

REFERENCE: N/A

PROJECT: DF18314.2045452

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	10+98.98 to 23+60.00	4,5	4,5

APPENDICES

APPENDIX	TITLE	SHEETS
A	SOIL TEST BORING LOGS	6-12
B	ROCK EMBANKMENT DRAWING, PROVISION, AND QUANTITIES	13-22
C	SUPPORTING CALCULATIONS	23-29

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

ROADWAY
SUBSURFACE INVESTIGATION

COUNTY HENDERSON
PROJECT DESCRIPTION SR 1700 (RIVERSIDE DR)
ALONG REEDYPATCH CREEK

INVENTORY & RECOMMENDATIONS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	DF18314.2045452	1	

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 PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS 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.

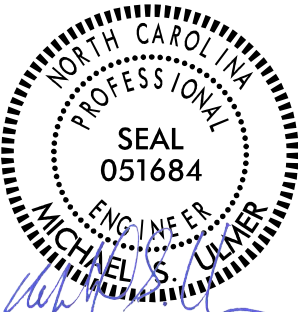
- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR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

PERSONNEL

- BRECCIA
V. AYALA
P. BARRERA
H.A. AGOPIAN
M.S. ULMER

INVESTIGATED BY ESP Associates, Inc.
DRAWN BY P. BARRERA
CHECKED BY H.A. AGOPIAN
SUBMITTED BY ESP Associates, Inc.
DATE JULY 2026

ESP ESP ASSOCIATES, INC.
P.O. BOX 7030
CHARLOTTE, NC 28241
WWW.ESPASSOCIATES.COM



2026.07.20 07:57:18-04'00'

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

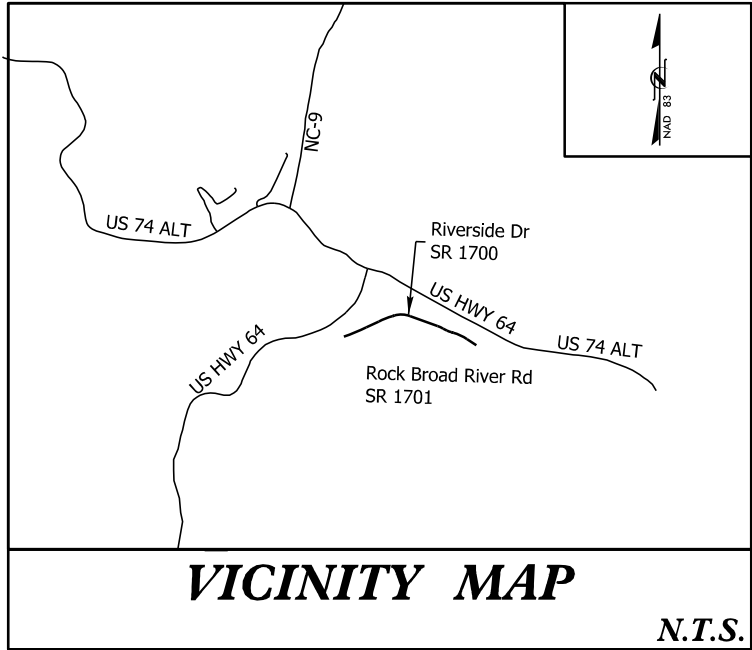
SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS									
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE 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, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>										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: WEATHERED ROCK (WR) NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. NON-CRYSTALLINE ROCK (NCR) FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN SEDIMENTARY ROCK (CP) COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.										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 DISLOGGED 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 (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (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.									
SOIL LEGEND AND AASHTO CLASSIFICATION										MINERALOGICAL COMPOSITION										WEATHERING																			
GENERAL CLASS. GRANULAR MATERIALS (< 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.																			
GROUP CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-4 A-5 A-6 A-7 A-1, A-2 A-3 A-4, A-5 A-6, A-7										SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50										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.																			
SYMBOL										PERCENTAGE OF MATERIAL										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.																			
Z PASSING #10 #40 #200										ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL										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.																			
MATERIAL PASSING #40 LL PI										GROUND WATER										SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i>																			
GROUP INDEX										MISCELLANEOUS SYMBOLS										VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i>																			
USUAL TYPES OF MAJOR MATERIALS										RECOMMENDATION SYMBOLS										COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.																			
GEN. RATING AS SUBGRADE										ABBREVIATIONS										ROCK HARDNESS																			
PI OF A-7-5 SUBGROUP IS < LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30										DRILL UNITS:										VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.																			
CONSISTENCY OR DENSENESS										EQUIPMENT USED ON SUBJECT PROJECT										HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.																			
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)										ADVANCING TOOLS:										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.																			
GENERALLY GRANULAR MATERIAL (NON-COHESSIVE)										HAMMER TYPE:										MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.																			
GENERALLY SILT-CLAY MATERIAL (COHESSIVE)										CORE SIZE:										SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.																			
TEXTURE OR GRAIN SIZE										HAND TOOLS:										VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.																			
U.S. STD. SIEVE SIZE OPENING (MM)										CAT 315D										FRACTURE SPACING																			
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)										INDURATION										BEDDING																			
GRAIN SIZE										INDURATION										BEDDING																			
SOIL MOISTURE - CORRELATION OF TERMS										INDURATION										BEDDING																			
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION										INDURATION										BEDDING																			
LL LIQUID LIMIT										INDURATION										BEDDING																			
PL PLASTIC LIMIT										INDURATION										BEDDING																			
OM OPTIMUM MOISTURE										INDURATION										BEDDING																			
SL SHRINKAGE LIMIT										INDURATION										BEDDING																			
PLASTICITY										INDURATION										BEDDING																			
NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC HIGHLY PLASTIC										INDURATION										BEDDING																			
COLOR										INDURATION										BEDDING																			
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.										INDURATION										BEDDING																			

4/16/2026 2:55:27 PM W:\Projects\2025\25-00871 WestDiv Riverside Drive (SR 1700)\Plans\4.8.26_Riverside Dr CADD Files\Roadway\Proj\RiversideDr_Geo_tsh.dgn

09/08/99

CONTRACT: _____ TIP PROJECT: _____

See Sheet 1A For Index of Sheets

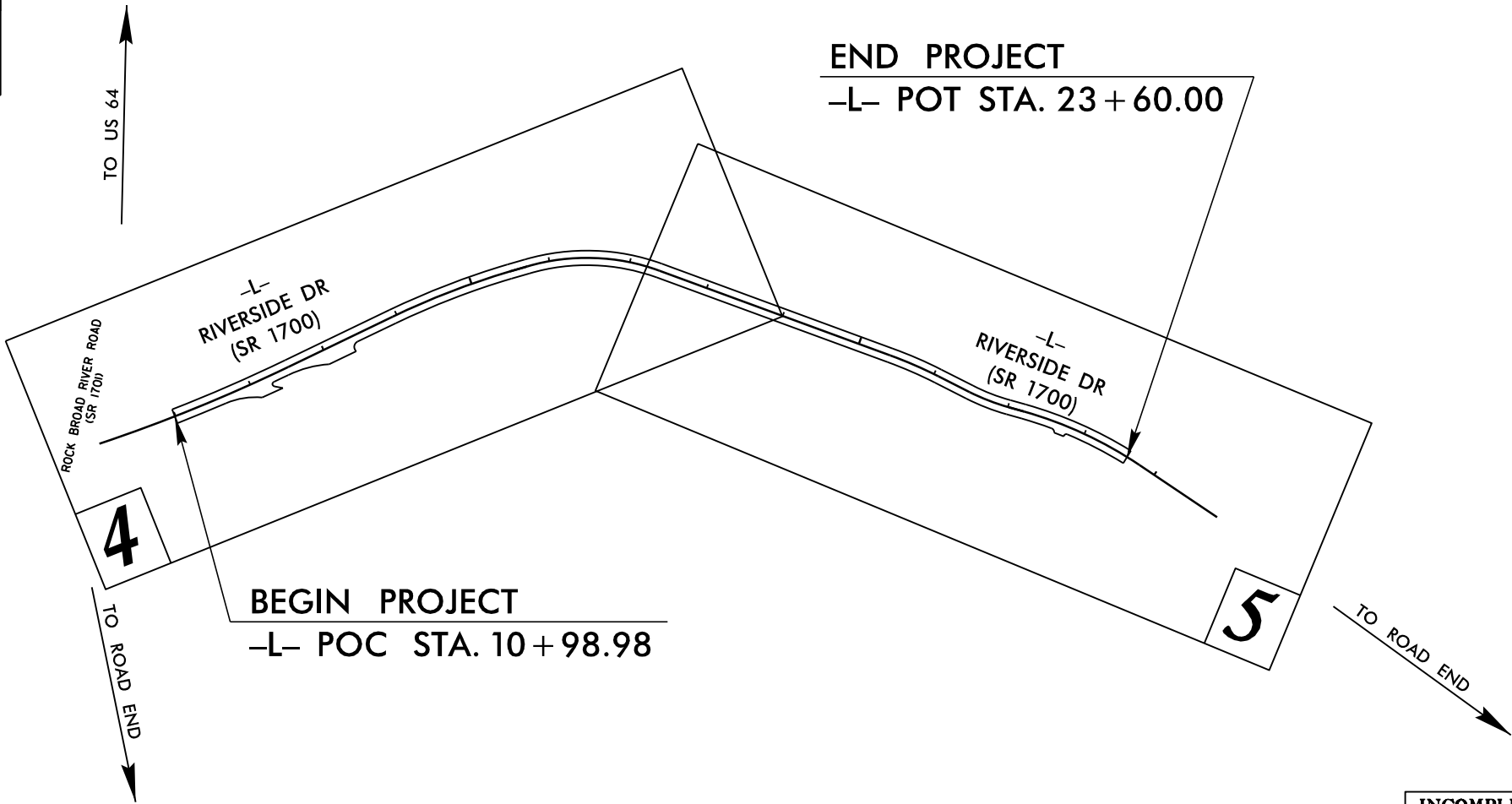


STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

HENDERSON COUNTY

LOCATION: SR 1700 (RIVERSIDE DR).
ALONG REEDYPATCH CREEK

TYPE OF WORK: GRADING, PAVING, AND STRUCTURE.

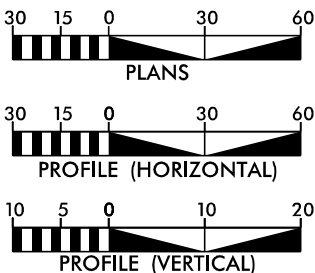


NOTES:

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

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES



DESIGN DATA

ADT _____ = N/A
ADT _____ = N/A
K = N/A %
D = N/A %
T = N/A % *
V = 30 MPH
* TTST = N/A DUAL N/A
FUNC CLASS =
LOCAL
N/A TIER

PROJECT LENGTH

LENGTH OF ROADWAY PROJECT = 0.24 MILES

TOTAL LENGTH OF PROJECT = 0.24 MILES

PLANS PREPARED BY:

AMT

A. MORTON THOMAS AND ASSOCIATES, INC.
900 RIDGEFIELD DRIVE, SUITE 325 • RALEIGH, NC 27609
(919) 855-9989 • NC LICENSE NO. F-1049
WWW.AMTENGINEERING.COM

2024 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
X

LETTING DATE:
X

ROBERT WILLIAMS, PE
PROJECT ENGINEER

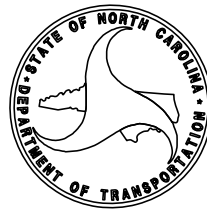
JP HAINLINE, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN
ENGINEER

SIGNATURE: _____ P.E.



July 6, 2026

STATE PROJECT NO.: DF18314.2045452
TIP: -
COUNTY: Henderson
DESCRIPTION: SR 1700 (Riverside Dr). Along Reedypatch Creek
SUBJECT: Geotechnical Report – Combined Roadway Inventory and Recommendations

Project and Site Description

The following Combined Roadway Geotechnical Inventory and Recommendations Memorandum is prepared for Riverside Drive. The proposed site construction consists of the emergency washout repairs.

The site under consideration is located approximately 0.2 miles southwest of Bat Cave, North Carolina. The site begins at -L- (SR-1700/Riverside Drive) Station 10+98.98 and continues to -L-Station 23+60.00. The total length of the site is approximately 0.24 miles.

The following alignments were investigated in this report:

Alignment	Station (±)
-L-	10+98.98 to 17+24.24
-L-	18+30.62 to 19+00.00

Physiography and Geography

The project corridor is located within the Chauga Belt of the Blue Ridge physiographic province. The Chauga Belt represents a structurally complex segment of the Blue Ridge, composed of metasedimentary and metavolcanic rocks that have undergone significant regional metamorphism and deformation during the Appalachian orogeny. This belt is distinguished by a mix of metamorphosed pelitic and psammitic sediments, as well as intrusive igneous bodies that contribute to its lithologic diversity. According to the *Geologic Map of North Carolina* (1985), the bedrock underlying the project corridor is predominantly composed of Henderson Gneiss and Granite Gneiss. The Henderson Gneiss is a coarse- to medium-grained, foliated metamorphic rock primarily composed of quartz, feldspar (plagioclase and microcline), and biotite, with accessory minerals such as muscovite and garnet. It exhibits a well-developed gneissic foliation due to the segregation of light-colored feldspar and quartz layers from darker bands rich in biotite and hornblende. The Henderson Gneiss is known for its high-grade metamorphic history, having undergone multiple episodes of deformation and recrystallization. This rock unit is commonly associated with migmatitic textures, indicating partial melting under high-temperature conditions. The Granite Gneiss is a granitic-textured rock that has been subjected to metamorphism, resulting in a weak to well-developed foliation. It consists primarily of feldspar (plagioclase and potassium feldspar) and quartz, with lesser amounts of biotite, muscovite, and amphibole. The foliation in the Granite Gneiss is often less pronounced than in the Henderson Gneiss, and in some locations, it may appear more massive. This rock type is generally lighter in color due to the dominance of feldspar and quartz, though localized mineral concentrations can create streaky or banded patterns. The Granite Gneiss typically represents the metamorphosed remnants of granitic intrusions that have been deformed and recrystallized over time. These rock units contribute to the rugged terrain characteristic of the Blue Ridge, influencing topographic relief, soil formation, and drainage patterns within the project corridor. Due to their metamorphic nature, both the Henderson Gneiss and Granite Gneiss can exhibit variable weathering characteristics, with more resistant sections forming ridges and more weathered portions contributing to saprolitic soils commonly observed in the region. Riverside Drive is located in an area of the project corridor consisting primarily of Henderson Gneiss.

The topography along the project corridor generally consists of rolling hills. The roadway along Riverside Drive generally slopes downward down station along -L-, with start/end elevations of approximately 1,470 feet (MSL) and 1,450 feet (MSL), respectively.

Soil Properties

Subsurface conditions along the roadway embankment were evaluated using 12 test pits (TP-1 through TP-12) to assess soil stratigraphy and rock elevation. Soils encountered within this project area have been divided into the following categories: roadway embankment, alluvial soils, and weathered rock.

Roadway embankment was encountered in test pits TP-1 through TP-8. The thickness of roadway embankment material ranged from approximately 3.0 to 6.0 feet. The roadway embankment encountered consists of silty fine to coarse sands (A-2-4) with gravel and riprap.

Alluvial soils were encountered in every test pit (TP-1 through TP-12) below the roadway embankment or the existing ground surface to depths ranging approximately from 5.5 to 14.0 feet. The alluvial soil consists of silty fine to coarse sands (A-2-4) with gravel, well-graded medium to coarse sands (A-1-b), sandy clays (A-6), clayey coarse sands (A-2-6), or poorly graded fine to coarse sands (A-3). Test pits encountered refusal at depths between 10.0 to 14.0 feet.

Rock Properties

The test pits cannot confirm that rock was encountered at the refusal depths, as the refusal could have been caused by very dense material or weathered rock. Refusal depths should not affect construction based on the plans provided to ESP.

Groundwater Properties

Groundwater data was collected in October 2025. Groundwater was encountered at all test pit locations at depths of 4.0 to 10.0 feet. Observations at the adjacent creek showed the water level to be approximately 6 inches to two feet below the ground line—this is considered a more representative indicator of near-surface groundwater conditions for design and construction purposes.

Areas of Special Geotechnical Interest

The existing embankment along the project area appears to have been reconstructed using uncontrolled riprap placement following the damage sustained during Hurricane Helene. Field observations indicate that the riprap was placed without compaction, gradation control, or proper engineering oversight. Further geotechnical evaluation, including slope stability analyses and subsurface verification, was performed to support the regrading design and confirm toe of embankment conditions.

Water Wells

No water wells were identified within or adjacent to the proposed right-of-way on the plans provided to ESP or by ESP personnel in the field.

Stability Evaluation and Recommendations

Field measurements, including test pits performed at the top of the embankment, were evaluated using a limit equilibrium slope stability program. Based on these findings, we recommend re-grading and reconstructing the embankment using Class VII clean, unweathered, durable, blasted rock material in accordance with NCDOT specifications and the project drawings. The reconstructed slope is designed to achieve a minimum factor of safety of 1.35 for surficial stability within the riprap under dry conditions, and 1.4 for a deeper block failure surface located behind the riprap. Extreme conditions, such as a rise in creek water level, were not analyzed as part of this assessment. A toe key is required for this site.

A wrap-around geotextile should be incorporated within the reconstructed embankment to improve slope performance by enhancing soil confinement, limiting internal erosion, and maintaining separation between riprap and underlying materials.

Prior to placement of engineered fill, construction monitoring should be conducted to assess the condition of the in-situ subgrade and verify the extent of any required undercutting. Proof-rolling under the supervision of a geotechnical engineer is recommended to confirm subgrade stability before fill placement.

While the emergency repairs currently appear stable with no observed signs of movement or distress, the proposed improvements are necessary to establish long-term slope performance and reliability. The slope at -L- Sta. 10+98.98 to 16+25.00 should be uniformly reconstructed to a consistent 2:1 (H:V) or flatter geometry using controlled fill. The slope at -L- Sta. 16+25.00 to 17+24.24 and -L- Sta. 18+30.62 to 19+00.00 should be uniformly reconstructed to a consistent 3:1 or flatter geometry using controlled fill. Periodic post-repair inspections are also recommended to monitor long-term stability. Geotechnical detail drawings have been provided in this report.

Construction Considerations

During the embankment construction, excavation may extend from the toe of the proposed roadway embankment upward into the existing embankment at a slope of 2:1 (H:V). To maintain a 9-ft wide travel lane operational during construction the right-side embankment should be constructed first. Slope stability analyses were performed for this temporary construction condition including the vehicular loading. The analyses indicate that temporary excavation is expected to remain stable during construction provided that temporary cut slopes into the existing roadway do not exceed 2:1 (H:V) from the toe of the proposed roadway embankment. Temporary shoring is not anticipated.

Prepared by,



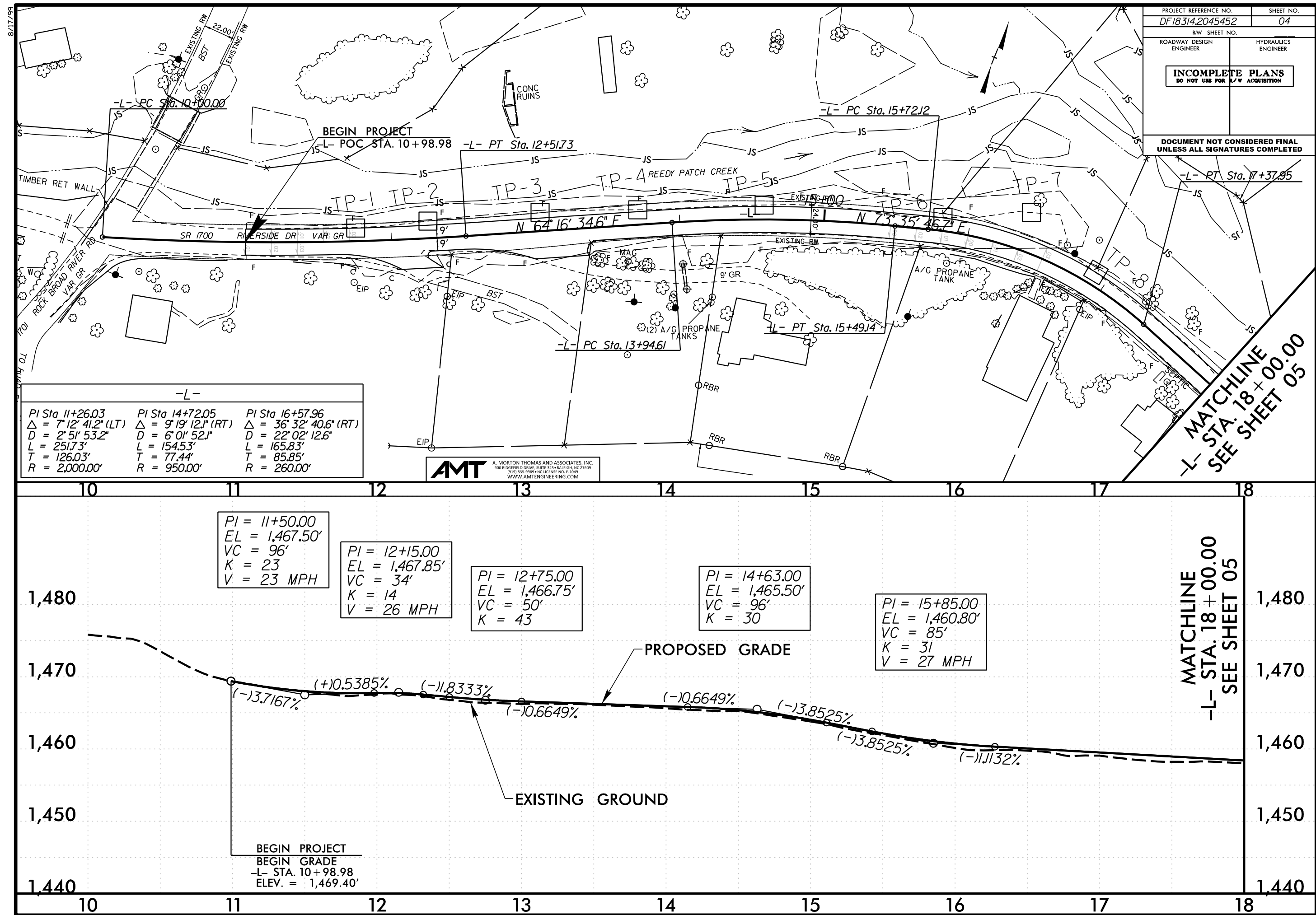
Pablo Barrera, EI
Geotechnical Engineer-In-Training



Valentina Ayala, EI
Geotechnical Engineer-In-Training



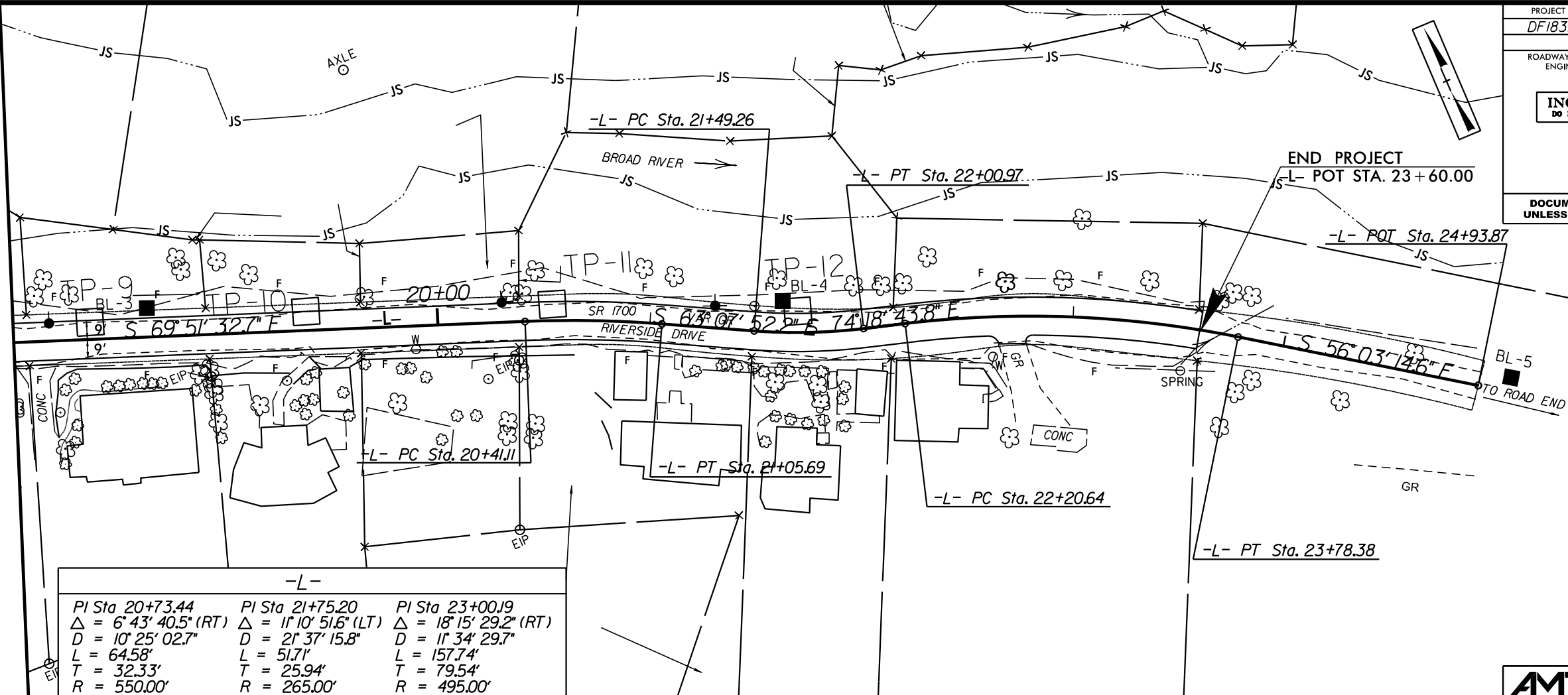
2026.07.20 07:57:53-04'00'
Michael S. Ulmer, PE
Senior Geotechnical Engineer



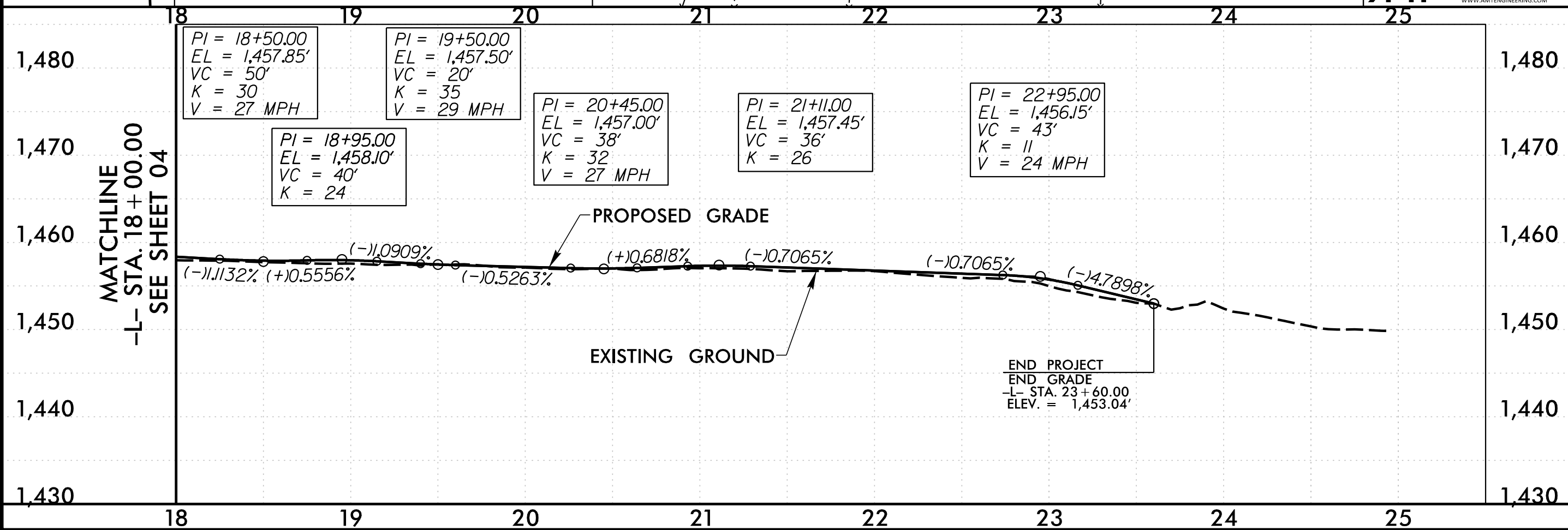
8/17/99

PROJECT REFERENCE NO. DF18314.2045452		SHEET NO. 05	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR A/W ACQUISITION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			

MATCHLINE
-L- STA. 18+00.00
SEE SHEET 04



AMT
A. MORTON THOMAS AND ASSOCIATES, INC.
300 RIDGEFIELD DRIVE, SUITE 300, RALEIGH, NC 27609
(919) 855-9989 • NC LICENSE NO. E-1049
WWW.AMTENGINEERING.COM



PROJECT: DF18314.2045452 REFERENCE: N/A

PROJECT REFERENCE NO.	SHEET NO.
DF18314.2045452	6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX A
SOIL TEST BORING LOGS

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045452				TIP N/A		COUNTY HENDERSON		GEOLOGIST Ayala, V.				
SITE DESCRIPTION Riverside Drive (SR 1700)								GROUND WTR (ft)				
BORING NO. TP-1		STATION 11+75		OFFSET 9 ft LT		ALIGNMENT -L-		0 HR. 4.0				
COLLAR ELEV. 1,466.2 ft		TOTAL DEPTH 10.0 ft		NORTHING 634,843		EASTING 1,021,161		24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE CAT 315D				DRILL METHOD Excavation		HAMMER TYPE N/A						
DRILLER N/A		START DATE 10/20/25		COMP. DATE 10/20/25		SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT			SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100		ELEV. (ft) DEPTH (ft)
1470												
1465												1,466.2 GROUND SURFACE 0.0
												ROADWAY EMBANKMENT Gray, Silty Fine to Coarse SAND, with Gravel
1460												1,460.2 6.0
												ALLUVIAL Brown, Silty Coarse SAND
												1,456.2 10.0
												Boring Terminated by Excavator Refusal at Elevation 1,456.2 ft On potentially Weathered Rock: GRANITIC GNEISS Approximate Test Pit Dimensions: 4 ft by 10 ft.

WBS DF18314.2045452				TIP N/A		COUNTY HENDERSON		GEOLOGIST Ayala, V.				
SITE DESCRIPTION Riverside Drive (SR 1700)								GROUND WTR (ft)				
BORING NO. TP-2		STATION 12+25		OFFSET 12 ft LT		ALIGNMENT -L-		0 HR. 4.0				
COLLAR ELEV. 1,466.0 ft		TOTAL DEPTH 10.0 ft		NORTHING 634,866		EASTING 1,021,206		24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE CAT 315D				DRILL METHOD Excavation		HAMMER TYPE N/A						
DRILLER N/A		START DATE 10/20/25		COMP. DATE 10/20/25		SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT			SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100		ELEV. (ft) DEPTH (ft)
1470												
1465												1,466.0 GROUND SURFACE 0.0
												ROADWAY EMBANKMENT Gray, Silty Fine to Coarse SAND, with Gravel
1460												1,460.0 6.0
												ALLUVIAL Brown, Medium to Coarse SAND with Silt, and Gravel
												1,456.0 10.0
												Boring Terminated by Excavator Refusal at Elevation 1,456.0 ft On potentially Weathered Rock: GRANITIC GNEISS Approximate Test Pit Dimensions: 4 ft by 10 ft.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045452					TIP N/A		COUNTY HENDERSON			GEOLOGIST Ayala, V.				
SITE DESCRIPTION Riverside Drive (SR 1700)										GROUND WTR (ft)				
BORING NO. TP-3			STATION 13+03			OFFSET 13 ft LT			ALIGNMENT -L-			0 HR. 5.0		
COLLAR ELEV. 1,464.5 ft			TOTAL DEPTH 10.0 ft			NORTHING 634,900			EASTING 1,021,275			24 HR. FIAD		
DRILL RIG/HAMMER EFF./DATE CAT 315D						DRILL METHOD Excavation				HAMMER TYPE N/A				
DRILLER N/A				START DATE 10/20/25			COMP. DATE 10/20/25			SURFACE WATER DEPTH N/A				
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
1465														
1460														
1455														
Boring Terminated by Excavator Refusal at Elevation 1,454.5 ft On potentially Weathered Rock: GRANITIC GNEISS														
Approximate Test Pit Dimensions: 4 ft by 10 ft.														

WBS DF18314.2045452					TIP N/A		COUNTY HENDERSON			GEOLOGIST Ayala, V.				
SITE DESCRIPTION Riverside Drive (SR 1700)										GROUND WTR (ft)				
BORING NO. TP-4			STATION 13+71			OFFSET 10 ft LT			ALIGNMENT -L-			0 HR. 5.0		
COLLAR ELEV. 1,462.2 ft			TOTAL DEPTH 9.0 ft			NORTHING 634,928			EASTING 1,021,337			24 HR. FIAD		
DRILL RIG/HAMMER EFF./DATE CAT 315D						DRILL METHOD Excavation				HAMMER TYPE N/A				
DRILLER N/A				START DATE 10/20/25			COMP. DATE 10/20/25			SURFACE WATER DEPTH N/A				
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
1465														
1460														
1455														
Boring Terminated by Excavator Refusal at Elevation 1,453.2 ft On potentially Weathered Rock: GRANITIC GNEISS														
Approximate Test Pit Dimensions: 4 ft by 10 ft.														

NCDOT BORE DOUBLE DF18314.2045452.GPJ NC_DOT.GDT 9/29/26

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045452					TIP N/A		COUNTY HENDERSON			GEOLOGIST Ayala, V.				
SITE DESCRIPTION Riverside Drive (SR 1700)										GROUND WTR (ft)				
BORING NO. TP-5			STATION 14+57			OFFSET 10 ft LT			ALIGNMENT -L-			0 HR. 5.0		
COLLAR ELEV. 1,461.5 ft			TOTAL DEPTH 10.0 ft			NORTHING 634,963			EASTING 1,021,417			24 HR. FIAD		
DRILL RIG/HAMMER EFF./DATE CAT 315D							DRILL METHOD Excavation			HAMMER TYPE N/A				
DRILLER N/A				START DATE 10/20/25			COMP. DATE 10/20/25			SURFACE WATER DEPTH N/A				
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)
1465														
1460													1,461.5	GROUND SURFACE 0.0
													1,457.5	ROADWAY EMBANKMENT 4.0
1455													1,453.5	ALLUVIAL 8.0
													1,451.5	Brown, Well-Graded Medim to Coarse SAND, with Pebbles 10.0
Boring Terminated by Excavator Refusal at Elevation 1,451.5 ft On potentially Weathered Rock: GRANITIC GNEISS														
Approximate Test Pit Dimensions: 4 ft by 10 ft.														

WBS DF18314.2045452			TIP N/A			COUNTY HENDERSON			GEOLOGIST Ayala, V.				
SITE DESCRIPTION Riverside Drive (SR 1700)									GROUND WTR (ft)				
BORING NO. TP-6			STATION 15+80			OFFSET 9 ft LT			ALIGNMENT -L-			0 HR. 5.0	
COLLAR ELEV. 1,459.2 ft			TOTAL DEPTH 11.0 ft			NORTHING 635,001			EASTING 1,021,535			24 HR. FIAD	
DRILL RIG/HAMMER EFF./DATE CAT 315D						DRILL METHOD Excavation			HAMMER TYPE N/A				
DRILLER N/A			START DATE 10/20/25			COMP. DATE 10/20/25			SURFACE WATER DEPTH N/A				
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			
1460													1,459.2 GROUND SURFACE 0.0
1455													

NC DOT BORE DOUBLE DF18314.2045452.GPJ NC_DOT_GDT 5/29/26

WBS				DF18314.2045452				TIP				N/A				COUNTY				HENDERSON				GEOLOGIST				Ayala, V.											
SITE DESCRIPTION																Riverside Drive (SR 1700)								GROUND WTR (ft)															
BORING NO.				TP-8				STATION				16+90				OFFSET				9 ft LT				ALIGNMENT				-L-				0 HR.				7.0			
COLLAR ELEV.				1,456.2 ft				TOTAL DEPTH				12.0 ft				NORTHING				635,006				EASTING				1,021,648				24 HR.				FIAD			
DRILL RIG/HAMMER EFF./DATE												CAT 315D				DRILL METHOD								Excavation				HAMMER TYPE				N/A							
DRILLER				N/A				START DATE				10/20/25				COMP. DATE				10/20/25				SURFACE WATER DEPTH								N/A							
ELEV (ft)		DRIVE ELEV (ft)		DEPTH (ft)		BLOW COUNT			BLOWS PER FOOT					SAMP. NO.		MOI		LOG		SOIL AND ROCK DESCRIPTION																			
						0.5ft 0.5ft 0.5ft			0 25 50 75 100																														
1460																																							
1455																				GROUND SURFACE 0.0																			
																				ROADWAY EMBANKMENT																			
																				Gray, Silty Fine to Coarse SAND, with Gravel 3.0																			
1450																				ALLUVIAL																			
																				Brown, Silty Fine to Medium SAND																			
																				1,448.2 8.0																			
1445																				Tan, Silty Fine to Medium SAND																			
																				1,444.2 12.0																			
																				Boring Terminated by Excavator Refusal at Elevation 1,444.2 ft On potentially Weathered Rock: GRANITIC GNEISS																			
																				Approximate Test Pit Dimensions: 4 ft by 10 ft.																			

GEOTECHNICAL BORING REPORT
BORE LOG

WBS DF18314.2045452				TIP N/A		COUNTY HENDERSON		GEOLOGIST Ayala, V.							
SITE DESCRIPTION Riverside Drive (SR 1700)								GROUND WTR (ft)							
BORING NO. TP-9		STATION 18+37		OFFSET 8 ft LT		ALIGNMENT -L-		0 HR.	7.0						
COLLAR ELEV. 1,449.9 ft		TOTAL DEPTH 12.0 ft		NORTHING 634,959		EASTING 1,021,787		24 HR.	FIAD						
DRILL RIG/HAMMER EFF./DATE CAT 315D				DRILL METHOD Excavation		HAMMER TYPE N/A									
DRILLER N/A		START DATE 10/20/25		COMP. DATE 10/20/25		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.		L O G	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75				100	ELEV. (ft)	DEPTH (ft)
1450													1,449.9	GROUND SURFACE	0.0
1445						<									

WBS DF18314.2045452				TIP N/A		COUNTY HENDERSON		GEOLOGIST Ayala, V.						
SITE DESCRIPTION Riverside Drive (SR 1700)								GROUND WTR (ft)						
BORING NO. TP-10		STATION 19+38		OFFSET 9 ft LT		ALIGNMENT -L-		0 HR. 8.0						
COLLAR ELEV. 1,454.6 ft		TOTAL DEPTH 9.0 ft		NORTHING 634,925		EASTING 1,021,883		24 HR. FIAD						
DRILL RIG/HAMMER EFF./DATE CAT 315D				DRILL METHOD Excavation		HAMMER TYPE N/A								
DRILLER N/A		START DATE 10/21/25		COMP. DATE 10/21/25		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
1455														1,454.6 GROUND SURFACE 0.0
1450						</								

NCDOT BORE DOUBLE DF18314.2045452.GPJ NC_DOT.GDT 9/29/26

GEOTECHNICAL BORING REPORT
BORE LOG

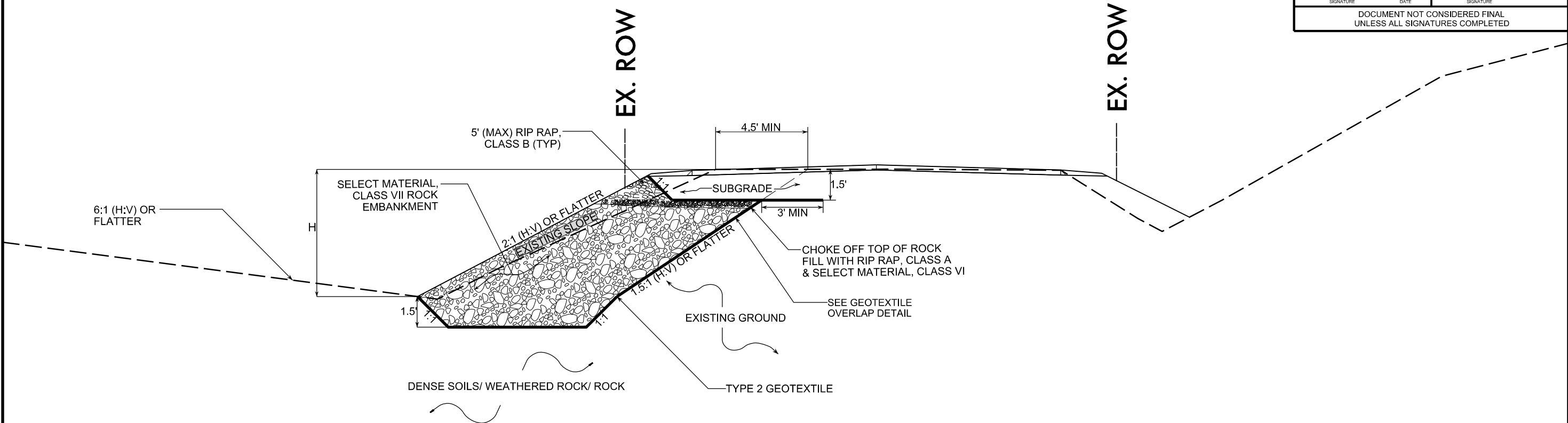
WBS DF18314.2045452					TIP N/A			COUNTY HENDERSON			GEOLOGIST Ayala, V.				
SITE DESCRIPTION Riverside Drive (SR 1700)										GROUND WTR (ft)					
BORING NO. TP-11					STATION 20+54			OFFSET 8 ft LT		ALIGNMENT -L-		0 HR. 9.0			
COLLAR ELEV. 1,450.4 ft					TOTAL DEPTH 10.0 ft			NORTHING 634,883		EASTING 1,021,992		24 HR. FIAD			
DRILL RIG/HAMMER EFF./DATE CAT 315D								DRILL METHOD Excavation			HAMMER TYPE N/A				
DRILLER N/A					START DATE 10/21/25			COMP. DATE 10/21/25		SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	▼ MOI	L O G	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
1455															
1450														1,450.4 GROUND SURFACE 0.0	
1445												M		Dark Brown, Silty Fine to Medium SAND, trace Organics and Roots	
												▽		1,440.4 10.0	
Boring Terminated by Excavator Refusal at Elevation 1,440.4 ft On potentially Weathered Rock: GRANITIC GNEISS															
Approximate Test Pit Dimensions: 4 ft by 10 ft.															

WBS DF18314.2045452					TIP N/A			COUNTY HENDERSON			GEOLOGIST Ayala, V.				
SITE DESCRIPTION Riverside Drive (SR 1700)										GROUND WTR (ft)					
BORING NO. TP-12					STATION 21+70			OFFSET 10 ft LT		ALIGNMENT -L-		0 HR. 10.0			
COLLAR ELEV. 1,453.2 ft					TOTAL DEPTH 14.0 ft			NORTHING 634,836		EASTING 1,022,097		24 HR. FIAD			
DRILL RIG/HAMMER EFF./DATE CAT 315D								DRILL METHOD Excavation			HAMMER TYPE N/A				
DRILLER N/A					START DATE 10/21/25			COMP. DATE 10/21/25		SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	▼ MOI	L O G	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
1455															
1450														1,453.2 GROUND SURFACE 0.0	
1445												M		ALLUVIAL Brown, Silty Fine to Medium SAND	
1440												▽		1,443.2 10.0	
												M		Tan, Poorly-Graded Medium to Coarse SAND	
														1,439.2 14.0	
Boring Terminated by Excavator Refusal at Elevation 1,439.2 ft On potentially Weathered Rock: GRANITIC GNEISS															
Approximate Test Pit Dimensions: 4 ft by 10 ft.															

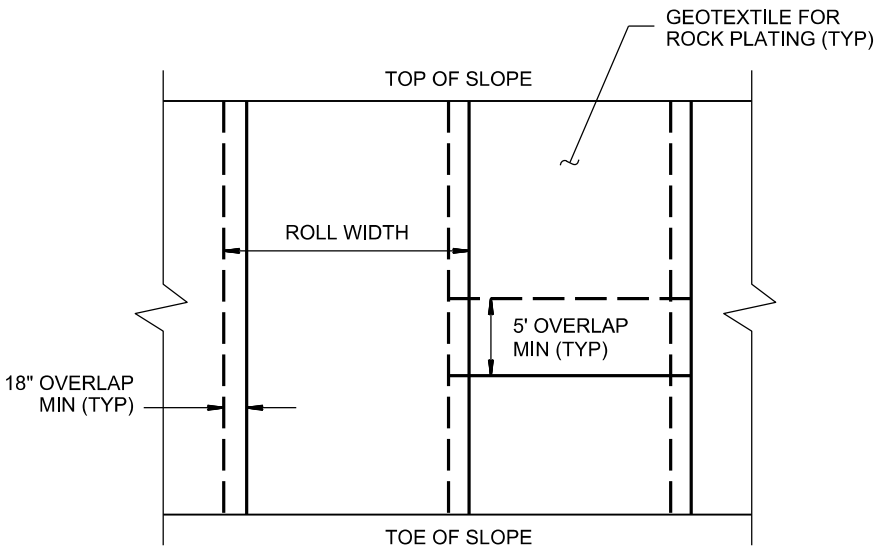
PROJECT: DF18314.2045452 REFERENCE: N/A

PROJECT REFERENCE NO.	SHEET NO.
DF18314.2045452	13

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX B
ROCK EMBANKMENT DRAWING, PROVISION, AND QUANTITIES

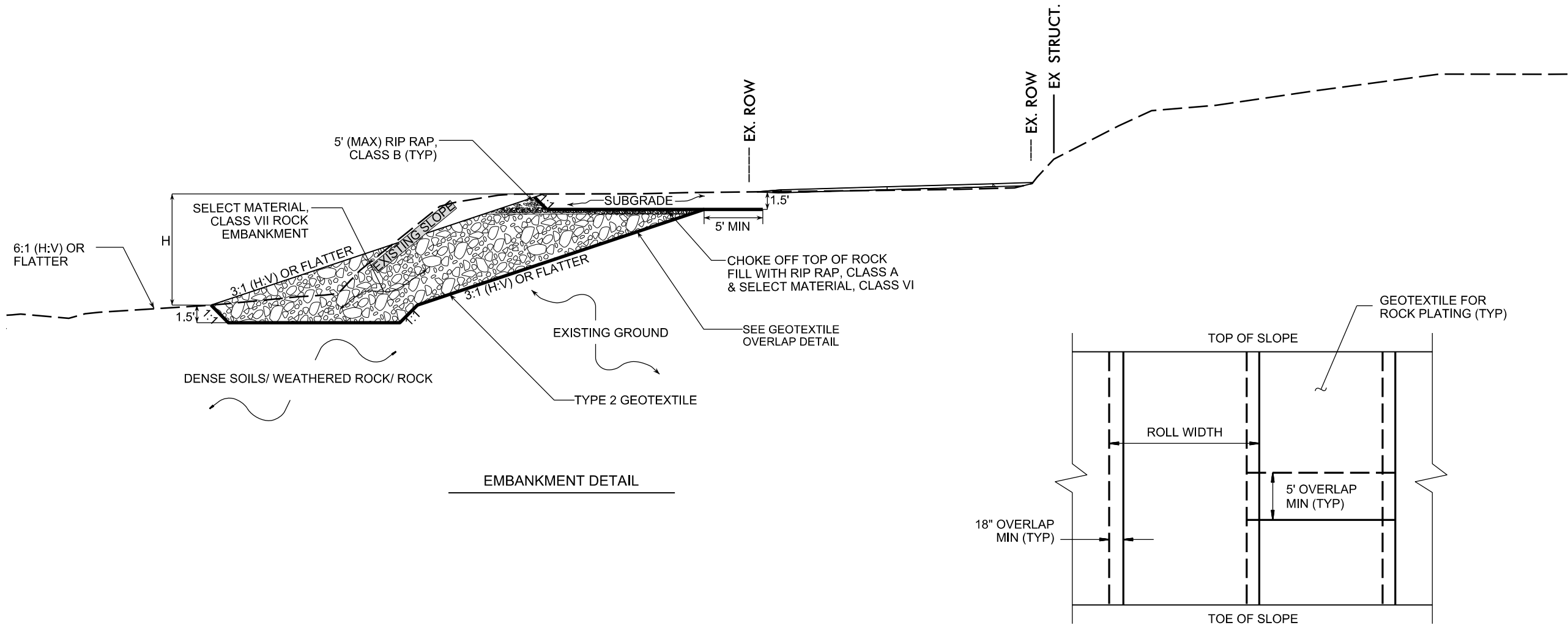


EMBANKMENT DETAIL

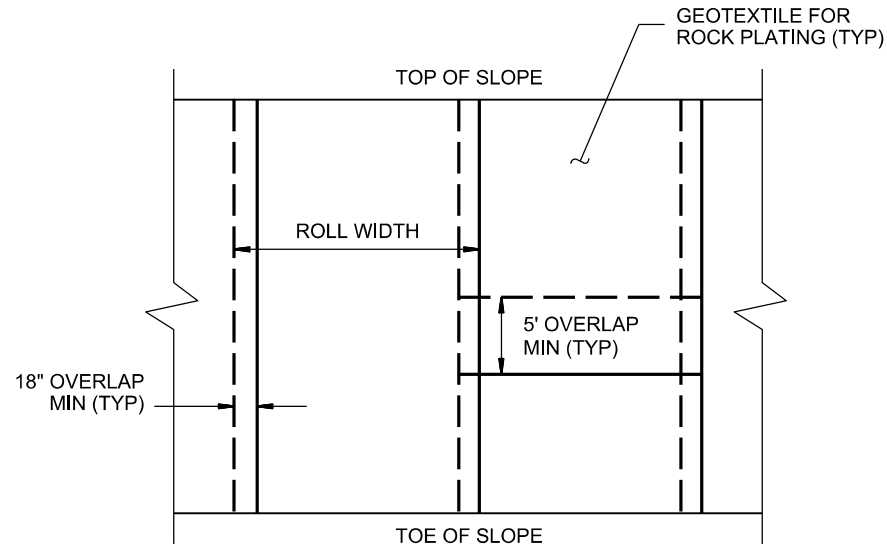


GEOTEXTILE OVERLAP DETAIL
(PLAN VIEW)

- NOTES:
- FOR ROCK EMBANKMENT, BENCH EXISTING SLOPE IN ACCORDANCE WITH SECTION 235 OF THE STANDARD SPECIFICATIONS, WHERE POSSIBLE.
 - INSTALL GEOTEXTILE FABRIC BENEATH RIP RAP TO SEPARATE RIP RAP FROM NATIVE SOILS AND REDUCE POTENTIAL FOR MIGRATION OF FINE MATERIALS. GEOTEXTILE SHALL BE EMBEDDED BENEATH THE ROADWAY SUBGRADE OR TO A MINIMUM DEPTH OF 1.5'. AT THE CREEK SIDE, PLACE THE FABRIC BENEATH THE RIP RAP.
 - TYPICAL DETAIL - DRAWN BASED ON CONDNTIONS AT -L- STA. 15+50.00. VERIFY APPLICABILITY AT EACH LOCATION FROM -L- STA. 10+98.98 TO 16+25.00.



EMBANKMENT DETAIL



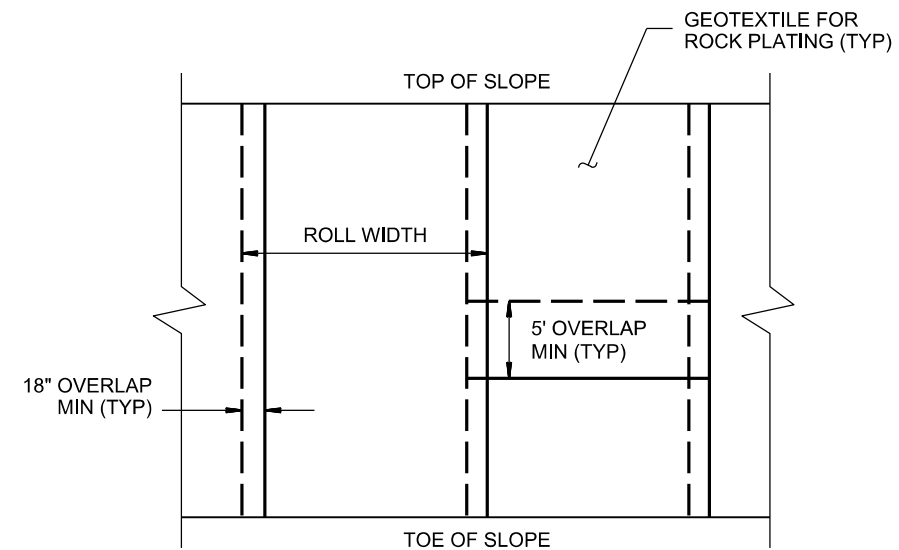
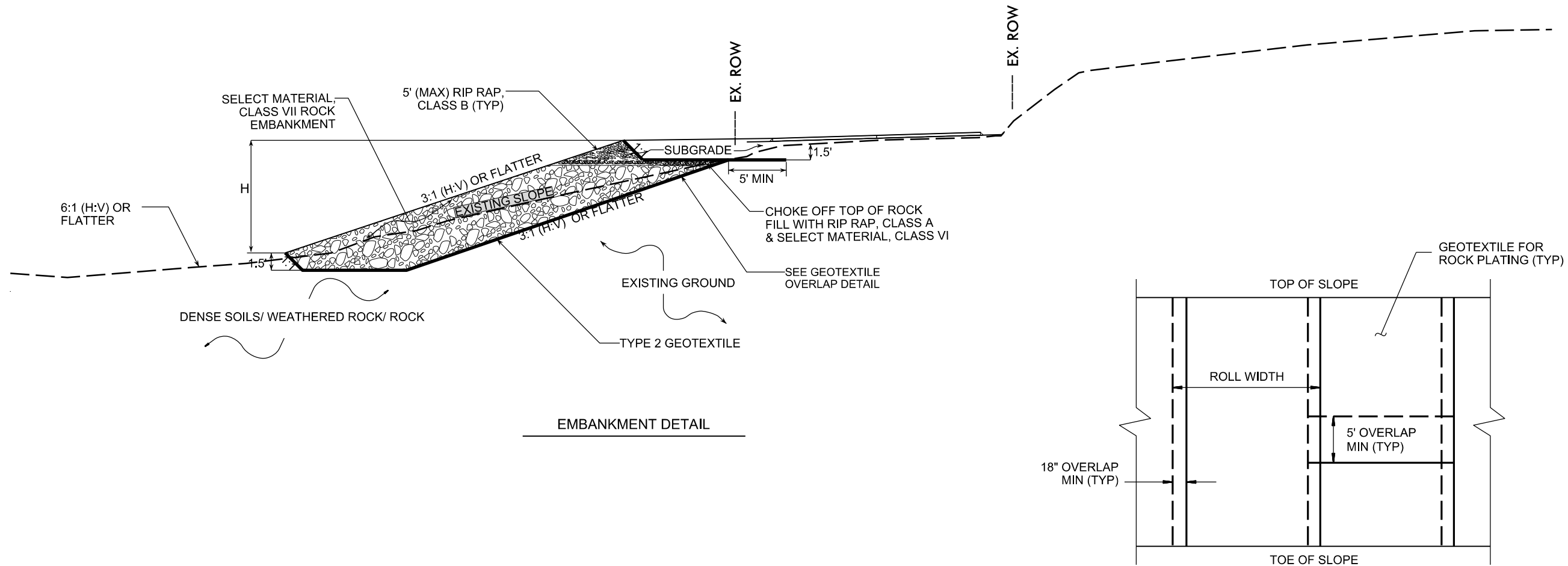
GEOTEXTILE OVERLAP DETAIL

(PLAN VIEW)

NOTES:

- FOR ROCK EMBANKMENT, BENCH EXISTING SLOPE IN ACCORDANCE WITH SECTION 235 OF THE STANDARD SPECIFICATIONS, WHERE POSSIBLE.
- INSTALL GEOTEXTILE FABRIC BENEATH RIP RAP TO SEPARATE RIP RAP FROM NATIVE SOILS AND REDUCE POTENTIAL FOR MIGRATION OF FINE MATERIALS. GEOTEXTILE SHALL BE EMBEDDED BENEATH THE ROADWAY SUBGRADE OR TO A MINIMUM DEPTH OF 1.5'. AT THE CREEK SIDE, PLACE THE FABRIC BENEATH THE RIP RAP.
- TYPICAL DETAIL - DRAWN BASED ON CONDNTIONS AT -L- STA. 16+50.00. VERIFY APPLICABILITY AT EACH LOCATION FROM -L- STA. 16+25.00 TO 16+75.00.





GEOTEXTILE OVERLAP DETAIL
(PLAN VIEW)

- NOTES:
- FOR ROCK EMBANKMENT, BENCH EXISTING SLOPE IN ACCORDANCE WITH SECTION 235 OF THE STANDARD SPECIFICATIONS, WHERE POSSIBLE.
 - INSTALL GEOTEXTILE FABRIC BENEATH RIP RAP TO SEPARATE RIP RAP FROM NATIVE SOILS AND REDUCE POTENTIAL FOR MIGRATION OF FINE MATERIALS. GEOTEXTILE SHALL BE EMBEDDED BENEATH THE ROADWAY SUBGRADE OR TO A MINIMUM DEPTH OF 1.5'. AT THE CREEK SIDE, PLACE THE FABRIC BENEATH THE RIP RAP.
 - TYPICAL DETAIL - DRAWN BASED ON CONDNTIONS AT -L- STA. 17+00. VERIFY APPLICABILITY AT EACH LOCATION FROM -L- STA. 16+75.00 TO 17+24.24.



GEOTECHNICAL
ENGINEER

SEAL
051684

ENGINEER
MICHAEL S. OLIVER

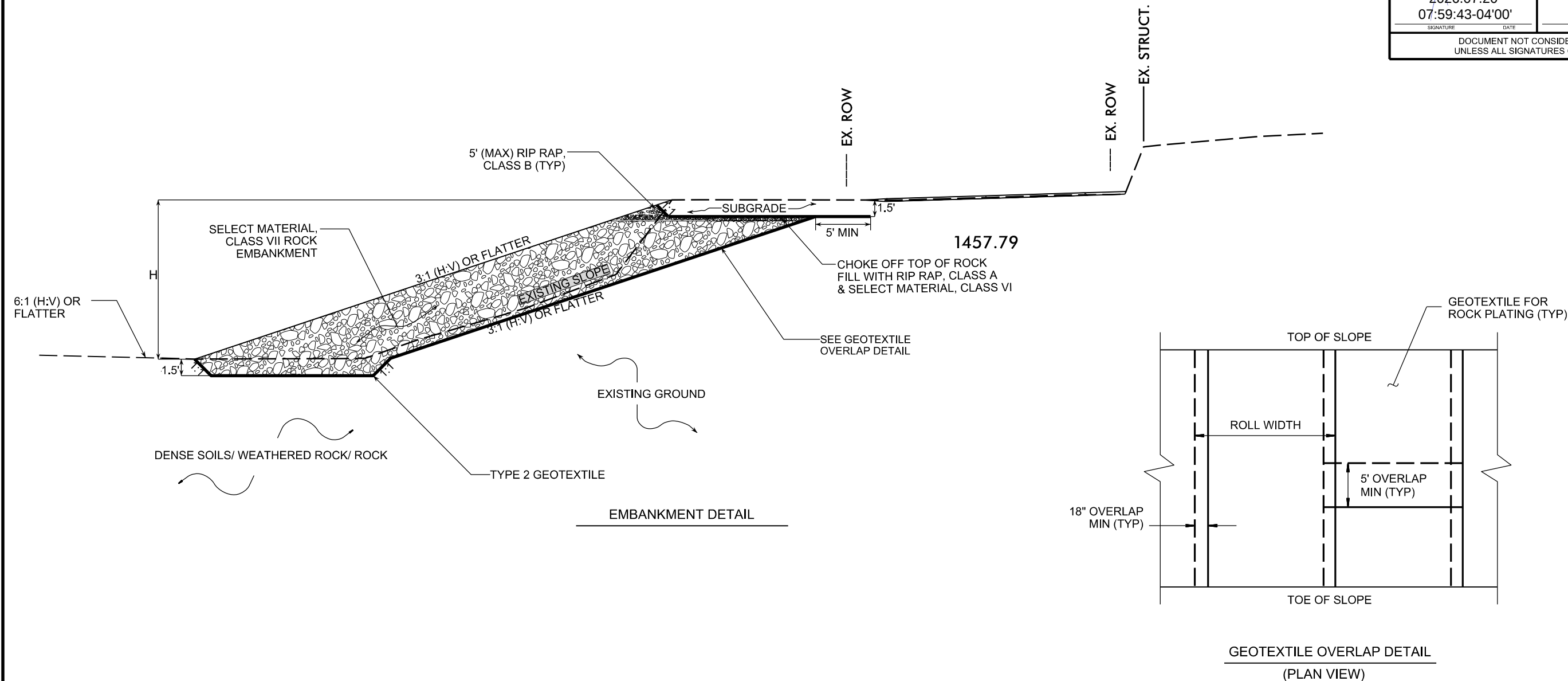
2026.07.20
07:59:43-04'00'

SIGNATUREDATE

ENGINEER

SIGNATURE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



- NOTES:
- FOR ROCK EMBANKMENT, BENCH EXISTING SLOPE IN ACCORDANCE WITH SECTION 235 OF THE STANDARD SPECIFICATIONS, WHERE POSSIBLE.
 - INSTALL GEOTEXTILE FABRIC BENEATH RIP RAP TO SEPARATE RIP RAP FROM NATIVE SOILS AND REDUCE POTENTIAL FOR MIGRATION OF FINE MATERIALS. GEOTEXTILE SHALL BE EMBEDDED BENEATH THE ROADWAY SUBGRADE OR TO A MINIMUM DEPTH OF 1.5'. AT THE CREEK SIDE, PLACE THE FABRIC BENEATH THE RIP RAP.
 - TYPICAL DETAIL - DRAWN BASED ON CONDNTIONS AT -L- STA. 18+50.00. VERIFY APPLICABILITY AT EACH LOCATION FROM -L- STA. 18+30.62 TO 18+75.00.

ROCK EMBANKMENTS:

(SPECIAL)

1.0 GENERAL

Construct rock embankments in accordance with the contract and as shown in the plans.

2.0 MATERIALS

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geotextile for Rock Embankments, Type 2	1056
Rip Rap Materials	1042
Select Materials	1016

Provide Class VII select material for rock embankments. Use Rip Rap, Class A, Rip Rap, Class B, and Select Material, Class VI stone (standard size No. 57 stone) to fill voids in rock embankments. Obtain aggregates from sources participating in the Department's Aggregate QC/QA Program in accordance with Section 1006 of the *Standard Specifications* or use similar size onsite material approved by the Engineer.

3.0 CONSTRUCTION METHODS

Construct rock embankments in accordance with the slopes, dimensions and elevations shown in the plans and Section 235 of the *Standard Specifications*. Prior to constructing rock embankments, install geotextile for rock embankments in accordance with the details and plans and Article 270-3 of the *Standard Specifications*. Place Select Material, Class VII so smaller rocks are uniformly distributed throughout rock embankments. Provide a uniform surface free of obstructions, debris and groups of large rocks that could cause voids in embankments.

Before placing geotextiles over the top of rock embankments, fill voids in the top of rock embankments with rip rap and Select Material, Class VI. Place and compact Rip Rap, Class B first followed by Rip Rap, Class A. Then, fill any remaining voids with Select Material, Class VI so geotextiles are not torn, ripped or otherwise damaged when installed and covered. Compact Rip Rap and Select Material, Class VI with tracked equipment or other approved methods. Install geotextiles on top of Select Material, Class VII, Rip Rap and Select Material, Class VI in accordance with Article 270-3 of the *Standard Specifications* before placing embankment fill material.

4.0 MEASUREMENT AND PAYMENT

Rock Embankments and #57 Stone will be measured and paid in tons. Select material will be measured by weighing material in trucks in accordance with Article 106-7 of the *Standard Specifications*. The contract unit prices for *Rock Embankments* and #57 Stone will be full compensation for providing, hauling, handling, placing, compacting and maintaining select material and rip rap.

Geotextile for Rock Embankments, Type 2 will be measured and paid in square yards. Geotextiles will be measured along the existing slope face and along the top of rock embankments as the square yard of exposed geotextiles before placing Select Material, Class

DF18314.2045452
SR 1700 (Riverside Dr)
Along Reedy Patch Creek

GT-1.2

Henderson County

VII, embankment fill material, and pavement section. No measurement will be made for overlapping geotextiles. The contract unit price for *Geotextile for Rock Embankments* will be full compensation for providing, transporting and installing geotextiles.

Rip Rap, Class A & B will be measured and paid in accordance with Article 876-4 of the *Standard Specifications*. The contract unit prices for *Rip Rap, Class A & B* will be full compensation for providing, hauling, handling, placing, compacting and maintaining select material and rip rap.

Payment will be made under:

Pay Item	Pay Unit
Rock Embankments	Ton
#57 Stone	Ton
Geotextile for Rock Embankments, Type 2	Square Yard
Rip Rap, Class A	Ton
Rip Rap, Class B	Ton



2026.07.20 08:01:03-04'00'



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

Summary of Quantities

WBS Number: _____

County: Henderson

Project Engineer: Pablo Barrera

TIP Number: DF18314.2045452

Field Office / PEF: ESP Associates, Inc.

Project Geologist: _____

Description: SR 1700 (Riverside Dr) Along Reedypatch Creek

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
0220000000-E	Rock Embankments	SP - Rock Embankments	I. A	-L-	10+98.98	16+25.00	1,930	TON
0220000000-E	Rock Embankments	SP - Rock Embankments	I. A	-L-	16+25.00	16+75.00	590	TON
0220000000-E	Rock Embankments	SP - Rock Embankments	I. A	-L-	16+75.00	17+24.24	450	TON
0220000000-E	Rock Embankments	SP - Rock Embankments	I. A	-L-	18+30.62	18+75.00	770	TON
0220000000-E	Rock Embankments	SP - Rock Embankments	I. A	-L-	18+75.00	19+00.00	360	TON
0220000000-E	Rock Embankments	SP - Rock Embankments	I. A	Contingency	N/A	N/A	410	TON
Total Quantity of Rock Embankments =							4,510	TON
0222000000-E	Geotextile for Rock Embankments	SP - Rock Embankments	I. A	-L-	10+98.98	16+25.00	1,700	SY
0222000000-E	Geotextile for Rock Embankments	SP - Rock Embankments	I. A	-L-	16+25.00	16+75.00	370	SY
0222000000-E	Geotextile for Rock Embankments	SP - Rock Embankments	I. A	-L-	16+75.00	17+24.24	310	SY
0222000000-E	Geotextile for Rock Embankments	SP - Rock Embankments	I. A	-L-	18+30.62	18+75.00	400	SY
0222000000-E	Geotextile for Rock Embankments	SP - Rock Embankments	I. A	-L-	18+75.00	19+00.00	210	SY
0222000000-E	Geotextile for Rock Embankments	SP - Rock Embankments	I. A	Contingency	N/A	N/A	300	SY
Total Quantity of Geotextile for Rock Embankments =							3,290	SY
1077000000-E	#57 Stone	SP - Rock Embankments	I. A	-L-	10+98.98	16+25.00	59	TON
1077000000-E	#57 Stone	SP - Rock Embankments	I. A	-L-	16+25.00	16+75.00	10	TON
1077000000-E	#57 Stone	SP - Rock Embankments	I. A	-L-	16+75.00	17+24.24	17	TON
1077000000-E	#57 Stone	SP - Rock Embankments	I. A	-L-	18+30.62	18+75.00	8	TON
1077000000-E	#57 Stone	SP - Rock Embankments	I. A	-L-	18+75.00	19+00.00	6	TON
1077000000-E	#57 Stone	SP - Rock Embankments	I. A	Contingency	N/A	N/A	25	TON
Total Quantity of #57 Stone =							125	TON



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

Summary of Quantities

WBS Number: _____

County: Henderson

Project Engineer: Pablo Barrera

TIP Number: DF18314.2045452

Field Office / PEF: ESP Associates, Inc.

Project Geologist: _____

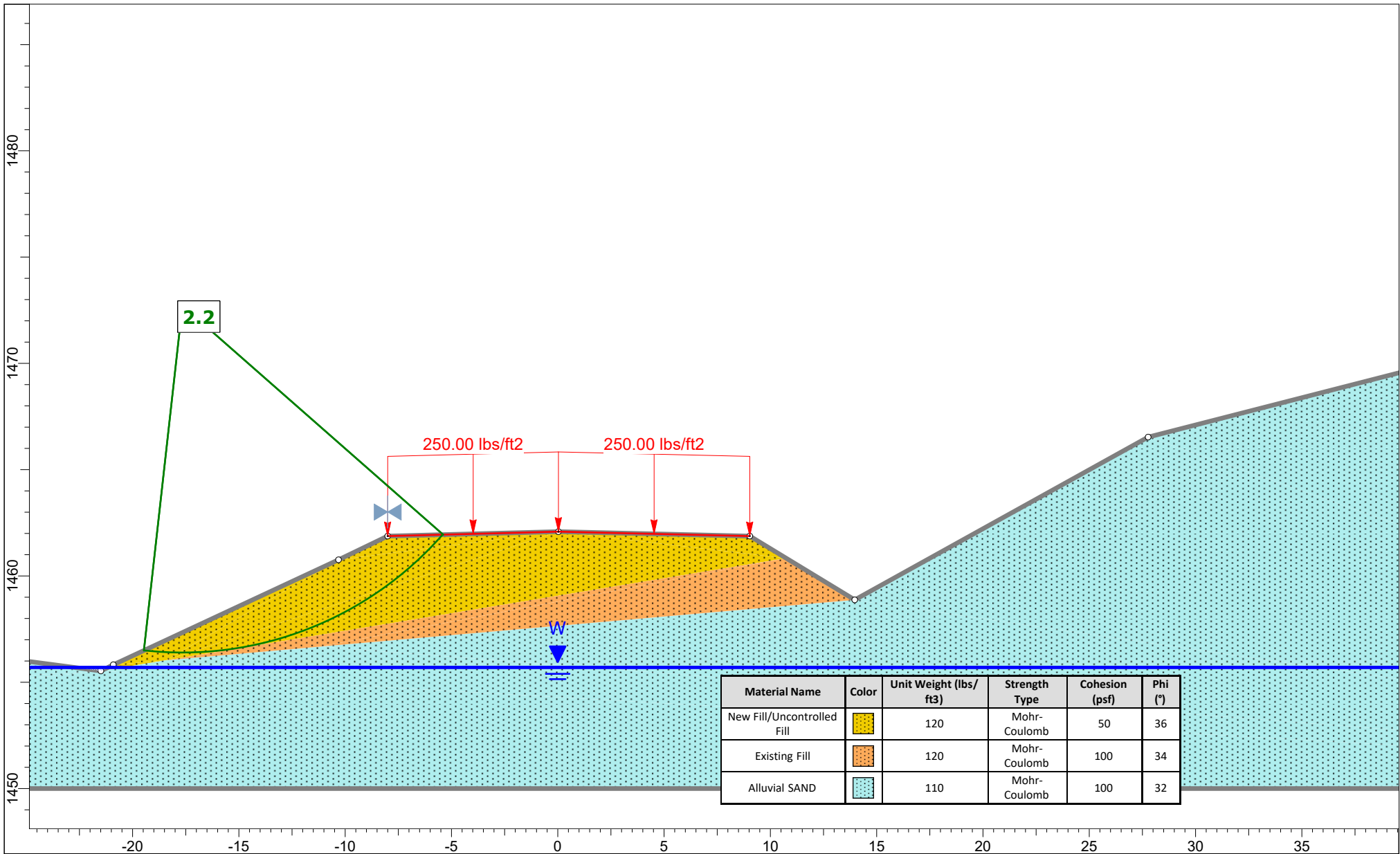
Description: SR 1700 (Riverside Dr) Along Reedypatch Creek

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
3642000000-E	Rip Rap, Class A	SP - Rock Embankments	I. A	-L-	10+98.98	16+25.00	112	TON
3642000000-E	Rip Rap, Class A	SP - Rock Embankments	I. A	-L-	16+25.00	16+75.00	30	TON
3642000000-E	Rip Rap, Class A	SP - Rock Embankments	I. A	-L-	16+75.00	17+24.24	28	TON
3642000000-E	Rip Rap, Class A	SP - Rock Embankments	I. A	-L-	18+30.62	18+75.00	22	TON
3642000000-E	Rip Rap, Class A	SP - Rock Embankments	I. A	-L-	18+75.00	19+00.00	16	TON
3642000000-E	Rip Rap, Class A	SP - Rock Embankments	I. A	Contingency	N/A	N/A	52	TON
Total Quantity of Rip Rap, Class A =							260	TON
3649000000-E	Rip Rap, Class B	SP - Rock Embankments	I. A	-L-	10+98.98	16+25.00	75	TON
3649000000-E	Rip Rap, Class B	SP - Rock Embankments	I. A	-L-	16+25.00	16+75.00	11	TON
3649000000-E	Rip Rap, Class B	SP - Rock Embankments	I. A	-L-	16+75.00	17+24.24	21	TON
3649000000-E	Rip Rap, Class B	SP - Rock Embankments	I. A	-L-	18+30.62	18+75.00	10	TON
3649000000-E	Rip Rap, Class B	SP - Rock Embankments	I. A	-L-	18+75.00	19+00.00	8	TON
3649000000-E	Rip Rap, Class B	SP - Rock Embankments	I. A	Contingency	N/A	N/A	31	TON
Total Quantity of Rip Rap, Class B =							156	TON

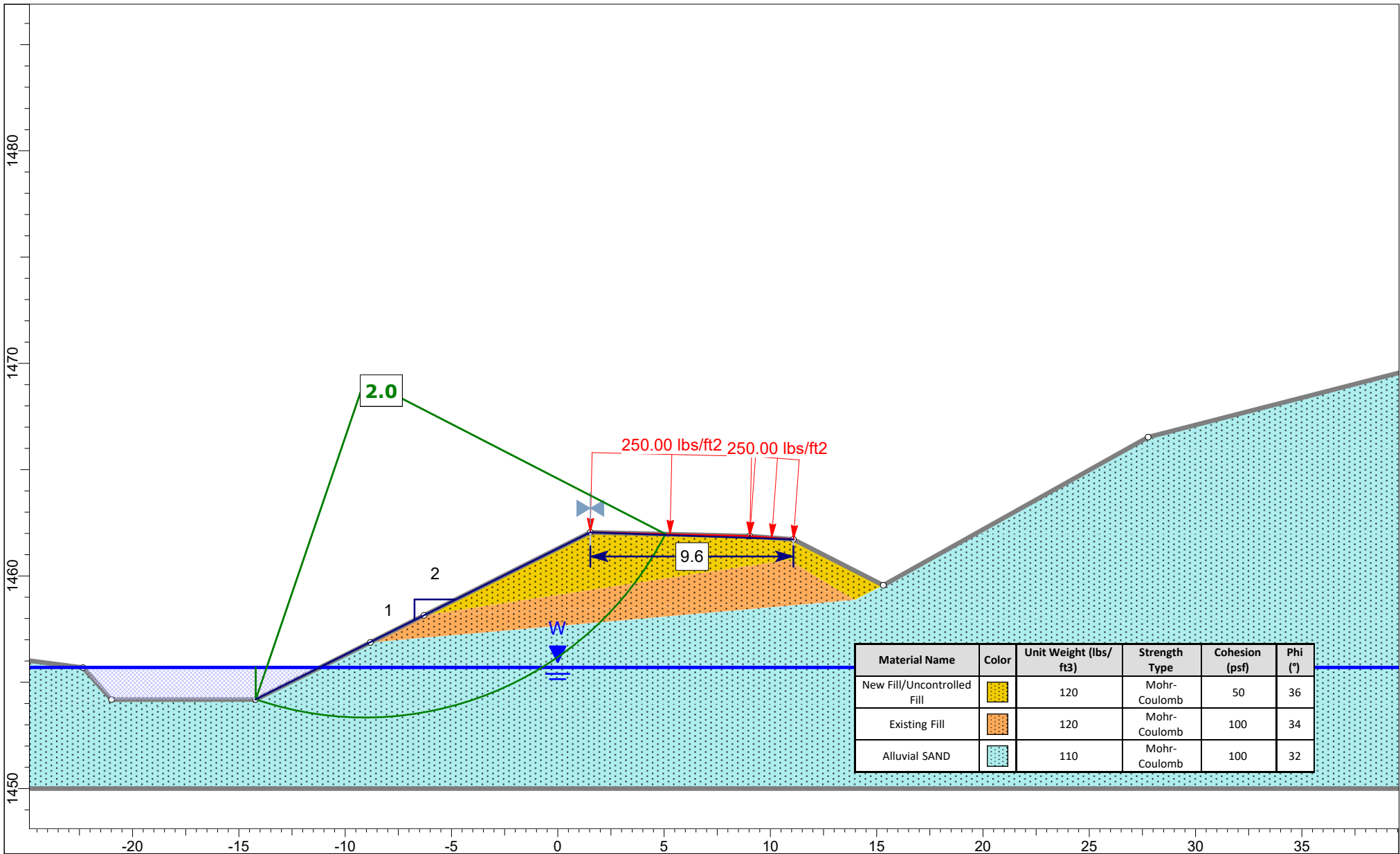
PROJECT: DF18314.2045452 REFERENCE: N/A

PROJECT REFERENCE NO.	SHEET NO.
DF18314.2045452	23

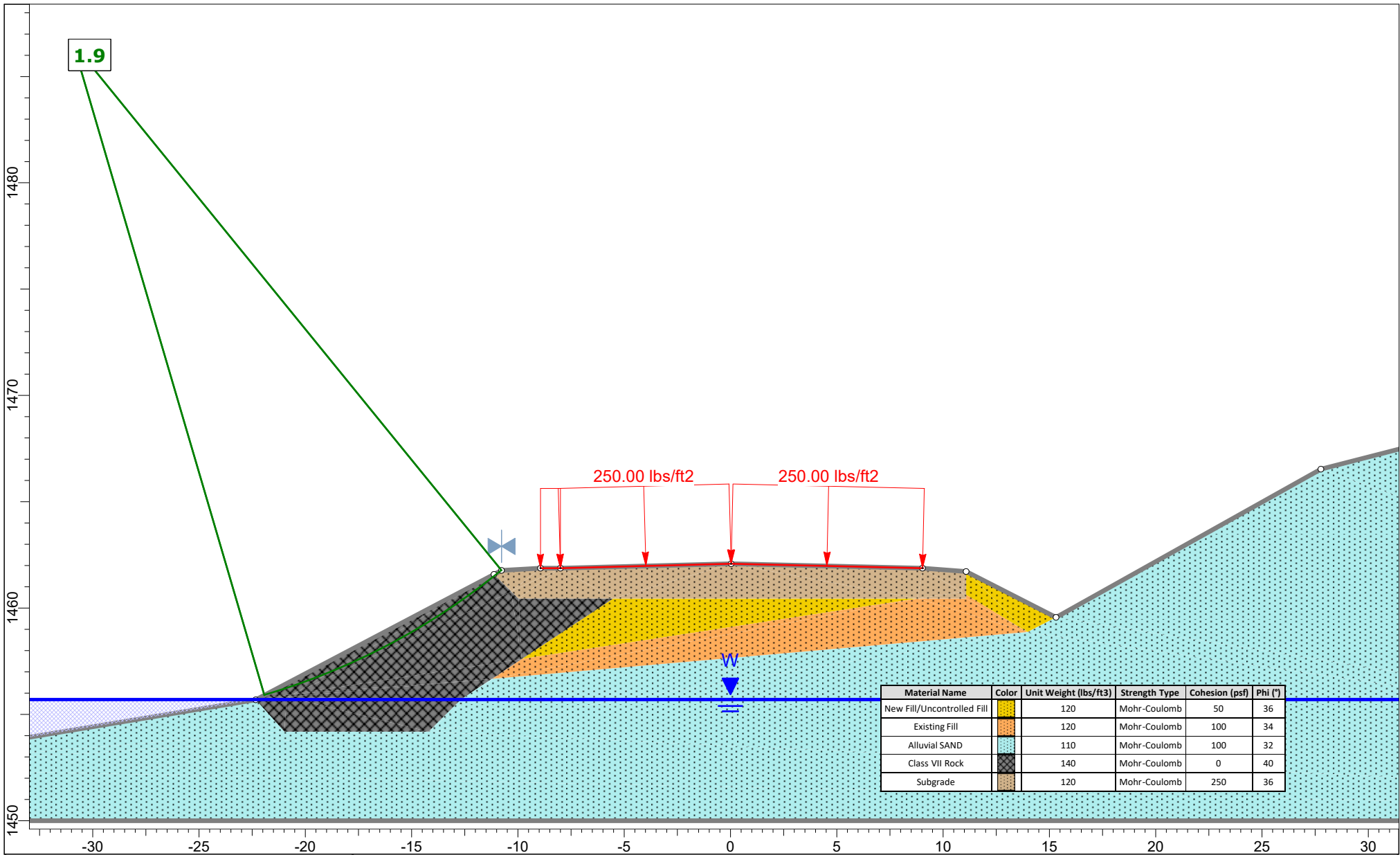
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX C
SUPPORTING CALCULATIONS



	Project		DF18314.2045452: Riverside Drive (SR 1700)	
	Analysis Description		STA. 15+50 Slope Stability, Existing Conditions	
	Drawn By	PB	Company	ESP Associates, Inc.
	Date	1/28/2026, 9:32:50 AM	File Name	STA. 15+50.slmd



	Project		DF18314.2045452: Riverside Drive (SR 1700)	
	Analysis Description		STA. 15+50 Slope Stability, 2:1 Excavation	
	Drawn By	PB	Company	ESP Associates, Inc.
	Date	1/28/2026, 9:32:50 AM	File Name	STA. 15+50.slmd



Project

DF18314.2045452: Riverside Drive (SR 1700)

Analysis Description

STA. 15+50 Slope Stability, Class VII Rock Embankment (Slope Protection)

Drawn By

PB

Company

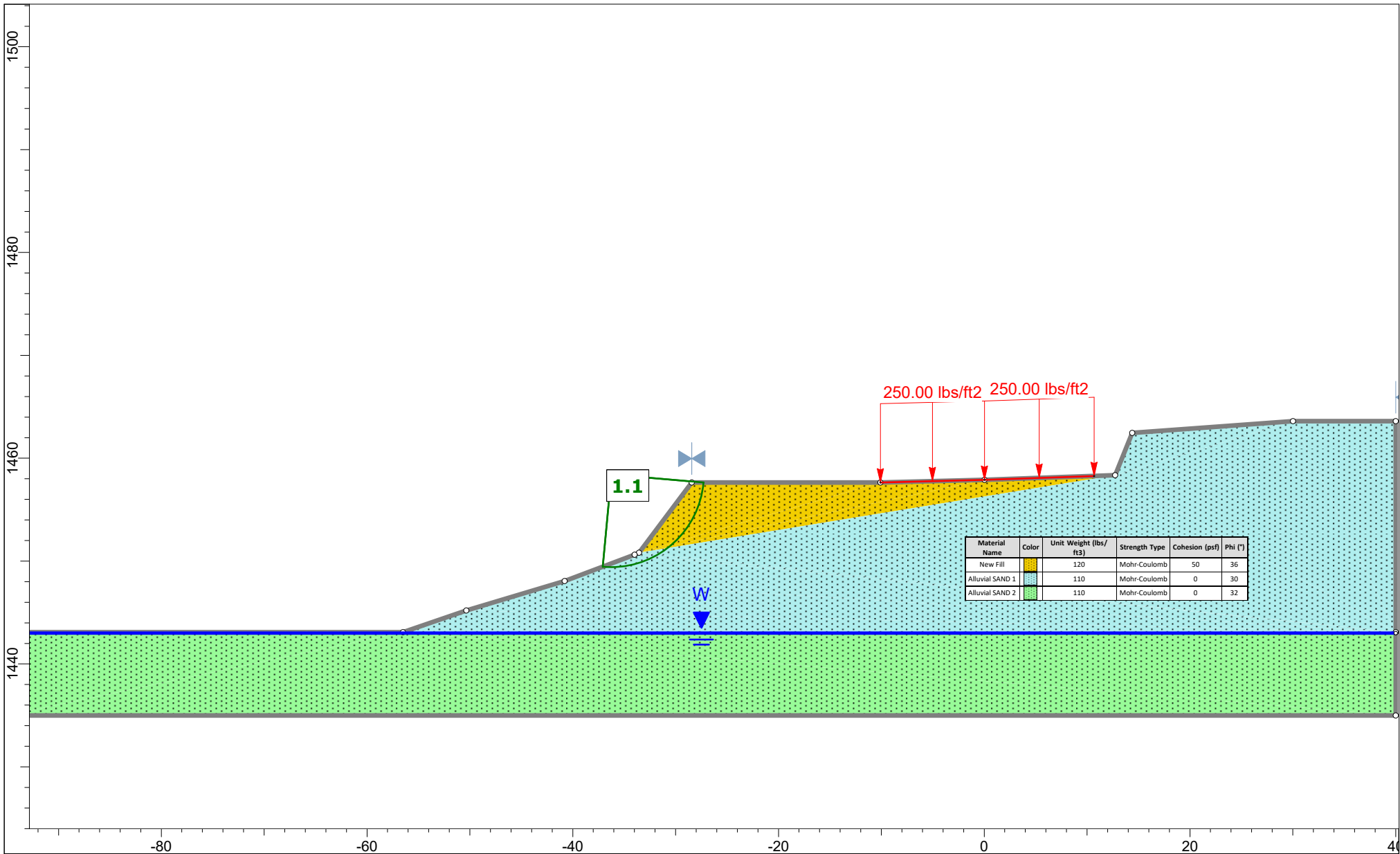
ESP Associates, Inc.

Date

1/28/2026, 9:32:50 AM

File Name

STA. 15+50.slmd



Project

DF18314.2045452: Riverside Drive (SR 1700)

Analysis Description

STA. 18+50 Slope Stability, Existing Conditions

Drawn By

PB

Company

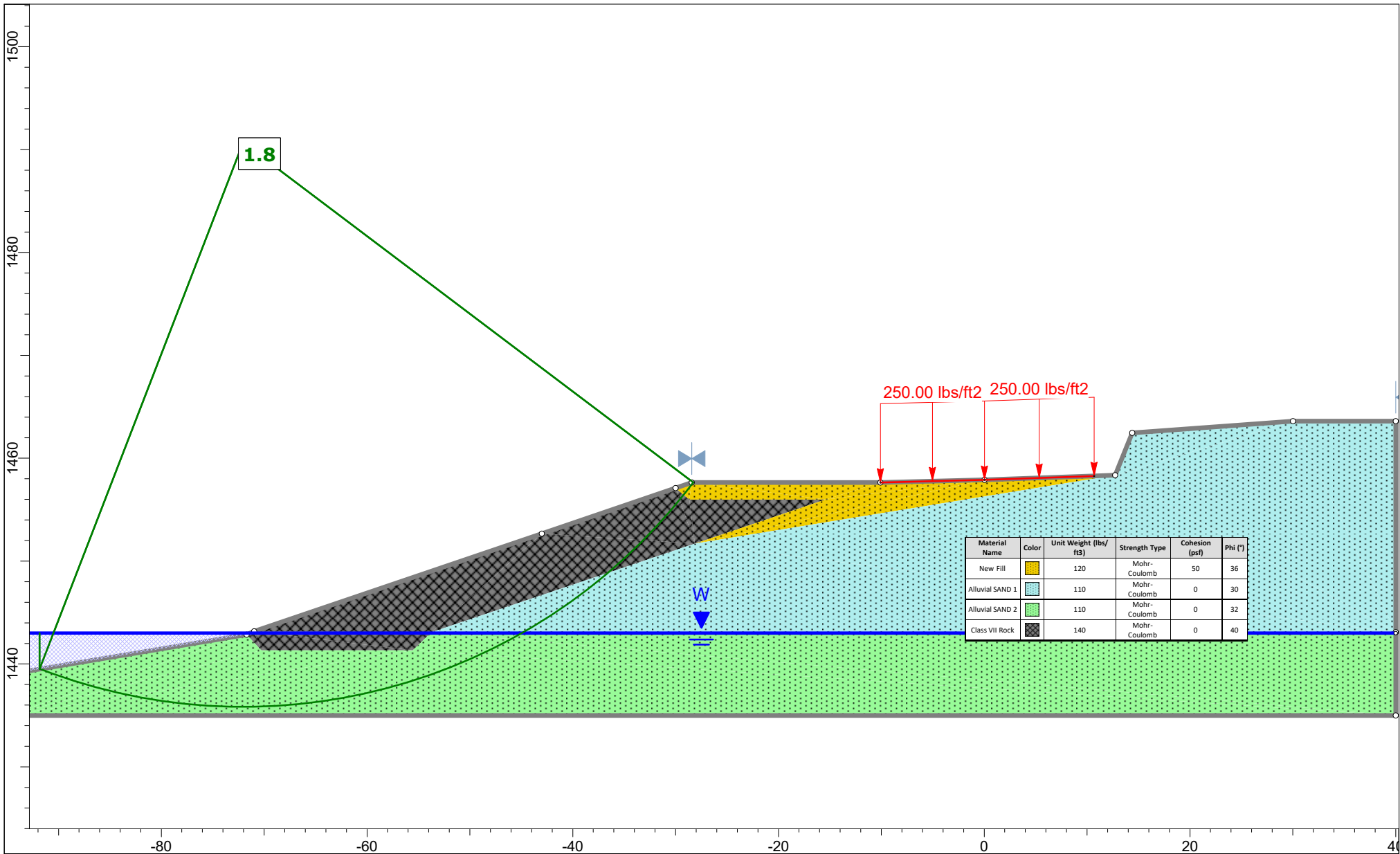
ESP Associates, Inc.

Date

1/28/2026, 9:32:50 AM

File Name

STA. 18+50.slmd



Project

DF18314.2045452: Riverside Drive (SR 1700)

Analysis Description

STA. 18+50 Slope Stability, Class VII Rock Embankment (Slope Protection)

Drawn By

PB

Company

ESP Associates, Inc.

Date

1/28/2026, 9:32:50 AM

File Name

STA. 18+50.slmd

Project Description: SR 1700 (Riverside Dr) Along Reedypatch Creek
ROADWAY QUANTITIES CALCULATIONS SPREADSHEET

SECTION NO.	ITEM DESCRIPTION	Begin Sta.	End Sta.	Length (ft)	Width (ft)	Avg. Depth/ Height (ft)	Sq. Ft	Sq. Yds	Cu. Ft.	Cu. Yds.	Tons/Cu Yd	Tons	Notes
I.A	Geotextile for Rock Embankments.												
	Total Geotextile for Rock Embankment							3290					Say 3,290 yd ²
	-L-	10+98.98	16+25.00	526.02	29	-	15255	1700					LT of CL
	-L-	16+25.00	16+75.00	50.00	65	-	3250	370					
	-L-	16+75.00	17+24.24	49.24	56	-	2757	310					
	-L-	18+30.62	18+75.00	44.38	80	-	3550	400					
	-L-	18+75.00	19+00.00	25	73	-	1825	210					
	Contingency (10%)	-	-	-	-	-	2664	300					
I.A	Class VII for Rock Embankments.												
	Total Class VII for Rock Embankment											4510	Say 4,510 tons
	-L-	10+98.98	16+25.00	526.02	-	-	52	6	27353	1013	1.90	1930	LT of CL
	-L-	16+25.00	16+75.00	50.00	-	-	165	18	8250	306	1.90	590	
	-L-	16+75.00	17+24.24	49.24	-	-	129	14	6352	235	1.90	450	
	-L-	18+30.62	18+75.00	44.38	-	-	245	27	10873	403	1.90	770	
	-L-	18+75.00	19+00.00	25	-	-	200	22	5000	185	1.90	360	
	Contingency (10%)	-	-	-	-	-	-	-	-	-	-	410	
I.A	Rip Rap, Class A for Rock Embankments.												
	Total Rip Rap, Class A for Rock Embankment											260	Say 260 tons
	-L-	10+98.98	16+25.00	526.02	-	-	3	1.00	1578	58	1.90	112	LT of CL
	-L-	16+25.00	16+75.00	50.00	-	-	8	1.00	400	15	1.90	30	
	-L-	16+75.00	17+24.24	49.24	-	-	8	1.00	394	15	1.90	28	
	-L-	18+30.62	18+75.00	44.38	-	-	7	1.00	311	12	1.90	22	
	-L-	18+75.00	19+00.00	25	-	-	9	1.00	225	8	1.90	16	
	Contingency (25%)	-	-	-	-	-	-	-	-	-	-	52	
I.A	Rip Rap, Class B for Rock Embankments.												
	Total Rip Rap, Class B for Rock Embankment											156	Say 156 tons
	-L-	10+98.98	16+25.00	526.02	-	-	2	0.22	1052	39	1.90	75	LT of CL
	-L-	16+25.00	16+75.00	50.00	-	-	3	0.33	150	6	1.90	11	
	-L-	16+75.00	17+24.24	49.24	-	-	6	0.67	295	11	1.90	21	
	-L-	18+30.62	18+75.00	44.38	-	-	3	0.33	133	5	1.90	10	
	-L-	18+75.00	19+00.00	25	-	-	4	0.44	100	4	1.90	8	
	Contingency (25%)	-	-	-	-	-	-	-	-	-	-	31	
I.A	Select Material, Class VI for Rock Embankments.												
	Total Select Material, Class VI (No. 57 Stone) for Rock Embankment											125	Say 125 tons
	-L-	10+98.98	16+25.00	526.02	-	-	2	0.22	1052	39	1.50	59	LT of CL
	-L-	16+25.00	16+75.00	50.00	-	-	3	0.33	150	6	1.50	10	
	-L-	16+75.00	17+24.24	49.24	-	-	6	0.67	295	11	1.50	17	
	-L-	18+30.62	18+75.00	44.38	-	-	3	0.33	133	5	1.50	8	
	-L-	18+75.00	19+00.00	25	-	-	4	0.44	100	4	1.50	6	
	Contingency (25%)	-	-	-	-	-	-	-	-	-	-	25	