STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

							F.A. PROJ
			VDERS RIPTION		NO. 22	OVER	BYERS CREEK
<u>ON</u>	SR	1006	(HOWA	ARD GAP	ROAD	AND	APPROXIMATELY
<u>450</u>	FEE	ET OF	NEW	ROADWA	AY ALIC	<u>GNMEN</u>	VTS
ITE	DES	CRIPTI	ON				

STATE STATE PROJECT REPERBNCE NO. SHEET TOTAL SHEETS N.C. R 5207B 1 19

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 BORNIO LOGS. ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GOTTECHNICAL REMINEERING UNIT AT 1991 2550-4088. INTITIET THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

CEMERAL 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 BORNOS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON DONLY TO THE DEGREE OF RELIABILITY INSPENDIT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOSTURE CONDITIONS NIDICATED IN THE SUBSURFACE INVESTICATIONS ARE AS RECORDED AT THE TIME OF THE INVESTICATION. THESE WATER LEVELS OR SOIL MOSISTURE CONDITIONS AND WATER OF THE AVENT OF THE MOSTURE CONDITION THE COMBINED COLUMNIC CONDITIONS THE SUBSURFACE INVESTICATION. THESE WATER LEVELS OR SOIL MOSISTURE CONDITIONS AND WATER OWNED THE MAY CONSIDERABLE 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 DIES NOT WARRANT OR QUARANTEE 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 BIODER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISTY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED IN THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OF 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.

	M. BAHIRADHAN
	J. HAMM
	T. EVANS
	P. ZHANG
_	C. BRUINSMA
	_
 Investigated by	P. Z. , C. B.
	M. BAHIRADHAN
	FALCON ENG.
	APRIL 20, 2011
~···~	

PERSONNEL M. ROBERTSON

20

CONTENTS

TITLE SHEET

SHEET

2

8

9

10-11 12-14

15

16

17

18-19

DESCRIPTION

PROJECT DESCRIPTION

FIELD INVESTIGATION

LABORATORY TESTING CONCLUSIONS

SUBSURFACE PROFILE ALONG -L-

CLOSURE

SITE VICINITY MAP

FINAL BORING LOGS

SITE PHOTOGRAPHS

FIELD SCOUR REPORT

BORING LOCATION PLAN

NCDOT DIVISION OF HIGHWAYS GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION REPORT

SITE DESCRIPTION AND GEOLOGY

FOUNDATION RECOMMENDATIONS

AND BEARING PILE PAY ITEM QUANTITIES

SUMMARY OF FOUNDATION RECOMMENDATIONS

SUBSURFACE CROSS SECTIONS ALONG END BENTS

SOIL CLASSIFICATION AND GRADATION SHEET

COMPACTION AND CBR TEST RESULTS

SOIL AND ROCK LEGEND, TERMS, AND ABBREVIATIONS

SUBSURFACE AND GROUNDWATER CONDITIONS - BRIDGE SUBSURFACE AND GROUNDWATER CONDITIONS - ROADWAY

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

	SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS													
SOIL DESCRIPTION	GRADATION WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	ROCK DESCRIPTION HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED	TERMS AND DEFINITIONS											
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS INTAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 180 BLUN'S PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO TZOE, ASTM 0-1586). SOIL LASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH SEMINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE. **VERY SIFE, FORK, SUT OUR DOST WITH MERGEDOE THE SOM DEFENSION PLASTIC. A7-6	UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE, (ALSO POORLY GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS, ANGULAR, SUBANDULAR, SUBROUNDED, OR ROUNDED.	ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PERETRATION 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 NON-COASTAL PLAIN MATERIAL THAT WOULD VIELD SPT N VALUES > 100	ALLUYIUM (ALLUY.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACCOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACCOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.											
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELOSPAR, MICA, TALC, KAQL.IN, ETC. ARE USED IN DESCRIPTIONS	ROCK (WR) BLOWS PER FOOT IF TESTED. COVETALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	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.											
GENERAL CLASS. GRANULAR MATERIALS CLASS. SILT-CLAY MATERIALS (> 35% PASSING *200) ORGANIC MATERIALS CROUP ORGANIC MATERIALS (> 35% PASSING *200) ORGANIC MATERIALS (> 36% PASSING *200)	WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE COMPRESSIBILITY	MOUCK (CR) MOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE. GRIESS, GABBAD, SCHIST, ETE RON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM											
CLASS. A-1-o A-1-b A-2-4 A-2-5 A-2-7 A-7-8 A-3 A-6, A-7	SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50	ROCK (NCR) SEDIMENTARY ROCK THAI WOULD YELLD SYT REFUSAL IF TESTED, ROCK TYPE	COLLECTION - ROCK PARAMETERS MILED WITH SOIL DEPOSITED BY CHAPTER ON SLOPE OR AT BUTTON OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL											
PASSING SILT- MICK	HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50 PERCENTAGE OF MATERIAL GRANULAR SILT - CLAY	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED (CP) SHELL BEDS, ETC. WEATHERING	LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT											
* 40 39 MX 90 MX 51 MX	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE											
10010 LINIT	LITTLE ORGANIC MATTER 3 - 5% 5 - 12%. LITTLE 18 - 28%. MODERATELY ORGANIC 5 - 18% 12 - 28%. SOME 28 - 35%. HIGHLY ORGANIC >18% >28%. HIGHLY 35%. AND ABOVE	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF	HORIZONTAL. <u>DIP DIRECTION (DIP AZIMUTH) -</u> THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKMISE FROM NORTH.											
ROUP INDEX 0 0 0 4 MX 0 MX 12 MX 16 MX No MX MODERATE AND OFFICE SULT YPES STORE FRACS. THE SILTY OF CLAYEY SILTY CLAYEY OR GRONIC SOILS	GROUND WATER ✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	OF A CRYSTALLINE NATURE. SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO SLIGHT ROCK GENERALLY FRESH, JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.											
F PRIJUE GRIFEL, RIM SAND GRAVEL AND SAND SOILS SOILS MATTER ATTRIBLES SAND SAND FOR SAND SOILS SOILS MATTER ATTRIBLES SAND SAND SAND SAND SOILS SOILS SOILS MATTER ATTRIBLES SAND SAND SAND SOILS S	STATIC WATER LEVEL AFTER 24 HOURS VPW PERCHED WATER SATURATED ZONE OR WATER READING STRATA	CRYSTALS ARE DULL AND DISCOLOREO. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS, IN	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES, FLOOT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM											
AS A EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA OM- SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.											
CONSISTENCY OR DENSENESS CONSISTENCY OR DENSENESS RANGE OF UNCONFINED RANGE OF UNCONFINED RANGE OF UNCONFINED	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SQUIND WHEN STRUCK.	THE STREAM A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.											
PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH (N-VALUE) COMPRESSIVE STRENGTH (TONS/F1?)	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION ROADWAY EMBANKMENT (RE) W/ CORE	IF TESTED, WOULD YIELD SPT REFUSAL SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEGGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO											
GENERALLY VERY LOOSE	ARTIFICIAL FILL (AF) OTHER - CORE BORING GEF)— SPT REFUSAL	(SEV.) IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, YIELDS. SPT N VALUES > 180 BPF	TIS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.											
(NON-COHESIVE) UENSE 30 TO 50 VERY DENSE >50	THAN ROADWAY EMBANKMENT THAN ROADWAY EMBANKMENT MONITORING WELL	VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT IV SEV.) THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH DNLY FRAGMENTS OF STRONG ROCK	MOTILED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.											
GENERALLY SOFT 2 TO 4 0.25 TO 0.50 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE A PIEZOMETER INSTALLATION	REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK MEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF <u>TESTED, YIELDS SPT N VALUES < 100 BPF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE AND VISION OF THE NOT OR THE NOT DISCERNIBLE.	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.											
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 330 >4	****** ALLUVIAL SOIL BOUNDARY SLOPE INDICATOR INSTALLATION 25/825 DIP & DIP DIRECTION OF	SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE.	ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGNENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND											
TEXTURE OR GRAIN SIZE	ROCK STRUCTURES CONE PENETROMETER TEST	ROCK HARDNESS VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE											
J.S. STD. SIEVE SIZE 4 10 40 60 200 270 PENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	SOUNDING ROD ABBREVIATIONS	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND BELATIVELY THIS COMPARED WITH ITS LATERAL EXTENT THAT HAS BEEN FOR APPROXIMATELY THAT HAS BEEN											
BOULDER COBBLE GRAVEL SAND SAND SILT CLAY (BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	TO DETACH HAND SPECIMEN. MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	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											
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	CL CLAY MOD MODERATELY γ - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC γ_d - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF											
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u> DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	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.											
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT CAN BE GROVED OR GOUGED BEADILY 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.	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.											
LASTIC (SAT.) FROM BELOW THE GROUND WATER TABLE	FRAC, - FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS & - MOISTURE CONTENT CR - CALIFORNIA BEARING HI HIGHLY V - VERY RATIO	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES I INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNALL.	STRATA ROCK QUALITY DESIGNATION ISROD - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR CREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.											
RANDE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE (P) PL PLASTIC LIMIT	EQUIPMENT USED ON SUBJECT PROJECT	FRACTURE SPACING BEDDING TERM SPACING TERM THICKNESS	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER,											
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CLAY BITS CLAY BITS MANUAL	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED > 4 FEET WIDE 3 TO 10 FFFT THICKLY BEDDED 1.5 - 4 FEET	BENCH MARK:											
SL SHRINKAGE LIMIT	G'CONTINUOUS FLIGHT AUGER CORE SIZE:	MODERATELY CLOSE 1 TO 3 FEET	BM #12, STA. II+32.78, I5.62' RTY6- ELEVATION: 2095.67 FT. NOTES:											
PLASTICITY		THINLY LAMINATED < 0.008 FEET INDURATION	FIAD - FILLED-IN AFTER DRILLING											
PLASTICITY INDEX (PI) DRY STRENGTH	THING -CARRIDE INSERTS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.												
IONPLASTIC 0-5 VERY LOW OW PLASTICITY 6-15 SLIGHT	X CME-550	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS: GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.												
MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH	PORTABLE HOIST X TRICONE 3 STEEL TEETH POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE:												
COLOR	X CME-55 TRICONE *TUNGCARB. HAND AUGER	BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;												
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY),	X CORE BIT	DIFFICULT TO BREAK WITH HAMMER.												
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	VANE SHEAR TEST	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.												

REVISED 09/23/

PROJECT REFERENCE NO. R 5207B SHEET NO.



April 20, 2011

Mr. Ray Elliot, P.E. TGS Engineers 804-C North Lafayette Street, Suite 141 Shelby, NC 28150

Re: Geotechnical Subsurface Exploration Report

Project No.:

R 5207B

County:

Henderson County

Description:

Bridge # 22 over Byers Creek on SR 1006 (Howard Gap Road)

And approximately 450 feet of new roadway alignments

Falcon Proj. No.:

G11005.00

Dear Mr. Elliot:

As authorized, Falcon Engineering, Inc. (Falcon) has revised the draft geotechnical subsurface exploration report completed by Tierra, Inc. (Tierra), dated December 18, 2006 in accordance with the current NCDOT geotechnical report guidelines for Bridge # 22 over Byers Creek on SR 1006 (Howard Gap Road) in Henderson County, North Carolina. The purpose of this report is to present subsurface conditions and foundation design recommendations for the planned structure. Field and laboratory test results, site and boring location plans, and profiles depicting subsurface conditions may be found in this report.

PROJECT DESCRIPTION

The road in the vicinity of Byers Creek will be realigned southwards with a new bridge located approximately 40 feet south of the existing bridge over Byers Creek. The new alignments on each side of the proposed bridge structure are to be merged to the existing roadway (SR 1006) at a distance of an approximately 200 feet each from its end bents.

The proposed replacement structure is to be located approximately 40 feet downstream of the existing bridge, consisting of a single span, two bent bridge with the proposed bridge length of an approximately 57 feet. The structure is planned to be located between Station 243+57.4 and Station 244+14.6, and have a skew angle of 75°. The bridge width is 39 feet. The bottom of the end bent caps at both end bents will be at elevation near 2,086 feet, based on North American Vertical Datum, 1988 (NAVD), and the finished grade of the structure will be at or near the exiting grade. Hydraulic scour information was not provided at the time of preparing this report.

Based on the standard loads provided by NCDOT for 60 feet long, 39 feet wide, single span low impact bridge, the factored design load for end piles is 81 Tons/pile. Each end bent will consist of a single row of 7 vertical piles spaced at 7 feet at center-to-center. End bent piles will not carry any lateral load.

www.FalconEngineers.com

Engineering | Inspection | Testing | Agency CM
1210 Trinity Road, Suite 110 | Raleigh, North Carolina 27607 | T 919.871.0800 | F 919.871.0803

If any of the above information is incorrect or has changed, please inform Falcon so that we may amend the recommendations presented in this report if appropriate.

SITE DESCRIPTION/GEOLOGY

The proposed project site is located along SR 1006 (Howard Gap Road), approximately two (2) miles south of Fletcher in Henderson County, North Carolina. Existing crossing is a single span bridge supported by vertical abutment walls and wingwalls. The area has a generally rolling terrain with a relatively well developed flood plain and some channel alteration. In general, the surrounding area is residential in use. It is estimated that the floodplain is approximately 70 feet wide at the bridge site. The site area, surrounding the existing bridge structure, consists of standing water and areas covered with grass, bushes and trees. Byers Creek are part of the French Broad River Basin. The French Broad River is approximately 5 miles west of Howard Gap Road.

According to *The Geologic Map of North Carolina* (1985), the project site is located within the Inner Piedmont Physiographic Province, just east of the Brevard Fault Zone. Fletcher and Swainville lie within the Chauga Belt. Specifically, the rock consists of the Swain Gneiss Formation (Chg). Rocks of this group are typically granodioritic and inequigranular gneisses. Materials encountered at these sites were classified as mica gneisses.

FIELD INVESTIGATION

The subsurface exploration consisted of performing four (4) soil test borings at each side of the proposed end bents and two (2) soil test borings along the proposed new roadway alignment at approximately 100 feet each from end bents of the proposed bridge. Borings were performed with a CME 550 drill rig with an auto hammer using hollow stem augers. Standard Penetration Tests (SPT) and soil sampling were performed in general accordance with American Association of State Highway Transportation Officials (AASHTO T-206-87). The borings for the proposed structure were advanced to depths ranging from 19.8 to 44.5 feet below existing grade and for the proposed detour to depths ranging from 10 to 20 feet below existing grade.

Groundwater measurement readings were taken within each borehole with a weighted 100-foot measuring tape from a reference location at the top of each boring. Readings were recorded immediately after boring termination and after a 24-hour waiting period. Ground surface elevations for the test borings were approximated from the surveyed topographic information provided.

In addition to our subsurface investigation, a visual scour evaluation was performed along the channel and banks of Byers Creek and is included in this report.

SUBSURFACE AND GROUNDWATER CONDITIONS - BRIDGE

Subsurface soils encountered along the proposed replacement bridge alignment typically consist of roadway embankment, alluvial deposits, residual, weathered rock and crystalline rock.

Soils beneath End Bent 1 typically consist of alluvial deposits underlain by residual soils, followed by weathered rock. A thin layer of rootmat approximately 2 inch thick was encountered at EB1B.

Bridge # 22 on SR 1006 over Byers Creek

Henderson County

Page 2 of 5

Alluvial deposits were encountered at elevations of 2,089.8 feet, NAVD, to 2,089 feet, NAVD, extending to elevations ranging from 2,083.5 feet, NAVD, to 2,082.8 feet, NAVD, and consist of very loose to medium dense silty sand and sand with gravel (A-2-4 and A-1-b), and soft sandy silt (A-4). Residual soils were encountered below the alluvial deposits, extending to elevations ranging from 2,079.5 to 2,077 feet, NAVD, and consist of medium dense silty sand (A-2-4). Weathered rock was encountered below the residual soils, extending to the boring termination depths. A thin layer of residual soil (4 feet thick) consisting of medium stiff sandy silt (A-4) was imbedded within weathered rock at EB1B at elevations between 2,068 feet, NAVD, and 2,064 feet, NAVD.

Soils beneath End Bent 2 typically consist of roadway embankment, alluvial deposits and residual soils underlain by weathered rock. A thin layer of rootmat approximately two (2) inch thick was encountered at BE2A and approximately two (2) inch thick pavement at EB2B. Roadway embankment soils were encountered at an elevation of 2,089.9 feet, NAVD, extending to elevations ranging from 2,087 feet, NAVD, to 2,084.5 feet, NAVD, and consist of medium stiff sandy/clayey silt and sandy clay with gravel (A-4 and A-6). Alluvial deposits one (1) foot thick were encountered below the roadway embankment and consist of loose to medium dense silty sand and sand with gravel (A-2-4 and A-1-b). Residual soils were encountered below the alluvial deposits at elevations of 2,086 feet, NAVD, to 2,083.5 feet, NAVD, extending to elevations ranging from 2,066 to 2,062 feet, NAVD, and consist of medium dense to very dense silty sand and sand (A-2-4, A-1-b), and stiff sandy silt (A-4). Weathered rock was encountered below the residual soils, extending to the boring termination depths. A thin layer of residual soil (5 feet thick) consisting of dense silty sand (A-2-4) was imbedded within weathered rock at EB2B at elevations between 2,051 feet, NAVD, and 2,046 feet, NAVD.

Groundwater elevations measured after 24 hours ranged from 2084.4 to 2,083.5 feet, NAVD.

SUBSURFACE AND GROUNDWATER CONDITIONS - ROADWAY

Subsurface soils encountered along the proposed detour alignment typically consist of fill materials, alluvial deposits and residual soils.

Soils encountered at boring S3-B1 consist of alluvial deposit underlain by residual soils. The alluvial deposit consists of approximately 6.5 feet of medium stiff sandy silt (A-4). Below this alluvial deposit, the residual soils was encountered at an elevation of approximately 2,083.5 feet, NAVD, extending to a boring termination elevation of 2080 feet, NAVD, and consist of medium dense silty sand and sand (A-1-b and A-2-4).

Soils encountered at boring S3-B2 consist of fill and alluvial deposits underlain by residual soils. The fill material consists of approximately 7.0 feet of soft to medium stiff silty clay (A-6). The alluvial deposits were encountered below the fill at an elevation of approximately 2088 feet and consist of loose gravelly sand (A-1-a) and soft sandy silty (A-4). Below the alluvial deposits, the residual soils were encountered at an elevation of approximately 2,084 feet, NAVD, extending to a boring termination elevation of 2097 feet, NAVD, and consist of very loose silty sand (A-2-4) and stiff silt (A-4).

Groundwater elevation in boring S3-B2 was 2,089 feet, NAVD. Groundwater was not encountered in boring S3-B1 after 24 hours.

Bridge # 22 on SR 1006 over Byers Creek

Henderson County

Page 3 of 5

LABORATORY TESTING

Representative split-spoon samples were selected from soil test borings to verify visual field classification and determine soil index properties. A total of thirteen (13) split-spoon samples were analyzed in our laboratory for natural moisture determination, Atterberg limits, and grain size analysis; nine (9) samples for replacement bridge and four (4) samples for new roadway alignments. Representative channel and bank samples were analyzed for grain size distribution.

- AASHTO T-88-00 (As Modified) "Particle Size Analysis of Soil"
- AASHTO T-89-02 (As Modified) "Determining the Liquid Limits of Soil"
- AASHTO T-90-00 "Determining the Plastic Limit and Plasticity of Soils"
- AASHTO T-265-93 "Laboratory Determination of Moisture Content of Soils"

The results of the laboratory testing are presented in AASHTO Soil Classification and Gradation Sheet attached.

CONCLUSIONS

Based on our subsurface investigation, the subsurface conditions at the bridge site consist of very loose to very dense sandy soils (A-1-b, and A-2-4) and very soft to stiff sandy clay and sandy silt (A-6 and A-4), underlain by weathered rock. Specifically End Bent 1 encountered weathered rock at shallow depths (9.5 feet to 13 feet deep). Considering the bottom of cap elevations provided and depths to weathered rock, deep foundation are anticipated for the bridge structure. Due to the presence of shallow weathered rock, pile excavation is anticipated for End Bent 1.

FOUNDATION RECOMMENDATIONS

HP12X53 piles are proposed at the end bents. The foundation recommendations presented below are based on the strength limit state.

The end bent piles will be driven to weathered rock where they are likely to refuse. The end bent piles will develop a factored resistance of 81 Tons per pile, bearing on bedrock. A resistance factor of 0.6 may be applied to evaluate the driving resistance of the piles, assuming they are driven to rock. The piles will be spaced at 7 feet inches on center. Therefore, the group axial capacity of the piles will be the sum of the individual capacities of the piles in a row. For more information, refer to the attached "Summary of Foundation Recommendations".

Temporary excavation or shoring system may be necessary during construction of end bent caps. The design and implementation of temporary slopes or shoring system is the responsibility of the contractor. Backfill behind the end bent caps shall be replaced in accordance with NCDOT Specifications.

From the information provided, we understand the proposed final grade is to be at or near existing grade with minimal fill. Therefore long term settlement is not anticipated to occur. Provided that the embankments are constructed in accordance with NCDOT Specifications and suitable slope protection measures are incorporated, the slopes may be reconstructed at 1.5H:1V as planned.

Bridge # 22 on SR 1006 over Byers Creek

Henderson County

Page 4 of 5

CLOSURE

Recommendations and evaluations provided by Falcon are based on the draft report prepared by Tierra, Inc. dated December 18, 2006. Modifications of our recommendations and evaluations may be required if there are changes to the design or location of the structure. Recommendations in this report are based on data obtained from soil borings. The nature and extent of variations between borings may not become evident until construction.

Our professional services for this project have been performed in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made. Falcon appreciates this opportunity to have provided you with geotechnical engineering services for this project. If you have any questions regarding this report, please contact our office.

Sincerely,

FALCON ENGINEERING, INC.

Jeremy R. Hamm Staff Professional

SEAL DE PROPERTIES DE LA COMPANIA DEL COMPANIA DE LA COMPANIA DEL COMPANIA DE LA COMPANIA DEL CO

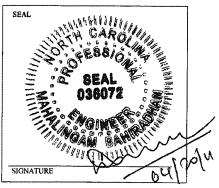
Mahalingam Bahiradhan (Bahi), P.E. Senior Geotechnical Project Manager

	·	

FOUNDATION RECOMMENDATIONS

WBS#		DESCRIPTION Br. # 22 over Byers Creek on SR 1006
T.I.P. NO.	R 5207B	
COUNTY	Henderson	
STATION	243+57.4 to 244+14.6 -L-	SEAL

	INITIALS	DATE
DESIGN	JH	02/28/11
CHECK	МВ	04/20/11
APPROVAL		



BENT	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS DETAILS
END BENT 1	243+57.4 -L-	Cap on HP 12X53 Steel Piles w/ Points	81 tons/pile	Bottom of Cap El. = 2086 ft +/- NAVD Tip El. No Higher Than = 2076 ft +/- NAVD Length of Pile = 15 ft Number of Piles = 7 Pile Spacing = 7 feet
END BENT 2	244+14.6 -L-	Cap on HP 12X53 Steel Piles w/ Points	81 tons/pile	Bottom of Cap El. = 2086 ft +/- NAVD Length of Pile = 30 ft Number of Piles = 7 Pile Spacing = 7 feet

FOUNDATION RECOMMENDATION NOTES ON PLANS

- 1. Drive piles at End Bents No. 1 and 2 to a required driving resistance of 135 tons per pile. A resistance factor of 0.6 is applied.
- 2. The factored resistance for piles at End Bents 1 and 2 is 81 tons per pile.
- 3. Steel pile tips are required for H piles at End Bents 1 & 2. See Section 450 of the NCDOT Standard Specifications.
- 4. For Piles, See Special Provisions attached in Appendix A.
- 5. Install piles at End Bent 1 to a tip elevation no higher than 2076 feet, NAVD.

FOUNDATION RECOMMENDATION COMMENTS

- 1. 1.5:1 (H:V) end bent slopes with proper slope protection are ok.
- 2. No waiting period required.

BEARING PILE PAY ITEM QUANTITIES

SI	ne	et	6
0	10	Cı	٠

WBS ELEMENT	0	_ DATE_	2/28/2011
TIP NO.	R 5207B	DESIGNED BY_	JH
COUNTY_	Henderson	CHECKED BY_	MB
STATION_	243+57.4 to 244+14.6 -L-	<u>.</u>	
DESCRIPTION B	r. # 22 over Byers Creek on SR 1006		
	F BENTS WITH PILES	.)	
NUMBER	R OF PILES PER BENT	Only required for "Pile	
NUMBER OF EN	D BENTS WITH PILES	Excavation" Pay Items.	
NUMBER OF I	PILES PER END BENT	-	

		Countries to a construction of the constructio					
			BEARING	PILE I	'AY ITEM	1S	
				P	ILE		
	PIPE	STEEL		EXCA	VATION		
	PILE	PILE	PILE	(per li	near ft/m)	PDA	PDA
BENT # OR	PLATES	POINTS	REDRIVES	IN	NOT IN	TESTING*	ASSISTANCE*
END BENT#	(yes/no/maybe)	(yes/no)	(per each)	SOIL	SOIL	(per each)	(per each)
EB1		yes					
EB2		yes					
		The second secon					
TOTALS		$\geq \leq$	0	0	0	0	0

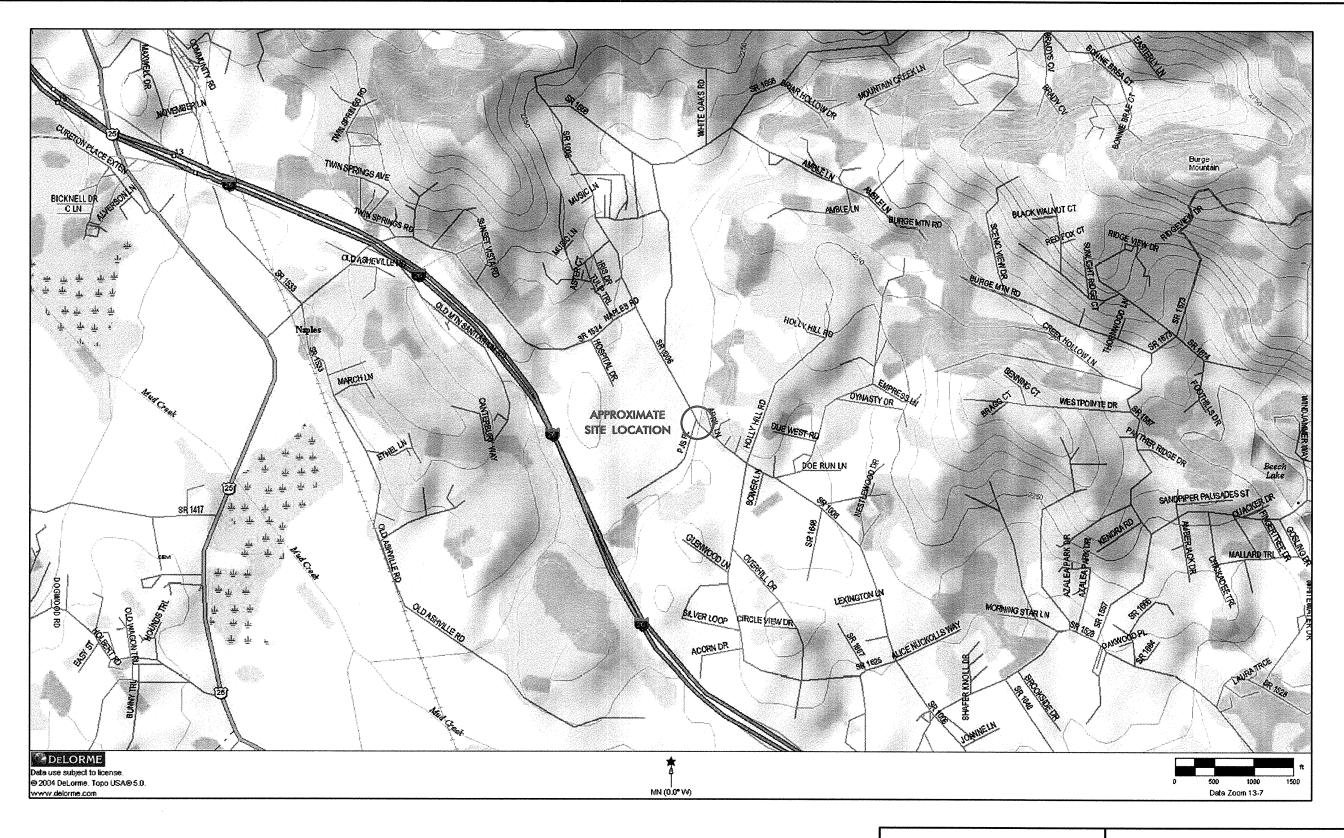
^{*} If PDA testing is required at a specific bent or end bent with a Note on Plans, show "PDA Testing" and "PDA Assistance" pay items per that specific bent or end bent. If PDA testing may be required or is required for multiple bents or end bents with a Note on Plans, show "PDA Testing" and "PDA Assistance" pay items as a total per structure only (do not show per bent or end bent).

Notes

Blanks or "no" represent quantity of zero.

If pipe pile plates are required or may be required, Structure Design should determine the pay item quantity, "Pipe Pile Plates" equal to the number of pipe piles per bent or end bent,

If pile points are required, Structure Design should determine the pay item quantity, "Steel Pile Points" equal to the number of steel piles per bent or end bent.

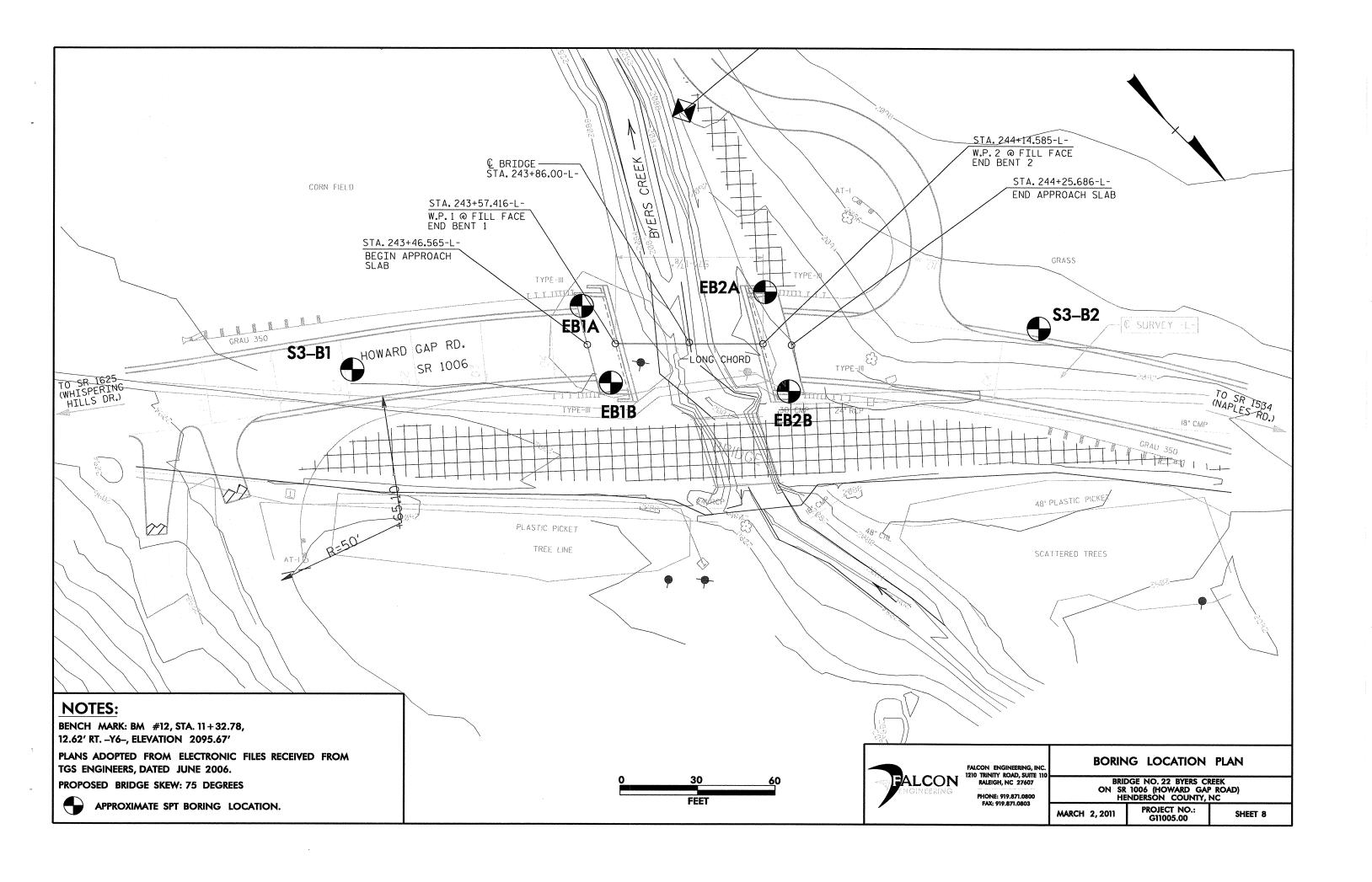


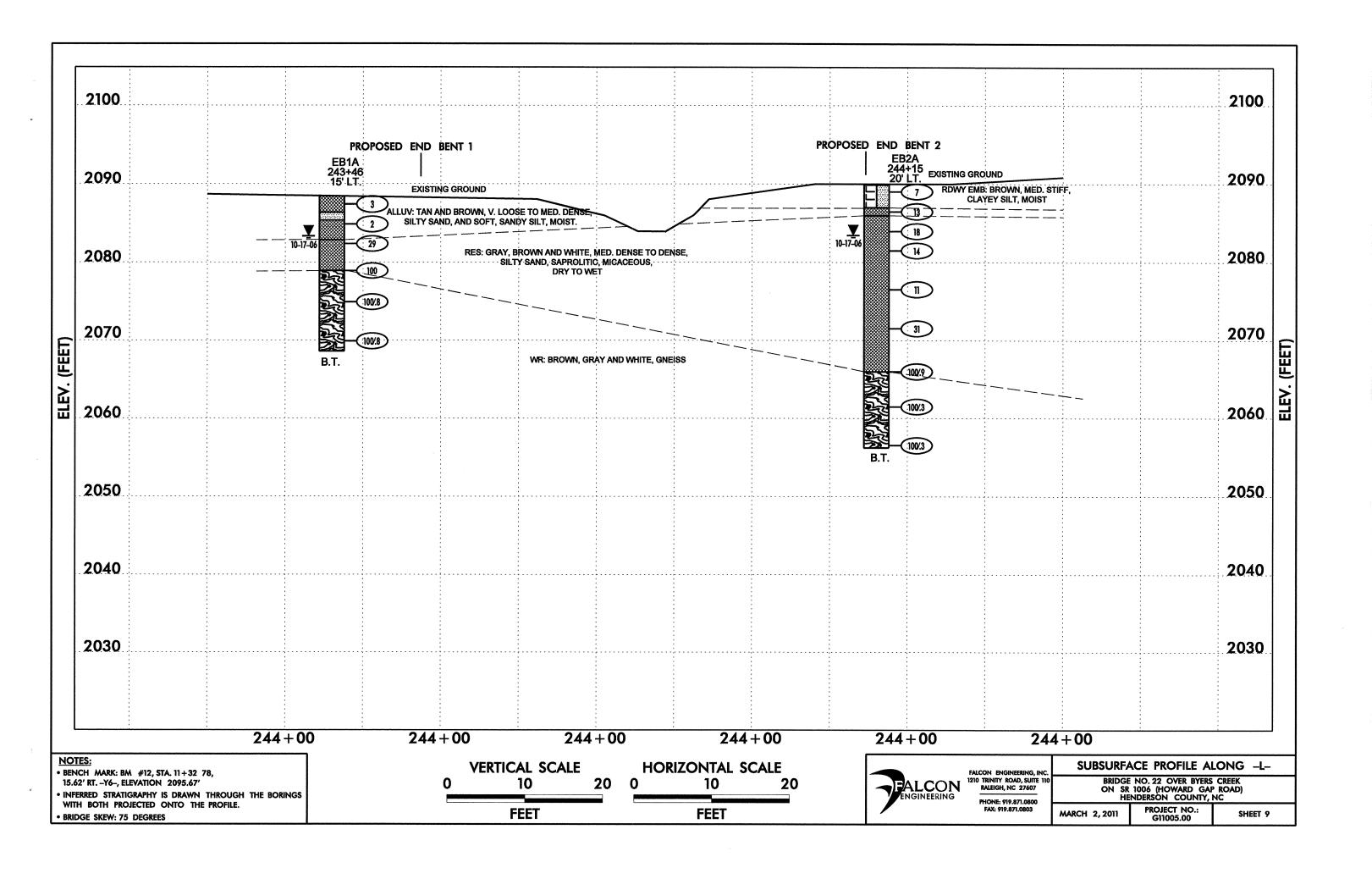


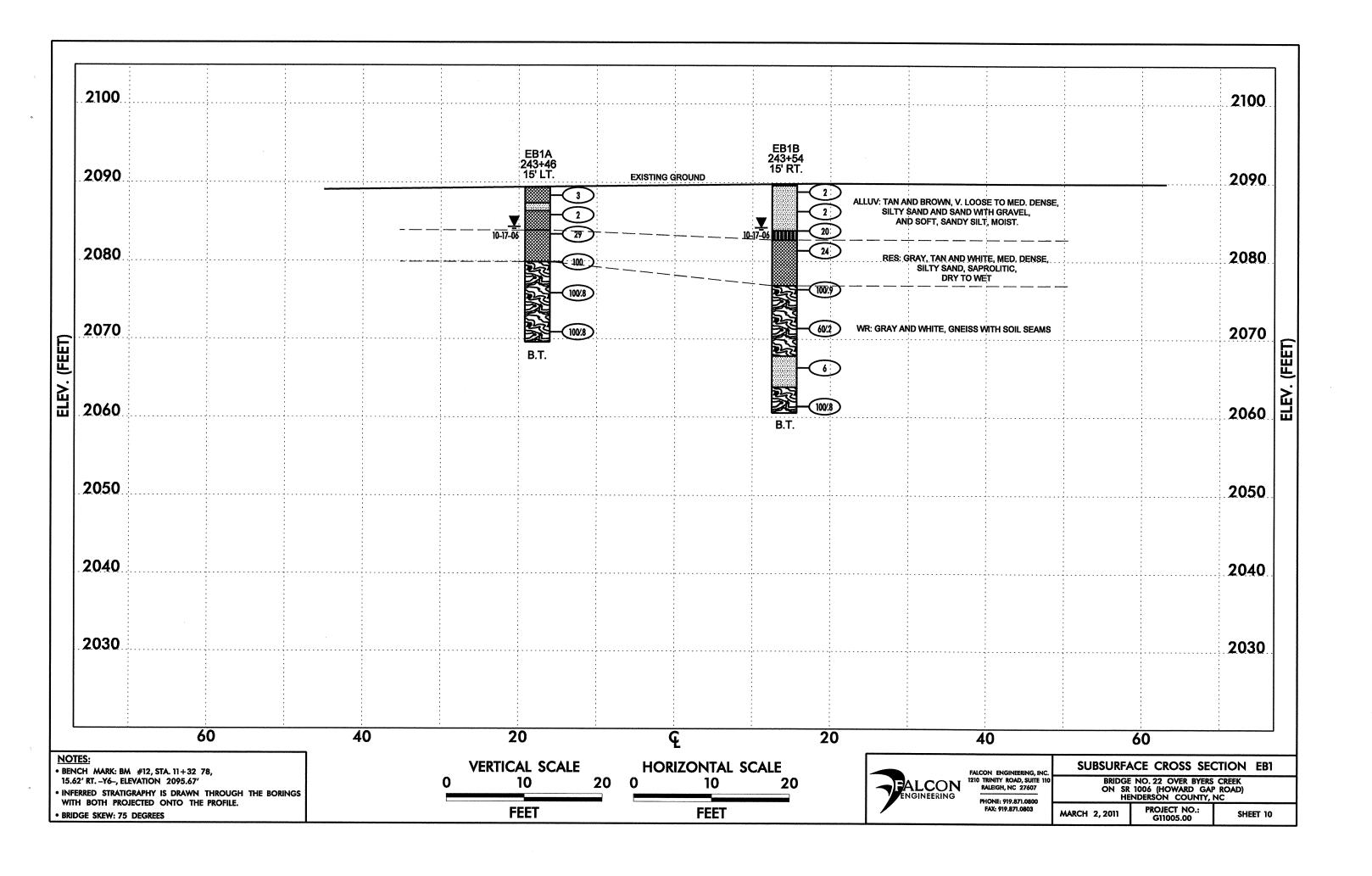
SITE VICINITY MAP

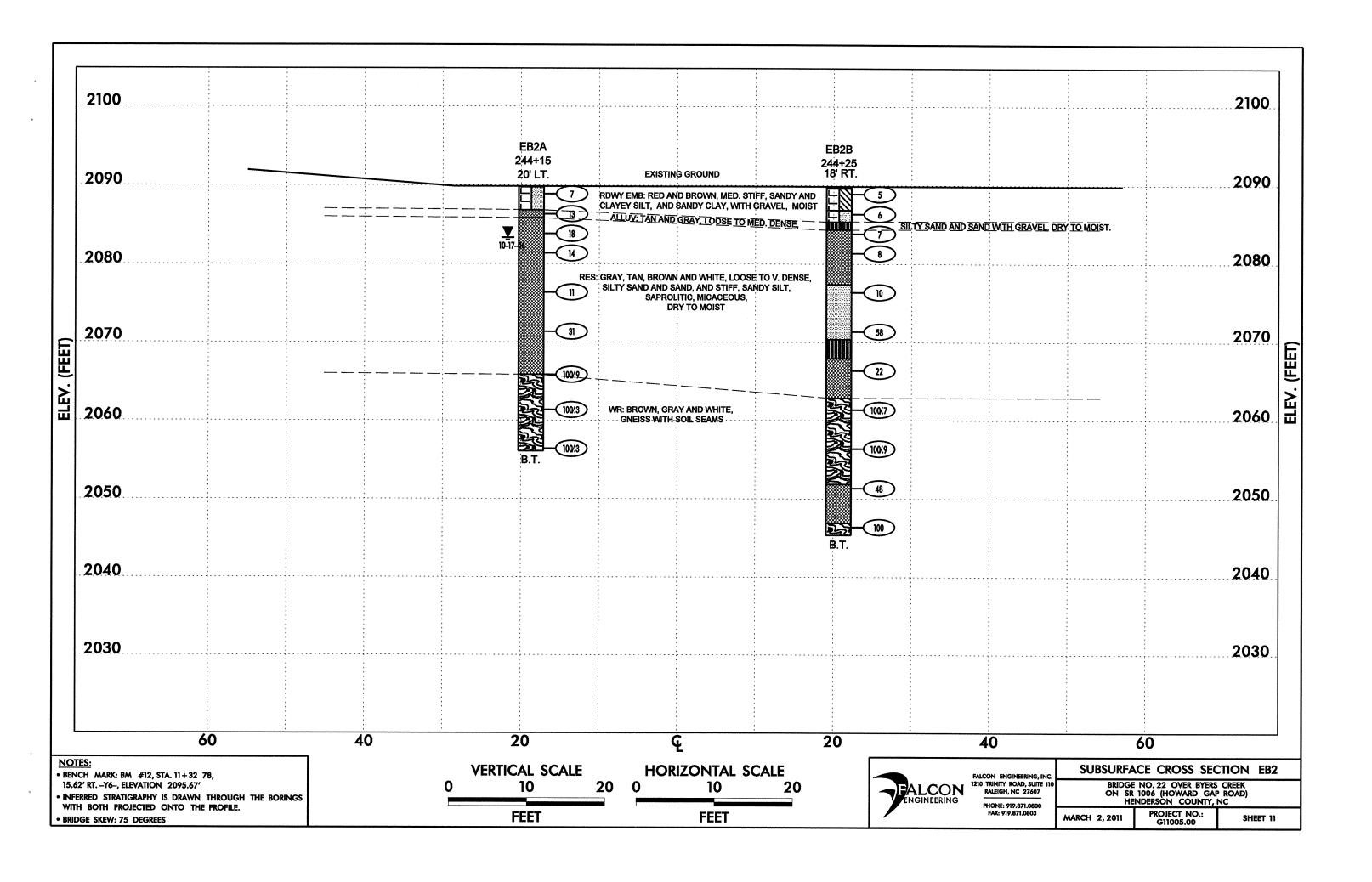
BRIDGE NO. 22 OVER BYERS CREEK ON SR 1006 (HOWARD GAP ROAD) HENDERSON COUNTY, NC

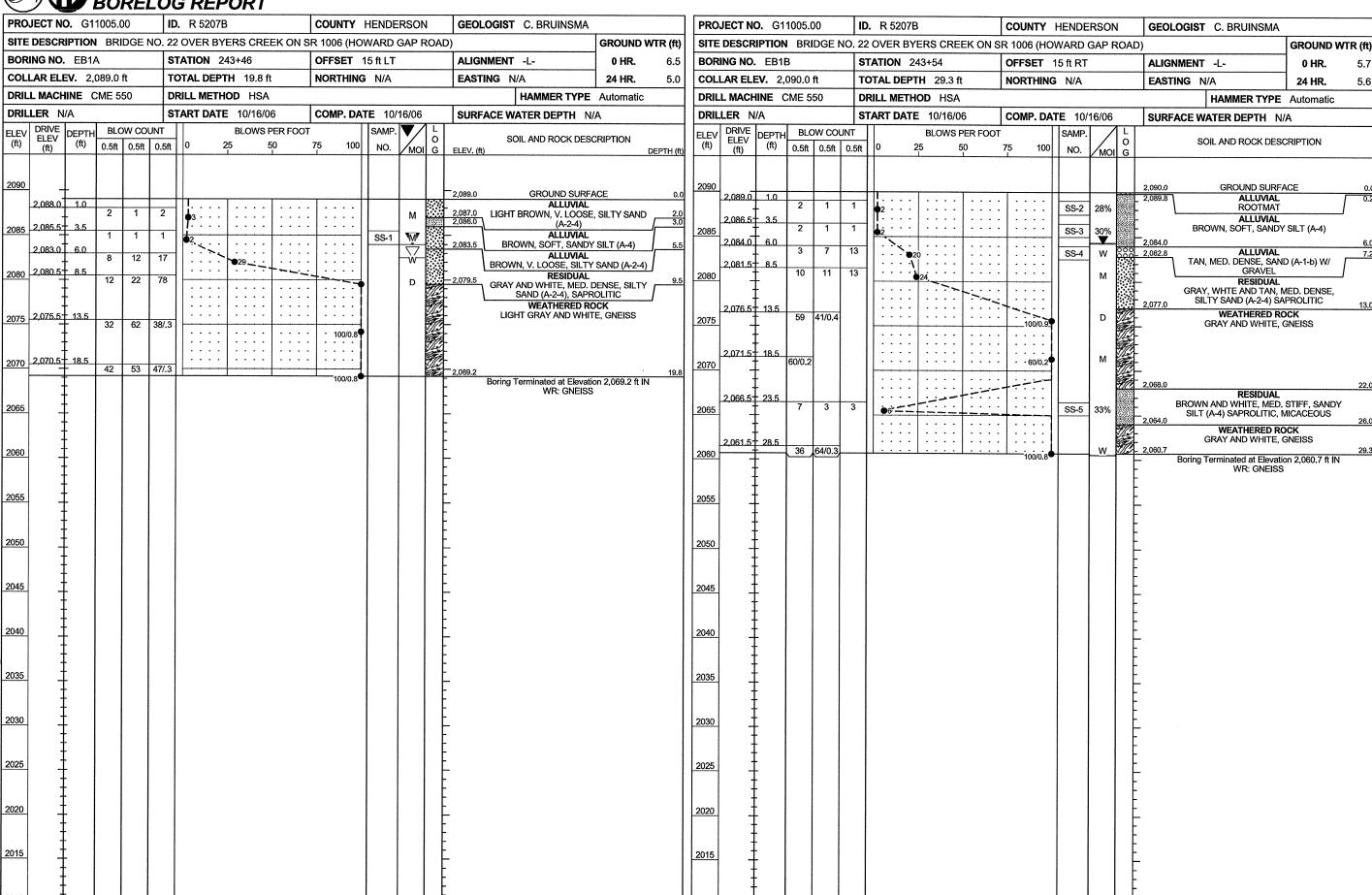
PROJECT NO.: G11005.00

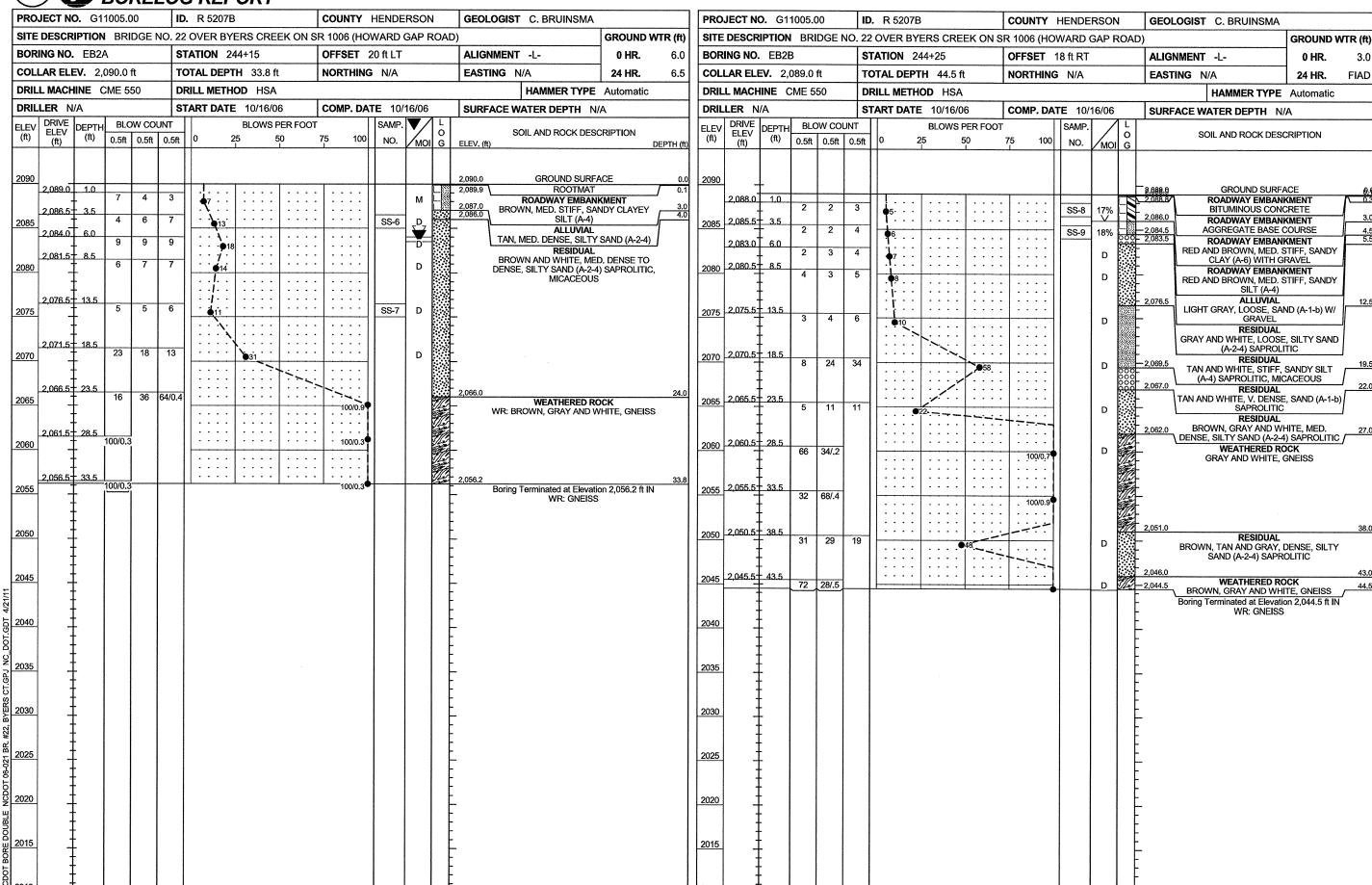












		O. G1				R 5207													PRC	JECT I	VO. G1	1005.	00	ID.	R 520	7B			COUNTY	HEND	ERSC	N	GE	OLOGI	ST C. E	RUINSMA									
SITE	DESCF	RIPTION	APF	ROAC	HRO	ADWAY	TO BR	IDGE	NO. 22	22 OVER BYERS CREEK ON SR 1006 (HOWARD GAP ROAD							OAD)	GROU	ID WTR (ft)	SITE	SITE DESCRIPTION APPROACH ROADWAY TO BRIDGE					NO. 22	OVER BY	ERS CR	EEK (ON S	R 1006	(HOW	ARD GA	P ROAD)	GROUN	D WTR (
BOR	NG NO	. S3-B	1		ST	ATION	242+55	5		OF	FSET	N/A				ALIGNI	MENT	-L-		0 HF	4.2	BORING NO. S3-B2			STATION 245+20					OFFSET 17 ft LT					IGNME	NT -L-		0 HR.	. 7						
COL	AR EL	EV. 2,0	090.0	t	TC	TAL DEF	TH 1	0.0 ft		NO	RTHIN	IG N	/A			EASTIN	IG N/A	١		24 HF	. Dry	COLLAR ELEV. 2,095.0 ft					тс	TAL DE	PTH :	20.0 ft		NORTHING N/A				EAS	STING	N/A		24 HR.	6				
DRIL	L MACI	INE C	ME 5	50	DF	ILL MET	HOD	HSA								HAMMER TYPE Automatic						DRII	L MAC	HINE	CME 5	50	DRILL METHOD HSA											HAM	MER TYPE	Automat	tic				
DRIL	LER N	I/A		START DATE 10/16/06						СО	MP. D	ATE	10/16/	06		SURFACE WATER DEPTH N/A					DRII	LER	N/A			ST	ART DA	TE 10	0/16/06	3	COMP. D.	ATE 10	/16/06	6	SUI	RFACE	WATER	DEPTH 1	1/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLC 0.5ft	W COL		0	BLC 25	OWS PE	R FOO	75	SAMP. L O NO. MOI G				100				5 100	ELEV. (ft)	SOII	_ AND RC	CK DES	CRIPTION	DEPTH (f	ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft	OW CO		0	BL 25	OWS P	ER FOOT	75 100	SAMF NO.	1/	L O OI G				D ROCK DE		
2090	2.089.0	1.0				1	T			<u>. T .</u>						2,090.0	······		ID SURF	ACE	0.	2095		0 1.0	-							T				2,095. 2,094.			OUND SUR						
2085	2,086.5 2,084.0	3.5	WOH 2	4	3	5		1				SS	S-10 26	3% 	E	0.000 5	TAN, N			SAND (A-	4)	2090		5 5 3.5	3	3		3 · · · · · · · · · · · · · · · · · · ·	- -			: : : :		Тм	· 🐹	-	TAN	Α	ROOTMAT RTIFICIAL F	ILL F, SANDY SI					
2080	2,081.5	+	8	11 5	15 7	· · · · · · · · · · · · · · · · · · ·	26					SS		м <u>600</u>	000	2,083.5 2,082.0 2,080.0	TAN ANI (A-	D BROWN 1-b) W/ C	UARTZ (DENSE, SÆ GRAVEL	6.9 AND 8.0	2085		5 = 8.5	2	2		- 8 - - 3					SS-13			2,088. 2,087.	0. 0. AT	N, LOOSE		/ SAND (A-1-	-a)				
2075		 													-	L	SAND (A	AND TAN -2-4) SAP rminated	ROLITIC at Elevati	DENSE, SI , MICACEO on 2,080.0	ous		2,081.	T 5 <u>13.5</u>	2	1	2									2,084. 		RAY AND	RESIDUAL WHITE, V. L	ANDY SILT (A OOSE, SILT					
2075	-	-			11000										- - -		·	RES: S	SILTY SA	ND		2080	2 076	+ - 5+ 18.5		,		\\ \\								2,078.		······································	(A-2-4) SAP		1				
2070	- - ,	+													-							2075	Z,VI.V.		4	6	7	· · \ i3		· · · l	• • • •		1			2,075.	.0	(A ng Termin	-4) SAPROL	tion 2,075.0 f	2				
2065	- - -														- - -							2070		‡												- - -		iv.	LO. GIETT O	טאר					
2060	-	† - - - -													- - -							2065		‡												-									
2055	-																					2060		‡												- - -									
2050		-													E							2055		‡ ‡ ‡												_ - -									
2045															F							2050		‡ ‡												[- -									
2040	-														[- -							2045		I I I												- - -									
2040	-			1											-							2040		† †												<u>-</u>									
2030	-	-													Ė Ę							2035		‡ ‡												-									
2025		-													F							2030		 												- -									
2025 2020 2015															F F F							2025		‡ ‡												- - - -									
2015															<u> </u>							2020		‡												- - - -									
2010		-													<u>-</u>							2015		† ‡																					

Template Revised 02/07/06



FIELD SCOUR REPORT

WBS:	TIP: R 5207B COUNTY: HENDERSON
DESCRIPTION(1): B	RIDGE #22 OVER BYERS CREEK ON SR 1106 (HOWARD GAP ROAD)
	EXISTING BRIDGE
Information from:	
Bridge No.: 3 Foundation Type: C	Length: 26 Total Bents: 2 Bents in Channel: 0 Bents in Floodplain: 2 ONCRETE VERT. ABUT. & WINGWALLS
EVIDENCE OF SC Abutments or En	d Bent Slopes: NOT VISABLE
Interior Bents: N	/A
Channel Bed: S	OME DEGRADATION
Channel Bank: S	OME UNDERMINING
EXISTING SCOUR Type(3): <u>C</u>	R PROTECTION ONCRETE WINGWALLS, RIP RAP
Extent(4): W	/ING WALL 20' IN ALL DIRECTIONS, RIP RAP AT DOWNSTREAM
Effectiveness(5): E	FFECTIVE

INSTRUCTIONS

Obstructions(6): NONE

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

			<u>DES</u>	<u>SIGN IN</u>	IFORM	<u>AHON</u>					
Channel	Bed Materia	al(7): SANDS	AND CC	DBBLES							
Channal F	Pank Matarie					····					
Channel	oank waten	al(8):									
Channe	l Bank Cove	er(9): TREES,	BUSHE	S, AND	SHRUBS	}					
Flood	lplain Width	(10): <u>70+ FEE</u>	:T								
Flood	plain Cover	(11): BUSHES	3, SHRU	JBS, AND	TREES	<u> </u>	· · · · · · · · · · · · · · · · · · ·				
	Stream is	(12): Ag	grading		Degr	ading	X_	Sta	atic		
nannel Migratio	n Tendency	(13): <u>TO THE</u>	SOUTH	IEAST			······································				
Observations a	and Other C	comments:			·					· · · · · · · · · · · · · · · · · · ·	
		Reported b	y:	FALC(N ENGI	NEERIN	G INC		Date:	3/2/2	011
DESIGN SCO	IID EI EWA			171200	JIV ENG						
DESIGN SCO						reet		wet	ers		
		<u>NTS</u> B1 B2	В3	B4							
100	yr DSE										
Comparison of	DSE to Hy	draulics Unit th	neoretica	al scour:					4		
	DSE	determined b	y:						Date:		
SOIL ANALYS			ANNEL	BED AN	D BANK	MATER	IAI				
Bed or Bank	BED	BANK	ANNEL	BED AN	D BANK	MATER	IAI				
Bed or Bank Sample No.	BED SS-4	BANK SS-2	ANNEL	BED AN	D BANK	MATER	IAI				
Bed or Bank Sample No. Retained #4	BED SS-4 35	BANK SS-2 0.7	ANNEL	BED AN	D BANK	MATER	IAI				
Bed or Bank Sample No. Retained #4 Passed #10	BED SS-4 35 57	BANK SS-2 0.7 99	ANNEL	BED AN	D BANK	MATER	IAI				
Bed or Bank Sample No. Retained #4 Passed #10 Passed #40	BED SS-4 35 57 43	BANK SS-2 0.7 99 98	ANNEL	BED AN	D BANK	MATER	IAI				
Bed or Bank Sample No. Retained #4 Passed #10 Passed #40 Passed #200	SS-4 35 57 43 24	BANK SS-2 0.7 99 98 61	ANNEL	BED AN	D BANK	MATER	RIAI				
Bed or Bank Sample No. Retained #4 Passed #10 Passed #40	BED SS-4 35 57 43	BANK SS-2 0.7 99 98 61	ANNEL	BED AN	D BANK	MATER	RIAI				
Bed or Bank Sample No. Retained #4 Passed #10 Passed #40 Passed #200 Coarse Sand	BED SS-4 35 57 43 24	BANK SS-2 0.7 99 98 61	ANNEL	BED AN	D BANK	MATER	RIAI				
Bed or Bank Sample No. Retained #4 Passed #10 Passed #200 Coarse Sand Fine Sand	BED SS-4 35 57 43 24	BANK SS-2 0.7 99 98 61	ANNEL	BED AN	D BANK	MATER	RIAI				
Bed or Bank Sample No. Retained #4 Passed #10 Passed #200 Coarse Sand Fine Sand Silt	BED SS-4 35 57 43 24	BANK SS-2 0.7 99 98 61	ANNEL	BED AN	D BANK	MATER	RIAI				
Bed or Bank Sample No. Retained #4 Passed #10 Passed #200 Coarse Sand Fine Sand Silt Clay	BED SS-4 35 57 43 24 14	BANK SS-2 0.7 99 98 61 1 37	ANNEL	BED AN	D BANK	MATER	RIAI				
Bed or Bank Sample No. Retained #4 Passed #10 Passed #200 Coarse Sand Fine Sand Silt Clay LL	BED SS-4 35 57 43 24 14 19	BANK SS-2 0.7 99 98 61 1 37	ANNEL	BED AN	D BANK	MATER	RIAI				
Bed or Bank Sample No. Retained #4 Passed #10 Passed #200 Coarse Sand Fine Sand Silt Clay LL PI	BED SS-4 35 57 43 24 14 19	BANK SS-2 0.7 99 98 61 1 37	ANNEL	BED AN	D BANK	MATER	RIAI				
Bed or Bank Sample No. Retained #4 Passed #10 Passed #200 Coarse Sand Fine Sand Silt Clay LL PI AASHTO	BED SS-4 35 57 43 24 14 19 18 NP A-1-b	BANK SS-2 0.7 99 98 61 1 37 31 7 A-4	ANNEL	BED AN	D BANK	MATER	RIAI				

÷		

SHEET 16

FALCON ENGINEERING, INC.

1210 TRINITY ROAD, SUITE 110, RALEIGH NC 27607

SOIL CLASSIFICATION AND GRADATION SHEET

BRIDGE # 22 OVER BYERS CREEK ON SR 1006 (HOWARD GAP ROAD)

TIP NO.: R 5207A HENDERSON COUNTY, NORTH CAROLINA FALCON ENGINEEERING, INC. PROJECT NO: G11005.00

BORU	NG#	SAMPLE#			TOTAL SAMPI			ERBERG	INGIT	
	SH TO Classi		NATURAL		PERCENT PASSIN					
	OFFSET (FEET)	DEPTH (FEET)	MOISTURE CONTENT	#10	#49	#200	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	
EB1		SS-1			T T					
	A-2-4		36.1%	99	93	35	26	-	NP	
243+46	15'LT	3.5-5.0								
EB1	В	· SS-2								
	A-4		28.3%	99	98	61	31	24	7	
243+54	15'RT	1.0-2.5								
EB1		SS-3								
	A-4		29.5%	100	99	62	26	23	3	
243+54	15'RT	3.5-5.0								
EB1		SS-4	40.004						l	
040.54	A-1-b		13.3%	57	43	24	18	-	NP	
243+54	15'RT	6.0-7.5			 		<u> </u>			
EB1	A-4	SS-5	22 00/	00					MP	
242154		22 5 25 2	33.0%	96	82	48	28	-	NP	
243+54 EB2	15'RT	23.5-25.0				<u>; </u>				
EBZ	A-2-4	SS-6	12.9%	75	50	0.5			ALD	
244+15	20'LT	3.5-5.0	12.5%	75	59	25	29	-	NP	
244+15 EB2		\$\$-5.0 \$\$-7			 					
ED2	A-2-4	33-/	22.2%	92	78	40	27	_	NP	
244+15	20'LT	13.5-15.0	22.2/0	J.L	10	40	21	-	145	
EB2		SS-8								
	A-6		16.8%	96	88	60	31	18	13	
244+25	18'RT	1.0-2.5	10.070	30	00		'	, 0		
EB2		SS-9		85	81		29		NP	
	A-4		17.6%			47		_		
244+25	18'RT	3.5-5.0							145	
S3-E		SS-10								
	A-4		25.6%	100	98	56	27	-	NP	
242+55	CL	1.0-2.5								
S3-E		SS-11								
	A-1-b		9.2%	48	31	11	17	-	NP	
242+55	CL	6.0-7.5								
S3-E		SS-12								
	A-6		21.5%	100	94	70	38	18	20	
245+20	17'LT	1.0-2.5								
\$3-E		SS-13			 				_	
	A-4		23.1%	78	71	45	29	27	2	
245+20	17'LT	8.5-10.0								
\$3-E		S-1	24.40/	00			07	40	40	
24E+20 T	A-6	0050	21.1%	99	94	72	37	19	18	
245+20	17'LT	0.0-5.0	<u> </u>		L					

FALCON ENGINEERING, INC.

1210 TRINITY RD, SUITE 110, RALEIGH, NORTH CAROLINA. 27607

BRIDGE # 22 OVER BYERS CREEK ON SR 1006 (HOWARD GAP ROAD) HENDERSON COUNTY, NORTH CAROLINA

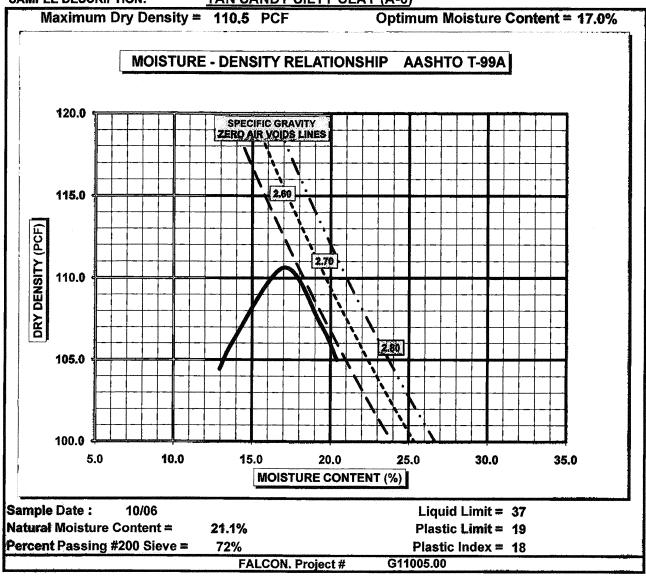
BORING NO.:

S3-B2 S-1

SAMPLE NO.:

DEPTH: 0.0-5.0

SAMPLE DESCRIPTION: TAN SANDY SILTY CLAY (A-6)



FALCON ENGINEERING, INC.

1210 TRINITY RD. SUITE 110, RALEIGH, NORTH CAROLINA 27607

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL AASHTO T-99 \ ASTM D-1883

PROJECT #:

G11005.00

DATE:

3/2/2011

PROJECT NAME: BRIDGE # 22 OVER BYERS CREEK ON SR 1006 (HOWARD GAP ROAD)

BORING:

S3-B2

SAMPLE: S-1

DEPTH: 0-5

SOIL DESCRIPTION: TAN SANDY SILTY CLAY (A-6)

COMPACTION:	AASHTO T99A	SOAK	96 HRS.			
MAXIMUM DRY DENSITY	110.5 PCF	STRAIN RATE	.05 IN / MIN.			
OPTIMUM MOISTURE CONTENT	17.0%	PROVING RING	1500 LB.			
TEST DATA		SURCHARGE WEIGHT 1				
DRY DENSITY	105.2 PCF	SURCHARGE PER SQUARE FOOT	100 lbs/sq.ft			
MOISTURE CONTENT	18.3%	FINAL MOISTURE CONTENT	N/A			
PERCENT COMPACTION	95.2%	SWELL	0.09%			

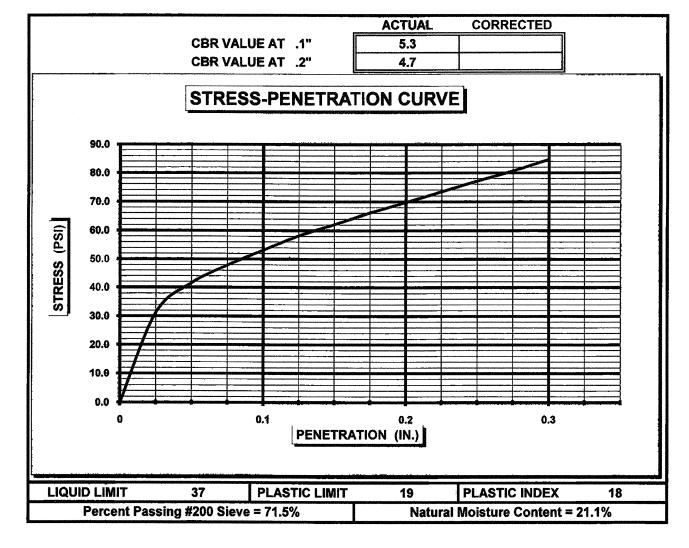




PHOTO 1: CENTERLINE PROFILE (-L-), LOOKING DOWNSTATION.



PHOTO 2: BYERS CREEK, LOOKING UPSTREAM.



SITE PHOTOS

BRIDGE NO. 22 OVER BYERS CREEK ON SR 1006 (HOWARD GAP ROAD) HENDERSON COUNTY, NC

MARCH 2, 2011

PROJECT NO.: G11005.00



PHOTO 3: END BENT 1, LOOKING FROM LEFT TO RIGHT.



PHOTO 4: END BENT 2, LOOKING FROM LEFT TO RIGHT.



PHONE: 919.871.0800 FAX: 919.871.0803

SITE PHOTOS

BRIDGE NO. 22 OVER BYERS CREEK ON SR 1006 (HOWARD GAP ROAD) HENDERSON COUNTY, NC

MARCH 2, 2011

PROJECT NO.: G11005.00

D: R-5207B

LEGEND SITE PLAN

PROFILE

BORE LOG REPORTS

ROJECT: 45393.1.2

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

CONT	ENTS	GEOTECHNICA
<u>SHEET</u>	DESCRIPTION	**************************************
1	TITLE SHEET	

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE N COUNTY <u>HENDE</u>		<i>207B</i>) F	.A. PROJ.
PROJECT DESCRIPT BRIDGE No. 20 1	ION <u>SR-1006 (HO</u>	WARD GAP	ROAD) FROM
SITE DESCRIPTION _	RETAINING WA	LL No. 2	-

STATE	STATE PROJECT REPERENCE NO.	SHEET NO.	TOTAL
N.C.	45393.1.2 (R-5207B)	1	6

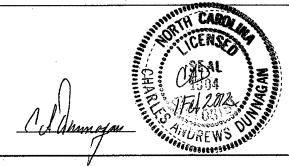
CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON MICH IT IS BASED WERE MADE FOR THE PURPOSE OF STLDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. IT VANDAY FELD BORNING LOOS, ROOK CORES, AND SOUL TEST DATA AVAILABLE MAY BE REVEWED OR INSPECIED IN RALEOH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, CEGITGENING. ENCHAFERING LINET AT 1919 250-4088. INTERET THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORNING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARLY 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 RELIBELITY INFERENT IN IT HE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOSTUME CONDITIONS NOICATED IN THE SUBSURFACE INVESTICATIONS ARE AS RECORDED AT THE THE OF THE INVESTICATION. THESE WATER LEVELS OR SOIL MOISTUME CONDITIONS MAY VARY CONSIDERABLY WITH THAT ACCORDING TO CLIMATE COMPTIONS 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 FAVAL DESIGN DETAILS ARE DIFFERENT. FOR BODING AND CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN REFORMATION ON THIS PROJECT, THE DEPARTMENT DOES NOT WARRANT OR GUARANTE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOT WARRANT OR GUARANTE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOT IES INTERPRETATIONS MADE, OR OPINION OF THE PREPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS IE DEBUS NECESSARY TO SATISFY MINISTER AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AM EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

	PERSONNEL
· .	M M HAGER
	D O CHEEK
	C J COFFEY
_	J T WILLIAMS
•	
•	
•	
**************************************	BY C A DUNNAGAN
NAF211CATED F	
CHECKED BY	W D FRYE, Jr
	W D FRYE, Jr W D FRYE, Jr



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

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

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

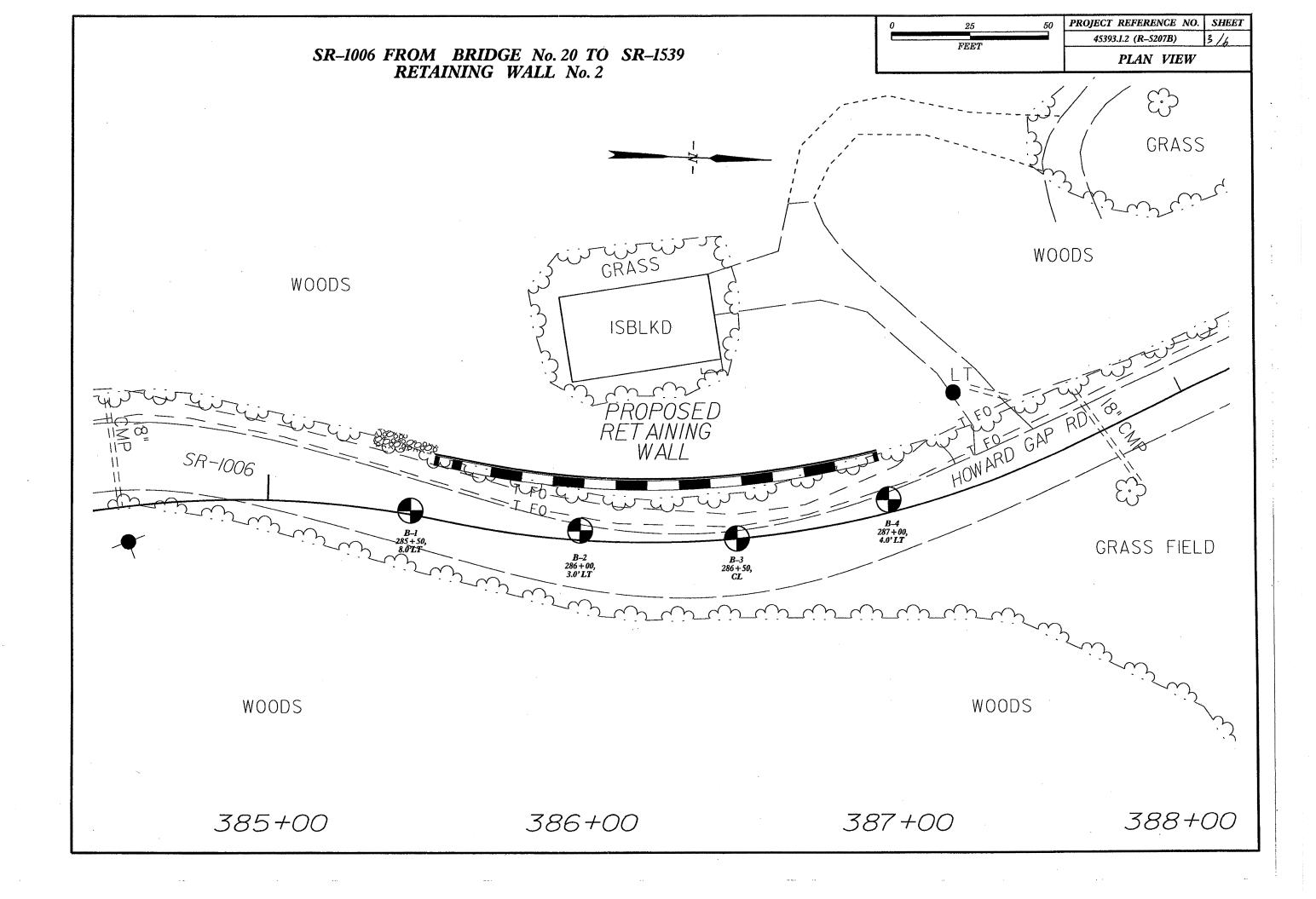
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

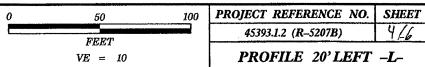
PROJECT REFERENCE NO.	SHEET	NO.
45393.1.2 (R-5207B)	2	1
		7

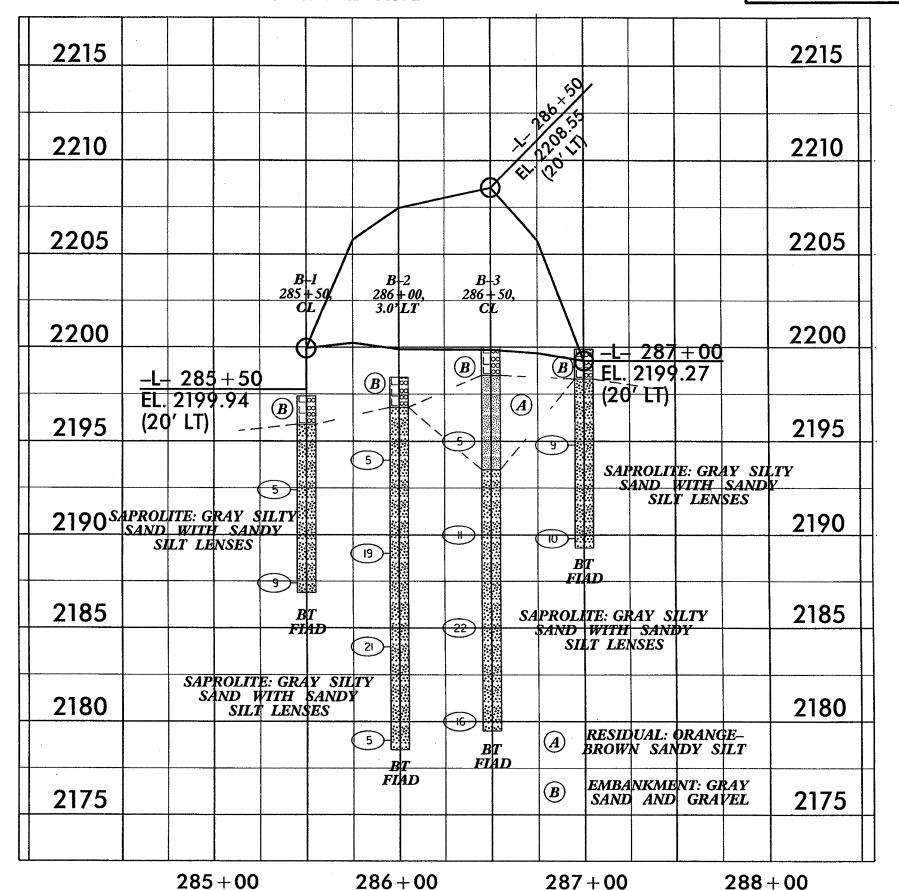
SUBSURFACE INVESTIGATION

	SOIL AND ROCK LEGEND	TERMS, SYMBOLS, AND ABBREVIATIONS	
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEHI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PERETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 188 BLOWS PER FOOT ACCORDING TO STANDARD PERETRATION TEST LARGANTO TEGA, ASTM D-1580. SOIL CLASSIFICATION IS BASED ON THE AGSHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHOLL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, ASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERAL COLOR-DISTITION, ANDLARTY, STRUCTURE, PLASTICITY, ETT, EXAMPLE.	MELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. LINIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE, (ALSO POORLY GRADED) INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS; ANGULAR,	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, MOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PERETRATION 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 WEATHERD ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ALLUVIUM (ALLUVJ - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AGUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS. OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.
VERY STEF, CRIN, SUTY CUN. HOST WITH WITERSECODED FINE SAND LIMERS SHOULD PLASTIC, A-7-6	SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 180 ROCK (NR) BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL
SOIL LEGEND AND AASHTO CLASSIFICATION CENERAL GRANULAR MATERIALS CLASS. (≤ 35% PASSING "200) S% PASSING "200) ORGANIC MATERIALS CLASS. (≤ 35% PASSING "200) ORGANIC MATERIALS	MINERAL DOCAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAQLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOLLD YIELD SY REFUSAL IF TESTED. ROCK TYPE INCLUDES CRANITE. ONEISS, GABBRO, SCHIST, ETC.	AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALCA: SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-5 A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6 A-7 A-1, A-2 A-7 A-1, A-1, A-2 A-7 A-1, A-1, A-1, A-1, A-1, A-1, A-1, A-1,	COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50	NON-CRYSTALLINE ROCK (NCR) FINE TO COARSE GRAIN METAHORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLO SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 0000.00000000000000000000000000000000	HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	SEDIMENTARY ROCK SPT REFUSAL ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS. ETC.	CORE RECOVERY OREC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
# 10 50 MX GRANULAR CLAY MUCK	PERCENTAGE OF MATERIAL ORGANIC MATERIAL ORGANIC MATERIAL SOLIS SOLIS SOLIS OTHER MATERIAL	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
* 40 38 MX 98 MX 51 MM 25 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN 50 MN 5	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 16%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
LIQUID LINIT PLASTIC HOEX 6 MX NP 16 MX 12 MX 11 MN 16 MX 13 MN 46 MX 11 MN 16 MX 11 MN 16 MX 11 MN 11	MODERATELY ORGANIC 5 - 18% 12 - 28% SOME 28 - 35% HIGHLY ORGANIC 318% 328% HIGHLY 35% AND ABOY	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (Y. S.L.) CRYSTALS ON A BROWEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLONS IF OF A CRYSTALLINE NATURE.	<u>DIP DIRECTION (DIP AZIMUTH)</u> THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROP INDEX 8 8 8 8 4 MX 8 MX IZ MX IS MX No MX MODERATE ORGAN USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC MATTER	GROUND WATER WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DAILLING	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) I INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS MATTER	STATIC WATER LEVEL AFTER 24 HOURS	CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM
AS A EXCELLENT TO CODO FAIR TO POOR FAIR TO POOR UNSUITA	1 0 000	(MOD.) 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,	PARENT MATERIAL. <u>FLOOD PLAIN (FP)</u> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 :PI OF A-7-6 SUBGROUP IS > LL - 30 CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAQLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH	THE STREAM, FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) SPT CPT ONT TEST BORING SAMPL	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK,	THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
GENERALLY VERY LOOSE 4	S - BULK SAMPL	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED (SEV.) IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KADLINIZED TO SOME	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
OKANAULAR	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY SAMPLE SAMPLE	### IF TESTED, YIELDS SPT N VALUES > 180 BPF YERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT IV SEV.1 THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED CHOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES FOOR ARRATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN
GENERALLY SOFT 2 TO 4 0.25 TO 4.50 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.8	INFERRED ROCK LINE A PIEZOMETER AS - ROCK SAMP		INTERVENING IMPERVIOUS STRATUM.
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD >30 >4	ALLUVIAL SOIL BOUNDARY SLOPE INDICATOR 25/825 DIP & DIP DIRECTION OF SLOPE INDICATOR INSTALLATION CBR - CALIFORNI	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	<u>RESIDUAL (RES.) SOIL</u> - SOIL FORMED IN PLACE BY THE MEATHERING OF ROCK. <u>ROCK QUALITY DESIGNATION (ROD)</u> - 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 AN
TEXTURE OR GRAIN SIZE	RATIO SAM		EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE
U.S. STO. SIEVE SIZE 4 10 40 60 200 270 OPENING (MH) 4.76 2.80 0.42 0.25 0.075 0.053	SOUNDING ROD (EF)—SPT REFUSAL APPRELIATIONS	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	PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
BOULDER COBBLE GRAVEL SAND SAND SLT CLAY (BLDR.) (COB.) (GR.) (CCE S.D.) (CCE C.D.) (CCE	ABBRE VIATIONS AR - AUGER REFUSAL HI HIGHLY # - MOISTURE CI BT - BORING TERMINATEO MED MEDIUM V - VERY	TO DETACH HAND SPECIMEN.	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	CL CLAY MICA MICACEOUS VST - VANE SHE CPT - CONE PENETRATION TEST MOD MODERATELY WEA WEATHERE	E TEST HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	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
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE NP - NON PLASTIC 7- UNIT WEIGH DMT - DILATOMETER TEST ORG ORGANIC 7- DRY UNIT W DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER TEST FIAD-FILLED IN FACE ORIL 0 VOID RATIO SAP SAPROLITIC FIAD-FILED ORIL 4 FEER DRIL 4 FEER DRIL	DIATELY POINT OF A GEOLOGIST'S PICK.	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 8.1 FOOT PER 60 BLOWS.
TATTERBERG LIMITS) DESCRIPTION - SATURATED - USUALLY LIQUID, VERY WET, USUALLY	F - FINE SD SAND, SANDY WOM-WEIGHT OF FOSS FOSSILIFEROUS SL SILT, SILTY	The state of the s	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
LL LIQUID LIMIT (SAT.) FROM BELOW THE GROUND WATER TABLE PLASTIC SEMISOLID; REQUIRES DRYING TO	FRAGS FRAGMENTS TCR - TRICONE REFUSAL	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PICKS 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAL.	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 (MCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
RANGE C WET - (W) ATTAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	FRACTURE SPACING BEDDING JERM SPACING JERM THICKNESS	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTUR	ORILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MANUAL VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDOED > 4 FEET	BENCH MARK: BM#14: SPIKE IN TREE 65.28' RT OF -YI8- STA 12+77.17
SL SHRINKAGE LIMIT	MOBILE B-	MIDE STO 16 FEET THINLY BEDDED 0.16 - 1.5 FEET WEDY THINLY BEDDED 0.23 - 0.16 FEET	ELEVATION: 2170.53 FT.
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	BK-51 S'CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED 4.008 FEET THINLY LAMINATED 4.008 FEET	NOTES:
PLASTICITY	CME-45C HARD FACED FINGER BITS -N	INDURATION	
PLASTICITY INDEX (PI) DRY STRENGTH NONPLASTIC 0-5 VERY LOW	X CME-ESQ	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FULBBING WITH FINGER FREES NUMEROUS GRAINS;	
LOW PLASTICITY 6-15 SLIGHT MED. PLASTICITY 16-25 MEDIUM	CASING W/ ADVANCER HAND TOOLS:	GENTLE BLOW BY HAMNER DISINTEGRATES SAMPLE.	
HIGH PLASTICITY 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH POST HOLE DI	ER MODERATELY INDURATEO GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE: BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE TUNG,-CARB. HAND AUGER	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH SIEEL PROBE;	
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.	CORE BIT SOUNDING ROO VANE SHEAR T	DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
		SAMPLE BREAKS ACROSS GRAINS.	



SR-1006 FROM BRIDGE No. 20 TO SR-1539 RETAINING WALL No. 2







SHEET

	45393						B-5207E			Y HENDI				GEOL	OGIST Hager, I	И. M.		
SITE	DESCF	RIPTIC	N SR	-1006	from	Bric	dge No. 20	0 to SR-1	539: Reta	ining Wall	No. 2					G	ROUNE	WTR (f
BOR	ING NO	. B-1			5	STA	ATION 28	35+50		OFFSET	CL			ALIGN	IMENT -L-		HR.	FIAD
COLI	LAR EL	. EV . 2	,197.4	ft	7	гот	AL DEP	ΓH 10.5 f	t	NORTHI	NG 618,	403		EAST	NG 960,323	24	4 HR	FIAD
DRILL	RIG/HAI	MMER E	EFFJDA	TE A	F0007	'0 C	ME-550X 8	1% 09/03/	2009	·	DRILL	METHO	D H	.S. Augers		HAMMER	TYPE /	Automatic
ORIL	LER C	offey,	Jr., C.			STA	RT DATE	E 01/31/1	2	COMP.	DATE 01	/31/12		SURF	ACE WATER DE	PTH N/A		
LEV	DRIVE ELEV	DEPTI	BL	ow cc	DUNT	T	V	BLOWS	PER FOO	T	SAMP	V /	L				UDTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft		0 2	5	50	75 10	NO.	MOI	O G	ELEV. (ft)	SOIL AND R	JUK DESUR	RIPTION	DEPTH (
				1														
200		L															-	
	-	ŀ													0001	ID 011DE4.0		
	7	F	\vdash	 	-	+	1		T	1	+	┨──	LRS	2,197.4 2,195.9		ND SURFAC		(
195	• -	F			١.	1	1				41					and and grav	/el.	
}	2,193.4	4.0	3	3	2	-	<u>i</u> : : :					D		-	Gray to brown s		sandy si	lt.
190	1	-				\parallel	1		: : : :					-				
	2,188.4	90								 	11			-				
			4	5	4	\coprod	9		<u> </u>	<u> </u>	Ш			2,186.9			<u> </u>	11
	1	-												-	Boring Terminated loos	at Elevatior saprolite.	1 2,186.9	ft in
	‡	-												-				
	‡	-												-				
	- 1	-																
	f	-												_				
	7	•												-				
	7	-												_				
	1	-				l								-				
	7	-												-		,		
	‡	•												-				
	1													• •				
	‡	-																
	‡				ĺ									-	•			
	1										1			-				
	‡													<u>.</u>				
	‡													- -				
	+													-				
	t													-				
			i										1	_				
	I					İ								-				
	+										1.	1		-				
	Ŧ													-				
	Ŧ													-				
	‡													- -				
	+											1		-	•			
	‡													-				
	#		ĺ								1			<u>-</u>				
	‡		I											-				
	‡	l											[-				
	f																•	
	Ŧ	ł	1	ĺ										-				
	Ŧ	1					•							-				
	‡	1	1											-				
	1			- 1									lt	-				



SHEET

WBS 45393.1.2 TIP B-5207B COUNTY HENDERSON GEOLOGIST Hager, M. M. SITE DESCRIPTION SR-1006 from Bridge No. 20 to SR-1539: Retaining Wall No. 2 GROUND WTR (ft) 0 HR. BORING NO. B-2 **STATION 286+00** OFFSET 3ftLT ALIGNMENT -L-FIAD COLLAR ELEV. 2,198.4 ft TOTAL DEPTH 19.9 ft **NORTHING 618,457 EASTING 960,328** 24 HR. FIAD DRILL METHOD H.S. Augers HAMMER TYPE Automatic DRILLER Coffey, Jr., C. **START DATE 01/31/12** COMP. DATE 01/31/12 SURFACE WATER DEPTH N/A ELEV DRIVE DEPTH (ft) (ft) **BLOW COUNT** SAMP. BLOWS PER FOOT MOI G SOIL AND ROCK DESCRIPTION (ft) 0.5ft 0.5ft 0.5ft 0 25 50 75 100 NO. DEPTH (ft) GROUND SURFACE
ROADWAY EMBANKMENT Brown sand and gravel. SAPROLITE 2195 2,195.0 Gray to tan silty sand with sandy silt lenses D 2190 2 190 0 84 10 D 2185 2 185 0 13 4 D 2180 2,180 0 18.4 2 D Boring Terminated at Elevation 2,178.5 ft in loose saprolite.

NCDOT GEOTECHNICAL ENGINEERING UNIT

SHEET

WBS	45393	3.1.2			TI	IP B-5207B	COUNT	Y HENDER	RSON			GEOLOGIST Hager,	M. M.		
SITE	DESC	RIPTIO	N SR	-1006	from B	Bridge No. 20 to SR-1	539: Retai	ining Wall N	0. 2				10	GROUN	D WTR (
3ORI	ING NO	. B-3			S	TATION 286+50		OFFSET	CL			ALIGNMENT -L-	***************************************	0 HR.	FIAI
COLL	AR EL	EV. 2,	200.0	ft	T	OTAL DEPTH 20.5 f	t	NORTHING	618,	507		EASTING 960,328	2	24 HR.	FIAI
RILL	RIG/HAI	MMER E	FF/DA	TE AF	=00070	CME-550X 81% 09/03/	2009				D H	.S. Augers			Automatic
	LER C			***************************************		TART DATE 01/31/1		COMP. DA				SURFACE WATER D			
LEV		DEPTH	T	ow co	~ <u>-</u>	7-7	PER FOOT		SAMP		L	JONI ACL WATER D	EFIN WA	~~~	
(ft)	ELEV (ft)	(ft)	-	0.5ft	·	-i i		75 100	NO.	MOI	0	SOIL AND R	OCK DESC	RIPTION	
				1	<u> </u>			-		INIOI		ELEV (ft)		•	DEPTH
200			 	 		H	Т		 				ND SURFAC Y EMBANKI		
	-	-									M	Gray s	and and grav		
195	2,196.0	4.0	2	1	4								ESIDUAL prown sandy	silt.	
	-		-			\$5 \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\				М		 - 2,193.5			
		<u> </u>					: : : :					SA	PROLITE silty sand.		
190	2,191.0	9.0	3	5	6	11				D		-	only sailu.		
	1	_										• '			
	2,186.0	14.0										•			
185		_	10	10	12	22	ļ	<u> </u>		D		• 			
ı	1	-				: : : i : : : :	: : : :					•			
80	2,181.0					:::/: ::::		: : :				•			
180		-	4	7	9	16		<u> </u>	1	D		-2,179.5			2
	+	-									F	Boring Terminate medium	at ⊨ievatio dense sapro	n 2,179.5 olite.	πın
	1	-											•		
	+	_										-			
	Ŧ	-										•			
	- ‡							,	İ			•			
	+	-			·							-			
ĺ	-	•										•			
	‡														
	1	-									lt	-			
	+	•										•			
	7				l							•			
	‡										l	-			
	±										l	•			
	+	.			į						F	•			
	7				l							- ·			
	1										lt				
	+											•			
	Ŧ				l							- ·			
	‡				l						lt	•			
					-						 	-			
	+											- -			
	‡											•			
									1		1 6	•			
	+											•			
	Ŧ		1		l	•						•			
	‡	.	- 1	l								· ' -			
	İ		ı		ı							•			
	Ŧ			1					1			•			
	‡	.	.		-				1			-			
	ł	l		1	1							•	•		
	Ŧ	1	- 1		1				1			•			
	#	ı									<u> </u>	-			
	+	- 1	1		- 1				1		ıſ				
		,	1	1	1				l .		l t	•			



				KEI			PORT								6/6
	45393				l	B-520			TY HENDE				GEOLOGIST Hager, M. M.	~	
	· · · · · · · · · · · · · · · · · · ·		N SR-	1006 f		•		1539: Ret	aining Wall				Tarrament :	GROUND	
	ING NO						287+00		OFFSET				ALIGNMENT -L-	0 HR.	FIAD
	LAR EL						PTH 10.6		NORTHIN				EASTING 960,314	24 HR.	FIAD
				TE AF			(81% 09/0							MMER TYPE A	utomatic
	LER C	Т				ART DA	TE 01/31		COMP. D			11	SURFACE WATER DEPTH	N/A	
(ft)	ELEV (ft)	DEPTH (ft)		0.5ft		0	25 	S PER FOO	75 10	SAMI NO.	1 /.	0	SOIL AND ROCK I	DESCRIPTION	DEPTH (ft)
200													2,199.9 GROUND SI		0.0
	_	ţ				1:1:		: : : :					ROADWAY EME - 2,198.3 Gray sand an		1.6
195	2,195.8 4.1 6 4 5						D	0	SAPROLITE Gray silty sand with sandy silt lenses.						
190	2,190.8- -	91	3	4	6			: : : :					-		
	_	-		ļ ⁻	•	●10				4	D		2,189.3 Boring Terminated at El medium dense	evation 2,189.3 ft	10.6 in
		▗┊╏╇╸╏╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒╒											medium dense	Sapronte.	

(D: R-5207E

CONTENTS

DESCRIPTION

TITLE SHEET

BORE LOG REPORTS

LEGEND SITE PLAN PROFILE

SHEET

ROJECT: 45393.1.2

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

	REFERENCE		(R-5207B)	F.	A. PROJ
ROJ	ECT DESCRIP		(HOWARD	GAP	ROAD) FROM
ITE	DESCRIPTION	RETAINING	WALL No	1	
				······································	

N.C. 45393.1.2 (R-5207B) 1 5

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 FELD BORNEY, LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1999 250-4088, NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOR AND ROCK STRATA DESCRIPTIONS AND MODICATED BOUNDARIES ARE BASED ON A CROTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARLY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNOS OR BETWEEN SAMPLED STRATA WITHIN THE BORRHOLE, THE LABORATORY SAMPLE DATA AND THE NITU HIN-PLACEL TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABLITY NEREMY IN THE STANDARD EST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOSTURE CONSTIDENTS NOICATED IN THE SUBSURFACE INVESTICATIONS ARE AS RECORDED AT THE TIME OF THE NIVESTICATION. THESE WATER LEVELS OR SOIL MOSISTURE CONSTIDENT ACCORDING TO CLIMATE CONDITIONS TO CLIMATE CONDITIONS NOICATED.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FRAIL DESCN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESCN MERORATION ON THIS PROJECT, THE DEPARTMENT DUES NOT WARRANT OR CUMPANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPENION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE GROUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISTY HAVELED AS TO CONDITIONS TO BE CHOCUNTERED TO A TUST 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 DEFERRING FROM THOSE WOICATED IN THE SUBSURFACE INFORMATION.

M M HAGER

D O CHEEK

C J COFFEY

J T WILLIAMS

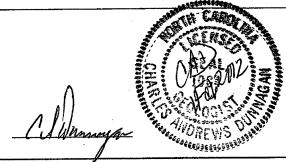
INVESTIGATED BY C A DUNNAGAN

CHECKED BY W D FRYE, Jr

SUBMITTED BY W D FRYE, Jr

DATE FEBRUARY 2012

PERSONNEL



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

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

PROJECT REFERENCE NO. 45393.1.2 (R-5207B)

SHEET NO.

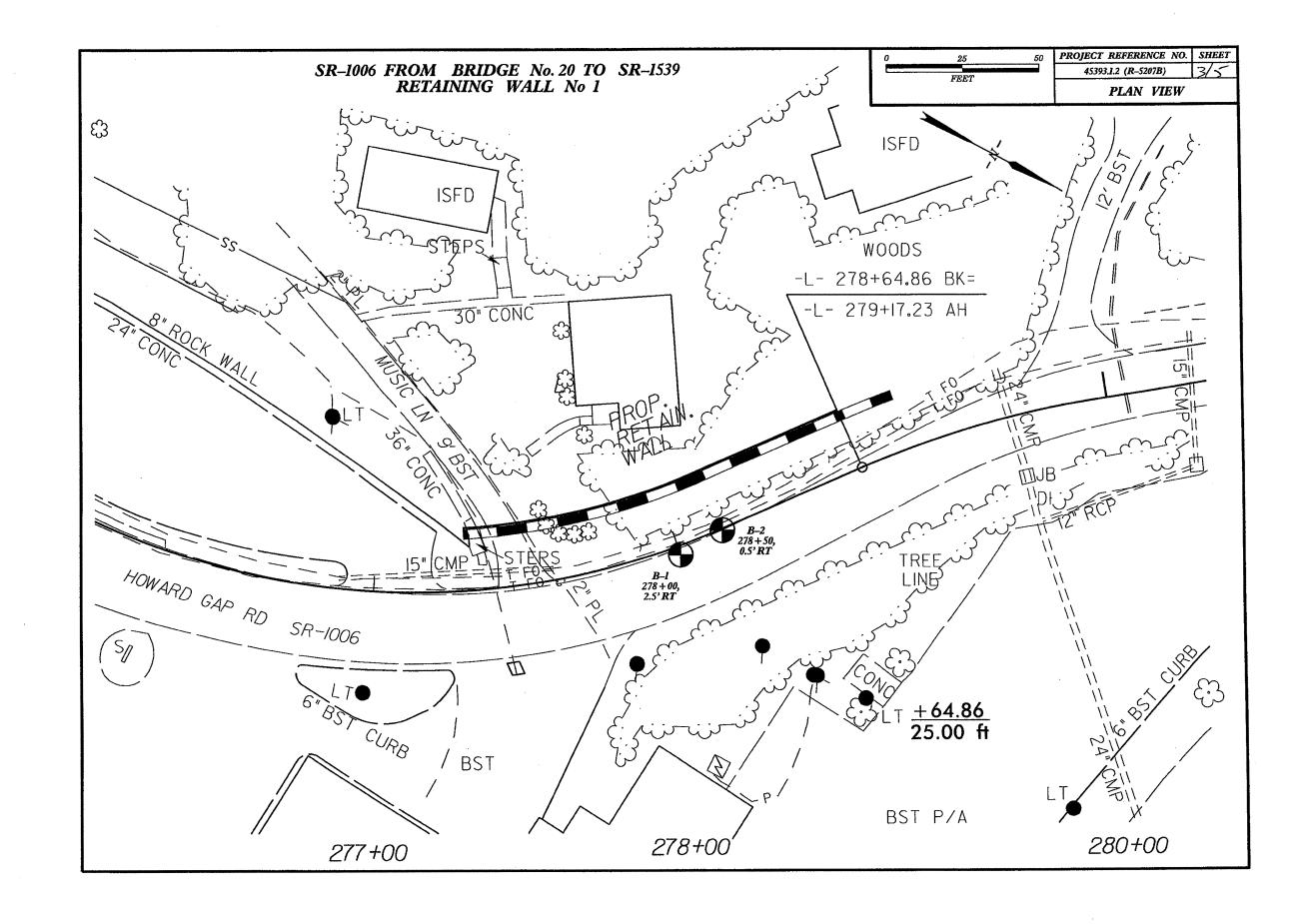
DIVISION OF HIGHWAYS

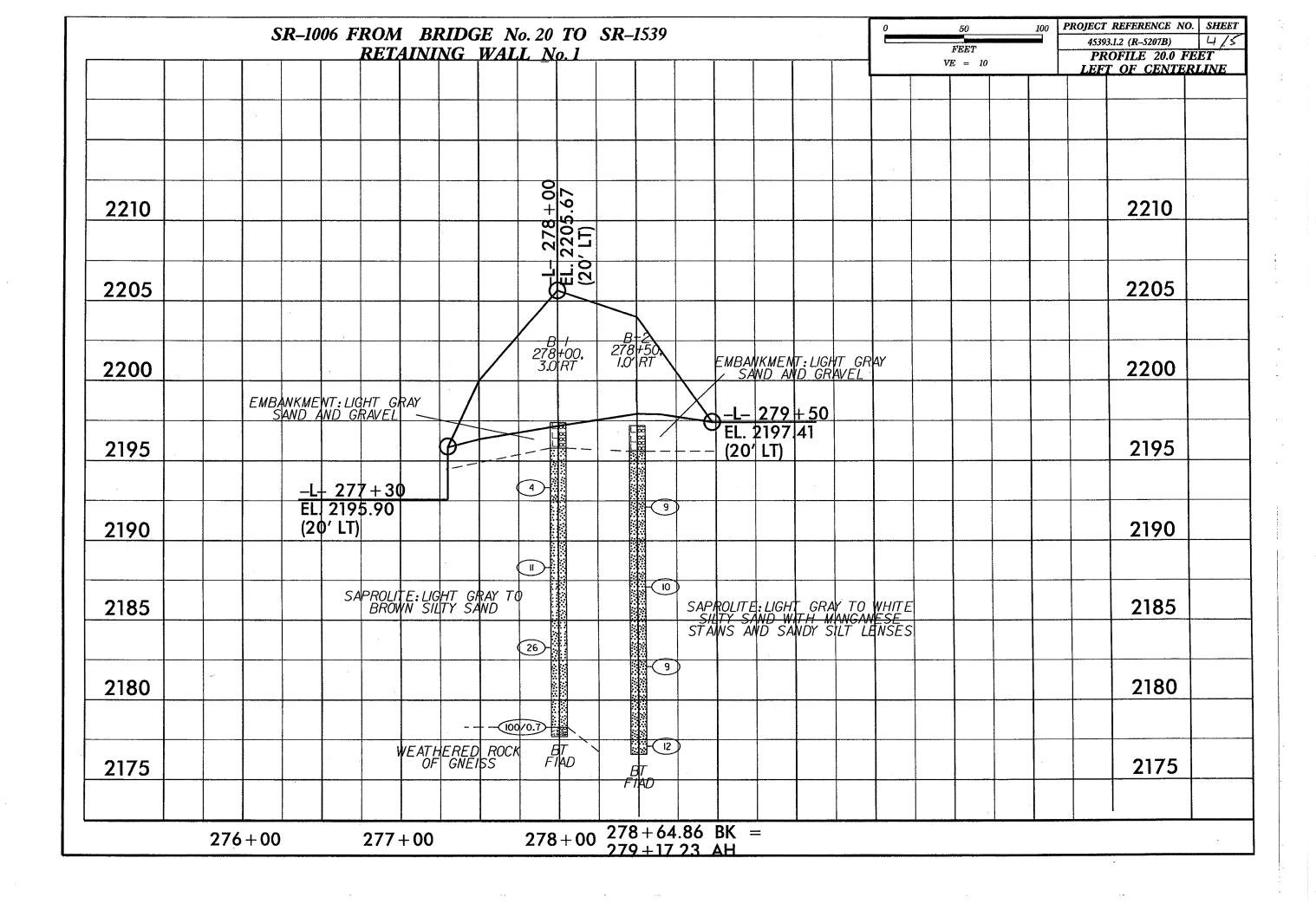
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

		CR DECEME, IEMPI	5, 51 MBOE5, AND ABBREVI		
SOIL DESCRIPTION	GRADATION WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES E	ROM FINE TO COARSE		DESCRIPTION T IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR MEATHERED EARTH MAYERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES F UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE POORLY GRADED!	SAME SIZE. IALSO	ROCK LINE INDICATES THE LEVEL AT WHICH NON-C	COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUYIUM (ALLUY,) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM D-1586). SOIL	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR N	IORE SIZES.	IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION	I SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. ON BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE	ACUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE; CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	TEGNE. ANCH AD	OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLI		ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS,
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: VER' STFF, GRY, SQTY CLM, NOST WITH RITERECOCO FWE SAND LIVERS, MOUVE PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE SUBANGULAR, SUBROUNDED, OR ROUNDED.	I ERITOULARY	WEATHERED WIND NON-COASTAL P	LAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100	OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITIO)N	ROCK (WR) BLOWS PER FOO	IT IF TESTED. E GRAIN ICKEOUS AND METAMORPHIC ROCK THAT	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
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE L	ISED IN DESCRIPTIONS	I ROCK (CR)	PI HEFUSHL IF TESTED, NOCK TIPE INCLUDES CHANTTE,	GROUND SURFACE.
CLASS. (5.35% PASSING "200) (>.35% PASSING "200)	WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		NON-CRYSTALLINE FINE TO COARSE	GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALCI) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-2-6 A-2-7 A-3 A-6, A-7	COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LIQUID LIMIT	LESS THAN 3I	BOCK (NCR) SEDIMENTARY RO	OCK THAT WOULD YELLO SPT REFUSAL IF TESTED. ROCK TYPE LITE, SLATE, SANDSTONE, ETC.	COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LIQUID LIMIT	EQUAL TO 31-50 GREATER THAN 50	COASTAL PLAIN COASTAL PLAIN	SEDIMENTS CEMENTED INTO BOCK BUT MAY NOT YIFLD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL
Z PASSING	PERCENTAGE OF MATERIA		(CP) SHELL BEOS, ETC	IOCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
" 10 S0 MX GRANULAR SILT- MUCK, CLAY PEAT	ORGANIC MATERIAL GRANULAR SILT - CLAY	OTHER MATERIAL		ATHERING	ROCKS OR CUTS MASSIVE ROCK.
# 46 39 MX 59 MX 51 NN SOILS SOILS PEAT P	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRA	ACE 1 - 10%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW J. HAMMER IF CRYSTALLINE.	OINTS MAY SHOW SLIGHT STAINING ROCK RINGS UNDER	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
LIQUID LIMIT 48 NX 41 NN 48 NX 41 NN 48 NX 41 NN 48 NX 41 NN 48 NX 41 NN SQILS WITH	LITTLE ORGANIC MATTER	TLE 10 - 20% 4E 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAIN	NED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF
PLASTIC INDEX 6 MX NP 16 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN LITTLE OR HIGHLY	HIGHLY DRGANIC >10% >20% HIG		(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FAI OF A CRYSTALLINE NATURE.	CE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF	THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 8 8 8 4 MX 8 MX IZ MX IG MX No MX MODERATE ORGANIC	GROUND WATER		SLIGHT ROCK GENERALLY FRESH, JOINTS STAIN	NEO AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MATOR PRAYEL AND FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER I	DRILLING	(SLI.) I INCH. OPEN JOINTS MAY CONTAIN CL	AY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
NATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS MATTER GEN. RATING	STATIC WATER LEVEL AFTER 24 HOURS		MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW	DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM
AS A EXCELLENT TO GOOD FAIR TO POOR PAIR TO POOR UNSUITABLE	PERCHED WATER, SATURATED ZONE, OR WATER BEARI	NG STRATA		RE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS NO SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.
SUBCRADE PLOF A-7-5 SUBGROUP IS ≤ LL - 30 ; PLOF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP		WITH FRESH ROCK.		FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	5		O OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL DW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN
PRIMARY SOIL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SPY CPT POPT DATA TEST BORIS			OGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	THE FIELD.
PRIMARY SOIL TYPE CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (N-VALUE) (TONS/FIZ)	WITH SOIL DESCRIPTION OF PHT TEST BORRIE			D or stained rock fabric clear and evident but reduced	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
GENERALLY VERY LOOSE 4 TO 10	SOIL SYMBOL AUGER BORING	S - BULK SAMPLE	(SEV.) IN STRENGTH TO STRONG SOIL. IN GR	ANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME	LEGGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
MATERIAL MEDIUM DENSE 10 TO 30 N/A	ARTIFICIAL FILL (AF) OTHER	SS - SPLIT SPOON SAMPLE	EXTENT. SOME FRAGMENTS OF STRONG IF TESTED, YIELDS SPI N VALUES > 1		LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
(NON-COHESIVE) DENSE 30 TO 50 VERY DENSE >50	THAN ROADWAY EMBANKMENT -CORE BORING	ST - SHELBY TUBE		D OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT	MOTTLEO (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD GRAINAGE.
VERY SOFT <2 <0.25	INFERRED SOIL BOUNDARY NO MONITORING WE	SAMPLE LL	REMAINING. SAPROLITE IS AN EXAMPLE	TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK E OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN
GENERALLY SOFT 2 TO 4 0.25 TO 0.50	INFERRED ROCK LINE A PIEZOMETER	HS - HOCK SAMPLE	1	BRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF	INTERVENING INPERVIOUS STRATUM.
MATERIAL STIFF 8 TO 15 1 TO 2	***** ALLUVIAL SOIL BOUNDARY INSTALLATION	RT - RECOMPACTED TRIAXIAL SAMPLE		NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD >30 >4	25/625 DIP & DIP DIRECTION OF SLOPE INDICATO		ALSO AN EXAMPLE.		ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND
TEXTURE OR GRAIN SIZE	ROCK STRUCTURES SPT N-VALUE	RATIO SAMPLE		CHARDNESS	EXPRESSED AS A PERCENTAGE.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	SOUNDING ROD REF SPT REFUSAL		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SEVERAL HARD BLOWS OF THE GEOLO	SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	ABBREVIATIONS		HARD CAN BE SCRATCHED BY KNIFE OR PIC	CK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	AR - AUGER REFUSAL HI HIGHLY	w - MOISTURE CONTENT	TO DETACH HAND SPECIMEN.		TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(8L0R.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	BT - BORING TERMINATED MED MEDIUM CL CLAY MICA MICACEOUS	V - VERY VST - VANE SHEAR TEST		CK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE OLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2,0 0.25 0.05 0.005 SIZE IN. 12 3	CPT - CONE PENETRATION TEST MOD MODERATELY	WEA WEATHERED	BY MODERATE BLOWS.		STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
	CSE COARSE NP - NON PLASTIC DMT - DILATOMETER TEST ORG ORGANIC	7 - UNIT WEIGHT 7 - DRY UNIT WEIGHT		NCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE COURT FOR FUEL AMOUNT OF SCALES	DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER TEST	· •	POINT OF A GEOLOGIST'S PICK.		A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	e - VOID RATIO SAP SAPROLITIC F - FINE SO SAND, SANDY	FIAD-FILLED IMMEDIATELY AFTER ORILLING WOH-WEIGHT OF HAMMER		SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH
- SATURATED - USUALLY LIQUID, VERY WET, USUALLY	FOSS FOSSILIFEROUS SL SILT, SILTY FRAC FRACTURED, FRACTURES SLI SLIGHTLY	THE PARTY OF THE PARTY	PIECES CAN BE BROKEN BY FINGER		OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY
LL LIQUID LIMIT (SAT.) FROM BELOW THE GROUND WATER TABLE	FRACE - FRACTURED, FRACTURES SELT - SELECTION FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED, FRACTURED		SOFT OR MORE IN THICKNESS CAN BE 8RO	E EXCAVATED READILY WITH POINT OF PICK, PIECES I INCH KEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	TOTAL LENGTH OF ROOK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC SEMISOLID: REQUIRES DRYING TO	CONTEMPNET LICED ON CURTICAL	DDO ICCT	FINGERNAIL.	BEDOME	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(PI) PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT I		FRACTURE SPACING	BEDDING TERM THICKNESS	
	DRILL UNITS: ADVANCING TOOLS:	HAMMER TYPE:	TERM SPACING VERY WIDE MORE THAN 10 FEET	VERY THICKLY BEDDED > 4 FEET	BENCH MARK: BM # 14: SPIKE IN TREE 65.28' RT OF -Y18- STA 12+77.17
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT	MOBILE 8- CLAY BITS	X AUTOMATIC MANUAL	WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET	THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET	ELEVATION: 2170.53 FT.
REQUIRES ADDITIONAL WATER TO	6° CONTINUOUS FLIGHT AUGER	CORE SIZE:	CLOSE Ø.16 TO 1 FEET	VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	NOTES:
- DRY - (D) ATTAIN OPTIMUM MOISTURE	BK-51 X 8" HOLLOW AUGERS	□-в	VERY CLOSE LESS THAN Ø.16 FEET	THINLY LAMINATED < 0.008 FEET	_[
PLASTICITY	CME-45C HARD FACED FINGER BITS			DURATION	4
PLASTICITY INDEX (PI) ORY STRENGTH	X TUNG,-CARBIDE INSERTS		numeru.	NING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NONPLASTIC 0-5 VERY LOW LOW PLASTICITY 6-15 SLIGHT	X CME-550 CASING W/ ADVANCER	HAND TOOLS:		G WITH FINGER FREES NUMEROUS GRAINS; : BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH	POST HOLE DIGGER		CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	
COLOR	TRICONE TUNGCARB.	HAND AUGER	BREAKS	EASILY WHEN HIT WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT	SOUNDING ROD		ARE DIFFICULT TO SEPARATE WITH STEEL PROBE:	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		VANE SHEAR TEST	EXTREMELY INDURATED SHARP	HAMMER BLOWS REQUIRED TO BREAK SAMPLE:	
· ·		🔲		E BREAKS ACROSS GRAINS.	





NCDOT GEOTECHNICAL ENGINEERING UNIT

SHEET

	45393	3.1.2		···	1	ΓIP	REPORT R-5207B		Y HENDEF				GEOLOGIST Hager, M. M.		~~~
SITE	DESCI	RIPTIO	N Sr-	1006 f	rom B	Brid	dge No. 20 to SR-15	39: Reta	ining Wall N	o. 1				GROUN	ID WTR (f
3OR	ING NO	. B-1			. 5	STA	ATION 278+00		OFFSET	3 ft RT			ALIGNMENT -L-	0 HR.	FIAC
COL	LAR EL	EV. 2	,197.4	ft	7	гот	TAL DEPTH 19.7 ft		NORTHIN	G 617,8	32		EASTING 960,673	24 HR.	FIAD
RILI	RIG/HA	MMER E	EFF./DA	TE A	FO007	0 C	CME-550X 81% 09/03/2	009		DRILL I	WETHO	D H	S. Augers HAM	MER TYPE	Automatic
RIL	LER C	heek,	D. Q.		S	STA	ART DATE: 01/31/1	2	COMP. DA	TE 01/	31/12		SURFACE WATER DEPTH	N/A	
LEV	DRIVE ELEV	DEPTI	BL	owco	TNUC	\prod		ER FOOT		SAMP.	V /	L	SOIL AND BOOK DE	COURTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	Ш	0 25 5	0	75 100	NO.	MOI		SOIL AND ROCK DE	SCRIPTION	DEPTH (
200		-											made		
	-												: 2,197.4 GROUND SUR	FACE	
95	-	•										<u> </u>	2,195.8 ROADWAY EMBA Light gray sand ar	NKMENT	1
	2,193.3	- - 4.1		1		11	İ				١.		SAPROLIT	E	
	-	-	3	2	2	11	Q 4				D		Light gray to brown	silty sand.	
90		-	ĺ				1				l ·		-		
ı	2,188.3	9.1	3	4	7	$\ \ $:::: ::: <i>j</i> ::								
ا ء	1	•	•	'	'		. 11				D				
85	- 2,183.3	-				$\ \cdot\ $			1				<u>-</u>		
İ	يدهمي		10	15	11		26		: : : :		D				
80	1	-											_		
i	2,178.3	19.1	30	90/0.2									2,178.3 -2,177.7 WEATHEDEN		19
			30	90/0.2		T			100/0.7	1		+67/6	WEATHERED Weathered rock o		19
į	1	-										F	Boring Terminated at Elev weathered rock of	ation 2,177.	7 ft in
	1												Weathered rock o	griciss.	
Ì	Ŧ												•		
	Ŧ	•											-		•
	Ŧ														
-	#												. .		
	‡					l									
	‡												•		
	+												-		
1	‡					l			•						
	#					ŀ							_		
ĺ	‡														
	‡														
	†												-		
	İ											-			
	1														
	7												-		
	Ŧ	i													
1	Ŧ												<u>-</u>		
-	Ŧ	1]												
	‡		- 1												
	‡	ĺ	ĺ				٠						-	,	
	‡	- 1	1												
	‡														
	‡		- 1												
	‡											F			
	+]									F	•		
	Ŧ							•				F			
1	I											l			

NCDOT GEOTECHNICAL ENGINEERING UNIT

57/

WBS 45393.1.2 TIP R-5207B COUNTY HENDERSON GEOLOGIST Hager, M. M. **GROUND WTR (ft)** SITE DESCRIPTION Sr-1006 from Bridge No. 20 to SR-1539: Retaining Wall No. 1 BORING NO. B-2 **STATION** 278+50 OFFSET 1ft RT ALIGNMENT -L-0 HR. FIAD COLLAR ELEV. 2,197.2 ft **NORTHING 617,840 EASTING 960,660** 24 HR. FIAD TOTAL DEPTH 20.6 ft DRILL RIG/HAMMER EFF/DATE AFO0070 CME-550X 81% 09/03/2009 DRILL METHOD H.S. Augers HAMMER TYPE Automatic DRILLER Cheek, D. O. **START DATE 01/31/12** COMP. DATE 01/31/12 SURFACE WATER DEPTH N/A ELEV (ft) | DRIVE (LEV (ft) | DEPTH | BLOW COUNT | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5ft | 0.5 SAMP. **BLOWS PER FOOT** SOIL AND ROCK DESCRIPTION MOI G 75 100 NO. 2200 **GROUND SURFACE** ROADWAY EMBANKMENT Light gray sand and gravel.

SAPROLITE 2195 Light gray to white silty sand with manganese D oxide stains and sandy silt lenses. 2190 2,188.1 D 2185 2,183.1 14.1 D 2180 2 178 1 19 1 D Boring Terminated at Elevation 2,176.6 ft in medium dense saprolite.