

REFERENCE: W-5704E

PROJECT: 44850

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5704E	1	17

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	13+00.00 to 91+65.66	4-9	10-12
-Y7-	10+00.00 to 24+37.97	5	13
-Y8-	10+00.00 to 21+31.71	6	13

ROADWAY SUBSURFACE INVESTIGATION

COUNTY JOHNSTON
PROJECT DESCRIPTION WIDEN SR 1700 (COVERED
BRIDGE RD.) FROM EAST OF SR 1003 BUFFALO RD.)
TO WEST OF SR 2685 (HELENA LN.)

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 (ON-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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

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

PERSONNEL

S. WOODS

M. DURWAY

INVESTIGATED BY M.A. ARNOLD

DRAWN BY T.T. WALKER

CHECKED BY R. RIVENBARK

SUBMITTED BY R. RIVENBARK

DATE JUNE 2018

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SIGNATURE _____ DATE _____

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																			
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 206, 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										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.										HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: WEATHERED ROCK (WR) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CP)										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. FISSELE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.																			
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS										ROCK DESCRIPTION										TERMS AND DEFINITIONS																			
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.																													
MINERALOGICAL COMPOSITION										COMPRESSION										WEATHERING																													
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50										FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SLI.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SLI.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. 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. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.																													
PERCENTAGE OF MATERIAL										GROUND WATER										ROCK HARDNESS																													
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										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										VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 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.																													
CONSISTENCY OR DENSENESS										MISCELLANEOUS SYMBOLS										RECOMMENDATION SYMBOLS										ABBREVIATIONS																			
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)										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 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										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										AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HL - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLL - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED % - UNIT WEIGHT % - DRY UNIT WEIGHT SAMPLE ABBREVIATIONS SS - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO									
TEXTURE OR GRAIN SIZE										RECOMMENDATION SYMBOLS										ABBREVIATIONS										SOIL MOISTURE - CORRELATION OF TERMS																			
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										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										AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HL - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLL - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED % - UNIT WEIGHT % - DRY UNIT WEIGHT SAMPLE ABBREVIATIONS SS - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO										SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - 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										EQUIPMENT USED ON SUBJECT PROJECT										ROCK HARDNESS										SOIL MOISTURE - CORRELATION OF TERMS																			
NON PLASTIC 0-5 SLIGHTLY PLASTIC 6-15 MODERATELY PLASTIC 16-25 HIGHLY PLASTIC 26 OR MORE										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 HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST										VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 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.										SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - 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																			
COLOR										ROCK HARDNESS										SOIL MOISTURE - CORRELATION OF TERMS										SOIL MOISTURE - CORRELATION OF TERMS																			
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.										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 HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST										VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 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.										SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - 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										SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - 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									
FRACURE SPACING										INDURATION										FRACURE SPACING										INDURATION																			
TERM SPACING THICKNESS VERY WIDE MORE THAN 10 FEET 4 FEET WIDE 3 TO 10 FEET 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.										TERM THICKNESS VERY WIDE MORE THAN 10 FEET 4 FEET WIDE 3 TO 10 FEET 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.									
NOTES:										FRACURE SPACING										INDURATION										FRACURE SPACING																			
FIAD= FILLED IMMEDIATELY AFTER DRILLING NM= NOT MEASURED HABT= HAND AUGER BORING TERMINATED BORING ELEVATIONS OBTAINED FROM .TIN FILE RECEIVED FROM NCDOT ON 04/13/2018										TERM SPACING THICKNESS VERY WIDE MORE THAN 10 FEET 4 FEET WIDE 3 TO 10 FEET 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.																			
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DATE: 8-15-14										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.										FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.																			



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June 5, 2018

State Project No.: 44850.1.5
 TIP No.: W-5704E
 F.A. Number: HSIP-1700 (020)
 County: Johnston
 Description: Widen SR 1700 (Covered Bridge Road) From East of SR-1003 (Buffalo Road) to West of SR-2685 (Helena Lane)
 F&R Report No.: 66V-0351

SUBJECT: Geotechnical Report – Inventory

Project Description

This project involves the widening of SR 1700 (Covered Bridge Road) in Johnston County, North Carolina. SR 1700 will be widened from one lane in each direction to a new typical section having three 12-foot lanes and two 4-foot paved shoulders. The project also includes installing two signals (one at the intersection with Buffalo Road and the other at the intersection with Archer Lodge Road, realigning SR 1703 (S Murphrey Road), and flattening the curve of SR 1700 to improve safety. The widening begins approximately 500 feet west of Helena Lane and ends approximately 500 feet east of Buffalo Road, approximately 1.5 miles total. The subject portion of SR 1700 generally extends through a mixture of small homes and agricultural properties.

The geotechnical field investigation was performed in April of 2018. During this time period, a total of 42 hand auger borings (HA-1 to HA-40, and HA-42 to HA-43) were drilled. Boring HA-41 was not drilled due to utility conflicts. Representative soil samples were collected from the hand auger cuttings for visual classification in the field and for analysis by F&R's testing laboratory. The existing asphalt was also sampled at 3 locations to determine representative pavement thickness only.

The following alignments were investigated within the approximate limits specified:

<u>Alignment</u>	<u>Station (±)</u>
-L-	14+00 to 86+00
-Y7-	15+00 to 20+00
-Y8-	13+00 to 16+00

Areas of Special Geotechnical Interest

1) Wet or Saturated Soils: The following areas contain wet or saturated soils that have the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-L-	20+50 to 21+50, right
-L-	24+50 to 25+50, right
-L-	37+50 to 38+50, left
-L-	51+50 to 52+50, right
-L-	57+50 to 58+50, right
-L-	64+50 to 65+50, right
-L-	74+00 to 75+00, right

2) Cohesive Soils: The following areas contain cohesive soils (silts and clays) at existing subgrade in fill areas or at/near proposed subgrade that have the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-L-	14+50 to 18+00
-L-	27+00 to 28+00, right
-L-	29+50 to 38+50
-L-	43+00 to 45+50, right
-L-	47+50 to 48+50, right
-L-	51+50 to 54+00
-L-	60+50 to 61+50, right
-L-	68+50 to 69+50, right
-L-	74+00 to 79+50, right
-L-	82+50 to 85+50, right
-Y7-	16+50 to 19+50
-Y8-	13+00 to 14+00, left

- 3) Highly Plastic Soils: The following areas of unclassified excavation contain soils with plasticity indices of 26 through 35:

<u>Alignment</u>	<u>Station (±)</u>
-L-	43+00 to 44+00, right
-L-	57+50 to 58+50, right

- 4) Groundwater: The following areas exhibited groundwater within six feet of the proposed grade:

<u>Alignment</u>	<u>Station (±)</u>
-L-	14+00 to 70+00

The following areas exhibited groundwater within three feet of existing grade, which has the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-L-	15+50 to 18+00
-L-	20+50 to 38+50
-L-	41+50 to 48+50
-L-	51+50 to 58+50
-L-	60+50 to 65+50, right

- 5) Cultivated Soil: The following location is a cultivated agricultural field. Soils at this location have the potential to be highly variable, which could cause subgrade problems during construction if undetected pockets of organics or soft/loose soils are present.

<u>Alignment</u>	<u>Station (±)</u>
-Y7-	15+70 to 20+25

Physiography and Geology

The existing road in the area of this project generally runs in an east to west direction, primarily through residential areas and some agricultural properties. The existing ground surface along the centerline of the proposed road generally stays within a ten foot elevation change (EL ±327 to EL ±338) for the majority of the project (-L- station 13+50 to 85+50). From -L- station 85+50 the ground surface slopes downward from an elevation (EL) of ±327 to EL ±310 at the end of the project (-L- station 91+50). The highest existing ground surface elevation on the project exists from -L- station 30+00 to 34+50 with an elevation of EL

±338. The lowest existing ground surface elevation on the project exists at -L- station 91+50 with an elevation of EL ±310.

The surface water across the project is ultimately drained by the Neuse River (approximately 3 miles southwest of the project) or its tributary Buffalo Creek (approximately 1 mile east). Since neither the Neuse River nor any of its tributaries exist within the project limits, no structures (bridges, culvert extensions, etc.) are proposed.

Based upon the provided cross sections, cuts and fills for the road widening appear to be minimal, with the average cut or fill being 1 to 3 feet. Areas of larger cuts and fills (3 to 6 feet) occur throughout the project limits where new ditch lines are being created and where a right turn lane is being added between -L- stations 70+00 and 82+00 along with the new -Y7- intersection.

The project site is geologically located near the border of the Piedmont and Coastal Plain physiographic provinces of North Carolina. The boundary between the Piedmont and Coastal Plain is the Fall Zone. This zone represents the elevation break between the resistant rocks of the Piedmont and the more easily eroded sediments of the Coastal Plain. Because this site is located at the border of two distinct geologic settings, determination of the soil origins (*i.e.*, coastal plain vs. piedmont residual) based on visual classification of a relatively small sample is subjective. All samples within the project limits were classified as cultivated soil or coastal plain; however, based on the above information F&R cannot rule out the presence of piedmont residual soils underneath the coastal plain soils. Consequently, the project is located within an area mapped as foliated to massive granitic rock (PPmg) and terrace deposits and upland sediment (Tt).

Soils Properties

The subsurface conditions discussed below and those shown on the attached drawings, represent an estimate of the subsurface conditions based on interpretation of the hand auger data using normally-accepted geotechnical engineering judgments. The transitions between different soil strata are usually less distinct than those shown on the profile. Sometimes the relatively small sample obtained in the field is insufficient to definitively describe the origin of the subsurface material. Although individual hand auger samples are representative of the subsurface conditions at the hand auger locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

The majority of the soils encountered on this project were coastal plain (CP) soils. Coastal plain soils were encountered below topsoil at all hand auger locations. The coastal plain soils were typically described as moist to saturated, silty and clayey SAND (A-2-4 & A-2-6) and sandy CLAY (A-6 & A-7). Thirteen (13) samples were lab tested and 8 samples were determined to be sandy CLAY (A-6 & A-7-6), with plasticity indexes ranging from 16 to 27 and water contents ranging from 4 to 30%. One (1) sample was determined

to be a clayey SAND (A-2-7), with a plasticity index of 33 and water content of 20%. The remaining four (4) samples were determined to be silty SAND (A-2-4)- two of the samples had plasticity indexes of 7 and the other two were determined to be non-plastic (NP). The water contents of these samples ranged from 8 to 15%.

Cultivated coastal plain soils were observed along -Y7- from station 15+70 to 20+25. These soils were encountered in two (2) hand augers and appeared to be associated with an existing agricultural field.

Groundwater Properties

Generally, groundwater measurements were attempted in a majority of the hand auger borings along the project. Nine (9) hand auger borings were backfilled immediately upon their completion. Groundwater was observed at the termination of the hand auger in 24 borings at depths ranging from 1.8 to 5.5 feet. Stabilized groundwater was encountered in 30 hand augers at depths ranging from 0.9 to 4.9 feet. Stabilized groundwater was not encountered in the remaining borings. The recovered soil samples were generally described as moist above the groundwater level and wet or saturated below the groundwater level. It should be noted that the groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary or be different from those described in this report.

Pavement Cores

As requested, F&R extracted three pavement cores from the existing SR 1700 (Covered Bridge Road) to investigate the thickness of the existing pavement. These cores were taken at -L- stations 21+95 RT LN, 62+00 LT LN, and 74+00 LT LN. The pavement thickness at these locations ranged from 5.5 to 6 inches. A pavement core photo document is attached to this report. Further investigation or testing of the existing subgrade was beyond our scope of work.

We appreciate the opportunity to work with you on this project. Please contact us if you have any questions regarding this report or if we may be of further service.

Sincerely,
FROEHLING & ROBERTSON, INC.

Meredith Arnold
 Staff Geologist

J. Russell Rivenbark, P.E.
 Geotechnical Project Manager

Appendix A

Bulk Samples

The following bulk samples were obtained and transported to our laboratory for potential testing to determine the engineering properties of the soil:

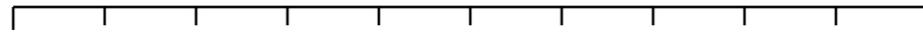
Sample No.	Boring No.	Line	Station	Offset	Depth (ft.)	Test(s) Performed
CBR-1	HA-31	-Y7-	17+00	CL	0.0-2.0	California Bearing Ratio, Standard Proctor
CBR-2	HA-37	-L-	78+00	15' RT	0.0-2.0	California Bearing Ratio, Standard Proctor
CBR-3	HA-3	-L-	17+50	15' LT	0.0-2.0	California Bearing Ratio, Standard Proctor



PAVEMENT CORE PHOTOGRAPHS
Tip No. W-5704 | WBS No. 44850.1.5
Johnston County, NC



0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0



SCALE IN FEET

8/17/99

REVISIONS
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Walker AT 66261103



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PROJECT REFERENCE NO. W-5704E		SHEET NO. 4	
R/W SHEET NO.			
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER		
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
GRAPHIC SCALE			
50 25 0 50 100			
PLANS			

10
LARRY S BOYETTE
KAY M BOYETTE

15
CHARLES E MATTHEW
JOHNNY MAX MOONEYHAM, JR.
THOMAS ANDREW KENNEDY

20
CHARLES W TIPPETT
ALLYSON P TIPPETT

WALLACE REID RENFROW
SASHA LARAE RENFROW

MICHAEL ANDREW HYATT
TERESA ANN HYATT

DISCOVERY CHURCH

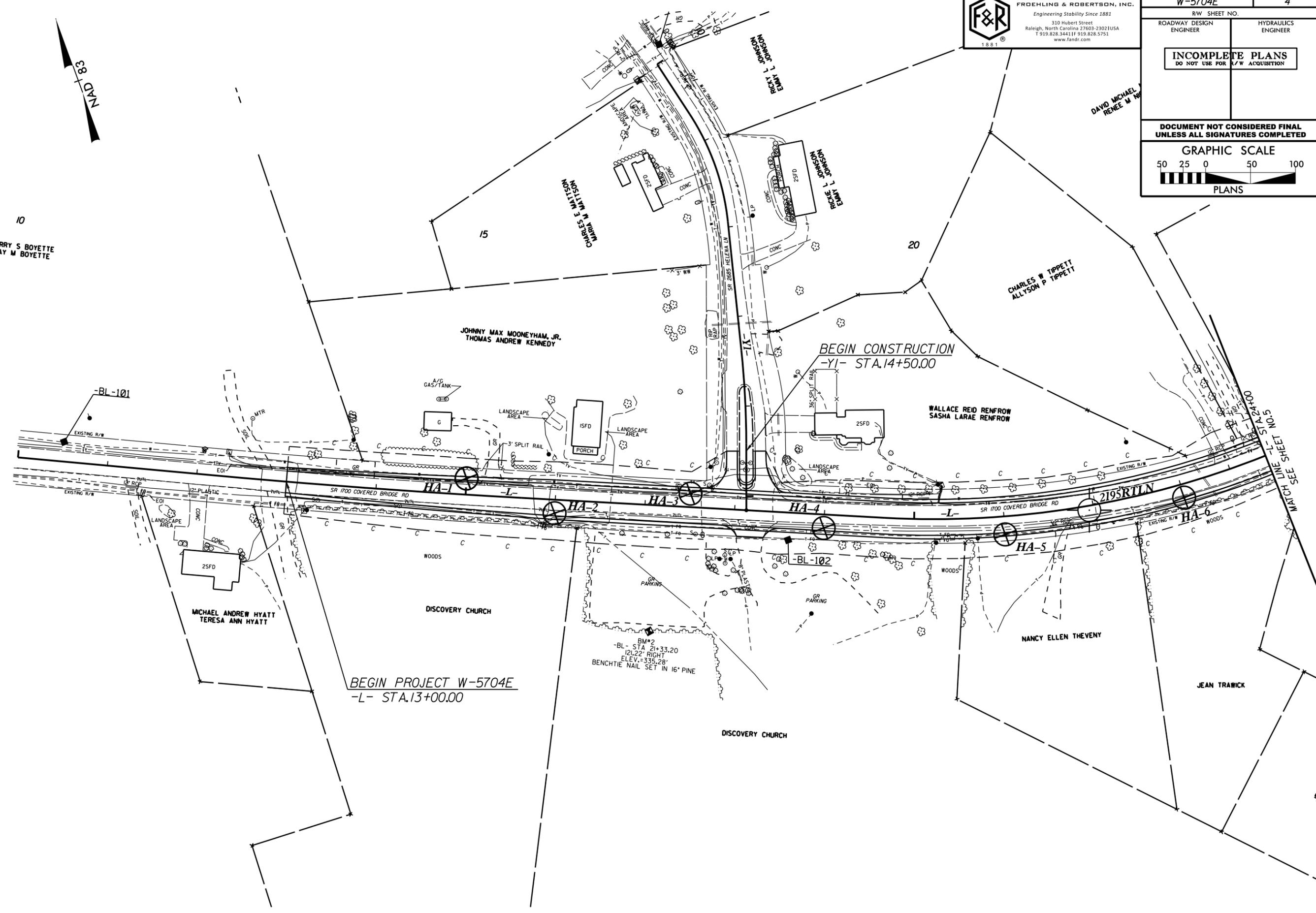
NANCY ELLEN THEVENY

JEAN TRAWICK

BEGIN PROJECT W-5704E
-L- STA.13+00.00

BEGIN CONSTRUCTION
-YI- STA.14+50.00

BM#2
-BL- STA 21+33.20
121.22' RIGHT
ELEV.=335.28'
BENCHTIE NAIL SET IN 16" PINE



STA 21+00.00
-L- STA 21+00.00
MATCH LINE SEE SHEET NO. 5

8/17/99

05-JUN-2018 10:41:05 (TDS Engineers-SR 1710 Covered Bridge Rd Johnston County) W5704E_GEO.DWG\Y\CADD_GEO\TECH\Plan\Prof\W-5704E_ROY_PSH05.dgn

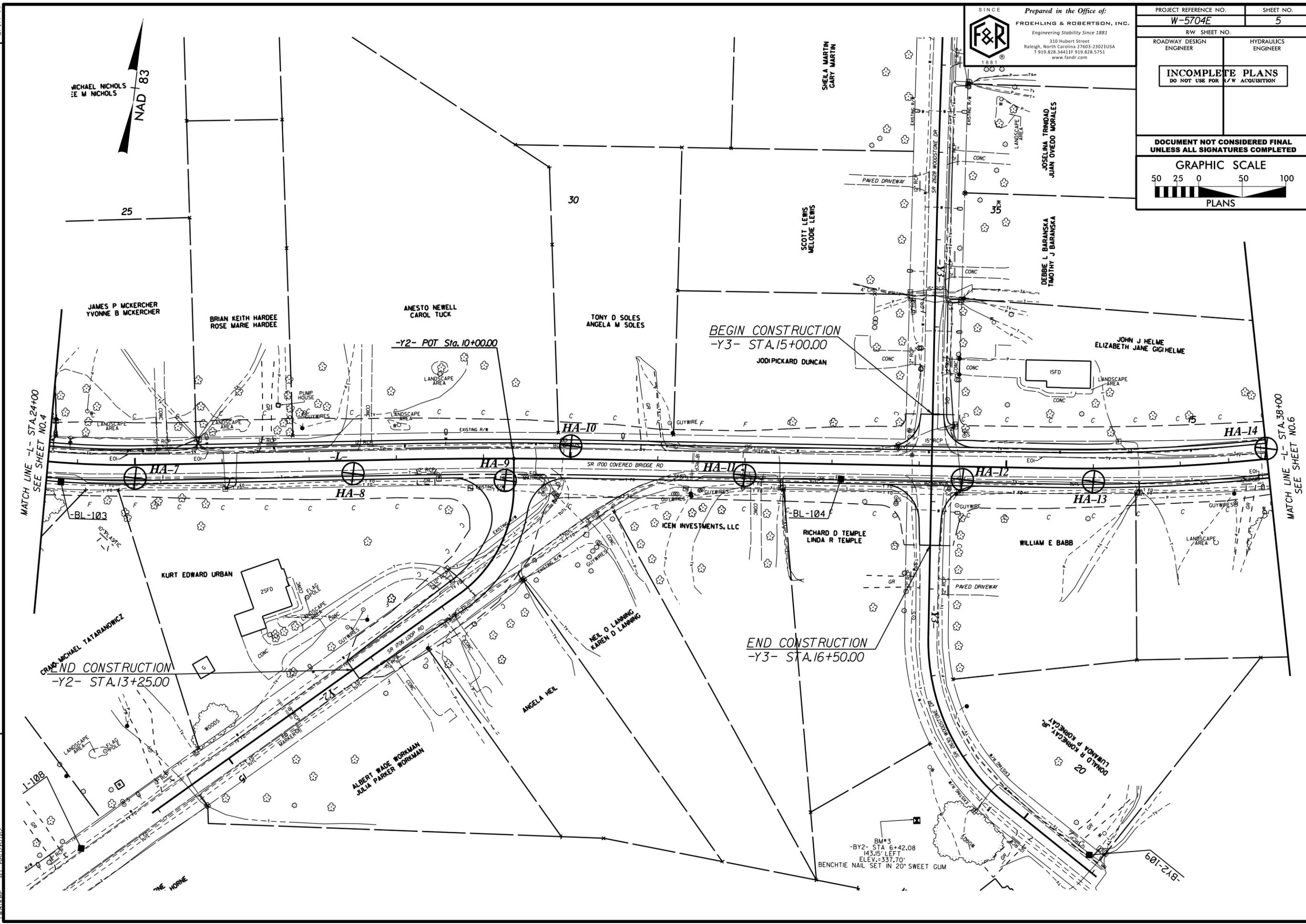
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MICHAEL NICHOLS
E M NICHOLS

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PROJECT REFERENCE NO. W-5704E	SHEET NO. 5
R/W SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	ENGINEER
INCOMPLETE PLANS DO NOT USE FOR A/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
GRAPHIC SCALE	
50 25 0 50 100	
PLANS	



MATCH LINE -L- STA.24+00
SEE SHEET NO.4

MATCH LINE -L- STA.38+00
SEE SHEET NO.6

BM#3
-BY2- STA 6+42.08
143.15' LEFT
ELEV.=337.70'
BENTHIE NAIL SET IN 20' SWEET GUM

1-108

-BY2-109

8/17/99

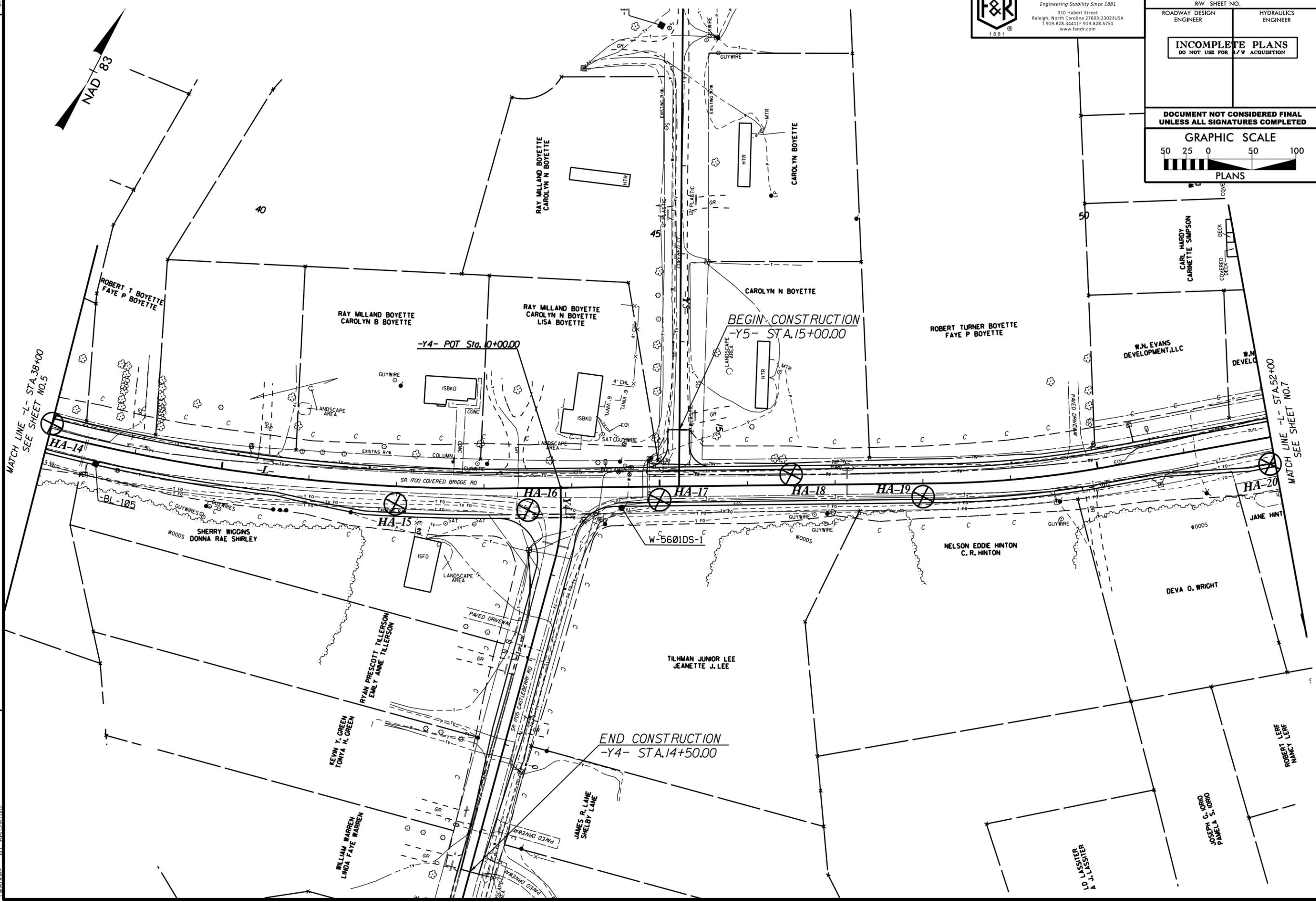
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W-5704E.RDY_PSH06.dgn

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PROJECT REFERENCE NO. W-5704E	SHEET NO. 6
R/W SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
GRAPHIC SCALE 50 25 0 50 100 PLANS	



MATCH LINE -L- STA. 38+00
SEE SHEET NO. 5

MATCH LINE -L- STA. 52+00
SEE SHEET NO. 7



JO LASSITER
A

JOSEPH C. IORIO
PANELA S. IORIO

ROBERT LEE
NANCY LEE

DEVA O. WRIGHT

NELSON EDDIE HINTON
C. R. HINTON

TILHMAN JUNIOR LEE
JEANETTE J. LEE

JAMES R. LANE
SHELBY LANE

KEVIN Y. GREEN
TONYA H. GREEN

RYAN PRESCOTT TILLERSON
EMILY ANNE TILLERSON

SHERRY WIGGINS
DONNA RAE SHIRLEY

BL-105

ROBERT T. BOYETTE
FAYE P. BOYETTE

RAY MILLAND BOYETTE
CAROLYN B. BOYETTE

RAY MILLAND BOYETTE
CAROLYN N. BOYETTE
LISA BOYETTE

RAY MILLAND BOYETTE
CAROLYN N. BOYETTE

CAROLYN BOYETTE

ROBERT TURNER BOYETTE
FAYE P. BOYETTE

CARL HARDY
CARNETTE SIMPSON

W.N. EVANS
DEVELOPMENT, LLC

W.N. DEVELC

JANE HINT

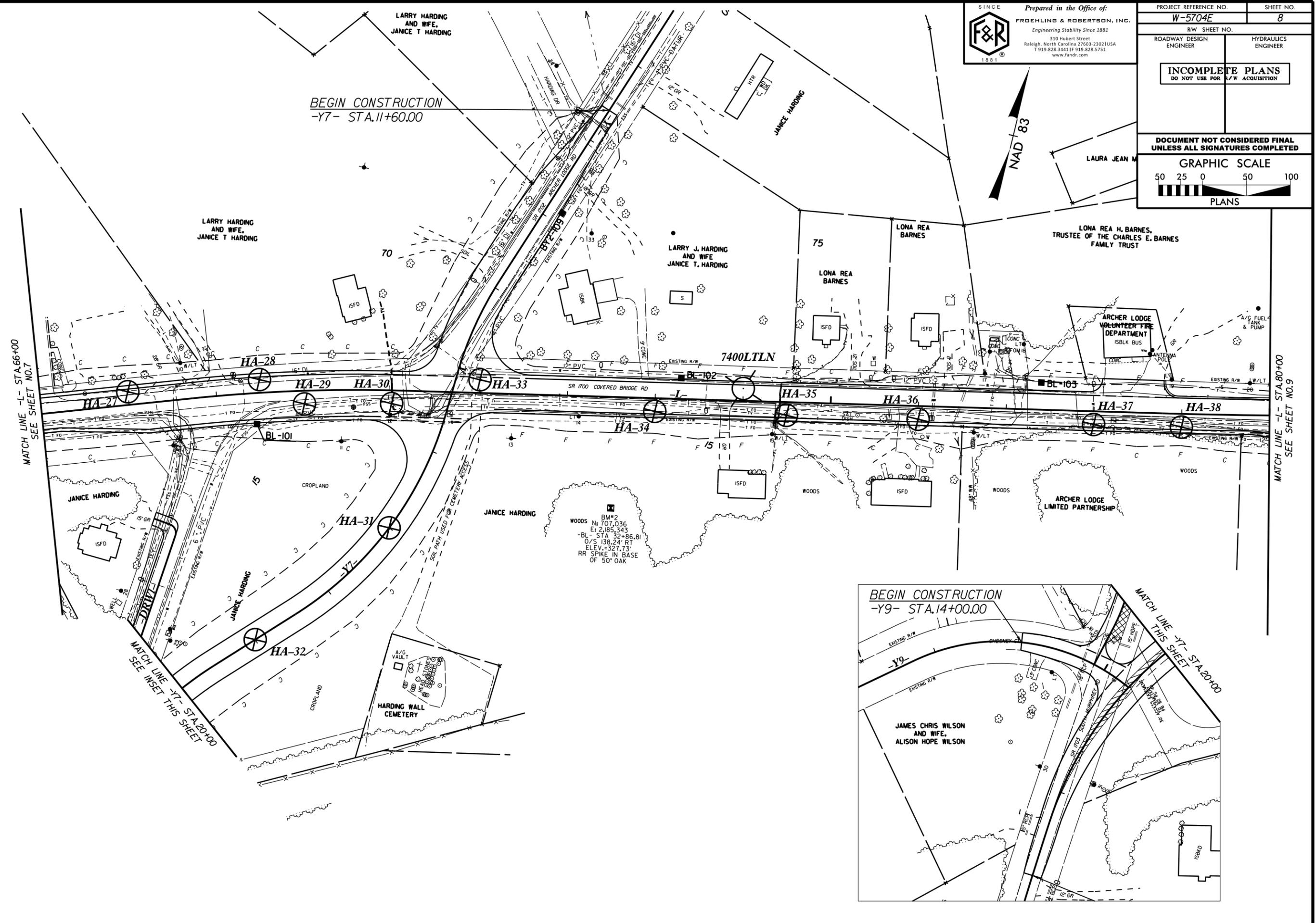
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 www.fandr.com

PROJECT REFERENCE NO. W-5704E	SHEET NO. 8
R/W SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
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GRAPHIC SCALE	
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PLANS	



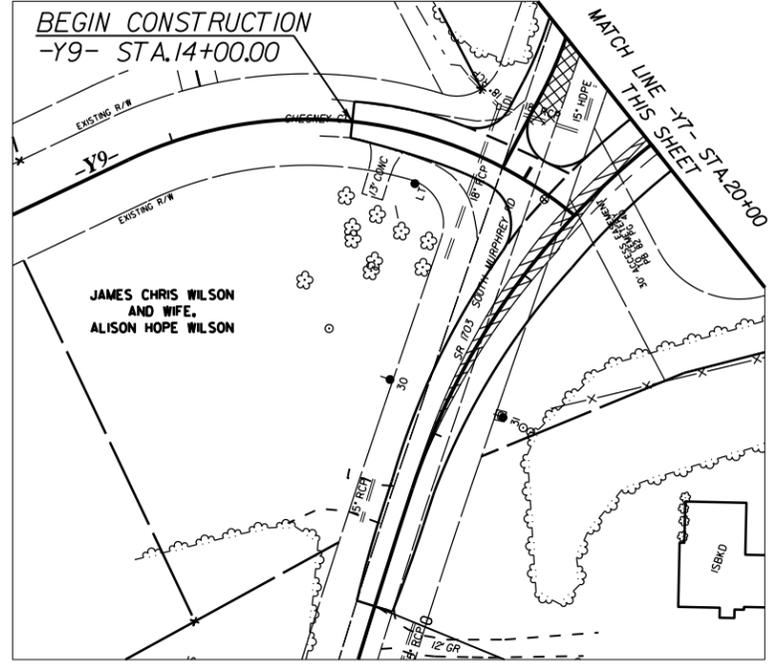
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 Walker AT 66261103



MATCH LINE -L- STA.66+00
SEE SHEET NO.7

MATCH LINE -Y7- STA.20+00
SEE INSET THIS SHEET

MATCH LINE -L- STA.80+00
SEE SHEET NO.9

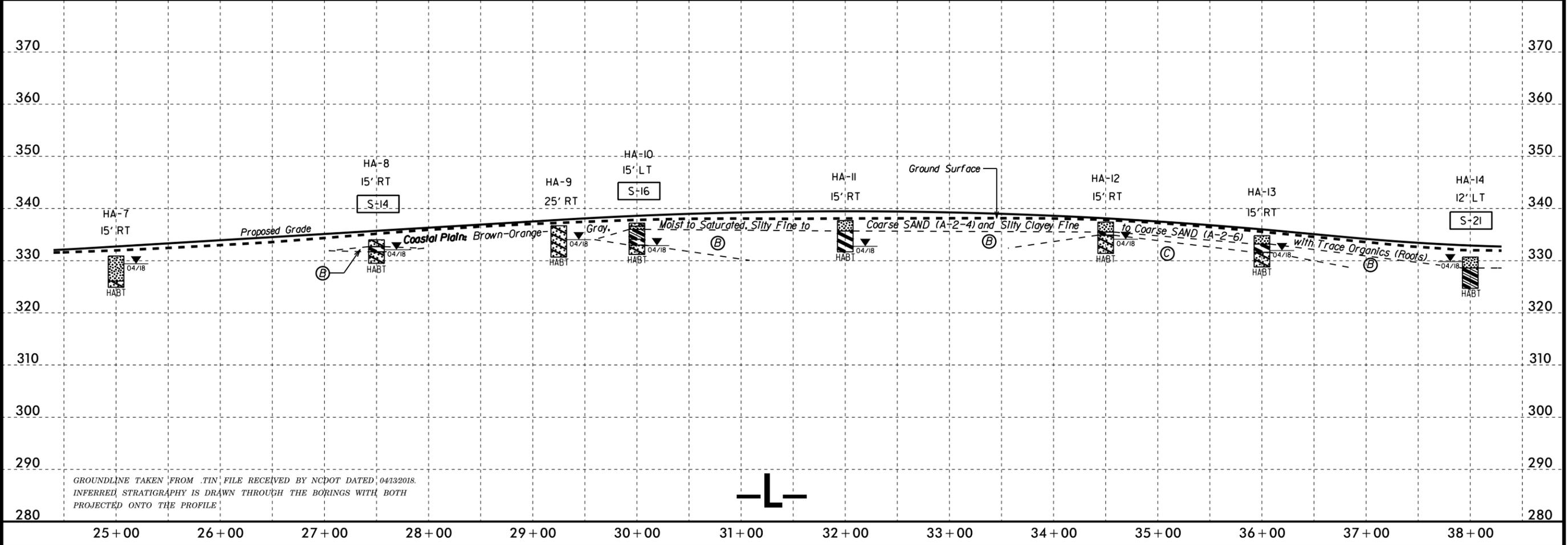
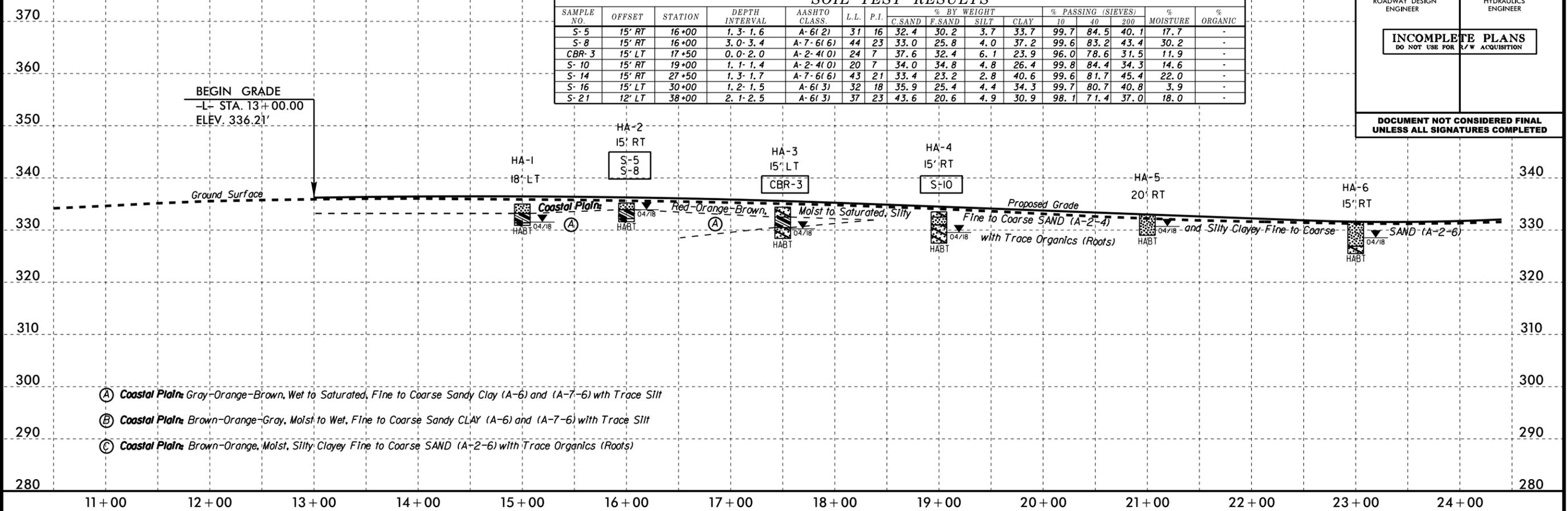


BM#2
 Woods N: 707.036
 E: 2,185.343
 O/S: 138.24' RT
 ELEV: 327.73'
 RR SPIKE IN BASE
 OF 50' OAK

5/28/99

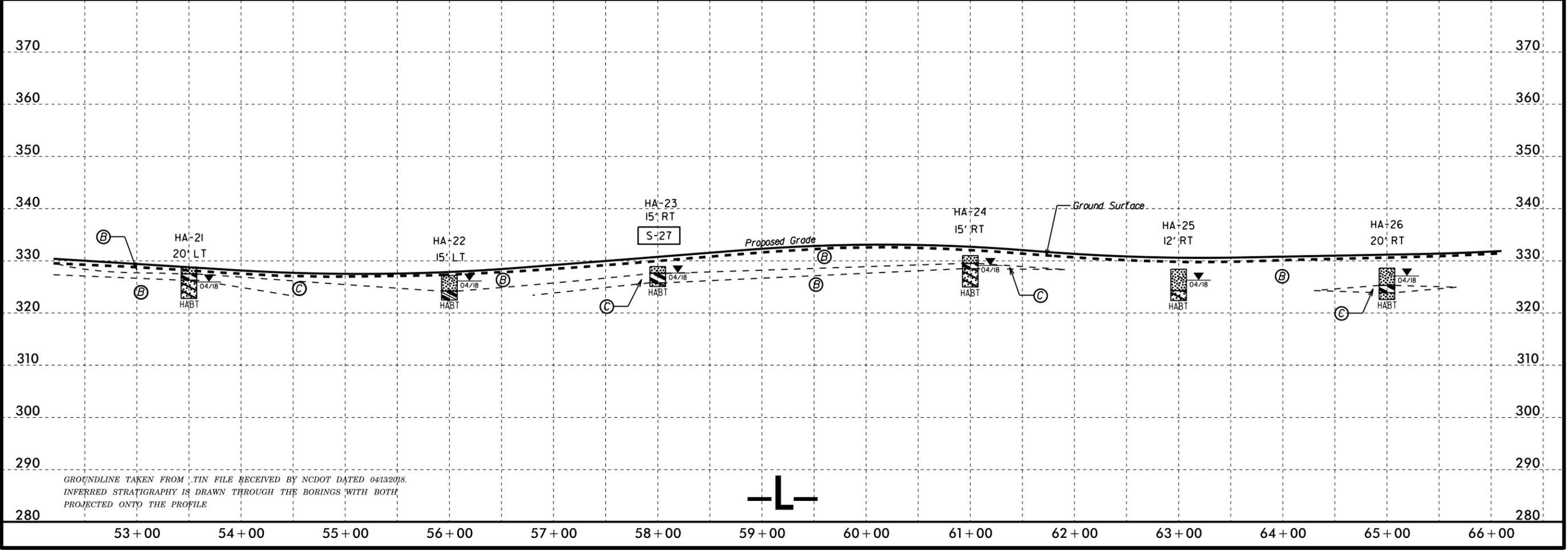
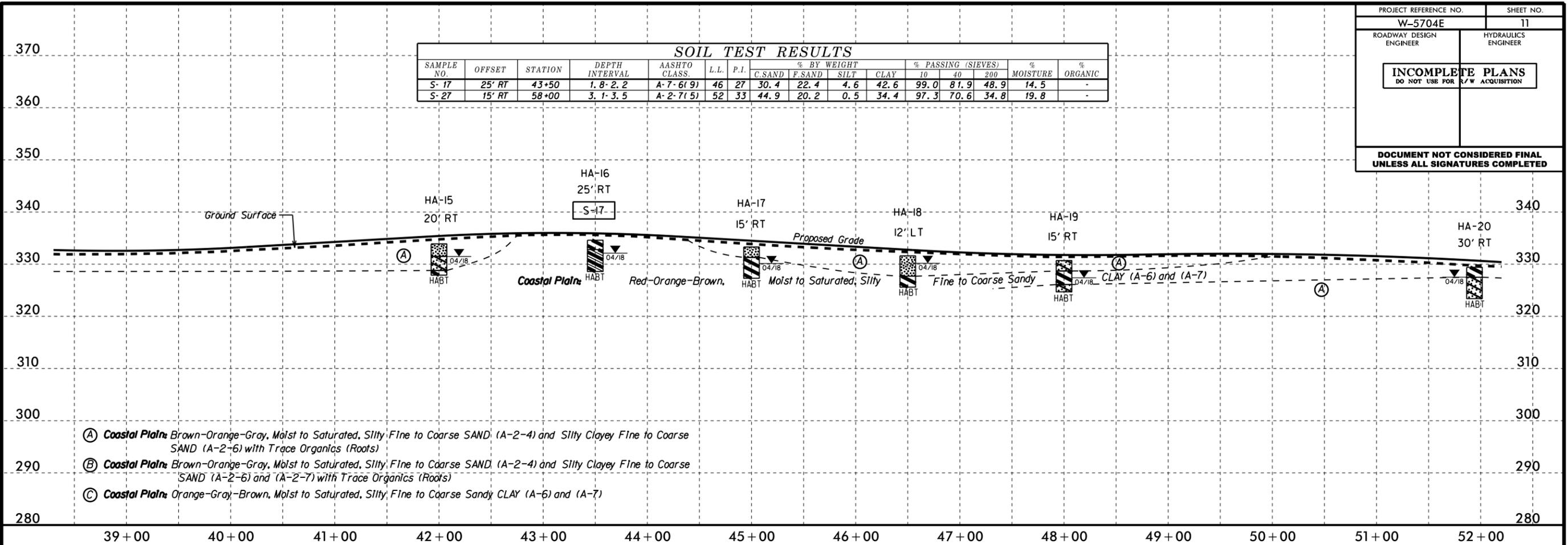
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W-5704E	10
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
S-5	15' RT	16+00	1.3- 1.6	A-6(2)	31	16	32.4	30.2	3.7	33.7	99.7	84.5	40.1	17.7	-
S-8	15' RT	16+00	3.0- 3.4	A-7-6(6)	44	23	33.0	25.8	4.0	37.2	99.6	83.2	43.4	30.2	-
CBR-3	15' LT	17+50	0.0- 2.0	A-2-4(0)	24	7	37.6	32.4	6.1	23.9	96.0	78.6	31.5	11.9	-
S-10	15' RT	19+00	1.1- 1.4	A-2-4(0)	20	7	34.0	34.8	4.8	26.4	99.8	84.4	34.3	14.6	-
S-14	15' RT	27+50	1.3- 1.7	A-7-6(6)	43	21	33.4	23.2	2.8	40.6	99.6	81.7	45.4	22.0	-
S-16	15' LT	30+00	1.2- 1.5	A-6(3)	32	18	35.9	25.4	4.4	34.3	99.7	80.7	40.8	3.9	-
S-21	12' LT	38+00	2.1- 2.5	A-6(3)	37	23	43.6	20.6	4.9	30.9	98.1	71.4	37.0	18.0	-



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 41-6525102

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
S-17	25' RT	43+50	1.8-2.2	A-7-6(9)	46	27	30.4	22.4	4.6	42.6	99.0	81.9	48.9	14.5	-
S-27	15' RT	58+00	3.1-3.5	A-2-7(5)	52	33	44.9	20.2	0.5	34.4	97.3	70.6	34.8	19.8	-

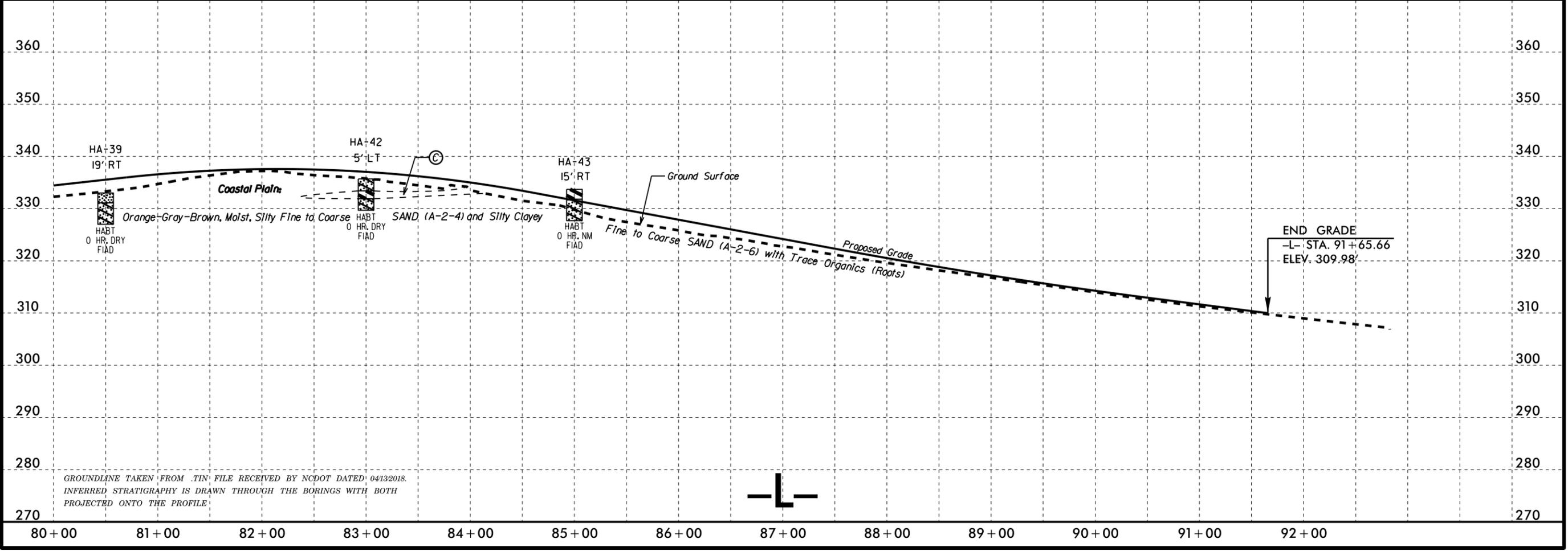
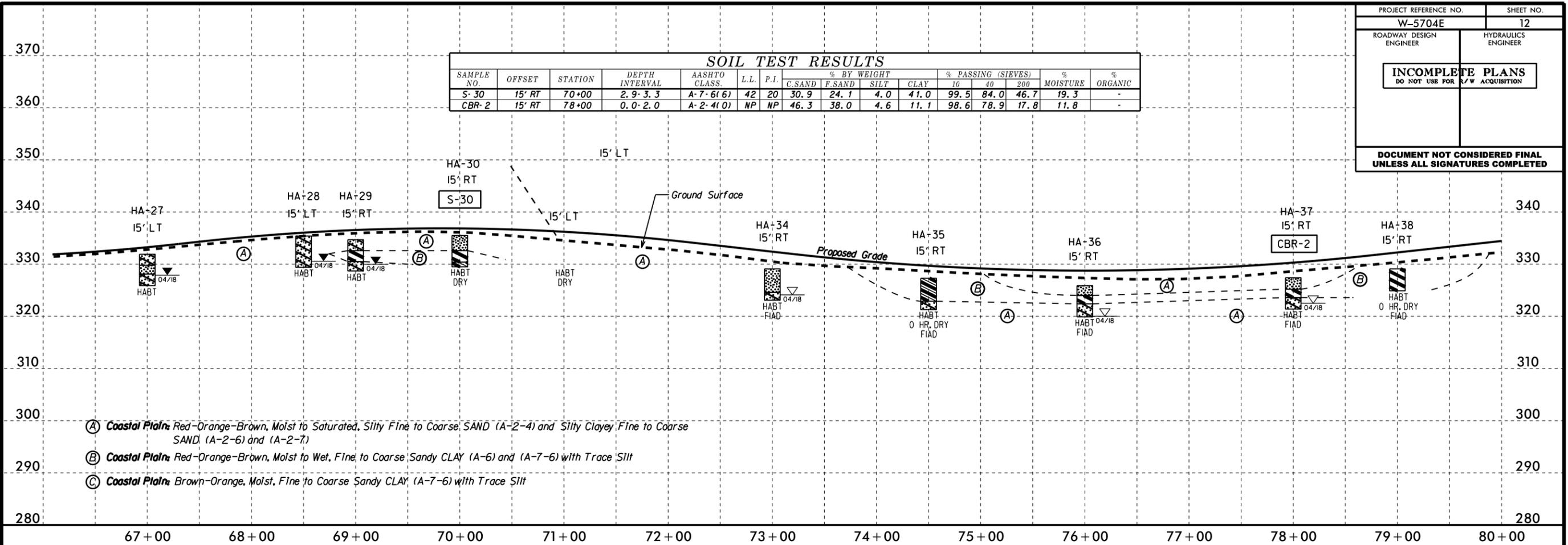


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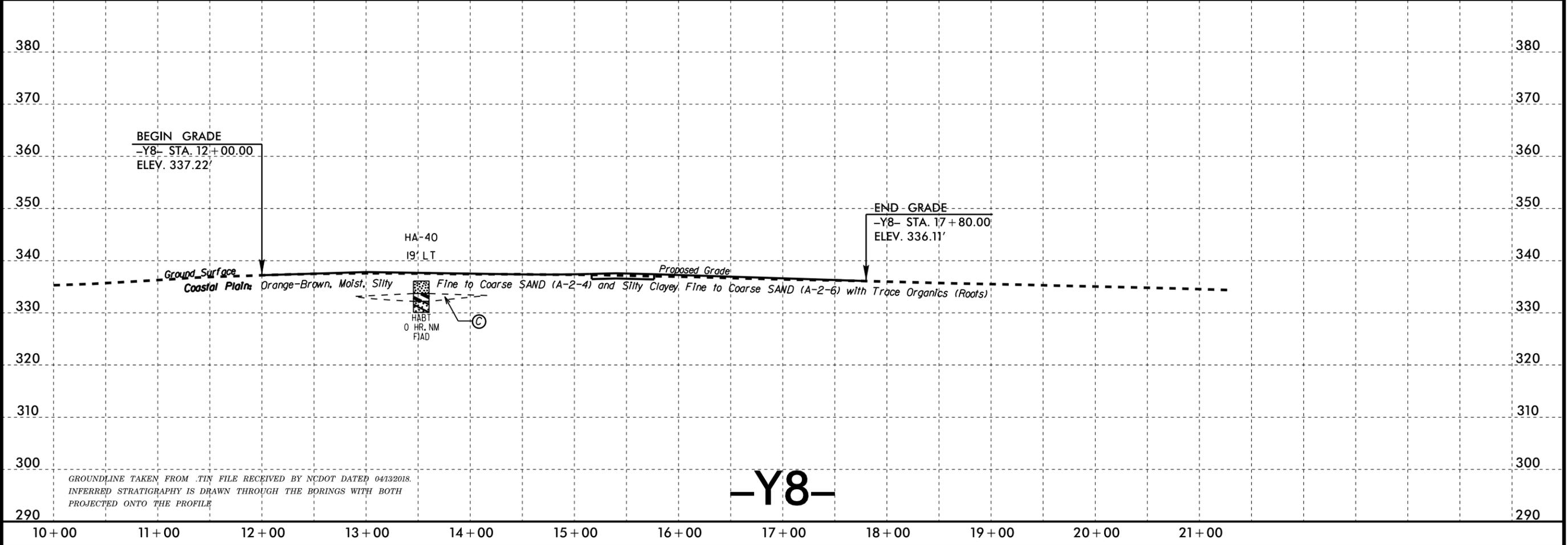
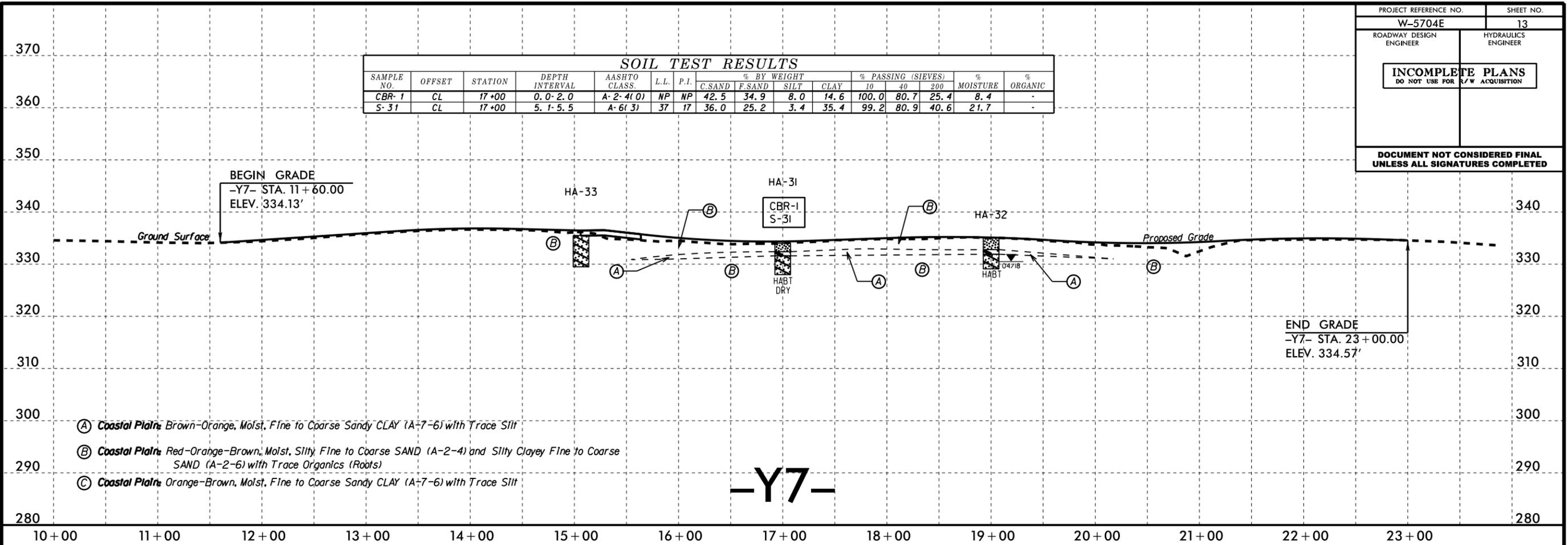
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SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
S-30	15' RT	70+00	2.9-3.3	A-7-6(6)	42	20	30.9	24.1	4.0	41.0	99.5	84.0	46.7	19.3	-
CBR-2	15' RT	78+00	0.0-2.0	A-2-4(0)	NP	NP	46.3	38.0	4.6	11.1	98.6	78.9	17.8	11.8	-



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SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
CBR-1	CL	17+00	0.0-2.0	A-2-4(0)	NP	NP	42.5	34.9	8.0	14.6	100.0	80.7	25.4	8.4	-
S-31	CL	17+00	5.1-5.5	A-6(3)	37	17	36.0	25.2	3.4	35.4	99.2	80.9	40.6	21.7	-



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