

PROJECT: 8.1991501 ID: B-4696

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

CONTENTS: APPENDICES

NC DEPARTMENT OF TRANSPORTATION,
DIVISION OF HIGHWAYS, GEOTECHNICAL UNIT,
SOIL AND ROCK LEGEND, TERMS, AND
ABBREVIATIONS

SITE VICINITY MAP

BORING LOCATION PLAN

PROFILE

END BENT 1 CROSS SECTION

BENT 1 CROSS SECTION

END BENT 2 CROSS SECTION

FINAL LOGS: BORE LOG
CORE LOG
CORE PHOTO

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

FIELD SCOUR REPORT

CHANNEL BED MATERIAL SUMMARY

CHANNEL BED MATERIAL GRAIN SIZE CURVE

STATE PROJECT 8.1991501 I.D. NO. B-4696

F.A. PROJECT STP-19(11)

COUNTY SWAIN

PROJECT DESCRIPTION BRIDGE #24 ON US

19/441 OVER THE OCONALUFTEE RIVER IN

CHEROKEE

SITE DESCRIPTION _____

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4696	I	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
8.1991501		P.E.	
		CONST.	

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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.

For Letting

INVESTIGATED BY TIERRA, INC. PERSONNEL C. BRUINSMA

CHECKED BY B. KEANEY, P.E. M. WILSON, E. I.

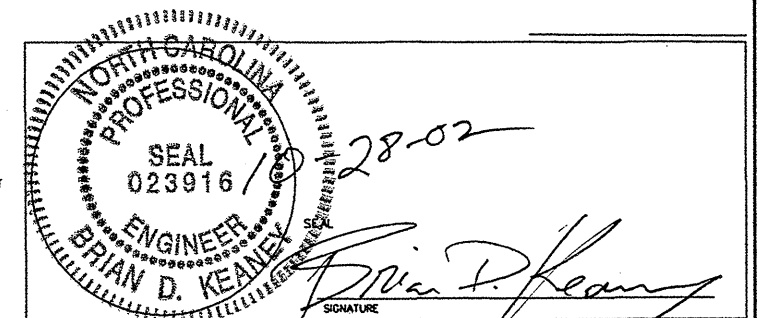
SUBMITTED BY M. ROBERTSON, L.G. J. LITTLE

DATE September 6, 2002

DRAWN BY: I. NEWSOME/E. WAGNER

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

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAVES 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.

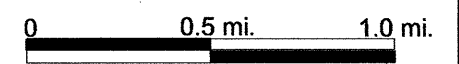
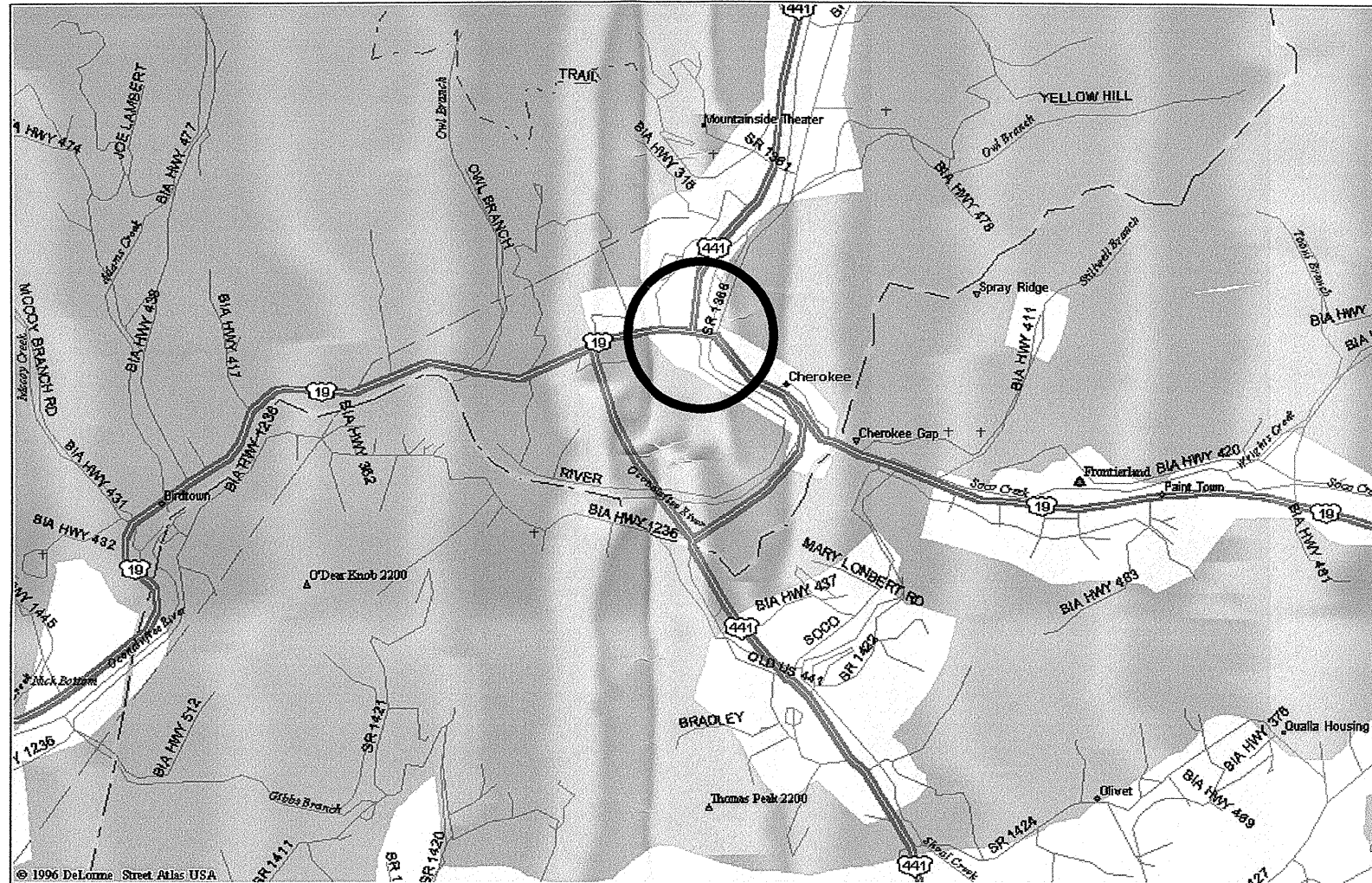


NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

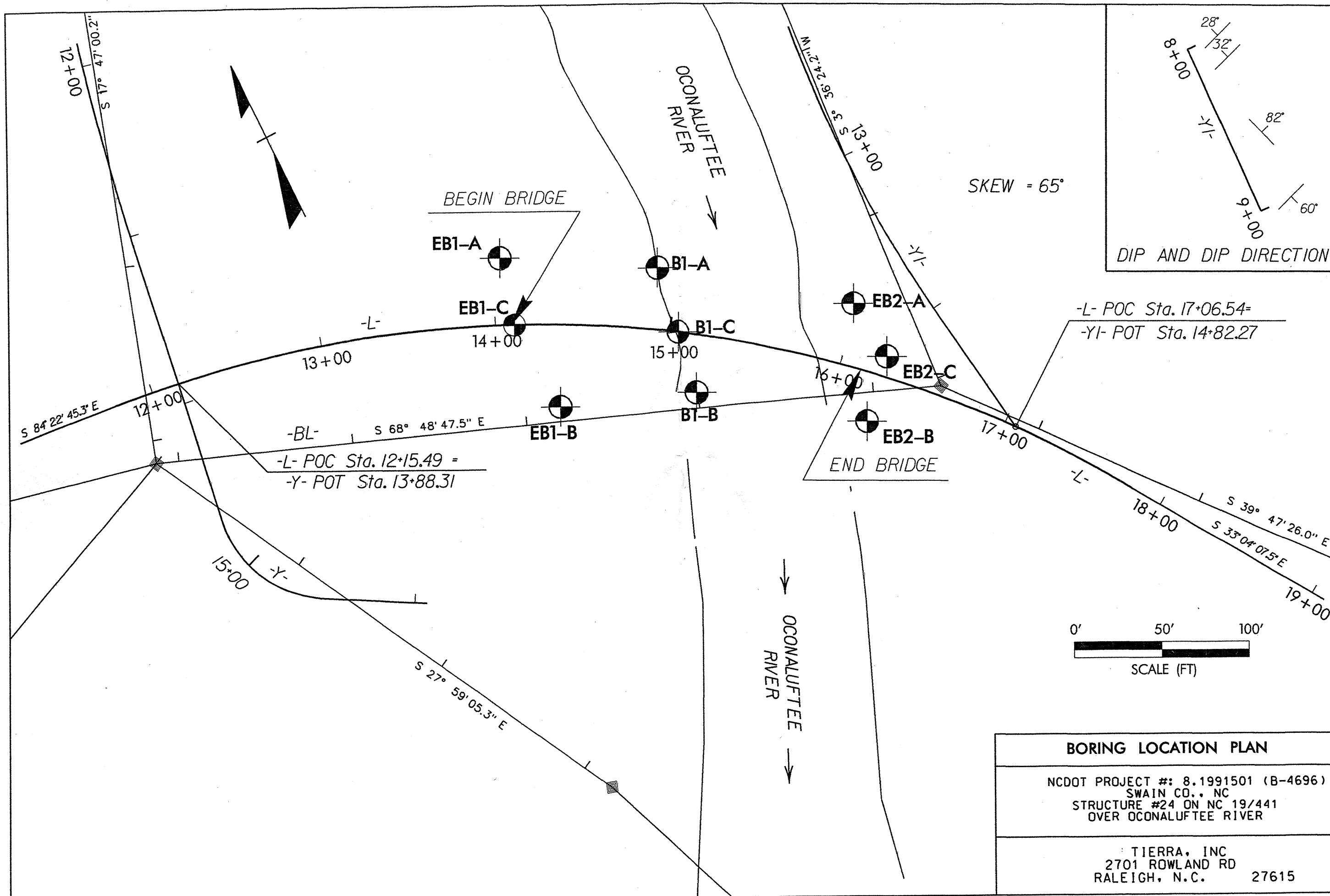
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

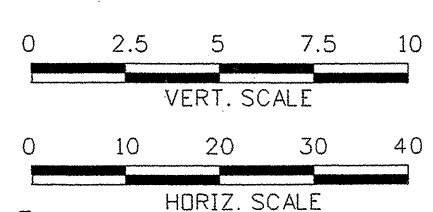
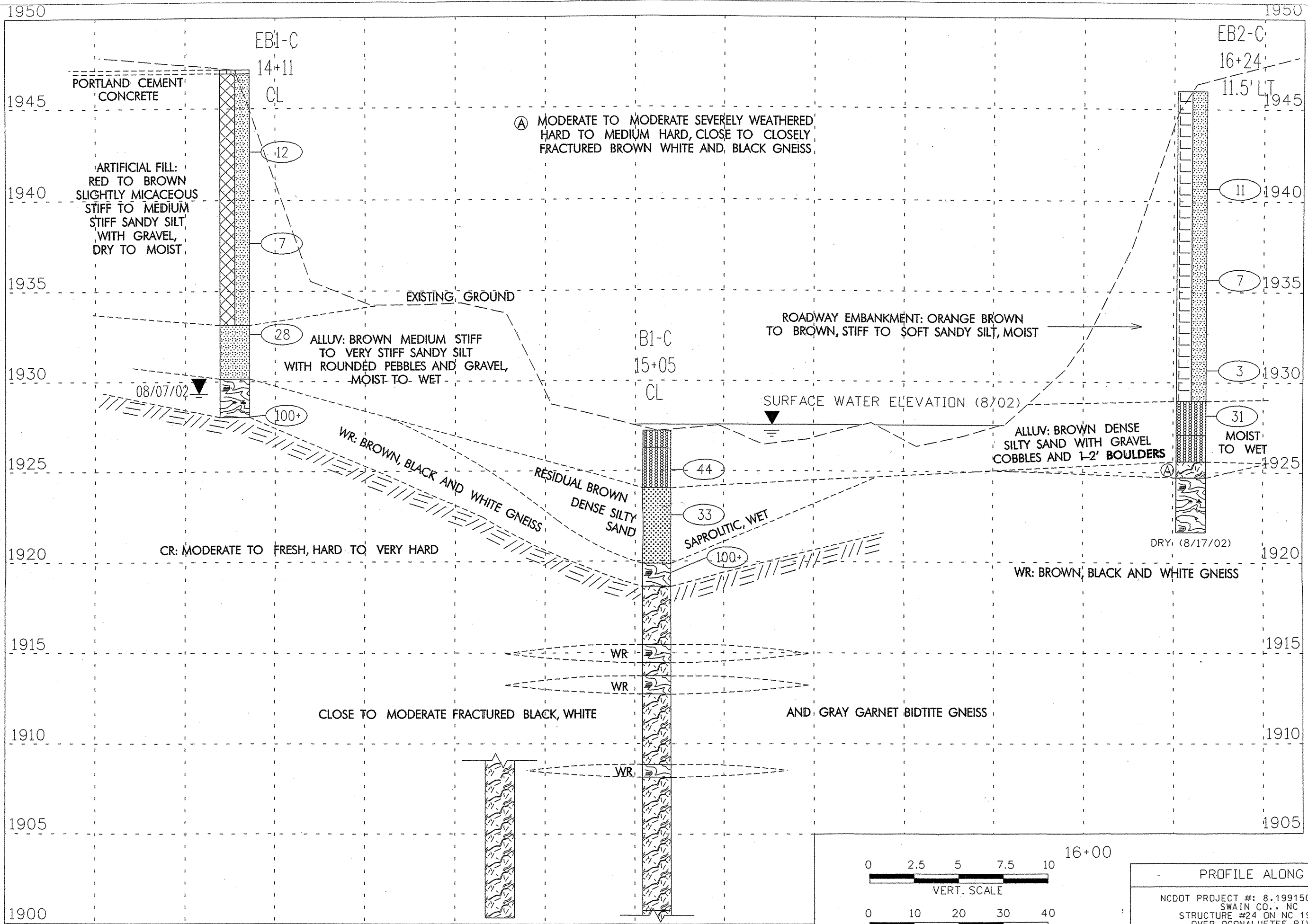
Main content table with multiple columns and rows, including sections for SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, MINERALOGICAL COMPOSITION, COMPRESSIBILITY, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, ABBREVIATIONS, EQUIPMENT USED ON SUBJECT PROJECT, FRACTURE SPACING, BEDDING, INDURATION, and PLASTICITY/COLOR.



Approximate Scale

Site Location
Bridge 24 on 19/441 over Oconaluftee Cherokee, North Carolina Tierra, Inc. Project No.: 6211-02-020



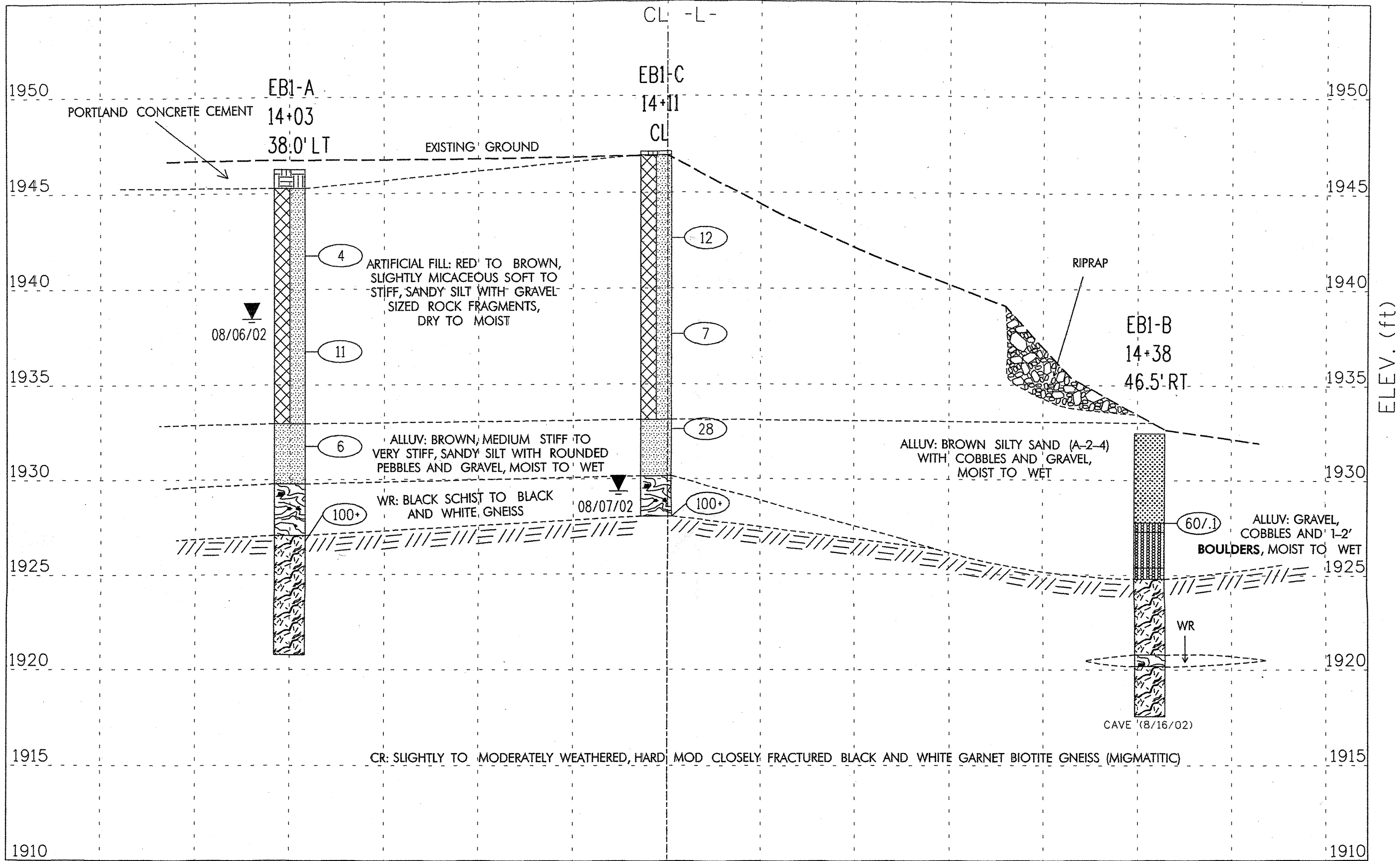


PROFILE ALONG -L-

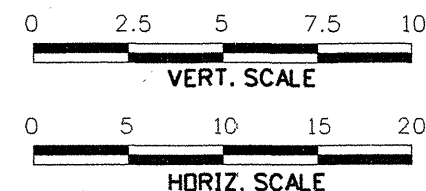
NCDOT PROJECT #: 8.1991501 (B-4696)
SWAIN CO., NC
STRUCTURE #24 ON NC 19/441
OVER OCONALUFTEE RIVER

TIERRA, INC
2701 ROWLAND RD
RALEIGH, N.C. 27615

PROFILE ALONG -L-



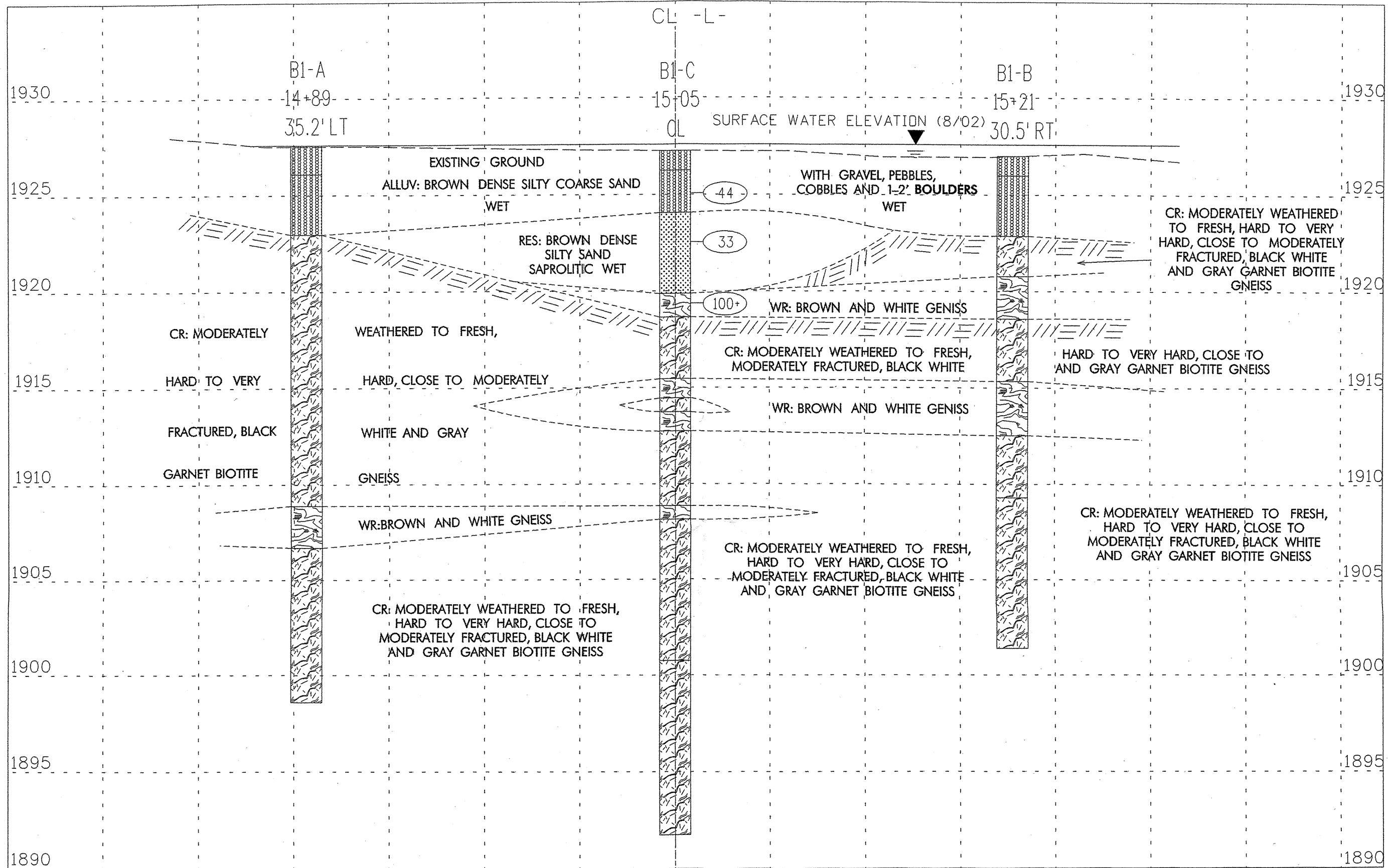
CROSS SECTION ALONG EB-1



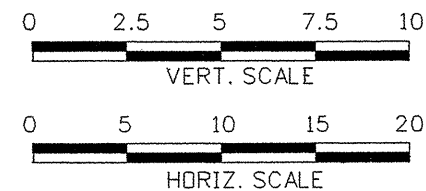
CROSSSECTION ALONG EB-1

NCDOT PROJECT #: 8.1991501 (B-4696)
SWAIN CO., NC
STRUCTURE #24 ON NC 19/441
OVER OCONALUFTEE RIVER

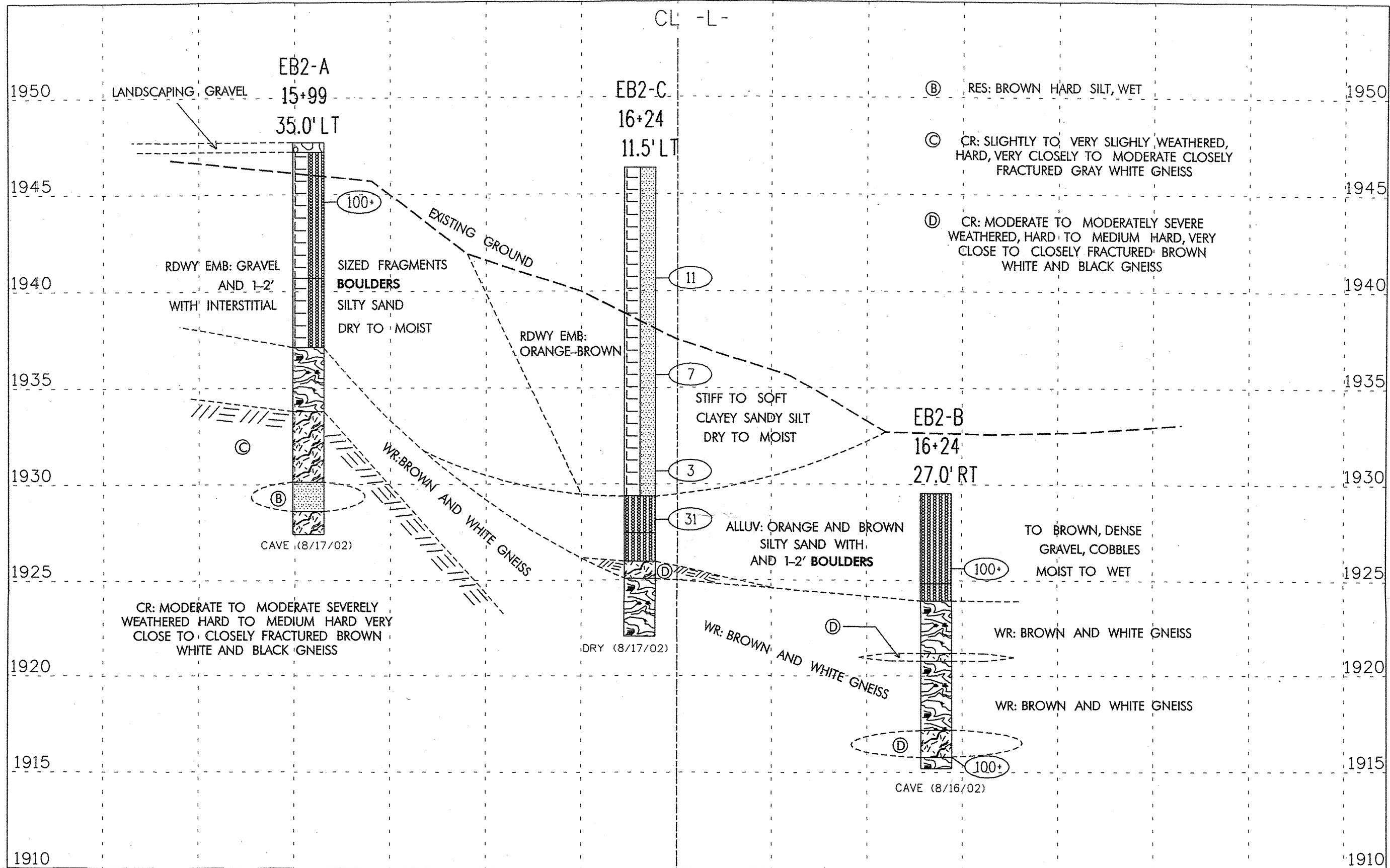
TIERRA, INC
2701 ROWLAND RD
RALEIGH, N.C. 27615



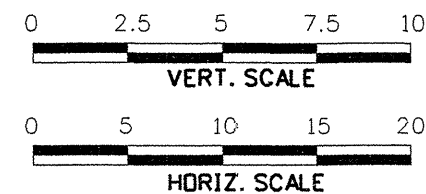
CROSS SECTION ALONG B-1



CROSSSECTION ALONG B-1	
NCDOT PROJECT #: 8.1991501 (B-4696) SWAIN CO., NC STRUCTURE #24 ON NC 19/441 OVER OCONALUFTEE RIVER	
TIERRA, INC 2701 ROWLAND RD RALEIGH, N.C.	27615



CROSS SECTION ALONG EB-2



CROSSSECTION ALONG EB-2
NCDOT PROJECT #: 8.1991501 (B-4696) SWAIN CO., NC STRUCTURE #24 ON NC 19/441 OVER OCONALUFTEE RIVER
TIERRA, INC 2701 ROWLAND RD RALEIGH, N.C. 27615



2701 ROWLAND ROAD
 RALEIGH, NORTH CAROLINA 27615
 Phone (919) 871-0800 Fax (919) 871-0803

N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1991501		ID. B-4696		COUNTY SWAIN		GEOLOGIST C. BRUINSMA							
SITE DESCRIPTION BRIDGE NO. 24 ON NC 19/441 OVER OCONALUFTEE RIVER						GROUND WATER (ft)							
BORING NO. EB1-A		BORING LOCATION 14+03		OFFSET 38.0' LT		ALIGNMENT -L-							
COLLAR ELEV. 1946.3 ft		NORTHING 714,289.3		EASTING 656,512.7		0 HR. 17.5							
TOTAL DEPTH 25.50 ft		DRILL MACHINE DIEDRICH D-50		DRILL METHOD HOLLOW STEM AUGER/ CORE		HAMMER TYPE MANUAL							
DATE STARTED 08/05/02		COMPLETED 08/05/02		SURFACE WATER DEPTH									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
1946.30													EXISTING GROUND
													1946.30 PORTLAND CEMENT CONCRETE 0.00
													1945.30 ARTIFICIAL FILL: BROWN TO RED SLI. MICA BROWN SOFT TO STIFF SANDY SILT WITH ANGULAR GRAVEL SIZED FRAGMENT (A-4) 1.00
1945	3.50	2	2	2							SS-1	24.5%	
1940	8.50	9	6	5									
1935	13.50	2	2	4							SS-2	31.3%	1933.00 ALLUVIAL: BROWN MICA. MED. STIFF SANDY SILT (A-4) 13.30
1930	18.50												1929.80 WR: BLACK SCHIST 16.50
1925													1927.10 CR: V. SLI. TO SLI. WEATHERED HARD V. CLOSELY TO MOD. CLOSELY FRACTURED BLACK AND WHITE GARNET-BIOTITE GNEISS 19.20
													1920.80 CORING TERMINATED AT ELEVATION 1920.8' IN CR: V. SLI. TO SLI. WEATHERED HARD V. CLOSELY TO MOD. CLOSELY FRACTURED BLACK AND WHITE GARNET-BIOTITE GNEISS 25.50

CORE BORING REPORT

DATE: 8/5/02

PROJECT: 8.1991501 I.D. NO.: B-4696 BORING NO: EB1-A GEOLOGIST: C. BRUINSMA

DESCRIPTION: BRIDGE NO. 24 ON 19/441 OVER OCONALUFTEE RIVER

COUNTY: SWAIN COLLAR ELEV.: 1946.3 FT TOTAL DEPTH: 25.5 FT

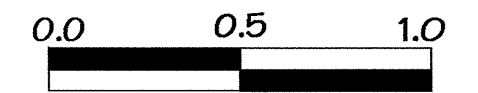
ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1927.1	19.2	3:15					19.2' - 25.5' CR: V. SLI. TO SLI. WEATHERED HARD V. CLOSE TO MOD. CLOSELY FRACTURED BLACK AND WHITE GARNET-BIOTITE GNEISS
		:30/3		1.25/1.3	1/1.3		
			1.3	96.2%	76.9%		
1925.8	20.5						STRATA REC=99.2% STRATA RQD=67.5%
1925.8	20.5	2:15					
		1:30			3.25/5		
		2:00	5.0	100%	65%		
1920.8	25.5	2:00					

CORING TERMINATED AT 25.5 FT
 ELEVATION 1,920.8 FT

DRILLER: J. LITTLE CORE SIZE: NQ2 EQUIPMENT: DIEDRICH D-50



EB1A Box 1 of 1, 19.2' - 25.5'



SCALE (ft.)

Core Photos

Bridge No. 24 on US 19/441 over Oconaluftee River

Cherokee, North Carolina

Tierra Project No.: 6211-02-020



2701 ROWLAND ROAD
 RALEIGH, NORTH CAROLINA 27615
 Phone (919) 871-0800 Fax (919) 871-0803

N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1991501		ID. B-4696		COUNTY SWAIN		GEOLOGIST C. BRUINSMA									
SITE DESCRIPTION BRIDGE NO. 24 ON NC 19/441 OVER OCONALUFTEE RIVER							GROUND WATER (ft)								
BORING NO. EB1-C		BORING LOCATION 14+11		OFFSET CL		ALIGNMENT -L-									
COLLAR ELEV. 1947.2 ft		NORTHING 714,279.8		EASTING 656,475.0		0 HR. 17.6									
TOTAL DEPTH 19.10 ft		DRILL MACHINE DIEDRICH D-50		DRILL METHOD HOLLOW STEM AUGER		HAMMER TYPE MANUAL									
DATE STARTED 08/06/02		COMPLETED 08/06/02		SURFACE WATER DEPTH											
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
1947.20					EXISTING GROUND							1947.20	0.00		
	3.50	2	5	7							SS-4	18.6%	1947.00	0.20	PORTLAND CEMENT CONCRETE ARTIFICIAL FILL: RED AND BROWN MICA. STIFF TO MED. STIFF SANDY SILT WITH GRAVEL (A-4)
	8.50	3	3	4							SS-5	23.2%			
	13.50	3	2	26							SS-6	26.4%	1933.20	14.00	ALLUVIAL: DARK BROWN V. STIFF SLI. SANDY SILT WITH ROUNDED PEBBLES AND GRAVEL (A-4)
	18.50	15	85/1										1930.20	17.00	WR: BLACK AND WHITE GNEISS
													1928.10	19.10	BORING TERMINATED BY AUGER REFUSAL AT ELEVATION 1,928.1' ON CRYSTALLINE ROCK

NCDOT_BORE_02020.GPJ NCDOT.GDT 10/31/02



2701 ROWLAND ROAD
 RALEIGH, NORTH CAROLINA 27615
 Phone (919) 871-0800 Fax (919) 871-0803

N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1991501		ID. B-4696		COUNTY SWAIN		GEOLOGIST C. BRUINSMA						
SITE DESCRIPTION BRIDGE NO. 24 ON NC 19/441 OVER OCONALUFTEE RIVER						GROUND WATER (ft)						
BORING NO. EB1-B		BORING LOCATION 14+38		OFFSET 46.5' RT		ALIGNMENT -L-						
COLLAR ELEV. 1932.5 ft		NORTHING 714,282.3		EASTING 656,421.4		0 HR. CAVE AT 1.6						
TOTAL DEPTH 14.90 ft		DRILL MACHINE DIEDRICH D-50		DRILL METHOD CASING ADV. /CORE		24 HR. DRY						
DATE STARTED 08/15/02		COMPLETED 08/15/02		SURFACE WATER DEPTH								
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100		
1932.50												EXISTING GROUND
												1932.50 0.00
												SS-3
												ALLUVIAL: BROWN SILTY SAND (A-2-4) WITH COBBLES AND GRAVEL
												1927.80 4.70
1930												1927.30 5.20
	4.70											ALLUVIAL: GRAVEL (ROUNDED)
												ALLUVIAL: QUARTZ BOULDER
												1925.40 7.10
												1924.80 7.70
												CR: MOD. WEATHERED MOD. HARD V. CLOSE TO CLOSELY FRACTURED BLACK, WHITE AND BROWN GNEISS
1925												1920.80 11.70
												1920.20 12.30
												WR: BROWN AND WHITE GNEISS
												CR: MOD. WEATHERED MOD. HARD V. CLOSE TO CLOSELY FRACTURED BLACK, WHITE AND BROWN GNEISS
1920												1917.60 14.90
												CORING TERMINATED AT ELEVATION 1917.6' IN CR: MOD. WEATHERED MOD. HARD V. CLOSE TO CLOSELY FRACTURED BLACK, WHITE AND BROWN GNEISS

CORE BORING REPORT

DATE: 8/15/02

PROJECT: 8.1991501 I.D. NO.: B-4696 BORING NO: EB1-B GEOLOGIST: C. BRUINSMA

DESCRIPTION: BRIDGE NO. 24 ON 19/441 OVER OCONALUFTEE RIVER

COUNTY: SWAIN COLLAR ELEV.: 1932.5 FT TOTAL DEPTH: 14.9 FT

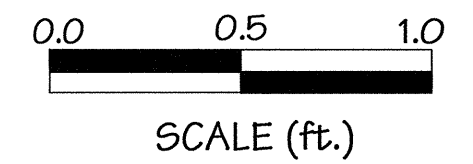
ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1927.8	4.7	1:30/0.5		0.4/0.5	N/A		4.7' - 5.2' ALLUVIAL: ROUNDED GRAVELS AND SILTY SANDS
1927.3	5.2		0.5	80.0%	N/A		
1927.3	5.2	1:00/0.2		0.2/0.2	N/A		5.2' - 7.1' ALLUVIAL: QUARTZ BOULDER
1927.1	5.4		0.2	100%	N/A		
1927.1	5.4	4:15					
		3:30/0.3		1.2/1.3	N/A		
1925.8	6.7		1.3	92.3%			
1925.8	6.7	1:00					7.1' - 7.7' ALLUVIAL: GRAVEL
		1:00		2.6/3.2			
		1:00	3.2				7.7' - 11.7' CR: MOD. WEATHERED MOD. HARD VERY CLOSE TO CLOSELY FRACTURED BACK, WHITE AND BROWN GNEISS
1922.6	9.9	0:15/0.2		81.2%	0%		STRATA REC. = 100% STRATA RQD = 0%
1922.6	9.9	0:45					WR: BROWN AND WHITE GNEISS
		0:30		4.4/5	1.6/5		STRATA REC. = 2.0%
		1:15	5.0				
		0:45		88.0%	32.0%		11.7' - 12.3'
1917.6	14.9	0:45					12.3' - 14.9' CR: SLI. TO MOD. WEATHERED MOD. HARD TO HARD VERY CLOSE TO CLOSELY FRACTURED WHITE, GRAY AND BLACK GNEISS
							STRATA REC. = 98.1% STRATA RQD = 46.2%

CORING TERMINATED AT 14.9 FT
 ELEVATION 1,917.6 FT

DRILLER: J. LITTLE CORE SIZE: NQ2 EQUIPMENT: DIEDRICH D-50



EB1B Box 1 of 1, 4.7' - 14.9'



Core Photos

Bridge No. 24 on US 19/441 over Oconaluftee River
Cherokee, North Carolina
Tierra Project No.: 6211-02-020



2701 ROWLAND ROAD
 RALEIGH, NORTH CAROLINA 27615
 Phone (919) 871-0800 Fax (919) 871-0803

N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1991501	ID. B-4696	COUNTY SWAIN	GEOLOGIST C. BRUINSMA
SITE DESCRIPTION BRIDGE NO. 24 ON NC 19/441 OVER OCONALUFTEE RIVER			GROUND WATER (ft)
BORING NO. B1-A	BORING LOCATION 14+89	OFFSET 35.0' LT	ALIGNMENT -L- 0 HR.
COLLAR ELEV. 1927.5 ft	NORTHING 714,367.1	EASTING 656,467.0	24 HR.
TOTAL DEPTH 29.00 ft	DRILL MACHINE DIETRICH D-50	DRILL METHOD CASING ADV. /CORE	HAMMER TYPE MANUAL
DATE STARTED 08/13/02	COMPLETED 08/13/02	SURFACE WATER DEPTH 0.2 FT	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	20	40	60	80			
1927.50												EXISTING GROUND
												1927.50 0.00
												ALLUVIAL: ROUNDED COBBLES AND GRAVEL
												1926.00 1.50
1925												ALLUVIAL: BOULDERS, GRAVEL AND COBBLES
												1922.90 4.60
												CR: MOD. WEATHER TO FRESH HARD TO V. HARD CLOSE TO MOD. CLOSELY FRACTURED BLACK GRAY AND WHITE GARNET BIOTITE GNEISS (MIGMATITIC)
1920												RS-1
1915												
1910												
												1908.80 18.70
												WR: MOD. SEVERELY WEATHERED V. SOFT V. CLOSE TO CLOSELY FRACTURED BROWN, WHITE AND BLACK GNEISS
												1906.60 20.90
												CR: FRESH HARD MOD. CLOSELY FRACTURED BLACK WHITE AND GRAY GARNET BIOTITE GNEISS (MIGMATITIC)
1905												
1900												
												1898.50 29.00
												CORING TERMINATED AT ELEVATION 1898.5' IN CR: FRESH HARD MOD. CLOSELY FRACTURED BLACK WHITE AND GRAY GARNET BIOTITE GNEISS (MIGMATITIC)

CORE BORING REPORT

DATE: 8/13/02

PROJECT: 8.1991501 I.D. NO.: B-4696 BORING NO: B1-A GEOLOGIST: C. BRUINSMA

DESCRIPTION: BRIDGE NO. 24 ON 19/441 OVER OCONALUFTEE RIVER

COUNTY: SWAIN COLLAR ELEV.: 1927.5 FT TOTAL DEPTH: 29.0 FT

ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1926.0	1.5	1:15	3.5	1.45/3.5	N/A		1.5' - 4.6' ALLUVIAL: BOULDERS, GRAVEL AND COBBLES
		1:15					
		:30					
1923.5	4.0	:15/5		41.4%			
1923.5	4.0	:30	5.0	3.8/5	2.6/5		4.6' - 18.7' CR: MOD. TO FRESH HARD TO V. HARD CLOSE TO MOD. CLOSELY FRACTURED BLACK GRAY AND WHITE GARNET BIOTITE GNEISS (MIGMATITIC)
		1:30					
		2:00					
1918.5	9.0	1:30		76%	52%		
1918.5	9.0	1:30	5.0	5.0/5.0	4.0/5		
		1:30					
		1:45					
1913.5	14.0	1:30		100%	80%		
1913.5	14.0	1:30	5.0	4.1/5	2.85/5		STRATA REC = 86% STRATA RQD = 63%
		1:30					
		2:00					
		2:00		82%	57%		WR: MOD. SEVERELY WEATHERED V. SOFT V. CLOSE TO CLOSELY FRACTURED BROWN, WHITE AND BLACK GNEISS
1908.5	19.0	1:15					
1908.5	19.0	1:00	5.0	3.55/5	2.95/5		18.7' - 20.9' STRATA REC = 31.3% STRATA RQD = 0%
		:45					
		2:00					
		1:30		71%	59%		20.9' - 29.0' CR: FRESH HARD MOD. CLOSELY FRACTURED BLACK WHITE AND GRAY GARNET BIOTITE GNEISS (MIGMATITIC)
1903.5	24.0	1:30					
1903.5	24.0	1:45	5.0	5.0/5.0	4.7/5		
		1:30					
		1:45					
		1:30		100%	94%		
1898.5	29.0	1:30					STRATA REC = 88.1% STRATA RQD = 78.9%

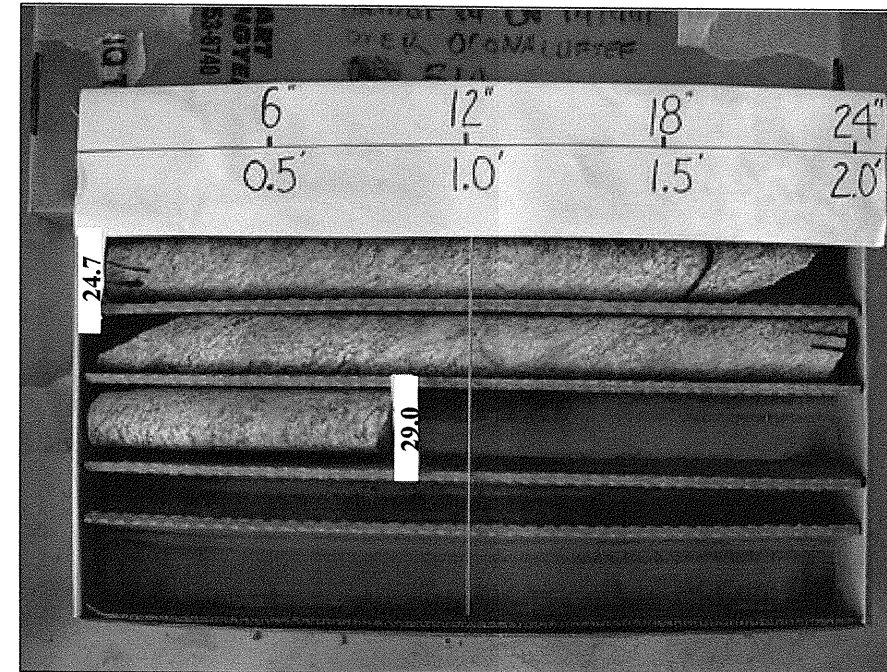
CORING TERMINATED AT 29.0 FT
 ELEVATION 1,898.5 FT

DRILLER: J. LITTLE CORE SIZE: NQ2 EQUIPMENT: DIETRICH D-50

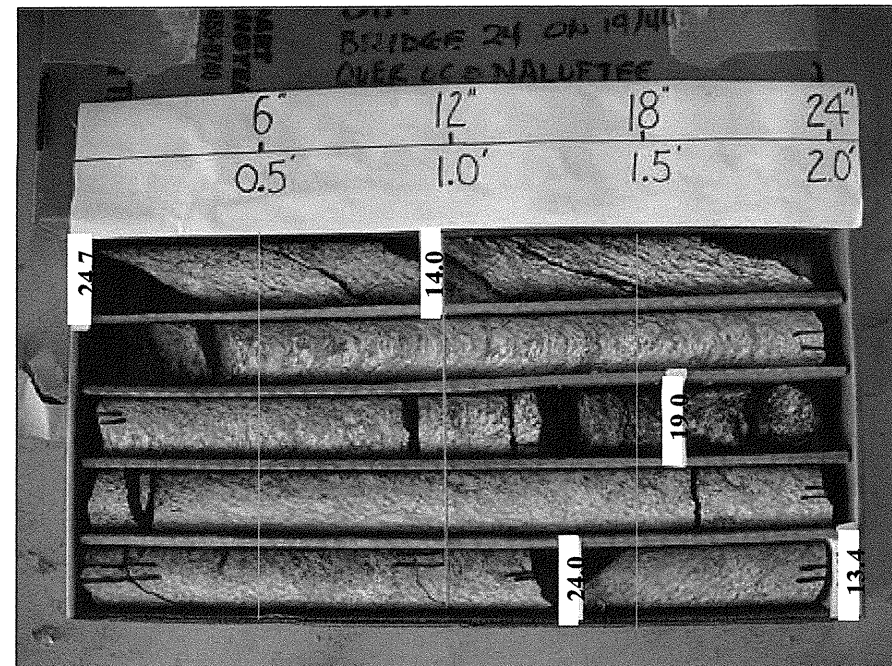
NCDOT_BORE 02020.GPJ NCDOT.GDT 10/31/02



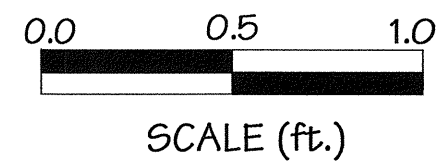
B1A Box 1 of 3, 1.5' - 13.4'



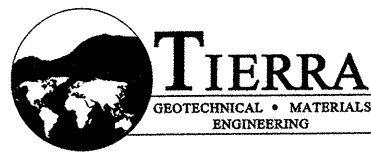
B1A Box 3 of 3, 24.7' - 29.0'



B1A Box 2 of 3, 13.4' - 24.7'



Core Photos
Bridge No. 24 on US 19/441 over Oconaluftee River Cherokee, North Carolina Tierra Project No.: 6211-02-020



2701 ROWLAND ROAD
RALEIGH, NORTH CAROLINA 27615
Phone (919) 871-0800 Fax (919) 871-0803

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1991501		ID. B-4696		COUNTY SWAIN		GEOLOGIST C. BRUINSMA							
SITE DESCRIPTION BRIDGE NO. 24 ON NC 19/441 OVER OCONALUFTEE RIVER						GROUND WATER (ft)							
BORING NO. B1-C		BORING LOCATION 15+05		OFFSET CL		ALIGNMENT -L-							
COLLAR ELEV. 1927.3 ft		NORTHING 714,361.5		EASTING 656,428.7		0 HR.							
TOTAL DEPTH 35.50 ft		DRILL MACHINE DIEDRICH D-50		DRILL METHOD CASING ADV. /CORE		HAMMER TYPE MANUAL							
DATE STARTED 08/13/02		COMPLETED 08/13/02		SURFACE WATER DEPTH 0.3 FT									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
1927.30													EXISTING GROUND
	1.20	18	32	12									1927.30 ALLUVIAL: COBBLES AND GRAVEL WITH SILTY SAND 1.00
1925	3.70	60	19	14									1926.30 ALLUVIAL: BROWN DENSE SILTY COARSE SAND WITH SUBANGULAR TO ROUNDED GRAVEL AND PEBBLES (A-1-a) 3.20
	6.90	30	55	45/25									1924.10 RES: WHITE, BROWN AND BLACK SLI MICA. DENSE SILTY SAND, SAPROLITIC (A-2-4) 7.40
1920													1919.90 WR: BROWN, WHITE AND DARK GRAY GNEISS 8.60
													1918.70 CR: SLI. TO MOD. WEATHERED MED. HARD V. CLOSE TO CLOSELY FRACTURED BROWN, WHITE AND BLACK GARNET BIOTITE GNEISS (MIGMATITIC) 11.80
1915													1915.50 WR: BROWN AND WHITE GNEISS 12.80
													1914.50 CR: MOD. WEATHERED MED. HARD CLOSELY FRACTURED BROWN, WHITE AND BLACK GARNET BIOTITE GNEISS (MIGMATITIC) 14.50
1910													1913.80 WR: BROWN AND WHITE GNEISS 18.40
													1912.80 CR: SLI. WEATHERED V. CLOSE TO CLOSELY FRACTURED WHITE, BLACK AND GRAY GNEISS 19.10
1905													1908.90 WR: BROWN AND WHITE GNEISS 26.50
													1908.20 CR: V. SLI. TO MOD. WEATHERED HARD TO MOD. HARD V. CLOSELY TO MOD. CLOSELY FRACTURED WHITE, BLACK AND GRAY GNEISS (MIGMATITIC) 26.50
1900													1900.80 CR: FRESH TO V. SLI. WEATHERED HARD CLOSE TO WIDELY FRACTURED GRAY, WHITE AND BLACK GARNET BIOTITE GNEISS (MIGMATITIC) 35.50
1895													CT AT ELEV. 1891.8' IN CR: FRESH TO V. SLI. WEATHERED HARD CLOSE TO WIDELY FRAC. GRAY, WHITE AND BLACK GARNET BIOTITE GNEISS (MIGMATITIC)

CORE BORING REPORT

DATE: 8/13/02

PROJECT: 8.1991501 I.D. NO.: B-4696 BORING NO: B1-C GEOLOGIST: C. BRUINSMA

DESCRIPTION: BRIDGE NO. 24 ON 19/441 OVER OCONALUFTEE RIVER

COUNTY: SWAIN COLLAR ELEV.: 1927.3 FT TOTAL DEPTH: 35.5 FT

ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1918.7	8.6	1:15	1.9	1.7/1.9	0.5/1.9	RS-4	8.6' - 11.8' CR: SLI. TO MOD. WEATHERED MED. HARD VERY. CLOSE TO CLOSELY FRACT. BROWN, WHITE AND BLACK GARNET BIOTITE GNEISS (MIGMATITIC) STRATA REC. = 90.6% STRATA RQD = 15.6%
1916.8	10.5	1:15/9					
1916.8	10.5	1:15	5.0	3.2/5	0.7/5		11.8' - 12.8' WR: BROWN AND WHITE GNEISS STRATA REC. = 10.0%
		0:45					
		0:45					
1911.8	15.5	1:15	5.0	64.0%	14.0%		12.8' - 13.5' CR: MOD. WEATHERED MED. HARD CLOSELY FRACTURED BROWN, WHITE AND BLACK GARNET BIOTITE GNEISS STRATA REC. = 100% STRATA RQD = 31.1%
1911.8	15.5	1:00					
		0:45					
1906.8	20.5	1:30	5.0	86.0%	50.0%		13.5' - 14.5' WR: BROWN AND WHITE GNEISS STRATA REC. = 15%
1906.8	20.5	1:45					
		1:00					
1906.8	20.5	1:45	5.0	4.9/5	4.1/5		14.5' - 18.4' CR: SLI. WEATHERED MOD. HARD VERY CLOSE TO CLOSELY FRACTURED WHITE BLACK AND GRAY GNEISS STRATA REC. = 100% STRATA RQD = 31.1%
		1:45					
		1:00					
1901.8	25.5	1:30	5.0	98.0%	82.0%		18.4' - 19.1' WR: BROWN AND WHITE GNEISS STRATA REC. = 0%
1901.8	25.5	1:45					
		1:45					
1896.8	30.5	2:00	5.0	5.0/5	4.8/5		19.1' - 26.5' CR: VERY SLI. TO MOD. WEATHERED HARD TO MOD. HARD VERY CLOSELY TO MOD. CLOSELY FRACTURED WHITE, BLACK AND GRAY GNEISS (MIGMATITIC) STRATA REC. = 98.3% STRATA RQD = 46.2%
		1:30					
		2:00					
1896.8	30.5	1:45	5.0	5.0/5	5.0/5		26.5' - 35.5' CR: FRESH TO VERY SLI. WEATHERED HARD CLOSE TO WIDELY FRACTURED GRAY, WHITE AND BLACK GARNET BIOTITE GNEISS (MIGMATITIC) STRATA REC. = 100% STRATA RQD = 98.0%
		2:00					
		2:30					
1891.8	35.5	2:15		100%	100%		
		2:45					

CORING TERMINATED AT 35.5 FT
ELEVATION 1,891.8 FT

DRILLER: J. LITTLE CORE SIZE: NQ2 EQUIPMENT: DIEDRICH D-50

NCDOT_BORE 02020.GPJ NCDOT.GDT 10/31/02



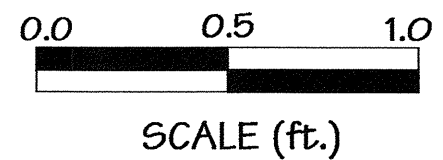
B1C Box 1 of 3, 8.6' - 20.5'



B1C Box 3 of 3, 29.7' - 35.5'



B1C Box 2 of 3, 20.5' - 29.7'



Core Photos
Bridge No. 24 on US 19/441 over Oconaluftee River Cherokee, North Carolina Tierra Project No.: 6211-02-020



2701 ROWLAND ROAD
 RALEIGH, NORTH CAROLINA 27615
 Phone (919) 871-0800 Fax (919) 871-0803

N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1991501		ID. B-4696		COUNTY SWAIN		GEOLOGIST C. BRUINSMA							
SITE DESCRIPTION BRIDGE NO. 24 ON NC 19/441 OVER OCONALUFTEE RIVER						GROUND WATER (ft)							
BORING NO. B1-B		BORING LOCATION 15+21		OFFSET 30.5' RT		ALIGNMENT -L-							
COLLAR ELEV. 1927.0 ft		NORTHING 714,356.0		EASTING 656,393.3		0 HR.							
TOTAL DEPTH 25.60 ft		DRILL MACHINE DIEDRICH D-50		DRILL METHOD CASING ADV. /CORE		HAMMER TYPE MANUAL							
DATE STARTED 08/14/02		COMPLETED 08/14/02		SURFACE WATER DEPTH 0.6 FT									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
1927.00													EXISTING GROUND
													1927.00 ALLUVIAL: BOULDERS, GRAVEL AND COBBLES 0.00
													1926.00 ALLUVIAL: BOULDERS, COBBLES, GRAVEL AND PEBBLES 1.00
1925													1922.90 CR: SLI. WEATHERED MOD. HARD TO HARD CLOSELY FRACTURED BLACK, WHITE AND GRAY GARNET BIOTITE GNEISS (MIGMATITIC) 4.10
													1920.80 WR: MOD. SEVERE TO SEVERELY WEATHERED SOFT TO V. SOFT V. CLOSELY TO CLOSELY FRACTURED BROWN AND WHITE GNEISS 6.20
1920													1918.60 CR V. SLI. WEATHERED HARD MOD. CLOSELY FRACTURED BLACK, WHITE AND GRAY GNEISS (MIGMATITIC) 8.40
													1915.30 WR: BROWN AND WHITE GNEISS 11.70
1915													1912.50 CR: SLI. TO MOD. WEATHERED MOD. HARD TO MED. HARD V. CLOSE TO CLOSELY FRACTURED BLACK, BROWN AND WHITE GNEISS 14.50
													1909.30 CR: FRESH V. HARD CLOSE TO WIDELY FRACTURED BLACK, WHITE AND GRAY GARNET BIOTITE GNEISS (MIGMATITIC) 17.70
1910													1901.40 CORING TERMINATED AT ELEVATION 1901.4' IN CR: FRESH V. HARD CLOSE TO WIDELY FRACTURED BLACK, WHITE AND GRAY GARNET BIOTITE GNEISS (MIGMATITIC) 25.60
1905													

CORE BORING REPORT

DATE: 8/14/02

PROJECT: 8.1991501 I.D. NO.: B-4696 BORING NO: B1-B GEOLOGIST: C. BRUINSMA

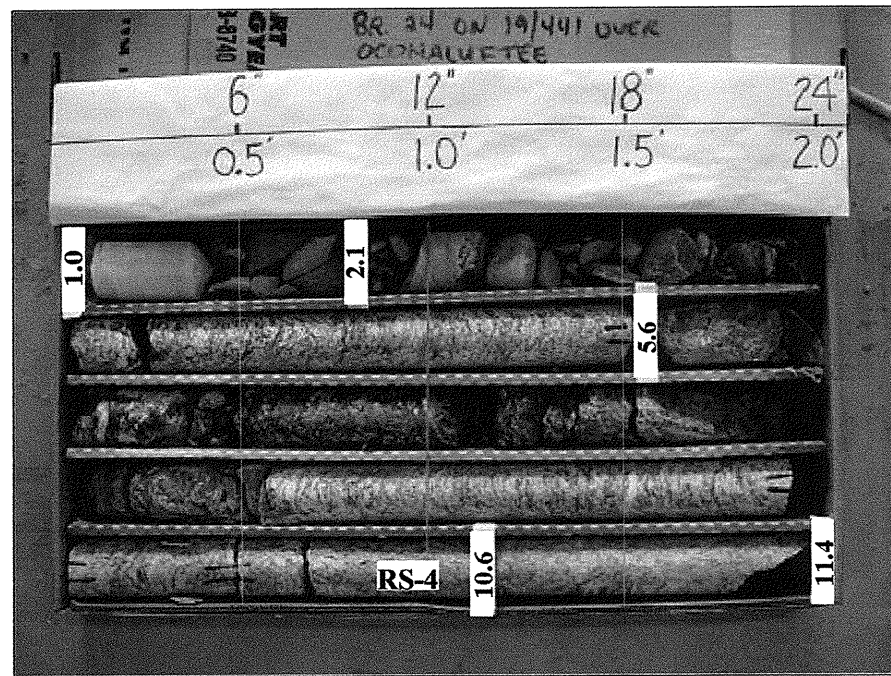
DESCRIPTION: BRIDGE NO. 24 ON 19/441 OVER OCONALUFTEE RIVER

COUNTY: SWAIN COLLAR ELEV.: 1927.0 FT TOTAL DEPTH: 25.6 FT

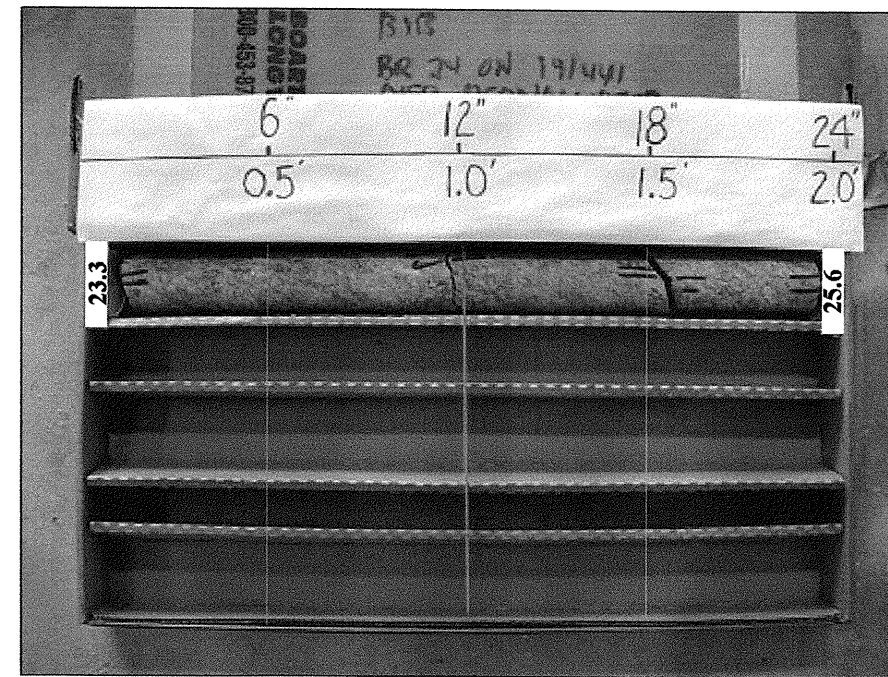
ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1926.0	1.0	1:15	1.1	0.8/1.1	N/A		1.0' - 4.1' ALLUVIAL: BOULDERS, COBBLES, GRAVEL AND PEBBLES
1924.9	2.1	:15/1					
1924.9	2.1	2:00	3.5	2.6/3.5	1.3/3.5		4.1' - 6.2' CR: SLI. WEATHERED MOD. HARD TO HARD CLOSELY FRACTURED BLACK, WHITE AND GRAY GARNET BIOTITE GNEISS (MIGMATITIC)
1921.4	5.6	2:15					
1921.4	5.6	2:00					
1921.4	5.6	0:45/0.5		74.3%	37.2%		STRATA REC = 100% STATA RQD = 61.9%
1921.4	5.6	1:15	5.0	4.8/5	2.3/5		6.2' - 8.4' WR: MOD. SEVERE TO SEVERELY WEATHERED SOFT TO V. SOFT V. CLOSELY TO CLOSELY FRACTURED BROWN AND WHITE GNEISS
		1:00					
		1:00					
		1:15					
1916.4	10.6	1:15		96%	46%		STRATA REC = 90.9% STATA RQD = 22.7%
1916.4	10.6	1:45	5.0	2.2/5	1.2/5		8.4' - 11.65' CR V. SLI. WEATHERED HARD MOD. CLOSELY FRACTURED BLACK, WHITE AND GRAY GNEISS (MIGMATITIC)
		:30					
		:45					
		:45					
1916.4	10.6	1:45		44%	24%		STRATA REC = 100% STATA RQD = 78.5%
1911.4	15.6	1:55	5.0	4.8/5	3.0/5		11.65' - 14.45' WR: BROWN AND WHITE GNEISS
1911.4	15.6	1:00					
		1:15					
		1:15					
1906.4	20.6	2:45		96%	60%		STRATA REC = 0%
1911.4	15.6	2:45		96%	60%		14.45' - 17.7' CR: SLI. TO MOD. WEATHERED MOD. HARD TO MED. HARD V. CLOSE TO CLOSELY FRACTURED BLACK, BROWN AND WHITE GNEISS
1906.4	20.6	1:45	5.0	4.6/5	4.6/5		17.7' - 25.6' CR: FRESH V. HARD CLOSE TO WIDELY FRACTURED BLACK, WHITE AND GRAY GARNET BIOTITE GNEISS (MIGMATITIC)
		2:30					
		2:00					
		3:00					
1906.4	20.6	2:15		92%	92%		STRATA REC = 93.9% STATA RQD = 29.2%
1901.4	25.6	2:15		92%	92%		STRATA REC = 94.9% STATA RQD = 89.9%

CORING TERMINATED AT 25.6 FT
 ELEVATION 1,901.4 FT

DRILLER: J. LITTLE CORE SIZE: NQ2 EQUIPMENT: DIEDRICH D-50



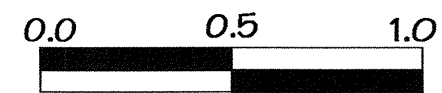
B1B Box 1 of 3, 1.0' - 11.4'



B1B Box 3 of 3, 23.3' - 25.6'



B1B Box 2 of 3, 11.4' - 23.3'



SCALE (ft.)

Core Photos

Bridge No. 24 on US 19/441 over Oconaluftee River
 Cherokee, North Carolina
 Tierra Project No.: 6211-02-020



2701 ROWLAND ROAD
RALEIGH, NORTH CAROLINA 27615
Phone (919) 871-0800 Fax (919) 871-0803

N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1991501		ID. B-4696		COUNTY SWAIN		GEOLOGIST C. BRUINSMA							
SITE DESCRIPTION BRIDGE NO. 24 ON NC 19/441 OVER OCONALUFTEE RIVER						GROUND WATER (ft)							
BORING NO. EB2-A		BORING LOCATION 15+99		OFFSET 35.0' LT		ALIGNMENT -L-							
COLLAR ELEV. 1947.7 ft		NORTHING 714,459.0		EASTING 656,398.5		0 HR. CAVE AT 1.5							
TOTAL DEPTH 20.30 ft		DRILL MACHINE DIEDRICH D-50		DRILL METHOD CASING ADV. /CORE		HAMMER TYPE MANUAL							
DATE STARTED 08/16/02		COMPLETED 08/16/02		SURFACE WATER DEPTH									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
1947.70												EXISTING GROUND	1947.70 0.00
												GRAVEL (LANDSCAPING) ROADWAY EMBANKMENT: GRAVEL SIZED FRAGMENTS WITH INTERSTITIAL SILTY SAND (A-1-a)	1947.20 0.50
1945	3.10	23	12	60/1.1									
												ROADWAY EMBANKMENT: FILL BOULDERS	1940.70 7.00
1940													
												WR: BROWN AND WHITE GNEISS	1937.10 10.60
1935													
												CR: SLI. TO V. SLI. WEATHERED HARD V. CLOSELY TO MOD. CLOSELY FRACTURED GRAY AND WHITE GNEISS	1933.80 13.90
1930													
												RESIDUUM: BROWN HARD SILT (A-4)	1930.10 17.60
												CR: MOD. WEATHERED HARD V. CLOSELY TO CLOSELY FRACTURED BLACK, WHITE, GRAY AND BROWN GNEISS (MIGMATITIC)	1928.60 19.10
												CORING TERMINATED AT ELEVATION 1927.4' IN CR: MOD. WEATHERED HARD V. CLOSELY TO CLOSELY FRACTURED BLACK, WHITE, GRAY AND BROWN GNEISS (MIGMATITIC)	1927.40 20.30

CORE BORING REPORT

DATE: 8/16/02

PROJECT: 8.1991501 I.D. NO.: B-4696 BORING NO: EB2-A GEOLOGIST: C. BRUINSMA

DESCRIPTION: BRIDGE NO. 24 ON 19/441 OVER OCONALUFTEE RIVER

COUNTY: SWAIN COLLAR ELEV.: 1947.7 FT TOTAL DEPTH: 20.3 FT

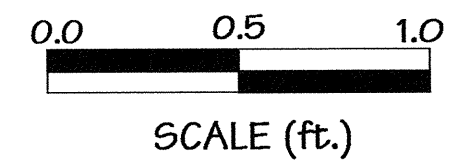
ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1940.7	7.0	1:00	3.3	1.8/3.3	N/A		7.0' - 10.6' ROADWAY EMBANKMENT FILL: BOULDERS
		1:30					
		1:00					
		0:15/0.3					
1937.4	10.3		5.0	2.1/5	1.3/5		10.6' - 13.9' WR: BROWN AND WHITE GNEISS STRATA REC. = 0%
1937.4	10.3	0:45					
		0:30					
		0:45					
1932.4	15.3	1:30	5.0	42.0%	26.0%		13.9' - 17.6' CR: SLI. TO VERY SLI. WEATHERED HARD VERY CLOSELY TO CLOSELY FRACTURED GRAY AND WHITE GNEISS STRATA REC. = 97.3% STRATA RQD = 77.0%
1932.4	15.3	1:30					
		1:15					
		1:00					
1927.4	20.3	1:00		70.0%	24.0%		17.6' - 19.1' RESIDUUM: BROWN HARD SILT (A-4)
							19.1' - 20.3' CR: MODERATELY WEATHERED HARD VERY CLOSELY TO CLOSELY FRACTURED BLACK, WHITE, GRAY AND BROWN GNEISS (MIGMATITIC) STRATA REC. = 100% STRATA RQD = 0%

CORING TERMINATED AT 20.3 FT
ELEVATION 1,927.4 FT

DRILLER: J. LITTLE CORE SIZE: NQ2 EQUIPMENT: DIEDRICH D-50



EB2A Box 1 of 1, 7.0' - 20.3'



Core Photos

Bridge No. 24 on US 19/441 over Oconaluftee River

Cherokee, North Carolina

Tierra Project No.: 6211-02-020



2701 ROWLAND ROAD
 RALEIGH, NORTH CAROLINA 27615
 Phone (919) 871-0800 Fax (919) 871-0803

N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1991501		ID. B-4696		COUNTY SWAIN		GEOLOGIST C. BRUINSMA							
SITE DESCRIPTION BRIDGE NO. 24 ON NC 19/441 OVER OCONALUFTEE RIVER						GROUND WATER (ft)							
BORING NO. EB2-C		BORING LOCATION 16+24		OFFSET 11.5' LT		ALIGNMENT -L-							
COLLAR ELEV. 1946.4 ft		NORTHING 714,462.7		EASTING 656,362.9		0 HR. 18.5							
TOTAL DEPTH 24.30 ft		DRILL MACHINE DIEDRICH D-50		DRILL METHOD CASING ADV. /CORE		24 HR. DRY							
DATE STARTED 08/16/02		COMPLETED 08/16/02		SURFACE WATER DEPTH									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
1946.40													EXISTING GROUND
													ROADWAY EMBANKMENT: ORANGE-BROWN STIFF TO SOFT CLAYEY SANDY SILT (A-4)
	4.70	5	4	7						SS-10	22%		
	9.70	5	3	4						SS-11	21.8%		
	14.70	1	2	1						SS-12	36.4%		
	17.20	9	13	18						SS-13			
													1929.40 ALLUVIAL: ORANGE AND BROWN DENSE SILTY SAND WITH ROCK FRAGMENTS AND COBBLE (A-1-a)
													1927.50 ALLUVIAL: BOULDERS, GRAVEL AND PEBBLES
													1926.00 CR: MOD. SEVERELY TO SEVERELY WEATHERED MED HARD V. CLOSE TO CLOSELY FRACTURED BROWN, WHITE AND GRAY GNEISS
													1925.10 WR: SEVERELY WEATHERED SOFT TO V. SOFT V. CLOSE TO CLOSELY FRACTURED BROWN, WHITE AND BLACK GNEISS
													1922.10 CORING TERMINATED AT ELEVATION 1922.1' IN WR: SEVERELY WEATHERED SOFT TO V. SOFT V. CLOSE TO CLOSELY FRACTURED BROWN, WHITE AND BLACK GNEISS

CORE BORING REPORT

DATE: 8/16/02

PROJECT: 8.1991501 I.D. NO.: B-4696 BORING NO: EB2-C GEOLOGIST: C. BRUINSMA

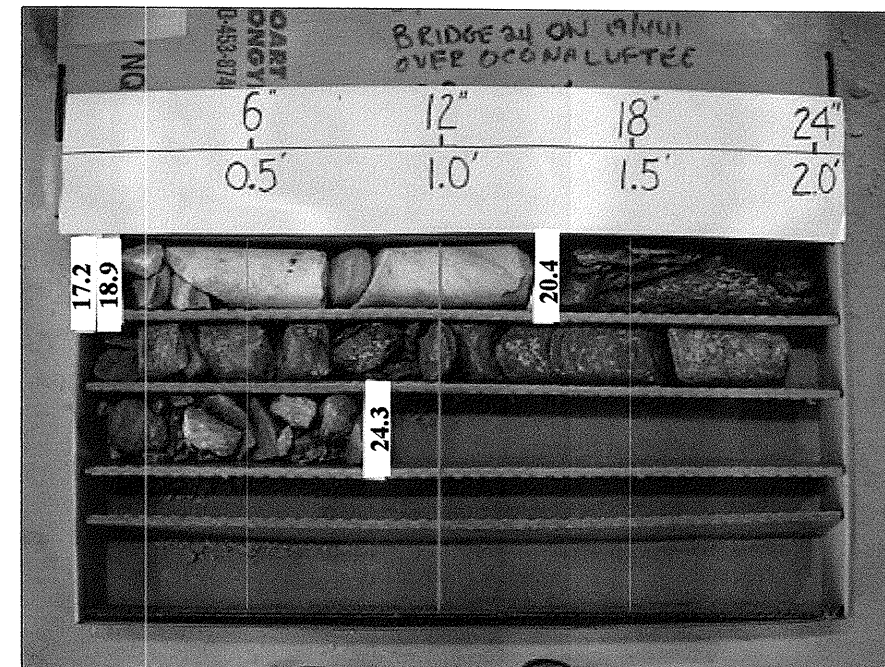
DESCRIPTION: BRIDGE NO. 24 ON 19/441 OVER OCONALUFTEE RIVER

COUNTY: SWAIN COLLAR ELEV.: 1946.4 FT TOTAL DEPTH: 24.3 FT

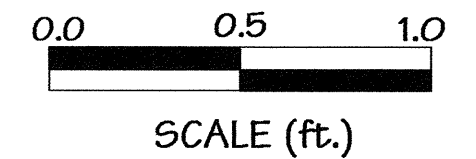
ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1929.2	17.2	0:45					17.2' - 18.9' ALLUV: ORANGE AND BROWN SANDY SILT W/ ROCK FRAGMENTS AND COBBLE
		1:00/0.7	1.7	0%	N/A		
1927.5	18.9						18.9' - 20.4' ALLUV: BOULDERS, GRAVEL AND PEBBLES
		0:45					
1926.0	20.4	1:30/0.5	1.5	1.3/1.5	N/A		20.4' - 21.3' CR: MODERATELY SEVERE TO SEVERE MED. HARD VERY CLOSE TO CLOSELY FRACTURED BROWN WHITE AND GRAY GNEISS
		1:15	3.9	86.7%			
1922.1	24.3	1:15/0.9		79.5%	N/A		21.3' - 24.3' WR: SEVERELY WEATHERED SOFT TO VERY SOFT VERY CLOSE TO CLOSELY FRACTURED BROWN, WHITE AND BLACK GNEISS
							STRATA REC. = 100% STRATA RQD = 0%
							STRATA REC. = 73.3%

CORING TERMINATED AT 24.3 FT
 ELEVATION 1,922.1 FT

DRILLER: J. LITTLE CORE SIZE: NQ2 EQUIPMENT: DIEDRICH D-50



EB2C Box 1 of 1, 17.2' - 24.3'



Core Photos

Bridge No. 24 on US 19/441 over Oconaluftee River

Cherokee, North Carolina

Tierra Project No.: 6211-02-020



2701 ROWLAND ROAD
 RALEIGH, NORTH CAROLINA 27615
 Phone (919) 871-0800 Fax (919) 871-0803

N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1991501		ID. B-4696		COUNTY SWAIN		GEOLOGIST C. BRUINSMA							
SITE DESCRIPTION BRIDGE NO. 24 ON NC 19/441 OVER OCONALUFTEE RIVER						GROUND WATER (ft)							
BORING NO. EB2-B		BORING LOCATION 16+24		OFFSET 27.0' RT		ALIGNMENT -L-							
COLLAR ELEV. 1929.5 ft		NORTHING 714,436.2		EASTING 656,335.0		0 HR. 0.5							
TOTAL DEPTH 14.40 ft		DRILL MACHINE DIEDRICH D-50		DRILL METHOD CASING ADV. /CORE		HAMMER TYPE MANUAL							
DATE STARTED 08/15/02		COMPLETED 08/15/02		SURFACE WATER DEPTH									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100
1929.50													EXISTING GROUND
	3.90												1929.50 0.00
		50	50/25										1924.80 4.70
1925													1923.90 5.60
													1921.10 8.40
													1920.70 8.80
1920													1917.10 12.40
													1916.10 13.40
	13.40	60	40/1										1915.10 14.40

CORE BORING REPORT

DATE: 8/15/02

PROJECT: 8.1991501 I.D. NO.: B-4696 BORING NO: EB2-B GEOLOGIST: C. BRUINSMA

DESCRIPTION: BRIDGE NO. 24 ON 19/441 OVER OCONALUFTEE RIVER

COUNTY: SWAIN COLLAR ELEV.: 1929.5 FT TOTAL DEPTH: 14.4 FT

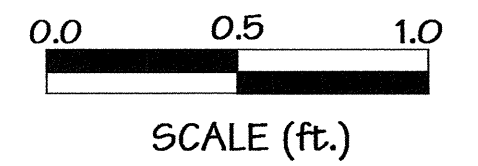
ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
1924.8	4.7	0:30					4.7' - 5.6' ALLUVIAL: BOULDERS GRAVEL AND COBBLES
		0:30		1.6/2.3			
		0:30/0.3	2.3		0%		5.6' - 8.4' WR: SEVERE TO VERY SEVERLY WEATHERED VERY SOFT VERY CLOSELY FRACTURED BROWN GNEISS
1922.5	7.0			69.6%			
1922.5	7.0	0:45					STRATA REC. = 29.1% STRATA RQD = 0%
		0:30/0.8		0.4/1.8			CR: MOD. SEVERELY WEATHERED MED. HARD CLOSELY FRACTURED WHITE, BROWN AND BLACK GNEISS
1920.8	8.8		1.8	20.0%	0%		8.4' - 8.8'
1920.8	8.8	1:00					8.8' - 12.4' WR: BROWN AND BLACK GNEISS
		1:00		1.4/5	0.4/5.0		
		1:00	5.0				STRATA REC. = 0%
		1:15		28%	8.0%		
1915.8	13.8	1:15					12.4' - 13.8' CR: MODERATELY TO MOD. SEVERELY WEATHERED MED. HARD VERY CLOSE TO CLOSELY FRACTURED BROWN, BLACK AND WHITE GNEISS
							STRATA REC. = 100% STRATA RQD = 28.6%

CORING TERMINATED AT 14.4 FT
 ELEVATION 1,915.1 FT

DRILLER: J. LITTLE CORE SIZE: NQ2 EQUIPMENT: DIEDRICH D-50



EB2B Box 1 of 1, 4.7' - 13.8'



Core Photos

Bridge No. 24 on US 19/441 over Oconaluftee River
Cherokee, North Carolina
Tierra Project No.: 6211-02-020

SOIL CLASSIFICATION AND GRADATION SHEET

BRIDGE 24 ON US 19441 OVER THE OCONOLUFTEE RIVER

NCDOT Project No: 8.1991501 - T.I.P. No: B-4696

SWAIN COUNTY

TIERRA, INC. PROJECT NO: 6211-02-020

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED						
STATION #	OFFSET (FEET)	DEPTH (FEET)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%
EB1A		SS-1	99	84	55	24	30	14	32	35	4	24.5
A-4 (1)												
14+03	38.0 LT	3.5-5.0										
EB1A		SS-2	99	90	36	22	51	6	21	21	NP	31.3
A-4 (0)												
14+03	38.0 LT	13.5-15.0										
EB1B		SS-3	81	69	27	28	49	6	17	29	NP	-
A-2-4 (0)												
14+38	46.5 RT	Surface										
EB1C		SS-4	87	69	42	29	34	21	16	29	1	18.6
A-4 (0)												
14+11	CL	3.5										
EB1C		SS-5	82	69	46	24	29	18	29	31	6	23.2
A-4 (0)												
14+11	CL	8.5										
EB1C		SS-6	72	61	38	24	33	10	33	31	7	26.4
A-4 (0)												
14+11	CL	13.5										
B1C		SS-7	35	17	8	62	21	9	8	TEST NOT PERFORMED		-
A-1-a (0)												
15+05	CL	1.2										
B1C		SS-8	66	53	35	26	31	26	17	34	8	-
A-2-4 (0)												
15+05	CL	3.7										
EB2B		SS-9	35	17	5	67	23	1	9	TEST NOT PERFORMED		-
A-1-a (0)												
16+24	27 RT	3.9										

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED						
STATION #	OFFSET (FEET)	DEPTH (FEET)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%
EB2C		SS-10	94	81	43	23	39	11	27	24	2	22.0
A-4 (0)												
16+24	11.5 LT	4.7										
EB2C		SS-11	87	75	43	23	37	16	24	26	4	21.8
A-4 (0)												
16+24	11.5 LT	9.7										
EB2C		SS-12	100	98	52	7	58	19	16	25	NP	36.4
A-4 (0)												
16+24	11.5 LT	14.7										
EB2C		SS-13	40	27	13	43	34	10	13	TEST NOT PERFORMED		-
A-1-a (0)												
16+24	11.5 LT	17.2										

GEOTECHNICAL UNIT FIELD SCOUR REPORT

PROJECT: 8.1991501 ID: B-4696 COUNTY: SWAIN

DESCRIPTION(1): BRIDGE NO. 24 ON NC 19/441 OVER THE OCONALUFTEE RIVER, CHEROKEE, NC

INFORMATION ON EXISTING BRIDGES Information obtained from: field inspection
 microfilm(Reel: _____ Pos: _____)
 other HYDRAULIC REPORT

COUNTY BRIDGE NO. 24 BRIDGE LENGTH 338' NO. BENTS IN: CHANNEL 3 FLOOD PLAIN 3

FOUNDATION TYPE: 5 SPAN, 6 BENT REINFORCED CONCRETE DECK GIRDER BRIDGE

EVIDENCE OF SCOUR(2):

ABUTMENTS OR END BENT SLOPES: NO SCOUR EVIDENT, SOME AGGRADATION

INTERIOR BENTS: SOME SCOUR. AGGREGATE OF CONCRETE EXPOSED FROM CHANNEL BED UP TO 1.5 FT ABOVE CURRENT WATER LEVEL. SCOUR ON UPSTREAM SIDE, WEST BANK BENT.

CHANNEL BED: CHANNEL IS COARSE GRAINED WITH LITTLE FINES, DOUBLE CHANNEL

CHANNEL BANKS: SCOUR EVIDENT DOWNSTREAM OF EXISTING BRIDGE ON EAST BANK

EXISTING SCOUR PROTECTION:

TYPE(3): EXTENSIVE RIPRAP ON BOTH ENDBENTS, SOME CEMENTED

EXTENT(4): EXTENDS APPROX. 20 FT FROM END BENTS OT FLOODPLAIN AND BANK

EFFECTIVENESS(5): GOOD, ALL IN PLACE ON WEST BANK, SOME RIP RAP WASHED AWAY EAST BANK

OBSTRUCTIONS(6) (DAMS,DEBRIS,ETC.): NONE

DESIGN INFORMATION

CHANNEL BED MATERIAL(7) (SAMPLE RESULTS ATTACHED): ROUNDED COBBLES, GRAVEL, 1-3 FT
 BOULDERS W/ INTERSTITIAL SILTS AND COARSE SANDS

CHANNEL BANK MATERIAL(8) (SAMPLE RESULTS ATTACHED): SILTY SAND AND SANDY SILT W/ ROUNDED
 GRAVEL, COBBLES AND 1-2 FT BOULDERS

FOUNDATION BEARING MATERIAL(9): THIN ALLUVIAL, SOME THIN RESIDUAL FILL AND GNEISS

CHANNEL BANK COVER(10): BARE TO GRASSES, SOME TREES AND SMALL BUSHES

FLOOD PLAIN WIDTH(11): APPROXIMATELY 1000 FT, HAS BEEN ALTERED BY DEVELOPMENT

FLOOD PLAIN COVER(12): DEVELOPED, PAVEMENT/CONCRETE, ROAD. SOME TREES, BUSH AND GRASSES.

DESIGN INFORMATION CONT.

STREAM IS DEGRADING AGGRADING (13)

OTHER OBSERVATIONS AND COMMENTS: CONCRETE AND TIMBER ABUTMENTS VISIBLE ON WEST
 BANK FROM BRIDGE PREDATING EXISTING STRUCTURE, RIFFLE SYSTEM AT BRIDGE SITE.

CHANNEL MIGRATION TENDENCY (14): TO THE EAST (ACQUONI RD)

REPORTED BY: Christina M Bransome DATE: 8/14/2002
 TIERRA, INC.

GEOTECHNICALLY ADJUSTED SCOUR ELEVATION (15):

Location	Left	Center	Right
Bent 1	1922.9 ft	1922.7 ft	1922.9 ft

REPORTED BY: David T. King DATE: 10/16/2002
 NCDOT GEOTECHNICAL UNIT
 INSTRUCTIONS

- (1) GIVE THE DESCRIPTION OF THE SPECIFIC SITE GIVING ROUTE NUMBER AND BODY OF WATER CROSSED.
- (2) NOTE ANY EVIDENCE OF SCOUR AT THE EXISTING END BENTS OR ABUTMENTS (UNDERMINING, SLOUGHING, SCOUR LOCATIONS, DEGRADATIONS, ETC.)
- (3) NOTE ANY EXISTING SCOUR PROTECTION (RIP RAP, ETC.)
- (4) DESCRIBE THE EXTENT OF ANY EXISTING SCOUR PROTECTION.
- (5) DESCRIBE WHETHER OR NOT THE SCOUR PROTECTION APPEARS TO BE WORKING.
- (6) NOTE ANY DAMS, FALLEN TREES, DEBRIS AT BENTS, ETC.
- (7) DESCRIBE THE CHANNEL BED MATERIAL: A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
- (8) DESCRIBE THE CHANNEL BANK MATERIAL: A SAMPLE SHOULD BE TAKEN FOR GRAIN SIZE DISTRIBUTION, ATTACH LAB RESULTS.
- (9) DESCRIBE THE FOUNDATION BEARING MATERIAL,
- (10) DESCRIBE THE BANK COVERING (GRASS, TREES, RIP RAP, NONE, ETC.)
- (11) GIVE THE APPROXIMATE FLOOD PLAIN WIDTH (ESTIMATE).
- (12) DESCRIBE THE FLOOD PLAIN COVERING (GRASS, TREES, CROPS, ETC.)
- (13) CHECK THE APPROPRIATE SPACE AS TO WHETHER THE STREAM IS DEGRADING OR AGGRADING
- (14) DESCRIBE THE POTENTIAL OF THE BODY OF WATER TO MIGRATE Laterally DURING THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS).
- (15) GIVE THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION EXPECTED OVER THE LIFE OF THE BRIDGE (APPROXIMATELY 100 YEARS). THIS CAN BE GIVEN AS AN ELEVATION RANGE ACROSS THE SITE, OR ON A BENT BY BENT BASIS WHERE VARIATIONS EXIST. DISCUSS RELATIONSHIP BETWEEN THE HYDRAULICS THEORETICAL SCOUR AND THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION. THE GEOTECHNICALLY ADJUSTED SCOUR ELEVATION IS BASED ON THE ERODABILITY OF MATERIALS WITH CONSIDERATION FOR JOINTING, FOLIATION, BEDDING ORIENTATION AND FREQUENCY; CORE RECOVERY PERCENTAGE; PERCENTAGE RQD; DIFFERENTIAL WEATHERING, SHEAR STRENGTH; OBSERVATIONS AT EXISTING STRUCTURES; OTHER TESTS DEEMED APPROPRIATE; AND OVERALL GEOLOGIC CONDITIONS AT THE SITE.

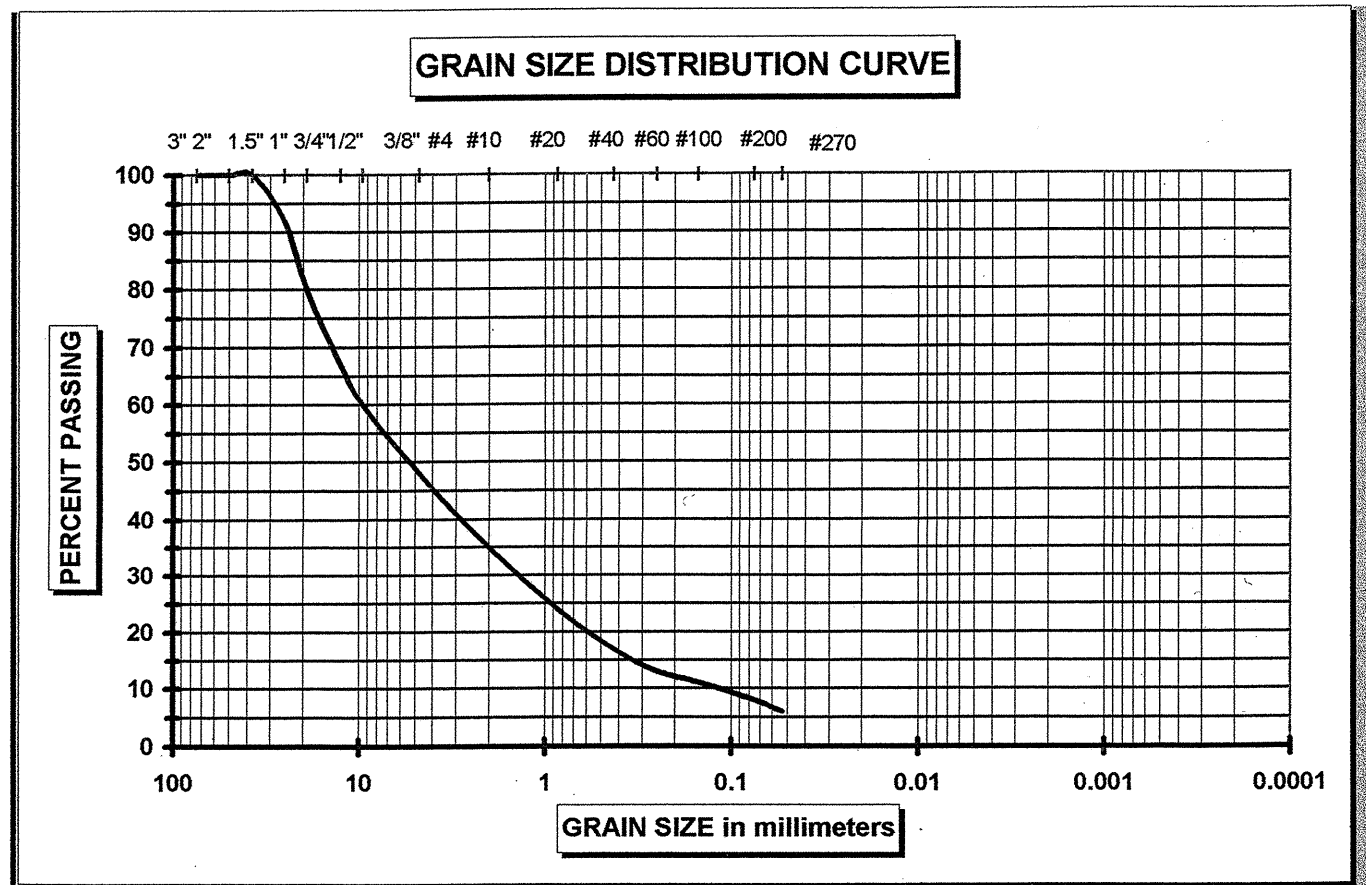
BRIDGE 24 ON US 19\441 OVER THE OCONOLUFTEE RIVER
 NCDOT Project No: 8.1991501 - T.I.P. No: B-4696

SWAIN COUNTY

TIERRA, INC. PROJECT NO: 6211-02-020

BORING #: B1C
 SAMPLE #: SS-7
 DEPTH: 1.2 - 2.5 FT.

SOIL DESCRIPTION: GRAY CLAYEY SILTY FINE-COARSE SANDY GRAVEL



ASTM D 2487 Classification of Soil for Engineering Purposes		Coarse Sand	< #4 and > #10	Cu = D60 / D10
Coarse Gravel	< 3" and > 3/4"	Medium Sand	< #10 and > #40	Cc = (D30) ² / (D10 x D60)
Fine Gravel	< 3/4" and > #4	Fine Sand	< #40 and > #200	

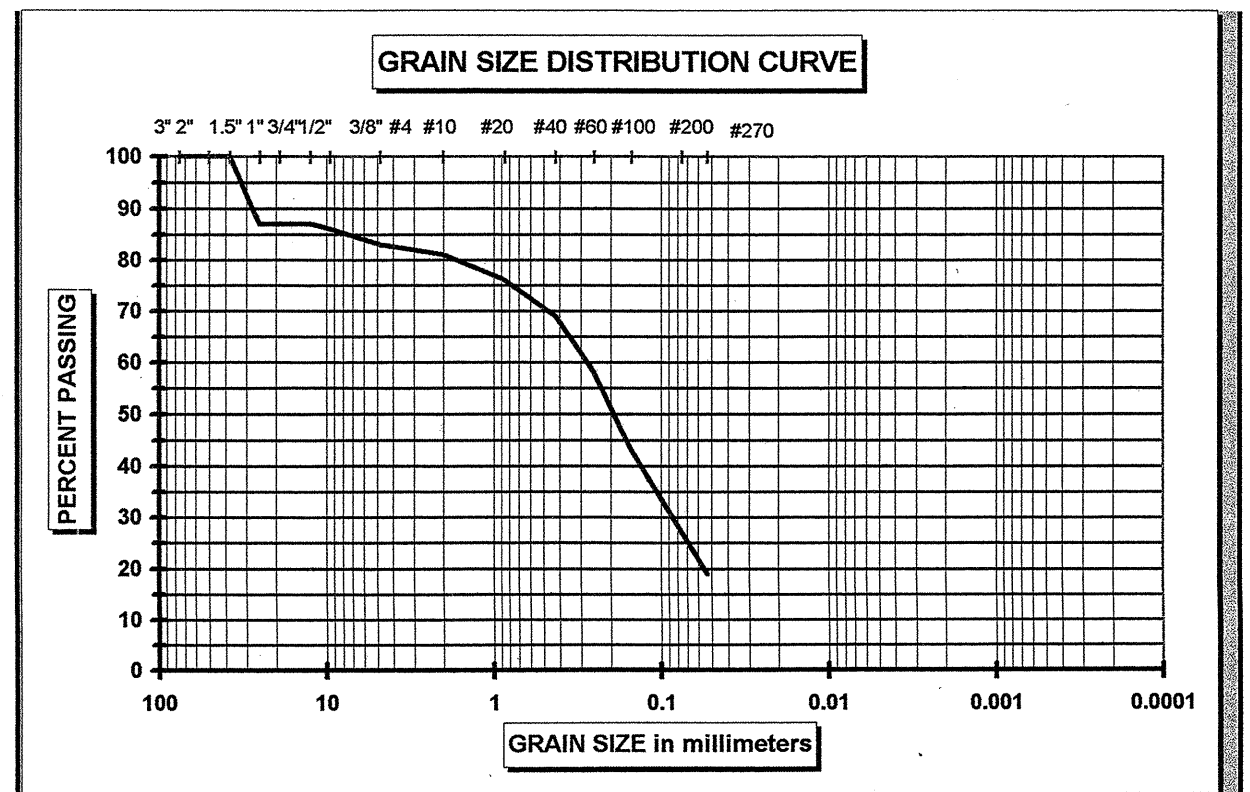
BRIDGE 24 ON US 19\441 OVER THE OCONOLUFTEE RIVER
 NCDOT Project No: 8.1991501 - T.I.P. No: B-4696

SWAIN COUNTY

TIERRA, INC. PROJECT NO: 6211-02-020

BORING #: EB1B
 SAMPLE #: SS-3
 DEPTH: SURFACE

SOIL DESCRIPTION: BROWN SILTY CLAYEY COARSE-FINE SAND WITH GRAVEL



ASTM D 2487 Classification of Soil for Engineering Purposes		Coarse Sand	< #4 and > #10	Cu = D60 / D10
Coarse Gravel	< 3" and > 3/4"	Medium Sand	< #10 and > #40	Cc = (D30) ² / (D10 x D60)
Fine Gravel	< 3/4" and > #4	Fine Sand	< #40 and > #200	

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	29
PLASTIC LIMIT	-
PLASTIC INDEX	NP

TIERRA, INC. PROJECT #: 6211-02-020

PROJECT #: 8.1991501 (B-4696)
 COUNTY: SWAIN
 DESCRIPTION: BRIDGE NO. 24 ON US 19/441 OVER OCONALUFTEE RIVER

	CHANNEL BED MATERIAL		CHANNEL BANK MATERIAL	
SAMPLE #		SS-7		SS-3
RETAINED #4				
PASSING #10		35		81
PASSING #40		17		69
PASSING #200		8		27
COARSE SAND		62.0		28.0
FINE SAND		21.0		49.0
SILT		9.0		6.0
CLAY		8.0		12.0
LL				29
PL		NP		NP
AASHTO CLASSIFICATION		A-1-a coarse sand		A-2-4 silty sand
STATION		15+05		14+38
OFFSET		CL		36.5 ft RT
DEPTH		1.2 ft		surface