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REFERENCE: R-5769

PROJECT: N/A

SEE SHEET 2A FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	10+00-43+69.04	4-6	7-9
-LI-	10+00-15+28.38	6	10
-YIREV-	10+00-25+46.29	4	10

CROSS SECTIONS

LINE	STATION	SHEETS
-YIREV-	10+00-25+46.29	11-18

APPENDICES

APPENDIX	TITLE	SHEETS
A	IN-SITU TESTING RESULTS	19-25
B	SOIL LABORATORY RESULTS	26-27

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *JOHNSTON*

PROJECT DESCRIPTION *NOVO NORDISK ACCESS FROM SR 1905 (GORDON ROAD) TO PROPOSED NOVO NORDISK SITE*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5769	1	30

CAUTION NOTICE

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

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

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

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

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DATE *JUNE 2016*

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8/22/2016

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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R-5769	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] D50 - (TER346)
- [X] D50 - (TER373)

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 7/8 " STEEL TEETH
- [X] TRICONE 2 7/8 " TUNG.-CARB.
- [ ] CORE BIT
- [X] TRICONE 3 7/8" STEEL TEETH

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: SEE NOTES

ELEVATION: N/A FEET

NOTES:

FIAD - FILLED IN AFTER DRILLING

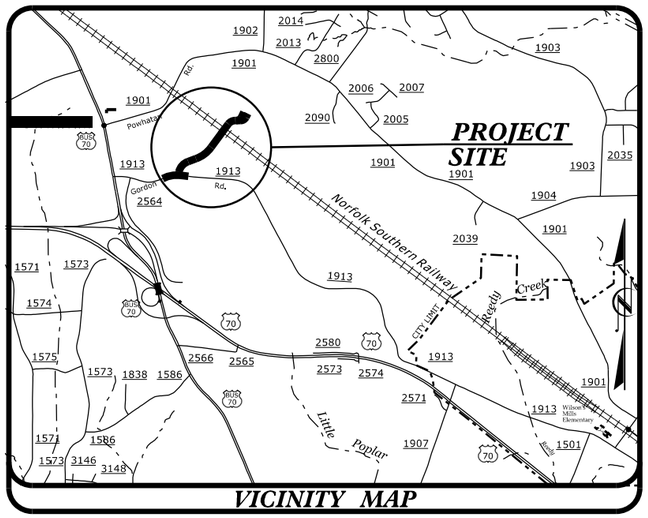
PROJECT WAS DRAFTED USING PROVIDED TIN FILE (FILE: R5769_012616)

DATE: 8-15-14

PROJECT: R-5769

CONTRACT:

See Sheet 1-A For Index of Sheets



VICINITY MAP

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

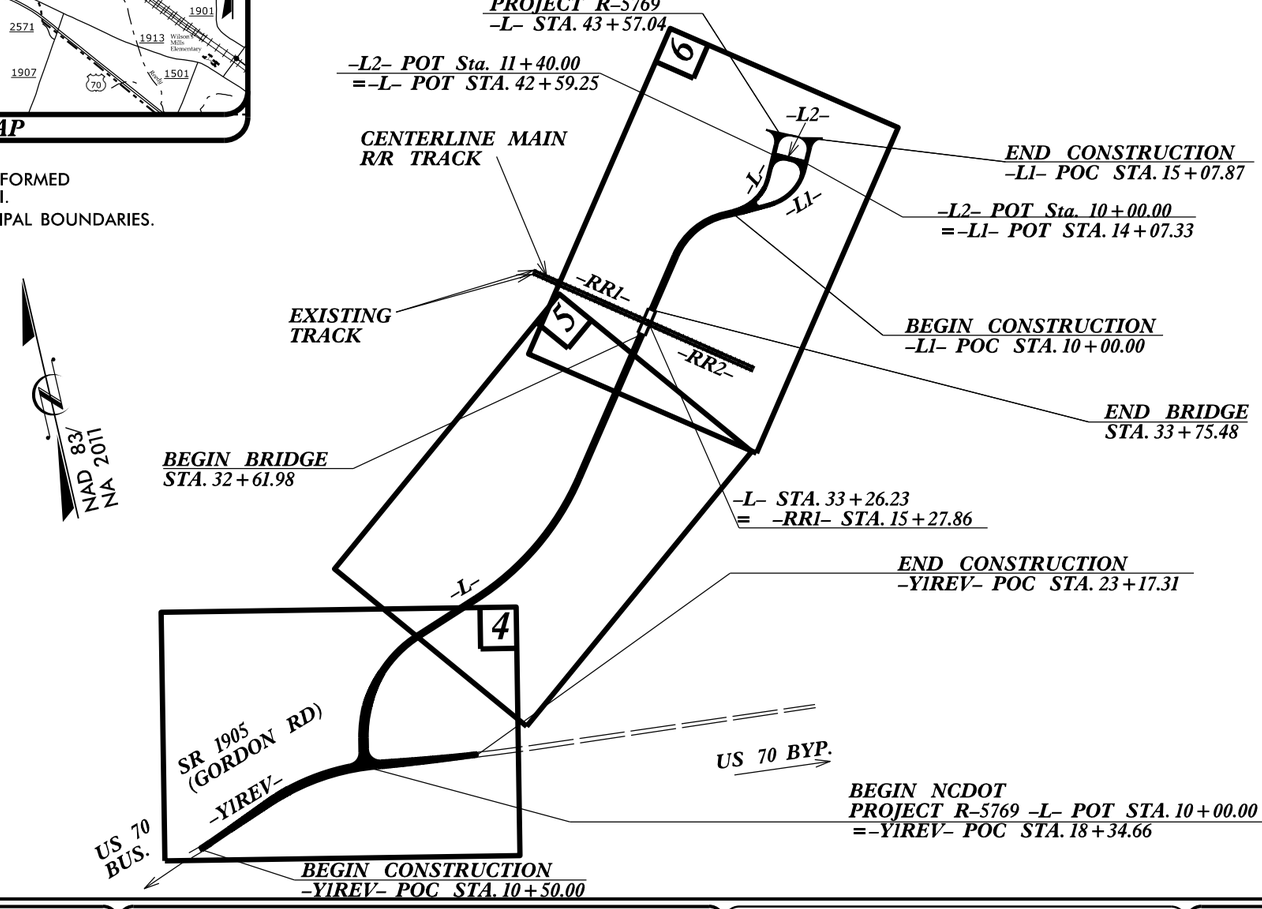
JOHNSTON COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5769	2A	30

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
46448.1.1		PE, UTIL., R/W
		CONST.

LOCATION: NOVO NORDISK ACCESS ROAD FROM SR 1905 (GORDON RD.) TO PROPOSED NOVO NORDISK SITE

TYPE OF WORK: GRADING, DRAINAGE, PAVING & STRUCTURE



WETHERILL ENGINEERING
1223 Jones Franklin Rd
Raleigh, N.C. 27606
License No. F-0377
Bus: 919 851 8077
Fax: 919 851 8107

TRANSPORTATION PLANNING/DESIGN - BRIDGE/STRUCTURE DESIGN
CIVIL/SITE DESIGN - GIS/GPS - CONSTRUCTION OBSERVATION

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

PLANS: 50 25 0 50 100
PROFILE (HORIZONTAL): 50 25 0 50 100
PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

ADT 2040 = 700

T = 4 % *
V = 40 MPH
* (TTST = 2% + DUAL = 2%)
FUNC CLASS = RURAL LOCAL
SUB REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY PROJECT R-5769 =	0.615 MILES
LENGTH STRUCTURE PROJECT R-5769 =	0.021 MILES
TOTAL LENGTH PROJECT R-5769 =	0.636 MILES

NCDOT CONTACT: JERRY PAGE, PE
DIVISION 4 PROJECT MANAGER

Prepared for:
DIVISION OF HIGHWAYS
DIVISION FOUR
509 Ward Boulevard, Wilson NC, 27895

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE:

EDWARD G. WETHERILL, PE
PROJECT ENGINEER

GREG S. PURVIS, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

Date: June 2016
TIP Number: R-5796
County: Johnston
Description: Novo Nordisk Access Road from SR 1905 (Gordon Road) to Proposed Novo Nordisk Site

Subject: Roadway Geotechnical Report - Inventory

Project Description

The project is located between Clayton and Wilsons Mills near the US 70 corridor in Johnston County, North Carolina. The proposed project consists of the construction of 0.6 miles of two-lane roadway on new location and the widening of an 800 feet long section of existing two-lane roadway to accommodate turn lanes. The new construction begins at SR 1905 (Gordon Road) and continues in a northeast direction through cultivated fields, wetlands, and woods before crossing two Norfolk Southern rail lines and ending at the proposed site of the new Novo Nordisk facility. The proposed access road will cross over the Norfolk Southern rail lines on a single span bridge with MSE walls proposed at the abutments. SR 1905 will be widened to the north to accommodate turn lanes to the proposed access road. The widening and new construction will be fill sections ranging from sliver fills on the existing SR 1905 embankments to 30 feet tall embankments at the bridge over the Norfolk Southern rail lines.

The geotechnical subsurface investigation was performed throughout March and April of 2016. Two Diedrich D-50 rotary drills were utilized to advance the soil test borings. Both of the rotary drill rigs utilized on this project were equipped with recently calibrated automatic Standard Penetration Test (SPT) hammers. A Pagani TG73-200 rig was utilized to push cone (CPT) and flat blade dilatometer (DMT) at the proposed bridge approach embankments. Pore water pressure dissipation tests were performed during selected CPT soundings.

The following alignments were investigated by soil testing and visual reconnaissance:

Alignment	Stations
-L-	10+00 to 43+57.04
-L1-	10+00 to 15+07.87
-Y1REV-	10+50 to 23+17.31

Physiography and Geology

The project is located near the western fringe of the Inner Coastal Plain Physiographic Province. The near surface soils consist of undivided upland coastal plain deposits. The coastal plain deposits are underlain by residual soils and weathered and crystalline rock within the depths of several soil test borings performed at the site. Where encountered in the SPT borings, the top of the residual soils and weathered rock is near Elevation 250 feet. SPT refusal on crystalline rock was encountered between Elevations 232 and 242 feet near the Norfolk Southern rail lines. The crystalline rock encountered in the soil test borings was mica schist.

The existing elevations along the corridor range from approximately 279 feet to 295 feet. In general, the topography is rolling with gentle slopes. The existing Norfolk Southern rail lines are located near the highest point on the project. An area delineated as wetlands between -L- Stations 22+00 and 29+50 is believed to be a portion of a Carolina Bay.

Soil Properties

-Y1REV-

Roadway embankment soils were encountered in the hand augers performed along the shoulder of existing SR 1905 (-Y1REV-). The roadway embankment soils begin near -Y1REV- Station 14+75 and continue to Station 22+00. The roadway embankment soils consist of high plasticity silty clay (A-7-6) over silty sand (A-2-4), both containing little quartz gravel. The clay layer was approximately 2 feet thick and the sand extended to approximately 6 feet below existing grades where encountered in the hand augers. In the up station direction along -Y1REV-, the roadway embankment tapers from at grade and gets deeper as existing SR 1905 crosses a small jurisdictional stream channeled through a 30 inch RCP culvert at -Y1REV- Station 20+52. The maximum existing embankment height occurs near the existing RCP culvert and is approximately 6 feet. As the alignment continues up station, the roadway embankment soils taper out and meet undivided coastal plain again at -Y1REV- Station 22+00.

Alluvial soils were encountered beneath the roadway embankment on -Y1REV- between Stations 19+11 and 21+67. The alluvial soils encountered directly beneath the roadway embankment were organic sandy clay (A-6). This layer is approximately 1 foot thick and is underlain by a loose clean sand (A-3) to hand auger termination depths of 6.5 feet. The alluvial soils occur in the low lying area on the -Y1REV- alignment as described above and continue north along the jurisdictional stream floodplain toward the -L- alignment.

-L- and -L1-

Alluvial soils are present on the -L- alignment at the surface near the jurisdictional stream that continues south toward SR 1905 (-Y1REV-). These alluvial soils are present near the surface between -L- Stations 15+97 and 16+79. The alluvial soils consist of loose clean sand (A-3).

The coastal plain deposits along the corridor can be generalized into three layers. There are organic soils present within and surrounding the delineated wetlands. Outside of the wetland areas and beneath the organic soils is a relatively stiff crust. Beneath the stiff crust is a very soft layer that extends to the top of residual and weathered rock.

The organic soil layer was encountered at the surface within the delineated wetlands and near their boundaries between approximately -L- Stations 21+25 to 29+50 and 37+00 to 39+50. This layer consists of organic clayey sand (A-2-6) and organic sandy clay (A-6). These soils contain trace to little organics and extend to depths as deep as 9 feet where encountered.

The second generalized coastal plain layer was encountered outside of the delineated wetlands and beneath the organic soils described previously. This layer is a medium stiff to hard layer that generally consists of silty clay (A-7-6) and sandy clay (A-6), although some samples from this layer also classify as a medium dense to dense clayey sand (A-2-6 or A-2-7) based on laboratory testing. This layer is notably stiffer / denser than the other coastal plain soils encountered along the project. This layer exhibits the highest SPT blow counts and in-situ moduli based on the CPT and DMT near the Norfolk Southern Railroad between approximately -L- Station 30+50 and 35+50, where the depth to groundwater is the deepest along the project. The layer extends from the surface to depths of up to 20 feet below existing site grades.

The third coastal plain layer exhibited very low SPT blow counts and was encountered once the SPT borings were advanced through the stiff crust layer along the project. The soft / loose layer consisted of wet to saturated high plasticity clay (A-7-6) with highly variable amounts of sand and gravel; saturated clayey sand (A-2-6 and A-2-7) with trace to little gravel; and clean, very loose to loose, sand and gravel (A-3 and A-1-a). The sandy and gravelly soils were typically encountered in the top 20 feet of the layer and the high plasticity clay was encountered below to the interface with the residual and weathered rock. Based on the in-situ testing and deeper SPT borings, the soft / loose layer extends to the top of residual and weathered rock which were encountered at depths ranging from 35 to 50 feet below existing site grades. The clay soils near the bottom of the layer also contained trace to little mica.

Residual soils were encountered in several of the deeper SPT borings advanced near the bridge and retaining wall structures at the Norfolk Southern Railroad. The residual soils were sampled as soft to stiff high plasticity clay (A-7-6) and dense to very dense silty sand (A-2-4) both of which contained trace to little mica.

Rock Properties

Weathered rock and crystalline rock along the project appear to be a micaceous schist based on the materials recovered in the split spoon sampler. Rock coring was not performed for the subsurface investigation along the project. The weathered rock and rock were encountered at depths of 40 to 60 feet below existing site grades. The weathered rock and crystalline rock at the site are not anticipated to have an impact on roadway construction.

Groundwater

The corridor generally drains to the delineated wetland areas which in turn drain to unnamed jurisdictional streams that run out of the corridor. The areas delineated as wetlands along the project were observed to retain water for several days following precipitation. In the suspected Carolina Bay, water depths of up to 3 feet were observed during a site visit to lay out boring locations. However, the site was revisited following a period of dry weather to begin the field investigation and the surface water had infiltrated or drained. Surface water depths of up to 1.5 feet were observed in the delineated wetland areas up station from the bridge over the Norfolk Southern Railroad. Similar to the suspected Carolina Bay, surface water was not observed when the site was revisited after a period of dry weather. Although surface water was not observed following dry weather, groundwater was encountered during drilling and sampling in and near the delineated wetlands at depths of 0.5 to 1 foot below existing site grades.

Away from the wetland areas, the depth to groundwater ranged from approximately 3 to 10 feet below existing site grades. From the SR 1905 and access road intersection to approximately -L- Station 21+00, groundwater was encountered between 3 and 7.5 feet below existing site grades which corresponds to an elevation of 278 to 280 feet. Between -L- Stations 29+00 and 37+00 groundwater was encountered between 2 and 10 feet below existing site grades. Along this section of the project, the depths to groundwater correspond to an elevation of 284 to 285 feet.

Areas of Special Geotechnical Interest

1. High Plasticity Clay

High plasticity clay was encountered near proposed subgrade or in fill sections at the following locations:

Alignment	Stations
-Y1REV-	10+50 to 23+17.31

2. Organic Soils

Soils containing little organic matter were encountered at the following locations:

Alignment	Stations
-L-	21+25 to 29+50
-L-	37+00 to 39+50

3. High Groundwater

Groundwater was encountered at the following locations within 6 feet of proposed grades:

Alignment	Stations
-L-	21+25 to 24+00
-L-	41+25 to 43+57.04
-L1-	10+50 to 15+07.87

4. Poor Drainage

The following areas are delineated as wetland and were observed to hold standing surface water for periods during the investigation:

Alignment	Stations
-L-	21+25 to 29+50
-L-	37+56 to 43+57.04
-L1-	10+00 to 15+07.87

Closing

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us at your convenience.

Sincerely,
Terracon Consultants, Inc.

Matthew J. Alexander, PE
Project Geotechnical Engineer

Andrew A. Nash, PE
Geotechnical Department Manager

PROJECT REFERENCE NO.	SHEET NO.
R-5769	4

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

WETHERILL ENGINEERING
1223 Jones Franklin Rd.
Raleigh, N.C. 27606
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CIVIL/SITE DESIGN - GIS/GPS - CONSTRUCTION OBSERVATION

Terracon
Consulting Engineers & Scientists

NC GRID
NAD 83 NA 2011

MATCHLINE SHEET 5 +/- STA 17+00.00

15+00

20+00

25+00

UNDIVIDED COASTAL PLAIN

ALLUVIAL

ROADWAY EMBANKMENT

NOVO NORDISK PHARMACEUTICAL INDUSTRIES, INC. DB 4706 PG 206

N 02°35'56" E
105.07' R/W TO EP
105.47' EP TO R/W

CP&L OR ASSIGNEES
DB 4514 PG 170
THE POWER LINE FOR WHICH THIS PORTION OF EASEMENT WAS GRANTED HAS BEEN REMOVED. NO RELEASE OF EASEMENT HAS BEEN FOUND.

PIEDMONT NATURAL GAS COMPANY
DB 4044 PG 197-205

NC NATURAL GAS CORPORATION
DB 4004 PG 128

CP&L OR ASSIGNEES
DB 4514 PG 170

WOODS

EXISTING R/W

30" RCP

SR 1905 (GORDON RD) 20' BST

US 70 BYP.

US 70 BUS.

SR 1905
(GORDON RD)
VARIABLE WIDTH BST

TBM "1"
-YIREV- STA. 19+57.34
40.07' RT.

TBM1 ELEVATION = 278.45
N 676965 E 2175790
BL STATION 540.00 168 RIGHT
YIREV- STA. 19+57.34 40.07' RT.
BENCHLITE NAIL IN BASE OF 14" SWEET GUM

PROJECT REFERENCE NO.	SHEET NO.
R-5769	5

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Terracon
Consulting Engineers & Scientists

NC GRID
NAD 83 NA 2011

WOODS

NOVO NORDISK PHARMACEUTICAL
INDUSTRIES, INC.
DB 4706 PG 206

NOVO NORDISK PHARMACEUTICAL
INDUSTRIES, INC.
DB 1486 PG 1

20+00

25+00

30+00

UNDIVIDED COASTAL PLAIN

MATCHLINE SHEET 4 -L- STA.17+00.00

MATCHLINE SHEET 6 -L- STA.31+00.00

S 87°25'31" E
1884.22'

S 87°25'31" E
200.02' TOTAL

S 88°36'05" E
205.76'

NEW BETHEL CHURCH
NO DEED REFERENCE

WLB

BTM

F

T

I

PROJECT REFERENCE NO.	SHEET NO.
R-5769	6

PRELIMINARY PLANS
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INCOMPLETE PLANS
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CIVIL/SITE DESIGN - GIS/GPS - CONSTRUCTION OBSERVATION

Terracon
Consulting Engineers & Scientists

NC GRID
NAD 83 NA 2011

NOVO NORDISK PHARMACEUTICAL INDUSTRIES, INC. DB 1486 PG 1

35+00

℄ FUTURE TRACK

EXISTING TRACK

CENTERLINE MAIN R/R TRACK

℄ FUTURE TRACK

NOVO NORDISK PHARMACEUTICAL INDUSTRIES, INC. DB 1486 PG 1

TBM3 ELEVATION = 286.33
N 679047 E 2177702
BL STATION 34+86.00 87 RIGHT
-L- STA. 39+23.65 99.24' LT.
BENCHLITE NAIL IN BASE OF 15" SWEET GUM

40+00

UNDIVIDED COASTAL PLAIN

TBM #3
-L- STA. 39+23.65
99.24' LT.

MATCHLINE SHEET 5 -L- STA.31+00.00

18" CMP

AT GRADE CROSSING

NOVO NORDISK PHARMACEUTICAL INDUSTRIES, INC. DB 1486 PG 1

EXISTING RR R/W

WLB

WOODS

NOVO NORDISK PHARMACEUTICAL INDUSTRIES, INC. DB 1486 PG 1

EXISTING RR R/W

WLB

WOODS

END NCDOT PROJECT R-5769
-L- STA. 43+57.04

WOODS

18" CMP

END CONSTRUCTION
-L1- POC STA. 15+07.87

UNDIVIDED COASTAL PLAIN

WLB

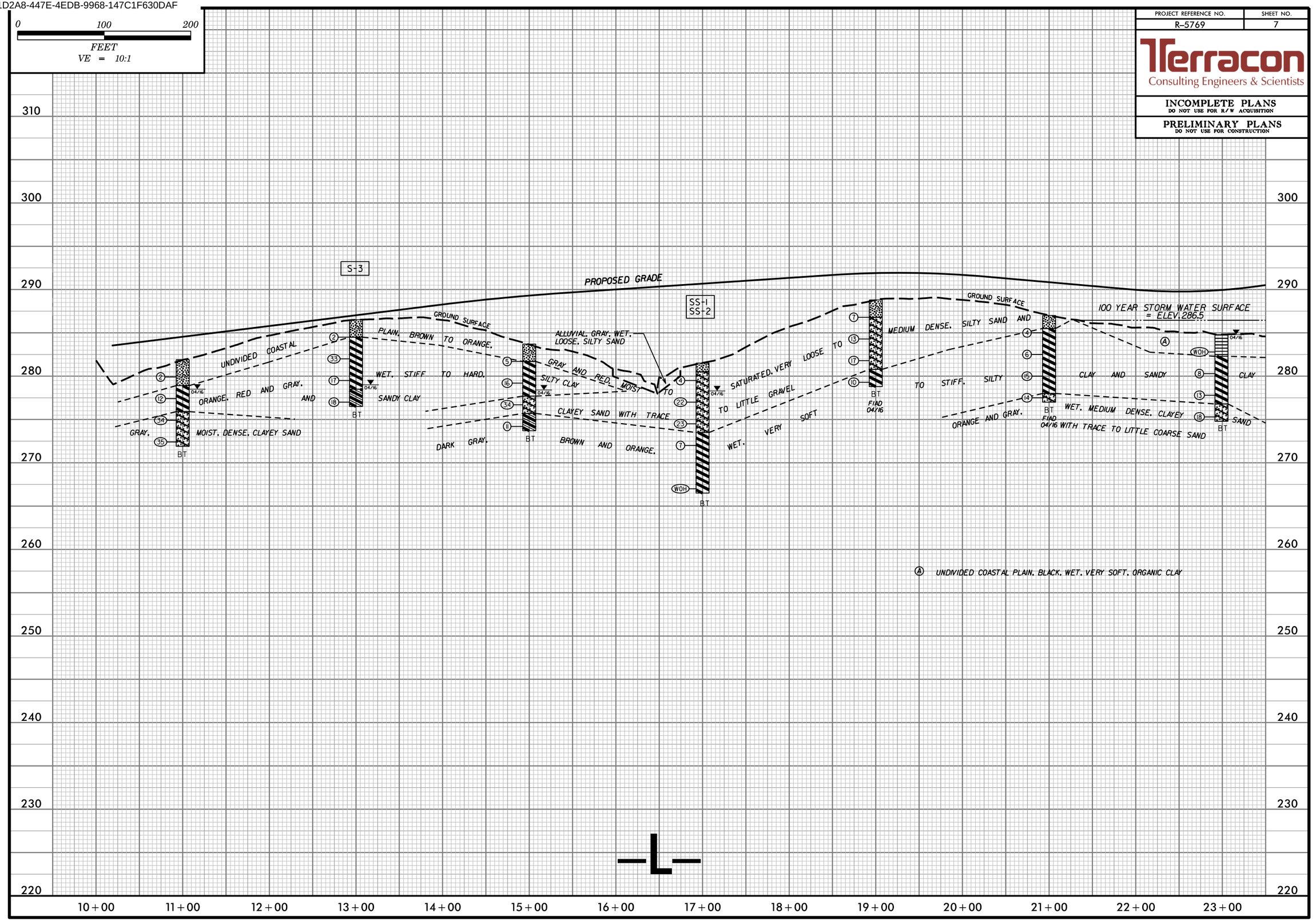
PROJECT REFERENCE NO.	SHEET NO.
R-5769	7

Terracon
Consulting Engineers & Scientists

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

0 100 200
FEET
VE = 10:1



PROJECT REFERENCE NO.	SHEET NO.
R-5769	8

Terracon
Consulting Engineers & Scientists

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

0 100 200
FEET
VE = 10:1

PROPOSED GRADE

80' RT

25' LT

SS-3 SS-4 SS-5

SS-6

SS-7 SS-8

SS-10 SS-11

SS-13 SS-14

SS-15 SS-16

SS-17

RAILROAD EMBANKMENT FILL

100 YEAR STORM WATER SURFACE = ELEV. 286.5

GROUND SURFACE

UNDIVIDED COASTAL PLAIN, BLACK, WET TO SATURATED, VERY SOFT, ORGANIC CLAY AND ORGANIC SAND

UNDIVIDED COASTAL PLAIN, BROWN, RED, ORANGE AND GRAY, SATURATED, VERY LOOSE TO LOOSE, CLAYEY SAND AND SANDY GRAVEL WITH TRACE CLAY

UNDIVIDED COASTAL PLAIN, ORANGE, GRAY AND RED, WET TO SATURATED, VERY STIFF TO MEDIUM, SILTY CLAY WITH TRACE MICA AND SANDY CLAY WITH TRACE MICA AND GRAVEL

RESIDUAL, ORANGE, GRAY, SAPROLITIC, FINE SANDY CLAY WITH LITTLE MICA

BLUE-GRAY AND BLACK, WET, STIFF, TO HARD, SOFT, SILTY CLAY WITH TRACE MICA

BLUE-GRAY, ORANGE AND DARK GRAY, MOIST TO WET, DENSE TO VERY DENSE, SILTY FINE SAND WITH TRACE TO LITTLE MICA

WEATHERED ROCK (SCHIST)

CRYSTALLINE ROCK (SCHIST)

BT

Ⓑ UNDIVIDED COASTAL PLAIN, BROWN AND GRAY-BROWN, MOIST, LOOSE, SILTY SAND
Ⓒ UNDIVIDED COASTAL PLAIN, BLACK, SATURATED, LOOSE, ORGANIC SAND
Ⓓ UNDIVIDED COASTAL PLAIN, ORANGE TO RED, WET, VERY SOFT, SILTY CLAY WITH TRACE MICA
Ⓔ UNDIVIDED COASTAL PLAIN, GRAY AND ORANGE, SATURATED, VERY SOFT, SANDY CLAY
Ⓕ RESIDUAL, BLUE-GRAY, ORANGE AND BLACK, WET, SOFT TO STIFF, FINE SANDY CLAY WITH LITTLE MICA

310 300 290 280 270 260 250 240 230

24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00 37+00

PROJECT REFERENCE NO.	SHEET NO.
R-5769	9

Terracon
Consulting Engineers & Scientists

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

0 100 200
FEET
VE = 10:1

PROPOSED GRADE

SS-18 26' LT
SS-19 26' LT
S-4

100 YEAR STORM WATER SURFACE = ELEV.285.6

GROUND SURFACE

UNDIVIDED COASTAL PLAIN. BROWN TO GRAY. SATURATED. VERY LOOSE. CLAYEY SAND

UNDIVIDED COASTAL PLAIN. ORANGE AND GRAY. SATURATED. SOFT TO VERY SOFT. SILTY CLAY

RESIDUAL. DARK GRAY. WET. MEDIUM STIFF. SILTY CLAY WITH TRACE MICA

WEATHERED ROCK (SCHIST)

ORANGE AND RED. WET. SAND AND TRACE GRAVEL

PLAIN. GRAY. SILTY CLAY AND SANDY CLAY WITH LITTLE GRAVEL WITH TRACE SILT

ORANGE AND GRAY. SATURATED. CLAYEY SAND AND SANDY GRAVEL

SATURATED. VERY LOOSE.

BT
FIAD 04/16

Ⓒ UNDIVIDED COASTAL PLAIN. BLACK. SATURATED. VERY LOOSE. ORGANIC SAND

Ⓖ UNDIVIDED COASTAL PLAIN. RED AND ORANGE. SATURATED. VERY SOFT. SANDY CLAY

310 300 290 280 270 260 250 240 230 220

38+00 39+00 40+00 41+00 42+00 43+00

PROJECT REFERENCE NO.	SHEET NO.
R-5769	10

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INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

0 100 200
FEET
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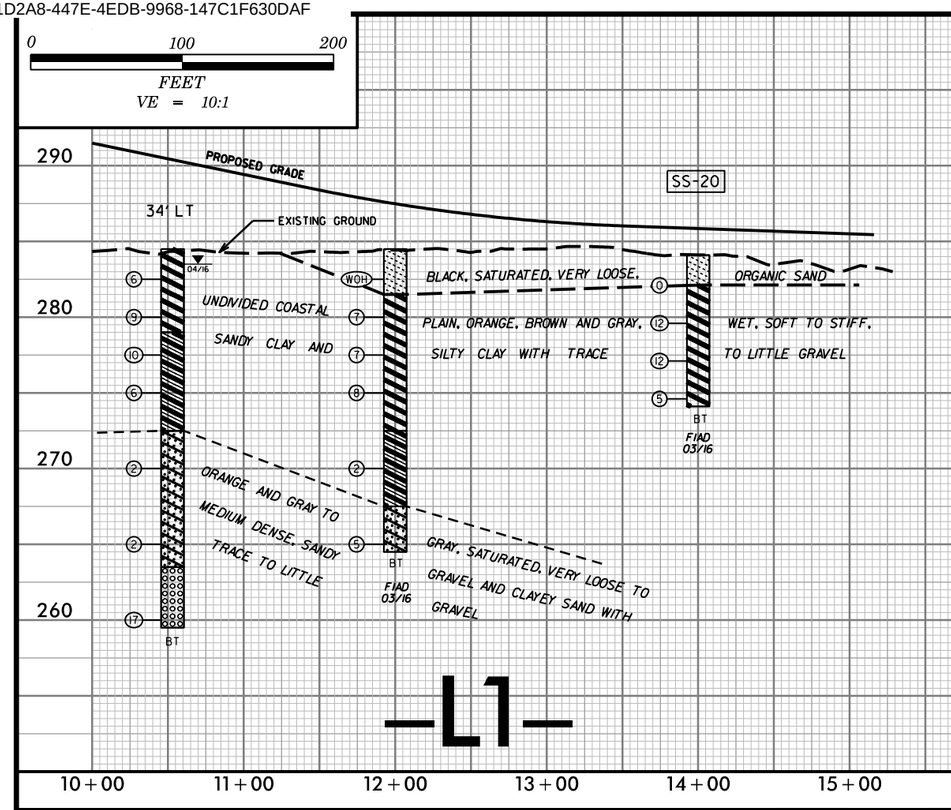

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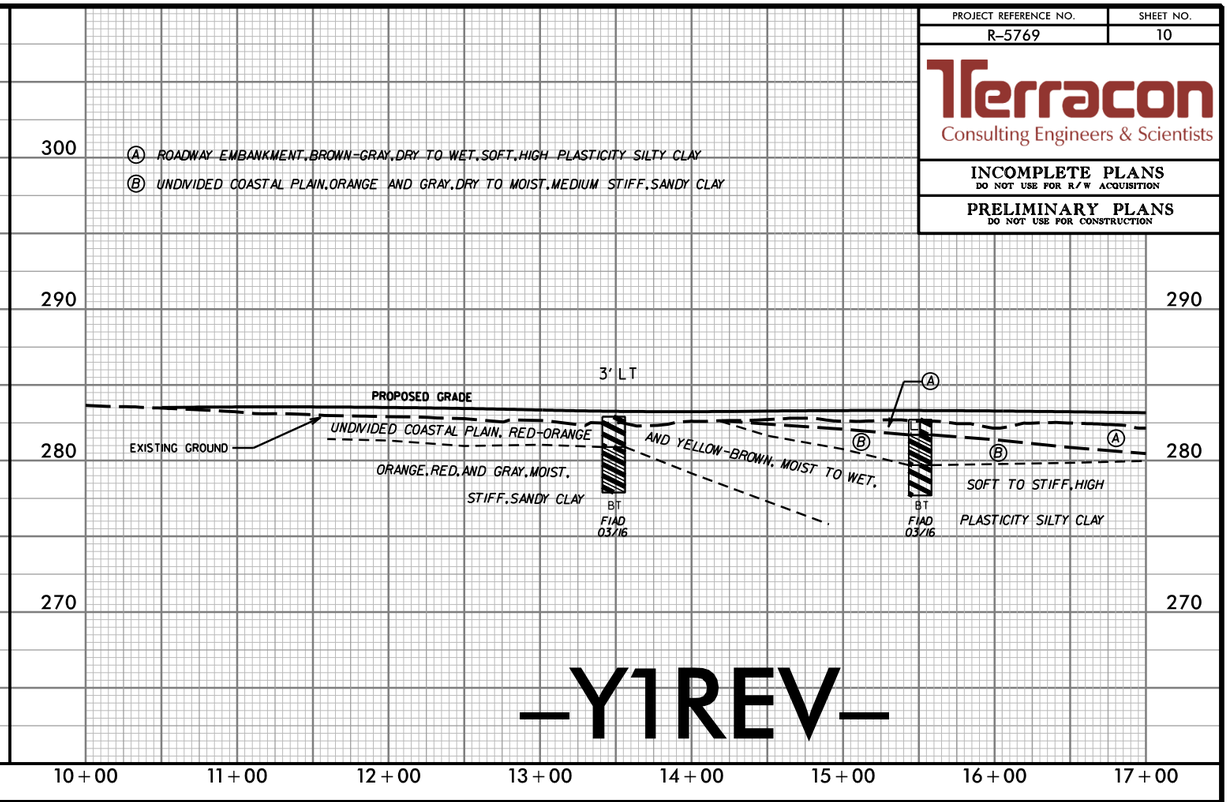

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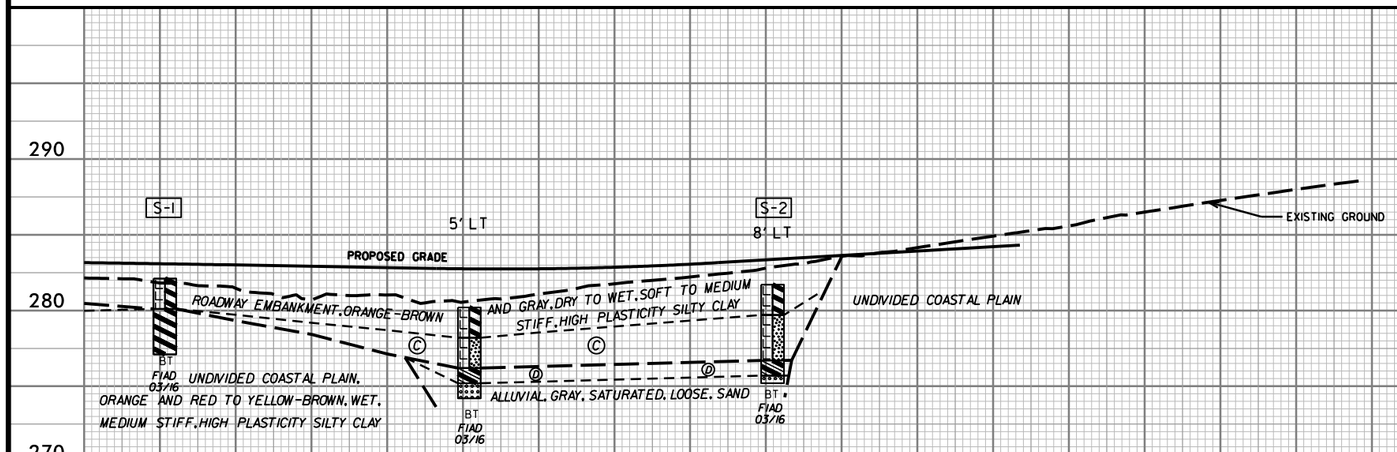

-Y1REV-

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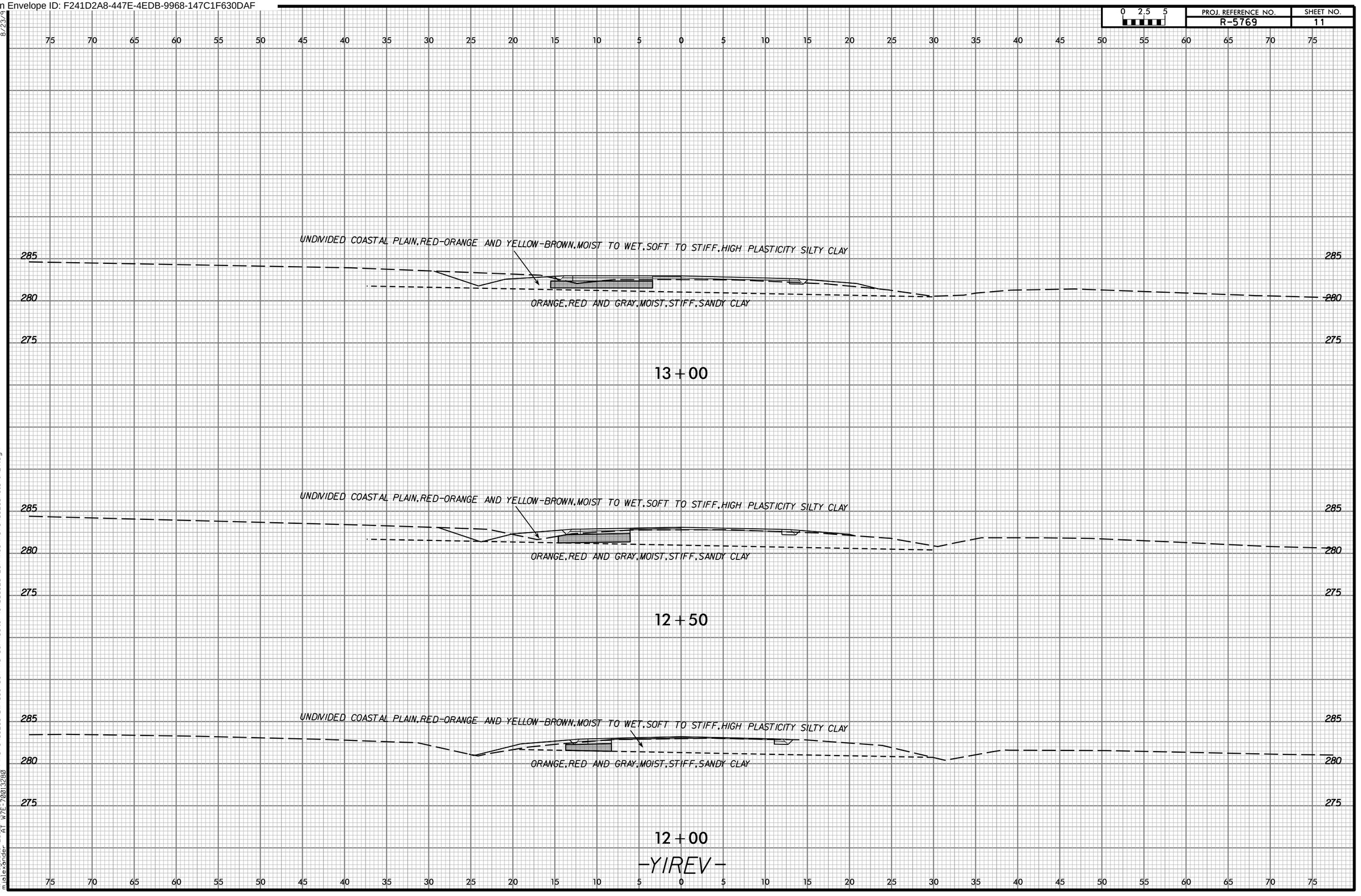
	R-5769	11



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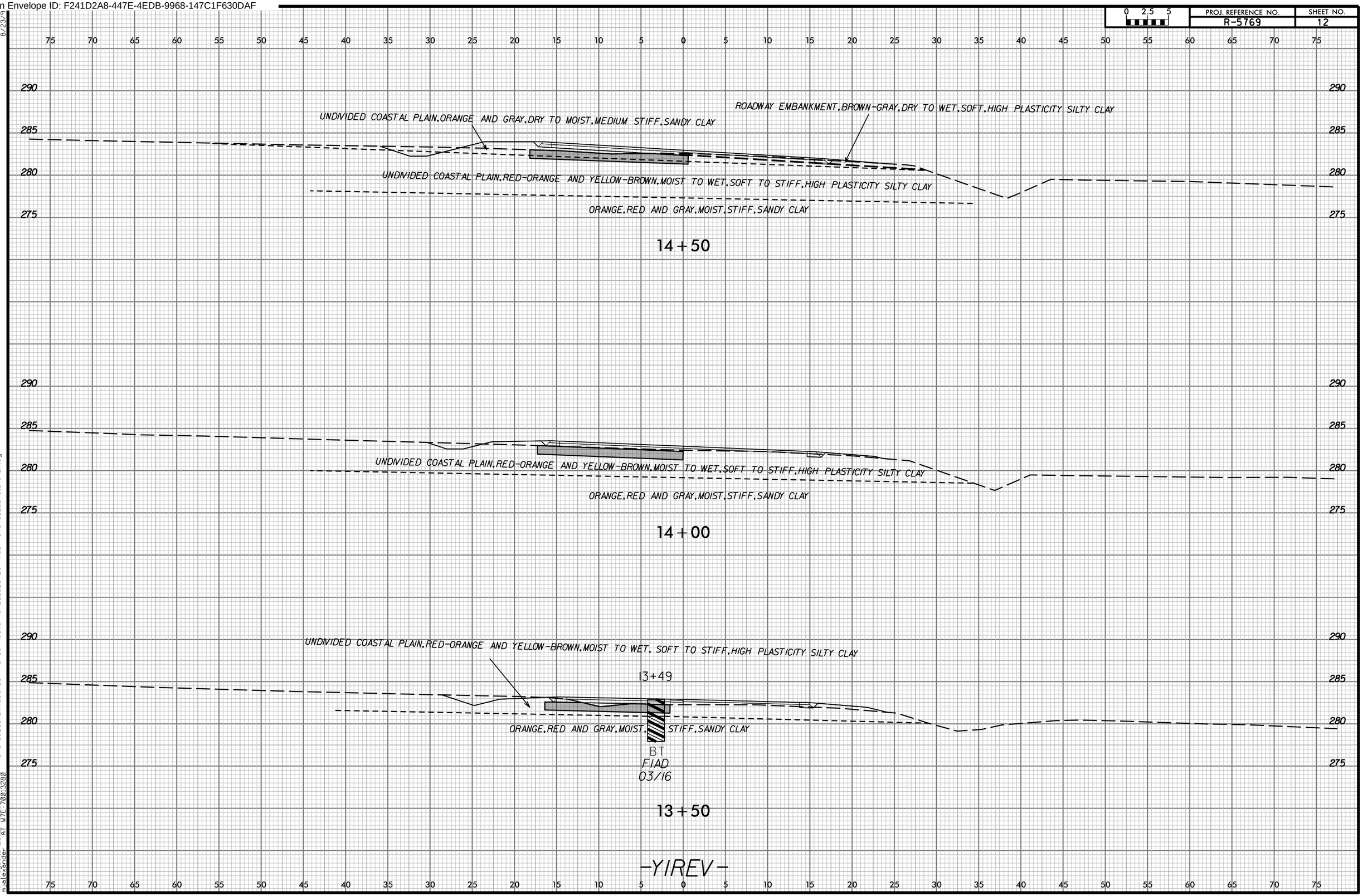
	R-5769	12



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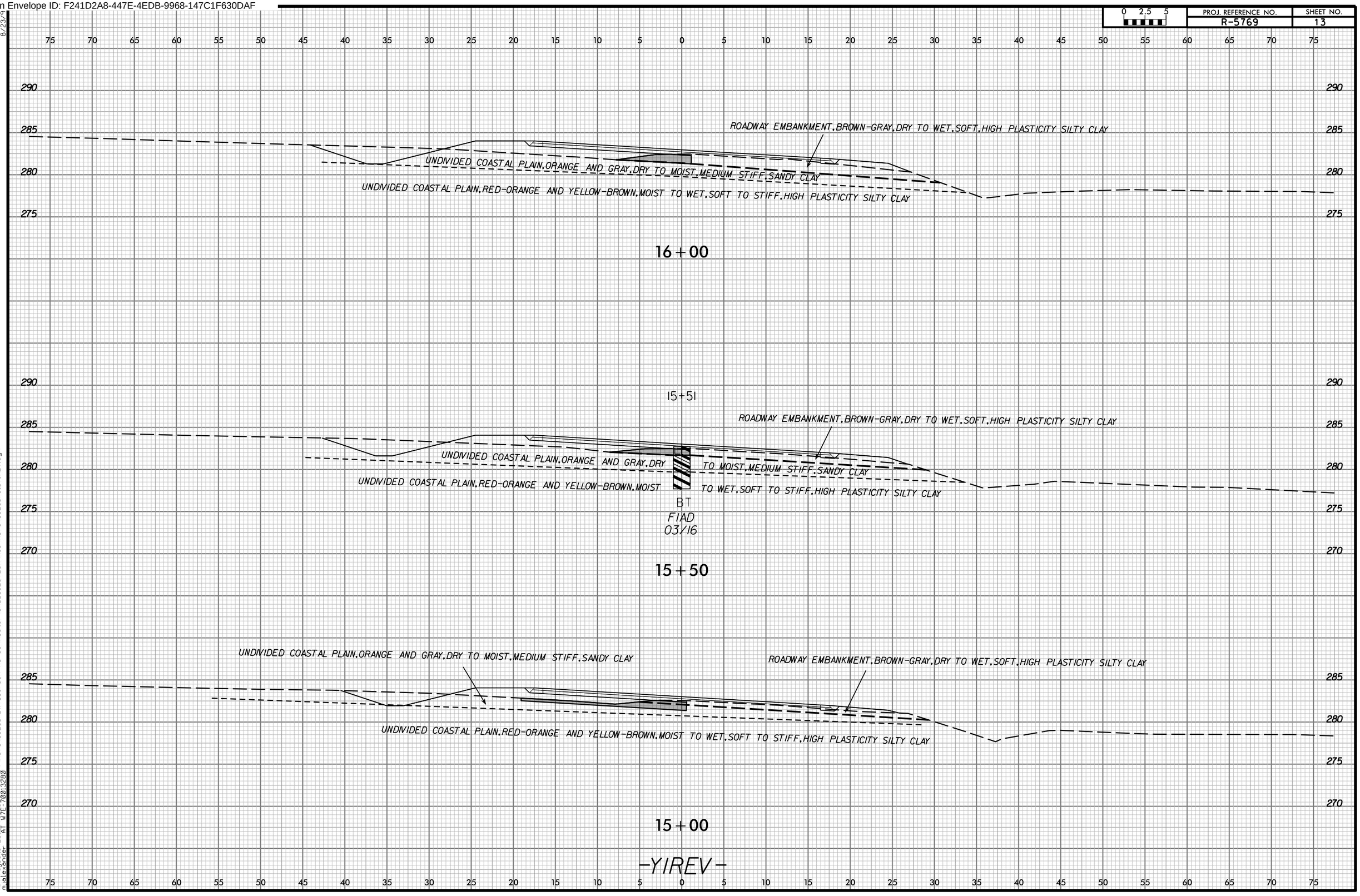
	R-5769	13



-YIREV-

PROJ. REFERENCE NO.	SHEET NO.
R-5769	14

0 2.5 5

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

290
285
280
275

S-1
17+53

ROADWAY EMBANKMENT,ORANGE-BROWN AND GRAY,DRY TO WET,SOFT TO MEDIUM STIFF,HIGH PLASTICITY SILTY CLAY

UNDIVIDED COASTAL PLAIN,ORANGE AND RED TO YELLOW-BROWN, WET,MEDIUM STIFF,HIGH PLASTICITY SILTY CLAY

BT
FIAD
03/16

17+50

UNDIVIDED COASTAL PLAIN,ORANGE AND GRAY,DRY TO MOIST,MEDIUM STIFF,SANDY CLAY

ROADWAY EMBANKMENT,ORANGE-BROWN AND GRAY,DRY TO WET,SOFT TO MEDIUM STIFF,HIGH PLASTICITY SILTY CLAY

UNDIVIDED COASTAL PLAIN, RED-ORANGE TO YELLOW-BROWN, WET, MEDIUM STIFF, HIGH PLASTICITY SILTY CLAY

17+00

UNDIVIDED COASTAL PLAIN,ORANGE AND GRAY,DRY TO MOIST,MEDIUM STIFF,SANDY CLAY

ROADWAY EMBANKMENT,BROWN-GRAY,DRY TO WET,SOFT,HIGH PLASTICITY SILTY CLAY

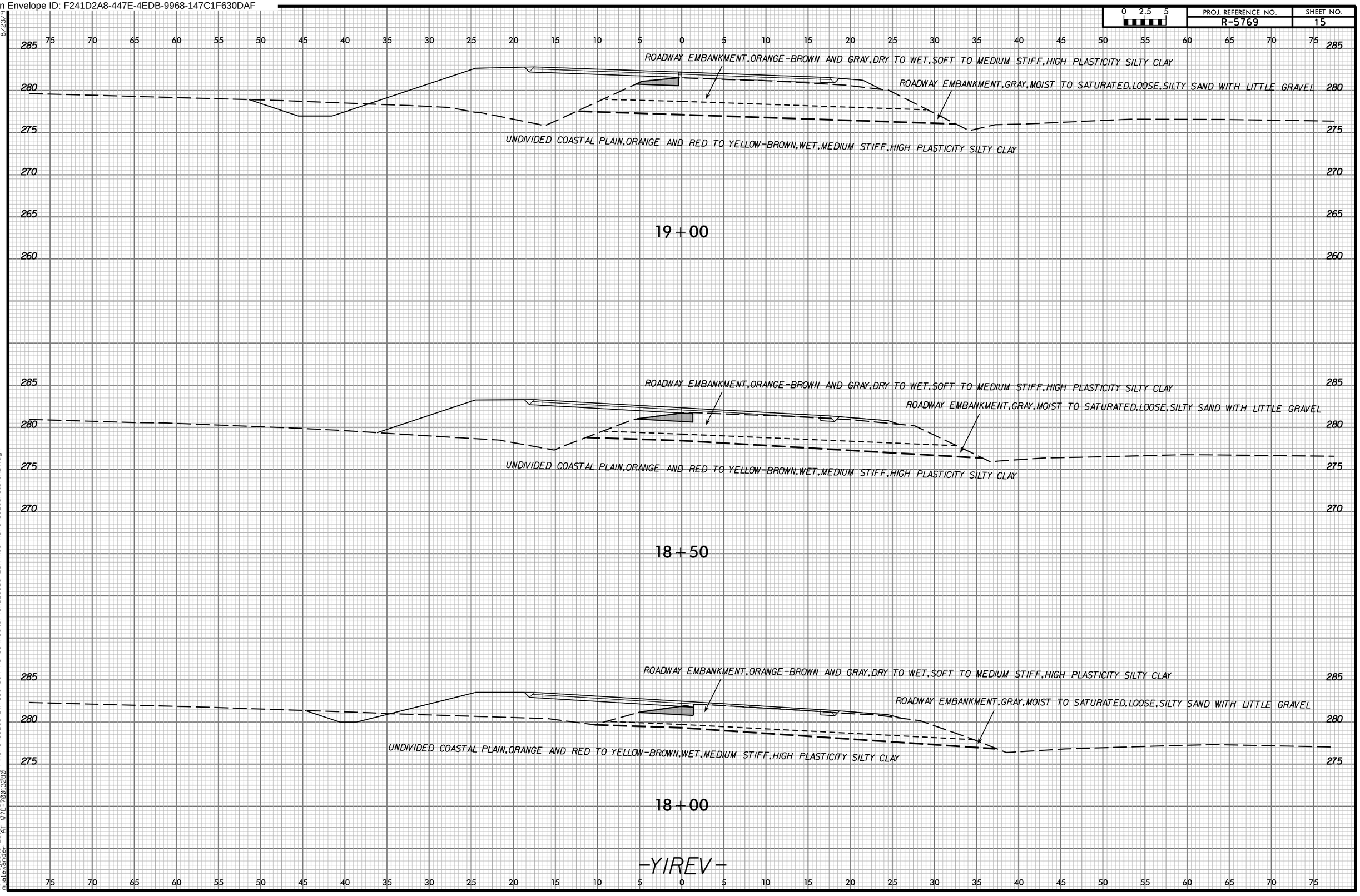
UNDIVIDED COASTAL PLAIN,RED-ORANGE AND YELLOW-BROWN,MOIST TO WET,SOFT TO STIFF,HIGH PLASTICITY SILTY CLAY

16+50

-YIREV-

PROJ. REFERENCE NO.	SHEET NO.
R-5769	15

0 2.5 5



8/23/9

22-AUG-2016 13:21
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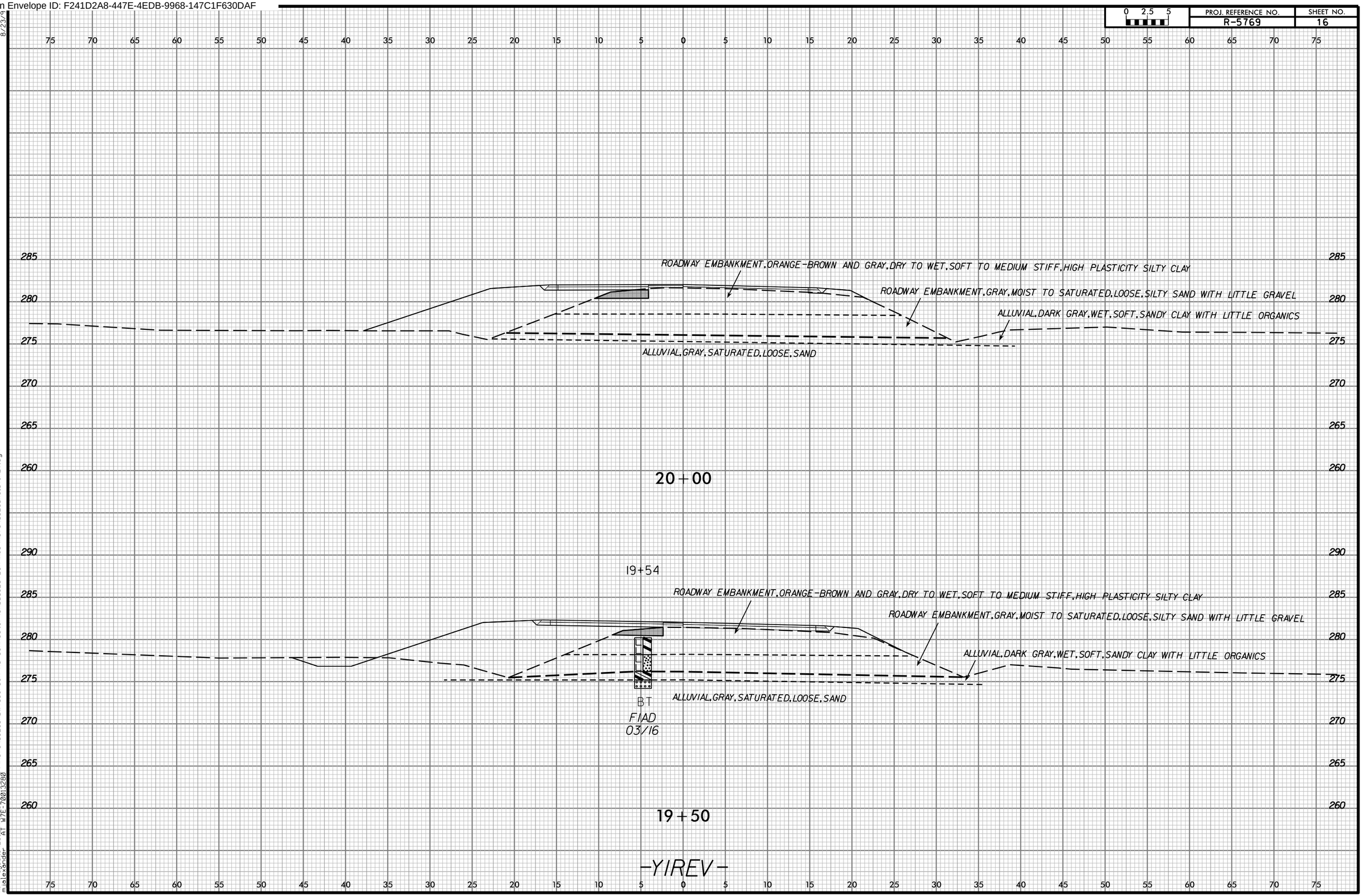
mjolejonder AT WJE-7001.3280

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	R-5769	16



8/23/9

22-AUG-2016 13:21
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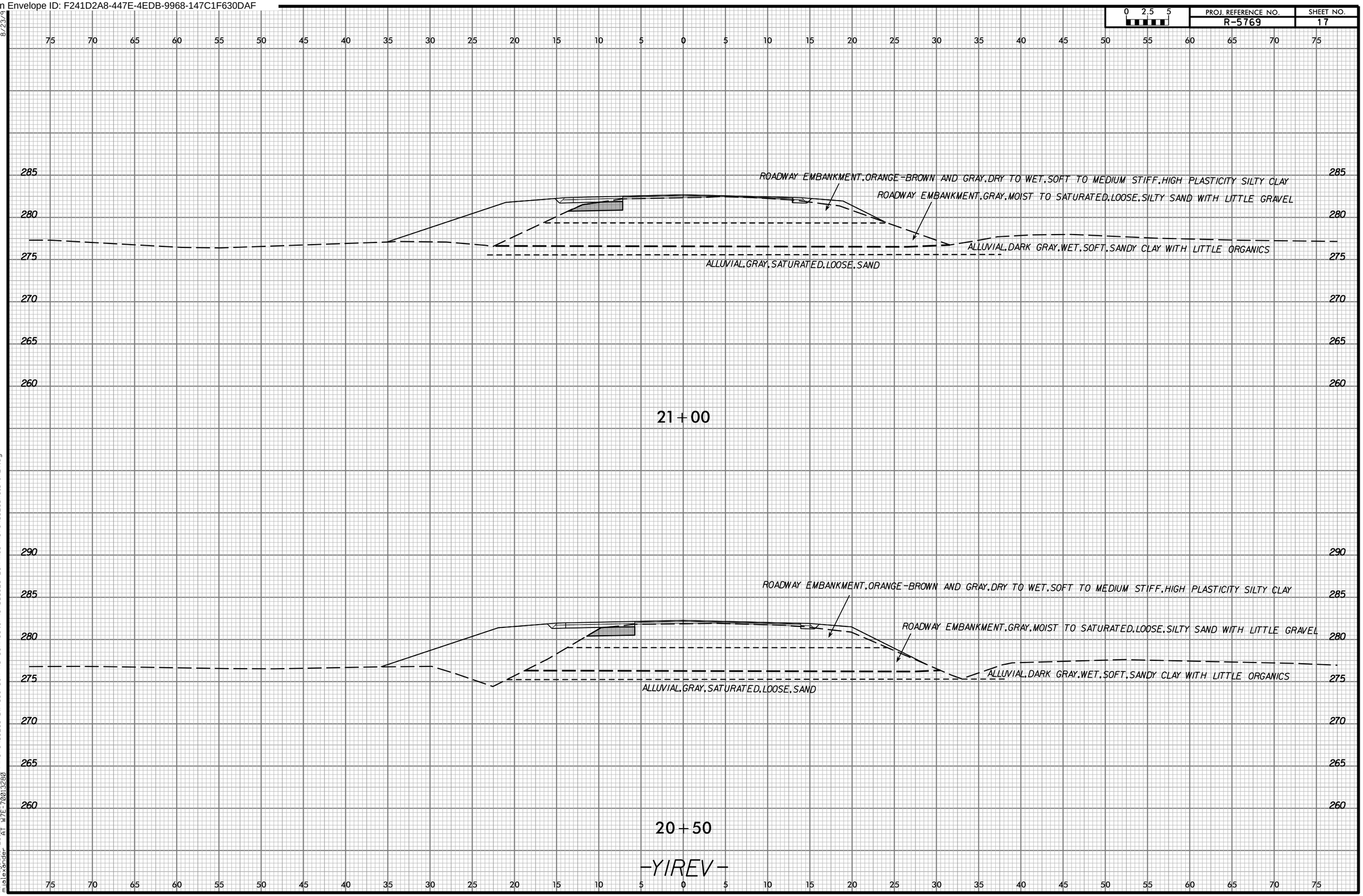
malexander
AT W/E-700013280

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	R-5769	17



8/23/9

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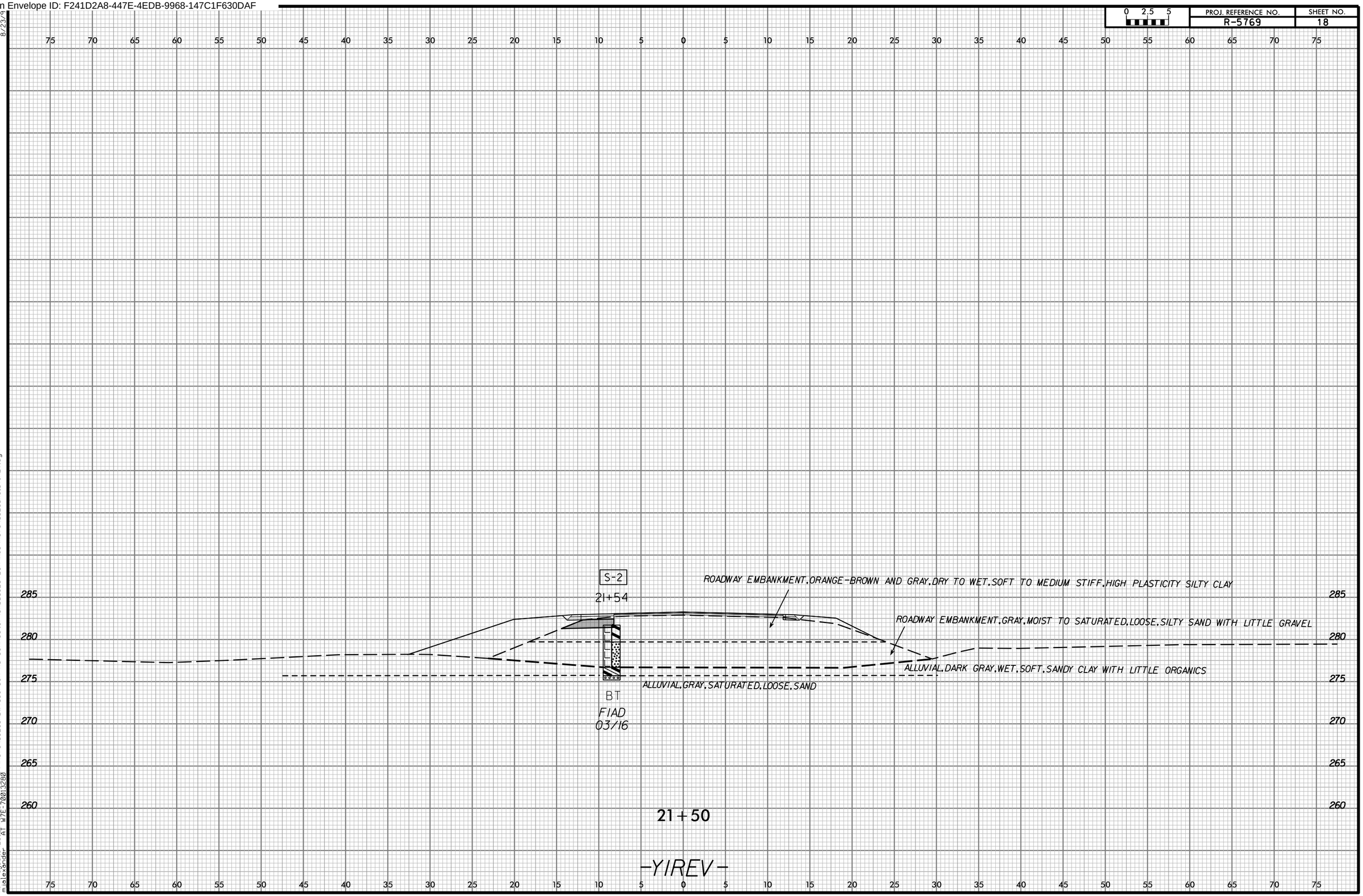
	R-5769	18



22-AUG-2016 13:21
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malexander
AT W/E-700013280

PROJECT REFERENCE NO.	SHEET NO.
R–5769	19

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX A
IN–SITU TESTING RESULTS

REFERENCE: R–5769

PROJECT: N/A

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873–2211 FAX: (919) 873–9555
NC REGISTERED FIRM: F–0869

INITIALS DATE

CPT LOG NO. C1

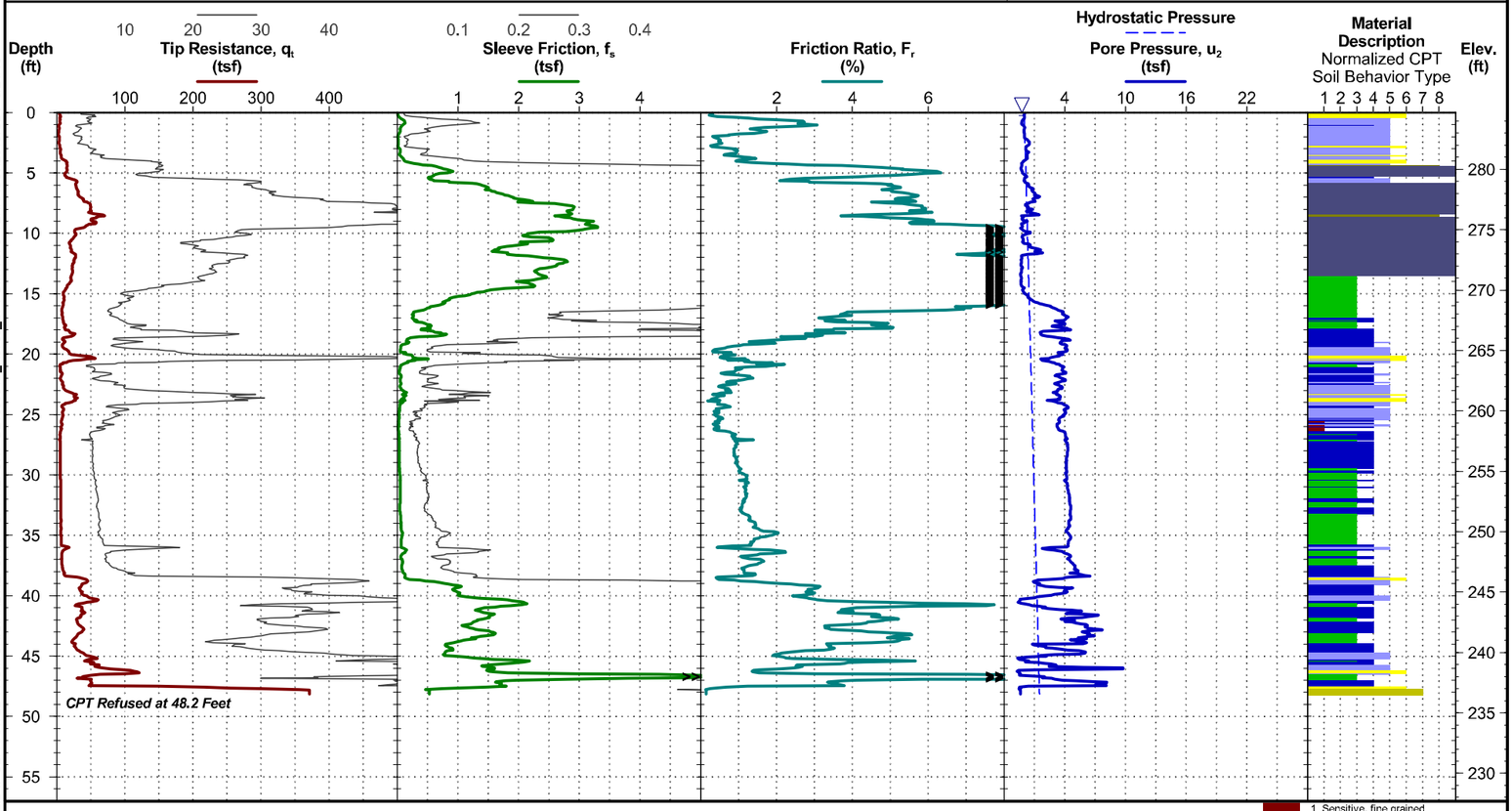
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

Surface Elev.: 284.7 ft
Northing: 677852
Easting: 2176700
Station: 24+00
Offset: CL



See Terracon's CPT General Notes for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION				
▽ 0 ft measured water depth (used in normalizations and correlations)	Probe no. 4526 with net area ratio of 0.83 U2 pore pressure transducer location Manufactured by Geotech A.B.; calibrated 12/7/2015 Tip and sleeve areas of 10 cm^2 and 150 cm^2 Ring friction reducer with O.D. of 1.875 in	Terracon 2401 Brentwood Rd Ste 107 Raleigh, NC	CPT Started: 4/25/2016 Rig: Pagani TG73-200 Project No.: R-5769	CPT Completed: 4/25/2016 Operator: JB

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT D2165034D_R5769_CPT-DMT.GPJ TERRACON2015.GDT 5/24/16

DMT LOG NO. D1

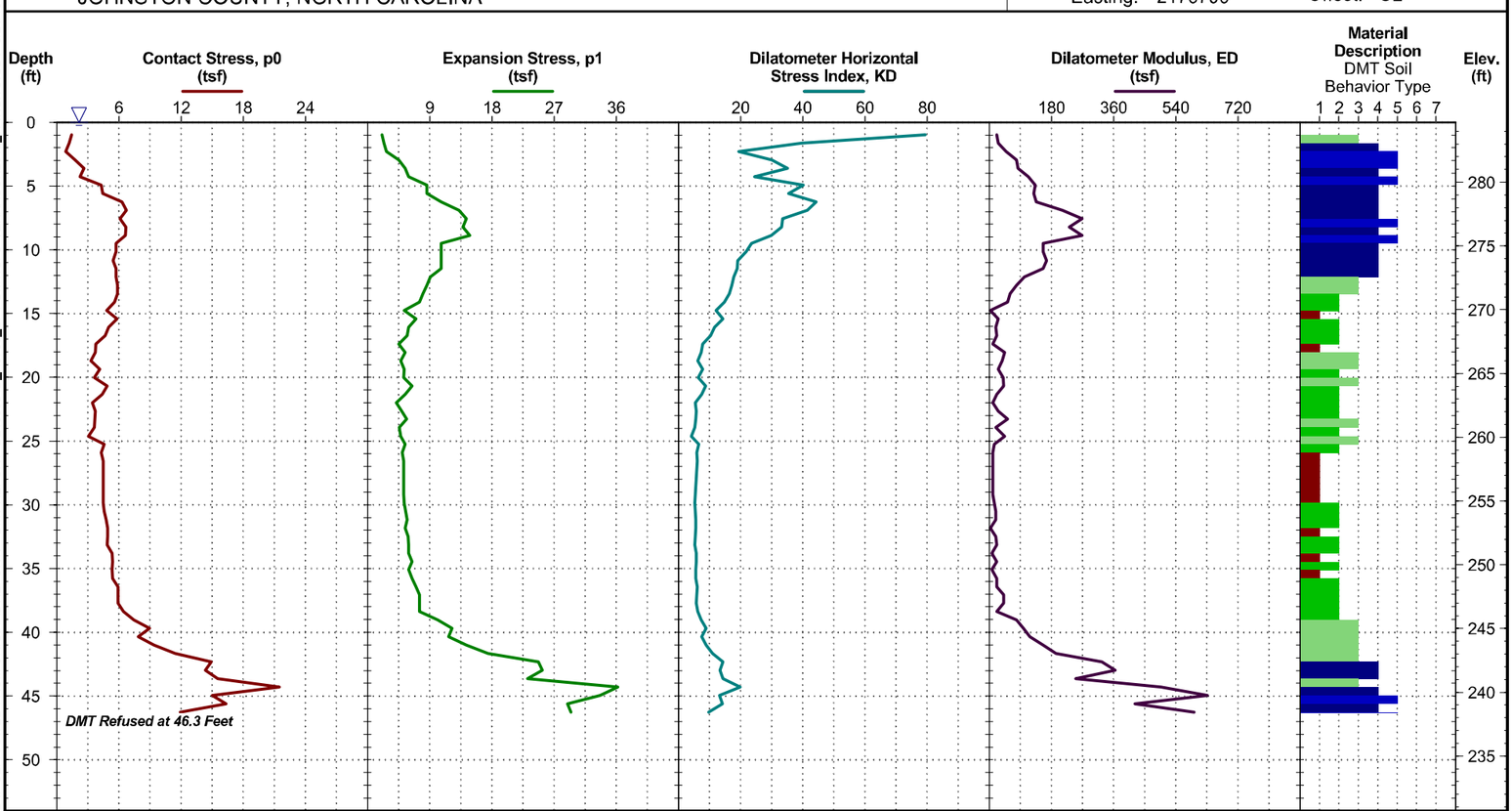
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

Surface Elev.: 284.7 ft
Northing: 677852
Easting: 2176700
Station: 24+00
Offset: CL



See Plan Sheets for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

DMT specification reports available upon request.

1 Muck / peat
2 Clay
3 Silty clay
4 Clayey silt
5 Silt
6 Sandy silt
7 Silty sand
8 Sand

WATER LEVEL OBSERVATION				
▽ 0 ft measured water depth (used in normalizations and correlations)	Calibrations: ΔA - 0.2 bar; ΔB - 0.4 bar; Zm - 0 bar Blade no. 507	Terracon 2401 Brentwood Rd Ste 107 Raleigh, NC	DMT Started: 4/26/2016 Rig: Pagani TG73-200 Project No.: R-5769	DMT Completed: 4/26/2016 Operator: JB

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. DMT REPORT D2165034D_R5769_CPT-DMT.GPJ TERRACON2012_W INSITU.GDT 5/24/16

CPT LOG NO. C2

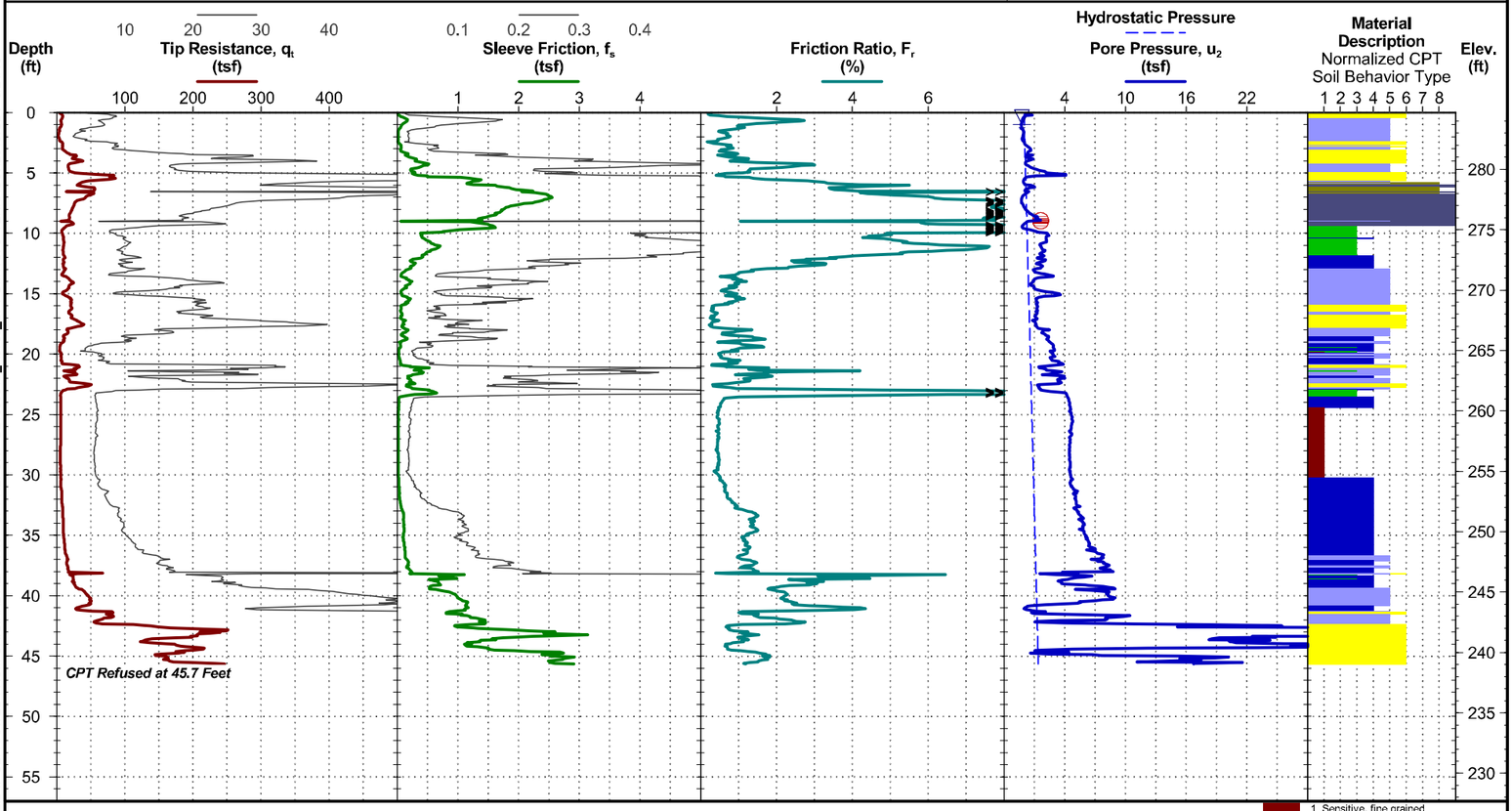
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

Surface Elev.: 284.7 ft
Northing: 678163
Easting: 2176951
Station: 28+00
Offset: CL



See Terracon's CPT General Notes for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION				
▽ 1 ft measured water depth (used in normalizations and correlations)	Probe no. 4526 with net area ratio of 0.83 U2 pore pressure transducer location Manufactured by Geotech A.B.; calibrated 12/7/2015 Tip and sleeve areas of 10 cm^2 and 150 cm^2 Ring friction reducer with O.D. of 1.875 in	Terracon 2401 Brentwood Rd Ste 107 Raleigh, NC	CPT Started: 4/25/2016 Rig: Pagani TG73-200 Project No.: R-5769	CPT Completed: 4/25/2016 Operator: JB

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT D2165034D_R5769_CPT-DMT.GPJ TERRACON2015.GDT 5/24/16

DMT LOG NO. D2

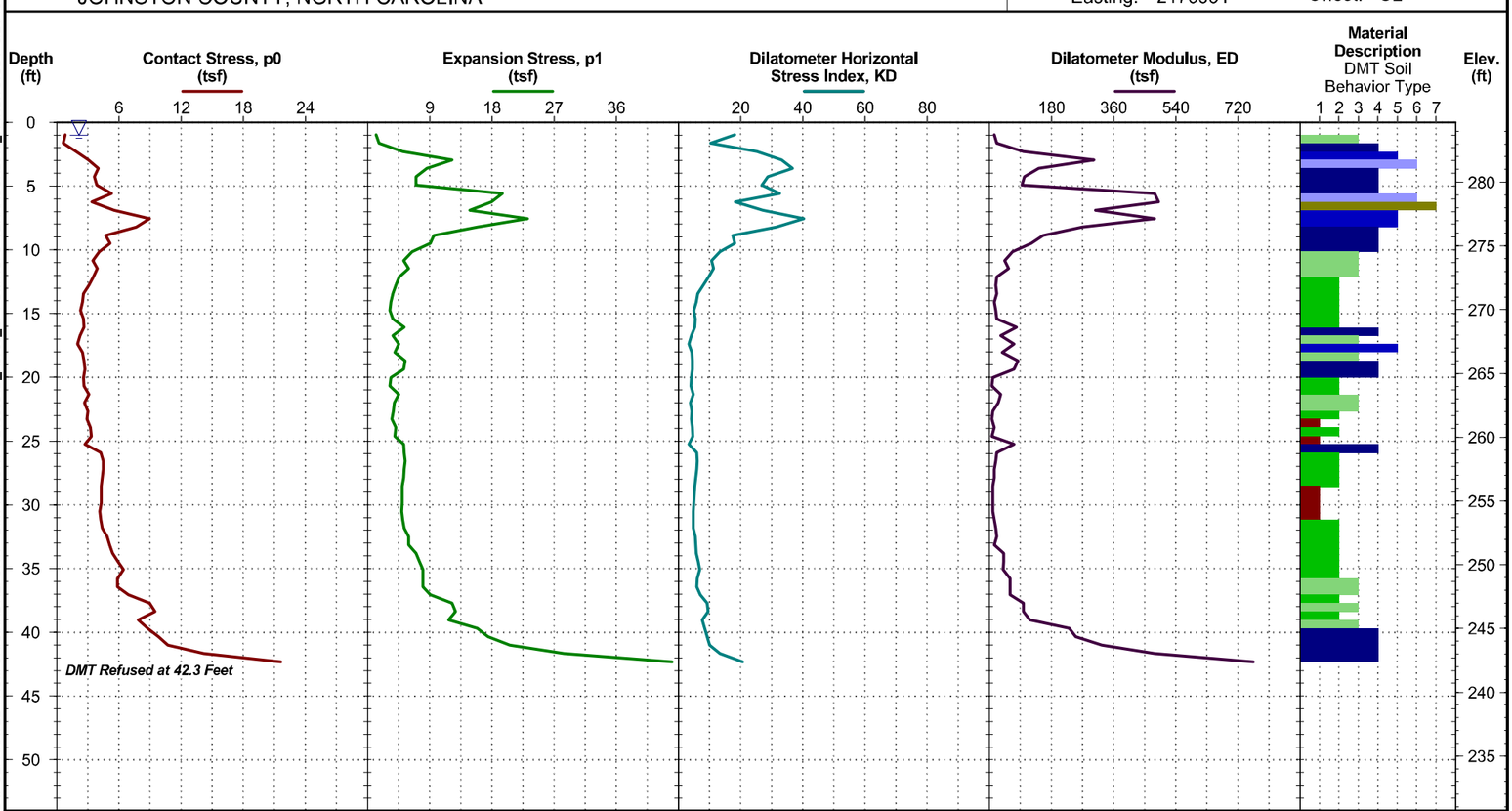
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

Surface Elev.: 284.7 ft
Northing: 678163
Easting: 2176951
Station: 28+00
Offset: CL



See Plan Sheets for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

DMT specification reports available upon request.

1 Muck / peat
2 Clay
3 Silty clay
4 Clayey silt
5 Silt
6 Sandy silt
7 Silty sand
8 Sand

WATER LEVEL OBSERVATION				
▽ 1 ft measured water depth (used in normalizations and correlations)	Calibrations: ΔA - 0.2 bar; ΔB - 0.4 bar; Zm - 0 bar Blade no. 507	Terracon 2401 Brentwood Rd Ste 107 Raleigh, NC	DMT Started: 4/27/2016 Rig: Pagani TG73-200 Project No.: R-5769	DMT Completed: 4/27/2016 Operator: JB

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. DMT REPORT D2165034D_R5769_CPT-DMT.GPJ TERRACON2012_W INSITU.GDT 5/24/16

CPT LOG NO. C3

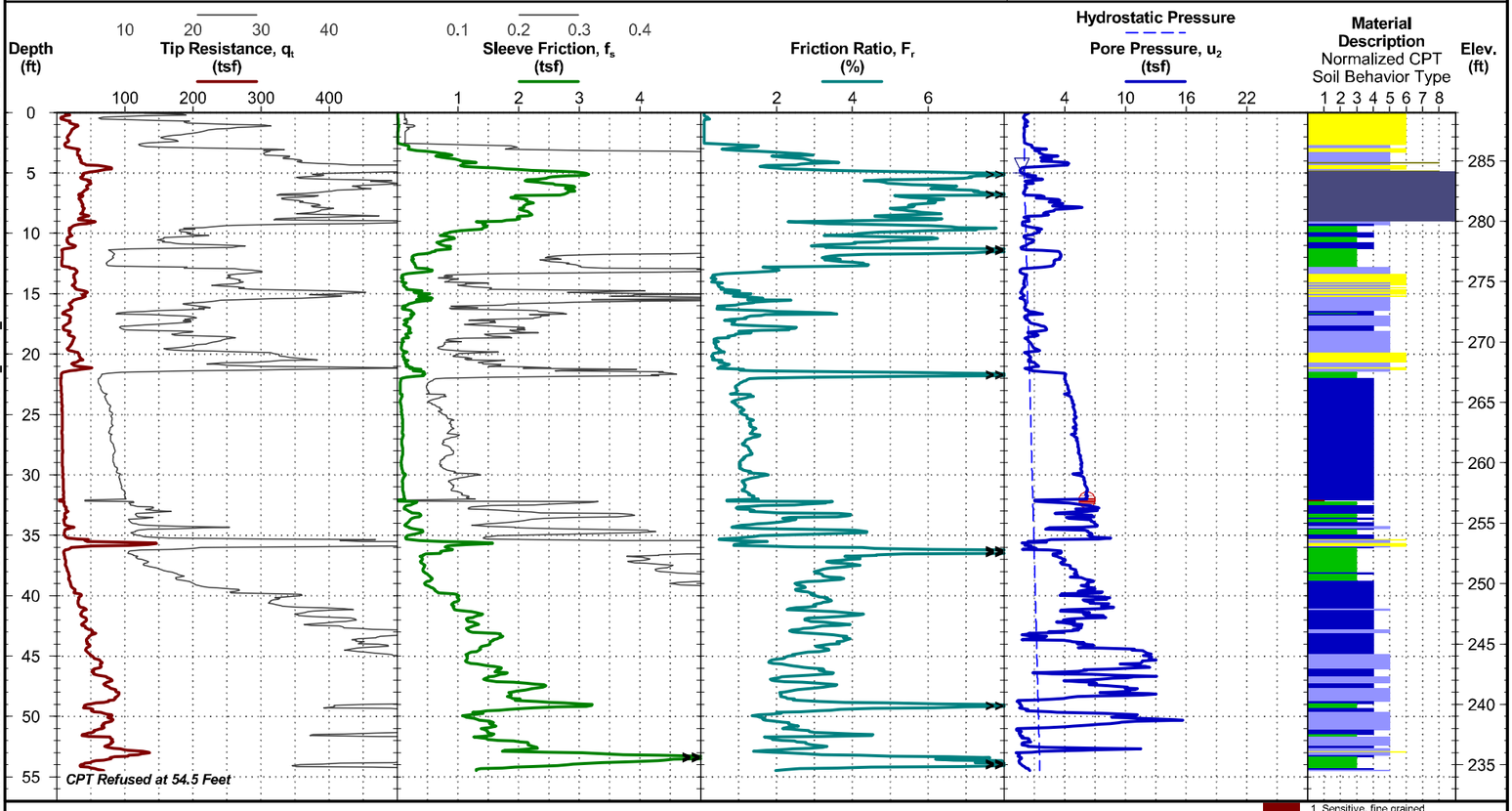
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

Surface Elev.: 289 ft
Northing: 678324
Easting: 2177070
Station: 30+00
Offset: CL



See Terracon's CPT General Notes for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION
▽ 5 ft measured water depth
(used in normalizations and correlations)

Probe no. 4526 with net area ratio of 0.83
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 12/7/2015
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
2401 Brentwood Rd Ste 107
Raleigh, NC

CPT Started: 4/25/2016
CPT Completed: 4/25/2016
Rig: Pagani TG73-200
Operator: JB
Project No.: R-5769

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT D2165034D_R5769_CPT-DMT.GPJ TERRACON2015.GDT 5/24/16

DMT LOG NO. D3

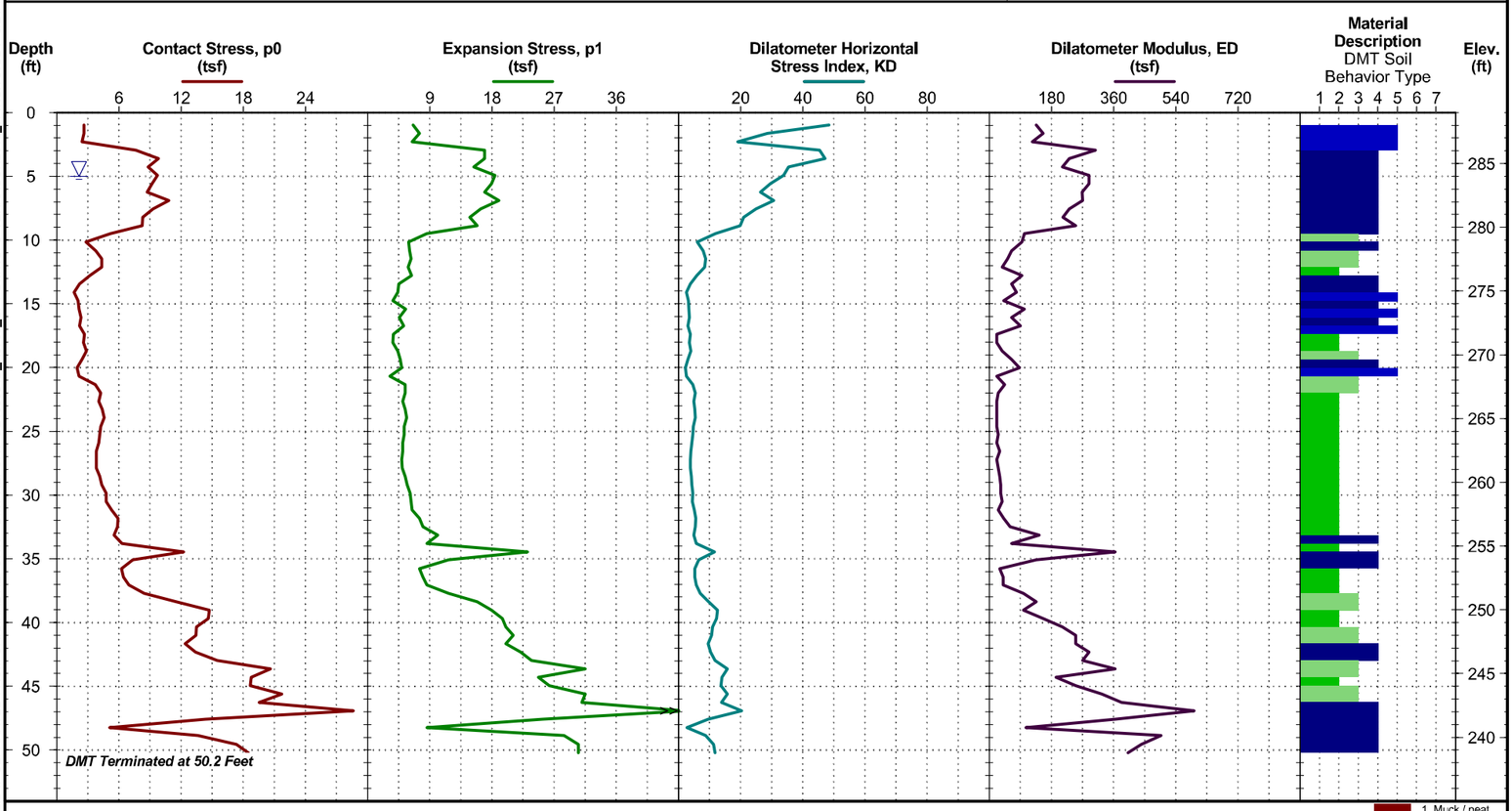
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

Surface Elev.: 289 ft
Northing: 678324
Easting: 2177070
Station: 30+00
Offset: CL



See Plan Sheets for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

DMT specification reports available upon request.

1 Muck / peat
2 Clay
3 Silty clay
4 Clayey silt
5 Silt
6 Sandy silt
7 Silty sand
8 Sand

WATER LEVEL OBSERVATION
▽ 5 ft measured water depth
(used in normalizations and correlations)

Calibrations: ΔA - 0.2 bar; ΔB - 0.4 bar; Zm - 0 bar
Blade no. 507

Terracon
2401 Brentwood Rd Ste 107
Raleigh, NC

DMT Started: 4/26/2016
DMT Completed: 4/26/2016
Rig: Pagani TG73-200
Operator: JB
Project No.: R-5769

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. DMT REPORT D2165034D_R5769_CPT-DMT.GPJ TERRACON2012_W INSITU.GDT 5/24/16

CPT LOG NO. C4

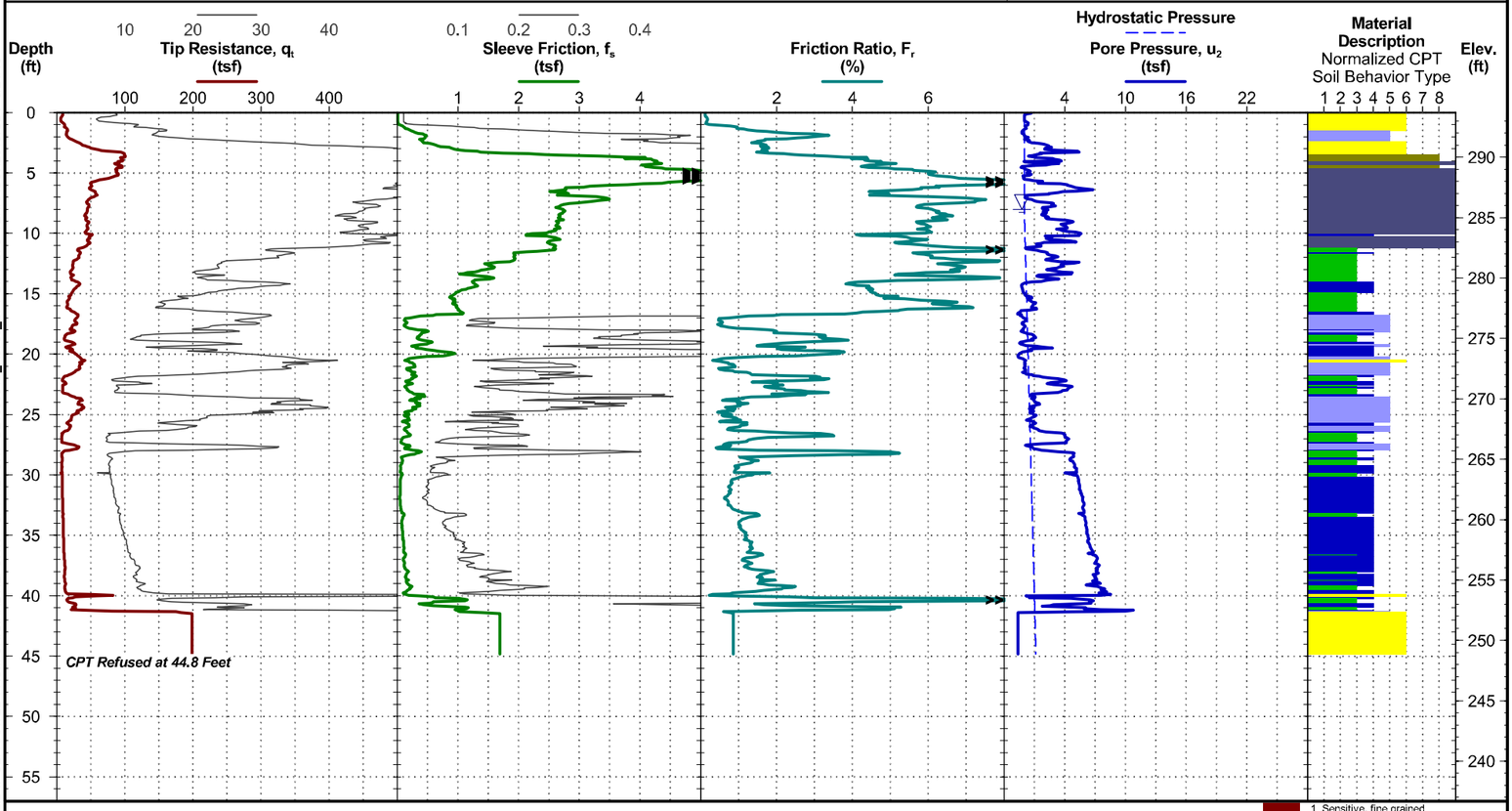
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

Surface Elev.: 293.7 ft
Northing: 678444
Easting: 2177159
Station: 31+50
Offset: CL



See Terracon's CPT General Notes for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION				
▽ 8 ft measured water depth (used in normalizations and correlations)	Probe no. 4526 with net area ratio of 0.83 U2 pore pressure transducer location Manufactured by Geotech A.B.; calibrated 12/7/2015 Tip and sleeve areas of 10 cm^2 and 150 cm^2 Ring friction reducer with O.D. of 1.875 in	Terracon 2401 Brentwood Rd Ste 107 Raleigh, NC	CPT Started: 4/25/2016 Rig: Pagani TG73-200 Project No.: R-5769	CPT Completed: 4/25/2016 Operator: JB

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT D2165034D_R5769_CPT-DMT.GPJ TERRACON2015.GDT 5/24/16

DMT LOG NO. D4

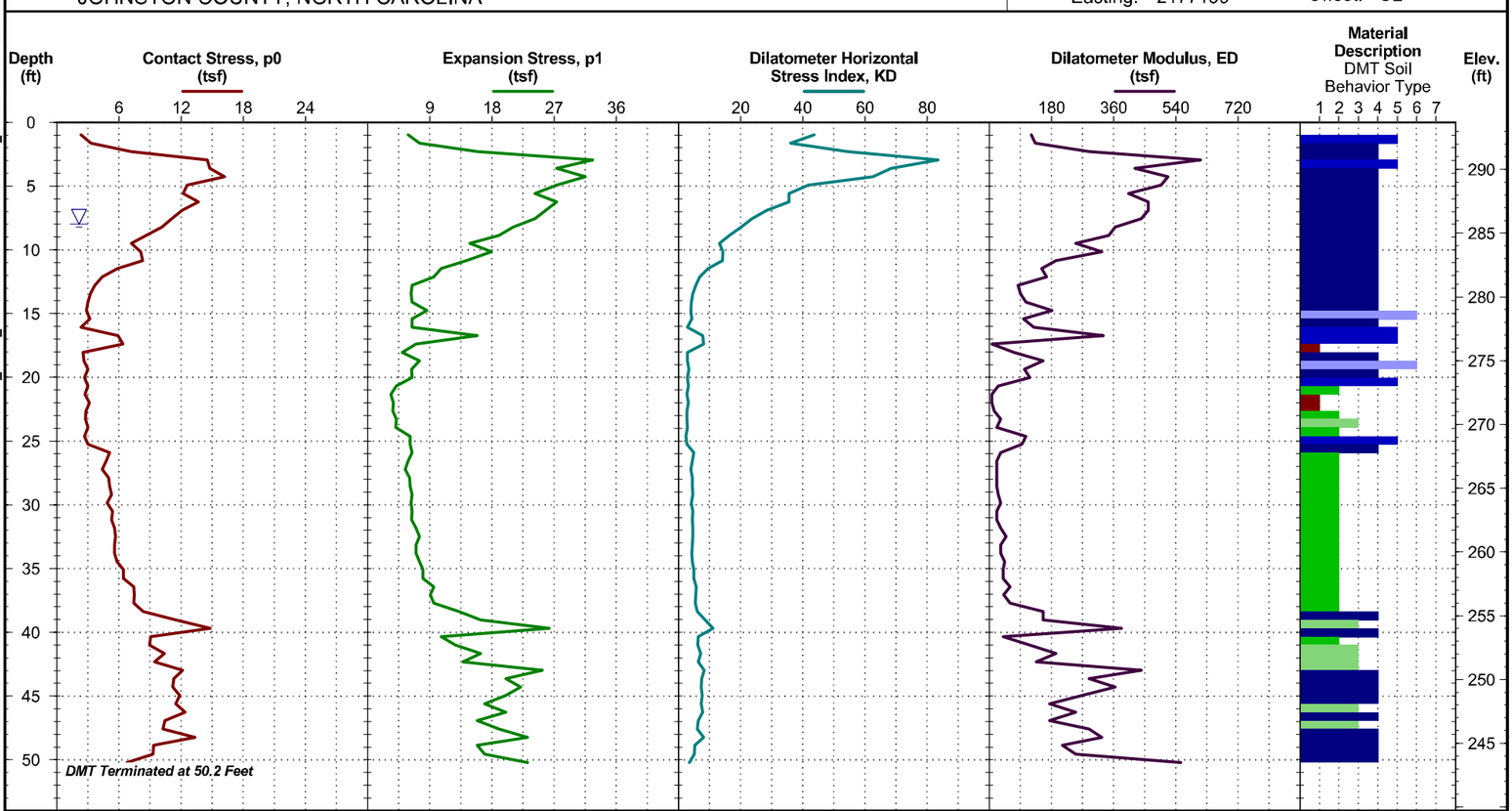
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

Surface Elev.: 293.7 ft
Northing: 678444
Easting: 2177159
Station: 31+50
Offset: CL



See Plan Sheets for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

DMT specification reports available upon request.

1 Muck / peat
2 Clay
3 Silty clay
4 Clayey silt
5 Silt
6 Sandy silt
7 Silty sand
8 Sand

WATER LEVEL OBSERVATION				
▽ 8 ft measured water depth (used in normalizations and correlations)	Calibrations: ΔA - 0.2 bar; ΔB - 0.4 bar; Zm - 0 bar Blade no. 507	Terracon 2401 Brentwood Rd Ste 107 Raleigh, NC	DMT Started: 4/27/2016 Rig: Pagani TG73-200 Project No.: R-5769	DMT Completed: 4/27/2016 Operator: JB

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. DMT REPORT D2165034D_R5769_CPT-DMT.GPJ TERRACON2012_W INSITU.GDT 5/24/16

CPT LOG NO. C5

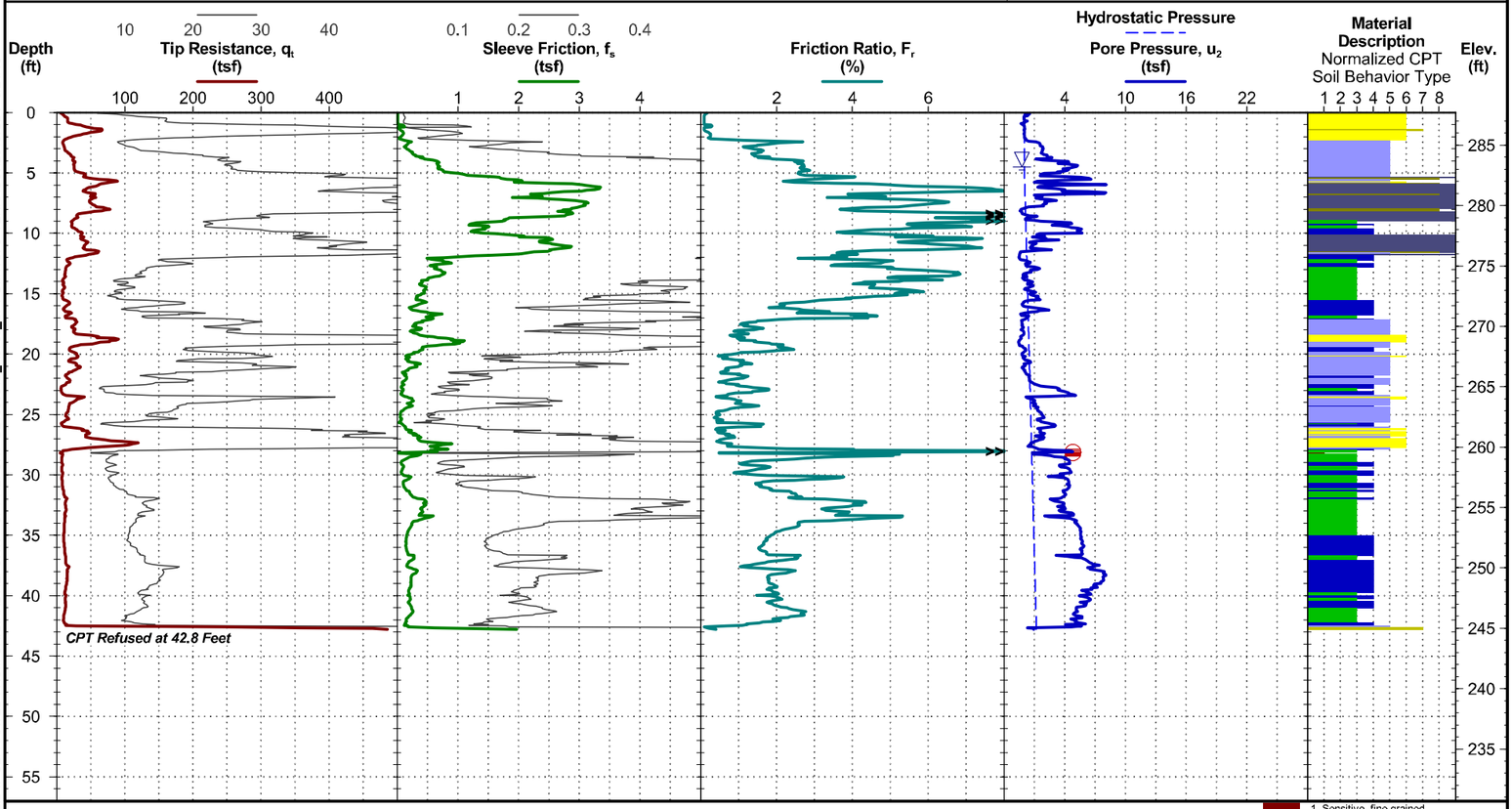
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

Surface Elev.: 287.7 ft
Northing: 678765
Easting: 2177397
Station: 35+50
Offset: CL



See Terracon's CPT General Notes for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION
▽ 4.5 ft measured water depth
(used in normalizations and correlations)

Probe no. 4526 with net area ratio of 0.83
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 12/7/2015
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
2401 Brentwood Rd Ste 107
Raleigh, NC

CPT Started: 4/25/2016
CPT Completed: 4/25/2016
Rig: Pagani TG73-200
Operator: JB
Project No.: R-5769

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT D2165034D_R5769_CPT-DMT.GPJ TERRACON2015.GDT 5/24/16

DMT LOG NO. D5

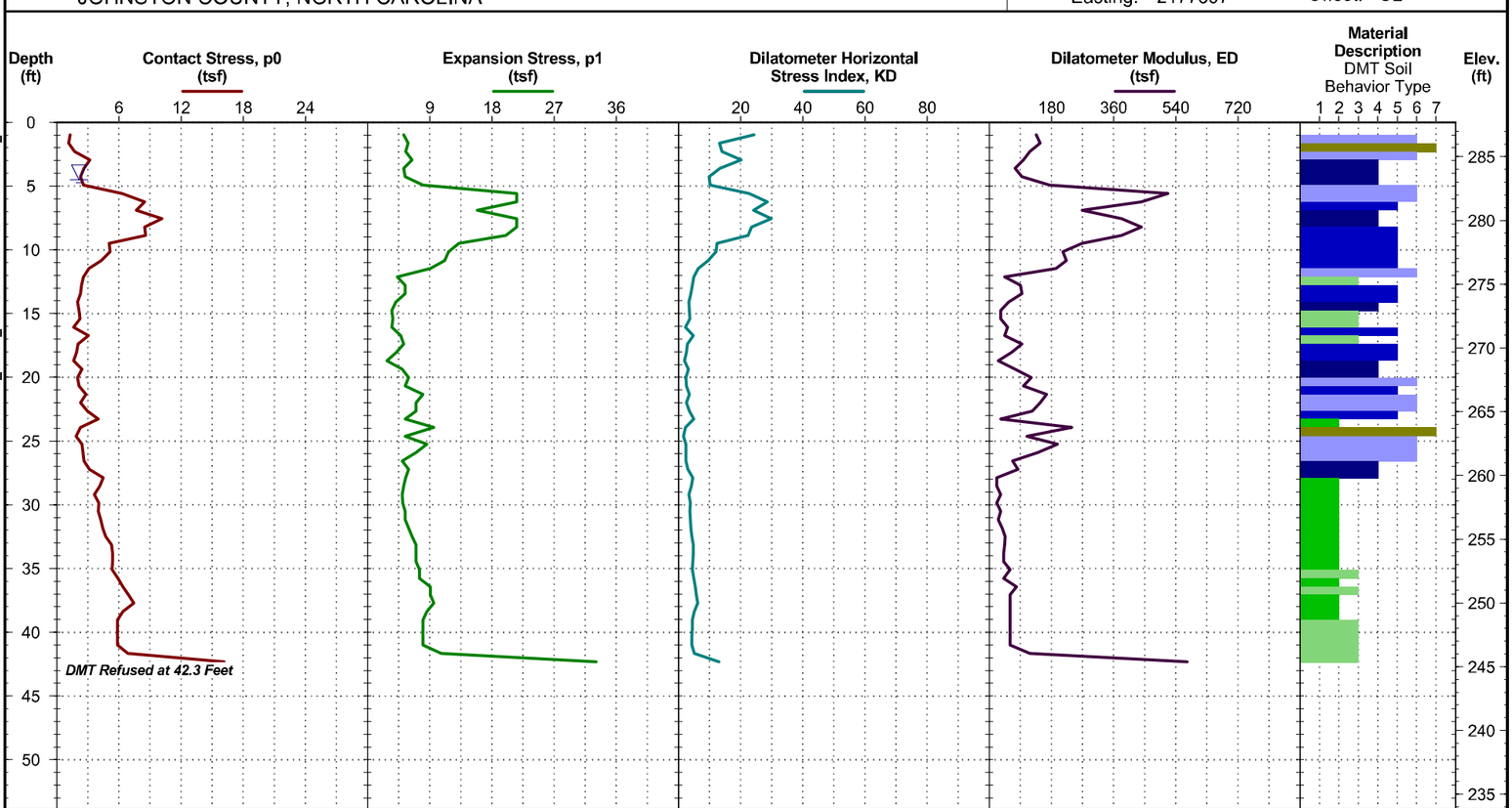
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

Surface Elev.: 287.7 ft
Northing: 678765
Easting: 2177397
Station: 35+50
Offset: CL



See Plan Sheets for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

DMT specification reports available upon request.

1 Muck / peat
2 Clay
3 Silty clay
4 Clayey silt
5 Silt
6 Sandy silt
7 Silty sand
8 Sand

WATER LEVEL OBSERVATION
▽ 4.5 ft measured water depth
(used in normalizations and correlations)

Calibrations: ΔA - 0.2 bar; ΔB - 0.4 bar; Zm - 0 bar
Blade no. 507

Terracon
2401 Brentwood Rd Ste 107
Raleigh, NC

DMT Started: 4/27/2016
DMT Completed: 4/27/2016
Rig: Pagani TG73-200
Operator: JB
Project No.: R-5769

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. DMT REPORT D2165034D_R5769_CPT-DMT.GPJ TERRACON2012_W INSITU.GDT 5/24/16

CPT LOG NO. C6

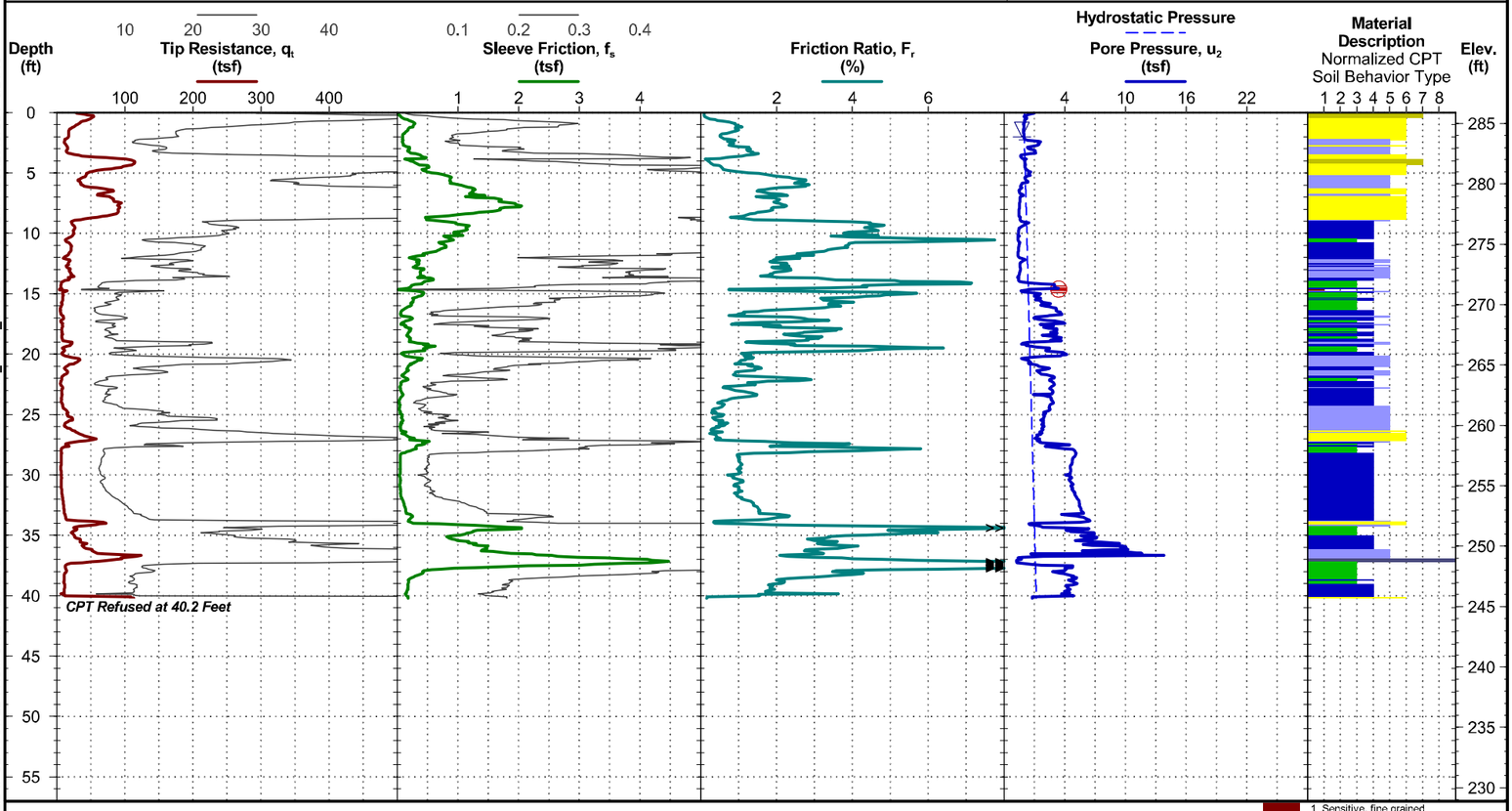
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

Surface Elev.: 285.9 ft
Northing: 678908
Easting: 2177535
Station: 37+50
Offset: CL



See Terracon's CPT General Notes for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION
▽ 2 ft measured water depth
(used in normalizations and correlations)

Probe no. 4526 with net area ratio of 0.83
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 12/7/2015
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
2401 Brentwood Rd Ste 107
Raleigh, NC

CPT Started: 4/25/2016
CPT Completed: 4/25/2016
Rig: Pagani TG73-200
Operator: JB
Project No.: R-5769

DMT LOG NO. D6

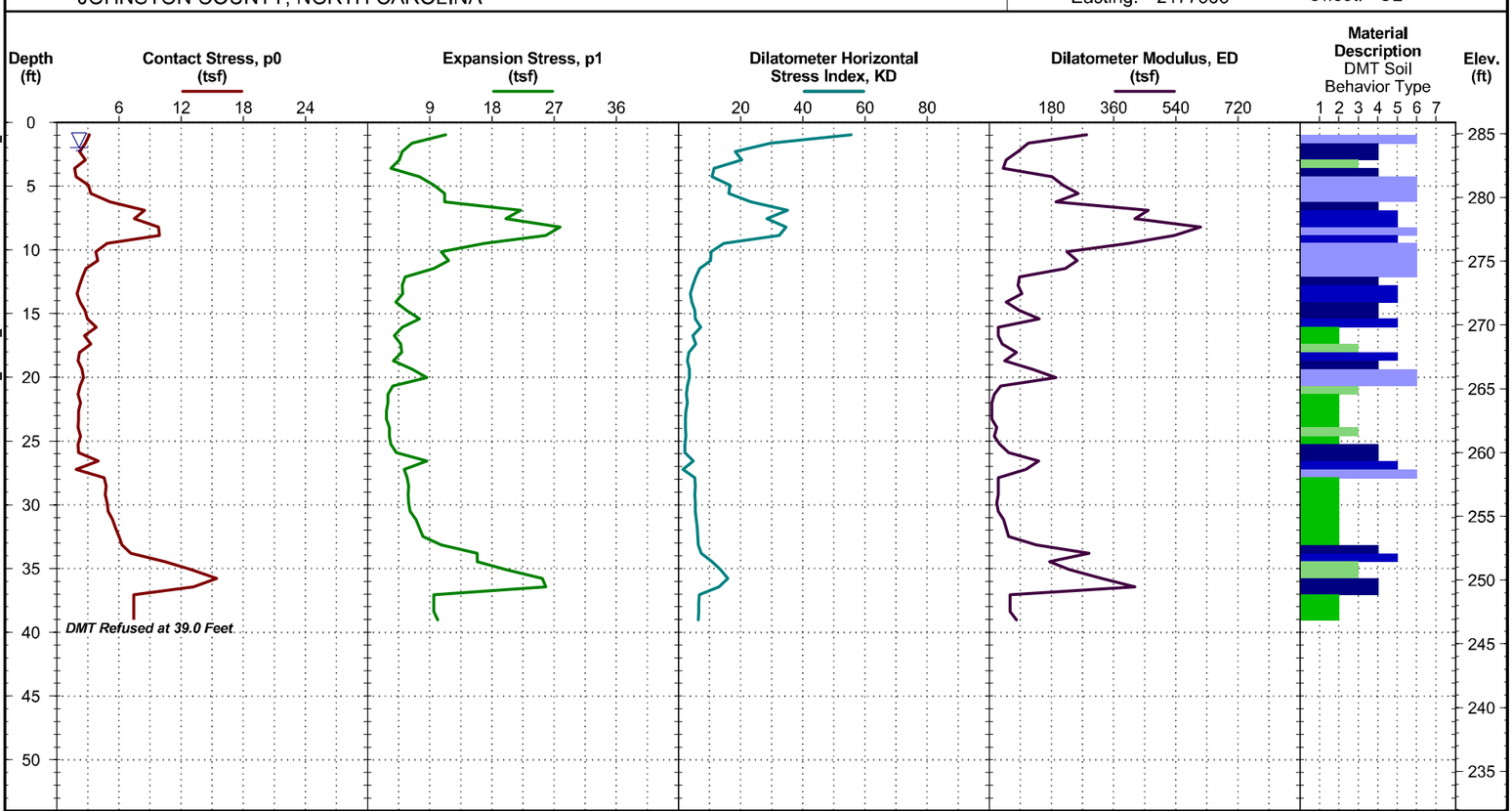
PROJECT: R-5769: NOVO NORDISK ACCESS ROAD

CLIENT: WETHERILL ENGINEERING RALEIGH, NORTH CAROLINA

TEST LOCATION: SEE ROADWAY INVENTORY

SITE: BETWEEN SR 1905 (GORDON ROAD) AND PROPOSED NOVO NORDISK FACILITY JOHNSTON COUNTY, NORTH CAROLINA

Surface Elev.: 285.9 ft
Northing: 678908
Easting: 2177535
Station: 37+50
Offset: CL



See Plan Sheets for explanation of symbols and abbreviations.
ELEVATION ESTIMATED FROM PROJECT .TIN FILE.

DMT specification reports available upon request.

1 Muck / peat
2 Clay
3 Silty clay
4 Clayey silt
5 Silt
6 Sandy silt
7 Silty sand
8 Sand

WATER LEVEL OBSERVATION
▽ 2 ft measured water depth
(used in normalizations and correlations)

Calibrations: ΔA - 0.2 bar; ΔB - 0.4 bar; Zm - 0 bar
Blade no. 507

Terracon
2401 Brentwood Rd Ste 107
Raleigh, NC

DMT Started: 4/27/2016
DMT Completed: 4/27/2016
Rig: Pagani TG73-200
Operator: JB
Project No.: R-5769

PROJECT REFERENCE NO.	SHEET NO.
R–5769	26

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX B
SOIL LABORATORY RESULTS

REFERENCE: R–5769

PROJECT: N/A

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873–2211 FAX: (919) 873–9555
NC REGISTERED FIRM: F–0869

INITIALS DATE

SOIL LABORATORY TESTING SUMMARY

PROJECT NUMBER: N/A **ID (TIP):** R-5769 **COUNTY:** JOHNSTON

DESCRIPTION: NOVO NORDISK ACCESS ROAD FROM SR 1905 (GORDON ROAD) TO PROPOSED NOVO NORDISK FACILITY

Boring No.	Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic
									Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200		
Y1REV_1753	S-1	-Y1REV-	17+53	CL	1.0 - 2.0	A-7-6 (7)	43	28	34.9	22.4	5.8	36.9	1	96	74	44	19.6	-
Y1REV_2154	S-2	-Y1REV-	21+00	9 LT	1.0 - 2.0	A-7-6 (8)	48	26	23.7	26.1	7.7	42.5	10	83	69	46	17.1	-
L_1300	S-3	-L-	13+00	CL	1.0 - 6.0	A-7-6 (7)	47	23	35.1	18.9	4.8	41.2	0	98	76	47	-	-
L_4300	S-4	-L-	43+00	CL	1.0 - 6.0	A-2-6 (1)	34	20	48.7	21.0	2.6	27.7	2	94	65	30	-	-
L_1700	SS-1	-L-	17+00	CL	3.5 - 5.0	A-2-6 (0)	39	23	53.7	15.3	4.6	26.4	15	73	43	24	10.6	-
L_1700	SS-2	-L-	17+00	CL	6.0 - 7.5	A-2-7 (0)	54	36	40.2	19.4	5.2	35.2	35	57	41	24	11.7	-
L_2700	SS-3	-L-	27+00	CL	1.0 - 2.5	A-6 (4)	35	11	21.8	26.7	27.1	24.4	0	99	86	58	34.5	8.0
L_2700	SS-4	-L-	27+00	CL	13.5 - 15.0	A-2-7 (0)	51	33	66.4	7.8	1.6	24.2	10	81	36	22	21.9	-
L_2700	SS-5	-L-	27+00	CL	23.5 - 25.0	A-2-6 (0)	25	14	68.2	13.4	2.0	16.4	43	41	21	8	14.7	-
L_2900	SS-6	-L-	29+00	CL	8.5 - 10.0	A-2-7 (2)	71	50	63.3	8.5	0.9	27.3	1	94	42	27	20.3	-
L_3100	SS-7	-L-	31+00	CL	6.0 - 7.5	A-7-6 (9)	55	36	46.5	12.5	2.5	38.5	0	100	77	42	24.4	-
L_3100	SS-8	-L-	31+00	CL	28.5 - 30.0	A-7-6 (8)	42	19	0.5	58.3	9.8	31.4	0	100	100	55	40.9	-
EB1-A	SS-9	-L-	32+26	17 LT	38.5 - 40.0	A-7-6 (12)	44	18	0.6	47.5	17.6	34.3	0	100	100	68	44.5	-
EB1-B	SS-10	-L-	32+26	17 RT	8.5 - 10.0	A-7-6 (13)	56	38	29.6	24.7	5.0	40.7	0	100	82	49	22.4	-
EB1-B	SS-11	-L-	32+26	17 RT	18.5 - 20.0	A-2-7 (2)	62	45	64.9	8.6	0.3	26.2	1	97	52	27	28.4	-
EB2-A	SS-12	-L-	34+27	17 LT	33.5 - 35.0	A-7-6 (7)	43	21	0.8	61.3	9.8	28.1	0	100	100	49	46.1	-
EB2-B	SS-13	-L-	34+27	17 RT	6.0 - 7.5	A-7-6 (12)	79	54	54.8	5.9	0.5	38.8	1	96	50	39	20.5	-
EB2-B	SS-14	-L-	34+27	17 RT	23.5 - 25.0	A-2-7 (1)	51	38	63.8	8.6	2.0	25.6	2	93	43	27	29.8	-
L_3500	SS-15	-L-	35+00	CL	23.5 - 25.0	A-2-6 (0)	34	22	51.6	22.2	1.0	25.2	13	81	54	23	25.0	-
L_3500	SS-16	-L-	35+00	CL	38.5 - 40.0	A-7-6 (28)	54	38	3.5	34.2	35.2	27.1	2	96	93	76	42.1	-
L_3700	SS-17	-L-	37+00	CL	18.5 - 20.0	A-6 (7)	38	26	25.8	32.8	8.6	32.8	2	97	86	45	30.5	-
L_3900	SS-18	-L-	39+00	CL	13.5 - 15.0	A-2-7 (0)	72	56	77.8	4.2	0.3	17.7	0	99	31	18	30.6	-
L_4100	SS-19	-L-	41+00	CL	1.0 - 2.5	A-6 (3)	33	18	31.6	28.8	6.6	33.0	0	99	87	41	20.4	-
L1_1400	SS-20	-L-	14+00	CL	1.0 - 2.0	A-6 (3)	34	20	41.1	21.9	6.5	30.5	2	95	71	37	25.6	-
EB2-A	ST-1	-L-	34+27	17 LT	33.5 - 36.0	A-7-6 (7)	42	17	0.2	57.2	16.4	26.2	0	100	100	55	-	-

ST-1 TESTED BY GEOTECHNICS

Terracon
Consulting Engineers & Scientists

Stephanie H. Huffman
Certified Lab Technician Signature

114-01-1203
Certification Number

Terracon

Date: July 2016

Memorandum to: Greg Purvis, PE
Project Manager
Wetherill Engineering

From: Matt Alexander, PE
Geotechnical Project Engineer
Terracon Consultants

TIP Number: R-5769
County: Johnston
Description: Novo Nordisk Access Road from SR 1905 (Gordon Road) to Proposed Novo Nordisk Site

Subject: Geotechnical Report - Design and Construction Recommendations

Terracon Consultants has completed a subsurface investigation for this project and presents the following recommendations:

I. Slope / Embankment Stability and Settlement

A. Slope Design

All permanent slopes should be constructed at a ratio of 3:1 (H:V) or flatter. Slopes steeper than 3:1 are proposed for sections of the -L- and -L1- alignments. The following sections of embankment side slope were identified as having a predicted slope stability factor of safety less than 1.5 based on our analyses:

Alignment	Stations	Offset
-L-	24+50 to 30+00	Left and Right
-L-	35+50 to 39+38	Right
-L2-	10+00 to 11+15	Right

The end slopes at the approach embankments to the bridge over the Norfolk Southern Railroad at -L- 33+26.23 were also predicted to have a global slope stability factor of safety less than 1.5 parallel to the -L- alignment behind the abutment MSE retaining walls. A PET geotextile reinforced aggregate platform has been designed to increase the global factor of safety at the abutment MSE retaining walls. Slope stability factors of safety predicted for the side slopes and MSE retaining walls at the bridge approach were in excess of 1.5.

Reinforcing the base of the embankments in these problem areas is preferred to undercut due to shallow groundwater or shallow standing water on the surface and because the borrow for the project will need to be imported from off site.

B. Geotextile for Embankment Stabilization

Polyester (PET) geotextile for embankment stabilization was used in the limit-equilibrium slope stability analyses to achieve a factor of safety greater than or equal to 1.5 for the roadway embankments. Please refer to the attached Geotextile for Embankment Stabilization Special Provision (GT-2) for details regarding the required properties of the geotextile. The following table outlines the locations for use of geotextile for embankment stabilization:

Alignment	Stations	Offset	Number of Layers
-L-	24+50 to 27+50	Left and Right	1
-L-	27+50 to 30+00	Left and Right	2
-L-	35+50 to 39+38	Right	1
-L1-	10+00 to 11+15	Left and Right	1

We recommend a quantity of 12,700 square yards of Geotextile for Embankment Stabilization be included in the project contract. An additional contingency quantity of 500 square yards of Geotextile for Embankment Stabilization is recommended for use at the discretion of the Engineer.

C. Rock Embankments

Rock embankment should be used at the following locations for embankment that will be constructed in wetlands:

Alignment	Stations
-L-	20+80 to 29+40
-L-	35+80 to 43+57
-L1-	10+00 to 15+15
-L2-	10+00 to 11+40

Due to the relatively short rock embankment heights needed to reach an elevation of 1 foot above the 100 year storm water level in the wetlands, we recommend construction follow the Rock Embankments Special Provision (GT-3) attached to this report.

We recommend a quantity of 12,200 tons of Rock Embankment and 3,900 tons of #57 Stone be included in the project contract for construction of the rock embankments in the wetlands. We recommend a quantity of 15,500 square yards of Geotextile for Rock Embankments, Type 2 be included in the project contract for use in conjunction with construction of the rock embankments in the wetlands.

D. Reinforced Aggregate Platforms

Reinforced aggregate platforms have been designed to increase global stability at the bridge abutment MSE retaining walls. The reinforced aggregate platforms should be constructed at the following locations:

Alignment	Stations
-L-	31+42 to 32+69
-L-	33+68 to 35+17

We recommend the reinforced aggregate platforms be constructed in accordance with the Reinforced Aggregate Platforms Special Provision (GT-4). We recommend a quantity of 500 tons of Rip Rap, Class A and 800 tons of #57 Stone for Aggregate Platforms be included in the project contract for construction of the reinforced aggregate platforms. We recommend a quantity of 5,500 square yards of Reinforcement Geotextile for Aggregate Platforms be included in the project contract for construction of the reinforced aggregate platforms. We recommend a quantity of 2,200 square yard of Separation Geotextile, Type 2 be included in the project contract for use in conjunction with construction of the reinforced aggregate platforms.

E. Rock Plating

We recommend rock plating for all embankment slopes steeper than 3:1. Rock plating should be used at the following locations:

Alignment	Stations	Offset
-L-	24+50 to 32+68	Left and Right
-L-	33+69 to 39+38	Right
-L2-	10+00 to 11+15	Right

We recommend a quantity of 9,700 square yards of Rock Plating be included in the project contract for use on the slopes described above.

F. Embankment Monitoring

We recommend settlement monitoring at the approach embankments for the bridge over the Norfolk Southern Railroad at -L- Station 33+26.23. The bridge foundations were designed to account for down drag from settlement of the approach embankments. We recommend a quantity of 13 Embankment Settlement Gauges be included in the project contract to monitor settlement at the approaches before releasing them for final grading and paving.

II. Subgrade Stability

A. Aggregate Subgrade

High plasticity coastal plain and roadway embankment soils were encountered on the -Y1REV- alignment. The following locations should be undercut to a depth of 1 foot below proposed subgrade elevation:

Alignment	Stations	Offset
-Y1REV-	10+50 to 22+75	Left

We recommend a quantity of 300 cubic yards of Undercut Excavation be included in the project contract for use at the widening of SR 1905. We recommend a contingency quantity of 200 cubic yards of Undercut Excavation be included in the project contract for use at the discretion of the Engineer.

B. Geotextile for Soil Stabilization

We recommend a quantity of 1,200 square yards of Geotextile for Soil Stabilization be included in the project contract for use in the bottom of the undercut areas described in Section II.A. We recommend a contingency quantity of 200 square yards of Geotextile for Embankment Stabilization be included in the project contract for use at the discretion of the Engineer.

III. Borrow Specifications

A. Disposal of Waste Materials

Unsuitable material derived from undercut or excavations should be wasted off site.

B. Borrow Criteria

Use the Statewide Criteria for Acceptance of Borrow Material as described in Section 1018 of the Standard Specifications.

C. Shrinkage Factor

A shrinkage factor of 25 percent is recommended for calculation of earthwork quantities on this project.

D. Class IV Subgrade Stabilization

We recommend a quantity of 200 tons of Class IV Subgrade Stabilization be included in the project contract for backfilling the shallow undercut described in Section II.A. We recommend a contingency quantity of 200 tons of Class IV Subgrade Stabilization be included in the project contract for use at the discretion of the Engineer to backfill additional undercut excavation.

IV. Miscellaneous

A. Reduction of Unclassified Excavation - Unsuitable

The coastal plain soils derived primarily from ditch cuts along -Y1REV- and the coastal plain soils that will need to be excavated to construct the reinforced aggregate platforms described previously are unsuitable for use as embankment fill. We estimate a quantity of 3,800 cubic yards of material derived from these excavations will need to be wasted off site.

B. <u>Construction Procedures</u>

See the attached project special provisions for applicable construction procedures and guidance.

Sincerely,
Terracon Consultants, Inc.

Matthew J. Alexander, PE
Geotechnical Project Engineer

Andrew A. Nash, PE
Geotechnical Department Manager

Attachments: Summary of Quantities
Geotextile for Embankment Stabilization Special Provision (GT-2)
Rock Embankments Special Provision (GT-3)
Reinforced Aggregate Platform Special Provision (GT-4)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
Summary of Quantities

WBS Number: N/A | County: Johnston | Project Engineer: Alexander, M. J.
TIP Number: R-5769 | Field Office: Terracon | Project Geologist:
Description: Novo Nordisk Access Road from SR 1905 (Gordon Road) to Proposed Novo Nordisk Site

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 / %
0127000000-N	Embankment Settlement Gauges	SP - Embankment Settlement Gauges	I. F	-L-	31+00.00	36+00.00	13	EA
						Total Quantity of Embankment Settlement Gauges =	**13**	**EA**
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. B	-Y1REV-	10+50.00	22+75.00	1,200	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. B	Contingency	N/A	N/A	200	SY
						Total Quantity of Geotextile for Soil Stabilization =	**1,400**	**SY**
0220000000-E	Rock Embankments	SP - Rock Embankments	I. C	Varies	N/A	N/A	12,200	TON
						Total Quantity of Rock Embankments =	**12,200**	**TON**
0222000000-E	Geotextile for Rock Embankments	SP - Rock Embankments	I. D	Varies	N/A	N/A	15,500	SY
						Total Quantity of Geotextile for Rock Embankments =	**15,500**	**SY**
0223000000-E	Rock Plating	275 - Rock Plating	I. E	Varies	N/A	N/A	9,700	SY
						Total Quantity of Rock Plating =	**9,700**	**SY**
0241000000-E	Geotextile for Embankment Stabilization	SP - Geotextile for Embankment Stabilization - Non-Standard Pay Item	I. B	Varies	N/A	N/A	12,700	SY
0241000000-E	Geotextile for Embankment Stabilization	SP - Geotextile for Embankment Stabilization - Non-Standard Pay Item	I. B	Contingency	N/A	N/A	500	SY
						Total Quantity of Geotextile for Embankment Stabilization =	**13,200**	**SY**
0241000000-E	Reinforcement Geotextile for Aggregate Platforms	SP - Reinforced Aggregate Platforms - Non-Standard Pay Item	I. D	-L-	31+42.00	35+17	5,500	SY
						Total Quantity of Reinforcement Geotextile for Aggregate Platforms =	**5,500**	**SY**
0241000000-E	Separation Geotextile, Type 2	SP - Reinforced Aggregate Platforms - Non-Standard Pay Item	I. D	-L-	31+42.00	35+17.00	2,200	SY
						Total Quantity of Separation Geotextile, Type 2 =	**2,200**	**SY**
0255000000-E	#57 Stone for Aggregate Platforms	SP - Reinforced Aggregate Platforms - Non-Standard Pay Item	I. D	-L-	31+42.00	35+17.00	800	TONS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
Summary of Quantities

WBS Number: N/A | County: Johnston | Project Engineer: Alexander, M. J.

TIP Number: R-5769 | Field Office: Terracon | Project Geologist:

Description: Novo Nordisk Access Road from SR 1905 (Gordon Road) to Proposed Novo Nordisk Site

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 / %
						Total Quantity of #57 Stone for Aggregate Platforms =	**800**	**TONS**
0255000000-E	Rip Rap, Class A for Aggregate Platforms	SP - Reinforced Aggregate Platforms - Non-Standard Pay Item	I. D	-L-	31+42.00	35+17.00	500	TONS
						Total Quantity of Rip Rap, Class A for Aggregate Platforms =	**500**	**TONS**
1077000000-E	#57 Stone	SP - Rock Embankments	I. C	Varies	N/A	N/A	3,900	TON
						Total Quantity of #57 Stone =	**3,900**	**TON**
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. A	-Y1REV-	10+50.00	22+75.00	300	CY
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. A	Contingency	N/A	N/A	200	CY
						Total Quantity of Shallow Undercut =	**500**	**CY**
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	III. D	-Y1REV-	10+50.00	22+75.00	200	TON
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	III. D	Contingency	N/A	N/A	200	TON
						Total Quantity of Class IV Subgrade Stabilization =	**400**	**TON**

These Items Only Impact Earthwork Totals								
N/A	Shrinkage Factor	235 - Embankments	III. C	N/A	N/A	N/A	25	%
N/A	Unclassified Excavation - Unsuitable Waste	225 - Roadway Excavation	IV. A	N/A	N/A	N/A	3,800	CY

GEOTEXTILE FOR EMBANKMENT STABILIZATION: **(Special)**

Description

This work consists of furnishing and installing synthetic geotextile for stabilizing embankment in accordance with this provision and as directed by the Engineer. The work shall include maintaining the geotextile in the required configuration until completion and acceptance of overlying work items. The geotextile shall be placed at the locations shown in the plans or as directed by the Engineer.

Materials

The geotextile for embankment stabilization shall be made of high-tenacity polyester in the machine direction with a plain or straight-warp weave pattern and polyester or polypropelene in the cross machine direction or approved equal. The geotextile shall be composed of strong rot-proof synthetic fibers formed into a geotextile of the woven type. The geotextile shall be free of any treatment or coating which might significantly alter its physical properties after installation.

The geotextile shall contain stabilizers and/or inhibitors to make the filaments resistant to deterioration resulting from ultraviolet light or heat exposure. The geotextile shall be a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain their relative positions with respect to each other. The edges of geotextile shall be finished to prevent the outer yarn from pulling away from the geotextile. The geotextile shall be free of defects or flaws which significantly affect its physical and/or filtering properties. Sheets of geotextile shall be sewn together with a seam that furnishes the required minimum strengths, when sewing is required. No seams are permitted perpendicular to the machine direction, geotextile sheets shall be continuous in the machine direction. Lamination of geotextile sheets to produce the physical requirements of a geotextile layer will not be accepted.

During all periods of shipment and storage, the geotextile shall be wrapped in a heavy duty protective covering to protect the geotextile from direct sunlight ultraviolet rays, mud, dust, dirt, and debris. The geotextile shall not be exposed to temperatures greater than 140° F. After the protective wrapping has been removed, the geotextile shall not be left uncovered under any circumstances for longer than one (1) week.

The geotextile shall meet the following physical requirements:

All values represent minimum average roll values (MARV) as defined by ASTM D4439 for geotextile properties (any roll in a lot, or single day's production, should meet or exceed the minimum values in this table). Machine direction (MD) and cross-machine direction (CD) are as defined by ASTM D4439.

Provide Type 1 Certified Mill Test Report in accordance with Article 106-3 of the *Standard Specifications* with minimum average roll values (MARV) as defined by ASTM D4439 for geotextile properties. For testing geotextiles, a lot is defined as a single day's production. The Engineer reserves the right to inspect or test the geotextiles at any time. If requested by the Engineer, provide a sample of the geotextile for testing.

Use woven polyester geotextiles with properties meeting the following requirements:

Geotextile for Embankment Stabilization

Property	ASTM Test Method	Requirement (MARV)
Wide Width Tensile Strength @ 5% Strain (MD)	D4595	8,000 lb/ft
Wide Width Tensile Strength @ Ultimate (MD)	D4595	20,000 lb/ft
Apparent Opening Size[1]	D4751	No. 20 to No. 70
Ultraviolet Stability (retained strength)[2]	D4355	50%
Ultimate Seam Strength (MD)	D4884	1,000 lb/ft
1 Per AASHTO M92 2 After 250 hours of exposure		

Construction Methods

The geotextile for embankment stabilization shall be placed at the locations shown in the plans or as directed by the Engineer. The location should be cleared and free of obstructions, debris, and pockets. Stumps shall be cut smooth at the ground elevation with the root system left intact. Where geotextile for embankment stabilization is being used in conjunction with rock embankments, the geotextile should be placed on the ground as described above or incorporated into the base of the rock embankment. Where the geotextile for embankment stabilization is being placed within the rock embankment, fill voids and provide a smooth surface for placing the geotextile to prevent damage when installed and covered. At the time of installation the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation, or storage.

The geotextile for embankment stabilization shall be placed with the machine direction as shown on the plans or as directed by the Engineer. Geotextile shall be laid smooth and free from tension, stress fold, wrinkles or creases without any joint, seam, or overlapping in the machine (roll) direction. All joints in the cross machine direction may be sewn by an approved method or overlapped a minimum of 18 inches. All sewn seams must be placed upward to allow for inspection. All geotextile which is damaged as a result of installation shall be replaced or repaired at the discretion of the Engineer with no additional cost to the Department. Compaction equipment must be operated such that it will not damage the geotextile.

Where piles will penetrate geotextile for embankment stabilization, establish horizontal control for bridge foundation construction and slit the geotextile using a hot knife in the machine direction as detailed in the plans.

Any geotextile which is left uncovered for longer than one week after placement shall be replaced at no additional cost to the Department.

Measurement and Payment

The quantity of geotextile to be paid for will be the number of square yard of *Geotextile for Embankment Stabilization* measured along the surface of the ground, which has been placed and accepted by the engineer. No measurement will be made for overlapping geotextiles or sewing

seams.

The quantity of geotextile, measured as described above, will be paid for at the contract unit price per square yard for *Geotextile for Embankment Stabilization*. Such price and payment will be full compensation for furnishing, transporting, placing, sewing, testing, and all incidentals necessary to complete the work as described in this provision and the plans.

Payment will be made under:

Pay Item	**Pay Unit**
Geotextile for Embankment Stabilization	SY

ROCK EMBANKMENTS: **(Special)**

Description

Construct rock embankments in accordance with the contract. Rock embankments are required to construct embankments in water and wetlands at locations shown in the plans and as directed.

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 Type 2 geotextile for separation geotextiles. Use Rip Rap Class B, Rip Rap Class A, and Class VI Select Material (standard size No. 57) for rock embankments as shown in the plans. Use Rip Rap Class B for core material and Rip Rap Class A and No. 57 stone to choke off voids near the top of rock embankments. Obtain aggregates from sources participating in the Department's Aggregate QC/QA Program in accordance with Section 1006 of the *Standard Specifications*.

Construction Methods

Construct rock embankments in accordance with the slopes, dimensions and elevations shown in the plans and Section 235 of the *Standard Specifications*. Provide a uniform surface free of obstructions, debris and groups of large rocks that could cause voids in embankments.

Before placing embankment fill material or filtration geotextiles over rock embankments, fill voids in the top of rock embankments with Rip Rap Class A and No. 57 stone. Place and compact Rip Rap Class A first. Then, fill any remaining voids with No. 57 stone so geotextiles are not torn, ripped or otherwise damaged when installed and covered. Compact rip rap and No. 57 stone with tracked equipment or other approved methods. Install Geotextiles for Rock Embankments, Type 2 on top of rip rap and No. 57 stone in accordance with Article 270-3 of the *Standard Specifications* before placing embankment fill material.

Measurement and Payment

Rock Embankments and *No. 57 Stone* will be measured and paid in tons. Select material and rip rap will be measured by weighing material and rip rap in trucks in accordance with Article 106-7 of the *Standard Specifications*. The contract unit prices for *Rock Embankments* and *No. 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 top of rock embankments as the square yards of exposed geotextiles before placing embankment fill material. No measurement will be made for overlapping geotextiles. The contract unit price for *Geotextile for Rock Embankments, Type 2* will be full compensation for providing, transporting and installing geotextiles.

Payment will be made under:

Pay Item	**Pay Unit**
Rock Embankments	Ton
#57 Stone	Ton
Geotextile for Rock Embankments, Type 2	Square Yard

DocuSigned by:
Matthew J. Alexander
0FB0036EEA0452...

NORTH CAROLINA PROFESSIONAL SEAL 040231 ENGINEER MATTHEW J. ALEXANDER

8/22/2016

REINFORCED AGGREGATE PLATFORMS: **(Special)**

Description

Construct reinforced aggregate platforms in accordance with the contract. Use Rip Rap Class A and Class VI Select Material in conjunction with the reinforcement geotextile for aggregate platforms as shown in the plans and described herein. Use only Class VI Select Material where piles will be driven through the reinforced aggregate platforms as shown in the plans. Reinforced aggregate platforms are required below the MSE walls at the bridge abutments for the bridge on -L- over the Norfolk Southern Railroad.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Separation Geotextile, Type 2	1056
Rip Rap Materials	1042
Select Materials	1016
Reinforcement Geotextile for Aggregate Platforms	SP

Provide Separation Geotextile, Type 2, for separation geotextiles. Install Separation Geotextile, Type 2 on top of completed platform in accordance with Article 270-3 of the *Standard Specifications* before placing embankment fill material.

Use Rip Rap Class A and Class VI Select Material (standard size No. 57) for reinforced aggregate platforms as shown in the plans. Use Rip Rap Class A to construct platforms and No. 57 stone to fill voids and provide a clean, level surface for placing separation and reinforcing geotextile. Obtain aggregates from sources participating in the Department's Aggregate QC/QA Program in accordance with Section 1006 of the *Standard Specifications*.

Provide Reinforcement Geotextile for Aggregate Platforms made of high-tenacity polyester in the machine direction with a plain or straight-warp weave pattern and polyester or polypropelene in the cross machine direction or approved equal. The Reinforcement Geotextile for Aggregate Platforms shall be composed of strong rot-proof synthetic fibers formed into a geotextile of the woven type. The Reinforcement Geotextile for Aggregate Platforms shall be free of any treatment or coating which might significantly alter its physical properties after installation.

The Reinforcement Geotextile for Aggregate Platforms shall contain stabilizers and/or inhibitors to make the filaments resistant to deterioration resulting from ultraviolet light or heat exposure. The Reinforcement Geotextile for Aggregate Platforms shall be a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain their relative positions with respect to each other. The edges of geotextile shall be finished to prevent the outer yarn from pulling away from the geotextile. The Reinforcement Geotextile for Aggregate Platforms shall be free of defects or flaws which significantly affect its physical and/or filtering properties. Sheets of Reinforcement Geotextile for Aggregate Platforms shall be sewn together with a seam that furnishes the required minimum strengths, when sewing is required. No seams are permitted perpendicular to the machine direction, reinforcement geotextile sheets shall be continuous in the machine direction. Lamination of geotextile sheets to produce the physical requirements of a geotextile layer will not be accepted.

During all periods of shipment and storage, the geotextile shall be wrapped in a heavy duty

protective covering to protect the geotextile from direct sunlight ultraviolet rays, mud, dust, dirt, and debris. The geotextile shall not be exposed to temperatures greater than 140° F. After the protective wrapping has been removed, the geotextile shall not be left uncovered under any circumstances for longer than one (1) week.

The geotextile shall meet the following physical requirements:

All values represent minimum average roll values (MARV) as defined by ASTM D4439 for geotextile properties (any roll in a lot, or single day's production, should meet or exceed the minimum values in this table). Machine direction (MD) and cross-machine direction (CD) are as defined by ASTM D4439.

Provide Type 1 Certified Mill Test Report in accordance with Article 106-3 of the *Standard Specifications* with minimum average roll values (MARV) as defined by ASTM D4439 for geotextile properties. For testing geotextiles, a lot is defined as a single day's production. The Engineer reserves the right to inspect or test the geotextiles at any time. If requested by the Engineer, provide a sample of the geotextile for testing.

Use woven polyester geotextiles with properties meeting the following requirements:

Reinforcement Geotextile for Aggregate Platforms

Property	ASTM Test Method	Requirement (MARV)
Wide Width Tensile Strength @ 5% Strain (MD)	D4595	14,000 lb/ft
Wide Width Tensile Strength @ Ultimate (MD)	D4595	32,000 lb/ft
Apparent Opening Size[1]	D4751	No. 20 to No. 70
Ultraviolet Stability (retained strength)[2]	D4355	50%
Ultimate Seam Strength (MD)	D4884	1,600 lb/ft
1 Per AASHTO M92 2 After 250 hours of exposure		

Construction Methods

Construct the reinforced aggregate platforms in accordance with the slopes, dimensions and elevations shown in the plans and Section 235 of the *Standard Specifications*. Provide a uniform surface free of obstructions, debris and groups of large rocks that could cause voids in embankments. Where piles will be installed through the reinforced aggregate platforms, place Rip Rap Class A so there will be at least 5 feet between rock and piles. Slit the Reinforcement Geotextile for Aggregate Platforms using a hot knife in the machine direction at the pile locations as shown in the plans. Provide and maintain a minimum of 1 foot of cover over Reinforcement Geotextile for Aggregate Platforms when operating equipment over the reinforced aggregate platform.

Before placing embankment fill material or filtration geotextiles over reinforced aggregate platforms, drive bridge piles then fill voids in the top of reinforced aggregate platforms with No. 57 stone. Fill any voids with No. 57 stone so separation geotextiles are not torn, ripped or

otherwise damaged when installed and covered. Compact rip rap and No. 57 stone with tracked equipment or other approved methods. Install separation geotextiles on top of rip rap and No. 57 stone in accordance with Article 270-3 of the *Standard Specifications* before placing embankment fill material.

Measurement and Payment

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

Reinforcement Geotextile for Aggregate Platforms will be measured and paid in square yards. *Reinforcement Geotextile for Aggregate Platforms* will be measured along the surface of the ground after placement and acceptance by the Engineer. No measurement will be made for overlapping geotextiles or sewing seams. The contract unit price for *Reinforcement Geotextile for Aggregate Platforms* will be full compensation for furnishing, transporting, placing, sewing, testing, and all incidentals necessary to complete the work as described in this provision and the plans.

Separation Geotextile, Type 2 will be measured and paid in square yards. *Separation Geotextile, Type 2* will be measured as the square yards of exposed geotextiles before placing embankment fill material. No measurement will be made for overlapping geotextiles. The contract unit proce for *Separation Geotextile, Type 2* will be full compensation for providing, transporting, and installing geotextiles.

Payment will be made under:

Pay Item	**Pay Unit**
Rip Rap, Class A for Aggregate Platforms	Ton
#57 Stone for Aggregate Platforms	Ton
Separation Geotextile, Type 2	Square Yard
Reinforcement Geotextile for Aggregate Platforms	Square Yard

PROJECT: N/A

REFERENCE: R-5769

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5769	1	17

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *JOHNSTON*

PROJECT DESCRIPTION *NOVO NORDISK ACCESS FROM SR 1905 (GORDON ROAD) TO PROPOSED NOVO NORDISK SITE*

RECOMMENDATIONS

CONTENTS

APPENDICES

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

TURNAGE, J. R.

EKLUND, M. A.

LEE, S.

LEE, B. C.

ALEXANDER, M. J.

INVESTIGATED BY *TERRACON CONSULTANTS*

DRAWN BY *FIELDS, W. D.*

CHECKED BY *ALEXANDER, M. J.*

SUBMITTED BY *TERRACON CONSULTANTS*

DATE *JULY 2016*

DocuSigned by:
Matthew J. Alexander

NORTH CAROLINA PROFESSIONAL SEAL 040231 ENGINEER MATTHEW J. ALEXANDER

8/22/2016

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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PROJECT REFERENCE NO.	SHEET NO.
R-5769	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] D50 - (TERR346)
- [X] D50 - (TERR373)

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 7/8 " STEEL TEETH
- [X] TRICONE 2 7/8 " TUNG.-CARB.
- [ ] CORE BIT
- [X] TRICONE 3 7/8" STEEL TEETH

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: SEE NOTES

ELEVATION: N/A FEET

NOTES:

FIAD - FILLED IN AFTER DRILLING

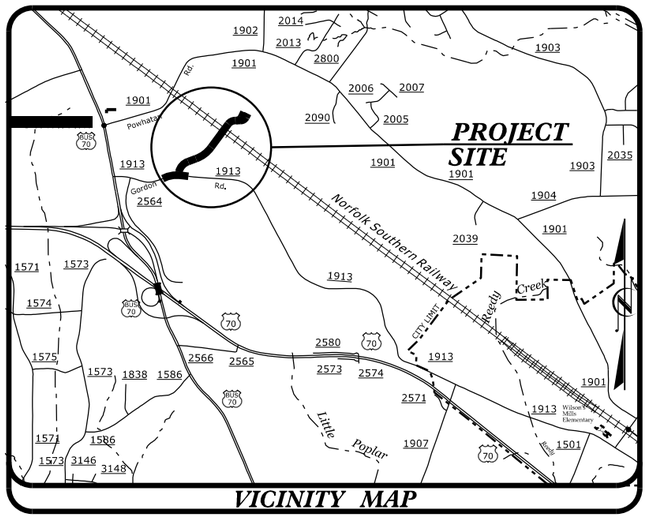
PROJECT WAS DRAFTED USING PROVIDED TIN FILE (FILE: R5769_012616)

DATE: 8-15-14

PROJECT: R-5769

CONTRACT:

See Sheet 1-A For Index of Sheets



VICINITY MAP

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

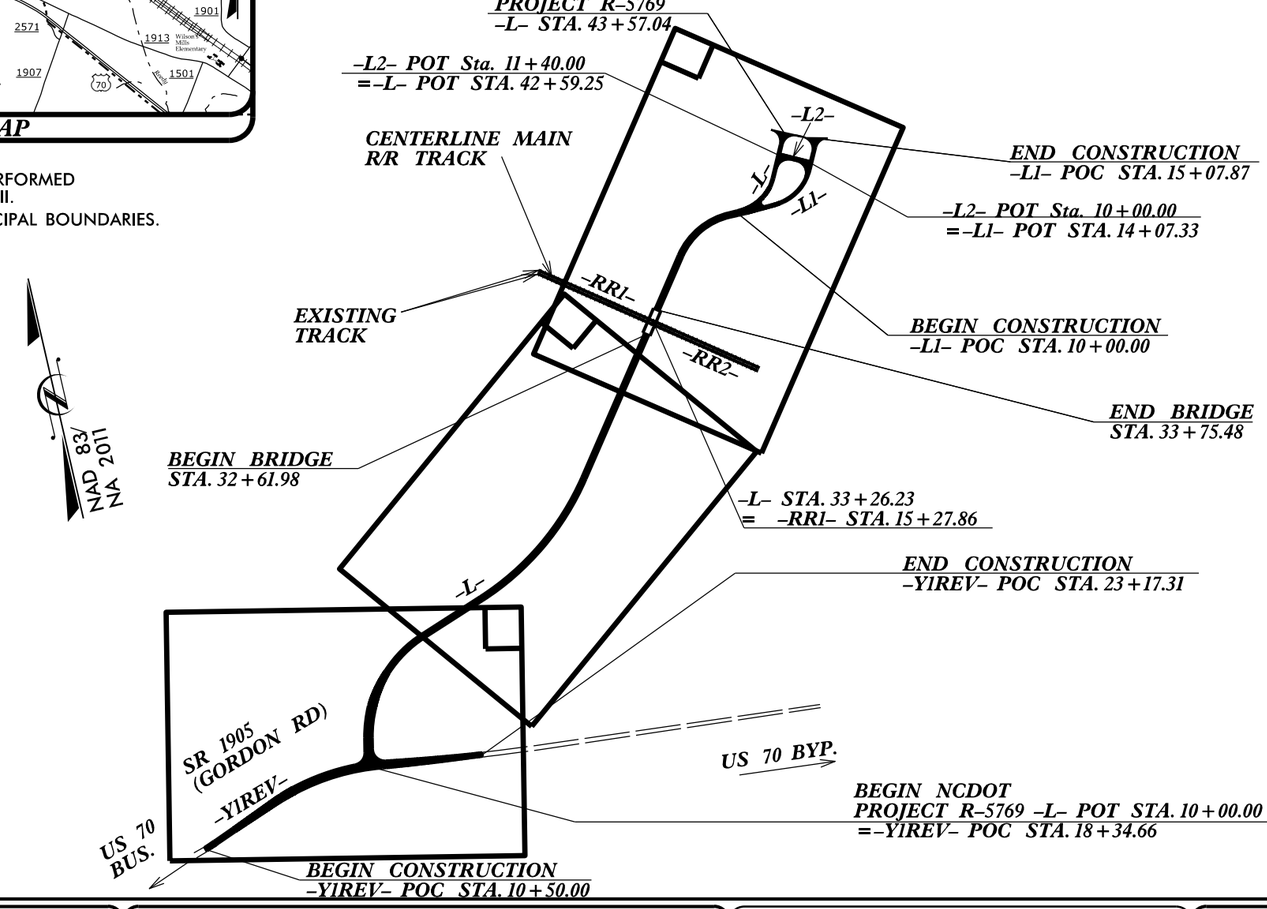
THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

JOHNSTON COUNTY

LOCATION: NOVO NORDISK ACCESS ROAD FROM SR 1905 (GORDON RD.) TO PROPOSED NOVO NORDISK SITE

TYPE OF WORK: GRADING, DRAINAGE, PAVING & STRUCTURE



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5769	3	17

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
46448.1.1		PE, UTIL., R/W
		CONST.

WETHERILL ENGINEERING
1223 Jones Franklin Rd
Raleigh, N.C. 27606
License No. F-0377
Bus: 919 851 8077
Fax: 919 851 8107

TRANSPORTATION PLANNING/DESIGN - BRIDGE/STRUCTURE DESIGN
CIVIL/SITE DESIGN - GIS/GPS - CONSTRUCTION OBSERVATION

Terracon
Consulting Engineers & Scientists

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

PLANS: 50 25 0 50 100

PROFILE (HORIZONTAL): 50 25 0 50 100

PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

ADT 2040 = 700

T = 4 % *
V = 40 MPH
* (TTST = 2% + DUAL = 2%)
FUNC CLASS =
RURAL LOCAL
SUB REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY PROJECT R-5769 =	0.615 MILES
LENGTH STRUCTURE PROJECT R-5769 =	0.021 MILES
TOTAL LENGTH PROJECT R-5769 =	0.636 MILES

NCDOT CONTACT: JERRY PAGE, PE
DIVISION 4 PROJECT MANAGER

Prepared for:
DIVISION OF HIGHWAYS
DIVISION FOUR
509 Ward Boulevard, Wilson NC, 27895

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE:

EDWARD G. WETHERILL, PE
PROJECT ENGINEER

GREG S. PURVIS, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

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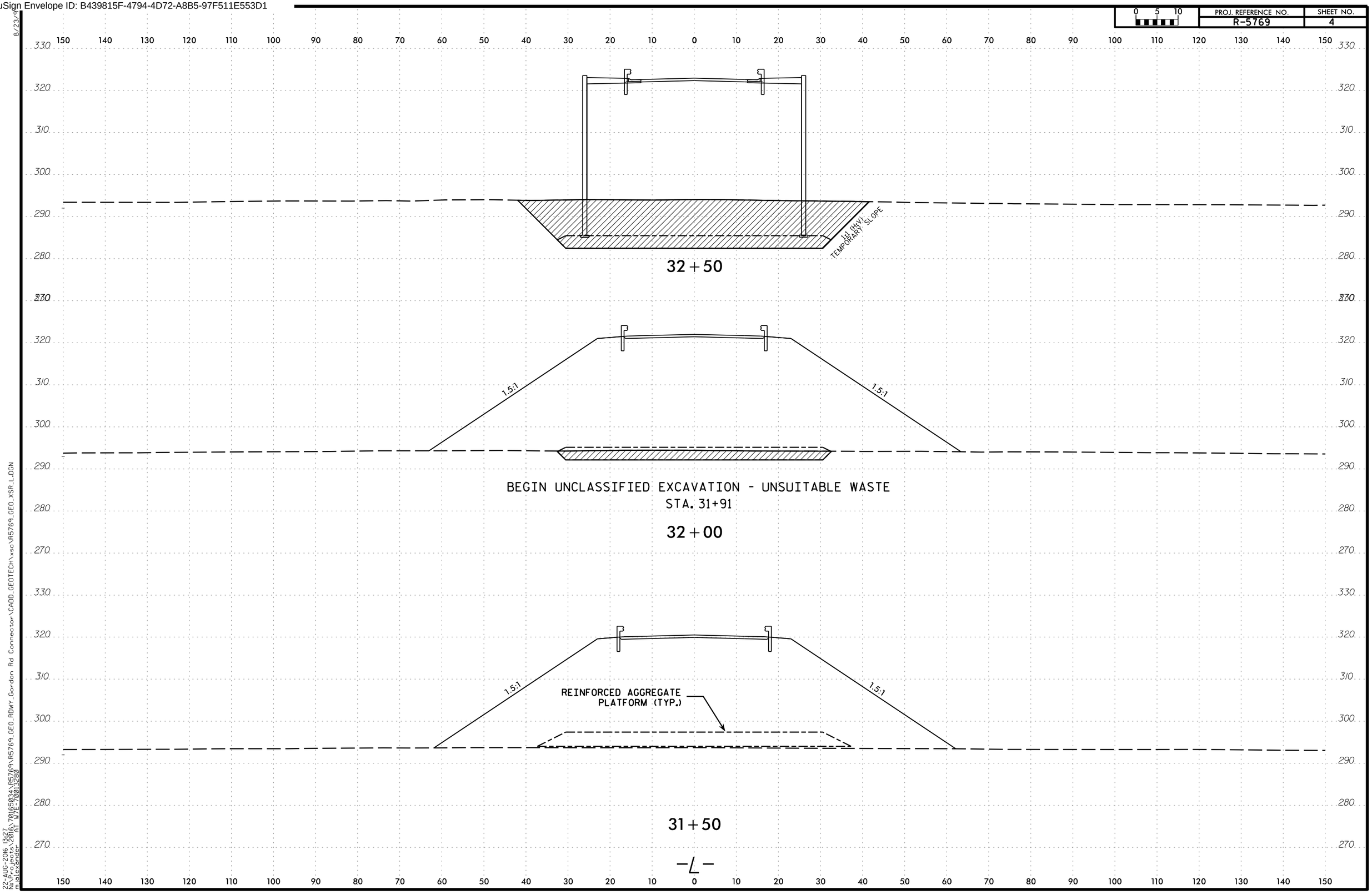

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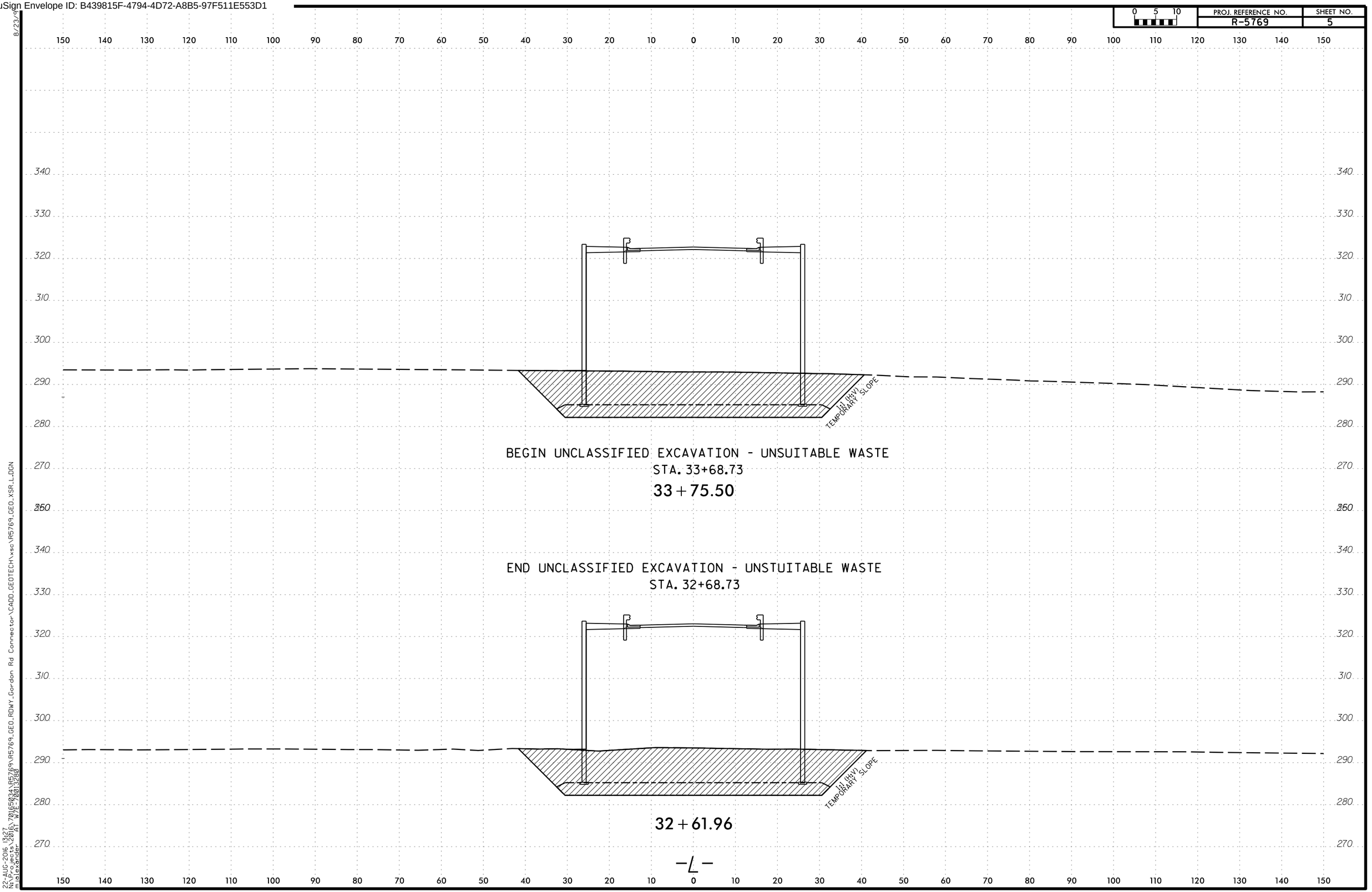

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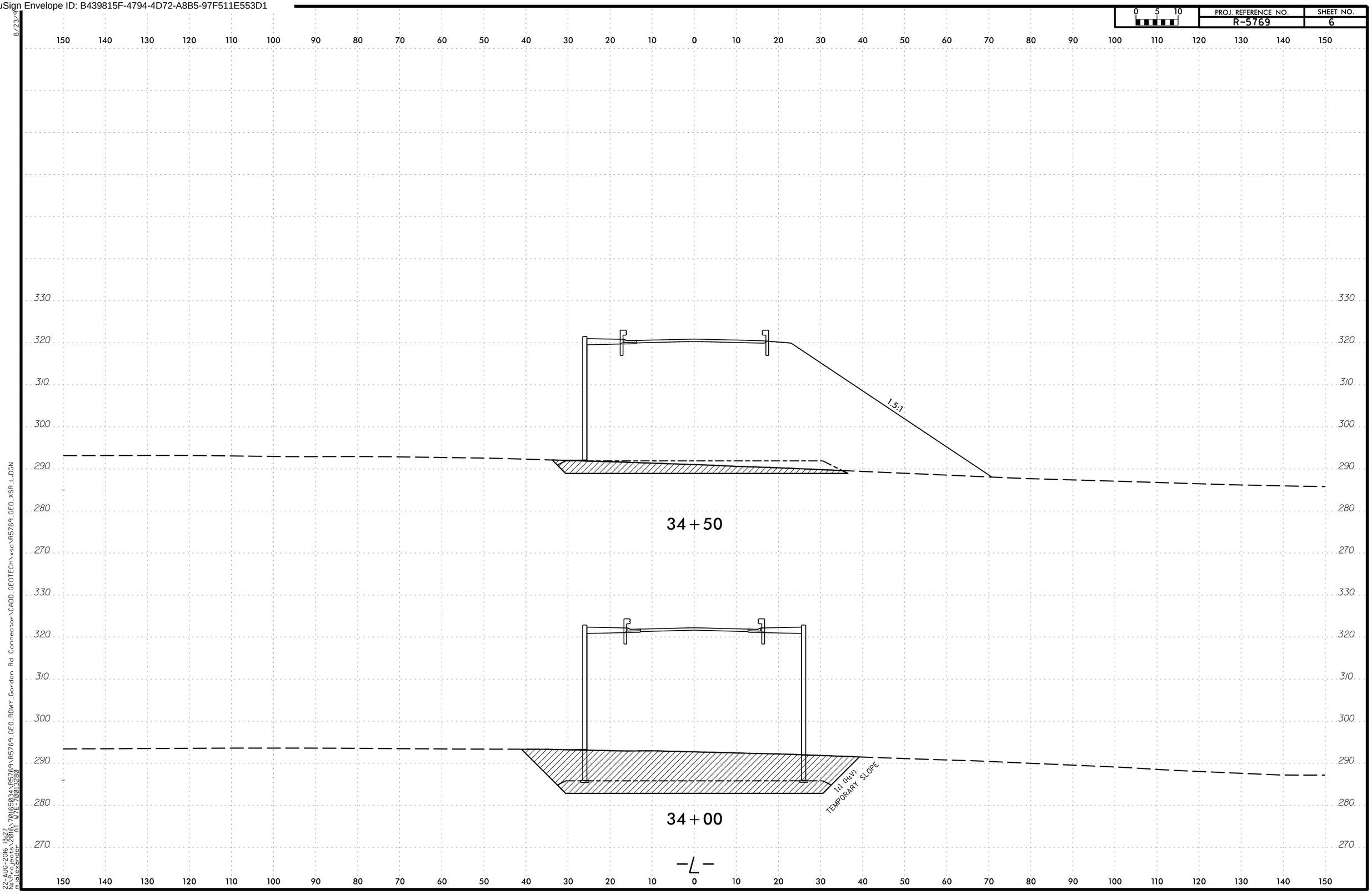

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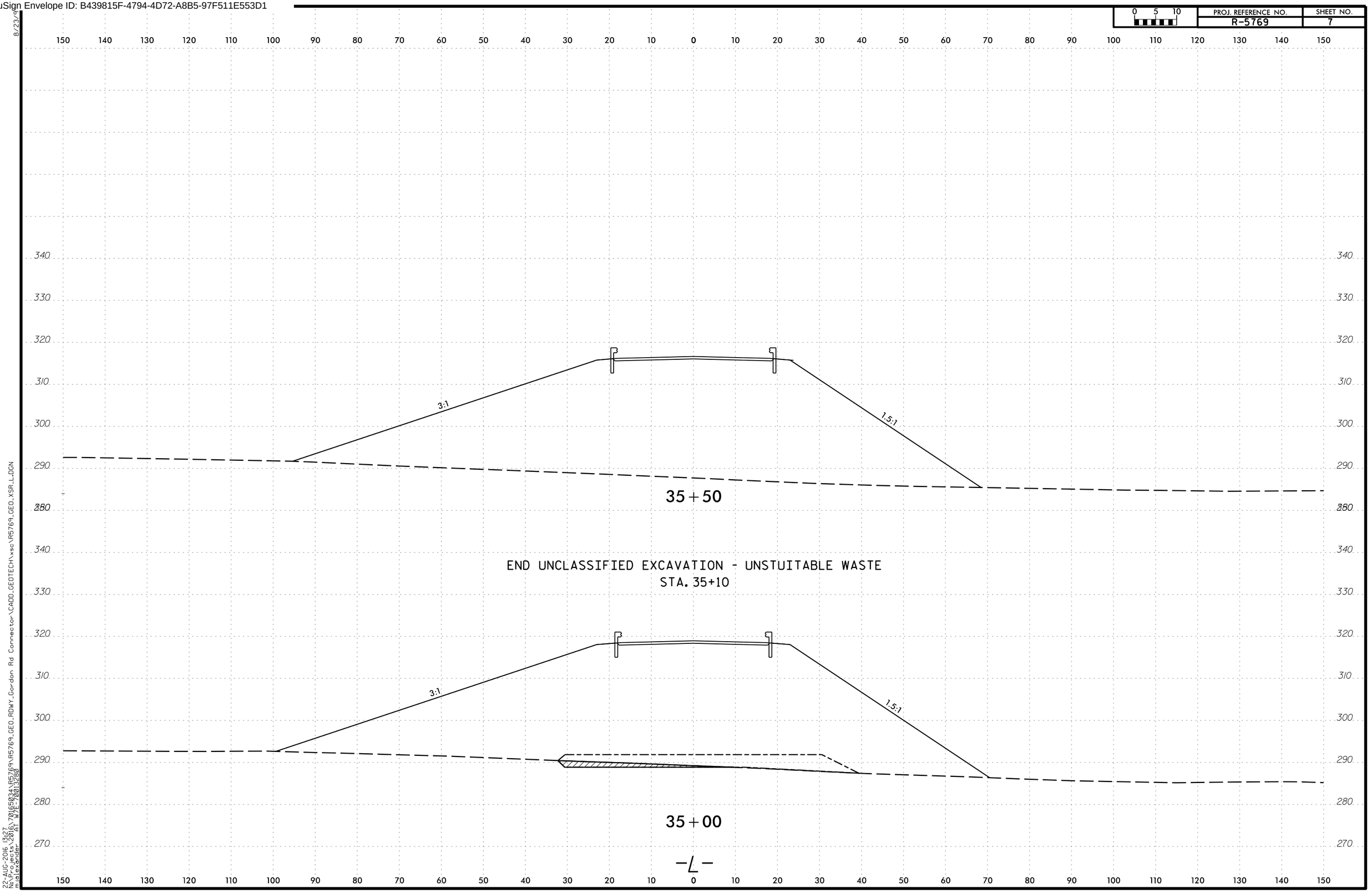

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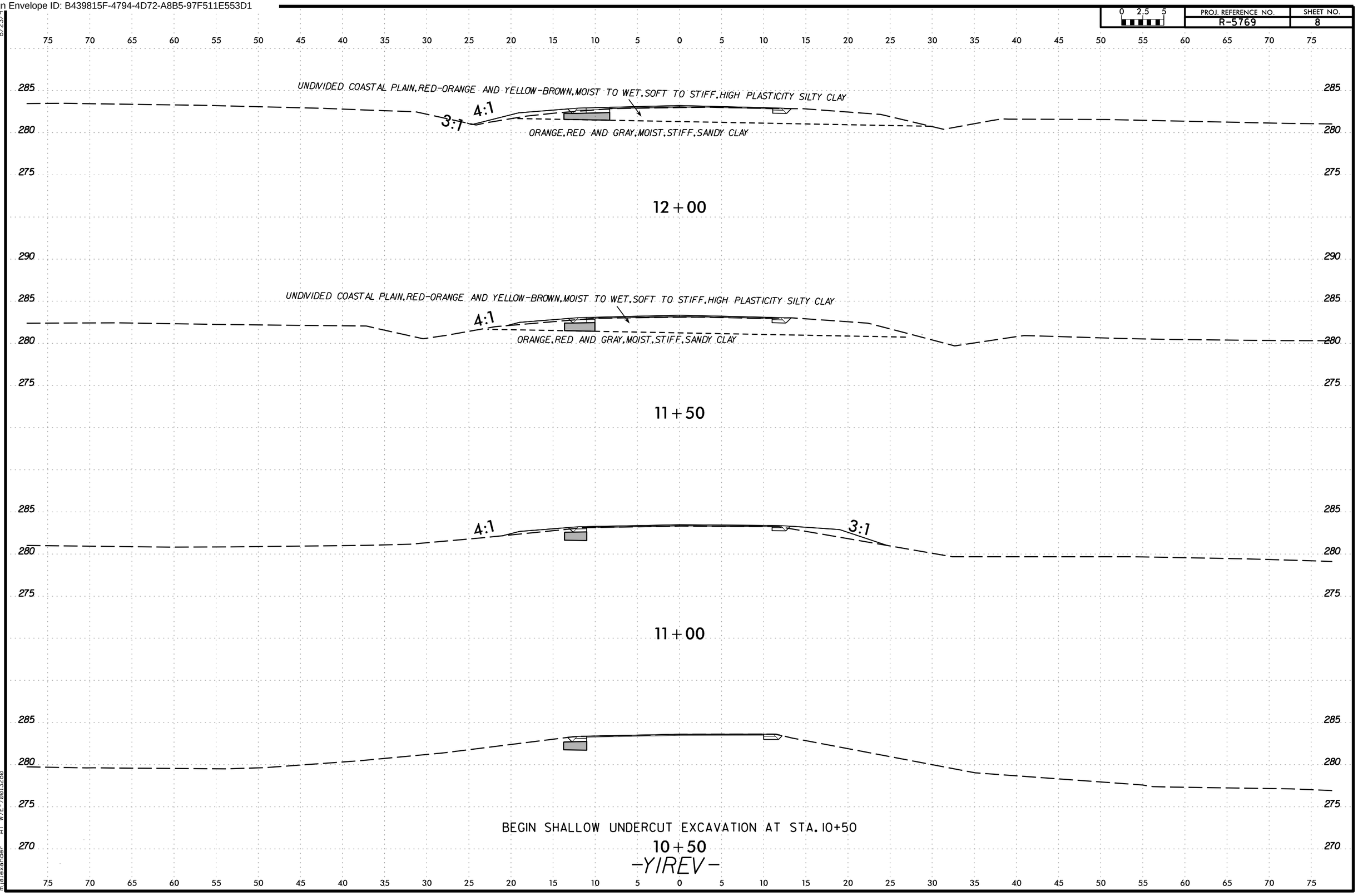

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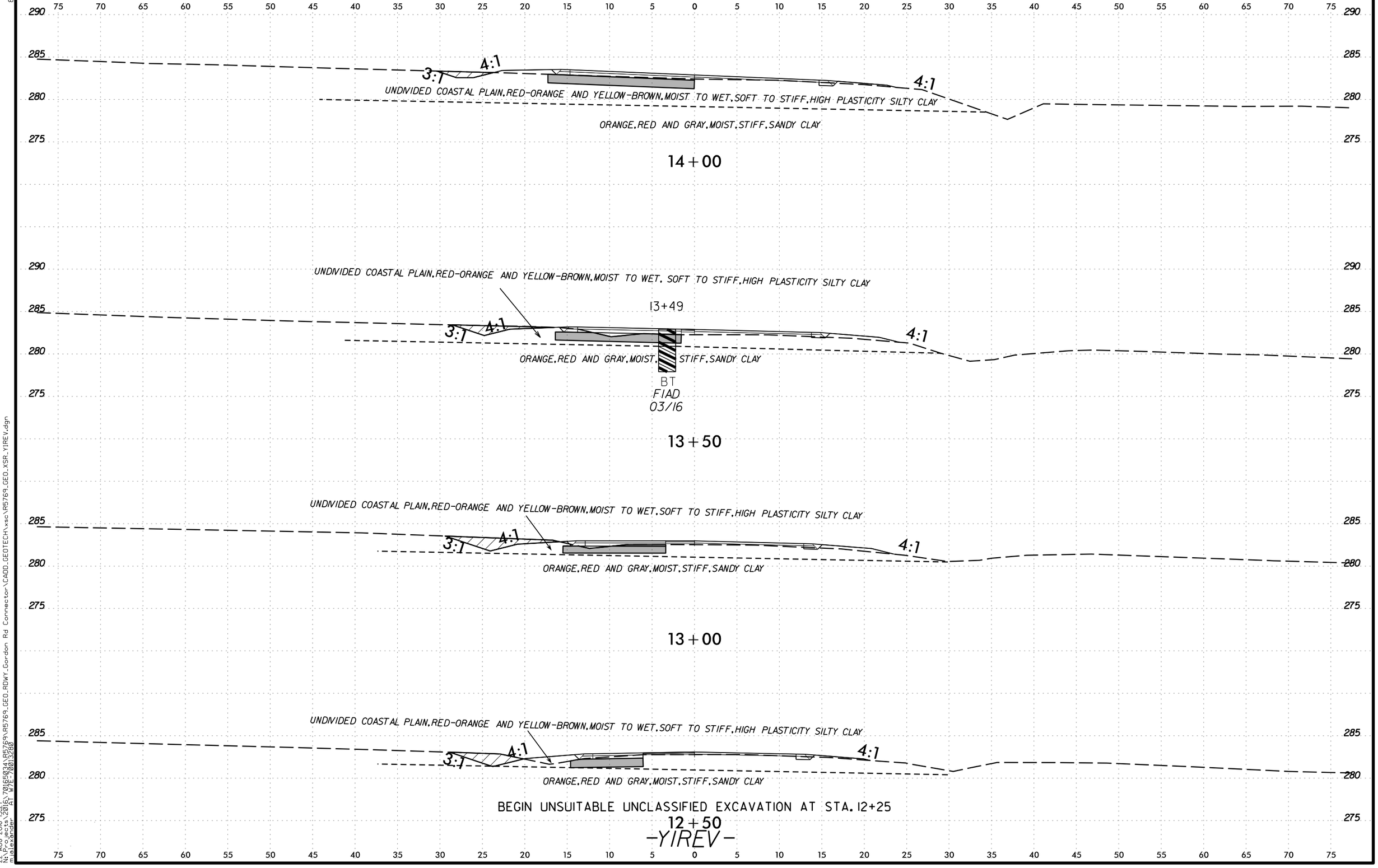

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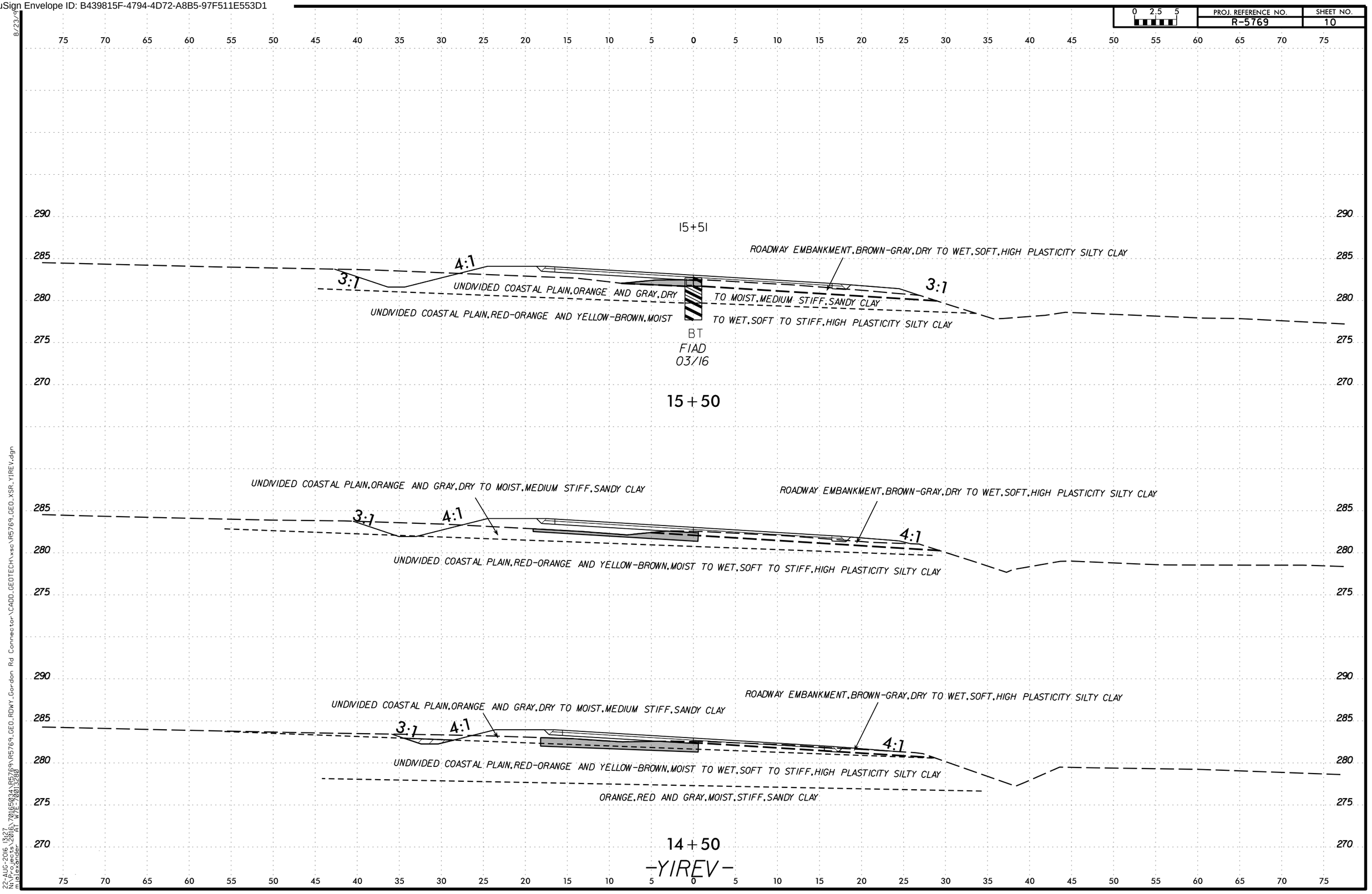

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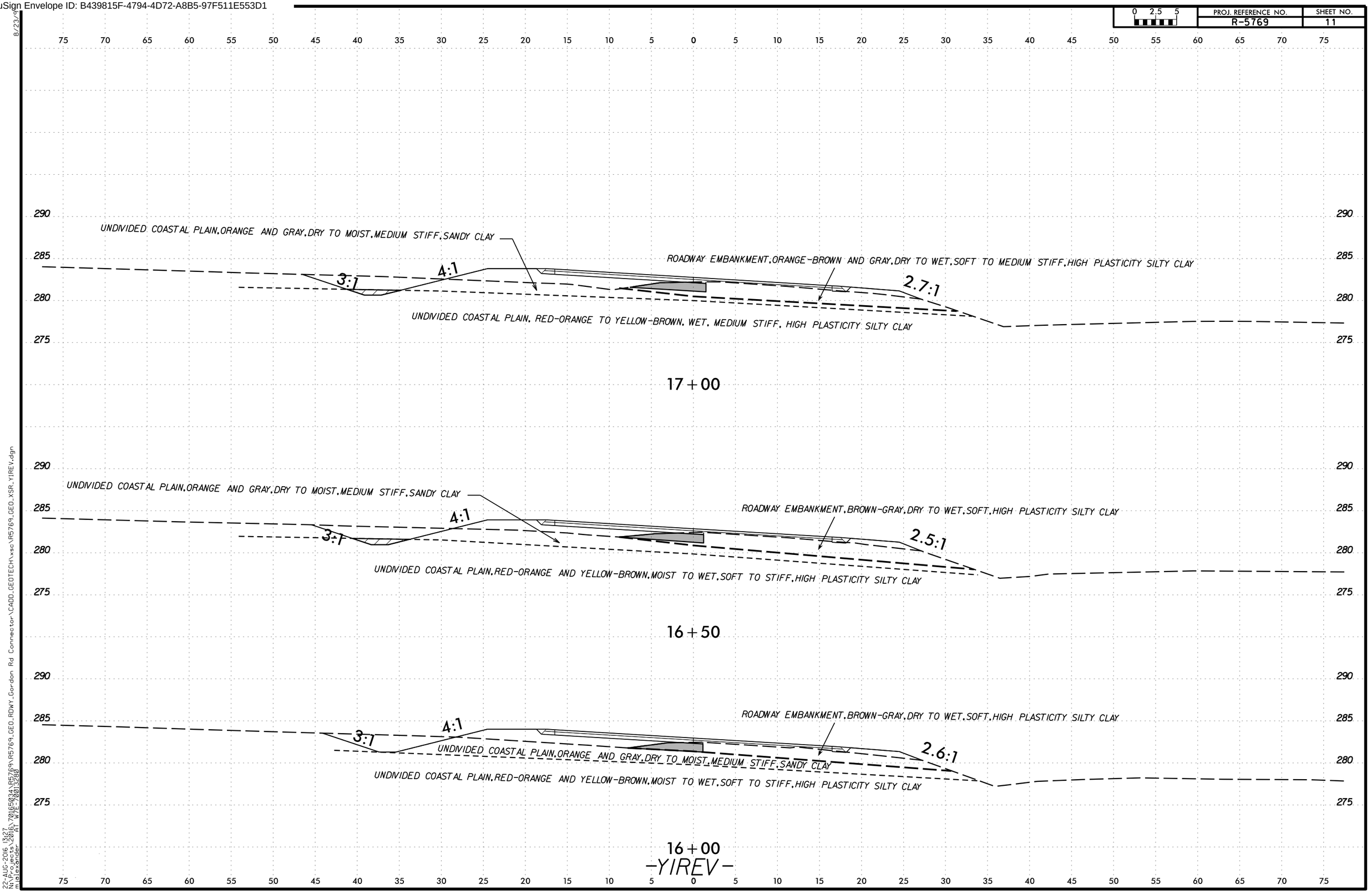

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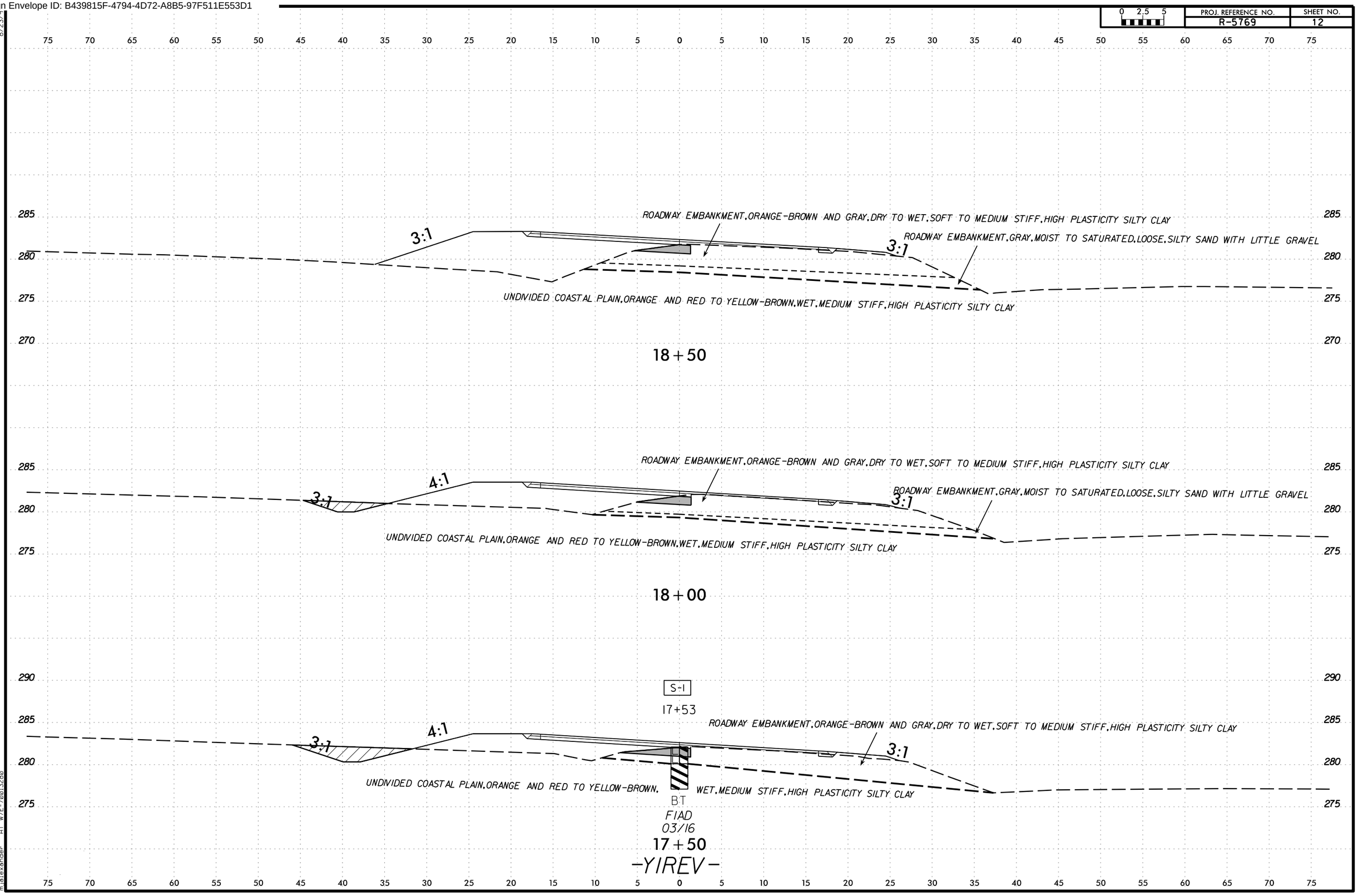

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75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

285
280
275
270

ROADWAY EMBANKMENT, ORANGE-BROWN AND GRAY, DRY TO WET, SOFT TO MEDIUM STIFF, HIGH PLASTICITY SILTY CLAY

3:1

2:1

ROADWAY EMBANKMENT, GRAY, MOIST TO SATURATED, LOOSE, SILTY SAND WITH LITTLE GRAVEL

ALLUVIAL, DARK GRAY, WET, SOFT, SANDY CLAY WITH LITTLE ORGANICS

ALLUVIAL, GRAY, SATURATED, LOOSE, SAND

20+00

290
285
280
275
270
265

19+54

ROADWAY EMBANKMENT, ORANGE-BROWN AND GRAY, DRY TO WET, SOFT TO MEDIUM STIFF, HIGH PLASTICITY SILTY CLAY

ROADWAY EMBANKMENT, GRAY, MOIST TO SATURATED, LOOSE, SILTY SAND WITH LITTLE GRAVEL

3:1

3:1

2:1

ALLUVIAL, DARK GRAY, WET, SOFT, SANDY CLAY WITH LITTLE ORGANICS

BT

ALLUVIAL, GRAY, SATURATED, LOOSE, SAND

FIAD
03/16

19+50

285
280
275
270

ROADWAY EMBANKMENT, ORANGE-BROWN AND GRAY, DRY TO WET, SOFT TO MEDIUM STIFF, HIGH PLASTICITY SILTY CLAY

3:1

3:1

2:1

ROADWAY EMBANKMENT, GRAY, MOIST TO SATURATED, LOOSE, SILTY SAND WITH LITTLE GRAVEL

UNDIVIDED COASTAL PLAIN, ORANGE AND RED TO YELLOW-BROWN, WET, MEDIUM STIFF, HIGH PLASTICITY SILTY CLAY

19+00

-YIREV-

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

8/23/9

22-AUG-2016 13:27
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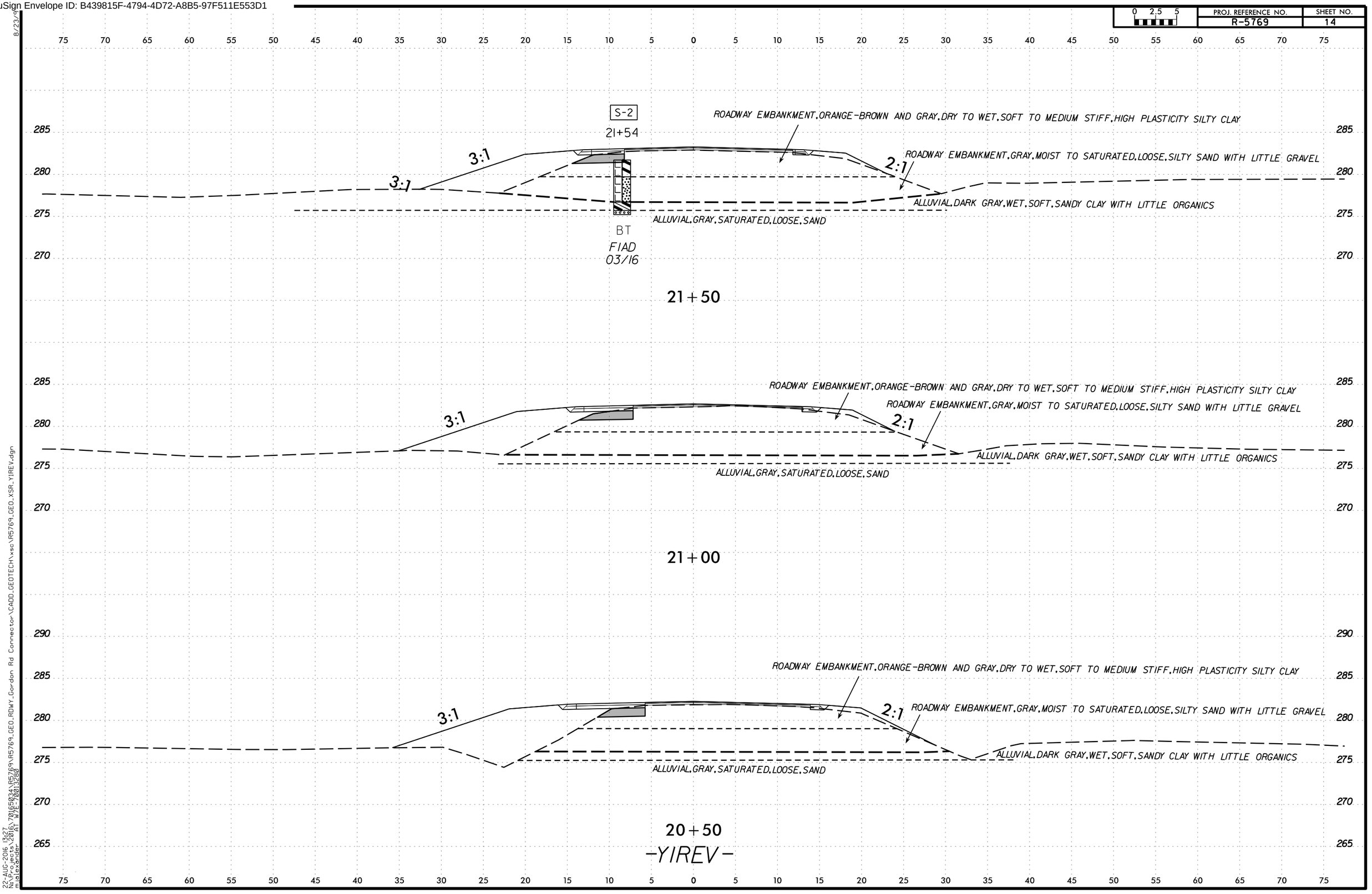

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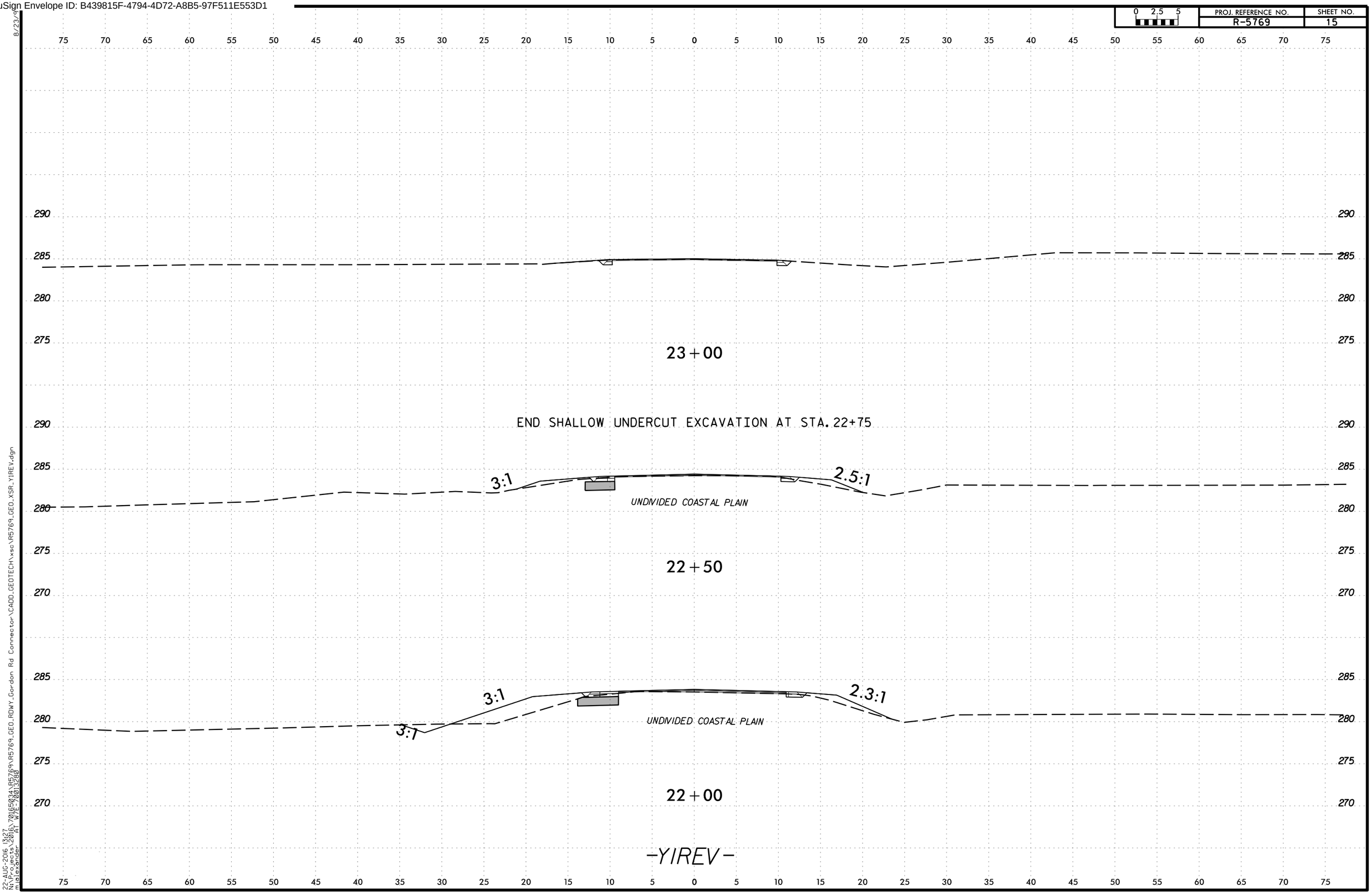

PROJECT REFERENCE NO.	SHEET NO.
R–5769	16

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX A
SOIL LABORATORY RESULTS

REFERENCE: R–5769

PROJECT: N/A

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873–2211 FAX: (919) 873–9555
NC REGISTERED FIRM: F–0869

INITIALS DATE

SOIL LABORATORY TESTING SUMMARY

PROJECT NUMBER: N/A **ID (TIP):** R-5769 **COUNTY:** JOHNSTON

DESCRIPTION: NOVO NORDISK ACCESS ROAD FROM SR 1905 (GORDON ROAD) TO PROPOSED NOVO NORDISK FACILITY

Boring No.	Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic
									Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200		
Y1REV_1753	S-1	-Y1REV-	17+53	CL	1.0 - 2.0	A-7-6 (7)	43	28	34.9	22.4	5.8	36.9	1	96	74	44	19.6	-
Y1REV_2154	S-2	-Y1REV-	21+00	9 LT	1.0 - 2.0	A-7-6 (8)	48	26	23.7	26.1	7.7	42.5	10	83	69	46	17.1	-

ST-1 TESTED BY GEOTECHNICS

Terracon
Consulting Engineers & Scientists

Stephanie H. Huffman
Certified Lab Technician Signature

114-01-1203
Certification Number