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REFERENCE: R-4060

PROJECT: 34605

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. | R-4060 | 1 | 29 |

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ROADWAY SUBSURFACE INVESTIGATION

COUNTY Alleghany
PROJECT DESCRIPTION US 21 Western Loop from SR 1172
(Grandview Drive) to US 21

INVENTORY

CAUTION NOTICE

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

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

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

- NOTES:
- 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.
 - 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

Robbie DeLost

Mike Morgan

Herold Morris

INVESTIGATED BY Michael Gragg

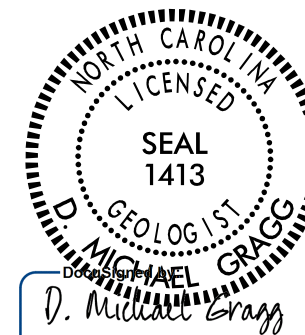
DRAWN BY Wesley Shuecraft

CHECKED BY Kenneth Bussey

SUBMITTED BY ICA Engineering

DATE APRIL 2015

DS
CBL



D. Michael Gragg

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5/19/2015

SIGNATURE

DATE



Kenneth R. Bussey, Jr.

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5/26/2015

SIGNATURE

DATE

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 | | | | | | | | | | TERMS AND DEFINITIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 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 (ASTM 1286, 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, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 . | | | | | | | | | | 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. | | | | | | | | | | 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 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 (CPS) COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. | | | | | | | | | | 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 PLANNAR 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. FIBRILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN 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 60 BLOWS PER FOOT. STRATA CORE RECOVERY (SCREC) - 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SOIL LEGEND AND AASHTO CLASSIFICATION | | | | | | | | | | ANGULARITY OF GRAINS | | | | | | | | | | WEATHERING | | | | | | | | | | ROCK HARDNESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (< 300 PASSING #200)</th> <th colspan="3">SILT-CLAY MATERIALS (> 300 PASSING #200)</th> <th colspan="2">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th> <th>A-2</th> <th>A-3</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>U</th> <th>OC</th> <th>OH</th> <th>OM</th> <th>OS</th> </tr> </thead> <tbody> <tr> <td>GROUP CLASS.</td> <td>A-1-a</td> <td>A-1-b</td> <td>A-2-4</td> <td>A-2-5</td> <td>A-2-6</td> <td>A-2-7</td> <td>A-4</td> <td>A-5</td> <td>A-6</td> <td>A-7</td> <td>A-1, A-2</td> <td>A-3, A-4, A-5</td> <td>A-6, A-7</td> </tr> <tr> <td>SYMBOL</td> <td colspan="12">[Patterned boxes representing soil types]</td> </tr> <tr> <td>% PASSING #10 #40 #200</td> <td colspan="12">[Tables for soil classification criteria]</td> </tr> <tr> <td>MATERIAL PASSING #10 #40 #200</td> <td colspan="12">[Tables for soil classification criteria]</td> </tr> <tr> <td>GROUP INDEX</td> <td colspan="12">[Tables for soil classification criteria]</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td colspan="12">[Tables for soil classification criteria]</td> </tr> <tr> <td>GENERAL RATING AS SUBGRADE</td> <td colspan="12">[Tables for soil classification criteria]</td> </tr> </tbody> </table> | | | | | | | | | | GENERAL CLASS. | GRANULAR MATERIALS (< 300 PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 300 PASSING #200) | | | ORGANIC MATERIALS | | A-1 | A-2 | A-3 | A-4 | A-5 | A-6 | A-7 | U | OC | OH | OM | OS | GROUP CLASS. | 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 | A-1, A-2 | A-3, A-4, A-5 | A-6, A-7 | SYMBOL | [Patterned boxes representing soil types] | | | | | | | | | | | | % PASSING #10 #40 #200 | [Tables for soil classification criteria] | | | | | | | | | | | | MATERIAL PASSING #10 #40 #200 | [Tables for soil classification criteria] | | | | | | | | | | | | GROUP INDEX | [Tables for soil classification criteria] | | | | | | | | | | | | USUAL TYPES OF MAJOR MATERIALS | [Tables for soil classification criteria] | | | | | | | | | | | | GENERAL RATING AS SUBGRADE | [Tables for soil classification criteria] | | | | | | | | | | | | MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE. | | | | | | | | | | FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SL) 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 (SL) 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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> . 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. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i> . 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. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i> . COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DICES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. | | | | | | | | | | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERAL CLASS. | GRANULAR MATERIALS (< 300 PASSING #200) | | | | | | | SILT-CLAY MATERIALS (> 300 PASSING #200) | | | ORGANIC MATERIALS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | A-1 | A-2 | A-3 | A-4 | A-5 | A-6 | A-7 | U | OC | OH | OM | OS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUP CLASS. | 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 | A-1, A-2 | A-3, A-4, A-5 | A-6, A-7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SYMBOL | [Patterned boxes representing soil types] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| % PASSING #10 #40 #200 | [Tables for soil classification criteria] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MATERIAL PASSING #10 #40 #200 | [Tables for soil classification criteria] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUP INDEX | [Tables for soil classification criteria] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USUAL TYPES OF MAJOR MATERIALS | [Tables for soil classification criteria] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERAL RATING AS SUBGRADE | [Tables for soil classification criteria] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSISTENCY OR DENSENESS | | | | | | | | | | MISCELLANEOUS SYMBOLS | | | | | | | | | | RECOMMENDATION SYMBOLS | | | | | | | | | | ABBREVIATIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| TEXTURE OR GRAIN SIZE | | | | | | | | | | SOIL MOISTURE - CORRELATION OF TERMS | | | | | | | | | | EQUIPMENT USED ON SUBJECT PROJECT | | | | | | | | | | FRACURE SPACING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 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) | SEMI-SOLID, REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OM - OPTIMUM MOISTURE | - MOIST - (M) | SOLID AT OR NEAR OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL - SHRINKAGE LIMIT | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input checked="" type="checkbox"/> CHE-45C | <input type="checkbox"/> CLAY BITS | <input checked="" type="checkbox"/> AUTOMATIC | <input type="checkbox"/> MANUAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> CHE-55 | <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER | CORE SIZE: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> CHE-55B | <input checked="" type="checkbox"/> 6" HOLLOW AUGERS | <input type="checkbox"/> # | <input type="checkbox"/> H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> VANE SHEAR TEST | <input type="checkbox"/> HARD FACED FINGER BITS | <input checked="" type="checkbox"/> #2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> PORTABLE HOIST | <input type="checkbox"/> TUNG-CARBIDE INSERTS | HAND TOOLS: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <input checked="" type="checkbox"/> CASING | <input checked="" type="checkbox"/> W/ ADVANCER | <input type="checkbox"/> POST HOLE DIGGER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <input type="checkbox"/> TRICONE | * STEEL TEETH | <input type="checkbox"/> HAND AUGER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <input type="checkbox"/> TRICONE | * TUNG-CARB. | <input type="checkbox"/> SOUNDING ROD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <input checked="" type="checkbox"/> CORE BIT | | <input type="checkbox"/> VANE SHEAR TEST | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TERM | SPACING | TERM | THICKNESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VERY WIDE | MORE THAN 18 FEET | VERY THICKLY BEDDED | 4 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WIDE | 3 TO 18 FEET | THICKLY BEDDED | 1.5 - 4 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.18 - 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PLASTICITY | | | | | | | | | | INDURATION | | | | | | | | | | NOTES: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>NON PLASTIC</th> <th colspan="2">PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> </thead> <tbody> <tr> <td>SLIGHTLY PLASTIC</td> <td>0-5</td> <td></td> <td>VERY LOW</td> </tr> <tr> <td>MODERATELY PLASTIC</td> <td>6-15</td> <td></td> <td>SLIGHT</td> </tr> <tr> <td>HIGHLY PLASTIC</td> <td>16-25</td> <td></td> <td>MEDIUM</td> </tr> <tr> <td></td> <td>26 OR MORE</td> <td></td> <td>HIGH</td> </tr> </tbody> </table> | | | | | | | | | | 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 | FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRAGILE 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | FRACURE SPACING | | | | | | | | | | FRACURE SPACING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

See Sheet 1-A For Index of Sheets

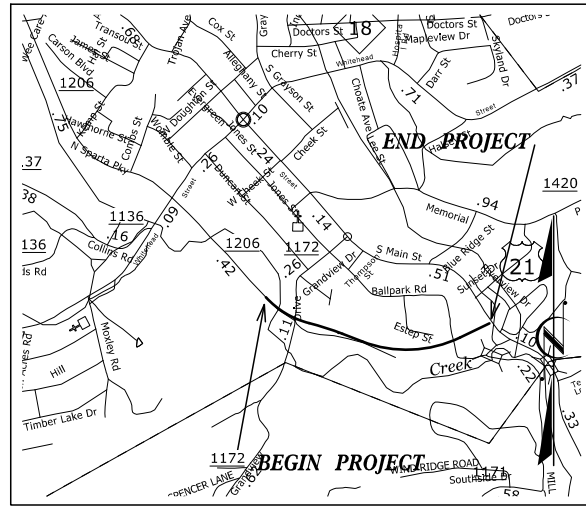
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

ALLEGHANY COUNTY

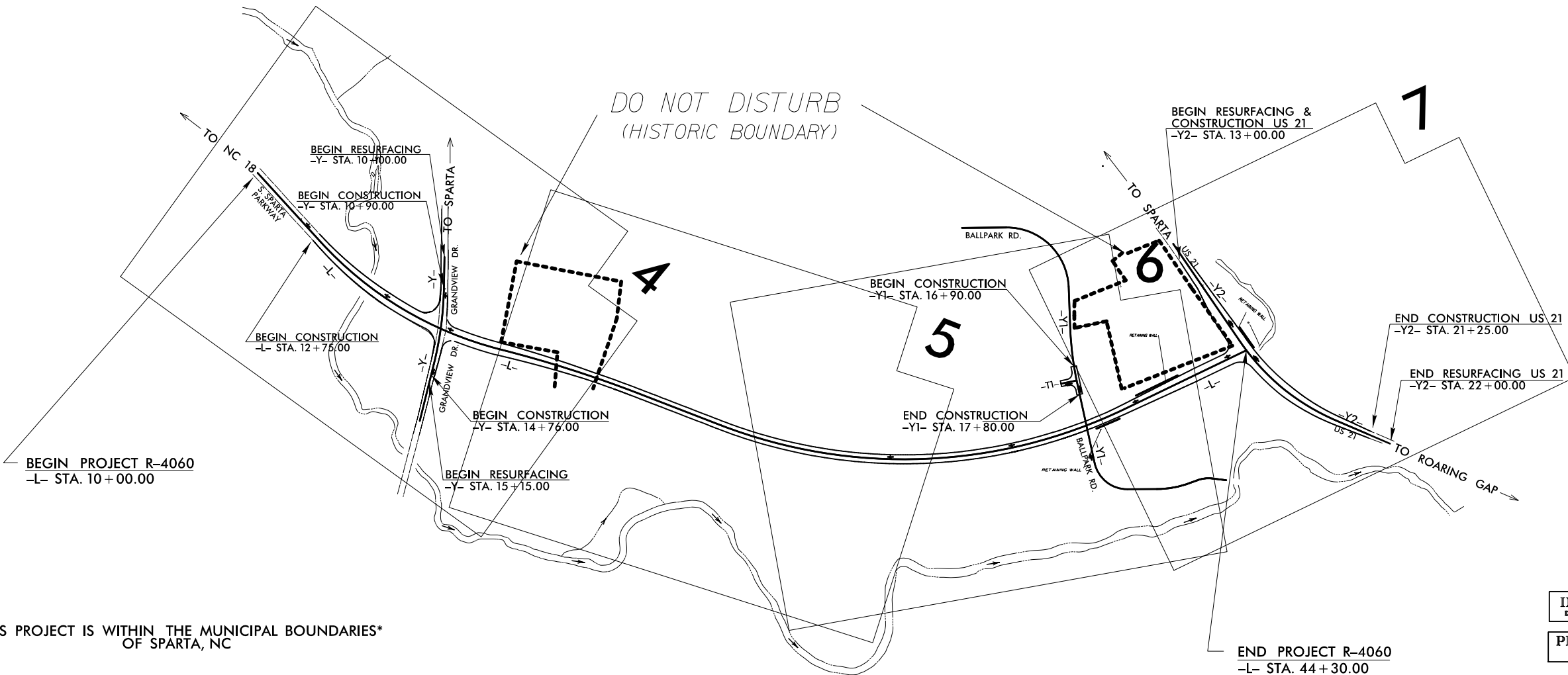
LOCATION: SPARTA BYPASS FROM SR 1172 (GRANDVIEW DR.)
TO US 21 - NEW LOCATION

TYPE OF WORK: GRADING, DRAINAGE, WIDENING, PAVING, AND SIGNALS
INVENTORY

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-----------------|-----------------------------|-------------|--------------|
| N.C. | R-4060 | 3 | 29 |
| STATE PROJ. NO. | F.A. PROJ. NO. | DESCRIPTION | |
| 34605.1.2 | | PE | |
| 34605.2.1 | | RW | |
| | | | |
| | | | |
| | | | |
| | | | |



VICINITY MAP



THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES
OF SPARTA, NC



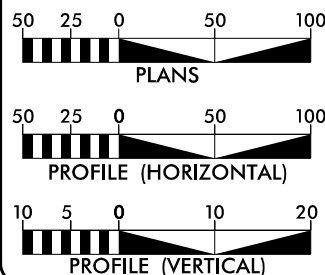
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PROJECT: R-4060

CONTRACT:

GRAPHIC SCALES



DESIGN DATA

ADT 2007 = 2300
ADT 2030 = 4400
DHV = %
D = %
T = 5 % *
V = 50 MPH
* TTST 1 DUAL 4

PROJECT LENGTH

PROJECT R-4060 LENGTH = 0.891 MI

Prepared in the Office of:
DIVISION OF HIGHWAYS
801 STATESVILLE ROAD, NORTH WILKESBORO, N.C. 28659

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
August 15, 2014

LETTING DATE:
July 21, 2015

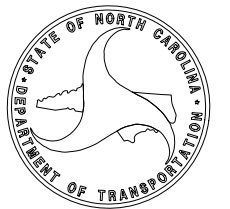
DIVISION ENGINEER
M.A. PETTYJOHN, PE

SIGNATURE _____ P.E.
DATE _____

HYDRAULICS ENGINEER
PE

SIGNATURE _____ P.E.
DIVISION PROJECT MANAGER
JOSEPH L. LAWS, PE

SIGNATURE _____ P.E.



\$\$\$\$\$ SYSTEM TIME\$\$\$\$\$
\$\$\$\$\$ DDON\$\$\$\$\$
\$\$\$\$\$ USERNAME\$\$\$\$\$



April 13, 2015

WBS NUMBER: 34605.1.2
TIP NUMBER: R-4060
F.A. NUMBER: STP-21 (10)
COUNTY: Alleghany
DESCRIPTION: US 21 Western Loop from SR 1172 (Grandview Drive) to US 21

SUBJECT: Geotechnical Report – Inventory

PROJECT DESCRIPTION

The project is located in central Alleghany County, North Carolina. This project consists of the reconstruction/widening of 0.09 miles of existing South Sparta Parkway (-L-), reconstruction/widening of 0.07 miles of existing Grandview Drive (-Y-), new alignment construction of 0.50 miles of US 21 Western Loop (-L-) and reconstruction/widening of 0.16 miles of existing US 21 (-Y2-), which is a two-lane roadway passing thru Sparta, NC.

A CME 45 drill rig with an automatic hammer was used for the geotechnical investigation during late October and November 2014. At selected locations standard penetration tests (SPT) were performed, Shelby tube samples extracted and representative bulk soil samples collected for laboratory analysis by ICA Engineering, Inc.

The following alignments, totaling 0.83 miles of roadway, were investigated. Profiles and cross sections of this alignment are included within this report.

| <u>LINE</u> | <u>STATIONS</u> |
|-------------|----------------------|
| -L- | 12+75.00 to 44+30.00 |
| -Y- | 10+90.00 to 14+76.00 |
| -Y2- | 13+00.00 to 21+25.00 |

AREAS OF SPECIAL GEOTECHNICAL INTEREST

High Plasticity Soils: No soils encountered during the subsurface investigation possessed plasticity indices in excess of 25.

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

| <u>LINE</u> | <u>STATIONS</u> | <u>OFFSETS</u> |
|-------------|----------------------|----------------|
| -L- | 12+50.00 to 13+50.00 | LT to RT |
| -L- | 16+50.00 to 17+50.00 | LT to RT |

Alluvial Soils: The following location was found to have very soft to soft alluvial soils.

| <u>LINE</u> | <u>STATIONS</u> | <u>OFFSETS</u> |
|-------------|----------------------|----------------|
| -L- | 13+00.00 to 16+00.00 | RT |

PHYSIOGRAPHY AND GEOLOGY

The project is located in the Blue Ridge Physiographic Province. The project corridor is comprised of small town subdivisions, industrial tracts and rural mountainsides. The general topography of the site consists of moderately sloping hillsides, a relatively narrow floodplain and a steep sided secondary drainage course along or dissecting the proposed -L-, -Y- and -Y2- alignments.

Geologically, the project is located within the Fries Block of the Blue Ridge Thrust Sheets Tectonic Unit (*Rankin, et.al., 1972*), specifically the Ashe Metamorphic Suite and Tallulah Falls Formation (*Geologic Map of North Carolina, 1985*). These stratigraphic units are considered Late Proterozoic Era. The overlying residual soils are the product of the physical and chemical weathering of this underlying crystalline rock.

SOIL PROPERTIES

Soils encountered during this investigation are separated into six (6) categories based on origin. The origins consist of roadway embankment, artificial fill, alluvial soils, residual soils, weathered rock, and crystalline rock.

Roadway embankment was encountered along the -L- alignment at the beginning of the project west of Grandview Drive and along the roadway passing thru the NCDOT district office complex. Materials encountered consist of moist, medium stiff to stiff, tan, red, brown, white, gray, micaceous, finely to coarsely sandy silts and moist, loose, fine to coarse grain, silty sand. Plasticity indices ranged from 3 to 7. Penetrated thickness ranged from 3.7 feet to 12.0 feet.

Artificial Fill was encountered south of the roadway passing thru the NCDOT district office. Materials encountered consist of moist, stiff, tan-orange, black, white, black-green, micaceous, finely to coarsely sandy silt. A plasticity index of 7 was reported. Penetrated thickness was 12.8 feet.

Alluvial soils are present along the existing -L- alignment (South Sparta Parkway) west of Grandview Drive underlying roadway embankment, within the footprint of the proposed widening, to a depth of 8.3 feet. The alluvial soils thickness is interpreted to be 4.6 feet and they consist of moist, soft, dark gray, gray, micaceous, finely sandy clay (A-7-5). A plasticity index of 15 was reported for the alluvial soils.

Residual soils are present along and throughout the proposed -L-, -Y- and -Y2- alignments and are derived from the weathering of the underlying metamorphic rock. Typically residual soils were recognized at the surface and penetrated to total boring depth however they may also underlie roadway embankment, artificial fill or alluvium. The majority of the residual soils consist of dry to saturated, loose to medium dense (rare very loose, dense and very dense occur), tan-orange-red, black, green-black, gray, white, brown, dark gray-gray, micaceous to highly micaceous, occasionally saprolitic, silty sands (A-2-4). Limited strata consisting of saturated, dense, brown and gray, coarse rock fragments and sand (A-1-a) and dry to moist, stiff to very stiff, red, tan, green-black, micaceous, saprolitic, sandy silt (A-4, A-5) were reported. The plasticity indices for residual soils ranged from non-plastic to 9 (A-2-4, A-1-a) and 3 to 10 (A-4, A-5).

ROCK PROPERTIES

Weathered rock, determined by SPT, was encountered along the proposed -L- and -Y2- alignments, generally east of the NCDOT district office at elevations ranging from 2,854.2 feet to 2,773.3 feet (MSL). The weathered rock consists of gneiss or interlayered gneiss and schist. One instance of intercepted weathered rock within and surrounded by residual soils was reported between elevations 2,828.0 feet and 2,826.5 feet (MSL) at the east end of the NCDOT district office yard.

Crystalline rock was intercepted along the proposed -L- and -Y2- alignments at elevations ranging from 2,854.2 feet to 2,775.0 feet (MSL) and consists of fresh to moderately severe weathered gneiss containing thin seams of severely weathered gneiss. Apparent foliation angles were widely variable and crenulated in some intervals. Discontinuity measurements of 0°-20°, 40°-60° and 70°-90° and very close to wide spacing were reported.

GROUNDWATER

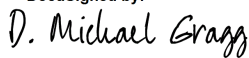
Groundwater was encountered during drilling operations (immediate) at several locations along the proposed -L- alignment at elevations ranging from 2,790.4 feet to 2,780.1 feet (MSL). A 24 hour measurement of 2,793.6 feet (MSL) was also recorded. Numerous attempts to acquire 24 hour measurements recorded dry conditions however collapse of the boreholes did not allow passage to the final boring depths. Groundwater may fluctuate with seasonal precipitation.

Prepared by,

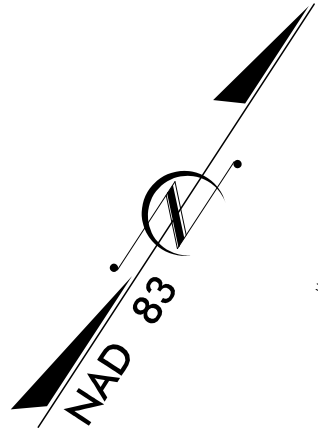
DocuSigned by:

22A188C7B3D7442...

Kenneth R. Bussey, Jr., PE
Project Engineer

DocuSigned by:

AF1EAFEB00144D7...
D. Michael Gragg, LG
Senior Project Geologist

| | |
|---|---------------------|
| PROJECT REFERENCE NO. | SHEET NO. |
| R-4060 | 4 |
| RW SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |
| PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION | |



-L-

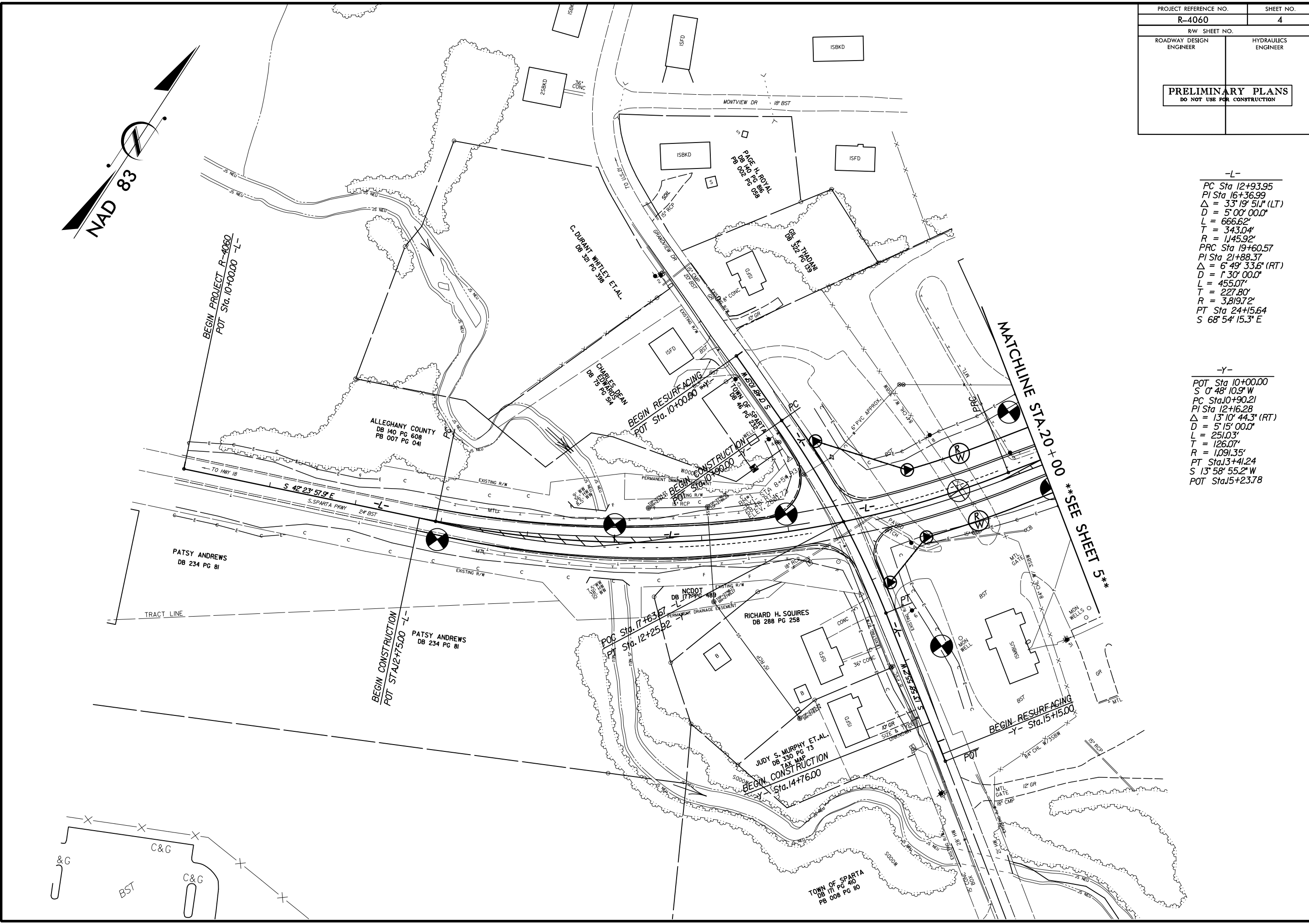
PC Sta 12+93.95
 PI Sta 16+36.99
 $\Delta = 33^{\circ}19'51"$ (LT)
 D = 5'00"00.0"
 L = 666.62'
 T = 343.04'
 R = 1145.92'
 PRC Sta 19+60.57
 PI Sta 21+88.37
 $\Delta = 6^{\circ}49'33.6"$ (RT)
 D = 1'30"00.0"
 L = 455.07'
 T = 227.80'
 R = 3,819.72'
 PT Sta 24+15.64
 S 68°54'15.3" E

-Y-

POT Sta 10+00.00
 S 0°48'10.9" W
 PC Sta 10+90.21
 PI Sta 12+16.28
 $\Delta = 13^{\circ}10'44.3"$ (RT)
 D = 5'15"00.0"
 L = 251.03'
 T = 126.07'
 R = 1,091.35'
 PT Sta 13+41.24
 S 13°58'55.2" W
 POT Sta 15+23.78

REVISIONS

8/17/99



*****SYTIME*****
 *****DESIGN*****

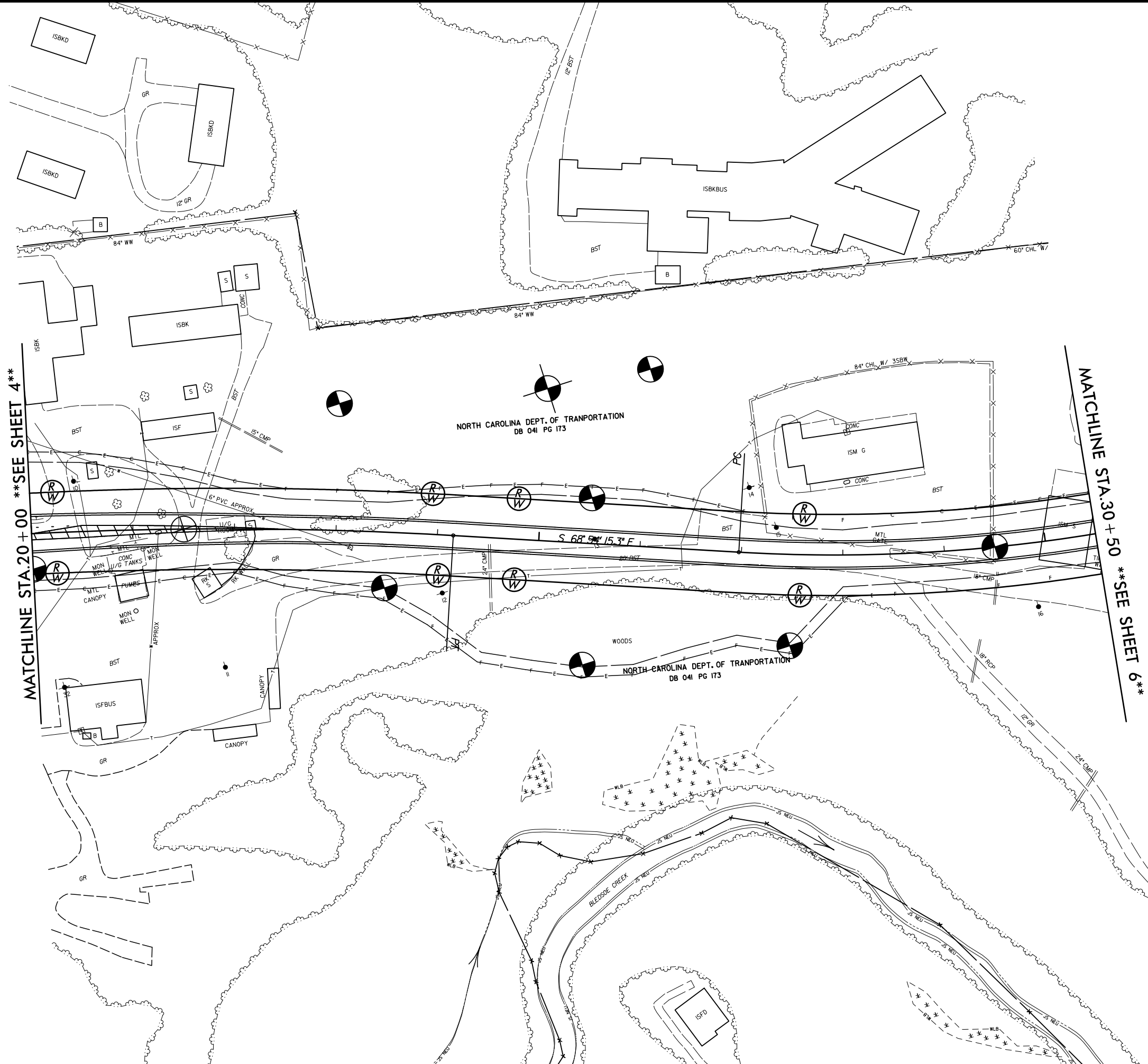
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|---|---------------------|
| PROJECT REFERENCE NO. | SHEET NO. |
| R-4060 | 5 |
| RW SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |
| PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION | |

REVISIONS

8/17/99

MATCHLINE STA.20+00 **SEE SHEET 4**

MATCHLINE STA.30+50 **SEE SHEET 6**



NORTH CAROLINA DEPT. OF TRANSPORTATION
DB 041 PG 173

NORTH CAROLINA DEPT. OF TRANSPORTATION
DB 041 PG 173



-L-
 PRC Sta 19+60.57
 PI Sta 21+88.37
 $\Delta = 6^\circ 49' 33.6''$ (RT)
 $D = 1^\circ 30' 00.0''$
 $L = 455.07'$
 $T = 227.80'$
 $R = 3,819.72'$
 PT Sta 24+15.64
 $S 68^\circ 54' 15.3'' E$
 PC Sta 26+97.40
 PI Sta 33+90.26
 $\Delta = 46^\circ 49' 43.7''$ (LT)
 $D = 3^\circ 34' 51.6''$
 $L = 1,307.71'$
 $T = 692.86'$
 $R = 1,600.00'$
 PT Sta.40+05.11
 $N 64^\circ 16' 01.0'' E$

*****SYTIME*****
 *****DESIGN*****

| | |
|-----------------------------|---------------------|
| PROJECT REFERENCE NO. | SHEET NO. |
| R-4060 | 6 |
| RW SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |
| PRELIMINARY PLANS | |
| DO NOT USE FOR CONSTRUCTION | |

-YI-

PT Sta 14+38.89
 S 2° 18' 42.4" E
 PC Sta 15+72.95
 PI Sta 16+60.81
 $\Delta = 10^{\circ} 02' 34.3"$ (LT)
 D = 5' 43' 46.5"
 L = 175.28'
 T = 87.87'
 R = 1,000.00'
 PT Sta 17+48.23
 S 12° 21' 16.6" E
 PC Sta 20+01.21
 PI Sta 20+86.13
 $\Delta = 77^{\circ} 55' 39.9"$ (LT)
 D = 54' 34' 02.7"
 L = 142.81'
 T = 84.92'
 R = 105.00'
 PT Sta 21+44.02
 N 89° 43' 03.5" E
 PC Sta 22+36.40
 PI Sta 22+90.78
 $\Delta = 20^{\circ} 33' 03.6"$ (LT)
 D = 19' 05' 54.9"
 L = 107.60'
 T = 54.39'
 R = 300.00'
 PT Sta 23+44.00
 N 69° 09' 59.9" E
 PC Sta 23+66.88
 PI Sta 23+91.59
 $\Delta = 27^{\circ} 45' 24.5"$ (RT)
 D = 57' 17' 44.8"
 L = 48.44'
 T = 24.71'
 R = 100.00'
 PT Sta 24+15.33
 S 83° 04' 35.6" E
 POT Sta 24+59.90

-L-

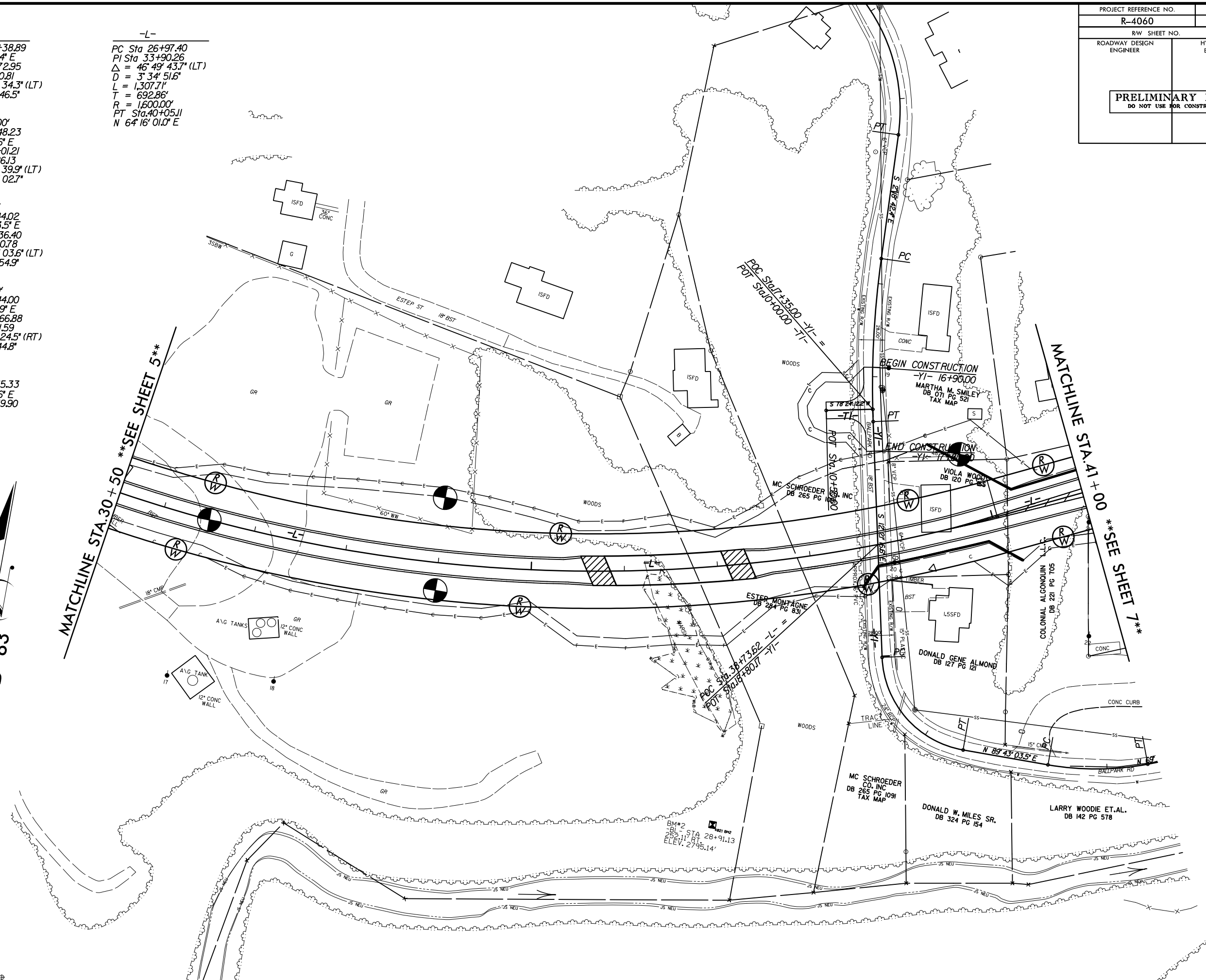
PC Sta 26+97.40
 PI Sta 33+90.26
 $\Delta = 46^{\circ} 49' 43.7"$ (LT)
 D = 3' 34' 51.6"
 L = 1,307.71'
 T = 692.86'
 R = 1,600.00'
 PT Sta 40+05.11
 N 64° 16' 01.0" E

REVISIONS



MATCHLINE STA. 30 + 50 **SEE SHEET 5**

MATCHLINE STA. 41 + 00 **SEE SHEET 7**



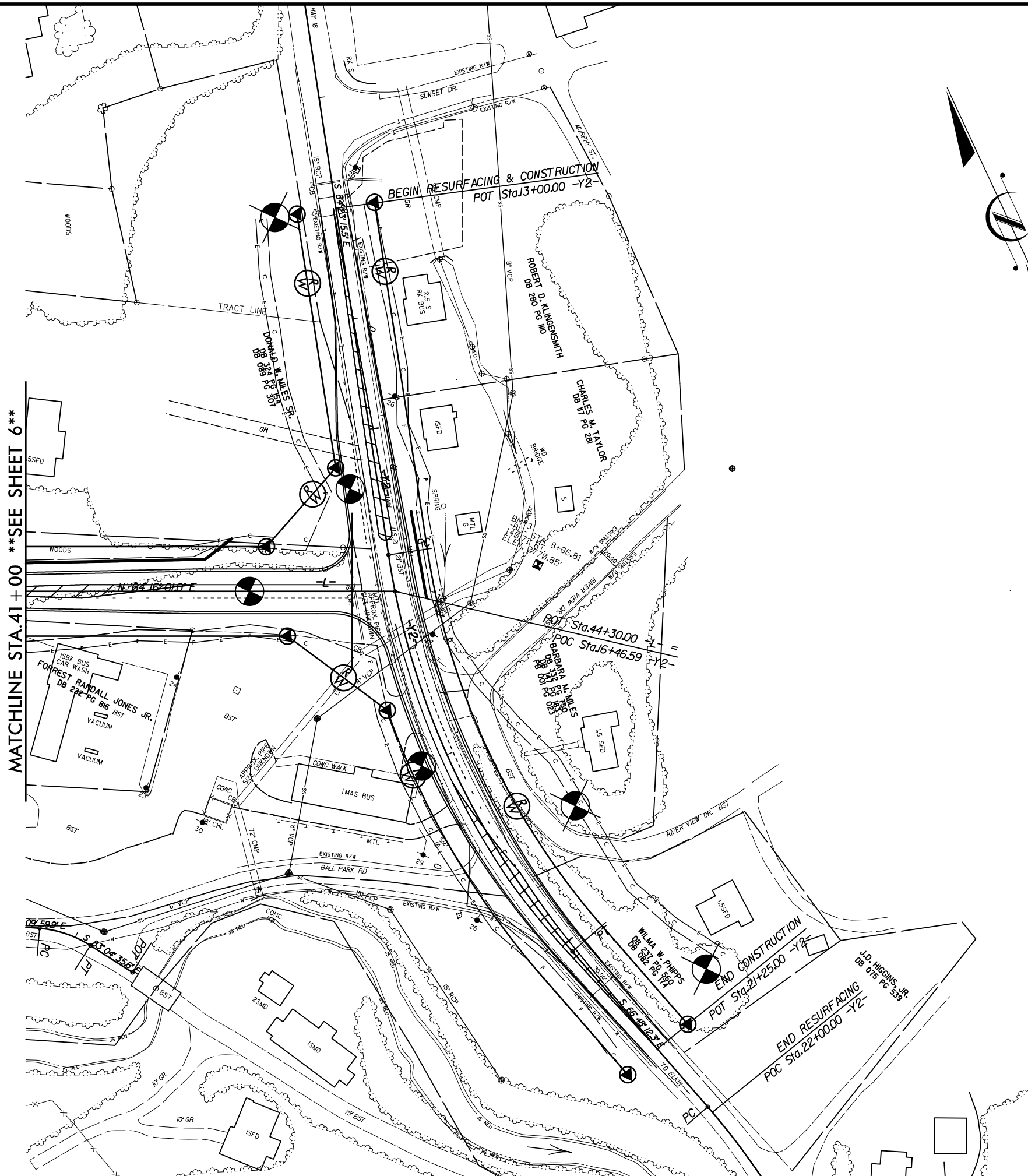
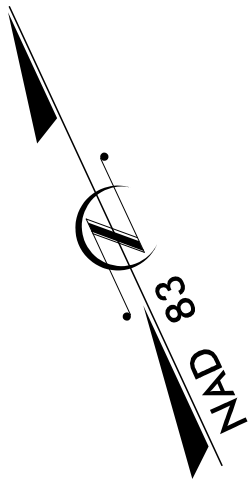
8/17/99

*****SYTIME*****

*****SYTIME*****

*****SYTIME*****

| | |
|---|---------------------|
| PROJECT REFERENCE NO. | SHEET NO. |
| R-4060 | 7 |
| RW SHEET NO. | |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |
| PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION | |



MATCHLINE STA. 41 + 00 **SEE SHEET 6**

-Y2-

POT Sta. 10+00.00
 S 34° 23' 15.5" E
 PC Sta. 16+13.41
 PI Sta. 18+16.89
 $\Delta = 32° 24' 56.9"$ (LT)
 D = 8' 11" 06.4"
 L = 396.03'
 T = 203.47'
 R = 700.00'
 PT Sta. 20+09.45
 S 66° 48' 12.3" E
 PC Sta. 21+93.61

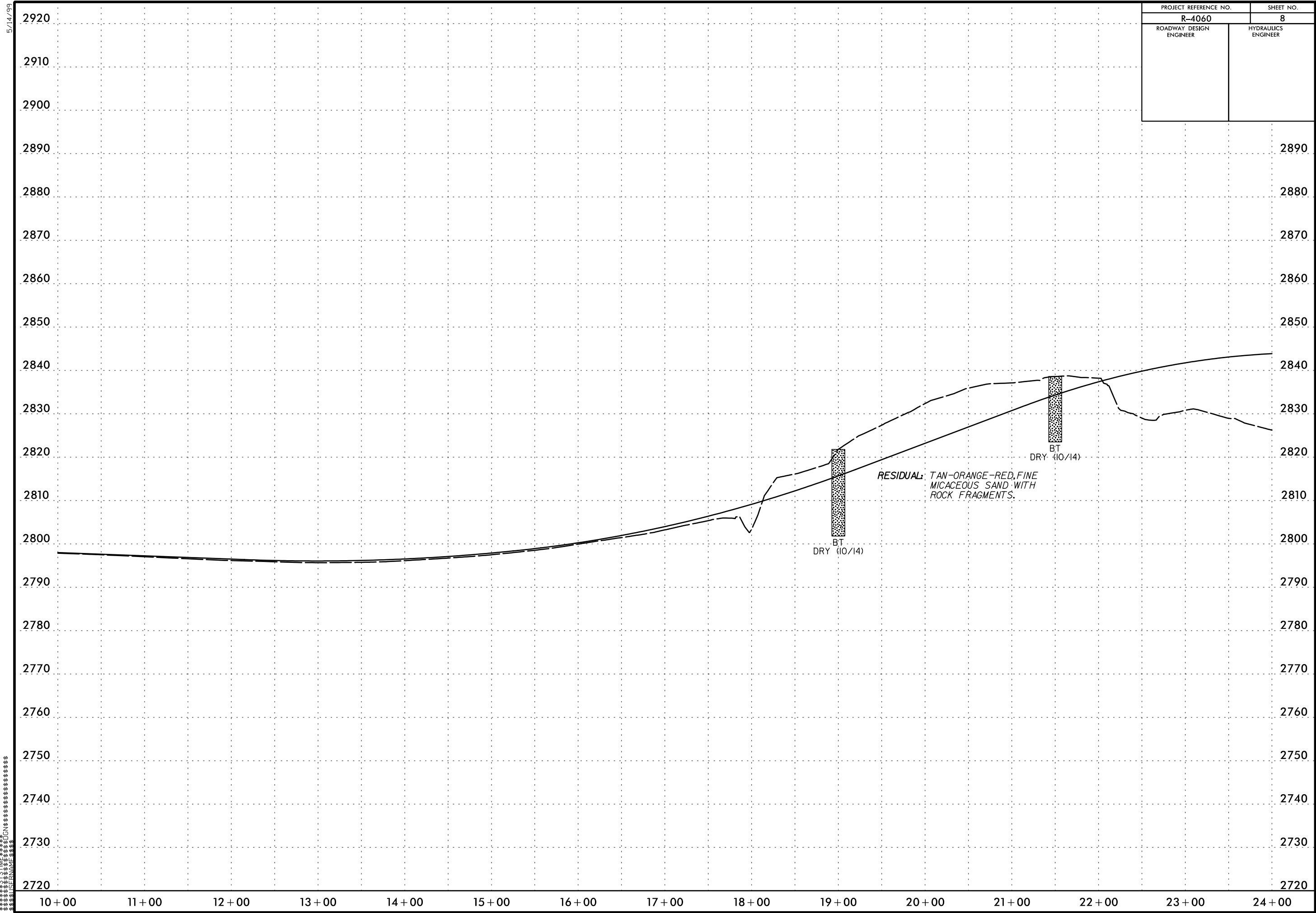
REVISIONS

8/17/99

\$\$\$SYTIME\$\$\$
 \$\$\$CDGN\$\$\$
 \$\$\$TRNG\$\$\$

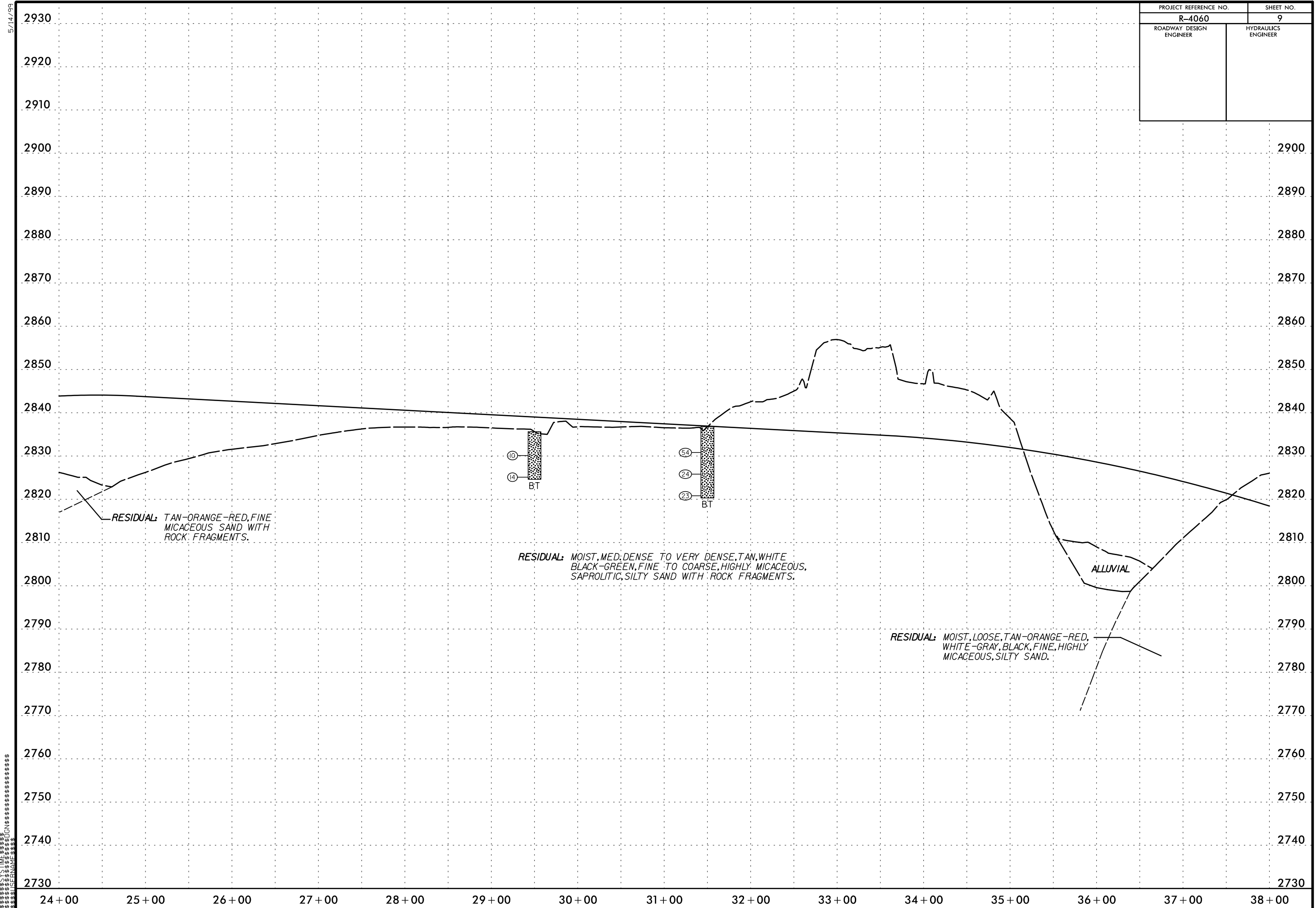
5/14/99

| | | | |
|-------------------------|--|---------------------|--|
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| R-4060 | | 8 | |
| ROADWAY DESIGN ENGINEER | | HYDRAULICS ENGINEER | |



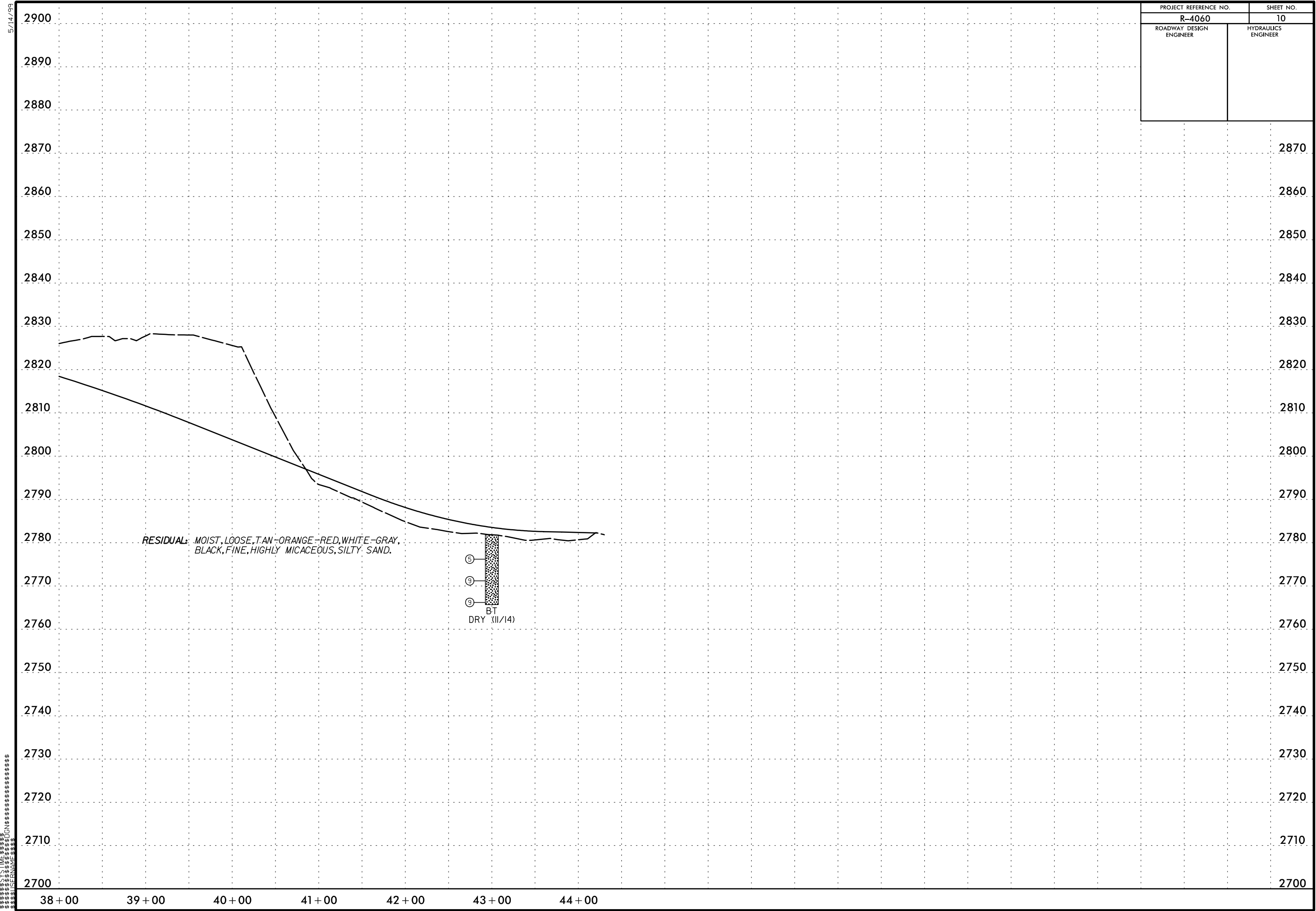
SYSTEMS DESIGN GROUP

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|-------------------------|--|---------------------|--|
| PROJECT REFERENCE NO. | | SHEET NO. | |
| R-4060 | | 9 | |
| ROADWAY DESIGN ENGINEER | | HYDRAULICS ENGINEER | |



5/14/99
 SYSTEMS DESIGN GROUP

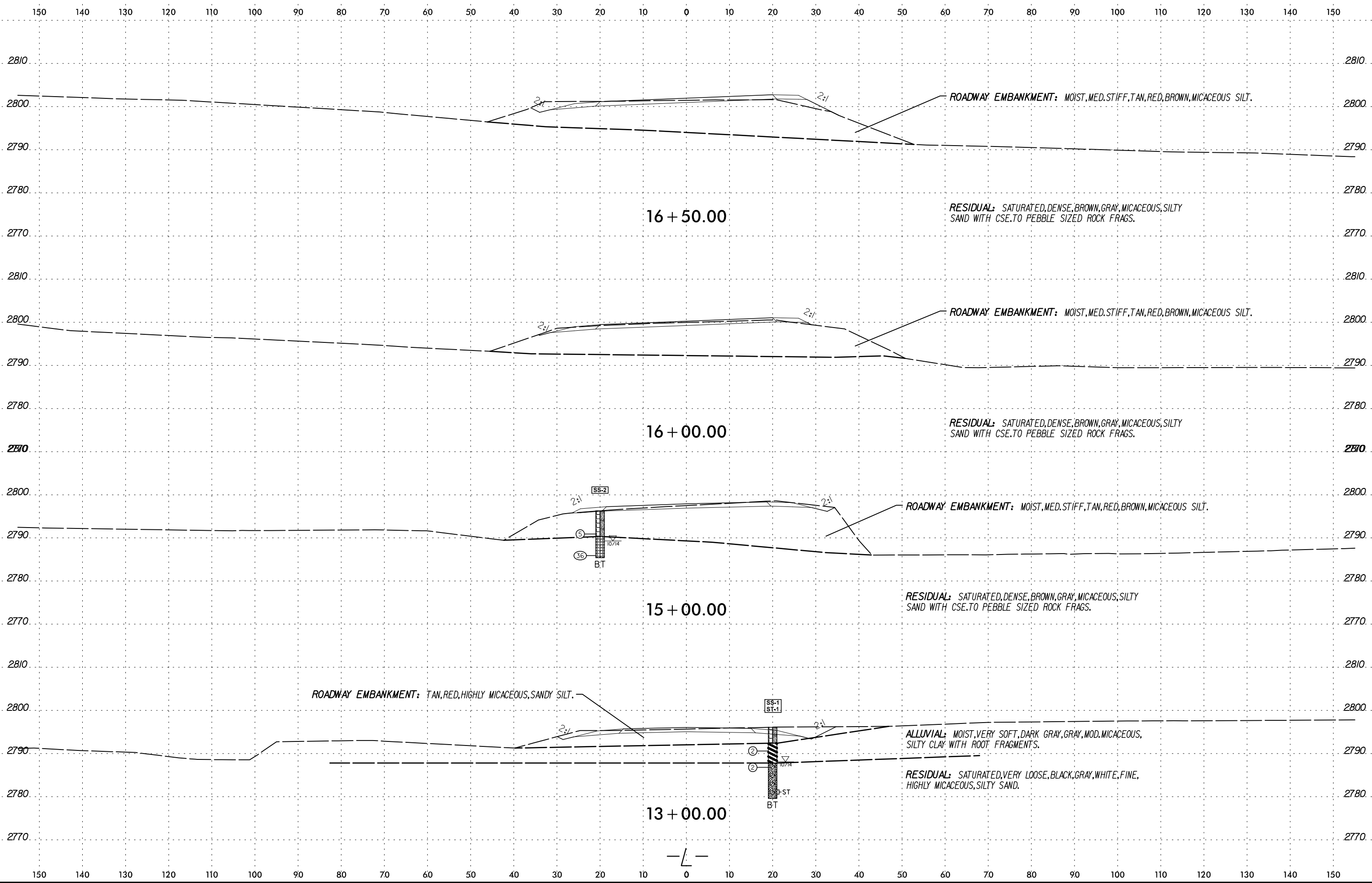
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|-------------------------|--|---------------------|--|
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| R-4060 | | 10 | |
| ROADWAY DESIGN ENGINEER | | HYDRAULICS ENGINEER | |



5/14/99

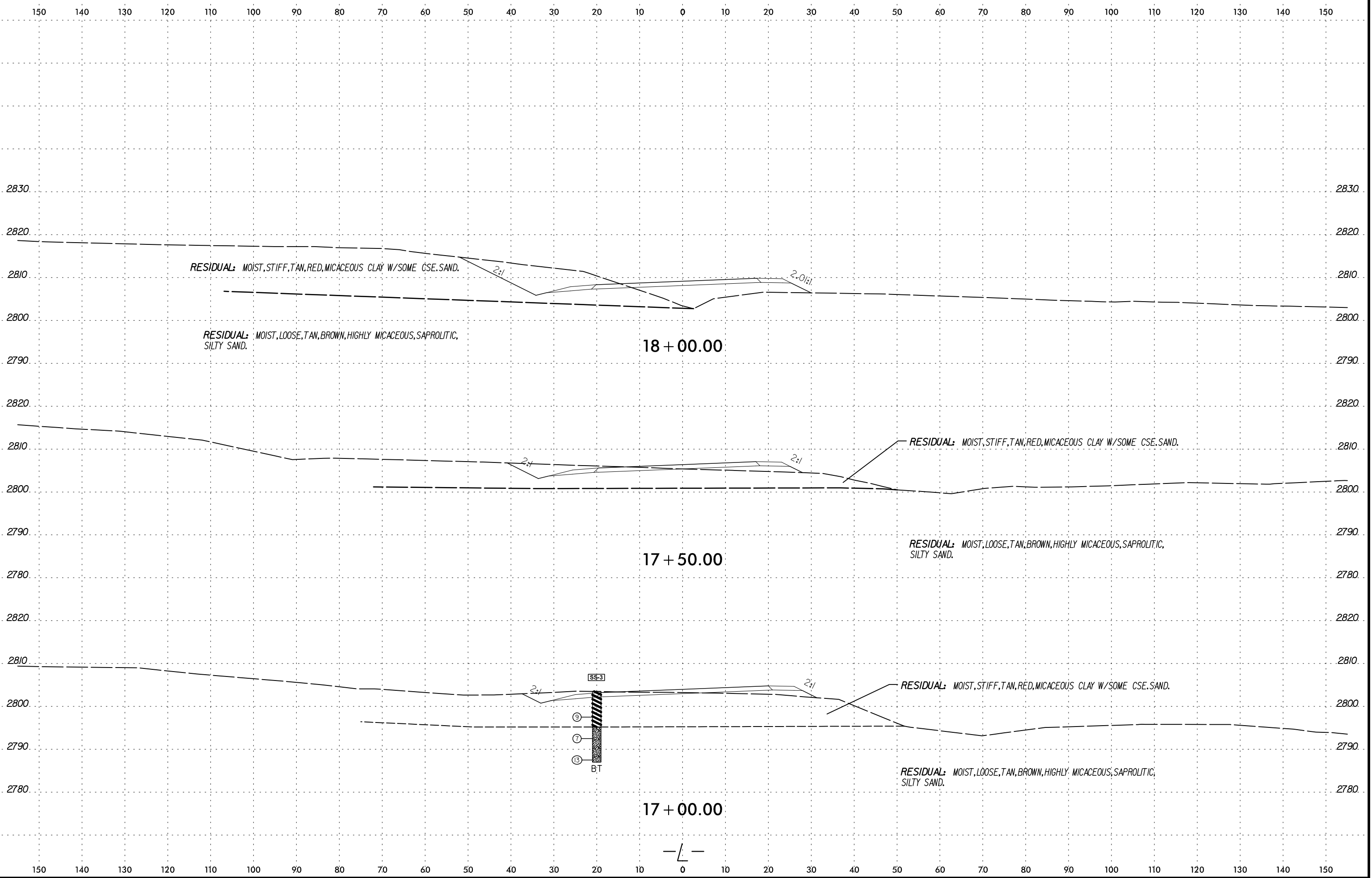
SYSTEMS DESIGN

8/23/99



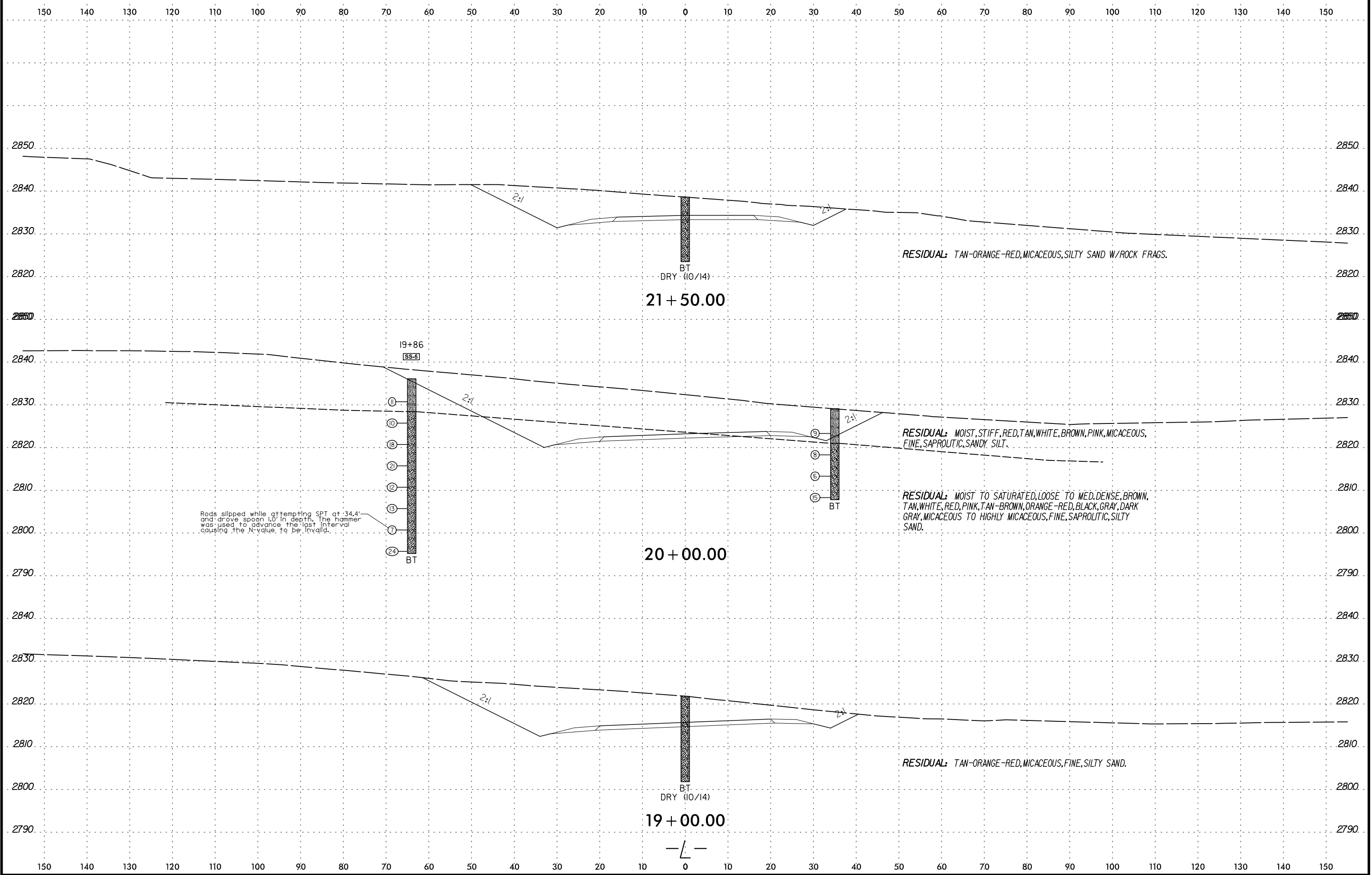
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SCALE: AS SHOWN
PROJECT: [illegible]

8/23/99

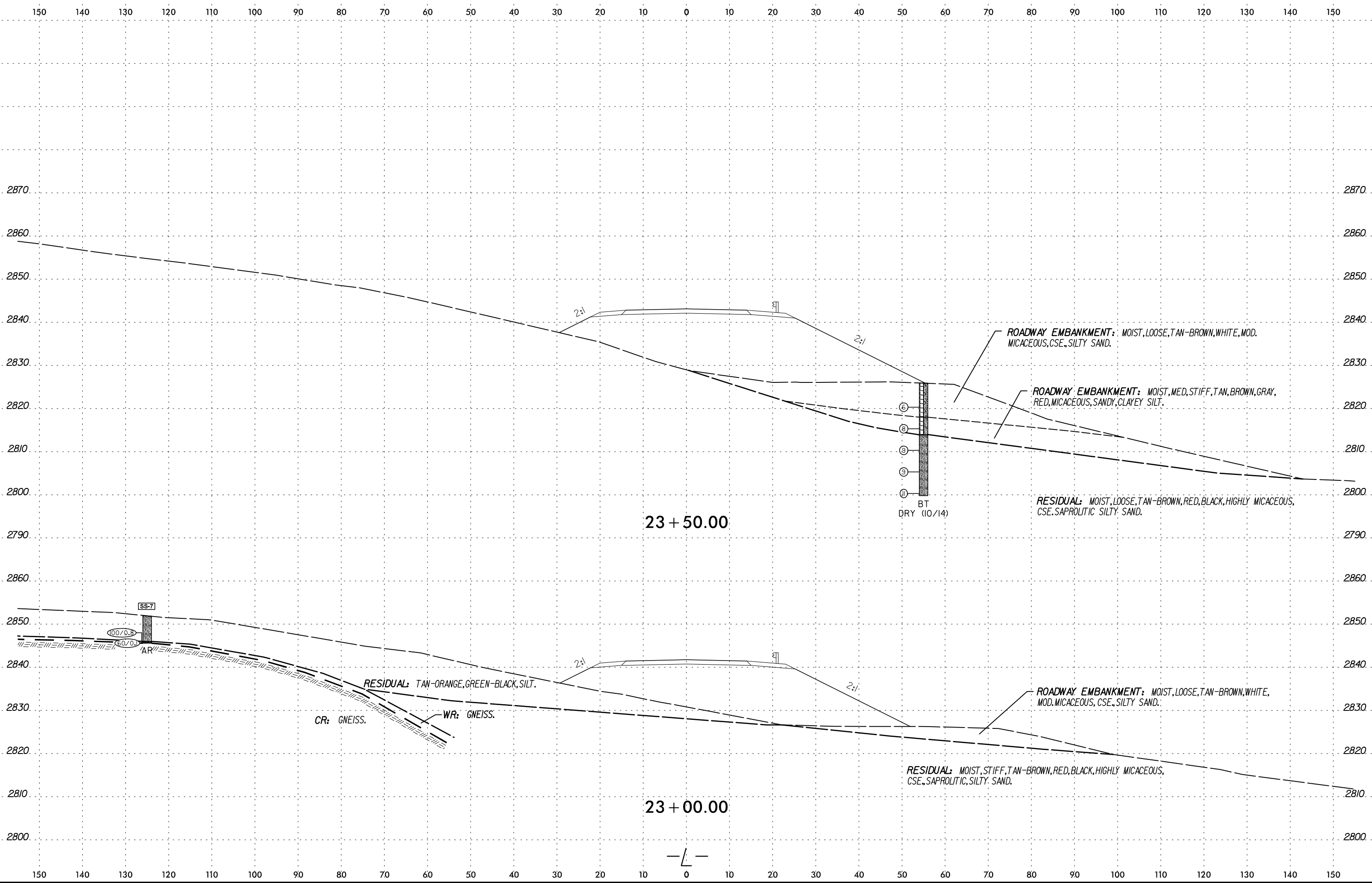


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SHEET NO.: 12
PROJECT: R-4060

8/23/99

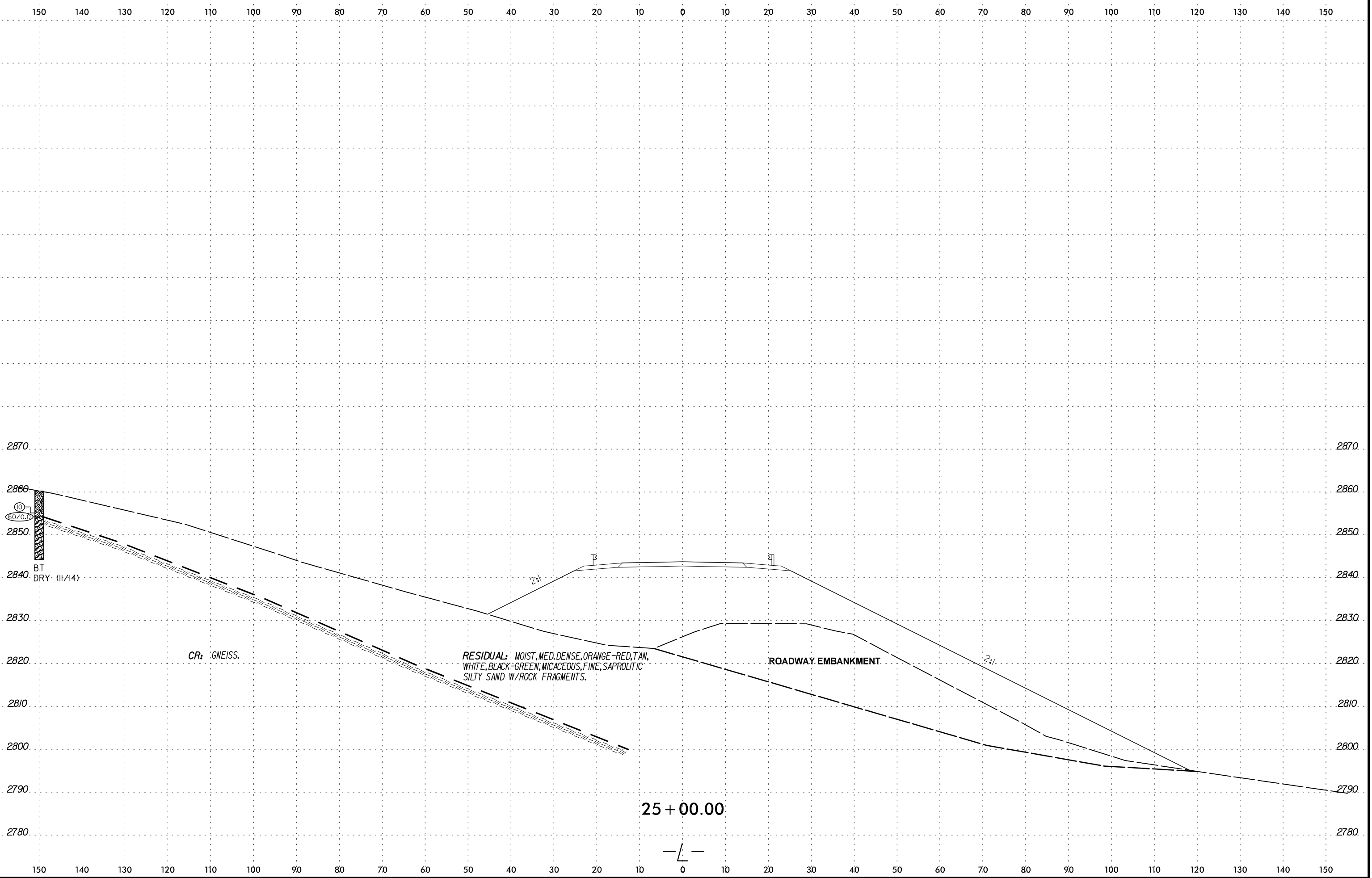


8/23/99



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PROJECT: R-4060
SHEET: 14

8/23/99



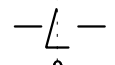
8/23/99
BT
DRY (11/14)
60/0.0

CR: GNEISS.

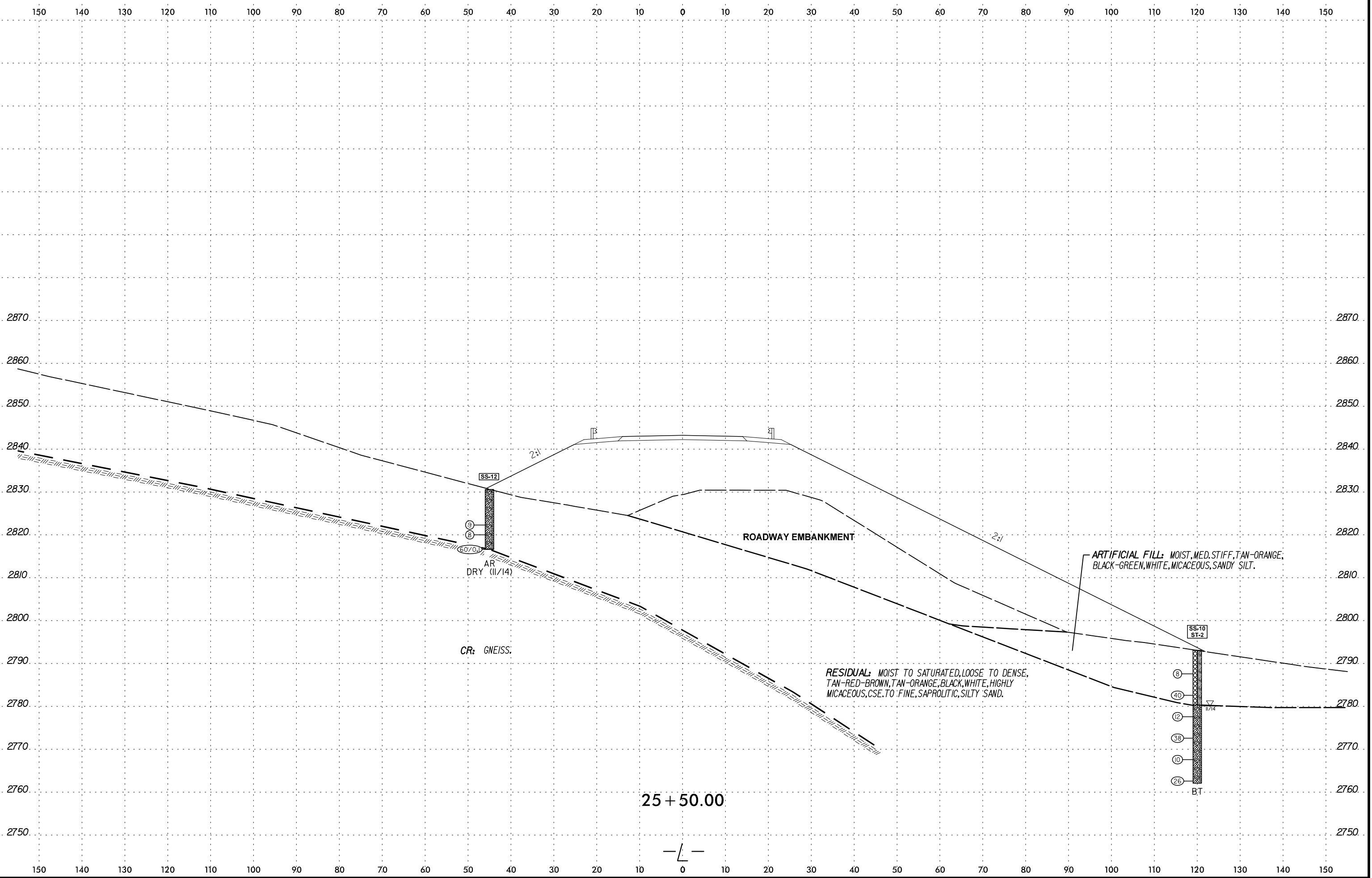
RESIDUAL: MOIST, MED. DENSE, ORANGE-RED, TAN,
WHITE, BLACK-GREEN, MICACEOUS, FINE, SAPROLITIC
SILTY SAND W/ROCK FRAGMENTS.

ROADWAY EMBANKMENT

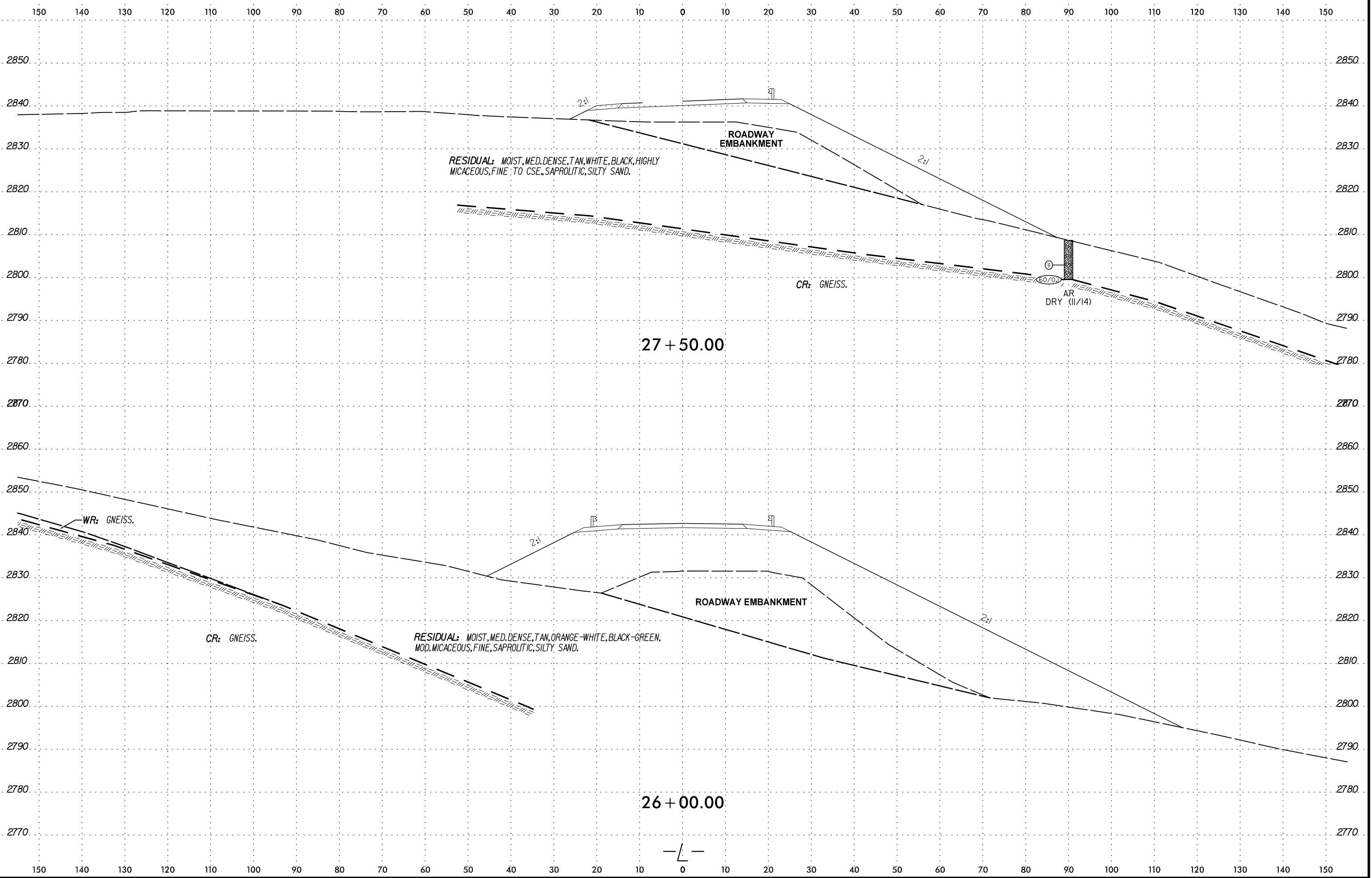
25 + 00.00



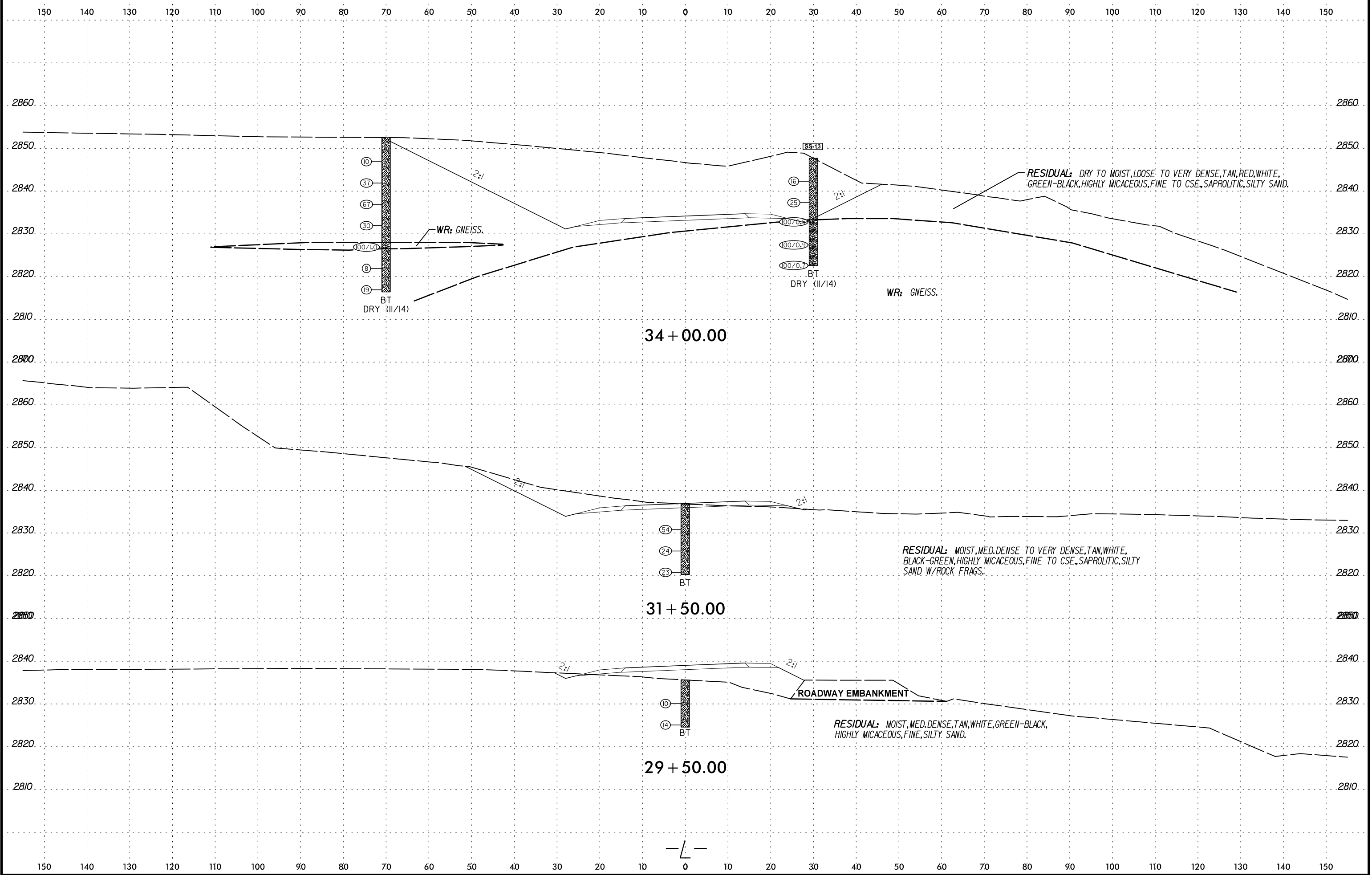
8/23/99



8/23/99



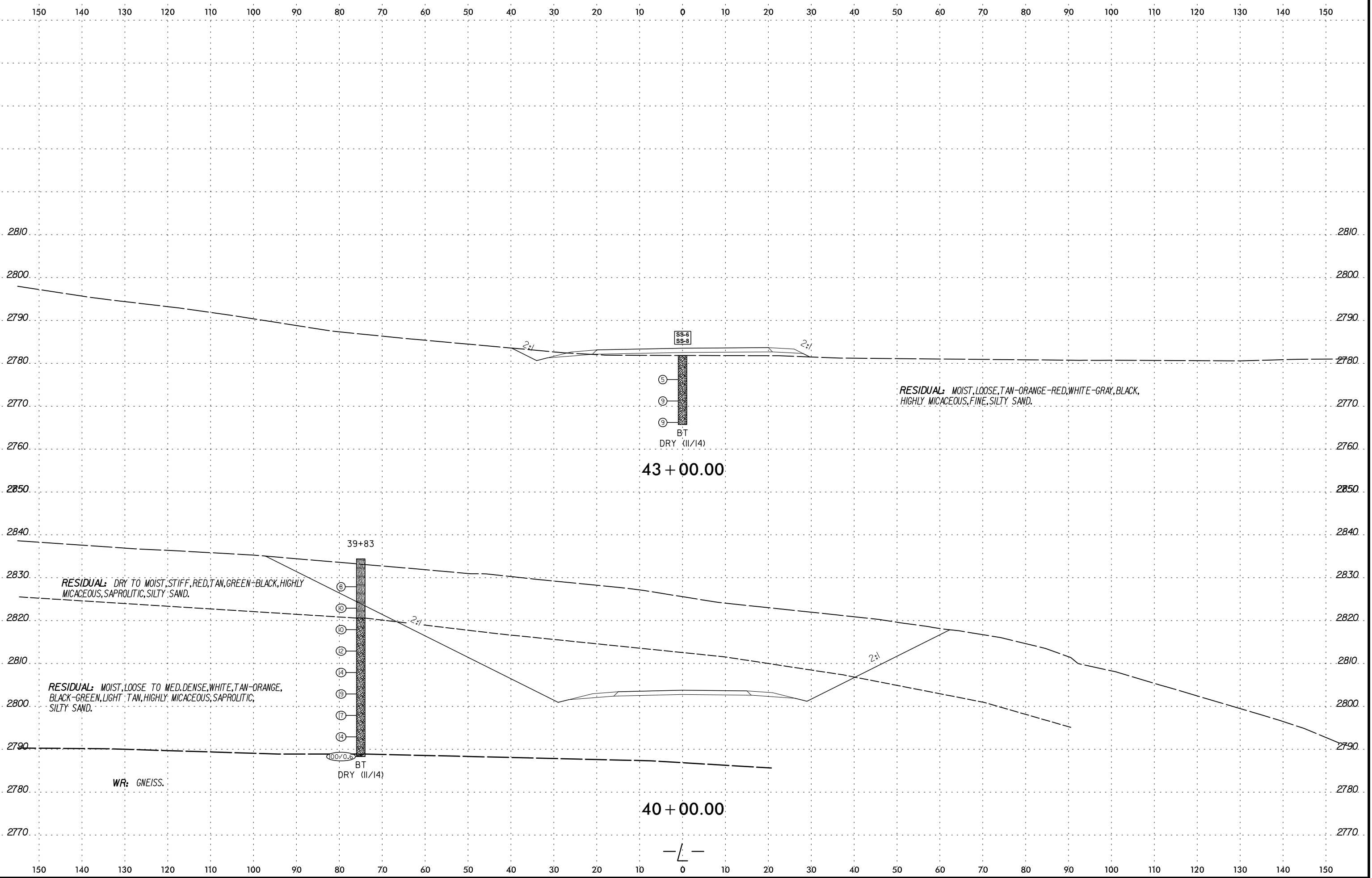
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CHECKED: [illegible]
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SHEET NO.: 17
PROJECT NO.: R-4060



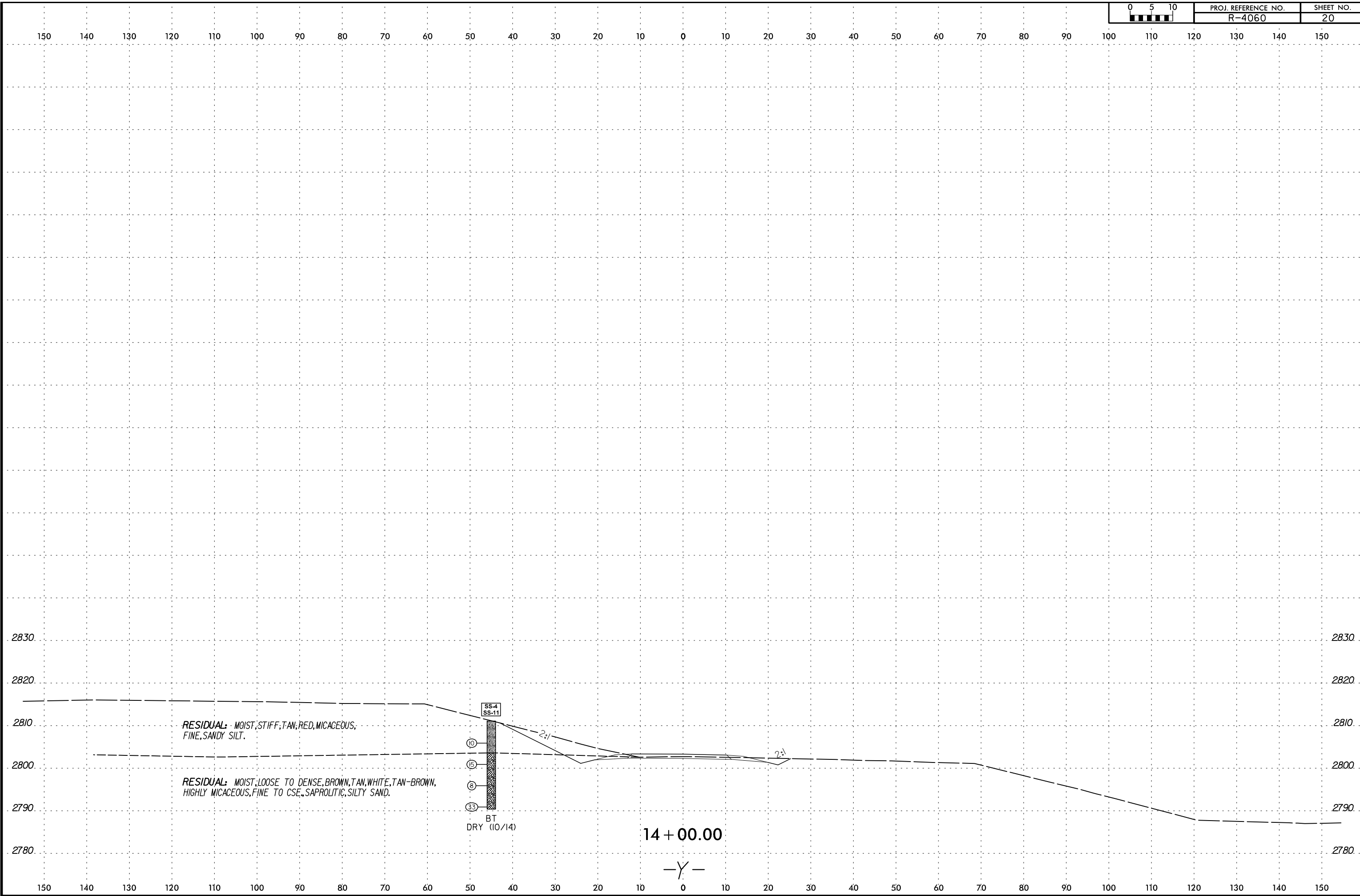
UNDESIGNED



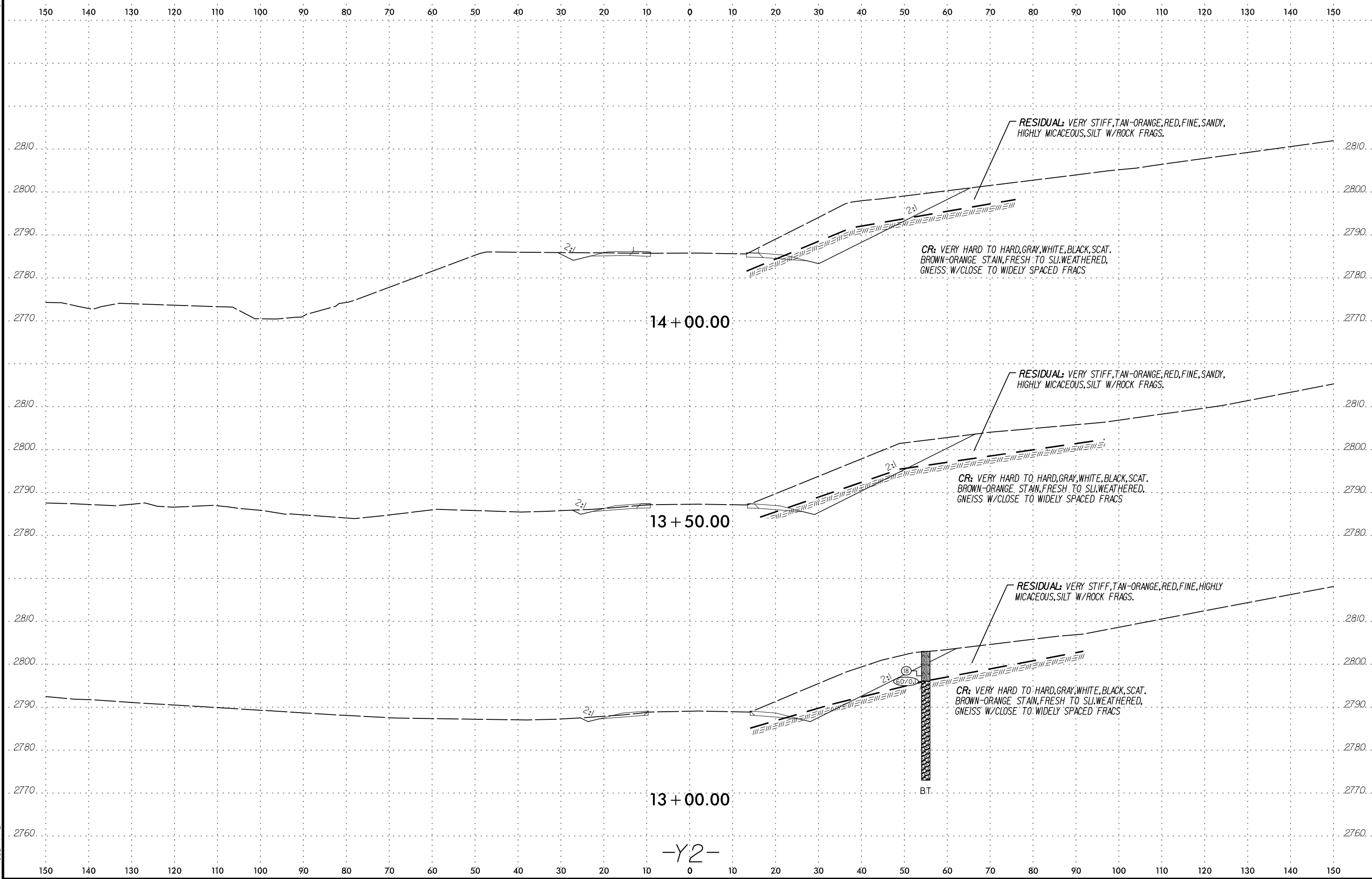
8/23/99



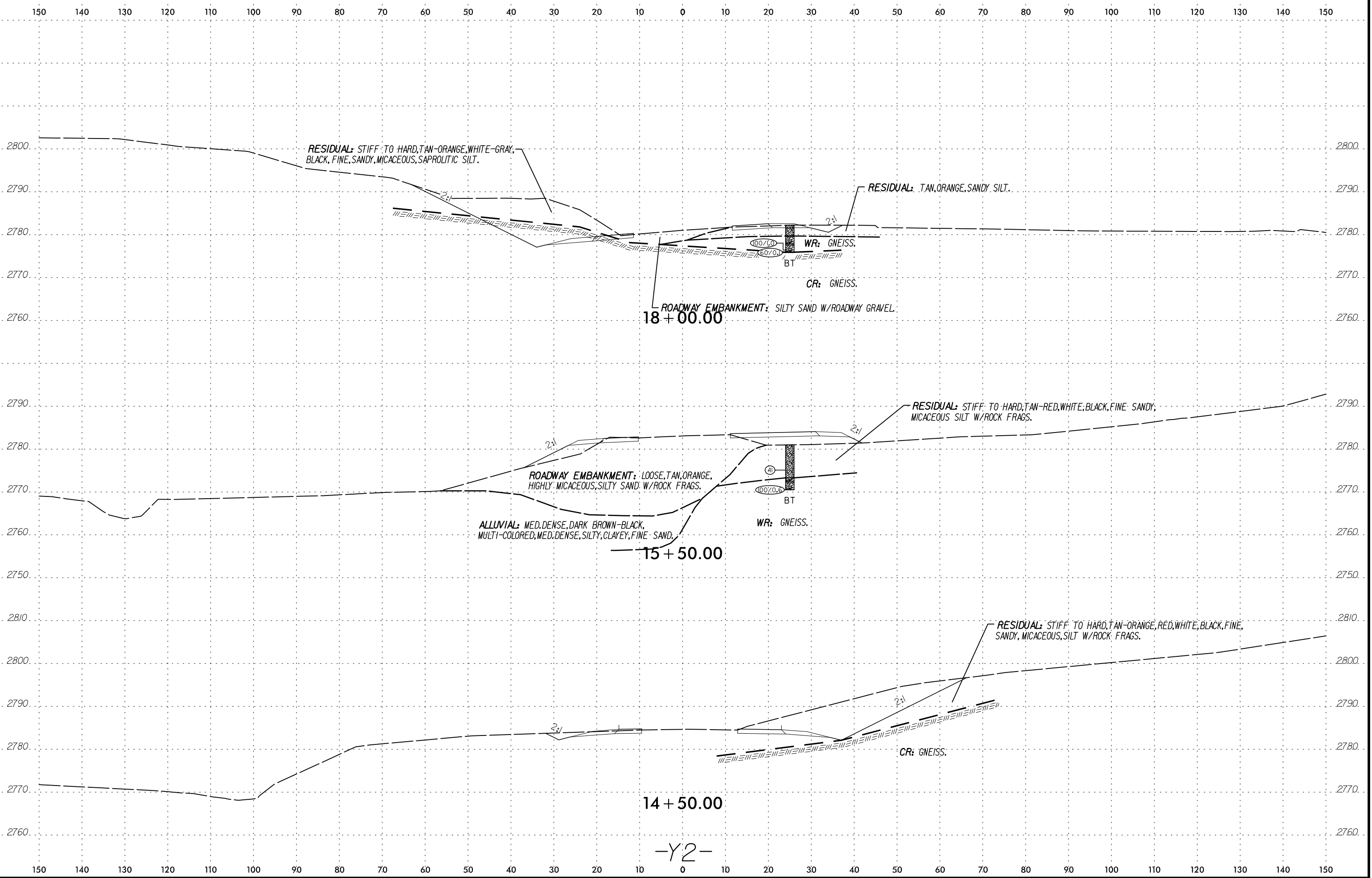
8/23/99



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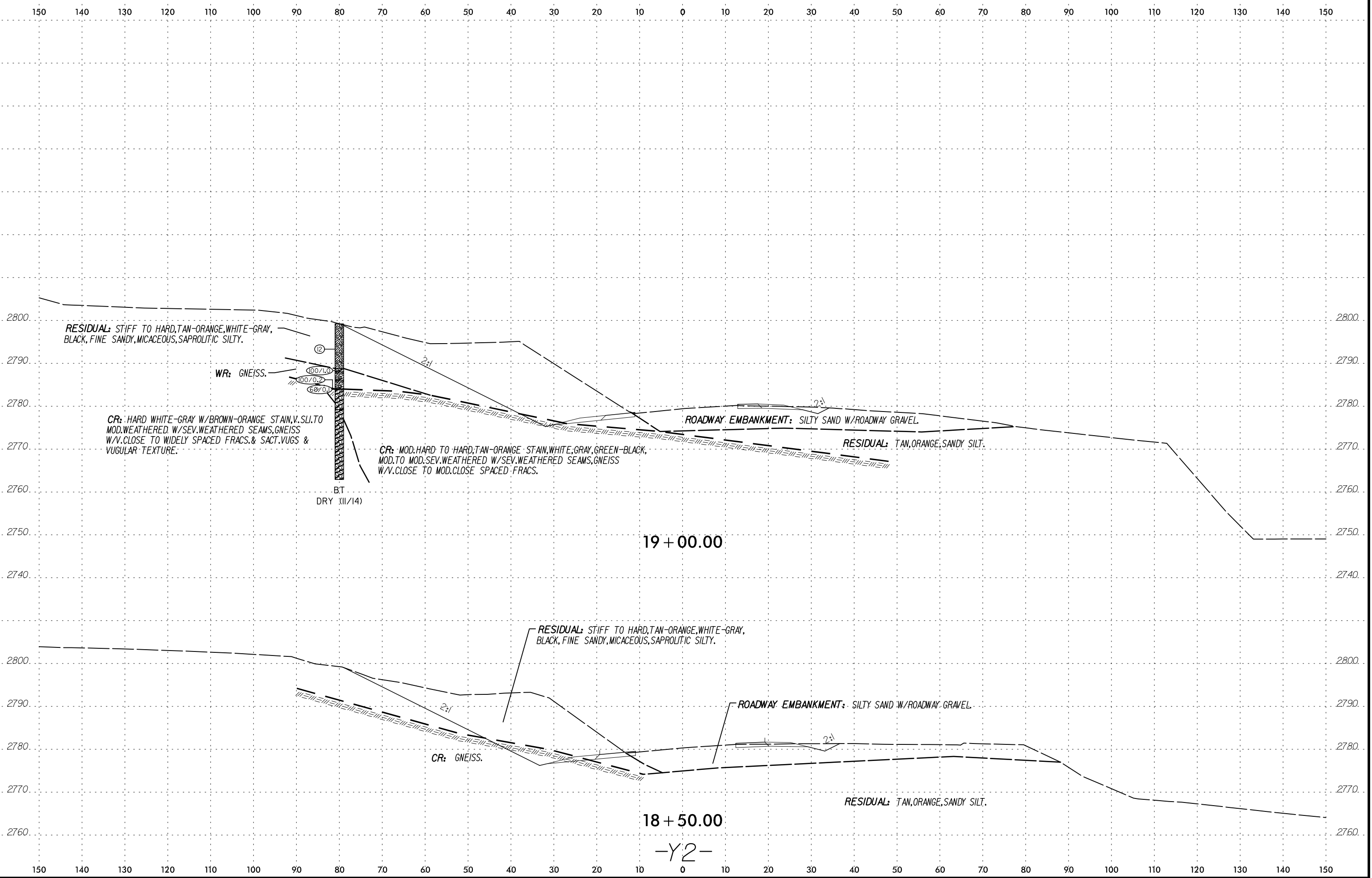


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-Y2-

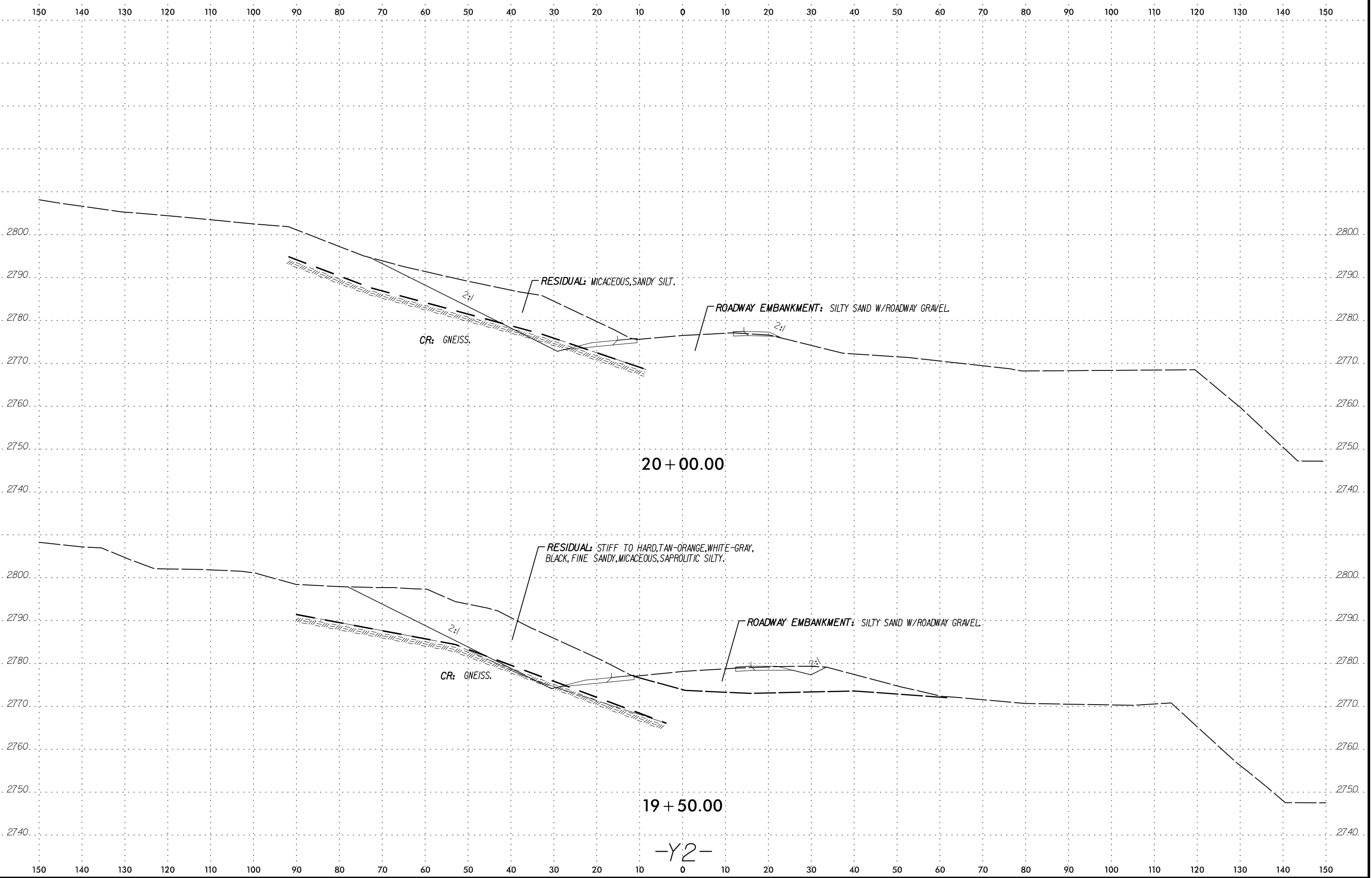
8/23/99



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-Y2-

8/23/99

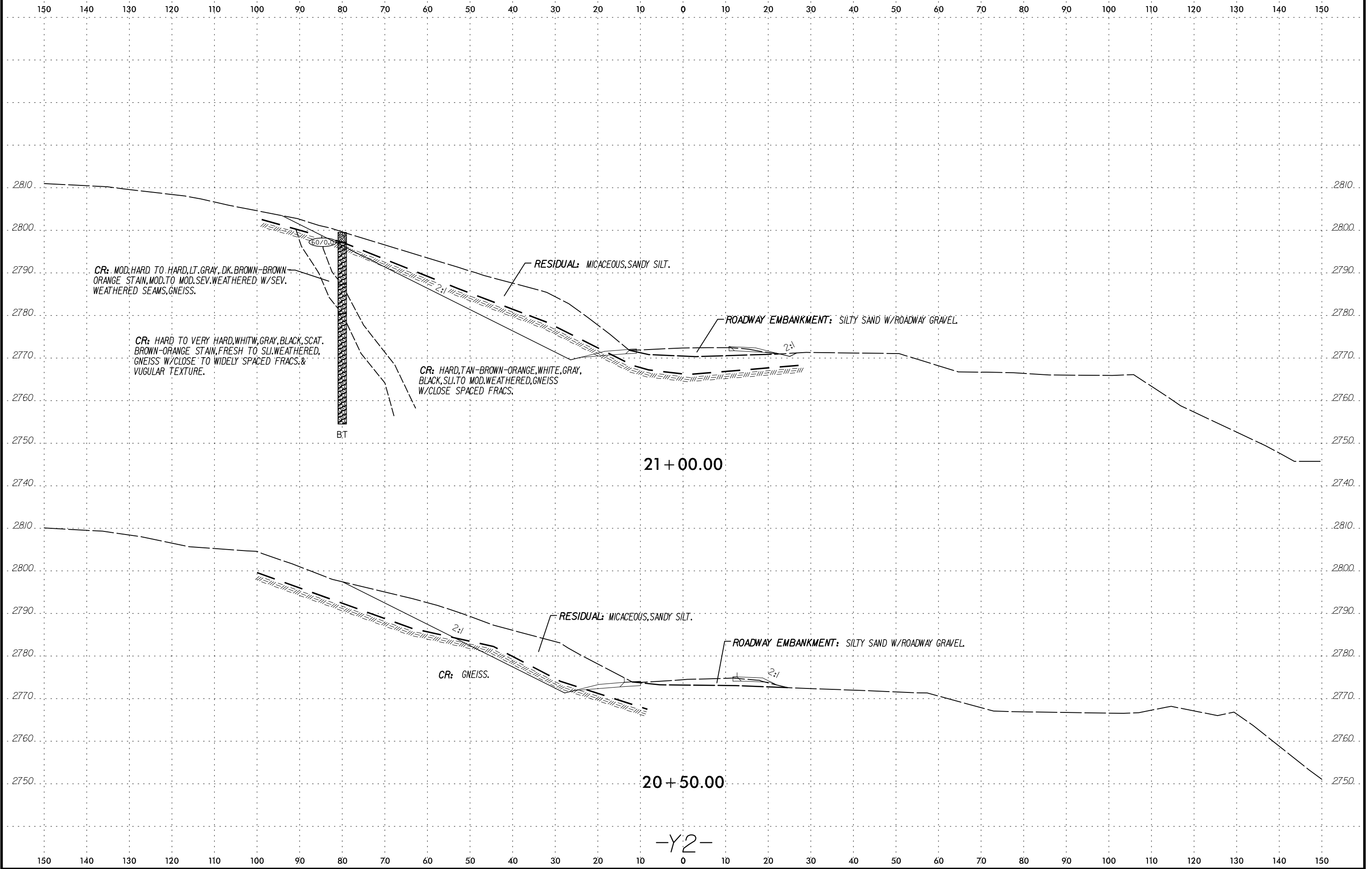


20 + 00.00

19 + 50.00

-Y2-

8/23/99



| 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 | 20 RT | 13+00 | 4.5-6.0 | A-7-5 (9) | 65 | 15 | 10 | 30.9 | 43.3 | 15.7 | 87.8 | 83.6 | 57.7 | 67.0 | - |
| SS-2 | 20 LT | 15+00 | 9.4-10.9 | A-1-a (0) | NP | NP | 51.6 | 36.7 | 11.7 | | 38.9 | 24.1 | 6.5 | 11.7 | - |
| SS-3 | 20 LT | 17+00 | 5.0-6.5 | A-7-5 (14) | 60 | 22 | 15.9 | 25.6 | 15.5 | 43 | 99.0 | 91.5 | 61.7 | 30.6 | - |
| SS-4 | 45 LT | 14+00 | 4.2-5.7 | A-4 (0) | 37 | 3 | 25.5 | 42.5 | 16.1 | 15.9 | 99.1 | 88.0 | 37.5 | 20.6 | - |
| SS-5 | 64 LT | 19+86 | 4.4-5.9 | A-5 (4) | 47 | 10 | 17.1 | 34.7 | 20.7 | 27.5 | 93.2 | 85.8 | 51.1 | 25.5 | - |
| SS-6 | CL | 43+00 | 14.6-16.1 | A-2-4 (0) | 39 | 5 | 25.0 | 50.4 | 20.5 | 4.1 | 96.5 | 86.2 | 31.9 | 28.7 | - |
| SS-7 | 125 LT | 23+00 | 4.9-5.9 | A-4 (0) | 38 | 7 | 27.9 | 35.9 | 23.1 | 13.1 | 90.6 | 75.4 | 38.5 | 29.5 | - |
| SS-8 | CL | 43+00 | 9.6-11.1 | A-2-4 (0) | NP | NP | 31.4 | 44.3 | 22.3 | 2.0 | 86.2 | 71.9 | 27.7 | 16.9 | - |
| SS-9 | 175 LT | 26+00 | 4.7-6.2 | A-2-4 (0) | NP | NP | 29.9 | 44.5 | 16.6 | 8.9 | 97.5 | 82.3 | 31.8 | 17.8 | - |
| SS-10 | 120 RT | 25+50 | 19.5-21.0 | A-2-4 (0) | 40 | 4 | 30.0 | 40.4 | 17.7 | 11.9 | 84.4 | 69.8 | 31.0 | 36.9 | - |
| SS-11 | 45 LT | 14+00 | 9.2-10.7 | A-2-4 (0) | NP | NP | 30.8 | 51.4 | 11.9 | 5.9 | 97.4 | 84.5 | 24.3 | 11.4 | - |
| SS-12 | 45 LT | 25+50 | 7.3-8.8 | A-2-4 (0) | 38 | 9 | 34.4 | 41.7 | 15.0 | 8.9 | 97.5 | 83.5 | 28.7 | 16.5 | - |
| SS-13 | 30 RT | 34+00 | 9.4-10.9 | A-2-4 (0) | NP | NP | 40.2 | 40.2 | 13.6 | 6.0 | 82.7 | 62.4 | 21.2 | 11.1 | - |
| ST-1 | 20 RT | 13+00 | 14.5-15.5 | A-2-4 (0) | NP | NP | 29.3 | 55.4 | 11.3 | 4.0 | 100.0 | 90.1 | 22.4 | 40.3 | - |
| ST-2 | 120 RT | 25+50 | 2.0-3.5 | A-4 (2) | 33 | 7 | 22.1 | 29.8 | 25.1 | 22.9 | 97.0 | 86.7 | 52.2 | 23.4 | - |



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

| | | | |
|--|----------------------------|---------------------------------|--------------------------------|
| WBS 34605.1.2 | TIP R-4060 | COUNTY ALLEGHANY | GEOLOGIST DeLost, R. |
| SITE DESCRIPTION US 21 Western Loop from SR 1172 (Grandview Drive) to US 21 | | | GROUND WTR (ft) |
| BORING NO. L_2600L | STATION 26+00 | OFFSET 175 ft LT | ALIGNMENT -L- |
| COLLAR ELEV. 2,857.2 ft | TOTAL DEPTH 8.2 ft | NORTHING 1,006,899 | EASTING 1,378,166 |
| DRILL RIG/HAMMER EFF./DATE ICA0404 CME-45C 90% 08/25/2014 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER Morgan, M. | START DATE 11/03/14 | COMP. DATE 11/03/14 | SURFACE WATER DEPTH N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | MOI | LOG | SOIL AND ROCK DESCRIPTION | DEPTH (ft) | |
|-----------|-----------------|------------|------------|-------|-------|----------------|----|----|----|-----|-----------|-----|-----|---------------------------|--|------------|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | | | ELEV. (ft) |
| 2860 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | 2,857.2 | GROUND SURFACE | 0.0 |
| 2855 | | | | | | | | | | | | | | | RESIDUAL Tan, orange-white, black-green, med. dense, mod. micaceous, silty, fine, saprolitic SAND (A-2-4). | |
| | 2,852.5 | 4.7 | | | | | | | | | | | | | | |
| 2850 | | | | | | | | | | | | | | | | |
| | 2,849.1 | 8.1 | | | | | | | | | | | | | | |
| | | | 60/0.1 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | 2,849.9 | WEATHERED ROCK Weathered rock | 7.3 |
| | | | | | | | | | | | | | | 2,849.1 | | 8.1 |
| | | | | | | | | | | | | | | 2,849.0 | CRYSTALLINE ROCK Crystalline rock (Gneiss) | 8.2 |
| | | | | | | | | | | | | | | | Boring Terminated with Standard Penetration Test Refusal at Elevation 2,849.0 ft in Crystalline Rock (Gneiss). Boring backfilled upon completion. | |

NCDOT BORE SINGLE R4060_GEO_BH_SPARTA BYPASS.GPJ NC_DOT.GDT 4/15/15