

NOTE: SEE SHEET 1A 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.	B-4965	1	8
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
40243.1.1	BRZ-1165(6)	P.E.	
		RW & UTIL.	

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LINE	STATION	PLAN	PROFILE	XSECT
-L-	16+60 - 17+50	4	-	5-6
-Y-	10+00 - 12+83.6	4	-	7-8

ROADWAY  
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 40243.1.1 (B-4965) F.A. PROJ. BRZ-1165(6)  
COUNTY ROCKINGHAM  
PROJECT DESCRIPTION BRIDGE NO. 249 ON SR 1165 (CARDINAL RD)  
OVER LITTLE BEAVER ISLAND CREEK

INVENTORY

CAUTION NOTICE

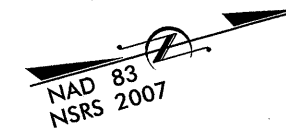
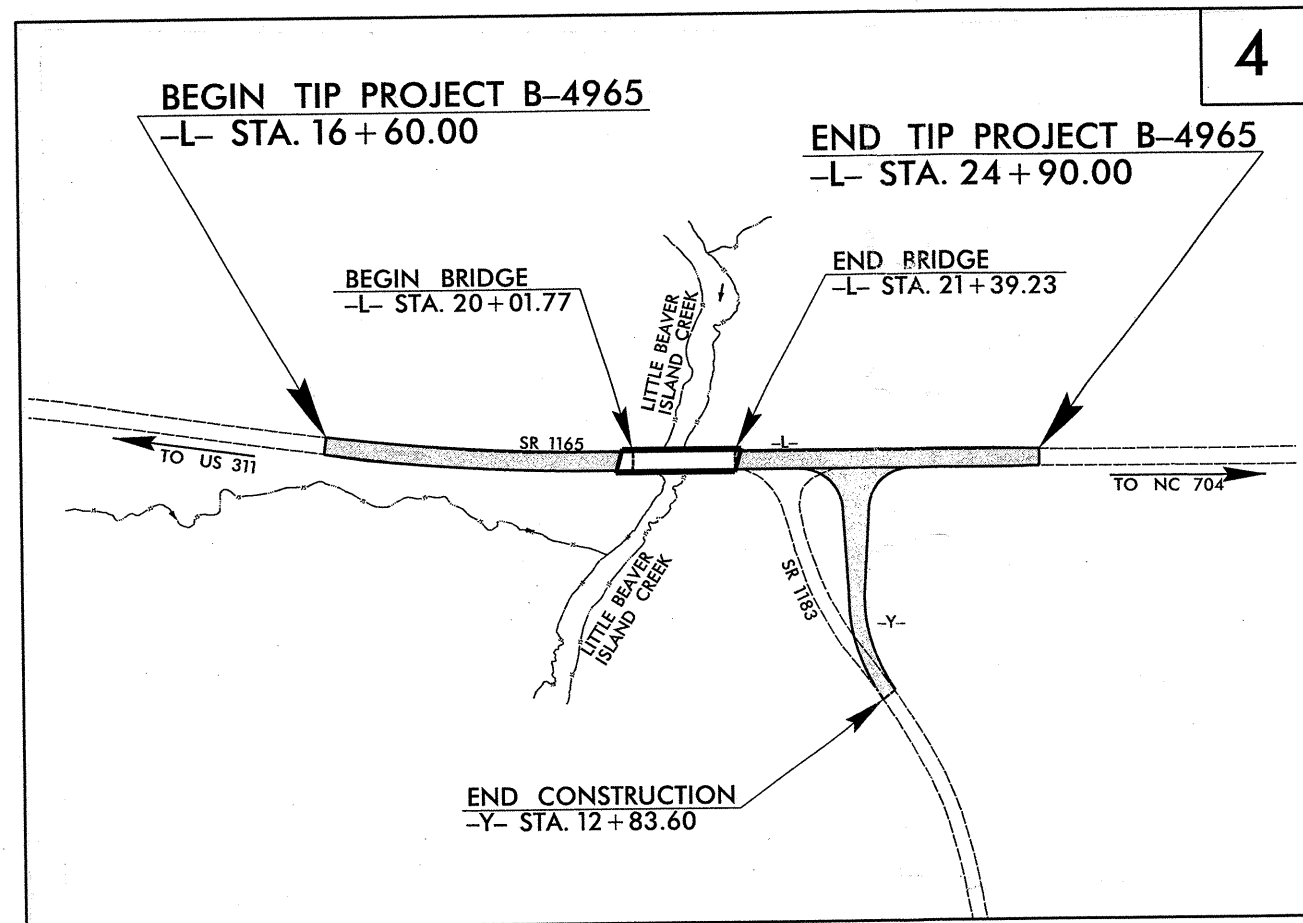
THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

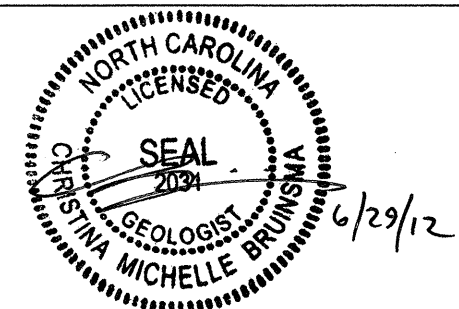
ID: B-4965

CONTRACT: C203086



PERSONNEL  
C. M. BRUINSMA  
C. M. WHELAN, JR.

INVESTIGATED BY C. M. WHALEN  
CHECKED BY C. M. BRUINSMA  
SUBMITTED BY K. B. MILLER  
DATE JUNE 2012



DRAWN BY: C. M. BRUINSMA

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

NOTE - 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.

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

PROJECT REFERENCE NO. B-4965	SHEET NO. 2
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**SUBSURFACE INVESTIGATION**

**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS																																																																																																																																																																																																																																																																																								
<p>SOIL IS CONSIDERED TO BE THE 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 STANDARD PENETRATION TEST (ASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p style="text-align: center;"><i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HEAVY PLASTIC, A-7-6</i></p>	<p><b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.  <b>UNIFORM</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)  <b>GAP-GRADED</b> - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p style="text-align: center;"><b>ANGULARITY OF GRAINS</b></p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <b>ANGULAR</b>, <b>SUBANGULAR</b>, <b>SUBROUNDED</b>, OR <b>ROUNDED</b>.</p>	<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> <p><b>WEATHERED ROCK (WR)</b>  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES &gt; 100 BLOWS PER FOOT IF TESTED.</p> <p><b>CRYSTALLINE ROCK (CR)</b>  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p> <p><b>NON-CRYSTALLINE ROCK (NCR)</b>  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.</p> <p><b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b>  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>	<p><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.  <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.  <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.  <b>ARTESIAN</b> - 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.  <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.  <b>CORE RECOVERY (REC)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.  <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.  <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.  <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.  <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.  <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.  <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.  <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.  <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  <b>ROCK QUALITY DESIGNATION (RQD)</b> - 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.  <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.  <b>SILL</b> - 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.  <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.  <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - 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.  <b>STRATA CORE RECOVERY (SREC)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.  <b>STRATA ROCK QUALITY DESIGNATION (SROD)</b> - 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.  <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																																																																																																																								
<p style="text-align: center;"><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (&lt;= 35% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="3">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th><th>A-3</th><th colspan="2">A-2</th><th>A-4</th><th>A-5</th><th>A-6</th><th>A-7</th> <th>A-1, A-2</th><th>A-3</th><th>A-4, A-5</th><th>A-6, A-7</th> <th>A-1, A-2</th><th>A-3</th><th>A-4, A-5</th><th>A-6, A-7</th> <th>A-1, A-2</th><th>A-3</th><th>A-4, A-5</th> </tr> <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-7-6</td><td>A-7-5</td> <td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td><td>A-6, A-7</td> <td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td><td>A-6, A-7</td> <td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td> </tr> <tr> <td>SYMBOL</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td> </tr> <tr> <td>% PASSING</td> <td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td> <td>100</td><td>100</td><td>100</td><td>100</td> <td>100</td><td>100</td><td>100</td><td>100</td> <td>100</td><td>100</td><td>100</td> </tr> <tr> <td>LIQUID LIMIT</td> <td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td><td>50</td> <td>50</td><td>50</td><td>50</td><td>50</td> <td>50</td><td>50</td><td>50</td><td>50</td> <td>50</td><td>50</td><td>50</td> </tr> <tr> <td>PLASTIC INDEX</td> <td>6</td><td>6</td><td>6</td><td>6</td><td>6</td><td>6</td><td>6</td><td>6</td> <td>6</td><td>6</td><td>6</td><td>6</td> <td>6</td><td>6</td><td>6</td><td>6</td> <td>6</td><td>6</td><td>6</td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td><td>0</td> <td>0</td><td>0</td><td>0</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS. GRAVEL AND SAND</td><td>FINE SAND</td><td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td><td colspan="2">SILTY SOILS</td><td colspan="2">CLAYEY SOILS</td> <td colspan="3">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td><td colspan="3">HIGHLY ORGANIC SOILS</td> </tr> <tr> <td>GEN. RATING AS A SUBGRADE</td> <td colspan="7">EXCELLENT TO GOOD</td><td colspan="7">FAIR TO POOR</td><td>FAIR TO POOR</td><td>POOR</td><td>UNSATURABLE</td> </tr> </table> <p style="text-align: center;">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS &gt; LL - 30</p>	GENERAL CLASS.	GRANULAR MATERIALS (<= 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)							ORGANIC MATERIALS			A-1	A-3	A-2		A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7	A-1, A-2	A-3	A-4, A-5	GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-7-6	A-7-5	A-1, A-2	A-3	A-4, A-5	A-6, A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7	A-1, A-2	A-3	A-4, A-5	SYMBOL																				% PASSING	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	LIQUID LIMIT	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	PLASTIC INDEX	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	GROUP INDEX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER			HIGHLY ORGANIC SOILS			GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR							FAIR TO POOR	POOR	UNSATURABLE	<p style="text-align: center;"><b>MINERALOGICAL COMPOSITION</b></p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;"><b>COMPRESSIBILITY</b></p> <p>SLIGHTLY COMPRESSIBLE      LIQUID LIMIT LESS THAN 31      MODERATELY COMPRESSIBLE      LIQUID LIMIT EQUAL TO 31-50      HIGHLY COMPRESSIBLE      LIQUID LIMIT GREATER THAN 50</p> <p style="text-align: center;"><b>PERCENTAGE OF MATERIAL</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th></th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 18%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt;18%</td> <td>&gt;20%</td> <td>HIGHLY</td> </tr> </table> <p style="text-align: center;"><b>GROUND WATER</b></p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p>		GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 18%	12 - 20%	SOME	HIGHLY ORGANIC	>18%	>20%	HIGHLY	<p style="text-align: center;"><b>WEATHERING</b></p> <p><b>FRESH</b> - ROCK GENERALLY FRESH, JOINTS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p><b>VERY SLIGHT (V SL.)</b> - 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.</p> <p><b>SLIGHT (SL.)</b> - 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.</p> <p><b>MODERATE (MOD.)</b> - 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.</p> <p><b>MODERATELY SEVERE (MOD. SEV.)</b> - 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></p> <p><b>SEVERE (SEV.)</b> - 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, YIELDS SPT N VALUES &gt; 100 BPF</i></p> <p><b>VERY SEVERE (V SEV.)</b> - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i></p> <p><b>COMPLETE</b> - 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.</p>	<p style="text-align: center;"><b>CONSISTENCY OR DENSENESS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT<sup>2</sup>)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>&lt;4 4 TO 10 10 TO 30 30 TO 50 &gt;50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>&lt;2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 &gt;30</td> <td>&lt;0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 &gt;4</td> </tr> </table> <p style="text-align: center;"><b>TEXTURE OR GRAIN SIZE</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>U.S. STD. 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<p style="text-align: center;"><b>FRACATURE SPACING</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>SPACING</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> </tr> </table>	TERM	SPACING	VERY WIDE	MORE THAN 10 FEET	WIDE	3 TO 10 FEET	MODERATELY CLOSE	1 TO 3 FEET	CLOSE	0.16 TO 1 FEET	VERY CLOSE	LESS THAN 0.16 FEET	<p style="text-align: center;"><b>BEDDING</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY THICKLY BEDDED</td> <td>&gt; 4 FEET</td> </tr> <tr> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td>THINLY LAMINATED</td> <td>&lt; 0.008 FEET</td> </tr> </table>	TERM	THICKNESS	VERY THICKLY BEDDED	> 4 FEET	THICKLY BEDDED	1.5 - 4 FEET	THINLY BEDDED	0.16 - 1.5 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET	THINLY LAMINATED	< 0.008 FEET	<p style="text-align: center;"><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p><b>FRIABLE</b> - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p><b>MODERATELY INDURATED</b> - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p><b>INDURATED</b> - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p><b>EXTREMELY INDURATED</b> - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>	<p><b>BENCH MARK:</b></p> <p style="text-align: right;">ELEVATION: _____ FT.</p> <p><b>NOTES:</b></p>																																																																																																																																																																																																																																																														
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STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE  
GOVERNOR

EUGENE A. CONTI, JR.  
SECRETARY

June 27, 2012

STATE PROJECT: 40243.1.1 (B-4965)  
F.A. PROJECT: BRZ-1165(6)  
COUNTY: Rockingham  
DESCRIPTION: Bridge No. 249 on SR 1165 (Cardinal Road) over Little Beaver Island Creek  
SUBJECT: Geotechnical Report - Inventory

**Project Description**

The project consists of raising the grade and widening the existing two lane roadway, replacement on location of the existing structure, and relocation of the intersection of -Y-, 80 feet up station from its present location. The project is 0.157 miles long and is located in the west central portion of Rockingham County between US 311 and NC 704.

The geotechnical investigation was conducted on May 31, 2012, and consisted of one hand auger boring along -L-, advanced to a depth of 2.0 feet, one hand auger boring along -Y-, advanced to a depth of 4.5 feet and two rod soundings along -Y-, advanced to depths of 4.6 and 4.9 feet.

The following alignments were investigated for this project:

<u>Line</u>	<u>Station(±)</u>
-L-	16+60 to 24+90
-Y-	10+00 to 12+83.60

**Areas of Special Geotechnical Interest**

- 1) Non-Crystalline Rock (Triassic) – Non Crystalline Triassic rock was encountered within 6 feet of proposed grade at the following locations.

<u>Line</u>	<u>Station (±)</u>
-Y-	10+30 to 12+50

**Physiography, Geology and Surface Water**

The project corridor is located in the central portion of the Dan River Basin, 2 miles northwest of the town of Madison in Rockingham County. Topography in the area is gently rolling to hilly. The project area is comprised of heavy forest, farm land and some residential development.

Geologically, the project area consists of Triassic-age sedimentary rocks of the Dan River Basin. These rocks consist of sandstones, siltstones and conglomerates. They are highly sensitive to weathering and exposure. Southeastern facing slopes are susceptible to failures.

Surface water is drained from the corridor by Little Beaver Island Creek which trends generally southeast across the project.

**Soils Properties**

Soils encountered along the project corridor consist of roadway embankment, alluvial soils deposited by Little Beaver Island Creek and an associated tributary along the southwestern toe of the roadway slope, and soils derived from the Triassic Age sedimentary rock of the Danville River Basin.

Roadway embankment soils consist of red-brown, soft to stiff, sandy silt and clay associated with SR 1165.

Alluvial soils consisting of sands, gravels and cobbles are located within the floodplain of Little Beaver Island Creek. Though not encountered, it is also assumed that there are soft sandy silts and clays deposited on the upstream and downstream of Little Beaver Creek.

Triassic soils consist of dry to moist, sandy silts with clay seams. These soils exhibit a liquid limit of 37 and a plastic index of 10.

MAILING ADDRESS:  
NC DEPARTMENT OF TRANSPORTATION  
GEOTECHNICAL ENGINEERING UNIT  
1589 MAIL SERVICE CENTER  
RALEIGH NC 27699-1589

TELEPHONE: 919-707-6850  
Fax: 919-250-4237  
[www.ncdot.gov/doh/preconstruct/highway/geotech](http://www.ncdot.gov/doh/preconstruct/highway/geotech)

LOCATION:  
CENTURY CENTER COMPLEX  
ENTRANCE B-2  
1020 BIRCH RIDGE DRIVE  
RALEIGH NC 27610

Weathered and Non-Crystalline rock was encountered along the -Y- alignment at depths ranging from 4 to 4.9 feet. Rock consists of red-brown, silty sandstone of Triassic origin.

**Ground Water**

No groundwater was encountered during our investigation. It is anticipated to be at a similar elevation to Little Beaver Island Creek.

Respectfully Submitted,



Christina M. Bruinsma, L.G.  
Project Geological Engineer

# Earthwork Balance Sheet

Volumes in Cubic Yards

PROJECT: B-4965

COUNTY: Rockingham

DATE: 12/4/2012

COMPILED BY: WAD

SHEET     OF     SHEETS

STATION	STATION	EXCAVATION					EMBANKMENT				BORROW	WASTE			
		TOTAL UNCLASS.	ROCK	UNDERCUT	UNSUIT. UNCLASS.	SUITABLE UNCLASS.	TOTAL	ROCK	EARTH	EMBANK. +20%		ROCK	SUITABLE	UNSUIT.	TOTAL
-L- 16+60.00	-L- 20+01.77 (Begin Bridge)	2,643				2,643	392		392	470			2,173		2,173
-L- 21+39.23 (End Bridge)	-L- 24+90.00	133				133	133		133	160	27				
-Y- 10+11.00	-Y- 12+50.00	1,003	39			964	54	39	15	57			946		946
	<b>SUBTOTAL</b>	3,779	39			3,740	579	39	540	687	27		3,119		3,119
	<b>SUBTOTAL</b>														
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	<b>TOTAL</b>	3,779	39			3,740	579	39	540	687	27		3,119		3,119
LOSS DUE TO CLEARING & GRUBBING		-25				-25							-25		-25
WASTE IN LIEU OF BORROW											-27		-27		-27
<b>PROJECT TOTAL</b>		3,754	39			3,715	579	39	540	687			3,067		3,067
<b>GRAND TOTAL</b>		3,754	39			3,715	579	39	540	687			3,067		3,067
SAY		3,800													
PER GEOTECH RECOMMENDATION, ESTIMATED 200 CUBIC YARDS OF UNDERCUT TO BE USED IN THE DISCRETION OF THE EST. SHALLOW UNDERCUT = 150 CUBIC YARDS (CONTINGENCY) CLASS IV SUBGRADE STABILIZATION = 300 TONS (CONTINGENCY) EST. DDE = 80 CUBIC YARDS															

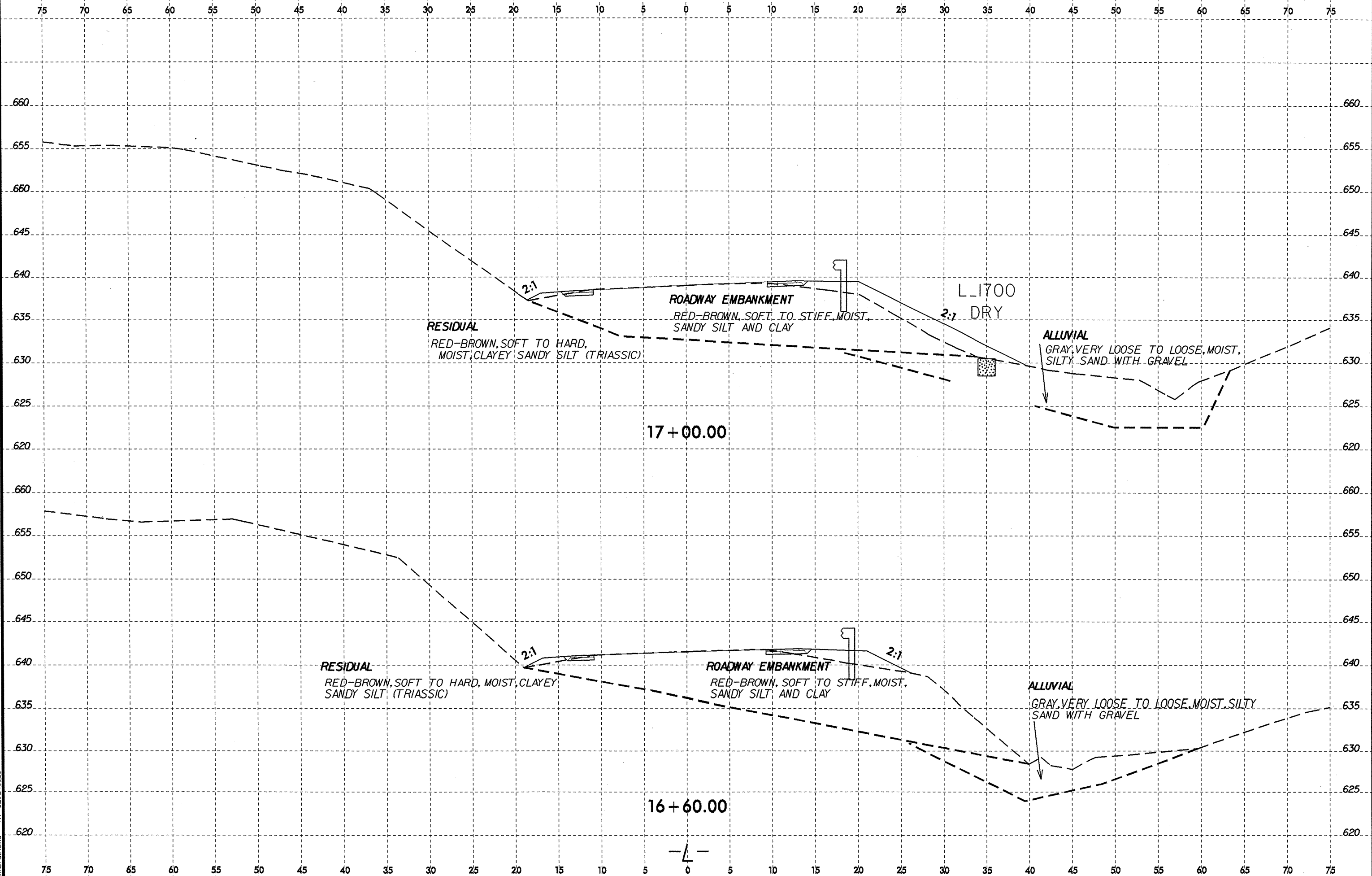
NOTE: EARTHWORK QUANTITIES ARE CALCULATED BY THE ROADWAY DESIGN UNIT. THESE EARTHWORK QUANTITIES ARE BASED IN PART ON SUBSURFACE DATA PROVIDED BY THE GEOTECHNICAL ENGINEERING UNIT.





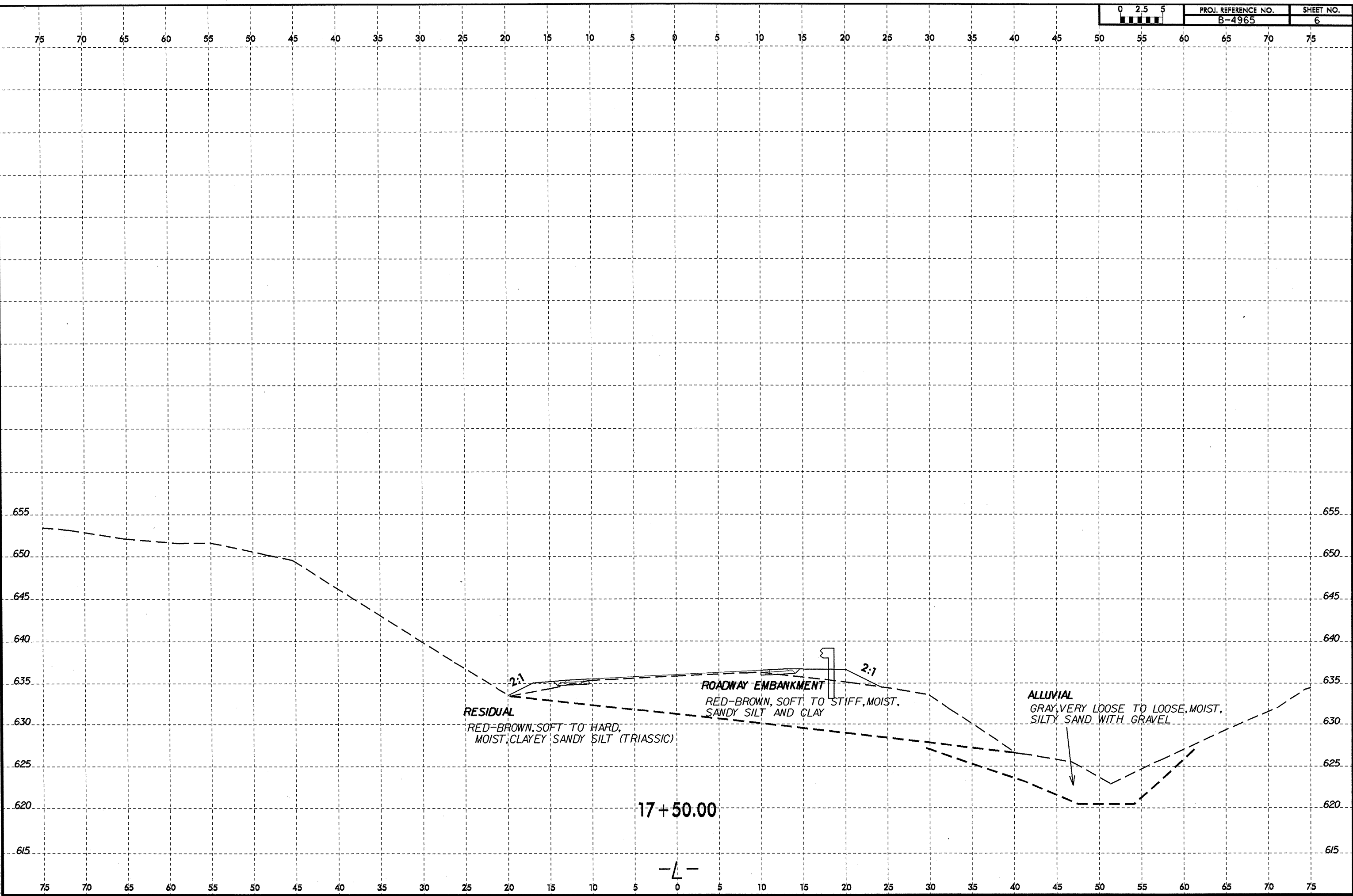
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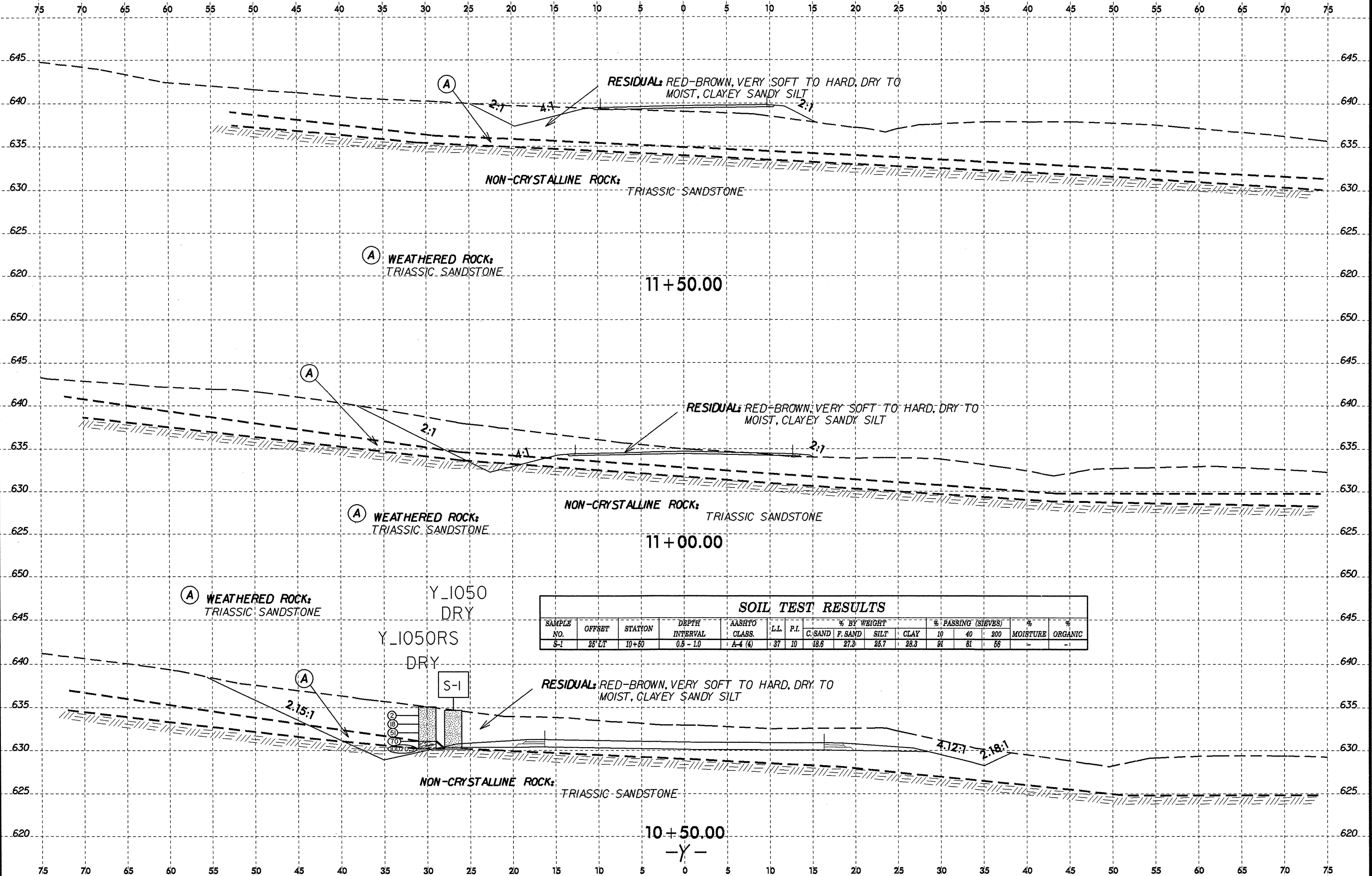




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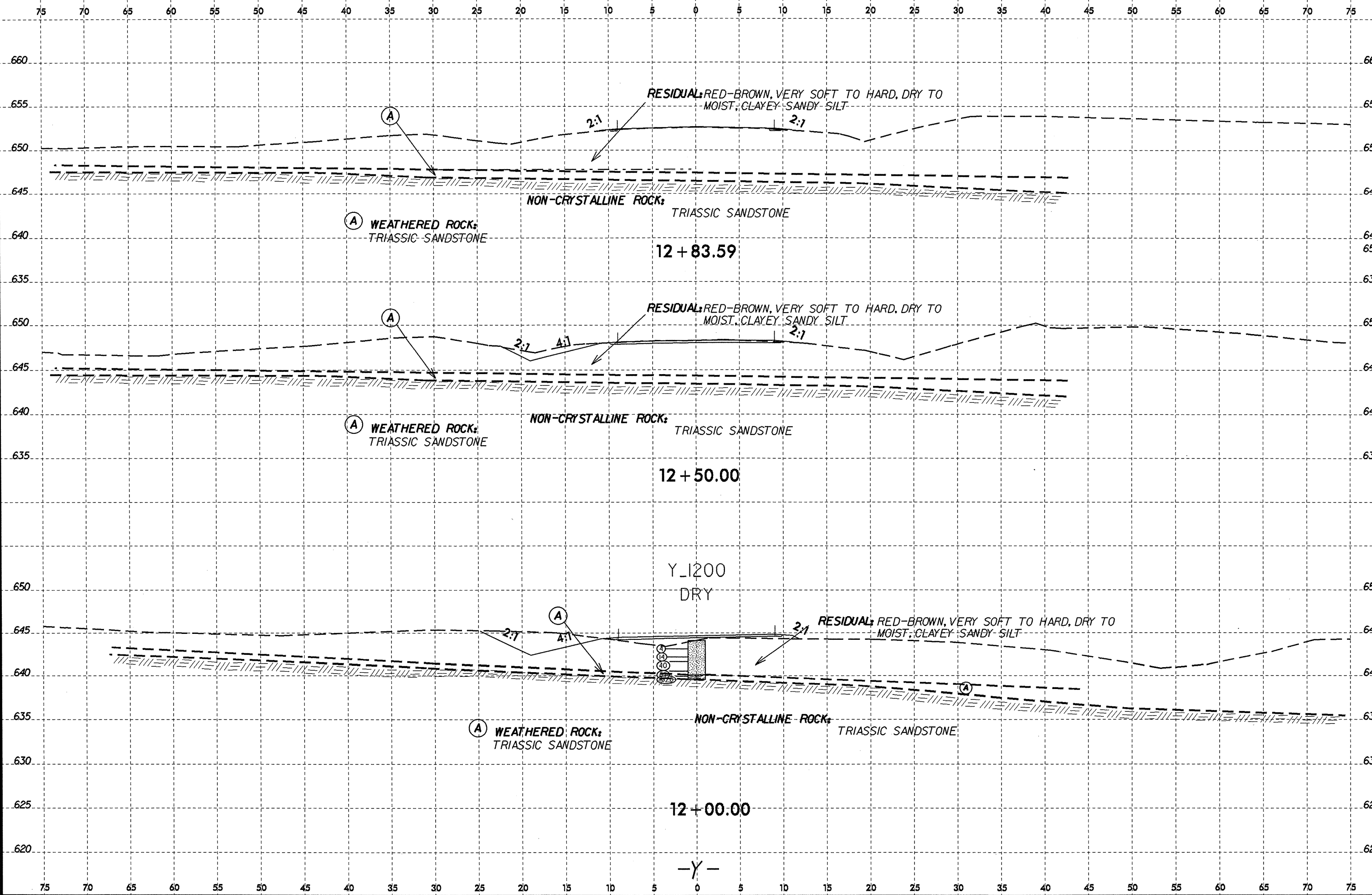


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SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							G. SAND	F. SAND	SILT	CLAY	10	40	200		
S-1	28' LT	10+60	0.5 - 1.0	A-4 (4)	37	10	18.6	27.3	25.7	28.3	81	81	66	-	-

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