REFERENCE: I-5711

PROJECT: 50401

SEE SHEET 2A FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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LINE	STATION	PLAN	PROFILE
-L-	18+03.85 - 50+00.00	4-6	9,10
-RPA_YI-	12+50.00 - 15+70.28	5	10
-RPB_YI-	10+75.00 - 21+28.91	5,7	11

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	41+50.00 - 44+50.00	13-27

APPENDICES

APPENDIX	TITLE	SHEETS
A	LABORATORY RESULTS	28-30

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *ALAMANCE*

PROJECT DESCRIPTION *INTERCHANGE IMPROVEMENTS AT I-40/I-85 AND SR 1007 (MEBANE OAKS RD) IN MEBANE*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5711	1	33

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

TRIGON

WEIS, J.M.

INVESTIGATED BY *FALCON ENG.*

DRAWN BY *HILL, M. J.*

CHECKED BY *HUNSBERGER, W. S.*

SUBMITTED BY *FALCON ENG.*

DATE *JANUARY 2019*

NORTH CAROLINA PROFESSIONAL SEAL 36283 ENGINEER W. SCOTT HUNSBERGER

DocuSigned by:
W. Scott Hunsberger
5A469AC805CD49E...

1/11/2019

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

COG PROJECT REFERENCE NO.	SHEET NO.
I-5711	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
- [X] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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
- [ ] 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:
BORING ELEVATIONS TAKEN FROM I5711_LS_tin_171025.tin
DATED 05/24/18 ELEVATION: FEET

NOTES:
FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 1-XX-17

TIP PROJECT: I-5711

CONTRACT: 50401

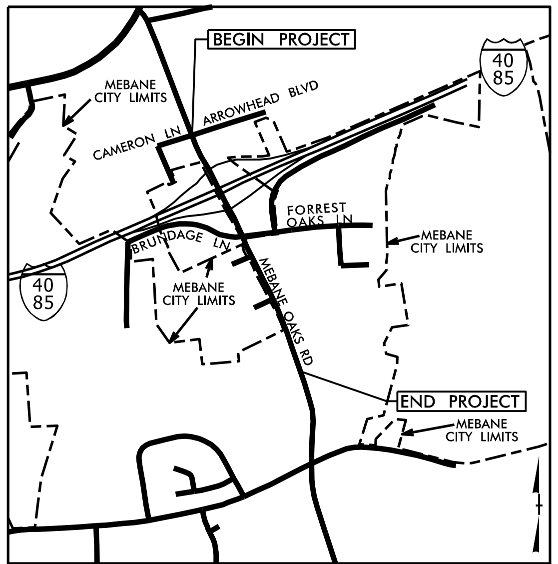
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

ALAMANCE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5711	2A	33
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
50401.1.FS1	NHPP-040-4(161)220	PE	

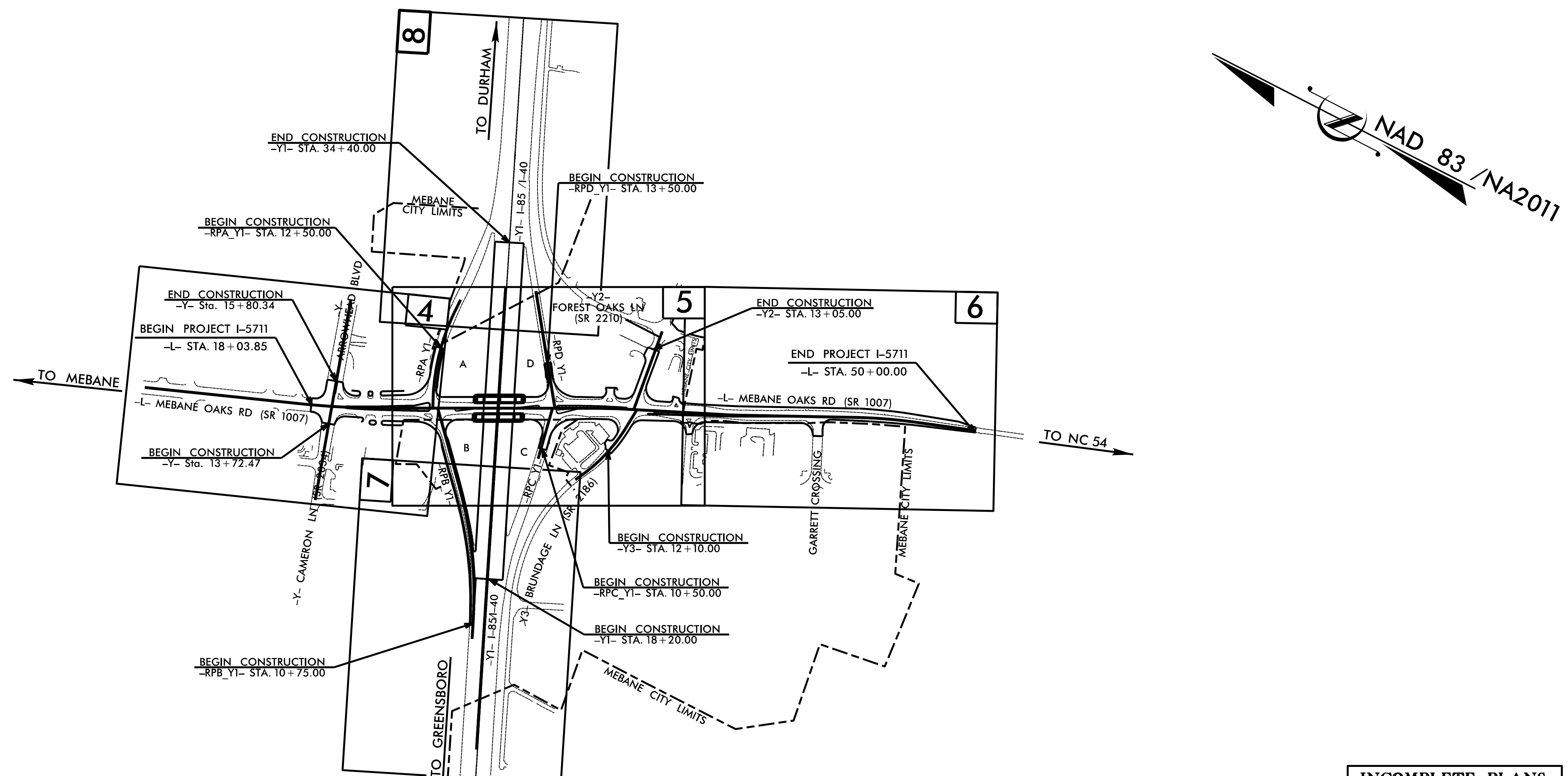
LOCATION: INTERCHANGE IMPROVEMENTS AT I-40/I-85 AND SR 1007 (MEBANE OAKS RD) IN MEBANE

TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCURES, SIGNALS AND PAVEMENT MARKINGS



VICINITY MAP *N.T.S.*

25% PLANS



PORTIONS OF THIS PROJECT ARE WITHIN THE MUNICIPAL BOUNDARY OF MEBANE.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD ___

INCOMPLETE PLANS
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GRAPHIC SCALES
50 25 0 50 100 — PLANS
50 25 0 50 100 — PROFILE (HORIZONTAL)
10 5 0 10 20 — PROFILE (VERTICAL)

DESIGN DATA
ADT 2019 = 26,440
ADT 2039 = 30,020
K = 8 %
D = 55 %
T = 3 % *
V = 40 MPH
* TTST = 1 DUAL 2
FUNC CLASS = MAJOR COLLECTOR
STATEWIDE TIER

PROJECT LENGTH
TOTAL LENGTH ROADWAY PROJECT	-	0.605 mi
TOTAL LENGTH BRIDGE PROJECT	-	0.042 mi
TOTAL LENGTH PROJECT	-	0.563 mi

Prepared In the Office of:
LOCHNER
H. W. LOCHNER, INC.
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2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: SEPT. 21, 2018

LETTING DATE: SEPT. 17, 2019

BRIAN K. EASON, PE
PROJECT ENGINEER

JEFFREY HEXT
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

10-JAN-2019 10:05
T:_Projects\2017\GI7066.00 Lochner I-5711Interchange Improvements\I5711_NCDOT_Electronic_File_Tree\Geotech\InvestigationDesign\I5711_GEO_RDWY\CADD_GEOTECH\PlanProf\I-5711_GEO_TSH.dgn
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Roadway Subsurface Investigation Report - Inventory

Interchange Improvements at I-85/I-40 and SR 1007 (Mebane Oaks Road) in Mebane
Alamance County, North Carolina
WBS: 50401.1.FS1, TIP: I-5711
Falcon Project No.: G17066.00

Prepared for:
Lochner
2840 Plaza Place, Suite 202
Raleigh, NC 27612

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

January 11, 2019

TIP:	I-5711
WBS:	50401.1.FS1
COUNTY:	Alamance
DESCRIPTION:	Interchange Improvements at I-40/I-85 and SR 1007 (Mebane Oaks Road) in Mebane
SUBJECT:	Roadway Subsurface Investigation – Inventory

PROJECT DESCRIPTION

This project consists of 0.563 miles of proposed roadway improvements along SR 1007 (Mebane Oaks Road) in Alamance County. A portion of SR 1007 will be widened and/or resurfaced near the interchange with I-40/I-85. The project also includes the widening and resurfacing of a portion of I-40/I-85 and Ramp B. Resurfacing and minor modifications to short sections of other various Y-lines, interchange ramps and driveways are also included at various locations. The bridge over I-40/I85 on SR 1007 will be widened on both sides and will match the current 4 span, 5 bent arrangement of the existing bridge. The structure investigation will be included under separate cover.

The investigation was conducted between June 6th and July 5th, 2018 in general accordance with our Proposal for Geotechnical Investigation and Engineering Services dated September 13, 2017. The recommendations provided in this report are based solely on our site reconnaissance, soil and pavement test borings laboratory test data, engineering evaluation of these data, and generally accepted soil and foundation engineering practices and principles.

A total of nineteen (19) Standard Penetration Test (SPT) were drilled for the proposed roadway alignments. All mechanical borings were drilled using a CME 55 ATV mounted drill rig equipped with 2 ¼-inch inside diameter hollow-stem augers, and SPT testing was performed with automatic hammers. 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. At seventeen (17) locations along the existing roadway, existing pavements were cored, measured and Dual Mass Dynamic Cone Penetrometer (DCP) testing completed on the subgrade to correlate in-situ CBR values to depths of up to three feet below subgrade. The dual mass DCP used is manufactured by Kessler Soils Engineering Products, Inc. CBR values were estimated using software provided by the manufacturer which utilizes correlations established by the Army Corps of Engineers Waterways Experiment Station. The pavement investigation will be included under separate cover.

Portions of the following alignments, totaling approximately 0.86 miles were investigated. Other minor Y-lines, ramps and driveways are included on the project but improvements are not anticipated to be significant enough to warrant investigation.

Alignment	Station (ft)
-L- (Mebane Oaks Road)	18+04—50+00
-RPA_Y1- (Ramp A)	12+50—15+43
-RPB_Y1- (Ramp A)	10+75—21+28

AREAS OF SPECIAL GEOTECHNICAL INTEREST

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

Alignment	Station (ft)
-L-	30+89, RT
-RPA_Y1-	12+88, RT

II. The following locations contain highly plastic soils with plasticity indices (PI) greater than 25 within 3 feet of proposed subgrade elevations:

Alignment	Station (ft)
-L-	43+12, LT

PHYSIOGRAPHY AND GEOLOGY

The project site is in the Piedmont Physiographic Province of North Carolina. According to the ***Geologic Map of North Carolina*** (1985), the site is underlain by two major geologic units in the Carolina Slate Belt. The site transitions from north to south across Intermediate Metavolcanic Rock (**CZiv**) to Felsic Metavolcanic Rock (**CZfv**).

The Intermediate Metavolcanic Rock (**CZiv)** consists of metamorphosed andesitic tuffs and flows, medium to dark grayish green; minor felsic and mafic metavolcanic rock. The Felsic Metavolcanic Rock (**CZfv**) consists of metamorphosed dacitic to rhyolitic flows and tuffs, light gray to greenish gray, interbedded with mafic and intermediate metavolcanic rock, meta-argillite, and metamudstone.

The corridor is highly developed with commercial properties north of I-40/I-85 and both commercial and residential properties to the south of the interchange. The site generally slopes down from north to south, elevating in the center to cross over I-40/I-85. Vegetation along the corridor consists largely of roadside grasses with intermittent landscaping, heavy and unmaintained brush, and in some locations mature forested lands or landscaped lawns. Surrounding land throughout the corridor is highly developed. Drainage along the roadways and developed properties is facilitated by a mixture of confined systems and roadside swales and ditches which direct drainage outside of the project limits. No standing water or natural drainage features were noted within the project limits.

SOIL PROPERTIES

A variety of soils were encountered along the project, including existing roadway embankments and residual soils and weathered and crystalline rock.

Topsoil was encountered in grassy areas ranging in thickness from 0.1 to 0.3 feet, and typically on the order of 0.2 feet.

Roadway Embankment soils were encountered at the ground surface beneath and adjacent to existing roadways. These soils consist of up to 8 feet of dry to moist, very loose to medium dense, silty sand (A-2-4) and very soft to stiff, sandy and silty clay and clayey silt (A-5, A-6, A-7). Tested samples have a PI value range from 13 to 25.

Residual soils were encountered at the ground surface or beneath the roadway embankment fills. These soils consist of dry to wet, soft to hard, sandy and silty clay and clayey silt (A-5, A-6, A-7). Tested samples have a PI value range from 5 to 45.

Weathered Rock (WR) is a very hard material with properties intermediate of soil and rock. WR is classified as having an N-value of greater than 100 blows per foot. WR encountered on this project generally consists of tan and white Metavolcanic Rock. WR was encountered from elevation 623.6 ft to 662.4 ft.

Crystalline Rock, in the form of Metavolcanic Rock was encountered beneath weathered rock at various locations throughout the site. Crystalline rock is classified as material that yields auger refusal or SPT refusal (blow count of 60/0.0 or 60/0.1 feet). CR was encountered from elevation 609.5 ft to 629.2 ft.

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.

Shallow groundwater was not encountered in the areas explored.

ADDITIONAL LABORATORY TESTING

The following bulk samples were obtained:

Sample	Location	Depth (ft)	Test
BS-1	43+12, 63' LT, -L-	1.0 – 5.0	California Bearing Ratio, Standard Proctor
BS-2	17+21, 68'LT, -RPB_Y1-	1.0 – 5.0	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:

NORTH CAROLINA PROFESSIONAL SEAL 36283 ENGINEER W. SCOTT HUNSBERGER

DocuSigned by:
W. Scott Hunsberger
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1/11/2019
W. Scott Hunsberger, PE
Geotechnical Engineer

Report Reviewed By:

Jeremy R. Hamm, PE
Geotechnical Engineering Manager

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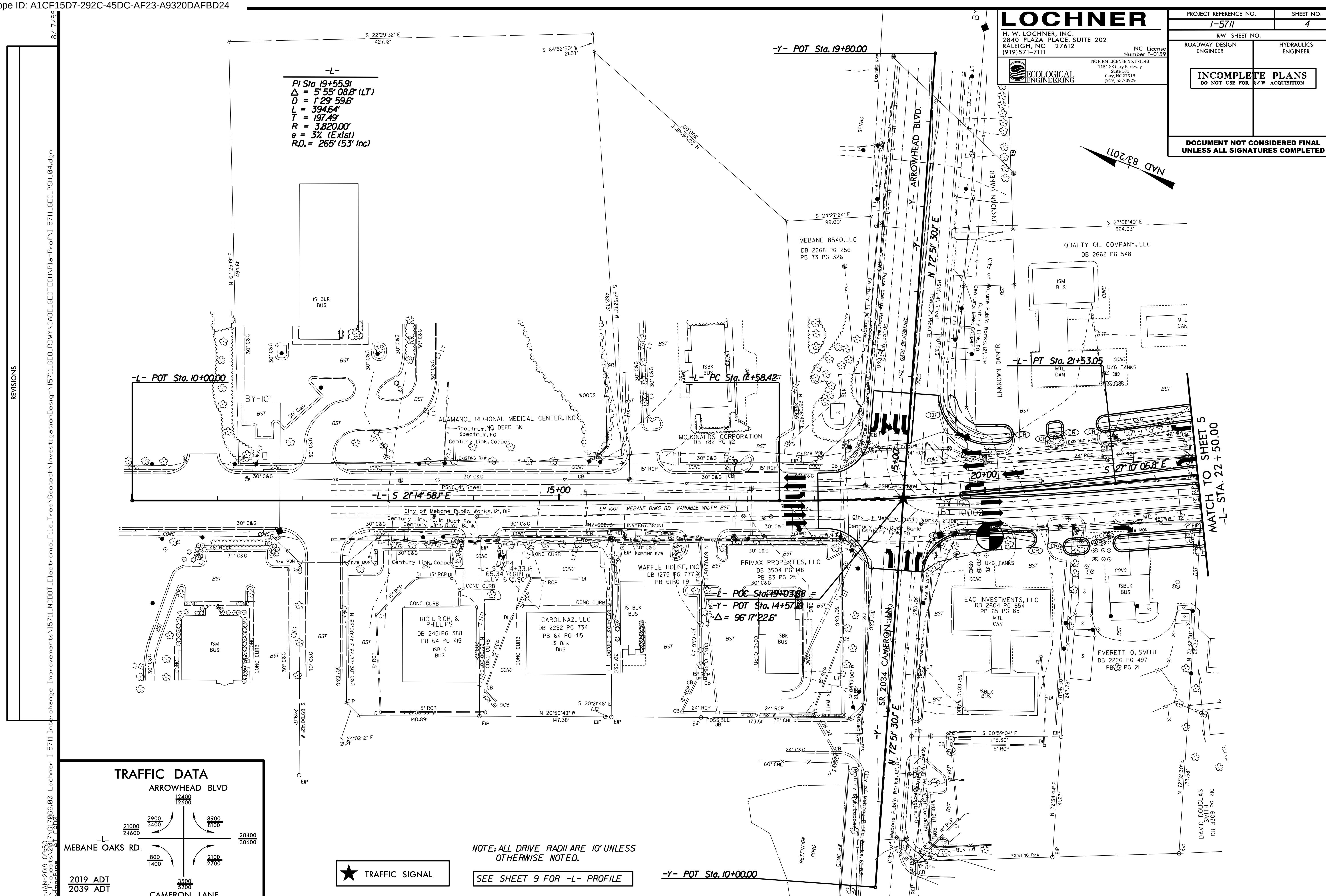

PROJECT REFERENCE NO.	SHEET NO.
I-5711	5

R/W SHEET NO.

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

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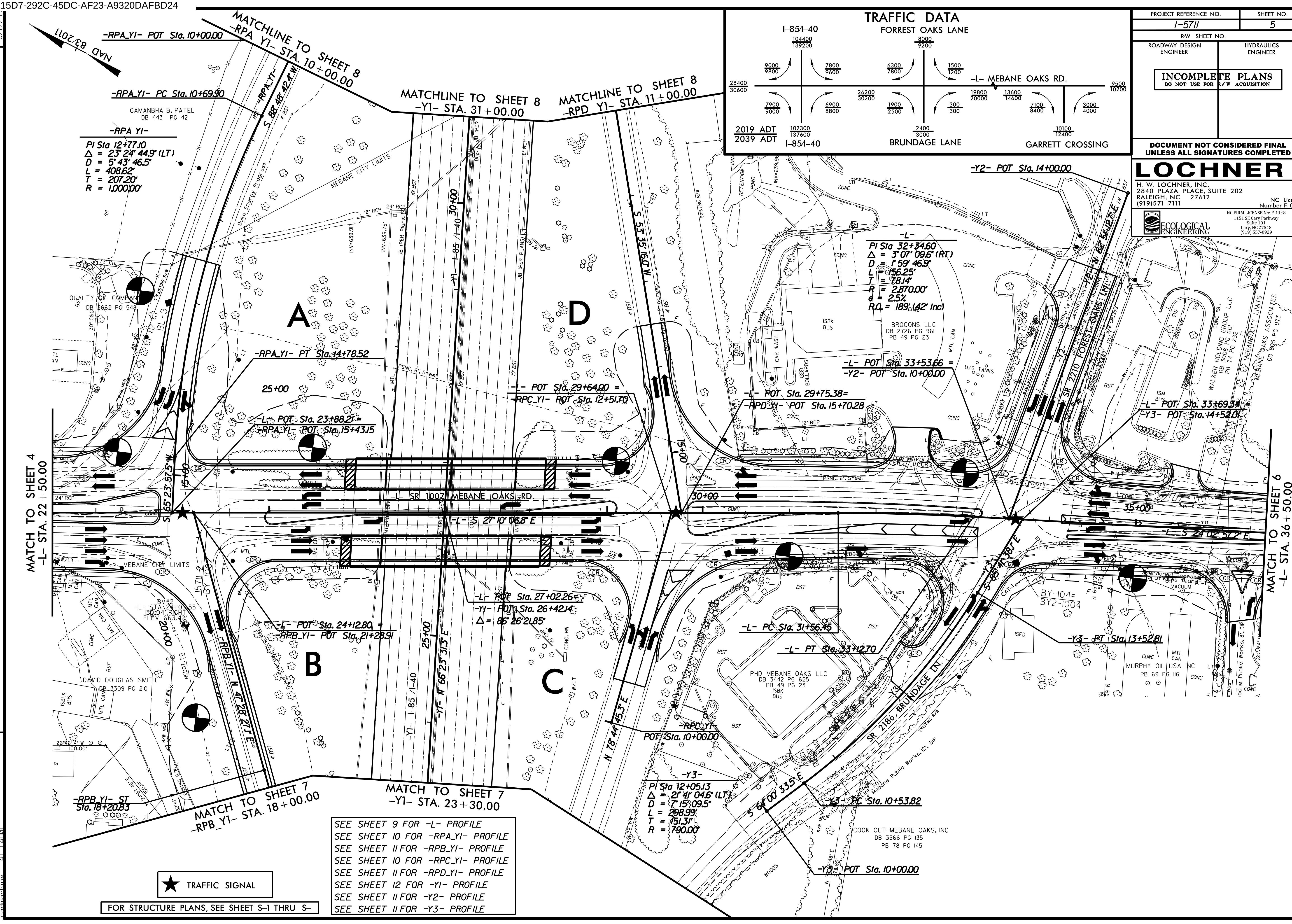
TRAFFIC DATA

2019 ADT / 2039 ADT

I-85/I-40: 104400/139200 (north), 102300/137600 (south)
FORREST OAKS LANE: 8000/9200
BRUNDAGE LANE: 2400/3000
GARRETT CROSSING: 10100/12400
-L- MEBANE OAKS RD.: 28400/30600; 26200/30200; 19800/20000; 13600/14600; 9500/10200
Turning movements: 9000/9800; 7800/9600; 6300/7800; 1500/1200; 7900/9000; 6900/8800; 1900/2500; 300/300; 7100/8400; 3000/4000



SEE SHEET 9 FOR -L- PROFILE
SEE SHEET 10 FOR -RPA_Y1- PROFILE
SEE SHEET 11 FOR -RPB_Y1- PROFILE
SEE SHEET 10 FOR -RPC_Y1- PROFILE
SEE SHEET 11 FOR -RPD_Y1- PROFILE
SEE SHEET 12 FOR -Y1- PROFILE
SEE SHEET 11 FOR -Y2- PROFILE
SEE SHEET 11 FOR -Y3- PROFILE

FOR STRUCTURE PLANS, SEE SHEET S-1 THRU S-

REVISIONS

8/17/99

10-JAN-2019 09:51

PROJECT REFERENCE NO.	SHEET NO.
I-5711	6

R/W SHEET NO.

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

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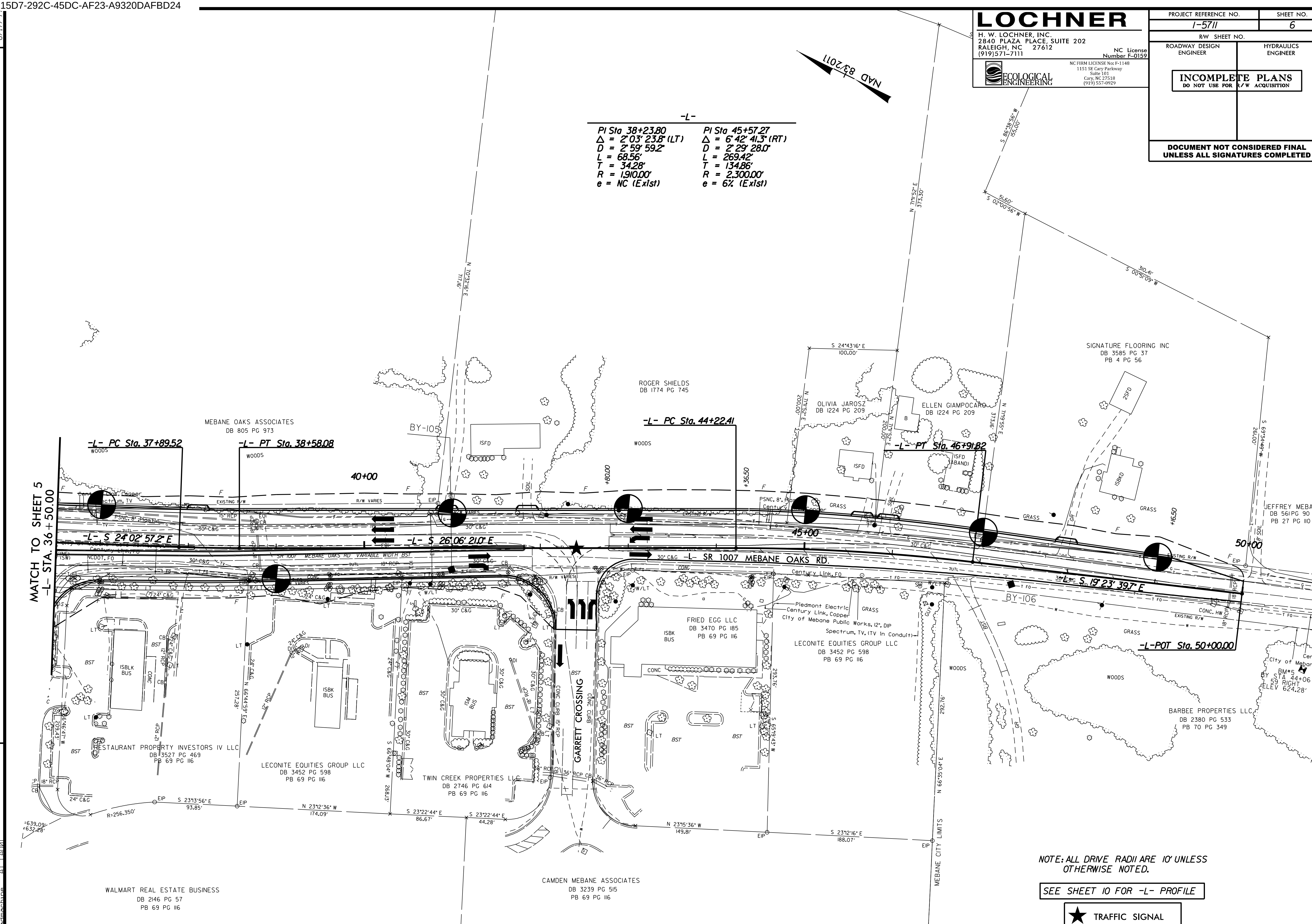

NOTE: ALL DRIVE RADII ARE 10' UNLESS OTHERWISE NOTED.

SEE SHEET 10 FOR -L- PROFILE

★ TRAFFIC SIGNAL

REVISIONS

8/17/99

10-JAN-2019 09:52
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PROJECT REFERENCE NO.	SHEET NO.
I-5711	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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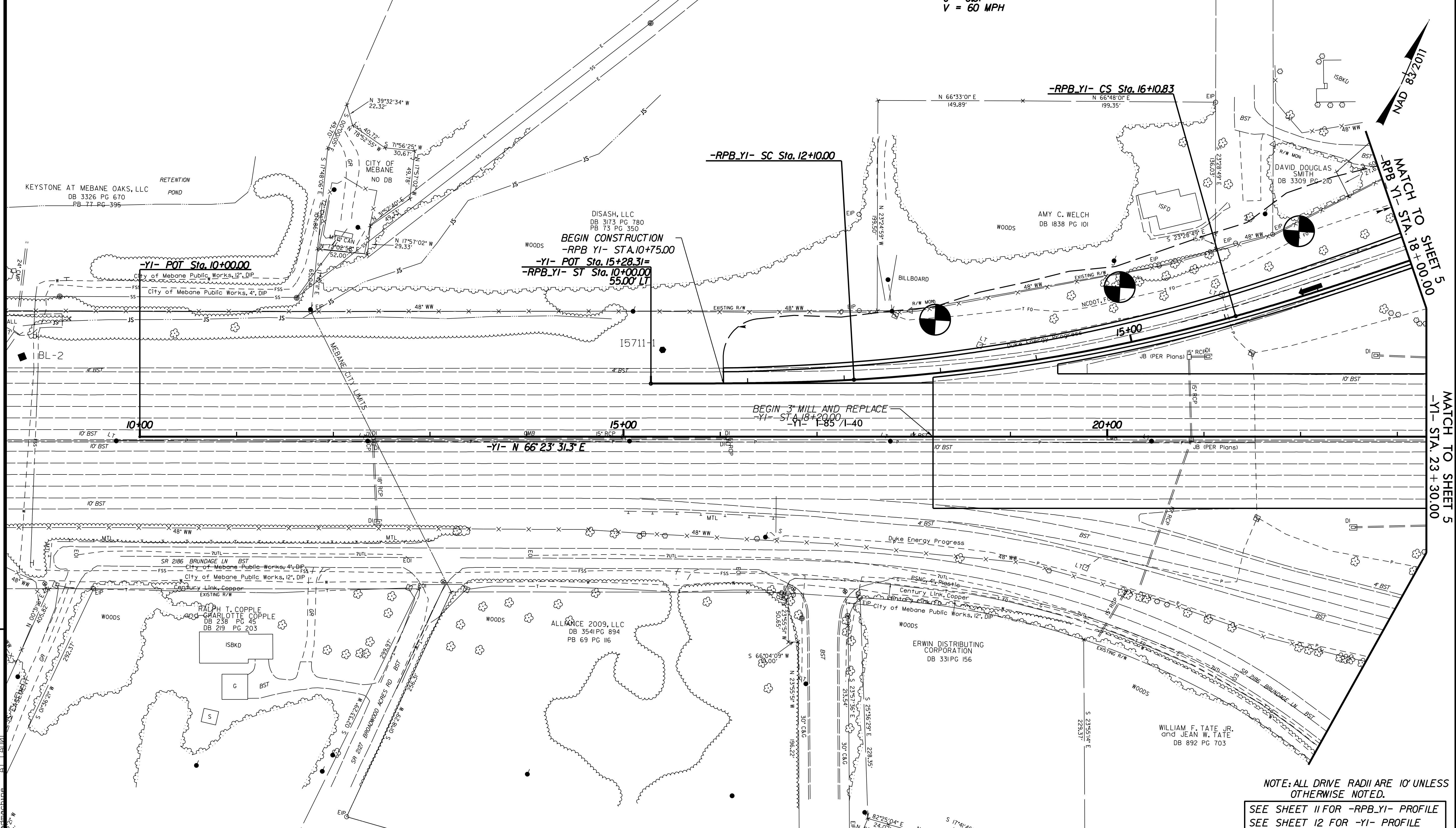
-RPB Y1-

PIs Sta 11+40.02	PI Sta 14+11.20	PIs Sta 16+80.85
θs = 3°15' 06.9"	Δ = 12° 24' 50.4" (LT)	θs = 3°15' 06.9"
Ls = 210.00'	D = 3° 05' 49.4"	Ls = 210.00'
LT = 140.02'	L = 400.83'	LT = 140.02'
ST = 70.02'	T = 201.20'	ST = 70.02'
	R = 1,850.00'	
	e = 0.07	
	V = 60 MPH	



NOTE: ALL DRIVE RADII ARE 10' UNLESS OTHERWISE NOTED.

SEE SHEET 11 FOR -RPB_Y1- PROFILE
SEE SHEET 12 FOR -Y1- PROFILE

NO BORINGS ON THIS SHEET

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I-5711	8
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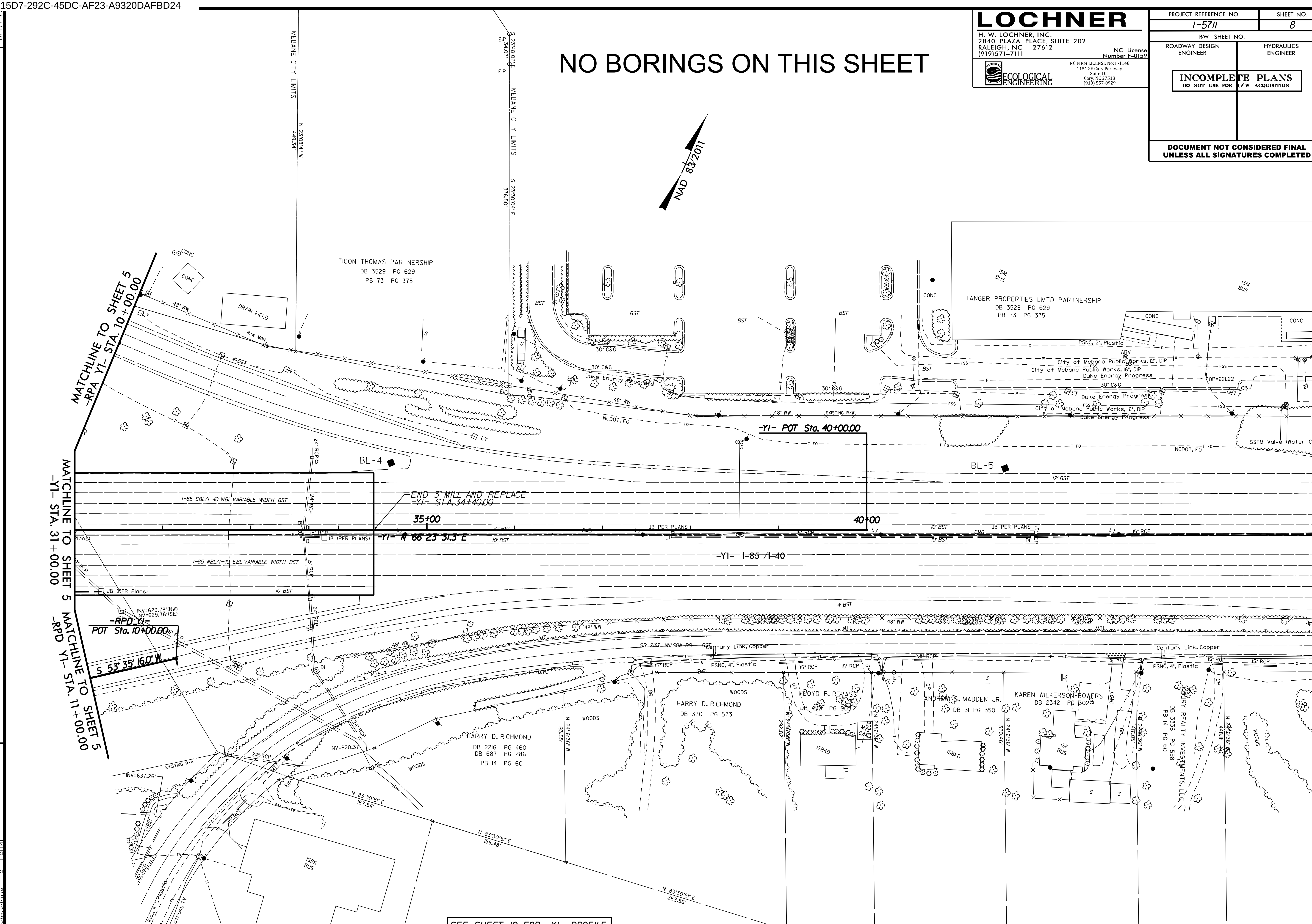

SEE SHEET 12 FOR -Y1- PROFILE

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PROJECT REFERENCE NO.	SHEET NO.
I-5711	9

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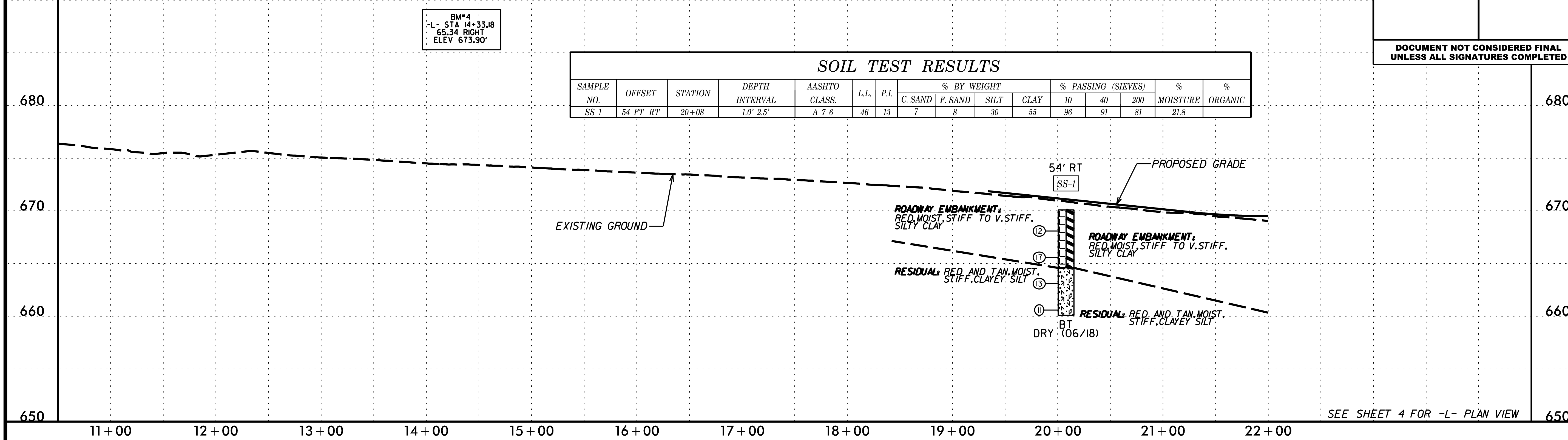
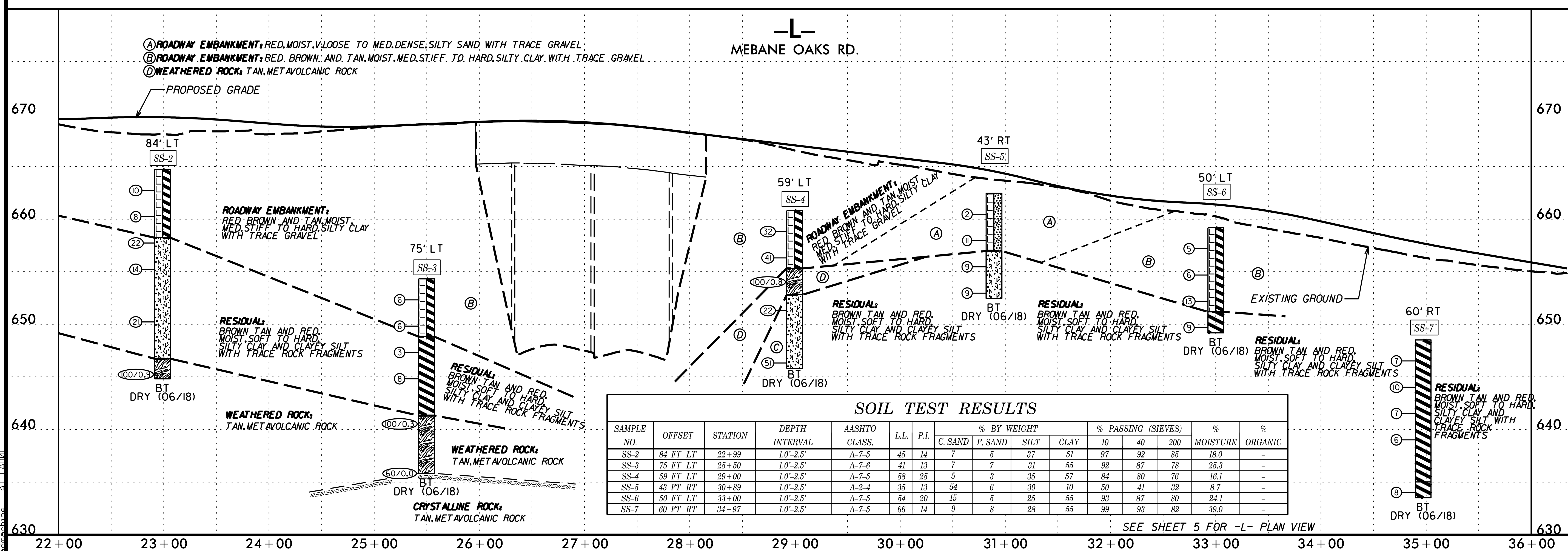
-L- MEBANE OAKS RD.



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-1	54 FT RT	20+08	1.0'-2.5'	A-7-6	46	13	7	8	30	55	96	91	81	21.8	-

-L- MEBANE OAKS RD.



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-2	84 FT LT	22+99	1.0'-2.5'	A-7-5	45	14	7	5	37	51	97	92	85	18.0	-
SS-3	75 FT LT	25+50	1.0'-2.5'	A-7-6	41	13	7	7	31	55	92	87	78	25.3	-
SS-4	59 FT LT	29+00	1.0'-2.5'	A-7-5	58	25	5	3	35	57	84	80	76	16.1	-
SS-5	43 FT RT	30+89	1.0'-2.5'	A-2-4	35	13	54	6	30	10	50	41	32	8.7	-
SS-6	50 FT LT	33+00	1.0'-2.5'	A-7-5	54	20	15	5	25	55	93	87	80	24.1	-
SS-7	60 FT RT	34+97	1.0'-2.5'	A-7-5	66	14	9	8	28	55	99	93	82	39.0	-

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PROJECT REFERENCE NO.	SHEET NO.
I-5711	10
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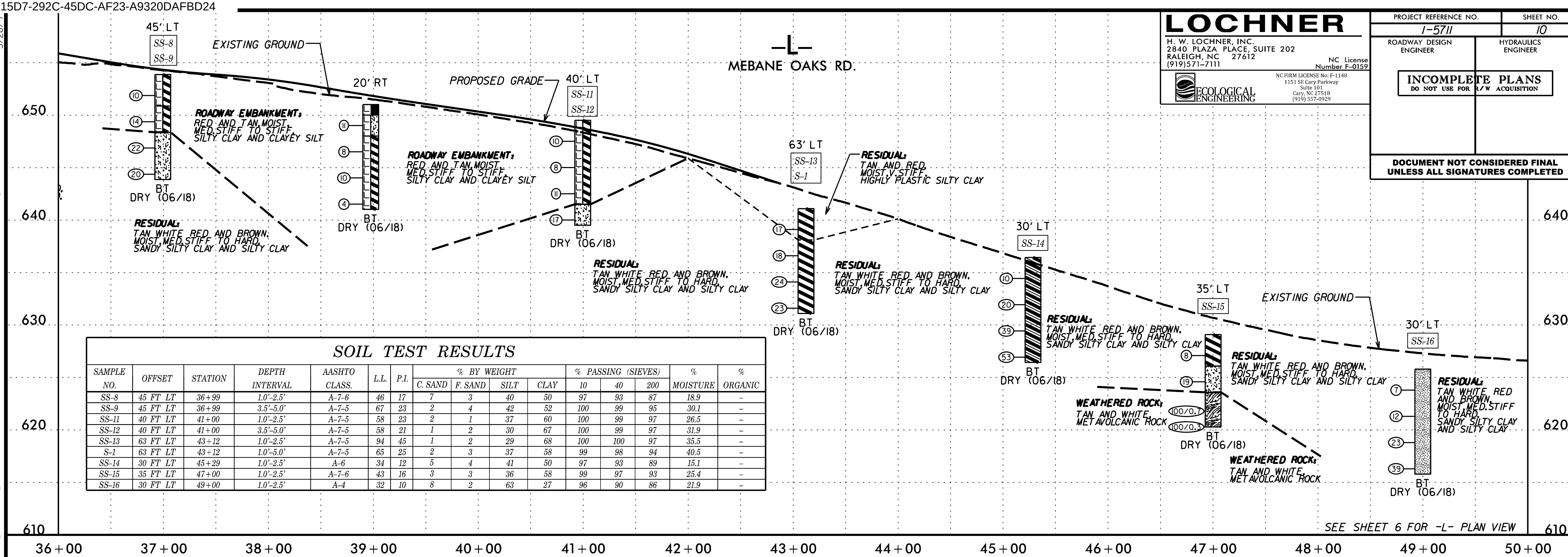
-L-
MEBANE OAKS RD.



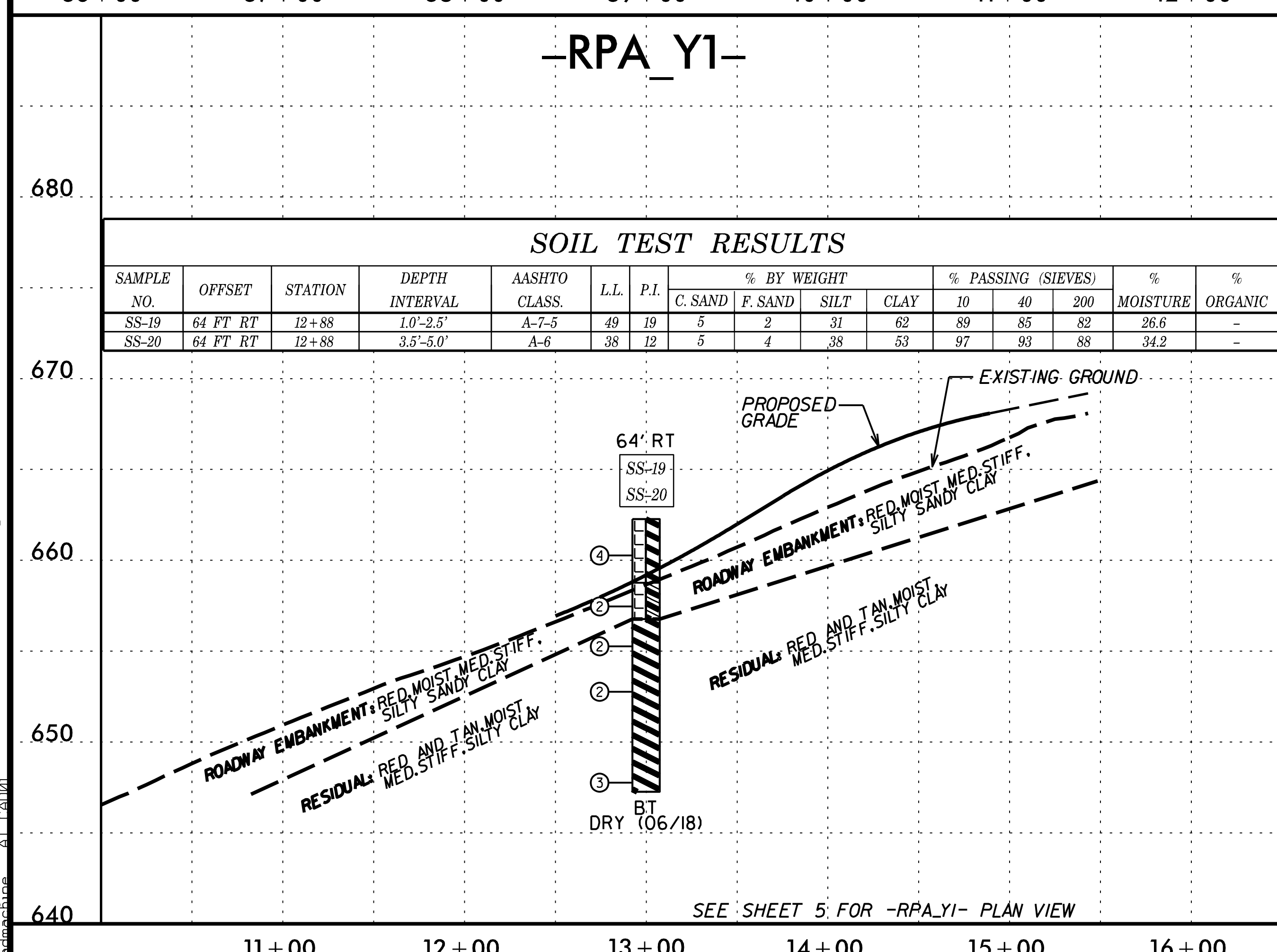
SOIL TEST RESULTS

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-8	45 FT LT	36+99	1.0'-2.5'	A-7-6	46	17	7	3	40	50	97	93	87	18.9	-
SS-9	45 FT LT	36+99	3.5'-5.0'	A-7-5	67	23	2	4	42	52	100	99	95	30.1	-
SS-11	40 FT LT	41+00	1.0'-2.5'	A-7-5	58	23	2	1	37	60	100	99	97	26.5	-
SS-12	40 FT LT	41+00	3.5'-5.0'	A-7-5	58	21	1	2	30	67	100	99	97	31.9	-
SS-13	63 FT LT	43+12	1.0'-2.5'	A-7-5	94	45	1	2	29	68	100	100	97	35.5	-
S-1	63 FT LT	43+12	1.0'-5.0'	A-7-5	65	25	2	3	37	58	99	98	94	40.5	-
SS-14	30 FT LT	45+29	1.0'-2.5'	A-6	34	12	5	4	41	50	97	93	89	15.1	-
SS-15	35 FT LT	47+00	1.0'-2.5'	A-7-6	43	16	3	3	36	58	99	97	93	25.4	-
SS-16	30 FT LT	49+00	1.0'-2.5'	A-4	32	10	8	2	63	27	96	90	86	21.9	-

-RPA_Y1-

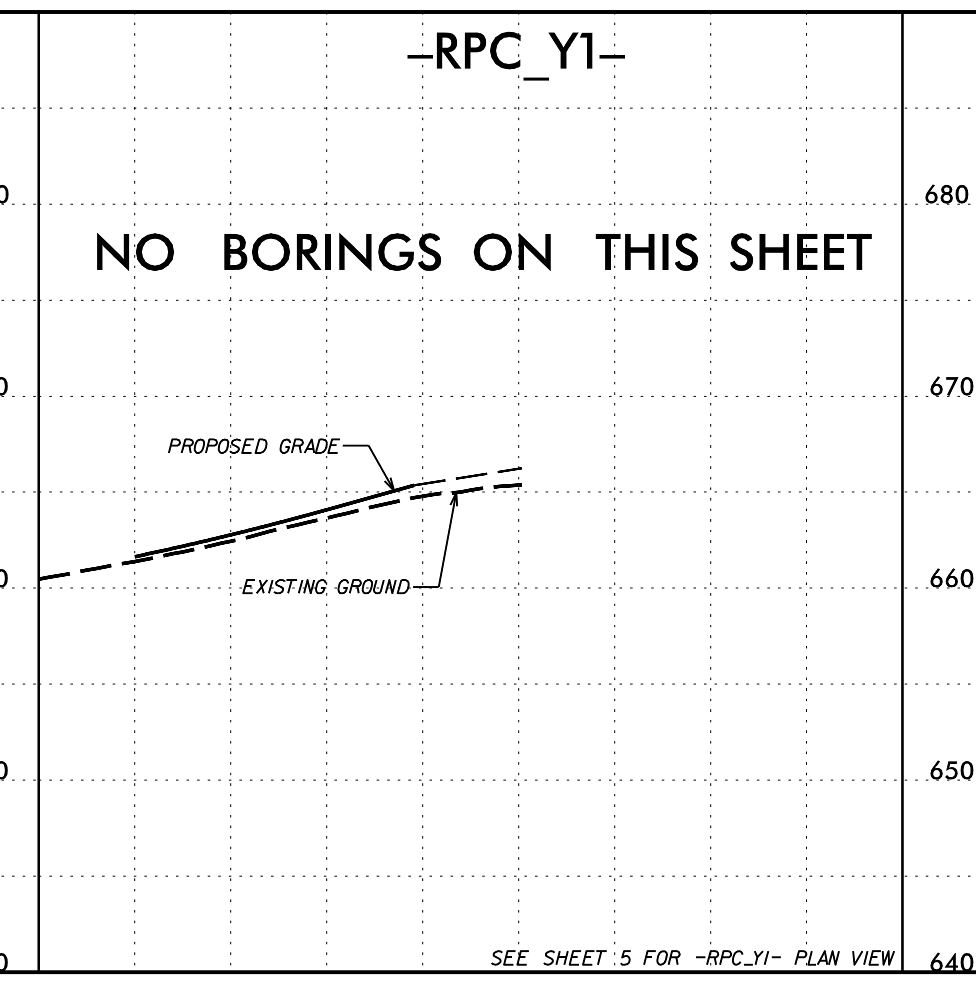
SOIL TEST RESULTS

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-19	64 FT RT	12+88	1.0'-2.5'	A-7-5	49	19	5	2	31	62	89	85	82	26.6	-
SS-20	64 FT RT	12+88	3.5'-5.0'	A-6	38	12	5	4	38	53	97	93	88	34.2	-



-RPC_Y1-

NO BORINGS ON THIS SHEET



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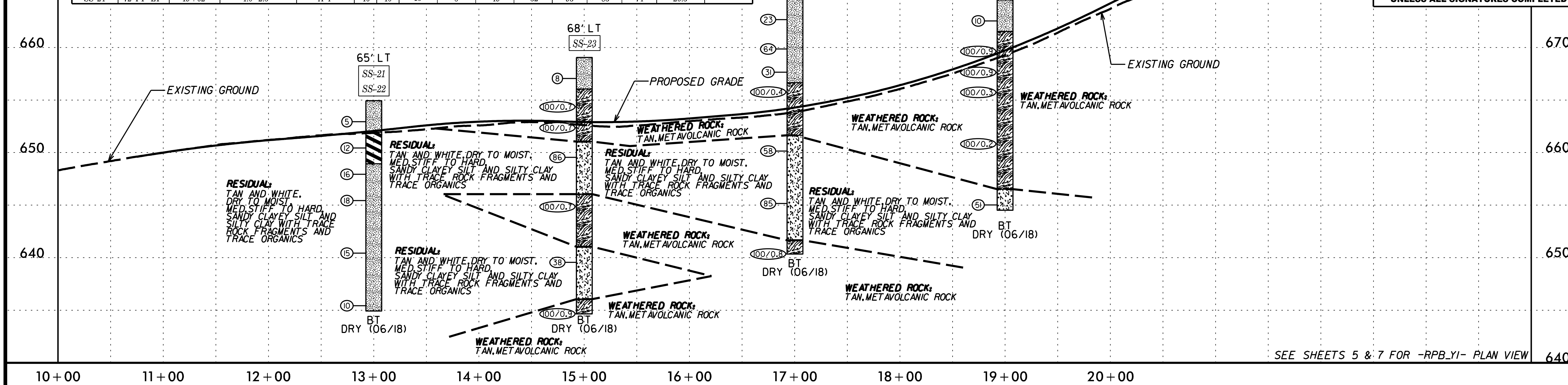
-RPB_Y1-

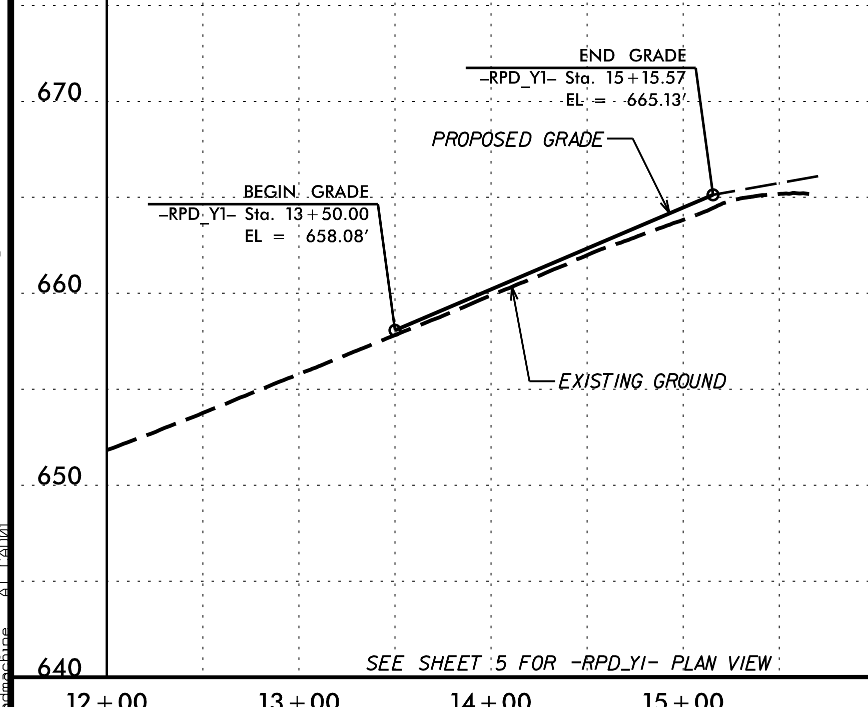
SOIL TEST RESULTS

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-21	65 FT LT	13+02	1.0'-2.5'	A-4	29	7	5	3	52	40	69	65	61	8.3	-
SS-22	65 FT LT	13+02	3.5'-5.0'	A-7-5	57	18	3	9	33	55	100	98	88	30.6	-
SS-23	68 FT LT	14+96	1.0'-2.5'	A-4	30	7	5	2	58	35	80	76	73	16.5	-
S-2	68 FT LT	17+21	1.0'-5.0'	A-4	22	5	22	8	49	21	84	67	54	10.7	-
SS-24	72 FT LT	19+02	1.0'-2.5'	A-4	40	10	13	6	49	32	93	83	74	20.3	-



-RPD_Y1-

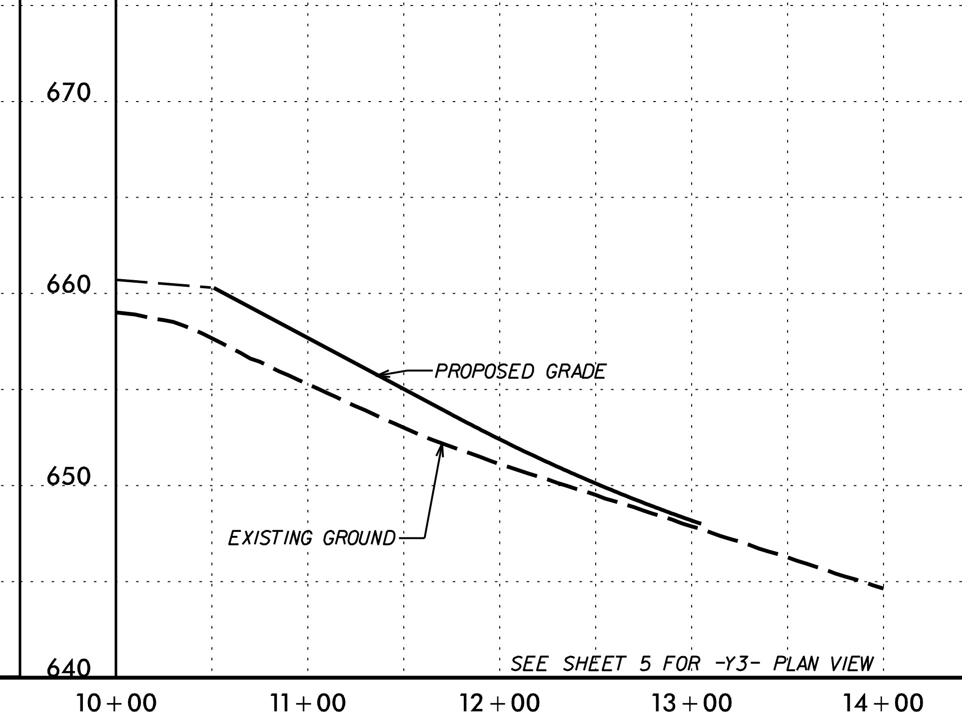
NO BORINGS ON THIS SHEET



-Y2-

SR 2210 FOREST OAKS LN.

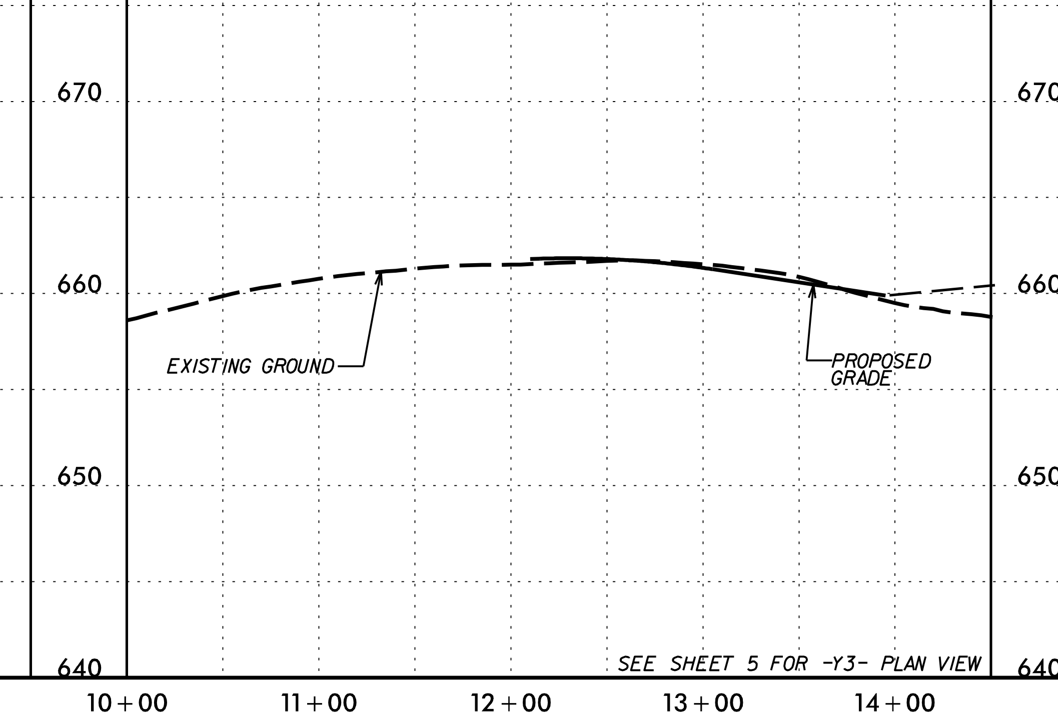
NO BORINGS ON THIS SHEET



-Y3-

SR 2186 BRUNDAGE LN.

NO BORINGS ON THIS SHEET



PROJECT REFERENCE NO.	SHEET NO.
I-5711	12

LOCHNER

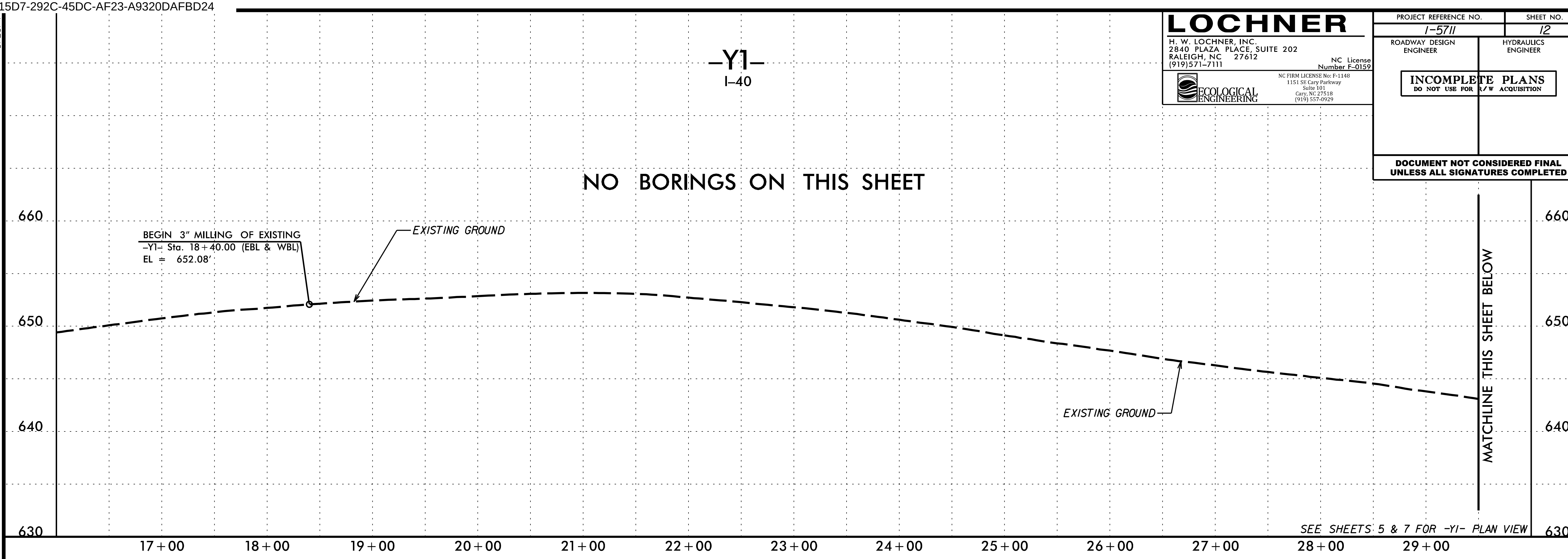
H. W. LOCHNER, INC.
2840 PLAZA PLACE, SUITE 202
RALEIGH, NC 27612
(919)571-7111
NC License Number F-0159

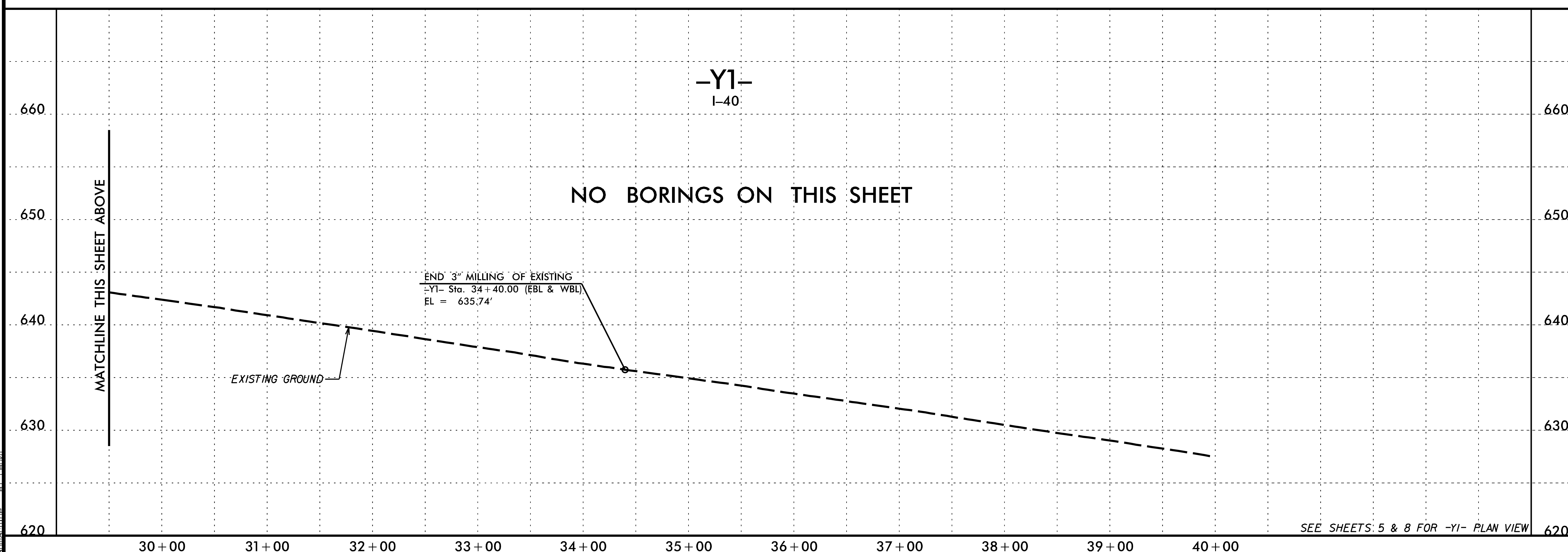
ECOLOGICAL ENGINEERING
NC FIRM LICENSE No: F-1148
1151 SE Cary Parkway
Suite 101
Cary, NC 27518
(919) 557-0929

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED





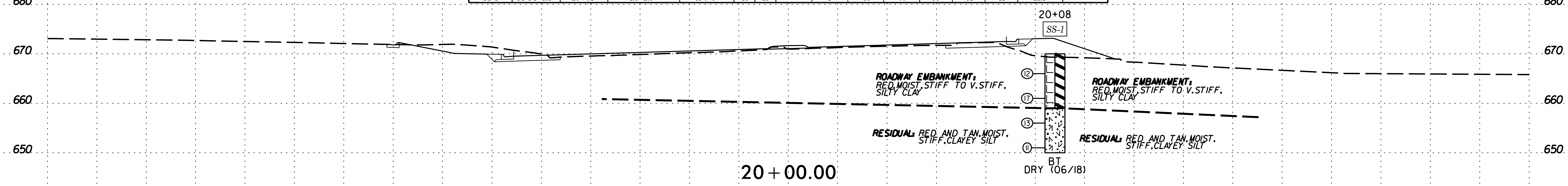
PROJ. REFERENCE NO.	SHEET NO.
I-5711	13

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

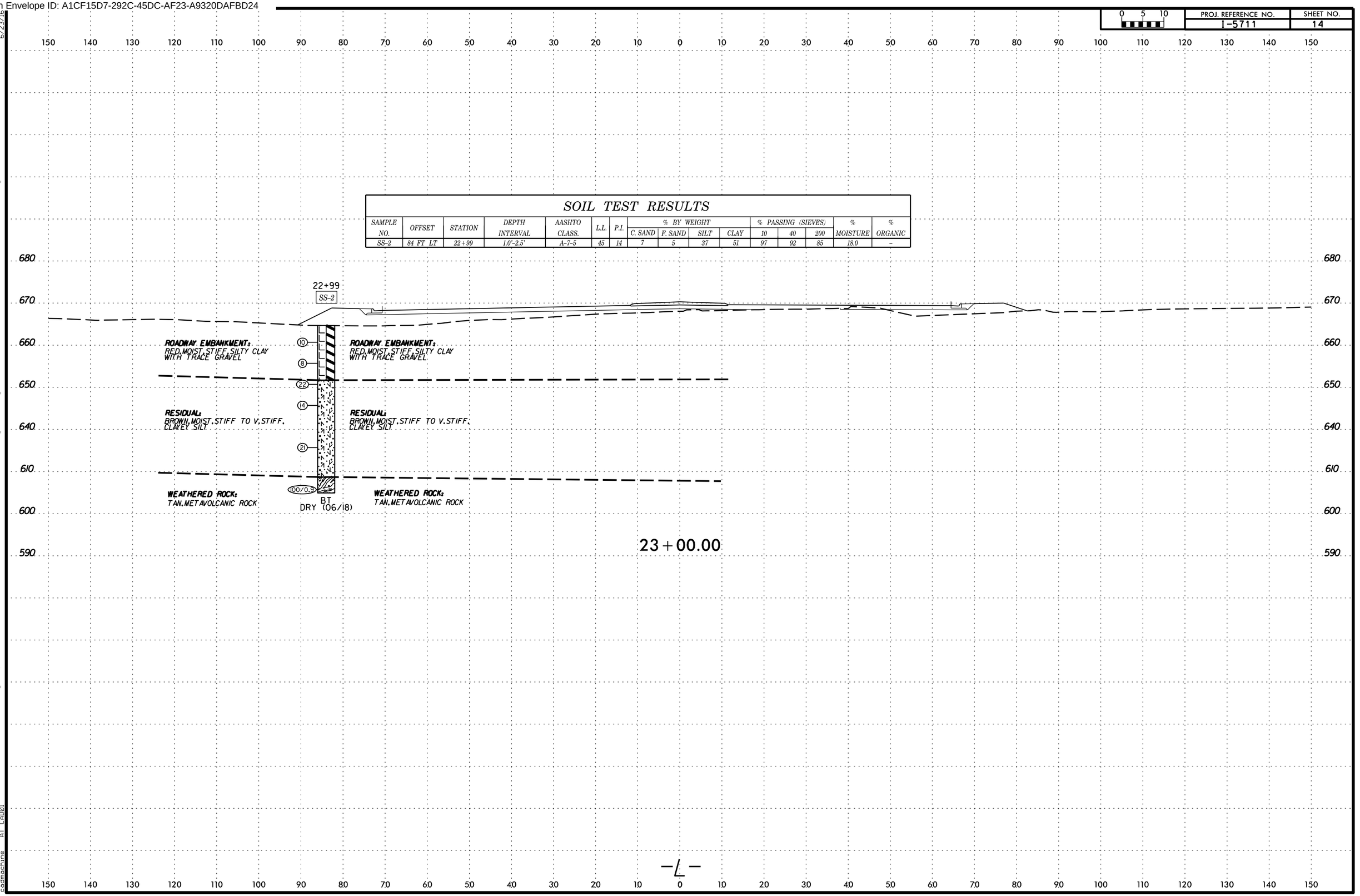
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	54 FT RT	20+08	1.0'-2.5'	A-7-6	46	13	7	8	30	55	96	91	81	21.8	-



-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-2	84 FT LT	22+99	1.0'-2.5'	A-7-5	45	14	7	5	37	51	97	92	85	18.0	–



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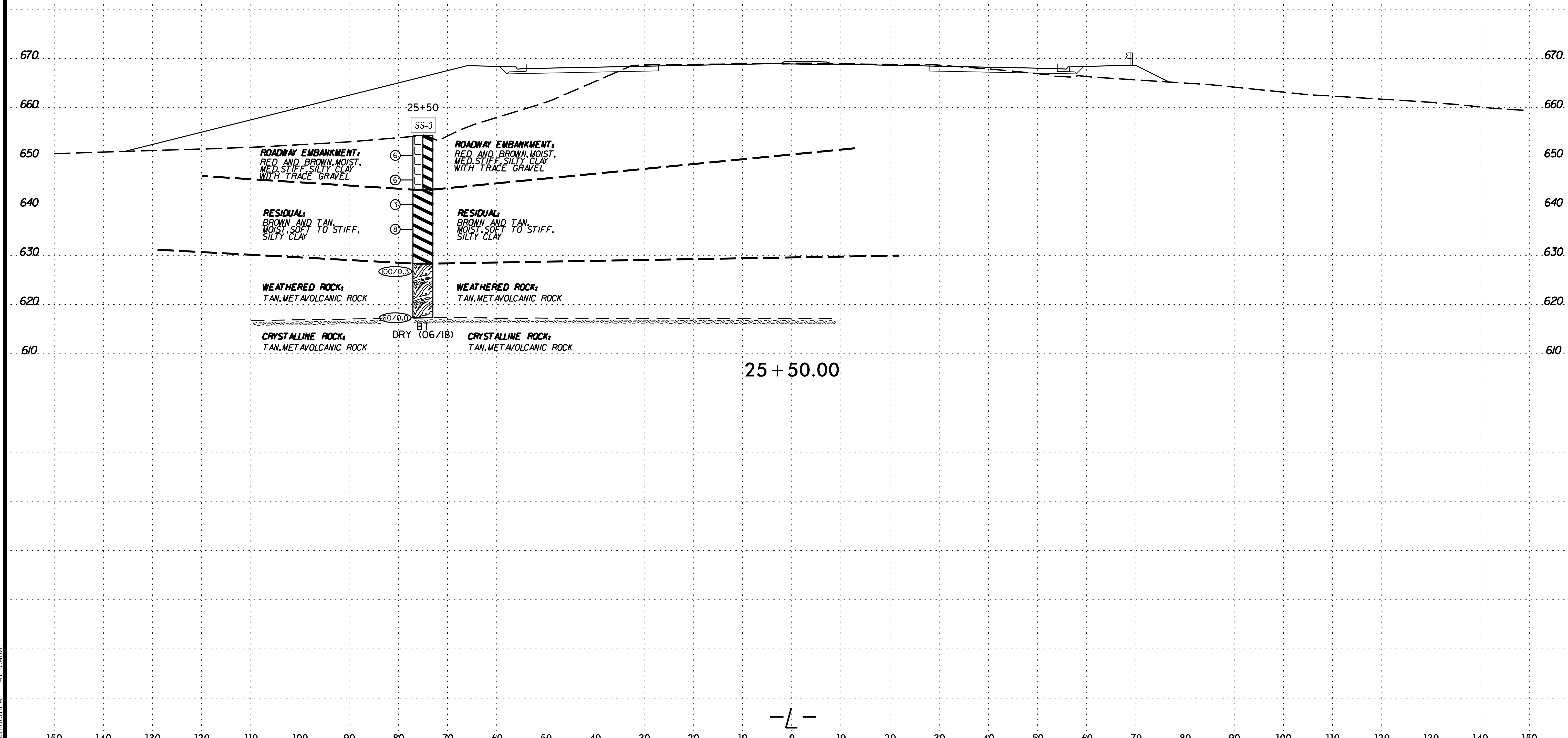
cadmachine
AT CAD01
6/23/16

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-3	75 FT LT	25+50	1.0'-2.5'	A-7-6	41	13	7	7	31	55	92	87	78	25.3	-



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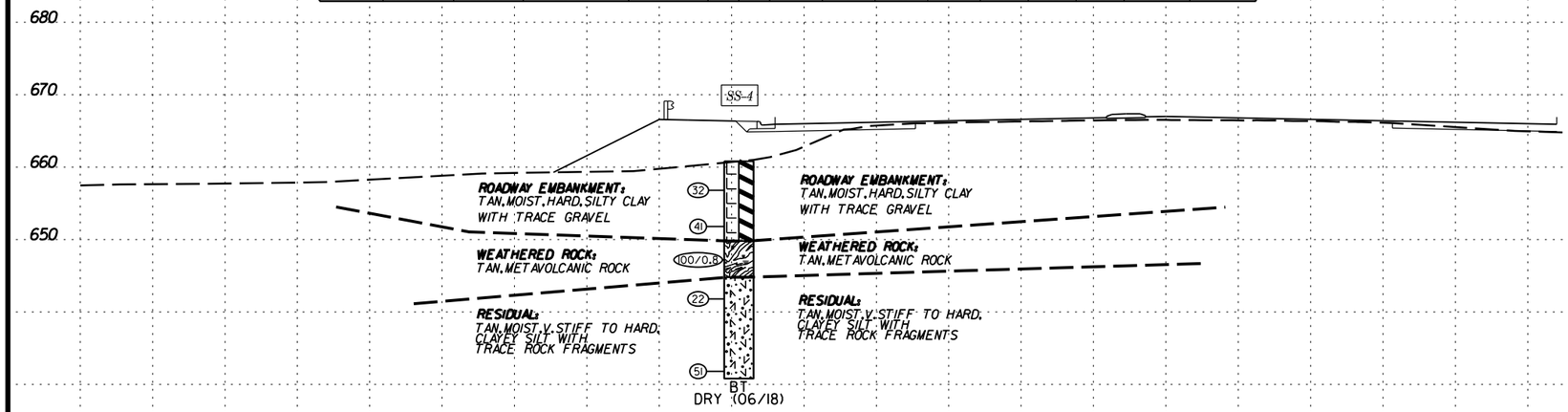
cadmachine AT CAD01
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	16

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-4	59 FT LT	29+00	1.0'-2.5'	A-7-5	58	25	5	3	35	57	84	80	76	16.1	–

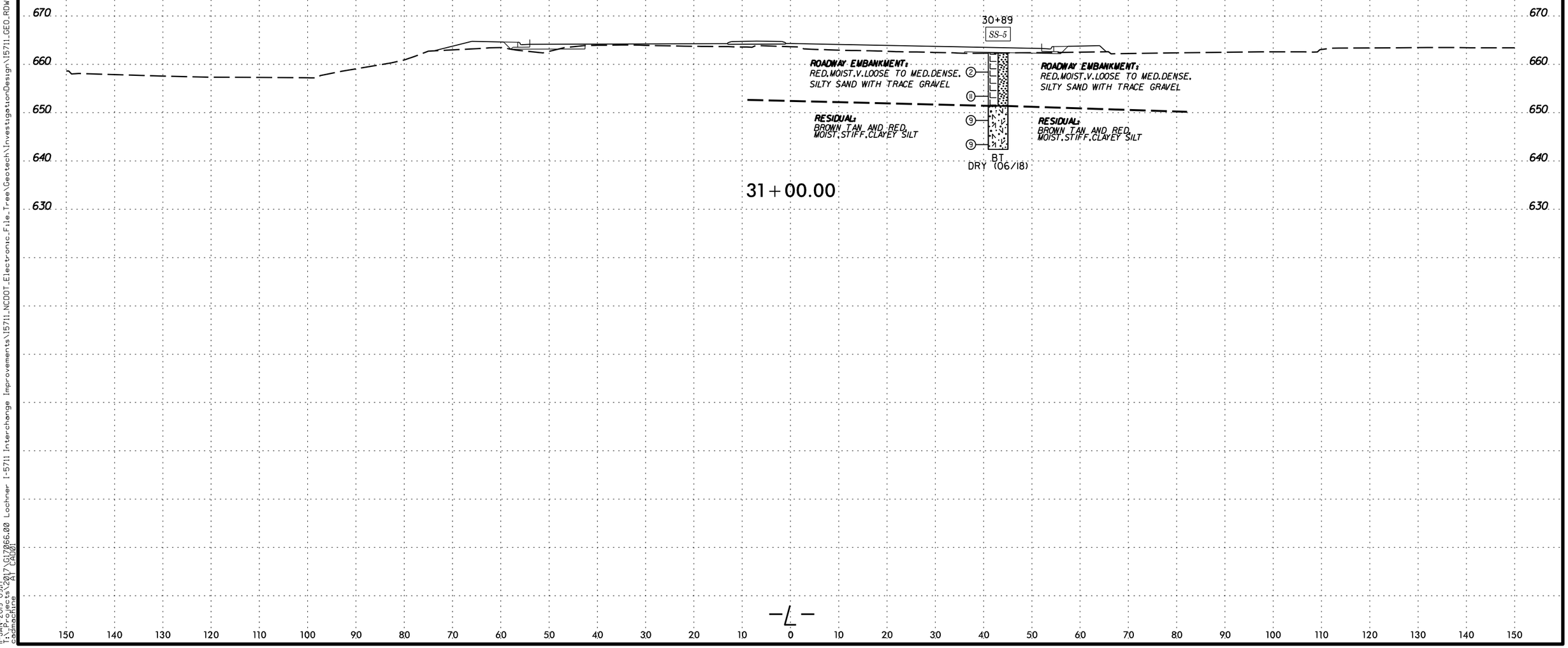


29+00.00

–L–

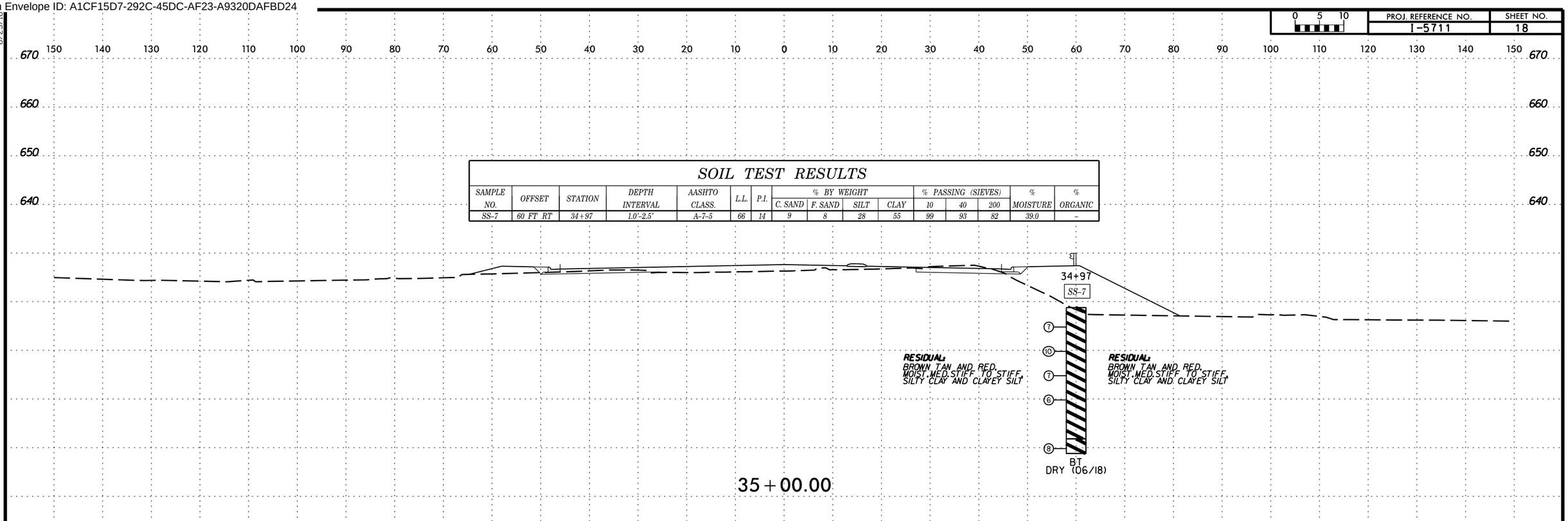
SOIL TEST RESULTS

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	43 FT RT	30+89	1.0'-2.5'	A-2-4	35	13	54	6	30	10	50	41	32	8.7	–



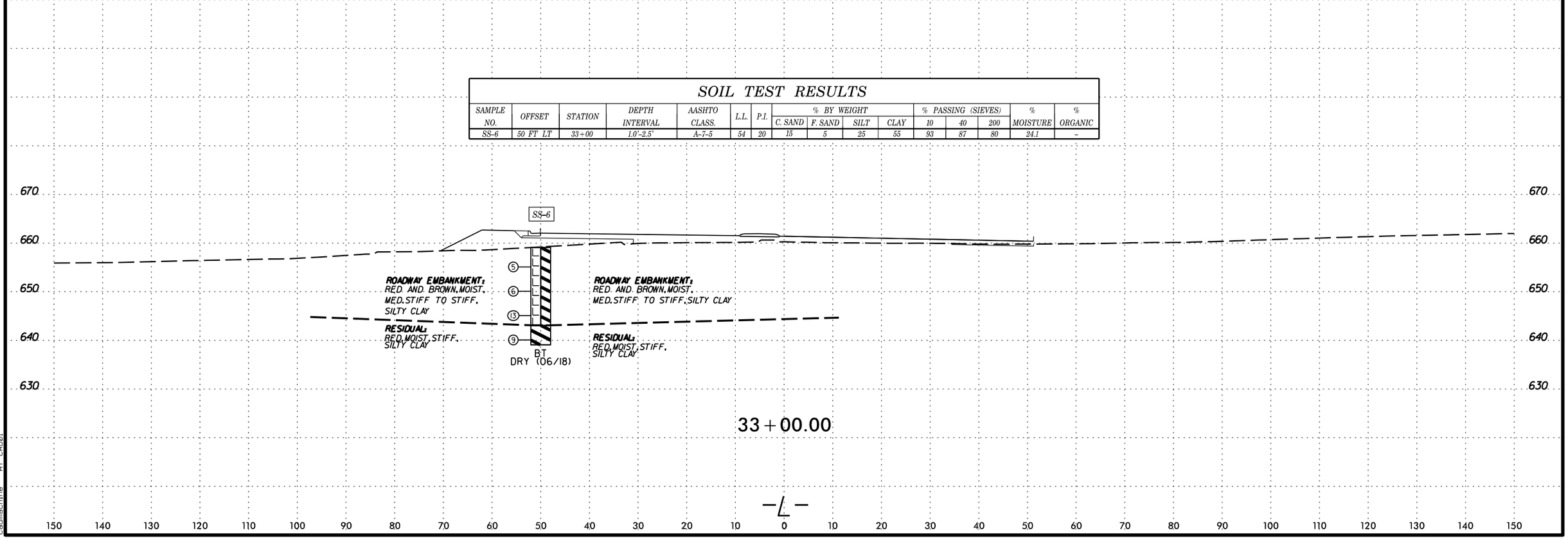
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-7	60 FT RT	34+97	1.0'-2.5'	A-7-5	66	14	9	8	28	55	99	93	82	39.0	-



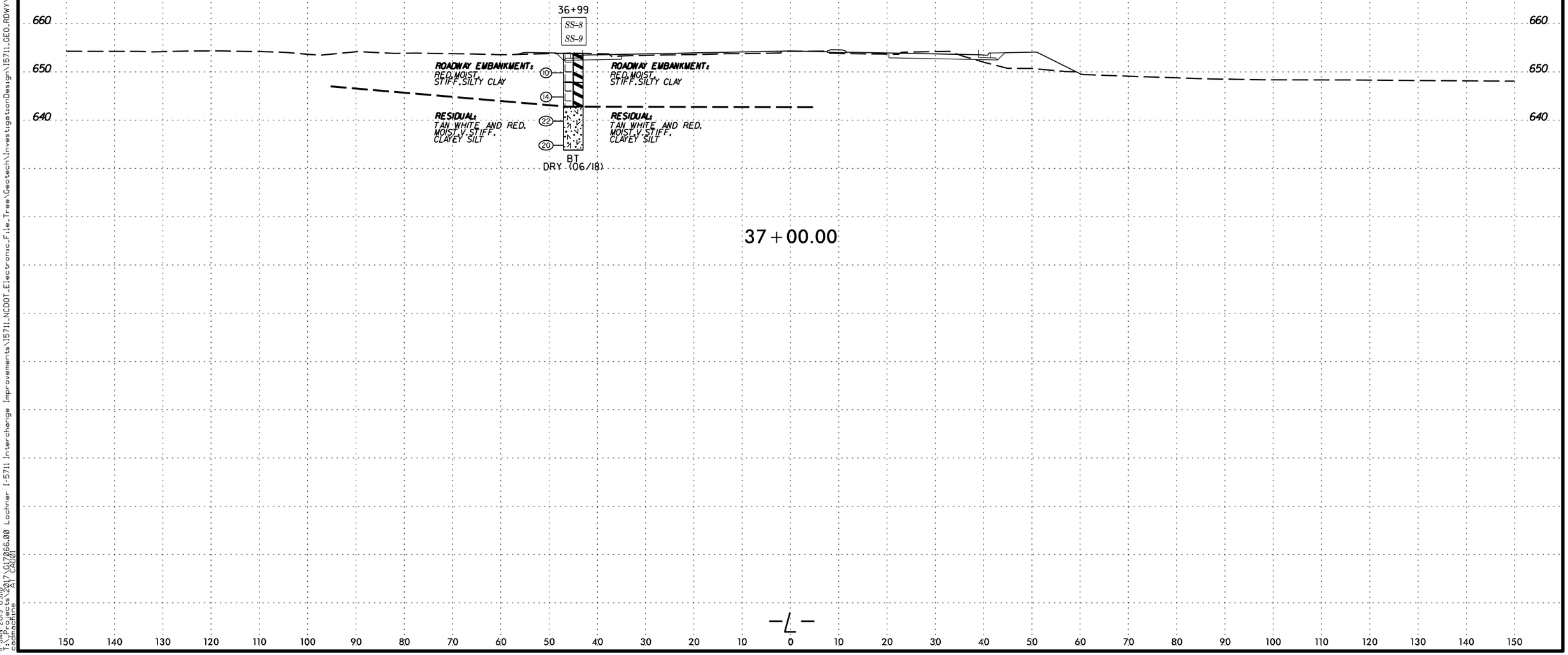
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-6	50 FT LT	33+00	1.0'-2.5'	A-7-5	54	20	15	5	25	55	93	87	80	24.1	-



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-8	45 FT LT	36+99	1.0'-2.5'	A-7-6	46	17	7	3	40	50	97	93	87	18.9	–
SS-9	45 FT LT	36+99	3.5'-5.0'	A-7-5	67	23	2	4	42	52	100	99	95	30.1	–



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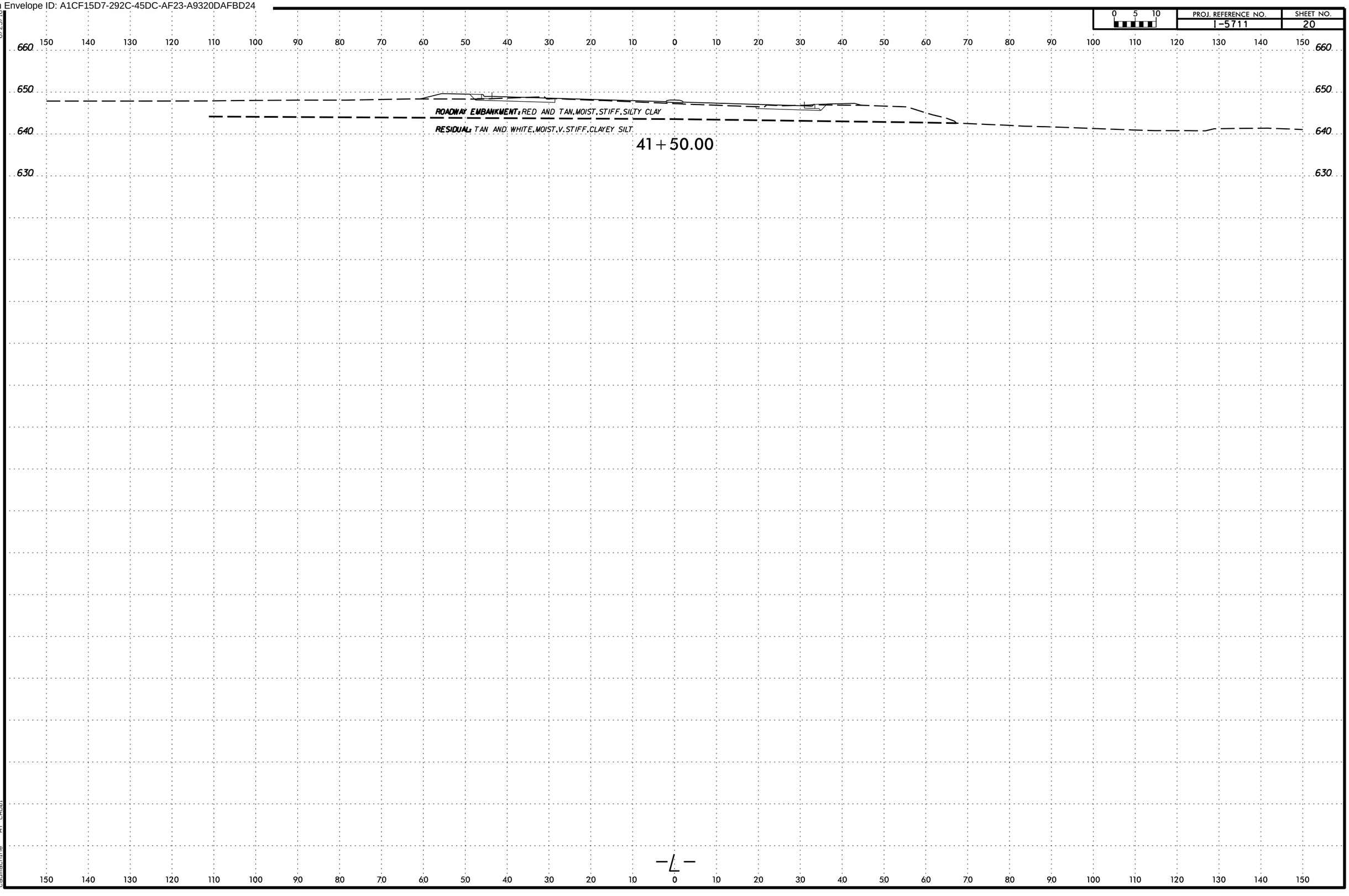
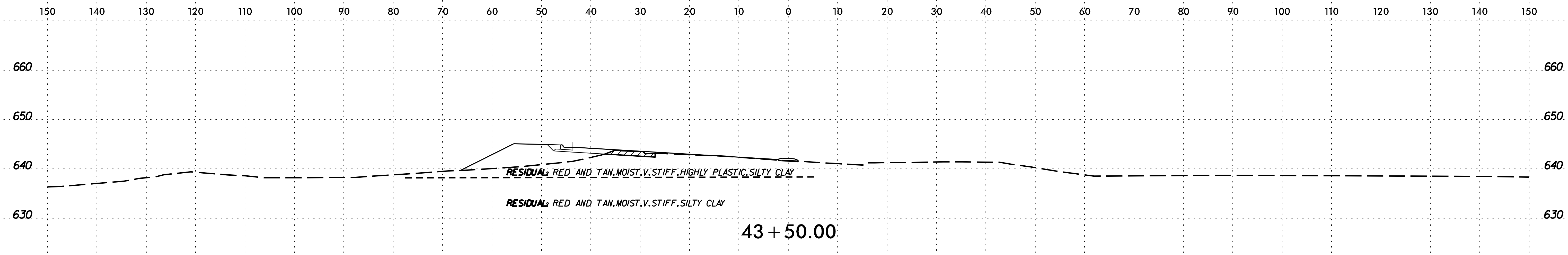
cadmachine
AT CAD01

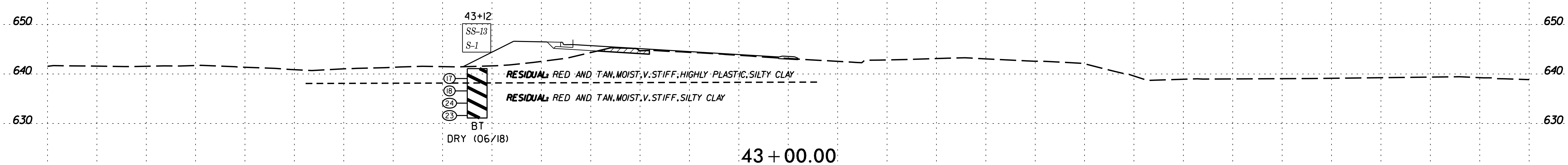
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	20

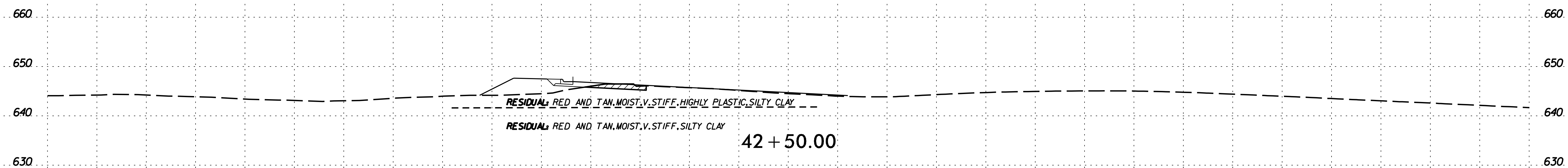


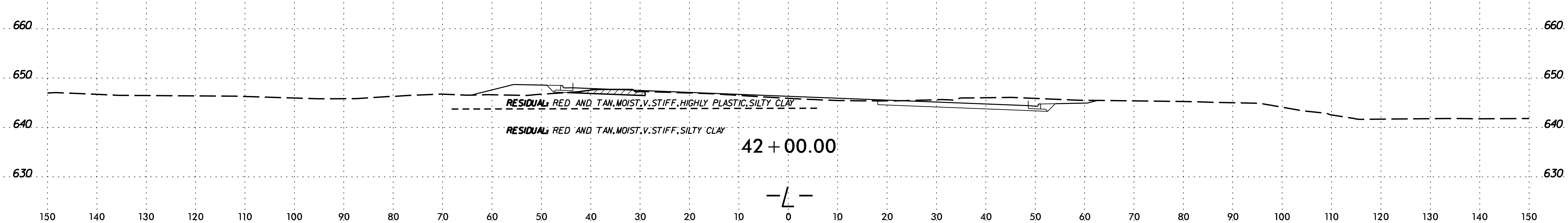


SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	% BY WEIGHT F. SAND	% BY WEIGHT SILT	% BY WEIGHT CLAY	% PASSING (SIEVES) 10	% PASSING (SIEVES) 40	% PASSING (SIEVES) 200	% MOISTURE	% ORGANIC
SS-13	63 FT LT	43+12	1.0'-2.5'	A-7-5	94	45	1	2	29	68	100	100	97	35.5	-
S-1	63 FT LT	43+12	1.0'-5.0'	A-7-5	65	25	2	3	37	58	99	98	94	40.5	-







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cadmachine AT CAD01
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	22

6/23/16

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

650
640
630

RESIDUAL: RED WHITE AND TAN,MOIST,STIFF TO HARD,SANDY SILT

44+50.00

660
650
640
630

RESIDUAL: RED AND TAN,MOIST,V.STIFF,HIGHLY PLASTIC,SILTY CLAY

RESIDUAL: RED AND TAN,MOIST,V.STIFF,SILTY CLAY

44+00.00

-L-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

11-JAN-2019 09:19
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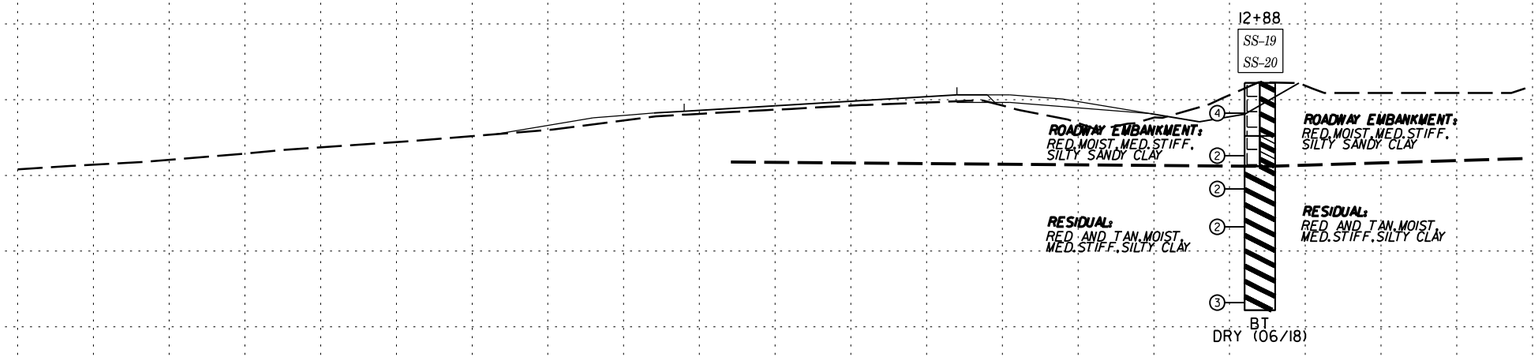
caddmachine AT CAD01

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	23

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-19	64 FT RT	12+88	1.0'-2.5'	A-7-5	49	19	5	2	31	62	89	85	82	26.6	-
SS-20	64 FT RT	12+88	3.5'-5.0'	A-6	38	12	5	4	38	53	97	93	88	34.2	-



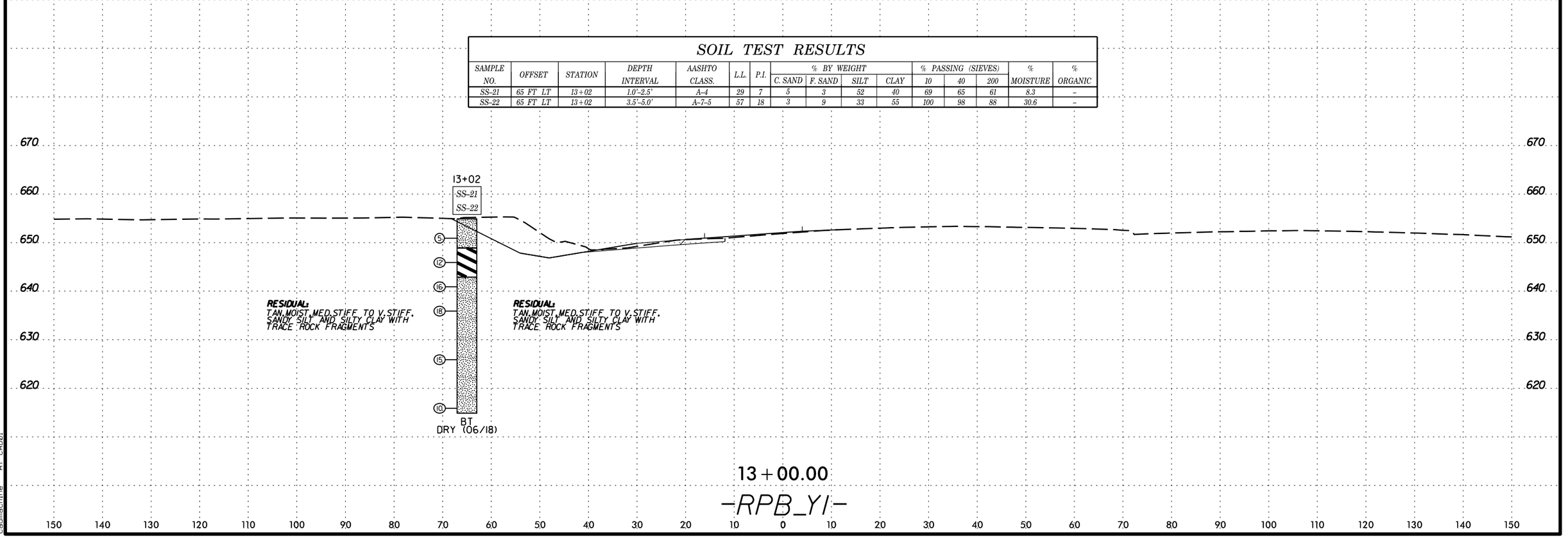
13+00.00

-RPA_Y1-

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	24

SOIL TEST RESULTS

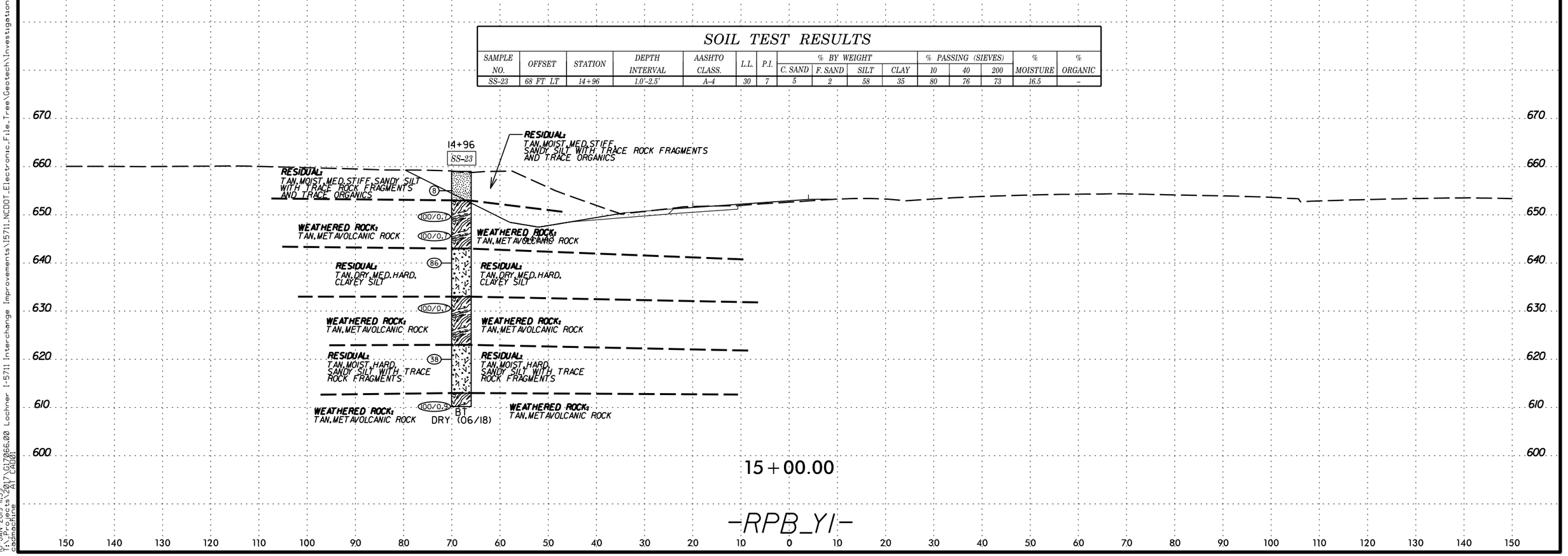
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-21	65 FT LT	13+02	1.0'-2.5'	A-4	29	7	5	3	52	40	69	65	61	8.3	–
SS-22	65 FT LT	13+02	3.5'-5.0'	A-7-5	57	18	3	9	33	55	100	98	88	30.6	–



0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	25

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-23	68 FT LT	14+96	1.0'-2.5'	A-4	30	7	5	2	58	35	80	76	73	16.5	–

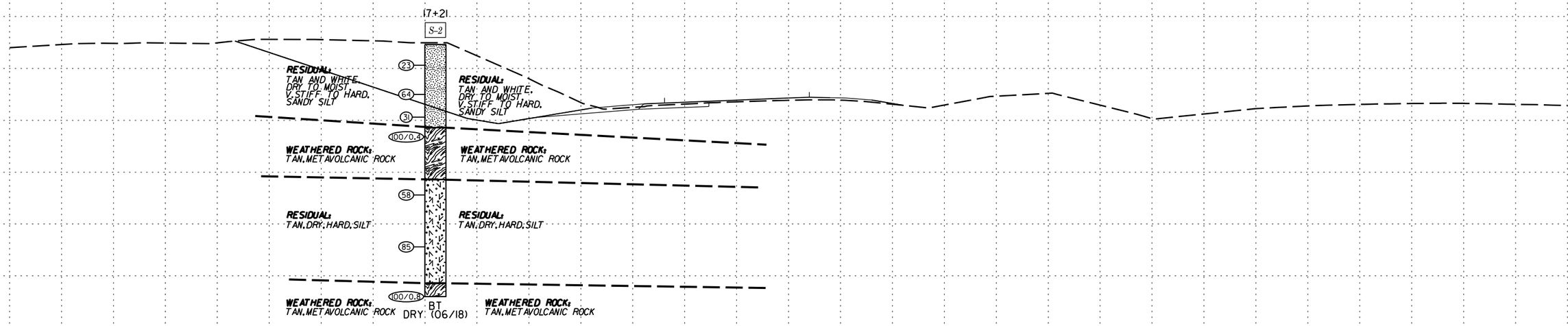


0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	26

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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-2	68 FT LT	17+21	1.0'-5.0'	A-4	22	5	22	8	49	21	84	67	54	10.7	–

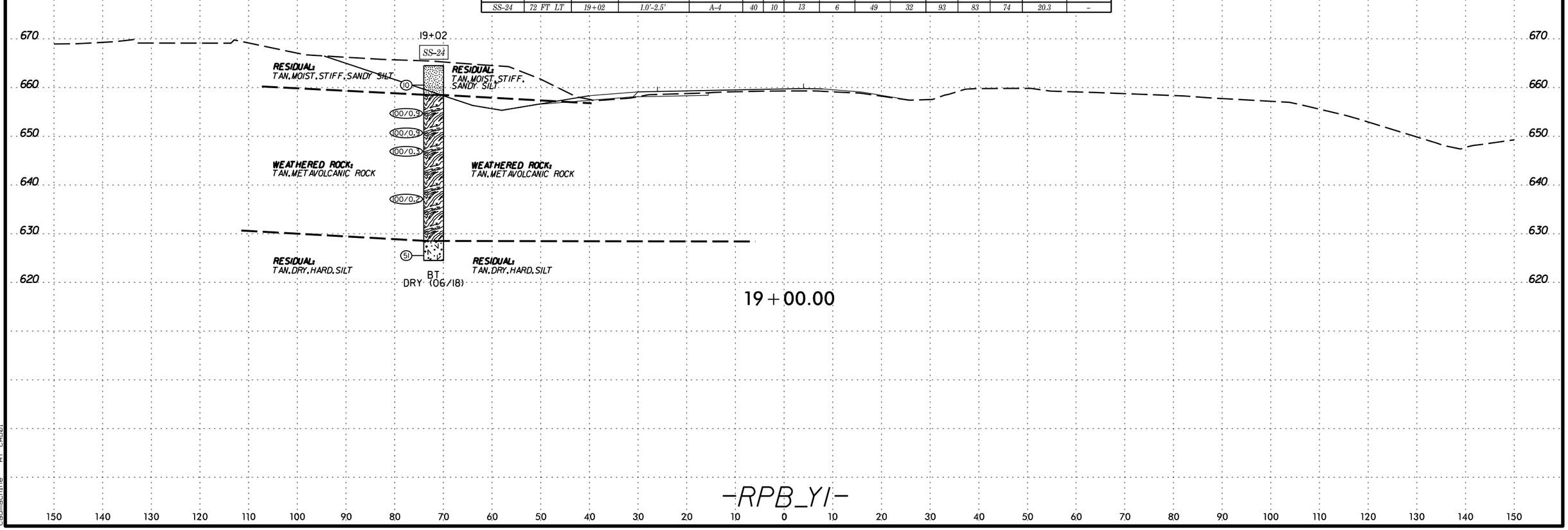


17+00.00

-RPB_Y1-

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-24	72 FT LT	19+02	1.0'-2.5'	A-4	40	10	13	6	49	32	93	83	74	20.3	-



-RPB_YI-

PROJECT REFERENCE NO.	SHEET NO.
I–5711	28

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX A
LABORATORY RESULTS

REFERENCE: I–5711

PROJECT: 50401

FALCON ENGINEERING 1210 TRINITY RD., SUITE 110, Cary, NC 27513

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

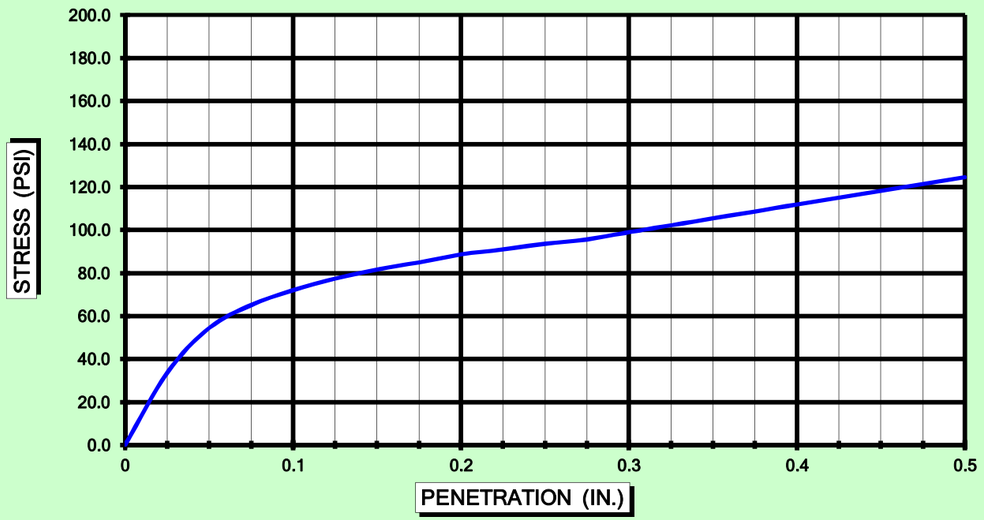
AASHTO T-193

PROJECT #:	G17066.00	DATE:	9/16/2018
PROJECT NAME:	I-5711 Interchange Improvement		
BORING:	B-11	SAMPLE: BS-1	DEPTH: 1-5'
SOIL DESCRIPTION:	A-7-5 Clay		

COMPACTION METHOD	AASHTO T-99A	SOAK	96 HRS.
MAXIMUM DRY DENSITY	82.5 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	34.0%	LOAD CELL	6000
TEST DATA		SURCHARGE WEIGHT	10 lb.
DRY DENSITY	80.4 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	35.0%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	97.5%	SWELL	4.38%

	ACTUAL	CORRECTED
CBR VALUE AT .1"	7.2	7.2
CBR VALUE AT .2"	5.9	5.9

STRESS-PENETRATION CURVE

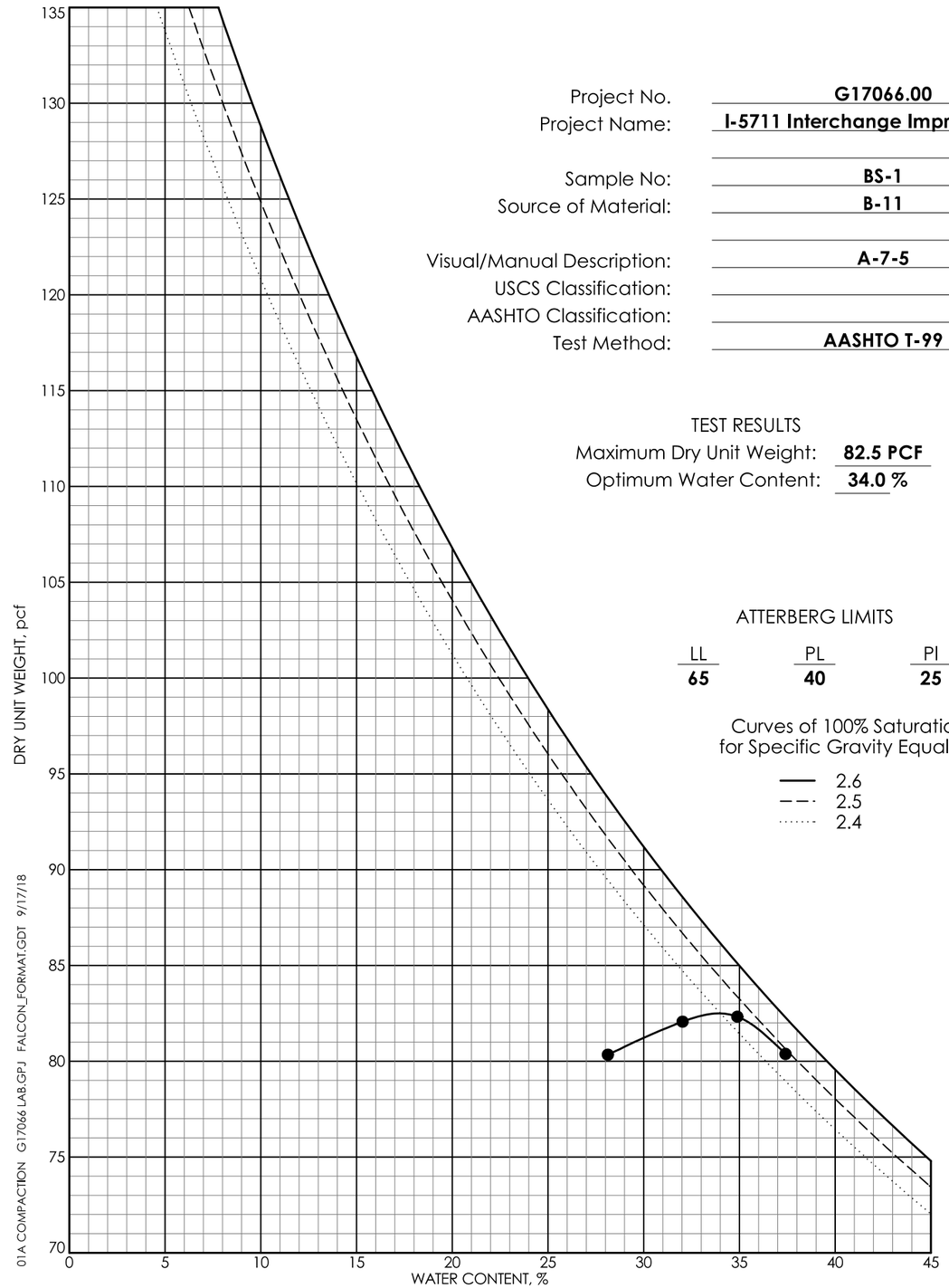


LIQUID LIMIT	65	PLASTIC LIMIT	40	PLASTIC INDEX	25

FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800
www.falconengineers.com

LABORATORY COMPACTION TEST RESULTS

9/17/2018



Project No.	G17066.00
Project Name:	I-5711 Interchange Improvements
Sample No:	BS-1
Source of Material:	B-11
Visual/Manual Description:	A-7-5
USCS Classification:	
AASHTO Classification:	
Test Method:	AASHTO T-99

TEST RESULTS

Maximum Dry Unit Weight:	82.5 PCF
Optimum Water Content:	34.0 %

01A COMPACTION G17066 LAB.GPJ FALCON_FORMAT.GDT 9/17/18

FALCON ENGINEERING 1210 TRINITY RD., SUITE 110, Cary, NC 27513

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

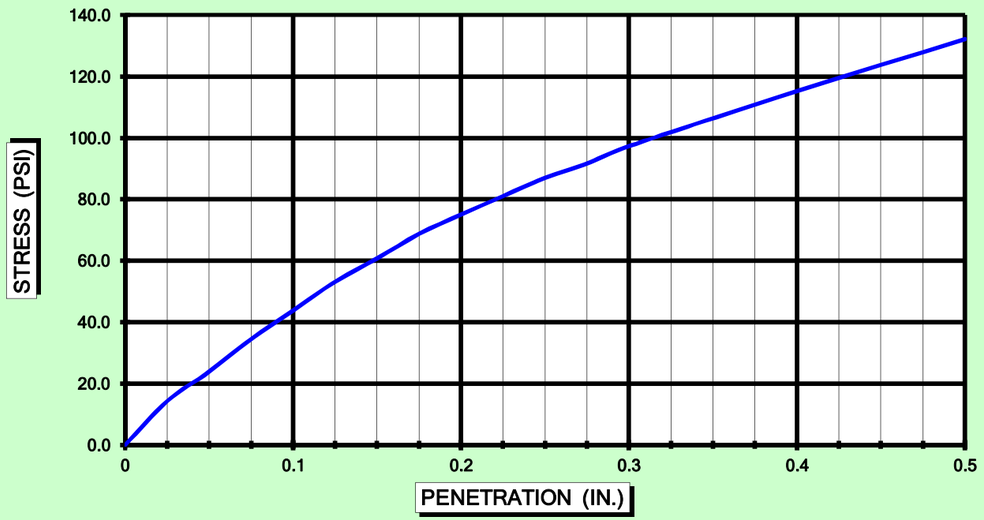
AASHTO T-193

PROJECT #:	G17066.00			DATE:	9/16/2018
PROJECT NAME:	I-5711 Interchange Improvement				
BORING:	RPB-3	SAMPLE:	BS-2	DEPTH:	1-5'
SOIL DESCRIPTION:	A-4 Silt				

COMPACTION METHOD	AASHTO T-99A	SOAK	96 HRS.
MAXIMUM DRY DENSITY	116.0 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	15.2%	LOAD CELL	6000
TEST DATA		SURCHARGE WEIGHT	10 lb.
DRY DENSITY	114.2 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	14.5%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	98.4%	SWELL	2.08%

	ACTUAL	CORRECTED
CBR VALUE AT .1"	4.4	4.4
CBR VALUE AT .2"	5.0	5.0

STRESS-PENETRATION CURVE



LIQUID LIMIT	22	PLASTIC LIMIT	17	PLASTIC INDEX	5

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1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
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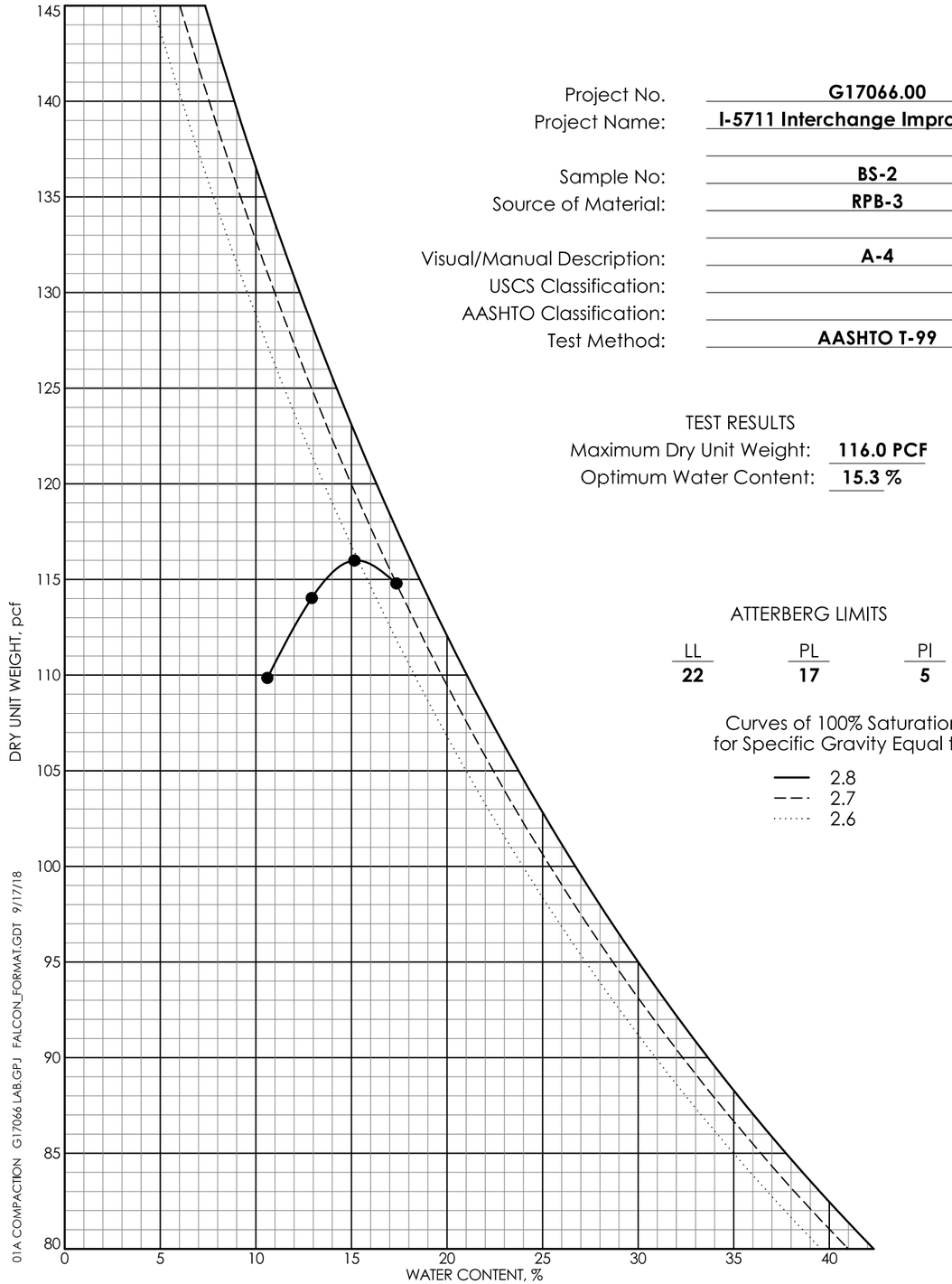
LABORATORY COMPACTION TEST RESULTS

9/17/2018



Project No.	G17066.00
Project Name:	I-5711 Interchange Improvements
Sample No:	BS-2
Source of Material:	RPB-3
Visual/Manual Description:	A-4
USCS Classification:	
AASHTO Classification:	
Test Method:	AASHTO T-99

TEST RESULTS

Maximum Dry Unit Weight:	116.0 PCF
Optimum Water Content:	15.3 %

ATTERBERG LIMITS

LL	PL	PI
22	17	5

Curves of 100% Saturation for Specific Gravity Equal to:

- 2.8
- 2.7
- 2.6