

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

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PROJ. REFERENCE NO. 42180.1.1 (B-5105) F.A. PROJ. BRSTP-4982 (7)  
COUNTY MECKLENBURG  
PROJECT DESCRIPTION BRIDGE NO. 49 OVER LITTLE SUGAR CREEK ON SR 4982 (LANCASTER HIGHWAY)

**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 1991 TOL-8650. 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.

PERSONNEL  
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R. MONTGOMERY

INVESTIGATED BY D. GOODNIGHT  
CHECKED BY X. BARRETT  
SUBMITTED BY KLEINFELDER  
DATE JANUARY 2014



**PROJECT: 42180.1.1 ID: B-5105**

DRAWN BY: W. FELDER

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.

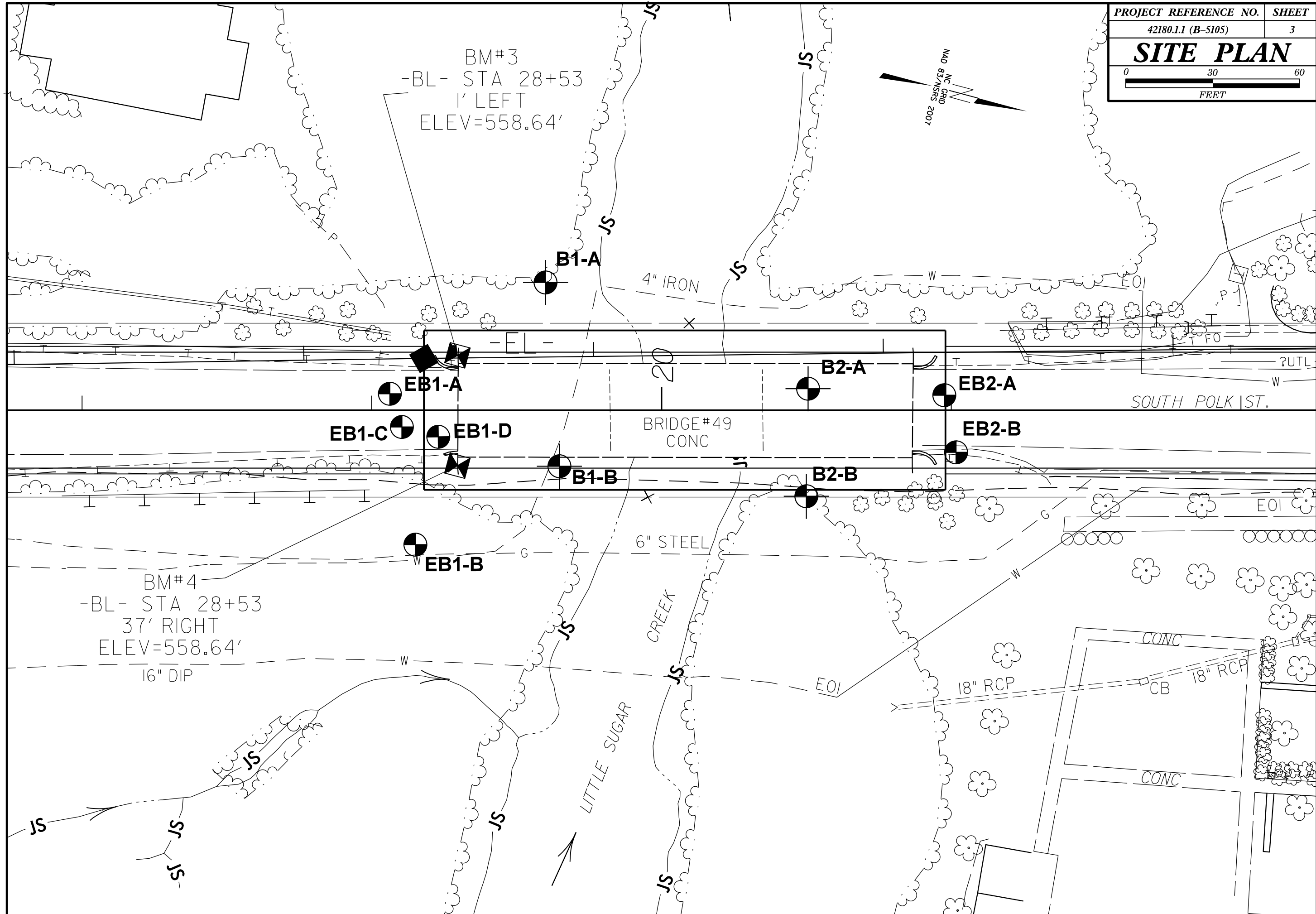
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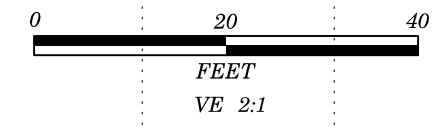
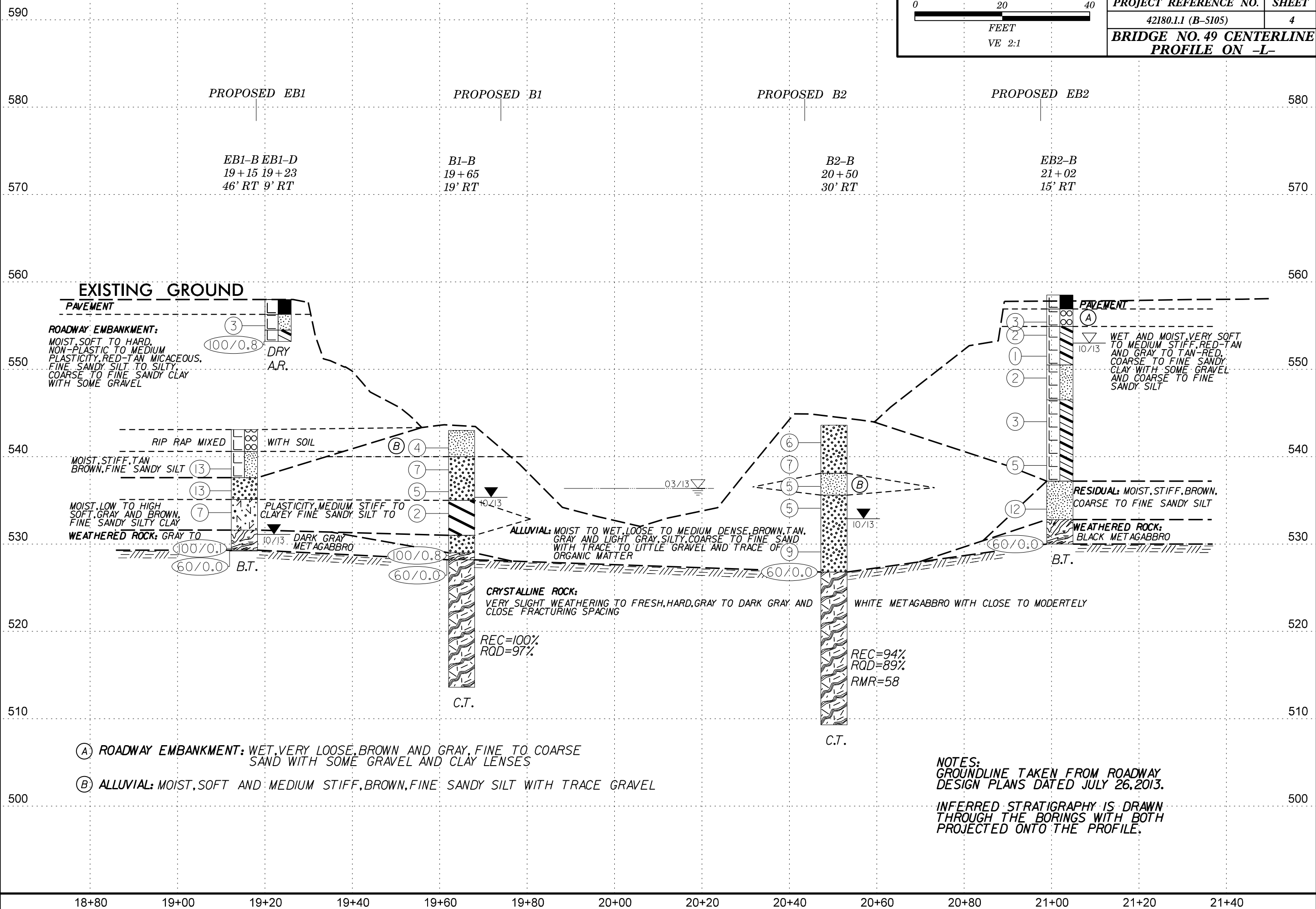
PROJECT REFERENCE NO. 42180.11 (B-5105)	SHEET NO. 2
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**SUBSURFACE INVESTIGATION**

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

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
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 (AASHTO 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: <i>VERY STIFF, GRAY-SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>	<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. <b>ANGULARITY OF GRAINS</b> 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> .	<b>HARD ROCK</b> 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: <b>WEATHERED ROCK (WR)</b> <b>CRYSTALLINE ROCK (CR)</b> <b>NON-CRYSTALLINE ROCK (NCR)</b> <b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b>	<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>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. <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 (MOTJ.)</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 (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 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 (SRQD)</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.
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b> GENERAL CLASS. GRANULAR MATERIALS (≤ 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS GROUP CLASS. A-1, A-3, A-2, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7 SYMBOL % PASSING: 10, 40, 200 LIQUID LIMIT PLASTIC INDEX GROUP INDEX USUAL TYPES OF MAJOR MATERIALS GEN. RATING AS A SUBGRADE	<b>MINERALOGICAL COMPOSITION</b> MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. <b>COMPRESSIBILITY</b> SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE <b>PERCENTAGE OF MATERIAL</b> ORGANIC 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	<b>WEATHERING</b> FRESH ROCK FRESH, CRYSTALLINE BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SLI.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SLI.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <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, YIELDS SPT N VALUES &gt; 100 BPF</i> VERY SEVERE (V SEV.) 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> 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.	<b>WEATHERING</b> FRESH ROCK FRESH, CRYSTALLINE BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SLI.) 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<b>CONSISTENCY OR DENSENESS</b> PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/F <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 0.50, 0.5 TO 1.0, 1 TO 2, 2 TO 4, >4	<b>MISCELLANEOUS SYMBOLS</b> 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 SPT DPT DMT VST PMT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD	<b>ROCK HARDNESS</b> VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.	<b>ROCK HARDNESS</b> VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.
<b>TEXTURE OR GRAIN SIZE</b> U.S. STD. SIEVE SIZE OPENING (MM) 4, 10, 40, 60, 200, 270 4.76, 2.00, 0.42, 0.25, 0.075, 0.053 BOULDER (BLDR.), COBBLE (COB.), GRAVEL (GR.), COARSE SAND (CSE, SD.), FINE SAND (F SD.), SILT (SL.), CLAY (CL.) GRAIN SIZE MM 305, 75, 2.0, 0.25, 0.05, 0.005 IN. 12, 3	<b>ABBREVIATIONS</b> 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 γ - UNIT WEIGHT γ <sub>d</sub> - DRY UNIT WEIGHT S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO	<b>FRACTURE SPACING</b> 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 <b>BEDDING</b> 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	<b>FRACTURE SPACING</b> 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 <b>BEDDING</b> 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
<b>SOIL MOISTURE - CORRELATION OF TERMS</b> 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 PL PLASTIC LIMIT - WET - (W) SEMISOLID; 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	<b>EQUIPMENT USED ON SUBJECT PROJECT</b> DRILL UNITS: MOBILE B-57, BK-51, CME-45C, CME-550, PORTABLE HOIST ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 8" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE STEEL TEETH, TRICONE 2 1/8" TUNG-CARB., CORE BIT HAMMER TYPE: AUTOMATIC, MANUAL CORE SIZE: B, N 0 2, H HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST	<b>INDURATION</b> FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE 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.	<b>INDURATION</b> FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE 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.
<b>PLASTICITY</b> NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH 0-5, 6-15, 16-25, 26 OR MORE			<b>TERMS AND DEFINITIONS</b> BENCH MARK: BM#4 (489.31 FT N, 1436.058 FT E) BM#3 (489.121 FT N, 1436.021 FT E) ELEVATION: SEE NOTES FT. NOTES: FIAD - FILLED IN AFTER DRILLING CT - CORING TERMINATED ELEVATIONS BM#4 - 558.64 FT BM#3 - 558.64 FT
<b>COLOR</b> 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.			

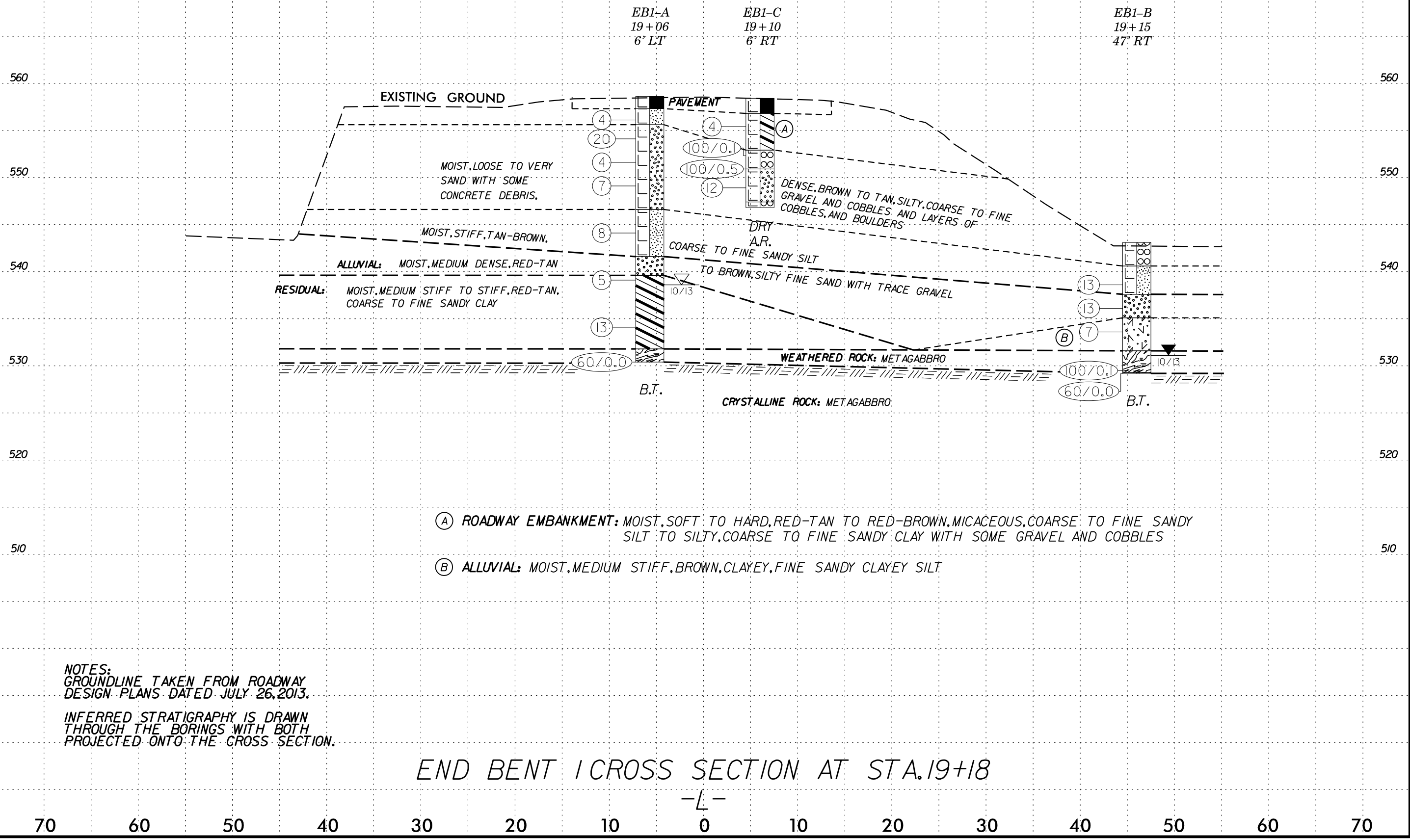




PROJECT REFERENCE NO. SHEET  
42180.1.1 (B-5105) 4  
BRIDGE NO. 49 CENTERLINE  
PROFILE ON -L-

- (A) ROADWAY EMBANKMENT: WET, VERY LOOSE, BROWN AND GRAY, FINE TO COARSE SAND WITH SOME GRAVEL AND CLAY LENSES
- (B) ALLUVIAL: MOIST, SOFT AND MEDIUM STIFF, BROWN, FINE SANDY SILT WITH TRACE GRAVEL

NOTES:  
GROUNDLINE TAKEN FROM ROADWAY  
DESIGN PLANS DATED JULY 26, 2013.  
INFERRED STRATIGRAPHY IS DRAWN  
THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE PROFILE.

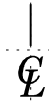


NOTES:  
GROUNDLINE TAKEN FROM ROADWAY  
DESIGN PLANS DATED JULY 26, 2013.  
INFERRED STRATIGRAPHY IS DRAWN  
THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION.

END BENT I CROSS SECTION AT STA. 19+18

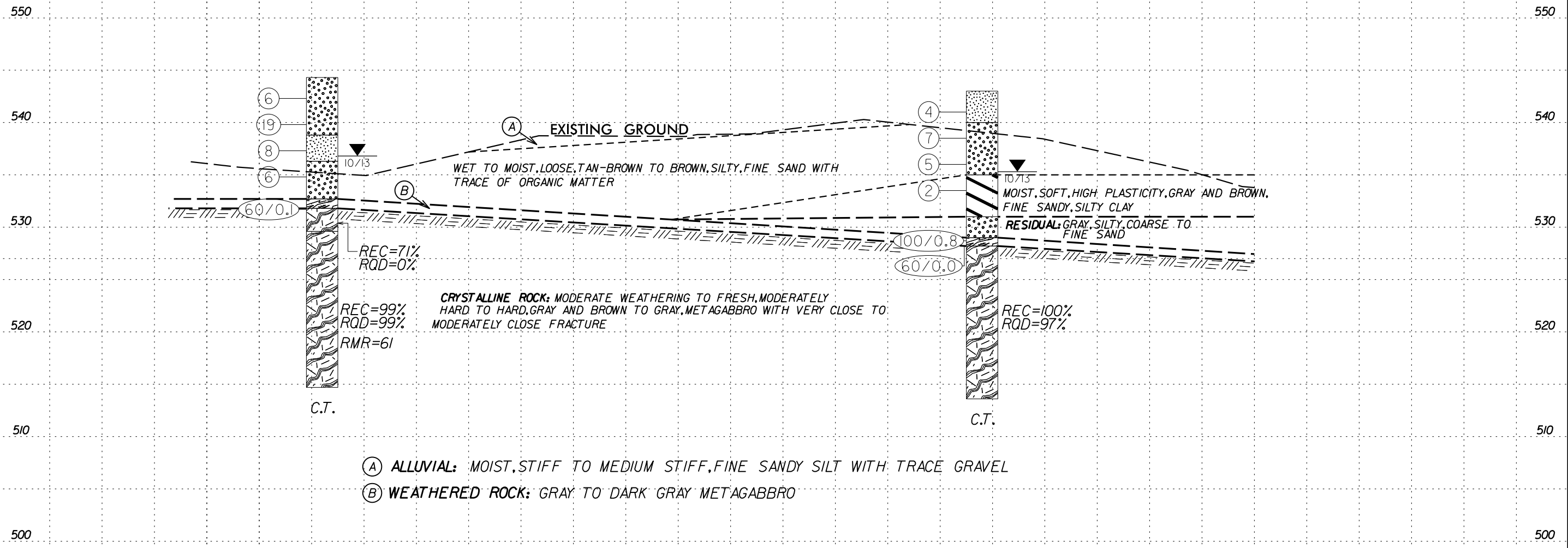
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BRIDGE NO. 49



B1-A  
19+60  
44' LT

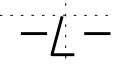
B1-B  
19+65  
19' RT



- (A) ALLUVIAL: MOIST, STIFF TO MEDIUM STIFF, FINE SANDY SILT WITH TRACE GRAVEL
- (B) WEATHERED ROCK: GRAY TO DARK GRAY METAGABBRO

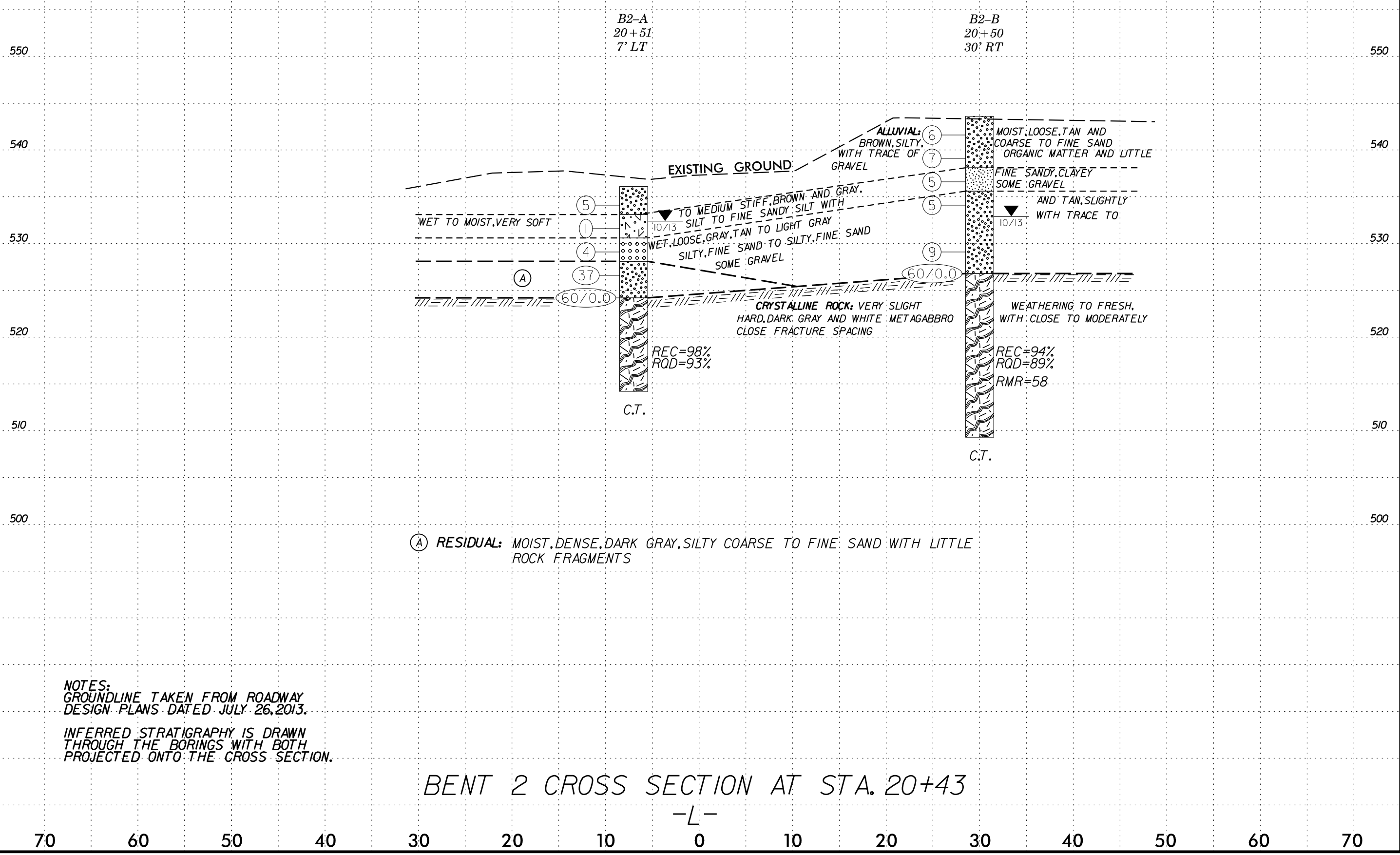
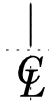
NOTES:  
GROUNDLINE TAKEN FROM ROADWAY  
DESIGN PLANS DATED JULY 26, 2013.  
  
INFERRED STRATIGRAPHY IS DRAWN  
THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION.

BENT I CROSS SECTION AT STA. 19+74



70 60 50 40 30 20 10 0 10 20 30 40 50 60 70

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B2-A  
20+51  
7' LT

B2-B  
20+50  
30' RT

EXISTING GROUND

ALLUVIAL:  
BROWN, SILTY,  
WITH TRACE OF  
GRAVEL

MOIST, LOOSE, TAN AND  
COARSE TO FINE SAND  
ORGANIC MATTER AND LITTLE

WET TO MOIST, VERY SOFT

TO MEDIUM STIFF, BROWN AND GRAY,  
SANDY SILT WITH

FINE SANDY, CLAYEY  
SOME GRAVEL

WET, LOOSE, GRAY, TAN TO LIGHT GRAY  
SILTY, FINE SAND TO SILTY, FINE SAND  
SOME GRAVEL

AND TAN, SLIGHTLY  
WITH TRACE TO:

(A)

60/0.0

CRYSTALLINE ROCK: VERY SLIGHT  
HARD, DARK GRAY AND WHITE METAGABBRO  
CLOSE FRACTURE SPACING

WEATHERING TO FRESH,  
WITH CLOSE TO MODERATELY

REC=98%  
RQD=93%

REC=94%  
RQD=89%  
RMR=58

C.T.

C.T.

(A) RESIDUAL: MOIST, DENSE, DARK GRAY, SILTY COARSE TO FINE SAND WITH LITTLE  
ROCK FRAGMENTS

NOTES:  
GROUNDLINE TAKEN FROM ROADWAY  
DESIGN PLANS DATED JULY 26, 2013.  
INFERRED STRATIGRAPHY IS DRAWN  
THROUGH THE BORINGS WITH BOTH  
PROJECTED ONTO THE CROSS SECTION.

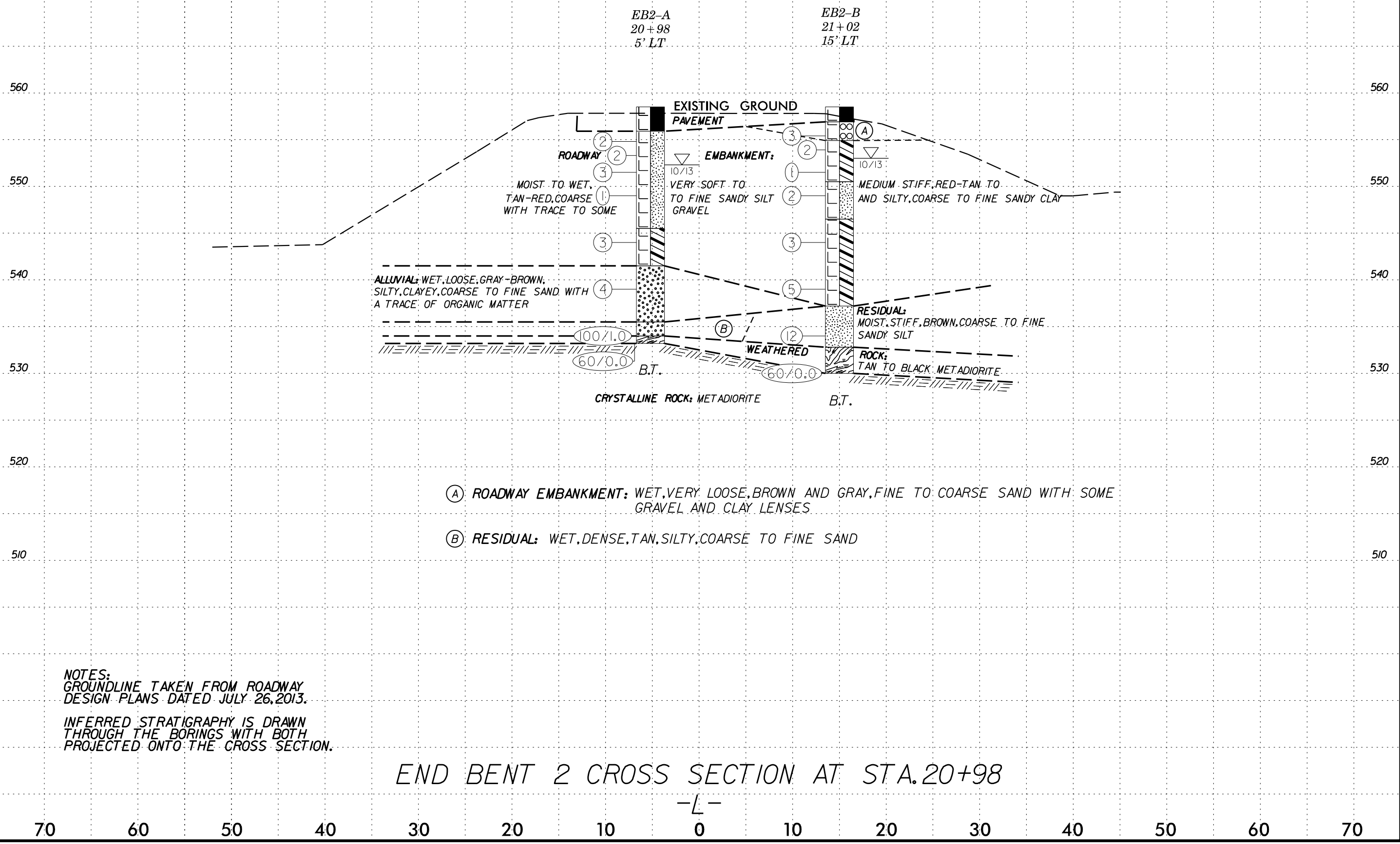
BENT 2 CROSS SECTION AT STA. 20+43

-L-

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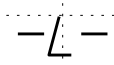
BRIDGE NO. 49



- (A) ROADWAY EMBANKMENT: WET, VERY LOOSE, BROWN AND GRAY, FINE TO COARSE SAND WITH SOME GRAVEL AND CLAY LENSES
- (B) RESIDUAL: WET, DENSE, TAN, SILTY, COARSE TO FINE SAND

NOTES:  
GROUNDLINE TAKEN FROM ROADWAY DESIGN PLANS DATED JULY 26, 2013.  
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

END BENT 2 CROSS SECTION AT STA. 20+98



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70 60 50 40 30 20 10 0 10 20 30 40 50 60 70



**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

WBS 42180.1.1	TIP B-5105	COUNTY MECKLENBURG	GEOLOGIST Goodnight, D. J.
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)			GROUND WTR (ft)
BORING NO. EB1-A	STATION 19+06	OFFSET 6 ft LT	ALIGNMENT -L-
COLLAR ELEV. 558.5 ft	TOTAL DEPTH 28.2 ft	NORTHING 489,102	EASTING 1,436,040
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER White, J. F.	START DATE 10/15/13	COMP. DATE 10/15/13	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
560														558.5 GROUND SURFACE 0.0	
	557.0	1.5	1	2	2									557.2 Asphalt (0.0 to 0.8 feet) Concrete (0.8 to 1.3 feet) 1.3	
555	555.0	3.5	6	10	10									555.5 ROADWAY EMBANKMENT 3.0	
	552.5	6.0	3	2	2									Red-Tan, Coarse to Fine SANDY SILT	
550	550.0	8.5	3	4	3									Brown, Silty, Coarse to Fine SAND with Some to Little Gravel and Some Clay Lenses	
545	545.0	13.5	4	4	4									546.5 Tan-Brown, Coarse to Fine SANDY SILT 12.9	
540	540.0	18.5	2	2	3									541.5 ALLUVIAL 17.0	
	539.5													Red-Tan, Silty, Fine SAND	
535	535.0	23.5	4	5	8									RESIDUAL	
	531.7													Red-Tan, Coarse to Fine SANDY CLAY	
	530.3	28.2												531.7 WEATHERED ROCK 26.8	
														Black METAGABBRO	
														Boring Terminated with Standard Penetration Test Refusal at Elevation 530.3 ft on CRYSTALLINE ROCK: METAGABBRO	

WBS 42180.1.1	TIP B-5105	COUNTY MECKLENBURG	GEOLOGIST Goodnight, D. J.
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)			GROUND WTR (ft)
BORING NO. EB1-C	STATION 19+10	OFFSET 6 ft RT	ALIGNMENT -L-
COLLAR ELEV. 558.4 ft	TOTAL DEPTH 11.6 ft	NORTHING 489,109	EASTING 1,436,050
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER White, J. F.	START DATE 10/14/13	COMP. DATE 10/14/13	SURFACE WATER DEPTH N/A

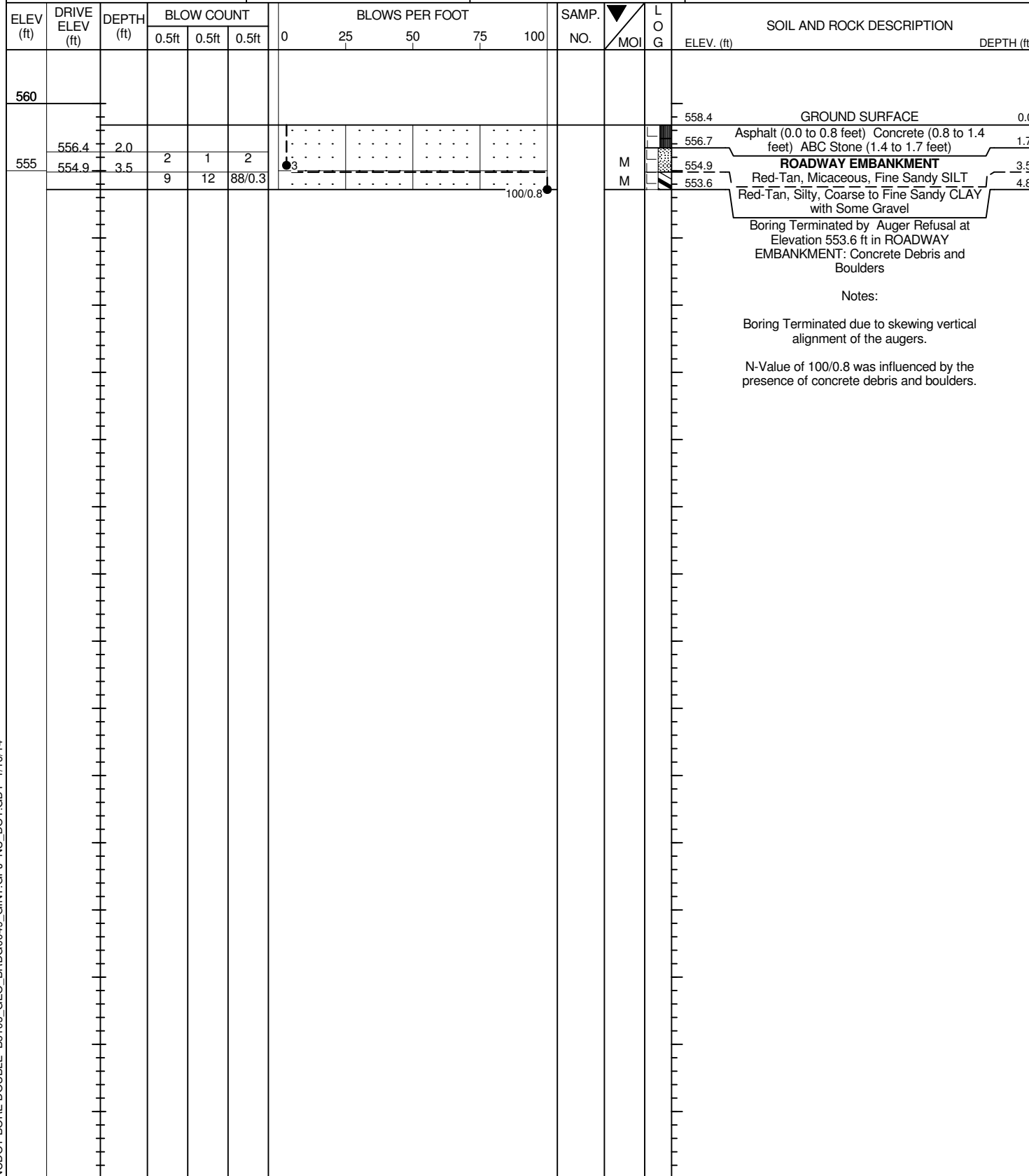
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
560														558.4 GROUND SURFACE 0.0	
	556.4	2.0	2	2	2									556.8 Asphalt (0.0 to 0.8 feet) Concrete (0.8 to 1.3 feet) ABC Stone (1.3 to 1.6 feet) 1.6	
555	554.9	3.5	100/0.5											555.4 ROADWAY EMBANKMENT 3.0	
	552.4	6.0	100/0.1											Red-Brown, Silty, Coarse to Fine SANDY CLAY with Some Gravel and Cobbles	
550	549.9	8.5	3	6	6									Concrete Debris, Cobbles, and Boulders	
	547.4													Tan, Silty, Coarse to Fine SAND with Some Gravel and Concrete Debris	
	546.8													Concrete Debris and Boulders	
														Boring Terminated by Auger Refusal at Elevation 546.8 ft in ROADWAY EMBANKMENT: Concrete Debris and Boulders	
														Notes: Boring Terminated because auger broke off below the ground surface.  N-Values of 100/0.1 and 100/0.5 were influenced by the presence of concrete debris, cobbles, and boulders.	

NCDOT BORE DOUBLE B5105\_GEO\_BRDG0049\_GINT.GPJ NC\_DOT.GDT 1/16/14

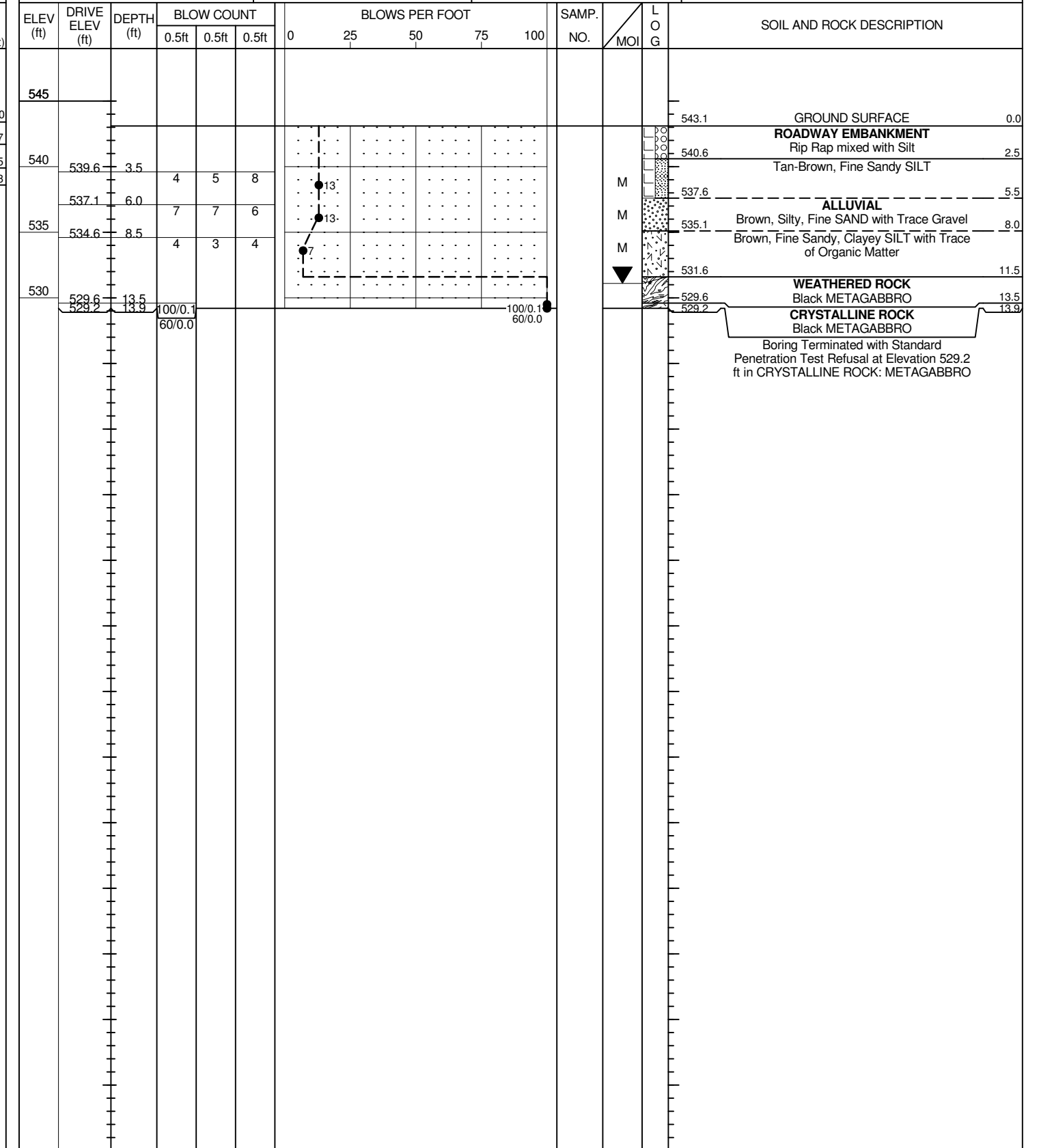


**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

WBS 42180.1.1	TIP B-5105	COUNTY MECKLENBURG	GEOLOGIST Goodnight, D. J.
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)			GROUND WTR (ft)
BORING NO. EB1-D	STATION 19+23	OFFSET 9 ft RT	ALIGNMENT -L-
COLLAR ELEV. 558.4 ft	TOTAL DEPTH 4.8 ft	NORTHING 489,122	EASTING 1,436,050
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER White, J. F.	START DATE 10/14/13	COMP. DATE 10/14/13	SURFACE WATER DEPTH N/A



WBS 42180.1.1	TIP B-5105	COUNTY MECKLENBURG	GEOLOGIST Goodnight, D. J.
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)			GROUND WTR (ft)
BORING NO. EB1-B	STATION 19+15	OFFSET 46 ft RT	ALIGNMENT -L-
COLLAR ELEV. 543.1 ft	TOTAL DEPTH 13.9 ft	NORTHING 489,124	EASTING 1,436,088
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER White, J. F.	START DATE 10/14/13	COMP. DATE 10/14/13	SURFACE WATER DEPTH N/A





# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 42180.1.1		TIP B-5105		COUNTY MECKLENBURG		GEOLOGIST Goodnight, D. J.										
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)							GROUND WTR (ft)									
BORING NO. B1-A		STATION 19+60		OFFSET 44 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 544.2 ft		TOTAL DEPTH 29.6 ft		NORTHING 489,144		EASTING 1,435,989										
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013				DRILL METHOD H.S. Augers/NQ Core		HAMMER TYPE Automatic										
DRILLER White, J. F.		START DATE 10/21/13		COMP. DATE 10/21/13		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
545														544.2	GROUND SURFACE	0.0
	543.2	1.0													ALLUVIAL	
			2	2	4										Tan-Brown, Silty, Fine SAND	
540	540.7	3.5														
			7	7	12											
	538.2	6.0													Brown, Fine Sandy SILT	5.5
			3	4	4											
535	535.7	8.5													Tan-Brown, Silty, Fine SAND	8.0
			3	3	3											
	531.7	12.5													WEATHERED ROCK	11.6
															Gray METAGABBRO	12.5
530															CRYSTALLINE ROCK	14.7
															Gray METAGABBRO	
															Gray METAGABBRO	
															R1 = 7, R2 = 20, R3 = 10, R4 = 20, R5 = 4, RMR = 61 ROCK CLASS II, ROCK TYPE E	
525																
520																
515																
Boring Terminated at Elevation 514.6 ft in CRYSTALLINE ROCK: METAGABBRO																
Notes: Boring was performed off of Proposed Bent Line due to Steep Creek Bank and Multiple Overhead Power Lines																

NCDOT BORE DOUBLE B5105\_GEO\_BRD0049\_GINT.GPJ NC\_DOT.GDT 1/16/14



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## CORE BORING REPORT

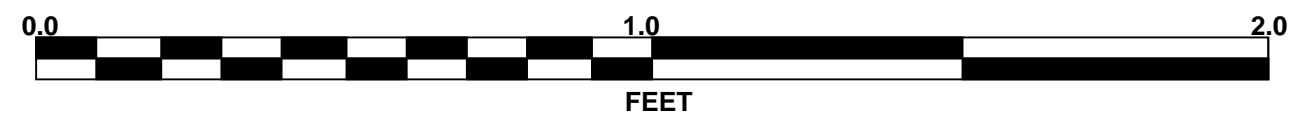
WBS 42180.1.1		TIP B-5105		COUNTY MECKLENBURG		GEOLOGIST Goodnight, D. J.					
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)							GROUND WTR (ft)				
BORING NO. B1-A		STATION 19+60		OFFSET 44 ft LT		ALIGNMENT -L-					
COLLAR ELEV. 544.2 ft		TOTAL DEPTH 29.6 ft		NORTHING 489,144		EASTING 1,435,989					
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013				DRILL METHOD H.S. Augers/NQ Core		HAMMER TYPE Automatic					
DRILLER White, J. F.		START DATE 10/21/13		COMP. DATE 10/21/13		SURFACE WATER DEPTH N/A					
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	ROD (%)	REC. (%)	ROD (%)			
531.7	531.6	12.6	2.0	N=60/0.1 1:42/1.0 2:50/1.0	(1.4) 70%	(0.0) 0%	(1.5) 71%	(0.0) 0%		Begin Coring @ 12.5 ft	12.5
530	529.6	14.6	5.0	1:25/1.0 1:20/1.0 1:19/1.0 1:18/1.0 1:29/1.0	(4.9) 98%	(4.8) 96%	(14.8) 99%	(14.8) 99%		CRYSTALLINE ROCK Moderate to Slight Weathering, Moderately Hard, Gray and Brown, METAGABBRO with Very Close Fracture Spacing	14.7
525	524.6	19.6	5.0	1:19/1.0 1:24/1.0 1:20/1.0 1:28/1.0 1:39/1.0	(5.0) 100%	(5.0) 100%			RS-1	Numerous Joints throughout Strata. Several Near Vertical Joints Fresh, Hard, Gray METAGABBRO with Close to Moderately Close Fracture Spacing	
520	519.6	24.6	5.0	1:20/1.0 1:34/1.0 1:27/1.0 1:40/1.0 1:41/1.0	(5.0) 100%	(5.0) 100%				5 Joints from 5 to 10 Degrees 3 Joints from 30 to 40 Degrees 1 Joint at 60 Degrees	
515	514.6	29.6								R1 = 7, R2 = 20, R3 = 10, R4 = 20, R5 = 4, ROCK CLASS II, ROCK TYPE E	
Boring Terminated at Elevation 514.6 ft in CRYSTALLINE ROCK: METAGABBRO											
Notes: Boring was performed off of Proposed Bent Line due to Steep Creek Bank and Multiple Overhead Power Lines											

NCDOT CORE SINGLE B5105\_GEO\_BRD0049\_GINT.GPJ NC\_DOT.GDT 1/16/14

# CORE PHOTOGRAPHS

## B1-A

BOXES 1 and 2: 12.6 - 29.6 FEET



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

# NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 42180.1.1	TIP B-5105	COUNTY MECKLENBURG	GEOLOGIST Goodnight, D. J.
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)			GROUND WTR (ft)
BORING NO. B1-B	STATION 19+65	OFFSET 19 ft RT	ALIGNMENT -L-
COLLAR ELEV. 543.0 ft	TOTAL DEPTH 29.4 ft	NORTHING 489,165	EASTING 1,436,049
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013		DRILL METHOD H.S. Augers/NQ Core	HAMMER TYPE Automatic
DRILLER White, J. F.	START DATE 10/18/13	COMP. DATE 10/18/13	SURFACE WATER DEPTH N/A

WBS 42180.1.1	TIP B-5105	COUNTY MECKLENBURG	GEOLOGIST Goodnight, D. J.
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)			GROUND WTR (ft)
BORING NO. B1-B	STATION 19+65	OFFSET 19 ft RT	ALIGNMENT -L-
COLLAR ELEV. 543.0 ft	TOTAL DEPTH 29.4 ft	NORTHING 489,165	EASTING 1,436,049
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013		DRILL METHOD H.S. Augers/NQ Core	HAMMER TYPE Automatic
DRILLER White, J. F.	START DATE 10/18/13	COMP. DATE 10/18/13	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
545													GROUND SURFACE	0.0
540	542.0	1.0	2	2	2						M		ALLUVIAL Brown, Fine Sandy SILT with Trace Gravel	3.0
	539.5	3.5	5	4	3						M		Brown, Silty, Fine SAND with a Trace of Organic Matter	
535	537.0	6.0	2	2	3								Gray and Brown, Fine Sandy, Silty CLAY	8.0
	534.5	8.5	2	1	1						M		RESIDUAL Gray, Silty, Coarse to Fine SAND	12.0
530	529.5	13.5	12	88/0.3									WEATHERED ROCK Dark Gray METAGABBRO	14.0
	528.2	14.8	60/0.0										CRYSTALLINE ROCK Gray METAGABBRO	14.8
525														
520														
515														
Boring Terminated at Elevation 513.6 ft in CRYSTALLINE ROCK: METAGABBRO														
Notes: Boring was performed off of Proposed Bent Line due to Access Issues.														

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	RQD (%)		REC. (%)	RQD (%)			
528.2	528.2	14.8	4.6	N=60/0.0 0.37/0.6 1.18/1.0 1.17/1.0 1.25/1.0 1.40/1.0	(4.6)	(4.6)		(14.6)	(14.1)		Begin Coring @ 14.8 ft CRYSTALLINE ROCK Fresh, Hard, Gray METAGABBRO with Close to Moderately Close Fracture Spacing	14.8
525	523.6	19.4	5.0	1.11/1.0 1.12/1.0 1.10/1.0 1.21/1.0 1.38/1.0	(5.0)	(4.5)					Some White Quartz Veins were present 6 Joints from 5 to 10 degrees	
520	518.6	24.4	5.0	1.16/1.0 1.26/1.0 1.12/1.0 1.23/1.0 1.42/1.0	(5.0)	(5.0)						
515	513.6	29.4									Boring Terminated at Elevation 513.6 ft in CRYSTALLINE ROCK: METAGABBRO	29.4
Notes: Boring was performed off of Proposed Bent Line due to Access Issues.												

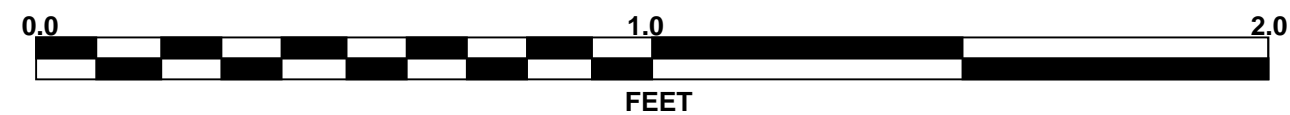
NCDOT BORE DOUBLE B5105\_GEO\_BRD0049\_GINT.GPJ NC\_DOT.GDT 1/16/14

NCDOT CORE SINGLE B5105\_GEO\_BRD0049\_GINT.GPJ NC\_DOT.GDT 1/16/14

# CORE PHOTOGRAPHS

## B1-B

BOXES 1 and 2: 14.8 - 29.4 FEET





**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**



**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**CORE BORING REPORT**

WBS 42180.1.1		TIP B-5105		COUNTY MECKLENBURG		GEOLOGIST Goodnight, D. J.										
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)							GROUND WTR (ft)									
BORING NO. B2-A		STATION 20+51		OFFSET 7 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 536.1 ft		TOTAL DEPTH 21.9 ft		NORTHING 489,241		EASTING 1,436,001										
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013				DRILL METHOD H.S. Augers/NQ Core		HAMMER TYPE Automatic										
DRILLER White, J. F.		START DATE 10/16/13		COMP. DATE 10/17/13		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
540																
535	535.1	1.0	3	3	2									536.1	GROUND SURFACE	0.0
	532.6	3.5	WOH	WOH	1									533.1	ALLUVIAL Tan-Brown, Silty, Coarse to Fine SAND with Little Gravel and Trace of Organic Matter	3.0
530	530.1	6.0												530.6	Brown and Gray, Fine Sandy, Clayey SILT with Some Gravel	5.5
	527.6	8.5												528.1	Gray, Silty, Fine SAND with Some Gravel	8.0
525	524.2	11.9												524.2	RESIDUAL Dark Gray, Silty, Coarse to Fine SAND with Little Rock Fragments	11.9
520															CRYSTALLINE ROCK Dark Gray and White METAGABBRO	
515														514.2		21.9
Boring Terminated at Elevation 514.2 ft in CRYSTALLINE ROCK: METAGABBRO																
Notes: Boring was performed off of Proposed Bent Line due to Configuration of Bridge Superstructure.																

NCDOT BORE DOUBLE B5105\_GEO\_BRDG0049\_GINT.GPJ NC\_DOT.GDT 1/16/14

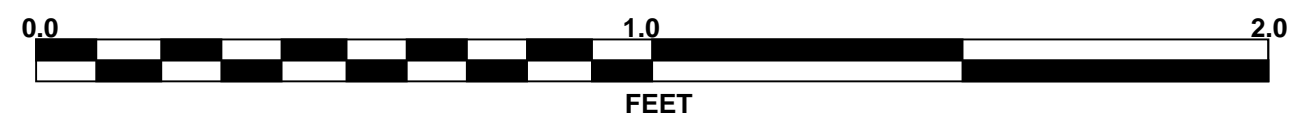
WBS 42180.1.1		TIP B-5105		COUNTY MECKLENBURG		GEOLOGIST Goodnight, D. J.						
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)							GROUND WTR (ft)					
BORING NO. B2-A		STATION 20+51		OFFSET 7 ft LT		ALIGNMENT -L-						
COLLAR ELEV. 536.1 ft		TOTAL DEPTH 21.9 ft		NORTHING 489,241		EASTING 1,436,001						
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013				DRILL METHOD H.S. Augers/NQ Core		HAMMER TYPE Automatic						
DRILLER White, J. F.		START DATE 10/16/13		COMP. DATE 10/17/13		SURFACE WATER DEPTH N/A						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	TOTAL RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft)	RQD (%)		REC. (ft)	RQD (%)			
524.2	524.2	11.9	5.0	N=60/0.0 1.48/1.0 1.45/1.0 1.50/1.0 1.55/1.0 2.06/1.0	(4.9) 98%	(4.6) 92%		(9.8) 98%	(9.3) 93%		Begin Coring @ 11.9 ft CRYSTALLINE ROCK Very Slight Weathering to Fresh, Hard, Dark Gray and White METAGABBRO with Close to Moderately Close Fracture Spacing	11.9
520	519.2	16.9	5.0	1.40/1.0 1.39/1.0 1.29/1.0 1.34/1.0 1.35/1.0	(4.9) 98%	(4.7) 94%					Several White Quartz Veins were present  1 Near Vertical Joint 3 Joints at 40 to 50 Degrees 3 Joints at 10 to 20 Degrees	
515	514.2	21.9									Boring Terminated at Elevation 514.2 ft in CRYSTALLINE ROCK: METAGABBRO	21.9
Notes: Boring was performed off of Proposed Bent Line due to Configuration of Bridge Superstructure.												

NCDOT CORE SINGLE B5105\_GEO\_BRDG0049\_GINT.GPJ NC\_DOT.GDT 1/16/14

# CORE PHOTOGRAPHS

## B2-A

BOX 1: 11.9 - 21.9 FEET





**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**CORE BORING REPORT**

WBS 42180.1.1		TIP B-5105		COUNTY MECKLENBURG		GEOLOGIST Goodnight, D. J.							
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)							GROUND WTR (ft)						
BORING NO. B2-B		STATION 20+50		OFFSET 30 ft RT		ALIGNMENT -L-							
COLLAR ELEV. 543.6 ft		TOTAL DEPTH 34.3 ft		NORTHING 489,250		EASTING 1,436,037							
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013				DRILL METHOD H.S. Augers/NQ Core		HAMMER TYPE Automatic							
DRILLER White, J. F.		START DATE 10/17/13		COMP. DATE 10/17/13		SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75				
545												GROUND SURFACE	0.0
	542.6	1.0	2	3	3						M	ALLUVIAL Tan and Brown, Silty, Fine SAND with Trace of Organic Matter and Little Gravel	
540	540.1	3.5	6	4	3						M		
	537.6	6.0	3	2	3						M	Brown, Fine Sandy SILT with Some Roots	5.5
535	535.1	8.5	3	3	2						M	Tan to Light Gray and Tan, Silty, Fine SAND with Trace of Gravel	8.0
530	530.1	13.5	3	3	6						W		
	526.8	16.8	60/0.0										16.8
525												CRYSTALLINE ROCK Gray and White METAGABBRO	
												R1 = 7, R2 = 17, R3 = 10, R4 = 20, R5 = 4, RMR = 58 ROCK CLASS III, ROCK TYPE E	
520											RS-2		
515													
510													
												Boring Terminated at Elevation 509.3 ft in CRYSTALLINE ROCK: METAGABBRO	34.3
Notes:													
Boring was performed off of Proposed Bent Line due to Access Issues.													

NCDOT BORE DOUBLE B5105\_GEO\_BRDG0049\_GINT.GPJ\_NC\_DOT.GDT 1/16/14

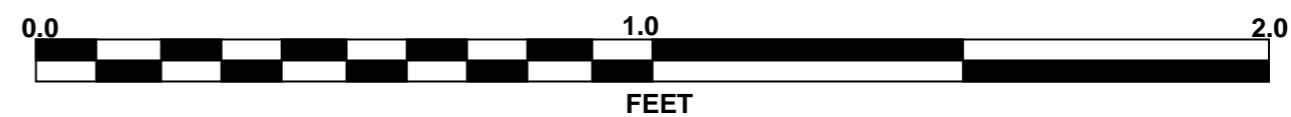
WBS 42180.1.1		TIP B-5105		COUNTY MECKLENBURG		GEOLOGIST Goodnight, D. J.					
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)							GROUND WTR (ft)				
BORING NO. B2-B		STATION 20+50		OFFSET 30 ft RT		ALIGNMENT -L-					
COLLAR ELEV. 543.6 ft		TOTAL DEPTH 34.3 ft		NORTHING 489,250		EASTING 1,436,037					
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013				DRILL METHOD H.S. Augers/NQ Core		HAMMER TYPE Automatic					
DRILLER White, J. F.		START DATE 10/17/13		COMP. DATE 10/17/13		SURFACE WATER DEPTH N/A					
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	ROD (%)	REC. (%)	ROD (%)			
526.8										Begin Coring @ 16.8 ft	
525	526.8	16.8	2.8	N=60/0.0 0.58/0.8	(2.2) 79%	(1.9) 68%	(16.4) 94%	(15.5) 89%		CRYSTALLINE ROCK	16.8
	524.0	19.6	5.0	1.20/1.0 1.52/1.0	(4.5) 90%	(3.9) 78%				Very Slight Weathering to Fresh, Hard, Dark Gray and White METAGABBRO with Close to Moderately Close Fracture Spacing	
				1.10/1.0 1.21/1.0 1.36/1.0 1.41/1.0 1.52/1.0						Some White Quartz Veins were present	
520	519.0	24.6	5.0	1.31/1.0 1.32/1.0 1.37/1.0 1.22/1.0 1.28/1.0	(5.0) 100%	(5.0) 100%			RS-2	3 Joints at 20 to 30 Degrees 3 Joints at 40 to 50 Degrees Several Healed Joints at 45 to 60 Degrees 1 Healed Near Vertical Joint	
515	514.0	29.6	4.7	1.10/1.0 1.18/1.0 1.15/1.0 1.18/1.0 0.58/0.7	(4.7) 100%	(4.7) 100%				Core Loss from 18.7 to 19.3 feet and 19.8 to 20.3 feet indicating presence of Weathered Rock.	
510	509.3	34.3								R1 = 7, R2 = 17, R3 = 10, R4 = 20, R5 = 4, RMR = 58 ROCK CLASS III, ROCK TYPE E	34.3
Boring Terminated at Elevation 509.3 ft in CRYSTALLINE ROCK: METAGABBRO											
Notes:											
Boring was performed off of Proposed Bent Line due to Access Issues.											

NCDOT CORE SINGLE B5105\_GEO\_BRDG0049\_GINT.GPJ\_NC\_DOT.GDT 1/16/14

# CORE PHOTOGRAPHS

## B2-B

BOXES 1 and 2: 16.8 - 34.3 FEET





# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 42180.1.1	TIP B-5105	COUNTY MECKLENBURG	GEOLOGIST Goodnight, D. J.
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)			GROUND WTR (ft)
BORING NO. EB2-A	STATION 20+98	OFFSET 5 ft LT	ALIGNMENT -L-
COLLAR ELEV. 558.5 ft	TOTAL DEPTH 25.3 ft	NORTHING 489,287	EASTING 1,435,991
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER White, J. F.	START DATE 10/15/13	COMP. DATE 10/15/13	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
560														558.5	GROUND SURFACE	0.0
														555.9	Asphalt (0.0 to 2.0 feet) Concrete (2.0 to 2.6 feet)	2.6
555	555.8	2.7													<b>ROADWAY EMBANKMENT</b>	
	554.3	4.2	1	WOH	2										Red-Tan, Coarse to Fine Sandy SILT with a Trace of Gravel	
	552.5	6.0	WOH	2	1											
550	550.0	8.5	WOH	WOH	1											
545	545.0	13.5	WOH	WOH	3											
540	540.0	18.5	WOH	1	3										<b>ALLUVIAL</b>	
															Gray-Brown, Silty, Clayey, Coarse to Fine SAND with a Trace of Organic Matter	
535	535.0	23.5														
	533.2	25.3	21	19	81/0.5										<b>RESIDUAL</b>	
															Tan, Silty, Coarse to Fine SAND	24.5
															<b>WEATHERED ROCK</b>	
															Tan METADIORITE	25.3
															Boring Terminated with Standard Penetration Test Refusal at Elevation 533.2 ft on CRYSTALLINE ROCK: METADIORITE	

WBS 42180.1.1	TIP B-5105	COUNTY MECKLENBURG	GEOLOGIST Goodnight, D. J.
SITE DESCRIPTION Bridge No. 49 over Little Sugar Creek on SR 4982 (Lancaster Highway)			GROUND WTR (ft)
BORING NO. EB2-B	STATION 21+02	OFFSET 15 ft RT	ALIGNMENT -L-
COLLAR ELEV. 558.4 ft	TOTAL DEPTH 28.5 ft	NORTHING 489,296	EASTING 1,436,009
DRILL RIG/HAMMER EFF./DATE SOI8513 CME-550X 90% 08/21/2013		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER White, J. F.	START DATE 10/16/13	COMP. DATE 10/16/13	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
560														558.4	GROUND SURFACE	0.0
														556.8	Asphalt (0.0 to 1.6 feet)	1.6
555	556.3	2.1													<b>ROADWAY EMBANKMENT</b>	
	554.8	3.6	3	1	2										Brown and Gray, Fine to Coarse SAND with Some Gravel and Clay Lenses	3.6
	552.4	6.0	WOH	WOH	1										Red-Tan and Gray, Coarse to Fine Sandy CLAY with Some Gravel	
550	549.9	8.5	WOH	WOH	2										Tan-Red, Coarse to Fine Sandy SILT	8.0
545	544.9	13.5	WOH	1	2										Tan-Red, Silty, Coarse to Fine Sandy CLAY	12.0
540	539.9	18.5	1	2	3											
535	534.9	23.5	4	4	8										<b>RESIDUAL</b>	
															Brown, Coarse to Fine Sandy SILT	21.3
															<b>WEATHERED ROCK</b>	
															Black METAGABBRO	25.7
530	529.9	28.5													Boring Terminated with Standard Penetration Test Refusal at Elevation 529.9 ft on CRYSTALLINE ROCK: METAGABBRO	

NCDOT BORE DOUBLE B5105\_GEO\_BRDG0049\_GINT.GPJ NC\_DOT.GDT 1/16/14



SITE PHOTOGRAPHS



View Looking Upstation along -L- from End Bent 1



Profile of Bridge Looking Downstation from End Bent 2