REFERENCE: B-3186/B-5898

PROJECT: 38332/48030

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3186/B-5898	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HAYWOOD*

PROJECT DESCRIPTION *US 23/US 74/US 19 (GREAT SMOKY MOUNTAIN HWY) FROM WEST OF NC 209 (CRABTREE RD.) TO EAST OF RUSS AVE.*

SITE DESCRIPTION *RETAINING WALL #6 FROM -L_LT- STA. 70+03.33 TO 73+97.95*

CONTENTS

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

J. CRENSHAW

N. YACOBI

R. DUGGER

GEOTECHNOLOGY, INC.

INVESTIGATED BY *C. SWAFFORD*

DRAWN BY *T. LYNN*

CHECKED BY *K. BUSSEY*

SUBMITTED BY *HDR*

DATE *NOVEMBER 2021*

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

NORTH CAROLINA PROFESSIONAL SEAL 038206 ENGINEER KENNETH R. BUSSEY, JR.

Kenneth R. Bussey, Jr. 9/6/2023
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	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
- [X] CME-55
- [X] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q2

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: N/A

ELEVATION: FEET

NOTES:

BORING ELEVATIONS OBTAINED USING b3186_br0022_r4047_Merged_1-12-21.tin

SITE 3 BORING ELEVATIONS OBTAINED FROM TRIMBLE R12 CNSS RECEIVER CERTIFIED WITH FCC PART 15 (CLASS B DEVICE), 24, 32; RCM; PTCRB; BT SIG

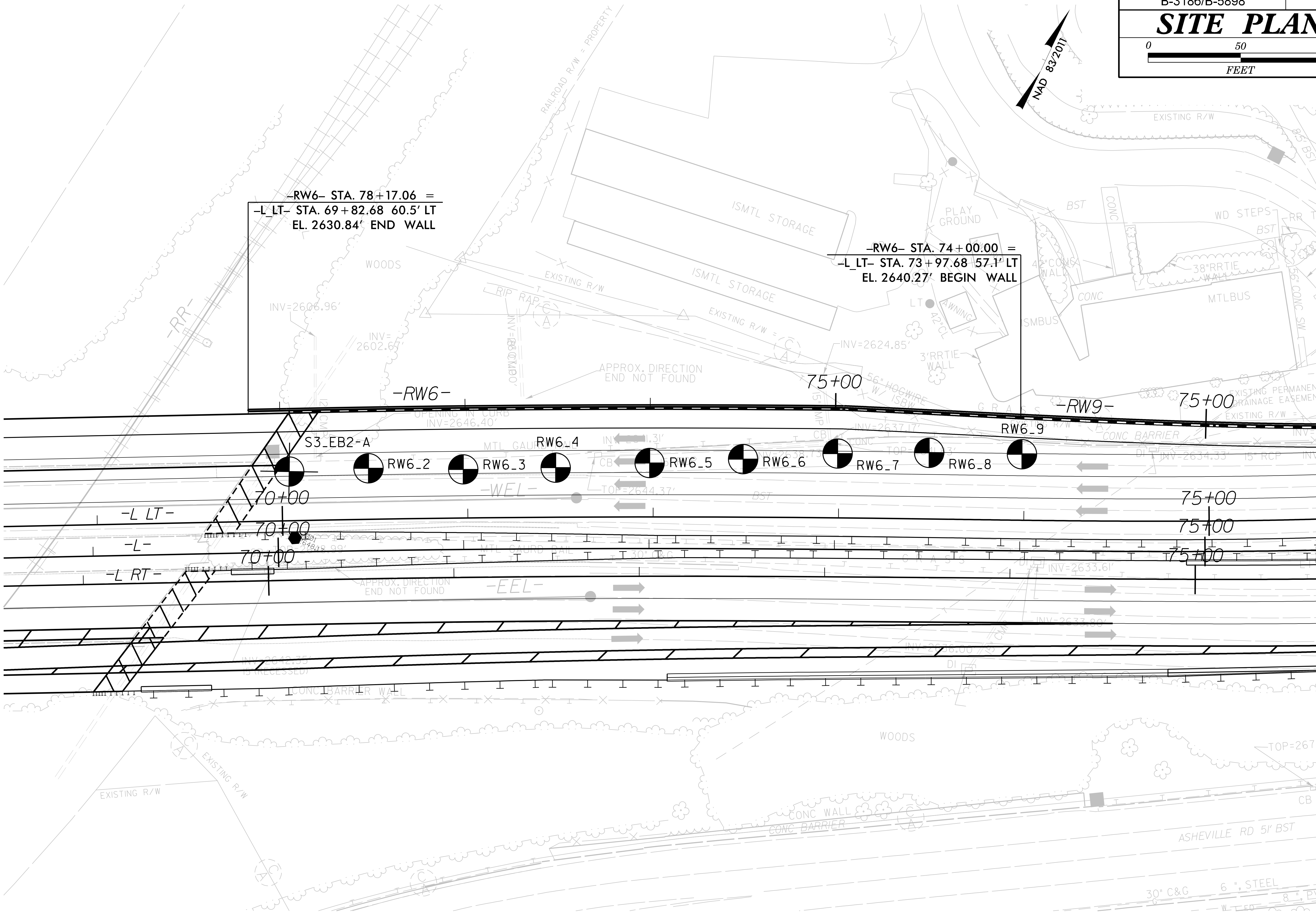
FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	3

SITE PLAN

0 50 100
FEET

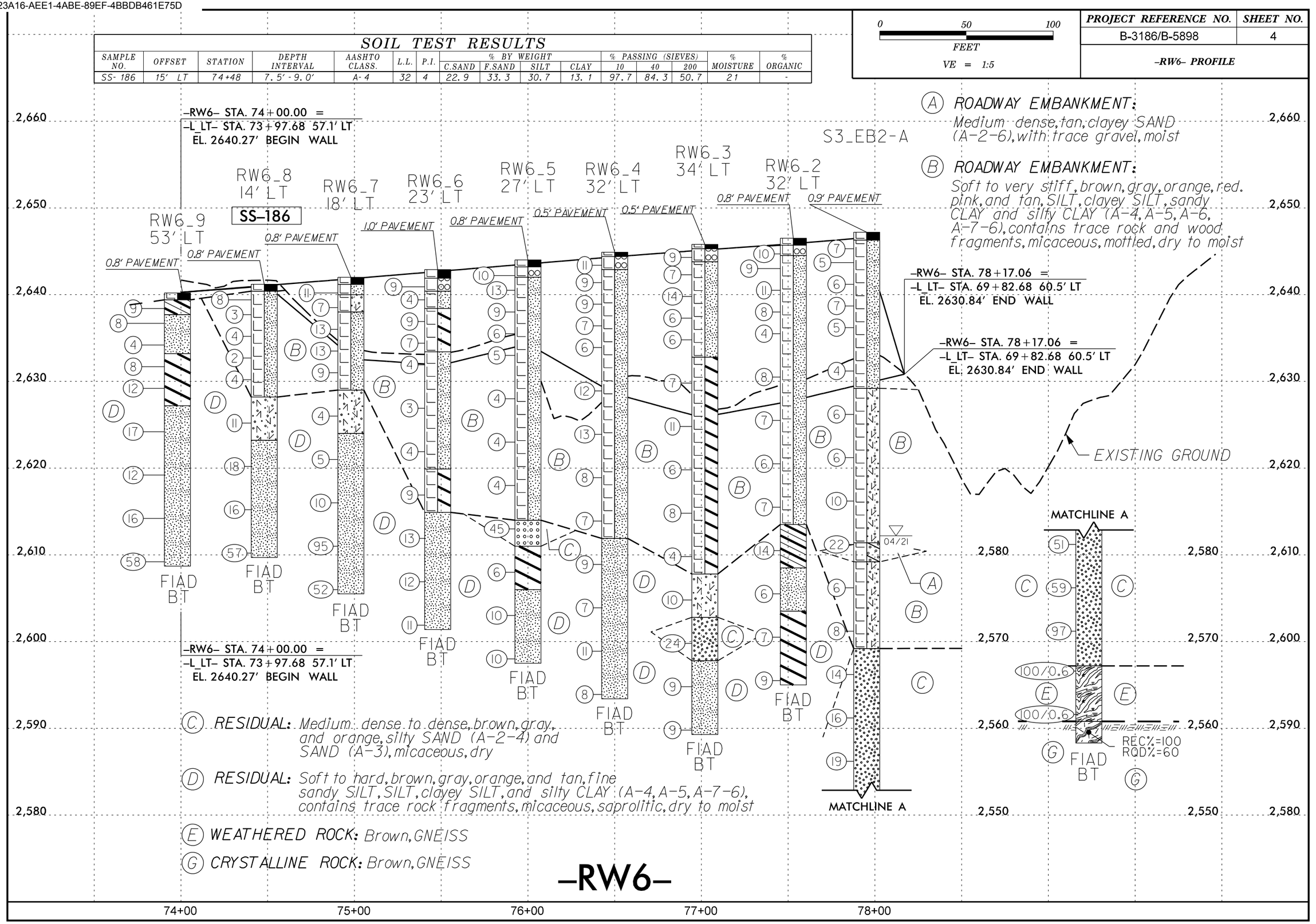


SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-186	15' LT	74+48	7.5' - 9.0'	A-4	32	4	22.9	33.3	30.7	13.1	97.7	84.3	50.7	21	-

0 50 100
FEET
VE = 1:5

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	4
–RW6– PROFILE	



(A) ROADWAY EMBANKMENT: *Medium dense, tan, clayey SAND (A-2-6), with trace gravel, moist*

(B) ROADWAY EMBANKMENT: *Soft to very stiff, brown, gray, orange, red, pink, and tan, SILT, clayey SILT, sandy CLAY and silty CLAY (A-4, A-5, A-6, A-7-6), contains trace rock and wood fragments, micaceous, mottled, dry to moist*

(C) RESIDUAL: *Medium dense to dense, brown, gray, and orange, silty SAND (A-2-4) and SAND (A-3), micaceous, dry*

(D) RESIDUAL: *Soft to hard, brown, gray, orange, and tan, fine sandy SILT, SILT, clayey SILT, and silty CLAY (A-4, A-5, A-7-6), contains trace rock fragments, micaceous, saprolitic, dry to moist*

(E) WEATHERED ROCK: *Brown, GNEISS*

(G) CRYSTALLINE ROCK: *Brown, GNEISS*

–RW6–

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38332.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** J. Crenshaw	
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)				**GROUND WTR (ft)**
BORING NO. S3_EB2-A	**STATION** 70+07	**OFFSET** 43 ft LT	**ALIGNMENT** -L-	**0 HR.** 35.0
COLLAR ELEV. 2,647.2 ft	**TOTAL DEPTH** 88.9 ft	**NORTHING** 667,892	**EASTING** 821,164	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC8255 CME-55 93% (11/24/2020)		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 04/12/21	**COMP. DATE** 04/13/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
2650										
	2,647.2	0.0								GROUND SURFACE
	2,646.3	0.9								0.9' PAVEMENT
2645			3	4	3	7		D		**ROADWAY EMBANKMENT** Medium stiff, orange, sandy SILT (A-4), with trace gravel, micaceous
	2,644.7	2.5								
			3	2	3	5		D		
	2,642.2	5.0								
2640			3	3	3	6		D		
	2,639.7	7.5								
			2	3	4	7		D		
	2,637.2	10.0								
2635			2	3	2	5		D		
	2,632.2	15.0								
			2	2	2	4		D		
2630										
	2,629.2	18.0								Medium stiff to stiff, brown, clayey SILT (A-5), contains trace wood fragments, micaceous
	2,627.2	20.0	2	2	4	6		M		
2625										
	2,622.2	25.0	2	2	4	6		M		
2620										
	2,617.2	30.0	4	4	6	10		M		
2615										
	2,612.2	35.0	10	14	8	22		M		
2610										
	2,611.4	35.8								Medium dense, tan, clayey SAND (A-2-6), with trace gravel
	2,609.2	38.0								Medium stiff, brown and gray, sandy and clayey SILT (A-4, A-5), with little gravel, micaceous
	2,607.2	40.0	2	2	4	6		M		
2605										
	2,602.2	45.0	3	3	5	8		M		
2600										
	2,599.2	48.0								**RESIDUAL** Medium dense to very dense, black and orange, silty SAND (A-2-4), micaceous, saprolitic
	2,597.2	50.0	3	6	8	14		W		
2595										
	2,592.2	55.0	4	7	9	16		Sat.		
2590										
	2,587.2	60.0	6	7	12	19		Sat.		
2585										
	2,582.2	65.0	22	22	29	51		Sat.		
2580										
	2,577.2	70.0	25	29	30	59		Sat.		
2575										
	2,572.2	75.0	44	44	53	97		Sat.		
2570										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2570						Match Line				
	2,567.2	80.0	90	10/0.1		100/0.6				**WEATHERED ROCK** Brown, GNEISS
2565										
	2,562.2	85.0	85	15/0.1		100/0.6				
2560										
	2,560.8	86.4								**CRYSTALLINE ROCK** Brown, Migmatitic Biotite GNEISS
	2,558.3	88.9								Boring Terminated at Elevation 2,558.3 ft in Crystalline Rock (GNEISS)

NOTES

Core barrel blocked off and wireline cable malfunction - Rock fell into hole when core barrel removed to retrieve core barrel Abandoned boring to allow for time to get off road before traffic closure stop time

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 38332.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** J. Crenshaw	
SITE DESCRIPTION US 23/ US 74 (Great Smoky Mountain Highway)				**GROUND WTR (ft)**
BORING NO. S3_EB2-A	**STATION** 70+07	**OFFSET** 43 ft LT	**ALIGNMENT** -L-	**0 HR.** 35.0
COLLAR ELEV. 2,647.2 ft	**TOTAL DEPTH** 88.9 ft	**NORTHING** 667,892	**EASTING** 821,164	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC8255 CME-55 93% (11/24/2020)		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER L. Wanstrath	**START DATE** 04/12/21	**COMP. DATE** 04/13/21	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 2.5 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) / DEPTH (ft)
2560.8											Begin Coring @ 86.4 ft
2560	2,560.8	86.4	2.5	1:11	(2.5)	(1.5)		(2.5)	(1.5)		2,560.8 — **CRYSTALLINE ROCK** — 86.4
	2,558.3	88.9		1:56	100%	60%		100%	60%		2,558.3 — Brown, Migmatitic Biotite GNEISS, moderate to severe weathering, hard, close fracture spacing — 88.9
				2:35/0.5							Boring Terminated at Elevation 2,558.3 ft in Crystalline Rock (GNEISS)

NOTES

Core barrel blocked off and wireline cable malfunction - Rock fell into hole when core barrel removed to retrieve core barrel
Abandoned boring to allow for time to get off road before traffic closure stop time

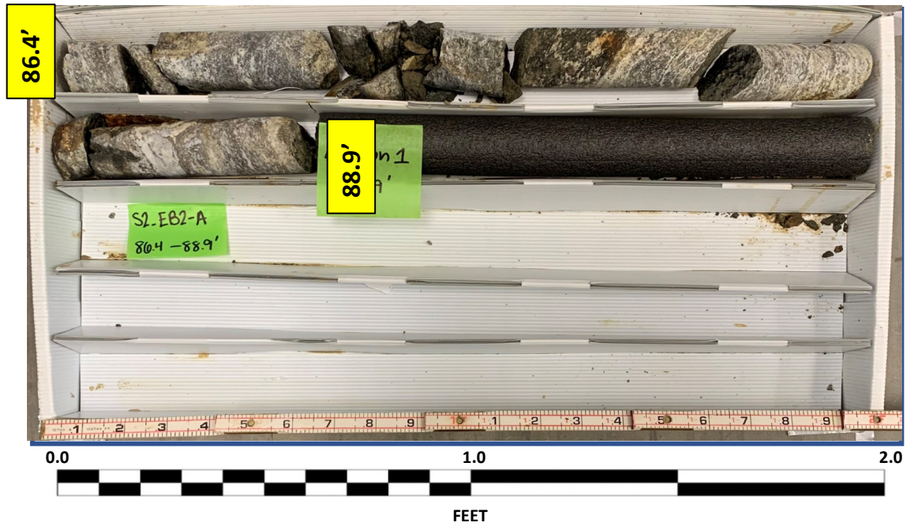
NCDOT CORE DOUBLE B3186_GEO_SPT.GPJ NC_DOT.GDT 8/10/21

CORE PHOTOGRAPHIC RECORD

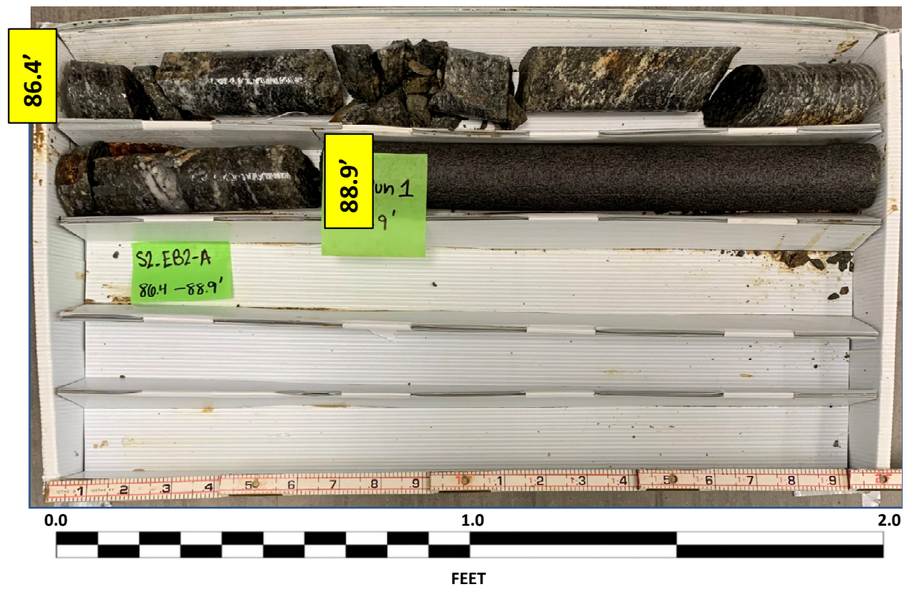
38330.1.FS1 (B-3186/B-5898)

US 23/ US 74 Great Smokey Mountain Highway

S3_EB2-A
Box 1 of 1: 86.4 – 88.9 FEET
DRY



S3_EB2-A
Box 1 of 1: 86.4 – 88.9 FEET
WET



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38332.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** R. Dugger	
SITE DESCRIPTION Retaining Wall No. 6 from -L_LT- STA 70+03 to 73+98				**GROUND WTR (ft)**
BORING NO. RW6_2	**STATION** 77+53	**OFFSET** 33 ft LT	**ALIGNMENT** -RW6-	**0 HR.** Dry
COLLAR ELEV. 2,646.5 ft	**TOTAL DEPTH** 51.5 ft	**NORTHING** 667,912	**EASTING** 821,202	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 02/02/21	**COMP. DATE** 02/02/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
2650										
2645	2,645.7	0.8								2,646.5 GROUND SURFACE 0.0
	2,644.0	2.5	7	5	5	10		D		2,645.7 0.8' PAVEMENT 0.8
			4	4	5	9		D		2,644.5 **ROADWAY EMBANKMENT** 2.0
	2,641.5	5.0								Medium dense, brown and orange, SAND and GRAVEL (A-1-b)
2640			5	5	6	11		D		Medium stiff to stiff, brown, orange and tan, SILT (A-4), with few gravel, micaceous
	2,639.0	7.5								
			3	4	4	8		D		
	2,636.5	10.0								
2635			2	2	2	4		D		
	2,631.5	15.0								
2630			3	4	4	8		D		
	2,626.5	20.0								
2625			3	3	4	7		D		
	2,621.5	25.0								
2620			2	3	3	6		D		
	2,616.5	30.0								
2615			3	3	4	7		D		
	2,611.5	35.0								2,613.5 **RESIDUAL** 33.0
2610			15	9	5	14		D		Stiff, gray and brown, sandy CLAY (A-6), with rock fragments, micaceous
	2,606.5	40.0								2,608.5 38.0
2605			2	2	4	6		D		Medium stiff, brown, tan and orange, SILT (A-4), with trace clay and sand, contains trace mica
	2,601.5	45.0								2,603.5 43.0
2600			2	3	4	7		D		Medium stiff to stiff, gray, silty CLAY (A-7-6) with rock fragments, contains trace wood fragments, micaceous
	2,596.5	50.0								
2595			6	4	5	9		D		2,595.0 51.5
										Boring Terminated at Elevation 2,595.0 ft in SILT

WBS 38332.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** R. Dugger	
SITE DESCRIPTION Retaining Wall No. 6 from -L_LT- STA 70+03 to 73+98				**GROUND WTR (ft)**
BORING NO. RW6_3	**STATION** 77+02	**OFFSET** 34 ft LT	**ALIGNMENT** -RW6-	**0 HR.** Dry
COLLAR ELEV. 2,645.8 ft	**TOTAL DEPTH** 56.5 ft	**NORTHING** 667,933	**EASTING** 821,248	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 02/02/21	**COMP. DATE** 02/02/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2650										
2645	2,645.3	0.5								2,645.8 GROUND SURFACE 0.0
			6	4	5	9		D		2,645.3 0.5' PAVEMENT 0.5
	2,643.3	2.5								2,643.8 **ROADWAY EMBANKMENT** 2.0
			4	4	3	7		D		Loose, brown and orange, SAND and GRAVEL (A-1-b)
	2,640.8	5.0								Medium stiff to stiff, brown, tan and orange, SILT (A-4), micaceous
2640			4	7	7	14		D		
	2,638.3	7.5								
			2	2	4	6		D		
	2,635.8	10.0								
2635			2	2	4	6		D		
										2,632.8 13.0
	2,630.8	15.0								Medium stiff, brown and orange, silty CLAY (A-7-6), micaceous
2630			3	3	4	7		D		
										2,627.8 18.0
	2,625.8	20.0								Medium stiff to stiff, brown, orange and tan, SILT (A-4), with rock fragments, micaceous
2625			2	7	4	11		D		
	2,620.8	25.0								
2620			2	3	3	6		D		
	2,615.8	30.0								
2615			2	4	4	8		D		
	2,610.8	35.0								2,612.8 33.0
2610			2	2	2	4		D		Medium stiff, brown, orange and gray, silty CLAY (A-7-6), with rock fragments, micaceous, saprolitic
	2,605.8	40.0								2,607.8 38.0
2605			2	4	6	10		D		**RESIDUAL**
										Stiff, brown, orange, and gray, clayey SILT (A-5), micaceous, saprolitic
	2,600.8	45.0	82	14	10	24		D		2,602.8 43.0
2600										Medium dense, brown and orange, silty SAND (A-2-4), micaceous
										*Suspected boulder at 45.0 feet.
	2,595.8	50.0	3	3	6	9		M		2,597.8 48.0
2595										Stiff, brown, tan, and orange, sandy SILT (A-4), micaceous, saprolitic
	2,590.8	55.0	3	4	5	9		M		
2590										2,589.3 56.5
										Boring Terminated at Elevation 2,589.3 ft in SILT

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** R. Dugger	
SITE DESCRIPTION Retaining Wall No. 6 from -L_LT- STA 70+03 to 73+98				**GROUND WTR (ft)**
BORING NO. RW6_4	**STATION** 76+50	**OFFSET** 32 ft LT	**ALIGNMENT** -RW6-	**0 HR.** Dry
COLLAR ELEV. 2,644.9 ft	**TOTAL DEPTH** 51.5 ft	**NORTHING** 667,955	**EASTING** 821,293	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER L. Wanstrath	**START DATE** 02/02/21	**COMP. DATE** 02/02/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2645											
	2,644.4	0.5	11	8	3	11		D		2,644.9 GROUND SURFACE	0.0
	2,642.4	2.5	4	4	5	9		D		2,644.4 0.5' PAVEMENT	0.5
2640	2,639.9	5.0	3	4	5	9		D		2,642.9 **ROADWAY EMBANKMENT** Medium dense, brown and orange, SAND and GRAVEL (A-1-b)	2.0
	2,637.4	7.5	2	3	4	7		D		Medium stiff to very stiff, brown, tan, and orange, SILT (A-4), with trace clay, micaceous	
2635	2,634.9	10.0	2	3	3	6		D			
2630	2,629.9	15.0	4	6	6	12		D			
2625	2,624.9	20.0	3	7	6	13		D			
2620	2,619.9	25.0	2	3	5	8		D			
2615	2,614.9	30.0	2	4	3	7		D			
2610	2,609.9	35.0	3	4	5	9		D			
2605	2,604.9	40.0	2	3	4	7		D			
2600	2,599.9	45.0	3	4	7	11		D			
2595	2,594.9	50.0	3	3	5	8		D		2,611.9 **RESIDUAL** Medium stiff to stiff, brown and orange SILT (A-4), micaceous, saprolitic	33.0
										2,593.4 Boring Terminated at Elevation 2,593.4 ft in SILT	51.5

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** R. Dugger	
SITE DESCRIPTION Retaining Wall No. 6 from -L_LT- STA 70+03 to 73+98				**GROUND WTR (ft)**
BORING NO. RW6_5	**STATION** 76+00	**OFFSET** 27 ft LT	**ALIGNMENT** -RW6-	**0 HR.** Dry
COLLAR ELEV. 2,644.0 ft	**TOTAL DEPTH** 46.5 ft	**NORTHING** 667,979	**EASTING** 821,338	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER L. Wanstrath	**START DATE** 02/02/21	**COMP. DATE** 02/02/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2645										
	2,643.2	0.8	24	6	4	10		D		2,644.0 GROUND SURFACE 0.0
	2,641.5	2.5	3	4	9	13		D		2,643.2 0.8' PAVEMENT 0.8
2640	2,639.0	5.0	3	4	5	9		D		2,642.0 **ROADWAY EMBANKMENT** 2.0
	2,636.5	7.5	2	3	3	6		D		Medium dense, brown and orange, SAND and GRAVEL (A-1-b)
2635	2,634.0	10.0	2	2	3	5		D		Medium stiff to stiff, brown and orange, SILT (A-4), with trace clay, micaceous
2630	2,629.0	15.0	2	2	2	4		D		
2625	2,624.0	20.0	2	2	2	4		D		
2620	2,619.0	25.0	2	2	2	4		D		
2615	2,614.0	30.0	12	37	8	45		D		2,614.0 30.0
2610	2,609.0	35.0	4	3	3	6		D		**RESIDUAL** Dense, gray, SAND (A-3) *Suspected Boulder
2605	2,604.0	40.0	3	4	6	10		M		2,611.0 33.0
2600	2,599.0	45.0	3	4	6	10		M		Medium stiff, gray, silty CLAY (A-7-6), micaceous, saprolitic
										2,606.0 38.0
										Stiff, brown and orange, SILT (A-4), micaceous, saprolitic
										2,597.5 46.5
										Boring Terminated at Elevation 2,597.5 ft in SILT

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** R. Dugger	
SITE DESCRIPTION Retaining Wall No. 6 from -L_LT- STA 70+03 to 73+98				**GROUND WTR (ft)**
BORING NO. RW6_6	**STATION** 75+48	**OFFSET** 23 ft LT	**ALIGNMENT** -RW6-	**0 HR.** Dry
COLLAR ELEV. 2,642.9 ft	**TOTAL DEPTH** 41.5 ft	**NORTHING** 668,003	**EASTING** 821,382	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER L. Wanstrath	**START DATE** 02/02/21	**COMP. DATE** 02/02/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2645										2,642.9 GROUND SURFACE	0.0
	2,641.9	1.0						D		2,641.9 1.0' PAVEMENT	1.0
2640	2,640.4	2.5	6	5	4	9		D		2,640.4 **ROADWAY EMBANKMENT** Loose, brown and orange, SAND and GRAVEL (A-1-b)	2.5
	2,637.9	5.0	3	2	2	4		D		2,638.4 Soft, brown and orange, SILT (A-4), micaceous	4.5
2635	2,635.4	7.5	2	3	6	9		D		Medium stiff, brown and orange, silty CLAY (A-7-6), micaceous	
	2,632.9	10.0	4	3	4	7		D		2,633.4 Soft, brown and orange, SILT (A-4), micaceous	9.5
2630			3	2	2	4		D			
	2,627.9	15.0	2	1	2	3		D			
2625	2,622.9	20.0	2	1	3	4		D		2,619.9 Stiff, brown and orange, silty CLAY (A-7-6), with trace rock fragments, micaceous	23.0
2620	2,617.9	25.0	8	5	4	9		D		2,614.9 **RESIDUAL** Stiff, brown and orange, SILT (A-4), micaceous, saprolitic	28.0
2615	2,612.9	30.0	3	5	8	13		D			
2610	2,607.9	35.0	3	5	7	12		D			
2605	2,602.9	40.0	3	4	7	11		D		2,601.4 Boring Terminated at Elevation 2,601.4 ft in SILT	41.5

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 6 from -L_LT- STA 70+03 to 73+98				**GROUND WTR (ft)**
BORING NO. RW6_7	**STATION** 74+98	**OFFSET** 18 ft LT	**ALIGNMENT** -RW6-	**0 HR.** Dry
COLLAR ELEV. 2,642.0 ft	**TOTAL DEPTH** 36.5 ft	**NORTHING** 668,028	**EASTING** 821,427	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER L. Wanstrath	**START DATE** 02/04/21	**COMP. DATE** 02/04/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2645										2,642.0 GROUND SURFACE 0.0
	2,641.2	0.8						D		2,641.2 0.8' PAVEMENT 0.8
2640	2,639.5	2.5	7	5	6	11		M		2,640.0 **ROADWAY EMBANKMENT** Stiff, gray, brown and red, SILT (A-4), with trace clay, micaceous 2.0
	2,637.0	5.0	3	3	4	7		D		2,638.0 Medium stiff, gray and red, clayey SILT (A-5), micaceous 4.0
2635	2,634.5	7.5	5	6	7	13		D		Stiff, brown, SILT (A-4), micaceous
	2,632.0	10.0	6	6	7	13		M		
2630			6	4	5	9		M		2,629.0 **RESIDUAL** Soft to medium stiff, red, clayey SILT (A-5), micaceous 13.0
	2,627.0	15.0	2	2	2	4		M		
2625	2,622.0	20.0	1	2	3	5		M		2,624.0 Stiff to hard, brown, orange and gray, SILT (A-4), micaceous, saprolitic 18.0
2620	2,617.0	25.0	4	4	6	10		D		
2615	2,612.0	30.0	13	34	61	95		D		
2610	2,607.0	35.0	14	27	25	52		D		2,605.5 Boring Terminated at Elevation 2,605.5 ft in SILT 36.5

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38332.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 6 from -L_LT- STA 70+03 to 73+98				**GROUND WTR (ft)**
BORING NO. RW6_8	**STATION** 74+48	**OFFSET** 15 ft LT	**ALIGNMENT** -RW6-	**0 HR.** Dry
COLLAR ELEV. 2,641.2 ft	**TOTAL DEPTH** 31.5 ft	**NORTHING** 668,049	**EASTING** 821,472	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 02/03/21	**COMP. DATE** 02/03/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2645											
2640	2,640.4	0.8	5	4	4	8		M		2,641.2 GROUND SURFACE	0.0
	2,638.7	2.5	1	2	1	3		M		2,640.4 0.8' PAVEMENT	0.8
2635	2,636.2	5.0	2	2	2	4		M		**ROADWAY EMBANKMENT** Soft to medium stiff, red, brown and pink, SILT (A-4)	
	2,633.7	7.5	1	1	1	2	SS-186	21%			
2630	2,631.2	10.0	1	2	2	4		D			
	2,626.2	15.0	3	4	7	11		D		2,628.2 **RESIDUAL** Stiff, brown and red, clayey SILT (A-5), micaceous	13.0
2625											
2620	2,621.2	20.0	5	7	11	18		D		2,623.2 Very stiff to hard, brown, red and gray, SILT (A-4), with trace rock fragments, micaceous	18.0
	2,616.2	25.0	4	7	9	16		D			
2615	2,611.2	30.0	13	24	33	57		D		2,609.7 Boring Terminated at Elevation 2,609.7 ft in SILT	31.5
2610											

WBS 38332.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 6 from -L_LT- STA 70+03 to 73+98				**GROUND WTR (ft)**
BORING NO. RW6_9	**STATION** 74+02	**OFFSET** 20 ft RT	**ALIGNMENT** -RW9-	**0 HR.** Dry
COLLAR ELEV. 2,640.2 ft	**TOTAL DEPTH** 31.5 ft	**NORTHING** 668,070	**EASTING** 821,517	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC9083 CME-550X 80% (11/24/2020)		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 02/03/21	**COMP. DATE** 02/03/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2645											
2640	2,639.4	0.8	7	4	5	9		D		2,640.2 GROUND SURFACE	0.0
	2,637.7	2.5	3	4	4	8		M		2,639.4 0.8' PAVEMENT	0.8
2635	2,635.2	5.0	2	2	2	4		M		**RESIDUAL** 2,637.7 Stiff, brown and orange, silty CLAY (A-6)	2.5
	2,632.7	7.5	2	3	5	8		M		Soft to stiff, brown and orange, SILT (A-4)	
2630	2,630.2	10.0	4	5	7	12		M		2,633.2 Stiff, brown, silty CLAY (A-7-6), with trace manganese oxide staining	7.0
	2,625.2	15.0	8	9	8	17		D		2,627.2 Stiff to hard, brown, gray and black, fine to coarse sandy SILT (A-4), saprolitic (Amphibolite and Gneiss)	13.0
2625											
2620	2,620.2	20.0	3	6	6	12		D			
	2,615.2	25.0	5	7	9	16		D			
2615											
2610	2,610.2	30.0	21	18	40	58		D		2,608.7 Boring Terminated at Elevation 2,608.7 ft in silty SAND	31.5

REFERENCE: B-3186/B-5898

PROJECT: 38332/48030

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3186/B-5898	1	9

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HAYWOOD*

PROJECT DESCRIPTION *US 23/US 74/US 19 (GREAT SMOKY MOUNTAIN HWY) FROM WEST OF NC 209(CRABTREE RD.) TO EAST OF RUSS AVE.*

SITE DESCRIPTION *RETAINING WALL #8 FROM -DET01_EB- STA. 34+83.83 TO 29+30.48*

CONTENTS

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

R. DUGGER

N. YACOBI

GEOTECHNOLOGY, INC.

INVESTIGATED BY *C. SWAFFORD*

DRAWN BY *T. LYNN*

CHECKED BY *K. BUSSEY*

SUBMITTED BY *HDR*

DATE *NOVEMBER 2021*

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

NORTH CAROLINA PROFESSIONAL SEAL 038206 ENGINEER KENNETH R. BUSSEY, JR.

kenneth R. Bussey, Jr. 9/6/2023
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	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
- [X] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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: N/A

ELEVATION: FEET

NOTES:

BORING ELEVATIONS OBTAINED USING b3186_br0022_r4047_Merged_1-12-21.tin

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	3

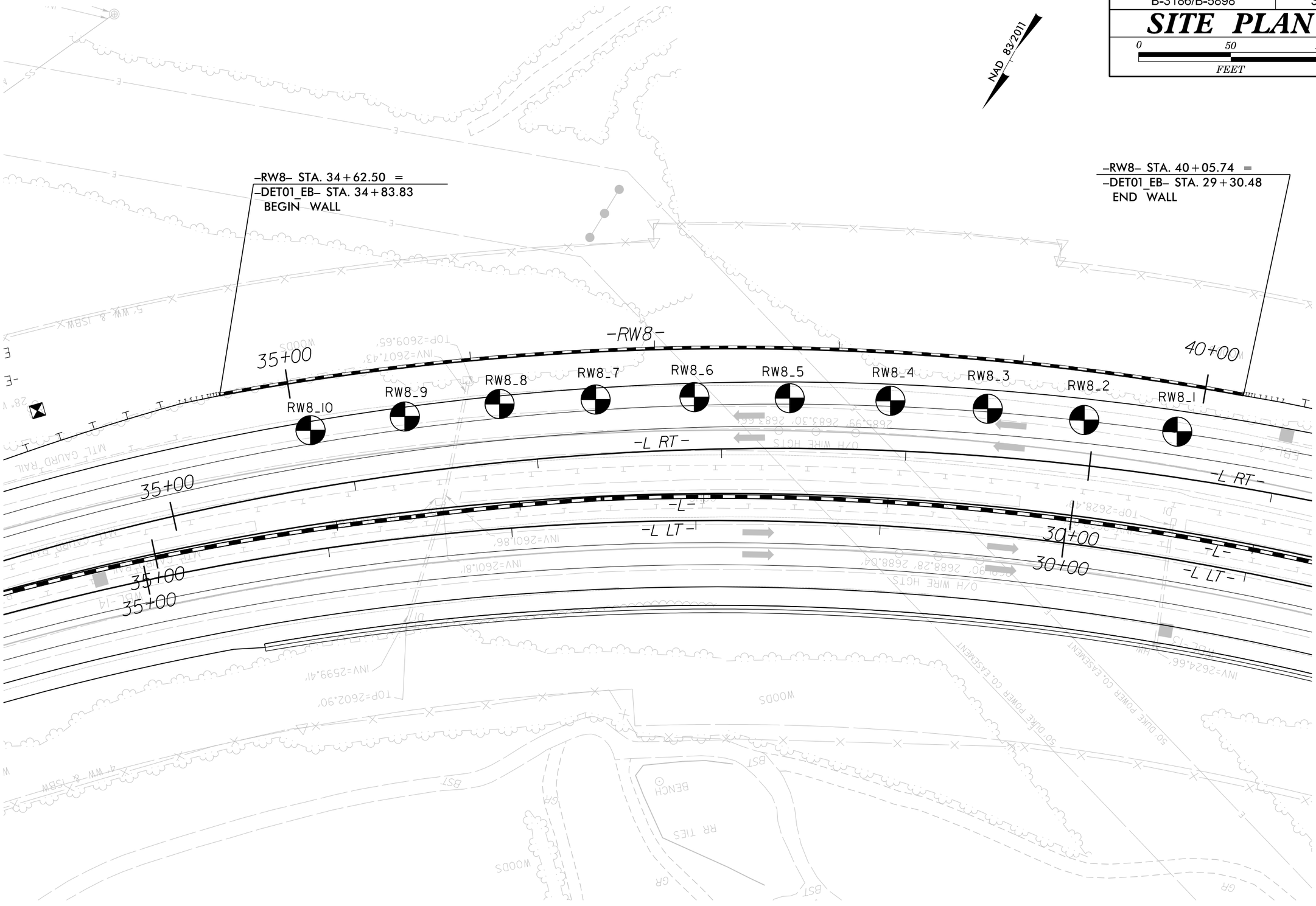
SITE PLAN

0 50 100
FEET

NAD 83/2011

–RW8– STA. 34+62.50 =
–DET01_EB– STA. 34+83.83
BEGIN WALL

–RW8– STA. 40+05.74 =
–DET01_EB– STA. 29+30.48
END WALL



PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	4
–RW8– PROFILE	

0 50 100
FEET
VE = 1:5

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-3	27' RT	35+08	2.5' - 4.0'	A-2-5	44	7	54.2	24.3	14.6	6.9	95.1	55.9	25.7	26	-
SS-4	25' RT	36+14	7.5' - 9.0'	A-2-4	28	6	54.4	23.4	15.4	6.8	87.7	50.7	24.3	10	-
SS-2	26' RT	39+37	2.5' - 4.0'	A-6 (2)	34	13	33.6	31.1	30.2	5.1	96.0	76.0	41.0	15	-

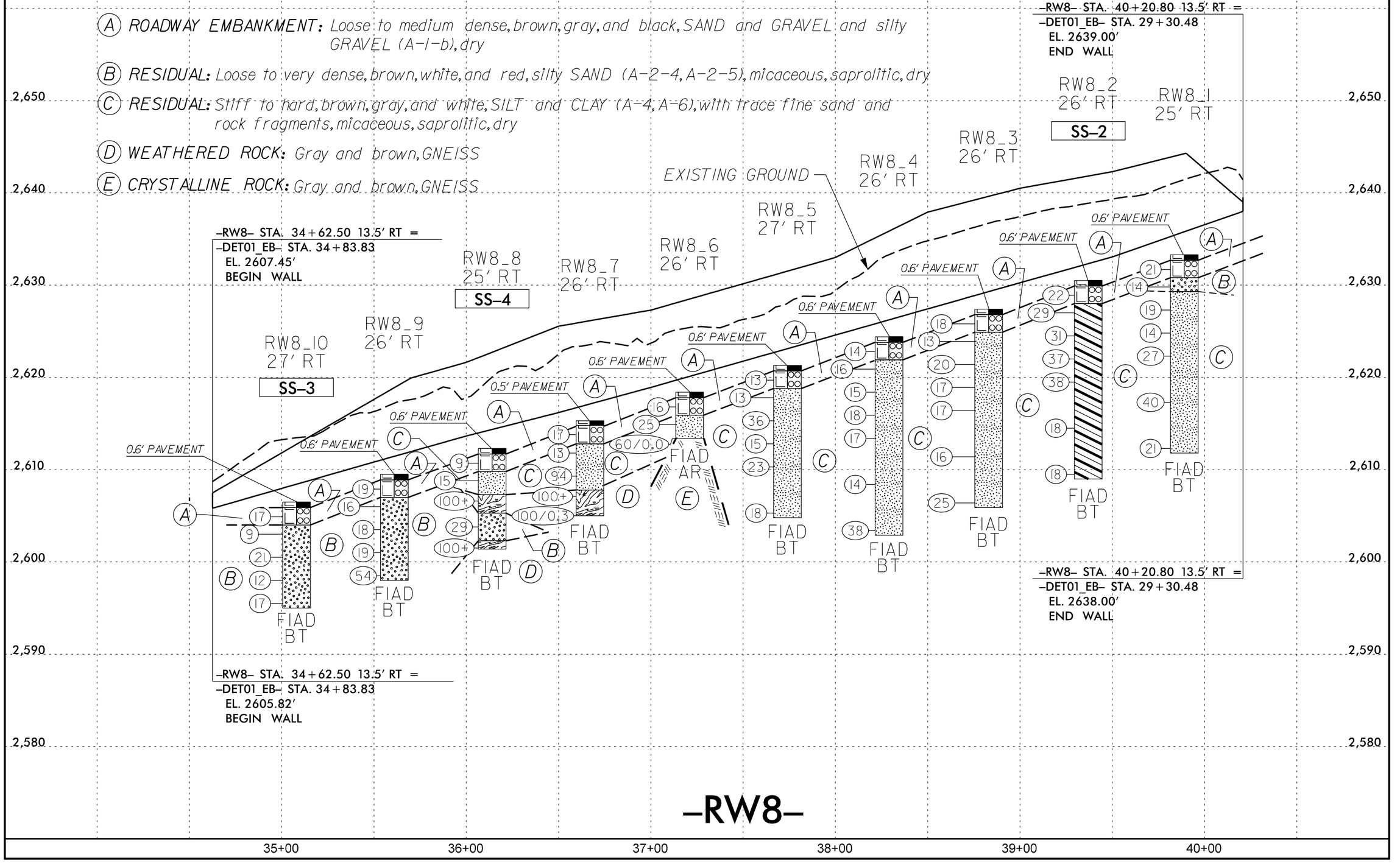
(A) ROADWAY EMBANKMENT: Loose to medium dense, brown, gray, and black, SAND and GRAVEL and silty GRAVEL (A-1-b), dry

(B) RESIDUAL: Loose to very dense, brown, white, and red, silty SAND (A-2-4, A-2-5), micaceous, saprolitic, dry

(C) RESIDUAL: Stiff to hard, brown, gray, and white, SILT and CLAY (A-4, A-6), with trace fine sand and rock fragments, micaceous, saprolitic, dry

(D) WEATHERED ROCK: Gray and brown, GNEISS

(E) CRYSTALLINE ROCK: Gray and brown, GNEISS



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 8 from -DET01_EB- STA 34+83.83 to 29+30.48				**GROUND WTR (ft)**
BORING NO. RW8_10	**STATION** 35+08	**OFFSET** 27 ft RT	**ALIGNMENT** -RW8-	**0 HR.** Dry
COLLAR ELEV. 2,606.5 ft	**TOTAL DEPTH** 11.5 ft	**NORTHING** 665,687	**EASTING** 818,414	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 01/26/21	**COMP. DATE** 01/26/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
2610										
	2,606.5	0.0								GROUND SURFACE 0.0
	2,605.9	0.6	7	10	7	17		D		0.6' PAVEMENT 0.6
2605	2,604.0	2.5	4	4	5	9	SS-3	26%		**ROADWAY EMBANKMENT** Medium dense, brown, SAND and GRAVEL (A-1-b) 2.5
	2,601.5	5.0	6	8	13	21		D		**RESIDUAL** Loose to medium dense, white, brown and red, fine to coarse SAND (A-2-5) with little silt and trace clay, micaceous, saprolitic
2600	2,599.0	7.5	5	5	7	12		D		
	2,596.5	10.0	6	7	10	17		D		
2595	2,595.0	11.5								Boring Terminated at Elevation 2,595.0 ft in SAND

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 8 from -DET01_EB- STA 34+83.83 to 29+30.48				**GROUND WTR (ft)**
BORING NO. RW8_9	**STATION** 35+61	**OFFSET** 26 ft RT	**ALIGNMENT** -RW8-	**0 HR.** Dry
COLLAR ELEV. 2,609.5 ft	**TOTAL DEPTH** 11.5 ft	**NORTHING** 665,656	**EASTING** 818,373	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 01/27/21	**COMP. DATE** 01/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2610										
	2,608.9	0.6	7	11	8	19		D		2,609.5 GROUND SURFACE 0.0
	2,607.0	2.5	4	9	7	16		D		2,608.9 0.6' PAVEMENT 0.6
2605	2,604.5	5.0	8	8	10	18		D		2,607.0 **ROADWAY EMBANKMENT** Medium dense, gray and brown, SAND and GRAVEL (A-1-b) 2.5
	2,602.0	7.5	4	8	11	19		D		**RESIDUAL** Medium dense to very dense, brown, white and black, silty SAND (A-2-4), with trace rock fragments, micaceous
2600	2,599.5	10.0	16	32	22	54		D		
	2,598.0	11.5								Boring Terminated at Elevation 2,598.0 ft in SAND

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 8 from -DET01_EB- STA 34+83.83 to 29+30.48				**GROUND WTR (ft)**
BORING NO. RW8_8	**STATION** 36+14	**OFFSET** 25 ft RT	**ALIGNMENT** -RW8-	**0 HR.** Dry
COLLAR ELEV. 2,612.3 ft	**TOTAL DEPTH** 10.9 ft	**NORTHING** 665,625	**EASTING** 818,331	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER L. Wanstrath	**START DATE** 01/27/21	**COMP. DATE** 01/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2615											
	2,612.3	0.0								GROUND SURFACE	0.0
	2,611.7	0.6	6	4	5	9 15		D		0.6' PAVEMENT	0.6
2610	2,609.8	2.5	8	7	8			D		**ROADWAY EMBANKMENT** Loose, gray and brown, SAND and GRAVEL (A-1-b)	2.5
	2,607.3	5.0	64	54/0.5		100+				**RESIDUAL** Stiff to very stiff, brown and black, SILT (A-4), micaceous	5.0
2605	2,604.8	7.5	10	15	14	29	SS-4	10%		**WEATHERED ROCK** Gray and brown, GNEISS	7.0
	2,602.3	10.0	24	100/0.4		100+				**RESIDUAL** Medium dense, brown, gray, and white, silty SAND (A-2-4), micaceous, saprolitic	10.0
	2,601.4	10.9								**WEATHERED ROCK** Gray, GNEISS	10.9
										Boring Terminated at Elevation 2,601.4 ft in Weathered Rock (GNEISS)	

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 8 from -DET01_EB- STA 34+83.83 to 29+30.48				**GROUND WTR (ft)**
BORING NO. RW8_7	**STATION** 36+67	**OFFSET** 26 ft RT	**ALIGNMENT** -RW8-	**0 HR.** Dry
COLLAR ELEV. 2,615.3 ft	**TOTAL DEPTH** 10.3 ft	**NORTHING** 665,597	**EASTING** 818,287	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER L. Wanstrath	**START DATE** 01/27/21	**COMP. DATE** 01/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2620										
	2,615.3	0.0								GROUND SURFACE 0.0
2615	2,614.8	0.5	6	8	9	17 13		D		0.5' PAVEMENT 0.5
	2,612.8	2.5	5	6	7			D		**ROADWAY EMBANKMENT** Medium dense, brown and gray, SAND and GRAVEL (A-1-b) 2.5
2610	2,610.3	5.0	10	53	41	94		D		**RESIDUAL** Stiff to hard, brown and gray, SILT (A-4), micaceous, saprolitic 7.5
	2,607.8	7.5	32	100/0.4		100+				**WEATHERED ROCK** Gray, GNEISS 10.3
2605	2,605.3	10.0	100/0.3			100/0.3				Boring Terminated at Elevation 2,605.0 ft in Weathered Rock (GNEISS)
	2,605.0	10.3								

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 8 from -DET01_EB- STA 34+83.83 to 29+30.48				**GROUND WTR (ft)**
BORING NO. RW8_6	**STATION** 37+21	**OFFSET** 26 ft RT	**ALIGNMENT** -RW8-	**0 HR.** Dry
COLLAR ELEV. 2,618.4 ft	**TOTAL DEPTH** 5.0 ft	**NORTHING** 665,570	**EASTING** 818,241	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 01/27/21	**COMP. DATE** 01/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
2620										
	2,618.4	0.0								GROUND SURFACE
	2,617.8	0.6	9	6	10	16		D		0.6' PAVEMENT
2615	2,615.9	2.5	9	10	15	25		D		**ROADWAY EMBANKMENT** Medium dense, brown and gray, SAND and GRAVEL (A-1-b)
	2,613.4	5.0	60/0.0			60/0.0				**RESIDUAL** Very stiff, brown, black, and gray, SILT (A-4), saprolitic
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,613.4 ft on Crystalline Rock (GNEISS)

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 8 from -DET01_EB- STA 34+83.83 to 29+30.48				**GROUND WTR (ft)**
BORING NO. RW8_5	**STATION** 37+74	**OFFSET** 27 ft RT	**ALIGNMENT** -RW8-	**0 HR.** Dry
COLLAR ELEV. 2,621.3 ft	**TOTAL DEPTH** 16.5 ft	**NORTHING** 665,545	**EASTING** 818,196	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 01/27/21	**COMP. DATE** 01/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2625										
	2,621.3	0.0								GROUND SURFACE
	2,620.7	0.6	6	6	7	13		D		0.6' PAVEMENT
2620	2,618.8	2.5	8	6	7	13		D		**ROADWAY EMBANKMENT** Medium dense, brown and gray, SAND and GRAVEL (A-1-b)
	2,616.3	5.0	18	21	15	36		D		**RESIDUAL** Stiff to hard, white, gray and brown, SILT (A-4), with trace clay, micaceous, saprolitic
2615	2,613.8	7.5	5	5	10	15		D		
	2,611.3	10.0	8	10	13	23		D		
2610										
	2,606.3	15.0	5	7	11	18		D		
2605										
	2,604.8	16.5								Boring Terminated at Elevation 2,604.8 ft in SILT

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 8 from -DET01_EB- STA 34+83.83 to 29+30.48				**GROUND WTR (ft)**
BORING NO. RW8_4	**STATION** 38+29	**OFFSET** 26 ft RT	**ALIGNMENT** -RW8-	**0 HR.** Dry
COLLAR ELEV. 2,624.4 ft	**TOTAL DEPTH** 21.5 ft	**NORTHING** 665,520	**EASTING** 818,149	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 01/27/21	**COMP. DATE** 01/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2625											
	2,624.4	0.0								GROUND SURFACE	0.0
	2,623.8	0.6	6	7	7	14				0.6" PAVEMENT	0.6
	2,621.9	2.5	7	8	8	16				**ROADWAY EMBANKMENT** Medium dense, brown and black, SAND and GRAVEL (A-1-b)	2.5
2620	2,619.4	5.0	4	6	9	15				**RESIDUAL** Stiff to hard, white, gray, brown and black, SILT (A-4), micaceous, saprolitic	
	2,616.9	7.5	10	10	8	18					
2615	2,614.4	10.0	7	7	10	17					
2610	2,609.4	15.0	6	6	8	14					
2605	2,604.4	20.0	12	15	23	38					
	2,602.9	21.5								Boring Terminated at Elevation 2,602.9 ft in SILT	21.5

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 8 from -DET01_EB- STA 34+83.83 to 29+30.48				**GROUND WTR (ft)**
BORING NO. RW8_3	**STATION** 38+83	**OFFSET** 26 ft RT	**ALIGNMENT** -RW8-	**0 HR.** Dry
COLLAR ELEV. 2,627.4 ft	**TOTAL DEPTH** 21.5 ft	**NORTHING** 665,498	**EASTING** 818,099	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 01/27/21	**COMP. DATE** 01/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
2630											
	2,627.4	0.0								GROUND SURFACE	0.0
	2,626.8	0.6	10	10	8	18		D		0.6" PAVEMENT	0.6
2625	2,624.9	2.5	8	7	6	13		D		**ROADWAY EMBANKMENT** Medium dense, gray and brown, SAND and GRAVEL (A-1-b)	2.5
	2,622.4	5.0	9	9	11	20		D		**RESIDUAL** Stiff to very stiff, brown and gray, SILT (A-4), micaceous, saprolitic	
2620	2,619.9	7.5	7	8	9	17		D			
	2,617.4	10.0	8	8	9	17		D			
2615	2,612.4	15.0	8	8	8	16		D			
2610	2,607.4	20.0	12	13	12	25		D			
	2,605.9	21.5								Boring Terminated at Elevation 2,605.9 ft in SILT	21.5

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 8 from -DET01_EB- STA 34+83.83 to 29+30.48				**GROUND WTR (ft)**
BORING NO. RW8_2	**STATION** 39+37	**OFFSET** 26 ft RT	**ALIGNMENT** -RW8-	**0 HR.** Dry
COLLAR ELEV. 2,630.5 ft	**TOTAL DEPTH** 21.5 ft	**NORTHING** 665,477	**EASTING** 818,051	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 01/26/21	**COMP. DATE** 01/27/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2635											
2630	2,629.9	0.6	11	12	10	22		D		2,630.5 GROUND SURFACE	0.0
	2,628.0	2.5	8	12	17	29		D		2,629.9 0.6' PAVEMENT	0.6
2625	2,625.5	5.0	9	15	16	31	SS-2	15%		2,628.0 **ROADWAY EMBANKMENT** Medium dense, gray and brown, SAND and GRAVEL (A-1-b)	2.5
	2,623.0	7.5	11	16	21	37		D		**RESIDUAL** Very stiff to hard, brown, silty, fine to coarse sandy CLAY (A-6)(2), micaceous, saprolitic	
2620	2,620.5	10.0	15	17	21	38		D			
2615	2,615.5	15.0	6	9	9	18		D			
2610	2,610.5	20.0	8	7	11	18		D		2,609.0	21.5
										Boring Terminated at Elevation 2,609.0 ft in CLAY	

WBS 38330.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD	**GEOLOGIST** N. Yacobi	
SITE DESCRIPTION Retaining Wall No. 8 from -DET01_EB- STA 34+83.83 to 29+30.48				**GROUND WTR (ft)**
BORING NO. RW8_1	**STATION** 39+89	**OFFSET** 25 ft RT	**ALIGNMENT** -RW8-	**0 HR.** Dry
COLLAR ELEV. 2,633.3 ft	**TOTAL DEPTH** 21.5 ft	**NORTHING** 665,458	**EASTING** 818,003	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC CME550X 9083		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER L. Wanstrath	**START DATE** 01/26/21	**COMP. DATE** 01/26/21	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2635										
2630	2,632.7	0.6	10	11	10	21		D		2,633.3 GROUND SURFACE 0.0
	2,630.8	2.5	8	6	8	14		D		2,632.7 0.6' PAVEMENT 0.6
2625	2,628.3	5.0	7	9	10	19		D		2,631.3 **ROADWAY EMBANKMENT** Medium dense, gray and brown, silty GRAVEL (A-1-b) 2.0
	2,625.8	7.5	5	8	6	14		D		2,629.3 **RESIDUAL** Medium dense, tan and brown, silty SAND (A-2-4), micaceous 4.0
2620	2,623.3	10.0	4	12	15	27		D		Stiff to hard, brown, tan and white, SILT (A-4), with trace sand, micaceous, saprolitic
2615	2,618.3	15.0	12	17	23	40		D		
	2,613.3	20.0	9	10	11	21		D		2,611.8 21.5
										Boring Terminated at Elevation 2,611.8 ft in SILT

REFERENCE: B-3186/B-5898

PROJECT: 38332/48030

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

CROSS SECTIONS

APPENDICES

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *HAYWOOD*

PROJECT DESCRIPTION *US 23/US 74/US 19 (GREAT SMOKY MOUNTAIN HWY) FROM WEST OF NC 209 (CRABTREE RD.) TO EAST OF RUSS AVE.*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3816/B-5898	1	66

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

C. SWAFFORD

R. DUGGER

N. YACOBI

GEOTECHNOLOGY, INC.

INVESTIGATED BY *C. SWAFFORD*

DRAWN BY *T. LYNN*

CHECKED BY *K. BUSSEY*

SUBMITTED BY *HDR*

DATE *NOVEMBER 2021*

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

NORTH CAROLINA PROFESSIONAL SEAL 038206 ENGINEER KENNETH R. BUSSEY, JR.

Kenneth R. Bussey, Jr. 11/22/21

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	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
- [X] CME-55
- [X] CME-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-75
- [ ] _____

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: N/A

ELEVATION: FEET

NOTES:

BORING ELEVATIONS OBTAINED USING b3186_br0022_r4047_Merged_1-12-21.tin

FIAD - FILLED IMMEDIATELY AFTER DRILLING

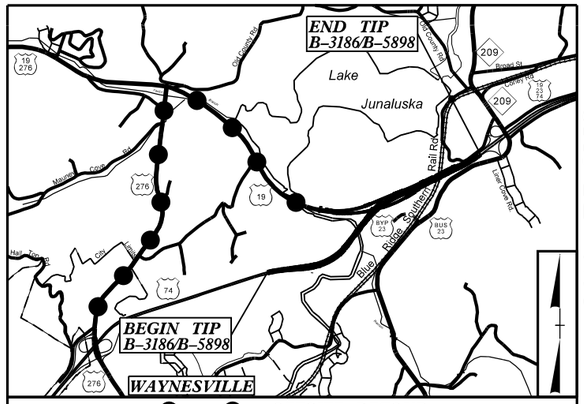
DATE: 8-15-14

09/08/99

TIP PROJECT: B-3186 /B-5898

CONTRACT: C204684

See Sheet 1-A For Conventional Symbols



VICINITY MAP

90% PLANS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

HAYWOOD COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-3186 /B-5898	3	66

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
38332.1.FS.1	BRNHP-0023(32)	P.E.
48030.1.FS.1	BRSTP-0019(49)	P.E.
38332.2.1	N/A	RW/UTILITY
48030.2.1	N/A	RW/UTILITY

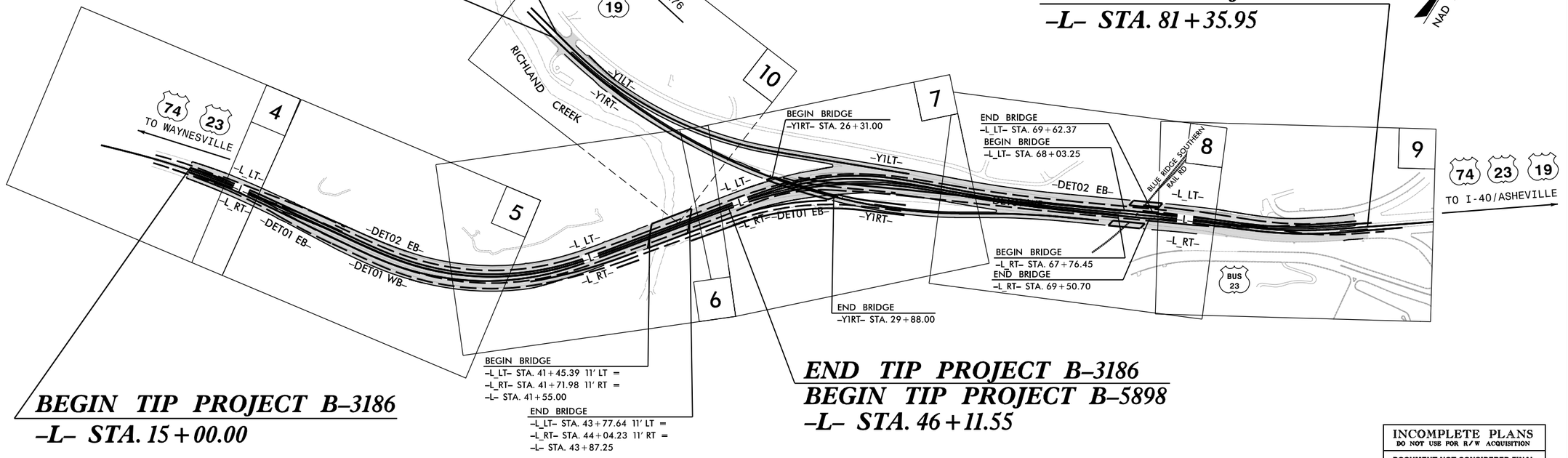
LOCATION: US 23/US 74/US 19 (GREAT SMOKY MOUNTAIN HWY) FROM WEST OF NC 209(CRABTREE RD.) TO EAST OF RUSS AVE.

TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES AND UTILITIES.

BEGIN CONSTRUCTION
–YILT– STA. 11+99.83

BEGIN CONSTRUCTION
–YIRT– STA. 12+00.00

END TIP PROJECT B–5898
–L– STA. 81+35.95



BEGIN TIP PROJECT B–3186
–L– STA. 15+00.00

END TIP PROJECT B–3186
BEGIN TIP PROJECT B–5898
–L– STA. 46+11.55

NAD 83/2011

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

THIS IS A CONTROLLED–ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES

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 2022 = 47,300
ADT 2042 = 59,400
K = 8 %
D = 55 %
T = 5 % *
V = 65 MPH
* TTST = 2% DUAL 3%

FUNC CLASS = FREEWAY
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B–3186 = 0.545 miles
TOTAL STRUCTURES TIP PROJECT B–3186 = 0.044 miles
TOTAL LENGTH TIP PROJECT B–3186 = 0.589 miles

LENGTH ROADWAY TIP PROJECT B–5898 = 0.636 miles
TOTAL STRUCTURES TIP PROJECT B–5898 = 0.033 miles
TOTAL LENGTH TIP PROJECT B–5898 = 0.669 miles

(LENGTHS BASED ON L_RT ALIGNMENT)

Prepared In the Office of:
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
JULY 8, 2021

LETTING DATE:
MARCH 15, 2022

PHILLIP E. ROGERS, PE
PROJECT ENGINEER

HENRY W. BARE
PROJECT DESIGN ENGINEER

GARRETT HIGDON
NCDOT CONTACT

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

PLOT DRIVER: NCDOT_pdf_color_eng_100.pit
USER: TLYNN
FILE: NCDOT\NCDOT-B3186_T02.c:\6.0_CAD_BIM\6.2_Work_In_Progress\B-3186-B-5898\Geotech\InvestigationDesign\B3186_GEO_RDY\CADD_GEOTECH\PlanProf\B3186-B5898_RDY_GEO_TSH.dgn
DATE: 10/22/2021
TIME: 3:47:35 PM
PENTABLE: NCDOT_Title Sheets.tbl

November 3, 2021

STATE PROJECT: B-3186/B-5898
FEDERAL PROJECT: N/A
COUNTY: HAYWOOD
DESCRIPTION: US 23/US 74/US 19 (Great Smoky Mountain Hwy.) from West of NC 209 (Crabtree Rd.) to East of Russ Ave.
SUBJECT: Geotechnical Inventory Report

Project Description

The project area lies in the town of Lake Junaluska, NC between Highway 276 and NC 209. This project consists of upgrading US 74 to a six-lane, median divided facility from east of the US 276 Interchange to the US 23 Business Interchange. Additionally, US 19 will be upgraded with full depth paved, 10-ft shoulders from east of Holston Village Road to the US 74 Interchange. In total, approximately 1.2 miles of roadway will be upgraded. Finally, a two-span bridge on US 19 over US 74/US 23, a three-span bridge on US 19/US 23/US 74 over Richland Creek, a dual, three-span bridges on US 19/US 23/US 74 over the Blue Ridge Southern Railroad, and nine retaining walls are included with this project, but are covered under separate reports.

The geotechnical field investigation was conducted from January 2021 to April 2021. Three drill rigs mounted on a rubber tracked all-terrain carrier and equipped with an automatic hammer (CME 55, CME 550X, and CME 75) were used to advance borings for the subsurface exploration. Hollow stem auger drilling procedures were used to advance borings to the required depths. Standard Penetration Tests were performed at approximately 2.5-foot to 5.0-foot intervals to termination in selected borings. Representative soil samples were collected for visual classification in the field and selected samples were submitted for laboratory analysis.

The following alignments were explored. Subsurface profiles and/or cross sections of these alignments are included in this report.

Line	Stations (±)
-L-	20+00 – 81+35.95
-Y1RT-	10+00 – 44+31.29
-Y1LT-	10+00 – 33+16.69

Areas of Special Geotechnical Interest

1) Loose/Soft Soils: Very soft or very loose soils were encountered during the investigation. Such soils (N-value < 4) could have the potential to cause embankment/subgrade and/or slope stability problems during construction. These soils were encountered along the following intervals:

Line	Station (±)	Offset (ft)
-L-	54+50	RT
-L-	57+00 – 59+50	RT
-L-	66+50	RT
-Y1RT-	20+00	RT
-Y1RT-	25+50	RT

2) Highly Plastic Soils: Highly plastic coils were encountered as part of the investigation. However, these soils were encountered at depths great enough to not adversely impact embankment/subgrade and/or slope stability. However, if encountered during construction, these soils have the potential to cause such problems.

3) Organic Soils: Though not encountered during the investigation, organic matter and wood debris could be present along the project limits, especially near streams and creeks.

4) Artificial Fill: Artificial fill was encountered at the following locations.

Line	Station (±)	Offset (ft)
-L-	38+00 – 41+00	LT to RT
-L-	44+50 – 46+50	LT

Several smaller areas of artificial fill may be present throughout the project corridor and are related to business developments, gravel, and soil driveways, as well as previous construction of utility lines.

5) Crystalline Rock: Crystalline rock was encountered within 6 feet of proposed grade at the following locations:

Line	Station (±)	Offset (ft)
-L-	32+00	RT
-L-	75+00 – 77+00	LT to RT
-Y1RT-	17+00 – 18+00	LT to RT

6) Groundwater: High groundwater was not encountered during the investigation. However, especially around streams and creeks, seasonal high ground water or the potential for groundwater related construction problems could be present.

7) Ponds: No ponds were found or identified on or within close proximity of right of way on this project. These were noted at the following locations:

8) Water Wells: Water wells were not found or identified within or in close proximity to the proposed right of way.

Physiography and Geology

The project is located in the Blue Ridge Physiographic Province. Land use along the project corridor consists of residential, agricultural, commercial businesses and woods. Geologically, the project is located within the Blue Ridge Belt. Bedrock generally consists of rocks from the Coweeta Group **(ZYbn)**, consisting of migmatitic Biotite Gneiss interlayered and gradational with biotite-garnet gneiss and amphibolite, with intrusive metamorphosed gabbro and diorite.

Soil Properties

Soils encountered at the project site include roadway embankment, artificial fill, alluvial, residual, weathered metamorphic rock and crystalline metamorphic rock.

Roadway Embankment soils were mainly encountered along the existing sections of US 74 and US 19 and consisting of gray, red, and brown, very soft to very stiff silt and clay (A-4, A-5, A-6, A-7) and loose to medium dense, clayey and silty sand and gravel (A-2-6, A-2-4, A-3, A-1-b).

Artificial fill soils consist of brown, orange, and gray, very soft to stiff, silt and clay (A-4, A-6, A-7-6), and loose to medium dense, sand and gravel (A-3, A-1-b). The artificial fill is underlain by residual soils.

Alluvial deposits are located within the floodplains of Richland Creek and nearby streams within the project limits. These soils are black, gray, and brown, very soft to medium stiff, silt and clay (A-4, A-5, A-7), and very loose to dense, sand and gravel and silty sand (A-1-b, A-2-4, A-2-6, A-3).

Residual soils were encountered throughout the project. These soils consist primarily of red, tan, and brown, soft to hard silt and clay (A-4, A-5, A-7), and loose to very dense, silty and clayey sand (A-2-4, A-2-5, A-2-6, A-2-7, A-3).

Rock Properties

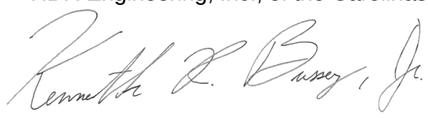
Weathered rock was encountered during the roadway investigation at elevations ranging from approximately 2638 to 2551 feet. It originates from the underlying metamorphic rock, specifically Gneiss.

Crystalline rock was encountered during the roadway investigation at elevations ranging from approximately 2653 to 2523 feet and consists of Gneiss. Refer to the “Areas of Special Geotechnical Interest” for areas of rock encountered within 6 feet of proposed grade.

Ground Water

Groundwater was encountered in multiple borings and ranges in elevation from approximately 2620 to 2567 feet. Groundwater may fluctuate with seasonal precipitation.

Prepared By,
HDR Engineering, Inc., of the Carolinas



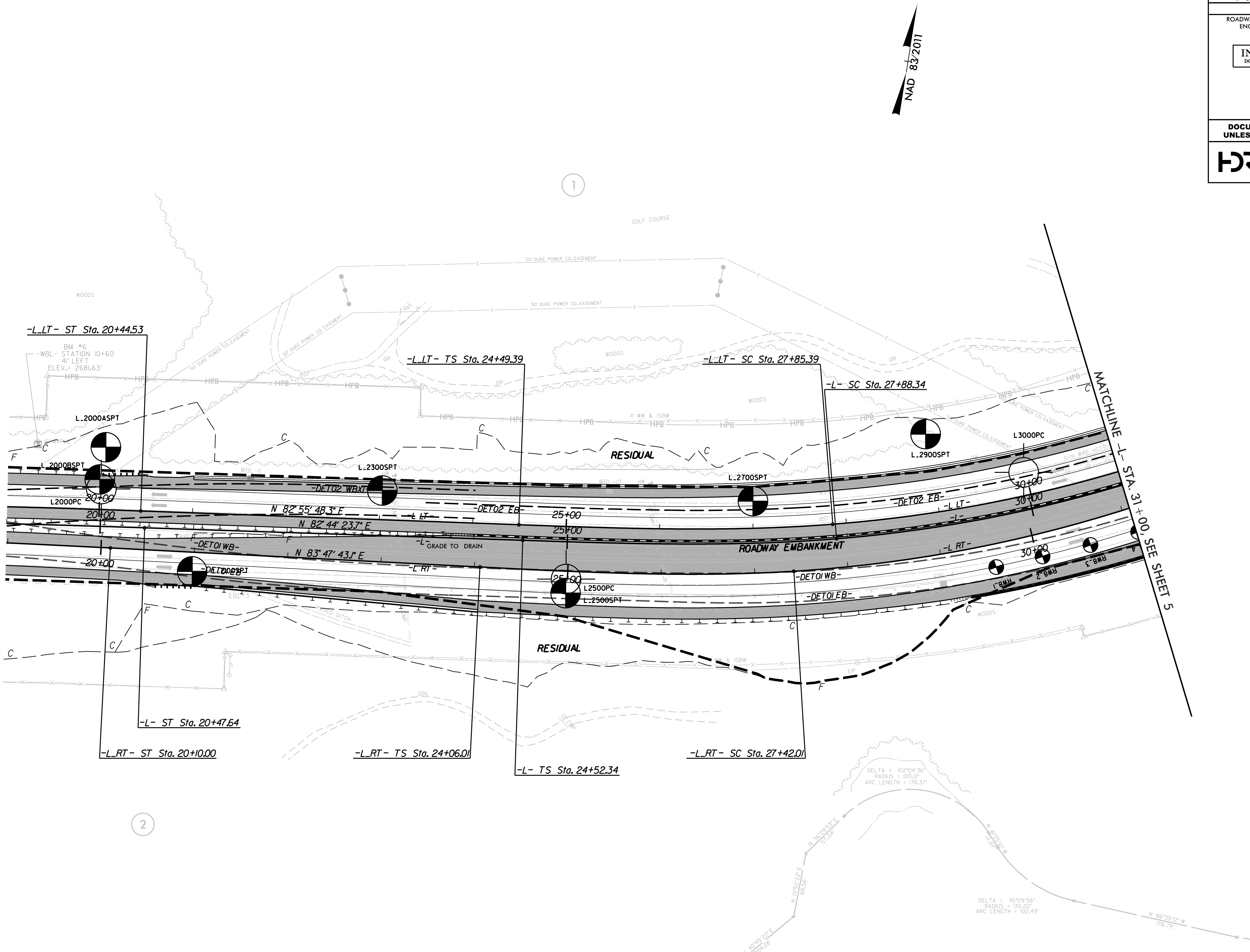
Kenneth R. Bussey, Jr., P.E.
Senior Geotechnical Engineer

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	4
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116



REVISIONS

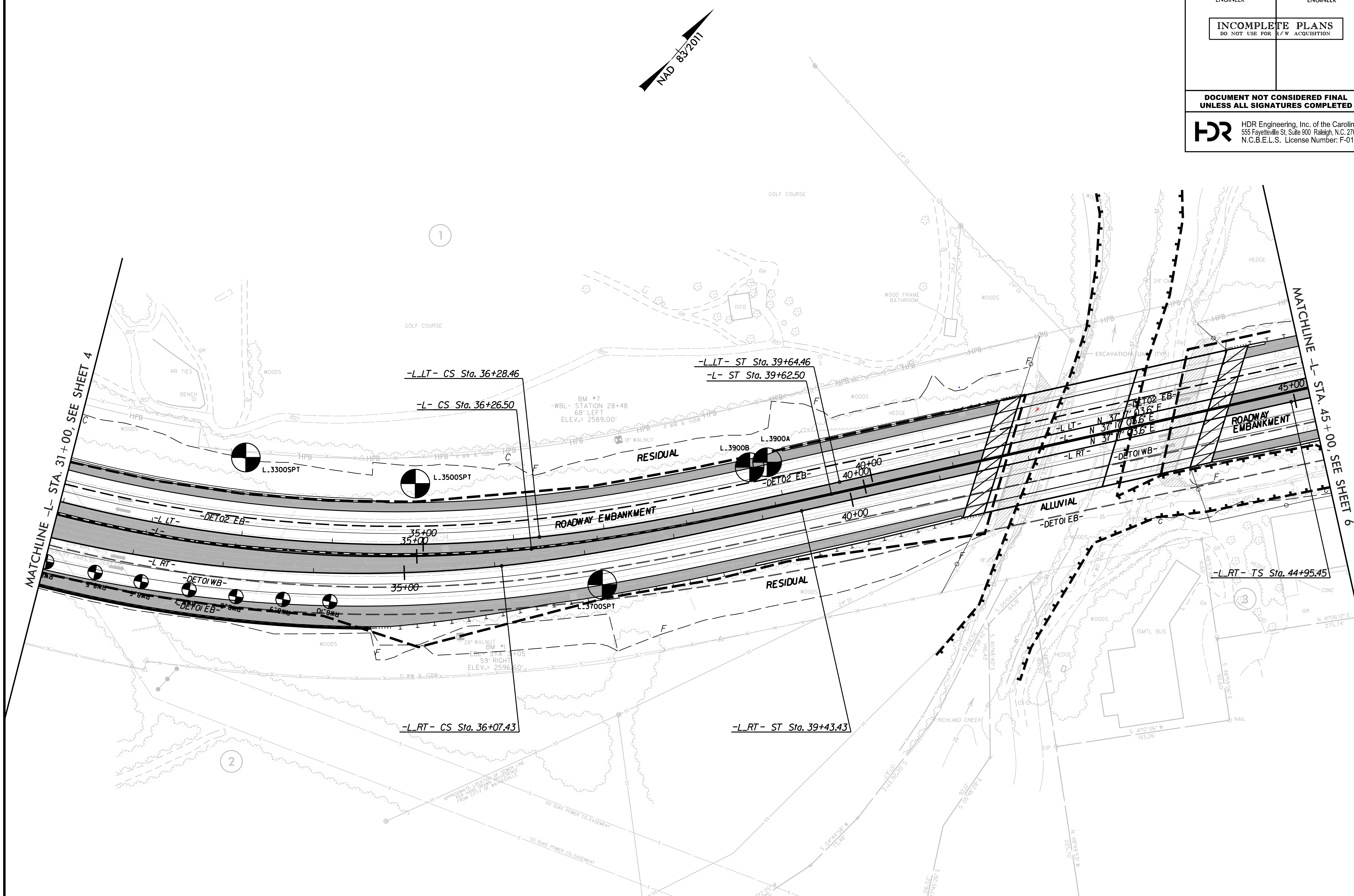
PLOT DRIVER: NCDOT_pdf_color_eng_100.plt
USER: TLYNN
FILE: \
PENTABLE: NCDOT_Plan Sheets_STR.tbl
DATE: 11/3/2021
TIME: 11:47:20 AM

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	5
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116



PLOT DRIVER: NCDOT_pdf_color_eng_100.plt
USER: TLYNN
FILE: \
PENTABLE: NCDOT_Plan Sheets_STR.tbl
DATE: 11/3/2021
TIME: 11:47:24 AM

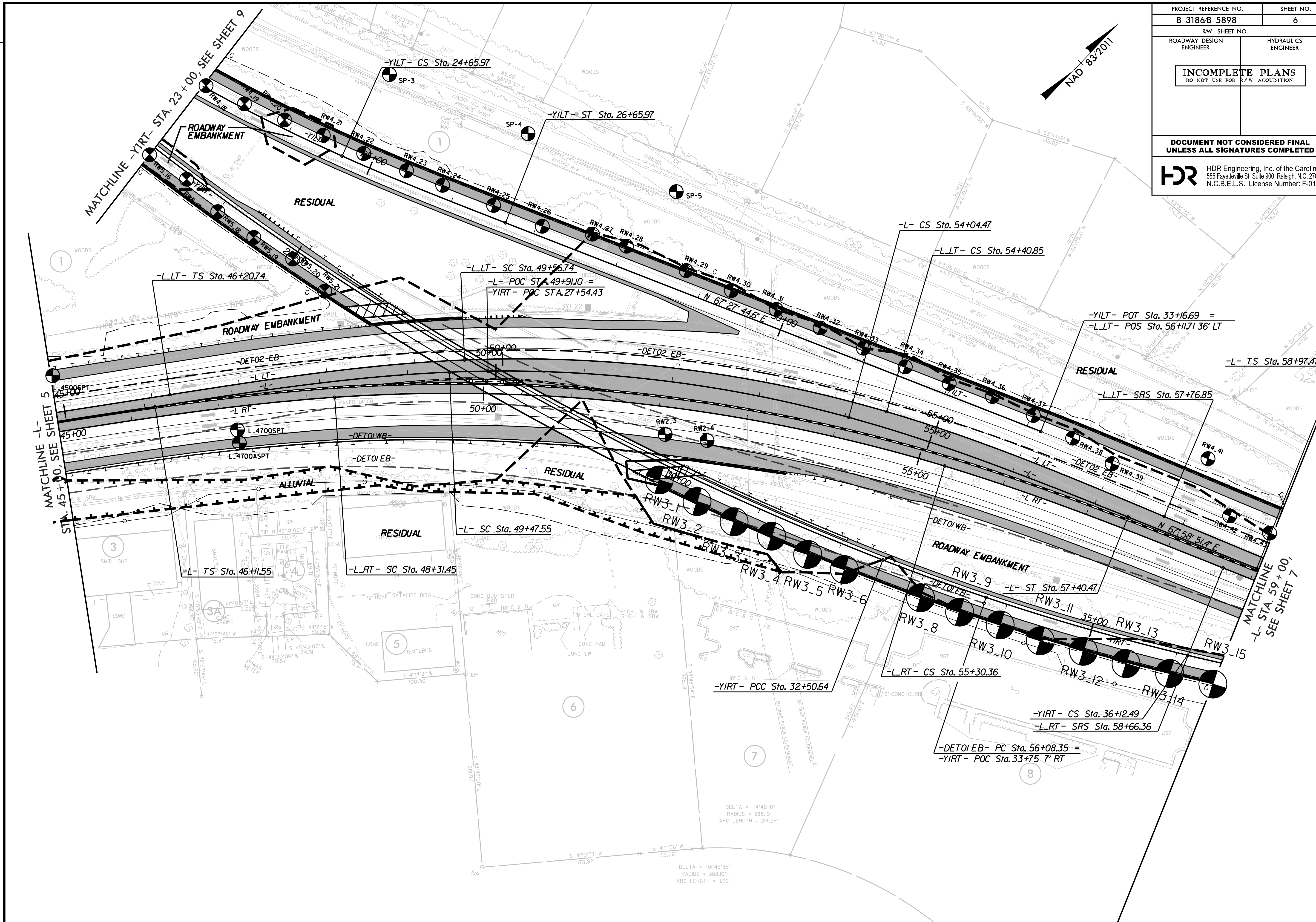
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	6
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116



REVISIONS

PLOT DRIVER: NCDOT_pdf_color_eng_100.plt
PENTABLE: NCDOT_Plan Sheets_STR.tbl
USER: TLYNN
DATE: 11/3/2021
TIME: 11:47:27 AM
FILE: \

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

NAD 83/2011

MATCHLINE -L- STA. 59+00, SEE SHEET 6

MATCHLINE -L- STA. 73+00, SEE SHEET 8

-L_LT- SC Sta. 59+02.85
-L- SC Sta. 60+97.47
-L- CS Sta. 63+82.63
-L_LT- CS Sta. 63+74.83
-L_LT- ST Sta. 65+00.83
-L- ST Sta. 65+82.63
-L- POT Sta. 68+72.05 =
-RR- POC Sta. 311+02.79
-RR- PC Sta. 1307+03.14
-RR- PT Sta. 1307+89.92
-RR- PC Sta. 1308+35.40
-L_LT- PC Sta. 70+02.65
-L- PT Sta. 72+69.17

RESIDUAL
ROADWAY EMBANKMENT
RESIDUAL
ROADWAY EMBANKMENT

RW4_44 RW4_45 L6000PC RW4_46 RW4_47 RW4_48 RW4_49 RW4_50 RW4_51 RW4_52 RW4_53 RW4_54A RW4_54B RW4_55 RW4_56 RW4_57 RW4_58 RW4_59
RW3_15 RW3_16 RW3_17 RW3_18 RW3_19 RW3_20 RW3_21 RW3_22 RW3_24 RW3_25 RW3_26 L6500PC RW3_27 RW3_28 RW3_30
RW6_3 RW6_4 RW6_5 RW6_6 L7000PC RW7_2 RW7_3 RW7_4 RW7_5 RW7_6

-DET02 EB-
-03 -LRT-
END SBG
-DET02 WBX2-
+80 -LRT-
BEGIN XBG
-DET01 WB-
GRADE TO DRAIN -L-
-YIRT- CS Sta. 41+60.85
-L_RT- CS Sta. 65+25.52
-YIRT- ST Sta. 43+10.85
-YIRT- POT Sta. 44+31.29 =
-L_RT- ST Sta. 66+75.52
36' RT
-YIRT- SC Sta. 39+12.49
-L_RT- SC Sta. 60+16.36
-YIRT- SRS Sta. 37+62.49
-L- PC Sta. 69+98.45
-L_RT- PC Sta. 70+19.82
-L_RT- PT Sta. 72+90.89
-RR- PT Sta. 1312+41.12

N 63° 27' 13.0" E

BM # 3
-EBL- STA 59+63
74°5'46.5" E Dist 329'
ELEV.= 2649.74'

LAT: 35.520066
LONG: -82.982875

321± Sq. Feet

-RR-

PI Sta 1307+46.53	PI Sta 1310+39.71
△ = 1° 25' 14.2" (RT)	△ = 16° 43' 25.2" (RT)
D = 1° 38' 13.3"	D = 4° 07' 19.2"
L = 86.78'	L = 405.72'
T = 43.39'	T = 204.31'
R = 3,500.00'	R = 1,390.00'

REVISIONS

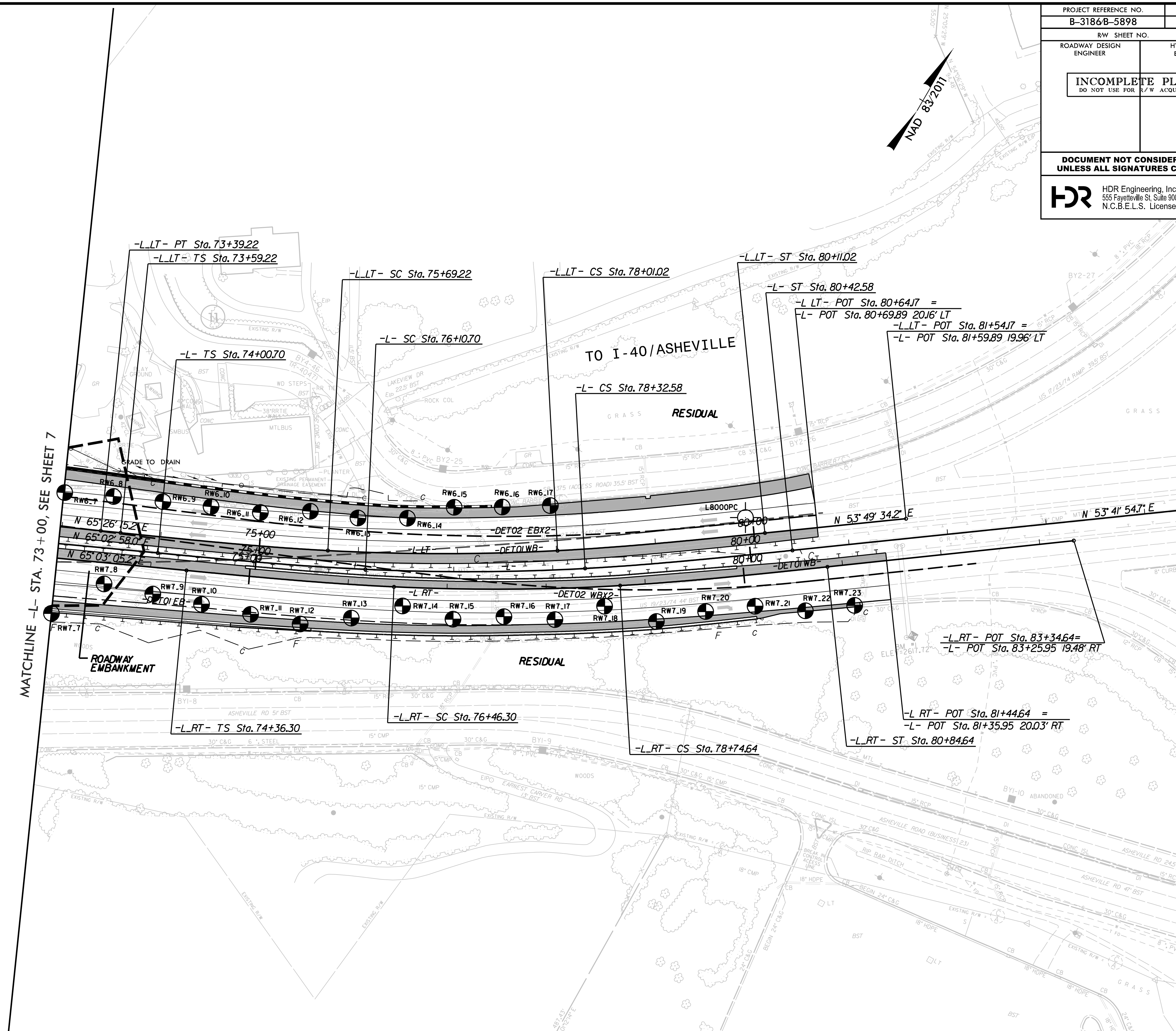
PLOT DRIVER: NCDOT_pdf_color_eng.100.plt
USER: TLYNN
FILE: \
PENTABLE: NCDOT_Plan Sheets_STR.tbl
DATE: 11/3/2021
TIME: 11:47:30 AM

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	8
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116


NAD 83/2011
-L_LT- PT Sta. 73+39.22
-L_LT- TS Sta. 73+59.22
-L_LT- SC Sta. 75+69.22
-L_LT- CS Sta. 78+01.02
-L_LT- ST Sta. 80+11.02
-L- ST Sta. 80+42.58
-L_LT- POT Sta. 80+64.17 =
-L- POT Sta. 80+69.89 20.16' LT
-L_LT- POT Sta. 81+54.17 =
-L- POT Sta. 81+59.89 19.96' LT
-L- SC Sta. 76+10.70
-L- TS Sta. 74+00.70
-L- CS Sta. 78+32.58
TO I-40/ASHEVILLE
RESIDUAL
GRADE TO DRAIN
N 65° 26' 15.2" E
N 65° 02' 58.0" E
N 65° 03' 05.2" E
N 53° 49' 34.2" E
N 53° 41' 54.7" E
L8000PC
75+00
80+00
-DET02 EBX2-
-DET01WB-
-DET01EB-
-DET02 WBX2-
-L_LT-
-L-
-L_RT-
RW6_7 RW6_8 RW6_9 RW6_10 RW6_11 RW6_12 RW6_13 RW6_14 RW6_15 RW6_16 RW6_17
RW7_7 RW7_8 RW7_9 RW7_10 RW7_11 RW7_12 RW7_13 RW7_14 RW7_15 RW7_16 RW7_17 RW7_18 RW7_19 RW7_20 RW7_21 RW7_22 RW7_23
MATCHLINE -L- STA. 73+00, SEE SHEET 7
ROADWAY EMBANKMENT
-L_RT- POT Sta. 83+34.64=
-L- POT Sta. 83+25.95 19.48' RT
-L_RT- POT Sta. 81+44.64 =
-L- POT Sta. 81+35.95 20.03' RT
-L_RT- ST Sta. 80+84.64
-L_RT- CS Sta. 78+74.64
-L_RT- SC Sta. 76+46.30
-L_RT- TS Sta. 74+36.30
ASHEVILLE ROAD (BUSINESS 23)
EARNEST CARVER RD
WOODS
GRASS

REVISIONS

PLOT DRIVER: NCDOT_pdf_color_eng_100.plt
USER: TLYNN
FILE: \
PENTABLE: NCDOT_Plan Sheets_STR.tbl
DATE: 11/3/2021
TIME: 11:47:33 AM

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

NAD 83/2011

UTILITY OWNERS

DUKE ENERGY CAROLINAS
217 CRAIG MANOR ROAD
LANCASTER, S.C. 29720
AT&T
P.O. BOX 537104
ATLANTA, GA. 30353
TOWN OF WAYNESVILLE
16 SOUTH MAIN STREET
P.O. BOX 100
WAYNESVILLE, N.C. 28786
TOWN OF WAYNESVILLE
16 SOUTH MAIN STREET, P.O. BOX 100
WAYNESVILLE, N.C. 28786
LAKE JUNALASKA ASSEMBLY PUBLIC WORKS
91 N. LAKESHORE DRIVE
LAKE JUNALUSKA, N.C. 28745
JUNALUSKA SANITARY DISTRIC
558 OLD CLYDE ROAD
CLYDE, N.C. 28721

TO US-276

-YILT- POT Sta. 10+00.00
-YILT- TS Sta. 12+06.91
-YILT- SC Sta. 14+06.91
-YIRT- POT Sta. 10+00.00
-YIRT- TS Sta. 11+12.00
-YIRT- SC Sta. 13+12.00
-YIRT- STA. 23+00, SEE SHEET 6
MATCHLINE

ROADWAY EMBANKMENT
RESIDUAL
GRADE TO DRAIN

RW4_1 RW4_2 RW4_3 RW4_4 RW4_5 RW4_6 RW4_7 RW4_8 RW4_9 RW4_10 RW4_11 RW4_12 RW4_13 RW4_14 RW4_15 RW4_16 RW4_17
RW5_1 RW5_2 RW5_3 RW5_4 RW5_5 RW5_6 RW5_7 RW5_8 RW5_9 RW5_10 RW5_11 RW5_12 RW5_13 RW5_14 RW5_15
SP-1 SP-2
YIRT_1250SPT
BM #8 -EBYI- STATION 5+00 N 76°31'22.3" W DIST 75' ELEV.= 2589.00'

HIKORY HILL ROAD PRIVATE ROAD
50' DUKE POWER CO. EASEMENT
WOODS
GREENHOUSE
WD GAZEBO
WD DK
CONC
ISFD
CONC ABUTMENT ABANDONED
CONC PIERS ABANDONED
PUMP HOUSE
CONC WATER INLET
DETENTION POND
RICHLAND CREEK
GOLF COURSE
APPROXIMATE LOCATION OF SEWER LINE PER HAND DRAWN REFERENCE FROM CITY OF WAYNESVILLE

PLOT DRIVER: NCDOT_pdf_color_eng_100.plt
USER: TLYNN
FILE: \
PENTABLE: NCDOT_Plan Sheets_STR.tbl
DATE: 11/3/2021
TIME: 11:47:36 AM

REVISIONS

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	10
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

2710 2700 2690 2680 2670 2660 2650 2640 2630 2620 2610 2600 2590 2580 2570 2560 2550 2540 2530 2520 2510

(A) **ROADWAY EMBANKMENT:** Loose, red and brown, clayey SAND (A-2-6), dry

(B) **ROADWAY EMBANKMENT:** Soft to medium stiff, red and brown, sandy CLAY (A-6, A-7-6), dry to moist

(C) **ARTIFICIAL FILL:** Medium dense, brown, SAND (A-3), with some rock fragments (quartz), moist

(D) **ARTIFICIAL FILL:** Stiff, brown, SILT (A-4), with little gravel, micaceous, dry

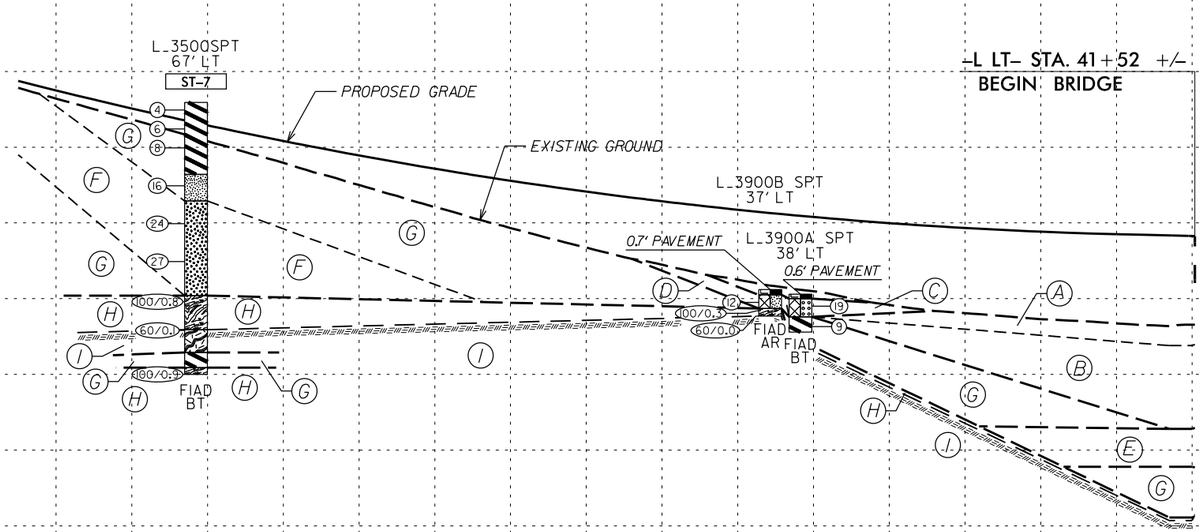
(E) **ALLUVIAL:** Dense, gray and black, SAND and GRAVEL (A-1-b), dry to moist

(F) **RESIDUAL:** Medium dense, brown, tan and red, silty SAND (A-2-4), with trace clay, micaceous, dry

(G) **RESIDUAL:** Medium stiff to very stiff, red, brown and orange, SILT and silty CLAY (A-4, A-7-5), contains trace rock fragments, micaceous, dry to moist

(H) **WEATHERED ROCK:** Brown and gray, GNEISS

(I) **CRYSTALLINE ROCK:** Brown and gray, GNEISS



-L_LT-

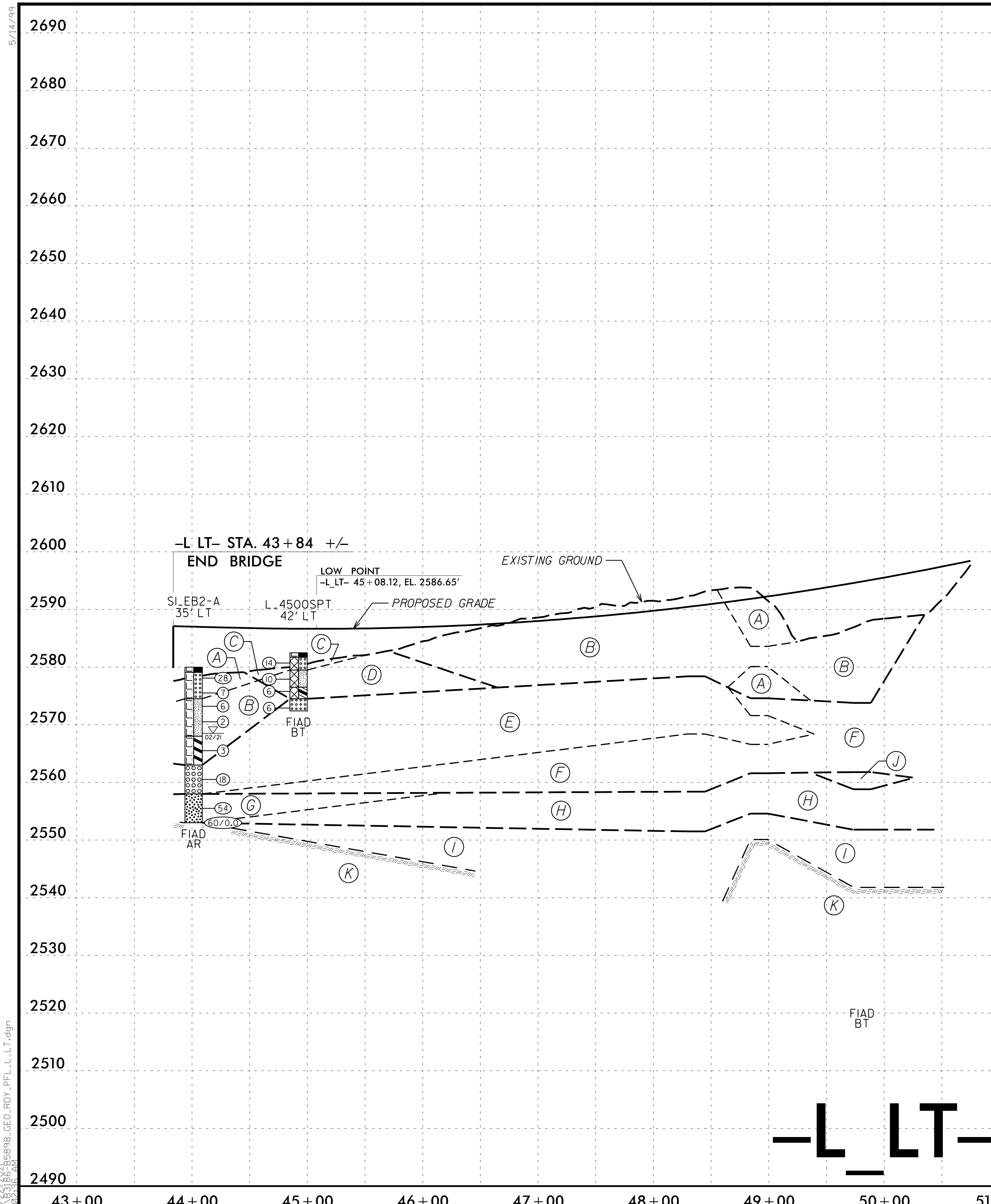
29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00 37+00 38+00 39+00 40+00 41+00 42+00 43+00

10/22/202
B3186_B5898_GEO_RDY_PFL_L_LT.dgn
7:54:55 AM

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	11
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



Ⓐ **ROADWAY EMBANKMENT:** Loose to medium dense, brown and gray, fine to coarse SAND (A-2-4, A-3), with trace to some gravel, dry to moist

Ⓑ **ROADWAY EMBANKMENT:** Soft to medium stiff, gray, orange and brown, SILT, clayey SILT and CLAY (A-4, A-5, A-7-6), contains trace root and wood fragments, with trace sand, micaceous, organic odor, moist to wet

Ⓒ **ARTIFICIAL FILL:** Medium dense, brown, SAND (A-3), with some rock fragments, moist

Ⓓ **ARTIFICIAL FILL:** Medium stiff to stiff, brown, orange and gray, SILT and silty CLAY (A-4, A-6), with trace sand, micaceous, mottled, moist

Ⓔ **ALLUVIAL:** Very loose to loose, gray, SAND and GRAVEL and silty SAND (A-1-b, A-2-4, A-3), micaceous, wet

Ⓕ **ALLUVIAL:** Very soft to medium stiff, gray and brown, sandy SILT, SILT and sandy CLAY (A-4, A-5, A-7), contains trace wood fragments, micaceous, organic odor, wet

Ⓖ **RESIDUAL:** Very dense, brown, orange and white, silty SAND (A-2-4), saprolitic, wet

Ⓗ **RESIDUAL:** Very stiff to hard, tan, brown and orange, sandy SILT and sandy CLAY (A-4, A-7), contains trace rock fragments, micaceous, saprolitic, moist to wet

Ⓘ **WEATHERED ROCK:** Brown, orange and white, GNEISS, micaceous

Ⓙ **NON-CRYSTALLINE ROCK:** Light gray, BOULDER (quartz fragments)

Ⓚ **CRYSTALLINE ROCK:** Light gray, black and white, Migmatic Biotite GNEISS

-L_LT-

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	12
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

(A) **ROADWAY EMBANKMENT:** *Loose to medium dense, brown, tan and orange, SAND and GRAVEL and clayey SAND (A-1-b, A-2-6), micaceous, dry*

(B) **ROADWAY EMBANKMENT:** *Medium stiff to very stiff, brown and orange, clayey SILT and sandy CLAY (A-5, A-6), micaceous, dry*

(C) **ARTIFICIAL FILL:** *Loose to medium dense, brown and gray, SAND and GRAVEL (A-1-b), saturated*

(D) **ARTIFICIAL FILL:** *Very soft to medium stiff, brown, orange and tan, silty CLAY (A-7-6), micaceous, moist*

(E) **ALLUVIAL:** *Medium dense, brown and gray, SAND and GRAVEL (A-1-b)*

(F) **RESIDUAL:** *Loose to very dense, brown, white and black, silty SAND (A-2-4, A-2-5), with trace rock fragments, micaceous, saprolitic, dry*

(G) **RESIDUAL:** *Medium stiff to hard, red, brown and gray, SILT, clayey SILT and silty CLAY (A-4, A-5, A-7-5) with little rock fragments, micaceous, saprolitic, dry to moist*

(H) **WEATHERED ROCK:** *Brown, tan and white, GNEISS*

(I) **CRYSTALLINE ROCK:** *GNEISS*

RW8_9
31' RT

RW8_10
31' RT

(19) (16) (18) (19) (54)
FIAD
BT

(17) (9) (21) (12) (17)
FIAD
BT

L-3700SPT
42' RT

SS-1011

(17) (10) (6) (7) (11) (9)
FIAD
BT

PROPOSED GRADE

EXISTING GROUND

–L RT– STA. 41+66 +/–
BEGIN BRIDGE

–L_RT–

2710 2700 2690 2680 2670 2660 2650 2640 2630 2620 2610 2600 2590 2580 2570 2560 2550 2540 2530 2520 2510

29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00 37+00 38+00 39+00 40+00 41+00 42+00 43+00

10/22/202
B3186_B5898_GEO_RDY_PFL_L_RT.dgn
8:12:27 AM

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	13
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

(A) ***ROADWAY EMBANKMENT:*** *Loose to medium dense, brown and orange, silty SAND and GRAVEL and clayey SAND (A-1-b, A-2-6), micaceous, dry to moist*

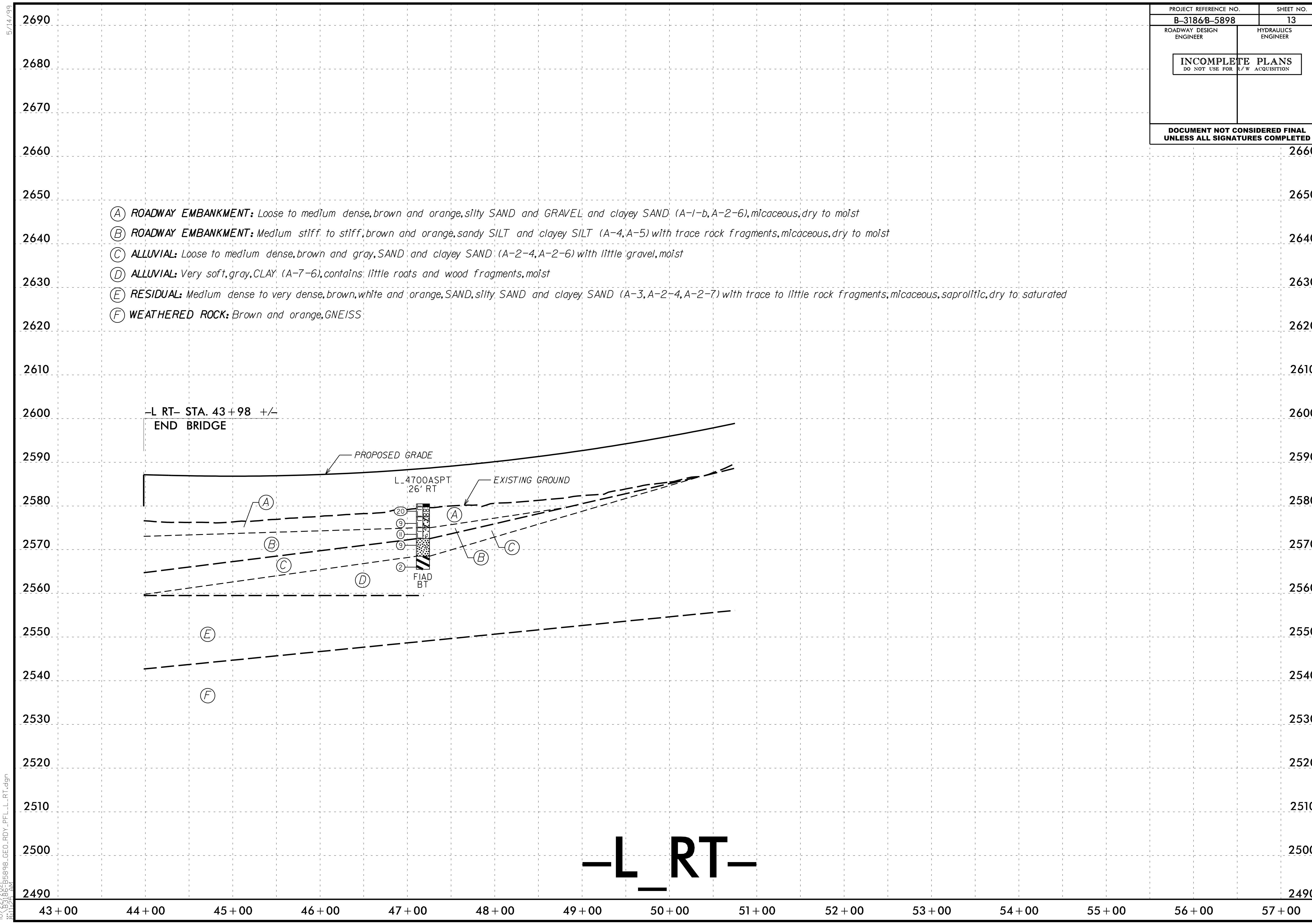
(B) ***ROADWAY EMBANKMENT:*** *Medium stiff to stiff, brown and orange, sandy SILT and clayey SILT (A-4, A-5) with trace rock fragments, micaceous, dry to moist*

(C) ***ALLUVIAL:*** *Loose to medium dense, brown and gray, SAND and clayey SAND (A-2-4, A-2-6) with little gravel, moist*

(D) ***ALLUVIAL:*** *Very soft, gray, CLAY (A-7-6), contains little roots and wood fragments, moist*

(E) ***RESIDUAL:*** *Medium dense to very dense, brown, white and orange, SAND, silty SAND and clayey SAND (A-3, A-2-4, A-2-7) with trace to little rock fragments, micaceous, saprolitic, dry to saturated*

(F) ***WEATHERED ROCK:*** *Brown and orange, GNEISS*



-L_RT-

5/14/99

10/22/2021
\B3186-B5898_GEO_RDY_PFL_L_RT.dgn
8:11:25 AM

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	14

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

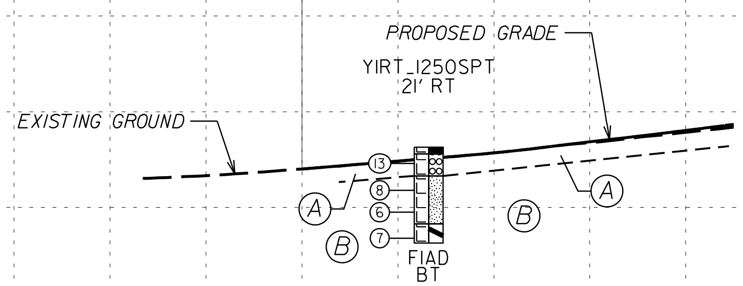
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Ⓐ ***ROADWAY EMBANKMENT:*** *Medium dense, brown, fine to coarse sandy GRAVEL (A-1-b), moist*

Ⓑ ***ROADWAY EMBANKMENT:*** *Medium stiff to stiff, brown, orange and black, SILT and CLAY (A-4, A-7) with trace rock fragments, contains trace wood fragments, micaceous, moist*

-Y1RT- STA. 12+00.00 =
EL. 2574.01'
BEGIN CONSTRUCTION



Elevations: 2690, 2680, 2670, 2660, 2650, 2640, 2630, 2620, 2610, 2600, 2590, 2580, 2570, 2560, 2550, 2540, 2530, 2520, 2510, 2500, 2490

Stations: 10+00, 11+00, 12+00, 13+00, 14+00, 15+00, 16+00, 17+00, 18+00, 19+00, 20+00, 21+00, 22+00, 23+00, 24+00

-Y1RT-

5/14/99

10/22/2021
..\B3186-B5898_GEO_RDY_PFL_Y1RT.dgn
8:12:09 AM

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	15

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2720 2700 2680 2660 2640 2620

L_2300SPT
STA 23+00

0.6' PAVEMENT

17 15 12 14 20

FIAD
BT

B A A

EX R/W

(A) ROADWAY EMBANKMENT: Medium dense, brown, silty SAND (A-2-4), with trace gravel, dry
(B) RESIDUAL: Stiff to very stiff, brown, tan, and white, SILT (A-4), dry

23+00.00

L_2100SPT
STA 21+00

0.5' PAVEMENT

11 15 11 10 11 15 23 50/0.1'

FIAD
AR

A B C A B C D D

(A) ROADWAY EMBANKMENT: Medium dense, gray and brown, silty SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Stiff to very stiff, red, orange, and brown, SILT (A-4, A-5), dry
(C) RESIDUAL: Medium dense, red and orange, clayey SAND (A-2-6), moist
(D) CRYSTALLINE ROCK: GNEISS

21+00.00

L_2000ASPT
STA 20+03

L_2000BSPT
STA 19+98

0.7' PAVEMENT

4 7 13 13 16 13 6 13

11 17 19 16 18 15 34 31

FIAD
BT

FIAD
BT

B B B A

(A) ROADWAY EMBANKMENT: Stiff, brown and tan, SILT (A-4), with little gravel, micaceous, dry
(B) RESIDUAL: Soft to hard, tan, red, brown, white, and black, SILT (A-4), silty CLAY (A-6), and CLAY (A-7-6), micaceous, saprolitic, dry to moist

20+00.00

—L—

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	16

L_2900SPT
STA 29+00

5
10 10
10 11
9
13
17
19
21
15

FIAD
RT

B

A

B

A

EX R/W

(A) ROADWAY EMBANKMENT: Interpreted as roadway embankment
(B) RESIDUAL: Medium stiff to very stiff, red, black, and tan, SILT (A-4), and CLAY (A-6), contains trace root fibers and rock fragments

29+00.00

EX R/W

L_2700SPT
STA 27+00
SS-547

12
12 12
12 6
13

FIAD
BT

B

B

A

EX R/W

(A) ROADWAY EMBANKMENT: Stiff, brown, SILT (A-4), and CLAY (A-6)(10), with trace sand and gravel, contains little roots and wood fragments, dry
(B) RESIDUAL: Medium stiff to stiff, brown and tan, SILT (A-4), with trace clay, micaceous, dry

27+00.00

L_2500SPT
STA 25+00
SS-1005

0.6' PAVEMENT

9
11 10
14

12
22
12
18

FIAD
BT

A

A

A

B

B

EX R/W

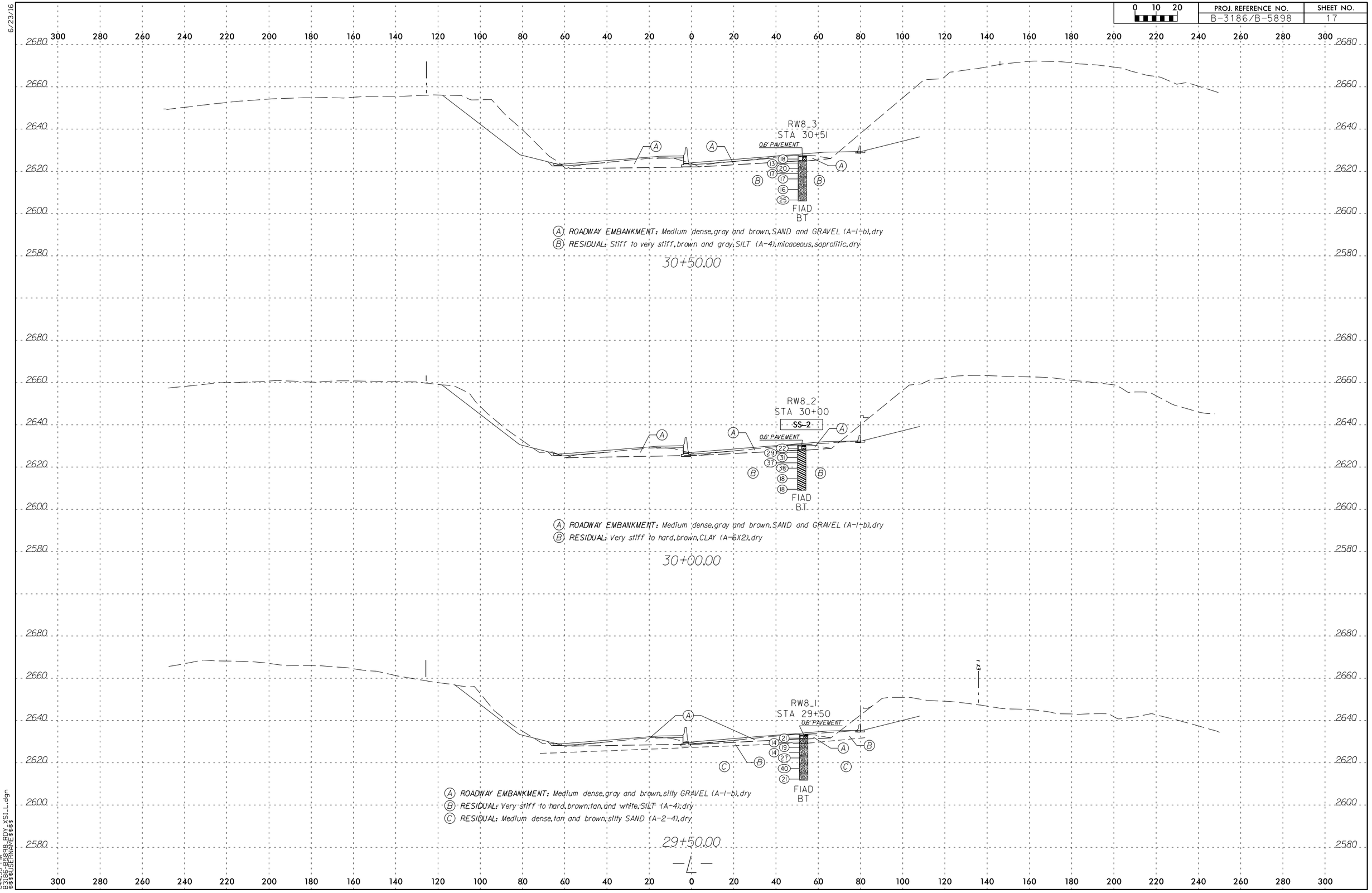
(A) ROADWAY EMBANKMENT: Loose, gray and brown, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Stiff to very stiff, red, brown, and gray, CLAY (A-6)(5), and clayey SILT (A-5), dry

25+00.00

—L—

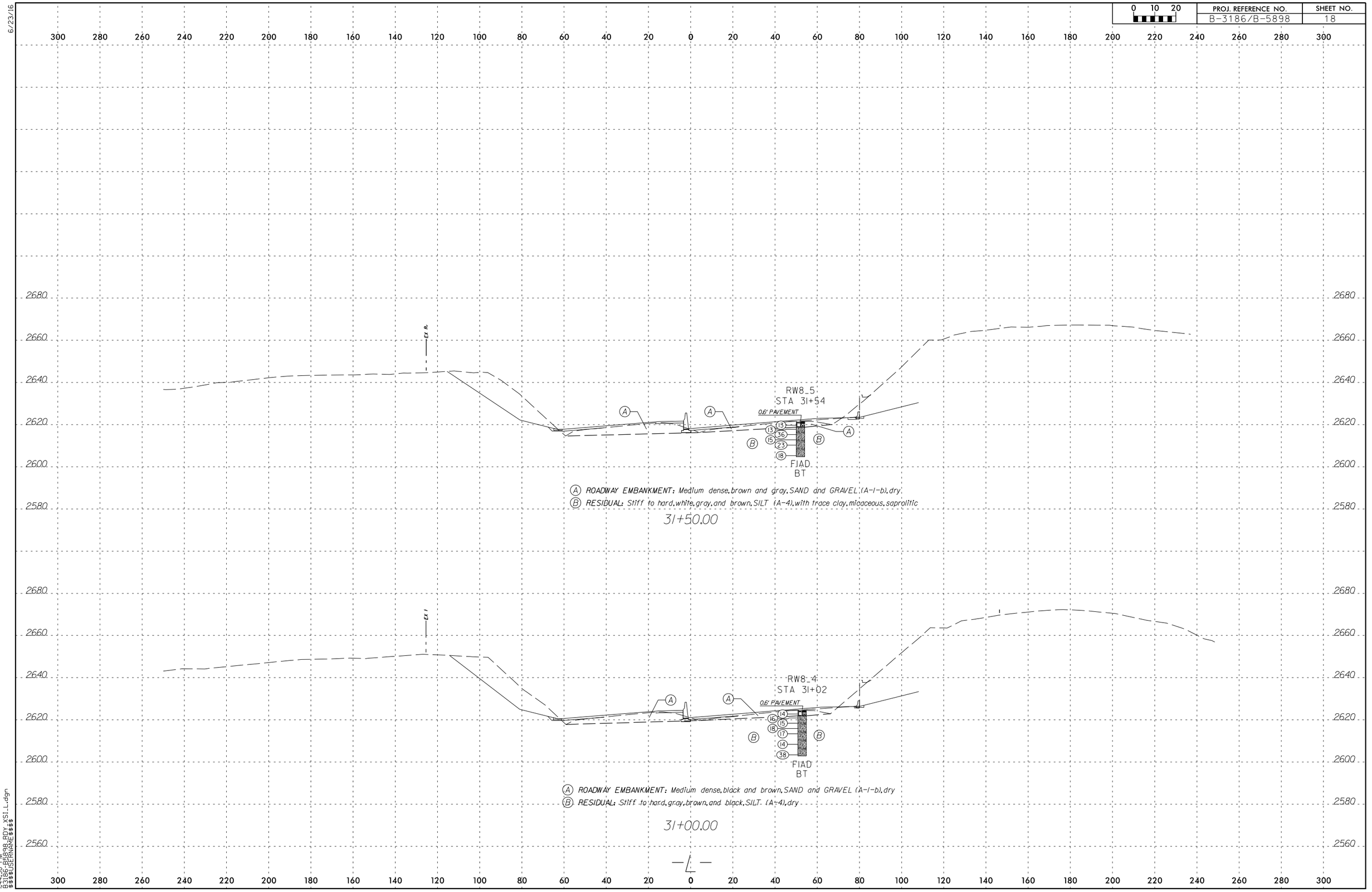
6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	17



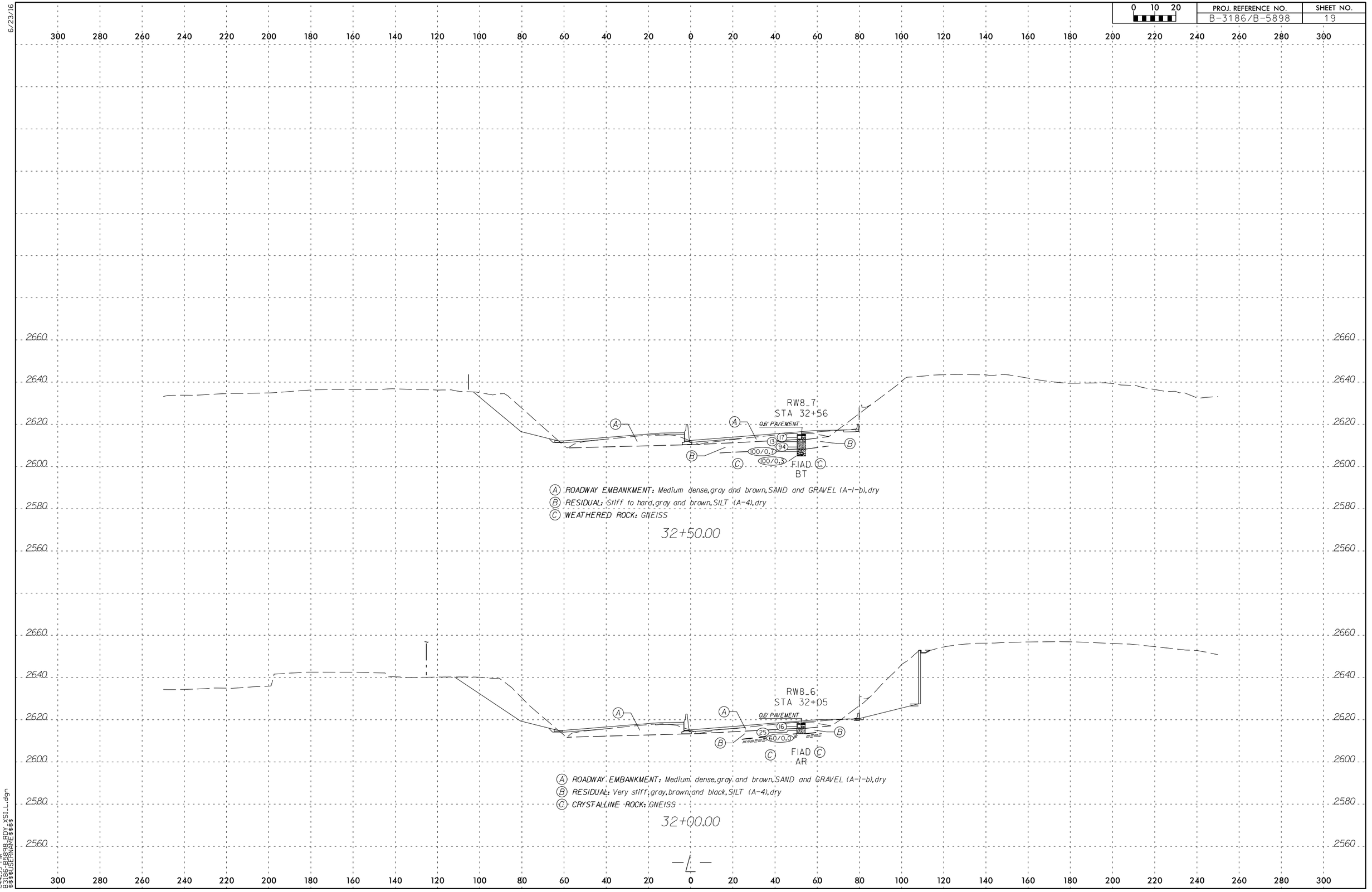
6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	18



6/23/16

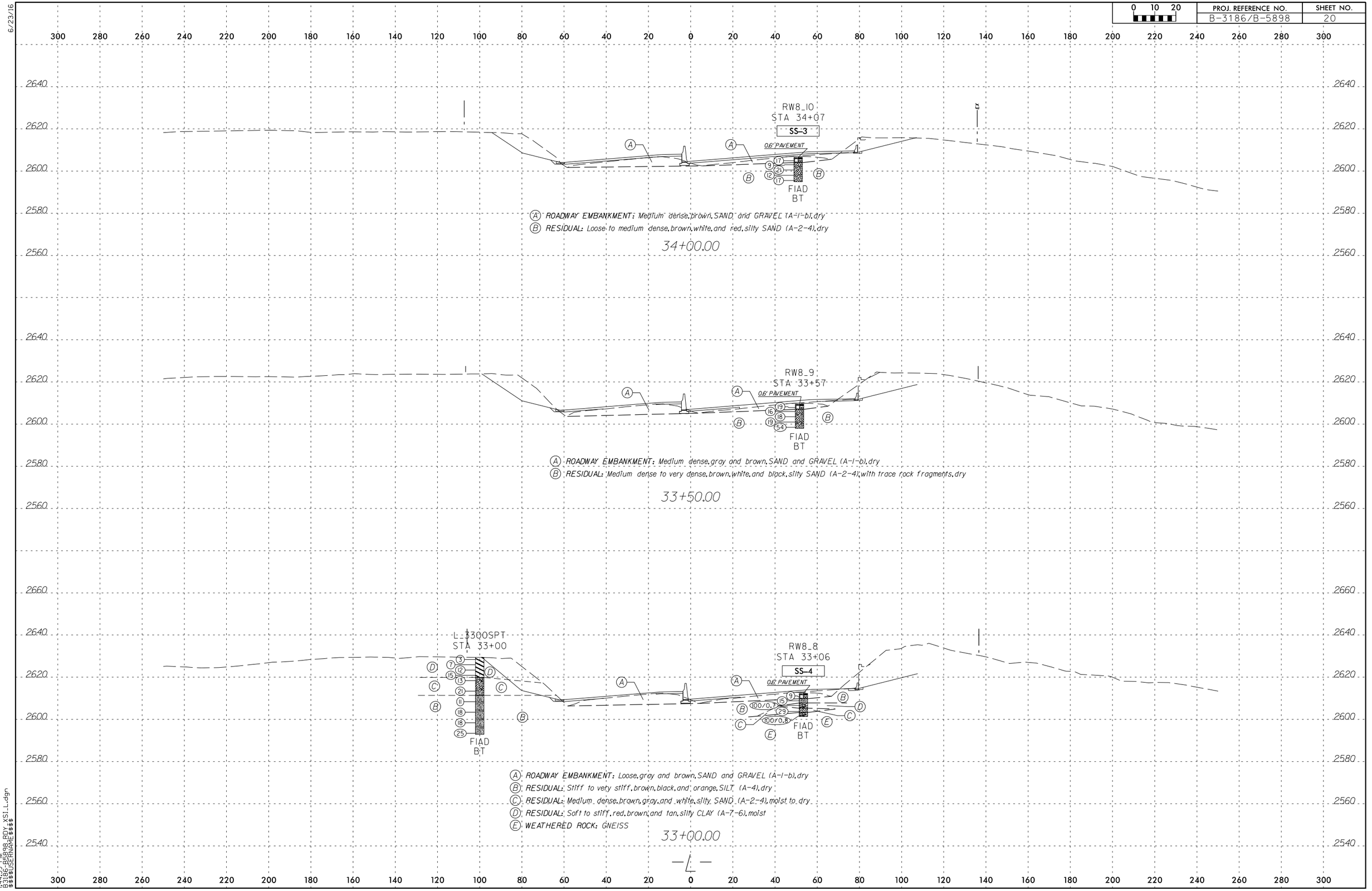
0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	19



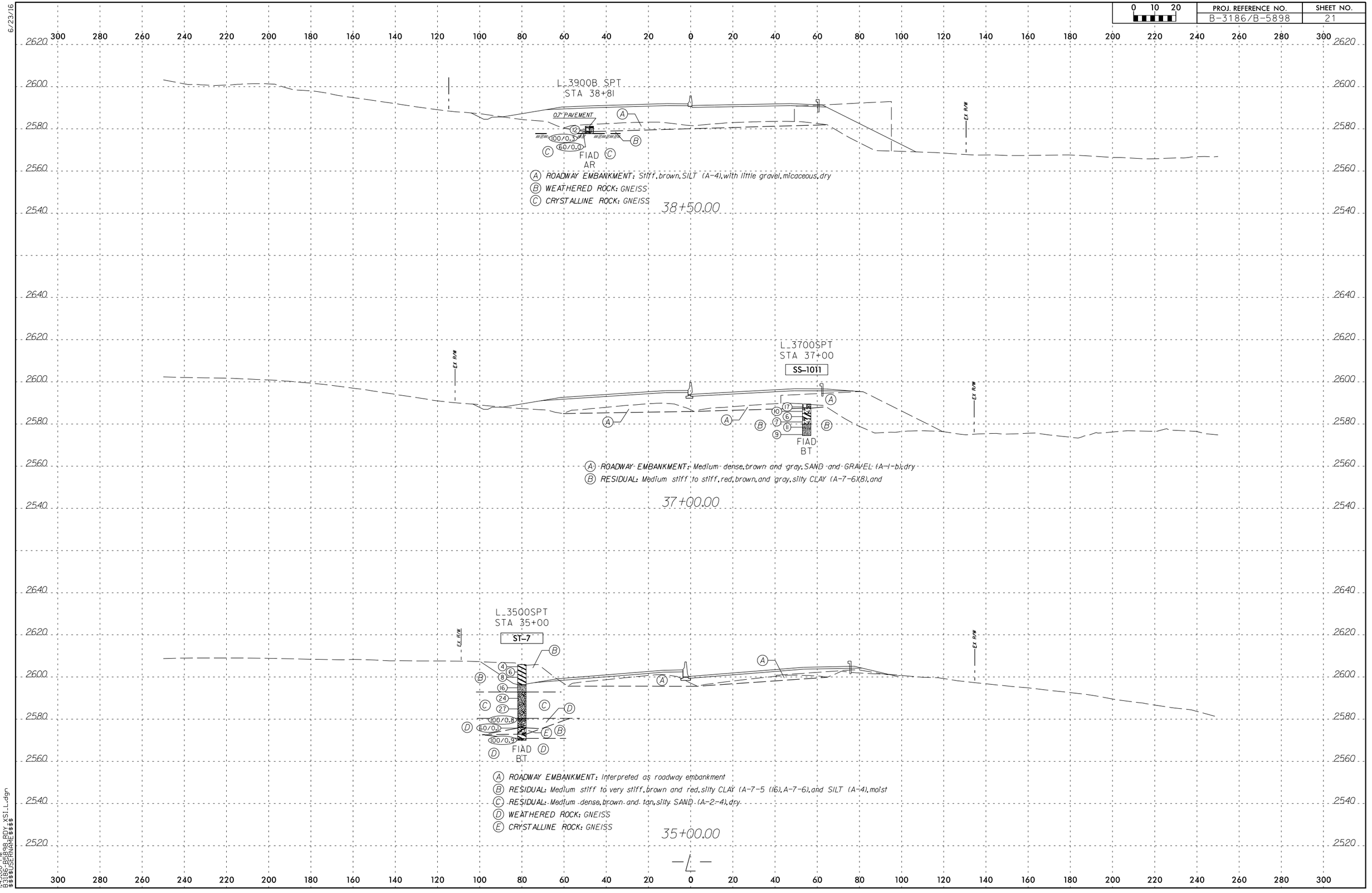
1:44:59 PM
B3186-B5898_RDY_XSI_L.dgn
$$$$USERNAME$$$$

6/23/16

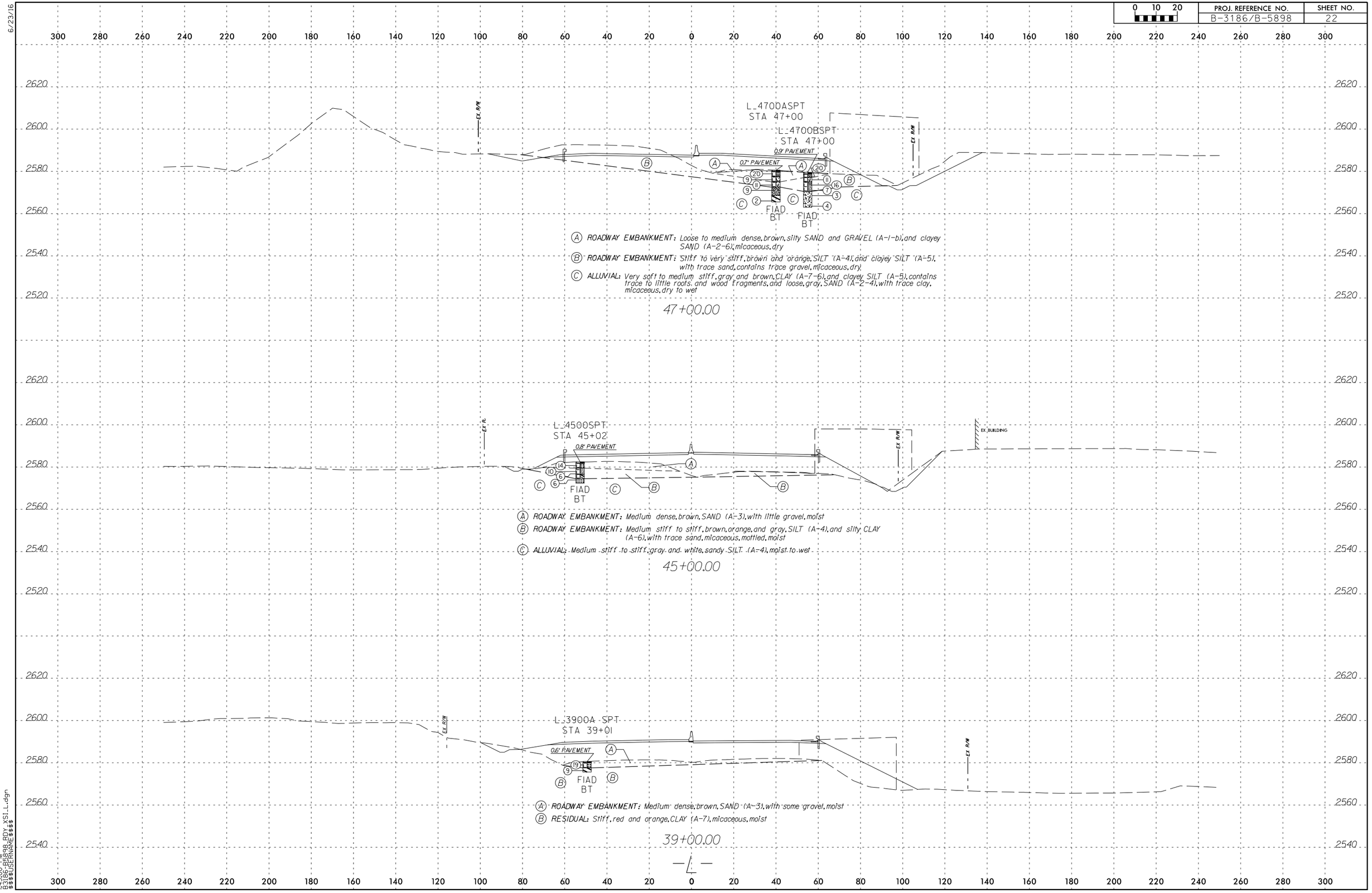
0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	20

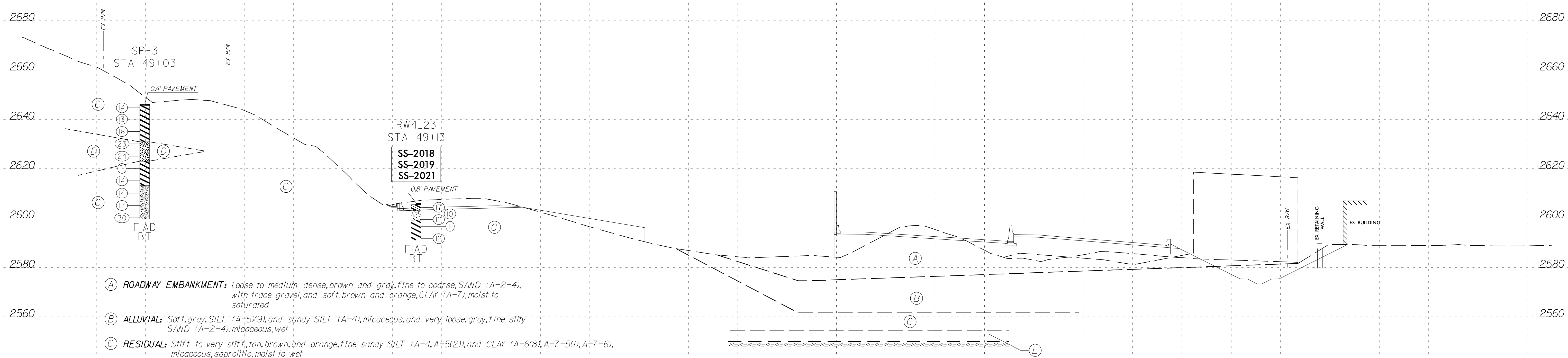


1:44:59 PM
B3186-B5898_RDY_XSI_L.dgn
$$$$USERNAME$$$$



0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	22





Ⓐ **ROADWAY EMBANKMENT:** *Loose to medium dense, brown and gray, fine to coarse, SAND (A-2-4), with trace gravel, and soft, brown and orange, CLAY (A-7), moist to saturated*

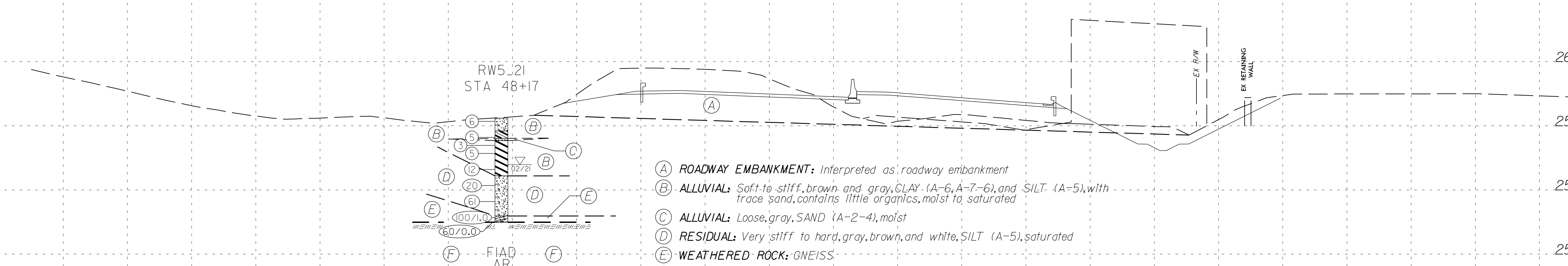
Ⓑ **ALLUVIAL:** *Soft, gray, SILT (A-5)(9), and sandy SILT (A-4), micaceous, and very loose, gray, fine silty SAND (A-2-4), micaceous, wet*

Ⓒ **RESIDUAL:** *Stiff to very stiff, tan, brown, and orange, fine sandy SILT (A-4, A-5(2)), and CLAY (A-6(8), A-7-5(1), A-7-6), micaceous, saprolitic, moist to wet*

Ⓓ **RESIDUAL:** *Medium dense, tan, white, and orange, silty SAND (A-2-4), moist*

Ⓔ **WEATHERED ROCK:** *GNEISS*

Ⓕ **CRYSTALLINE ROCK:** *GNEISS*



Ⓐ **ROADWAY EMBANKMENT:** *Interpreted as roadway embankment*

Ⓑ **ALLUVIAL:** *Soft to stiff, brown and gray, CLAY (A-6, A-7-6), and SILT (A-5), with trace sand, contains little organics, moist to saturated*

Ⓒ **ALLUVIAL:** *Loose, gray, SAND (A-2-4), moist*

Ⓓ **RESIDUAL:** *Very stiff to hard, gray, brown, and white, SILT (A-5), saturated*

Ⓔ **WEATHERED ROCK:** *GNEISS*

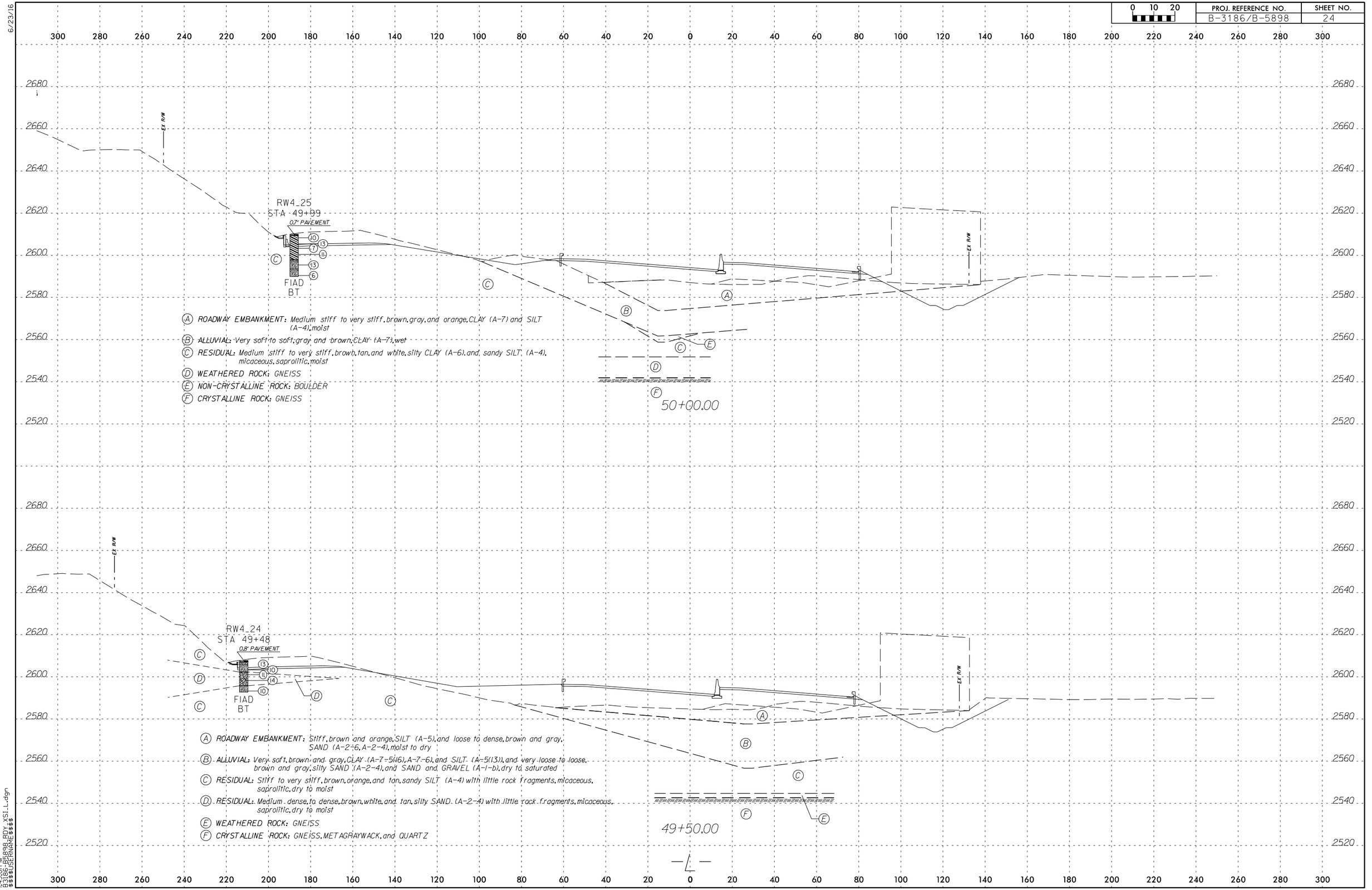
Ⓕ **CRYSTALLINE ROCK:** *GNEISS*

48+00.00

-L-

6/23/16

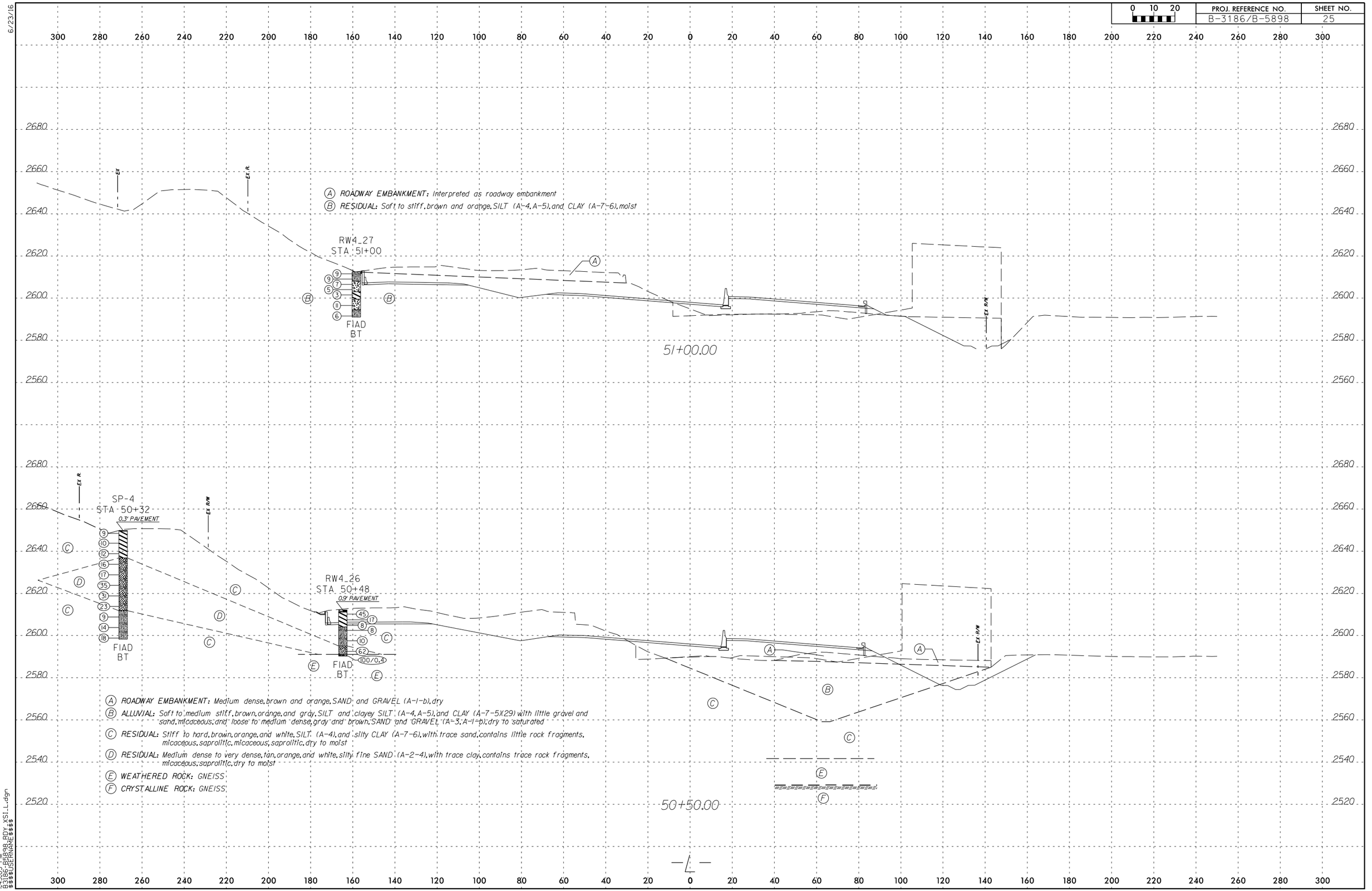
0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	24



1:45:01 PM
B3186-B5898_RDY_XS1_L.dgn
$$$$USERNAME$$$$

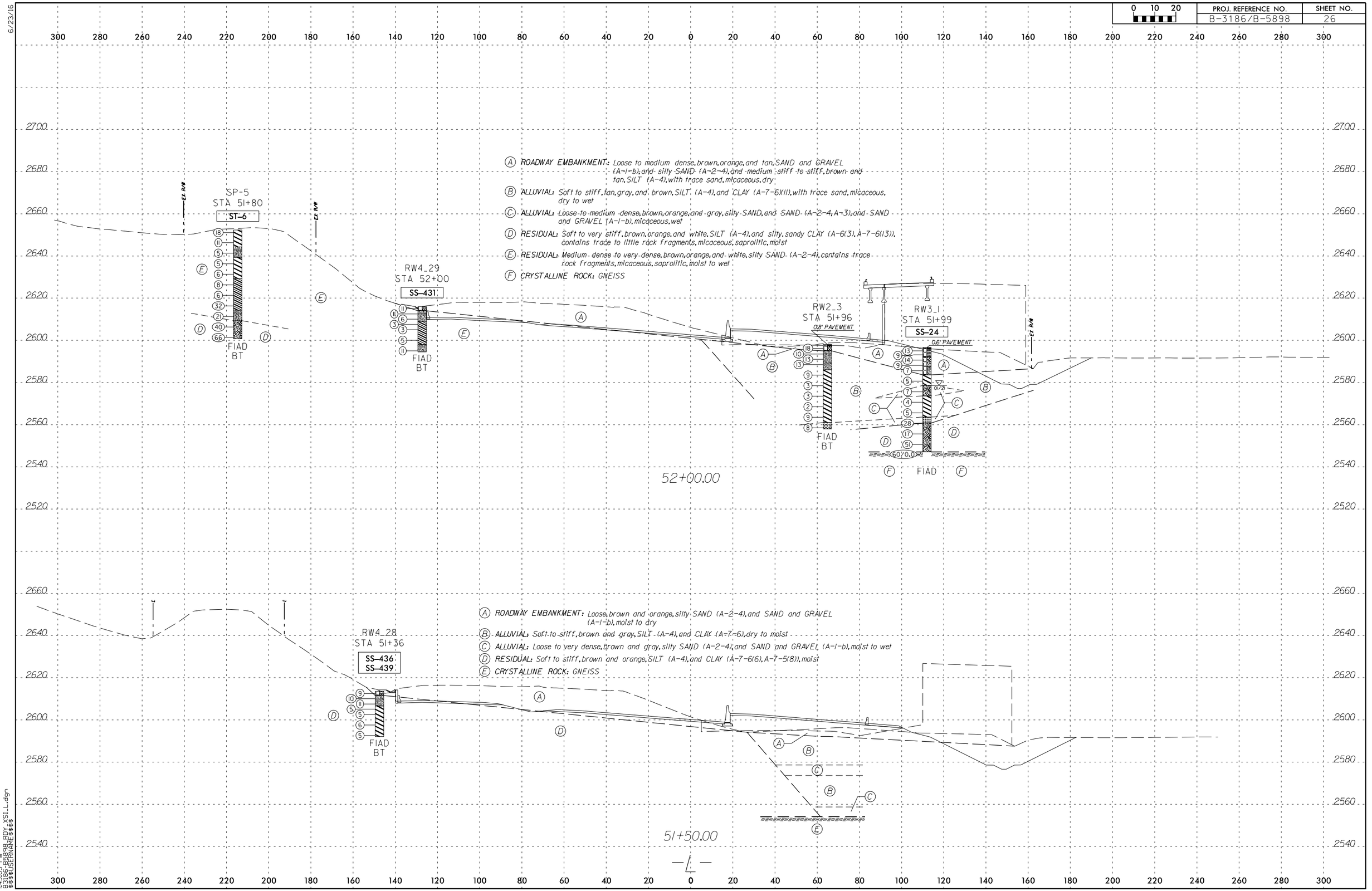
6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	25



1:45:05 PM
B3186-B5898_RDY_XS1_L.dgn
$$$$USERNAME$$$$

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	26



6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	27

Ⓐ ROADWAY EMBANKMENT: Medium dense, brown, orange, and tan, SAND and GRAVEL (A-1-b), dry
Ⓑ ROADWAY EMBANKMENT: Medium stiff to very stiff, brown, orange, and gray, SILT, and fine to coarse, sandy SILT (A-4, A-5(2)), with trace to little clay and little gravel, micaceous, dry to moist
Ⓒ ALLUVIAL: Medium stiff, gray, highly silty CLAY (A-7-5(31)), with little fine to coarse sand, micaceous, moist
Ⓓ ALLUVIAL: Medium dense, brown, SAND (A-3), wet
Ⓔ RESIDUAL: Soft to very stiff, brown, orange, and tan, SILT (A-4), and sandy CLAY (A-6), contains little rock fragments, micaceous, saprolitic, dry to moist
Ⓕ RESIDUAL: Very loose to medium dense, brown, orange, and tan, silty SAND (A-2-4), contains trace rock fragments, micaceous, dry
Ⓖ WEATHERED ROCK: GNEISS
Ⓗ CRYSTALLINE ROCK: GNEISS

EX R/W

RW4_30
STA 52+50
SS-422
FIAD
BT

RW2_4
STA 52+50
0.8' PAVEMENT
FIAD
BT

RW3_2
STA 52+50
SS-58
SS-62
FIAD
AR

52+50.00

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	28

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2700 2680 2660 2640 2620 2600 2580 2560 2540 2520 2500

EX R/W

EX R/W

RW4_3I
STA 53+00

14
11 12
7 34
50
100/0.6
100/0.2
60/0.0

FIAD
AR

RW3_3
STA 53+00

SS-35
SS-46

0.6' PAVEMENT

12
12 18
8 8
5
5
5
28
11
18
35
42
36
34
60/0.4

FIAD
AR

EX R/W

(A) ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), dry

(B) ROADWAY EMBANKMENT: Medium stiff to very stiff, brown, tan, and orange, fine to coarse, sandy SILT (A-4X2), with trace gravel and little clay, micaceous, dry

(C) ALLUVIAL: Medium stiff, gray, silty CLAY (A-7-6), micaceous, moist

(D) ALLUVIAL: Medium dense, brown and gray, fine to coarse, silty SAND and SAND (A-2-4, A-3), micaceous, wet

(E) RESIDUAL: Medium stiff to hard, brown, tan, and white, SILT (A-4), with trace clay, micaceous, saprolitic, dry

(F) RESIDUAL: Medium dense to dense, brown, tan, and orange, fine to coarse SAND (A-2-4), with little silt and clay, contains trace rock fragments, micaceous, saprolitic, dry to wet

(G) WEATHERED ROCK: GNEISS

(H) CRYSTALLINE ROCK: GNEISS

53+00.00

—L—

11:45:06 PM
B3186-B5898.FDY-XSI_L.dgn
$$$$USERNAME$$$$

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	29

(A) ROADWAY EMBANKMENT: Loose, brown, orange, and tan, SAND and GRAVEL (A-1-b), and silty SAND (A-2-4), dry
(B) ROADWAY EMBANKMENT: Soft, brown and tan, SILT (A-4), dry
(C) ALLUVIAL: Very soft to medium stiff, dark gray, clayey SILT (A-5), and silty CLAY (A-7-6), micaceous, moist to wet
(D) ALLUVIAL: Medium dense, gray, coarse SAND (A-3), wet
(E) RESIDUAL: Very stiff to hard, brown, tan, and orange, SILT (A-4), micaceous, dry
(F) RESIDUAL: Loose to medium dense, tan, red, and brown, silty SAND (A-2-4), micaceous, saprolitic, dry to moist
(G) WEATHERED ROCK: GNEISS
(H) CRYSTALLINE ROCK: GNEISS

RW4_32
STA 53+50

RW3_4
STA 53+50

EX RW

FIAD AR

FIAD BT

53+50.00

-L-

1:45:07 PM
B3186-B5898_RDY_XSLL.dgn
$$$$USERNAME$$$$

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	30

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2740 2720 2700 2680 2660 2640 2620 2600 2580 2560 2540

EX R/W EX R/W

(A) ROADWAY EMBANKMENT: Loose to medium dense, brown, orange, and tan, SAND and GRAVEL (A-1-b), and silty SAND (A-2-4), with trace clay, micaceous, dry to moist

(B) ROADWAY EMBANKMENT: Soft to medium stiff, brown, SILT (A-4), moist

(C) ALLUVIAL: Soft, gray, green, and red-orange, clayey SILT (A-5), and fine sandy and silty CLAY (A-6, A-7-6), micaceous, moist to wet

(D) ALLUVIAL: Very loose, gray and green, SAND (A-3), with a 0.1' layer of clay, wet

(E) RESIDUAL: Very stiff to hard, brown, tan, and orange, SILT (A-4), with trace sand, micaceous, dry

(F) WEATHERED ROCK: GNEISS

(G) CRYSTALLINE ROCK: GNEISS

RW4_33
STA 54+00

15 24 100/0.2 38 100/0.6 100/0.2 60/0.0

FIAD
AR

RW3_5
STA 54+01

8 4 4 2 2 2 3 4 6 60+

FIAD
AR

54+00.00

—L—

11:45:07 PM
B3186-B5898_RDY_XSLL.dgn
$$$$USERNAME$$$$

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	31

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

27.40
27.20
2700
2680
2660
2640
2620
2600
2580
2560
2540

EX RW

EX RW

(A) ROADWAY EMBANKMENT: Loose to medium dense, brown and orange, silty SAND (A-2-4), and SAND and GRAVEL (A-1-b), dry to moist
(B) ROADWAY EMBANKMENT: Stiff, brown and white, SILT (A-4), dry
(C) ALLUVIAL: Loose, gray and brown, silty SAND (A-2-4), moist
(D) ALLUVIAL: Very soft to stiff, gray, silty CLAY (A-7-6), with trace sand, micaceous, moist to saturated
(E) RESIDUAL: Stiff, brown and tan, SILT (A-4), dry
(F) RESIDUAL: Medium dense, brown and white, silty SAND (A-2-4), dry
(G) WEATHERED ROCK: GNEISS
(H) CRYSTALLINE ROCK: GNEISS

RW4_34
STA 54+49

(13) (15) (100/0.9) (100/0.2) (100/0.3)
(G)
FIAD
BT

(A) (E) (G)

EX RW

RW3_6
STA 54+50

(B) (C) (D) (F) (H)
(5) (12) (5) (2) (4) (WOH) (3) (13) (15) (100+) (60/0.1)
FIAD
AR

54+50.00

—L—

6:45:08 PM
B3186-B5898_RDY_XSI_L.dgn
$$$$USERNAME$$$$

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	32

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2720 2700 2680 2660 2640 2620 2600 2580 2560

EX R/W

EX R/W

RW4_36
STA 55+50

(A) ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Very stiff to hard, brown and tan, SILT (A-4), dry
(C) RESIDUAL: Dense, brown, red, and white, fine silty SAND (A-2-4), with trace clay, contains trace rock fragments, saprolitic, dry
(D) WEATHERED ROCK: GNEISS
(E) CRYSTALLINE ROCK: GNEISS

11 10 12 10 10 21 31 63 60/0.0

FIAD AR

RW3_8
STA 55+50

10 5 14 8 15 42 31 100/0.3 60/0.0

FIAD AR

55+50.00

EX R/W

EX R/W

RW4_35
STA 55+00

12 18 11 43 53 100/0.8 78 100/0.8

FIAD BT

(A) ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Very stiff to hard, brown and tan, SILT (A-4), dry
(C) WEATHERED ROCK: GNEISS

EX R/W

0.020

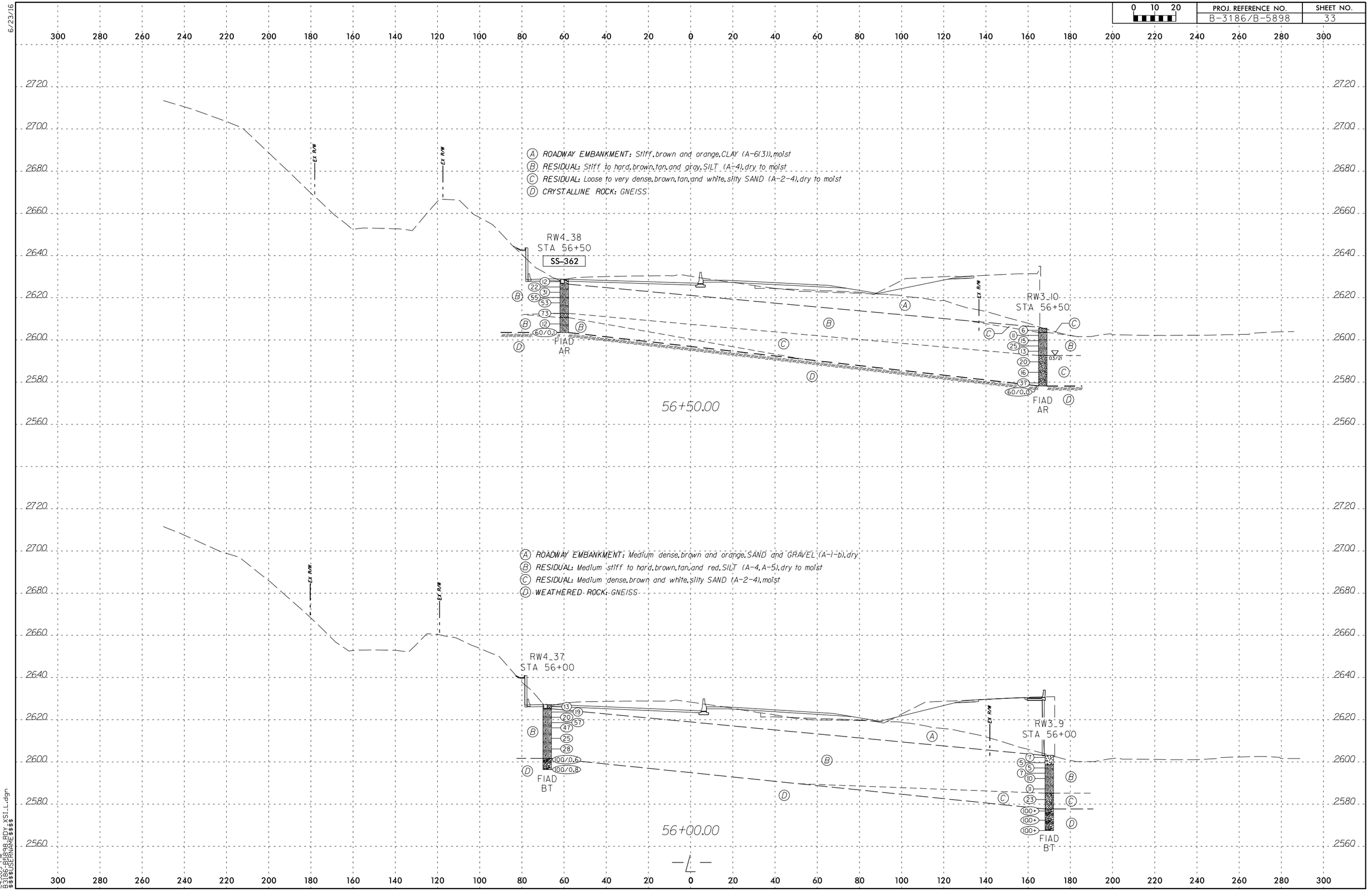
55+00.00

—L—

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

6/23/16

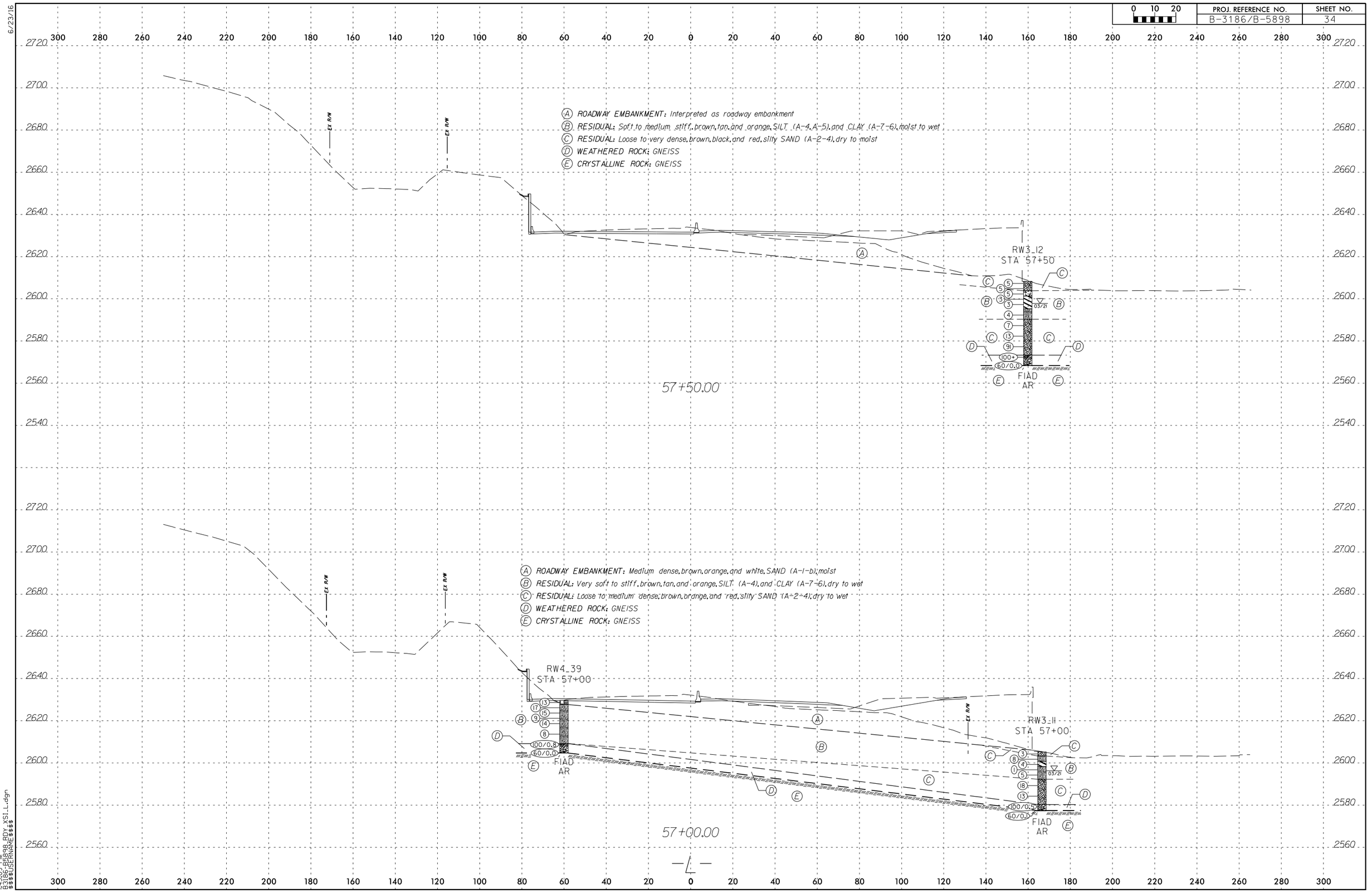
0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	33



1:45:09 PM
B3186-B5898_RDY_XSI_L.dgn
$$$$USERNAME$$$$

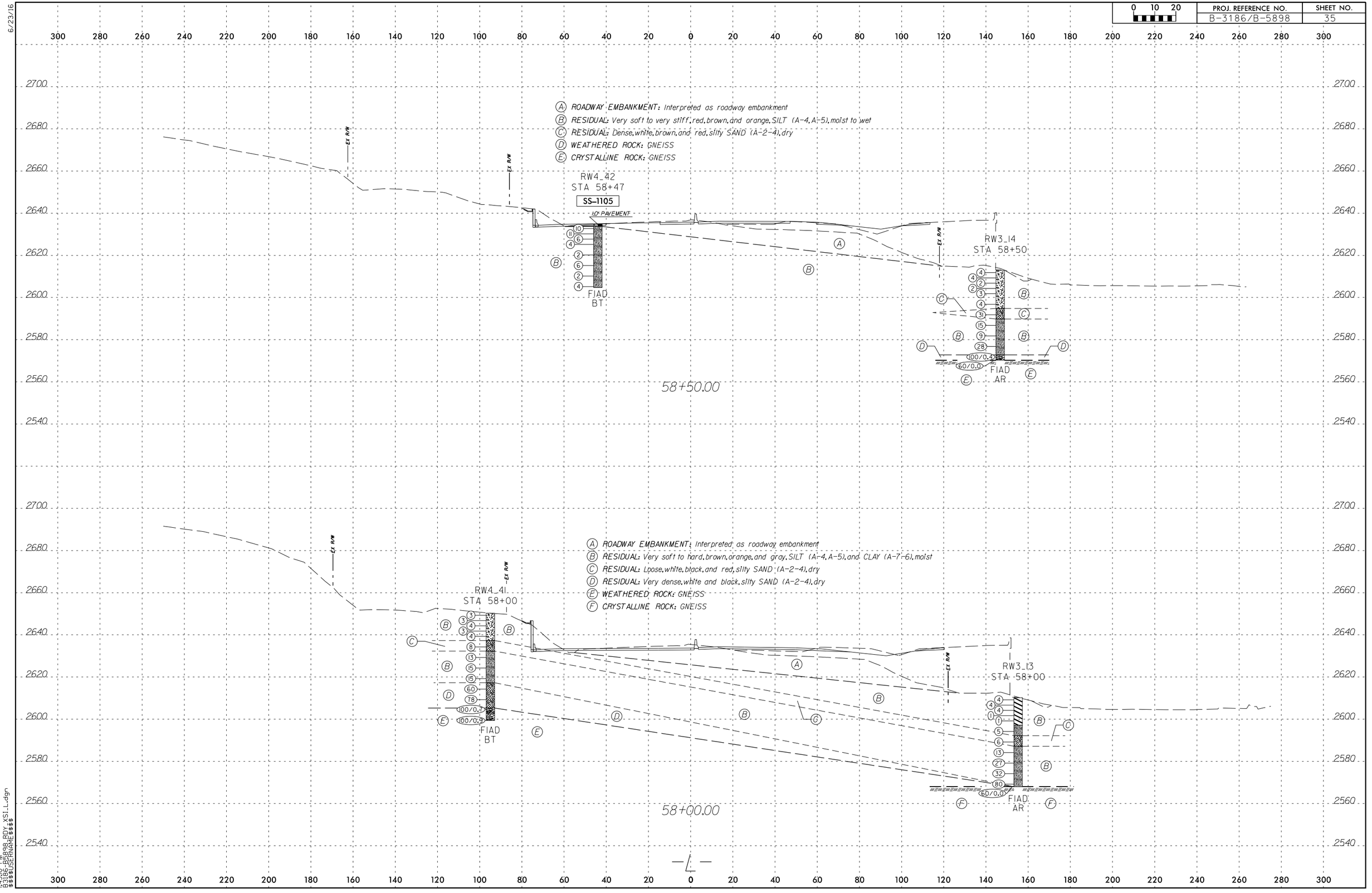
6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	34

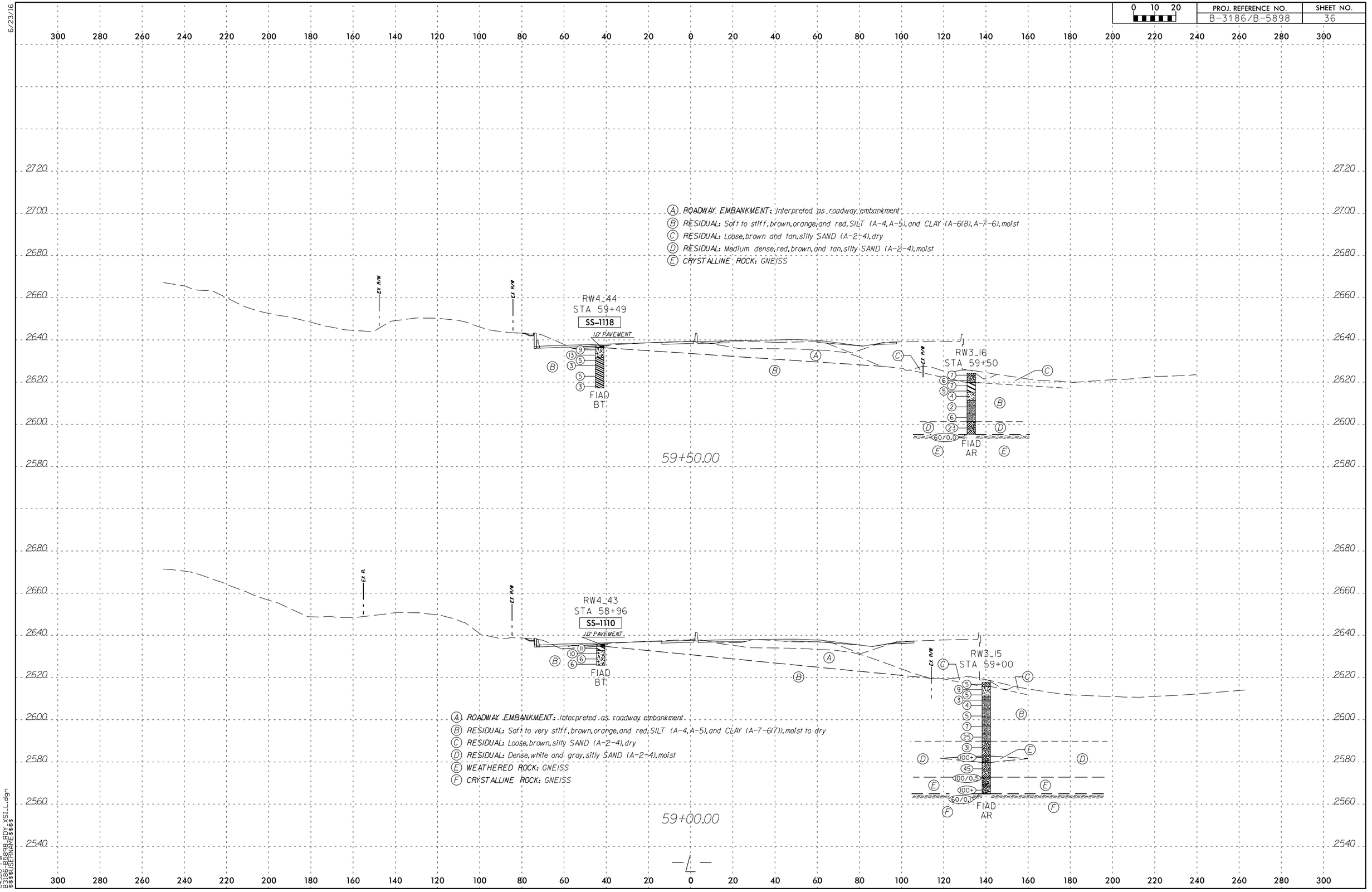


1:45:09 PM
B3186-B5898_RDY_XSI_L.dgn
$$$$USERNAME$$$$

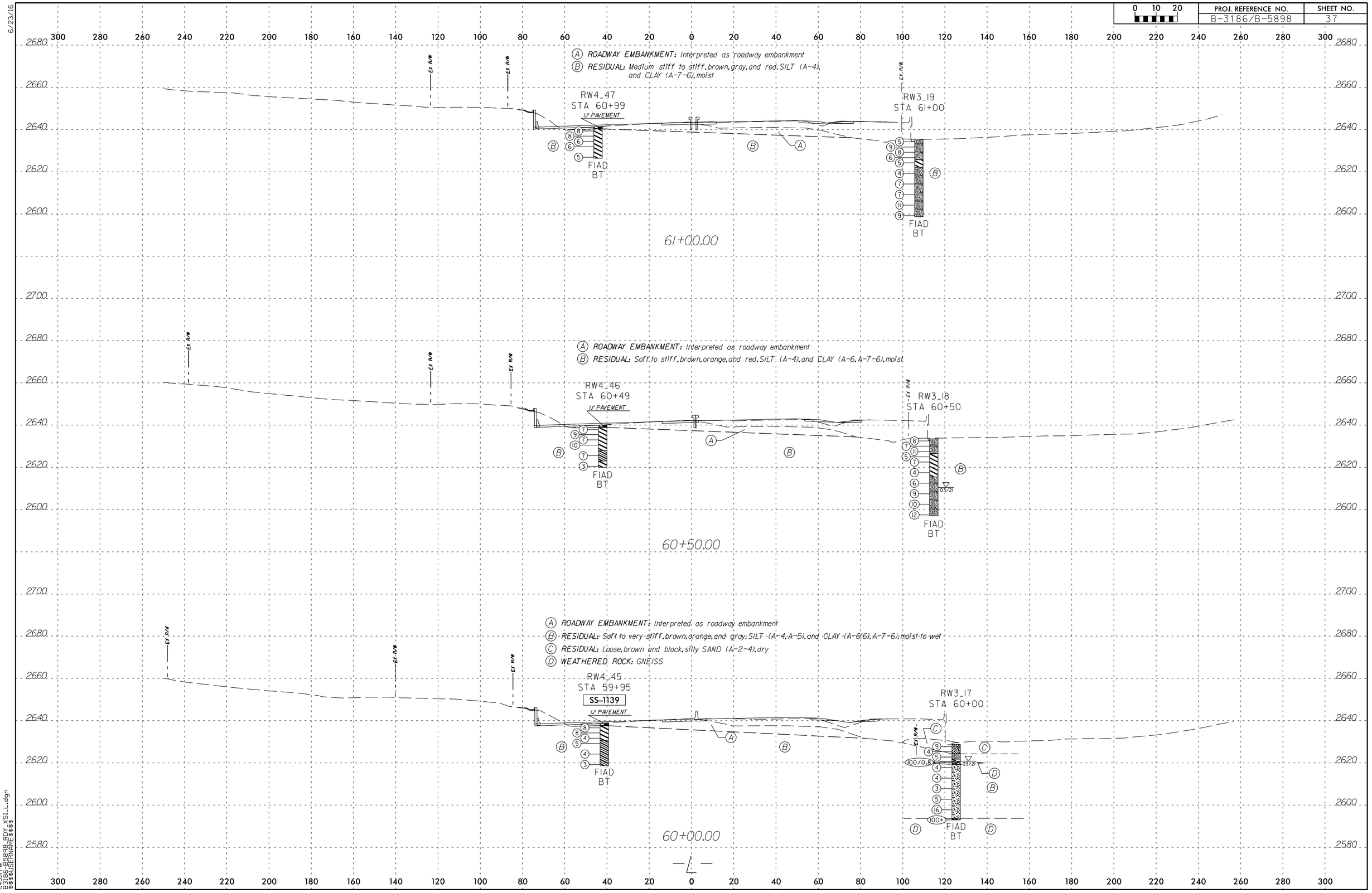
0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	35



0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	36



0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	37



6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	38

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2700 2680 2660 2640 2620

Ⓐ ROADWAY EMBANKMENT: Interpreted as roadway embankment
Ⓑ RESIDUAL: Medium stiff to stiff, brown, orange, and red, SILT (A-4), and CLAY (A-7-6), moist
Ⓒ RESIDUAL: Medium dense, brown and tan, silty SAND (A-2-4), moist

EX R/W

RW4_50
STA 62+50
1.4' PAVEMENT
FIAD
BT

RW3_22
STA 62+50
FIAD
BT

62+50.00

EX R/W

RW4_49
STA 62+00
0.6' PAVEMENT
FIAD
BT

RW3_21
STA 62+00
FIAD
BT

62+00.00

Ⓐ ROADWAY EMBANKMENT: Interpreted as roadway embankment
Ⓑ RESIDUAL: Soft to very stiff, brown, orange, and red, SILT (A-4, A-5), and CLAY (A-6, A-7-6), moist

EX R/W

RW4_48
STA 61+50
0.4' PAVEMENT
FIAD
BT

RW3_20
STA 61+50
FIAD
BT

61+50.00

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	39

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2720 2700 2680 2660 2640 2620

(A) ROADWAY EMBANKMENT: Loose, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Medium stiff to very stiff, brown, orange, and white, SILT (A-4, A-5), dry to moist
(C) RESIDUAL: Loose, white and gray, silty SAND (A-2-4), dry

EX. R/W

RW4_54B
STA 64+17

RW4_53
STA 64+00

RW3_25
STA 64+00

10' PAVEMENT

EX. BUILDING

FIAD
B.T

64+00.00

(A) ROADWAY EMBANKMENT: Loose, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Medium stiff to stiff, brown, orange, and white, SILT (A-4, A-5(4)), dry to moist

RW4_52
STA 63+50

SS-302

RW3_24
STA 63+50

0.9' PAVEMENT

63+50.00

(A) ROADWAY EMBANKMENT: Loose, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Stiff, brown, orange, and tan, SILT (A-4), dry

RW4_51
STA 63+00

63+00.00

0 10 20

PROJ. REFERENCE NO.	SHEET NO.
B-3186/B-5898	40

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2700
2680
2660
2640
2620

Ⓐ ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), dry
Ⓑ RESIDUAL: Medium stiff to very stiff, brown, orange, and tan, SILT (A-4), dry to moist

RW4_56
STA 65+50
SS-260
10 7 10 13 13 16 23
FIAD
BT

65+50.00

RW3_28
STA 65+50
6 7 6 8 9 11
FIAD
BT

EX R/W

EX R/W

RW4_55
STA 65+00
12 7 11 10 7 13 10 17
FIAD
BT

65+00.00

RW3_27
STA 65+00
12 7 9 8 8
FIAD
BT

EX R/W
EX BUILDING
I.D. PAVEMENT
EX R/W

RW4_54A
STA 64+50
12 8 15 16 12 9 5 10 15 15
FIAD
BT

64+50.00

RW3_26
STA 64+50
13 8 8 8 8
FIAD
BT

EX R/W
EX BUILDING
I.D. PAVEMENT

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	41

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2700 2680 2660 2640 2620

EX R/W

RW4_59
STA 67+00
SS-278
SS-282

(A) ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Medium stiff, brown, orange, and tan, CLAY (A-7-6(2)), dry
(C) RESIDUAL: Medium dense, brown, tan, and white, clayey SAND (A-2-7(1)), dry

(B) 8 8 13 (C) (B) 18 12 12 10 12 (C) (A)

FIAD
BT

67+00.00

EX R/W

RW4_58
STA 66+50
SS-242

(A) ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Soft to very stiff, brown, orange, and tan, SILT (A-4) and CLAY (A-7-5(2)), dry to moist

(B) 11 12 11 20 13 13 7 10 (A) (B)

FIAD
BT

EX R/W

RW3_30
STA 66+50

3 3 10 10 7 9 (B)

FIAD
BT

66+50.00

EX R/W

RW4_57
STA 66+00
SS-256
SS-258

(A) ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Medium stiff to very stiff, brown, orange, and tan, SILT (A-4, A-5), dry to moist
(C) RESIDUAL: Loose to medium dense, brown, tan, and orange, silty SAND (A-2-4), dry

(B) 13 19 12 17 19 15 12 10 9 19 (C) (A) (B) (C)

FIAD
BT

EX R/W

RW3_29
STA 66+00

5 4 7 7 7 9 (B)

FIAD
BT

EX R/W

66+00.00

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	42

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2720 2700 2680 2660 2640 2620 2600 2580

Ⓐ ROADWAY EMBANKMENT: Loose, brown and orange, SAND and GRAVEL (A-1-b), dry
Ⓑ ROADWAY EMBANKMENT: Soft to stiff, brown, orange, and tan, SILT (A-4), and CLAY (A-7-6), dry to moist
Ⓒ RESIDUAL: Stiff, brown, tan, and orange, SILT (A-5, A-4), dry to moist
Ⓓ WEATHERED ROCK: GNEISS
Ⓔ RESIDUAL: Medium dense, brown and orange, silty SAND (A-2-4), with boulders, dry

RW6_3
STA 71+00
0.5' PAVEMENT
EX R/W
0.020
FIAD
BT

RW7_3
STA 71+00
EX R/W
100/0.3
FIAD
BT

71+00.00

Ⓐ ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), dry
Ⓑ RESIDUAL: Soft to stiff, brown, orange, and tan, SILT (A-4), and CLAY (A-6), dry to moist
Ⓒ RESIDUAL: Soft, brown, orange, and tan, CLAY (A-7-6, A-6), and SILT (A-4), moist

RW6_2
STA 70+49
0.8' PAVEMENT
0.020
FIAD
BT

RW7_2
STA 70+49
EX R/W
FIAD
BT

70+50.00

—L—

1:45:14 PM
B3186-B5898_RDY_XSLL.dgn
$$$$USERNAME$$$$

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	43

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2720 2700 2680 2660 2640 2620 2600

(A) ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), and silty SAND (A-2-4), dry
(B) ROADWAY EMBANKMENT: Medium stiff to stiff, brown, orange, and tan, SILT (A-4), dry
(C) RESIDUAL: Medium dense to hard, brown, tan, and orange, SILT (A-4), and CLAY (A-7-6), dry to moist
(D) RESIDUAL: Dense, gray, SAND (A-3), with boulders, dry
(E) RESIDUAL: Very dense, brown, tan, and white, silty SAND (A-2-4), with rock fragments, dry
(F) WEATHERED ROCK: GNEISS
(G) CRYSTALLINE ROCK: GNEISS

RW6_5
STA 72+01
0.8' PAVEMENT
EX R/W
0.020
FIAD
BT

RW7_5
STA 72+00
EX R/W
FIAD
AR

72+00.00

(A) ROADWAY EMBANKMENT: Loose, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) ROADWAY EMBANKMENT: Very soft to stiff, brown, orange, and tan, SILT (A-4), dry to moist
(C) RESIDUAL: Medium stiff to stiff, brown, tan, and orange, SILT (A-4), and CLAY (A-7-6), dry to moist
(D) RESIDUAL: Dense, brown, tan, and orange, silty SAND (A-2-4), with rock fragments, dry
(E) WEATHERED ROCK: GNEISS

RW6_4
STA 71+51
0.5' PAVEMENT
EX R/W
EX R/W
0.020
FIAD
BT

RW7_4
STA 71+50
EX R/W
FIAD
BT

71+50.00

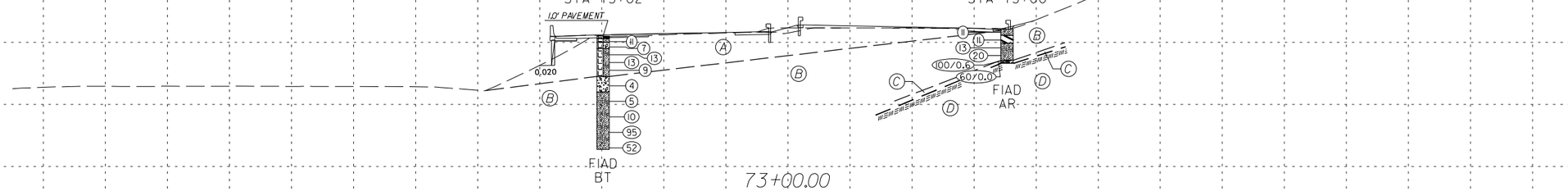
6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	44

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

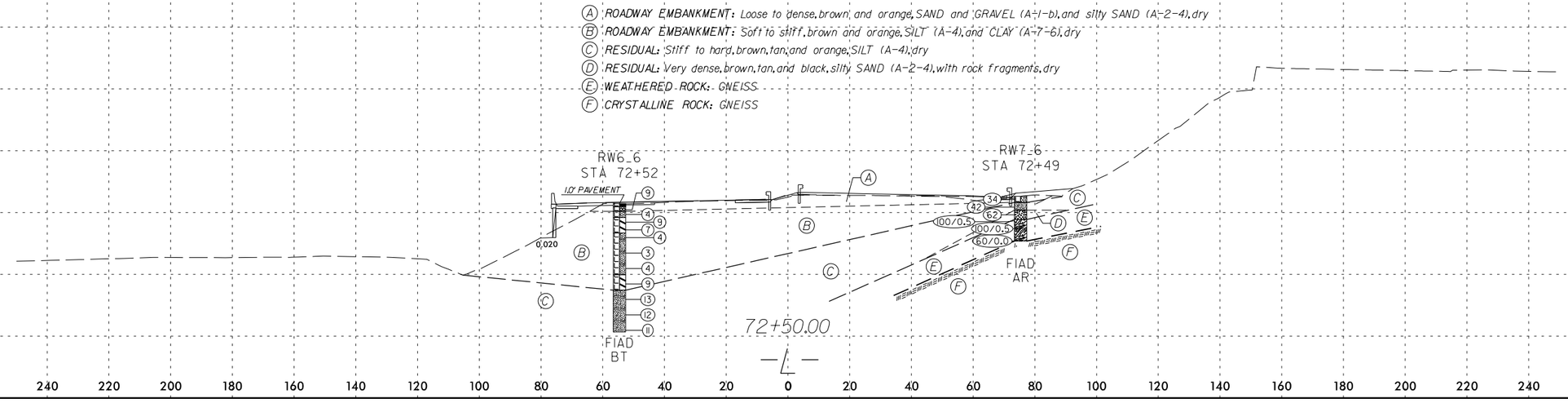
2700 2680 2660 2640 2620 2600

(A) ROADWAY EMBANKMENT: Medium stiff to stiff, brown, red, and gray, SILT (A-4, A-5), dry to moist
(B) RESIDUAL: Soft to hard, brown, red, and orange, SILT (A-4, A-5), and CLAY (A-7-6), moist to dry
(C) WEATHERED ROCK: GNEISS
(D) CRYSTALLINE ROCK: GNEISS



73+00.00

(A) ROADWAY EMBANKMENT: Loose to dense, brown, and orange, SAND and GRAVEL (A-1-b), and silty SAND (A-2-4), dry
(B) ROADWAY EMBANKMENT: Soft to stiff, brown and orange, SILT (A-4), and CLAY (A-7-6), dry
(C) RESIDUAL: Stiff to hard, brown, tan, and orange, SILT (A-4), dry
(D) RESIDUAL: Very dense, brown, tan, and black, silty SAND (A-2-4), with rock fragments, dry
(E) WEATHERED ROCK: GNEISS
(F) CRYSTALLINE ROCK: GNEISS



72+50.00

1:45:15 PM
B3186_B5898_RDY_XSLL.dgn
$$$$USERNAME$$$$

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	45

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2720
2700
2680
2660
2640
2620
2600

Ⓐ RESIDUAL: Soft to hard, brown, gray, and orange, SILT (A-4) and CLAY (A-7-6, A-6), moist to dry
Ⓑ WEATHERED ROCK: GNEISS

EX BUILDING

RW6_9
STA 74+01
0.8' PAVEMENT
9 4 8 12 17 12 16 58
FIAD
BT

RW7_9
STA 74+00
0.8' PAVEMENT
14 14 100/0.3

74+00.00

Ⓐ ROADWAY EMBANKMENT: Soft to medium stiff, brown, red, and pink, SILT (A-4), dry to moist
Ⓑ RESIDUAL: Stiff to hard, brown, red, and gray, SILT (A-4, A-5) and CLAY (A-7-6), moist to dry

RW6_8
STA 73+51
SS-186
0.8' PAVEMENT
0.020
8 4 4 11 18 16 57
3 2
FIAD
BT

RW7_8
STA 73+50
1.0' PAVEMENT
32 27 30 24
FIAD
BT

73+50.00

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	46

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2720 2700 2680 2660 2640 2620 2600

Ⓐ RESIDUAL: Medium stiff to hard, brown and tan, SILT (A-4), dry
Ⓑ RESIDUAL: Dense to very dense, brown and orange, silty SAND (A-2-4), dry
Ⓒ CRYSTALLINE ROCK: GNEISS

EX BUILDING

RW6_II
STA 74+99
10' PAVEMENT

Ⓐ 27 23 39 37 Ⓑ 57 60/0.1 Ⓒ
FIAD
AR

RW7_II
STA 74+99
10' PAVEMENT

Ⓐ 35 60/0.0 Ⓒ
FIAD
AR

75+00.00

Ⓐ ROADWAY EMBANKMENT: Medium dense, gray, SAND and GRAVEL (A-1-b), dry
Ⓑ RESIDUAL: Medium dense to very dense, brown, white, and gray, silty SAND (A-2-4), dry
Ⓒ WEATHERED ROCK: GNEISS

EX BUILDING

RW6_IO
STA 74+49
SS-1077
11' PAVEMENT

Ⓐ 11 13 16 19 Ⓑ 36 100+ Ⓒ 70
FIAD
BT

RW7_IO
STA 74+49
SS-1022
0.7' PAVEMENT

Ⓐ 11 15 11 Ⓑ 100/0.2 Ⓒ
FIAD
BT

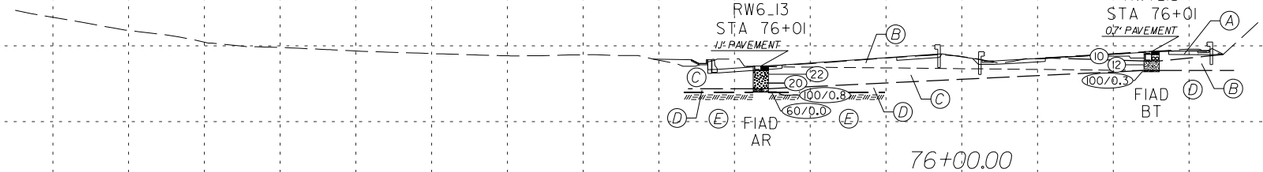
74+50.00

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	47

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

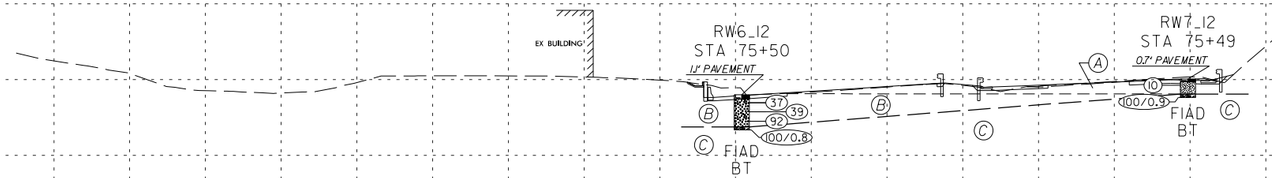
2720 2700 2680 2660 2640 2620 2600

(A) ROADWAY EMBANKMENT: Medium dense, brown and tan, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Stiff, brown, orange, and white, SILT (A-4), dry
(C) RESIDUAL: Medium dense, brown and tan, silty SAND (A-2-4), dry
(D) WEATHERED ROCK: GNEISS
(E) CRYSTALLINE ROCK: GNEISS



76+00.00

(A) RESIDUAL: Stiff, brown, SILT (A-4), dry
(B) RESIDUAL: Dense to very dense, brown and gray, silty SAND (A-2-4), dry
(C) WEATHERED ROCK: GNEISS



75+50.00

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	48

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2720 2700 2680 2660 2640 2620 2600

Ⓐ RESIDUAL: Medium stiff, brown, SILT (A-4), dry
Ⓑ RESIDUAL: Medium dense to very dense, brown and gray, silty SAND (A-2-4), dry
Ⓒ WEATHERED ROCK: GNEISS
Ⓓ CRYSTALLINE ROCK: GNEISS

RW6_I5
STA 77+00
0.9' PAVEMENT
FIAD
BT

RW7_I5
STA 76+99
0.9' PAVEMENT
FIAD
AR

77+00.00

Ⓐ RESIDUAL: Medium stiff to hard, brown and gray, SILT (A-4), dry
Ⓑ RESIDUAL: Medium dense, brown and gray, silty SAND (A-2-4), dry
Ⓒ WEATHERED ROCK: GNEISS

RW6_I4
STA 76+53
1.2' PAVEMENT
FIAD
BT

RW7_I4
STA 76+49
0.8' PAVEMENT
FIAD
BT

76+50.00

—℄—

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	49

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2700
2680
2660
2640
2620
2600

Ⓐ RESIDUAL: Medium dense to very dense, brown, gray, and black, silty SAND (A-2-4), and GRAVEL (A-1-b), dry
Ⓑ WEATHERED ROCK: GNEISS

RW6_I7
STA 78+00
SS-1046
0.9' PAVEMENT
10
13
15
13
FIAD
BT

RW7_I7
STA 78+00
SS-1027
1.0' PAVEMENT
11
20
21
68
100/0.6
FIAD
BT

78+00.00

2720
2700
2680
2660
2640
2620
2600

Ⓐ RESIDUAL: Stiff, brown, black, and gray, SILT (A-4, A-5), dry
Ⓑ RESIDUAL: Medium dense to very dense, brown, black, and gray, silty SAND (A-2-4), dry
Ⓒ CRYSTALLINE ROCK: GNEISS

RW6_I6
STA 77+50
SS-1053
1.0' PAVEMENT
35
67
17
6
FIAD
BT

RW7_I6
STA 77+50
1.0' PAVEMENT
9
9
13
11
60/0.0
FIAD
AR

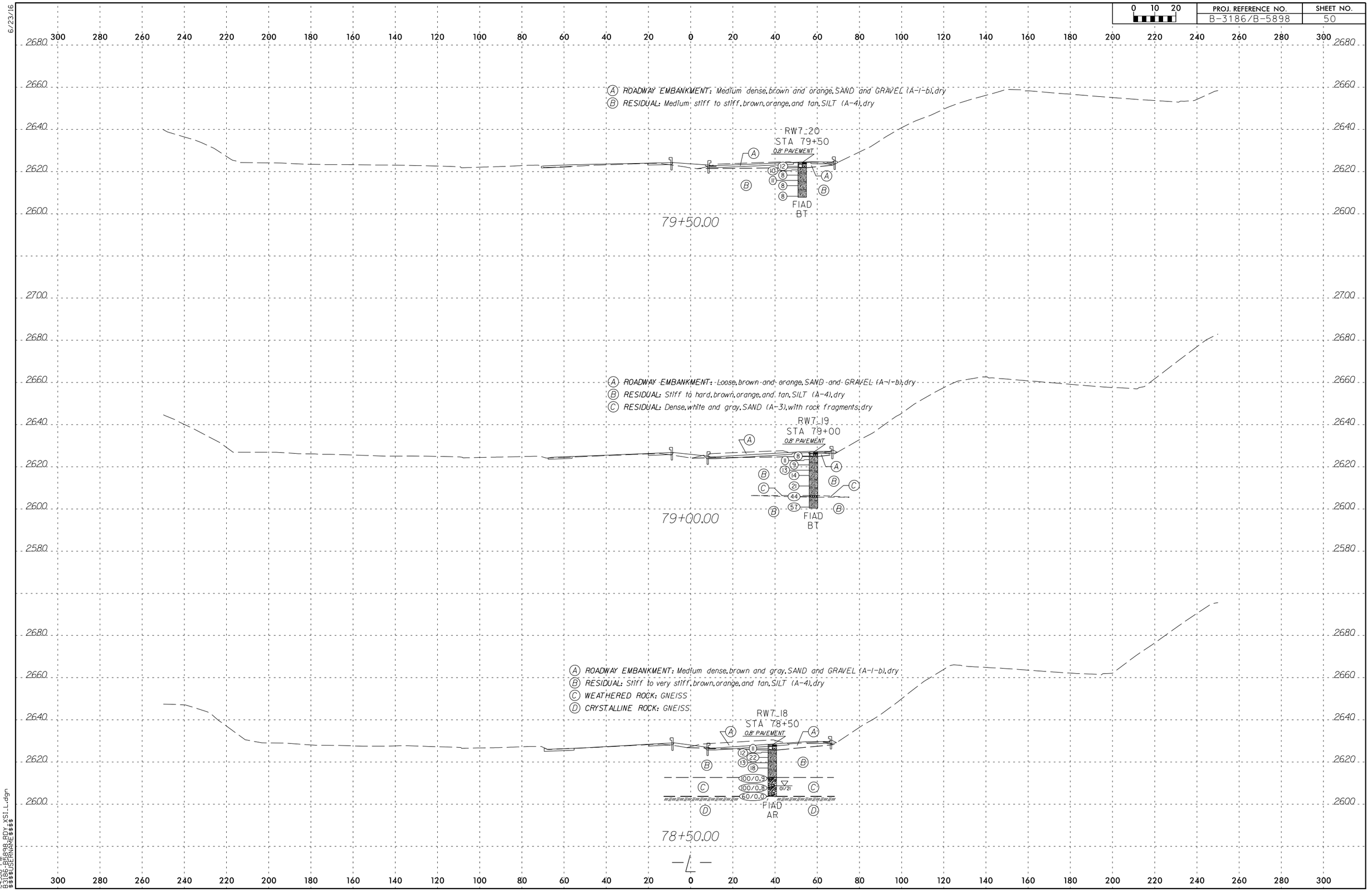
77+50.00

—L—

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	50



11:45:18 PM
B3186-B5898_RDY-XSI_L.dgn
$$$$USERNAME$$$$

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	51

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2660
2640
2620
2600

RW7_23
STA 80+99
SS-721
0.8' PAVEMENT

RESIDUAL: Medium stiff to stiff, brown, orange, and tan, SILT (A-4(6), A-5), dry.

(12) (6) (9) (4) (5) (4)

FIAD
BT

81+00.00

(A) ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Medium stiff to stiff, brown, orange, and tan, SILT (A-4), dry

RW7_22
STA 80+49
0.8' PAVEMENT

(A) (11) (9) (8) (7) (12) (7) (B)

FIAD
BT

80+50.00

(A) ROADWAY EMBANKMENT: Medium dense, brown and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Medium stiff to stiff, brown, orange, and tan, SILT (A-4), dry

RW7_21
STA 79+99
0.8' PAVEMENT

(A) (15) (9) (9) (9) (8) (A) (B)

FIAD
BT

80+00.00

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	52

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2640 2620 2600 2580 2560 2540

Ⓐ RESIDUAL: Medium stiff to hard,brown and orange,SILT (A-4),and CLAY (A-7-6),dry to moist
Ⓑ RESIDUAL: Very dense,brown and tan,silty SAND (A-2-4),dry
Ⓒ WEATHERED ROCK: GNEISS
Ⓓ CRYSTALLINE ROCK: GNEISS

EX R/W
EX R/W
RW4_2
STA 15+00
Ⓐ 7 86
Ⓑ 64 96
Ⓒ 100/0.5
60/0.0
Ⓓ
FIAD
AR
15+00.00
EX W/P
EX W/P
EX R/W

Ⓐ RESIDUAL: Soft to very stiff,brown and orange,SILT (A-4),and CLAY (A-7-6),dry to moist
Ⓑ RESIDUAL: Medium dense,brown,silty SAND (A-2-4),dry
Ⓒ WEATHERED ROCK: GNEISS

EX R/W
EX R/W
RW4_1
STA 14+59
SS-503
Ⓐ 4 7
Ⓑ 8 7
28
25
Ⓒ 100/0.8
FIAD
BT
14+50.00
EX W/P
EX W/P
EX R/W

EX R/
EX R/
YIRT_1250SPT
STA 12+66
Ⓐ 0.3' PAVEMENT
Ⓑ 13
8
6
7
FIAD
BT

Ⓐ ROADWAY EMBANKMENT: Medium dense,brown,sandy GRAVEL (A-1-b),moist
Ⓑ ROADWAY EMBANKMENT: Medium stiff to stiff,brown,orange,and black,SILT (A-4),and CLAY (A-7),moist

12+50.00

-YIRT-

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	53

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2640 2620 2600 2580 2560 2540

EX R/W

(A) RESIDUAL: Medium dense, brown and tan, silty SAND (A-2-4), moist
(B) RESIDUAL: Stiff to hard, brown, white, and orange, SILT (A-4, A-5), and CLAY (A-6), moist to dry
(C) CRYSTALLINE ROCK: GNEISS

RW4_5
STA 16+49
0.8' PAVEMENT
21 21 8
(A) (B)
37 12 18
FIAD
AR

RW5_3
STA 16+51
0.9' PAVEMENT
10 11 12 10
50/0.0
FIAD
AR
(C)

EX MUP EX MUP EX R/W

16+50.00

RW4_4
STA 16+01
SS-2065
1.0' PAVEMENT
12 16 42 5
20 6 6
FIAD
BT

RESIDUAL: Medium stiff to hard, orange and tan, SILT (A-4(0)), moist

EX MUP EX MUP EX R/W

16+00.00

EX R/W EX R/W

(A) RESIDUAL: Loose to medium dense, brown and tan, silty SAND (A-2-4, A-3), moist
(B) RESIDUAL: Medium stiff to very stiff, brown, tan, and orange, SILT (A-4), moist

RW4_3
STA 15+56
0.8' PAVEMENT
12 9 8 6
(A) (B)
4 5
FIAD
BT

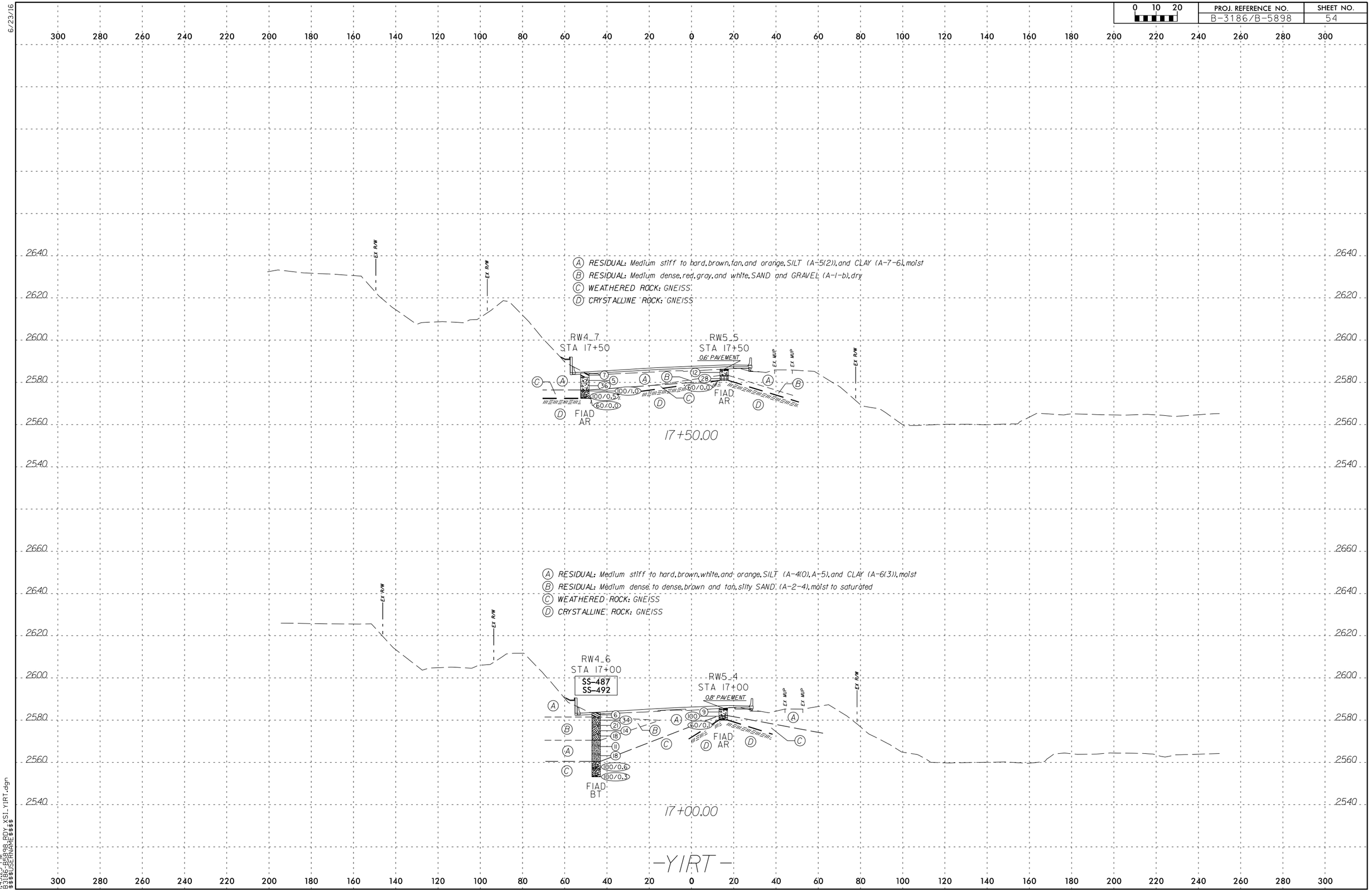
RW5_1
STA 15+51
0.9' PAVEMENT
25 7 14 16
(A) (B)
13 16
FIAD
BT

EX MUP EX MUP EX R/W

15+50.00

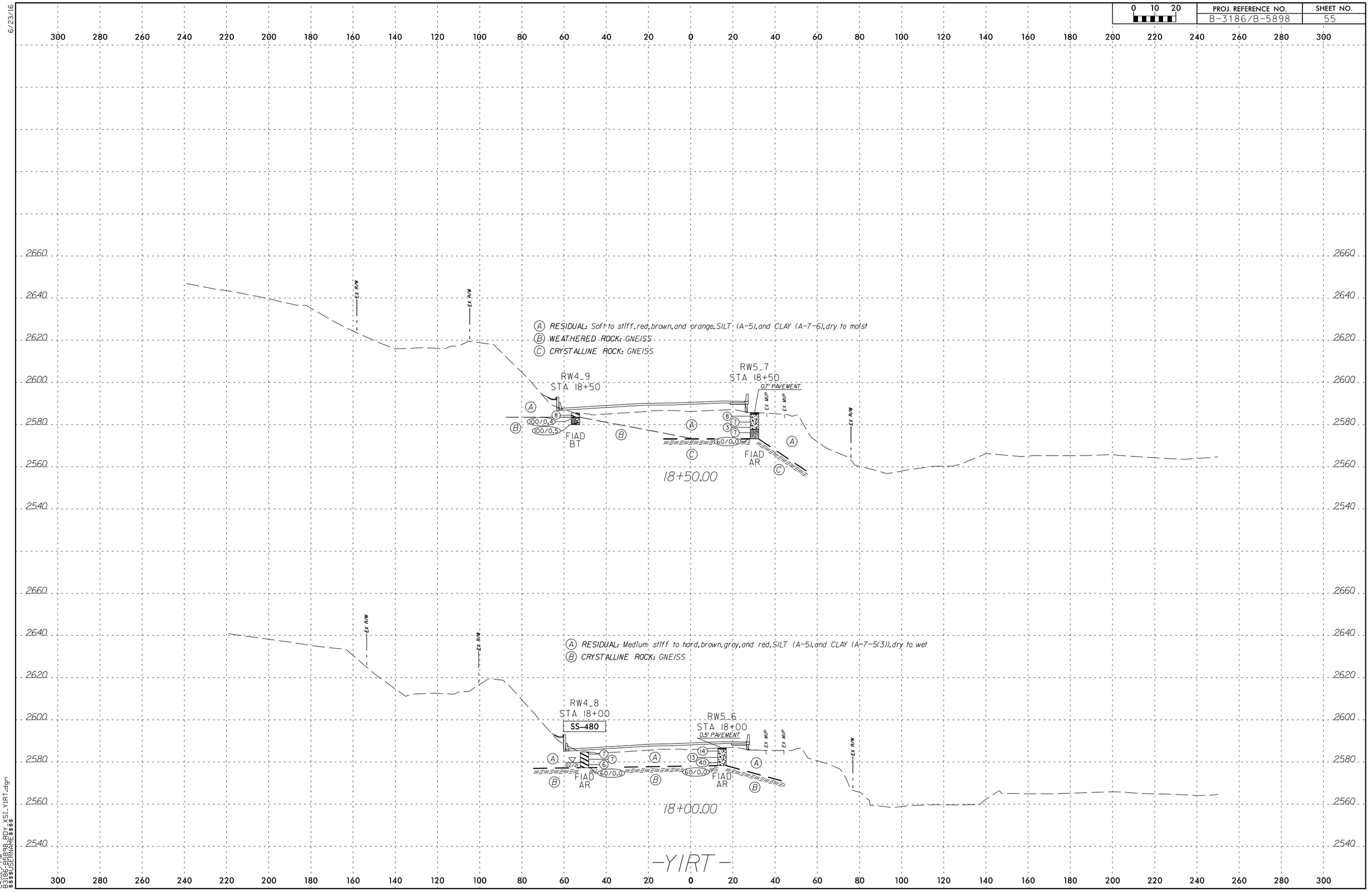
-YIRT-

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	54



6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	55



0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	56

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2660 2640 2620 2600 2580 2560 2540

EX R/W EX R/W

(A) RESIDUAL: Loose to very dense, brown and black, silty SAND (A-2-4), dry
(B) RESIDUAL: Very stiff to hard, brown, red, and orange, SILT (A-4), dry to moist
(C) WEATHERED ROCK: GNEISS
(D) CRYSTALLINE ROCK: GNEISS

RW4_11
STA 19+50

RW5_9
STA 19+50

EX MUP EX MUP EX R/W

19 100/0.6" 60/0.0" FIAD AR

5 52 86 57 19 100+ 60/0.0" FIAD AR

19+50.00

EX R/W EX R/W

(A) ROADWAY EMBANKMENT: Medium dense, brown and orange, GRAVEL (A-1-b), dry
(B) RESIDUAL: Medium stiff to hard, brown, tan, and black, SILT (A-4, A-5), dry to moist
(C) WEATHERED ROCK: GNEISS
(D) CRYSTALLINE ROCK: GNEISS

RW4_10
STA 19+00
SS-472

RW5_8
STA 19+00

EX MUP EX MUP EX R/W

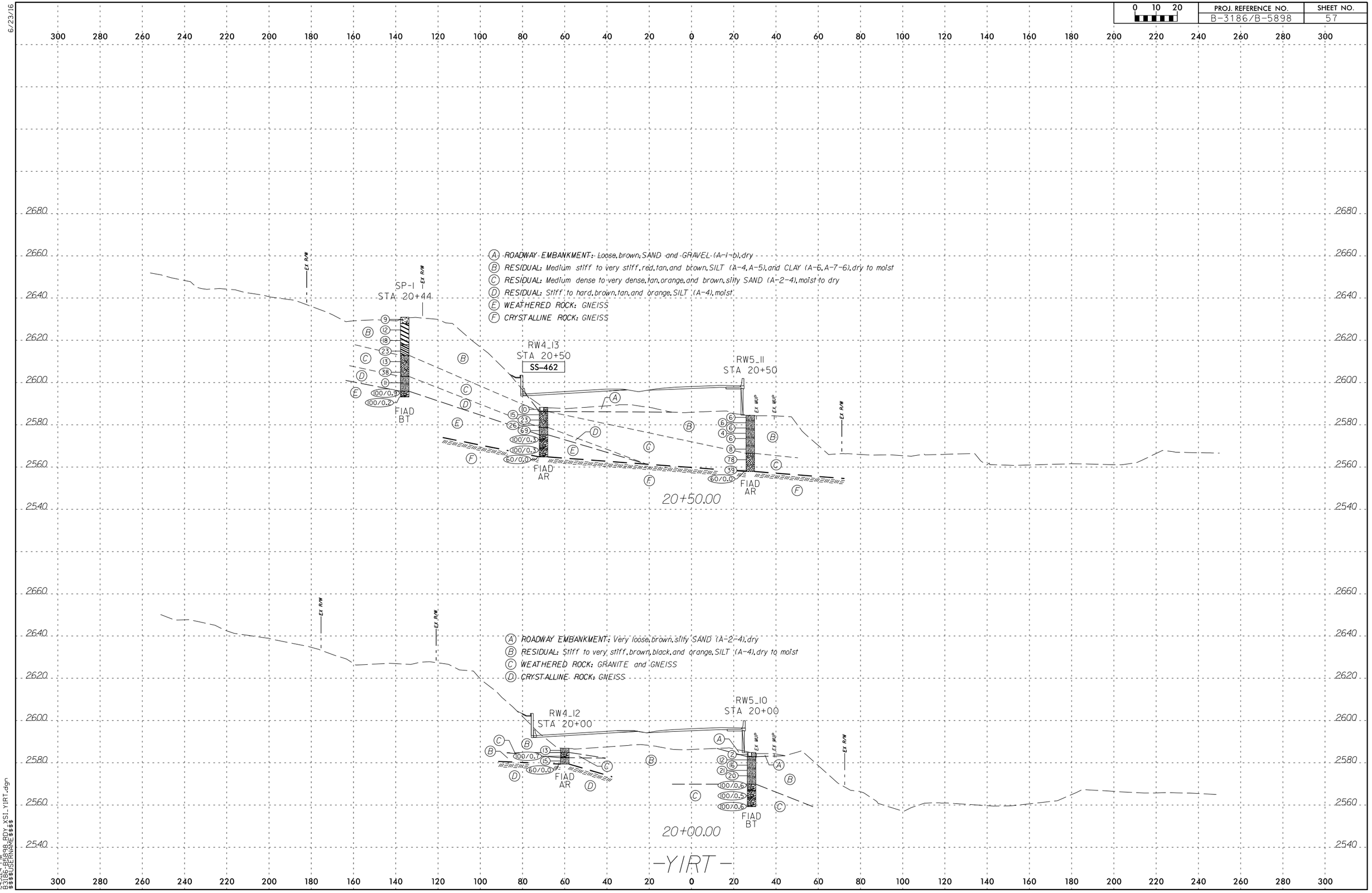
12 17 33 100/0.4" 100/0.5" 60/0.0" FIAD AR

8 10 8 17 17 12 17 60/0.0" FIAD AR

19+00.00

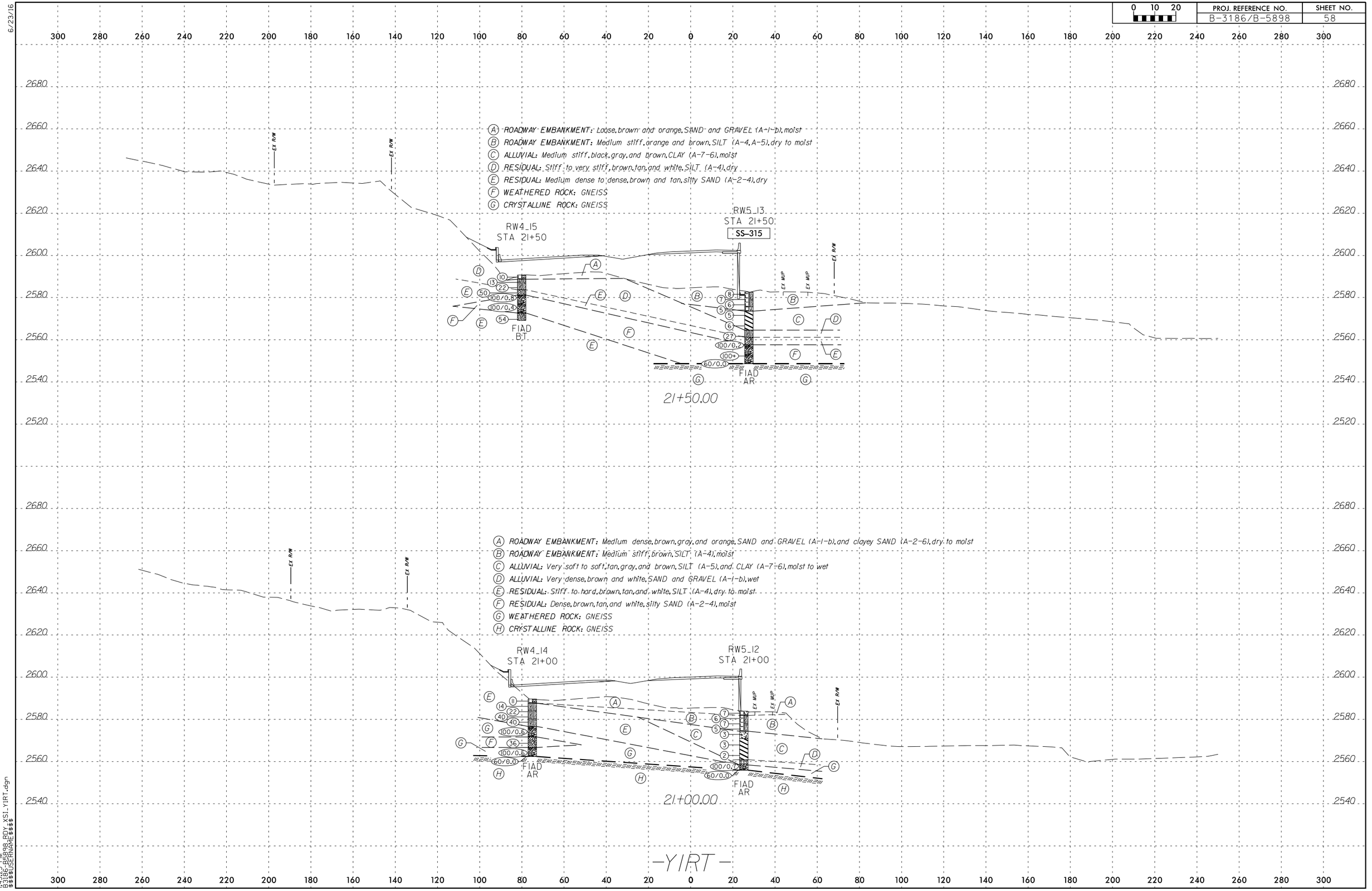
-YIRT-

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	57



6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	58



1:45:25 PM
B3186-B5898_RDY_XSI_YIRT.dgn
$$$$USERNAME$$$$

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	59

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2660 2640 2620 2600 2580 2560 2540

EX R/W

EX R/W

(A) ROADWAY EMBANKMENT: Loose to medium dense, brown, black, and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Medium dense to very dense, brown and tan, silty SAND (A-2-4), moist
(C) RESIDUAL: Medium stiff to hard, white and tan, SILT (A-4(0)), moist to dry
(D) WEATHERED ROCK: QUARTZ and AMPHIBOLITE

RW4_17
STA 22+51
SS-2051
SS-2052
10' PAVEMENT

B 21 B 17 51 C 74 C 94
FIAD
BT

B C

RW5_15
STA 22+50

A 10 6 26 40 78 31 100/0.3 100/0.5 100/0.4
FIAD
BT

22+50.00

EX R/W

EX R/W

(A) ROADWAY EMBANKMENT: Loose to medium dense, brown, tan, and orange, SAND and GRAVEL (A-1-b), dry
(B) RESIDUAL: Medium dense, brown and tan, silty SAND (A-2-4), moist
(C) RESIDUAL: Stiff to hard, brown, white, and tan, SILT (A-4(0)), moist to dry
(D) WEATHERED ROCK: GNEISS
(E) CRYSTALLINE ROCK: GNEISS

RW4_16
STA 22+01
SS-2056
0.9' PAVEMENT

B 27 14 9 C 23 15
FIAD
BT

B C

RW5_14
STA 22+00

A 8 27 50 33 49 100/0.8 100/0.4 50/0.0
FIAD
AR

22+00.00

EX R/W

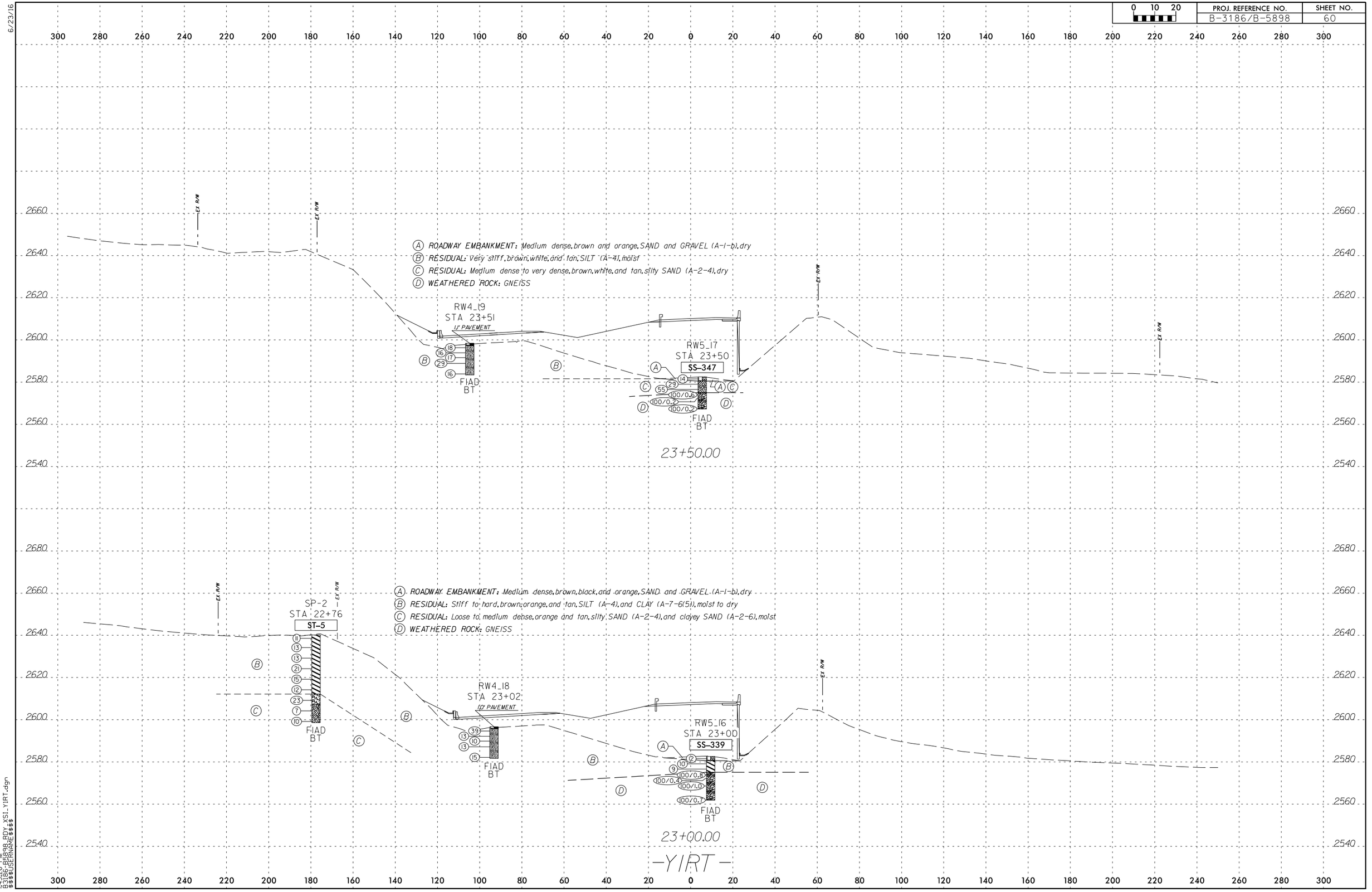
-YIRT-

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

1:45:25 PM
B3186-B5898_RDY_XSI_YIRT.dgn
$$$$USERNAME$$$$

6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	60



0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	61

300 280 260 240 220 200 180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

2680 2660 2640 2620 2600 2580 2560 2540

EX R/W

SP-3
STA 24+71
0.4' PAVEMENT
14 13 16 23 24 11 14 14 17 30
FIAD
BT

RW4_21
STA 24+48
0.8' PAVEMENT
21 12 10 16 37
FIAD
BT

RW5_19
STA 24+50
7 11 11 7 100+
FIAD
BT

EX R/W

EX R/W

Ⓐ ROADWAY EMBANKMENT: Medium dense, brown, silty SAND (A-2-4), moist
Ⓑ RESIDUAL: Medium stiff to very stiff, brown, tan, and white, SILT (A-4, A-5), and CLAY (A-7-6), moist
Ⓒ RESIDUAL: Medium dense to dense, tan, white, and orange, silty SAND (A-2-4), moist
Ⓓ WEATHERED ROCK: GNEISS

24+50.00

EX R/W

EX R/W

Ⓐ ROADWAY EMBANKMENT: Dense, brown, GRAVEL (A-1-b), moist
Ⓑ RESIDUAL: Stiff to hard, brown, white, and tan, SILT (A-4, A-5), moist to dry
Ⓒ WEATHERED ROCK: GNEISS
Ⓓ CRYSTALLINE ROCK: GNEISS

RW4_20
23+99.88 R
0.8' PAVEMENT
33 17 12 41 100/0.3
FIAD
BT

RW5_18
STA 24+00
12 41 64 100+ 60/0.0
FIAD
AR

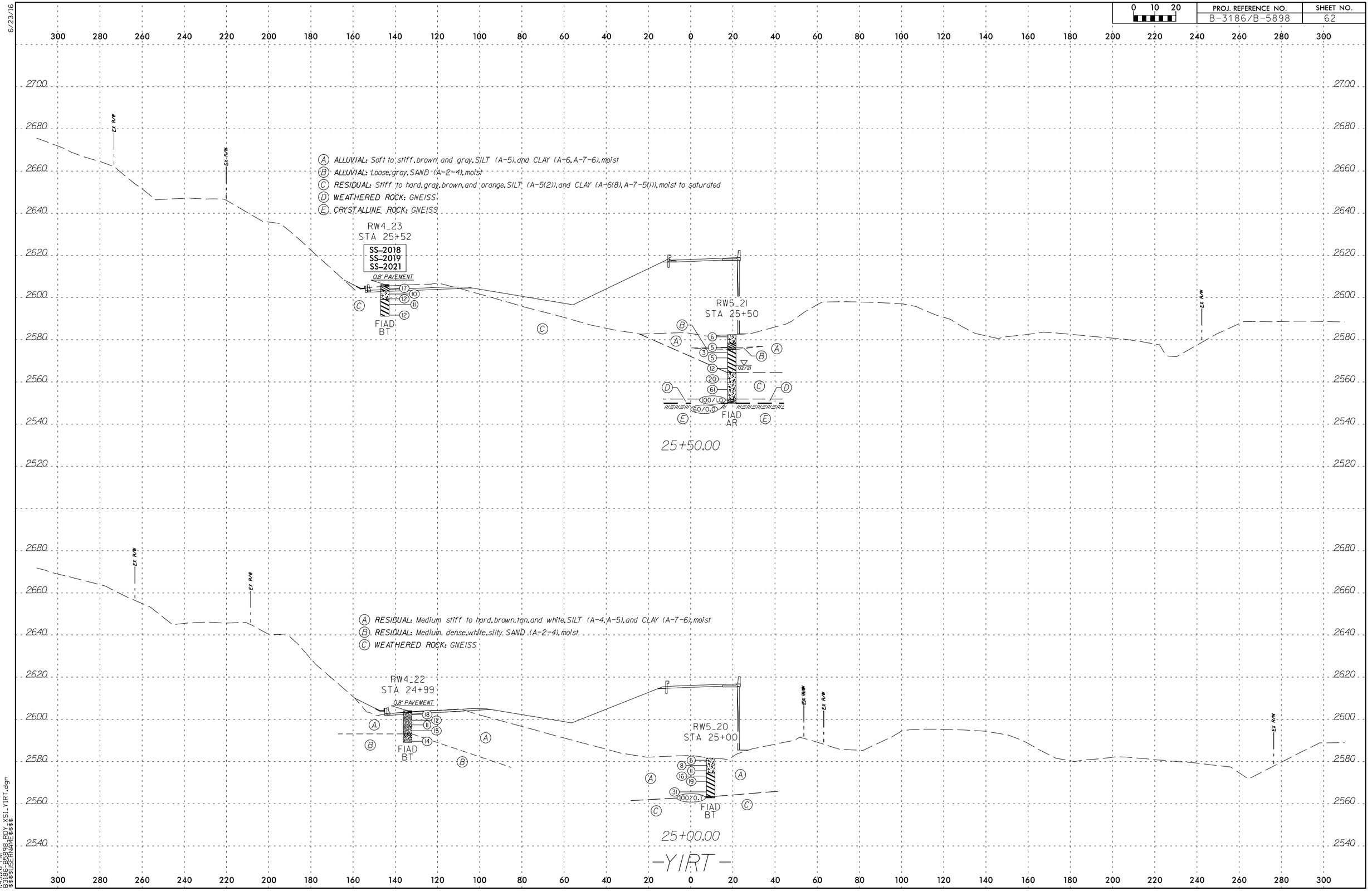
EX R/W

EX R/W

24+00.00

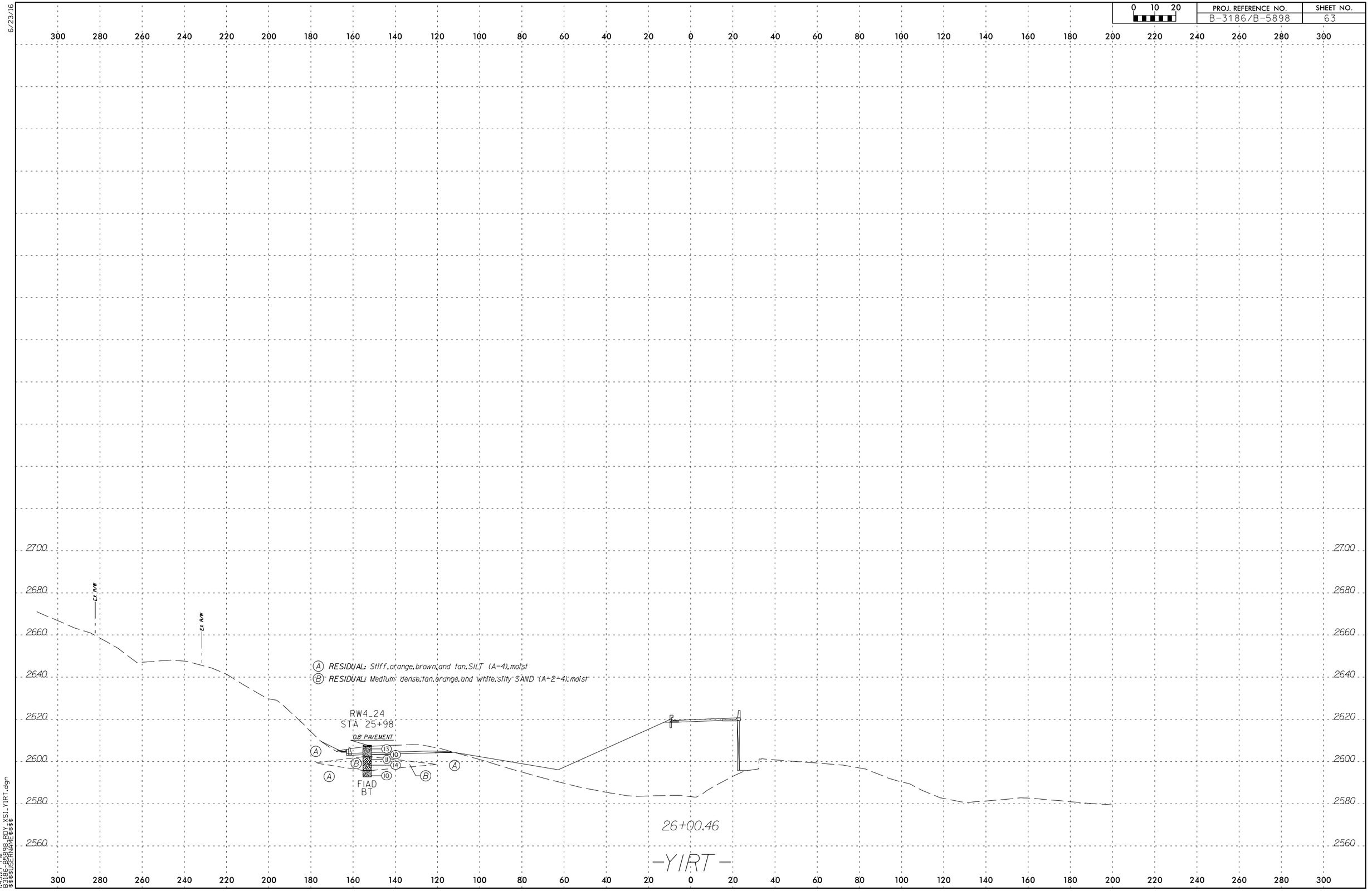
-YIRT-

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	62



6/23/16

0 10 20	PROJ. REFERENCE NO.	SHEET NO.
	B-3186/B-5898	63



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 38332.1.FS1	**TIP** B-3186 / B-5898	**COUNTY** HAYWOOD		**GEOLOGIST** N. Yacobi
SITE DESCRIPTION Retaining Wall No. 5 from -Y1RT- STA 15+25 to 26+13				**GROUND WTR (ft)**
BORING NO. RW5_2	**STATION** 16+54	**OFFSET** 16 ft LT	**ALIGNMENT** -RW5-	**0 HR.** Dry
COLLAR ELEV. 2,583.8 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 666,847	**EASTING** 818,249	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GTC3277 CME-75 83% (09/15/2020)		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER K. Boone	**START DATE** 02/13/21	**COMP. DATE** 02/13/21		**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2585										2,583.8 GROUND SURFACE	0.0
	2,583.0	0.8	2	4	6	10		D		2,583.0 0.8' Pavement	0.8
2580	2,580.3	3.5	5	6	7	13		D		**ROADWAY EMBANKMENT** 2,580.8 Loose to medium dense, red and brown, silty GRAVEL (A-1-b)	3.0
	2,577.8	6.0	4	7	10	17		D		**RESIDUAL** 2,578.3 Stiff, red and brown, SILT (A-4), micaceous	5.5
2575	2,575.3	8.5	3	8	13	21		D		Very stiff, gray, clayey SILT (A-5), micaceous, saprolitic	
2570	2,570.3	13.5	3	8	11	19		M			
2565	2,565.3	18.5	4	8	12	20		M		2,563.8	20.0
										Boring Terminated at Elevation 2,563.8 ft in SILT	

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	65
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

-L- SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS- 1005	55' RT	25+00	15.0' - 16.5'	A-6 (5)	38	13	29.4	21.7	36.0	12.9	99.3	80.2	53.9	17	-
SS- 547	45' LT	27+00	2.5' - 4.0'	A-6 (10)	38	15	17.5	29.7	30.4	22.4	93.5	84.2	72.0	21	-
SS- 2	52' RT	30+00	2.5' - 4.0'	A-6 (2)	34	13	33.6	31.1	30.2	5.1	96.0	76.0	41.0	15	-
SS- 4	53' RT	33+06	7.5' - 9.0'	A-2-4 (0)	28	6	54.4	23.4	15.4	6.8	87.7	50.7	24.3	10	-
SS- 3	51' RT	34+07	2.5' - 4.0'	A-2-5 (0)	44	7	54.2	24.3	14.6	6.9	95.1	55.9	25.7	26	-
ST- 7	80' LT	35+00	3.5' - 5.5'	A-7-5 (16)	53	19	12.4	12.2	15.6	59.8	99.1	91.7	75.0	34	-
SS- 1011	55' RT	37+00	5.0' - 6.5'	A-7-5 (8)	49	17	23.9	20.6	42.7	12.8	90.6	76.4	54.6	28	-
SS- 2018	230' LT	49+13	0.8' - 2.3'	A-6 (8)	38	15	13.9	20.3	29.7	36.1	91.2	83.0	63.9	13	-
SS- 2019	230' LT	49+13	3.5' - 5.0'	A-5 (2)	45	6	23.5	31.4	38.6	6.5	92.9	77.9	49.7	12	-
SS- 2021	230' LT	49+13	8.5' - 10.0'	A-7-5 (1)	48	14	33.9	28.3	28.5	9.3	83.1	62.6	36.8	24	-
SS- 436	147' LT	51+36	7.5' - 9.0'	A-7-5 (8)	55	20	24.0	23.4	34.3	18.3	87.8	73.7	50.2	27	-
SS- 439	147' LT	51+36	20.0' - 21.5'	A-7-6 (6)	44	18	23.0	32.0	20.6	34.4	97.8	84.3	49.3	24	-
ST- 6	214' LT	51+80	18.0' - 20.0'	A-7-6 (13)	50	25	24.5	14.8	15.4	45.3	97.2	80.0	59.4	25	-
SS- 431	127' LT	52+00	15.0' - 16.5'	A-6 (3)	40	11	34.3	21.8	22.1	21.8	96.4	71.7	46.6	18	-
SS- 24	112' RT	51+99	15.0' - 16.1'	A-7-6 (11)	47	23	20.8	20.5	23.6	35.1	92.0	79.1	58.5	26	-
SS- 422	112' LT	52+50	10.0' - 11.5'	A-2-4(0)	33	9	47.9	18.0	20.2	13.8	88.9	54.7	33.4	17	-
SS- 58	130' RT	52+50	7.5' - 9.0'	A-5 (2)	44	10	26.6	29.4	23.9	20.1	88.8	73.7	44.4	28	-
SS- 62	130' RT	52+50	25.0' - 26.5'	A-7-5(31)	82	33	16.9	8.5	58.4	16.2	100	87.0	77.1	71	-
SS- 35	145' RT	53+00	10.0' - 11.5'	A-4 (2)	38	9	27.5	26.8	24.5	21.2	94.3	76.9	48.8	25	-
SS- 46	145' RT	53+00	55.0' - 56.5'	A-2-4(0)	32	NP	47.6	32.0	9.7	10.7	98.9	67.6	26.2	18	-
SS- 362	60' LT	56+50	0.0' - 1.5'	A-6 (3)	36	14	20.9	24.3	28.8	26.0	78.9	68.2	46.9	14	-
SS- 1105	44' LT	58+47	8.5' - 10.0'	A-4 (4)	40	9	17.8	28.7	36.5	17.0	99.3	88.9	59.4	29	-
SS- 1110	43' LT	58+96	1.0' - 2.5'	A-7-6 (7)	46	16	21.9	23.4	26.4	28.3	92.4	78.2	55.1	10	-
SS- 1118	43' LT	59+49	13.5' - 15.0'	A-6 (8)	38	15	15.7	24.8	46.0	13.5	98.6	89.3	63.5	28	-
SS- 1139	41' LT	59+95	8.5' - 10.0'	A-6 (6)	34	13	13.3	30.8	33.9	22.0	100.0	92.9	62.1	22	-
SS- 302	60' LT	63+50	2.5' - 4.0'	A-5 (4)	46	5	10.9	29.7	45.7	13.7	95.0	89.1	64.5	26	-
SS- 260	55' RT	65+50	0.0' - 1.5'	A-5 (5)	47	10	20.1	25.6	23.3	31.0	92.1	80.0	54.9	17	-
SS- 256	60' LT	66+00	15.0' - 16.5'	A-4 (1)	38	10	41.6	22.4	25.9	10.1	98.2	65.9	40.0	12	-
SS- 258	60' LT	66+00	25.0' - 26.5'	A-2-5(0)	42	10	47.2	26.8	24.5	1.5	92.0	60.9	28.4	34	-
SS- 242	55' LT	66+50	7.5' - 9.0'	A-7-5 (2)	52	13	33.8	32.5	25.1	8.6	98.6	76.8	39.8	28	-
SS- 278	60' LT	67+00	5.0' - 6.5'	A-7-6 (2)	42	13	21.7	44.4	31.8	2.1	100.0	91.3	42.2	22	-
SS- 282	60' LT	67+00	20.0' - 21.5'	A-2-7 (1)	53	16	38.6	36.2	22.5	2.7	95.9	73.1	29.7	18	-
SS- 186	61' LT	73+51	7.5' - 9.0'	A-4(0)	32	4	22.9	33.3	30.7	13.1	97.7	84.3	50.7	21	-
SS- 1077	59' LT	74+49	8.5' - 10.0'	A-2-4(0)	35	8	44.0	27.6	20.9	7.5	97.4	66.1	34.0	16	-
SS- 1022	47' RT	74+49	3.5' - 5.0'	A-2-4(0)	31	9	35.4	28.0	18.9	17.7	75.8	59.9	32.7	10	-
SS- 1053	65' LT	77+50	8.5' - 10.0'	A-4 (1)	39	10	39.1	23.4	19.6	17.9	96.5	69.9	41.0	30	-
SS- 1046	65' LT	78+00	0.9' - 2.4'	A-2-4(0)	39	9	21.0	45.2	20.8	13.0	80.7	74.1	33.9	15	-
SS- 1027	50' RT	78+00	8.5' - 10.0'	A-2-4(0)	29	NP	44.1	34.2	12.7	9.0	95.3	68.2	26.8	8	-
SS-721	62' RT	80+99	10.0' - 11.5'	A-4 (6)	40	10	14.7	31.3	51.1	2.9	98.8	90.7	63.1	38	-

-Y1RT- SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
SS- 503	58' LT	14+59	2.5' - 4.0'	A-4(0)	36	4	30.1	31.9	21.0	17.0	88.4	70.9	39.3	27	-
SS- 2065	36' LT	16+01	1.0' - 2.5'	A-4(0)	31	9	33.4	31.2	33.9	1.5	87.3	68.3	36.8	16	-
SS- 487	45' LT	17+00	0.0' - 1.5'	A-6 (3)	39	14	23.2	23.9	27.6	25.3	79.8	67.3	45.9	20	-
SS- 492	45' LT	16+94	15.0' - 16.5'	A-4	35	7	34.3	25.0	26.4	14.3	83.0	62.5	38.6	21	-
SS- 480	50' LT	18+00	2.5-4.0'	A-7-5 (3)	46	14	27.2	32.8	28.2	11.8	94.9	79.7	44.6	31	-
SS- 472	50' LT	19+00	0.0' - 1.5'	A-2-6	33	12	37.6	26.4	13.9	22.1	57.5	41.8	23.5	9	-

PLOT DRIVER: NCDOT.pdf.color_eng.100.pit PENTABLE: NCDOT_Title Sheets.tbl
USER: TLYNN DATE: 10/22/2021 TIME: 3:30:57 PM
FILE: NCDOT\NCDOT-B3186..T02.c..\6.0.CAD.BIM\6.2.Work.In.Progress\B-3186-B-5898\Geotech\InvestigationDesign\B3186.GEO.RDY\CADD.GEOTECH\PlanProf\B3186-B5898.GEO.Laboratory Summary Sheet.dgn

REVISIONS

-Y1RT- SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
SS-462	70' LT	20+50	2.5' - 4.0'	A-2-4	40	9	44.0	25.3	19.7	11.0	94.6	62.5	34.0	11	-
SS-315	28' RT	21+50	2.5' - 4.0'	A-4 (1)	38	8	28.5	29.9	34.3	7.3	94.2	75.9	45.9	21	-
SS-2056	75' LT	22+01	8.8' - 10.3'	A-4	31	NP	34.8	27.9	34.3	3.0	98.2	73.2	42.6	19	-
SS-2051	84' LT	22+51	8.6' - 10.1'	A-2-4	32	NP	37.1	25.9	33.1	3.9	59.6	43.3	25.7	8	-
SS-2052	84' LT	22+51	13.6' - 15.1'	A-4	31	NP	39.5	22.7	34.4	3.4	98.5	70.5	41.7	13	-
ST-5	178' LT	22+76	35.0' 37.0'	A-2-4(0)	NP	NP	51.7	20.6	16.5	11.2	98.2	65.2	28.2	42	-
SS-339	9' RT	23+00	2.5' - 4.0'	A-7-6 (5)	45	16	12.2	49.5	29.5	8.8	100.0	95.7	49.2	25	-
SS-347	5' RT	23+50	5.0' - 6.5'	A-2-4	34	8	39.8	31.4	18.9	9.9	96.5	70.5	33.6	11	-
SS-2018	145' LT	25+52	0.8' - 2.3'	A-6 (8)	38	15	13.9	20.3	29.7	36.1	91.2	83.0	63.9	13	-
SS-2019	145' LT	25+52	3.5' - 5.0'	A-5 (2)	45	6	23.5	31.4	38.6	6.5	92.9	77.9	49.7	12	-
SS-2021	145' LT	25+52	8.5' - 10.0'	A-7-5 (1)	48	14	33.9	28.3	28.5	9.3	83.1	62.6	36.8	24	-

PROJECT REFERENCE NO.	SHEET NO.
B-3186/B-5898	66
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

REVISIONS

PLOT DRIVER: NCDOT_pdf_color_eng_100.plt PENTABLE: NCDOT_Title Sheets.tbl
USER: TLYNN DATE: 10/22/2021 TIME: 3:31:25 PM
FILE: NCDOT\NCDOT-B3186_T02_c_\6.0_CAD_BIM\6.2_Work_In_Progress\B-3186-B-5898\Geotech\InvestigationDesign\B3186_GEO_RDY\CADD_GEOTECH\PlanProf\B3186-B5898_GEO_Laboratory Summary Sheet.dgn

5/26/20

NAD 83/2001

S1_EB2_A

END BENT 2

END BENT 1

S1_EB2_B

S1_EB1_A

S2_B1_A (HDR)

S1_EB1_B

S1_EB1_C

-Y1_RT- PCC 21+18.95

-Y1_RT- PCC 23+59.22

-Y1_RT- PRC 25+14.76

SCS DATA -0.00-
PIscs 6+89.01
Δscs = 6+89.01
Tscs = 0.00, 0.00

SPI DATA -L_LT-
PIs 29+44.47
θs = 03°27'05.6"
Ls = 200
LT = 133.36
ST = 66.69

SUR DATA -L_LT-
PIc 32+96.15
Δc = 26°27'03.5" (RT)
D = 03°27'05.6"
Lc = 756.69
Tc = 385.04
R = 1,660

-L_LT- SC 30+11.11

-L_RT- TS 25+96.55

-L_RT- SC 27+96.55

-L_LT- TS 28+11.11

-L_RT- CS 33+17.57

-L_RT- ST 35+17.57

-L_LT-
N36°29'12.7"E

-L_RT-
N36°29'12.7"E

-L_RT-
N60°05'36.2"E

SAG
26+81.13

GREU_TL-3

B-77

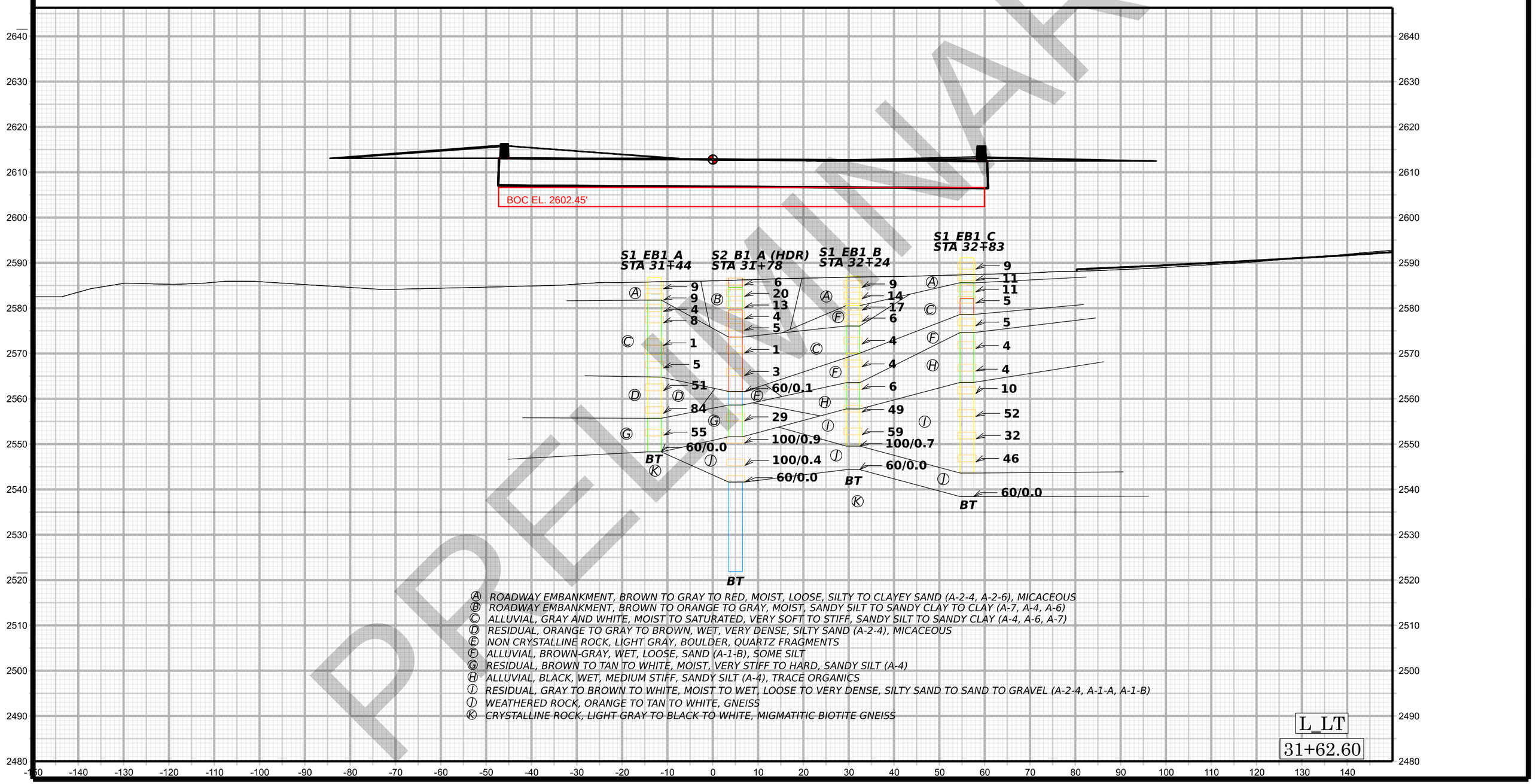
MATCH LINE - - STA 22+89.01 SEE SHEET Plan

MATCH LINE - - STA 36+89.01 SEE SHEET Plan-2

5/26/20

B-5898
X 31+62.60

END BENT 1
STA 31+62.60



Ⓐ ROADWAY EMBANKMENT, BROWN TO GRAY TO RED, MOIST, LOOSE, SILTY TO CLAYEY SAND (A-2-4, A-2-6), MICACEOUS
Ⓑ ROADWAY EMBANKMENT, BROWN TO ORANGE TO GRAY, MOIST, SANDY SILT TO SANDY CLAY TO CLAY (A-7, A-4, A-6)
Ⓒ ALLUVIAL, GRAY AND WHITE, MOIST TO SATURATED, VERY SOFT TO STIFF, SANDY SILT TO SANDY CLAY (A-4, A-6, A-7)
Ⓓ RESIDUAL, ORANGE TO GRAY TO BROWN, WET, VERY DENSE, SILTY SAND (A-2-4), MICACEOUS
Ⓔ NON CRYSTALLINE ROCK, LIGHT GRAY, BOULDER, QUARTZ FRAGMENTS
Ⓕ ALLUVIAL, BROWN-GRAY, WET, LOOSE, SAND (A-1-B), SOME SILT
Ⓖ RESIDUAL, BROWN TO TAN TO WHITE, MOIST, VERY STIFF TO HARD, SANDY SILT (A-4)
Ⓗ ALLUVIAL, BLACK, WET, MEDIUM STIFF, SANDY SILT (A-4), TRACE ORGANICS
Ⓘ RESIDUAL, GRAY TO BROWN TO WHITE, MOIST TO WET, LOOSE TO VERY DENSE, SILTY SAND TO SAND TO GRAVEL (A-2-4, A-1-A, A-1-B)
Ⓙ WEATHERED ROCK, ORANGE TO TAN TO WHITE, GNEISS
Ⓚ CRYSTALLINE ROCK, LIGHT GRAY TO BLACK TO WHITE, MIGMATITIC BIOTITE GNEISS

L_LT
31+62.60

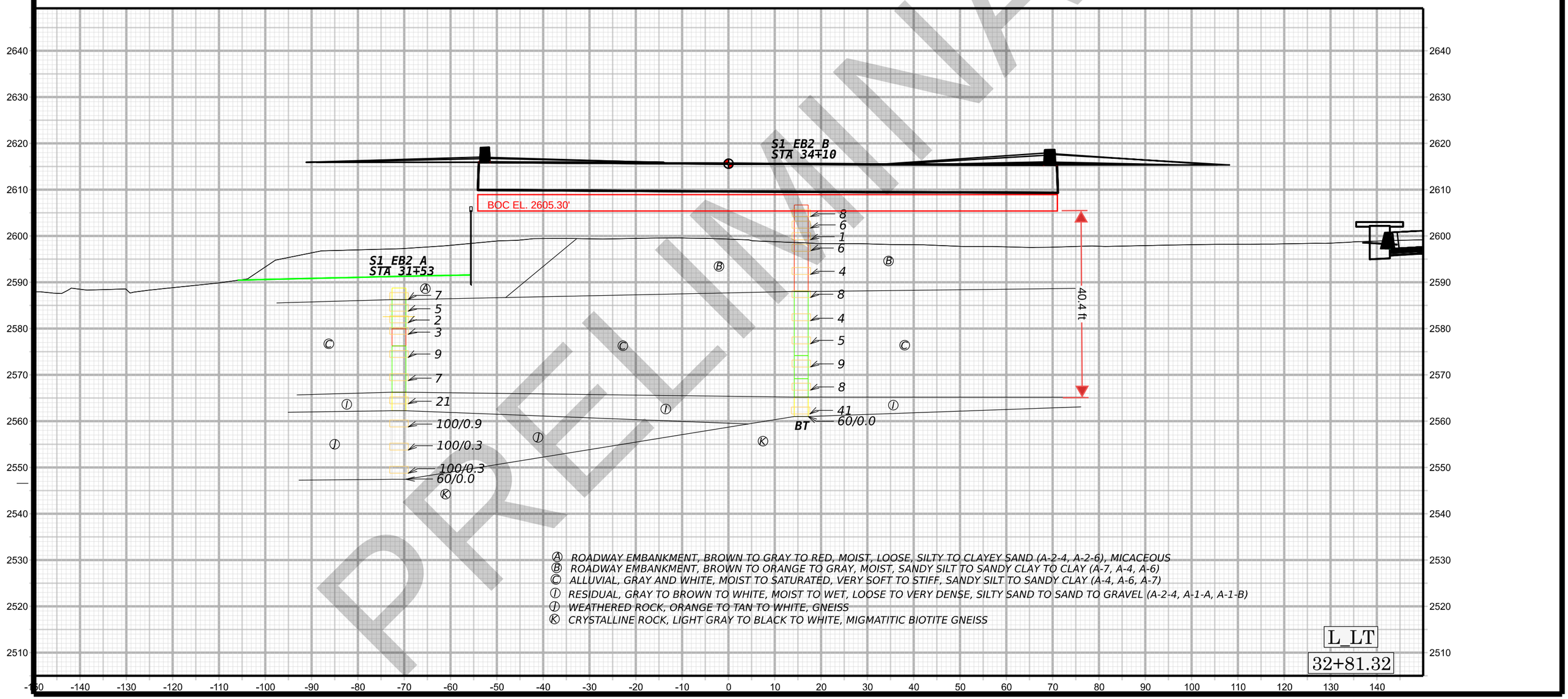
5/26/20

0 10 20

B-0000

X 32+81.32

END BENT 2
STA 32+81.32



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48030.1.FS1	**TIP** B-5898/B-3186	**COUNTY** WAKE	**GEOLOGIST** Alex Lozada	
SITE DESCRIPTION Bridges 430155 and 430158 over Richland Creek and Bridge 430168 over US 19/23 on US 23-74				**GROUND WTR (ft)**
BORING NO. S1_EB1_A	**STATION** 31+44	**OFFSET** 13 ft LT	**ALIGNMENT** L_LT	**0 HR.** 9.0
COLLAR ELEV. 2,585.9 ft	**TOTAL DEPTH** 38.5 ft	**NORTHING** 666,931	**EASTING** 819,344	**24 HR.** 7.0
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 95% 11/30/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Michael Moseley	**START DATE** 02/14/23	**COMP. DATE** 02/14/23	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) / DEPTH (ft)
2590										
2585	2,584.9	1.0								2,585.9 GROUND SURFACE 0.0
			2	5	4	9	SS-001	M		**RESIDUAL** Brown to gray, loose, silty sand (A-2-4), micaceous
	2,582.4	3.5								
			3	5	4	9	SS-002	M		
2580	2,579.9	6.0								2,580.9 5.0
			2	2	2	4	SS-003	M		**ALLUVIAL** Gray and white, soft, fine sandy silt (A-4)
	2,577.4	8.5								
			4	4	4	8	SS-004	M		
2575										
	2,572.4	13.5								
			0	0	1	1	SS-005	Sat.		
2570										
	2,567.4	18.5								
			WOH	2	3	5	SS-006	M		
2565										2,563.9 22.0
	2,562.4	23.5								
			46	32	19	51	SS-007	W		**RESIDUAL** Orange to grey to brown, very dense, silty sand (A-2-4), micaceous
2560										
	2,557.4	28.5								
			10	19	65	84	SS-008	M		
2555										2,554.8 31.1
	2,552.4	33.5								
			30	29	26	55	SS-009	M		**RESIDUAL** Brown to white, very dense, sandy silt (A-4), micaceous
2550										
	2,547.4	38.5								2,547.4 38.5
			60/0.0'	-	-		SS-010			Boring Terminated by Auger Refusal at Elevation 2,547.4 ft on Rock.

ST-001 had 100% recovery.

Other Samples:
ST-001 (15.0 - 17.0)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48030.1.FS1	**TIP** B-5898/B-3186	**COUNTY** WAKE	**GEOLOGIST** Alex Lozada	
SITE DESCRIPTION Bridges 430155 and 430158 over Richland Creek and Bridge 430168 over US 19/23 on US 23-74				**GROUND WTR (ft)**
BORING NO. S1_EB1_B	**STATION** 32+24	**OFFSET** 31 ft RT	**ALIGNMENT** L_LT	**0 HR.** Dry
COLLAR ELEV. 2,587.7 ft	**TOTAL DEPTH** 42.7 ft	**NORTHING** 666,954	**EASTING** 819,431	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 95% 11/30/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Michael Moseley	**START DATE** 02/14/23	**COMP. DATE** 02/14/23	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2590										2,587.7 GROUND SURFACE	0.0
	2,586.7	1.0								**ROADWAY EMBANKMENT** Brown, loose, clayey sand (A-2-6), micaceous, trace gravel	
2585			4	4	5	9	SS-011	M			
	2,584.2	3.5									
			7	6	8	14	SS-012	M			
	2,581.7	6.0									
2580			5	7	10	17	SS-013	M			
	2,579.2	8.5									
			3	3	3	6	SS-014	W			
2575										2,581.2	6.5
	2,574.2	13.5								**ALLUVIAL** Gray-brown, medium dense, sand (A-1-B), fine to medium grained sand	
			0	2	2	4	SS-015	W		2,576.7	11.0
2570										**ALLUVIAL** Dark gray, soft, sandy silt (A-4), fine grained sand, micaceous	
	2,569.2	18.5									
			0	2	2	4	SS-016	W		2,570.7	17.0
2565										**ALLUVIAL** Brown-gray, loose, sand (A-1-B), some silt	
	2,564.2	23.5									
			2	3	3	6	SS-017	W		2,564.2	23.5
2560										**ALLUVIAL** Black, medium stiff, sandy silt (A-4), organic, some wood fragments	
	2,559.2	28.5									
			6	13	36	49	SS-018	W		2,558.4	29.3
2555										**RESIDUAL** Gray and white, very dense, gravel (A-1-A), some coarse sand	
	2,554.2	33.5									
			22	24	35	59	SS-019	W			
2550										2,550.2	37.5
	2,549.2	38.5								**WEATHERED ROCK** White, migmatitic biotite gneiss	
			87	13/0.2'	-		SS-020	W			
	2,545.0	42.7								2,545.0	42.7
			60/0.0'	-	-		SS-021			Boring Terminated by Auger Refusal at Elevation 2,545.0 ft on Rock. Hard drilling from 29.3' to 42.7', quartz lenses and WR present.	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48030.1.FS1	**TIP** B-5898/B-3186	**COUNTY** WAKE	**GEOLOGIST** Alex Lozada	
SITE DESCRIPTION Bridges 430155 and 430158 over Richland Creek and Bridge 430168 over US 19/23 on US 23-74				**GROUND WTR (ft)**
BORING NO. S1_EB1_C	**STATION** 32+83	**OFFSET** 56 ft RT	**ALIGNMENT** L_LT	**0 HR.** Dry
COLLAR ELEV. 2,591.3 ft	**TOTAL DEPTH** 53.0 ft	**NORTHING** 666,974	**EASTING** 819,491	**24 HR.** 10.2
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 95% 11/30/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Michael Moseley	**START DATE** 02/14/23	**COMP. DATE** 02/14/23	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
									ELEV. (ft) — DEPTH (ft)
2595									
	2,591.3	0.0							GROUND SURFACE
2590	2,590.3	1.0	4	4	5	SS-022	M		**ROADWAY EMBANKMENT** Brown-red, loose, clayey sand (A-2-6), micaceous
	2,587.8	3.5	4	5	6	SS-023	M		
2585	2,585.8	5.5							
	2,585.3	6.0	7	6	5	SS-024	M		**ALLUVIAL** Gray, loose, sandy silt (A-4), fine grained sand, micaceous
	2,582.8	8.5							
	2,582.3	9.0	3	2	3	SS-025	W		**ALLUVIAL** Brown and gray, medium stiff, sandy clay (A-6)
2580	2,578.8	12.5							
	2,577.8	13.5	3	2	3	SS-026	M		**ALLUVIAL** Brown, loose, sand (A-1-B), fine to medium grained sand
2575	2,574.8	16.5							
	2,572.8	18.5	1	2	2	SS-027	M		**ALLUVIAL** Dark brown-gray, soft, silt (A-4).
2570									
	2,567.8	23.5	0	1	3	SS-028	M		
2565	2,563.8	27.5							
	2,562.8	28.5	25	5	5	SS-029	M		**RESIDUAL** Dark gray to red-brown to orange-brown, loose, silty sand (A-2-4), micaceous.
2560									
	2,557.8	33.5	21	23	29	SS-030	M		
2555									
	2,552.8	38.5	20	16	16	SS-031	M		
2550									
	2,547.8	43.5	12	21	25	SS-032	M		
2545									
	2,543.8	47.5							
	2,542.8	48.5	40	60	-	SS-033	M		**WEATHERED ROCK** White, migmatitic biotite gneiss
2540									
	2,538.3	53.0	60/0.0'	-	-	SS-034	M		Boring Terminated by Auger Refusal at Elevation 2,538.3 ft on Rock.

BLOWS PER FOOT: 0 — 25 — 50 — 75 — 100

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48030.1.FS1	**TIP** B-5898/B-3186	**COUNTY** WAKE	**GEOLOGIST** Alex Lozada
SITE DESCRIPTION Bridges 430155 and 430158 over Richland Creek and Bridge 430168 over US 19/23 on US 23-74			**GROUND WTR (ft)**
BORING NO. S1_EB2_A	**STATION** 31+53	**OFFSET** 71 ft LT	**ALIGNMENT** L_LT	**0 HR.** Dry
COLLAR ELEV. 2,585.4 ft	**TOTAL DEPTH** 41.3 ft	**NORTHING** 666,978	**EASTING** 819,308	**24 HR.** 6.2
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 95% 11/30/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Michael Moseley	**START DATE** 02/15/23	**COMP. DATE** 02/15/23	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2590											
2585										2,585.4 GROUND SURFACE	0.0
	2,584.4	1.0	4	3	4	7	SS-035	M		**ROADWAY EMBANKMENT** Red, loose, clayey sand (A-2-6), fine to coarse grained sand	
	2,581.9	3.5								2,582.9	2.5
2580			3	2	3	5	SS-036	M		**RESIDUAL** Gray, medium stiff, sandy silt (A-4), fine grained sand	
	2,579.4	6.0									
			0	0	2	2	SS-037	M			
	2,576.9	8.5								2,576.6	8.8
2575			0	0	3	3	SS-038	W		**RESIDUAL** Red-brown, soft, sandy clay (A-6), medium plasticity	
	2,571.9	13.5								2,572.9	12.5
2570			4	4	5	9	SS-039	M		**RESIDUAL** Orange to gray, stiff, sandy silt (A-4), fine grained sand	
	2,566.9	18.5									
2565			3	3	4	7	SS-040	M			
	2,561.9	23.5								2,562.9	22.5
2560			4	8	13	21	SS-041	W		**RESIDUAL** Brown to gray, medium dense, silty sand (A-2-4), fine to coarse grained sand	
	2,556.9	28.5								2,558.9	26.5
2555			28	39	61/0.4'		SS-042	M		**WEATHERED ROCK** Orange-brown to white, migmatitic biotite gneiss	
	2,551.9	33.5									
2550			100/0.3'	-	-		SS-043	M			
	2,546.9	38.5									
2545			100/0.3'	-	-		SS-044	M			
	2,544.1	41.3								2,544.1	41.3
			60/0.0'				SS-045			Boring Terminated by Auger Refusal at Elevation 2,544.1 ft on Rock.	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48030.1.FS1	**TIP** B-5898/B-3186	**COUNTY** WAKE	**GEOLOGIST** Alex Lozada	
SITE DESCRIPTION Bridges 430155 and 430158 over Richland Creek and Bridge 430168 over US 19/23 on US 23-74				**GROUND WTR (ft)**
BORING NO. S1_EB2_B	**STATION** 34+10	**OFFSET** 16 ft RT	**ALIGNMENT** L_LT	**0 HR.** N/A
COLLAR ELEV. 2,607.3 ft	**TOTAL DEPTH** 45.7 ft	**NORTHING** 667,083	**EASTING** 819,563	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 95% 11/30/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Michael Moseley	**START DATE** 02/16/23	**COMP. DATE** 02/16/23	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2610										
										2,607.3 GROUND SURFACE 0.0
	2,606.3	1.0								**ROADWAY EMBANKMENT**
2605			5	4	4	8	SS-066	M		Red-brown, very soft to medium stiff, sandy clay (A-6)
	2,603.8	3.5								
			4	3	3	6	SS-067	M		
	2,601.3	6.0								
2600			0	0	1	1	SS-068	M		
	2,598.8	8.5								
			2	3	3	6	SS-069	M		
2595										
	2,593.8	13.5								
			2	2	2	4	SS-070	M		
2590										
	2,588.8	18.5								2,588.6 18.7
			4	3	5	8	SS-071	W		**ALLUVIAL**
2585										Gray, soft to medium stiff, sandy silt (A-4)
	2,583.8	23.5								
			0	2	2	4	SS-072	M		
2580										
	2,578.8	28.5								
			2	2	3	5	SS-073	M		
2575										2,574.8 32.5
	2,573.8	33.5								**ALLUVIAL**
			3	4	5	9	SS-074	M		Gray, medium stiff, sandy silt (A-5), high plasticity
2570										2,569.8 37.5
	2,568.8	38.5								**ALLUVIAL**
			3	4	4	8	SS-075	M		Black, medium stiff, silt (A-4), trace organic matter
2565										2,565.8 41.5
	2,563.8	43.5								**RESIDUAL**
			12	12	29	41	SS-076	M		Gray and white, dense, sand (A-1-B), fine to coarse grained sand
	2,561.6	45.7								2,561.6 45.7
			60/0.0'	-	-		SS-077	M		Boring Terminated by Auger Refusal at Elevation 2,561.6 ft on Rock.

EB2-LT		Average between S1-EB2-A and S1-EB2-B			
Depth from (ft)	Depth to (ft)	Soil Description	unit weight (pcf)	Phi (deg)	Su (psf)
0	9	Fill	120	29	
9	17	Roadway embankment (medium stiff clay, N=5)	115		600
17	23	Residual (soft clay, N=3)	115		300
23	29	Residual (medium stiff clay/silt, N=8)	115		1000
29	40	Alluvial (medium stiff clay/silt, N=6)	115		700
40	44	Residual (medium dense sand, N=30)	120	32	
44	52	PWR	125	40	
52	60	Rock	165	40	

EB2-RT		Average between S1-EB1-C and S1-EB2-B			
Depth from (ft)	Depth to (ft)	Soil Description	unit weight (pcf)	Phi (deg)	Su (psf)
0	7	Fill	120	29	
7	16	Roadway embankment (medium stiff clay, N=5)	115		600
16	38	Alluvial (medium stiff clay/silt, N=6)	115		700
38	41	Residual (m dense/loose sand, N=10)	120	29	
41	50	Residual (dense sand, N=40)	120	34	
50	55	PWR	125	40	
55	60	Rock	165	40	