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FOUNDATION RECOMMENDATIONS

WBS 38368.1.2

T.I.P. NO. B-4442

COUNTY Buncombe

STATION 315+72.39 -L-

DESIGN SY 4/21/22
CHECK MHS 4/22/22
APPROVAL SCC 05/04/2022

DESCRIPTION Bridge Nos. 370&373 ON US 19/US 23/US

25/US 70/FUTURE I-26 over Reems Creek



| BENT | STATION | FOUNDATION TYPE | FACTORED RESISTANCE | MISCELLANEOUS & DETAILS |
|---------------|--------------------|----------------------------------|------------------------|---|
| END BENT 1 | STA. 313+81.25 -L- | Cap on HP 14x73 Steel Piles | 144 tons/pile | Bottom of Cap El. = 2,031.8 ft ± Estimated Length of Pile = 25 ft (LT); 50 ft (CT); 50 ft (RT) Number of Piles = 28 |
| BENT 1 | STA. 315+36.25 -L- | 60 inch Diameter Drilled Pier | 745 tons/pier | Bottom of Cap Elev. = 2,031.0 ft (LT); 2,031.9 ft (CT); 2,031.1 ft (RT) Point of Fixity Elev. = 1,962.0 ft (LT); 1,962.0 ft (CT); 1,962.0 ft (RT) Tip No Higher Than Elev. = 1,955.0 ft (LT); 1,955.0 ft (CT); 1,955.0 ft (RT) Number of Drilled Piers =9 |
| END BENT 2 | STA. 316+71.25 -L- | Cap on HP 14x73 Steel Piles | 135 tons/pile | Bottom of Cap El. = 2,033.2 ft ± Estimated Length of Pile = 50 ft (LT); 50 ft (CT); 45 ft (RT) Number of Piles = 28 |

NOTES ON PLANS & COMMENTS

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS HIGHWAY BUILDING PO BOX 25201 RALEIGH, NORTH CAROLINA 27611

| SUBJECT: Bridge Nos. 370&373 ON US 19/US 23/US | | | | | | | | | | | |
|--|--------------------|--|--|--|--|--|--|--|--|--|--|
| 25/US 70/FUTURE I-26 over Reems Creek | | | | | | | | | | | |
| PREPARED BY: SY | PROJECT: 38368.1.2 | | | | | | | | | | |
| DATE: 4/21/22 | TIP: B-4442 | | | | | | | | | | |
| CHECKED BY: MHS | COUNTY: Buncombe | | | | | | | | | | |
| DATE: 4/22/22 | | | | | | | | | | | |

FOUNDATION RECOMMENDATION NOTES ON PLANS

| 1 |) | For piles, | see | Section | 450 o | f the | Standa | ırd : | Specifications. |
|---|---|------------|-----|---------|-------|-------|--------|-------|-----------------|
|---|---|------------|-----|---------|-------|-------|--------|-------|-----------------|

| 2) | For drilled piers | s, see Section 41 | 1 of the Standard | Specifications. |
|----|-------------------|-------------------|-------------------|-----------------|
|----|-------------------|-------------------|-------------------|-----------------|

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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| CHECKED BY: MHS | COUNTY: Buncombe | | | | | | | | | | |
| DATE: 4/22/22 | | | | | | | | | | | |

FOUNDATION RECOMMENDATION COMMENTS

- 1) Please advise Western Regional Office, if factored resistance is less than max. factored structure load.
- 2) PDA will not be used to monitor driving stresses.
- 3) No re-strikes are required.
- 4) End bent slopes of 1½:1 are ok with slope protection to berm and to 1½:1.
- 5) Bridge approach Fill Use Type I approach fill at End Bent No. 1. Alternate A for integral abutment can be used.
- 6) Bridge approach Fill Use Type I approach fill at End Bent No. 2. Alternate A for integral abutment can be used.
- 7) Please send Western Regional Design Engineer a half size copy of the final general drawing sheets, including the location sketch, plan notes and quantities, at the time they are submitted to the plan checking & review squad.

Ŕ REFERENCE **CONTENTS**

DESCRIPTION

CROSS SECTIONS

LEGEND (SOIL & ROCK)

BORE & CORE LOGS w/ PHOTOGRAPHS

TITLE SHEET

SITE PLAN

PROFILES

SHEET NO.

2-2A

6-8

9-26

38368

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS**

GEOTECHNICAL ENGINEERING UNIT **STRUCTURE**

BUNCOMBE COUNTY _ PROJECT DESCRIPTION REPLACE BRDG's #0370 & 0373 on US-19/23/25/70 over REEMS CREEK

SUBSURFACE INVESTIGATION

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|--------------|-----------------|
| N.C. | B-4442 | _ | 26 |

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 METHOL. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS NIDICATED 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.

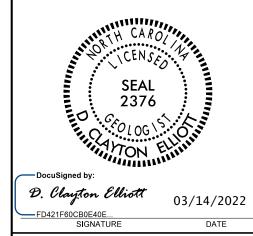
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT, FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT 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 SATISTY 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 FOOD THE PROJECT 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.

 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.

-NCDOT-__DC CHEEK <u>CJ COFFEY</u> CD JOHNSON DC ELLIOTT INVESTIGATED BY NCDOT GEU /DCE DC ELLIOTT JC KUHNE CHECKED BY ____ SUBMITTED BY JC KUHNE



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO. SHEET NO. B-4442

2

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

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

| 2011 252221212 | | | |
|--|--|--|--|
| SOIL DESCRIPTION SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN | GRADATION <u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. | ROCK DESCRIPTION HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED | TERMS AND DEFINITIONS |
| BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT | <u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COMPSE. <u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. | 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 | ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. |
| ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: | GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES. | BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN | ACUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. |
| CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, | ANGULARITY OF GRAINS | REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: | ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING |
| VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 | THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: | WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > | A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. |
| SOIL LEGEND AND AASHTO CLASSIFICATION | ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED. | ROCK (WR) 100 BLOWS PER FOOT IF TESTED. | ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT |
| GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS | MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS OUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. | CRYSTALLINE CRYSTALLINE WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, | WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. |
| CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) Class (1 | ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE. | GNEISS, GABBRO, SCHIST, ETC. | CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. |
| CLASS. A-1-0 A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-5, A-3 A-6, A-7 | COMPRESSIBILITY | NON-CRYSTALLINE SEDIMENTARY ROCK THAT WOULD YELD SPT REFUSAL IF TESTED. | COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM |
| SYMBOL GOOGGOOGG | SLIGHTLY COMPRESSIBLE LL < 31 | ROCK (NCR) ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD | OF SLOPE. |
| 7. PASSING | MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50 | SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED | 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. |
| *10 50 MX GRANULAR SIL1" MUCK, | PERCENTAGE OF MATERIAL | (CP) SHELL BEDS.ETC. WEATHERING | DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT |
| *40 38 MX 58 MX 51 MN S01LS SOILS SO | GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL | FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER | ROCKS OR CUTS MASSIVE ROCK. |
| MATERIAL | TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% | HAMMER IF CRYSTALLINE. | DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. |
| PASSING *40 SOILS WITH | LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% | VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, | DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE |
| LL 40 MX 41 MN LITTLE OR PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN MODERATE HIGHLY | HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE | (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. | LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. |
| GROUP INDEX Ø Ø Ø 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOILS | GROUND WATER | SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO | FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE |
| USUAL TYPES STONE FRAGS. FINE CITY OF SLAVEY CITY CLAVEY | ✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING | (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. | SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. |
| OF MAJOR GRAVEL AND SAND GRAVEL AND SAND GRAVEL AND SAND SOILS SOILS | STATIC WATER LEVEL AFTER 24 HOURS | MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN | FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM |
| CEN BATING FAIR TO | | (MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS | PARENT MATERIAL. |
| AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE | SPRING OR SEEP | DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. | FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. |
| PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30 | | MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL | FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE |
| CONSISTENCY OR DENSENESS | MISCELLANEOUS SYMBOLS | SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. | FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. |
| PRIMARY SOIL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH | ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION | IF TESTED, WOULD YIELD SPT REFUSAL | LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO |
| CONSISTENCY CONSISTENCY (N-VALUE) (TONS/FT ²) | ☐ ☐ WITH SOIL DESCRIPTION → OF ROCK STRUCTURES | SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT | ITS LATERAL EXTENT. |
| GENERALLY VERY LOOSE 4 TO 10 | SOIL SYMBOL | (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. | LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. |
| MATERIAL MEDIUM DENSE 10 TO 30 N/A | - 13.1 m | IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF | MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AFRATION AND LACK OF GOOD DRAINAGE. |
| (NON-COHESIVE) DENSE 30 TO 50 VERY DENSE > 50 | ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT TEST | VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK | PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE |
| VERY SOFT < 2 < 0.25 | — — INFERRED SOIL BOUNDARY — CORE BORING ■ SOUNDING ROD | (V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR | OF AN INTERVENING IMPERVIOUS STRATUM. |
| GENERALLY SOFT 2 TO 4 0.25 TO 0.5 | TEST BORING | VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF | RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. |
| SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0 MATERIAL STIFF 8 TO 15 1 TO 2 | WITH CORE | 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 | 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 |
| (COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4 | →▼▼▼→▼ ALLUVIAL SOIL BOUNDARY △ PIEZOMETER INSTALLATION — SPT N-VALUE | ALSO AN EXAMPLE. | RUN AND EXPRESSED AS A PERCENTAGE. |
| TEXTURE OR GRAIN SIZE | RECOMMENDATION SYMBOLS | ROCK HARDNESS | SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT |
| U.S. STD. SIEVE SIZE 4 10 40 60 200 270 | | VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. | ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND |
| OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053 | UNSUITABLE WASTE ACCEPTABLE, BUT NOT TO BE | HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED | RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO |
| BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY | SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TUP 3 FEET OF EMBANKMENT OR BACKFILL | TO DETACH HAND SPECIMEN. | THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. |
| (BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.) | ABBREVIATIONS | MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED | SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. |
| GRAIN MM 305 75 2.0 0.25 0.05 0.005 | AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST | BY MODERATE BLOWS. | STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF |
| SIZE IN. 12 3 | BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED | MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. | 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 |
| SOIL MOISTURE - CORRELATION OF TERMS | CL CLAY MOD MODERATELY 7 - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 - DRY UNIT WEIGHT | HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. | TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. |
| SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION | CSE COARSE ORG ORGANIC | SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS | STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY |
| (ATTERBERG LIMITS) DESCRIPTION SOIDE FOR FIELD MOISTONE DESCRIPTION | DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u> DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK | FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. | TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. |
| - SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT,) FROM BELOW THE GROUND WATER TABLE | e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON | VERY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH | 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 |
| LL LIOUID LIMIT | F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK | SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY | THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. |
| PLASTIC SEMISOLID; REQUIRES DRYING TO | FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING | FINGERNAIL. FRACTURE SPACING BEDDING | TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. |
| (PI) PL PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE | FRAGS FRAGMENTS w - MOISTURE CONTENT CBR - CALIFORNIA BEARING Hi HIGHLY V - VERY RATIO | TERM SPACING TERM THICKNESS | BENCH MARK: "B4442_Is.tin.tin" FILE : SEE BELOW IN NOTES |
| ON CONTINUE MOIST - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE | EQUIPMENT USED ON SUBJECT PROJECT | VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET | ELEVATION: *See below* FEET |
| OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT | DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: | WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET | NOTES. |
| PEGUIDES ADDITIONAL MATER TO | CME-45C CLAY BITS X AUTOMATIC MANUAL | 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 | NOTES: |
| - DRY - (D) ATTAIN OPTIMUM MOISTURE | CME-55 6° CONTINUOUS FLIGHT AUGER CORE SIZE: | THINLY LAMINATED < 0.008 FEET | EXISTING GROUND LINES USED & ELEVATIONS OF BORINGS ARE FROM L&S FILE -B4442-Is.tin.tin DATED 12/08/21 FROM THE 'B-4442' 75%. Files' FOLDER FOUND ON NCDOT CONNECT |
| PLASTICITY | T S' HOLLOW AUGERS | INDURATION | FROM THE B-4442 75% FILES FOLDER FOUND ON NCDOT CONNECT |
| PLASTICITY INDEX (PI) DRY STRENGTH | X CME-550 HARD FACED FINGER BITS X-N NXWL | FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. | |
| NON PLASTIC Ø-5 VERY LOW | TUNGCARBIDE INSERTS | RUBBING WITH FINGER FREES NUMEROUS GRAINS; FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. | |
| SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM | VANE SHEAR TEST X CASING X W/ ADVANCER HAND TOOLS: POST HOLE DIGGER | CRAINC CAN BE CERARATER FROM CAMPLE WITH CITEL PROPE. | FIAD - FILLED IMMEDIATELY AFTER DRILLING |
| HIGHLY PLASTIC 26 OR MORE HIGH | PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER | MODERATELY INDURATED MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER. | The state of the s |
| COLOR | TRICONE TUNGCARB. SOUNDING ROD | INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; | |
| DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). | X CORE BIT VANE SHEAR TEST | DIFFICULT TO BREAK WITH HAMMER. | |
| MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. | | EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. | DATE: 8-15-14 |
| NOBEL COLONIA | | | |

| DJECT REFERENCE NO. | SHEET NO. |
|---------------------|-----------|
| 3–4442 | 2A |

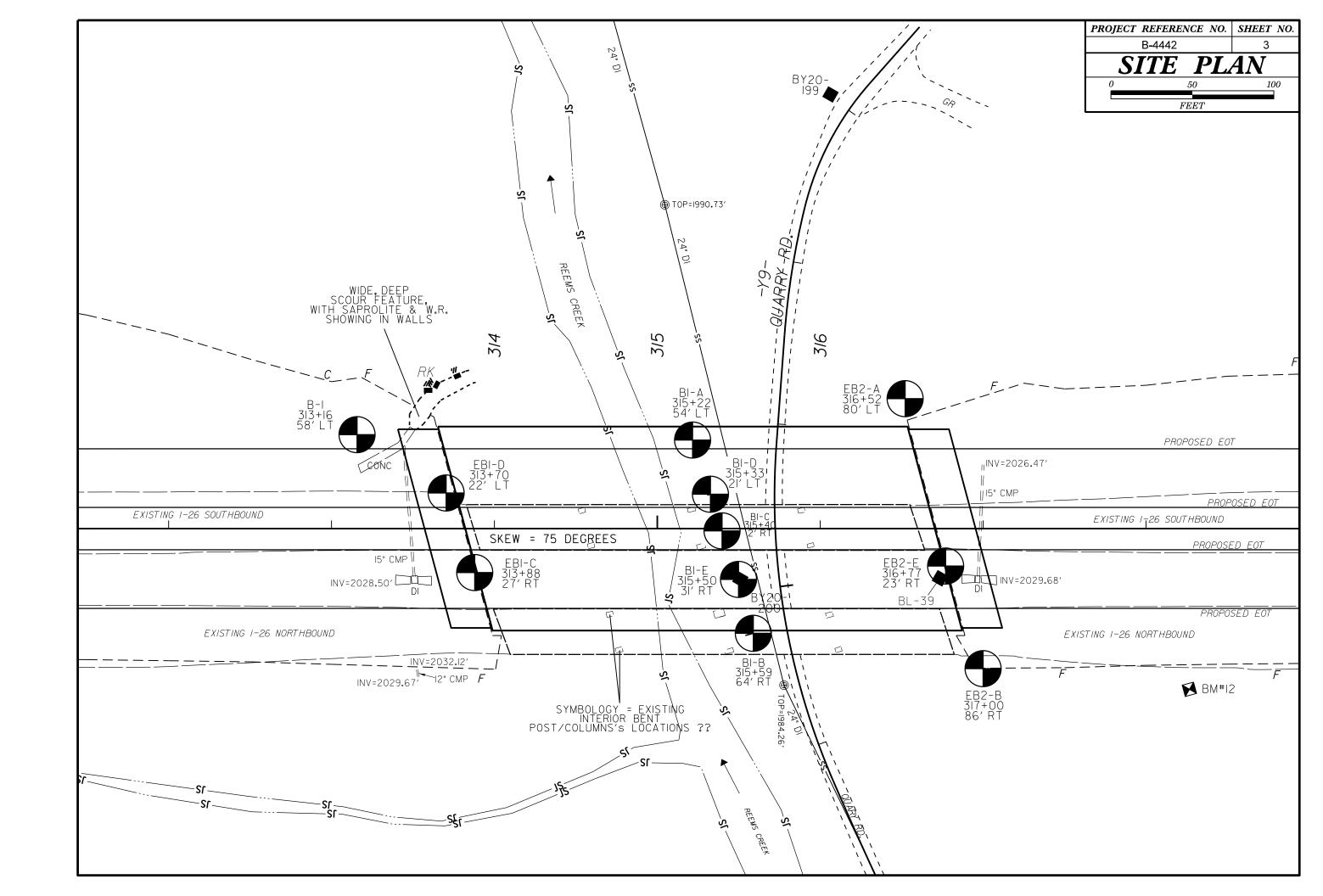
DATE: 8-19-16

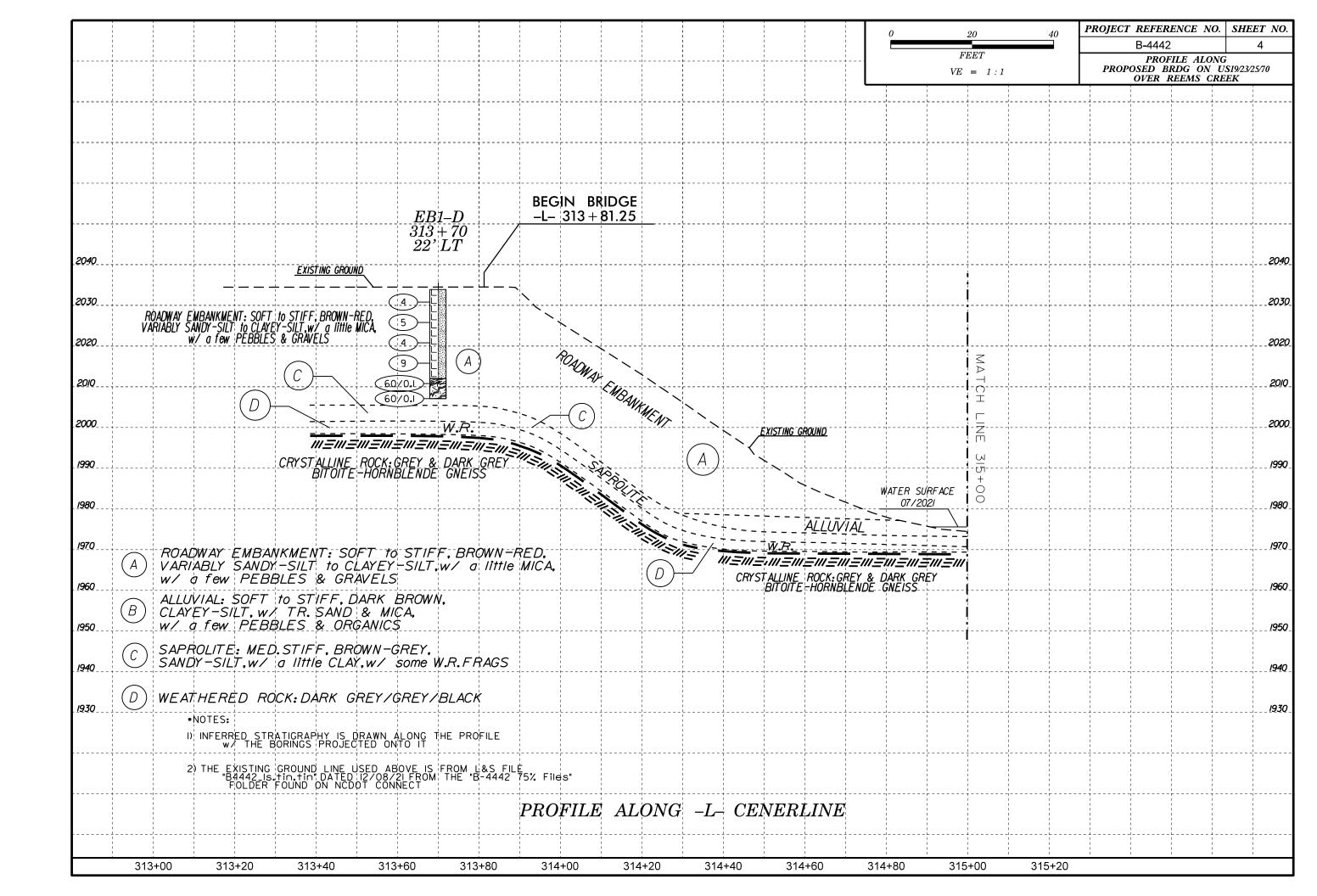
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

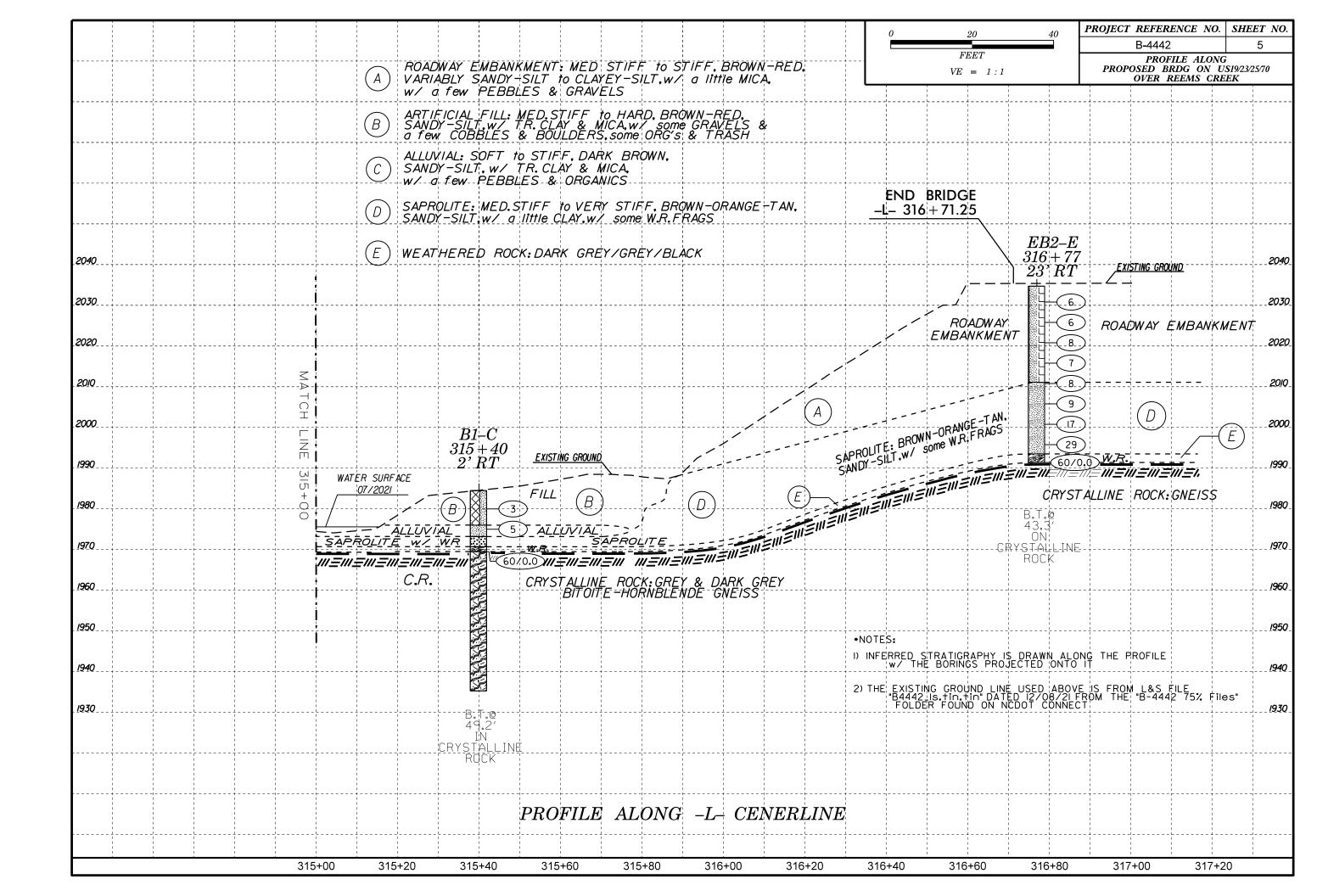
SUBSURFACE INVESTIGATION

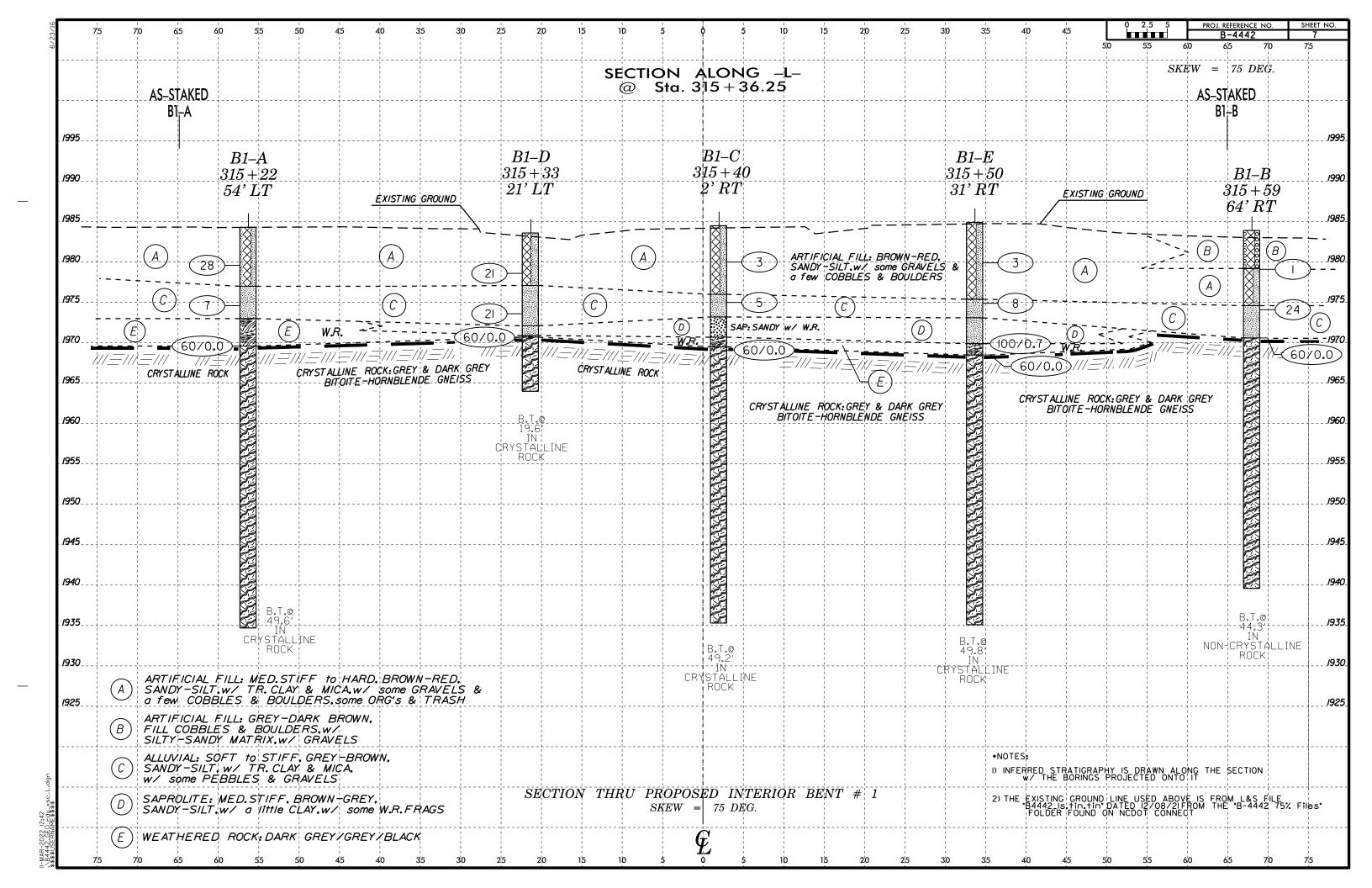
SUPPLEMENTAL LEGEND GEOLOGICAL STRENGTH INDEX (GSI) TARLES

| AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jo | inted Ro | ock Mass (Marinos ar | nd Hoek, 2 | 2000) | | | AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000) |
|--|--------------------|---|--|--|--|--|---|
| GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) | | ν Φ | Ъ | | o O O | у Ф () | GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos.P and Hoek E., 2000) |
| 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. | SURFACE CONDITIONS | VERY GOOD Very rough, fresh unweathered surfac | Rough, slightly weathered, iron stained surfaces | FAIR Smooth, moderately weathered and altered surfaces | POOR Slickensided, highly weathered surfac with compact coatings or fillings or angular fragments | VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings | 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 CSI = 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 thanks or fillings with a significant 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 poor and very |
| STRUCTURE | | ! | | | ALITY | | COMPOSITION AND STRUCTURE |
| INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities BLOCKY - well interlocked un- | PIECES | 90 | | | N/A | N/A | 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. |
| disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets | ROCK | 70 | 60 | | | | B. Sand- stone with Stone and Stone Stone and Stone Stone Stone and Stone Ston |
| VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets | OCKING OF | | | ji0 | | | stone with thin inter-layers of siltstone in similar amounts amounts amounts and siltstone with sand-stone layers of siltstone layers amounts amounts amounts amounts and siltstone layers amounts amounts amounts and siltstone amounts amounts amounts amounts and siltstone amounts amount amounts |
| BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity | - INTERL | | | 40 | 30 | | C.D.E. and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H. F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure |
| DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces | | | | | 20 | | G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sands tone are transformed into small prock places. |
| LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes | — - - | N/A | N/A | | | 10 | sandstone are transformed into small rock pieces. Means deformation after tectonic disturbance |

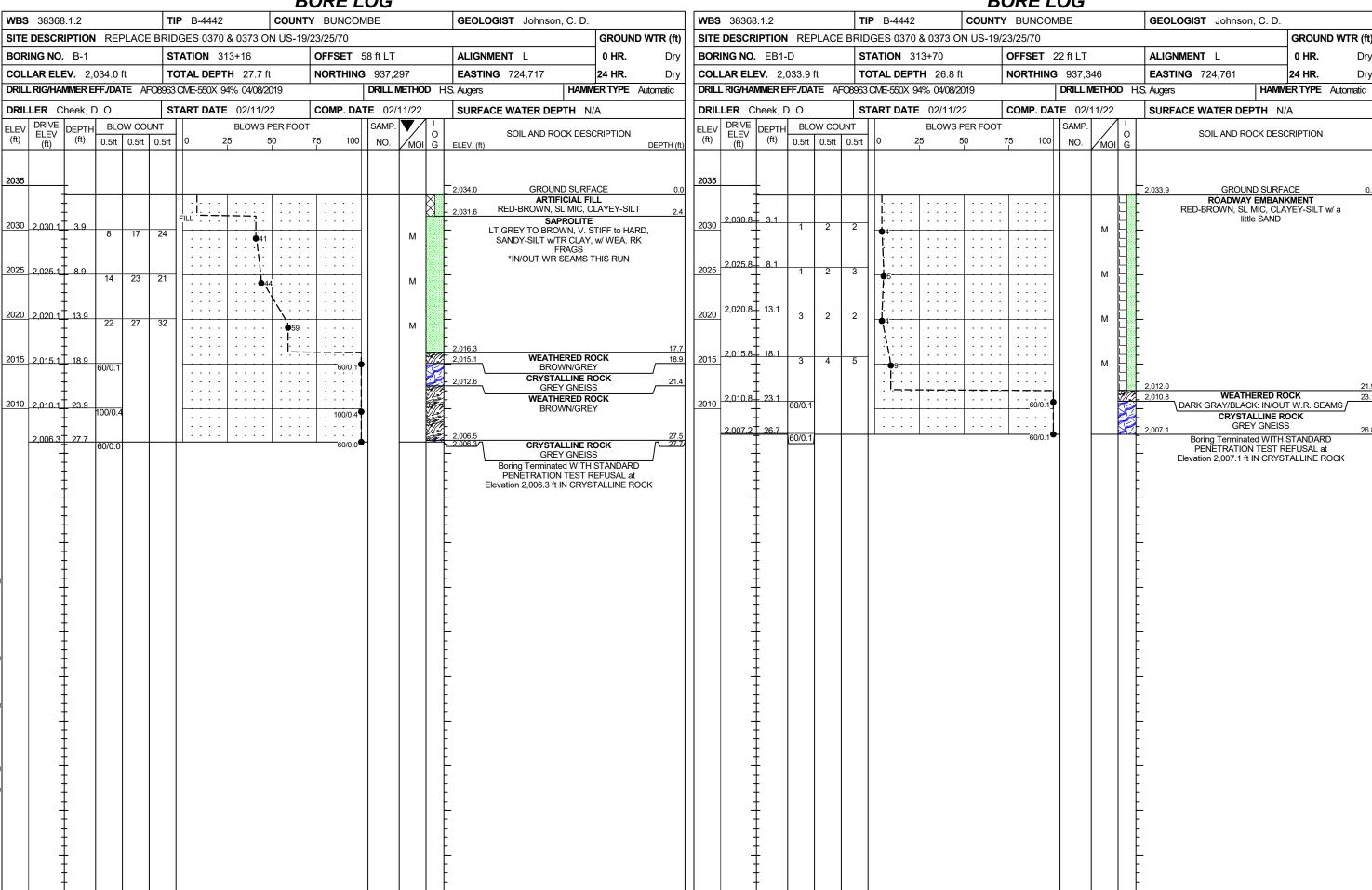








GEOTECHNICAL BORING REPORT BORE LOG



| | | | | | | | | | ONL L | | | | T | | |
|-------|---------------|------------------|------------|--------|--------|--|-------------|--------------|-------------------|----------|------------|----------|---|---------------------|--------------|
| | 38368 | | | | | P B-4442 | | | Y BUNCON | /IBE | | | GEOLOGIST Johnson, | | |
| | | | | PLACE | | OGES 0370 | | N US-19/ | | | | | T | | UND WTR (ft) |
| | ING NO. | | | | | TATION 3 | | | OFFSET 2 | | | | ALIGNMENT L | 0 HF | 1 |
| | LAR ELE | | | | | OTAL DEPT | | | NORTHING | | | | EASTING 724,765 | 24 HF | , |
| DRILL | _ RIG/HAN | /IMER E | FF./DA | TE A | -08963 | CME-550X 9 | 4% 04/08/20 | 019 | | DRILL | NETHO | D H | .S. Augers | HAMMER TYP | PE Automatic |
| DRIL | LER C | offey, c | Jr., C. | | S | TART DATE | 02/08/2 | 2 | COMP. DA | _ | 08/22 | <i>a</i> | SURFACE WATER DEP | TH N/A | |
| ELEV | DRIVE ELEV | DEPTH | - | W CO | | | | PER FOOT | | SAMP. | lacksquare | 1 L | SOIL AND ROC | K DESCRIPTION | ON |
| (ft) | (ft) | (ft) | 0.5ft | 0.5ft | 0.5ft | 0 2 | 25 5 | 50 | 75 100 | NO. | /MO | l G | ELEV. (ft) | | DEPTH (ft) |
| | | | | | | | | | | | | | | | |
| 2035 | | _ | | | | | | | | | | | -2,034.3 GROUND | SURFACE | 0.0 |
| | 1 | - | | | | 1 | | | | | | H | ROADWAY E | MBANKMENT | |
| | 1 | - - | | | | | | | | | | | BROWN-RED, CLAY MICA, w/ some P | EBBLES-GRAV | |
| 2030 | 2,030.0 | 4.3 | 2 | 1 | 3 | 1 | | | | | М | | _ THROU | JGHOUT | |
| | + | - | | | | 1 7 | | | | | | | - | | |
| 2025 | 2.025.0 | - - 9.3 | | | | }::: | : : : : | : : : : | | | | | - - | | |
| | ,020.0 | - 0.0 | 1 | 2 | 6 | .∳8 | | | | | М | | - - | | |
| | 1 | - | | | | : : : : | | | | | | | - - | | |
| 2020 | 2,020.0 | 14.3 | 2 | 2 | 4 | 1 | | | | | | | • - | | |
| | | - - | 4 | 2 | 4 | 6 | | | | | M | | - - | | |
| 0045 | 1 | - - | | | | : : : : | | | | | | | <u>.</u> | | |
| 2015 | 2,015.0 | _ 19.3 - | 2 | 3 | 4 | <u> </u> | | | | | М | | _ - | | |
| | 1 | - | | | | | | | | | | | <u>.</u> | | |
| 2010 | 2,010.0 | - - - 24 3 | | | | | : : : : | : : : : | | | | | - - | | |
| | - 2,010.0 | - 27.0 | 3 | 3 | 4 | • 7 · · | | | | | М | | - - | | |
| | ‡ | - | | | | :\; : : | | | | | | | - - | | |
| 2005 | 2,005.0 | 29.3 | 3 | - | 7 | • • • | | | ļ · · · · · | | | | - - | | |
| | 1 | - | 3 | 5 | 7 | 12 | | | | | M | | - - | | |
| | 1 | - | | | | | | | | | | | • • | | |
| 2000 | 2,000.0 | 34.3 | 3 | 5 | 8 | | | | | | М | | 2,000.0 ALL | UVIAL | 34.3 |
| | 1 | - | | | | | | | | | " | | BLACK-DARK I CLAYEY-SILT, w/ SA | | |
| 1995 | 1,995.0 | - - 39.3 | | | | | | | | | | | | CS (ROOTS) | |
| | 1,990.0 | - 09.0 | 4 | 10 | 11 | 62 | 1 | | | | М | | - - | | |
| | BEC | OMING | V DENS | Ew/DE | PTH w/ | ∏ · · · · · · · . · · · · · · · · · · · | | | | | | | 1,992.0 | OU ITE | 42.3 |
| 1990 | 1,990.0 | 44.3 | | | , | | | | | | | cam | 1,990.0 _ GREY/DARK GREY, | | |
| | | - - | 61 | 39/0.1 | | | : : : : | : : : : | - 100/0.6 | ' | | | | THROUGHOU' RED ROCK | <u> </u> |
| 400- | | - | | | | | | : : : : | | | | | - V. HAI | RD W.R. | |
| 1985 | 1,985.0 | _ | 60/0.1 | 1 | | | | l | 60/0.1 | • | | | 1,985.0 CRYSTAL | LINE ROCK | 49.3 |
| | 1,983.0 | 51.3 | 60/0.0 | | | | I | l | V. HARD 60/0.0 | \dashv | | کاهم | | GNEISS | 51.3 |
| | | - | | | | | | | | | | | - PENETRATION | TEST REFUSA | L at |
| | 7 | - | | | | | | | | | | | Elevation 1,983.0 f | TON CRYSTAL OCK | LINE |
| | | - | | | | | | | | | | | . - | | |
| | | - - | | | | | | | | | | | - - | | |
| | 1 | - | | | | | | | | | | | <u>-</u> - | | |
| | 1 | - | | | | | | | | | | | - | | |
| | 1 | - | | | | | | | | | | | - - | | |
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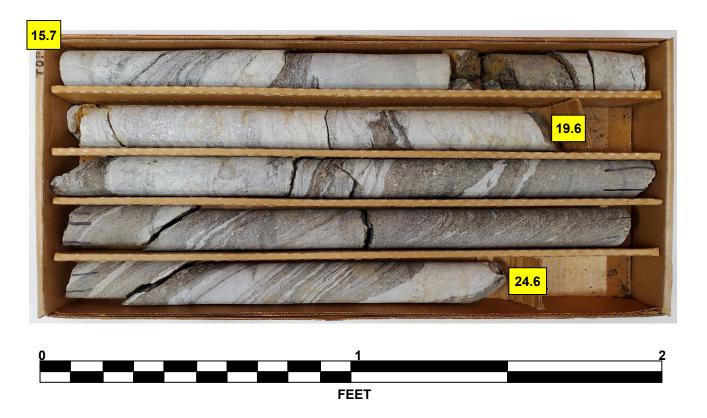


COUNTY BUNCOMBE **WBS** 38368.1.2 **TIP** B-4442 GEOLOGIST Johnson, C. D. **SITE DESCRIPTION** REPLACE BRIDGES 0370 & 0373 ON US-19/23/25/70 **GROUND WTR (ft)** BORING NO. B1-A **STATION** 315+22 OFFSET 54 ft LT ALIGNMENT L 0 HR. N/A COLLAR ELEV. 1,984.3 ft TOTAL DEPTH 49.6 ft **NORTHING** 724,915 **EASTING** 937,354 24 HR. Caved **DRILL RIG/HAMMER EFF./DATE** AFO8963 CME-550X 94% 04/08/2019 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic SURFACE WATER DEPTH N/A DRILLER Cheek, D. O. **START DATE** 01/31/22 **COMP. DATE** 01/31/22 ELEV DRIVE DEPTH BLOW COUNT **BLOWS PER FOOT** SAMP. SOIL AND ROCK DESCRIPTION (ft) (ft) 0.5ft 0.5ft 0.5ft 100 NO. /MOI ELEV. (ft) DEPTH (ft) 1985 **GROUND SURFACE** 1,984.3 ARTIFICIAL FILL BROWN, SANDY-SILT, SL MIC, w/ a few FILL COBBLES/BOULDERS, TRASH 1980 1,979.6 4.7 (GLASS PIECES) *FILL BOULDERS from 6.0' to 7.3' 14 15 13 M FILL BOULDERS ALLUVIAL GREY to ORANGE-RED, SL MIC, 1975 1,974.6 9.7 SILTY-SAND w/ TR CLAY, w/ FEW PEBBLES & GRAVELS, TR ORGANICS (ROOTS) 1970 1,969.6 14.7 WEATHERED ROCK **-** 1,969.6 IN/OUT WR LAYERS 60/0.0 . 60/0.0 CRYSTALLINE ROCK 1965 1960 1955 1950 1945 1940 <u>1935</u> _1,934.7 Boring Terminated at Elevation 1,934.7 ft IN CRYSTALLINE ROCK

GEOTECHNICAL BORING REPORT CORE LOG

| | | | | | | | | | | JK | ELC | JĿ | 7 | | | | | | | | | |
|--------------|---------------------|---------------|-------------|--|-------------------------------|------------------------------|-----------------|--------------------------|------------------|-------------|----------------------------|-------|-------|---------|---------|-----------|----------|--------------------------------------|----------|---------|----------|------------|
| WBS | 38368. | 1.2 | | | TIP | B-444 | 12 | C | OUNT | Y B | UNCON | ИВЕ | | | | GEOL | .OGIS | T Jol | hnson | , C. D. | | |
| SITE | DESCRII | PTION | REF | PLACE B | RIDGI | ES 037 | 70 & 037 | 3 ON L | JS-19 | /23/2 | 5/70 | | | | | | | | | | GROU | ND WTR (ft |
| BORII | NG NO. | B1-A | | | STA | TION | 315+22 | | | OF | FSET 5 | 54 ft | LT | | | ALIGN | NMEN | T L | | | 0 HR. | N/A |
| COLL | AR ELE | V. 1,9 | 984.3 | ft | тот | AL DE | PTH 49 | .6 ft | | NO | RTHING | 7 | 24,9 | 15 | | EAST | ING | 937,35 | 54 | | 24 HR. | Caveo |
| DRILL | RIG/HAM | IMER E | FF./DA | TE AFOS | 8963 CIV | 1 E-550X | (94% 04/(| 08/2019 | | | | DR | ILL M | ETHO | D NW | /Casing\ | W/SPT | & Core | | HAMI | MER TYPE | Automatic |
| DRILL | .ER Ch | eek, C |). O. | | STAI | RT DA | TE 01/3 | 31/22 | | СО | MP. DA | TE | 01/3 | 31/22 | | SURF | ACE \ | WATE | R DEF | PTH N | I/A | |
| CORE | SIZE | NXWX | (| | 1 | | N 33.9 f | | | | | | | | | | | | | | | |
| ELEV (ft) | RUN ELEV (ft) | OEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | REC. (ft) % | JN RQD (ft) % | SAMP. NO. | STR REC. (ft) % | RQD (ft) % | L O G | ELEV. (f | ft) | | | D | ESCRIP | TION A | AND RE | MARK | S | | DEPTH (|
| 968.61 | 4 000 C | 15.7 | | | | | | | | | | | | | | Begin | | | | | | |
| 1965 | 1,968.6 | . 19.6 | 5.0 | 1:24/0.9 2:53/1.0 2:27/1.0 2:41/1.0 2:42/1.0 1:47/1.0 1:06/1.0 1:31/1.0 | (3.6) 92% (5.0) 100% | (2.7) 69% (4.6) 92% | | | | | - - - - - - | | | | C | RYSTAL | LINE I | ROCK (| contini | ued) | | |
| | 1,959.7 | | 5.0 | 2:27/1.0 1:57/1.0 2:13/1.0 1:54/1.0 2:22/1.0 2:31/1.0 1:29/1.0 | (5.0) | (3.1) 62% | | | | | - - - - | | | | | 24.6' | - 32.8 | 6l: 5' : 50 - 5' : 35 - | 45 | | | |
| 1950 | 1,949.7 | . 34.6 | 5.0 | 1:23/1.0 1:33/1.0 2:00/1.0 3:28/1.0 2:32/1.0 2:14/1.0 2:02/1.0 | 100% | (4.7) | | | | | - - - - - | | | | | | | 6 : 05 - 6' : 45 - | | | | |
| | 1,944.7 | | 5.0 | 1:19/1.0 2:00/1.0 1:55/1.0 1:38/1.0 1:22/1.0 2:27/1.0 | (5.0) 100% | (4.3) 86% | | | | | - - - - - | | | | | | | | | | | |
| | 1,939.7 | | 5.0 | 3:18/1.0 2:50/1.0 2:31/1.0 2:40/1.0 2:06/1.0 1:50/1.0 | (5.0) 100% | (4.9) 98% | | | | | | | | | | | | | | | | 49. |
| | | | | | | | | | | | | | Bori | ing Ter | minated | d at Elev | ration 1 | ,934.7 f | ft IN CF | RYSTAL | LINE ROC | |

B1-ABOX 1 of 4: 15.7 - 24.6 FEET



GEOLOGICAL STRENGTH INDEX: GSI 15.7' - 24.6' : 50 - 60



B1-A

BOX 2 of 4: 24.6 - 34.6 FEET

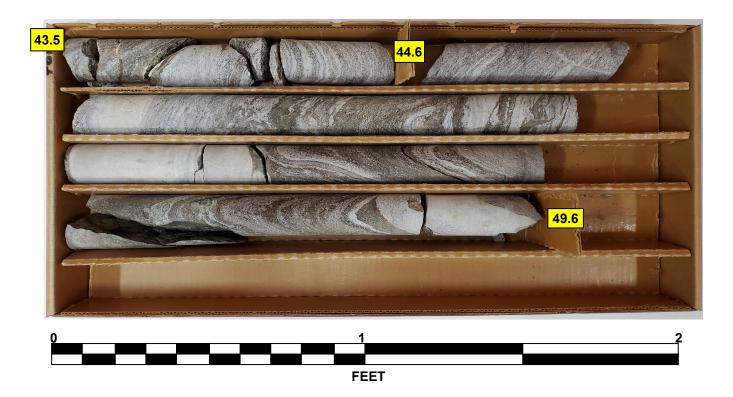
GEOLOGICAL STRENGTH INDEX: GSI

24.6' - 32.8' : 35 - 45 32.8' - 34.6' : 65 - 75

B1-ABOX 3 of 4: 34.6 - 43.5 FEET

43.5 1 2 FEET

GEOLOGICAL STRENGTH INDEX: GSI 34.6' - 43.5' : 65 - 75



B1-A

BOX 4 of 4: 43.5 - 49.6 FEET

GEOLOGICAL STRENGTH INDEX: GSI 43.5' - 49.6' : 45 - 55

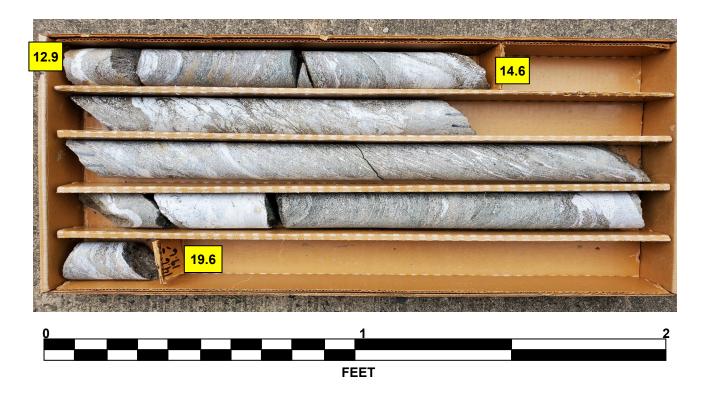
GEOTECHNICAL BORING REPORT

BORE LOG WBS 38368.1.2 **TIP** B-4442 COUNTY BUNCOMBE GEOLOGIST Johnson, C. D. SITE DESCRIPTION REPLACE BRIDGES 0370 & 0373 ON US-19/23/25/70 **GROUND WTR (ft)** BORING NO. B1-D **STATION** 315+33 OFFSET 21 ft LT **ALIGNMENT** L 0 HR. N/A TOTAL DEPTH 19.6 ft COLLAR ELEV. 1,983.6 ft **NORTHING** 724,917 **EASTING** 937,389 24 HR. 6.0 **DRILL RIG/HAMMER EFF./DATE** AFO8963 CME-550X 94% 04/08/2019 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic DRILLER Coffey, Jr., C. **START DATE** 02/03/22 **COMP. DATE** 02/03/22 SURFACE WATER DEPTH N/A ELEV DRIVE DEPTH BLOW COUNT **BLOWS PER FOOT** SAMP. SOIL AND ROCK DESCRIPTION MOI G ELEV. (ft) (ft) 0.5ft 0.5ft 0.5ft 100 NO. (ft) DEPTH (ft) 1985 GROUND SURFACE 1,983.6 ARTIFICIAL FILL RED-BROWN, SL MIC, SANDY-SILT, W/SOME ORGANICS (ROOTS), a TR. of GRAVELS & COBBLES 1980 *FILL BOULDER @1.4' ALLUVIAL GREY, SL MIC, SANDY-SILT, w/TR CLAY 1975 *DENSE WOOD DEBRIS (11.0'-11.5') 1,973.6 + 10.0 WOH 2 М SAPROLITE 1,970.7 + 12.9 BROWN, SL MIC, SANDY-SILT 60/0.0 60/0.0 WEATHERED ROCK DARK GREY/BLACK CRYSTALLINE ROCK 1965 **GREY GNEISS** 1,964.0 Boring Terminated at Elevation 1,964.0 ft IN CRYSTALLINE ROCK

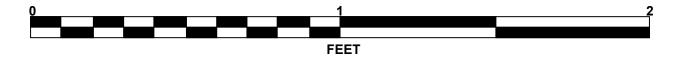
GEOTECHNICAL BORING REPORT CORE LOG

| | | | | | | | | C | U | KE L | -06 | j | | | | | | |
|-----------------|--------------------|-----------|---|----------------------------|-----------|-----------------|-------------|------|--------|------------------|---------|-------------|----------|--------------------|--------------------|----------|----------|------------|
| WBS | 38368.1.2 | 2 | | TIP | B-444 | 12 | С | OUNT | ΥΕ | BUNCO | MBE | | | GEOLOGIST | Johnso | n, C. D. | | |
| | DESCRIPT | | PLACE R | RIDGI | ES 037 | 70 & 037 | | | | | | | | 1 | | | GROUN | D WTR (ft) |
| | ING NO. B | | | _ | | 315+33 | 2 3.10 | | | FSET | 21 ft l | т | | ALIGNMENT | 1 | | 0 HR. | N/A |
| | | | \ f. | - | | | 0.5 | | + | | | | | | | | 1 | |
| | LAR ELEV. | | | | | PTH 19 | | | NC | RTHIN | | | | EASTING 9 | | 1 | 24 HR. | 6.0 |
| DRIL | _ RIG/HAMME | R EFF./D | ATE AFO | 963 CIV | /IE-550X | 94% 04/ |)8/2019 |) | | | DRIL | LMETHOD | D NW | Casing W/SPT 8 | Core | HAMM | ER TYPE | Automatic |
| DRIL | LER Coffe | y, Jr., C | | START DATE 02/03/22 | | | | | | MP. DA | TE C | 2/03/22 | | SURFACE W | ATER DE | PTH N | 'A | |
| COR | E SIZE NX | XWX | | TOT | AL RU | N 6.7 ft | | | | | | | | | | | | |
| ELEV | RUN DE | PTH RUN | DRILL | REC. | UN RQD | SAMP. | STF REC. | RATA | Ļ | | | | | | | | | |
| (ft) | | ft) (ft) | | (ft) % | (ft) | NO. | (ft) % | (ft) | O G | ELEV. | (ft) | | DI | ESCRIPTION AN | ND REMAR | KS | | DEPTH (ft) |
| 1070 66 | | | | | 70 | | 70 | /0 | | | (11) | | Col | ntinued from p | rovious r | 2200 | | <u> </u> |
| 1970.60 1970 | 1,970.7 1,969.0 | 2.9 1.7 | N=60/0.0 2:39/1.7 2:39/1.7 N=60/0.0 2:39/1.7 N=60/0.0 (2:39/1.7 1:40/1.0 1:50/1.0 2:02/1.0 2:13/1.0 | (1.3) | (1.0) | | | | | - 1,970.7 | , | | <u> </u> | CRYSTALL | NE ROCK | age | | 12.9 |
| | 1,303.0 | 5.0 | 2:39/1.7 2:39/1.7 | (5.0) | (4.6) | 1 | | | | _ | | | | GS | l: | | | |
| | l ± | | 2:39/1.7 | 100% | | | | | | E | | | | 12.9' - 19.6 | <u>'</u> : 65 - 75 | i | | |
| 1965 | 1,964.0 | 9.6 | N=60/0.0 2:39/1.7 | | | | | | | 1,964.0 |) | | | | | | | 19.6 |
| | 1,00.10 | | 1:40/1.0 | | | 1 | | | | - 1,001.0 | | Boring Tern | minated | d at Elevation 1,9 | 64.0 ft IN 0 | CRYSTALL | INE ROCK | |
| | | | 1:50/1.0 | | | | | | | _ | | | | | | | | |
| | + | | 2:13/1.0 | 1 | | | | | | - | | | | | | | | |
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B1-DBOX 1 of 1: 12.9 - 19.6 FEET







GEOLOGIST Johnson, C. D. **WBS** 38368.1.2 **TIP** B-4442 **COUNTY** BUNCOMBE SITE DESCRIPTION REPLACE BRIDGES 0370 & 0373 ON US-19/23/25/70 GROUND WTR (ft) BORING NO. B1-C **STATION** 315+40 OFFSET 2 ft RT ALIGNMENT L 0 HR. N/A TOTAL DEPTH 49.2 ft COLLAR ELEV. 1,984.5 ft **NORTHING** 724,918 **EASTING** 937,413 Caved 24 HR. **DRILL RIG/HAMMER EFF/DATE** AFO8963 CME-550X 94% 04/08/2019 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic **COMP. DATE** 02/01/22 DRILLER Cheek, D. O. **START DATE** 02/01/22 SURFACE WATER DEPTH N/A ELEV DRIVE DEPTH BLOW COUNT SAMP. **BLOWS PER FOOT** SOIL AND ROCK DESCRIPTION (ft) 0.5ft 0.5ft 0.5ft 50 75 100 NO. (ft) MOI G 1985 GROUND SURFACE ARTIFICIAL FILL BROWN, SL MIC, SANDY-SILT, w/ CLAY, w/ a TR GRAVELS 1980 <u>1,980.0 4.5</u> М 1,976.0 ALLUVIAL BROWN, SL MIC, SANDY-SILT, w/ CLAY, 1975 1,975.0 9.5 M 1,973.2 w/ some ORGANICS SAPROLITE GREY-ORANGE SILTY-SAND, w/ W.R. FRAGS 1,970.7 1,969.5 1970 1,969.1 15.4 60/0.0 15.0 WEATHERED ROCK 60/0.0 DARK GREY/BLACK/DARK ORANGE CRYSTALLINE ROCK 1965 1960 1955 1950 1945 1940 . Boring Terminated at Elevation 1,935.3 ft IN CRYSTALLINE ROCK

GEOTECHNICAL BORING REPORT CORE LOG

| | WBS 38368.1.2 TIP B-4442 COUNTY BUNCOMBE GEOLOGIST Johnson, C. D. | | | | | | | | | | | | | | | | | |
|-----------------------------|---|-------|-------------|--|---------------|------------------------|-----------------|--------------------------|-------------------------|--------|------------------|---------------|----------|-------------------|---|---------|----------|------------|
| WBS 38368.1.2 TIP B-4442 CO | | | | | | | | TNUC | Y E | BUNCOM | BE | | | GEOLOGIST Johnson | , C. D. | | | |
| SITE | DESCRIPT | ION | REP | LACE B | RIDGE | S 037 | 0 & 0373 | ONL | JS-19/ | 23/2 | 25/70 | | | | | | GROUN | D WTR (ft) |
| BOR | ING NO. B | 1-C | | | STA | ΓΙΟΝ | 315+40 | | | OF | FSET 2 | ft RT | | | ALIGNMENT L | | 0 HR. | N/A |
| COL | LAR ELEV. | 1,98 | 34.5 f | t | TOT | AL DEI | PTH 49. | 2 ft | | NO | RTHING | 724,91 | 8 | | EASTING 937,413 | | 24 HR. | Caved |
| DRILI | RIG/HAMME | REFF | F./DAT | TE AFO | 963 CIV | 1E-550X | 94% 04/0 | 08/2019 | | | | DRILL ME | THOD | NW | Casing W/SPT & Core | HAMM | ER TYPE | Automatic |
| DRIL | LER Chee | k, D. | Ο. | | STAF | RT DA | TE 02/0 | 1/22 | | СО | MP. DAT | E 02/0 | 1/22 | | SURFACE WATER DE | TH N | /A | |
| COR | E SIZE NX | WX | | | TOTA | AL RUI | N 33.8 f | t | | | | | | • | | | | |
| ELEV (ft) | RUN ELEV (ft) DEF | | RUN (ft) | DRILL RATE (Min/ft) | REC. (ft) | JN RQD (ft) % | SAMP. NO. | STR REC. (ft) % | ATA RQD (ft) % | LOG | ELEV. (ft |) | | DI | ESCRIPTION AND REMARK | S | | DEPTH (ft) |
| 1969.13 | 169 13 | | | | | | | | | | | | | Cor | ntinued from previous pa | age | | |
| 1965 | 1,969.1 15.4 3.8 N=60/0.0 (3.8) (3.5) 2:40/0.8 100% 92% 2:33/1.0 2:28/1.0 2:38/1.0 100% 90% 1:44/1.0 100% 90% 1:44/1.0 1:27/1.0 | | | | | | | | | | - - - | | | CF | RYSTALLINE ROCK (contin | ued) | | |
| | | | | | | | | | | | | | | | | | | |
| 1960 | 1,960.3 24 | | 5.0 | 2:10/1.0 2:12/1.0 1:56/1.0 1:39/1.0 | (4.9) 98% | (4.2) 84% | | | | | - - - | | | | | | | |
| 1955 | 1,955.3 29 | | 5.0 | 2:19/1.0 2:51/1.0 2:25/1.0 2:13/1.0 1:43/1.0 | (5.0) 100% | (5.0) 100% | | | | | - - - | | | | GSI: 15.4' - 30.3' : 45 - 55 30.3' - 42.1' : 75 - 85 | | | |
| 1950 | 1,950.3 34 | | 5.0 | 2:14/1.0 2:51/1.0 1:25/1.0 1:15/1.0 | (5.0) | (5.0) 100% | | | | | - - - | | | | 42.1' - 49.2' : 65 - 75 | | | |
| 1945 | 1,945.3 - 39 | | 5.0 | 2:13/1.0 1:49/1.0 2:24/1.0 3:10/1.0 | (5.0) | (5.0) | | | | | | | | | | | | |
| 1940 | 1,940.3 44 | | | 1:51/1.0 2:30/1.0 2:04/1.0 2:01/1.0 | | 100% | | | | | - - - - | | | | | | | |
| 10.10 | 1,005,0 | | 5.0 | 1:44/1.0 1:58/1.0 2:07/1.0 1:51/1.0 | (4.9) 98% | (4.7) 94% | | | | | - - - | | | | | | | |
| | 1,935.3 + 49 | 0.2 | | 1:57/1.0 | | | | | | ركراهن | 1,935.3 — | Borir | ng Termi | nated | at Elevation 1,935.3 ft IN C | RYSTALL | INE ROCK | 49.2 |
| | | | | | | | | | | | | | g | | | | | |

B1-CBOX 1 of 4: 15.4 - 24.2 FEET

19.2 19.2 0 1 2 FEET

GEOLOGICAL STRENGTH INDEX: GSI 15.4' - 24.2' : 45 - 55



B1-C

BOX 2 of 4: 24.2 - 33.4 FEET

GEOLOGICAL STRENGTH INDEX: GSI

24.2' - 30.3' : 45 - 55 30.3' - 33.4' : 75 - 85

B1-CBOX 3 of 4: 33.4 - 42.1 FEET



GEOLOGICAL STRENGTH INDEX: GSI 33.4' - 42.1' : 75 - 85



B1-C

BOX 4 of 4: 42.1 - 49.2 FEET

GEOLOGICAL STRENGTH INDEX: GSI 42.1' - 49.2' : 65 - 75

GEOTECHNICAL BORING REPORT CORE LOG

| | | BORE LOG | | | CORE LOG | | | | | | |
|--------------------------------|--------------------------------|-------------------------|---|--------------------|---|---|---------------------|--|-----------------|--|--|
| WBS 38368.1.2 | TIP B-4442 COUN | ITY BUNCOMBE | GEOLOGIST Johnson, C. D. | | WBS 38368.1.2 | TIP B-4442 COUN | ITY BUNCOMBE | GEOLOGIST Johnson, C. D. | | | |
| SITE DESCRIPTION REPLACE | E BRIDGES 0370 & 0373 ON US-1 | 9/23/25/70 | | GROUND WTR (ft) | SITE DESCRIPTION REPLA | CE BRIDGES 0370 & 0373 ON US-1 | 9/23/25/70 | GR | ROUND WTR (| | |
| BORING NO. B1-E | STATION 315+50 | OFFSET 31 ft RT | ALIGNMENT L | 0 HR. N/A | BORING NO. B1-E | STATION 315+50 | OFFSET 31 ft RT | ALIGNMENT L 0 | HR. N | | |
| COLLAR ELEV. 1,984.9 ft | TOTAL DEPTH 49.8 ft | NORTHING 724,920 | EASTING 937,444 | 24 HR. 4.0 | COLLAR ELEV. 1,984.9 ft | TOTAL DEPTH 49.8 ft | NORTHING 724,920 | EASTING 937,444 24 | HR . 4 | | |
| DRILL RIG/HAMMER EFF./DATE A | FO8963 CME-550X 94% 04/08/2019 | DRILL METHOD N | W Casing W/SPT & Core HAMI | MER TYPE Automatic | DRILL RIG/HAMMER EFF./DATE | AFO8963 CME-550X 94% 04/08/2019 | DRILL METHOD | NW Casing W/SPT & Core HAMMER T | TYPE Automation | | |
| DRILLER Coffey, Jr., C. | START DATE 02/02/22 | COMP. DATE 02/02/22 | SURFACE WATER DEPTH | I/A | DRILLER Coffey, Jr., C. | START DATE 02/02/22 | COMP. DATE 02/02/22 | SURFACE WATER DEPTH N/A | | | |
| ELEV DRIVE DEPTH BLOW CO | DUNT BLOWS PER FO | OT SAMP. | SOIL AND ROCK DES | COUDTION | CORE SIZE NXWX | TOTAL RUN 33.4 ft | | | | | |
| (ft) (ft) (ft) 0.5ft 0.5ft | 0.5ft 0 25 50 | 75 100 NO. MOI G | | DEPTH (ft) | | | | | | | |
| | | | | | (ft) ELEV (ft) (ft) R | RILL RUN STRATA ATE REC. RQD SAMP. REC. RQ Iin/ft) (ft) (ft) (ft) (ft) (ft) (ft) (ft) (| D O G | DESCRIPTION AND REMARKS | | | |
| 1985 | | | 1,984.9 GROUND SURF | FACE 0.0 | 1968 48 | | | Continued from previous page | | | |
| T | | | ARTIFICIAL F BROWN-RED, SANDY-SIL | | 1,968.5 + 16.4 3.4 N= 1965 1,965.1 19.8 1:2 | 60/0.0 (3.3) (2.1) 4/1.4 0.79/ 6.29/ | 1,968.5 | CRYSTALLINE ROCK | 1 | | |
| | | . | GRAVELS, w/ a fev | | 1965 1,965.1 19.8 1:0 1:2 | 05/1.0 12/1.0 | | | | | |
| 1980 1,979.9 5.0 | 2 1 | I | - - | | | 00/1.0 (5.0) (4.5) | | | | | |
| | 43 | | - - | | 1:1 | 9/1.0 0/1.0 | | | | | |
| 1075 | | | - - 1,975.4 | 9.5 | 1960 1,960.1 24.8 1:3 | 86/1.0 | | | | | |
| 1975 1,974.9 10.0 2 3 | 5 | | ALLUVIAL | SANDY-SILT w/ 11.8 | 1 | 04/1.0 (5.0) (3.9) 20/1.0 100% 78% 6/1.0 | | | | | |
| | | | some PEBBL | ES / | 1955 1,955.1 29.8 1:3 2:0 | 07.1.0 32/1.0 03/1.0 | | | | | |
| 1970 1,969.9 15.0 | | | SAPROLITI 1,969.9 BROWN, SL MIC, CLAYE | Y-SILTY-SAND,15.0 | 5.0 2:2 | 26/1.0 (5.0) (4.8) 14/1.0 100% 96% | | GSI: | | | |
| 1,968.5 16.4 41 59/0.2 | | · · 100/0.7 | GRADUALLY ST - 1,968.5 GRADUALLY ST - WEATHERED F | | T 1.5 | 58/1 0 | | 16.4' - 34.4' : 55 - 65 34.4' - 39.0' : 40 - 50 | | | |
| | | | - DARK GREY/DARK | BROWN | 1950 1,950.1 34.8 2:3 | 33/1.0 38/1.0 | | 39.0' - 49.8' : 70 - 80 | | | |
| 1965 | | | CRYSTALLINE I GREY GNEIS | | 5.0 2:1 | 6/1.0 (5.0) (2.9) 04/1.0 100% 58% | | | | | |
| | | | - - | | 1:5 | 57/1.0 19/1.0 57/1.0 | | | | | |
| 1960 | | | - - | | 1945 1,945.1 39.8 2:3 5.0 3:2 | 37/1.0 24/1.0 (5.0) (4.9) | | | | | |
| + | | | - - | | T 1:5 | 24/1.0 (5.0) (4.9) 59/1.0 100% 98% 17/1.0 | | | | | |
| | | | - - | | | 22/1.0 4/1.0 | | | | | |
| 1955 | | | - - | | 5.0 2:4 | 12/1.0 (5.0) (4.3) 17/1.0 100% 86% | | | | | |
| | | | - | | | 58/1.0 | | | | | |
| | | | - - | | 1,935.1 49.8 3:3 3:3 | 6/1.0 34/1.0 | 1,935.1 | | 4 | | |
| 1950 | | | - - | | | | Boring Termin | nated at Elevation 1,935.1 ft IN CRYSTALLINE | ROCK | | |
| | | 1 1 1 1 V 21 | - - | |]] | | F | | | | |
| 1945 | | | . - | | | | F | | | | |
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| 1940 | | | <u>-</u> | | <u>a</u> <u>†</u> | | - | | | | |
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| | | · · · · · · | 1,935.1 Boring Terminated at Eleva | 49.8 | g T [| | F | | | | |
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B1-EBOX 1 of 4: 16.4 - 24.8 FEET

16.4 19.8 24.8 FEET

GEOLOGICAL STRENGTH INDEX: GSI 16.4' - 24.8' : 55 - 65

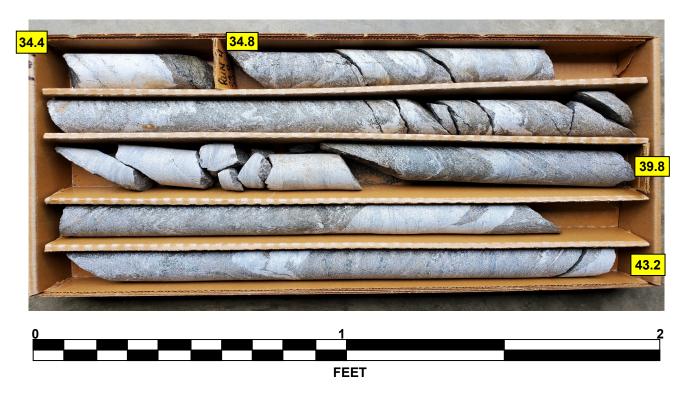


B1-E

BOX 2 of 4: 24.8 - 34.4 FEET

GEOLOGICAL STRENGTH INDEX: GSI 24.8' - 34.4' : 55 - 65

B1-EBOX 3 of 4: 34.4 - 43.2 FEET



GEOLOGICAL STRENGTH INDEX: GSI

34.4' - 39.0' : 40 - 50 39.0' - 43.2' : 70 - 80



B1-E

BOX 4 of 4: 43.2 - 49.8 FEET

GEOLOGICAL STRENGTH INDEX: GSI 43.2' - 49.8' : 70 - 80

SHEET 22

GEOTECHNICAL BORING REPORT BORE LOG

WBS 38368.1.2 COUNTY BUNCOMBE **TIP** B-4442 GEOLOGIST Johnson, C. D. **GROUND WTR (ft)** SITE DESCRIPTION REPLACE BRIDGES 0370 & 0373 ON US-19/23/25/70 BORING NO. B1-B **STATION** 315+59 OFFSET 64 ft RT ALIGNMENT L 0 HR. N/A **NORTHING** 724,920 **EASTING** 937,479 6.0 COLLAR ELEV. 1,983.9 ft TOTAL DEPTH 44.3 ft 24 HR. DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic DRILLER Coffey, Jr., C. **START DATE** 02/02/22 COMP. DATE 02/03/22 SURFACE WATER DEPTH N/A | DRIVE | DEPTH | BLOW COUNT | | ELEV (ft) | 0.5ft | 0.5ft | 0.5ft | **BLOWS PER FOOT** SAMP. SOIL AND ROCK DESCRIPTION (ft) 0.5ft 0.5ft 0.5ft 75 100 NO. 1985 GROUND SURFACE 1.983.9 ARTIFICIAL FILL
GREY-DARK BROWN, BOULDERS &
COBBLES, w/ SILTY-SAND MATRIX w/ 1980 GRAVELS 1,979.1 4.8 WOH WOH FILL COBBLES & BLDRS to 4.7' ARTIFICIAL FILL BROWN, SANDY-SILT, w/ CLAY, w/ TR GRAVELS, w/ ORGS-TRASH 1975 1,974.1 9.8 ALLUVIAL W GREY-BROWN, SL MIC, SANDY-SILT, w/PEBBLES/GRAVELS 1,970.6 13.3 1,970.6 60/0.0 CRYSTALLINE ROCK **GREY GNEISS** 1965 1960 1955 1950 1945 . 1940 Boring Terminated at Elevation 1,939.6 ft IN CRYSTALLINE ROCK

GEOTECHNICAL BORING REPORT CORE LOG

| | | | | | | | | C | OF | RE L | <u> </u> | } | | | | | | | | |
|---|--------------|-------------|--|---------------|---|-----------------|--------------------------|------------------|-------------|---|----------|-----------|----------|----------|---------|------------------------|----------|---------|-----------|--------------|
| WBS 38368.1. | .2 | | | TIP | B-444 | 2 | C | OUNT | Y B | UNCOM | IBE | | | GEO | DLOGI | ST Jo | hnson | , C. D. | | |
| SITE DESCRIP | TION | REF | PLACE B | RIDGE | ES 037 | 70 & 0373 | ON L | JS-19/ | /23/2 | 5/70 | | | | | | | | | GROUN | ND WTR (ft) |
| BORING NO. | B1-B | | | STAT | ΓΙΟΝ | 315+59 | | | OF | FSET 6 | 4 ft F | RT | | ALI | GNME | NT L | | | 0 HR. | N/A |
| COLLAR ELEV | | | | | | PTH 44. | | | NO | RTHING | | • | | | | 937,4 | | | 24 HR. | 6.0 |
| DRILL RIG/HAMIN | MER EF | F./DA | TE AFOS | 963 CIV | 1E-550X | 94% 04/0 | 08/2019 | | | | | L METHO | | W Casir | g WSP | T & Core |) | HAMN | MER TYPE | Automatic |
| DRILLER Coff | fey, Jr | ., C. | | STA | RT DA | TE 02/0 | 2/22 | | СО | MP. DAT | E | 2/03/22 | | SUF | RFACE | WATE | R DEF | PTH N | /A | |
| CORE SIZE N | IXWX | | | | | N 31.0 f | |) A T A | ļ., | | | | | | | | | | | |
| | EPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | REC. (ft) | JN RQD (ft) | SAMP. NO. | STR REC. (ft) % | RQD (ft) % | L O G | ELEV. (ft |) | | [| DESCR | IPTION | AND RE | EMARK | S | | DEPTH (f |
| 970.57 1970 1 970.6 1 | 13.3 | 1.0 | N=60/0.0 | (1.0) | (0.6) | | | | | 1.070.6 | | | C | ontinu | ed fron | n previo | ous pa | ige | | 40.5 |
| 1,964.6 | | 5.0 | N=60/0.0 2:15/1.0 2:22/1.0 1:57/1.0 1:03/1.0 1:29/1.0 1:40/1.0 2:06/1.0 1:29/1.0 | (4.9) 98% | (0.6) (60% / (4.6) 92% (4.9) 98% | | | | | — 1,970.6 - - - - - - | | | | C | KTSTAI | LLINE K | OCK | | | 13. |
| 1960 1,959.6 2 | 24.3 | 5.0 | 1:47/1.0 2:43/1.0 4:21/1.0 2:45/1.0 1:14/1.0 2:14/1.0 | | (4.0) 80% | | | | | - - - - - | | | | 13 | | SI: .3' : 65 | - 75 | | | |
| 1,954.6 2 1,954.6 2 1,950 1,949.6 3 | | 5.0 | 2:53/1.0 2:52/1.0 2:59/1.0 3:23/1.0 1:36/1.0 1:35/1.0 | (5.0) 100% | (3.9) 78% | | | | | - - - - - | | | | | | .3' : 75 | | | | |
| 1045 | 39.3 | 5.0 | 5:38/1.0 3:43/1.0 4:36/1.0 2:51/1.0 3:23/1.0 2:17/1.0 | 100% | (4.9) 98% | | | | | - - - - | | | | | | | | | | |
| 1,939.6 4 | 44.3 | 5.0 | 2:52/1.0 2:08/1.0 1:17/1.0 2:01/1.0 2:46/1.0 | (5.0) 100% | (5.0) 100% | | | | | - - - - - 1,939.6 | | Borina Te | erminate | ed at El | evation | 1.939.6 | ft IN CF | RYSTALI | LINE ROCK | <u>44.</u> : |
| | | | | | | | | | | | | Boring Te | erminate | ed at El | evation | 1,939.6 | ft IN CF | RYSTALI | LINE ROCH | |

B1-BBOX 1 of 4: 13.3 - 22.9 FEET

13.3

14.3

19.3

22.9

FEET

GEOLOGICAL STRENGTH INDEX: GSI 13.3' - 22.9' : 65 - 75

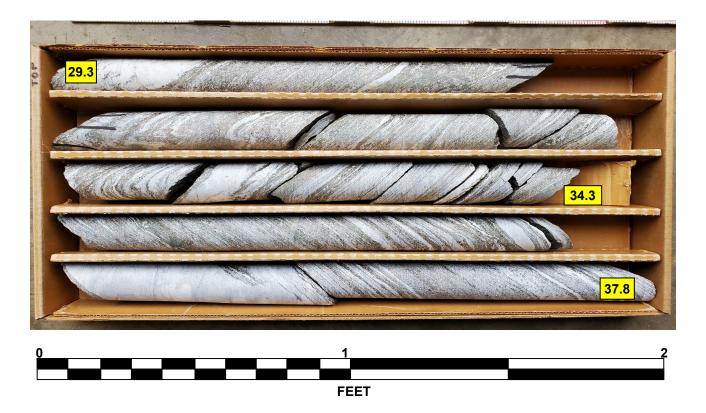


B1-B

BOX 2 of 4: 22.9 - 29.3 FEET

GEOLOGICAL STRENGTH INDEX: GSI 22.9' - 29.3' : 65 - 75

B1-BBOX 3 of 4: 29.3 - 37.8 FEET



GEOLOGICAL STRENGTH INDEX: GSI

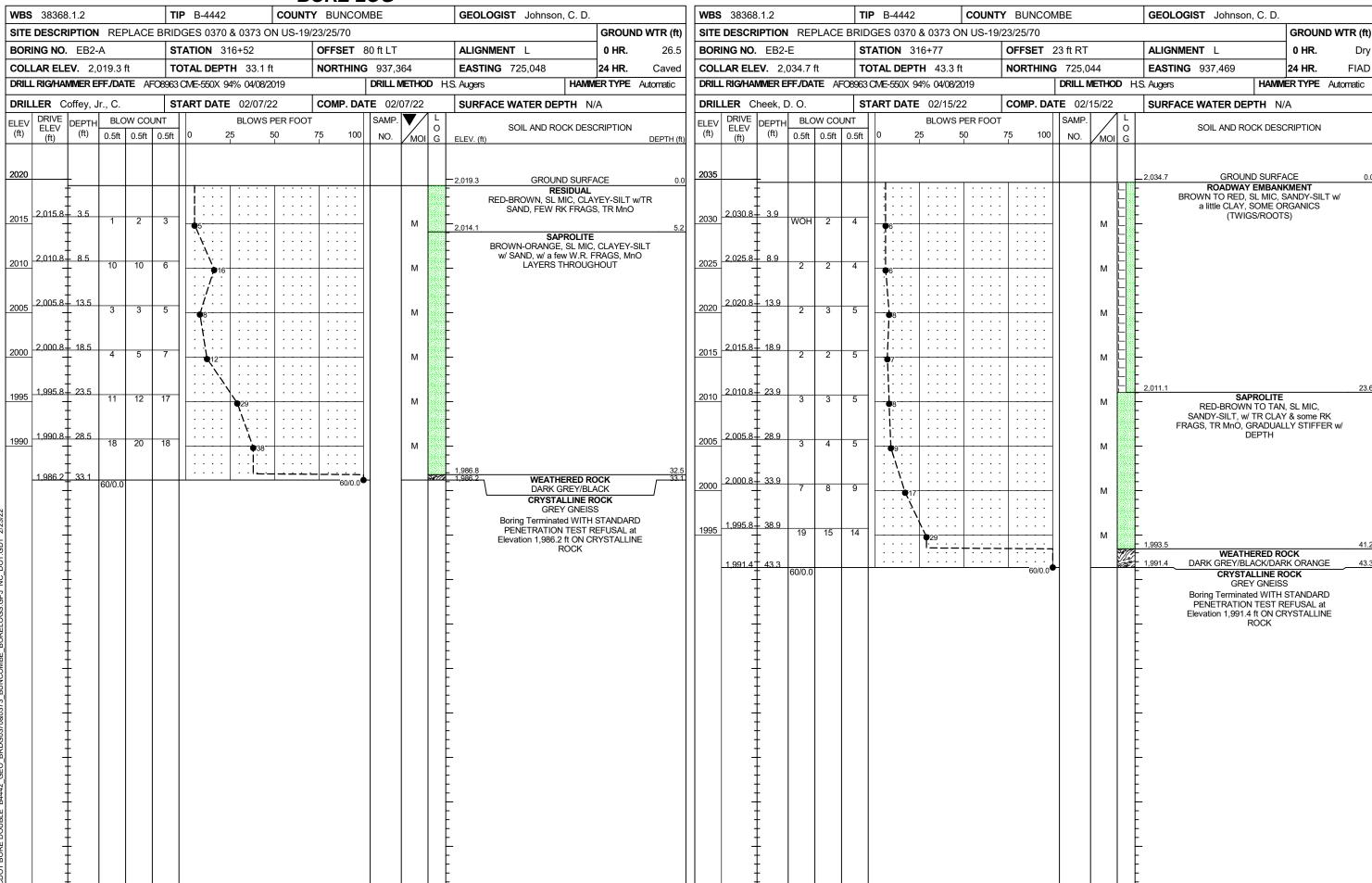
29.3' - 34.3' : 65 - 75 34.3' - 37.8' : 75 - 85



B1-B

BOX 4 of 4: 37.8 - 44.3 FEET

GEOLOGICAL STRENGTH INDEX: GSI 37.8' - 44.3' : 75 - 85



| | | | | | | | | | <u>URE L</u> | <u> </u> | | | | |
|-------|--------------|---------------|--------|-------|--------|------------------|------------------|--------------|--|----------------|------------|----------|--|--------------------|
| WBS | 38368 | 3.1.2 | | | TI | P B-4442 | | COUNT | Y BUNCON | /IBE | | | GEOLOGIST Johnson, C. D. | |
| SITE | DESCR | IPTION | N REF | PLAC | BRID | GES 0370 | & 0373 O | N US-19/ | 23/25/70 | | | | | GROUND WTR (ft) |
| BOR | ING NO. | EB2 | -B | | S | TATION 3 | 17+00 | | OFFSET 8 | 36 ft RT | | | ALIGNMENT L | 0 HR . Dry |
| COL | LAR ELE | EV. 2, | 034.3 | ft | TO | OTAL DEP | TH 36.1 f | t | NORTHING | 725,04 | 19 | | EASTING 937,536 | 24 HR . Dry |
| DRILI | _ RIG/HAI | MMER E | FF./DA | TE A | FO8963 | CME-550X 9 | 94% 04/08/2 | 019 | · | DRILL M | ETHO | D H.S | S. Augers HAMM | IER TYPE Automatic |
| DRIL | LER C | heek, [| D. O. | | S | TART DATI | 02/14/2 | 2 | COMP. DAT | TE 02/1 | 4/22 | | SURFACE WATER DEPTH NA | /A |
| ELEV | DRIVE | DEPTH | BLC | ow co | UNT | | BLOWS | PER FOOT | | SAMP. | V / | L | SOIL AND DOOK DESC | CDIDTION |
| (ft) | ELEV (ft) | (ft) | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 100 | NO. | /MOI | O G | SOIL AND ROCK DESC | DEPTH (ft) |
| | | | | | | | | | | | | | | |
| 2035 | | | | | | | | | | | | | | |
| | - | ļ — | | | | 1 | | · · · · | | | | | -2,034.3 GROUND SURFA ROADWAY EMBAN | |
| | - | ‡ | | | | | | | | | | l-III | RED-BROWN-GREY, CLAYEY-SILT w/ SAND, sor | SL MIC, |
| 2030 | 2,030.8- | 3.5 | 2 | 2 | 4 | | | | | | М | F | (TWIGS/ROOTS), w/ a f | |
| | - | t | | | | | | | | | | | | |
| | 2.025.8- | 8.5 | | | | j::: | | | | | | ĿĿ | | |
| 2025 | | - 0.0 | 2 | 3 | 4 | 7 | | | | | М | ᄩ | - | |
| | - | Ī | | | | : : : : | | : : : : | | | | ᄩ | | |
| 2020 | 2,020.8- | 13.5 | | | | : : : : | | | | | | H | | |
| 2020 | - | ‡ | 2 | 3 | 6 | 9 | | | | | М | | • | |
| | - | <u> </u> | | | | . 1 | | | | | | | | |
| 2015 | 2,015.8- | 18.5 | WOH | 3 | 10 | <u> · ·j·</u> · | | | | | М | Ŀ | -2,014.6 | 19.7 |
| | - | F | | | | 13 | | | | | IVI | F | SAPROLITE | · |
| | 0.040.0 | | | | | ::;::: | | | | | | F | LT BROWN-TAN, SL MIC, w/TR CLAY, w/ N | |
| 2010 | 2,010.8- | 23.5 | 3 | 5 | 5 | 10 | | | | | М | | - | |
| | - | ‡ | | | | ::::: | | | | | | | | |
| | 2.005.8- | 28.5 | | | | ::::: | | | | | | l t | | |
| 2005 | _ | t | 3 | 6 | 6 | 12- | <u> </u> | | | | М | | | |
| | - | F | | | | | | : : : : | | | | F | | |
| 2000 | 2,000.8- | 33.5 | 10 | 61 | 39/0.1 | :: ::: | | | | | | F | 1 000 8 | 34.5 |
| 2000 | 1.998.2 | 36.1 | 10 | 01 | 39/0.1 | W.R | T | T | 100/0.6 | ' | | | 1,999.8 WEATHERED RO 1,998.2 GREY/DARK GF | OCK COL |
| | -1,000.2 | - 50.1 | 60/0.0 | | | ' | • | | 60/0.0 | 7 [| | - | CRYSTALLINE R | OCK |
| | _ | ‡ | | | | | | | | | | | GREY GNEIS: Boring Terminated WITH | |
| | - | t | | | | | | | | | | <u> </u> | PENETRATION TEST R | REFUSAL at |
| | - | ł | | | | | | | | | | l | Elevation 1,998.2 ft ON CF ROCK | RYSTALLINE |
| | _ | F | | | | | | | | | | ΙF | - | |
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SHEET 26

SUMMARY OF PILE INFORMATION/INSTALLATION

(Blank entries indicate item is not applicable to structure)

| End Bent/ | | | | | | Driven Piles | | | Predrilling for Piles* | | Drilled-In Piles | | |
|--|--|--|---|--------------------------------------|---|---|---|---|---|---|--|--|---|
| Bent No, Pile(s) ## (e.g., "Bent 1, Piles 1-5") | Factored Resistance per Pile TONS | Pile Cut-Off (Top of Pile) Elevation FT | Estimated Pile Lenth per Pile FT | Scour Critical Elevation FT | Min Pile Tip (Tip No Higher Than) Elev FT | Required Driving Resistance (RDR)** per Pile TONS | Total Pile Redrives Quantity EACH | Predrilling Length per Pile Lin FT | Predrilling Elevation (Elev Not To Predrill Below) FT | Maximum Predrilling Dia INCHES | Pile Excavation (Bottom of Hole) Elev FT | Pile Exc Not In Soil per Pile Lin FT | Pile Exc In Soil per Pile Lin FT |
| End Bent 1, Piles 1-9 | 144 | See Structure Plans | 25 | | | 240 | | | | | | | |
| End Bent 1, Piles 10-18 | 144 | See Structure Plans | 50 | | | 240 | | | | | | | |
| End Bent 1, Piles 19-28 | 144 | See Structure Plans | 50 | | | 240 | | | | | | | |
| End Bent 2, Piles 1-9 | 135 | See Structure Plans | 50 | | | 225 | | | | | | | |
| End Bent 2, Piles 10-18 | 135 | See Structure Plans | 50 | | | 225 | | | | | | | |
| End Bent 2, Piles 19-28 | | See Structure Plans | 45 | | | 225 | | | | | | | |

*Predrilling for Piles is required for end bents/bents with a predrilling length and at the Contractor's option for end bents/bents with predrilling information but no predrilling length.

ng for Piles is required for end beinstreams with a production of the factored Dead Load - Factored Resistance + Factored Downdrag Load + Factored Dead Load - Nominal Downdrag Resistance + Nominal Scour Resistance Factor Nominal Scour Resistance

PILE DESIGN INFORMATION

(Blank entries indicate item is not applicable to structure)

| End Bent/ Bent No, Pile(s) #-# (e.g., "Bent 1, Piles 1-5") | Factored Axial Load per Pile TONS | Factored Downdrag Load per Pile TONS | Factored Dead Load* per Pile TONS | Dynamic Resistance Factor | Nominal Downdrag Resistance per Pile TONS | Nominal Scour Resistance per Pile TONS | Scour Resistance Factor (Default = 1.00) |
|--|---|--|---|---------------------------------|---|---|---|
| End Bent 1, Piles 1-9 | 143 | | | | | | 1.00 |
| End Bent 1, Piles 10-18 | 143 | | | | | | 1.00 |
| End Bent 1, Piles 19-28 | 143 | | | | | | 1.00 |
| End Bent 2, Piles 1-9 | 135 | | | | | | 1.00 |
| End Bent 2, Piles 10-18 | 135 | • | | | | | 1.00 |
| End Bent 2, Piles 19-28 | 135 | | | | | | 1.00 |

*Factored Dead Load is factored weight of pile above the ground line.

SUMMARY OF DRILLED PIER INFORMATION/INSTALLATION

(Blank entries indicate item is not applicable to structure)

| End Bent/ Bent No, Pier(s) #- (e.g., "Bent 1, Piers 1-3") | Factored Resistance per Pier TONS | Minimum Pier Tip (Tip No Higher Than) Elevation FT | Required Tip Resistance per Pier TSF | Scour Critical Elevation FT | Minimum Drilled Pier Penetration Into Rock per Pier Lin FT | Drilled Pier Length per Pier Lin FT | Drilled Pier Length Not In Soil per Pier Lin FT | Drilled Pier Length In Soil per Pier Lin FT | Permanent Steel Casing Required? YES or MAYBE | Permanent Steel Casing Tip Elevation (Elev Not To Extend Casing Below) FT | Permanent Steel Casing Length* per Pier Lin FT |
|---|--|---|---|--------------------------------------|--|---|--|--|--|---|---|
| Bent 1, Piers 1-3 | 742 | 1958.0 | 100 | 1968 | 12.0 | 25.0 | | | Yes | 1970.0 | 15.0 |
| Bent 1, Piers 4-6 | 742 | 1958.0 | 100 | 1968 | 12.0 | 24.5 | | | Yes | 1970.0 | 15.0 |
| Bent 1, Piers 7-9 | 742 | 1958.0 | 100 | 1968 | 12.0 | 24.0 | | | Yes | 1970.0 | 15.0 |
| | | | | | | | | | | | |

*Permanent Steel Casing Length equals the difference between the ground line or top of drilled pier elevation, whichever is higher, and the permanent casing tip elevation.

FOUNDATION NOTES

- 1. FOR PILES, SEE PILES PROVISION AND SECTION 450 OF THE STANDARD SPECIFICATIONS.
- 2. FOR DRILLED PIERS, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.

- 1. The Pile and Drilled Pier Foundation Tables are based on the bridge substructure design and foundation recommendations sealed by a North Carolina Professional Engineer Shiping Yang, PE, seal # 031361) on 05-03-2022
- 2. Total Pile Driving Equipment Setup quantity (not shown in Pile Foundation Tables) equals the number of driven piles, i.e., the number of piles with a Required Driving Resistance.
- 3. The Engineer will determine the need for PDA Testing, Pipe Pile Plates, Permanent Steel Casing, SPTs, CSL Testing, SID Inspections and PITs when these items may be required.

SUMMARY OF DRILLED PIER TESTING

(Blank entries indicate item is not applicable to structure)

| End Bent/ Bent No, Pier(s) #-# (e.g., "Bent 1, Piers 1-3") | Standard Penetration Test (SPT) Required? YES or MAYBE | Crosshole Sonic Logging (CSL) Required?* YES or MAYBE | Total CSL Tube Length (For All Tubes) per Pier Lin FT | Shaft Inspection Device (SID) Required? YES or MAYBE | Pile Integrity Test (PIT) Required? MAYBE |
|--|--|---|---|--|--|
| Bent 1, Piers 1-3 | | MAYBE | 133 | | |
| Bent 1, Piers 4-6 | | MAYBE | 130 | | |
| Bent 1, Piers 7-9 | | MAYBE | 128 | | |
| | | | | | |
| | · | | | | |
| | | | | | |
| TOTAL QTY: | | | 1170 | | |
| • | | | | | |

*CSL Tubes are required if CSL Testing is or may be required. The number of CSL Tubes per drilled pier is equal to one tube per foot of design pier diameter with at least 4 tubes per pier. The length of each CSL Tube is equal to the drilled pier length plus 1.5 ft.

| PROJECT N | √O. <u>B-4</u> 4 | 142 |
|-----------|------------------|--------|
| | Buncombe | COUNTY |
| STATION: | 315+72.3 | 9 -L- |



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PILE AND DRILLED PIER **FOUNDATION TABLES**

| SIGNATURE | DATE | | | REV | ISIONS | 3 | | SHEET NO. |
|--------------|------------|-----|-----|-------|--------|-----|-------|-----------|
| DOCUMENT NOT | CONSIDERED | NO. | BY: | DATE: | NO. | BY: | DATE: | TOTAL |
| FINAL UNL | ESS ALL | 1 | | | 3 | | | SHEETS |
| SIGNATURES (| COMPLETED | 2 | | | 1 | | | |



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

May 3, 2022

MEMORANDUM TO: Kevin Fischer, PE

Assistant State Structures Engineer - PEF Coordination,

Program Management & Field Ops.

ATTENTION: Hoang T. Dieu, PE

Team Leader

Team Leader

EMU

John L. Pilipchuk, L.G., P.E. State Geotechnical Engineer

John Pilipchuk

—52C44B94B8BE444...

STATE PROJECT: 38368.1.2 (B-4442)

COUNTY: Buncombe

FROM:

DESCRIPTION: Bridge Nos. 370&373 ON US 19/US 23/US

25/US 70/FUTURE I-26 over Reems Creek

SUBJECT: Foundation Design Recommendations

The Geotechnical Engineering Unit has completed the subsurface investigation and has prepared foundation design recommendations and presents the following project data:

☐ Bridge Inventory (27) pages

Foundation Design Recommendations (3) pages

Geotechnical Foundation Tables (1) pages

Please call Shiping Yang, Ph.D., P.E. at (980) 258-6402 if there are any questions concerning this memorandum.

cc: John Casey Morrison, PE (casey.morrison@aecom.com)

Website: www.ncdot.gov