

REFERENCE: HL-0004

PROJECT: 49346

SEE SHEET 3 FOR PLAN SHEET LAYOUT  
AT TIME OF INVESTIGATION

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HL-0004	1	14

**ROADWAY**  
**SUBSURFACE INVESTIGATION**

COUNTY CATAWBA  
PROJECT DESCRIPTION 17TH ST. NW. EXTENSION FROM  
9TH AVE. NW TO CLEMENT BLVD.

**INVENTORY**

**CONTENTS**

<u>LINE</u>	<u>STATION</u>	<u>PLAN</u>	<u>PROFILE</u>
-L-	10+46 - 22+12	4	N/A
-DR-	10+00 - 11+00	4	N/A

**CROSS SECTIONS**

<u>LINE</u>	<u>STATION</u>	<u>SHEETS</u>
-L-	13+00 - 21+50	5-11
-DR-	10+50	12

**APPENDICES**

<u>APPENDIX</u>	<u>TITLE</u>	<u>SHEETS</u>
A	LABORATORY TEST RESULTS	13-14

**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 PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS 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

CG2 EXPLORATION

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SUBMITTED BY CG2, PLLC

DATE AUGUST 2023

Prepared in the Office of:  
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SIGNATURE

08/04/2023

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 208, 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		
	A-1	A-3	A-2		A-2		A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7			
GROUP CLASS.	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 35 MX 35 MX	40 MX 35 MX	41 MN 35 MX	41 MN 35 MX	40 MX 36 MN	41 MN 36 MN	40 MX 36 MN	41 MN 36 MN							
MATERIAL PASSING #40 LL PI	- 6 MX	- NP	40 MX 41 MN	40 MX 41 MN	41 MN 41 MN	40 MX 41 MN	40 MX 41 MN	40 MX 41 MN	41 MN 41 MN								
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	UNSATURABLE								

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 <sup>2</sup> )
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 OPENING (MM)	4	10	40	60	200	270
	4.75	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						
IN.	12	3				

**SOIL MOISTURE - CORRELATION OF TERMS**

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
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 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**

	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
- 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
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

**RECOMMENDATION SYMBOLS**

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

**ABBREVIATIONS**

- AR - AUGER REFUSAL
- BT - BORING TERMINATED
- CL - CLAY
- CPT - CONE PENETRATION TEST
- CSE - COARSE
- DMT - DILATOMETER TEST
- DPT - DYNAMIC PENETRATION TEST
- e - VOID RATIO
- F - FINE
- FOSS. - FOSSILIFEROUS
- FRAC. - FRACTURED, FRACTURES
- FRAGS. - FRAGMENTS
- HI. - HIGHLY
- MED. - MEDIUM
- MICA. - MICACEOUS
- MOD. - MODERATELY
- NP - NON PLASTIC
- ORG. - ORGANIC
- PMT - PRESSUREMETER TEST
- SAP. - SAPROLITIC
- SD. - SAND, SANDY
- SL. - SILT, SILTY
- SLI. - SLIGHTLY
- TCR - TRICONE REFUSAL
- w - MOISTURE CONTENT
- V - VERY
- VST - VANE SHEAR TEST
- WEA. - WEATHERED
- W - UNIT WEIGHT
- W<sub>d</sub> - DRY UNIT WEIGHT
- 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-550X
  - VANE SHEAR TEST
  - PORTABLE HOIST
  - DIEDRICH D50
  - MOBILE B29
- 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 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 (IV 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 (IV 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 PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
- SOFT** CAN BE GROOVED 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	SPACING	TERM	THICKNESS
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	4 FEET
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET
CLOSE	0.16 TO 1 FOOT	VERY THINLY BEDDED	0.03 - 0.16 FEET
VERY CLOSE	LESS THAN 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 DISLOADED 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 (ROD)** - 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.
- SLICKENISE** - 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 (SROD)** - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
- TOPSOIL (TS.)** - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: N/A

ELEVATION: N/A FEET

**NOTES:**

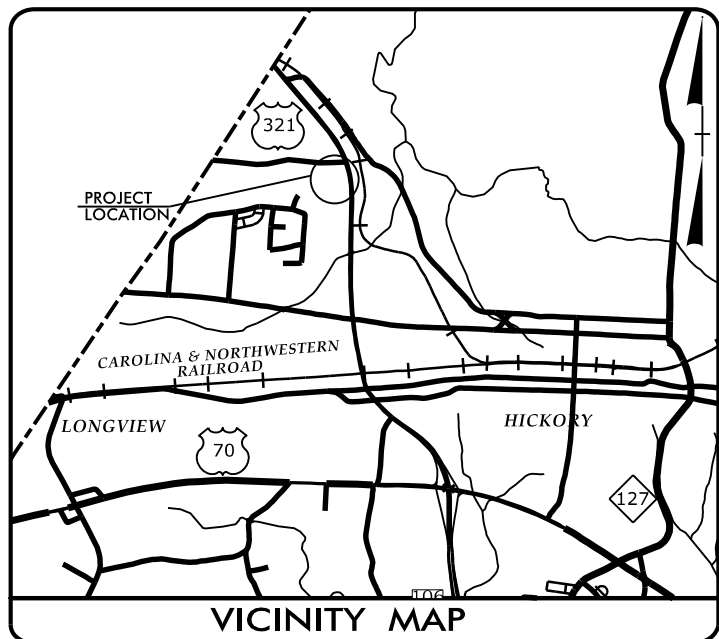
ROADWAY DESIGN AND SURVEY INFORMATION DATED 12/19/2022 PROVIDED BY TGS ENGINEERS.  
F.I.A.D. = FILLED IMMEDIATELY AFTER DRILLING

09/08/99  
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 C:\Users\SierraPatterson\OneDrive\Documents\GeotechnicalGroup, PLLC\Matt Brewer - Projects\0136 - 17th Street Extension\_TGS\CADD\_Geotech\PlanProj\17thSt\_Rdy\_tsh.dgn  
 SierraPatterson AT DESKTOP-4ETD641

**CONTRACT: HL-0004**

**CONTRACT: HL-0004**

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



**RIGHT OF WAY PLANS**

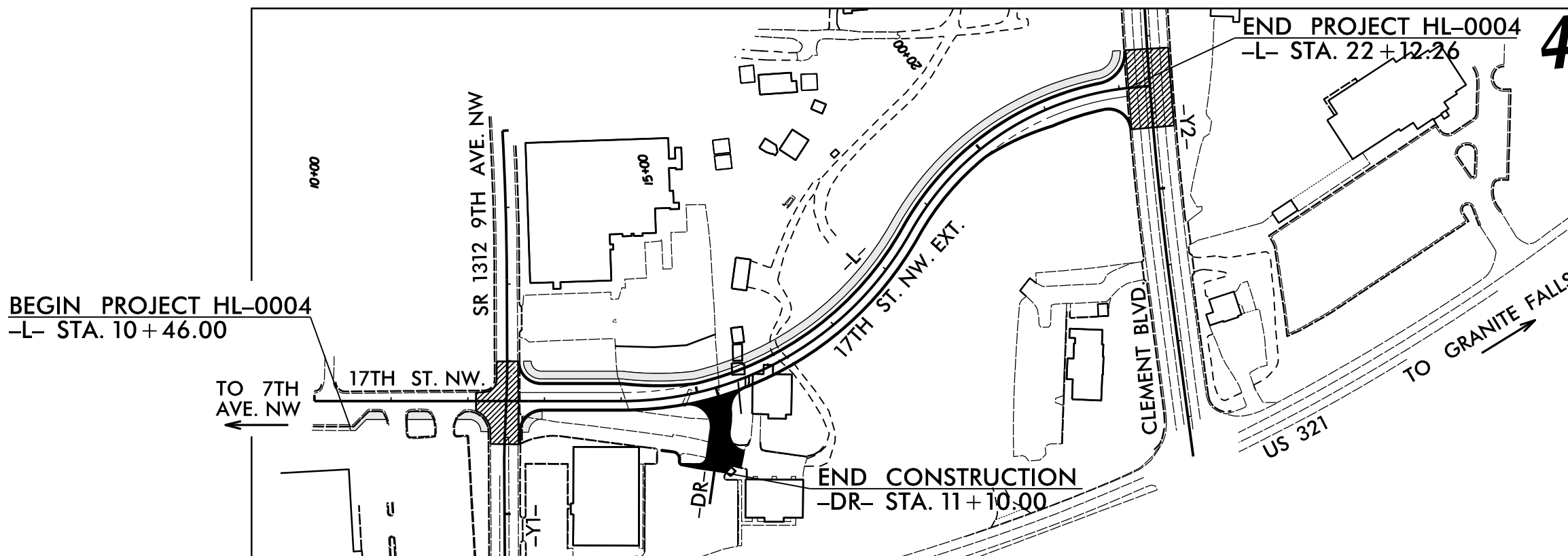
CITY OF HICKORY, NC

# CATAWBA COUNTY

**LOCATION: 17TH ST. NW. EXTENSION FROM  
 9TH AVE. NW TO CLEMENT BLVD.**

**TYPE OF WORK: GRADING, PAVING, DRAINAGE,  
 AND CURB AND GUTTER,**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HL-0004	3	14
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
49346.1.1	1143026	PE	
49346.2.1	1143026	ROW, UTIL.	
49346.3.1	1143026	CONST.	



THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE CITY OF HICKORY.  
 CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

DOCUMENT NOT CONSIDERED FINAL  
 UNLESS ALL SIGNATURES COMPLETED

<p><b>GRAPHIC SCALES</b></p> <p>50 25 0 50 100 PLANS</p> <p>50 25 0 50 100 PROFILE (HORIZONTAL)</p> <p>10 5 0 10 20 PROFILE (VERTICAL)</p>	<p><b>DESIGN DATA</b></p> <p>ADT 2022 = -          ADT 2045 = 4,500          D = 60%          T = 3% *          V = 40 MPH          * TTST = 1% DUALS = 2%          FUNC CLASS =          MAJOR COLLECTOR          - URBAN          REGIONAL TIER</p>	<p><b>PROJECT LENGTH</b></p> <p>LENGTH ROADWAY TIP PROJECT HL-0004 = 0.221 MILES          TOTAL LENGTH TIP PROJECT HL-0004 = 0.221 MILES</p>	<p><b>CITY CONTACT: JOHN MARSHALL</b></p> <p>PLANS PREPARED BY:   TGS ENGINEERS          201 W. MARION ST          SHELBY, NC 28150          PH (704) 476-0003          CORP. LICENSE NO. C-0275</p> <p>PLANS PREPARED FOR:   HICKORY  <small>North Carolina</small>          Life. Walk. Cracked.          76 N CENTER ST          HICKORY, NC 28601</p> <p>RIGHT OF WAY DATE:          FEBRUARY 28, 2023</p> <p>LETTING DATE:          -</p> <p><small>2018 STANDARD SPECIFICATIONS</small></p>	<p><b>HYDRAULICS ENGINEER</b></p> <p>SIGNATURE: _____ P.E.</p> <p><b>ROADWAY DESIGN ENGINEER</b></p> <p>JIMMY L. TERRY, PE  <small>PROJECT ENGINEER</small></p> <p>AUSTIN R. TURNER, PE  <small>PROJECT DESIGN ENGINEER</small></p> <p>SIGNATURE: _____ P.E.</p>	
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/ /2023

STATE PROJECT: 49346.1.1  
 TIP NO.: HL-0004  
 COUNTY: Catawba  
 DESCRIPTION: 17<sup>th</sup> Street NW Extension from 9<sup>th</sup> Avenue NW to Clement Boulevard

SUBJECT: Geotechnical Roadway Inventory Report

### PROJECT DESCRIPTION

Based on a review of the plans provided to us by TGS, we understand this project consists of improving and extending 17<sup>th</sup> Street NW from SR 1312 (9<sup>th</sup> Avenue NW) to Clement Boulevard in Hickory, Catawba County, North Carolina. The project is approximately 0.221 miles in length, measured along -L- (17<sup>th</sup> Street NW Extension) from Station 10+46 to 22+12. The work on 17<sup>th</sup> Street NW Extension includes intersection improvements at -Y1- SR 1312 (9<sup>th</sup> Avenue NW) and -Y2- Clement Boulevard and construction of -DR- driveway.

The provided roadway plans generally indicate up to 7 feet or less of fill and up to 38 feet of cut along -L-. The larger cuts are anticipated towards the end of the -L- alignment to tie into Clement Boulevard and are planned to be oriented at a 2:1 (horizontal: vertical) geometry. Maximum cut and fill heights along -DR- are anticipated to be on the order of 13 feet and 4 feet, respectively.

The following alignments are included as part of this investigation:

<u>Alignment</u>	<u>Stations</u>
-L- (17 <sup>th</sup> Street NW Extension)	10+46 to 22+12
-DR- (Driveway)	10+00 to 11+00

The geotechnical field investigation was conducted by CG2 during June 2023. A subcontracted drilling crew was used to drill and sample each of the nine (9) borings included in this report. The drill rig utilized was a track-mounted Diedrich D-50 equipped with an automatic hammer. Standard Penetration Tests (SPT) were performed at selected depths within each boring. Representative soil samples were collected for visual-manual classification in the field and evaluated in the office by a staff geologist under the supervision of a licensed engineer or geologist. Selected soil samples were submitted for laboratory analysis by an approved NCDOT M&T testing facility.

### PHYSIOGRAPHY AND GEOLOGY

The project corridor is located within the Piedmont Physiographic Province of North Carolina. The Piedmont Physiographic Province generally consists of hills and ridges which are intertwined with an established system of draws, streams, and valleys. According to the 1985 Geologic Map of North Carolina, the bedrock under the site consists of the CZms formation. The rock unit generally consists of lenses and layers of quartz schist, micaceous quartzite, calc-silicate rock, biotite gneiss, amphibolite, and phyllite. Rock encountered during this investigation was classified as Mica Schist.

Within the project alignment, much of the bedrock is overlain by near-surface material consisting of residual soils. Residual soils are derived from in situ chemical and physical weathering of the rock in the area and vary in thickness. The residual soils in this region are typically finer grained with a higher clay content near the surface due to advanced

weathering, and typically become coarser grained with increasing depth as the degree of weathering decreases. As the degree of weathering decreases, the residual soils generally retain the overall appearance and fabric of the parent rock (sometimes referred to as "saprolite"). The boundary between soil and rock is not always sharply defined. A transitional zone termed "weathered rock" is often found overlying the parent bedrock. Weathered rock is defined as material requiring 100 blows with less than one foot of penetration from the SPT hammer.

### SOIL PROPERTIES

Soils and rock encountered during this investigation include artificial fill, residual, weathered rock, and crystalline rock.

Artificial fill soils were encountered in Borings L\_1490, L\_1650L, and L\_2150L at depths ranging from approximately 5.5 to 12.0 feet below existing grades. Artificial Fill soils are materials that have been manipulated by the activity of man. The artificial fill soils encountered consist of soft to very stiff sandy silts (A-4) and sandy clays (A-6), with trace amounts of gravel. The artificial fill soils encountered during this investigation appeared to be sourced locally.

Residual soils were encountered underlying the artificial fill soils in Borings L\_1490, L\_1650L, and L\_2150L and in each of the remaining borings performed during this investigation. The residual soils generally consist of medium stiff to hard sandy clays (A-6), silty clays (A-7), sandy silts (A-4), and medium dense to dense silty sands (A-2-4). Trace amounts of mica and gravel-sized rock fragments, were encountered intermittently within the residual soils. Manganese oxide staining was observed at various depths within the residual soils.

Weathered rock was encountered along the project corridor, within and underlying the residual soils in Borings L\_2050L, L\_2150L, and L\_2150R at depths ranging from approximately 5.5 to 23.5 feet below existing grades. The weathered rock encountered within the borings consisted of Mica Schist. . The thickness of the weathered rock layers within the residual soils varied between approximately 2.1 to 2.5 feet.

Crystalline rock was encountered along the project corridor within Borings L\_2000L and L\_2150R at depths of 13.0 to 19.2 feet below existing grades, respectively. The crystalline rock encountered within the borings consisted of Mica Schist. The crystalline rock was encountered at depths ranging from approximately 13.0 to 19.2 feet below existing grades at the boring locations.

### GROUNDWATER

Groundwater measurements were taken during June 2023. Groundwater measurements were attempted at the completion of drilling in each boring, at which time groundwater was encountered in Borings L\_1819L, L\_2000L, L\_2050L, and L\_2150L at depths ranging from approximately 11.2 to 31.4 feet below the existing grades. Subsequent groundwater measurements were attempted after at least 24 hours following the completion of drilling in Borings L\_1819L, L\_2000L, L\_2050L, L\_2150L, and L\_2150R. At the time of subsequent water level measurements, groundwater was encountered at depths ranging from 7.0 to 26.7 feet below existing grades. The remaining borings were either recorded as dry or filled in after drilling due to our demobilization from the project site. The soils encountered were generally described as moist above and below groundwater elevation.

Water Wells: There are several residences near the project site which could indicate that water wells may be present. Water wells were not observed within the proposed construction corridor. However, wells may be encountered that were not observed during our field services.

### AREAS OF SPECIAL GEOTECHNICAL INTEREST

Very soft to soft or very loose to loose soils were not encountered in borings of the project.

Highly Plastic Soils: Highly plastic soils (PI > 25) were not encountered in borings of the project.

Shallow groundwater was not encountered within 3 feet of the existing ground. In addition, shallow groundwater was encountered within 6 feet of proposed subgrade at the following locations.

<u>Alignment</u>	<u>Stations</u>	<u>Offsets (ft)</u>
-L-	18+19	30 LT
-L-	20+00	27 LT
-L-	21+50	18 RT

Crystalline rock was encountered above or within 6 feet of proposed grade at the following locations.

<u>Alignment</u>	<u>Stations</u>	<u>Offsets (ft)</u>
-L-	20+00	27 LT
-L-	21+50	18 RT

Artificial Fill soils were encountered on the project at the following borehole locations:

<u>Alignment</u>	<u>Stations</u>	<u>Offsets (ft)</u>
-L-	14+90	17 LT
-L-	16+50	3 LT
-L-	21+50	96 LT

Rock Outcrops: Rock outcrops were not observed withing the project limits.

### GEOTECHNICAL TESTING

No thin-wall Shelby tube or bulk samples were collected during the investigation.

Sincerely,  
Carolinan Geotechnical Group, PLLC

DocuSigned by:  
*Sierra N. Patterson*  
1249E0C0637E485...  
Sierra Patterson, PG  
Project Geologist

DocuSigned by:  
*Robert E. Kral*  
8AD703B2A8484F4...  
Robert E. Kral, PE  
Senior Project Engineer



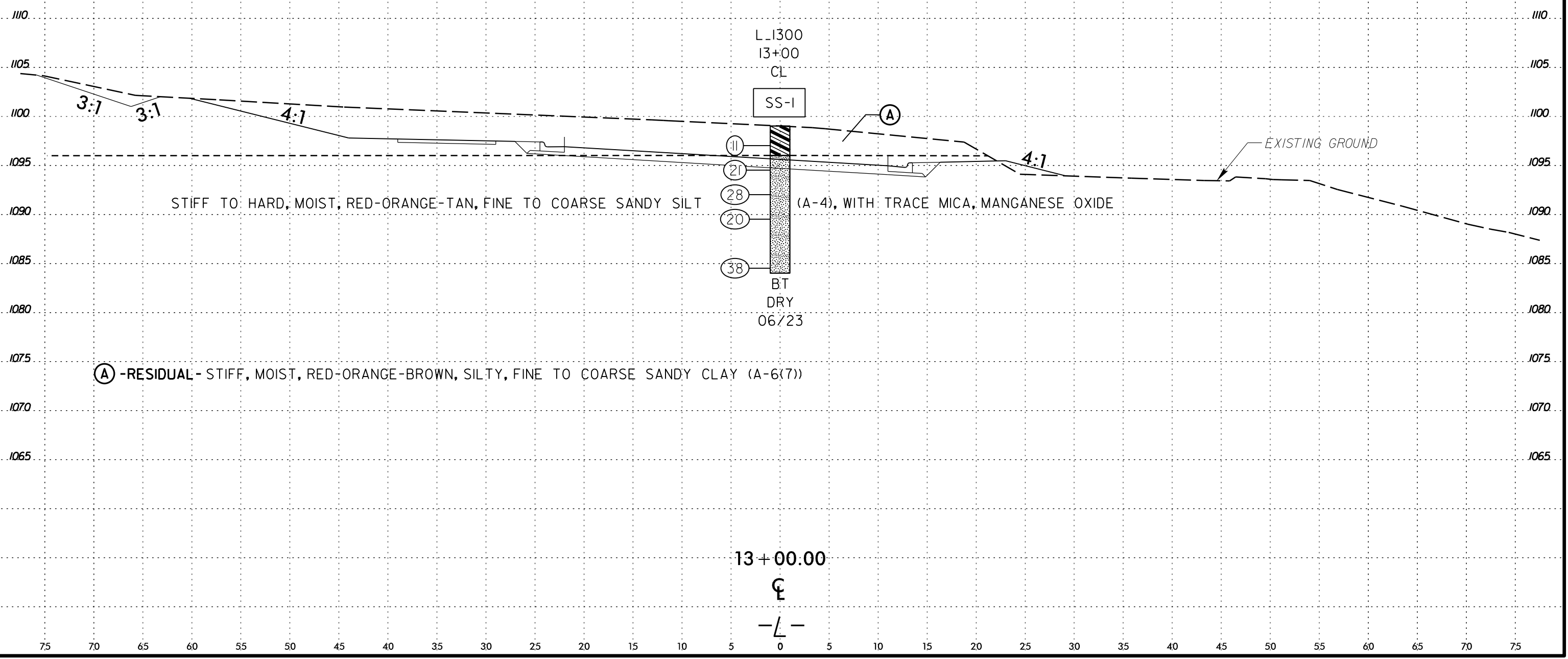


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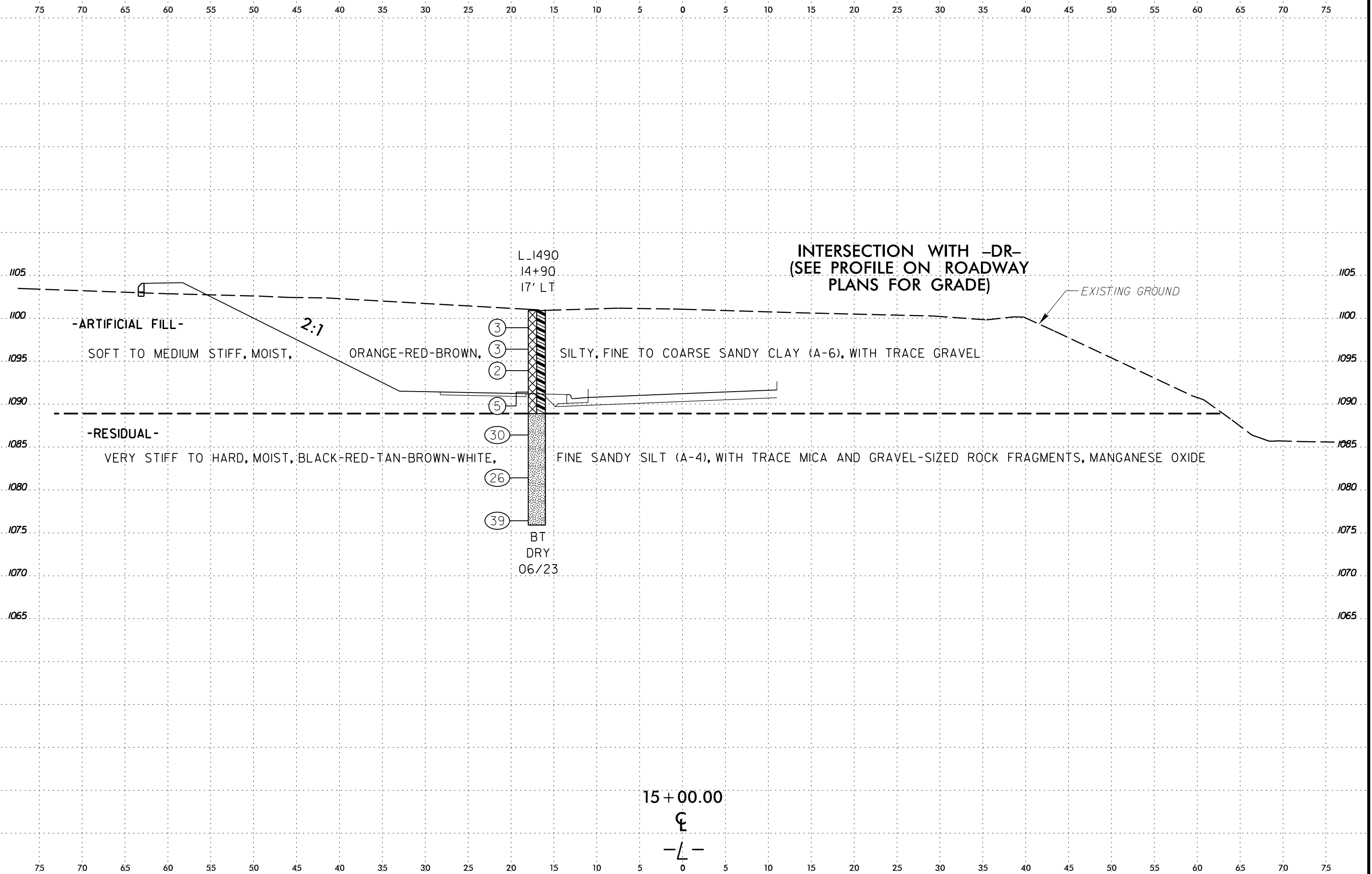
## SOIL TEST RESULTS

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	13+00 -L-	1.0' - 2.5'	A-6(7)	35	14	16.2	24.4	17.8	41.6	100	91.6	64.2	14.4	-



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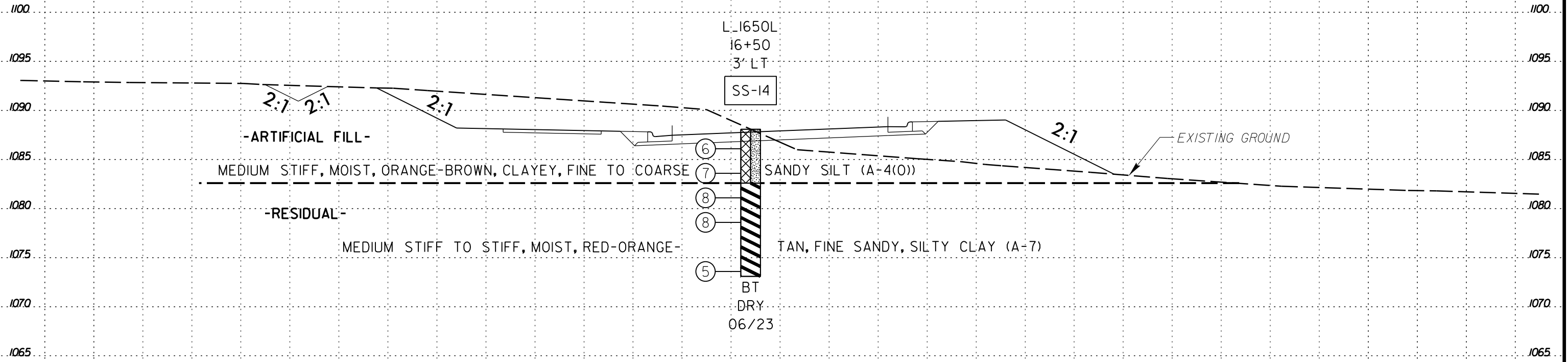
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# SOIL TEST RESULTS

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-14	3' LT	16+50 -L-	3.5' - 5.0'	A-4(0)	25	3	24.6	28.8	15.0	31.7	100	85.6	51.7	17.8	-

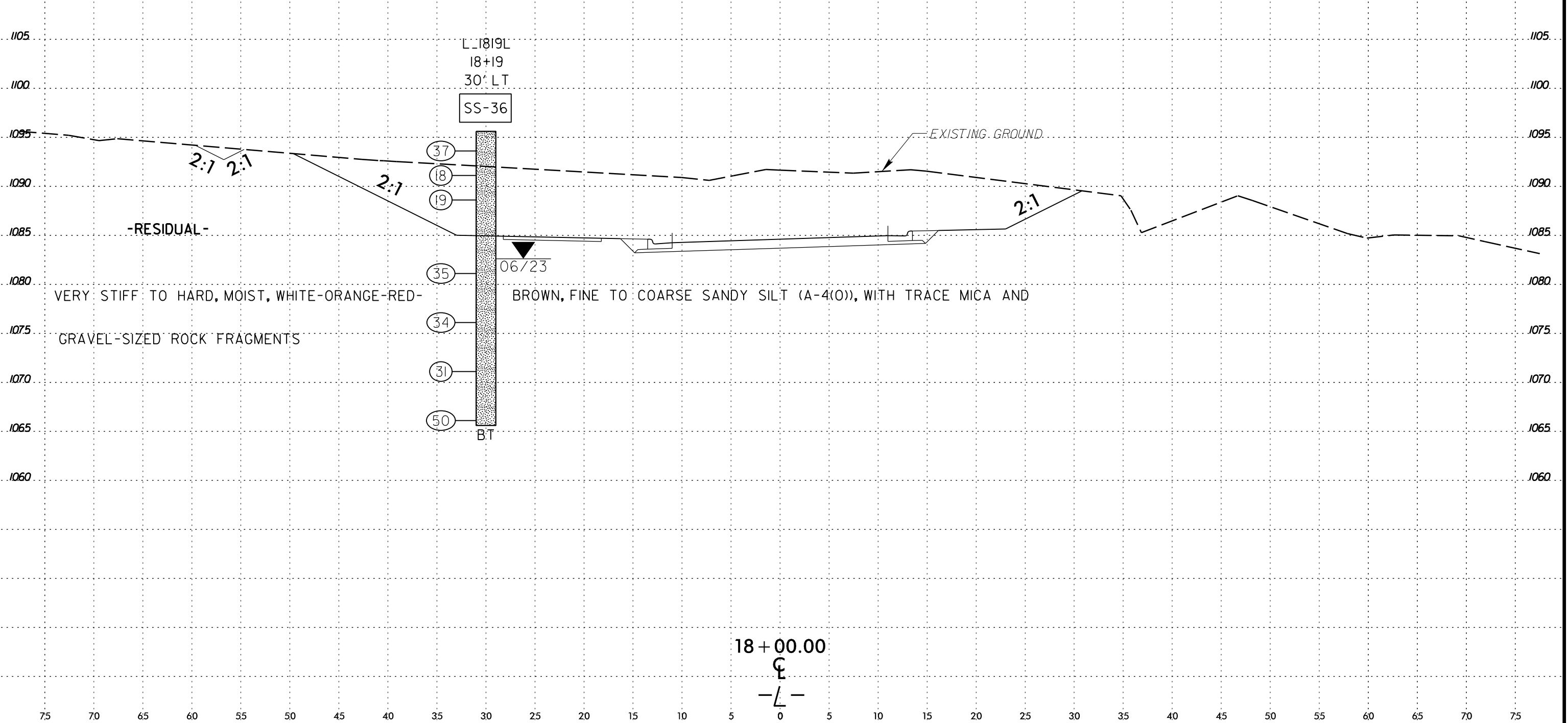


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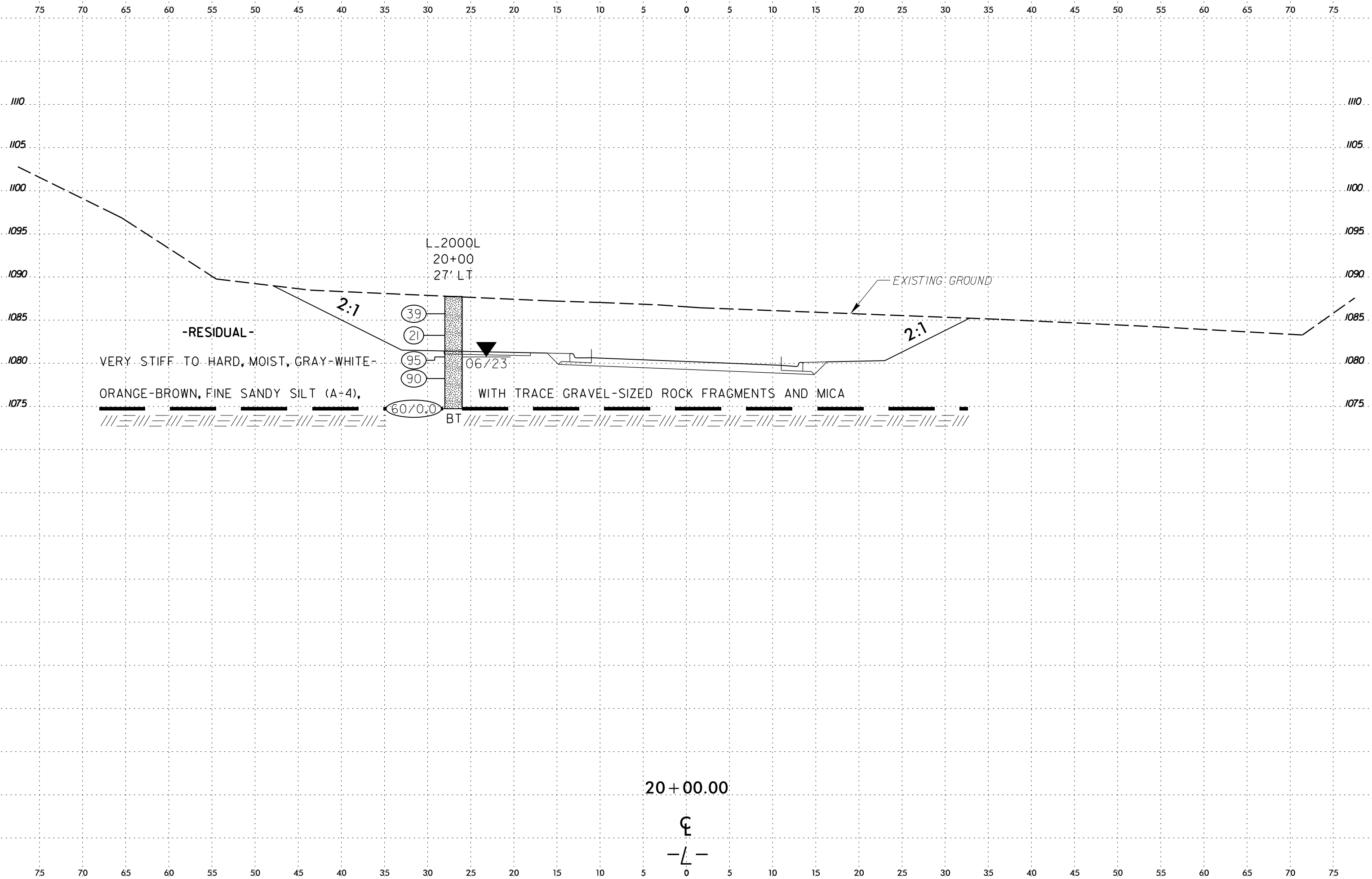
# SOIL TEST RESULTS

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-36	30' LT	18+19 -L-	6.0' - 7.5'	A-4(0)	NP	NP	24.5	49.3	17.6	8.7	100	87.3	36.2	14.0	-

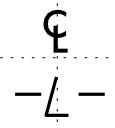


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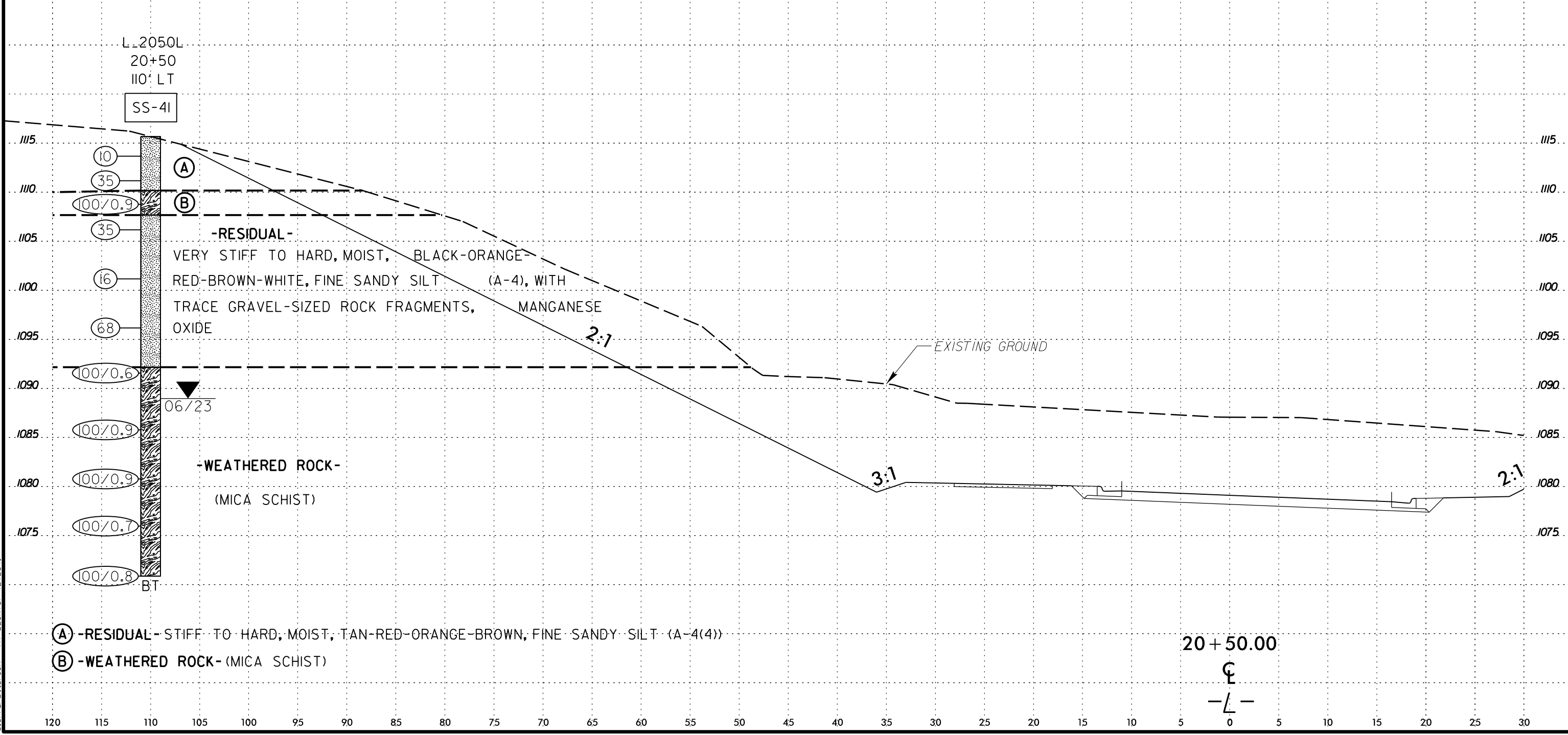


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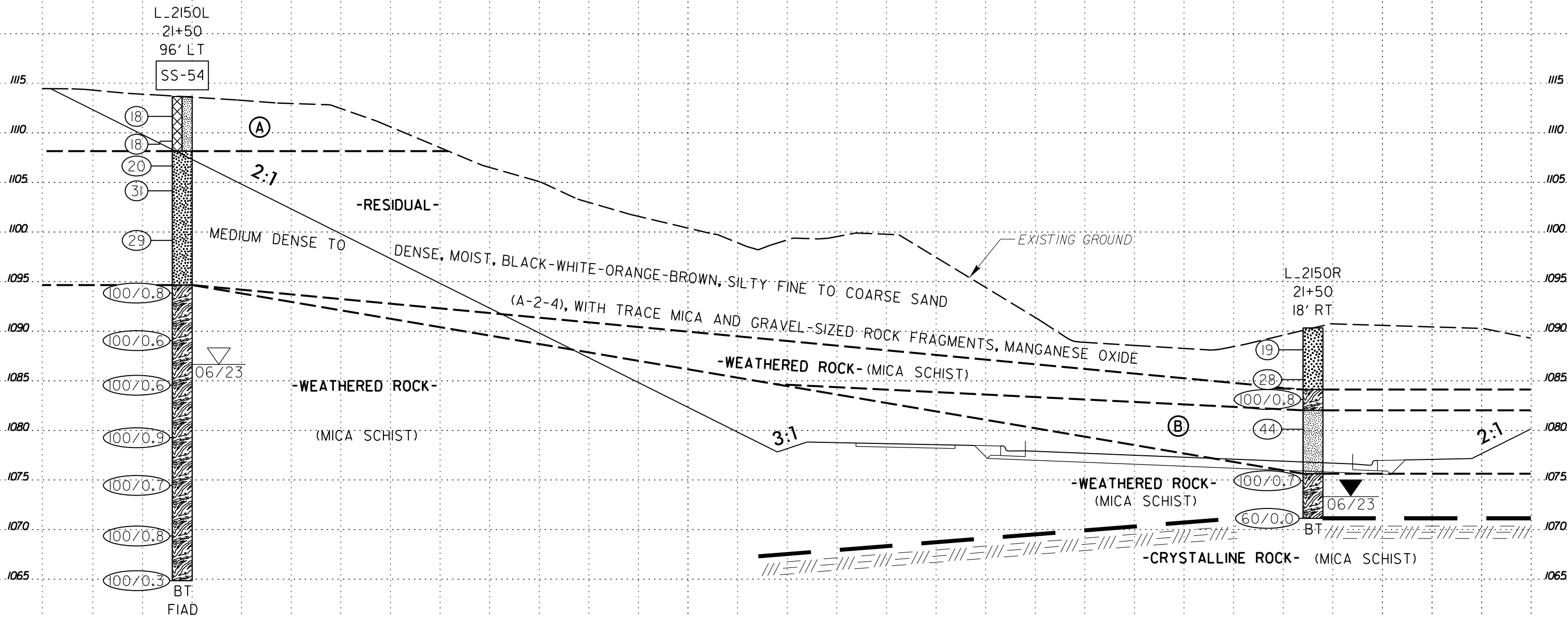
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-41	110' LT	20+50 -L-	1.0' - 2.5'	A-4(4)	37	8	14.4	31.3	15.6	38.8	100	92.8	61.3	20.7	-



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 SierraPatterson AT DESK TOP-4 [D64]

# 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-54	96' LT	21+50 -L-	8.5' - 10.0'	A-2-4(0)	NP	NP	41.7	37.9	12.9	7.5	100	74.8	27.5	9.8	-



Ⓐ -ARTIFICIAL FILL- VERY STIFF, MOIST, RED-BROWN, FINE TO COARSE SANDY SILT (A-4), WITH TRACE GRAVEL

Ⓑ -RESIDUAL- HARD, MOIST, BLACK-ORANGE-TAN-RED-BROWN, FINE SANDY SILT (A-4), WITH TRACE MICA AND GRAVEL-SIZED ROCK FRAGMENTS, MANGANESE OXIDE

21 + 50.00

⊕

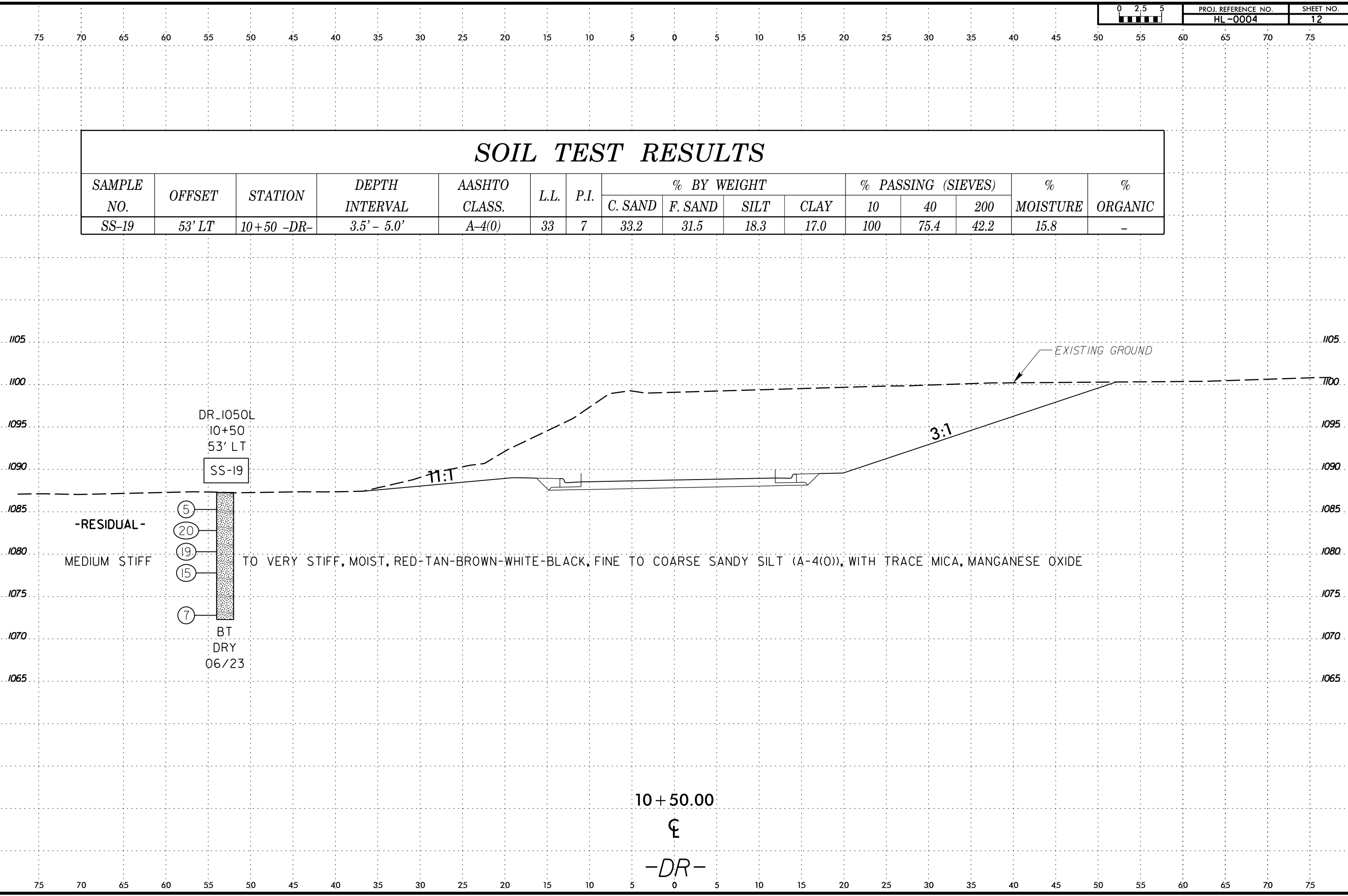
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# SOIL TEST RESULTS

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-19	53' LT	10+50 -DR-	3.5' - 5.0'	A-4(0)	33	7	33.2	31.5	18.3	17.0	100	75.4	42.2	15.8	-



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

REFERENCE: HL-0004

PROJECT: 49346

Prepared in the Office of:  
SUMMIT ENGINEERING  
LABORATORY & TESTING, INC.  
PINEVILLE, NORTH CAROLINA  
NCDOT LAB CERT. NO. 119-0705

## 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	13+00 -L-	1.0' - 2.5'	A-6(7)	35	14	16.2	24.4	17.8	41.6	100	91.6	64.2	14.4	-
SS-14	3' LT	16+50 -L-	3.5' - 5.0'	A-4(0)	25	3	24.6	28.8	15.0	31.7	100	85.6	51.7	17.8	-
SS-36	30' LT	18+19 -L-	6.0' - 7.5'	A-4(0)	NP	NP	24.5	49.3	17.6	8.7	100	87.3	36.2	14.0	-
SS-41	110' LT	20+50 -L-	1.0' - 2.5'	A-4(4)	37	8	14.4	31.3	15.6	38.8	100	92.8	61.3	20.7	-
SS-54	96' LT	21+50 -L-	8.5' - 10.0'	A-2-4(0)	NP	NP	41.7	37.9	12.9	7.5	100	74.8	27.5	9.8	-
SS-19	53' LT	10+50 -DR-	3.5' - 5.0'	A-4(0)	33	7	33.2	31.5	18.3	17.0	100	75.4	42.2	15.8	-