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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-2500AB	1	22

REFERENCE: B-2500AB

PROJECT: 32635

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *DARE*

PROJECT DESCRIPTION *NC HWY 12 OVER PEA ISLAND BREACH*

SITE DESCRIPTION *BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75*

CONTENTS

CAUTION NOTICE

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

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

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

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

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W. DUGGINS, CWC

INVESTIGATED BY *CATLIN ET AL.*

DRAWN BY *STEVEN HUDSON, LG*

CHECKED BY *CATLIN*

SUBMITTED BY *STEVEN HUDSON*

DATE *AUGUST 2015*

NORTH CAROLINA LICENSED SEAL 1583 GEOLOGIST STEVEN V. HUDSON

DocuSigned by: Steve Hudson 8/24/2015
62EFD8818E445F... SIGNATURE DATE

NOT CONSIDERED FINAL UNLESS ALL SIGNATURES ARE COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

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

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 7/8 " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: SURVEY CONDUCTED WITH TRIMBLE 5800 GPS AND TSC2 DATA COLLECTOR USING RTK

ELEVATION: FEET

NOTES:

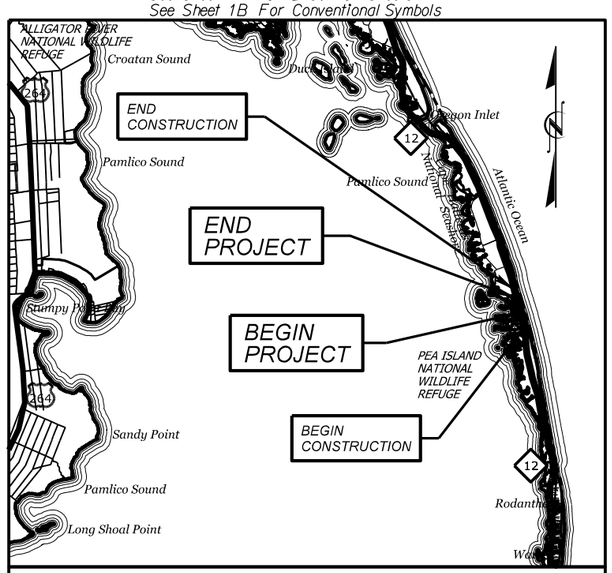
COORDINATE SYSTEM = NORTH CAROLINA STATE 1983
PROJECT DATUM = NORTH AMERICAN DATUM 1983 (CONUS)
ZONE = NORTH CAROLINA 3200
GEOID MODEL = GEOID03 (CONUS)
ALL UNITS = US FEET

DATE: 8-15-14

TIP PROJECT: B-2500AB

CONTRACT: C203756

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP N.T.S.

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

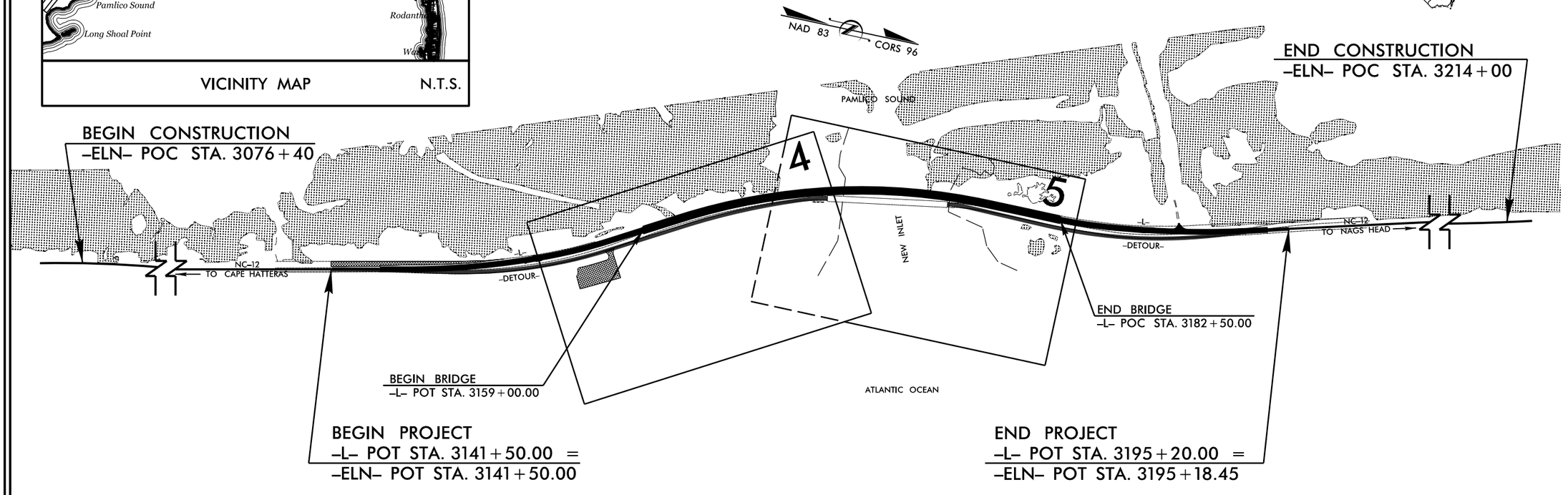
DARE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-2500AB	3	22

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
32635.1.3	BRNHF-0012(62)	P.E.
32635.3.9	BRNHF-0012(62)	CONSTR.

LOCATION: PHASE II, NC-12 SHORT-TERM IMPROVEMENTS AT PEA ISLAND

TYPE OF WORK: GRADING, PAVING, DRAINAGE & STRUCTURE



GRAPHIC SCALES

PLANS 50 25 0 50 100

PROFILE (HORIZONTAL) 50 25 0 50 100

PROFILE (VERTICAL) 10 5 0 10 20

DESIGN DATA
(B-2500A DATA)

ADT 2012 = 7,300
ADT 2032 = 10,900
K = N/A %
D = N/A %
T = 6% % **
* V = 55 MPH
** (TTST 1%, DUAL 5%)

FUNC CLASS = COLLECTOR

REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-2500AB = 0.572 MILES
LENGTH STRUCTURE TIP PROJECT B-2500AB = 0.445 MILES

TOTAL LENGTH TIP PROJECT B-2500AB = 1.017 MILES

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh, NC 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: N/A

LETTING DATE: OCTOBER 20, 2015

GARY LOVERING, PE
PROJECT ENGINEER

CHRISTOPHER H. LEE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 024897 ENGINEER John W. Twisdale P.E.

SIGNATURE:

ROADWAY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 025873 ENGINEER GARY R. LOVERING P.E.

SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	4
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

0 50 100
FEET

SKEW = 90°

3160

3165

3170

B8-A
(B-18)

B11-B
(B-56)

B19-A
(B-57)

B18-B
(B-19)

B3-B
(B-55)

N 29° 41' 33.0" W

NC 12 30' BST

MATCHLINE SEE SHEET
-L- STA. 3170+90

B 23 BENT LINE
B 22 BENT LINE
B 21 BENT LINE
B 20 BENT LINE
B 19 BENT LINE
B 18 BENT LINE
B 17 BENT LINE
B 16 BENT LINE
B 15 BENT LINE
B 14 BENT LINE
B 13 BENT LINE
B 12 BENT LINE
B 11 BENT LINE
B 10 BENT LINE
B 9 BENT LINE
B 8 BENT LINE
B 7 BENT LINE
B 6 BENT LINE
B 5 BENT LINE
B 4 BENT LINE
B 3 BENT LINE
B 2 BENT LINE
B 1 BENT LINE
EB1 BENT LINE

REVISIONS

8/17/99

20-AUG-2015 11:09
S:\wpmkt\PROJECT\2015\15078_NCDOT B-2500B RODANTHE BRIDGE\B2500_RevisedPeaIsland\B2500AB\B2500AB_GEO_BRDG_Breach-Revised\CADD_GEOTECH\Site&Sub\B2500AB_GEO_Rdy_psh01.dgn
jmcgregor
ET DWF2PRESENT.P

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	5
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

0 50 100
FEET

SKEW = 90°

B35-A
(B-59)

B31-B
(B-58)

B32-B
(TER-B1)

B38-B
(B-21)

B43-B
(B-60)

MTL CHECKER PLATE

MATCHLINE SEE SHEET
STA. 3170+90

N 07°10'21" E

NC 12 30' BST

3175

3180

B 24 BENT LINE
B 25 BENT LINE
B 26 BENT LINE
B 27 BENT LINE
B 28 BENT LINE
B 29 BENT LINE
B 30 BENT LINE
B 31 BENT LINE
B 32 BENT LINE
B 33 BENT LINE
B 34 BENT LINE
B 35 BENT LINE
B 36 BENT LINE
B 37 BENT LINE
B 38 BENT LINE
B 39 BENT LINE
B 40 BENT LINE
B 41 BENT LINE
B 42 BENT LINE
B 43 BENT LINE
B 44 BENT LINE
B 45 BENT LINE
B 46 BENT LINE
EB2 BENT LINE

REVISIONS

8/17/99

20-AUG-2015 11:11
S:\wpmktg\PROJECT\2015\215078_NCDOT B-2500B RODANTHE BRIDGE\B2500_RevisedPeaIsland\B2500AB\B2500AB_GEO_BRDG_Breach-Revised\CADD_GEOTECH\Site&Sub\B2500AB_GEO_Rdy_psh02.dgn
dmcferren
ET DMCFERRENPW

PROJECT REFERENCE NO.	SHEET NO.
B-2500	6

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

EB 1 | IB 1 | IB 2 | IB 3 | IB 4 | IB 5 | IB 6 | IB 7 | IB 8 | IB 9 | IB 10 | IB 11 | IB 12 | IB 13 | IB 14 | IB 15 | IB 16 | IB 17 | IB 18 | IB 19 | IB 20

BEGIN BRIDGE
STA 3159+00 +/-

B3-B (B-55) 52 RT
B8-A (B-18) 2 LT
B11-B (B-56) 1 RT
B18-B (B-19) 46 RT
B19-A (B-57) 14 LT

LOOSE,GRAY TO BROWN,F.TO CSE.SAND TO SILTY,F.TO CSE.SAND.WET TO SAT.(U.C.P.)
MED.DENSE,GRAY,TAN,AND BROWN, SILTY,F.TO CSE.SAND.SAT. (U.C.P.)
LOOSE,DARK BROWN,SILTY, F.SAND.STRONG ORG.ODOR.SAT.
MED.DENSE,GRAY,BROWN,AND TAN, F.TO CSE.SAND TO SILTY,F.TO CSE.SAND, TR.ORG.IN TOP OF STRATUM.SAT.
MED.DENSE, DARK GRAY,SILTY,F.TO CSE.SAND. WET TO SAT.
STIFF TO HARD,DARK GRAY BROWN, F.SANDY SILT.WET TO SAT.
LOOSE TO V.LOOSE,GRAY TO DARK GRAY, SILTY,F.SAND W/SOME LAYERS OF MED.STIFF SANDY SILT.TR.TO HIGH SHELL FRAGS.SAT.
V.DENSE TO DENSE,SILTY, F.SAND W/NO TO LITTLE SHELL FRAGS.SAT.
MED.DENSE W/LOOSE LAYERS, LIGHT TO DARK GRAY, F.SAND TO SILTY/CLAYEY,F.TO CSE.SAND, TR.TO HIGH SHELL CONTENT W/INTER BEDDED CLAY LENSES (0.5 FT).WET TO SAT.
LOOSE,GRAY,SILTY/CLAYEY,F.SAND W/SOME LENSES OF CLAY OR SILT.
DENSE TO V.DENSE,GRAY TO BROWN, F.TO CSE.SAND W/INTER BEDDED CLAY LENSES
V.STIFF,GRAY,F.SANDY SILT W/LAYERS OF SILTY SAND.WET.

LOOSE TO MED.DENSE,TAN,BROWN, AND GRAY,F.SAND AND SILTY,F.TO CSE.SAND,MOI.TO WET.(ROADWAY EMBANKMENT)
MED.DENSE,DARK BROWN TO BROWN, SILTY,F.TO CSE.SAND, STRONG ORG.ODOR.SAT.(U.C.P.)
LOOSE,DARK BROWN TO GRAY, SILTY,F.TO CSE.SAND, SOME WELL ROUNDED F.GRAVEL, ORGANIC ODOR W/TR.ORG.SAT.
MED.DENSE, GRAY BROWN,SILTY,F.SAND TO F.SAND.SAT.
DENSE TO V.DENSE,GRAY TO GRAY BROWN, F.SAND TO SILTY,F.SAND.SAT.
MED.TO V.DENSE,GRAY TO DARK GRAY, SILTY,F.TO CSE.SAND TO F.TO CSE.SAND SOME LAYERS OF V.STIFF SANDY SILT.SAT.
MED.DENSE W/LOOSE LAYERS, LIGHT TO DARK GRAY, F.SAND TO SILTY,CLAYEY,F.TO CSE.SAND, TR.TO HIGH SHELL CONTENT W/INTER BEDDED CLAY LENSES (0.5 FT).WET TO SAT.
MED.DENSE TO DENSE, GRAY,SILTY,F.SAND.WET TO SAT.
V.STIFF,GRAY,F.SANDY TO CLAYEY SILT.WET.

MED.DENSE TO LOOSE,BROWN TO GRAY, F.SAND TO SILTY,F.SAND, TR.TO LITTLE CSE.SAND.(U.C.P.)
VERY LOOSE TO LOOSE,BROWN TO GRAY,F.SAND.SAT.
V.LOOSE,BROWN,F.SAND W/LITTLE ORG.(WOOD FRAGS) SAT.
STIFF,DARK GRAY,SANDY CLAY.WET.
LOOSE,GRAY,SILTY/CLAYEY,F.SAND W/SOME LENSES OF CLAY OR SILT.
LOOSE,GRAY,SILTY,F.SAND.WET TO SAT.

MATCH LINE A

STIFF TO V.STIFF,GRAY, SANDY SILT TO SILTY CLAY
LOOSE TO MED.DENSE,GRAY, F.SAND W/SHELL FRAGS.
V.DENSE,GRAY, F.SAND W/SHELL FRAGS.

3157+00 | 3158+00 | 3159+00 | 3160+00 | 3161+00 | 3162+00 | 3163+00 | 3164+00 | 3165+00 | 3166+00 | 3167+00 | 3168+00 | 3169+00 | 3170+00

5/14/99

J9-AUG-2015 16:49
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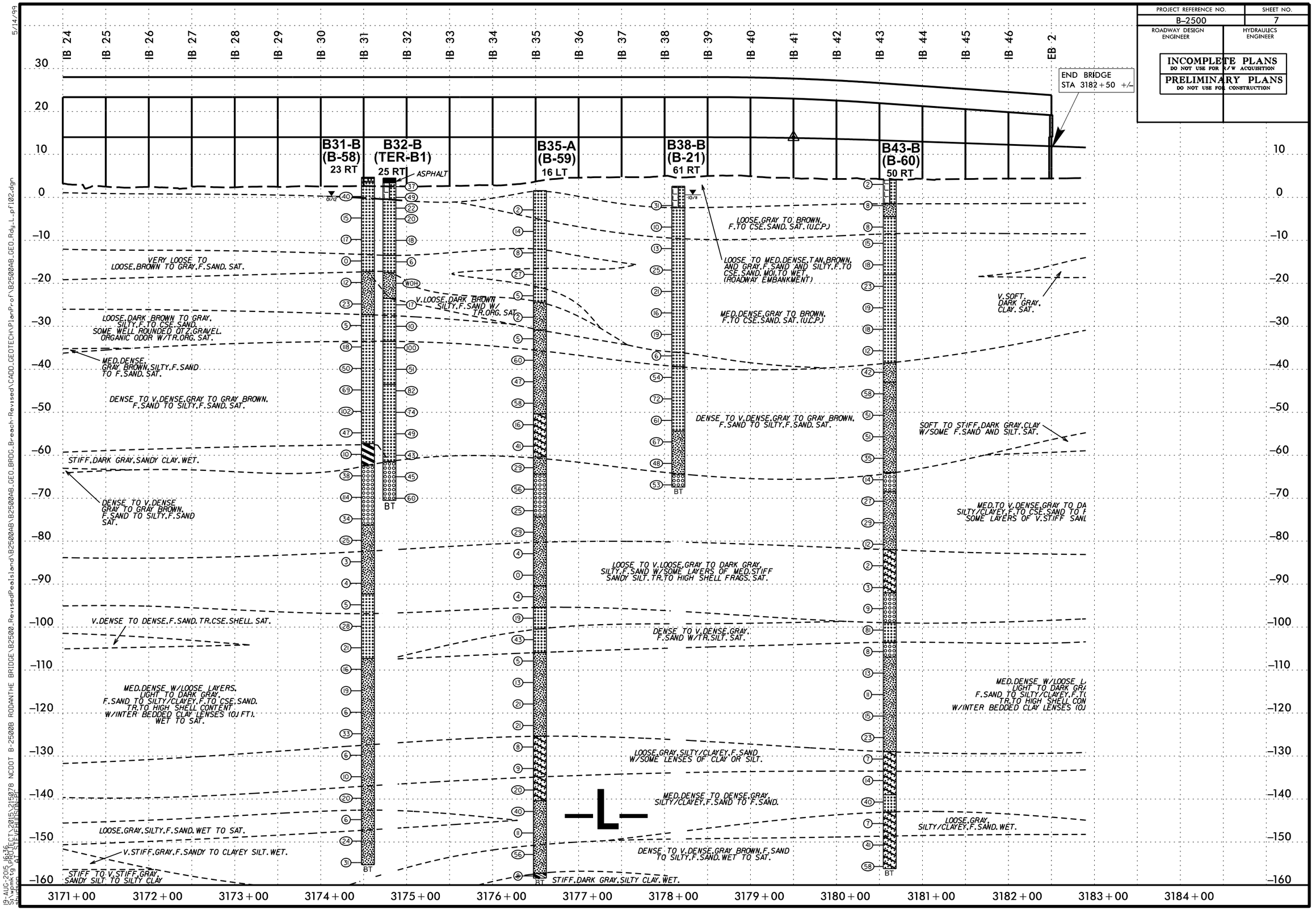
dwrdsgn at STEVEHILTSLEY

PROJECT REFERENCE NO.	SHEET NO.
B-2500	7
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



GEOTECHNICAL BORING REPORT
BORE LOG

CATLIN Engineers and Scientists
220 Old Dairy Road
Wilmington, NC 28405
Corporate Licensure No. for Engineering Services C-0585
215078

PROJECT REFERENCE NO.	SHEET
B-2500AB	8

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Tom Stetler
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B3-B (B-55)	**STATION** 3160+57	**OFFSET** 52ft RT	**ALIGNMENT** -L- **0 HR.** 5.4
COLLAR ELEV. 4.2 ft	**TOTAL DEPTH** 155.4 ft	**NORTHING** 721,284	**EASTING** 3,044,353 **24 HR.** 4.2
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 92% 11/16/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER CATLIN	**START DATE** 01/31/12	**COMP. DATE** 02/01/12	**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)
5										
	4.2	0.0								4.2 0.0 LAND SURFACE
			2	3	5	8		M		2.7 1.5 ROADWAY EMBANKMENT Light brown, f. SAND w/tr. shell frags. Geotextile fabric at base of sample. Loose.
0	-0.7	4.9						▼		COASTAL PLAIN Light grayish brown, f. SAND w/tr. to no shell frags. and cse. sand. Poorly graded. Loose grading to med. dense.
			6	4	4	8		Sat.		
-5	-4.7	8.9								
			4	4	5	9		Sat.		
-10	-9.7	13.9								
			4	5	7	12		Sat.		
-15	-14.7	18.9								
			3	5	6	11		Sat.		
-20	-19.7	23.9								
			4	5	7	12		Sat.		-18.3 22.5 Dark brown, Silty, f. SAND. Strong organic odor. Med. dense.
-25	-24.7	28.9								
			3	7	6	13		Sat.		-23.8 28.0 Brown to light brown, f. SAND w/tr. silt. Poorly graded. Strong "odor" at top of interval. Med. dense.
-30	-29.7	33.9								
			4	6	8	14		Sat.		
-35	-34.7	38.9								
			5	7	7	14		Sat.		
-40	-39.7	43.9								
			4	4	7	11		Sat.		-43.8 48.0 Grayish brown, Silty, f. SAND. Poorly graded. Med. to v. dense.
-45	-44.7	48.9								
			4	6	15	21		Sat.		
-50	-49.7	53.9								
			14	23	35	58		W		
-55	-54.7	58.9								
			10	15	15	30		W		
-60	-59.7	63.9								-58.8 63.0 Dark gray, f. Sandy SILT. Low plast. Poorly graded. V. stiff.
			6	12	18	30		W		
-65	-64.7	68.9								-63.8 68.0 Gray, Silty, cse. to f. SAND w/shell frags. Well graded. Dense.
			4	9	30	39		Sat.		-66.8 71.0 Driller noted "hard" layering at top of interval.
-70	-69.7	73.9								Gray, Silty, f. SAND w/tr. shell frags. Dense to med. dense.
			10	20	27	47		Sat.		
-75	-74.7	78.9								

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-75						Match Line				
			10	15	21	36		Sat.		Gray, Silty, f. SAND w/tr. shell frags. Dense to med. dense. *(continued)*
-80	-79.7	83.9								
			6	8	9	17		Sat.		-82.8 87.0 Gray, Silty, f. SAND w/tr. clay grading to Silty/Clayey, f. SAND. Loose to v. loose.
-85	-84.7	88.9								
			2	2	2	4		Sat.		
-90	-89.7	93.9								
			1	2	1	3		Sat.		
-95	-94.7	98.9								-93.8 98.0 Gray, Silty to Clayey, cse. to f. SAND w/little calc. gravels and shell frags. Well graded. Med. dense. Driller noted "hard" layering.
			3	5	6	11		Sat.		-98.8 103.0 Gray, cse. to f. SAND w/little shell frags. V. dense.
-100	-99.7	103.9								
			35	47	42	89		Sat.		-104.3 108.5 Gray, Silty, f. SAND. Poorly graded. Med. dense to dense.
-105	-104.7	108.9								
			4	8	13	21		Sat.		
-110	-109.7	113.9								
			5	8	10	18		W		
-115	-114.7	118.9								
			9	15	21	36		W		-117.8 122.0 Gray, Silty to Silty/Clayey, f. SAND w/tr. shell frags. and shells. Clay content increases w/depth. Med. dense to loose.
-120	-119.7	123.9								
			2	5	10	15		W		
-125	-124.7	128.9								
			5	4	8	12		W		
-130	-129.7	133.9								
			4	3	5	8		W		
-135	-134.7	138.9								
			2	4	5	9		W		
-140	-139.7	143.9								
			3	3	5	8		W		-143.3 147.5 Gray, Silty, cse. to f. SAND w/little to mod. shell content. Dense to v. dense.
-145	-144.7	148.9								
			14	13	21	34		W		
-150	-149.7	153.9								
			12	21	51	72		W		-151.2 155.4 Boring Terminated at Elevation -151.2 ft in Silty, cse. to f. SAND. Coastal Plain

GEOTECHNICAL BORING REPORT
BORE LOG

215078 — CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE NO.	SHEET
B-2500AB	9

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** J. Howard
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B8-A (B-18)	**STATION** 3162+83	**OFFSET** 2ft LT	**ALIGNMENT** -L- — **0 HR.** 0.8
COLLAR ELEV. 4.1 ft	**TOTAL DEPTH** 90.6 ft	**NORTHING** 721,456	**EASTING** 3,044,198 — **24 HR.** 2.5 Caved
DRILL RIG/HAMMER EFF./DATE MAC1145 CME-55LC 87% 10/29/2010		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER AMEC	**START DATE** 10/12/11	**COMP. DATE** 10/12/11	**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))
5										
	4.1	0.0	2	3	3	6		D		4.1 / 0.0 LAND SURFACE
0	0.0	4.1								ROADWAY EMBANKMENT Tan, Silty, f. to cse. SAND w/tr. organics. Loose.
			4	4	5	9		Sat.		1.1 / 3.0 COASTAL PLAIN Gray, Silty, f. to cse. SAND w/tr. shell frags. Loose to med. dense.
-5	-5.1	9.1								
			2	2	4	6		Sat.		
-10	-10.1	14.1								
			4	4	5	9		Sat.		
-15	-15.1	19.1								
			3	5	7	12		Sat.		-18.0 / 22.0 Brown to brown gray, Silty, f. to cse. SAND w/tr. organics. Loose to med. dense.
-20	-20.1	24.1								
			2	2	5	7		Sat.		
-25	-25.1	29.1								
			4	5	7	12		Sat.		
-30	-30.1	34.1								
			2	3	4	7		Sat.		-32.0 / 36.0 Gray grading to dark gray, Silty, f. to cse. SAND w/tr. shell frags. Med. dense to dense.
-35	-35.1	39.1								
			3	4	6	10		Sat.		
-40	-40.1	44.1								
			4	8	9	17		Sat.		
-45	-45.1	49.1								
			18	20	22	42		Sat.		
-50	-50.1	54.1								
			6	10	10	20		Sat.		
-55	-55.1	59.1								
			9	17	20	37		Sat.		
-60	-60.1	64.1								
			5	9	3	12		Sat.		-59.0 / 63.0 Dark gray, Sandy SILT. Stiff.
-65	-65.1	69.1								
			14	22	28	50		Sat.		-64.0 / 68.0 Gray, Silty, f. to cse. SAND w/few shell frags. V. dense.
-70	-70.1	74.1								
			24	44	21	65		Sat.		
-75										

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** J. Howard
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B8-A (B-18)	**STATION** 3162+83	**OFFSET** 2ft LT	**ALIGNMENT** -L- — **0 HR.** 0.8
COLLAR ELEV. 4.1 ft	**TOTAL DEPTH** 90.6 ft	**NORTHING** 721,456	**EASTING** 3,044,198 — **24 HR.** 2.5 Caved
DRILL RIG/HAMMER EFF./DATE MAC1145 CME-55LC 87% 10/29/2010		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER AMEC	**START DATE** 10/12/11	**COMP. DATE** 10/12/11	**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
-75						Match Line				
	-75.1	79.1	23	38	36	74		Sat.		Gray, Silty, f. to cse. SAND w/few shell frags. V. dense. *(continued)*
-80	-80.1	84.1								
			29	44	41	85		Sat.		
-85	-85.1	89.1								-84.0 / 88.0
			3	3	3	6		Sat.		-86.6 / 90.6 Gray, Sandy SILT w/tr. shells and clay. Med. stiff.

Boring Terminated at Elevation -86.6 ft in Sandy SILT. Coastal Plain

1) Boring advanced w/3" Roller Cone
2) Casing set to 29.0 ft. BLS

NCDOT BORE DOUBLE B2500AB_GEO_BRDG_CATLIN.GPJ CATLIN.GDT 08/19/15

GEOTECHNICAL BORING REPORT
BORE LOG

CATLIN Engineers and Scientists
220 Old Dairy Road
Wilmington, NC 28405
Corporate Licensure No. for Engineering Services C-0585
215078

PROJECT REFERENCE NO.	SHEET
B-2500AB	10

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Tom Stetler
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B11-B (B-56)	**STATION** 3164+73	**OFFSET** 1ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 4.6 ft	**TOTAL DEPTH** 160.5 ft	**NORTHING** 721,629	**EASTING** 3,044,120	**24 HR.** 4.8
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 92% 11/16/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER CATLIN	**START DATE** 01/26/12	**COMP. DATE** 01/31/12	**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))
5										
	4.6	0.0	1	2	3	5		M		4.6 / 0.0 LAND SURFACE
0	0.6	4.0	5	5	7	12		W		ROADWAY EMBANKMENT Brown, f. SAND w/tr. root and shell frags. Loose. 1.6 / 3.0 COASTAL PLAIN Brown, f. SAND grading to cse. to f. SAND. Layers w/tr. cse. sand and shell frags. Loose w/med. dense at top.
-5	-4.4	9.0	2	2	2	4		Sat.		
-10	-9.4	14.0	4	2	2	4		Sat.		
-15	-14.4	19.0	3	2	2	4		Sat.		
-20	-19.4	24.0	8	14	18	32		Sat.		-18.4 / 23.0 Dark brown, Silty, f. SAND. Strong organic odor. Poorly graded. Dense.
-25	-24.4	29.0	6	9	11	20		Sat.		-23.4 / 28.0 Light brown, f. SAND w/tr. silt. Poorly graded. Med. dense.
-30	-29.4	34.0	3	4	4	8		Sat.		-28.4 / 33.0 Dark brown, Silty, cse. to f. SAND w/little white, well rounded quartzite gravels. Well graded. Loose.
-35	-34.4	39.0	2	3	3	6		Sat.		-31.9 / 36.5 Grayish brown, Silty, f. SAND. Mod. to poorly graded. Loose.
-40	-39.4	44.0	2	2	6	8		Sat.		-43.4 / 48.0 Grayish brown, Silty, f. SAND. Poorly graded. Med. to v. dense.
-45	-44.4	49.0	13	21	20	41		Sat.		
-50	-49.4	54.0	12	13	15	28		Sat.		
-55	-54.4	59.0	15	25	28	53		Sat.		
-60	-59.4	64.0	3	3	5	8		Sat.		-57.9 / 62.5 Dark grayish brown, f. Sandy SILT w/tr. silty clay. Low plast. Med. stiff.
-65	-64.4	69.0	18	36	45	81		Sat.		-63.4 / 68.0 Gray, Silty, cse. to f. SAND w/abundant shell frags. Well graded. V. dense.
-70	-69.4	74.0	8	28	32	60		Sat.		-66.4 / 71.0 Gray, f. SAND. Little shell frags. V. dense. (Driller noted hard ~2ft hard layer from 76ft to 78ft)
-75	-74.4	79.0								-73.4 / 78.0

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-75						Match Line				
	-79.4	84.0	10	16	25	41		Sat.		Gray, Silty, f. SAND. Tr. shell frags. Dense grading to loose. *(continued)*
-80			5	4	5	9		Sat.		
-85	-84.4	89.0	2	3	2	5		Sat.		
-90	-89.4	94.0	2	2	2	4		Sat.		
-95	-94.4	99.0	3	4	7	11		Sat.		-92.9 / 97.5 Gray, Clayey, cse. to f. SAND w/abundant shell frags. Well graded. Med. dense.
-100	-99.4	104.0	12	22	31	53		W		-96.9 / 101.5 Gray, Silty, f. SAND w/little to no shell frags and clay. Dense grading to med. dense. (NOTE: No sample return from sample collected at 144ft)
-105	-104.4	109.0	5	15	15	30		W		
-110	-109.4	114.0	5	8	11	19		W		
-115	-114.4	119.0	3	6	13	19		W		
-120	-119.4	124.0	5	8	10	18		W		
-125	-124.4	129.0	3	5	8	13		W		
-130	-129.4	134.0	4	5	5	10		W		
-135	-134.4	139.0	5	5	6	11		W		
-140	-139.4	144.0	7	6	9	15		W		-142.4 / 147.0 Gray, Silty, f. SAND w/little shell frags. and clay to tr. clay. Sand size increases with depth. Dense to v. dense.
-145	-144.4	149.0	14	16	18	34		W		-146.4 / 151.0 Driller noted increased shell frags. in cuttings
-150	-149.4	154.0	27	30	31	61		W		-148.4 / 153.0
-155	-154.4	159.0								

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Tom Stetler		
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75				**GROUND WTR (ft)**	
BORING NO. B11-B (B-56)	**STATION** 3164+73	**OFFSET** 1ft RT	**ALIGNMENT** -L-	**0 HR.**	N/A
COLLAR ELEV. 4.6 ft	**TOTAL DEPTH** 160.5 ft	**NORTHING** 721,629	**EASTING** 3,044,120	**24 HR.**	4.8
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 92% 11/16/2011		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
DRILLER CATLIN	**START DATE** 01/26/12	**COMP. DATE** 01/31/12	**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			15	41	51	Match Line 92		W		ELEV. (ft) -155.9 DEPTH (ft) 160.5 Boring Terminated at Elevation -155.9 ft in Silty, f. SAND. Coastal Plain 1. NW Casing set to 30.0ft. BLS 2. SW101 & Bentonite drilling mud

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GEOTECHNICAL BORING REPORT
BORE LOG

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215078

PROJECT REFERENCE NO.	SHEET
B-2500AB	12

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** J. Howard
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B18-B (B-19)	**STATION** 3167+93	**OFFSET** 46ft RT	**ALIGNMENT** -L-	**0 HR.** 0.8
COLLAR ELEV. 4.1 ft	**TOTAL DEPTH** 75.5 ft	**NORTHING** 721,942	**EASTING** 3,044,049	**24 HR.** 1.0 Caved
DRILL RIG/HAMMER EFF./DATE MAC1145 CME-55LC 87% 10/29/2010		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER AMEC	**START DATE** 10/17/11	**COMP. DATE** 10/17/11	**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)
5											
	4.1	0.0	1	5	7	12		D		4.1 LAND SURFACE	0.0
										ROADWAY EMBANKMENT Tan, Silty, f. SAND. Med. dense.	
0	0.1	4.0	6	9	10	19		Sat.		1.1	3.0
										COASTAL PLAIN Gray, Silty, f. SAND. Tr. shell frags. at top of strata. Med. dense.	
-5	-4.9	9.0	9	11	12	23		Sat.			
-10	-9.9	14.0	7	9	11	20		Sat.			
-15	-14.9	19.0	8	11	14	25		Sat.		-17.9	22.0
-20	-19.9	24.0	9	15	15	30		Sat.		Brown to gray brown, Silty, f. SAND w/tr. org. Cse. sand and shell frags. at base of strata. Med. dense to loose.	
-25	-24.9	29.0	4	5	6	11		Sat.			
-30	-29.9	34.0	2	3	4	7		Sat.			
-35	-34.9	39.0	8	13	19	32		Sat.		-32.9	37.0
-40	-39.9	44.0	11	13	15	28		Sat.		Gray, Silty, f. to cse. SAND w/tr. shell frags. Dense to med. dense.	
-45	-44.9	49.0	15	22	30	52		Sat.		-43.9	48.0
-50	-49.9	54.0	10	10	22	32		Sat.		Gray, Silty, f. SAND. V. dense. Tr. shell frags. and dense in middle of strata.	
-55	-54.9	59.0	16	21	30	51		Sat.			
-60	-59.9	64.0	7	9	11	20		Sat.		-58.9	63.0
-65	-64.9	69.0	6	7	23	30		Sat.		Dark gray, Sandy SILT w/tr. shell frags. V. stiff.	
-70	-69.9	74.0	14	19	20	39		Sat.		-63.9	68.0
										Gray, Silty, f. to cse. SAND w/few to little shell frags. Dense.	
								Sat.		-71.4	75.5
										Boring Terminated at Elevation -71.4 ft in Silty, f. SAND. Coastal Plain	

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** J. Howard
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B18-B (B-19)	**STATION** 3167+93	**OFFSET** 46ft RT	**ALIGNMENT** -L-	**0 HR.** 0.8
COLLAR ELEV. 4.1 ft	**TOTAL DEPTH** 75.5 ft	**NORTHING** 721,942	**EASTING** 3,044,049	**24 HR.** 1.0 Caved
DRILL RIG/HAMMER EFF./DATE MAC1145 CME-55LC 87% 10/29/2010		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER AMEC	**START DATE** 10/17/11	**COMP. DATE** 10/17/11	**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
-75						Match Line				1) Boring advanced w/3" Roller Cone 2) Casing set to 29.0 ft. BLS

NCDOT BORE DOUBLE B2500AB_GEO_BRDG_CATLIN.GPJ CATLIN.GDT 08/19/15

GEOTECHNICAL BORING REPORT
BORE LOG

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PROJECT REFERENCE NO.	SHEET
B-2500AB	13

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Stetler/Heter
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B19-A (B-57)	**STATION** 3168+64	**OFFSET** 14ft LT	**ALIGNMENT** -L- **0 HR.** 1.4
COLLAR ELEV. 1.6 ft	**TOTAL DEPTH** 191.0 ft	**NORTHING** 721,991	**EASTING** 3,043,971 **24 HR.** 1.4
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 92% 11/16/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER CATLIN	**START DATE** 01/20/12	**COMP. DATE** 01/25/12	**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)
5										
0										1.6 LAND SURFACE 0.0
										COASTAL PLAIN Brown to dark grayish brown, f. SAND. Uniform. Tr. to little cse. sand and tr. to no shell frags. Loose to med. dense.
-5	-2.9	4.5	3	3	3	6		Sat.		
-10	-7.9	9.5	5	6	7	13		Sat.		
-15	-12.9	14.5	3	2	4	6		Sat.		
-20	-17.9	19.5	2	2	2	4		Sat.		-18.9 20.5
										-20.4 Brown, f. SAND w/little wood frags. and tr. shell. Uniform. Strong "pungent oyster bed" odor noted. Loose. 22.0
-25	-22.9	24.5	4	6	7	13		Sat.		Brown, f. SAND. "Oyster bed" odor still present. Med. dense.
	-27.9	29.5	2	2	2	4		Sat.		-26.4 28.0
-30										Olive brown, f. to cse. SAND w/high amounts of sub-angular gravel and quartz grains. Tr. pebbles. Well graded. Loose.
-35	-32.9	34.5	3	3	3	6		Sat.		-31.4 33.0
										Brown, f. SAND w/tr. cse. sand. Uniform. Loose.
-40	-37.9	39.5	3	8	19	27		Sat.		-35.4 37.0
	-42.9	44.5	16	29	31	60		Sat.		Grayish brown, f. SAND. Tr. to little shells at top grading to no shells. Med. to v. dense.
-45										
-50	-47.9	49.5	8	29	32	61		Sat.		
-55	-52.9	54.5	16	23	21	44		Sat.		
-60	-57.9	59.5	8	16	16	32		Sat.		-56.4 58.0
										Grayish brown, Silty, f. SAND w/tr. shell and cse. sand at bottom. Uniform at top an mod. grading at bottom. Dense to med. dense.
-65	-62.9	64.5	4	9	10	19		Sat.		
-70	-67.9	69.5	9	19	23	42		Sat.		-66.4 68.0
										Gray, Silty, f. SAND. tr. cse. sand and shell frags. Dense to med. dense.
-75	-72.9	74.5	5	15	17	32		Sat.		

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Stetler/Heter
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B19-A (B-57)	**STATION** 3168+64	**OFFSET** 14ft LT	**ALIGNMENT** -L- **0 HR.** 1.4
COLLAR ELEV. 1.6 ft	**TOTAL DEPTH** 191.0 ft	**NORTHING** 721,991	**EASTING** 3,043,971 **24 HR.** 1.4
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 92% 11/16/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER CATLIN	**START DATE** 01/20/12	**COMP. DATE** 01/25/12	**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
-75						Match Line				
-80	-77.9	79.5	6	8	10	18		Sat.		Gray, Silty, f. SAND. tr. cse. sand and shell frags. Dense to med. dense. *(continued)*
-85	-82.9	84.5	3	3	2	5		Sat.		-81.4 83.0
-90	-87.9	89.5	2	1	2	3		Sat.		Gray, Silty, f. SAND w/tr. shell frags. Increase in silt content from above. Tr. clay in middle of strata. Loose to v. loose.
-95	-92.9	94.5	2	3	4	7		Sat.		
-100	-97.9	99.5	5	6	4	10		Sat.		-96.4 98.0
-105	-102.9	104.5	14	21	17	38		Sat.		Gray, Silty, cse. to f. SAND w/high shell content. Well graded. Med. dense.
-110	-107.9	109.5	4	4	4	8		Sat.		-101.9 103.5
-115	-112.9	114.5	5	5	7	12		Sat.		Gray, f. SAND. Tr. cse. shell frags. w/some interlayered silty/clayey f. sand at base. Dense to loose.
-120	-117.9	119.5	2	3	3	6		Sat.		-110.9 112.5
-125	-122.9	124.5	3	7	8	15		Sat.		Gray, Silty, f. SAND w/little interlayered clayey, f. sand. Clay content increases w/depth. Tr. shells. Med. dense to loose.
-130	-127.9	129.5	5	6	10	16		W		-131.9 133.5
-135	-132.9	134.5	3	2	4	6		W		Gray, Silty to Clayey, f. SAND. Loose.
-140	-137.9	139.5	9	6	10	16		W		-136.9 138.5
-145	-142.9	144.5	7	12	19	31		W		Gray, Sandy to Clayey SILT. Low plast. Little shell frags. V. stiff.
-150	-147.9	149.5	4	3	6	9		W		-140.4 142.0
-155	-152.9	154.5	6	7	8	15		W		Gray, Silty, f. SAND grading to Clayey, f. SAND. Tr. shell frags. Dense grading to loose.
										-151.9 153.5
										Gray, f. Sandy to Clayey SILT. Low plast. Stiff.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Stetler/Heter		
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75				**GROUND WTR (ft)**	
BORING NO. B19-A (B-57)	**STATION** 3168+64	**OFFSET** 14ft LT	**ALIGNMENT** -L-	**0 HR.**	1.4
COLLAR ELEV. 1.6 ft	**TOTAL DEPTH** 191.0 ft	**NORTHING** 721,991	**EASTING** 3,043,971	**24 HR.**	1.4
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 92% 11/16/2011		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
DRILLER CATLIN	**START DATE** 01/20/12	**COMP. DATE** 01/25/12	**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)
-155						Match Line				
										-156.4 / 158.0
-160								M		Gray, Silty CLAY. Uniform w/tr. shell frags. Low plast. Silt content increases w/depth. Stiff to v. stiff. (No N-value from 159.5ft due to dropped drill string)
	-162.9	164.5	5	5	6	11				
-165								M		
	-167.9	169.5	6	9	10	19				
-170								M		
	-172.9	174.5	4	4	5	9				
-175								M		
	-177.9	179.5	2	3	5	8				-176.9 / 178.5
-180								W		Gray, Clayey, f. SAND w/shell frags. Some Sandy Clay at top of strata. Loose grading to v. dense.
	-182.9	184.5	9	6	8	14				
-185								W		
	-187.9	189.5	29	42	51	93		W		-189.4 / 191.0
										Boring Terminated at Elevation -189.4 ft in Silty, f. SAND. Coastal Plain

1. NW Casing set to 25.0ft. BLS
2. SW101 & Bentonite drilling mud

NCDOT BORE DOUBLE B2500AB_GEO_BRDG_CATLIN.GPJ CATLIN.GDT 08/19/15

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215078

PROJECT REFERENCE NO.	SHEET
B-2500AB	14

GEOTECHNICAL BORING REPORT
BORE LOG

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Corporate Licensure No. for Engineering Services C-0585
215078

PROJECT REFERENCE NO.	SHEET
B-2500AB	15

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** TRB	
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75				**GROUND WTR (ft)**
BORING NO. B31-B (B-58)	**STATION** 3174+55	**OFFSET** 23ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 4.7 ft	**TOTAL DEPTH** 160.0 ft	**NORTHING** 722,576	**EASTING** 3,043,888	**24 HR.** 4.4
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER TERRACON	**START DATE** 01/24/12	**COMP. DATE** 01/25/12	**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)
5										
										4.7 LAND SURFACE 0.0
										4.4 Asphalt 0.3
										3.6 ROADWAY EMBANKMENT 1.1 Stone Base
0	1.2	3.5	11	16	24	40				COASTAL PLAIN Tan, f. SAND w/tr. shell. Med. dense to v. loose.
-5	-3.8	8.5	5	8	7	15				
-10	-8.8	13.5	6	8	9	17				
-15	-13.8	18.5	3	0	0	0				
-20	-18.8	23.5	4	5	7	12				-17.3 22.0 Dark brown, Silt SAND. Med. dense.
-25	-23.8	28.5	8	10	13	23				
-30	-28.8	33.5	4	3	2	5				-27.3 32.0 Gray, f. SAND w/tr. shell. Loose to v. dense.
-35	-33.8	38.5	30	66	52	100+				
-40	-38.8	43.5	19	25	25	50				
-45	-43.8	48.5	18	35	34	69				
-50	-48.8	53.5	39	46	56	100+				
-55	-53.8	58.5	10	21	26	47				-57.3 62.0 Dark gray, f. Sandy CLAY w/silt.
-60	-58.8	63.5	3	7	3	10				
-65	-63.8	68.5	7	16	22	38				-62.3 67.0 Dark gray, Silty, f. to cse. SAND w/some shell intervals. V. dense to dense.
-70	-68.8	73.5	11	60	54	100+				
-75	-73.8	78.5	20	17	17	34				

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** TRB	
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75				**GROUND WTR (ft)**
BORING NO. B31-B (B-58)	**STATION** 3174+55	**OFFSET** 23ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 4.7 ft	**TOTAL DEPTH** 160.0 ft	**NORTHING** 722,576	**EASTING** 3,043,888	**24 HR.** 4.4
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER TERRACON	**START DATE** 01/24/12	**COMP. DATE** 01/25/12	**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
-75						Match Line				-76.3 81.0 Gray, Silty, f. SAND. Loose to med. dense.
-80	-78.8	83.5	10	15	10	25				
-85	-83.8	88.5	4	1	2	3				
-90	-88.8	93.5	3	2	2	4				-92.3 97.0 Gray, f. SAND. Loose to med. dense.
-95	-93.8	98.5	3	2	3	5				
-100	-98.8	103.5	2	8	20	28				
-105	-103.8	108.5	8	11	10	21				
-110	-108.8	113.5	3	6	10	16				-107.3 112.0 Gray, Silty, f. SAND w/tr. shell. Loose to med. dense.
-115	-113.8	118.5	8	10	9	19				
-120	-118.8	123.5	4	2	4	6				
-125	-123.8	128.5	5	16	17	33				
-130	-128.8	133.5	1	3	3	6				
-135	-133.8	138.5	2	4	6	10				
-140	-138.8	143.5	3	8	12	20				
-145	-143.8	148.5	6	3	3	6				
-150	-148.8	153.5	8	10	14	24				
-155	-153.8	158.5	2	7	24	31				

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** TRB		
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75				**GROUND WTR (ft)**	
BORING NO. B31-B (B-58)	**STATION** 3174+55	**OFFSET** 23ft RT	**ALIGNMENT** -L-	**0 HR.**	N/A
COLLAR ELEV. 4.7 ft	**TOTAL DEPTH** 160.0 ft	**NORTHING** 722,576	**EASTING** 3,043,888	**24 HR.**	4.4
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
DRILLER TERRACON	**START DATE** 01/24/12	**COMP. DATE** 01/25/12	**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)
-155						Match Line					
										-155.3 Boring Terminated at Elevation -155.3 ft in Silty, f. SAND. Coastal Plain	160.0
										1. HSA to 5.3ft. 2. 2 15/16" tricone to 178.5ft. 3. NW Casing set to 90ft.	

NCDOT BORE DOUBLE B2500AB_GEO_BRDG_CATLIN.GPJ CATLIN.GDT 08/19/15

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PROJECT REFERENCE NO.	SHEET
B-2500AB	16

GEOTECHNICAL BORING REPORT
BORE LOG

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215078

PROJECT REFERENCE NO.	SHEET
B-2500AB	17

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Alexander, M.J.
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B32-B (TER-B1)	**STATION** 3174+80	**OFFSET** 25ft RT	**ALIGNMENT** -L- **0 HR.** 4.0
COLLAR ELEV. 4.5 ft	**TOTAL DEPTH** 75.0 ft	**NORTHING** 722,601	**EASTING** 3,043,887 **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER TERRACON	**START DATE** 09/07/11	**COMP. DATE** 09/08/11	**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)
5											
										4.5 GROUND SURFACE	0.0
	3.5	1.0	12	16	21	37		M		3.4 4" ASPHALT & 10" STABILIZED SUBGRADE	1.1
0	1.0	3.5	19	23	26	49		M		ROADWAY EMBANKMENT Dense, Gray, Fine **SAND**, (A-3)	
	-1.5	6.0	9	10	12	22		Sat.		-0.5 COASTAL PLAIN Dense to Medium Dense, Gray, Fine **SAND** (A-3)	5.0
-5	-4.0	8.5	7	9	11	20		Sat.			
	-9.0	13.5	9	9	9	18		Sat.			
-10	-14.0	18.5	4	3	3	6		Sat.		-13.5 Loose, Gray, Fine **SAND**, (A-3) with Coarse Sand Seam at 19.5 to 20 feet	18.0
-15	-19.0	23.5	WOH	WOH	WOH	0		Sat.		-17.5 Very Loose, Brown, Silty, Fine **SAND** (A-2-4), with Trace Organic Matter	22.0
-20	-24.0	28.5	4	8	9	17		Sat.		-23.5 Medium Dense, Brown to Gray, Fine **SAND**, (A-3)	28.0
-25	-29.0	33.5	5	5	5	10		Sat.			
-30	-34.0	38.5	19	49	51	100		Sat.		-33.5 Very Dense, Gray, Fine to Coarse **SAND** (A-3), with Moderate to High Shell Content	38.0
-35	-39.0	43.5	21	21	30	51		Sat.			
-40	-44.0	48.5	20	35	47	82		Sat.		-43.5 Very Dense to Dense, Gray to Dark Gray, Fine **SAND**(A-3)	48.0
-45	-49.0	53.5	27	30	44	74		Sat.			
-50	-54.0	58.5	16	24	25	49		Sat.			
-55	-59.0	63.5	8	19	24	43		Sat.		-61.5 Dense to Very Dense, Dark Gray, Fine to Coarse **SAND** (A-1-b), with Trace Silt and High Shell Content	66.0
-60	-64.0	68.5	13	16	29	45		Sat.			
-65	-69.0	73.5	18	29	31	60		Sat.		-70.5 Boring Terminated at Elevation -70.5 ft in fine to coarse SAND with high shell content. Coastal Plain	75.0
-70											

1) Advanced 3-7/8" tricone bit to a depth of 28.5 feet
2) Advanced 2-15/16 tricone between 28.5 to 73.5 feet.
3) Set NW casing to a depth of 30 feet.
4) Used water with SW101 salt water bentonite added as drilling fluid.

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Alexander, M.J.
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B32-B (TER-B1)	**STATION** 3174+80	**OFFSET** 25ft RT	**ALIGNMENT** -L- **0 HR.** 4.0
COLLAR ELEV. 4.5 ft	**TOTAL DEPTH** 75.0 ft	**NORTHING** 722,601	**EASTING** 3,043,887 **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER TERRACON	**START DATE** 09/07/11	**COMP. DATE** 09/08/11	**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
-75						Match Line				

GEOTECHNICAL BORING REPORT
BORE LOG

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PROJECT REFERENCE NO.	SHEET
B-2500AB	18

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** TRB	
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75				**GROUND WTR (ft)**
BORING NO. B35-A (B-59)	**STATION** 3176+55	**OFFSET** 16ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1.6 ft	**TOTAL DEPTH** 160.0 ft	**NORTHING** 722,772	**EASTING** 3,043,833	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER TERRACON	**START DATE** 01/25/12	**COMP. DATE** 01/26/12	**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)
5										
										1.6 LAND SURFACE 0.0
0										COASTAL PLAIN Gray to tan, f. SAND. Poorly graded. V. loose to med. dense.
	-1.9	3.5	2	1	1	2				
-5										
	-6.9	8.5	4	7	7	14				
-10										
	-11.9	13.5	1	3	5	8				
-15										
	-16.9	18.5	5	11	16	27				
-20										
	-21.9	23.5	3	3	2	5				
-25										
	-24.4	26.0								Dark brown, Silty, f. SAND. Tr. org. V. loose.
	-26.9	28.5	1	0	2	2				
-30										
	-30.9	32.5								Gray, Silty, f. SAND w/tr. shells. Loose to med. dense.
	-31.9	33.5	2	2	3	5				
-35										
	-36.9	38.5	16	22	38	60				
-40										
	-41.9	43.5	17	24	23	47				
-45										
	-46.9	48.5	16	26	32	58				
-50										
	-50.4	52.0								Dark gray, Clayey, f. SAND. Med. dense to dense.
	-51.9	53.5	5	6	10	16				
-55										
	-56.9	58.5	18	26	15	41				
-60										
	-60.4	62.0								Gray, Silty, f. SAND. Med. dense.
	-61.9	63.5	9	15	14	29				
-65										
	-64.4	66.0								Tan brown, cse. SAND w/shells. Med. dense to dense.
	-66.9	68.5	42	27	29	56				
-70										
	-71.9	73.5	16	10	15	25				
-75										
	-74.4	76.0								

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-75						Match Line				
	-76.9	78.5	7	12	17	29				Gray, Silty, f. SAND w/some to tr. shells. Med. dense to v. loose. *(continued)*
-80										
	-81.9	83.5	4	2	2	4				
-85										
	-86.9	88.5	1	0	0	0				
-90										
	-90.4	92.0								Gray, Silty, f. SAND w/high SHELL content. Loose
	-91.9	93.5	1	1	3	4				
-95										
	-95.4	97.0								Light gray, f. SAND w/tr. shell. Med. dense.
	-96.9	98.5	4	9	10	19				
-100										
	-100.4	102.0								Gray, f. SAND. Dense.
	-101.9	103.5	21	20	23	43				
-105										
	-105.9	107.5								Gray, Silty, f. SAND w/tr. shells. Loose to med. dense.
	-106.9	108.5	1	2	3	5				
-110										
	-111.9	113.5	5	5	8	13				
-115										
	-116.9	118.5	6	8	13	21				
-120										
	-121.9	123.5	10	8	13	21				
-125										
	-125.4	127.0								Gray, Clayey, f. SAND w/tr. shell. Loose to med. dense.
	-126.9	128.5	2	3	5	8				
-130										
	-131.9	133.5	4	5	4	9				
-135										
	-136.9	138.5	5	8	12	20				
-140										
	-140.4	142.0								Gray, Silty, f. SAND. Dense to loose.
	-141.9	143.5	16	20	20	40				
-145										
	-146.9	148.5	2	3	8	11				
-150										
	-151.9	153.5	30	30	26	56				
-155										

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** TRB	
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75				**GROUND WTR (ft)**
BORING NO. B35-A (B-59)	**STATION** 3176+55	**OFFSET** 16ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1.6 ft	**TOTAL DEPTH** 160.0 ft	**NORTHING** 722,772	**EASTING** 3,043,833	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER TERRACON	**START DATE** 01/25/12	**COMP. DATE** 01/26/12	**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)
-155						Match Line					
	-156.9	158.5	13	3	5	8				Gray, Silty, f. SAND. Dense to loose.	
										(continued) -157.3	158.9
										Dark gray, Silty CLAY. Med. stiff. -158.4	160.0
										Boring Terminated at Elevation -158.4 ft in Silty CLAY. Coastal Plain	

1. NW Casing set to 90ft.

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** A. Ezzell		
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75				**GROUND WTR (ft)**	
BORING NO. B38-B (B-21)	**STATION** 3178+16	**OFFSET** 61ft RT	**ALIGNMENT** -L-	**0 HR.**	N/A
COLLAR ELEV. 2.6 ft	**TOTAL DEPTH** 70.0 ft	**NORTHING** 722,934	**EASTING** 3,043,905	**24 HR.**	2.0
DRILL RIG/HAMMER EFF./DATE TER255 DIEDRICH D-50 77% 07/15/2011		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
DRILLER TERRACON	**START DATE** 10/05/11	**COMP. DATE** 10/05/11	**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)
5											
										2.6 LAND SURFACE	0.0
0										2.3 ROADWAY EMBANKMENT Asphalt Debris Lt. brown, f. to cse. SAND. Med. dense.	0.3
	-0.9	3.5	12	16	15	31		M		-2.4	5.0
-5										COASTAL PLAIN Lt. gray to gray, f. to cse. SAND w/tr. shell frags. at approximately 35 ft. BLS. Loose/Med. dense. V. dense at base of strata.	
	-5.9	8.5	3	4	6	10		Sat.			
-10											
	-10.9	13.5	4	6	7	13		Sat.			
-15											
	-15.9	18.5	8	11	14	25		Sat.			
-20											
	-20.9	23.5	6	8	13	21		Sat.			
-25											
	-25.9	28.5	7	7	9	16		Sat.			
-30											
	-30.9	33.5	6	8	11	19		Sat.			
-35											
	-35.9	38.5	3	3	3	6		Sat.		-39.4	42.0
-40										Gray, f. SAND. Lt. gray w/cse. at top. V. dense.	
	-40.9	43.5	9	22	32	54		Sat.			
-45											
	-45.9	48.5	22	33	39	72		Sat.			
-50											
	-50.9	53.5	22	31	30	61		Sat.			
-55										-54.4	57.0
	-55.9	58.5	21	33	34	67		Sat.		Gray, f. SAND. V. dense to dense.	
-60											
	-60.9	63.5	20	30	18	48		Sat.			
-65										-64.4	67.0
	-65.9	68.5	23	26	27	53		Sat.		Gray, f. to cse. SAND w/high shell content. V. dense.	
										-67.4	70.0
										Boring Terminated at Elevation -67.4 ft in f. to cse. SAND w/high shell content. Coastal Plain	
										1) Boring advanced w/2 15/16" Tricone Carbide bit.	

NCDOT BORE DOUBLE B2500AB_GEO_BRDG_CATLIN.GPJ CATLIN.GDT 08/19/15

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PROJECT REFERENCE NO.	SHEET
B-2500AB	20

GEOTECHNICAL BORING REPORT
BORE LOG

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PROJECT REFERENCE NO.	SHEET
B-2500AB	21

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Tom Stetler
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B43-B (B-60)	**STATION** 3180+62	**OFFSET** 50ft RT	**ALIGNMENT** -L-	**0 HR.** 3.5
COLLAR ELEV. 4.0 ft	**TOTAL DEPTH** 160.2 ft	**NORTHING** 723,179	**EASTING** 3,043,895	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 92% 11/16/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER CATLIN	**START DATE** 02/14/12	**COMP. DATE** 02/15/12	**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)
										4.0 LAND SURFACE	0.0
	4.0	0.0	2	1	1	2		M		ROADWAY EMBANKMENT Tan, f. SAND w/tr. gravel and shell frags. V. loose.	
0	-0.9	4.9	3	4	4	8		Sat.		-1.5 COASTAL PLAIN Dark brownish gray, Silty, f. SAND w/little interlayered cse. sand. Loss of circulation. Geotextile fabric noted @ approx. 5.5ft.	5.5
-5	-5.9	9.9	5	4	4	8		Sat.		-4.5 Brownish gray to gray, f. SAND. Tr. cse. at top. Loose to med. dense.	8.5
-10	-9.7	13.7	6	7	8	15		Sat.			
-15	-14.7	18.7	6	8	10	18		Sat.			
-20	-19.7	23.7	6	10	13	23		Sat.		-18.0 Brownish gray to grayish brown, f. SAND w/tr. silt. Med. dense	22.0
-25	-24.7	28.7	6	9	10	19		Sat.			
-30	-29.7	33.7	9	10	8	18		Sat.			
-35	-34.7	38.7	5	6	6	12		Sat.			
-40	-39.7	43.7	12	17	25	42		W		-38.5 Brown gray, Silty, f. SAND w/tr. cse. and little shell frags. Dense.	42.5
-45	-44.7	48.7	20	28	30	58		W		-43.0 Brownish gray, Silty, f. SAND. Poorly graded. V. dense to dense.	47.0
-50	-49.7	53.7	16	24	27	51		W			
-55	-54.7	58.7	14	25	26	51		W			
-60	-59.7	63.7	8	14	21	35		Sat.			
-65	-64.7	68.7	5	6	8	14		Sat.		-64.0 Gray, Silty, cse. to f. SAND w/mod. shell content. Med. dense.	68.0
-70	-69.7	73.7	8	14	13	27		Sat.		-68.5 Gray, Silty, f. SAND w/no to tr. shell frags. Med. dense.	72.5
-75	-74.7	78.7									

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Tom Stetler
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75			**GROUND WTR (ft)**
BORING NO. B43-B (B-60)	**STATION** 3180+62	**OFFSET** 50ft RT	**ALIGNMENT** -L-	**0 HR.** 3.5
COLLAR ELEV. 4.0 ft	**TOTAL DEPTH** 160.2 ft	**NORTHING** 723,179	**EASTING** 3,043,895	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 92% 11/16/2011		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER CATLIN	**START DATE** 02/14/12	**COMP. DATE** 02/15/12	**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
-75						Match Line				
	-79.7	83.7	6	14	15	29		Sat.		Gray, Silty, f. SAND w/no to tr. shell frags. Med. dense. *(continued)*
-80			5	5	7	12		Sat.		-82.0 86.0
-85	-84.7	88.7	2	1	1	2		Sat.		Gray, Silty, f. SAND w/tr. to little clay and tr. shell frags. V. loose.
-90	-89.8	93.8	2	2	1	3		Sat.		-92.0 96.0
-95	-94.7	98.7	3	4	5	9		Sat.		Gray, Silty to Clayey, cse. to f. SAND. Well graded w/little shell frags. Loose.
-100	-99.7	103.7	30	39	42	81		Sat.		-99.0 103.0
-105	-104.7	108.7	4	4	4	8		Sat.		Gray, f. SAND w/tr. silt and shell frags. V. dense.
-110	-109.7	113.7	4	4	9	13		W		-103.5 107.5
-115	-114.7	118.7	2	3	8	11		W		Gray, Silty to Clayey, cse. to f. SAND w/little shell frags. Well graded. Loose.
-120	-119.7	123.7	4	3	12	15		W		-107.0 111.0
-125	-124.7	128.7	10	11	12	23		W		Gray, Silty, f. SAND w/little interlayered to tr. clay. Med. dense.
-130	-129.7	133.7	3	3	4	7		W		-129.0 133.0
-135	-134.7	138.7	5	5	9	14		W		Gray, Silty to Clayey, f. SAND w/little Sandy Silt and tr. shells. Loose to med. dense.
-140	-139.7	143.7	11	18	22	40		W		-139.0 143.0
-145	-144.7	148.7	2	3	4	7		W		Gray, f. SAND w/tr. silt and shell frags. Dense.
-150	-149.7	153.7	8	21	20	41		W		-143.0 147.0
-155	-154.7	158.7								Gray, Silty to Clayey, f. SAND grades to include interlayered f. Sandy Silt. Loose to V. dense.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 32635	**TIP** B-2500AB	**COUNTY** DARE	**GEOLOGIST** Tom Stetler	
SITE DESCRIPTION BRIDGE ON NC 12 OVER PEA ISLAND BREACH AT -L- STA. 3170+75				**GROUND WTR (ft)**
BORING NO. B43-B (B-60)	**STATION** 3180+62	**OFFSET** 50ft RT	**ALIGNMENT** -L-	**0 HR.** 3.5
COLLAR ELEV. 4.0 ft	**TOTAL DEPTH** 160.2 ft	**NORTHING** 723,179	**EASTING** 3,043,895	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 92% 11/16/2011		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER CATLIN	**START DATE** 02/14/12	**COMP. DATE** 02/15/12	**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				ELEV. (ft) DEPTH (ft)
			9	27	31	58		W		-156.2 160.2
										Boring Terminated at Elevation -156.2 ft in Silty, f. SAND. Coastal Plain
										1. NW Casing set to 9.9ft. BLS
										2. SW101 & Bentonite drilling mud

NCDOT BORE DOUBLE B2500AB_GEO_BRDG_CATLIN.GPJ CATLIN.GDT 08/19/15

CATLIN Engineers and Scientists
220 Old Dairy Road
Wilmington, NC 28405
Corporate Licensure No. for Engineering Services C-0585
215078

PROJECT REFERENCE NO.	SHEET
B-2500AB	22

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-2500AB	1	4

REFERENCE: B-2500AB

PROJECT: 32635

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *DARE*

PROJECT DESCRIPTION *PHASE II, NC-12 SHORT-TERM IMPROVEMENTS AT PEA ISLAND*

SITE DESCRIPTION *WALL 1 AT -L- STA. 3153+50, 20.75' RT*

CONTENTS

CAUTION NOTICE

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

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

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

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

PERSONNEL

CATLIN

INVESTIGATED BY *J.L. STONE*

DRAWN BY *C.P. TURNER*

CHECKED BY *D.N. ARGENBRIGHT*

SUBMITTED BY *D.N. ARGENBRIGHT*

DATE *JULY 2015*

NORTH CAROLINA LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE

DocuSigned by:
Lee Stone
29AA9934F4A2414...
SIGNATURE

7/28/2015
DATE

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-45B
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK:

ELEVATION: FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	3

SITE PLAN

0 50 100
FEET

BEGIN RETAINING WALL -WI-
-WI- POC Sta. 3153+50.00 =
-L- POC STA. 3153+50.00
(20.75' RT.)

END RETAINING WALL -WI-
-WI- POT Sta. 3158+96.37 =
-L- POT STA. 3158+93.81
(20.75' RT.)

-WI- PT Sta. 3157+08.32 =
-L- PT STA. 3157+05.77
(20.75' RT.)

-WI- PCC Sta. 3153+68.76 =
-L- PCC STA. 3153+68.66
(20.75' RT.)

S 29° 41' 33.0" E

2 ROWS OF SANDBAGS

B-17

B-54

-W2-
-L-
-WI-

WLB
WLI
BST
F

3154
3155
3156
3157
3158

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

WALL 1
-W1-

BEGIN RETAINING WALL -W1-
-W1- POC Sta. 3153+50.00 =
-L- POC STA. 3153+50.00
(20.75' RT.)

END RETAINING WALL -W1-
-W1- POT Sta. 3158+96.37 =
-L- POT STA. 3158+93.81
(20.75' RT.)

B-54
3156+49
33' RT

B-17
3157+90
20' RT

02/12

10/11

LOOSE TO MEDIUM DENSE WITH WITH VARYING SILT, CLAY, TRACE TO HIGH

SOME VERY LOOSE, AND SHELL CONTENT ORGANIC CONTENT,

FINE TO COARSE SAND SOME ZONES WITH COASTAL PLAIN

DENSE TO VERY COARSE TO FINE CONTENT

DENSE WITH SOME SAND WITH NO AND

MEDIUM DENSE, TO SOME SILT/CLAY SHELLS

MEDIUM DENSE TO SAND GRADING LATERALLY TO

DENSE STIFF

SILTY/CLAYEY FINE TO COARSE SANDY SILTS AND CLAYS

MEDIUM DENSE COARSE TO FINE SAND AND SOME

TO DENSE WITH HIGH TO NO ZONES WITH INCREASED SILT CONTENT

SHELL CONTENT

LOOSE TO MEDIUM DENSE TO COARSE SAND WITH

SILTY TO CLAYEY, FINE SOME ZONES OF MEDIUM STIFF SANDY SILT

LOOSE TO MEDIUM DENSE

WITH SOME VERY LOOSE

SILTY TO CLAYEY,

FINE TO COARSE SAND

WITH ZONES OF COARSE

SAND WITH SHELLS

MEDIUM DENSE TO FINE SAND WITH SOME CLAYEY, FINE TO

VERY DENSE COARSE SAND TO SILTY/ COARSE SAND

VERY STIFF FINE SANDY SILT, LOW TO MEDIUM PLASTICITY

40 30 20 10 0 –10 –20 –30 –40 –50 –60 –70 –80 –90 –100 –110 –120 –130 –140 –150 –160

3154+00 3155+00 3156+00 3157+00 3158+00 3159+00

5/14/99

28-JUL-2015 11:28
L:\ERO\Greenville Investigation\TIP\B2500AB_GEO_RETWALL 1\CADD_GEOTECH\Site&Sub\B2500AB_GEO_pf1_WALL 1.dgn
default GT (GEOPAK)

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-2500AB	1	4

REFERENCE: B-2500AB

PROJECT: 32635

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *DARE*

PROJECT DESCRIPTION *PHASE II, NC-12 SHORT-TERM IMPROVEMENTS AT PEA ISLAND*

SITE DESCRIPTION *WALL 2 AT -L- STA. 3159+06.19, 20.75' LT*

CONTENTS

CAUTION NOTICE

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

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

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

NOTES:
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2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

CATLIN

INVESTIGATED BY *J.L. STONE*

DRAWN BY *C.P. TURNER*

CHECKED BY *D.N. ARGENBRIGHT*

SUBMITTED BY *D.N. ARGENBRIGHT*

DATE *JULY 2015*

NORTH CAROLINA LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE

DocuSigned by:
Lee Stone
29AA9934F2A2414...
SIGNATURE

7/28/2015
DATE

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-45B
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK:

ELEVATION: FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	3

SITE PLAN

0 50 100

FEET

BEGIN RETAINING WALL -W2-
-W2- POT Sta. 3159+06.19 =
-L- POT STA. 3159+06.19
(20.75' LT.)

-W2- PC Sta. 3161+06.61 =
-L- PT STA. 3157+05.77
(20.75' LT.)

END RETAINING WALL -W2-
-W2- PC STA. 3164+10.14 =
-L- POC STA. 3154+00.00
(20.75' LT.)

S 29° 41' 33.0" E

2 ROWS OF SANDBAGS

B-17

B-54

-W2-

-L-

-W1-

WLB

WL

F

BST

3154

3155

3156

3157

3158

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	4

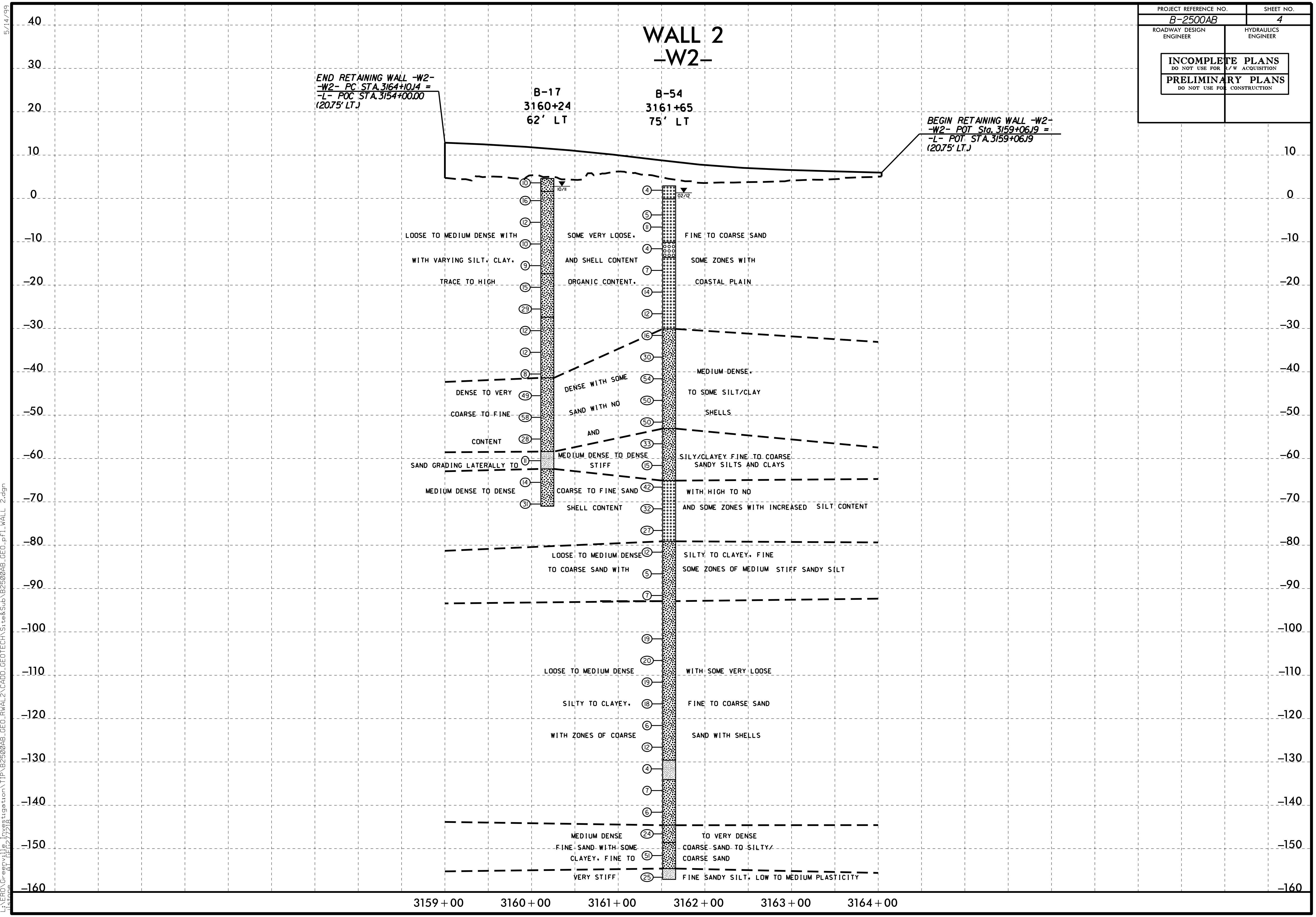
ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

WALL 2
-W2-



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ilstone AT GEG277218

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-2500AB	1	4

REFERENCE: B-2500AB

PROJECT: 32635

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *DARE*

PROJECT DESCRIPTION *PHASE II, NC-12 SHORT-TERM IMPROVEMENTS AT PEA ISLAND*

SITE DESCRIPTION *WALL 3 AT -L- STA. 3186+50, 20.75' LT*

CONTENTS

CAUTION NOTICE

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

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

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

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

PERSONNEL

CATLIN

INVESTIGATED BY *J.L. STONE*

DRAWN BY *C.P. TURNER*

CHECKED BY *D.N. ARGENBRIGHT*

SUBMITTED BY *D.N. ARGENBRIGHT*

DATE *JULY 2015*

NORTH CAROLINA LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE

DocuSigned by:
Lee Stone 7/31/2015
29AA9934F5A2447... SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-45B
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK:

ELEVATION: FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	3

SITE PLAN

0 50 100
FEET

-L- PCC Sta. 3185+51.82

-L- PC Sta. 3182+06.45

3185

3187

3188

3189

3190

B-61

B-22

-W4-

-L-

-W3-

NC 12

30' BST

WLB

WLB

BEGIN RETAINING WALL -W3-
-W3- PT Sta. 3186+50.00 =
-L- POC STA. 3186+50.00
(20.75' LT.)

-W3- PCC Sta. 3187+47.80 =
-L- PCC STA. 3185+51.82
(20.75' LT.)

END RETAINING WALL -W3-
-W3- PC STA. 3190+51.97 =
-L- POC STA. 3182+45.41
(20.75' LT.)

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

WALL 3
-W3-

B-61
3188+44
70' LT

B-22
3189+67
28' LT

BEGIN RETAINING WALL -W3-
-W3- PT Sta. 3186+50.00 =
-L- POC STA. 3186+50.00
(20.75' LT)

END RETAINING WALL -W3-
-W3- PC STA. 3190+51.97 =
-L- POC STA. 3182+45.41
(20.75' LT)

LOOSE DENSE FINE TO COARSE SAND WITH VARYING VERY SOFT SILT, CLAY, AND SHELL CONTENT. SOME ZONES WITH HIGH ORGANIC CONTENT. COASTAL PLAIN

DENSE TO VERY DENSE COARSE TO FINE SAND WITH NO TO SOME SILT/CLAY CONTENT AND SHELLS

MEDIUM DENSE LATERALLY TO SOFT TO CLAYEY FINE TO COARSE SAND GRADING STIFF SANDY SILTS AND CLAYS

MEDIUM DENSE WITH HIGH TO NO SHELL CONTENT AND SOME COARSE TO FINE SAND ZONES WITH INCREASED SILT CONTENT

LOOSE TO MEDIUM DENSE, SILTY TO CLAYEY, FINE TO COARSE SAND

VERY DENSE SOME COARSE SAND AND SHELLS. FINE SAND WITH TRACE TO SILTY TO CLAYEY, FINE SAND IN FEW ZONES

LOOSE TO MEDIUM DENSE SILTY TO CLAYEY, FINE TO COARSE SAND

WITH ZONES OF COARSE SAND WITH SHELLS

(A) LOOSE TO MEDIUM DENSE WITH SOME VERY LOOSE SILTY TO CLAYEY, FINE TO COARSE SAND WITH ZONES OF COARSE SAND WITH SHELLS

MEDIUM DENSE, FINE SAND WITH SOME FINE TO COARSE SAND TO SILTY/CLAYEY, COARSE SAND

MEDIUM DENSE FINE TO COARSE SAND WITH SILTY TO CLAYEY, ZONES OF COARSE SAND WITH SHELLS

VERY DENSE COARSE SAND TO SILTY/CLAYEY. FINE SAND WITH SOME FINE TO COARSE SAND

40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160

3186+00 3187+00 3188+00 3189+00 3190+00 3191+00

5/14/99

30-JUL-2015 10:10
L:\ERO\Greenville Investigation\TIP\B2500AB.GEO.RWAL3\CADD.GEOTECH\Site&Sub\B2500AB_GEO_pf1_WALL 3.dgn
Projector at (Z=27.2)30

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-2500AB	1	4

REFERENCE: B-2500AB

PROJECT: 32635

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *DARE*

PROJECT DESCRIPTION *PHASE II, NC-12 SHORT-TERM IMPROVEMENTS AT PEA ISLAND*

SITE DESCRIPTION *WALL 4 AT -L- STA. 3182+54.52, 20.75' RT*

CONTENTS

CAUTION NOTICE

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

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

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

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

PERSONNEL

CATLIN

INVESTIGATED BY *J.L. STONE*

DRAWN BY *C.P. TURNER*

CHECKED BY *D.N. ARGENBRIGHT*

SUBMITTED BY *D.N. ARGENBRIGHT*

DATE *JULY 2015*

NORTH CAROLINA LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE

DocuSigned by:
Lee Stone 7/31/2015
29AA9934F4A2414... SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-45B
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK:

ELEVATION: FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	3

SITE PLAN

0 50 100

FEET

-L- PC Sta. 3182+06.45

-L- PCC Sta. 3185+51.82

3185

NC 12 30' BST

-W3-

-L-

F

B-22

3183

3184

-W4-

B-61

3185

3186

F

F

BEGIN RETAINING WALL -W4-
-W4- PC STA. 3182+54.52 =
-L- POC STA. 3182+54.52
(20.75' RT.)

END RETAINING WALL -W4-
-W4- PT STA. 3186+02.36 =
-L- PCC STA. 3186+00.00
(20.75' RT.)

-W4- PCC STA. 3185+53.99 =
-L- PCC STA. 3185+51.82
(20.75' RT.)

PROJECT REFERENCE NO.	SHEET NO.
B-2500AB	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

WALL 4
-W4-

B-22
3183+31
14' LT

B-61
3184+56
28' RT

BEGIN RETAINING WALL -W4-
-W4- PC STA 3182+54.52 =
-L- POC STA 3182+54.52
(20.75' RT)

END RETAINING WALL -W4-
-W4- PT STA 3186+02.36 =
-L- PCC STA 3186+00.00
(20.75' RT)

10/8

LOOSE TO DENSE FINE TO COARSE SAND WITH VARYING SILT, CLAY, AND SHELL CONTENT, SOME ZONES WITH HIGH ORGANIC CONTENT, COASTAL PLAIN

DENSE TO VERY DENSE COARSE TO FINE SAND WITH NO TO SOME SILT/CLAY CONTENT AND SHELLS

MEDIUM DENSE SAND GRADING CLAYEY LATERALLY TO FINE TO COARSE STIFF SANDY SILTS AND CLAYS

MEDIUM DENSE WITH HIGH TO NO SHELL CONTENT AND SOME COARSE TO FINE SAND ZONES WITH INCREASED SILT CONTENT

LOOSE TO MEDIUM DENSE SILTY TO CLAYEY, FINE TO COARSE SAND

Ⓐ VERY DENSE SOME COARSE SAND AND SHELLS. FINE SAND WITH TRACE TO SILTY TO CLAYEY, FINE SAND IN FEW ZONES

LOOSE TO MEDIUM DENSE WITH SOME VERY LOOSE SILTY TO CLAYEY, FINE TO COARSE SAND WITH ZONES OF COARSE SAND WITH SHELLS

LOOSE TO MEDIUM-DENSE WITH SOME VERY LOOSE, SILTY TO CLAYEY, FINE TO COARSE SAND WITH ZONES OF COARSE SAND WITH SHELLS

MEDIUM DENSE COARSE SAND TO SILTY/CLAYEY. FINE SAND WITH SOME FINE TO COARSE SAND

MEDIUM DENSE FINE TO COARSE SAND WITH SILTY TO CLAYEY, ZONES OF COARSE SAND WITH SHELLS

VERY DENSE COARSE SAND TO SILTY/CLAYEY. FINE SAND WITH SOME FINE TO COARSE SAND

Ⓐ LOOSE TO MEDIUM DENSE WITH SOME VERY LOOSE SILTY TO CLAYEY, FINE TO COARSE SAND WITH ZONES OF COARSE SAND WITH SHELLS

40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160

3182+00 3183+00 3184+00 3185+00 3186+00 3187+00

5/14/99

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