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REFERENCE: U-5604

PROJECT: 45832

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	13+00 - 40+95.08	4,5	7,8
-Y2-	11+00 - 13+49.48	4	8
-Y5-	10+55 - 13+50.00	5	9
-Y6-	10+55 - 12+00.00	5	9
-Y7-	11+00 - 13+32.84	6	9
-Y8-	14+00 - 16+03.63	6	10
-RI-	10+00 - 12+61.13	5	11
-WL1-	35+25 - 36+50	12	12
-WL2-	38+25 - 40+50	12	12
-WL3-	10+72.75 - 12+80	12	12

APPENDICES

APPENDIX	TITLE	SHEETS
A	PAVEMENT INVESTIGATION RESULTS	13-20
B	LABORATORY RESULTS	21-23

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *MACON*

PROJECT DESCRIPTION *US 441 BUSINESS INTERSECTION IMPROVEMENTS AT WOMACK STREET, MAPLE STREET, PORTER STREET, AND DEPOT STREET*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5604	1	25

CAUTION NOTICE

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

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

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

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

PERSONNEL

GOODNIGHT, D. J.

LANE, R. W.

TRIGON EXP.

INVESTIGATED BY *GOODNIGHT, D. J.*

DRAWN BY *HILL, M.J.*

CHECKED BY *HAMM, J.R.*

SUBMITTED BY *FALCON*

DATE *SEPTEMBER 2017*

NORTH CAROLINA PROFESSIONAL SEAL 036283 ENGINEER W. SCOTT HUNSBERGER 9/29/17

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
U-5604	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] MOBILE B-57
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [X] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V 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.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF 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.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (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.

BENCH MARK: ELEVATIONS TAKEN FROM *.TIN FILE DATED 2/16/16

ELEVATION: FEET

NOTES:

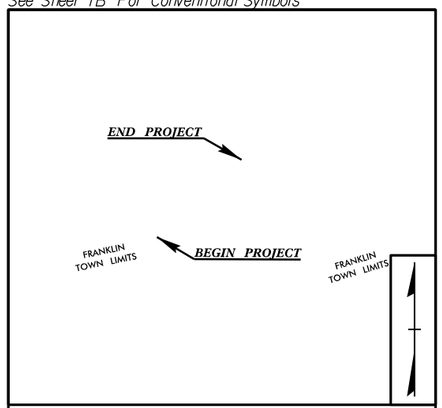
DATE: 8-15-14

09/08/99

TIP PROJECT: U-5604

CONTRACT:

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP

75% PLANS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

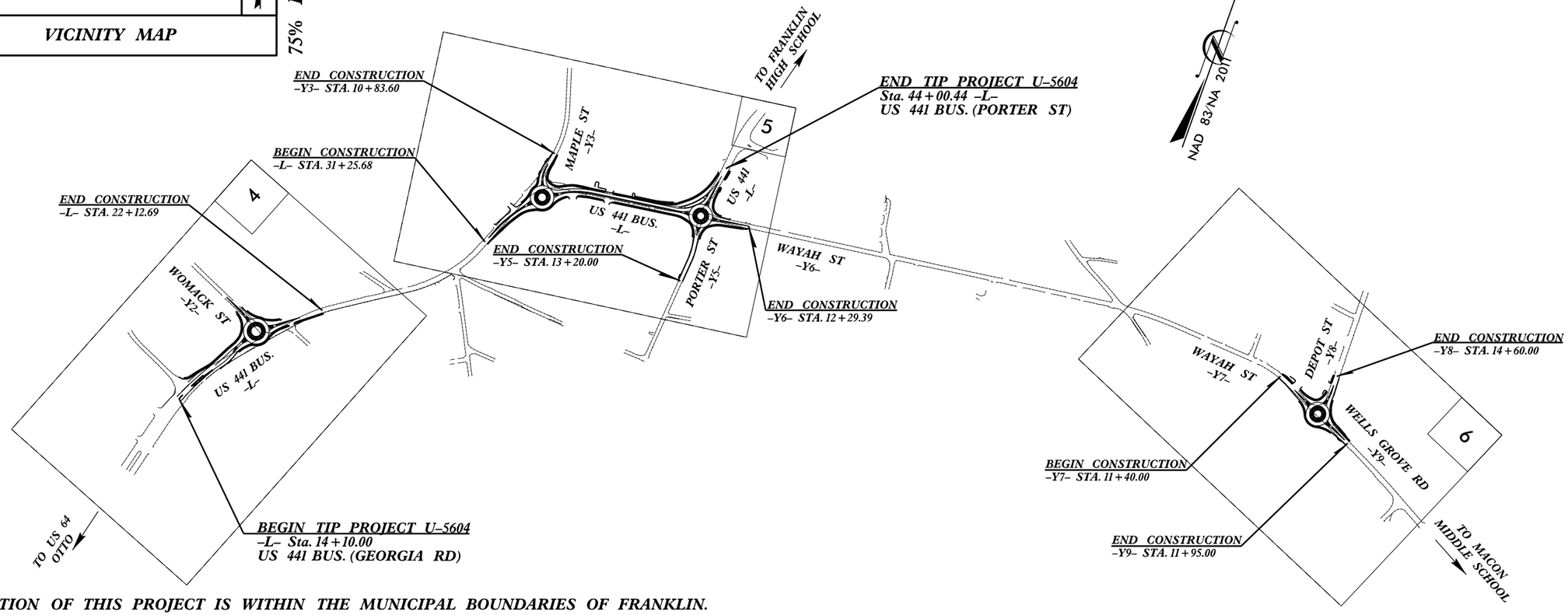
MACON COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5604	3	25

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
45832.1.1	N/A	PE
45832.2.1	N/A	RW/UTIL

LOCATION: US 441 BUSINESS INTERSECTION IMPROVEMENTS AT WOMACK STREET, MAPLE STREET, PORTER STREET, AND DEPOT STREET

TYPE OF WORK: GRADING, PAVING, DRAINAGE, AND RETAINING WALLS



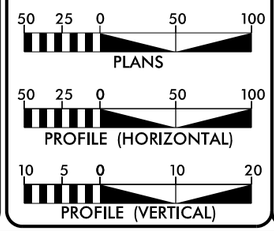
A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF FRANKLIN.

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

THIS IS A NO CONTROL OF ACCESS PROJECT

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES



DESIGN DATA

ADT 2015 = 14,308
ADT 2040 = 20,800
K = 10 %
D = 55 %
T = 2 % *
V = 40 MPH
REGIONAL TIER =
URBAN COLLECTOR

PROJECT LENGTH

LENGTH OF –L– TIP PROJECT U–5604 =	*0.395 miles*
LENGTH OF –Y7– TIP PROJECT U–5604 =	*0.047 miles*
LENGTH OF –Y9– TIP PROJECT U–5604 =	*0.037 miles*
TOTAL LENGTH TIP PROJECT U–5604 =	*0.479 miles*

Prepared In The Office of:

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www.stantec.com License No. F-0672

for the North Carolina Department of Transportation

2012 STANDARD SPECIFICATIONS

STANTEC CONTACT

STEVE SMALLWOOD, P.E.
PROJECT ENGINEER

NCDOT DIVISION 14 CONTACT:

KENNETH MCDOWELL

RIGHT OF WAY DATE: APRIL 21, 2017

LETTING DATE: June 19, 2018

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

29-SEP-2017 14:56
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Roadway Subsurface Investigation Report - Inventory

US 441 Business Intersection Improvements Womack Street, Maple Street, and Depot Street
Macon County, North Carolina
TIP: U-5604 WBS: 45832.1.1
Falcon Project No.: G15062.00

Prepared for:
Stantec
801 Jones Franklin Road, Suite 300
Raleigh, NC 27606

Submitted by:
Falcon Engineering, Inc.
1210 Trinity Road, Suite 110
Cary, North Carolina 27513
(919) 871-0800
www.falconengineers.com

September 29, 2017

TIP: U-5604
WBS: 45832.1.1
COUNTY: Macon
DESCRIPTION: US 441 Business Intersection Improvements Womack Street, Maple Street, and Depot Street

SUBJECT: Roadway Subsurface Investigation – Inventory

PROJECT DESCRIPTION

This project consists of approximately roundabout construction and intersection improvements at four intersections along US-441 Business in Franklin, Macon County, North Carolina.

Also included in this project are three retaining wall structures, two along -L- (left) and one along -Y5- (right). Investigation data for the retaining walls are incorporated into this report.

The investigation was conducted in two mobilizations; the first on March 9th and 10th, 2017 and the second between June 9th and July 11th, 2017 in general accordance with our Scope and Fee Estimates for Geotechnical Investigation and Engineering Services. The recommendations provided in this report are based solely on our site reconnaissance, soil test borings and laboratory test data, engineering evaluation of these data, and generally accepted soil and foundation engineering practices and principles.

A total of seventeen (17) Standard Penetration Test (SPT) borings were drilled for the proposed roadway alignments and retaining walls. All mechanical borings were drilled using a Mobile B-57 ATV drill rig equipped with 2 ¼-inch inside diameter hollow-stem augers, and SPT testing was performed with an automatic hammer. Representative soil samples, collected with a split-barrel sampler or hand auger, were selected for laboratory testing to verify visual field classifications. In addition, bulk samples were collected for standard Proctor compaction and California Bearing Ratio (CBR) testing. Ten (10) pavement core borings were also performed as part of this investigation, and in-situ CBR testing was performed using Kessler Dynamic Cone Penetrometer to depths of up to three feet below subgrade. An additional ten (10) hand auger borings were performed along retaining wall alignments which were added to the project after our initial mobilization. Hand auger borings were necessary at most locations due to overhead utilities.

The following alignments, totaling approximately 0.9 miles were explicitly investigated. Other minor Y-lines and driveways are included on the project but improvements are not anticipated to be significant enough to warrant investigation.

Alignment	Station (ft)
-L- (US 441 Business)	14+10.00—44+00.44
-Y2- (Womack Street)	10+00.00—14+09.48
-Y3- (Maple Street)	10+00.00—13+02.70
-Y5- (Porter Street)	10+00.00—14+66.69
-Y6- (Wayah Street)	10+00.00—13+82.43

AREAS OF SPECIAL GEOTECHNICAL INTEREST

I. The following locations contain very soft to soft/very loose soils with an N-value less than 4 near the ground surface:

Alignment	Station (ft)
-L-	16+00 to 18+00
-L-	32+00 to 36+00
-L-	38+00 to 40+00
-Y5-	10+50 to 12+00
-Y8-	15+50 to 16+50

II. Artificial fill was encountered at the following locations:

Alignment	Station (ft)
-L-	34+50 to 36+00
-L-	38+50 to 42+00
-Y7-	12+50 to 13+50
-Y8-	15+50 to 16+50
-R1-	11+50 to 12+50

III. Roadway Embankment was encountered at the following locations:

Alignment	Station (ft)
-L-	35+50 to 38+50
-Y6-	10+00 to 10+75

PHYSIOGRAPHY AND GEOLOGY

The project site is in the Blue Ridge Belt Physiographic Province of North Carolina. According to the ***Geologic Map of North Carolina*** (1985), the site is underlain by two major geologic units of the Coweeta Group (**ZYba** and **ZYbn**) in the Blue Ridge Belt Physiographic Provence. These units are of the Middle/Late Proterozoic Peroiod. The site is bound on the north and south by the Coweeta Group (**ZYba**) which is noted to consist of Amphibiolite – equigranular, massive to well foliated, rarely discordant, metamorphosed intrusive to extrusive mafic rock and may include metasedimetary rock. The majority of the middle of the site consists of a different unit of the Coweeta Group (**ZYbn**). This unit consists of Biotite Gneiss – migmatitic; interlayered and gradational with bitotite-garnett gneiss and amphibiolite; locally abundant quartz and alumino-silicates.

Existing site topography is typical of North Carolina's mountain region. The site lies predominantly within the Little Tennessee River valley, generally sloping west to east towards the river. The Womack, Maple, and Porter/Wayah sites lie atop a minor local high point/ridge line, while the Depot/Wayah site is much closer to the river and at a significantly lower elevation. Although frequent and large exposed rock outcroppings are common in the mountain region, no such features were observed at the site. None of the sites are close enough to notable water features to observe rock present in the bed or banks.

Sparse vegetation, occasional mature trees, landscaping, and maintained ground cover is present adjacent within proposed improvement areas, but otherwise much of the site is developed. Mixed industrial, commercial, and residential properties featuring various buildings, driveways, and parking lots line both sides of the road in all directions throughout most of the site.

SOIL PROPERTIES

A variety of soils were encountered along the project, including artificial fill, existing roadway embankments and residual soils.

Topsoil and rootmat was encountered in grassy, brushy, and wooded areas ranging in thickness from 0.3 to 0.7 feet, and typically on the order of 0.4 feet.

Artificial Fill soils were encountered at the ground surface beneath and adjacent to existing roadways. These consist of up to 0 to 10 feet of moist, very loose to loose, silty sand (A-2-4) and moist, very soft to medium stiff, sandy silt and sandy and silty clay (A-4, A-5, A-6, A-7).

Roadway Embankment soils were encountered at the ground surface beneath and adjacent to existing roadways. These consist of up to 3 to 12 feet of moist, very loose to medium dense, silty sand (A-2-5) and moist, medium stiff, silty clay (A-7).

Residual soils were encountered at the ground surface, or beneath artificial fill, roadway embankments or alluvial deposits. These soils consist of moist to wet, loose to dense, silty sand (A-1-b, A-2-4, A-2-5) and soft to stiff, sandy clay and silt, clayey silt and silty clays (A-4, A-5, A-6, A-7).

GROUNDWATER PROPERTIES

Groundwater levels were measured at the time of boring completion, and in many cases after a waiting period of at least 24 hours. Borings drilled within and in close proximity to existing roadways, and within residential or commercial areas were backfilled immediately after completion due to safety considerations.

Detailed groundwater measurements are included in the attached subsurface profiles and cross sections, and noted areas of shallow groundwater are included in the Areas of Special Geotechnical Interest earlier in this report.

ADDITIONAL LABORATORY TESTING

The following bulk samples were obtained:

Sample	Location	Depth(ft)	Test
BS-1	16+96, 25’ LT, -L-	1.0 – 8.5	California Bearing Ratio, Standard Proctor
BS-2	10+97, 24’RT, -Y6-	1.0 – 8.5	California Bearing Ratio, Standard Proctor

Classification test results for bulk samples are included in the subsurface profiles and cross sections and Standard Proctor and California Bearing Ratio (CBR) data is attached in the Appendix.

CLOSING

Falcon appreciates the opportunity to have provided our geotechnical engineering services for the above referenced project. If you have any questions concerning the contents of this report or need additional information, please do not hesitate to contact our office.

FALCON ENGINEERING, INC.

Report Prepared By:

W. Scott Hunsberger, PE
Geotechnical Engineer

Report Reviewed By:

Jeremy R. Hamm, PE
Geotechnical Engineering Manager

PROJECT REFERENCE NO.	SHEET NO.
U-5604	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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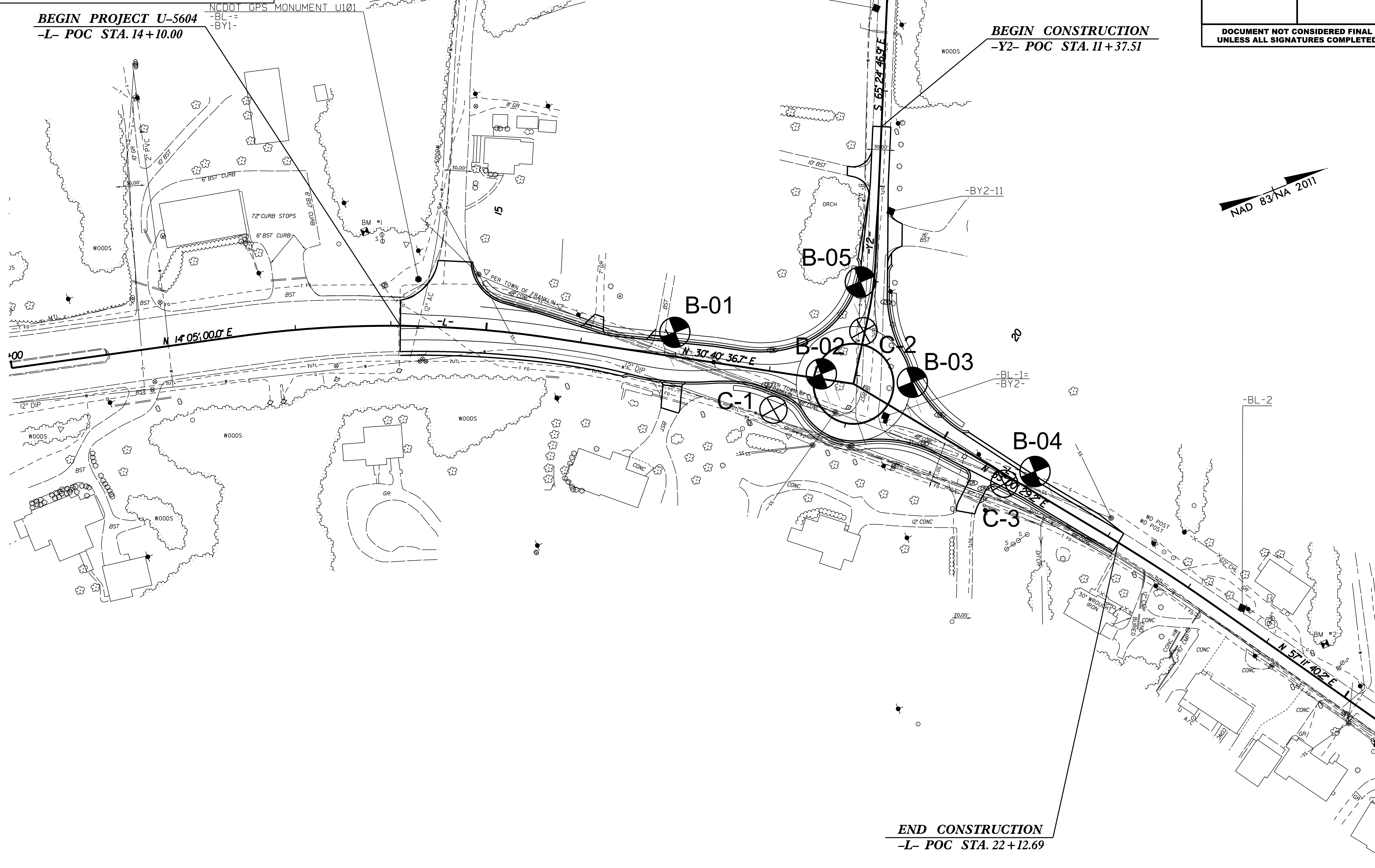
SEE SHEET 7 FOR -L- PROFILE
SEE SHEET 8 FOR -Y2- PROFILE
SEE SHEET 10 FOR -RBT1- PROFILE
SEE SHEET 2B-1 FOR ROUNDABOUT DETAIL AND TRAFFIC DIAGRAM
SEE SHEET 2B-5 FOR -DET1-
SEE PAVEMENT MARKING PLANS FOR EXACT LOCATION OF CURB RAMPS.
ALL DRIVEWAY RADII ARE 3' UNLESS OTHERWISE NOTED.



REVISIONS

5/17/17 - RIGHT OF WAY REVISION NUMBER 1: REVISED PUE STATIONS AND OFFSETS ON PARCELS 1 AND 6, REVISED PUE AND EASEMENT STATIONS AND OFFSETS ON PARCEL 2, REVISED PUE STATIONS AND OFFSETS AND REMOVED EASEMENT ON PARCEL 3, REMOVED PARCEL 4, REVISED PUE, ADDED PDE AND EASEMENT, AND REMOVED DUE ON PARCEL 5, REVISED ROW STATIONS, ADDED PUE STATION AND OFFSETS ON PARCEL 7, ADDED PARCELS 37 AND 38, ADDED PUE TO PARCEL NUMBERS 37 AND 38

8/17/99

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PROJECT REFERENCE NO.	SHEET NO.
U-5604	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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SEE SHEET 8 FOR -L- AND- Y3- PROFILES

SEE SHEET 9 FOR -Y4-, -Y5-, AND -Y6- PROFILES

SEE SHEET 10 FOR -RBT2- PROFILE

SEE SHEET 11 FOR -RBT3- AND -R1- PROFILES

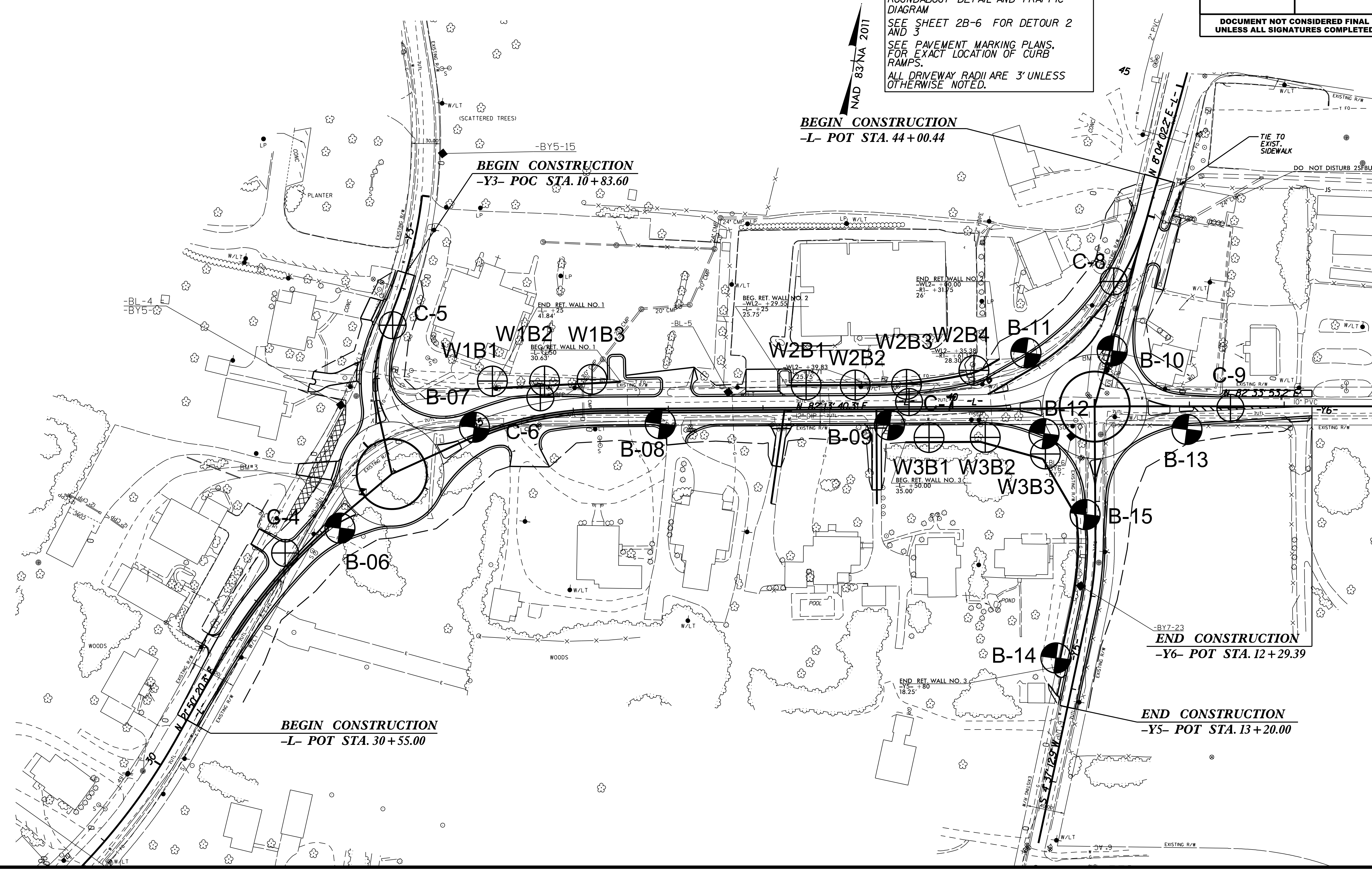
SEE SHEET 13 FOR -DRWY1- AND -DRWY2- PROFILES

SEE SHEET 2B-2 AND 2B-3 FOR ROUNDABOUT DETAIL AND TRAFFIC DIAGRAM

SEE SHEET 2B-6 FOR DETOUR 2 AND 3

SEE PAVEMENT MARKING PLANS. FOR EXACT LOCATION OF CURB RAMPS.

ALL DRIVEWAY RADII ARE 3' UNLESS OTHERWISE NOTED.



REVISIONS

5/17/17 - RIGHT OF WAY REVISION NUMBER 1: REVISED PUE STATIONS AND OFFSETS FOR PARCELS 8, 9, 14, 15, 19, 23, 24, REVISED ROW ON PARCELS 11 AND 12, REVISED PUE LINE ON PARCELS 10 AND 11, REVISED PARCEL 19 INTO FOUR PARCELS, REMOVED PUE ON PARCEL 25 AND MOVED PARCEL 25 FROM PREVIOUS LOCATION, ADDED PARCEL 25 TO NEW LOCATION AND ADDED DUE TO RELOCATED PARCEL 25

6/13/17 - RIGHT OF WAY REVISION NUMBER 2: REMOVED PDE AND BERM DITCHES FOR PARCELS 20, 21, 22 AND WIDENED DRIVES AND CHANGED DRIVES TO STREET TURNOUT ON PARCEL 20 FOR TRUCKS.

8/17/99

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SEE SHEET 9 FOR -Y7- PROFILE
SEE SHEET 10 FOR -Y8- PROFILE
SEE SHEET 10 FOR -Y9- PROFILE
SEE SHEET 11 FOR -RBT4- PROFILE
SEE SHEET 2B-4 FOR ROUNDABOUT DETAIL AND TRAFFIC DIAGRAM
SEE SHEET 2B-7 FOR DETOUR
SEE PAVEMENT MARKING PLANS, FOR EXACT LOCATION OF CURB RAMPS.
ALL DRIVEWAY RADII ARE 3' UNLESS OTHERWISE NOTED.

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PROJECT REFERENCE NO.	SHEET NO.
U-5604	6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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NAD 83/NA 2011

BEGIN CONSTRUCTION
-Y8- POT STA. 14+60.00

BEGIN CONSTRUCTION
-Y7- POC STA. 11+40.00

END CONSTRUCTION
-Y9- POC STA. 11+95.00

S 63° 36' 33" E

-Y7-

-Y8-

-Y9-

-RBT4-

-BY6-22

SEE SHEET 2B-3 FOR SUPERELEVATION

-Y7-	-Y8-	-Y9-		-RBT4-
PI Sta 10+95.86	PI Sta 15+90.48	PI Sta 10+70.33	PI Sta 13+25.12	PI Sta 10+00.00
Δ = 22° 21' 37.6" (RT)	Δ = 22° 37' 45.7" (RT)	Δ = 2° 41' 08.7" (RT)	Δ = 4° 08' 37.1" (RT)	Δ = 359° 59' 59.7" (RT)
D = 11° 48' 48.8"	D = 16° 22' 12.8"	D = 1° 54' 35.5"	D = 1° 07' 24.4"	D = 154° 51' 12.4"
L = 189.28'	L = 138.23'	L = 140.63'	L = 368.83'	L = 232.48'
T = 95.86'	T = 70.03'	T = 70.33'	T = 184.50'	T = 0.00'
R = 485.00'	R = 350.00'	R = 3,000.00'	R = 5,100.00'	R = 37.00'
SE = EXIST.	SE = SEE PLANS	SE = SEE PLANS	SE = EXIST.	SE = SEE PLANS
RO = SEE PLANS	RO = SEE PLANS	RO = SEE PLANS	RO = SEE PLANS	RO = SEE PLANS

REVISIONS
5/17/17 - RIGHT OF WAY REVISION NUMBER 1: ADDED PLE STATIONS AND OFFSETS TO PARCELS 30 AND 34, REVISED PLE STATIONS AND OFFSETS ON PARCEL 33, REVISED PLE STATIONS AND OFFSETS ON PARCELS 34-36

8/17/99

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PROJECT REFERENCE NO.	SHEET NO.
U-5604	7

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

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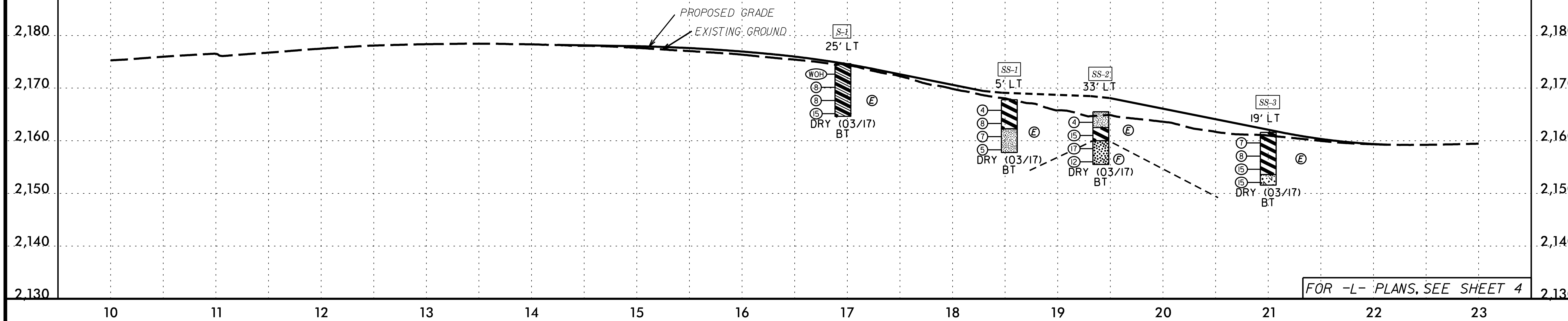
-L-

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-1	25 FT LT	16+96	1.0'-8.5'	A-6	40	15	–	–	–	–	98	86	54	23	–
SS-1	5 FT LT	18+54	1.0'-2.5'	A-7-6	56	29	–	–	–	–	100	94	69	28	–
SS-2	33 FT LT	19+41	3.5'-5.0'	A-7-5	51	17	–	–	–	–	100	93	67	25	–
SS-3	19 FT RT	21+00	1.0'-2.5'	A-7-6	46	21	–	–	–	–	98	92	63	23	–

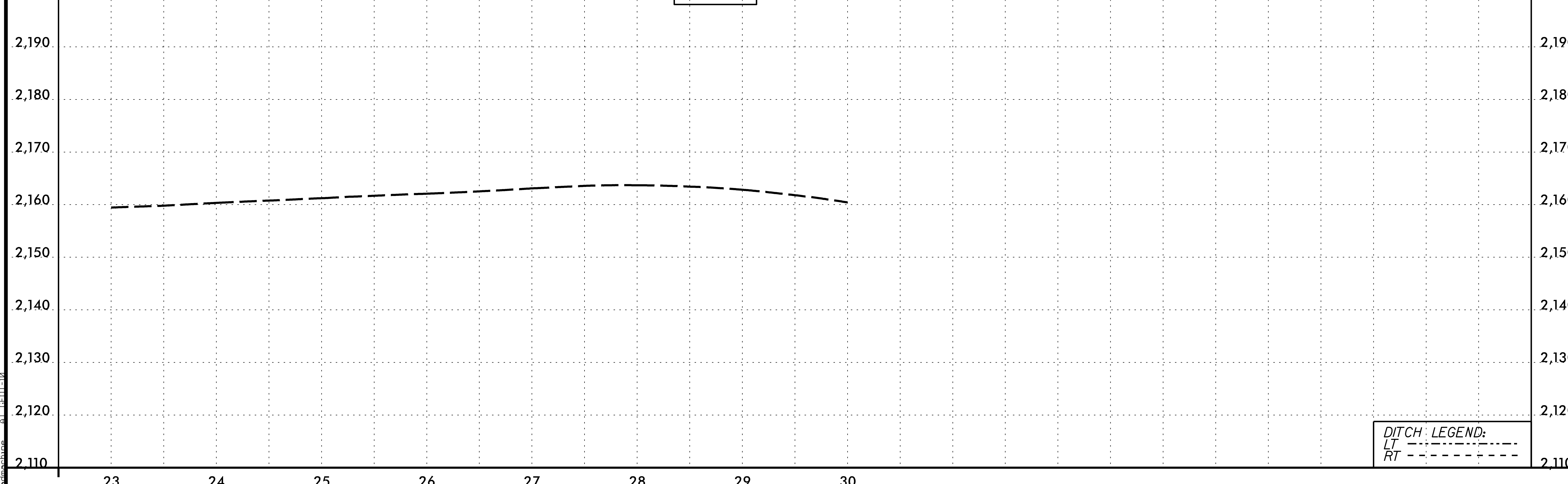
(E) **RESIDUAL:** BROWN TAN AND BLACK, MOIST, V. SOFT TO STIFF, SANDY SILT AND SILTY CLAY

(F) **RESIDUAL:** BROWN, MOIST, MED. DENSE, SILTY SAND



FOR -L- PLANS, SEE SHEET 4

-L-



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LT
RT

5/28/99

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PROJECT REFERENCE NO.	SHEET NO.
U-5604	8
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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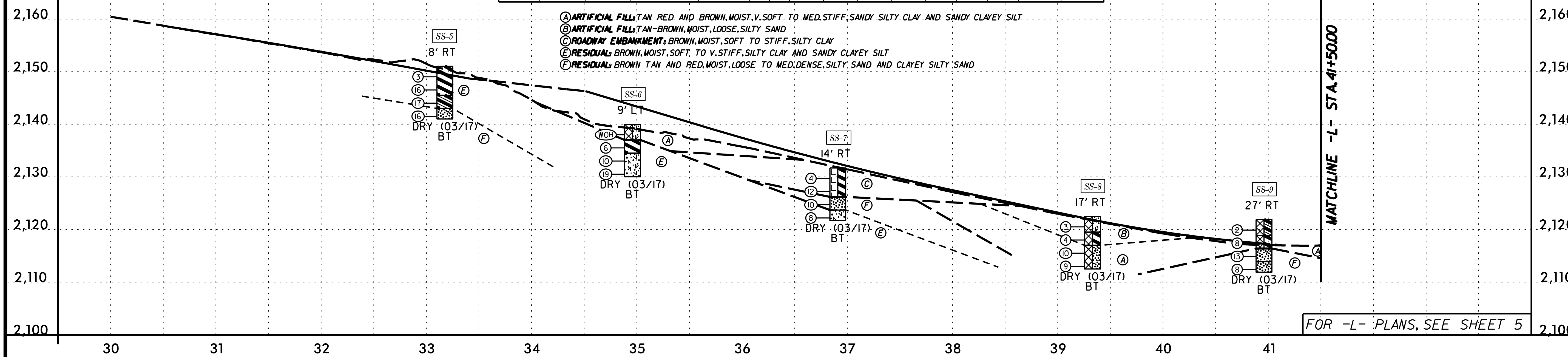
-L-

SOIL TEST RESULTS

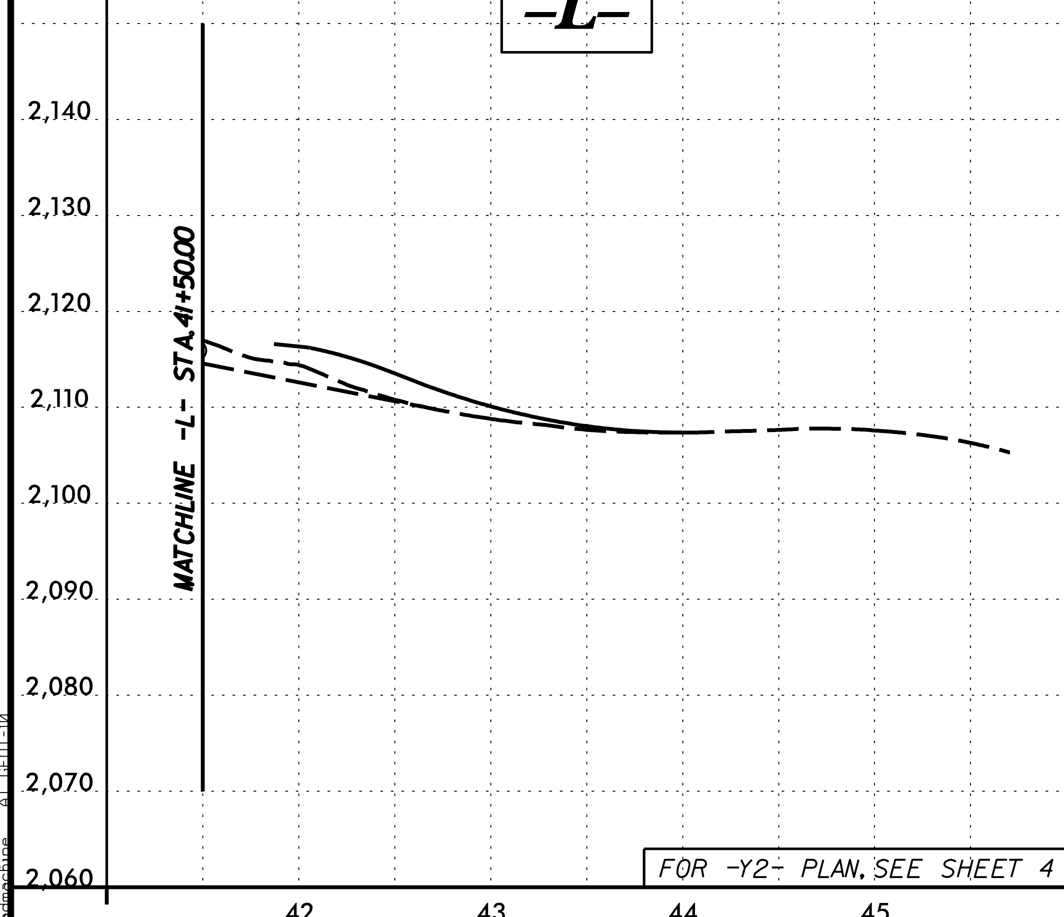
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-5	8 FT RT	33+18	1.0'-8.5'	A-7-6	49	21	–	–	–	–	100	96	71	25	–
SS-6	9 FT LT	34+96	3.5'-5.0'	A-7-6	45	17	–	–	–	–	100	93	66	25	–
SS-7	14 FT RT	36+91	1.0'-2.5'	A-7-5	49	19	–	–	–	–	100	92	69	27	–
SS-8	17 FT RT	39+33	3.5'-5.0'	A-7-6	46	20	–	–	–	–	93	82	52	23	–
SS-9	27 FT RT	40+96	1.0'-2.5'	A-6	37	17	–	–	–	–	100	92	63	22	–

(A) **ARTIFICIAL FILL:** TAN RED AND BROWN, MOIST, V. SOFT TO MED. STIFF, SANDY SILTY CLAY AND SANDY CLAYEY SILT
(B) **ARTIFICIAL FILL:** TAN-BROWN, MOIST, LOOSE, SILTY SAND
(C) **ROADWAY EMBANKMENT:** BROWN, MOIST, SOFT TO STIFF, SILTY CLAY
(E) **RESIDUAL:** BROWN, MOIST, SOFT TO V. STIFF, SILTY CLAY AND SANDY CLAYEY SILT
(F) **RESIDUAL:** BROWN TAN AND RED, MOIST, LOOSE TO MED. DENSE, SILTY SAND AND CLAYEY SILTY SAND



FOR -L- PLANS, SEE SHEET 5

-L-

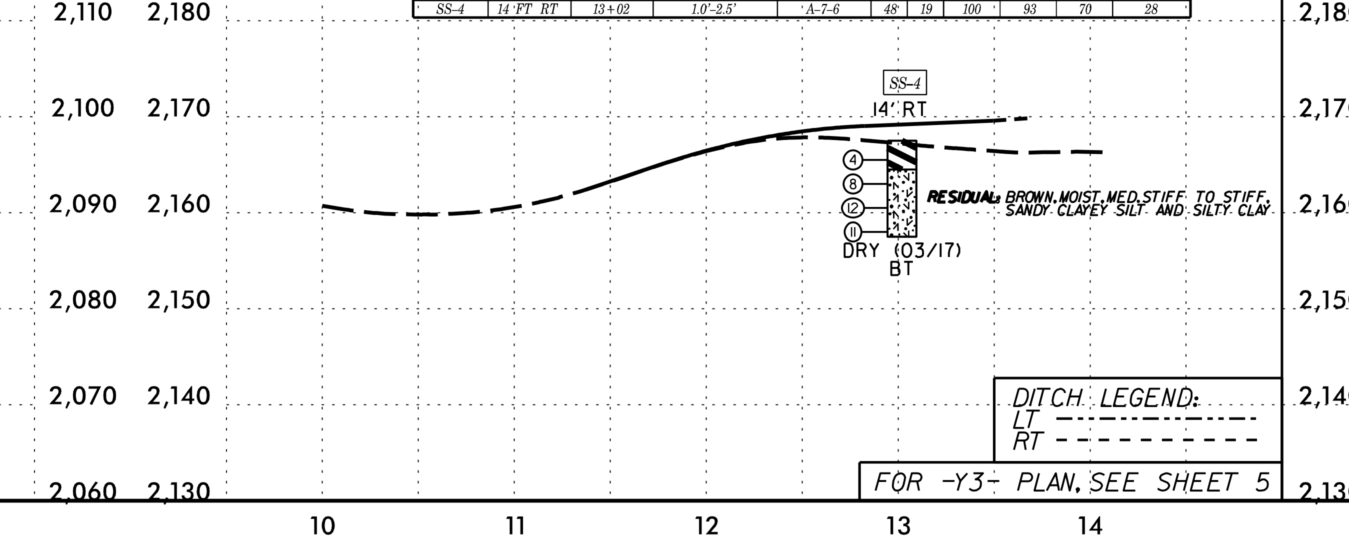


FOR -Y2- PLAN, SEE SHEET 4

-Y2-

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% PASSING (SIEVES)			% MOISTURE
							10	40	200	
SS-4	14 FT RT	13+02	1.0'-2.5'	A-7-6	48	19	100	93	70	28



DITCH LEGEND:
LT -·-·-·-·-
RT - - - - - -

FOR -Y3- PLAN, SEE SHEET 5

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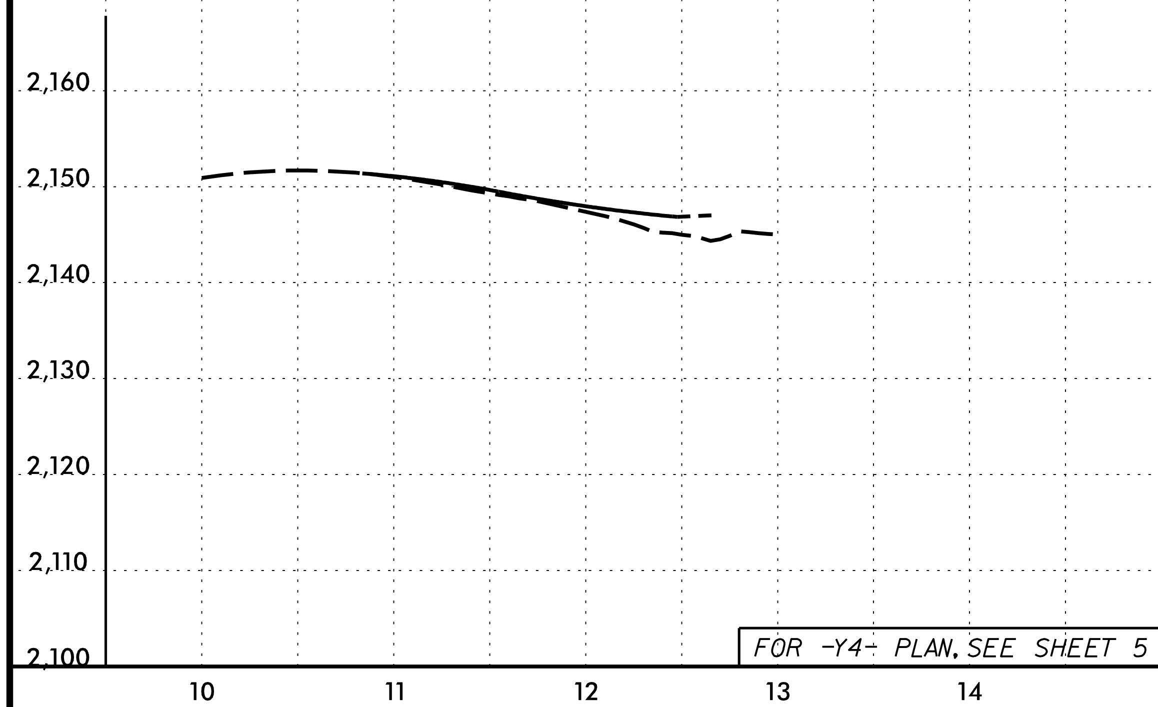
PROJECT REFERENCE NO.	SHEET NO.
U-5604	9
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

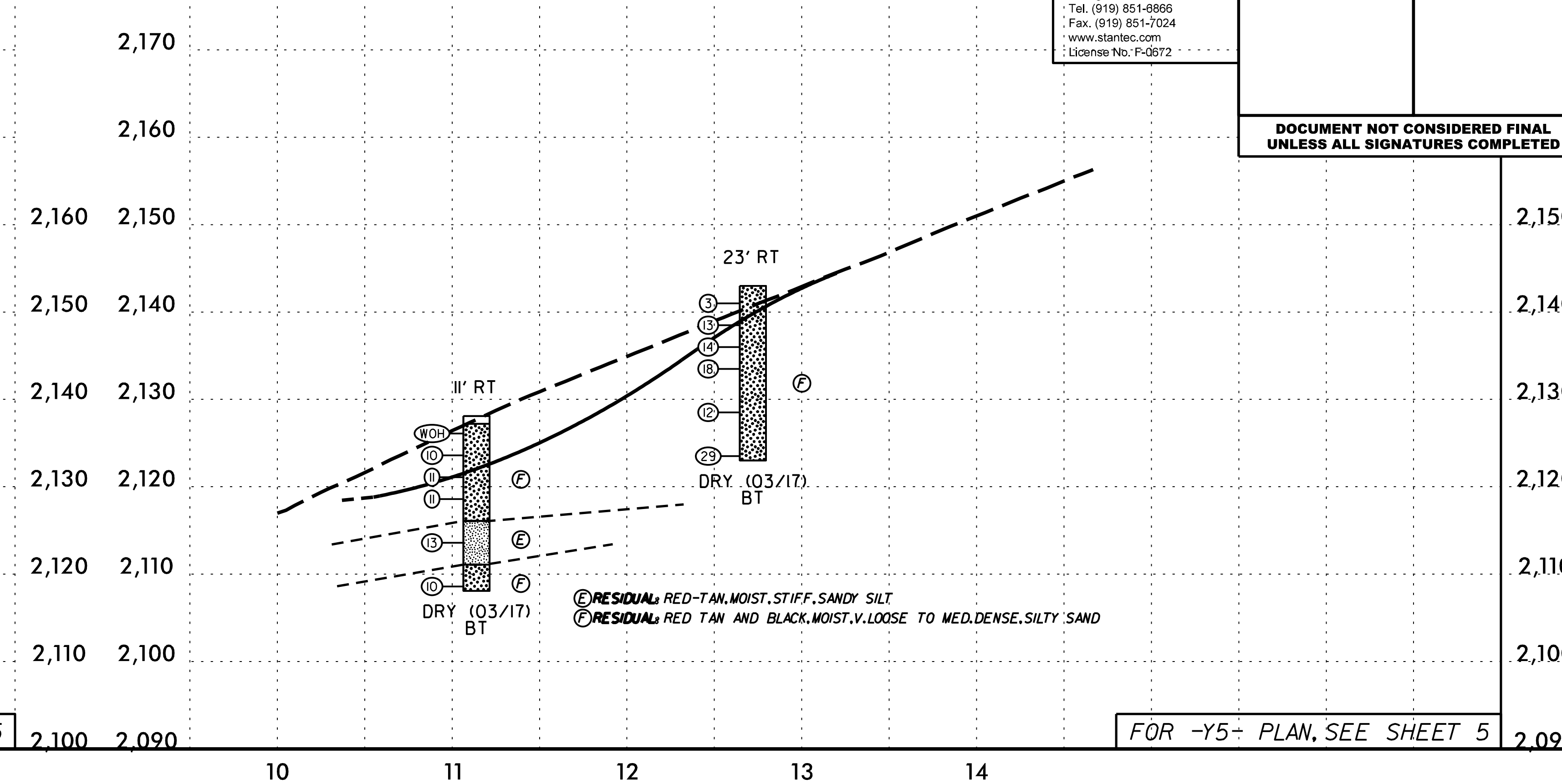
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

-Y3-



FOR -Y4- PLAN, SEE SHEET 5

-Y5-

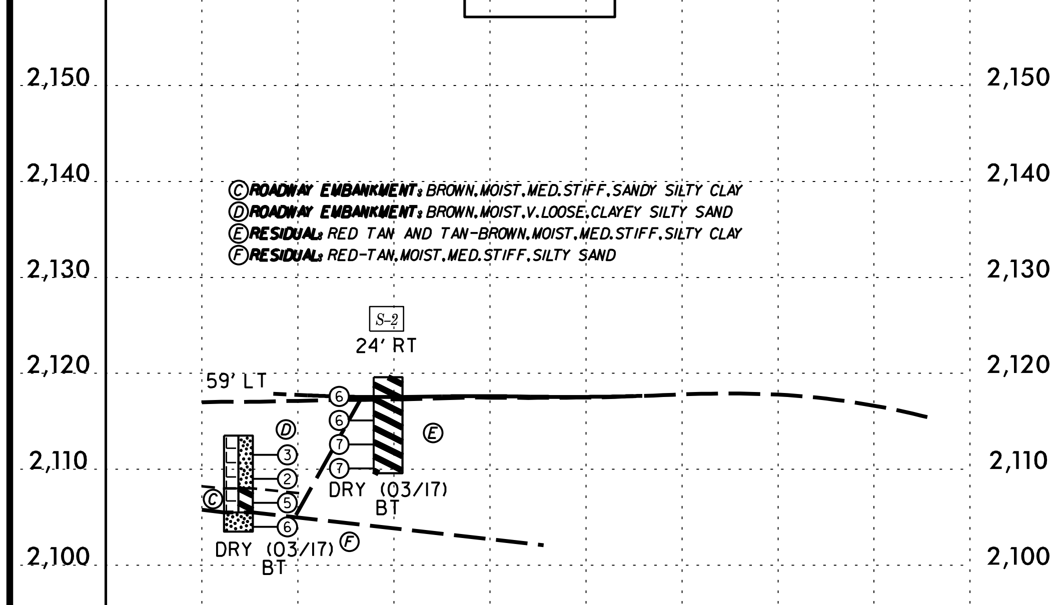


E RESIDUAL: RED-TAN, MOIST, STIFF, SANDY SILT
F RESIDUAL: RED TAN AND BLACK, MOIST, V. LOOSE TO MED. DENSE, SILTY SAND

FOR -Y5- PLAN, SEE SHEET 5

-Y6-

C ROADWAY EMBANKMENT: BROWN, MOIST, MED. STIFF, SANDY SILTY CLAY
D ROADWAY EMBANKMENT: BROWN, MOIST, V. LOOSE, CLAYEY SILTY SAND
E RESIDUAL: RED TAN AND TAN-BROWN, MOIST, MED. STIFF, SILTY CLAY
F RESIDUAL: RED-TAN, MOIST, MED. STIFF, SILTY SAND



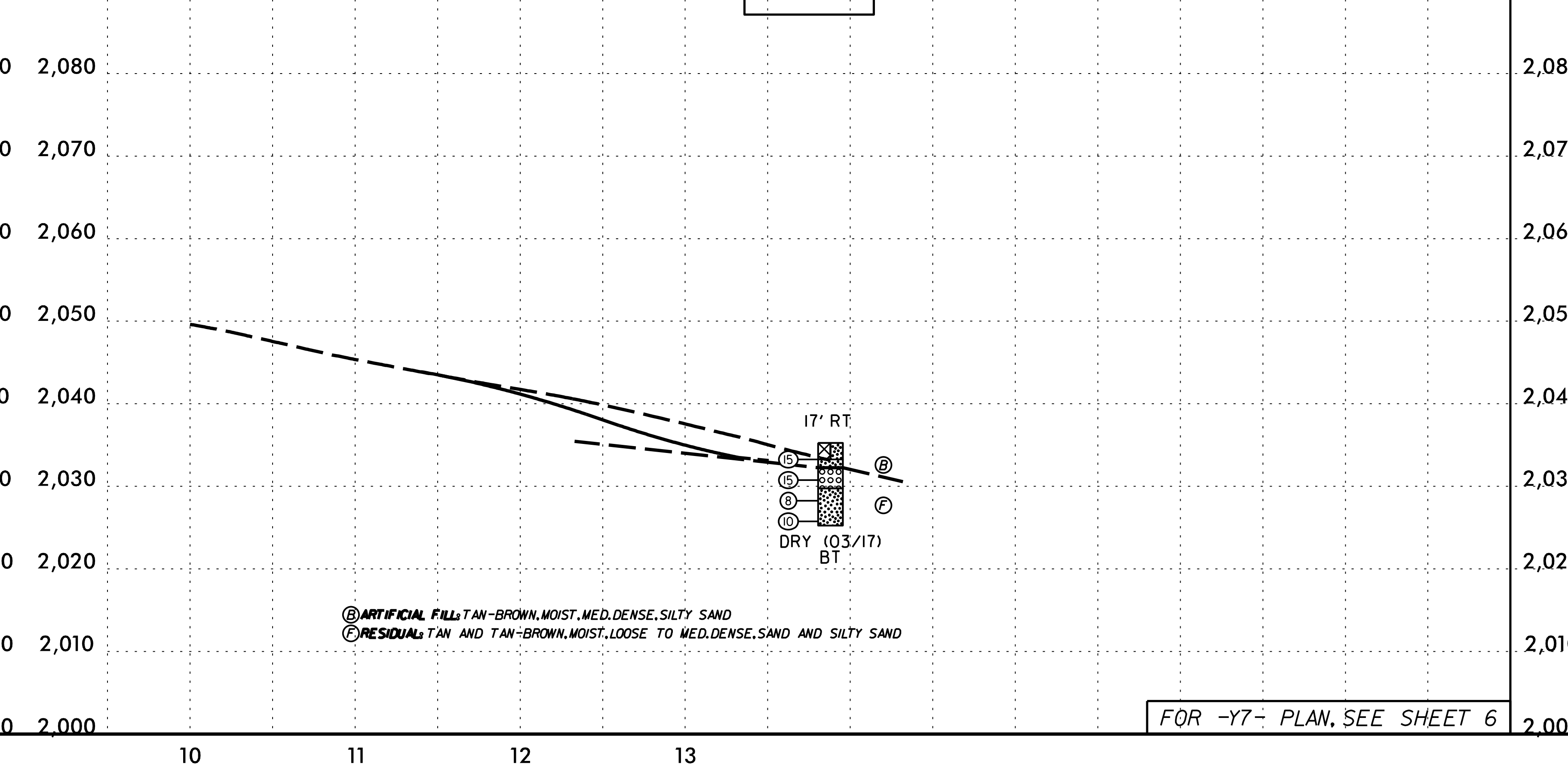
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% PASSING (SIEVES) 10	40	200	% MOISTURE
S-2	24 FT RT	10+97	1.0'-8.5'	A-7-5	62	27	98	92	74	35

2,090
2,080
2,070
10 11 12 13

FOR -Y6- PLAN, SEE SHEET 5

-Y7-



B ARTIFICIAL FILL: TAN-BROWN, MOIST, MED. DENSE, SILTY SAND
F RESIDUAL: TAN AND TAN-BROWN, MOIST, LOOSE TO MED. DENSE, SAND AND SILTY SAND

FOR -Y7- PLAN, SEE SHEET 6

5/28/99
29-SEP-2017 13:56
T:\Projects\2015\G15062.00 U-5604 US-441 Intersection Improvements\U5604_GEO_RDWY\CADD_GEOTECH\PlanProf\U5604_GEO_pf1_layout.dgn

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road
Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
License No. F-0672

PROJECT REFERENCE NO.	SHEET NO.
U-5604	10

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

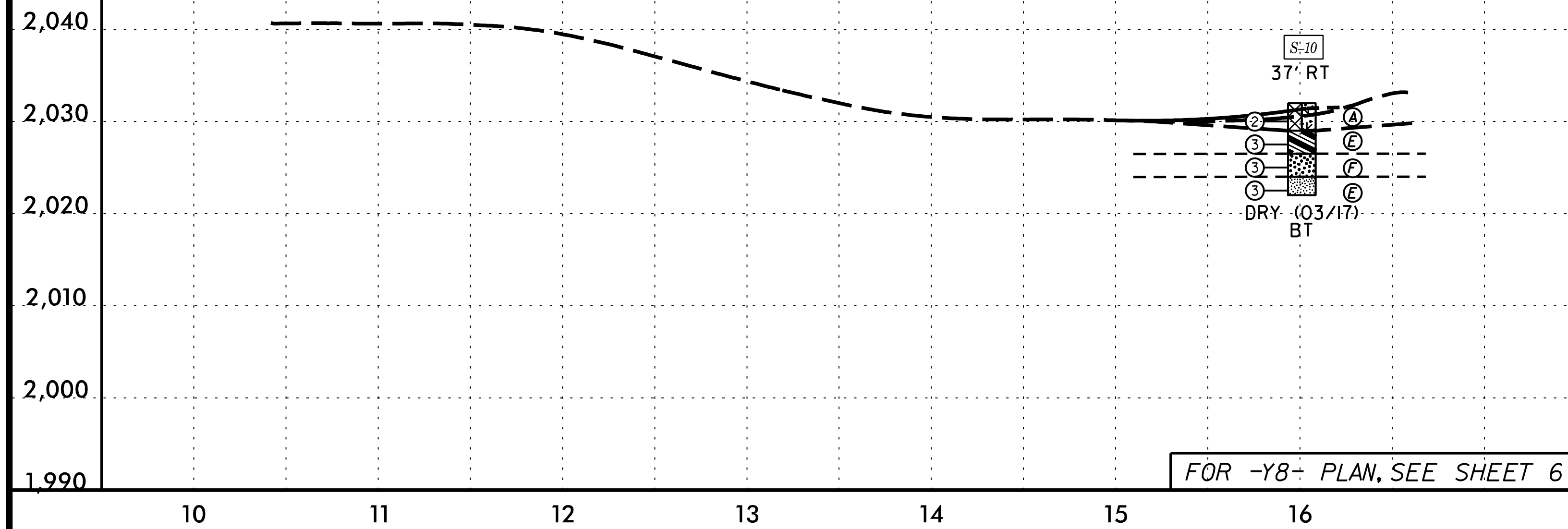
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

-Y8-

SOIL TEST RESULTS

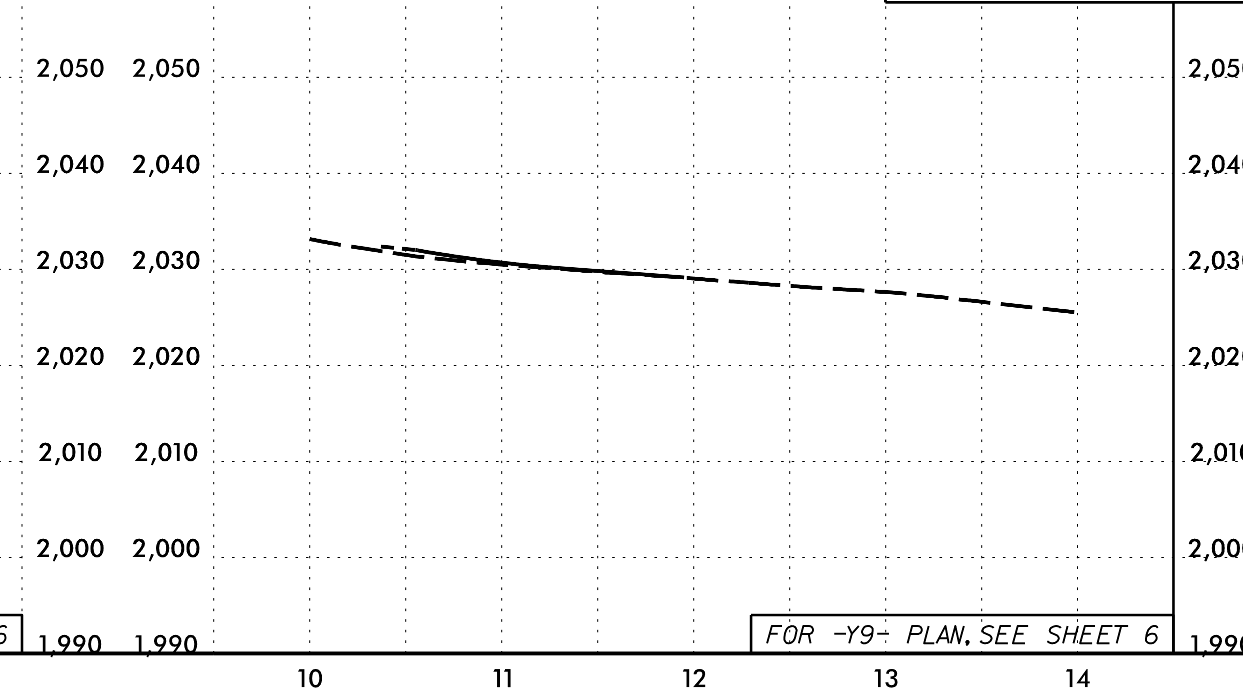
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-10	37 FT RT	16+01	3.5'-5.0'	A-6	36	12	-	-	-	-	99	93	60	25	-

(A) **ARTIFICIAL FILL:** TAN, MOIST, SOFT, SANDY CLAYEY SILT
(E) **RESIDUAL:** TAN, MOIST TO WET, SOFT, SANDY SILT AND SANDY CLAY
(F) **RESIDUAL:** TAN, MOIST, V. LOOSE, SILTY SAND



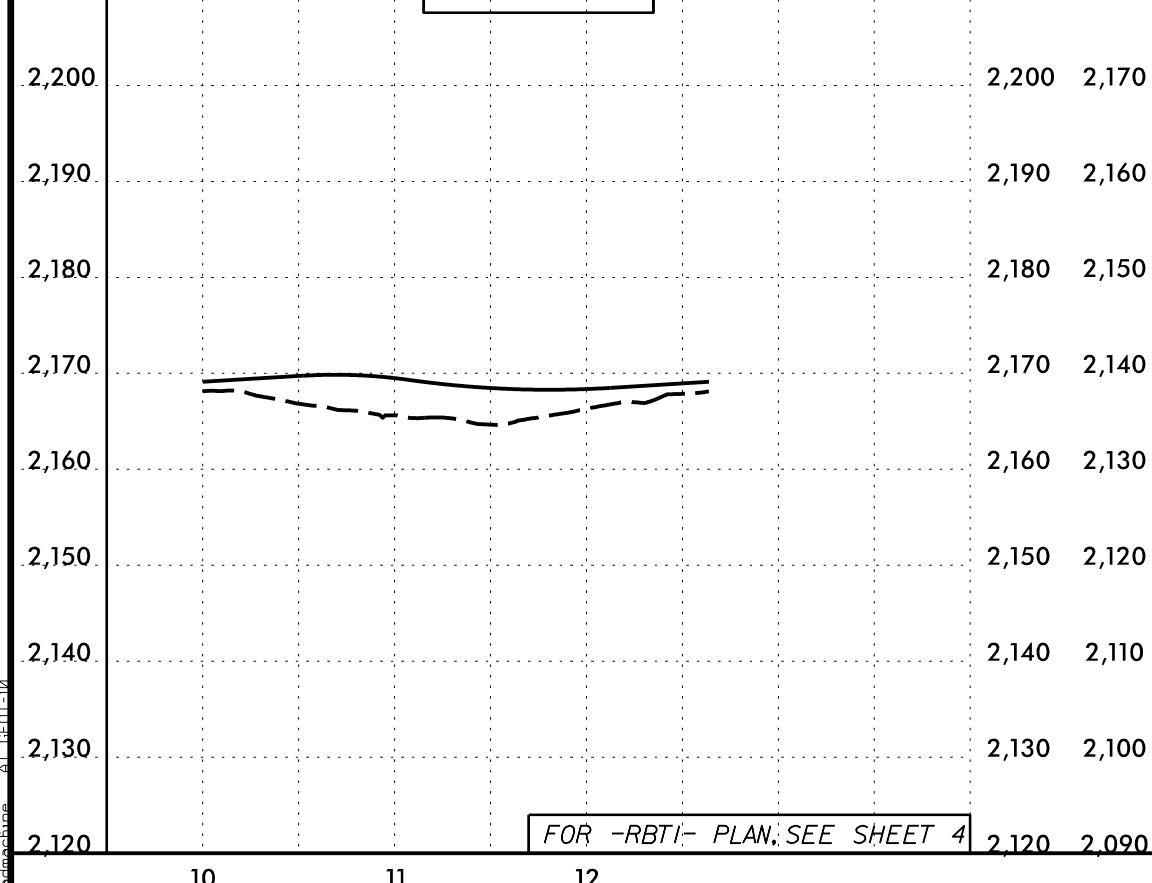
FOR -Y8- PLAN, SEE SHEET 6

-Y9-



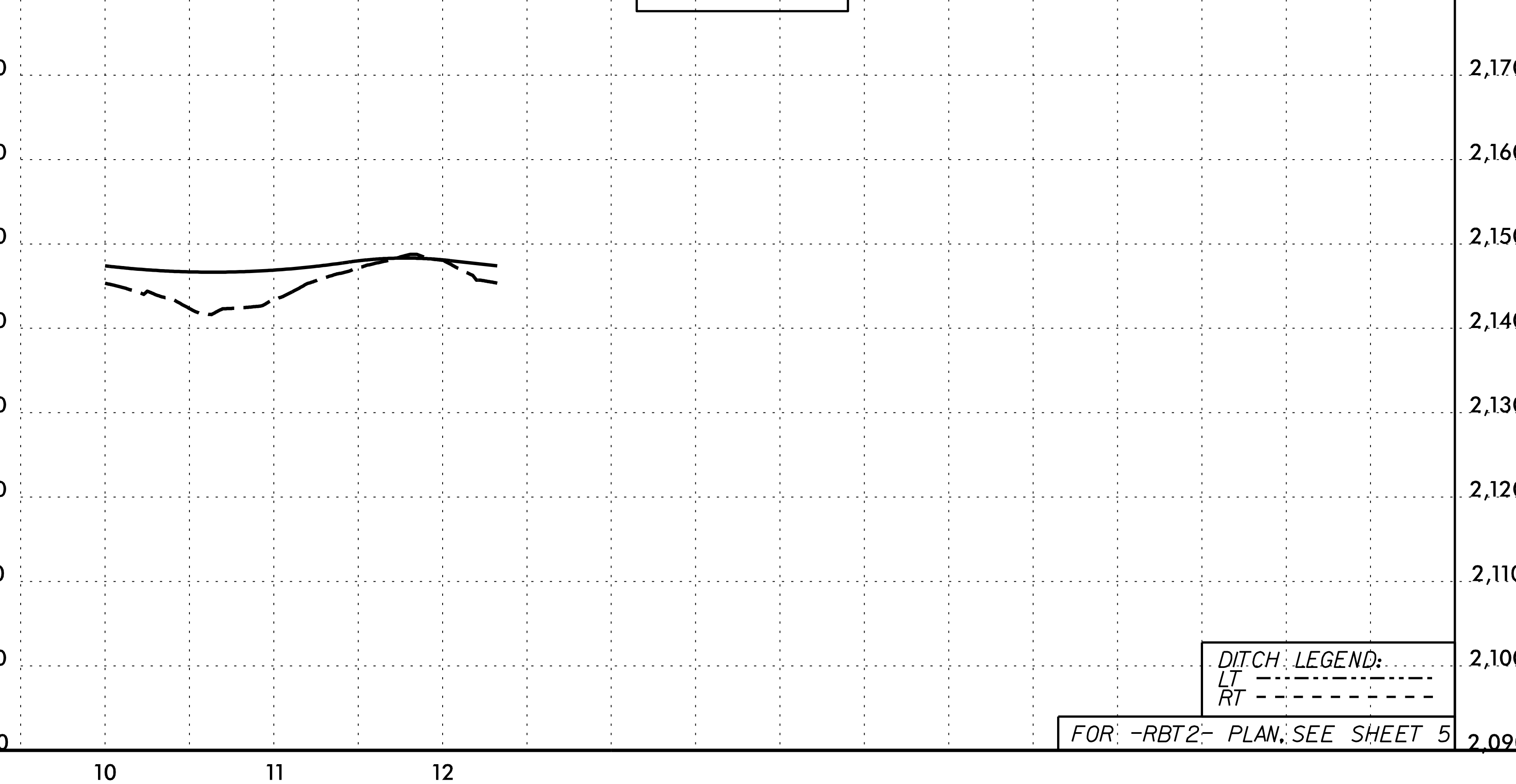
FOR -Y9- PLAN, SEE SHEET 6

-RBT1-



FOR -RBT1- PLAN, SEE SHEET 4

-RBT2-



DITCH LEGEND:
LT — · — · — · —
RT — — — — — —

FOR -RBT2- PLAN, SEE SHEET 5

5/28/99
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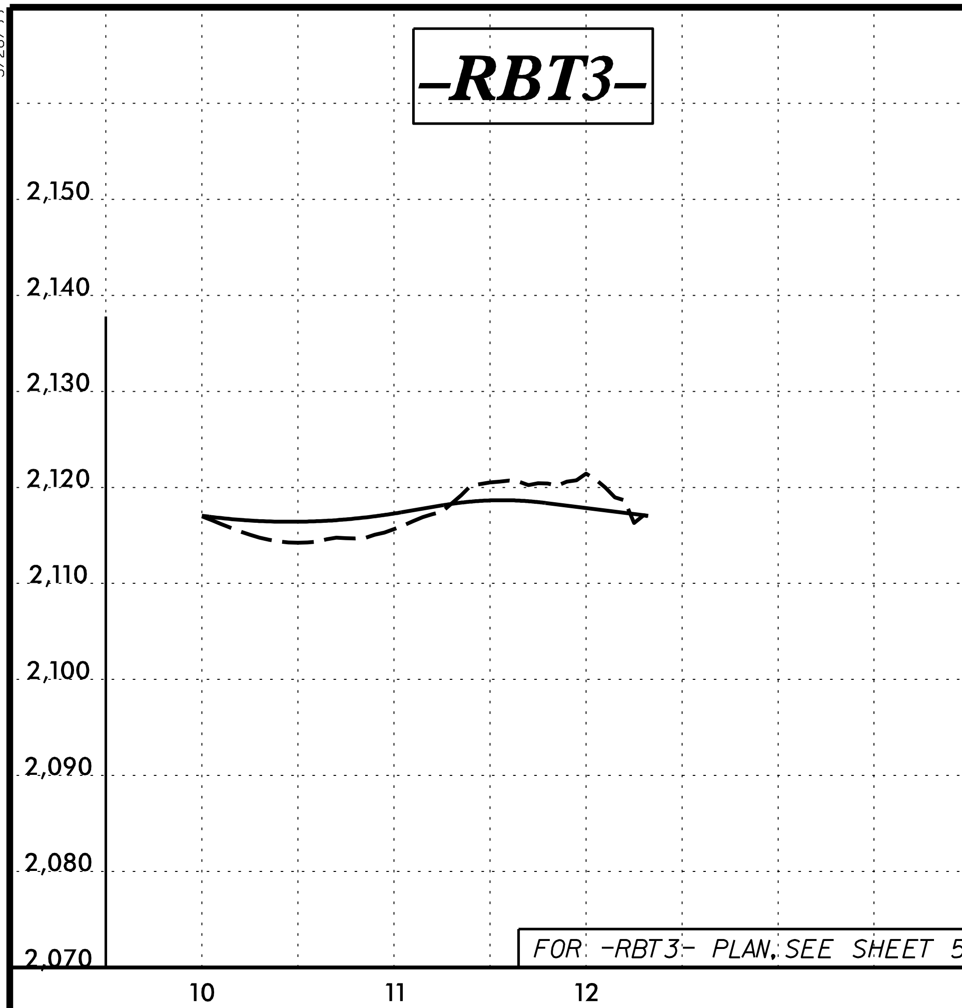

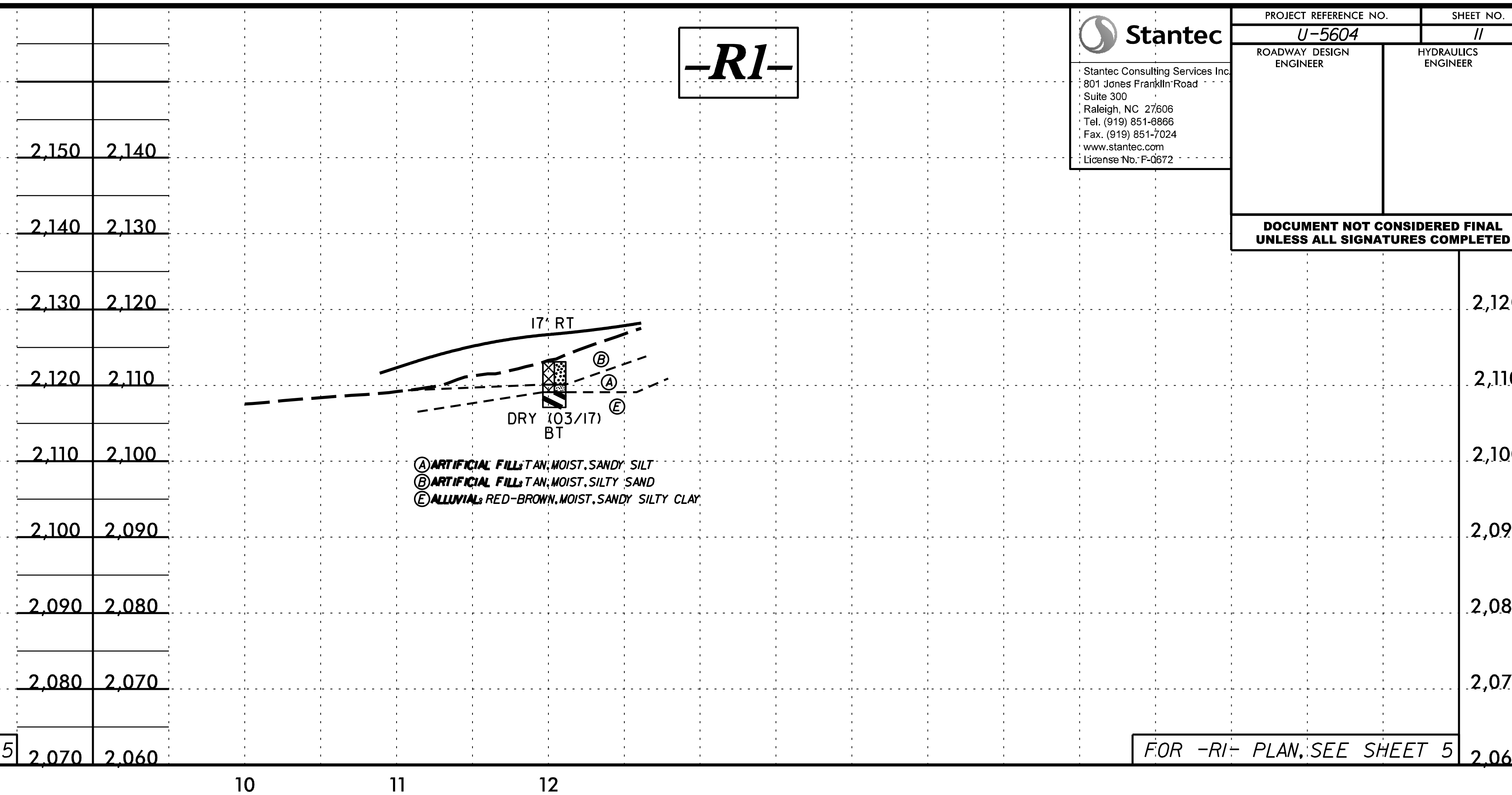

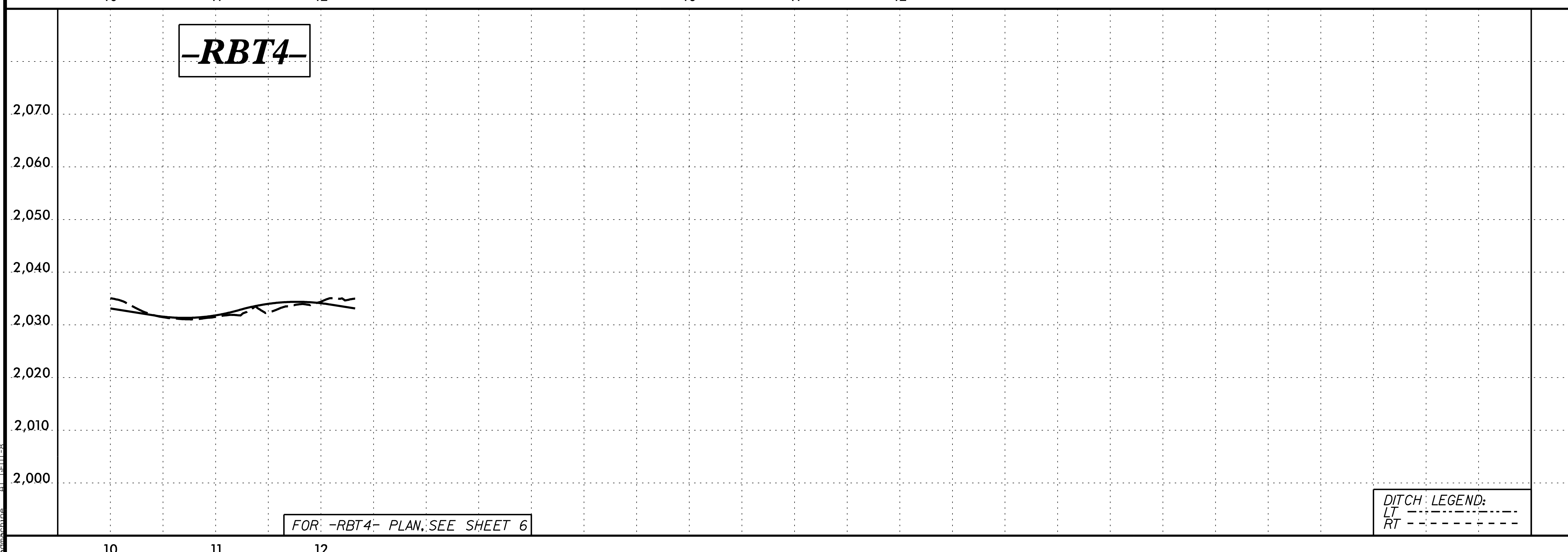

PRELIMINARY RETAINING WALL ENVELOPES

PROJECT REFERENCE NO.	SHEET NO.
U-5604	12
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

Stantec
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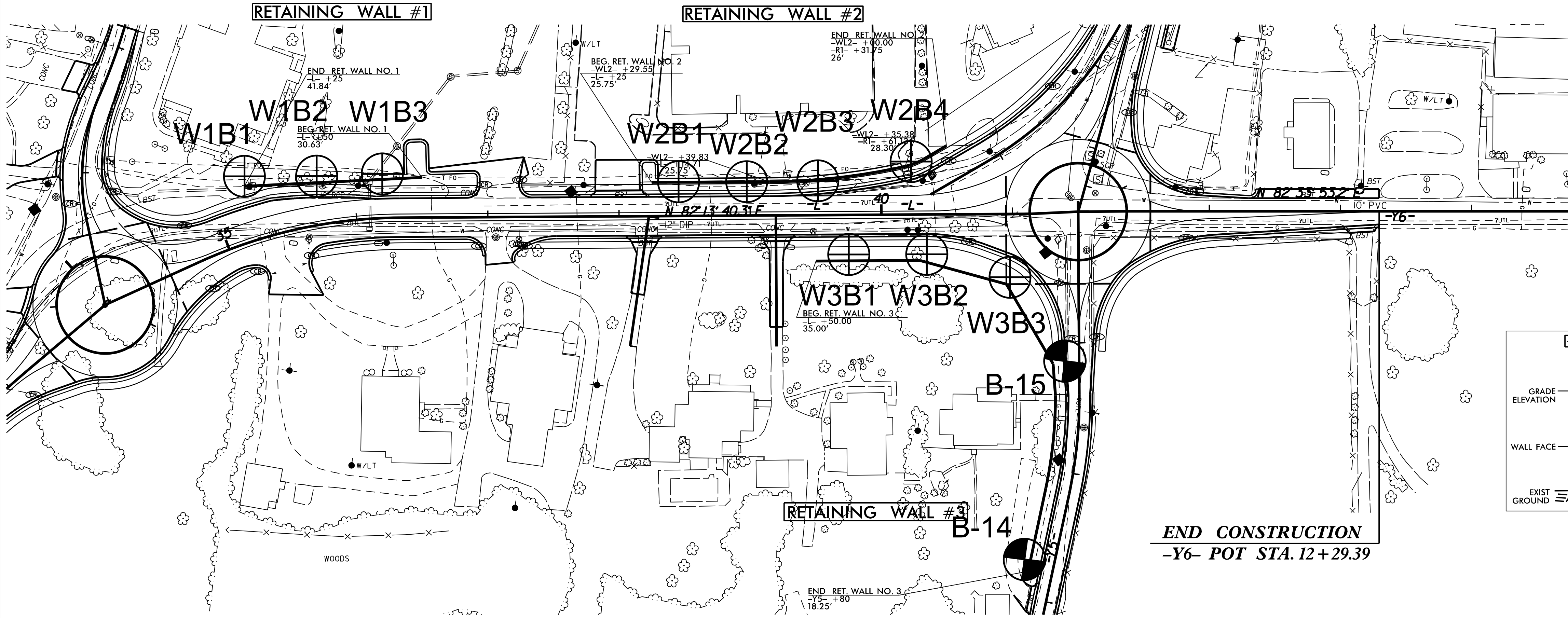
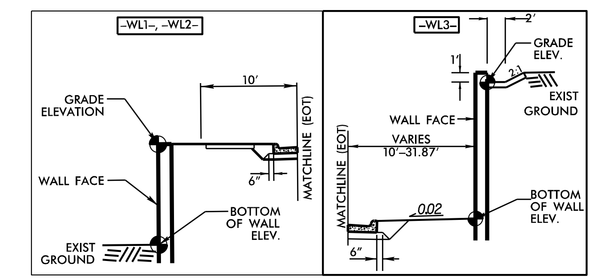
www.stantec.com
License No. F-0672

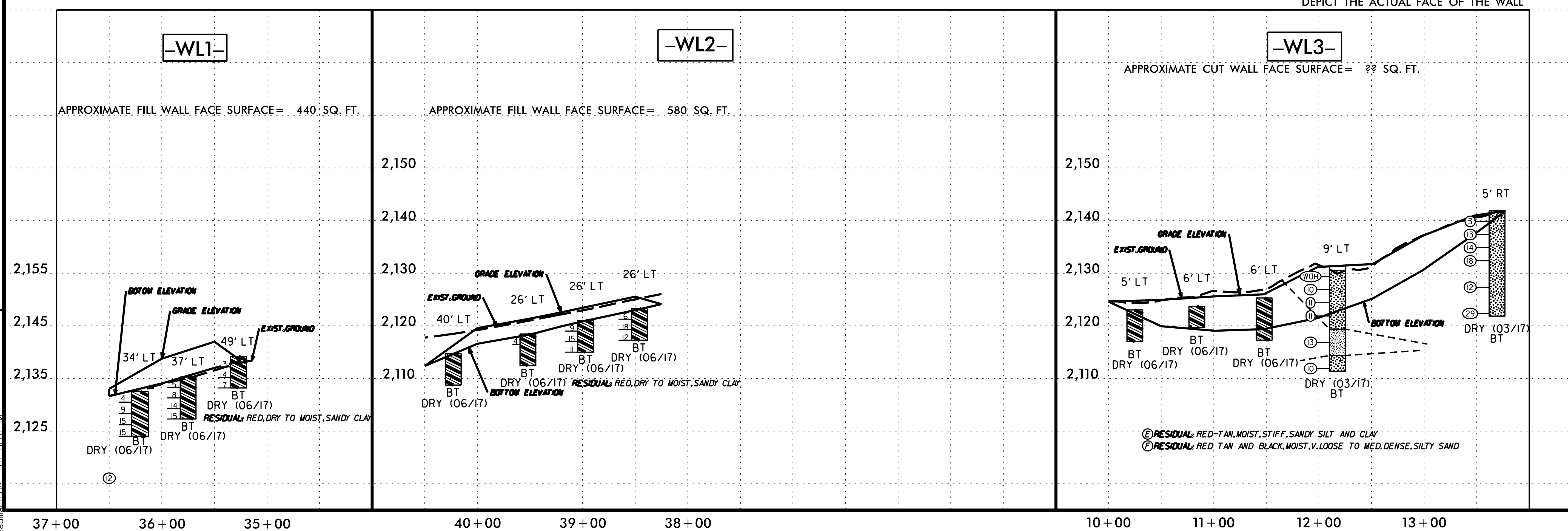
NAD 83/NA 2011





50 25 0 50 100

THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL



REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
U–5604	13

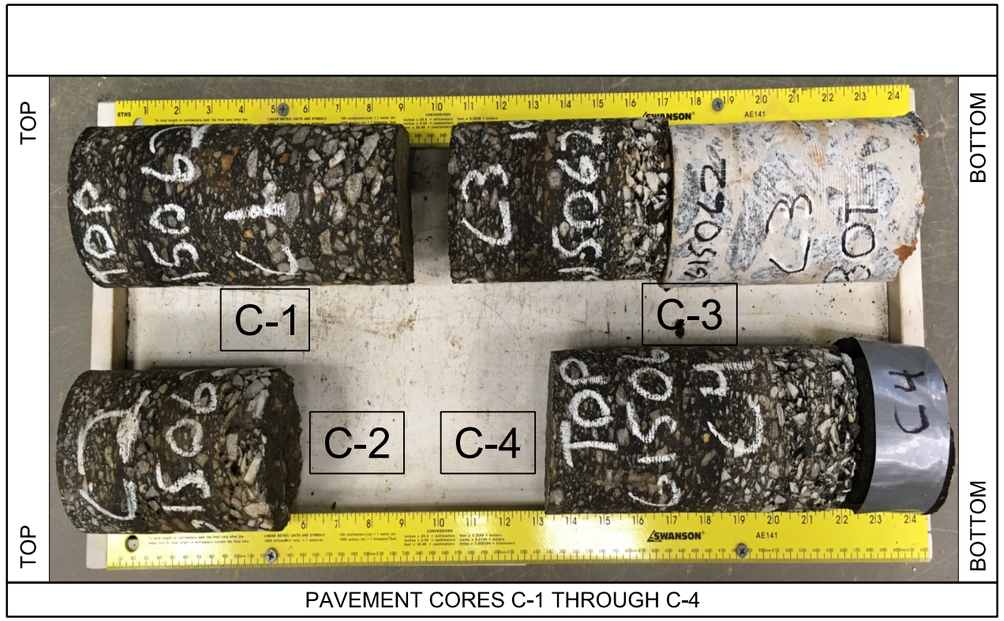
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

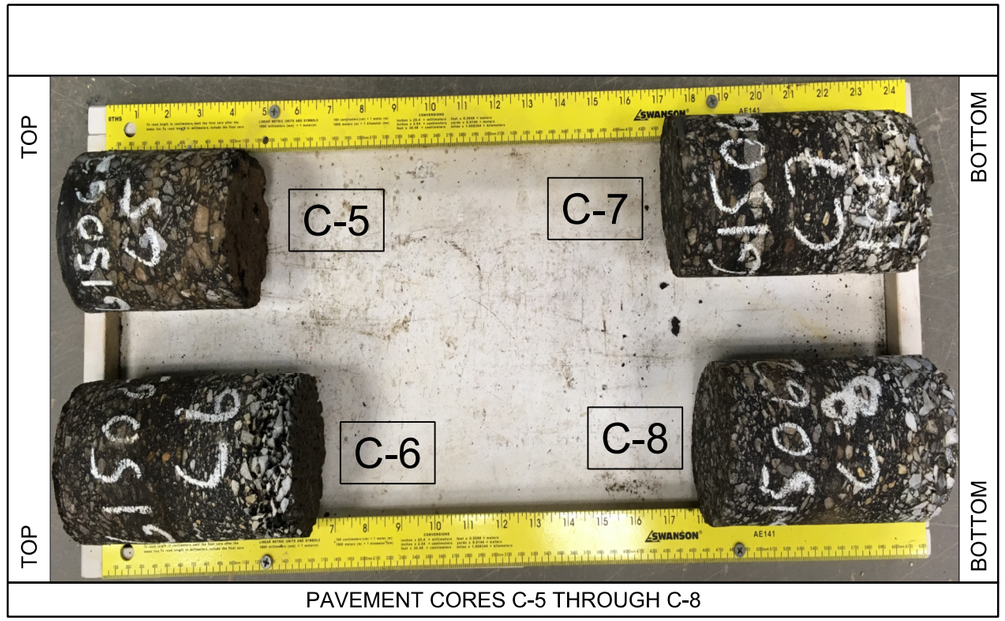
APPENDIX A
PAVEMENT INVESTIGATION RESULTS

REFERENCE: U–5604

PROJECT: N/A



PAVEMENT CORES C-1 THROUGH C-4



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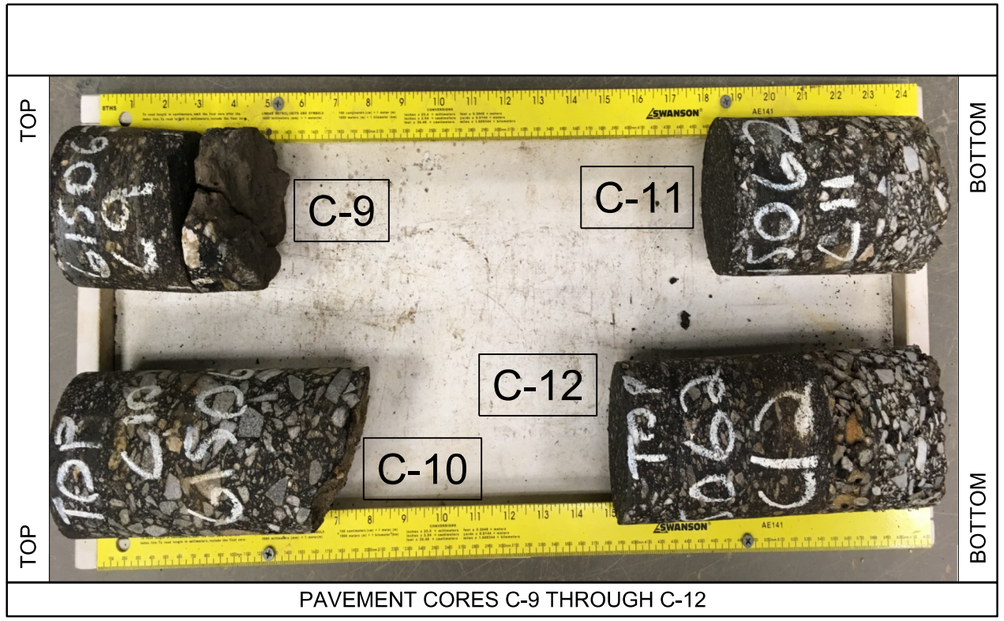


PAVEMENT CORES C-9 THROUGH C-12

FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
RALEIGH, NC 27607

PHONE: 919.871.0800
FAX: 919.871.0803

PAVEMENT CORE PHOTOGRAPHS

US 23/ US 64/ US 441 TO PORTER STREET
INTERSCTION IMPROVEMENTS AT WOMAK
MACON COUNTY, NC
TIP NO. :U-5604
FALCON PROJECT NO.: G15062.00

DCP TEST DATA

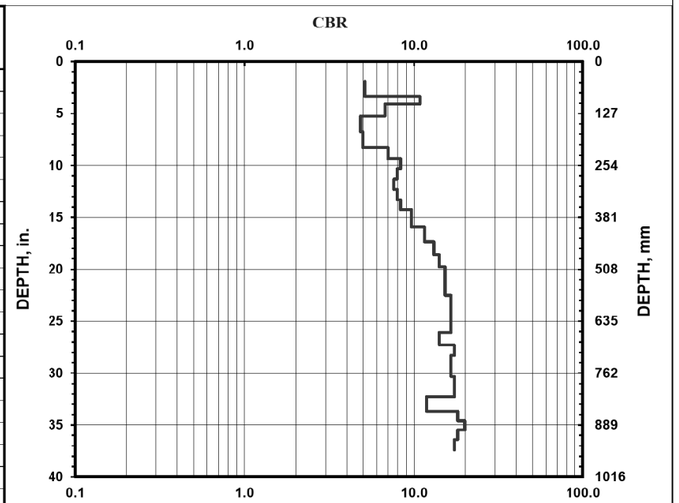
File Name: C-1

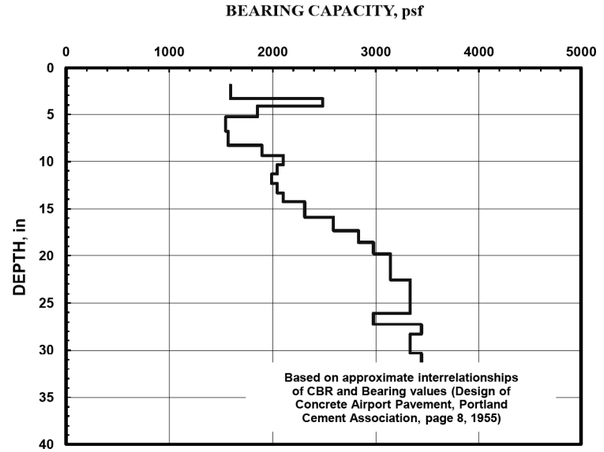
Project: *G15062.00*
Location: Macon County, NC
Date: 14-Jul-17
Soil Type(s): CL

Hammer: ○ 10.1 lbs. ◉ 17.6 lbs. ○ Both hammers used

Soil Type: ○ CH ◉ CL ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	48	1
1	85	1
1	104	1
1	133	1
1	172	1
1	210	1
1	238	1
1	262	1
1	287	1
1	313	1
1	313	1
1	338	1
1	362	1
2	404	1
2	440	1
2	472	1
2	502	1
2	530	1
3	572	1
2	598	1
3	637	1
2	663	1
2	693	1
2	718	1
2	744	1
2	770	1
2	795	1
2	820	1
2	855	1
2	879	1
2	901	1
2	925	1
2	950	1





DCP TEST DATA

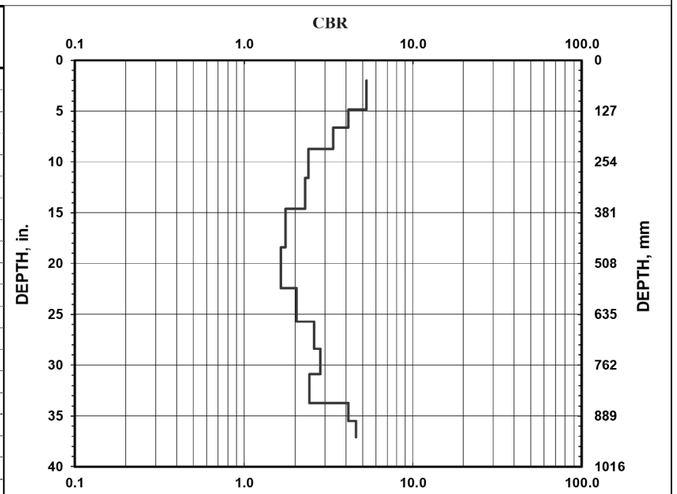
File Name: C-2

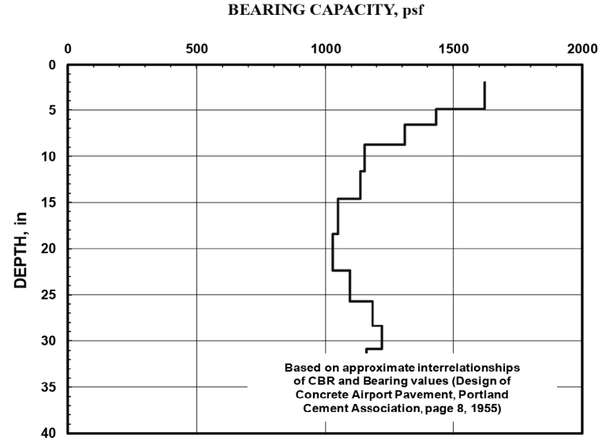
Project: *G15062.00*
Location: Macon County, NC
Date: 15-Jul-17
Soil Type(s): CL

Hammer: ○ 10.1 lbs. ◉ 17.6 lbs. ○ Both hammers used

Soil Type: ○ CH ◉ CL ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	51	1
1	87	1
1	123	1
1	168	1
1	222	1
1	295	1
1	371	1
1	467	1
1	569	1
1	653	1
1	721	1
1	784	1
1	856	1
1	901	1
1	942	1





DCP TEST DATA

File Name: C-3

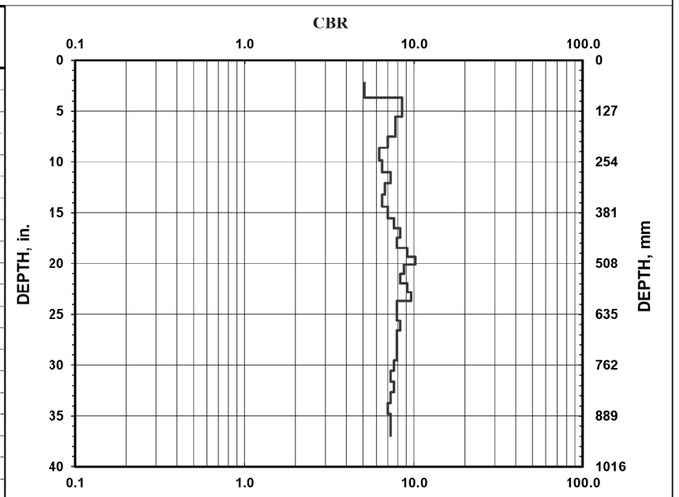
Project: *G15062.00* **Date:** 14-Jul-17

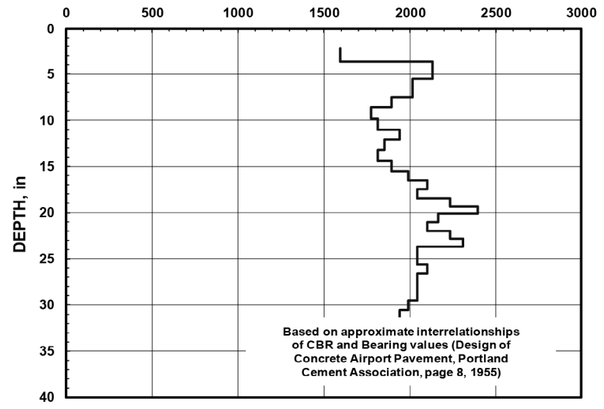
Location: Macon County, NC **Soil Type(s):** CL

Hammer: ○ 10.1 lbs. ◉ 17.6 lbs. ○ Both hammers used

Soil Type: ○ CH ◉ CL ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	56	1
1	93	1
2	140	1
2	191	1
1	219	1
1	250	1
1	280	1
1	307	1
1	336	1
1	366	1
1	394	1
1	420	1
1	444	1
1	469	1
1	491	1
1	511	1
1	534	1
1	558	1
1	580	1
1	601	1
2	651	1
1	675	1
1	700	1
1	725	1
1	750	1
1	776	1
1	803	1
1	829	1
1	856	1
1	884	1
1	911	1
1	938	1





DCP TEST DATA

File Name: C-4

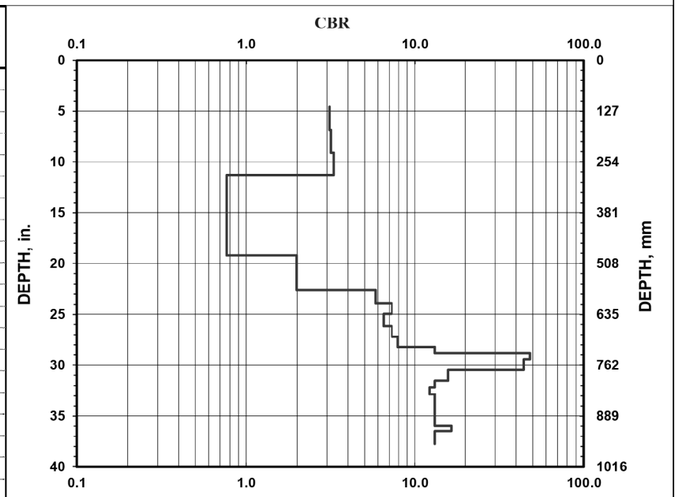
Project: *G15062.00* **Date:** 14-Jul-17

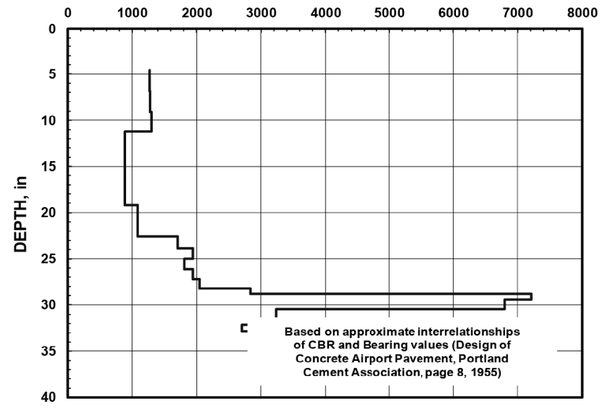
Location: Macon County, NC **Soil Type(s):** CL

Hammer: ○ 10.1 lbs. ◉ 17.6 lbs. ○ Both hammers used

Soil Type: ○ CH ◉ CL ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	116	1
1	174	1
1	231	1
1	286	1
1	488	1
1	574	1
1	607	1
1	634	1
1	664	1
1	691	1
1	716	1
1	732	1
3	747	1
5	774	1
2	801	1
1	817	1
1	834	1
1	850	1
1	866	1
1	882	1
1	898	1
1	914	1
1	927	1
1	943	1
1	959	1





DCP TEST DATA

File Name: C-5

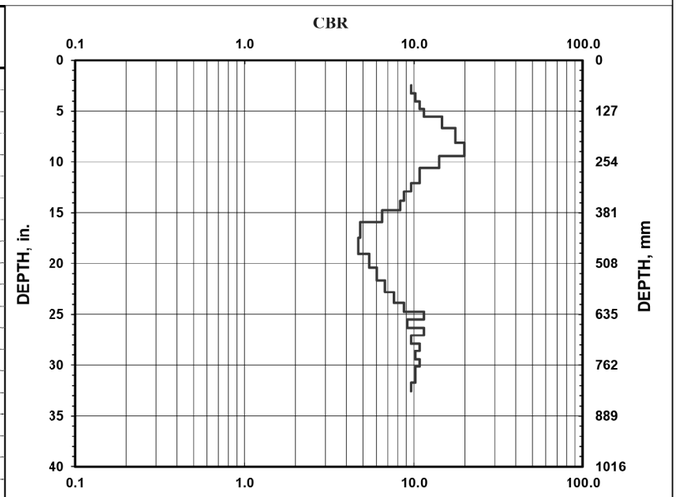
Project: *G15062.00* **Date:** 15-Jul-17

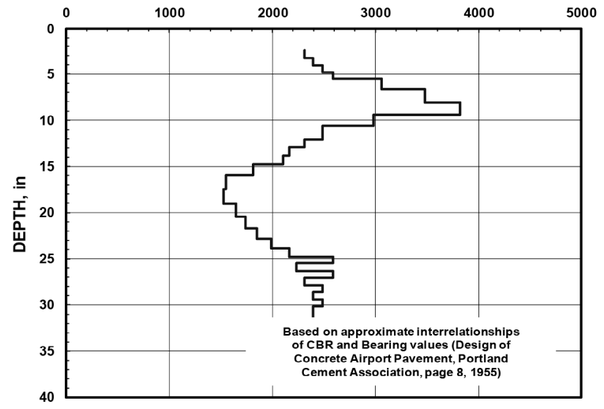
Location: Macon County, NC **Soil Type(s):** CL

Hammer: ○ 10.1 lbs. ◉ 17.6 lbs. ○ Both hammers used

Soil Type: ○ CH ◉ CL ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	62	1
1	83	1
1	103	1
1	122	1
1	140	1
2	169	1
3	206	1
3	239	1
2	269	1
1	288	1
1	307	1
1	328	1
1	351	1
1	375	1
1	405	1
1	444	1
1	484	1
1	519	1
1	551	1
1	580	1
1	606	1
1	629	1
1	647	1
1	669	1
1	687	1
1	708	1
1	727	1
1	747	1
1	766	1
1	786	1
1	806	1
1	827	1





DCP TEST DATA

File Name: C-6

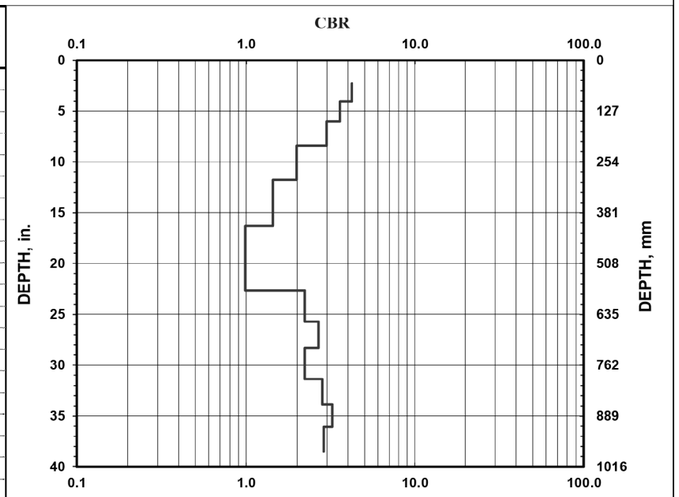
Project: *G15062.00* **Date:** 14-Jul-17

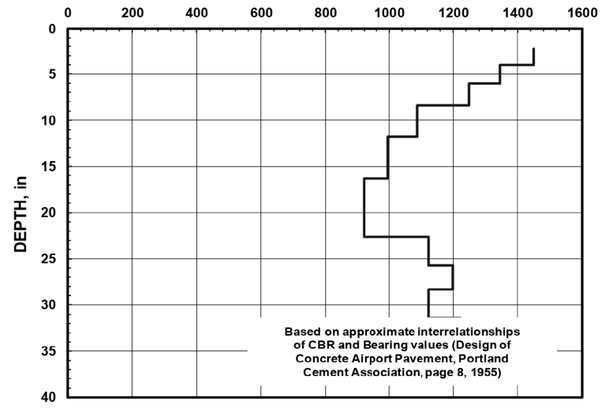
Location: Macon County, NC **Soil Type(s):** CL

Hammer: ○ 10.1 lbs. ◉ 17.6 lbs. ○ Both hammers used

Soil Type: ○ CH ◉ CL ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	58	1
1	102	1
1	153	1
1	213	1
1	299	1
1	414	1
1	575	1
1	653	1
1	719	1
1	797	1
1	860	1
1	916	1
1	978	1





DCP TEST DATA

File Name: C-7

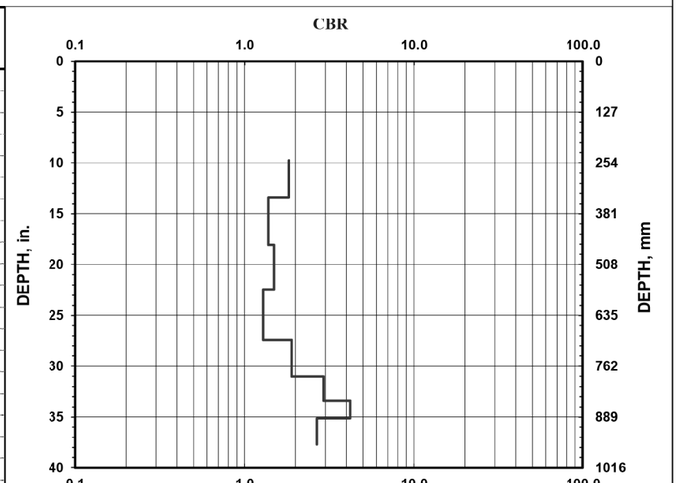
Project: *G15062.00* **Date:** 15-Jul-17

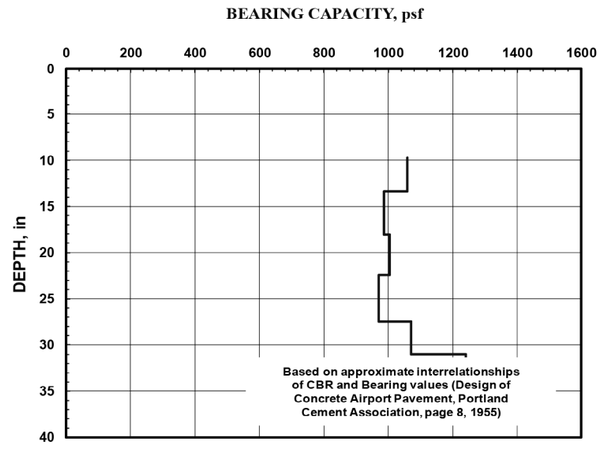
Location: Macon County, NC **Soil Type(s):** CL

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ◉ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	247	1
1	340	1
1	459	1
1	570	1
1	697	1
1	787	1
1	848	1
1	892	1
1	958	1





DCP TEST DATA

File Name: C-8

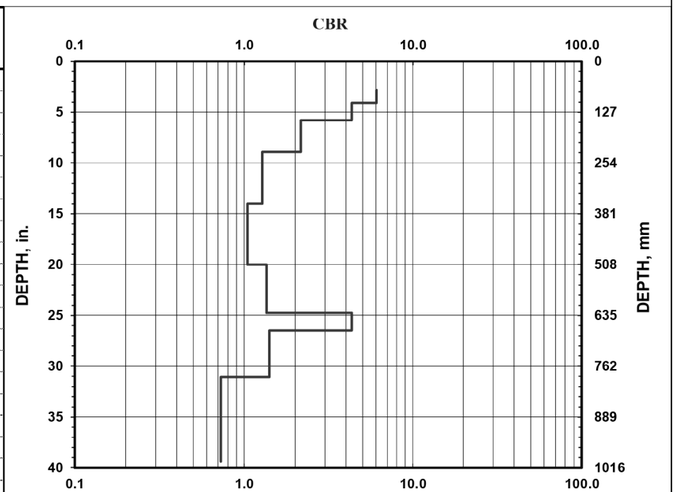
Project: *G15062.00* **Date:** 15-Jul-17

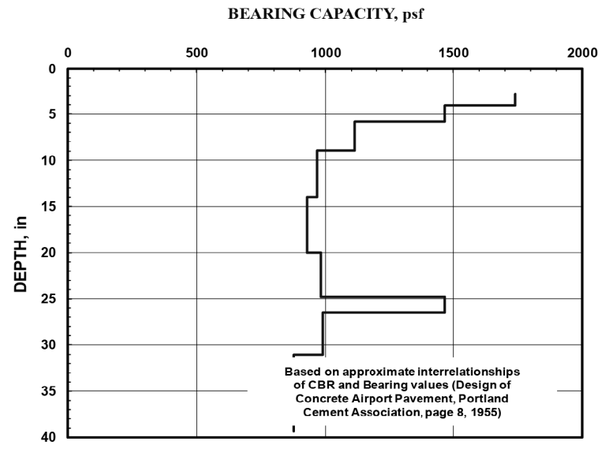
Location: Macon County, NC **Soil Type(s):** CL

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ◉ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	72	1
1	104	1
1	147	1
1	227	1
1	355	1
1	508	1
1	629	1
1	672	1
1	789	1
1	1000	1





DCP TEST DATA

File Name: C-9

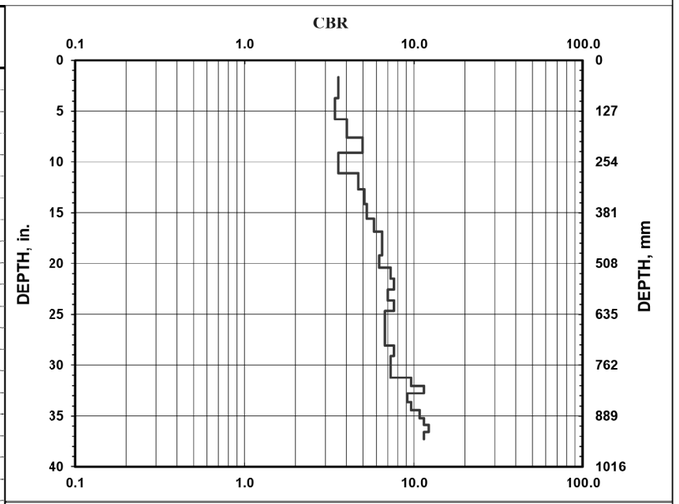
Project: *G15062.00* **Date:** 14-Jul-17

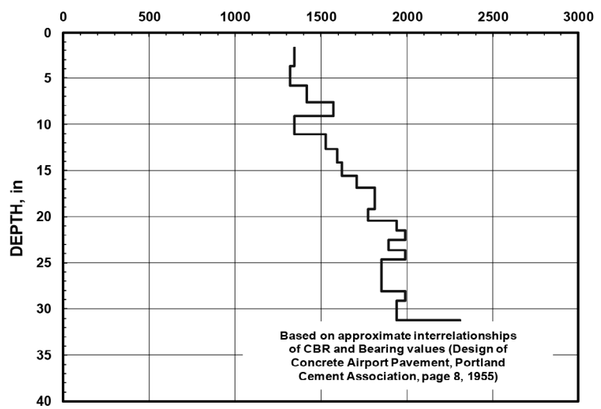
Location: Macon County, NC **Soil Type(s):** CL

Hammer: ○ 10.1 lbs. ◉ 17.6 lbs. ○ Both hammers used

Soil Type: ○ CH ◉ CL ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	43	1
1	94	1
1	147	1
1	193	1
1	231	1
1	282	1
1	322	1
1	359	1
1	395	1
1	428	1
1	458	1
1	488	1
1	519	1
1	546	1
1	572	1
1	600	1
1	626	1
1	655	1
1	684	1
1	713	1
1	739	1
1	766	1
1	793	1
1	814	1
1	832	1
1	854	1
1	875	1
1	894	1
1	912	1
1	929	1
1	947	1





DCP TEST DATA

File Name: C-10

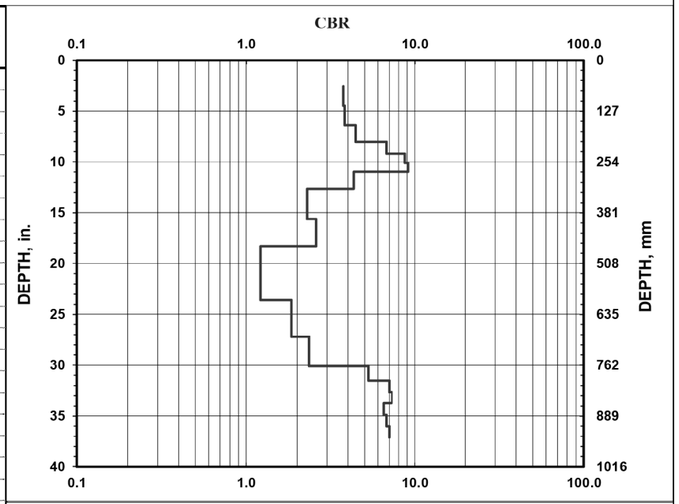
Project: *G15062.00* **Date:** 15-Jul-17

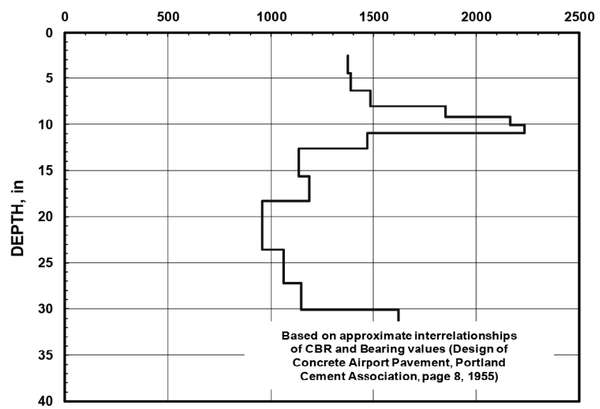
Location: Macon County, NC **Soil Type(s):** CL

Hammer: ○ 10.1 lbs. ◉ 17.6 lbs. ○ Both hammers used

Soil Type: ○ CH ◉ CL ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	65	1
1	114	1
1	162	1
1	204	1
1	233	1
1	256	1
1	278	1
1	321	1
1	397	1
1	465	1
1	599	1
1	691	1
1	765	1
1	801	1
1	829	1
1	856	1
1	886	1
1	915	1
1	943	1





PROJECT REFERENCE NO.	SHEET NO.
U–5604	20

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX B
LABORATORY RESULTS

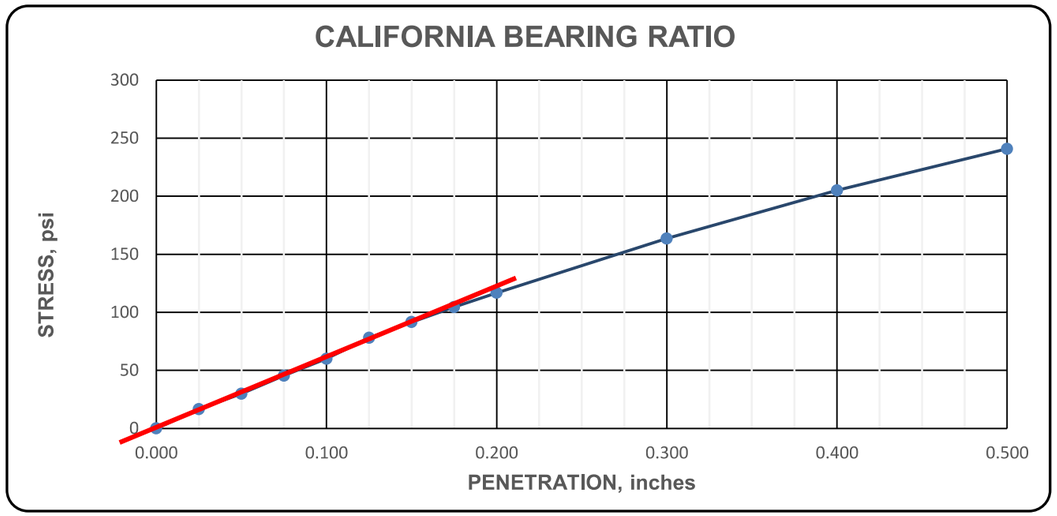
REFERENCE: U–5604

PROJECT: N/A

May 12, 2017

REPORT OF CALIFORNIA BEARING RATIO (CBR)
AASHTO T 193

PROJECT NAME: (U-5604) US-441 Intersection Improvements
PROJECT NUMBER: G15062.01
SAMPLE IDENTIFICATION: B-01, BS-1, 1-8.5'



Bearing Ratio: **at 0.1 inches of penetration: 6.1**
at 0.2 inches of penetration: 7.8

Compaction Method: AASHTO T 99, AASHTO T 193: 5.1.1
Maximum Dry Unit Weight, lbs/ft^3: 107.1
Optimum Water Content, %: 18.2
Compacted Dry Unit Weight, lbs/ft^3: 105.0
Compacted Water Content, %: 20.3 — Surcharge, lbs: 10
Compaction Percentage: 98.0 — Immersion period, hours: 97
Water Content, Top one-inch after test, %: 23.9 — Swell, %: 0.6

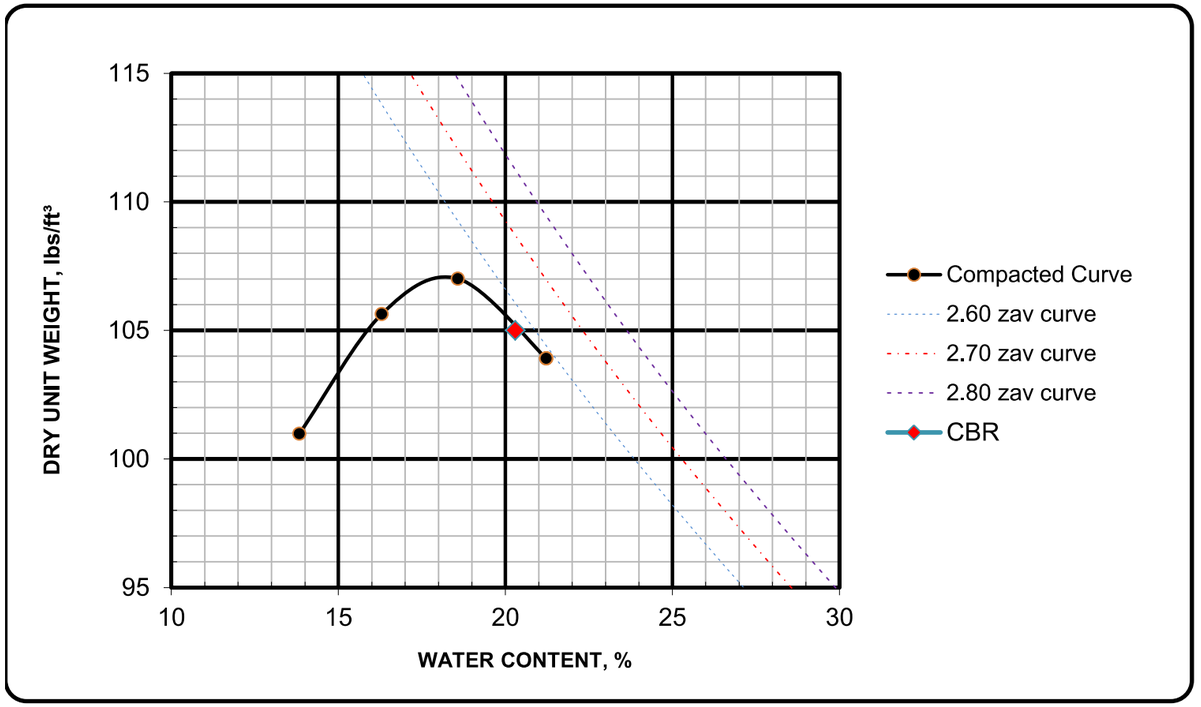
Remarks: Soaked specimen

Reviewed by: John Dailly

Document ID: BS-1 CBR

REPORT OF MOISTURE-DENSITY RELATIONS OF SOILS
USING A 5.5-LB RAMMER AND A 12-IN. DROP
Performed in general accordance with AASHTO T 99, Method A
May 12, 2017

PROJECT NAME: (U-5604) US-441 Intersection Improvements
PROJECT NUMBER: G15062.01
SAMPLE IDENTIFICATION: B-01, BS-1, 1-8.5'
VISUAL DESCRIPTION: Brown sandy clay



MAXIMUM DENSITY, lbs/ft³: 107.1
OPTIMUM MOISTURE CONTENT, %: 18.2

AS-RECEIVED WATER CONTENT: 22.7
LIQUID LIMIT: 40
PLASTIC LIMIT: 25
PLASTICITY INDEX: 15
PERCENT FINER NO. 200: 53.6
AASHTO CLASSIFICATION: A-6 (6)

REMARKS:

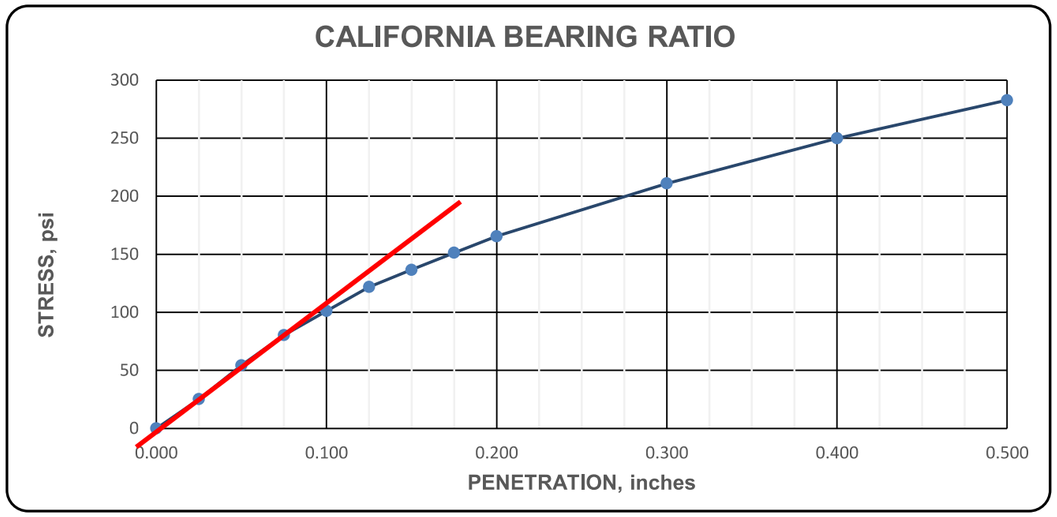
REVIEWED BY: John Dailly

Document ID: BS-1 Laboratory Compaction

May 12, 2017

REPORT OF CALIFORNIA BEARING RATIO (CBR)
AASHTO T 193

PROJECT NAME: (U-5604) US-441 Intersection Improvements
PROJECT NUMBER: G15062.01
SAMPLE IDENTIFICATION: B-13, BS-2, 1-8.5'



Bearing Ratio: **at 0.1 inches of penetration: 10.3**
at 0.2 inches of penetration: 11.1

Compaction Method: AASHTO T 99, AASHTO T 193: 5.1.1
Maximum Dry Unit Weight, lbs/ft^3: 94.3
Optimum Water Content, %: 28.0
Compacted Dry Unit Weight, lbs/ft^3: 92.1
Compacted Water Content, %: 30.2
Compaction Percentage: 97.7
Water Content, Top one-inch after test, %: 34.0
Surcharge, lbs: 10
Immersion period, hours: 97
Swell, %: 0.5

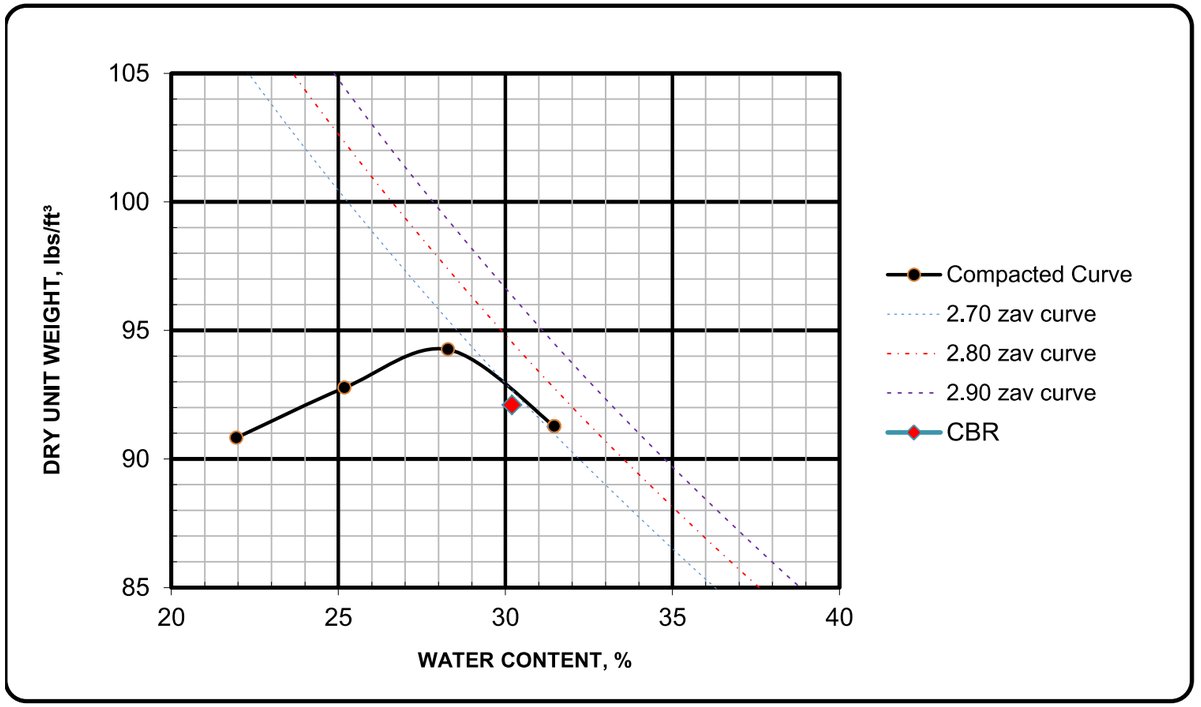
Remarks: Soaked specimen

Reviewed by: John Dailly

Document ID: BS-2 CBR

REPORT OF MOISTURE-DENSITY RELATIONS OF SOILS
USING A 5.5-LB RAMMER AND A 12-IN. DROP
Performed in general accordance with AASHTO T 99, Method A
May 12, 2017

PROJECT NAME: (U-5604) US-441 Intersection Improvements
PROJECT NUMBER: G15062.01
SAMPLE IDENTIFICATION: B-13, BS-2, 1-8.5'
VISUAL DESCRIPTION: Red sandy clay



MAXIMUM DENSITY, lbs/ft³: 94.3
OPTIMUM MOISTURE CONTENT, %: 28.0

AS-RECEIVED WATER CONTENT: 34.7
LIQUID LIMIT: 62
PLASTIC LIMIT: 35
PLASTICITY INDEX: 27
PERCENT FINER NO. 200: 73.9
AASHTO CLASSIFICATION: A-7-5 (22)

REMARKS:

REVIEWED BY: John Dailly

Document ID: BS-2 Laboratory Compaction