August 1, 2014

Mr. Thomas K. Goodwin, PE
Rivers & Associates, Inc.
5808 Faringdon Place, Suite 203
Raleigh, NC 27609

Re:	**Roadway Subsurface Investigation - Recommendations**
WBS:	45336.1.21
TIP No.:	W-5206U
County:	Cumberland
Project Description:	SR 2252 (Chickenfoot Road) at SR 2242 (Braxton Rd) and SR 2238 (Sandhill Road)
Falcon Project No.:	G13072.00

Dear Mr. Goodwin,

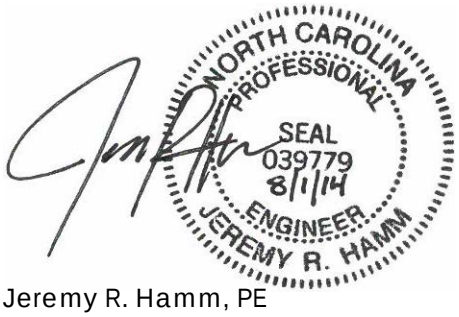
As authorized, Falcon Engineering, Inc. (Falcon) has completed the geotechnical subsurface investigation for the proposed SR 2252 (Chicken Foot Rd) at SR 2242 (Braxton Rd) and SR 2242 (Sandhill Rd) project in Cumberland County, North Carolina. Our investigation was performed in general accordance with our Scope and Fee Estimate for Geotechnical Investigation and Engineering Services, dated July 2, 2013. This report includes roadway geotechnical recommendations for the preparation of final design, right of way plans, construction cost estimates, and construction procedures.

Recommendations and evaluations provided by Falcon are based on the information provided by Rivers and Associates and established NCDOT standards. Modifications of our recommendations and evaluations may be required if there are changes to the design or location of the roadway. Recommendations in this report are in part based on data obtained from soil borings. The nature and extent of variations between borings may not become evident until construction.

Our professional services for this project have been performed in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made. Falcon appreciates the opportunity to have provided you with geotechnical engineering services for this project. If you have any questions regarding this report, please contact our office.

Sincerely,

FALCON ENGINEERING, INC.



Thomas E. Evans, PE
Geotechnical Engineer

Jeremy R. Hamm, PE
Geotechnical Engineering Manager

TIP: W-5206U
COUNTY: Cumberland
DESCRIPTION: SR 2252 (Chicken Foot Rd) at SR 2242 (Braxton Rd) and SR 2238 (Sandhill Rd)
SUBJECT: Roadway Subsurface Investigation – Recommendations

I. Slope/Embankment Stability

A. Slope Design

Existing cut and fill slopes along Chickenfoot Road are generally 2:1, and in some cases steeper, with heights approaching 10 feet. The existing slopes appear stable based on our site reconnaissance. Proposed slopes generally do exceed 10 feet, with only short sections approaching 11 feet in height. Therefore, it is recommended all roadway embankment fill and cut slopes be constructed at a 2:1(H:V) ratio or flatter for this project. The stability of all slopes is subject to the stabilization recommendations provided below, and additional stabilization of areas not specifically recommended but where similar subsurface conditions exist.

B. Undercut for Embankment Stability

Soft, wet, and organic soils were encountered in areas to receive fill at the following locations. In order to promote embankment and slope stability, we recommend these areas be undercut to a depth of up to 3 feet or to more stable materials.

Station	Offset	Depth	Quantity
22+33 to 24+75 -Y1-	LT and RT	Up to 3.0	2,700 CY

It is recommended an additional quantity of 500 CY of undercut be included in the contract as a contingency to be used at the discretion of the Engineer.

C. Geotextile for Soil Stabilization

It is recommended a quantity of 2,700 SY of Geotextile for Soil Stabilization be included in the project between stations -Y1- 22+33 and 24+75. It is recommended an additional 500 SY Geotextile for soil stabilization be included in the contract as a contingency to be used at the discretion of the Engineer.

II. Subgrade Stability

A. Undercut for Subgrade Stability

Moderate to high plasticity soils were encountered at proposed pavement subgrades in cut and near-grade construction areas at many locations throughout the project. We recommend undercut be performed to remove materials with a Plasticity Index (PI) greater than 15 from within 3 feet of pavement subgrades. Based on our subsurface investigation, undercut is anticipated at the following locations.

Station	Offset	Depth	Quantity
16+50 to 21+43 -Y1-	LT and RT	Up to 3.0	1,150 CY
28+50 to 30+00 -Y1-	LT and RT	Up to 3.0	300 CY
10+50 to 26+20 -Y2-	LT and RT	Up to 3.0	6,850 CY

These areas are represented on the subsurface cross sections by a double hatch pattern. If highly plastic or otherwise unsuitable subgrades are present in other areas, perform Undercut. To assist in subgrade stabilization in such locations, it is recommended a quantity of 1,000 CY of undercut be included in the contract as a contingency to be used at the discretion of the Engineer.

B. Geotextile for Soil Stabilization

Following undercut for subgrade stability, the use of Geotextile for Soil Stabilization is anticipated at the following locations.

Station	Offset	Depth	Quantity
16+50 to 21+00 -Y1-	LT and RT	Up to 3.0	1,200 CY
11+50 to 25+75 -Y2-	LT and RT	Up to 3.0	6,200 CY

It is recommended that an additional quantity of 1,000 CY of Geotextile for Soil Stabilization be included in the contract as a contingency to be used at the discretion of the Engineer.

C. Aggregate Subgrade

Aggregate Subgrade may be utilized in place of deeper undercuts in order to avoid encountering utilities, undermining of existing pavements, or other considerations. It is recommended a quantity of 250 CY of Shallow Undercut, 500 SY of Geotextile for Soil Stabilization, and 500 tons of Class IV Subgrade Stabilization be included in the contract as a contingency to be used at the discretion of the Engineer.

D. Grade Point Undercut

It is recommended a quantity of 500 CY of undercut be included in contract for undercutting grade points at the discretion of the Engineer.

E. Subsurface Drainage - Underdrains

Some portions of the project may encounter perched groundwater, poor drainage, and/or wet conditions. Groundwater was encountered on the order of 4 to 6 feet beneath proposed pavement throughout the majority of the site. An isolated occurrence of groundwater within 3.5 feet of subgrade was measured at station 25+56 -Y1-. Depending on modifications to site drainage and sensitivity of borrow material to moisture, the use of subsurface drains may be warranted in these areas. It is recommended a quantity of 1,000 LF of 6-inch perforated corrugated plastic pipe be included in the contract as a contingency to be used at the discretion of the Engineer. Construction of underdrains shall follow Standard Specifications, Section 815 “Subsurface Drainage”, and Roadway Standard Drawing 815.03 “Pipe Underdrain and Blind Drain”.

III. Borrow Specifications

A. Common Borrow

Common borrow for embankment fill shall meet the Exception to Statewide Criteria outlined in the Standard Specification, Article 1018-2, Section II (B).

B. Select Granular Material

Standing water is likely to be present in the vicinity of Station 22+33 to 24+75 at the time of undercut and fill placement. After completing undercut, Class III Select Granular Material should be placed up to one foot above the water level. It is recommended a quantity of 2,800 CY of Class III Select Granular Material be included in the contract for use in conjunction with Undercut for Embankment Stability as recommended in Section I.C above. An additional quantity of 750 CY of Class III, Select Granular Material should be included in the contract as contingency to be used at the discretion of the Engineer.

It is recommended a quantity of 7,400 CY of Class II or III Select Granular Material be included in the contract for use in conjunction with Geotextile for Soil Stabilization as recommended in Section II.B above. We recommend an additional 1,000 CY of Select Granular Material be included in the contract as a contingency to be used at the discretion of the Engineer.

C. Shrinkage Factor

A shrinkage factor of 25 percent is recommended to be used in the earthwork computations for this project.

IV. Miscellaneous

A. Reduction of Unclassified Excavation - Loss Due to Clearing and Grubbing

The project site is currently wooded between 17+50 and 21+50 -L- with rootmat exceeding 4 inches in thickness. We recommend unclassified excavation be reduced by 250 CY for loss due to clearing and grubbing.

B. Reduction of Unclassified Excavation - Unsuitable Unclassified Excavation

Unclassified excavation in the following areas is anticipated to be unsuitable and should be wasted offsite, or utilized outside of roadway embankments at the discretion of the Engineer.

Station	Offset	Quantity
17+50 to 21+43 -Y1-	LT and RT	300 CY
28+50 to 30+56 -Y1-	LT and RT	2,050 CY
10+50 to 25+75 -Y2-	LT and RT	6,100 CY

These areas are represented on the subsurface cross sections by a single hatch pattern. Based on the above areas, we recommend unclassified excavation be reduced by 8,450 CY.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
Summary of Quantities

WBS No.: 45336.1.21 County: Cumberland Project Engineer: Jeremy R. Hamm
TIP No.: W-5206U Field Office: Consultant Project Geologist: N/A
Description: SR 2252 (Chicken Foot Rd) at SR 2242 (Braxton Rd) and SR 2238 (Sandhill Rd)

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units
0036000000-E	Undercut Excavation	225 - Roadway Excavation	I. B	-Y-	22+33.00	24+75.00	2,700	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	I. B	Contingency	N/A	N/A	500	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. A	-Y1-	16+50.00	21+43.00	1,150	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. A	-Y-	28+50.00	30+00.00	300	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. A	-Y1-	10+50.00	26+20.00	6,850	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. A	Contingency	N/A	N/A	1,000	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. D	Contingency	N/A	N/A	500	CY
						Total Quantity of Undercut Excavation =	**13,000**	**CY**
0194000000-E	Select Granular Material, Class III	SP - Select Granular Material	III. B	-Y1-	22+33.00	24+75.00	2,800	CY
0194000000-E	Select Granular Material, Class III	SP - Select Granular Material	III. B	Contingency	N/A	N/A	750	CY
						Total Quantity of Select Granular Material, Class III =	**3,550**	**CY**
0195000000-E	Select Granular Material	265 - Select Granular Material	III. C	-Y1-	16+50.00	21+00.00	1,200	CY
0195000000-E	Select Granular Material	265 - Select Granular Material	III. C	-Y2-	11+50.00	25+75.00	6,200	CY
0195000000-E	Select Granular Material	265 - Select Granular Material	III. C	Contingency	N/A	N/A	1,000	CY
						Total Quantity of Select Granular Material =	**8,400**	**CY**
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	I. C	-Y-	22+33.00	24+75.00	2,700	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	I. C	Contingency	N/A	N/A	500	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. B	-Y1-	16+50.00	21+00.00	1,200	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. B	-Y2-	11+50.00	25+75.00	6,200	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. B	Contingency	N/A	N/A	1,000	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. C	Contingency	N/A	N/A	500	SY
						Total Quantity of Geotextile for Soil Stabilization =	**12,100**	**SY**
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. C	Contingency	N/A	N/A	250	CY
						Total Quantity of Shallow Undercut =	**250**	**CY**

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
Summary of Quantities

WBS No.: 45336.1.21 County: Cumberland Project Engineer: Jeremy R. Hamm
TIP No.: W-5206U Field Office: Consultant Project Geologist: N/A
Description: SR 2252 (Chicken Foot Rd) at SR 2242 (Braxton Rd) and SR 2238 (Sandhill Rd)

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. C	Contingency	N/A	N/A	500	TON
						Total Quantity of Class IV Subgrade Stabilization =	**500**	**TON**
2044000000-E	6" Perforated Subdrain Pipe	815 - Subsurface Drainage	II. E	Contingency	N/A	N/A	1,000	LF
						Total Quantity of 6" Perforated Subdrain Pipe =	**1,000**	**LF**

These Items Only Impact Earthwork Totals								
N/A	Loss Due to Clearing & Grubbing	200 - Clearing and Grubbing	IV. A	N/A	N/A	N/A	250	CY
N/A	Shrinkage Factor	235 - Embankments	III. D	N/A	N/A	N/A	25	%
N/A	Unsuitable Waste	225 - Roadway Excavation	IV. B	N/A	N/A	N/A	8,450	CY

CONTRACT: ID: W-5206U

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

CONTENTS

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

ROADWAY SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 45336.1.21(W-5206U) F.A. PROJ. HRRR-2238(1)

COUNTY CUMBERLAND

PROJECT DESCRIPTION SR 2252 (CHICKENFOOT ROAD) AT SR 2242 (BRAXTON ROAD) AND SR 2238 (SANDHILL ROAD)

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	45336.1.21 (W-5206U)	1	36

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
		P.E.
		R/W & UTIL.

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. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

PERSONNEL

C. V. NORVILLE

J. R. HAMM

T. E. EVANS

A. S. PAUL

SDS

INVESTIGATED BY A. S. PAUL

CHECKED BY J. R. HAMM

SUBMITTED BY FALCON

DATE AUGUST 2014

DRAWN BY: T. E. EVANS, A. S. PAUL

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

PROJECT REFERENCE NO.	SHEET NO.
45336.1.21 (W-5206U)	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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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
LIQUID LIMIT	6 MX			NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX					10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MX	11 MN			
GROUP INDEX	0		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 A 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/FT²)
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 0.50 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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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 W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [x] CME-550X
- [ ] 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_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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 BASED ON .TIN FILES AND CONTOUR ELEVATIONS
ELEVATION: FT.

NOTES:
FIAD - FILLED IMMEDIATELY AFTER DRILLED
UCP - UNDIVIDED COASTAL PLAIN

REVISED 09/23/09

TIP PROJECT: W5206U

CONTRACT:

$FILE$

$DATE$

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W5206U	2A	36

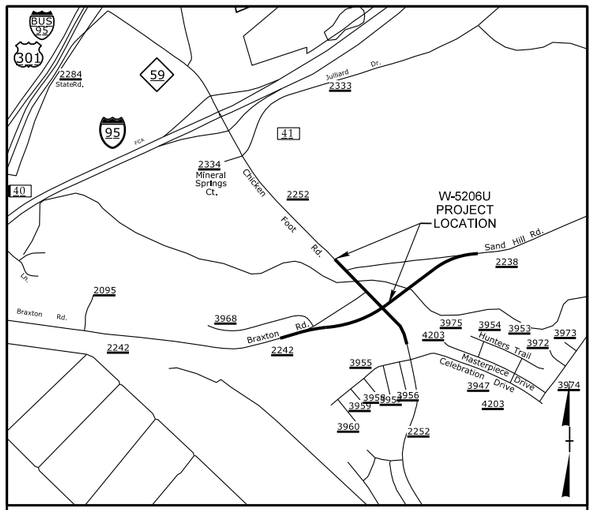
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
45336.1.21	HRRR–2238(1)	P.E.
45336.2.21	HRRR–2238(1)	R /W & UTILITY
45336.3.21	HRRR–2238(1)	CONSTRUCTION

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

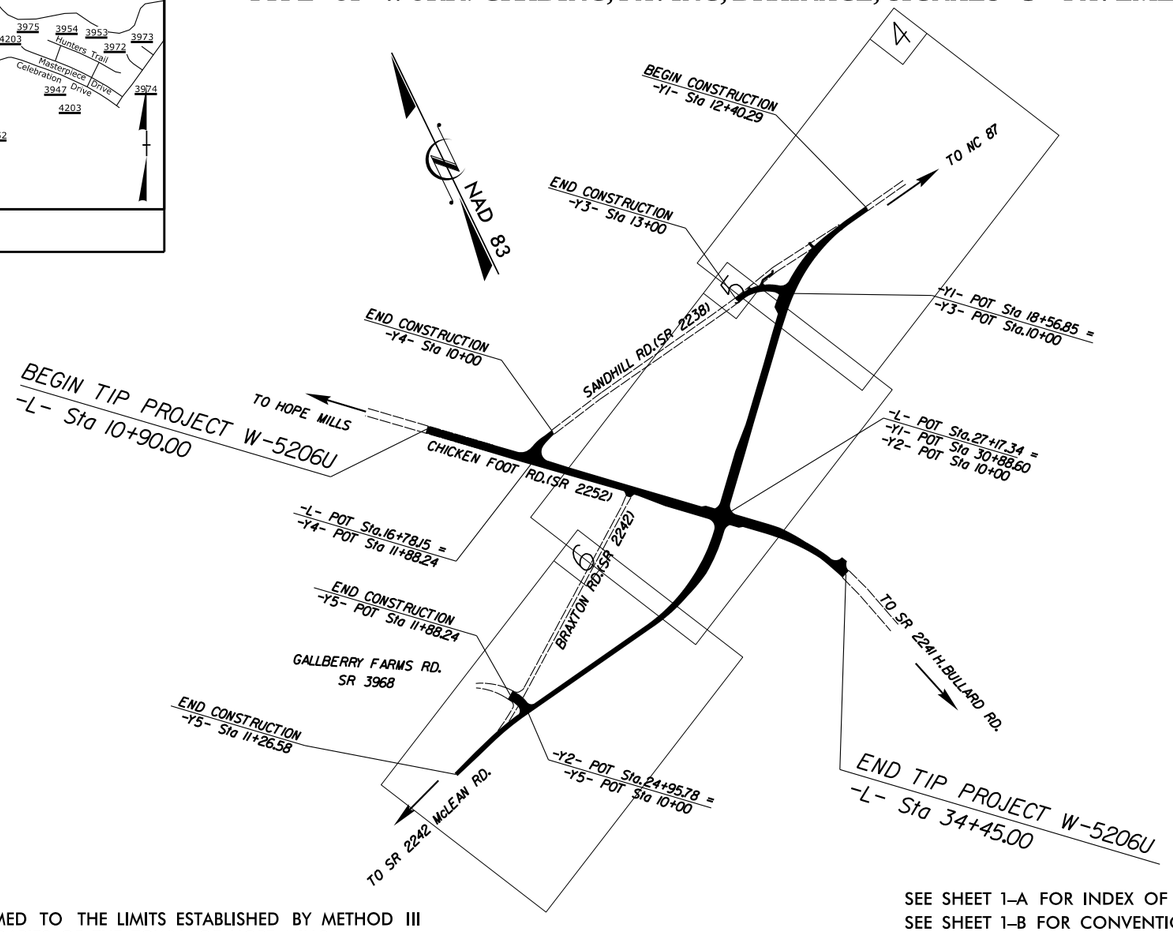
CUMBERLAND COUNTY

LOCATION: SR 2252 (CHICKENFOOT ROAD) AT SR 2238 (SANDHILL ROAD)

TYPE OF WORK: GRADING, PAVING, DRAINAGE, SIGNALS & PAVEMENT MARKINGS



VICINITY MAP



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III
THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE TOWN OF HOPE MILLS

SEE SHEET 1–A FOR INDEX OF SHEETS
SEE SHEET 1–B FOR CONVENTIONAL PLAN SHEET SYMBOLS

75% REVIEW PLANS
APRIL 29, 2014

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

PLANS: 50 25 0 50 100

PROFILE (HORIZONTAL): 50 25 0 50 100

PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

ADT 2012 = 11,000
ADT 2033 = 20,500
DHV = 14 %
D = 60 %
T = 1.5 %
V = 50 MPH

FUNC CLASS =
RURAL MAJOR COLLECTOR

PROJECT LENGTH

LENGTH ROADWAY –L– = 0.45 MILES
LENGTH ROADWAY PROJECT W5206U = 0.45 MILES

NCDOT CONTACT: SEAN MATUSZEWSKI
DIVISION DESIGN ENGINEER

PLANS PREPARED FOR THE NCDOT BY:

RIVERS & ASSOCIATES, INC.
5808 Farlngdon Place
Suite 203
Raleigh, NC 27609
(919) 848-3347
Engineers
Planners
Surveyors
Lansdcape Architects

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
MAY 2014

LETTING DATE:
MARCH 2015

THOMAS K. GOODWIN, P.E.
PROJECT ENGINEER

DAVID L. SMITH, P.E.
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: *P.E.*

ROADWAY DESIGN ENGINEER

SIGNATURE: *P.E.*

DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

P.E.
STATE HIGHWAY DESIGN ENGINEER

Roadway Subsurface Investigation Report - Inventory

SR 2252 (Chicken Foot Road) at SR 2242
(Braxton Road) and SR 2238 (Sandhill Road)
Cumberland County, North Carolina
WBS: 45336.1.21; TIP: W-5206U
Falcon Project No.: G13076.00

Prepared for:
Rivers & Associates, Inc.
5808 Faringdon Place, Suite 203
Raleigh, NC 27609

Submitted by:
Falcon Engineering, Inc.
1210 Trinity Road, Suite 110
Raleigh, North Carolina 27607
(919) 871-0800
www.falconengineers.com

July 24, 2014

PREFACE

This roadway subsurface investigation was conducted between April 17 and April 23, 2014 in general accordance with our Proposal to Provide Geotechnical Engineering Services, dated July 2, 2013. 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 twenty (20) Standard Penetration Test (SPT) borings were drilled for the new roadway alignments. In addition, one (1) rod sounding and three (3) hand auger probes were advanced in inaccessible areas of the proposed alignment and is included herein as additional roadway subsurface data. All SPT borings were drilled using a CME-550X all-terrain-vehicle (ATV) mounted drill rig equipped with 2 ¼-inch inside diameter hollow-stem augers and an automatic hammer. Representative soil samples, collected with a split-barrel sampler, were selected for laboratory testing to verify visual field classifications. In addition, bulk samples were collected for additional laboratory testing for use in our geotechnical engineering analyses.

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:

Thomas E. Evans, PE
Geotechnical Engineer

Report Reviewed By:

Jeremy R. Hamm, PE
Geotechnical Engineering Manager

WBS: 45336.1.21
TIP: W-5206U
COUNTY: Cumberland
DESCRIPTION: SR 2252 (Chicken Foot Road) at SR 2242 (Braxton Rd) and SR 2238 (Sandhill Road)
SUBJECT: Roadway Subsurface Investigation – Inventory

PROJECT DESCRIPTION

This project consists of realignment of Braxton Road (SR 2242) and Sandhill Road (SR 2238) to reconfigure their intersections with Chickenfoot Road (SR 2252), in Cumberland County, North Carolina. Both Braxton and Sandhill Roads will be significantly reconstructed along new locations. Portions of the old pavement will be demolished, with new tie-ins. The project will make use of existing pavement on Chicken Foot Road but will provide widening near the new intersection. A culvert crossing is planned near Station 23+50 on -Y1-. We understand this crossing will consist of small diameter pipe(s). Therefore, preparation of a separate culvert investigation report is not within our scope and culvert subsurface information is provided within this document.

The following alignments, totaling approximately 5,450 feet (1.03 miles) were explicitly investigated.

Alignment	Station
-L- (Chickenfoot Road)	22+00 – 32+00
-Y1-	12+40 – 30+89
-Y2-	10+00 – 30+00
-Y3-	10+00 – 13+00

Subsurface profiles and cross sections showing the existing and proposed grades along these alignments are included in this report.

AREAS OF SPECIAL GEOTECHNICAL INTEREST

The following section contains soft/loose, and/or wet soils which have the potential to cause embankment/subgrade and or slope stability problems during construction:

Station

22+25 to 26+00 -Y1-

The following sections contain cohesive soils which have the potential to cause embankment/subgrade and or slope stability problems during construction:

Station

23+00 to 29+00, -L-
17+46 to 20+48, -Y1-
27+57 to 29+57, -Y1-
10+00 to 24+88, -Y2-

Ground water was measured within the following areas within 6 feet of existing grade and/or may cause groundwater related stability problems during construction:

Station

17+00 to 26+00 -Y1-
11+00 to 14+00 -Y1-
16+00 to 18+00 -Y2-

CONTRACT: ID: W-5206U

NOTE: SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

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

ROADWAY SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 45336.1.21(W-5206U) F.A. PROJ. HRRR-2238(1)

COUNTY CUMBERLAND

PROJECT DESCRIPTION SR 2252 (CHICKENFOOT ROAD) AT SR 2242 (BRAXTON ROAD) AND SR 2238 (SANDHILL ROAD)

RECOMMENDATIONS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	45336.1.21 (W-5206U)	1	21

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
		P.E.
		R/W & UTIL.

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. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

PERSONNEL

C. V. NORVILLE

J. R. HAMM

T. E. EVANS

A. S. PAUL

SDS

INVESTIGATED BY A. S. PAUL

CHECKED BY J. R. HAMM

SUBMITTED BY FALCON

DATE AUGUST 2014

DRAWN BY: T. E. EVANS, A. S. PAUL

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

PROJECT REFERENCE NO.	SHEET NO.
45336.1.21 (W-5206U)	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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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
LIQUID LIMIT	6 MX			NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX					10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0			0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A 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/FT²)
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 0.50 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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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 W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [x] CME-550X
- [ ] 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_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
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 THE 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, 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 BASED ON .TIN FILES AND CONTOUR ELEVATIONS
ELEVATION: FT.

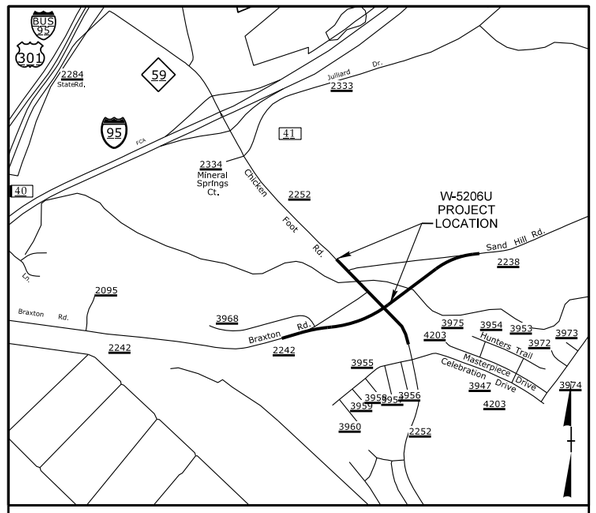
NOTES:
FIAD - FILLED IMMEDIATELY AFTER DRILLED
UCP - UNDIVIDED COASTAL PLAIN

REVISED 09/23/09

TIP PROJECT: W5206U

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W5206U	3	21

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
45336.1.21	HRRR-2238(1)	P.E.
45336.2.21	HRRR-2238(1)	R /W & UTILITY
45336.3.21	HRRR-2238(1)	CONSTRUCTION



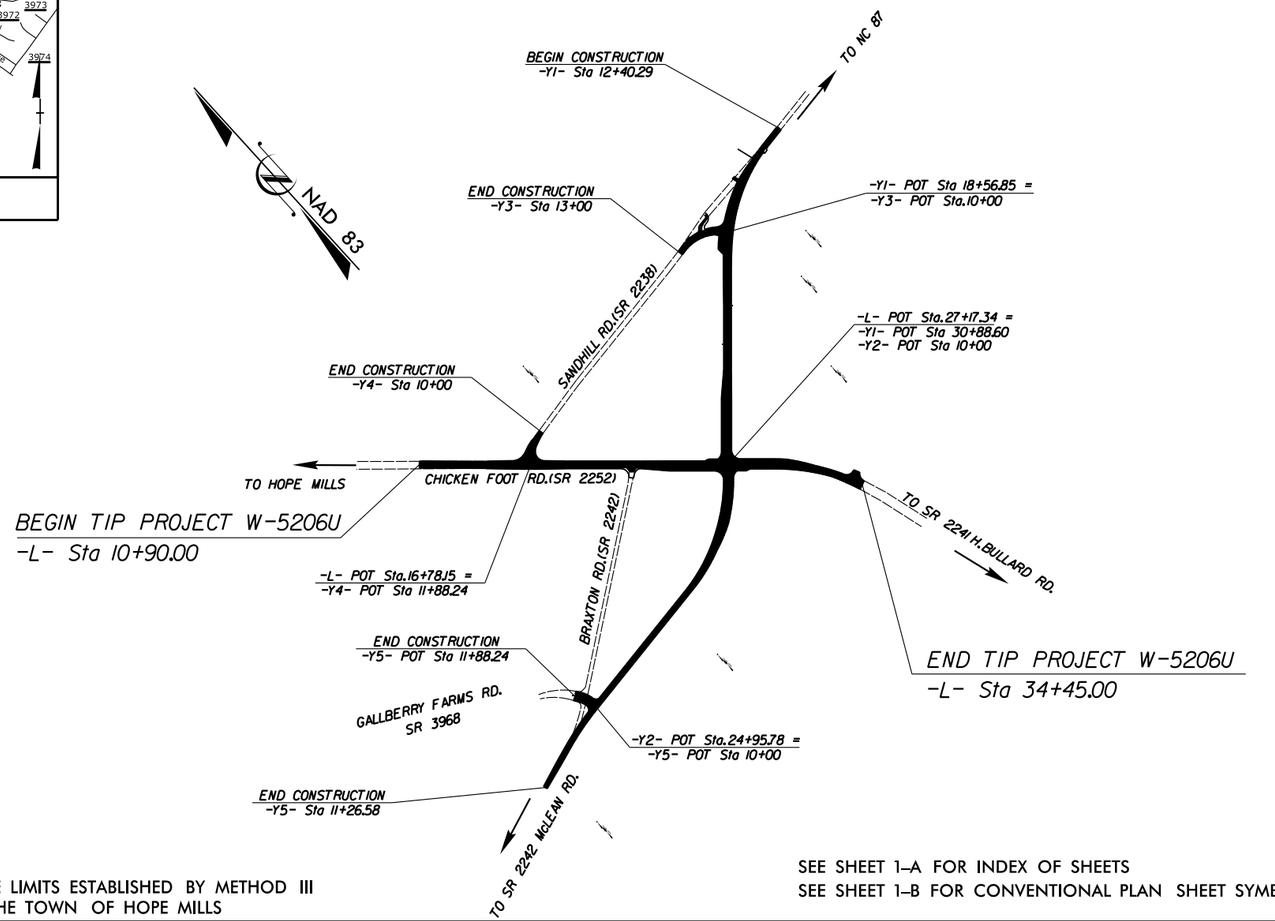
VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CUMBERLAND COUNTY

LOCATION: SR 2252 (CHICKENFOOT ROAD) AT SR 2238 (SANDHILL ROAD)

TYPE OF WORK: GRADING, PAVING, DRAINAGE, SIGNALS & PAVEMENT MARKINGS



75% REVIEW PLANS
APRIL 29, 2014

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III
THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE TOWN OF HOPE MILLS

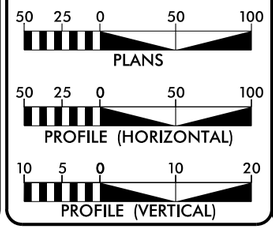
SEE SHEET 1-A FOR INDEX OF SHEETS
SEE SHEET 1-B FOR CONVENTIONAL PLAN SHEET SYMBOLS

CONTRACT:

$FILE$

$DATE$

GRAPHIC SCALES



DESIGN DATA

ADT 2012 = 11,000
ADT 2033 = 20,500
DHV = 14 %
D = 60 %
T = 1.5 %
V = 50 MPH

FUNC CLASS =
RURAL MAJOR COLLECTOR

PROJECT LENGTH

LENGTH ROADWAY -L- = 0.45 MILES
LENGTH ROADWAY PROJECT W5206U = 0.45 MILES

NCDOT CONTACT: SEAN MATUSZEWSKI
DIVISION DESIGN ENGINEER

PLANS PREPARED FOR THE NCDOT BY:

RIVERS & ASSOCIATES, INC.
5808 Farlngdon Place Suite 203
Raleigh, NC 27609
(919) 848-3347
Engineers
Planners
Surveyors
Lansdcape Architects

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
MAY 2014

LETTING DATE:
MARCH 2015

THOMAS K. GOODWIN, P.E.
PROJECT ENGINEER

DAVID L. SMITH, P.E.
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

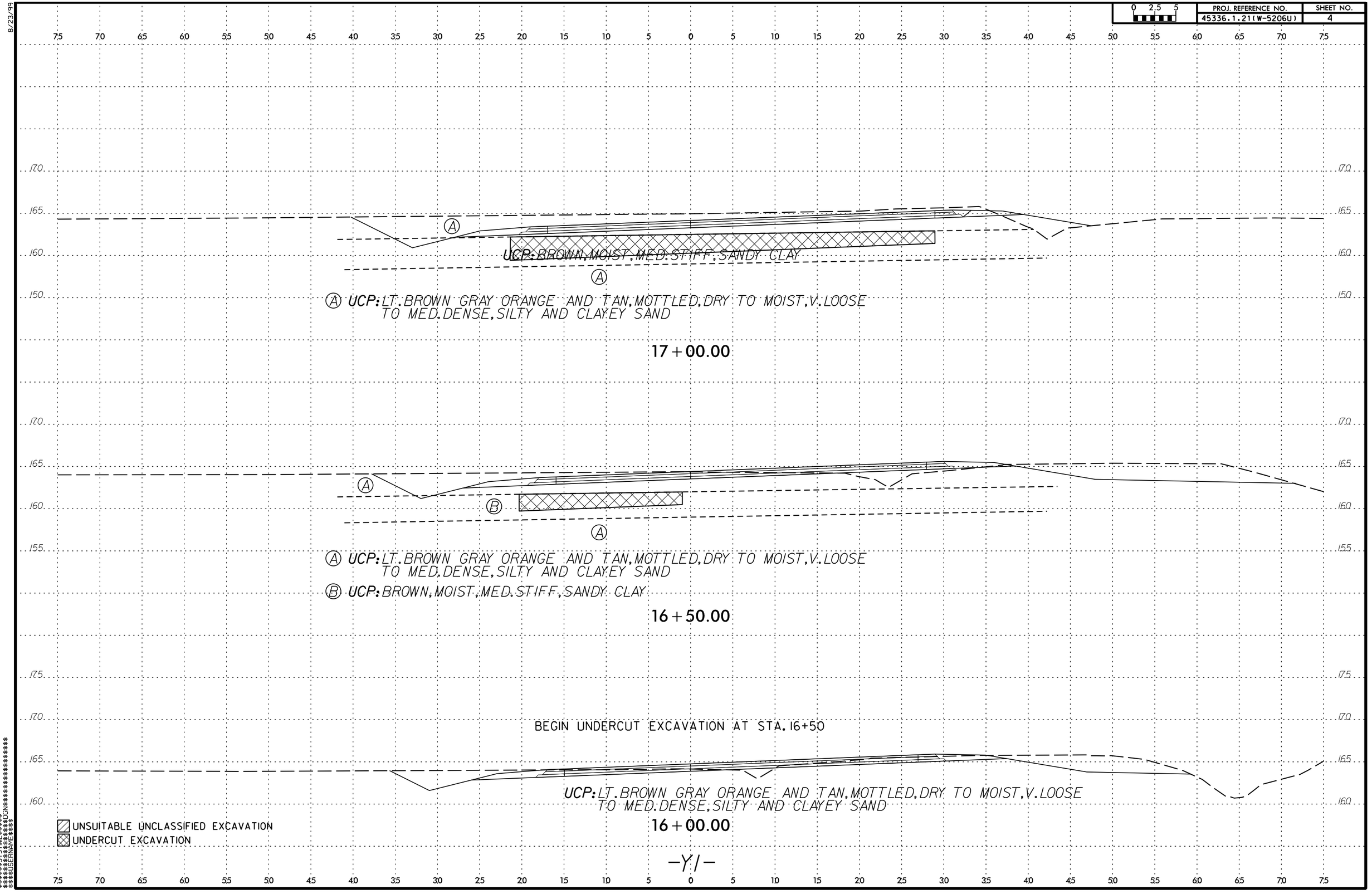
DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION ·

P.E.
STATE HIGHWAY DESIGN ENGINEER

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	4



$$$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

-Y/-

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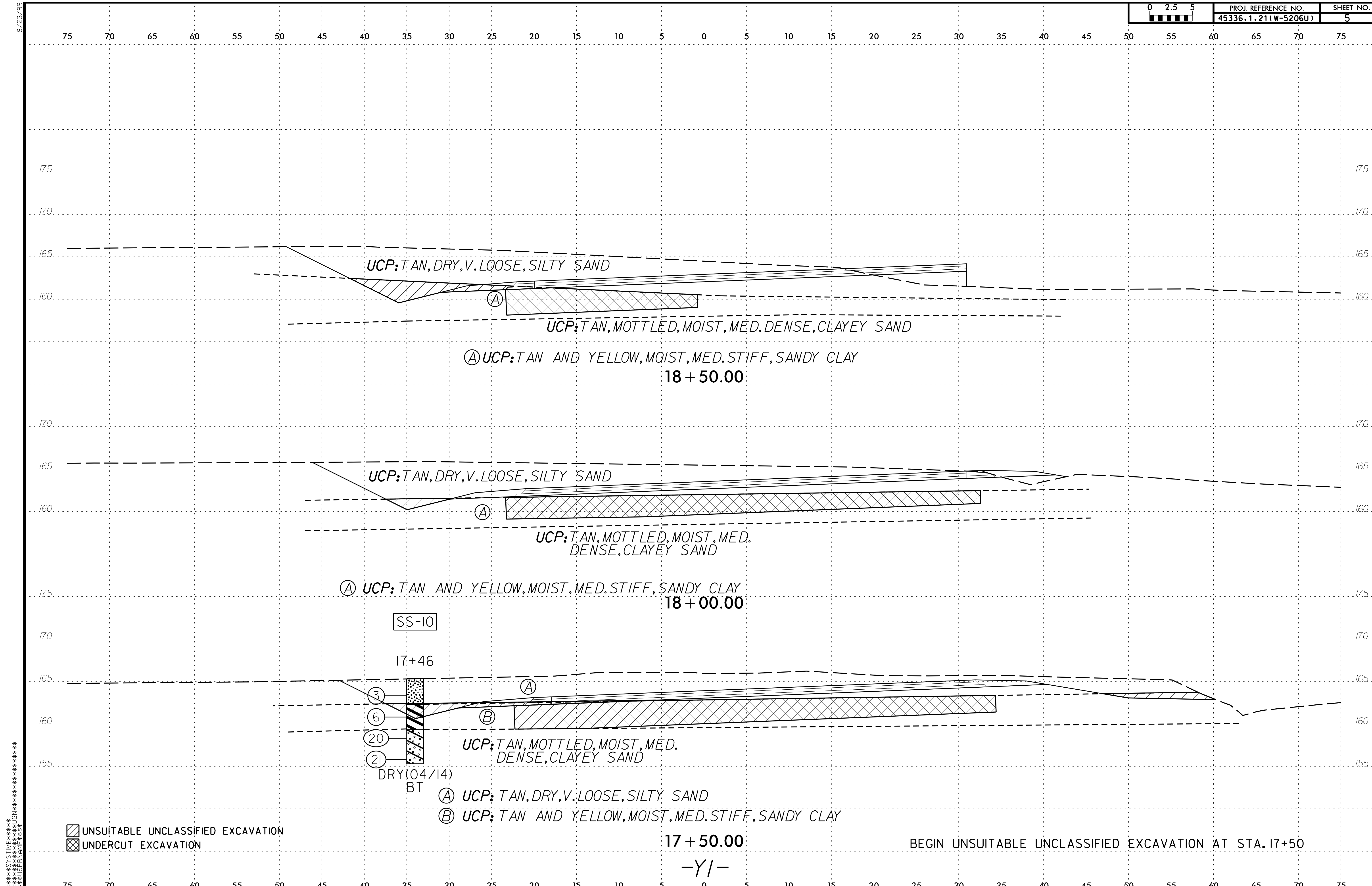

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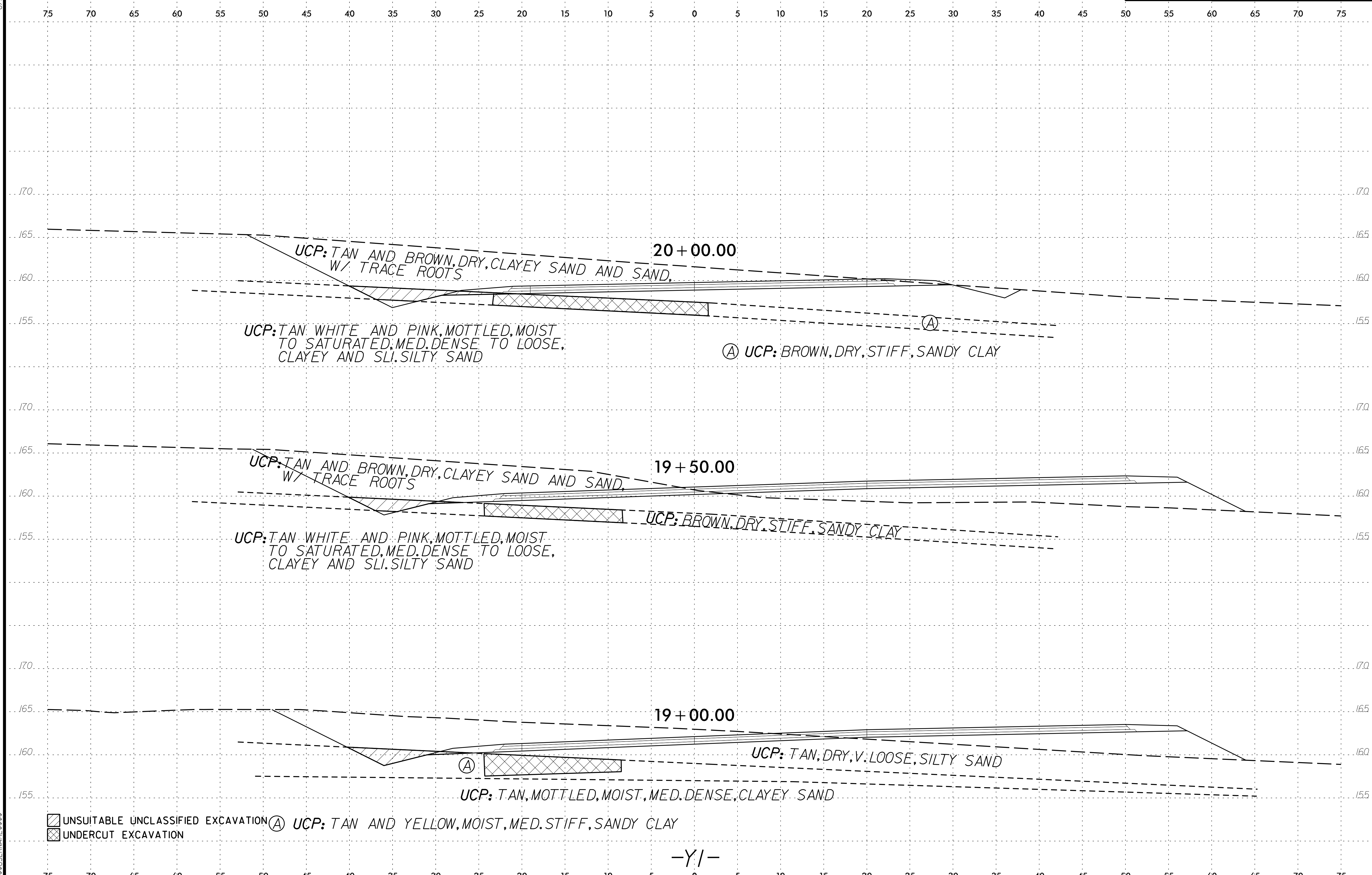


8/23/99

$$$$SYSTIME$$$$ $$$$DGN$$$$ $$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	7

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

165 160 155 150

UCP: LT. BROWN GRAY ORANGE AND TAN, MOTTLED, MOIST TO SATURATED, MED. DENSE TO LOOSE, CLAYEY AND SILTY SAND AND SAND

21+50.00

END UNSUITABLE UNCLASSIFIED EXCAVATION AT STA. 21+43
END UNDERCUT EXCAVATION AT STA. 21+43

UCP: TAN AND BROWN, DRY, CLAYEY SAND AND SAND, W/ TRACE ROOTS

UCP: TAN WHITE AND PINK, MOTTLED, MOIST TO SATURATED, MED. DENSE TO LOOSE, CLAYEY AND SLI. SILTY SAND

Ⓐ UCP: BROWN, DRY, STIFF, SANDY CLAY

21+00.00

170 165 160 155 150 145

SS-8
SS-9
BS-2

20+48

UCP: TAN AND BROWN, DRY, CLAYEY SAND AND SAND, W/ TRACE ROOTS

3 10 17 8 7

UCP: TAN WHITE AND PINK, MOTTLED, MOIST TO SATURATED, MED. DENSE TO LOOSE, CLAYEY AND SLI. SILTY SAND

Ⓐ UCP: BROWN, DRY, STIFF, SANDY CLAY

DRY (04/14)
BT

20+50.00

UNSUITABLE UNCLASSIFIED EXCAVATION
UNDERCUT EXCAVATION

$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$$USERNAME$$$$

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	8

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

155 150 145 140

S-1
22+90
07/14

ALLUV: GRAY AND TAN, SATURATED, V. LOOSE, SILTY SAND

UCP: GRAY ORANGE AND RED, SATURATED, LOOSE TO MED. DENSE, CLAYEY AND SILTY SAND

23+00.00

155 150 145 140

Ⓐ

UCP: GRAY ORANGE AND RED, SATURATED, LOOSE TO MED. DENSE, SAND AND CLAYEY AND SILTY SAND

Ⓐ **ALLUV:** GRAY, SATURATED, SAND

22+50.00

BEGIN UNDERCUT EXCAVATION AT STA. 22+33

160 155 150 145 140 135

22+12

04/14

9
15
4
6
14

BT

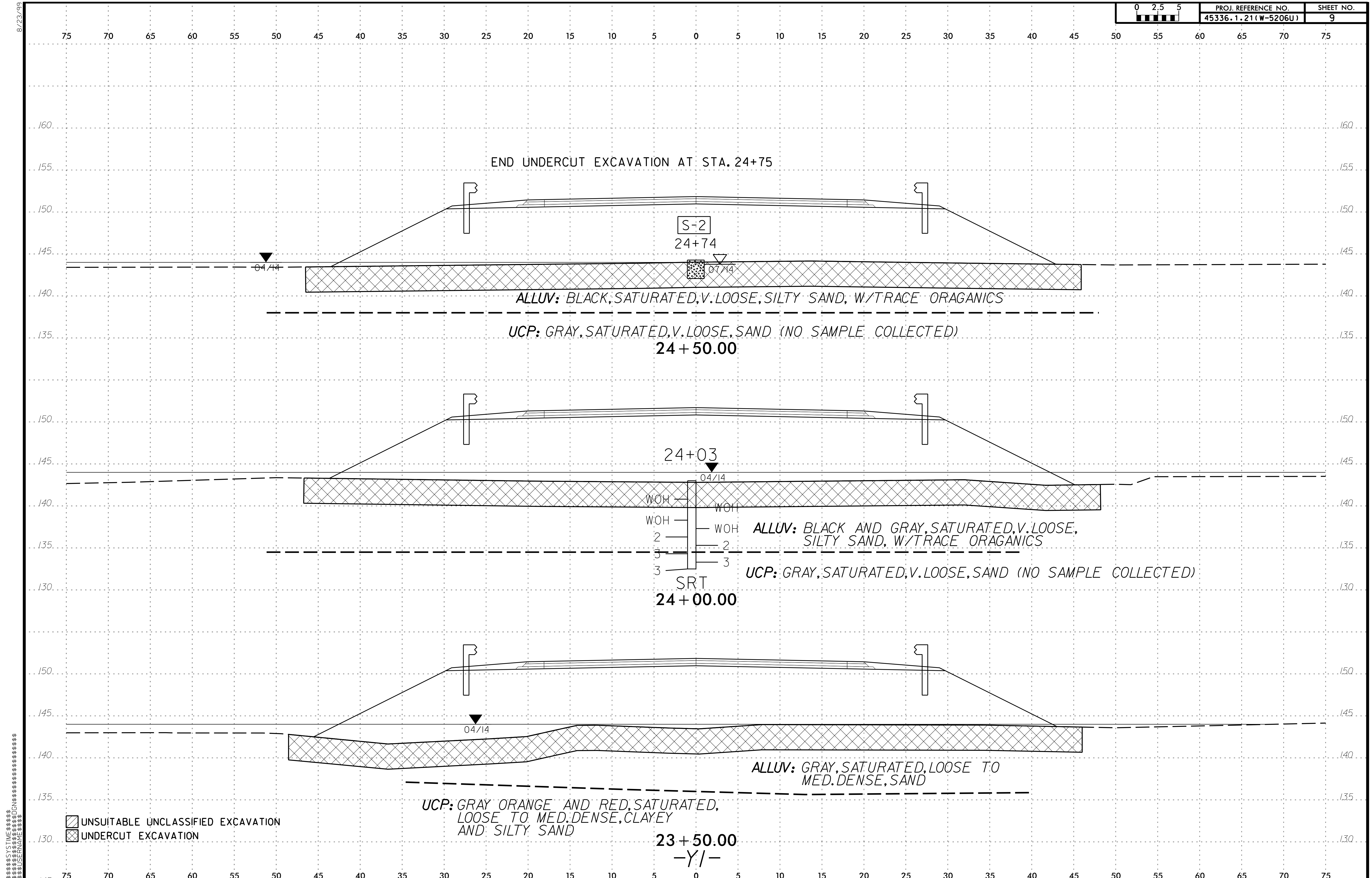
UCP: GRAY ORANGE AND RED, SATURATED, LOOSE TO MED. DENSE, SAND AND CLAYEY AND SILTY SAND

UNSUITABLE UNCLASSIFIED EXCAVATION
UNDERCUT EXCAVATION

22+00.00

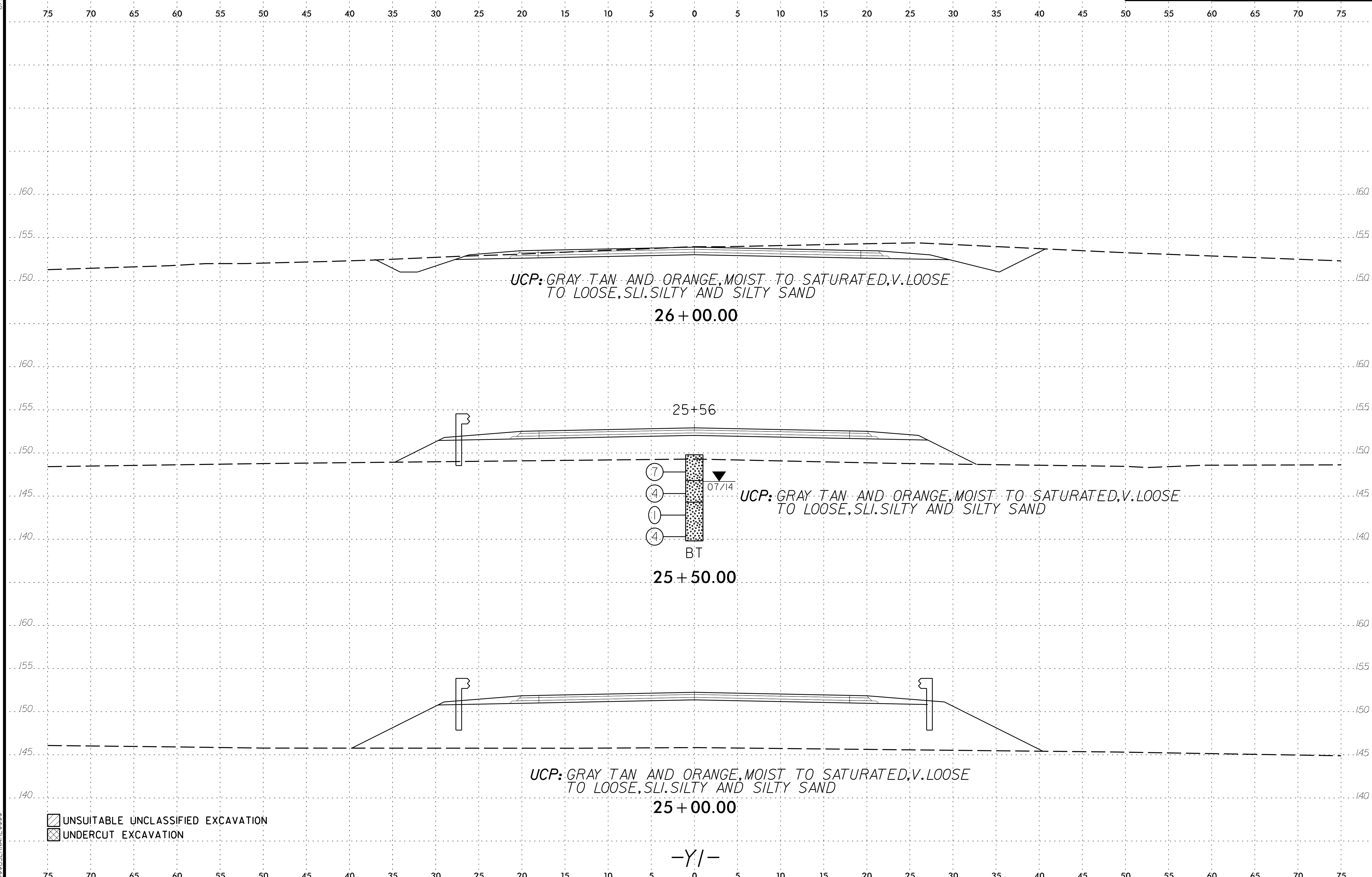
-Y/-

$$$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$


8/23/99
0 2.5 5
PROJ. REFERENCE NO.
45336.1.21(W-5206U)
SHEET NO.
9
END UNDERCUT EXCAVATION AT STA. 24+75
S-2
24+74
04/14
07/14
ALLUV: BLACK,SATURATED,V.LOOSE,SILTY SAND, W/TRACE ORAGANICS
UCP: GRAY,SATURATED,V.LOOSE,SAND (NO SAMPLE COLLECTED)
24+50.00
24+03
04/14
WOH
WOH
WOH
WOH
2
2
3
3
3
SRT
ALLUV: BLACK AND GRAY,SATURATED,V.LOOSE, SILTY SAND, W/TRACE ORAGANICS
UCP: GRAY,SATURATED,V.LOOSE,SAND (NO SAMPLE COLLECTED)
24+00.00
04/14
ALLUV: GRAY,SATURATED,LOOSE TO MED.DENSE,SAND
UCP: GRAY ORANGE AND RED,SATURATED, LOOSE TO MED.DENSE,CLAYEY AND SILTY SAND
UNSUITABLE UNCLASSIFIED EXCAVATION
UNDERCUT EXCAVATION
23+50.00
-Y1-
$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

8/23/99

PROJ. REFERENCE NO.	SHEET NO.
45336.1.21(W-5206U)	10



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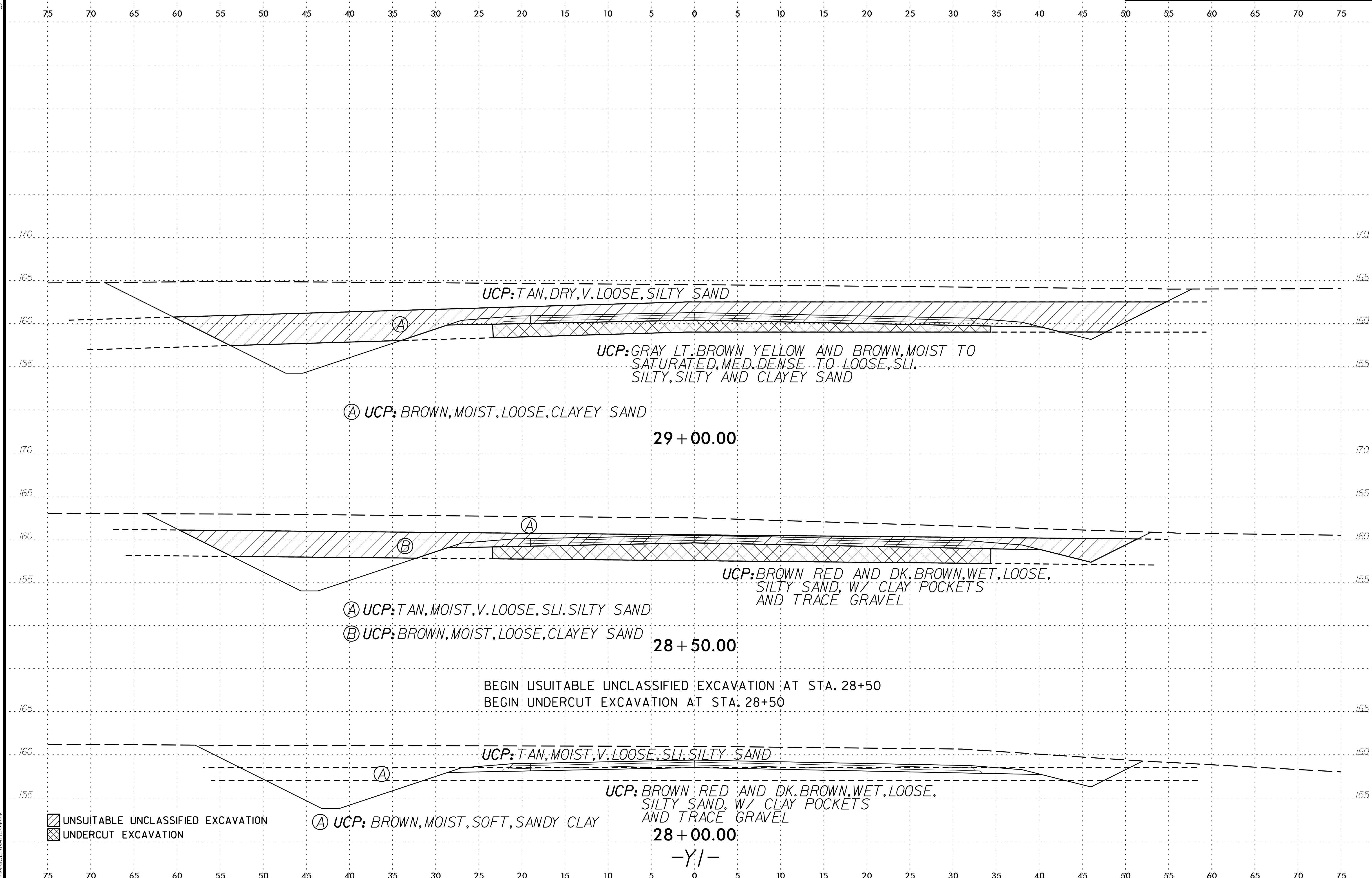
$$$$DGN$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

8/23/99

PROJ. REFERENCE NO.	SHEET NO.
45336.1.21(W-5206U)	11



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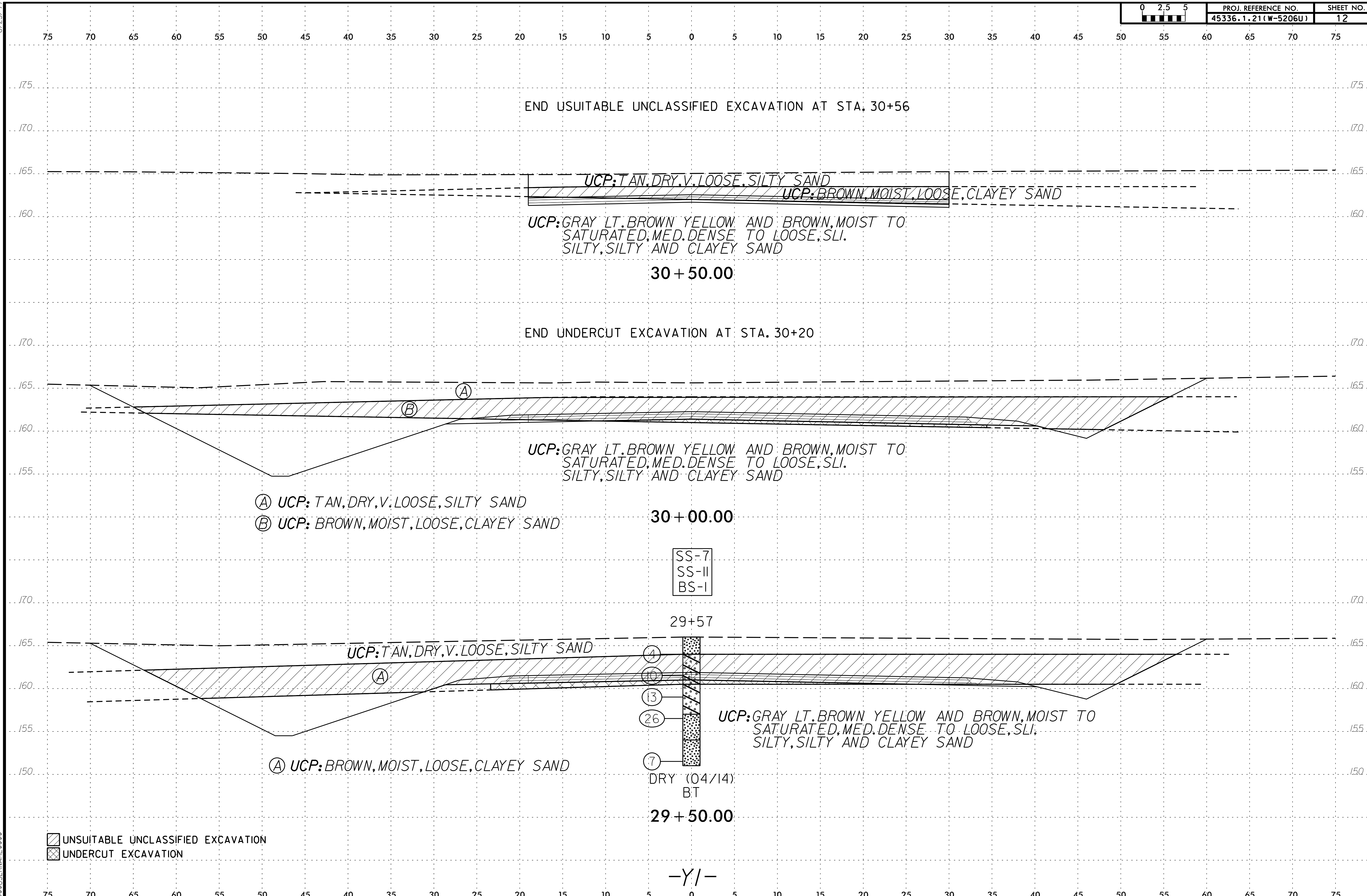

PROJ. REFERENCE NO.
45336.1.21(W-5206U)
SHEET NO.
12
0 2.5 5
END USUITABLE UNCLASSIFIED EXCAVATION AT STA. 30+56
UCP: TAN, DRY, V. LOOSE, SILTY SAND
UCP: BROWN, MOIST, LOOSE, CLAYEY SAND
UCP: GRAY LT. BROWN YELLOW AND BROWN, MOIST TO SATURATED, MED. DENSE TO LOOSE, SLI. SILTY, SILTY AND CLAYEY SAND
30 + 50.00
END UNDERCUT EXCAVATION AT STA. 30+20
UCP: GRAY LT. BROWN YELLOW AND BROWN, MOIST TO SATURATED, MED. DENSE TO LOOSE, SLI. SILTY, SILTY AND CLAYEY SAND
(A) UCP: TAN, DRY, V. LOOSE, SILTY SAND
(B) UCP: BROWN, MOIST, LOOSE, CLAYEY SAND
30 + 00.00
SS-7
SS-11
BS-1
29+57
UCP: TAN, DRY, V. LOOSE, SILTY SAND
4
10
13
26
7
UCP: GRAY LT. BROWN YELLOW AND BROWN, MOIST TO SATURATED, MED. DENSE TO LOOSE, SLI. SILTY, SILTY AND CLAYEY SAND
(A) UCP: BROWN, MOIST, LOOSE, CLAYEY SAND
DRY (04/14)
BT
29 + 50.00
UNSUITABLE UNCLASSIFIED EXCAVATION
UNDERCUT EXCAVATION
-Y1-

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	13

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

175
170
165
160

UCP: BLACK AND TAN, DRY TO WET, V. LOOSE TO LOOSE, SILTY SAND (CULTIVATED FARM PASTURE)

UCP: BROWN, WET TO MOIST, MED. STIFF TO STIFF, SANDY CLAY

UCP: TAN ORANGE BROWN AND GRAY, MOTTLED, MOIST TO SATURATED, MED. DENSE TO V. LOOSE, SILTY SAND

11+50.00

UCP: BROWN, WET TO MOIST, MED. STIFF TO STIFF, SANDY CLAY

UCP: TAN ORANGE BROWN AND GRAY, MOTTLED, MOIST TO SATURATED, MED. DENSE TO V. LOOSE, SILTY SAND

11+00.00

10+68

UCP: BROWN, WET TO MOIST, MED. STIFF TO STIFF, SANDY CLAY

UCP: TAN ORANGE BROWN AND GRAY, MOTTLED, MOIST TO SATURATED, MED. DENSE TO V. LOOSE, SILTY SAND

6
14
18
14
4
04/14
BT

10+50.00

BEGIN UNSUITABLE UNCLASSIFIED EXCAVATION AT 10+50
BEGIN UNDERCUT EXCAVATION AT 10+50

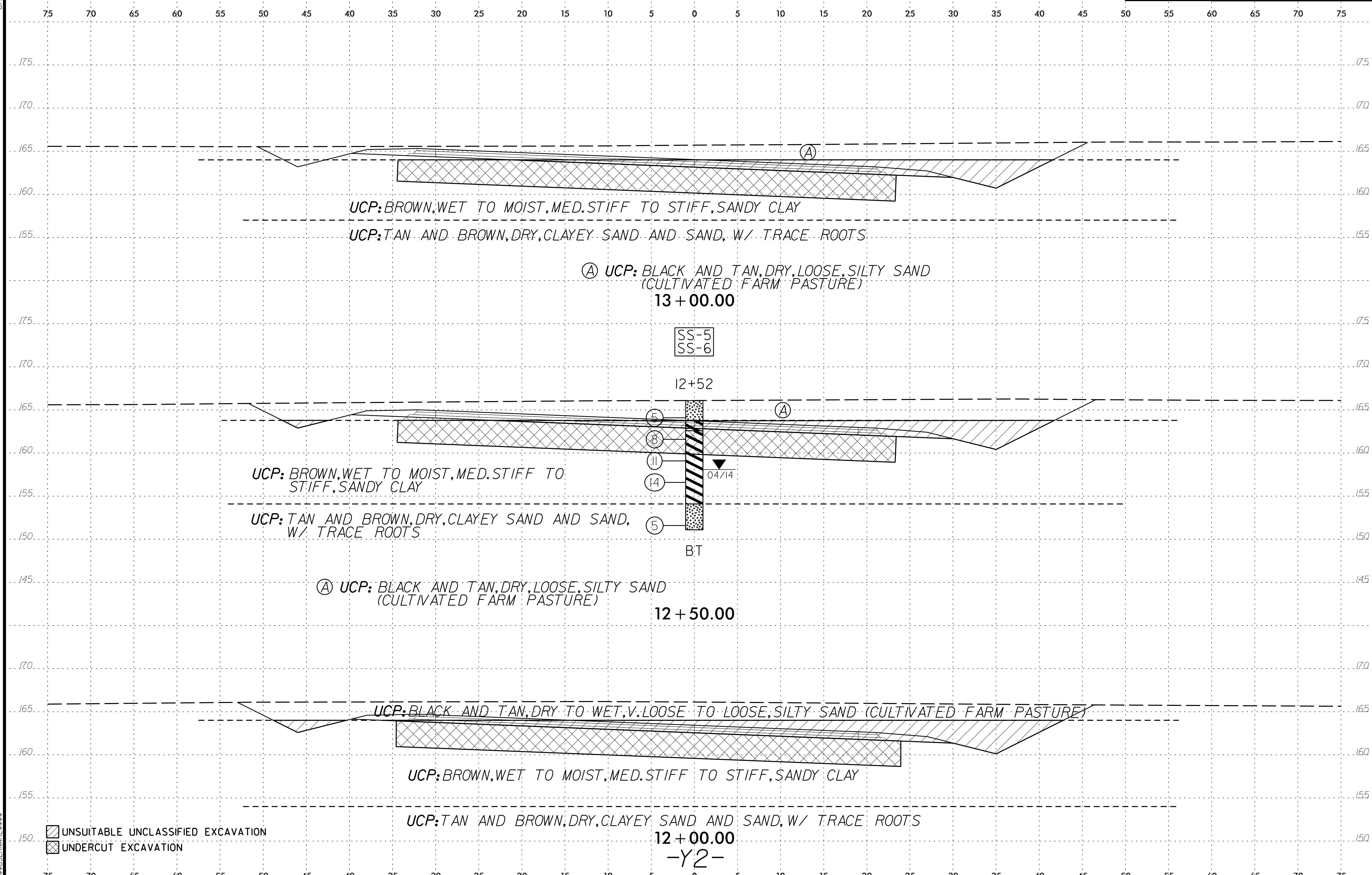
UNSUITABLE UNCLASSIFIED EXCAVATION
UNDERCUT EXCAVATION

-Y2-

$$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$$$USERNAME$$$$

8/23/99

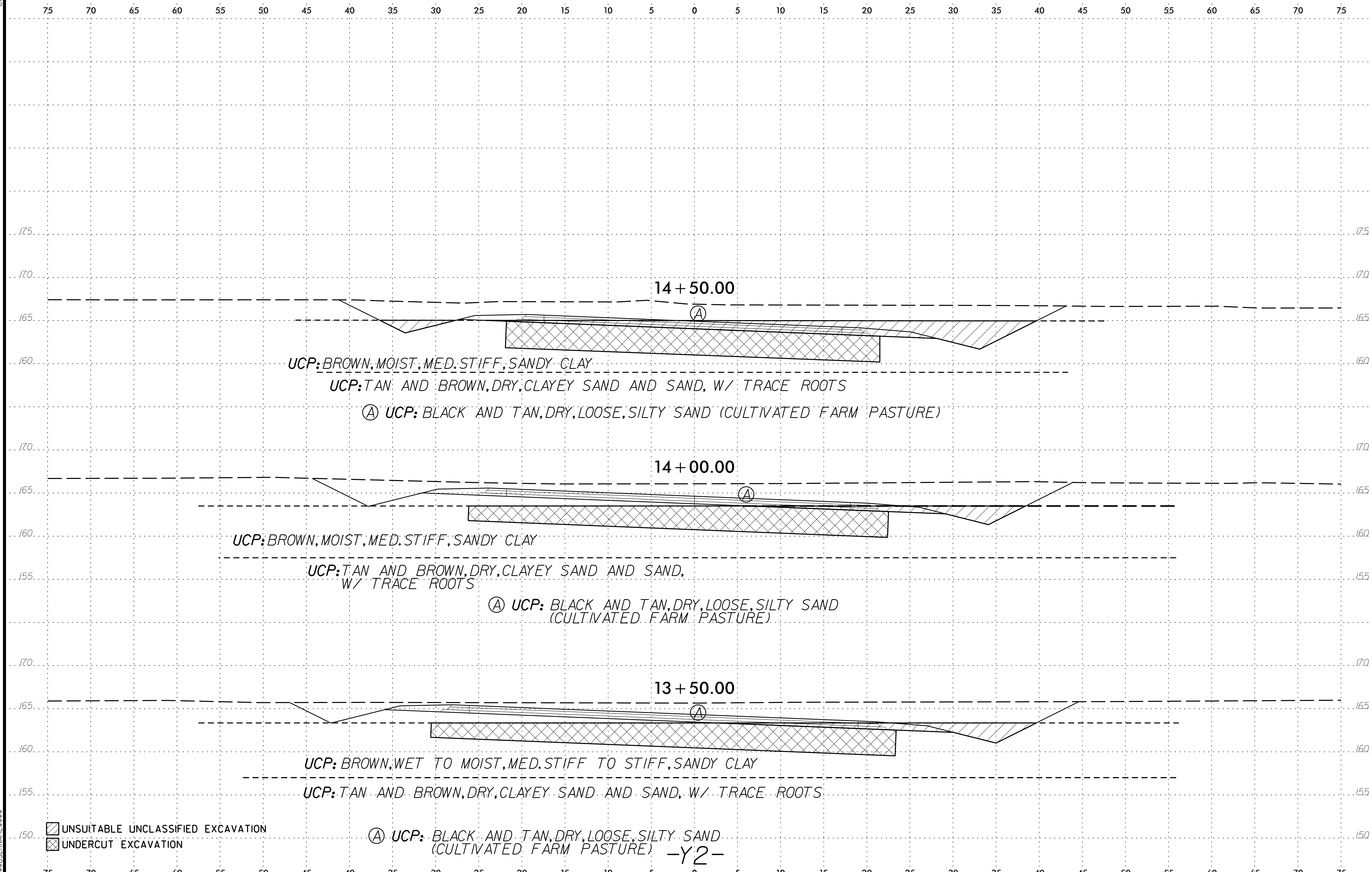
0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	14



$$$$$SYSTIME$$$$ $$$$$$DGN$$$$$$$$$$$$$$$$ $$$$$USERNAME$$$$

8/23/99

PROJ. REFERENCE NO.	SHEET NO.
45336.1.21(W-5206U)	15



$$$$SYSTIME$$$$ $$$$$$$$$$$DGN$$$$$$$$$$$$$$$$ $$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	16

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

175
170
165
160
155
150
145

UCP: BROWN LT. BROWN AND GRAY, MOTTLED, MOIST TO WET, MED. STIFF TO V. STIFF, SANDY CLAY

16+50.00

UCP: BROWN LT. BROWN AND GRAY, MOTTLED, MOIST TO WET, MED. STIFF TO V. STIFF, SANDY CLAY

16+00.00

UCP: BROWN, MOIST, MED. STIFF, SANDY CLAY

UCP: TAN AND RED, MOIST TO SATURATED, SILTY SAND

15+50.00

Ⓐ UCP: BLACK AND TAN, WET, V. LOOSE, SILTY SAND (CULTIVATED FARM PASTURE)

14+78

3
7
8
24
WOH

04/14

BT

UCP: BROWN, MOIST, MED. STIFF, SANDY CLAY

UCP: TAN AND RED, MOIST TO SATURATED, SILTY SAND

Ⓐ UCP: BLACK AND TAN, WET, V. LOOSE, SILTY SAND (CULTIVATED FARM PASTURE)

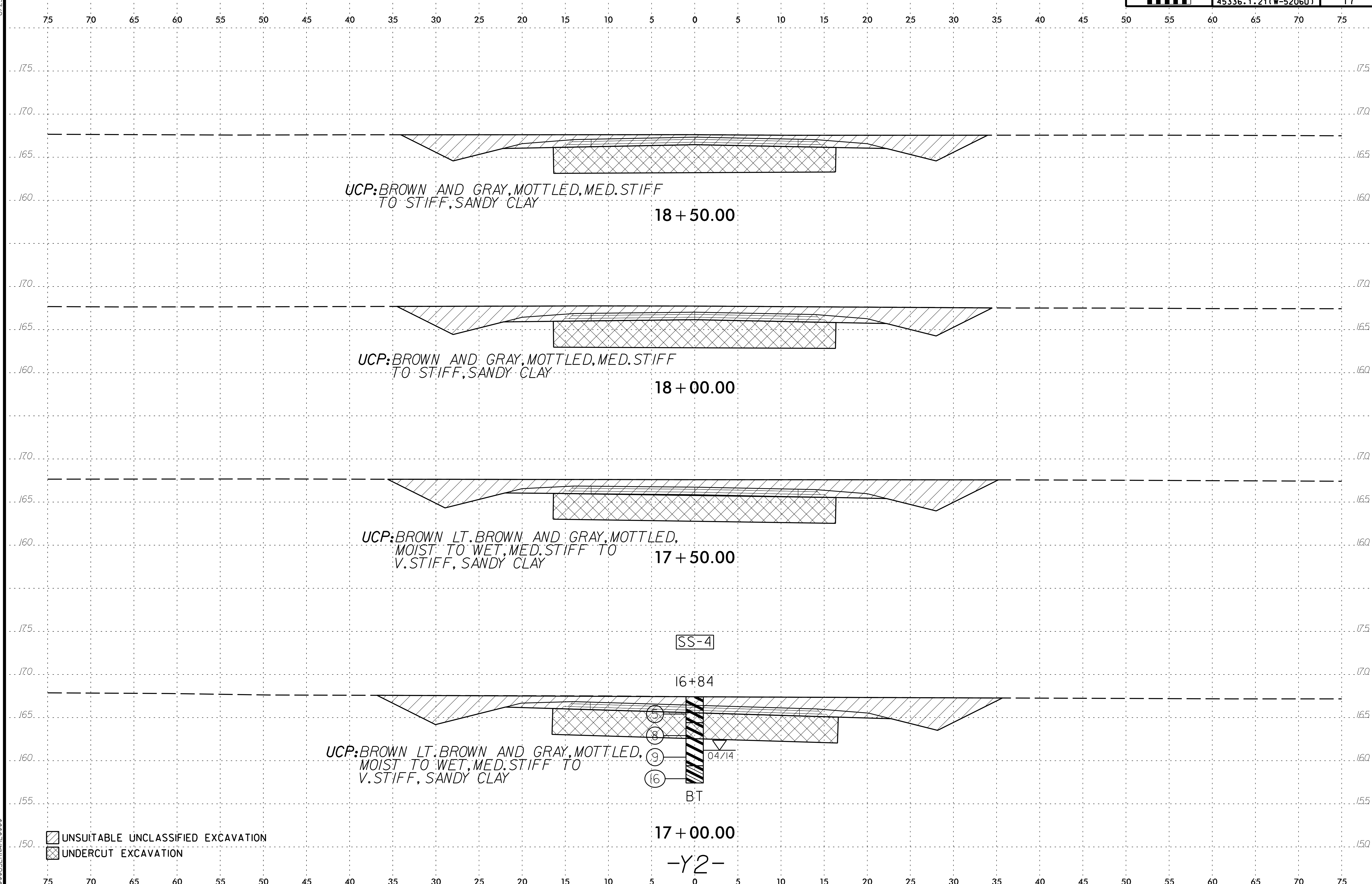
15+00.00

UNSUITABLE UNCLASSIFIED EXCAVATION
UNDERCUT EXCAVATION

-Y2-

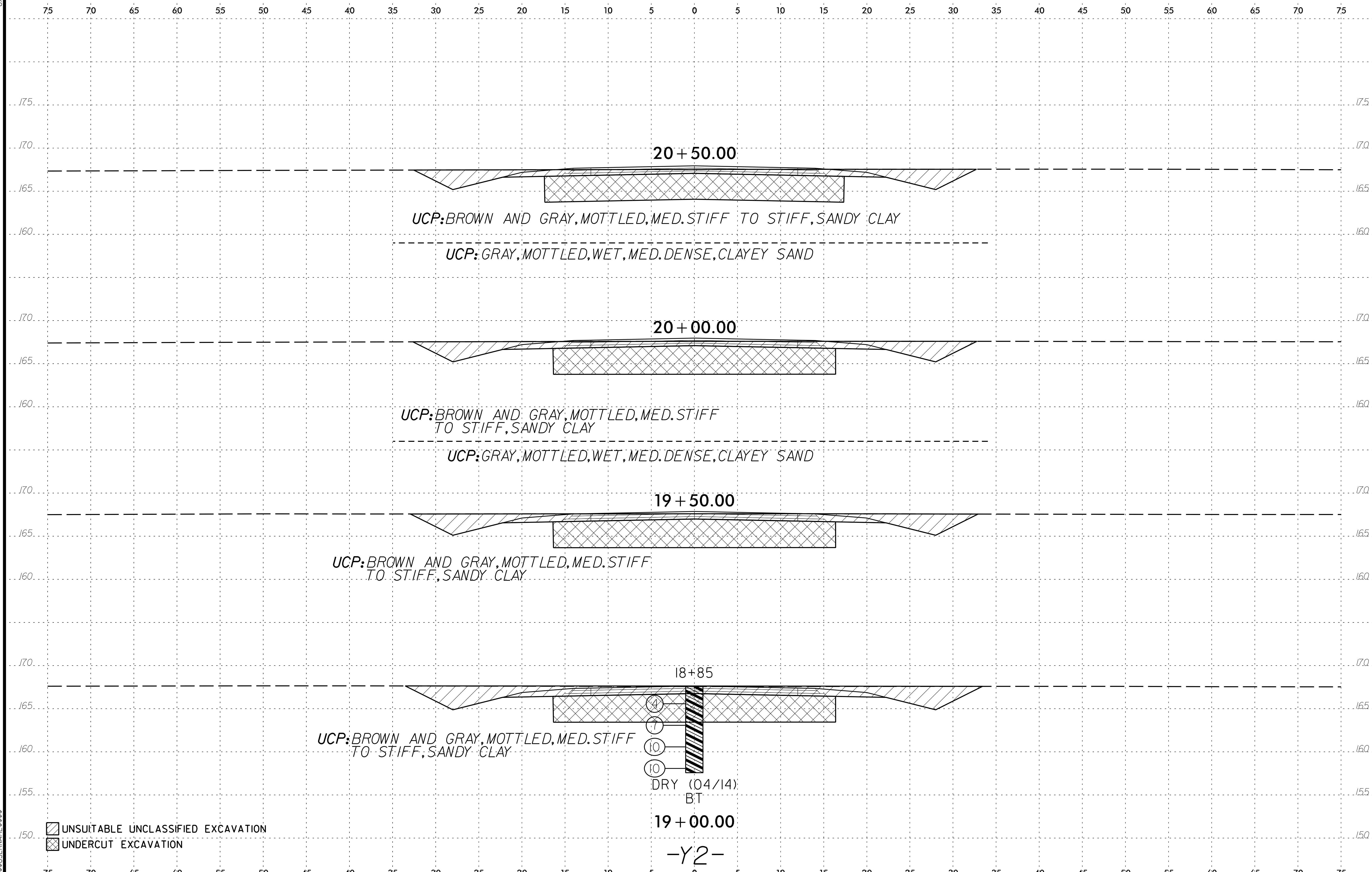
$$$$SYSTIME$$$$
$$$$DGN$$$$
$$$$USERNAME$$$$

PROJ. REFERENCE NO.	SHEET NO.
45336.1.21(W-5206U)	17



8/23/99

$$$$$$SYSTIME$$$$$ $$$$$$$$DGN$$$$$$$$$$$$$$$$$ $$$$USERNAME$$$$


20+50.00
UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY
UCP: GRAY, MOTTLED, WET, MED. DENSE, CLAYEY SAND
20+00.00
UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY
UCP: GRAY, MOTTLED, WET, MED. DENSE, CLAYEY SAND
19+50.00
UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY
18+85
4
7
10
10
DRY (04/14)
BT
UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY
19+00.00
-Y2-
UNSUITABLE UNCLASSIFIED EXCAVATION
UNDERCUT EXCAVATION

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	19

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

180 175 170 165 160

22+50.00

UCP: BROWN, WET TO MOIST, SOFT TO STIFF, SANDY CLAY

UCP: GRAY, MOTTLED, MOIST TO SATURATED, MED. DENSE, CLAYEY AND SILTY SAND

22+00.00

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

UCP: GRAY, MOTTLED, WET, MED. DENSE, CLAYEY SAND

21+50.00

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

UCP: GRAY, MOTTLED, WET, MED. DENSE, CLAYEY SAND

SS-3

20+86

14 10 11 17

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

UCP: GRAY, MOTTLED, WET, MED. DENSE, CLAYEY SAND

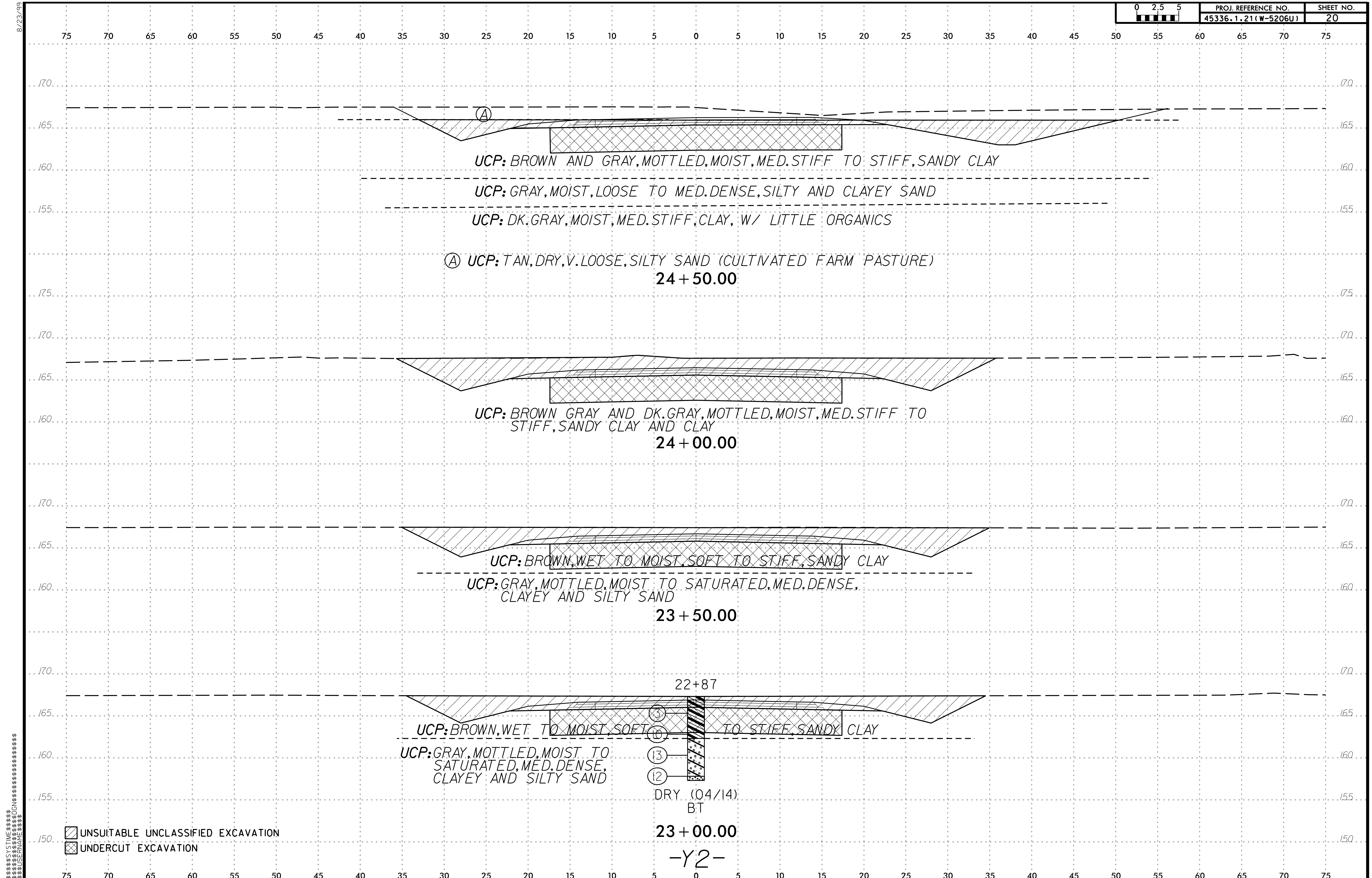
DRY (04/14)
BT

21+00.00

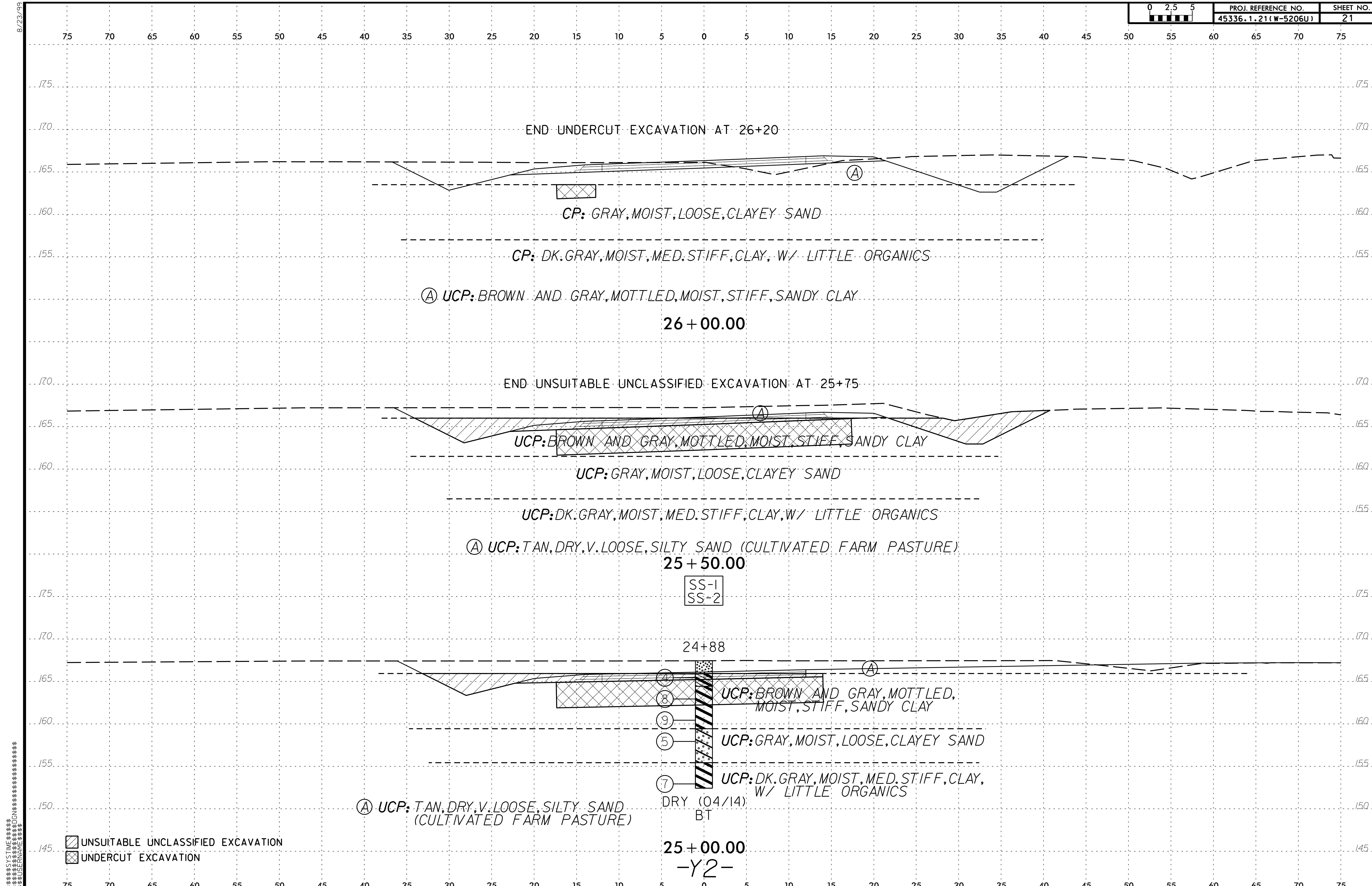
-Y2-

UNSUITABLE UNCLASSIFIED EXCAVATION
UNDERCUT EXCAVATION

$$$$USERNAME$$$$ $$$$SYSTIME$$$$


8/23/99
0 2.5 5
Ⓐ
UCP: BROWN AND GRAY, MOTTLED, MOIST, MED. STIFF TO STIFF, SANDY CLAY
UCP: GRAY, MOIST, LOOSE TO MED. DENSE, SILTY AND CLAYEY SAND
UCP: DK. GRAY, MOIST, MED. STIFF, CLAY, W/ LITTLE ORGANICS
Ⓐ UCP: TAN, DRY, V. LOOSE, SILTY SAND (CULTIVATED FARM PASTURE)
24+50.00
UCP: BROWN GRAY AND DK. GRAY, MOTTLED, MOIST, MED. STIFF TO STIFF, SANDY CLAY AND CLAY
24+00.00
UCP: BROWN, WET TO MOIST, SOFT TO STIFF, SANDY CLAY
UCP: GRAY, MOTTLED, MOIST TO SATURATED, MED. DENSE, CLAYEY AND SILTY SAND
23+50.00
22+87
3
10
13
12
UCP: BROWN, WET TO MOIST, SOFT TO STIFF, SANDY CLAY
UCP: GRAY, MOTTLED, MOIST TO SATURATED, MED. DENSE, CLAYEY AND SILTY SAND
DRY (04/14)
BT
23+00.00
-Y2-
UNSUITABLE UNCLASSIFIED EXCAVATION
UNDERCUT EXCAVATION
$$$$$$SYSTIME$$$$$
$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$$$USERNAME$$$$

PROJ. REFERENCE NO.	SHEET NO.
45336.1.21(W-5206U)	21



PHYSIOGRAPHY AND GEOLOGY

The project site is in the western portion of the Coastal Plain Physiographic Province of North Carolina. According to the ***Geologic Map of North Carolina*** (1985), the site is underlain by the Black Creek Formation (Kb) of the Cretaceous age. This unit is noted to contain gray to black, lignitic clay with thin beds and laminae of fine-grained micaceous sand and thick lenses of cross-bedded sand. Glauconitic, fossiliferous clayey sandy lenses are present in the upper portions.

New cuts on the order of up to 4.5 feet and fills on the order of up to 10 feet are proposed along both left and right sides of the project within the right-of-way, including the embankment at the culvert locations previously identified.

Existing site topography is relatively flat; typical of the coastal plains especially in flood plains. Predominantly wide and shallow drainage swales parallel existing roadway alignments, and carry roadway drainage toward various drainage features and natural creeks. Topography is relatively flat in agricultural areas but slope downward to flood plains.

SOIL PROPERTIES

A variety of soils were encountered along the project, including artificial fills of nearby origins, existing roadway embankments, alluvial deposits, and coastal plains deposits.

Artificial fill soils were encountered at the ground surface in agricultural areas, potentially from previous cultivation by agricultural operations, and consisted of moist to wet, loose, silty sands (A-2-4) and soft to medium stiff, sandy clays (A-6, A-7) with organics and roots.

Roadway Embankment soils were encountered at the ground surface or beneath existing pavements in and adjacent to existing roadways and consisted of moist, medium dense, clayey sand (A-2-6) and stiff, sandy clay (A-6, A-7) with trace gravel.

Alluvial soils were encountered at the ground surface in the vicinity of wetlands and floodplains. These soils consist of saturated, very loose to medium dense, sand (A-3).

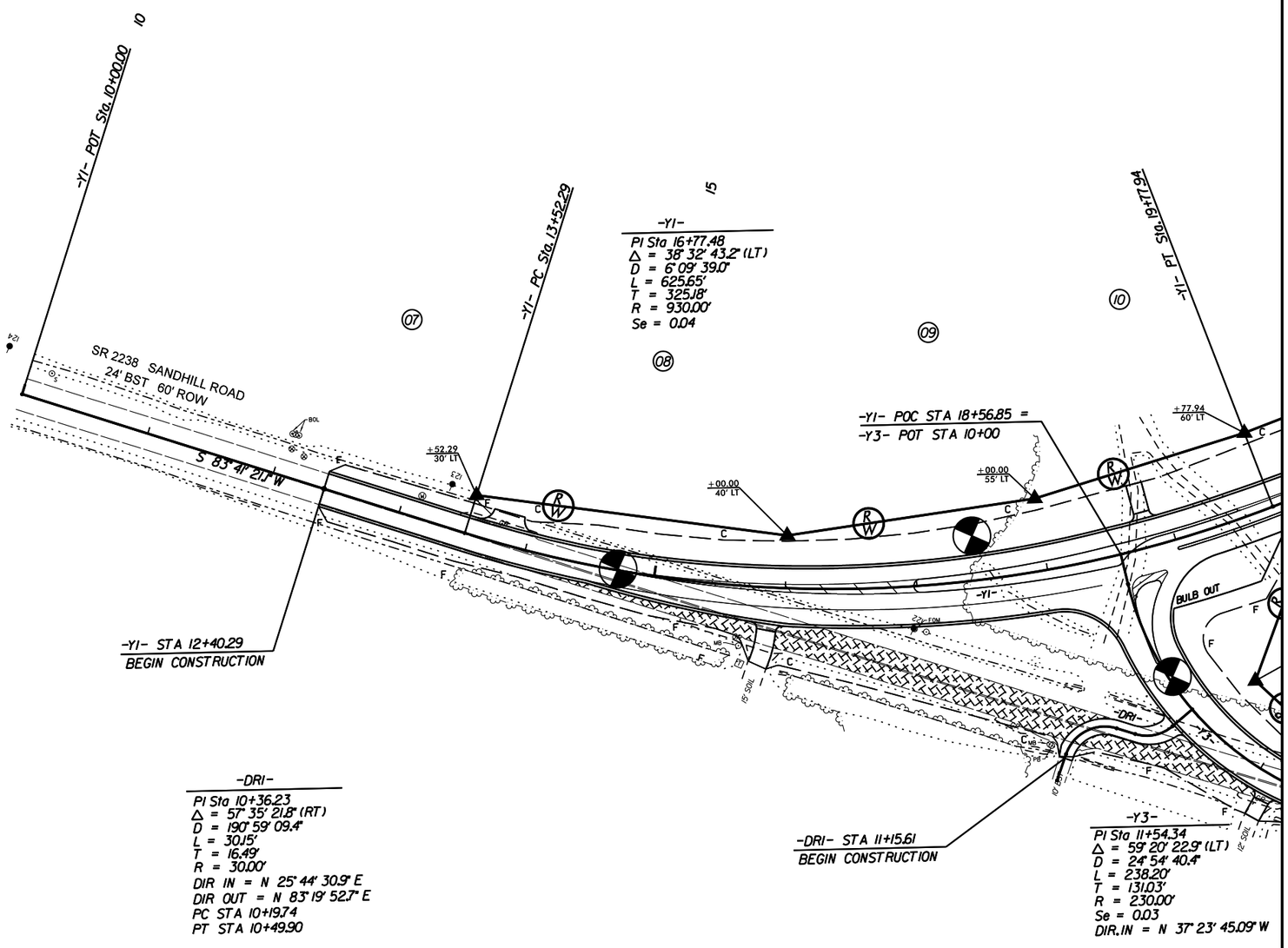
Coastal Plain soils were encountered at the ground surface and underneath artificial fill, roadway embankment, and/or alluvial soils. These soils consist of dry to saturated, very loose to medium dense, slightly silty and silty and clayey sands (A-1-a, A-2-4, A-2-6) and very soft to very stiff, sandy clays (A-6, A-7).

GROUNDWATER PROPERTIES

Groundwater levels were measured at the time of boring completion, and in some cases after a waiting period of at least 24 hours. Borings drilled within and in close proximity to existing roadways, and within active horse pasture were backfilled immediately after completion due to safety considerations. Groundwater was observed at shallow depths near streams and in low lying areas and will should be anticipated to be within 6 feet of finished roadway grades near Station 22+00 to 26+00 -Y1-. Detailed groundwater measurements are included in the attached boring logs and subsurface profiles.

The project alignment crosses Grays Creek and associated wetland/floodplain in the vicinity of -Y1- Station 22+25 to 25+10. Standing water is present in this area seasonally, with shallow groundwater also present for some distance beyond the mapped wetlands as discussed above. The ground surface was saturated with some standing water in the area at the time of our investigation. Shallow groundwater, flowing surface water, and saturated, soft soils are likely to be encountered in this area during construction.

NAD 83 NSRS 2007



-DRI-
PI Sta 10+36.23
Δ = 57° 35' 21.8" (RT)
D = 190° 59' 09.4"
L = 30.15'
T = 16.49'
R = 30.00'
DIR IN = N 25° 44' 30.9" E
DIR OUT = N 83° 19' 52.7" E
PC STA 10+19.74
PT STA 10+49.90

NOTES:

PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM RIVERS AND ASSOCIATES, INC. IN APRIL, 2014.

0 100 200
FEET

FALCON ENGINEERING

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

PHONE: 919.871.0800
FAX: 919.871.0803

SITE PLAN

SR 2252 (CHICKEN FOOT RD) AT
SR 2242 (BRAXTON RD AND SANDHILL RD)
CUMBERLAND COUNTY, NORTH CAROLINA
WBS: 45336.1.21, TIP: W-5206U
FALCON PROJECT NO.: G13072.00

NOTES:

PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM RIVERS AND ASSOCIATES, INC. IN APRIL, 2014.

0 100 200
FEET

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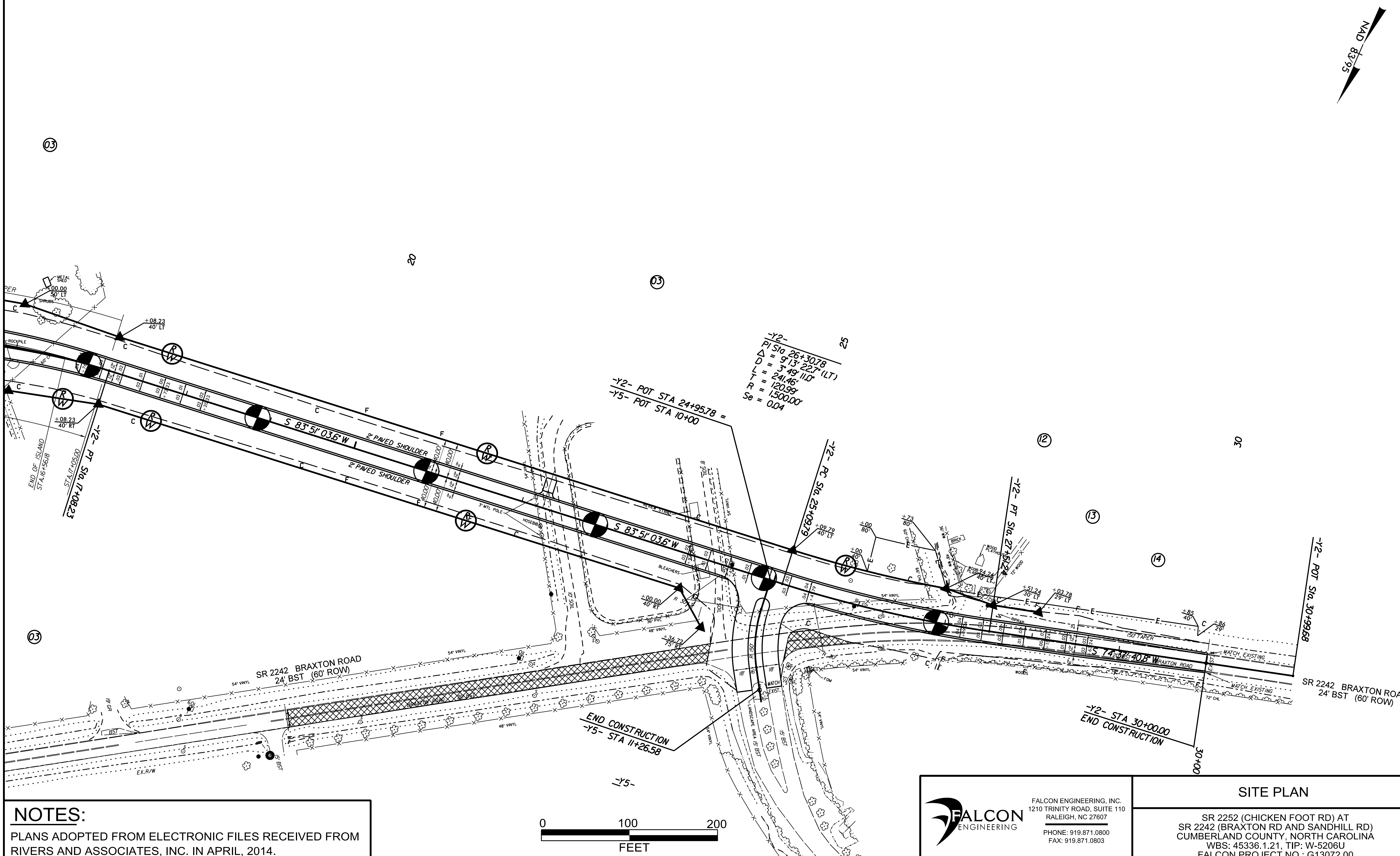
SR 2242 (BRAXTON RD AND SANDHILL RD)
CUMBERLAND COUNTY, NORTH CAROLINA
WBS: 45336.1.21, TIP: W-5206U
FALCON PROJECT NO.: G13072.00


NAD 83/95
03
20
25
30
12
13
14
METAL SHED
SHRUBS
ROCKPILE
+00.00 50' LT
+08.23 40' LT
+08.23 40' RT
END OF ISLAND STA.16+56.18
STA.17+05.00
-Y2- PT Sta. 17+08.23
S 83° 51' 03.6" W
2' PAVED SHOULDER
-Y2-
PI Sta 26+30.78
Δ = 9° 13' 22.7" (LT)
D = 3° 49' 11.0"
L = 241.46'
T = 120.99'
R = 1,500.00'
Se = 0.04
-Y2- POT STA 24+95.78 =
-Y5- POT STA 10+00
-Y2- PC Sta. 25+09.79
+09.79 40' LT
3" MTL POLE
HOSEBIB
REVIEW STAND
BLEACHERS
54" VINYL
48" VINYL
36" PVC
10' SOIL
8' SOIL
+00.00 40' RT
+36.72 75' RT
R 30'
R 150'
18'
16'
MATCH EXIST.
LANDSCAPE AREA 15' BST
15' BST
FOM
END CONSTRUCTION
-Y5- STA 11+26.58
-Y5-
SR 2242 BRAXTON ROAD
24' BST (60' ROW)
19' GR
BST
EX.R/W
-Y2- PT Sta. 27+51.24
+94.26 40' LT
+51.24 30' LT
+03.78 29' LT
WOOD PLAYHOUSE
WOOD PLANTER
BRICK
72" WOOD
RIPRAP
150' TAPER
S 74° 37' 40.8" W
BRAXTON ROAD
WOODS
MATCH EXISTING
72" CHL
+85 40'
+86 29'
-Y2- POT Sta. 30+99.68
-Y2- STA 30+00.00
END CONSTRUCTION
30+00
0 100 200
FEET

NOTES:

PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM RIVERS AND ASSOCIATES, INC. IN APRIL, 2014.

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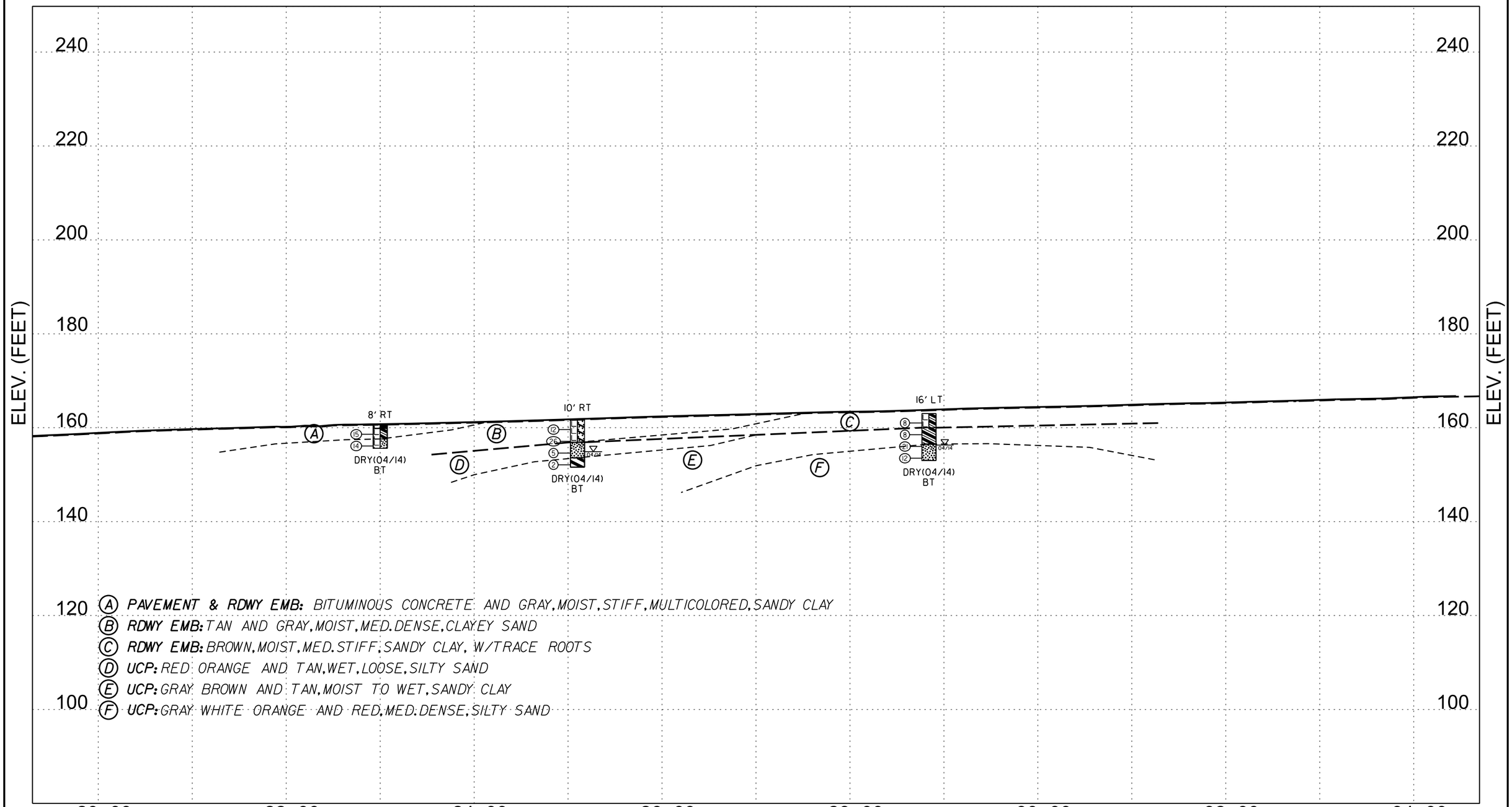
SITE PLAN

SR 2252 (CHICKEN FOOT RD) AT
SR 2242 (BRAXTON RD AND SANDHILL RD)
CUMBERLAND COUNTY, NORTH CAROLINA
WBS: 45336.1.21, TIP: W-5206U
FALCON PROJECT NO.: G13072.00



(A) ***PAVEMENT & RDWY EMB:*** *BITUMINOUS CONCRETE AND GRAY, MOIST, STIFF, MULTICOLORED, SANDY CLAY*

(B) ***RDWY EMB:*** *TAN AND GRAY, MOIST, MED. DENSE, CLAYEY SAND*

(C) ***RDWY EMB:*** *BROWN, MOIST, MED. STIFF, SANDY CLAY, W/TRACE ROOTS*

(D) ***UCP:*** *RED ORANGE AND TAN, WET, LOOSE, SILTY SAND*

(E) ***UCP:*** *GRAY BROWN AND TAN, MOIST TO WET, SANDY CLAY*

(F) ***UCP:*** *GRAY WHITE ORANGE AND RED, MED. DENSE, SILTY SAND*

NOTES:

- GROUNDLINE PROFILE TAKEN FROM ELECTRONIC FILES RECEIVED FROM RIVERS & ASSOCIATES, DATED APRIL 2014.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

VERTICAL SCALE

0 20 40

FEET

HORIZONTAL SCALE

0 100 200

FEET

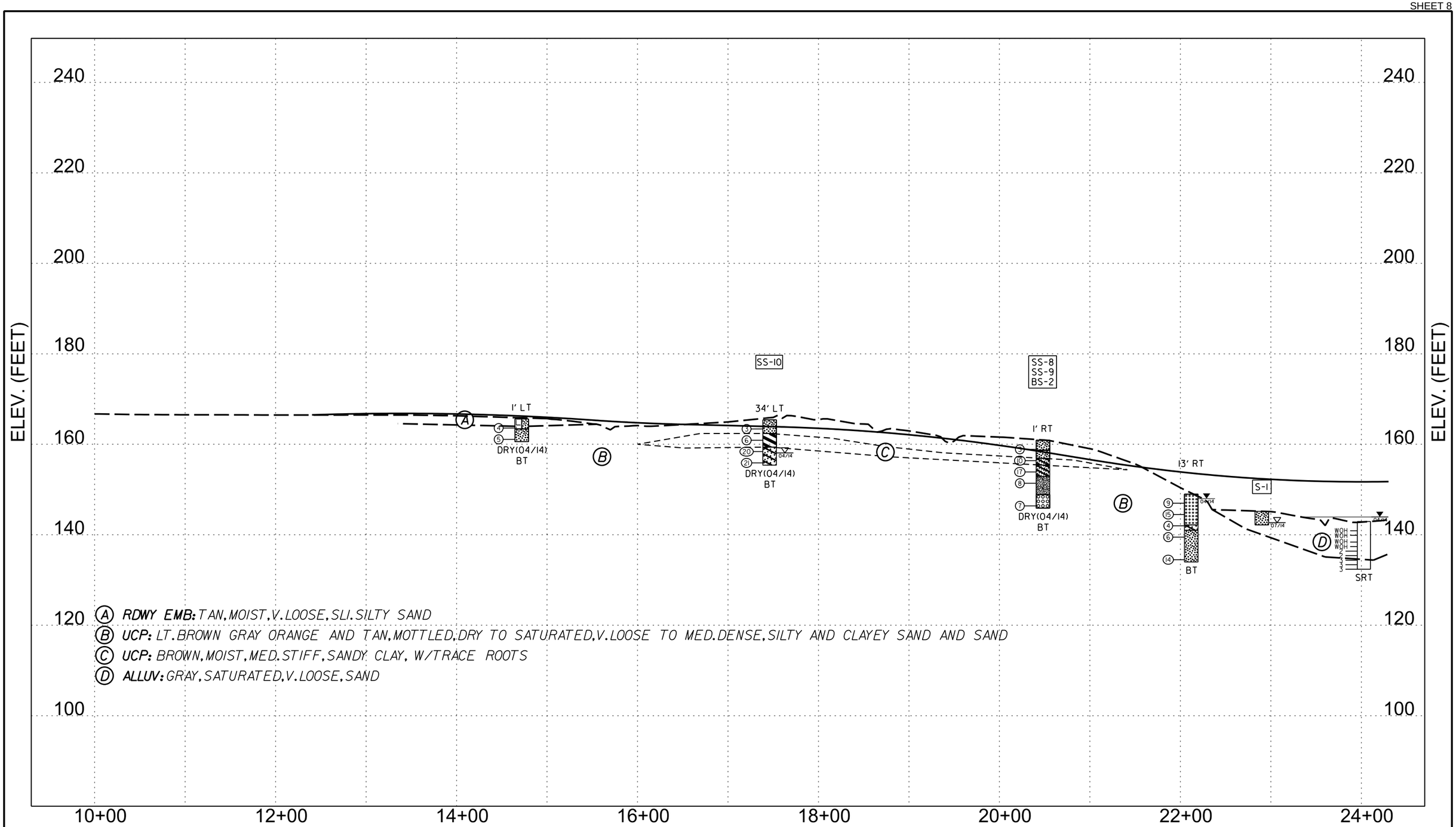
FALCON ENGINEERING

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

PHONE: 919.871.0800
FAX: 919.871.0803

SUBSURFACE PROFILE ALONG -L-

SR 2252 (CHICKEN FOOT RD) AT
SR 2242 (BRAXTON RD) AND (SANDHILL RD)
CUMBERLAND COUNTY, NORTH CAROLINA
WBS: 45336.1.21, TIP: W-5206U
FALCON PROJECT NO.: G13072.00



NOTES:

- GROUNDLINE PROFILE OF TAKEN FROM ELECTRONIC FILES RECEIVED FROM RIVERS & ASSOCIATES, DATED APRIL 2014.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

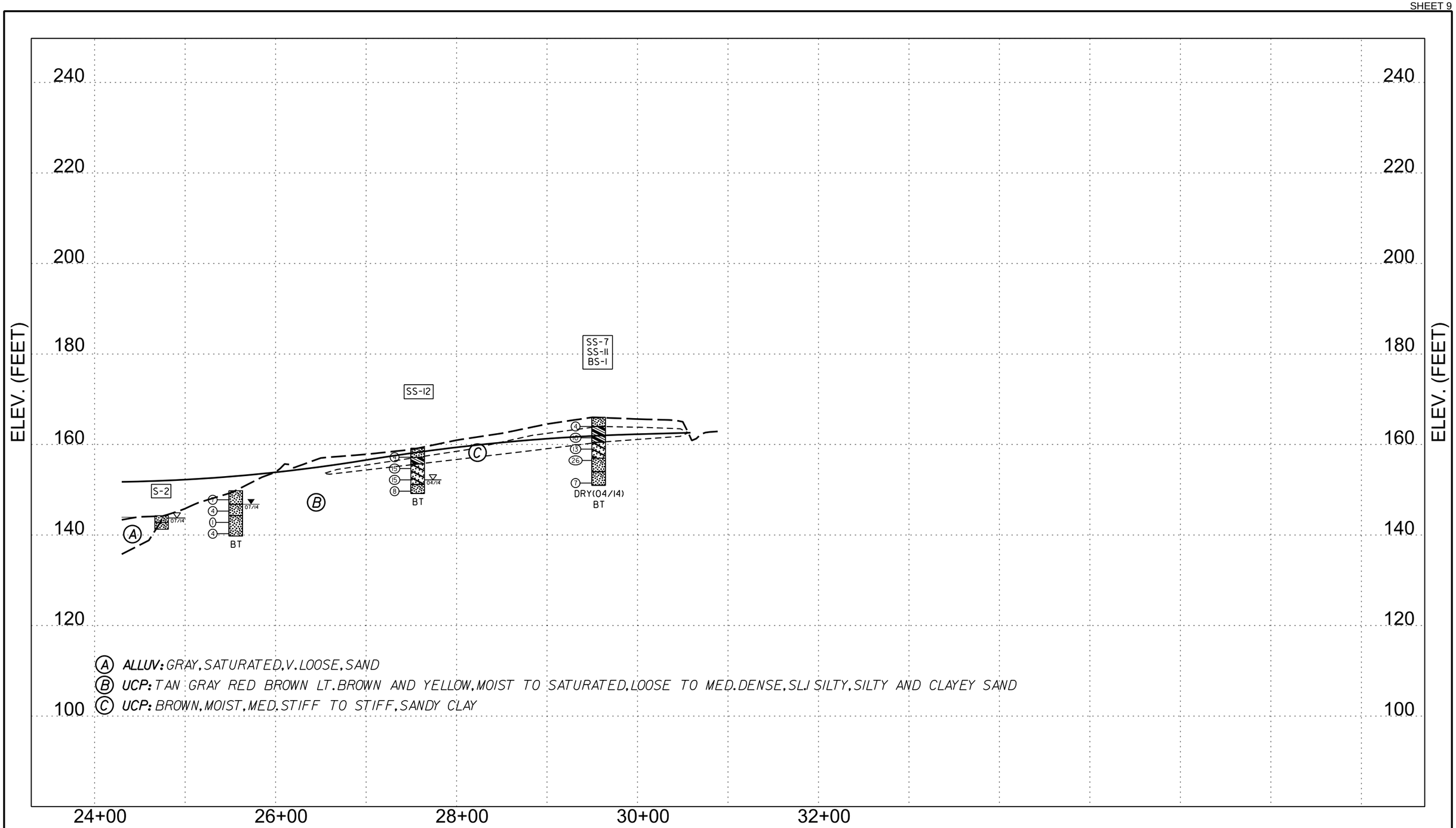
VERTICAL SCALE
0 20 40
FEET

HORIZONTAL SCALE
0 100 200
FEET

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
RALEIGH, NC 27607
PHONE: 919.871.0800
FAX: 919.871.0803

SUBSURFACE PROFILE ALONG -Y1-

SR 2252 (CHICKEN FOOT RD) AT
SR 2242 (BRAXTON RD) AND (SANDHILL RD)
CUMBERLAND COUNTY, NORTH CAROLINA
WBS: 45336.1.21, TIP: W-5206U
FALCON PROJECT NO.: G13072.00



(A) ***ALLUV:*** *GRAY, SATURATED, V. LOOSE, SAND*

(B) ***UCP:*** *TAN GRAY RED BROWN LT. BROWN AND YELLOW, MOIST TO SATURATED, LOOSE TO MED. DENSE, SLI SILTY, SILTY AND CLAYEY SAND*

(C) ***UCP:*** *BROWN, MOIST, MED. STIFF TO STIFF, SANDY CLAY*

NOTES:

- GROUNDLINE PROFILE TAKEN FROM ELECTRONIC FILES RECEIVED FROM RIVERS & ASSOCIATES, DATED APRIL 2014.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

VERTICAL SCALE
0 20 40
FEET

HORIZONTAL SCALE
0 20 200
FEET

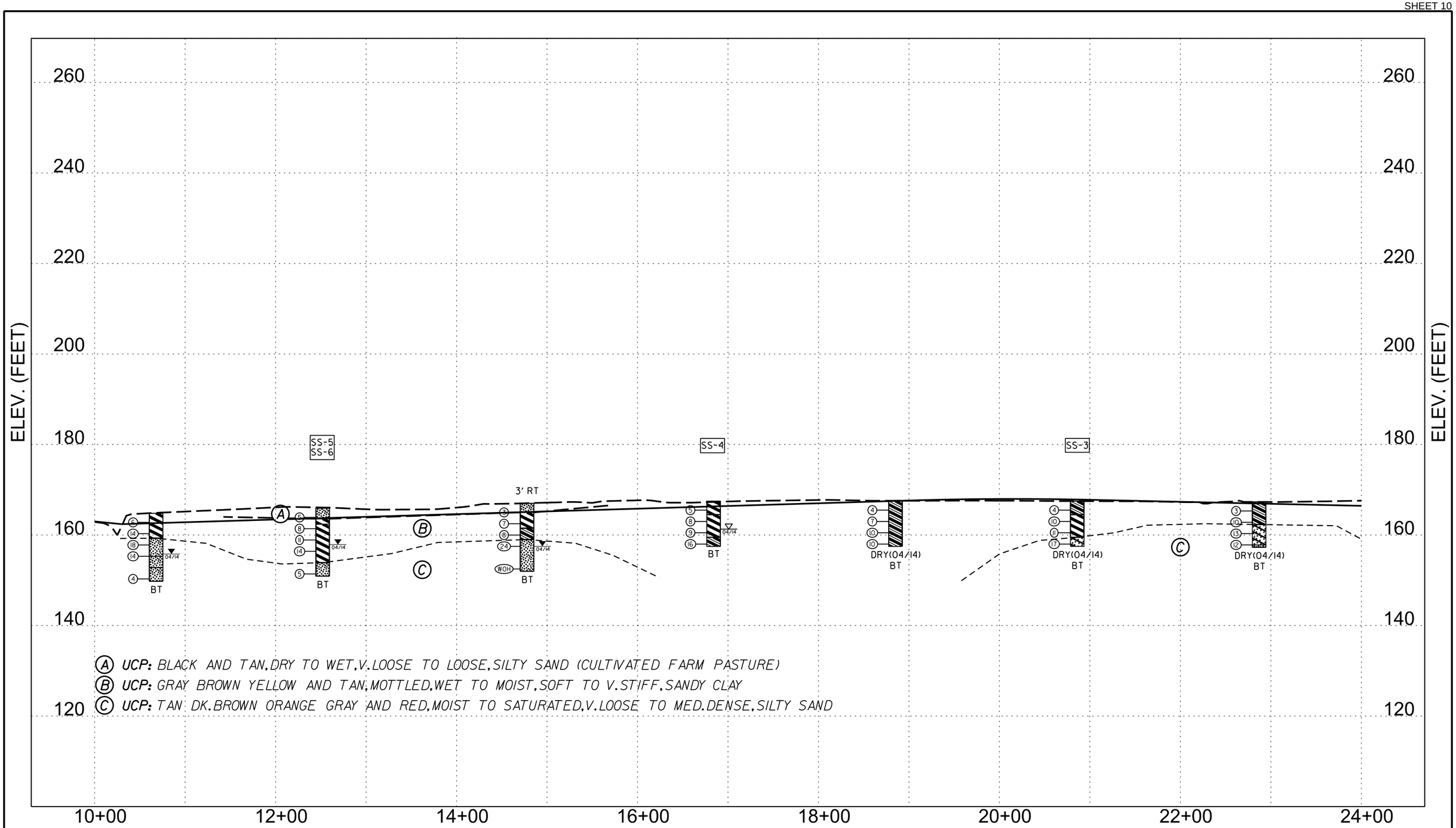
FALCON ENGINEERING

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

PHONE: 919.871.0800
FAX: 919.871.0803

SUBSURFACE PROFILE ALONG -Y1-

SR 2252 (CHICKEN FOOT RD) AT
SR 2242 (BRAXTON RD) AND (SANDHILL RD)
CUMBERLAND COUNTY, NORTH CAROLINA
WBS: 45336.1.21, TIP: W-5206U
FALCON PROJECT NO.: G13072.00



NOTES:

- GROUNDLINE PROFILE TAKEN FROM ELECTRONIC FILES RECEIVED FROM RIVERS & ASSOCIATES, DATED APRIL 2014.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

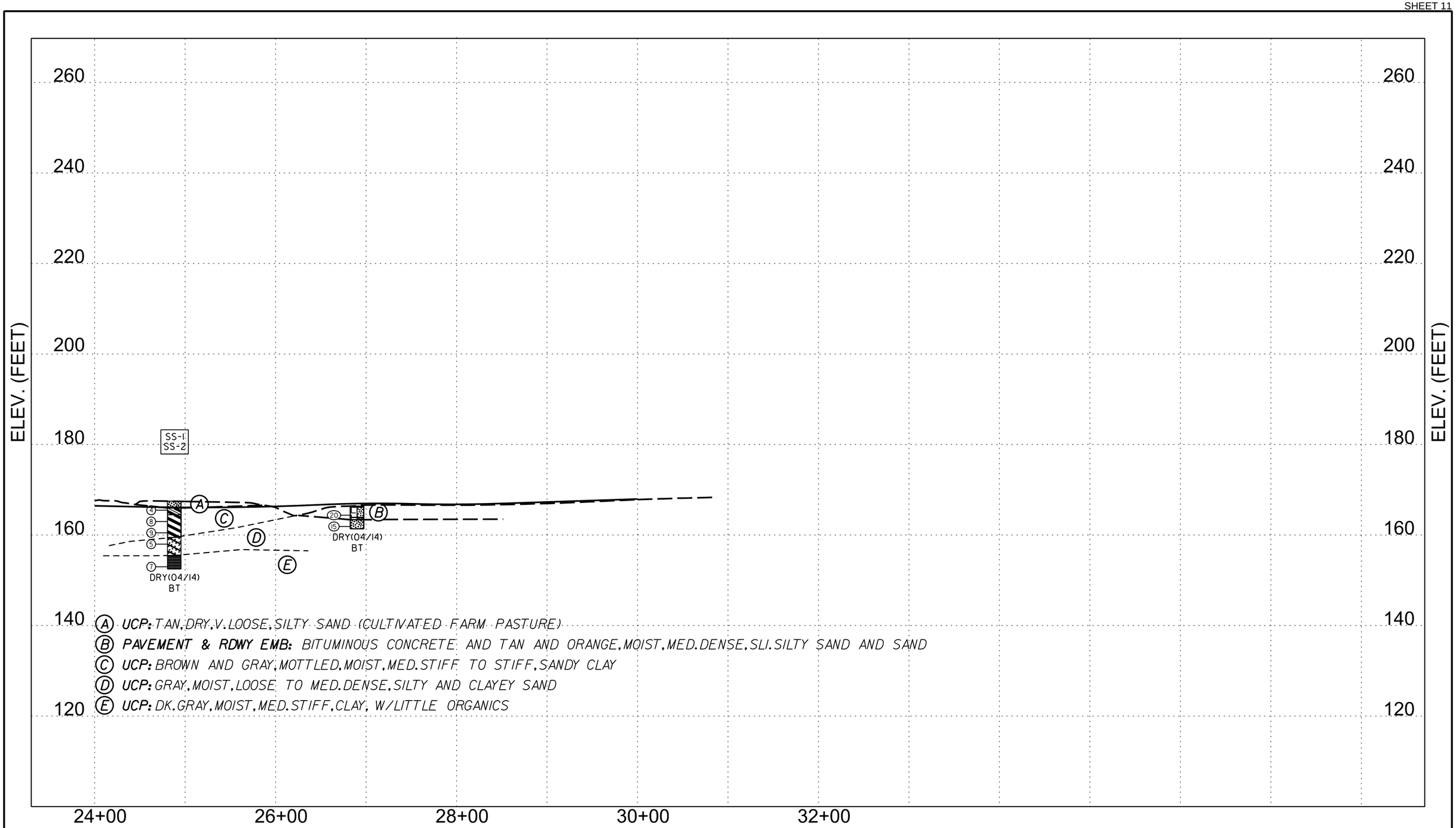
VERTICAL SCALE
0 20 40
FEET

HORIZONTAL SCALE
0 100 200
FEET

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
RALEIGH, NC 27607
PHONE: 919.871.0800
FAX: 919.871.0803

SUBSURFACE PROFILE ALONG -Y2-

SR 2252 (CHICKEN FOOT RD) AT
SR 2242 (BRAXTON RD) AND (SANDHILL RD)
CUMBERLAND COUNTY, NORTH CAROLINA
WBS: 45336.1.21, TIP: W-5206U
FALCON PROJECT NO.: G13072.00



(A) ***UCP:*** *TAN,DRY,V.LOOSE,SILTY SAND (CULTIVATED FARM PASTURE)*

(B) ***PAVEMENT & RDWY EMB:*** *BITUMINOUS CONCRETE AND TAN AND ORANGE,MOIST,MED.DENSE,SLI.SILTY SAND AND SAND*

(C) ***UCP:*** *BROWN AND GRAY,MOTTLED,MOIST,MED.STIFF TO STIFF,SANDY CLAY*

(D) ***UCP:*** *GRAY,MOIST,LOOSE TO MED.DENSE,SILTY AND CLAYEY SAND*

(E) ***UCP:*** *DK.GRAY,MOIST,MED.STIFF,CLAY, W/LITTLE ORGANICS*

NOTES:

- GROUNDLINE PROFILE TAKEN FROM ELECTRONIC FILES RECEIVED FROM RIVERS & ASSOCIATES, DATED APRIL 2014.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

VERTICAL SCALE
0 20 40
FEET

HORIZONTAL SCALE
0 100 200
FEET

FALCON ENGINEERING

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

PHONE: 919.871.0800
FAX: 919.871.0803

SUBSURFACE PROFILE ALONG -Y2-

SR 2252 (CHICKEN FOOT RD) AT
SR 2242 (BRAXTON RD) AND (SANDHILL RD)
CUMBERLAND COUNTY, NORTH CAROLINA
WBS: 45336.1.21, TIP: W-5206U
FALCON PROJECT NO.: G13072.00

240
220
200
180
160
140
120
100

ELEV. (FEET)

10+00
12+00
14+00

3" LT

3
16
10
5

DRY(04/14)
BT

UCP: TAN LT.BROWN AND YELLOW,MOTTLED, MOIST TO SATURATED,V.LOOSE TO MED.DENSE,SLI SILTY,SILTY AND CLAYEY SAND

NOTES:

- GROUNDLINE PROFILE TAKEN FROM ELECTRONIC FILES RECEIVED FROM RIVERS & ASSOCIATES, DATED APRIL 2014.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

VERTICAL SCALE
0 20 40
FEET

HORIZONTAL SCALE
0 100 200
FEET

FALCON ENGINEERING

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

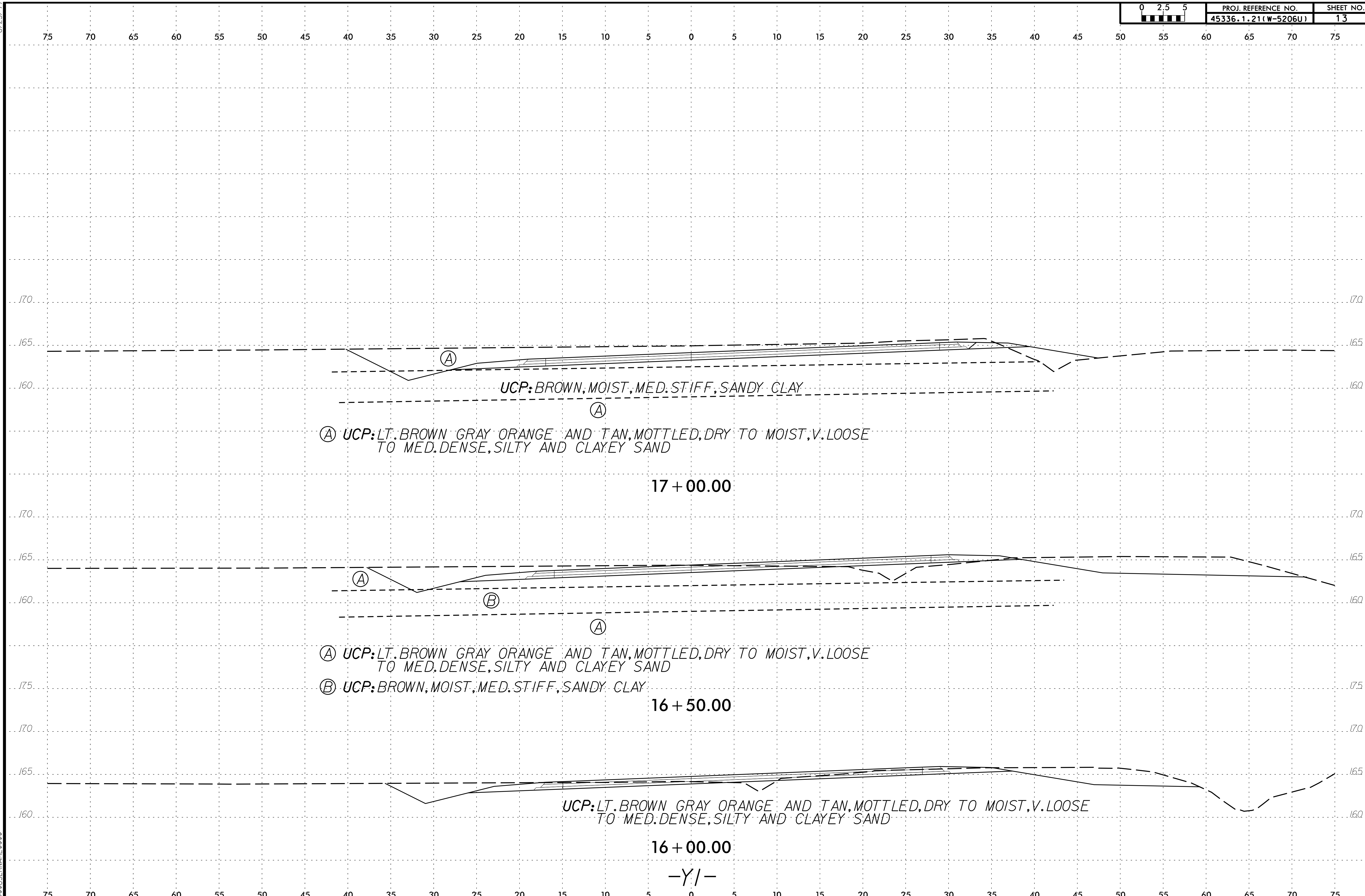
PHONE: 919.871.0800
FAX: 919.871.0803

SUBSURFACE PROFILE ALONG -Y3-

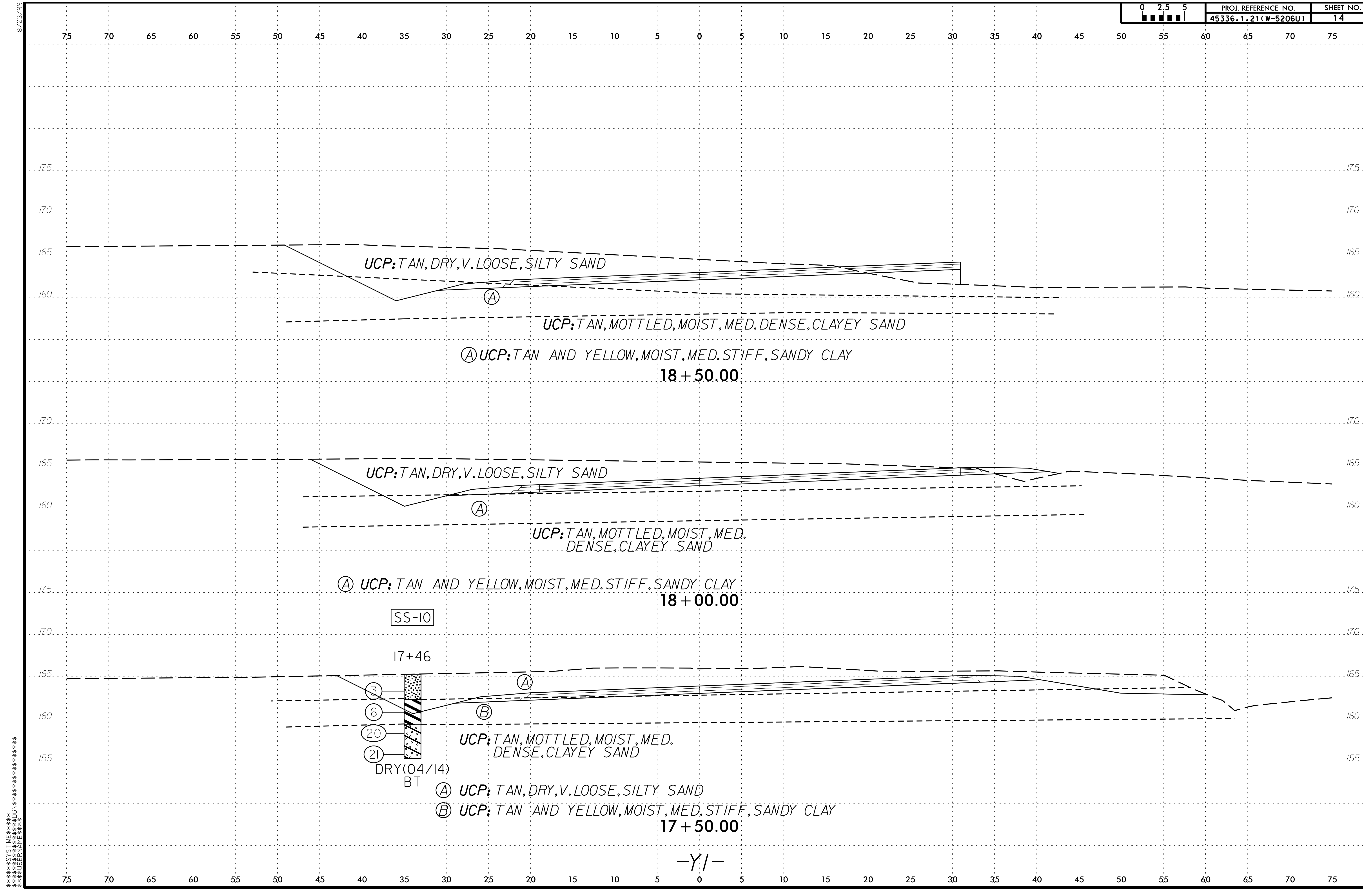
SR 2252 (CHICKEN FOOT RD) AT
SR 2242 (BRAXTON RD) AND (SANDHILL RD)
CUMBERLAND COUNTY, NORTH CAROLINA
WBS: 45336.1.21, TIP: W-5206U
FALCON PROJECT NO.: G13072.00

8/23/99

PROJ. REFERENCE NO.	SHEET NO.
45336.1.21(W-5206U)	13


0 2.5 5
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
170
165
160
(A)
UCP: BROWN, MOIST, MED. STIFF, SANDY CLAY
(A)
(A) UCP: LT. BROWN GRAY ORANGE AND TAN, MOTTLED, DRY TO MOIST, V. LOOSE
TO MED. DENSE, SILTY AND CLAYEY SAND
17+00.00
170
165
160
(A)
(B)
(A)
(A) UCP: LT. BROWN GRAY ORANGE AND TAN, MOTTLED, DRY TO MOIST, V. LOOSE
TO MED. DENSE, SILTY AND CLAYEY SAND
(B) UCP: BROWN, MOIST, MED. STIFF, SANDY CLAY
16+50.00
175
170
165
160
UCP: LT. BROWN GRAY ORANGE AND TAN, MOTTLED, DRY TO MOIST, V. LOOSE
TO MED. DENSE, SILTY AND CLAYEY SAND
16+00.00
-Y1-
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

$$$$$SYSTIME$$$$$
$$$$$$$$$$DGN$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$


8/23/99
PROJ. REFERENCE NO.
45336.1.21(W-5206U)
SHEET NO.
14
UCP: TAN, DRY, V. LOOSE, SILTY SAND
(A)
UCP: TAN, MOTTLED, MOIST, MED. DENSE, CLAYEY SAND
(A) UCP: TAN AND YELLOW, MOIST, MED. STIFF, SANDY CLAY
18 + 50.00
UCP: TAN, DRY, V. LOOSE, SILTY SAND
(A)
UCP: TAN, MOTTLED, MOIST, MED. DENSE, CLAYEY SAND
(A) UCP: TAN AND YELLOW, MOIST, MED. STIFF, SANDY CLAY
18 + 00.00
SS-10
17+46
3
6
20
21
DRY(04/14)
BT
(A)
(B)
UCP: TAN, MOTTLED, MOIST, MED. DENSE, CLAYEY SAND
(A) UCP: TAN, DRY, V. LOOSE, SILTY SAND
(B) UCP: TAN AND YELLOW, MOIST, MED. STIFF, SANDY CLAY
17 + 50.00
-Y1-

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	15

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

170
165
160
155

UCP: TAN AND BROWN, DRY, CLAYEY SAND AND SAND, W/ TRACE ROOTS

UCP: TAN WHITE AND PINK, MOTTLED, MOIST TO SATURATED, MED. DENSE TO LOOSE, CLAYEY AND SLI. SILTY SAND

Ⓐ UCP: BROWN, DRY, STIFF, SANDY CLAY

20+00.00

170
165
160
155

UCP: TAN AND BROWN, DRY, CLAYEY SAND AND SAND, W/ TRACE ROOTS

UCP: BROWN, DRY, STIFF, SANDY CLAY

UCP: TAN WHITE AND PINK, MOTTLED, MOIST TO SATURATED, MED. DENSE TO LOOSE, CLAYEY AND SLI. SILTY SAND

19+50.00

170
165
160
155

UCP: TAN, DRY, V. LOOSE, SILTY SAND

Ⓐ

UCP: TAN, MOTTLED, MOIST, MED. DENSE, CLAYEY SAND

Ⓐ UCP: TAN AND YELLOW, MOIST, MED. STIFF, SANDY CLAY

19+00.00

$$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	16

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

165 160 155 150

UCP: LT. BROWN GRAY ORANGE AND TAN, MOTTLED, MOIST TO SATURATED, MED. DENSE TO LOOSE, CLAYEY AND SILTY SAND AND SAND

21+50.00

UCP: TAN AND BROWN, DRY, CLAYEY SAND AND SAND, W/ TRACE ROOTS

UCP: TAN WHITE AND PINK, MOTTLED, MOIST TO SATURATED, MED. DENSE TO LOOSE, CLAYEY AND SLI. SILTY SAND

Ⓐ UCP: BROWN, DRY, STIFF, SANDY CLAY

21+00.00

SS-8
SS-9
BS-2

20+48

UCP: TAN AND BROWN, DRY, CLAYEY SAND AND SAND, W/ TRACE ROOTS

3
10
17
8
7

UCP: TAN WHITE AND PINK, MOTTLED, MOIST TO SATURATED, MED. DENSE TO LOOSE, CLAYEY AND SLI. SILTY SAND

Ⓐ UCP: BROWN, DRY, STIFF, SANDY CLAY

DRY (04/14)
BT

20+50.00

170 165 160 155 150 145

$$$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$$$$
$$$$$$USERNAME$$$$

–Y/–

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	17

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

160 155 150 145 140 135

S-1
22+90
07/14

ALLUV: GRAY AND TAN, SATURATED, V. LOOSE, SILTY SAND

UCP: GRAY ORANGE AND RED, SATURATED, LOOSE TO MED. DENSE, CLAYEY AND SILTY SAND

23+00.00

Ⓐ

UCP: GRAY ORANGE AND RED, SATURATED, LOOSE TO MED. DENSE, SAND AND CLAYEY AND SILTY SAND

Ⓐ **ALLUV:** GRAY, SATURATED, SAND

22+50.00

22+12
04/14
9
15
4
6
14
BT

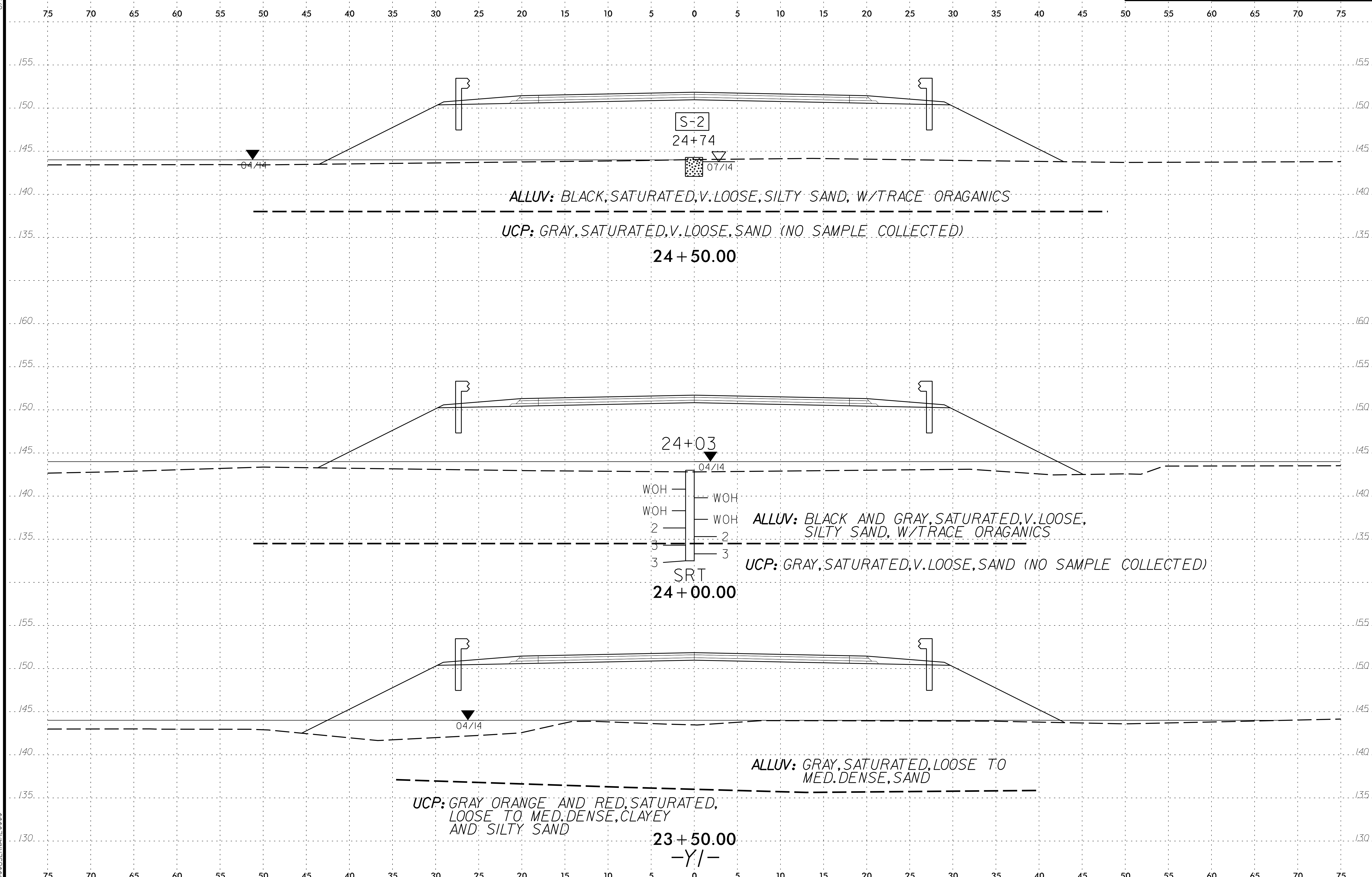
UCP: GRAY ORANGE AND RED, SATURATED, LOOSE TO MED. DENSE, SAND AND CLAYEY AND SILTY SAND

22+00.00

-Y/-

$$$$USERNAME$$$$
$$$$SYSTIME$$$$
$$$$DGN$$$$

PROJ. REFERENCE NO.	SHEET NO.
45336.1.21(W-5206U)	18



8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	19

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

160
155
150

UCP: GRAY TAN AND ORANGE, MOIST TO SATURATED, V. LOOSE TO LOOSE, SLI. SILTY AND SILTY SAND

26+00.00

160
155
150

25+56

:7
:4
:1
:4

07/14

BT

UCP: GRAY TAN AND ORANGE, MOIST TO SATURATED, V. LOOSE TO LOOSE, SLI. SILTY AND SILTY SAND

25+50.00

160
155
150
145

25+00.00

UCP: GRAY TAN AND ORANGE, MOIST TO SATURATED, V. LOOSE TO LOOSE, SLI. SILTY AND SILTY SAND

-Y/-

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

$$$$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	20

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

170
165
160
155

UCP: TAN, DRY, V. LOOSE, SILTY SAND

Ⓐ

UCP: GRAY LT. BROWN YELLOW AND BROWN, MOIST TO SATURATED, MED. DENSE TO LOOSE, SLI. SILTY, SILTY AND CLAYEY SAND

29+00.00

170
165
160
155

Ⓐ

Ⓑ

UCP: BROWN RED AND DK. BROWN, WET, LOOSE, SILTY SAND, W/ CLAY POCKETS AND TRACE GRAVEL

Ⓐ UCP: TAN, MOIST, V. LOOSE, SLI. SILTY SAND

Ⓑ UCP: BROWN, MOIST, LOOSE, CLAYEY SAND

28+50.00

165
160
155

UCP: TAN, MOIST, V. LOOSE, SLI. SILTY SAND

Ⓐ

UCP: BROWN RED AND DK. BROWN, WET, LOOSE, SILTY SAND, W/ CLAY POCKETS AND TRACE GRAVEL

Ⓐ UCP: BROWN, MOIST, SOFT, SANDY CLAY

28+00.00

-Y/-

$$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	21

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

175 170 165 160

UCP: TAN,DRY,V.LOOSE,SILTY SAND

UCP: BROWN,MOIST,LOOSE,CLAYEY SAND

UCP: GRAY LT.BROWN YELLOW AND BROWN,MOIST TO SATURATED,MED.DENSE TO LOOSE,SLI. SILTY,SILTY AND CLAYEY SAND

30+50.00

170 165 160 155

Ⓐ **UCP:** TAN,DRY,V.LOOSE,SILTY SAND

Ⓑ **UCP:** BROWN,MOIST,LOOSE,CLAYEY SAND

UCP: GRAY LT.BROWN YELLOW AND BROWN,MOIST TO SATURATED,MED.DENSE TO LOOSE,SLI. SILTY,SILTY AND CLAYEY SAND

30+00.00

SS-7
SS-11
BS-1

170 165 160 155 150

29+57

UCP: TAN,DRY,V.LOOSE,SILTY SAND

Ⓐ **UCP:** BROWN,MOIST,LOOSE,CLAYEY SAND

4 10 13 26 7

UCP: GRAY LT.BROWN YELLOW AND BROWN,MOIST TO SATURATED,MED.DENSE TO LOOSE,SLI. SILTY,SILTY AND CLAYEY SAND

DRY (04/14)
BT

29+50.00

-Y/-

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

$$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	22

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

175
170
165
160

UCP: BLACK AND TAN, DRY TO WET, V.LOOSE TO LOOSE, SILTY SAND (CULTIVATED FARM PASTURE)

UCP: BROWN, WET TO MOIST, MED.STIFF TO STIFF, SANDY CLAY

UCP: TAN ORANGE BROWN AND GRAY, MOTTLED, MOIST TO SATURATED, MED.DENSE TO V.LOOSE, SILTY SAND

11+50.00

175
170
165
160

UCP: BROWN, WET TO MOIST, MED.STIFF TO STIFF, SANDY CLAY

UCP: TAN ORANGE BROWN AND GRAY, MOTTLED, MOIST TO SATURATED, MED.DENSE TO V.LOOSE, SILTY SAND

11+00.00

175
170
165
160
155
150

10+68

UCP: BROWN, WET TO MOIST, MED.STIFF TO STIFF, SANDY CLAY

UCP: TAN ORANGE BROWN AND GRAY, MOTTLED, MOIST TO SATURATED, MED.DENSE TO V.LOOSE, SILTY SAND

6
14
18
14
4

04/14

BT

10+50.00

-Y2-

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

$$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$$USERNAME$$$$

8/23/99

0 2.5 5

PROJ. REFERENCE NO.	SHEET NO.
45336.1.21(W-5206U)	23

13+00.00

Ⓐ

UCP: BROWN, WET TO MOIST, MED. STIFF TO STIFF, SANDY CLAY

UCP: TAN AND BROWN, DRY, CLAYEY SAND AND SAND, W/ TRACE ROOTS

Ⓐ UCP: BLACK AND TAN, DRY, LOOSE, SILTY SAND
(CULTIVATED FARM PASTURE)

SS-5
SS-6

12+52

5
8
11
14
5

04/14

BT

UCP: BROWN, WET TO MOIST, MED. STIFF TO STIFF, SANDY CLAY

UCP: TAN AND BROWN, DRY, CLAYEY SAND AND SAND, W/ TRACE ROOTS

Ⓐ UCP: BLACK AND TAN, DRY, LOOSE, SILTY SAND
(CULTIVATED FARM PASTURE)

12+50.00

12+00.00

UCP: BLACK AND TAN, DRY TO WET, V. LOOSE TO LOOSE, SILTY SAND (CULTIVATED FARM PASTURE)

UCP: BROWN, WET TO MOIST, MED. STIFF TO STIFF, SANDY CLAY

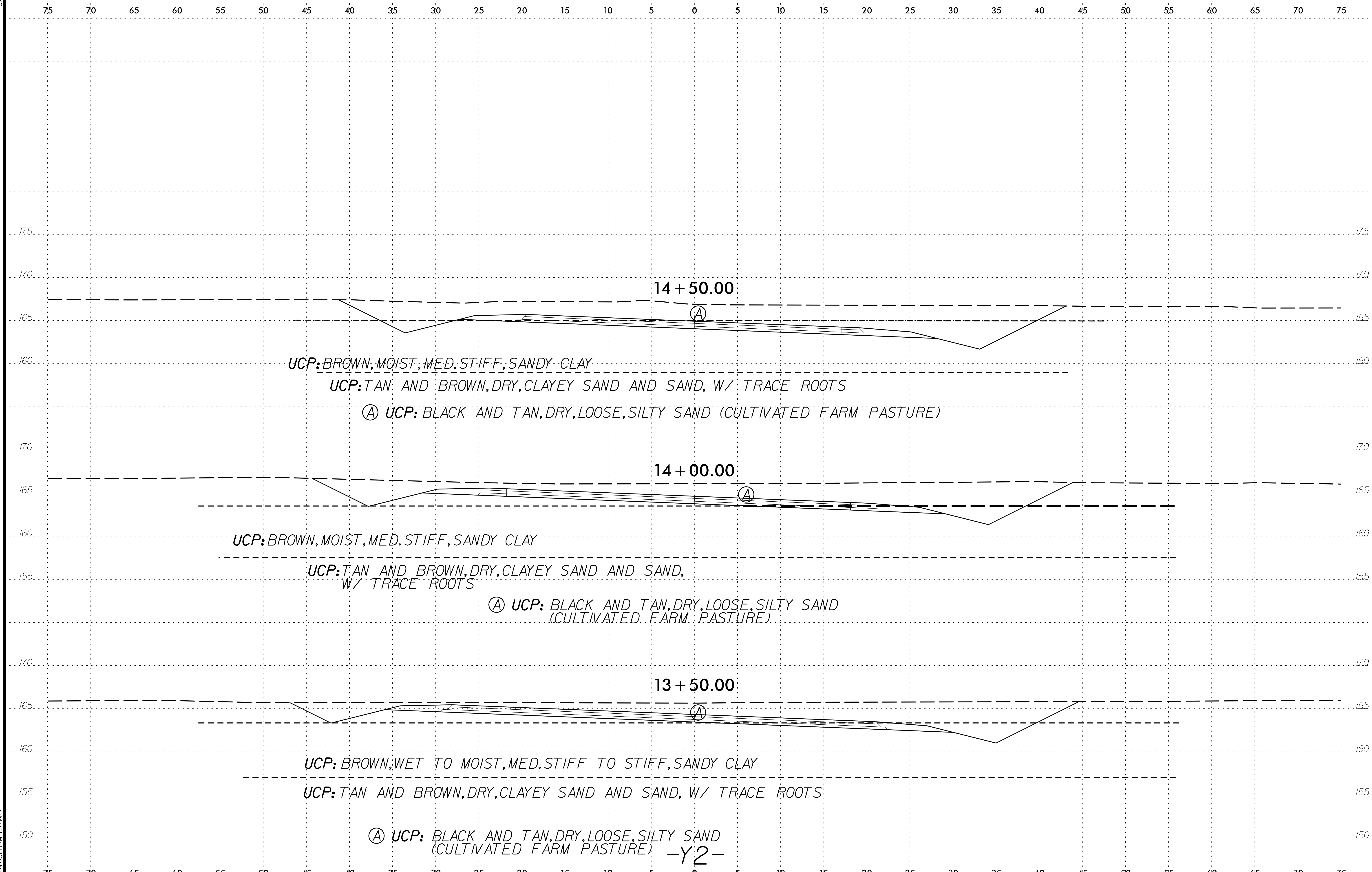
UCP: TAN AND BROWN, DRY, CLAYEY SAND AND SAND, W/ TRACE ROOTS

-Y2-

$$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

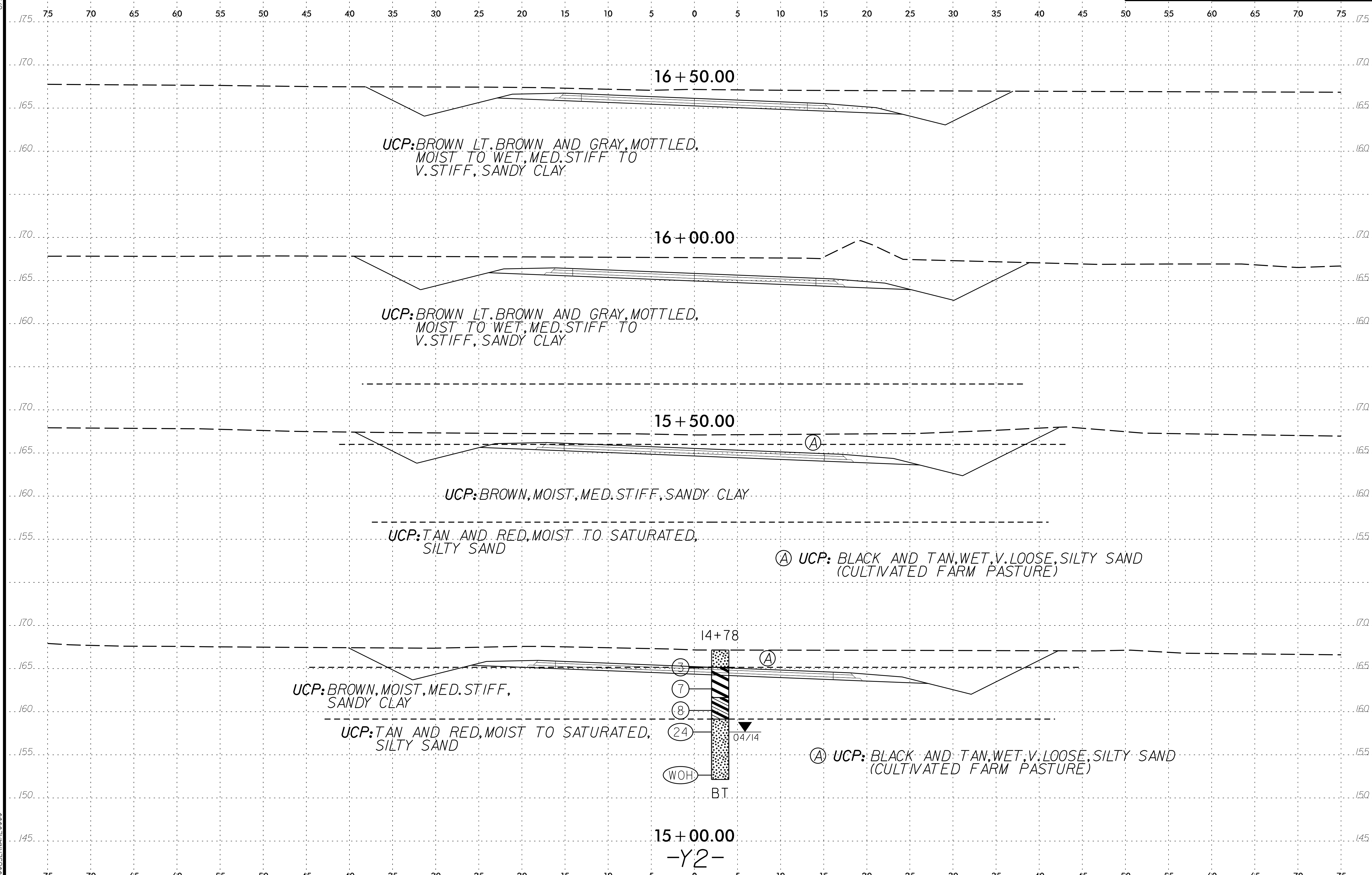
8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	24



$$$$$SYSTIME$$$$$ $$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$ $$$$USERNAME$$$$

PROJ. REFERENCE NO.	SHEET NO.
45336.1.21(W-5206U)	25



8/23/99

$$$$$SYSTIME$$$$$ $$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$ $$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	26

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

175
170
165

18+50.00

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

175
170
165

18+00.00

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

160

170
165

17+50.00

UCP: BROWN LT. BROWN AND GRAY, MOTTLED, MOIST TO WET, MED. STIFF TO V. STIFF, SANDY CLAY

160
175
170

SS-4

16+84

.5
.8
.9
16

04/14

BT

165
160
155

17+00.00

150

-Y2-

$$$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	27

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

175
170
165
160

20+50.00

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

UCP: GRAY, MOTTLED, WET, MED. DENSE, CLAYEY SAND

20+00.00

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

UCP: GRAY, MOTTLED, WET, MED. DENSE, CLAYEY SAND

19+50.00

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

18+85

.4
.7
1.0
1.0

DRY (04/14)
BT

19+00.00

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

155
150

-Y2-

$$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	28

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

180 175 170 165 160

22+50.00

UCP: BROWN, WET TO MOIST, SOFT TO STIFF, SANDY CLAY

UCP: GRAY, MOTTLED, MOIST TO SATURATED, MED. DENSE, CLAYEY AND SILTY SAND

170 165 160

22+00.00

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

UCP: GRAY, MOTTLED, WET, MED. DENSE, CLAYEY SAND

170 165 160

21+50.00

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

UCP: GRAY, MOTTLED, WET, MED. DENSE, CLAYEY SAND

175 170 165 160 155 150

SS-3

20+86

:4 :10 :11 :17

UCP: BROWN AND GRAY, MOTTLED, MED. STIFF TO STIFF, SANDY CLAY

UCP: GRAY, MOTTLED, WET, MED. DENSE, CLAYEY SAND

DRY (04/14)

BT

21+00.00

-Y2-

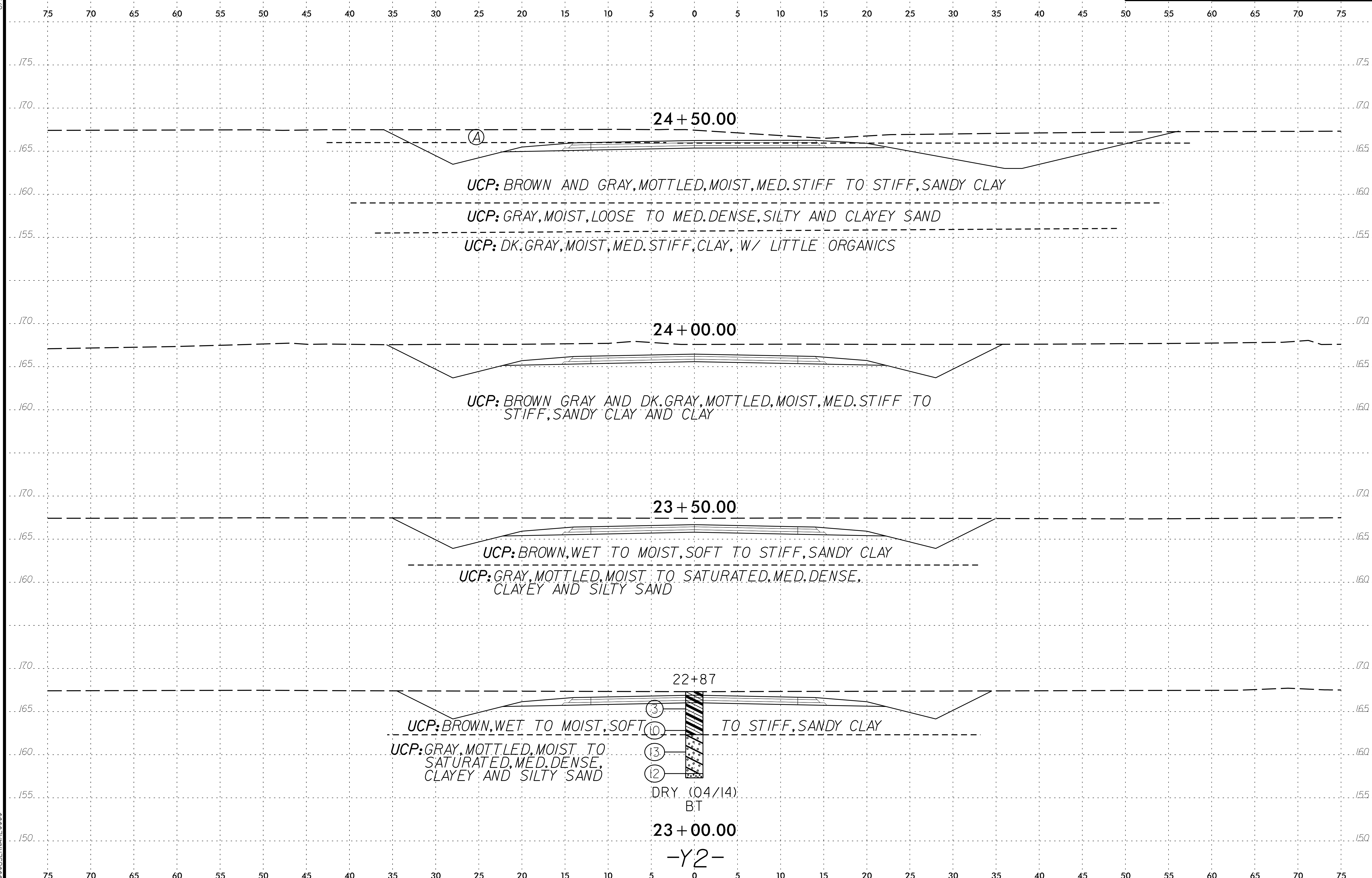
$$$$$$$$SYSTIME$$$$$$

$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$

$$$$USERNAME$$$$

PROJ. REFERENCE NO.	SHEET NO.
45336.1.21(W-5206U)	29

8/23/99


0 2.5 5
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
175
170
165
160
155
150
24+50.00
A
UCP: BROWN AND GRAY, MOTTLED, MOIST, MED. STIFF TO STIFF, SANDY CLAY
UCP: GRAY, MOIST, LOOSE TO MED. DENSE, SILTY AND CLAYEY SAND
UCP: DK. GRAY, MOIST, MED. STIFF, CLAY, W/ LITTLE ORGANICS
24+00.00
UCP: BROWN GRAY AND DK. GRAY, MOTTLED, MOIST, MED. STIFF TO STIFF, SANDY CLAY AND CLAY
23+50.00
UCP: BROWN, WET TO MOIST, SOFT TO STIFF, SANDY CLAY
UCP: GRAY, MOTTLED, MOIST TO SATURATED, MED. DENSE, CLAYEY AND SILTY SAND
22+87
3
10
13
12
UCP: BROWN, WET TO MOIST, SOFT TO STIFF, SANDY CLAY
UCP: GRAY, MOTTLED, MOIST TO SATURATED, MED. DENSE, CLAYEY AND SILTY SAND
DRY (04/14)
BT
23+00.00
-Y2-

$$$$$SYSTIME$$$$$ $$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$$$$$$$ $$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	45336.1.21(W-5206U)	30

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

175
170
165
160

26+00.00

Ⓐ

CP: GRAY, MOIST, LOOSE, CLAYEY SAND

CP: DK. GRAY, MOIST, MED. STIFF, CLAY, W/ LITTLE ORGANICS

Ⓐ UCP: BROWN AND GRAY, MOTTLED, MOIST, STIFF, SANDY CLAY

170
165
160

25+50.00

Ⓐ

UCP: BROWN AND GRAY, MOTTLED, MOIST, STIFF, SANDY CLAY

UCP: GRAY, MOIST, LOOSE, CLAYEY SAND

UCP: DK. GRAY, MOIST, MED. STIFF, CLAY, W/ LITTLE ORGANICS

180
175
170
165
160
155
150
145

Ⓐ UCP: TAN, DRY, V. LOOSE, SILTY SAND (CULTIVATED FARM PASTURE)

SS-1
SS-2

24+88

Ⓐ

④ UCP: BROWN AND GRAY, MOTTLED, MOIST, STIFF, SANDY CLAY

⑧

⑨

⑤ UCP: GRAY, MOIST, LOOSE, CLAYEY SAND

⑦ UCP: DK. GRAY, MOIST, MED. STIFF, CLAY, W/ LITTLE ORGANICS

DRY (04/14)
BT

Ⓐ UCP: TAN, DRY, V. LOOSE, SILTY SAND (CULTIVATED FARM PASTURE)

25+00.00

-Y2-

$$$$$$$$SYSTIME$$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

FALCON 1210 TRINITY ROAD, SUITE 110, RALEIGH, NORTH CAROLINA 27607

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

SR 2252 (CHICKEN FOOT RD) AND SR 2242 (BRAXTON RD) AND SR 2238 (SANDHILL RD)

WBS: 45336.1.21, TIP NO.: W-5206U

CUMBERLAND COUNTY, NORTH CAROLINA

FALCON ENGINEERING, INC. PROJECT NO: G13072.00

BORING		SAMPLE	TOTAL SAMPLE			Atterberg Limit Test Results			Natural Moisture Content	Organic Content	Corrected CBR @ 0.1"	Optimum Water Content	Max. Dry Density
AASHTO Classification			PERCENT PASSING										
STATION	OFFSET (FEET)	DEPTH (FEET)	#10	#40	#200	LL	PL	PI	%	%		%	PCF
Y2_2488		SS-1	100	86	44	39	15	24	20.6	-	-	-	-
A-6													
24+88, -Y2-	CL	1.5 - 2.5											
Y2_2488		SS-2	-	-	-	-	-	-	36.7	7.1	-	-	-
A-7-6*													
24+88, -Y2-	CL	13.5-15.0											
Y2_2086		SS-3	100	86	40	38	19	19	20.1	-	-	-	-
A-6													
20+86, -Y2-	CL	1.0-2.5											
Y2_1684		SS-4	100	89	54	48	21	27	24.1	-	-	-	-
A-7-6													
16+84, -Y2-	CL	1.0-2.5											
Y2_1252		SS-5	100	86	28	15	0	NP	12.9	-	-	-	-
A-2-4													
12+52, -Y2-	CL	1.0 - 2.3											
Y2_1252		SS-6	100	90	57	50	17	33	20.6	-	-	-	-
A-7-6													
12+52, -Y2-	CL	3.5-5.0											
Y1_2957		SS-7	100	75	28	18	15	3	10.3	-	-	-	-
A-2-4													
29+57, -Y1-	CL	1.0 - 2.0											
Y1_2048		SS-8	100	92	26	24	18	6	13.7	-	-	-	-
A-2-4													
20+48, -Y1-	1' RT	1.0 - 2.2											
Y1_2048		SS-9	100	96	35	48	20	28	19.1	-	-	-	-
A-2-7													
20+48, -Y1-	1' RT	4.0 - 5.0											
Y1_1746		SS-10	-	-	-	-	-	-	11.2	1.4	-	-	-
A-2-4*													
17+46, -Y1-	34' LT	1.0 - 2.5											
Y1_2957		SS-11	100	71	33	48	26	22	12.7	-	-	-	-
A-2-7													
29+57, -Y1-	CL	3.5 - 5.0											
Y1_2757		SS-12	100	82	38	26	15	11	14.0	-	-	-	-
A-6													
27+57, -Y1-	CL	3.5 - 5.0											
Y1_2290		S-1	-	-	12	-	-	-	19.7	0.3	-	-	-
A-2-4*													
22+90, -Y1-	CL	1.0 - 3.0											
Y1_2474		S-2	-	-	4	-	-	-	44.5	2.7	-	-	-
A-2-4*													
24+74, -Y1-	CL	0.8 - 2.8											
Y1_2957		BS-1	-	-	28	18	15	3	10.3	-	22.2	11.2	121.1
A-2-4													
29+57, -Y1-	CL	0 - 3.0											
Y1_2048		BS-2	-	-	26	24	18	6	13.7	-	18.2	13.0	114.3
A-2-4													
20+48, -Y1-	1' RT	0 - 3.0											

SIGNATURE

105-03-0803

Notes:
LL = Liquid limit
PL = Plastic limit
PI = Plasticity index = LL - PL

***Based on visual classification only**

FALCON ENGINEERING 1210 TRINITY RD., SUITE 110, RALEIGH, NC 27607

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

AASHTO T-193 \ ASTM D-1883

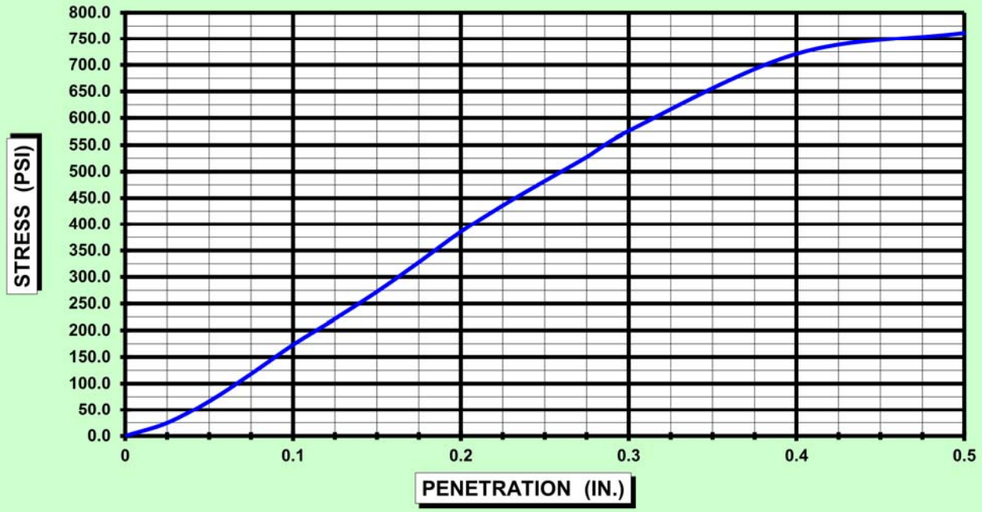
PROJECT #:	G13072.00			DATE:	5/5/2014
PROJECT NAME:		W-5206U			
BORING:	R-10	SAMPLE:	BS-1	DEPTH:	0-3'

SOIL DESCRIPTION:

COMPACTION METHOD	AASHTO T99	SOAK	96 HRS.
MAXIMUM DRY DENSITY	121.1 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	11.2%	LOAD CELL	2500LB
TEST DATA		SURCHARGE WEIGHT	10 lb.
DRY DENSITY	118.3 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	10.5%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	97.7%	SWELL	-0.02%

	ACTUAL	CORRECTED
CBR VALUE AT .1"	17.3	22.2
CBR VALUE AT .2"	25.7	29.0

STRESS-PENETRATION CURVE



LIQUID LIMIT	18	PLASTIC LIMIT	15	PLASTIC INDEX	3
Percent Passing #200 Sieve = 27.9%		Natural Moisture Content = 10.3%			

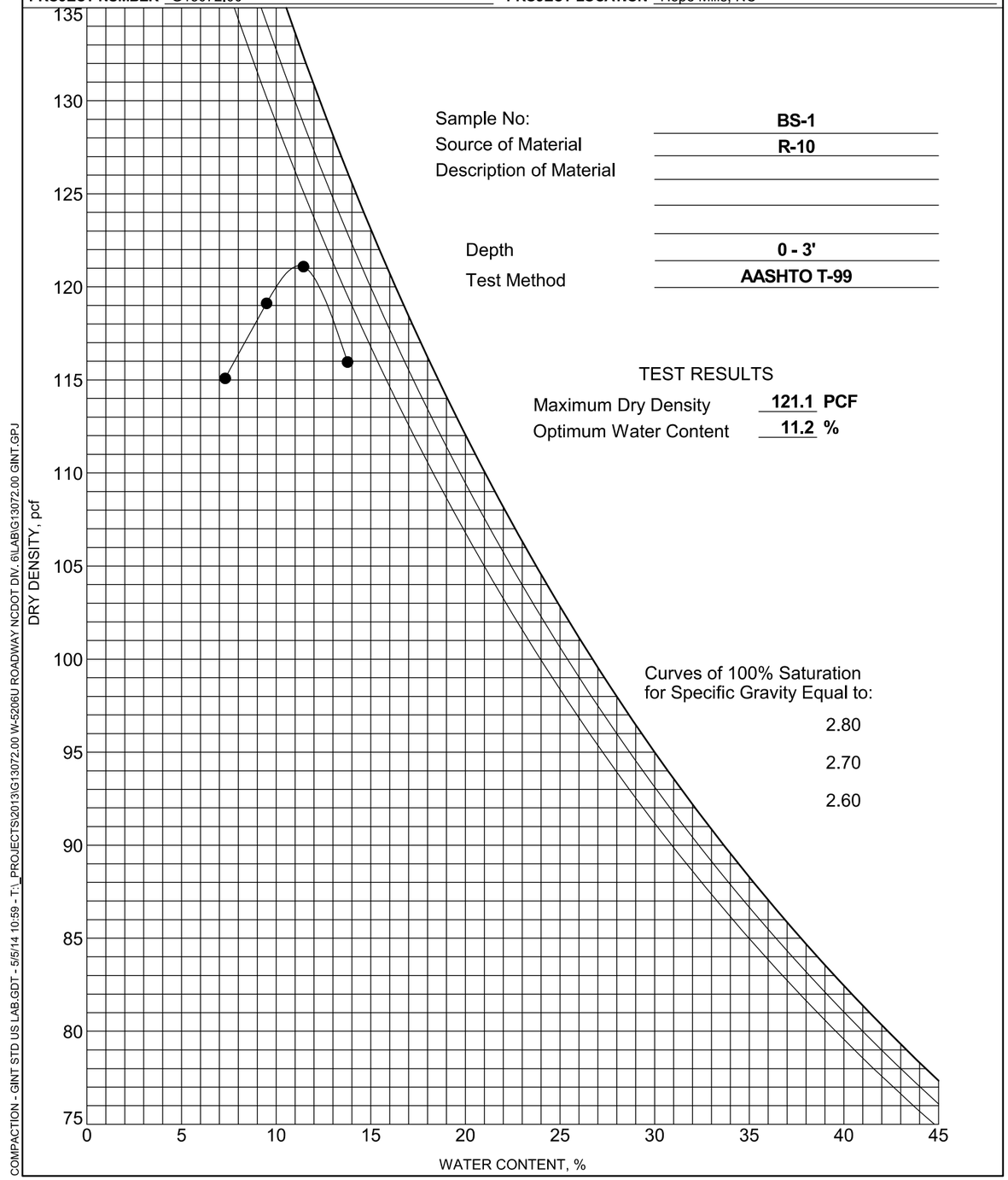
Falcon Engineering, Inc.
1210 Trinity Rd., Suite 110
Raleigh, NC 27607
Telephone: (919) 871-0800
Fax: (919) 871-0803

MOISTURE-DENSITY RELATIONSHIP

SHEET 32

CLIENT Rivers and Associates PROJECT NAME W-5206U

PROJECT NUMBER G13072.00 PROJECT LOCATION Hope Mills, NC



Sample No: BS-1

Source of Material R-10

Description of Material

Depth 0 - 3'

Test Method AASHTO T-99

TEST RESULTS

Maximum Dry Density 121.1 PCF

Optimum Water Content 11.2 %

COMPACTION - GINT STD US LAB.GDT - 5/5/14 10:59 - T:_PROJECTS\2013\G13072.00 W-5206U ROADWAY NCDOT DIV. 6\LAB\G13072.00 GINT.GPJ

FALCON ENGINEERING 1210 TRINITY RD., SUITE 110, RALEIGH, NC 27607

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

AASHTO T-193 \ ASTM D-1883

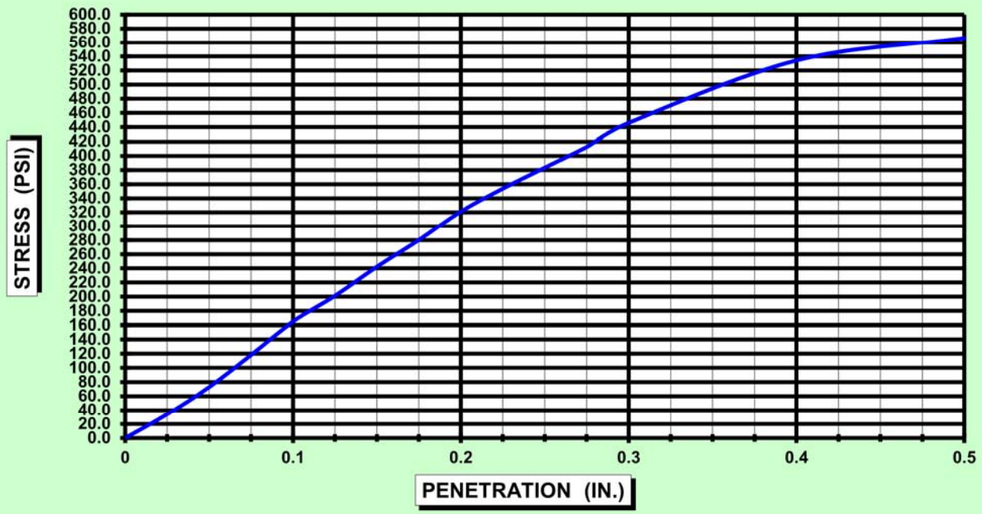
PROJECT #:	G13072.00			DATE:	5/5/2014
PROJECT NAME:		W-5206U			
BORING:	R-15	SAMPLE:	BS-2	DEPTH:	0-3'

SOIL DESCRIPTION:

COMPACTION METHOD	AASHTO T99	SOAK	96 HRS.
MAXIMUM DRY DENSITY	114.3 PCF	STRAIN RATE	.05 IN / MIN.
OPTIMUM MOISTURE CONTENT	13.0%	LOAD CELL	2500LB
TEST DATA		SURCHARGE WEIGHT	10 lb.
DRY DENSITY	109.5 PCF	SURCHARGE PER SQUARE FOOT	51 lbs/sq.ft.
MOISTURE CONTENT	13.0%	FINAL MOISTURE CONTENT	N/A
PERCENT COMPACTION	95.8%	SWELL	0.02%

	ACTUAL	CORRECTED
CBR VALUE AT .1"	16.5	18.2
CBR VALUE AT .2"	21.4	22.5

STRESS-PENETRATION CURVE



LIQUID LIMIT	24	PLASTIC LIMIT	18	PLASTIC INDEX	6
Percent Passing #200 Sieve = 26.4%		Natural Moisture Content = 13.7%			

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1210 Trinity Rd., Suite 110
Raleigh, NC 27607
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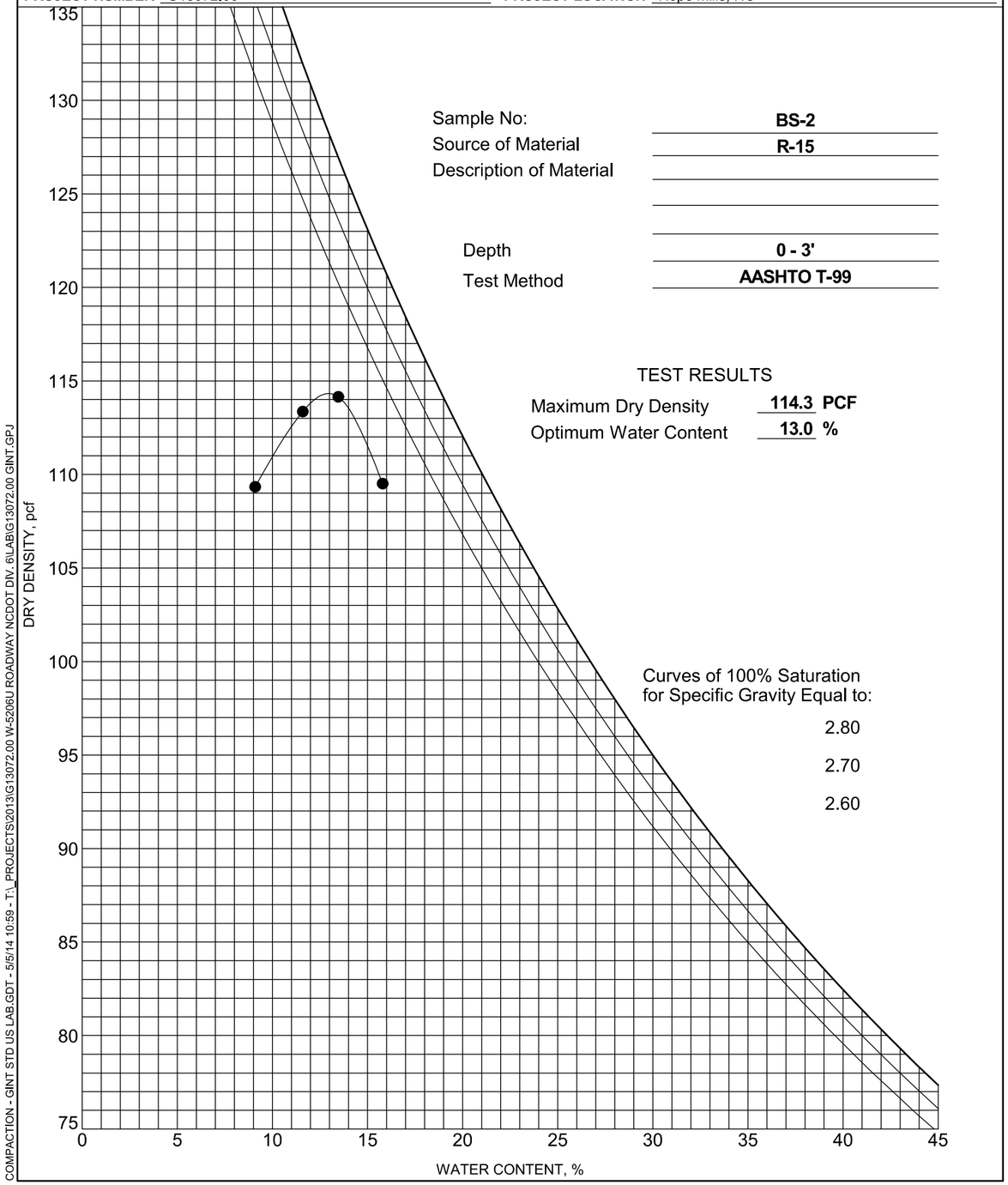
MOISTURE-DENSITY RELATIONSHIP

CLIENT Rivers and Associates PROJECT NAME W-5206U

PROJECT NUMBER G13072.00 PROJECT LOCATION Hope Mills, NC



Sample No: BS-2

Source of Material R-15

Description of Material

Depth 0 - 3'

Test Method AASHTO T-99

TEST RESULTS

Maximum Dry Density 114.3 PCF

Optimum Water Content 13.0 %

COMPACTION - GINT STD US LAB.GDT - 5/5/14 10:59 - T:_PROJECTS\2013\G13072.00 W-5206U ROADWAY NCDOT DIV. 6\LAB\G13072.00 GINT.GPJ