	28.5	4.1	14.1	100	74	19	-	-
SS-32	10' RT	29+94	12.2-13.7	A-2-4(0)	26	NP	26.2	53.9	7.8	12.1	100	94	21	-	-
SS-33	10' RT	29+94	14.7-16.2	A-7-6(52)	76	49	1.6	9.9	19.9	68.6	100	99	93	-	-
SS-34	10' RT	29+94	22.2-23.7	A-2-4(0)	23	NP	48.0	36.7	7.2	8.1	100	97	16	-	-
SS-38	26' RT	30+96	3.9-5.4	A-2-4(0)	18	NP	46.9	38.9	3.9	10.2	99	74	19	-	-
SS-39	26' RT	30+96	7.2-8.7	A-7-6(43)	70	43	3.3	12.3	14.8	69.7	100	98	89	-	-
SS-40	26' RT	30+96	17.2-18.7	A-2-4(0)	23	NP	54.1	35.2	0.4	10.2	100	91	12	-	-
SS-41	26' RT	30+96	27.2-28.7	A-7-6(57)	79	51	2.3	3.3	10.5	84.0	100	99	96	-	-
SS-42	10' RT	31+46	4.0-5.5	A-7-6(7)	43	25	35.5	23.4	6.4	34.8	98	77	45	-	-
SS-43	10' RT	31+46	12.2-13.7	A-7-6(17)	45	24	1.4	29.3	16.0	53.3	100	99	74	26.6	-
SS-44	10' RT	31+46	17.2-18.2	A-2-4(0)	25	NP	18.0	59.8	5.7	16.4	100	97	27	-	-
SS-16	10' RT	31+96	2.5-4.0	A-7-6(21)	57	35	25.2	13.3	13.0	48.4	100	83	65	-	-
SS-17	10' RT	31+96	4.4-5.9	A-2-4(0)	20	NP	54.9	27.4	5.5	12.1	99	67	20	-	-
SS-18	10' RT	31+96	6.9-8.4	A-7-6(49)	73	47	1.4	12.9	17.1	68.6	100	99	91	26.4	-
SS-19	10' RT	31+96	11.9-13.4	A-7-6(36)	56	34	0.8	12.3	28.4	58.5	100	100	95	-	-
SS-20	10' RT	31+96	16.9-18.4	A-7-6(51)	71	46	1.8	3.0	16.4	78.7	100	98	96	-	-
SS-21	10' RT	31+96	19.4-20.9	A-6(6)	31	12	0.6	15.2	23.9	30.3	100	100	69	-	-
SS-22	10' RT	32+46	3.5-5.0	A-6(2)	34	13	38.7	25.4	15.6	20.2	99	77	40	60.9	6.2
SS-23	10' RT	32+46	7.0-8.5	A-7-6(4)	41	21	39.2	22.0	12.6	26.2	98	75	41	-	5.9
SS-24	10' RT	32+46	12.0-13.5	A-7-6(31)	54	32	2.6	10.3	28.6	58.5	100	99	90	36.8	-
SS-25	10' RT	32+46	17.0-18.5	A-7-6(60)	80	51	0.6	1.4	23.3	74.7	100	100	99	-	-
SS-26	26' RT	32+96	4.1-5.6	A-2-4(0)	22	NP	56.1	27.9	6.0	10.1	94	64	18	-	-
SS-27	26' RT	32+96	7.3-8.8	A-7-6(60)	81	53	1.2	5.2	20.9	72.7	100	99	96	26.4	-
SS-28	26' RT	32+96	14.8-16.3	A-7-6(34)	58	36	1.6	15.1	24.7	58.5	100	99	88	25.8	-
SS-29	26' RT	32+96	17.3-18.8	A-1-b(0)	23	NP	81.9	11.1	2.9	4.0	100	40	8	-	-
SS-30	26' RT	32+96	27.3-28.8	A-7-6(56)	76	52	2.0	5.7	15.6	76.7	100	99	95	27.1	-
SS-49	24' RT	34+96	3.9-5.4	A-7-6(41)	65	38	2.8	7.7	22.5	66.9	100	98	93	25.0	-
SS-50	24' RT	34+96	12.3-13.8	A-7-5(35)	61	31	0.8	4.9	27.4	66.9	100	100	95	-	-
SS-51	24' RT	34+96	27.8-28.8	NOT	ENOU	GHT	80.7	9.9	1.2	8.1	98	25	10	-	-
SS-52	14' RT	36+49	2.3-3.8	A-7-6(5)	42	23	32.5	20.8	4.3	34.5	96	77	41	-	-
SS-53	14' RT	36+49	5.2-6.7	A-2-4(0)	23	NP	38.7	43.4	3.7	14.2	98	82	20	-	-

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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519CB)	1	8

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34817.1.2 (U-2519CB)* F.A. PROJ. *NHF-DPR-0100(001)*

COUNTY *CUMBERLAND*

PROJECT DESCRIPTION *FAYETTEVILLE OUTER LOOP FROM SOUTH OF SR 1400 (CLIFFDALE RD.) TO EAST OF SR 1415 (YADKIN RD.)*

SITE DESCRIPTION *RETAINING WALL RIGHT OF -Y2- STATION 25+50 AND RETAINING WALL LEFT OF -Y2- STATION 23+00*

PROJECT: 34817.1.2

ID: U-2519CB

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1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4-5	PROFILE
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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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

PERSONNEL

C. M. WRIKE

F & R PERSONNEL

INVESTIGATED BY *F.M. WESCOTT III*

CHECKED BY *D.N. ARGENBRIGHT*

SUBMITTED BY *D.N. ARGENBRIGHT*

DATE *FEBRUARY, 2008*

NORTH CAROLINA LICENSED SEAL 1050 GEOLOGIST D. N. ARGENBRIGHT

2-22-08

DRAWN BY: *C.P. TURNER*

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NOTE - 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.

PROJECT REFERENCE NO.	SHEET NO.
34817.1.2 (U-2519CB)	2 OF 8

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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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
LIQUID LIMIT PLASTIC INDEX	6 MX		NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MX	41 MN 11 MX	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 A 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 0.50
	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 (PLASTIC RANGE (PI))	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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
- 25/825 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT / CPT / PMT / VST TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

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

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 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_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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:

ELEVATION: FT.

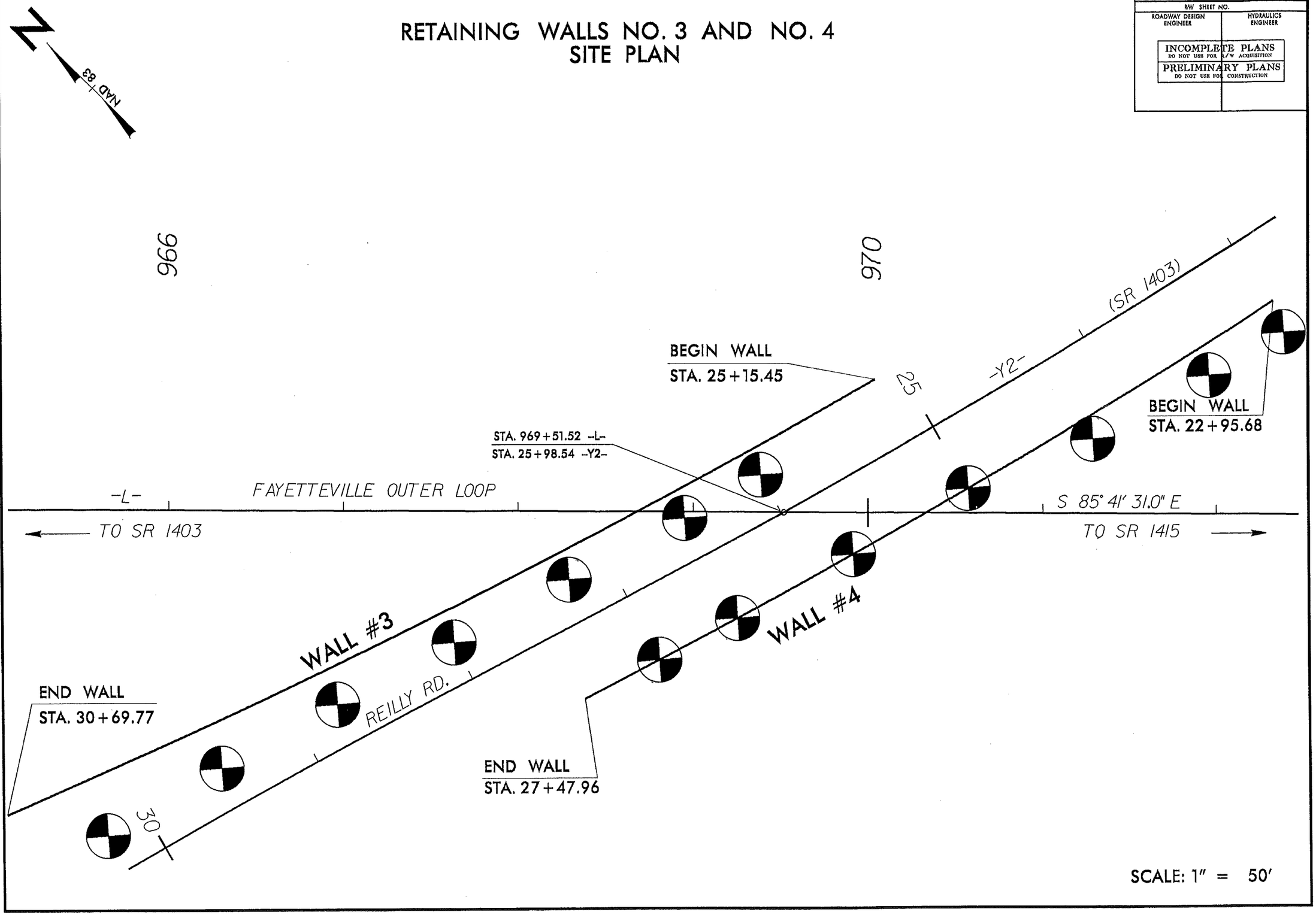
NOTES:

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	3 OF 8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

RETAINING WALLS NO. 3 AND NO. 4
SITE PLAN



SCALE: 1" = 50'

10-DEC-2015 14:00
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5/14/99

PROFILE OF BORINGS PROJECTED ALONG -WALL 3-

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	4 OF 8
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

290
280
270
260
250
240
230
220
210
200

26+00 25' RT
26+50 24' RT
27+25 24' RT
28+00 23' RT
28+75 23' RT
29+50 23' RT
30+25 22' RT

12/07

NOTE: GROUNDLINE PROFILE OFFSET 40' RIGHT OF -Y2- TAKEN FROM ROADWAY DESIGN PLANS AS OF 11/03/04

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

Ⓐ PAVEMENT

Ⓑ LOOSE TO MEDIUM DENSE RED SAND AND CLAYEY SAND, MOIST (ROADWAY EMBANKMENT)

Ⓒ MEDIUM STIFF TO HARD GRAY SANDY AND SILTY CLAY, MOIST TO WET

Ⓓ LOOSE TO MEDIUM DENSE GRAY SAND AND CLAYEY SAND, MOIST TO SATURATED

Ⓔ VERY LOOSE GRAY SAND WITH A TRACE OF ORGANIC MATTER, MOIST (ALLUVIAL)

Ⓕ SOFT DARK GRAY SANDY SILT WITH A TRACE OF ORGANIC MATTER, MOIST TO WET

25+00 26+00 27+00 28+00 29+00 30+00 31+00

10-DEC-2013 14:07
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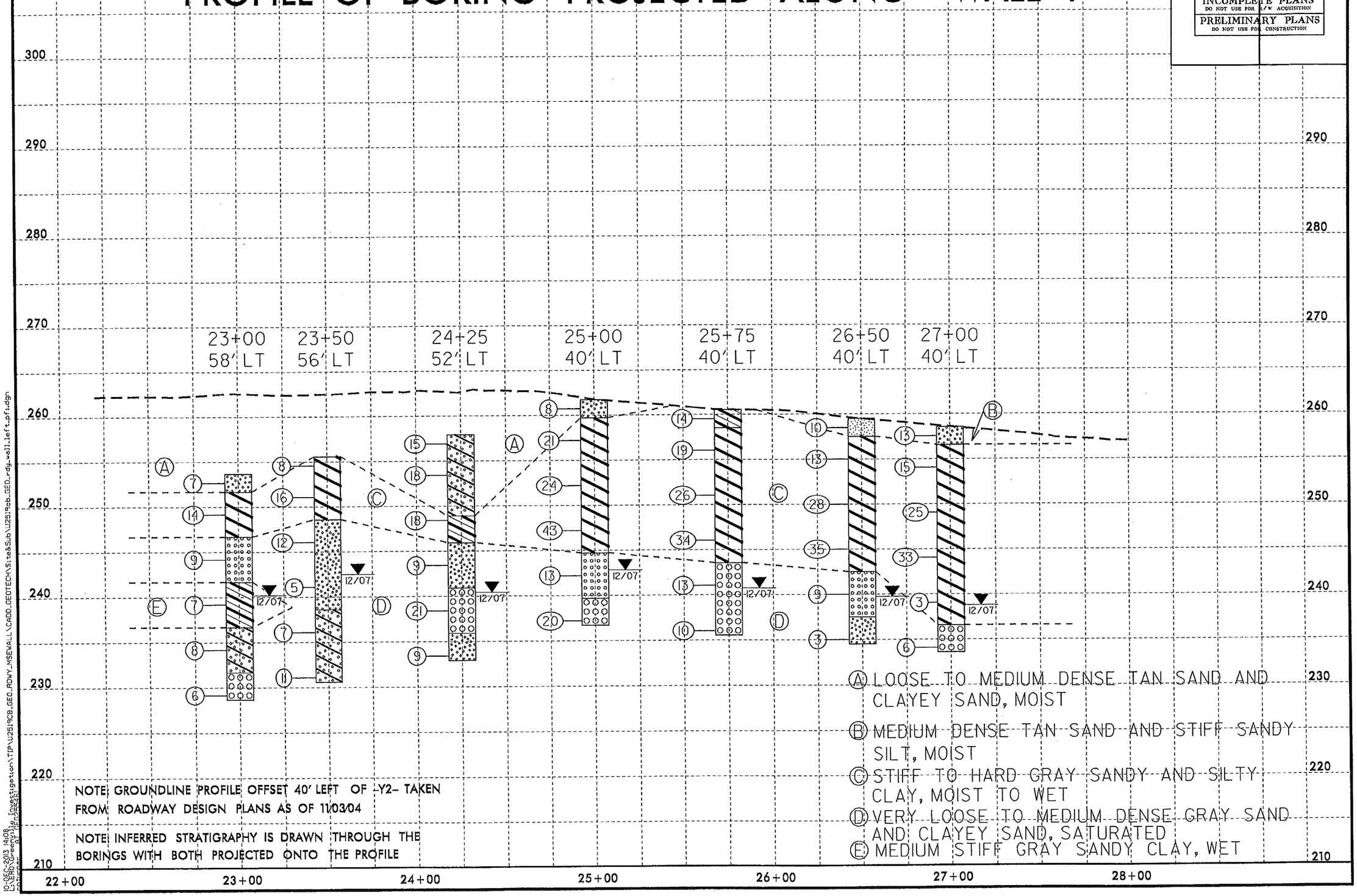
PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	5 OF 8
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PROFILE OF BORING PROJECTED ALONG -WALL 4-



Ⓐ LOOSE TO MEDIUM DENSE TAN SAND AND CLAYEY SAND, MOIST

Ⓑ MEDIUM DENSE TAN SAND AND STIFF SANDY SILT, MOIST

Ⓒ STIFF TO HARD GRAY SANDY AND SILTY CLAY, MOIST TO WET

Ⓓ VERY LOOSE TO MEDIUM DENSE GRAY SAND AND CLAYEY SAND, SATURATED

Ⓔ MEDIUM STIFF GRAY SANDY CLAY, WET

NOTE: GROUNDLINE PROFILE OFFSET 40' LEFT OF -Y2- TAKEN FROM ROADWAY DESIGN PLANS AS OF 11/03/04

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

5/14/99

10-DEC-2013 14:08
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SOIL TEST RESULTS -WALL 4-

HOLE #	SAMPLE #	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
23+00	SS-42	100	68	21	53.6	28.9	12.4	5.0	13	NP	A-2-4(0)	1.0-1.5		
58' LT	SS-43	99	80	58	23.5	21.5	12.9	42.2	47	26	A-7-6(12)	3.5-5.0	22.5	
	SS-44	100	89	10	53.3	37.7	2.0	7.0	19	NP	A-3(0)	8.5-10.0		
	SS-45	100	93	66	23.1	12.4	18.3	46.2	37	17	A-6(9)	13.5-15.0		
	SS-46	100	66	32	59.6	9.4	6.8	24.1	31	14	A-2-6(1)	18.5-20.0		
	SS-47	98	42	14	73.4	13.4	4.2	9.0	21	4	A-1-b(0)	23.5-25.0		
23+50	SS-48	99	87	70	17.7	13.3	8.8	60.2	54	27	A-7-6(19)	1.0-1.5	31.1	
56' LT	SS-49	100	58	11	76.1	14.1	2.8	7.0	22	NP	A-2-4(0)	9.0-10.0		
	SS-50	90	66	21	46.4	31.1	6.4	16.1	31	18	A-2-6(0)	18.5-20.0		
	SS-51	100	68	33	51.0	16.5	6.4	26.1	31	14	A-2-6(1)	23.5-25.0		
24+25	SS-52	96	69	35	40.8	28.3	14.9	16.1	27	12	A-2-6(0)	1.0-1.5		
52' LT	SS-53	99	86	63	21.5	19.9	16.5	42.2	38	21	A-6(11)	8.5-10.0	19.9	
	SS-54	100	95	12	35.6	52.9	3.4	8.0	21	NP	A-2-4(0)	13.5-15.0		
	SS-55	99	39	9	77.6	14.1	2.3	6.0	22	NP	A-1-b(0)	18.5-20.0		
	SS-56	100	90	21	38.4	43.2	6.4	12.0	23	NP	A-2-4(0)	23.5-25.0		
25+00	SS-57	95	72	25	40.1	41.0	14.0	5.0	14	NP	A-2-4(0)	1.0-1.5		
40' LT	SS-58	100	98	92	3.4	7.0	19.3	70.3	81	50	A-7-5(54)	3.5-5.0	26.2	
	SS-59	100	89	74	15.1	13.9	12.9	58.2	47	27	A-7-6(19)	13.5-15.0		
	SS-60	100	77	9	65.6	26.5	3.9	4.0	17	NP	A-3(0)	18.5-20.0		
	SS-61	98	28	7	83.9	9.7	2.3	4.0	21	NP	A-1-b(0)	23.5-25.0		
25+75	SS-62	100	81	51	30.7	21.7	9.4	38.2	40	20	A-6(7)	1.0-1.5		
40' LT	SS-63	100	98	93	3.0	6.8	17.9	72.3	61	35	A-7-6(37)	3.5-5.0	23.2	
	SS-64	100	100	100	0.2	0.6	4.8	94.4	73	36	A-7-5(46)	13.5-15.0		
	SS-65	100	47	9	82.2	10.2	3.5	4.0	23	NP	A-1-b(0)	18.5-20.0		
	SS-66	97	30	10	81.6	8.7	2.6	7.0	20	3	A-1-b(0)	23.5-25.0		
26+50	SS-67	99	80	38	36.1	30.5	13.3	20.1	24	7	A-4(0)	1.0-1.5		
40' LT	SS-68	100	91	74	13.1	17.9	18.9	50.2	47	26	A-7-6(19)	3.5-5.0		
	SS-69	100	100	98	0.6	2.4	8.6	88.4	77	46	A-7-5(54)	8.5-10.0	27.4	
	SS-70	100	77	7	72.9	20.8	2.3	4.0	26	NP	A-3(0)	18.5-20.0		
	SS-71	96	83	23	42.6	34.5	6.8	16.1	24	4	A-2-4(0)	23.5-25.0		
27+00	SS-72	97	74	30	42.1	31.2	8.6	18.1	20	5	A-2-4(0)	1.0-1.5		
40' LT	SS-73	100	99	96	2.2	4.4	15.1	78.3	78	46	A-7-5(53)	3.5-5.0	22.9	
	SS-74	100	100	96	0.4	7.8	17.5	74.3	58	31	A-7-6(35)	13.5-15.0		
	SS-75	100	46	7	83.8	9.8	2.3	4.0	23	NP	A-1-b(0)	23.5-25.0		

Proj. No. 34817.1.2
County: CUMBERLAND

SOIL TEST RESULTS -WALL 3-

HOLE #	SAMPLE #	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
26+00	SS-81	100	99	96	1.4	4.8	21.5	72.3	77	47	A-7-5(53)	3.5-5.0	26.3	
25' RT	SS-82	100	93	55	19.3	27.7	8.8	44.2	38	17	A-6(7)	13.5-15.0		
	SS-83	98	50	11	79.1	10.7	3.1	7.0	20	NP	A-1-b(0)	18.5-20.0		
	SS-84	100	95	18	14.6	68.7	5.7	11.0	18	NP	A-2-4(0)	28.5-30.0		
	SS-85	100	45	13	77.2	10.8	3.9	8.0	25	2	A-1-b(0)	33.5-35.0		
26+50	SS-76	100	100	94	0.4	14.1	27.3	58.2	49	20	A-7-6(22)	3.5-5.0	20.5	
24' RT	SS-77	100	74	31	50.6	19.3	4.0	26.1	30	13	A-2-6(0)	13.5-15.0		
	SS-78	100	67	9	68.7	23.0	2.3	6.0	19	NP	A-3(0)	18.5-20.0		
	SS-79	83	37	11	71.0	17.0	4.0	8.0	24	6	A-1-b(0)	23.5-25.0		
	SS-80	100	36	11	79.6	9.8	4.5	6.0	23	2	A-1-b(0)	34.5-36.0		
27+25	SS-86	98	73	46	36.9	21.1	13.9	28.1	31	12	A-6(2)	3.5-5.0	18.1	
24' RT	SS-87	100	100	99	0.2	1.2	30.3	68.3	62	31	A-7-5(37)	8.5-10.0		
	SS-88	100	94	74	18.3	10.0	19.5	52.2	50	29	A-7-6(21)	18.5-20.0	39.8	
	SS-89	100	100	98	0.6	2.8	8.2	88.5	86	55	A-7-5(64)	28.5-30.0		
28+00	SS-90	97	72	33	43.4	27.5	13.1	16.1	22	7	A-2-4(0)	3.5-5.0		
23' RT	SS-91	100	99	95	1.6	5.0	17.1	76.3	56	26	A-7-5(30)	8.5-10.0	23.8	
	SS-92	100	80	39	45.8	20.3	13.9	20.1	31	14	A-6(2)	18.5-20.0		
	SS-93	96	68	58	33.1	8.0	16.7	42.2	45	21	A-7-6(10)	23.5-25.0		
	SS-94	100	99	97	1.2	2.8	11.6	84.3	78	49	A-7-6(56)	28.5-30.0		
28+75	SS-95	100	60	16	72.6	12.1	3.2	12.0	27	6	A-2-4(0)	3.5-5.0		
23' RT	SS-96	99	70	30	43.6	30.1	8.2	18.1	23	7	A-2-4(0)	8.5-10.0	16.9	1.8
	SS-97	98	78	39	37.6	27.9	10.4	24.1	30	12	A-6(1)	13.5-15.0		
	SS-98	100	92	66	13.7	26.8	19.3	40.2	50	28	A-7-6(17)	18.5-20.0		
	SS-99	98	33	25	68.0	6.7	4.1	21.1	47	19	A-2-7(1)	23.5-25.0		
	SS-100	100	99	97	1.4	2.6	9.5	86.5	65	35	A-7-5(41)	28.5-30.0		
29+50	SS-101	99	61	17	69.3	14.8	2.8	13.1	24	5	A-2-4(0)	3.5-5.0		
23' RT	SS-102	100	84	49	31.0	23.1	7.6	38.2	44	15	A-7-6(5)	8.5-10.0		
	SS-103	97	77	37	30.8	36.6	16.5	16.1	30	8	A-4(0)	13.5-15.0	46.9	4.5
	SS-104	100	82	38	25.8	30.6	13.5	20.1	25	9	A-4(0)	18.5-20.0	47.6	2.2
	SS-105	99	90	64	16.9	22.1	18.7	42.3	38	20	A-6(10)	23.5-25.0	67.9	
	SS-106	100	93	72	17.5	12.5	9.7	60.4	53	31	A-7-6(22)	28.5-30.0		
	SS-107	100	100	96	0.6	4.2	14.7	80.5	69	45	A-7-6(49)	33.5-35.0		

SOIL TEST RESULTS -WALL 3-

HOLE #	SAMPLE #	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
30+25	SS-108	93	67	33	44.3	23.9	9.7	22.1	29	11	A-2-6(0)	3.5-5.0		
22' RT	SS-109	99	88	73	15.9	14.5	21.3	48.3	57	29	A-7-6(22)	8.5-10.0		
	SS-110	100	78	34	45.1	23.9	8.9	22.1	24	7	A-2-4(0)	18.5-20.0		
	SS-111	100	97	71	5.2	31.8	22.7	40.2	34	13	A-6(8)	28.5-30.0		
	SS-112	100	99	93	1.8	6.6	11.1	80.5	77	49	A-7-6(53)	33.5-35.0		

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.2.8 (U-2519CB)	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34817.2.8 (U-2519CB)* F.A. PROJ. *N/A*

COUNTY *CUMBERLAND*

PROJECT DESCRIPTION *FAYETTEVILLE OUTER LOOP (FOL) – FROM SOUTH OF SR1400 (CLIFFDALE RD) TO EAST OF ALL AMERICAN FREEWAY*

SITE DESCRIPTION *RETAINING WALL –RW6–, STA 10+00.00 TO 11+89.46*
RETAINING WALL –RW7–, STA 10+00.00 TO 11+87.53

INVENTORY

ID: U-2519CB

PROJECT: 34817.2.8

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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. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

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INVESTIGATED BY *S&ME, INC.*
CHECKED BY *A.F. Riggs Jr. P.E.*
SUBMITTED BY *S&ME, INC.*
DATE *MAY 2014*

NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER ALBERT F. RIGGS, JR. 5/20/14

DRAWN BY: *B. Ratti*

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NOTE: 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.

PROJECT REFERENCE NO.	SHEET NO.
34817.2.8 (U-2519CB)	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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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-7-5, A-7-6)	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							
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#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			
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MN	11 MN	11 MN			
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 A 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/FT²)
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 0.50
	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		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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
- BPT / DPT / DHT / VST / PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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
γd - 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:
- [ ] MOBILE B-__
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] CME-55 LC
- [X] CME-45 TRACK

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
- [X] 2-1/4" HSA

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIDINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FINDERNAIL.

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 FEET
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 THE 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, 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: BYI-107 E: 1,997,456.73 N: 493,205.54

ELEVATION: 279.43 FT.

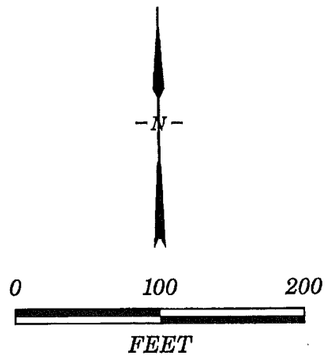
NOTES:
FIAD - FILLED IN AFTER DRILLING

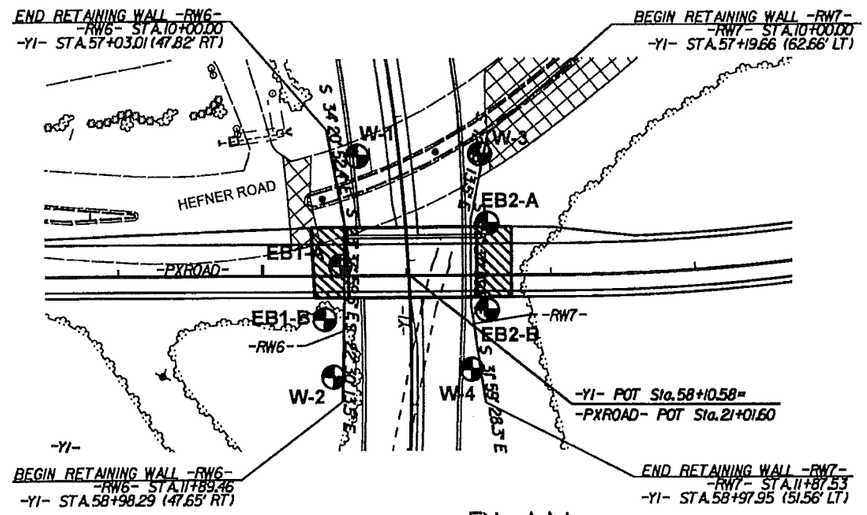
ST-1 SHELBY TUBE

REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	3
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION





PLAN

Ⓐ **ROADWAY EMBANKMENT FILL:**
BROWN, DRY, MEDIUM DENSE TO LOOSE, SILTY FINE SAND

Ⓑ **ROADWAY EMBANKMENT FILL:**
BROWN RED, MOIST, STIFF, SILTY CLAY

Ⓒ **UNDIVIDED COASTAL PLAIN:**
RED, ORANGE, GRAY, TAN AND BROWN, DRY TO WET, LOOSE TO MEDIUM DENSE CLAYEY TO SILTY FINE TO COARSE SAND

Ⓓ **UNDIVIDED COASTAL PLAIN:**
RED, ORANGE, BROWN AND TAN, MOIST, MEDIUM STIFF TO VERY STIFF, FINE SANDY SILTY CLAY

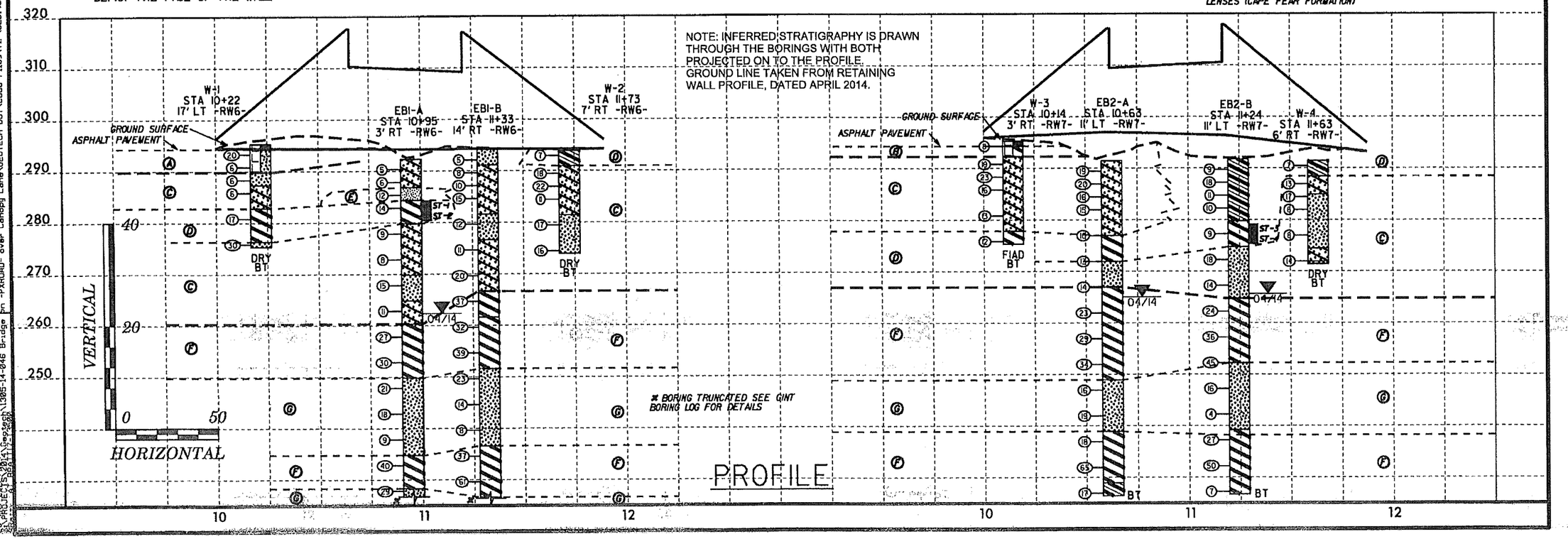
Ⓔ **UNDIVIDED COASTAL PLAIN:**
RED TAN, MOIST, STIFF, CLAYEY SILT

Ⓕ **COASTAL PLAIN:**
GRAY ORANGE TAN AND PURPLE, MOIST, STIFF TO HARD, SILTY CLAY (CAPE FEAR FORMATION)

Ⓖ **COASTAL PLAIN:**
RED-TAN, ORANGE AND WHITE, WET TO MOIST, LOOSE TO DENSE SILTY FINE TO COARSE SAND WITH TRACE OF CLAY LENSES (CAPE FEAR FORMATION)

NOTE: WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE FACE OF THE WALL.

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE PROFILE. GROUND LINE TAKEN FROM RETAINING WALL PROFILE, DATED APRIL 2014.



* BORING TRUNCATED SEE GINT BORING LOG FOR DETAILS

PROFILE

© 2014 NCDOT
PROJECT: 2519CB
Scale: 1" = 50'

REVISIONS

8/17/99

C:\Projects\2014\Geotech\1305-14-046 Bridge on -PXROAD- over Canopy Lane\GEOTECH DOT\Cadd Files\TIP\U2519CB_GEO_RETWALL_RW6-7\CADD_GEOTECH\Sheets\Sub\u2519cb_rdy_RETAINING_WALLS.dgn

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Retaining Wall -RW6- STA 10+00.00 to 11+89.46				**GROUND WTR (ft)**
BORING NO. W-1	**STATION** 10+22	**OFFSET** 17 ft LT	**ALIGNMENT** -RW6-	**0 HR.** Dry
COLLAR ELEV. 295.3 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 493,156	**EASTING** 1,996,636	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER K. Parton	**START DATE** 04/16/14	**COMP. DATE** 04/16/14	**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
300										
295	295.3	0.0								ASPHALT PAVEMENT
	294.3	1.0								Asphalt Pavement (4 inches of Asphalt over 8 inches of CABC Stone)
			11	12	8	20		D		**ROADWAY EMBANKMENT** Brown Silty Fine SAND
	291.8	3.5								
290			5	3	3	6		D		
	289.3	6.0								**UNDIVIDED COASTAL PLAIN** Tan Silty Fine SAND
			4	3	3	6		M		
	286.8	8.5								Gray Brown and Orange Clayey Fine SAND
285			4	3	3	6		M		
	281.8	13.5								Tan Silty CLAY
280			4	7	10	17		M		
	276.8	18.5								
			9	15	15	30		M		Tan Silty Fine SAND
	276.3	19.0								Boring Terminated at Elevation 275.3 ft in Silty Fine SAND (UNDIVIDED COASTAL PLAIN)
	275.3	20.0								1) 2-1/4" HSA Advanced to 18.5 Feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Retaining Wall -RW6- STA 10+00.00 to 11+89.46				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 10+95	**OFFSET** 3 ft RT	**ALIGNMENT** -RW6-	**0 HR.** N/A
COLLAR ELEV. 292.3 ft	**TOTAL DEPTH** 75.0 ft	**NORTHING** 493,082	**EASTING** 1,996,655	**24 HR.** 30.0
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER K. Parton	**START DATE** 04/17/14	**COMP. DATE** 04/22/14	**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)
295										292.3 GROUND SURFACE	0.0
	291.3	1.0	3	3	2	5		M		UNDIVIDED COASTAL PLAIN Orange Clayey Fine SAND	
290	288.8	3.5	3	2	4	6		M			
	286.3	6.0	3	5	7	12		M		286.8 Red Tan Clayey SILT	5.5
285	283.8	8.5	5	6	8	14		M		284.3 Red Tan Gray Silty CLAY	8.0
	278.8	13.5	5	5	4	9		W		279.8 Red Clayey Fine SAND	12.5
275	273.8	18.5	5	4	4	8		M			
	268.8	23.5	9	9	6	15		M		269.8 Red White Tan Silty Fine to Coarse SAND	22.5
270	263.8	28.5	5	6	5	11		M		264.8 Gray Tan Clayey Fine to Coarse SAND	27.5
265	258.8	33.5	7	11	16	27		M		260.3 COASTAL PLAIN Gray Silty CLAY (CAPE FEAR FORMATION)	32.0
	253.8	38.5	8	12	18	30		M			
260	248.8	43.6	15	12	9	21		W		249.8 Red Tan White Silty Fine to Coarse SAND	42.5
255	243.8	48.5	6	8	10	18		W			
	238.8	53.5	4	4	5	9		W			
250	233.8	58.5	8	16	24	40		M		234.8 Gray Silty CLAY	57.5
245	228.8	63.5	14	12	17	29		W		228.3 Orange Tan White Silty Fine to Coarse SAND with Trace of Clay Lenses	64.0
	223.8	68.5	5	8	10	18		M		224.8 Gray Silty Fine SAND	67.5
240	218.8	73.5	5	7	11	18		M		217.3 Boring Terminated at Elevation 217.3 ft In Silty Fine SAND (CAPE FEAR FORMATION)	75.0
235											
230											
225											
220											
215											

1) Advanced 2-15/16 inch Tricone Bit to 73.5 Feet
2) Set 7.5 Feet of NW Casing
3) Fresh Water Used as Drilling Fluid
4) Some Drilling Fluid Loss Observed

Other Samples:
ST-1 (8.0 - 10.0)
ST-2 (10.0 - 12.0)

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Retaining Wall -RW6- STA 10+00.00 to 11+89.46				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 10+95	**OFFSET** 3 ft RT	**ALIGNMENT** -RW6-	**0 HR.** N/A
COLLAR ELEV. 292.3 ft	**TOTAL DEPTH** 75.0 ft	**NORTHING** 493,082	**EASTING** 1,996,655	**24 HR.** 30.0
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER K. Parton	**START DATE** 04/17/14	**COMP. DATE** 04/22/14	**SURFACE WATER DEPTH** N/A	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Retaining Wall -RW6- STA 10+00.00 to 11+89.46				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 11+33	**OFFSET** 14 ft RT	**ALIGNMENT** -RW6-	**0 HR.** N/A
COLLAR ELEV. 294.1 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 493,044	**EASTING** 1,996,660	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CONETEC 331145 CME-55 LC 78.8% 04/02/2013		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER D. White	**START DATE** 04/24/14	**COMP. DATE** 04/25/14	**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
295										ELEV. (ft) DEPTH (ft)
										294.1 GROUND SURFACE 0.0
	293.1	1.0	3	2	3	5		D		**UNDIVIDED COASTAL PLAIN** Orange Silty Fine SAND
290	290.6	3.5	7	4	4	8		M		291.1 3.0 Orange Clayey Fine to Coarse SAND
	288.1	6.0	5	4	6	10		M		
285	285.6	8.5	6	8	7	15		M		
										281.6 12.5 Red Orange Silty Fine SAND
280	280.6	13.5	5	7	5	12		M		
										276.6 17.5 Orange Clayey Fine SAND
275	275.6	18.5	5	4	7	11		M		
270	270.6	23.5	4	8	12	20		M		
265	265.6	28.5	10	16	21	37		M		266.6 27.5 **COASTAL PLAIN** Gray Orange Silty CLAY with Trace of Fine to Coarse Sand (CAPE FEAR FORMATION)
260	260.6	33.5	5	13	19	32		M		261.6 32.5 Gray White Silty CLAY
255	255.6	38.5	10	16	23	39		M		
250	250.6	43.5	8	9	14	23		W		251.6 42.5 Orange White Silty Fine to Coarse SAND
245	245.6	48.5	7	6	8	14		W		
240	240.6	53.5	5	6	2	8		W		
235	235.6	58.5	11	13	24	37		M		236.6 57.5 Gray Silty CLAY
230	230.6	63.5	20	30	31	61		M		
225	225.6	68.5	3	5	7	12		W		226.6 67.5 White Orange and Gray Silty Fine SAND
220	220.6	73.5	4	6	8	14		W		
215	215.6	78.5								216.6 77.5 Gray Silty CLAY

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Retaining Wall -RW6- STA 10+00.00 to 11+89.46				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 11+33	**OFFSET** 14 ft RT	**ALIGNMENT** -RW6-	**0 HR.** N/A
COLLAR ELEV. 294.1 ft	**TOTAL DEPTH** 79.9 ft	**NORTHING** 493,044	**EASTING** 1,996,660	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CONETEC 331145 CME-55 LC 78.8% 04/02/2013		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER D. White	**START DATE** 04/24/14	**COMP. DATE** 04/25/14	**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
215			27	43	57/0.4	Match Line 100/0.9		M		214.2 79.9 Boring Terminated at Elevation 214.2 ft In Silty CLAY (CAPE FEAR FORMATION)
										1) Advanced 2-15/16 inch Tricone Bit to 78.5 Feet
										2) Set 3.5 Feet of NW Casing
										3) Fresh Water Used as Drilling Fluid
										4) Some Drilling Fluid Loss Observed

NCDOT BORE DOUBLE U2519CB_GEO_RWAL6,7 GINT.GPJ NC_DOT.GDT 5/20/14

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Retaining Wall -RW6- STA 10+00.00 to 11+89.46				**GROUND WTR (ft)**
BORING NO. W-2	**STATION** 11+73	**OFFSET** 7 ft RT	**ALIGNMENT** -RW6-	**0 HR.** Dry
COLLAR ELEV. 293.9 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 493,009	**EASTING** 1,996,682	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER K. Parton	**START DATE** 04/16/14	**COMP. DATE** 04/16/14	**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)
300										
295	293.9	0.0	2	2	5	7		M		293.9 GROUND SURFACE 0.0 **UNDIVIDED COASTAL PLAIN** Red Orange Fine Sandy CLAY
290	290.4	3.5	8	8	10	18 22		M		290.9 3.0 Red Orange Clayey Fine SAND
	287.9	6.0	4	10	12			D		
285	285.4	8.5	4	6	5	11		D		
280	280.4	13.5	8	8	9					281.4 12.5 Tan Silty Fine SAND
						17		M		
275	275.4	18.5	11	9	7	16		M		273.9 20.0 Boring Terminated at Elevation 273.9 ft in Silty Fine SAND (UNDIVIDED COASTAL PLAIN) 1) 2-1/4" HSA Advanced to 18.5 Feet

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Retaining Wall -RW7- STA 10+00.00 to 11+87.53				**GROUND WTR (ft)**
BORING NO. W-3	**STATION** 10+14	**OFFSET** 3 ft RT	**ALIGNMENT** -RW7-	**0 HR.** Dry
COLLAR ELEV. 295.3 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 493,191	**EASTING** 1,996,713	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER K. Parton	**START DATE** 04/16/14	**COMP. DATE** 04/16/14	**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
300										
295	294.3	1.0	3	4	4	8		M		295.3 ASPHALT PAVEMENT 0.0 294.3 Asphalt Pavement (4 inches of Asphalt over 8 inches of CABC Stone) 1.0 292.3 **ROADWAY EMBANKMENT** 3.0 Brown Red Silty CLAY **UNDIVIDED COASTAL PLAIN** Red Tan Clayey Fine SAND
290	291.8	3.5	7	8	11	19		M		
	289.3	6.0	12	11	12	23		D		
285	286.8	8.5	6	8	8	16		M		
280	281.8	13.5	7	6	7	13		M		277.8 17.5 Gray Tan Silty CLAY
	276.8	18.5	4	5	7	12		M		275.3 20.0 Boring Terminated at Elevation 275.3 ft in Silty CLAY (UNDIVIDED COASTAL PLAIN) 1) 2-1/4" HSA Advanced to 18.5 Feet

NCDOT BORE DOUBLE U2519CB_GEO_RVAL6,7 GINT.GPJ NC_DOT.GDT 5/20/14

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page
SITE DESCRIPTION Retaining Wall -RW7- STA 10+00.00 to 11+87.53			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 10+63	**OFFSET** 11 ft LT	**ALIGNMENT** -RW7- **0 HR.** N/A
COLLAR ELEV. 291.4 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 493,149	**EASTING** 1,996,737 **24 HR.** 26.4
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER K. Parton	**START DATE** 04/16/14	**COMP. DATE** 04/17/14	**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
295										291.4 GROUND SURFACE 0.0
290	290.4	1.0	6	9	10	19		M		UNDIVIDED COASTAL PLAIN Tan Red Clayey Fine SAND
	287.9	3.5	13	9	11	20		M		
285	285.4	6.0	8	7	9	16		M		
	282.9	8.5	5	5	10	15		M		
280	277.9	13.5	3	4	6	10		M		276.9 14.5 Tan Silty CLAY
275	272.9	18.5	4	5	8	13		M		271.9 19.5 Gray Red Silty Fine SAND
270	267.9	23.5	4	4	10	14		M		266.9 24.5 COASTAL PLAIN Tan Gray Silty CLAY (CAPE FEAR FORMATION)
265	262.9	28.5	8	10	13	23		M		
260	257.9	33.5	8	13	16	29		M		
255	252.9	38.5	10	14	20	34		M		
250	247.9	43.5	6	8	8	16		W		248.9 42.5 Red White Tan Silty Fine SAND
245	242.9	48.5	6	9	10	19		W		
240	237.9	53.5	6	8	10	18		M		238.9 52.5 Gray Silty CLAY
235	232.9	58.5	16	23	42	65		M		
230	227.9	63.5	4	7	10	17		M		228.9 62.5 Tan White Fine Sandy CLAY 226.4 65.0 Boring Terminated at Elevation 226.4 ft In Fine Sandy CLAY (CAPE FEAR FORMATION) 1) Advanced 2-15/16 inch Tricone Bit to 63.5 Feet 2) Set 3.5 Feet of NW Casing 3) Fresh Water Used as Drilling Fluid 4) Some Drilling Fluid Loss Observed

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Retaining Wall -RW7- STA 10+00.00 to 11+87.53				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 11+24	**OFFSET** 11 ft LT	**ALIGNMENT** -RW7-	**0 HR.** N/A
COLLAR ELEV. 291.7 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 493,094	**EASTING** 1,996,761	**24 HR.** 26.1
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER K. Parton	**START DATE** 04/15/14	**COMP. DATE** 04/16/14	**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
295										ELEV. (ft) DEPTH (ft)
										291.7 GROUND SURFACE 0.0
290	290.7	1.0	4	3	6	9		M		UNDIVIDED COASTAL PLAIN Orange Brown Fine Sandy CLAY
	288.2	3.5	8	9	9	18		M		
285	285.7	6.0	5	5	6	11		M		
	283.2	8.5	4	4	6	10		M		
280	278.2	13.5	3	3	6	9		M		279.7 12.0 Tan Fine Sandy Silty CLAY
275	273.2	18.5	8	7	11	18		M		274.7 17.0 Orange Brown Silty Fine to Coarse SAND
270	268.2	23.5	5	6	8	14		M		
265	263.2	28.5	6	7	17	24		M		264.7 27.0 **COASTAL PLAIN** Gray-White and Purple Silty CLAY (CAPE FEAR FORMATION)
260	258.2	33.5	9	12	24	36		M		
255	253.2	38.5	12	17	28	45		W		252.2 39.5 Orange Silty Fine to Coarse SAND
250	248.2	43.5	8	7	9	16		W		
245	243.2	48.5	3	2	2	4		W		
240	238.2	53.5	6	9	18	27		M		239.2 52.5 Gray Silty CLAY
235	233.2	58.5	14	17	33	50		M		
230	228.2	63.5	4	4	3	7		M		226.7 65.0 Boring Terminated at Elevation 226.7 ft in Silty CLAY (CAPE FEAR FORMATION) 1) Advanced 2-15/16 inch Tricone Bit to 63.5 Feet 2) Set 3.5 Feet of NW Casing 3) Fresh Water Used as Drilling Fluid 4) Some Drilling Fluid Loss Observed Other Samples: ST-3 (12.5 - 14.5)

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Retaining Wall -RW7- STA 10+00.00 to 11+87.53				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 11+24	**OFFSET** 11 ft LT	**ALIGNMENT** -RW7-	**0 HR.** N/A
COLLAR ELEV. 291.7 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 493,094	**EASTING** 1,996,761	**24 HR.** 26.1
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER K. Parton	**START DATE** 04/15/14	**COMP. DATE** 04/16/14	**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
215						Match Line				ST-4 (14.5 - 16.5)

NCDOT BORE DOUBLE U2519CB_GEO_RWAL6.7 GINT.GPJ NC_DOT.GDT 5/20/14

WBS 34817.2.8	**TIP** U-2519CB	**COUNTY** CUMBERLAND	**GEOLOGIST** N. Page	
SITE DESCRIPTION Retaining Wall -RW7- STA 10+00.00 to 11+87.53				**GROUND WTR (ft)**
BORING NO. W-4	**STATION** 11+63	**OFFSET** 6 ft RT	**ALIGNMENT** -RW7-	**0 HR.** Dry
COLLAR ELEV. 291.4 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 493,053	**EASTING** 1,996,767	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE CONETEC 163745 CME-55 90.9% 04/23/2013		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER K. Parton	**START DATE** 04/15/14	**COMP. DATE** 04/15/14	**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
295										
	291.4	0.0								291.4 GROUND SURFACE 0.0
290			3	3	4	7		M		UNDIVIDED COASTAL PLAIN Tan Orange Fine Sandy CLAY
	287.9	3.5								288.4 3.0
			4	6	7	13		M		Red Brown Clayey Fine SAND
285	285.4	6.0								284.9 6.5
			6	10	7	17		M		Orange Silty Fine SAND
	282.9	8.5								
			6	4	4	8		M		
280										
	277.9	13.5								
			4	4	4	8		M		
275										274.4 17.0
	272.9	18.5								Pinkish Gray Clayey Fine SAND
			3	5	9	14		M		271.9 19.5 271.4 Orange Silty Fine to Coarse SAND 20.0
										Boring Terminated at Elevation 271.4 ft In Silty Fine SAND (UNDIVIDED COASTAL PLAIN)

1) 2-1/4" HSA Advanced to 18.5 Feet

SUMMARY OF LABORATOTY TEST DATA

Soil Classification and Gradation

S&ME

Quality Assurance

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

S&ME Project #:	1305-14-046	Date Report	5/5/2014
State Project No.:	34817.2.8	County: Cumberland	Date Tested 5/2 - 5/5/14
Federal ID No.:	NA	TIP No. U-2519CB	
Project Name:	Retaining Wall -RW6- and -RW7-		
Client Name:	NCDOT	Client Address: Raleigh, North Carolina	

Boring No.	Sample No.	Sample Depth (ft)	AASHTO Classification		Total % Passing Sieve #					Total Mortar Fraction (%)				LL	PL	PI	Organic Content %	Moisture Content %
					10	40	60	200	270	Coarse Sand	Fine Sand	Silt	Clay					
EB1-A	ST-1	8 - 10	A-7-6	(29)	100	94	91	81.1	75.4	9	16	21	54	62	29	33	0.5	22.9
EB2-B	ST-3	12.5 - 14.5	A-7-6	(10)	100	69	56	44.1	41.5	43	15	12	30	63	29	34	0.7	19.1

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	Abner F. Riggs, Jr., P.E.	Senior Engineer
Technician Name:	*Signature*	*Certification #*	*Technical Responsibility:*	*Position*

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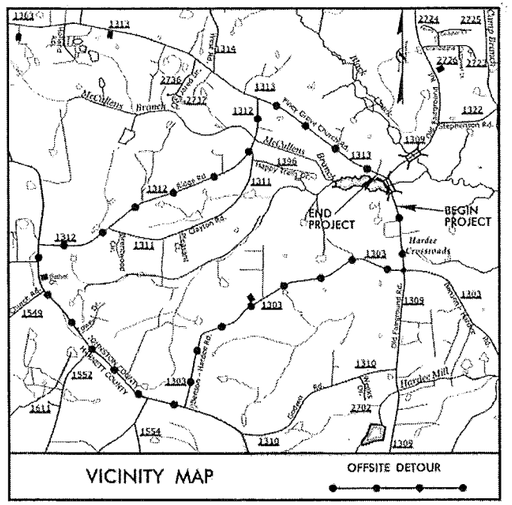
TIP PROJECT: 17BP.4.R.51

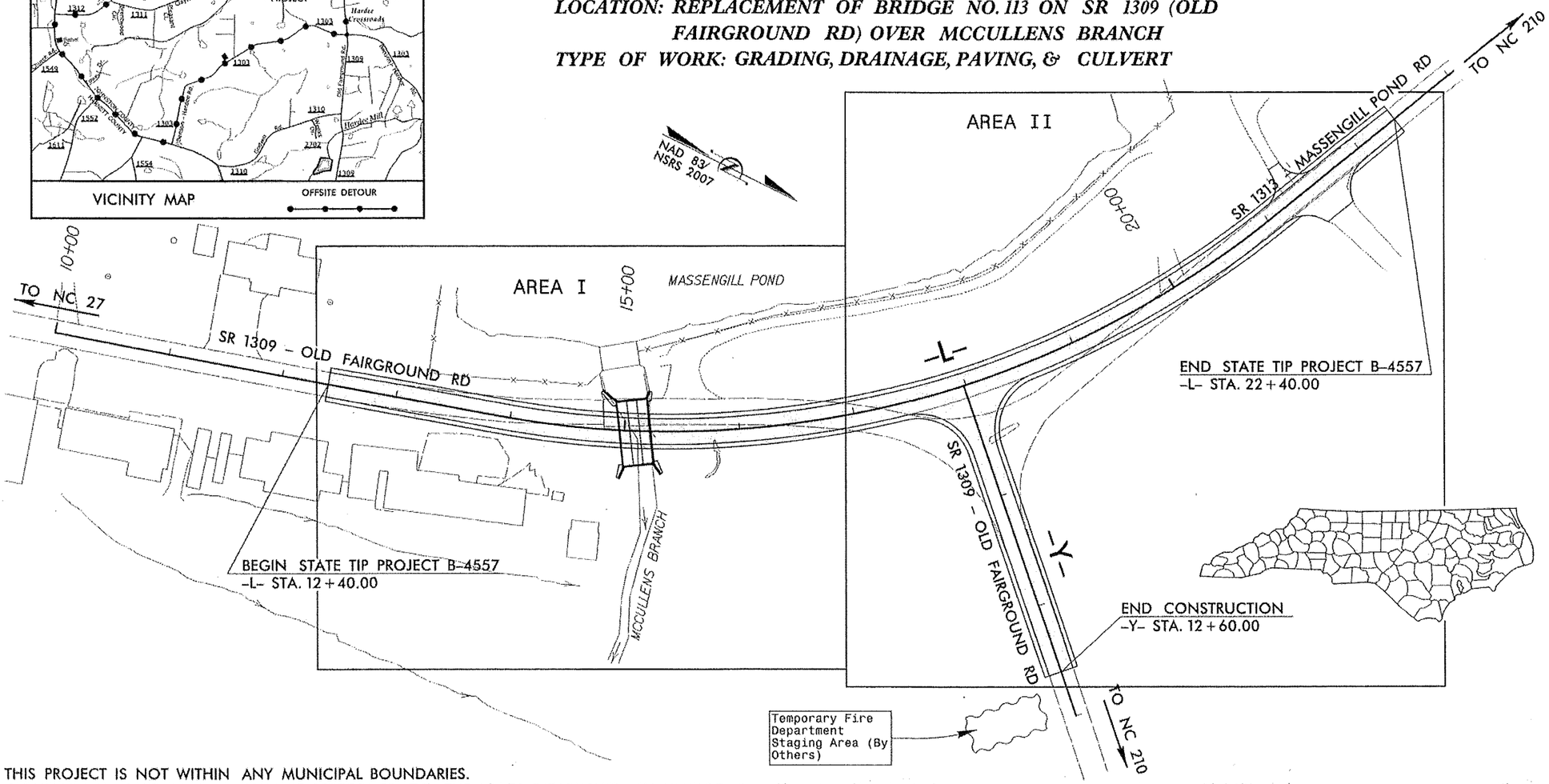
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

JOHNSTON COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.4.R.51	1	
STATE WBS ELEMENT	F.A. PROJ. NO.	DESCRIPTION	
17BP.4.R.51		PE	

LOCATION: REPLACEMENT OF BRIDGE NO. 113 ON SR 1309 (OLD FAIRGROUND RD) OVER MCCULLENS BRANCH
TYPE OF WORK: GRADING, DRAINAGE, PAVING, & CULVERT





THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

See Sheet 1A For Index of Sheets

CONTRACT: _____

GRAPHIC SCALES

PLANS: 50 25 0 50 100
PROFILE (HORIZONTAL): 50 25 0 50 100
PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

ADT 2011 = 2,300
ADT 2025 = 3,250
T = 6%
V = 50 MPH
FUNC CLASS = RURAL MIN. COLLECTOR SUB-REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-4557 = 0.184 MILES
LENGTH STRUCTURE TIP PROJECT B-4557 = 0.005 MILES
TOTAL LENGTH TIP PROJECT B-4557 = 0.189 MILES

Prepared for: ***HIGHWAY DIVISION 4***
509 Ward Blvd.
Wilson, NC 27895

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE:

Prepared by: MULKEY ENGINEERS & CONSULTANTS
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Raleigh, NC 27636
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L. KEVIN AUSTIN, PE
PROJECT ENGINEER

W. CRAIG PARKER, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER
SIGNATURE: _____ P.E. 2/14/14

ROADWAY DESIGN ENGINEER
SIGNATURE: _____ P.E. 3/3/14

NORTH CAROLINA PROFESSIONAL SEAL 25474 ENGINEER W. CRAIG PARKER

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION ·

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.2.8 (U-2519CB)	1	54

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34817.2.8 (U-2519CB) F.A. PROJ. N/A

COUNTY CUMBERLAND

PROJECT DESCRIPTION FAYETTEVILLE OUTER LOOP (FOL) FROM SOUTH OF SR-1400 (CLIFFDALE RD) TO EAST OF ALL AMERICAN FREEWAY

SITE DESCRIPTION NOISE WALL 1 - FROM -RPD1- STA 7+70 12.40' LT TO STA 820+85 60.42' RT. NOISE WALL 2 - FROM -L- STA. 969+44 77.21' RT TO STA 987+74 77.68' RT

NOISE WALL INVENTORY

ID: U-2519CB

PROJECT: 34817.2.8

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3 - 9	SITE PLAN
10 - 54	CPT LOGS

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. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

PERSONNEL

F. Wright

T. Westfall (ConeTec)

K. Parton (ConeTec)

A. Sweeney (ConeTec)

INVESTIGATED BY S&ME, INC.

CHECKED BY A.F. RIGGS JR., P.E.

SUBMITTED BY S&ME, INC.

DATE MAY 2014

NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER ADNER F RIGGS, JR 5/19/14

DRAWN BY: B. Ratti

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

PROJECT REFERENCE NO.	SHEET NO.
34817.2.8 (U-2519CB)	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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#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			
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
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 A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-6 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/FT²)
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 0.50
	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		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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 W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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:
- ☐ MOBILE B-___
- ☐ BK-51
- ☐ CME-45C
- ☐ CME-550
- ☐ PORTABLE HOIST
- ☒ CPT-TRACK
- ☐ _____

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

HAMMER TYPE:
- ☐ AUTOMATIC ☐ MANUAL

CORE SIZE:
- ☐ -B_____
- ☐ -N_____
- ☐ -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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: ROADWAY TIN FILE

ELEVATION: _____ FT.

NOTES:

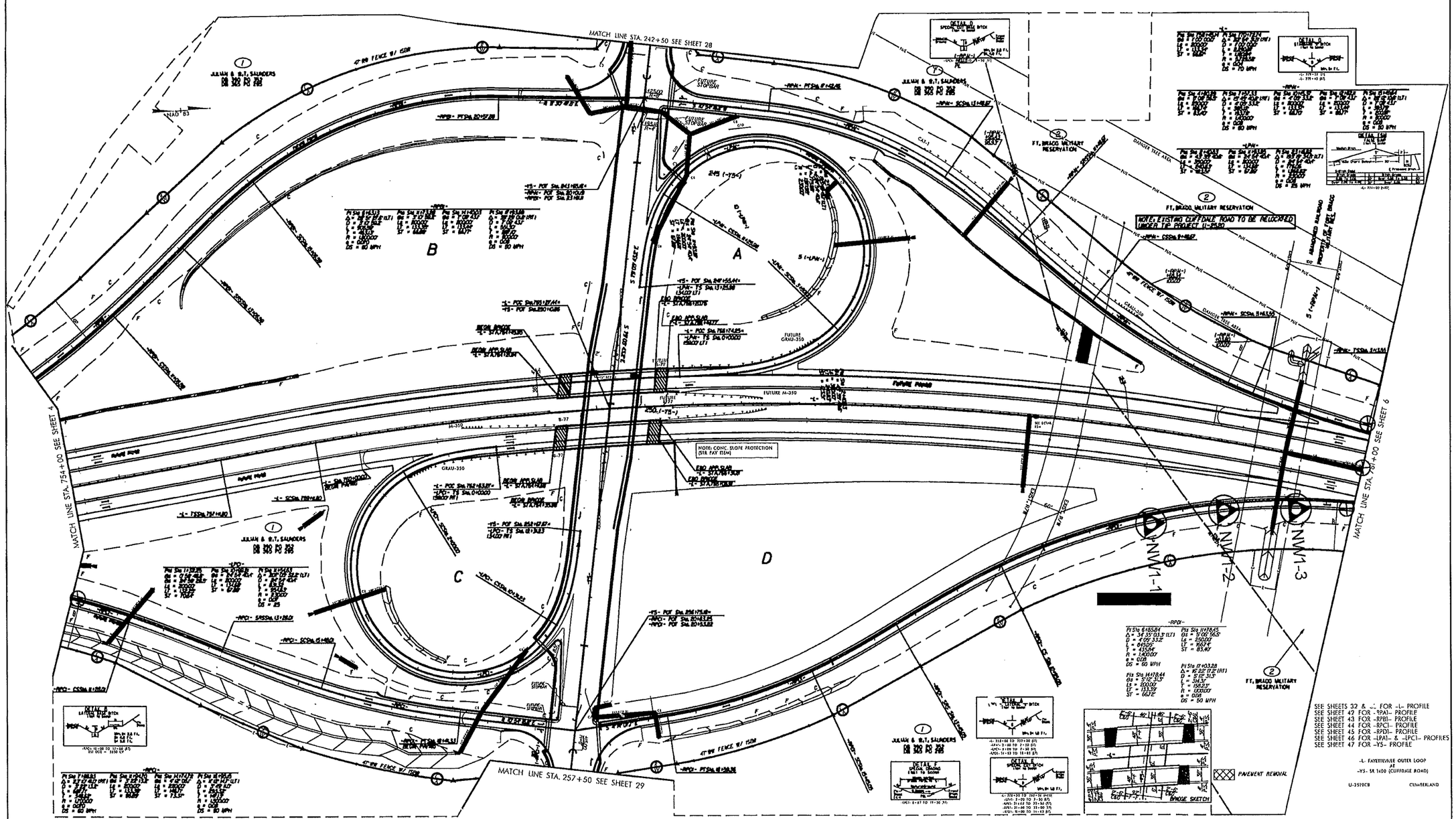
REVISED 09/23/09

7/2/99

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	3
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



SEE SHEETS 32 & -... FOR -L- PROFILE
SEE SHEET 42 FOR -RPA1- PROFILE
SEE SHEET 43 FOR -RPB1- PROFILE
SEE SHEET 44 FOR -RPC1- PROFILE
SEE SHEET 45 FOR -RPD1- PROFILE
SEE SHEET 46 FOR -LPA1- & -LPC1- PROFILES
SEE SHEET 47 FOR -Y5- PROFILE

-L- FAYETTEVILLE OUTER LOOP
AT
-Y5- SR 1400 (CUFFDALE ROAD)

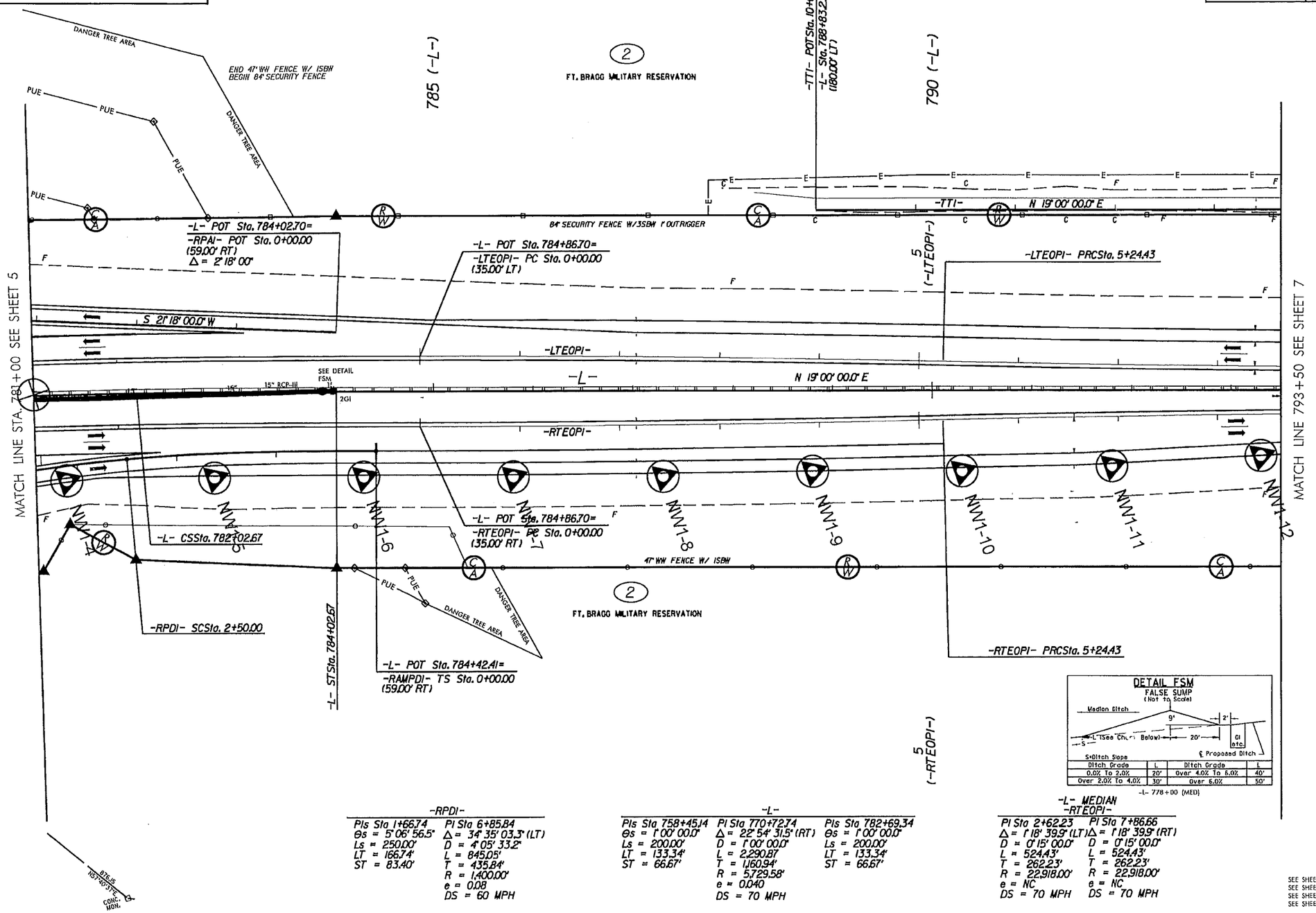
U-2519CB CUMBERLAND

7/2/99

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



DETAIL FSM
FALSE SUMP
(Not to Scale)

S=Ditch Slope

Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

-L- 778+00 (MED)

-RPDI-

PIs Sta 1+66.74	PI Sta 6+85.84
Θs = 5° 06' 56.5"	Δ = 34° 35' 03.3" (LT)
Ls = 250.00'	D = 4° 05' 33.2"
LT = 166.74'	L = 845.05'
ST = 83.40'	T = 435.84'
	R = 1,400.00'
	e = 0.08
	DS = 60 MPH

-L-

PIs Sta 758+45.14	PI Sta 770+72.74	PIs Sta 782+69.34
Θs = 1° 00' 00.0"	Δ = 22° 54' 31.5" (RT)	Θs = 1° 00' 00.0"
Ls = 200.00'	D = 1° 00' 00.0"	Ls = 200.00'
LT = 133.34'	L = 2,290.87	LT = 133.34'
ST = 66.67'	T = 1,160.94'	ST = 66.67'
	R = 5,729.58'	
	e = 0.040	
	DS = 70 MPH	

-L- MEDIAN
-RTEOPI-

PI Sta 2+62.23	PI Sta 7+86.66
Δ = 1° 18' 39.9" (LT)	Δ = 1° 18' 39.9" (RT)
D = 0° 15' 00.0"	D = 0° 15' 00.0"
L = 524.43'	L = 524.43'
T = 262.23'	T = 262.23'
R = 22,918.00'	R = 22,918.00'
e = NC	e = NC
DS = 70 MPH	DS = 70 MPH

SEE SHEET 33 FOR -L- PROFILE
SEE SHEET 42 FOR -RPAI- PROFILE
SEE SHEET 45 FOR -RPDI- PROFILE
SEE SHEET 65 FOR -TTI- PROFILE

7/2/99

REVISIONS

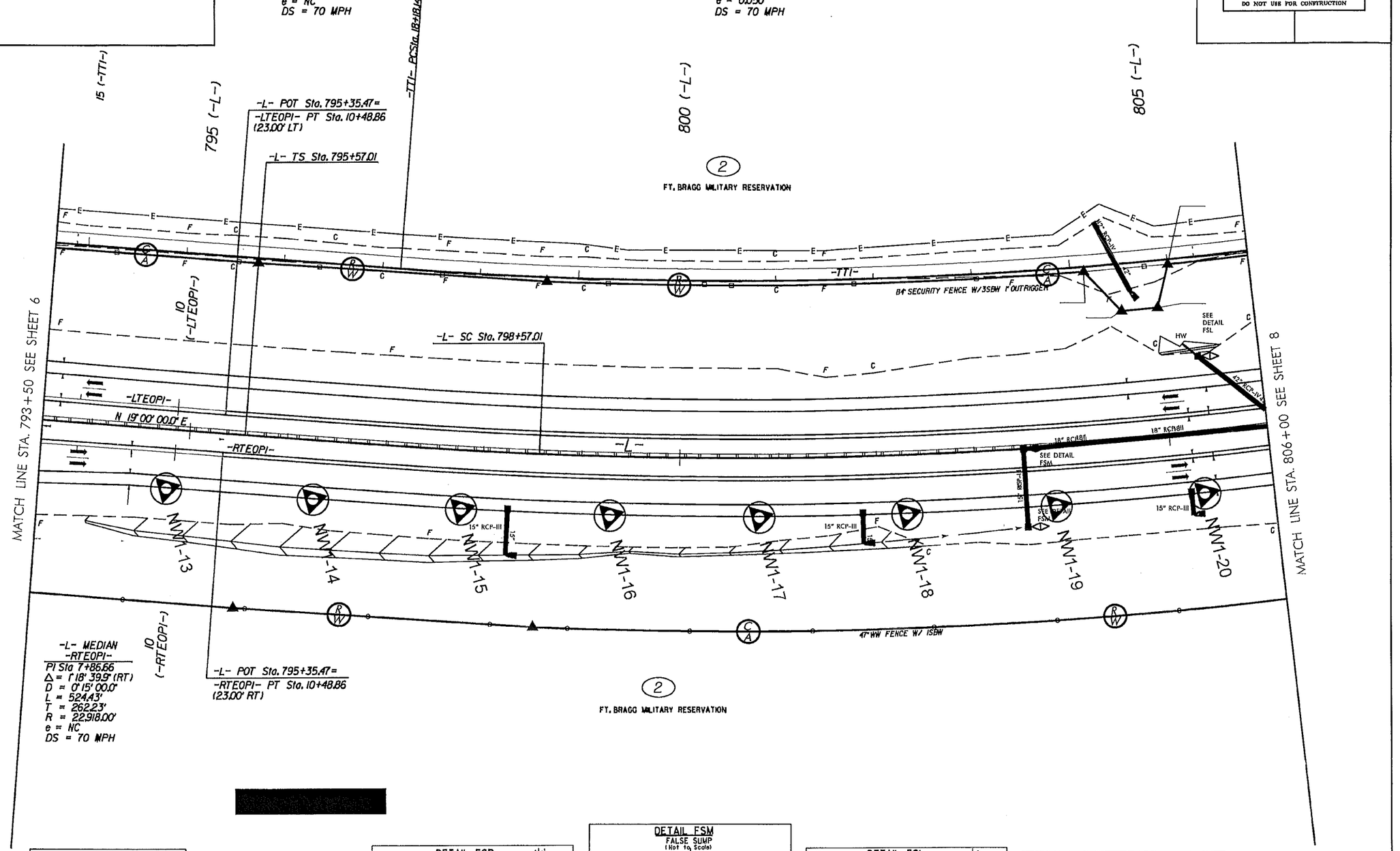
PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-L- MEDIAN
-LTEOPI-
PI Sta 7+86.66
Δ = 1°18' 39.9" (LT)
D = 0°15' 00.0"
L = 524.43'
T = 262.23'
R = 22,918.00'
e = NC
DS = 70 MPH

-L-
PIs Sta 797+57.02 PI Sta 815+21.68
θs = 1°51' 22.4" Δ = 39° 33' 04.0" (LT)
Ls = 300.00' D = 1°14' 15.0"
LT = 200.01' L = 3,196.08
ST = 100.01' T = 1,664.67'
R = 4,630.00'
e = 0.050
DS = 70 MPH

-TTI-
PI Sta 30+17.35
Δ = 30° 04' 02.0" (LT)
D = 1°16' 59.6"
L = 2,343.11'
T = 1,199.20'
R = 4,465.00'



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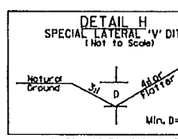
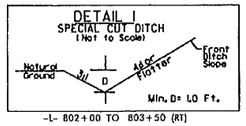
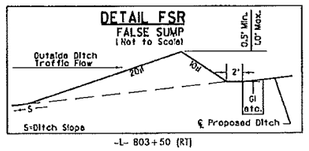


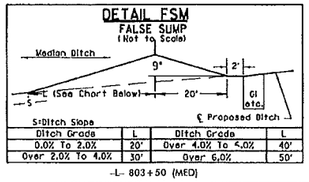
-L- 794+00 TO 802+00 (RT)



-L- 802+00 TO 803+50 (RT)

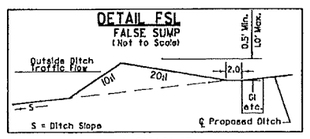


-L- 803+50 (RT)

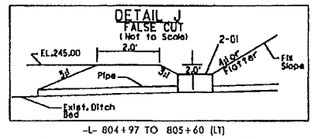


Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 5.0%	40'
Over 2.0% To 4.0%	30'	Over 5.0%	50'

-L- 803+50 (MED)



-L- 805+36 (LT)



-L- 804+97 TO 805+60 (LT)

SEE SHEETS 33 & 34 FOR -L- PROFILE
SEE SHEET 65 FOR -TTI- PROFILE

7/2/99

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

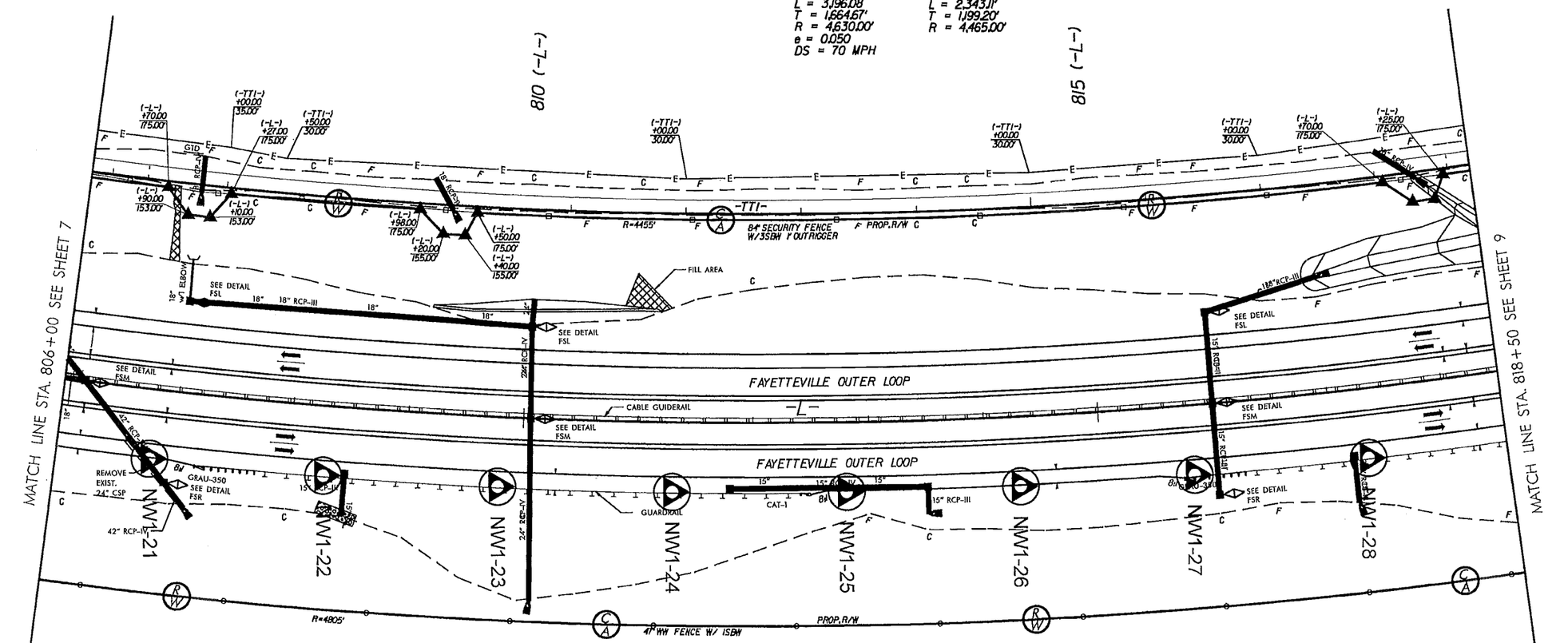
30 (-TTI-)

35 (-TTI-)

(2)

FT. BRAGG MILITARY RESERVATION

-L-	-TTI-
PI Sta 815+21.58	PI Sta 30+17.35
Δ = 39° 33' 04.0" (LT)	Δ = 30° 04' 02.0" (LT)
D = 1° 14' 15.0"	D = 1° 16' 59.6"
L = 3,196.08	L = 2,343.11'
T = 1,664.67'	T = 1,199.20'
R = 4,630.00'	R = 4,465.00'
e = 0.050	
DS = 70 MPH	

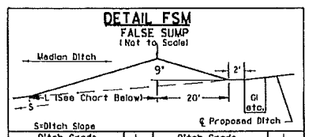


(2)

FT. BRAGG MILITARY RESERVATION

[redacted]

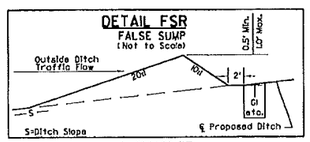
DETAIL FSM
FALSE SUMP
(Not to Scale)



Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

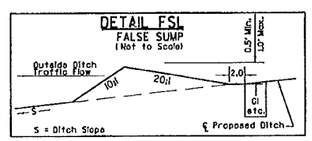
-L- 806+17 (MED)
-L- 810+06 (MED)
-L- 816+00 (MED)

DETAIL FSR
FALSE SUMP
(Not to Scale)



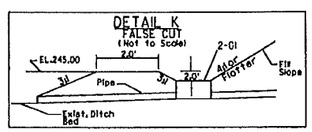
-L- 806+93 (RT)
-L- 816+00 (RT)

DETAIL FSL
FALSE SUMP
(Not to Scale)



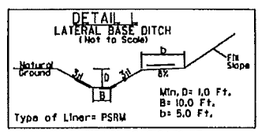
-L- 807+00 (LT)
-L- 810+04 (LT)
-L- 816+00 (LT)

DETAIL K
FALSE CUT
(Not to Scale)



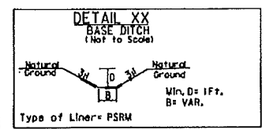
-L- 809+13 TO 811+15 (LT)

DETAIL L
LATERAL BASE DITCH
(Not to Scale)



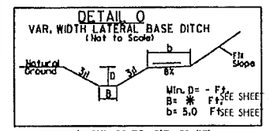
-L- 817+50 TO 818+50 (LT)
EST. DDE = 96 CY
EST. PSRM = 111 SY

DETAIL XX
BASE DITCH
(Not to Scale)



-TTI- 38+36 (RT) TO -TTI- 39+00 (RT)
EST. PSRM = 38 SY

DETAIL Q
VAR. WIDTH LATERAL BASE DITCH
(Not to Scale)



-L- 817+00 TO 817+50 (LT)
EST. DDE = 41 CY
* B VARIES (2' TO 10')

SEE SHEET 34 FOR -L- PROFILE
SEE SHEET 65 & 66 FOR -TTI- PROFILE

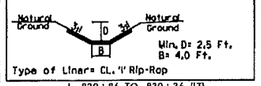
7/2/99

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	7
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

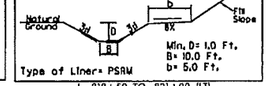
DETAIL ZZ
BASE DITCH
(Not to Scale)



Type of Liner= CL. 'I' Rip-Rap

-L- 829+86 TO 830+36 (LT)
EST. DDE = 19 CY
EST. CLASS I RIP-RAP = 20 TN

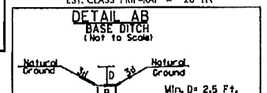
DETAIL L
LATERAL BASE DITCH
(Not to Scale)



Type of Liner= PSRM

-L- 818+50 TO 821+90 (LT)
EST. DDE = 578 CY
EST. PSRM = 378 SY

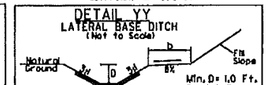
DETAIL AB
BASE DITCH
(Not to Scale)



Type of Liner= PSRM

-L- 830+36 TO 831+00 (LT)
EST. DDE = 172 CY
EST. PSRM = 28 SY

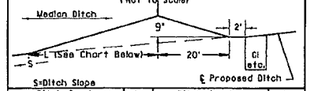
DETAIL YY
LATERAL BASE DITCH
(Not to Scale)



Type of Liner= CL. 'I' Rip-Rap

-L- 821+90 TO 822+40 (LT)
EST. DDE = 208 CY
EST. CLASS I RIP-RAP = 39 TN

DETAIL FSM
FALSE SUMP
(Not to Scale)



S=Ditch Slope

Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

-L- 820+50 (MED)

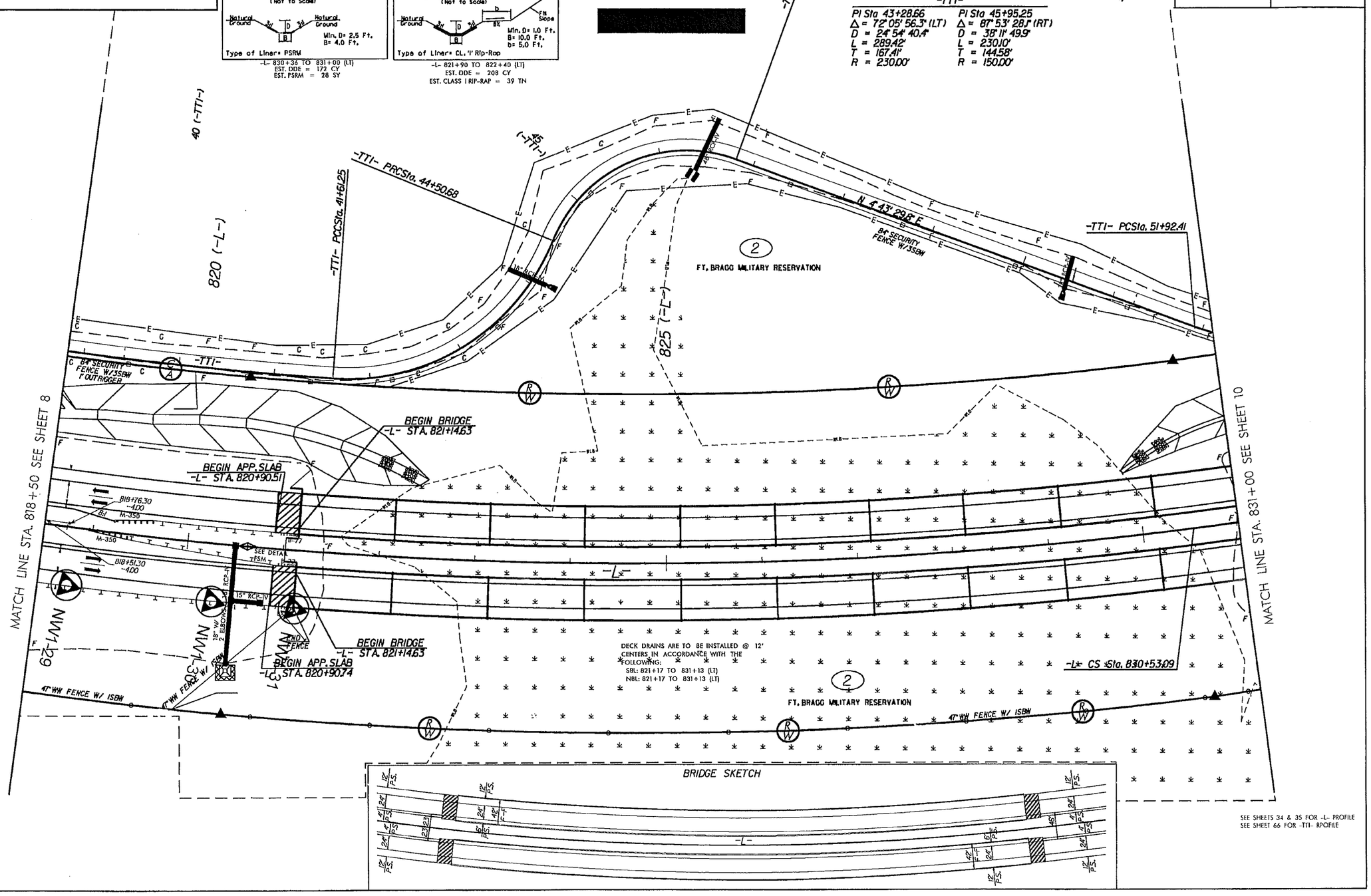
[redacted]

-L-

PIs Sta 831+53.10	PI Sta 815+21.68
Θs = 1° 51' 22.4"	Δ = 39° 33' 04.0" (LT)
Ls = 300.00'	D = 1° 14' 15.0"
LT = 200.01'	L = 3,196.08
ST = 100.01'	T = 1,664.67'
	R = 4,630.00'
	θ = 0.050
	DS = 70 MPH

-TTI-

PI Sta 43+28.66	PI Sta 45+95.25
Δ = 72° 05' 56.3" (LT)	Δ = 87° 53' 28.1" (RT)
D = 24° 54' 40.4"	D = 38° 11' 49.9"
L = 289.42'	L = 230.10'
T = 167.41'	T = 144.58'
R = 230.00'	R = 150.00'



SEE SHEETS 34 & 35 FOR -L- PROFILE
SEE SHEET 66 FOR -TTI- RPOFILE

7/2/99

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	8
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

MATCH LINE STA. 965+50 SEE SHEET 19

MATCH LINE STA. 977+00 SEE SHEET 21

NAD 83

F.T. BRAGG MILITARY RESERVATION

-TT5- PCSta. 35+11.42
PC Sta. 35+11.45
PT Sta. 23+93.80
BEGIN APP. SLAB -L- STA. 968+60.04
PC Sta. 23+65.98
BEGIN BRIDGE -L- STA. 968+83.97
POT Sta. 24+69.81
PRC Sta. 36+53.50
-TT5- PTSta. 37+36.14
-TT5- PCSta. 39+33.00
-TT5- PTSta. 39+67.23
N 62° 29' 51.0" E
S 38.0°W
-Y2- POT Sta. 21+72.29=
-TT5- POT Sta. 40+24.24
S 62° 23' 22.3" W
PC Sta. 14+75.50
-TT5- PTSta. 41+06.22
-TT5- PCSta. 40+63.12
VISUAL BARRIER
S 85° 41' 31.1" E
END VISUAL BARRIER
-Y2- PC Sta. 23+56.97
S 82° 30' 14.5" E
S 85° 41' 31.4" E
S 85° 41' 31.0" E
-Y2- SRS Sta. 27+82.90
-L- POT Sta. 969+51.52=
-Y2- POC Sta. 25+98.54
-Y2- SC Sta. 29+32.90
-Y2- CS Sta. 26+32.90
END APP. SLAB -L- STA. 971+13.39
END APP. SLAB -L- STA. 970+30.78
END BRIDGE -L- STA. 970+07.78
END BRIDGE -L- STA. 970+90.57
PT Sta. 11+05.44
PC Sta. 10+78.20
POT Sta. 10+00.00
NW2-1
NW2-2
NW2-3
NW2-4
NW2-5
84" WW SECURITY FENCE W/3SBW T OUTRIGGER
LIFT STATION
SEE DETAIL FSM
FT. BRAGG MILITARY RESERVATION
N89°14'09"E 677.95 356.98
N89°12'04"E 387.74
N89°15'14"E 125.00 45.87
154.28 25.79 EIP
CONC. MON.
388.09

DETAIL KK
STANDARD "V" DITCH
(Not to Scale)
Min. D= 1.0 Ft.
-Y2 REV- 24+50 (RT)

DETAIL MM
VAR. WIDTH LATERAL BASE DITCH
(Not to Scale)
Min. D= 2.0 Ft.
B= * Ft.
D= 5.0 Ft.
-L- 973+50 TO 977+00 (RT)
EST. DDE = 13123 CY
* B (VARIES 57' TO 47')

DETAIL FSM
FALSE SUMP
(Not to Scale)
Median Ditch
S-Ditch Slope
℄ Proposed Ditch

Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

-L- 870+00 (MED)

DETAIL LL
STANDARD BASE DITCH
(Not to Scale)
Min. D= 1.5 Ft.
B= 4.0 Ft.
-L- 971+00 (RT)
EST. DDE = 5 CY

7/2/99

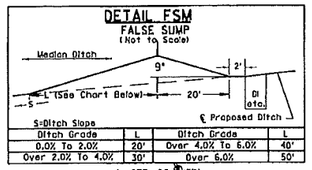
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	9
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

FOR CONTINUATION SEE SHEET 2-0

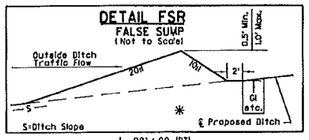
DETAIL FSM
FALSE SUMP
(Not to Scale)



S=Ditch Slope			
Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

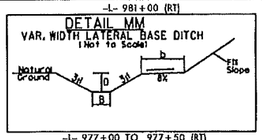
-L- 977+25 (MED)
-L- 981+00 (MED)
-L- 983+50 (MED)
-L- 987+50 (MED)

DETAIL FSR
FALSE SUMP
(Not to Scale)



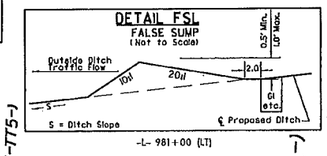
-L- 981+00 (RT)

DETAIL MM
VAR. WIDTH LATERAL BASE DITCH
(Not to Scale)



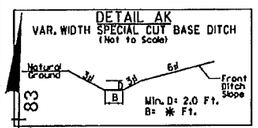
-L- 977+00 TO 977+50 (RT)
EST. DDE = 2549 CY
*B (VARIES 47' to 57')

DETAIL FSL
FALSE SUMP
(Not to Scale)



-L- 981+00 (LT)

DETAIL AK
VAR. WIDTH SPECIAL CUT BASE DITCH
(Not to Scale)



-L- 979+00 TO 983+50 (RT)
EST. DDE = 21000 CY
*B (VARIES 5' to 40')

TO BE UPDATED BY RS&H

R = 1,370.00'

-L- Sta 12+56.98
Θs = 3°08'11.9"
Ls = 150.00'
LT = 100.02'
ST = 50.01'

BEGIN CONSTRUCTION -TT5DET- POC Sta. 977+35.95

-TT5- PI Sta 54+26.45
Δ = 100°53'02.50" (RT)
D = 38°11'49.9"
L = 264.11'
T = 181.59'
R = 150.00'

-TT5- PI Sta 56+42.01
Δ = 59°14'07.8" (RT)
D = 114°35'29.6"
L = 51.69'
T = 28.42'
R = 50.00'

-TT5- PI Sta 57+26.80
Δ = 90°00'00.6" (RT)
D = 114°35'29.6"
L = 78.54'
T = 50.00'
R = 50.00'

-TT5- PTSta. 56+65.28 =
-TT5REV- PTSta. 56+65.28

-TT5REV- PTSta 58+21.44

-TT5REV- PCSta. 57+51.13
R = 2,340.00'
L = 469.25'
-TT5- POT Sta. 57+19.99

-TT5- POT Sta. 13+67.10

-L- MEDIAN -LTEOP2-
PIs Sta 1+33.34
Θs = 1°06'28.9"
Ls = 200.00'
LT = 133.34'
ST = 66.67'

-L-
PIs Sta 978+96.73
Θs = 1°06'06.6"
Ls = 200.00'
LT = 133.34'
ST = 66.67'

PIs Sta 986+51.27
Δ = 15°04'15.8" (LT)
D = 1°06'06.6"
L = 1,367.81
T = 687.87'
R = 5,200.00'
DS = 70 MPH

-L- MEDIAN -LTEOP2-
PI Sta 8+83.47
Δ = 15°03'31.3" (LT)
D = 1°06'28.9"
L = 1,359.06
T = 683.47'
R = 5,171.00'
e = 0.040
RO = 200.00'

-L- MEDIAN -RTEOP2-
PIs Sta 1+79.48
Θs = 1°18'53.5"
Ls = 240.00'
LT = 160.00'
ST = 80.00'

PI Sta 9+31.42
Δ = 14°38'42.0" (LT)
D = 1°05'44.6"
L = 1,336.55
T = 671.94'
R = 5,229.00'
e = 0.040
RO = 240.50'

REMOVE CURB AND GUTTER IN LOCATION OF TANK TRAIL

-TT5- PCSta. 56+13.58

-TT5- PT Sta. 15+13.40

-TT5- PTSta. 55+08.98

MATCH LINE -Y3- STA. 14+60 SEE SHEET 22

POINT NUMBER	BASELINE STATION	-L- STATION	OFFSET
BL-61	BL-PINC 240+93.14	-L- POC 977+35.95	68.23' RT
BL-62	BL-PINC 243+42.85	-L- POC 979+84.11	66.07' RT

45 (-TT5-)
980 (-L-)
NAD 83
50 (-TT5-)
55
985 (-L-)
10 (-LTEOP2-)

FT. BRAGG MILITARY RESERVATION

-L- POT Sta. 977+68.90
-LTEOP2- TS Sta. 0+00.00 (23.00' LT)
-L- TS Sta. 977+63.39
-RTEOP2- PT Sta. 0+00.00 (23.00' RT)
PT Sta. 16+81.49

-LTEOP2- SC Sta. 2+00.00
POT Sta. 17+90.63
-L- SC Sta. 979+63.39

-RTEOP2- TS Sta. 0+19.48
-RTEOP2- SC Sta. 2+59.48

S 88°27'06.3" E
S 86°16'56.5" E
S 85°41'31.0" E

-TT5-
84" WW SECURITY FENCE W/35BW FOUTRIGGER

-LTEOP2-
-RTEOP2-
-L-

NW2-6
NW2-7
NW2-8
NW2-9
NW2-10
NW2-11
NW2-12
NW2-13

CAT-1
GRAU 350
GUARDRAIL
CABLE GUIDERAIL 30" RCP-IV
SEE DETAIL FSM
SEE DETAIL FSL
SEE DETAIL FSR
SEE DETAIL FSM-A
15" RCP-III
15" RCP-IV
30" RCP-IV
15" W/2 ELBOWS
30" W/2 ELBOWS
18" W/1 ELBOW
6'VCP STUB
8'VCP STUB
TEMP. SECURITY FENCE
REMOVE

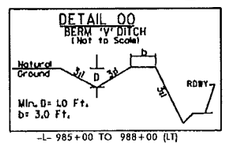
MATCH LINE STA. 977+00 SEE SHEET 20

MATCH LINE STA. 988+00 SEE SHEET 22

2
FT. BRAGG MILITARY RESERVATION

169.00 CONC. MON.
N89°13'32"E 706.58
532.78
EIP
173.80

DETAIL OO
BERM "V" DITCH
(Not to Scale)



-L- 985+00 TO 988+00 (LT)

SEE SHEETS 2-0 & 2-P FOR -Y3 DET-
SEE SHEETS 40 & 41 FOR -L- PROFILE
SEE SHEET 70 & 71 FOR -TT5- PROFILE

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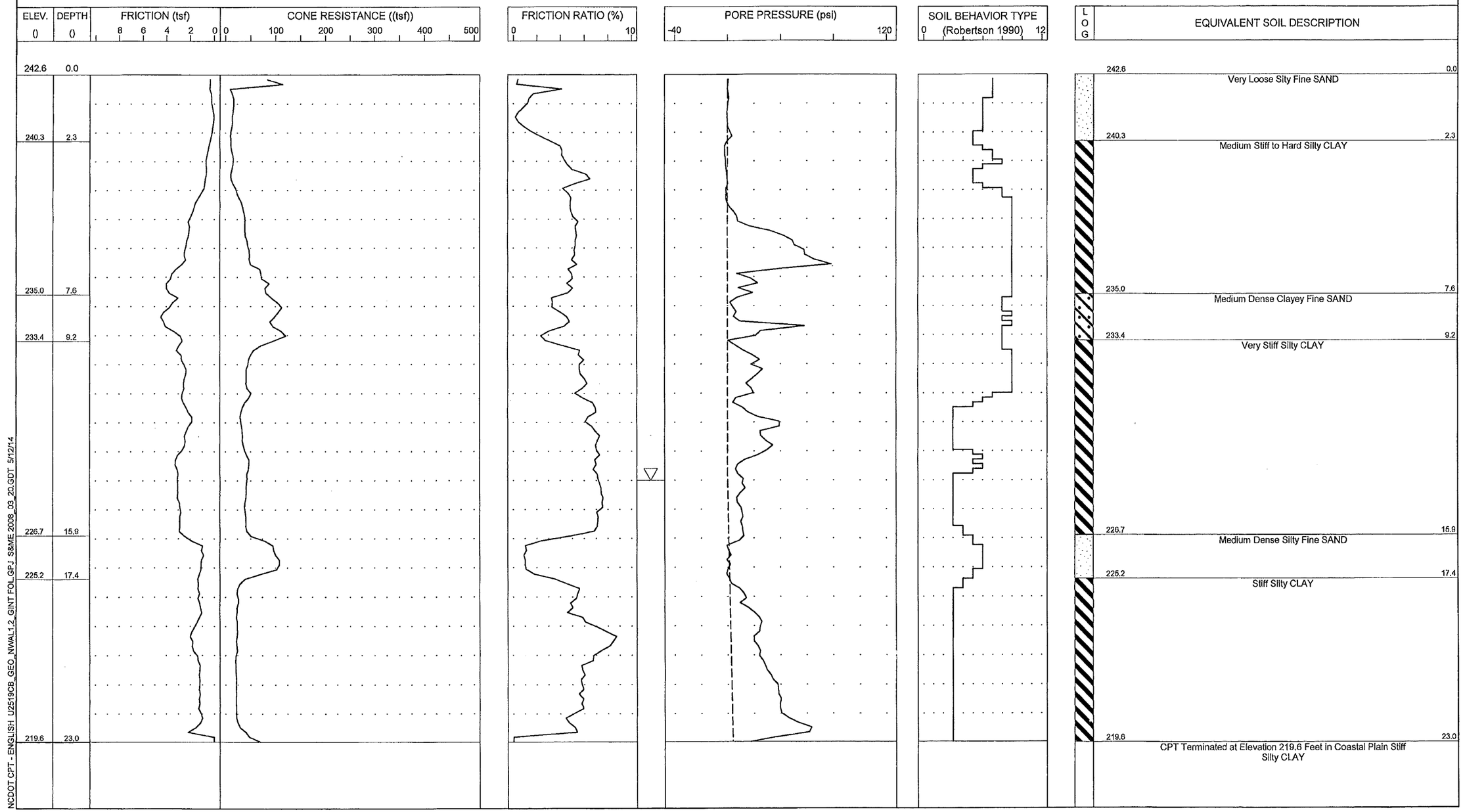
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	ID. U-2519CB	COUNTY Cumberland	GEOLOGIST A. Riggs	TYPE OF CONE 1.75 In. PEIZO CONE	ROD TYPE 1.75 in Dia.	MAXIMUM DOWN PRESSURE Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			GROUND WATER (ft)	TOTAL DEPTH 23.0	DRILL MACHINE CPT-TRACK	DRILL METHOD Direct Push	HAMMER TYPE N/A
BORING NO. NW1-01	BORING LOCATION 4+64	OFFSET 18 LT	ALIGNMENT -RPD1-	0 HR. 14.0	DATE STARTED 3/27/2014	COMPLETED 3/27/2014	SURFACE WATER DEPTH N/A
COLLAR ELEV. 242.6	NORTHING 479,355.4	EASTING 1,993,173.0		24 HR. N/M	DRILLER: T. WESTFALL	TECHNICIAN K. PARTON	



LOG

EQUIVALENT SOIL DESCRIPTION

242.6 — 0.0
Very Loose Silty Fine SAND

240.3 — 2.3
Medium Stiff to Hard Silty CLAY

235.0 — 7.6
Medium Dense Clayey Fine SAND

233.4 — 9.2
Very Stiff Silty CLAY

226.7 — 15.9
Medium Dense Silty Fine SAND

225.2 — 17.4
Stiff Silty CLAY

219.6 — 23.0
CPT Terminated at Elevation 219.6 Feet in Coastal Plain Stiff Silty CLAY

NCDOT CPT - ENGLISH U2519CB_GEO_NWAL1.2_GINT FOL.GPJ S&ME 2008_03_20.GDT 5/12/14

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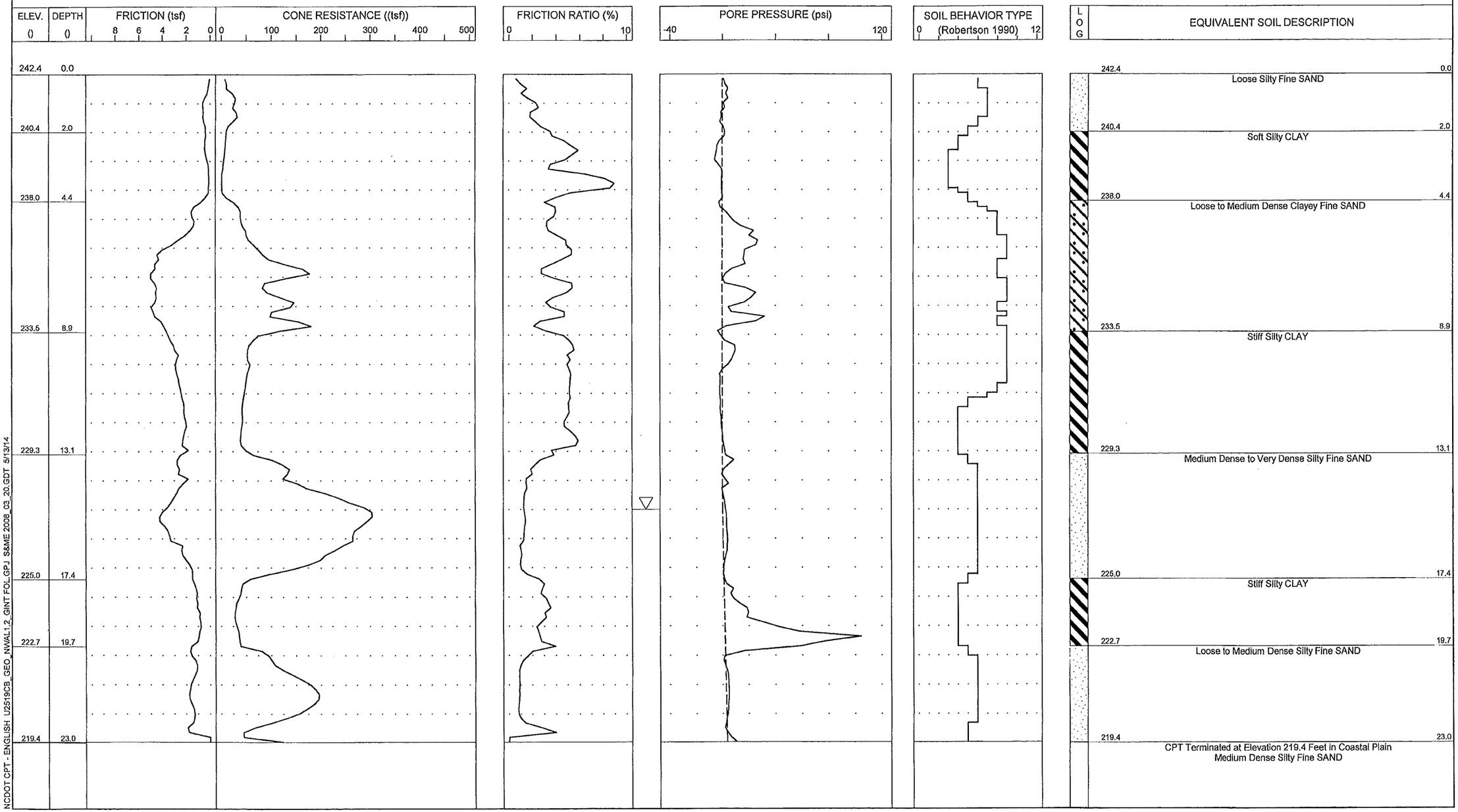
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 23.0	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-02	**BORING LOCATION** 6+15	**OFFSET** 14 LT	**ALIGNMENT** -RPD1-	**0 HR.** 15.0	**DATE STARTED** 3/27/2014	**COMPLETED** 3/27/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 242.4	**NORTHING** 479,508.5	**EASTING** 1,993,158.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



LOG	EQUIVALENT SOIL DESCRIPTION
242.4 / 0.0	Loose Silty Fine SAND
240.4 / 2.0	Soft Silty CLAY
238.0 / 4.4	Loose to Medium Dense Clayey Fine SAND
233.5 / 8.9	Stiff Silty CLAY
229.3 / 13.1	Medium Dense to Very Dense Silty Fine SAND
225.0 / 17.4	Stiff Silty CLAY
222.7 / 19.7	Loose to Medium Dense Silty Fine SAND
219.4 / 23.0	CPT Terminated at Elevation 219.4 Feet in Coastal Plain Medium Dense Silty Fine SAND

NCDOT CPT - ENGLISH U2519CB_GEO_NWAL1_2_GINT FOL.GPJ S&ME 2008_03_20.GDT 5/13/14

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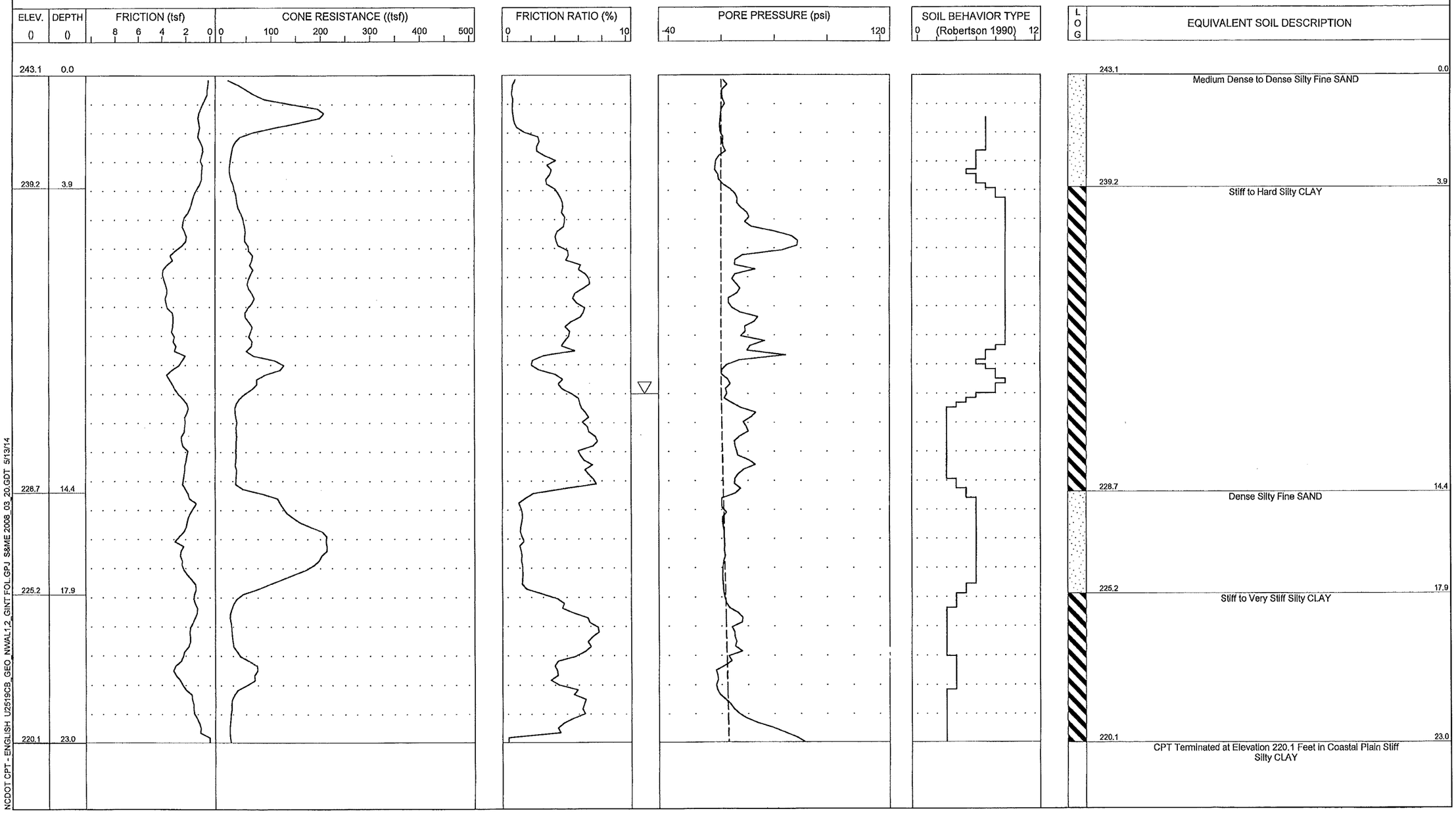
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 23.0	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-03	**BORING LOCATION** 7+71	**OFFSET** 18 LT **ALIGNMENT** -RPD1-	**0 HR.** 11.0	**DATE STARTED** 3/27/2014	**COMPLETED** 3/27/2014	**SURFACE WATER DEPTH** N/A	
COLLAR ELEV. 243.1	**NORTHING** 479,658.1	**EASTING** 1,993,167.0	**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON		



LOG

243.1 0.0
Medium Dense to Dense Silty Fine SAND

239.2 3.9
Stiff to Hard Silty CLAY

228.7 14.4
Dense Silty Fine SAND

225.2 17.9
Stiff to Very Stiff Silty CLAY

220.1 23.0
CPT Terminated at Elevation 220.1 Feet in Coastal Plain Stiff Silty CLAY

NCDOT CPT - ENGLISH U2519CB_GEO_NWAL1-2_GINT FOL.GPJ S&ME 2008_03_20.GDT 5/13/14

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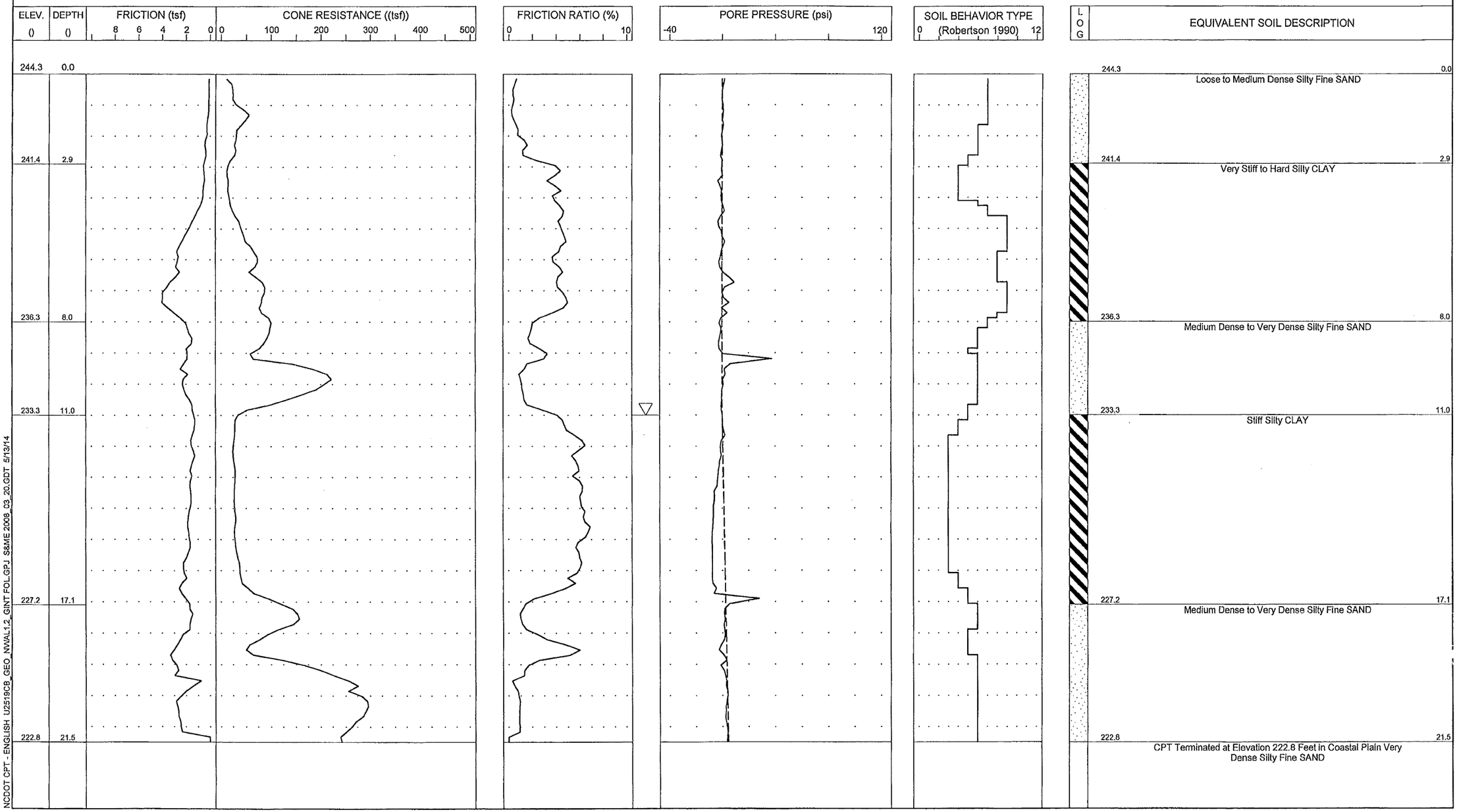
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 21.5	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-04	**BORING LOCATION** 3+12	**OFFSET** 15 LT	**ALIGNMENT** -RPD1-	**0 HR.** 11.0	**DATE STARTED** 3/27/2014	**COMPLETED** 3/27/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 244.3	**NORTHING** 479,806.6	**EASTING** 1,993,185.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



LOG

EQUIVALENT SOIL DESCRIPTION

244.3 — 0.0
Loose to Medium Dense Silty Fine SAND

241.4 — 2.9
Very Stiff to Hard Silty CLAY

236.3 — 8.0
Medium Dense to Very Dense Silty Fine SAND

233.3 — 11.0
Stiff Silty CLAY

227.2 — 17.1
Medium Dense to Very Dense Silty Fine SAND

222.8 — 21.5
CPT Terminated at Elevation 222.8 Feet in Coastal Plain Very Dense Silty Fine SAND

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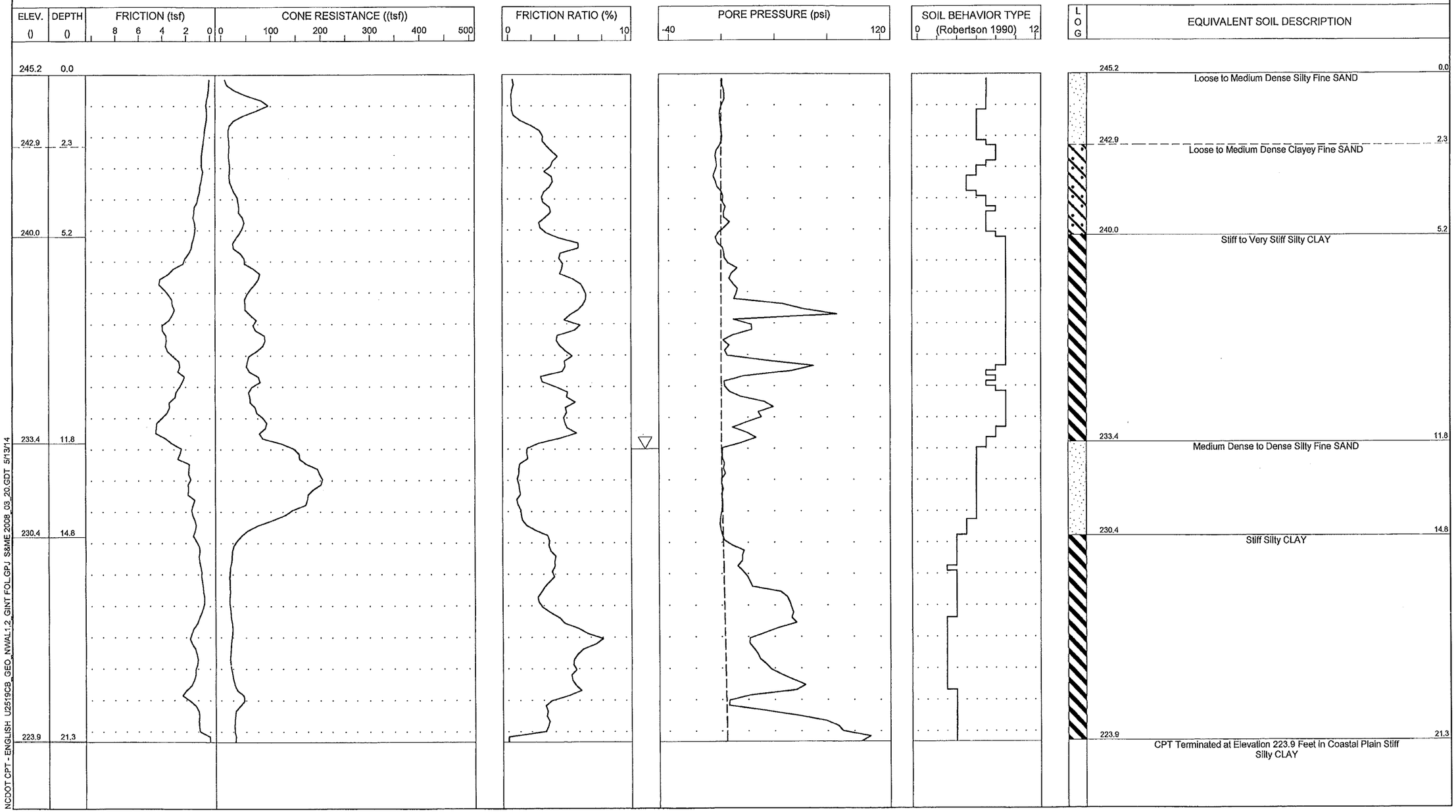
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 21.3	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-05	**BORING LOCATION** 782+80	**OFFSET** 85 RT	**ALIGNMENT** -L-	**0 HR.** 12.0	**DATE STARTED** 3/27/2014	**COMPLETED** 3/27/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 245.2	**NORTHING** 479,947.8	**EASTING** 1,993,231.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



NCDOT CPT - ENGLISH U2519CB_GEO_NWAL1.2_GINT FOL.GPJ S&ME 2008_03_20.GDT 5/13/14

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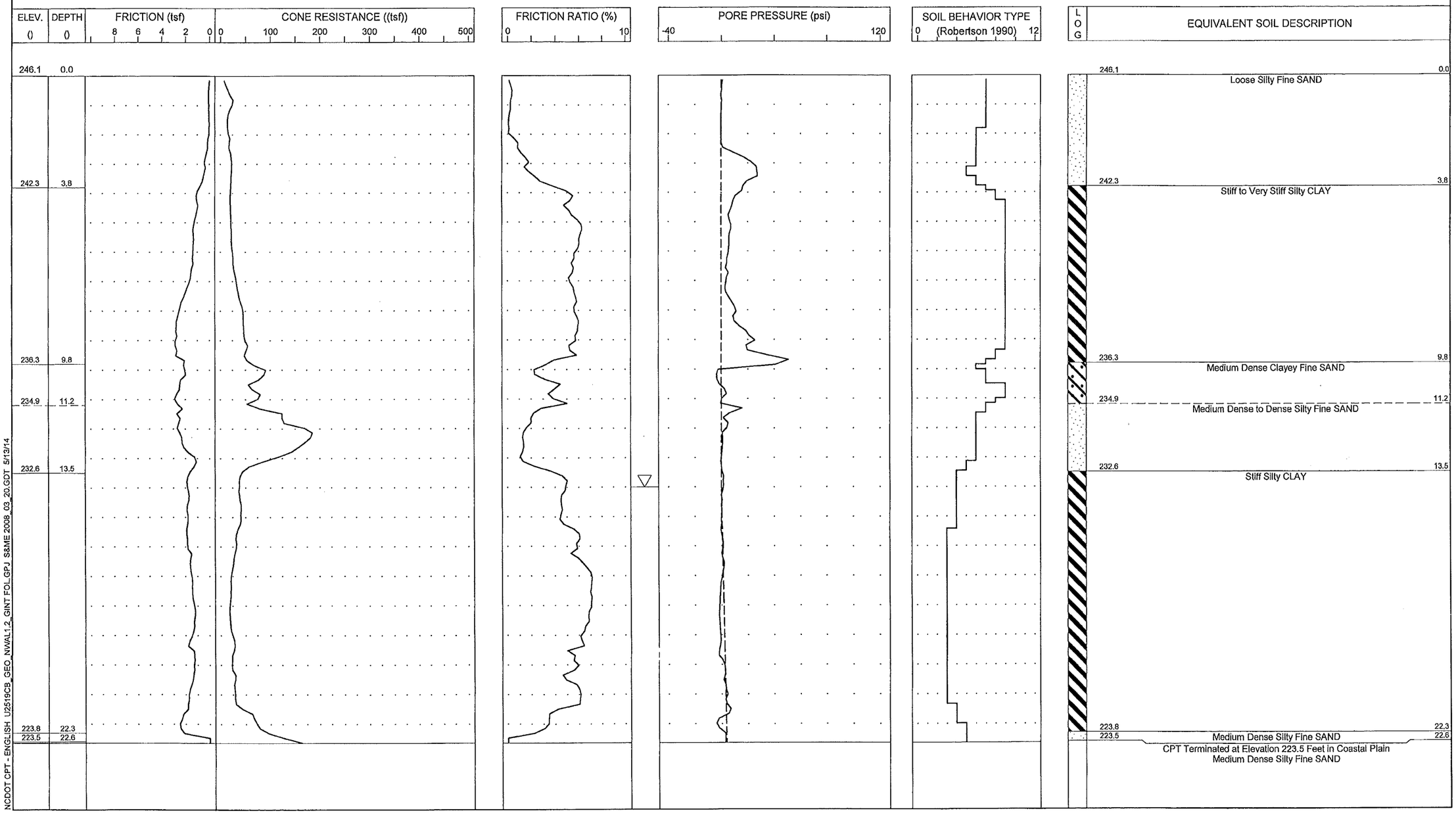
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 22.6	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-06	**BORING LOCATION** 784+30	**OFFSET** 85 RT	**ALIGNMENT** -L-	**0 HR.** 14.0	**DATE STARTED** 3/27/2014	**COMPLETED** 3/27/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 246.1	**NORTHING** 480,088.8	**EASTING** 1,993,279.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



LOG

EQUIVALENT SOIL DESCRIPTION

246.1 — 0.0
Loose Silty Fine SAND
242.3 — 3.8
Stiff to Very Stiff Silty CLAY
236.3 — 9.8
Medium Dense Clayey Fine SAND
234.9 — 11.2
Medium Dense to Dense Silty Fine SAND
232.6 — 13.5
Stiff Silty CLAY
223.8 — 22.3
223.5 — 22.6
Medium Dense Silty Fine SAND
CPT Terminated at Elevation 223.5 Feet in Coastal Plain
Medium Dense Silty Fine SAND

NCDOT CPT - ENGLISH U2519CB_GEO_NWAL1,2_GINT FOL.GPJ S&ME 2008_03_20.GDT 5/13/14

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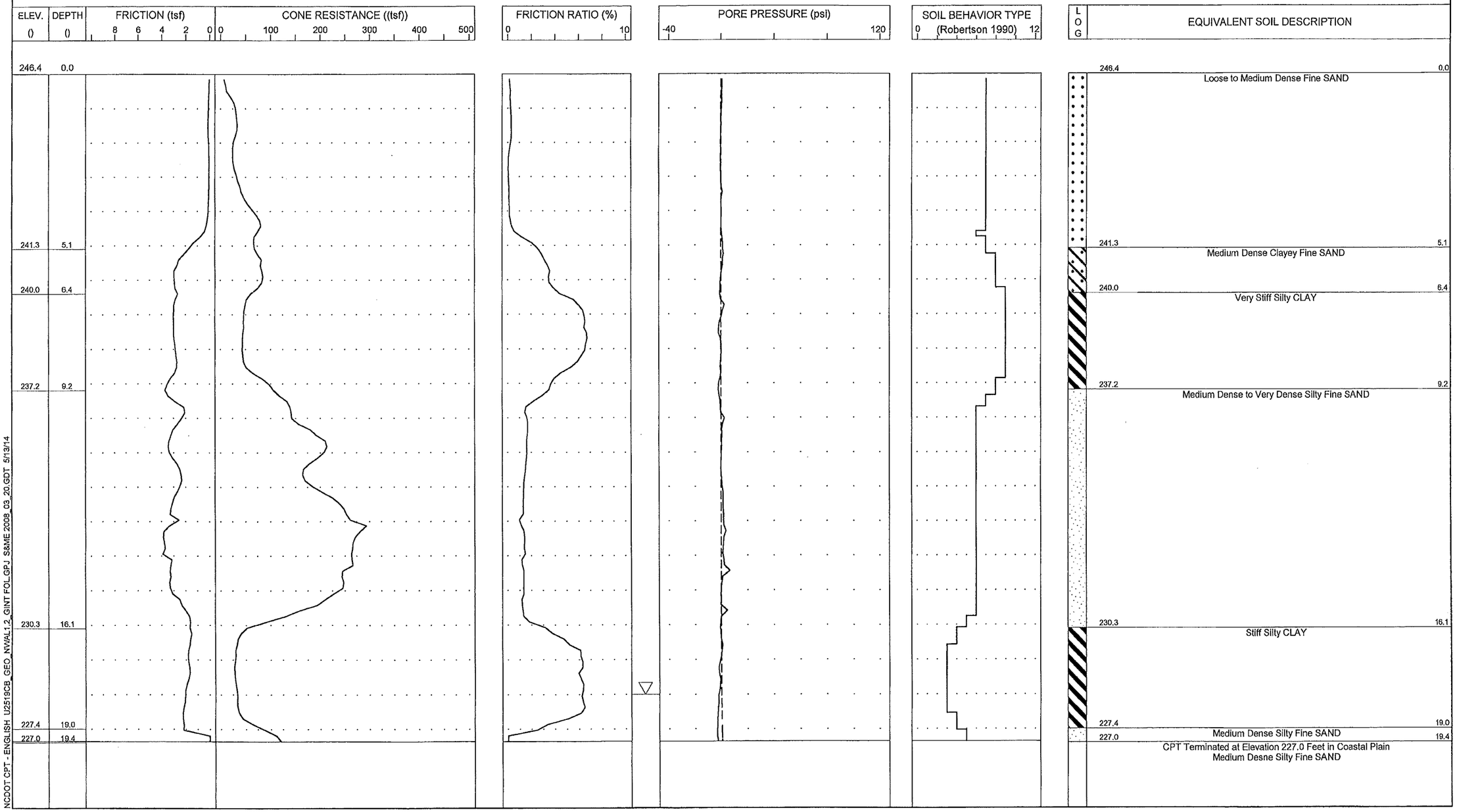
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	ID. U-2519CB	COUNTY Cumberland	GEOLOGIST A. Riggs	TYPE OF CONE 1.75 In. PEIZO CONE	ROD TYPE 1.75 in Dia.	MAXIMUM DOWN PRESSURE Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			GROUND WATER (ft)	TOTAL DEPTH 19.4	DRILL MACHINE CPT-TRACK	DRILL METHOD Direct Push	HAMMER TYPE N/A
BORING NO. NW1-07	BORING LOCATION 785+80	OFFSET 85 RT	ALIGNMENT -L-	0 HR. 18.0	DATE STARTED 3/27/2014	COMPLETED 3/27/2014	SURFACE WATER DEPTH N/A
COLLAR ELEV. 246.4	NORTHING 480,230.7	EASTING 1,993,328.0		24 HR. N/M	DRILLER: T. WESTFALL	TECHNICIAN K. PARTON	



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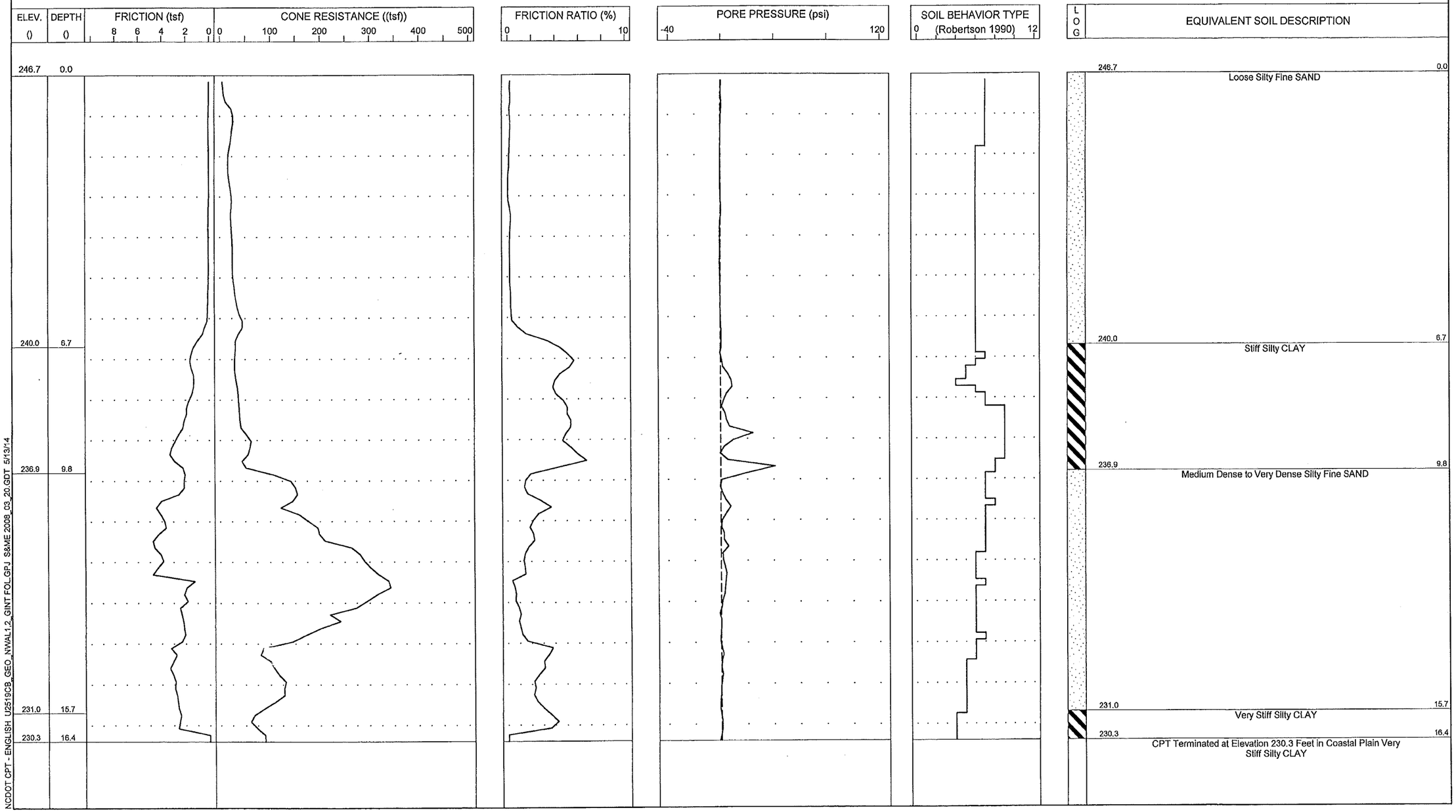
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 16.4	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-08	**BORING LOCATION** 787+30	**OFFSET** 85 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/27/2014	**COMPLETED** 3/27/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 246.7	**NORTHING** 480,372.5	**EASTING** 1,993,377.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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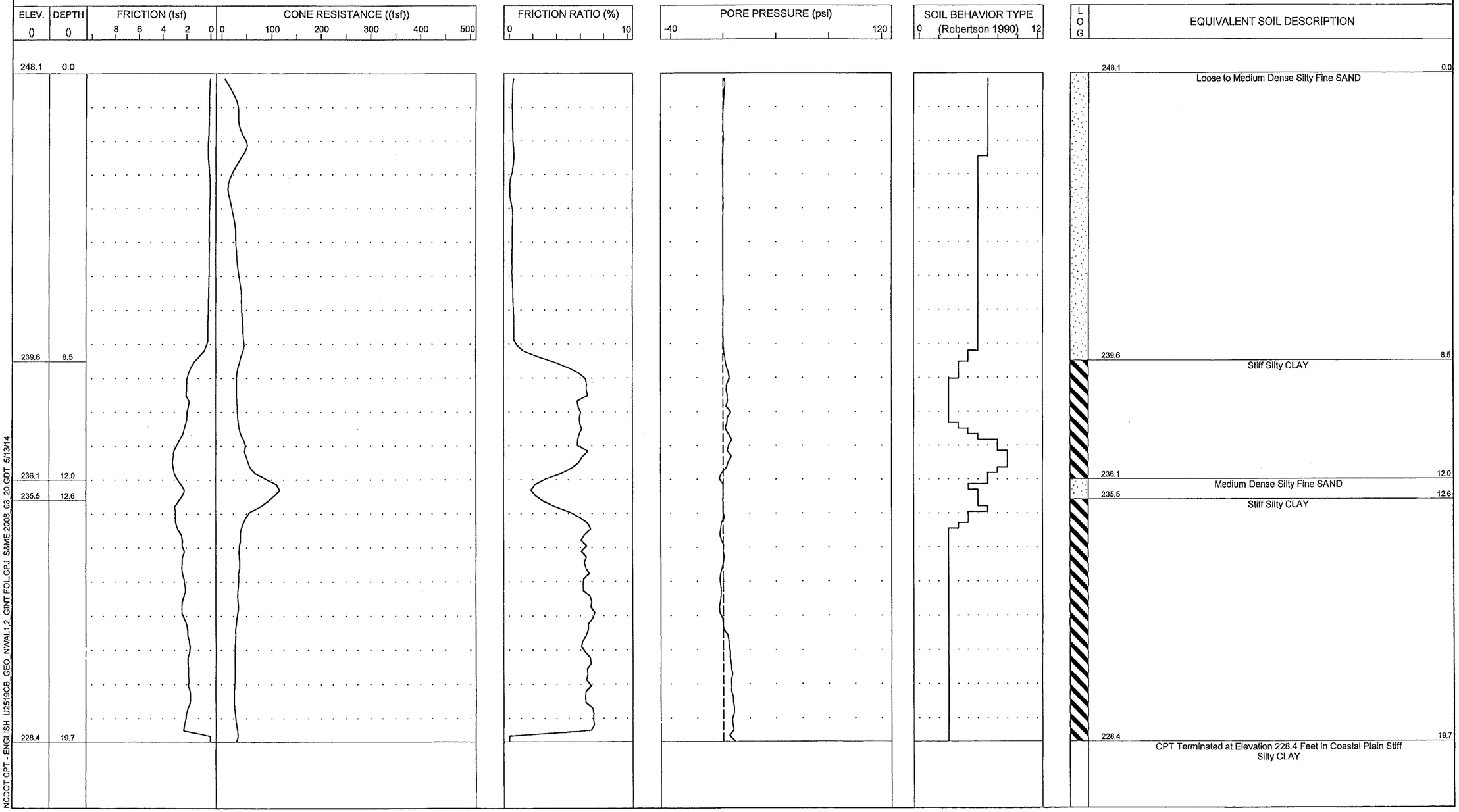
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 In Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 19.7	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-09	**BORING LOCATION** 788+80	**OFFSET** 80 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/27/2014	**COMPLETED** 3/27/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 248.1	**NORTHING** 480,516.0	**EASTING** 1,993,421.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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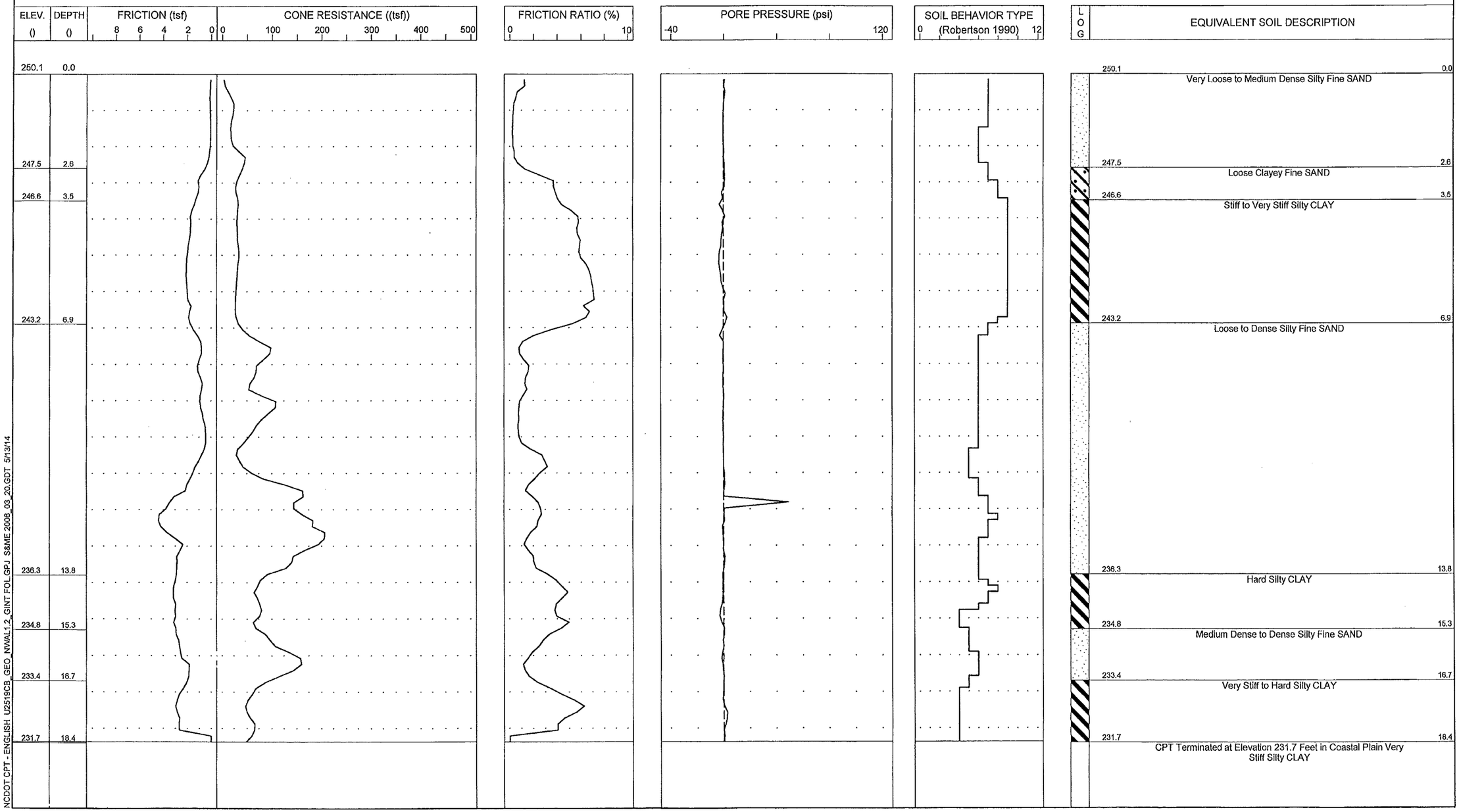
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 18.4	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-10	**BORING LOCATION** 790+30	**OFFSET** 80 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/28/2014	**COMPLETED** 3/28/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 250.1	**NORTHING** 480,657.8	**EASTING** 1,993,470.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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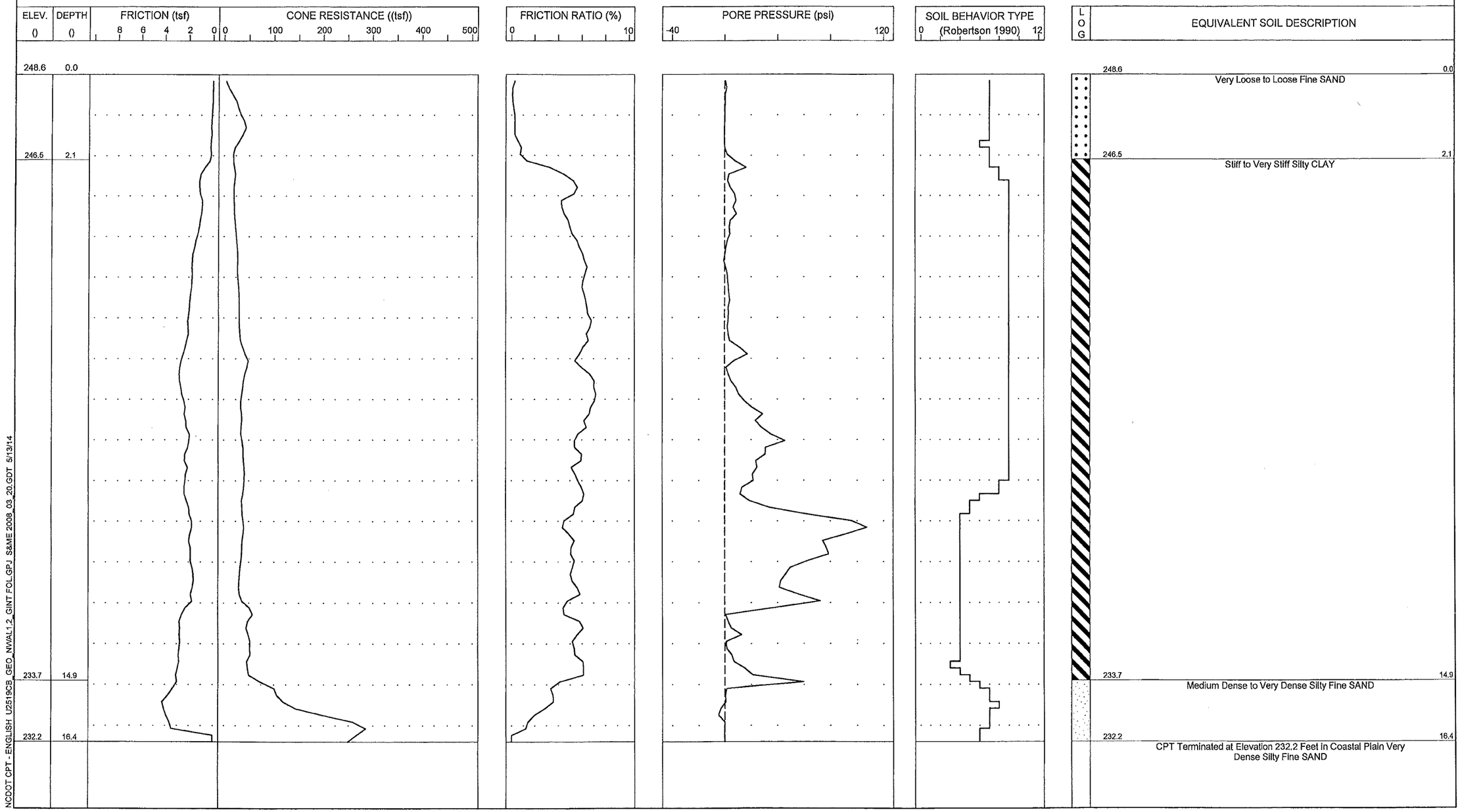
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 16.4	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-11	**BORING LOCATION** 791+80	**OFFSET** 75 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/28/2014	**COMPLETED** 3/28/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 248.6	**NORTHING** 480,801.2	**EASTING** 1,993,514.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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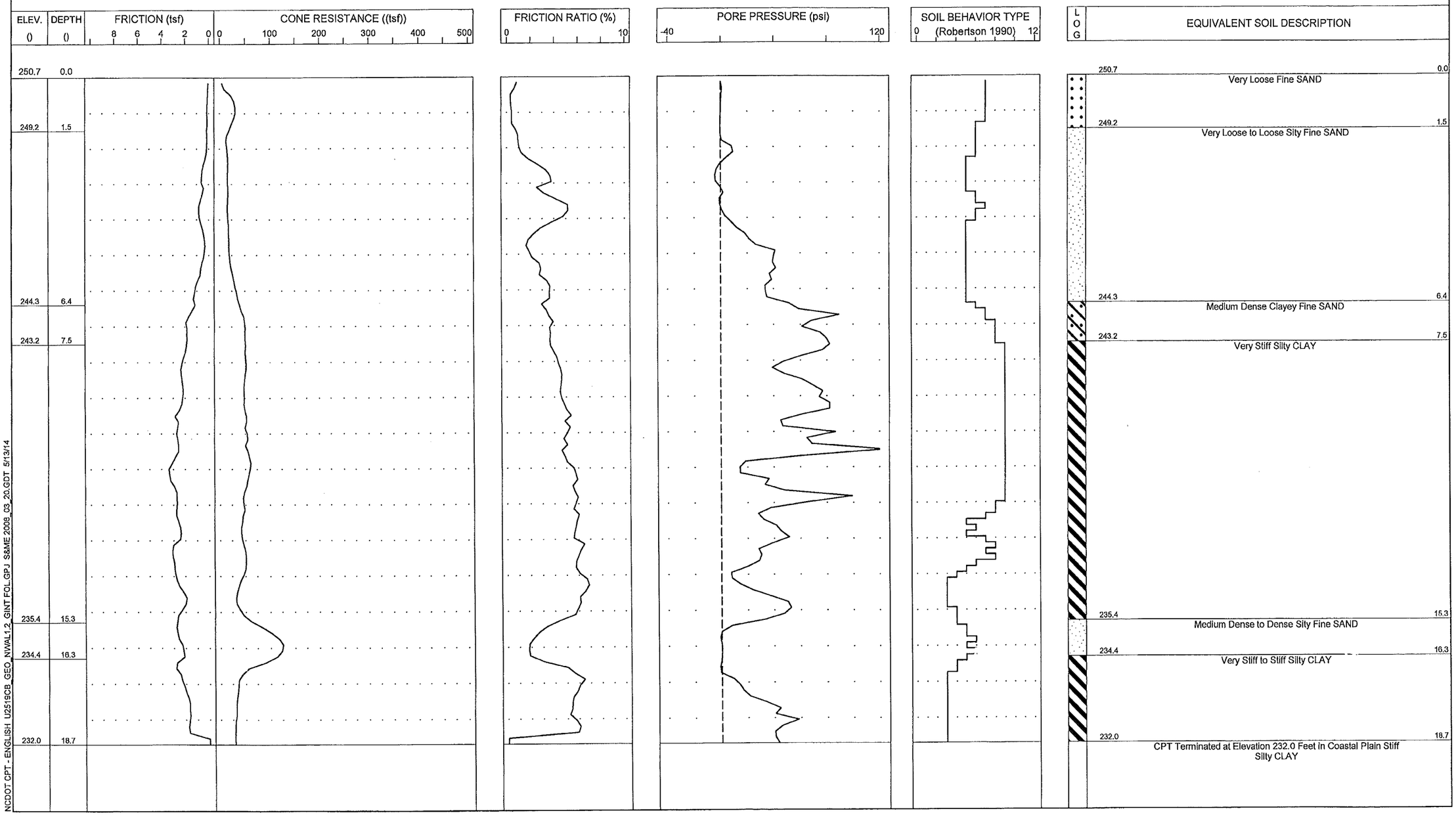
PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 18.7	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-12	**BORING LOCATION** 793+30	**OFFSET** 65 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/28/2014	**COMPLETED** 3/28/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 250.7	**NORTHING** 480,946.3	**EASTING** 1,993,554.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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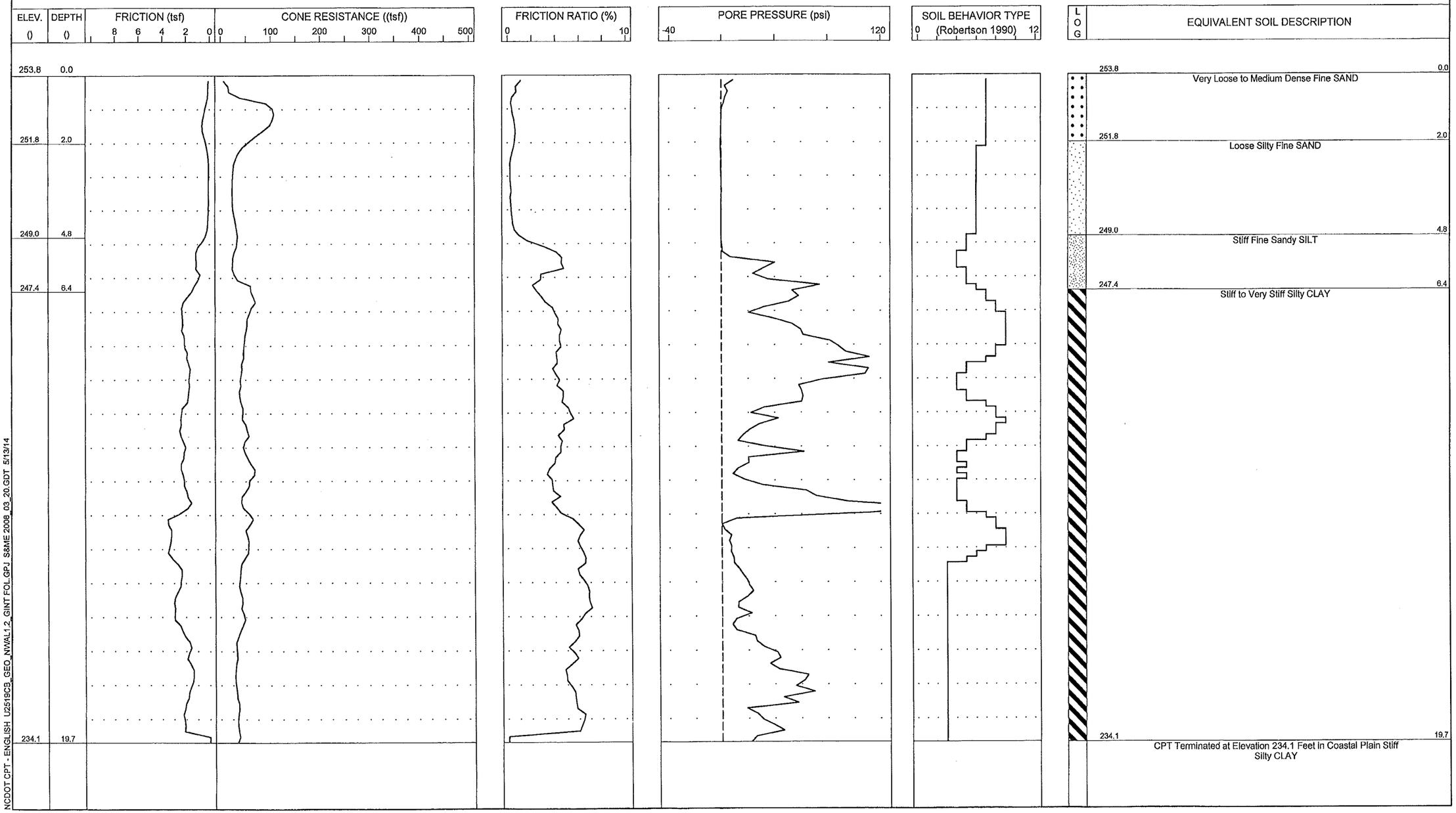
PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 19.7	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-13	**BORING LOCATION** 794+80	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/28/2014	**COMPLETED** 3/28/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 253.8	**NORTHING** 481,089.7	**EASTING** 1,993,598.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



LOG

EQUIVALENT SOIL DESCRIPTION

253.8 0.0 — Very Loose to Medium Dense Fine SAND

251.8 2.0 — Loose Silty Fine SAND

249.0 4.8 — Stiff Fine Sandy SILT

247.4 6.4 — Stiff to Very Stiff Silty CLAY

234.1 19.7 — CPT Terminated at Elevation 234.1 Feet in Coastal Plain Stiff Silty CLAY

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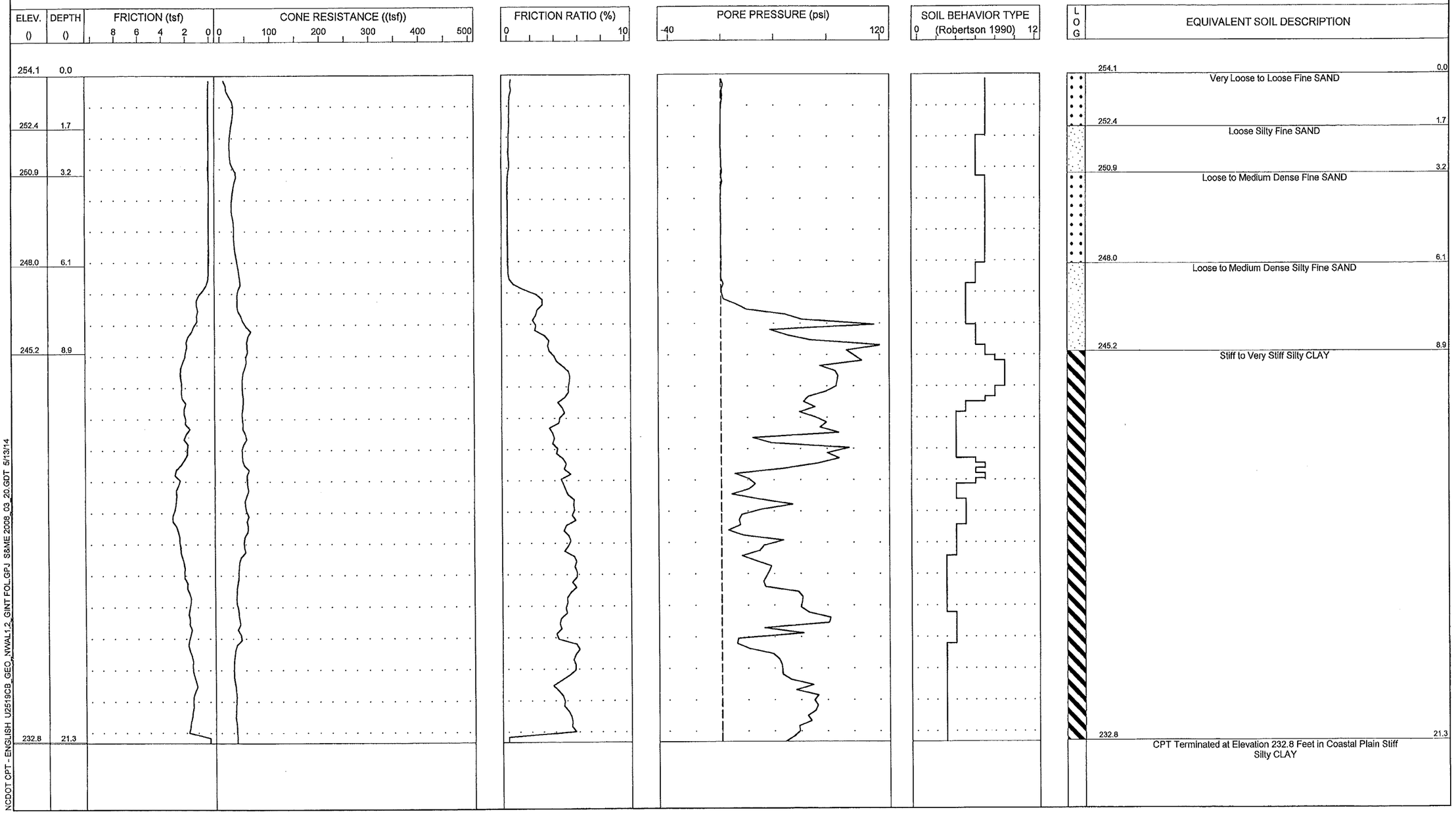
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 21.3	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-14	**BORING LOCATION** 797+30	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/28/2014	**COMPLETED** 3/28/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 254.1	**NORTHING** 481,231.7	**EASTING** 1,993,646.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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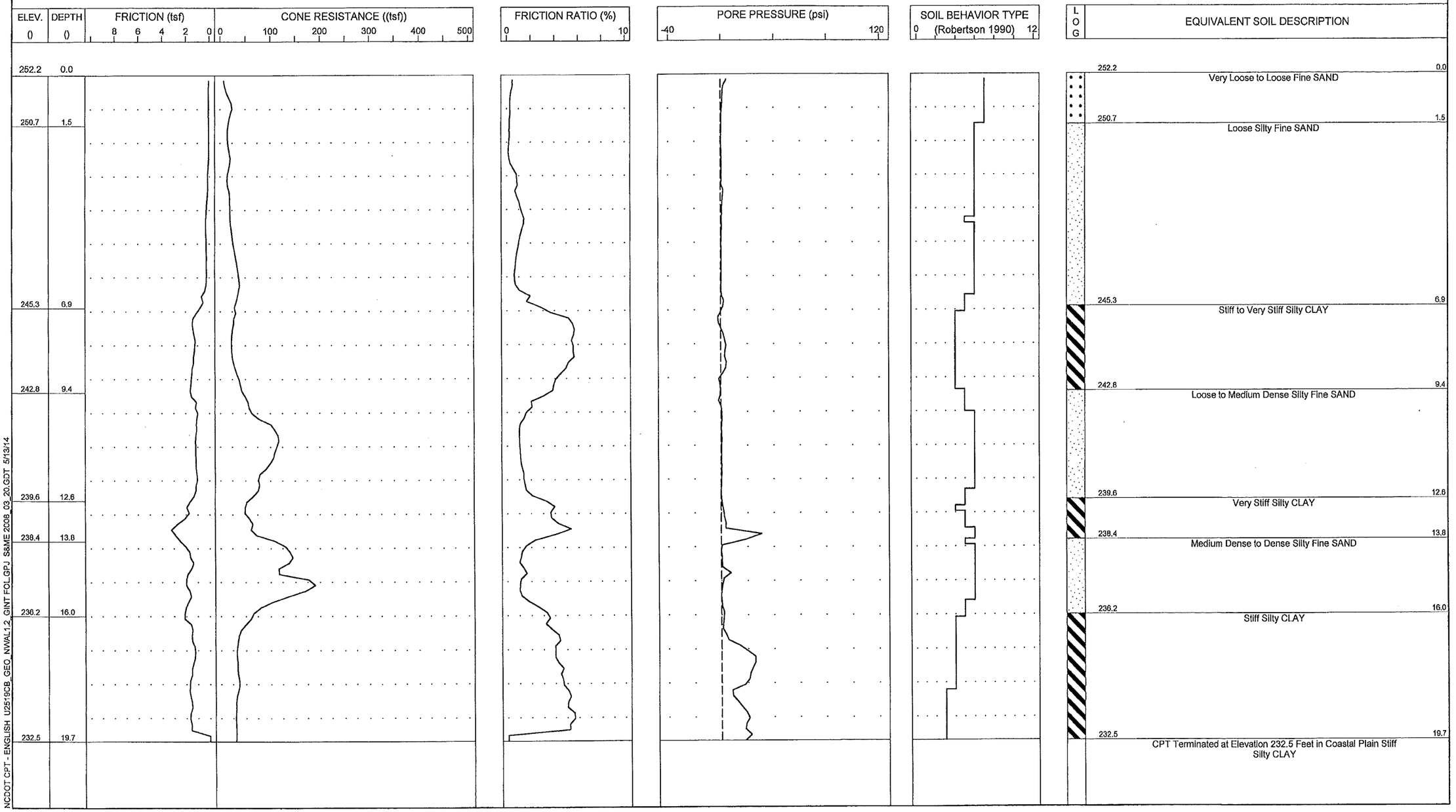
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 19.7	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-15	**BORING LOCATION** 797+80	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/31/2014	**COMPLETED** 3/31/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 252.2	**NORTHING** 481,374.9	**EASTING** 1,993,694.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



L O G

EQUIVALENT SOIL DESCRIPTION

252.2 — 0.0
Very Loose to Loose Fine SAND

250.7 — 1.5
Loose Silty Fine SAND

245.3 — 6.9
Stiff to Very Stiff Silty CLAY

242.8 — 9.4
Loose to Medium Dense Silty Fine SAND

239.6 — 12.6
Very Stiff Silty CLAY

238.4 — 13.8
Medium Dense to Dense Silty Fine SAND

236.2 — 16.0
Stiff Silty CLAY

232.5 — 19.7
CPT Terminated at Elevation 232.5 Feet in Coastal Plain Stiff Silty CLAY

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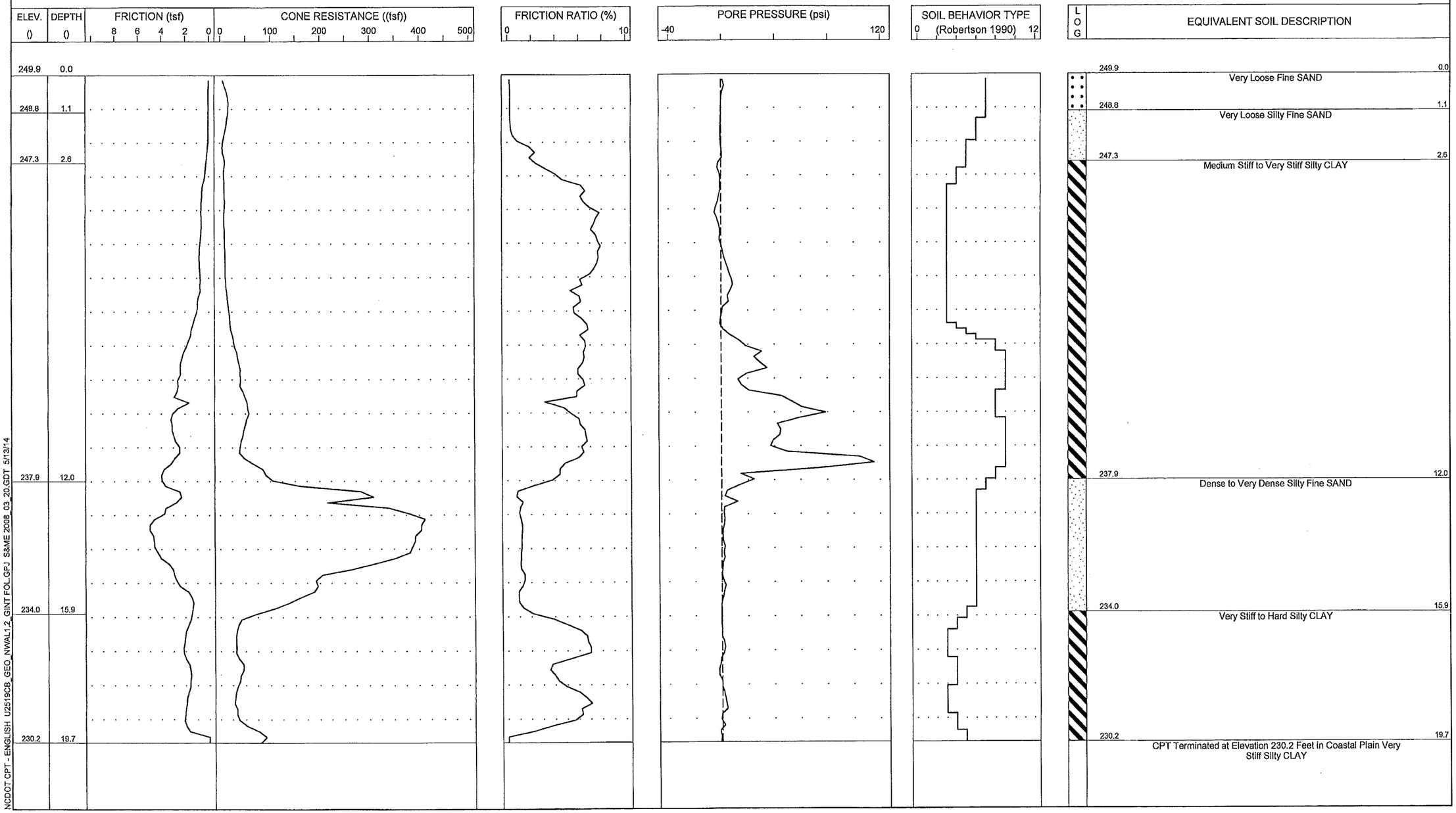
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 19.7	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-16	**BORING LOCATION** 799+30	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/31/2014	**COMPLETED** 3/31/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 249.9	**NORTHING** 481,520.0	**EASTING** 1,993,739.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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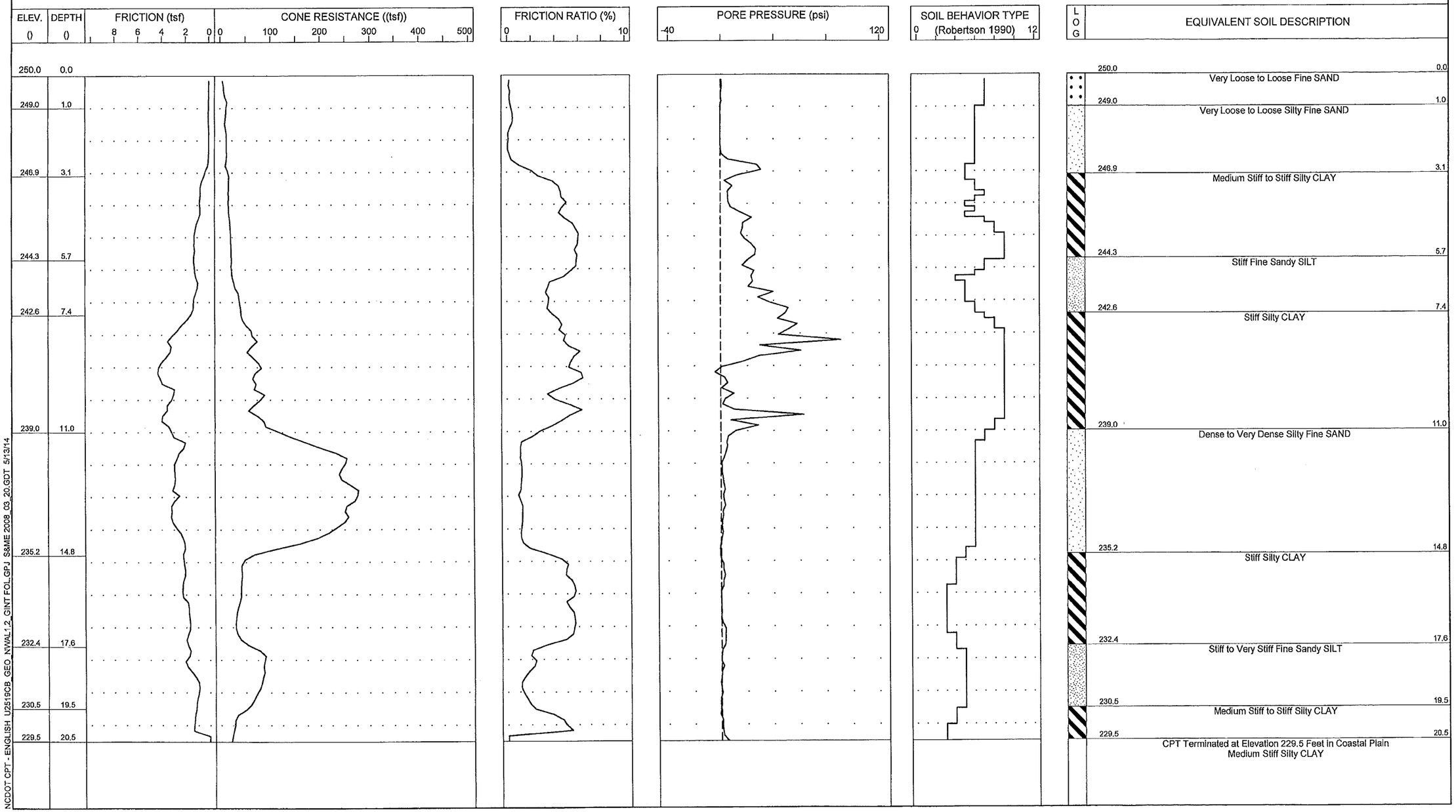
PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 20.5	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-17	**BORING LOCATION** 800+80	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/31/2014	**COMPLETED** 3/31/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 250.0	**NORTHING** 481,666.6	**EASTING** 1,993,779.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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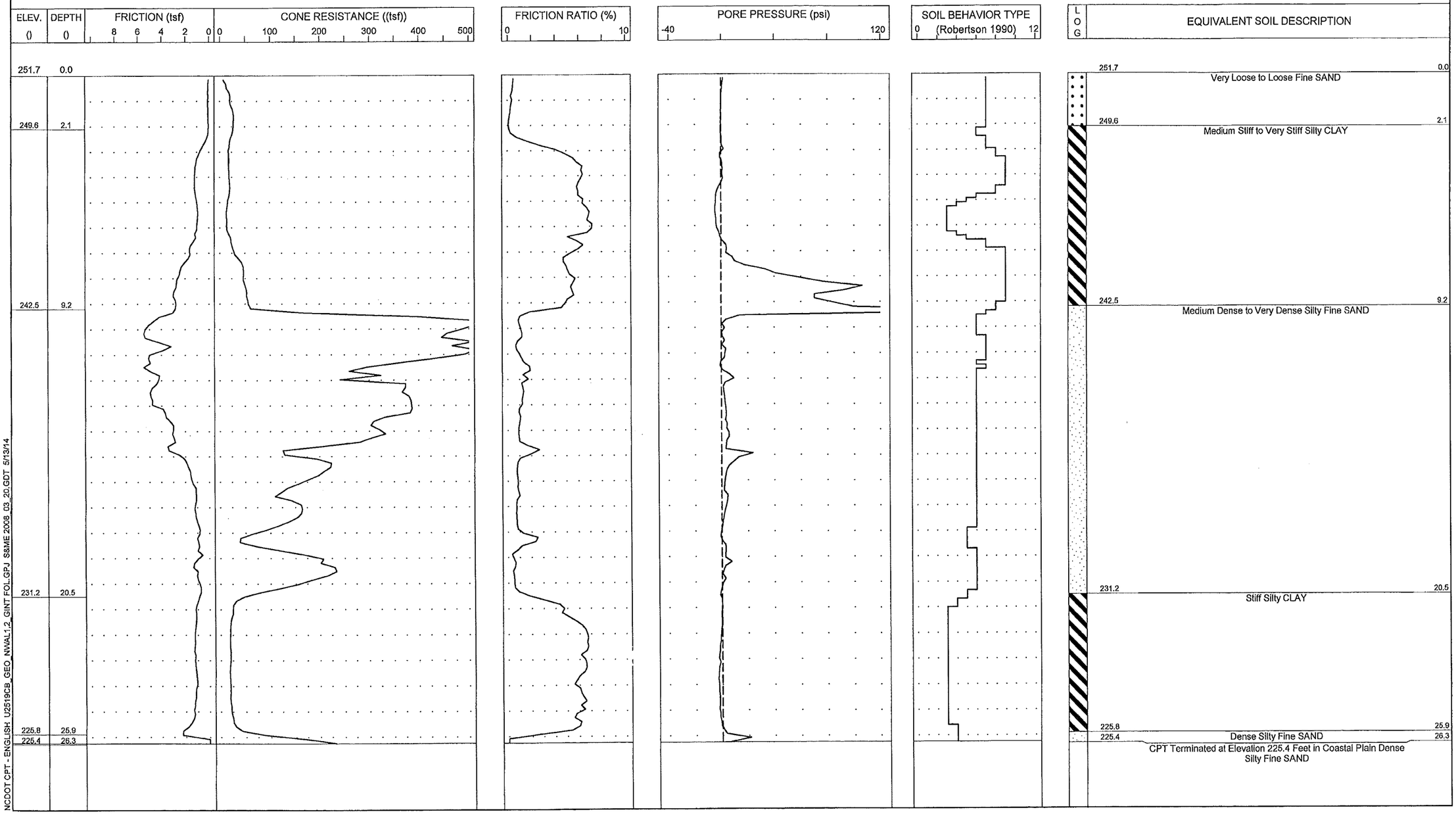
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 26.3	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-18	**BORING LOCATION** 802+30	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/31/2014	**COMPLETED** 3/31/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 251.7	**NORTHING** 481,814.3	**EASTING** 1,993,815.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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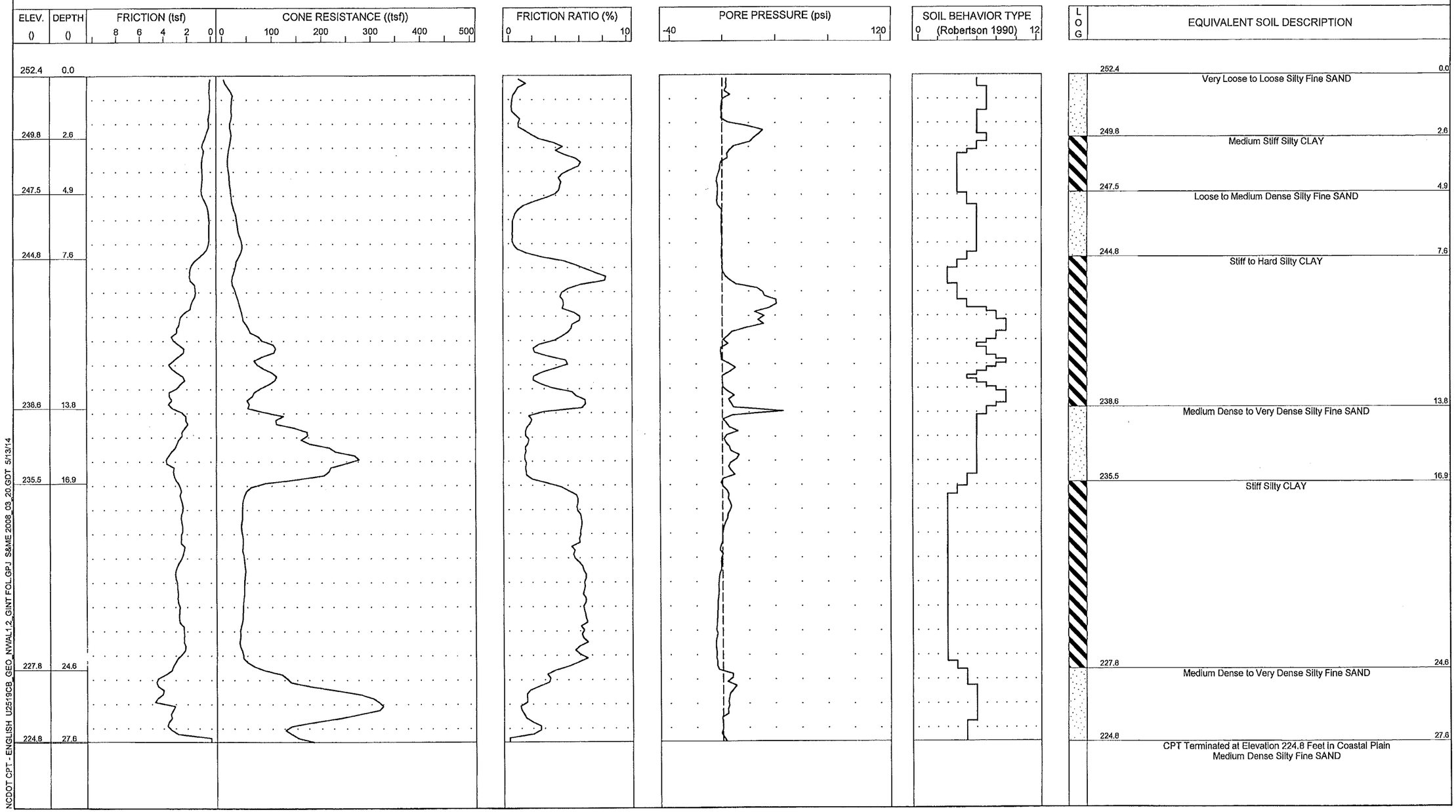
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 27.6	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-19	**BORING LOCATION** 803+80	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/31/2014	**COMPLETED** 3/31/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 252.4	**NORTHING** 481,963.1	**EASTING** 1,993,845.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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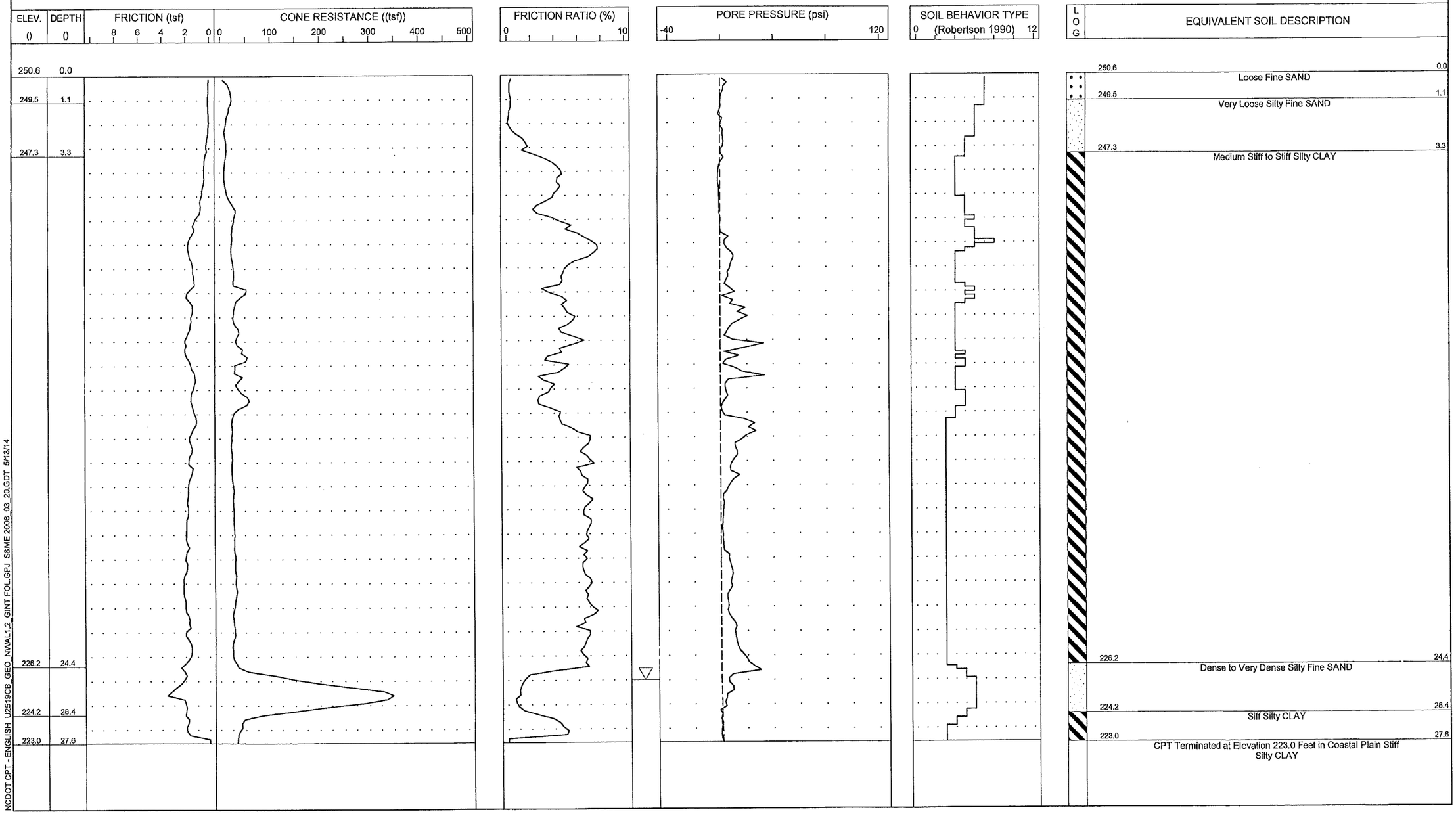
PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 27.6	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-20	**BORING LOCATION** 805+30	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** 25.0	**DATE STARTED** 3/31/2014	**COMPLETED** 3/31/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 250.6	**NORTHING** 482,112.8	**EASTING** 1,993,871.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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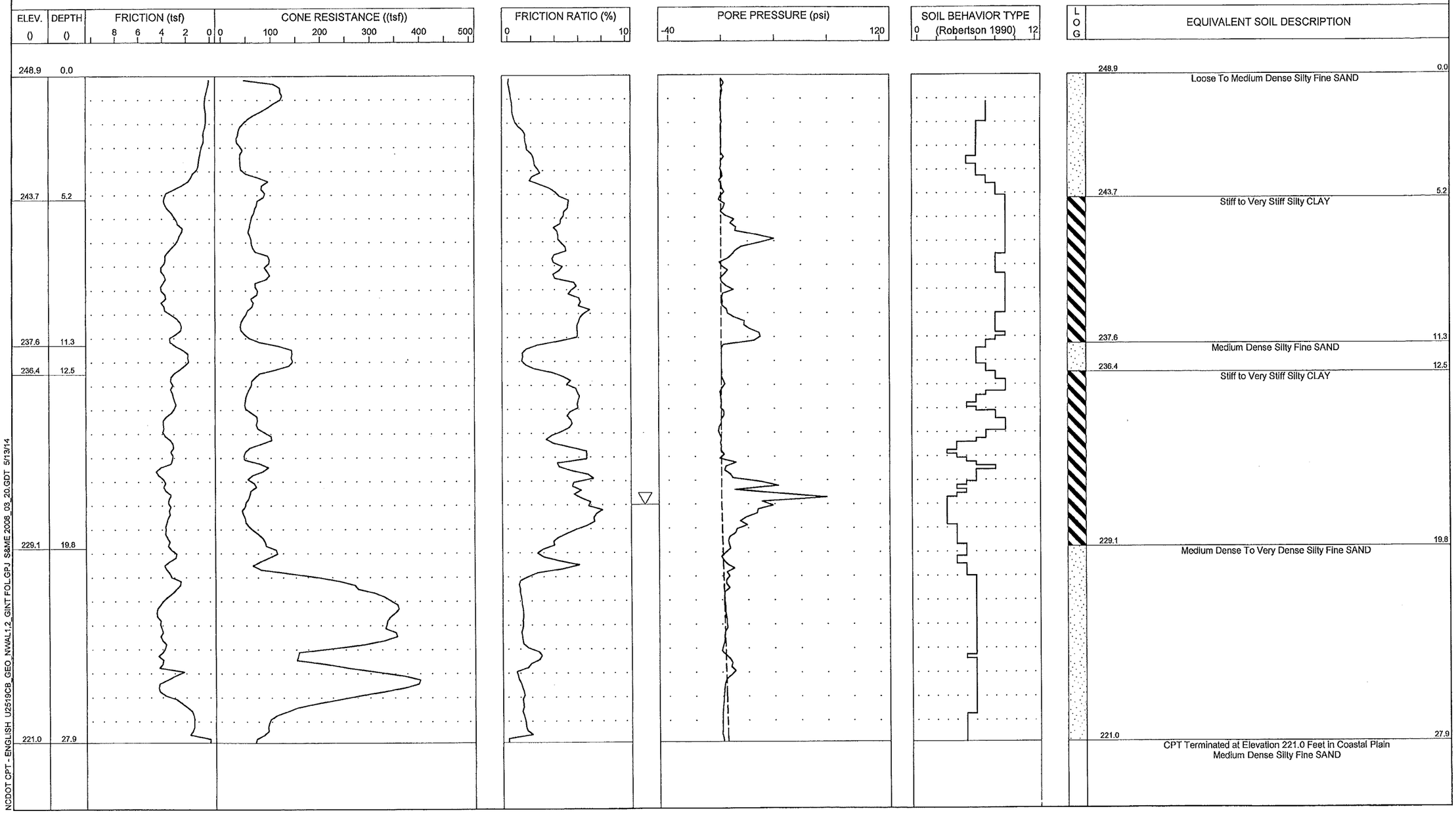
PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 27.9	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-21	**BORING LOCATION** 806+80	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** 18.0	**DATE STARTED** 3/31/2014	**COMPLETED** 3/31/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 248.9	**NORTHING** 482,263.4	**EASTING** 1,993,892.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



NCDOT CPT - ENGLISH U2519CB_GEO_NWAL1.2_GINT FOL.GPJ S&ME 2008_03_20.GDT 5/13/14

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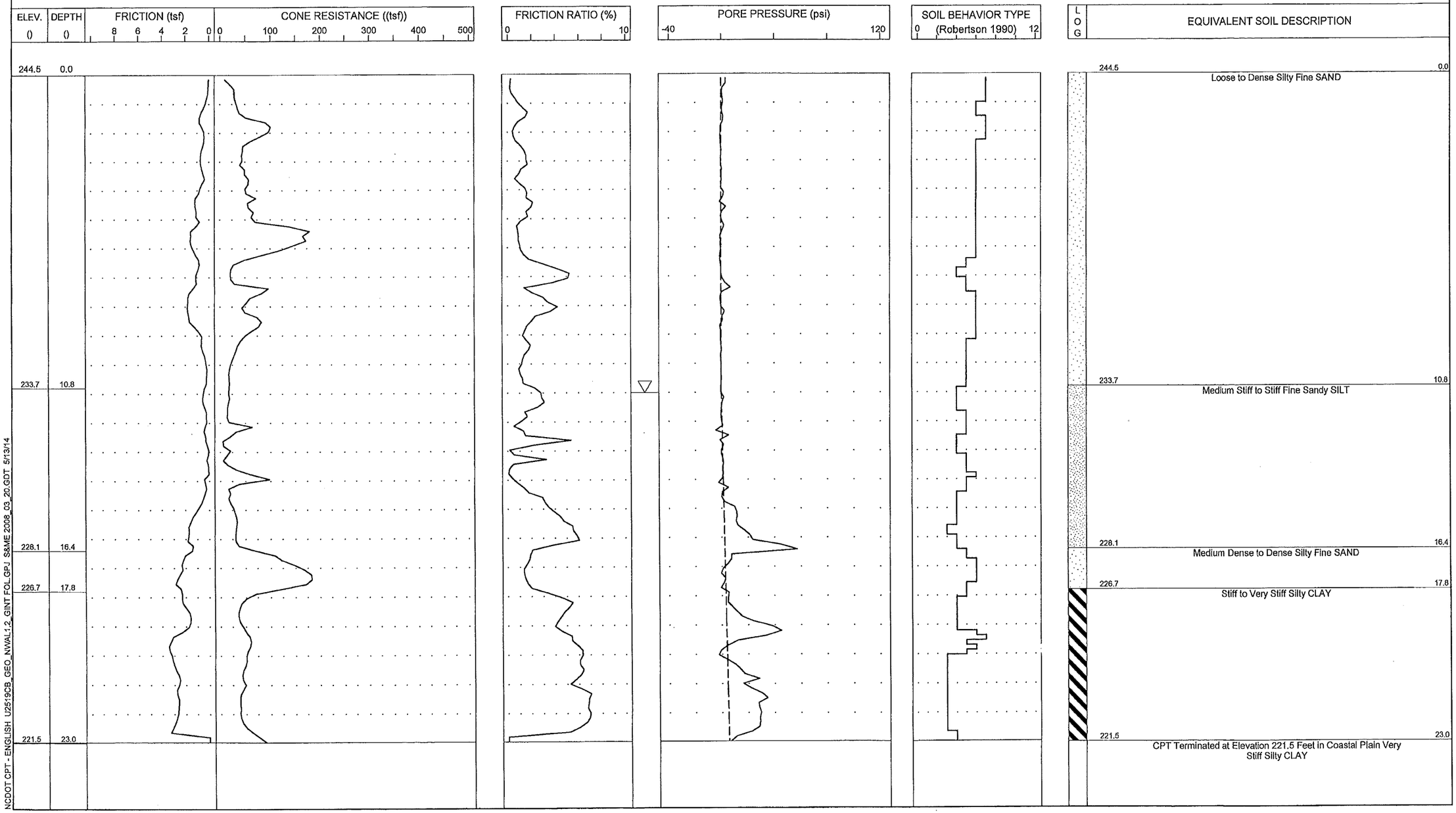
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 23.0	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-22	**BORING LOCATION** 808+30	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** 11.0	**DATE STARTED** 3/31/2014	**COMPLETED** 3/31/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 244.5	**NORTHING** 482,414.4	**EASTING** 1,993,908.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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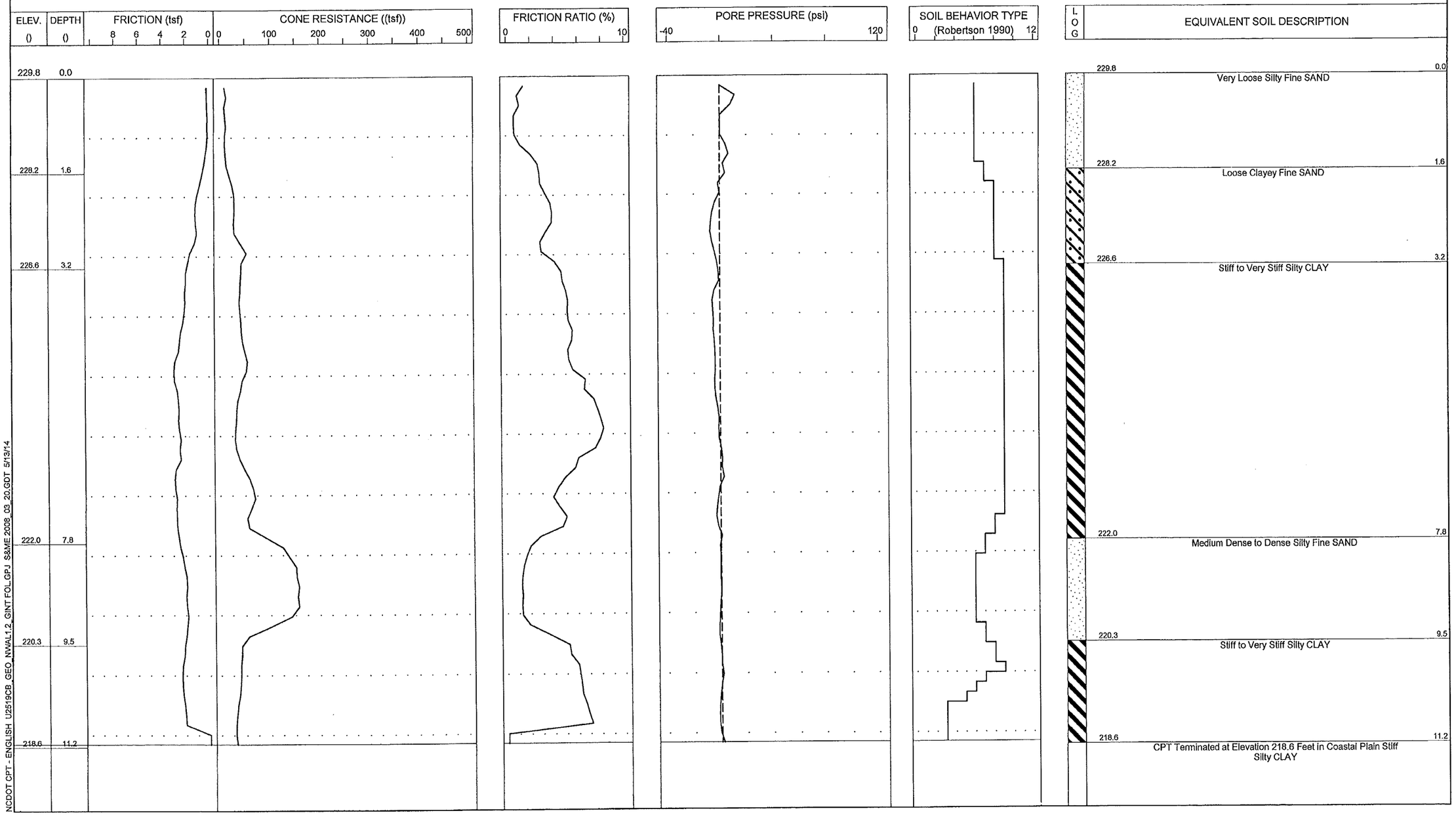
BORING LOG

PROJECT NO. 34817.2.8	ID. U-2519CB	COUNTY Cumberland	GEOLOGIST A. Riggs	TYPE OF CONE 1.75 In. PEIZO CONE	ROD TYPE 1.75 in Dia.	MAXIMUM DOWN PRESSURE Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L- Sta. 820+85, 60.42 ft RT			GROUND WATER (ft)	TOTAL DEPTH 11.2	DRILL MACHINE CPT-TRACK	DRILL METHOD Direct Push	HAMMER TYPE N/A
BORING NO. NW1-23	BORING LOCATION 809+80	OFFSET 60 RT	ALIGNMENT -L-	0 HR. DRY	DATE STARTED 3/31/2014	COMPLETED 3/31/2014	SURFACE WATER DEPTH N/A
COLLAR ELEV. 229.8	NORTHING 482,566.0	EASTING 1,993,919.0		24 HR. N/M	DRILLER: T. WESTFALL	TECHNICIAN K. PARTON	



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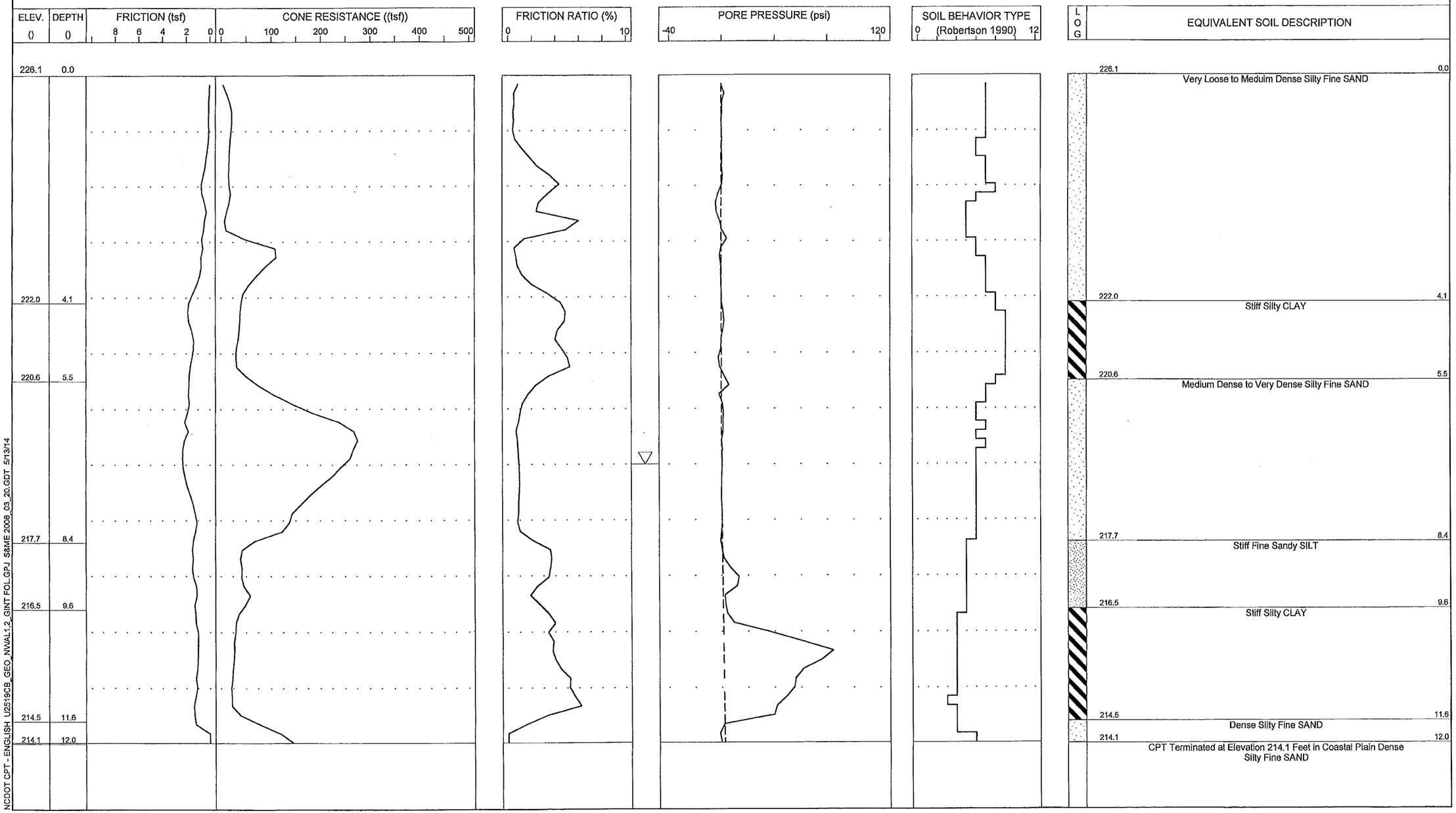
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 12.0	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-24	**BORING LOCATION** 811+30	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** 7.0	**DATE STARTED** 3/31/2014	**COMPLETED** 3/31/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 226.1	**NORTHING** 482,717.8	**EASTING** 1,993,925.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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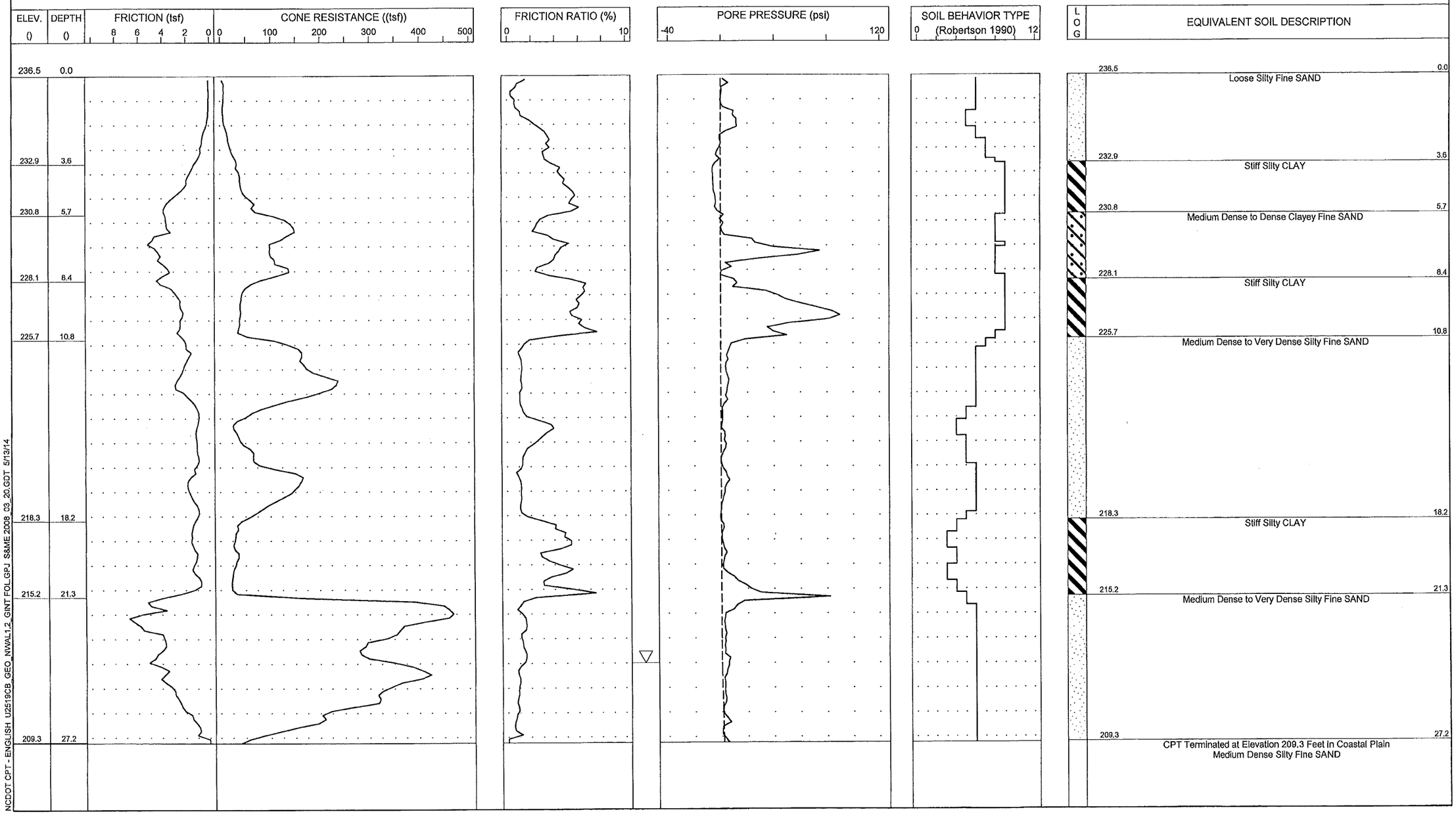
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 27.2	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-25	**BORING LOCATION** 812+80	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** 24.0	**DATE STARTED** 4/1/2014	**COMPLETED** 4/1/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 236.5	**NORTHING** 482,869.7	**EASTING** 1,993,926.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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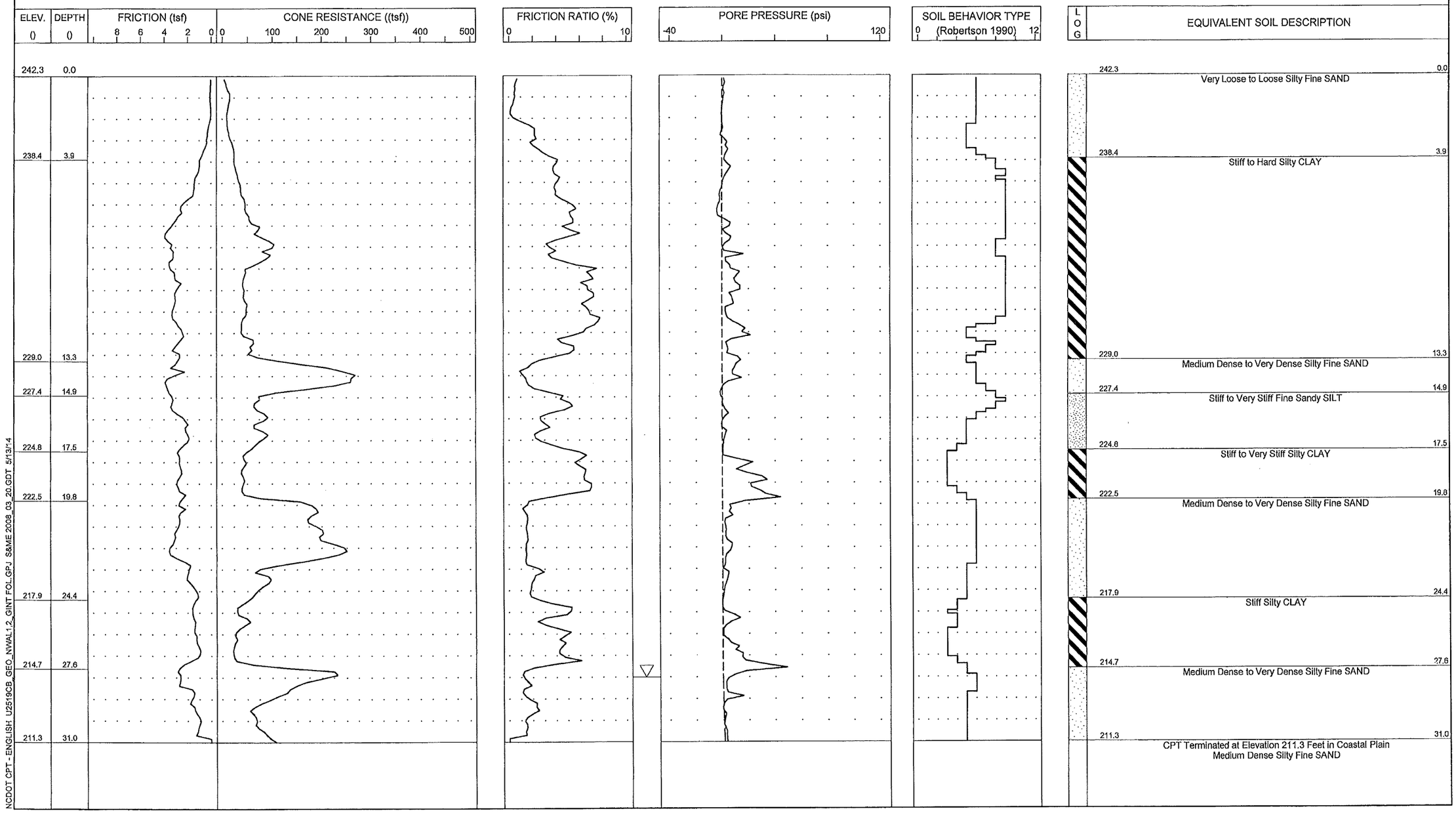
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 31.0	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-26	**BORING LOCATION** 814+30	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** 28.0	**DATE STARTED** 4/1/2014	**COMPLETED** 4/1/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 242.3	**NORTHING** 483,021.6	**EASTING** 1,993,922.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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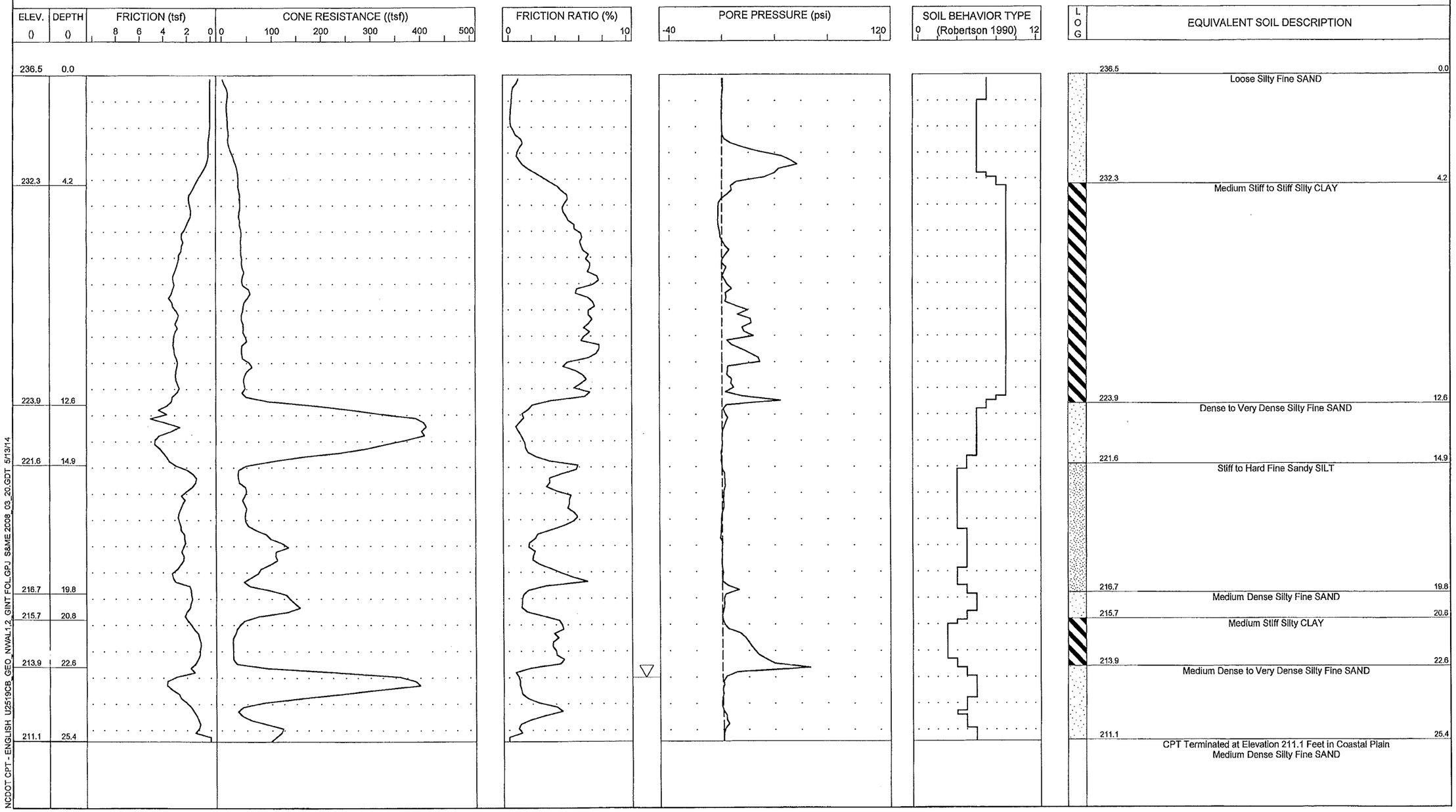
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 25.4	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-27	**BORING LOCATION** 815+80	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** 23.0	**DATE STARTED** 4/1/2014	**COMPLETED** 4/1/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 236.5	**NORTHING** 483,173.3	**EASTING** 1,993,914.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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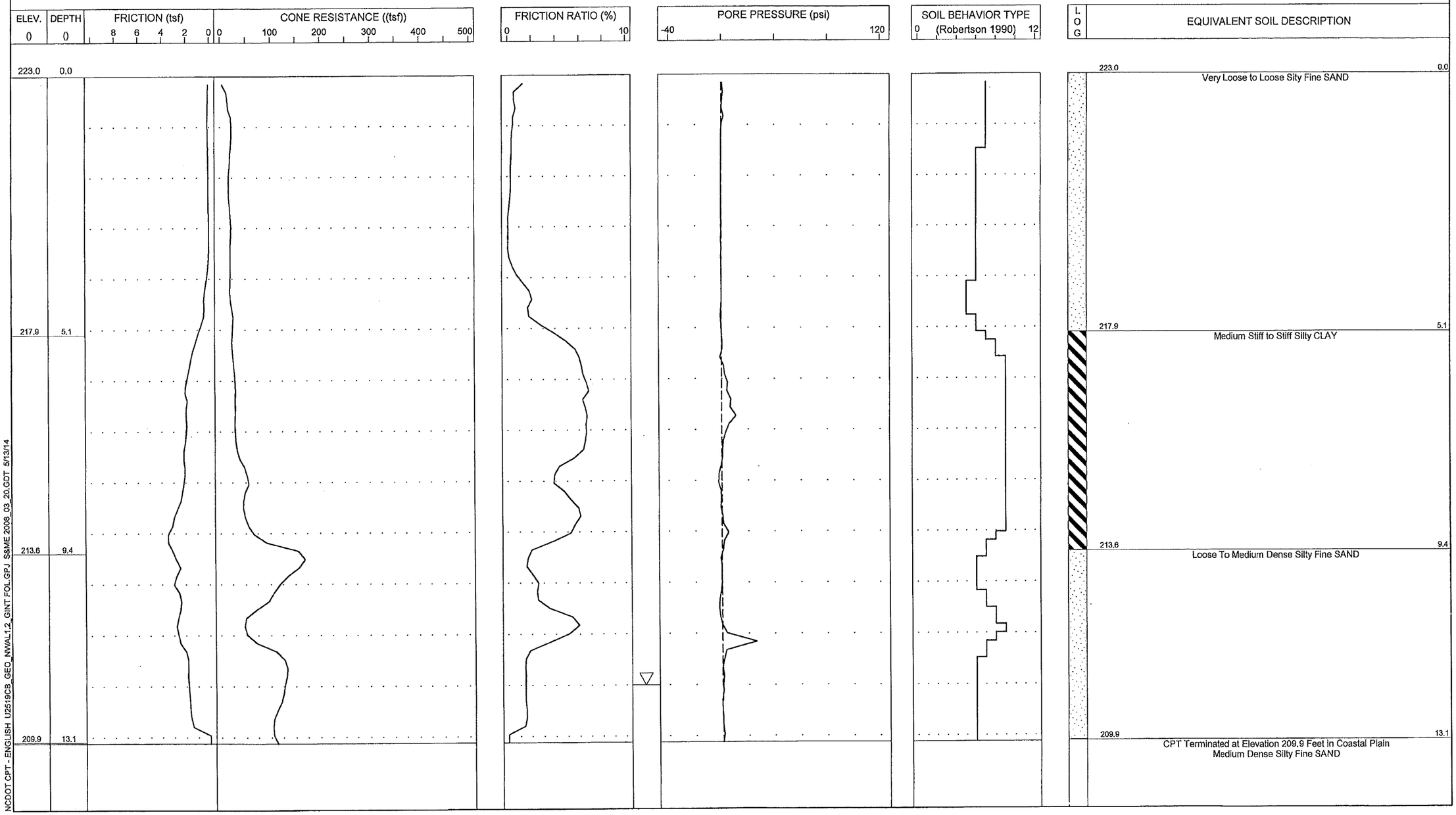
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 13.1	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-28	**BORING LOCATION** 847+30	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** 12.0	**DATE STARTED** 4/1/2014	**COMPLETED** 4/1/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 223.0	**NORTHING** 483,324.6	**EASTING** 1,993,900.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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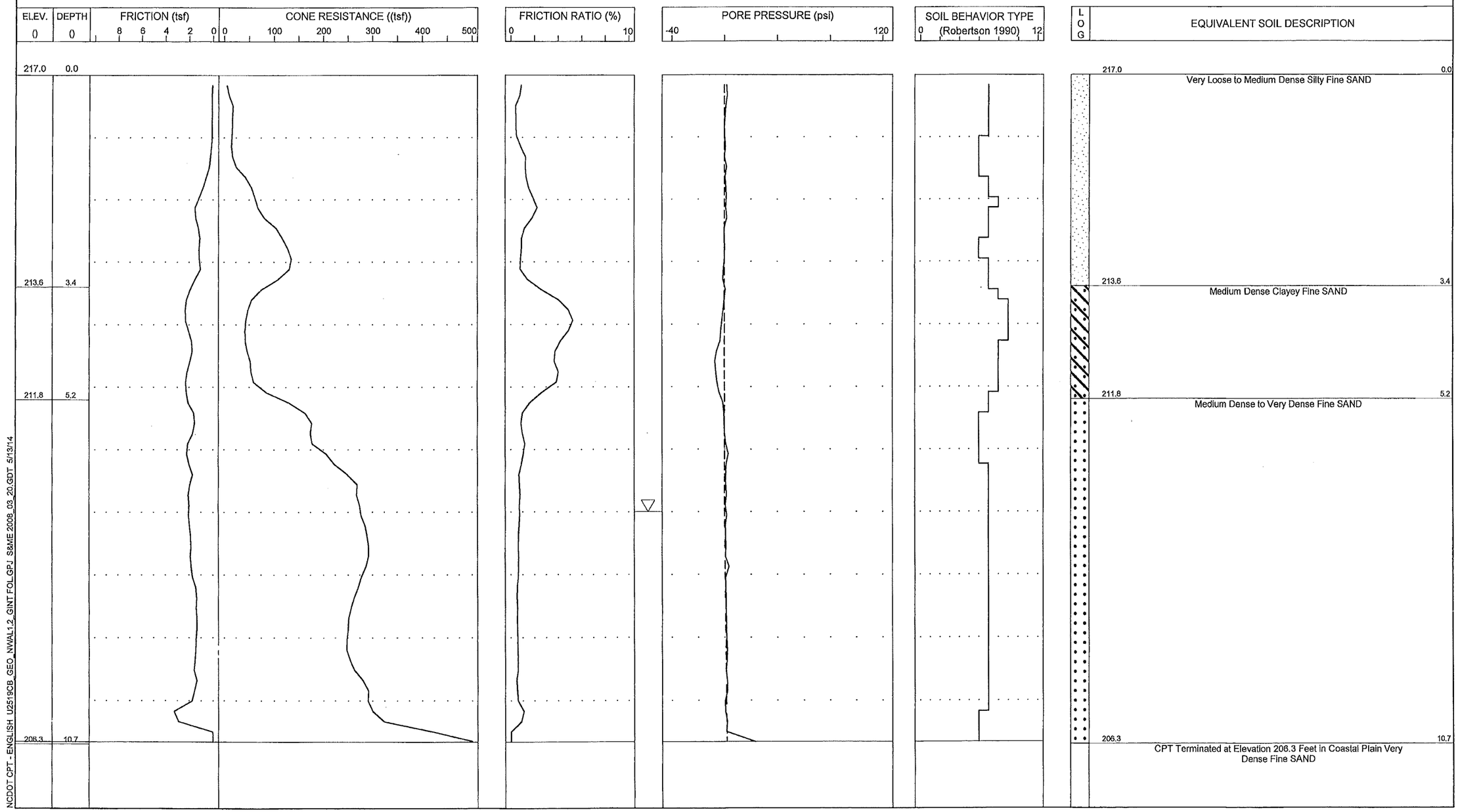
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 10.7	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-29	**BORING LOCATION** 818+80	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** 7.0	**DATE STARTED** 4/1/2014	**COMPLETED** 4/1/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 217.0	**NORTHING** 483,475.5	**EASTING** 1,993,882.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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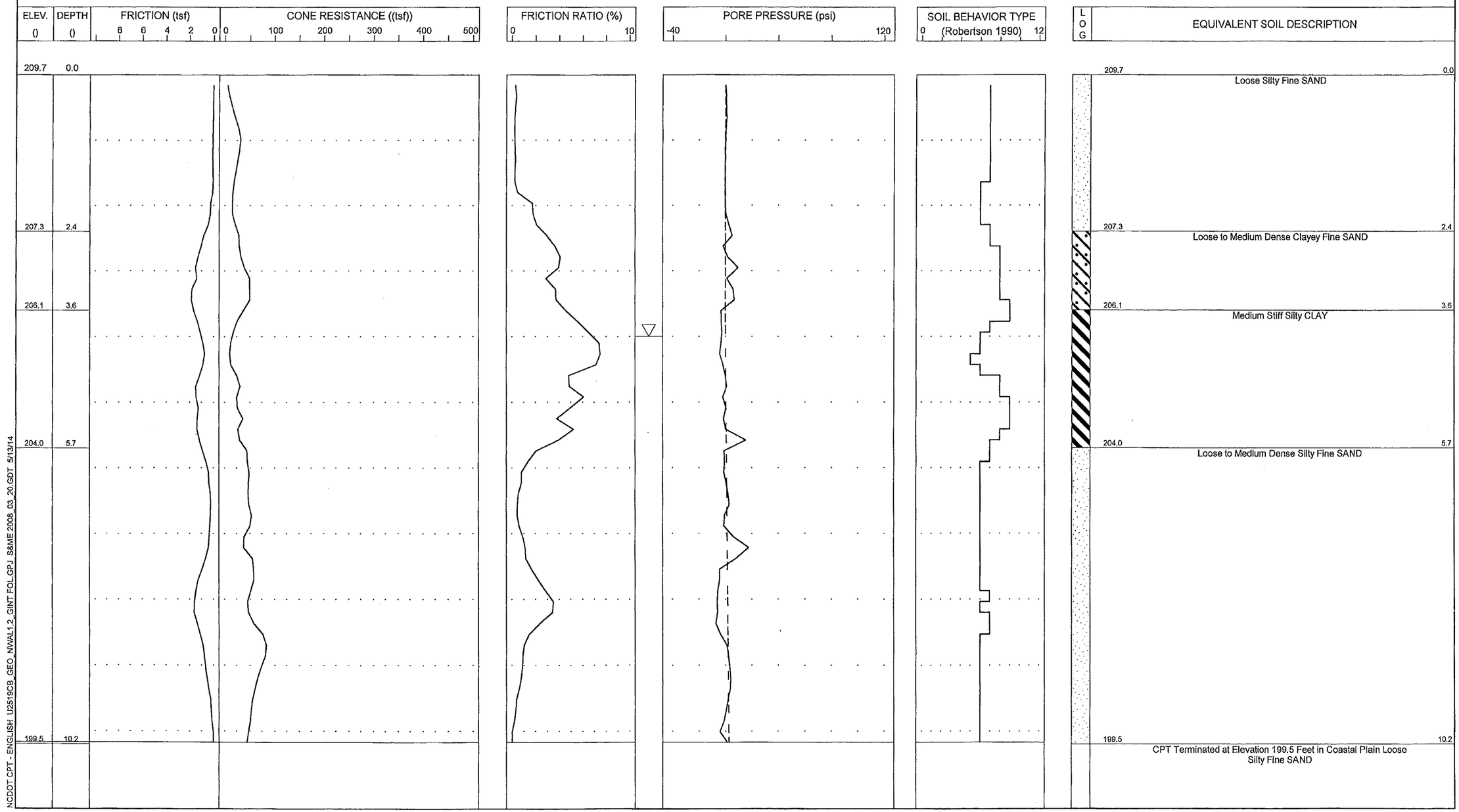
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 10.2	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW1-30	**BORING LOCATION** 820+30	**OFFSET** 60 RT	**ALIGNMENT** -L-	**0 HR.** 4.0	**DATE STARTED** 4/1/2014	**COMPLETED** 4/1/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 209.7	**NORTHING** 483,625.5	**EASTING** 1,993,859.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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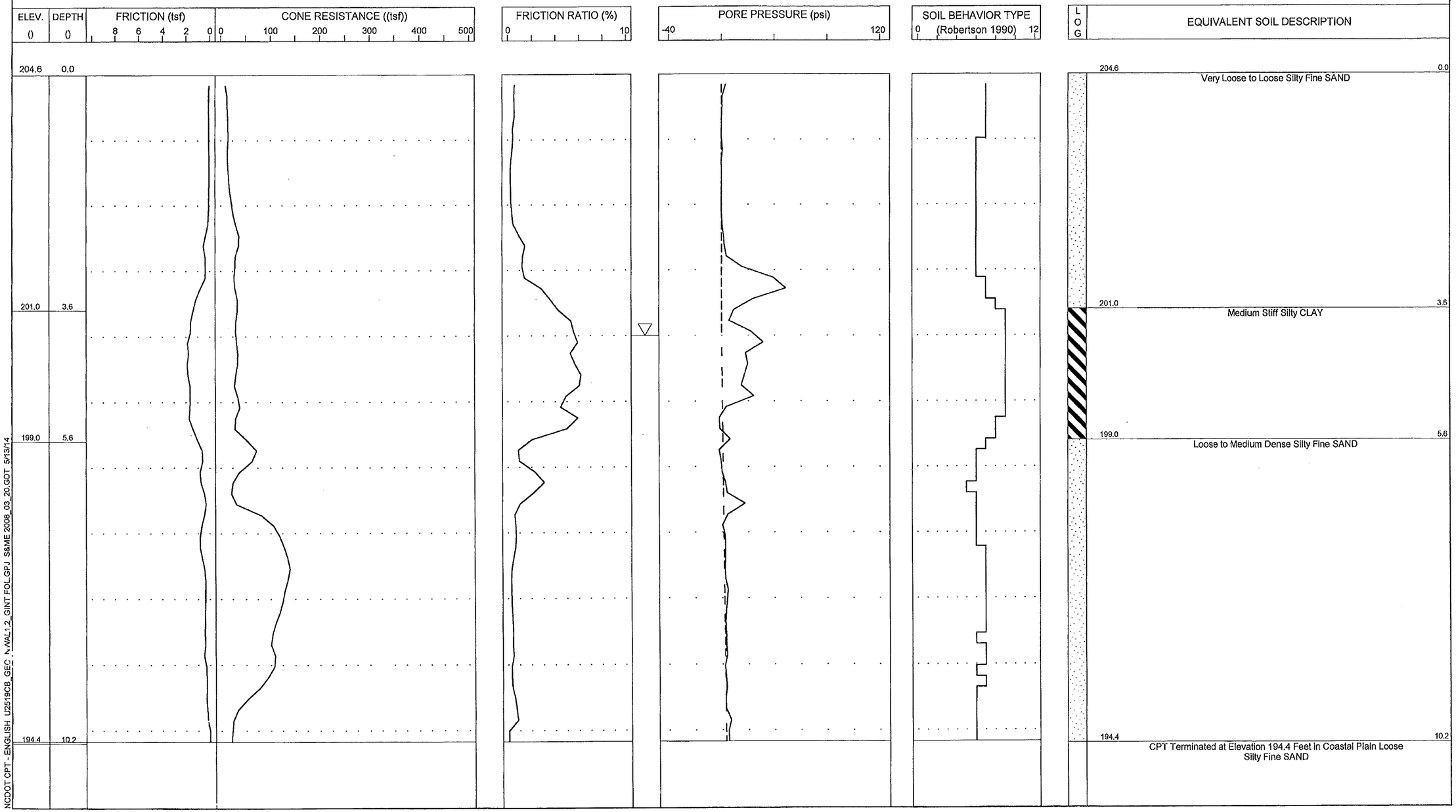
BORING LOG

PROJECT NO. 34817.2.8	ID. U-2519CB	COUNTY Cumberland	GEOLOGIST A. Riggs	TYPE OF CONE 1.75 In. PEIZO CONE	ROD TYPE 1.75 in Dia.	MAXIMUM DOWN PRESSURE Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 1 from -RPD1- Sta. 7+70, 17.40 ft LT to -L-Sta. 820+85, 60.42 ft RT			GROUND WATER (ft)	TOTAL DEPTH 10.2	DRILL MACHINE CPT-TRACK	DRILL METHOD Direct Push	HAMMER TYPE N/A
BORING NO. NW1-31	BORING LOCATION 821+15	OFFSET 60 RT	ALIGNMENT -L-	0 HR. 4.0	DATE STARTED 4/1/2014	COMPLETED 4/1/2014	SURFACE WATER DEPTH N/A
COLLAR ELEV. 204.6	NORTHING 483,710.2	EASTING 1,993,843.0		24 HR. N/M	DRILLER: T. WESTFALL	TECHNICIAN K. PARTON	



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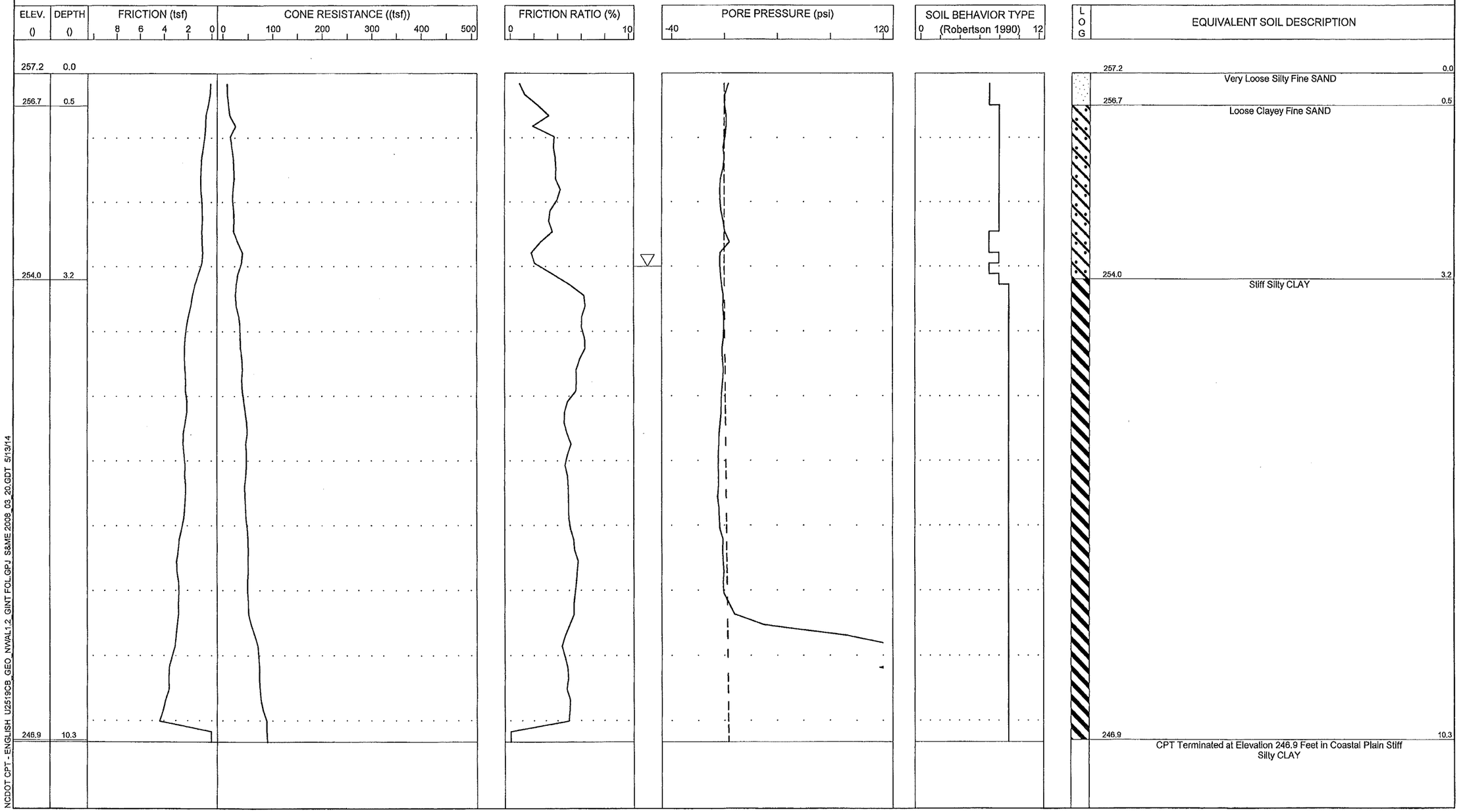
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 10.3	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW2-01	**BORING LOCATION** 969+60	**OFFSET** 74 RT	**ALIGNMENT** -L-	**0 HR.** 3.0	**DATE STARTED** 3/25/2014	**COMPLETED** 3/25/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 257.2	**NORTHING** 493,880.0	**EASTING** 1,998,767.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



LOG

EQUIVALENT SOIL DESCRIPTION

257.2 0.0
Very Loose Silty Fine SAND

256.7 0.5
Loose Clayey Fine SAND

254.0 3.2
Stiff Silty CLAY

246.9 10.3
CPT Terminated at Elevation 246.9 Feet in Coastal Plain Stiff Silty CLAY

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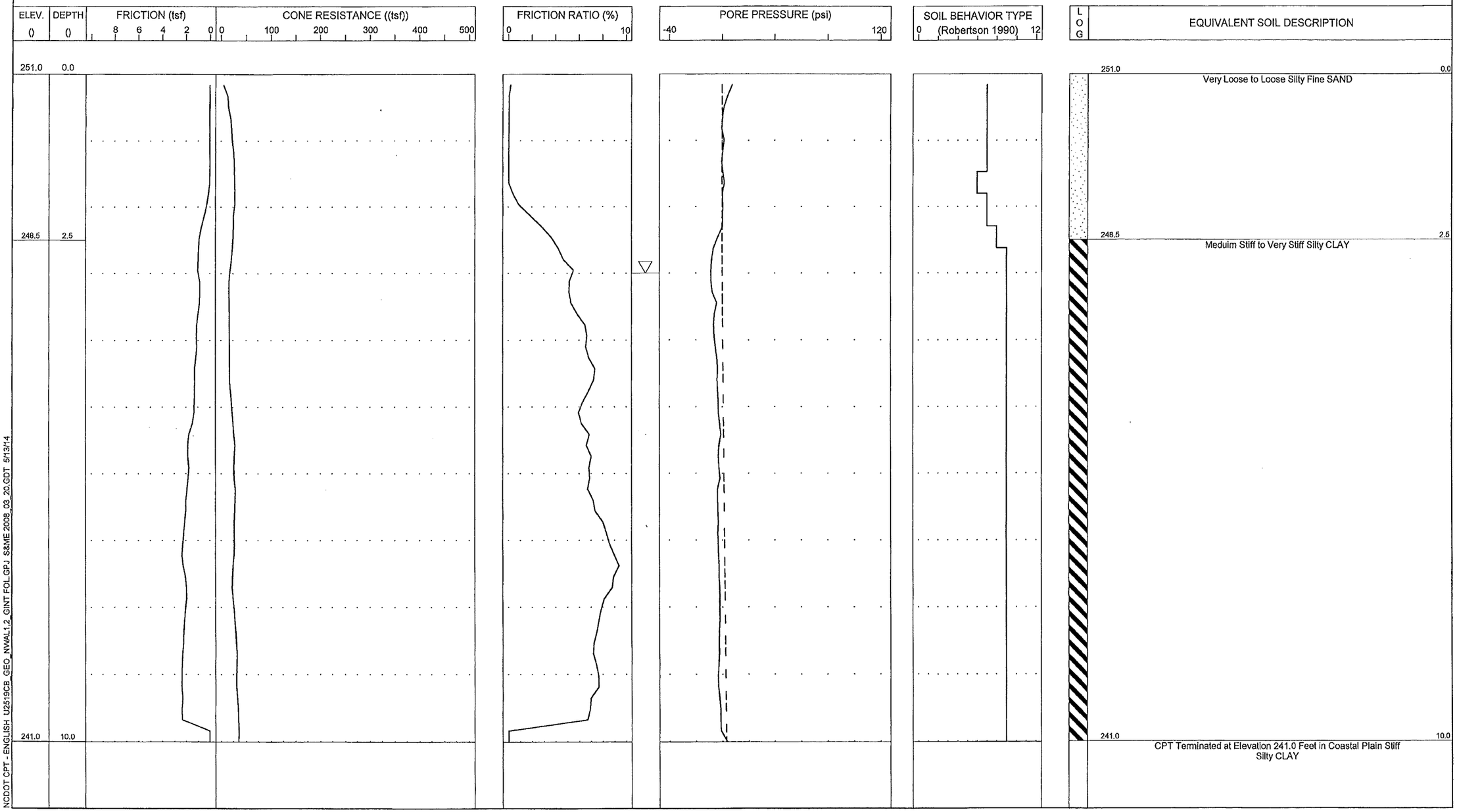
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 10.0	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW2-02	**BORING LOCATION** 971+10	**OFFSET** 78 RT	**ALIGNMENT** -L-	**0 HR.** 3.0	**DATE STARTED** 3/25/2014	**COMPLETED** 3/25/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 251.0	**NORTHING** 493,834.8	**EASTING** 1,998,916.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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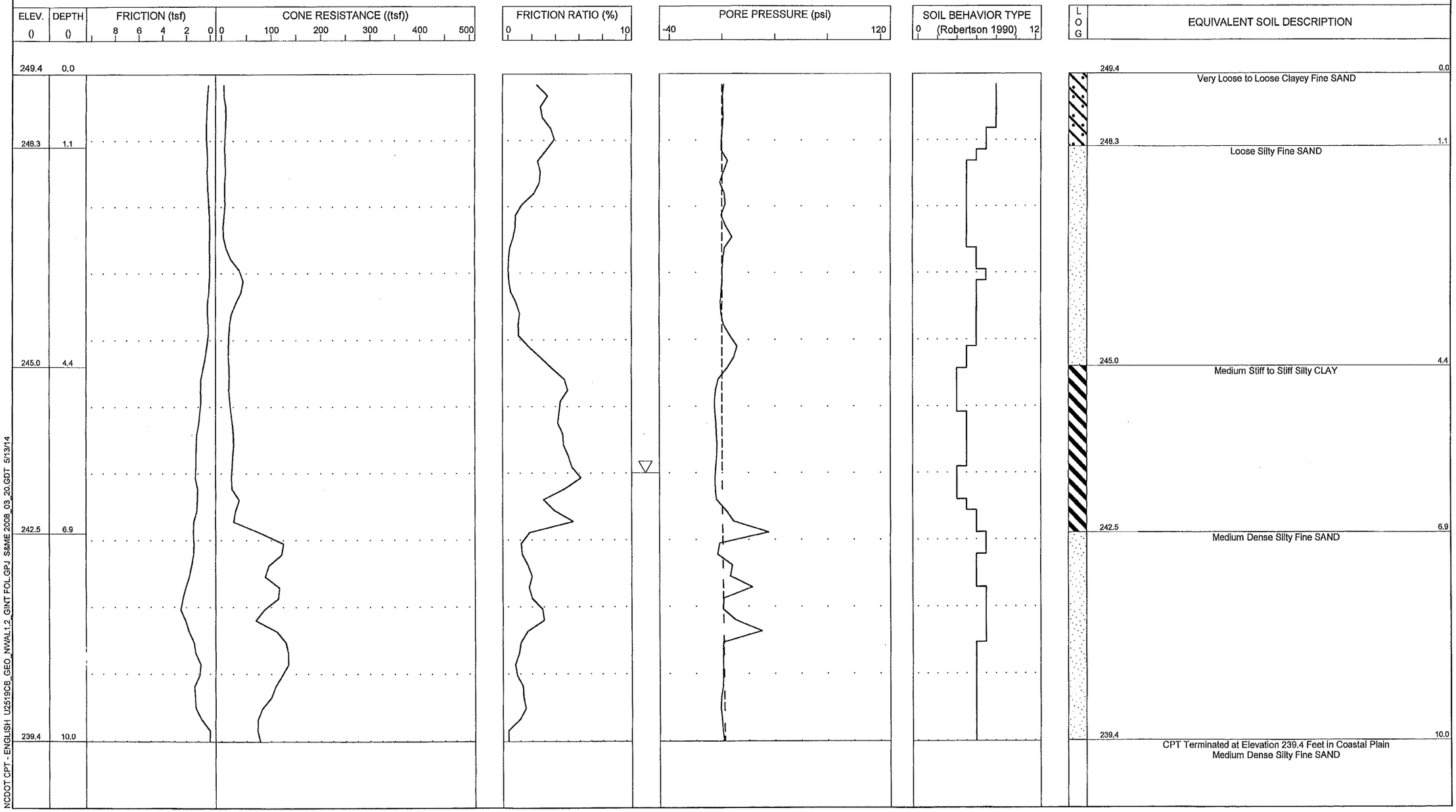
PROJECT NO. 34817.2.8	ID. U-2519CB	COUNTY Cumberland	GEOLOGIST A. Riggs	TYPE OF CONE 1.75 In. PEIZO CONE	ROD TYPE 1.75 in Dia.	MAXIMUM DOWN PRESSURE Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			GROUND WATER (ft)	TOTAL DEPTH 10.0	DRILL MACHINE CPT-TRACK	DRILL METHOD Direct Push	HAMMER TYPE N/A
BORING NO. NW2-03	BORING LOCATION 972+60	OFFSET 80 RT	ALIGNMENT -L-	0 HR. 6.0	DATE STARTED 3/25/2014	COMPLETED 3/25/2014	SURFACE WATER DEPTH N/A
COLLAR ELEV. 249.4	NORTHING 493,851.5	EASTING 1,999,066.0		24 HR. N/M	DRILLER: T. WESTFALL	TECHNICIAN K. PARTON	



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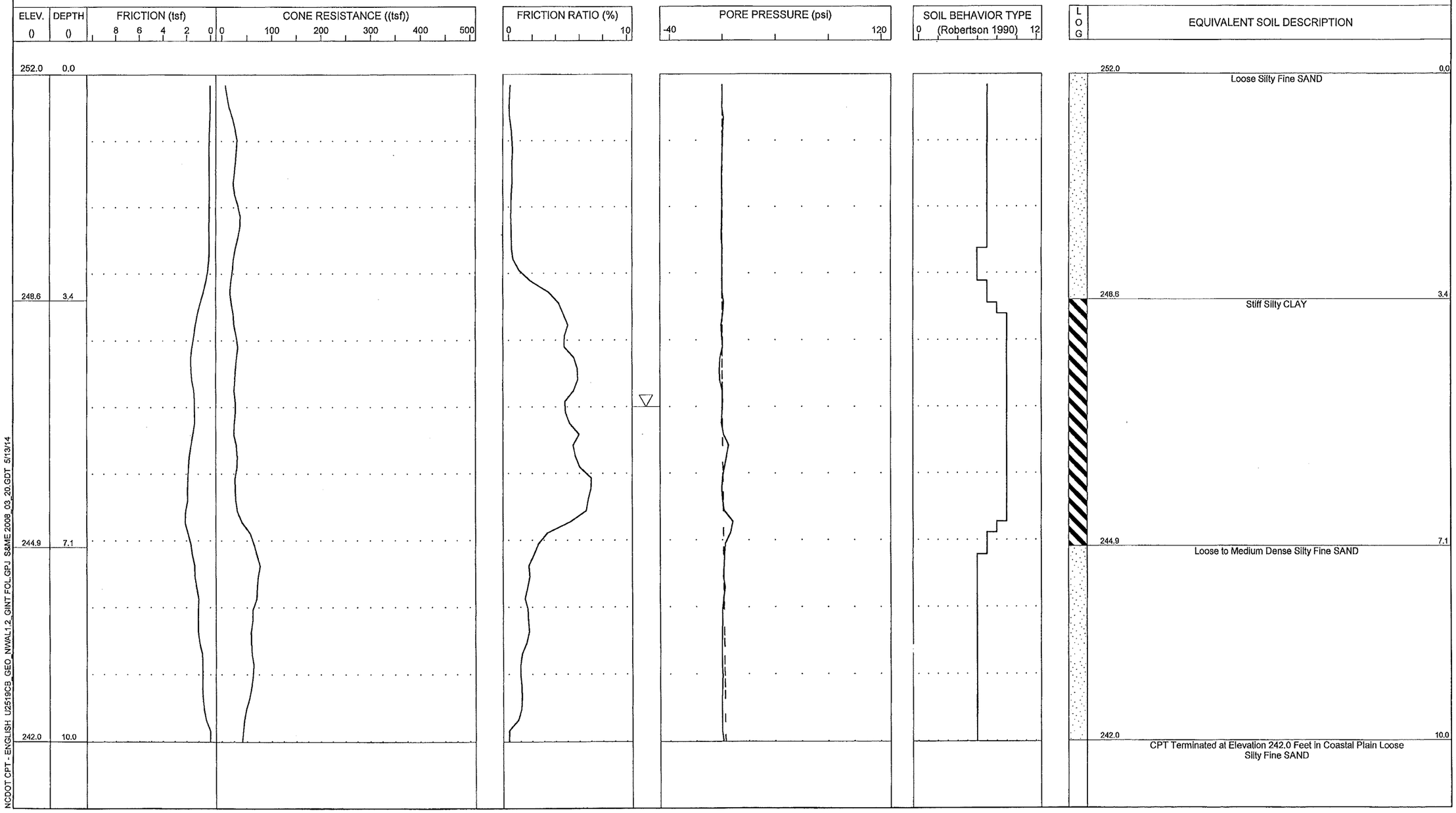
PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 10.0	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW2-04	**BORING LOCATION** 974+10	**OFFSET** 84 RT	**ALIGNMENT** -L-	**0 HR.** 5.0	**DATE STARTED** 3/25/2014	**COMPLETED** 3/25/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 252.0	**NORTHING** 493,836.3	**EASTING** 1,999,215.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



LOG

EQUIVALENT SOIL DESCRIPTION

252.0 — 0.0
Loose Silty Fine SAND

248.6 — 3.4
Stiff Silty CLAY

244.9 — 7.1
Loose to Medium Dense Silty Fine SAND

242.0 — 10.0
CPT Terminated at Elevation 242.0 Feet in Coastal Plain Loose Silty Fine SAND

NCDOT CPT - ENGLISH U2519CB_GEO_NWAL1-2_GINT FOL.GPJ S&ME 2008_03_20.GDT 5/13/14

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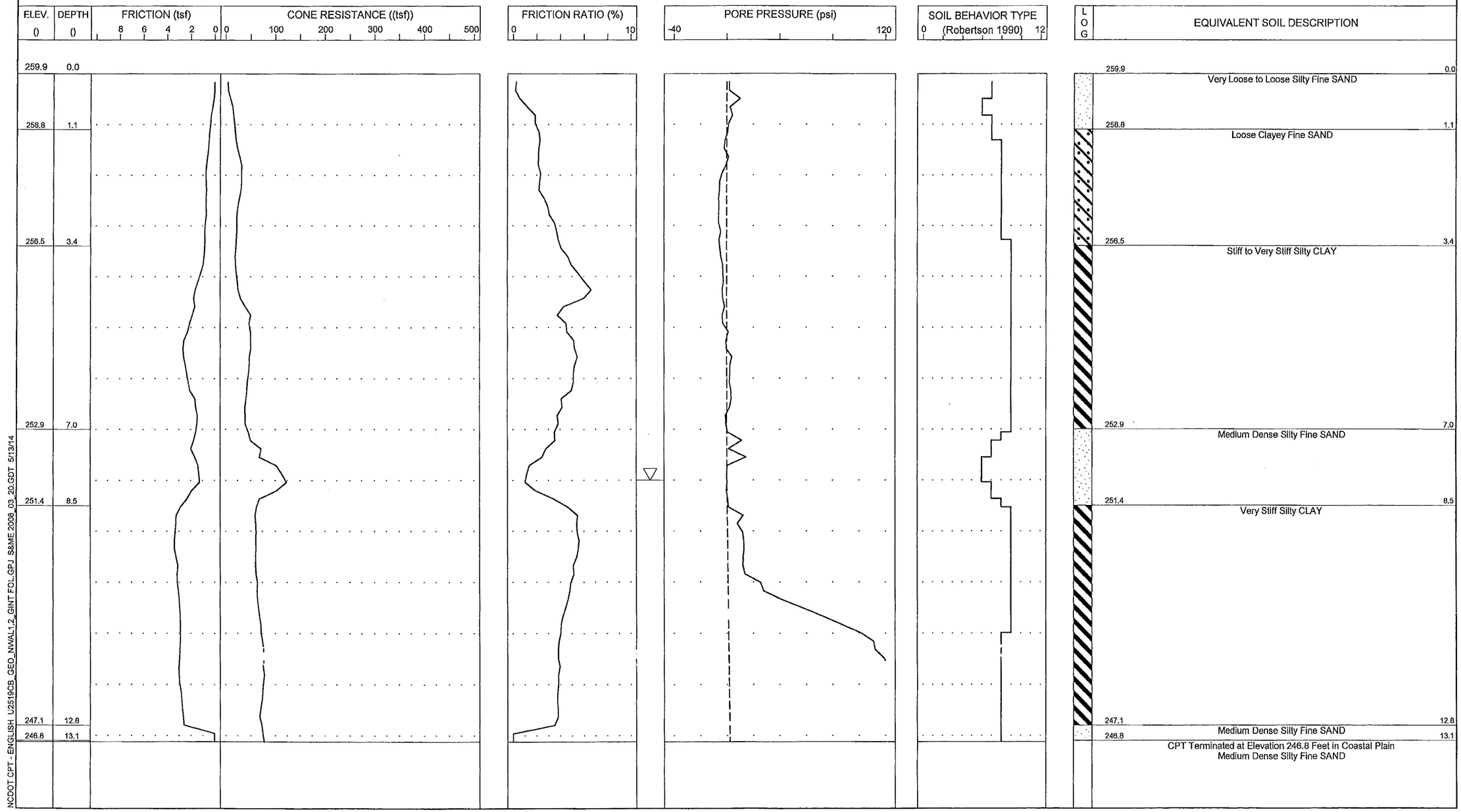
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 13.1	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW2-05	**BORING LOCATION** 975+60	**OFFSET** 76 RT	**ALIGNMENT** -L-	**0 HR.** 8.0	**DATE STARTED** 3/25/2014	**COMPLETED** 3/25/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 259.9	**NORTHING** 493,833.0	**EASTING** 1,999,365.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



LOG

EQUIVALENT SOIL DESCRIPTION

259.9 — 0.0
Very Loose to Loose Silty Fine SAND
258.8 — 1.1
Loose Clayey Fine SAND
256.5 — 3.4
Stiff to Very Stiff Silty CLAY
252.9 — 7.0
Medium Dense Silty Fine SAND
251.4 — 8.5
Very Stiff Silty CLAY
247.1 — 12.8
Medium Dense Silty Fine SAND
246.8 — 13.1
CPT Terminated at Elevation 246.8 Feet in Coastal Plain
Medium Dense Silty Fine SAND

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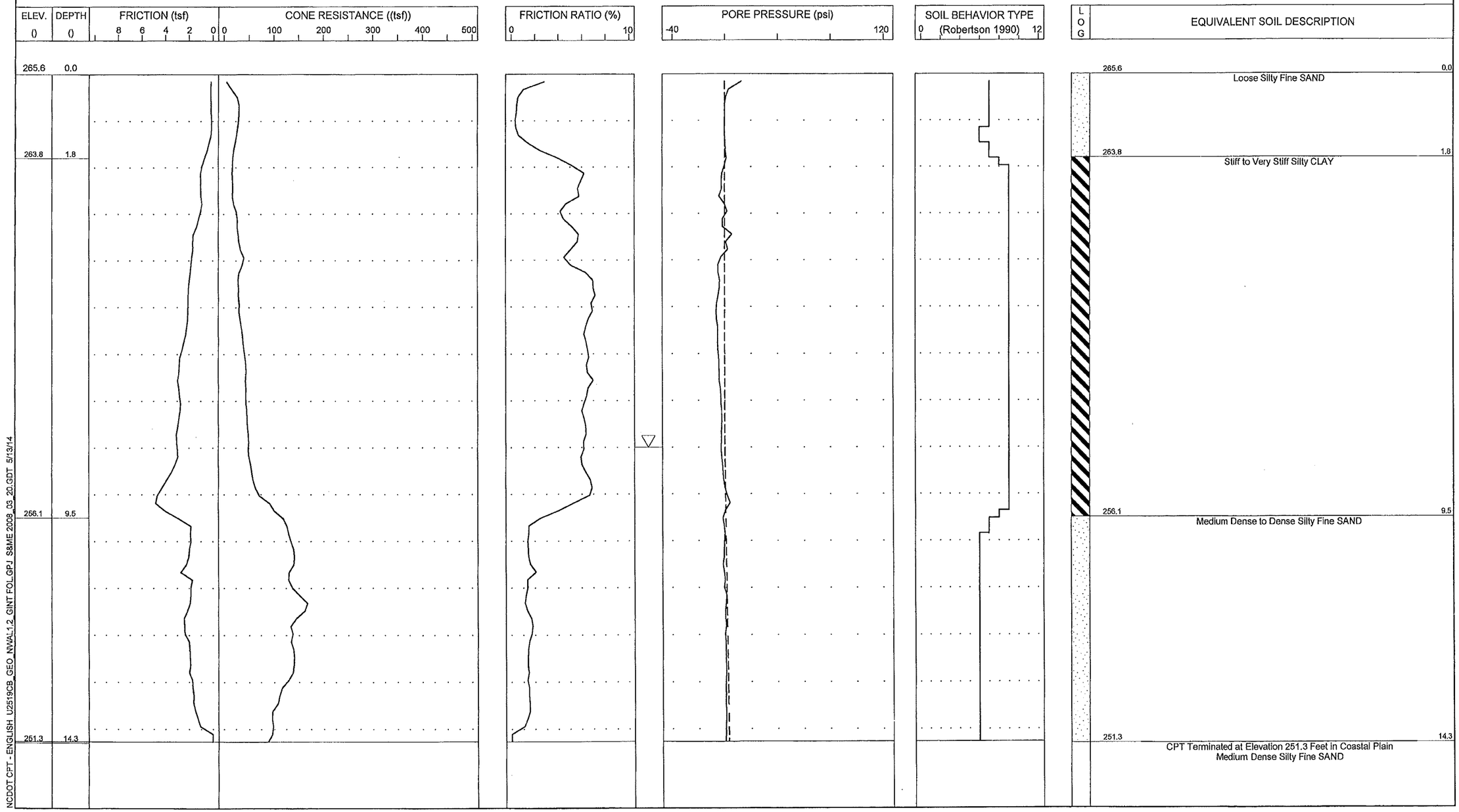
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 14.3	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW2-06	**BORING LOCATION** 977+10	**OFFSET** 70 RT	**ALIGNMENT** -L-	**0 HR.** 8.0	**DATE STARTED** 3/26/2014	**COMPLETED** 3/26/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 265.6	**NORTHING** 493,827.7	**EASTING** 1,999,515.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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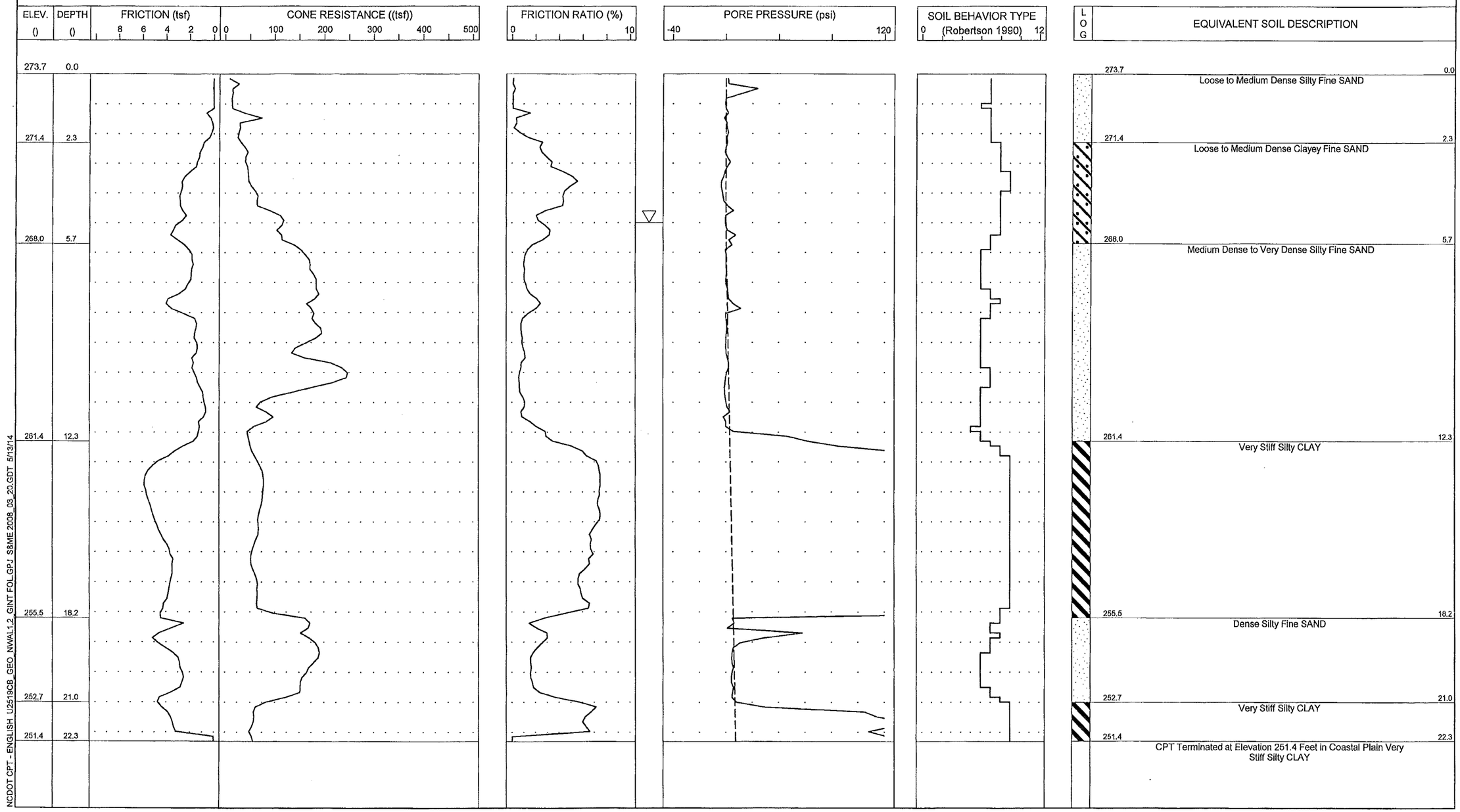
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	ID. U-2519CB	COUNTY Cumberland	GEOLOGIST A. Riggs	TYPE OF CONE 1.75 In. PEIZO CONE	ROD TYPE 1.75 in Dia.	MAXIMUM DOWN PRESSURE Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			GROUND WATER (ft)	TOTAL DEPTH 22.3	DRILL MACHINE CPT-TRACK	DRILL METHOD Direct Push	HAMMER TYPE N/A
BORING NO. NW2-07	BORING LOCATION 978+60	OFFSET 70 RT	ALIGNMENT -L-	0 HR. 5.0	DATE STARTED 3/26/2014	COMPLETED 3/26/2014	SURFACE WATER DEPTH N/A
COLLAR ELEV. 273.7	NORTHING 493,816.6	EASTING 1,999,665.0		24 HR. N/M	DRILLER: T. WESTFALL	TECHNICIAN K. PARTON	



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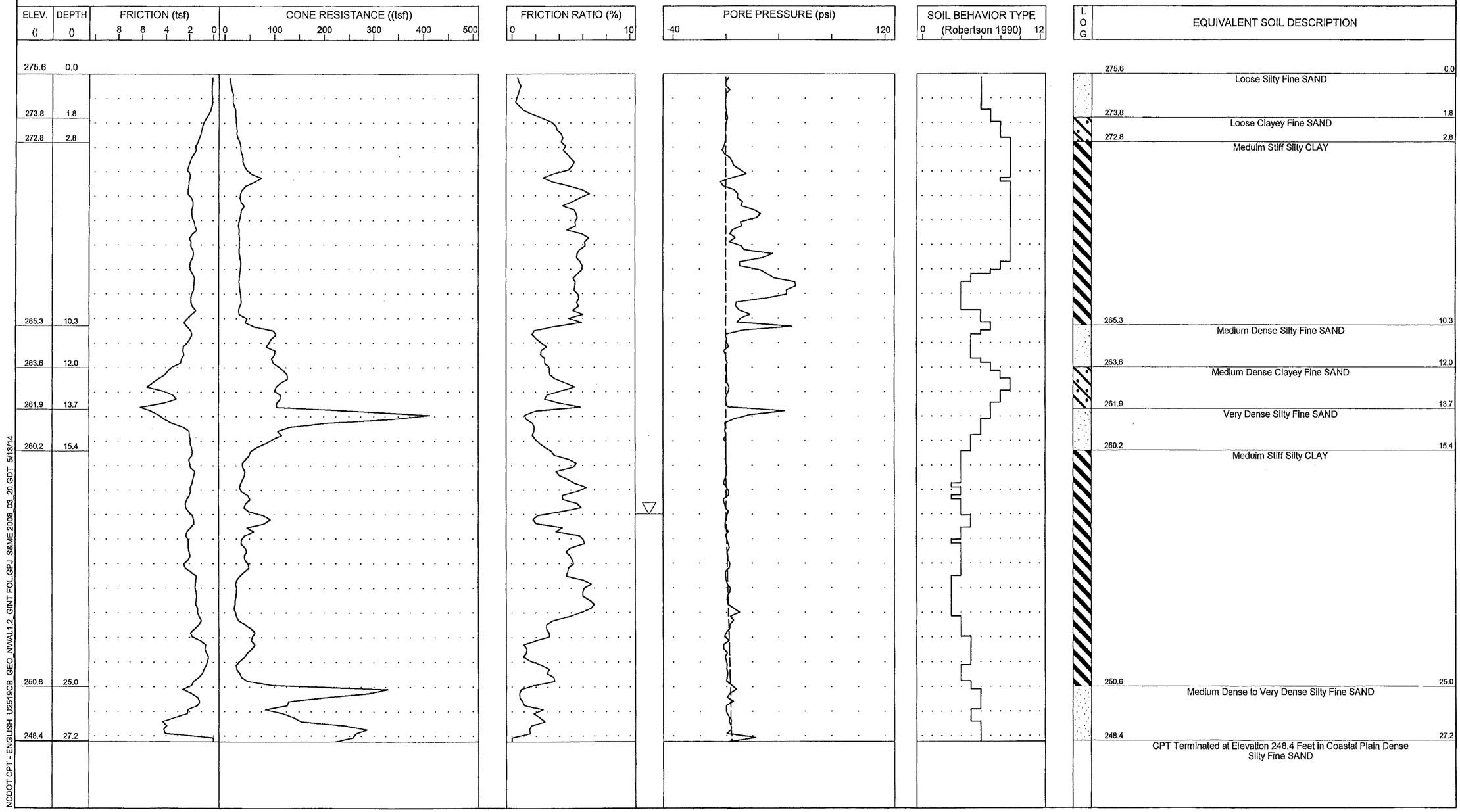
BORING LOG

PROJECT NO. 34817.2.8	ID. U-2519CB	COUNTY Cumberland	GEOLOGIST A. Riggs	TYPE OF CONE 1.75 In. PEIZO CONE	ROD TYPE 1.75 in Dia.	MAXIMUM DOWN PRESSURE Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			GROUND WATER (ft)	TOTAL DEPTH 27.2	DRILL MACHINE CPT-TRACK	DRILL METHOD Direct Push	HAMMER TYPE N/A
BORING NO. NW2-08	BORING LOCATION 980+10	OFFSET 70 RT	ALIGNMENT -L-	0 HR. 18.0	DATE STARTED 3/26/2014	COMPLETED 3/26/2014	SURFACE WATER DEPTH N/A
COLLAR ELEV. 275.6	NORTHING 493,807.4	EASTING 1,999,817.0		24 HR. N/M	DRILLER: T. WESTFALL	TECHNICIAN K. PARTON	



NCDOT CPT - ENGLISH U2519CB_GEO_NWALL1_2_GINT FOL.GPJ S&ME 2008_03_20.GDT 5/13/14

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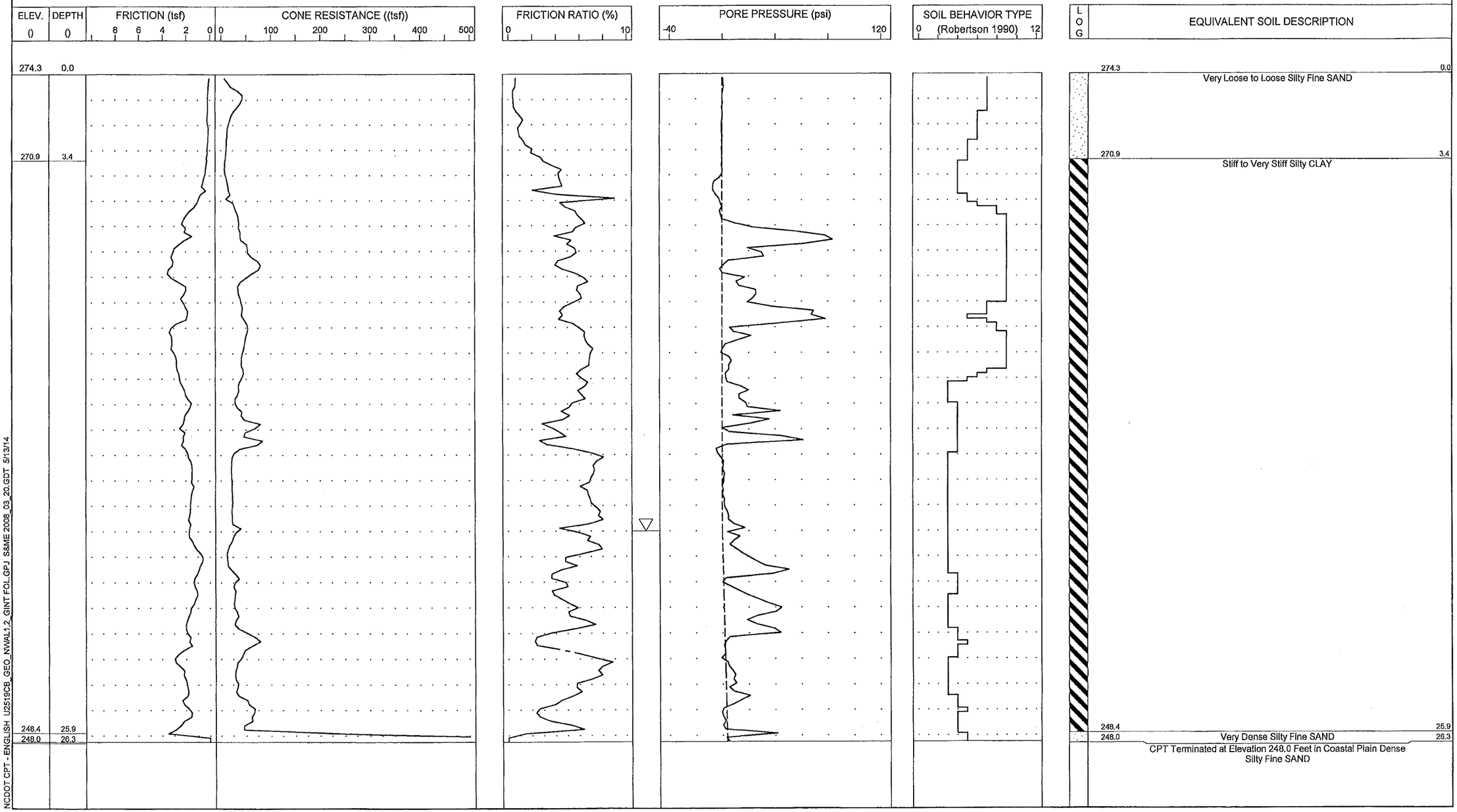
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 26.3	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW2-09	**BORING LOCATION** 981+60	**OFFSET** 72 RT	**ALIGNMENT** -L-	**0 HR.** 18.0	**DATE STARTED** 3/26/2014	**COMPLETED** 3/26/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 274.3	**NORTHING** 493,800.4	**EASTING** 1,999,969.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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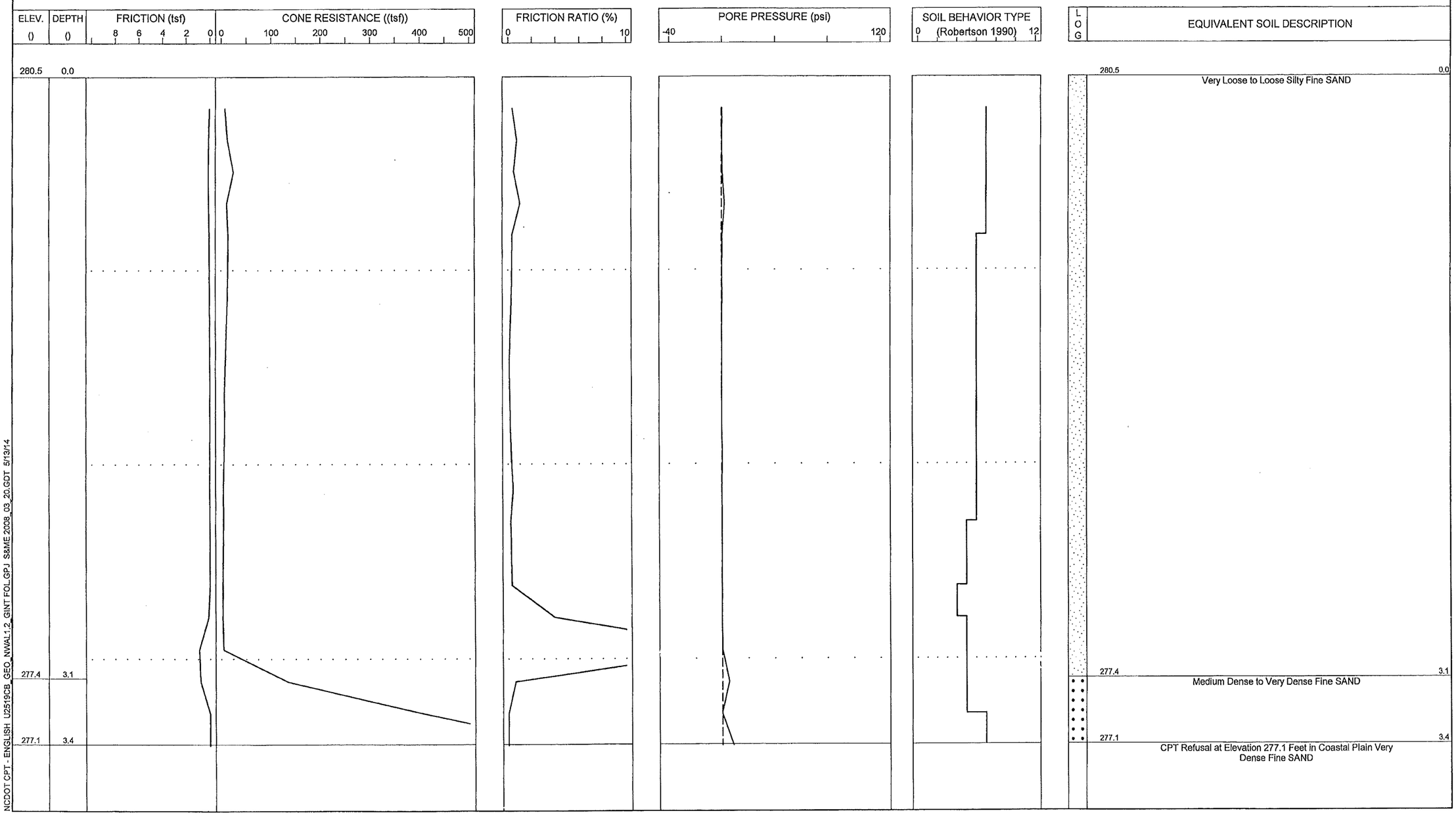
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 3.4	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW2-10	**BORING LOCATION** 983+10	**OFFSET** 74 RT	**ALIGNMENT** -L-	**0 HR.** DRY	**DATE STARTED** 3/26/2014	**COMPLETED** 3/26/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 280.5	**NORTHING** 493,797.9	**EASTING** 2,000,121.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



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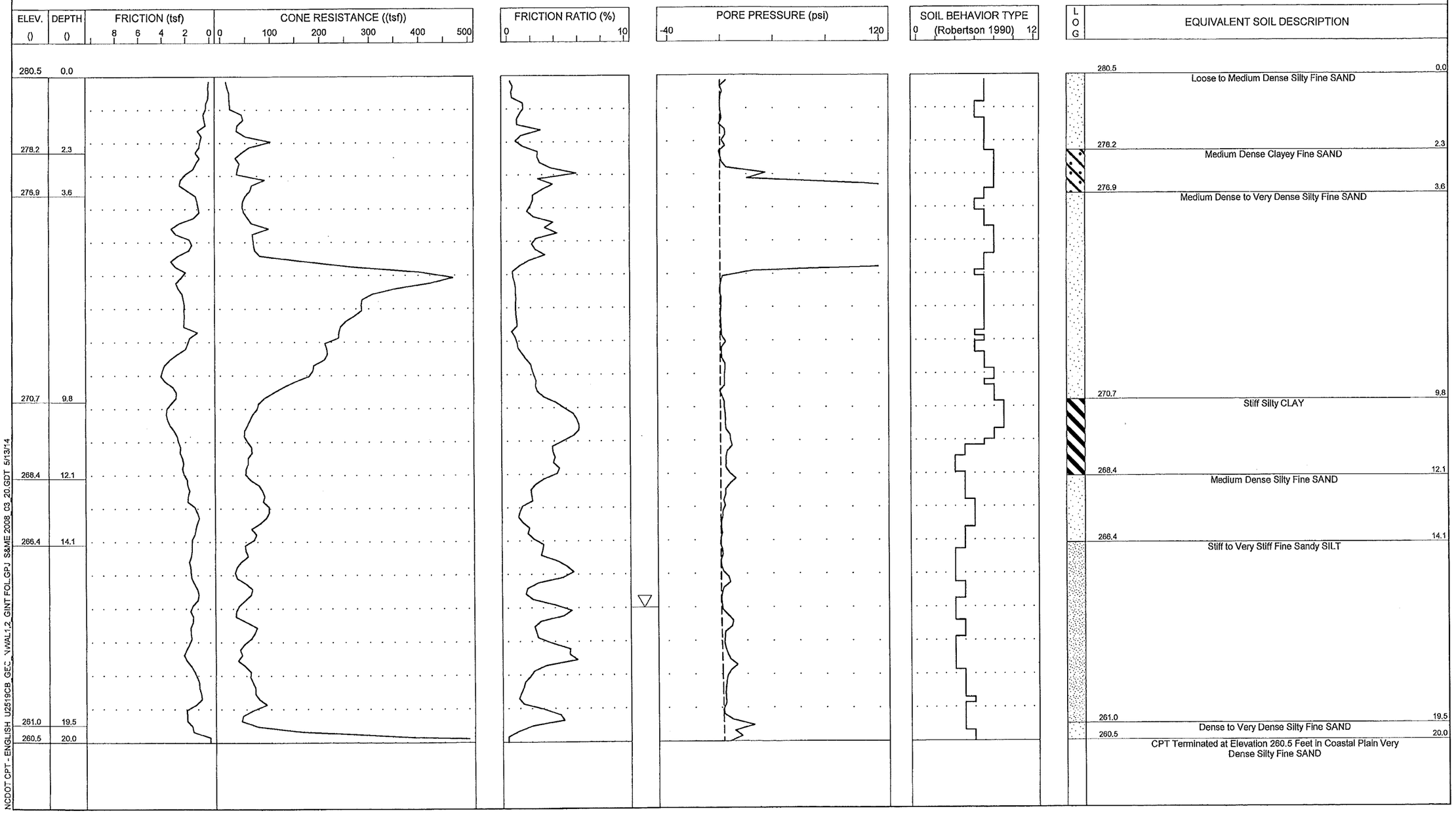
BORING LOG

PROJECT NO. 34817.2.8	ID. U-2519CB	COUNTY Cumberland	GEOLOGIST A. Riggs	TYPE OF CONE 1.75 In. PEIZO CONE	ROD TYPE 1.75 in Dia.	MAXIMUM DOWN PRESSURE Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			GROUND WATER (ft)	TOTAL DEPTH 20.0	DRILL MACHINE CPT-TRACK	DRILL METHOD Direct Push	HAMMER TYPE N/A
BORING NO. NW2-10a	BORING LOCATION 983+10	OFFSET 74 RT	ALIGNMENT -L-	0 HR. 16.0	DATE STARTED 3/26/2014	COMPLETED 3/26/2014	SURFACE WATER DEPTH N/A
COLLAR ELEV. 280.5	NORTHING 493,797.9	EASTING 2,000,121.0		24 HR. N/M	DRILLER: T. WESTFALL	TECHNICIAN K. PARTON	



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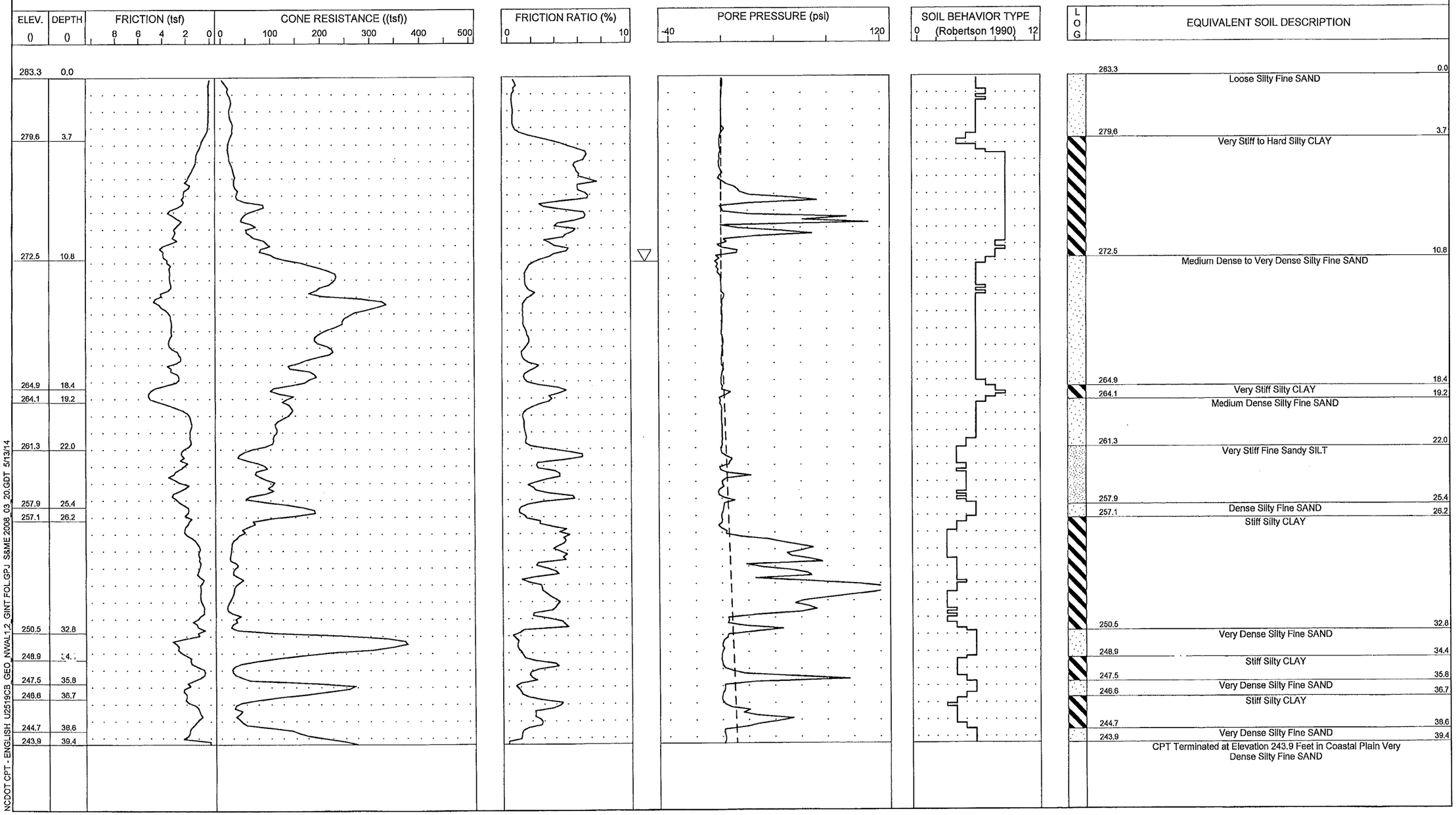
BORING LOG

PROJECT NO. 34817.2.8	ID. U-2519CB	COUNTY Cumberland	GEOLOGIST A. Riggs	TYPE OF CONE 1.75 In. PEIZO CONE	ROD TYPE 1.75 in Dia.	MAXIMUM DOWN PRESSURE Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			GROUND WATER (ft)	TOTAL DEPTH 39.4	DRILL MACHINE CPT-TRACK	DRILL METHOD Direct Push	HAMMER TYPE N/A
BORING NO. NW2-11	BORING LOCATION 984+60	OFFSET 74 RT	ALIGNMENT -L-	0 HR. 11.0	DATE STARTED 3/26/2014	COMPLETED 3/26/2014	SURFACE WATER DEPTH N/A
COLLAR ELEV. 283.3	NORTHING 493,801.7	EASTING 2,000,273.0		24 HR. N/M	DRILLER: T. WESTFALL	TECHNICIAN K. PARTON	



NCDOT CPT - ENGLISH U2519CB_GEO_NWALL1_2_GINT FOLGPJ S&ME 2008_03_20.GDT 5/13/14

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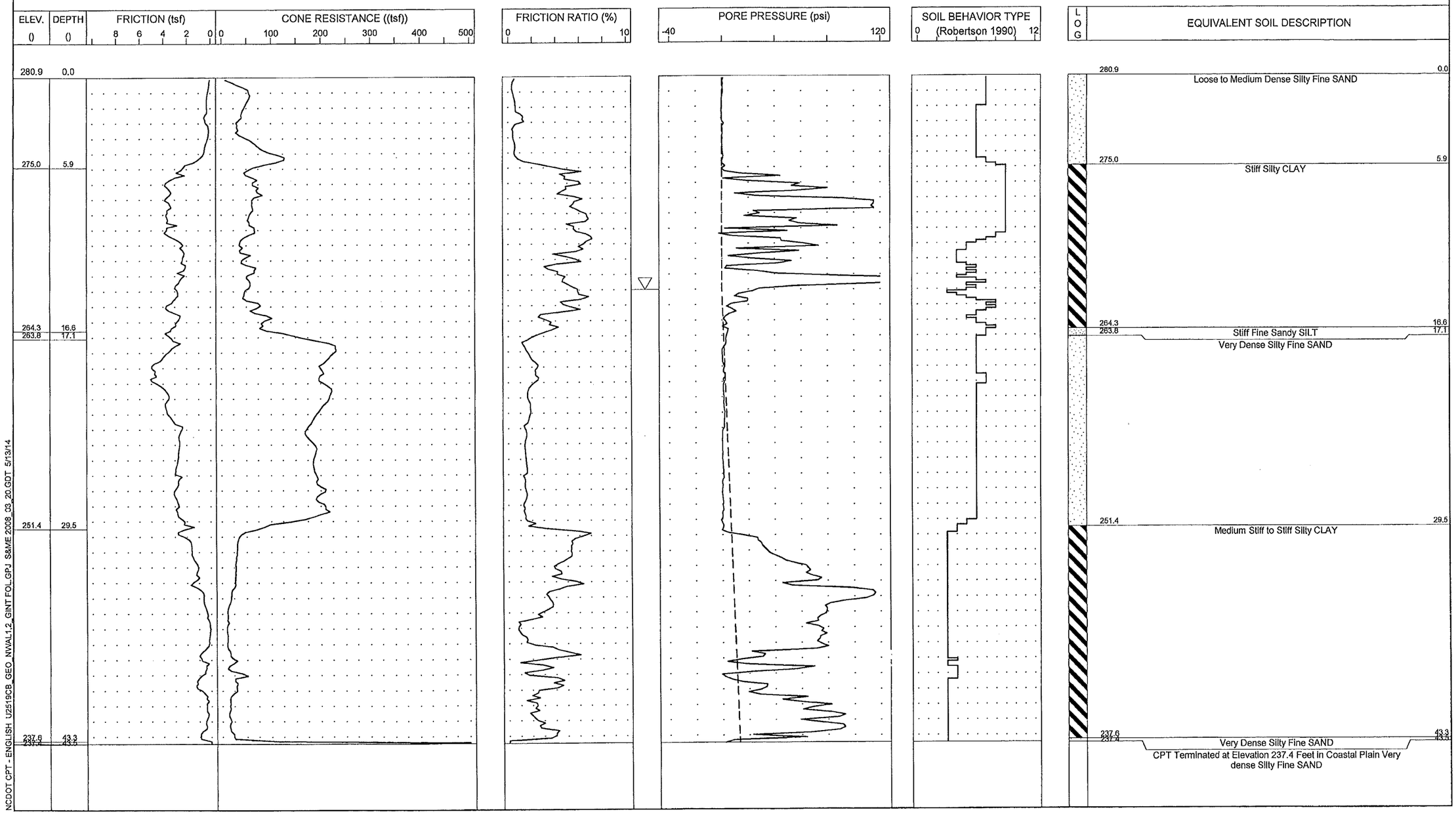
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	**ID.** U-2519CB	**COUNTY** Cumberland	**GEOLOGIST** A. Riggs	**TYPE OF CONE** 1.75 In. PEIZO CONE	**ROD TYPE** 1.75 in Dia.	**MAXIMUM DOWN PRESSURE** Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			**GROUND WATER (ft)**	**TOTAL DEPTH** 43.5	**DRILL MACHINE** CPT-TRACK	**DRILL METHOD** Direct Push	**HAMMER TYPE** N/A
BORING NO. NW2-12	**BORING LOCATION** 986+10	**OFFSET** 74 RT	**ALIGNMENT** -L-	**0 HR.** 14.0	**DATE STARTED** 3/26/2014	**COMPLETED** 3/26/2014	**SURFACE WATER DEPTH** N/A
COLLAR ELEV. 280.9	**NORTHING** 493,810.0	**EASTING** 2,000,425.0		**24 HR.** N/M	**DRILLER:** T. WESTFALL	**TECHNICIAN** K. PARTON	



NCDOT CPT - ENGLISH U2519CB_GEO_NWAL1.2_GINT FOL.GPJ S&ME 2008_03_20.GDT 5/13/14

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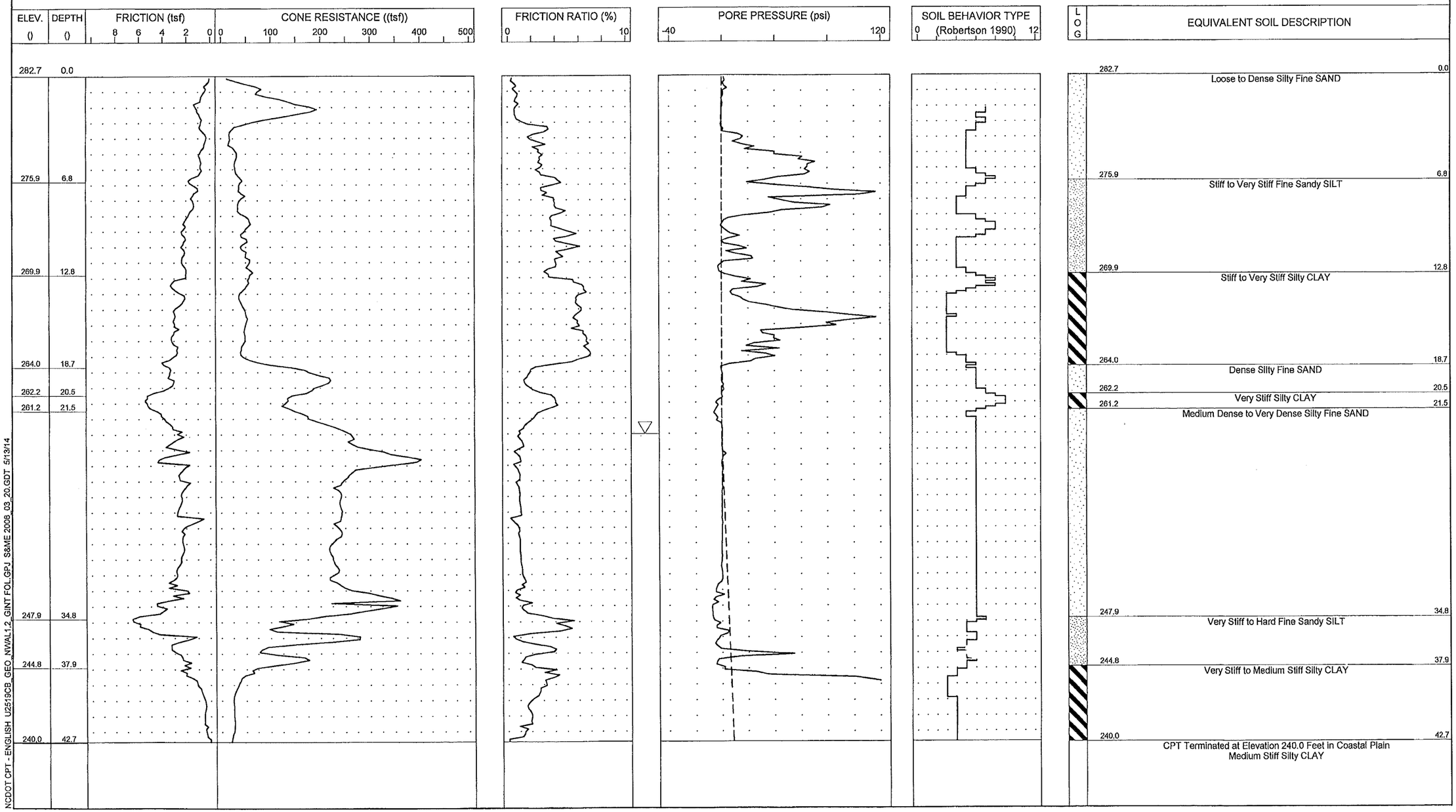
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

PROJECT NO. 34817.2.8	ID. U-2519CB	COUNTY Cumberland	GEOLOGIST A. Riggs	TYPE OF CONE 1.75 In. PEIZO CONE	ROD TYPE 1.75 in Dia.	MAXIMUM DOWN PRESSURE Approximately 920 tsf	
SITE DESCRIPTION Noise Wall 2 from -L- Sta. 969+44, 77.21 ft RT to -L- Sta. 987+74, 77.68 ft RT			GROUND WATER (ft)	TOTAL DEPTH 42.7	DRILL MACHINE CPT-TRACK	DRILL METHOD Direct Push	HAMMER TYPE N/A
BORING NO. NW2-13	BORING LOCATION 987+70	OFFSET 74 RT	ALIGNMENT -L-	0 HR. 23.0	DATE STARTED 3/26/2014	COMPLETED 3/26/2014	SURFACE WATER DEPTH N/A
COLLAR ELEV. 282.7	NORTHING 493,823.5	EASTING 2,000,586.0		24 HR. N/M	DRILLER: T. WESTFALL	TECHNICIAN K. PARTON	



NCDOT CPT - ENGLISH U2519CB_GEO_NWAL1.2_GINT FOL.GPJ S&ME 2008_03_20.GDT 5/13/14

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34817.1.2 (U-2519CB)	1	9

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34817.1.2 (U-2519CB)* F.A. PROJ. *NHF-DPR-0100(001)*

COUNTY *CUMBERLAND*

PROJECT DESCRIPTION *FAYETTEVILLE OUTER LOOP FROM EAST OF SR 1415 (CLEARWATER RD.) TO EAST OF NC 24 (BRAGG BLVD.)*

SITE DESCRIPTION *NOISE WALL 1 RIGHT OF -L- STA. 32+81*
NOISE WALL 2 RIGHT OF -L- STA. 46+61
NOISE WALL 3 RIGHT OF -L- STA. 52+17
NOISE WALL 4 RIGHT OF -L- STA. 71+03

WALL INVENTORY

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3-4	SITE PLAN AND PROFILE NOISE WALL -NW1-
5	SITE PLAN AND PROFILE NOISE WALL -NW2-
6-7	SITE PLAN AND PROFILE NOISE WALL -NW3-
8	SITE PLAN AND PROFILE NOISE WALL -NW4-
9	SOIL TEST RESULTS

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. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

PERSONNEL

NCDOT PERSONNEL

C. D. CZAJKA

F&R PERSONNEL

J. W. GILCHRIST

J. D. SECHULSTER

T. N. FICKLING

J. A. FULLER

MACTEC PERSONNEL

D. E. RHODES

B. MILLER

INVESTIGATED BY *C. A. YOUNGBLOOD*

CHECKED BY *N. T. ROBERSON*

SUBMITTED BY *N. T. ROBERSON*

DATE *JANUARY 2014*

NORTH CAROLINA LICENSED SEAL 2157 GEOLOGIST JAIME LOVE PEDRO

1-13-14

PROJECT: 34817.1.2

ID: U-2519CB

DRAWN BY: *T. T. WALKER, J. L. PEDRO*

NOTE: THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE: 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.

PROJECT REFERENCE NO.	SHEET NO.
	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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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	25 MX	50 MX 10 MX	51 MN 35 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
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 A 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 0.50
	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		
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE		
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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, CPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [X] MARSH BUGGY
- [X] CME-45B

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

HAMMER TYPE:
- [X] AUTOMATIC [X] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.6 - 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 THE 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, 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:

ELEVATION: _____ FT.

NOTES:

REVISED 09/23/09

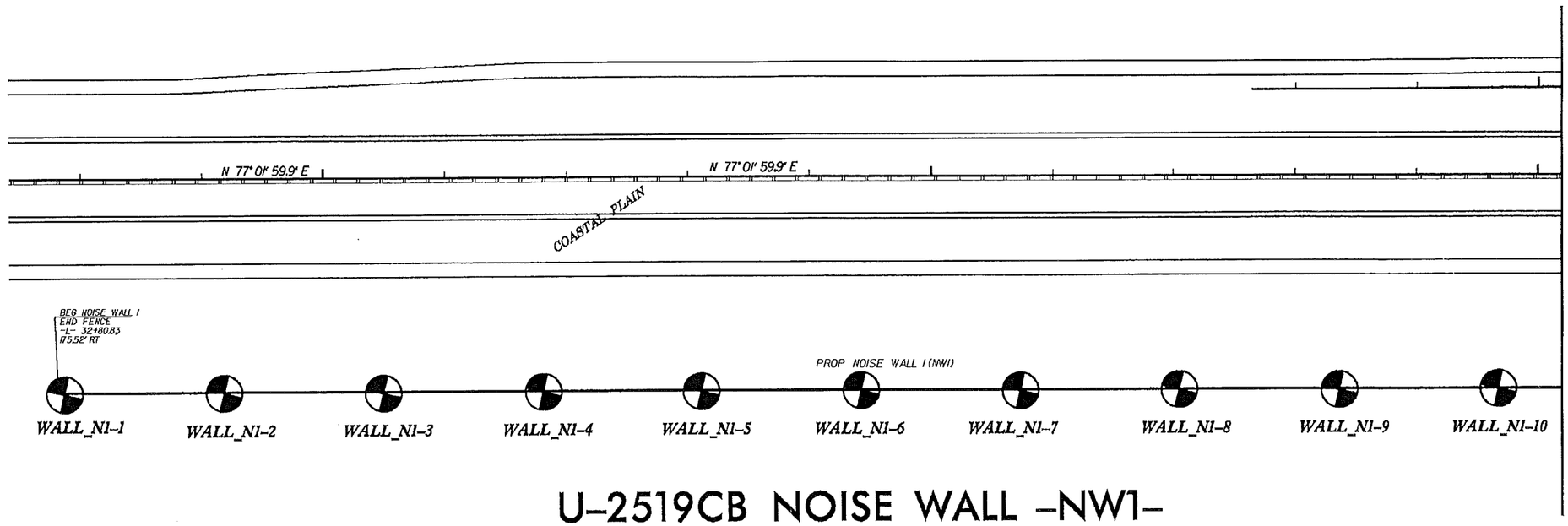
8/17/99

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	3
BUILD ALTERNATIVE	

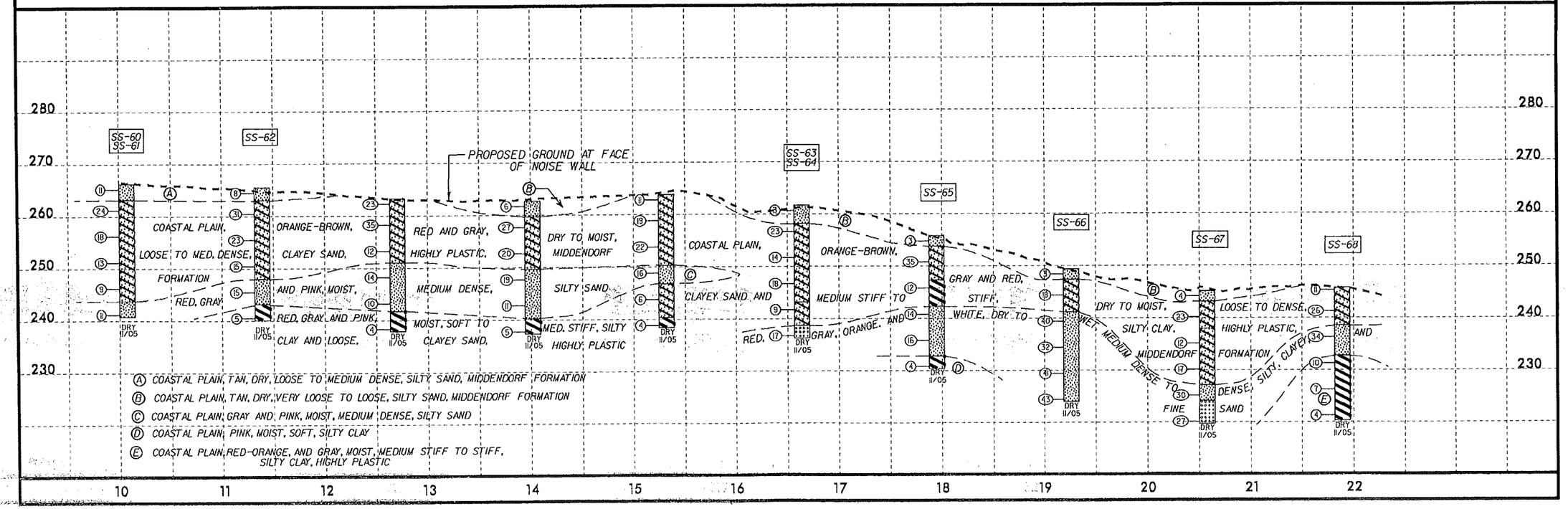
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PLAN AND PROFILE OF NOISE WALL



U-2519CB NOISE WALL -NW1-



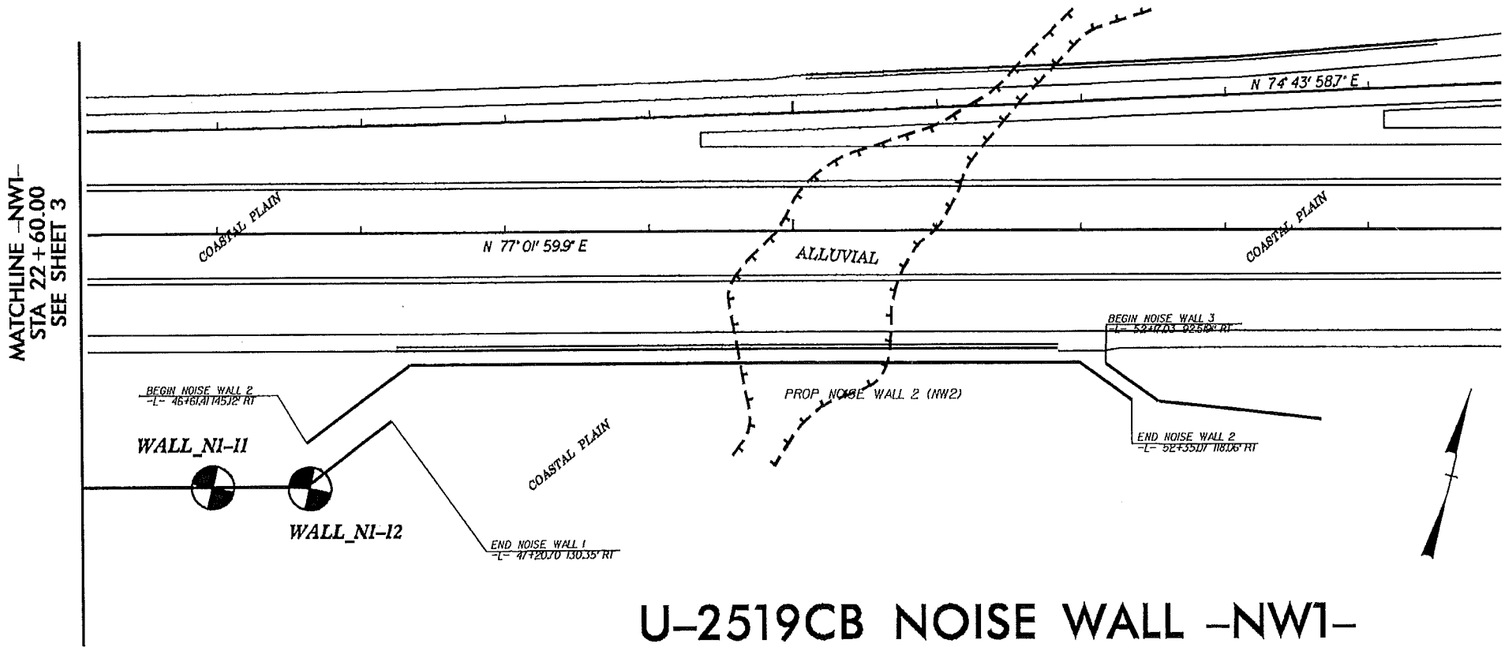
8/17/99

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	4
BUILD ALTERNATIVE	

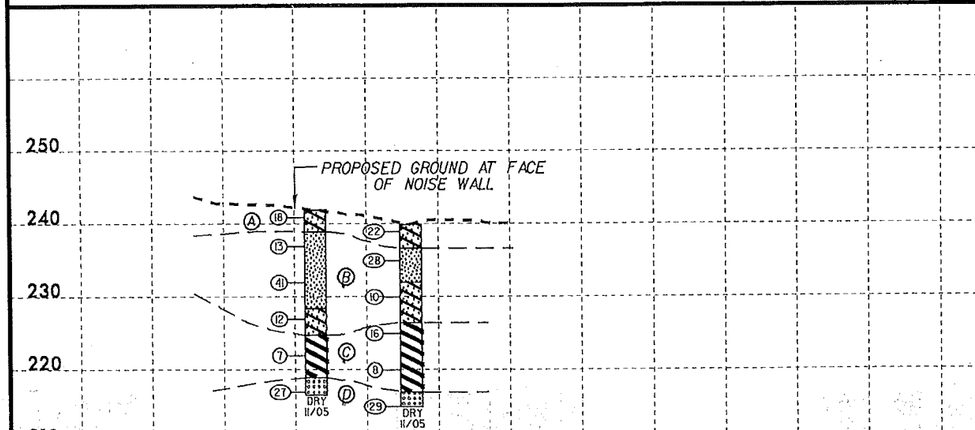
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PLAN AND PROFILE OF NOISE WALL



U-2519CB NOISE WALL -NW1-



Ⓐ COASTAL PLAIN, ORANGE-BROWN, GRAY, AND RED; DRY TO MOIST, LOOSE TO DENSE, CLAYEY SAND, CLAY, HIGHLY PLASTIC, MIDDENDORF FORMATION

Ⓑ COASTAL PLAIN, RED, GRAY, ORANGE, AND WHITE, DRY TO WET, MEDIUM DENSE, SILTY, CLAYEY, AND FINE SAND

Ⓒ COASTAL PLAIN, RED, ORANGE, AND GRAY, MOIST, MEDIUM STIFF TO STIFF, SILTY CLAY, HIGHLY PLASTIC,

Ⓓ COASTAL PLAIN, ORANGE, WET, MEDIUM DENSE, FINE SAND

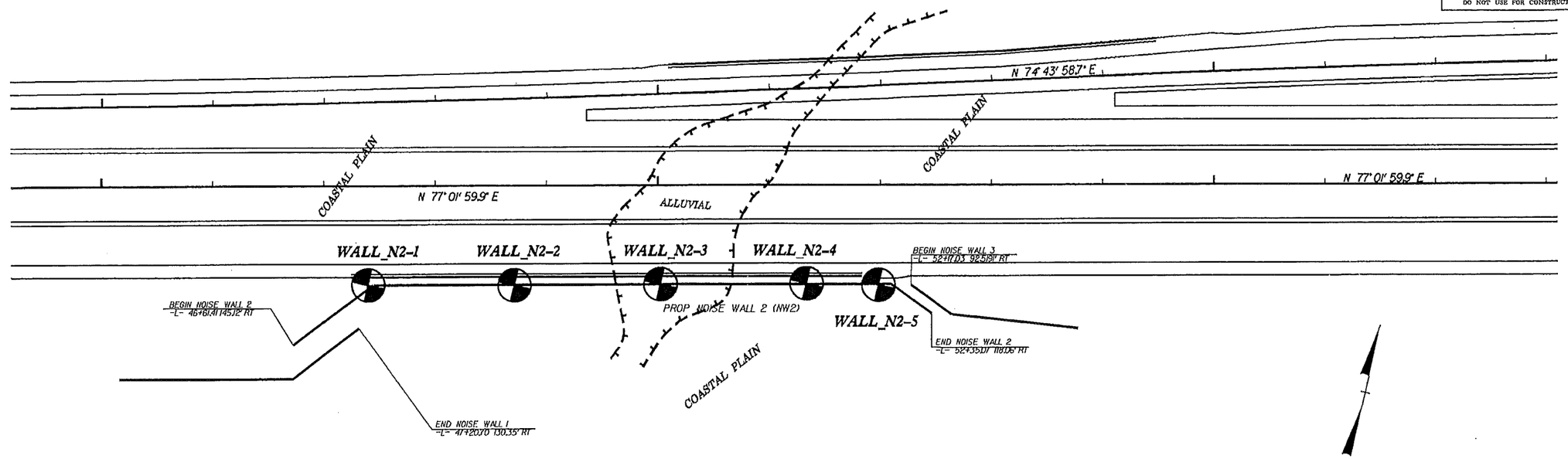
8/17/06

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	5
BUILD ALTERNATIVE	

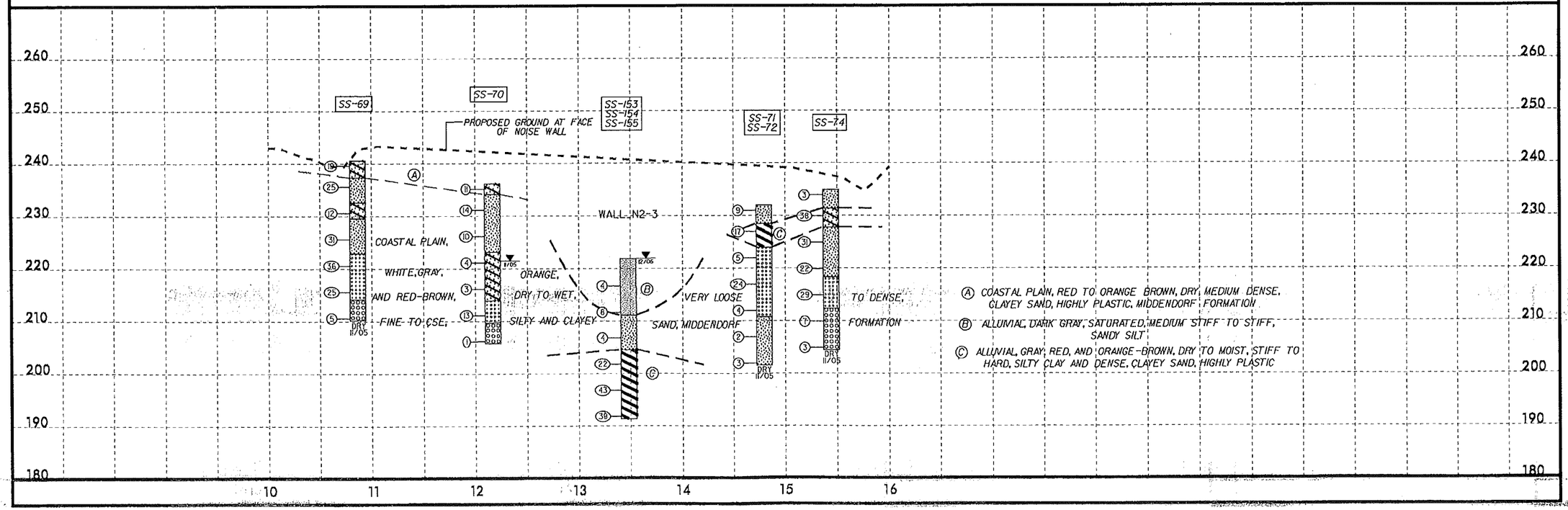
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PLAN AND PROFILE OF NOISE WALL



U-2519CB NOISE WALL -NW2-



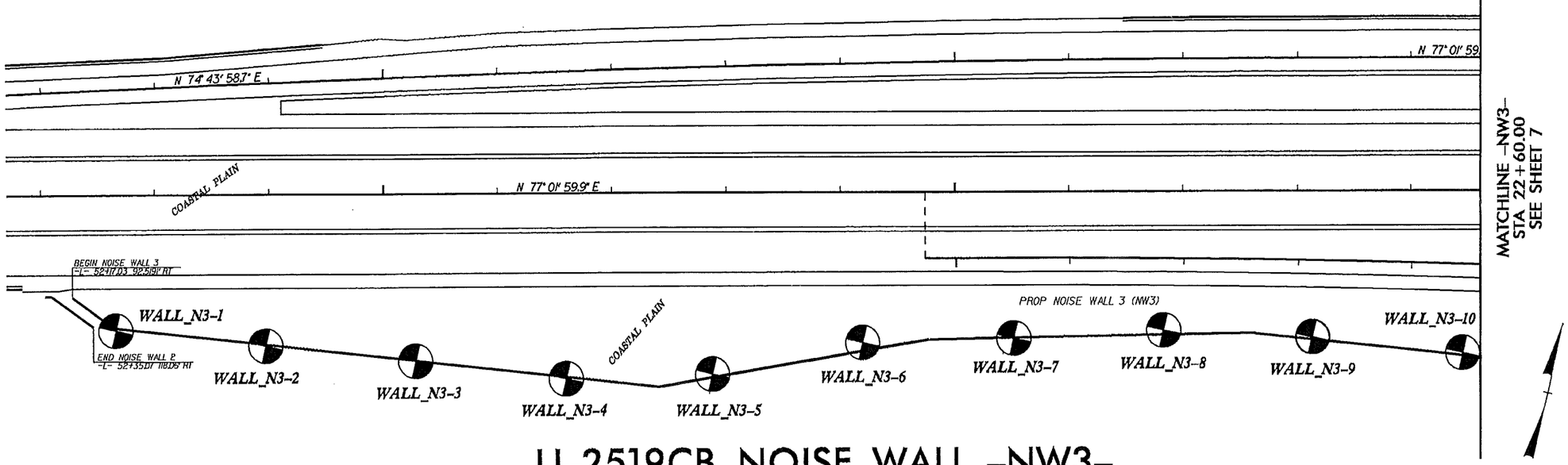
8/17/99

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	6
BUILD ALTERNATIVE	

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PLAN AND PROFILE OF NOISE WALL



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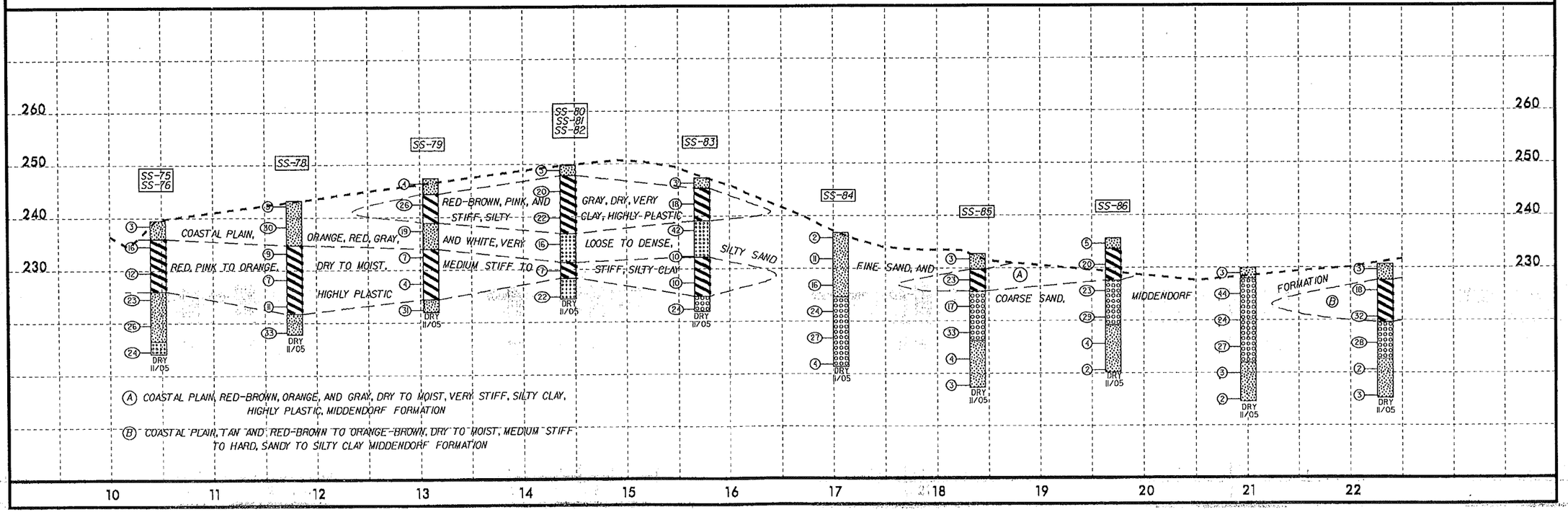


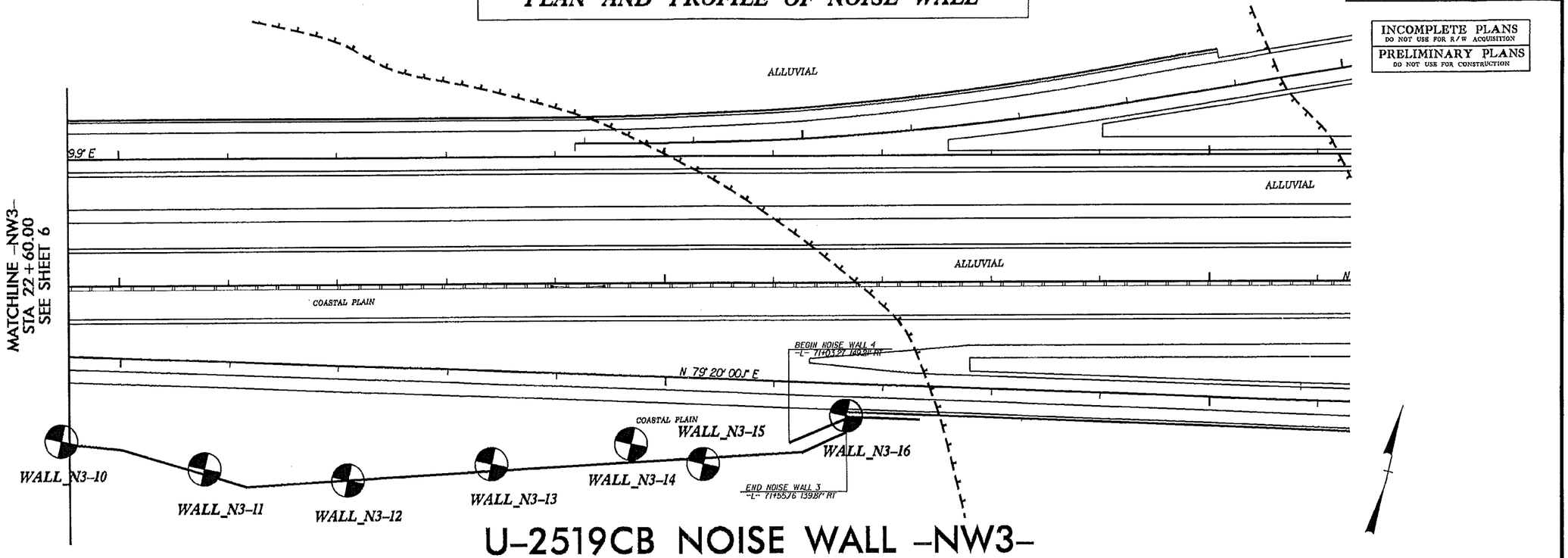
8/17/99

PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	7
BUILD ALTERNATIVE	

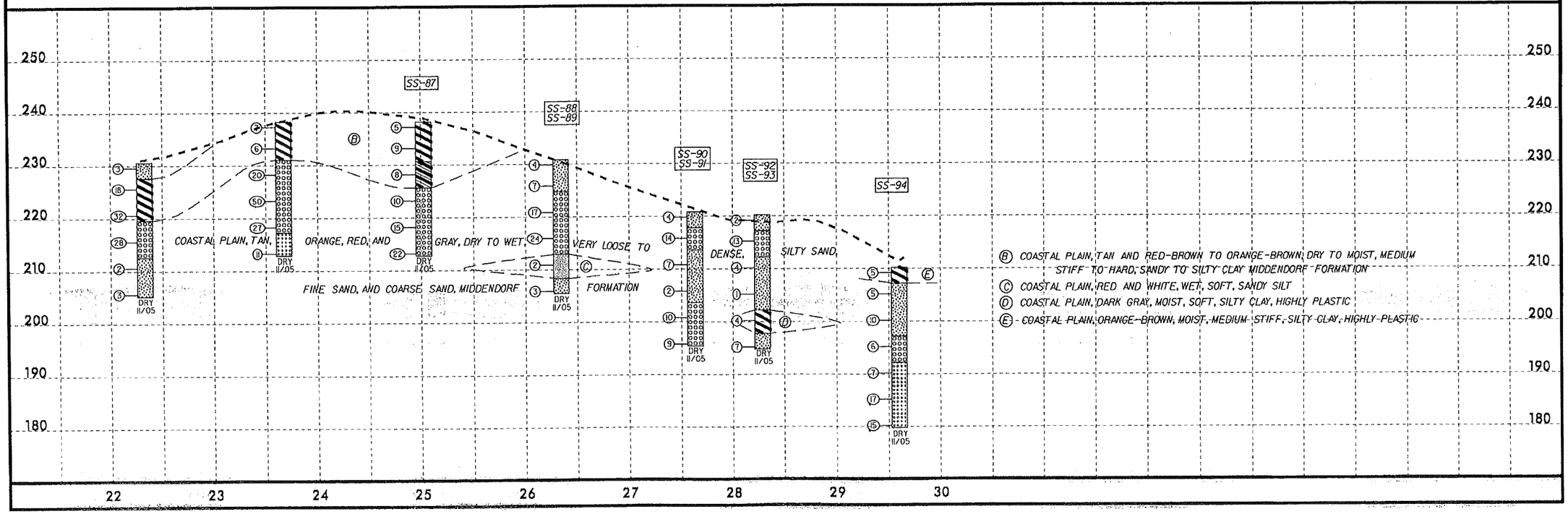
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PLAN AND PROFILE OF NOISE WALL



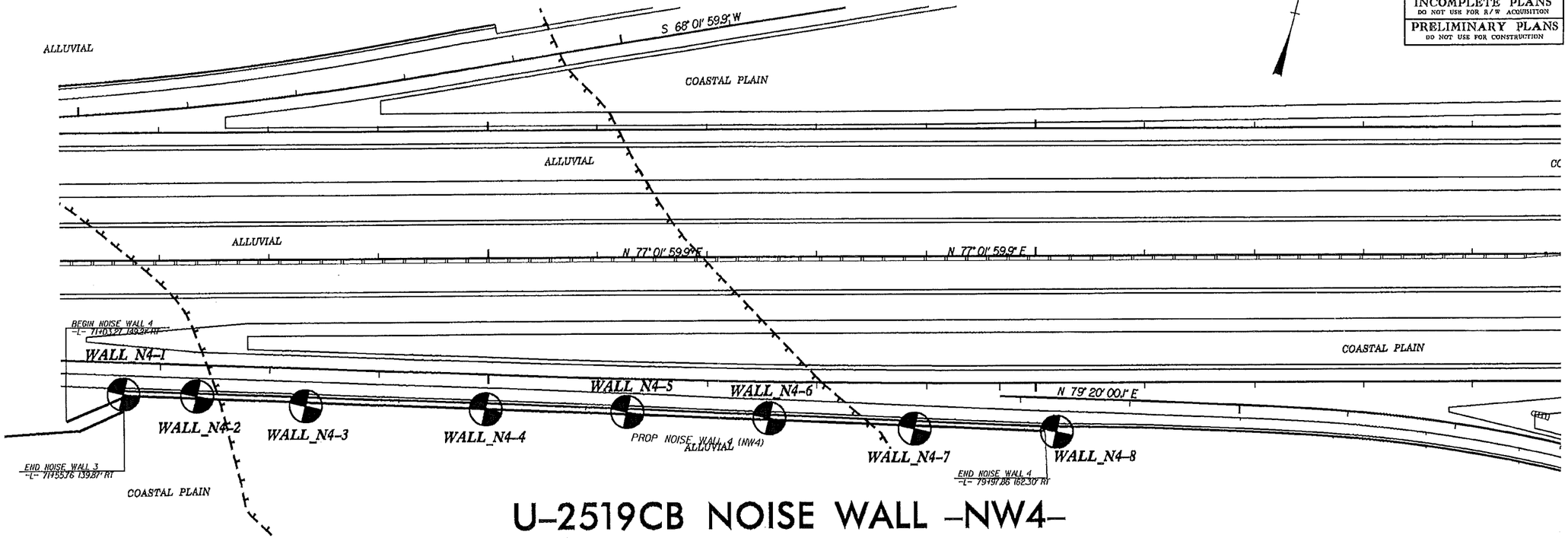
U-2519CB NOISE WALL –NW3–



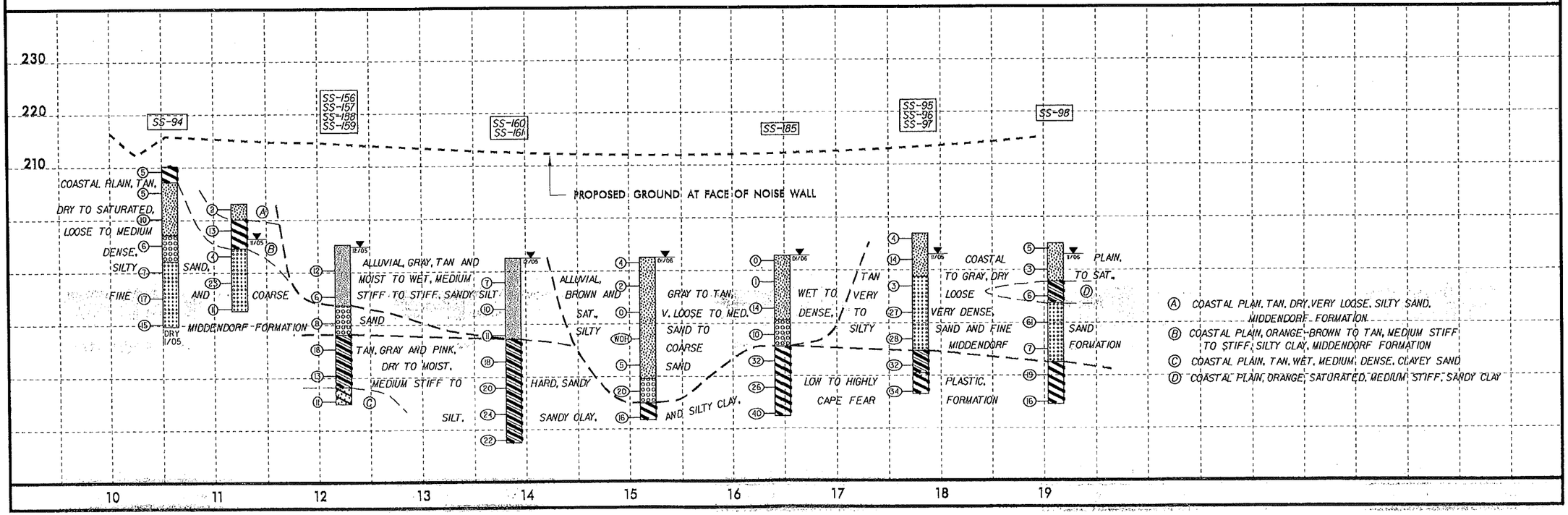
PROJECT REFERENCE NO.	SHEET NO.
U-2519CB	8
BUILD ALTERNATIVE	

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PLAN AND PROFILE OF NOISE WALL



U-2519CB NOISE WALL -NW4-



PROJ. NO. - 34817.1.2
ID NO. - U-2519CB
COUNTY - CUMBERLAND

WALLN1

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-60	1'RT	10+05	14.0-15.5	A-2-6(0)	29	11	40.6	35.1	4.2	20.1	100	76	29	-	-
SS-61	1'RT	10+05	23.4-25.4	A-2-4(0)	22	NP	50.2	34.3	3.4	12.0	100	73	21	-	-
SS-62	1'RT	11+37	23.4-25.4	A-7-6(7)	41	20	9.4	50.4	12.0	28.1	100	94	50	-	-
SS-63	CL	16+61	14.0-15.5	A-2-7(4)	51	33	43.5	27.6	3.6	25.4	100	74	32	-	-
SS-64	CL	16+61	23.4-25.4	A-3(0)	21	NP	39.6	53.8	1.5	5.1	100	80	9	-	-
SS-65	1'RT	17+92	9.0-10.5	A-7-6(24)	56	33	15.4	15.6	16.2	52.7	100	91	73	-	-
SS-66	CL	19+24	9.0-10.5	A-2-4(0)	21	NP	73.1	15.5	1.2	10.1	97	56	12	-	-
SS-67	1'RT	20+55	23.4-25.4	A-3(0)	24	NP	75.9	21.8	0.3	2.0	96	57	4	-	-
SS-68	CL	21+87	14.0-15.5	A-7-6(76)	102	73	7.1	2.8	19.1	71.0	100	95	91	-	-

WALLN2

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-69	3'LT	10+86	28.9-30.4	A-1-b(0)	24	4	61.8	24.7	4.4	9.1	95	49	20	-	-
SS-70	CL	12+17	14.0-15.5	A-2-6(1)	31	15	42.5	31.4	2.7	23.3	100	78	29	-	-
SS-153	CL	13+48	4.2-5.6	A-4(0)	32	3	31.3	37.5	17.1	14.1	98	74	37	-	-
SS-154	CL	13+48	14.1-15.6	A-2-4(0)	21	NP	18.2	69.4	0.3	12.1	92	82	15	-	-
SS-155	CL	13+48	19.1-20.6	A-7-6(36)	61	34	2.8	8.3	16.2	72.7	100	98	92	-	-
SS-71	1'LT	14+80	4.0-5.5	A-7-5(91)	111	80	2.4	2.2	12.2	83.2	100	98	96	-	-
SS-72	1'LT	14+80	24.0-25.4	A-2-4(0)	26	NP	16.0	75.3	1.6	7.1	95	84	12	-	-
SS-74	1'RT	15+44	4.0-5.5	A-2-7(5)	66	37	54.2	13.3	0.1	32.5	100	69	34	-	-

WALLN3

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-75	2'RT	10+47	4.0-5.5	A-7-6(45)	86	58	15.6	12.0	11.6	60.9	100	90	74	-	-
SS-76	2'RT	10+47	9.0-10.5	A-7-5(84)	108	75	3.9	1.8	17.2	77.1	100	98	95	-	-
SS-78	1'RT	11+79	13.9-15.5	A-7-6(71)	91	64	1.8	3.9	23.3	71.0	100	99	96	-	-
SS-79	CL	13+11	13.9-15.5	A-7-6(71)	98	70	8.1	3.9	19.1	69.0	100	95	89	-	-
SS-80	1'RT	14+43	4.0-5.5	A-7-6(7)	52	32	28.8	36.7	4.1	30.4	100	83	40	-	-
SS-81	1'RT	14+43	9.0-10.5	A-7-6(30)	65	43	9.1	28.0	12.2	50.7	100	95	71	-	-
SS-82	1'RT	14+43	13.9-15.5	A-3(0)	21	NP	73.1	22.3	0.5	4.1	100	62	6	-	-
SS-83	3'LT	15+73	23.9-25.4	A-1-b(0)	19	NP	91.5	7.3	0.2	1.0	100	32	2	-	-
SS-84	8'LT	17+07	9.0-10.5	A-2-4(0)	24	5	51.8	31.5	3.6	13.1	100	72	20	-	-
SS-85	CL	18+39	19.0-20.5	A-2-4(0)	29	7	46.5	30.0	7.4	16.1	100	60	35	-	-
SS-86	4'LT	19+71	4.0-5.5	A-7-6(42)	77	54	13.5	16.7	13.4	56.4	100	94	75	-	-
SS-87	1'LT	25+03	9.0-10.5	A-6(4)	34	16	13.1	51.7	11.1	24.1	100	94	47	-	-
SS-88	7'LT	26+35	19.0-20.5	A-4(5)	31	8	11.7	53.3	14.9	20.1	100	93	75	-	-
SS-89	7'LT	26+35	23.9-25.4	A-2-4(0)	23	NP	24.2	62.2	2.5	11.1	100	91	17	-	-
SS-90	17'LT	27+64	9.0-10.5	A-2-4(0)	24	NP	38.3	44.1	5.5	12.1	100	73	26	-	-
SS-91	17'LT	27+64	14.0-15.5	A-2-4(0)	23	NP	20.1	63.3	4.5	12.1	100	91	21	-	-
SS-92	5'RT	28+29	14.0-15.5	A-2-4(0)	22	NP	20.7	53.5	5.6	20.1	100	90	34	-	-
SS-93	5'RT	28+29	19.0-20.5	A-7-6(23)	55	29	18.7	6.4	18.5	56.3	100	86	77	-	-
SS-94	15'LT	29+60	14.0-15.5	A-1-b(0)	20	NP	71.4	15.4	4.1	9.1	95	50	14	-	-

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-94	3'LT	10+58	14.0-15.5	A-1-b(0)	20	NP	71.4	15.4	4.1	9.1	95	50	14	-	-
SS-156	3'RT	12+24	3.8-5.3	A-4(0)	19	NP	9.5	62.2	12.2	16.1	100	99	41	-	-
SS-157	3'RT	12+24	13.8-15.3	A-1-b(0)	20	NP	83.7	8.1	2.2	6.0	99	27	9	-	-
SS-158	3'RT	12+24	18.8-20.3	A-6(5)	33	19	16.3	38.5	4.7	40.4	100	96	48	-	-
SS-159	3'RT	12+24	28.7-30.2	A-2-6(0)	33	19	72.2	7.6	2.0	18.1	95	44	20	-	-
SS-160	CL	13+88	3.6-5.1	A-4(0)	20	NP	30.3	17.7	49.0	3.0	96	79	51	-	-
SS-161	CL	13+88	18.6-20.1	A-6(4)	29	14	9.1	47.0	7.6	36.3	100	93	51	-	-
SS-185	2'LT	16+48	19.0-20.5	A-7-6(41)	63	41	1.8	13.6	31.9	52.7	100	99	91	-	-
SS-95	3'RT	17+80	4.0-5.5	A-2-4(0)	21	NP	16.6	68.6	5.7	9.1	100	98	22	-	-
SS-96	3'RT	17+80	23.9-25.4	A-6(10)	34	16	0.8	35.6	25.4	38.2	100	100	75	19.6	-
SS-97	3'RT	17+80	28.9-30.4	A-7-6(18)	42	21	0.4	23.9	27.4	48.3	100	100	84	-	-
SS-98	CL	19+11	23.9-25.4	A-7-6(18)	44	23	4.2	23.7	21.7	50.3	100	98	78	-	-