

REFERENCE: U-4700CC

PROJECT: N/A

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

CONTENTS

<u>LINE</u>	<u>STATION</u>	<u>PLAN</u>	<u>PROFILE</u>
-L-	529+00 TO 559+10	4-6	N/A
-Y36-	13+00 TO 29+00	5	N/A
-Y37-	13+75 TO 16+36	6	N/A

CROSS SECTIONS

<u>LINE</u>	<u>STATION</u>	<u>SHEETS</u>
-L-	529+50 TO 559+00	7-19
-Y36-	13+00 TO 29+00	20-28
-Y37-	13+50 TO 16+00	29-31

APPENDICES

<u>APPENDIX</u>	<u>TITLE</u>	<u>SHEETS</u>
A	LABORATORY TEST RESULTS	32-33

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

ROADWAY
SUBSURFACE INVESTIGATION

COUNTY CALDWELL

PROJECT DESCRIPTION US-321 (HICKORY BLVD) AT
MISSION ROAD

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-4700CC	1	35

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

A. SUTTLE, GIT

INVESTIGATED BY ECS SOUTHEAST, LLP

DRAWN BY K. DE MONTBRUN, P.E.

CHECKED BY M. WALKO, P.E.

SUBMITTED BY ECS SOUTHEAST, LLP

DATE AUGUST 2021

Prepared in the Office of:

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NC REGISTERED
ENGINEERING
FIRM # F-1078



DocuSigned by:

Kelly de Montbrun 8/27/2021

7BDD9975E22C490 SIGNATURE

DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

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	
SYMBOL	A-1-a		A-1-b		A-2-4		A-2-5		A-2-6		A-2-7		A-4		A-5		A-6		A-7-5		A-7-6	
% PASSING #10 #40 #200	50 MX 15 MX	30 MX 25 MX	50 MX 10 MX	51 MN	35 MX 35 MX	35 MX 35 MX	35 MX 35 MX	35 MX 35 MX	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN
MATERIAL PASSING #40 LL PI	—		—		40 MX 10 MX		41 MN 11 MN		40 MX 11 MN		41 MN 11 MN		40 MX 10 MX		41 MN 11 MN		40 MX 10 MX		41 MN 11 MN		41 MN 11 MN	
GROUP INDEX	0		0		0		0		0		0		0		0		0		0		0	
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS		MUCK, PEAT							
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 RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY 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 OPENING (MM)	4	10	40	60	200	270
	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

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
PL		
OM	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
SL	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

NON PLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH
SLIGHTLY PLASTIC	0-5	VERY LOW
MODERATELY PLASTIC	6-15	SLIGHT
HIGHLY PLASTIC	16-25	MEDIUM
	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
MODERATELY COMPRESSIBLE
HIGHLY COMPRESSIBLE

LL < 31
LL = 31 - 50
LL > 50

PERCENTAGE OF MATERIAL

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

GROUND WATER

WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING

STATIC WATER LEVEL AFTER 24 HOURS

PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA

SPRING OR SEEP

MISCELLANEOUS SYMBOLS

ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION

SOIL SYMBOL

ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT

INFERRED SOIL BOUNDARY

INFERRED ROCK LINE

ALLUVIAL SOIL BOUNDARY

DIP & DIP DIRECTION OF ROCK STRUCTURES

TEST BORING

AUGER BORING

CORE BORING

MONITORING WELL

PIEZOMETER INSTALLATION

SLOPE INDICATOR INSTALLATION

CONE PENETROMETER TEST

SOUNDING ROD

TEST BORING WITH CORE

SPT N-VALUE

RECOMMENDATION SYMBOLS

UNDERCUT

UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE

UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK

SHALLOW UNDERCUT

UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL - CLAY
CPT - CONE PENETRATION TEST
CSE - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY

MED. - MEDIUM
MICA - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY

VST - VANE SHEAR TEST
WEA. - WEATHERED
% - UNIT WEIGHT
% - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

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

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 YIELD 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 FINGER NAIL.

FRACTURE SPACING

TERM

VERY WIDE

WIDE

MODERATELY CLOSE

CLOSE

VERY CLOSE

SPACING

MORE THAN 10 FEET

3 TO 10 FEET

1 TO 3 FEET

0.16 TO 1 FOOT

LESS THAN 0.16 FEET

BEDDING

TERM

VERY THICKLY BEDDED

THICKLY BEDDED

THINLY BEDDED

VERY THINLY BEDDED

THICKLY LAMINATED

THINLY LAMINATED

THICKNESS

4 FEET

1.5 - 4 FEET

0.16 - 1.5 FEET

0.03 - 0.16 FEET

0.008 - 0.03 FEET

< 0.008 FEET

BENCH MARK: N/A

ELEVATION: FEET

NOTES:

ROADWAY DESIGN FILES, .TIN FILE, AND GPK FILE PROVIDED BY VAUGHN & MELTON.

NORTHING AND EASTINGS OBTAINED USING A TRIMBLE GEOTX. BORING ELEVATIONS FOR ROADWAY BORINGS WERE OBTAINED USING PROVIDED .TIN FILE

FIAD = FILLED IN AFTER DRILLING

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

☐

☐

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.

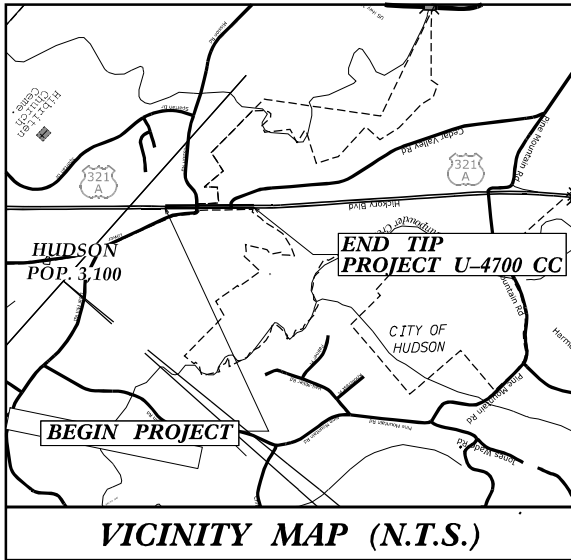
DATE: 8-15-14

09/28/2019

6/6/2019 2:45:15 PM
V:\Asheville\Transportation\31535-15 U4700CC\Roadway\Proj\U4700CC_Rdy_TSH.dgn
User: jrzimmerman

TIP PROJECT: U-4700CC

CONTRACT:



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

25% PRELIMINARY PLANS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
CALDWELL COUNTY

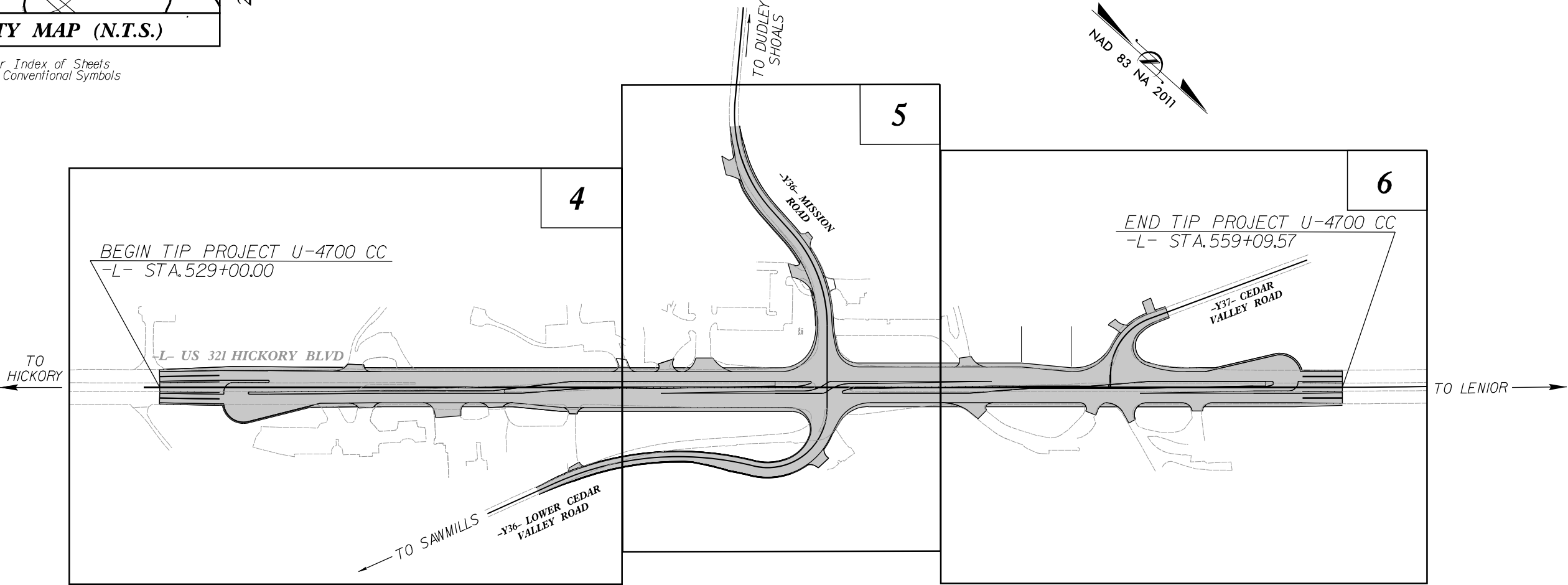
LOCATION: US 321 (HICKORY BLVD) AT MISSION ROAD
TYPE OF WORK: GRADING, DRAINAGE, PAVING AND SIGNALS

V&M
Vaughn & Melton
Consulting Engineers
Asheville, North Carolina
828-253-2786

□ Boone, NC 828-255-1833
□ Tri-Cities, TN 423-467-9402
□ Knoxville, TN 865-546-1800
□ Spartanburg, SC 864-514-4775
□ Charleston, SC 843-314-3650
□ Mississippi, MS 662-248-6600
□ Raleigh, NC 919-971-9459
□ Charlotte, NC 704-351-0488
□ Atlanta, GA 770-627-3509

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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-4700CC	3	35
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
35993.1.12	NHF-321(18)	PE	
			



Clearing on this project shall be performed to the limits established by Method III.
This project is within the municipal boundaries of the city of Hudson
This is a partially Controlled-Access Project with access being limited to points as shown on the plans.

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

GRAPHIC SCALES 50 0 50 100 PLANS 50 0 50 100 PROFILE (HORIZONTAL) 10 0 10 20 PROFILE (VERTICAL)	DESIGN DATA ADT 2019 = 33,500 ADT 2039 = 43,900 K = 8 % D = 55 % T = 7 % * V = 60 MPH * TTST = 3 DUAL 4 FUNC CLASS = PRINCIPAL ARTERIAL	PROJECT LENGTH LENGTH ROADWAY PROJECT U-4700CC = 0.570 MI. LENGTH STRUCTURE PROJECT U-4700CC = 0.000 MI. TOTAL LENGTH OF PROJECT U-4700CC = 0.570 MI.	Prepared in the Office of: VAUGHN & MELTON 1318-F PATTON AVE. ASHEVILLE NC, 28806 FOR THE NORTH CAROLINA DIVISION OF HIGHWAYS 2018 STANDARD SPECIFICATIONS RIGHT OF WAY DATE: _____ LETTING DATE: JUNE 2019 REECE SCHULER, PE, PLS PROJECT ENGINEER DANIEL ALMUETI, EIT PROJECT DESIGN ENGINEER	HYDRAULICS ENGINEER SIGNATURE: _____ P.E. ROADWAY DESIGN ENGINEER SIGNATURE: _____ P.E.	
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August 27, 2021

WBS NO: N/A
TIP NO: U-4700CC
COUNTY: Caldwell
DESCRIPTION: US 321 (Hickory Boulevard) at Mission Road

SUBJECT: Geotechnical Report – Inventory

Project Description

The project consists of interchange improvements along US 321/Hickory Boulevard at Mission Road in Caldwell County, North Carolina. Improvements include widening and resurfacing US 321 (-L-) and constructing two U-turn bulb outs along the L-alignment to the north and south of the Mission Road. Other improvements also consist of widening and resurfacing Mission Road (-Y36-). The project is approximately 0.57 miles in length, measured along the US 321 (-L-) alignment.

US 321 will be widened in the vicinity of Mission Road to accommodate 2 through lanes in each direction, with either a 30-foot wide median or a turning lane. Two (2) corresponding U-Turn bulb outs to the north and south of the intersection will also be constructed along the -L- alignment. Mission Road (-Y36-alignment) will consist of one 12-foot-wide travel lane in each direction.

At the beginning of the project, the proposed road grade along the -L- alignment centerline start at approximate elevation 1,232 feet and slopes downward to a low elevation of approximately 1,220 feet at the end of the project. Soils encountered in the proposed construction areas generally consisted of roadway embankment underlain by residual soils. Mass grading will generally be limited to the widened areas with cut depths on the order of approximately 18 feet or less and fill heights on the order of 9 feet or less.

The following roads are included as part of this exploration:

Line	Road Name	Station (±)	Offsets
-L-	US 321/Hickory Blvd	529+00 to 559+10	LT to RT
-Y36-	Mission Road	13+00 to 29+00	LT to RT

A geotechnical field investigation was performed by ECS in March 2019. During this time period, a total of twenty-five (25) hand auger borings supplemented with Dynamic Cone Penetrometer (DCP) tests were performed along the -L- and -Y36- alignments. Representative soil samples were collected for visual classification in the field and for analysis by ECS’s testing laboratory.

Physiography and Geology

In accordance with the Geologic Map of North Carolina, 1985, the project corridor is located in the Piedmont Physiographic Provinces of North Carolina. Piedmont soils are the residual product of in-place chemical weathering of rock that is similar to the rock presently underlying the site. Bedrock at the site is mapped predominantly as mica schist, with local lenses of quartz schist, biotite gneiss, amphibolite, and phyllite.

Soil Properties

Soils within the area of this project have been divided into two categories: roadway embankment, and residual soils.

Roadway Embankment: Roadway Embankment (R.E.) soils generally consist of loose to medium dense silty fine to coarse sand (A-2-4), medium stiff to very stiff fine to coarse sandy silt (A-4), soft clayey silt (A-5), and stiff to very stiff silty clay (A-7-5). Trace amounts mica were encountered throughout the roadway embankment. The roadway embankment extends to depths ranging from approximately 1.0 to 5.0 feet below existing grades. Laboratory testing of the roadway embankment soils indicated a Plasticity Index (PI) 9 for the silty (A-4) soils, and a PI of 20 for the clayey (A-7-5) soils.

Residual Soils: Residual soils throughout the project corridor are derived from the weathering of the underlying parent bedrock. A majority of the residual soils encountered generally consisted of loose to medium dense silty fine to coarse sand (A-2-4), medium stiff to very stiff fine to coarse sandy silt (A-4), soft to very stiff clayey silt (A-5), and medium stiff to very stiff silty clay (A-7-5). Laboratory testing of the residual soils indicated Plasticity Indices (PI’s) ranging from 27 to 30 for the clayey (A-7-5) soils.

Groundwater Properties

Groundwater levels were measured in the borings immediately after drilling (0-hr reading). At the time of drilling, water was not encountered within the borings to the depths explored. Upon the completion of

drilling, borings were backfilled for safety reasons and proximity to the roadway. The recovered soil samples were generally described as moist.

Areas of Special Geotechnical Interest

- 1) Soft/Very Loose Soils: The following areas contain relatively soft or very loose soils that have the potential for subgrade instability, embankment stability or long-term settlement problems during construction:

<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-Y36-	13+75 to 15+25	RT
-Y36-	24+75 to 29+00	LT to RT

- 2) High Plasticity Soils: The following areas contain high plasticity soils with plasticity indices (PI’s) in excess of 25. High plasticity soils have the potential to cause subgrade instability during construction, embankment stability or long term settlement problems.

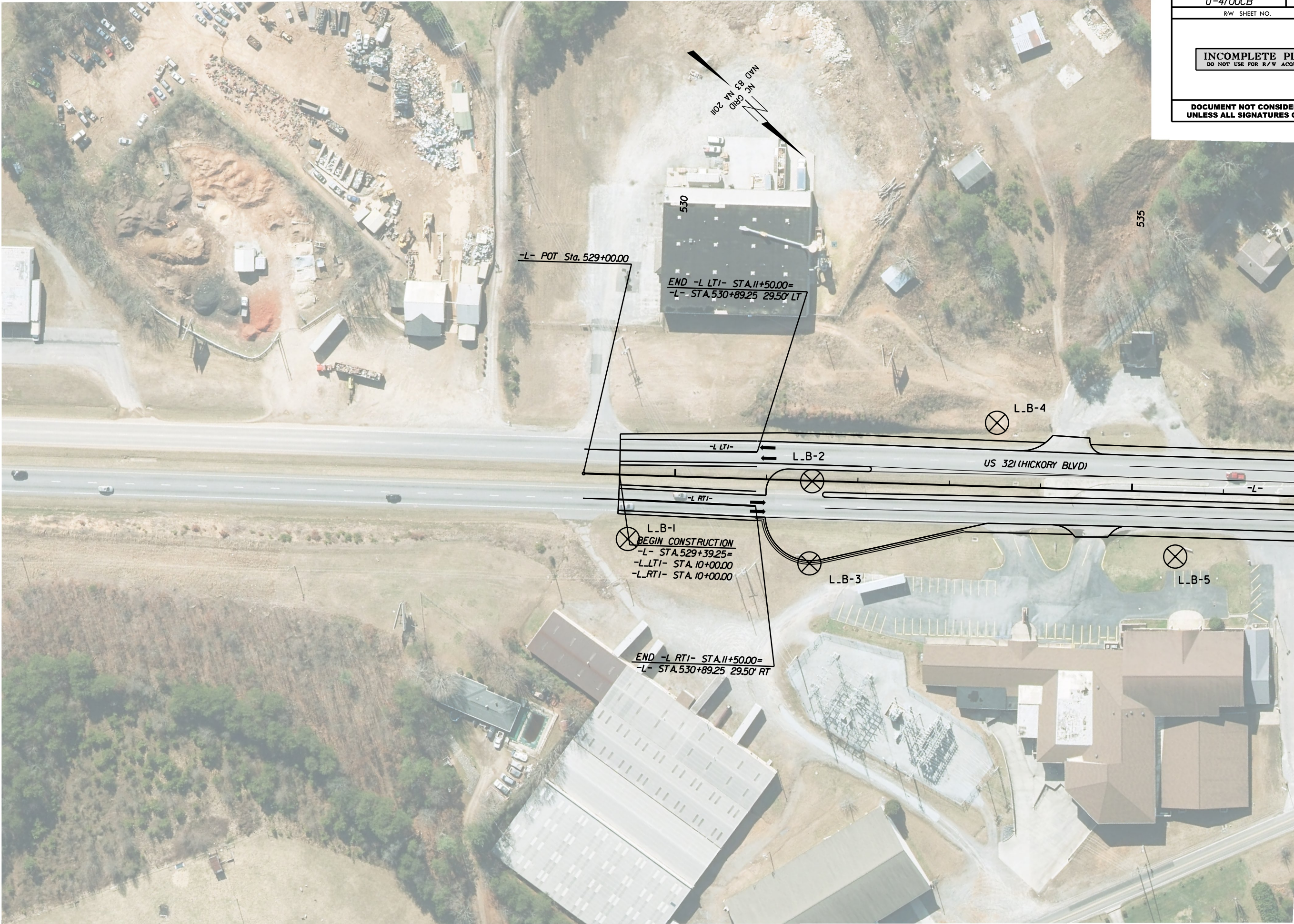
<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-L-	536+25 to 538+25	LT to RT
-L-	550+25 to 554+25	LT to RT
-Y36-	24+75 to 29+00	LT to RT

- 3) Hand Auger Refusal: The following areas encountered hand auger refusal above or within 6 feet of proposed subgrade. Hand auger refusal could indicate areas of rocky embankment fill, hard or dense residual soils layers, weathered rock or crystalline rock.

<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-L-	529+00 to 536+75	LT to RT
-L-	538+25 to 540+25	LT
-L-	542+25 to 546+25	LT to RT
-L-	554+25 to 557+25	LT to RT
-L-	558+25 to 559+10	LT
-Y36-	15+25 to 17+25	RT
-Y36-	24+25 to 26+75	RT

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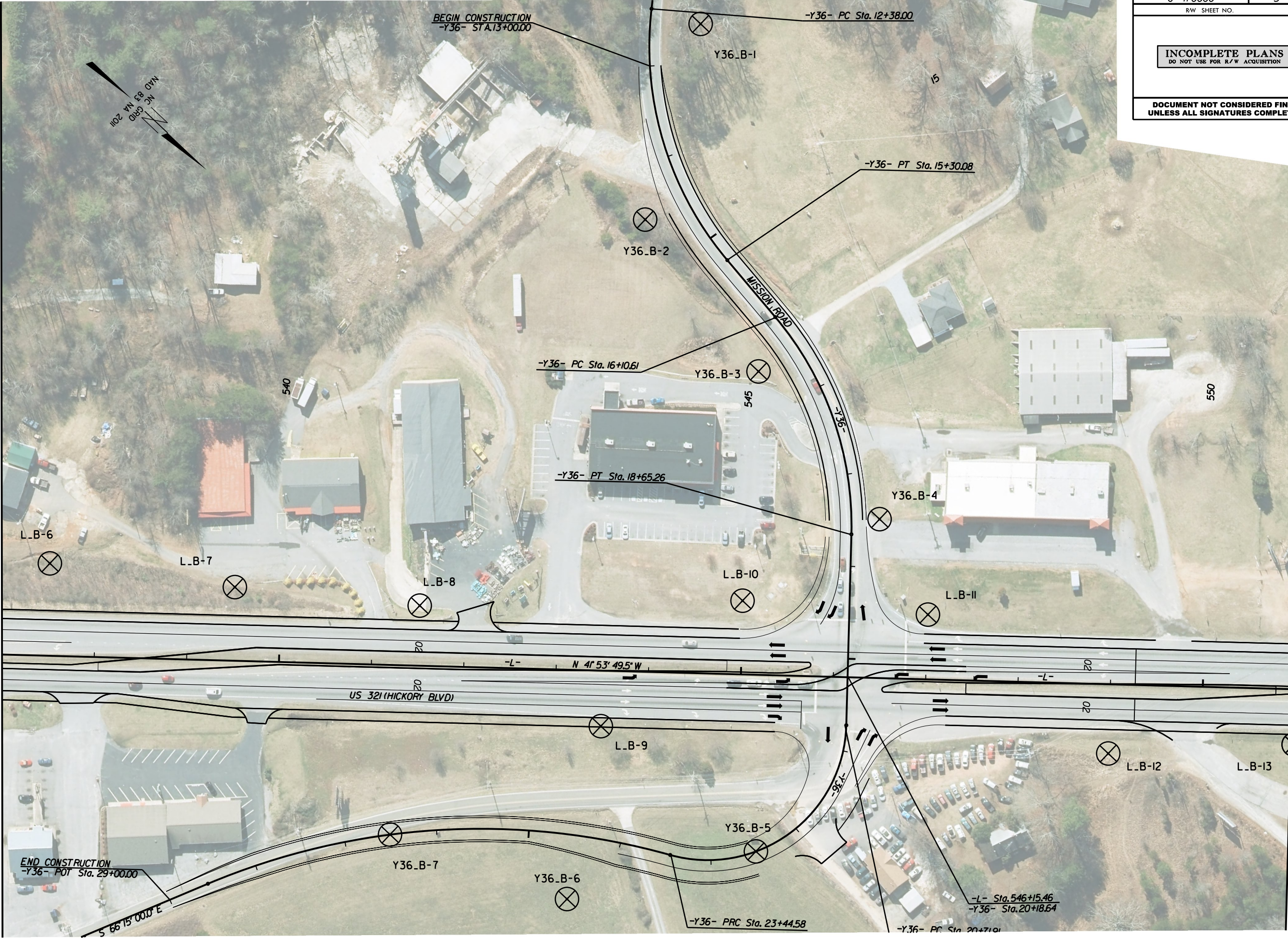
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

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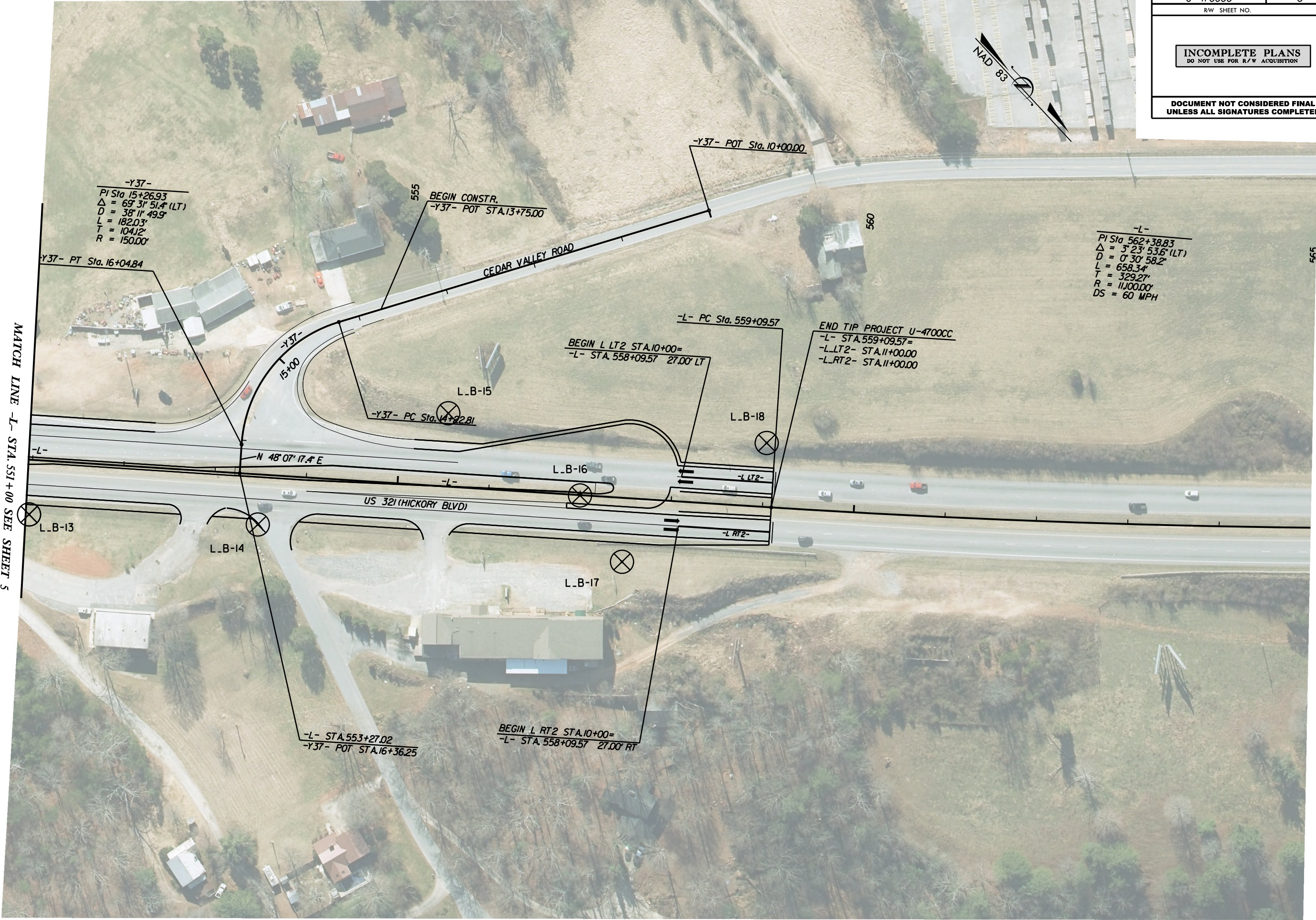
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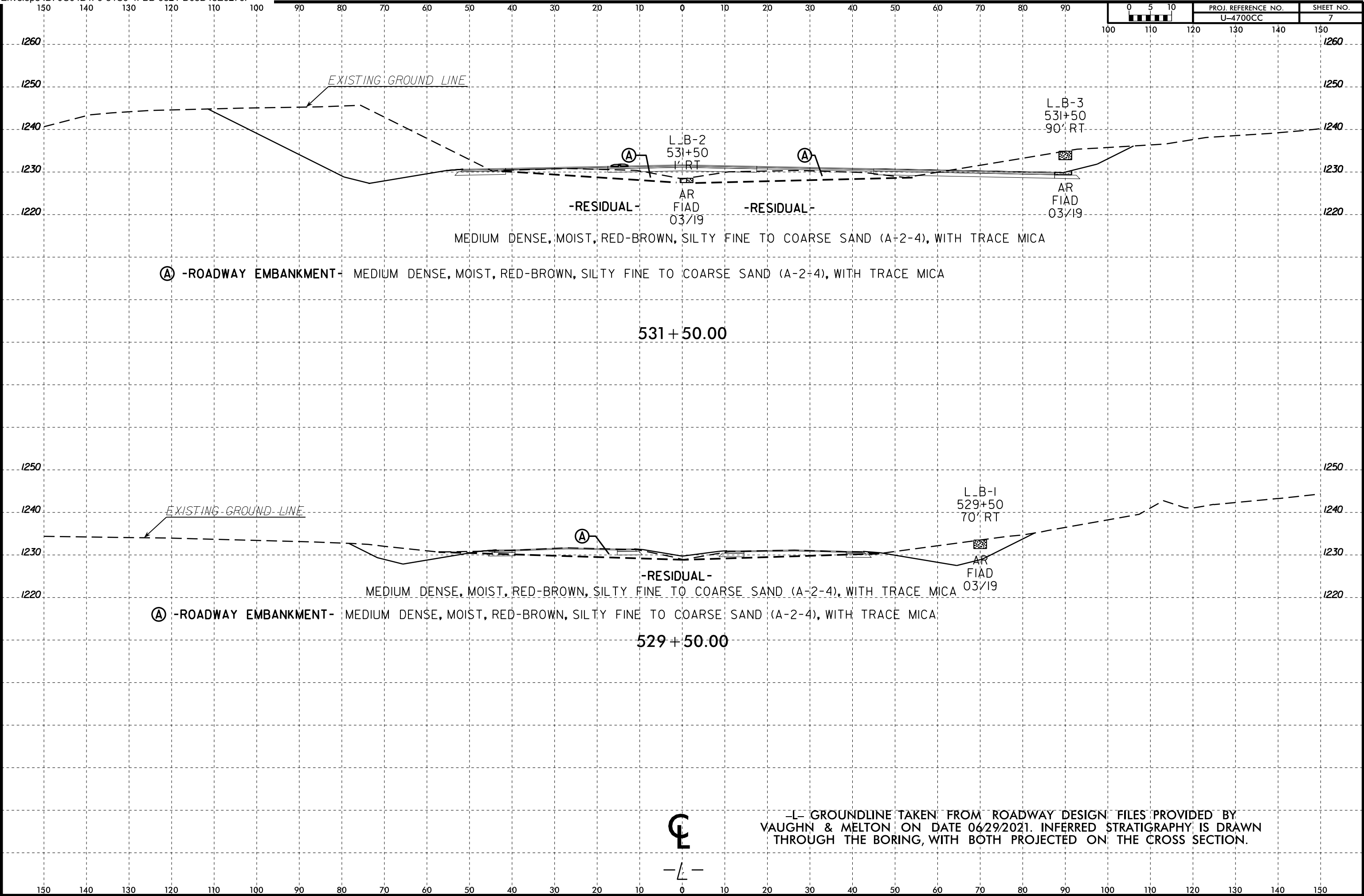
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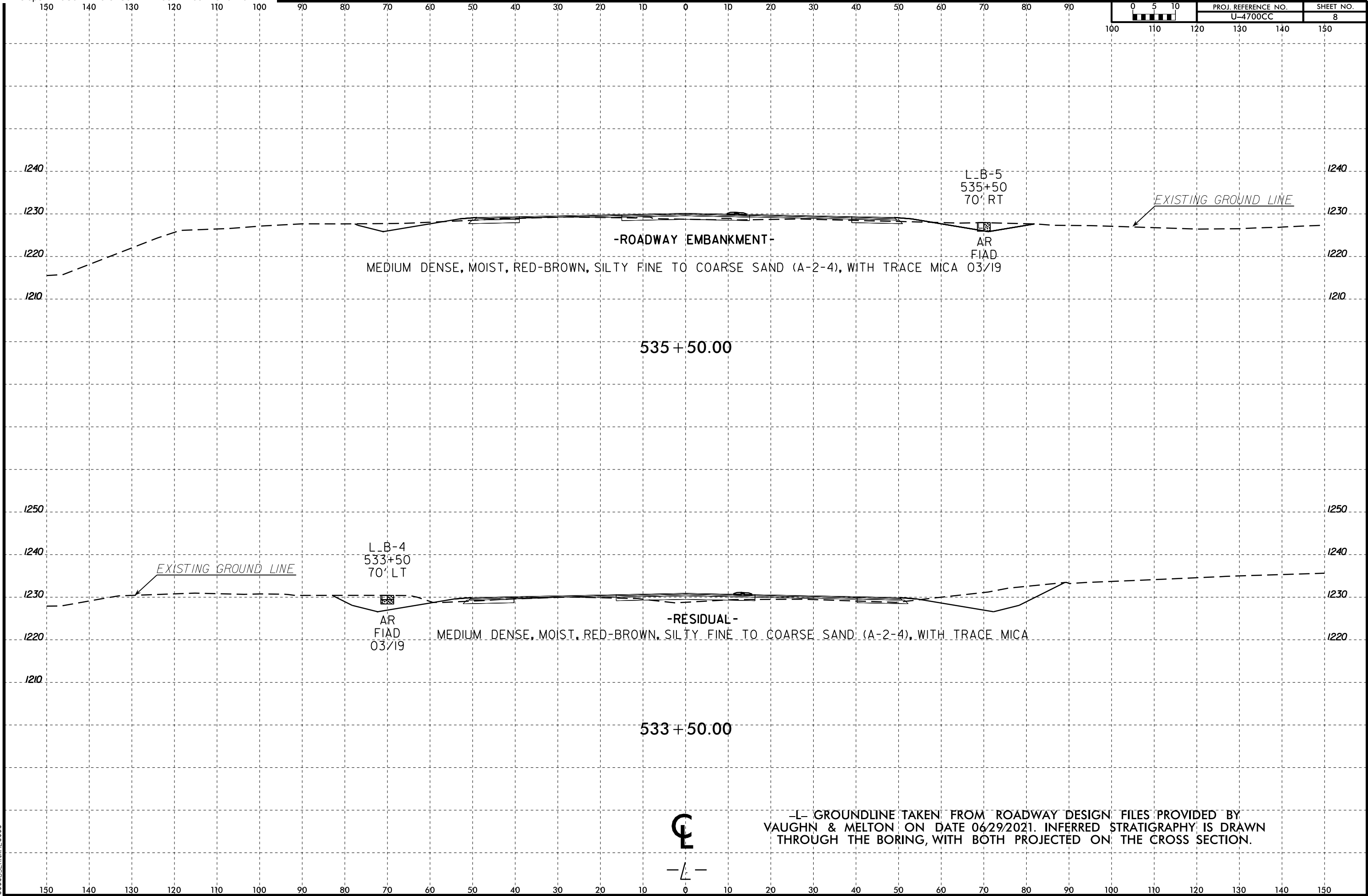
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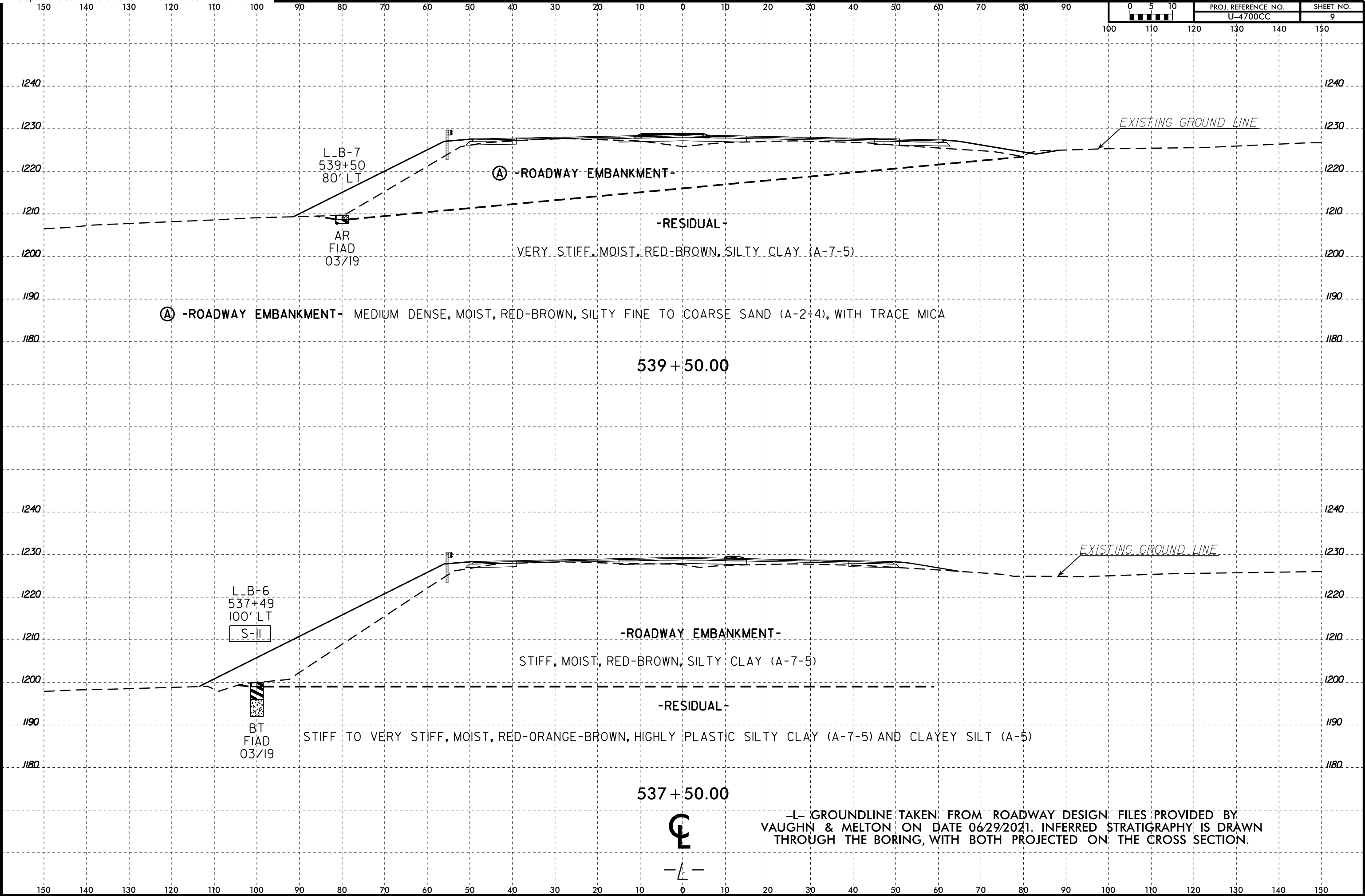


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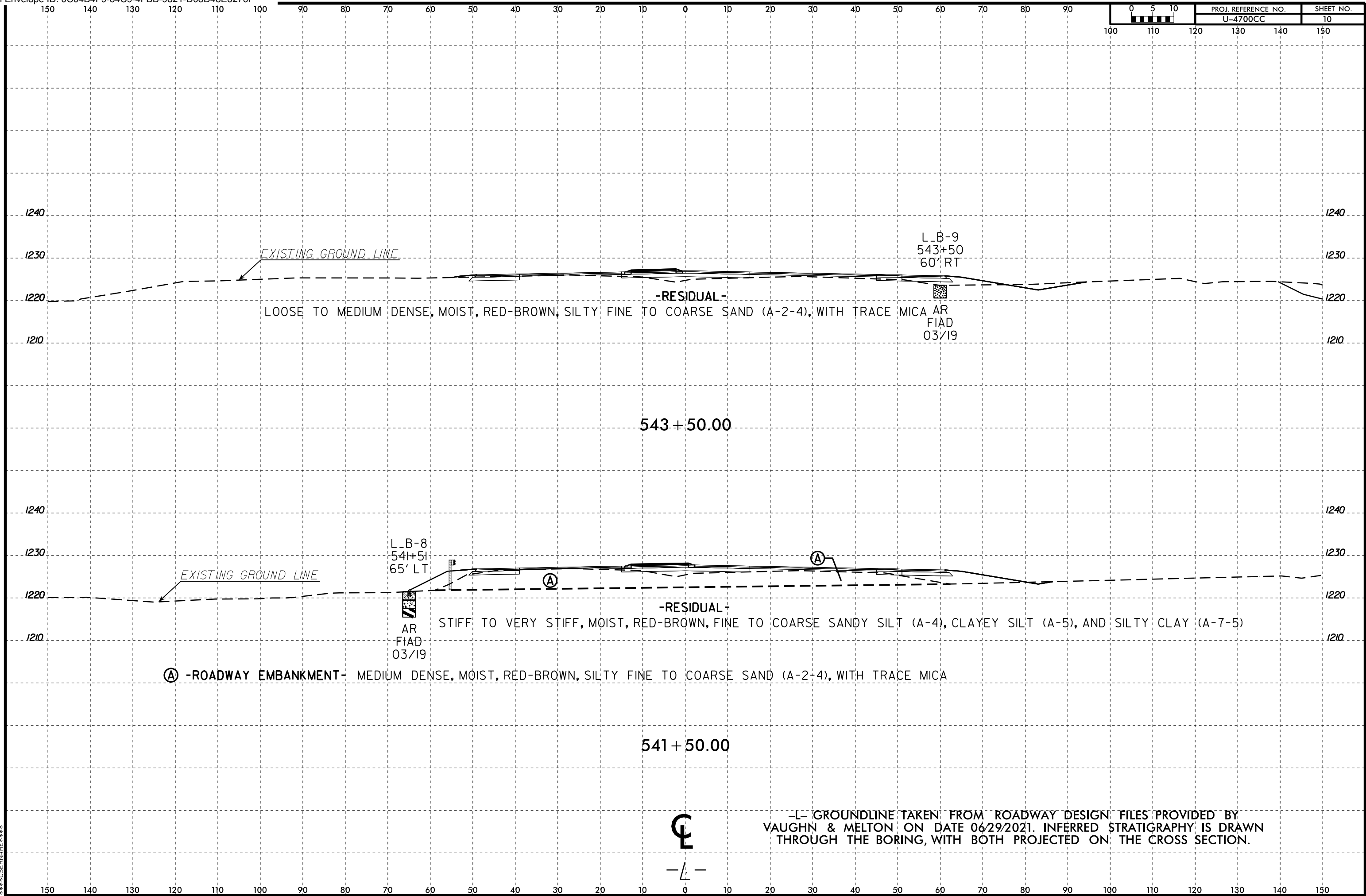
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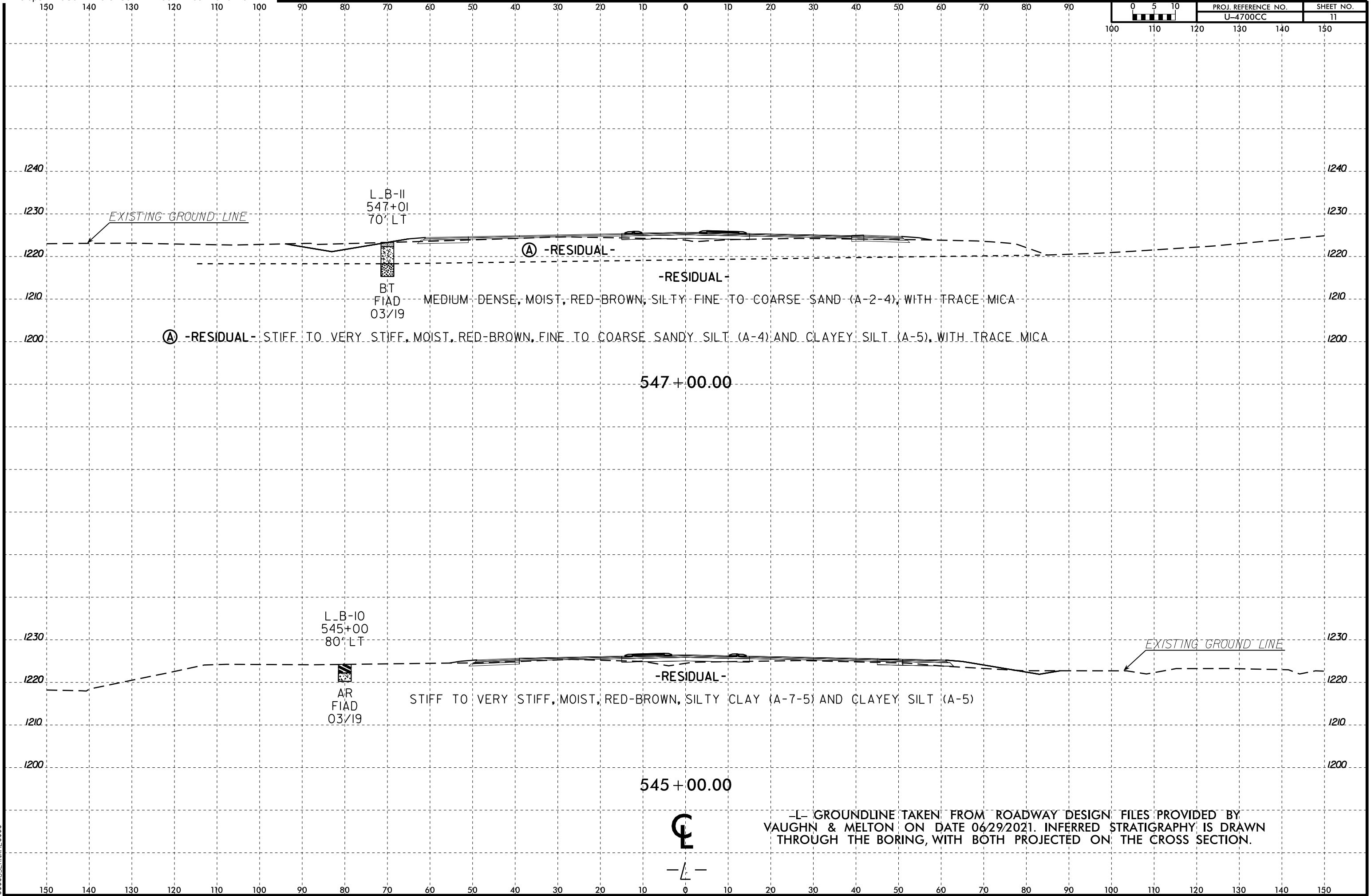
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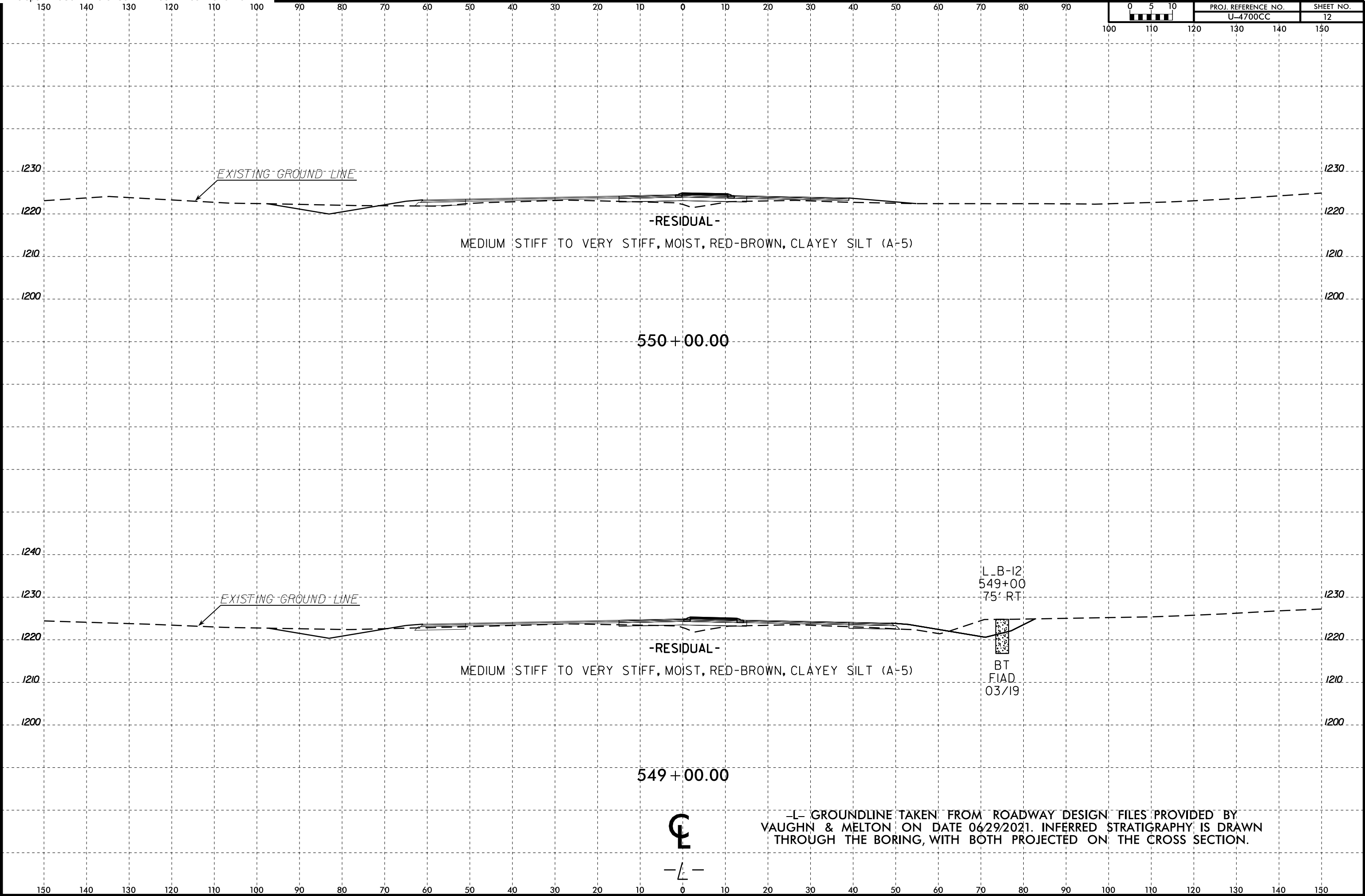
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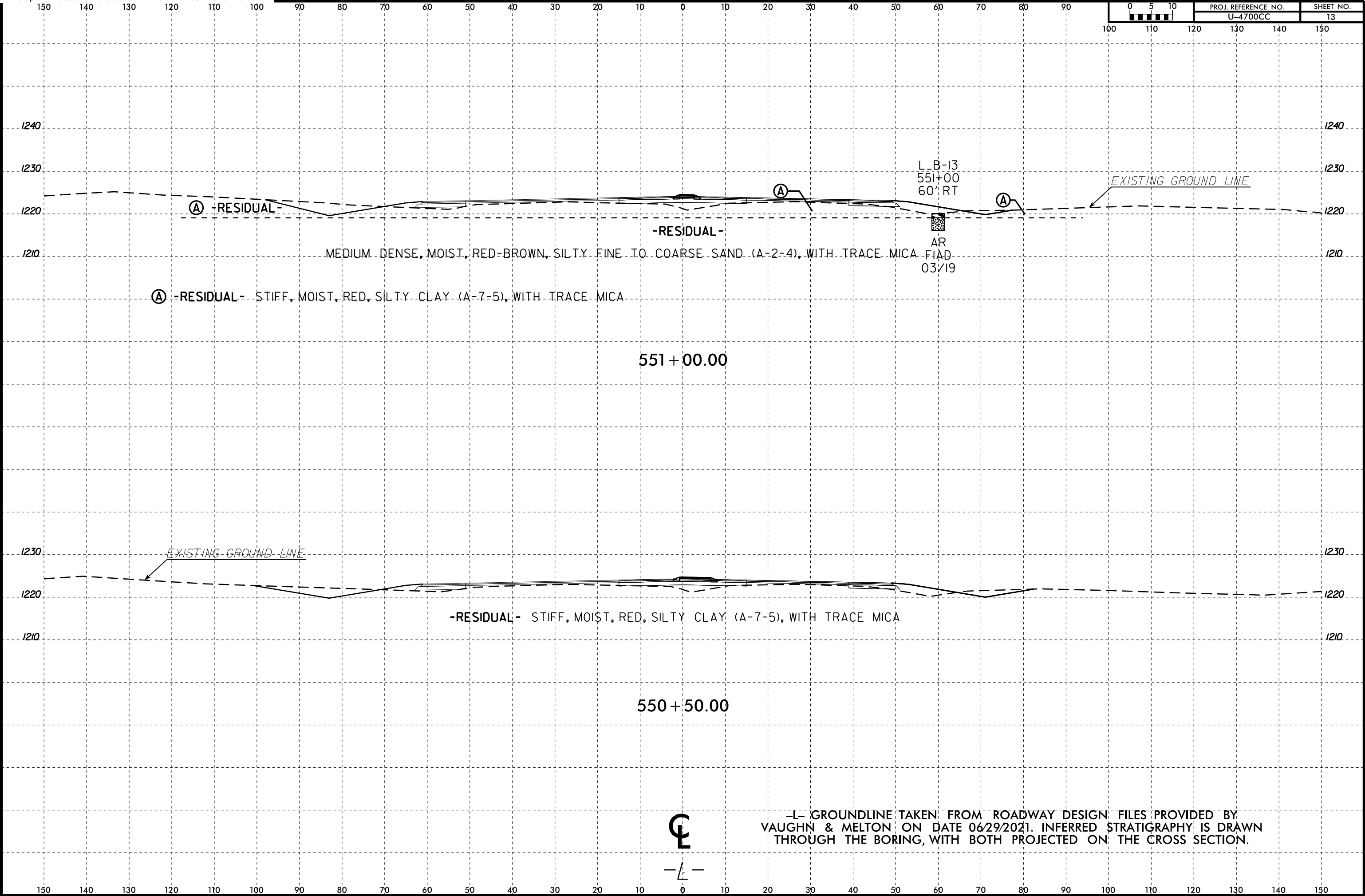


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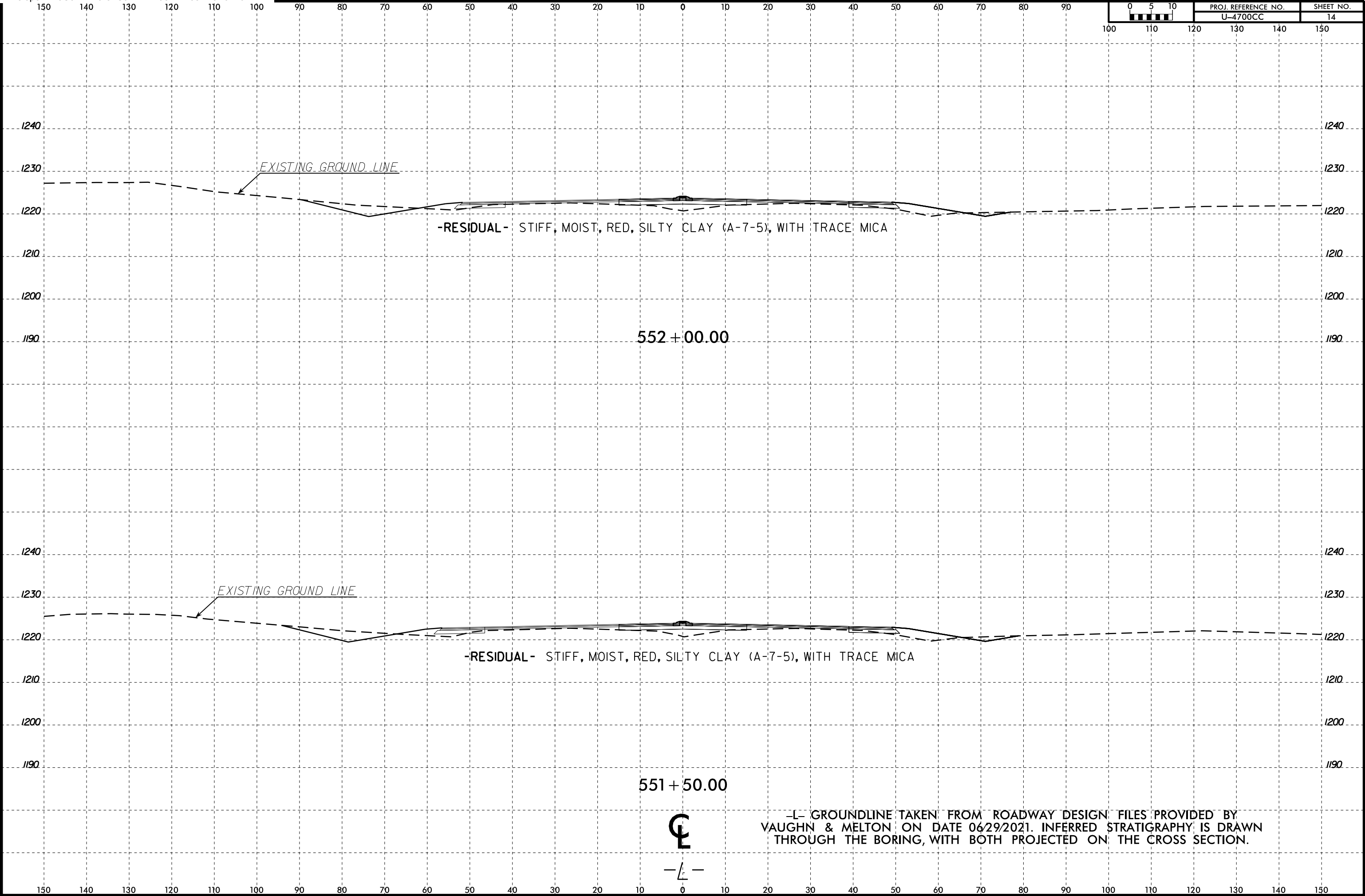


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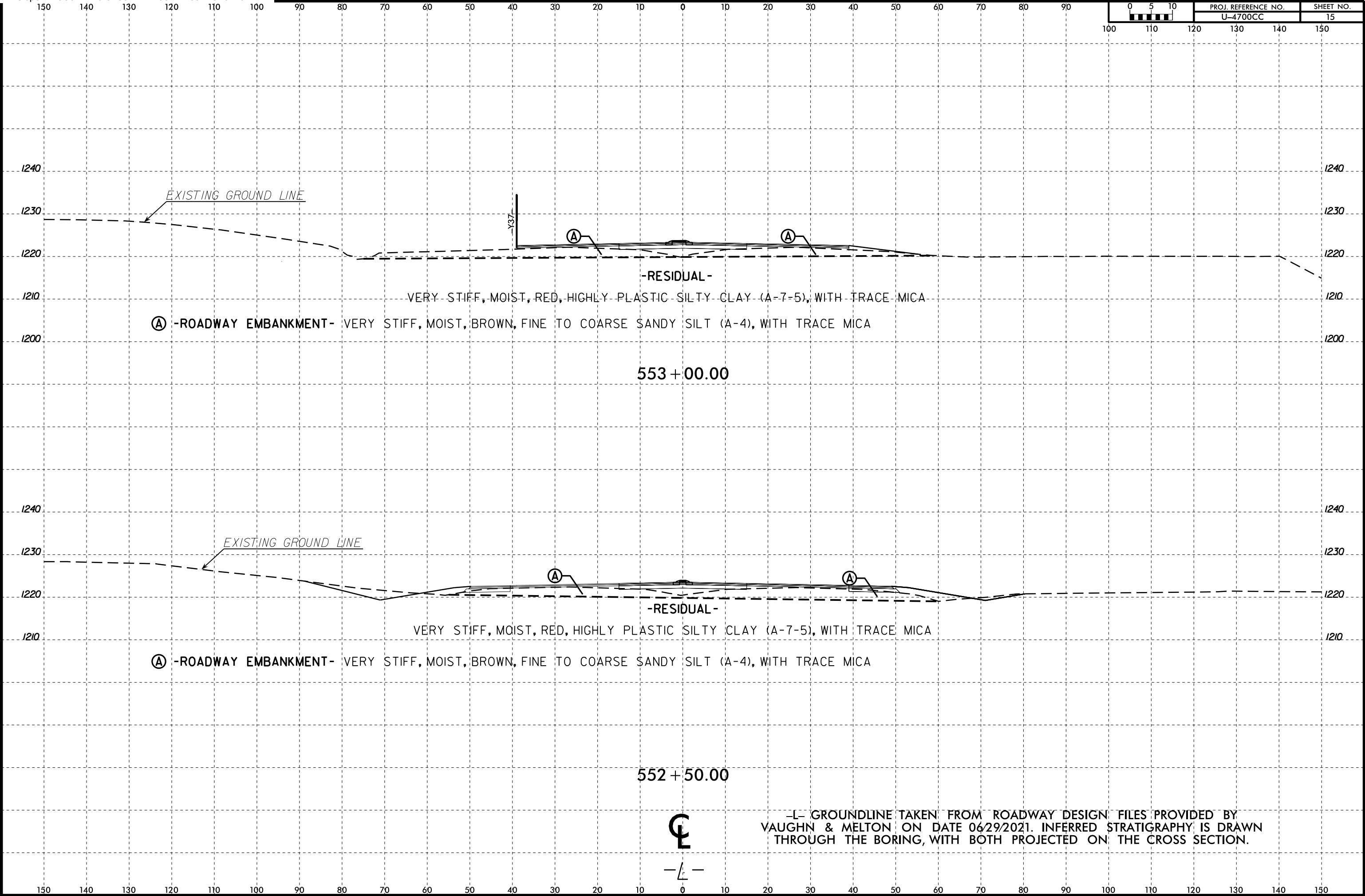
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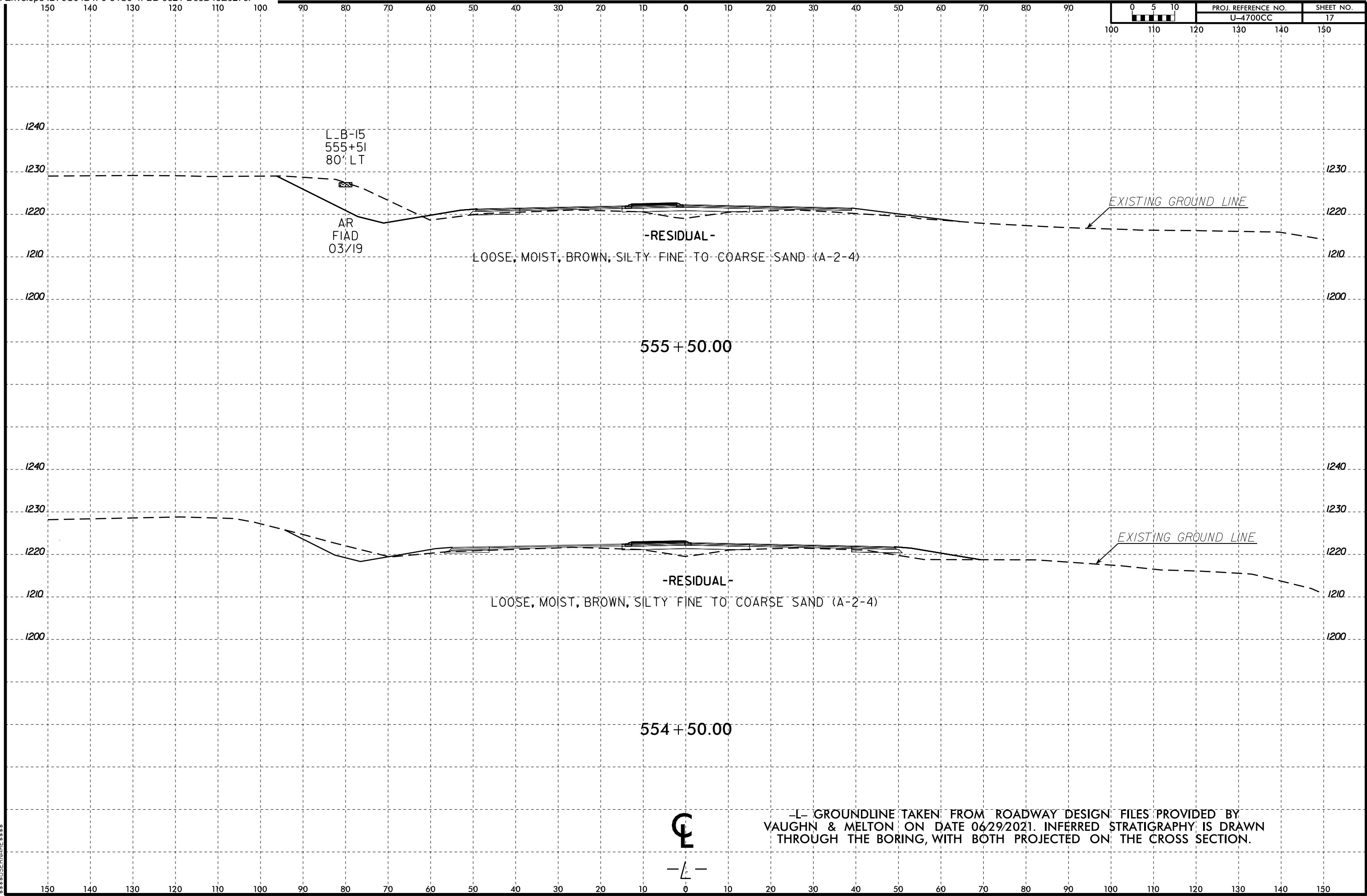
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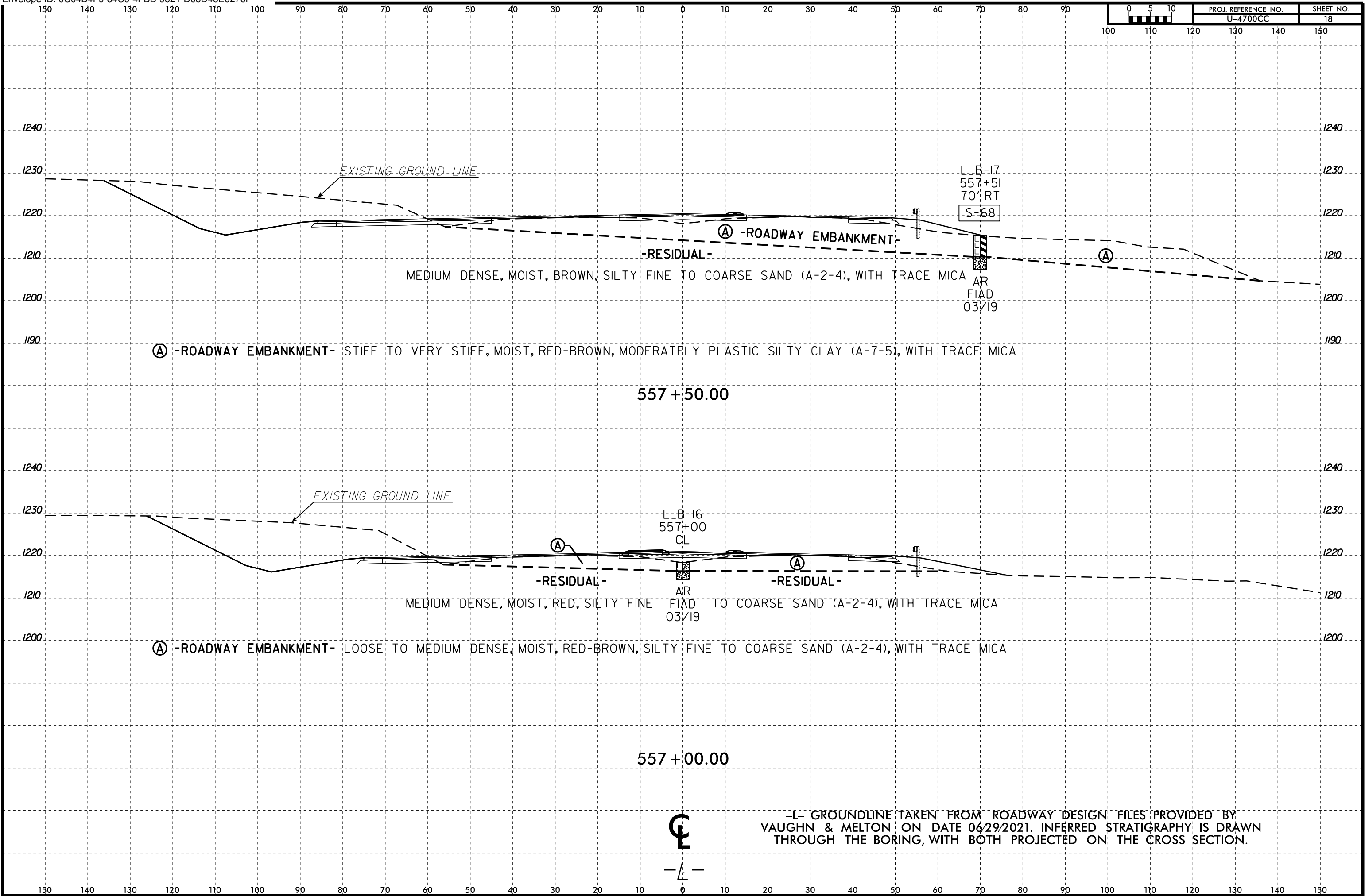


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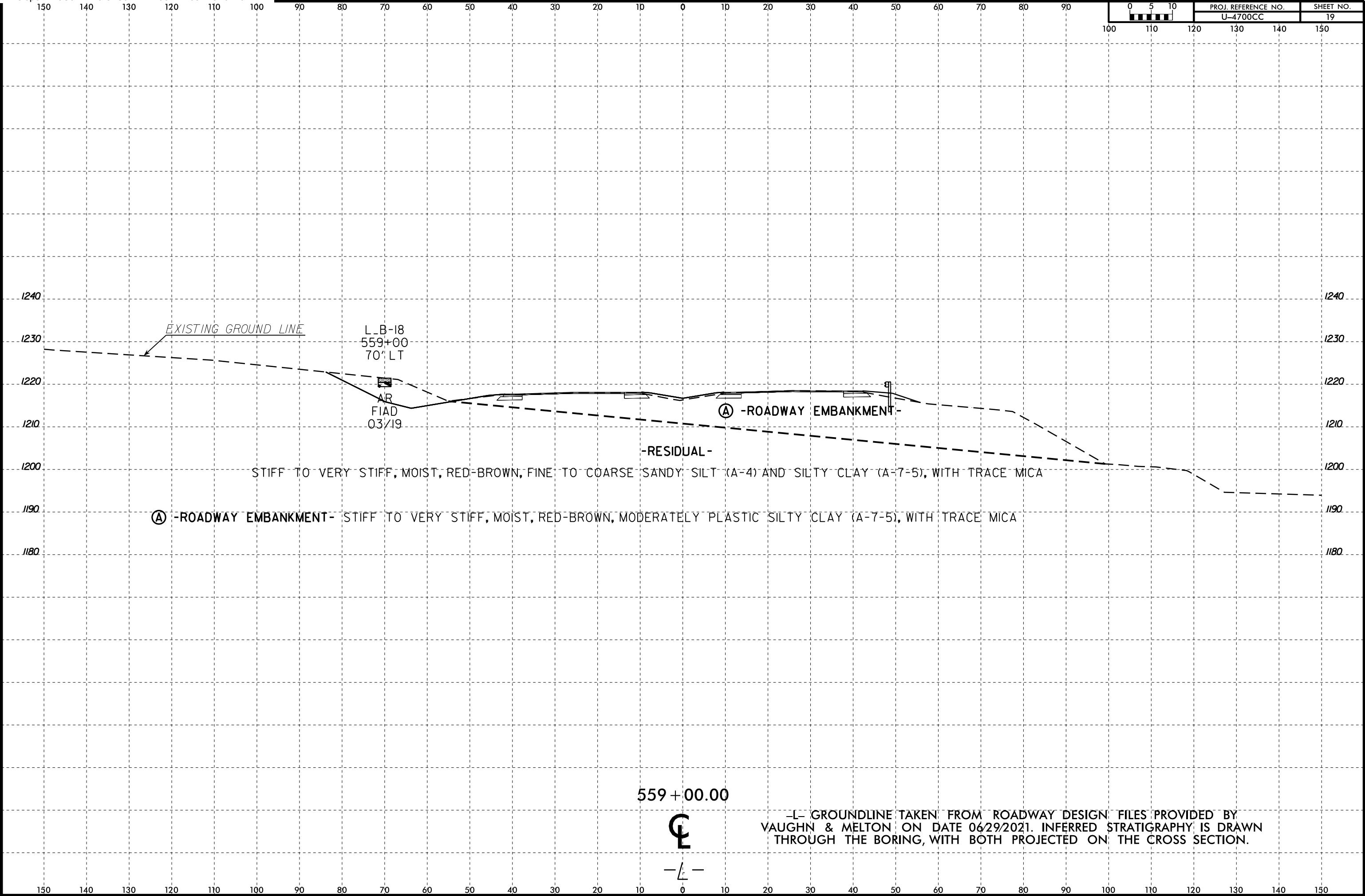
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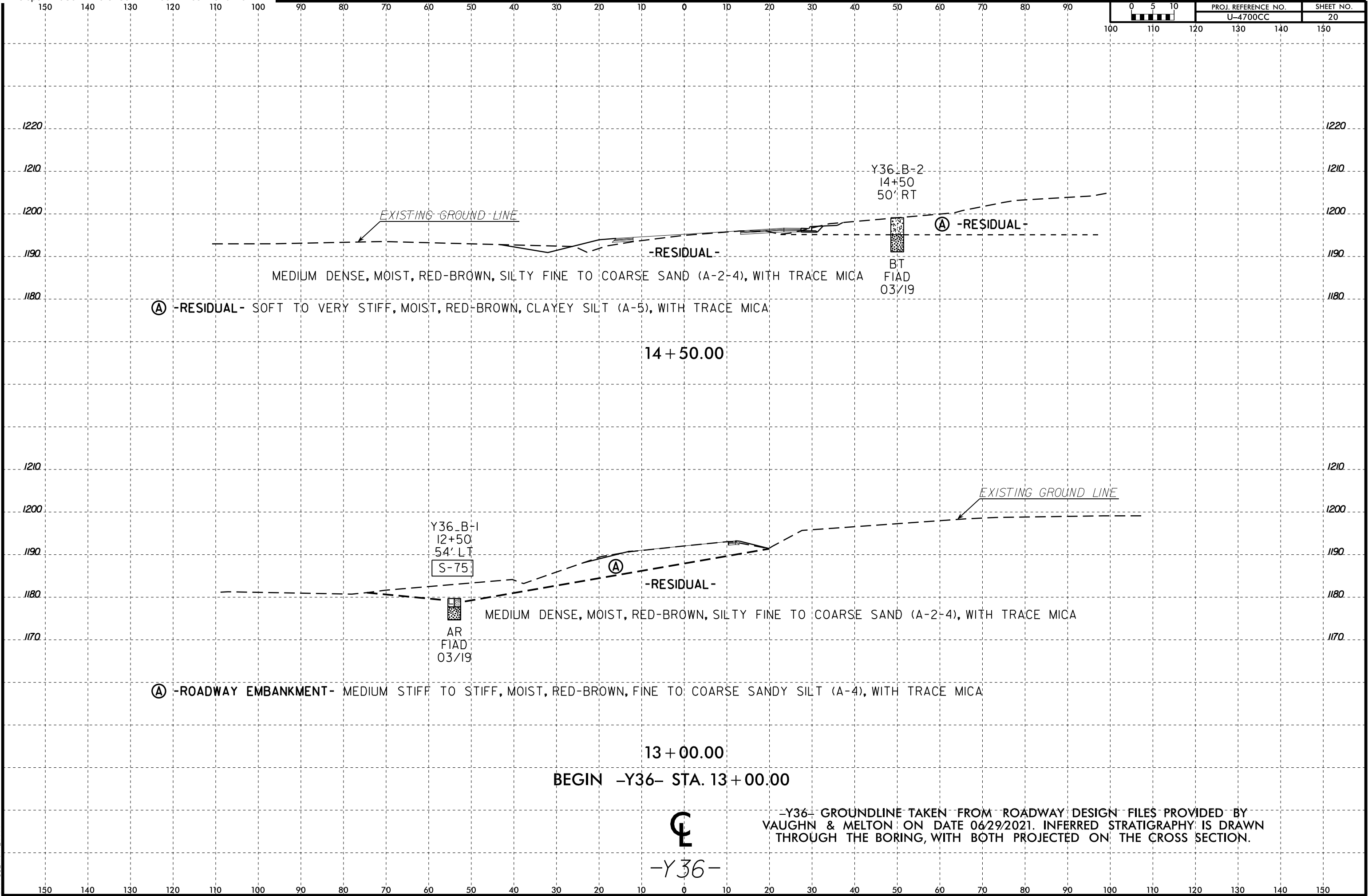
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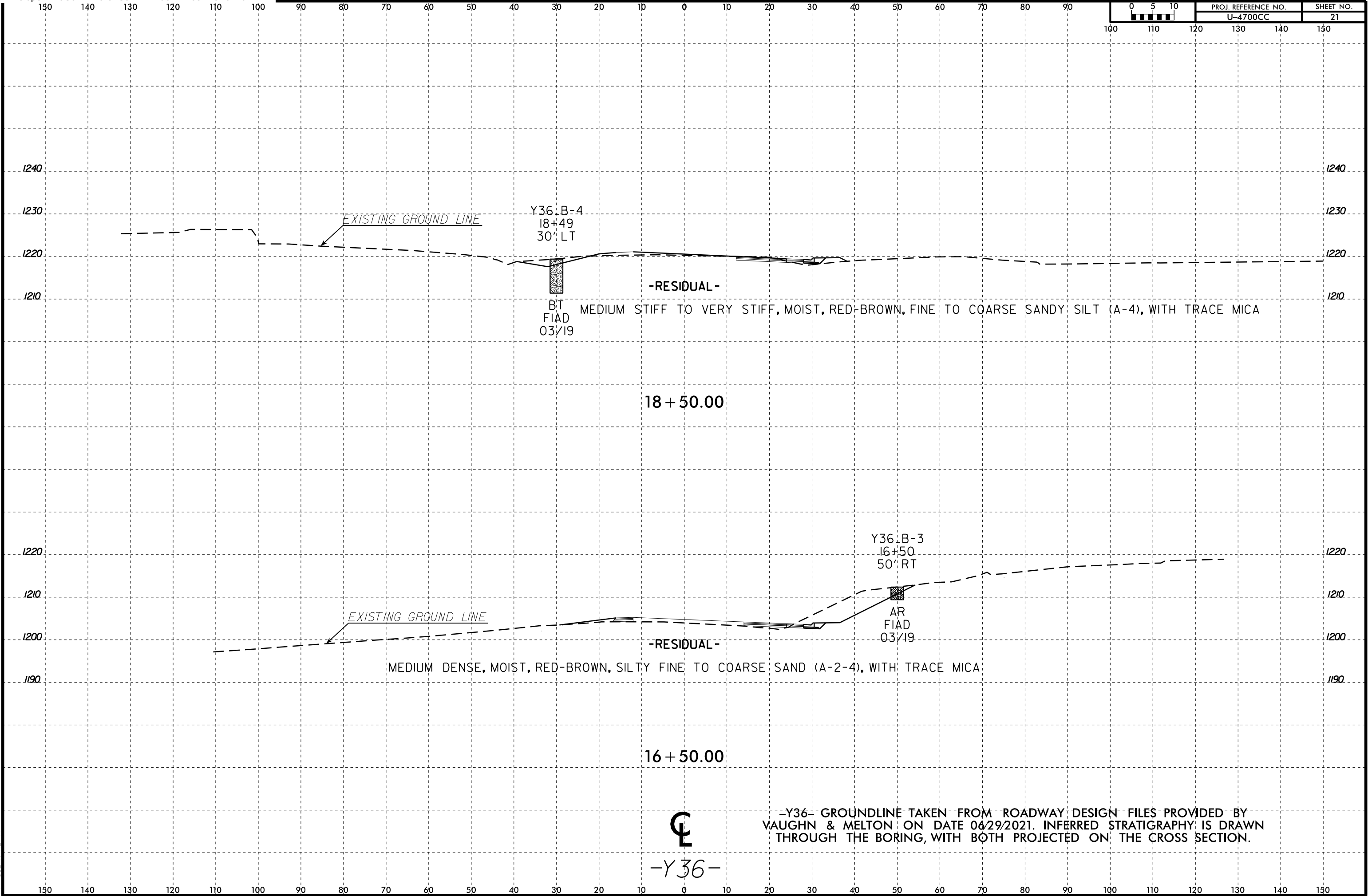
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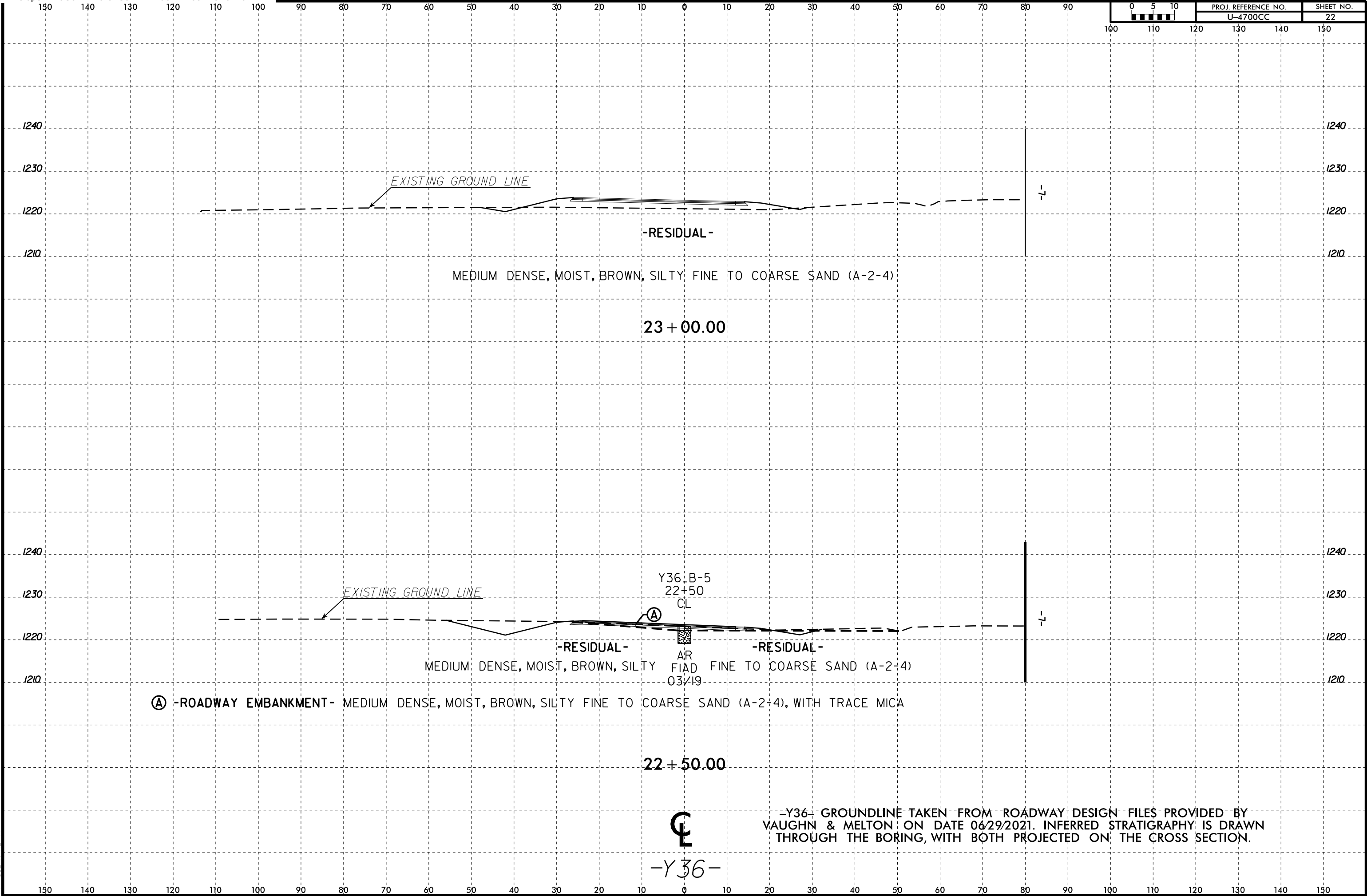
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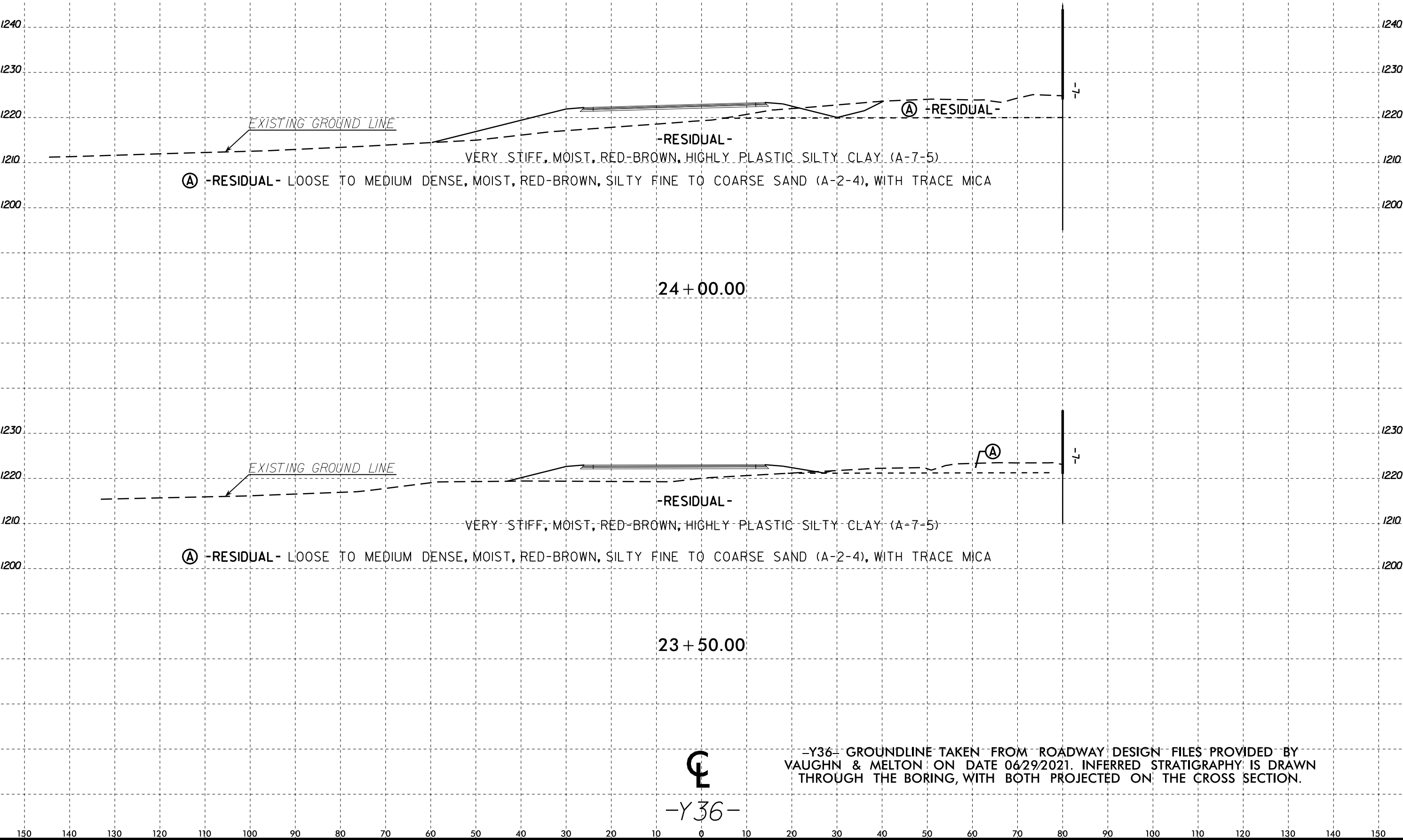


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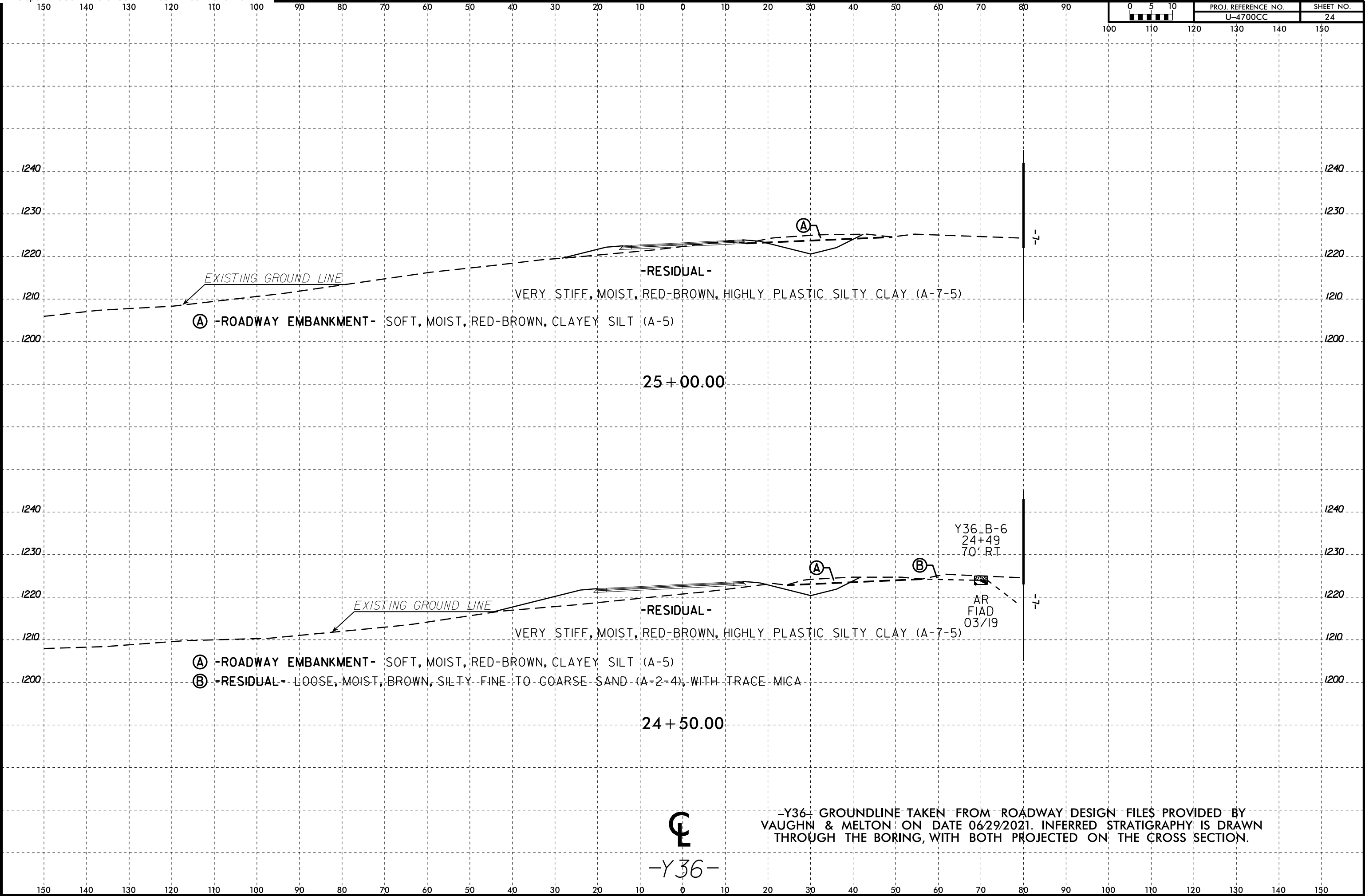


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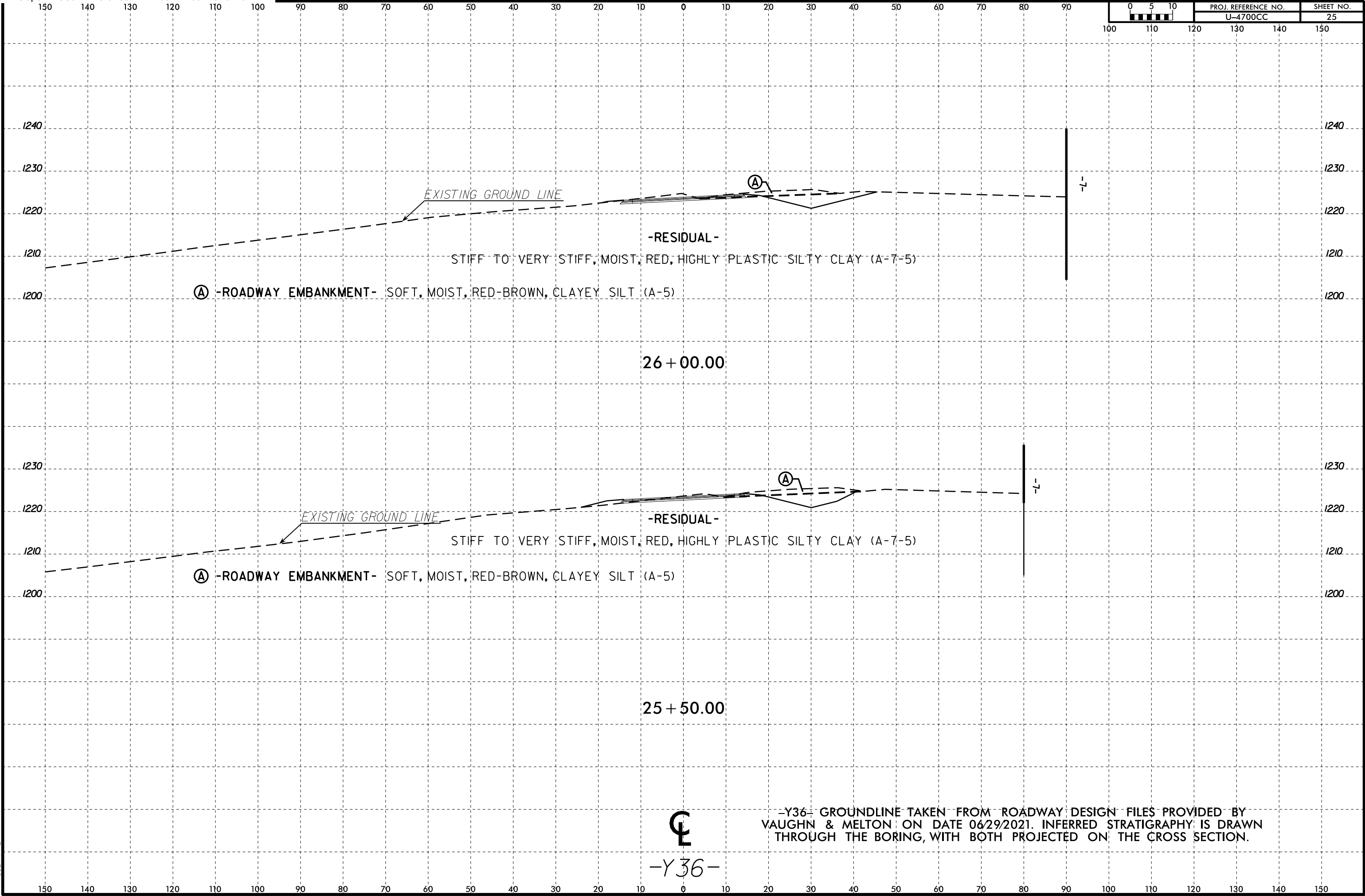
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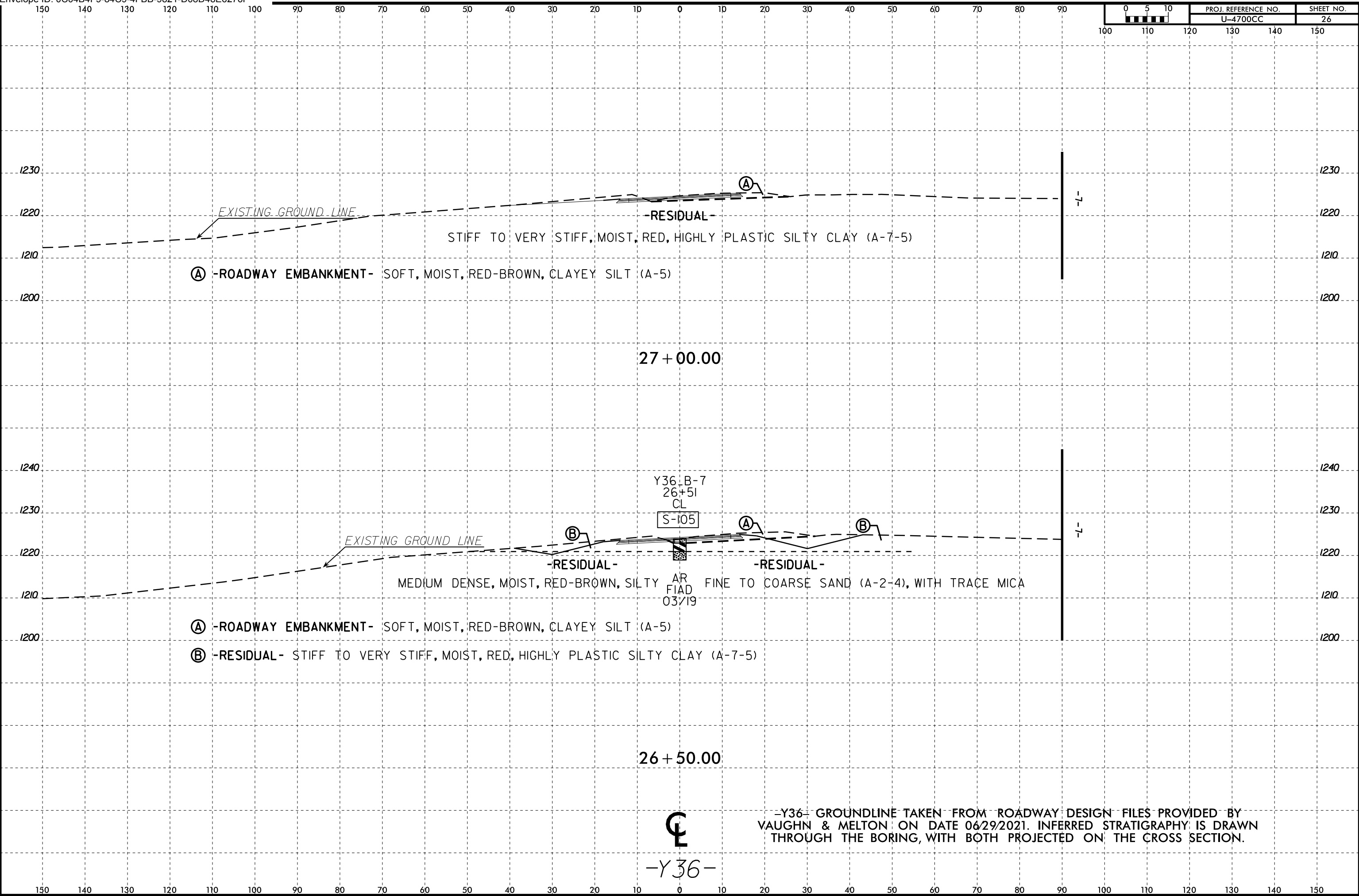
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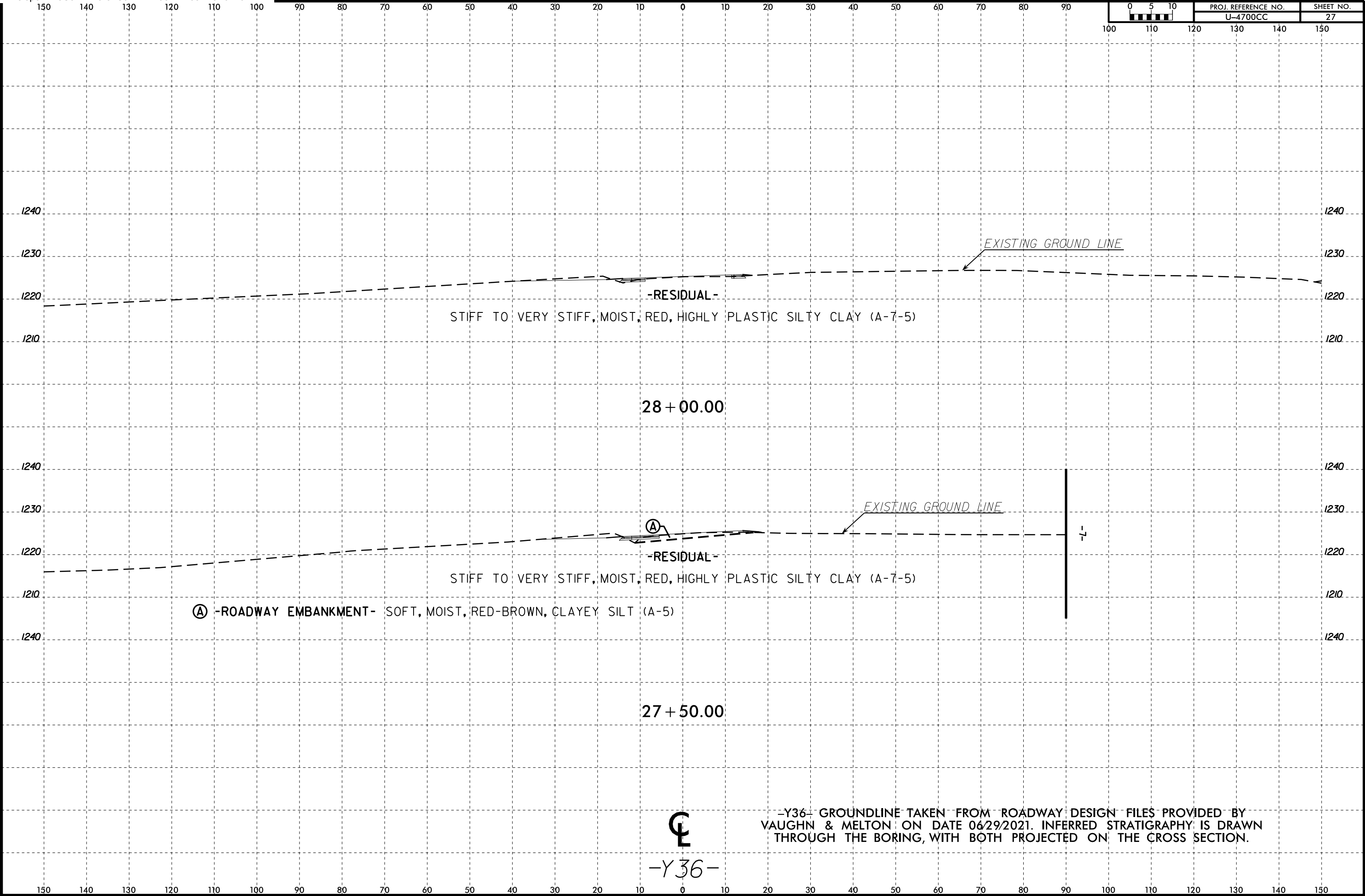
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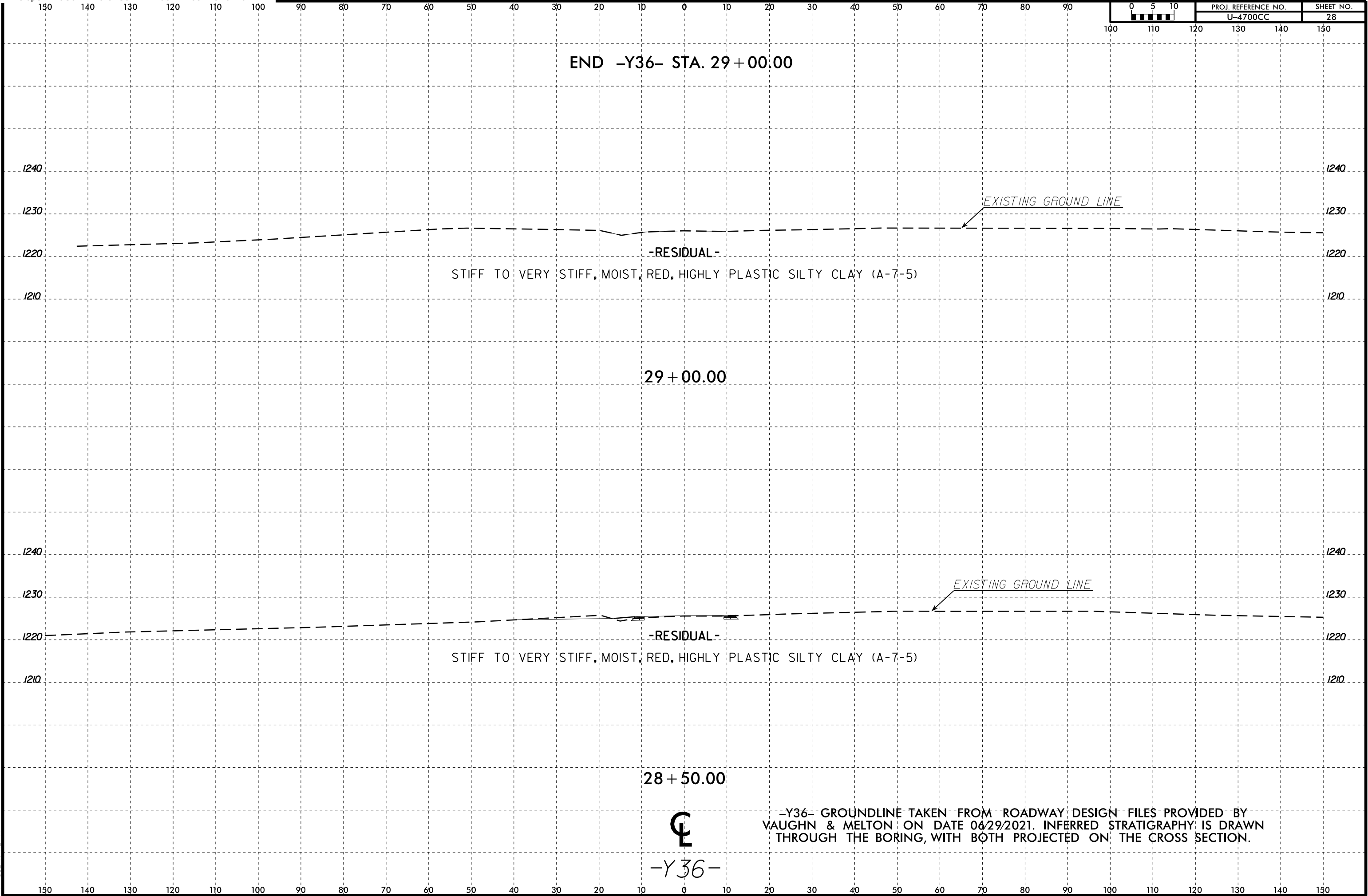
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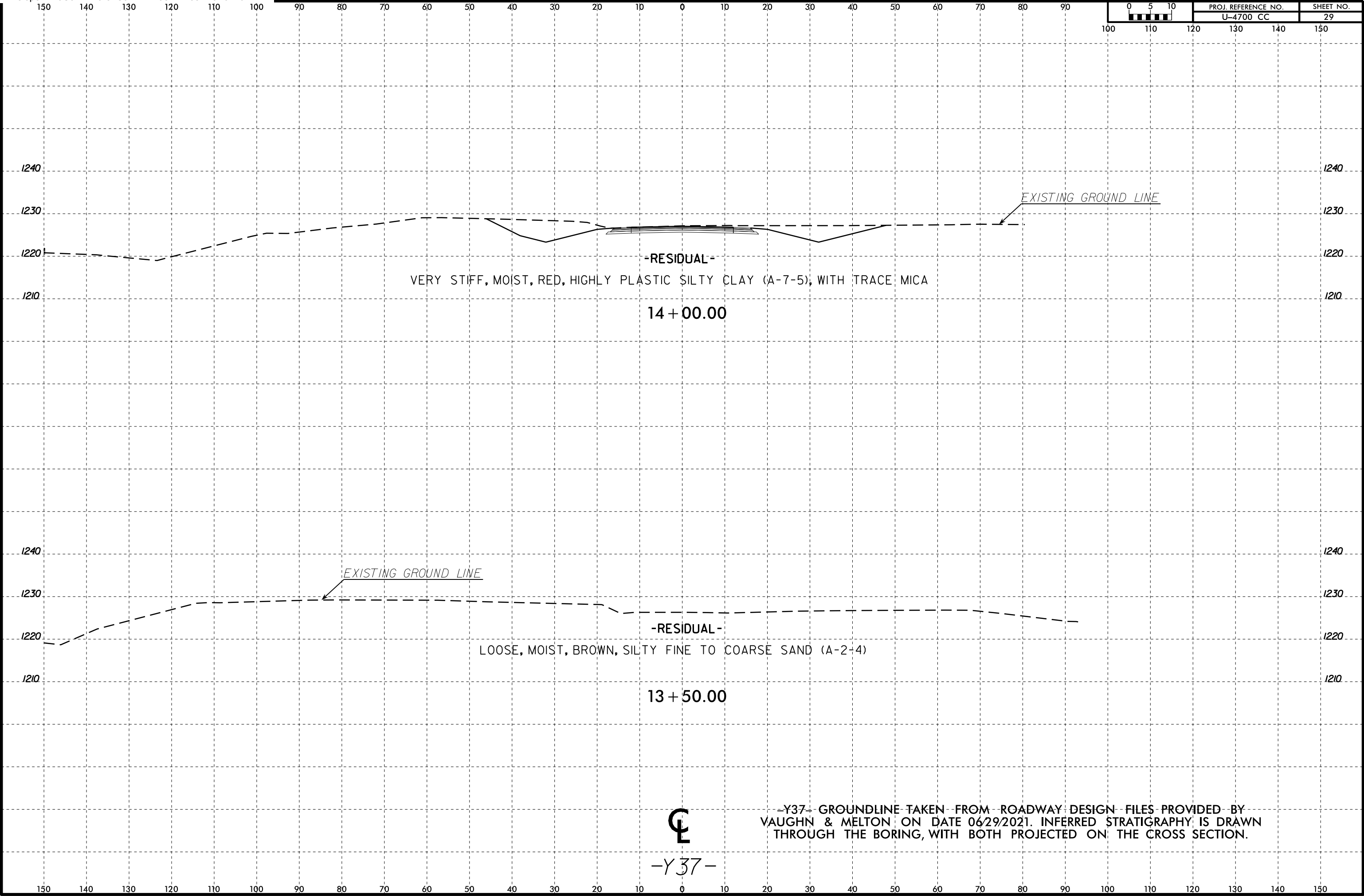
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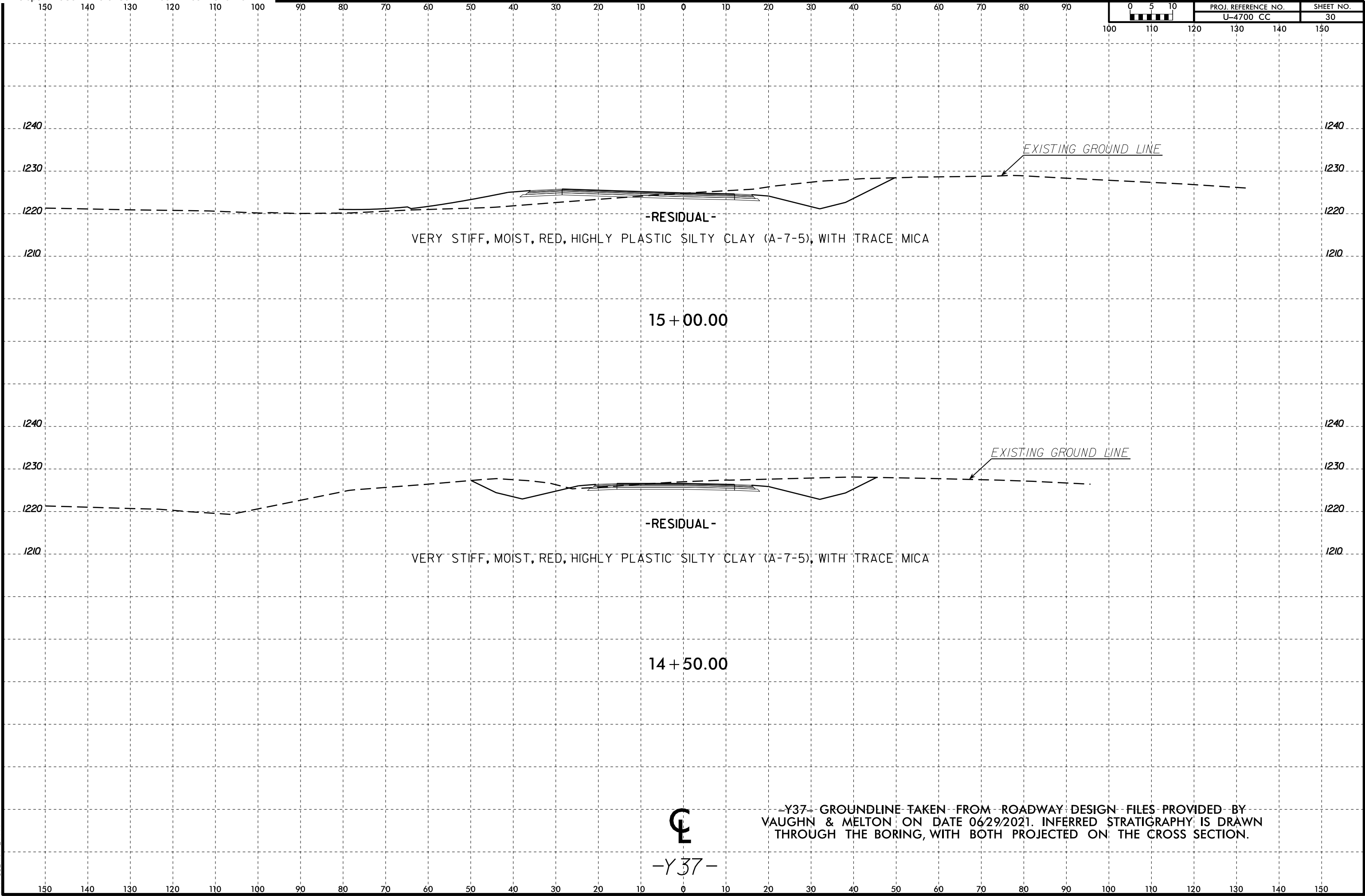
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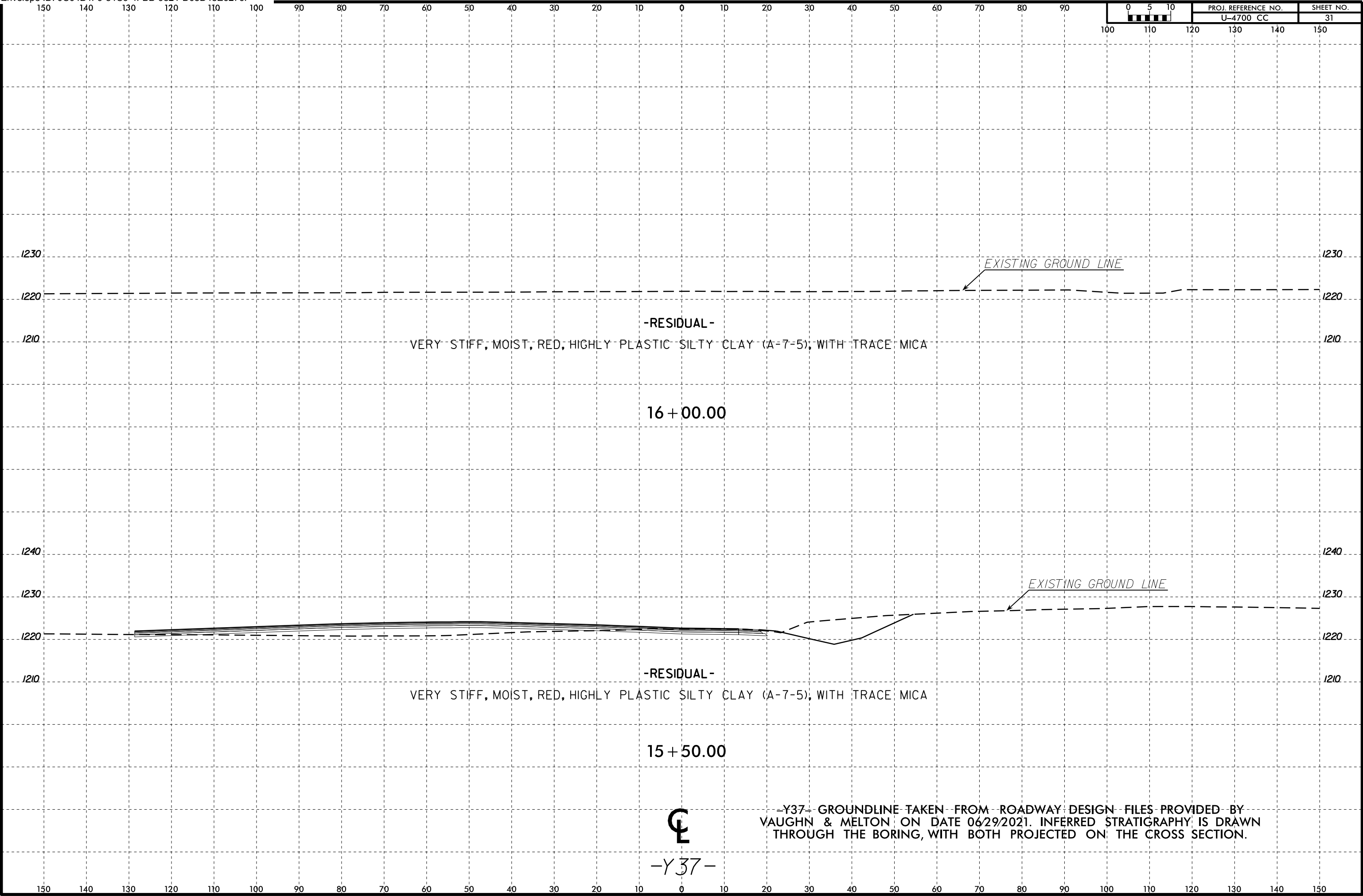
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PROJECT: N/A

REFERENCE: U-4700CC

PROJECT REFERENCE NO.	SHEET NO.
U-4700CC	32

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX A
LABORATORY TEST RESULTS

SOIL TEST RESULTS																
BORING NO.	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		
L B-6	S-11	100' LT	537+49	1.0-2.0'	A-7-5(19)	64	27	22.3	12.1	11.3	54.4	96.1	80.6	66.0	24.8	-
L B-14	S-24	55' RT	553+50	1.0-2.0'	A-7-5(19)	57	28	19.3	11.7	9.0	60.1	95.3	82.6	68.4	22.4	-
L B-17	S-68	70' RT	557+51	4.0-5.0'	A-7-5(13)	60	20	24.2	13.0	8.9	53.9	94.6	77.5	62.4	22.5	-
Y36 B-1	S-75	54' LT	12+50	1.0-2.0'	A-4(0)	30	9	36.5	18.5	15.6	29.4	76.7	56.4	37.5	10.3	-
Y36 B-7	S-105	CL	26+51	1.0-2.0'	A-7-5(24)	70	30	19.7	9.9	8.5	61.9	97.4	83.6	70.6	31.2	-

LAB TECHNICIAN: C. RUPERT

NCDOT CERTIFICATION NO. 112-01-1003