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CONTRACT:

ID: B-5239

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

CONTENTS

LINE	STATION	PLAN	PROFILE	XSECT
-L-	10+50 TO 22+00	4	5	7-13
-Y1-	10+85 TO 12+36	4	6	14
-Y2-	10+00 TO 10+75	4	6	N/A
-Y3-	10+15 TO 11+06.44	4	6	15

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

ROADWAY SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 42841.1.1 (B-5239) F.A. PROJ. BRSTP-0087(29)

COUNTY ALAMANCE

PROJECT DESCRIPTION REPLACE BRIDGE NO. 126 OVER MILL RACE ON NC 87 & BRIDGE NO. 119 OVER HAW RIVER ON NC 87

INVENTORY - REVISED

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	42841.1.1 (B-5239)	1	17

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
42841.1.1	BRSTP-0087(29)	P.E.
		R/W & UTIL.

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. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT 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 THIS 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.

PERSONNEL

S. GOWER

W. TRAPP

INVESTIGATED BY D. GOODNIGHT

CHECKED BY T. WELLS

SUBMITTED BY KLEINFELDER

DATE JUNE 2014

NORTH CAROLINA PROFESSIONAL SEAL 37998 ENGINEER THOMAS R. WELLS

DocuSigned by: Thomas R. Wells 7DA5D2D0518F4B0...

DRAWN BY: W. FELDER

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

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

PROJECT REFERENCE NO.	SHEET NO.
42841.1.1 (B-5239)	2 OF 17

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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
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 A 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	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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 / CPT / DMT / VST / PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] CME-55
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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: N/A

ELEVATION: N/A FT.

NOTES: FIAD - FILLED IN AFTER DRILLING

BORING ELEVATIONS OBTAINED USING B5239_LS_TIN.TIN DATED 11/8/13.

REVISED 09/23/09

09/08/99

TIP PROJECT: B-5239

CONTRACT:

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

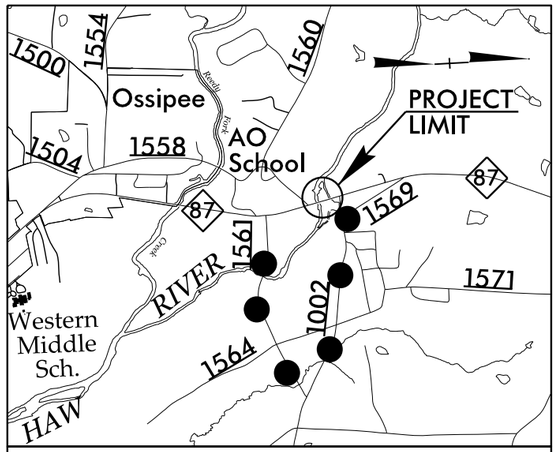
ALAMANCE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5239	2A	17

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
42841.1.1	BRSTP-0087(29)	PE

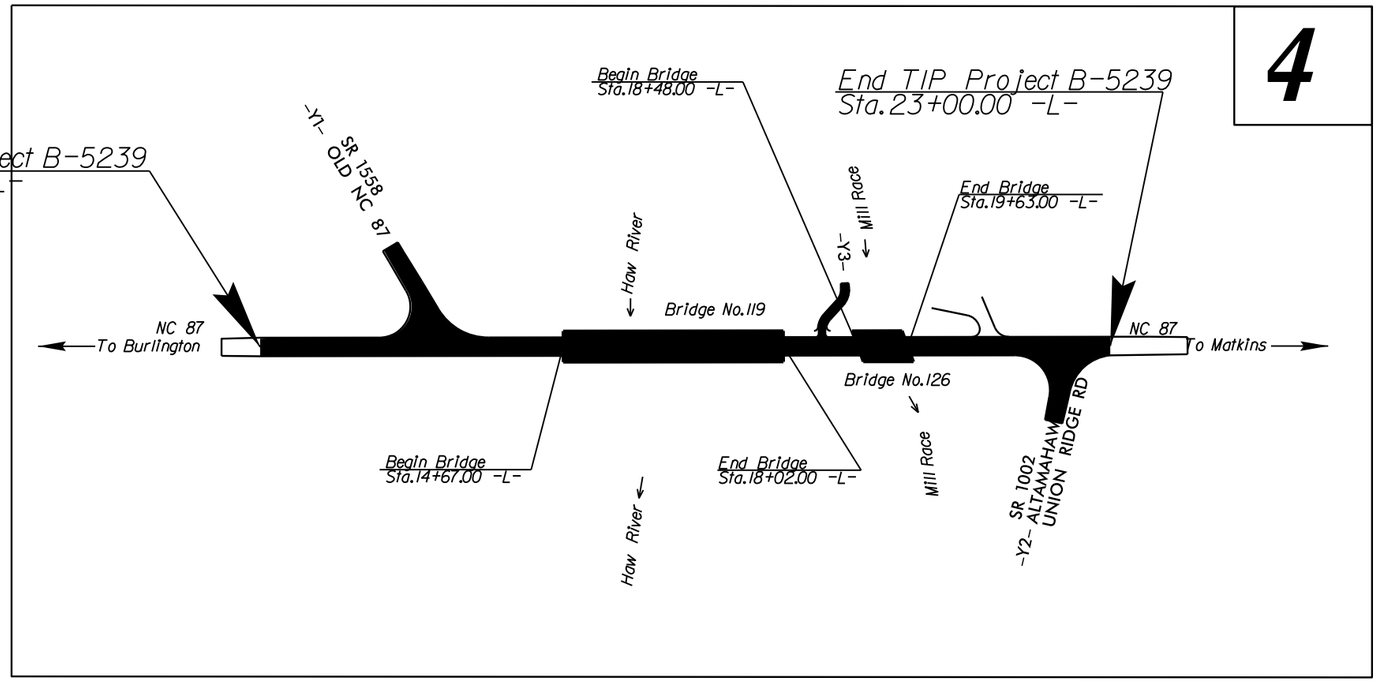
LOCATION: BRIDGE NO. 126 OVER MILL RACE & NO. 119 OVER HAW RIVER ON NC 87

TYPE OF WORK: GRADING, PAVING, DRAINAGE AND STRUCTURES



VICINITY MAP
OFFSITE DETOUR ROUTE

NAD 83/ NSRS 2007



This Project is not within any municipal boundaries.
Clearing on this project shall be performed to the limits established by Method .

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT 2013 = 6850 vpd
ADT 2035 = 8500 vpd
DHV = 10 %
D = 60 %
T = 6 % *
V = 50 MPH
* TTST =2% DUAL 4%
FUNC CLASS =
Principal Arterial
STATEWIDE TIER

PROJECT LENGTH

Length Roadway Tip Project B-5239 = Miles
Length Structure(s) Tip Project B-5239 = Miles
Total Length TIP Project B-5239 = 0.237 Miles

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
March 20, 2015

LETTING DATE:
March 15, 2016

JAMES A. SPEER, PE
PROJECT ENGINEER

JOHN LANSFORD, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

June 11, 2014
File No. 137891 | GSO14R0111

STATE PROJECT: 42841.1.1 (B-5239)
FEDERAL PROJECT: BRSTP-0087 (29)
COUNTY: Alamance
DESCRIPTION: Replace Bridge 126 over Mill Race on NC 87 & Bridge 119 over Haw River on NC 87

SUBJECT: Geotechnical Report – Inventory - REVISED

PROJECT DESCRIPTION

The project is located in northwestern Alamance County, North Carolina. This project consists of the reconstruction of 0.21 miles of NC Highway 87 (-L-) which is a two-lane roadway Also proposed is the reconstruction of the intersection with Old NC 87 (-Y1-), Altamahaw Union Ridge Road (-Y2-), and -Y3- which are approximately 151, 75, and 56 feet, respectively.

The geotechnical investigation was conducted during December 2013. One drill machine, a CME 55 with an automatic hammer, was used during the investigation. Standard Penetration Tests were performed at selected locations. Representative soil samples were collected in the field for laboratory analysis by Kleinfelder Southeast, Inc.

The following alignments, totaling 0.26 mile, were investigated. Profiles and cross sections of these alignments are included in this report.

LINE	STATIONS
-L-	10+50 to 23+00
-Y1-	10+85 to 12+36
-Y2-	10+00 to 10+75
-Y3-	10+15 to 11+06.44

AREAS OF SPECIAL GEOTECHNICAL INTEREST

High Plasticity Soils: The following locations were found to have soils with a plasticity index greater than 25.

LINE	STATIONS	OFFSET
-L-	10+50 to12+80	LT to RT
-L-	14+00	LT
-L-	19+90 to 20+50	LT to RT
-L-	20+60 to 21+70	LT

Alluvial Soils: The following location was found to have very soft to soft alluvial soils.

LINE	STATIONS	OFFSET
-L-	17+80 to 18+70	RT

Ponds: One pond is located within the close proximity of the right of way on this project. This was noted at the following location.

LINE	STATIONS	OFFSET
-L-	18+00 to 20+80	100 RT to 330 RT

PHYSIOGRAPHY AND GEOLOGY

The project is located in the Piedmont Physiographic Province. The project corridor is comprised primarily of residential and industrial properties. The general topography of the site consists of rolling hills with flat to moderate slopes along the existing roadways.

Geologically, the project is located within the Carolina Slate Belt based on the 1985 Geologic Map on North Carolina. Soils are derived from the underlying bedrock which consists of late Proterozoic to late Cambrian age metamorphic rocks generally consisting of metavolcanic rock. The overlying residual soils are the product of the physical and chemical weathering of the underlying Crystalline rock.

SOIL PROPERTIES

Soils encountered during this investigation are separated into five categories based on origin. They consist of roadway embankment, alluvial, residual soils, weathered rock, and crystalline rock.

Roadway Embankment soils are present along the existing roadway (-L-) to depths ranging from 2.5 to 3.0 feet below the existing ground surface in the project. These soils consist of moist, low plasticity, stiff, tan, sandy silts (A-4).

Alluvial soils are soils that have been transported and deposited by water; these soils are present along a portion of the existing roadway (-L-) to a depth of 5.5 feet below the existing ground surface. The alluvial soils encountered consist of wet, low plasticity, soft to very soft, tan and gray, sandy silts (A-4). The plasticity index of the alluvial soils tested was 8.

Residual soils are present along the existing roadways (-L-, -Y1-, and -Y3-) in the project. Residual soils are derived from the weathering of the underlying metavolcanic rock. The majority of these soils consist of moist to wet, low to high plasticity, soft to stiff, red-brown and red-tan, sandy, silty clays (A-6 and A-7-5) and moist, low plasticity, tan-brown, gray-brown, red-brown, red-tan, and green, sandy silts (A-4, A-5). Minor amounts of moist, non-plastic, medium dense, tan, silty sand (A-2-4). The plasticity index of the residual soils tested ranged from 18 to 29.

Weathered rock was encountered along the existing roadways (-L- and -Y1-) at elevations ranging from 613.0 to 596.0 feet (MSL). The weathered rock consists of tan and gray-green metavolcanic rock.

Crystalline rock was encountered along the existing roadways (-L- and -Y1-) at elevations ranging from 608.0 to 594.7 feet (MSL). The crystalline rock consists of metavolcanic rock.

GROUNDWATER

Groundwater was encountered at several locations along the existing roadways (-L- and-Y1-) at elevations ranging from 613.3 to 590.0 feet (MSL).

PONDS

One pond is located near the project right of way and will be impacted by construction. This pond is listed by alignment, station, and offset in the “Areas of Special Geotechnical Interest”.

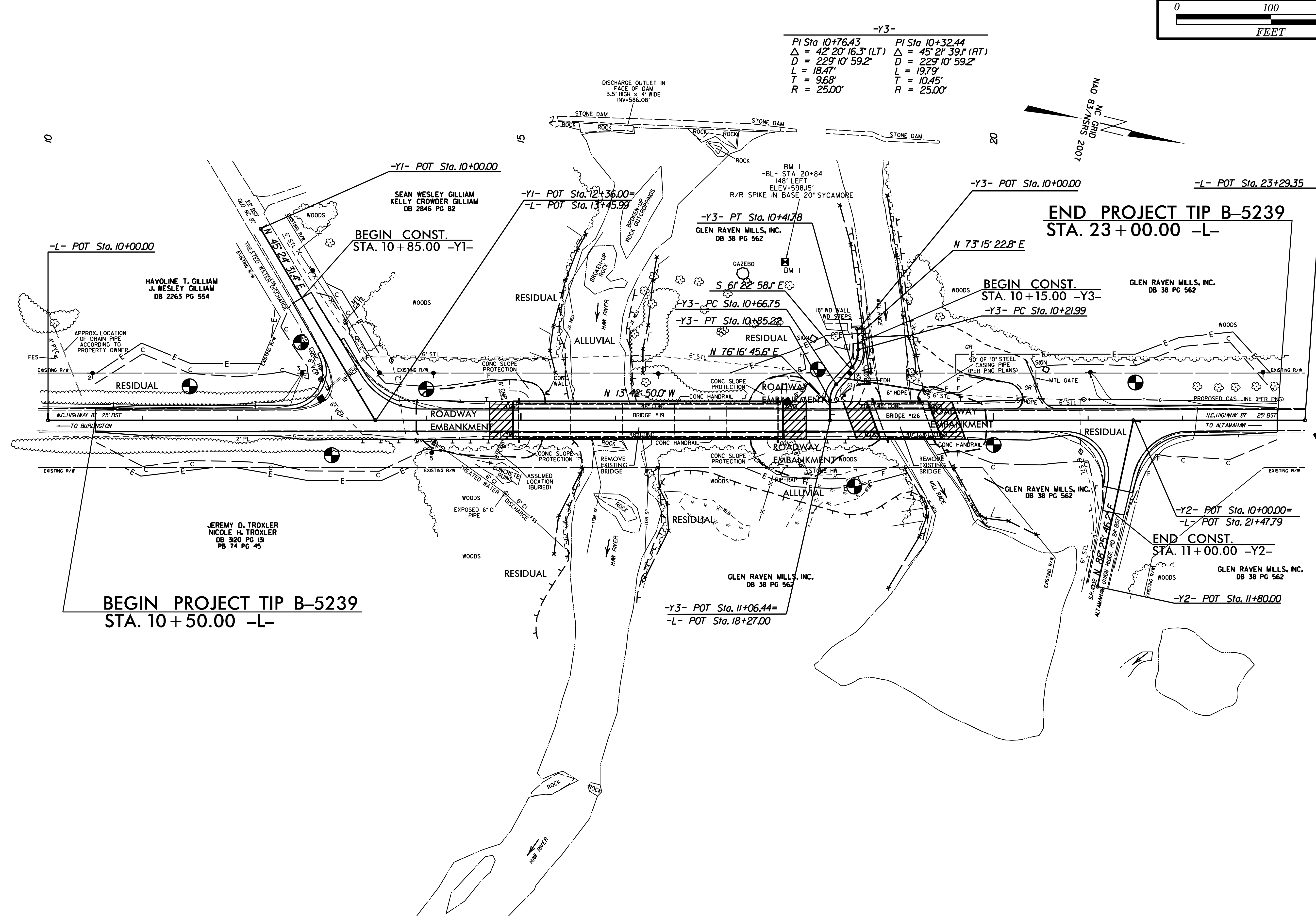
Prepared by,

Thomas R. Wells, P.E.
Senior Professional

Xavier C. Barrett, P.E.
Principal Professional

PROJECT REFERENCE NO.	SHEET
42841.1.1 (B–5239)	4

SITE PLAN

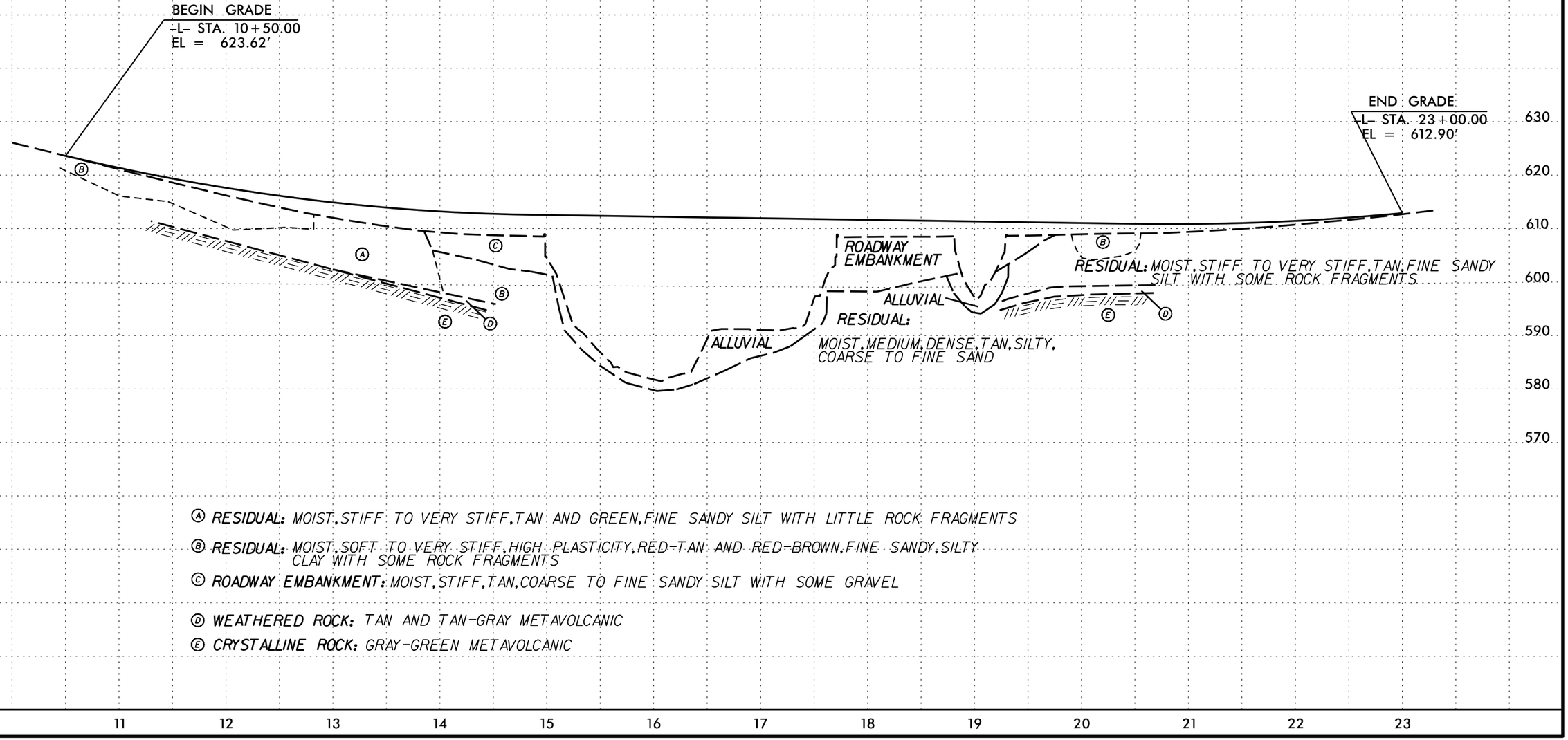


51499

PROJECT REFERENCE NO.	SHEET NO.
B-5239	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-L-



Ⓐ **RESIDUAL:** MOIST, STIFF TO VERY STIFF, TAN AND GREEN, FINE SANDY SILT WITH LITTLE ROCK FRAGMENTS

Ⓑ **RESIDUAL:** MOIST, SOFT TO VERY STIFF, HIGH PLASTICITY, RED-TAN AND RED-BROWN, FINE SANDY, SILTY CLAY WITH SOME ROCK FRAGMENTS

Ⓒ **ROADWAY EMBANKMENT:** MOIST, STIFF, TAN, COARSE TO FINE SANDY SILT WITH SOME GRAVEL

Ⓓ **WEATHERED ROCK:** TAN AND TAN-GRAY METAVOLCANIC

Ⓔ **CRYSTALLINE ROCK:** GRAY-GREEN METAVOLCANIC

51499

PROJECT REFERENCE NO.	SHEET NO.
B-5239	6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

–Y1–

BEGIN GRADE
–Y1– STA. 10+85.00
EL = 616.43'

END GRADE
–Y1– STA. 12+22.02 =
–L– STA. 13+38.81, 12' OFF. LT
EL = 613.89'

RESIDUAL: MOIST, MEDIUM STIFF TO STIFF, BROWN, FINE SANDY SILT

WEATHERED ROCK: GRAY-GREEN METAVOLCANIC

CRYSTALLINE ROCK: METAVOLCANIC

–Y2–

BEGIN GRADE
–Y2– STA. 10+12.27
–L– STA. 21+45.21, 12' OFF. RT
EL = 610.77'

END GRADE
–Y2– STA. 10+75.00
EL = 609.23'

–Y3–

BEGIN GRADE
–Y3– STA. 10+15.00
EL = 609.19'

END GRADE
–Y3– STA. 10+94.40
–L– STA. 18+27.00, 12' OFF. LT
EL = 611.32'

ROADWAY EMBANKMENT

RESIDUAL: MOIST, MEDIUM STIFF TO VERY STIFF, RED-BROWN, SILTY, COARSE TO FINE SANDY, CLAY AND TAN, COARSE TO FINE SANDY SILT WITH SOME ROCK FRAGMENTS

RESIDUAL: MOIST, MEDIUM DENSE TO DENSE, TAN, SILTY, COARSE TO FINE SAND

620 610 600 590 580 570 560 550 540 530 520

10 11 12 13

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	7

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

630 625 620 615

RESIDUAL: MOIST, SOFT TO STIFF, HIGH PLASTICITY, RED-TAN, FINE SANDY, SILTY CLAY WITH SOME ROCK FRAGMENTS

RESIDUAL: MOIST, STIFF TO VERY STIFF, TAN AND GREEN, FINE SANDY SILT WITH LITTLE ROCK FRAGMENTS

3 13 8 17 60/0.1

12/13

2:1 4:1 4:1 2:1

CRYSTALLINE ROCK: GRAY-GREEN METAVOLCANIC

11+50.00

630 625 620 615

3:1 4:1 4:1 3:1

RESIDUAL: MOIST, SOFT TO STIFF, HIGH PLASTICITY, RED-TAN, FINE SANDY, SILTY CLAY WITH SOME ROCK FRAGMENTS

RESIDUAL: MOIST, STIFF TO VERY STIFF, TAN AND GREEN, FINE SANDY SILT WITH LITTLE ROCK FRAGMENTS

11+00.00

635 630 625 620 615

RESIDUAL: MOIST, SOFT TO STIFF, HIGH PLASTICITY, RED-TAN, FINE SANDY, SILTY CLAY WITH SOME ROCK FRAGMENTS

RESIDUAL: MOIST, STIFF TO VERY STIFF, TAN AND GREEN, FINE SANDY SILT WITH LITTLE ROCK FRAGMENTS

10+50.00

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

-L-

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

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	8

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

615
610
605

4:1 4:1 4:1 2:1

RESIDUAL: MOIST, SOFT TO STIFF, HIGH PLASTICITY, RED-TAN, FINE SANDY, SILTY CLAY WITH SOME ROCK FRAGMENTS

RESIDUAL: MOIST, STIFF TO VERY STIFF, TAN AND GREEN, FINE SANDY SILT WITH LITTLE ROCK FRAGMENTS

12 + 50.00

620
615
610

3:1 4:1 4:1 2:1

RESIDUAL: MOIST, SOFT TO STIFF, HIGH PLASTICITY, RED-TAN, FINE SANDY, SILTY CLAY WITH SOME ROCK FRAGMENTS

RESIDUAL: MOIST, STIFF TO VERY STIFF, TAN AND GREEN, FINE SANDY SILT WITH LITTLE ROCK FRAGMENTS

12 + 35.44

620
615
610
605

2:1 4:1 4:1 2:1

RESIDUAL: MOIST, SOFT TO STIFF, HIGH PLASTICITY, RED-TAN, FINE SANDY, SILTY CLAY WITH SOME ROCK FRAGMENTS

RESIDUAL: MOIST, STIFF TO VERY STIFF, TAN AND GREEN, FINE SANDY SILT WITH LITTLE ROCK FRAGMENTS

12 + 00.00

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

$-\mathit{L}-$

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

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	9

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

615 610 605

SS-1

2:1

2:1

ROADWAY EMBANKMENT MOIST, STIFF, TAN, COARSE TO FINE SANDY SILT WITH SOME GRAVEL

11
6
7
22

RESIDUAL: MOIST, MEDIUM STIFF TO VERY STIFF, HIGH PLASTICITY, RED-BROWN, FINE SANDY, SILTY CLAY

WEATHERED ROCK: 60/0.0 TAN METAVOLCANIC

DRY

CRYSTALLINE ROCK: 12/13 METAVOLCANIC

14+00.00

615 610 605

4:1

4:1

2:1

7
8
6
13
4

RESIDUAL: MOIST, MEDIUM STIFF AND STIFF, TAN-BROWN TO GRAY TAN, FINE SANDY SILT

DRY
12/13

13+00.00

615 610 605

4:1

4:1

4:1

2:1

RESIDUAL: MOIST, SOFT TO STIFF, HIGH PLASTICITY, RED-TAN, FINE SANDY, SILTY CLAY WITH SOME ROCK FRAGMENTS

RESIDUAL: MOIST, STIFF TO VERY STIFF, TAN AND GREEN, FINE SANDY SILT WITH LITTLE ROCK FRAGMENTS

12+74.46

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

$-L-$

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

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	10

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

620
615
610
605
600
595
590

2:1

ROADWAY EMBANKMENT

2:1

Ⓐ ALLUVIAL:
WET, SOFT TO VERY SOFT, TAN AND GRAY, CLAYEY, COARSE TO FINE SANDY SILT

Ⓐ

RESIDUAL: MOIST, MEDIUM DENSE TAN, SILTY, COARSE TO FINE SAND

WEATHERED ROCK: TAN METAVOLCANIC

18+00.00

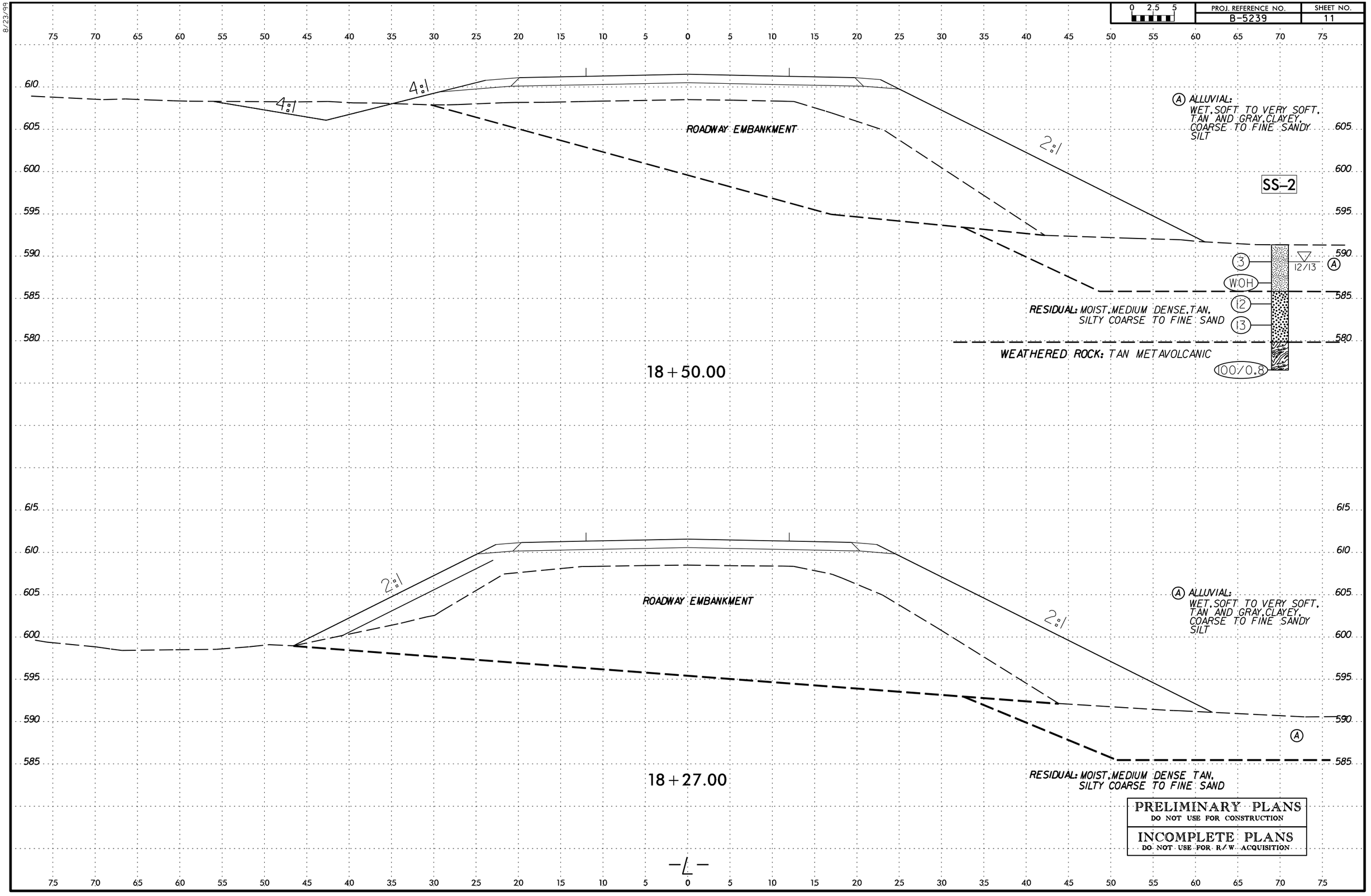
—℄—

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	11



PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	12

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

610 605 600 595

4:1 4:1 4:1

RESIDUAL: MOIST, MEDIUM STIFF, HIGH PLASTICITY, RED-BROWN, FINE SANDY, SILTY CLAY

RESIDUAL: MOIST, STIFF TO VERY STIFF, TAN, FINE SANDY SILT WITH SOME ROCK FRAGMENTS

20+37.85

615 610 605 600 595

SS-3

2:1 4:1 4:1 4:1

RESIDUAL: MOIST, MEDIUM STIFF, HIGH PLASTICITY, RED-BROWN, FINE SANDY, SILTY CLAY

RESIDUAL: MOIST, STIFF TO VERY STIFF, TAN, FINE SANDY SILT WITH SOME ROCK FRAGMENTS

5 9 24

WEATHERED ROCK: TAN-GRAY METAVOLCANIC

60/0.0 DRY

12/13

CRYSTALLINE ROCK: GRAY-GREEN METAVOLCANIC

20+00.00

610 605 600 595

2:1 2:1

ROADWAY EMBANKMENT

RESIDUAL: MOIST, MEDIUM STIFF, HIGH PLASTICITY, RED-BROWN, FINE SANDY, SILTY CLAY

19+50.00

$-\mathit{L}-$

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

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	13

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

620 615 610 605 620

RESIDUAL: MOIST, MEDIUM STIFF, HIGH PLASTICITY, RED-BROWN, FINE SANDY, SILTY CLAY

RESIDUAL: MOIST, MEDIUM STIFF TO VERY STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT TO RED-TAN TO TAN, FINE SANDY SILT

2:1 4:1 4:1 3:1

(8) (8) (6) (7) (8) (19)

DRY
12/13

21+50.00

620 615 610 605 600

RESIDUAL: MOIST, MEDIUM STIFF TO VERY STIFF, HIGH TO LOW PLASTICITY, RED-BROWN, RED-TAN TO TAN, COARSE TO FINE SANDY, SILTY CLAY TO CLAYEY, FINE SANDY SILT

2:1 4:1 4:1 4:1

21+00.00

615 610 605 600

RESIDUAL: MOIST, MEDIUM STIFF, HIGH PLASTICITY, RED-BROWN, FINE SANDY, SILTY CLAY

RESIDUAL: MOIST, STIFF TO VERY STIFF, TAN, FINE SANDY SILT WITH SOME ROCK FRAGMENTS

2:1 4:1 4:1 4:1

20+50.00

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

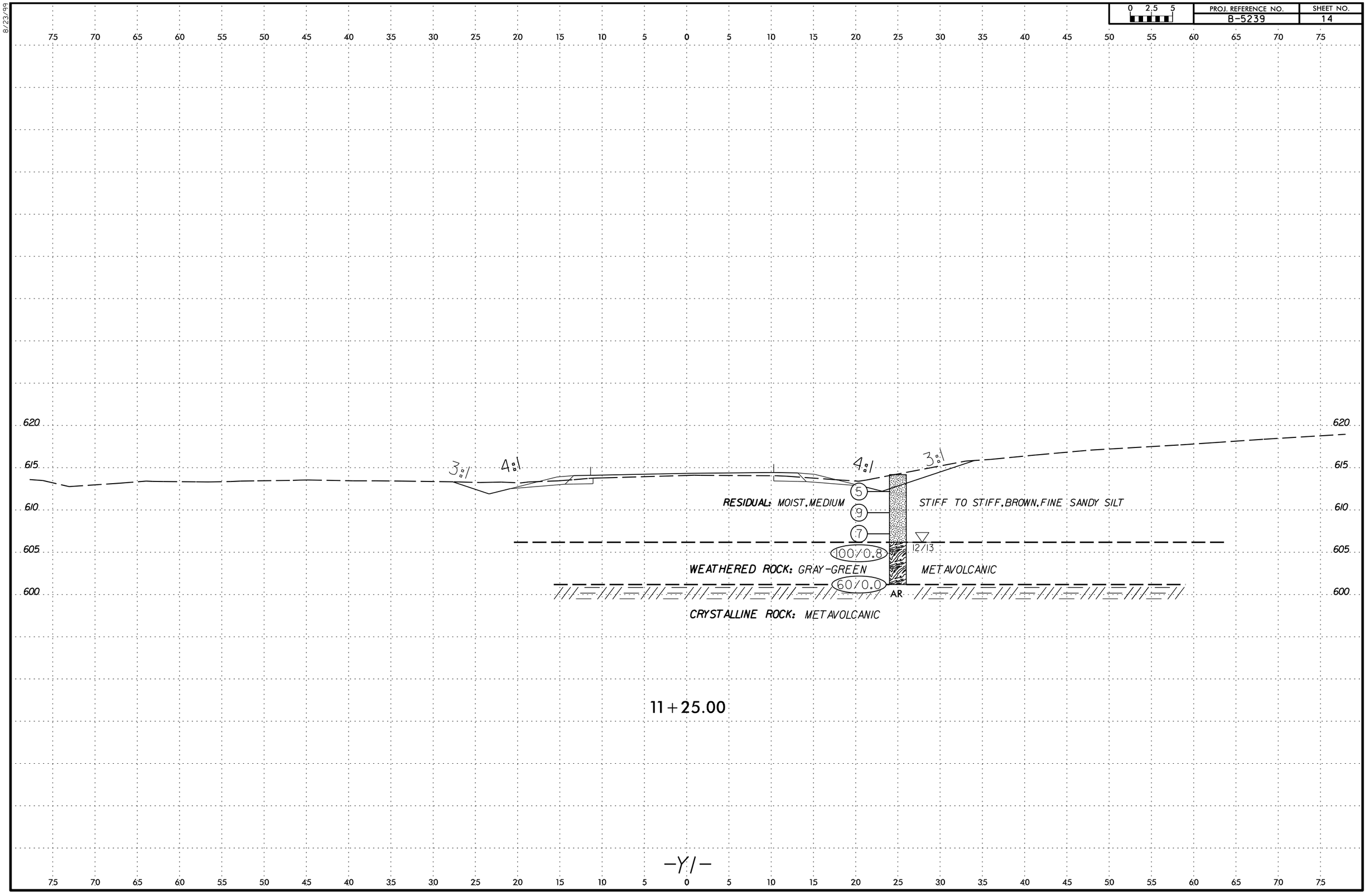
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

$-L-$

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

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	14



8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	15

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

610
605
600
595
590

10+67

SS-4

3:1

3:1

ROADWAY EMBANKMENT

6
29
5
11
28
45

RESIDUAL: MOIST, MEDIUM STIFF TO VERY STIFF, RED BROWN, SILTY, COARSE TO FINE SANDY, CLAY AND TAN, COARSE TO FINE SANDY SILT WITH SOME ROCK FRAGMENTS

RESIDUAL: MOIST, MEDIUM DENSE TO DENSE, TAN, SILTY, COARSE TO FINE SAND

10+66.75

DRY
12/13

-Y3-

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

SUMMARY OF LABORATORY TEST DATA

PROJECT NO. 42841.1.1 (B-5239)
FA NO. BRSTP-0087 (29)
COUNTY: ALAMANCE
REPLACE BRIDGE 126 OVER MILL RACE ON NC 87 & BRIDGE 119 OVER HAW RIVER ON NC 87

									Atterberg Limits			Gradation Results							
Boring Number	Alignment	Station	Offset	Sample Depth (ft.)	Sample No.	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ ft.)	L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
L_1400	-L-	14+00	33' LT	3.5 - 5.0	SS-1	45.5	A-7-5 (30)	6	59	30	29	99	96	88	14	4.0	9.5	28.7	57.8
L_1850	-L-	18+50	70' RT	1.0 – 2.5	SS-2	25.5	A-4 (1)	3	27	19	8	99	81	48	56	27.5	28.2	22.5	21.8
L_2000	-L-	20+00	26' RT	1.0 – 2.5	SS-3	34.3	A-7-5 (25)	5	53	25	28	99	96	84	20	5.6	14.6	30.1	49.7
Y4_1000	-Y4-	10+00	25' RT	1.0 – 2.5	SS-4	27.2	A-6 (4)	5	40	22	18	86	61	44	52	36.0	16.3	21.5	26.2

SS = Split-Barrel Sample (ASTM-D-1586) ST = Shelby Tube (Undisturbed) Sample
S = Grab Sample
NP -- Non Plastic NA-- Non Applicable

Page: 1 of 1

Lab Technician: NCDOT Certification No.: 111-06-1203

Rhonda K. Hudson

Rhonda Hudson

REFERENCE: B-5239

PROJECT: 42841

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

CONTENTS

LINE	STATION	PLAN	PROFILE
-LDET-	11+11.74 TO 23+78.13	4	5
-YIDET-	11+20.00 TO 12+68.06	4	5
-Y2DET-	10+11.25 TO 10+88.00	4	5
-DRV-	9+76.32 TO 11+40.00	4	6

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	11+00 TO 12+00	7-8
-L-	11+00 TO 12+74	9-13
-L-	16+50 TO 25+00	14-24
-YIDET-	11+00 TO 11+50	25-25
-Y2DET-	10+50 TO 11+00	26-26
-DRV-	10+30 TO 11+40	27-29

APPENDICES

APPENDIX	TITLE	SHEETS
A	LABORATORY RESULTS	30-31

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *ALAMANCE*

PROJECT DESCRIPTION *BRIDGE NO. 126 OVER MILL RACE ON NC 87 & BRIDGE NO. 119 OVER HAW RIVER*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5239	1	33

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

B. JOHNSON

J. CAIN

P. DEWIRE

T. WELLS

INVESTIGATED BY *B. JOHNSON*

DRAWN BY *B. JOHNSON*

CHECKED BY *X. BARRETT*

SUBMITTED BY *KLEINFELDER, INC.*

DATE *MAY 2016*

NC REGISTERED FIRM LICENSE NO. F-1132

NORTH CAROLINA PROFESSIONAL SEAL 015741 ENGINEER XAVIER C. BARRETT

DocuSigned by:
Xavier C. Barrett 6/30/2016
2D00374FA68B417...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
B-5239	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] D-50
- [X] B-57

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] 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:

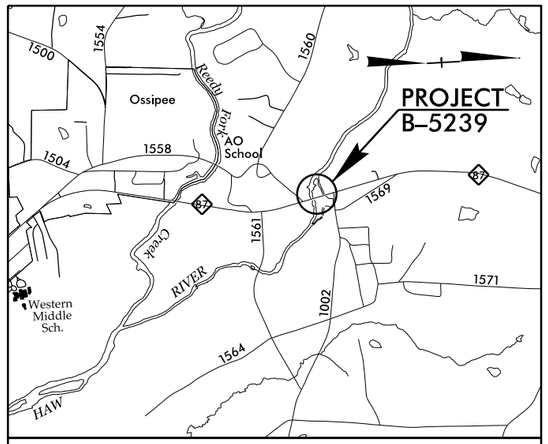
TOP OF BORING ELEVATIONS OBTAINED FROM PROVIDED PROJECT TIN FILE (B5239_LS_TIN.TIN, DATED DECEMBER 21, 2015)

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

TIP PROJECT: B–5239

CONTRACT:



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

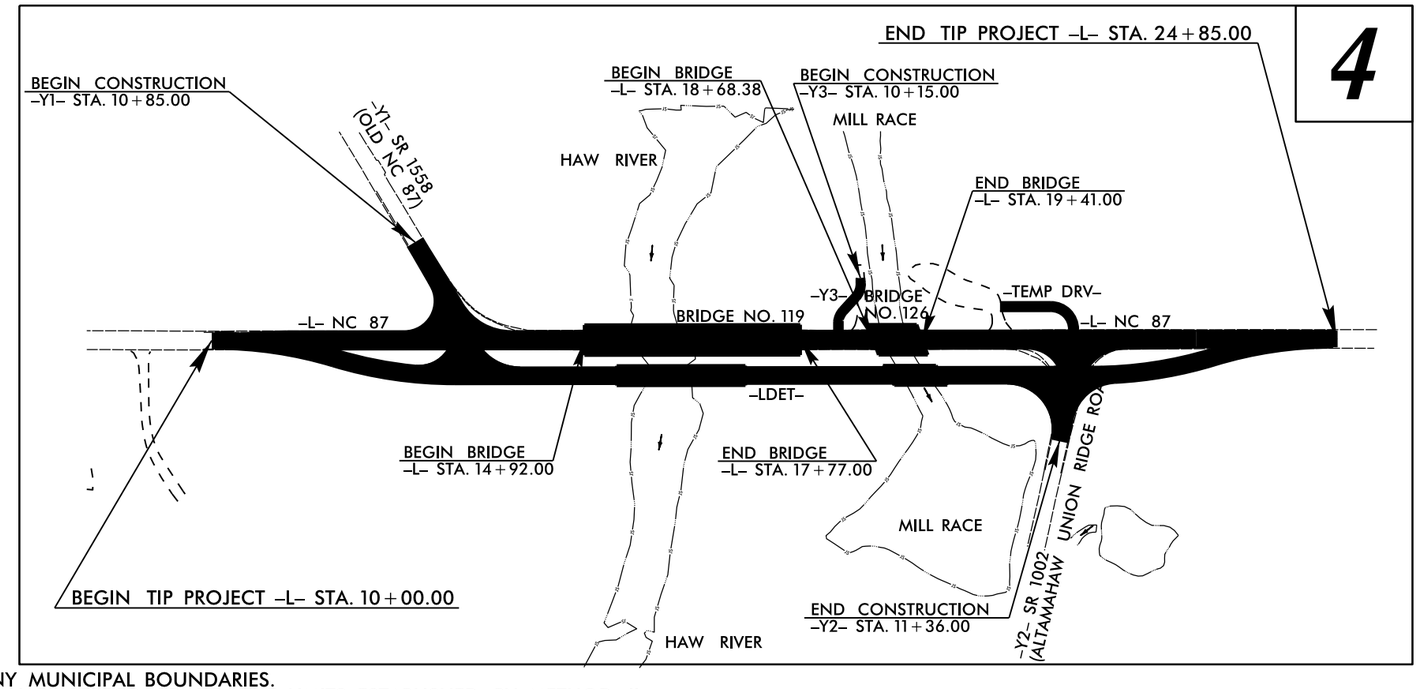
ALAMANCE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B–5239	2A	33
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
42841.1.1	BRSTP–0087(29)	PE	

LOCATION: BRIDGE NO. 126 OVER MILL RACE & NO. 119 OVER HAW RIVER ON NC 87

TYPE OF WORK: GRADING, PAVING, DRAINAGE AND STRUCTURES

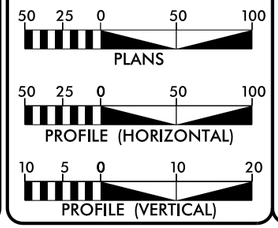
NAD 83/
NSRS 2007



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

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

GRAPHIC SCALES



DESIGN DATA

ADT 2017 = 7150
ADT 2035 = 8500
K = 10 %
D = 60 %
T = 6 % *
V = 50 MPH
V_{DET} = 40 MPH
* TTST = 2% DUAL = 4%
FUNC CLASS =
PRINCIPAL ARTERIAL
"STATEWIDE TIER"

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B–5239 = 0.213 MILES
LENGTH STRUCTURES TIP PROJECT B–5239 = 0.068 MILES
TOTAL LENGTH TIP PROJECT B–5239 = 0.281 MILES

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
DECEMBER 16, 2016

LETTING DATE:
DECEMBER 19, 2017

JAMES A. SPEER, PE
PROJECT ENGINEER

DANIEL W GARDNER, JR, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

May 24, 2016
File No. 20151548.020A

STATE PROJECT: 42841.1.1 (B-5239)
COUNTY: Alamance
DESCRIPTION: Bridge No. 126 over Mill Race on NC 87 & Bridge No. 119 over Haw River

SUBJECT: GEOTECHNICAL REPORT - INVENTORY

PROJECT DESCRIPTION

This project consists of the construction of the detour roadway and bridges on NC 87 (-LDET-), Old NC 87 (-Y1DET-), Altamahaw Union Ridge Road (-Y2DET-) and a temporary drive (-DRV-).

The geotechnical investigation was conducted during March of 2015. Data was reviewed from a previous investigation from December 2013. Standard Penetration Test borings were advanced with a CME 550X and a Diedrich D-50. Both drill machines utilized automatic hammers. Representative soil samples were collected for visual classification in the field and selected samples were submitted for laboratory analysis by Kleinfelder, Inc.

The following alignments, totaling approximately 0.3 miles, were investigated. Subsurface profiles and cross sections of these alignments are included in this report.

LINE	STATIONS
-LDET-	10+00 to 24+85
-Y1DET-	10+85 to 12+68
-Y2DET-	10+11 to 10+88
-DRV-	9+76 to 11+40

AREAS OF SPECIAL GEOTECHNICAL INTEREST

1) Highly Plastic Clays: Highly plastic clays (PI > 25) were encountered on the project at the following locations:

LINE	STATIONS	OFFSETS
-LDET-	17+95 to 18+60	LT to RT
-LDET-	19+75 to 20+50	LT to RT
-DRV-	10+35 to 11+30	RT

A discussion of these highly plastic clay soils is located below in the section titled “Soil Properties”.

2) Artificial Fill: Artificial fill comprised of concrete ruins, was encountered on the project at the following location:

LINE	STATIONS	OFFSETS
-LDET-	14+20 to 15+00	LT to RT

3) Ponds: One pond is located within the close proximity of the right of way on this project with an attached mill race that feeds into the pond. This was noted at the following location:

LINE	STATIONS	OFFSET
-LDET-	18+00 to 20+80	50 RT to 280 RT

PHYSIOGRAPHY AND GEOLOGY

The project is located in the Piedmont Physiographic Province. The project corridor is comprised primarily of residential and business properties. The general topography of the site consists of rolling hills with flat to steep slopes along the existing roadway.

Geologically, the project is located within the Carolina Slate Belt based on the 1985 Geologic Map on North Carolina. Soils are derived from the underlying bedrock which consists of late Proterozoic to late Cambrian age metamorphic rocks generally consisting of metavolcanic rock. The overlying residual soils are the product of the physical and chemical weathering of the underlying Crystalline rock.

SOIL PROPERTIES

Soils encountered during this investigation are separated into five categories based on origin. They consist of roadway embankment, alluvial, residual soils, weathered rock, and crystalline rock.

Roadway Embankment soils are present along the proposed roadways (-LDET-, -Y2DET-, and –DRV-) to depths ranging from 0 to 4.0 feet below the existing ground surface in the project. These soils consist of moist, non-plastic to moderately plastic, medium stiff, light brown to dark brown, clayey, fine to coarse sandy silts (A-4), and fine sandy, silty clays (A-6). The plasticity index of the residual soils tested ranged from 3 to 5.

Alluvial soils are soils that have been transported and deposited by water; these soils are present along a portion of the proposed roadway (-LDET-) to a depth of 8 feet below the existing ground surface. The alluvial soils encountered consist of moist, non plastic to highly plastic, very soft to medium stiff, orange-tan-white-brown, silty, fine to coarse sands (A-4) to fine sandy clays (A-7-6).

Residual soils are present along the proposed roadways (-LDET-, -Y1DET-, -Y2DET-, and -DRV-) in the project. Residual soils are derived from the weathering of the underlying metavolcanic rock. The majority of these soils consist of moist, slightly to highly plastic, soft to hard, sandy, silty clays to sandy clayey silts (A-4, A-6 and A-7-5) and moist, non plastic to low plastic, loose to very dense, silty, fine to coarse sands to clayey, fine to coarse sands (A-2-4 and A-2-6). The plasticity index of the residual soil tested was 15.

Weathered rock was encountered along the proposed roadways (-LDET- and -Y1DET-) at elevations ranging from 578.0 to 606.3 feet (MSL). The weathered rock consists of gray to white-tan metamorphosed granite.

Crystalline rock was encountered along the existing roadways (-LDET- and -Y1DET-) at elevations ranging from 583.8 to 601.25 feet (MSL). The crystalline rock consists of metamorphosed granite.

GROUNDWATER

Groundwater was encountered at several locations along the existing roadways (-LDET- and-Y1DET-) at elevations ranging from 579.0 to 611.9 feet (MSL). Groundwater may fluctuate with seasonal precipitation.

PONDS

One pond is located near the project right of way and will be impacted by construction. This pond is listed by alignment, station, and offset in the “Areas of Special Geotechnical Interest”.

Prepared by,

DocuSigned by:
Benjamin A. Johnson
6B3F37F997254E1...

Benjamin A. Johnson, EI
Staff Professional

DocuSigned by:
Xavier C. Barrett
2D00374FA68B407...

Xavier C. Barrett, PE
Principal Professional

BAJ/XCB:cas

PROJECT REFERENCE NO.	SHEET NO.
B-5239	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
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FEET

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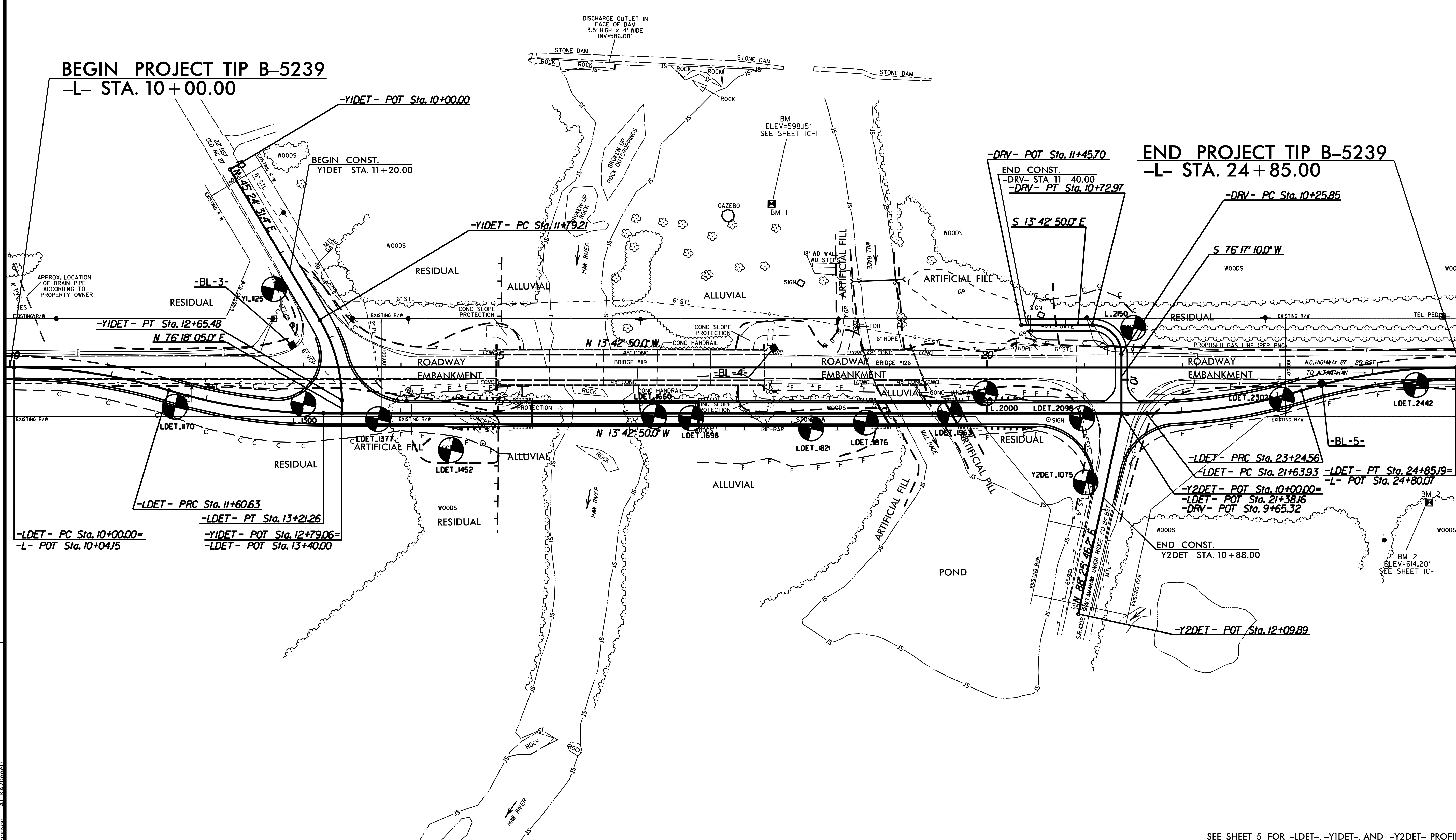

SEE SHEET 5 FOR -LDET-, -Y1DET-, AND -Y2DET- PROFILE
SEE SHEET 6 FOR -DRV- PROFILE

REVISIONS

8/17/99

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PROJECT REFERENCE NO.	SHEET NO.
B-5239	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

-LDET-

(A) RESIDUAL: MOIST, SOFT, SLIGHTLY PLASTIC TO MODERATELY PLASTIC, ORANGE, SILTY CLAY

(B) RESIDUAL: MOIST, SLIGHTLY PLASTIC TO NON PLASTIC, MEDIUM DENSE TO VERY DENSE, ORANGE-BROWN TO WHITE-TAN-ORANGE, SILTY, FINE TO COARSE SAND

(C) RESIDUAL: MOIST, SLIGHTLY PLASTIC TO MODERATELY PLASTIC, SOFT TO STIFF, BROWN-RED TO DARK BROWN, FINE SANDY, SILTY CLAY WITH LITTLE GRAVEL TO SILTY, FINE SANDY CLAY

(D) ARTIFICIAL FILL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF TO STIFF, DARK BROWN, FINE SANDY, SILTY CLAY WITH SOME LARGE CONCRETE FRAGMENTS

(E) WEATHERED ROCK: GRAY TO WHITE-TAN METAMORPHOSED GRANITE

(F) ALLUVIAL: MOIST, NON PLASTIC, VERY SOFT TO MEDIUM STIFF, DARK BROWN, SILTY, FINE TO COARSE SAND WITH TRACE ROCK FRAGMENTS

(G) RESIDUAL: MOIST, NON PLASTIC, MEDIUM DENSE TO VERY DENSE, GRAY TO ORANGE-TAN-WHITE-BROWN, SILTY, FINE TO COARSE SAND

(H) ALLUVIAL: MOIST, HIGHLY PLASTIC, MEDIUM STIFF, DARK GRAY, FINE SANDY CLAY

(I) RESIDUAL: MOIST, SLIGHTLY PLASTIC, SOFT, DARK BROWN, CLAYEY SILT

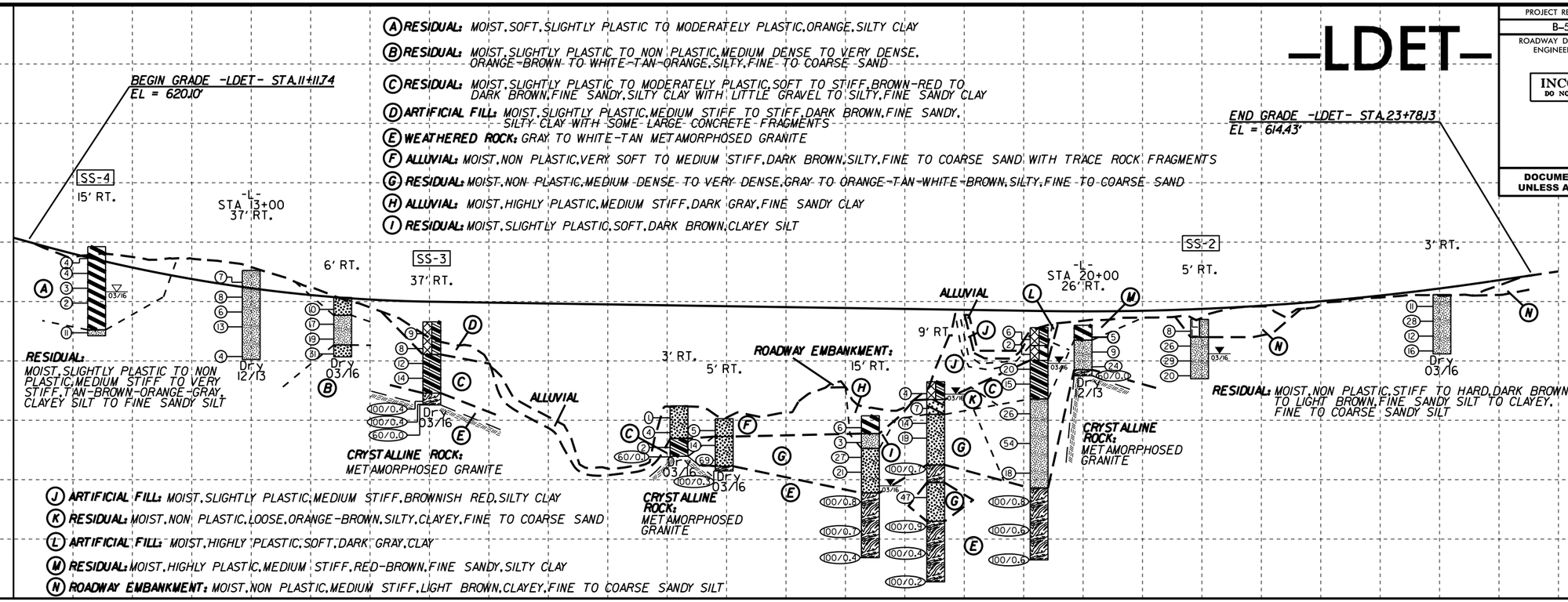
(J) ARTIFICIAL FILL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, BROWNISH RED, SILTY CLAY

(K) RESIDUAL: MOIST, NON PLASTIC, LOOSE, ORANGE-BROWN, SILTY, CLAYEY, FINE TO COARSE SAND

(L) ARTIFICIAL FILL: MOIST, HIGHLY PLASTIC, SOFT, DARK GRAY, CLAY

(M) RESIDUAL: MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, SILTY CLAY

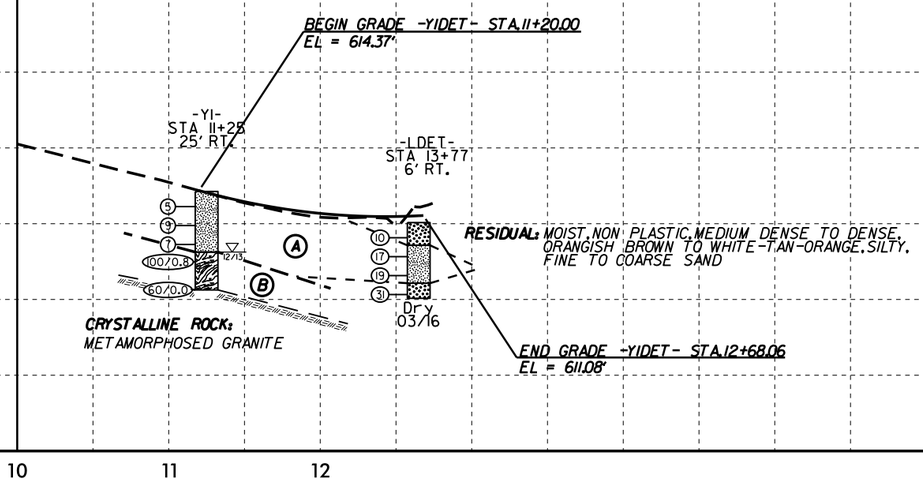
(N) ROADWAY EMBANKMENT: MOIST, NON PLASTIC, MEDIUM STIFF, LIGHT BROWN, CLAYEY, FINE TO COARSE SANDY SILT



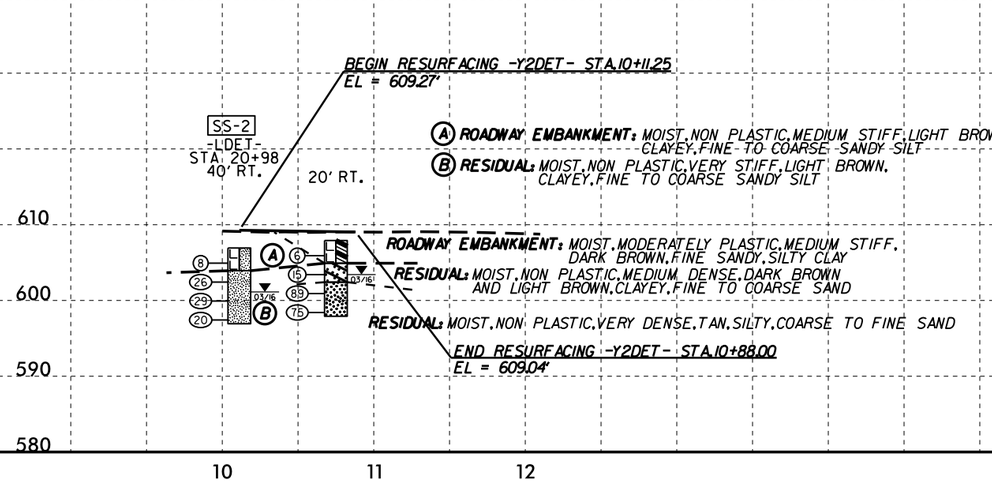
-Y1DET-

(A) RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-BROWN TO ORANGISH BROWN, FINE SANDY SILT TO CLAYEY SILT

(B) WEATHERED ROCK: GRAY METAMORPHOSED GRANITE



-Y2DET-



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kwells

PROJECT REFERENCE NO.	SHEET NO.
B-5239	6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

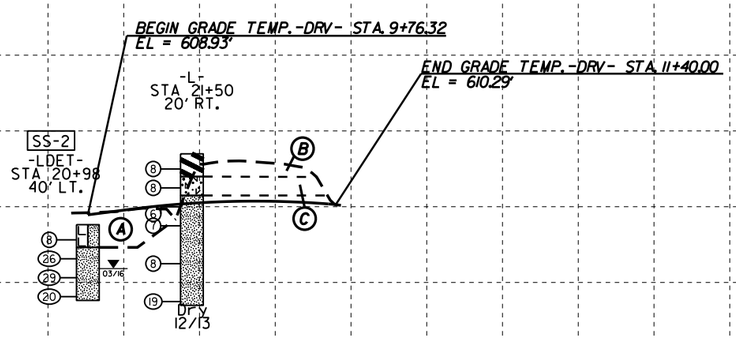
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TEMP. -DRV-

(A) **ROADWAY EMBANKMENT:** MOIST, NON PLASTIC, MEDIUM STIFF, LIGHT BROWN, CLAYEY, FINE TO COARSE SANDY SILT

(B) **RESIDUAL:** MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, COARSE TO FINE SANDY, SILTY CLAY

(C) **RESIDUAL:** MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT



RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, LIGHT BROWN TO TAN, CLAYEY, FINE TO COARSE SANDY SILT

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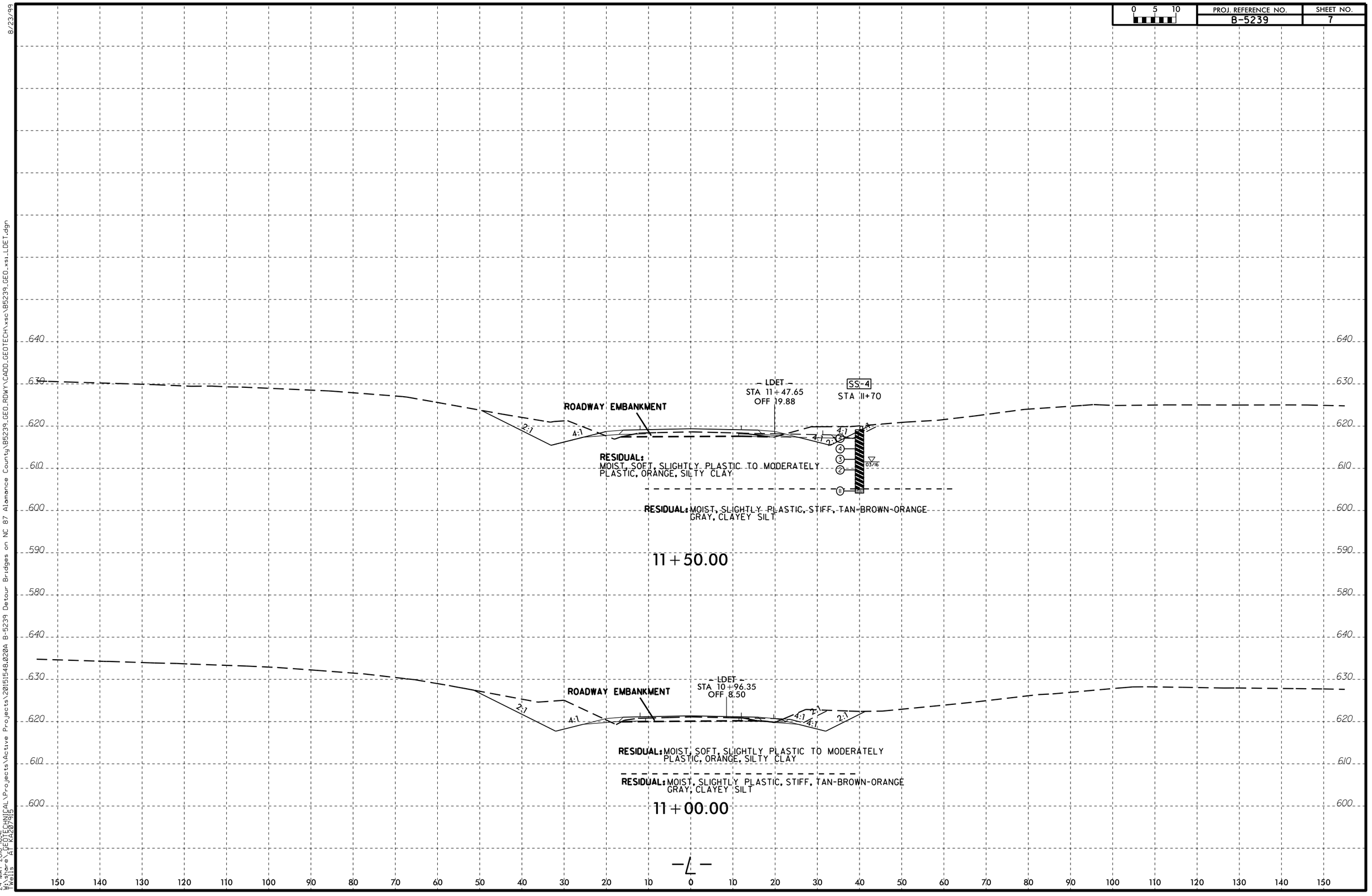

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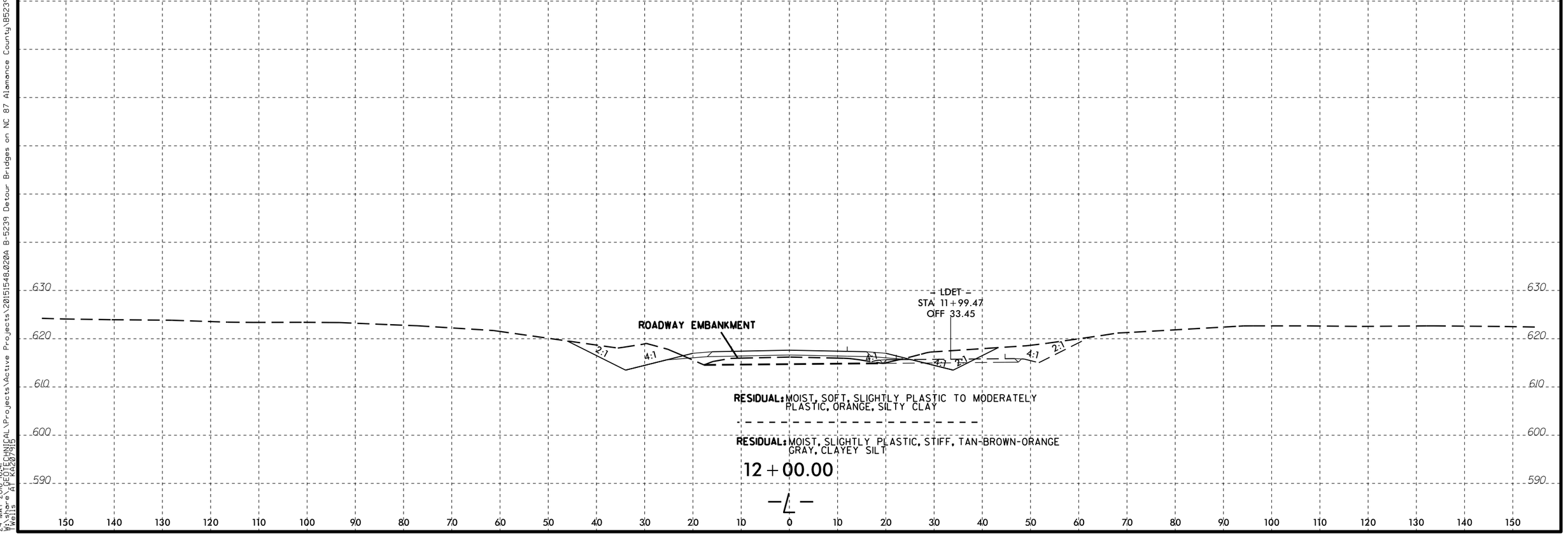

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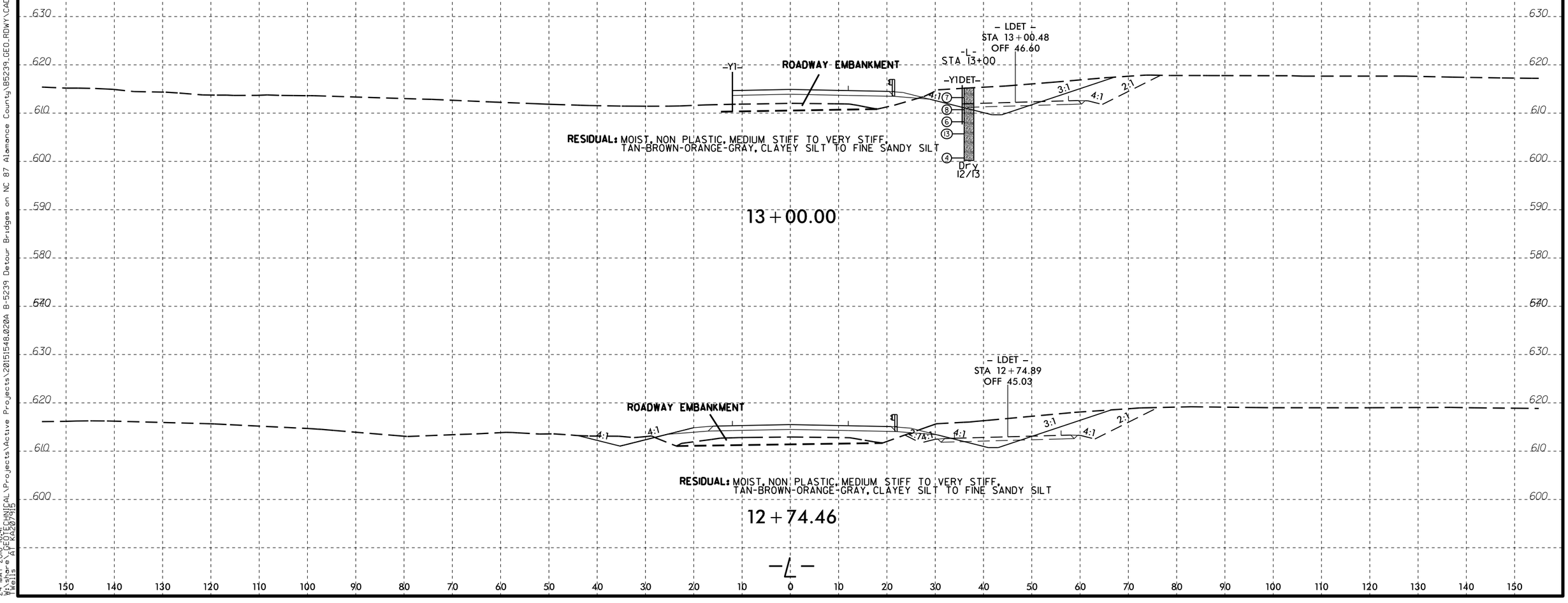

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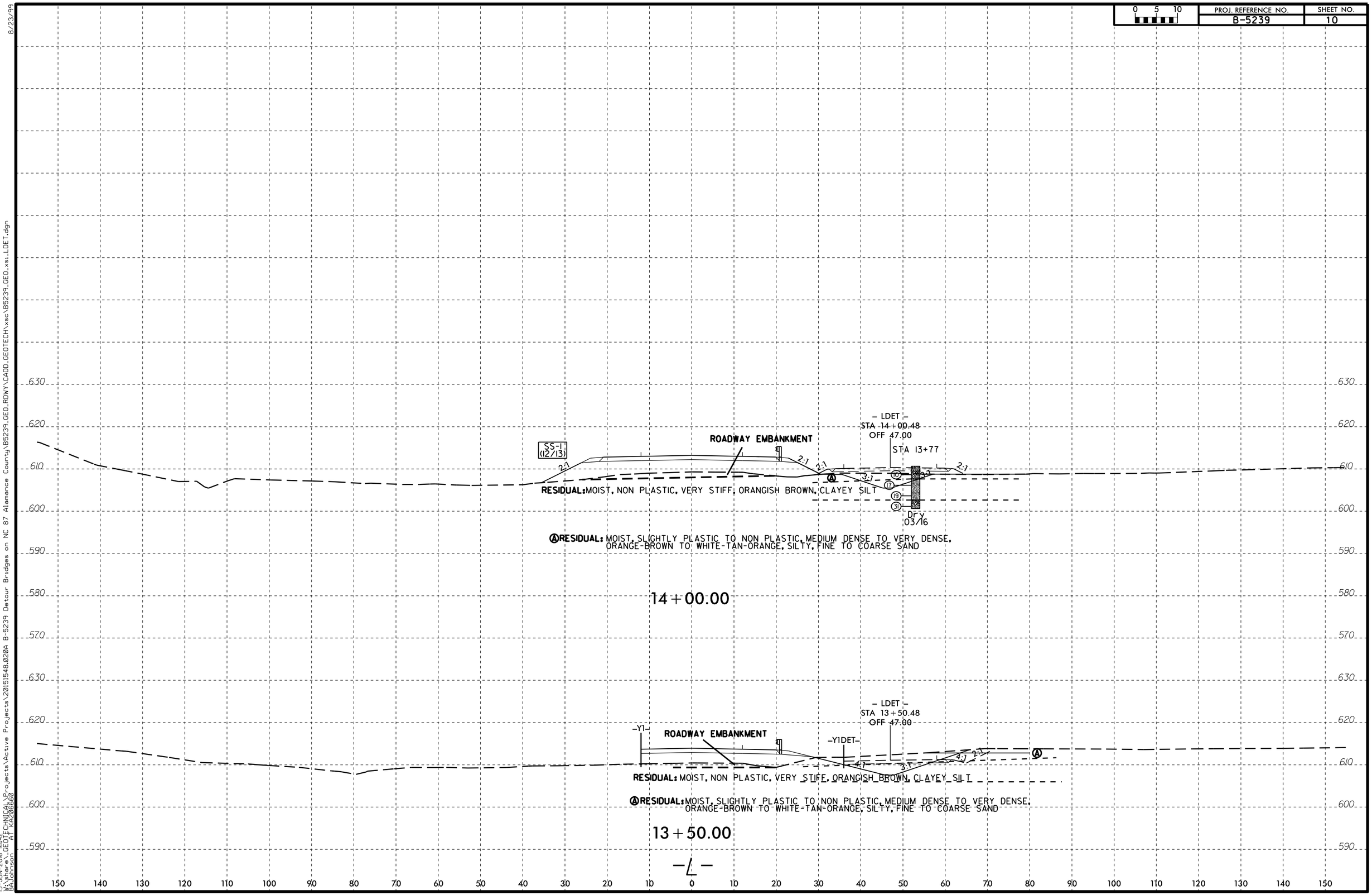

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BAJohnson
AT KA206860

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14+50.00

– LDET –
STA 14+50.48
OFF 47.00

SS-3
STA 14+52

ROADWAY EMBANKMENT

2:1 2:1 2:1 2:1 3:1 3:1

Ⓐ **ARTIFICIAL FILL:** MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF TO STIFF, DARK BROWN, FINE SANDY, SILTY CLAY WITH SOME LARGE CONCRETE FRAGMENTS

Ⓑ **WEATHERED ROCK:** GRAY METAMORPHOSED GRANITE

RESIDUAL: MOIST, SLIGHTLY PLASTIC, STIFF, BROWNISH RED, FINE SANDY, SILTY CLAY WITH LITTLE GRAVEL

9 8 12 14 100/0.4 100/0.4 50/0.0

DRY
03/16

CRYSTALLINE ROCK: METAMORPHOSED GRANITE

14+22.09

– LDET –
STA 14+22.57
OFF 47.00

ROADWAY EMBANKMENT

2:1 2:1 2:1 3:1 3:1

Ⓐ **WEATHERED ROCK:** GRAY METAMORPHOSED GRANITE

ARTIFICIAL FILL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF TO STIFF, DARK BROWN, FINE SANDY, SILTY CLAY WITH SOME LARGE CONCRETE FRAGMENTS

RESIDUAL: MOIST, SLIGHTLY PLASTIC, STIFF, BROWNISH RED, FINE SANDY, SILTY CLAY WITH LITTLE GRAVEL

Ⓐ

CRYSTALLINE ROCK: METAMORPHOSED GRANITE

630 620 610 600 590 580 570 630 620 610 600 590 580

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

8/23/99

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Wells AT KA20715

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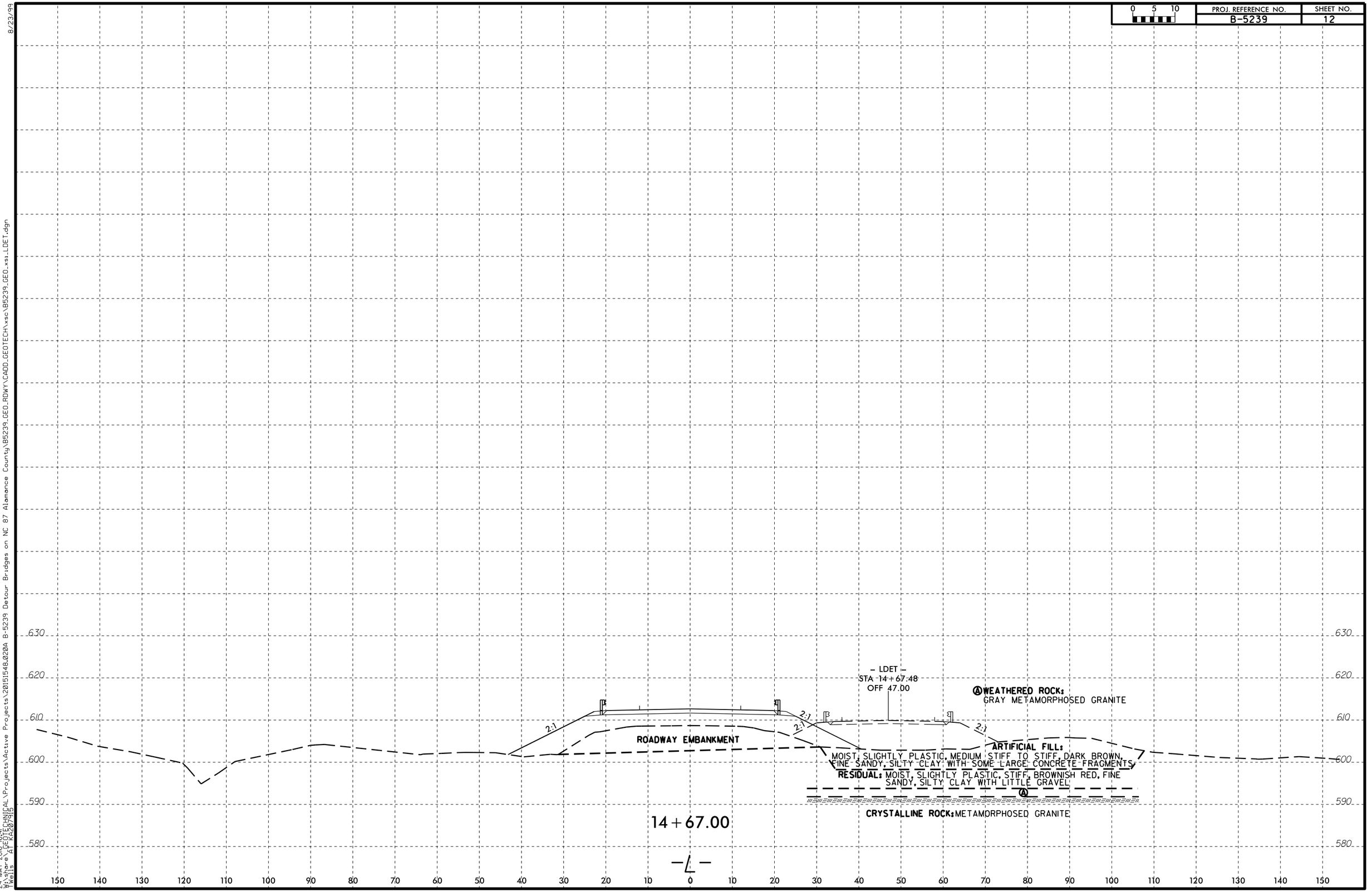

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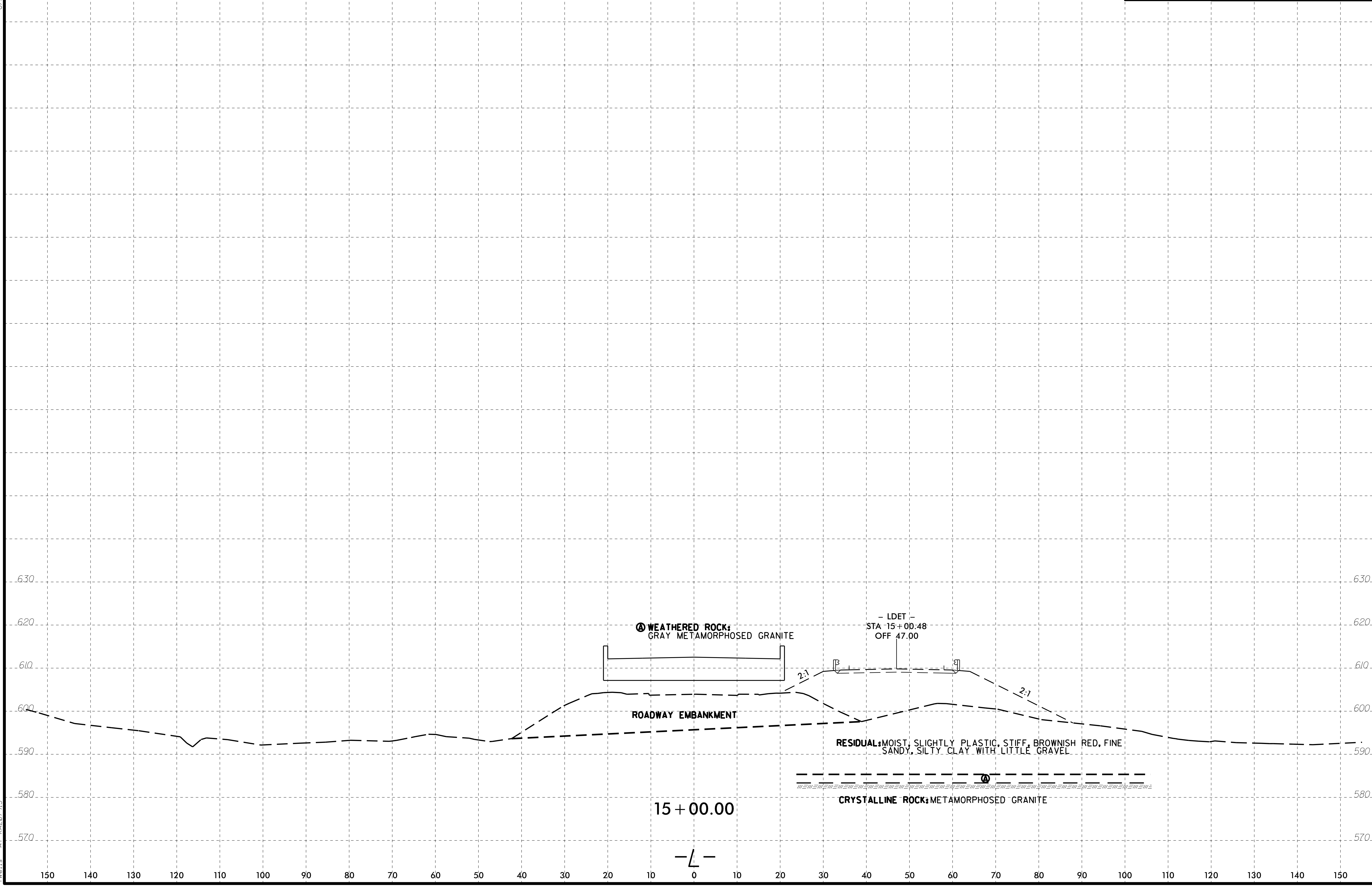

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TWells AT KA207915

– LDET –
STA 16+50.48
OFF 47.00

STA 16+60

ALLUVIAL: MOIST, NON PLASTIC, VERY SOFT TO SOFT, DARK BROWN, SILTY, FINE SAND WITH TRACE ROCK FRAGMENTS

RESIDUAL: MOIST, SLIGHTLY PLASTIC, SOFT, DARK BROWN SILTY, FINE SANDY CLAY

60/60 DC 03/16

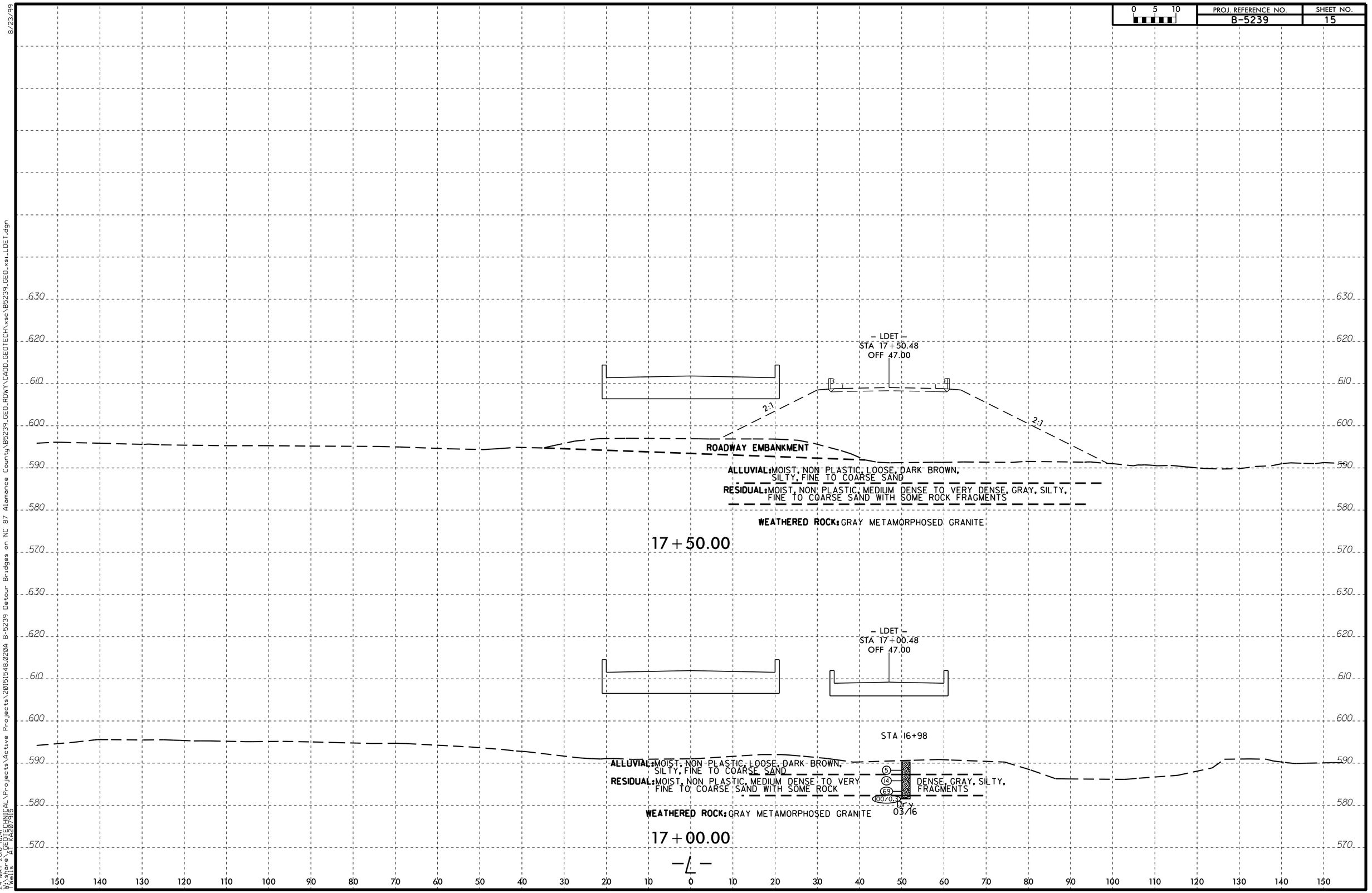
CRYSTALLINE ROCK: METAMORPHOSED GRANITE

16+50.00

630 620 610 600 590 580 570

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

– L –



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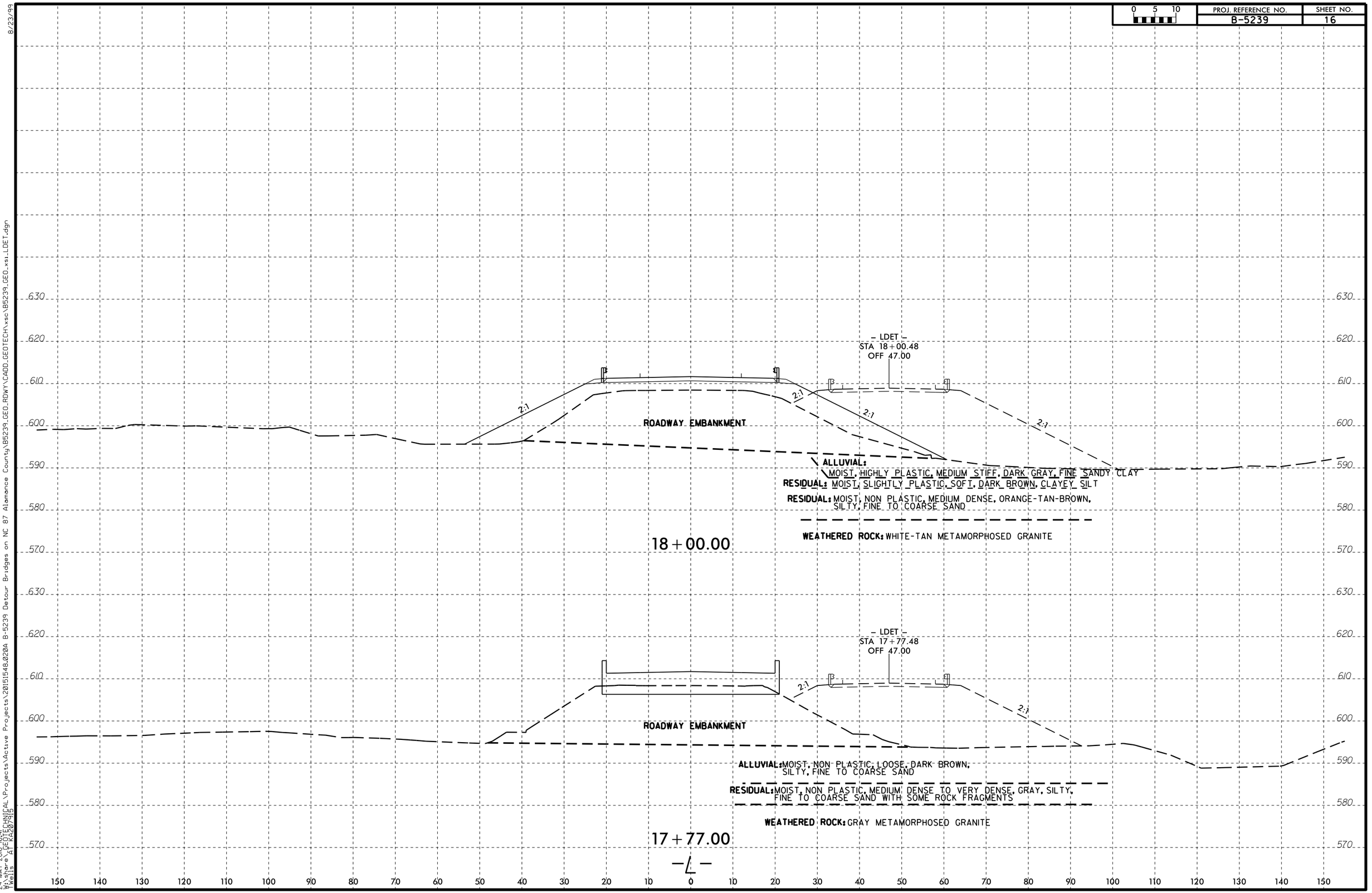

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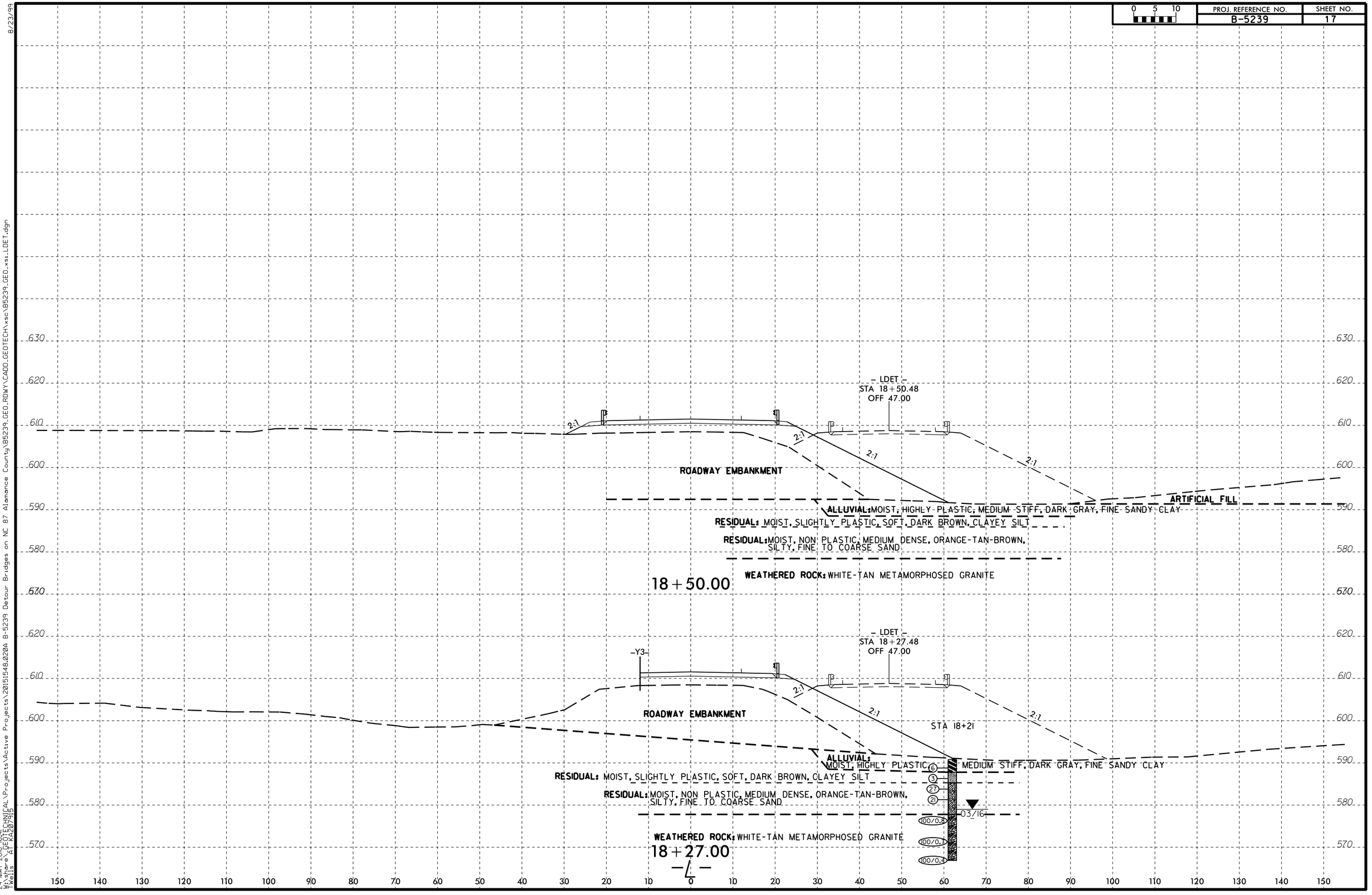

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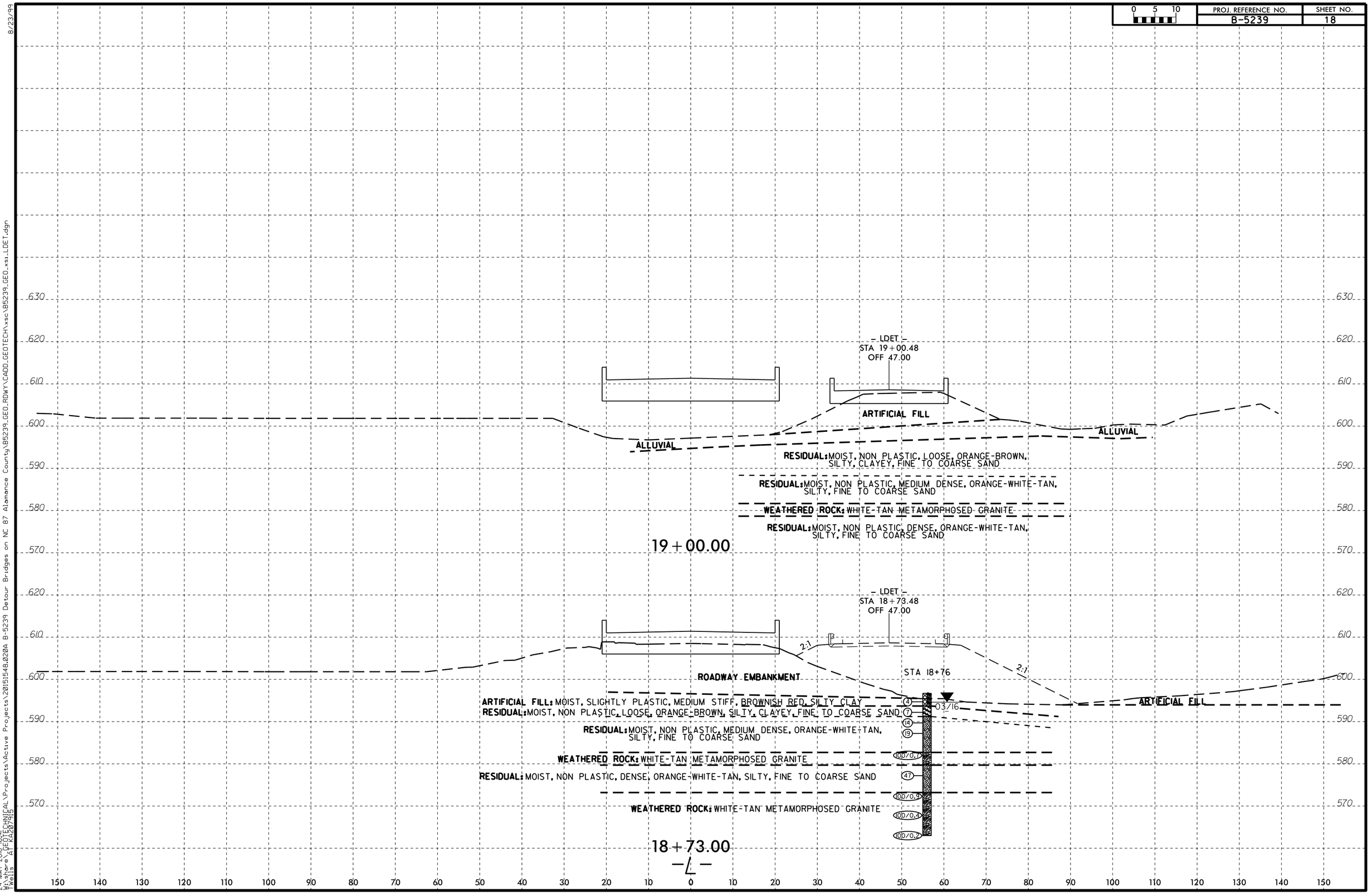

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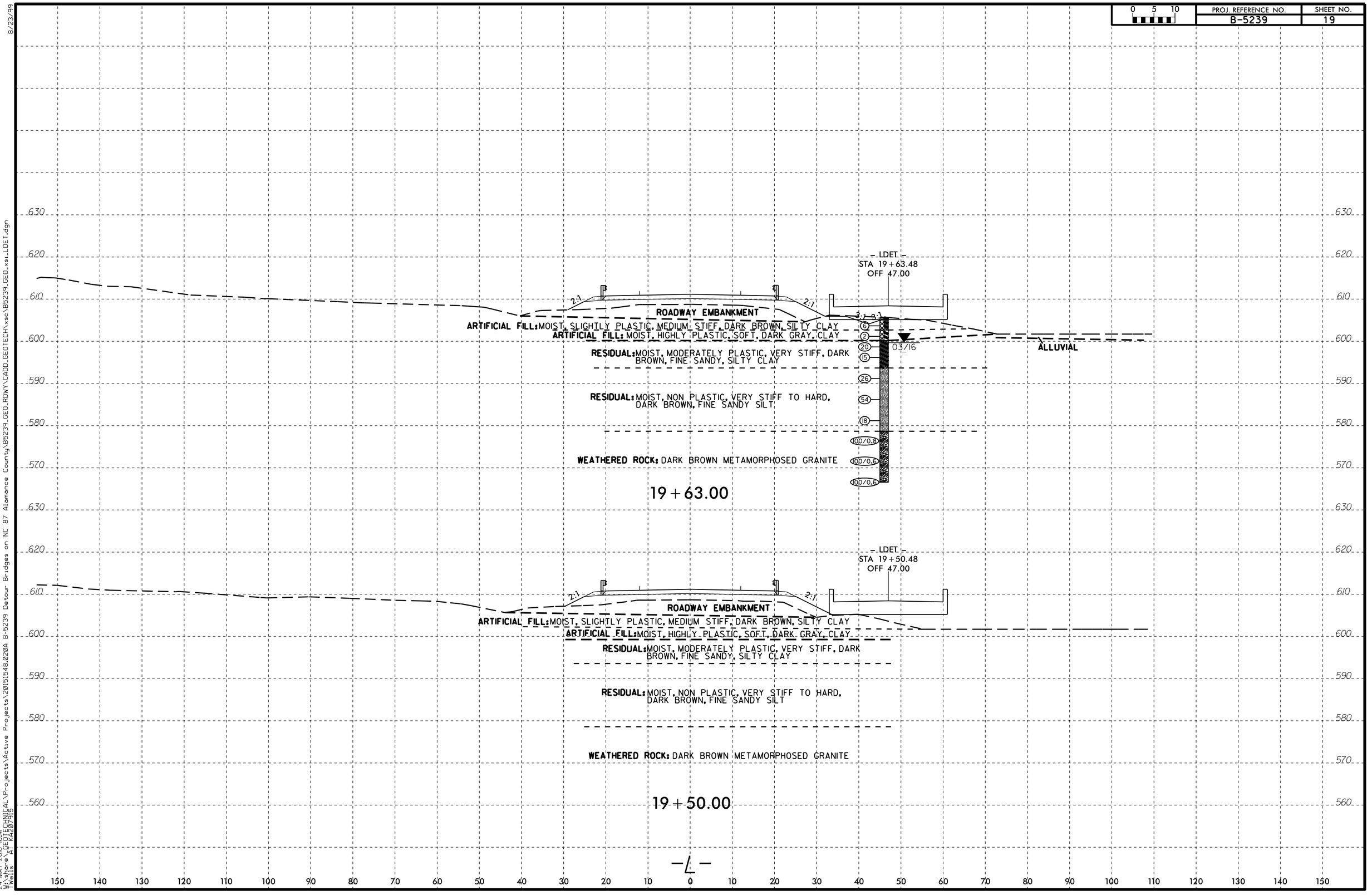
Wells AT KA20715



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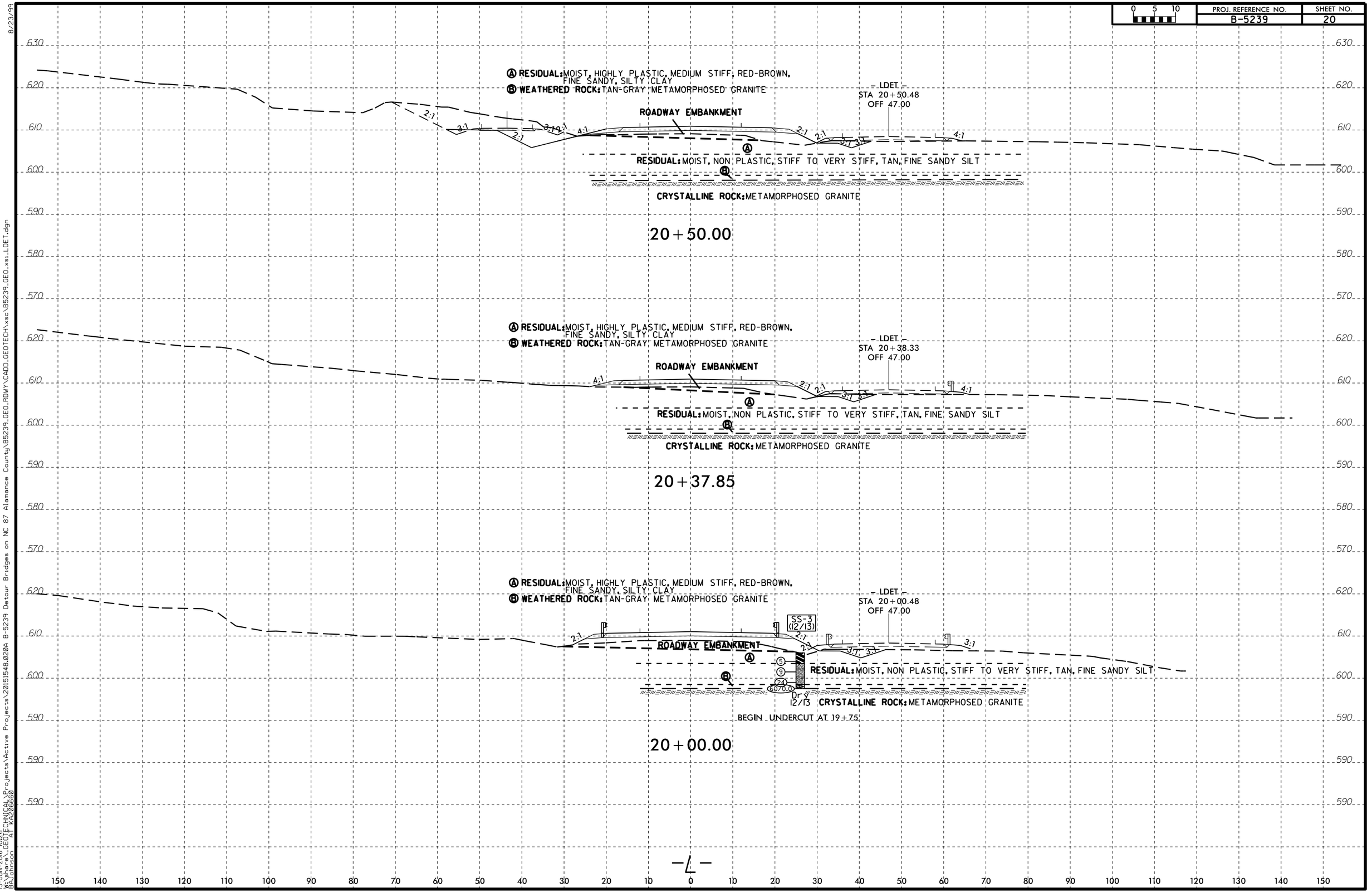

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GEOTECHNICAL
DESIGN
BAJohnson
AF KA206660

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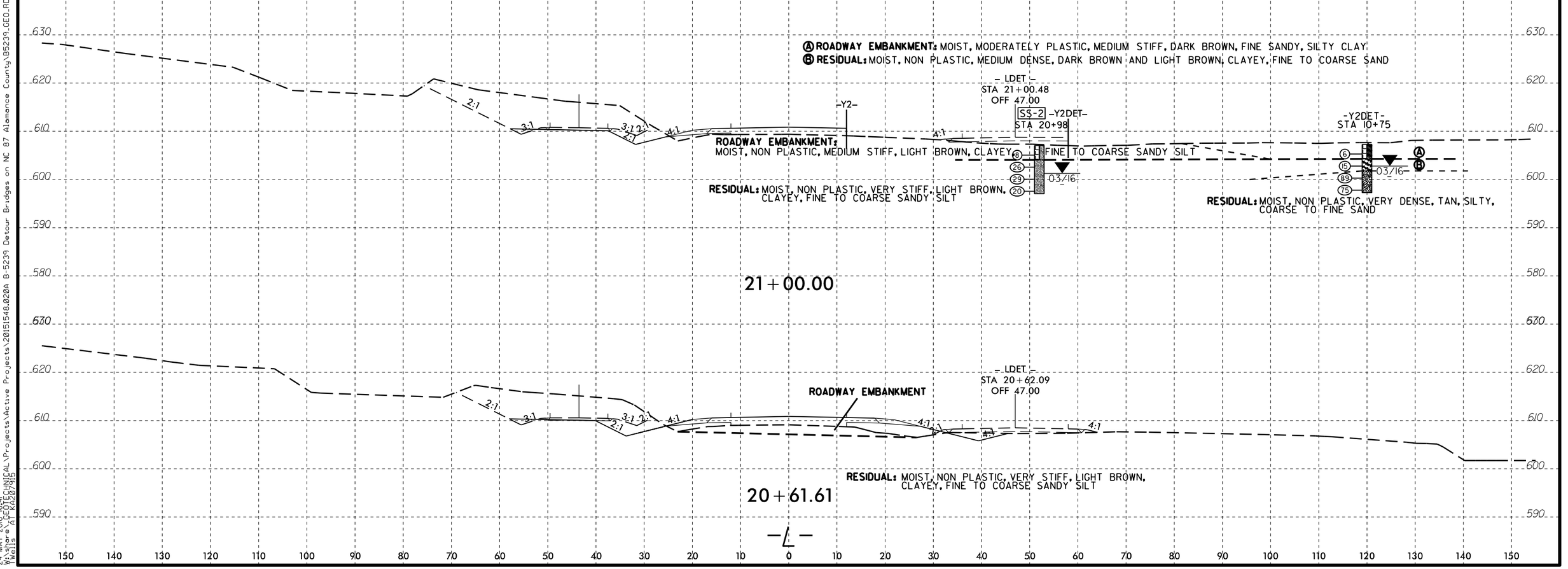

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Wells AT KA20715

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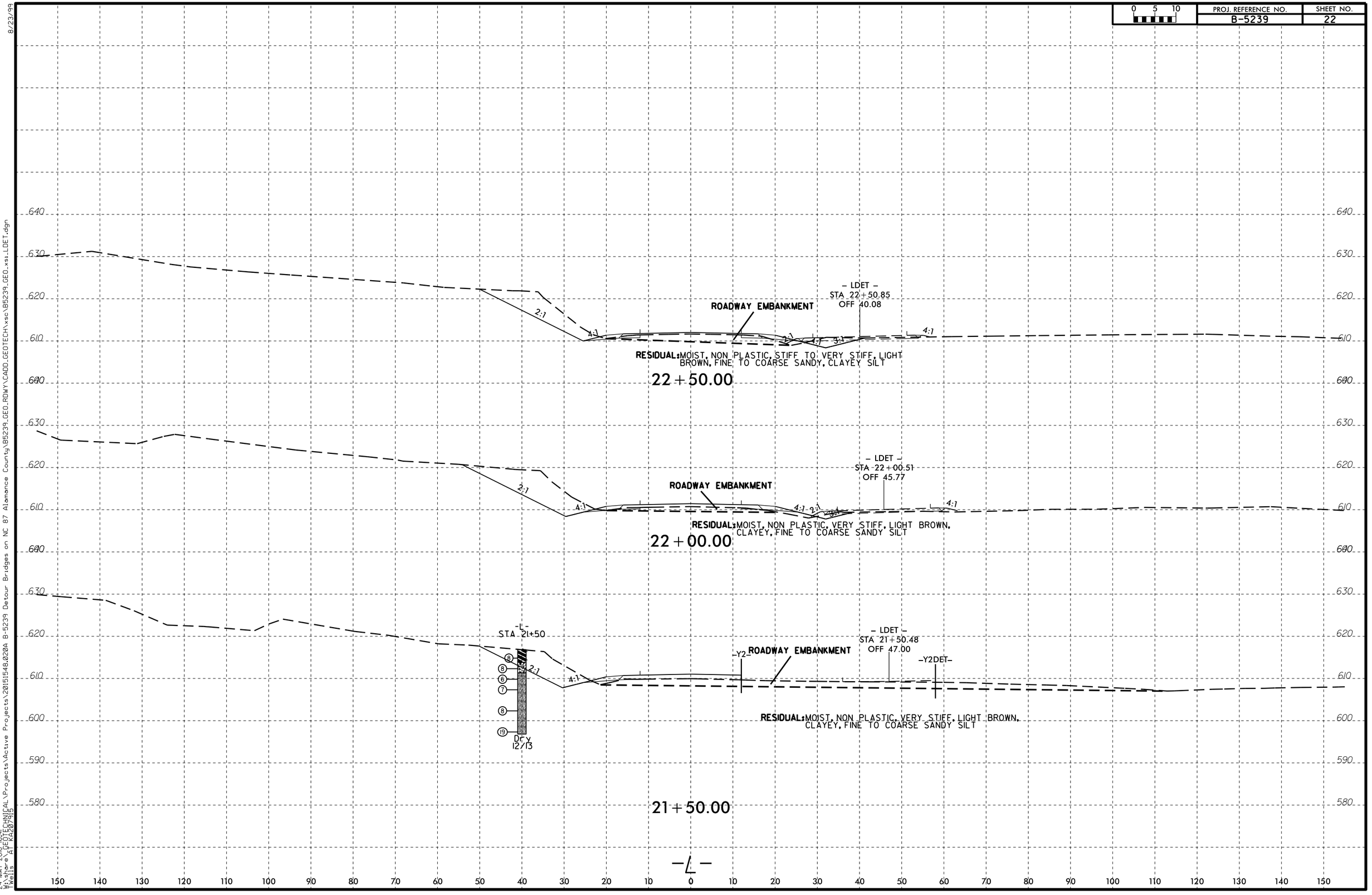

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Wells AT KA20715

640
630
620
610
600
590
580

– LDET –
STA 24+04.82
OFF 5.91

ROADWAY EMBANKMENT

3:1

RESIDUAL: MOIST, NON PLASTIC, STIFF TO HARD, BROWN-GRAY, FINE TO COARSE SANDY SILT

24+00.00

– LDET –
STA 23+53.85
OFF 15.75

ROADWAY EMBANKMENT

4:1

RESIDUAL: MOIST, NON PLASTIC, STIFF TO VERY STIFF, LIGHT BROWN, FINE TO COARSE SANDY, CLAYEY SILT

23+50.00

– LDET –
STA 23+01.95
OFF 29.62

STA 23+02

ROADWAY EMBANKMENT

4:1

RESIDUAL: MOIST, NON PLASTIC, STIFF TO VERY STIFF, LIGHT BROWN, FINE TO COARSE SANDY, CLAYEY SILT

11
28
12
16
Dry
03/16

23+00.00

–L–

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

8/23/99

24-MAY-2016 16:41
W:\share\GEOTECHNICAL\Projects\Active Projects\20151548.020A B-5239 Detour Bridges on NC 87 Alamance County\B5239_GEO_RDWY\CADD_GEOTECH\xsc\B5239_GEO_xsL_LDET.dgn
AT Wells
AT KA207915

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	24

ROADWAY EMBANKMENT

RESIDUAL: MOIST, NON PLASTIC, STIFF TO HARD, BROWN-GRAY, FINE TO COARSE SANDY SILT

25+00.00

– LDET –
STA 24+55.10
OFF 0.83

ROADWAY EMBANKMENT

SS-1
STA 24+42

Ⓐ **ROADWAY EMBANKMENT:** MOIST, NON PLASTIC, STIFF, BROWN-TAN, FINE TO COARSE SANDY, CLAYEY SILT

2:1

11
12
53
44

03/16

RESIDUAL: MOIST, NON PLASTIC, STIFF TO HARD, BROWN-GRAY, FINE TO COARSE SANDY SILT

24+50.00

640 630 620 610 640 630 620 610 600

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

8/23/99

24-MAY-2016 16:41
W:\share\GEOTECHNICAL\Projects\Active Projects\20151548.020A B-5239 Detour Bridges on NC 87 Alamance County\B5239_GEO_RDWY\CADD_GEOTECH\xsc\B5239_GEO_xsLLDET.dgn
T. Wells AT KA20715

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	25

620
610
600
590

ROADWAY EMBANKMENT

4:1 4:1 2:1

RESIDUAL:
MOIST, NON-PLASTIC, MEDIUM STIFF TO STIFF, RED-BROWN, FINE SANDY SILT

WEATHERED ROCK:
GRAY-GREEN METAMORPHOSED GRANITE

CRYSTALLINE ROCK: METAMORPHOSED GRANITE

11+50.00

-YI-
STA 11+25

ROADWAY EMBANKMENT

RESIDUAL:
MOIST, NON-PLASTIC, MEDIUM STIFF TO STIFF, RED-BROWN, FINE SANDY SILT

5
9
7
100/0.8
12/3
50/0.0

WEATHERED ROCK:
GRAY-GREEN METAMORPHOSED GRANITE

CRYSTALLINE ROCK: METAMORPHOSED GRANITE

11+20.00

ROADWAY EMBANKMENT

RESIDUAL:
MOIST, NON-PLASTIC, MEDIUM STIFF TO STIFF, RED-BROWN, FINE SANDY SILT

WEATHERED ROCK:
GRAY-GREEN METAMORPHOSED GRANITE

CRYSTALLINE ROCK: METAMORPHOSED GRANITE

11+00.00

-YIDET-

630
620
610
600
590

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

8/23/99

W:\share\GEOTECHNICAL\Projects\Active Projects\20151548.020A B-5239 Detour Bridges on NC 87 Alamance County\B5239_GEO_RDWY\CADD_GEOTECH\xsc\B5239_GEO_xsi_YIDET.dgn
24-MAY-2016 16:41
Wells AT KA20715

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	26

620
610
600
590

RESIDUAL: MOIST, NON PLASTIC, MEDIUM DENSE, DARK BROWN AND LIGHT BROWN, CLAYEY, COARSE TO FINE SAND

RESIDUAL: MOIST, NON PLASTIC, VERY DENSE, TAN, SILTY, FINE TO COARSE SAND

11+00.00

ROADWAY EMBANKMENT: MOIST, MODERATELY PLASTIC, MEDIUM STIFF, DARK BROWN FINE SANDY, SILTY CLAY

ALLUVIAL

RESIDUAL: MOIST, NON PLASTIC, MEDIUM DENSE, DARK BROWN AND LIGHT BROWN, CLAYEY, COARSE TO FINE SAND

RESIDUAL: MOIST, NON PLASTIC, VERY DENSE, TAN, SILTY, FINE TO COARSE SAND

10+88.00

ROADWAY EMBANKMENT: MOIST, MODERATELY PLASTIC, MEDIUM STIFF, DARK BROWN FINE SANDY, SILTY CLAY

6
15
89
75
03/16

RESIDUAL: MOIST, NON PLASTIC, MEDIUM DENSE, DARK BROWN AND LIGHT BROWN, CLAYEY, COARSE TO FINE SAND

RESIDUAL: MOIST, NON PLASTIC, VERY DENSE, TAN, SILTY, FINE TO COARSE SAND

10+75.00

ROADWAY EMBANKMENT: MOIST, MODERATELY PLASTIC, MEDIUM STIFF, DARK BROWN FINE SANDY, SILTY CLAY

RESIDUAL: MOIST, NON PLASTIC, MEDIUM DENSE, DARK BROWN AND LIGHT BROWN, CLAYEY, FINE TO COARSE SAND

RESIDUAL: MOIST, NON PLASTIC, VERY DENSE, TAN, SILTY, FINE TO COARSE SAND

10+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

-Y2DET-

8/23/99

24-MAY-2016 16:41
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Wells AT KA20715

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	27

-L-
STA 21+50
40° LT.

RESIDUAL: MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, COARSE TO FINE SANDY, SILTY CLAY

RESIDUAL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT

RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

8 8 6 7 8 19

Dry
12/13

2:1 3:1 2:1

10+40.00

RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

10+30.00

-DRV-

8/23/99

24-MAY-2016 16:41
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T. Wells AT KA207915

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	B-5239	28

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

630 620 610 600

RESIDUAL: MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, COARSE TO FINE SANDY, SILTY CLAY
RESIDUAL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT
RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

10+90.00

RESIDUAL: MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, COARSE TO FINE SANDY, SILTY CLAY
RESIDUAL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT
RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

10+80.00

2:1 3:1 3:1

RESIDUAL: MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, COARSE TO FINE SANDY, SILTY CLAY
RESIDUAL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT
RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

10+70.00

2:1 3:1 3:1

RESIDUAL: MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, COARSE TO FINE SANDY, SILTY CLAY
RESIDUAL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT
RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

10+60.00

2:1 3:1 3:1

RESIDUAL: MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, COARSE TO FINE SANDY, SILTY CLAY
RESIDUAL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT
RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

10+50.00

2:1 3:1 3:1

-DRV-

630 620 610 600

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

PROJ. REFERENCE NO.	SHEET NO.
B-5239	29

0 5 10

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

630 620 610 600

RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO

11+40.00

RESIDUAL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT

RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

11+30.00

Ⓐ **RESIDUAL:** MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, COARSE TO FINE SANDY, SILTY CLAY

RESIDUAL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT

RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

11+20.00

Ⓐ **RESIDUAL:** MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, COARSE TO FINE SANDY, SILTY CLAY

RESIDUAL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT

RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

11+10.00

RESIDUAL: MOIST, HIGHLY PLASTIC, MEDIUM STIFF, RED-BROWN, COARSE TO FINE SANDY, SILTY CLAY

RESIDUAL: MOIST, SLIGHTLY PLASTIC, MEDIUM STIFF, RED-BROWN, FINE SANDY, CLAYEY SILT

RESIDUAL: MOIST, NON PLASTIC, MEDIUM STIFF TO VERY STIFF, RED-TAN, FINE SANDY SILT

11+00.00

-DRV-

8/23/99

13-JUN-2016 16:49
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BAJohnson
AT KA206660

PROJECT REFERENCE NO.	SHEET NO.
B–5239	30

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX A
LABORATORY RESULTS

REFERENCE: B–5239

PROJECT: 42841

XCB	MAY 2016
INITIALS	DATE

SUMMARY OF LABORATORY TEST DATA

PROJECT NO. 42841.1.1 (B-5239)
COUNTY: ALAMANCE
BRIDGE NO. 126 OVER MILL RACE ON NC 87 & NO. 119 OVER HAW RIVER

												Atterberg Limits			Gradation Results							
Sample No.	Boring Number	Alignment	-LDET- Station	-LDET- Offset	Alignment	-L- Station	-L- Offset	Sample Depth (ft.)	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ ft.)	L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
SS-1	LDET_2442	-LDET-	24+42	16' RT	-L-	24+38	18' RT	1.0-2.5	31.7	A-4(7)	11	40	35	5	100	100	86	20.8	1.0	19.8	59.9	19.3
SS-2	LDET_2098	-LDET-	20+98	5' RT	-L-	21+00	52' RT	1.0-2.5	16.8	A-4(0)	8	31	28	3	95	76	44	58.9	27.2	31.7	28.1	13.0
SS-3	LDET_1452	-LDET-	14+52	37' RT	-L-	14+52	84' RT	1.0-2.5	19.1	A-6(2)	9	33	22	11	64	55	45	32.8	18.1	14.7	34.3	32.9
SS-4	LDET_1170	-LDET-	11+70	15' RT	-L-	11+67	41' RT	1.0-2.5	49.2	A-7-5(14)	4	58	43	15	95	84	73	25	15.4	9.6	37.6	37.4
SS-1 (12/13)	L_1400	-	-	-	-L-	14+00	33' LT	3.5-5.0	45.5	A-7-5(30)	6	59	30	29	99	96	88	14	4.0	9.5	28.7	57.8
SS-3 (12/13)	L_2000	-	-	-	-L-	20+00	26' RT	1.0-2.5	34.3	A-7-5(25)	5	53	25	28	99	96	84	20	5.6	14.6	30.1	49.7

SS = Split-Barrel Sample (ASTM-D-1586) ST = Shelby Tube (Undisturbed) Sample
S = Grab Sample
NP -- Non Plastic NA-- Non Applicable

Lab Technician: NCDOT Certification No.: 111-06-1203

Rhonda K. Hudson

Rhonda Hudson