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DESCRIPTION
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BORE LOGS & CORE LOG

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY POLK

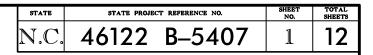
PROJECT DESCRIPTION REPLACE BRIDGE 34 ON SR-1311 (ROCK SPRING RD) OVER WALNUT CREEK

SITE DESCRIPTION _

540

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22 461 **PROIECT**



CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1919 TO7-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAIL

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSUFFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSUFFACE 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 DEOREE OF RELIABILITY INHERENT IN THE STANDARD TEST WETHOD. THE OBSERVED WATER LEVELS OR SOLI MOISTURE CONDITIONS INDICATED IN THE SUBSUFFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOLI MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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

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

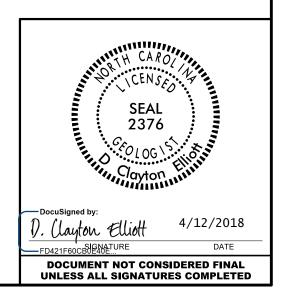
PERSONNEL

CJ COFFEE

DO CHEEK

DC ELLIOTT

NVESTIGATED BY DC ELLIOTT
DRAWN BY PQ LOCKAMY
CHECKED BYJC KUHNE
SUBMITTED BY
DATE



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION							
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO I 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING;	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TEST ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EDUAL TO OR LESS THAN 0. BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK DEDUCENTED BY A JOINT OF UNDIVERSION OF THE STATE							
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:							
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPI							
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.							
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) URGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE IN GNEISS, GABBRO, SCHIST, ETC.							
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-7, A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE. COMPRESSIBILITY	NON-CRYSTALLINE SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL							
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR) ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETG							
2 Pageine	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT SEDIMENTARY ROCK SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDS							
*10 50 MX GRANULAR SILT- MUCK,	PERCENTAGE OF MATERIAL								
*40 38 MX 58 MX 51 MN *200 15 MX 25 MX 18 MX 35 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 50 LS SOLLS	GRANULAR SILT - CLAY ORGANIC MATERIAL <u>SOILS OTHER MATERIAL</u>	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK							
MATERIAL PASSING *40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.							
LL – – 40 MX 41 MN	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY CO (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HI							
PI 6 MX NP 18 MX 11 MN 11 MN 18 MX 11 MN 10 MX 10 MX<	GROUND WATER	OF A CRYSTALLINE NATURE.							
USUAL TYPES STONE FRACE	✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO RO (SLI.) I INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL							
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER <u>24</u> HOURS	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS							
CEN BATING	∇ PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLA							
AS SUBGRADE EXCELLENT TO GOUD FAIR TO POOR POOR ONSUTTABLE	SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH WITH FRESH ROCK.							
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ;PI OF A-7-6 SUBGROUP IS > LL - 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL F							
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LI (MOD, SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND '							
PRIMARY SOIL TYPE COMPACTNESS OR PENETARTION RESISTENCE COMPRESSIVE STRENGTH CONSISTENCY (N-VALUE) (TONS/FT ²)	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND E							
GENERALLY VERY LOOSE < 4		(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS A							
GRANULAR MEDIUM DENSE 10 TO 30 N/A		TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</u>							
MATERIAL DENSE 30 TO 50 (NON-COHESIVE) VERY DENSE > 50	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS AR							
VERY SOFT < 2 < 0.25	I - INFERRED SOIL BOUNDARY - CORE BORING • SOUNDING ROD	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF (V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT							
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0		VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N V</u> COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY							
MATERIAL STIFF 8 TO 15 1 TO 2		SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS							
(COHESIVE) VERY STIFF 15 T0 30 2 T0 4 HARD > 30 > 4	TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT	ALSO AN EXAMPLE.							
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMEN:							
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE ACCEPTABLE, BUT NOT TO BE	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.							
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053 DOW DED COARSE FINE SU Z	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BI TO DETACH HAND SPECIMEN.							
BOULDER COBBLE GRAVEL SAND SAND SILT CLAY (BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)		MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DE							
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DI BY MODERATE BLOWS.							
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE O							
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\dot{\gamma}_{ m d}$ - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD POINT OF A GEOLOGIST'S PICK.							
SOIL MOISTURE SCALE FIELD MOISTURE (ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POIN							
- SATURATED - USUALLY LIOUID; VERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	PIECES CAN BE BROKEN BY FINGER PRESSURE.							
(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCH							
LL LIOUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.							
(PI) - WEI - (W) ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING HI HIGHLY V - VERY RATIO	FRACTURE SPACING BEDDING							
	EQUIPMENT USED ON SUBJECT PROJECT	T <u>ERM</u> <u>SPACING</u> <u>TERM</u> VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED							
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1. MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.1							
	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.0 VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.00							
- DRY - (D) ATTAIN OPTIMUM MOISTURE	CME-55 6' CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED <							
PLASTICITY	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■								
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC Ø-5 VERY LOW		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HE RUBBING WITH FINGER FREES NUMEROUS GRAINS:							
SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST X CASING X W/ ADVANCER	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.							
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH ST BREAKS EASILY WHEN HIT WITH HAMMER.							
COLOR		COMING ARE DIFFICULT TO SEPARATE WITH STEEL							
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).		DIFFICULT TO BREAK WITH HAMMER.							
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE SAMPLE BREAKS ACROSS GRAINS.							

PROJECT REFERENCE NO. SHEET NO. 46122 B-5407

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ED. AN INFERRED	TERMS AND DEFINITIONS
) SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
I FOOT PER 60 IS OFTEN	AQUIFER - A WATER BEARING FORMATION OR STRATA.
	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
T N VALUES >	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
T IN VALUES /	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
OCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
NCLUDES GRANITE,	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
AL PLAIN IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
с.	OF SLOPE.
MAY NOT YIELD STONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
	$\underline{\text{DIKE}}$ - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
RINGS UNDER	$\overline{\text{DIP}}$ - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
COATINGS IF OPEN, HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
DCK UP TO AL FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
R BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
S. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
AY. ROCK HAS H AS COMPARED	PARENT MATERIAL.
	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM,
FELDSPARS DULL LOSS OF STRENGTH	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
EVIDENT BUT ARE KAOLINIZED	ITS LATERAL EXTENT.
	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
RE DISCERNIBLE OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
T ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
<u>VALUES < 100 BPF</u> IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
S. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
IS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
BLOWS REQUIRED	<u>SILL</u> - AN INTRUSIVE BODY OF ICNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
EEP CAN BE DETACHED	<u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
OR PICK POINT. BLOWS OF THE	STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT) - NUMBER OF BLOWS (N OR BPF)OF A 140 LB.HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
I FRAGMENTS NT. SMALL, THIN	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
. PIECES 1 INCH	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEOMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
HED READILY BY	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
THICKNESS	
4 FEET 1.5 - 4 FEET	ELEVATION: 892.34 FEET
.16 - 1.5 FEET	NOTES:
03 - 0.16 FEET 08 - 0.03 FEET	
< 0.008 FEET	
EAT, PRESSURE, ETC.	
.	
TEEL PROBE;	
PROBE:	
E;	DATE: 8-15-14
	DATE: 8-13-14

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

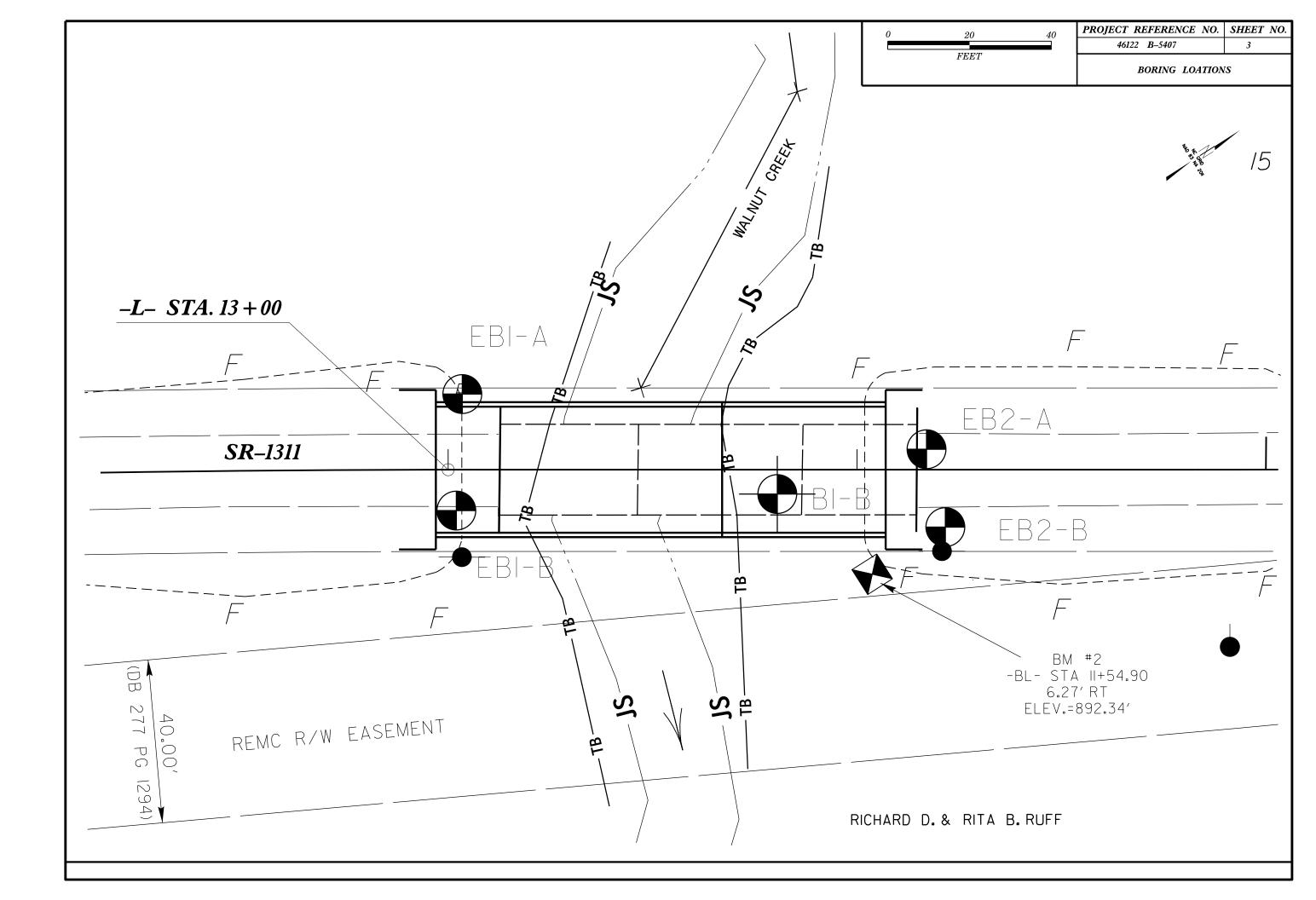
AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed F	Rock Mass (Marı	nos and Hoek,2	2000)			AASHTO LRFD Figure 10.4.6.4–2 — Determination of GSI for T
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation	Nock Mass (Mari s s s s c r s s c r s s c r s s c r s s c r s s	ed, iron stained	weathered and	weathered surfaces ngs or fillings ts	weathered surfaces ings or fillings	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000) From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average valu of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the
With respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	VERY GOOD Very rough, fresh	BEAS COOD Surfaces Surfaces	FAIR Smooth, moderately altered surfaces	POOR Slickensided, highly v With compact coating or angular fragment	VERY POOR Slickensided, highly with soft clay coat	Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fai poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
STRUCTURE		REASING SU		ALITY 💳		COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.
BLOCKY - well interlocked un- disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70 [′] 60				B. Sand- stone with thun inter-
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		5	0			layers of siltstone amounts stone layers
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H .
discontinuity sets. Persistence of bedding planes or schistosity DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Manana into small rock pr

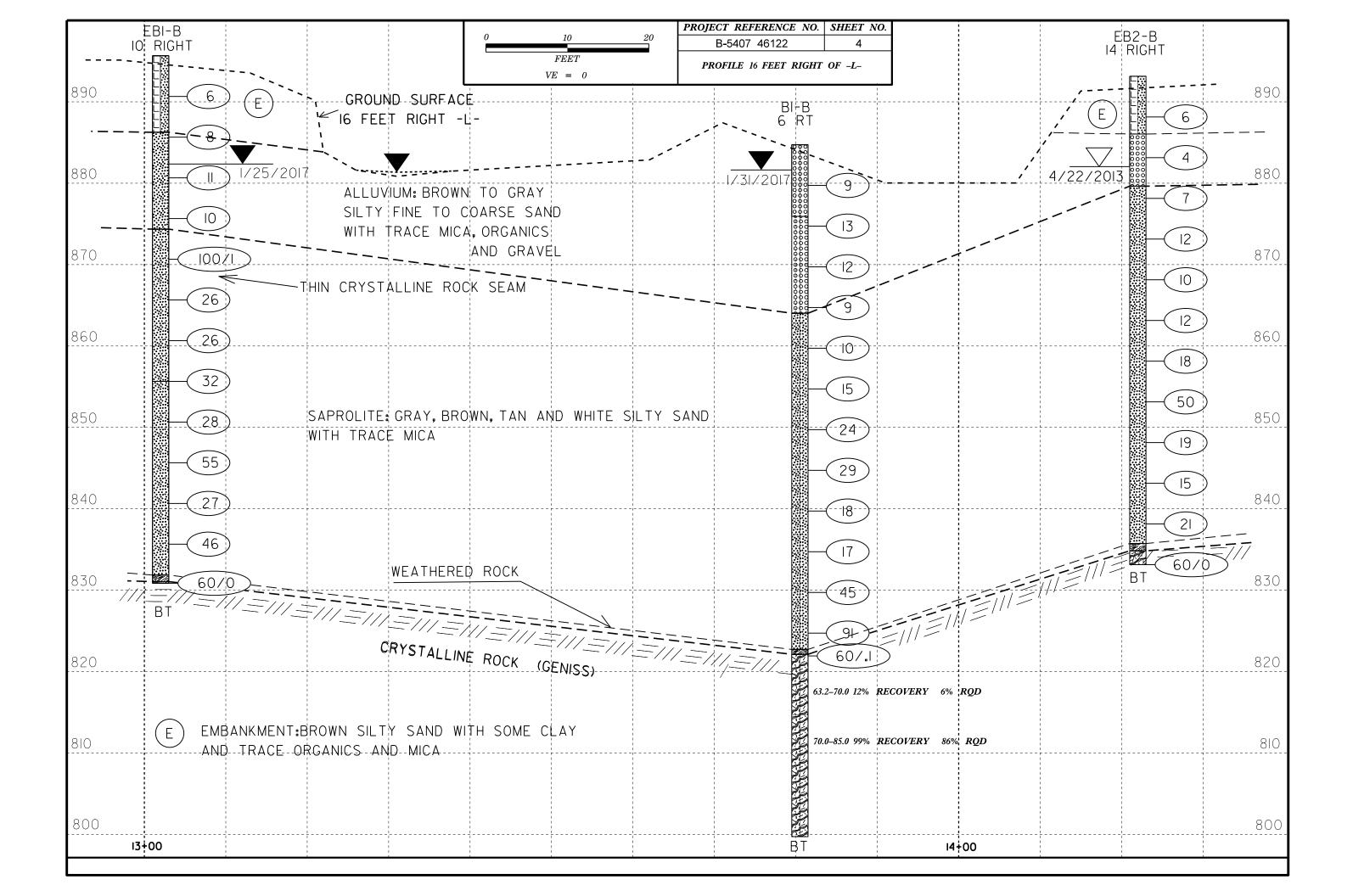
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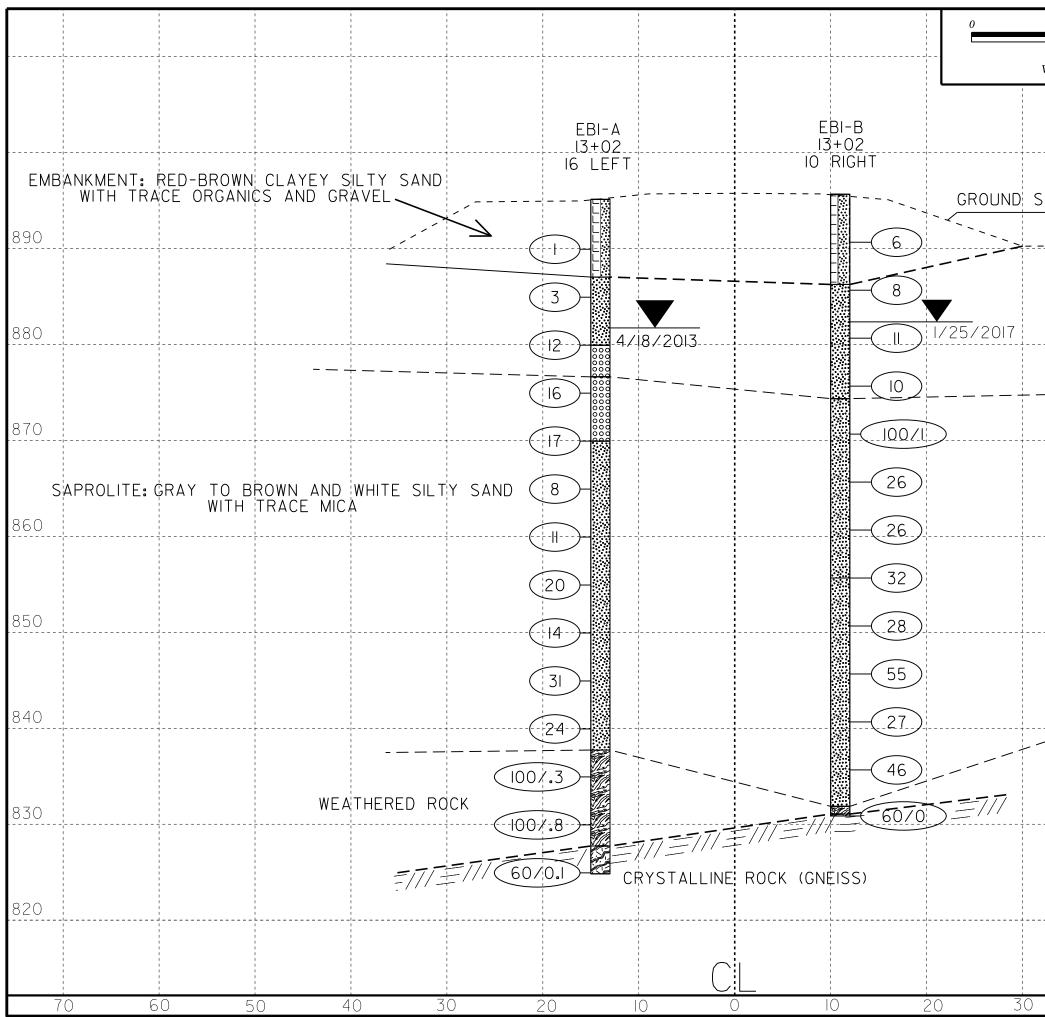
 46122
 B-5407
 2A

All - Smooth, moderately weathered surfaces	weathered and altered surfaces POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments VERY POOR - Very smooth, slicken- sided or highly weathered surfaces with solf clain coatings or fillings
E. Weak sultstone or clayey shale with sandstone	
eformed, d/faulted, hale or sultstone deformed forming an tructure eformed sulty forming a	

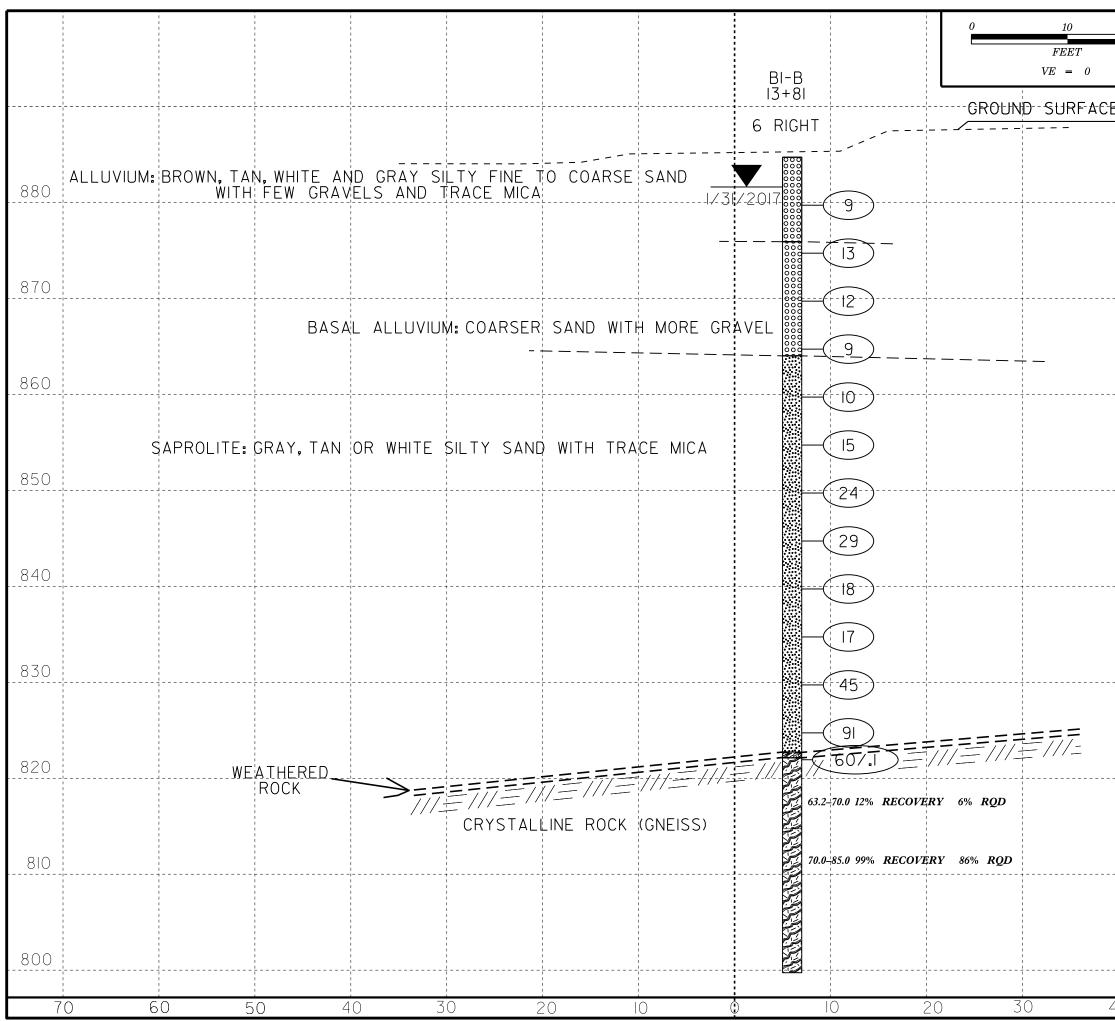
DATE: 8-19-16



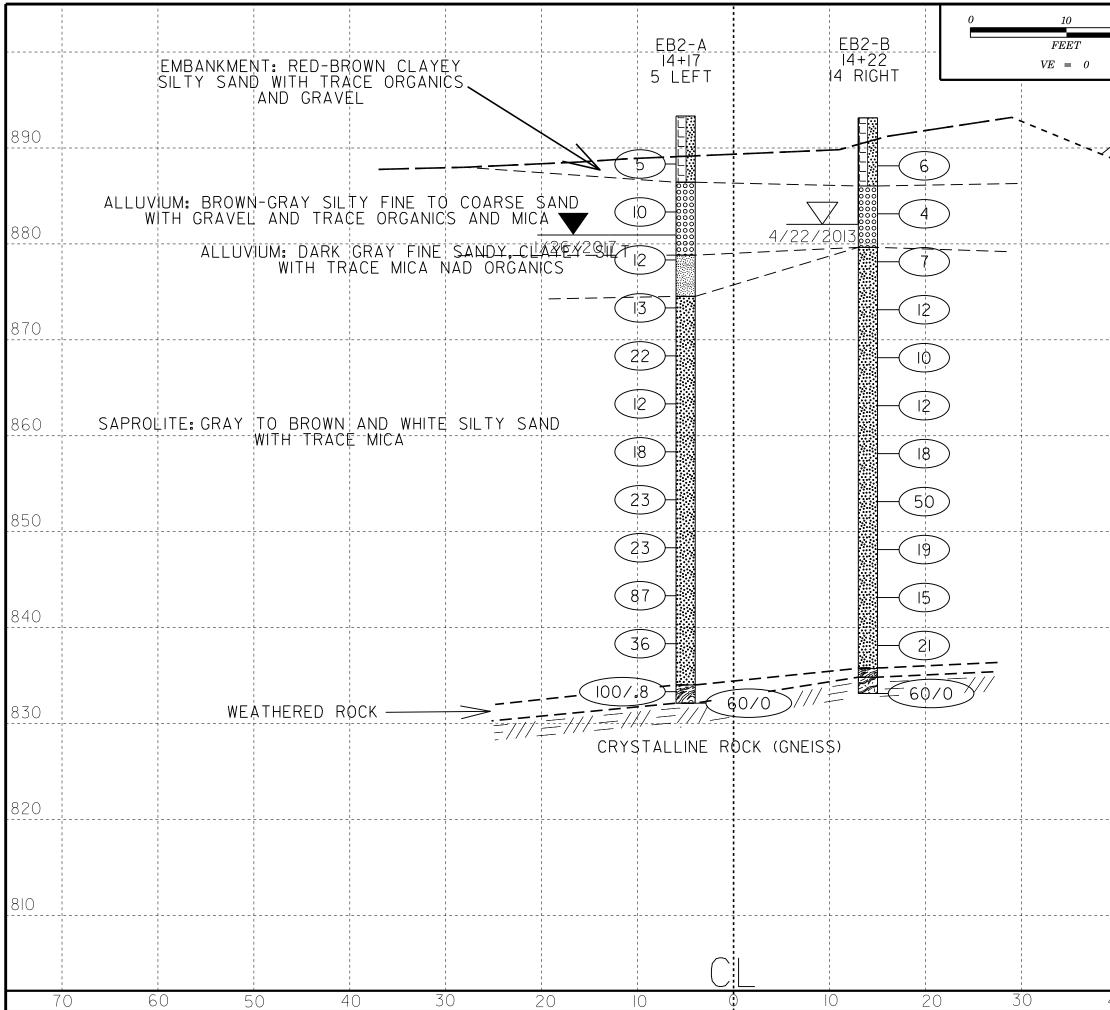




10 20	PROJECT REFERENCE N	
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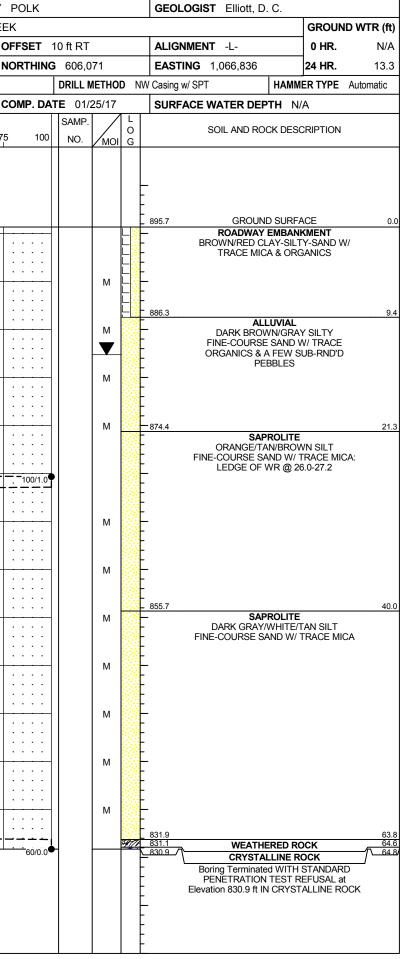
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20	PROJECT	REFERENCE NO.	SHEET NO.
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GEOTECHNICAL BORING REPORT BORE LOG

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GEOTECHNICAL BORING REPORT BORE LOG

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WBS	4 612	2.1.1			ТІ	P B-540	7	COL	UNTY	POLK				GEOLOGIST Elliott,). C.			WBS	4612	2.1.1			TI	P B-540	7	COUNT	YF
SITE	DESCR	RIPTION	BRI	DG # 3	4 ON 3	SR-1311	OVER W	/ALNUT	CRE	EK						GROUND WTR	(ft)	SITE	DESCR	RIPTIO	N BRI	DG # 3	4 ON 3	SR-1311	OVER WA	LNUT CR	<pre> </pre>
BOR	ING NO). B1-B	8		ST	ATION	13+81			OFFSET	6 ft RT			ALIGNMENT -L-		0 HR. 1	N/A	BOR	ING NO). B1-E	В		ST	ATION	13+81		OF
COL	LAR EL	.EV. 88	384.7 ft TOTAL DEPTH 85.0 ft					.0 ft	NORTHING 606,140					EASTING 1,066,874 24 HR. 3.1				COL	LAR EL	EV. 8	84.7 ft		т	ť	NO		
DRILL RIG/HAMMER EFF./DATE AME9533 CME-550X 83% 01/					0//2015			DRILL	METHO) DD	IW Casing W/SPT & Core HAMMER TYPE Automatic				DRILL	RIG/HA	MMER I	eff./da	TE AN	/IE9533	E9533 CME-550X 83% 01/0//2015						
DRIL	DRILLER Cheek, D. O. START DATE 01/31/17						1/17		COMP. D	ATE 01	/31/17	7	SURFACE WATER DEPTH N/A				DRIL	LER (Cheek,	D. O.		ST	START DATE 01/31/17				
ELEV	DRIVE ELEV	UEPIN		ow co			BLOV	VS PER F	TOOT		SAMP.		L	SOIL AND R		CRIPTION		ELEV	DRIVE ELEV	IDEPT	·	ow cou			BLOWS	PER FOOT	r
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	7	75 10	⁰ NO.	Имо	DI G			DEPT	H (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75
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840	839.7 -	+ 45.0 +	5	8	10		18					м		<u> </u>					-	‡							
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835	- 834.7 -	± 50.0												<u>-</u>						Ŧ							
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830	829.7 -	55.0	13	21	24	<u> </u>				<u> </u>		D		F					-	ł							
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830 830 825	004 7	Ŧ												F						Ŧ							
	824.7 -	+ 60.0 +	20	14	77					· · •	11	D		-			e		-	Ŧ							
00034 028 BRDG0034	821.9	<u>+ 62.8</u>	60/0.1	-					· · ·	· · · · · · · · · · · · · · · · · · ·	i 🔶		14		HERED RO	оск /—	62.0 62.6			‡							
유 <u>820</u>		‡	00/0.1				· · · ·	· · · ·	· · ·					- CRYST	ALLINE R	OCK				‡							
		‡							· · ·											‡							
5		‡							· · ·	· · · ·										‡							
	-	±				· · · · ·	+			<u> </u>	-11								-	±							
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١T	Y POLK				GEOLOGIST Elliott, D.	C.		
R	EEK						GROUN	D WTR (ft)
	OFFSET	6 ft RT			ALIGNMENT -L-		0 HR.	N/A
	NORTHING	G 606,1	40		EASTING 1,066,874		24 HR.	3.1
		DRILL	NETHO	D NW	Casing W/SPT & Core	НАММ	ER TYPE	Automatic
	COMP. DA	TE 01/	31/17		SURFACE WATER DEP	TH N/	Ą	
ОТ		SAMP.	$\left \right $	L O	SOIL AND ROC	K DESC	RIPTION	
	75 100	NO.	моі					
		+	┣					
					ontonaline		Jonanaoa)	
· ·					799.7			85.0
					Boring Terminated		STANDAR	D
				F	PENETRATION Elevation 799.7 ft IN	CRYST	ALLINE RO	СК
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GEOTECHNICAL BORING REPORT CORE LOG

WBS	46122	.1.1			TIP	B-540	7	С	OUNT	Y P	OLK	GEOLOGIST Elliott, D.	C.								
SITE	DESCR	IPTION	BRD	G # 34 O	N SR-	1311 C	VER WA	LNUT	CREE	K				GROUN	ID WTR (ft)						
BORI	NG NO.	B1-B			STAT	ΓΙΟΝ	13+81			OFI	SET 6 ft RT	ALIGNMENT -L-		0 HR.	N/A						
COLI	LAR ELE	EV. 88	84.7 ft		Тот	AL DEI	PTH 85	.0 ft		NO	RTHING 606,140	EASTING 1,066,874		24 HR. 3.1							
DRILL	. RIG/HAM	IMER EF	F./DATI	E AME95	33 CME	-550X	83% 01/0/	/2015			DRILL METHOD NW	Casing W/SPT & Core	HAMME	R TYPE	Automatic						
DRIL	LER C	heek, D). O.		STAF	rt da'	TE 01/3	1/17		co	MP. DATE 01/31/17	SURFACE WATER DEP	TH N/A	4							
COR	E SIZE	NXWL					N 21.8 f														
ELEV	RUN ELEV	DEPTH		DRILL RATE	REC.	JN RQD	SAMP.	STR REC.	RATA RQD												
(ft)	(ft)	(ft)	(ft)	(Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	Ğ	ELEV. (ft)		<u> </u>		DEPTH (ft						
21.53	821.5	63.2	1.0	0.07/0.0		(0,4)						Begin Coring @ 63.2 ft									
820	821.5 - 819.7_	65.0	1.8 5.0	0:27/0.8 0:35/1.0	(0.6) 33%	(0.4) 22%						RYSTALLINE ROCK (continu	eu)								
	-	E	0.0	0:19/1.0 0:29/1.0 0:20/1.0	(0.2) 4%	(0.0) 0%															
815	814.7	70.0		0:15/1.0 0:17/1.0																	
	-		5.0	0:39/1.0 0:48/1.0	(4.7)	(3.7) 74%															
	-	E		1.18/1 0		7470															
810	809.7_	75.0	5.0	1:29/1.0 1:37/1.0	(5.0)	(5.0)					- 										
	-	Ł		1:37/1.0 1:41/1.0 1:43/1.0	100%	100%															
305	804.7	80.0		1:45/1.0																	
	-		5.0	1.28/1.0	(4.9) 98%	(4.2) 84%															
	-	L		1:38/1.0 1:34/1.0 1:43/1.0		01/0															
300	799.7_	85.0		1:43/1.0 1:35/1.0							799.7 Boring Terminated W	ITH STANDARD PENETRA		ST REFL	85.0						
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SHEET10

B-5407

BORING B1-B

BOX 1 OF 2

DEPTH: 63.2-78.7



B-5407

BORING B1-B

BOX 2 OF 2

DEPTH: 78.7-85.0



Sheet 11

GEOTECHNICAL BORING REPORT BORE LOG

									_		JRE																							
WBS	46122	2.1.1			TI	P B-54	407		COU	NTY	POLK					GE	OLOGI	ST E	lliott, D.	. C.	1		WBS	46122	2.1.1			Т	IP B-	5407		CC	DUNTY	[
SITE	DESCR	IPTION	BRE)G # 3	4 ON 3	SR-131	1 OV	'ER WA	ALNUT												GROUN	ND WTR (ft)	SITE	DESCR	IPTION	BRI	DG # 3	34 ON	SR-1	<u>311 O'</u>	VER W	ALNU	IT CRE	EF
BORI	NG NO.	EB2-	A		ST	TATION	14+	+17			OFFSET	5 ft L	Т			AL	IGNME	NT -L			0 HR.	N/A	BOR	ING NO.	. EB2	-В		s	TATIC	DN 14	+22			OF
COLL	AR ELE	EV. 89	3.3 ft		т	DTAL D	EPTH	i 61.2	ft		NORTHI	NG 60	6,17	7		EA	STING	1,066	6,885		24 HR.	12.4	COL	LAR ELI	EV. 89	93.1 ft		Т	OTAL	DEPT	H 60.0) ft		NC
DRILL	RIG/HAI	MMER E	FF./DA	TE AN	/E9533	CME-55	60X 83	3% 01/0//	/2015			DRIL	L ME	ethoi	D N	W Cas	ing w/ SP	Ϋ́Τ		HAMME	ER TYPE	Automatic	DRIL	L RIG/HA	MMER E	FF./DA	TE A	ME953	3 CME-	550X 8	3% 01/0)//2015		
DRILI	ER C	heek, D). O.		ST	FART D	ATE	01/26/	/17		COMP. I	DATE	01/26	6/17		SU	RFACE	WATE	ER DEP	TH N/	A		DRIL	LER C	heek, I	D. O.		S	TART	DATE	04/22	2/13		СС
ELEV	DRIVE ELEV	DEPTH	BLO	W COL	JNT			BLOWS				SAN	ЛР.	▼∕	L O			SOIL A	AND RO	CK DESC	RIPTION		ELEV	DRIVE ELEV	DEPTH	' 	w co					/S PER		
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25		50	7	75 1	00 NC). 	моі	Ğ	ELEV	/. (ft)		-		-	DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	2	25	50		75 I
895		Ļ																					895		Ļ									
	-	<u> </u>					• •			• •		.	_			- 893.3 -	5			D SURFA		0.0												
890	-	Ļ					· ·	· · · · ·	· · · · · ·		· · · · · ·					-		OWN S	ILTY-SA	ND W/ TI	RACE MIC		890	-	ŧ				į	· · ·		· · ·	· · · · · ·	.
090		5.0										.				_	One	5/ 1100		11100		VELO	090	000 1	+ 5.0									+
Ī		- 0.0	4	3	2	• 5		· · · · ·			· · · ·			М		- - 886.4	Ļ					6.9		888.1	- <u>5.0</u>	4	2	4	│ 	 j		· · ·	· · · · · ·	.
885	-	<u>L</u>				j.	•••	· · · ·		•••		·				-				UVIAL			885		ŧ.				i	· · ·	· · ·	· ·		
-	883.3	10.0	4	4	6			· · · ·			· · · ·					-		FINE-C	COURSE		V/ TRACE			883.1	10.0	1	2	2		· · ·			· · ·	.
	-	ł			Ŭ	_ ● 10		· · · ·	· · ·		· · · ·			$\mathbf{\Psi}$		-				S/GRAVE			000	-	ŧ	'	2	2	• 4	· · ·		· · ·	· · ·	.
880	878.3	- 15.0														878.8						14.5	880		<u>+</u>				l∣†		<u> </u>	.		+
		- 13.0	5	5	7		 12.	· · · ·	· · ·		· · · ·			М		-			AY FINE		LAY-SILT			878.1	15.0	5	3	4	. •	 7			· · · · · ·	.
875	-	<u>L</u>					•••			•••		·				- 		RACE M		ADE ALU GANICS	JV w/ TRA	ACE 18.8	875		ŧ.					· · ·	· · ·	· ·		
ŀ	873.3	20.0	2	7	6			· · · · ·			· · · · · ·					_					TE SILT-S			873.1	20.0	2	2	10	:'	ι::			· · ·	.
070	-	ŧ	-		Ŭ	●● 		· · · ·	· · ·					М		_	Di			ACE MIC			070	-	ŧ			10	:	♦12 ·			· · ·	.
870	868.3	25.0														_							870		ŧ					<u>↓</u>	<u> </u>	. .		+
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f	-000.0	 	7	8	10		•18				· · ·			М		-								858.1	<u> 35.0 </u>	5	7	11	11:				· · ·	
855	-	Ł				· · ·	· 1			•••		·				-							855		ŧ				·	· · · · ·	<u> </u>	• •		
	853.3	40.0	6	9	14					•••		:				_								853.1	40.0	10	07	00	11:				· · ·	
050	-	L	Ŭ	5	14		● 23 · ·	3 	· · ·		· · · · · ·			М		_							050	-	ŧ	12	27	23	11	 		. • 50	· · ·	
850		45.0					<u>. i</u>																850		ŧ						1.	<u> </u>		+
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0.40	-	ł						· · · ·	· · ·		9 87	·		М		-							0.40	-	ŧ		0	9		• • 15			· · ·	.
840	838.3	55.0						<u></u>			<u>!</u>					_							840		ŧ					<u></u>	<u> </u>	. .		+
ŀ	-030.3	55.0	19	24	14			 •38.		· ·	· · ·	·		М		-								838.1	55.0	7	12	9	11:	· · \ · · •	1	· · ·	· · ·	
835	-	Ł						· · · ·		• •		·				- 							835		ŧ					· · i	<u></u>		<u> </u>	÷
ŀ	833.3	60.0	11	89/0.3				· · ' ·				-				834.0				RED RO		59.3		833.1	60.0				μ·			• •		
F	832.1	61.2	60/0.0	00/0.0							100/0 60/0	.8 0 - .0	F			832.1		ARK GR		K BROW /IICA	N/WHITE	W/ 61.2		-	ŧ	60/0.0								
	-	Ļ														_				d WITH S)CK STANDAF				ŧ									
	-	ł														-		PENET	RATION	TEST RE	EFUSAL a	at		-	‡									
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SHEET 12

' POLK				GEOL	.OGIST Elliott, D.	C.		
EK							GROUN	D WTR (ft)
OFFSET 1	4 ft RT			ALIGN	MENT -L-		0 HR.	11.1 FIAD
NORTHING	606,1	70		EAST	ING 1,066,903		24 HR.	N/A
	DRILL N	IETHO	D NV	V Casing	w/ SPT	НАММЕ	R TYPE	Automatic
COMP. DAT	E 04/2	22/13		SURF	ACE WATER DEP	TH N//	4	
	SAMP.		L O		SOIL AND ROO			
75 100	NO.	моі	G		SOIL AND ROU	JK DESC		
	NO.		G 	- <u>893.1</u> - <u>886.0</u> - <u>879.6</u>	ALL Brown-gray silty GRAVEL w SAP Brown-gray-whites	EMBANK ID with tra ravel UVIAL fine-coars vith trace ROLITE	AMENT ace organi se SAND & mica	7.1 k 13.5
				-				
60/0.0				835.7 834.8 	CRYSTAL	neiss) LINE RO NEISS d WITH S TEST RE	DCK STANDAR EFUSAL at	t