



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

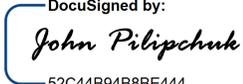
ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

November 5, 2018

MEMORANDUM TO: Brian Hanks, P.E.
State Structures Engineer

ATTENTION: Kristy Alford, P.E.
Project Engineer

FROM:  John L. Pilipchuk, L.G., P.E.
State Geotechnical Engineer 
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STATE PROJECT: 50118.1.FS1 (I-5700)
COUNTY: WAKE

DESCRIPTION: Bridge No. 1499 on SR 3015 (Airport Blvd.) and Replace Bridge
No. 37 on SR 3015 (Airport Blvd.) over I-40

SUBJECT: Structure Inventory

The Geotechnical Engineering Unit has reviewed and presents the subsurface investigation recommendations prepared by Kleinfelder Inc. for the above referenced project.

Structure Inventory (19) pages

Please call Jaime Love, LG or Neil Roberson, LG at (919) 662-4710x227 if there are any questions concerning this memorandum.

Attachment

REFERENCE: I-5700

PROJECT: 50118

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY WAKE
PROJECT DESCRIPTION I-40 AND SR 3015 (AIRPORT BOULEVARD) REVISE INTERCHANGE AND CONSTRUCT AUXILIARY LANE ON I-40 WESTBOUND FROM SR 3015 (AIRPORT BOULEVARD) TO I-540
SITE DESCRIPTION BRIDGE ON AIRPORT BOULEVARD OVER I-40

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4	PROFILE
5-7	CROSS SECTIONS
8-17	BORE LOGS, CORE REPORTS AND CORE PHOTOGRAPHS
18	ROCK CORE TEST RESULTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5700	1	18

CAUTION NOTICE

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

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

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

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

PERSONNEL

C. DRISCOLL

TRIGON EXPLORATION

INVESTIGATED BY C. DRISCOLL

DRAWN BY S. PAPKE

CHECKED BY T. WELLS

SUBMITTED BY KLEINFELDER, INC.

DATE OCTOBER 2018

Prepared in the Office of:




DocuSigned by:
Thomas Wells 11/6/2018
7DA6D2D0618F480 SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL
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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 (AASHTO T 208, 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*

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)							ORGANIC MATERIALS		
	A-1	A-1-b	A-1-c	A-2	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7	
GROUP CLASS.	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7					A-1, A-2	A-3	A-4, A-5	A-6, A-7		
SYMBOL																	
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX		40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN		
MATERIAL PASSING #40 LL PI	-	-		40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN		
GROUP INDEX	0	0		0	4 MX	8 MX	12 MX	16 MX	NO MX								
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND	FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS	CLAYEY SOILS											
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR	POOR	UNSATURABLE						

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)
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 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

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 (CS, SD.)						
FINE SAND (F SD.)						
SILT (SL.)						
CLAY (CL.)						
GRAIN SIZE	305	75	2.0	0.25	0.05	0.005
MM						
IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL	LIQUID LIMIT	
PL	PLASTIC LIMIT	
OM	OPTIMUM MOISTURE SHRINKAGE LIMIT	
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
	- 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

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	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.

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

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
- 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

RECOMMENDATION SYMBOLS

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

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
- 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_u - UNIT WEIGHT
- γ_d - DRY UNIT WEIGHT
- S - BULK
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RS - ROCK
- RT - RECOMPACTED TRIAXIAL
- CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

- DRILL UNITS:
 - CME-45C
 - CME-55
 - CME-550
 - VANE SHEAR TEST
 - 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 -H
 - N Q2
- HAND TOOLS:
 - POST HOLE DIGGER
 - HAND AUGER
 - SOUNDING ROD
 - VANE SHEAR TEST

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)
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.

WEATHERING

- 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, WOULD YIELD SPT N VALUES > 100 BPF*
- VERY SEVERE (V SEV.)** ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *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. FABRIC MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

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 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 PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
- SOFT** CAN BE GROOVED 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.

FRACTURE SPACING

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

INDURATION

- FRIBLE** 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.

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 DISLOADED 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 (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
- 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 (SROD)** - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
- TOPSOIL (TS.)** - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: N/A

ELEVATION: N/A FEET

NOTES:

BORING ELEVATIONS OBTAINED FROM PROJECT TIN FILE 157000_LS_DTM_180126.TIN, RECEIVED ON APRIL 2, 2018

FIAD- FILLED IMMEDIATELY AFTER DRILLING

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

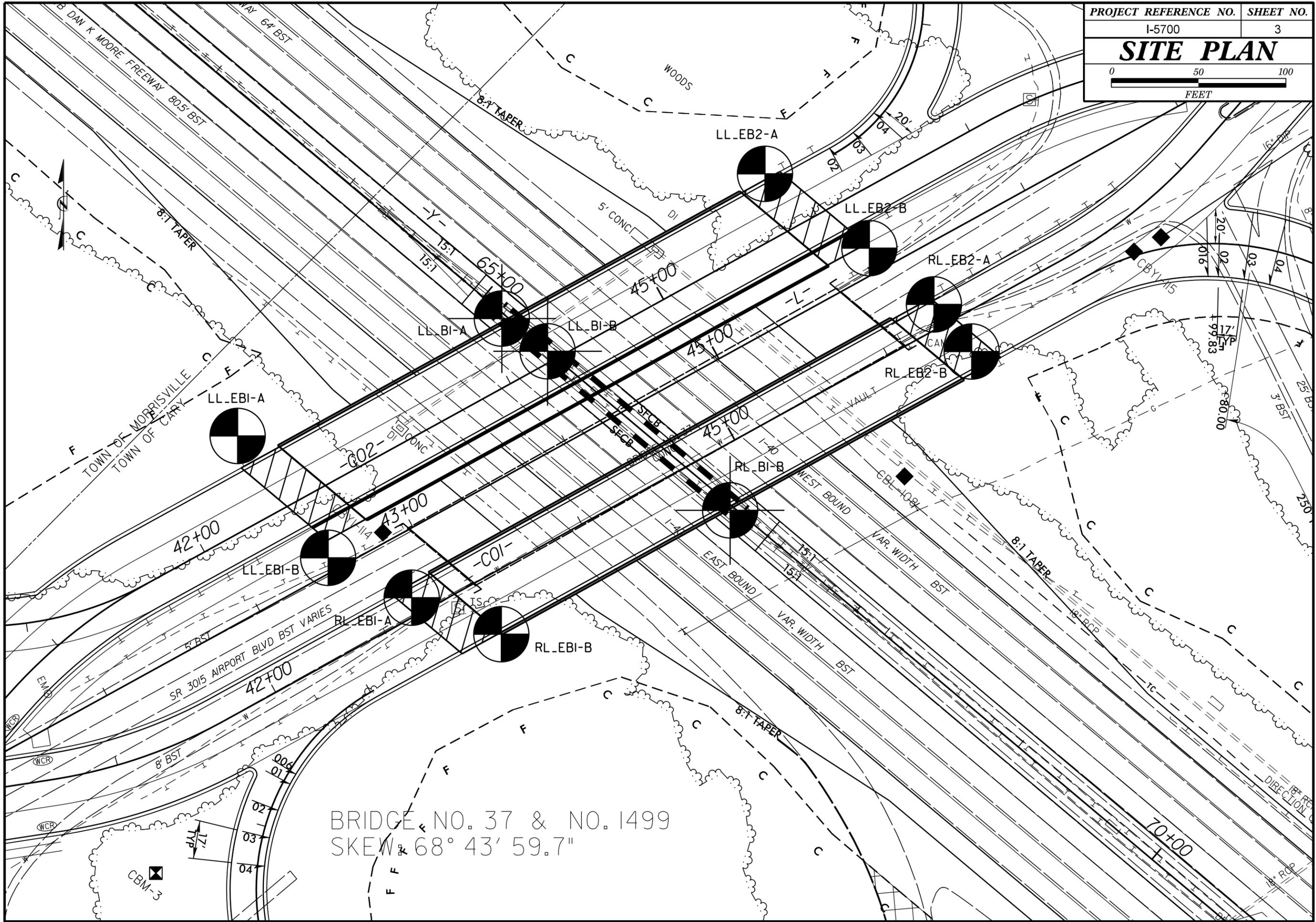
SUBSURFACE INVESTIGATION

**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS**

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

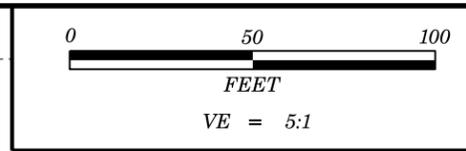
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

<p>GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)</p> <p>From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.</p> <p>STRUCTURE</p>	<p>SURFACE CONDITIONS</p>	<p>VERY GOOD Very rough, fresh unweathered surfaces</p>	<p>GOOD Rough, slightly weathered, iron stained surfaces</p>	<p>FAIR Smooth, moderately weathered and altered surfaces</p>	<p>POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments</p>	<p>VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings</p>
<p>GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)</p> <p>From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.</p> <p>COMPOSITION AND STRUCTURE</p>	<p>SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)</p>	<p>VERY GOOD - Very Rough, fresh unweathered surfaces</p>	<p>GOOD - Rough, slightly weathered surfaces</p>	<p>FAIR - Smooth, moderately weathered and altered surfaces</p>	<p>POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments</p>	<p>VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings</p>
<p>INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities</p> <p>BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets</p> <p>VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets</p> <p>BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity</p> <p>DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces</p> <p>LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes</p>	<p>DECREASING INTERLOCKING OF ROCK PIECES</p>	<p>DECREASING SURFACE QUALITY →</p>				
<p>A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.</p> <p>B. Sandstone with thin inter-layers of siltstone</p> <p>C. Sandstone and siltstone in similar amounts</p> <p>D. Siltstone or silty shale with sandstone layers</p> <p>E. Weak siltstone or clayey shale with sandstone layers</p> <p>F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure</p> <p>G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers</p> <p>H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.</p> <p>→ Means deformation after tectonic disturbance</p>	<p>VERY GOOD - Very Rough, fresh unweathered surfaces</p>	<p>GOOD - Rough, slightly weathered surfaces</p>	<p>FAIR - Smooth, moderately weathered and altered surfaces</p>	<p>POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments</p>	<p>VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings</p>	
		<p>90</p>	<p>80</p>	<p>70</p>	<p>60</p>	<p>50</p>
		<p>N/A</p>	<p>N/A</p>	<p>N/A</p>	<p>N/A</p>	<p>N/A</p>
		<p>70</p>	<p>60</p>	<p>50</p>	<p>40</p>	<p>30</p>
		<p>60</p>	<p>50</p>	<p>40</p>	<p>30</p>	<p>20</p>
		<p>50</p>	<p>40</p>	<p>30</p>	<p>20</p>	<p>10</p>
		<p>40</p>	<p>30</p>	<p>20</p>	<p>10</p>	<p>0</p>
		<p>30</p>	<p>20</p>	<p>10</p>	<p>0</p>	<p>0</p>
		<p>20</p>	<p>10</p>	<p>0</p>	<p>0</p>	<p>0</p>
		<p>10</p>	<p>0</p>	<p>0</p>	<p>0</p>	<p>0</p>
		<p>0</p>	<p>0</p>	<p>0</p>	<p>0</p>	<p>0</p>



BRIDGE NO. 37 & NO. 1499
 SKEW $\approx 68^{\circ} 43' 59.7''$

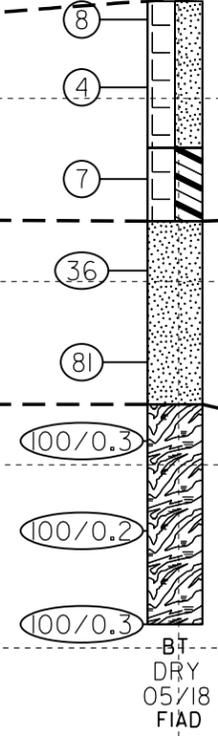
370
360
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270



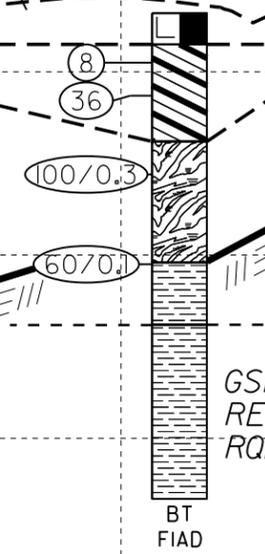
PROJECT REFERENCE NO.	SHEET NO.
I-5700	4
PROFILE ALONG -L- (AIRPORT BOULEVARD)	

- (A) ROADWAY EMBANKMENT: ASPHALT
- (B) TRIASSIC RESIDUAL: DRY TO MOIST, MEDIUM STIFF TO HARD, BROWN, RED AND WHITE, SANDY SILT AND SANDY CLAY WITH TRACE ROCK FRAGMENTS
- (C) WEATHERED ROCK: BROWN, RED, TAN, ORANGE, PALE OLIVE, PURPLE AND WHITE, TRIASSIC SANDSTONE AND SILTSTONE
- (D) NON-CRYSTALLINE ROCK: SLIGHTLY TO MODERATELY WEATHERED, MEDIUM HARD, BROWN AND RED, THINLY TO VERY THINLY BEDDED, MODERATELY INDURATED, TRIASSIC SANDSTONE WITH MODERATELY CLOSE TO CLOSE FRACTURE SPACING
- (E) ROADWAY EMBANKMENT: MOIST, SOFT TO MEDIUM STIFF, BROWN, RED AND GRAY, SANDY SILT AND SANDY CLAY

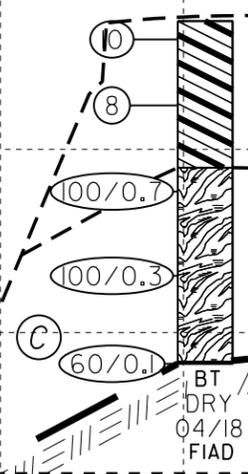
LL_EBI-B
42+49
8' LT



LL_BI-B
44+16
51' LT



LL_EB2-B
46+06
14' LT



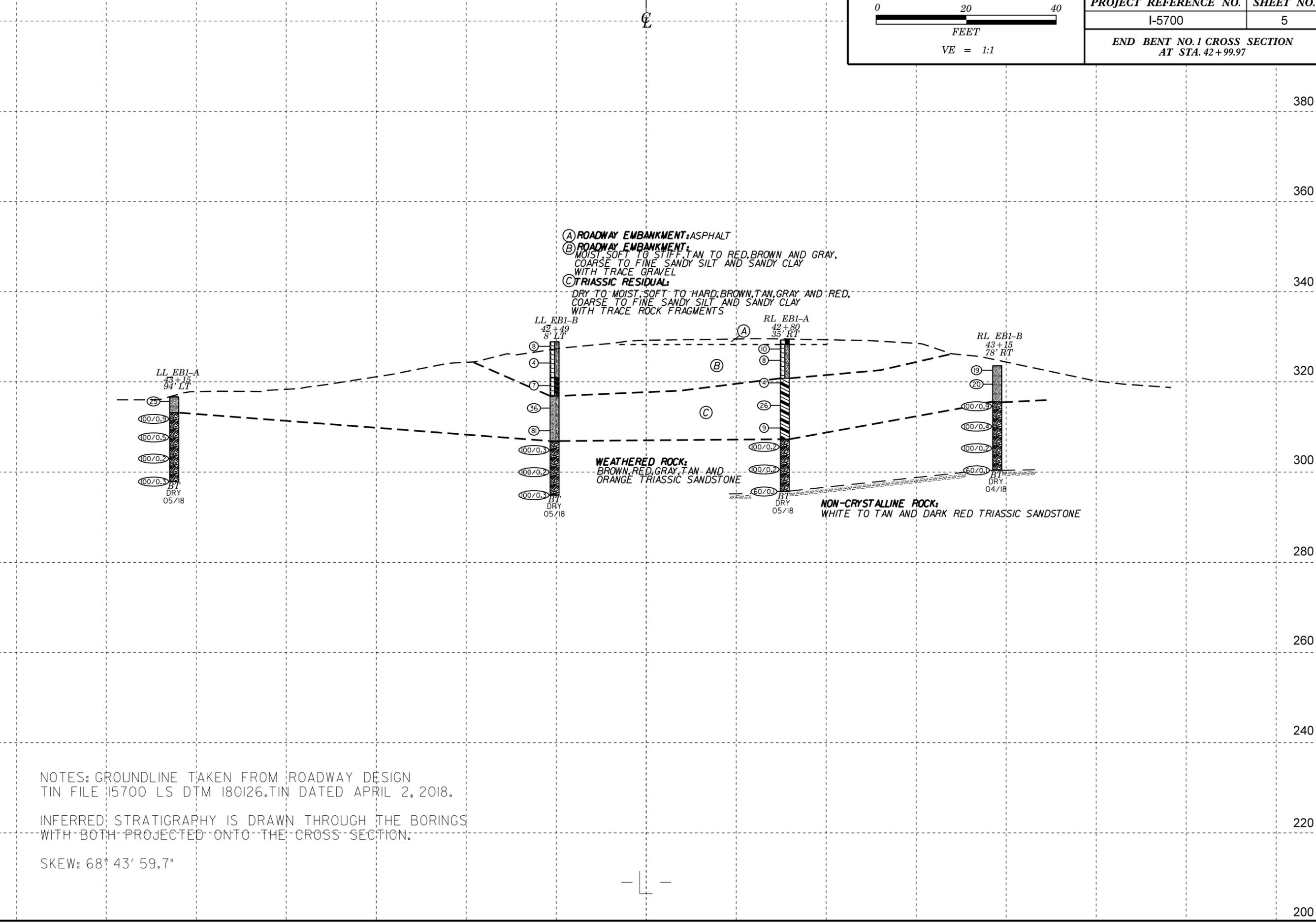
NON-CRYSTALLINE ROCK:
MODERATELY WEATHERED, MEDIUM HARD TO SOFT, BROWN AND RED, THINLY TO VERY THINLY BEDDED, MODERATELY INDURATED, TRIASSIC SILTSTONE WITH MODERATELY CLOSE TO CLOSE FRACTURE SPACING

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

NOTES: GROUNDLINE TAKEN FROM ROADWAY DESIGN TIN FILE, I5700_LS_DTM_I80I26.TIN DATED APRIL 2, 2018.

41+50 42+00 42+50 43+00 43+50 44+00 44+50 45+00 45+50 46+00 46+50 47+00 47+50 48+00

400
380
360
340
320
300
280
260
240
220
200

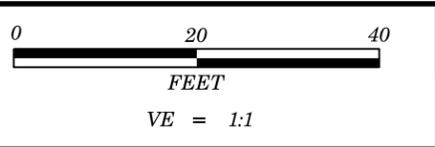


NOTES: GROUNDLINE TAKEN FROM ROADWAY DESIGN
TIN FILE I5700 LS DTM I80I26.TIN DATED APRIL 2, 2018.

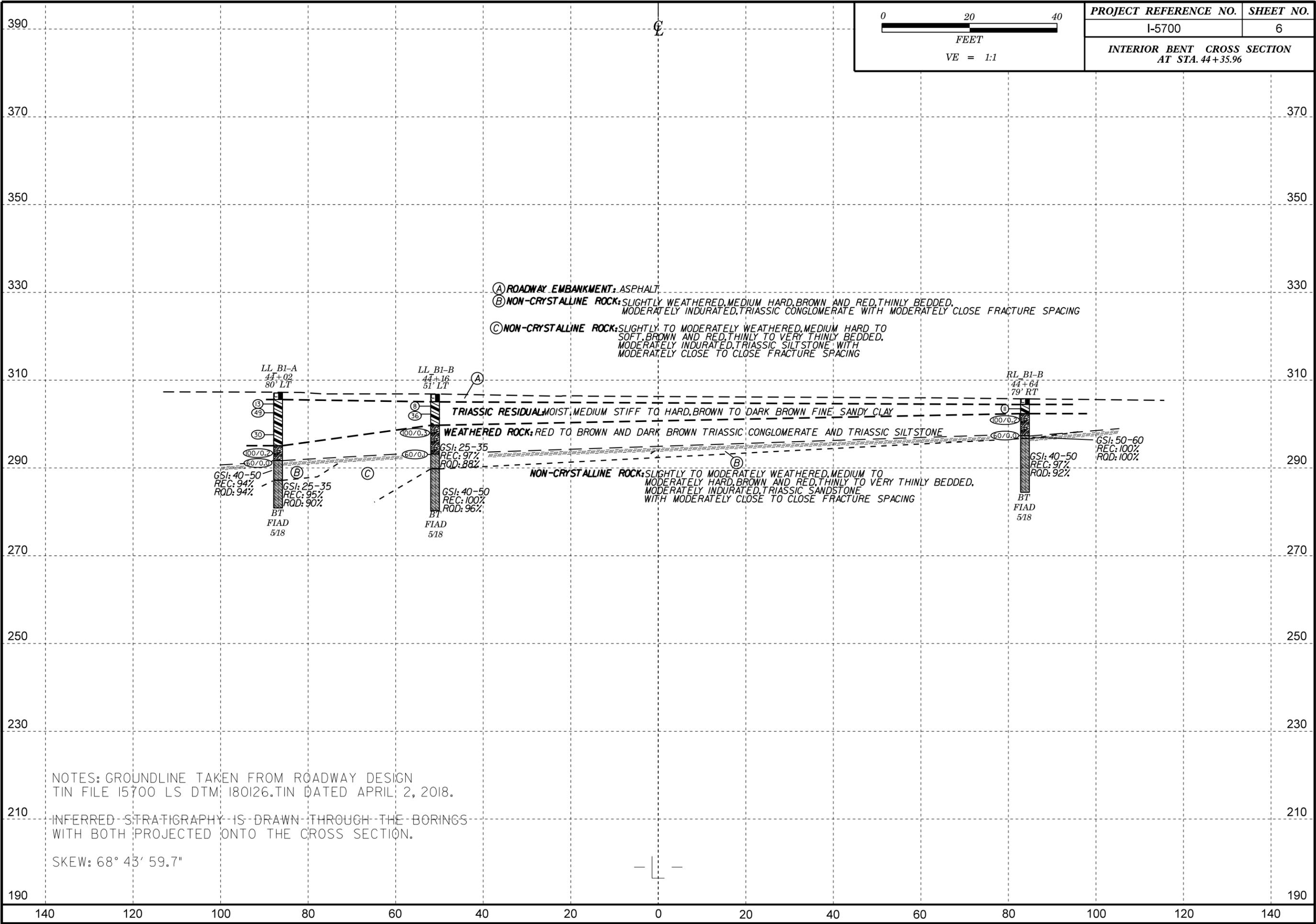
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS
WITH BOTH PROJECTED ONTO THE CROSS SECTION.

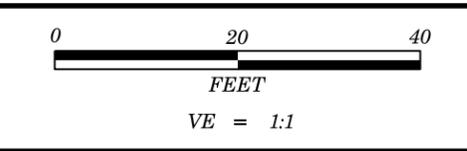
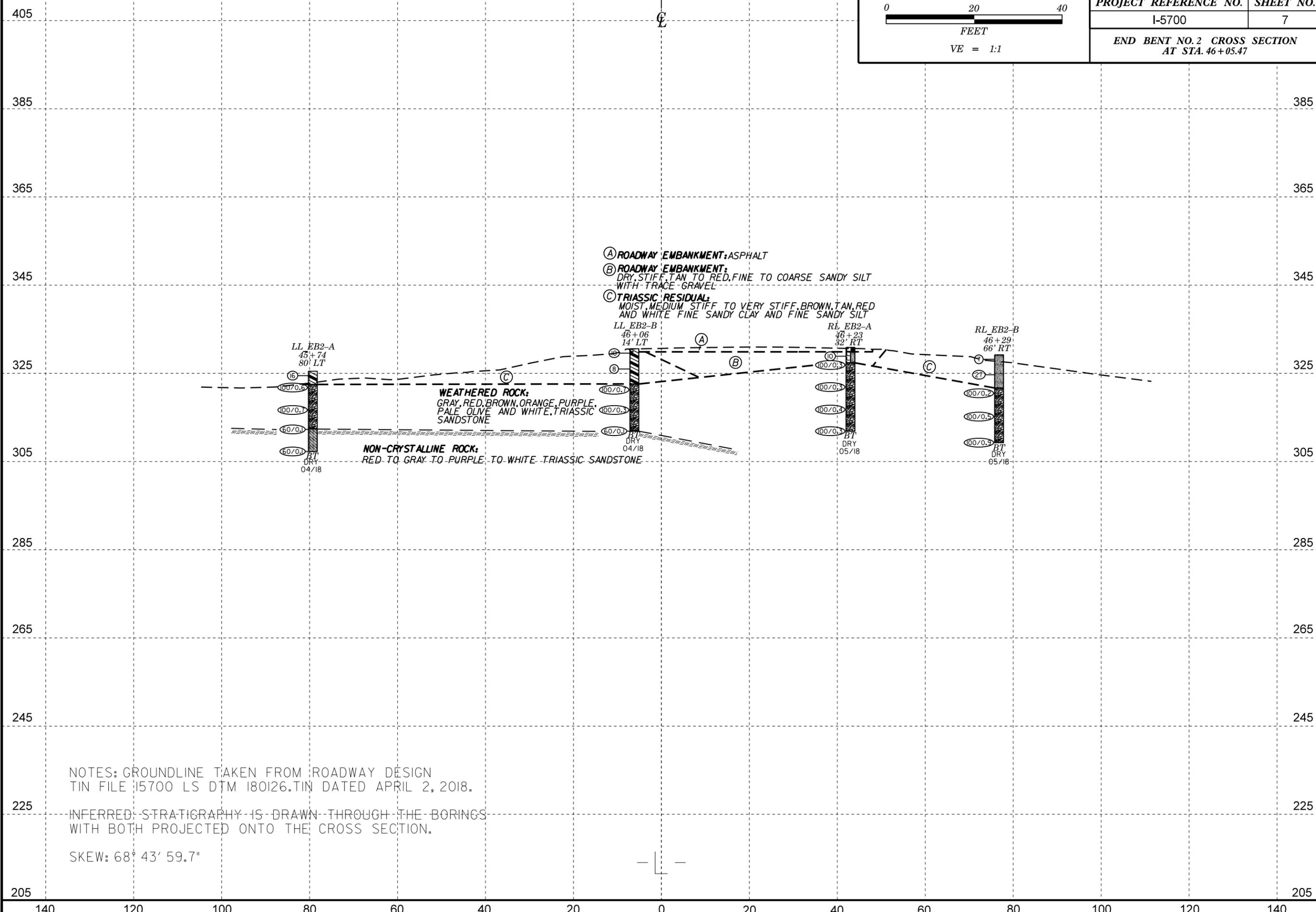
SKEW: 68° 43' 59.7"

140 120 100 80 60 40 20 0 20 40 60 80 100 120 140



PROJECT REFERENCE NO.	SHEET NO.
I-5700	6
INTERIOR BENT CROSS SECTION AT STA. 44+35.96	





PROJECT REFERENCE NO.	SHEET NO.
I-5700	7
END BENT NO. 2 CROSS SECTION AT STA. 46+05.47	

- (A) ROADWAY EMBANKMENT: ASPHALT
- (B) ROADWAY EMBANKMENT: DRY, STIFF TAN TO RED, FINE TO COARSE SANDY SILT WITH TRACE GRAVEL
- (C) TRIASSIC RESIDUAL: MOIST, MEDIUM STIFF TO VERY STIFF, BROWN, TAN, RED AND WHITE FINE SANDY CLAY AND FINE SANDY SILT

WEATHERED ROCK:
GRAY, RED, BROWN, ORANGE, PURPLE,
PALE OLIVE AND WHITE, TRIASSIC
SANDSTONE

NON-CRYSTALLINE ROCK:
RED TO GRAY TO PURPLE TO WHITE TRIASSIC SANDSTONE

LL EB2-A
45+74
80' LT
BT
DRY
04/18

LL EB2-B
46+06
14' LT
BT
DRY
04/18

RL EB2-A
46+23
32' RT
BT
DRY
05/18

RL EB2-B
46+29
66' RT
BT
DRY
05/18

NOTES: GROUNDLINE TAKEN FROM ROADWAY DESIGN
TIN FILE I5700 LS DTM I80I26.TIN DATED APRIL 2, 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS
WITH BOTH PROJECTED ONTO THE CROSS SECTION.

SKIEW: 68° 43' 59.7"

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50118.1.FS1		TIP I-5700		COUNTY WAKE		GEOLOGIST C. Driscoll									
SITE DESCRIPTION I-40 and SR 3015 (Airport Boulevard) Revise Interchange and Construct Auxiliary Lane							GROUND WTR (ft)								
BORING NO. LL_EB1-A		STATION 42+37		OFFSET 94 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 313.1 ft		TOTAL DEPTH 18.8 ft		NORTHING 768,475		EASTING 2,054,662									
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER R. Toothman		START DATE 05/01/18		COMP. DATE 05/01/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
315	313.1	0.0	3	15	10									313.1	0.0
310	309.6	3.5	27	66	34/0.4									309.6	3.5
305	304.6	8.5	100/0.5											100/0.9	
300	299.6	13.5	100/0.2											100/0.5	
295	294.6	18.5	100/0.3											100/0.2	
														100/0.3	18.8
Boring Terminated at Elevation 294.3 ft in WEATHERED ROCK: TRIASSIC SANDSTONE															

WBS 50118.1.FS1		TIP I-5700		COUNTY WAKE		GEOLOGIST C. Driscoll									
SITE DESCRIPTION I-40 and SR 3015 (Airport Boulevard) Revise Interchange and Construct Auxiliary Lane							GROUND WTR (ft)								
BORING NO. LL_EB1-B		STATION 42+49		OFFSET 8 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 325.3 ft		TOTAL DEPTH 34.0 ft		NORTHING 768,405		EASTING 2,054,714									
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER R. Toothman		START DATE 05/04/18		COMP. DATE 05/04/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
330															
325	325.3	0.0	4	4	4									325.3	0.0
320	321.6	3.7	3	2	2										
315	316.6	8.7	3	3	4										
310	311.6	13.7	56	23	13										
305	306.6	18.7	17	43	38										
300	301.6	23.7	100/0.3											100/0.3	
295	296.6	28.7	100/0.2											100/0.2	
	291.6	33.7	100/0.3											100/0.3	
Boring Terminated at Elevation 291.3 ft in WEATHERED ROCK: TRIASSIC SANDSTONE															

NCDOT BORE DOUBLE I5700_GEO_RDWY_GINT.GPJ NC_DOT.GDT 10/8/18

CORE PHOTOGRAPHS

LL_B1-A
BOXES 1 - 2 15.4 to 26.2 FEET



GEOTECHNICAL BORING REPORT

BORE LOG

GEOTECHNICAL BORING REPORT

CORE LOG

WBS 50118.1.FS1		TIP I-5700		COUNTY WAKE		GEOLOGIST C. Driscoll										
SITE DESCRIPTION I-40 and SR 3015 (Airport Boulevard) Revise Interchange and Construct Auxiliary Lane							GROUND WTR (ft)									
BORING NO. LL_B1-B		STATION 44+16		OFFSET 51 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 303.2 ft		TOTAL DEPTH 26.5 ft		NORTHING 768,523		EASTING 2,054,839										
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 85% 02/22/2016				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic										
DRILLER R. Toothman		START DATE 05/10/18		COMP. DATE 05/10/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
305																
	301.5	1.7	4	3	5									303.2	0.0	GROUND SURFACE
	299.7	3.5	8	16	20									301.5	1.7	ROADWAY EMBANKMENT Asphalt: (0.0 to 1.7 Foot)
300																TRIASSIC RESIDUAL Dark Brown, Sandy CLAY (A-6)
	294.7	8.5	100/0.3											296.2	7.0	WEATHERED ROCK Red to Brown TRIASSIC SILTSTONE
295																
	289.6	13.6	60/0.1											289.6	13.6	NON-CRYSTALLINE ROCK Moderately Weathered, Medium Hard to Soft, Brown and Red, Thinly to Very Thinly Bedded, Moderately Indurated, TRIASSIC SILTSTONE with Moderately Close to Close Fracture Spacing (REC: 97 %, RQD: 88 %, GSI: 25-35)
290																
														286.2	17.0	NON-CRYSTALLINE ROCK Slightly to Moderately Weathered, Medium Hard, Brown and Red, Thinly to Very Thinly Bedded, Moderately Indurated, TRIASSIC SANDSTONE with Moderately Close to Close Fracture Spacing (REC: 100 %, RQD: 98 %, GSI: 40-50)
285																
														276.7	26.5	Boring Terminated at Elevation 276.7 ft in NON-CRYSTALLINE ROCK: TRIASSIC SANDSTONE

WBS 50118.1.FS1		TIP I-5700		COUNTY WAKE		GEOLOGIST C. Driscoll	
SITE DESCRIPTION I-40 and SR 3015 (Airport Boulevard) Revise Interchange and Construct Auxiliary Lane							GROUND WTR (ft)
BORING NO. LL_B1-B		STATION 44+16		OFFSET 51 ft LT		ALIGNMENT -L-	
COLLAR ELEV. 303.2 ft		TOTAL DEPTH 26.5 ft		NORTHING 768,523		EASTING 2,054,839	
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 85% 02/22/2016				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER R. Toothman		START DATE 05/10/18		COMP. DATE 05/10/18		SURFACE WATER DEPTH N/A	
CORE SIZE NQ2		TOTAL RUN 12.8 ft		L O G		DESCRIPTION AND REMARKS	
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.
289.5	289.5	13.7	2.8	2:30/0.8 4:15 5:45	(2.7) 96%	(2.4) 86%	
	286.7	16.5	5.0	5:30 4:00 3:15 5:00 4:30	(5.0) 100%	(4.8) 96%	RS-2
285							
	281.7	21.5	5.0	5:00 5:00 4:30 3:15 4:30	(5.0) 100%	(4.9) 98%	
280							
	276.7	26.5					
Boring Terminated at Elevation 276.7 ft in NON-CRYSTALLINE ROCK: TRIASSIC SANDSTONE							

CORE PHOTOGRAPHS

LL_B1-B
BOXES 1 - 2: 13.7 to 26.5 FEET



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50118.1.FS1	TIP I-5700	COUNTY WAKE	GEOLOGIST C. Driscoll
SITE DESCRIPTION I-40 and SR 3015 (Airport Boulevard) Revise Interchange and Construct Auxiliary Lane			GROUND WTR (ft)
BORING NO. RL_EB1-A	STATION 42+80	OFFSET 35 ft RT	ALIGNMENT -L-
COLLAR ELEV. 325.7 ft	TOTAL DEPTH 33.6 ft	NORTHING 768,381	EASTING 2,054,762
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER R. Toothman	START DATE 05/07/18	COMP. DATE 05/07/18	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					
330															
325	324.7	1.0	16	5	5										
320	322.2	3.5	3	5	3										
315	317.2	8.5	2	1	3										
310	312.2	13.5	4	15	11										
305	307.2	18.5	5	5	4										
300	302.2	23.5	100/0.2												
295	297.2	28.5	100/0.2												
	292.2	33.5	60/0.1												

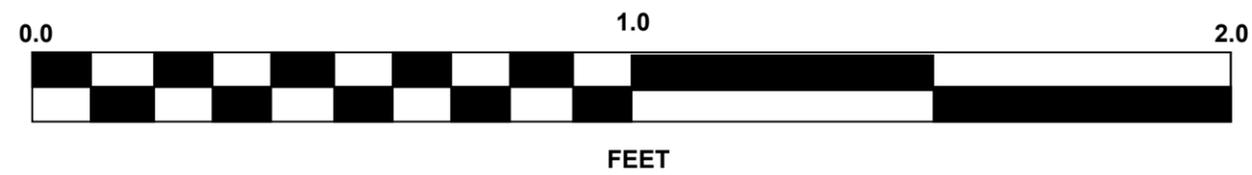
WBS 50118.1.FS1	TIP I-5700	COUNTY WAKE	GEOLOGIST C. Driscoll
SITE DESCRIPTION I-40 and SR 3015 (Airport Boulevard) Revise Interchange and Construct Auxiliary Lane			GROUND WTR (ft)
BORING NO. RL_EB1-B	STATION 43+15	OFFSET 78 ft RT	ALIGNMENT -L-
COLLAR ELEV. 320.0 ft	TOTAL DEPTH 23.2 ft	NORTHING 768,361	EASTING 2,054,813
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER R. Toothman	START DATE 04/23/18	COMP. DATE 04/23/18	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					
320	320.0	0.0	3	9	10										
315	316.9	3.1	5	10	10										
310	311.9	8.1	30	65	35/0.4										
305	306.9	13.1	100/0.4												
300	301.9	18.1	100/0.2												
	296.9	23.1	60/0.1												

NCDOT BORE DOUBLE I5700_GEO_RDWY_GINT.GPJ NC_DOT.GDT 10/8/18

CORE PHOTOGRAPHS

RL_B1-B
BOXES 1 - 2: 8.4 to 21.3 FEET



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50118.1.FS1		TIP I-5700		COUNTY WAKE		GEOLOGIST C. Driscoll									
SITE DESCRIPTION I-40 and SR 3015 (Airport Boulevard) Revise Interchange and Construct Auxiliary Lane							GROUND WTR (ft)								
BORING NO. RL_EB2-A		STATION 46+23		OFFSET 32 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 327.3 ft		TOTAL DEPTH 19.0 ft		NORTHING 768,549		EASTING 2,055,061									
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER R. Toothman		START DATE 05/07/18		COMP. DATE 05/07/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
330															
325	326.3	1.0	11	5	5										
	323.6	3.7	100/0.3												
320	318.6	8.7	100/0.3												
315	313.6	13.7	100/0.4												
310	308.6	18.7	100/0.3												

WBS 50118.1.FS1		TIP I-5700		COUNTY WAKE		GEOLOGIST C. Driscoll									
SITE DESCRIPTION I-40 and SR 3015 (Airport Boulevard) Revise Interchange and Construct Auxiliary Lane							GROUND WTR (ft)								
BORING NO. RL_EB2-B		STATION 46+29		OFFSET 66 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 325.6 ft		TOTAL DEPTH 19.9 ft		NORTHING 768,522		EASTING 2,055,083									
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER R. Toothman		START DATE 05/01/18		COMP. DATE 05/01/18		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
330															
325	325.6	0.0	3	3	4										
	322.1	3.5	7	13	14										
320	317.1	8.5	100/0.2												
315	312.1	13.5	100/0.5												
310	307.1	18.5	35	19	81/0.4										

LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.: 50118.1.FS1 (I-5700)

COUNTY: Wake

I-40 AND SR 3015 (AIRPORT BOULEVARD) REVISE INTERCHANGE AND CONSTRUCT AUXILIARY LANE

Sample No.	Boring No.	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD (%)	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Young's Modulus (psi)	Splitting Tensile Strength (psi)	Remarks
RS-1	LL B1-A	21.7 - 22.1	TRIASSIC SILTSTONE	TRc	96	4.82	1.97	162.9	6,277	N/A	N/A	GSI - 25 to 35
RS-2	LL B1-B	17.3 - 17.7	TRIASSIC SANDSTONE	TRc	96	4.78	1.98	163.2	2,939	49,864	N/A	GSI - 40 to 50
RS-3	RL B1-B	10.7 - 11.1	TRIASSIC SANDSTONE	TRc	86	4.58	1.98	158.8	8,830	N/A	N/A	GSI - 40 to 50