

REFERENCE: R-2707C

PROJECT: 34497

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-2707C	1	13

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SHEET NO.	DESCRIPTION
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STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CLEVELAND
PROJECT DESCRIPTION US 74 BYPASS FROM EAST OF NC 226 TO EAST OF NC 150

SITE DESCRIPTION BRIDGE NO. 470 ON -Y4- REV (MCBAYER-SPRINGS RD) OVER -L- (US 74 BYPASS)

CAUTION NOTICE

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

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

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

- NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

B. WORLEY, PG

B. SMITH, PG

J. BARE

T. BRIGMAN

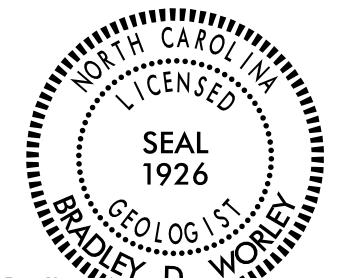
INVESTIGATED BY B. WORLEY

DRAWN BY B. WORLEY and B. SMITH

CHECKED BY D. DEWEY, PE

SUBMITTED BY Summit Design and Engineering Services, PLLC

DATE MAY, 2015



DocuSigned by
Bradley D. Worley
CA8721209FCB476...

12/8/2015

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
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 D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

GRADATION
WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.
ANGULARITY OF GRAINS
THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.
MINERALOGICAL COMPOSITION
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.
COMPRESSIBILITY
SLIGHTLY COMPRESSIBLE LL < 31
MODERATELY COMPRESSIBLE LL = 31 - 50
HIGHLY COMPRESSIBLE LL > 50
PERCENTAGE OF MATERIAL
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

ROCK DESCRIPTION
HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:
WEATHERED ROCK (WR)
CRYSTALLINE ROCK (CR)
NON-CRYSTALLINE ROCK (NCR)
COASTAL PLAIN SEDIMENTARY ROCK (CPS)
WEATHERING
FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT 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 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 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 ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL.
SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF
VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF
COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

TERMS AND DEFINITIONS
ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
AQUIFER - A WATER BEARING FORMATION OR STRATA.
ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
CORE RECOVERY (REC) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
ROCK QUALITY DESIGNATION (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 0.1 FOOT PER 60 BLOWS.
STRATA CORE RECOVERY (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
STRATA ROCK QUALITY DESIGNATION (SRQD) - 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
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS
GROUP CLASS. 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
SYMBOL
% PASSING #10 #40 #200
MATERIAL PASSING #40 LL PI
GROUP INDEX
USUAL TYPES OF MAJOR MATERIALS
GEN. RATING AS SUBGRADE

MISCELLANEOUS SYMBOLS
ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
SOIL SYMBOL
ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
INFERRED SOIL BOUNDARY
INFERRED ROCK LINE
ALLUVIAL SOIL BOUNDARY
DIP & DIP DIRECTION OF ROCK STRUCTURES
SPT TEST BORING
AUGER BORING
CORE BORING
MONITORING WELL
PIEZOMETER INSTALLATION
SLOPE INDICATOR INSTALLATION
CONE PENETROMETER TEST
SOUNDING ROD
TEST BORING WITH CORE
SPT N-VALUE

ROCK HARDNESS
VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT CAN BE 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.

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

TEXTURE OR GRAIN SIZE
U.S. STD. SIEVE SIZE OPENING (MM)
BOULDER (BLOR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)
GRAIN SIZE MM IN.

ABBREVIATIONS
AR - AUGER REFUSAL
BT - BORING TERMINATED
CL - CLAY
CPT - CONE PENETRATION TEST
CSE - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HL - HIGHLY
MED. - MEDIUM
MICA - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
UNIT WEIGHT
DRY UNIT WEIGHT

ROCK HARDNESS (continued)
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UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK

SOIL MOISTURE - CORRELATION OF TERMS
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION
LIQUID LIMIT (LL) PLASTIC LIMIT (PL)
WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE
DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

EQUIPMENT USED ON SUBJECT PROJECT
DRILL UNITS: CME-45C, CME-55, CME-550, VANE SHEAR TEST, PORTABLE HOIST, Diederich D-50
ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 6" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE STEEL TEETH, TRICONE TUNG-CARB., CORE BIT
HAMMER TYPE: AUTOMATIC, MANUAL
CORE SIZE: B, H, N Q2
HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST

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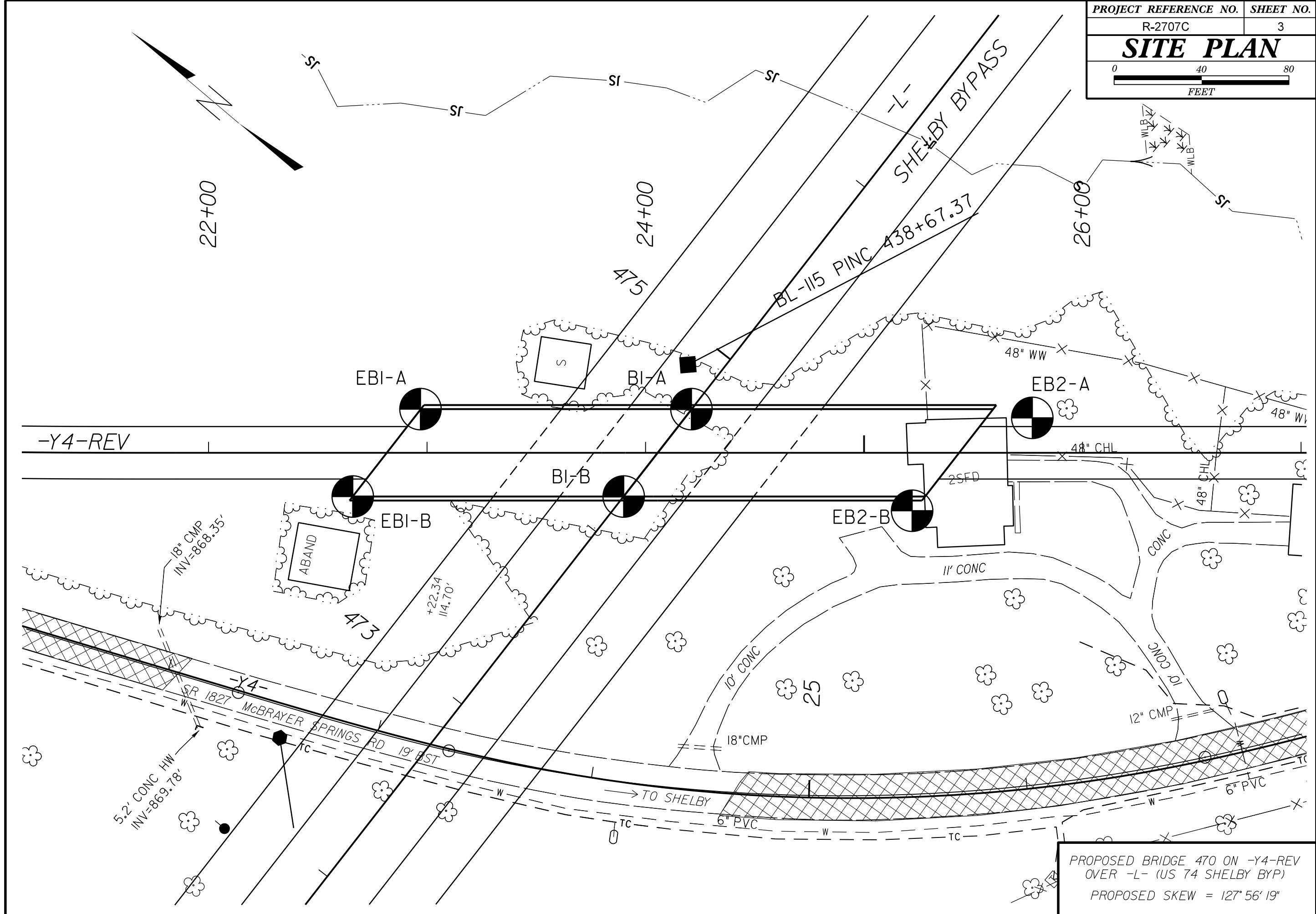
FRACTURE SPACING BEDDING
TERM SPACING THICKNESS
VERY WIDE MORE THAN 10 FEET 4 FEET
WIDE 3 TO 10 FEET 1.5 - 4 FEET
MODERATELY CLOSE 1 TO 3 FEET 0.16 - 1.5 FEET
CLOSE 0.16 TO 1 FOOT 0.03 - 0.16 FEET
VERY CLOSE LESS THAN 0.16 FEET 0.008 - 0.03 FEET
THINLY LAMINATED < 0.008 FEET

PLASTICITY
NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC HIGHLY PLASTIC
PLASTICITY INDEX (PI) DRY STRENGTH
VERY LOW SLIGHT MEDIUM HIGH

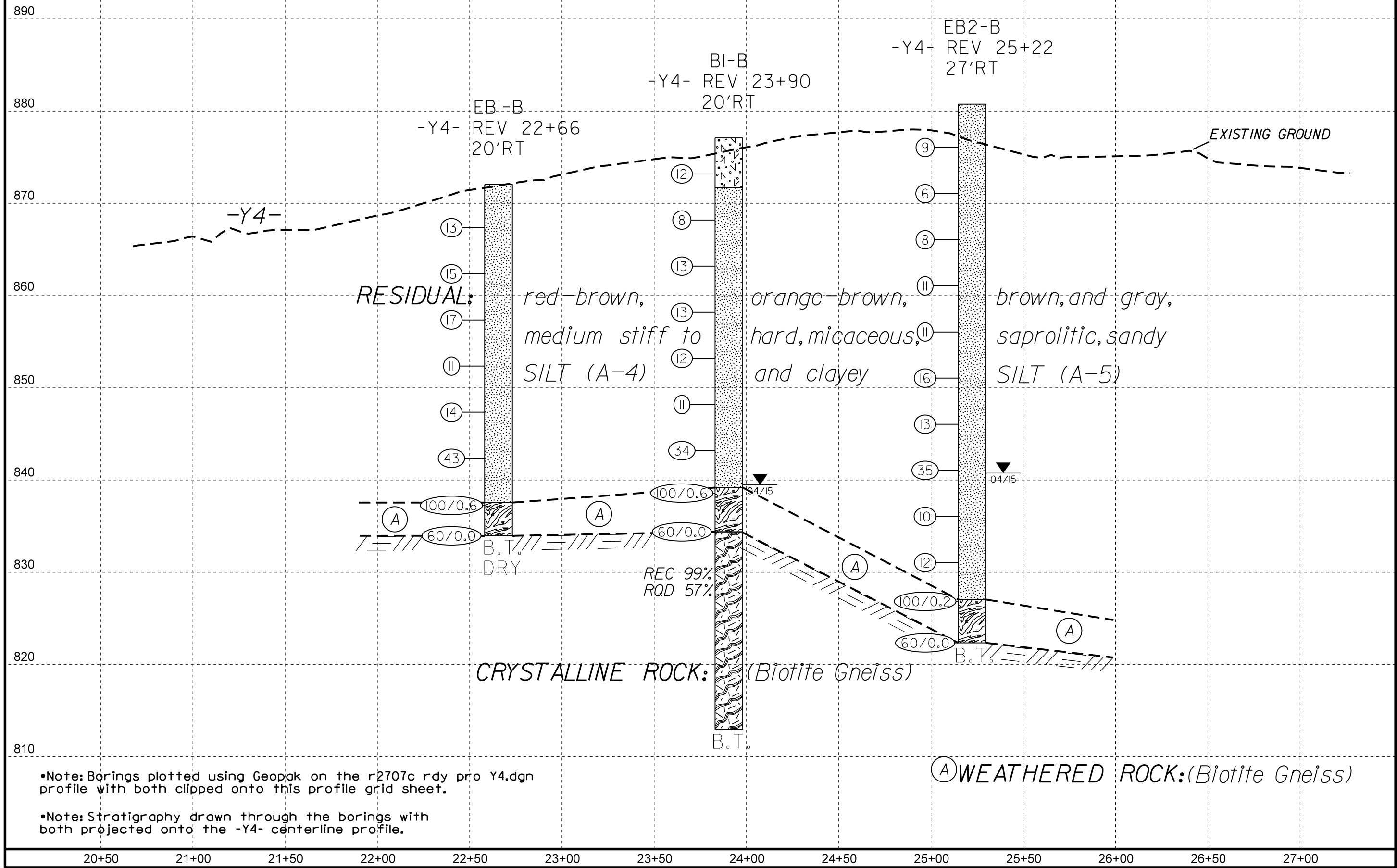
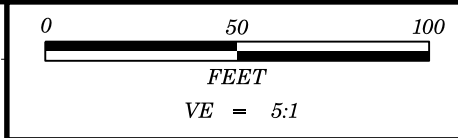
INDURATION
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.
FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

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NOTES:
BENCH MARK: BL-115
N 583,217.3760
E 1,245,136.1329 ELEVATION: 872.98 FEET
DATE: 8-15-14



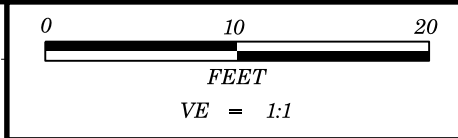
PROPOSED BRIDGE 470 ON -Y4-REV
 OVER -L- (US 74 SHELBY BYP)
 PROPOSED SKEW = 127° 56' 19"



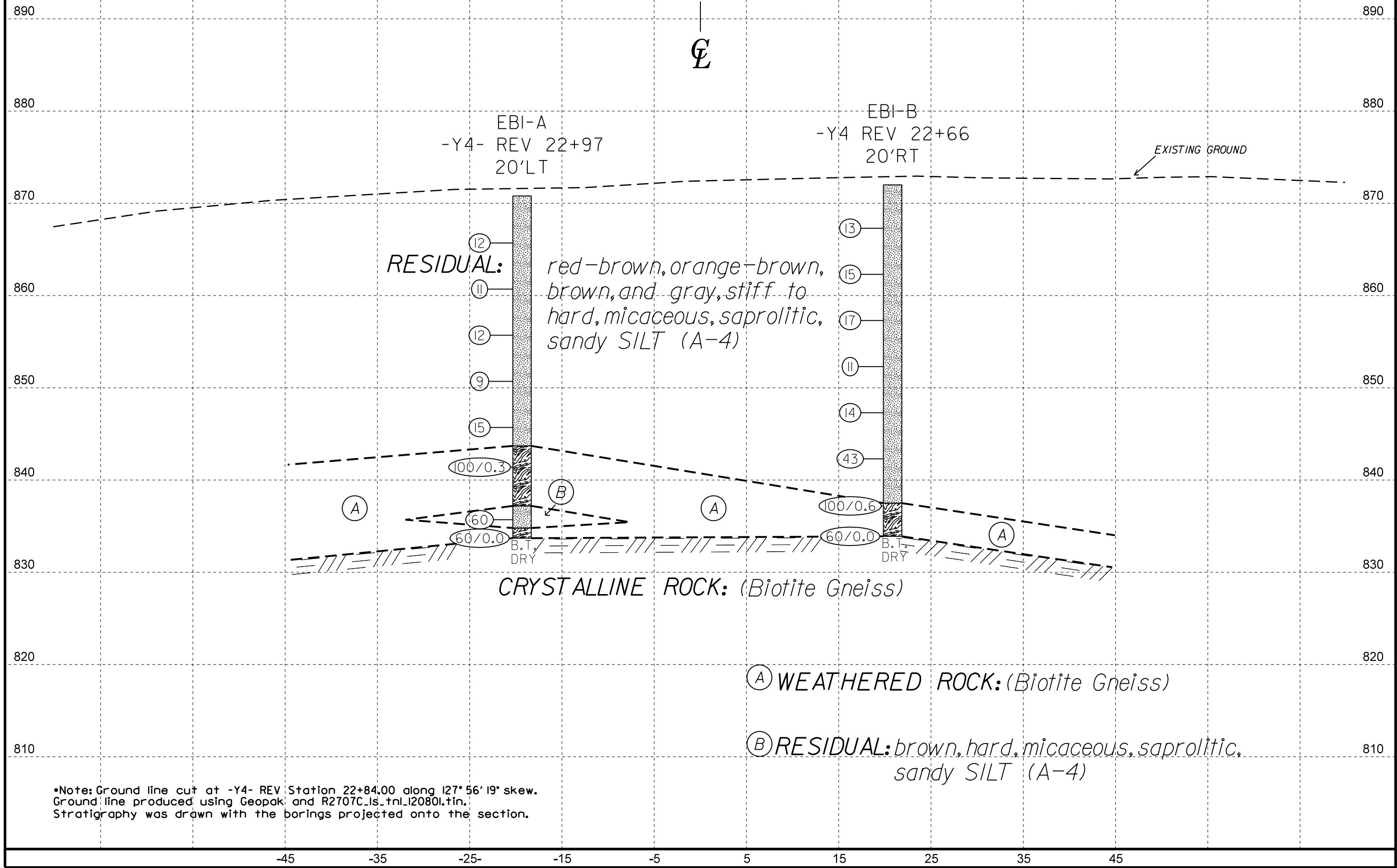
•Note: Borings plotted using Geopak on the r2707c rdy pro Y4.dgn profile with both clipped onto this profile grid sheet.

•Note: Stratigraphy drawn through the borings with both projected onto the -Y4- centerline profile.

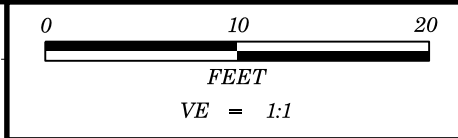
Ⓐ WEATHERED ROCK: (Biotite Gneiss)



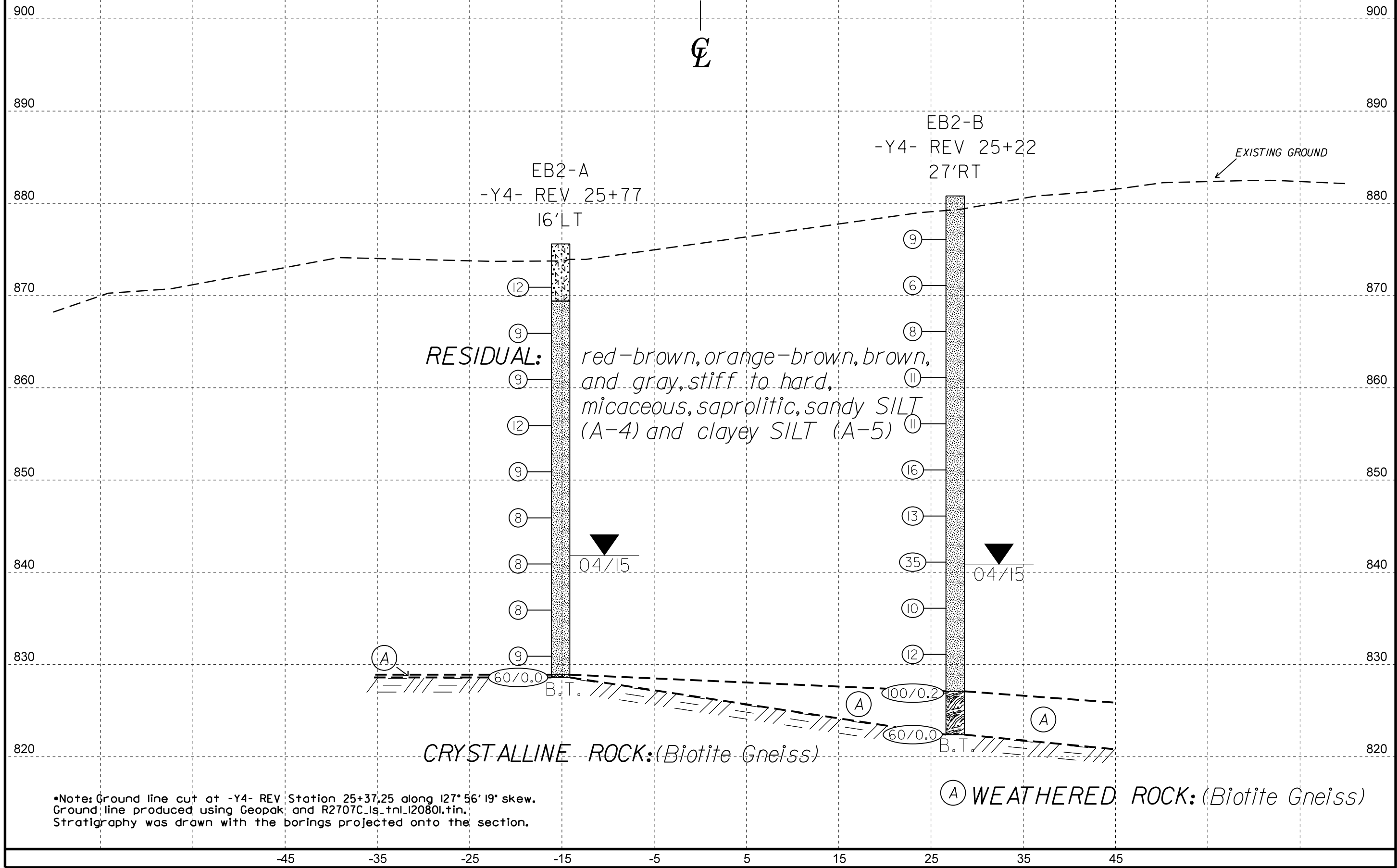
PROJECT REFERENCE NO.	SHEET
R-2707C	5
BRIDGE 470	
END BENT 1 Cross Section	



•Note: Ground line cut at -Y4- REV Station 22+84.00 along 127° 56' 19" skew.
 Ground line produced using Geopak and R2707C_ls_tnl_120801.tin.
 Stratigraphy was drawn with the borings projected onto the section.



PROJECT REFERENCE NO.	SHEET
R-2707C	7
BRIDGE 470	
END BENT 2 Cross Section	



EB2-A
-Y4- REV 25+77
16' LT

RESIDUAL: red-brown, orange-brown, brown, and gray, stiff to hard, micaceous, saprolitic, sandy SILT (A-4) and clayey SILT (A-5)

EB2-B
-Y4- REV 25+22
27' RT

EXISTING GROUND

04/15

04/15

CRYSTALLINE ROCK: (Biotite Gneiss)

(A) WEATHERED ROCK: (Biotite Gneiss)

•Note: Ground line cut at -Y4- REV Station 25+37.25 along 127° 56' 19" skew.
Ground line produced using Geopak and R2707C_Is_tnl_120801.tin.
Stratigraphy was drawn with the borings projected onto the section.

WBS 34497.1.2		TIP R-2707C		COUNTY CLEVELAND		GEOLOGIST Smith, B.											
SITE DESCRIPTION Bridge No. 470 on -Y4- REV (SR 1827) over -L- (US 74 Shelby Bypass)							GROUND WTR (ft)										
BORING NO. B1-A		STATION 24+21		OFFSET 20 ft LT		ALIGNMENT -Y4- REV											
COLLAR ELEV. 874.9 ft		TOTAL DEPTH 53.1 ft		NORTHING 583,203		EASTING 1,245,121											
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER Bare, J.		START DATE 04/07/15		COMP. DATE 04/08/15		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			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
875															874.9	GROUND SURFACE	0.0
870	871.3	3.6	3	3	5								M		868.8	RESIDUAL Red-brown, micaceous, clayey SILT (A-5)	6.1
865	866.3	8.6	2	3	5								M			Brown and orange-brown, saprolitic, micaceous, sandy SILT (A-4)	
860	861.3	13.6	3	3	4								M				
855	856.3	18.6	5	5	7								M				
850	851.3	23.6	4	6	7								M				
845	846.3	28.6	4	4	5								M				
840	841.3	33.6	5	7	6								M				
835	836.3	38.6	36	64/0.4									M		836.3	WEATHERED ROCK (biotite gneiss)	38.6
830	831.3	43.6	3	4	7								Sat.		833.7	RESIDUAL Brown to orange-brown and gray, saprolitic, micaceous, sandy SILT (A-4)	41.2
825	826.3	48.6	15	28	19								Sat.		822.6	WEATHERED ROCK (biotite gneiss)	52.3
	821.8	53.1	60/0.0												821.8	CRYSTALLINE ROCK (biotite gneiss)	53.1
Boring Terminated with Standard Penetration Test Refusal at Elevation 821.8 ft on Crystalline Rock (biotite gneiss) Softer drilling at 41.2' interpreted as residual Harder drilling at 52.3' interpreted as WR Auger refusal at 53.1'																	

NCDOT BORE SINGLE R2707C_GEO_BRDGG470_GINT.GPJ NC_DOT_GDT 4/14/15

WBS 34497.1.2		TIP R-2707C		COUNTY CLEVELAND		GEOLOGIST Smith, B.											
SITE DESCRIPTION Bridge No. 470 on -Y4- REV (SR 1827) over -L- (US 74 Shelby Bypass)							GROUND WTR (ft)										
BORING NO. B1-B		STATION 23+90		OFFSET 20 ft RT		ALIGNMENT -Y4- REV											
COLLAR ELEV. 877.1 ft		TOTAL DEPTH 64.1 ft		NORTHING 583,200		EASTING 1,245,071											
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014			DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic												
DRILLER Bare, J.		START DATE 04/08/15		COMP. DATE 04/08/15		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			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
880															877.1	GROUND SURFACE	0.0
875	874.2	2.9	2	5	7								M		871.7	RESIDUAL Red-brown, clayey SILT (A-5)	5.4
870	869.2	7.9	2	3	5								M			Brown to orange-brown and gray, saprolitic, micaceous, sandy SILT (A-4)	
865	864.2	12.9	4	6	7								M				
860	859.2	17.9	4	6	7								M				
855	854.2	22.9	5	5	7								M				
850	849.2	27.9	4	5	6								M				
845	844.2	32.9	7	14	20								M				
840	839.2	37.9	47	53/0.1									M		839.2	WEATHERED ROCK (biotite gneiss)	37.9
835	834.4	42.7	60/0.0										M		834.4	CRYSTALLINE ROCK (biotite gneiss)	42.7
830																	
825																	
820																	
815																	
Boring Terminated at Elevation 813.0 ft in Crystalline Rock (biotite gneiss)																	

NCDOT BORE SINGLE R2707C_GEO_BRDGG470_GINT.GPJ NC_DOT_GDT 4/14/15

WBS 34497.1.2		TIP R-2707C		COUNTY CLEVELAND		GEOLOGIST Smith, B.						
SITE DESCRIPTION Bridge No. 470 on -Y4- REV (SR 1827) over -L- (US 74 Shelby Bypass)							GROUND WTR (ft)					
BORING NO. B1-B		STATION 23+90		OFFSET 20 ft RT		ALIGNMENT -Y4- REV						
COLLAR ELEV. 877.1 ft		TOTAL DEPTH 64.1 ft		NORTHING 583,200		EASTING 1,245,071						
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014			DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic							
DRILLER Bare, J.		START DATE 04/08/15		COMP. DATE 04/08/15		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2		TOTAL RUN 22.4 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	RQD (ft) %	LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
834.4	834.4	42.7	2.4	N=60/0.0	(1.8)	(0.7)		(21.2)	(12.3)		Begin Coring @ 42.7 ft	42.7
	833.0	44.1	5.0		75%	29%		99%	57%		CRYSTALLINE ROCK Light to dark gray and black with orange-brown satining, v. slightly to slightly weathered, mostly hard, moderately close to close-fractured, biotite gneiss with zones (43.9'- 47.9', 54.1'-55.1', and 58.0'-59.1') of moderate to moderately severe-weathered, soft to medium hard, v. close-fractured weathered rock (biotite gneiss)	
830	832.0	45.1			(5.0)	(0.7)						
	828.0	49.1	5.0		(4.7)	(4.7)						
825	823.0	54.1	5.0		94%	94%						
	818.0	59.1	5.0		(4.8)	(1.9)		96%	38%			
820	818.0	59.1	5.0		(4.9)	(4.3)		98%	86%			
815	813.0	64.1									Boring Terminated at Elevation 813.0 ft in Crystalline Rock (biotite gneiss)	64.1

NCDOT CORE SINGLE R2707C_GEO_BRDG0470_GINT.GPJ NC_DOT.GDT 4/14/15

WBS 34497.1.2		TIP R-2707C		COUNTY CLEVELAND		GEOLOGIST Smith, B.											
SITE DESCRIPTION Bridge No. 470 on -Y4- REV (SR 1827) over -L- (US 74 Shelby Bypass)							GROUND WTR (ft)										
BORING NO. EB2-A		STATION 25+77		OFFSET 16 ft LT		ALIGNMENT -Y4- REV											
COLLAR ELEV. 875.6 ft		TOTAL DEPTH 47.0 ft		NORTHING 583,081		EASTING 1,245,219											
DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER Bare, J.		START DATE 04/07/15		COMP. DATE 04/07/15		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							
880																	
875														875.6	GROUND SURFACE	0.0	
870	871.9	3.7	3	6	6								M	869.4	RESIDUAL Red-orange, micaceous, silty CLAY (A-7-5) w/ some sand	6.2	
865	866.9	8.7	2	3	6								M		Brown to orange-brown and gray, saprolitic, micaceous, sandy SILT (A-4)		
860	861.9	13.7	2	4	5								M				
855	856.9	18.7	5	4	8								D				
850	851.9	23.7	4	4	5								M				
845	846.9	28.7	2	4	4								M				
840	841.9	33.7	3	3	5								W				
835	836.9	38.7	3	3	5								W				
830	831.9	43.7	2	3	6								W				
	828.6	47.0	60/0.0												828.9	WEATHERED ROCK (biotite gneiss)	46.7
														828.6	CRYSTALLINE ROCK (biotite gneiss)	47.0	

NCDOT BORE SINGLE R2707C_GEO_BRDG0470_GINT.GPJ NC_DOT.GDT 4/14/15

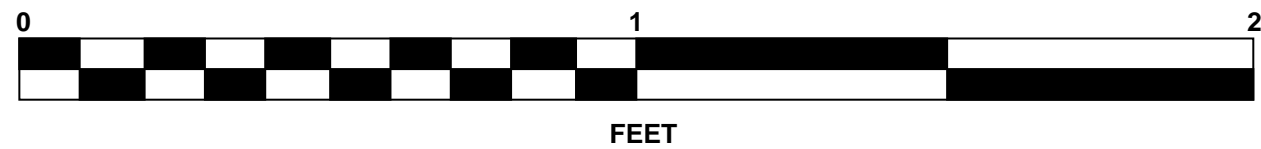
Boring Terminated with Standard Penetration Test Refusal at Elevation 828.6 ft on Crystalline Rock (biotite gneiss)

Driller indicates harder drilling (WR) at 46.7 ft. Auger refusal at 47.0 ft.

CORE PHOTOGRAPHS

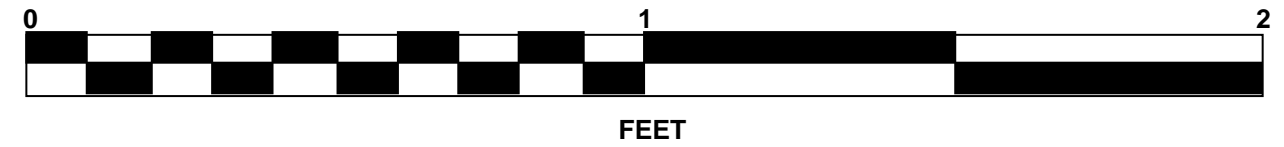
B1-B

BOX 1&2 of 3: 42.7 - 60.9 FEET



B1-B

BOX 3 of 3: 60.9 - 64.1 FEET



SITE PHOTOGRAPHS

Bridge No. 470 on -Y4- REV (SR 1827) over -L- (US 74 Shelby Bypass)



Standing at EB1-A looking upstation (southeast) towards EB2-A



Standing at EB2-B looking downstation (northwest) towards EB1-B