ID: N/A

PROJECT: N/A

CONTENTS:

NCDOT GEOTECHNICAL UNIT
SOIL AND ROCK CLASSIFICATION SHEET 2

EARTHWORK SUMMARY SHEET 3

LINE	STATION	PLAN	PROFILE	XSECTS
-Y1-	200+00.00 – 224+13.18	4 & 5	7	X-6 – 9
-Y2-	10+00.00 – 15+13.68	4 & 6	8	

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	N/A	1	12
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
N/A	N/A	P.E.	
		CONST.	

SUBSURFACE INVESTIGATION

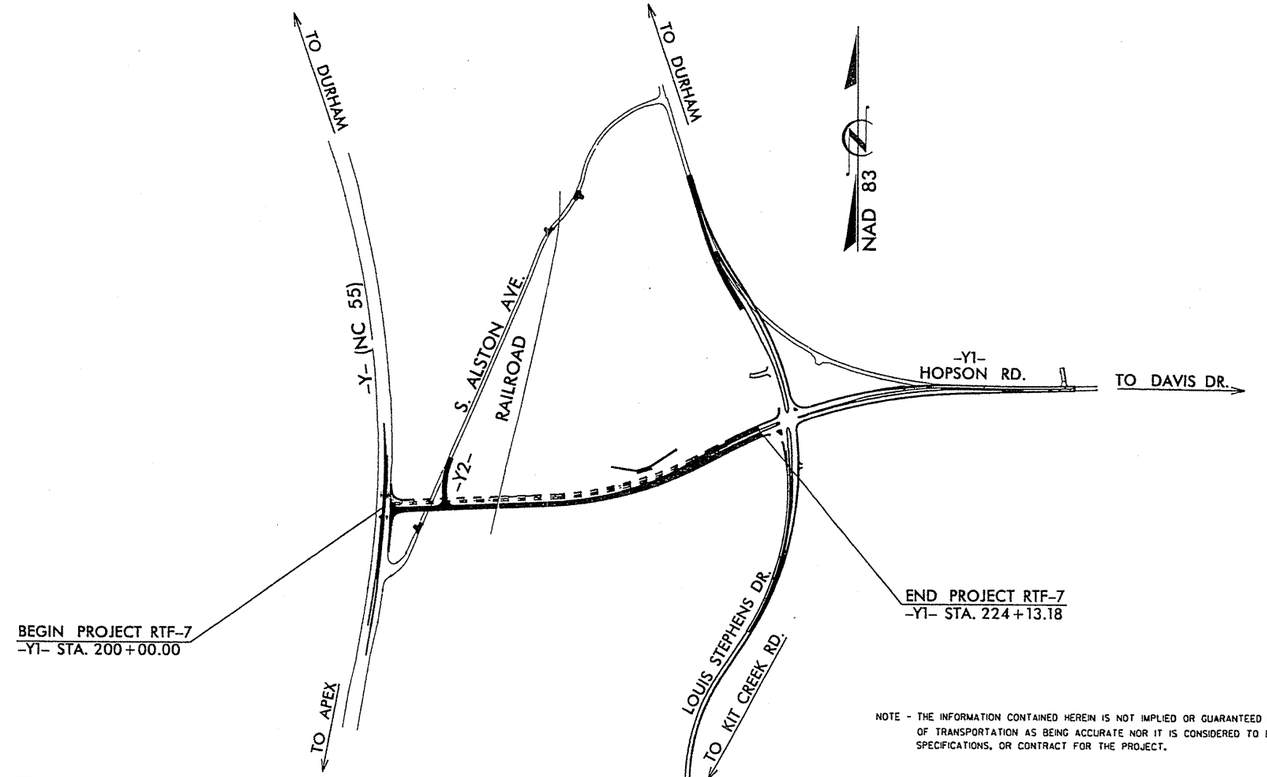
STATE PROJECT N/A I.D. NO. N/A

F.A. PROJECT N/A

COUNTY DURHAM

DESCRIPTION HOPSON ROAD FROM NC 55 TO LOUIS STEPHENS DRIVE

INVENTORY REPORT



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INVESTIGATED BY S&ME, INC. PERSONNEL J.S. JOHNSON

CHECKED BY A.F. RIGGS, JR. A. NASH

SUBMITTED BY S&ME, INC. M. CLARY

DATE 3/5/2004 S. LOW

L. BALLARD

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NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER AGNER F. RIGGS, JR. 3/10/04

SIGNATURE

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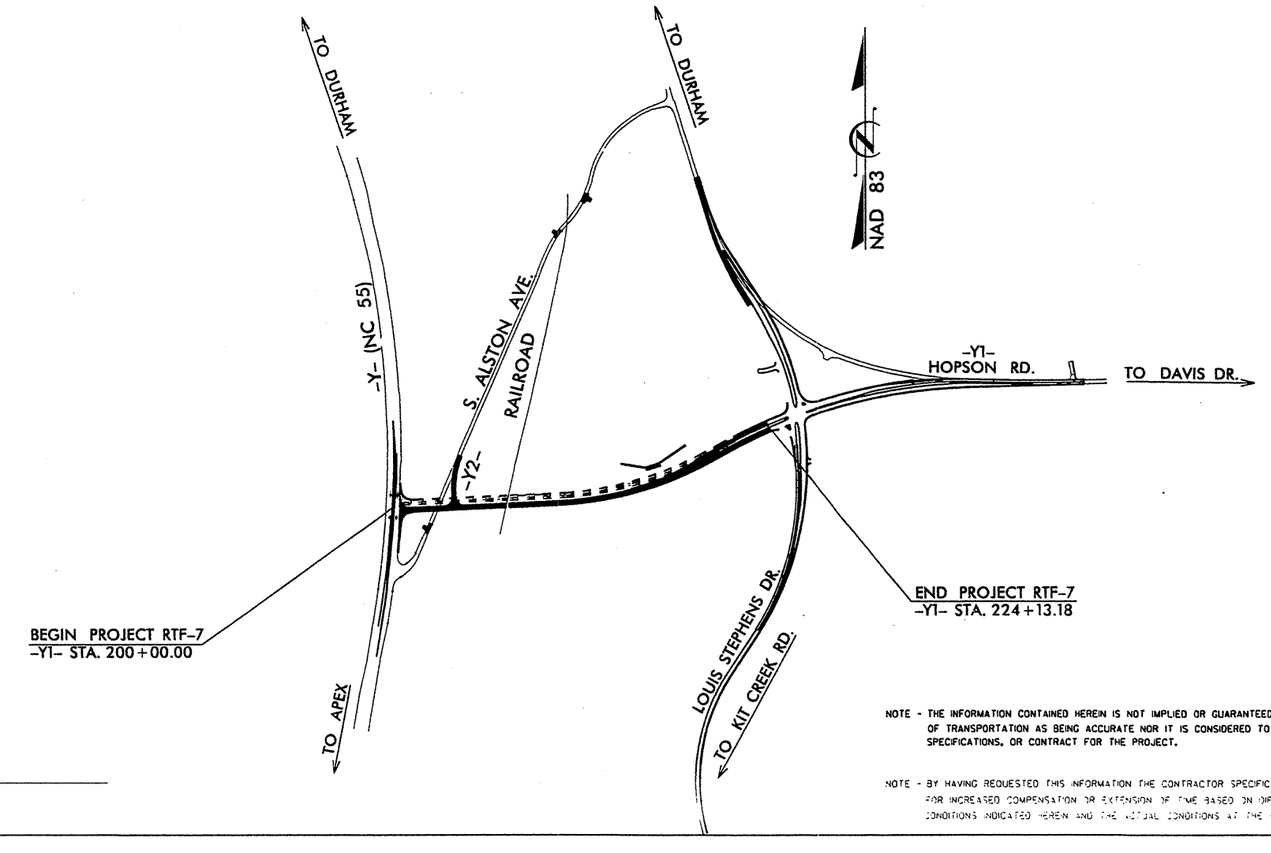

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SEAL

SIGNATURE

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
N/A	N/A	2	12

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL 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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND 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 PLASTIC INDEX	6 MX		N.P.	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
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, YEL-BRN, 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 ARE 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 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

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

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING.
- STATIC WATER LEVEL AFTER 24 HOURS.
- PW - PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA
- SPRING OR SEEPAGE
- HC - HOLE CAVED

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 - DIP/DIP DIRECTION OF ROCK STRUCTURES
- ● - SOUNDING ROD
- SPT / CPT / PMT - TEST BORING
- CPT TEST BORING
- GEO-PROBE
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION

SAMPLE DESIGNATIONS
- S- BULK SAMPLE
- SS- SPLIT SPOON SAMPLE
- ST- SHELBY TUBE SAMPLE
- RS- ROCK SAMPLE
- RT- RECOMPACTED TRIAXIAL SAMPLE
- CBR - CBR SAMPLE
- SPT N-VALUE
- CPT N60 EQUIVALENT

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
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B- 57
- [ ] BK-51
- [X] CME-550x
- [X] CME-750
- [ ] PORTABLE HOIST
- [ ] OTHER _____
- [ ] OTHER _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [X] OTHER 3-1/4" H.S.A.
- [ ] OTHER _____

HAMMER TYPE:
- [X] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN 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 FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
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 FELOSPARS 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 FELOSPARS 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 ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELOSPARS 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 GEOLOGISTS 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 GEOLOGISTS 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 GEOLOGISTS 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 WHICH 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 IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - 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 WHICH 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, WHICH 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 B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 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 (S.R.Q.D.) - 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 (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION:

NOTES: COLLAR ELEVATIONS WERE OBTAINED FROM PROFILE AND CROSS SECTIONS SHEETS PROVIDED BY MULKEY ENGINEERIS AND CONSULTANTS.

REVISED 09/15/00

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-4410DB	3	
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
	N/A	P.E.	
		CONST.	

EMB. % 0.15

SUMMARY OF EARTHWORK (IN CUBIC YARDS)

PROJECT U-4410DB DATE 4/3/2007 COUNTY DURHAM

LINE	STATION	STATION	EXCAVATION					EMBANKMENT				BORROW	WASTE		
			TOTAL UNCLASS	ROCK	TOTAL UNDERCUT	UNSUITABLE EARTH	SUITABLE EARTH	TOTAL	EMBT -15%	EARTH	EARTH +15%		ROCK +15%	EARTH SUITABLE	TOTAL
-Y1-	200+38.31	224+13.18	94,180	52,500			41,680	40,104							
-Y2-	10+32.75	12+89.94	2				2	4,474							
SUBTOTAL			94,182	52,500			41,682	44,578							
-TURN AROUND-								350							
-CUL-DE-SAC-								280							
-CUL-DE-SAC-								280							
SUBTOTAL								910							
TOTAL			94,182	52,500			41,682	45,488							
EST. LOSS DUE TO CLEAR AND GRUB			(2,000)				(2,000)								
GRAND TOTAL			92,182	52,500			39,682	45,488	39,555				14,887	39,682	54,569
SAY			92,500												55,000

EST. DDE = 4335 CY
EST. UNDERCUT = 200 CY
EST. SELECT GRANULAR MATERIAL = 500 CY
EST. FABRIC FOR SOIL STABILIZATION = 500 SY
EST. SHOULDER BORROW = 1500 CY

PROJECT: U-4410DB

DATUM DESCRIPTION
-Y-

THE LOCALIZED CONTROL SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE GRID COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "HEALTH" WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: 771,289.35 EASTING: 2,036,544.86 (US)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.9991958
THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "HEALTH" TO -Y- STATION 503+24.41 IS S 80°52'28.6" W 4,387.96 (4)
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NGVD 29

Δ=32°58'10"
D=18.315°
T=129.35
R=313.00'
L=180.00'

MULKEY
ENGINEERING & CONSULTANTS
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RALEIGH, NC 27636
(919) 851-1191
(919) 851-1192 (FAX)
WWW.MULKEYINC.COM

RTF-7 | 4
R/W SHEET NO.

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

FOR -Y1- PROFILE SEE SHEET 7
FOR -Y2- PROFILE SEE SHEET 8

TIE TO EX. C&G
200' TAPER
260' FULL
75' TRANSITION
+75.53
5' MONO. ISLAND
-Y- POC Sta. 503+24.41
-Y1- POT Sta. 200+00.00
505+00
-Y2- POT Sta. 10+00.00
-Y1- POT Sta. 203+80.00
165'-55'-165' 6° OFFSET
180'-50' 7° OFFSET
B-1
B-2
B-3
B-4
B-5
B-12
-Y1-
-Y2-
N 2° 23' 24.8" W
N 87° 36' 33.6" E
N 24° 26' 57.2" E
-Y2- PC Sta. 10+72.12
-Y2- PT Sta. 12+89.94
-Y2- POT Sta. 15+13.68
-Y1- TS Sta. 209+30.00
205+00
210+00
MATCH TO SHEET 5
-Y1- STA. 210+50
MATCH LINE A -Y- STA. 498+25
-Y1- SC Sta. 498+19.90
+13.18
TIE TO EX. C&G +93.04
-Y- ST Sta. 495+69.90
N 9° 38' 52.9" E
TIE TO EX. C&G +09.86
+73.17
500+00
+54.28
150' TRANSITION
MATCH LINE A -Y- STA. 498+25

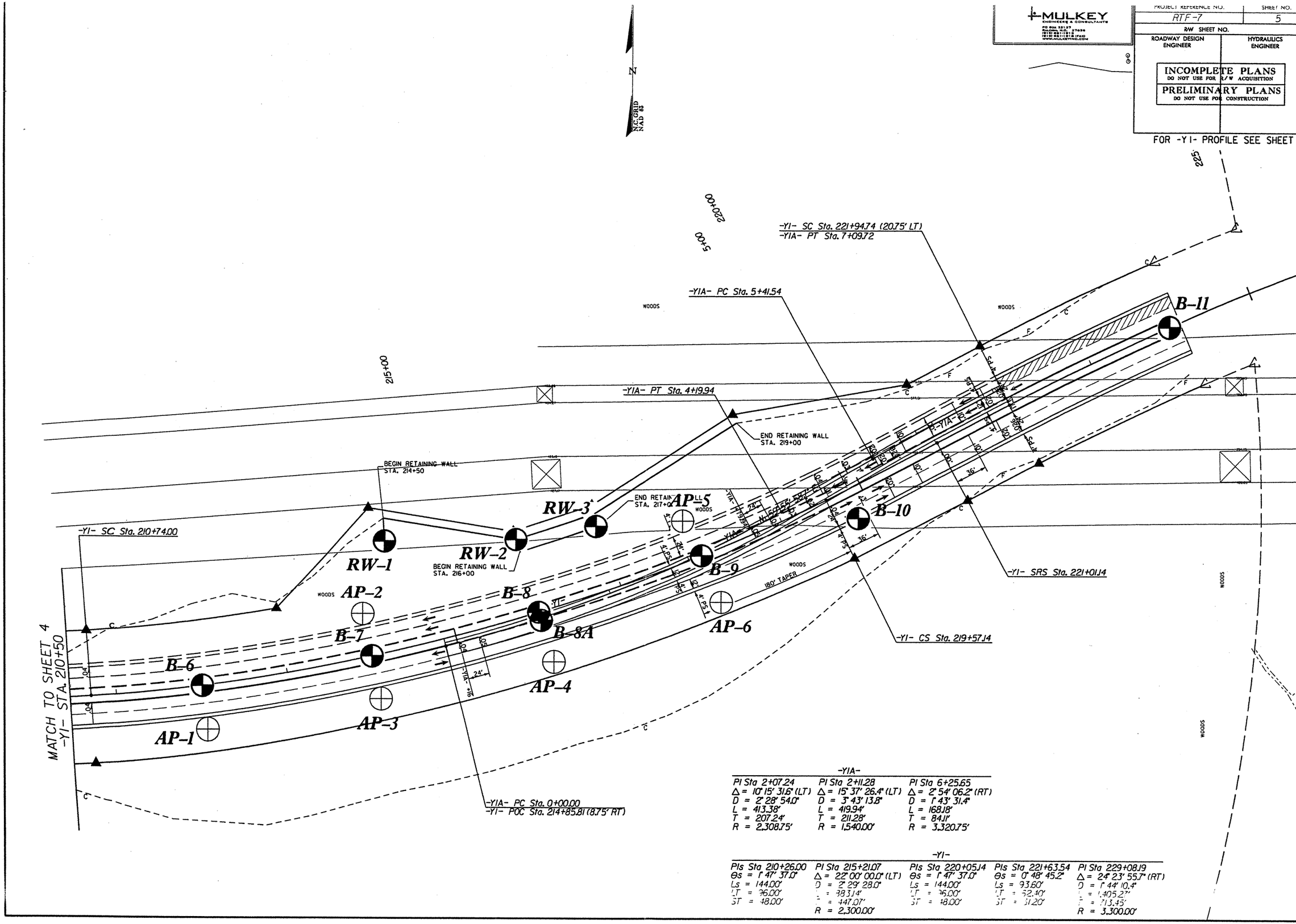
MULKEY ENGINEERS & CONSULTANTS

PROJECT REFERENCE NO.	SHEET NO.
RTF-7	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

FOR -Y1- PROFILE SEE SHEET 7



-Y1A-

PI Sta 2+07.24	PI Sta 2+11.28	PI Sta 6+25.65
Δ = 10° 15' 31.6" (LT)	Δ = 15° 37' 26.4" (LT)	Δ = 2° 54' 06.2" (RT)
D = 2° 28' 54.0"	D = 3° 43' 13.8"	D = 1° 43' 31.4"
L = 413.38'	L = 419.94'	L = 168.18'
T = 207.24'	T = 211.28'	T = 84.11'
R = 2,308.75'	R = 1,540.00'	R = 3,320.75'

-Y1-

PIs Sta 210+26.00	PI Sta 215+21.07	PIs Sta 220+05.14	PIs Sta 221+63.54	PI Sta 229+08.19
θs = 1° 47' 37.0"	Δ = 22° 00' 00.0" (LT)	θs = 1° 47' 37.0"	θs = 0° 48' 45.2"	Δ = 24° 23' 55.7" (RT)
Ls = 144.00'	D = 2° 29' 28.0"	Ls = 144.00'	Ls = 93.60'	D = 1° 44' 10.4"
LT = 96.00'	L = 883.14'	LT = 96.00'	LT = 62.40'	L = 1,405.27'
ST = 48.00'	T = 447.07'	ST = 48.00'	ST = 31.20'	T = 713.45'
	R = 2,300.00'			R = 3,300.00'

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(919) 851-1918 (FAX)
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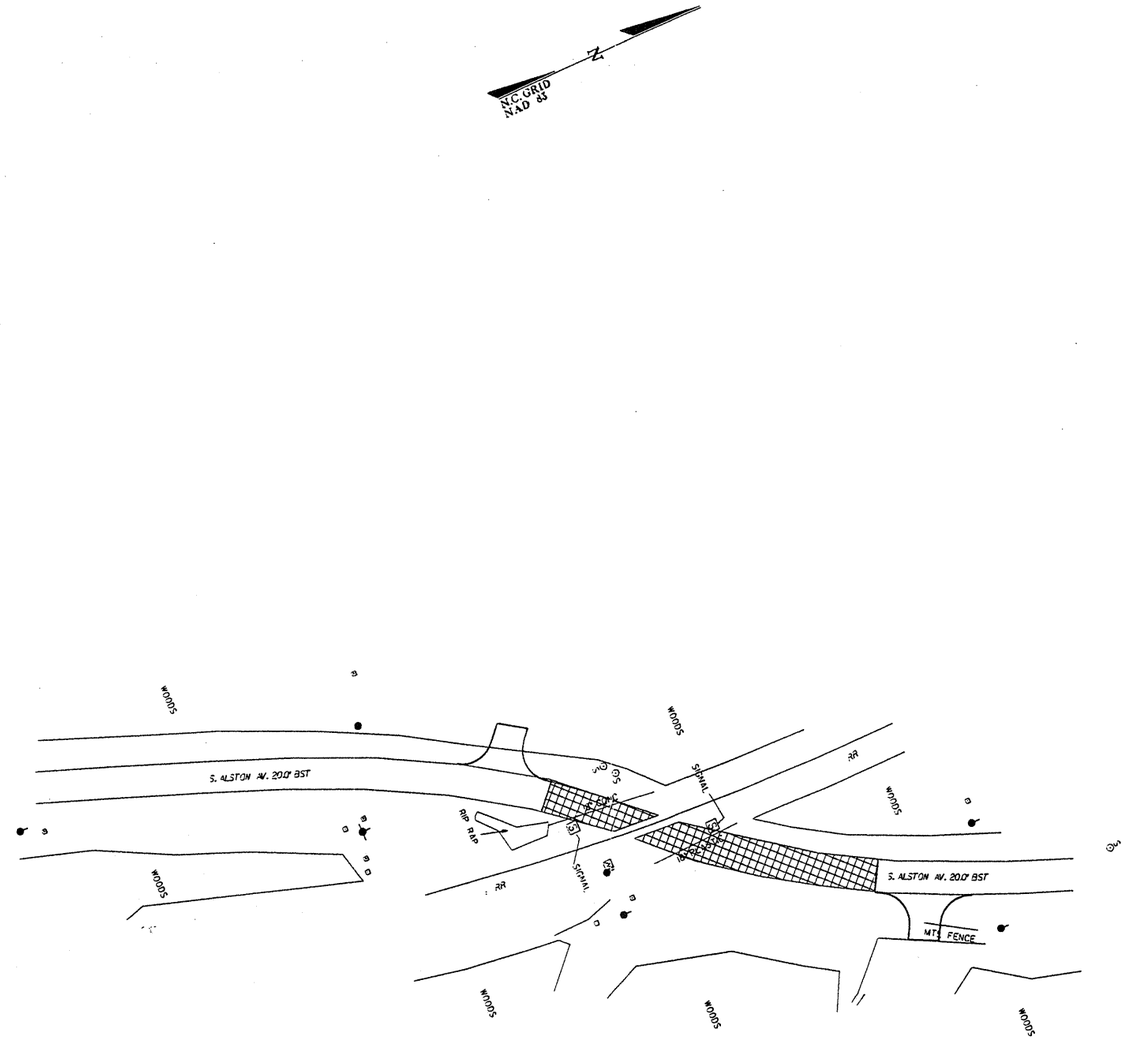
PROJECT REFERENCE NO.	SHEET NO.
RTF-7	6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



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PROJECT REFERENCE NO. RTF-7 | SHEET NO. 7

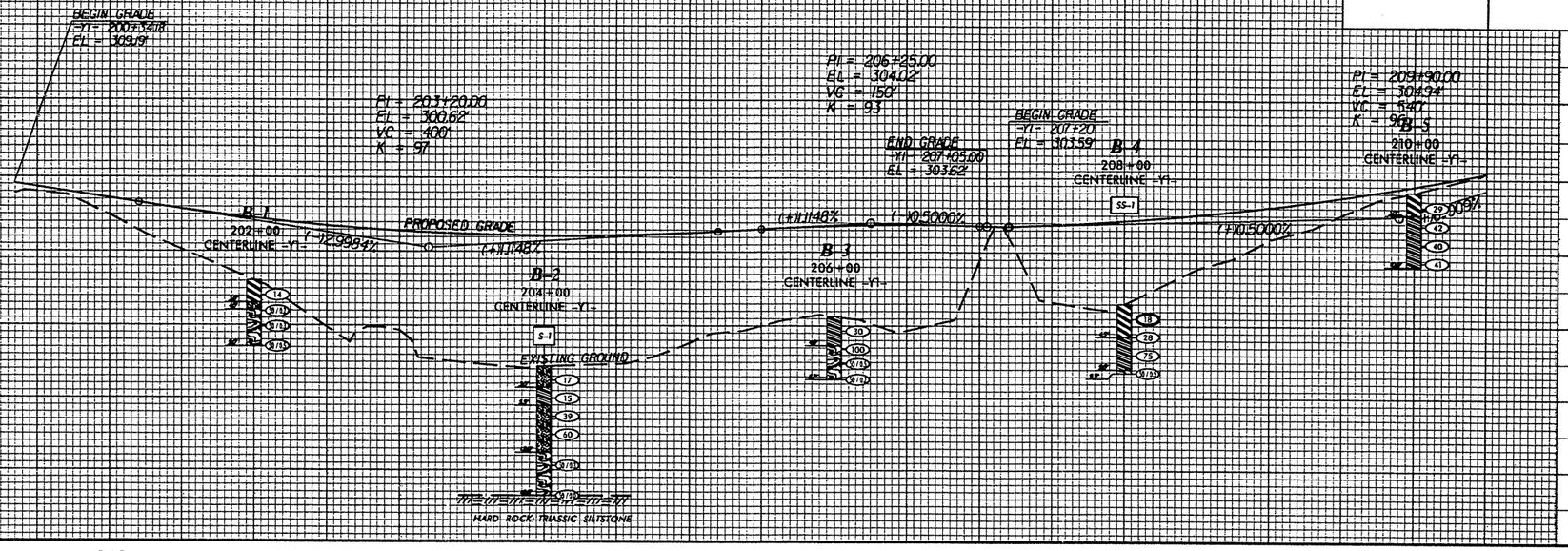
R/W SHEET NO.

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

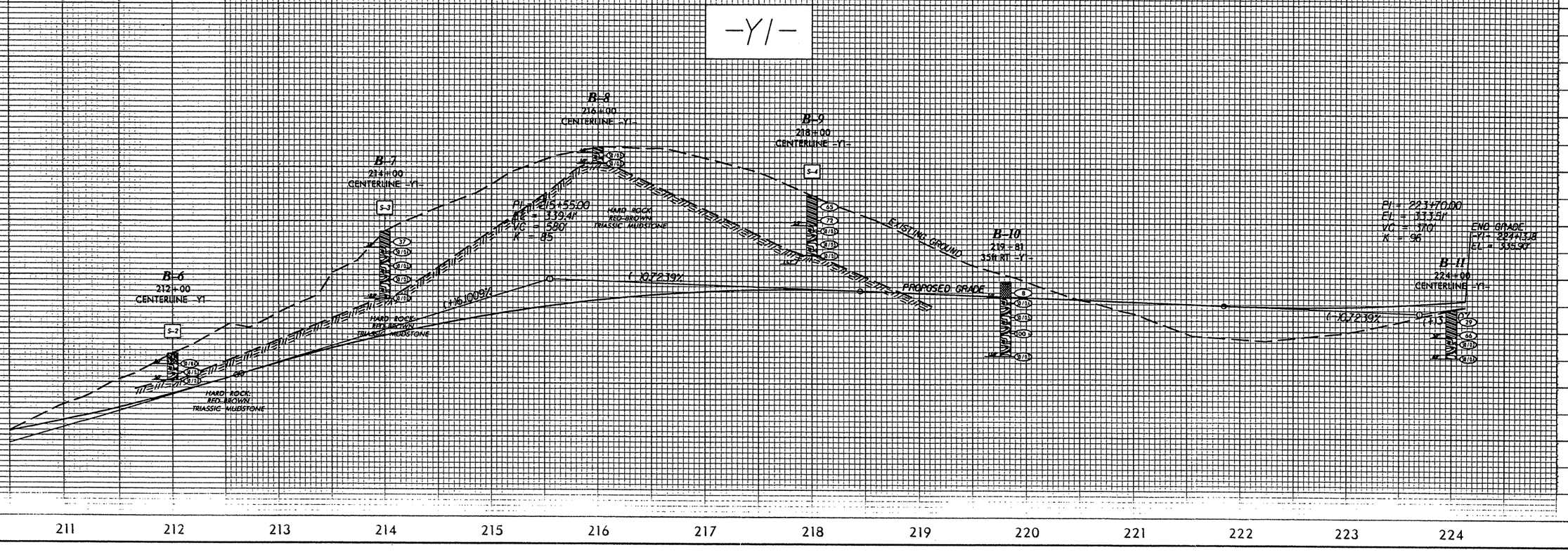
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-Y1-



-Y1-



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PROJECT REFERENCE NO.	SHEET NO.
RTF-7	8
R/W SHEET NO.	

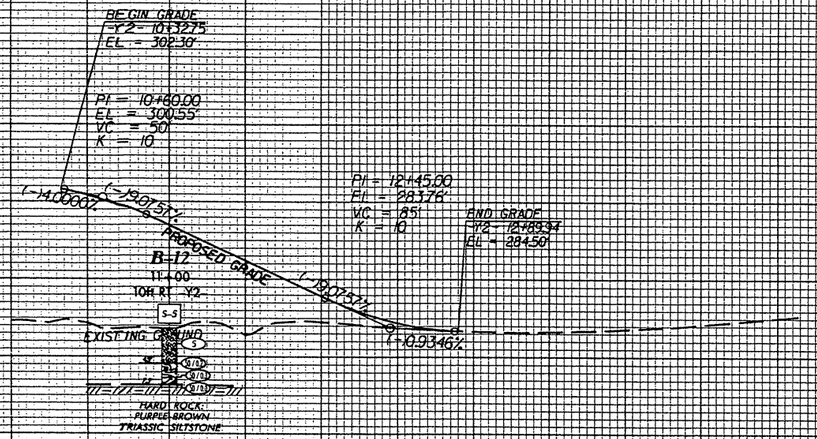
ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

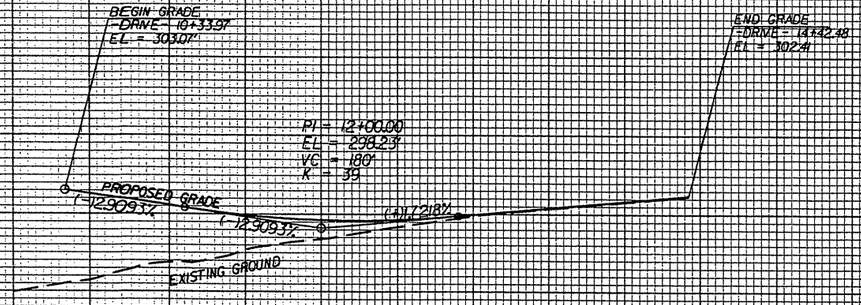
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

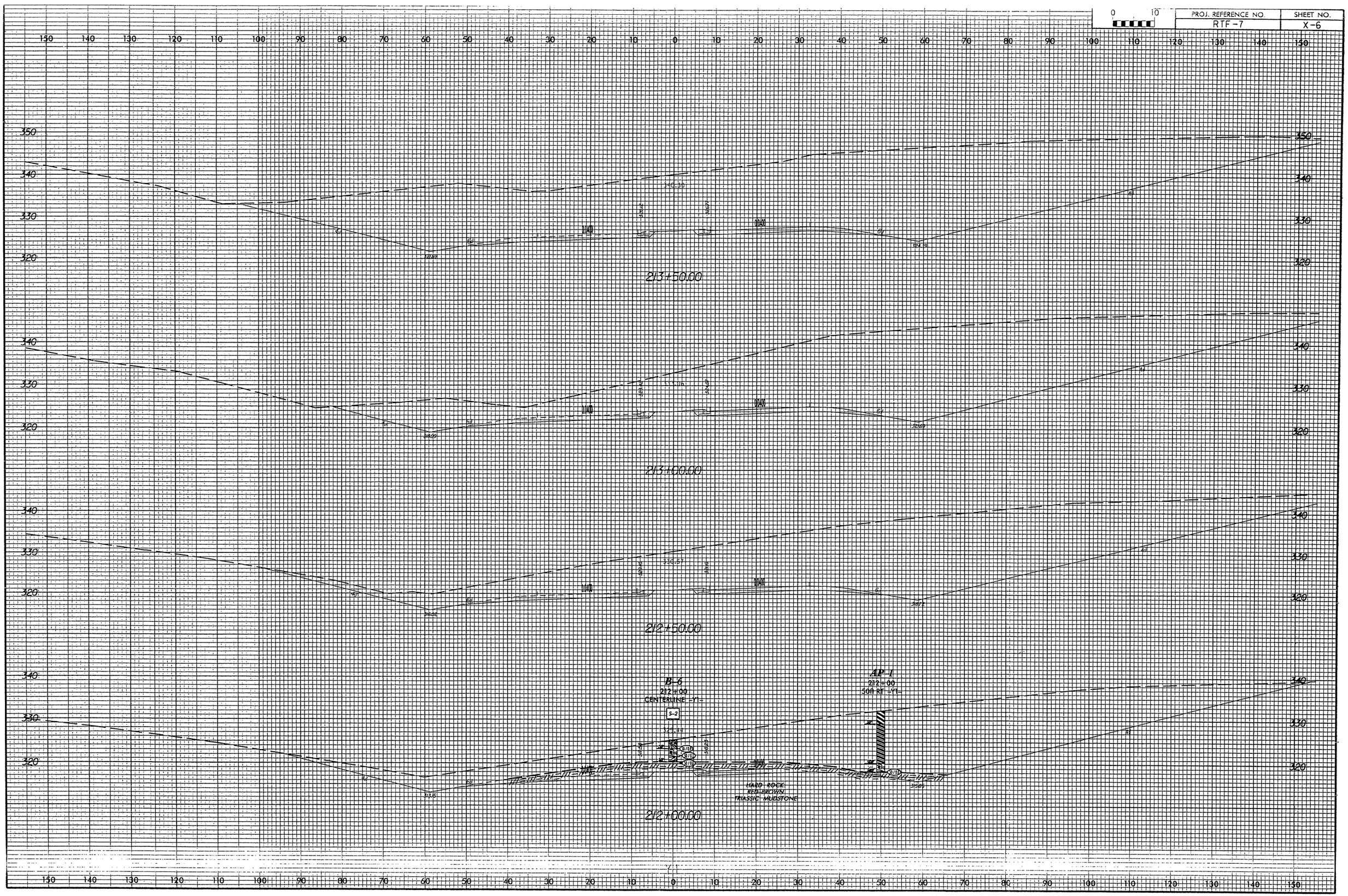
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-Y2-



-DRIVE-





PROJ. REFERENCE NO.
RTF-7
SHEET NO.
X-6
213+50.00
213+00.00
212+50.00
212+00.00
B-6
212+00
CENTERLINE -Y1-
S-2
AP-1
212+00
50ft RT -Y1-
HARD ROCK
RED-BROWN
TRIASSIC MUDSTONE

0 10	PROJ. REFERENCE NO.	SHEET NO.
	RTF-7	X-7

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

360 350 340 330

215+50.00

215+00.00

214+50.00

214+00.00

RW-1
214+45
128' LT -Y1-

HARD ROCK:
RED-BROWN
TRIASSIC MUDSTONE

AP-2
214+00
50' LT -Y1-

HARD ROCK:
RED-BROWN
TRIASSIC MUDSTONE

B-1
214+00
CENTERLINE -Y1-

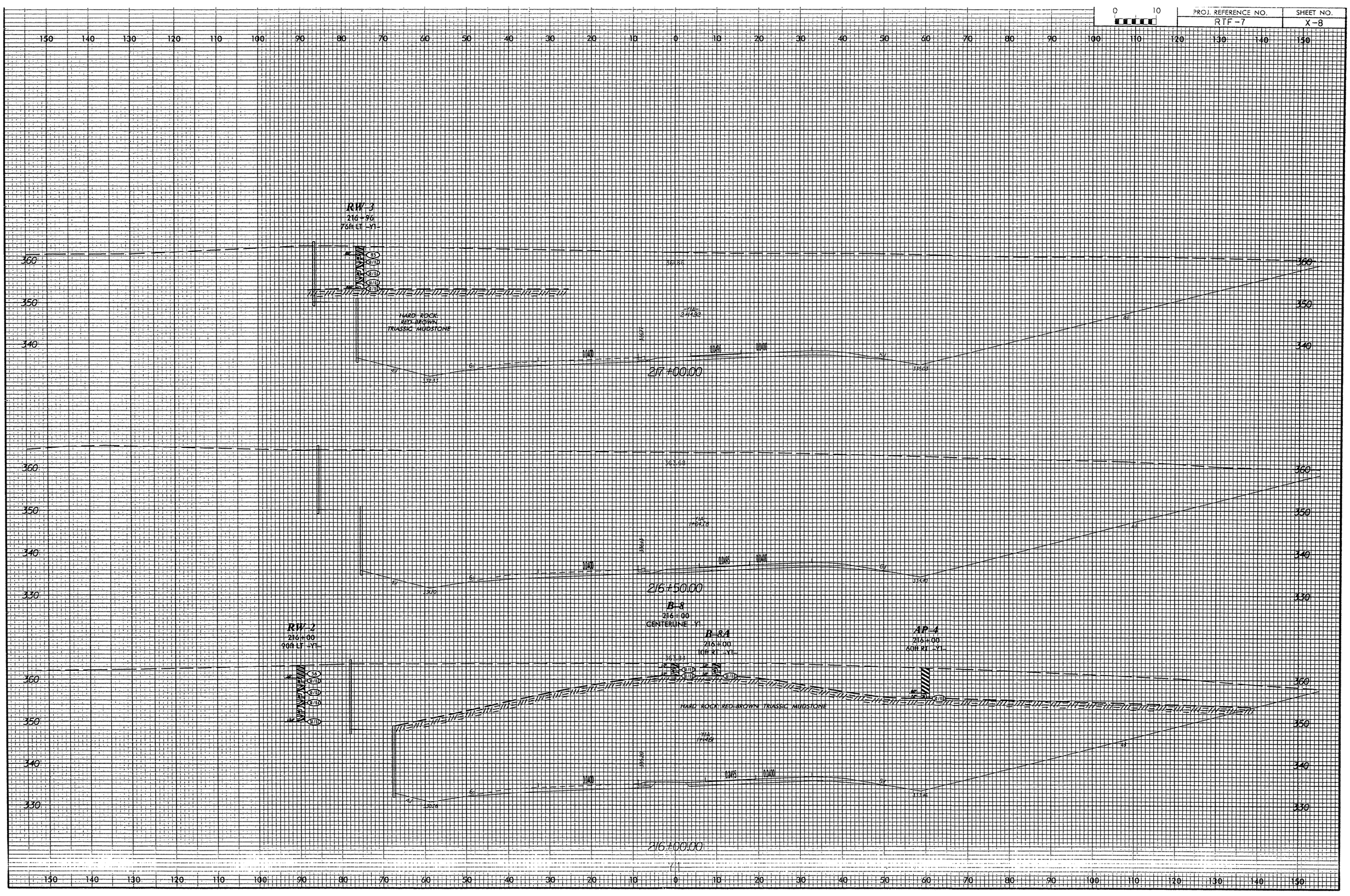
S-3

AP-3
214+00
50' RT -Y1-

HARD ROCK:
RED-BROWN
TRIASSIC MUDSTONE

PROJ. REFERENCE NO. RTF-7 | SHEET NO. X-8

0 10



PROJ. REFERENCE NO.	SHEET NO.
RTF-7	X-9

STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEETS
N.C.	N/A		1	18
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION		
N/A	N/A	P.E.		
		CONST.		

ID: N/A

PROJECT: N/A

CONTENTS:

NCDOT GEOTECHNICAL UNIT
SOIL AND ROCK CLASSIFICATION SHEET 2

EARTHWORK SUMMARY SHEET 3

LINE	STATION	PLAN	PROFILE	XSECTS
-L-	85+00.00 - 139+00.00	4 - 8	10 - 12	X-5, 8, 21, 22
-Y1-	224+13.18 - 244+03.59	7 & 9	13 & 14	

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

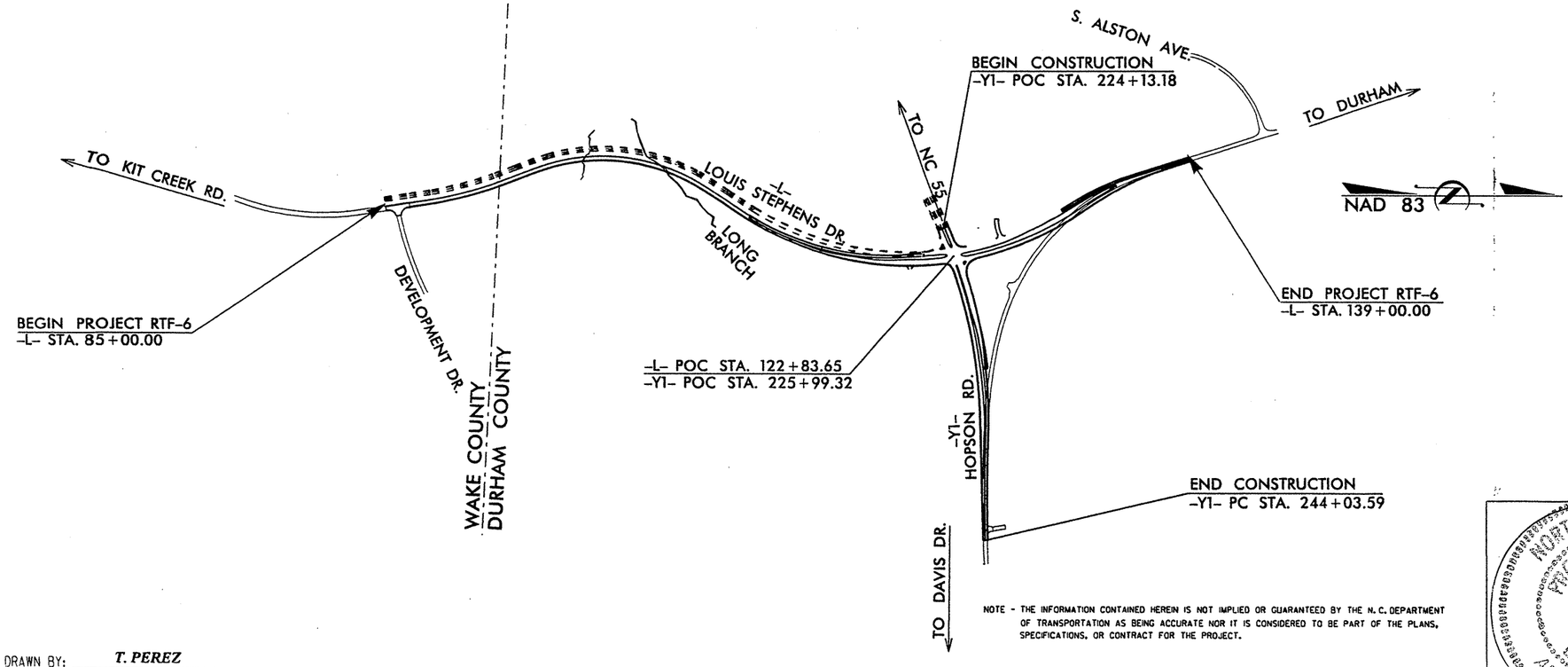
STATE PROJECT N/A I.D. NO. N/A

F.A. PROJECT N/A

COUNTY WAKE/DURHAM

DESCRIPTION LOUIS STEPHENS DRIVE FROM DEVELOPMENT DRIVE TO NORTH OF HOPSON ROAD

INVENTORY REPORT



DRAWN BY: T. PEREZ

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.

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.

INVESTIGATED BY S&ME, INC. PERSONNEL J.S. JOHNSON

CHECKED BY A.F. RIGGS, JR. A. NASH

SUBMITTED BY S&ME, INC. M. CLARY

DATE 3/5/2004 S. LOW

L. BALLARD

E. MOSELEY

J. PASCHALL

R. NORWOOD

A. GALLAGHER

M. MOSELEY

J. WHITE

G. PAYNTER

P. PHELPS

T. PEREZ

NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER ABNER F. RIGGS, JR. 3/12/04

SIGNATURE

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
N/A	N/A	2	18

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL 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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND 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 PLASTIC INDEX	6 MX		N.P.	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 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	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR 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, YEL-BRN, 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 ARE 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 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP/DIP DIRECTION OF ROCK STRUCTURES
- ● - SOUNDING ROD
- SPT, OPT, VST, DMT, PMT — TEST BORING
- CPT TEST BORING
- GEO-PROBE
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION

SAMPLE DESIGNATIONS

- S- BULK SAMPLE
- SS- SPLIT SPOON SAMPLE
- ST- SHELBY TUBE SAMPLE
- RS- ROCK SAMPLE
- RT- RECOMPACTED TRIAXIAL SAMPLE
- CBR - CBR SAMPLE
- SPT N-VALUE
- CPT N60 EQUIVALENT

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
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B- 57
- [ ] BK-51
- [X] CME-550x
- [X] CME-750
- [ ] PORTABLE HOIST
- [ ] OTHER _____
- [ ] OTHER _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [X] OTHER 3-1/4" H.S.A.
- [ ] OTHER _____

HAMMER TYPE:
- [X] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN 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 FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
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 ROCKS 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 GEOLOGISTS 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 GEOLOGISTS 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 GEOLOGISTS 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 WHICH 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 IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - 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 WHICH 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, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 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 (S.R.Q.D.) - 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 (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION:

NOTES: COLLAR ELEVATIONS WERE OBTAINED FROM PROFILE AND CROSS SECTIONS SHEETS PROVIDED BY MULKEY ENGINEERS AND CONSULTANTS.

REVISED 09/15/00

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	N/A	3	18

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
N/A	N/A	P.E.
		CONST.

ID: N/A

PROJECT: N/A

INSERT

EARTHWORK SUMMARY

SHEET HERE

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
Raleigh, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
www.mulkeyinc.com

PROJECT REFERENCE NO.	SHEET NO.
RTF-6	4
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

FOR -L- PROFILE SEE SHEET 10

N.C. GRID
NAD 83

75+00

80+00

85+00

90+00

N/F RESEARCH TRIANGLE FOUNDATION OF NORTH CAROLINA
DB 1670 PG 239

-L- SC Sta. 88+01.02

-L- TS Sta. 86+57.02

BEGIN PROJECT RTF-6
-L- POT 85+00.00

-L- PT Sta. 83+37.83

FUTURE SB LANES

B-13

B-14

BEGIN PROP. 1'-6" CURB AND GUTTER

-L- N 8° 40' 34.7" W 2880.00'

TIE TO EXISTING

LOUIS STEPHENS RD 31'-0" BST

EXISTING R/W

WOODS

MATCH TO SHEET 5
-L- STA. 90+00

RESEARCH TRIANGLE FOUNDATION
DB 315 PG 537
DB 248 PG 341

DEVELOPMENT DR BST

50.00'

MAGNEQUENCH INTERNATIONAL INC
DB 8489 PG 1476

DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "HEALTH" WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: 773,555.138ft(s) EASTING: 2,036,544.869ft(s)

THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.9991958

THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "HEALTH" TO -L- STATION 85+00.00 IS

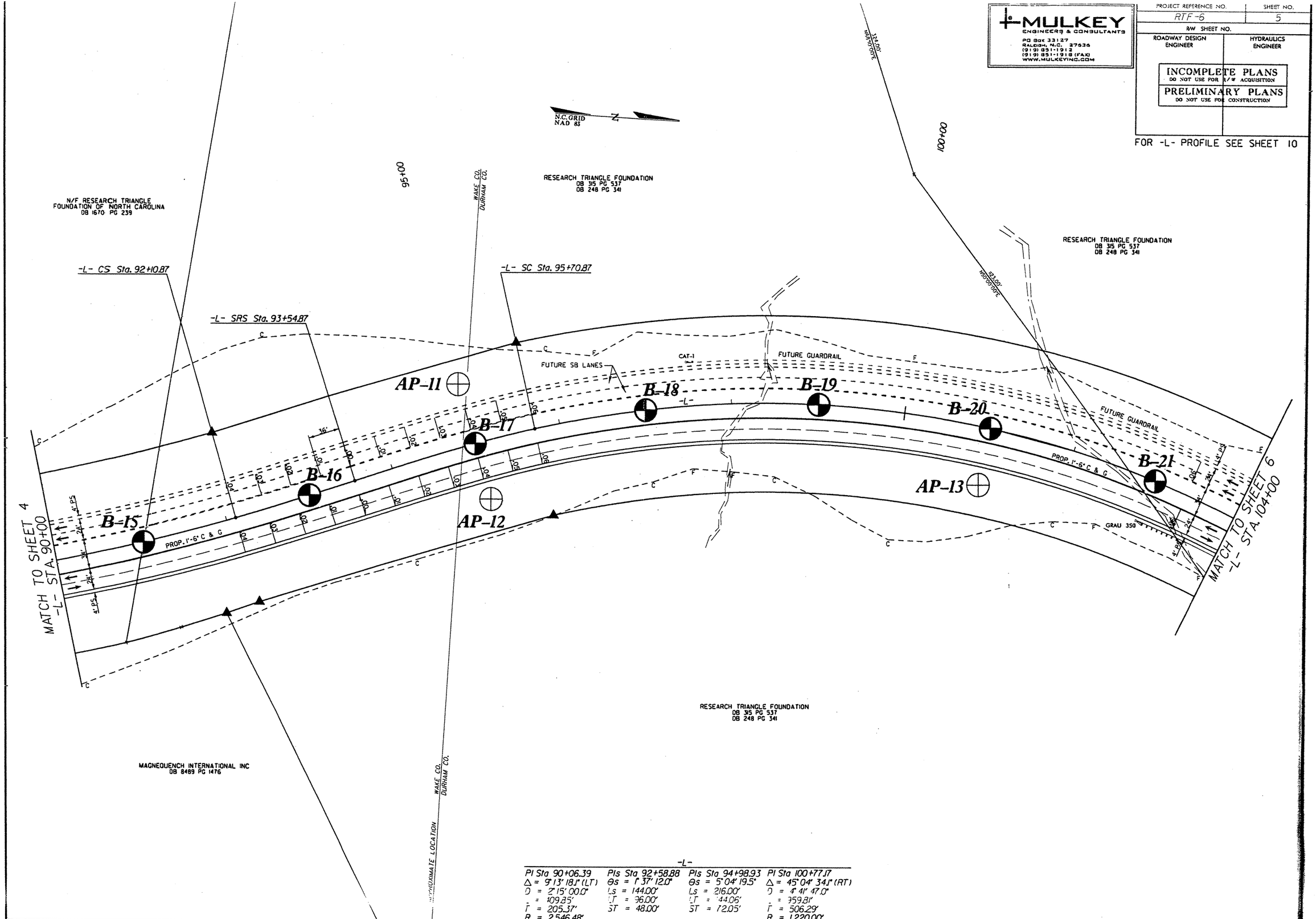
S 29° 59' 56.7" W 4,309.363'

ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES

VERTICAL DATUM USED IS NGVD 29

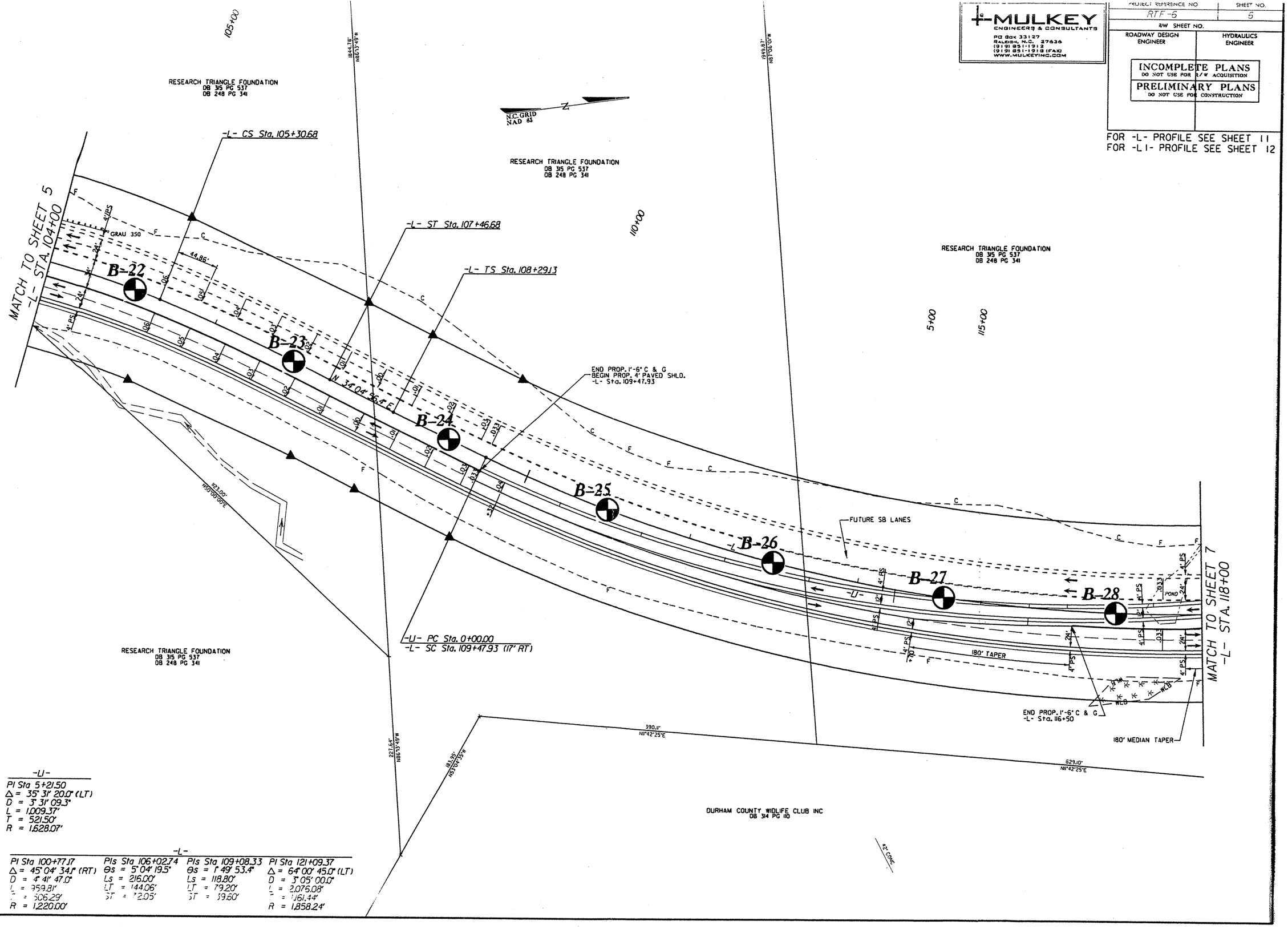
-L-

PI Sta 77+81.98	PIs Sta 87+53.03	PI Sta 90+06.39
Δ = 44° 54' 51.7" (LT)	Θs = 1° 37' 12.0"	Δ = 9° 13' 18.1" (LT)
D = 3° 49' 11.0"	Ls = 144.00'	D = 2° 15' 00.0"
L = 1175.35'	LT = 96.00'	L = 109.35'
T = 620.01'	ST = 48.00'	T = 205.37'
R = 1,500.00'		R = 2,546.48'



-L-

PI Sta 90+06.39	PIs Sta 92+58.88	PIs Sta 94+98.93	PI Sta 100+77.17
Δ = 9° 13' 18.1" (LT)	Θs = 1° 37' 12.0"	Θs = 5° 04' 19.5"	Δ = 45° 04' 34.1" (RT)
D = 2° 15' 00.0"	Ls = 144.00'	Ls = 216.00'	D = 4° 41' 47.0"
L = 409.85'	LT = 96.00'	LT = 144.06'	L = 959.81'
T = 205.37'	ST = 48.00'	ST = 72.05'	T = 506.29'
R = 2,546.48'			R = 1,220.00'



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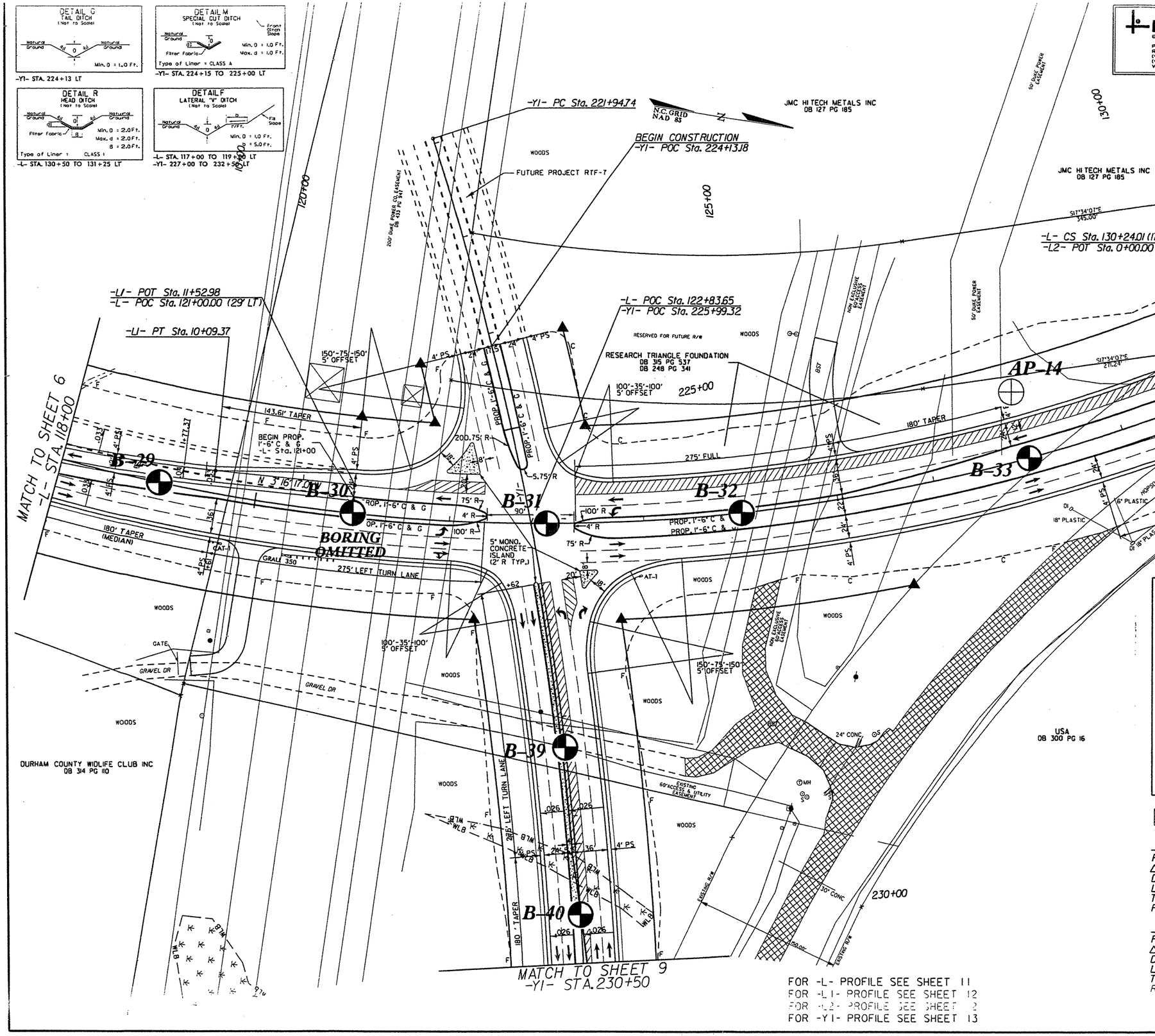
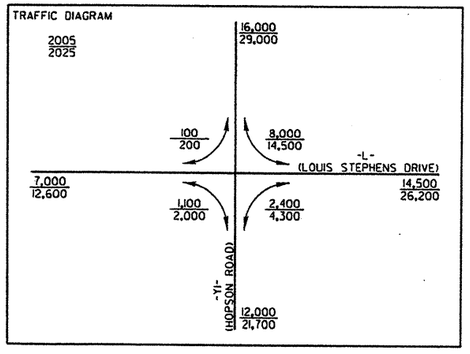
PO Box 33127
RALEIGH, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
WWW.MULKEYINC.COM
PROJECT REFERENCE NO
RTF-6
SHEET NO.
6
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
FOR -L- PROFILE SEE SHEET 11
FOR -L1- PROFILE SEE SHEET 12
RESEARCH TRIANGLE FOUNDATION
DB 315 PG 537
DB 248 PG 341
N.C. GRID
NAD 83
-L- CS Sta. 105+30.68
-L- ST Sta. 107+46.68
-L- TS Sta. 108+29.13
MATCH TO SHEET 5
-L- STA. 104+00
MATCH TO SHEET 7
-L- STA. 118+00
GRAU 350
44.86'
B-22
B-23
B-24
B-25
B-26
B-27
B-28
N 34°04'56.4" E
END PROP. 1'-6" C & G
BEGIN PROP. 4' PAVED SHLD.
-L- Sta. 109+47.93
FUTURE SB LANES
-L1- PC Sta. 0+00.00
-L- SC Sta. 109+47.93 (17' RT)
180' TAPER
END PROP. 1'-6" C & G
-L- Sta. 116+50
180' MEDIAN TAPER
DURHAM COUNTY WIDLIFE CLUB INC
DB 314 PG 110
105+00
110+00
115+00
5+00
390.11'
N11°42'25"E
629.10'
N11°42'25"E
227.64'
N86°13'49"W
183.95'
N53°04'35"W
1844.78'
N86°13'49"W
1949.87'
N87°06'01"W
1123.00'
N50°00'00"E
42" CONC
-L1-
PI Sta 5+21.50
Δ = 35° 31' 20.0" (LT)
D = 3° 31' 09.3"
L = 1,009.37'
T = 521.50'
R = 1,628.07'
-L-
PI Sta 100+77.17
Δ = 45° 04' 34.1" (RT)
D = 4° 41' 47.0"
L = 959.81'
T = 506.29'
R = 1,220.00'
PIs Sta 106+02.74
Θs = 5° 04' 19.5"
Ls = 216.00'
LT = 144.06'
ST = 72.05'
PIs Sta 109+08.33
Θs = 1° 49' 53.4"
Ls = 118.80'
LT = 79.20'
ST = 39.60'
PI Sta 121+09.37
Δ = 64° 00' 45.0" (LT)
D = 3° 05' 00.0"
L = 2,076.08'
T = 1,161.44'
R = 1,858.24'





PAINT STRIPING

-L1-	-L2-	-Y1-
PI Sta 5+21.50	PI Sta 13+00.76	PI Sta 229+26.47
Δ = 35° 31' 20.0" (LT)	Δ = 14° 13' 09.1" (RT)	Δ = 25° 00' 16.8" (RT)
D = 3° 31' 09.3"	D = 3° 55' 38.7"	D = 1° 44' 10.4"
L = 1,009.37'	L = 362.05'	L = 1,440.17'
T = 521.50'	T = 181.96'	T = 731.73'
R = 1,628.07'	R = 1,458.87'	R = 3,300.00'

-L-		
PI Sta 121+09.37	PIs Sta 130+63.61	PIs Sta 132+62.82
Δ = 64° 00' 45.0" (LT)	Θs = 1° 49' 53.4"	Θs = 2° 42' 00.0"
D = 3° 05' 00.0"	Ls = 118.80'	Ls = 180.00'
L = 2,076.08'	LT = 79.20'	LT = 120.01'
T = 1,161.44'	ST = 39.60'	ST = 60.01'
R = 1,858.24'		

FOR -L- PROFILE SEE SHEET 11
FOR -L1- PROFILE SEE SHEET 12
FOR -L2- PROFILE SEE SHEET 12
FOR -Y1- PROFILE SEE SHEET 13

MULKEY
ENGINEERS & CONSULTANTS
PO Box 33127
Raleigh, N.C. 27636
(919) 851-1912
(919) 851-1918 (FAX)
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PROJECT REFERENCE NO.	SHEET NO.
RTF-6	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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PROJECT REFERENCE NO.	SHEET NO.
RTF-6	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

FOR -L- PROFILE SEE SHEET 12
FOR -L2- PROFILE SEE SHEET 12

N.C. GRID
N.A.D. 83

135+00

5+00

140+00

RESEARCH TRIANGLE FOUNDATION
DB 395 PG 537
DB 248 PG 341

-L- CS Sta. 136+77.83

-L- ST Sta. 138+57.83

-L- POT Sta. 142+19.46

MATCH TO SHEET 7
-L- STA 132+00

444.54' TAPER (PAINT STRIPE)

600' TAPER (PAINT STRIPE)

392.8' TRANSITION (PAINT STRIPED)

B-36

B-37

B-38

N 17° 32' 32.9" W

HOPSON RD 240' BST

REMOVE MTL 36'

-L2- PT Sta. 4+80.85

-L- SC Sta. 133+22.81

END PROJECT RTF-6
-L- ST Sta. 139+00.00 (29' RT)
-L2- POT Sta. 8+75.87

USA
DB 300 PG 16

-L2-

PI Sta 13+00.76
Δ = 14° 13' 09.1" (RT)
D = 3° 55' 38.7"
L = 362.05'
T = 181.96'
R = 1,458.87'

-L-

PIs Sta 132+62.82	PI Sta 135+00.83	PIs Sta 137+37.85
θs = 2° 42' 00.0"	Δ = 10° 39' 02.5" (RT)	θs = 2° 42' 00.0"
Ls = 180.00'	D = 3° 00' 00.0"	Ls = 180.00'
LT = 120.01'	L = 355.02'	LT = 120.01'
ST = 60.01'	T = 178.02'	ST = 60.01'
	R = 1,909.86'	

PAINT STRIPING

-Y1-

PIs Sta 221+63.54	PI Sta 229+08.19	PIs Sta 236+55.21	PI Sta 248+11.75
θs = 0° 48' 45.2"	Δ = 24° 23' 55.7" (RT)	θs = 1° 26' 15.4"	Δ = 4° 16' 06.6" (LT)
Ls = 93.60'	D = 1° 44' 10.4"	Ls = 165.60'	D = 0° 30' 00.0"
LT = 62.40'	L = 1,405.27'	LT = 110.40'	L = 853.70'
ST = 31.20'	T = 713.45'	ST = 55.20'	T = 427.05'
	R = 3,300.00'		R = 11,459.16'

-Y1B-

PI Sta 1+73.36	PI Sta 7+75.57
Δ = 8° 37' 14.9" (RT)	Δ = 2° 51' 08.2" (LT)
D = 2° 29' 28.0"	D = 0° 29' 58.6"
L = 346.06'	L = 570.89'
T = 173.36'	T = 285.50'
R = 2,300.00'	R = 11,467.91'

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PROJECT REFERENCE NO.	SHEET NO.
RTF-6	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

FOR -Y1- PROFILE SEE SHEET 12
FOR -Y1B- PROFILE SEE SHEET 12

N
NC GRID
NAD 83

235+00 5+00 240+00 10+00

USA
DB 300 PG 16

-Y1B- PC Sta. 0+00.00
-Y1- POC Sta. 233+45.02 (20.75' LT)

-Y1B- PT Sta. 3+46.06

-Y1B- PC Sta. 4+90.06

END CONSTRUCTION
-Y1B- PT Sta. 10+60.95
-Y1- PC Sta. 244+03.59 (8.75' RT)

MATCH TO SHEET 7
-Y1- STA 230+50

EXISTING R/W
WOODS
CHL
PROFESSOR RD.
DRIVE
MH
WV
END PROP. 1'-6" C & G
180' TAPER
GRAU 350
PROP. 1'-6" C & G
B-41
B-42
CAT-1
600' TAPER
R/W MON.
S 88° 34' 22.4" E
N 88° 34' 29.4" E
-Y1B-
-Y1-
BST
LANDSCAPE AREA
WVS
4" PS
12" PS
4" PSL
15" CM
WIRE FENCE

MULLIN AND COURTNEY ALEXANDER
DB 1192 PG 211
PB 150 PG 33

-Y1- ST Sta. 237+24.06

-Y1- CS Sta. 236+30.46

DUKE ENERGY
DB 1242 PG 902

RESEARCH TRIANGLE FOUNDATION
DB 315 PG 537
DB 248 PG 341

200' DUKE POWER CO. EASEMENT
DB 433 PG 347

WLB

N10°55'42.00"W 365.36'
S00°55'42.00"E 365.36'
37.00' S89°07'01"W
50.00' N00°55'42.00"W
94.00' S89°07'00"W
1775.00' S89°14'35"E

PAINT STRIPING

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PROJECT REFERENCE NO.	SHEET NO.
RTF-6	10

R/W SHEET NO.

ROADWAY DESIGN ENGINEER

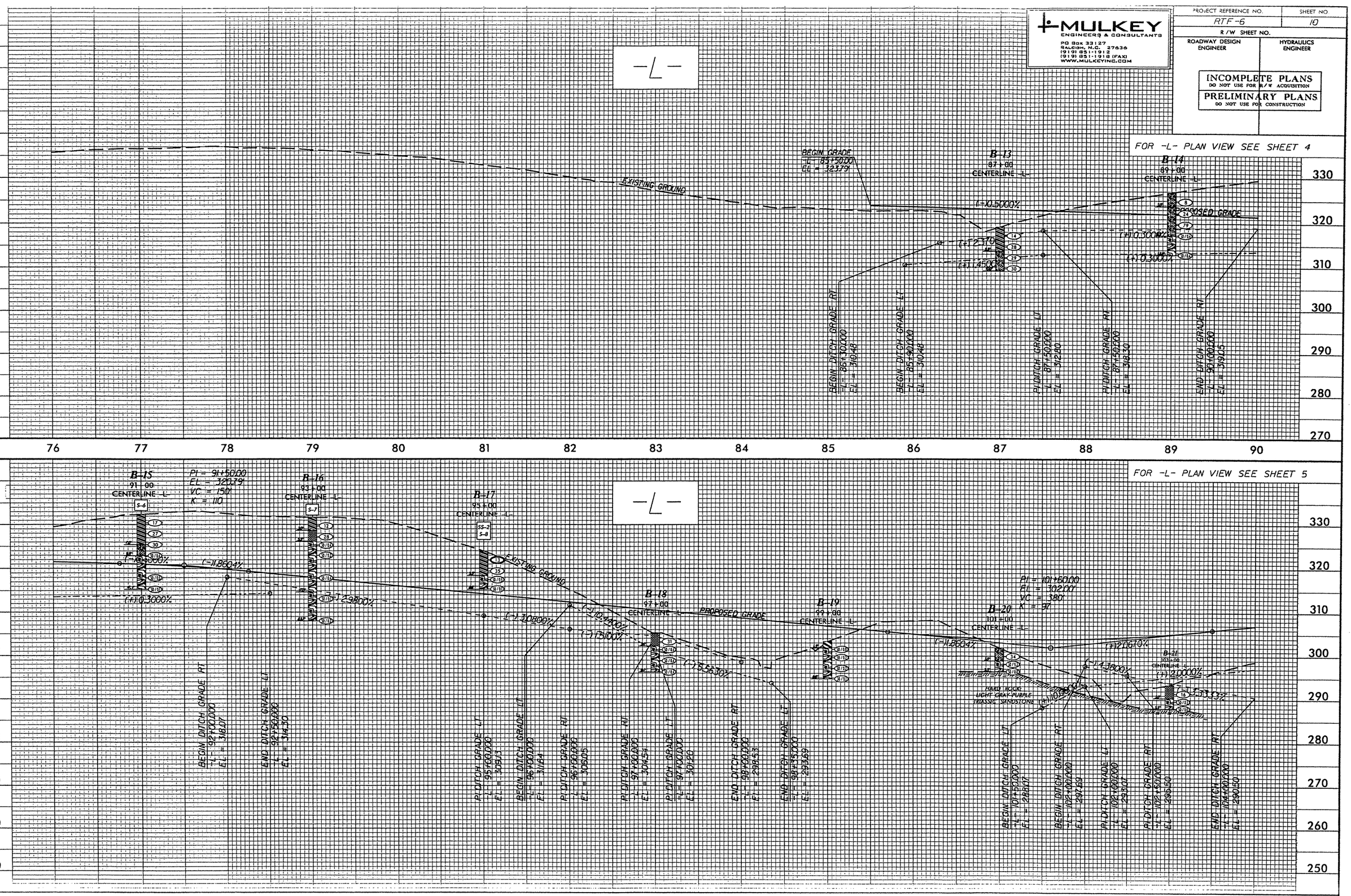
HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

FOR -L- PLAN VIEW SEE SHEET 4

FOR -L- PLAN VIEW SEE SHEET 5



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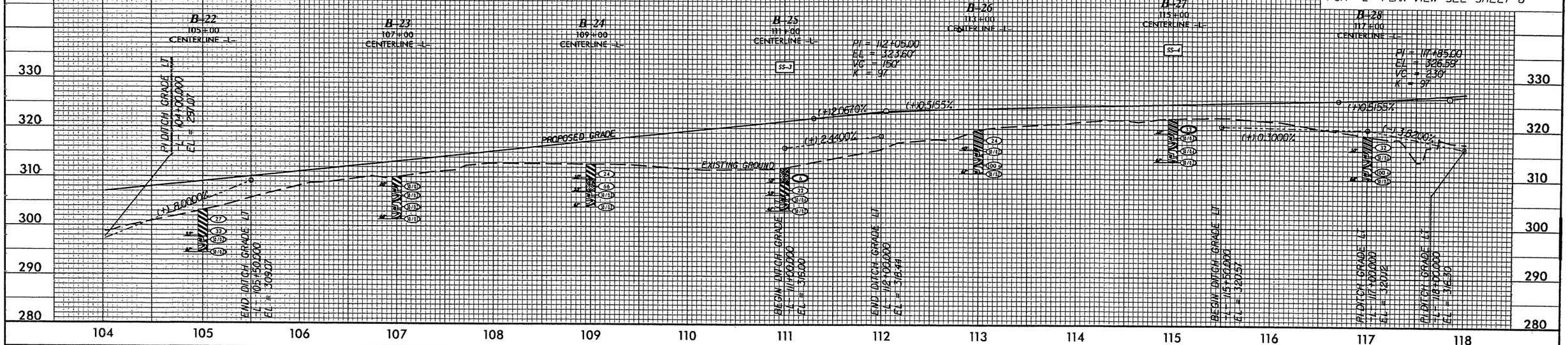
PROJECT REFERENCE NO.	SHEET NO.
RTF-6	H
R/W SHEET NO:	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

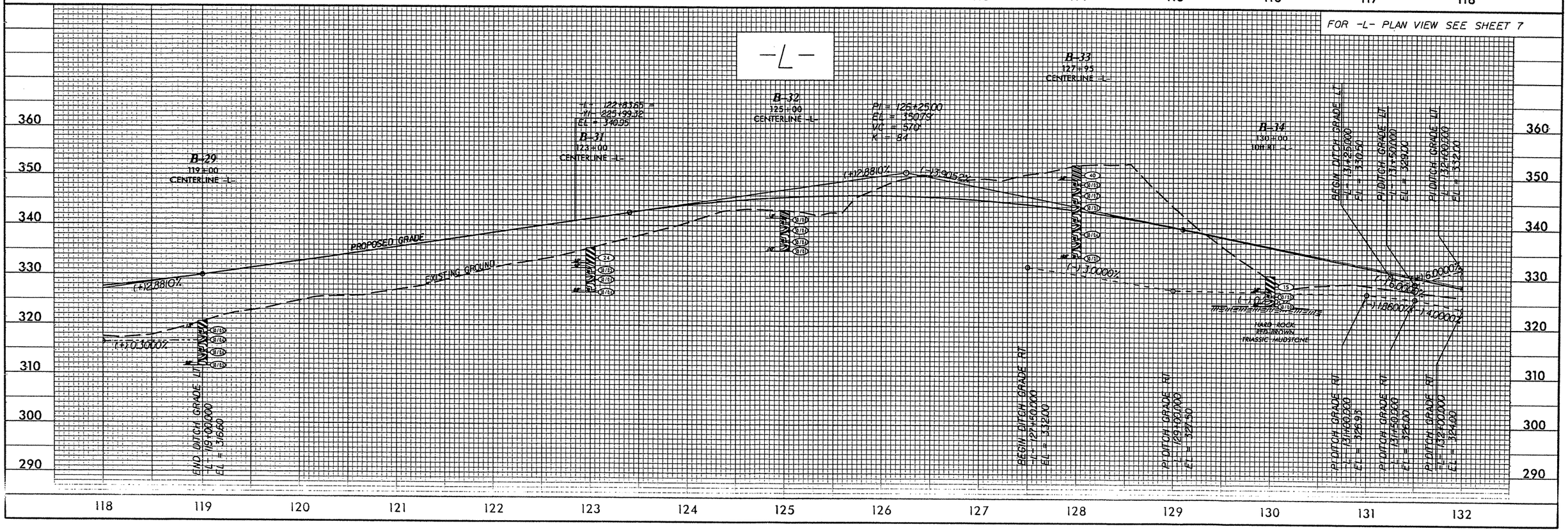
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

FOR -L- PLAN VIEW SEE SHEET 6



FOR -L- PLAN VIEW SEE SHEET 7



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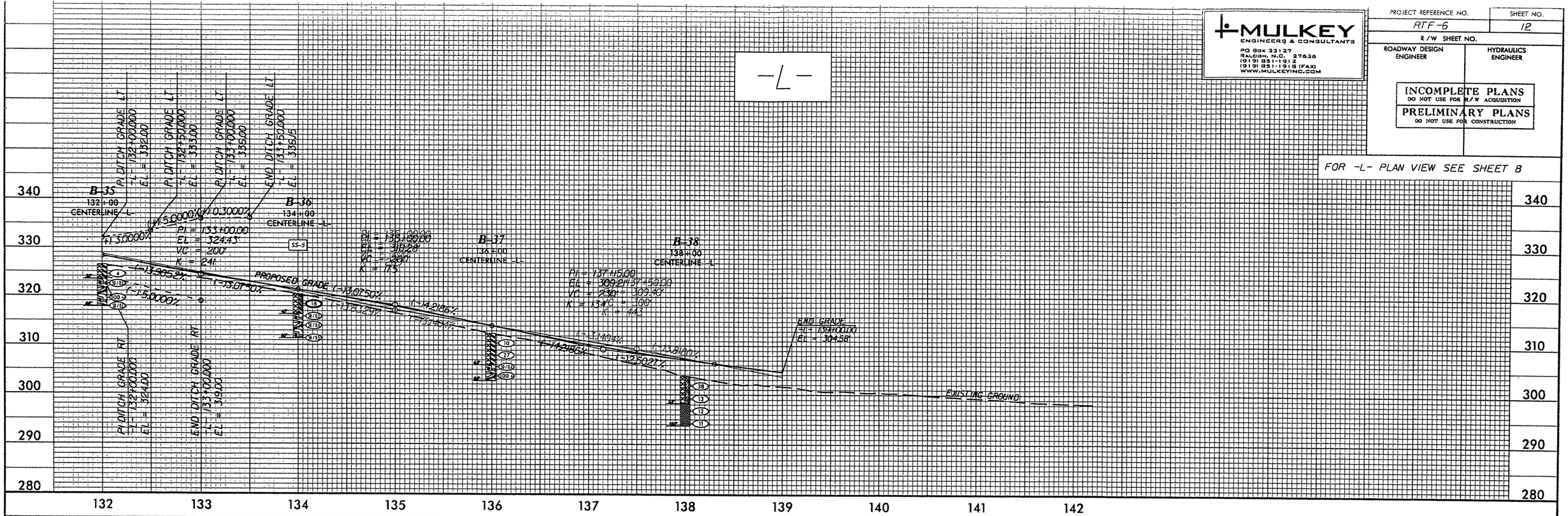
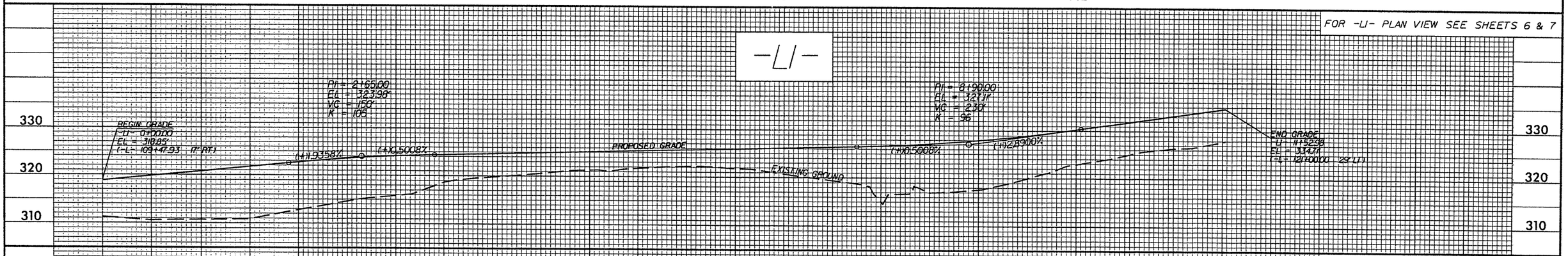
PROJECT REFERENCE NO.	SHEET NO.
RTF-6	12
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

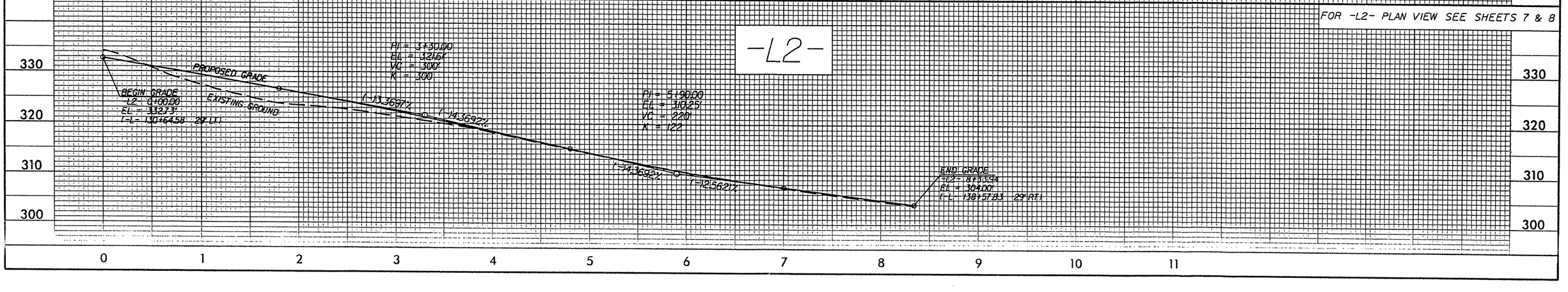
FOR -L- PLAN VIEW SEE SHEET 8



FOR -L1- PLAN VIEW SEE SHEETS 6 & 7



FOR -L2- PLAN VIEW SEE SHEETS 7 & 8



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PROJECT REFERENCE NO.	SHEET NO.
RTF-6	13
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER

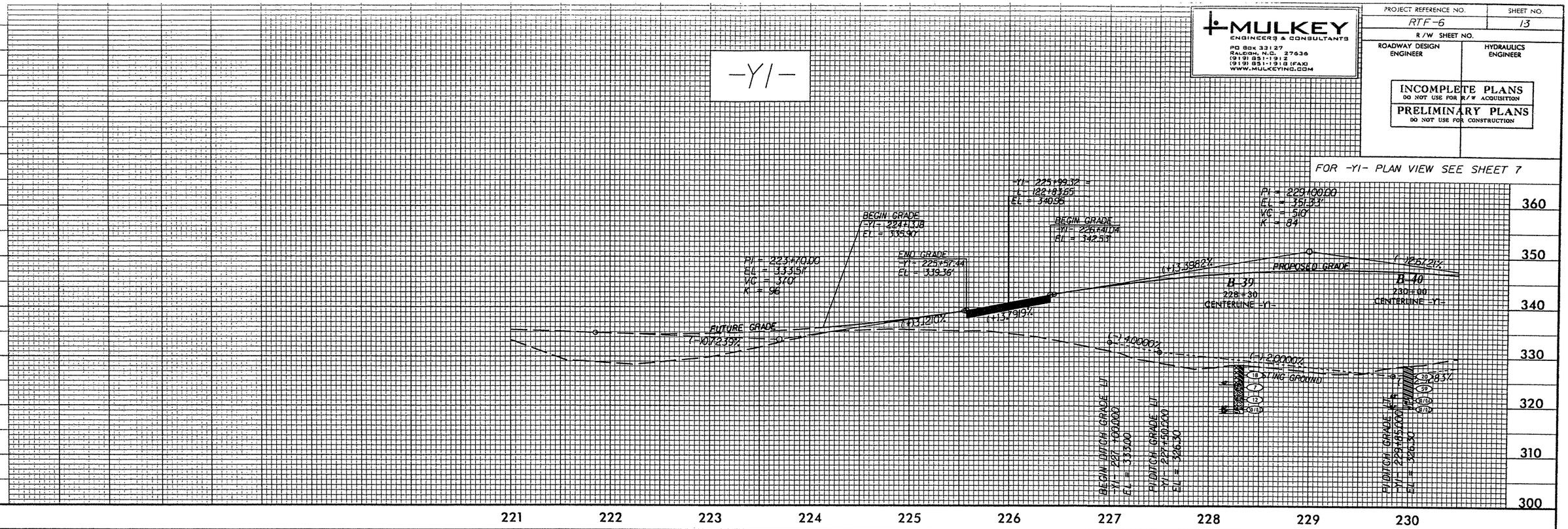
HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

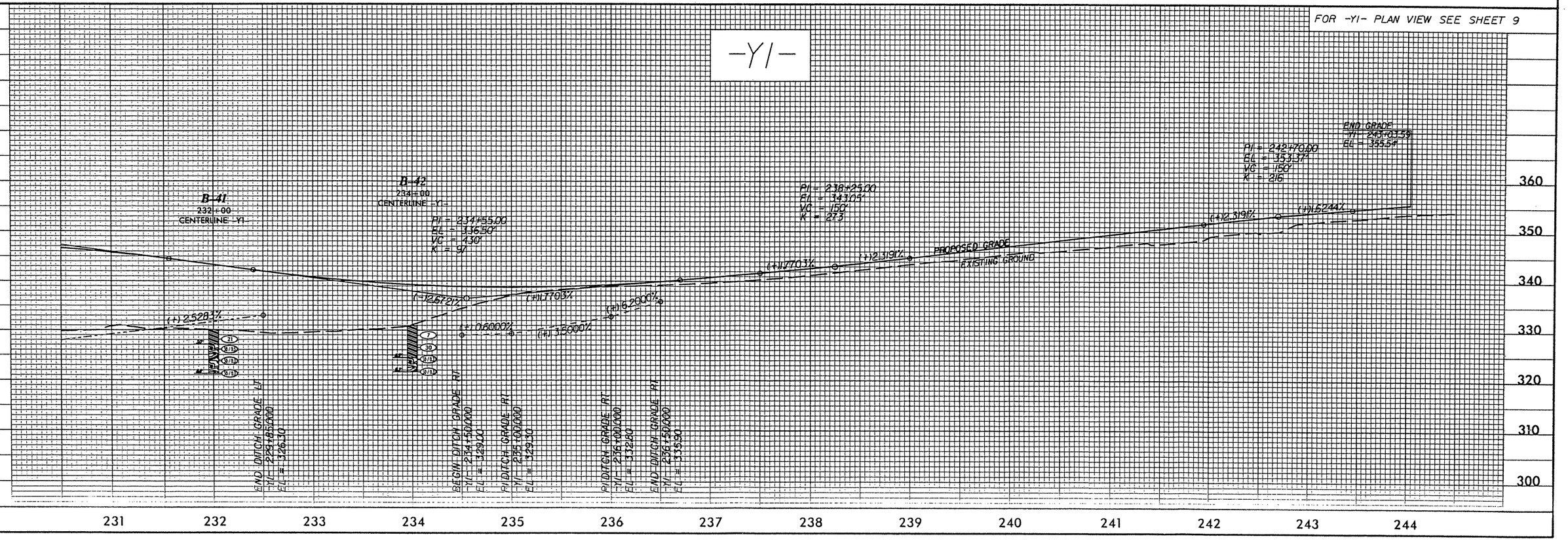
FOR -Y1- PLAN VIEW SEE SHEET 7

-Y1-



FOR -Y1- PLAN VIEW SEE SHEET 9

-Y1-



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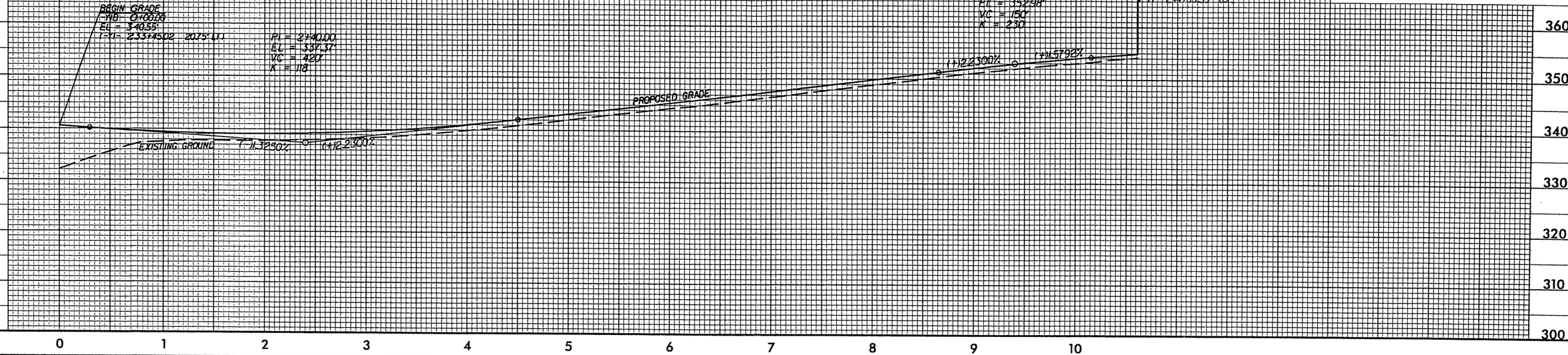
PROJECT REFERENCE NO.	SHEET NO.
RTF-6	14
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

FOR -L- PLAN VIEW SEE SHEET 9

-YIB-



PROJ. REFERENCE NO.	SHEET NO.
RTF-6	X-5

0 10

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

330
320
310

AP-11
95+00
70ft LT -L-

B-17
95+00
CENTERLINE -L-

AP-12
95+00
65ft RT -L-

95+00.00

330
320
310

94+50.00

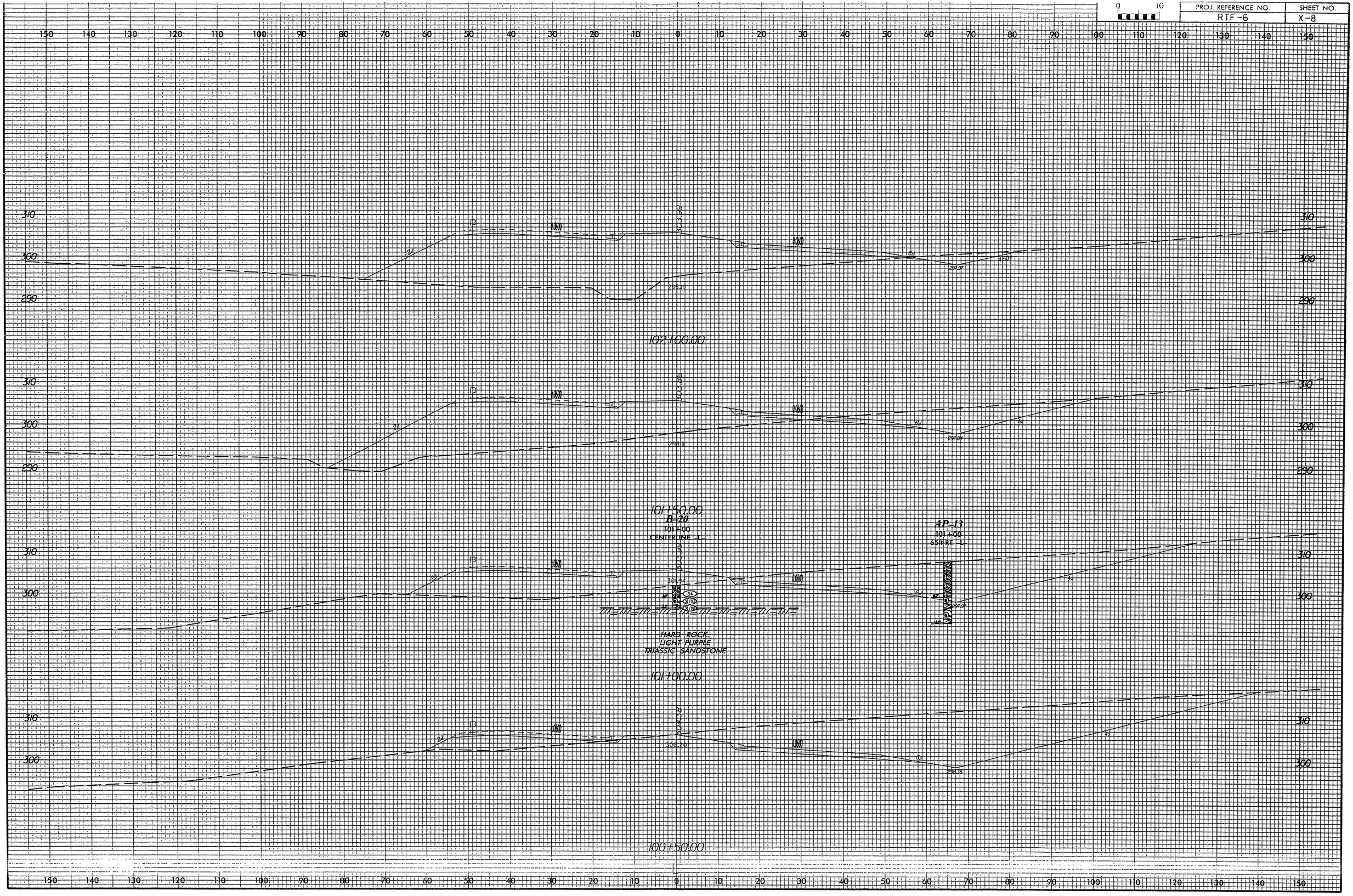
330
320
310

94+00.00

340
330
320

93+50.00

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



PROJ. REFERENCE NO.
RTF-6
SHEET NO.
X-8
0
10
102+00.00
101+50.00
B-20
101+00
CENTERLINE -L-
AP-13
101+00
65ft RT -L-
HARD ROCK
LIGHT PURPLE
TRIASSIC SANDSTONE
101+00.00
100+50.00

PROJ. REFERENCE NO.	SHEET NO.
RTF-6	X-21

129+50.00

129+00.00

128+50.00

AP-14
128+00
70ft LT

B-33
127+95
CENTERLINE

127+50.00

0 10	PROJ. REFERENCE NO.	SHEET NO.
	RTF-6	X-22

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

340
330

132+100.00

131+50.00

131+00.00

130+50.00

130+00.00

AP-15
130+00
70ft LT

B-34
130+00
10ft RT

HARD ROCK:
RED-BROWN
TRIASSIC MUDSTONE

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

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B- 1	**BORING LOCATION** 202+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 296.1 ft	**NORTHING** 772,853.8	**EASTING** 2,032,411.3		**24 HR.** N/M
TOTAL DEPTH 9.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA		**HAMMER TYPE** MANUAL
DATE STARTED 12/11/03	**COMPLETED** 12/11/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
296.1					GROUND SURFACE				296.1 0.0
295.1	1.0	3	5	9	14		M		RESIDUUM: STIFF ORANGE-RED FINE SANDY CLAY (A-7-5) 293.1 3.0
292.6	3.5	40	50/0.2		50/0.2		M		HARD DARK BROWN SILT (A-4) 292.1 4.0
290.1	6.0	50/0.3			50/0.3		D		WEATHERED ROCK: (LIGHT PURPLE-GRAY TRIASSIC SANDSTONE)
287.6	8.5	50/0.5			50/0.5		D		287.1 9.0
					BORING TERMINATED AT ELEV. 287.1 FEET IN WEATHERED ROCK: (LIGHT PURPLE GRAY TRIASSIC SANDSTONE).				1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

NCDOT BORE SINGLE 51-202.GPJ NCDOT.GDT 3/3/04

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

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B- 2	**BORING LOCATION** 204+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 284.4 ft	**NORTHING** 772,862.2	**EASTING** 2,032,611.1		**24 HR.** N/M
TOTAL DEPTH 18.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA		**HAMMER TYPE** MANUAL
DATE STARTED 12/10/03	**COMPLETED** 12/10/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
284.4					GROUND SURFACE				284.4 0.0
283.4	1.0						D		RESIDUUM: VERY STIFF TAN-ORANGE SILT (A-4)
		8	8	9	17	S-1			
280.9	3.5						D		281.4 3.0 WITH TRACE OF FINE SAND
		5	6	9	15				STIFF ORANGE FINE SANDY CLAY (A-6)
278.4	6.0						D		278.9 5.5
		9	14	25	39				VERY HARD PURPLE-BROWN SILT (A-4)
275.9	8.5						D		
		22	25	35	60				
270.9	13.5						D		272.4 12.0 WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)
		50/0.3			50/0.3				
266.4	18.0						D		266.4 18.0
		50/0.0			50/0.0 BORING TERMINATED WITH STANDARD PENETRATION TEST REFUSAL AT ELEV. 266.4 FEET ON HARD ROCK: PURPLE-BROWN TRIASSIC SILTSTONE.				1) ADVANCED 3-1/4" HSA TO 18 FEET. 2) BULK SAMPLE TAKEN BETWEEN 1 TO 5 FEET.

NCDOT BORE SINGLE 51-202.GPJ NCDOT.GDT 3/3/04

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

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B- 3	BORING LOCATION 206+00	OFFSET 0.0 ft CL	ALIGNMENT -Y1-
COLLAR ELEV. 291.3 ft	NORTHING 772,870.5	EASTING 2,032,810.9	0 HR. DRY
TOTAL DEPTH 8.7 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	24 HR. N/M
DATE STARTED 12/10/03	COMPLETED 12/10/03	SURFACE WATER DEPTH N/A	HAMMER TYPE MANUAL

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
291.3					GROUND SURFACE				291.3 0.0
290.3	1.0								RESIDUUM: HARD RED-BROWN SILTY CLAY (A-6)
		5	6	24	30		M		
287.8	3.5								287.3 4.0
		35	65				M		WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)
285.3	6.0				100				
		50/0.5			50/0.5		D		
282.8	8.5								282.6 8.7
		50/0.2			50/0.2		D		1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

BORING TERMINATED
AT ELEV. 282.6 FEET
IN WEATHERED ROCK:
(PURPLE-BROWN TRIASSIC SILTSTONE)

NCDOT BORE SINGLE 51-202.GPJ NCDOT.GDT 1/26/04

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

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B- 4	BORING LOCATION 208+00	OFFSET 0.0 ft CL	ALIGNMENT -Y1-	0 HR. DRY
COLLAR ELEV. 293.0 ft	NORTHING 772,878.9	EASTING 2,033,010.7	24 HR. N/M
TOTAL DEPTH 9.5 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	HAMMER TYPE MANUAL
DATE STARTED 12/9/03	COMPLETED 12/9/03	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
293.0					GROUND SURFACE				293.0 0.0
292.0	1.0								RESIDUUM:
		6	8	10	18	SS-1	M		VERY STIFF YELLOW-TAN CLAY (A-7-6)
289.5	3.5								WITH TRACE OF SILT
		8	12	16	28		M		288.5 4.5
287.0	6.0								HARD RED-BROWN SILTY CLAY (A-6)
		15	32	43	75		M		
284.5	8.5								284.0 9.0
		13	50		50/0.5		D		283.5 9.5
					BORING TERMINATED AT ELEV. 283.5 FEET IN WEATHERED ROCK: (BROWN-GRAY TRIASSIC MUDSTONE)				WEATHERED ROCK: (BROWN-GRAY TRIASSIC MUDSTONE)

1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

NCDOT BORE SINGLE 5T-202.GPJ NCDOT.GDT 3/3/04

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

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B- 5	**BORING LOCATION** 210+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 308.2 ft	**NORTHING** 772,887.4	**EASTING** 2,033,210.6		**24 HR.** N/M
TOTAL DEPTH 10.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 12/9/03	**COMPLETED** 12/9/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
308.2					GROUND SURFACE				308.2 — 0.0
307.2	1.0						D		RESIDUUM:
		5	10	19	⊙29				VERY STIFF BROWN CLAY
304.7	3.5								(A-7-6)
		18	22	20	⊙42		M		WITH TRACE OF SILT
302.2	6.0								305.2 — 3.0
		13	19	21	⊙40		M		HARD RED-BROWN SILTY CLAY
299.7	8.5								(A-6)
		13	19	22	⊙41		M		WITH LITTLE FINE SAND
					BORING TERMINATED AT ELEV. 298.2 FEET IN HARD RED-BROWN SILTY CLAY				298.2 — 10.0
									1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

NCDOT BORE SINGLE S1-202.GPJ NCDOT1.GDT 1/22/04

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

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B- 6	**BORING LOCATION** 212+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 325.4 ft	**NORTHING** 772,904.4	**EASTING** 2,033,409.8		**24 HR.** N/M
TOTAL DEPTH 5.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA		**HAMMER TYPE** MANUAL
DATE STARTED 12/9/03	**COMPLETED** 12/9/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
325.4					GROUND SURFACE				325.4 0.0
324.4	1.0								RESIDUUM:
		7	5	50/0.4	50/0.4	S-2	D		STIFF TAN-BROWN SILT 323.4 2.0
321.9	3.5						D		(A-4)
320.4	5.0	50/0.3			50/0.3		D		WEATHERED ROCK:
		50/0.0			50/0.0				(RED BROWN TRIASSIC MUDSTONE) 320.4 5.0
					BORING TERMINATED WITH STANDARD PENETRATION TEST REFUSAL AT ELEV. 320.4 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE				1) ADVANCED 3-1/4" HSA TO 5.0 FEET. 2) BULK SAMPLE TAKEN BETWEEN 1 TO 5 FEET.

NCDOT BORE SINGLE 01-202.GPJ NCDOT1.GDT 3/3/04

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B- 7	BORING LOCATION 214+00	OFFSET 0.0 ft CL	ALIGNMENT -Y1-
COLLAR ELEV. 348.2 ft	NORTHING 772,938.5	EASTING 2,033,606.8	0 HR. DRY
TOTAL DEPTH 12.5 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	24 HR. N/M
DATE STARTED 12/9/03	COMPLETED 12/9/03	SURFACE WATER DEPTH N/A	HAMMER TYPE MANUAL

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
348.2					GROUND SURFACE				348.2 0.0
347.2	1.0								RESIDUUM: HARD TAN SILTY CLAY (A-6) WITH TRACE OF FINE SAND
		16	17	20	37		M		
344.7	3.5								345.2 3.0
		50/0.4			50/0.4		D		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
342.2	6.0								
		50/0.5			50/0.5		D		
339.7	8.5					S-3			
		50/0.5			50/0.5		D		
335.7	12.5								335.7 12.5
		50/0.0			50/0.0				1) ADVANCED 3-1/4" HSA TO 12.5 FEET. 2) BULK SAMPLE TAKEN BETWEEN 5 TO 12 FEET.

BORING TERMINATED WITH STANDARD PENETRATION TEST REFUSAL AT ELEV. 335.7 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B- 8	**BORING LOCATION** 216+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 363.8 ft	**NORTHING** 772,989.6	**EASTING** 2,033,800.1		**24 HR.** N/M
TOTAL DEPTH 3.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA		**HAMMER TYPE** MANUAL
DATE STARTED 12/5/03	**COMPLETED** 12/5/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
363.8					GROUND SURFACE				363.8 0.0
362.8	1.0								362.8 1.0 RESIDUUM: MEDIUM STIFF BROWN CLAY (A-6)
		50/0.5			50/0.5		D		
360.8	3.0	50/0.0			50/0.0				360.8 3.0 WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)

BORING TERMINATED WITH STANDARD PENETRATION TEST REFUSAL AT ELEV. 360.8 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE

1) ADVANCED 3-1/4" HSA TO 3.0 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B- 8A	**BORING LOCATION** 216+00	**OFFSET** 10.0 ft RT	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 363.8 ft	**NORTHING** 772,989.6	**EASTING** 2,033,800.1		**24 HR.** N/M
TOTAL DEPTH 3.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA		**HAMMER TYPE** MANUAL
DATE STARTED 12/5/03	**COMPLETED** 12/5/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
363.8					GROUND SURFACE				363.8 0.0
362.8									RESIDUUM: 1.0
360.8	3.0						D		MEDIUM STIFF BROWN CLAY (A-6) 360.8 3.0
		50/0.0			50/0.0				WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)

BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 360.8 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE

1) ADVANCED 3-1/4" HSA TO 3.0 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B- 9	BORING LOCATION 218+00	OFFSET 0.0 ft CL	ALIGNMENT -Y1-
COLLAR ELEV. 355.0 ft	NORTHING 773,057.2	EASTING 2,033,988.2	0 HR. DRY
TOTAL DEPTH 11.1 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	24 HR. N/M
DATE STARTED 11/26/03	COMPLETED 11/26/03	SURFACE WATER DEPTH N/A	HAMMER TYPE MANUAL

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 20 40 60 80 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
355.0					GROUND SURFACE				355.0 / 0.0
354.0	1.0								RESIDUUM: HARD RED BROWN SILTY CLAY (A-6) WITH TRACE OF FINE SAND
351.5	3.5	12	20	45	65	S-4	M		
349.0	6.0	26	30	42	72		D		349.5 / 5.5
346.5	8.5	50/0.5			50/0.5		D		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
344.0	11.0	50/0.5			50/0.5		D		343.9 / 11.1
		50/0.1			50/0.1				

BORING TERMINATED WITH AUGER REFUSAL AT ELEV. 343.9 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE

1) ADVANCED 3-1/4" HSA TO 11.0 FEET.
2) BULK SAMPLE TAKEN BETWEEN 1 TO 5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-10	**BORING LOCATION** 219+81	**OFFSET** 35.0 ft RT	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 339.0 ft	**NORTHING** 773,101.0	**EASTING** 2,034,168.6		**24 HR.** N/M
TOTAL DEPTH 13.8 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/26/03	**COMPLETED** 11/26/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
339.0					GROUND SURFACE				339.0 0.0
338.0	1.0								RESIDUUM:
		4	4	4	8		M		LOOSE TAN-ORANGE SILTY FINE SAND
335.5	3.5								(A-2-4)
		50/0.4			50/0.4		D		336.0 3.0
333.0	6.0								WEATHERED ROCK:
		50/0.5			50/0.5		D		(RED-BROWN TRIASSIC MUDSTONE)
330.5	8.5								
		26	34	50/0.4	100+		D		
325.5	13.5								325.2 13.8
		50/0.3			50/0.3		D		1) ADVANCED 3-1/4" HSA TO 13.5 FEET.
					BORING TERMINATED AT ELEV. 325.2 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				

NCDOT BORING SINGLE 5-26-06.GPJ NCDOT.GDT 3/9/06

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B-11	BORING LOCATION 224+00	OFFSET 0.0 ft CL	ALIGNMENT -Y1-	0 HR. DRY
COLLAR ELEV. 334.2 ft	NORTHING 773,319.4	EASTING 2,034,527.7	24 HR. N/M
TOTAL DEPTH 8.9 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	HAMMER TYPE MANUAL
DATE STARTED 11/26/03	COMPLETED 11/26/03	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 20 40 60 80 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
334.2					GROUND SURFACE				334.2 0.0
333.2	1.0								RESIDUUM: VERY STIFF TO HARD RED BROWN SILTY CLAY (A-6)
		8	12	17	29		M		
330.7	3.5								
		22	26	40	66		D		329.2 5.0
328.2	6.0								WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
		50/0.2			50/0.2		D		
325.7	8.5								325.3 8.9
		50/0.4			50/0.4		D		1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

BORING TERMINATED
AT ELEV. 325.3 FEET
IN WEATHERED ROCK:
(RED-BROWN TRIASSIC MUDSTONE)

NCDOT BORE SINGLE 5-1-202.GPJ NCDOT.GDT 3/3/04

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B-12	BORING LOCATION 11+00	OFFSET 10.0 ft RT	ALIGNMENT -Y2-
COLLAR ELEV. 283.6 ft	NORTHING 772,961.3	EASTING 2,032,587.8	0 HR. DRY
TOTAL DEPTH 7.3 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	24 HR. N/M
DATE STARTED 12/10/03	COMPLETED 12/10/03	SURFACE WATER DEPTH N/A	HAMMER TYPE MANUAL

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	BLOW COUNT 0.5ft	BLOW COUNT 0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
283.6					GROUND SURFACE				283.6 0.0
282.6	1.0								RESIDUUM: MEDIUM STIFF BROWN FINE SANDY SILT (A-4)
		2	2	3	5		W		
280.1	3.5								
		3	35	50/0.2		S-5	D		279.1 4.5
277.6	6.0				50/0.2				WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)
276.3	7.3	50/0.3			50/0.3		D		276.3 7.3
		50/0.0			50/0.0				

BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 276.3 FEET ON HARD ROCK: PURPLE-BROWN TRIASSIC SILTSTONE

1) ADVANCED 3-1/4" HSA TO 7.3 FEET.
2) BULK SAMPLE TAKED BETWEEN 1 TO 7 FEET.

NCDOT BORE SINGLE 01-202.GPJ NCDOT.GDT 3/3/04

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BORING LOG

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-13	**BORING LOCATION** 87+00	**OFFSET** 0.0 ft CL / **ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 319.2 ft	**NORTHING** 770,000.8	**EASTING** 2,034,360.0	**24 HR.** N/M
TOTAL DEPTH 10.0 ft	**DRILL MACHINE** CME-550x	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** AUTOMATIC
DATE STARTED 11/11/03	**COMPLETED** 11/11/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
319.2					GROUND SURFACE				319.2 — 0.0
318.2	1.0	4	5	9	14		D		RESIDUUM: STIFF TO VERY STIFF BROWN SILTY CLAY (A-6)
315.7	3.5	7	12	16	28		D		313.7 — 5.5
313.2	6.0	8	13	16	29		D		VERY STIFF TO HARD PURPLE-BROWN SILT (A-4)
310.7	8.5	6	7	23	30		D		309.2 — 10.0

BORING TERMINATED AT ELEV. 309.2 FEET IN VERY STIFF TO HARD PURPLE-BROWN SILT

1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-14	**BORING LOCATION** 89+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 326.8 ft	**NORTHING** 770,197.5	**EASTING** 2,034,323.9		**24 HR.** N/M
TOTAL DEPTH 13.9 ft	**DRILL MACHINE** CME-550x	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** AUTOMATIC
DATE STARTED 11/11/03	**COMPLETED** 11/11/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
326.8					GROUND SURFACE				326.8 0.0
325.8	1.0								RESIDUUM: MEDIUM STIFF TAN FINE SANDY SILT (A-4)
323.3	3.5	4	4	4	8		D		323.8 3.0
320.8	6.0	6	10	14	24		D		VERY STIFF TO HARD PURPLE-GRAY SILT (A-4)
318.3	8.5	10	33	46	79		D		
313.3	13.5	25	32	50/0.4	50/0.4		D		317.3 9.5
		50/0.4			50/0.4				WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)
					BORING TERMINATED AT ELEV. 312.9 FEET IN WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE).				312.9 13.9
									1) ADVANCED 3-1/4" HSA TO 13.5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B-15	BORING LOCATION 91+00	OFFSET 0.0 ft CL	ALIGNMENT -L-	0 HR. DRY
COLLAR ELEV. 332.4 ft	NORTHING 770,391.3	EASTING 2,034,272.9	24 HR. N/M
TOTAL DEPTH 17.1 ft	DRILL MACHINE CME-550x	DRILL METHOD 3¼" HSA	HAMMER TYPE AUTOMATIC
DATE STARTED 11/12/03	COMPLETED 11/12/03	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 20 40 60 80 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
332.4					GROUND SURFACE				332.4 0.0
331.4	1.0								RESIDUUM: STIFF TO VERY STIFF TAN SILTY CLAY (A-4) WITH TRACE FINE SAND
		10	8	9	17		M		
328.9	3.5								
		9	9	18	27		M		
326.4	6.0								
		10	14	16	30	S-6	D		325.4 7.0
323.9	8.5								HARD PURPLE BROWN SILT (A-4)
		28	28	50/0.4	50/0.4		D		322.9 9.5
318.9	13.5								WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)
		30	50/0.5		50/0.5		D		
315.4	17.0								315.3 17.1
		50/0.1			50/0.1		D		1) ADVANCED 3-1/4" HSA TO 17.0 FEET. 2) BULK SAMPLE TAKEN BETWEEN 5 TO 10 FEET.

BORING TERMINATED AT ELEV. 315.3 FEET IN WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE).

NCDOT BORE SINGLE 3-1-02.GPJ NCDOT.GDT 3/3/04

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-16	**BORING LOCATION** 93+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L- **0 HR.** DRY
COLLAR ELEV. 331.7 ft	**NORTHING** 770,579.7	**EASTING** 2,034,207.2	**24 HR.** N/M
TOTAL DEPTH 23.7 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/24/03	**COMPLETED** 11/24/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
331.7					GROUND SURFACE				331.7 0.0
330.7	1.0								RESIDUUM: STIFF ORANGE SILTY CLAY (A-6)
328.2	3.5	4	4	8	12	S-7	M		WITH TRACE OF FINE SAND 328.7 3.0
325.7	6.0	8	11	17	28		M		MEDIUM DENSE TAN ORANGE SILTY FINE SAND (A-2-4) 326.2 5.5
323.2	8.5	50/0.4			50/0.4		D		WITH TRACE CLAY
318.2	13.5	50/0.2			50/0.2		D		WEATHERED ROCK: (TAN-GRAY TRIASSIC SILTSTONE)
313.2	18.5	50/0.4			50/0.4		D		314.7 17.0
308.2	23.5	50/0.1			50/0.1		D		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
		50/0.2			50/0.2 BORING TERMINATED AT ELEV. 308.0 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)		D		308.0 23.7

1) ADVANCED 3-1/4" HSA TO 23.5 FEET.
2) BULK SAMPLE TAKEN BETWEEN 1 TO 5 FEET.

NCDOT BORE SINGLE 91-402.GPJ NCDOT.GDT 1/2/04

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BORING LOG

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-17	**BORING LOCATION** 95+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L- **0 HR.** DRY
COLLAR ELEV. 323.9 ft	**NORTHING** 770,766.8	**EASTING** 2,034,137.0	**24 HR.** N/M
TOTAL DEPTH 8.6 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/24/03	**COMPLETED** 11/24/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
323.9					GROUND SURFACE				323.9 0.0
322.9	1.0								RESIDUUM: STIFF TO HARD RED BROWN SILTY CLAY (A-6)
		3	5	8	13	SS-2	D		
320.4	3.5					S-8			
		8	12	23	35		D		
317.9	6.0								318.4 5.5
		50/0.5			50/0.5		D		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
315.4	8.5								315.3 8.6
		50/0.1			50/0.1		D		1) ADVANCED 3-1/4" HSA TO 8.5 FEET. 2) BULK SAMPLE TAKEN BETWEEN 1 TO 5 FEET.
					BORING TERMINATED AT ELEV. 315.3 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				

...DOT Bore SINGLE SHEET.GPJ NCDOT.GDT 1/2/04

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-18	**BORING LOCATION** 97+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 305.3 ft	**NORTHING** 770,960.2	**EASTING** 2,034,086.5	**24 HR.** N/M
TOTAL DEPTH 9.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/24/03	**COMPLETED** 11/24/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
305.3					GROUND SURFACE				305.3 0.0
304.3	1.0	12	16	15	31		D		RESIDUUM: DENSE TAN SILTY FINE SAND (A-2-4)
301.8	3.5	50/0.4			50/0.4		D		302.3 3.0 WEATHERED ROCK: (GRAY-BROWN TRIASSIC SILTSTONE)
299.3	6.0	50/0.4			50/0.4		D		
296.8	8.5	50/0.4			50/0.4		D		296.3 9.0
					BORING TERMINATED AT ELEV. 296.3 FEET IN WEATHERED ROCK: (GRAY-BROWN TRIASSIC SILTSTONE).				1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

NCDOT BORE SINGLE 51-2UZ.GPJ NCDOT.GDT 1/26/04

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B-19	BORING LOCATION 99+00	OFFSET 0.0 ft CL	ALIGNMENT -L-	0 HR. DRY
COLLAR ELEV. 303.4 ft	NORTHING 771,159.1	EASTING 2,034,068.1	24 HR. N/M
TOTAL DEPTH 8.6 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	HAMMER TYPE MANUAL
DATE STARTED 11/24/03	COMPLETED 11/24/03	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 20 40 60 80 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
303.4					GROUND SURFACE				303.4 0.0
302.4	1.0								301.9 1.5
		6	50/0.3		50/0.8		D		RESIDUUM: MEDIUM STIFF TAN-BROWN FINE SANDY CLAY (A-7-5)
299.9	3.5								
		50/0.2			50/0.2		D		WEATHERED ROCK: (LIGHT PURPLE-GRAY TRIASSIC SANDSTONE)
297.4	6.0								
		50/0.2			50/0.2		D		
294.9	8.5								294.8 8.6
		50/0.1			50/0.1		D		1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

BORING TERMINATED AT ELEV. 294.8 FEET IN WEATHERED ROCK: (LIGHT PURPLE-GRAY TRIASSIC SANDSTONE).

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-20	**BORING LOCATION** 101+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 301.9 ft	**NORTHING** 771,358.4	**EASTING** 2,034,082.3		**24 HR.** N/M
TOTAL DEPTH 5.5 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/24/03	**COMPLETED** 11/24/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
301.9					GROUND SURFACE				301.9 0.0
300.9	1.0	6	8	26	34		D		RESIDUUM: HARD BROWN SILT (A-4) WITH TRACE OF FINE SAND 298.9 3.0
298.4	3.5	50/0.3			50/0.3		D		WEATHERED ROCK: (LIGHT GRAY-PURPLE TRIASSIC SANDSTONE) 296.4 5.5
296.4	5.5	50/0.0			50/0.0		D		1) ADVANCED 3-1/4" HSA TO 5.5 FEET.
					BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 295.9 FEET ON HARD ROCK: LIGHT GRAY-PURPLE TRIASSIC SANDSTONE				

.OT BC ... .GLE 5 ... .PJ NC... .JT 3/3...

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PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B-21	BORING LOCATION 103+00	OFFSET 0.0 ft CL	ALIGNMENT -L-
COLLAR ELEV. 293.4 ft	NORTHING 771,552.7	EASTING 2,034,128.9	0 HR. DRY
TOTAL DEPTH 5.5 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	24 HR. N/M
DATE STARTED 11/24/03	COMPLETED 11/24/03	SURFACE WATER DEPTH N/A	HAMMER TYPE MANUAL

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
293.4					GROUND SURFACE				293.4 0.0
292.4	1.0								RESIDUUM: MEDIUM DENSE TAN YELLOW SILTY FINE SAND (A-2-4)
		6	10	6	16		D		
289.9	3.5								290.4 3.0
		50/0.3			50/0.3		D		WEATHERED ROCK: (LIGHT GRAY-PURPLE TRIASSIC SANDSTONE)
287.9	5.5								287.9 5.5
		50/0.0			50/0.0		D		1) ADVANCED 3-1/4" HSA TO 5.5 FEET.

BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 287.9 FEET ON HARD ROCK: LIGHT GRAY-PURPLE TRIASSIC SANDSTONE

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-22	**BORING LOCATION** 105+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 303.2 ft	**NORTHING** 771,736.7	**EASTING** 2,034,206.5		**24 HR.** N/M
TOTAL DEPTH 8.7 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/24/03	**COMPLETED** 11/24/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
303.2					GROUND SURFACE				303.2 0.0
302.2	1.0	7	11	16	27		D		RESIDUUM: VERY STIFF TO HARD YELLOW TAN CLAY (A-7-6) WITH TRACE OF SILT
299.7	3.5	10	13	19	32		D		
297.2	6.0	50/0.2			50/0.2		D		297.7 5.5
294.7	8.5	50/0.2			50/0.2		D		WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)
					BORING TERMINATED AT ELEV. 294.5 FEET IN WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)				294.5 8.7
									1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B-23	BORING LOCATION 107+00	OFFSET 0.0 ft CL	ALIGNMENT -L-
COLLAR ELEV. 310.0 ft	NORTHING 771,907.4	EASTING 2,034,310.6	0 HR. DRY
TOTAL DEPTH 8.6 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	24 HR. N/M
DATE STARTED 11/25/03	COMPLETED 11/25/03	SURFACE WATER DEPTH N/A	HAMMER TYPE MANUAL

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
310.0					GROUND SURFACE				310.0 0.0
309.0	1.0								
		4	10	50/0.1	50/0.1		D		308.0 RESIDUUM: STIFF BROWN SILTY CLAY (A-7-5) 2.0
306.5	3.5								
		50/0.3			50/0.3		D		WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)
304.0	6.0								
		50/0.2			50/0.2		D		
301.5	8.5								301.4 8.6
		50/0.1			50/0.1		D		1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

BORING TERMINATED
AT ELEV. 301.4 FEET
IN WEATHERED ROCK:
(PURPLE-BROWN TRIASSIC SILTSTONE)

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-24	**BORING LOCATION** 109+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 312.7 ft	**NORTHING** 772,073.2	**EASTING** 2,034,422.4		**24 HR.** N/M
TOTAL DEPTH 8.7 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/25/03	**COMPLETED** 11/25/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
312.7					GROUND SURFACE				312.7 0.0
311.7	1.0								RESIDUUM:
		4	10	14	24		D		VERY STIFF YELLOW FINE SANDY CLAY (A-7-5)
309.2	3.5								309.7 3.0
		24	30	36	66		D		WITH TRACE OF SILT
306.7	6.0								HARD BROWN GRAY SILT (A-4) 307.2 5.5
		50/0.3			50/0.3		D		WEATHERED ROCK:
304.2	8.5								(PURPLE-BROWN TRIASSIC SILTSTONE) 304.0 8.7
		50/0.2			50/0.2		D		1) ADVANCED 3-1/4" HSA TO 8.5 FEET.
					BORING TERMINATED AT ELEV. 304.0 FEET IN WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)				

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-25	**BORING LOCATION** 111+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 312.1 ft	**NORTHING** 772,245.3	**EASTING** 2,034,524.2	**24 HR.** N/M
TOTAL DEPTH 8.7 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/25/03	**COMPLETED** 11/25/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
312.1					GROUND SURFACE				312.1 0.0
311.1	1.0	2	2	4	6	SS-3	D		RESIDUUM: MEDIUM STIFF ORANGE-TAN FINE SANDY SILT (A-4)
308.6	3.5	9	10	12	22		D		309.1 3.0 VERY STIFF TAN FINE SANDY CLAY (A-7-5)
306.1	6.0	50/0.4			50/0.4		D		306.6 5.5 WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)
303.6	8.5	50/0.2			50/0.2 BORING TERMINATED AT ELEV. 303.4 FEET IN WEATHERED ROCK: (PURPLE-BROWN TRIASSIC SILTSTONE)		D		303.4 8.7 1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. B-26	BORING LOCATION 113+00	OFFSET 0.0 ft CL	ALIGNMENT -L-
COLLAR ELEV. 319.7 ft	NORTHING 772,427.2	EASTING 2,034,607.1	0 HR. DRY
TOTAL DEPTH 8.7 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	24 HR. N/M
DATE STARTED 11/25/03	COMPLETED 11/25/03	SURFACE WATER DEPTH N/A	HAMMER TYPE MANUAL

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
319.7					GROUND SURFACE				319.7 0.0
318.7	1.0								RESIDUUM: VERY STIFF BROWN SILTY CLAY (A-6)
		3	11	13	24		D		
316.2	3.5								315.7 4.0
		40	50/0.2		50/0.2		D		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
313.7	6.0								
		9	40	50/0.3	100+		D		
311.2	8.5								311.0 8.7
		50/0.2			50/0.2		D		1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

BORING TERMINATED
AT ELEV. 311.0 FEET
IN WEATHERED ROCK:
(RED-BROWN TRIASSIC MUDSTONE)

NCDOT BORE SINGLE 01-202.GPJ NCDOT.GDT 3/5/04

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BORING LOG

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-27	**BORING LOCATION** 115+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 322.2 ft	**NORTHING** 772,616.9	**EASTING** 2,034,669.9		**24 HR.** N/M
TOTAL DEPTH 8.7 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA		**HAMMER TYPE** MANUAL
DATE STARTED 11/25/03	**COMPLETED** 11/25/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
322.2					GROUND SURFACE				322.2 0.0
321.2	1.0	9	12	21	33	SS-4	D		RESIDUUM: HARD BROWN SILTY CLAY (A-6) WITH TRACE OF FINE SAND
318.7	3.5	50/0.3			50/0.3		D		319.2 3.0 WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
316.2	6.0	50/0.4			50/0.4		D		
313.7	8.5	50/0.2			50/0.2		D		313.5 8.7 1) ADVANCED 3-1/4" HSA TO 8.5 FEET.
					BORING TERMINATED AT ELEV. 313.5 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				

NCDOT BORE SINGLE 51-02.GPJ NCDOT.GDT 1/28/04

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-28	**BORING LOCATION** 117+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 318.9 ft	**NORTHING** 772,812.4	**EASTING** 2,034,711.9	**24 HR.** N/M
TOTAL DEPTH 8.8 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/25/03	**COMPLETED** 11/25/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
318.9					GROUND SURFACE				318.9 0.0
317.9	1.0								RESIDUUM:
		10	16	16	32		D		HARD TAN BROWN SILTY CLAY
315.4	3.5								315.9 (A-6) 3.0
		50/0.5			50/0.5		D		WEATHERED ROCK:
312.9	6.0								(RED-BROWN TRIASSIC MUDSTONE)
		26	30	50/0.2			D		
310.4	8.5				100+				310.1 8.8
		50/0.3			50/0.3		D		1) ADVANCED 3-1/4 HSA TO 8.5 FEET.
					BORING TERMINATED AT ELEV. 310.1 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				

NCDOT BORE SINGLE 3-12-04.GPJ NCDOT.GDT 3/3/04

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-29	**BORING LOCATION** 119+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L- **0 HR.** DRY
COLLAR ELEV. 320.5 ft	**NORTHING** 773,011.2	**EASTING** 2,034,732.8	**24 HR.** N/M
TOTAL DEPTH 9.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/26/03	**COMPLETED** 11/26/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
320.5					GROUND SURFACE				320.5 0.0
319.5	1.0								319.0 1.5 RESIDUUM: HARD BROWN SILTY CLAY (A-7-5)
		5	50/0.5		50/0.5		M		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
317.0	3.5	50/0.4			50/0.4		D		
314.5	6.0	50/0.4			50/0.4		D		
312.0	8.5	50/0.5			50/0.5		D		311.5 9.0 1) ADVANCED 3-1/4" HSA TO 8.5 FEET.
					BORING TERMINATED AT ELEV. 311.5 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				

NCDOT Bore SINGLE 51-202.GPJ NCDOT.GDT 3/3/04

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-31	**BORING LOCATION** 123+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 335.6 ft	**NORTHING** 773,409.8	**EASTING** 2,034,710.0		**24 HR.** N/M
TOTAL DEPTH 8.9 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/26/03	**COMPLETED** 11/26/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
335.6					GROUND SURFACE				335.6 0.0
334.6	1.0								RESIDUUM:
		8	10	14	24		D		VERY STIFF TAN BROWN CLAY (A-7-5)
332.1	3.5								332.6 3.0
		22	50/0.5		50/0.5		M		331.6 WITH TRACE OF SILT AND FINE SAND 4.0
329.6	6.0								HARD RED BROWN SILTY CLAY (A-6)
		50/0.4			50/0.4		D		WEATHERED ROCK:
327.1	8.5								(RED-BROWN TRIASSIC MUDSTONE)
		50/0.4			50/0.4		D		326.7 8.9
					BORING TERMINATED AT ELEV. 326.7 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

NCDOT BORE SINGLE SHEET.GPJ NCDOT.GDT 3/5/04

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-32	**BORING LOCATION** 125+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 343.1 ft	**NORTHING** 773,604.9	**EASTING** 2,034,666.6		**24 HR.** N/M
TOTAL DEPTH 8.1 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL	
DATE STARTED 11/26/03	**COMPLETED** 11/26/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
343.1					GROUND SURFACE				343.1 0.0
342.1	1.0						D		341.6 RESIDUUM: 1.5
		40	50/0.3		50/0.8				HARD RED-BROWN SILTY CLAY
339.6	3.5						D		(A-6)
		50/0.4			50/0.4				WEATHERED ROCK:
337.1	6.0						D		(RED-BROWN TRIASSIC MUDSTONE)
		50/0.4			50/0.4				
335.1	8.0								335.1 8.0
		50/0.1			50/0.1		D		1) ADVANCED 3-1/4" HSA TO 8.0 FEET.
					BORING TERMINATED AT ELEV. 335.0 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-33	**BORING LOCATION** 127+95	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 352.5 ft	**NORTHING** 773,886.1	**EASTING** 2,034,563.0		**24 HR.** N/M
TOTAL DEPTH 18.6 ft	**DRILL MACHINE** Mobile B-57	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 1/8/04	**COMPLETED** 1/8/04	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
352.5					GROUND SURFACE				352.5 0.0
351.5	1.0								RESIDUUM:
349.0	3.5	9	17	23	40		M		HARD TAN TO BROWN SILTY CLAY (A-6) 349.5 3.0
346.5	6.0	50/0.5			50/0.5		D		WITH TRACE OF FINE SAND
344.0	8.5	50/0.2			50/0.2		D		WEATHERED ROCK:
339.0	13.5	50/0.1			50/0.1		D		(RED-BROWN TRIASSIC MUDSTONE)
334.0	18.5	50/0.4			50/0.4		D		
		50/0.1			50/0.1		D		333.9 18.6
					BORING TERMINATED AT ELEV. 333.9 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				1) ADVANCED 3-1/4" HSA TO 18.5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-34	**BORING LOCATION** 130+00	**OFFSET** 10.0 ft RT	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 329.5 ft	**NORTHING** 774,067.9	**EASTING** 2,034,477.9		**24 HR.** N/M
TOTAL DEPTH 6.0 ft	**DRILL MACHINE** Mobile B-57	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 1/8/04	**COMPLETED** 1/8/04	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
329.5					GROUND SURFACE				329.5 0.0
328.5	1.0						M		ARTIFICIAL FILL: STIFF BROWN SILTY CLAY (A-7-5) WITH TRACE OF FINE SAND
		6	7	8	15				
326.0	3.5						D		326.5 3.0
		50/0.5			50/0.5				WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
323.5	6.0								323.5 6.0
		50/0.0			50/0.0				1) ADVANCED 3-1/4" HSA TO 6.0 FEET.
					BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 323.5 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE				

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-35	**BORING LOCATION** 132+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 326.4 ft	**NORTHING** 774,230.6	**EASTING** 2,034,360.6		**24 HR.** N/M
TOTAL DEPTH 8.6 ft	**DRILL MACHINE** Mobile B-57	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 1/8/04	**COMPLETED** 1/8/04	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
326.4					GROUND SURFACE				326.4 0.0
325.4	1.0								ARTIFICIAL FILL: SOFT BROWN SILTY CLAY (A-7-5) WITH TRACE OF FINE SAND
322.9	3.5	5	2	2	4		M		323.4 3.0
320.4	6.0	50/0.5			50/0.5		D		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
317.9	8.5	14	50/0.4		100+		D		317.8 8.6
		50/0.1			50/0.1 BORING TERMINATED AT ELEV. 317.8 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)		D		1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-36	**BORING LOCATION** 134+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 320.4 ft	**NORTHING** 774,401.4	**EASTING** 2,034,256.7		**24 HR.** N/M
TOTAL DEPTH 9.0 ft	**DRILL MACHINE** Mobile B-57	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 1/8/04	**COMPLETED** 1/8/04	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
320.4					GROUND SURFACE				320.4 0.0
319.4	1.0	6	8	10	18	SS-5	M		ARTIFICIAL FILL: VERY STIFF BROWN SILTY CLAY (A-6) WITH TRACE OF FINE SAND
316.9	3.5	6	50/0.5		50/0.5		D		316.4 4.0 WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
314.4	6.0	50/0.4			50/0.4		D		
311.9	8.5	50/0.5			50/0.5		D		311.4 9.0 1) ADVANCED 3-1/4" HSA TO 8.5 FEET.
					BORING TERMINATED AT ELEV. 311.4 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-37	**BORING LOCATION** 136+00	**OFFSET** 0.0 ft CL **ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 312.4 ft	**NORTHING** 774,581.7	**EASTING** 2,034,170.4	**24 HR.** N/M
TOTAL DEPTH 9.8 ft	**DRILL MACHINE** Mobile B-57	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 1/8/04	**COMPLETED** 1/8/04	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
312.4					GROUND SURFACE				312.4 0.0
311.4	1.0								ARTIFICIAL FILL: STIFF TO VERY STIFF BROWN SILTY CLAY (A-7-5) WITH TRACE OF FINE SAND
308.9	3.5	4	4	6	10		M		
306.4	6.0	5	13	14	27		M		
303.9	8.5	23	50/0.4		50/0.4		D		305.9 6.5 WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
		16	38	50/0.3	100+		D		302.6 9.8
					BORING TERMINATED AT ELEV. 302.6 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-38	**BORING LOCATION** 138+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 303.7 ft	**NORTHING** 774,769.8	**EASTING** 2,034,102.6		**24 HR.** N/M
TOTAL DEPTH 10.0 ft	**DRILL MACHINE** Mobile B-57	**DRILL METHOD** 3¼" HSA		**HAMMER TYPE** MANUAL
DATE STARTED 1/8/04	**COMPLETED** 1/8/04	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
303.7					GROUND SURFACE				303.7 0.0
302.7	1.0								ARTIFICIAL FILL: HARD TO STIFF BROWN CLAYEY SILT (A-4) WITH TRACE OF FINE SAND
		9	23	15	38		M		
300.2	3.5								298.2 5.5
		5	6	7	13				MEDIUM DENSE TAN SILTY FINE SAND (A-2-4) WITH TRACE OF ORGANIC MATTER
297.7	6.0								
		3	4	8	12		M		
295.2	8.5								293.7 10.0
		7	6	5	11				1) ADVANCED 3-1/4" HSA TO 8.5 FEET.
					BORING TERMINATED AT ELEV. 293.7 FEET IN MEDIUM DENSE TAN SILTY SAND				

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SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-39	**BORING LOCATION** 228+30	**OFFSET** 0.0 ft CL **ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 328.4 ft	**NORTHING** 773,465.5	**EASTING** 2,034,932.1	**24 HR.** N/M
TOTAL DEPTH 9.8 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 1/23/04	**COMPLETED** 1/23/04	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
328.4					GROUND SURFACE				328.4 0.0
327.4	1.0								ARTIFICIAL FILL: VERY STIFF RED-BROWN SILTY CLAY (A-6) WITH TRACE OF FINE SAND
324.9	3.5	9	9	9	18		M		324.4 4.0
322.4	6.0	6	4	3	7		M		RESIDUUM: MEDIUM STIFF TO STIFF GRAY-BROWN SILT (A-4)
319.9	8.5	4	5	7	12		D		319.4 9.0
		4	11	50/0.3	50/0.3				318.6 9.8
					BORING TERMINATED AT ELEV. 318.6 FEET IN WEATHERED ROCK: (TRIASSIC SILTSTONE)				WEATHERED ROCK: (GRAY-BROWN TRIASSIC SILTSTONE)
									1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

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BORING LOG

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-40	**BORING LOCATION** 230+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -Y1- **0 HR.** DRY
COLLAR ELEV. 328.4 ft	**NORTHING** 773,508.5	**EASTING** 2,035,096.2	**24 HR.** N/M
TOTAL DEPTH 8.7 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 1/23/04	**COMPLETED** 1/23/04	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
328.4					GROUND SURFACE				328.4 0.0
327.4	1.0								RESIDUUM: VERY STIFF TO HARD RED-BROWN SILTY CLAY (A-6) WITH TRACE FINE SAND
324.9	3.5	5	7	13	20		M		
322.4	6.0	14	19	40	59		M		
319.9	8.5	23	50/0.4		50/0.4		D		321.9 6.5
		50/0.2			50/0.2		D		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE) 319.7 8.7
					BORING TERMINATED AT ELEV. 319.7 FEET IN WEATHERED ROCK: (TRIASSIC MUDSTONE)				1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-41	**BORING LOCATION** 232+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 330.1 ft	**NORTHING** 773,548.2	**EASTING** 2,035,292.2		**24 HR.** N/M
TOTAL DEPTH 8.8 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 1/23/04	**COMPLETED** 1/23/04	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
330.1					GROUND SURFACE				330.1 0.0
329.1	1.0	5	7	14	21		M		RESIDUUM: VERY STIFF RED-BROWN SILTY CLAY (A-6)
327.1									327.1 3.0
326.6	3.5	50/0.5			50/0.5				WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
324.1	6.0	50/0.3			50/0.3				
321.6	8.5	50/0.3			50/0.3				321.3 8.8
					BORING TERMINATED AT ELEV. 321.3 FEET IN WEATHERED ROCK: (TRIASSIC MUDSTONE)				1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. B-42	**BORING LOCATION** 234+00	**OFFSET** 0.0 ft CL	**ALIGNMENT** -Y1-
COLLAR ELEV. 331.0 ft	**NORTHING** 773,575.9	**EASTING** 2,035,490.2	**0 HR.** DRY
TOTAL DEPTH 9.3 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**24 HR.** N/M
DATE STARTED 1/23/04	**COMPLETED** 1/23/04	**SURFACE WATER DEPTH** N/A	**HAMMER TYPE** MANUAL

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
331.0					GROUND SURFACE				331.0 0.0
330.0	1.0								RESIDUUM: MEDIUM STIFF TO VERY STIFF RED-BROWN SILTY CLAY (A-6)
327.5	3.5	3	3	4	7		M		
325.0	6.0	7	12	18	30		M		
322.5	8.5	40	50/0.3		50/0.3		D		324.5 6.5 WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
		45	50/0.3		50/0.3		D		321.7 9.3

BORING TERMINATED AT ELEV. 321.7 FEET IN WEATHERED ROCK: (TRIASSIC MUDSTONE)

1) ADVANCED 3-1/4" HSA TO 8.5 FEET.

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SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. AP- 1	**BORING LOCATION** 212+00	**OFFSET** 50.0 ft RT	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 332.2 ft	**NORTHING** 772,854.8	**EASTING** 2,033,416.1		**24 HR.** N/M
TOTAL DEPTH 14.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3-1/4" HSA		**HAMMER TYPE** MANUAL
DATE STARTED 12/9/03	**COMPLETED** 12/9/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
332.2					GROUND SURFACE				332.2 0.0
							D		RESIDUUM: STIFF ORANGE RED FINE SANDY CLAY (A-7-5)
329.2									3.0
							D		HARD DARK BROWN SILTY CLAY (A-6)
							D		
320.2									12.0
318.2	14.0	50/0.0			50/0.0 BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 318.2 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE		D		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE) 318.2 14.0
									1) ADVANCED 3-1/4" HSA TO 14.0 FEET.

NCDOT BORE SINGLE 01-202.GPJ NCDOT.GDT 3/3/04

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. AP- 2	**BORING LOCATION** 214+00	**OFFSET** 50.0 ft LT	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 345.7 ft	**NORTHING** 772,987.4	**EASTING** 2,033,596.1		**24 HR.** N/M
TOTAL DEPTH 5.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA		**HAMMER TYPE** MANUAL
DATE STARTED 12/9/03	**COMPLETED** 12/9/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
345.7					GROUND SURFACE				345.7 0.0
									RESIDUUM: HARD TAN SILTY CLAY (A-6)
340.7	5.0								341.7 WITH TRACE OF FINE SAND 4.0
		50/0.0			50/0.0				340.7 WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE) 5.0
					BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 340.7 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE				1) ADVANCED 3-1/4" HSA TO 5.0 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. AP- 3	BORING LOCATION 214+00	OFFSET 50.0 ft RT	ALIGNMENT -Y1-
COLLAR ELEV. 350.4 ft	NORTHING 772,889.7	EASTING 2,033,617.4	0 HR. DRY
TOTAL DEPTH 8.0 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	24 HR. N/M
DATE STARTED 12/9/03	COMPLETED 12/9/03	SURFACE WATER DEPTH N/A	HAMMER TYPE MANUAL

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
350.4					GROUND SURFACE				350.4 0.0
							D		RESIDUUM: HARD TAN SILTY CLAY (A-6) WITH TRACE OF FINE SAND 345.4 5.0
342.4	8.0						D		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE) 342.4 8.0
		50/0.0			50/0.0 BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 342.4 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE				1) ADVANCED 3-1/4" HSA TO 8.0 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. AP- 4	BORING LOCATION 216+00	OFFSET 60.0 ft RT	ALIGNMENT -Y1-	0 HR. DRY
COLLAR ELEV. 362.8 ft	NORTHING 772,932.3	EASTING 2,033,817.9	24 HR. N/M
TOTAL DEPTH 7.2 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	HAMMER TYPE MANUAL
DATE STARTED 12/5/03	COMPLETED 12/5/03	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
362.8					GROUND SURFACE				362.8 0.0 RESIDUUM: MEDIUM STIFF BROWN CLAY (A-7-6)
355.6	7.2	50/0.0			50/0.0 BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 355.6 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE				356.8 6.0 355.6 7.2 WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE) 1) ADVANCED 3-1/4" HSA TO 7.2 FEET.

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SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. AP- 5	**BORING LOCATION** 217+95	**OFFSET** 45.5 ft LT **ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 355.3 ft	**NORTHING** 773,097.3	**EASTING** 2,033,966.1	**24 HR.** N/M
TOTAL DEPTH 19.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 11/26/03	**COMPLETED** 11/26/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
355.3					GROUND SURFACE				355.3 0.0
									RESIDUUM: HARD RED BROWN SILTY CLAY (A-6) WITH TRACE OF FINE SAND
									343.3 12.0
									WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
336.3	19.0								336.3 19.0
		50/0.1			50/0.1				1) ADVANCED 3-1/4" HSA TO 19.0 FEET.
					BORING TERMINATED WITH AUGER REFUSAL AT ELEV. 336.4 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE				

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. AP- 6	**BORING LOCATION** 218+00	**OFFSET** 60.0 ft RT **ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 355.6 ft	**NORTHING** 773,001.7	**EASTING** 2,034,010.9	**24 HR.** N/M
TOTAL DEPTH 14.2 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 12/5/03	**COMPLETED** 12/5/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
355.6					GROUND SURFACE				355.6 0.0
									RESIDUUM: RED-BROWN SILTY CLAY (A-6) WITH TRACE OF FINE SAND
341.6	14.0								343.1 12.5
		50/0.2			50/0.2				341.6 WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE) 14.0
					BORING TERMINATED WITH AUGER REFUSAL AT ELEV. 341.4 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE				1) ADVANCED 3-1/4" HSA TO 14.0 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. AP-11	BORING LOCATION 95+00	OFFSET 70.0 ft LT / ALIGNMENT -L-	0 HR. DRY
COLLAR ELEV. 325.8 ft	NORTHING 770,742.8	EASTING 2,034,071.3	24 HR. N/M
TOTAL DEPTH 15.0 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	HAMMER TYPE MANUAL
DATE STARTED 12/11/03	COMPLETED 12/11/03	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
325.8					GROUND SURFACE				325.8 0.0
									RESIDUUM: STIFF TO HARD RED BROWN SILTY CLAY (A-6)
									311.8 14.0
									310.8 15.0 WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
					BORING TERMINATED AT ELEV. 310.8 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				1) ADVANCED 3-1/4" HSA TO15.0 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. AP-12	**BORING LOCATION** 95+00	**OFFSET** 65.0 ft RT	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 321.5 ft	**NORTHING** 770,789.1	**EASTING** 2,034,198.1		**24 HR.** N/M
TOTAL DEPTH 13.3 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL	
DATE STARTED 12/11/03	**COMPLETED** 12/11/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
321.5					GROUND SURFACE				321.5 0.0
									RESIDUUM: STIFF TO HARD RED BROWN SILTY CLAY (A-6)
308.3	13.2								311.5 10.0
		50/0.1			50/0.1				WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
					BORING TERMINATED AT ELEV. 308.2 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				308.3 13.2
									1) ADVANCED 3-1/4" HSA TO 13.2 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. AP-13	**BORING LOCATION** 101+00	**OFFSET** 65.0 ft RT	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 307.7 ft	**NORTHING** 771,348.5	**EASTING** 2,034,146.6		**24 HR.** N/M
TOTAL DEPTH 15.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA		**HAMMER TYPE** MANUAL
DATE STARTED 11/24/03	**COMPLETED** 11/24/03	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
307.7					GROUND SURFACE				307.7 0.0
									RESIDUUM: HARD BROWN SILT (A-4) WITH TRACE OF FINE SAND
									299.2 8.5
									WEATHERED ROCK: (GRAY-RED TRIASSIC SILTSTONE)
									292.7 15.0
					BORING TERMINATED AT ELEV. 292.7 FEET IN WEATHERED ROCK: (GRAY-RED TRIASSIC SILTSTONE)				1) ADVANCED 3-1/4" HSA TO 15.0 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. AP-14	**BORING LOCATION** 128+00	**OFFSET** 70.0 ft LT	**ALIGNMENT** -L-	**0 HR.** DRY
COLLAR ELEV. 353.1 ft	**NORTHING** 773,856.7	**EASTING** 2,034,499.5		**24 HR.** N/M
TOTAL DEPTH 13.6 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL	
DATE STARTED 1/8/04	**COMPLETED** 1/8/04	**SURFACE WATER DEPTH** N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
353.1					GROUND SURFACE				353.1 0.0
									RESIDUUM: HARD BROWN SILTY CLAY (A-6) WITH TRACE OF FINE SAND
350.1									3.0
									WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
339.6	13.5								339.6 13.5
		50/0.1			50/0.1				1) ADVANCED 3-1/4" HSA TO 13.5 FEET.
					BORING TERMINATED AT ELEV. 339.5 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE).				

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. AP-15	BORING LOCATION 130+00	OFFSET 70.0 ft LT	ALIGNMENT -L-
COLLAR ELEV. 345.6 ft	NORTHING 774,026.8	EASTING 2,034,409.3	0 HR. DRY
TOTAL DEPTH 7.5 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	24 HR. N/M
DATE STARTED 1/8/04	COMPLETED 1/8/04	SURFACE WATER DEPTH N/A	HAMMER TYPE MANUAL

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	▼/MOI	LOG	SOIL AND ROCK DESCRIPTION
345.6					GROUND SURFACE				345.6 0.0
									RESIDUUM: HARD BROWN SILTY CLAY (A-6) WITH TRACE OF SILTSTONE
									341.6 4.0
									WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
338.1	7.5								338.1 7.5
		50/0.0			50/0.0 BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 338.1 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE				1) ADVANCED 3-1/4" HSA TO 7.5 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	ID. N/A	COUNTY Wake/Durham	GEOLOGIST A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			GROUND WATER (ft)
BORING NO. RW- 1	BORING LOCATION 214+45	OFFSET 128.0 ft LT / ALIGNMENT -Y1-	0 HR. DRY
COLLAR ELEV. 349.2 ft	NORTHING 773,073.3	EASTING 2,033,621.1	24 HR. N/M
TOTAL DEPTH 5.0 ft	DRILL MACHINE CME-750	DRILL METHOD 3¼" HSA	HAMMER TYPE MANUAL
DATE STARTED 12/9/03	COMPLETED 12/9/03	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
349.2					GROUND SURFACE				349.2 0.0
348.2	1.0								RESIDUUM: STIFF RED-BROWN SILTY CLAY (A-6)
		3	5	6	11		M		
345.7	3.5								346.2 3.0
344.2	5.0	50/0.2			50/0.2		D		WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
		50/0.0			50/0.0				344.2 5.0

1) ADVANCED 3-1/4" HSA TO 5.0 FEET.

BORING TERMINATED WITH
STANDARD PENETRATION TEST REFUSAL
AT ELEV. 344.2 FEET
ON HARD ROCK:
RED-BROWN TRIASSIC MUDSTONE

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. RW- 2	**BORING LOCATION** 216+00	**OFFSET** 90.0 ft LT **ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 363.3 ft	**NORTHING** 773,075.5	**EASTING** 2,033,773.3	**24 HR.** N/M
TOTAL DEPTH 13.4 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 12/5/03	**COMPLETED** 12/5/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
363.3					GROUND SURFACE				363.3 0.0
362.3	1.0								RESIDUUM:
		6	16	40	56				HARD BROWN SILTY CLAY
359.8	3.5								(A-6)
		50/0.2			50/0.2				WITH TRACE OF FINE SAND
357.3	6.0								WEATHERED ROCK:
		50/0.5			50/0.5				(RED-BROWN TRIASSIC MUDSTONE)
354.8	8.5								
		50/0.4			50/0.4				
350.0	13.3								360.3 3.0
		50/0.1			50/0.1				349.9 13.4
					BORING TERMINATED AT ELEV. 349.9 FEET IN WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)				1) ADVANCED 3-1/4" HSA TO 13.3 FEET.

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BORING LOG

SHEET 1 OF 1

PROJECT NO. N/A	**ID.** N/A	**COUNTY** Wake/Durham	**GEOLOGIST** A. NASH
SITE DESCRIPTION Louis Stephens Drive & Hopson Road Extensions			**GROUND WATER (ft)**
BORING NO. RW- 3	**BORING LOCATION** 216+96	**OFFSET** 75.5 ft LT **ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 363.2 ft	**NORTHING** 773,091.1	**EASTING** 2,033,865.8	**24 HR.** N/M
TOTAL DEPTH 10.0 ft	**DRILL MACHINE** CME-750	**DRILL METHOD** 3¼" HSA	**HAMMER TYPE** MANUAL
DATE STARTED 12/5/03	**COMPLETED** 12/5/03	**SURFACE WATER DEPTH** N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
363.2					GROUND SURFACE				363.2 0.0
362.2	1.0								RESIDUUM: HARD RED BROWN SILTY CLAY (A-6) WITH TRACE OF FINE SAND
359.7	3.5	27	35	50/0.5	50/0.5				361.2 2.0
357.2	6.0	50/0.2			50/0.2				WEATHERED ROCK: (RED-BROWN TRIASSIC MUDSTONE)
354.7	8.5	50/0.4			50/0.4				
353.2	10.0	50/0.1			50/0.1				353.2 10.0
		50/0.0			50/0.0				1) ADVANCED 3-1/4" HSA TO 10.0 FEET.
					BORING TERMINATED WITH STANDARD PENETRATION TESTING REFUSAL AT ELEV. 353.2 FEET ON HARD ROCK: RED-BROWN TRIASSIC MUDSTONE				

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Loouis Stephens Drive and Hopson Road
Wake and Durham Couties, North Carolina
S&ME Project Number 1051-03-202

TABLE 1
Summary of Laboratory Test Results
Standard Proctor and CBR

SAMPLE	BORING NUMBER	SAMPLE DEPTH (ft)	AASHTO CLASSIFICATION	STANDARD PROCTOR TEST RESULTS			CALIFORNIA BEARING RATIO (CBR)			
				Maximum Dry Density ($lb./ft^3$)	Optimum Moisture Content (%)	Natural Moisture Content (%)	Compaction Moisture (%)	Percent Compaction (%)	CBR Value 0.1"	CBR Value 0.2"
S-1	B-2	1.0 to 5.0	A-6 (11)	114.0	14.1	15.5	16.1	100.7	3.7	3.9
S-2	B-6	1.0 to 5.0	A-4 (5)	121.5	12.5	13.6	12.8	101.1	3.8	4.6
S-3	B-7	5.0 to 12.0	A-6 (4)	120.3	11.6	8.5	13.5	100.6	3.6	4.6
S-4	B-8	1.0 to 5.0	A-6 (16)	114.9	14.0	8.4	15.8	99.7	1.5	1.8
S-5	B-12	1.0 to 7.0	A-4 (1)	121.0	12.0	19.6	13.7	97.7	1.9	2.2
S-6	B-15	5.0 to 10.0	A-6 (4)	115.1	14.3	8.0	16.2	98.9	3.2	3.7
S-7	B-16	1.0 to 5.0	A-6 (6)	113.0	14.1	16.2	15.7	100.9	3.3	4
S-8	B-17	1.0 to 5.0	A-6 (14)	115.8	14.9	6.1	16.6	98.4	1.7	1.9

TABLE 2
Summary of Laboratory Test Results
Natural Moisture Content, Percent Passing No. 200 Sieve, Atterberg Limits, & AASHTO Classification

SAMPLE	BORING NUMBER	SAMPLE DEPTH (ft.)	AASHTO CLASSIFICATION	NATURAL MOISTURE CONTENT (%)	PRECENT PASSING NO. 200 SIEVE (%)	ATTERBERG LIMITS		
						Liquid Limit	Plastic Limit	Plasticity Index
S-1	B-2	1.0 to 5.0	A-6 (11)	15.5	74.0	34	16	18
S-2	B-6	1.0 to 5.0	A-4 (5)	13.6	69.0	27	17	10
S-3	B-7	5.0 to 12.0	A-6 (4)	8.5	59.6	28	17	11
S-4	B-8	1.0 to 5.0	A-6 (16)	8.4	83.3	38	18	20
S-5	B-12	1.0 to 7.0	A-4 (1)	19.6	44.0	25	15	10
S-6	B-15	5.0 to 10.0	A-6 (4)	8.0	48.9	31	17	14
S-7	B-16	1.0 to 5.0	A-6 (6)	16.2	54.6	34	18	16
S-8	B-17	1.0 to 5.0	A-6 (14)	6.1	84.0	36	18	18
SS-1	B-4	1.0 to 2.5	A-7-6 (27)	16.5	95.0	46	19	27
SS-2	B-17	1.0 to 2.5	A-6 (17)	14.3	88.8	40	21	19
SS-3	B-25	1.0 to 2.5	A-4 (4)	11.8	64.8	27	17	10
SS-4	B-27	1.0 to 2.5	A-6 (12)	11.5	88.1	36	22	14
SS-5	B-36	1.0 to 2.5	A-6 (8)	7.1	72.6	31	18	13

Laboratory Report Version 4.2

Moisture - Density Report

S&ME

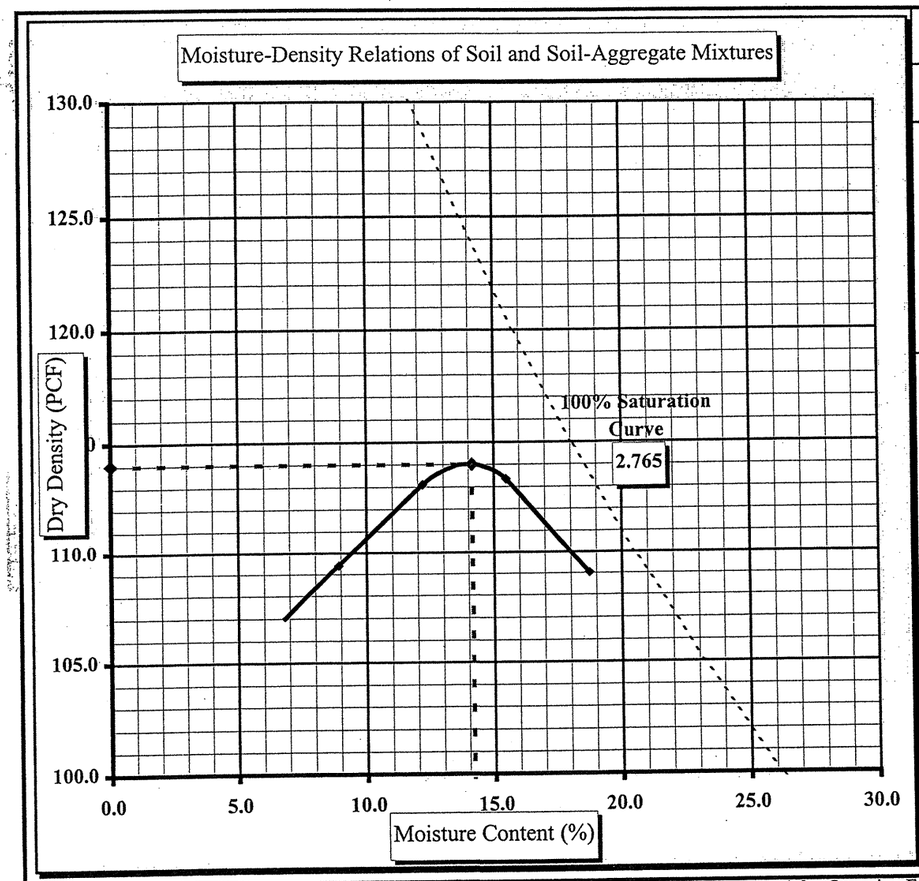
S&ME Project #: **1051-03-202**
Project Name: **Louis Stephens Drive**
Client Name:
Client Address:

Report Date: 01/09/04
Test Date(s): 01/06/04 - 01/09/04

Boring #:	B-2	Sample #:	S-1	Sample Date:	December 10, 2003
Location:	204+00 -Y1-	Offset:	0	Depth (ft):	1-5
Sample Description:	Tan-Orange Fine Sandy CLAY				

Maximum Dry Density **114.0** **PCF.** **Optimum Moisture Content** **14.1** **%**

ASTM D 698 Method A



Soil Properties	
Natural Moisture Content:	15.5%
Liquid Limit:	34
Plastic Limit:	16
Plastic Index:	18
Specific Gravity:	2.765
% Passing #4	100

Oversize Fraction

Bulk Sp. Gravity
% Moisture
Oversize Fraction
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
Mechanical Hammer ☐ Manual Hammer ☒ Moist Preparation ☐ Dry Preparation ☒

References: ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
AASHTO T88: Particle Size Analysis of Soils
AASHTO T 100: Specific Gravity of Soils
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

S&ME,INC. **3109 Spring Forest Road, Raleigh, NC. 27616** **B-2 S-1 1-5' Proctor**

CBR (California Bearing Ratio) of Laboratory Compacted Soil

S&ME

ASTM D 1883

Project #: **1051-03-202** Report Date: 01/14/03

Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/14/03

Client Name:

Client Address:

Boring #: B-2 Sample #: S-1 Sample Date: 12/10/03

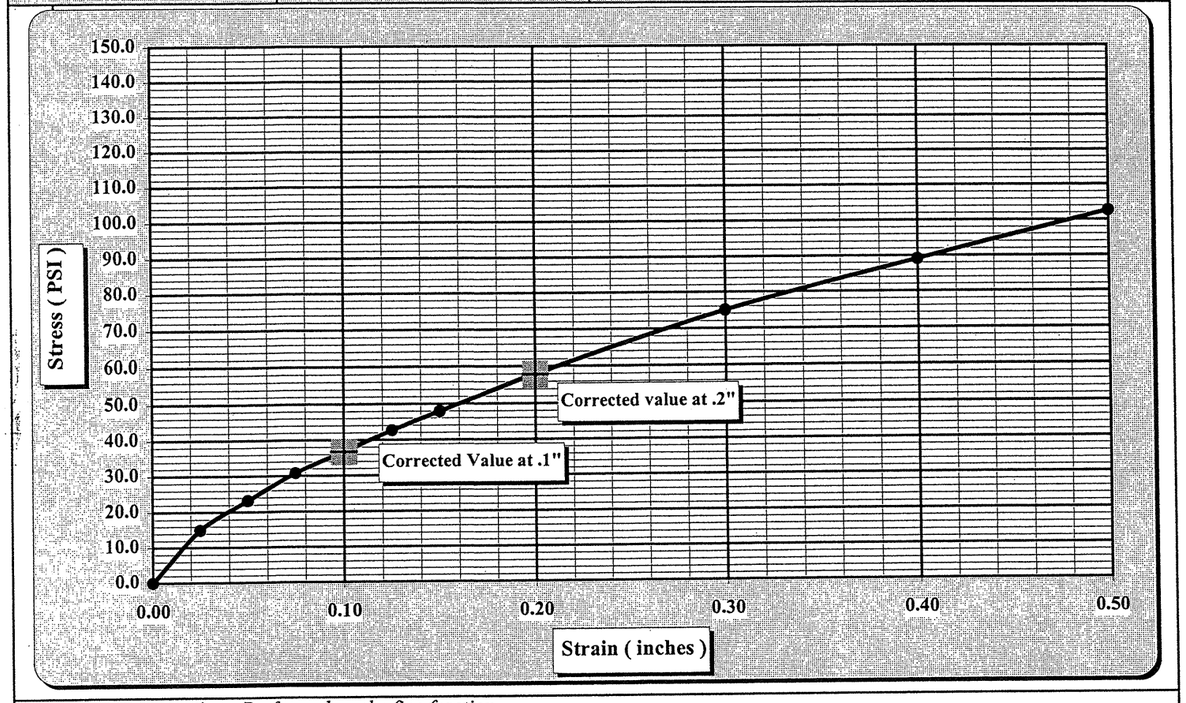
Location: 204+00 -Y1- Offset: 0 Depth (ft): 1-5

Sample Description: Tan-Orange Fine Sandy CLAY

ASTM D 698 Method A Maximum Dry Density (PCF): 114.0 Optimum Moisture Content: 14.1%

Compaction Test performed on the Fine Fraction only % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 3.7	CBR at 0.2 in. 3.9	CBR at 0.1 in. 3.7	CBR at 0.2 in. 3.9



CBR Sample Preparation: *Performed on the fine fraction*

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	75	Final Dry Density (PCF)	113.2
Initial Dry Density (PCF)	114.8	Average Final Moisture Content	16.6%
Moisture Content of the Compacted Specimen	16.1%	Moisture Content (top 1" after soaking)	18.4%
Percent Compaction	100.7%	Percent Swell	1.0%

Soak Time: 101.4 hrs. Surcharge Weight 10.0 Surcharge Wt. per sq. Ft. 50.9

Liquid Limit 34 Plastic Index 18 Apparent Relative Density 2.765

References: ASTM D 1883: CBR (California Bearing Ratio) of Laboratory-Compacted Soil

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T88: Particle Size Analysis of Soils

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

3100 Spring Forest Road, Raleigh, NC 27616

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/6/04-1/12/04
Report Date: 1/12/04

Boring #: B-2 Sample #: S-1 Sample Date: 12/10/03
Location: 204+00 -Y1- Offset: 0 Depth: 1-5'
Sample Description: Tan-Orange Fine Sandy CLAY A-6

Pan #:	7	Beaker #:	15	Group Index		(11)	
Hydrometer Jar #:			5	Apparent Relative Density			
Pan Tare Weight (grams):			7.94	**Moisture Content**		Hygroscopic	Natural
Total Sample Dry Wt. + tare wt. (grams):			308.99		Tare #	7	41
Weight of Total Sample Air Dried:			301.05	A	Tare Wt.	15.36	8.02
Weight of Air Dried Hydrometer Sample (g):			50.45	B	Wet Wt. + A	36.38	277.29
Total Sample Oven Dried:			296.60	C	Dry Wt. + A	36.07	241.17
Hydrometer Sample Oven Dried (W):			49.70	D	Water Wt. (B-C)	0.31	36.12
% Passing #10:			100.0%	E	Dry Wt.(C-A)	20.71	233.15
Correction Factor a (Table 1):			1.00		% Moisture (100 x D/E)	1.5%	15.5%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	**0.00**	**100.0%**	**100.0%**
#20	0.20	99.6%	99.6%
#40	0.93	98.1%	98.1%
#60	2.46	95.1%	95.1%
#100	5.87	88.2%	88.2%
#200	12.92	74.0%	74.0%
#270	17.29	65.2%	65.2%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm
Coarse Sand:	4.9%	< 2.00 mm and > 0.25 mm
Fine Sand:	29.9%	< 0.25 mm and > 0.05 mm
% Silt:	32%	< 0.05 and > 0.005 mm
% Clay:	33%	< 0.005 mm

Maximum Particle Size: #10
% Retained on #60: 4.9% Total Sample
Minus #10 portion (Soil Mortar)
Coarse Sand: 4.9% Silt: 32.4%
Fine Sand: 29.9% Clay: 32.8%

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 74%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Liquid Limit 34 Plastic Limit 16 Plastic Index 18

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P = (R x a / W) x 100	P (total) = P x % Passing #10			D = K x ((L/T)^1/2
Clock	T (Min.)	(°C)	Reading			R			L	K	
12:00	0.58	18.4	42.0	6.2	5.7	35.8	72.0%	72.0%	10.4	0.01414	0.05988
1:00	60	19.3	22.5	6.2	5.9	16.3	32.8%	32.8%	13.6	0.01378	0.00656
2:00	120	20.8	20.0	6.2	6.2	13.8	27.8%	27.8%	14.0	0.01342	0.00458

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan
OCT-1433 (Certification #)
Signature
Laboratory Supervisor (Position)

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616

B-2 Classification

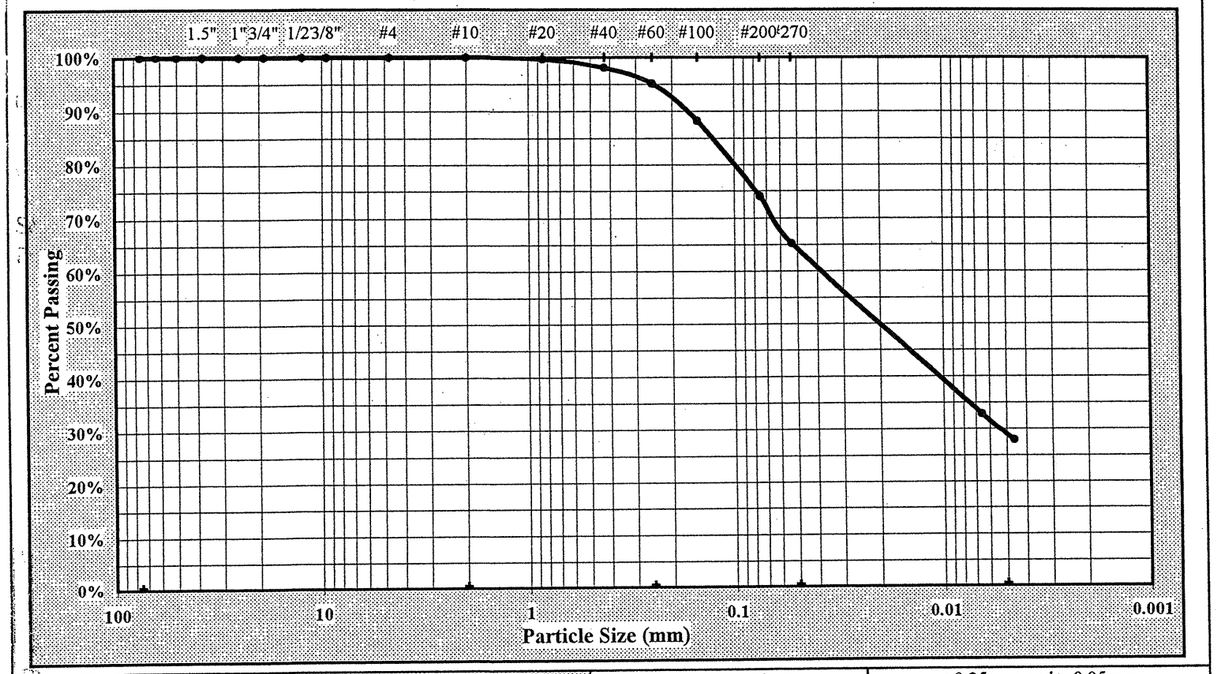
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/12/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/6/04-1/12/04
Client Name:			
Client Address:			
State Project #:		F.A. Project No:	TIP NO:
Boring #:	B-2	Sample #: S-1	Sample Date: 12/10/03
Location:	204+00 -Y1-	Offset: 0	Depth: 1-5'
Sample Description:			Tan-Orange Fine Sandy CLAY A-6 (11)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	4.9%	Silt	32%
Gravel	0.0%	Fine Sand	29.9%	Clay	33%
Apparent Relative Density		Moisture Content	15.5%	% Passing #200	74.0%
Liquid Limit	34	Plastic Limit	16	Plastic Index	18

Soil Mortar (-#10 Sieve)

Coarse Sand	4.9%	Fine Sand	29.9%	Silt	32%	Clay	33%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616 B-2 Classification

Laboratory Record Version 4.2

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:

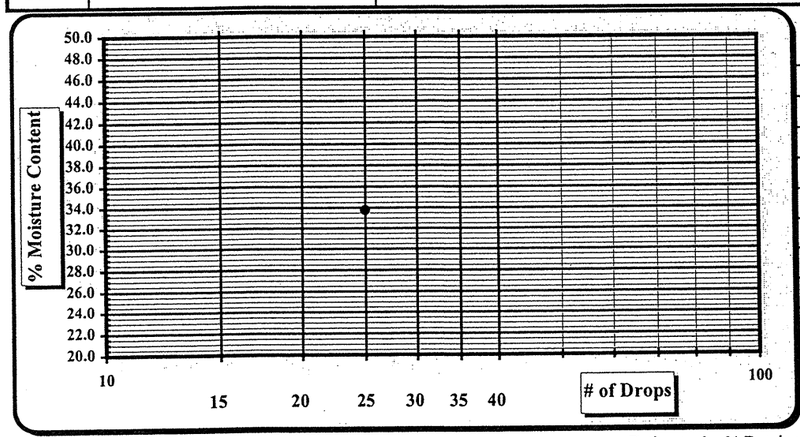
Report Date: 1/12/04
Test Date(s): 1/6/04-1/12/04

Boring #: B-2 Sample #: S-1 Sample Date: 12/10/03

Location: 204+00 -Y1- Offset: Depth(ft): 1-5'

Sample Description: Tan-Orange Fine Sandy CLAY A-6 (11)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	13						2		
A	Tare Weight	8.15						6.56		
B	Wet Soil Weight + A	18.01						15.48		
C	Dry Soil Weight + A	15.52						14.23		
D	Water Weight (B-C)	2.49						1.25		
E	Dry Soil Weight (C-A)	7.37						7.67		
F	% Moisture Content (D/E)*100	33.8%						16.3%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							16.3%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☐	One-point Method ☒		Liquid Limit	34
Classification:	ASTM D 2487 ☐	AASHTO M 145 ☒		Plastic Limit	16
Liquid limit Test:	ASTM D 4318 ☐	AASHTO T 89 ☒		Plastic Index	18
Plastic limit Test:	ASTM D 4318 ☐	AASHTO T 90 ☒		Group Symbol	A-6

Technician Name: Tom Savanapridi OCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Laboratory Report Version 4.2

Moisture - Density Report

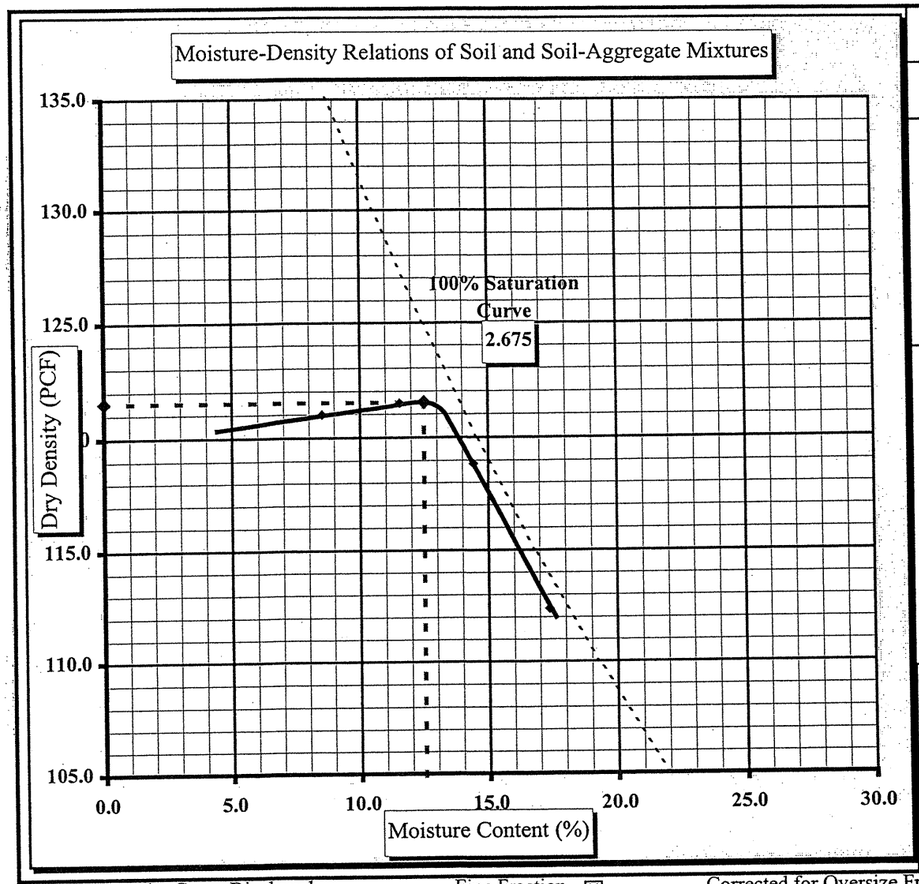
S&ME

S&ME Project #: **1051-03-202** Report Date: 01/09/04
Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/09/04
Client Name:
Client Address:

Boring #:	B-6	Sample #:	S-2	Sample Date:	December 9, 2003
Location:	212+00 -Y1-	Offset:	0	Depth (ft):	1-5
Sample Description:	Tan-Brown SILT				

Maximum Dry Density **121.5** **PCF.** **Optimum Moisture Content** **12.5** **%**

ASTM D 698 Method A



Soil Properties	
Natural Moisture Content:	13.6%
Liquid Limit:	27
Plastic Limit:	17
Plastic Index:	10
Specific Gravity:	2.675
% Passing #4	100

Oversize Fraction

Bulk Sp. Gravity
% Moisture
Oversize Fraction
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
Mechanical Hammer ☐ Manual Hammer ☒ Moist Preparation ☒ Dry Preparation ☐

References: ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
AASHTO T88: Particle Size Analysis of Soils
AASHTO T 100: Specific Gravity of Soils
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

S&ME INC 3109 Spring Forest Road, Raleigh, NC. 27616 B-6 S-2 1-5' Proctor

CBR (California Bearing Ratio) of Laboratory Compacted Soil

S&ME

ASTM D 1883

Project #: **1051-03-202** Report Date: 01/14/03

Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/14/03

Client Name:

Client Address:

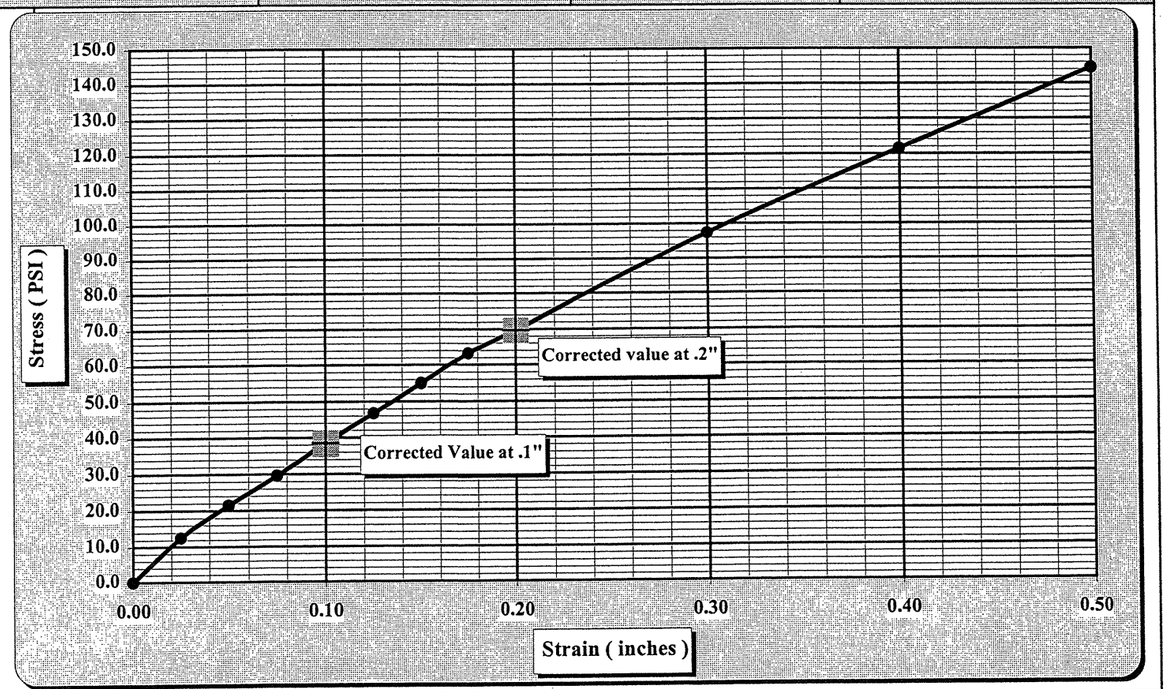
Boring #:	B-6	Sample #:	S-2	Sample Date:	12/9/03
Location:	212+00 -Y1-	Offset:	0	Depth (ft):	1-5

Sample Description: Tan-Brown SILT

ASTM D 698 Method A Maximum Dry Density (PCF): 121.5 Optimum Moisture Content: 12.5%

Compaction Test performed on the Fine Fraction only % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values				Corrected CBR Values			
CBR at 0.1 in.	3.8	CBR at 0.2 in.	4.6	CBR at 0.1 in.	3.8	CBR at 0.2 in.	4.6



CBR Sample Preparation: *Performed on the fine fraction*

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	80	Final Dry Density (PCF)	121.0
Initial Dry Density (PCF)	122.9	Average Final Moisture Content	13.7%
Moisture Content of the Compacted Specimen	12.8%	Moisture Content (top 1" after soaking)	15.4%
Percent Compaction	101.1%	Percent Swell	0.9%

Soak Time:	101.5 hrs.	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.9
Liquid Limit	27	Plastic Index	10	Apparent Relative Density	2.675

References: ASTM D 1883: CBR (California Bearing Ratio) of Laboratory-Compacted Soil
ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
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AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Laboratory Record version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/6/04-1/12/04
Report Date: 1/12/04

Boring #: B-6 Sample #: S-2 Sample Date: 12/9/03
Location: 212+00 -Y1- Offset: 0 Depth: 1-5'
Sample Description: Tan-Brown SILT A-4

Pan #:	15	Beaker #:	8	Group Index		(5)
Hydrometer Jar #:			10	Apparent Relative Density		
Pan Tare Weight (grams):			7.93	**Moisture Content**	Hygroscopic	Natural
Total Sample Dry Wt. + tare wt. (grams):			341.70	Tare #	6	49
Weight of Total Sample Air Dried:			333.77	A Tare Wt.	15.22	7.99
Weight of Air Dried Hydrometer Sample (g):			51.60	B Wet Wt. + A	36.95	184.98
Total Sample Oven Dried:			330.47	C Dry Wt. + A	36.74	163.73
Hydrometer Sample Oven Dried **(W)**:			51.09	D Water Wt. (B-C)	0.21	21.25
% Passing #10:			100.0%	E Dry Wt.(C-A)	21.52	155.74
Correction Factor a (Table 1):			1.00	% Moisture (100 x D/E)	1.0%	13.6%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	0.00	**100.0%**	**100.0%**
#20	0.08	99.8%	99.8%
#40	0.39	99.2%	99.2%
#60	1.16	97.7%	97.7%
#100	4.43	91.3%	91.3%
#200	15.86	69.0%	69.0%
#270	21.37	58.2%	58.2%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm
Coarse Sand:	2.3%	< 2.00 mm and > 0.25 mm
Fine Sand:	39.5%	< 0.25 mm and > 0.05 mm
% Silt:	36%	< 0.05 and > 0.005 mm
% Clay:	22%	< 0.005 mm

Maximum Particle Size: #10
% Retained on #60: 2.3% Total Sample
Minus #10 portion (Soil Mortar)
Coarse Sand: 2.3% Silt: 36.1%
Fine Sand: 39.5% Clay: 22.1%

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 69%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Liquid Limit 27 Plastic Limit 17 Plastic Index 10

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)$^{1/2}$
12:00	0.58	19.3	36.0	6.2	5.9	29.8	58.3%	58.3%	11.4	0.01378	0.06109
1:00	60	20.0	17.5	6.2	6.0	11.3	22.1%	22.1%	14.4	0.01378	0.00675
2:00	120	21.4	15.5	6.2	6.3	9.3	18.2%	18.2%	14.8	0.01342	0.00471

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan
QCT-1433 (Certification #)
Signature
Laboratory Supervisor (Position)

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616

B-6 Classification

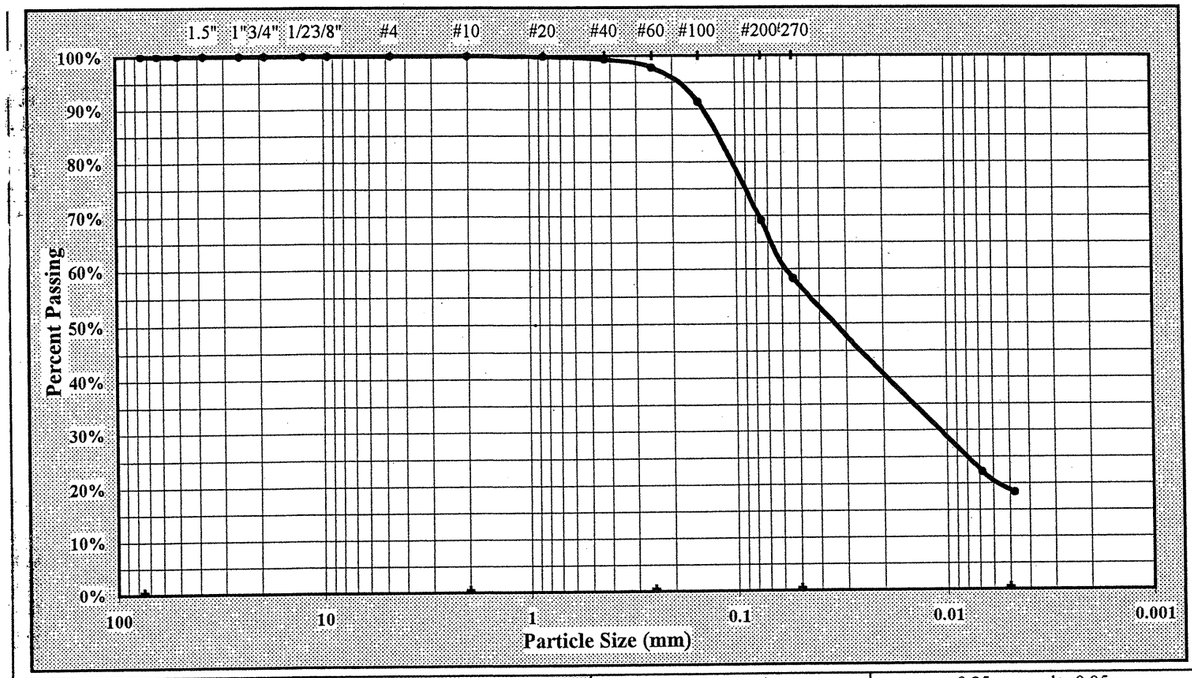
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/12/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/6/04-1/12/04
Client Name:			
Client Address:			
State Project #:	F.A. Project No:	TIP NO:	
Boring #: B-6	Sample #: S-2	Sample Date: 12/9/03	
Location: 212+00 -Y1-	Offset: 0	Depth: 1-5'	
Sample Description:		Tan-Brown SILT	A-4 (5)



As Defined by NCDOT			
Gravel	< 75 mm and > 2.00 mm	Fine Sand	< 0.25 mm and > 0.05 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Silt	< 0.05 and > 0.005 mm
		Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	2.3%	Silt	36%
Gravel	0.0%	Fine Sand	39.5%	Clay	22%
Apparent Relative Density		Moisture Content	13.6%	% Passing #200	69.0%
Liquid Limit	27	Plastic Limit	17	Plastic Index	10

Soil Mortar (-#10 Sieve)

Coarse Sand 2.3% Fine Sand 39.5% Silt 36% Clay 22%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616

B-6 Classification

Liquid Limit, Plastic Limit, and Plastic Index

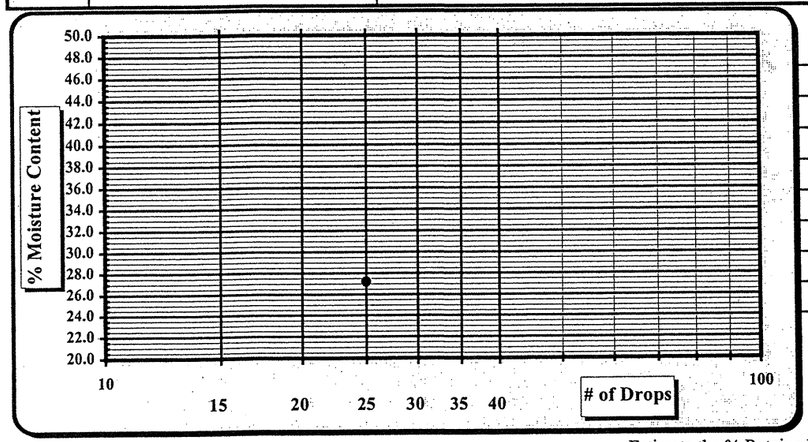
S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:

Report Date: 1/12/04
Test Date(s): 1/6/04-1/12/04

Boring #: B-6 Sample #: S-2 Sample Date: 12/9/03
Location: 212+00 -Y1- Offset: Depth(ft): 1-5'
Sample Description: Tan-Brown SILT A-4 (5)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	21						69		
A	Tare Weight	8.26						6.45		
B	Wet Soil Weight + A	19.80						15.74		
C	Dry Soil Weight + A	17.33						14.41		
D	Water Weight (B-C)	2.47						1.33		
E	Dry Soil Weight (C-A)	9.07						7.96		
F	% Moisture Content (D/E)*100	27.2%						16.7%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							16.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried	☒	NP, Non-Plastic ☐
Liquid limit Test:	Multipoint Method	☐	One-point Method	☒			Liquid Limit 27
Classification:	ASTM D 2487	☐	AASHTO M 145	☒			Plastic Limit 17
Liquid limit Test:	ASTM D 4318	☐	AASHTO T 89	☒			Plastic Index 10
Plastic limit Test:	ASTM D 4318	☐	AASHTO T 90	☒			Group Symbol A-4

Technician Name: Tom Savanapridi OCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Laboratory Report Version 4.2

Moisture - Density Report

S&ME

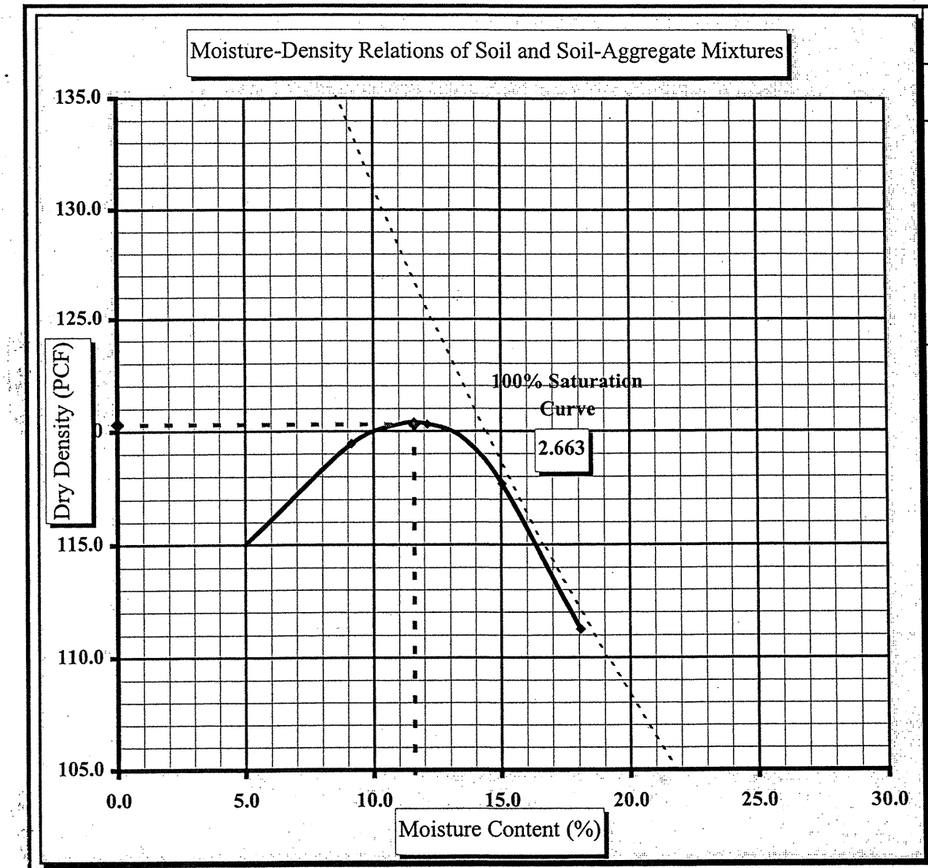
S&ME Project #: **1051-03-202**
Project Name: **Louis Stephens Drive**
Client Name:
Client Address:

Report Date: 01/09/04
Test Date(s): 01/06/04 - 01/09/04

Boring #:	B-7	Sample #:	S-3	Sample Date:	December 9, 2003
Location:	214+00 -Y1-	Offset:	0	Depth (ft):	5-12'
Sample Description:	Red Brown Silty CLAY				

Maximum Dry Density **120.3** **PCF.** **Optimum Moisture Content** **11.6** **%**

ASTM D 698 Method A



Soil Properties	
Natural Moisture Content:	8.5%
Liquid Limit:	28
Plastic Limit:	17
Plastic Index:	11
Specific Gravity:	2.663
% Passing #4	100

Oversize Fraction

Bulk Sp. Gravity
% Moisture
Oversize Fraction
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
Mechanical Hammer ☐ Manual Hammer ☒ Moist Preparation ☒ Dry Preparation ☐

References: ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
AASHTO T88: Particle Size Analysis of Soils
AASHTO T 100: Specific Gravity of Soils
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

S&ME,INC. 3109 Spring Forest Road, Raleigh, NC. 27616 B-7 S-3 5-12' Proctor

CBR (California Bearing Ratio) of Laboratory Compacted Soil

S&ME

ASTM D 1883

Project #: **1051-03-202** Report Date: 01/14/03

Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/14/03

Client Name:

Client Address:

Boring #: B-7 Sample #: S-3 Sample Date: 12/9/03

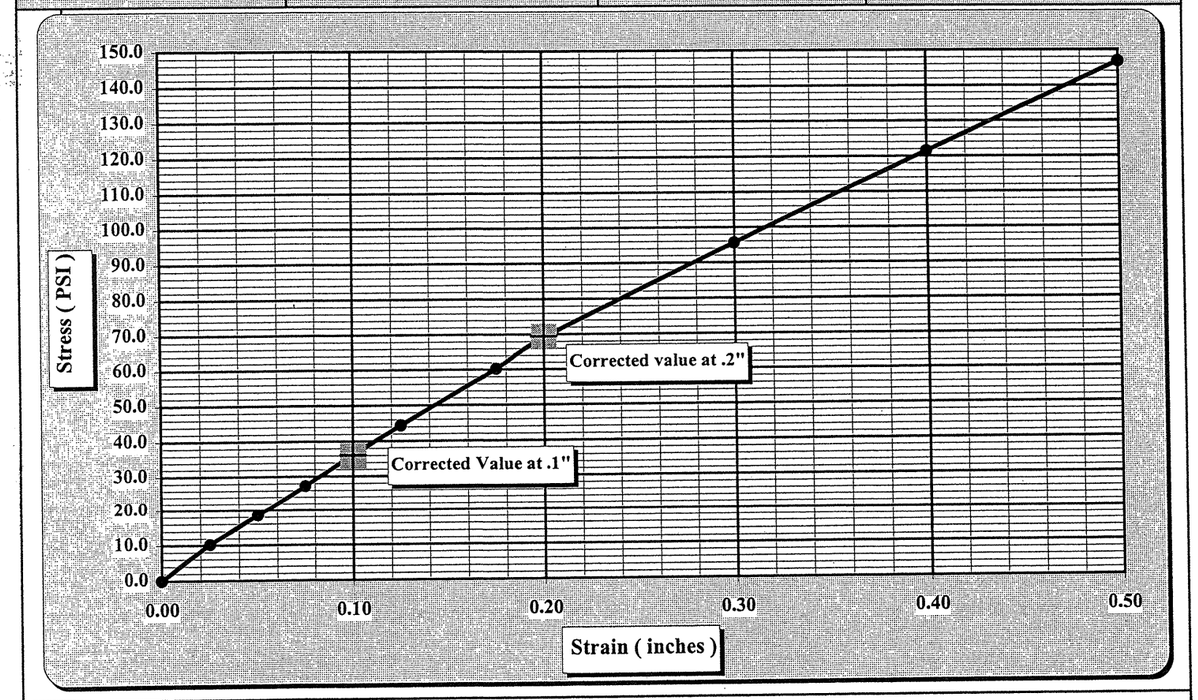
Location: 214+00 -Y1- Offset: 0 Depth (ft): 5-12

Sample Description: Red Brown Silty CLAY

ASTM D 698 Method A Maximum Dry Density (PCF): 120.3 Optimum Moisture Content: 11.6%

Compaction Test performed on the Fine Fraction only % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 3.6	CBR at 0.2 in. 4.6	CBR at 0.1 in. 3.6	CBR at 0.2 in. 4.6



CBR Sample Preparation: *Performed on the fine fraction*

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	77	Final Dry Density (PCF)	118.5
Initial Dry Density (PCF)	121.1	Average Final Moisture Content	14.6%
Moisture Content of the Compacted Specimen	13.5%	Moisture Content (top 1" after soaking)	17.4%
Percent Compaction	100.6%	Percent Swell	1.2%

Soak Time: 101.7 hrs. Surcharge Weight 10.0 Surcharge Wt. per sq. Ft. 51.0

Liquid Limit 28 Plastic Index 11 Apparent Relative Density 2.663

References: ASTM D 1883: CBR (California Bearing Ratio) of Laboratory-Compacted Soil

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T88: Particle Size Analysis of Soils

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

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B-7 S-3 5-12' CBR

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/6/04-1/12/04
Report Date: 1/12/04

Boring #: B-7 Sample #: S-3 Sample Date: 12/9/03
Location: 214+00 -Y1- Offset: 0 Depth: 5-12
Sample Description: Red Brown Silty CLAY A-6

Pan #:	8	Beaker #:	ED
Hydrometer Jar #:			7
Pan Tare Weight (grams):			7.93
Total Sample Wet Wt. + tare wt. (grams):			331.73
Weight of Total Sample Air Dried:			323.80
Weight of Air Dried Hydrometer Sample (g):			50.79
Total Sample Oven Dried:			319.61
Hydrometer Sample Oven Dried (W):			50.13
% Passing #10:			100.0%
Correction Factor a (Table 1):			1.00

Group Index			(4)
Apparent Relative Density			
Moisture Content		Hygroscopic	Natural
	Tare #	4	26
A	Tare Wt.	15.21	7.87
B	Wet Wt. + A	35.37	238.81
C	Dry Wt. + A	35.11	220.72
D	Water Wt. (B-C)	0.26	18.09
E	Dry Wt.(C-A)	19.90	212.85
	% Moisture (100 x D/E)	1.31%	8.5%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	**0.00**	**100.0%**	**100.0%**
#20	4.61	90.8%	90.8%
#40	7.46	85.1%	85.1%
#60	9.18	81.7%	81.7%
#100	12.68	74.7%	74.7%
#200	20.27	59.6%	59.6%
#270	24.65	50.8%	50.8%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm
Coarse Sand:	18.3%	< 2.00 mm and > 0.25 mm
Fine Sand:	30.9%	< 0.25 mm and > 0.05 mm
% Silt:	32%	< 0.05 and > 0.005 mm
% Clay:	19%	< 0.005 mm

Maximum Particle Size: # 10
% Retained on #60: 18.3% Total Sample

Minus #10 portion (Soil Mortar)

Coarse Sand:	18.3%	Silt:	32.2%
Fine Sand:	30.9%	Clay:	18.6%

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 60%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Liquid Limit **28** Plastic Limit **17** Plastic Index **11**

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)$^{1/2}$
11:40	0.58	18.8	32.0	6.2	6.2	25.8	51.5%	51.5%	12.1	0.01378	0.06294
12:40	60	19.7	15.5	6.2	6.2	9.3	18.6%	18.6%	14.8	0.01378	0.00684
1:40	120	20.9	13.5	6.2	6.2	7.3	14.6%	14.6%	15.1	0.01342	0.00476

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan
OCT-1433 (Certification #)
Signature
Laboratory Supervisor (Position)

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

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B-7 Classification

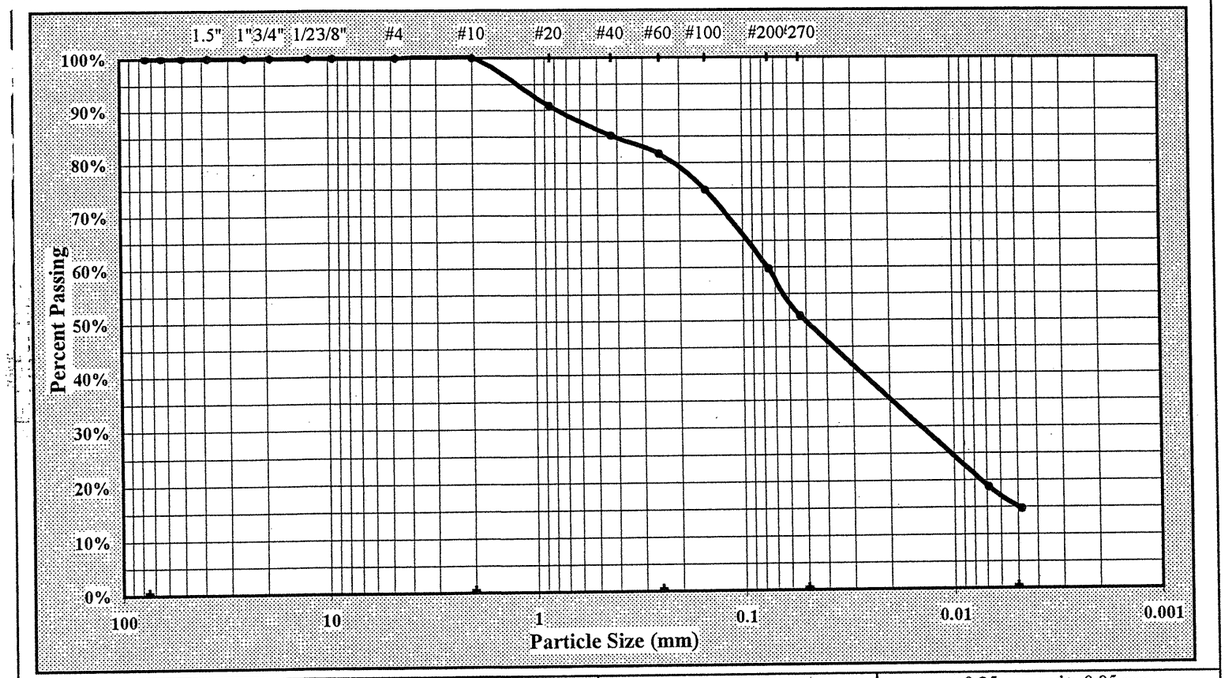
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	01/12/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/6/04-1/12/04
Client Name:			
Client Address:			
State Project #:	F.A. Project No:	TIP NO:	
Boring #: B-7	Sample #: S-3	Sample Date: 12/9/03	
Location: 214+00 -Y1-	Offset: 0	Depth: 5-12	
Sample Description:		Red Brown Silty CLAY	A-6 (4)



As Defined by NCDOT			
Gravel	< 75 mm and > 2.00 mm	Fine Sand	< 0.25 mm and > 0.05 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Silt	< 0.05 and > 0.005 mm
		Clay	< 0.005 mm

Maximum Particle Size	# 10	Coarse Sand	18.3%	Silt	32%
Gravel	0.0%	Fine Sand	30.9%	Clay	19%
Apparent Relative Density		Moisture Content	8.5%	% Passing #200	59.6%
Liquid Limit	28	Plastic Limit	17	Plastic Index	11

Soil Mortar (-#10 Sieve)

Coarse Sand 18.3% Fine Sand 30.9% Silt 32% Clay 19%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T265: Laboratory Determination of Moisture Content of Soils
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

S&ME, INC. 3100 Spring Forest Road, Raleigh, N.C. 27616

B-7 Classification

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:

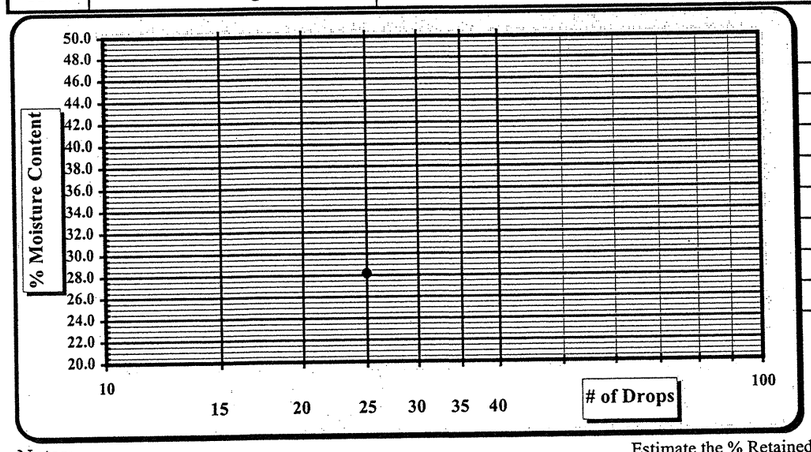
Report Date: 1/12/04
Test Date(s): 1/6/04-1/12/04

Boring #: B-7 Sample #: S-3 Sample Date: 12/9/03

Location: 214+00 -Y1- Offset: Depth(ft): 5-12

Sample Description: Red Brown Silty CLAY A-6 (4)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	7						49		
A	Tare Weight	7.99						**6.18**		
B	Wet Soil Weight + A	18.05						14.74		
C	Dry Soil Weight + A	15.84						13.47		
D	Water Weight (B-C)	2.21						1.27		
E	Dry Soil Weight (C-A)	7.85						7.29		
F	% Moisture Content (D/E)*100	28.2%						17.4%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							17.4%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☐	One-point Method ☒		Liquid Limit	28
Classification:	ASTM D 2487 ☐	AASHTO M 145 ☒		Plastic Limit	17
Liquid limit Test:	ASTM D 4318 ☐	AASHTO T 89 ☒		Plastic Index	11
Plastic limit Test:	ASTM D 4318 ☐	AASHTO T 90 ☒		Group Symbol	A-6

Technician Name: Tom Savanapridi — QCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) — Laboratory Supervisor (Position)

Laboratory Report Version 4.2

Moisture - Density Report

S&ME

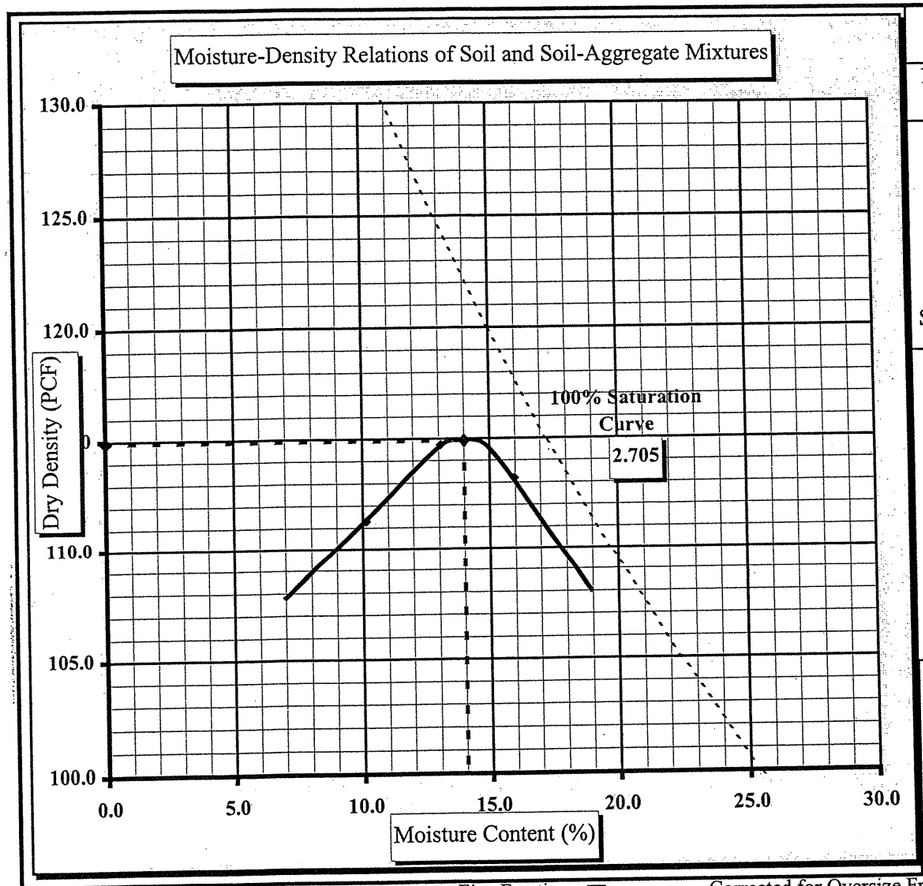
S&ME Project #: **1051-03-202**
Project Name: **Louis Stephens Drive**
Client Name:
Client Address:

Report Date: 01/09/04
Test Date(s): 01/06/04 - 01/09/04

Boring #:	B-9	Sample #:	S-4	Sample Date:	November 26, 2003
Location:	218+00 -Y1-	Offset:	0	Depth (ft):	1-5
Sample Description:	Red Brown Silty CLAY				

Maximum Dry Density **114.9** **PCF.** **Optimum Moisture Content** **14.0** **%**

ASTM D 698 Method A



Soil Properties	
Natural Moisture Content:	8.4%
Liquid Limit:	38
Plastic Limit:	18
Plastic Index:	20
Specific Gravity:	2.705
% Passing #4	100

Oversize Fraction

Bulk Sp. Gravity
% Moisture
Oversize Fraction
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
Mechanical Hammer ☐ Manual Hammer ☒ Moist Preparation ☒ Dry Preparation ☐

References: ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
AASHTO T88: Particle Size Analysis of Soils
AASHTO T100: Specific Gravity of Soils
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

S&ME,INC. 3109 Spring Forest Road, Raleigh, NC. 27616 B-9 S-4 1-5' Proctor

CBR (California Bearing Ratio) of Laboratory Compacted Soil

S&ME

ASTM D 1883

Project #: **1051-03-202** Report Date: 01/14/03

Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/14/03

Client Name:

Client Address:

Boring #: B-9 Sample #: S-4 Sample Date: 11/26/03

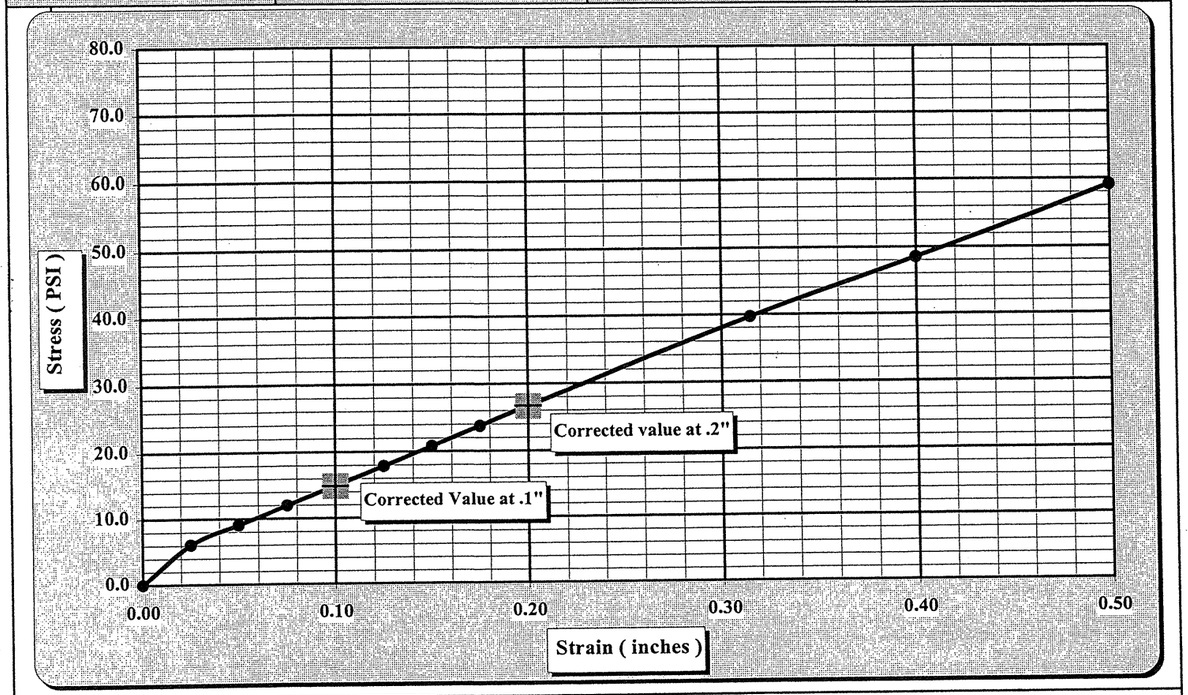
Location: 218+00 -Y1- Offset: Depth (ft): 1-5

Sample Description: Red Brown Silty CLAY

ASTM D 698 Method A Maximum Dry Density (PCF): 114.9 Optimum Moisture Content: 14.0%

Compaction Test performed on the Fine Fraction only % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 1.5	CBR at 0.2 in. 1.8	CBR at 0.1 in. 1.5	CBR at 0.2 in. 1.8



CBR Sample Preparation: *Performed on the fine fraction*

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	70	Final Dry Density (PCF)	108.7
Initial Dry Density (PCF)	114.6	Average Final Moisture Content	18.2%
Moisture Content of the Compacted Specimen	15.8%	Moisture Content (top 1" after soaking)	23.6%
Percent Compaction	99.7%	Percent Swell	3.3%

Soak Time: 101.9 hrs. Surcharge Weight 10.0 Surcharge Wt. per sq. Ft. 50.9

Liquid Limit 38 Plastic Index 20 Apparent Relative Density 2.705

References: ASTM D 1883: CBR (California Bearing Ratio) of Laboratory-Compacted Soil

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T88: Particle Size Analysis of Soils

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

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B-9 S-4 1-5' CBR

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/6/04-1/12/04
Report Date: 1/12/04

Boring #: B-9 Sample #: S-4 Sample Date: 11/26/03
Location: 218+00 -Y1- Offset: 0 Depth (ft): 1-5
Sample Description: Red Brown Silty CLAY A-6

Pan #:	3	Beaker #:	PP-2
Hydrometer Jar #:			24
Pan Tare Weight (grams):			7.96
Total Sample Wet Wt. + tare wt. (grams):			299.33
Weight of Total Sample Air Dried:			291.37
Weight of Air Dried Hydrometer Sample (g):			50.39
Total Sample Oven Dried:			287.35
Hydrometer Sample Oven Dried (W):			49.69
% Passing #10:			100.0%
Correction Factor a (Table 1):			1.00

Group Index: **(16)**
Apparent Relative Density:

	Moisture Content	Hygroscopic	Natural
	Tare #	40	36
A	Tare Wt.	22.35	7.91
B	Wet Wt. + A	45.32	129.75
C	Dry Wt. + A	45.01	120.36
D	Water Wt. (B-C)	0.31	9.39
E	Dry Wt.(C-A)	22.66	112.45
	% Moisture (100 x D/E)	1.4%	8.4%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	0.04	**100.0%**	**100.0%**
#20	0.09	99.8%	99.8%
#40	0.49	99.0%	99.0%
#60	1.21	97.6%	97.6%
#100	2.80	94.4%	94.4%
#200	8.30	83.3%	83.3%
#270	12.25	75.3%	75.3%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm
Coarse Sand:	2.4%	< 2.00 mm and > 0.25 mm
Fine Sand:	22.3%	< 0.25 mm and > 0.05 mm
% Silt:	38%	< 0.05 and > 0.005 mm
% Clay:	38%	< 0.005 mm

Maximum Particle Size: #4
% Retained on #60: 2.4% Total Sample

Minus #10 portion (Soil Mortar)

Coarse Sand:	2.4%	Silt:	37.5%
Fine Sand:	22.3%	Clay:	37.8%

Liquid Limit 38 Plastic Limit 18 Plastic Index 20

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 83%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)$^{1/2}$
12:00	0.58	19.2	46.0	6.2	5.8	39.8	80.1%	80.1%	9.8	0.01378	0.05664
1:00	60	19.9	25.0	6.2	6.0	18.8	37.8%	37.8%	13.2	0.01378	0.00646
2:00	120	21.2	23.5	6.2	6.2	17.3	34.8%	34.8%	13.5	0.01342	0.00450

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi QCT-1433 (Certification #)
Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

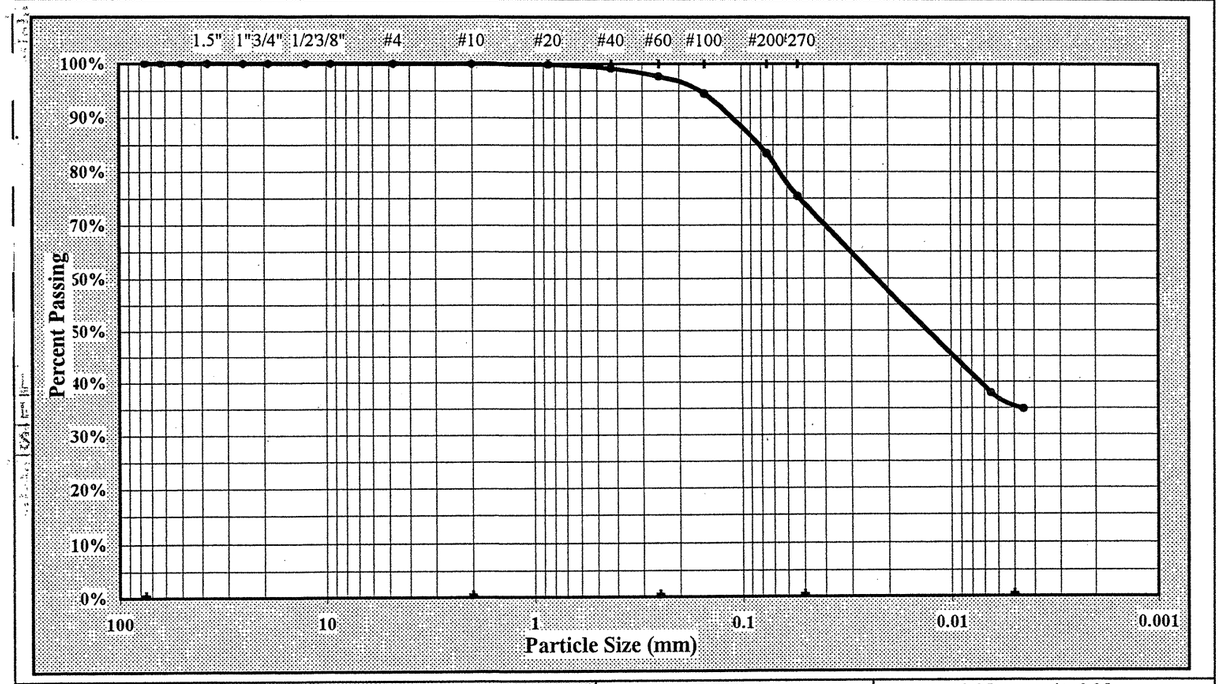
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/12/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/6/04-1/12/04
Client Name:			
Client Address:			
State Project #:	F.A. Project No:	TIP NO:	
Boring #: B-9	Sample #: S-4	Sample Date: 11/26/03	
Location: 218+00 -Y1-	Offset: 0	Depth (ft): 1-5	
Sample Description:		Red Brown Silty CLAY	A-6 (16)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	2.4%	Silt	38%
Gravel	0.0%	Fine Sand	22.3%	Clay	38%
Apparent Relative Density		Moisture Content	8.4%	% Passing #200	83.3%
Liquid Limit	38	Plastic Limit	18	Plastic Index	20

Soil Mortar (-#10 Sieve)

Coarse Sand	2.4%	Fine Sand	22.3%	Silt	38%	Clay	38%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616 B-9 Classification

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1051-03-202** Report Date: 1/12/04

Project Name: Louis Stephens Drive Test Date(s): 1/6/04-1/12/04

Client Name:

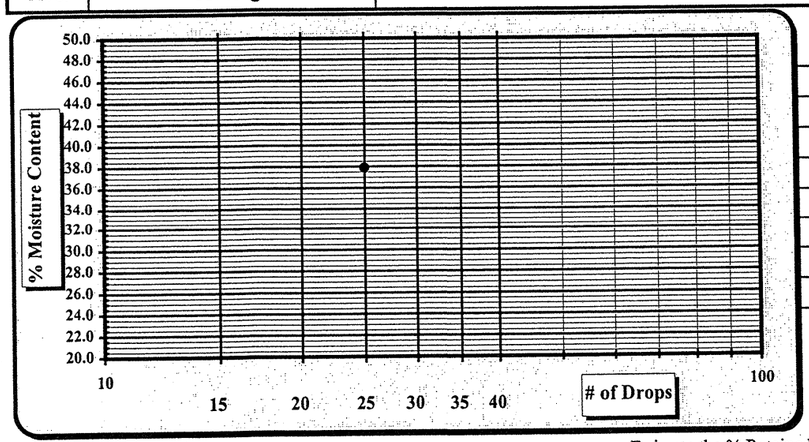
Client Address:

Boring #: B-9 Sample #: S-4 Sample Date: 11/26/03

Location: 218+00 -Y1- Offset: Depth(ft): 1-5

Sample Description: Red Brown Silty CLAY A-6 (16)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	7						49C		
A	Tare Weight	7.99						6.17		
B	Wet Soil Weight + A	19.42						14.07		
C	Dry Soil Weight + A	16.28						12.86		
D	Water Weight (B-C)	3.14						1.21		
E	Dry Soil Weight (C-A)	8.29						6.69		
F	% Moisture Content (D/E)*100	37.9%						18.1%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							18.1%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried	☒	NP, Non-Plastic ☐
Liquid limit Test:	Multipoint Method	☐	One-point Method	☒			Liquid Limit 38
Classification:	ASTM D 2487	☐	AASHTO M 145	☒			Plastic Limit 18
Liquid limit Test:	ASTM D 4318	☐	AASHTO T 89	☒			Plastic Index 20
Plastic limit Test:	ASTM D 4318	☐	AASHTO T 90	☒			Group Symbol A-6

Technician Name: Tom Savanapridi QCT-1433 (*Certification #*)

Technical Responsibility: Mal Karajan (*Signature*) Laboratory Supervisor (*Position*)

Laboratory Report Version 4.2

Moisture - Density Report

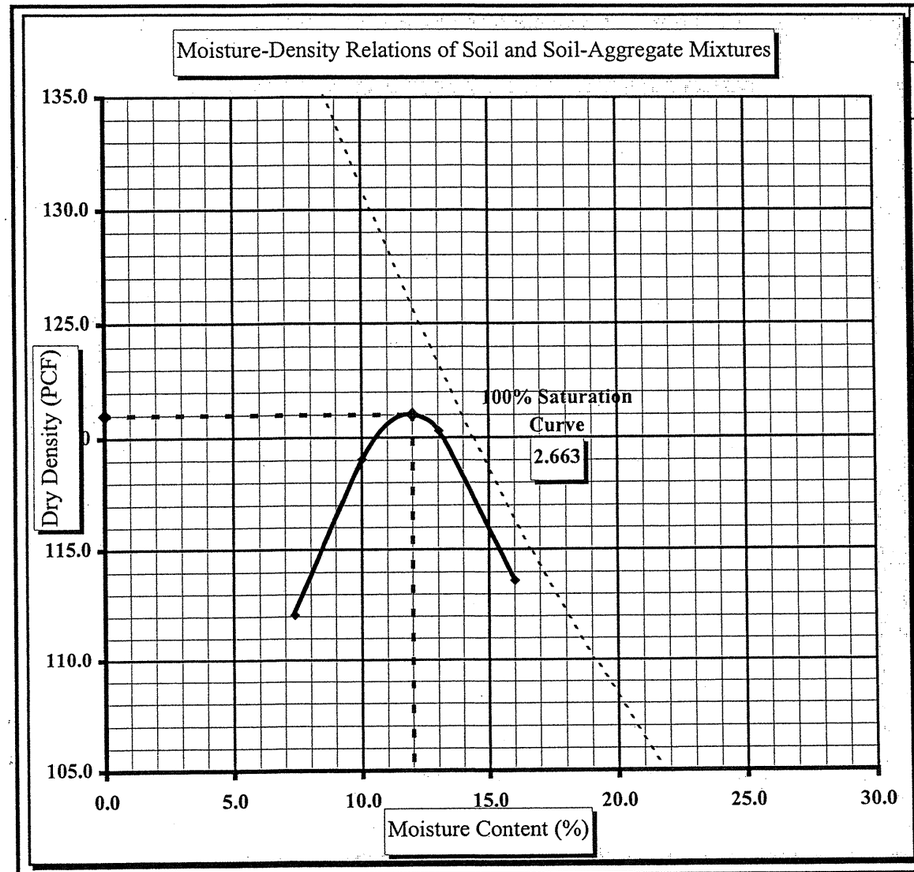
S&ME

S&ME Project #:	**1051-03-202**	Report Date:	01/09/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	01/06/04 - 01/09/04
Client Name:			
Client Address:			

Boring #:	B-12	Sample #:	S-5	Sample Date:	December 10, 2003
Location:	11+00 -Y2-	Offset:	10 ft. RT	Depth (ft):	1-7
Sample Description:	Brown Fine Sandy SILT				

Maximum Dry Density **121.0** **PCF.** **Optimum Moisture Content** **12.0** **%**

ASTM D 698 Method A



Soil Properties	
Natural Moisture Content:	19.6%
Liquid Limit:	25
Plastic Limit:	15
Plastic Index:	10
Specific Gravity:	2.663
% Passing #4	100

Oversize Fraction

Bulk Sp. Gravity
% Moisture
Oversize Fraction
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Hammer ☐ Manual Hammer ☒ Moist Preparation ☐ Dry Preparation ☒

References: ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
AASHTO T88: Particle Size Analysis of Soils
AASHTO T 100: Specific Gravity of Soils
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

S&ME,INC. **3109 Spring Forest Road, Raleigh, NC. 27616** **B-12 S-5 1-7' Proctor**

CBR (California Bearing Ratio) of Laboratory Compacted Soil

S&ME

ASTM D 1883

Project #: **1051-03-202** Report Date: 01/14/03

Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/14/03

Client Name:

Client Address:

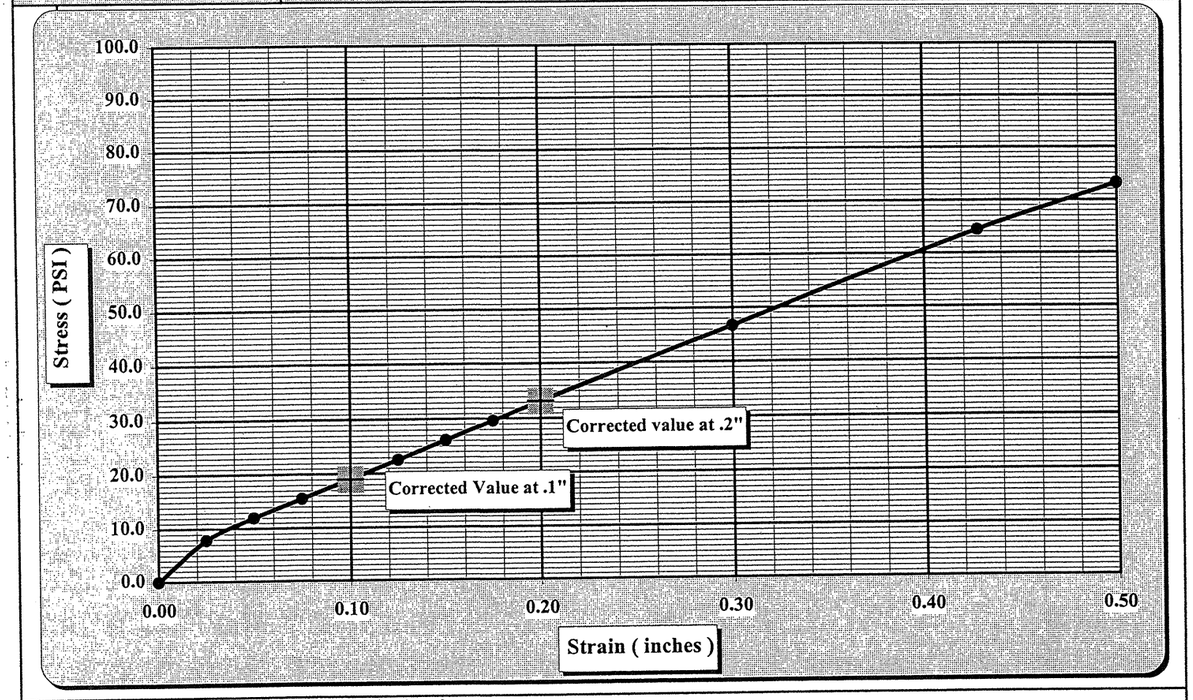
Boring #:	B-12	Sample #:	S-5	Sample Date:	12/10/03
Location:	11+00 -Y2-	Offset:	10 ft. RT	Depth (ft):	1-7

Sample Description: Brown Fine Sandy SILT

ASTM D 698 Method A Maximum Dry Density (PCF): 121.0 Optimum Moisture Content: 12.0%

Compaction Test performed on the Fine Fraction only % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 1.9	CBR at 0.2 in. 2.2	CBR at 0.1 in. 1.9	CBR at 0.2 in. 2.2



CBR Sample Preparation: *Performed on the fine fraction*

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	60	Final Dry Density (PCF)	117.5
Initial Dry Density (PCF)	118.2	Average Final Moisture Content	14.3%
Moisture Content of the Compacted Specimen	13.7%	Moisture Content (top 1" after soaking)	14.7%
Percent Compaction	97.7%	Percent Swell	0.0

Soak Time:	101.9 hrs.	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.9
Liquid Limit	25	Plastic Index	10	Apparent Relative Density	2.663

References: ASTM D 1883: CBR (California Bearing Ratio) of Laboratory-Compacted Soil
ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T88: Particle Size Analysis of Soils
AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

S&ME, Inc. **3109 Spring Forest Road, Raleigh, NC. 27616** **B-12 S-5 1-7' CBR**

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/6/04-1/12/04
Report Date: 1/12/04

Boring #: B-12 Sample #: S-5 Sample Date: 12/10/03
Location: 11+00 -Y2- Offset: 10 ft. RT Depth: 1-7'
Sample Description: Brown Fine Sandy SILT A-4

Pan #:	17	Beaker #:	1
Hydrometer Jar #:			41
Pan Tare Weight (grams):			7.87
Total Sample Dry Wt. + tare wt. (grams):			279.11
Weight of Total Sample Air Dried:			271.24
Weight of Air Dried Hydrometer Sample (g):			50.21
Total Sample Oven Dried:			268.82
Hydrometer Sample Oven Dried (W):			49.76
% Passing #10:			100.0%
Correction Factor a (Table 1):			1.00

Group Index: (1)
Apparent Relative Density:

	Moisture Content	Hygroscopic	Natural
	Tare #	10	48
A	Tare Wt.	15.23	8.07
B	Wet Wt. + A	35.74	157.41
C	Dry Wt. + A	35.55	132.95
D	Water Wt. (B-C)	0.19	24.46
E	Dry Wt.(C-A)	20.32	124.88
	% Moisture (100 x D/E)	0.9%	19.6%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	**0.00**	**100.0%**	**100.0%**
#20	1.50	97.0%	97.0%
#40	6.82	86.3%	86.3%
#60	12.55	74.8%	74.8%
#100	20.18	59.4%	59.4%
#200	27.88	44.0%	44.0%
#270	31.02	37.7%	37.7%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm
Coarse Sand:	25.2%	< 2.00 mm and > 0.25 mm
Fine Sand:	37.1%	< 0.25 mm and > 0.05 mm
% Silt:	17%	< 0.05 and > 0.005 mm
% Clay:	21%	< 0.005 mm

Maximum Particle Size: #10
% Retained on #60: 25.2% Total Sample

Minus #10 portion (Soil Mortar)

Coarse Sand:	25.2%	Silt:	17.0%
Fine Sand:	37.1%	Clay:	20.7%

Liquid Limit 25 Plastic Limit 15 Plastic Index 10

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 44%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
Clock	T (Min.)	(°C)	Reading	Control Cylinder	Composite Correction	R	P = (R x a / W) x 100	P (total) = P x % Passing #10	L	K	D = K x ((L/T)^1/2
12:00	0.58	18.9	26.0	6.2	5.8	19.8	39.8%	39.8%	13.0	0.01378	0.06524
1:00	60	19.4	16.5	6.2	5.9	10.3	20.7%	20.7%	14.6	0.01378	0.00680
2:00	120	20.9	15.5	6.2	6.2	9.3	18.7%	18.7%	14.8	0.01342	0.00471

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan
OCT-1433 (Certification #)
Signature
Laboratory Supervisor (Position)

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616

B-12 Classification

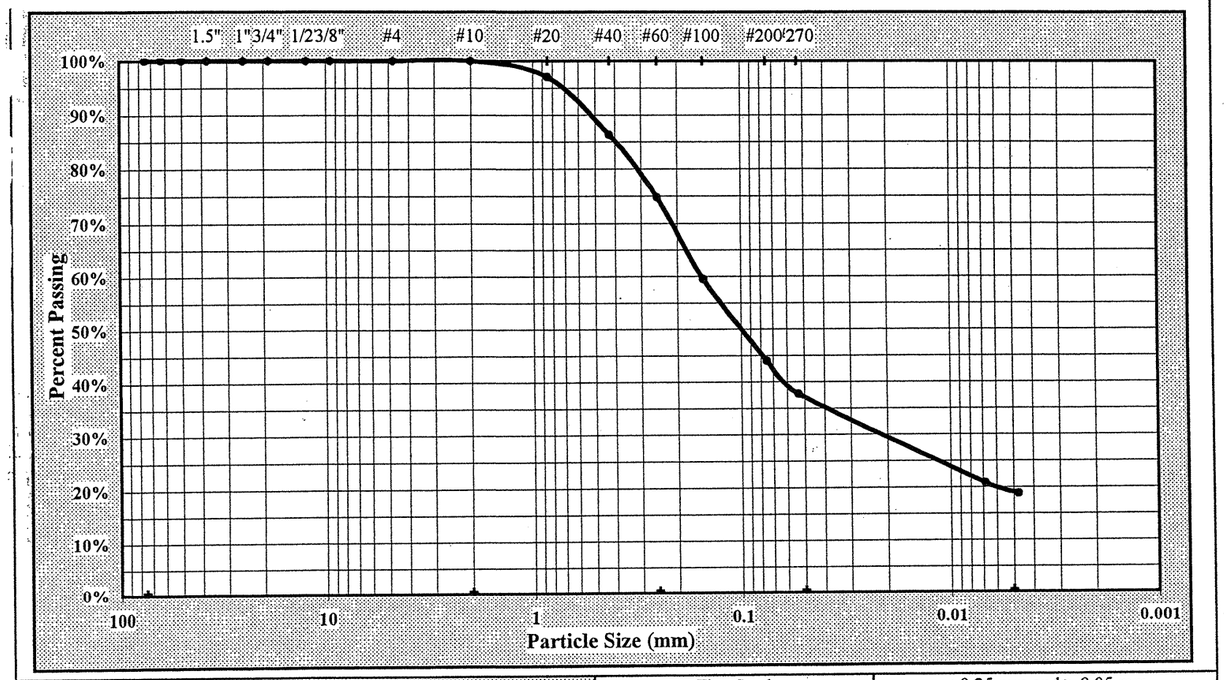
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/12/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/6/04-1/12/04
Client Name:			
Client Address:			
State Project #:		F.A. Project No:	TIP NO:
Boring #:	B-12	Sample #: S-5	Sample Date: 12/10/03
Location:	11+00 -Y2-	Offset: 10 ft. RT	Depth: 1-7'
Sample Description:			Brown Fine Sandy SILT A-4 (1)



As Defined by NCDOT			
Gravel	< 75 mm and > 2.00 mm	Fine Sand	< 0.25 mm and > 0.05 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Silt	< 0.05 and > 0.005 mm
		Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	25.2%	Silt	17%
Gravel	0.0%	Fine Sand	37.1%	Clay	21%
Apparent Relative Density		Moisture Content	19.6%	% Passing #200	44.0%
Liquid Limit	25	Plastic Limit	15	Plastic Index	10

Soil Mortar (-#10 Sieve)

Coarse Sand 25.2% Fine Sand 37.1% Silt 17% Clay 21%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616

B-12 Classification

Laboratory Record Version 4.2

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:

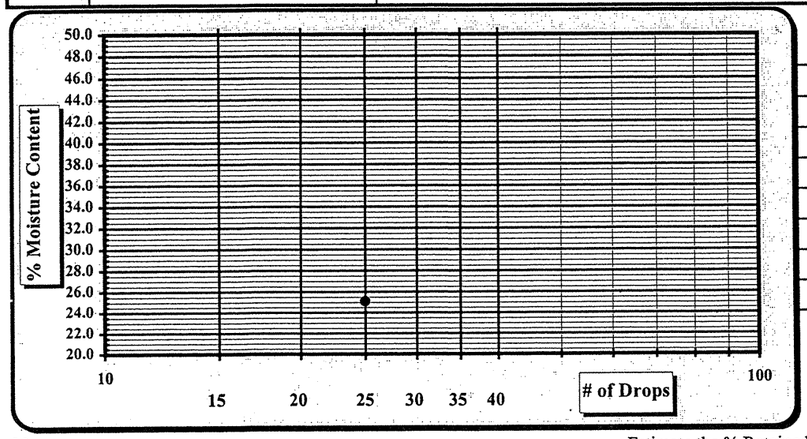
Report Date: 1/12/04
Test Date(s): 1/6/04-1/12/04

Boring #: B-12 Sample #: S-5 Sample Date: 12/10/03

Location: 11+00 -Y2- Offset: 10 ft. RT Depth(ft): 1-7'

Sample Description: Brown Fine Sandy SILT A-4 (1)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	7						231		
A	Tare Weight	8.13						6.47		
B	Wet Soil Weight + A	20.67						13.81		
C	Dry Soil Weight + A	18.15						12.87		
D	Water Weight (B-C)	2.52						0.94		
E	Dry Soil Weight (C-A)	10.02						6.40		
F	% Moisture Content (D/E)*100	25.1%						14.7%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							14.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☐	One-point Method ☒		Liquid Limit	25
Classification:	ASTM D 2487 ☐	AASHTO M 145 ☒		Plastic Limit	15
Liquid limit Test:	ASTM D 4318 ☐	AASHTO T 89 ☒		Plastic Index	10
Plastic limit Test:	ASTM D 4318 ☐	AASHTO T 90 ☒		Group Symbol	A-4

Technician Name: Tom Savanapridi QCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Laboratory Report Version 4.2

Moisture - Density Report

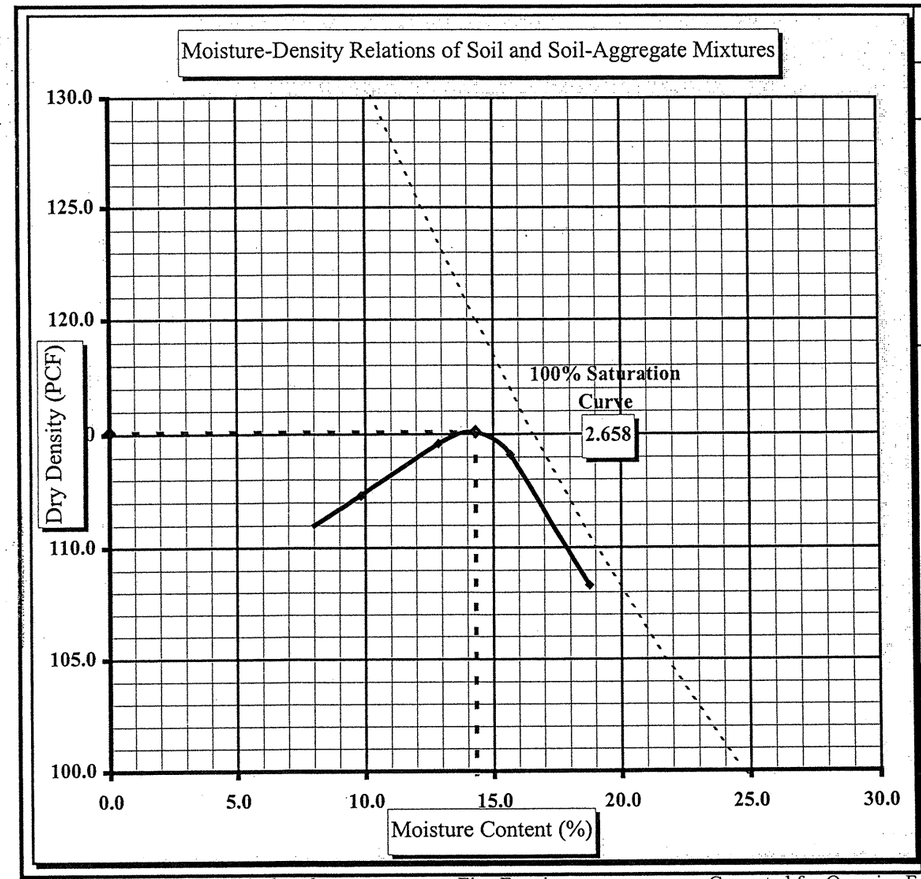
S&ME

S&ME Project #: **1051-03-202** Report Date: 01/09/04
Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/09/04
Client Name:
Client Address:

Boring #:	B-15	Sample #:	S-6	Sample Date:	November 12, 2003
Location:	91+00 -L-	Offset:	0	Depth (ft):	5-10'
Sample Description:	Tan to Brown Silty CLAY				

Maximum Dry Density **115.1** **PCF.** **Optimum Moisture Content** **14.3** **%**

ASTM D 698 Method A



Soil Properties	
Natural Moisture Content:	8.0%
Liquid Limit:	31
Plastic Limit:	17
Plastic Index:	14
Specific Gravity:	2.658
% Passing #4	100

Oversize Fraction

Bulk Sp. Gravity
% Moisture
Oversize Fraction
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
Mechanical Hammer ☐ Manual Hammer ☒ Moist Preparation ☒ Dry Preparation ☐

References: ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
AASHTO T88: Particle Size Analysis of Soils
AASHTO T 100: Specific Gravity of Soils
AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

S&ME,INC. 3109 Spring Forest Road, Raleigh, NC. 27616 B-15 S-6 5-10' Proctor

CBR (California Bearing Ratio) of Laboratory Compacted Soil

S&ME

ASTM D 1883

Project #: **1051-03-202** Report Date: 01/14/03

Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/14/03

Client Name:

Client Address:

Boring #: B-15 Sample #: S-6 Sample Date: 11/12/03

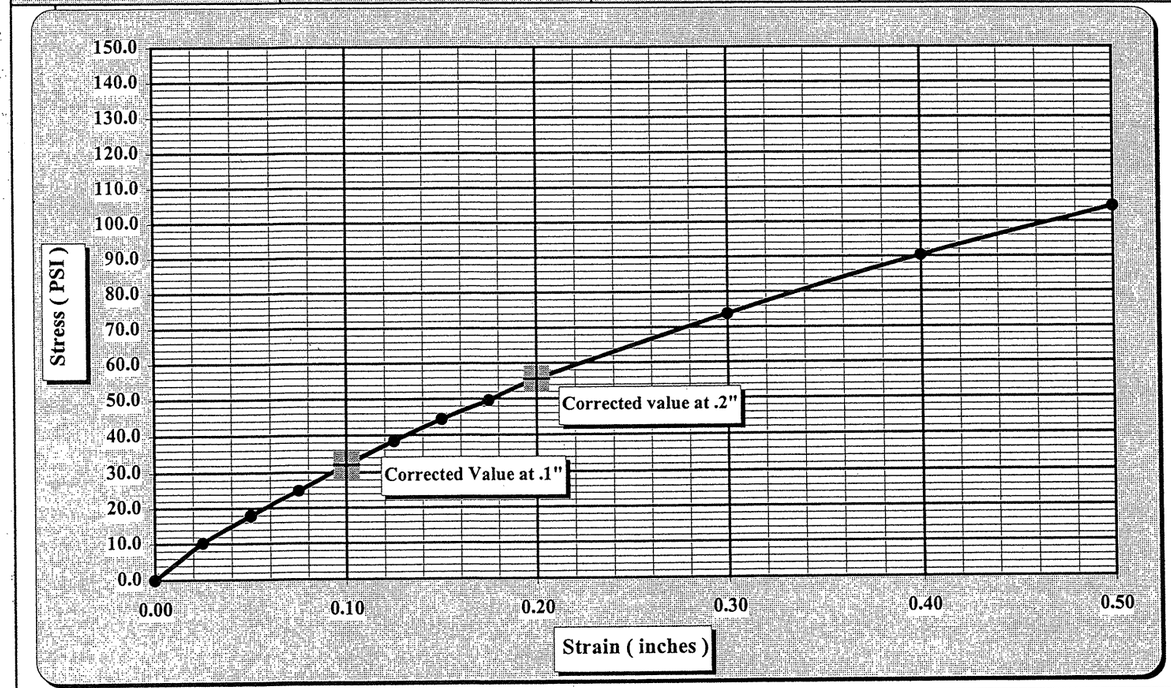
Location: 91+00 -L- Offset: 0 Depth (ft): 5-10'

Sample Description: Tan to Brown Silty CLAY

ASTM D 698 Method A Maximum Dry Density (PCF): 115.1 Optimum Moisture Content: 14.3%

Compaction Test performed on the Fine Fraction only % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 3.2	CBR at 0.2 in. 3.7	CBR at 0.1 in. 3.2	CBR at 0.2 in. 3.7



CBR Sample Preparation: *Performed on the fine fraction*

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	65	Final Dry Density (PCF)	112.9
Initial Dry Density (PCF)	113.8	Average Final Moisture Content	16.4%
Moisture Content of the Compacted Specimen	16.2%	Moisture Content (top 1" after soaking)	17.7%
Percent Compaction	98.9%	Percent Swell	0.6%

Soak Time: 102.9 hrs. Surcharge Weight 10.0 Surcharge Wt. per sq. Ft. 50.9

Liquid Limit 31 Plastic Index 14 Apparent Relative Density 2.658

References: ASTM D 1883: CBR (California Bearing Ratio) of Laboratory-Compacted Soil

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T88: Particle Size Analysis of Soils

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/6/04-1/12/04
Report Date: 1/12/04

Boring #: B-15 Sample #: S-6 Sample Date: 11/12/03
Location: 91+00 -L- Offset: 0 Depth (ft): 5-10'
Sample Description: Tan to Brown Silty CLAY A-6

Pan #:	42	Beaker #:	pp1	Group Index		(4)	
Hydrometer Jar #:			4	Apparent Relative Density			
Pan Tare Weight (grams):			7.98	**Moisture Content**		Hygroscopic	Natural
Total Sample Dry Wt. + tare wt. (grams):			317.98		Tare #	2	12
Weight of Total Sample Air Dried:			310.00	A	Tare Wt.	15.27	8.04
Weight of Air Dried Hydrometer Sample (g):			50.40	B	Wet Wt. + A	35.58	175.38
Total Sample Oven Dried:			305.72	C	Dry Wt. + A	35.30	163.03
Hydrometer Sample Oven Dried (W):			49.70	D	Water Wt. (B-C)	0.28	12.35
% Passing #10:			100.0%	E	Dry Wt.(C-A)	20.03	154.99
Correction Factor a (Table 1):			1.00		% Moisture (100 x D/E)	1.4%	8.0%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	**0.00**	**100.0%**	**100.0%**
#20	1.39	97.2%	97.2%
#40	6.81	86.3%	86.3%
#60	12.94	74.0%	74.0%
#100	19.54	60.7%	60.7%
#200	25.42	48.9%	48.9%
#270	27.79	44.1%	44.1%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm
Coarse Sand:	26.0%	< 2.00 mm and > 0.25 mm
Fine Sand:	29.9%	< 0.25 mm and > 0.05 mm
% Silt:	19%	< 0.05 and > 0.005 mm
% Clay:	25%	< 0.005 mm

Maximum Particle Size: #10
% Retained on #60: 26.0% Total Sample
Minus #10 portion (Soil Mortar)
Coarse Sand: 26.0% Silt: 19.4%
Fine Sand: 29.9% Clay: 24.7%

Liquid Limit 31 Plastic Limit 17 Plastic Index 14

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 49%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)$^{1/2}$
12:00	0.58	19.4	31.0	6.2	5.9	24.8	49.9%	49.9%	12.2	0.01378	0.06320
1:00	60	20.0	18.5	6.2	6.0	12.3	24.7%	24.7%	14.3	0.01378	0.00673
2:00	120	21.4	17.0	6.2	6.3	10.8	21.7%	21.7%	14.5	0.01342	0.00466

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan
OCT-1433
Certification #
Signature
Laboratory Supervisor
Position

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616

B-15 Classification

Laboratory Report Version 4.2

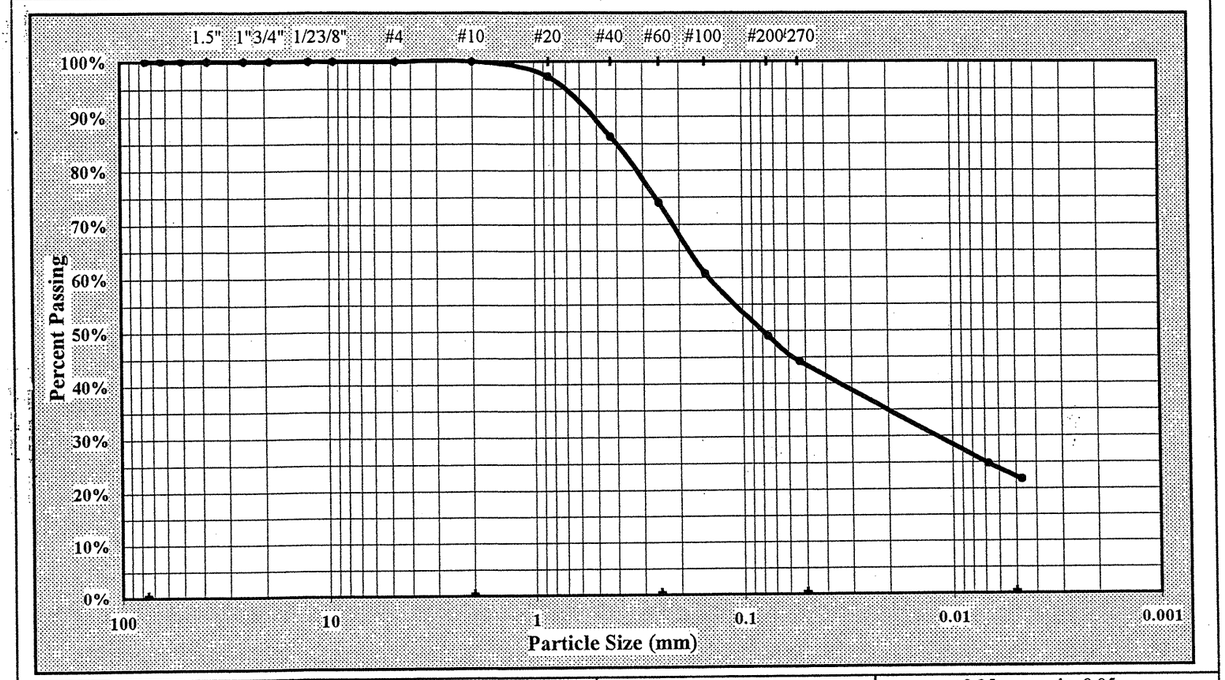
Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/12/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/6/04-1/12/04
Client Name:			
Client Address:			
State Project #:		F.A. Project No:	TIP NO:

Boring #:	B-15	Sample #: S-6	Sample Date: 11/12/03
Location:	91+00 -L-	Offset: 0	Depth (ft): 5-10'
Sample Description:			Tan to Brown Silty CLAY A-6 (4)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	26.0%	Silt	19%
Gravel	0.0%	Fine Sand	29.9%	Clay	25%
Apparent Relative Density		Moisture Content	8.0%	% Passing #200	48.9%
Liquid Limit	31	Plastic Limit	17	Plastic Index	14

Soil Mortar (-#10 Sieve)

Coarse Sand	26.0%	Fine Sand	29.9%	Silt	19%	Clay	25%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

Liquid Limit, Plastic Limit, and Plastic Index

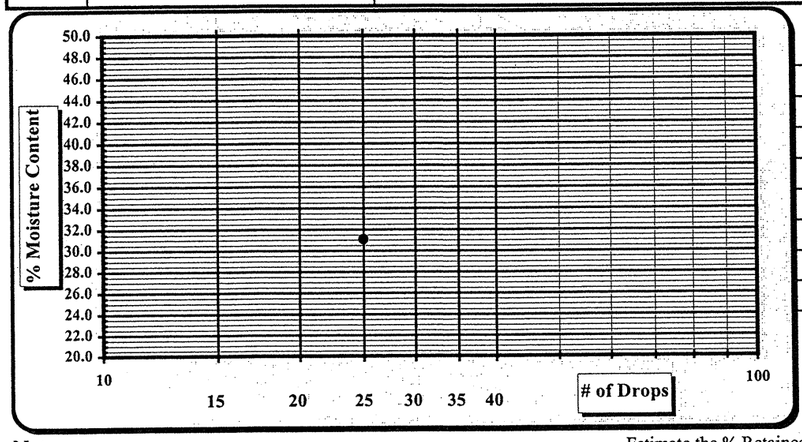
S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:

Report Date: 1/12/04
Test Date(s): 1/6/04-1/12/04

Boring #: B-15 Sample #: S-6 Sample Date: 11/12/03
Location: 91+00 -L- Offset: Depth(ft): 5-10'
Sample Description: Tan to Brown Silty CLAY A-6 (4)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	171						101		
A	Tare Weight	8.15						6.13		
B	Wet Soil Weight + A	20.42						13.13		
C	Dry Soil Weight + A	17.51						12.13		
D	Water Weight (B-C)	2.91						1.00		
E	Dry Soil Weight (C-A)	9.36						6.00		
F	% Moisture Content (D/E)*100	31.1%						16.7%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							16.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☐	One-point Method ☒		Liquid Limit	31
Classification:	ASTM D 2487 ☐	AASHTO M 145 ☒		Plastic Limit	17
Liquid limit Test:	ASTM D 4318 ☐	AASHTO T 89 ☒		Plastic Index	14
Plastic limit Test:	ASTM D 4318 ☐	AASHTO T 90 ☒		Group Symbol	A-6

Technician Name: Tom Savanapridi — OCT-1433 *Certification #*

Technical Responsibility: Mal Karajan — *Signature* — Laboratory Supervisor *Position*

Laboratory Report Version 4.2

Moisture - Density Report

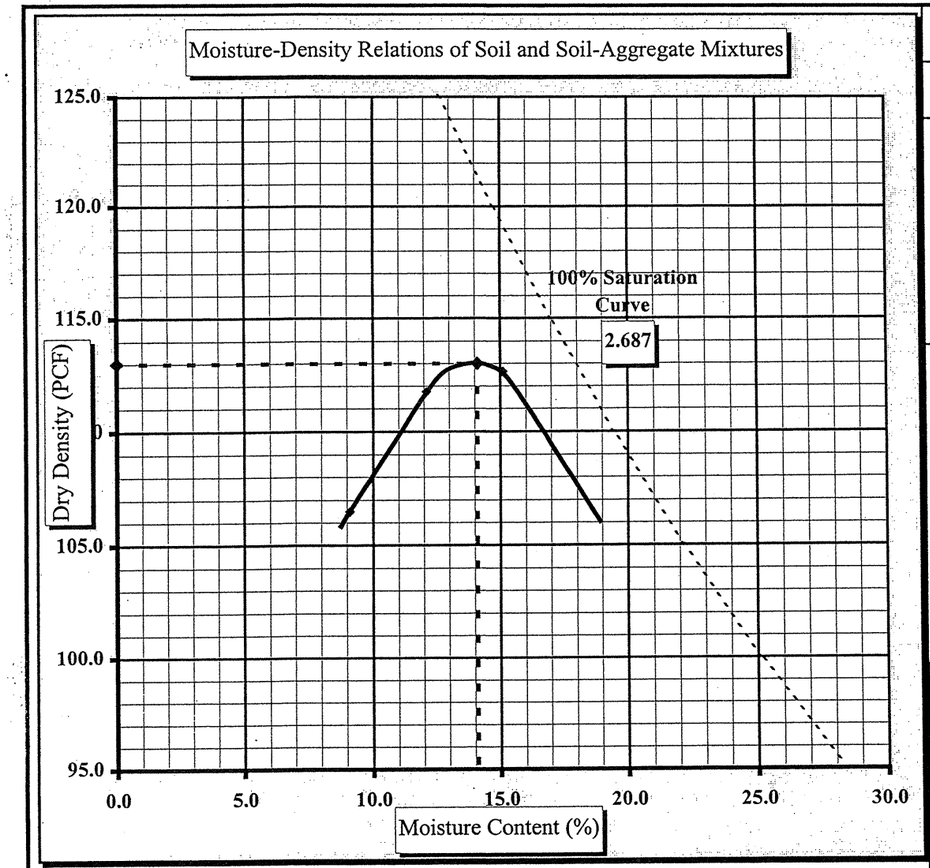
S&ME

S&ME Project #:	**1051-03-202**	Report Date:	01/09/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	01/06/04 - 01/09/04
Client Name:			
Client Address:			

Boring #:	B-16	Sample #:	S-7	Sample Date:	November 24, 2003
Location:	93+00 -L-	Offset:	0	Depth (ft):	1-5
Sample Description:	Orange Silty CLAY				

Maximum Dry Density 113.0 PCF. **Optimum Moisture Content 14.1 %**

ASTM D 698 Method A



Soil Properties	
Natural Moisture Content:	16.2%
Liquid Limit:	34
Plastic Limit:	18
Plastic Index:	16
Specific Gravity:	2.687
% Passing #4	100

Oversize Fraction

Bulk Sp. Gravity
% Moisture
Oversize Fraction
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Hammer ☐ Manual Hammer ☒ Moist Preparation ☒ Dry Preparation ☐

References: ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
AASHTO T88: Particle Size Analysis of Soils
AASHTO T89: Determining the Liquid Limit of Soils AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

S&ME,INC. **3109 Spring Forest Road, Raleigh, NC. 27616** **B-16 S-7 1-5' Proctor**

CBR (California Bearing Ratio) of Laboratory Compacted Soil

S&ME

ASTM D 1883

Project #: **1051-03-202** Report Date: 01/14/03

Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/14/03

Client Name:

Client Address:

Boring #: B-16 Sample #: S-7 Sample Date: 11/24/03

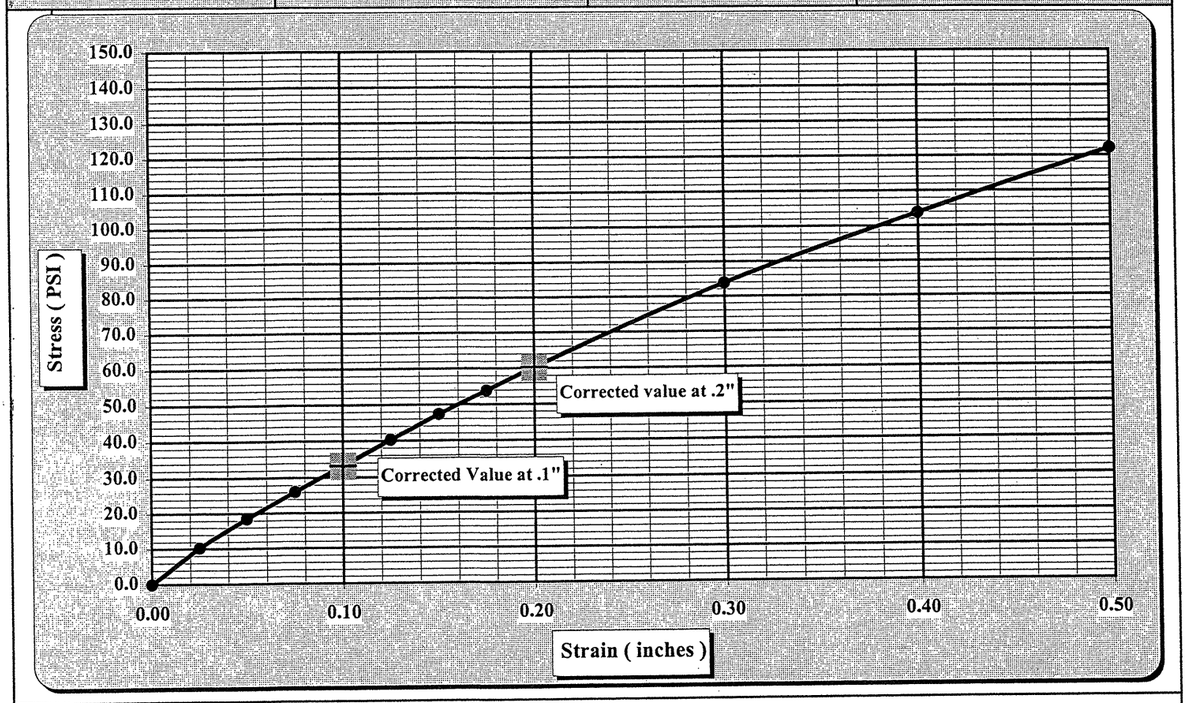
Location: 93+00 -L- Offset: 0 Depth (ft): 1-5

Sample Description: Orange Silty CLAY

ASTM D 698 Method A Maximum Dry Density (PCF): 113.0 Optimum Moisture Content: 14.1%

Compaction Test performed on the Fine Fraction only % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 3.3	CBR at 0.2 in. 4.0	CBR at 0.1 in. 3.3	CBR at 0.2 in. 4.0



CBR Sample Preparation: *Performed on the fine fraction*

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	65	Final Dry Density (PCF)	113.1
Initial Dry Density (PCF)	114.0	Average Final Moisture Content	16.2%
Moisture Content of the Compacted Specimen	15.7%	Moisture Content (top 1" after soaking)	17.7%
Percent Compaction	100.9%	Percent Swell	0.3%

Soak Time: 103.0 hrs. Surcharge Weight 10.0 Surcharge Wt. per sq. Ft. 50.9

Liquid Limit 34 Plastic Index 16 Apparent Relative Density 2.687

References: ASTM D 1883: CBR (California Bearing Ratio) of Laboratory-Compacted Soil

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T88: Particle Size Analysis of Soils

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Laboratory Record version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/6/04-1/12/04
Report Date: 1/12/04

Boring #: B-16 Sample #: S-7 Sample Date: 11/24/03
Location: 93+00 -L- Offset: 0 Depth: 1-5'
Sample Description: Orange Silty CLAY A-6

Pan #:	4	Beaker #:	5
Hydrometer Jar #:			6
Pan Tare Weight (grams):			7.86
Total Sample Dry Wt. + tare wt. (grams):			310.08
Weight of Total Sample Air Dried:			302.22
Weight of Air Dried Hydrometer Sample (g):			50.74
Total Sample Oven Dried:			299.52
Hydrometer Sample Oven Dried (**W**):			50.29
% Passing #10:			100.0%
Correction Factor a (Table 1):			1.00

Group Index: **(6)**
Apparent Relative Density:

	Moisture Content	Hygroscopic	Natural
	Tare #	10	18
A	Tare Wt.	15.23	8.04
B	Wet Wt. + A	35.74	153.29
C	Dry Wt. + A	35.55	133.00
D	Water Wt. (B-C)	0.19	20.29
E	Dry Wt.(C-A)	20.32	124.96
	% Moisture (100 x D/E)	0.9%	16.2%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	**0.00**	**100.0%**	**100.0%**
#20	0.51	99.0%	99.0%
#40	2.93	94.2%	94.2%
#60	7.57	84.9%	84.9%
#100	15.57	69.0%	69.0%
#200	22.85	54.6%	54.6%
#270	25.39	49.5%	49.5%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm
Coarse Sand:	15.1%	< 2.00 mm and > 0.25 mm
Fine Sand:	35.4%	< 0.25 mm and > 0.05 mm
% Silt:	18%	< 0.05 and > 0.005 mm
% Clay:	31%	< 0.005 mm

Maximum Particle Size: #10
% Retained on #60: 15.1% Total Sample
Minus #10 portion (Soil Mortar)
Coarse Sand: 15.1% Silt: 18.1%
Fine Sand: 35.4% Clay: 31.4%

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 55%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Liquid Limit **34** Plastic Limit **18** Plastic Index **16**

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)$^{1/2}$
12:00	0.58	18.7	32.0	6.2	5.7	25.8	51.3%	51.3%	12.1	0.01378	0.06294
1:00	60	19.4	22.0	6.2	5.9	15.8	31.4%	31.4%	13.7	0.01378	0.00658
2:00	120	20.7	20.0	6.2	6.1	13.8	27.4%	27.4%	14.0	0.01342	0.00458

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan

OCT-1433
Certification #

Signature

Laboratory Supervisor
Position

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616

B-16 Classification

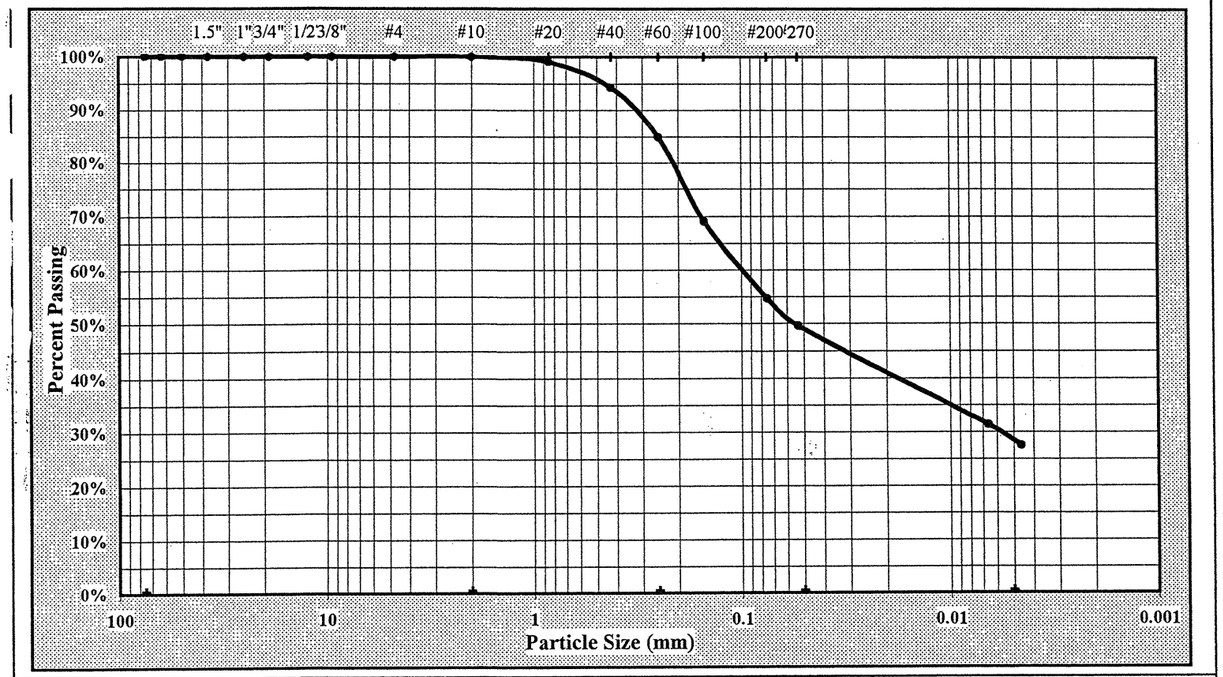
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/12/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/6/04-1/12/04
Client Name:			
Client Address:			
State Project #:		F.A. Project No:	TIP NO:
Boring #:	B-16	Sample #: S-7	Sample Date: 11/24/03
Location:	93+00 -L-	Offset: 0	Depth: 1-5'
Sample Description:			Orange Silty CLAY A-6 (6)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	15.1%	Silt	18%
Gravel	0.0%	Fine Sand	35.4%	Clay	31%
Apparent Relative Density		Moisture Content	16.2%	% Passing #200	54.6%
Liquid Limit	34	Plastic Limit	18	Plastic Index	16

Soil Mortar (-#10 Sieve)

Coarse Sand 15.1% Fine Sand 35.4% Silt 18% Clay 31%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616

B-16 Classification

Laboratory Record Version 4.2

Liquid Limit, Plastic Limit, and Plastic Index

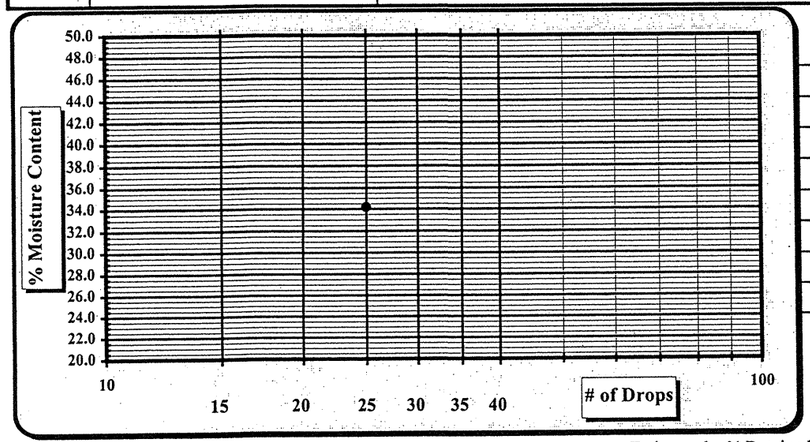
S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:

Report Date: 1/12/04
Test Date(s): 1/6/04-1/12/04

Boring #: B-16 Sample #: S-7 Sample Date: 11/24/03
Location: 93+00 -L- Offset: Depth(ft): 1-5'
Sample Description: Orange Silty CLAY A-6 (6)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	31						101		
A	Tare Weight	8.20						6.13		
B	Wet Soil Weight + A	20.05						14.16		
C	Dry Soil Weight + A	17.03						12.94		
D	Water Weight (B-C)	3.02						1.22		
E	Dry Soil Weight (C-A)	8.83						6.81		
F	% Moisture Content (D/E)*100	34.2%						17.9%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							17.9%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried	☒	NP, Non-Plastic ☐
Liquid limit Test:	Multipoint Method	☐	One-point Method	☒			Liquid Limit 34
Classification:	ASTM D 2487	☐	AASHTO M 145	☒			Plastic Limit 18
Liquid limit Test:	ASTM D 4318	☐	AASHTO T 89	☒			Plastic Index 16
Plastic limit Test:	ASTM D 4318	☐	AASHTO T 90	☒			Group Symbol A-6

Technician Name: Tom Savanapridi OCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Laboratory Report Version 4.2

Moisture - Density Report

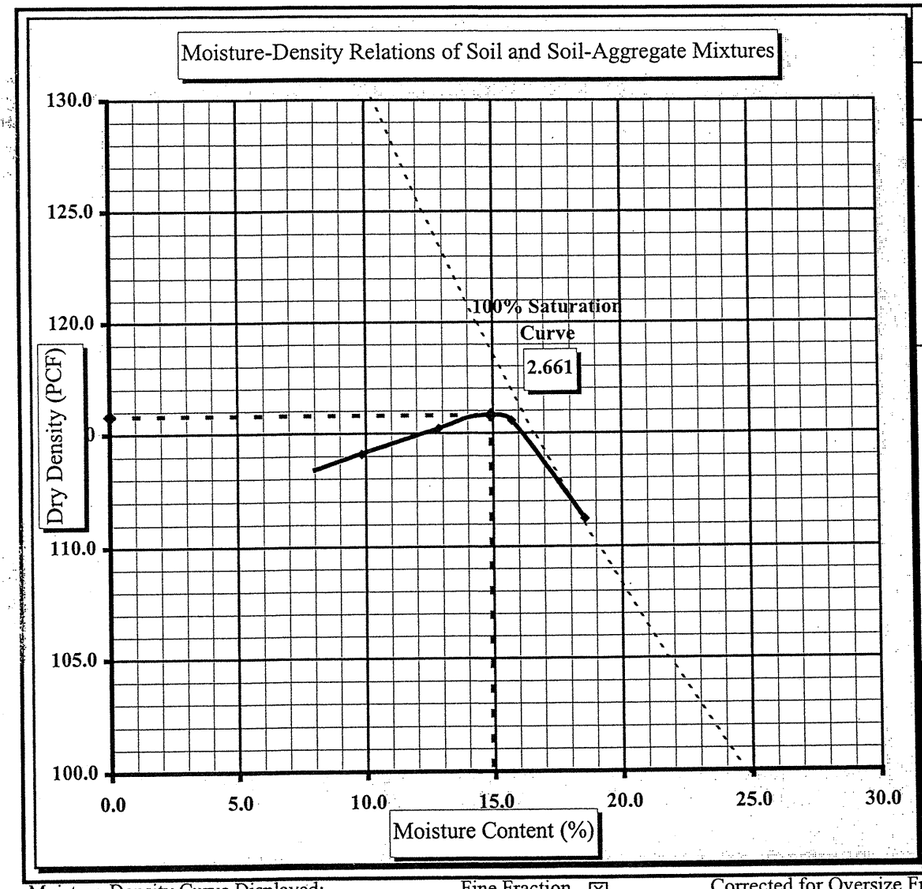
S&ME

S&ME Project #: **1051-03-202** Report Date: 01/09/04
Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/09/04
Client Name:
Client Address:

Boring #:	B-17	Sample #:	S-7	Sample Date:	November 24, 2003
Location:	95+00 -L-	Offset:	0	Depth (ft):	1-5
Sample Description:	Red Brown Silty CLAY				

Maximum Dry Density 115.8 PCF. **Optimum Moisture Content 14.9 %**

ASTM D 698 Method A



Soil Properties	
Natural Moisture Content:	6.1%
Liquid Limit:	36
Plastic Limit:	18
Plastic Index:	18
Specific Gravity:	2.661
% Passing #4	100

Oversize Fraction

Bulk Sp. Gravity
% Moisture
Oversize Fraction
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
Mechanical Hammer ☐ Manual Hammer ☒ Moist Preparation ☒ Dry Preparation ☐

References: ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
AASHTO T88: Particle Size Analysis of Soils
AASHTO T 100: Specific Gravity of Soils
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

S&ME,INC. 3109 Spring Forest Road, Raleigh, NC. 27616 B-17 S-8 5-8.5' Proctor

CBR (California Bearing Ratio) of Laboratory Compacted Soil

S&ME

ASTM D 1883

Project #: **1051-03-202** Report Date: 01/14/03

Project Name: **Louis Stephens Drive** Test Date(s): 01/06/04 - 01/14/03

Client Name:

Client Address:

Boring #: B-17 Sample #: S-8 Sample Date: 11/24/03

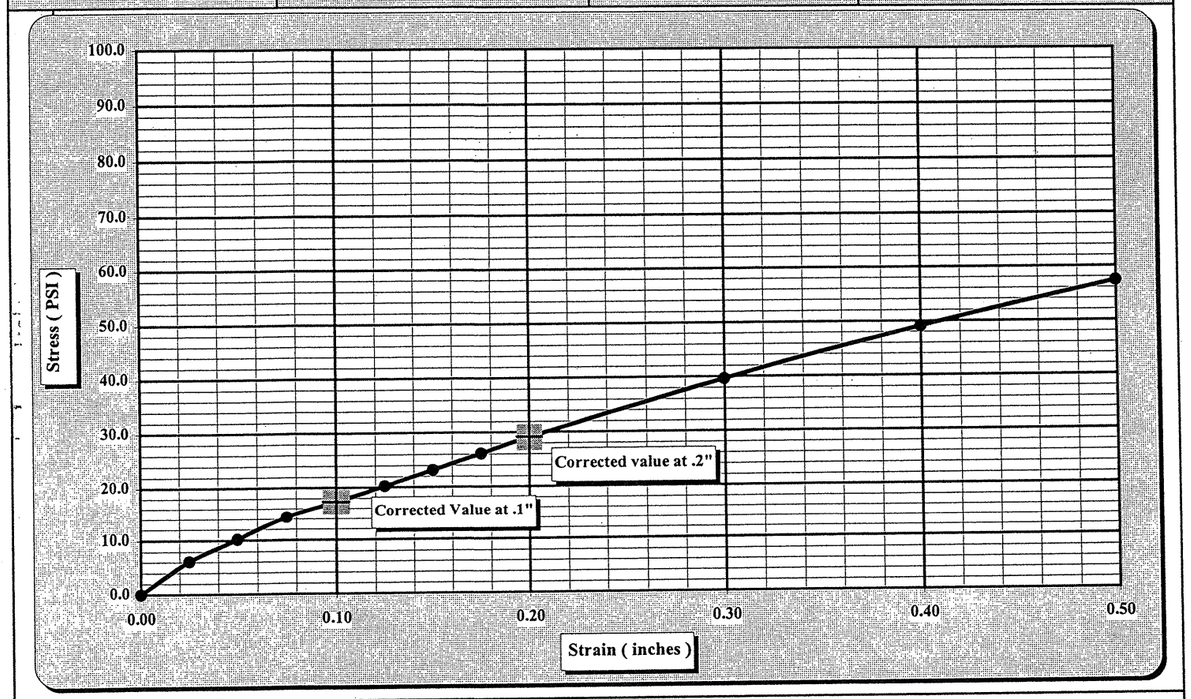
Location: 95+00 -L- Offset: 0 Depth (ft): 1-5

Sample Description: Brown Sandy Silty CLAY

ASTM D 698 Method A Maximum Dry Density (PCF): 115.8 Optimum Moisture Content: 14.9%

Compaction Test performed on the Fine Fraction only % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 1.7	CBR at 0.2 in. 1.9	CBR at 0.1 in. 1.7	CBR at 0.2 in. 1.9



CBR Sample Preparation: *Performed on the fine fraction*

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	75	Final Dry Density (PCF)	109.6
Initial Dry Density (PCF)	114.0	Average Final Moisture Content	18.3%
Moisture Content of the Compacted Specimen	16.6%	Moisture Content (top 1" after soaking)	21.9%
Percent Compaction	98.4%	Percent Swell	2.6%

Soak Time: 101.8 hrs. Surcharge Weight 10.0 Surcharge Wt. per sq. Ft. 50.8

Liquid Limit 36 Plastic Index 18 Apparent Relative Density 2.661

References: ASTM D 1883: CBR (California Bearing Ratio) of Laboratory-Compacted Soil

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T88: Particle Size Analysis of Soils

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

S&ME, Inc. **3109 Spring Forest Road, Raleigh, NC. 27616** **B-17 S-8 5-8.5' CBR**

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/6/04-1/12/04
Report Date: 1/12/04

Boring #: B-17 Sample #: S-8 Sample Date: 11/24/03
Location: 95+00 -L- Offset: 0 Depth: 1-5
Sample Description: Red Brown Silty CLAY A-6

Pan #:	23	Beaker #:	17
Hydrometer Jar #:			16
Pan Tare Weight (grams):			7.92
Total Sample Dry Wt. + tare wt. (grams):			339.12
Weight of Total Sample Air Dried:			331.20
Weight of Air Dried Hydrometer Sample (g):			50.30
Total Sample Oven Dried:			325.98
Hydrometer Sample Oven Dried (W):			49.51
% Passing #10:			100.0%
Correction Factor a (Table 1):			1.00

Group Index: **(14)**
Apparent Relative Density:

	Moisture Content	Hygroscopic	Natural
	Tare #	3	44
A	Tare Wt.	15.25	7.93
B	Wet Wt. + A	36.33	253.88
C	Dry Wt. + A	36.00	239.69
D	Water Wt. (B-C)	0.33	14.19
E	Dry Wt.(C-A)	20.75	231.76
	% Moisture (100 x D/E)	1.6%	6.1%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	**0.00**	**100.0%**	**100.0%**
#20	0.50	99.0%	99.0%
#40	1.02	97.9%	97.9%
#60	1.64	96.7%	96.7%
#100	3.24	93.5%	93.5%
#200	7.93	84.0%	84.0%
#270	11.99	75.8%	75.8%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm
Coarse Sand:	3.3%	< 2.00 mm and > 0.25 mm
Fine Sand:	20.9%	< 0.25 mm and > 0.05 mm
% Silt:	39%	< 0.05 and > 0.005 mm
% Clay:	37%	< 0.005 mm

Maximum Particle Size: #10
% Retained on #60: 3.3% Total Sample
Minus #10 portion (Soil Mortar)
Coarse Sand: 3.3% Silt: 38.8%
Fine Sand: 20.9% Clay: 37.0%

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 84%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Liquid Limit 36 Plastic Limit 18 Plastic Index 18

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)^1/2
12:00	0.58	19.0	45.0	6.2	5.8	38.8	78.4%	78.4%	9.9	0.01378	0.05693
1:00	60	19.8	24.5	6.2	6.0	18.3	37.0%	37.0%	13.3	0.01378	0.00649
2:00	120	21.3	21.5	6.2	6.3	15.3	30.9%	30.9%	13.8	0.01342	0.00455

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan
OCT-1433 (Certification #)
Signature
Laboratory Supervisor (Position)

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

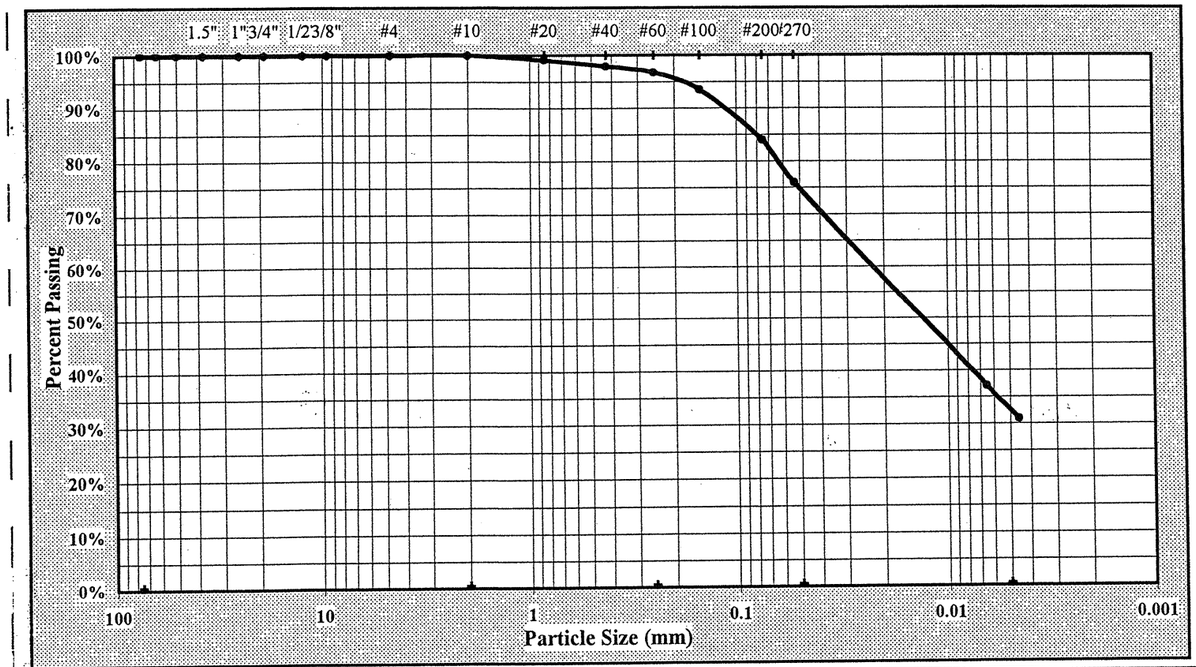
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/12/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/6/04-1/12/04
Client Name:			
Client Address:			
State Project #:		F.A. Project No:	TIP NO:
Boring #:	B-17	Sample #: S-8	Sample Date: 11/24/03
Location:	95+00 -L-	Offset: 0	Depth: 1-5
Sample Description:			Red Brown Silty CLAY A-6 (14)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	3.3%	Silt	39%
Gravel	0.0%	Fine Sand	20.9%	Clay	37%
Apparent Relative Density		Moisture Content	6.1%	% Passing #200	84.0%
Liquid Limit	36	Plastic Limit	18	Plastic Index	18

Soil Mortar (-#10 Sieve)

Coarse Sand 3.3% Fine Sand 20.9% Silt 39% Clay 37%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

Laboratory Record Version 4.2

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1051-03-202** Report Date: 1/12/04

Project Name: Louis Stephens Drive Test Date(s): 1/6/04-1/12/04

Client Name:

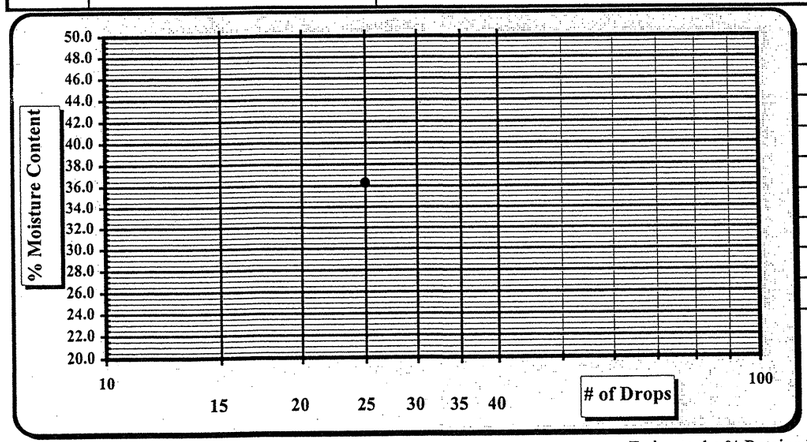
Client Address:

Boring #: B-17 Sample #: S-8 Sample Date: 11/24/03

Location: 95+00 -L- Offset: Depth(ft): 1-5

Sample Description: Red Brown Silty CLAY A-6 (14)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	22						33		
A	Tare Weight	8.31						6.09		
B	Wet Soil Weight + A	20.59						15.08		
C	Dry Soil Weight + A	17.32						13.72		
D	Water Weight (B-C)	3.27						1.36		
E	Dry Soil Weight (C-A)	9.01						7.63		
F	% Moisture Content (D/E)*100	36.3%						17.8%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							17.8%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☐	One-point Method ☒		Liquid Limit	36
Classification:	ASTM D 2487 ☐	AASHTO M 145 ☒		Plastic Limit	18
Liquid limit Test:	ASTM D 4318 ☐	AASHTO T 89 ☒		Plastic Index	18
Plastic limit Test:	ASTM D 4318 ☐	AASHTO T 90 ☒		Group Symbol	A-6

Technician Name: Tom Savanapridi OCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/16//04-1/23/04
Report Date: 1/23/04

Boring #: B-4 Sample #: SS-1 Sample Date: 12/ 9/03
Location: 208+00 -Y-1 Offset: 0 Depth (ft): 1-2.5
Sample Description: Tan Silty CLAY A-7-6

Pan #:	5	Beaker #:	PP-2	Group Index	(27)	
Hydrometer Jar #:			24	Apparent Relative Density		
Pan Tare Weight (grams):			7.89	**Moisture Content**	Hygroscopic	Natural
Total Sample Wet Wt. + tare wt. (grams):			167.95	Tare #	6	16
Weight of Total Sample Air Dried:			160.06	A Tare Wt.	15.22	7.88
Weight of Air Dried Hydrometer Sample (g):			50.05	B Wet Wt. + A	35.27	39.42
Total Sample Oven Dried:			157.03	C Dry Wt. + A	34.89	34.95
Hydrometer Sample Oven Dried (W):			49.10	D Water Wt. (B-C)	0.38	4.47
% Passing #10:			100.0%	E Dry Wt.(C-A)	19.67	27.07
Correction Factor a (Table 1):			1.00	% Moisture (100 x D/E)	1.93%	16.5%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	**0.00**	**100.0%**	**100.0%**
#20	0.17	99.7%	99.7%
#40	0.31	99.4%	99.4%
#60	0.43	99.1%	99.1%
#100	0.68	98.6%	98.6%
#200	2.44	95.0%	95.0%
#270	6.20	87.4%	87.4%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm	Maximum Particle Size:	#10		Mechanical Stirring Apparatus (A)	ID#
Coarse Sand:	0.9%	< 2.00 mm and > 0.25 mm	% Retained on #60:	0.9%	Total Sample	Dispersion Time:	1 min.
Fine Sand:	11.7%	< 0.25 mm and > 0.05 mm	Minus #10 portion (Soil Mortar)			Sodium Hexametaphosphate:	40 g./ Liter
% Silt:	54%	< 0.05 and > 0.005 mm	Coarse Sand:	0.9%	Silt: 53.8%	% passing #200 as whole % #:	95%
% Clay:	34%	< 0.005 mm	Fine Sand:	11.7%	Clay: 33.6%	Control Cylinder ☐	Composite Correction ☒
Liquid Limit	46	Plastic Limit	19	Plastic Index	27	Hydrometer:	151H ☐ 152H ☒

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)$^{1/2}$
2:52	0.58	20.4	51.0	6.0	6.1	45.0	91.6%	91.6%	8.9	0.01378	0.05398
3:52	60	22.3	22.5	6.0	6.5	16.5	33.6%	33.6%	13.6	0.01342	0.00639
4:52	120	23.4	19.9	6.0	6.7	13.9	28.3%	28.3%	14.0	0.01304	0.00445

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan
OCT-1433 (Certification #)
Signature
Laboratory Supervisor (Position)

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

3109 Spring Forest Road, Raleigh, N.C. 27616

B-4 SS-1 Classification

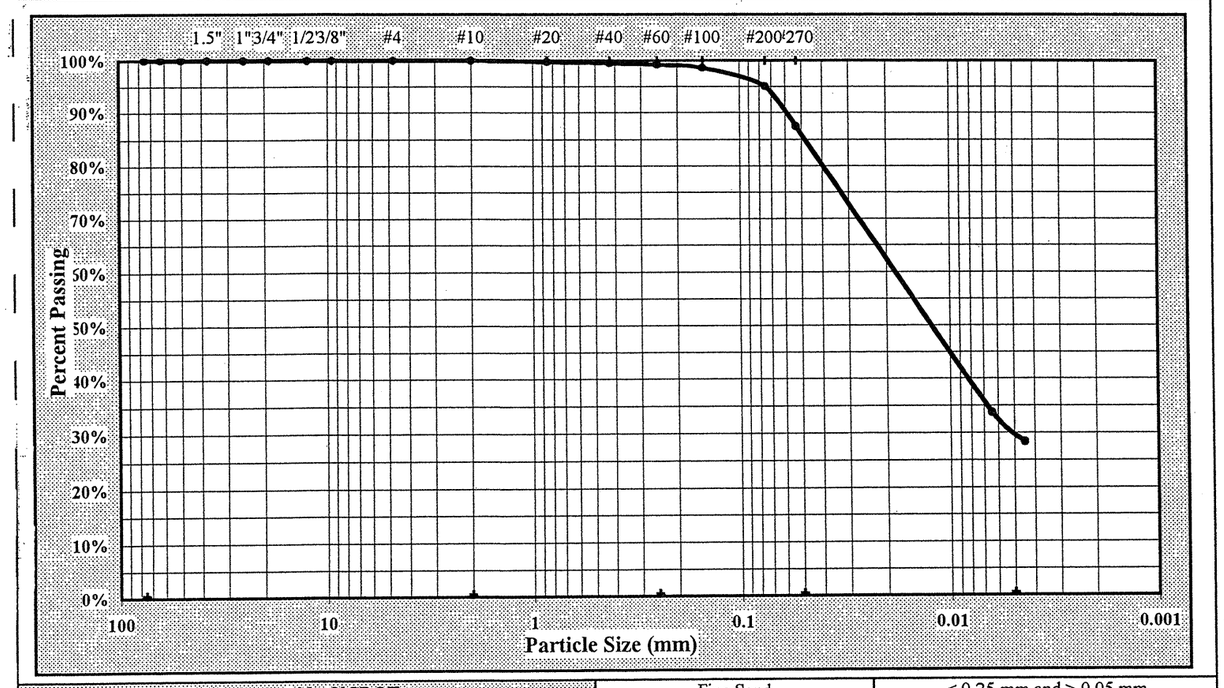
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/23/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/16//04-1/23/04
Client Name:			
Client Address:			
State Project #:		F.A. Project No:	TIP NO:
Boring #:	B-4	Sample #: SS-1	Sample Date: 12/ 9/03
Location:	208+00 -Y-1	Offset: 0	Depth (ft): 1-2.5
Sample Description:			Tan Silty CLAY A-7-6 (27)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	0.9%	Silt	54%
Gravel	0.0%	Fine Sand	11.7%	Clay	34%
Apparent Relative Density		Moisture Content	16.5%	% Passing #200	95.0%
Liquid Limit	46	Plastic Limit	19	Plastic Index	27

Soil Mortar (-#10 Sieve)

Coarse Sand	0.9%	Fine Sand	11.7%	Silt	54%	Clay	34%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:

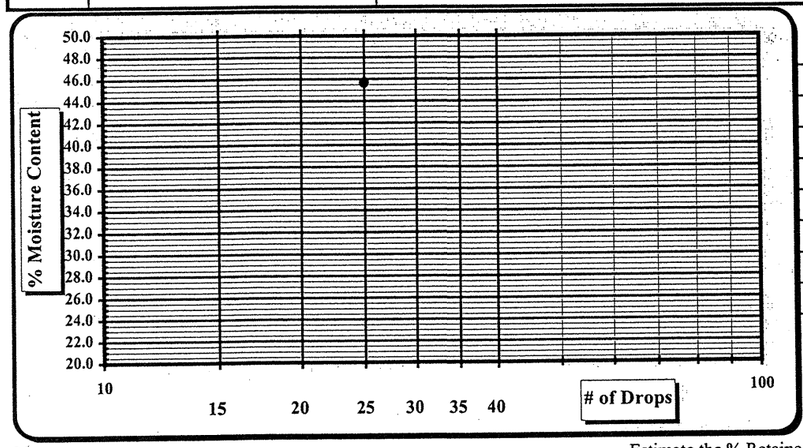
Report Date: 1/23/04
Test Date(s): 1/16//04-1/23/04

Boring #: B-4 Sample #: SS-1 Sample Date: 12/29/03

Location: 208+00 -Y-1 Offset: Depth(ft): 1-2.5

Sample Description: Tan Silty CLAY A-7-6 (27)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	24						231		
A	Tare Weight	8.04						6.47		
B	Wet Soil Weight + A	20.86						15.13		
C	Dry Soil Weight + A	16.84						13.75		
D	Water Weight (B-C)	4.02						1.38		
E	Dry Soil Weight (C-A)	8.80						7.28		
F	% Moisture Content (D/E)*100	45.7%						19.0%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							19.0%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried	☒	NP, Non-Plastic ☐
Liquid limit Test:	Multipoint Method	☐	One-point Method	☒			Liquid Limit 46
Classification:	ASTM D 2487	☐	AASHTO M 145	☒			Plastic Limit 19
Liquid limit Test:	ASTM D 4318	☐	AASHTO T 89	☒			Plastic Index 27
Plastic limit Test:	ASTM D 4318	☐	AASHTO T 90	☒			Group Symbol A-7-6

Technician Name: Tom Savanapridi OCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/16//04-1/23/04
Report Date: 1/23/04

Boring #: B-17 Sample #: SS-2 Sample Date: 11/24/03
Location: 95+00 -L- Offset: 0 Depth (ft): 1-2.5
Sample Description: Red Brown Silty CLAY A-6

Pan #:	18	Beaker #:	PB-2	Group Index		(17)
Hydrometer Jar #:			10	Apparent Relative Density		
Pan Tare Weight (grams):			7.96	**Moisture Content**	Hygroscopic	Natural
Total Sample Wet Wt. + tare wt. (grams):			215.59	Tare #	2	46
Weight of Total Sample Air Dried:			207.63	A Tare Wt.	15.29	7.97
Weight of Air Dried Hydrometer Sample (g):			51.08	B Wet Wt. + A	35.27	62.79
Total Sample Oven Dried:			203.68	C Dry Wt. + A	34.89	55.93
Hydrometer Sample Oven Dried (W):			50.11	D Water Wt. (B-C)	0.38	6.86
% Passing #10:			100.0%	E Dry Wt.(C-A)	19.60	47.96
Correction Factor a (Table 1):			1.00	% Moisture (100 x D/E)	1.94%	14.3%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	**0.00**	**100.0%**	**100.0%**
#20	0.10	99.8%	99.8%
#40	0.42	99.2%	99.2%
#60	0.99	98.0%	98.0%
#100	2.29	95.4%	95.4%
#200	5.62	88.8%	88.8%
#270	8.47	83.1%	83.1%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm
Coarse Sand:	2.0%	< 2.00 mm and > 0.25 mm
Fine Sand:	14.9%	< 0.25 mm and > 0.05 mm
% Silt:	38%	< 0.05 and > 0.005 mm
% Clay:	45%	< 0.005 mm

Maximum Particle Size: #10
% Retained on #60: 2.0% Total Sample

Minus #10 portion (Soil Mortar)

Coarse Sand:	2.0%	Silt:	38.2%
Fine Sand:	14.9%	Clay:	44.9%

Liquid Limit 40 Plastic Limit 21 Plastic Index 19

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 89%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)$^{1/2}$
2:46	0.58	21.0	46.0	6.0	6.2	40.0	79.8%	79.8%	9.7	0.01342	0.05488
3:46	60	22.4	28.5	6.0	6.5	22.5	44.9%	44.9%	12.6	0.01342	0.00615
4:46	120	22.4	26.5	6.0	6.5	20.5	40.9%	40.9%	12.9	0.01342	0.00440

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan

QCT-1433
Certification #

Signature

Laboratory Supervisor
Position

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616

B-17-SS-2 Classification

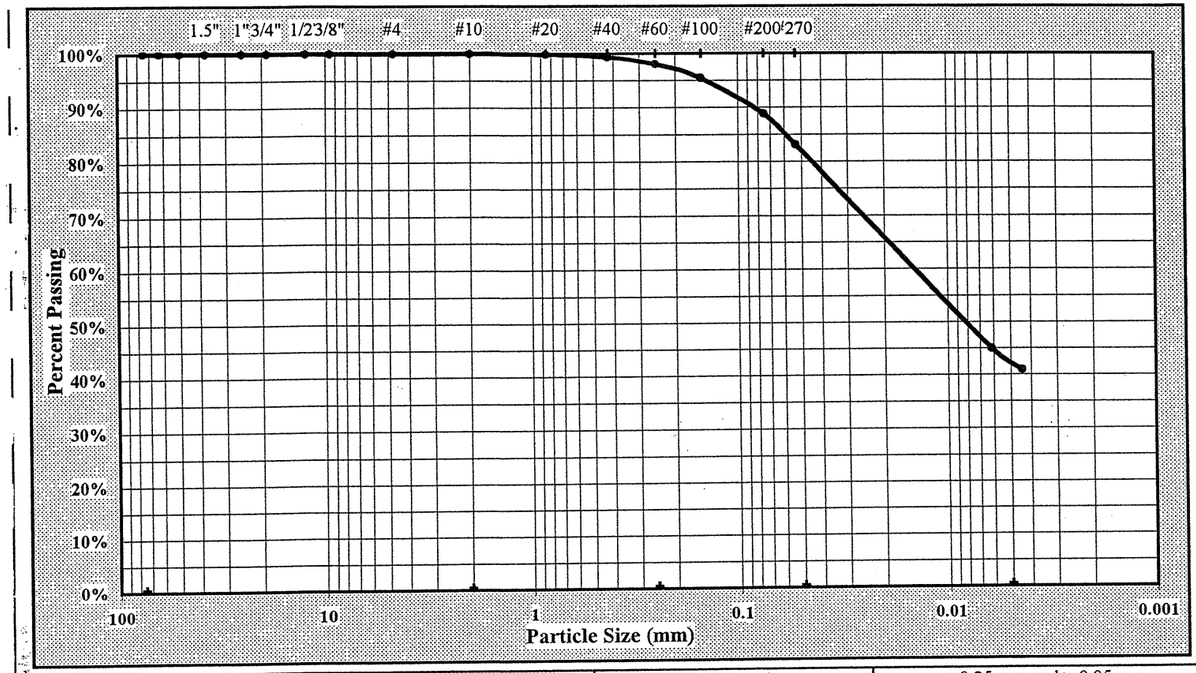
aboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/23/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/16//04-1/23/04
Client Name:			
Client Address:			
State Project #:		F.A. Project No:	TIP NO:
Boring #:	B-17	Sample #: SS-2	Sample Date: 11/24/03
Location:	95+00 -L-	Offset: 0	Depth (ft): 1-2.5
Sample Description:			Red Brown Silty CLAY A-6 (17)



As Defined by NCDOT			
Gravel	< 75 mm and > 2.00 mm	Fine Sand	< 0.25 mm and > 0.05 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Silt	< 0.05 and > 0.005 mm
		Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	2.0%	Silt	38%
Gravel	0.0%	Fine Sand	14.9%	Clay	45%
Apparent Relative Density		Moisture Content	14.3%	% Passing #200	88.8%
Liquid Limit	40	Plastic Limit	21	Plastic Index	19

Soil Mortar (-#10 Sieve)

Coarse Sand 2.0% Fine Sand 14.9% Silt 38% Clay 45%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

S&ME, INC. 3109 Spring Forest Road, Raleigh, N.C. 27616 B-17-SS-2 Classification

Laboratory Record Version 4.2

Liquid Limit, Plastic Limit, and Plastic Index

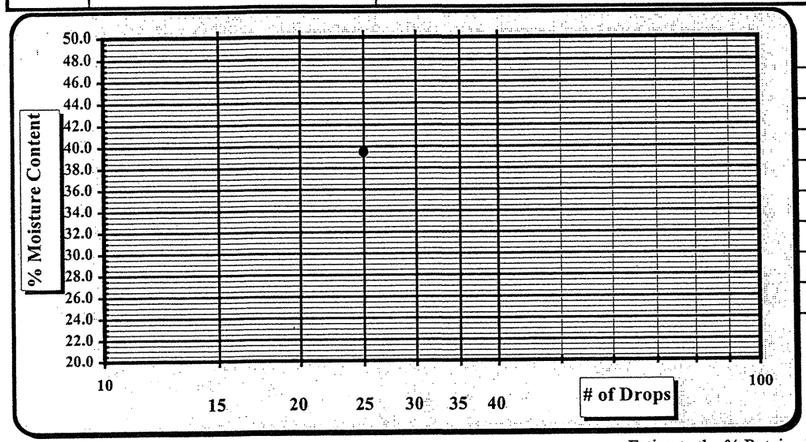
S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:

Report Date: 1/23/04
Test Date(s): 1/16//04-1/23/04

Boring #: B-17 Sample #: SS-2 Sample Date: 11/24/03
Location: 95+00 -L- Offset: Depth(ft): 1-2.5
Sample Description: Red Brown Silty CLAY A-6 (17)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	103						26		
A	Tare Weight	8.23						6.42		
B	Wet Soil Weight + A	19.18						14.24		
C	Dry Soil Weight + A	16.08						12.87		
D	Water Weight (B-C)	3.10						1.37		
E	Dry Soil Weight (C-A)	7.85						6.45		
F	% Moisture Content (D/E)*100	39.5%						21.2%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							21.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried	☒	NP, Non-Plastic ☐
Liquid limit Test:	Multipoint Method	☐	One-point Method	☒			Liquid Limit 40
Classification:	ASTM D 2487	☐	AASHTO M 145	☒			Plastic Limit 21
Liquid limit Test:	ASTM D 4318	☐	AASHTO T 89	☒			Plastic Index 19
Plastic limit Test:	ASTM D 4318	☐	AASHTO T 90	☒			Group Symbol A-6

Technician Name: Tom Savanapridi OCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/16//04-1/23/04
Report Date: 1/23/04

Boring #: B-25 Sample #: SS-3 Sample Date: 11/25/03
Location: 111+00 -L- Offset: Depth (ft): 1-2.5
Sample Description: Orange Tan Sandy SILT A-4

Pan #:	47	Beaker #:	.41
Hydrometer Jar #:			7
Pan Tare Weight (grams):			8.20
Total Sample Wet Wt. + tare wt. (grams):			155.56
Weight of Total Sample Air Dried:			147.36
Weight of Air Dried Hydrometer Sample (g):			50.74
Total Sample Oven Dried:			147.07
Hydrometer Sample Oven Dried (W):			50.64
% Passing #10:			99.7%
Correction Factor a (Table 1):			1.00

Group Index: **(4)**
Apparent Relative Density:

	Moisture Content	Hygroscopic	Natural
	Tare #	3	15
A	Tare Wt.	15.29	9.26
B	Wet Wt. + A	35.83	54.51
C	Dry Wt. + A	35.79	49.74
D	Water Wt. (B-C)	0.04	4.77
E	Dry Wt.(C-A)	20.50	40.48
	% Moisture (100 x D/E)	0.20%	11.8%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	0.46	**100.0%**	**99.7%**
#20	0.16	99.7%	99.4%
#40	1.19	97.7%	97.4%
#60	3.60	92.9%	92.6%
#100	8.93	82.4%	82.2%
#200	17.73	65.0%	64.8%
#270	22.41	55.7%	55.5%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.3%	< 75 mm and > 2.00 mm
Coarse Sand:	7.1%	< 2.00 mm and > 0.25 mm
Fine Sand:	37.1%	< 0.25 mm and > 0.05 mm
% Silt:	30%	< 0.05 and > 0.005 mm
% Clay:	26%	< 0.005 mm

Maximum Particle Size: #4
% Retained on #60: 7.4% Total Sample

Minus #10 portion (Soil Mortar)
Coarse Sand: 7.1% Silt: 30.0%
Fine Sand: 37.2% Clay: 25.7%

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 65%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Liquid Limit **27** Plastic Limit 17 Plastic Index 10

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)$^{1/2}$
2:01	0.58	20.5	38.0	6.0	6.1	32.0	63.2%	63.0%	11.0	0.01342	0.05844
3:.01	60	22.4	19.0	6.0	6.5	13.0	25.7%	25.6%	14.2	0.01342	0.00653
4:01	120	23.1	16.5	6.0	6.6	10.5	20.7%	20.6%	14.6	0.01304	0.00455

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan

OCT-1433
Certification #
Signature

Laboratory Supervisor
Position

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

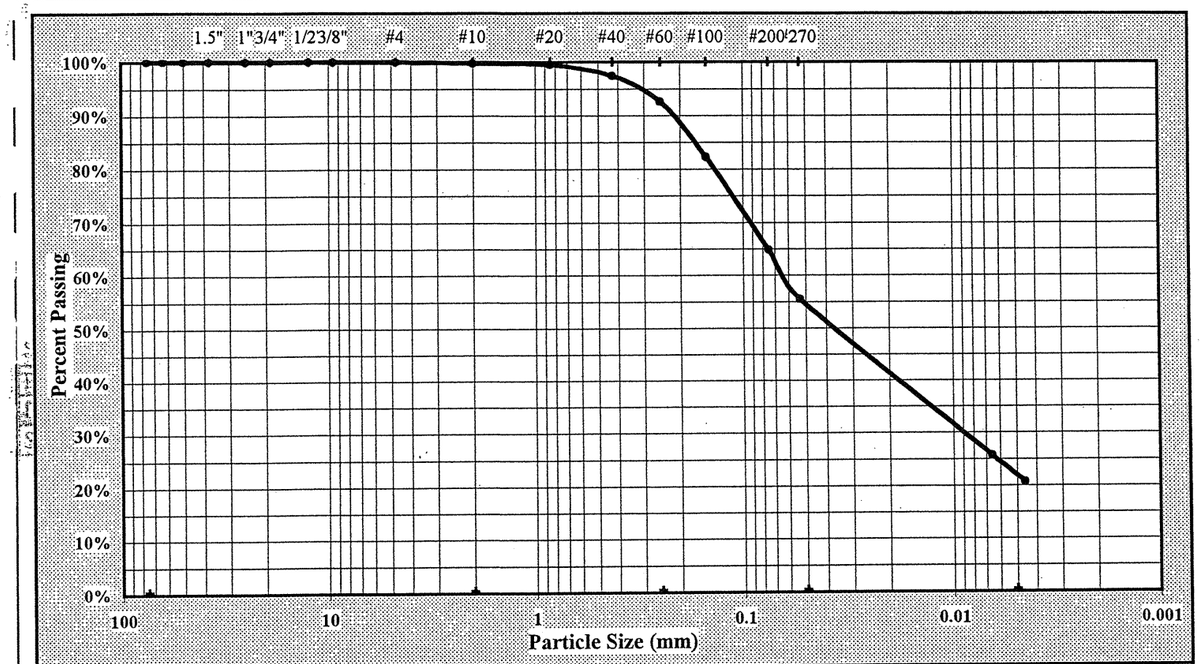
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/23/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/16//04-1/23/04
Client Name:			
Client Address:			
State Project #:	F.A. Project No:	TIP NO:	
Boring #: B-25	Sample #: SS-3	Sample Date: 11/25/03	
Location: 111+00 -L-	Offset:	Depth (ft): 1-2.5	
Sample Description:		Orange Tan Sandy SILT	A-4 (4)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	7.1%	Silt	30%
Gravel	0.3%	Fine Sand	37.1%	Clay	26%
Apparent Relative Density		Moisture Content	11.8%	% Passing #200	64.8%
Liquid Limit	27	Plastic Limit	17	Plastic Index	10

Soil Mortar (-#10 Sieve)

Coarse Sand	7.1%	Fine Sand	37.2%	Silt	30%	Clay	26%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T265: Laboratory Determination of Moisture Content of Soils
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

Laboratory Record Version 4.2

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1051-03-202** Report Date: 1/23/04

Project Name: Louis Stephens Drive Test Date(s): 1/16//04-1/23/04

Client Name:

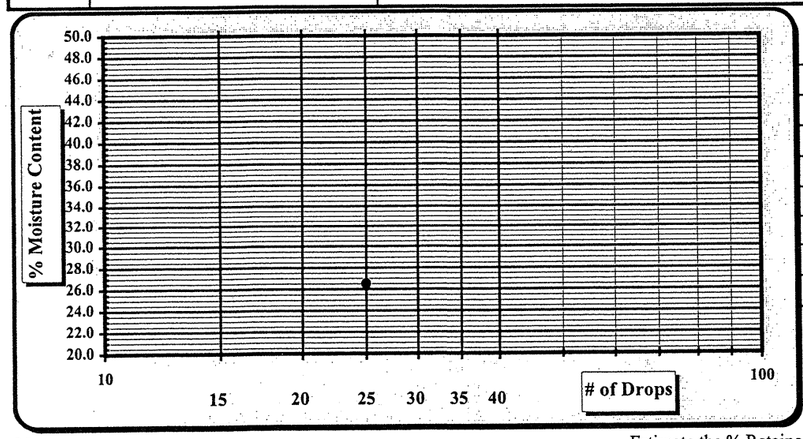
Client Address:

Boring #: B-25 Sample #: SS-3 Sample Date: 11/25/03

Location: 111+00 -L- Offset: Depth(ft): 1-2.5

Sample Description: Orange Tan Sandy SILT A-4 (4)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	25						30		
A	Tare Weight	7.92						6.22		
B	Wet Soil Weight + A	20.62						14.95		
C	Dry Soil Weight + A	17.96						13.66		
D	Water Weight (B-C)	2.66						1.29		
E	Dry Soil Weight (C-A)	10.04						7.44		
F	% Moisture Content (D/E)*100	26.5%						17.3%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							17.3%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried	☒	NP, Non-Plastic ☐
Liquid limit Test:	Multipoint Method	☐	One-point Method	☒			Liquid Limit 27
Classification:	ASTM D 2487	☐	AASHTO M 145	☒			Plastic Limit 17
Liquid limit Test:	ASTM D 4318	☐	AASHTO T 89	☒			Plastic Index 10
Plastic limit Test:	ASTM D 4318	☐	AASHTO T 90	☒			Group Symbol A-4

Technician Name: Tom Savanapridi OCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/16//04-1/23/04
Report Date: 1/23/04

Boring #: B-27 Sample #: SS-4 Sample Date: 11/25/03
Location: 115+00 -L- Offset: 0 Depth: 1-2.5
Sample Description: Brown Silty CLAY A-6

Pan #:	27	Beaker #:	1
Hydrometer Jar #:			5
Pan Tare Weight (grams):			7.89
Total Sample Wet Wt. + tare wt. (grams):			174.23
Weight of Total Sample Air Dried:			166.34
Weight of Air Dried Hydrometer Sample (g):			51.05
Total Sample Oven Dried:			163.83
Hydrometer Sample Oven Dried **(W)**:			50.28
% Passing #10:			100.0%
Correction Factor a (Table 1):			1.00

Group Index: **(12)**
Apparent Relative Density:

	Moisture Content	Hygroscopic	Natural
	Tare #	9	142
A	Tare Wt.	15.30	9.23
B	Wet Wt. + A	35.25	61.19
C	Dry Wt. + A	34.95	55.82
D	Water Wt. (B-C)	0.30	5.37
E	Dry Wt.(C-A)	19.65	46.59
	% Moisture (100 x D/E)	1.53%	11.5%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	0.00		100.0%
#4	0.00	Soil Mortar	100.0%
#10	**0.00**	**100.0%**	**100.0%**
#20	0.23	99.5%	99.5%
#40	0.30	99.4%	99.4%
#60	0.47	99.1%	99.1%
#100	1.10	97.8%	97.8%
#200	5.97	88.1%	88.1%
#270	12.35	75.4%	75.4%

Notes: Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

% Gravel:	0.0%	< 75 mm and > 2.00 mm
Coarse Sand:	0.9%	< 2.00 mm and > 0.25 mm
Fine Sand:	23.7%	< 0.25 mm and > 0.05 mm
% Silt:	45%	< 0.05 and > 0.005 mm
% Clay:	31%	< 0.005 mm

Maximum Particle Size: #10
% Retained on #60: 0.9% Total Sample
Minus #10 portion (Soil Mortar)
Coarse Sand: 0.9% Silt: 44.6%
Fine Sand: 23.7% Clay: 30.8%

Liquid Limit **36** Plastic Limit **22** Plastic Index **14**

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 88%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)$^{1/2}$
2:49	0.58	20.5	47.0	6.0	6.1	41.0	81.5%	81.5%	9.6	0.01342	0.05460
3:49	60	22.3	21.5	6.0	6.5	15.5	30.8%	30.8%	13.8	0.01342	0.00644
4:49	120	23.5	18.5	6.0	6.7	12.5	24.9%	24.9%	14.2	0.01304	0.00449

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi OCT-1433 (Certification #)
Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

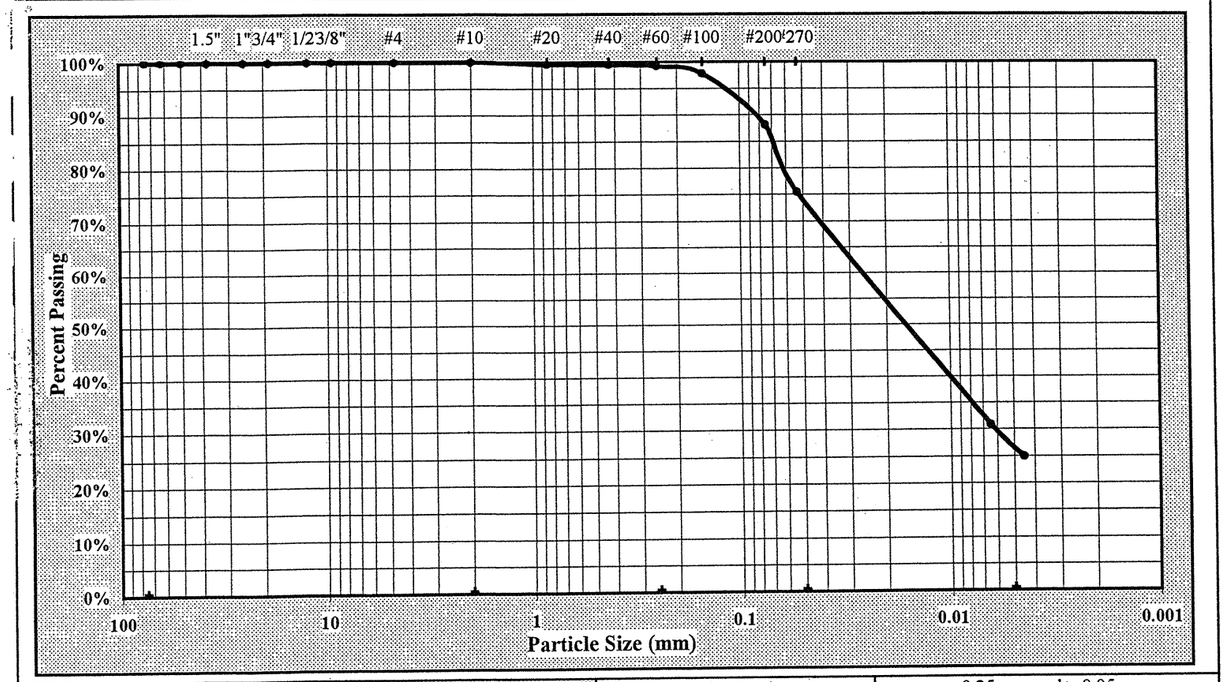
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/23/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/16//04-1/23/04
Client Name:			
Client Address:			
State Project #:	F.A. Project No:	TIP NO:	
Boring #: B-27	Sample #: SS-4	Sample Date: 11/25/03	
Location: 115+00 -L-	Offset: 0	Depth: 1-2.5	
Sample Description:		Brown Silty CLAY	A-6 (12)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	0.9%	Silt	45%
Gravel	0.0%	Fine Sand	23.7%	Clay	31%
Apparent Relative Density		Moisture Content	11.5%	% Passing #200	88.1%
Liquid Limit	36	Plastic Limit	22	Plastic Index	14

Soil Mortar (-#10 Sieve)

Coarse Sand	0.9%	Fine Sand	23.7%	Silt	45%	Clay	31%		
Description of Sand & Gravel Particles:		Rounded ☐	Angular ☐	Hard & Durable ☐	Soft ☐	Weathered & Friable ☐			
Mechanical Stirring Apparatus (A)		Length of Dispersion Period:	1 min.	Dispersing Agent:		Sodium Hexametaphosphate:	40 g./ Liter		

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T265: Laboratory Determination of Moisture Content of Soils
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

Laboratory Record Version 4.2

Liquid Limit, Plastic Limit, and Plastic Index

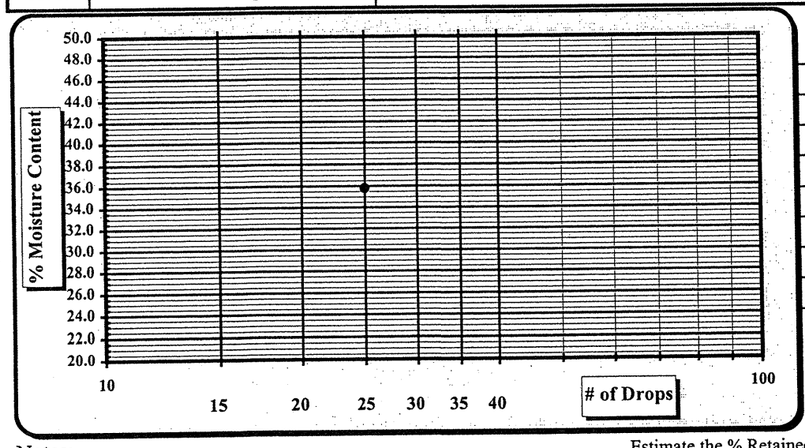
S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:

Report Date: 1/23/04
Test Date(s): 1/16//04-1/23/04

Boring #: B-27 Sample #: SS-4 Sample Date: 11/25/03
Location: 115+00 -L- Offset: Depth(ft): 1-2.5
Sample Description: Brown Silty CLAY A-6 (12)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	90						8		
A	Tare Weight	8.25						6.28		
B	Wet Soil Weight + A	19.81						14.25		
C	Dry Soil Weight + A	16.76						12.82		
D	Water Weight (B-C)	3.05						1.43		
E	Dry Soil Weight (C-A)	8.51						6.54		
F	% Moisture Content (D/E)*100	35.8%						21.9%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							21.9%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☐	One-point Method ☒		Liquid Limit	36
Classification:	ASTM D 2487 ☐	AASHTO M 145 ☒		Plastic Limit	22
Liquid limit Test:	ASTM D 4318 ☐	AASHTO T 89 ☒		Plastic Index	14
Plastic limit Test:	ASTM D 4318 ☐	AASHTO T 90 ☒		Group Symbol	A-6

Technician Name: Tom Savanapridi OCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)

Laboratory Record Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

Project #: **1051-03-202**
Project Name: Louis Stephens Drive
Client Name:
Client Address:
State Project #: F.A. Project No: TIP NO:

Test Date(s): 1/16//04-1/23/04
Report Date: 1/23/04

Boring #: B-36 Sample #: SS-5 Sample Date: 1/8/04
Location: 134+00 -L- Offset: 0 Depth (ft): 1-2.5
Sample Description: Brown Silty CLAY A-6

Pan #:	6	Beaker #:	42	Group Index		(8)	
Hydrometer Jar #:			6	Apparent Relative Density			
Pan Tare Weight (grams):			7.85	Moisture Content		Hygroscopic	Natural
Total Sample Wet Wt. + tare wt. (grams):			231.28		Tare #	10	2
Weight of Total Sample Air Dried:			223.43	A	Tare Wt.	15.23	8.02
Weight of Air Dried Hydrometer Sample (g):			51.59	B	Wet Wt. + A	35.29	54.61
Total Sample Oven Dried:			222.83	C	Dry Wt. + A	35.23	51.51
Hydrometer Sample Oven Dried (W):			51.44	D	Water Wt. (B-C)	0.06	3.10
% Passing #10:			90.1%	E	Dry Wt.(C-A)	20.00	43.49
Correction Factor a (Table 1):			1.00		% Moisture (100 x D/E)	0.30%	7.1%

Sieve	Retained Wt.	Percent Passing	
3.0"	0.00	Pan # (washed)	100.0%
1.5"	0.00		100.0%
1.0"	0.00		100.0%
3/4"	0.00		100.0%
1/2"	0.00		100.0%
3/8"	2.07		99.1%
#4	7.37	Soil Mortar	96.7%
#10	22.07	**100.0%**	**90.1%**
#20	0.49	99.0%	89.2%
#40	1.04	98.0%	88.3%
#60	1.83	96.4%	86.9%
#100	4.19	91.9%	82.8%
#200	9.96	80.6%	72.6%
#270	13.80	73.2%	66.0%

Notes: Description of Sand & Gravel Particles: Rounded ☒ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

% Gravel:	9.9%	< 75 mm and > 2.00 mm
Coarse Sand:	3.2%	< 2.00 mm and > 0.25 mm
Fine Sand:	20.9%	< 0.25 mm and > 0.05 mm
% Silt:	41%	< 0.05 and > 0.005 mm
% Clay:	25%	< 0.005 mm

Maximum Particle Size: 1/2"
% Retained on #60: 13.1% Total Sample

Minus #10 portion (Soil Mortar)

Coarse Sand:	3.6%	Silt:	45.0%
Fine Sand:	23.2%	Clay:	28.2%

Liquid Limit 31 Plastic Limit 18 Plastic Index 13

Mechanical Stirring Apparatus (A) ID#
Dispersion Time: 1 min.
Sodium Hexametaphosphate: 40 g./ Liter
% passing #200 as whole % #: 73%
Control Cylinder ☐ Composite Correction ☒
Hydrometer: 151H ☐ 152H ☒

Time		Temp.	Hydrometer	Corrections		Hydrometer	Percent Passing		Effective Depth	Table 3	Diameter
				Control Cylinder	Composite Correction		P =	P (total) =			D =
Clock	T (Min.)	(°C)	Reading			R	(R x a / W) x 100	P x % Passing #10	L	K	K x ((L/T)$^{1/2}$
2:58	0.58	19.8	44.0	6.0	6.0	38.0	73.9%	66.6%	10.1	0.01378	0.05750
3:58	60	21.9	20.5	6.0	6.4	14.5	28.2%	25.4%	13.9	0.01342	0.00646
4:58	120	23.1	18.5	6.0	6.6	12.5	24.3%	21.9%	14.2	0.01304	0.00449

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
ASTM D 854: Specific Gravity of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes
AASHTO T265: Laboratory Determination of Moisture Content of Soils

Technician Name: Tom Savanapridi
Technical Responsibility: Mal Karajan

QCL-1433
Certification #
Signature

Laboratory Supervisor
Position

Effective Depth (cm)
$L=L1+0.5(L2-(V_B/A))$

3109 Spring Forest Road, Raleigh, N.C. 27616

B-36 SS-5 Classification

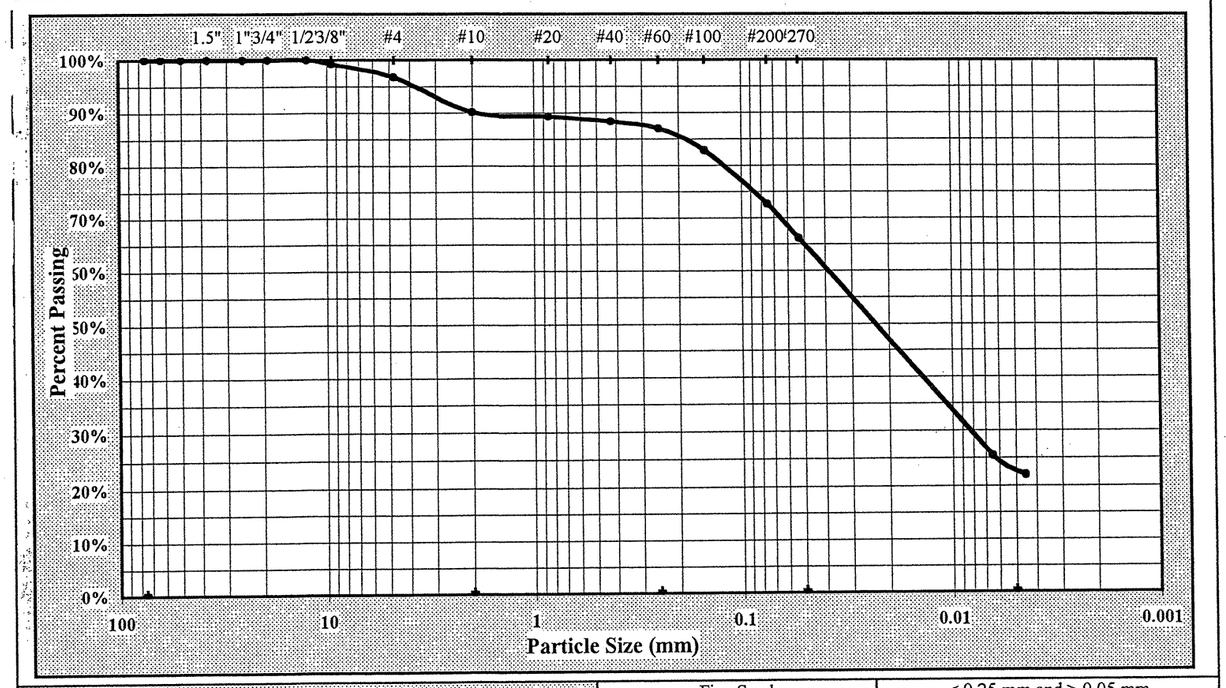
Laboratory Report Version 4.2

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME

S&ME Project #:	**1051-03-202**	Report Date:	1/23/04
Project Name:	**Louis Stephens Drive**	Test Date(s):	1/16//04-1/23/04
Client Name:			
Client Address:			
State Project #:		F.A. Project No:	TIP NO:
Boring #:	B-36	Sample #: SS-5	Sample Date: 1/8/04
Location:	134+00 -L-	Offset: 0	Depth (ft): 1-2.5
Sample Description:			Brown Silty CLAY A-6 (8)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	1/2"	Coarse Sand	3.2%	Silt	41%
Gravel	9.9%	Fine Sand	20.9%	Clay	25%
Apparent Relative Density		Moisture Content	7.1%	% Passing #200	72.6%
Liquid Limit	31	Plastic Limit	18	Plastic Index	13

Soil Mortar (-#10 Sieve)

Coarse Sand	3.6%	Fine Sand	23.2%	Silt	45%	Clay	28%

Description of Sand & Gravel Particles: Rounded ☒ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

ASTM D 854: Specific Gravity of Soils

Technical Responsibility: Mal Karajan *Signature* Laboratory Supervisor *Signature*

Laboratory Record Version 4.2

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1051-03-202** Report Date: 1/23/04

Project Name: Louis Stephens Drive Test Date(s): 1/16//04-1/23/04

Client Name:

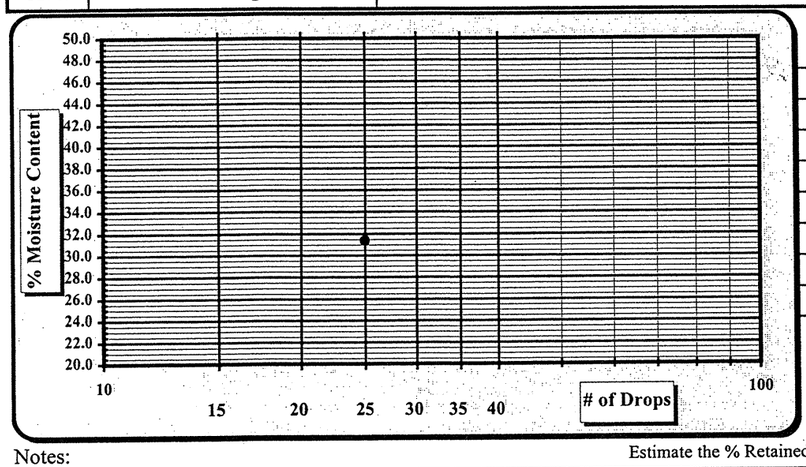
Client Address:

Boring #: B-36 Sample #: SS-5 Sample Date: 1/8/04

Location: 134+00 -L- Offset: Depth(ft): 1-2.5

Sample Description: Brown Silty CLAY A-6 (8)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	8						12		
A	Tare Weight	8.25						6.49		
B	Wet Soil Weight + A	20.39						14.30		
C	Dry Soil Weight + A	17.49						13.13		
D	Water Weight (B-C)	2.90						1.17		
E	Dry Soil Weight (C-A)	9.24						6.64		
F	% Moisture Content (D/E)*100	31.4%						17.6%		
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							17.6%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried	☒	NP, Non-Plastic ☐
Liquid limit Test:	Multipoint Method	☐	One-point Method	☒			Liquid Limit 31
Classification:	ASTM D 2487	☐	AASHTO M 145	☒			Plastic Limit 18
Liquid limit Test:	ASTM D 4318	☐	AASHTO T 89	☒			Plastic Index 13
Plastic limit Test:	ASTM D 4318	☐	AASHTO T 90	☒			Group Symbol A-6

Technician Name: Tom Savanapridi OCT-1433 (Certification #)

Technical Responsibility: Mal Karajan (Signature) Laboratory Supervisor (Position)