

REFERENCE: U-5888

PROJECT: 44625.1.1

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5888	1	23

# ROADWAY SUBSURFACE INVESTIGATION

COUNTY HAYWOOD  
 PROJECT DESCRIPTION WAYNESVILLE -  
INTERSECTION OF US 23 BUSINESS (N. MAIN ST.)  
AND WALNUT ST.

## INVENTORY

**CONTENTS**

LINE	STATION	PLAN	PROFILE
-RAB-	10+00-14+08.41	5	8
-L1-	10+60-14+80	4	8
-L1-	14+80-16+00	5	8
-L2-	16+00-18+80	5	9
-L2-	18+80-22+80	6	9
-Y1-	10+44-11+64.88	4	10
-Y2-	15+00-17+10	4	10
-Y3-	11+50-12+77.52	5	10
-Y4-	144+00-16+26.21	5	10
-Y5-	10+00-14+00	7	11
-Y5-	14+00-16+45.95	5	11
-Y6-	10+50-11+00	7	11
-Y6-	11+00-12+78.33	5	11

**CROSS SECTIONS**

LINE	STATION	SHEETS
-L2-	19+00-20+50	12-13
-Y5-	11+00-13+00	14-16

**APPENDICES**

APPENDIX	DESCRIPTION	SHEETS
A	LAB RESULTS	18-21

**CAUTION NOTICE**

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

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

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

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

PERSONNEL

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DATE MAY 2018



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DocuSigned by:  
Robert E Kral 05/31/2018  
 8F44867067294AF SIGNATURE DATE

**DOCUMENT NOT CONSIDERED FINAL  
 UNLESS ALL SIGNATURES COMPLETED**

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										TERMS AND DEFINITIONS									
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6										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 TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:										ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (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. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.									
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>										<b>ANGULARITY OF GRAINS</b>										<b>WEATHERED ROCK (WR)</b>										<b>CRYSTALLINE ROCK (CR)</b>									
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.										FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.									
<b>MINERALOGICAL COMPOSITION</b>										<b>COMPRESSION</b>										<b>NON-CRYSTALLINE ROCK (NCR)</b>										<b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b>									
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50										FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.										COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.									
<b>PERCENTAGE OF MATERIAL</b>										<b>GROUND WATER</b>										<b>WEATHERING</b>																			
ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL										WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING										FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.																			
TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC > 10%										STATIC WATER LEVEL AFTER 24 HOURS										VERY SLIGHT (V SL.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.																			
										PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA										SLIGHT (SL.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.																			
										SPRING OR SEEP										MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.																			
<b>MISCELLANEOUS SYMBOLS</b>										<b>RECOMMENDATION SYMBOLS</b>										<b>SEVERE (MOD. SEV.)</b>										<b>SEVERE (SEV.)</b>									
ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION										UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE										ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL										ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF									
SOIL SYMBOL										UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK										ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF										ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. FABRIC MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.									
ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT										SOUNDING ROD										VERY SEVERE (IV SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF										ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. FABRIC MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.									
INFERRED SOIL BOUNDARY										TEST BORING WITH CORE										COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. FABRIC MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.																			
INFERRED ROCK LINE										SPT N-VALUE																													
ALLUVIAL SOIL BOUNDARY																																							
<b>TEXTURE OR GRAIN SIZE</b>										<b>ABBREVIATIONS</b>										<b>ROCK HARDNESS</b>																			
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270										AR - AUGER REFUSAL MED. - MEDIUM VST - VANE SHEAR TEST										VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.																			
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)										BT - BORING TERMINATED MICA - MICACEOUS WEA. - WEATHERED										HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.																			
GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005										CL. - CLAY MOD. - MODERATELY UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL										MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.																			
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>										<b>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</b>										<b>MEDIUM HARD</b>										<b>SOFT</b>									
FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										FIELD MOISTURE DESCRIPTION										CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE										SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE										WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE										MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE										DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
<b>PLASTICITY</b>										<b>EQUIPMENT USED ON SUBJECT PROJECT</b>										<b>VERY SOFT</b>										<b>COMPLETE</b>									
PLASTICITY INDEX (PI) DRY STRENGTH										DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
NON PLASTIC 0-5 VERY LOW										CME-45C CLAY BITS										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
SLIGHTLY PLASTIC 6-15 SLIGHT										CME-55 6" CONTINUOUS FLIGHT AUGER										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
MODERATELY PLASTIC 16-25 MEDIUM										CME-550X 8" HOLLOW AUGERS										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
HIGHLY PLASTIC 26 OR MORE HIGH										VANE SHEAR TEST										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
<b>COLOR</b>										PORTABLE HOIST										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
DESCRIPTORS 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										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.										CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.									
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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5888	3	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
44625.1.1	N/A	PE	
44625.1.1	N/A	RW /UTIL.	

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

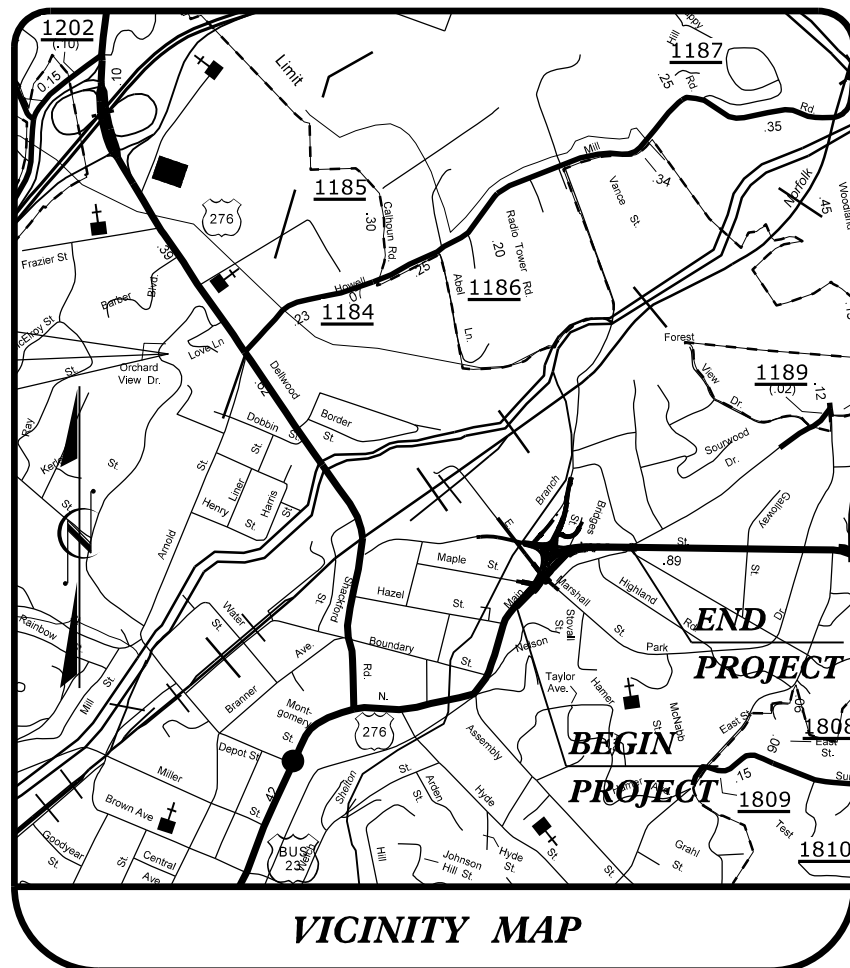
# HAYWOOD COUNTY

LOCATION: WAYNESVILLE - INTERSECTION OF US 23 BUSINESS (N. MAIN ST.) AND WALNUT ST.

TYPE OF WORK: GRADING, DRAINAGE, PAVING, & CULVERT.

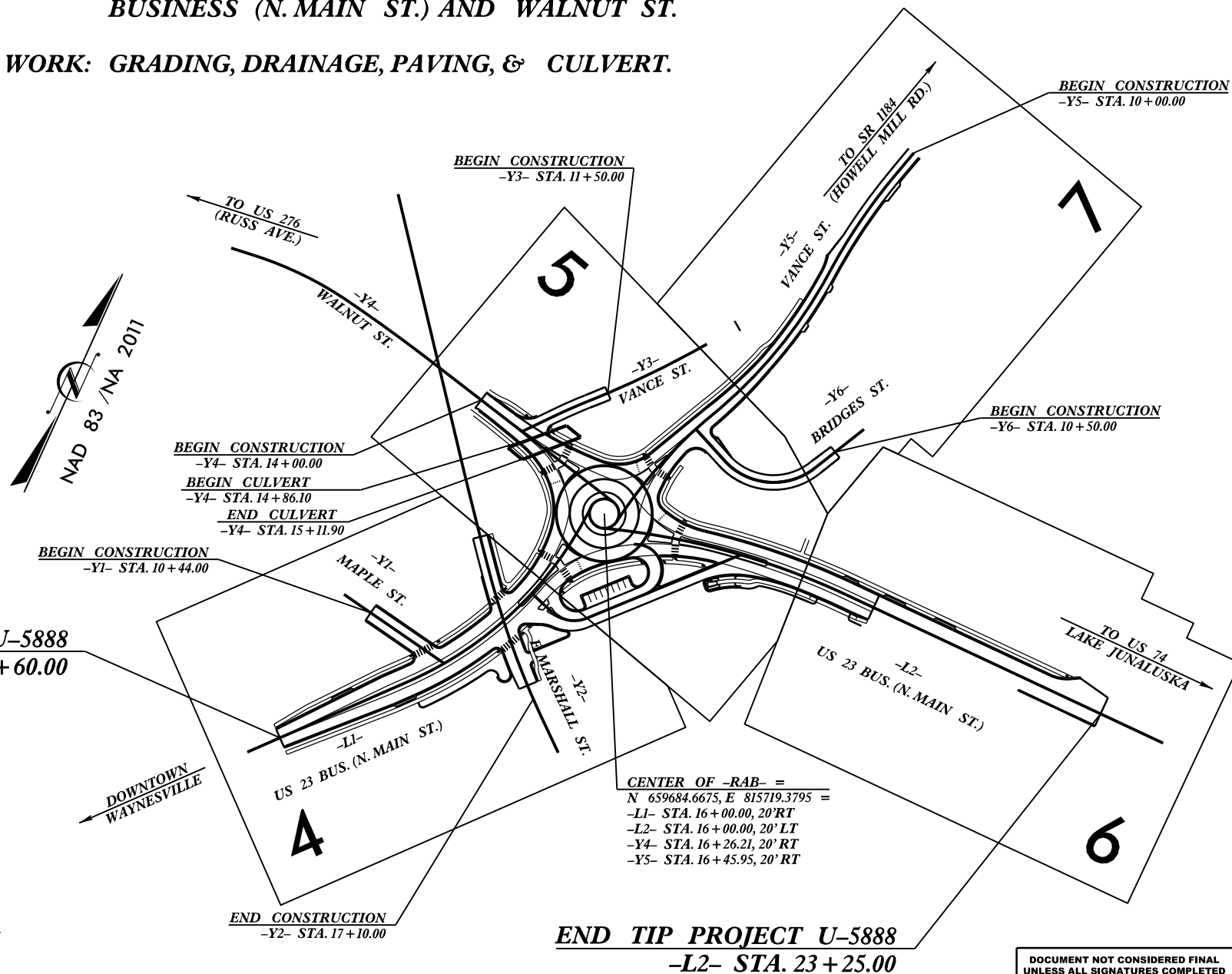
TIP PROJECT: U-5888

CONTRACT: DN00634



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

U-5888 Right-Of-Way Plans



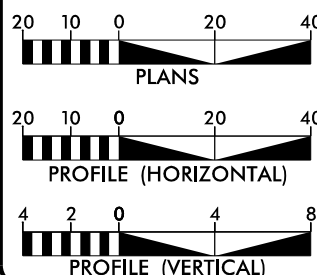
BEGIN TIP PROJECT U-5888  
-L1- STA. 10+60.00

END TIP PROJECT U-5888  
-L2- STA. 23+25.00

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.  
THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE TOWN OF WAYNESVILLE.

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES



DESIGN DATA

ADT 2021 = 7,800  
ADT 2040 = 9,000  
K = 9 %  
D = 50 %  
T = 6 % \*  
V = 40 MPH  
\* TTST = 2% DUAL = 4%  
FUNC. CLASS = MINOR ARTERIAL

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-5888 = 0.240 MILES  
TOTAL LENGTH TIP PROJECT U-5888 = 0.240 MILES

NOTE: -L1- AND -L2- USED FOR PROJECT LENGTH

Prepared in the Office of:  
**ETHERILL ENGINEERING**  
1223 Jones Franklin Rd. Raleigh, N.C. 27606  
License No. F-0377  
Bus: 919.851.8077 Fax: 919.851.8107

Prepared for:  
**DIVISION OF HIGHWAYS  
DIVISION 14**  
253 Webster Road  
Sylva, NC, 28779

2012 STANDARD SPECIFICATIONS  
RIGHT OF WAY DATE:  
June 30, 2018

GREG S. PURVIS, PE  
PROJECT ENGINEER

LETTING DATE:  
February 18, 2020

JONATHAN HEFNER, PE  
PROJECT DESIGN ENGINEER

NCDOT CONTACT:

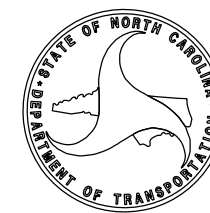
J. SCOTT MILLER, III  
DIVISION 14 DDC ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: \_\_\_\_\_ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: \_\_\_\_\_ P.E.



\$\$\$\$\$SYTIME\$\$\$\$\$DDON\$\$\$\$\$SERNAME\$\$\$\$\$



DATE: May 31, 2018

STATE PROJECT: 44625.1.1 (U-5888)  
 FEDERAL PROJECT: N/A  
 COUNTY: HAYWOOD

DESCRIPTION: Intersection of US 23 Business (N. Main St.) and Walnut St.

SUBJECT: **Geotechnical Report – Inventory, REV 1**

S&ME, Inc. has completed a reconnaissance and subsurface investigation for the above roadway project and presents the following inventory. Plans, profiles, and cross-sections are included in this report.

**Project Description**

This report presents the findings for the proposed intersection modification of US 23 Business (N. Main Street) and Walnut Street to a roundabout in Haywood County, North Carolina. The investigation consisted of exploring US 23 Business (N. Main Street) (-L1- and -L2-), E. Marshal Street (-Y2-), the roundabout (-RAB-), Walnut Street (-Y4-), and Vance Street (-Y3- and -Y5-). One Shelton Creek culvert (Culvert No. 2) will be replaced at the Walnut Street (-Y4-) and Vance Street (-Y3-) intersection.

The geotechnical field investigation was conducted on February 26, 2018. One drill crew was used to drill, sample, and log the borings in this report. The drill rig used was a rubber tired ATV-mounted CME-550X and it was equipped with an automatic hammer. Standard Penetration Tests (SPT) were performed at selected locations and additional borings were advanced using continuous flight augers. Rod sounding was used at the proposed culvert replacement in conjunction with the SPT soil test borings. Representative soil samples (split-spoon and bulk) were collected for visual classification in the field and selected soil samples were submitted for laboratory analysis.

The following alignments, totaling 0.42 miles, were investigated. Subsurface profiles and/or cross-sections of these alignments are included in this report.

<u>Line</u>	<u>Station</u>
-RAB-	10+00 to 14+10
-L1-	10+60 to 15+50
-L2-	16+60 to 20+00
-Y2-	16+20 to 17+10
-Y3-	11+50 to 12+60
-Y4-	14+00 to 15+65
-Y5-	10+00 to 15+85

**Areas of Special Geotechnical Interest**

1) **Alluvial Soils:** The following borehole locations encountered alluvial soils:

<u>Line</u>	<u>Stations</u>	<u>Offsets (ft)</u>
-Y02-	16+75	RT
-Y03-	12+22	RT
-Y04-	14+64	RT
-Y05-	11+93 to 15+00	CL, RT

2) **Micaceous Soils:** Micaceous soils were encountered at various depths and locations along the proposed / existing alignments. Below is a summary of the locations where micaceous soils were noted by our field professional(s) at the time of drilling:

<u>Line</u>	<u>Stations</u>	<u>Offset (ft)</u>
-L1-	12+00 to 15+50	5 RT to 30 RT
-L2-	14+90	2 LT
-Y2-	16+75	5 RT
-Y3-	12+22	9 RT
-Y4-	11+96 to 14+64	16 RT to 17 RT

3) **Water wells:** Seven water wells were found within or in close proximity to the proposed right of way at the following locations:

<u>Line</u>	<u>Stations and Offsets (ft)</u>
-L2-	16+16, 34 RT
-L2-	16+42, 46 RT
-L2-	16+68, 24 RT
-L2-	17+09, 2 RT
-L2-	17+41, 2 RT
-L2-	19+76, 33 LT
-Y5-	14+41, 41 RT

**Physiography and Geology**

The project corridor is located in western North Carolina in the Piedmont Physiographic Province of North Carolina in Waynesville. Commercial and residential properties exist adjacent to the project corridor. Topography along the project is rolling with elevations along the proposed corridor ranging between 2,615± to 2,645± feet (MSL).

Geologically the project area is located within the Coweeta Group of the Blue Ridge Belt and consists of Biotite Gneiss. These are metamorphic rock that were formed around the middle to late Proterozoic period. The Biotite Gneiss is characterized as inequigranular, locally abundant potassic feldspar and garnet; interlayered and gradational with calc-silicate rock, sillimanite-mica schist, mica schist, and amphibolite. Contains small masses of granitic rock.

The residual soils derived from these rocks can contain a high mica content in some locations. Through not encountered, weathered and crystalline rock typically underlay these residual soils at depth.

**Water Bodies**

The Shelton Creek generally runs from south to north through the project corridor. At the southern side of the project, Shelton Creek flows under W. Marshall Street (-Y2-) through a 7 feet by 5 feet culvert (Culvert No. 1) towards Walnut Street (-Y4-). Shelton Creek then flows north beneath Walnut Street (-Y4-) through

Culvert No. 2 and continues to run parallel with Vance Street (-Y5-) to the east and crosses under Vance Street (-Y5-) through Culvert 3 before flowing beyond the project limits.

**Soil Properties**

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

Alluvial soils are found in the low lying areas from the nearby Shelton Creek and underlying roadway embankment material. These soils consist of brown, tan, gray, and black, very soft to very stiff, sandy silt (A-4), clayey silt (A-5) and very loose to loose, silty sand (A-2-4) and coarse sand (A-1-b) with varying amounts of organics, mica, and gravel.

Roadway Embankment soils are similar in nature to Residual soils and may be derived from nearby sources. These soils consist of gray, tan, brown, red, orange, yellow, and black, soft to medium stiff, sandy silt (A-4) and silty clay (A-7-6) and very loose to medium dense coarse sand (A-1-b) and silty sand (A-2-4/A-2-5). Varying amounts of clay and trace mica and gravel were encountered within the Roadway Embankment soils.

Residual soils are derived from the weathering of underlying rock in the area. These soils consist of gray, tan, brown, red, orange, yellow, black, and white, soft to stiff, sandy silt (A-4) and clayey silt (A-5) and very loose to medium dense silty sand (A-2-4/A-2-5). The Residual soils contained varying amounts of mica; from trace to highly micaceous.

**Ground Water**

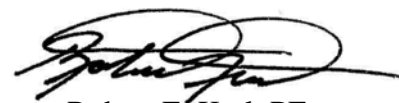
Ground water measurements were taken in February 2018 during above average rainfall conditions. Ground water elevations ranged between 2,609.5 feet and 2,630.1 feet (MSL). Ground water was not encountered in many of the borings and recorded as dry, FIAD, or caved at the bottom of the boring cylinder. Ground water is not expected to cause any significant impacts.

**Bulk Samples**

Two bulk samples were collected for CBR and Proctor testing at the following location:

<u>Sample No.</u>	<u>Line</u>	<u>Station &amp; Offset</u>	<u>Depth</u>	<u>Test</u>
BULK-1	-L1-	15+50, 30 RT	1.0 - 10.0'	Proctor, CBR
BULK-2	-Y5-	11+96, 16 RT	1.0 - 10.0'	Proctor, CBR

Respectfully Submitted,



Robert E. Kral, PE  
Project Manager

















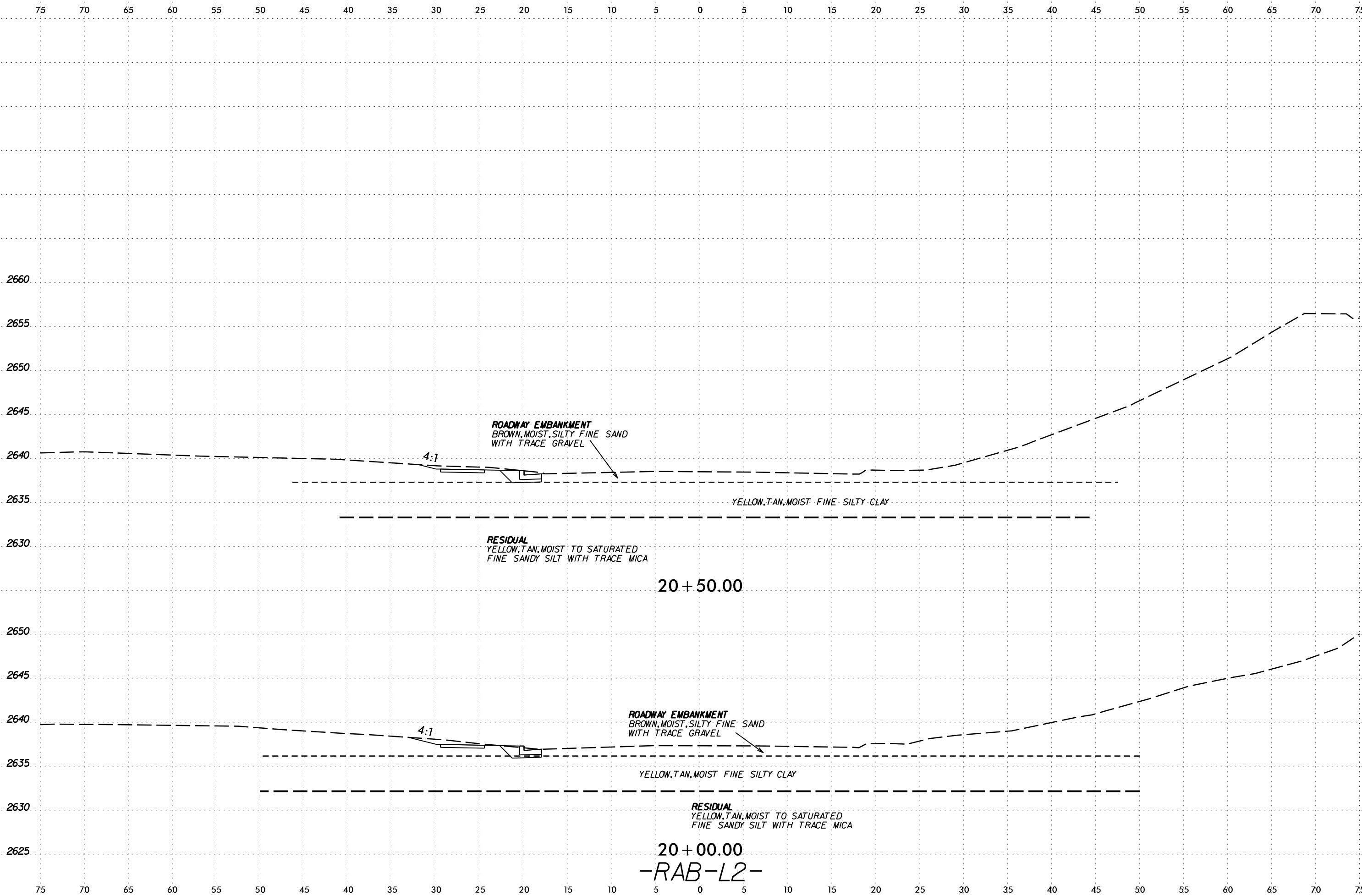








6/23/16



**ROADWAY EMBANKMENT**  
BROWN, MOIST, SILTY FINE SAND  
WITH TRACE GRAVEL

4:1

YELLOW, TAN, MOIST FINE SILTY CLAY

**RESIDUAL**  
YELLOW, TAN, MOIST TO SATURATED  
FINE SANDY SILT WITH TRACE MICA

20 + 50.00

**ROADWAY EMBANKMENT**  
BROWN, MOIST, SILTY FINE SAND  
WITH TRACE GRAVEL

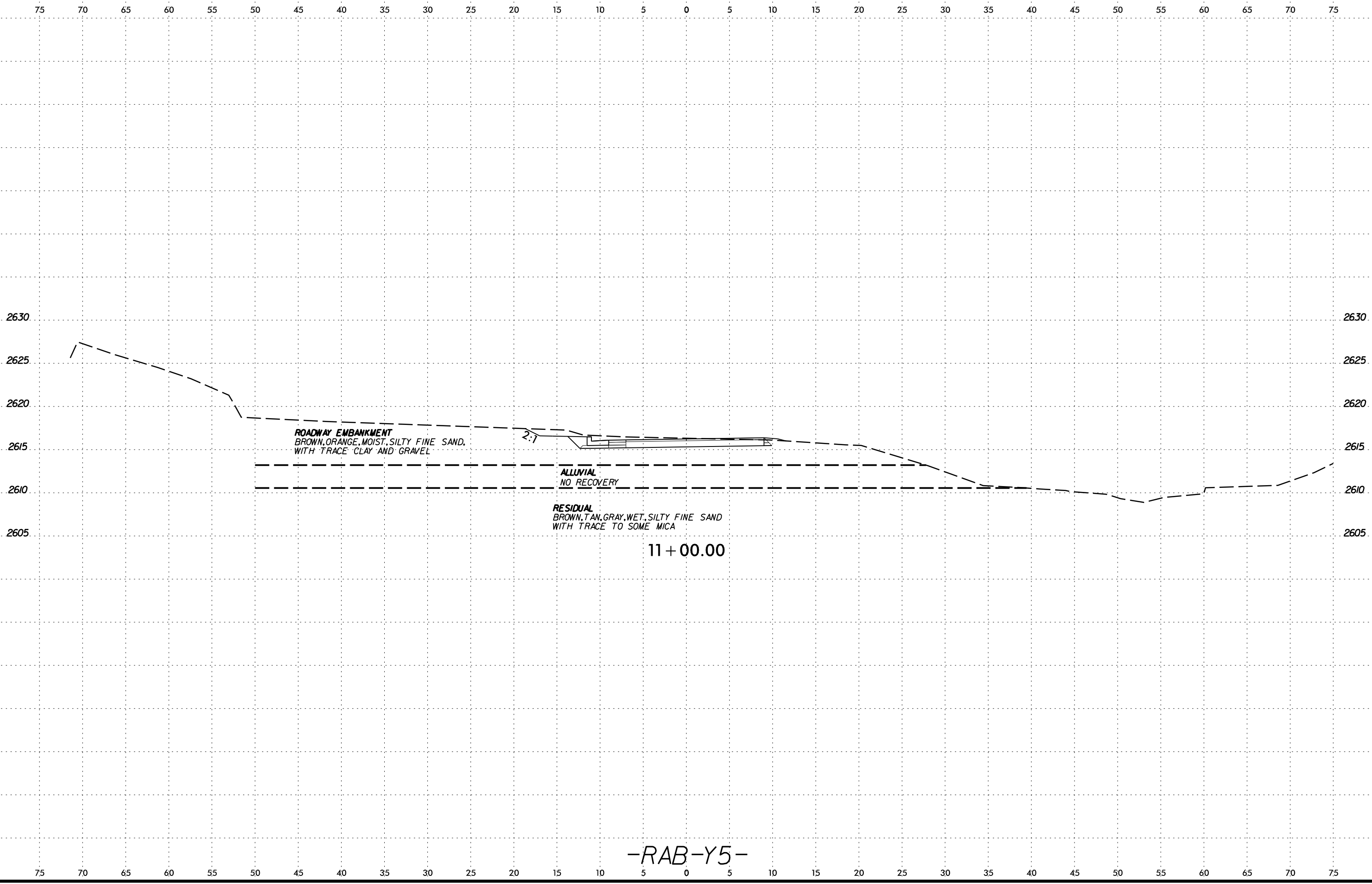
4:1

YELLOW, TAN, MOIST FINE SILTY CLAY

**RESIDUAL**  
YELLOW, TAN, MOIST TO SATURATED  
FINE SANDY SILT WITH TRACE MICA

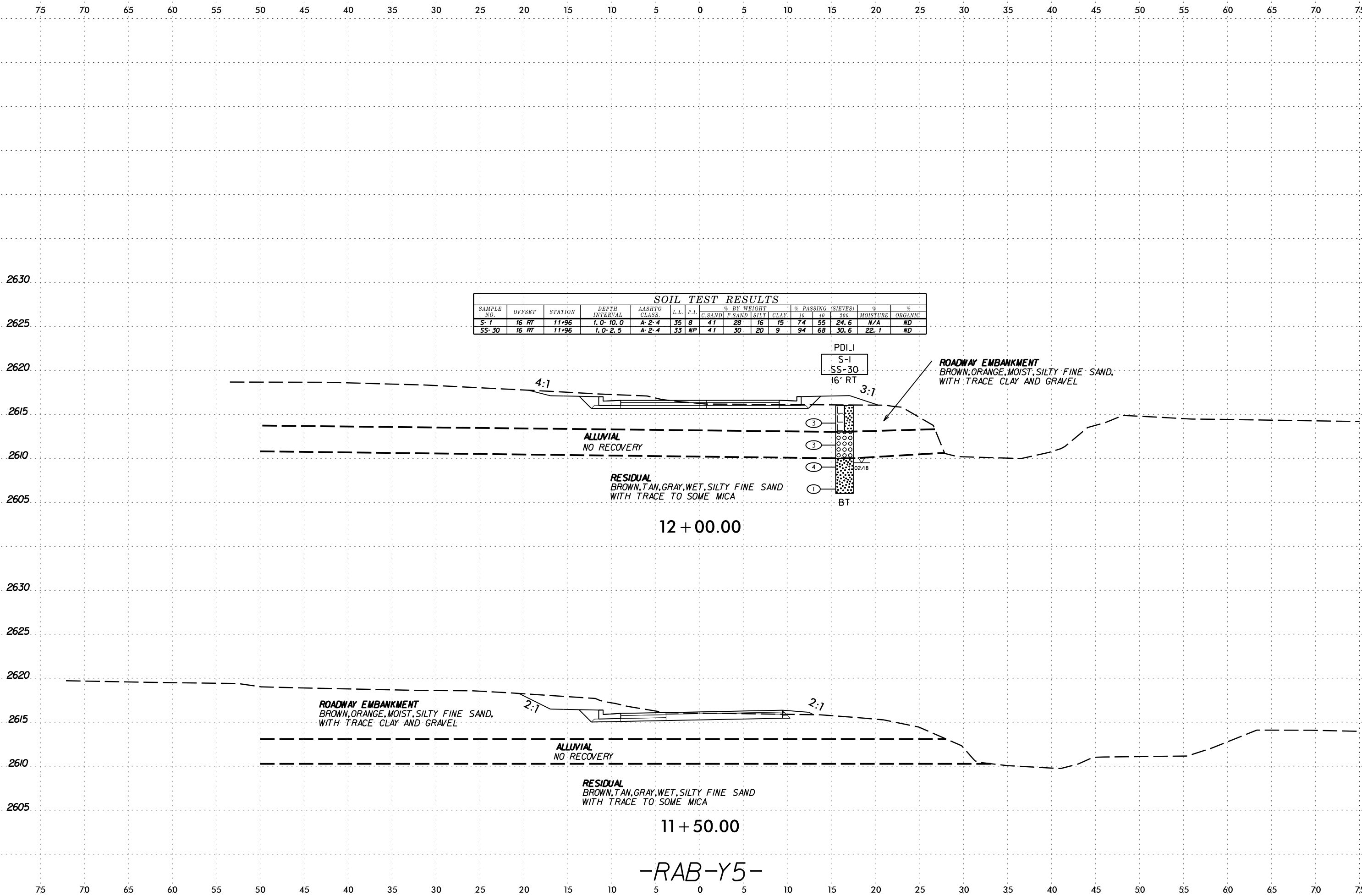
20 + 00.00  
-RAB-L2-

SYTIME  
CON  
ARRIVE



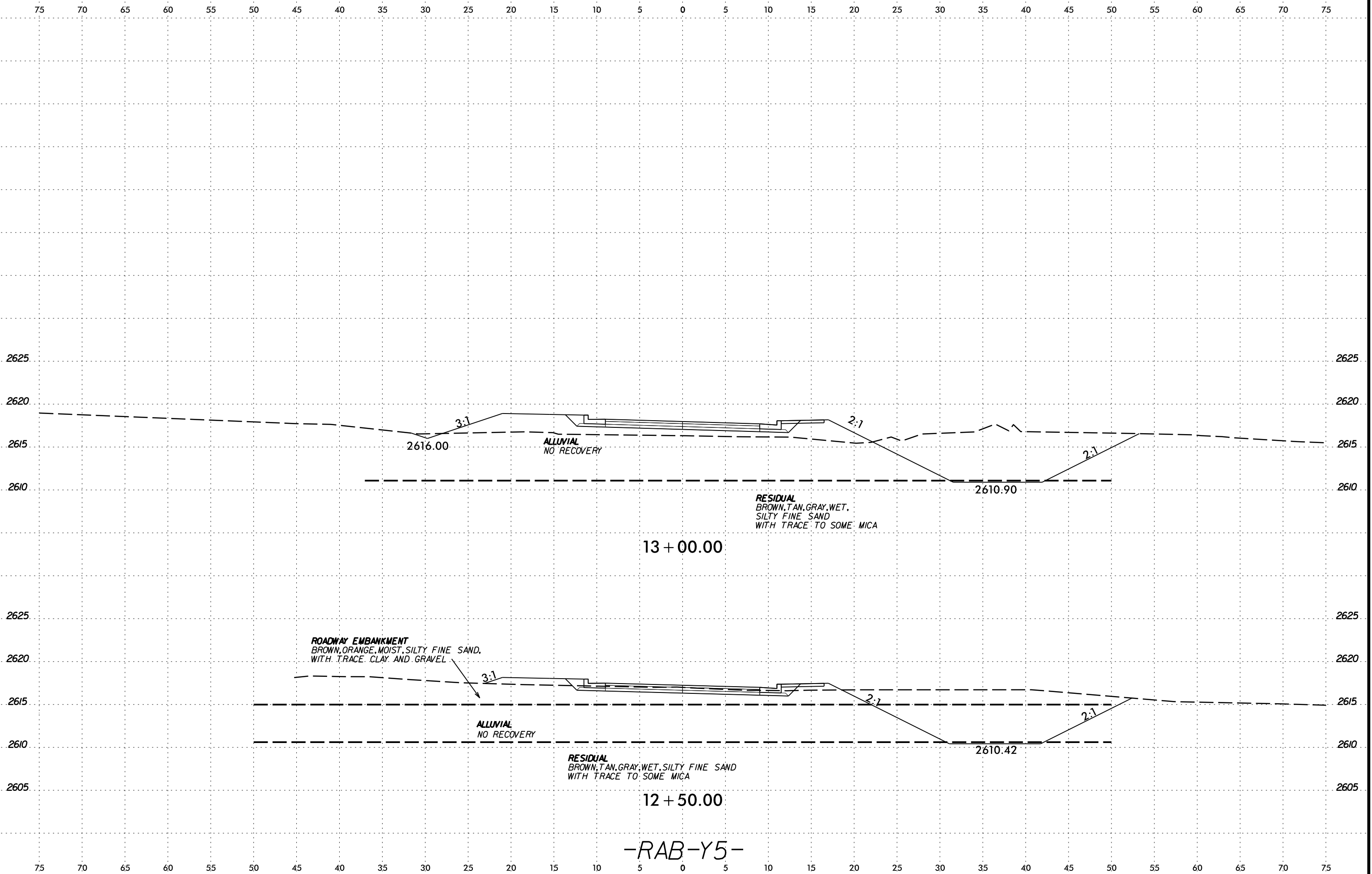
-RAB-Y5-

DATE: 6/23/16  
DRAWN BY: [illegible]  
CHECKED BY: [illegible]  
SCALE: [illegible]  
SHEET NO.: 14



DATE PLOTTED: 6/23/16  
SCALE: 1" = 10'  
DRAWN BY: J. BARRANE  
CHECKED BY: J. BARRANE

6/23/16  
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RKR:al AT PKR:al 7/10



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

***SUBSURFACE INVESTIGATION***

*APPENDIX A  
LABORATORY RESULTS*

**REFERENCE: U-5888**

**PROJECT: 44625.1.1**

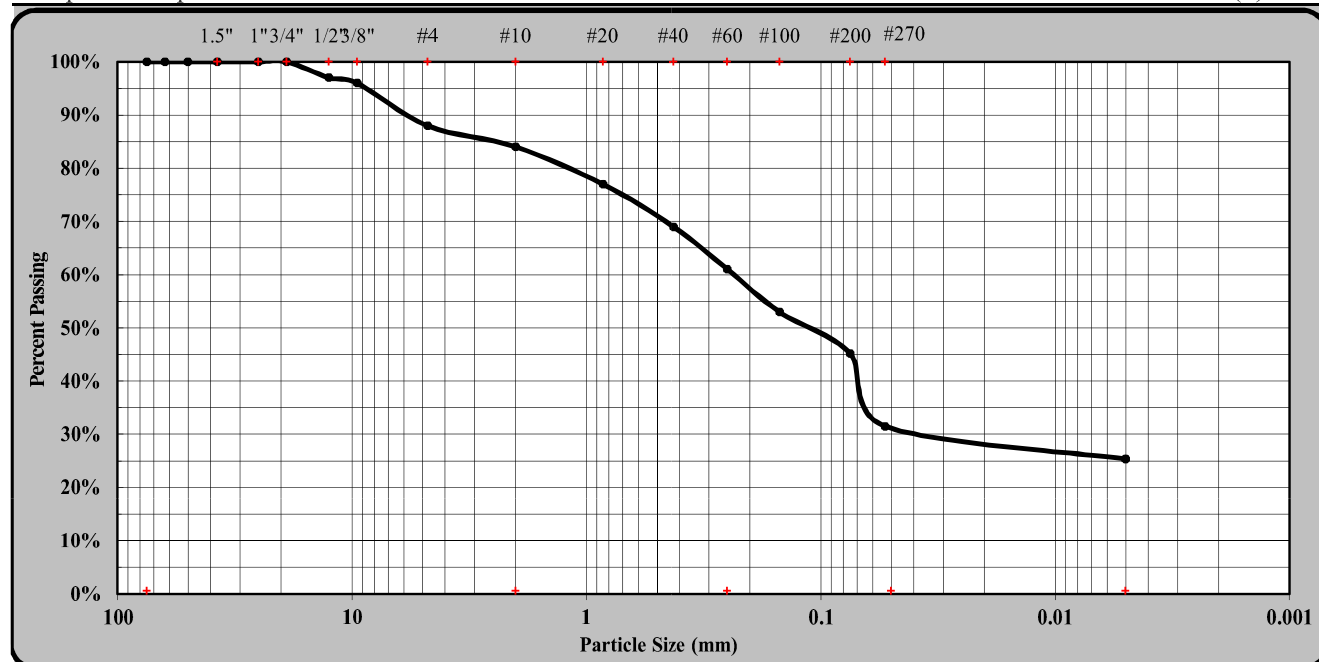
Form No. TR-T88  
 Revision No. 0  
 Revision Date: 12/20/09

**Particle Size Analysis of Soils**

AASHTO T88 as Modified by NCDOT



<b>S&amp;ME, Inc. 9751 Southern Pine Blvd., Charlotte, NC 28273</b>			
Project #:	1305-16-049	Report Date:	3/16/18
Project Name:	US 23 Business (U-5888)	Test Date(s):	3/5-16/18
State Project #:	44625.1.1	F.A. Project No:	TIP NO: U-5888
Client Name:	WEI		
Address:	Raleigh, NC		
Alignment	RAB-L1	Boring #:	RAB-L1-1550
Station #:	15+50	Offset:	30 RT
Sample Description:	0 A-6 (3)		



As Defined by NCDOT		Fine Sand		< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm		
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm		
Maximum Particle Size	1/2"	Coarse Sand	23%	Silt	6%
Gravel	16%	Fine Sand	30%	Clay	25%
Apparent Relative Density	ND	Moisture Content		% Passing #200	45.2%
Liquid Limit	38	Plastic Limit	26	Plastic Index	12
Soil Mortar (-#10 Sieve)					
Coarse Sand	27%	Fine Sand	36%	Silt	7%
				Clay	30%
Description of Sand & Gravel Particles:		Rounded	<input type="checkbox"/>	Angular	<input checked="" type="checkbox"/>
Hard & Durable		<input checked="" type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable
					<input type="checkbox"/>

References / Comments / Deviations: ND=Not Determined.

Karen Warner      118-06-0305      Laboratory Technician      3/16/2018  
 Technician Name      Certification No.      Position      Date

Rob Kral            Project Manager      3/28/2018  
 Technical Responsibility      Signature      Position      Date

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Form No. TR-D698-2  
 Revision No. : 1  
 Revision Date: 07/25/17

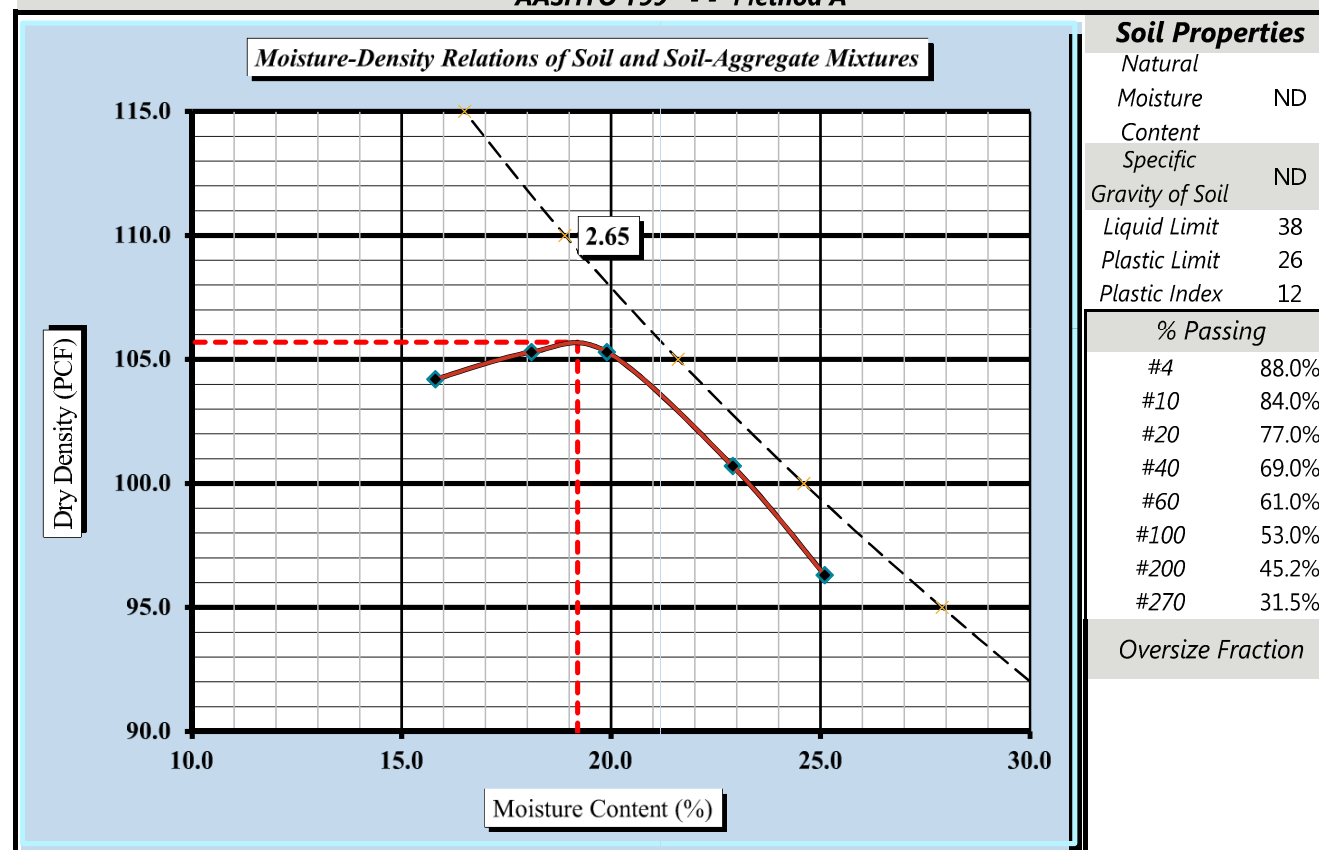
**MOISTURE - DENSITY REPORT**



Quality Assurance

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273			
S&ME Project #:	1305-16-049	Report Date:	3/16/18
Project Name:	US 23 Business (U-5888)	Test Date(s):	3/5-8/18
Client Name:	WEI		
Client Address:	Raleigh, NC		
Boring #:	RAB-L1 1550	Sample #:	Bulk 1
Location:	Waynesville, NC	Offset:	30 LT
Sample Description:	A-6		

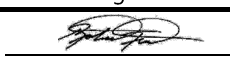
**Maximum Dry Density 105.7 PCF. Optimum Moisture Content 19.2%**  
**AASHTO T99 - - Method A**



Moisture-Density Curve Displayed: Fine Fraction  Corrected for Oversize Fraction (ASTM D 4718)   
 Sieve Size used to separate the Oversize Fraction: #4 Sieve  3/8 inch Sieve  3/4 inch Sieve   
 Mechanical Rammer  Manual Rammer  Moist Preparation  Dry Preparation

References / Comments / Deviations: ND: Not Determined

AASHTO T 99: Moisture-Density Relations of Soil Using a 5.5 Lb. Rammer and a 12" Drop

Rob Kral            Project Manager      3/28/2018  
 Technical Responsibility      Signature      Position      Date

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**CBR (CALIFORNIA BEARING RATIO)  
 OF LABORATORY COMPACTED SOIL**

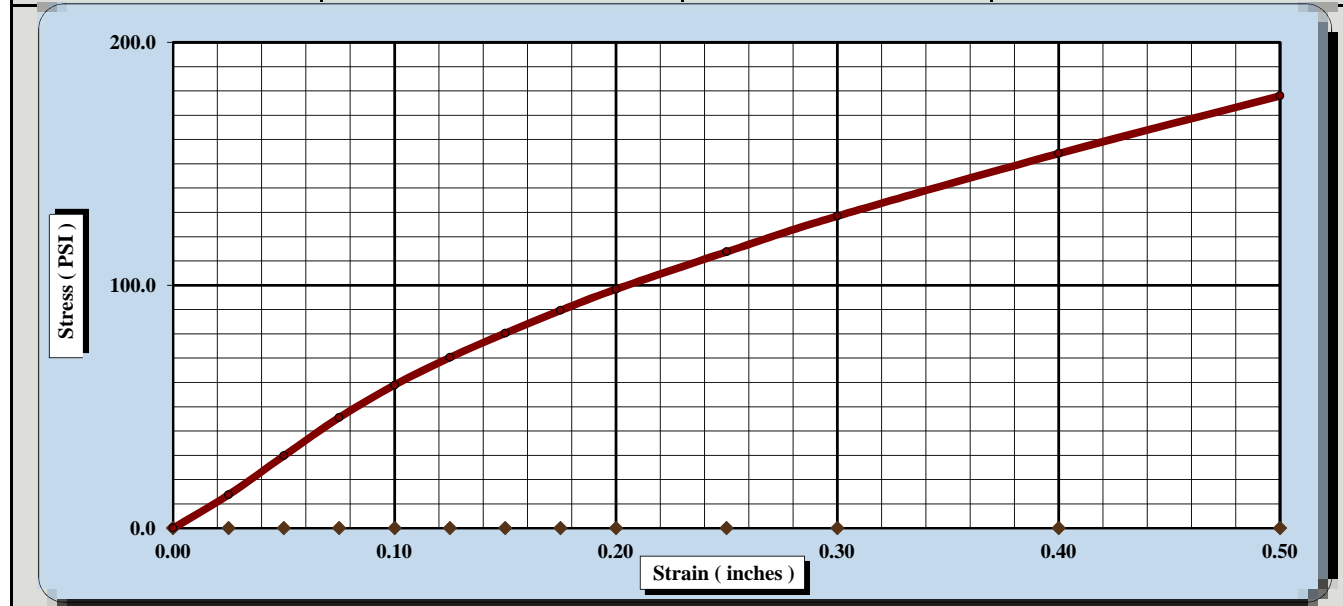


AASHTO T 193

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273			
Project #:	1305-16-049	Report Date:	3/16/18
Project Name:	US 23 Business (U-5888)	Test Date(s)	3/7-16/18
Client Name:	WEI		
Client Address:	Raleigh, NC		
Boring #:	RAB-L1-1550	Sample #:	Bulk 1 (B)
Location:	Raleigh, NC	Offset:	30 LT
		Elevation:	1.0-10.0'
Sample Description:	A-6		

AASHTO T99 Method A	Maximum Dry Density:	105.7 PCF	Optimum Moisture Content:	19.2%
	Line 20: Use an alternate description here if applicable		% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	5.9	CBR at 0.1 in.	5.9
CBR at 0.2 in.	6.6	CBR at 0.2 in.	6.6



CBR Sample Preparation: Performed on the fine fraction  
 The entire gradation was used and compacted in a 6" CBR mold in accordance with

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	56	Final Dry Density (PCF)	105.0
Initial Dry Density (PCF)	105.7	Moisture Content (top 1" after soaking)	23.1%
Moisture Content of the Compacted Specimen	19.9%	Percent Swell	1.0%
Percent Compaction	100.0%		

Soak Time: 96 Hours    Surcharge Weight: 10.0    Surcharge Wt. per sq. Ft.: 51.0  
 Liquid Limit: 38    Plastic Index: 12    Assumed Apparent Relative Density: 2.650

Notes/Deviations/References:

Rob Kral       Project Manager    3/28/2018  
 Technical Responsibility    Signature    Position    Date

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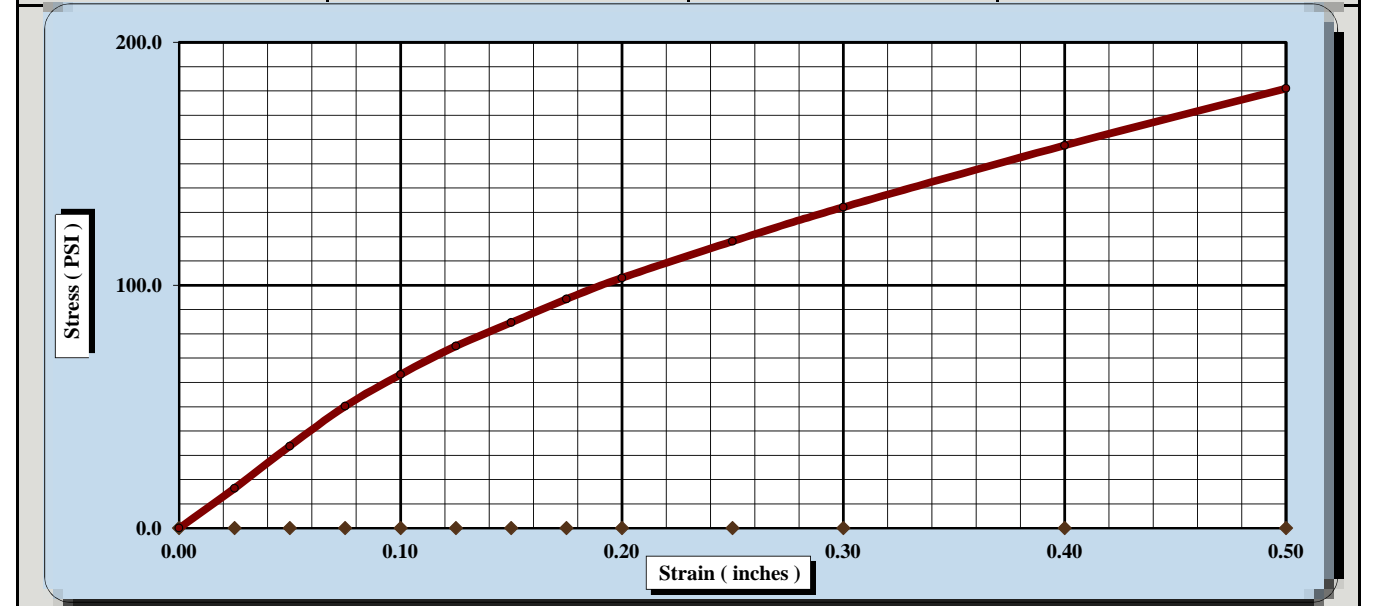
**CBR (CALIFORNIA BEARING RATIO)  
 OF LABORATORY COMPACTED SOIL**

AASHTO T 193

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273			
Project #:	1305-16-049	Report Date:	3/16/18
Project Name:	US 23 Business (U-5888)	Test Date(s)	3/7-16/18
Client Name:	WEI		
Client Address:	Raleigh, NC		
Boring #:	RAB-L1-1550	Sample #:	Bulk 1 (A)
Location:	Raleigh, NC	Offset:	30 LT
		Elevation:	1.0-10.0'
Sample Description:	A-6		

AASHTO T99 Method A	Maximum Dry Density:	105.7 PCF	Optimum Moisture Content:	19.2%
	Line 20: Use an alternate description here if applicable		% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	6.3	CBR at 0.1 in.	6.3
CBR at 0.2 in.	6.9	CBR at 0.2 in.	6.9



CBR Sample Preparation: Performed on the fine fraction  
 The entire gradation was used and compacted in a 6" CBR mold in accordance with

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	56	Final Dry Density (PCF)	104.3
Initial Dry Density (PCF)	105.4	Moisture Content (top 1" after soaking)	23.2%
Moisture Content of the Compacted Specimen	19.6%	Percent Swell	1.0%
Percent Compaction	99.7%		

Soak Time: 96 Hours    Surcharge Weight: 10.0    Surcharge Wt. per sq. Ft.: 51.0  
 Liquid Limit: 38    Plastic Index: 12    Assumed Apparent Relative Density: 2.650

Notes/Deviations/References:

Rob Kral       Project Manager    3/28/2018  
 Technical Responsibility    Signature    Position    Date

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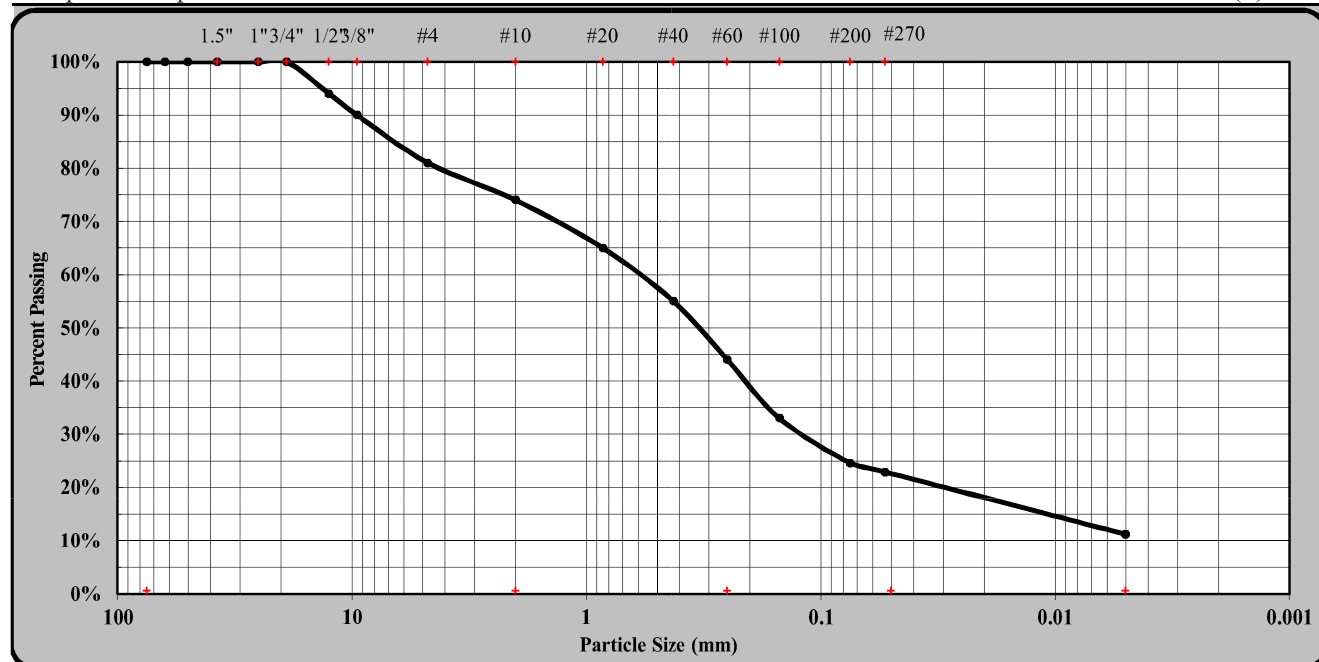
Form No. TR-T88  
Revision No. 0  
Revision Date: 12/20/09

**Particle Size Analysis of Soils**

AASHTO T88 as Modified by NCDOT



<b>S&amp;ME, Inc. 9751 Southern Pine Blvd., Charlotte, NC 28273</b>			
Project #:	1305-16-049	Report Date:	3/16/18
Project Name:	US 23 Business (U-5888)	Test Date(s):	3/5-16/18
State Project #:	44625.1.1	F.A. Project No:	TIP NO: U-5888
Client Name:	WEI		
Address:	Raleigh, NC		
Alignment	RAB-Y05	Boring #:	PDI-1
Station #:	11+96	Offset:	16 RT
Sample Description:	0 A-2-4 (0)		



As Defined by NCDOT		Fine Sand		< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm		
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm		
Maximum Particle Size	1/2"	Coarse Sand	30%	Silt	12%
Gravel	26%	Fine Sand	21%	Clay	11%
Apparent Relative Density	ND	Moisture Content		% Passing #200	24.6%
Liquid Limit	35	Plastic Limit	27	Plastic Index	8
Soil Mortar (-#10 Sieve)					
Coarse Sand	41%	Fine Sand	28%	Silt	16%
				Clay	15%
Description of Sand & Gravel Particles:		Rounded	<input type="checkbox"/>	Angular	<input checked="" type="checkbox"/>
Hard & Durable		<input checked="" type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable
					<input type="checkbox"/>

References / Comments / Deviations: ND=Not Determined.

Karen Warner      118-06-0305      Laboratory Technician      3/16/2018  
Technician Name      Certification No.      Position      Date

Rob Kral            Project Manager      3/28/2018  
Technical Responsibility      Signature      Position      Date

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Form No. TR-D698-2  
Revision No. : 1  
Revision Date: 07/25/17

**MOISTURE - DENSITY REPORT**

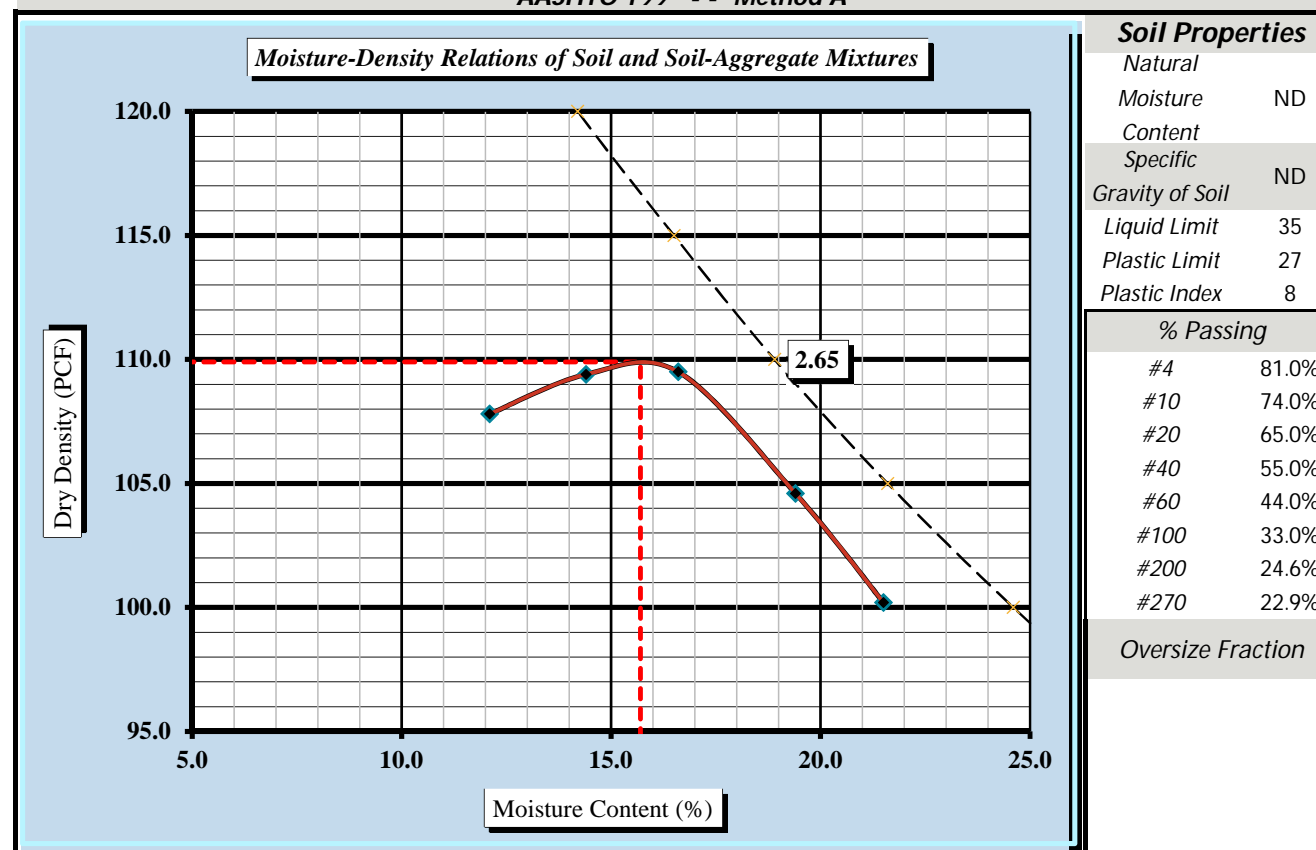


Quality Assurance

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273			
S&ME Project #:	1305-16-049	Report Date:	3/16/18
Project Name:	US 23 Business (U-5888)	Test Date(s):	3/5-8/18
Client Name:	WEI		
Client Address:	Raleigh, NC		
Boring #:	PDI-1	Sample #:	Bulk 2
Location:	Waynesville, NC	Offset:	16 RT
Sample Description:	A-2-4		

Maximum Dry Density 109.9 PCF.      Optimum Moisture Content 15.7%

AASHTO T99 - - Method A



**Soil Properties**

Natural Moisture Content	ND
Specific Gravity of Soil	ND
Liquid Limit	35
Plastic Limit	27
Plastic Index	8

**% Passing**

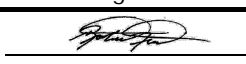
#4	81.0%
#10	74.0%
#20	65.0%
#40	55.0%
#60	44.0%
#100	33.0%
#200	24.6%
#270	22.9%

**Overflow Fraction**

Moisture-Density Curve Displayed: Fine Fraction       Corrected for Overflow Fraction (ASTM D 4718)   
 Sieve Size used to separate the Overflow Fraction: #4 Sieve       3/8 inch Sieve       3/4 inch Sieve   
 Mechanical Rammer       Manual Rammer       Moist Preparation       Dry Preparation

References / Comments / Deviations: ND: Not Determined

AASHTO T 99: Moisture-Density Relations of Soil Using a 5.5 Lb. Rammer and a 12" Drop

Rob Kral            Project Manager      3/28/2018  
Technical Responsibility      Signature      Position      Date

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**CBR (CALIFORNIA BEARING RATIO)  
 OF LABORATORY COMPACTED SOIL**



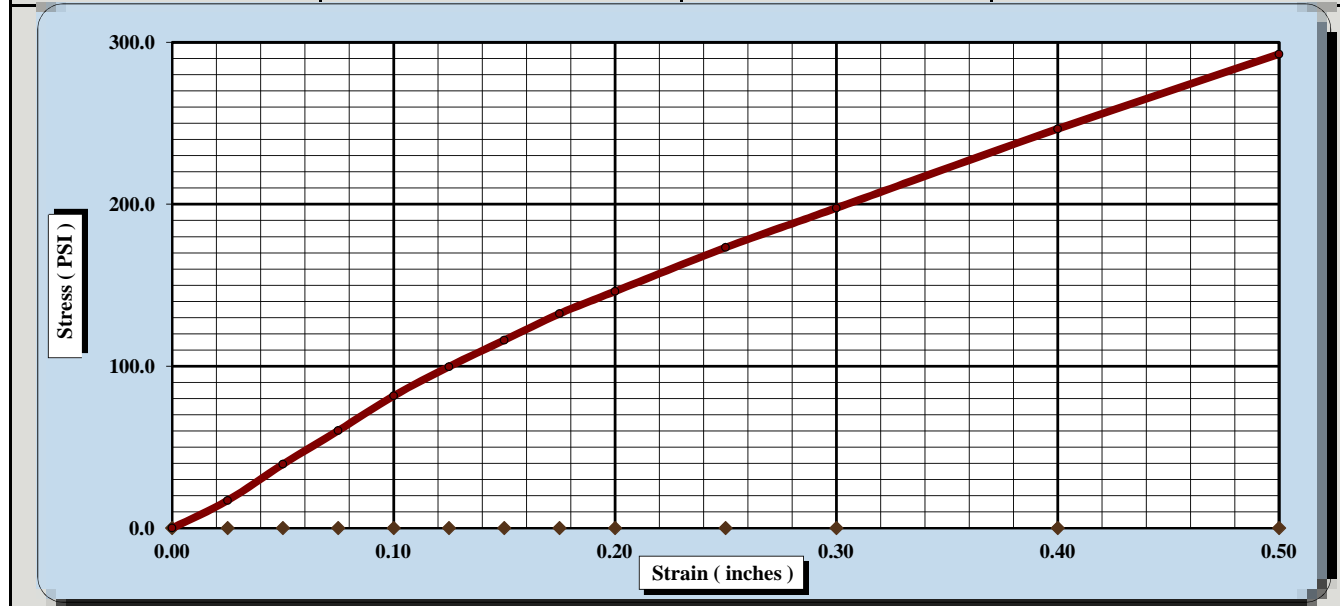
AASHTO T 193

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1305-16-049 Report Date: 3/16/18  
 Project Name: US 23 Business (U-5888) Test Date(s) 3/7-16/18  
 Client Name: WEI  
 Client Address: Raleigh, NC  
 Boring #: PDI-1 Sample #: Bulk 2 (B) Sample Date: 2/26/18  
 Location: Raleigh, NC Offset: 16 RT Elevation: 1.0-10.0'  
 Sample Description: A-2-4

AASHTO T99 Method A	Maximum Dry Density: 109.9 PCF	Optimum Moisture Content: 15.7%
Line 20: Use an alternate description here if applicable	% Retained on the 3/4" sieve: 0.0%	

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	8.2	CBR at 0.1 in.	8.2
CBR at 0.2 in.	9.7	CBR at 0.2 in.	9.7




CBR Sample Preparation: Performed on the fine fraction  
 The entire gradation was used and compacted in a 6" CBR mold in accordance with

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	56	Final Dry Density (PCF)	108.6
Initial Dry Density (PCF)	109.5	Moisture Content (top 1" after soaking)	18.6%
Moisture Content of the Compacted Specimen	15.0%	Percent Swell	1.1%
Percent Compaction	99.6%		

Soak Time: 96 Hours Surcharge Weight 10.0 Surcharge Wt. per sq. Ft. 50.9  
 Liquid Limit 35 Plastic Index 8 Assumed Apparent Relative Density 2.650

Notes/Deviations/References:

Rob Kral  Project Manager 3/28/2018  
 Technical Responsibility Signature Position Date

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**CBR (CALIFORNIA BEARING RATIO)  
 OF LABORATORY COMPACTED SOIL**

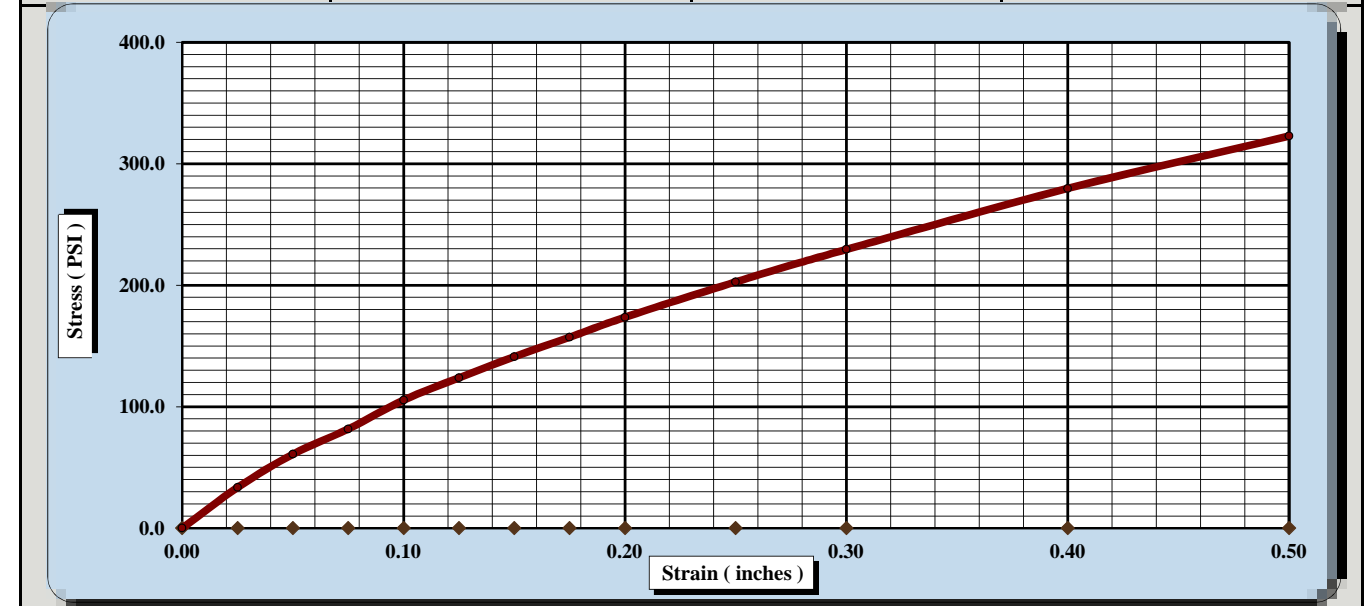
AASHTO T 193

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273

Project #: 1305-16-049 Report Date: 3/16/18  
 Project Name: US 23 Business (U-5888) Test Date(s) 3/7-16/18  
 Client Name: WEI  
 Client Address: Raleigh, NC  
 Boring #: PDI-1 Sample #: Bulk 2 (A) Sample Date: 2/26/18  
 Location: Raleigh, NC Offset: 16 RT Elevation: 1.0-10.0'  
 Sample Description: A-2-4

AASHTO T99 Method A	Maximum Dry Density: 109.9 PCF	Optimum Moisture Content: 15.7%
Line 20: Use an alternate description here if applicable	% Retained on the 3/4" sieve: 0.0%	

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	10.5	CBR at 0.1 in.	10.5
CBR at 0.2 in.	11.6	CBR at 0.2 in.	11.6




CBR Sample Preparation: Performed on the fine fraction  
 The entire gradation was used and compacted in a 6" CBR mold in accordance with

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	56	Final Dry Density (PCF)	110.0
Initial Dry Density (PCF)	110.7	Moisture Content (top 1" after soaking)	18.2%
Moisture Content of the Compacted Specimen	15.0%	Percent Swell	0.8%
Percent Compaction	100.8%		

Soak Time: 96 Hours Surcharge Weight 10.0 Surcharge Wt. per sq. Ft. 50.9  
 Liquid Limit 35 Plastic Index 8 Assumed Apparent Relative Density 2.650

Notes/Deviations/References:

Rob Kral  Project Manager 3/28/2018  
 Technical Responsibility Signature Position Date

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