REFERENCE: BR-0139

PROJECT: 67139

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN
-L-	12+50 TO 40+20	4-5
-Y1-	10+00 TO 11+90	5

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	13+50 TO 39+00	6-28
CULVERT	33+27	29

SAMPLE RESULTS	30

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY BRUNSWICK

PROJECT DESCRIPTION REPLACE CULVERT #003 OVER SAND HILL CREEK AND THREE OTHER CULVERTS ON NC 133 (RIVER RD)

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0139	1	

CAUTION NOTICE

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

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

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

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

PERSONNEL

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J.M. EDMONDSON

D. PINTER

INVESTIGATED BY T.C. BOTTOMS

DRAWN BY T.C. BOTTOMS

CHECKED BY D.N. ARGENBRIGHT

SUBMITTED BY D.N. ARGENBRIGHT

DATE OCTOBER 2022

NORTH CAROLINA LICENSED SEAL 2240 GEOLOGIST TYLER C. BOTTOMS

DocuSigned by:
Tyler C. Bottoms
48A2D3BD08CF4A8...
SIGNATURE

02/02/2023
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
BR-0139	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		—	—	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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
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:
- [X] CME-45C
- [X] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [X] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

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: br0139_ls_tin.dtm DATED 5/3/22

ELEVATION: _____ FEET

NOTES:

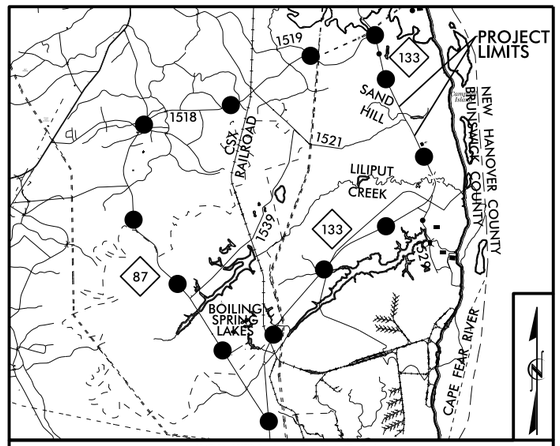
FIAD: FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

09/08/99

CONTRACT: TIP PROJECT: BR-0139

See Sheet 1B For Standard Symbology Sheet



VICINITY MAP (N.T.S.)

OFFSITE DETOUR

APPROVED 25% PLANS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

BRUNSWICK COUNTY

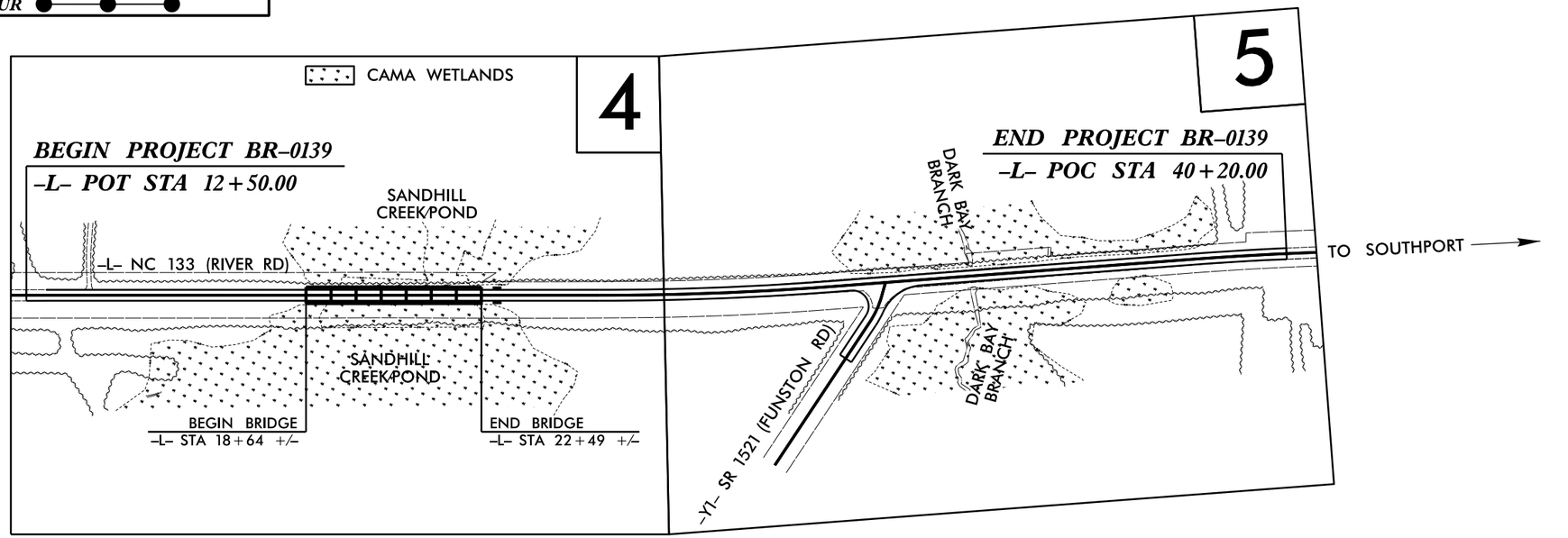
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0139	3	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
67139.1		PE
67139.2		UTIL & R/W
67139.3		CONSTRUCTION

LOCATION: REPLACE CULVERT #003 OVER SAND HILL CREEK AND THREE OTHER CULVERTS ON NC 133 (RIVER RD)

TYPE OF WORK: GRADING, DRAINAGE, PAVING, CULVERT AND STRUCTURE

NAD 83/NA 2011



THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.

CLEARING LIMITS ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III (MODIFIED).

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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 2024 = 7,300
ADT 2044 = 13,200
K = 10 %
D = 55 %
T = 8 % *
V = 60 MPH
* TTST=2% DUAL=6%
FUNC CLASS = MINOR ARTERIAL
REGIONAL TIER

PROJECT LENGTH

LENGTH OF ROADWAY T.I.P. PROJECT BR-0139 = 0.452 MI

LENGTH OF STRUCTURES T.I.P. PROJECT BR-0139 = 0.073 MI

TOTAL LENGTH OF T.I.P. PROJECT BR-0139 = 0.525 MI

Prepared in the Office of:

HNTB HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
JANUARY 13, 2023

LETTING DATE:
APRIL 16, 2024

BRIAN P. BLACKWELL, PE
PROJECT ENGINEER

TANNER A. ROBERTS, EI
PROJECT DESIGN ENGINEER

DEREK PIELECH, PE
NCDOT CONTACT

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

26-SEP-2022 13:09
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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

September 27, 2022

State Project: 67139.1.1 (BR-0139)
F.A. Project: N/A
County: Brunswick
Description: Replace Culvert #003 over Sand Hill Creek and three other culverts on NC 133 (River Road)

Subject: Geotechnical Inventory Report

Project Description

This project begins approximately 0.3 miles north of the intersection of NC 133 and Funston Road in Brunswick County and extends south along NC 133 for approximately 0.5 miles. Proposed construction consists of widening and raising the grade of NC 133 as well as culvert replacements. This geotechnical investigation was confined to the areas of proposed construction.

Fieldwork was conducted in November of 2017, January of 2019 and August of 2022. SPT, power auger and hand auger borings were completed at various offsets along the project corridor. Representative soil samples were collected for visual classification in the field and for laboratory analysis by the Materials and Tests Unit.

The following alignments were investigated. Subsurface profiles and selected cross sections of these alignments are included in this report.

Line	Station(±)
-L-	12+50 to 40+20
-Y1-	10+00 to 11+90

Areas of Special Geotechnical Interest

1) The entire project was found to exhibit seasonal high ground water.

2) The following sections contain cohesive soils which have the potential to cause embankment/subgrade and or slope stability problems during construction:

Line	Station(±)
-L-	16+25 to 16+75
-L-	17+75 to 18+75
-L-	27+25 to 30+25
-L-	31+25 to 31+75

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT – EASTERN REGIONAL OFFICE
1570 MAIL SERVICE CENTER
RALEIGH, NC 27699-1570

Telephone: (984) 920-8900
Customer Service: 1-877-368-4968
Website: www.ncdot.gov

Location:
3301 JONES SAUSAGE RD. SUITE 100
GARNER, NC 27529

Line	Station(±)
-L-	33+25 to 33+75
-L-	34+25 to 34+75

3) The following sections contain organic soils which have the potential to cause embankment/subgrade and or slope stability problems during construction:

Line	Station(±)
-L-	18+75 to 22+90
-L-	32+84 to 33+58
-L-	34+20 to 35+35

Physiography and Geology

This project corridor is located within the Coastal Plain Physiographic Province. Topography along the project is nearly flat to gently sloping. Natural ground elevations ranged from 8± to 22± feet above sea level.

Surficial soils in this area are generally classified as alluvial sediments and are underlain by formational soils belonging to the Waccamaw Formation.

Ground Water

Ground water data was collected in November of 2017, January of 2019 and August of 2022. Ground water elevations ranged from 6± to 22± feet above sea level.

Soils

Soils encountered within this project area have been divided into three categories: Roadway Embankment, alluvial and formational

Roadway embankment soils were found along the existing NC 133 corridor and Funston Road. Where encountered it was composed of 1± to 10± feet of loose to medium dense sand (A-2-4, A-3).

Soils identified as alluvial are composed of 1± to 15± feet of very loose to medium dense sand (A-2-6, A-2-4, A-3), 2± to 4± or feet of soft sandy clay (A-6, A-7-6), 5± feet of loose moderately organic sand, 7± feet of very soft moderately organic silt, and 5 to 13± feet of soft muck. Moisture samples taken within units returned a natural moisture content ranging from 23% to 203%. Organic percentages ranged from 4% to 60%.

Formational soils belonging to the Waccamaw formation were encountered beneath the alluvial soils. Where encountered, these soils consisted of 10± of very loose sand, 3± of hard silt (A-4) and soft limestone.

Culvert

A culvert is proposed at -L- Sta. 33+27 at Dark Bay Branch. A cross section showing anticipated soil conditions at this site is included in this report. Beneath 4 to 6 feet of embankment is approximately 7 feet of very soft muck and moderately organic silt. Soft sandy clay and loose sands underlie the organic material. Soft limestone was encountered at elevation -16 feet at Sta. 33+20, 10' RT. The variability between the SPT borings at 33+20, 10' RT and 33+37, 8' LT suggest there is a sinkhole present. The limits of the sinkhole have not been defined.

Shelby Tubes

Shelby tubes were collected at the following locations and submitted to the lab for testing:

Sample Number	Location	Depth	Test Type
ST-1	33+37, 9' LT	7.0'-9.0'	Consolidation
ST-2	33+37, 9' LT	13.5'-15.5'	Consolidation

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343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

PROJECT REFERENCE NO.	SHEET NO.
BR-0139	4
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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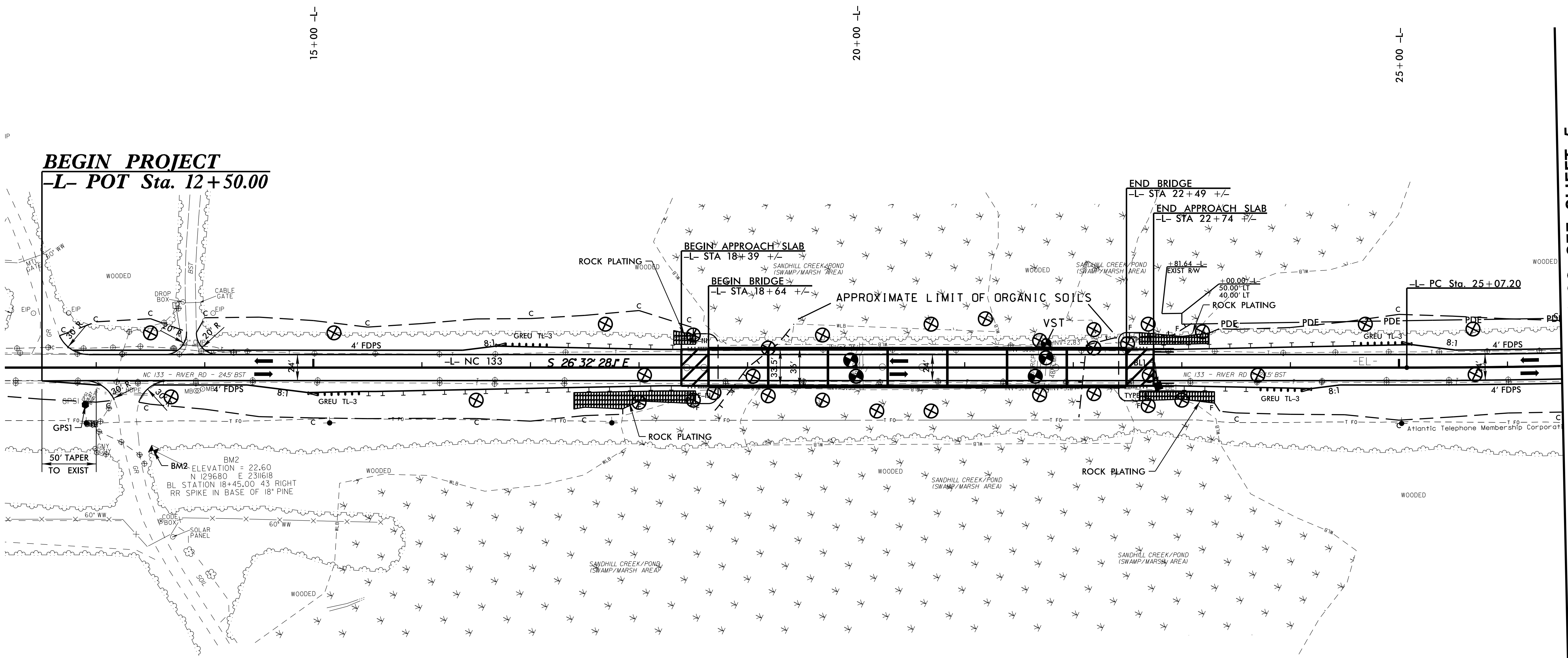
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



CAMA WETLANDS

FOR -L- PROFILE, SEE SHEET 6

-L-
PI Sta 27+63.86
Δ = 4°19' 23.0" (LT)
D = 0°50' 33.3"
L = 513.07'
T = 256.66'
R = 6,800.00'
SE = 3%
RO = 72'

HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

PROJECT REFERENCE NO.	SHEET NO.
BR-0139	5
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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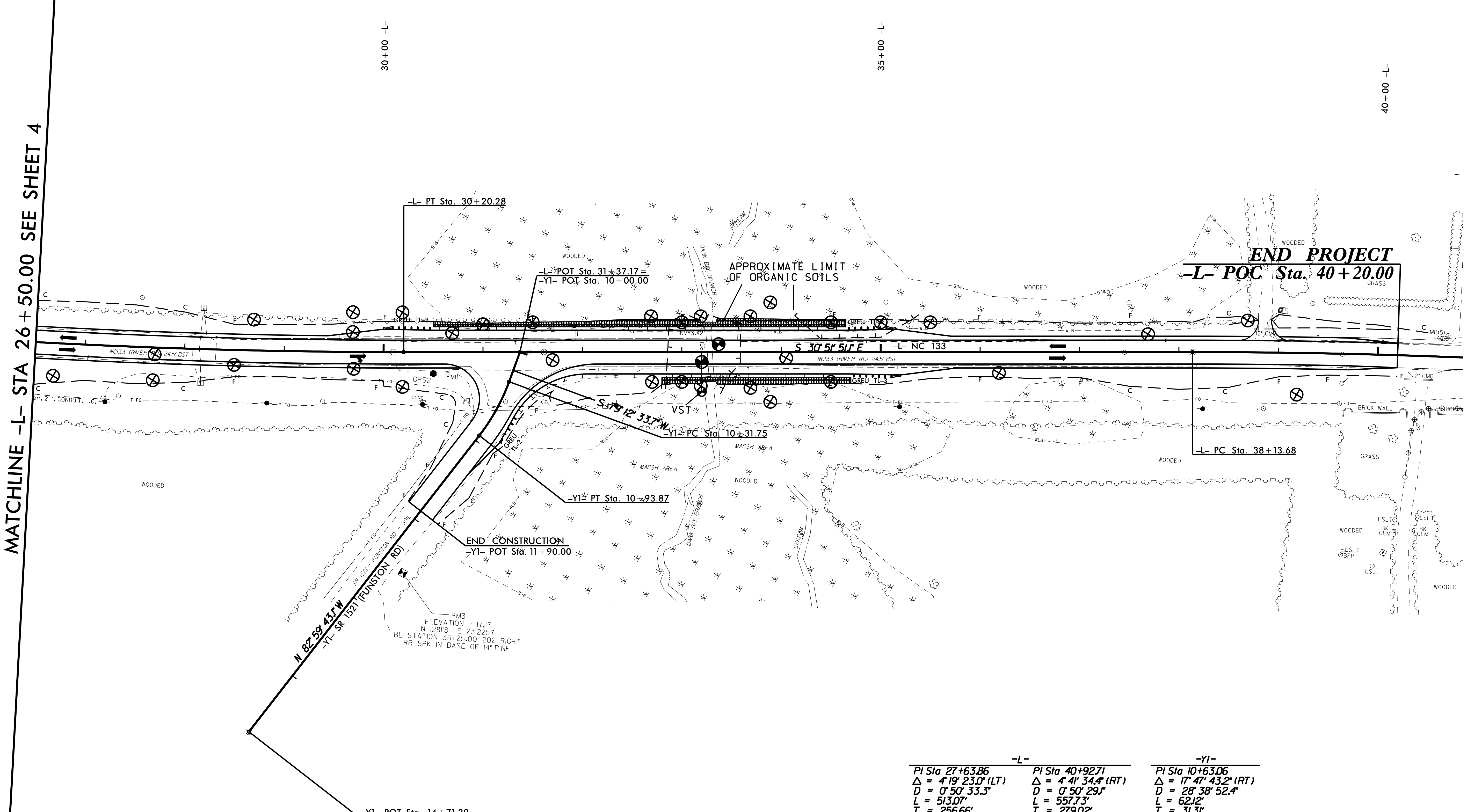

FOR -L- PROFILE, SEE SHEETS 6 & 7
FOR -Y1- PROFILE, SEE SHEET 7

-L-		-Y1-
PI Sta 27+63.86	PI Sta 40+92.71	PI Sta 10+63.06
Δ = 4° 19' 23.0" (LT)	Δ = 4° 41' 34.4" (RT)	Δ = 17° 47' 43.2" (RT)
D = 0° 50' 33.3"	D = 0° 50' 29.1"	D = 28° 38' 52.4"
L = 513.07'	L = 557.73'	L = 62.12'
T = 256.66'	T = 279.02'	T = 31.31'
R = 6,800.00'	R = 6,809.35'	R = 200.00'
SE = 3%	SE = 3%	SE = SEE PLANS
RO = 72'	RO = 72'	RO = SEE PLANS

8/17/99
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6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	6

15+19

4:1 3:1

01/19

LOOSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

15+00.00

4:1 4:1

LOOSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

14+50.00

4:1 4:1

LOOSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

14+00.00

13+69

3:1 4:1 4:1

DRY

01/19

LOOSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

13+50.00

—℄—

6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	7

Ⓐ MEDIUM STIFF TAN AND GRAY SILTY CLAY, MOIST (ALLUVIAL)

4:1

3:1

LOOSE TO MEDIUM DENSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

Ⓐ

DRY

16+50.00

4:1

3:1

LOOSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

16+00.00

4:1

3:1

LOOSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

15+50.00

6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	8

Ⓑ LOOSE TO MEDIUM DENSE TAN, BROWN AND GRAY SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)

Ⓒ LOOSE TO MEDIUM DENSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

18+05

S-13

3:1

1.5:1

PAVEMENT

Ⓒ

Ⓑ

11/17

09/22

SOFT GRAY, TAN AND ORANGE SANDY AND SILTY CLAY, MOIST TO WET (ALLUVIAL)

LOOSE TO MEDIUM DENSE TAN, BROWN AND GRAY SILTY SAND, SATURATED (ALLUVIAL)

LOOSE TO MEDIUM DENSE TAN, BROWN AND GRAY SILTY SAND, SATURATED (ALLUVIAL)

18+00.00

17+69

3:1

3:1

01/19

LOOSE TO MEDIUM DENSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

17+50.00

3:1

3:1

LOOSE TO MEDIUM DENSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

17+00.00

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6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	9

Ⓑ LOOSE BROWN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)

18+69

Ⓑ

01/19

LOOSE GRAY SAND, SATURATED (ALLUVIAL)

18+64.00

Ⓒ LOOSE TO MEDIUM DENSE TAN, BROWN AND GRAY SILTY SAND, MOIST TO SATURATED (ALLUVIAL)

WLB

1.6:1

1.5:1

Ⓒ

09/22

Ⓒ

09/22

Ⓒ

SOFT GRAY, TAN AND ORANGE
SANDY CLAY, WET (ALLUVIAL)

18+50.00

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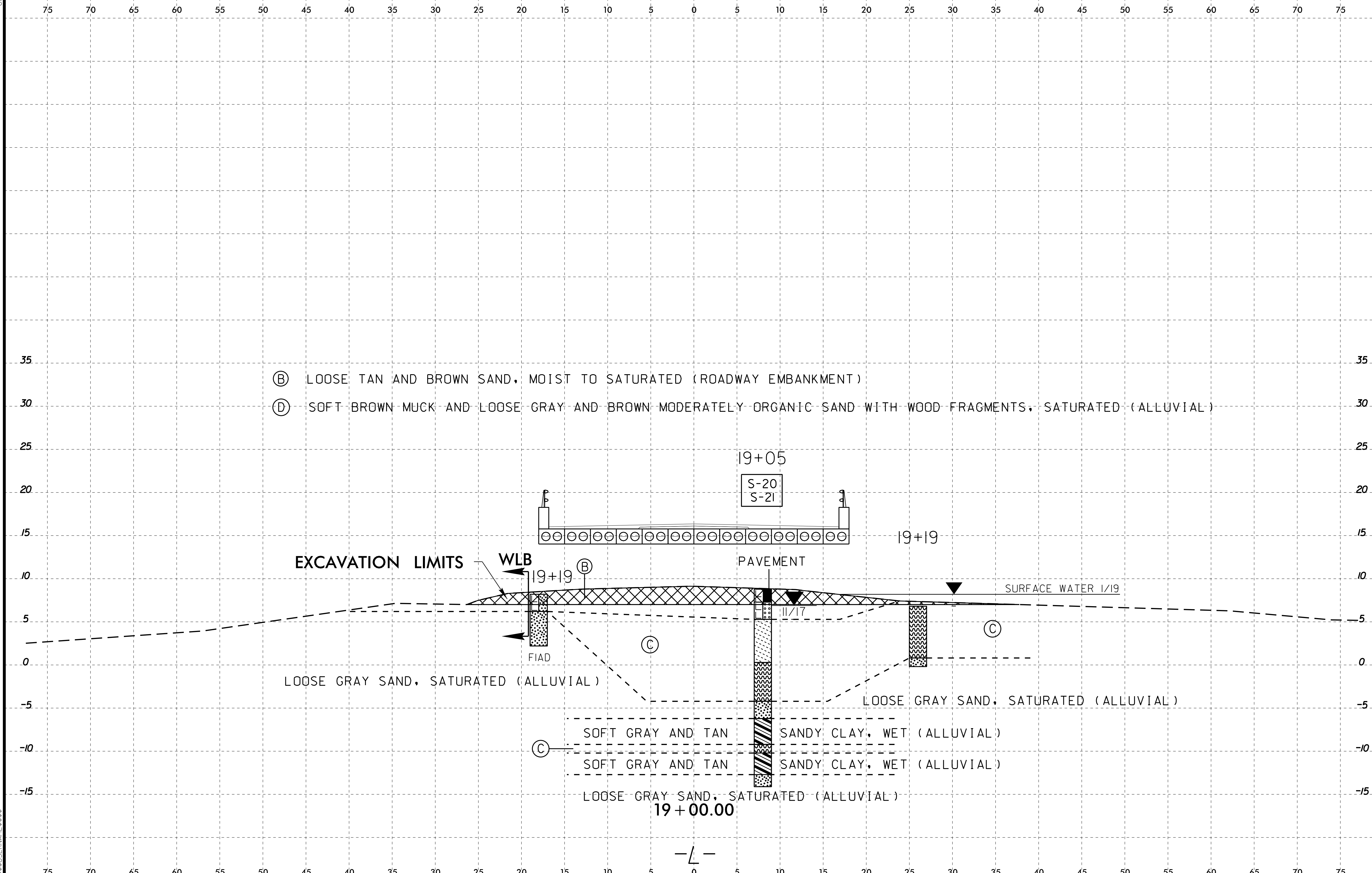
PROJ. REFERENCE NO.	SHEET NO.
BR-0139	10



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0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
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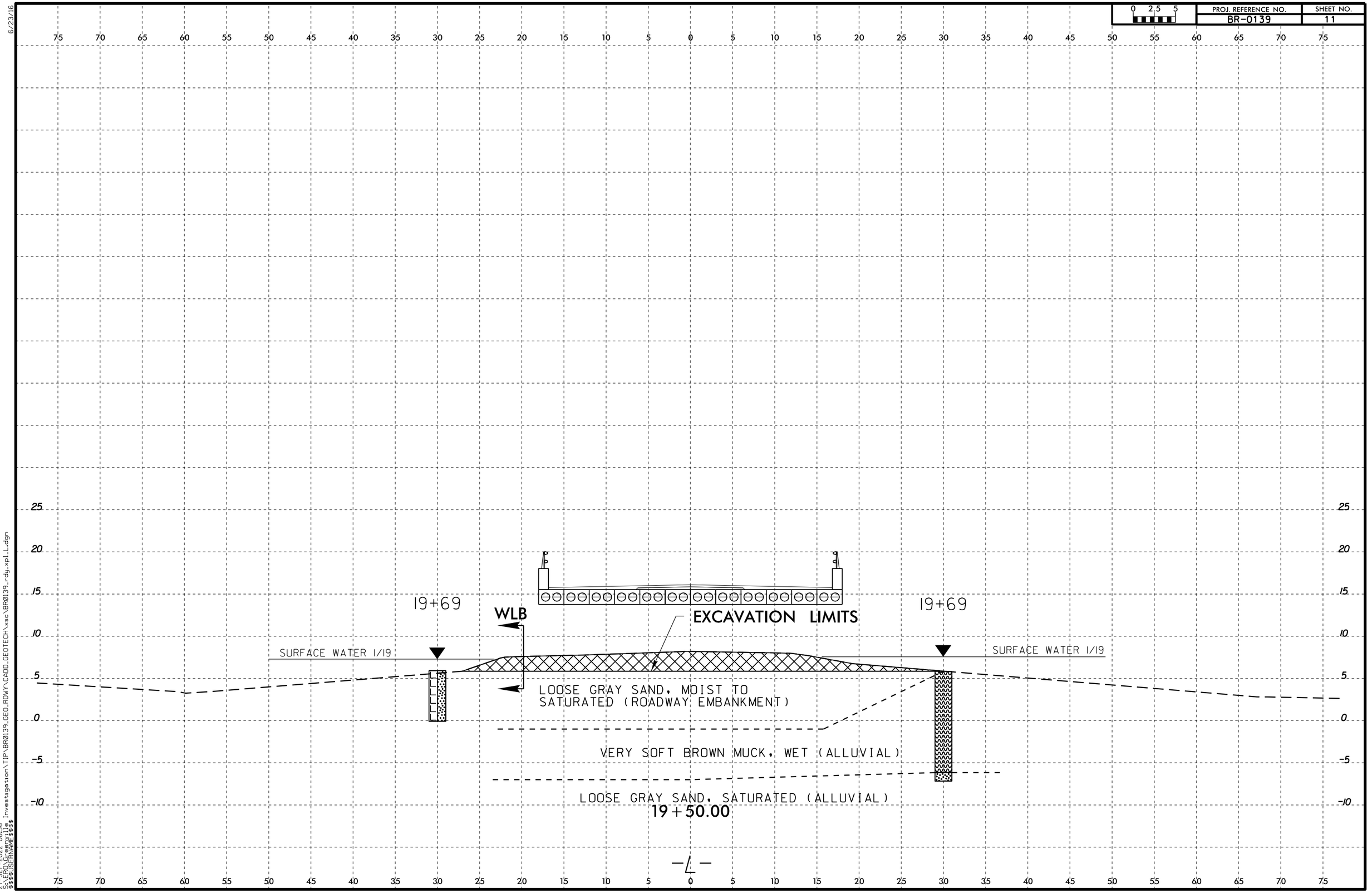

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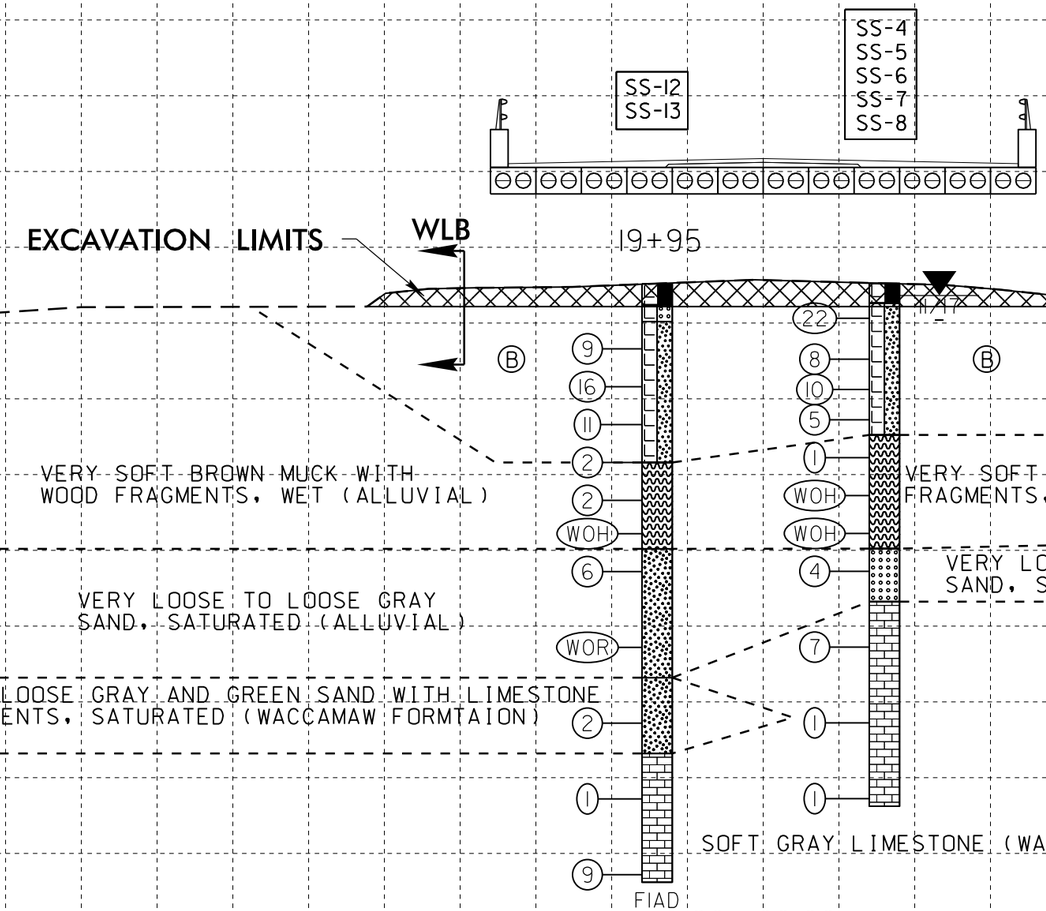
0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	12

Ⓑ LOOSE TO MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)



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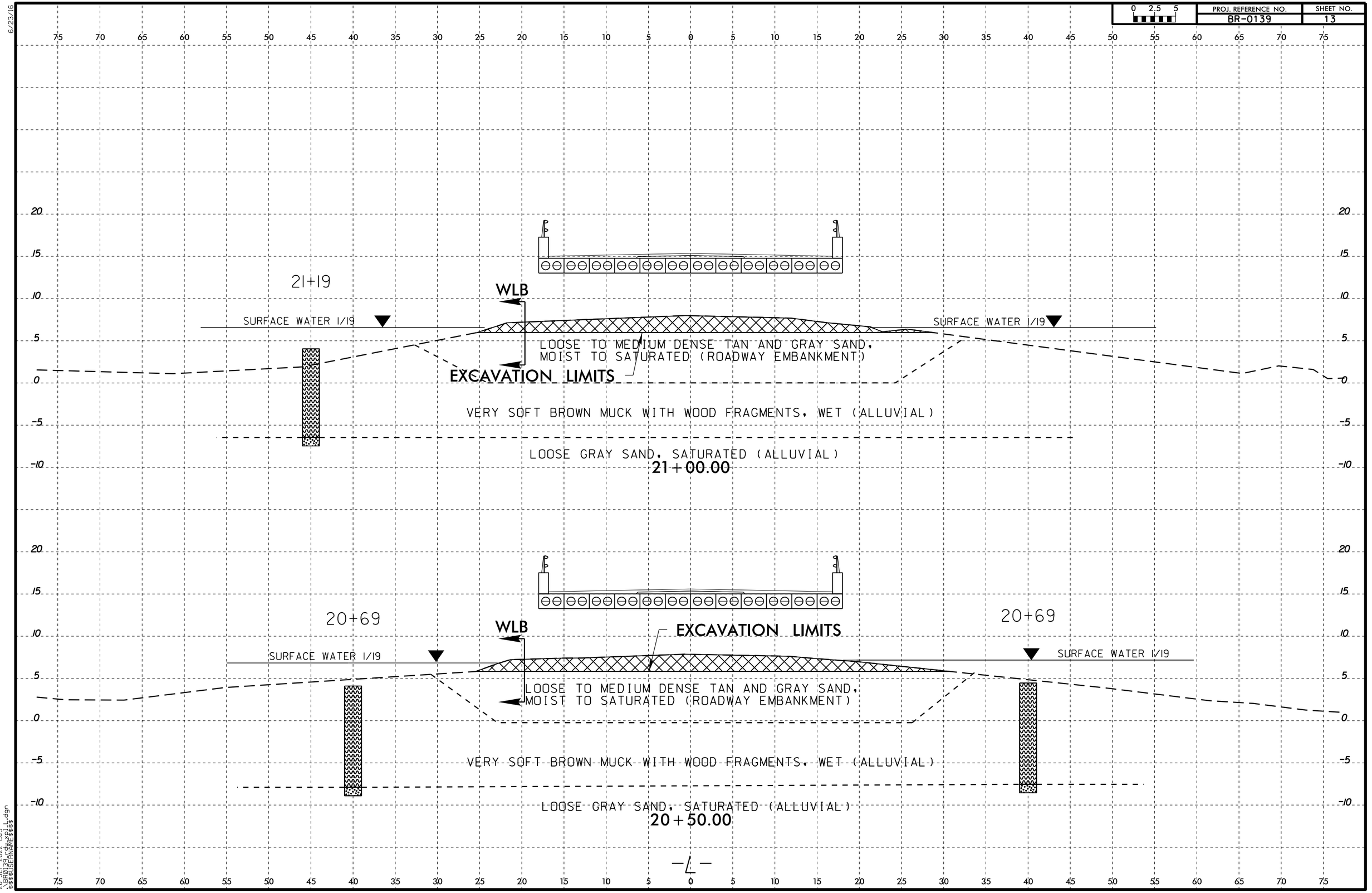

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PROJ. REFERENCE NO.	SHEET NO.
BR-0139	14

0 2.5 5

(B) LOOSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)

(D) SOFT BROWN MUCK, MOIST TO WET (ALLUVIAL)

22+19 22+19 22+19

WLB

(B) (D) 01/19 01/19

FIAD

EXCAVATION LIMITS

LOOSE GRAY SAND, MOIST TO SATURATED (ALLUVIAL)

22+00.00

(B) LOOSE TO MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)

(D) VERY SOFT TO SOFT BROWN MUCK, WET (ALLUVIAL)

SS-10 SS-9

21+75 21+65

21+69 21+69

WLB

EXCAVATION LIMITS

SURFACE WATER 1/19 SURFACE WATER 1/19

(B) (D)

VERY LOOSE TO MEDIUM DENSE BROWN AND GRAY SAND, SATURATED (ALLUVIAL)

VERY LOOSE TO MEDIUM DENSE BROWN AND GRAY SAND, SATURATED (ALLUVIAL)

SOFT GRAY SANDY CLAY, WET (ALLUVIAL)

SOFT GRAY LIMESTONE (WACCAMAW FORMATION)

21+50.00

VANE SHEAR TESTS

STATION	OFFSET	DEPTH	S (KPa)	SR (psf)
21+75	22' LT	0.5	MAX	MAX
21+75	22' LT	1.0	88	1837.44
21+75	22' LT	1.5	28	584.64
21+75	22' LT	2.0	39	814.32
21+75	22' LT	2.5	49	1023.12
21+75	22' LT	3.0	68	1419.84
21+75	22' LT	3.5	115	2401.20
21+75	22' LT	4.0	97	2025.36
21+75	22' LT	4.5	MAX	MAX
21+75	22' LT	5.0	52	1085.76
21+75	22' LT	5.5	40	835.20
21+75	22' LT	6.0	28	584.64
21+75	22' LT	6.5	0	0.0
21+75	22' LT	7.0	9	187.92
21+75	22' LT	7.5	8	167.04
21+75	22' LT	8.0	0	0
21+75	22' LT	8.5	0	0
21+75	22' LT	9.0	0	0
21+75	22' LT	9.5	0	0
21+75	22' LT	10.0	0	0
21+75	22' LT	10.5	MAX	MAX
21+75	22' LT	11.0	68	1419.84
21+75	22' LT	11.5	78	1628.64
21+75	22' LT	12.0	MAX	MAX

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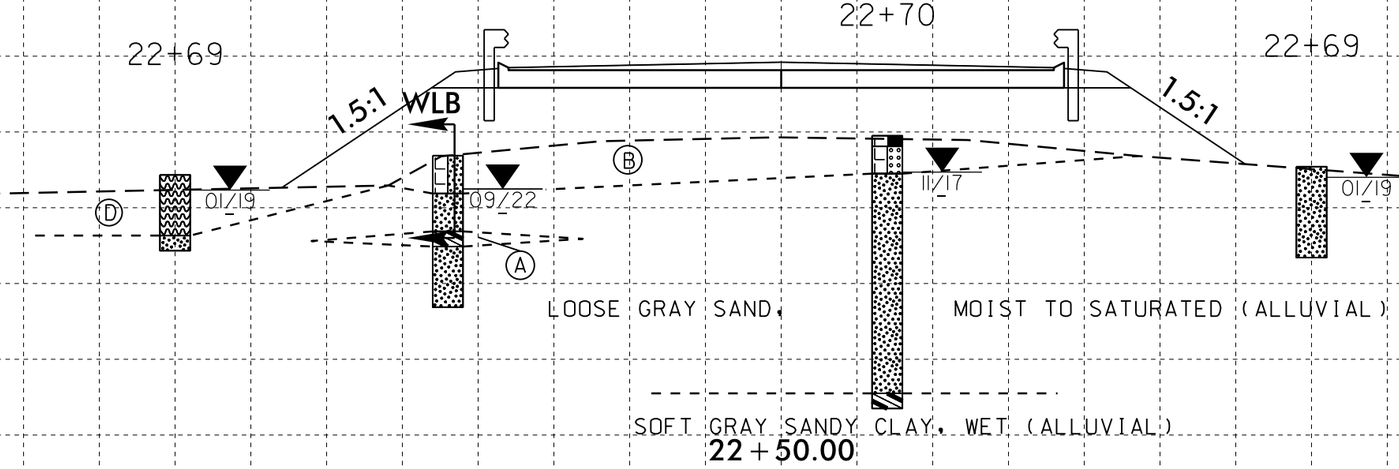
6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	15

Ⓐ SOFT GRAY SANDY CLAY, WET (ALLUVIAL)
Ⓑ LOOSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
Ⓓ SOFT BROWN MUCK, MOIST TO WET (ALLUVIAL)



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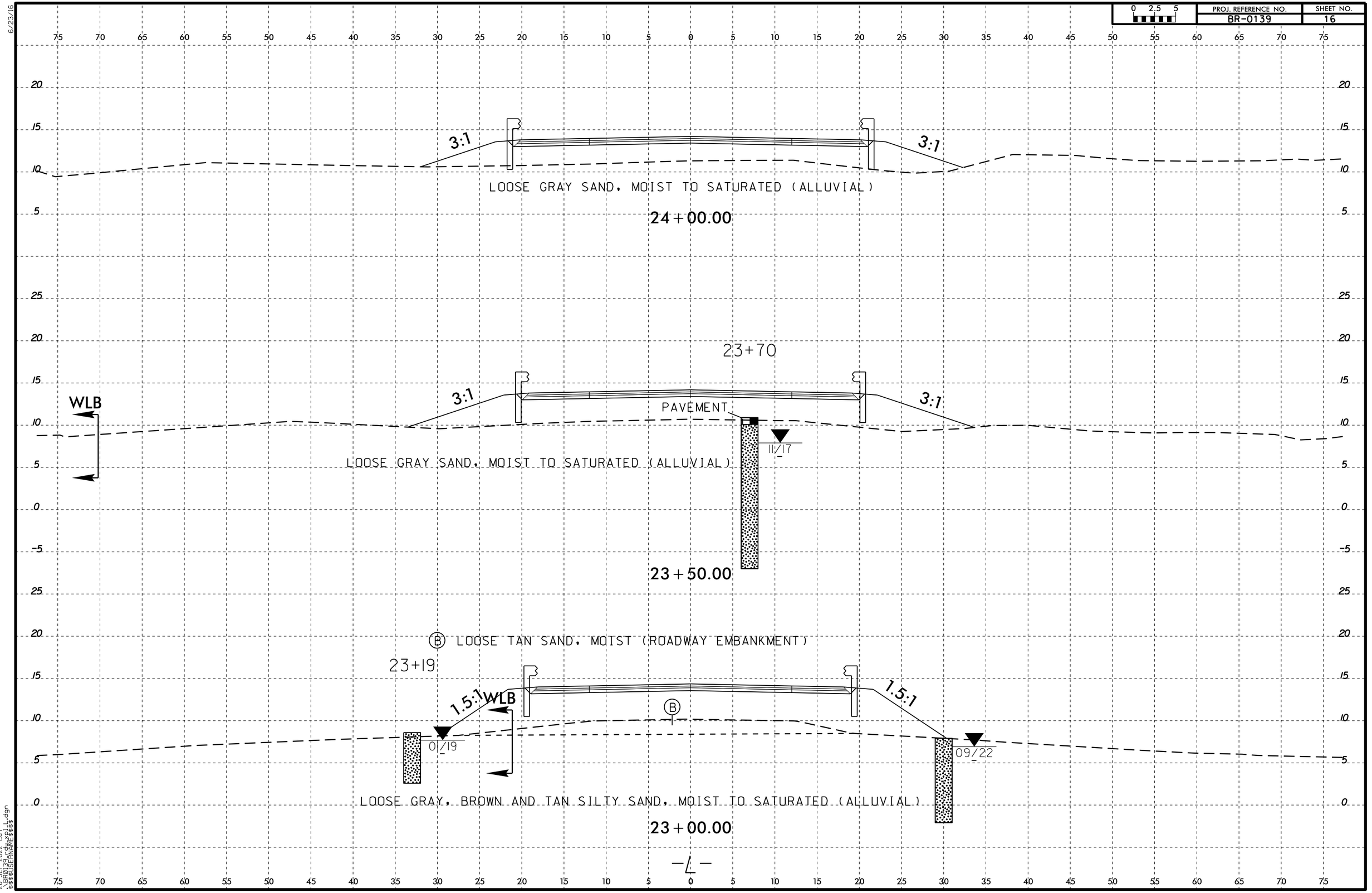

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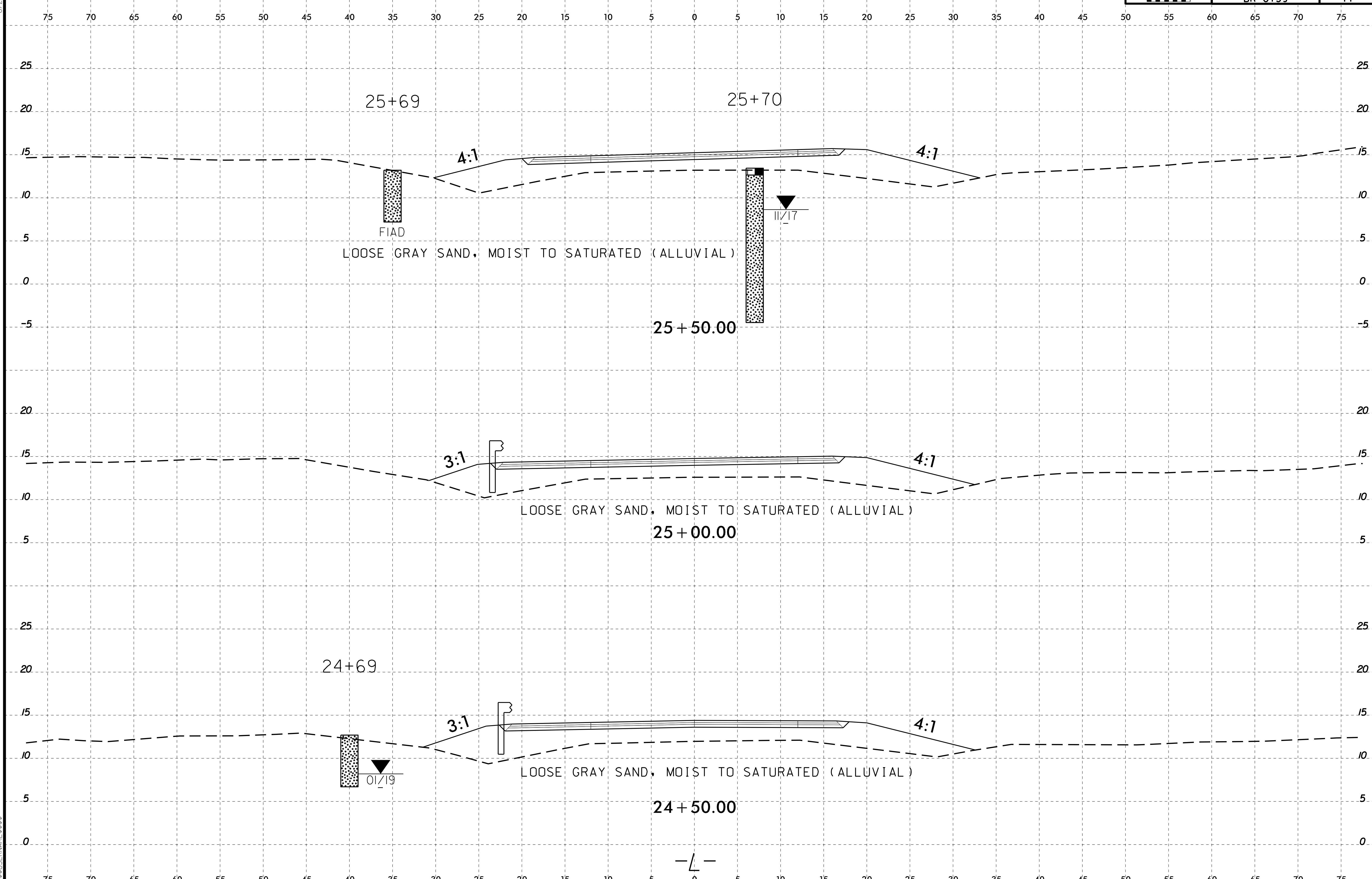

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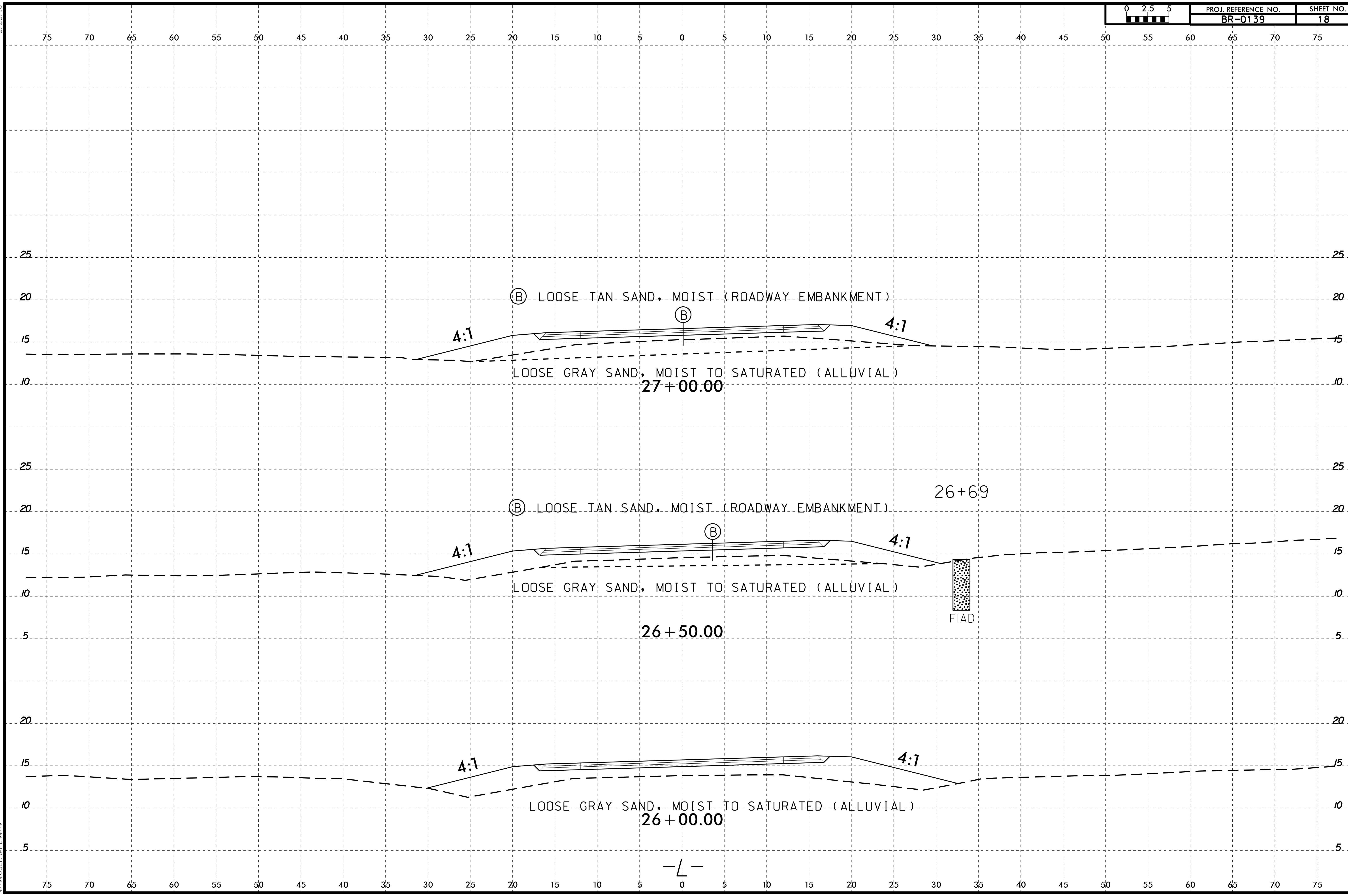

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0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	19

28+69

Ⓒ LOOSE GRAY AND TAN SAND, MOIST TO SATURATED (ALLUVIAL)

4:1 4:1

Ⓒ Ⓒ

FIAD DRY

SOFT GRAY SANDY AND SILTY CLAY, MOIST TO WET (ALLUVIAL)

28+50.00

4:1 4:1

LOOSE GRAY AND TAN SAND, MOIST TO SATURATED (ALLUVIAL)

SOFT GRAY SANDY AND SILTY CLAY, MOIST TO WET (ALLUVIAL)

28+00.00

27+70 27+69

S-23

PAVEMENT

4:1 4:1

LOOSE GRAY AND TAN SAND, MOIST TO SATURATED (ALLUVIAL)

SOFT GRAY SANDY AND SILTY CLAY, MOIST TO WET (ALLUVIAL)

01/19

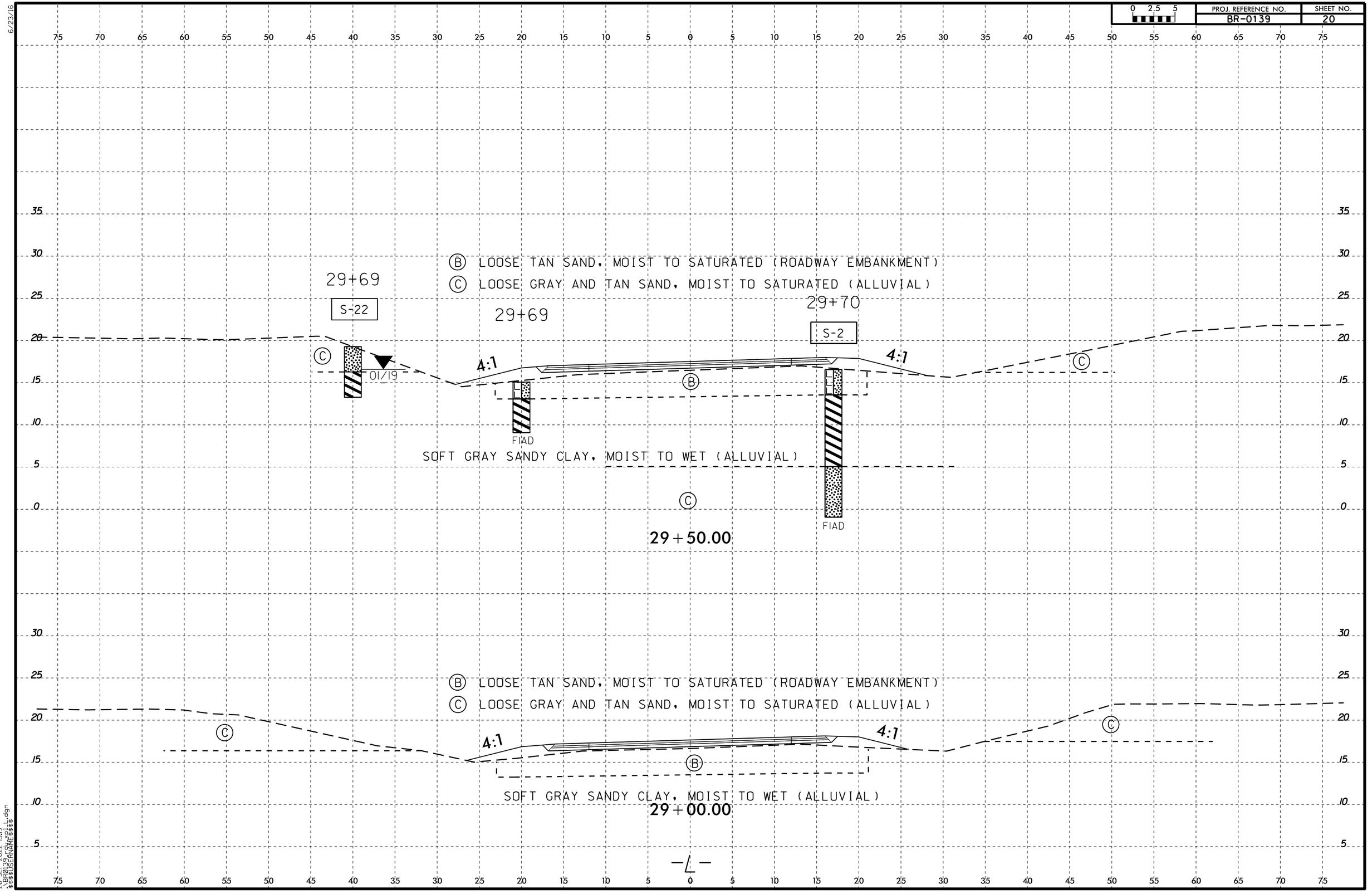
11/17

LOOSE ORANGE, TAN AND GRAY SAND, MOIST TO SATURATED (ALLUVIAL)

27+50.00

6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	20



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6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	21

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

25 20 15 10 5

1.5:1 WLB

09/22

Y1

LOOSE GRAY AND TAN SAND, MOIST TO SATURATED (ALLUVIAL)

31+00.00

25 20 15 10 5

WLB

30+69

2.5:1

4:1

01/19

LOOSE GRAY AND TAN SAND, MOIST TO SATURATED (ALLUVIAL)

30+50.00

30 25 20 15 10 5

30+19

Ⓒ

3:1

FIAD

Ⓒ LOOSE GRAY AND TAN SAND, MOIST TO SATURATED (ALLUVIAL)

30+19

4:1

Ⓒ

Ⓒ

FIAD

SOFT GRAY SANDY CLAY, MOIST TO WET (ALLUVIAL)

30+00.00

—℄—

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

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6/23/16

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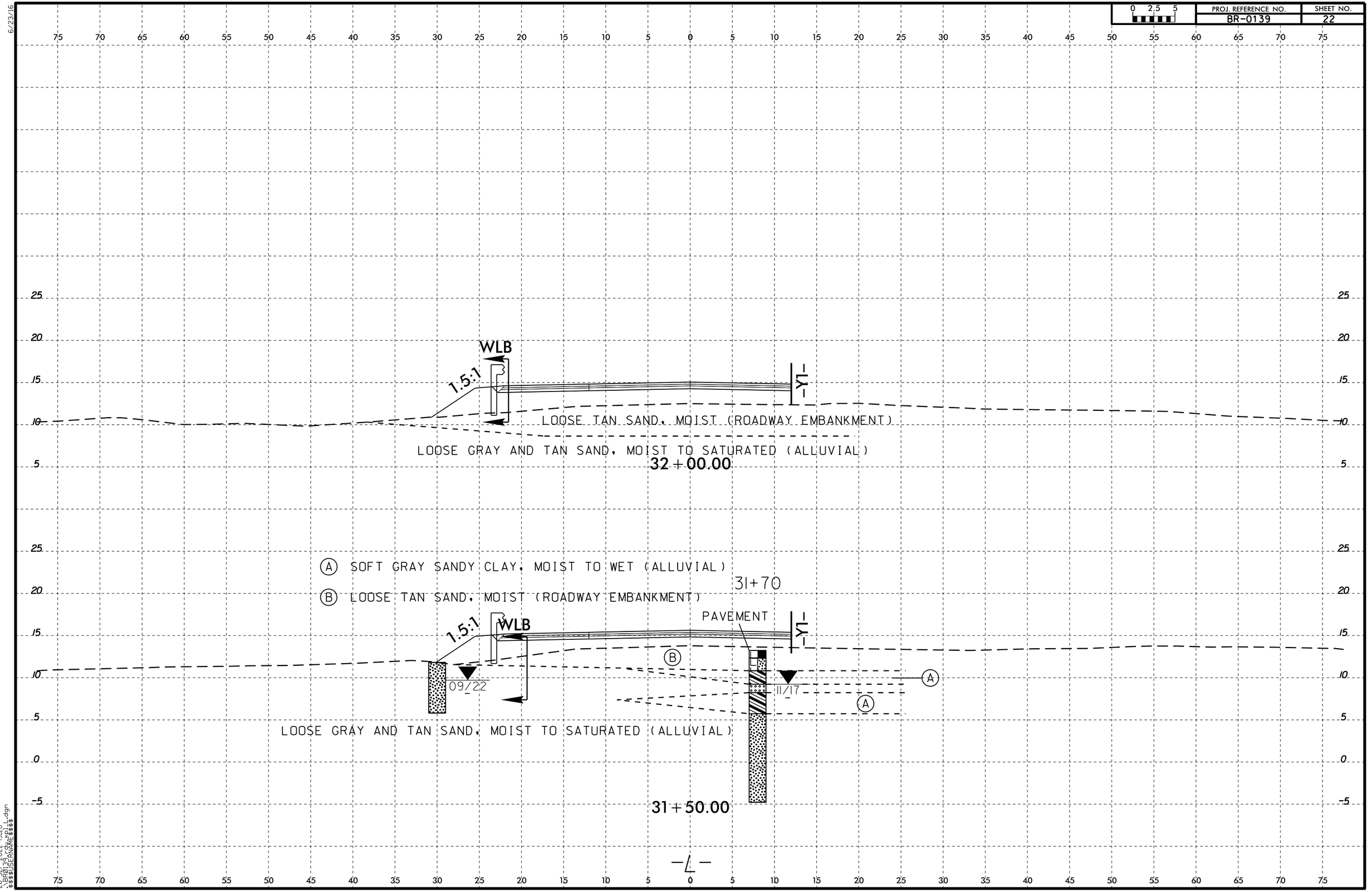
	BR-0139	22



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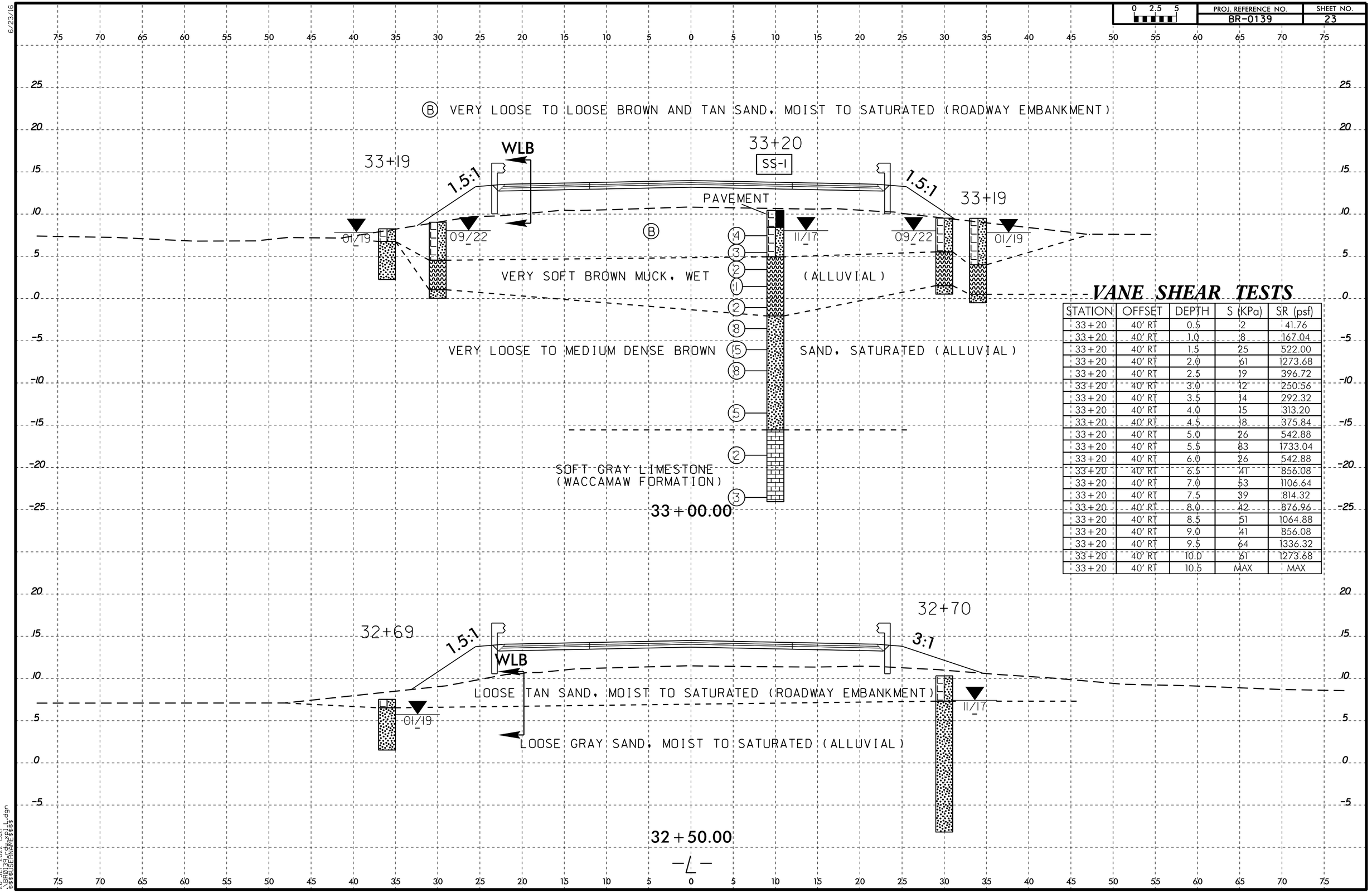
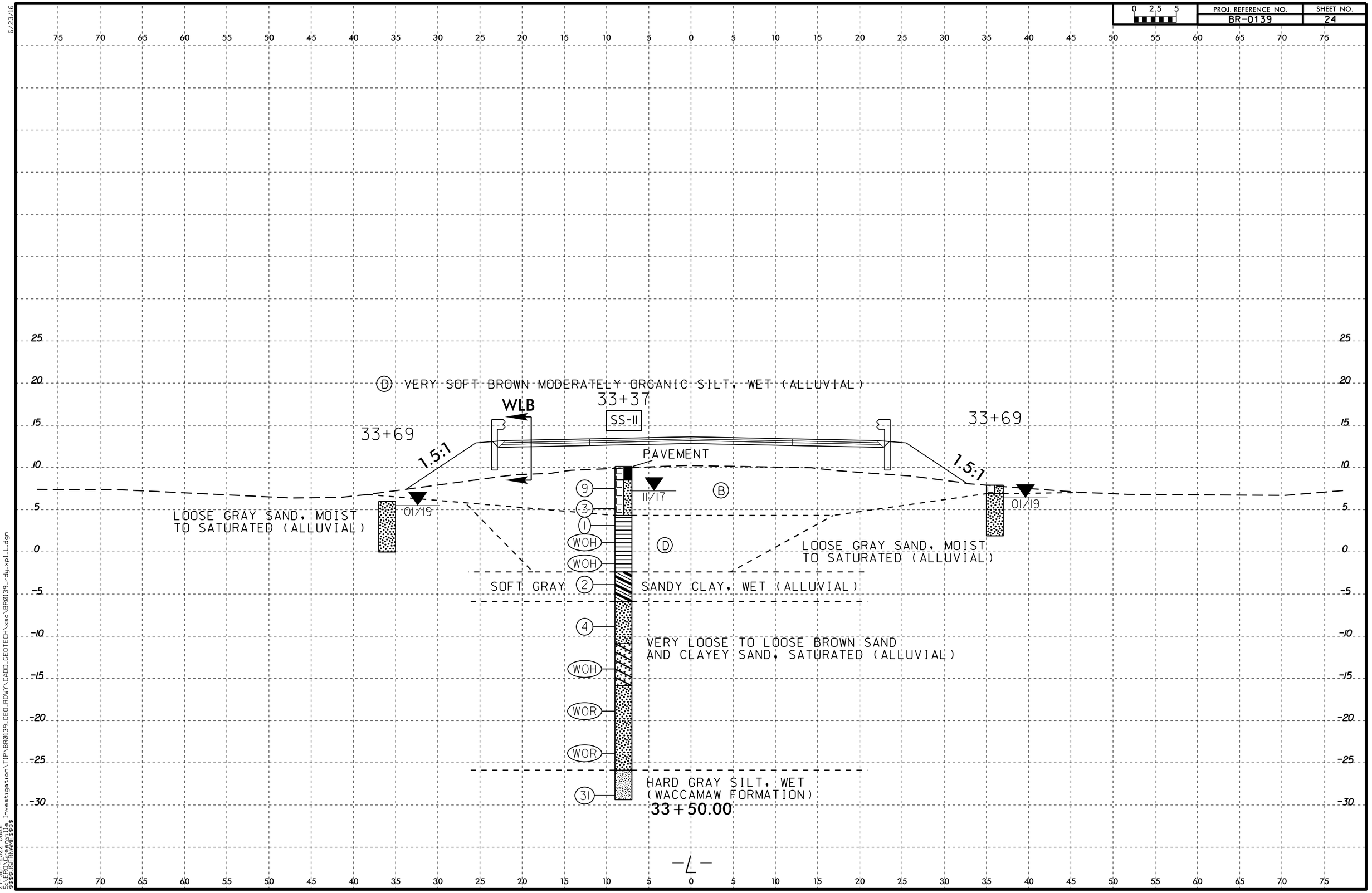


VANE SHEAR TESTS

STATION	OFFSET	DEPTH	S (KPa)	SR (psf)
33+20	40' RT	0.5	2	41.76
33+20	40' RT	1.0	8	167.04
33+20	40' RT	1.5	25	522.00
33+20	40' RT	2.0	61	1273.68
33+20	40' RT	2.5	19	396.72
33+20	40' RT	3.0	12	250.56
33+20	40' RT	3.5	14	292.32
33+20	40' RT	4.0	15	313.20
33+20	40' RT	4.5	18	375.84
33+20	40' RT	5.0	26	542.88
33+20	40' RT	5.5	83	1733.04
33+20	40' RT	6.0	26	542.88
33+20	40' RT	6.5	41	856.08
33+20	40' RT	7.0	53	1106.64
33+20	40' RT	7.5	39	814.32
33+20	40' RT	8.0	42	876.96
33+20	40' RT	8.5	51	1064.88
33+20	40' RT	9.0	41	856.08
33+20	40' RT	9.5	64	1336.32
33+20	40' RT	10.0	61	1273.68
33+20	40' RT	10.5	MAX	MAX

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	24

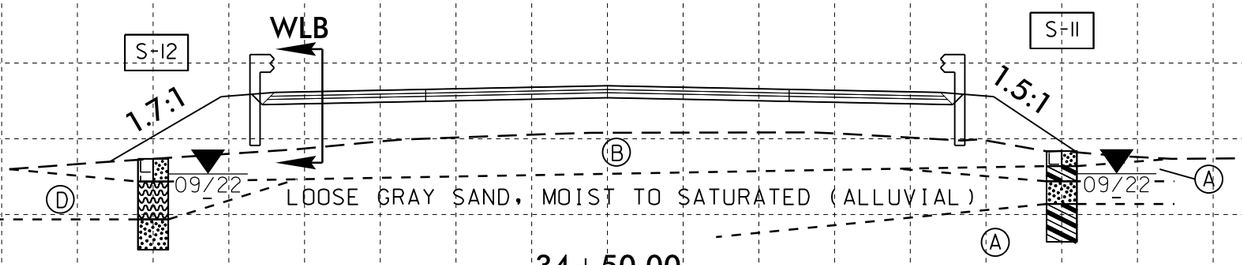


0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	25

Ⓐ SOFT GRAY SANDY CLAY, MOIST TO WET (ALLUVIAL)

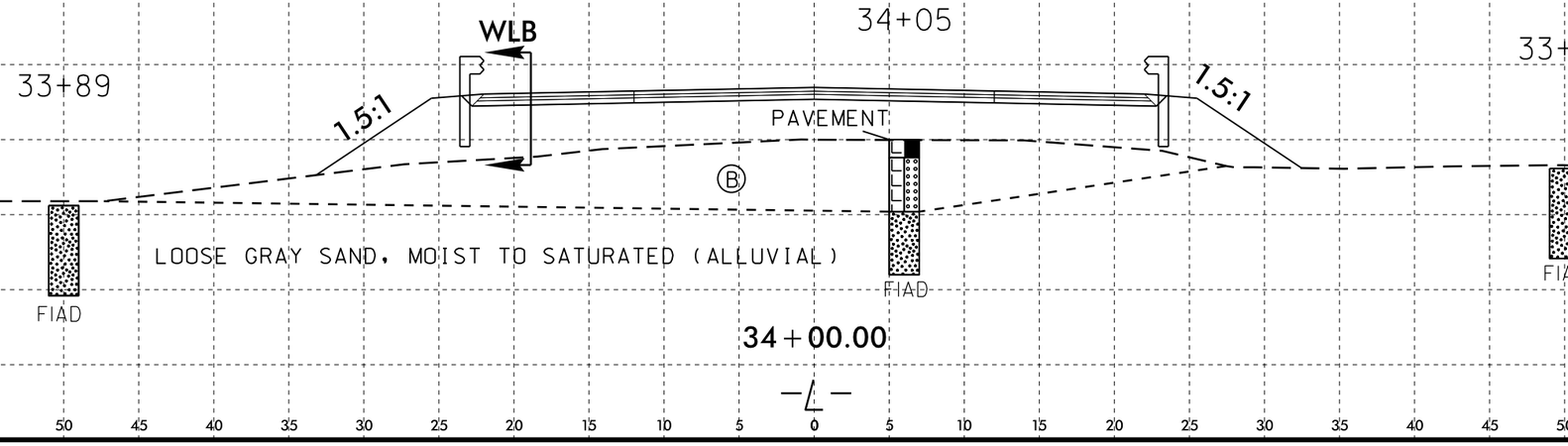
Ⓑ VERY LOOSE TO LOOSE BROWN AND TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)

Ⓓ VERY LOOSE BROWN MUCK, MOIST TO SATURATED (ALLUVIAL)



34+50.00

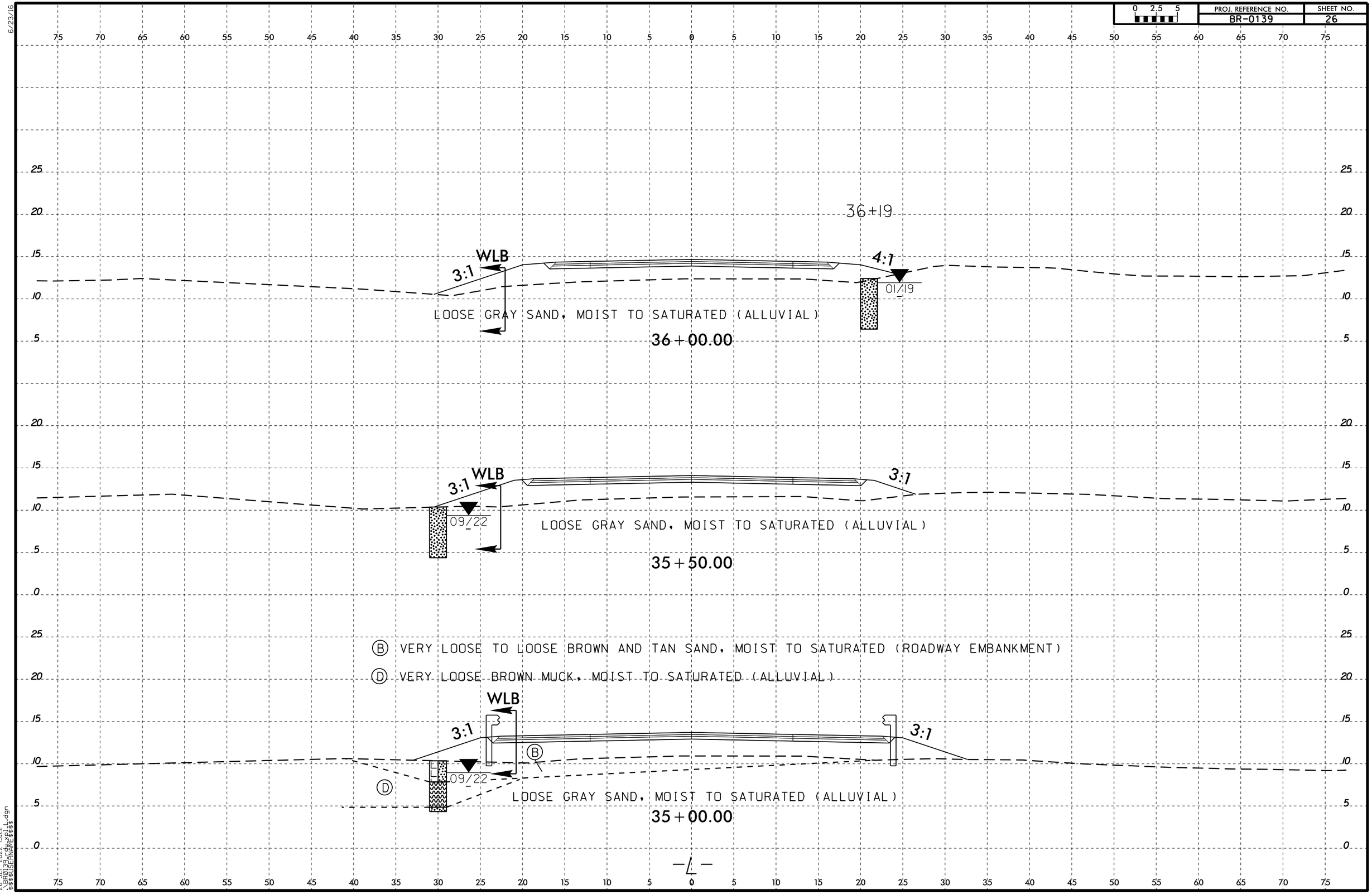
Ⓑ VERY LOOSE TO LOOSE BROWN AND TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)



34+00.00

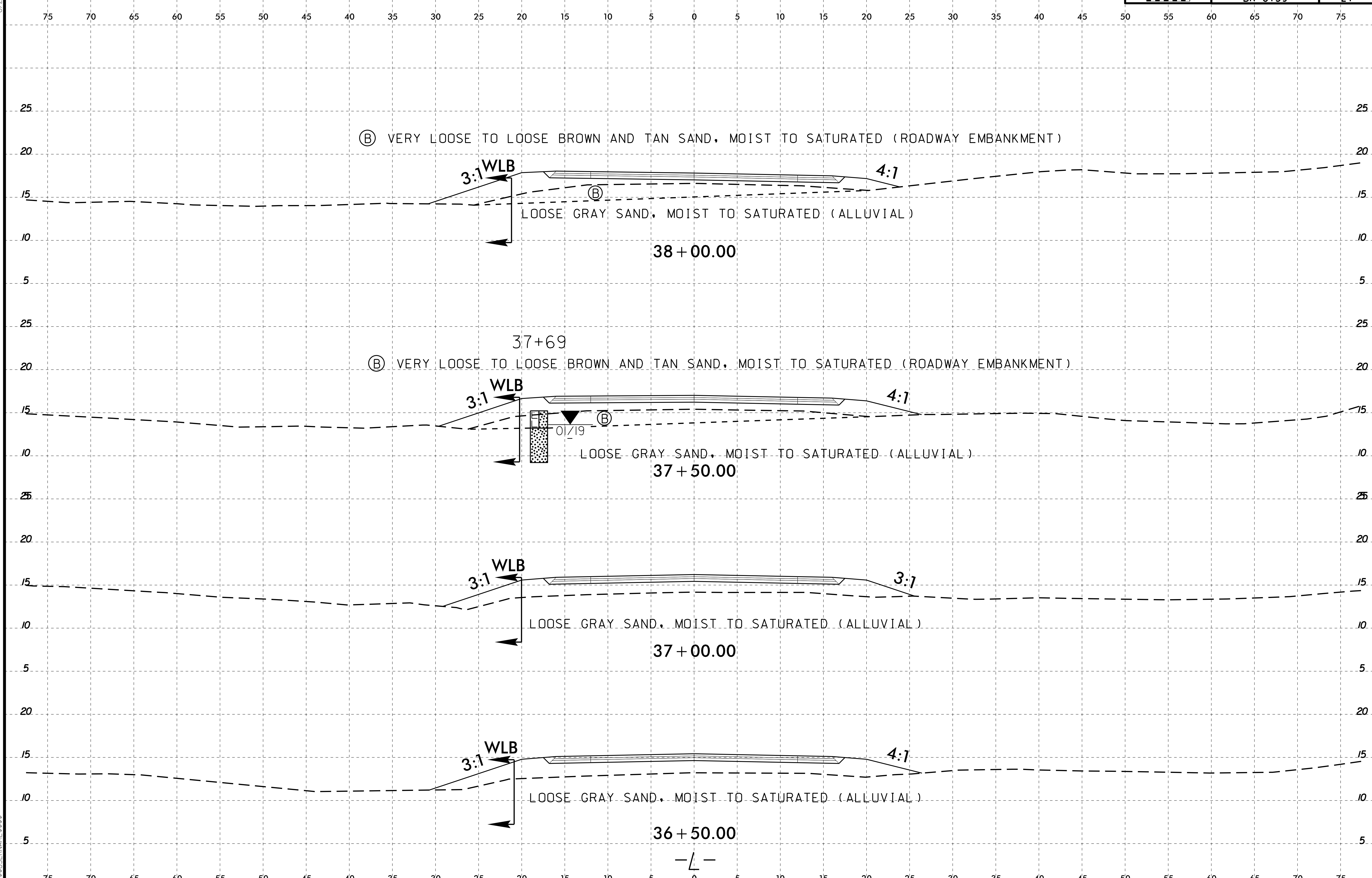
6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	26



26-SEP-2022 13:22
DRG\139_xsc.dgn
$$$$USERNAME$$$$

PROJ. REFERENCE NO.	SHEET NO.
BR-0139	27



6/23/16

26-SEP-2022 13:23
$$$$USERNAME$$$$

6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0139	28

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

35 30 25 20 15 10

39+19

3:1 4:1

01/19

LOOSE GRAY SAND, MOIST TO SATURATED (ALLUVIAL)

39+00.00

38+69

WLB

3:1 4:1

01/19

LOOSE GRAY SAND, MOIST TO SATURATED (ALLUVIAL)

38+50.00

—L—

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

PROJ. REFERENCE NO.	SHEET NO.
BR-0139	29

VE: 2

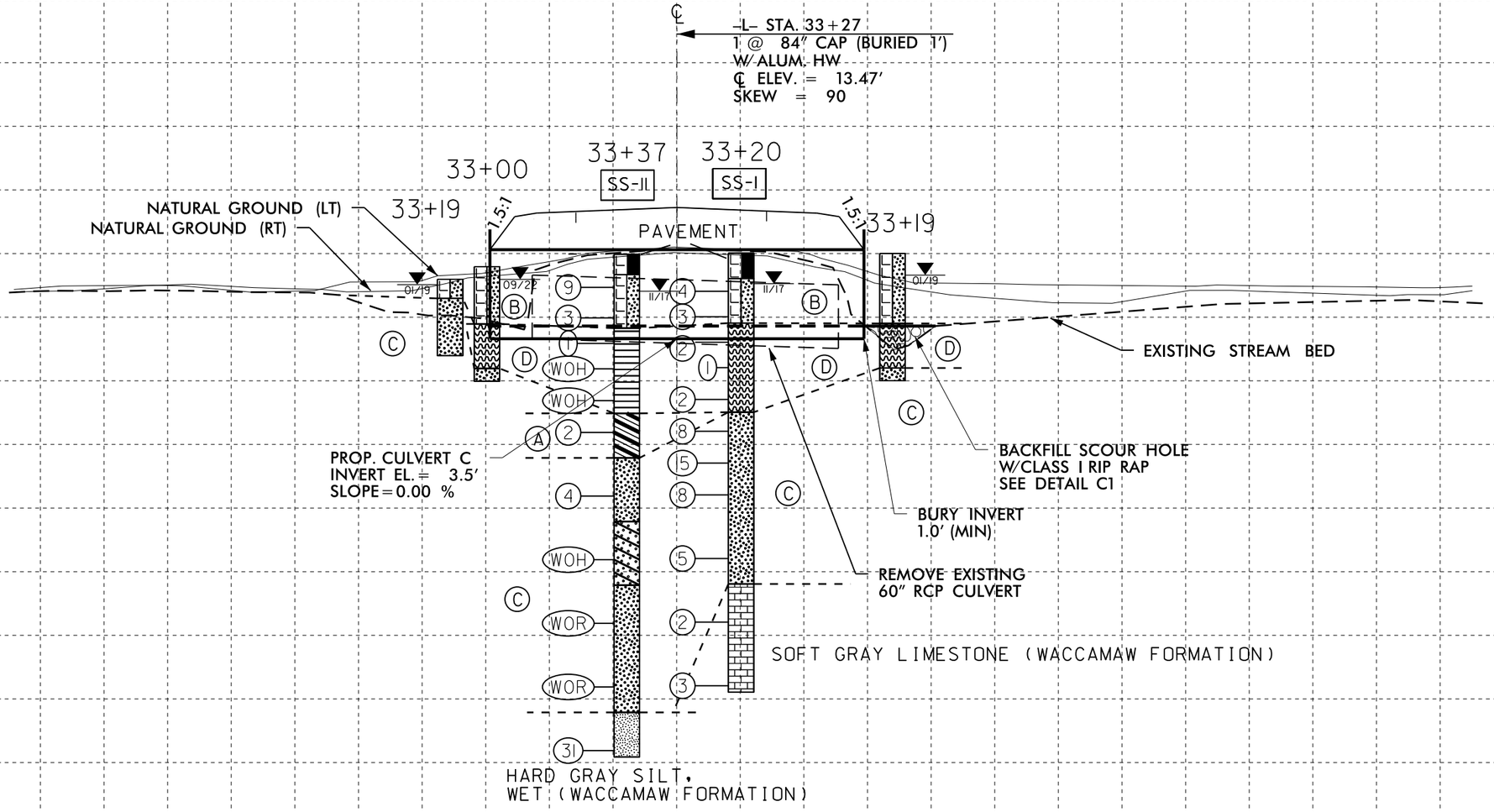
PROPOSED CULVERT CROSS SECTION AT -L- STA. 33+27

(A) SOFT GRAY SANDY CLAY, WET (ALLUVIAL)

(B) VERY LOOSE TO LOOSE BROWN AND TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)

(C) VERY LOOSE TO MEDIUM DENSE BROWN AND GRAY SAND AND CLAYEY SAND, SATURATED (ALLUVIAL)

(D) VERY SOFT BROWN MUCK AND MODERATELY ORGANIC SILT, WET (ALLUVIAL)



PROJECT REFERENCE NO.	SHEET NO.
BR–0139	30

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- 1	10′ RT	33+20	6.0- 7.5	A- 1- b(0)	0	NP	68.3	14.9	8.7	8.1	93	43	16	-	59.8
SS- 4	8′ RT	20+00	10.5- 12.0	A- 4(0)	0	NP	46.1	13.3	24.4	16.2	97	62	41	-	55.0
SS- 5	8′ RT	20+00	13.0- 14.5	A- 2- 4(0)	0	NP	58.2	21.8	11.9	8.1	95	51	20	-	60.4
SS- 6	8′ RT	20+00	15.5- 17.0	A- 2- 4(0)	0	NP	40.0	35.6	16.4	8.1	100	73	26	124.7	-
SS- 7	8′ RT	20+00	18.0- 19.5	A- 3(0)	0	NP	40.8	51.7	3.4	4.0	100	77	9	-	-
SS- 8	8′ RT	20+00	33.0- 34.5	A- 1- b(0)	0	NP	48.5	29.7	5.7	16.2	49	32	12	-	-
SS- 9	8′ RT	21+65	10.5- 12.0	A- 2- 4(0)	0	NP	51.3	28.7	11.9	8.1	94	57	20	-	39.6
SS- 10	9′ LT	21+75	10.5- 12.0	A- 1- b(0)	0	NP	49.7	33.9	8.3	8.1	80	50	15	-	48.5
SS- 11	8′ LT	33+37	6.0- 8.5	A- 4(0)	0	NP	30.7	33.9	23.2	12.1	99	79	37	203.4	16.0
SS- 12	7′ LT	19+95	23.0- 24.5	A- 2- 4(0)	0	NP	37.4	48.7	1.8	12.1	100	90	17	-	-
SS- 13	7′ LT	19+95	28.0- 29.5	A- 2- 4(0)	29	7	39.8	35.4	4.6	20.2	88	68	24	-	-
S- 2	17′ RT	29+70	3.0- 11.5	A- 7- 6(49)	72	47	0.8	10.7	17.8	70.7	100	100	92	-	-
S- 11	30′ RT	34+50	1.0- 2.0	A- 6(10)	38	22	8.5	33.0	18.2	40.3	100	98	61	22.7	-
S- 12	30′ LT	34+50	1.5- 4.0	A- 2- 4(0)	-	NP	23.0	45.3	23.7	8.1	97	87	34	111.2	14.1
S- 13	32′ RT	18+00	0.0- 2.0	A- 7- 6(20)	46	23	5.2	15.5	32.9	46.3	100	98	82	33.3	-
S- 20	8′ RT	19+05	3.5- 8.5	A- 2- 4(0)	0	NP	42.0	47.5	6.5	4.0	99	74	14	72.8	4.4
S- 21	8′ RT	19+05	8.5- 13.0	A- 2- 4(0)	0	NP	50.5	21.4	20.0	8.1	99	61	30	182.9	27.1
S- 22	40′ LT	29+69	3.0- 6.0	A- 7- 6(40)	62	42	3.8	11.5	24.3	60.4	100	99	88	27.0	-
S- 23	33′ RT	27+69	3.5- 6.0	A- 7- 6(31)	56	36	5.2	17.9	24.5	52.4	100	98	82	43.4	-
ST- 1	9′ LT	33+37	7.0- 9.0	-	-	-	-	-	-	-	-	-	-	-	-
ST- 2	9′ LT	33+37	13.5- 15.5	-	-	-	-	-	-	-	-	-	-	-	-

DATE: 9-15-14