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PROJECT: 44105

REFERENCE: W-5516

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5516	1	48

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

CONTENTS

LINE	*STATION*	*PLAN*	*PROFILE*
-L-	15+50.00 - 141+70.00	4 - 14	15 - 24

CROSS SECTIONS

LINE	*STATION*	*SHEETS*
-L-	35+00.00 - 139+50.00	25 - 47

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *Rowan*

PROJECT DESCRIPTION *Old Beatty Ford Road (SR1210) from West of Bostian Road Intersection to Lentz Road*

INVENTORY

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

Z. BRUCE
A. WILDER
B. MASSEY

INVESTIGATED BY *M. GRAGG*
DRAWN BY *T. STIVERS*
CHECKED BY *K. BUSSEY*
SUBMITTED BY *HDR | ICA*
DATE *APRIL 2015*

SEAL 1413
D. MICHAEL GRAGG

DocuSigned by:
D. Michael Gragg 6/8/2015
SIGNATURE DATE
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SEAL 038206
KENNETH R. BUSSEY, JR.

DocuSigned by:
Kenneth R. Bussey, Jr. 6/8/2015
SIGNATURE DATE
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PROJECT REFERENCE NO.	SHEET NO.
W-5516	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
GRAIN SIZE 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
PLASTIC RANGE (PI): LL — LIQUID LIMIT; PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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	25/025 ⊢→	DIP & DIP DIRECTION OF ROCK STRUCTURES		
⊢	SOIL SYMBOL	◕ SPT DPT DMT VST PMT	TEST BORING	⬡	SLOPE INDICATOR INSTALLATION
▨	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	⊕	AUGER BORING	◬	CONE PENETROMETER TEST
— — —	INFERRED SOIL BOUNDARY	⌖	CORE BORING	●	SOUNDING ROD
▬ ▬ ▬	INFERRED ROCK LINE	MW ○	MONITORING WELL	◕	TEST BORING WITH CORE
┬┬┬┬	ALLUVIAL SOIL BOUNDARY	△	PIEZOMETER INSTALLATION	⬭—	SPT N-VALUE

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
☐ CME-45C
☒ CME-55
☐ CME-550
☐ VANE SHEAR TEST
☐ PORTABLE HOIST
☐ ____________
☐ ____________

ADVANCING TOOLS:
☐ CLAY BITS
☐ 6" CONTINUOUS FLIGHT AUGER
☒ 8" HOLLOW AUGERS
☐ HARD FACED FINGER BITS
☐ TUNG.-CARBIDE INSERTS
☐ CASING ☐ W/ ADVANCER
☐ TRICONE ______" STEEL TEETH
☐ TRICONE ______" TUNG.-CARB.
☐ CORE BIT
☐ ____________

HAMMER TYPE:
☒ 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: ____________

ELEVATION: ______ FEET

NOTES:

DATE: 8-15-14

DocuSign Envelope ID: D3B63FBF-0373-449A-A5FD-F1669DF928F2

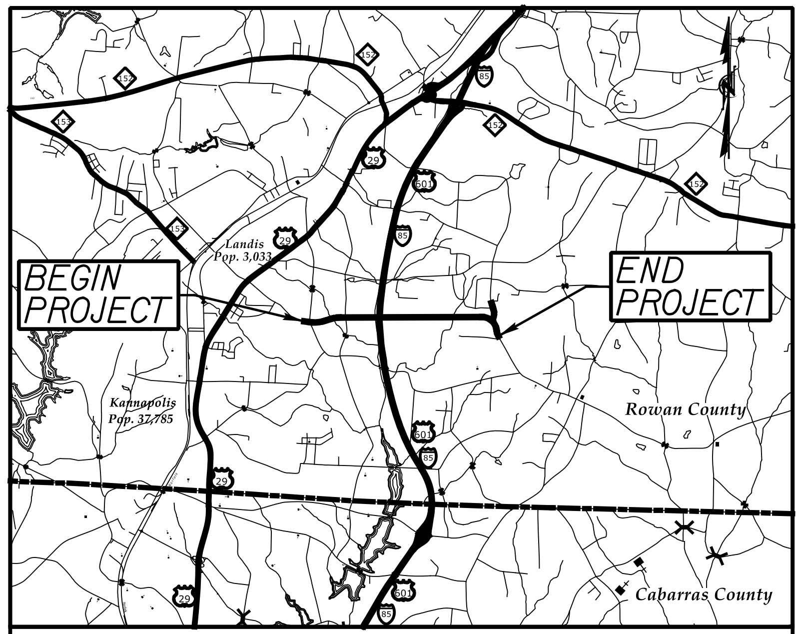
09/08/9

TIP PROJECT: W-5516

CONTRACT:

$$$$$SYSTIME$$$$$
$$$$$$$$$DGN$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbols



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

ROW PLANS
rev. OCT. 22, 2014

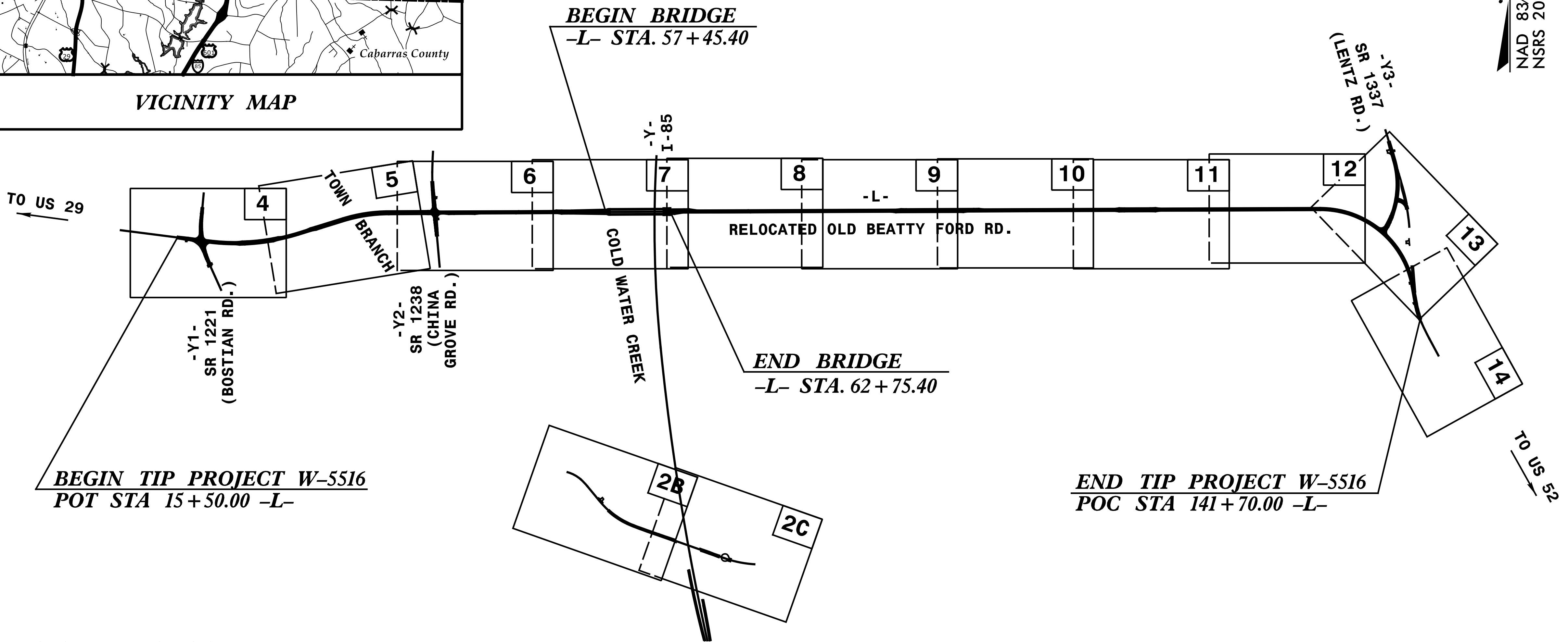
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5516	3	48

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
44105.1.FD	HSIP-1221(18)	PE

ROWAN COUNTY

LOCATION: OLD BEATTY FORD ROAD FROM WEST OF BOSTIAN ROAD INTERSECTION TO LENTZ ROAD

TYPE OF WORK: GRADING, PAVING, DRAINAGE, TRAFFIC CONTROL, SIGNING PAVEMENT MARKINGS AND STRUCTURES



NCDOT CONTACT: BRETT ABERNATHY, PE
DIVISION 9 PROJECT MANAGER

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

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT =
ADT =
DHV = %
D = %
T = % *
V = 50 MPH
* TTST = DUAL
FUNC CLASS = COLLECTOR
REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT W-5516 = 2.290 MILE
LENGTH STRUCTURE TIP PROJECT W-5516 = 0.100 MILE
TOTAL LENGTH TIP PROJECT W-5516 = 2.390 MILE

Prepared for the
North Carolina Department
of Transportation
In the office of:

HDR | ICA

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
SEPTEMBER 16, 2014

LETTING DATE:
SEPTEMBER 15, 2015

DAVID C. WALLER, PE
PROJECT ENGINEER

HENRY BARE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: ____________ *P.E.*

ROADWAY DESIGN ENGINEER

SIGNATURE: ____________ *P.E.*

ICA Engineering

March 28, 2015

WBS NUMBER: 44105.1.FD1
TIP NUMBER: W-5516
F.A. NUMBER: HSIP-1221(18)
COUNTY: Rowan
DESCRIPTION: Realignment of Old Beatty Ford Road from West of Bostian Road Intersection to Lentz Road

SUBJECT: **Geotechnical Report – Inventory**

PROJECT DESCRIPTION

The project is located in southwestern Rowan County, North Carolina. This project consists of the realignment of 2.39 miles of Old Beatty Ford Road (-L-), realignment of 0.11 miles of Bostian Road (-Y1-), realignment of 0.10 miles of China Grove Road (-Y2-), constructing a grade separation over I-85, realignment/reconstruction of 0.17 miles of existing Lentz Road (-Y3-) and demolition/pavement removal of 0.23 miles of existing Old Beatty Ford Road (-SAC_ALN-).

A CME 45 drill rig with an automatic hammer was used for the geotechnical investigation during December 2014 and January 2015. At selected locations standard penetration tests (SPT) were performed and rock core samples extracted for laboratory analysis by HDR | ICA.

The following alignment, totaling 2.39 miles of roadway, was investigated. Profiles and cross sections of this alignment are included within this report.

LINE	STATIONS
-L-	15+50.00 to 141+70.00

AREAS OF SPECIAL GEOTECHNICAL INTEREST

High Plasticity Soils: The following intervals, encountered during the subsurface investigation, possessed soils with plasticity indices in excess of 25.

LINE	STATIONS	OFFSETS
-L-	55+50 to 57+00	LT to CL
-L-	61+00 to 62+50	LT to RT
-L-	71+00 to 74+50	LT to RT
-L-	104+00 to 105+50	LT to RT
-L-	136+50 to 141+70	LT to RT

Wet or Saturated Soils: Soils with natural moisture contents in excess of the liquid limit or excessively high moisture contents were encountered at the following locations:

LINE	STATIONS	OFFSETS
-L-	31+00 to 32+00	LT to RT
-L-	57+00 to 59+00	LT to RT
-L-	61+50 to 62+55	LT to RT
-L-	78+00	LT
-L-	103+50 to 104+50	RT
-L-	108+00 to 108+50	LT to RT

Alluvial Soils: The following locations were found to have very soft to soft alluvial soils.

LINE	STATIONS	OFFSETS
-L-	31+00 to 32+50	LT to RT
-L-	57+00 to 59+50	LT to RT
-L-	107+50 to 108+50	LT to RT

Crystalline Rock above proposed grade: The following locations were found to intercept crystalline rock above the proposed roadway grade.

LINE	STATIONS	OFFSETS
-L-	64+50 to 68+00	LT to RT
-L-	73+50 to 75+50	LT
-L-	75+50 to 77+50	LT to RT
-L-	93+50 to 95+00	LT to RT
-L-	95+50 to 97+50	LT
-L-	103+00 to 105+50	LT

PHYSIOGRAPHY AND GEOLOGY

The project is located in the Piedmont Physiographic Province. The project corridor is comprised of subdivision lots and wooded tracts. The general topography of the site consists of relatively flat hill tops, moderately to steeply sloping hillsides, a relatively narrow floodplain and steep sided secondary drainage courses along or dissecting the proposed -L-, alignment.

Geologically, the project is located within the Charlotte Litho-tectonic Belt (*Geologic Map of North Carolina, 1985; Geologic Map of the Charlotte 1° X 2° Quadrangle, North Carolina and South Carolina*) within units described as felsic metavolcanic rock with intrusive plutonic bodies. The metavolcanic stratigraphic units are considered Late Proterozoic Era while intrusive plutons are considered Silurian/Devonian to Pennsylvanian/Permian. The overlying residual soils are the product of the physical and chemical weathering of these underlying crystalline rocks.

SOIL PROPERTIES

Soils encountered during this investigation are separated into five (5) categories based on origin. The origins consist of roadway embankment, alluvial soils, residual soils, weathered rock, and crystalline rock.

Roadway embankment was encountered along the –L- alignment immediately east of Cold Water Creek and underlying I-85 within borings advanced for the bridge investigation. Materials encountered consist of moist to wet, stiff to very stiff, silty to sandy, tan, brown, orange, gray, black and white, medium plasticity clay with rock fragments (A-7-5, A-7-6) and moist, very dense, tan, gray, black, orange, brown, green, red, white, poorly graded to silty sand with rock fragments (A-1-b). Plasticity indices ranged from 23 to 26 (A-7-5, A-7-6). Penetrated thickness ranged from 4.4 feet to 14.4 feet.

Alluvial soils are present along the existing –L- alignment at Cold Water Creek and at the culvert site, Station 108+15. The alluvial soils thickness is interpreted to range from 4.8 feet to 7.5 feet consisting of moist to saturated, soft, brown, tan-orange, finely sandy, silty clay (A-7-5) and medium stiff, tan, brown, black, medium stiff finely sandy silt (A-4). A plasticity index range of 4 to 26 was reported for the alluvial soils.

Residual soils are present along and throughout the proposed –L– alignment and are derived from the weathering of the underlying metamorphic and plutonic rock. Typically residual soils were recognized at the surface and penetrated to total boring depth or to interception of weathered rock. In only two (2) borings were residual soils overlain by roadway embankment or alluvium. A large portion of the residual soils consisted of dry to moist, stiff to hard, tan-orange-red, black, gray, white, brown, slightly micaceous, saprolitic, finely to coarsely sandy silt with some rock fragments (A-4). Less frequent residual soils consisted of dry to wet, stiff to very stiff, tan, white, gray, orange, tan, green, red, medium to high plasticity, silty clay (A-7-5 and A-7-6) and dry to moist, medium dense to dense, tan, gray, black, orange, yellow-white, saprolitic, fine to coarse grain silty sand (A-2-4). Limited strata consisting of dry, very dense, white, green and tan, clayey rock fragments and/or sand (A-2-6) and dry, very stiff, saprolitic sandy, silty clay (A-6) were reported. The plasticity indices for residual soils ranged from non-plastic to 9 (A-4, A-2-4), 13 to 29 (A-7-5, A-7-6) and 12 to 13 (A-2-6, A-6).

Weathered rock, determined by SPT, was encountered throughout the proposed -L- alignment, with the exception of intervals Station 77+00 to Station 86+00 and Station 117+00 to the end of project, at elevations ranging from 786.9 feet to 688.6 feet (MSL) however lower elevations at the top of weathered rock were encountered beneath the proposed bridge.. The weathered rock consists of metatuff (metavolcanic rock) or granite. Isolated weathered rock seams were encountered within and surrounded by residual soils between elevations 771.2 feet and 697.6 feet (MSL) immediately east of I-85 and extending 2000 feet further east.

Advanced borings intercepted crystalline rock throughout the proposed -L- alignment at elevations ranging from 783.2 feet to 695.7 feet (MSL). Advanced borings suggest crystalline rock will be encountered above grade as described in the Areas of Special Geotechnical Interest discussed above. Where cored crystalline consists of slight to moderately weathered granite containing thin to thick seams of severely to completely weathered granite or moderate to moderately severe weathered metatuff with seams of severely to very severely weathered metatuff. Discontinuity measurements of 0°-20°, 30°-40° and 60°-90° and very close to close spacing were reported.

GROUNDWATER

Groundwater level measurements were performed within forty one (41) advanced borings where dry conditions were recorded immediately after drilling, after a 24 hour stabilization period or both where borehole conditions allowed. Attempts to acquire 24 hour measurements were thwarted by collapse of the boreholes therefore not allowing passage to the final boring depths. Four (4) boring measurements recorded elevation levels of 725.8 feet (L_7300), 757.9 (L_7500), 754.9 feet (L_8905_L) and 759.7 feet (L_10200_L) after the stabilization period. Twenty four (24) hour measurements, from five (5) borings advanced during the structure subsurface investigation for the bridge over Cold Water Creek, recorded an elevation range of 658.2 feet to 653.9 feet (MSL). This data as well as the bridge subsurface interpretation within the Cold Water Creek floodplain is included to clarify and enhance an interval where centerline profile boring information was limited.

Prepared by,

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

DocuSigned by:
Kenneth R. Bussey, Jr.
22A188C7B3D7442...
6/8/2015

Kenneth R. Bussey, Jr., PE
Project Engineer

NORTH CAROLINA LICENSED GEOLOGIST
SEAL 1413
D. MICHAEL GRAGG

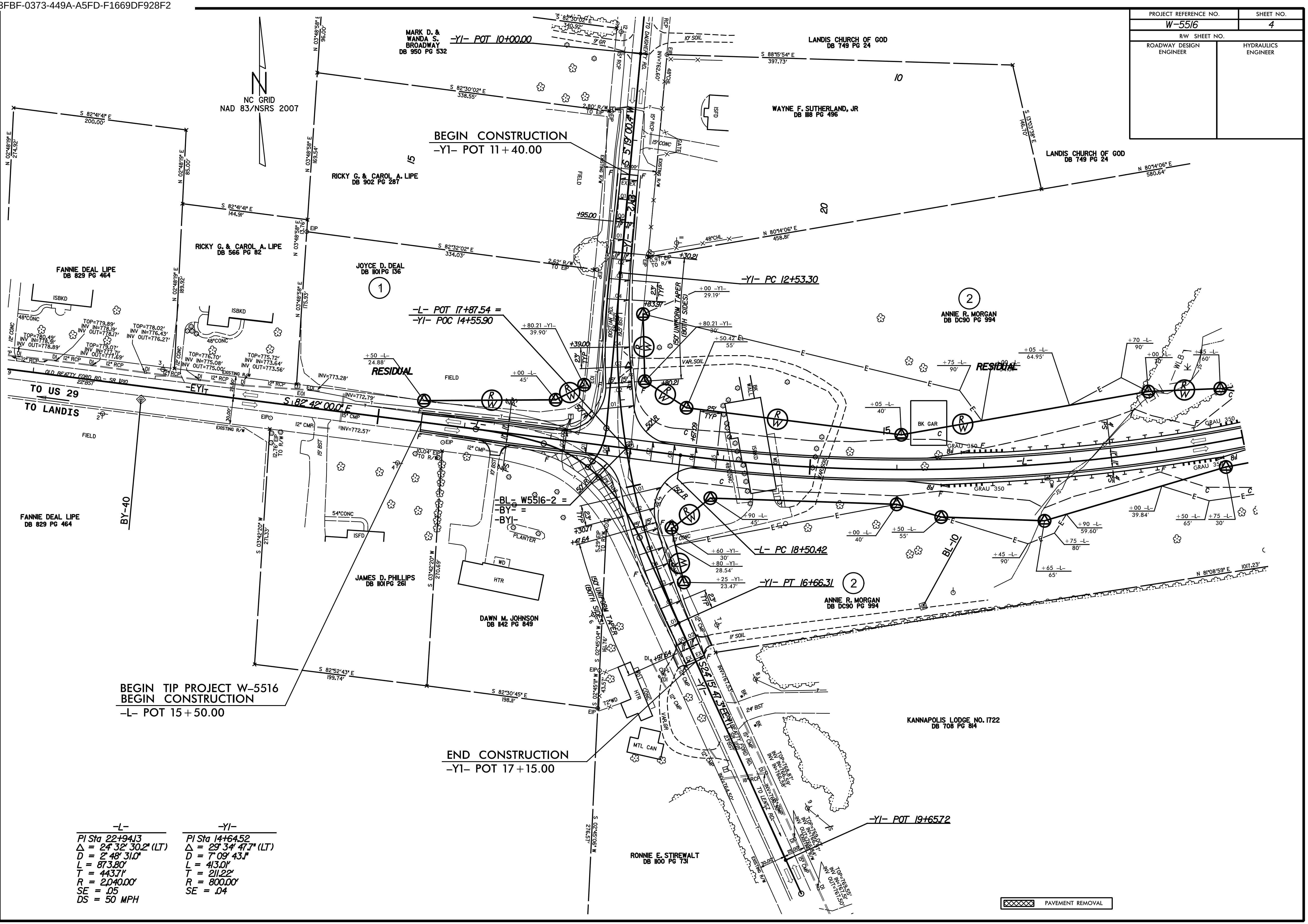
DocuSigned by:
D. Michael Gragg
B67B5CEBC21A460...
6/8/2015

D. Michael Gragg, LG
Senior Project Geologist

PROJECT REFERENCE NO.	SHEET NO.
W-5516	4
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

REVISIONS

10-22-14 REVISED STATION/OFFSET CALLOUTS ON PARCELS 1 & 2



-L-
PI Sta 22+94.13
Δ = 24° 32' 30.2" (LT)
D = 2° 48' 31.0"
L = 873.80'
T = 443.71'
R = 2,040.00'
SE = .05
DS = 50 MPH

-Y1-
PI Sta 14+64.52
Δ = 29° 34' 47.7" (LT)
D = 7° 09' 43.1"
L = 413.01'
T = 211.22'
R = 800.00'
SE = .04

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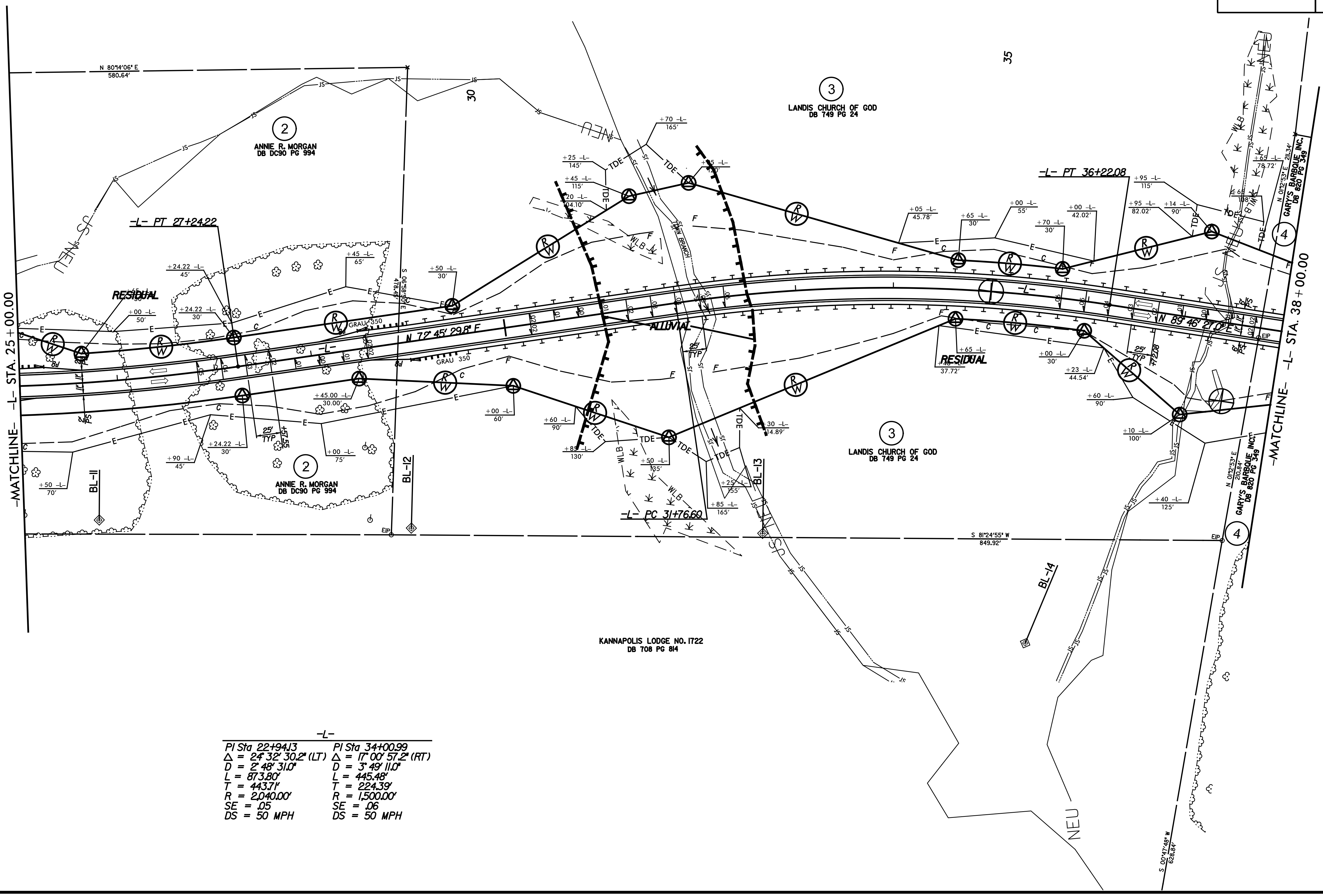
PROJECT REFERENCE NO.	SHEET NO.
W-5516	5
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

REVISIONS



-L-	
PI Sta 22+94.13	PI Sta 34+00.99
Δ = 24° 32' 30.2" (LT)	Δ = 17° 00' 57.2" (RT)
D = 2° 48' 31.0"	D = 3° 49' 11.0"
L = 873.80'	L = 445.48'
T = 443.71'	T = 224.39'
R = 2,040.00'	R = 1,500.00'
SE = .05	SE = .06
DS = 50 MPH	DS = 50 MPH

5/14/99

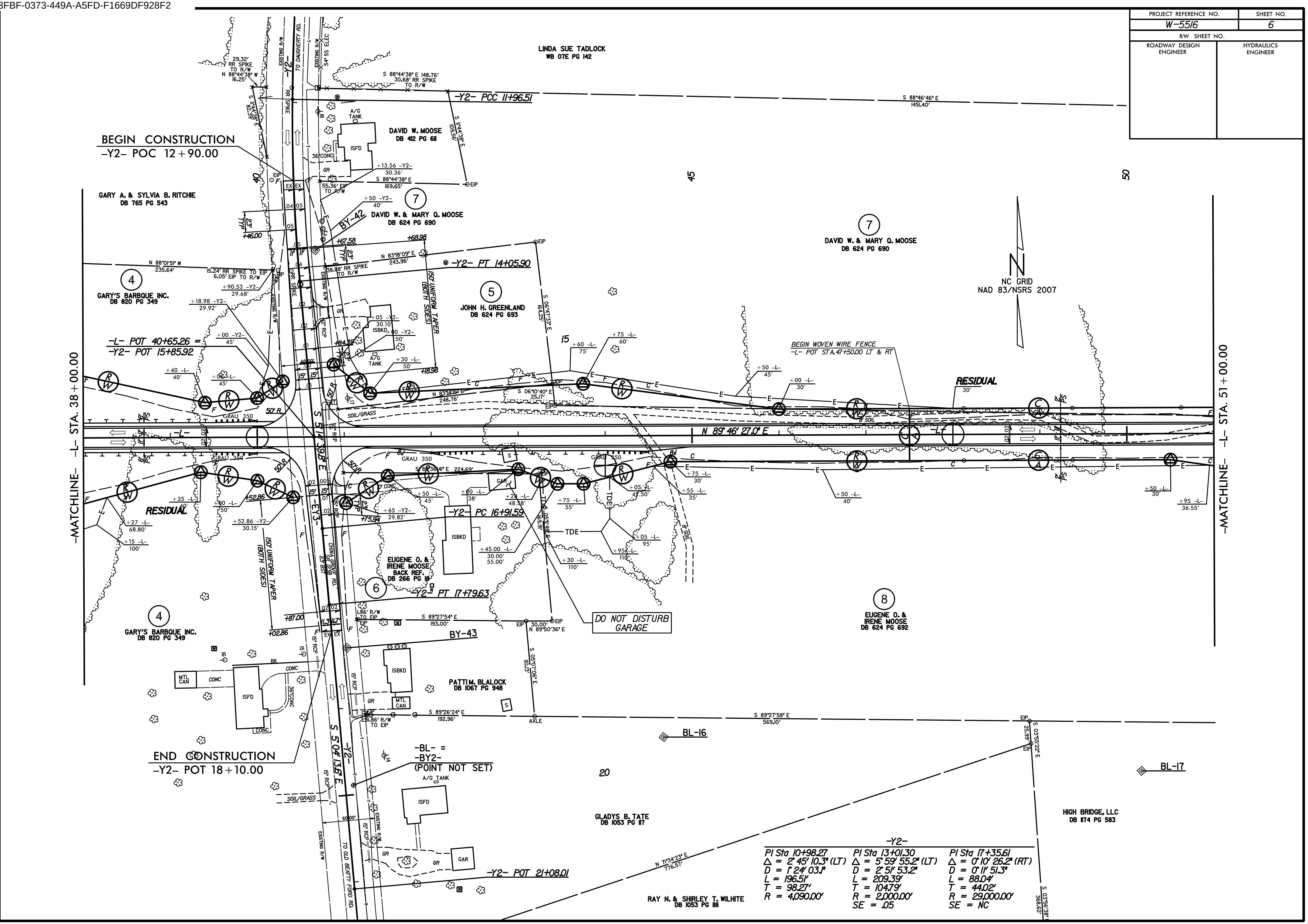
$$$$SYSTIME$$$$
$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
W-5516	6
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

REVISIONS

10-22-14 REVISED STATION/OFFSET CALLOUTS ON PARCELS 4, 5, 6 & 8

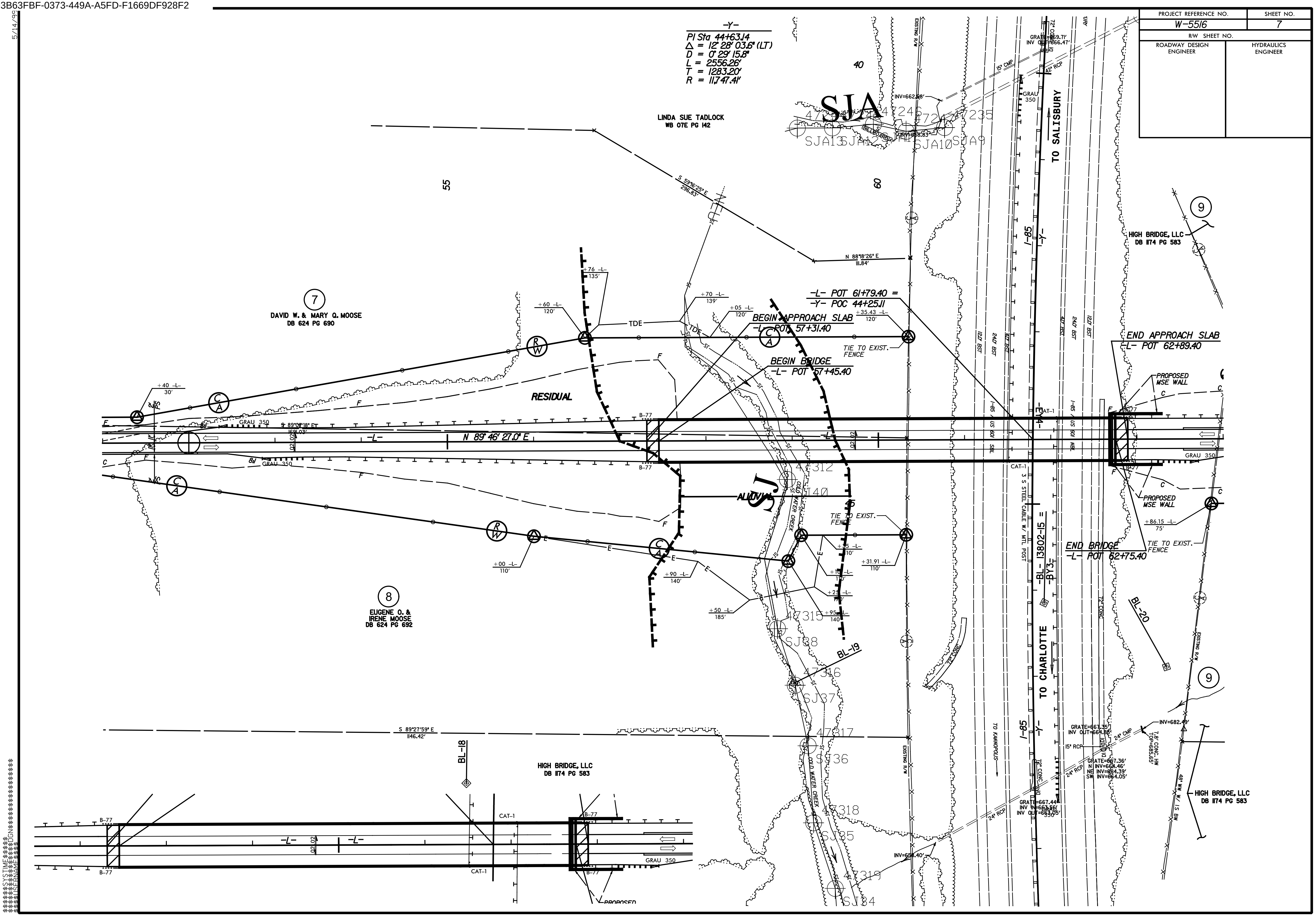
5/14/99



-Y2-

PI Sta 10+98.27	PI Sta 13+01.30	PI Sta 17+35.61
Δ = 2° 45' 10.3" (LT)	Δ = 5° 59' 55.2" (LT)	Δ = 0° 10' 26.2" (RT)
D = 1° 24' 03.1"	D = 2° 51' 53.2"	D = 0° 11' 51.3"
L = 196.51'	L = 209.39'	L = 88.04'
T = 98.27'	T = 104.79'	T = 44.02'
R = 4,090.00'	R = 2,000.00'	R = 29,000.00'
	SE = .05	SE = NC

PROJECT REFERENCE NO.	SHEET NO.
W-5516	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



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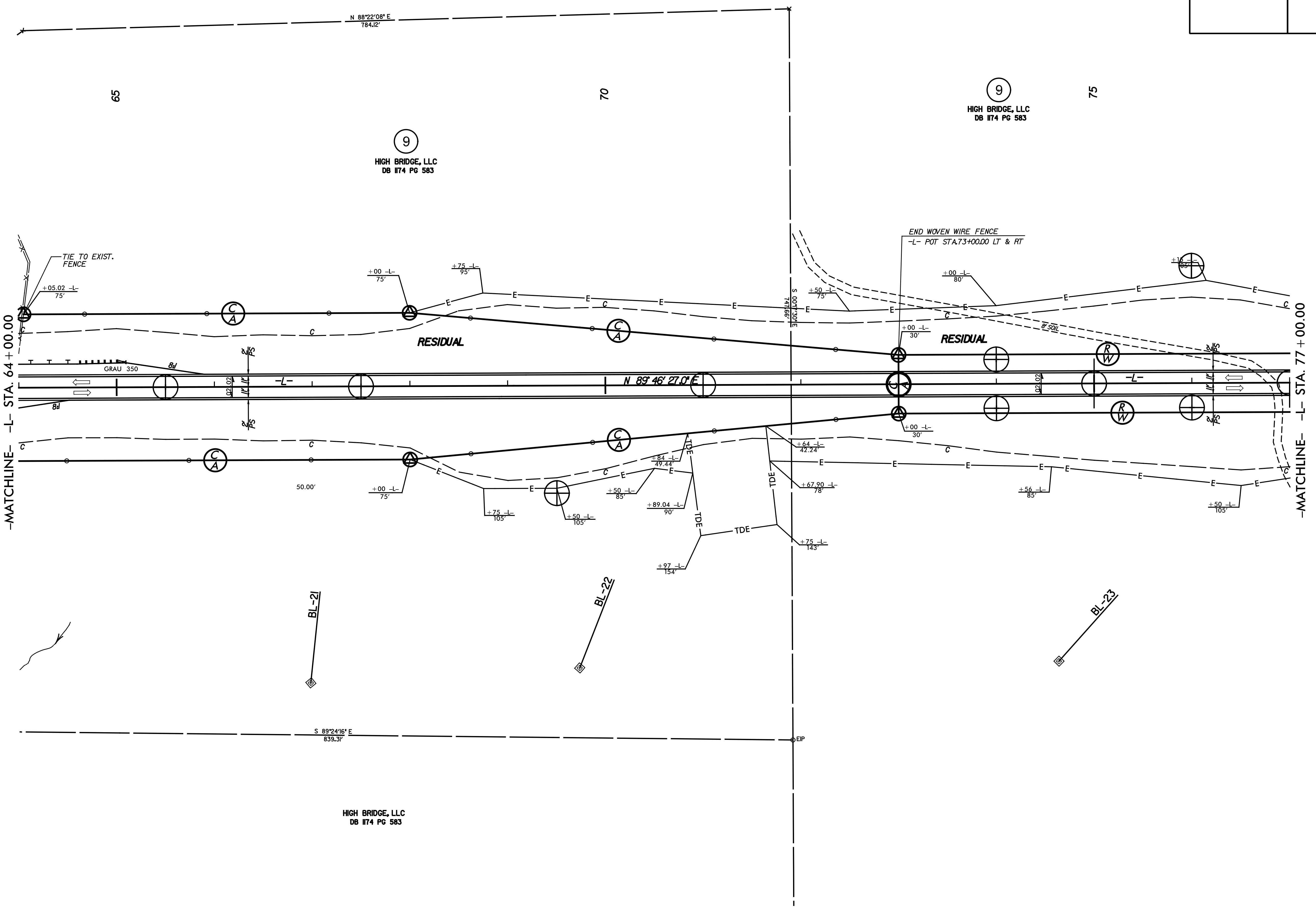
PROJECT REFERENCE NO.	SHEET NO.
W-5516	8
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

REVISIONS

10-22-14 REVISED STATION/OFFSET CALLOUTS ON PARCEL 9



PROJECT REFERENCE NO.	SHEET NO.
W-5516	9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

REVISIONS

10-22-14 REVISED STATION/OFFSET CALLOUTS ON PARCEL 9

5/14/99

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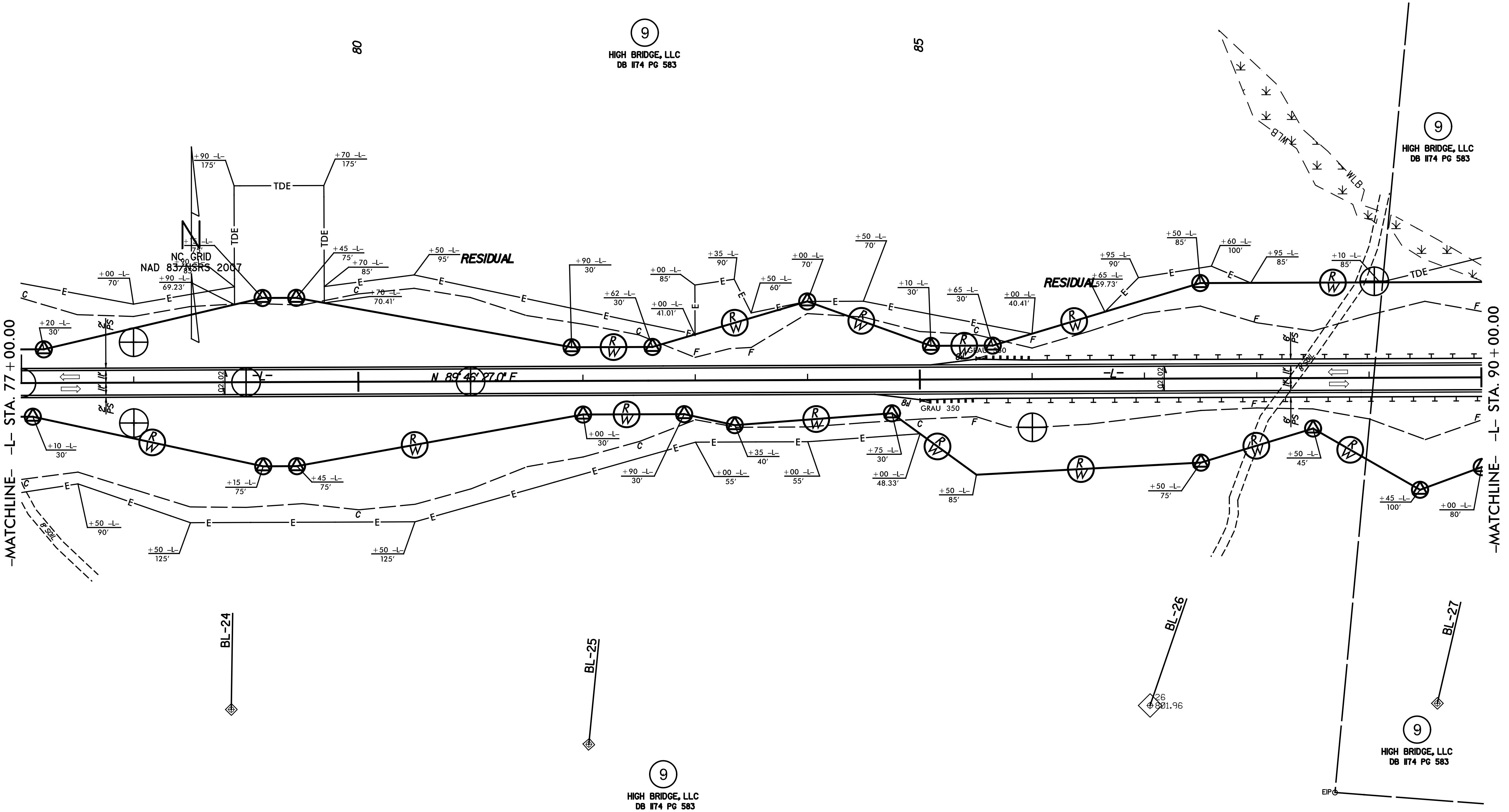
$$$$DGN$$$$
$$$$USERNAME$$$$

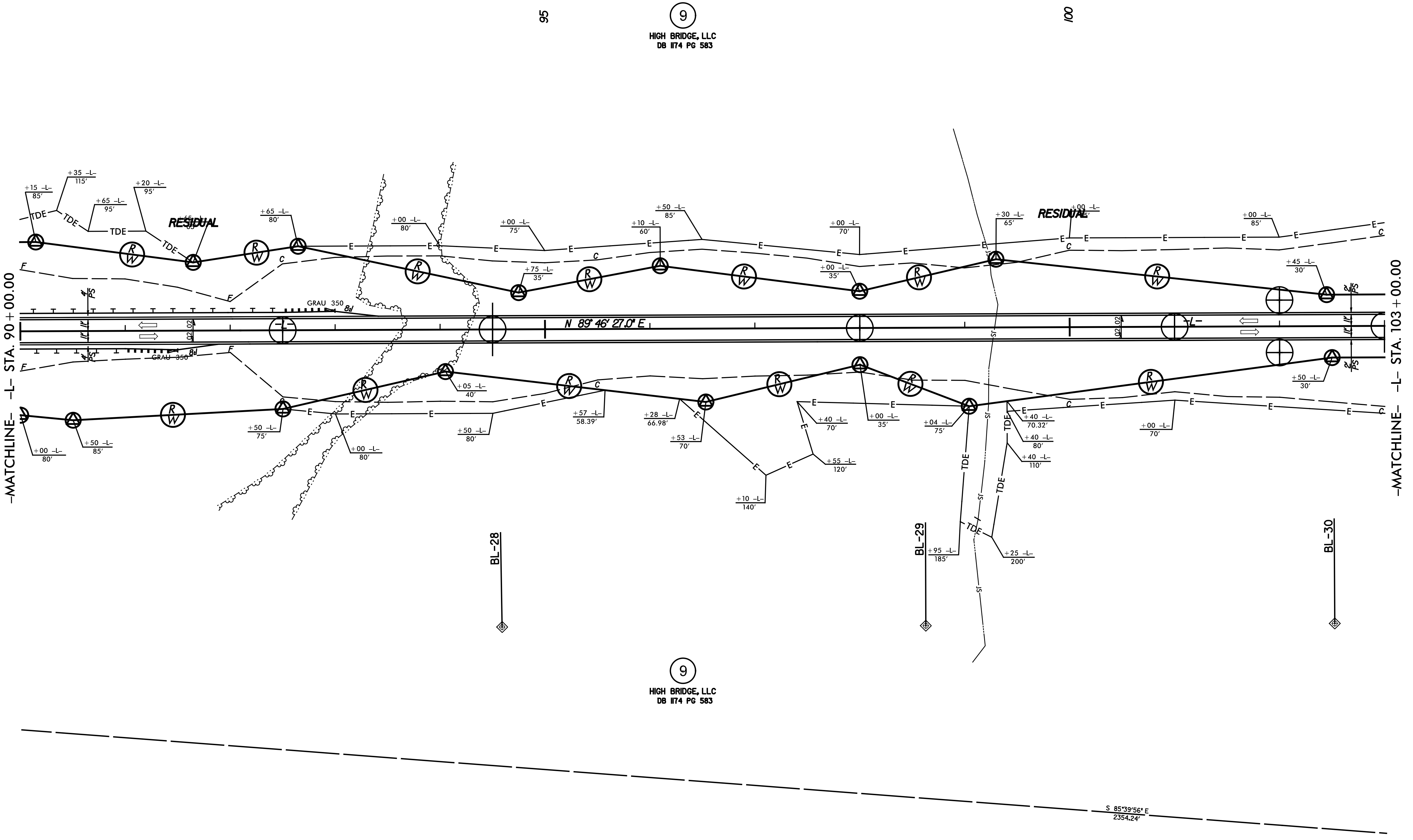


PROJECT REFERENCE NO.	SHEET NO.
W-5516	10
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

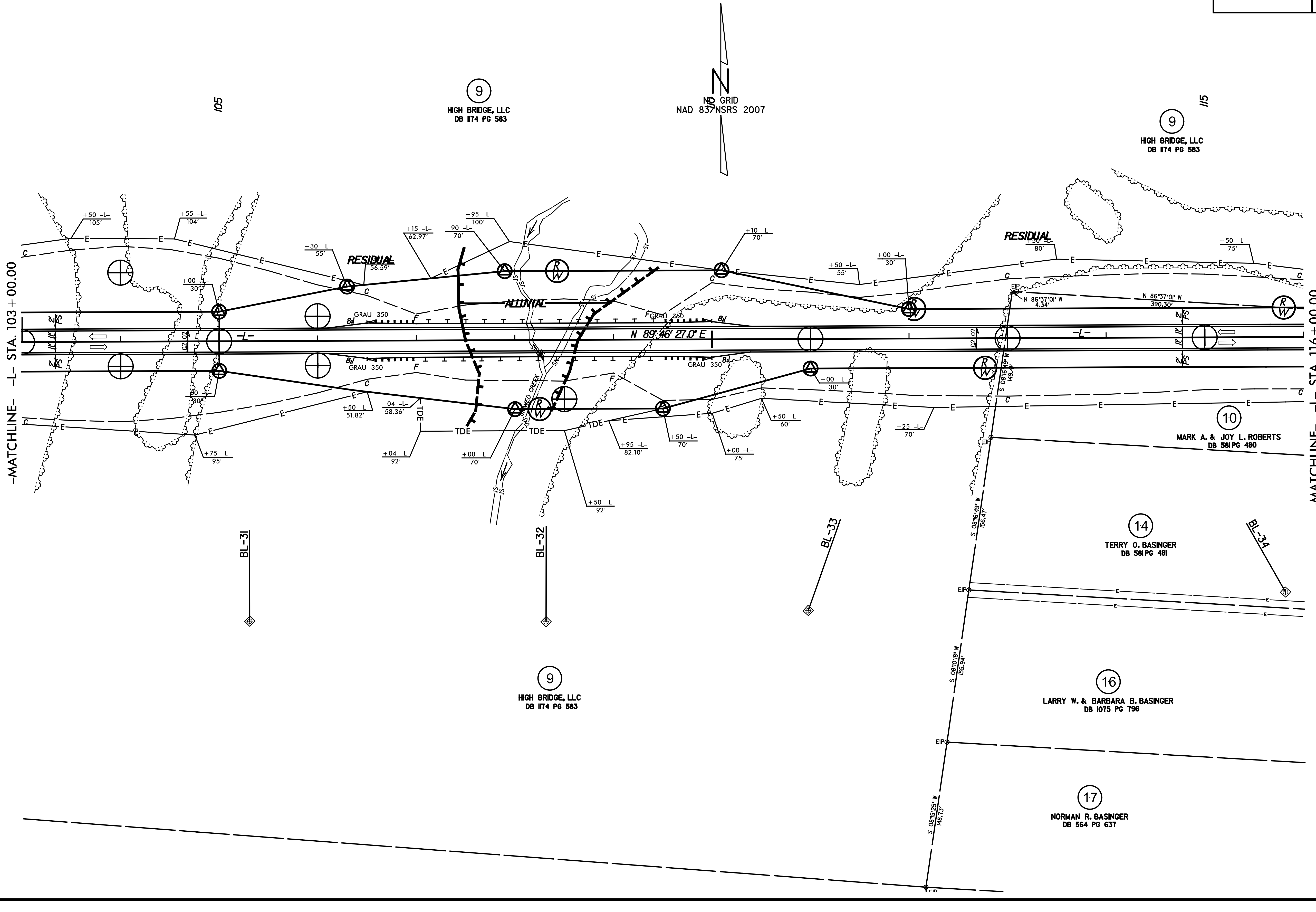
REVISIONS

10-22-14 REVISED STATION/OFFSET CALLOUTS ON PARCEL 9

5/14/99



PROJECT REFERENCE NO.	SHEET NO.
W-5516	11
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



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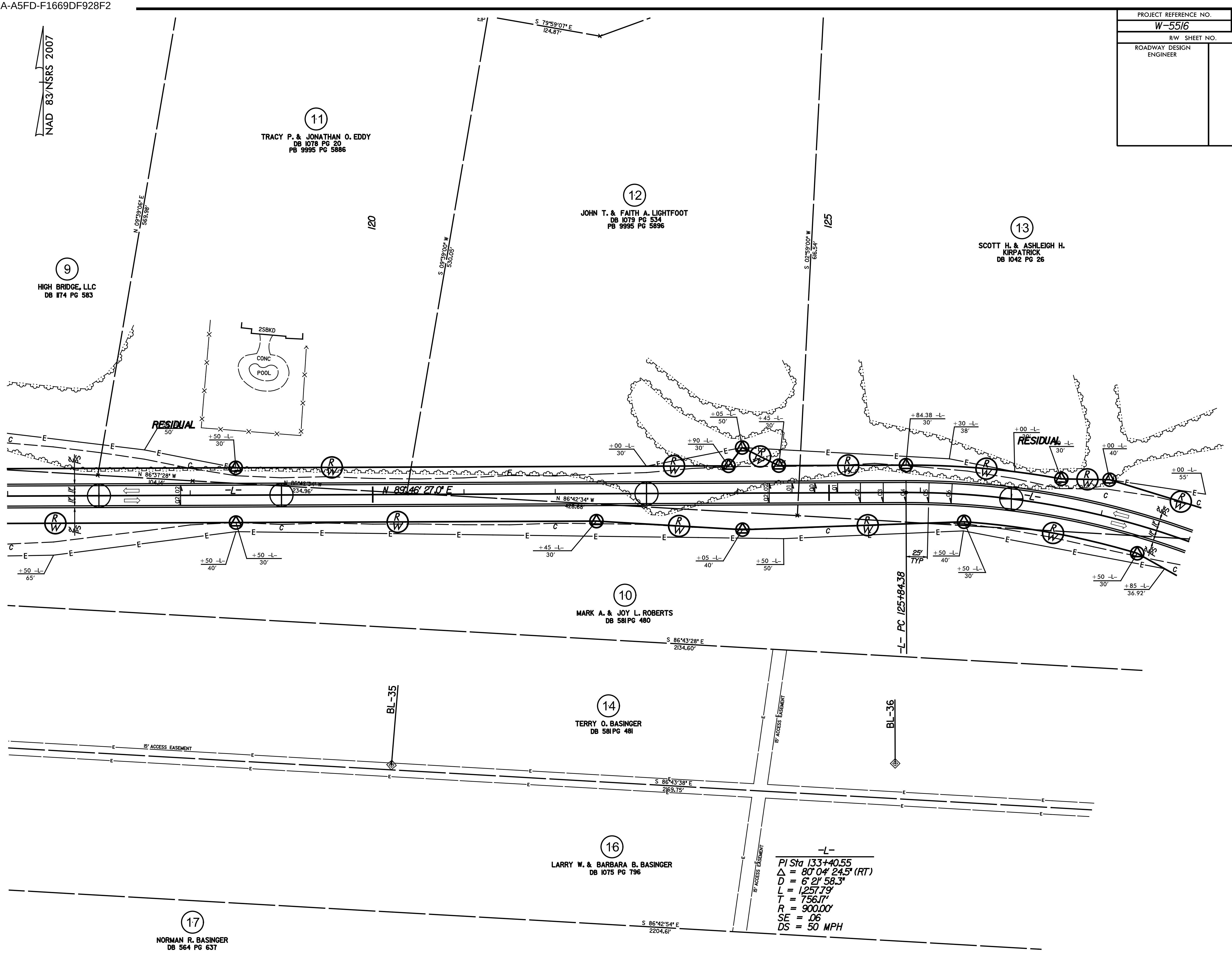
PROJECT REFERENCE NO.	SHEET NO.
W-5516	12
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

REVISIONS

10-22-14 REVISED STATION/OFFSET CALLOUTS ON PARCEL 10



-L-

PI Sta 133+40.55
Δ = 80° 04' 24.5" (RT)
D = 6° 21' 58.3"
L = 1,257.79'
T = 756.17'
R = 900.00'
SE = .06
DS = 50 MPH

PROJECT REFERENCE NO.	SHEET NO.
W-5516	13
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

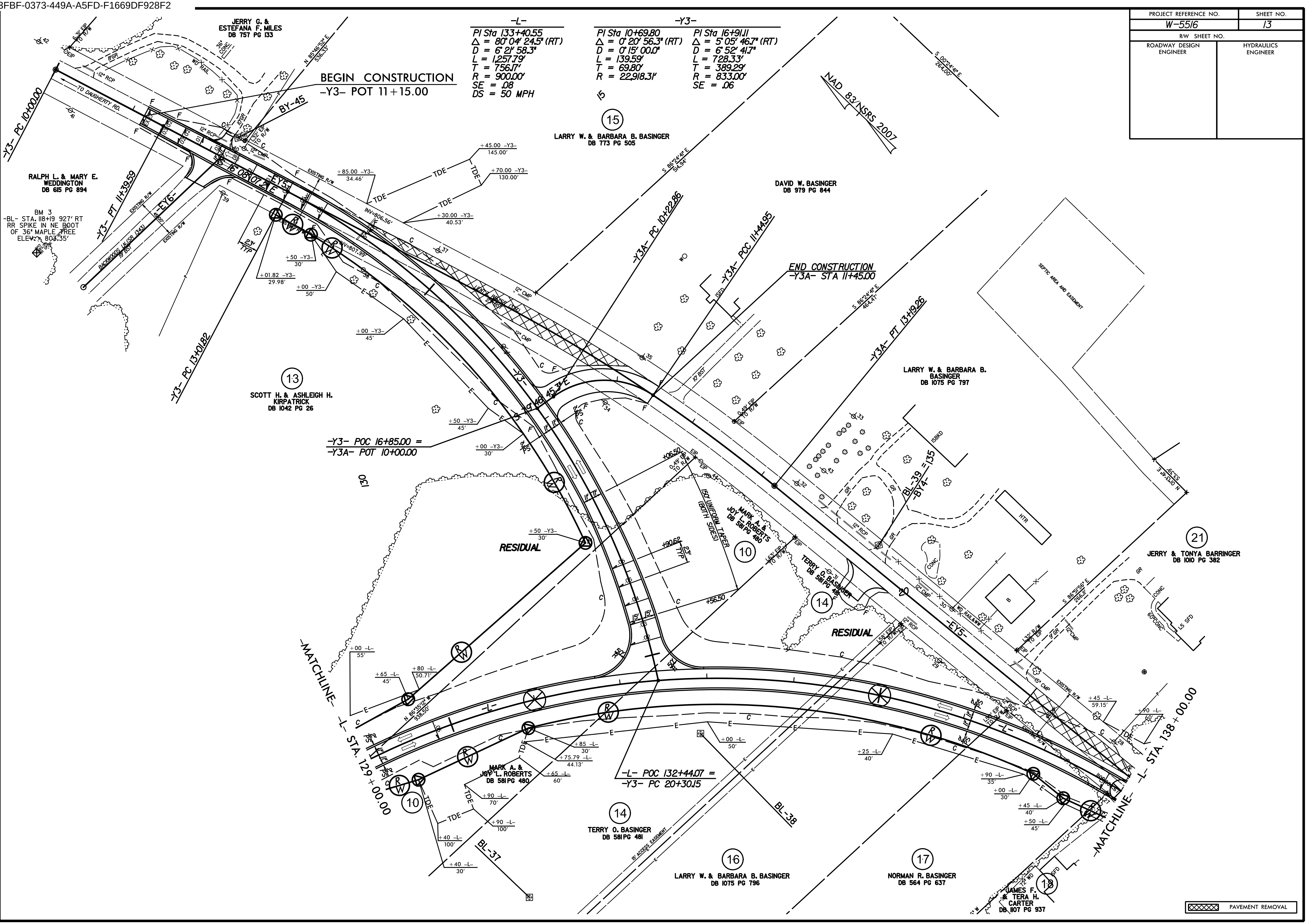
REVISIONS

10-22-14 REVISED STATION/OFFSET CALLOUTS ON PARCEL 10, ADDED PARCEL NO. 21

-L-
PI Sta 133+40.55
Δ = 80° 04′ 24.5″ (RT)
D = 6° 21′ 58.3″
L = 1,257.79′
T = 756.17′
R = 900.00′
SE = .08
DS = 50 MPH

-Y3-
PI Sta 10+69.80
Δ = 0° 20′ 56.3″ (RT)
D = 0° 15′ 00.0″
L = 139.59′
T = 69.80′
R = 22,918.31′

PI Sta 16+91.11
Δ = 5° 05′ 46.7″ (RT)
D = 6° 52′ 41.7″
L = 728.33′
T = 389.29′
R = 833.00′
SE = .06



▨ PAVEMENT REMOVAL

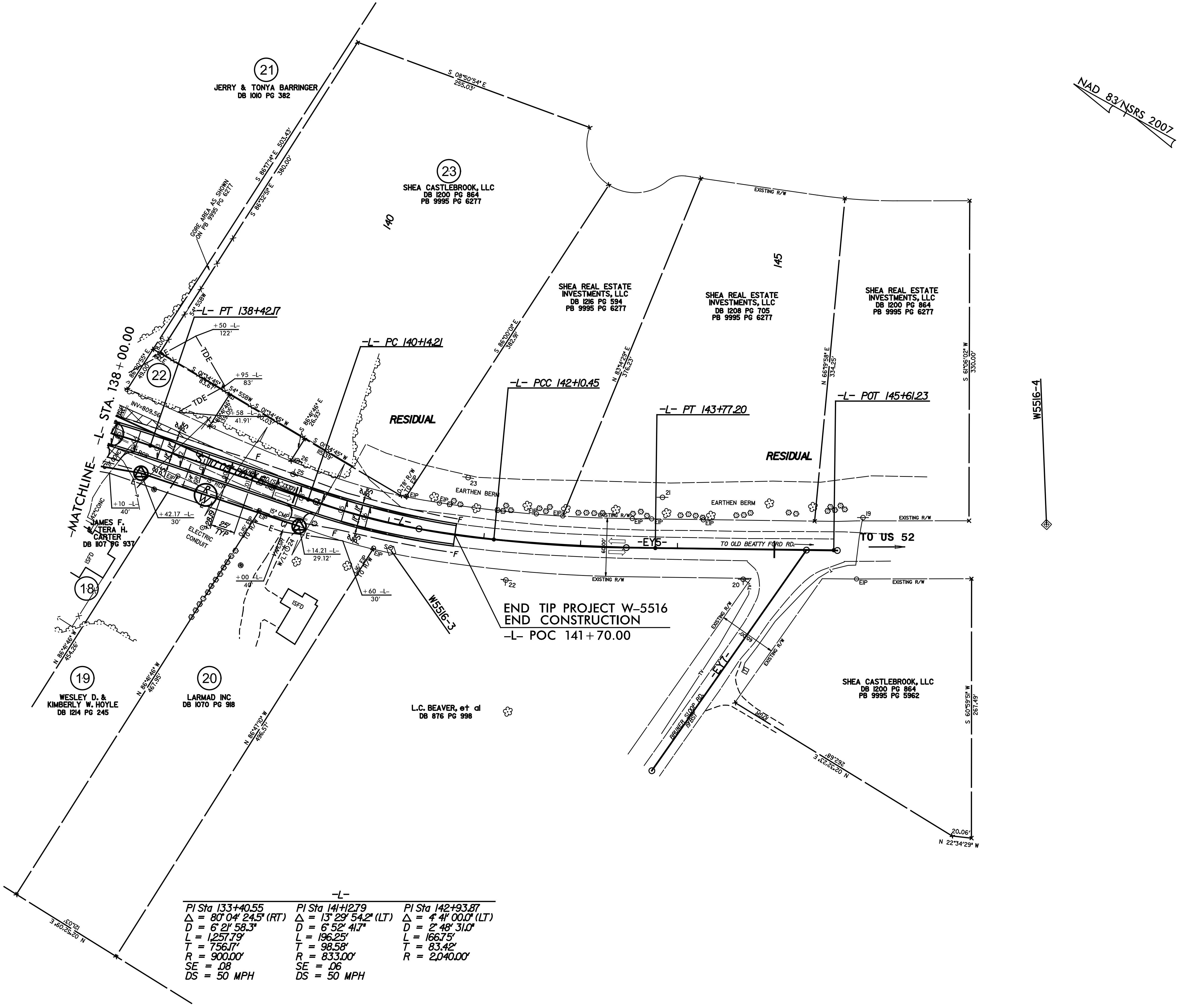
5/14/99

$$$$SYSTIME$$$$ $$$$USERNAME$$$$ $$$$DGN$$$$

PROJECT REFERENCE NO.	SHEET NO.
W-5516	14
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

REVISIONS

10-22-14 ADDED PARCEL NOS. 21, 22 & 23



-L-

PI Sta 133+40.55	PI Sta 141+12.79	PI Sta 142+93.87
Δ = 80° 04' 24.5" (RT)	Δ = 13° 29' 54.2" (LT)	Δ = 4° 41' 00.0" (LT)
D = 6° 21' 58.3"	D = 6° 52' 41.7"	D = 2° 48' 31.0"
L = 1,257.79'	L = 196.25'	L = 166.75'
T = 756.17'	T = 98.58'	T = 83.42'
R = 900.00'	R = 833.00'	R = 2,040.00'
SE = .08	SE = .06	
DS = 50 MPH	DS = 50 MPH	

▨ PAVEMENT REMOVAL

5/14/9

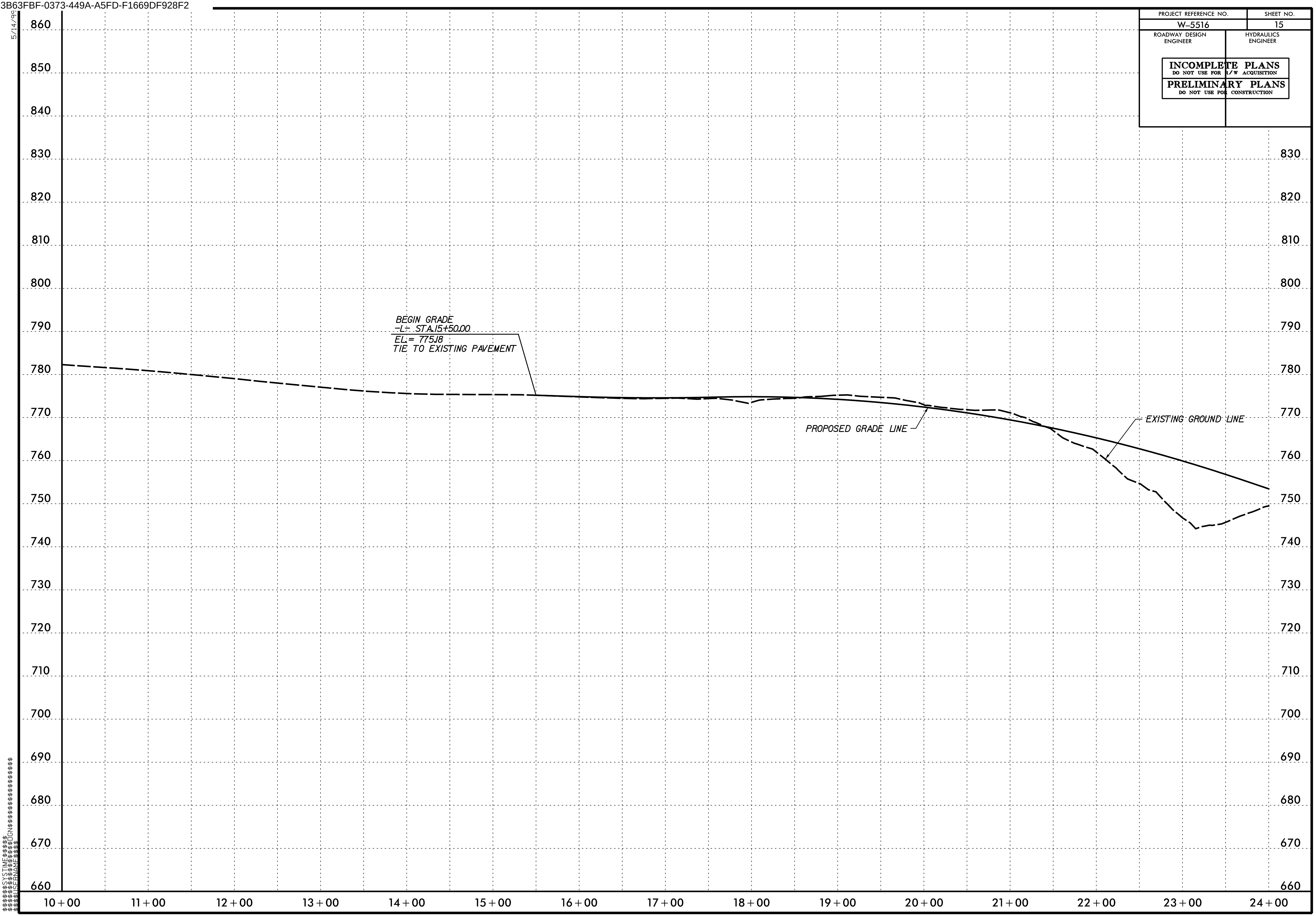
PROJECT REFERENCE NO.	SHEET NO.
W-5516	15

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



$$$$$$SYSTIME$$$$$
$$$$$$$$$$DGN$$$$$$$$$$$$$$$$
$$$$$USERNAME$$$$

5/14/99

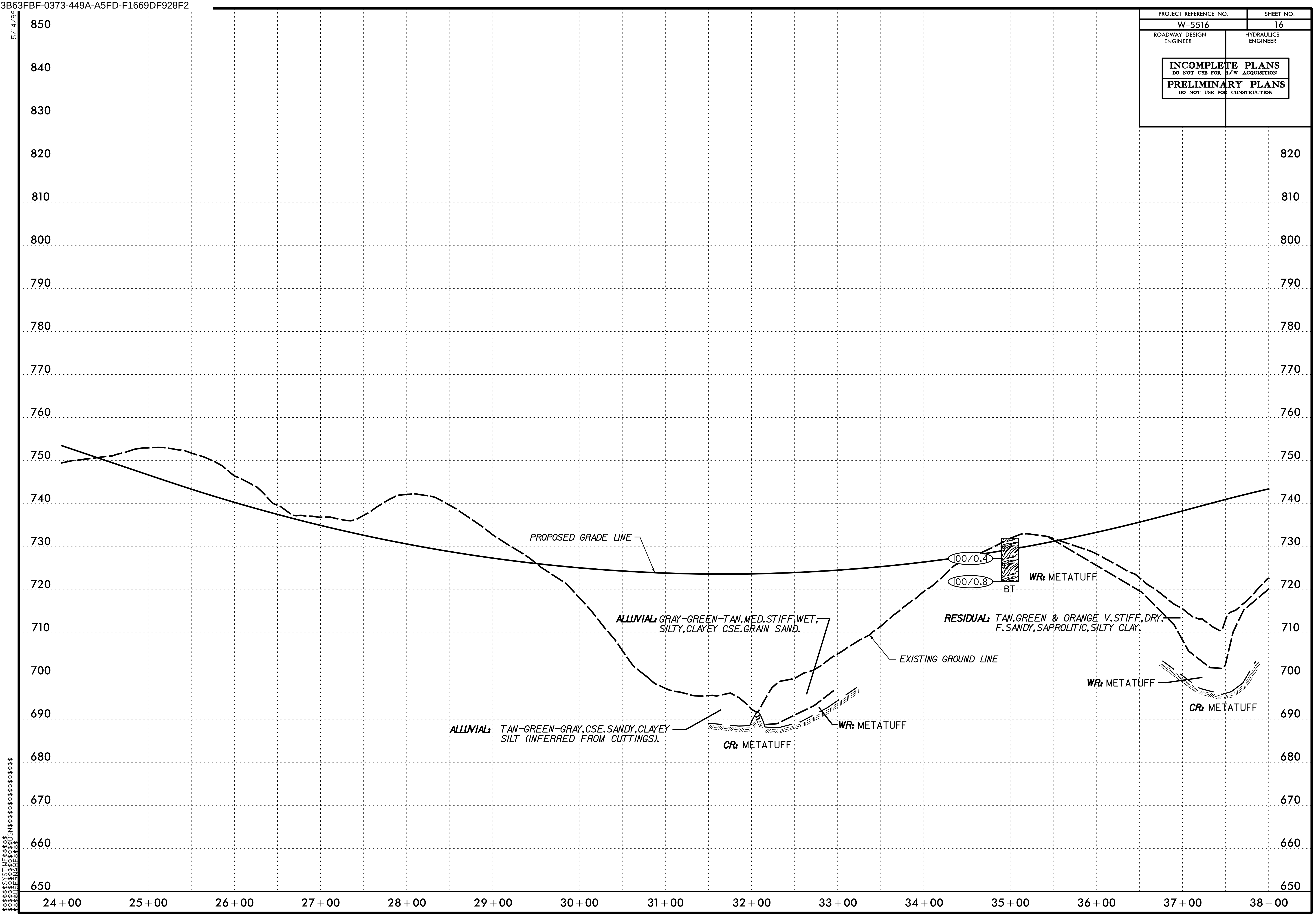
PROJECT REFERENCE NO.	SHEET NO.
W-5516	16

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



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$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$
$$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
W-5516	17
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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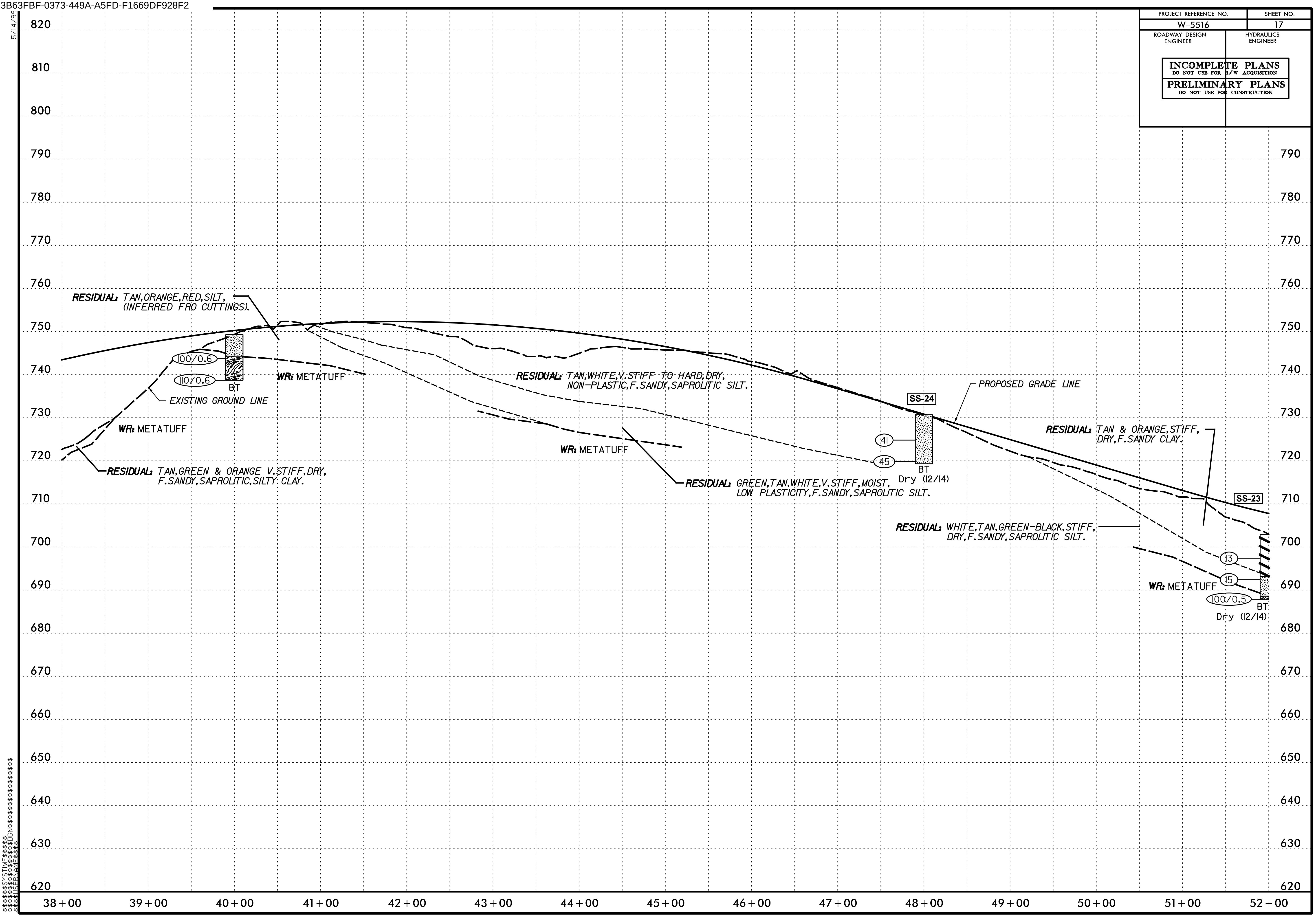
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



5/14/99

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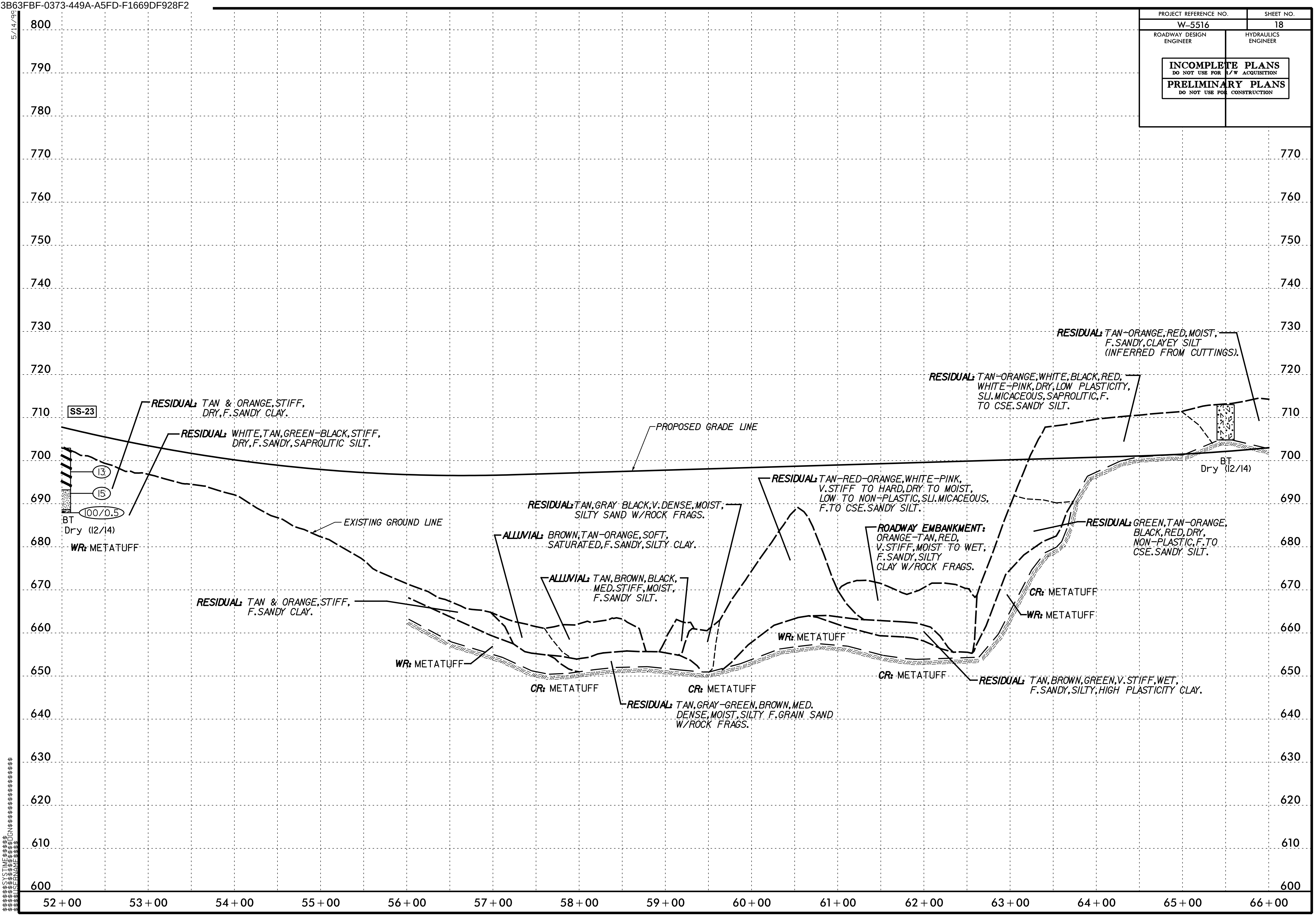
PROJECT REFERENCE NO.	SHEET NO.
W-5516	18

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



PROJECT REFERENCE NO.	SHEET NO.
W-5516	19
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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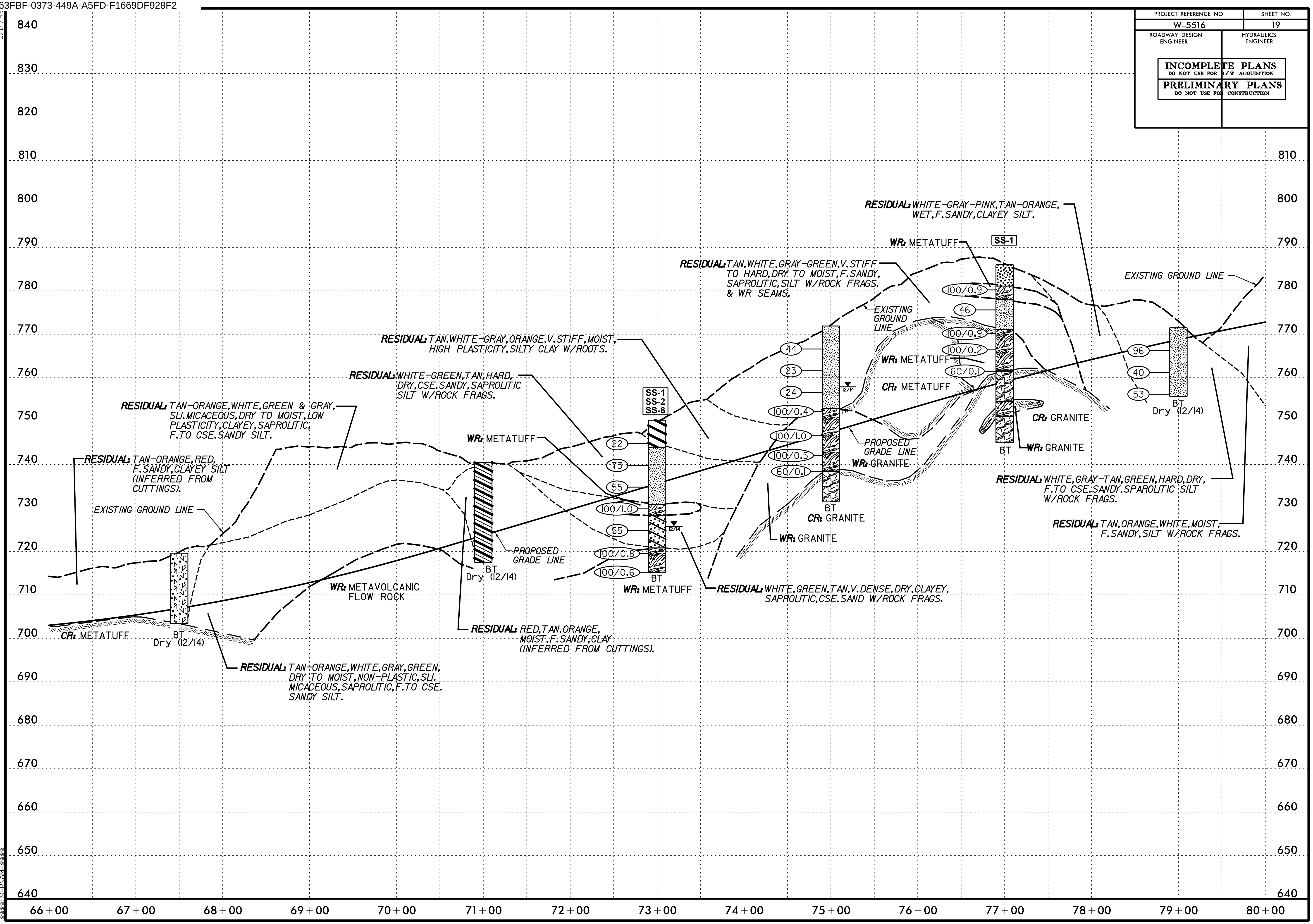
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



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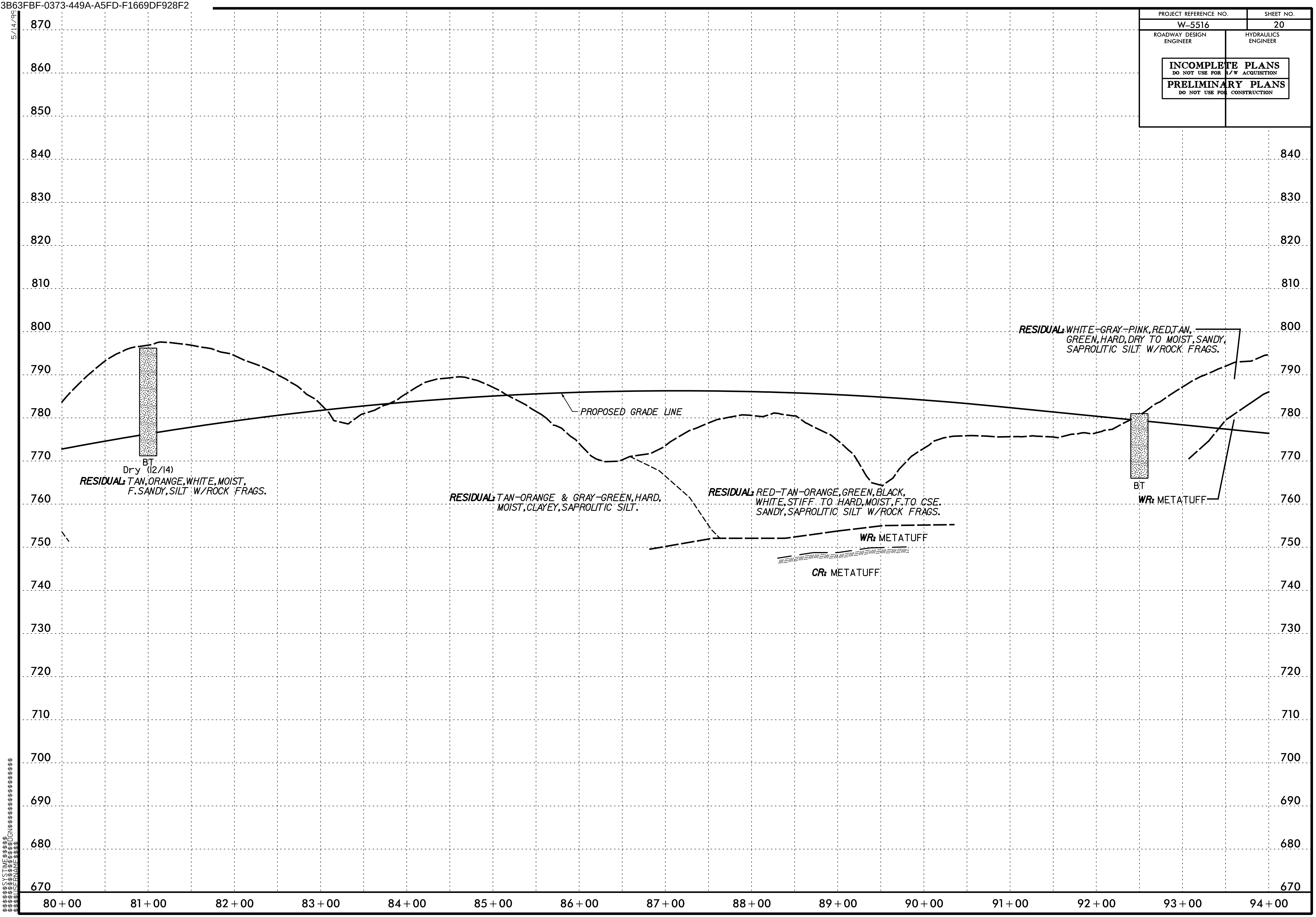
PROJECT REFERENCE NO.	SHEET NO.
W-5516	20
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

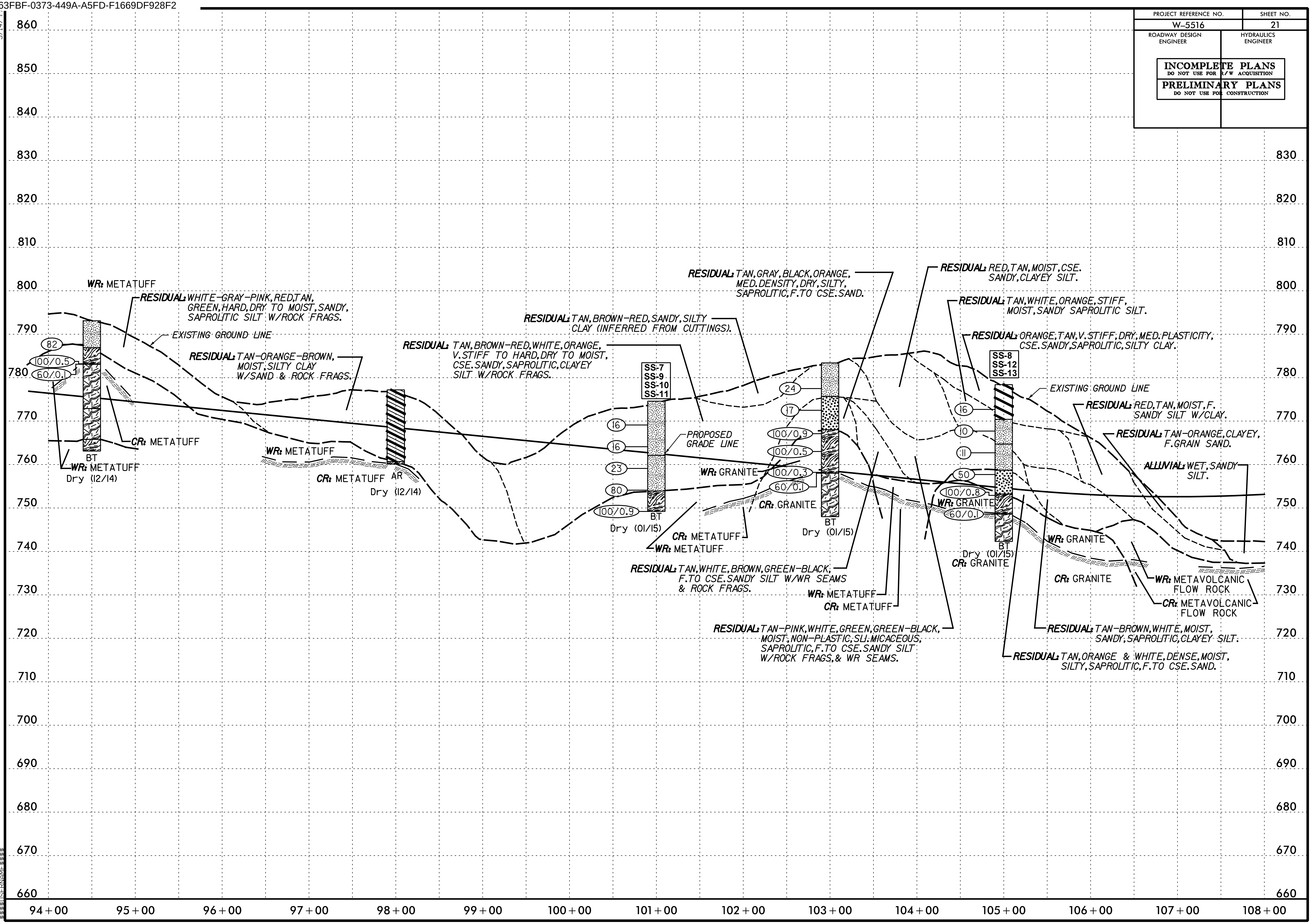
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



PROJECT REFERENCE NO.	SHEET NO.
W-5516	21
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



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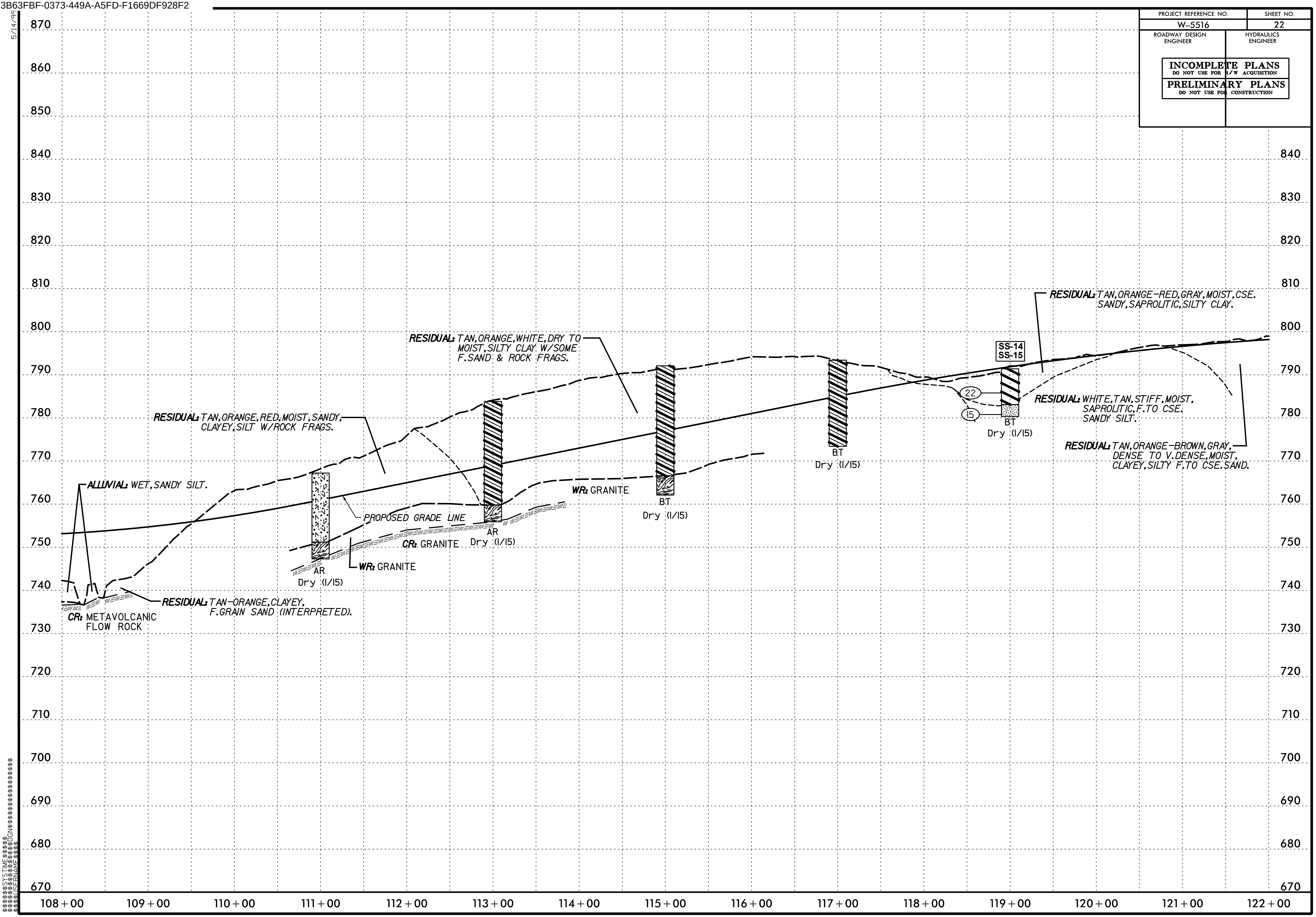
PROJECT REFERENCE NO.	SHEET NO.
W-5516	22
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

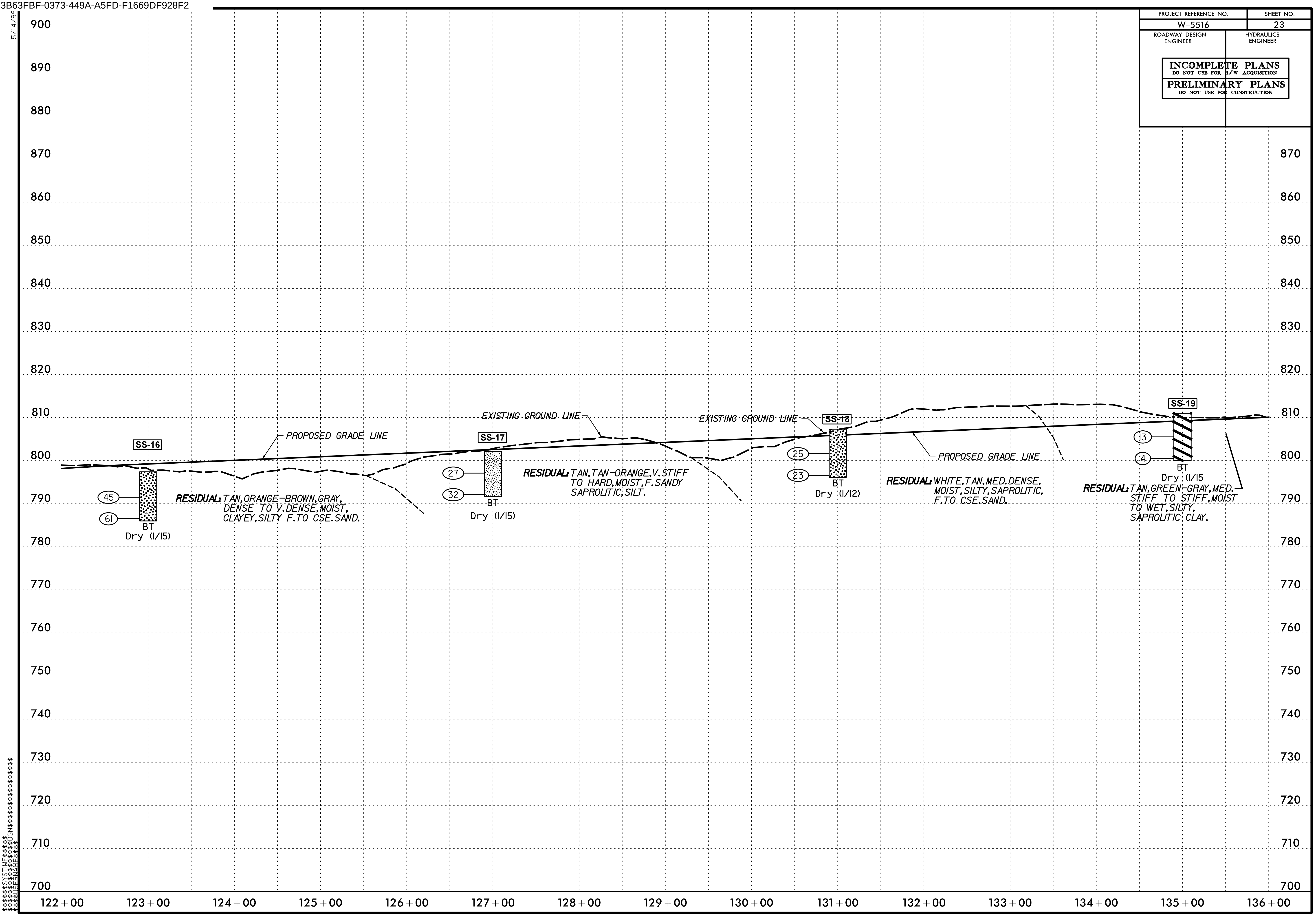
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



PROJECT REFERENCE NO.	SHEET NO.
W-5516	23
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



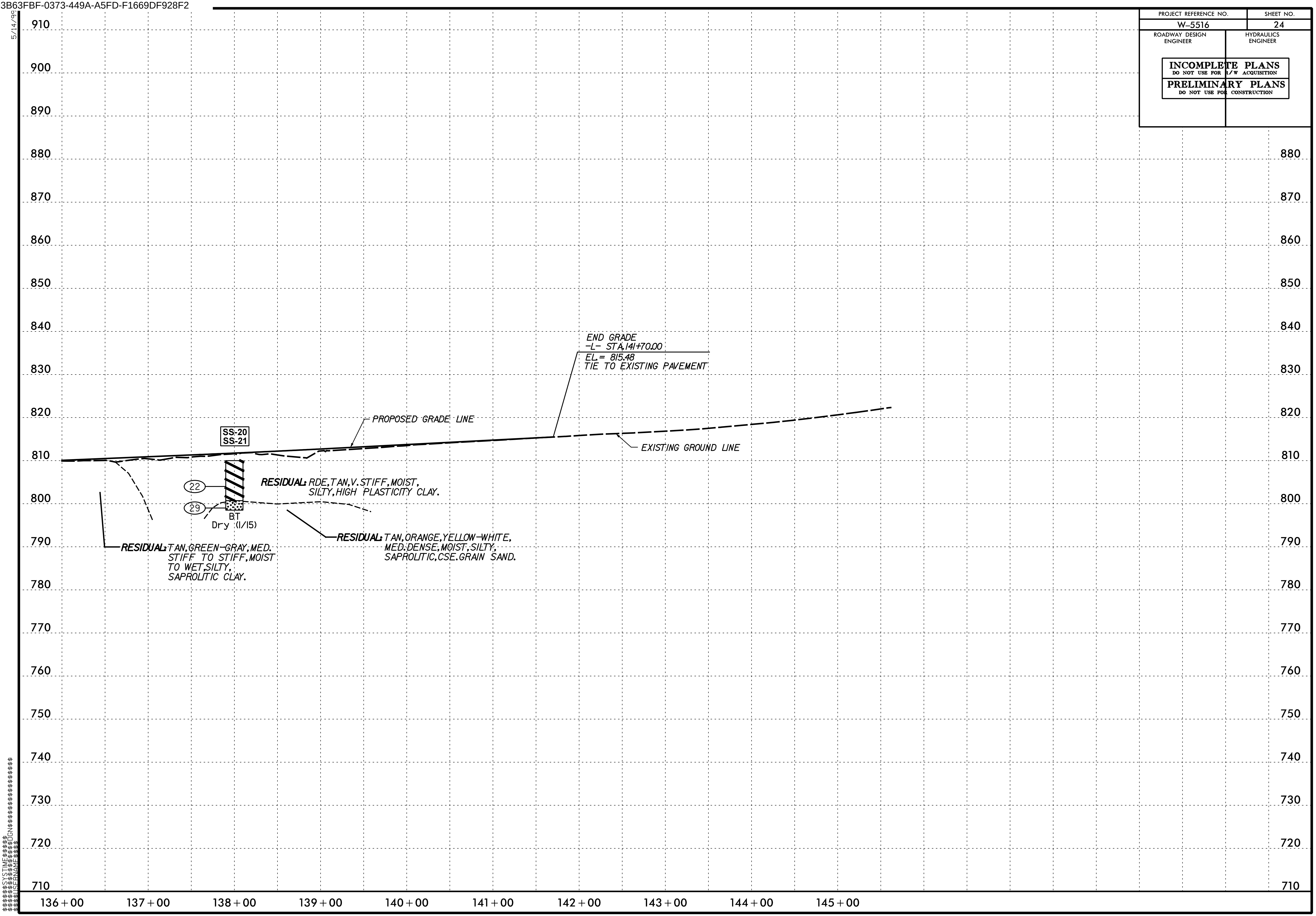
PROJECT REFERENCE NO.	SHEET NO.
W-5516	24

ROADWAY DESIGN ENGINEER

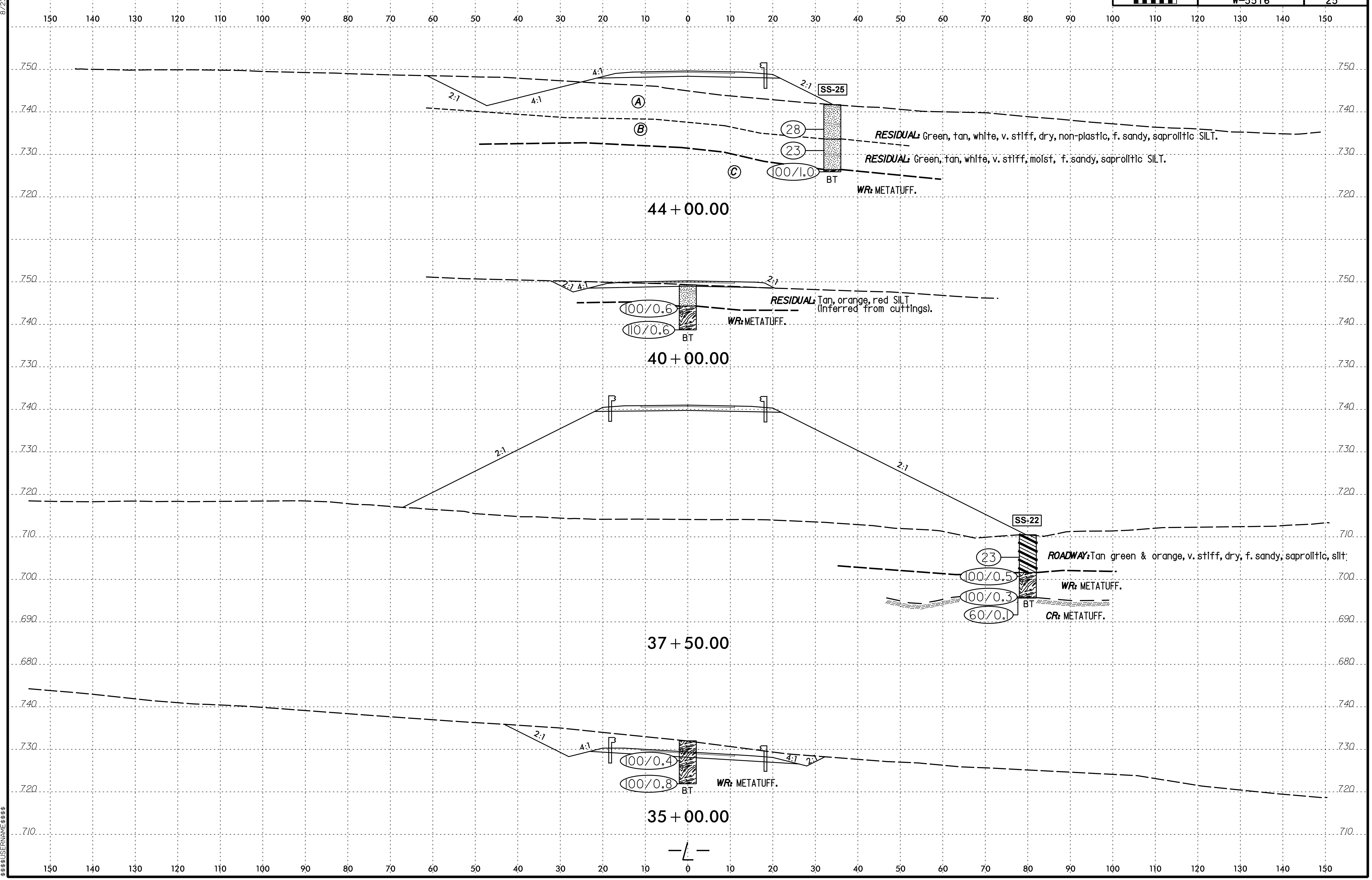
HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

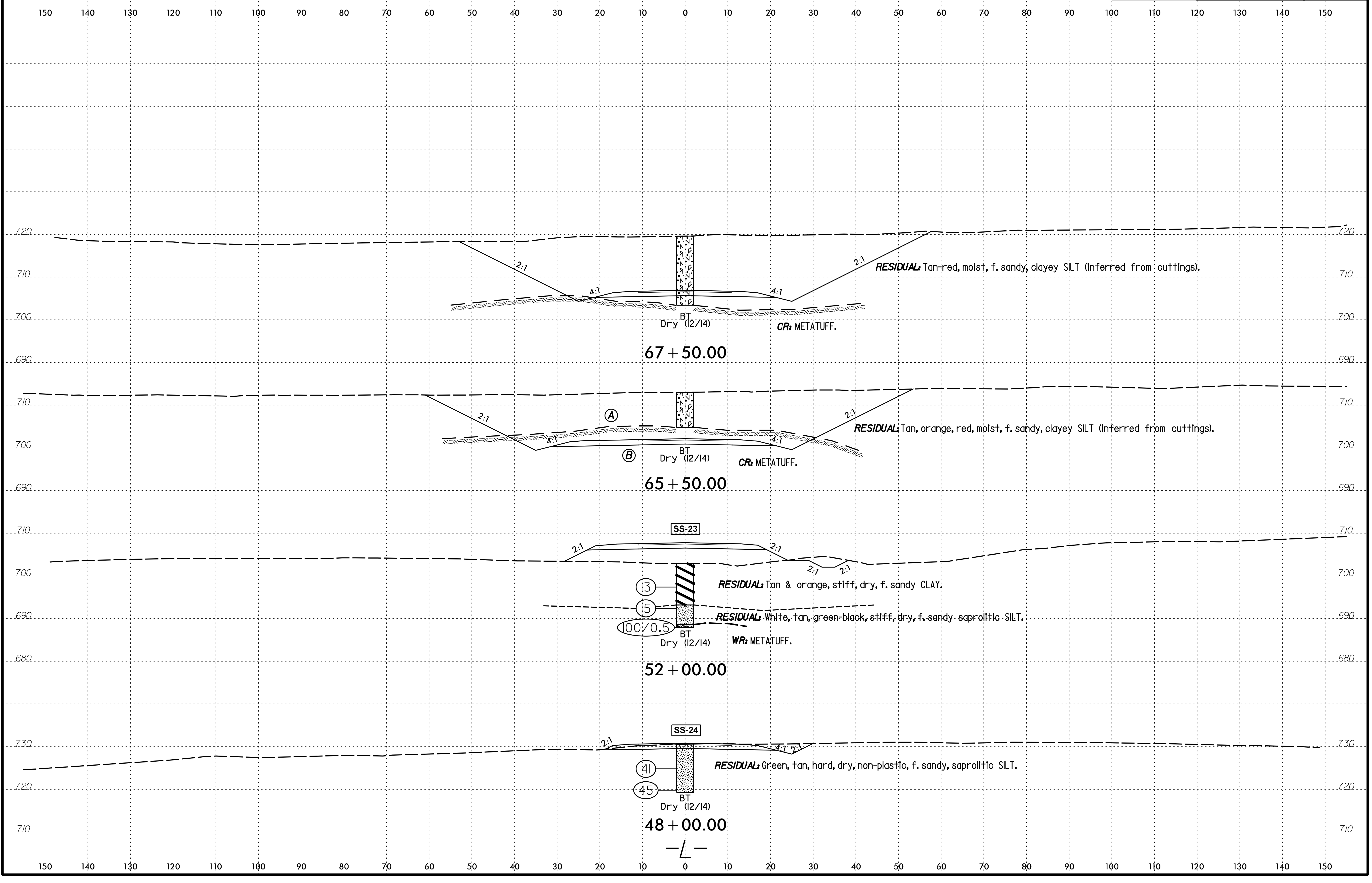
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



PROJ. REFERENCE NO.	SHEET NO.
W-5516	25



PROJ. REFERENCE NO.	SHEET NO.
W-5516	26



RESIDUAL: Tan-red, moist, f. sandy, clayey SILT (Inferred from cuttings).

Dry (12/14)

CR: METATUFF.

67 + 50.00

RESIDUAL: Tan, orange, red, moist, f. sandy, clayey SILT (Inferred from cuttings).

Dry (12/14)

CR: METATUFF.

65 + 50.00

SS-23

RESIDUAL: Tan & orange, stiff, dry, f. sandy CLAY.

RESIDUAL: White, tan, green-black, stiff, dry, f. sandy saprolitic SILT.

Dry (12/14)

WR: METATUFF.

52 + 00.00

SS-24

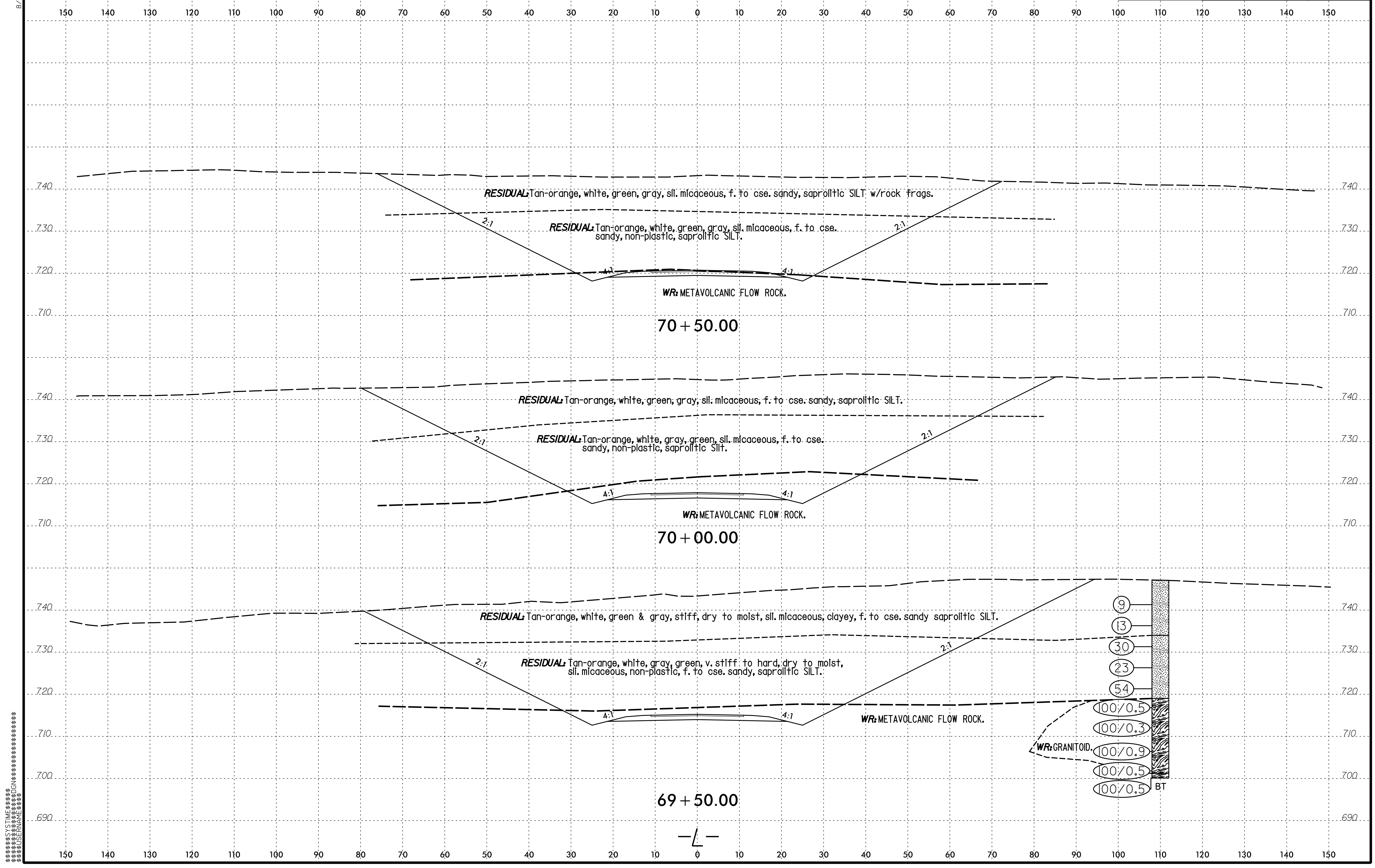
RESIDUAL: Green, tan, hard, dry, non-plastic, f. sandy, saprolitic SILT.

Dry (12/14)

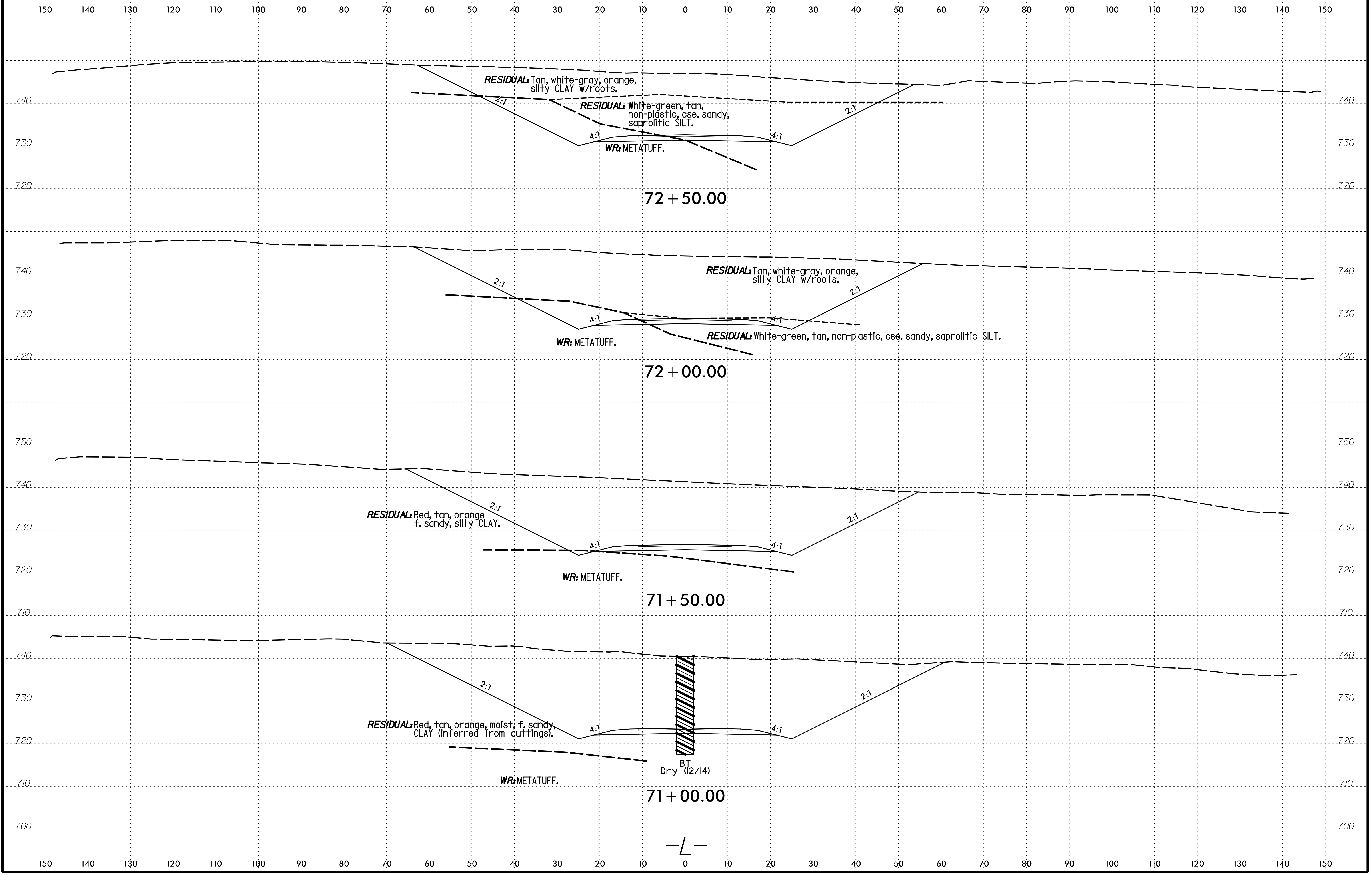
48 + 00.00

-L-

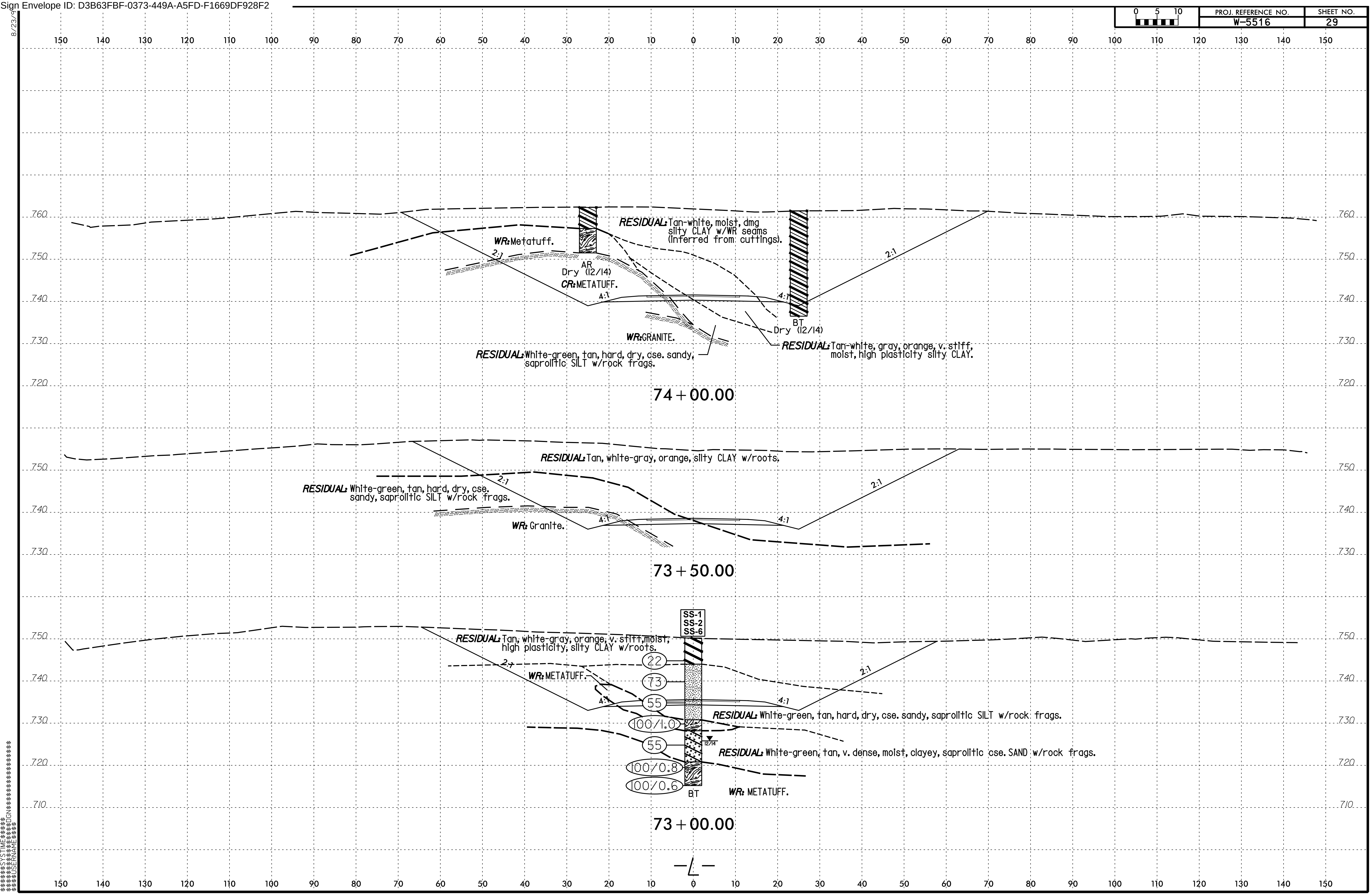
PROJ. REFERENCE NO.	SHEET NO.
W-5516	27



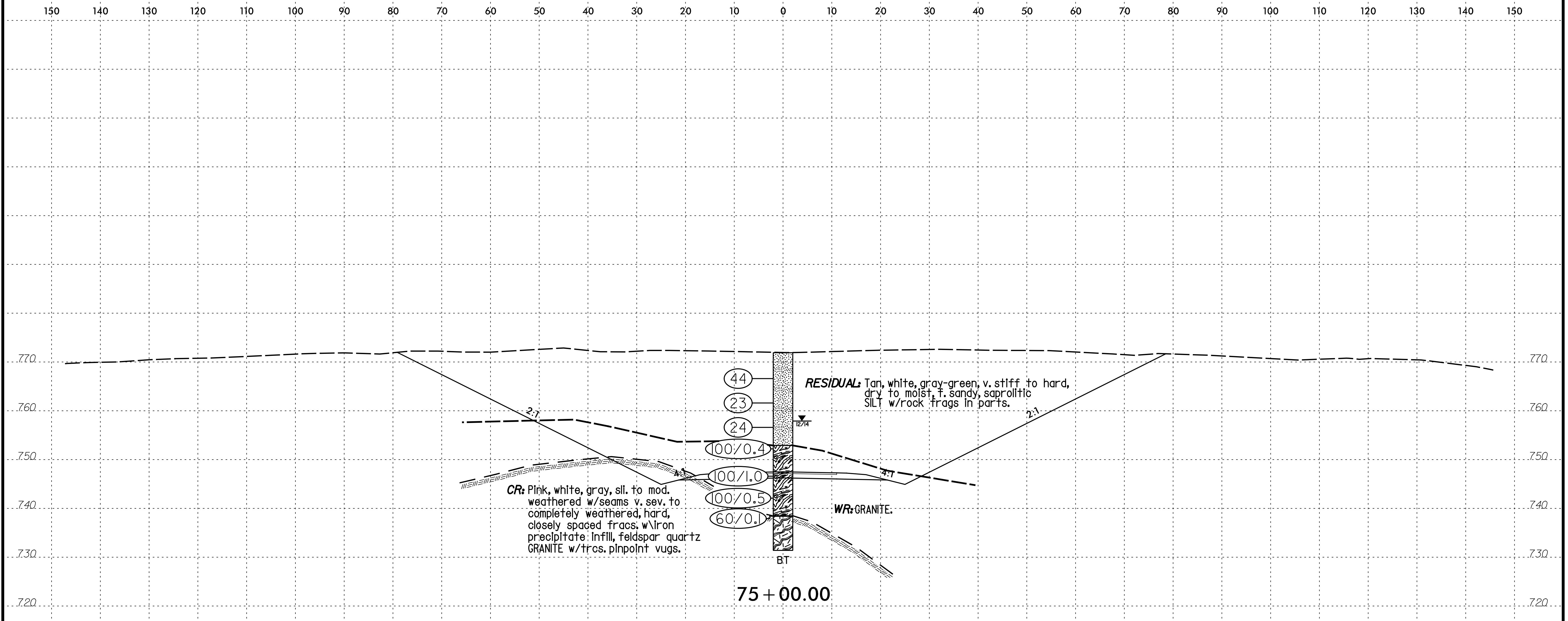
PROJ. REFERENCE NO.	SHEET NO.
W-5516	28



PROJ. REFERENCE NO.	SHEET NO.
W-5516	29



PROJ. REFERENCE NO.	SHEET NO.
W-5516	30

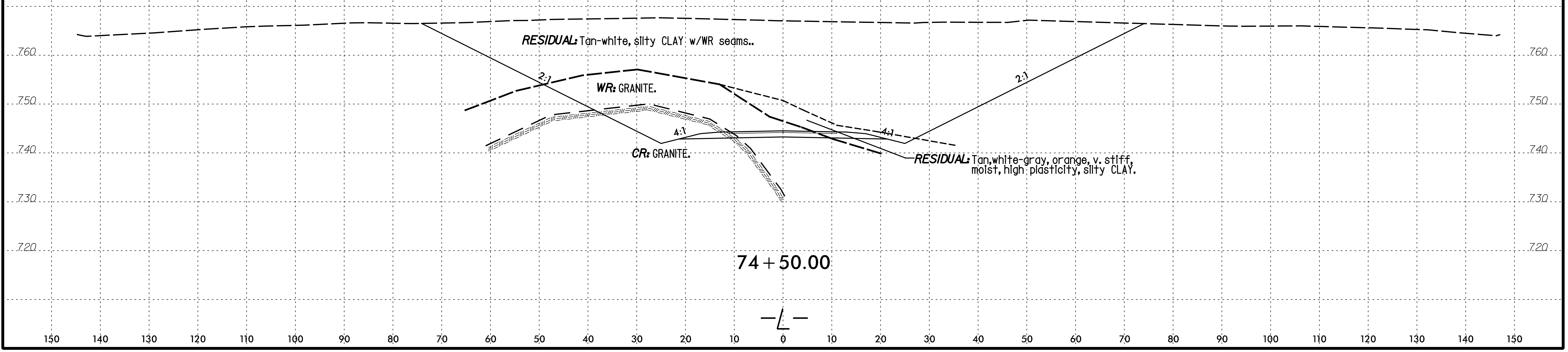


RESIDUAL: Tan, white, gray-green, v. stiff to hard, dry to moist, f. sandy, saprolitic SILT w/rock frags in parts.

CR: Pink, white, gray, sli. to mod. weathered w/seams v. sev. to completely weathered, hard, closely spaced fracs. w\iron precipitate infill, feldspar quartz GRANITE w/trcs. pinpoint vugs.

WR: GRANITE.

75 + 00.00



RESIDUAL: Tan-white, silty CLAY w/WR seams..

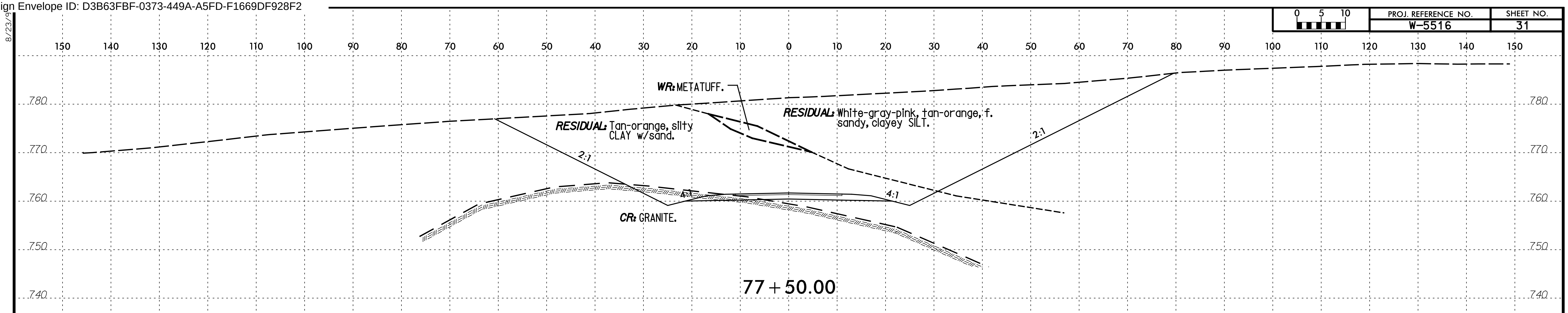
WR: GRANITE.

CR: GRANITE.

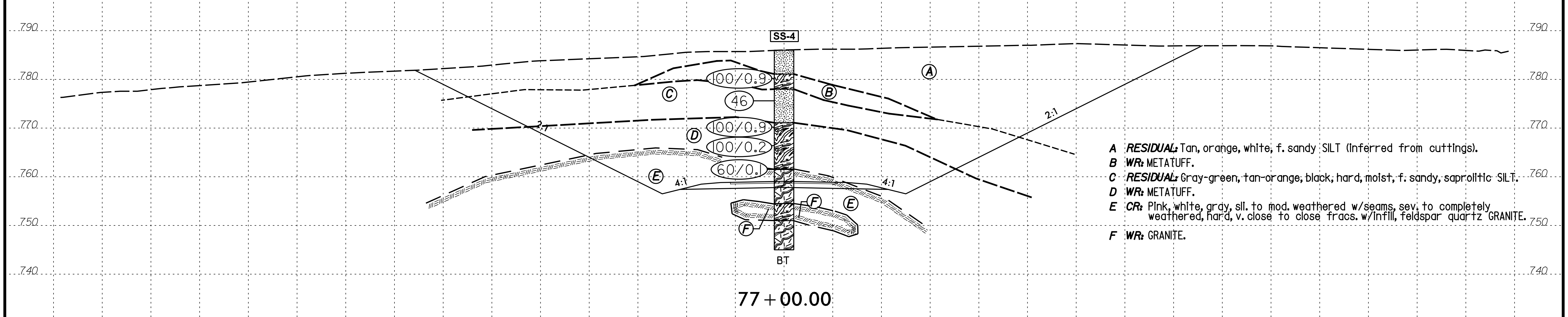
RESIDUAL: Tan, white-gray, orange, v. stiff, moist, high plasticity, silty CLAY.

74 + 50.00

-L-

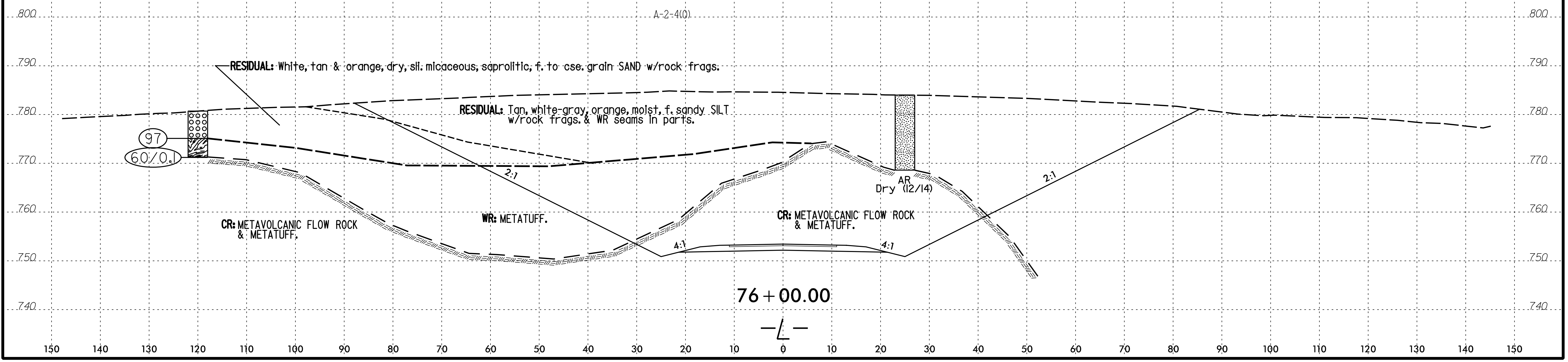


77+50.00



A RESIDUAL: Tan, orange, white, f. sandy SILT (inferred from cuttings).
B WR: METATUFF.
C RESIDUAL: Gray-green, tan-orange, black, hard, moist, f. sandy, saprolitic SILT.
D WR: METATUFF.
E CR: Pink, white, gray, sli. to mod. weathered w/seams, sev. to completely weathered, hard, v. close to close fracs. w/infill, feldspar quartz GRANITE.
F WR: GRANITE.

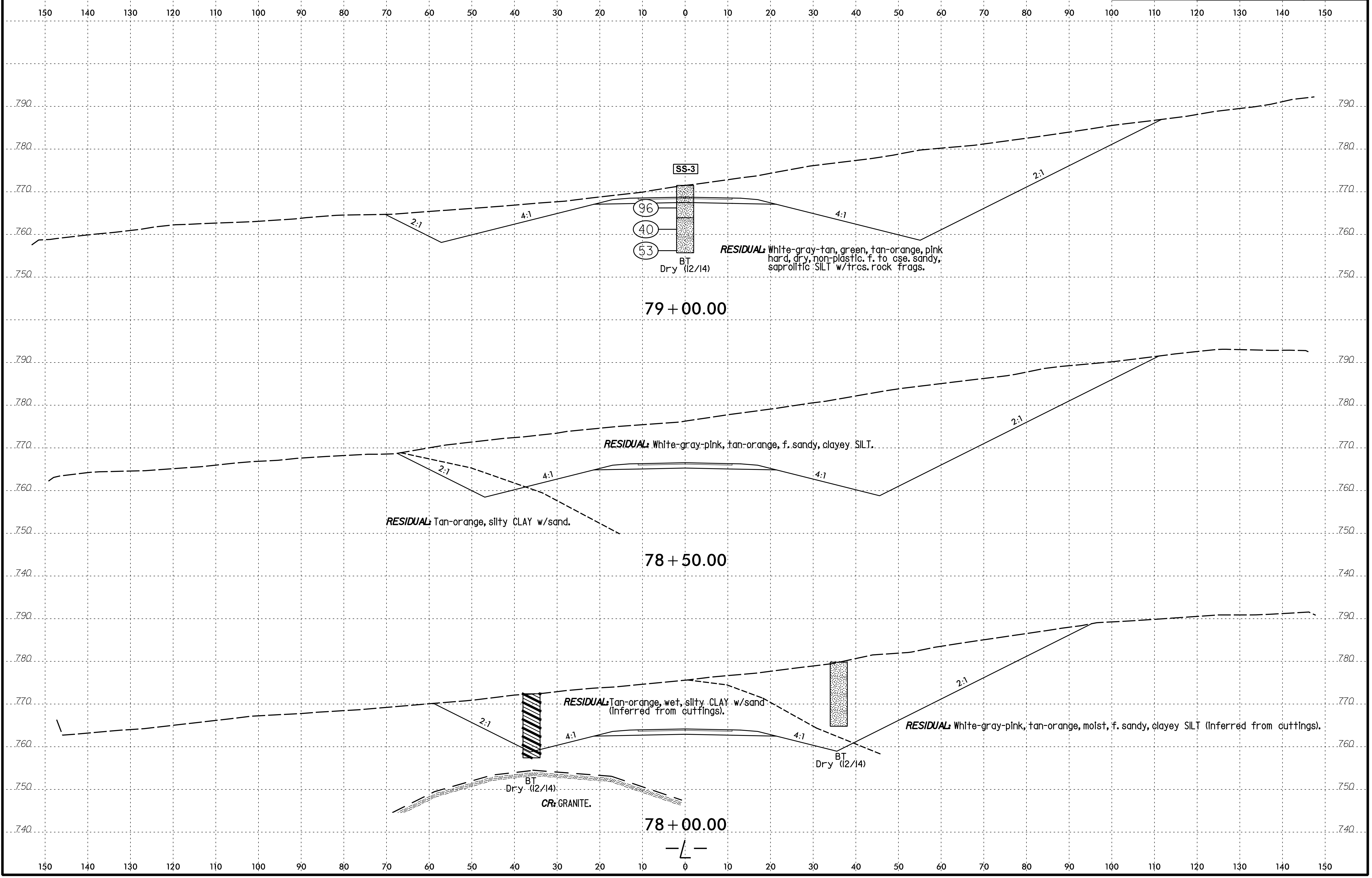
77+00.00



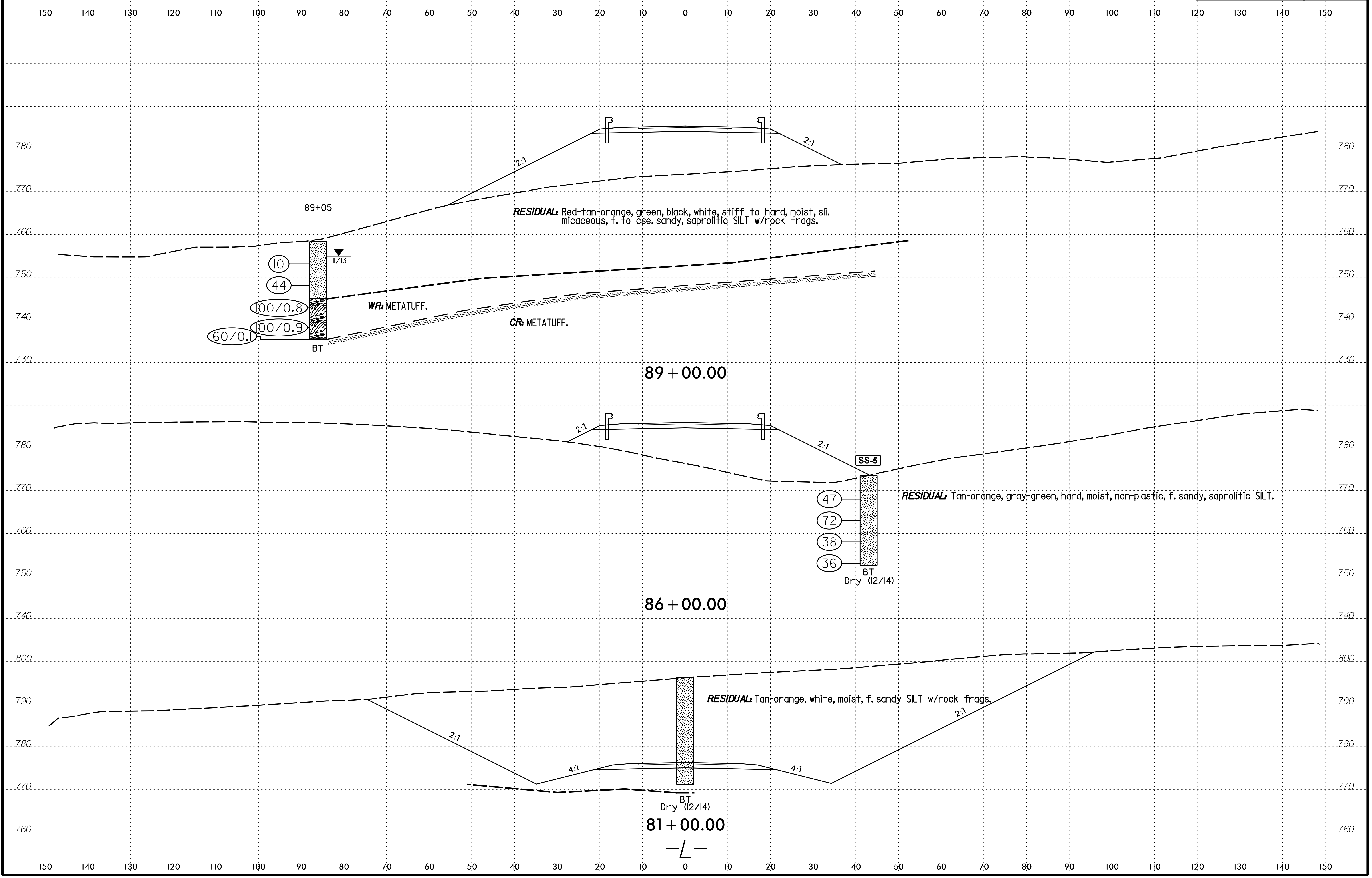
76+00.00

-L-

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	W-5516	32

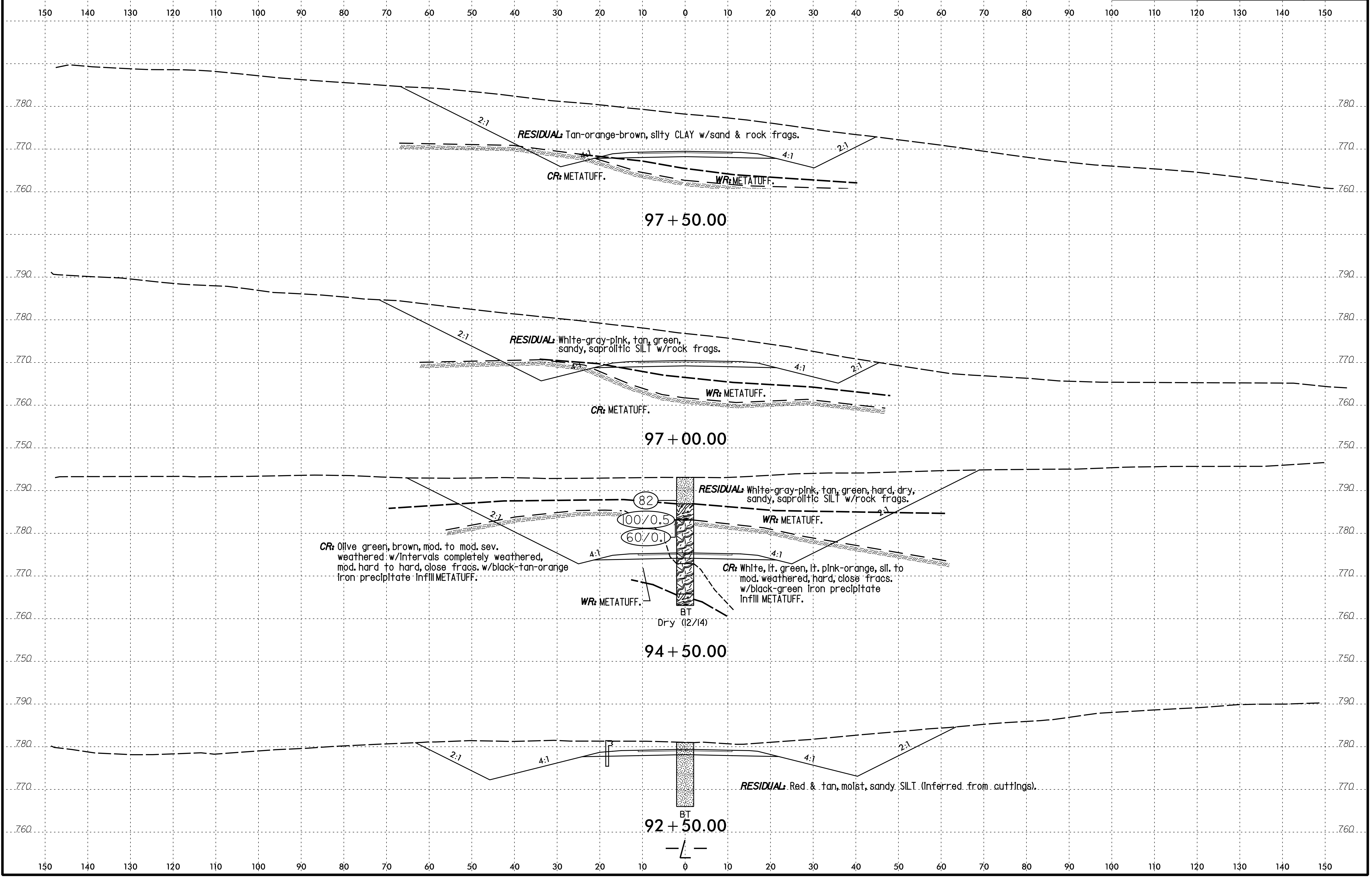


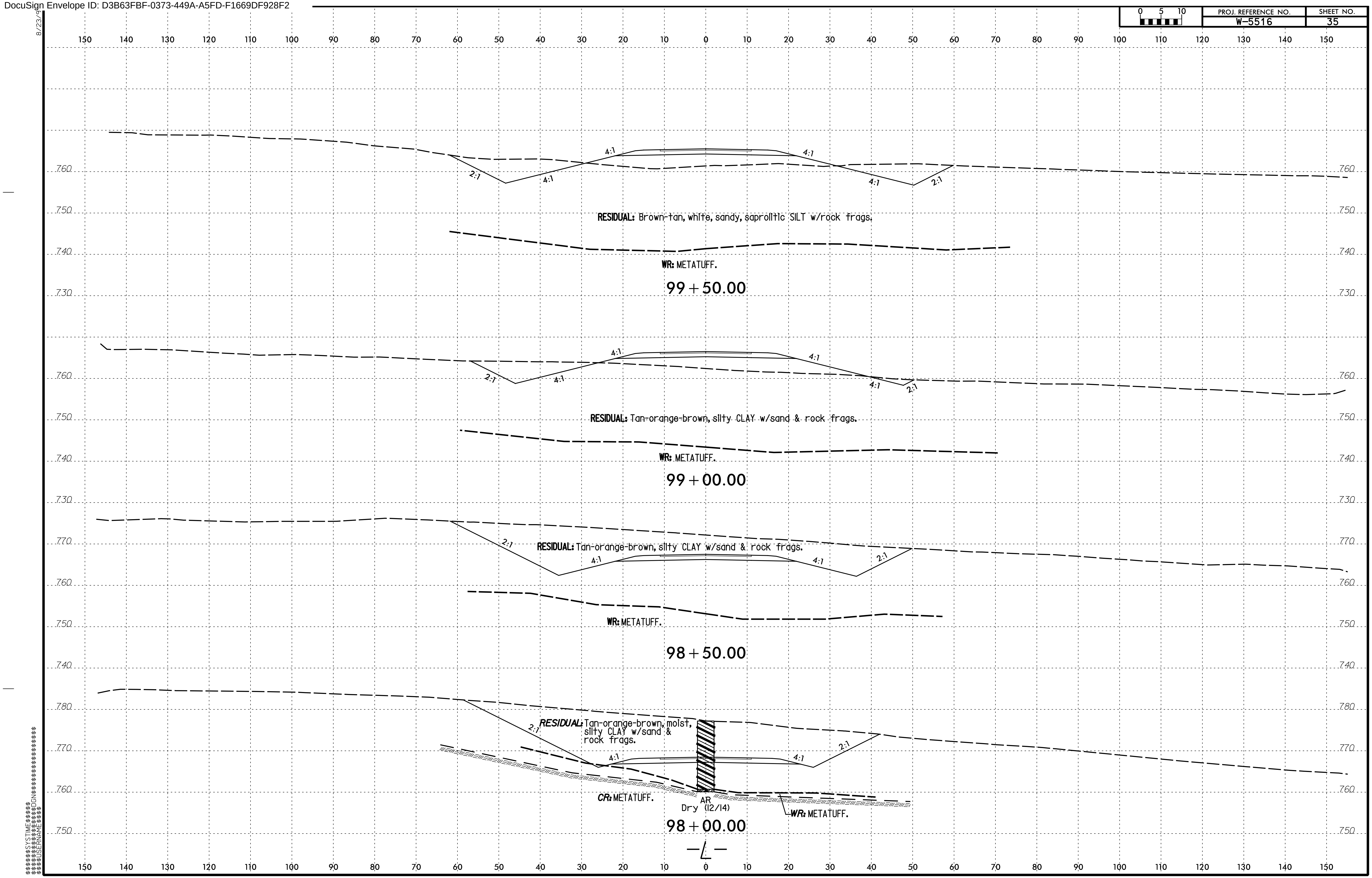
PROJ. REFERENCE NO.	SHEET NO.
W-5516	33



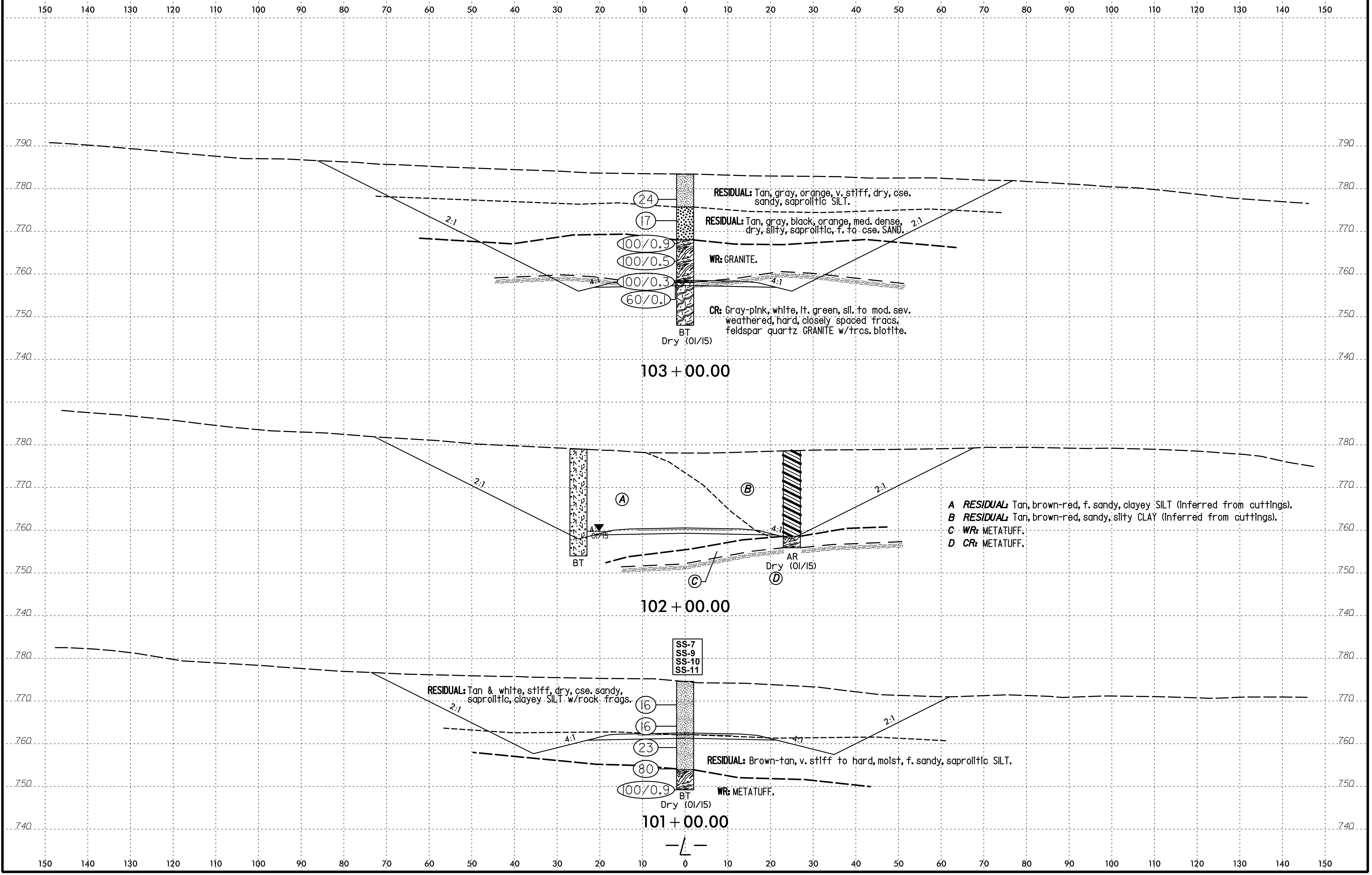
$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	W-5516	34

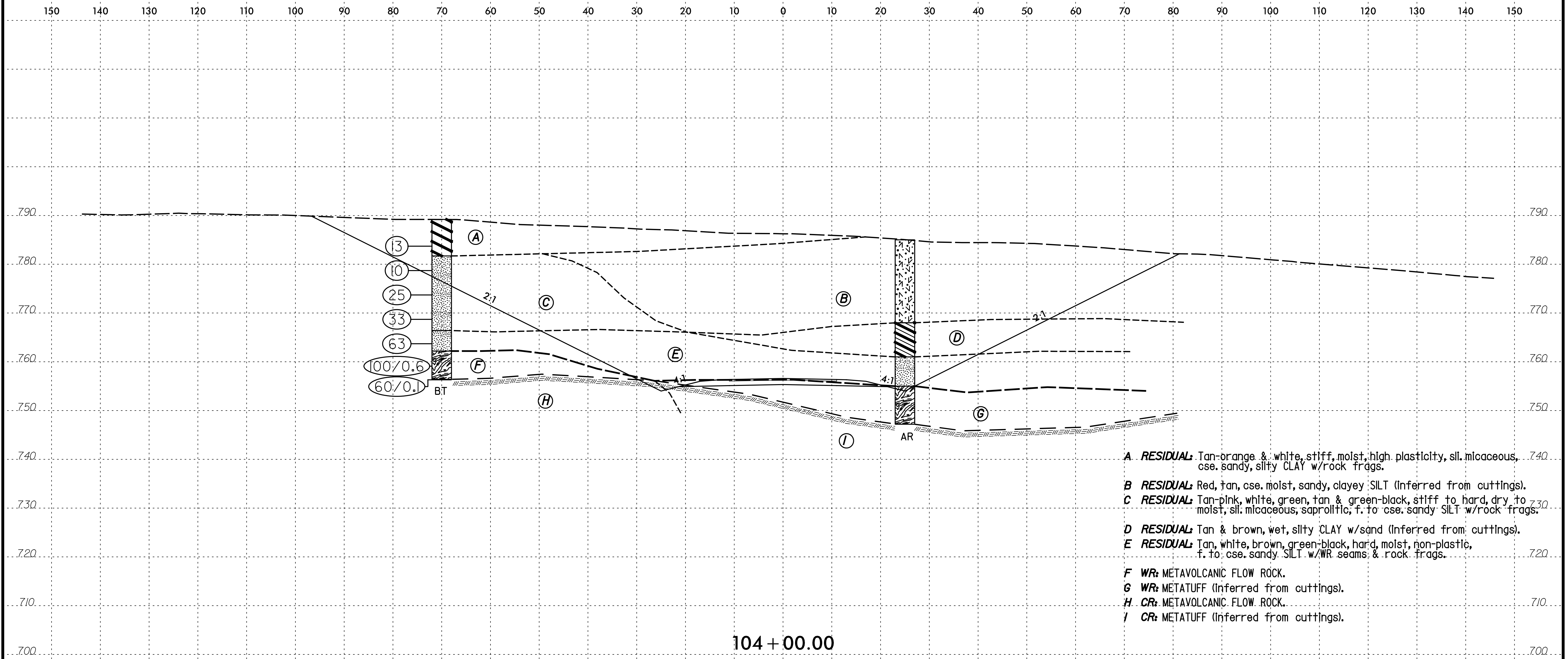



0 5 10
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
760
750
740
730
770
780
4:1
2:1
RESIDUAL: Brown-tan, white, sandy, saprolitic SILT w/rock frags.
WR: METATUFF.
99+50.00
RESIDUAL: Tan-orange-brown, silty CLAY w/sand & rock frags.
WR: METATUFF.
99+00.00
RESIDUAL: Tan-orange-brown, silty CLAY w/sand & rock frags.
WR: METATUFF.
98+50.00
RESIDUAL: Tan-orange-brown, moist, silty CLAY w/sand & rock frags.
CR: METATUFF.
AR
Dry (12/14)
WR: METATUFF.
98+00.00
-L-
8/23/
$$$$SYSTIME$$$$
$$$$DGN$$$$
$$$$USERNAME$$$$

PROJ. REFERENCE NO.	SHEET NO.
W-5516	36



PROJ. REFERENCE NO.	SHEET NO.
W-5516	37



A **RESIDUAL:** Tan-orange & white, stiff, moist, high plasticity, sli. micaceous, cse. sandy, silty CLAY w/rock frags.

B **RESIDUAL:** Red, tan, cse. moist, sandy, clayey SILT (inferred from cuttings).

C **RESIDUAL:** Tan-pink, white, green, tan & green-black, stiff to hard, dry to moist, sli. micaceous, saprolitic, f. to cse. sandy SILT w/rock frags.

D **RESIDUAL:** Tan & brown, wet, silty CLAY w/sand (inferred from cuttings).

E **RESIDUAL:** Tan, white, brown, green-black, hard, moist, non-plastic, f. to cse. sandy SILT w/WR seams & rock frags.

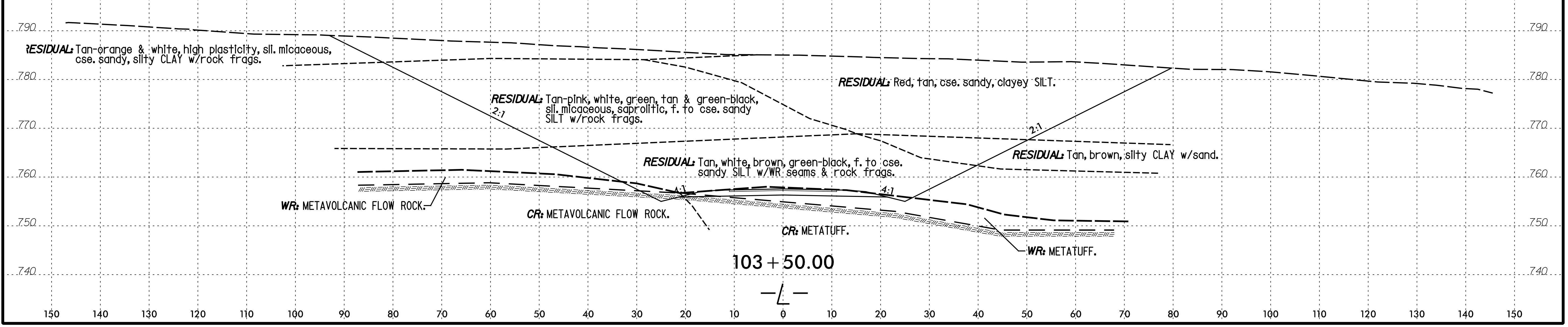
F **WR:** METAVOLCANIC FLOW ROCK.

G **WR:** METATUFF (inferred from cuttings).

H **CR:** METAVOLCANIC FLOW ROCK.

I **CR:** METATUFF (inferred from cuttings).

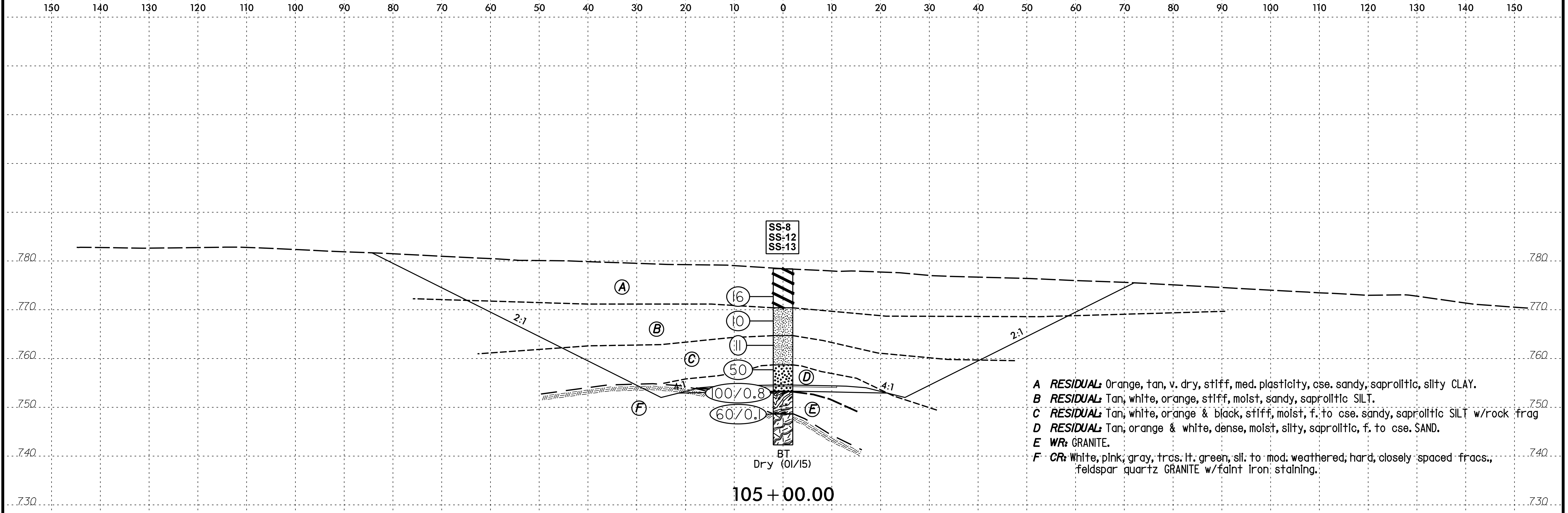
104 + 00.00



103 + 50.00

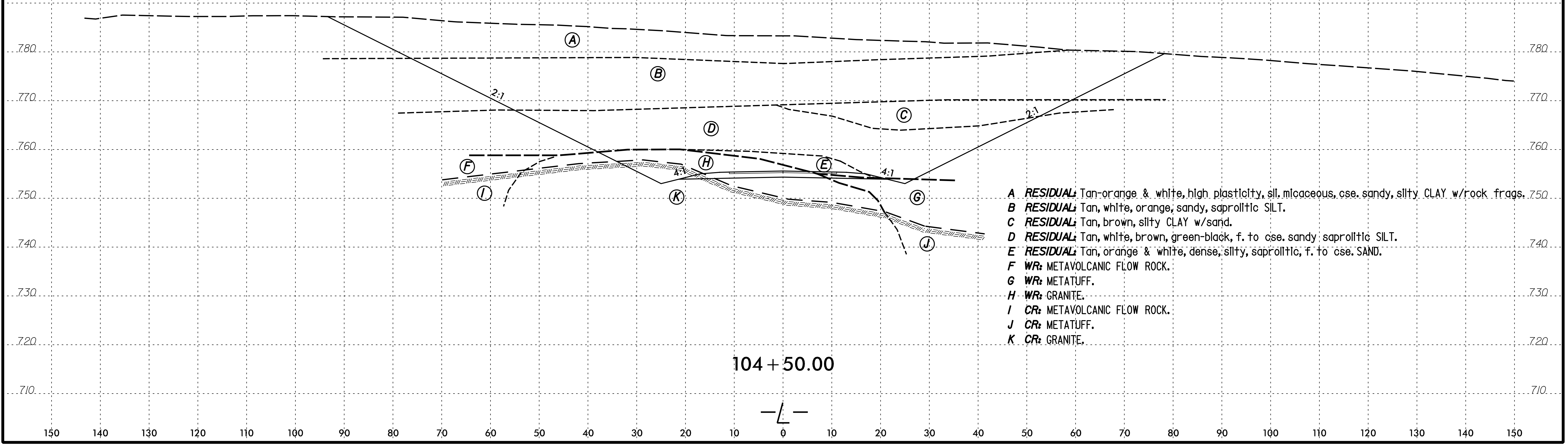
-L-

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	W-5516	38



A ***RESIDUAL:*** Orange, tan, v. dry, stiff, med. plasticity, cse. sandy, saprolitic, silty CLAY.
B ***RESIDUAL:*** Tan, white, orange, stiff, moist, sandy, saprolitic SILT.
C ***RESIDUAL:*** Tan, white, orange & black, stiff, moist, f. to cse. sandy, saprolitic SILT w/rock frag
D ***RESIDUAL:*** Tan, orange & white, dense, moist, silty, saprolitic, f. to cse. SAND.
E ***WR:*** GRANITE.
F ***CR:*** White, pink, gray, trcs. lt. green, sli. to mod. weathered, hard, closely spaced fracs., feldspar quartz GRANITE w/faint iron staining.

105 + 00.00



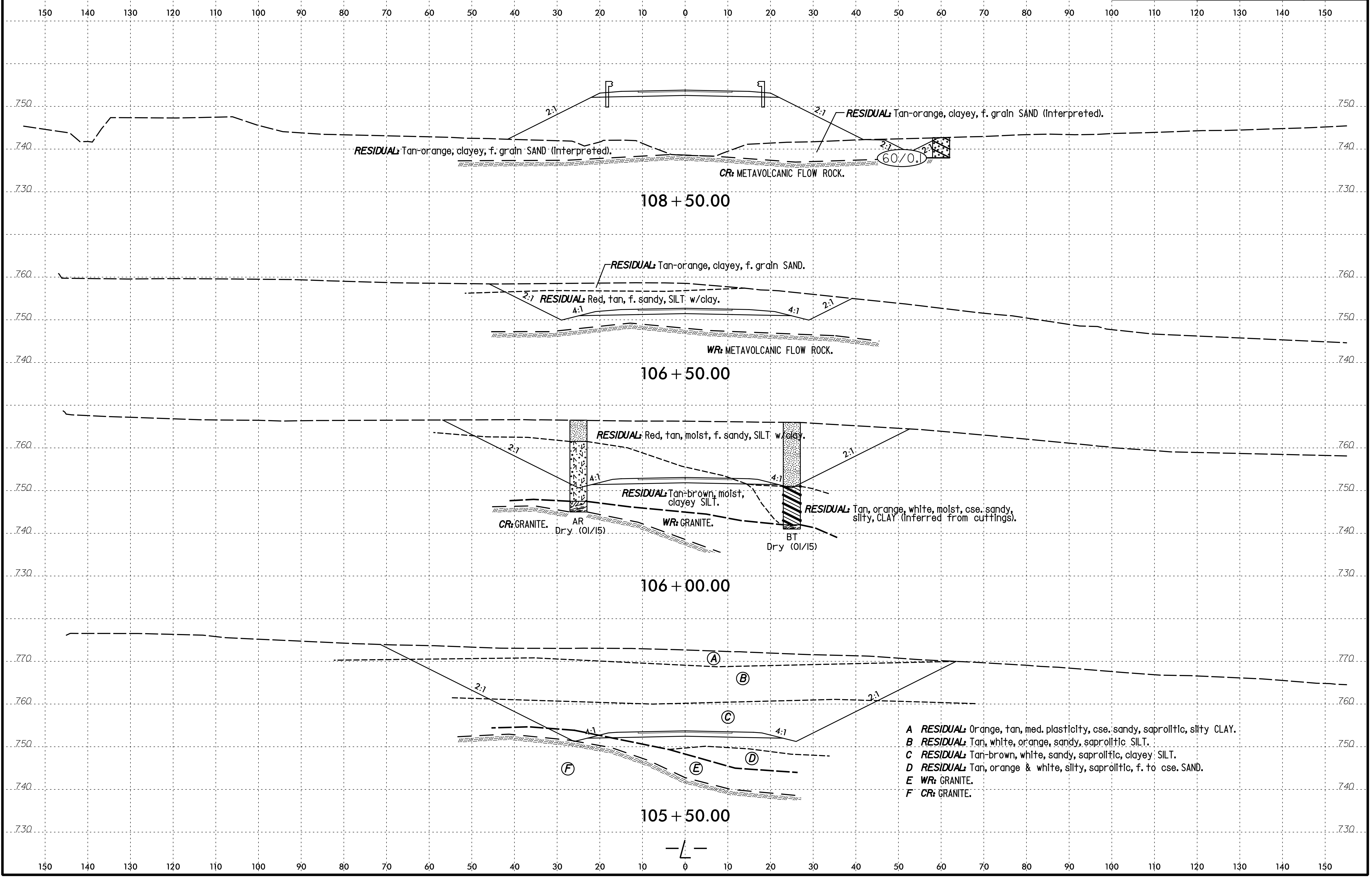
A ***RESIDUAL:*** Tan-orange & white, high plasticity, sli. micaceous, cse. sandy, silty CLAY w/rock frags.
B ***RESIDUAL:*** Tan, white, orange, sandy, saprolitic SILT.
C ***RESIDUAL:*** Tan, brown, silty CLAY w/sand.
D ***RESIDUAL:*** Tan, white, brown, green-black, f. to cse. sandy saprolitic SILT.
E ***RESIDUAL:*** Tan, orange & white, dense, silty, saprolitic, f. to cse. SAND.
F ***WR:*** METAVOLCANIC FLOW ROCK.
G ***WR:*** METATUFF.
H ***WR:*** GRANITE.
I ***CR:*** METAVOLCANIC FLOW ROCK.
J ***CR:*** METATUFF.
K ***CR:*** GRANITE.

104 + 50.00

-L-

8/23/9

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	W-5516	39



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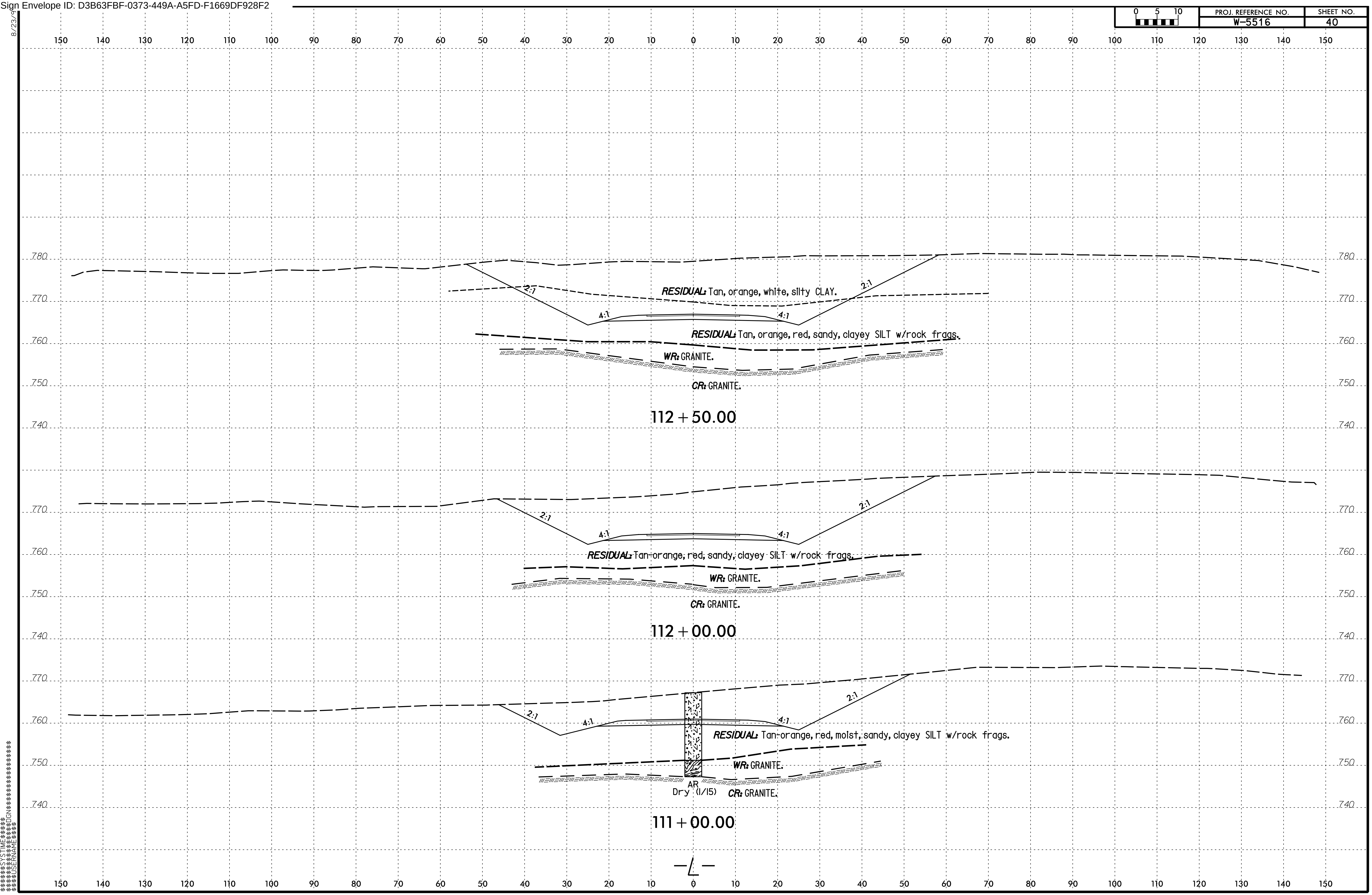
PROJ. REFERENCE NO.	SHEET NO.
W-5516	40



8/23/9

$$$$SYSTIME$$$$
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$$$$USERNAME$$$$

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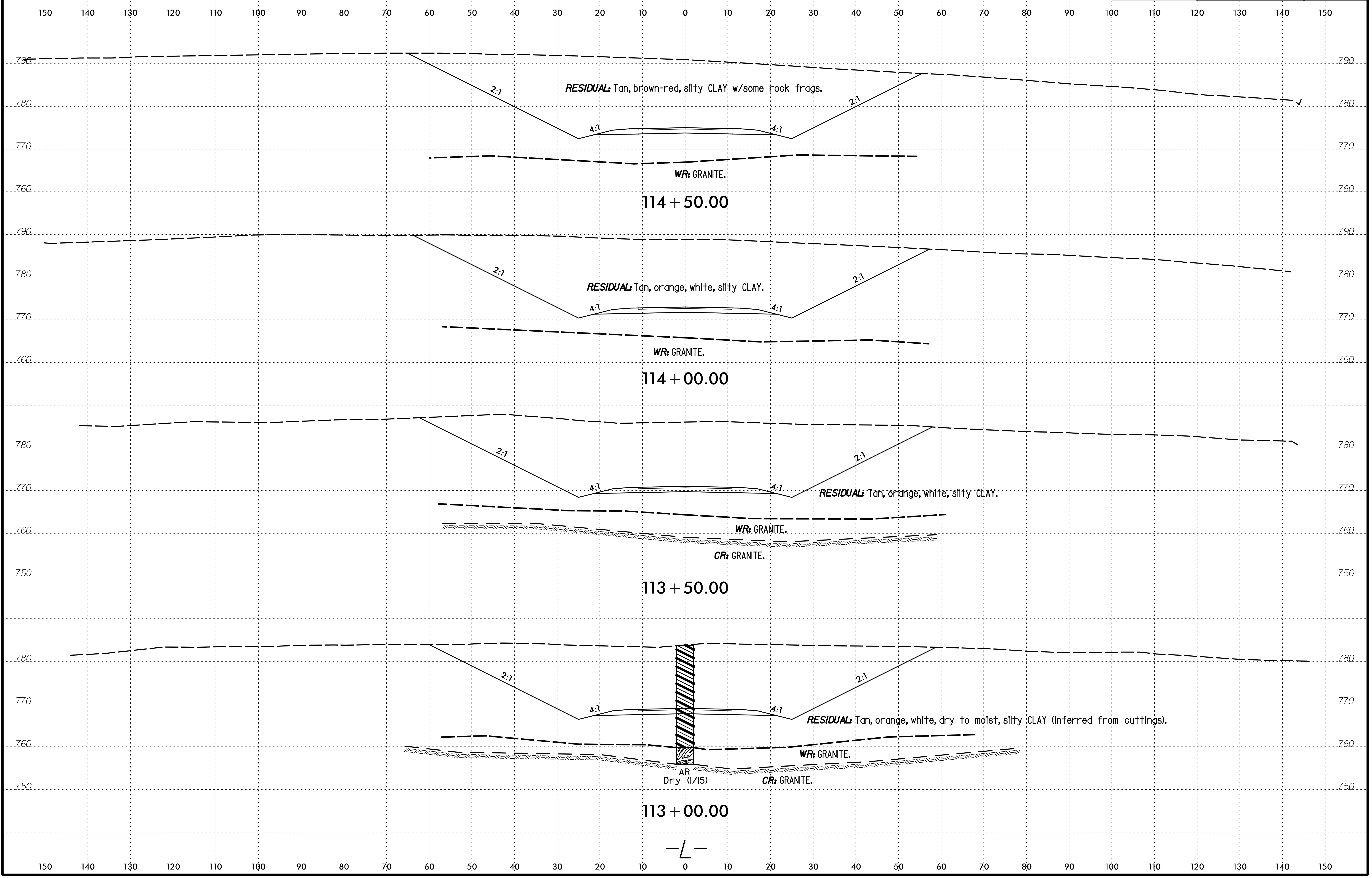
8/23/9

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	W-5516	41



$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

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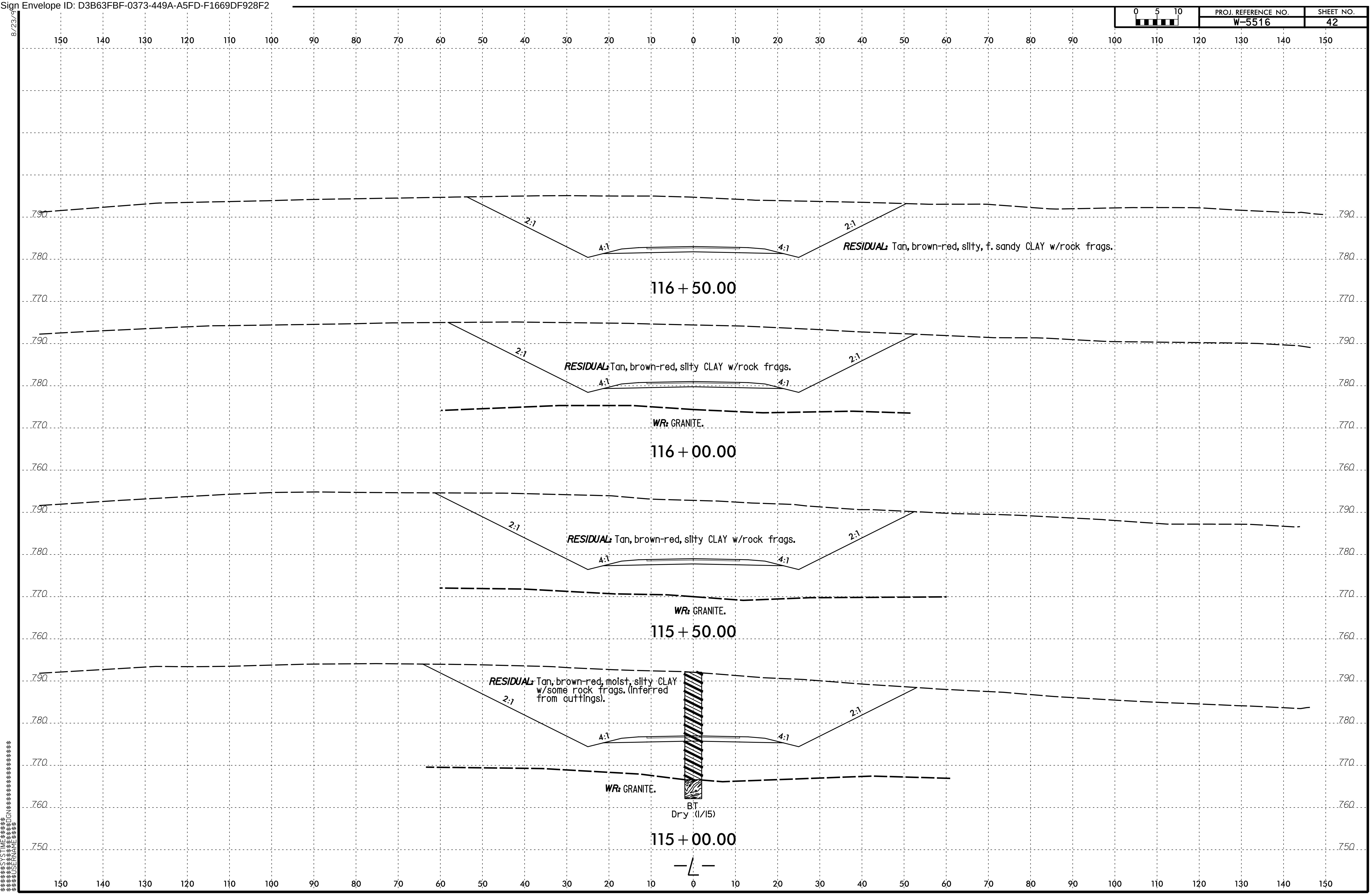
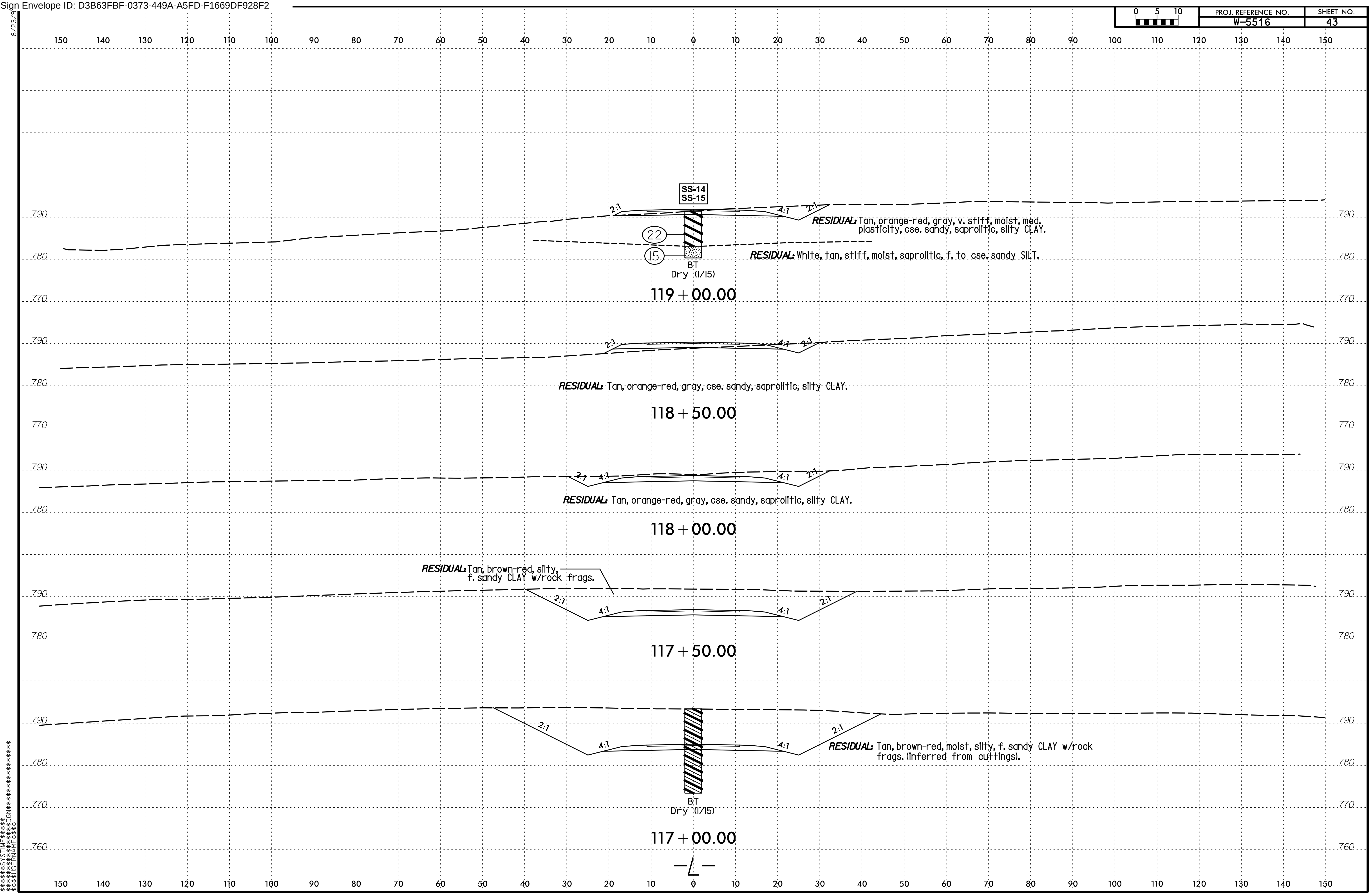
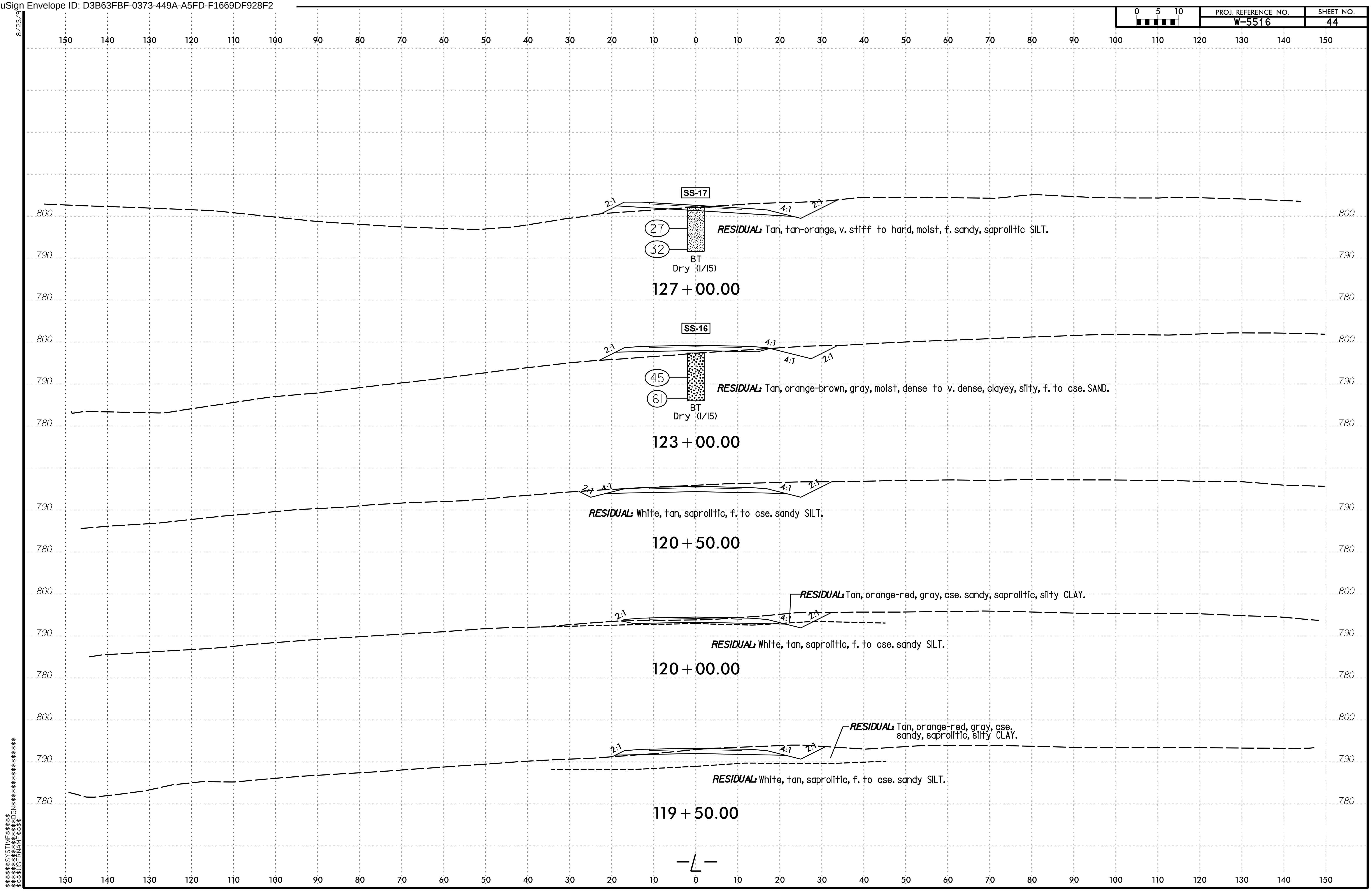
PROJ. REFERENCE NO.	SHEET NO.
W-5516	42



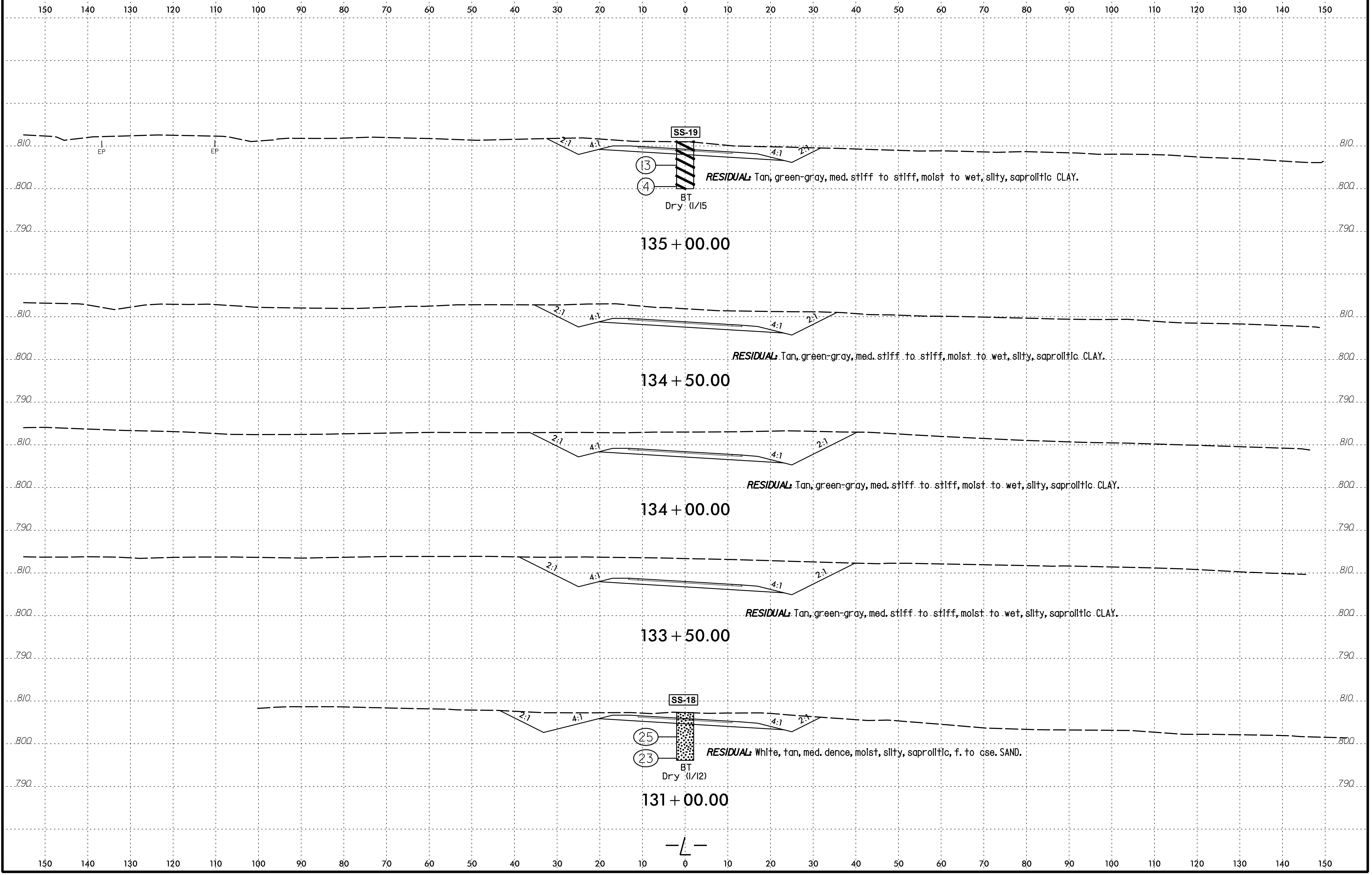
PROJ. REFERENCE NO.	SHEET NO.
W-5516	43



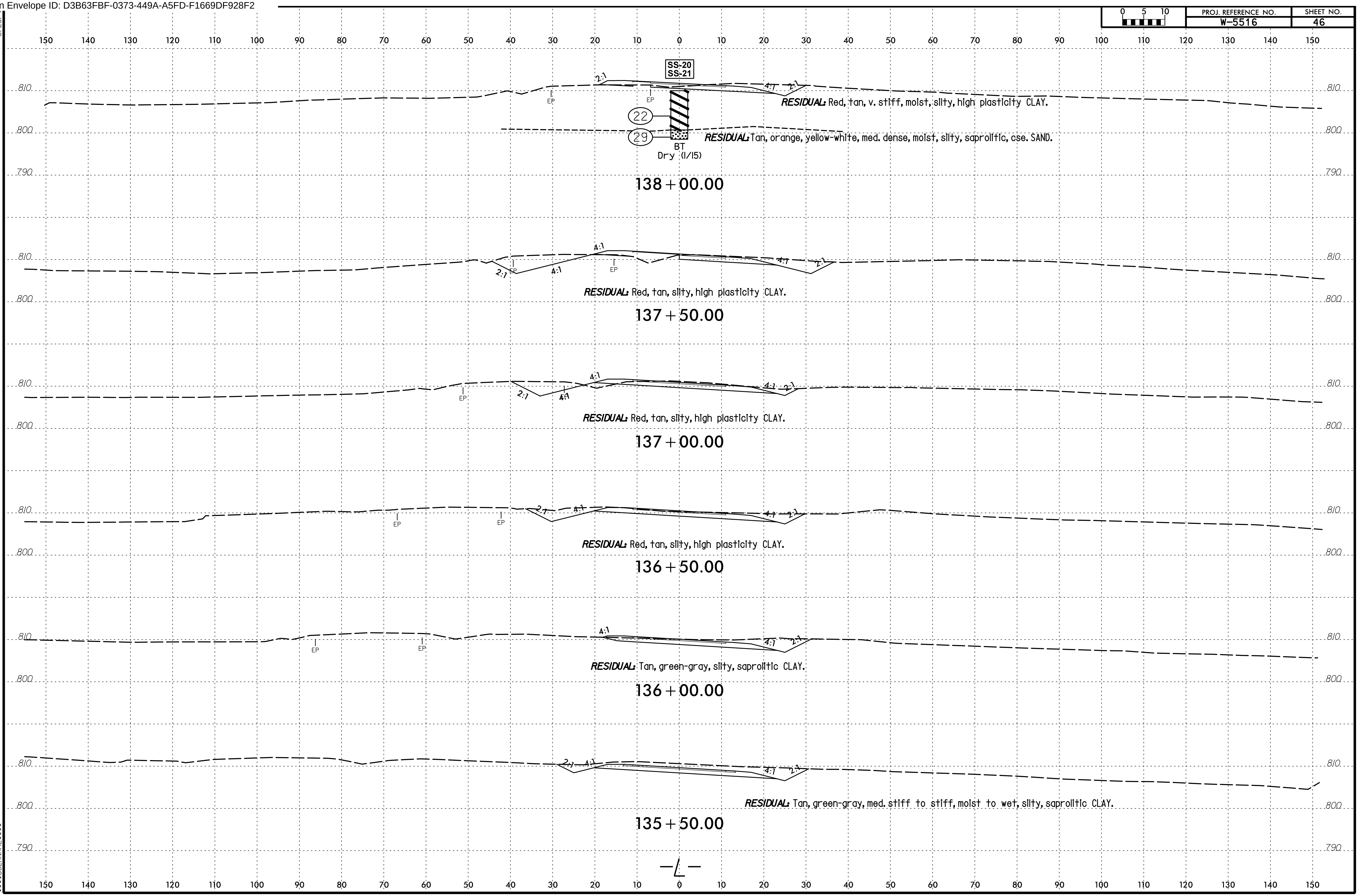


0 5 10
8/23/9
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
800
790
780
SS-17
2:1
4:1
2:1
27
32
RESIDUAL: Tan, tan-orange, v. stiff to hard, moist, f. sandy, saprolitic SILT.
BT
Dry (1/15)
127 + 00.00
SS-16
45
61
RESIDUAL: Tan, orange-brown, gray, moist, dense to v. dense, clayey, silty, f. to cse. SAND.
BT
Dry (1/15)
123 + 00.00
RESIDUAL: White, tan, saprolitic, f. to cse. sandy SILT.
120 + 50.00
RESIDUAL: Tan, orange-red, gray, cse. sandy, saprolitic, silty CLAY.
RESIDUAL: White, tan, saprolitic, f. to cse. sandy SILT.
120 + 00.00
RESIDUAL: Tan, orange-red, gray, cse. sandy, saprolitic, silty CLAY.
RESIDUAL: White, tan, saprolitic, f. to cse. sandy SILT.
119 + 50.00
-L-
$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJ. REFERENCE NO.	SHEET NO.
W-5516	45



PROJ. REFERENCE NO.	SHEET NO.
W-5516	46



RESIDUAL: Red, tan, v. stiff, moist, silty, high plasticity CLAY.

RESIDUAL: Tan, orange, yellow-white, med. dense, moist, silty, saprolitic, cse. SAND.

138 + 00.00

RESIDUAL: Red, tan, silty, high plasticity CLAY.

137 + 50.00

RESIDUAL: Red, tan, silty, high plasticity CLAY.

137 + 00.00

RESIDUAL: Red, tan, silty, high plasticity CLAY.

136 + 50.00

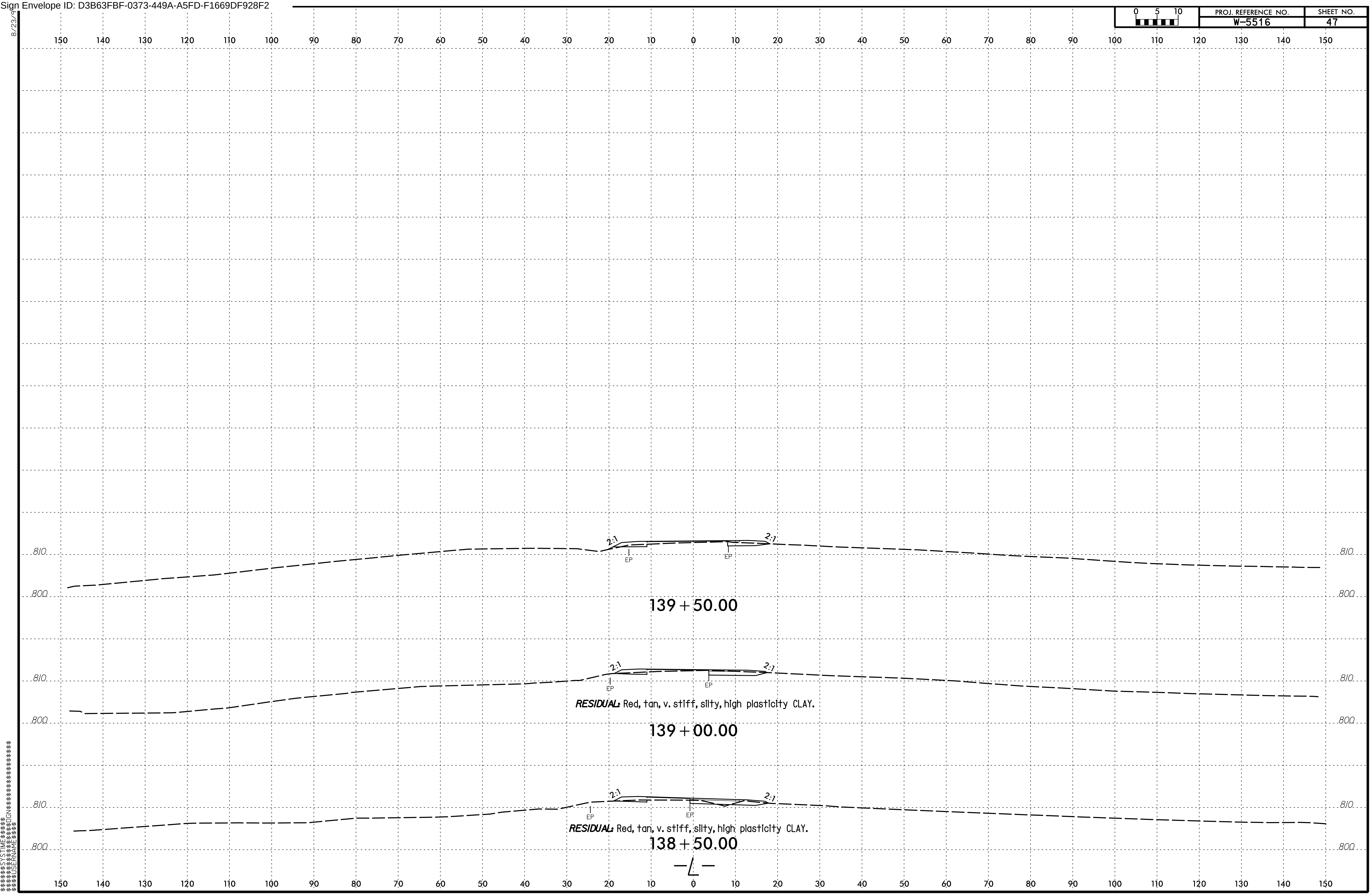
RESIDUAL: Tan, green-gray, silty, saprolitic CLAY.

136 + 00.00

RESIDUAL: Tan, green-gray, med. stiff to stiff, moist to wet, silty, saprolitic CLAY.

135 + 50.00

PROJ. REFERENCE NO.	SHEET NO.
W-5516	47



8/23/9

$$$$SYSTIME$$$$
$$$$DGN$$$$
$$$$USERNAME$$$$

HDR | ICA

PROJECT REFERENCE NO.	SHEET NO.
W-5516	48
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DGN

REVISIONS

$$$$$$SYSTIME$$$$$
$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

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	CL	73+00	4.4-5.9	A-7-5(36)	67	29	1.7	4.8	39.9	53.6	100.0	98.9	95.5	32.3	-
SS-2	CL	73+00	9.4-10.9	A-4(0)	27	2	39.8	19.9	28.3	12	92.0	64.0	42.6	10.6	-
SS-3	CL	79+00	9.3-10.8	A-4(1)	34	9	23.7	22.9	35.3	18	68.1	55.5	41.9	14.7	-
SS-4	CL	77+00	9.4-10.9	A-4(3)	32	2	2	19.6	67.5	10.9	99.9	98.9	86.1	17.8	-
SS-5	43' RT	86+00	14.5-16.0	A-4(4)	38	5	12.7	28	45.3	14	99.9	95.1	67.8	25.4	-
SS-6	CL	73+00	24.4-25.9	A-2-6(0)	28	12	48	15.6	16.4	20	46.4	28.6	18.9	15.0	-
SS-7	CL	101+00	4.5-6.0	A-4(4)	39	9	25	15.9	33.1	26.1	89.2	70.5	56.1	13.9	-
SS-8	CL	105+00	4.7-6.2	A-7-5(13)	54	23	27.3	8.6	24	40.2	91.0	69.3	60.3	19.3	-
SS-9	CL	101+00	9.5-11.0	A-4(1)	37	10	29.6	21.7	23.8	25	70.5	54.5	37.9	18.3	-
SS-10	CL	101+00	14.5-16.0	A-4(4)	40	4	8.6	23.5	48.7	19.2	94.6	89.9	70.9	25.3	-
SS-11	CL	101+00	19.5-21.0	A-4(5)	39	6	5.5	26.8	58.6	9.1	100.0	97.4	77.4	14.5	-
SS-12	CL	105+00	9.7-11.2	A-4(4)	39	6	14.5	21.4	40	24	89.5	79.8	63.4	26.4	-
SS-13	CL	105+00	19.7-21.2	A-2-4(0)	25	1	41	27.1	24	8	92.4	64.5	34.0	11.2	-
SS-14	CL	119+00	4.6-6.1	A-7-6(4)	51	24	52.7	11	19.2	17.1	93.9	50.2	36.8	22.9	-
SS-15	CL	119+00	9.6-11.1	A-4(0)	35	4	33.1	22.12	30.9	14	85.3	64.4	42.1	17.4	-
SS-16	CL	123+00	9.9-11.4	A-2-4(0)	22	2	51	23.2	17.9	7.9	91.4	54.3	27.8	10.5	-
SS-17	CL	127+00	9.0-10.5	A-4(3)	35	4	5.7	30.8	51.9	11.7	99.6	96.9	73.2	16.5	-
SS-18	62' LT	32+17	4.1-5.6	A-2-6(0)	30	12	29.2	30.1	20.7	20	71.6	57.4	35.0	18.7	-
SS-19	CL	135+00	9.5-11.0	A-7-5(17)	54	13	3.1	12.6	68.1	16.2	100.0	98.0	89.8	40.8	-
SS-20	CL	138+00	5.0-6.5	A-7-5(32)	63	29	6.1	5.5	26.9	61.4	99.8	95.4	89.8	28.6	-
SS-21	CL	138+00	10.0-11.5	A-2-4(0)	28	1	52.8	19.4	19.9	7.9	95.8	55.1	31.5	11.7	-
SS-22	80' RT	37+50	4.3-5.8	A-6(6)	33	13	10.2	30.3	30.8	28.7	89.2	84.4	63.2	10.6	-
SS-23	CL	52+00	4.5-6.0	A-7-5(15)	47	15	1.5	28	44.9	25.6	100.0	99.4	83.2	21.2	-
SS-24	CL	48+00	9.9-11.4	A-4(0)	30	NP	21	44.2	28.8	5.9	96.2	82.5	46.2	12.3	-
SS-25	34' RT	44+00	9.8-11.3	A-4(3)	38	6	4.6	51.2	34.3	9.9	99.8	98.4	58.2	22.2	-

ICA
Engineering

May 27, 2015

WBS NUMBER:	44105.1.FD1
TIP NUMBER:	W-5516
F.A. NUMBER:	HSIP-1221(18)
COUNTY:	Rowan
DESCRIPTION:	Realignment of Old Beatty Ford Road from west of Bostian Rd. Intersection to Lentz Road

SUBJECT: **Geotechnical Report – Design and Construction Recommendations**

HDR | ICA Engineering, Inc. has completed the subsurface investigation for this project and submits the following recommendations.

I. SLOPE AND EMBANKMENT STABILITY

A. Slope Design

It is recommended that all fill embankment be constructed at a ratio of 2:1 (H:V) or flatter. It is recommended that all cut slopes be constructed at a ratio of 2:1 (H:V).

B. Undercut

A quantity of 150 cubic yards of shallow undercut is recommended for inclusion in the contract as a contingency item, to be used at the discretion of the Engineer.

C. Geotextile for Soil Stabilization

A quantity of 150 square yards of geotextile for soil stabilization is recommended for inclusion in the contract as a contingency item, to be used at the discretion of the Engineer.

II. SUBGRADE STABILITY

A. Undercut for Subgrade Stability

Soils were encountered consisting of highly plastic clays with plastic indices (PI) greater than 25. These soils could adversely impact the proposed pavement structure and should be undercut. These areas are shown by a double hatch symbol of the cross sections. The depth of undercut should be up to 3 feet or to suitable soil, whichever is less.

LINE	STATION	OFFSET (FEET)
-L-	73+50 to 74+00	CL to 22 RT
-L-	134+00 to 139+00	20 LT to 23 RT

It is recommended that 1,600 cubic yards of undercut be included in the project contract for subgrade stability. The material may be used in embankment construction at the discretion of the Engineer. An additional quantity of 200 cubic yards of undercut is recommended for inclusion in the contract as a contingency item, to be used at the discretion of the Engineer.

B. Aggregate Subgrade

A quantity of 150 cubic yards of shallow undercut is recommended for inclusion in the contract as a contingency item, to be used at the discretion of the Engineer.

A quantity of 300 tons of Class IV material is recommended for inclusion in the contract as a contingency item, to be used at the discretion of the Engineer.

A quantity of 300 square yards of Geotextile for Soil Stabilization is recommended for inclusion in the contract item, to be used at the discretion of the Engineer.

C. Geotextile for Soil Stabilization

It is recommended that 1,600 square yards of geotextile be included in the project contract for subgrade stability at the following locations:

LINE	STATION	OFFSET (FEET)
-L-	73+50 to 74+00	CL to 22 RT
-L-	134+00 to 139+00	14 LT to 14 RT

A quantity of 200 square yards of geotextile for soil stabilization should be included in the project contract as a contingency item, to be used at the discretion of the Engineer.

III. BORROW SPECIFICATIONS

A. Borrow Criteria

Common borrow for embankment construction to subgrade shall meet Statewide criteria outlined in the Standard Specifications, Article 1018-2(A).

B. Select Granular Material

Select Granular Material for embankment construction on geotextile for soil stabilization shall meet the criteria outlined in Standard Specifications, Article 1016-3 Class II or III.

A quantity of 300 cubic yards of Select Granular Material should be included in the project contract as a contingency item, to be used at the discretion of the Engineer.

C. Shrinkage Factor

Recommend a 20 percent shrinkage factor be used for earthwork calculations.

IV. MISCELLANEOUS

A. Reduction of Unclassified Excavation – Clearing and Grubbing

Given the amount of excavation on this project, removal of topsoil, rootmats, stumps, shrubs, trees, and other ground cover is anticipated to be significant to include as a reduction in the excavation quantity. It is recommended that 12,140 cubic yards of excavation quantity be reduced in the project contract.

B. Reduction of Unclassified Excavation – Unsuitable Unclassified Excavation

Soils were encountered consisting of highly plastic clays with plastic indices (PI) greater than 35 and other characteristics unsuitable for construction (i.e. plastic limits equally moisture contents). It is recommended that 1,650 cubic yards of excavation quantity be reduced in the project contract.

C. Unclassified Excavation – Unsuitable Waste

Soils were encountered consisting of highly plastic clays with plastic indices (PI) greater than 35.

LINE	STATION	OFFSET (FEET)
-L-	72+00 to 74+00	70 LT to 70 RT
-L-	134+00 to 138+50	40 LT to 40 RT

D. Rock Blasting

Crystalline Rock (Felsic Metavolcanic Rock) is present within six feet of proposed grade at the following locations and may require blasting. It is recommended that 11,125 cubic yards be included in the project contract at the following locations:

LINE	STATION	OFFSET (FEET)
-L-	65+50 to 67+50	42 LT to 30 RT
-L-	73+00 to 77+50	47 LT to 42 RT
-L-	94+50 to 98+00	45 LT to 35 RT
-L-	103+00 to 105+00	34 LT to 32 RT

The crystalline rock encountered on this project is shown on cross-sections within the inventory report. Refer to Section 220 of the 2012 Standard Specifications for rock blasting.

E. Rock Slopes

Rocks cut slopes are anticipated at the following locations:

LINE	STATION	OFFSET (FEET)
-L-	65+00 to 67+50	42 LT to 30 RT
-L-	73+00 to 78+00	47 LT to 42 RT
-L-	94+00 to 98+00	45 LT to 35 RT
-L-	102+50 to 105+50	34 LT to 32 RT

Prepared by,

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

DocuSigned by:
Kenneth R. Bussey, Jr.
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6/8/2015

Kenneth R. Bussey, Jr., PE
Project Engineer

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
Summary of Quantities

WBS Number: 44105.1.FD
TIP Number: W-5516
Description: Old Beatty Ford Rd. from west of Bostian Rd. intersection to Lentz Rd.
County: Rowan
Field Office: HDR | ICA
Project Engineer: Kenneth R. Bussey, Jr.
Project Geologist: Mike Gragg

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
0036000000-E	Undercut Excavation	225 - Roadway Excavation	I. B	Contingency	N/A	N/A	150	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. A	-L-	73+50.00	74+00.00	50	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. A	-L-	134+00.00	139+00.00	1,550	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. A	Contingency	N/A	N/A	200	CY
Total Quantity of Undercut Excavation =							**1,950**	**CY**
0195000000-E	Select Granular Material	265 - Select Granular Material	III. B	Contingency	N/A	N/A	300	CY
Total Quantity of Select Granular Material =							**300**	**CY**
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	I. C	Contingency	N/A	N/A	150	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. B	Contingency	N/A	N/A	300	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. C	-L-	73+50.00	74+00.00	50	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. C	-L-	134+00.00	139+00.00	1,550	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. C	Contingency	N/A	N/A	200	SY
Total Quantity of Geotextile for Soil Stabilization =							**2,250**	**SY**
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. B	Contingency	N/A	N/A	150	CY
Total Quantity of Shallow Undercut =							**150**	**CY**
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. B	Contingency	N/A	N/A	300	TON
Total Quantity of Class IV Subgrade Stabilization =							**300**	**TON**

These Items Only Impact Earthwork Totals								
N/A	Loss Due to Clearing & Grubbing	200 - Clearing and Grubbing	IV. A	N/A	N/A	N/A	12,140	CY
N/A	Shrinkage Factor	235 - Embankments	III. C	N/A	N/A	N/A	20	%
N/A	Unclassified Excavation - Unsuitable Waste	225 - Roadway Excavation	IV. B	N/A	N/A	N/A	1,650	CY

PROJECT: 44105

REFERENCE: W-5516

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5516	1	12

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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LINE	*STATION*	*PROFILE*
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CROSS SECTIONS

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *Rowan*

PROJECT DESCRIPTION *Old Beatty Ford Road*
West of Bostian Road Intersection to Lentz Road

RECOMMENDATIONS

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

Z. BRUCE
A. WILDER
B. MASSEY

INVESTIGATED BY *M. GRAGG*
DRAWN BY *T. STIVERS*
CHECKED BY *K. BUSSEY*
SUBMITTED BY *HDR | ICA*
DATE *APRIL 2015*

SEAL 1413
D. MICHAEL GRAGG

DocuSigned by:
D. Michael Gragg 6/8/2015
SIGNATURE DATE
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SEAL 038206
KENNETH R. BUSSEY, JR.

DocuSigned by:
Kenneth R. Bussey, Jr. 6/8/2015
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PROJECT REFERENCE NO.	SHEET NO.
W-5516	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	305	75	2.0	0.25	0.05	0.005
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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — 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	25/025 ⊢▶	DIP & DIP DIRECTION OF ROCK STRUCTURES		
⊢	SOIL SYMBOL	◕ SPT DPT DMT VST PMT	TEST BORING	⬡	SLOPE INDICATOR INSTALLATION
▨	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	⊕	AUGER BORING	◬	CONE PENETROMETER TEST
— — —	INFERRED SOIL BOUNDARY	⌖	CORE BORING	●	SOUNDING ROD
═══	INFERRED ROCK LINE	MW ○	MONITORING WELL	⊕	TEST BORING WITH CORE
▾▾▾	ALLUVIAL SOIL BOUNDARY	△	PIEZOMETER INSTALLATION	⬭—	SPT N-VALUE

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
☐ CME-45C
☒ CME-55
☐ CME-550
☐ VANE SHEAR TEST
☐ PORTABLE HOIST
☐ ____________
☐ ____________

ADVANCING TOOLS:
☐ CLAY BITS
☐ 6" CONTINUOUS FLIGHT AUGER
☒ 8" HOLLOW AUGERS
☐ HARD FACED FINGER BITS
☐ TUNG.-CARBIDE INSERTS
☐ CASING ☐ W/ ADVANCER
☐ TRICONE ______" STEEL TEETH
☐ TRICONE ______" TUNG.-CARB.
☐ CORE BIT
☐ ____________

HAMMER TYPE:
☒ 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: ____________

ELEVATION: ______ FEET

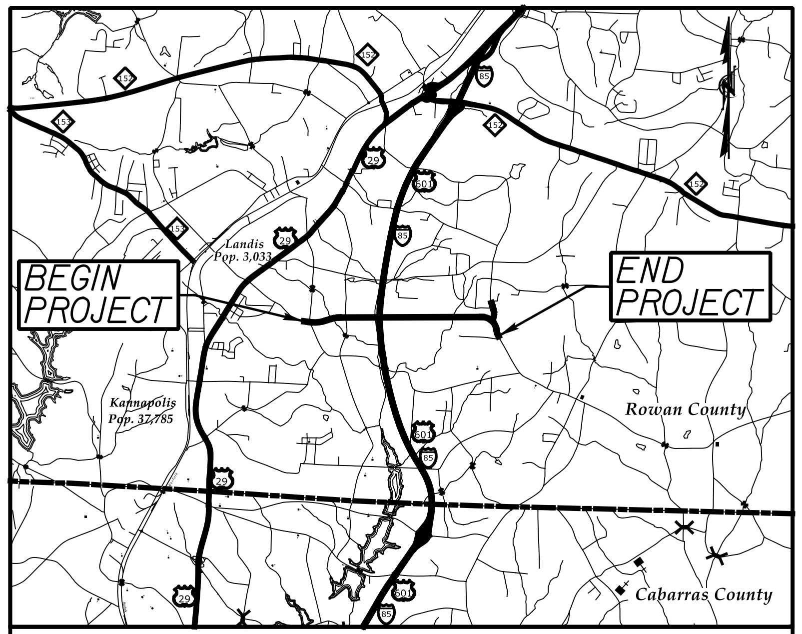
NOTES:

DATE: 8-15-14

TIP PROJECT: W-5516

CONTRACT:

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbols



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

ROW PLANS
rev. OCT. 22, 2014

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5516	3	12

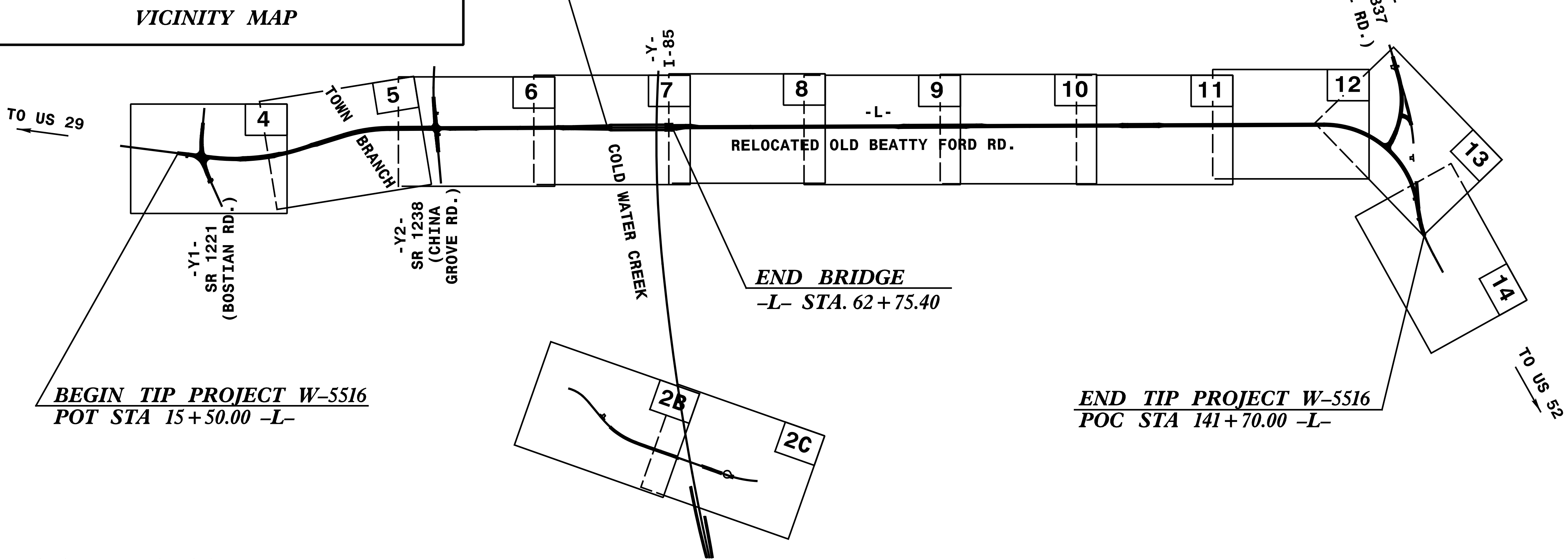
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
44105.1.FD	HSIP-1221(18)	PE

ROWAN COUNTY

LOCATION: OLD BEATTY FORD ROAD FROM WEST OF BOSTIAN ROAD INTERSECTION TO LENTZ ROAD
TYPE OF WORK: GRADING, PAVING, DRAINAGE, TRAFFIC CONTROL, SIGNING PAVEMENT MARKINGS AND STRUCTURES

NAD 83/ NSRS 2007

BEGIN BRIDGE
-L- STA. 57+45.40



END BRIDGE
-L- STA. 62+75.40

BEGIN TIP PROJECT W-5516
POT STA 15+50.00 -L-

END TIP PROJECT W-5516
POC STA 141+70.00 -L-

NCDOT CONTACT: BRETT ABERNATHY, PE
DIVISION 9 PROJECT MANAGER

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

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT =
ADT =
DHV = %
D = %
T = % *
V = 50 MPH
* TTST = DUAL

FUNC CLASS = COLLECTOR
REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT W-5516 = 2.290 MILE
LENGTH STRUCTURE TIP PROJECT W-5516 = 0.100 MILE
TOTAL LENGTH TIP PROJECT W-5516 = 2.390 MILE

Prepared for the North Carolina Department of Transportation In the office of:
HDR | ICA

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
SEPTEMBER 16, 2014

LETTING DATE:
SEPTEMBER 15, 2015

DAVID C. WALLER, PE
PROJECT ENGINEER

HENRY BARE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

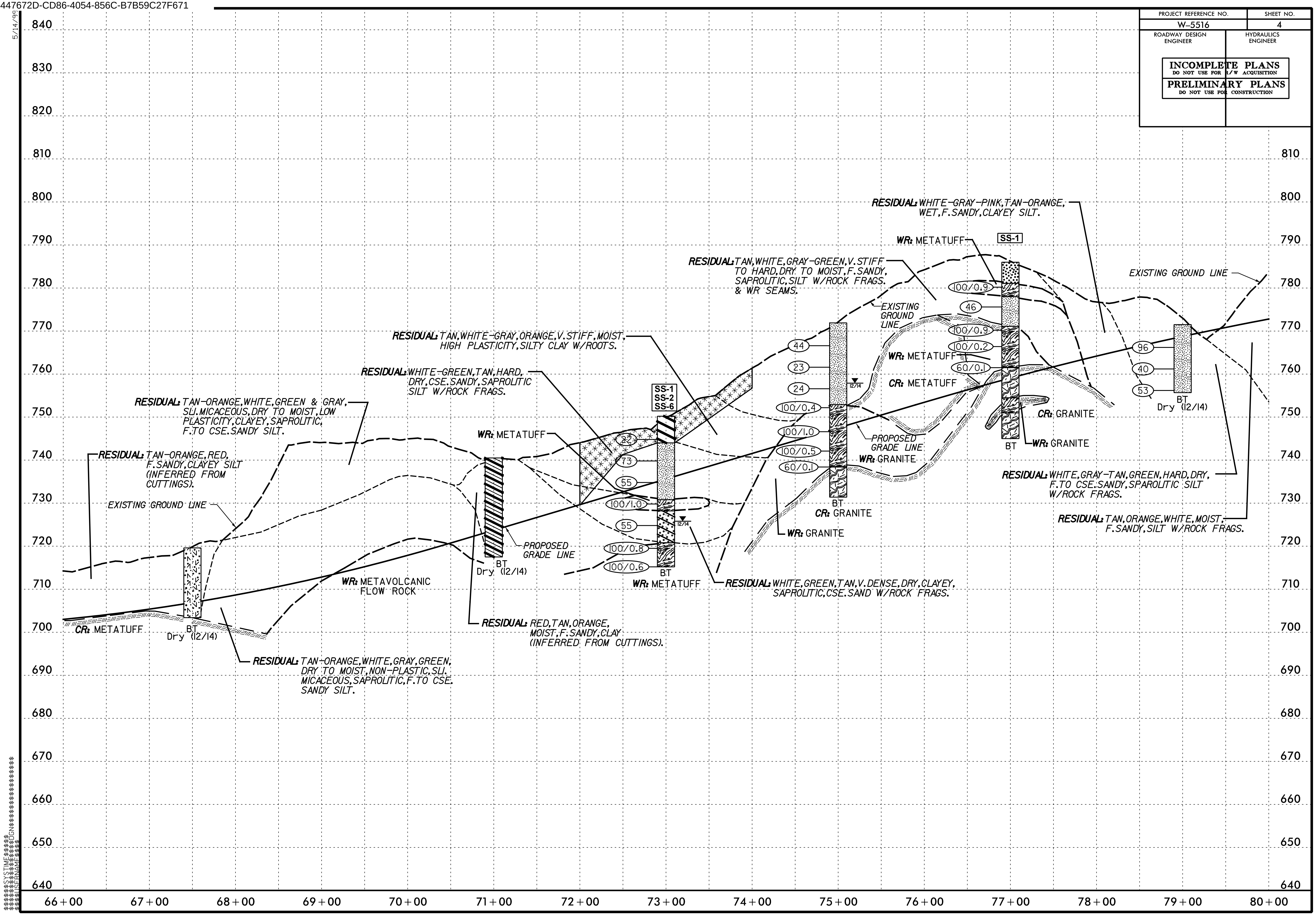
SIGNATURE: P.E.

DocuSign Envelope ID: 6447672D-CD86-4054-856C-B7B59C27F671

PROJECT REFERENCE NO.	SHEET NO.
W-5516	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



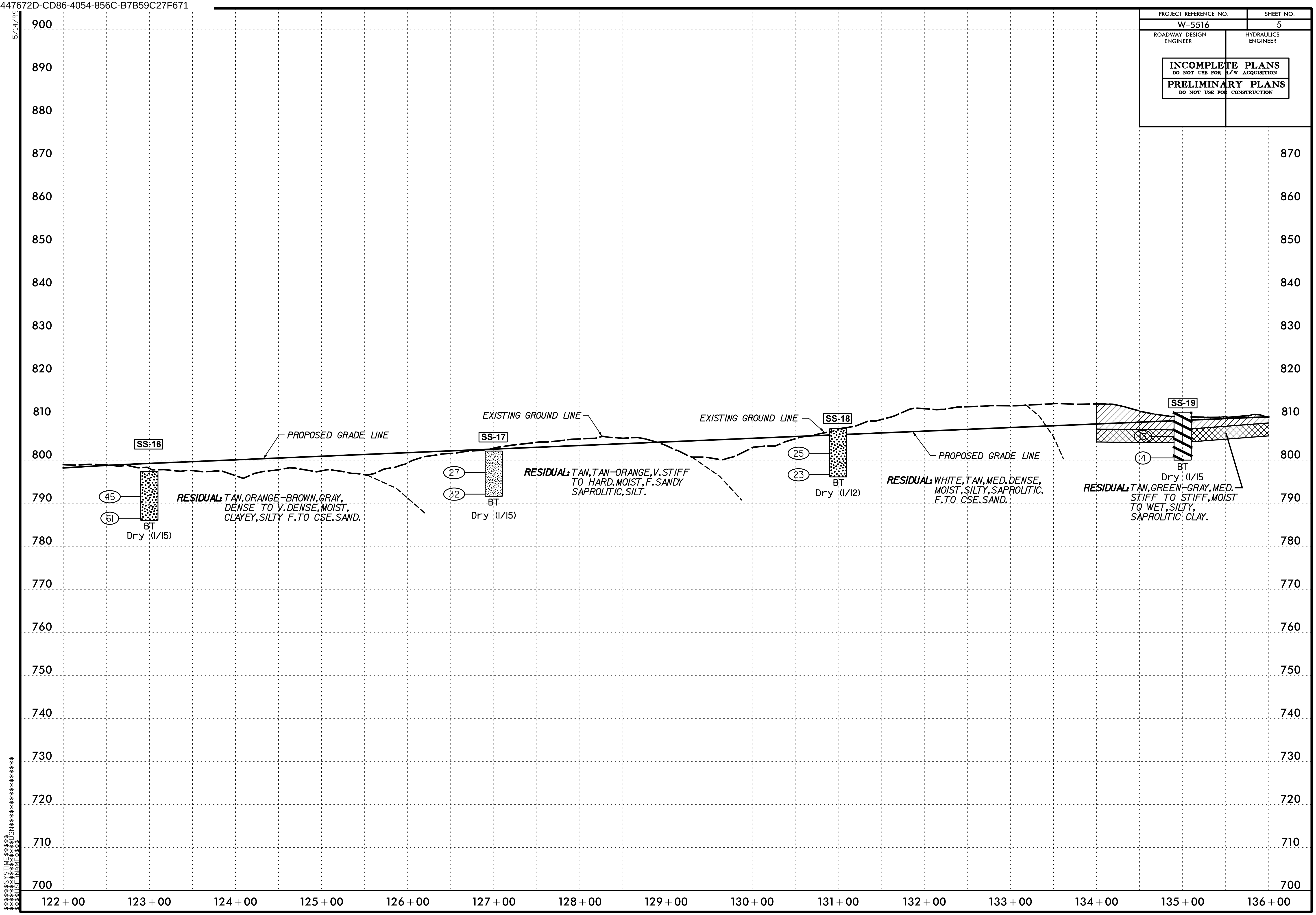
PROJECT REFERENCE NO.	SHEET NO.
W–5516	5

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

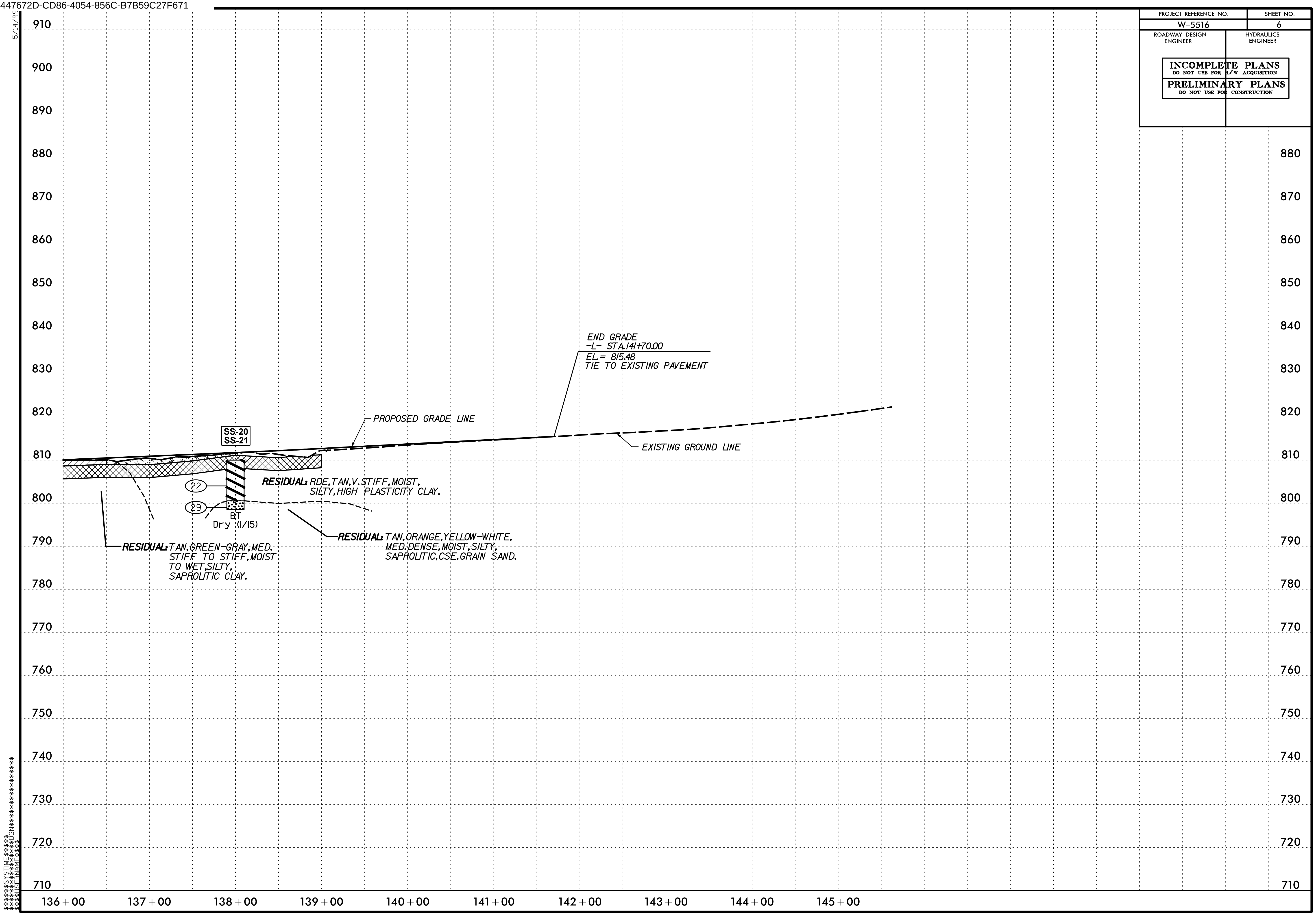
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

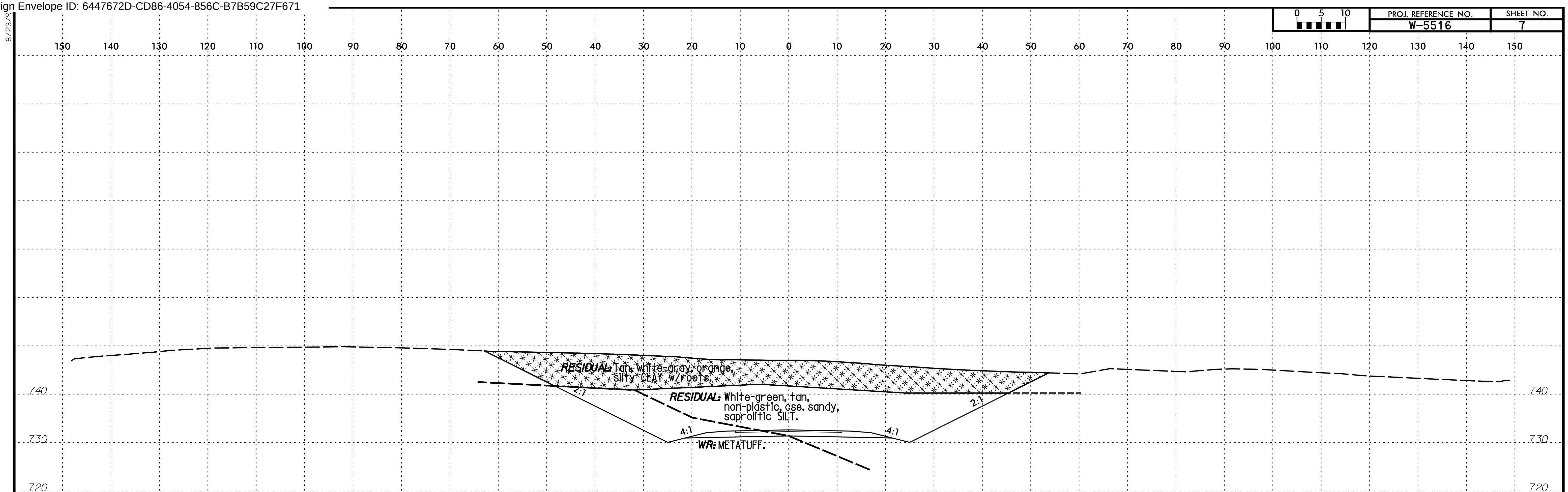


PROJECT REFERENCE NO.	SHEET NO.
W-5516	6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

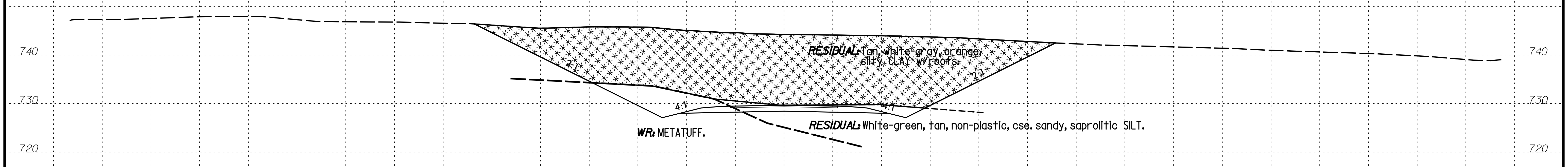
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



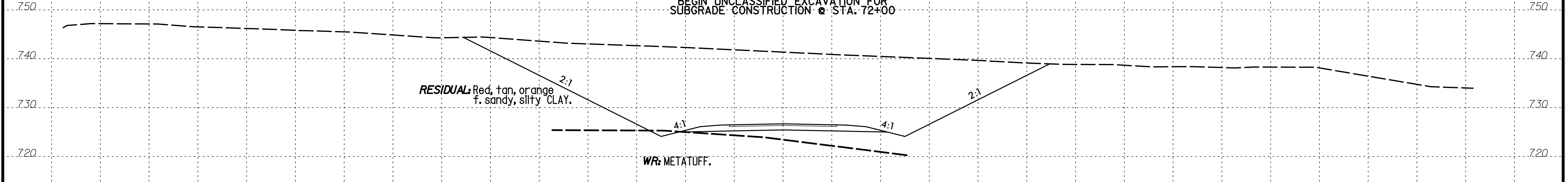


72 + 50.00



72 + 00.00

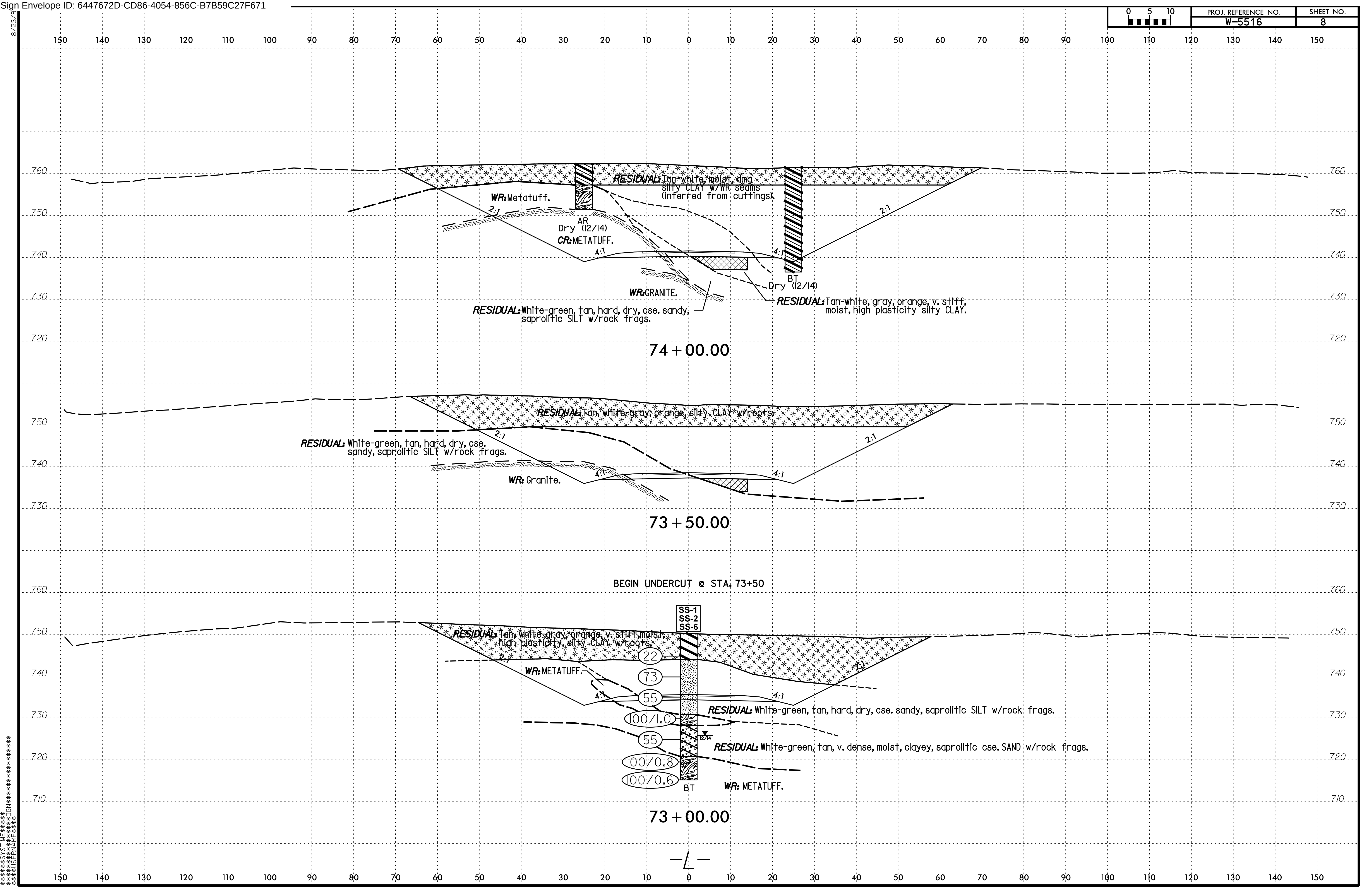
BEGIN UNCLASSIFIED EXCAVATION FOR
SUBGRADE CONSTRUCTION @ STA. 72+00



71 + 50.00

-L-

PROJ. REFERENCE NO.	SHEET NO.
W-5516	8



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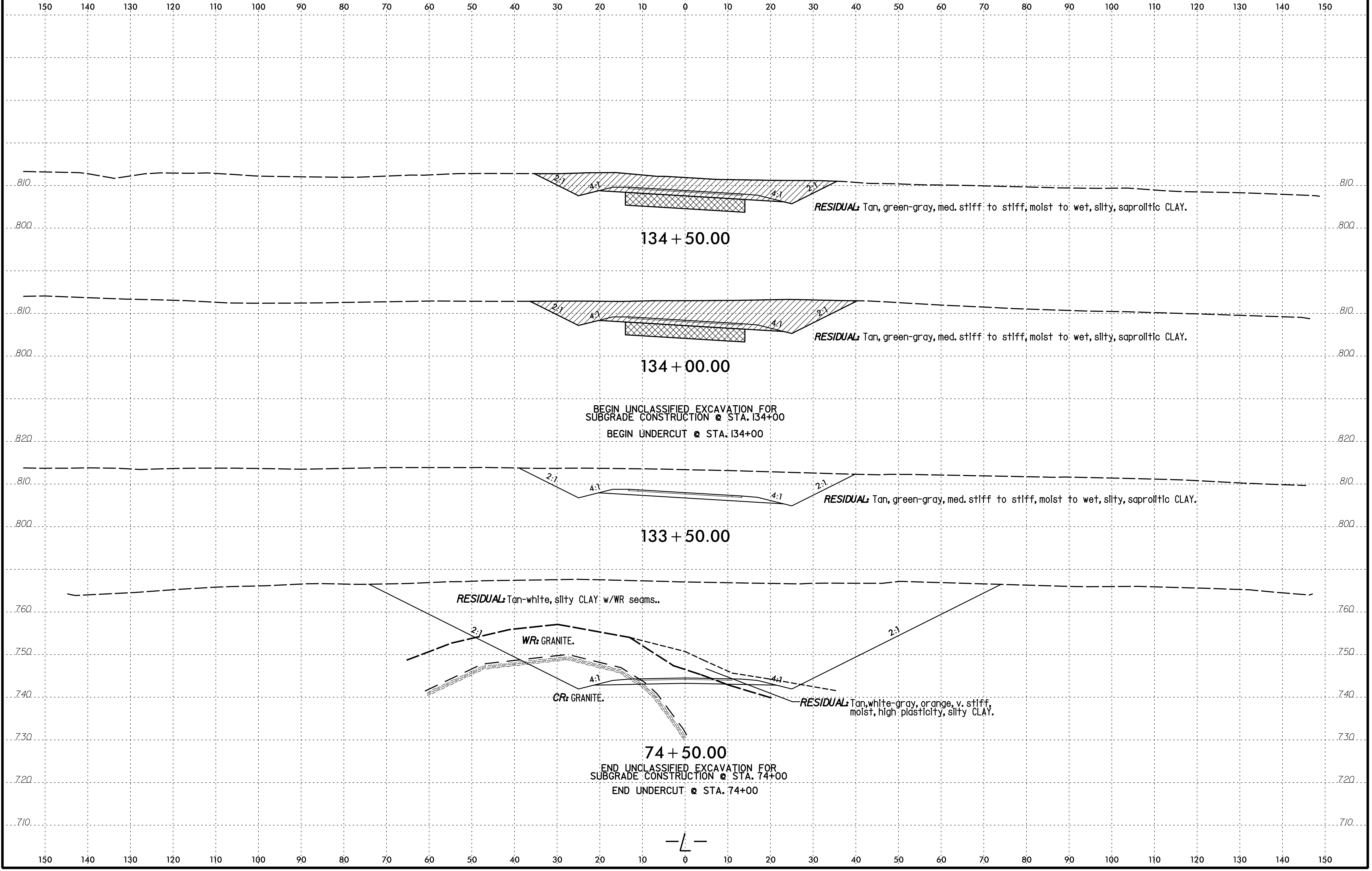
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	W-5516	9



RESIDUAL: Tan, green-gray, med. stiff to stiff, moist to wet, silty, saprolitic CLAY.

134+50.00

RESIDUAL: Tan, green-gray, med. stiff to stiff, moist to wet, silty, saprolitic CLAY.

134+00.00

BEGIN UNCLASSIFIED EXCAVATION FOR SUBGRADE CONSTRUCTION @ STA. 134+00

BEGIN UNDERCUT @ STA. 134+00

RESIDUAL: Tan, green-gray, med. stiff to stiff, moist to wet, silty, saprolitic CLAY.

133+50.00

RESIDUAL: Tan-white, silty CLAY w/WR seams..

WR: GRANITE.

CR: GRANITE.

RESIDUAL: Tan,white-gray, orange, v. stiff, moist, high plasticity, silty CLAY.

74+50.00

END UNCLASSIFIED EXCAVATION FOR SUBGRADE CONSTRUCTION @ STA. 74+00

END UNDERCUT @ STA. 74+00

8/23/9

$$$$SYSTIME$$$$
$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

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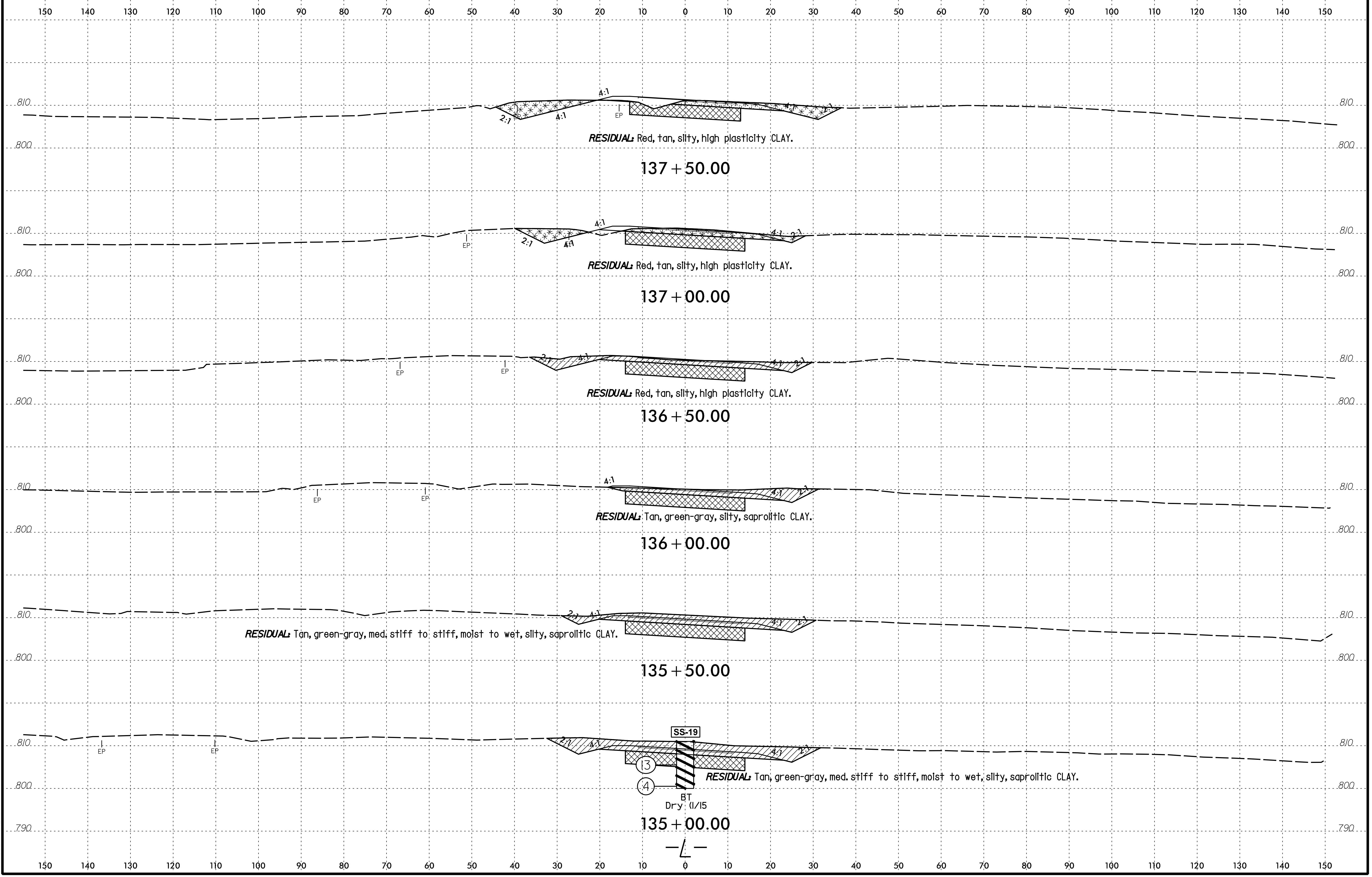
PROJ. REFERENCE NO.	SHEET NO.
W-5516	10



RESIDUAL: Red, tan, silty, high plasticity CLAY.

137+50.00

RESIDUAL: Red, tan, silty, high plasticity CLAY.

137+00.00

RESIDUAL: Red, tan, silty, high plasticity CLAY.

136+50.00

RESIDUAL: Tan, green-gray, silty, saprolitic CLAY.

136+00.00

RESIDUAL: Tan, green-gray, med. stiff to stiff, moist to wet, silty, saprolitic CLAY.

135+50.00

RESIDUAL: Tan, green-gray, med. stiff to stiff, moist to wet, silty, saprolitic CLAY.

135+00.00

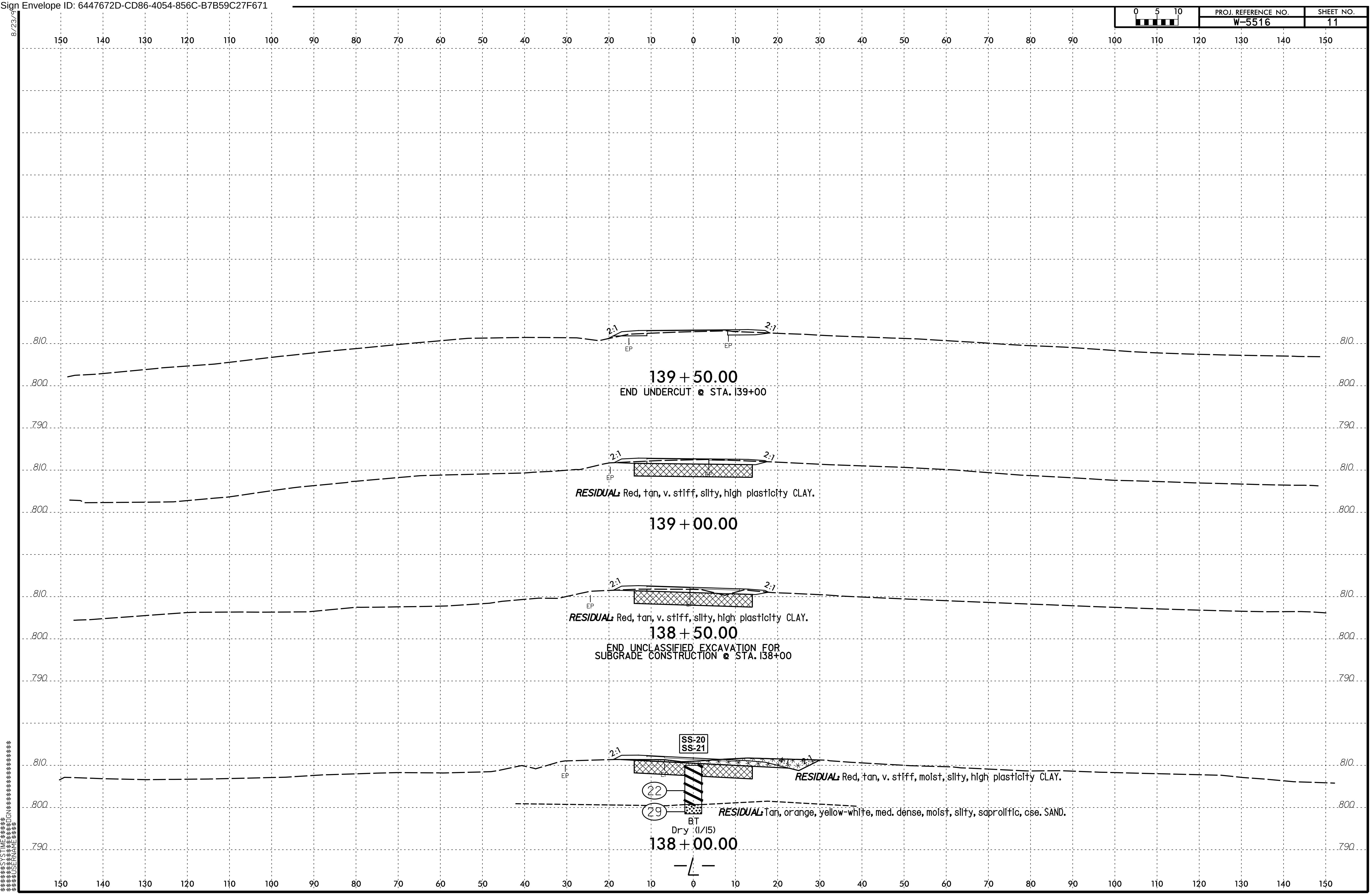
-L-

8/23/9

$$$$SYSTIME$$$$ $$$$DGN$$$$ $$$$USERNAME$$$$

8/23/9

PROJ. REFERENCE NO.	SHEET NO.
W-5516	11



INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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	CL	73+00	4.4-5.9	A-7-5(36)	67	29	1.7	4.8	39.9	53.6	100.0	98.9	95.5	32.3	-
SS-2	CL	73+00	9.4-10.9	A-4(0)	27	2	39.8	19.9	28.3	12	92.0	64.0	42.6	10.6	-
SS-3	CL	79+00	9.3-10.8	A-4(1)	34	9	23.7	22.9	35.3	18	68.1	55.5	41.9	14.7	-
SS-4	CL	77+00	9.4-10.9	A-4(3)	32	2	2	19.6	67.5	10.9	99.9	98.9	86.1	17.8	-
SS-5	43' RT	86+00	14.5-16.0	A-4(4)	38	5	12.7	28	45.3	14	99.9	95.1	67.8	25.4	-
SS-6	CL	73+00	24.4-25.9	A-2-6(0)	28	12	48	15.6	16.4	20	46.4	28.6	18.9	15.0	-
SS-7	CL	101+00	4.5-6.0	A-4(4)	39	9	25	15.9	33.1	26.1	89.2	70.5	56.1	13.9	-
SS-8	CL	105+00	4.7-6.2	A-7-5(13)	54	23	27.3	8.6	24	40.2	91.0	69.3	60.3	19.3	-
SS-9	CL	101+00	9.5-11.0	A-4(1)	37	10	29.6	21.7	23.8	25	70.5	54.5	37.9	18.3	-
SS-10	CL	101+00	14.5-16.0	A-4(4)	40	4	8.6	23.5	48.7	19.2	94.6	89.9	70.9	25.3	-
SS-11	CL	101+00	19.5-21.0	A-4(5)	39	6	5.5	26.8	58.6	9.1	100.0	97.4	77.4	14.5	-
SS-12	CL	105+00	9.7-11.2	A-4(4)	39	6	14.5	21.4	40	24	89.5	79.8	63.4	26.4	-
SS-13	CL	105+00	19.7-21.2	A-2-4(0)	25	1	41	27.1	24	8	92.4	64.5	34.0	11.2	-
SS-14	CL	119+00	4.6-6.1	A-7-6(4)	51	24	52.7	11	19.2	17.1	93.9	50.2	36.8	22.9	-
SS-15	CL	119+00	9.6-11.1	A-4(0)	35	4	33.1	22.12	30.9	14	85.3	64.4	42.1	17.4	-
SS-16	CL	123+00	9.9-11.4	A-2-4(0)	22	2	51	23.2	17.9	7.9	91.4	54.3	27.8	10.5	-
SS-17	CL	127+00	9.0-10.5	A-4(3)	35	4	5.7	30.8	51.9	11.7	99.6	96.9	73.2	16.5	-
SS-18	62' LT	32+17	4.1-5.6	A-2-6(0)	30	12	29.2	30.1	20.7	20	71.6	57.4	35.0	18.7	-
SS-19	CL	135+00	9.5-11.0	A-7-5(17)	54	13	3.1	12.6	68.1	16.2	100.0	98.0	89.8	40.8	-
SS-20	CL	138+00	5.0-6.5	A-7-5(32)	63	29	6.1	5.5	26.9	61.4	99.8	95.4	89.8	28.6	-
SS-21	CL	138+00	10.0-11.5	A-2-4(0)	28	1	52.8	19.4	19.9	7.9	95.8	55.1	31.5	11.7	-
SS-22	80' RT	37+50	4.3-5.8	A-6(6)	33	13	10.2	30.3	30.8	28.7	89.2	84.4	63.2	10.6	-
SS-23	CL	52+00	4.5-6.0	A-7-5(15)	47	15	1.5	28	44.9	25.6	100.0	99.4	83.2	21.2	-
SS-24	CL	48+00	9.9-11.4	A-4(0)	30	NP	21	44.2	28.8	5.9	96.2	82.5	46.2	12.3	-
SS-25	34' RT	44+00	9.8-11.3	A-4(3)	38	6	4.6	51.2	34.3	9.9	99.8	98.4	58.2	22.2	-

DGN

REVISIONS

$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$