SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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TITLE

SOIL TEST RESULTS

SHEET

42,43

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY MECKLENBURG

PROJECT DESCRIPTION SR 3440 (McKEE ROAD) FROM SR 3448 (PLEASANT PLAINS ROAD) TO SR 1009 (EAST JOHN STREET)

INVENTORY

STATE PROJECT REFERENCE NO U-4713A 43

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 ENCINEERING UNIT AT (99) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL 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 INF-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 PINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:

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

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

PERSONNEL C.T. TANG, PE S. WOODS HPC DRILLING C. ODOM G. MEDLIN

INVESTIGATED BY _S. WOODS DRAWN BY __C.T. TANG, PE CHECKED BY __D. BROWN, PE

DATE _JUNE 2019

SUBMITTED BY __C.T. TANG, PE

DocuSigned by Chim-ting Tang

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8/8/2019

DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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REFERENCE

PROJECT REPERENCE NO. SHEET N

U-4713A

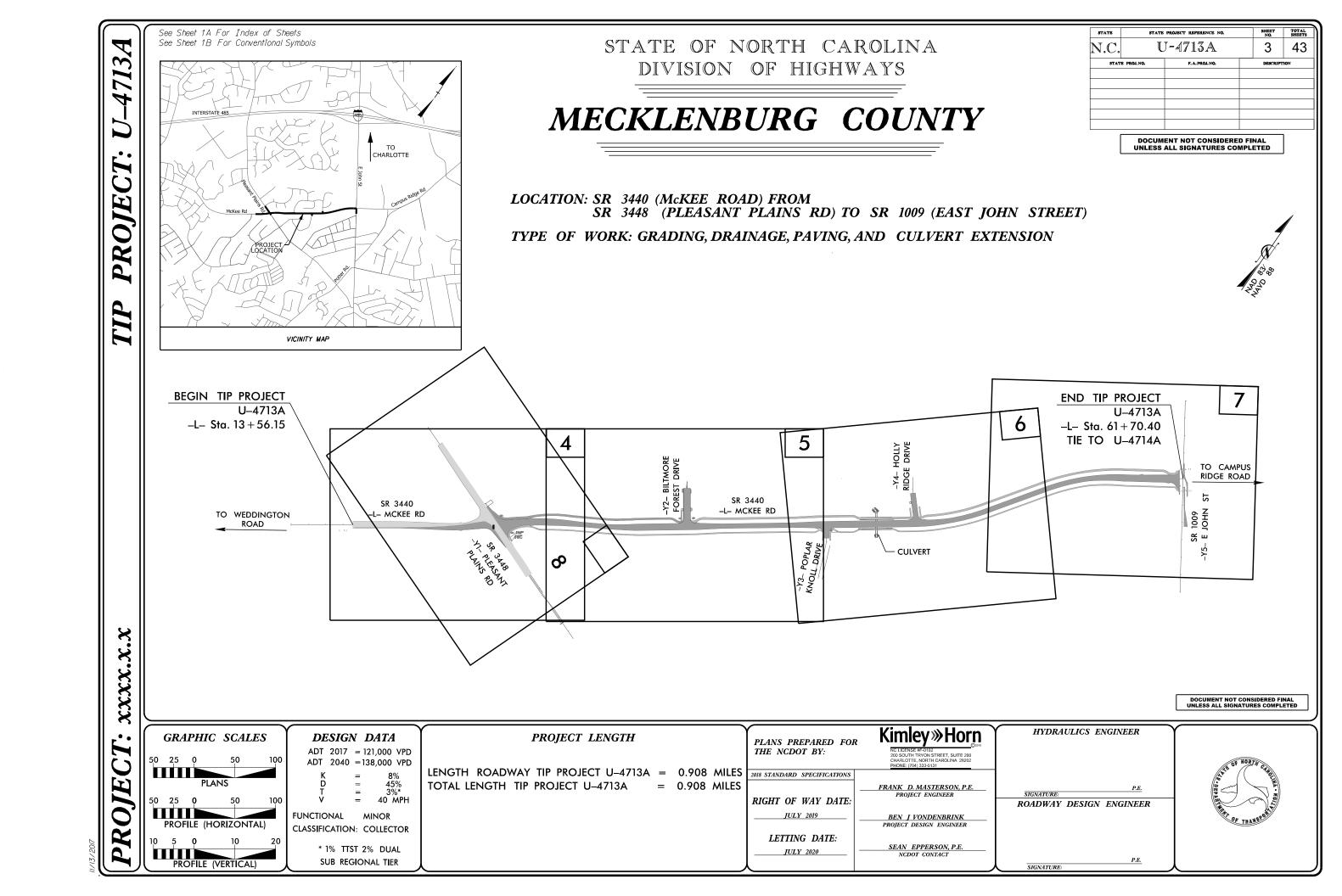
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED	TERMS AND DEFINITIONS
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	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.	ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM DI586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	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	AQUIFER - A WATER BEARING FORMATION OR STRATA.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	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
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	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	WEATHERED VISCOUSTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERALOGICAL COMPOSITION	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) CROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1,A-2 A-4,A-5 CLASS. A-1-o A-1-b A-2-4 A-2-5 A-2-6 A-2-7 B-2-6 A-2-7 A-4,A-5 A-3 A-6,A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 0000 d0000 d00000 d0000 d00000 d0000 d00000 d0000 d00000 d0000 d00000 d0000 d00000 d0000 d000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	OF SLOPE.
7. PASSING	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN SEDIMENTARY ROCK COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	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.
*10 50 MX GRANULAR SIL1- MUCK,	PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*40 30 MX 50 MX 51 MN PEAT *200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 40 MX 41 MN	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN LITTLE UR HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH,
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOUR	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER		(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAYEL AND SAND GRAVEL AND SAND SOILS SOILS	$lacktright$ Static water level after $\underline{24}$ hours	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN.RATING EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	∇PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) 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	PARENT MATERIAL.
AS SUBURADE PUUR	SPRING OR SEEP	WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ;PI OF A-7-6 SUBGROUP IS > LL - 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
CONSISTENCY OR DENSENESS COMPAGNICS OR RANGE OF STANDARD RANGE OF UNCONFINED	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD.SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTIVES OF PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	<u>IF TESTED, WOULD YIELD SPT REFUSAL</u>	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
(N-VALUE) (TUNS/FT-)	WITH SOIL DESCRIPTION → OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE	SOIL SYMBOL OPT ONT TEST BORING SLOPE INDICATOR INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANULAR MEDIUM DENSE 10 TO 30 N/A MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF VERY ALL ROCK EXCEPT DIJARTZ DISCOLORED OR STAINED, ROCK EARRIC ELEMENTS ARE DISCERNIRIE	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THAN ROADWAY EMBANKMENT AUGER BURING TEST	VERY ALL ROCK EXCEPT OUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT	── INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MN MONITORING WELL TEST BORING	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	WITH CORE PIEZOMETER PIEZOMETER COLUMNARY COLUMNARY	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	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
HARD > 30 > 4	→ SPT N-VALUE	ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(CSE. SD.) (F SD.) (SE.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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
	CL CLAY MOD MODERATELY γ - UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE CAUGE FOR ANION MOISTURE CONTROL MO	CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 _d - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH	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
(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC CEMISOLID, DEGUIDES ORVING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(P) ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK:
	EQUIPMENT USED ON SUBJECT PROJECT	TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: FEET
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	ELEVATION: FEET
SL SHRINKAGE LIMIT	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6' CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	BORING ELEVATIONS GENERATED FROM FILE U4713A_IS_TNL.TIN
PLASTICITY	CME-55 X 8* HOLLOW AUGERS CURE SIZE:	INDURATION	HA = HAND AUGER BORING FIAD = FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY INDEX (PI) DRY STRENGTH	X CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC 0-5 VERY LOW	TUNG -CARRIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST CASING W/ ADVANCER HAND TOOLS:	GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH X HAND AUGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE TUNGCARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1
		Contract Statement (Indiana)	DATE: 0 10 1-



PROJECT REFERENCE NO.	SHEET NO.
U-4713A	3A



June 24, 2019

STATE PROJECT: 39077.1.2 (U-4713A)

COUNTY: Mecklenburg

DESCRIPTION: SR 3440 (McKee Road) from SR 3448 (Pleasant Plains Road) to SR 1009 (East

John Street)

SUBJECT: Roadway Subsurface Inventory

Project Description

The proposed project consists of the extension of McKee Road, located in Matthews, North Carolina. The total length of the project is approximately 0.9 miles, with six alignments:

Alignment	Road Name	Stations
-L-	McKee Road	13+56 to 61+70±
-Y1-	Pleasant Plains Road	14+96 to 26+47±
-Y2-	Biltmore Forest Drive	10+00 to 12+20±
-Y3-	Poplar Knoll Drive	10+00 to 10+77±
-Y4-	Holly Ridge Drive	10+00 to 11+75±
-Y5-	East John Street	-

Plans call for the extension of McKee Road on new alignment (-L-) from the current intersection of McKee Road and Pleasant Plains Road to East John Street. The extension will be two-lanes with associated turn lanes. The project also includes a 10-foot wide multi-use path and a 5-foot sidewalk. The plans also include the improvements of the five alignments (-Y1- thru -Y5) that connect to the new McKee Road extension.

This project includes an 8-foot x 6-foot reinforced concrete box culvert (RCBC), located at approximate station 43+65 -L-. The structure of the proposed culvert is an. Project embankments will range in height up to 15 feet and the cut sections will vary and extend as deep as 10 feet.

A geotechnical field investigation was conducted in March of 2019 for this project. Drilling was performed by HPC of Albemarle, NC using an ATV-mounted CME-550 drill rig. The drill rig was equipped with a - automatic hammer with the hammer efficiency of 89%. All drilling activities were supervised by Stewart personnel.

A total of 24 Standard Penetration Test (SPT) borings were performed for the project. Representative soil samples from select borings were collected in the field for laboratory analysis. Six hand auger borings were also performed in areas that were inaccessible to drill rigs or have underground utility conflict.

Physiography & Geology

The project site is located in Mecklenburg County, North Carolina, which lies within the Charlotte Belt of the Piedmont Geologic Province of North Carolina. The project corridor contains primarily undeveloped land, between residential communities.

Review of the Geologic Map of the Charlotte 1° x 2° Quadrangle, North Carolina and South Carolina (Goldsmith, Mitton and Horton) shows that the site is primarily underlain by metamorphosed tonalite porphyry (mqdp) from between the Cambrian and Late Proterozoic periods.

Soil Properties

Soils encountered at the site include artificial fill, alluvial, and residual soils. Artificial fill was encountered in borings L_3600, L_3800, L_4350 and L_4400, with material classified as medium stiff to stiff Sandy CLAY (A-6), stiff Clayey SILT (A-5), and loose to medium dense Clayey SAND (A-2-6) and Silty SAND (A-2-4).

Alluvial deposits associated with the stream that runs across -L- alignment were encountered in boring L_4350 below artificial fill, with material classified as soft Sandy SILT (A-4) and very dense, coarse SAND (A-1).

The native residual soils, which are the weathered remains of the parent rock, consists of soft to very stiff Sandy SILT (A-4), Silty CLAY (A-7), Clayey SILT (A-5), Sandy CLAY (A-6), and loose to very dense Silty SAND (A-2-4) and Clayey SAND (A-2-6). N-values in residual soil ranged from 4 to 86 bpf. The clays exhibit variable plastic indices of 12 to 66 percent.

Rock Properties

Weathered rock (porphyry) was encountered in borings L_3000, L_4350, L_4800 and L_5800 at depths ranging from approximately 12 to 17 feet below the current ground surface (el. 704.7± to 740.6± feet).

Refusal on hard rock (porphyry) was encountered at three boring locations, L_3000, L_4350, L_4400 and L_6000, at depths of approximately 10.6 to 12.5 feet below the current ground surface (el. 704.3± to 740.1± feet).

Groundwater

Five out of 24 SPT borings were encountered groundwater during the drilling process, at depths ranging from 2.3 to 13.8 feet below the ground surface (el. 711.1± to 727.5± feet). Sixteen borings were left open for a 24+ hour stabilization period, after which groundwater was measured in eight borings at depths ranging from approximately 1.3 to 13.7 feet below the current ground surface (el. 725.9± to 751.5± feet).

Areas of Special Geotechnical Interest

Highly Plastic Soils

Highly plastic soils are present in portions of the project and will impact grading at the following locations.

PROJECT REFERENCE NO.	SHEET NO.
U-4713A	3B

Alignment	Station	Offset (ft)
-L-	22+00± to 30+50±	55± LT - 60± RT
-L-	33+00± to 35+00±	65± LT - 62± RT
-L-	39+00± to 42+50±	57± LT – 57± RT
-L-	51+50± to 53+50±	20± LT - 62± RT

Alluvial Soils

A stream runs across -L- alignment near station of 43+70 and thus alluvial soils are likely to be encountered in the area. This is the crossing with a planned RCBC with approximately 15 feet of roadway embankment cover. Lesser amounts of alluvium may also be encountered where -L- crosses a small stream at approximate station 60+10.

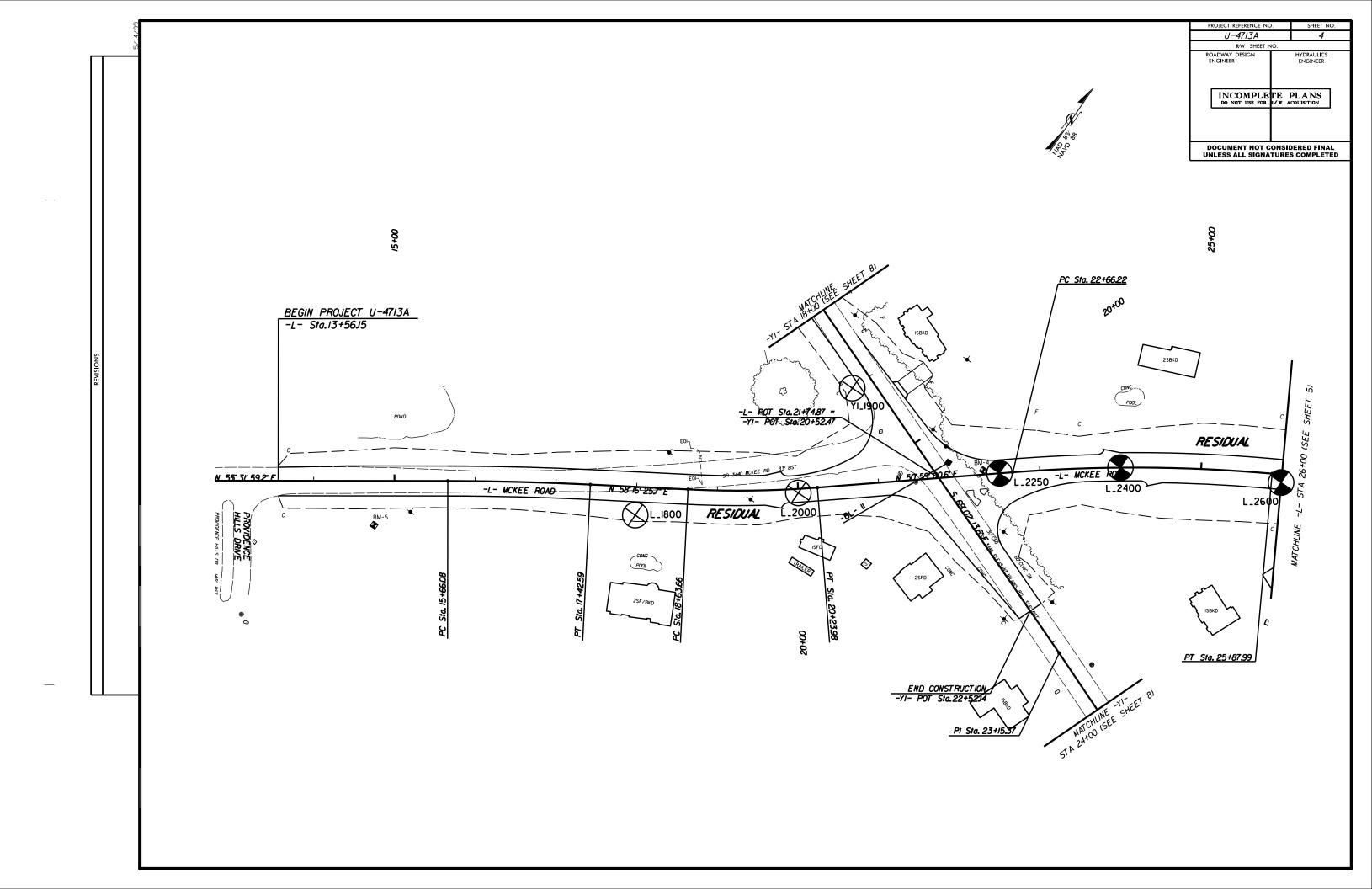
Sewer Line

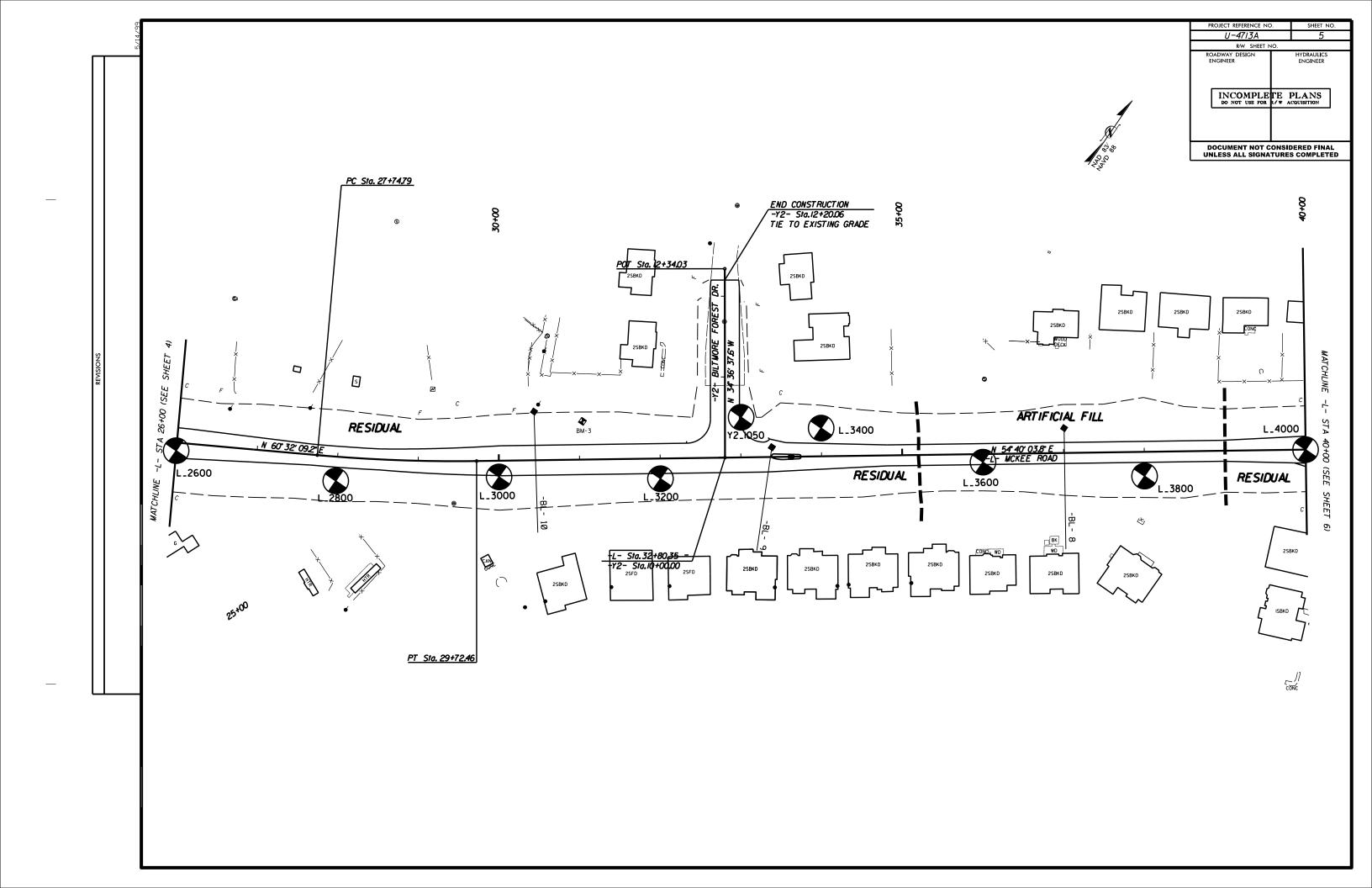
Two 8-inch PVC sewer pipes extend across -L- alignment - one near station of 43+70 and one near station of 44+20.

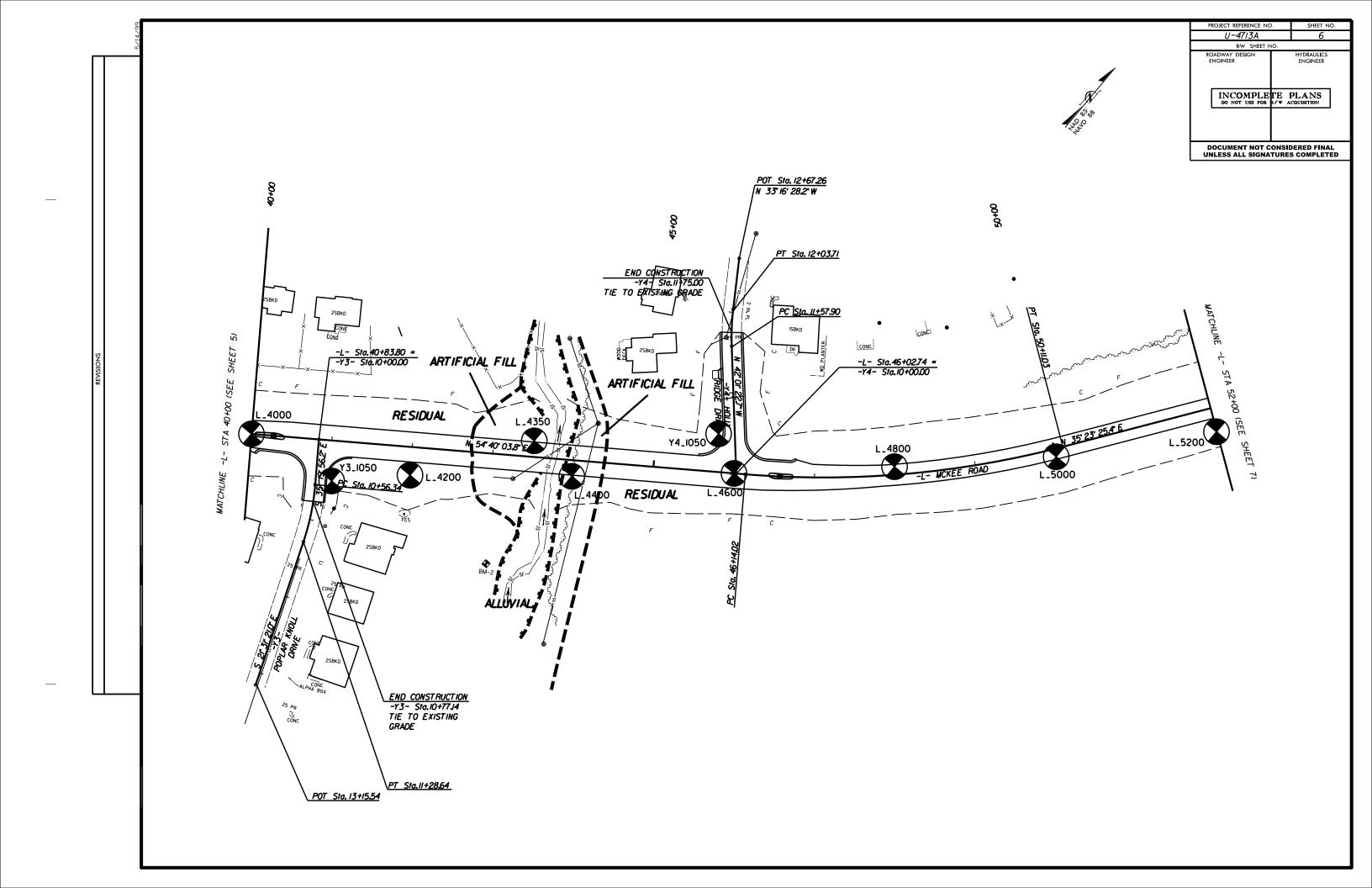
Laboratory CBR Testing

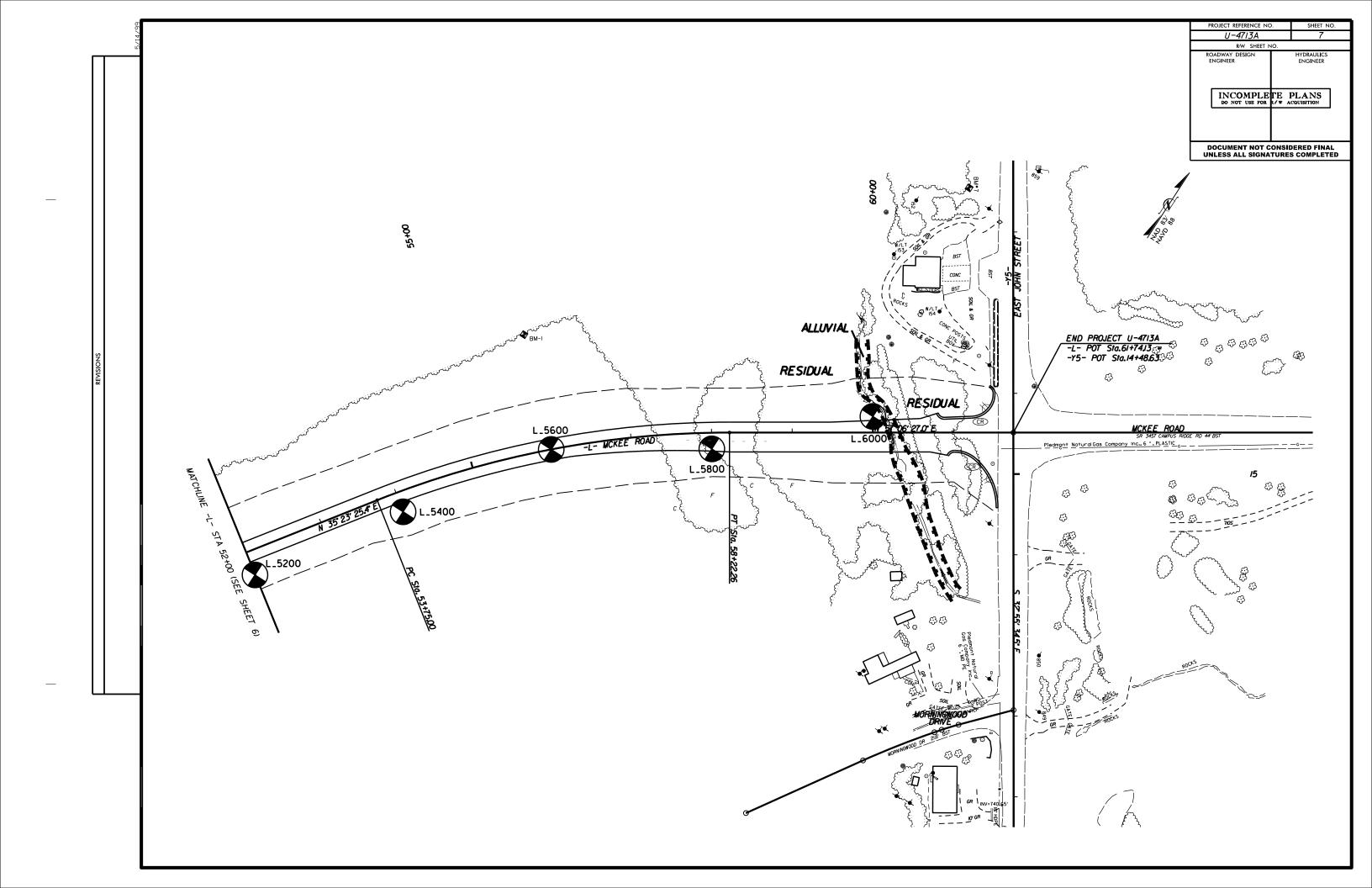
Three bulk samples were collected and tested to determine their standard-effort maximum dry density (MDD), optimum water content (Wc), and California Bearing Ratio (CBR).

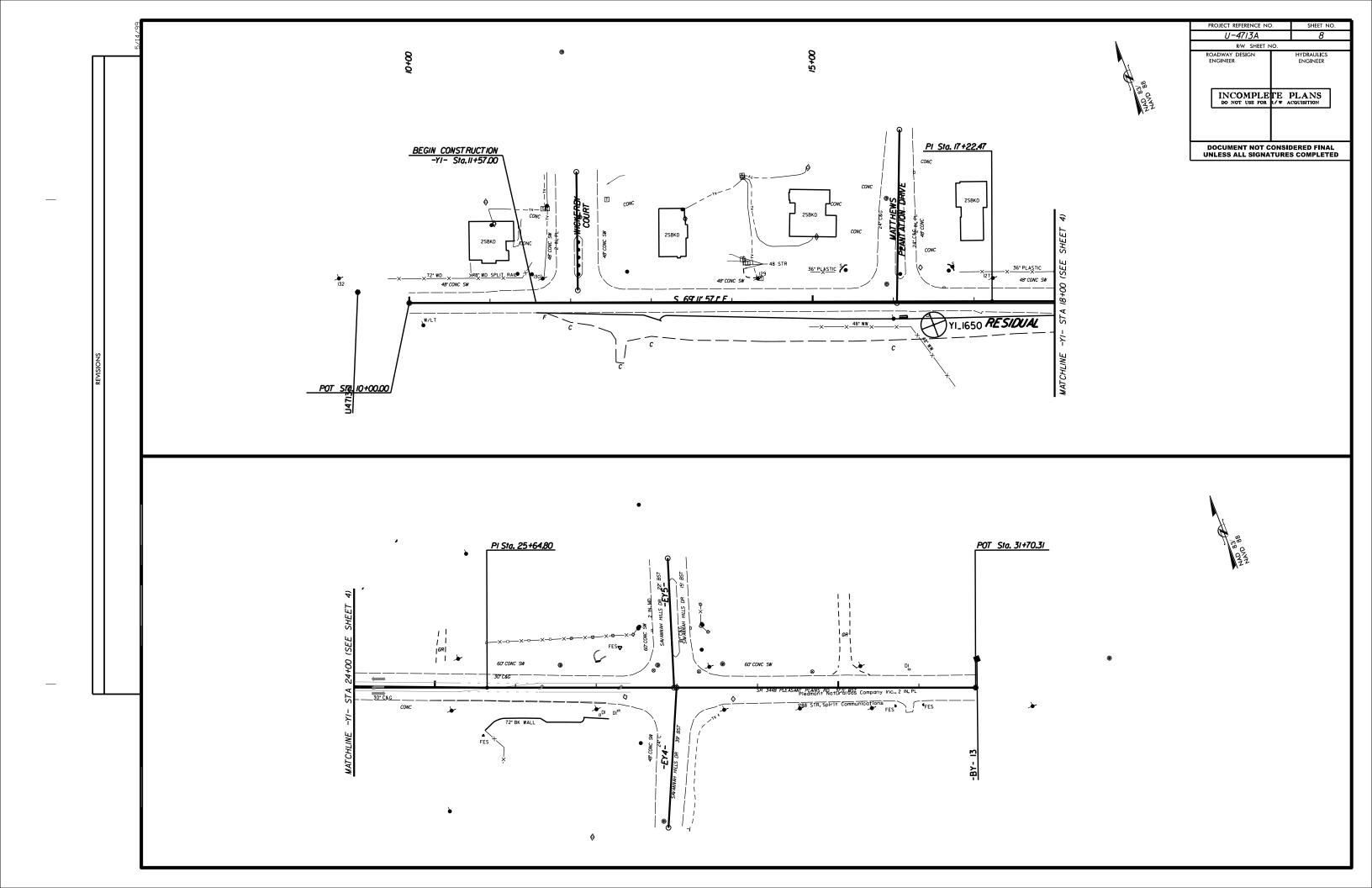
Sample I.D.	Boring	Station	Offset (ft)	Depth (ft)	MDD (pcf)	Opt. Wc (%)	CBR
CBR-1	L_5000	50+00 -L-	10 RT	3.0-5.0	116.2	14.1	11.7
CBR-2	L_2600	26+00 -L-	10 RT	5.0-7.0	107.5	16.9	8.7
CBR-3	L_3000	30+00 -L-	20 RT	3.0-5.0	99.9	21.7	9.2
CBR-4	L_4200	42+00 -L-	35 RT	3.0-5.0	100.1	20.7	9.1

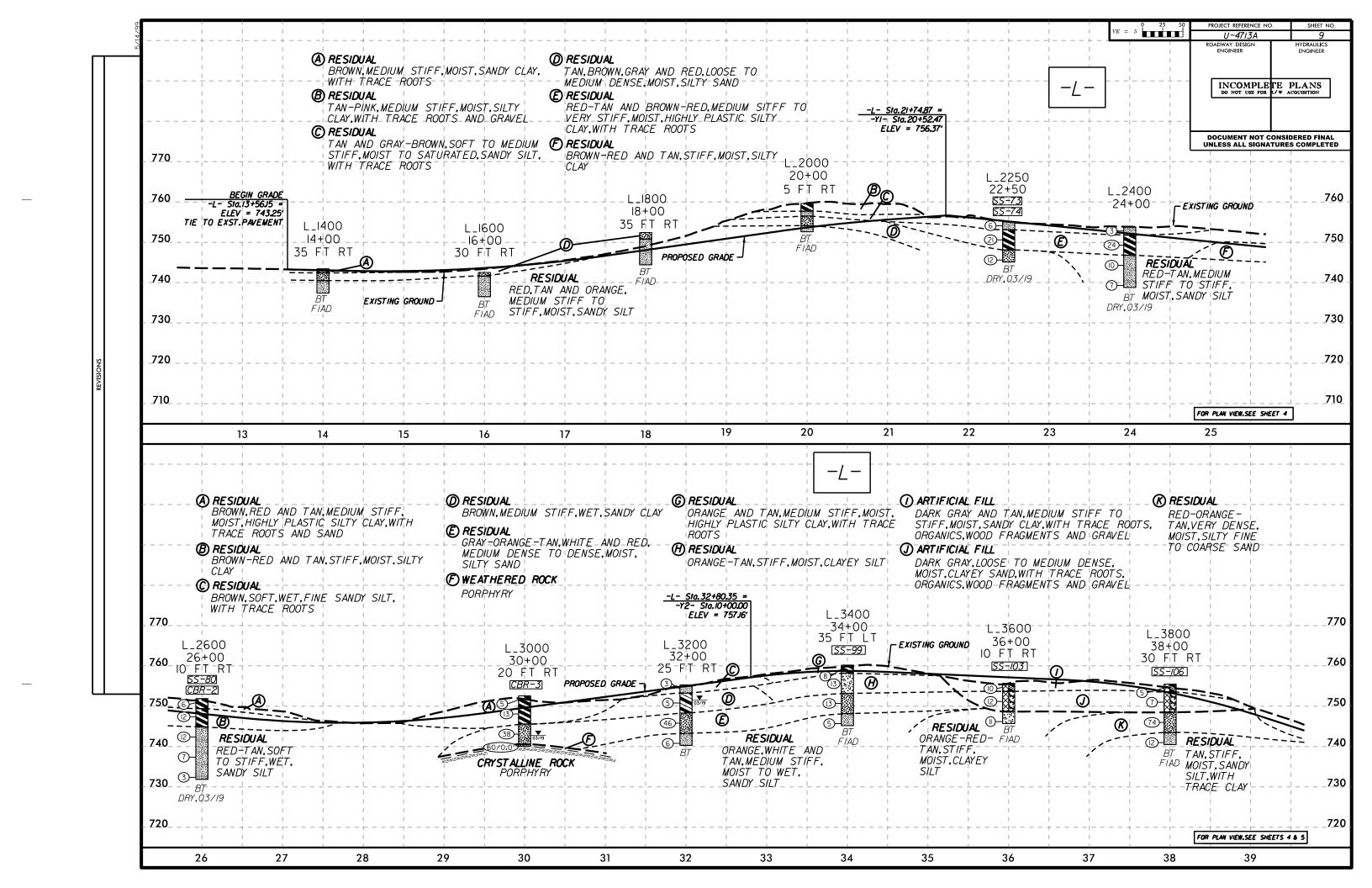


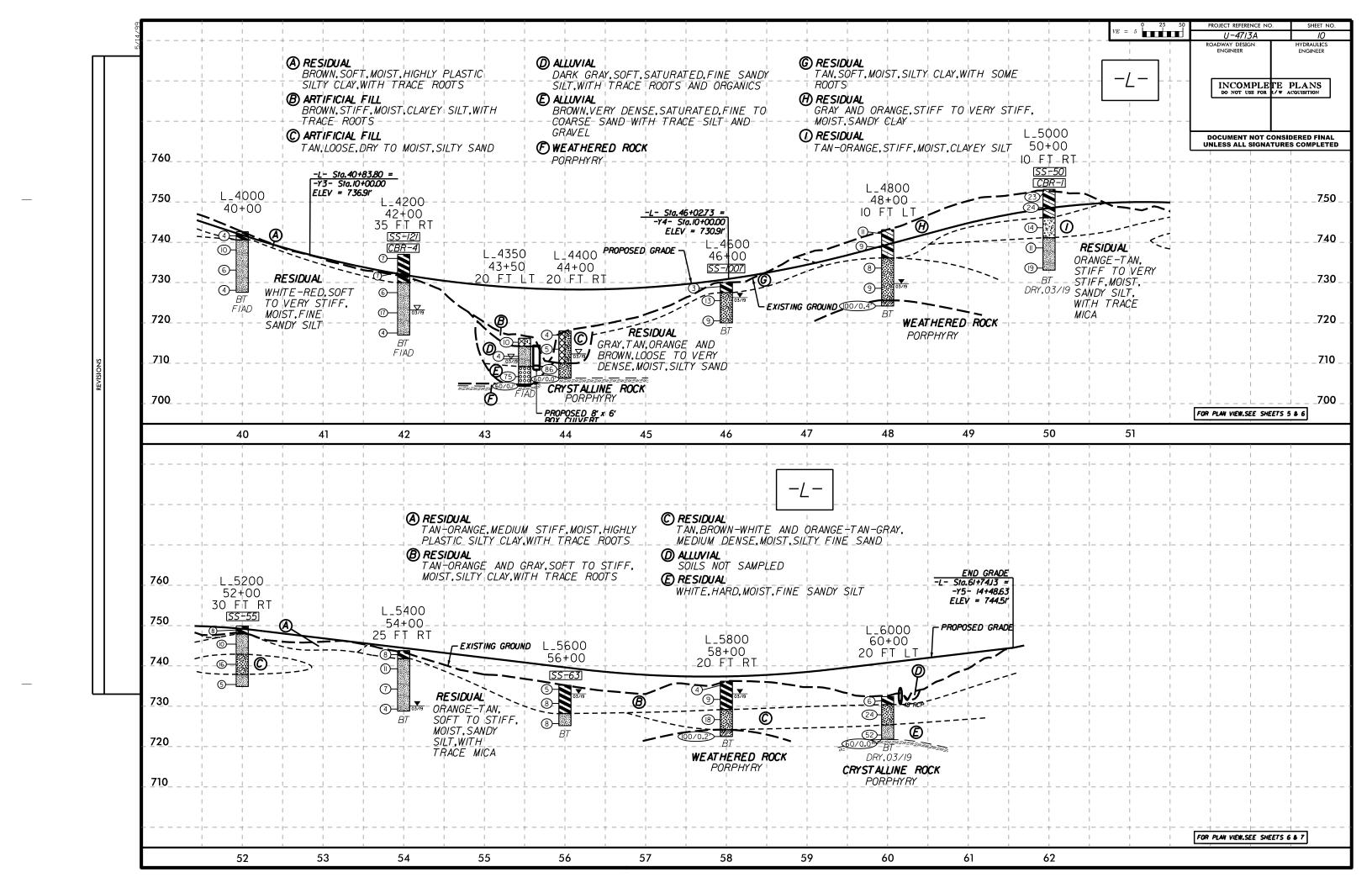


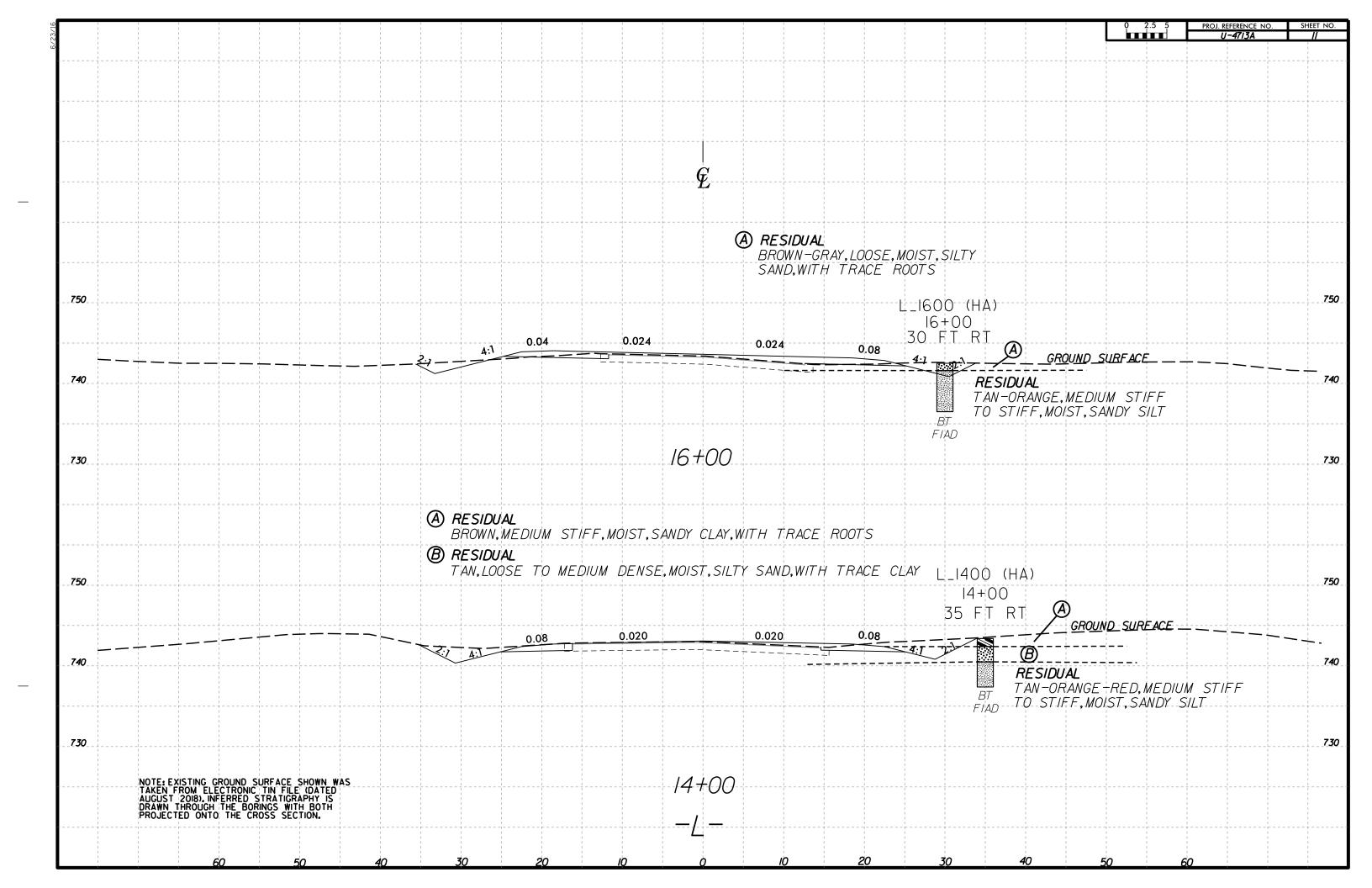


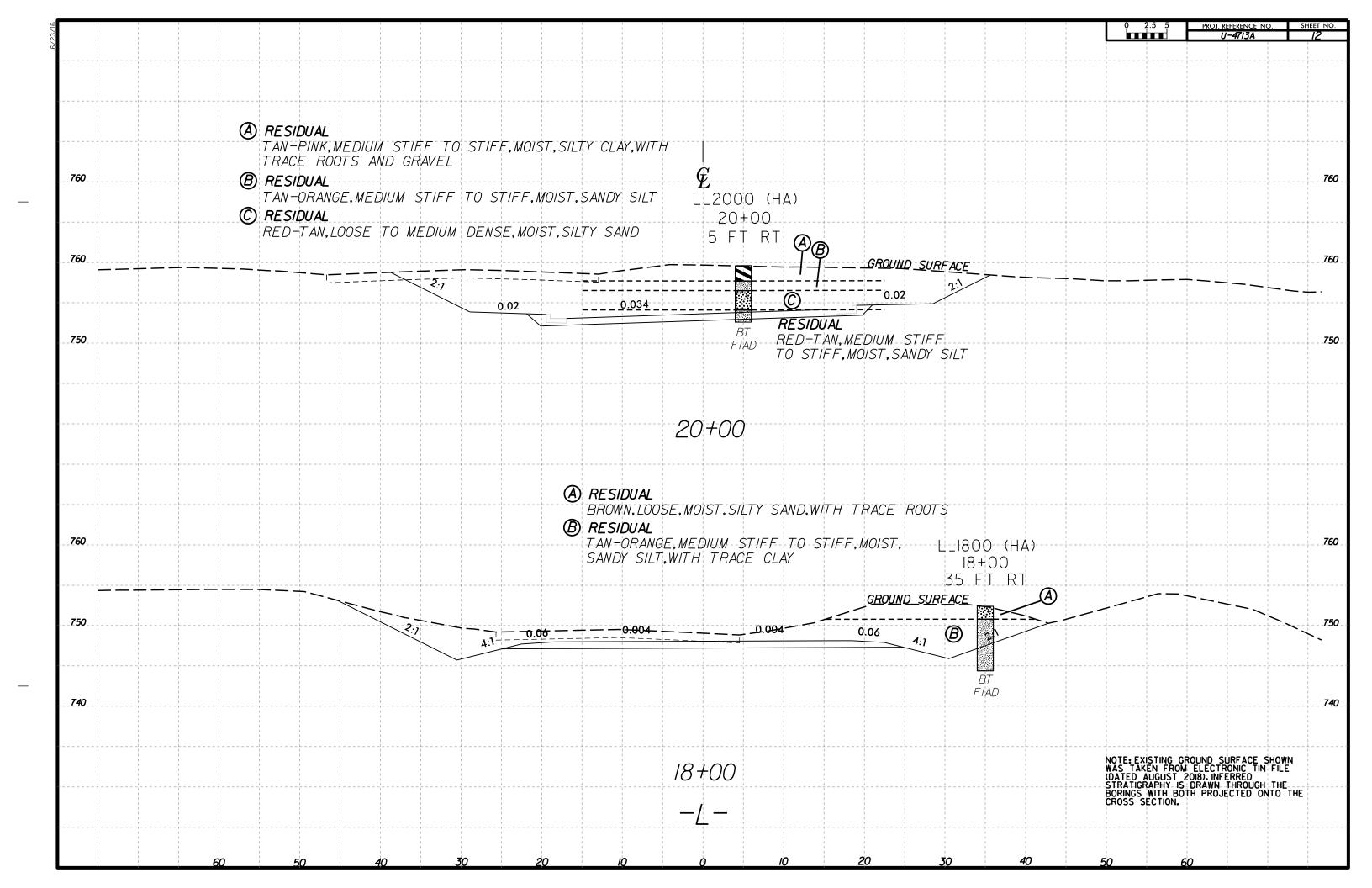




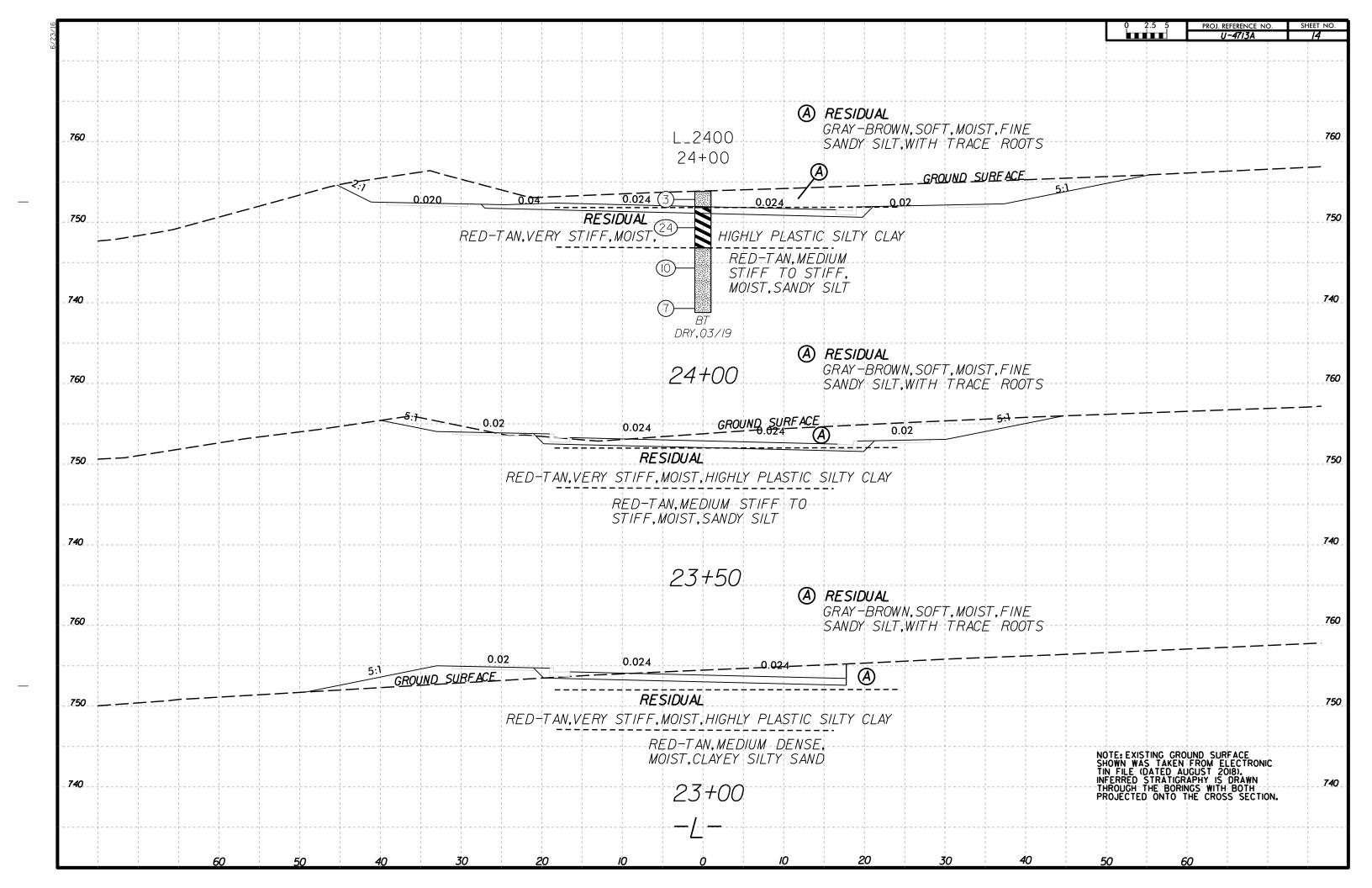


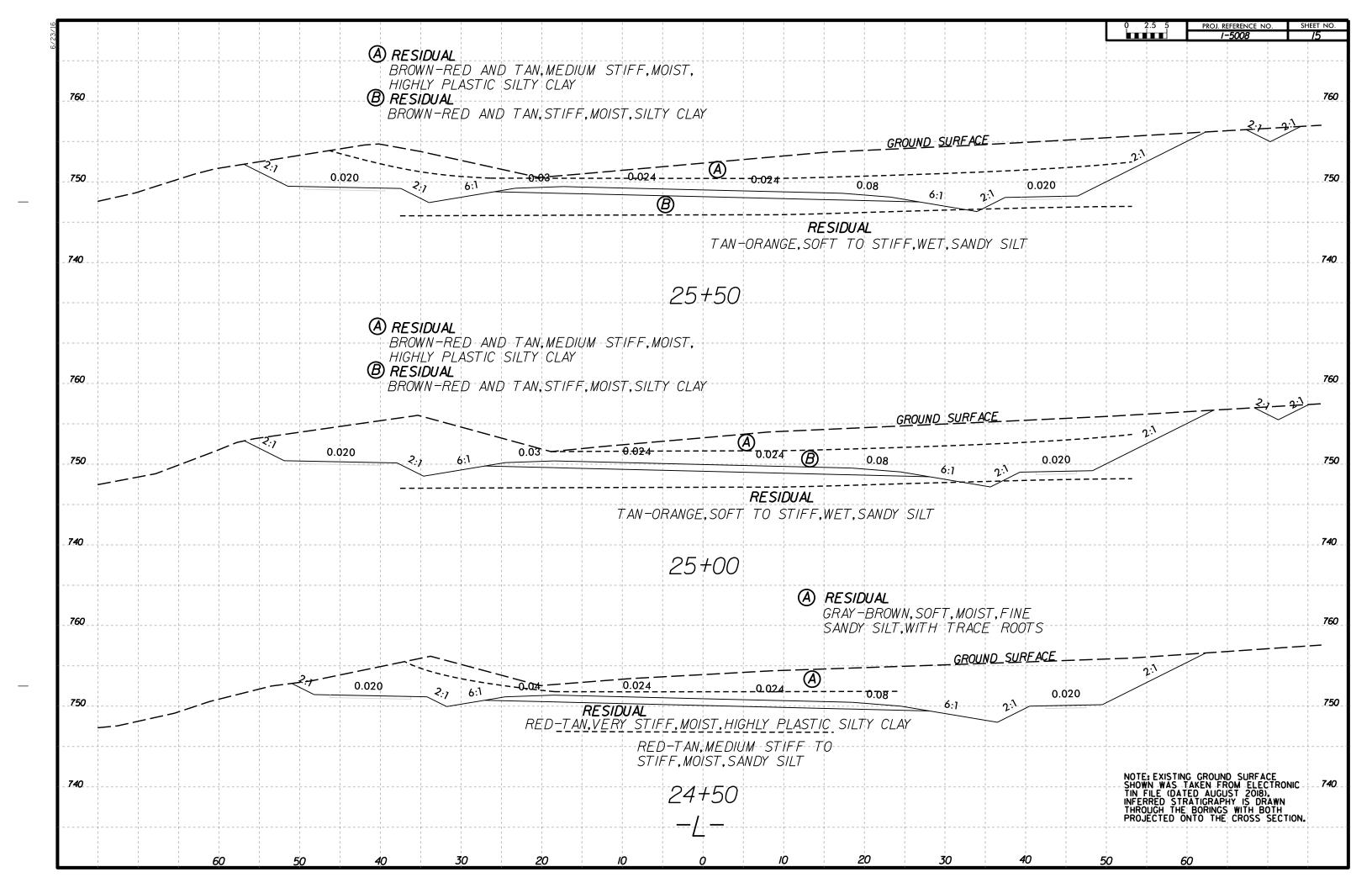


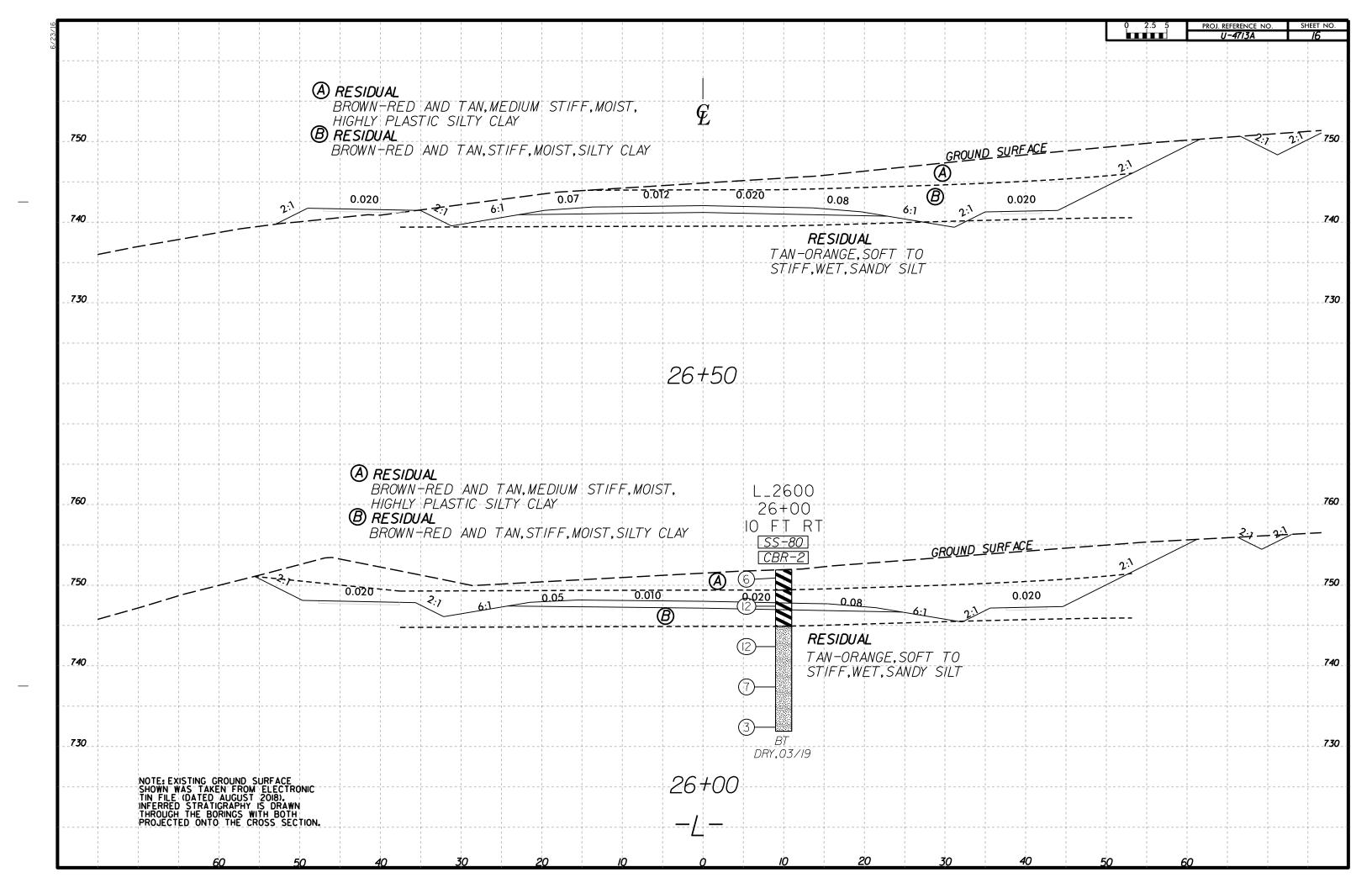


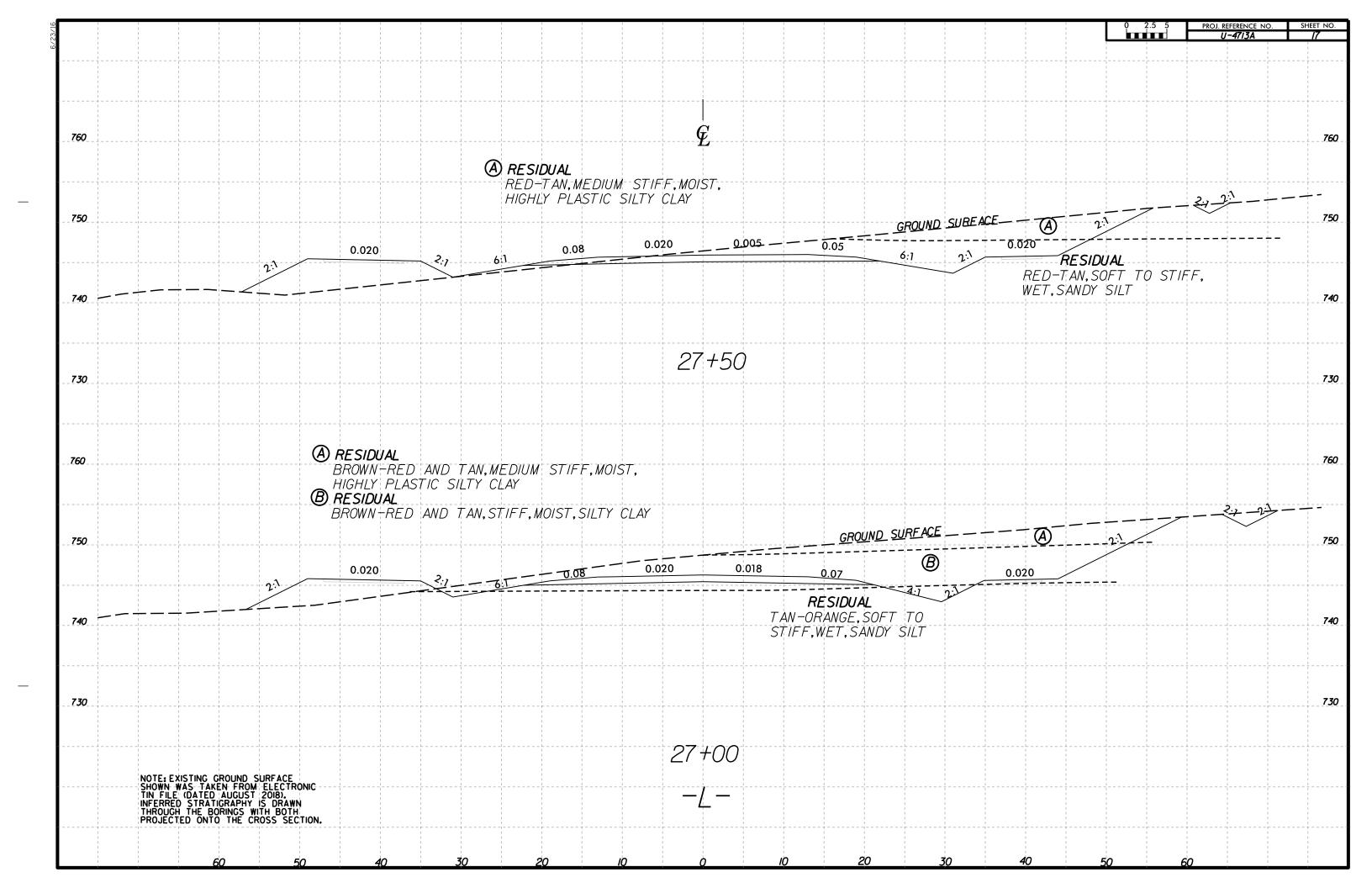


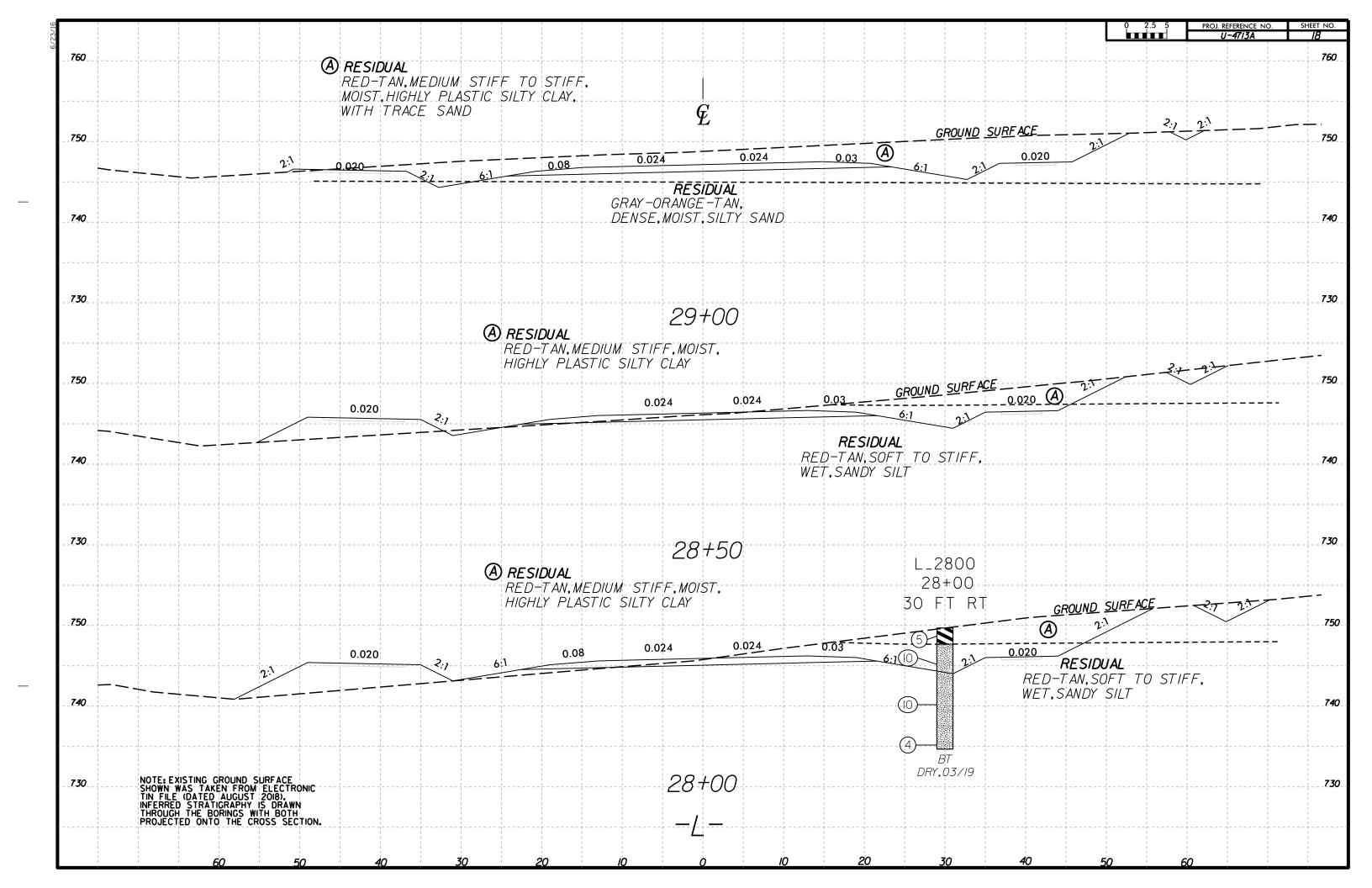
				ERENCE NO. SHEET NO. 47/3A 13
		£		
760		L_2250		760
750	GROUND SURFACE	RESIDUAL RED-TAN, VERY STIFF, MOIST, HIGHLY PLASTIC SILTY CLAY, WITH TRACE ROOTS RED-TAN, MEDIUM DENSE, MOIST, CLAYEY SILTY SAND		750
740		BT MOIST, CLAYEY SILTY SAND DRY, 03/19		740
		22+50		
760		(A) RESIDUAL GRAY-BROWN, MEDIUM STIFF, MOIST, SANDY SILT		760
	GROUND SURFACE	<u>0.010</u> <u>0.010</u>		
750		RESIDUAL RED-TAN, VERY STIFF, MOIST, HIGHLY PLASTIC SILTY CLAY, WITH TRACE ROOTS RED-TAN, MEDIUM DENSE, MOIST, CLAYEY SILTY SAND		750
740		22+00		740
760		(A) RESIDUAL GRAY—BROWN, MEDIUM STIFF, MOIST, SANDY SILT		
		0.0100.010		
750		RESIDUAL RED-TAN, VERY STIFF, MOIST, HIGHLY PLASTIC SILTY CLAY, WITH TRACE ROOTS RED-TAN, MEDIUM DENSE, MOIST, CLAYEY SILTY SAND		750
740		2/+50	NOTE: EXISTING GROUND SURFA SHOWN WAS TAKEN FROM ELEC TIN FILE (DATED AUGUST 2018) INFERRED STRATIGRAPHY IS DR THROUGH THE BORINGS WITH B PROJECTED ONTO THE CROSS	CE CTRONIC 740 RAWN OTH SECTION.
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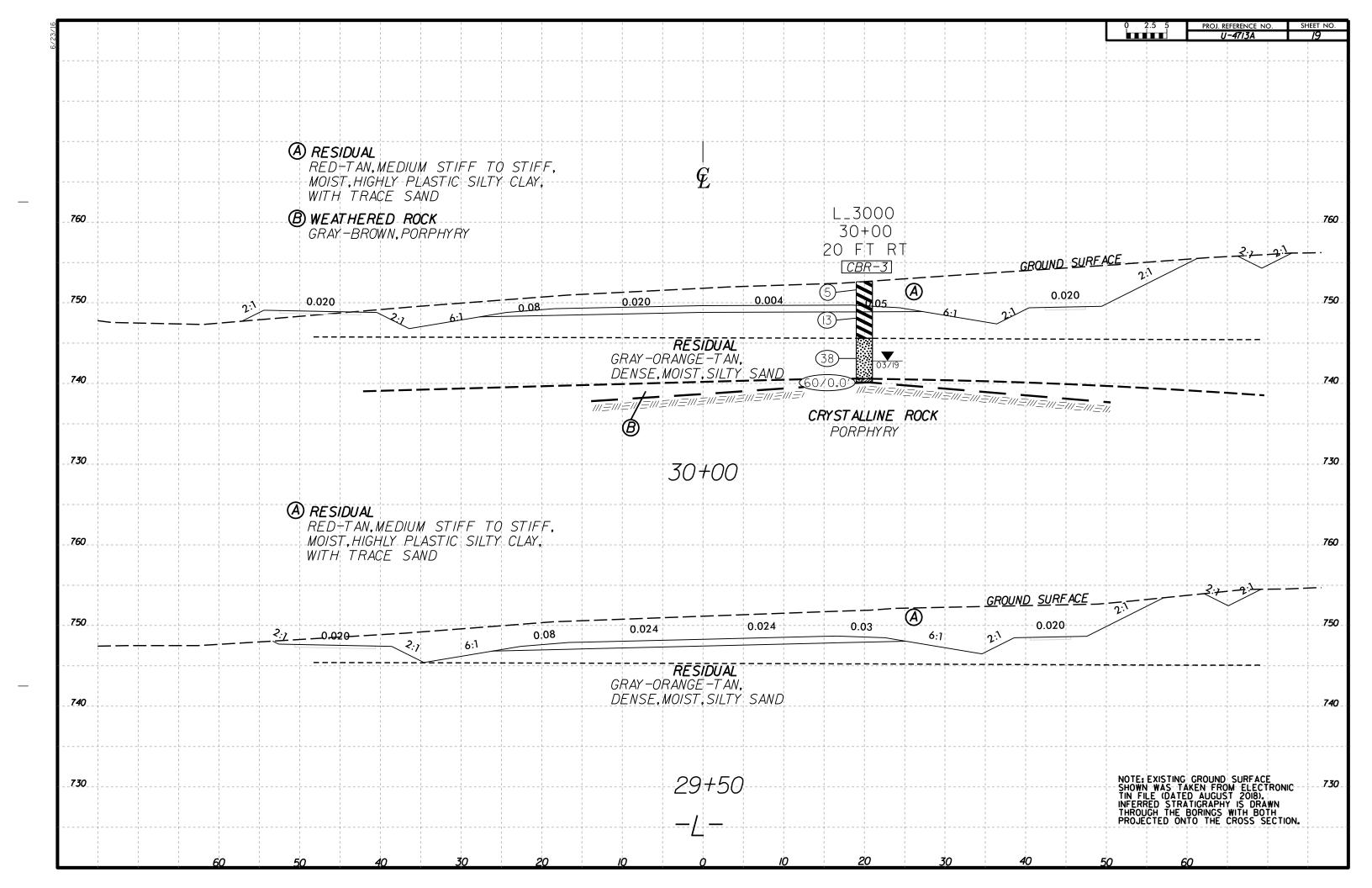


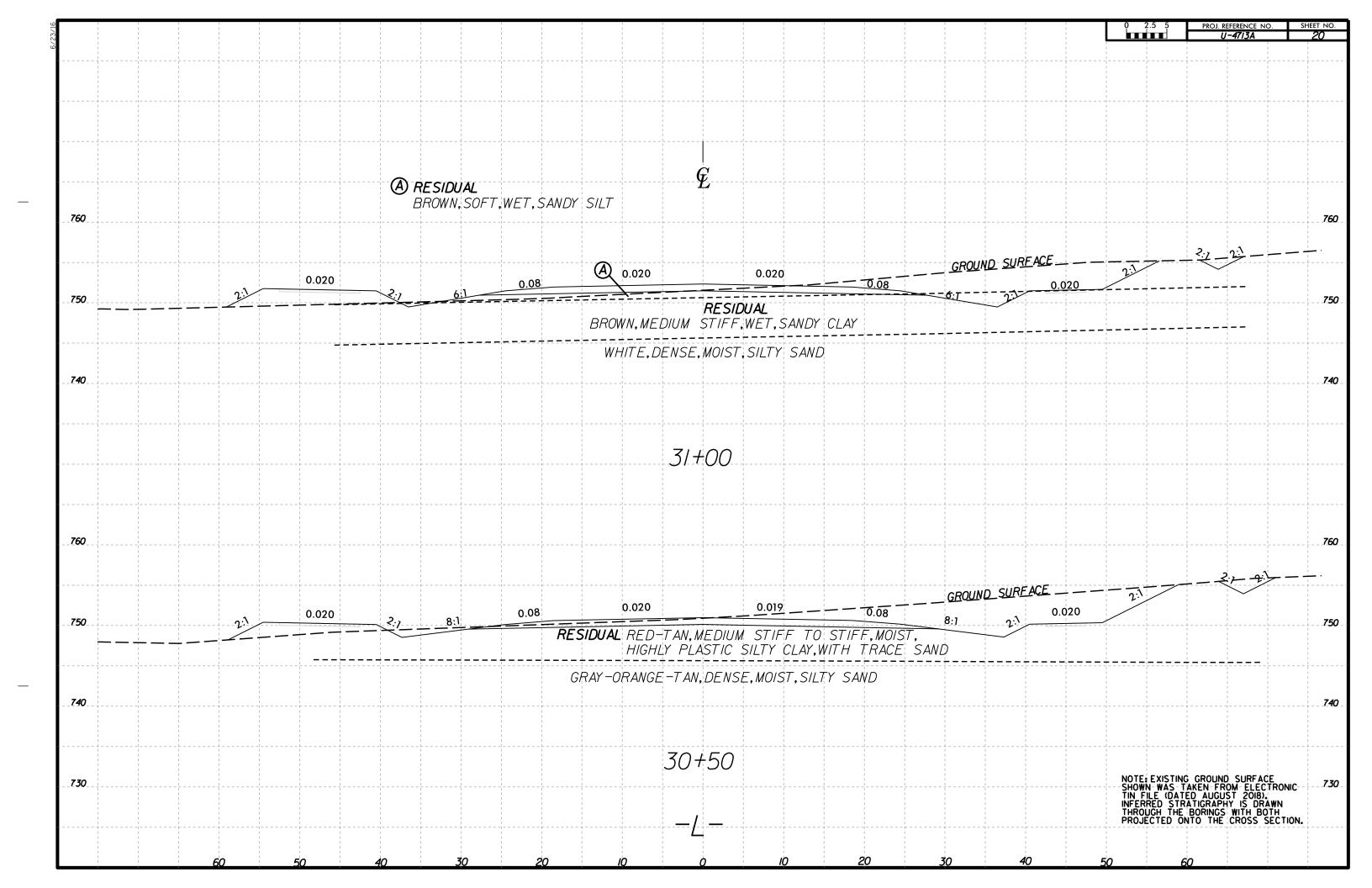


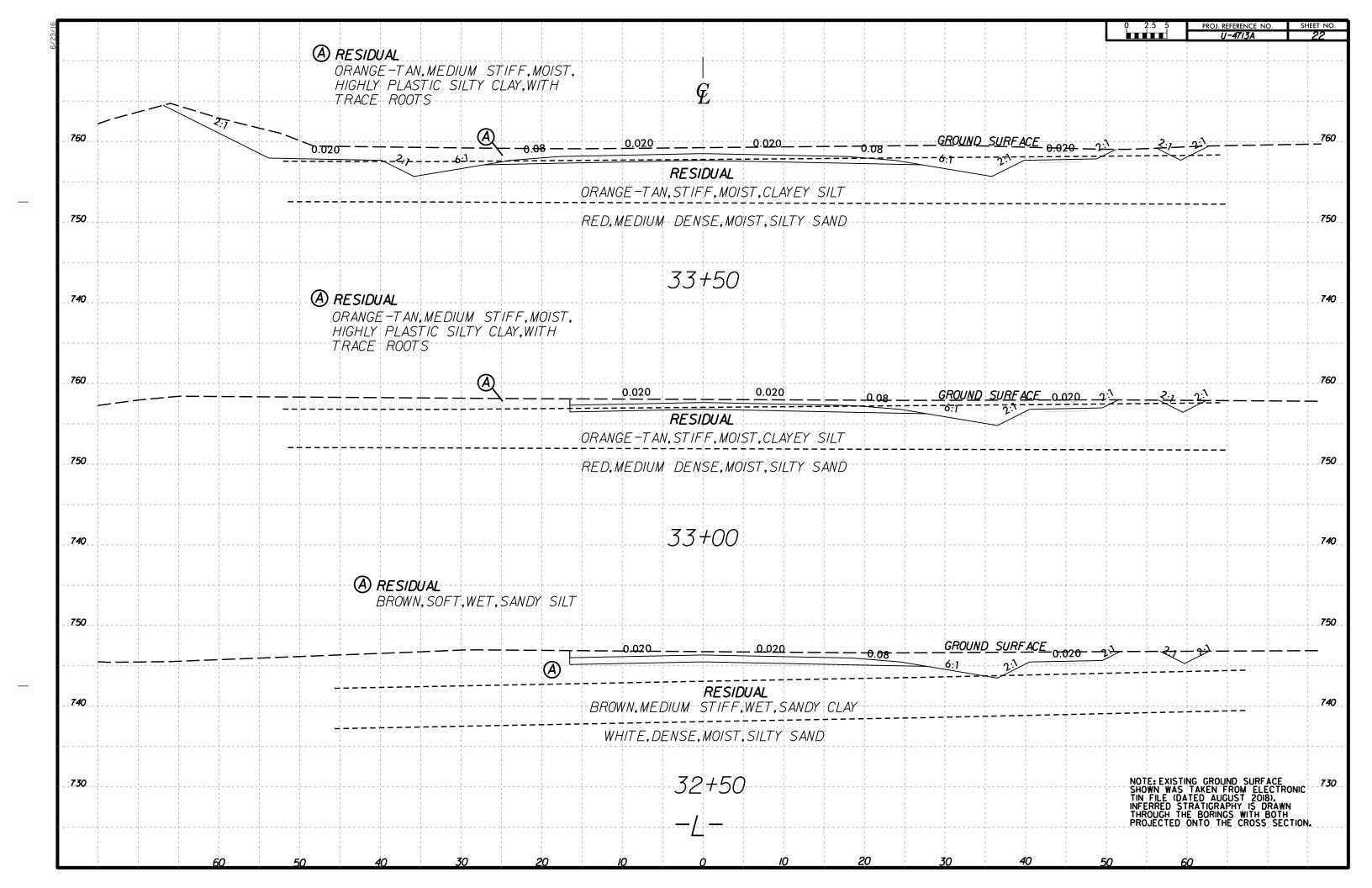


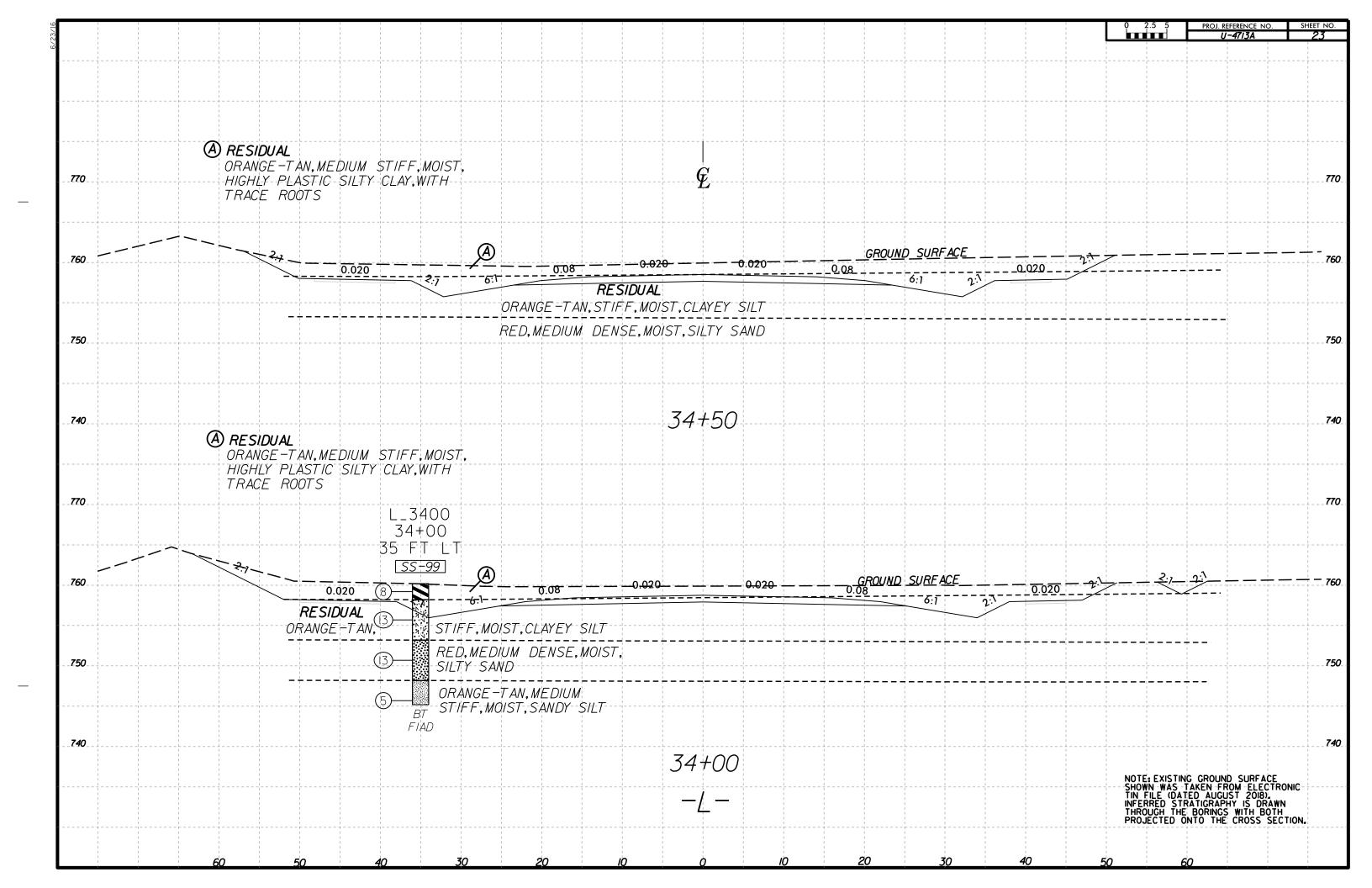


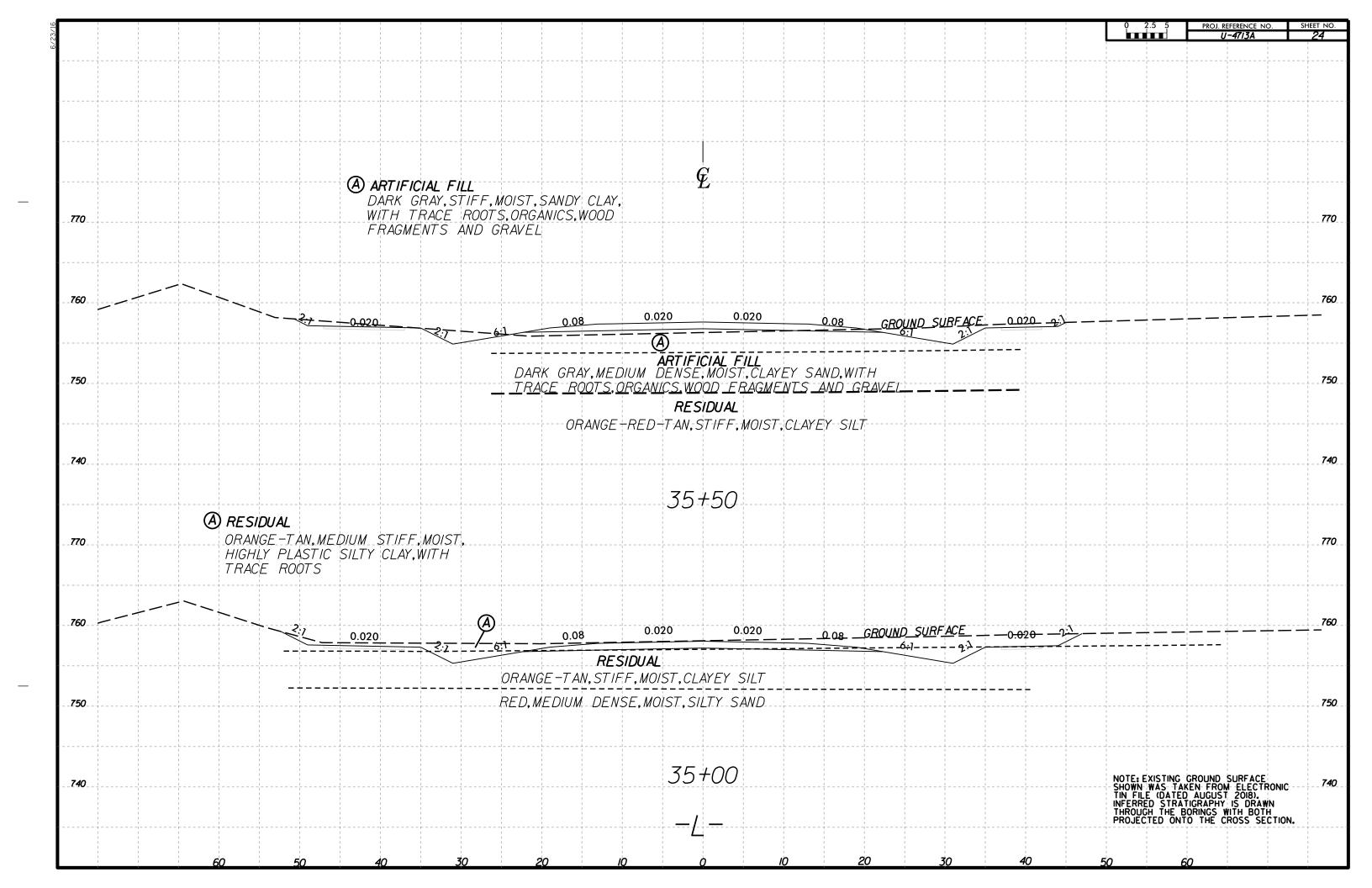


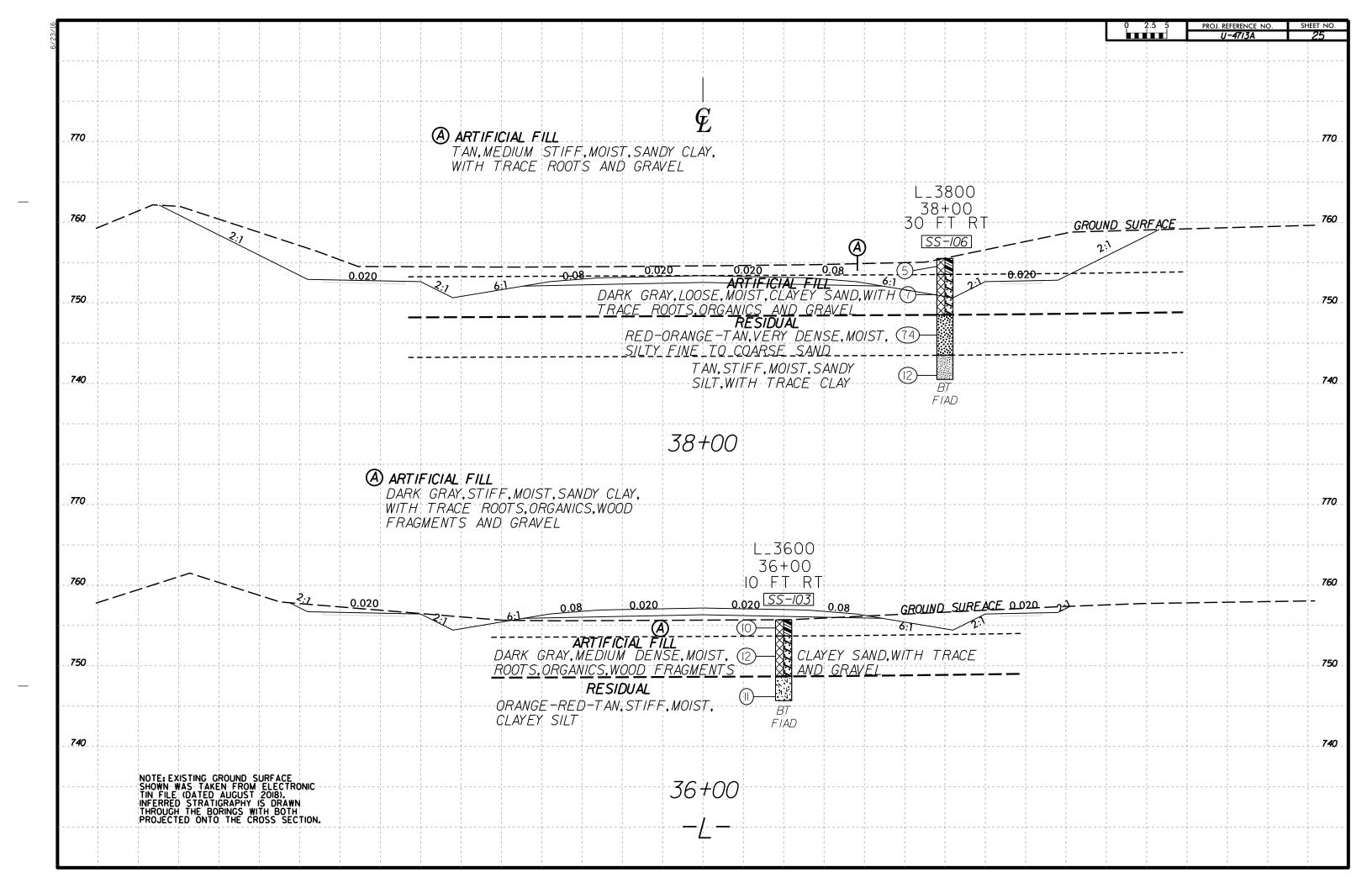


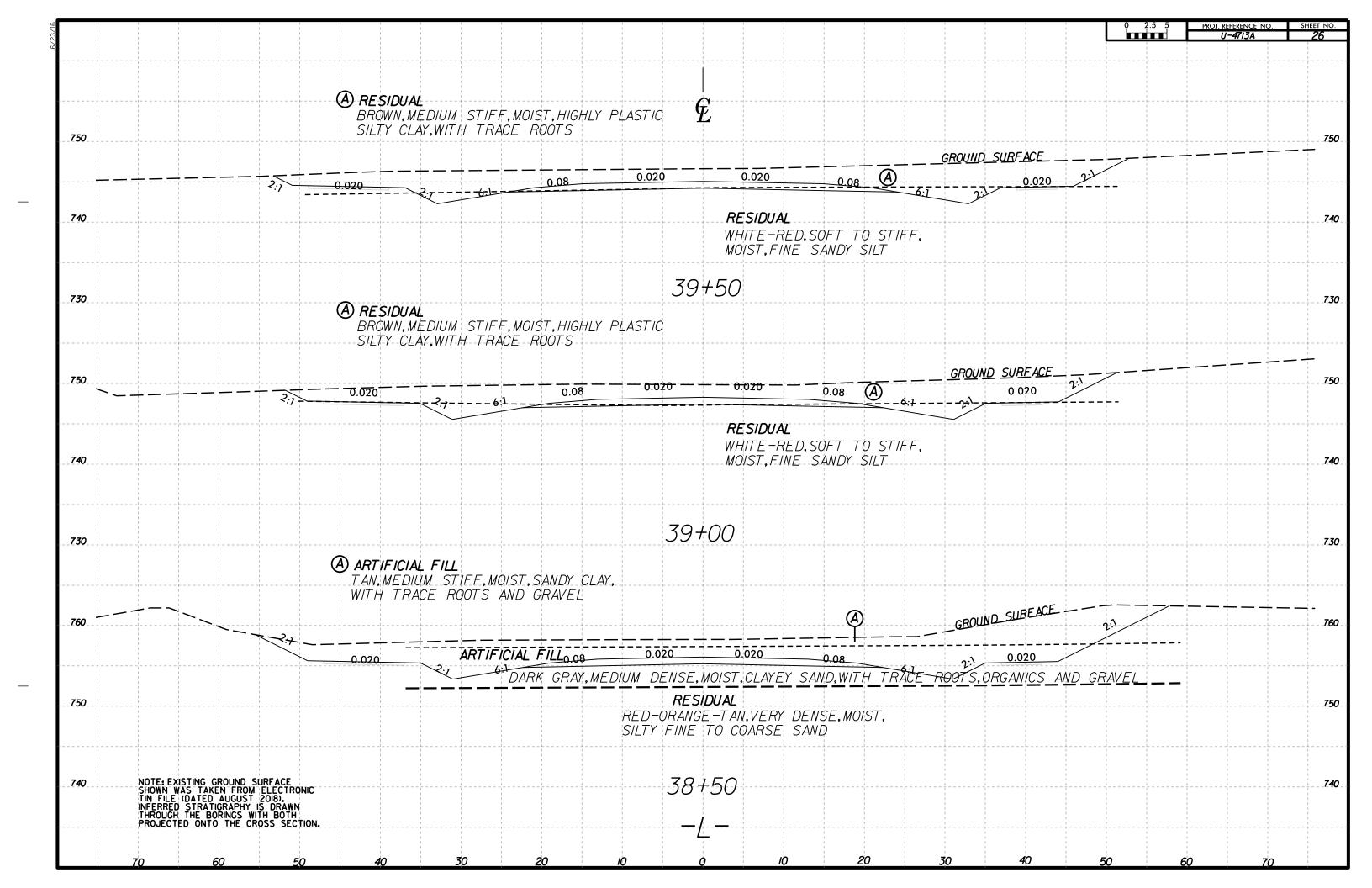


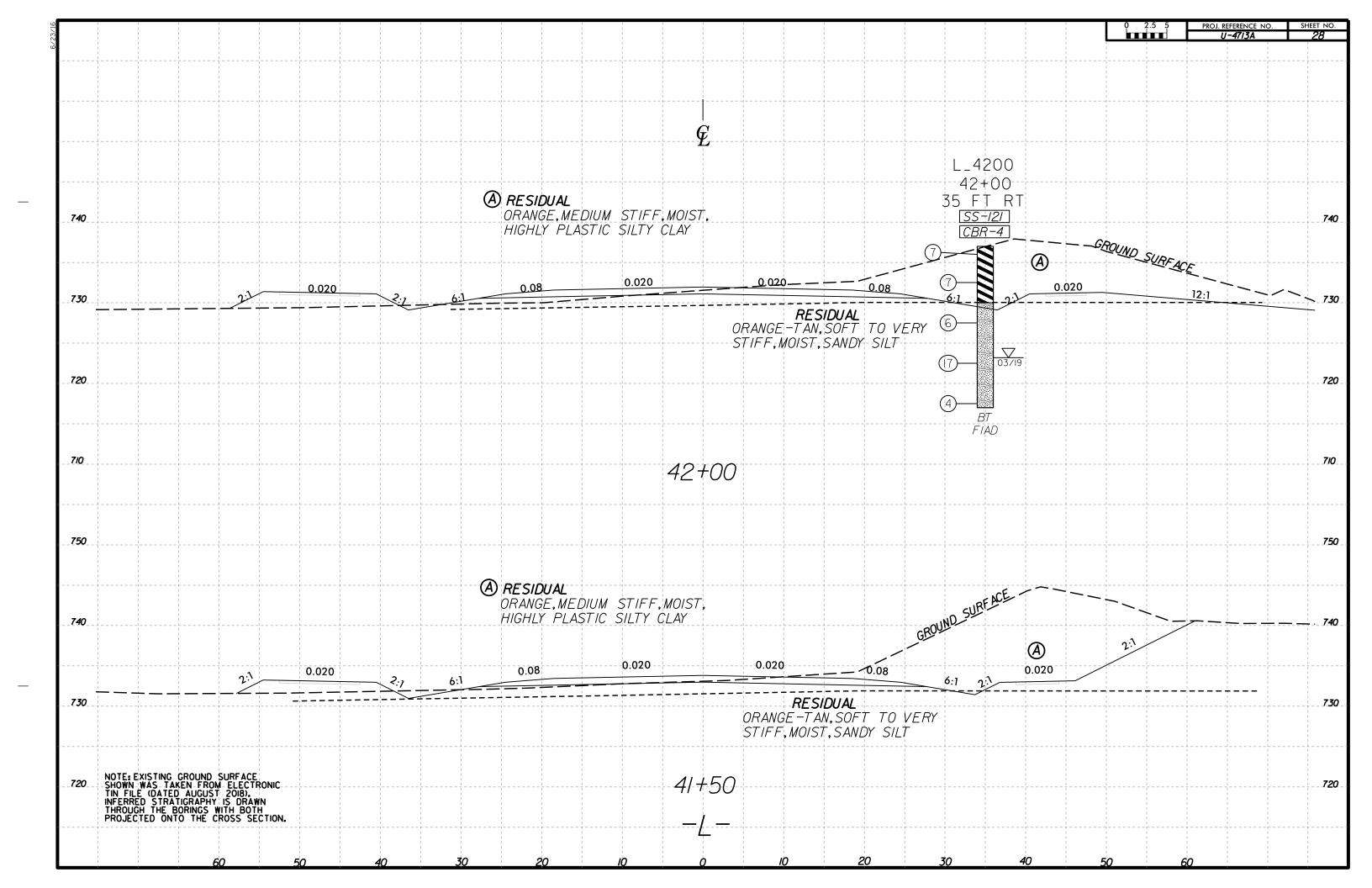


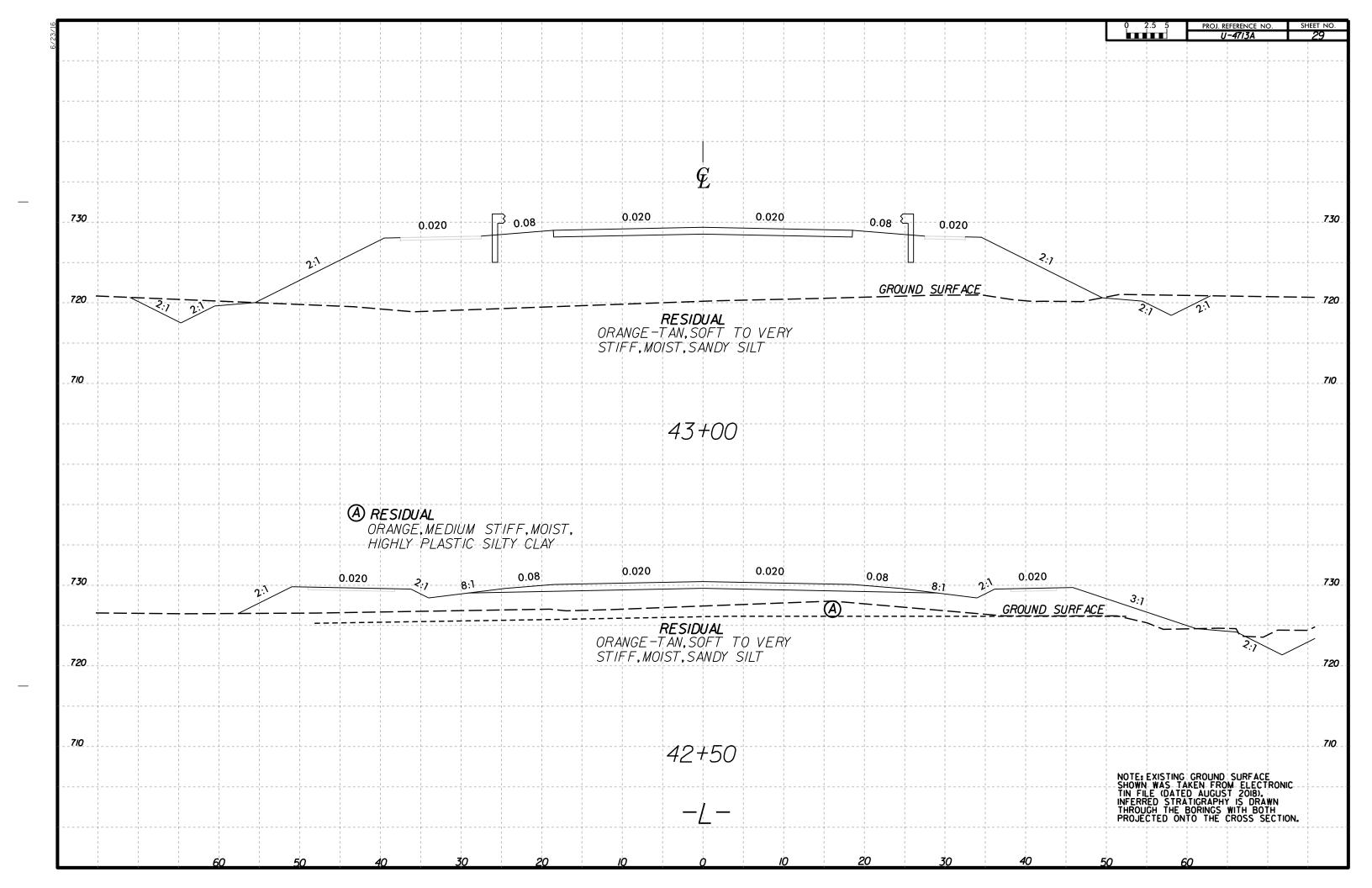


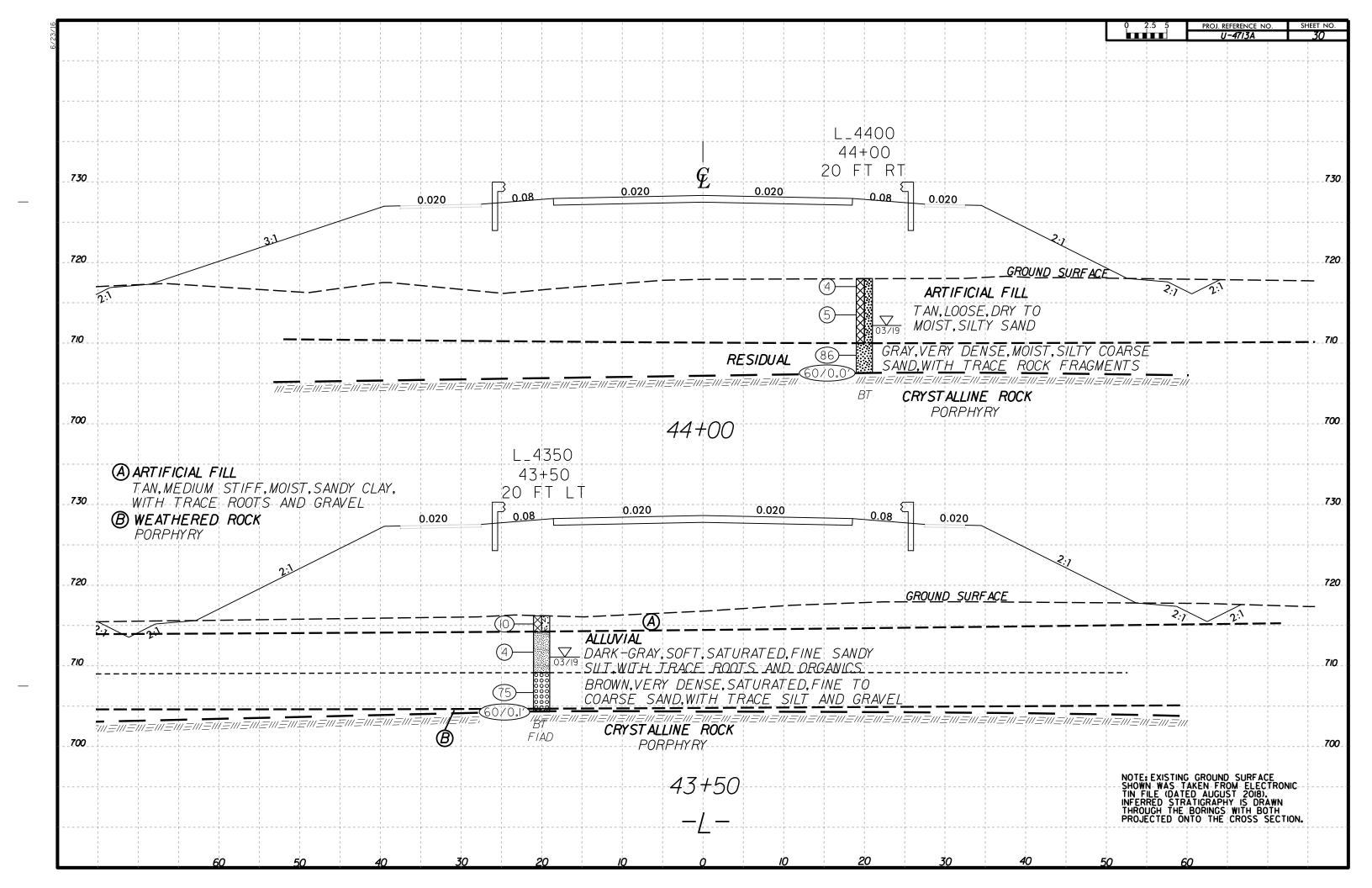


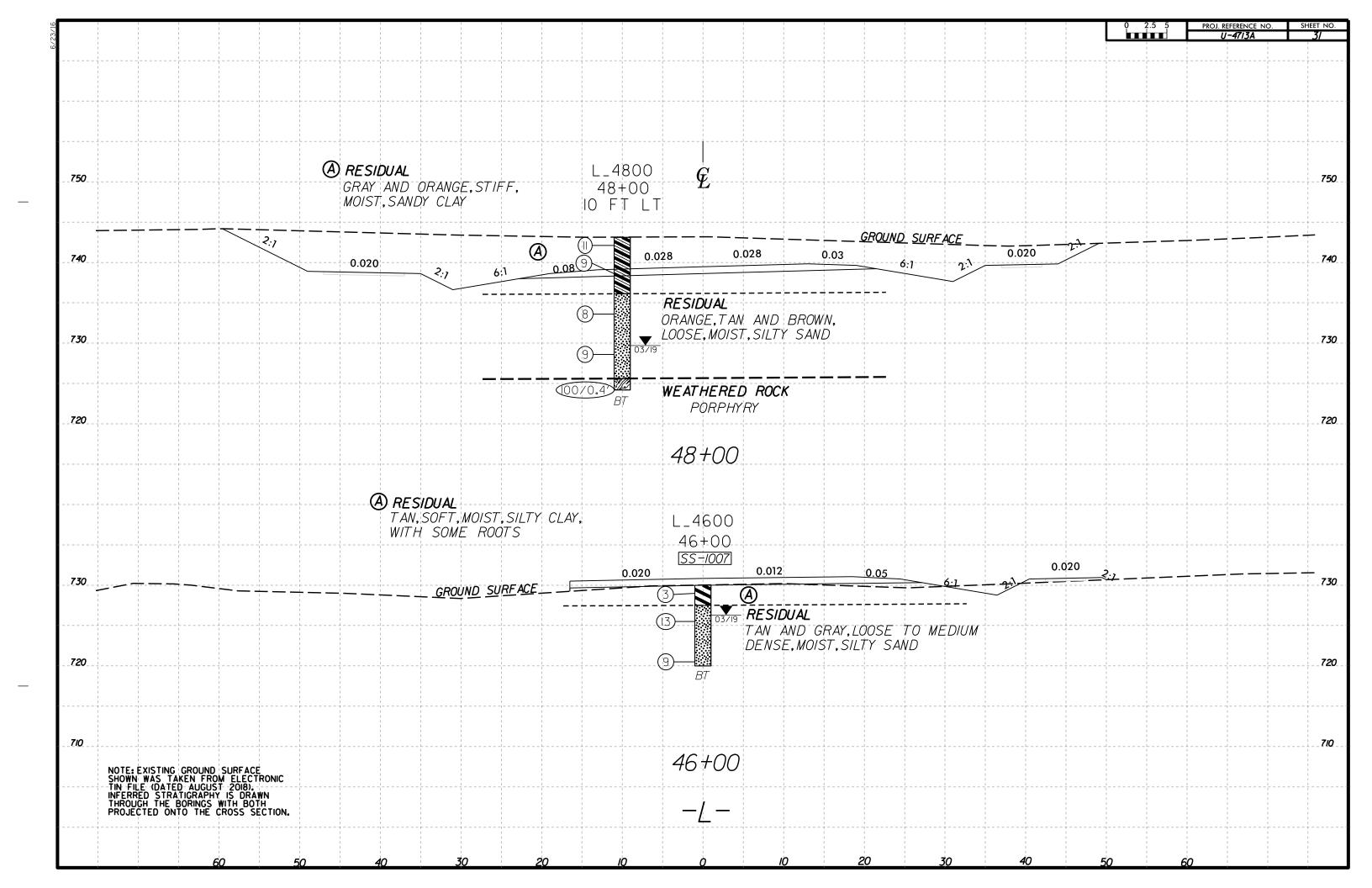


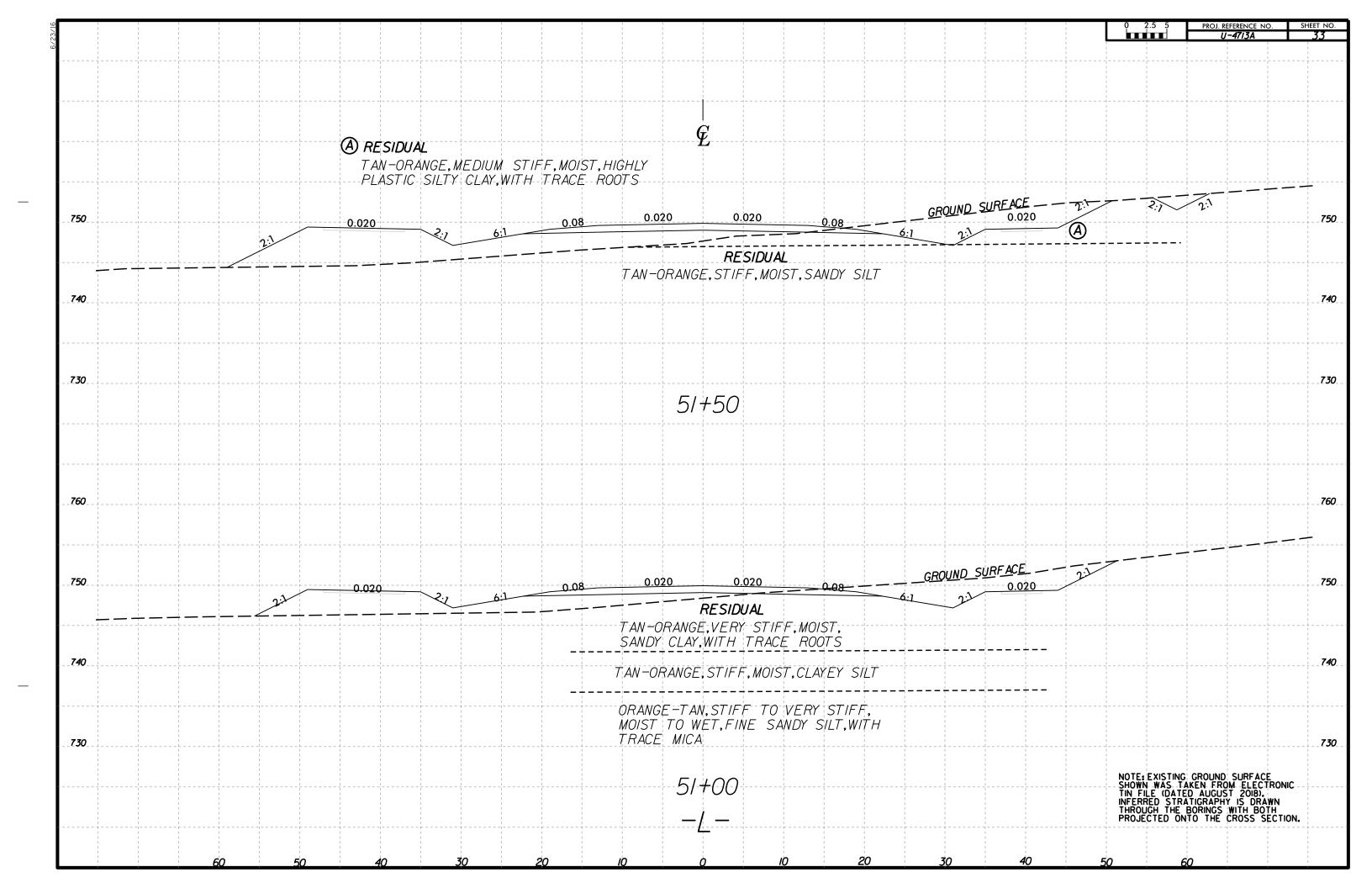


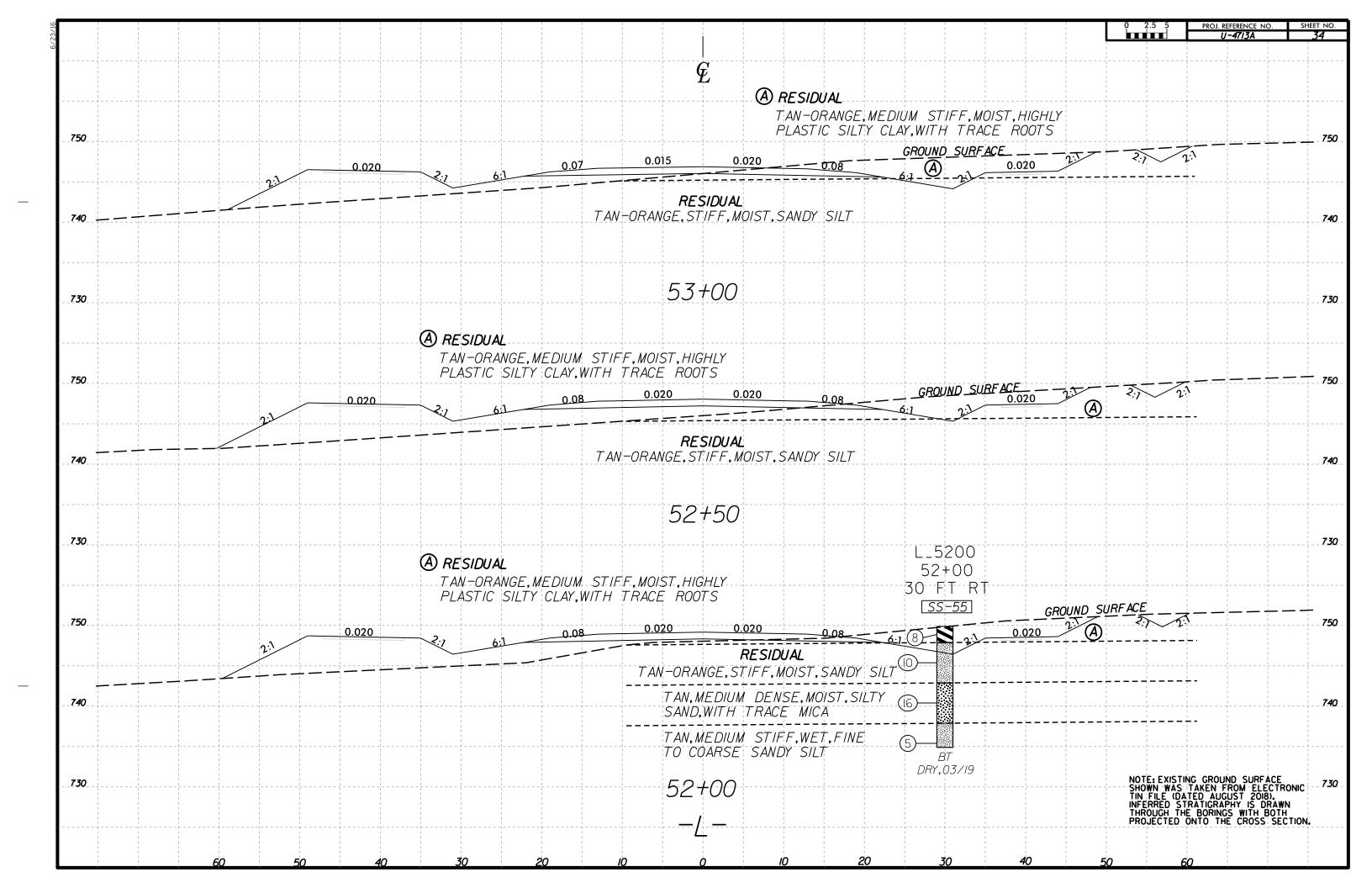


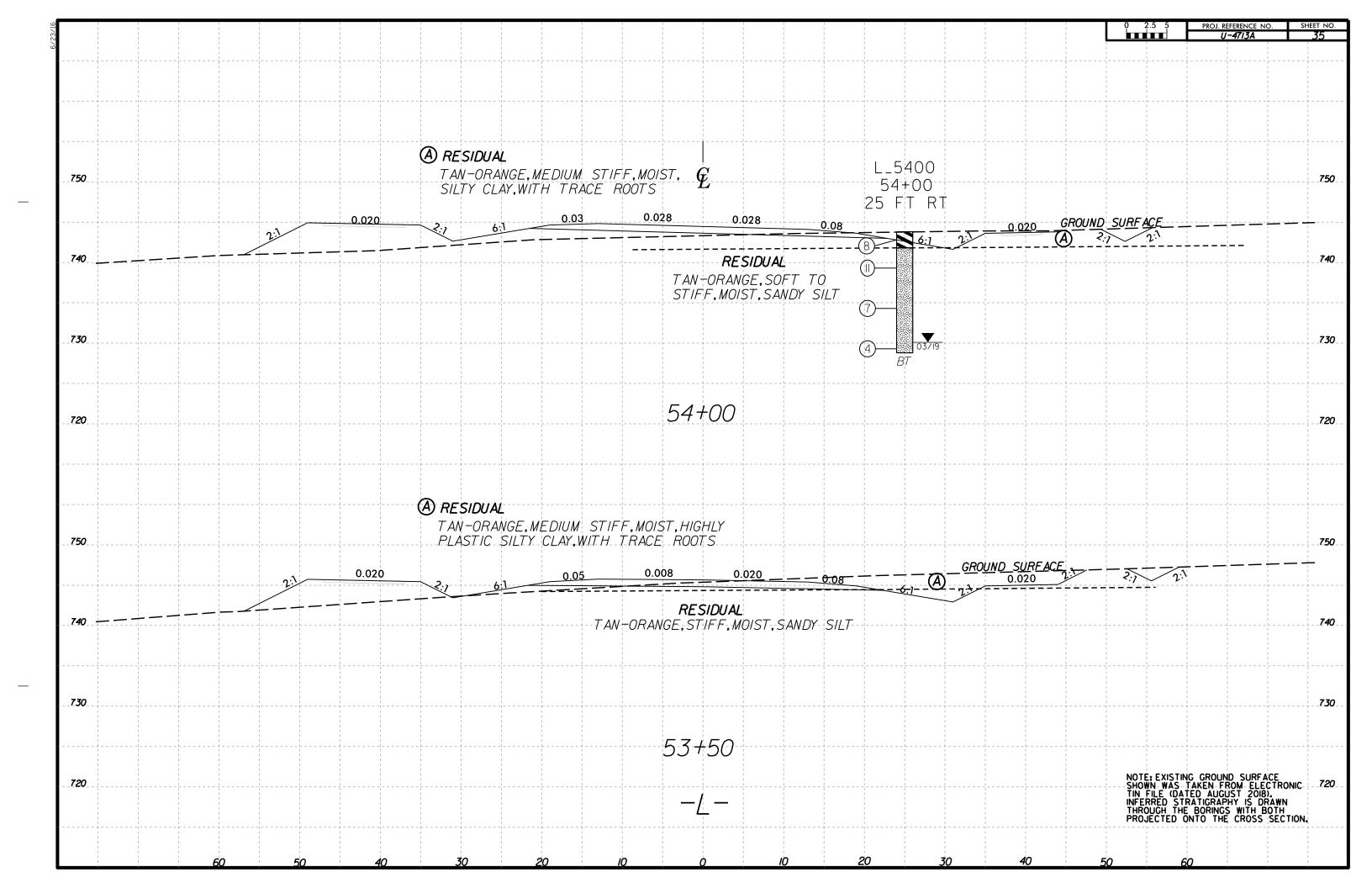


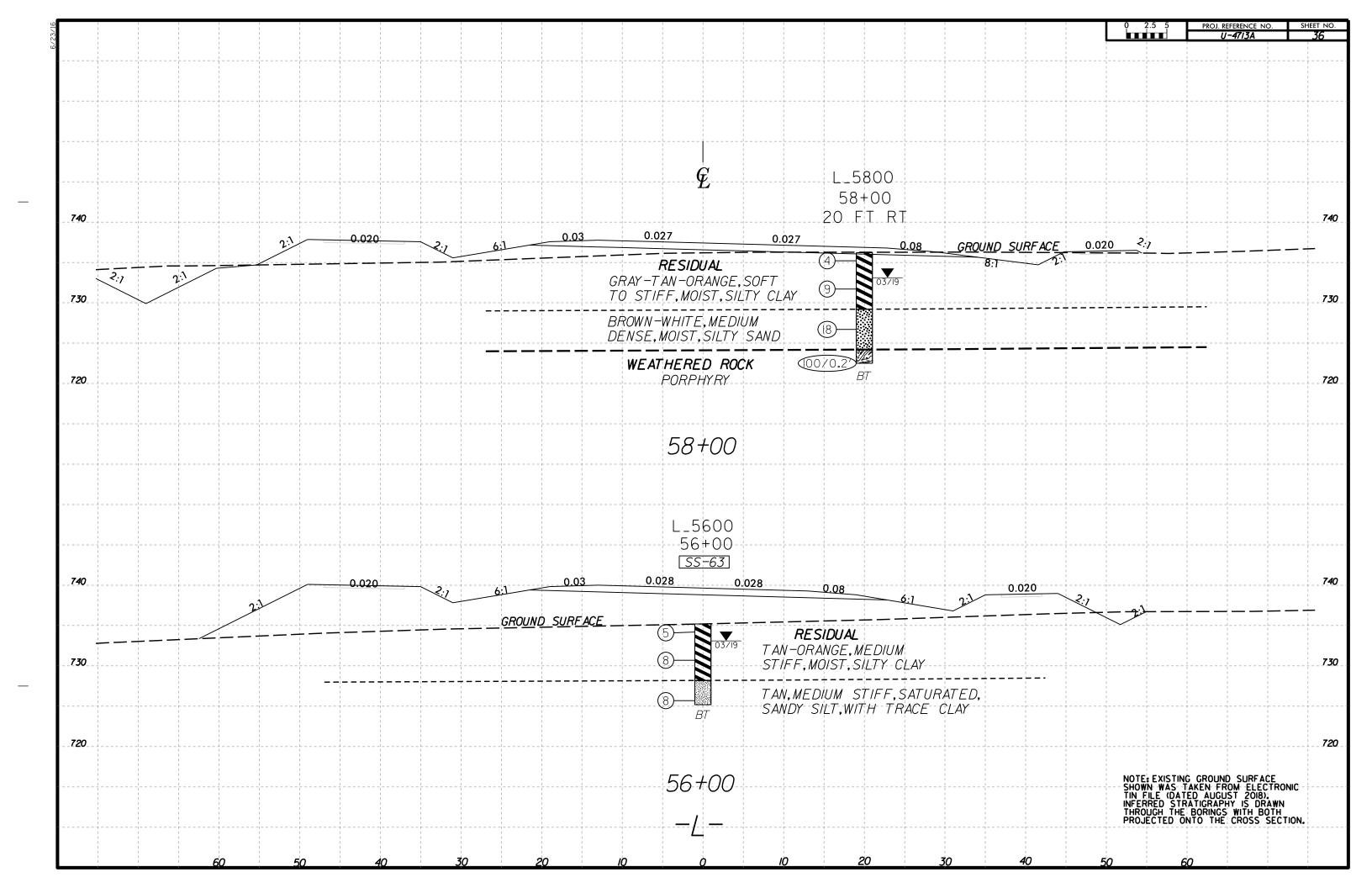


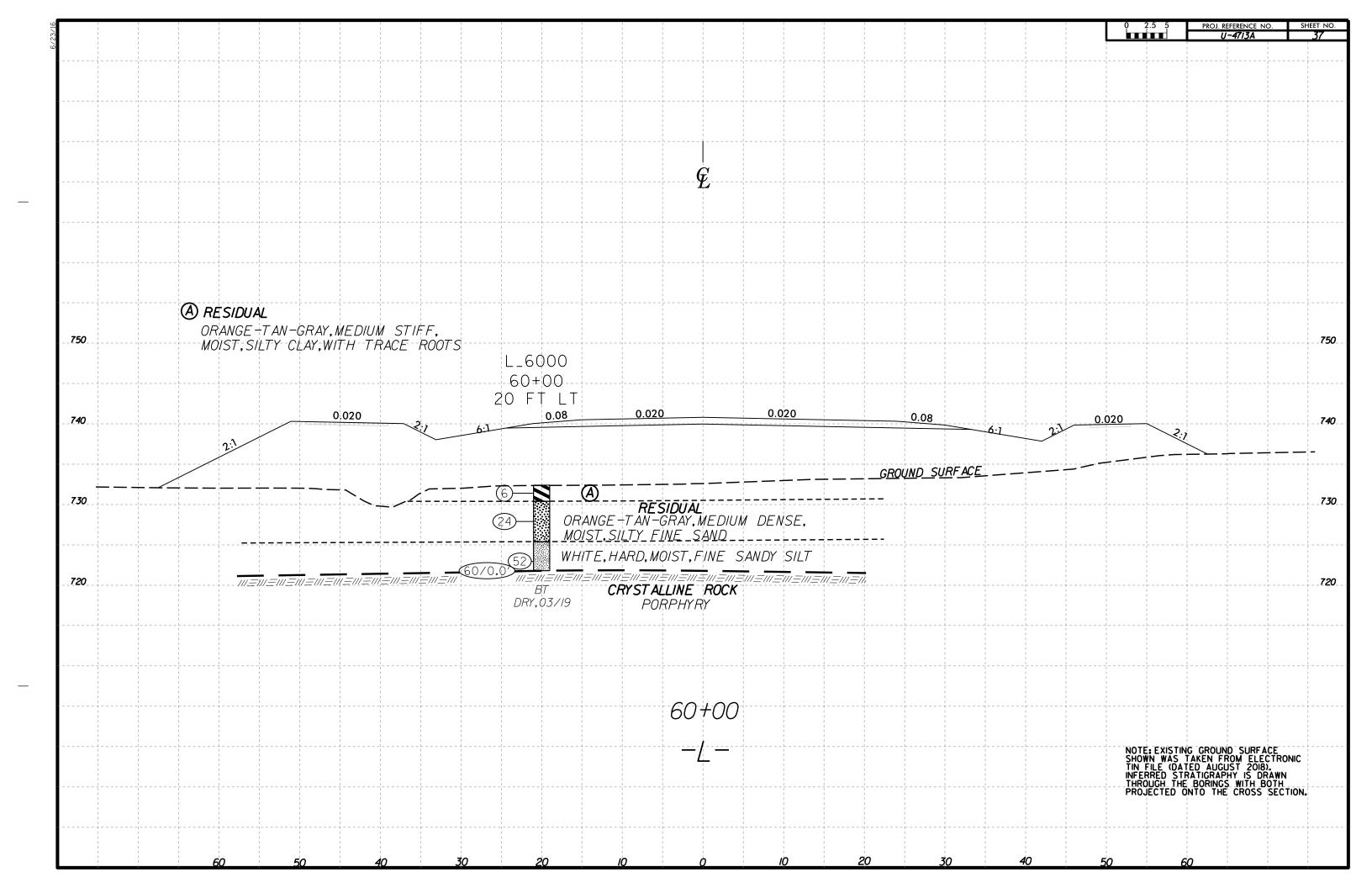


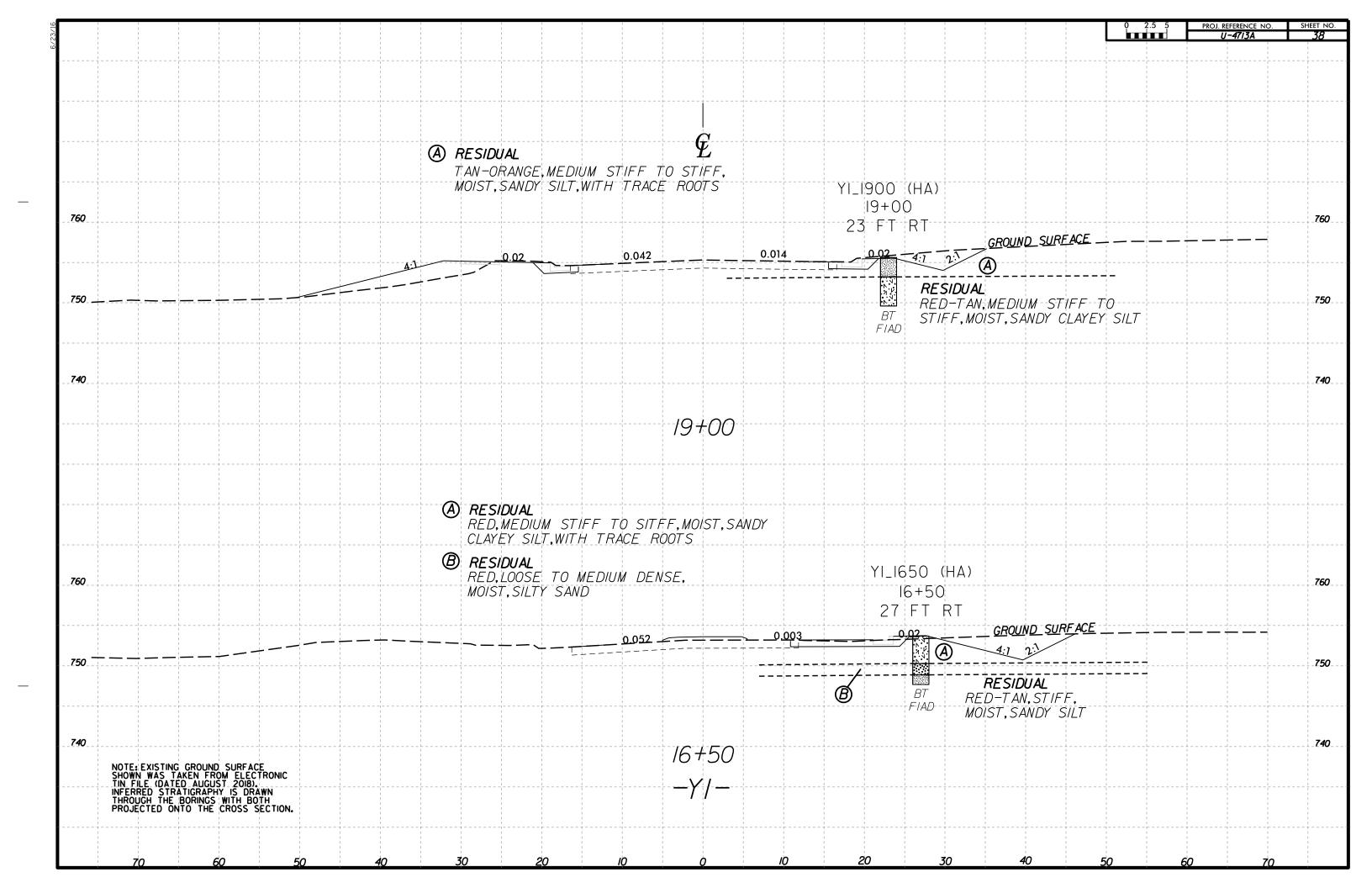




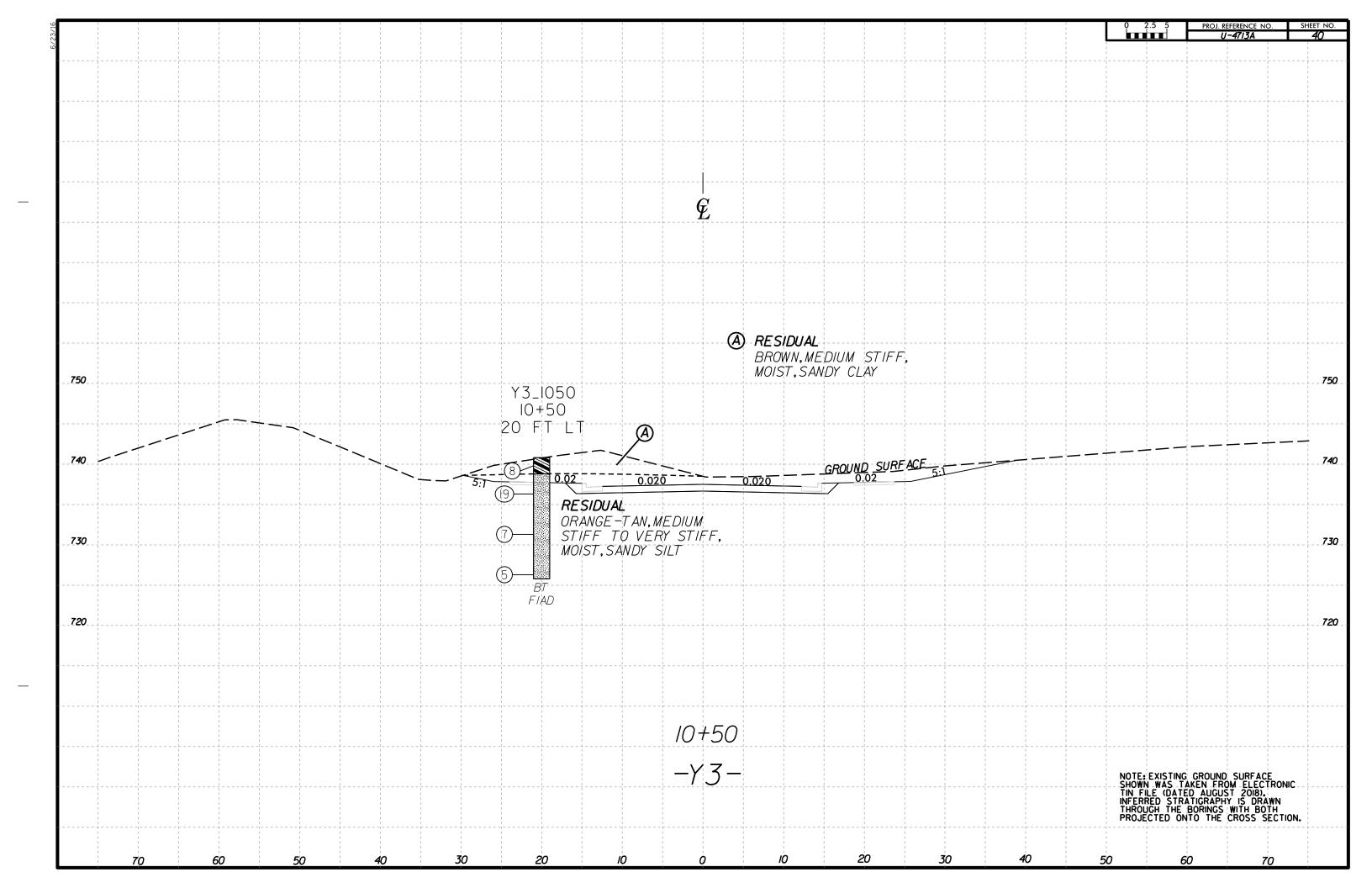


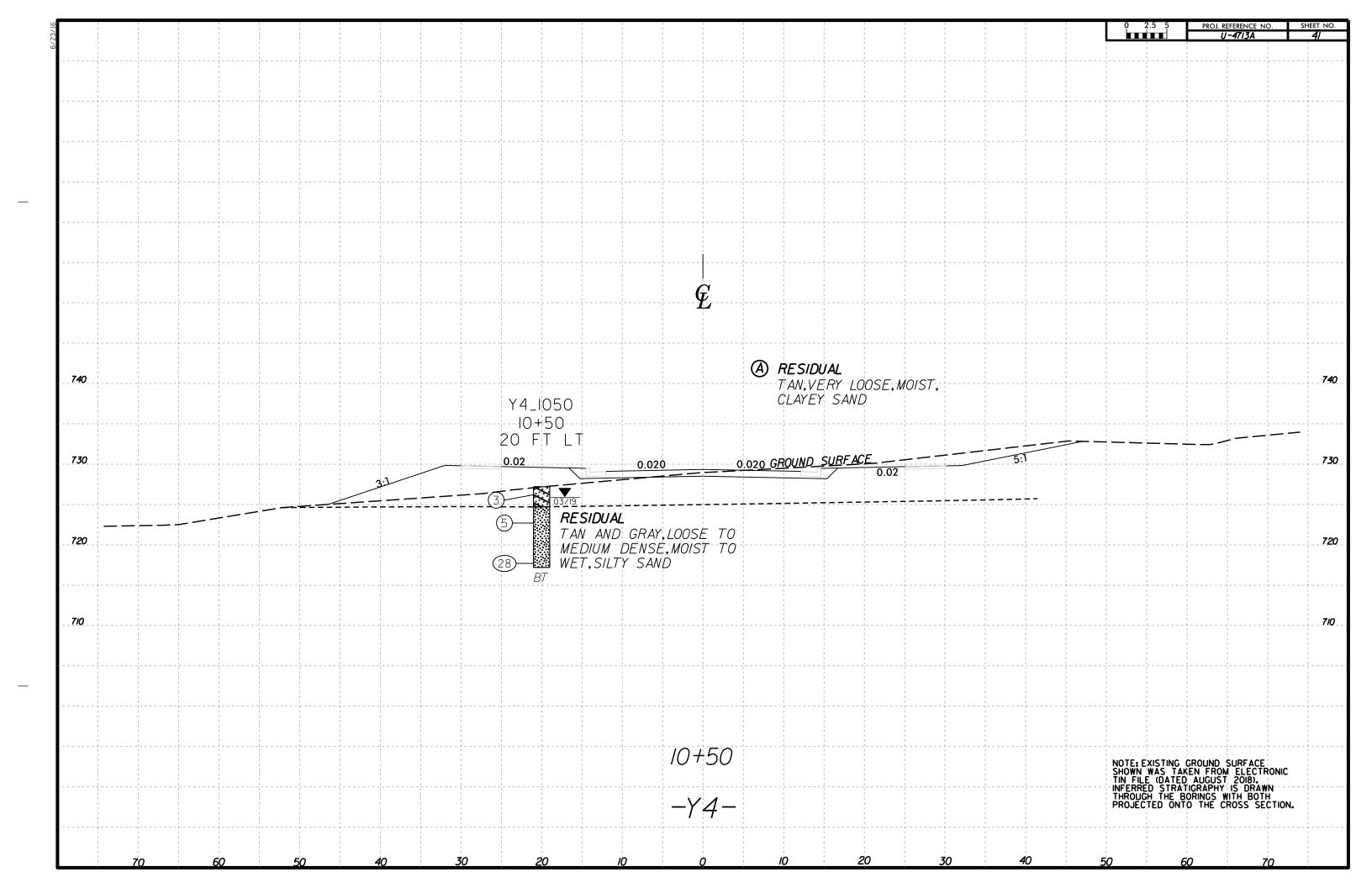






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	(A) F	RFSIDIIAI								
	B	RESIDUAL BROWN-GRAY,SOFT,MO SILT,WITH TRACE RO	DIST, SANDY							
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				A	20 FT RT					
	5:1			/		GROUND	<u>SURFACE</u>			
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					5)————————————————————————————————————				 	
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NOTE: EXISTING GROUND SURFACE SHOWN WAS TAKEN FROM ELECTRONIC			-Y2-							
NOTE: EXISTING GROUND SURFACE SHOWN WAS TAKEN FROM ELECTRONIC TIN FILE (DATED AUGUST 2018). INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.			<i>'</i>						 	
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70 60 50 40	o 30	20 10	0	<i>IO</i>	20	30 40	50	60	,	70





PROJECT REFERENCE NO.	SHEET NO.
U-4713A	42

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ROADWAY SUBSURFACE INVESTIGATION

APPENDIX A
SOIL TEST RESULTS

PROJECT REFERENCE NO.	SHEET NO.
U-4713A	43

SOIL TEST RESULTS																
SAMPLE	OFFSET	STATION		DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
NO.	OFFSET							C. Sand	F. Sand	Silt	Clay	10	40	200	MOISTURE	ORGANIC
SS-95	20 RT	10+50	-Y2-	0.3-1.5	A-4 (0)	16	1	34.1	30.8	23.4	11.7	99.5	73.8	40.3	15.7	-
SS-73	CL	22+50	-L-	0.3-1.5	A-4 (0)	11	2	38.4	24.8	24.8	11.9	99.4	71.0	41.3	8.9	-
SS-74	CL	22+50	-L-	3.5-5.0	A-7-5 (39)	79	49	17.8	9.0	15.0	58.3	100.0	85.4	75.0	28.6	-
SS-80	10 RT	26+00	-L-	0.4-1.5	A-7-6 (20)	64	39	28.9	14.6	12.3	44.3	99.7	77.5	58.7	19.5	-
SS-99	35 LT	34+00	-L-	0.4-1.5	A-7-6 (30)	66	40	17.0	12.4	13.3	57.4	100.0	86.3	73.2	14.9	-
SS-103	10 RT	36+00	-L-	0.4-1.5	A-6 (6)	32	16	27.6	20.9	21.1	30.3	97.8	77.0	54.7	16.1	-
SS-106	30 RT	38+00	-L-	0.3-1.5	A-6 (1)	25	12	40.9	20.7	17.2	21.2	99.1	65.4	42.3	12.6	-
SS-121	35 RT	42+00	-L-	0.2-1.5	A-7-6 (21)	58	38	23.5	16.2	15.4	44.8	97.6	80.9	61.8	22.7	-
SS-1007	CL	46+00	-L-	0.0-1.5	A-7-6 (7)	41	21	30.9	21.1	18.7	29.2	95.5	72.9	50.4	16.5	-
SS-50	10 RT	50+00	-L-	0.0-1.5	A-6 (2)	29	12	35.1	24.9	16.1	24.0	99.8	74.5	44.6	10.9	-
SS-55	30 RT	52+00	-L-	0.0-1.5	A-7-5 (52)	87	56	9.8	10.0	13.9	66.3	100.0	93.2	82.3	32.2	-
SS-63	CL	56+00	-L-	0.2-1.5	A-7-6 (13)	50	24	26.0	15.9	20.8	37.4	100.0	80.7	61.4	24.9	-
CBR-2	10 RT	26+00	-L-	5.0-7.0	A-7-6 (8)	44	15	25.7	17.6	23.9	32.9	99.7	79.2	60.6	23.9	-
CBR-3	20 RT	30+00	-L-	3.0-5.0	A-7-6 (17)	57	28	24.3	13.2	18.7	43.8	99.4	79.1	64.9	27.2	-
CBR-4	35 RT	42+00	-L-	3.0-5.0	A-7-6 (13)	56	27	31.5	15.9	19.1	33.6	99.9	76.0	55.6	31.2	-
CBR-1	10 RT	50+00	-L-	3.0-5.0	A-6 (3)	28	12	28.1	24.4	21.2	26.3	99.8	80.6	52.3	14.6	-