

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	40097.1.1 (B-4973)	1	13

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 40097.1.1 (B-4973) F.A. PROJ. BRSTP-1157(5)  
COUNTY CABARRUS  
PROJECT DESCRIPTION BRIDGE #271 OVER IRISH BUFFALO CREEK  
ON SR 1157 BETWEEN SR 1007 AND US 601

SITE DESCRIPTION \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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**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) 250-4088. 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.

**PROJECT: 40097.1.1 ID: B-4973**

PERSONNEL

J. K. STICKNEY

C. L. SMITH

J. E. ESTEP

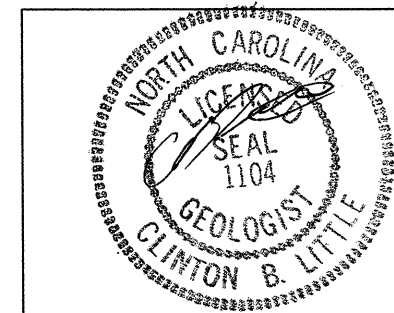
M. R. MOORE

INVESTIGATED BY J. E. BEVERLY

CHECKED BY C. B. LITTLE

SUBMITTED BY C. B. LITTLE

DATE OCTOBER 2012



DRAWN BY: C. E. BURRIS

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.

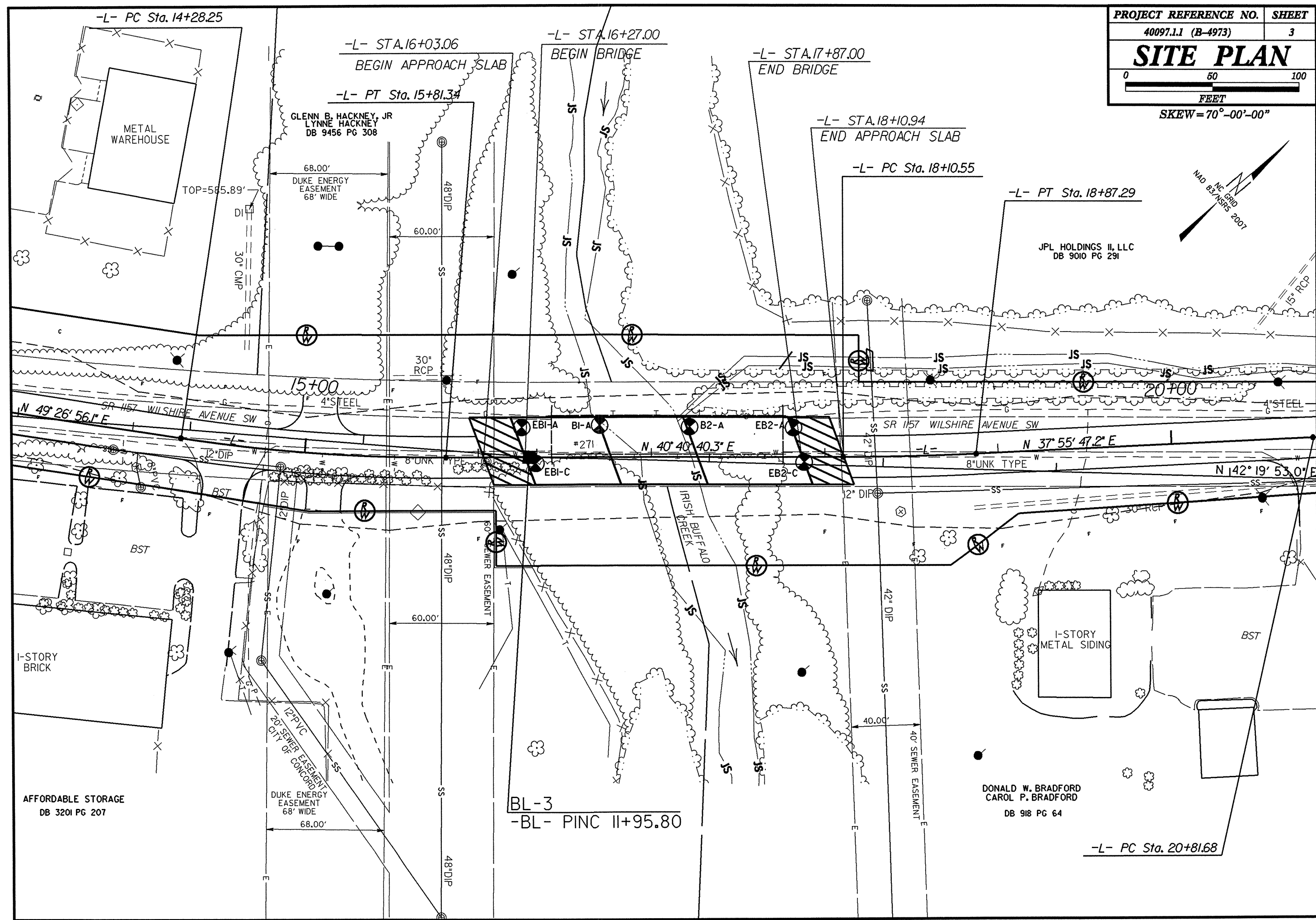
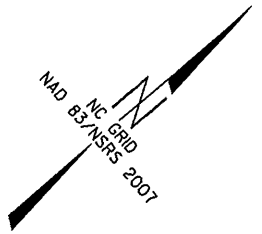
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO.  
40097.11 (B-4973) SHEET NO.  
2

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 T208, 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, HIGH PLASTIC, A-7-6</i>		WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) DAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.  THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.		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:  WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.  CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.  NON-CRYSTALLINE ROCK (NCR)  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.  COASTAL PLAIN SEDIMENTARY ROCK (CP)  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.		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, 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 (ICALC.) - 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 - A 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 INTRODUCED 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 (SCREC.) - 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		MINERALOGICAL COMPOSITION		WEATHERING		ROCK HARDNESS																			
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS		MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SL.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SL.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL. SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, YIELDS SPT N VALUES > 100 BPF. 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. IF TESTED, YIELDS 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.		COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 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		GROUND WATER WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP  MISCELLANEOUS SYMBOLS ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD TEST BORING WITH CORE TEST BORING W/ CORE AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST		CONSISTENCY OR DENSENESS PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/F <sup>2</sup> ) GENERAL GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE 4 TO 10 LOOSE 10 TO 30 MEDIUM DENSE 30 TO 50 DENSE VERY DENSE >50 GENERAL SILT-CLAY MATERIAL (COHESIVE) VERY SOFT 2 TO 4 SOFT 4 TO 8 MEDIUM STIFF 8 TO 15 STIFF 15 TO 30 VERY STIFF HARD >30		TEXTURE OR GRAIN SIZE 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		SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE 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		ABBREVIATIONS AR - AUGER REFUSAL MED. - MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA - MICACEOUS WE - WEATHERED CL - CLAY MOD. - MODERATELY WEA - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC W <sub>d</sub> - DRY UNIT WEIGHT CSE - COARSE ORG. - ORGANIC SAMPLE ABBREVIATIONS DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST S - BULK DPT - DYNAMIC PENETRATION TEST SAP - SAPROLITIC SS - SPLIT SPOON F - FINE SD. - SAND, SANDY ST - SHELBY TUBE FOSS - FOSSILIFEROUS SLI - SLIGHTLY RS - ROCK FRAC. - FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS. - FRAGMENTS MO - MOISTURE CONTENT V - VERY RATIO HL - HIGHLY		EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: MOBILE B- 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 * TUNG-CARB. CORE BIT HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B N H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST		FRACTURE SPACING 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  BEDDING 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		INDURATION 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.		BENCH MARK: BL-3 STA. 16+29.24 0.15 LT -L- N 599076.0420 E 1529228.8780 STA. 11+95.8 -BL- ELEVATION: 581.7 FT. NOTES: STRATIGRAPHY SHOWN THROUGH BORINGS	
PLASTICITY NONPLASTIC PLASTICITY INDEX (PI) DRY STRENGTH 0-5 VERY LOW 6-15 SLIGHT 16-25 MEDIUM 26 OR MORE HIGH		COLOR DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.																							



-L- PC Sta. 14+28.25

-L- STA. 16+03.06  
BEGIN APPROACH SLAB

-L- STA. 16+27.00  
BEGIN BRIDGE

-L- STA. 17+87.00  
END BRIDGE

-L- STA. 18+10.94  
END APPROACH SLAB

-L- PC Sta. 18+10.55

-L- PT Sta. 18+87.29

-L- PC Sta. 20+81.68

METAL WAREHOUSE

GLENN B. HACKNEY, JR  
LYNNE HACKNEY  
DB 9456 PG 308

JPL HOLDINGS II, LLC  
DB 9010 PG 291

DONALD W. BRADFORD  
CAROL P. BRADFORD  
DB 918 PG 64

AFFORDABLE STORAGE  
DB 3201 PG 207

DUKE ENERGY  
EASEMENT  
68' WIDE

BL-3  
-BL- PINC 11+95.80

SR 1157 WILSHIRE AVENUE SW  
N 49° 26' 56.1" E

SR 1157 WILSHIRE AVENUE SW

N 37° 55' 47.2" E

N 40° 40' 40.3" E

N 142° 19' 53.0" E

BST

1-STORY BRICK

1-STORY METAL SIDING

BST

20' SEWER EASEMENT  
CITY OF CONCORD

60' SEWER EASEMENT

40' SEWER EASEMENT

IRISH BUFFALO  
IRISH CREEK

TOP=585.89'

DI

30' CMP

68.00'

DUKE ENERGY  
EASEMENT  
68' WIDE

48" DIP

60.00'

SS

30' RCP

15+00

4" STEEL

8" UNK

SS

48" DIP

60.00'

SS

48" DIP

SS

48" DIP

42" DIP

SS

40.00'

SS

42" DIP

20+00

4" STEEL

12" DIP

SS

30' RCP

SS

SS

SS

SS

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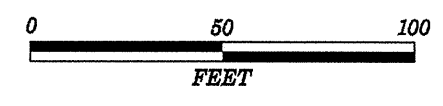
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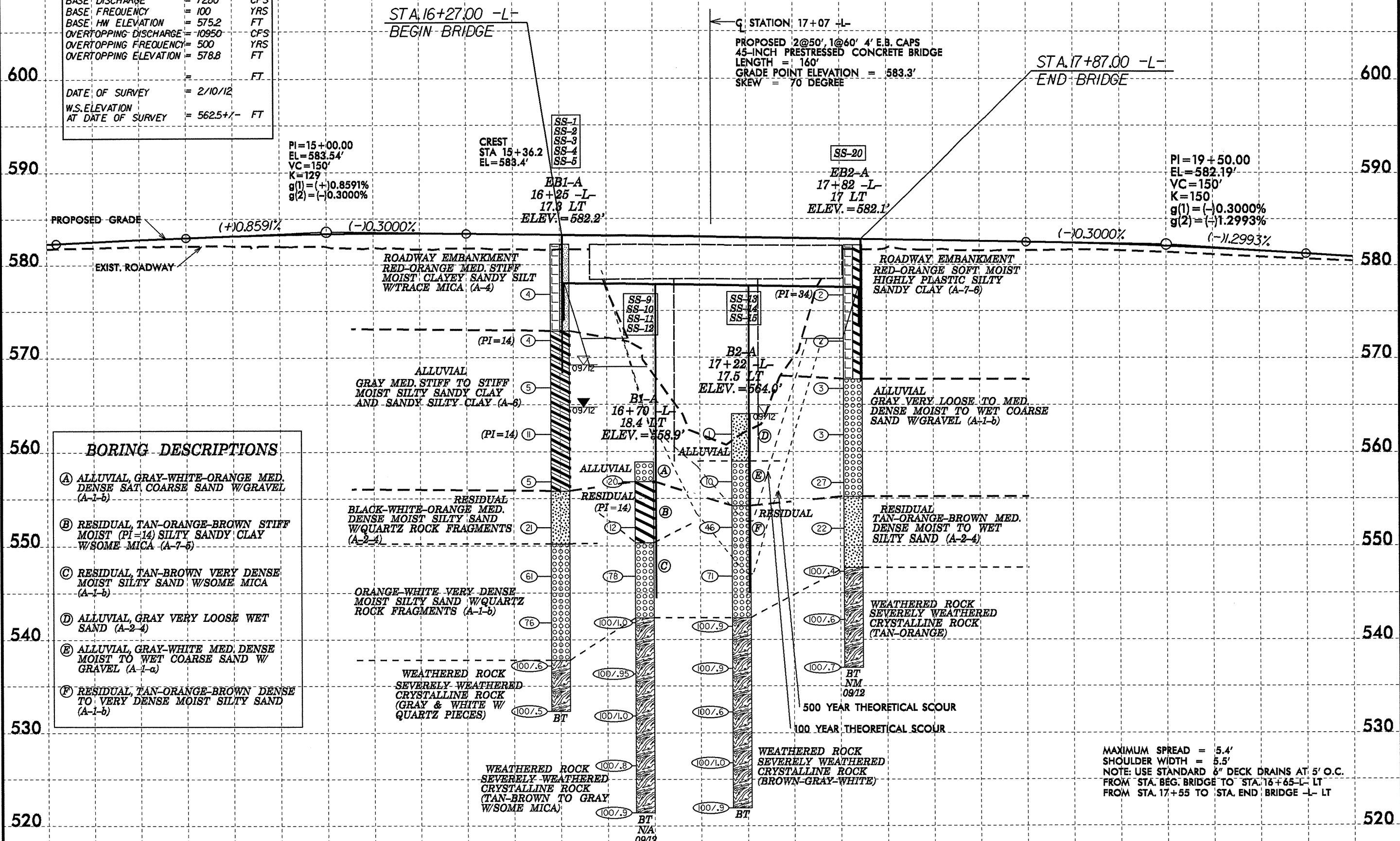
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**BRIDGE HYDRAULIC DATA**

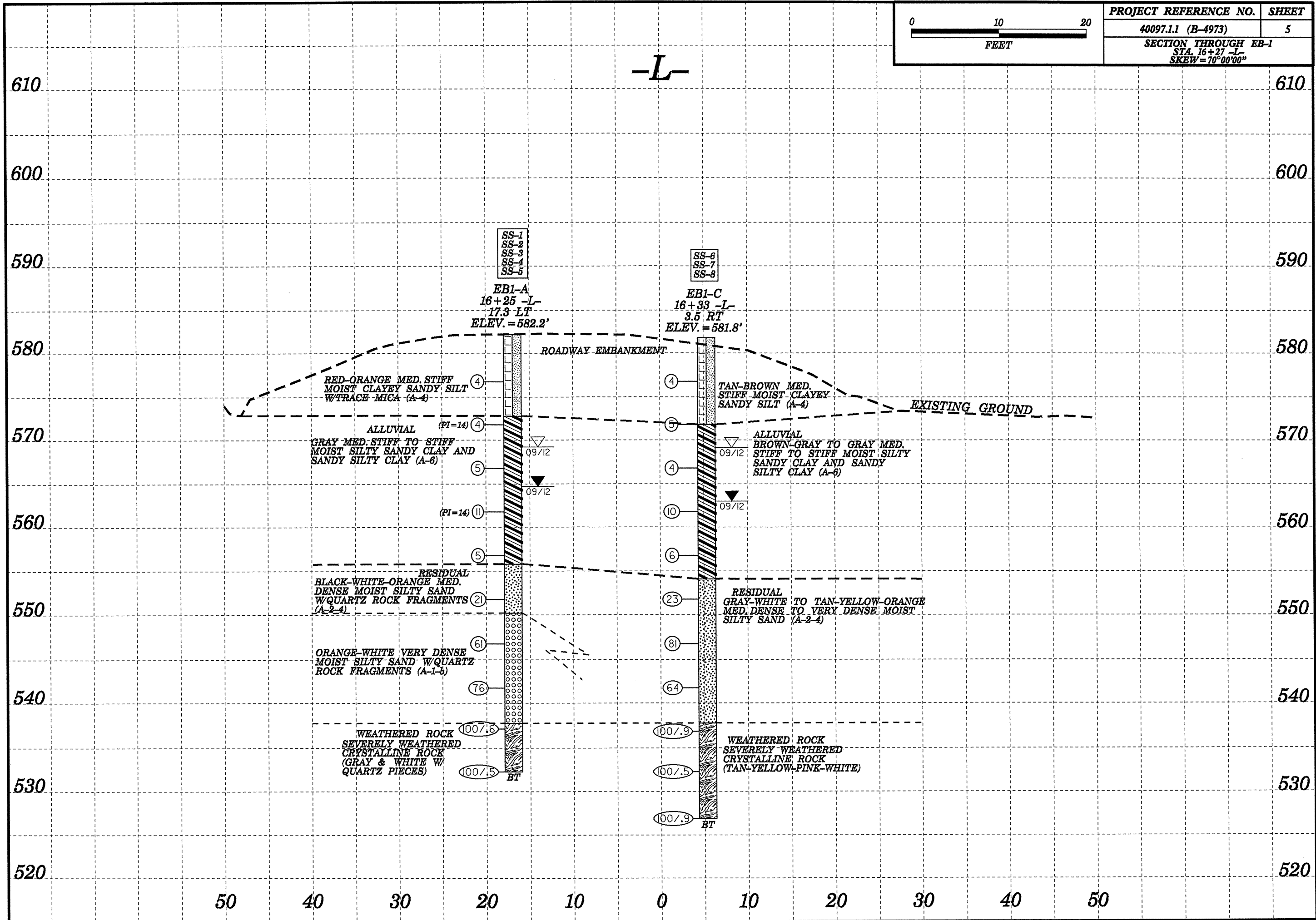
DESIGN DISCHARGE	= 5630	CFS
DESIGN FREQUENCY	= 25	YRS
DESIGN HW ELEVATION	= 574.1	FT
BASE DISCHARGE	= 7280	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 575.2	FT
OVERTOPPING DISCHARGE	= 10950	CFS
OVERTOPPING FREQUENCY	= 500	YRS
OVERTOPPING ELEVATION	= 578.8	FT
DATE OF SURVEY	= 2/10/12	
W.S. ELEVATION AT DATE OF SURVEY	= 562.5 +/-	FT

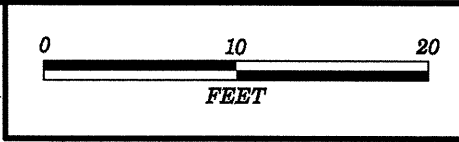


**BORING DESCRIPTIONS**

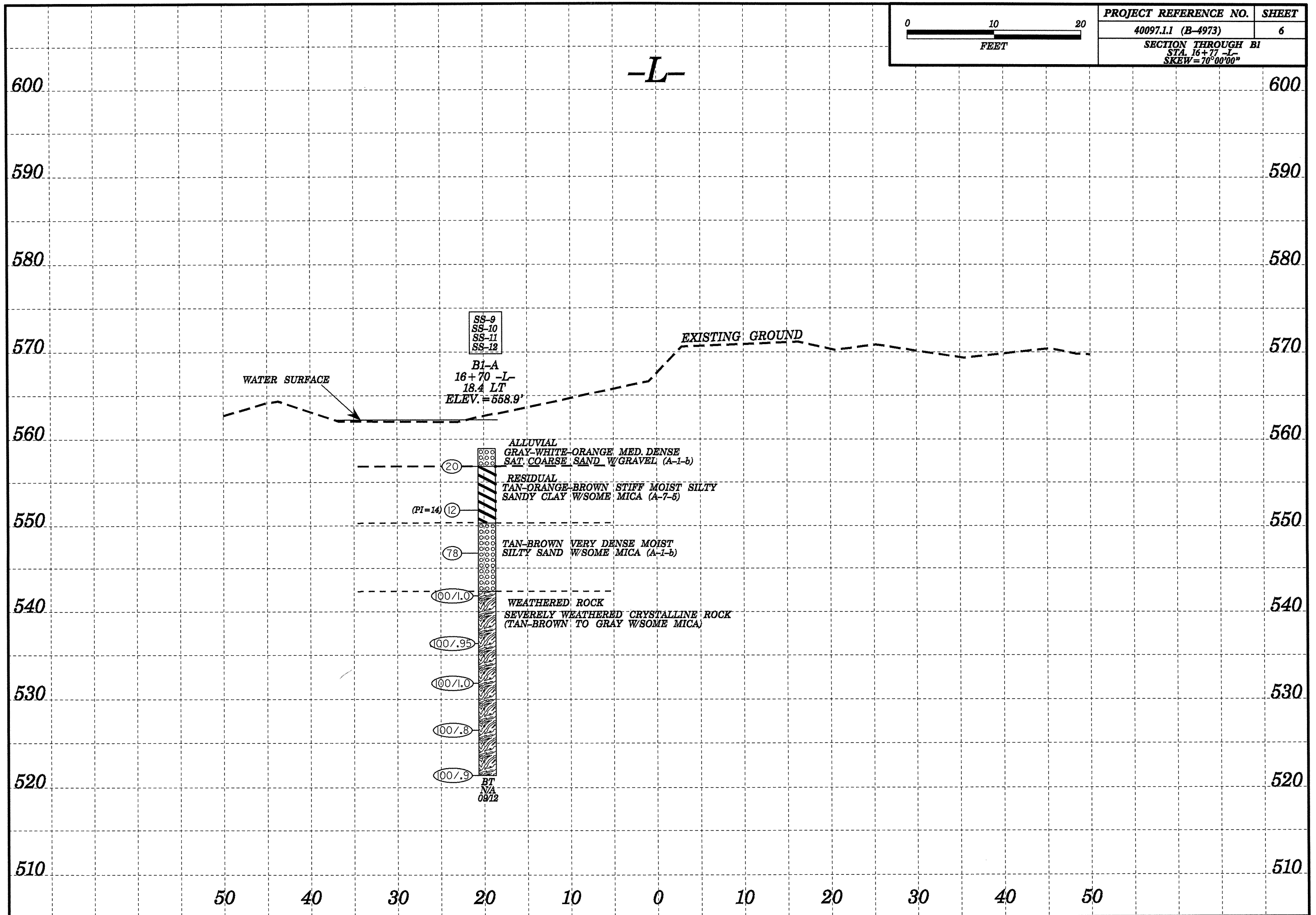
- (A) ALLUVIAL, GRAY-WHITE-ORANGE MED. DENSE SAT COARSE SAND W/GRAVEL (A-1-b)
- (B) RESIDUAL, TAN-ORANGE-BROWN STIFF MOIST (PI=14) SILTY SANDY CLAY W/SOME MICA (A-7-6)
- (C) RESIDUAL, TAN-BROWN VERY DENSE MOIST SILTY SAND W/SOME MICA (A-1-b)
- (D) ALLUVIAL, GRAY VERY LOOSE WET SAND (A-2-4)
- (E) ALLUVIAL, GRAY-WHITE MED. DENSE MOIST TO WET COARSE SAND W/GRAVEL (A-1-a)
- (F) RESIDUAL, TAN-ORANGE-BROWN DENSE TO VERY DENSE MOIST SILTY SAND (A-1-b)

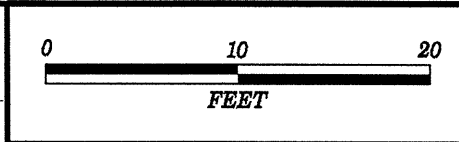
MAXIMUM SPREAD = 5.4'  
 SHOULDER WIDTH = 5.5'  
 NOTE: USE STANDARD 6" DECK DRAINS AT 5' O.C.  
 FROM STA. BEG. BRIDGE TO STA. 16+65 -L- LT  
 FROM STA. 17+55 TO STA. END BRIDGE -L- LT



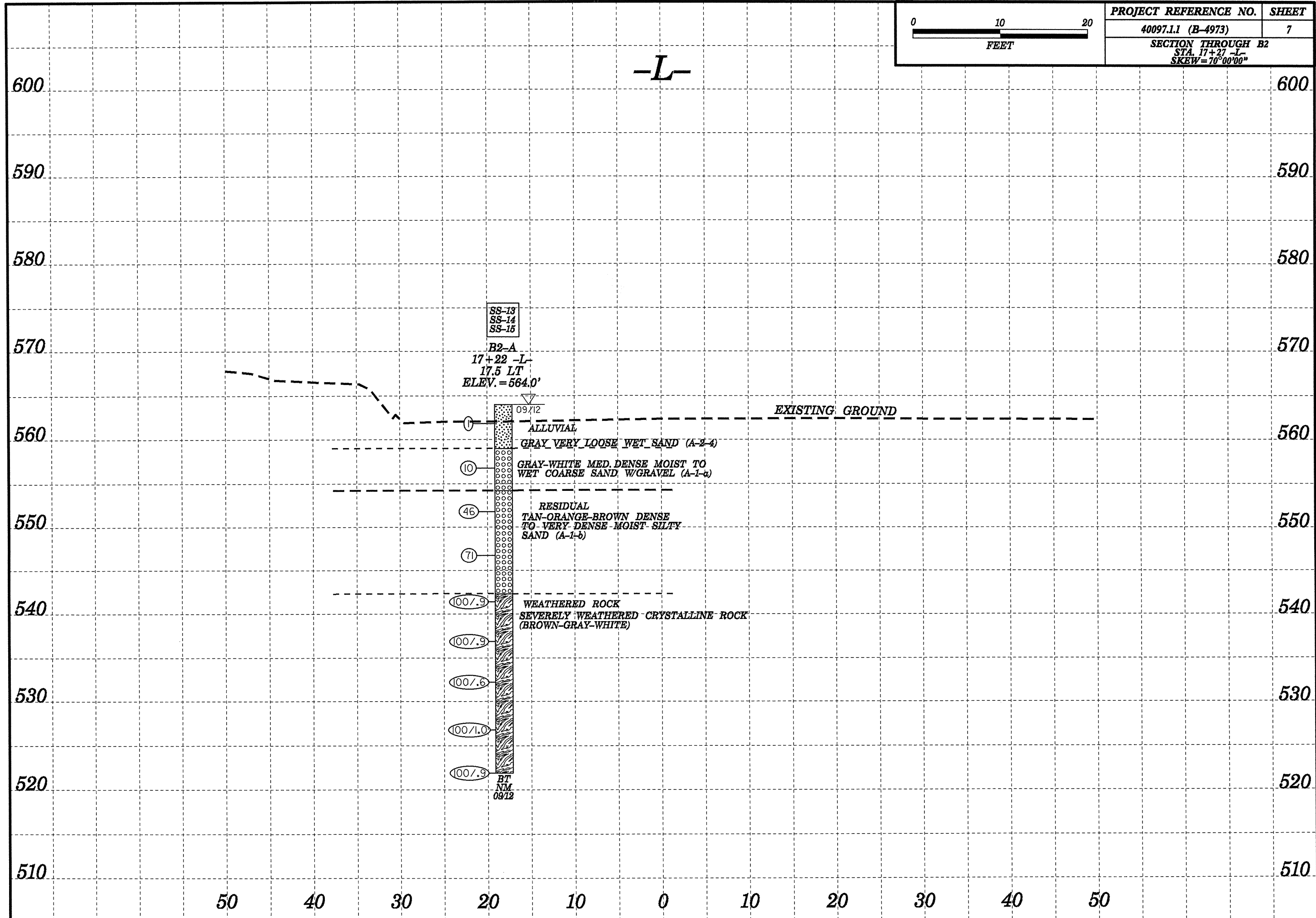


PROJECT REFERENCE NO.	SHEET
40097.1.1 (B-4973)	6
SECTION THROUGH BI	
STA. 16+77 -L	
SKEW = 70°00'00"	





PROJECT REFERENCE NO.	SHEET
40097.1.1 (B-4973)	7
SECTION THROUGH B2 STA. 17+27 -L- SKEW=70°00'00"	



SS-13  
SS-14  
SS-15

B2-A  
17+22 -L-  
17.5 LT  
ELEV. = 564.0'

09/12

0

10

46

71

100/.9

100/.9

100/.6

100/1.0

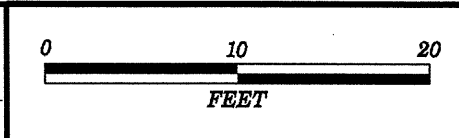
100/.9

BT  
NM  
09/12

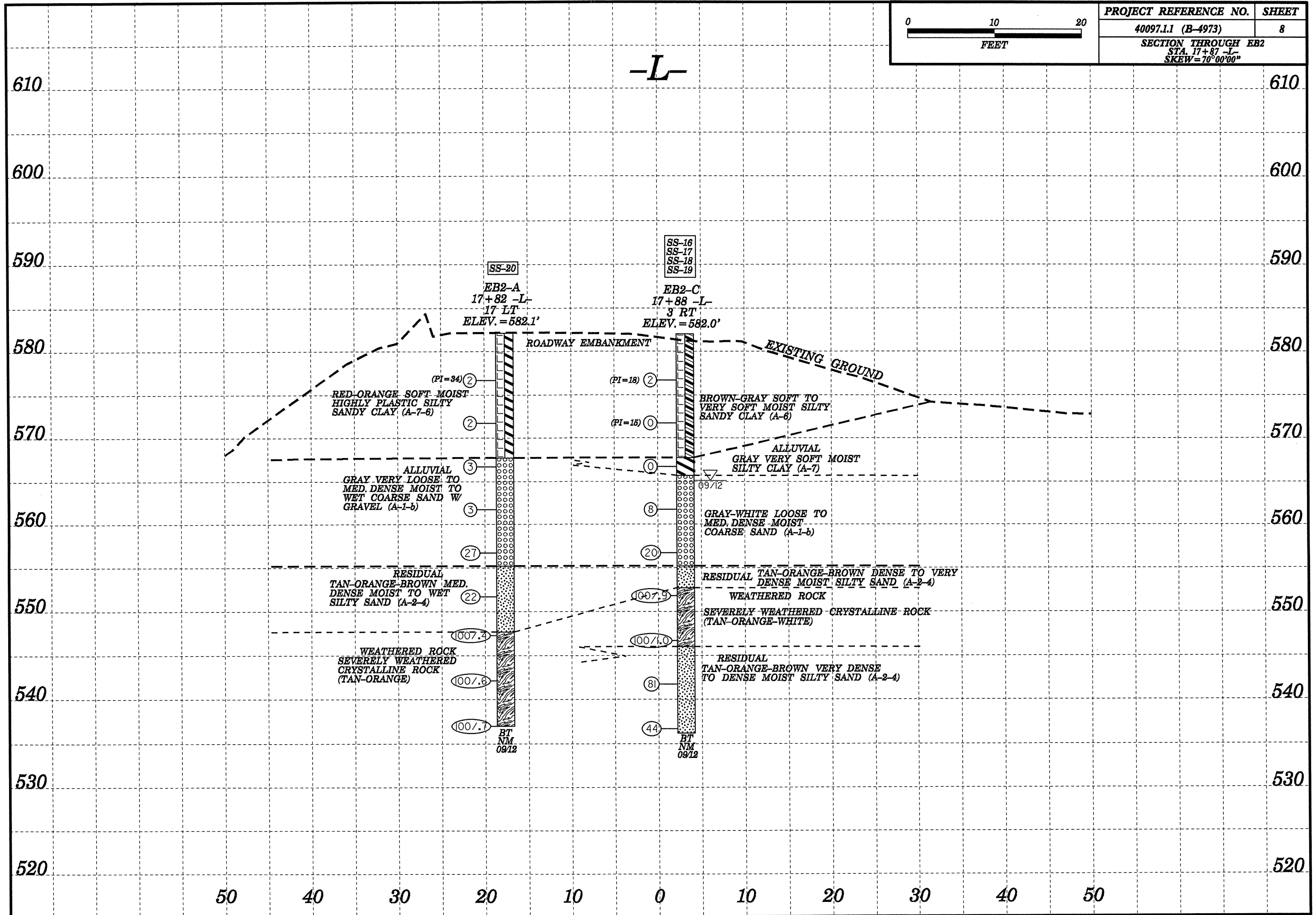
600  
590  
580  
570  
560  
550  
540  
530  
520  
510

600  
590  
580  
570  
560  
550  
540  
530  
520  
510

50 40 30 20 10 0 10 20 30 40 50



PROJECT REFERENCE NO.	SHEET
40097.1.1 (B-4973)	8
SECTION THROUGH EB2 STA. 17+87 -L- SKEW = 70° 00' 00"	





WBS 40097.1.1		TIP B-4973		COUNTY CABARRUS		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION Bridge #271 over Irish Buffalo Creek on SR 1157 between SR 1007 and US 601						GROUND WTR (ft)										
BORING NO. EB1-A		STATION 16+25		OFFSET 17 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 582.2 ft		TOTAL DEPTH 49.9 ft		NORTHING 599,084		EASTING 1,529,213										
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic												
DRILLER Smith, C. L.		START DATE 09/14/12		COMP. DATE 09/14/12		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						
585														582.2	0.0	GROUND SURFACE
580	577.8	4.4	1	2	2							SS-1	M	ROADWAY EMBANKMENT RED-ORANGE MED. STIFF MOIST CLAYEY SANDY SILT W/ TRACE MICA (A-4)		
575	572.8	9.4	0	2	2							SS-2	M	ALLUVIAL GRAY MED. STIFF TO STIFF MOIST (PI=14) SILTY SANDY CLAY AND SANDY SILTY CLAY (A-6)	9.4	
570	567.8	14.4	0	2	3							M				
565	562.8	19.4	2	4	7							SS-3	M			
560	557.8	24.4	2	2	3							M				
555	552.8	29.4	4	7	14							SS-4	M	RESIDUAL BLACK-WHITE-ORANGE MED. DENSE MOIST SILTY SAND W/ QUARTZ ROCK FRAGMENTS (A-2-4)	26.4	
550	547.8	34.4	19	25	36							SS-5	M	RESIDUAL ORANGE-WHITE VERY DENSE MOIST SILTY SAND W/ QUARTZ ROCK FRAGMENTS (A-1-b)	32.0	
545	542.8	39.4	18	28	48							M				
540	537.8	44.4	76	24/1								M				
535	532.8	49.4	89	11/0								M		WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK (GRAY & WHITE W/ QUARTZ PIECES)	44.4	
														532.3	49.9	Boring Terminated at Elevation 532.3 ft in severely weathered crystalline rock

NCDOT BORE SINGLE B4973\_GEO\_BH\_BRD0271\_CABARRUS.GPJ NC\_DOT\_GDT\_10/24/12

WBS 40097.1.1		TIP B-4973		COUNTY CABARRUS		GEOLOGIST Stickney, J. K.										
SITE DESCRIPTION Bridge #271 over Irish Buffalo Creek on SR 1157 between SR 1007 and US 601						GROUND WTR (ft)										
BORING NO. EB1-C		STATION 16+33		OFFSET 4 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 581.8 ft		TOTAL DEPTH 54.9 ft		NORTHING 599,077		EASTING 1,529,234										
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 89% 09/02/2009		DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic												
DRILLER Smith, C. L.		START DATE 09/15/12		COMP. DATE 09/15/12		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						
585														581.8	0.0	GROUND SURFACE
580	577.8	4.0	3	2	2							SS-6	M	ROADWAY EMBANKMENT TAN-BROWN MED. STIFF MOIST CLAYEY SANDY SILT (A-4)		
575	572.8	9.0	1	2	3							M		ALLUVIAL BROWN-GRAY TO GRAY MED. STIFF TO STIFF MOIST SILTY SANDY CLAY AND SANDY SILTY CLAY (A-6)	10.0	
570	567.8	14.0	1	2	2							M				
565	562.8	19.0	3	5	5							M				
560	557.8	24.0	2	3	3							M				
555	552.8	29.0	7	11	12							SS-7	M	RESIDUAL GRAY-WHITE TO TAN-YELLOW-ORANGE MED. DENSE TO VERY DENSE MOIST SILTY SAND (A-2-4)	27.7	
550	547.8	34.0	22	33	48							SS-8	M			
545	542.8	39.0	25	27	37							M				
540	537.8	44.0	45	55/4								M				
535	532.8	49.0	84	16/0								M		WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK (TAN-YELLOW-PINK-WHITE)	44.0	
530	527.8	54.0	63	37/4								M				
														526.9	54.9	Boring Terminated at Elevation 526.9 ft in severely weathered crystalline rock

NCDOT BORE SINGLE B4973\_GEO\_BH\_BRD0271\_CABARRUS.GPJ NC\_DOT\_GDT\_10/24/12





TEST RESULTS

PROJECT: 40097.1.1 (B-4973)

COUNTY: CABARRUS

SITE DESCRIPTION: BRIDGE NO. 271 OVER IRISH BUFFALO CREEK ON SR 1157 BETWEEN SR 1007 AND US 601

SHEET

12

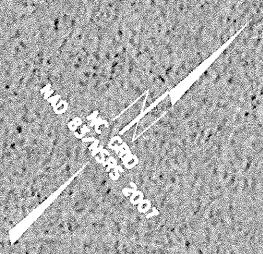
SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
								C. SAND	F. SAND	SILT	CLAY	10	40	200				
<b>EB1-A</b>																		
SS-1	17.3 LT	16+25 -L-	4.9-5.9	-	4	-	-	31.2	24.5	19.9	24.3	98	76	49				
SS-2	17.3 LT	16+25 -L-	9.9-10.9	A-6(7)	4	33	14	20.3	19.5	29.8	30.4	100	86	65				
SS-3	17.3 LT	16+25 -L-	19.9-20.9	A-6(9)	11	36	14	6.5	29.6	39.6	24.3	99	95	72				
SS-4	17.3 LT	16+25 -L-	29.9-30.9	A-2-4(0)	21	30	NP	29.6	43.2	21.1	6.1	95	79	34				
SS-5	17.3 LT	16+25 -L-	34.9-35.9	A-1-b(0)	61	26	NP	51.7	27.2	15.0	6.1	77	47	20				
<b>EB1-C</b>																		
SS-6	3.5 RT	16+33 -L-	4.5-5.5	A-4(0)	4	36	8	35.5	26.4	23.9	14.2	91	67	39				
SS-7	3.5 RT	16+33 -L-	29.5-30.5	A-2-4(0)	23	28	NP	47.7	31.0	17.2	4.1	89	57	24				
SS-8	3.5 RT	16+33 -L-	34.5-35.5	A-2-4(0)	81	26	NP	53.4	28.4	14.1	4.1	86	51	19				
<b>B1-A</b>																		
SS-9	18.4 LT	16+70 -L-	1.1-2.1	A-1-b(0)	20	21	NP	74.0	17.4	8.5	0.0	52	21	6				
SS-10	18.4 LT	16+70 -L-	6.6-7.6	A-7-5(9)	12	46	14	5.7	43.6	42.6	8.1	100	97	64				
SS-11	18.4 LT	16+70 -L-	11.6-12.6	A-1-b(0)	78	27	NP	54.8	27.8	15.4	2.0	72	42	16				
SS-12	18.4 LT	16+70 -L-	26.6-27.6	A-4(0)	100	30	NP	7.1	59.8	29.0	4.1	100	99	44				
<b>B2-A</b>																		
SS-13	17.5 LT	17+22 -L-	1.7-2.7	A-2-4(0)	1	26	NP	48.3	38.3	9.3	4.1	93	70	15		3.7		
SS-14	17.5 LT	17+22 -L-	6.7-7.7	A-1-a(0)	10	22	NP	71.2	21.2	6.6	1.0	48	20	5				
SS-15	17.5 LT	17+22 -L-	11.7-12.7	A-1-b(0)	46	28	NP	62.3	21.5	14.2	2.0	79	39	16				
<b>EB2-A</b>																		
SS-20	17.0 LT	17+82 -L-	4.9-5.9	A-7-6(15)	2	55	34	25.4	19.7	16.4	38.5	94	79	54				
<b>EB2-C</b>																		
SS-16	3.0 RT	17+88 -L-	4.8-5.8	A-6(5)	2	34	18	32.5	22.3	16.8	28.4	96	76	47				
SS-17	3.0 RT	17+88 -L-	9.8-10.8	A-6(6)	0	36	15	23.5	22.9	25.2	28.4	98	84	57				
SS-18	3.0 RT	17+88 -L-	19.8-20.8	A-1-b(0)	8	25	NP	75.9	19.2	5.0	0.0	95	43	7				
SS-19	3.0 RT	17+88 -L-	39.8-40.8	A-2-4(0)	81	32	8	50.9	22.9	20.1	6.1	76	46	23				

# AERIAL PHOTO



SKEW = 70°-00'-00"



-L- PC Sta. 14+28.25

-L- STA. 16+03.06  
BEGIN APPROACH SLAB

-L- STA. 16+27.00  
BEGIN BRIDGE

-L- STA. 17+87.00  
END BRIDGE

-L- STA. 18+10.94  
END APPROACH SLAB

-L- PC Sta. 18+10.55

-L- PT Sta. 18+87.29

15+00

20+00

N 49° 28' 56" E

EB1-A BI-A EB2-A EB2-B

N 40° 40' 40.3" E

N 37° 55' 47.2" E

N 142° 19' 53.07" E

EB1-C

EB2-C

FRESH CREEK  
SIDE FALD

BL-3  
-BL- PINC 11+95.80

-L- PC Sta. 20+81.68