TVA 64 (09-9-69)

UNITED STATES GOVERNMENT

Memorandum

CSB '810616 301

TENNESSEE VALLEY AUTHORITY

TO : G. L. Buchanan, Chief, Civil Engineering and Design Branch, W3C126 C-K (2)

FROM : Frank Van Meter, Chief, Construction Services Branch, 500 SPT-K

DATE : June 16, 1981

810623E0363 (2)

SUBJECT: CUMBERLAND STEAM PLANT - ASH DIKE RAISING - BORROW AREA B EXPANSION AND PROPOSED BORROW AREA D

During the week of April 13, 1981, a total of 412 lin ft was drilled and sampled at 27 locations. Borings were advanced with 6-in. solid flight augers and sampled in accordance with ASTM D 1452. This work is a followup of the field reconnaisance conducted to estimate fill volumes in areas B and D as reported in SME 810223 001. A preliminary family of curves for area D was submitted in SME 810507 002.

Borrow Area B Expansion

The area investigated is a triangular-shaped tract of about 6 acres in the northwest corner of area B. See drawing 604A1093RO for the plan. The overburden consists of lean to medium clays, CL and CH, slightly wet of optimum. At 3 locations, chert lenses or concentrations were encountered at a depth of 8 to 13 ft. (Beneath the chert, nongravelly soils persist to the depths drilled.) No free ground water was encountered, but beneath the chert zone soils are wet of optimum. Assuming borrowing operations will cease on encountering the cherty zone at about a 12-ft depth, the area should yield about 80,000 yd^3 fill assuming 25 percent shrinkage.

Soil classes established fall on the original family of curves developed for borrow areas A, B, and C, reported on April 14, 1978. Soil classes III through V are represented in the expanded area.

Borrow Area D

This area lies east of the plant, bounded by Highway 49 to the east, the railroad line to the west, and backwaters of Lake Barkely to the north. See drawing 604A1092RO for plan. About 6 of the 18 acres explored are unsuitable, due to high water table and wet subsoils or to shallow overburden. High ground water was encountered at borings PAH-7, 14, 15, 22, and 23. In addition, 4 designated locations on the northern perimeter were not drilled due to wet conditions. Shallow overburden was found at borings PAH-11 and 12. The remaining borings ranged from 6 to 23 ft and averaged 11 ft in depth. The 12 acres remaining should yield about 120,000 yd^3 of suitable fill assuming 25 percent shrinkage.

G. L. Buchanan
June 16, 1981

CUMBERLAND STEAM PLANT - ASH DIKE RAISING - BORROW AREA B EXPANSION AND PROPOSED BORROW AREA D

Soils include lean to medium clays, CL and CH, with liquid limits ranging from 40 to 53 percent, optimum moistures from 17.8 to 22.2 percent, and maximum densities from 99.4 pcf to 107.5 pcf. In most cases, in-situ moistures are above optimum.

Laboratory Testing

As soils encountered in the expansion of area B were similar to those previously tested, no additional engineering tests were performed. Two soil types were identified which fall between soil classes III and V on the original family of curves. See graphic logs for details of index tests and drill data.

For borrow area D, triaxial compression Q and R tests were conducted on each soil type at 95 percent compaction and 3 percent above and below optimum moisture respectively. Results are summarized in table 1 and in attached plots. Index test and drill data are detailed on the graphic logs.

Summary

The expanded borrow area B area should yield about 80,000 yd^3 suitable fill. Additional yardage may be obtained if it is practical to penetrate the cherty zone and to handle the wet of optimum soils at greater depth. The soils in this area consist of lean to medium clays with the same compaction indices established as for areas A, B, and C.

Borrow area D should yield about 120,000 yd^3 of suitable soils. Due to locally shallow overburden and wet subsoils, expansion of this area is not feasible. Overburden consists of lean to medium clay with natural moisture contents usually above optimum.

Originated by
Frank Van Meter

Frank Van Meter

ROL:HPM:SML
Attachments
cc (Attachments):
R. O. Barnett, W9D224 C-K
C. Hathaway, 446 SPT-K
R. O. Lane, SME-K
H. H. Mull, E7B24 C-K (w/o Attachments)
MEDS, E4B37 C-K

6/19/81 - GLB:NCH
cc: S. B. Jack, 5100 MIB-K
M. N. Sprouse, W11A9 C-K
xc: MEDS, E4B37 C-K

CUMBERLAND STEAM PLANT

ASH DIKE RAISING

BORROW AREA B EXPANSION AND

PROPOSED BORROW AREA D

TVA 64 (08-9-65)

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

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CONSOLIDATED STEAM PLANT

ASH DISPOSAL

BORROW AREA B EXPANSION AND

PROPOSED BORROW AREA D

G. L. Buchanan
June 16, 1981

CUMBERLAND STEAM PLANT - ASH DIKE RAISING - BORROW AREA B EXPANSION AND PROPOSED BORROW AREA D

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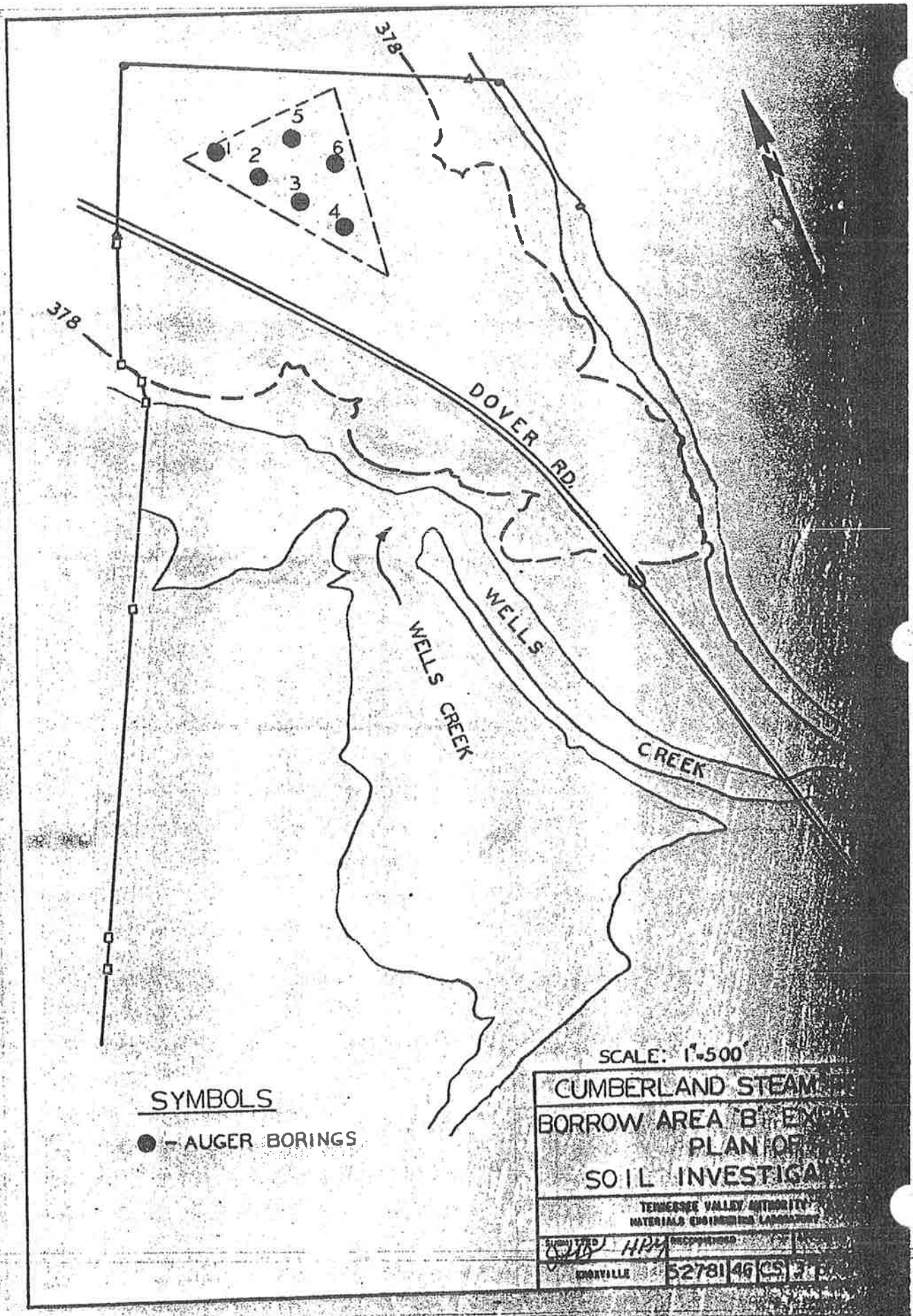
MEDS, E4B37 C-K

CUMBERLAND STEAM PLANT

ASH DIKE RAISING

BORROW AREA B EXPANSION AND

PROPOSED BORROW AREA D


378
5
1
2
6
3
4
378
DOVER RD.
WELLS CREEK
WELLS
CREEK
SCALE: 1"=500'
SYMBOLS
● - AUGER BORINGS
CUMBERLAND STEAM
BORROW AREA 'B' EX
PLAN OF
SOIL INVESTIGA
TENNESSEE VALLEY AUTHORITY
MATERIALS ENGINEERING LABORATORY
HRH
KNOXVILLE
52781
46
CS

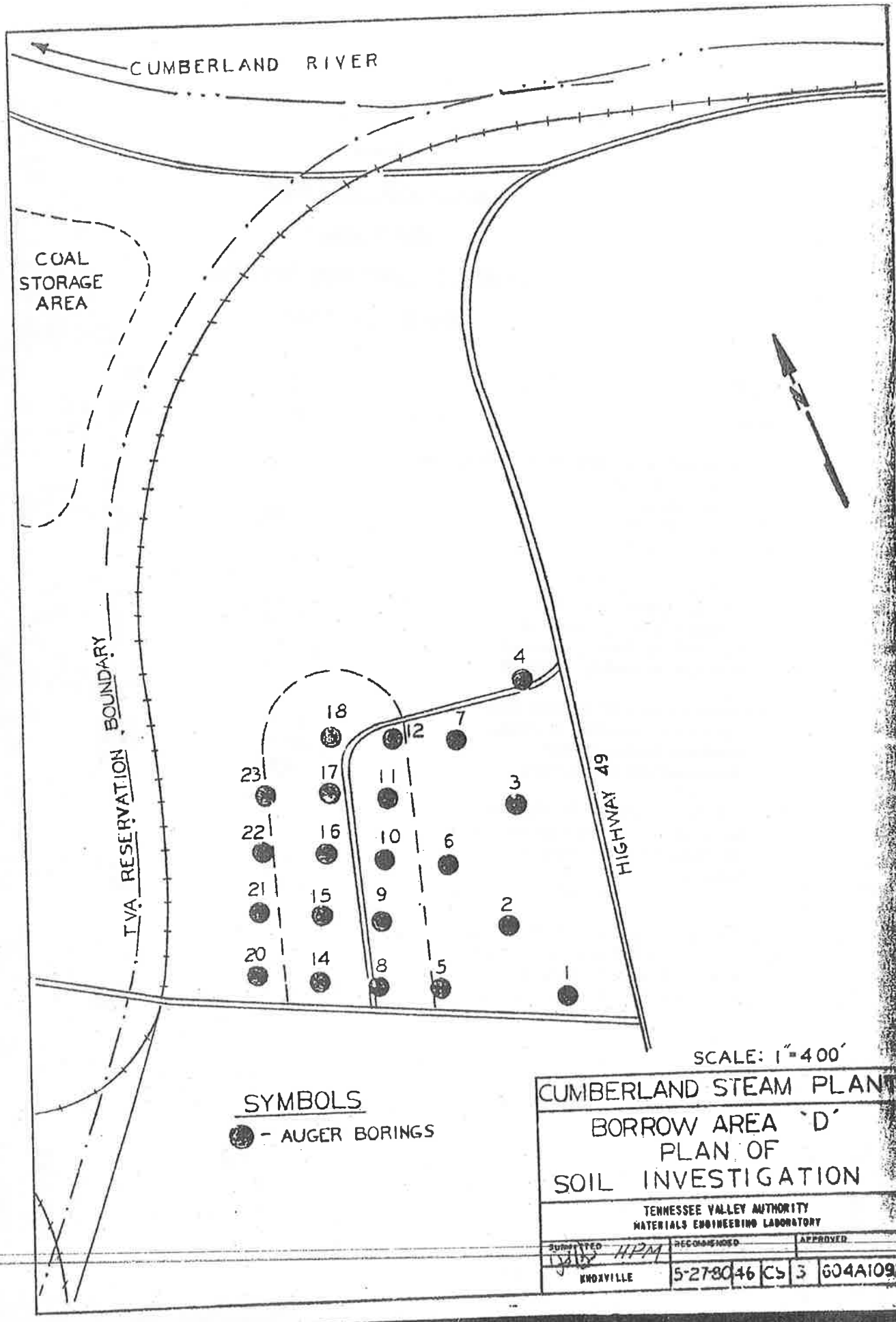

CUMBERLAND RIVER
COAL STORAGE AREA
TVA RESERVATION BOUNDARY
HIGHWAY 49
1
2
3
4
5
6
7
8
9
10
11
12
14
15
16
17
18
20
21
22
23
SYMBOLS
- AUGER BORINGS
SCALE: 1"=400'
CUMBERLAND STEAM PLANT
BORROW AREA 'D'
PLAN OF
SOIL INVESTIGATION
TENNESSEE VALLEY AUTHORITY
MATERIALS ENGINEERING LABORATORY
SUBMITTED
RECOMMENDED
APPROVED
KNOXVILLE
5-27-80
46
CS
3
604A1092

Table 1

CUMBERLAND STEAM PLANT

BORROW AREA D

SUMMARY OF LABORATORY TEST DATA

BORROW SOIL CLASSES

Class	I	II	
Symbol	CL	CL	
Mechanical and Hydrometer Analysis			
Gravel, percent	0	0	
Sand, percent	23	9	
Silt, percent	43	46	
Clay, percent	34	45	
Atterberg Limits			
Liquid limit, percent	40	45	
Plastic limit, percent	19	19	
Plasticity index, percent	21	26	
Shrinkage limit, percent	—	—	
Standard Proctor Compaction			
Optimum moisture, percent	17.8	19.8	
Maximum density, pcf	107.5	104.0	
Penetration resistance, psi	830	340	
Shear Strength at 3% Wet of Optimum Moisture and at 95% of Maximum Unit Weight			
Triaxial Q: ϕ degrees	3.9	2.3	4.7
c tsf	0.74	0.85	0.76
Shear Strength at 3% Dry of Optimum Moisture and at 95% of Maximum Unit Weight			
Triaxial R: ϕ degrees	14.7	19.0	
c tsf	0.05	0.00	

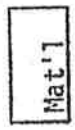
TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE LEGEND AND SYMBOLS

DEPTH 1"=5'	EL	SPT (N)	LOG	W	LL	PI	X	REMARKS OR TEST RESULTS
Boring Depth and Scale	Elevation	Blows/Foot (SS Boring)	Lab Soil Type	Moisture Content	Liquid Limit	Plasticity Index	Soil Letter	

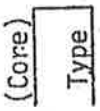
LEGEND


Topsoil

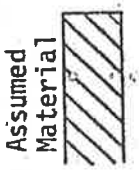
Soil Type (Unified Classification)



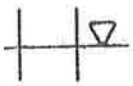
Notation of Soil Not Sampled (SS, PA, HA Logs)



Bedrock (Note Core if Cored)



Refusal (Impractical to Penetrate with Boring Equipment Used)


Watertable (Date)


Explanation of UD Sampling Limits if Applicable

BORING SYMBOLS

SS - 2" OD Splitspoon Boring
SPT - Standard Penetration Test Blows Per Foot with 2" Splitspoon
UD - Undisturbed Sample Boring
PA - Power Auger Boring
HA - Hand Auger Boring
TP - Test Pit or Trench

IN BLOCKS BESIDE UD BORING SAMPLES		
Test	Engineering Test Results	
Q, R, R̄, S	Friction Angle (Degrees)	Cohesion (tsf)
UC	Unconfined Compressive Strength (tsf)	Sensitivity Ratio
C	Compression Index	Preconsolidation Pressure (tsf)
k	Coefficient of Permeability (cm/sec x 10^{-4})	

Example: Blocks as Required:

Q	12.0	0.62	R	19.6	0.21	S	34.0	0
UC	4.0	2.6	C	0.27	2.0	k	5.6	

SOIL TEST SYMBOLS

Q - Unconsolidated-Undrained Triaxial Compression
R - Consolidated-Undrained Triaxial Compression
R̄ - Effective Consolidated-Undrained Triaxial Compression
S - Consolidated-Drained Direct Shear
UC - Unconfined Compression
C - Consolidation
k - Permeability
X - Letter Identification of Soil Type. Lower Case (a, etc.), By Index Tests. Capital (A, etc.), Subjected to Additional Tests.

SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'B'

BORING PAH-1 STATION _____ RANGE _____ SURFACE ET 420.4

DATE DRILLED 4-15-81 TO 4-15-81 PREPARED BY JLB CHECKED BY HF

DEPTH	ET	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	420			22.7	39	18	
5	415		CL	22.0	42	18	
10	410			27.7			
15	405			28.9			
20	400		CH	28.9	51	31	
25	395			24.9			
							DISCONTINUED
30	390						
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'B'

BORING PAH-2 STATION _____ RANGE _____ SURFACE EL 415.1

DATE DRILLED 4-16-81 TO 4-16-81 PREPARED BY JLB CHECKED BY _____

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	415		CL	25.2	31	10	
5	410			25.4			
10	405			23.0			
							CHERT LAYER
15	400			24.6	40	18	
20	395			23.3			
25	390			20.3			
							DISCONTINUED
30	385						
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'B'

BORING PAH-3 STATION _____ RANGE _____ SURFACE EL 419.

DATE DRILLED 4-16-81 TO 4-16-81 PREPARED BY JLB CHECKED BY H

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0			CL	23.3	39	18	
5	415		CH	22.9	51	31	
10	410			21.6			
15	405		CL	22.7	40	18	
20	400			25.2			
25	395			25.4			
							DISCONTINUED
30	390						
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'B'

BORING PAH-4 STATION _____ RANGE _____ SURFACE EL 427.0

DATE DRILLED 4-16-81 TO 4-16-81 PREPARED BY JLB CHECKED BY HH

DEPTH	EL	SPT (N)	GOL G	W	LL	PI	REMARKS
1"=5'							
0							
	425		CH	26.4	52	33	
5				22.6			
	420						
10				17.4			
	415						
15			CL	17.4	39	23	
	410						
20				17.7			
	405						
25			CH	17.9	51	32	
	400						DISCONTINUED
30							
	395						
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'B'

BORING PAH-5 STATION RANGE SURFACE EL 433.

DATE DRILLED 4-16-81 TO 4-16-81 PREPARED BY JLB CHECKED BY HL

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0				24.2	52	33	
	430						
5				24.4			
					55	35	
	425						
10				27.9			
			CH				
	420						
15				28.5			
	415						
20				26.2	52	33	
	410						
25				26.9			
	405						DISCONTINUED
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S.P. FEATURE BORROW AREA 'B'

BORING PAH-6 STATION _____ RANGE _____ SURFACE EL 432.2

DATE DRILLED 4-16-81 TO 4-16-81 PREPARED BY JLB CHECKED BY HE

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
	430		CL	24.6	48	27	
5				26.5			
	425						
10				24.8	55	35	
	420						
15				27.8			
	415		CH		51	32	
20				30.2			
	410						
25				29.5	61	42	
	405						DISCONTINUED
30							
	400						
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S.P. FEATURE BORROW AREA 'D'

BORING PAH - 1 STATION _____ RANGE _____ SURFACE ET 406.0

DATE DRILLED 4-15-81 TO 4-15-81 PREPARED BY JLR CHECKED BY HP

DEPTH	ET	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	405		CL	24.6	33	15	
5	400			23.8	38	18	
10	395		CH	26.5	58	39	
15	390			28.0			
20	385		CL	20.7	46	28	
25	380						DISCONTINUED
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-2 STATION _____ RANGE _____ SURFACE EL 387.3

DATE DRILLED 4-15-81 TO 4-15-81 PREPARED BY JLB CHECKED BY HPL

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
	385			20.6	33	15	
5				14.9			
	380		CL		34	14	
10				21.4			
	375						
15				24.1	44	25	
	370						DISCONTINUED
20							
	365						
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-3 STATION RANGE SURFACE EL 371.4

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY HP

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	370		CL	23.6	33	15	
5	365		CH	36.5	52	32	
				42.1			
10	360						BEDROCK
15							
20							
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-4 STATION RANGE SURFACE EL 373

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY HPM

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
				14.0	37	15	
	370						
5				21.6	38	18	
	365		CL				
10				23.5			
					34	14	
	360						
15				23.8			
	355						
20			CH	28.3	52	32	
							BEDROCK
	350						
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PA-H-5 STATION RANGE SURFACE EL 382.7

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY HP

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
	380		CL	22.6	38	17	
5				28.0			
	375						BEDROCK
10							
15							
20							
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-6 STATION _____ RANGE _____ SURFACE EL 375

DATE DRILLED 4-15-81 TO 4-15-81 PREPARED BY JLB CHECKED BY

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	375		CH	27.6	52	32	
5	370		CL	22.4	37	15	
				23.8	44	25	
10	365						BEDROCK
15							
20							
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SH 1 O

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-7 STATION _____ RANGE _____ SURFACE EL 37

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	370			25.3			
5	365						▼
10	360		CL	26.0	31	10	
15	355			28.0			
20	350						NO SAMPLE RECOVERY
25	345						BEDROCK
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SH 1 O

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-8 STATION _____ RANGE _____ SURFACE EL 402

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY _____

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
	400		CL	22.4	38	18	
5				23.8	38	17	
	395						
			CH	25.9	52	32	
10							
	390						BEDROCK
15							
	385						
20							
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-9 STATION _____ RANGE _____ SURFACE ET 400

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY H

DEPTH	ET	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	400		TOPSOIL				
			CL	22.1	38	17	
5	395			23.3	37	15	
							NO SAMPLE RECOVERY
10	390						BEDROCK
15	385						
20							
25							
30							
35							

SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S.P. FEATURE BORROW AREA 'D'

BORING PAH-10 STATION _____ RANGE _____ SURFACE EL 402.7

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
	400		CL	24.2	38	17	
5				21.3	38	18	
	395						BEDROCK
10							
	390						
15							
20							
25							
30							
35							

SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-11 STATION RANGE SURFACE ET 383.2

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY

DEPTH	ET	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
				22.0	33	15	
	380						BEDROCK
5							
	375						
10							
15							
20							
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-12 STATION • RANGE SURFACE EL 374

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
			CH	38.2	52	32	
			CL	35.1	44	25	
	370						BEDROCK
5							
	365						
10							
15							
20							
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SH 1 O

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-14 STATION _____ RANGE _____ SURFACE EL 389

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY H

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
				24.3	38	20	▽
			CL				
5	385			24.8	33	15	
							WEATHERED SHALE
10	380						DISCONTINUED
15	375						
20							
25							
30							
35							

SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-15 STATION _____ RANGE _____ SURFACE EL 385.3

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY HPA

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	385		CL	25.3	37	15	
5	380			22.4			▼
10	375			24.5	38	18	DISCONTINUED ON WEATHERED SHALE
15	370						
20							
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SH 1

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-16 STATION _____ RANGE _____ SURFACE ET 395

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY

DEPTH	ET	SPT (N)	LOG	W.	LL	PI	REMARKS
1"=5'							
0	395		CL	19.8	37	15	
5	390			23.4	46	28	
							BEDROCK
10	385						
15							
20							
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-17 STATION _____ RANGE _____ SURFACE ET 405.2

DATE DRILLED 4-15-81 TO 4-15-81 PREPARED BY JLB CHECKED BY HR

DEPTH	ET	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	405		TOPSOIL				
				24.6	33	15	
5	400		CL	23.6	39	19	
10	395			19.3	34	14	
15	390		CH	26.1	52	32	
							DISCONTINUED
20	385						
25							
30							
35							

SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S P. FEATURE BORROW AREA 'D'

BORING PAH-18 STATION RANGE SURFACE EL 388.9

DATE DRILLED 4-15-81 TO 4-15-81 PREPARED BY JLB CHECKED BY HL

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
	385		CL-ML	29.1	41	16	
5				29.0			
	380						BEDROCK
10							
15							
20							
25							
30							
35							

TENNESSEE VALLEY AUTHORITY
SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SH 1 O

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-20 STATION RANGE SURFACE ET 390

DATE DRILLED 4-15-81 TO 4-15-81 PREPARED BY JLB CHECKED BY

DEPTH	ET	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	390		CL	23.0	39	19	
5	385			20.9			
							BEDROCK
10	380						
15							
20							
25							
30							
35							

SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SH 1 O

PROJECT CUMBERLAND S.P. FEATURE BORROW AREA 'D'

BORING PAH-21 STATION _____ RANGE _____ SURFACE ET 378

DATE DRILLED 4-14-81 TO 4-14-81 PREPARED BY JLB CHECKED BY H

DEPTH	ET	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0							
	375		CL	20.7	34	14	
				20.0			
5							WEATHERED SHALE
							DISCONTINUED
	370						
10							
15							
20							
25							
30							
35							

SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

SHEET 1 OF

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-22 STATION _____ RANGE _____ SURFACE EL 372

DATE DRILLED 4-15-81 TO 4-15-81 PREPARED BY JLB CHECKED BY HC

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0			CL	25.6	33	15	▼
	370						
5							NO SAMPLE TAKEN — SOIL SATURATED
	365						
10							DISCONTINUED
	360						
15							
20							
25							
30							
35							

SINGLETON MATERIALS ENGINEERING LABORATORY
SOIL PROFILE (SS, PA, HA, TP BORING)

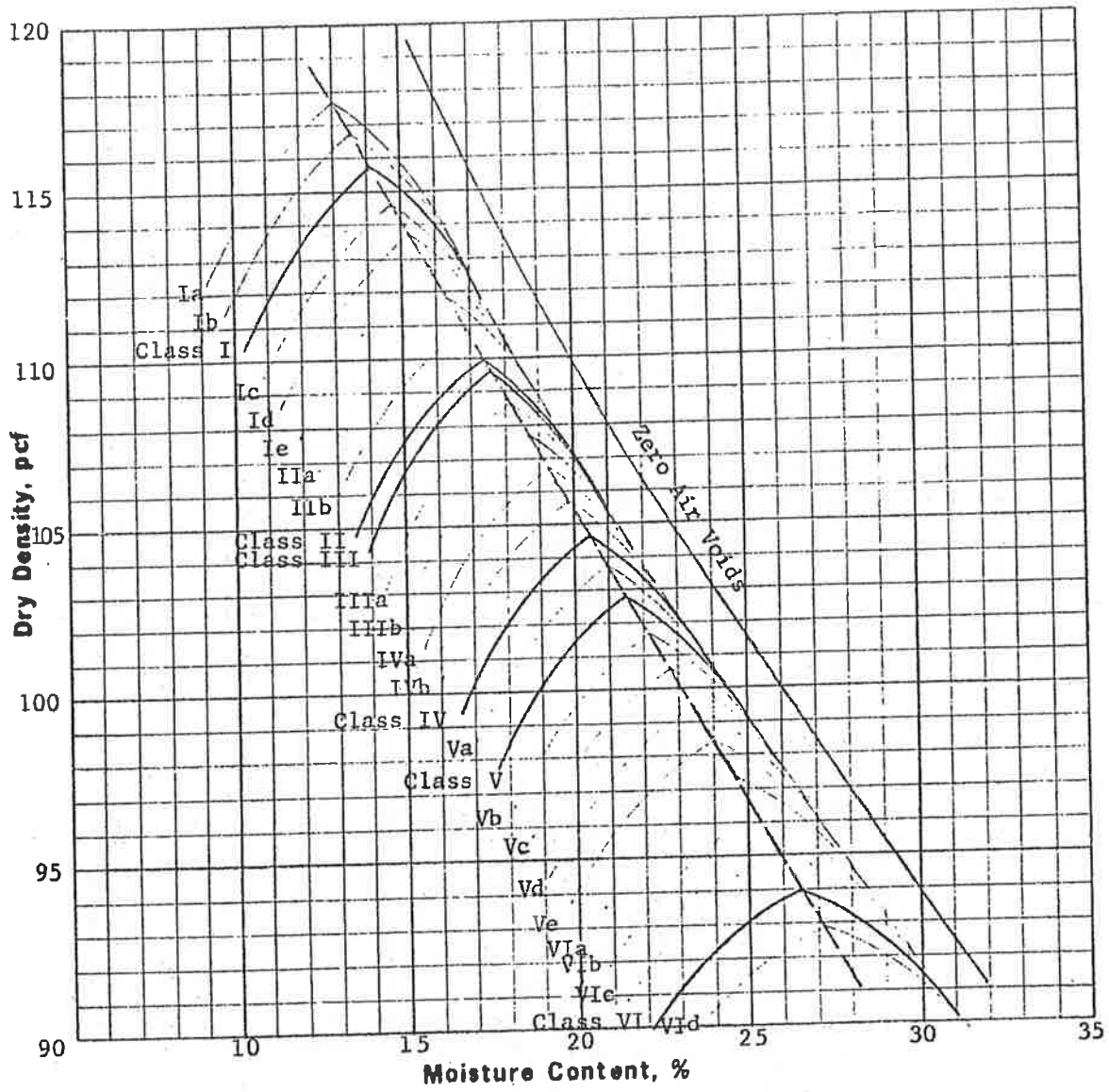
SH 1 O

PROJECT CUMBERLAND S. P. FEATURE BORROW AREA 'D'

BORING PAH-23 STATION _____ RANGE _____ SURFACE EL 371

DATE DRILLED 4-15-81 TO 4-15-81 PREPARED BY JLB CHECKED BY _____

DEPTH	EL	SPT (N)	LOG	W	LL	PI	REMARKS
1"=5'							
0	370			26.6	31	10	▽
5	365		CL	23.5	38	20	
10	360			23.6			
							HARD AUGERING
15	355						BEDROCK
20							
25							
30							
35							



Soil Class	Gravel %	Sand %	Silt %	Clay %	Specific Gravity	LL %	PI %	Optimum Moisture, %	Maximum Density, pcf
I-ML-CL	0	39	36	25	2.71	24.4	6.5	14.1	115.8
II-CL	0	46	19	35	2.71	44.3	24.7	17.4	110.0
III-CL	0	15	46	39	2.72	38.0	17.9	17.6	109.7
IV-CL	0	12	44	44	2.75	41.1	18.2	20.5	104.7
V-CH	0	16	30	54	2.76	53.0	28.3	21.5	102.8
VI-CH	0	9	27	64	2.75	73.5	46.1	26.5	94.0

Plus No. 4 Specific Gravity, S S D	2.28
Plus No. 4 Absorption, %	8.9

Remarks:

Project Cumberland Steam Plant

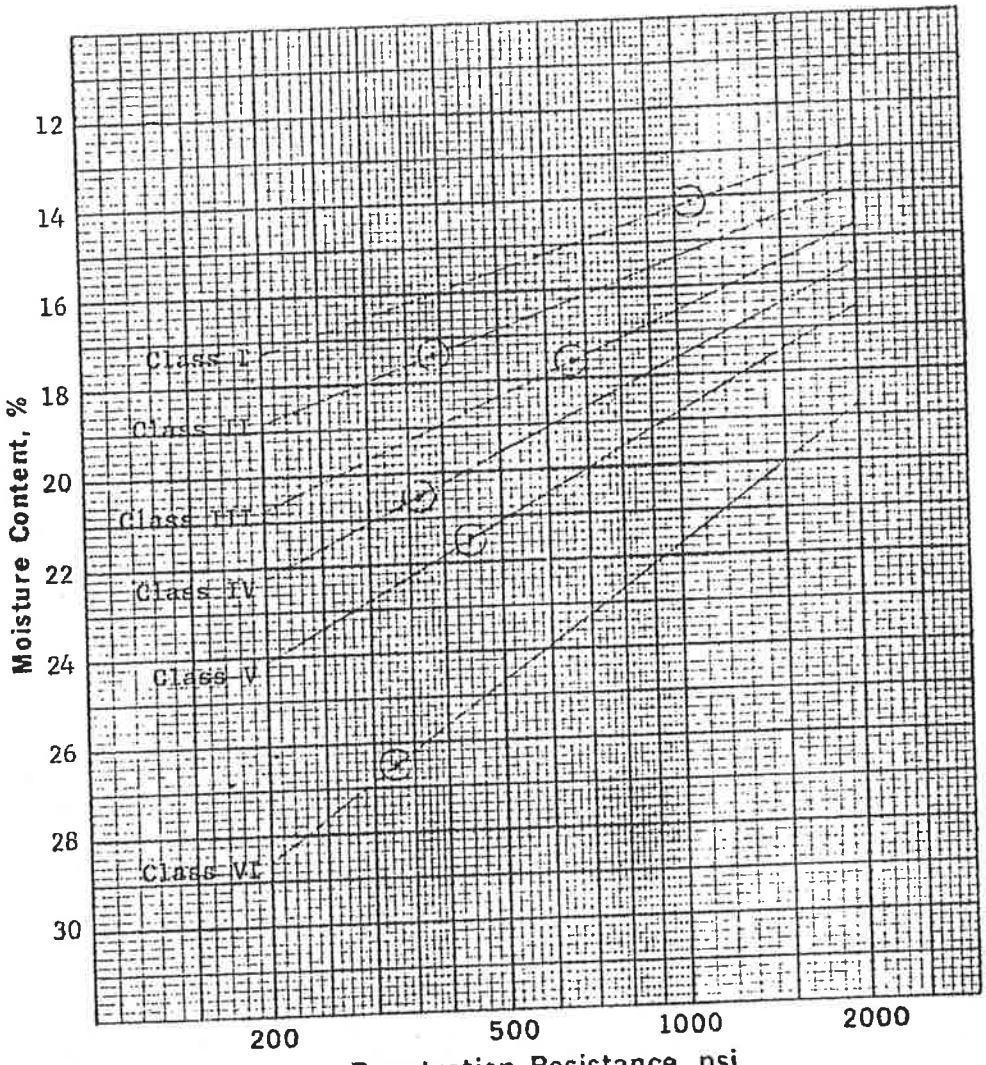
Feature Borrow Areas A, B & C

Date Tested 4/14/78

COMPACTION TEST (FAMILY OF CURVES)

TVA 10201 (CONST-6-77)

Tested by: _____ Reviewed by: _____



Soil Class	Optimum Moisture, %	Maximum Density, pcf	Penetration Resistance, psi
I-ML-CL	14.1	115.8	1070
II-CL	17.4	110.0	390
III-CL	17.6	109.7	665
IV-CL	20.5	104.7	365
V-CH	21.5	102.8	445
VI-CH	26.5	94.0	325

Remarks:

(·) Denotes Optimum Moisture

Project Cumberland Steam Plant

Feature Borrow Areas A, B & C

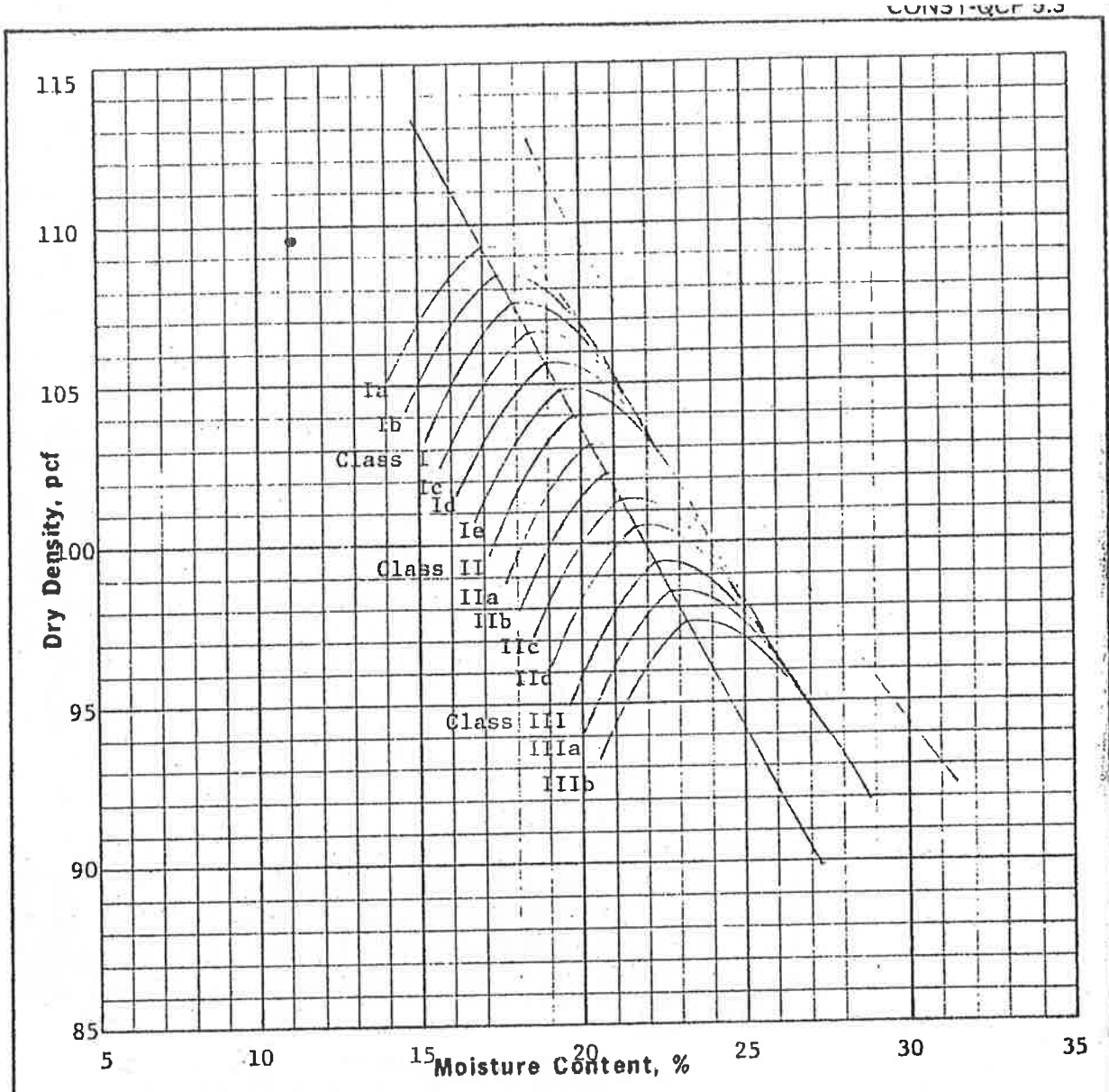
Date Tested 4/14/78

MOISTURE - PENETRATION TEST

Tested by:

Reviewed by: JCS

TVA 10200 (CONST 6-77)



Soil Class	Gravel %	Sand %	Silt %	Clay %	Specific Gravity	LL %	PI %	Optimum Moisture, %	Maximum Density, pcf
I-CL	0	23	43	34	2.70	40	21	17.8	107.5
II-CL	0	9	46	45	2.72	45	26	19.8	104.0
III-CH	0	11	37	52	2.74	53	34	22.2	99.4

Plus No. 4 Specific Gravity, S S D	--
Plus No. 4 Absorption, %	--

Remarks:

Project Cumberland Steam Plant

Feature Borrow Area D

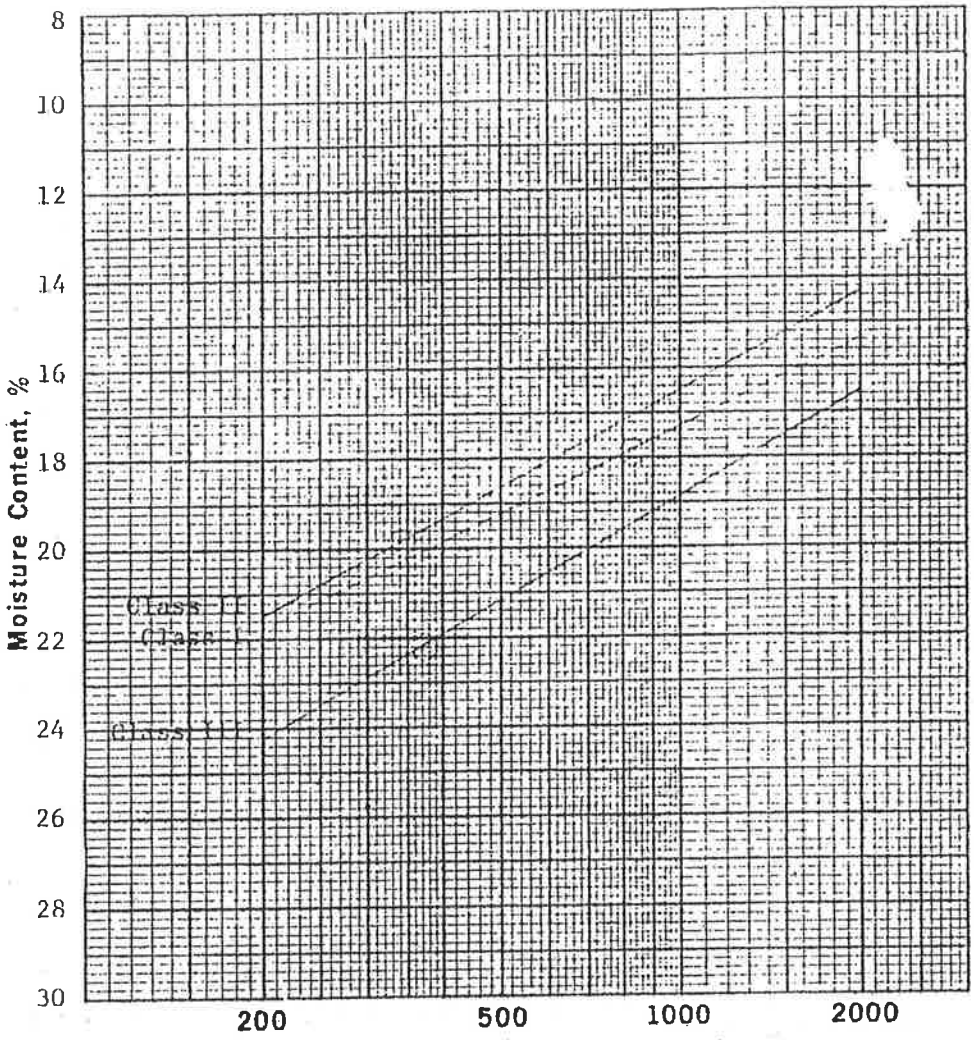
ASTM Designation D698A

Date Tested 4-28-81

COMPACTION TEST (FAMILY OF CURVES)

TVA 10201 (CONST-12-76)

Tested by: JDC Reviewed by:



Soil Class	Optimum Moisture, %	Maximum Density, pcf	Penetration Resistance, psi
I-CL	17.8	107.4	830
II-CL	19.8	104.0	340
III-CH	22.2	99.4	370

Remarks:

( ) Denotes Optimum Moisture

Project Cumberland Steam Plant

Feature Borrow Area D

ASTM Designation D698A

Date Tested 4-28-81

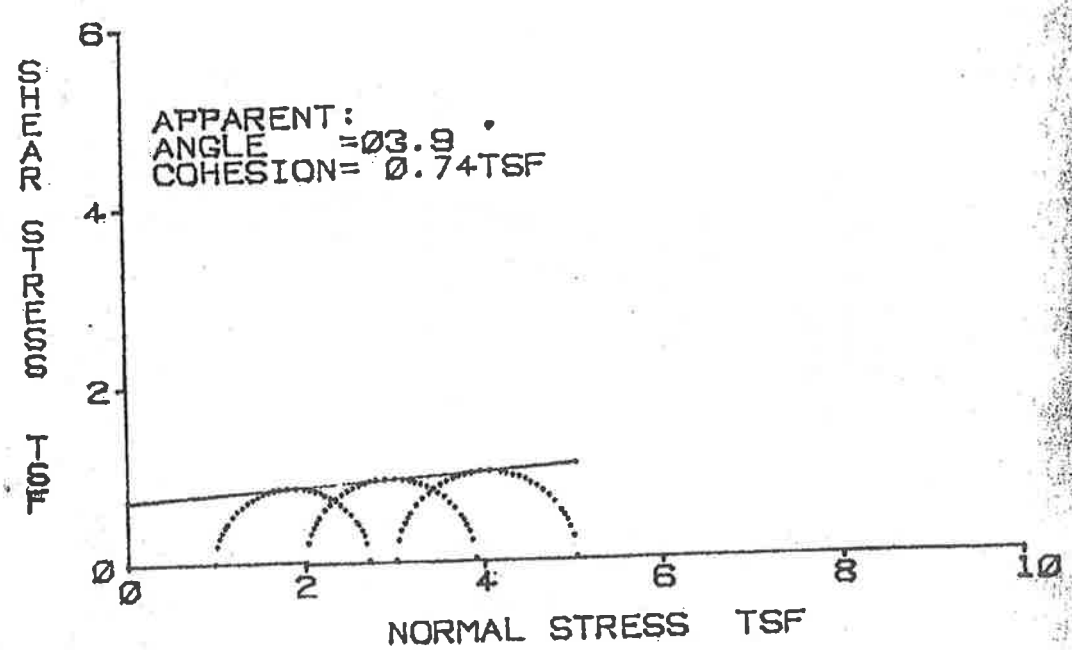
MOISTURE - PENETRATION TEST

TVA 10200 (CONST-12-76)

Tested by: JDC Reviewed by:

TVA SINGLETON MATERIALS ENGINEERING LABORATORY
UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION(Q) TEST

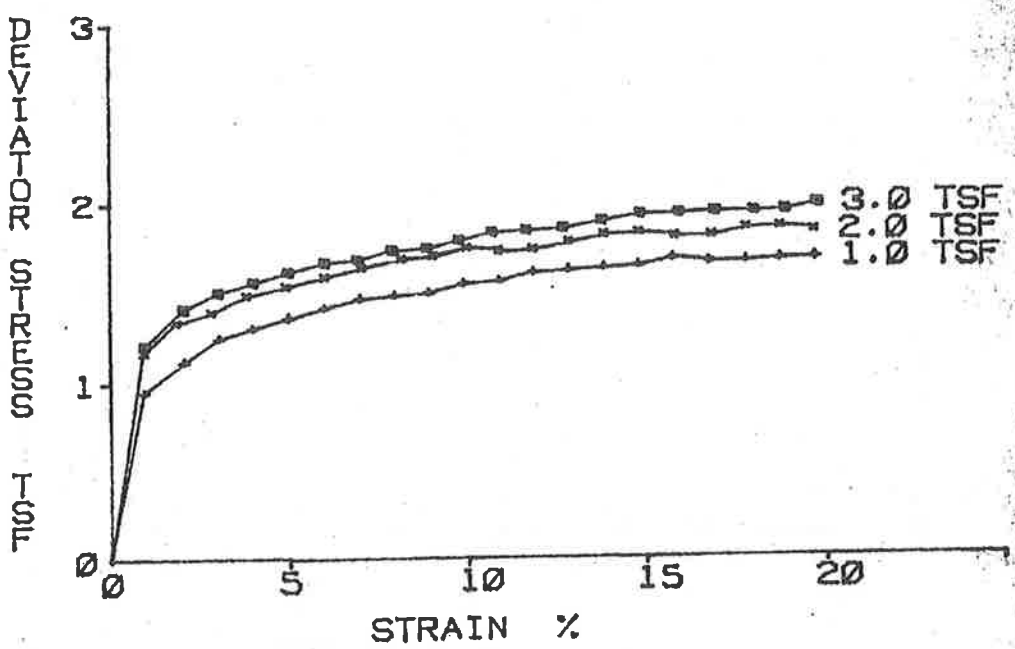
PROJECT:CUMBERLAND S.P.	EL. :
FEATURE:BORROW AREA D	SAMPLE :CLASS I
STATION:	PART :
RANGE :	SOIL SYM:CL
BORING :	DATE :6-10-81



TVA SINGLETON MATERIALS ENGINEERING LABORATORY

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION(Q) TEST

PROJECT:	CUMBERLAND S.P.	EL.	:
FEATURE:	BORROW AREA D	SAMPLE	: CLASS I
STATION:		PART	:
RANGE	:	SOIL SYM:	CL
BORING	:	DATE	: 6-10-81



Tennessee Valley Authority
Singleton Materials Engineering Laboratory
Unconsolidated Undrained Triaxial Compression (Q) Test

Project: CUMBERLAND S.P.
Feature: BORROW AREA D
Station:
Range :
Boring :

El. :
Sample: CLASS I
Part :

Tested By : RA
Computed By: MHD
Checked By : GMD
Report Date: 6-10-81

Soil Sybmbol= CL
Sp. Gr. = 2.7

L.L.(%)= 40
D10(mm)= 0

P.I.(%)= 21

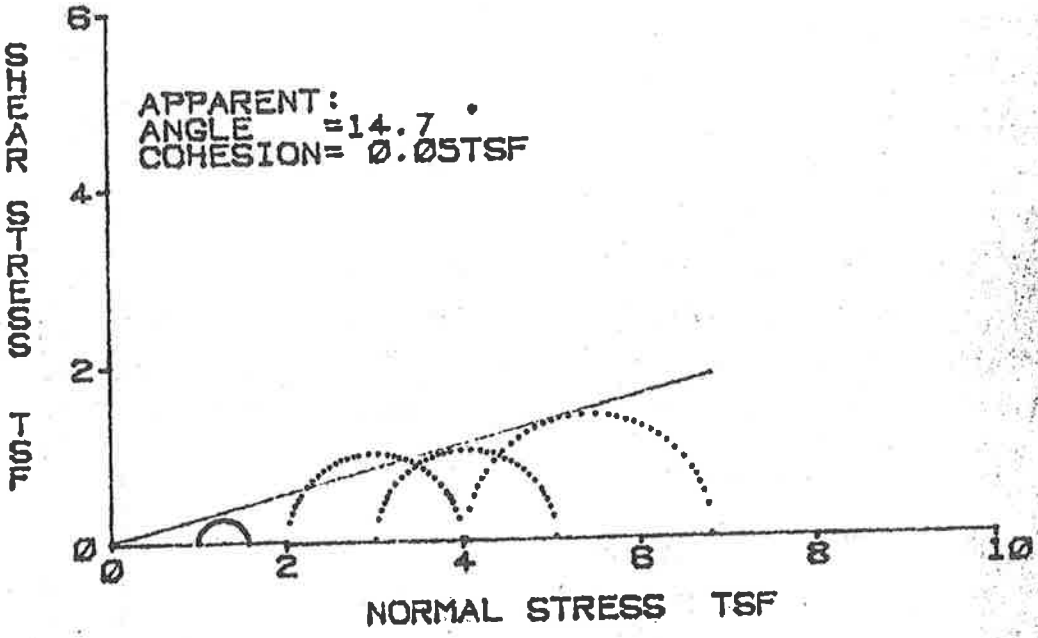
Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	20.9	20.9	20.7	0.0
Dry Density(pcf)	102.1	102.1	102.2	0.0
Void Ratio	0.652	0.652	0.649	0.000
Saturation(%)	86.5	86.5	86.1	0.0
Before Shearing:				
Moisture(%) (after satur.)	--	--	--	--
Saturation(%)	--	--	--	--
Moisture(%) (after cons.)	--	--	--	--
Void Ratio (after cons.)	--	--	--	--
Final Moisture Content(%)	20.8	20.8	20.6	0.0
Minor Principal Stress(tsf)	1.01	2.02	3.02	0.00
Major Principal Stress(tsf)	2.74	3.92	5.05	0.00
Eff. Minor Prin. Stress(tsf)	--	--	--	--
Eff. Major Prin. Stress(tsf)	--	--	--	--
Time to Failure(min.)	20	19	20	0
Rate of Strain(%/min.)	1.00	1.00	1.00	0.00
Specimen Height(in.)	3.15	3.15	3.15	3.15
Specimen Diameter(in.)	1.40	1.40	1.40	1.40

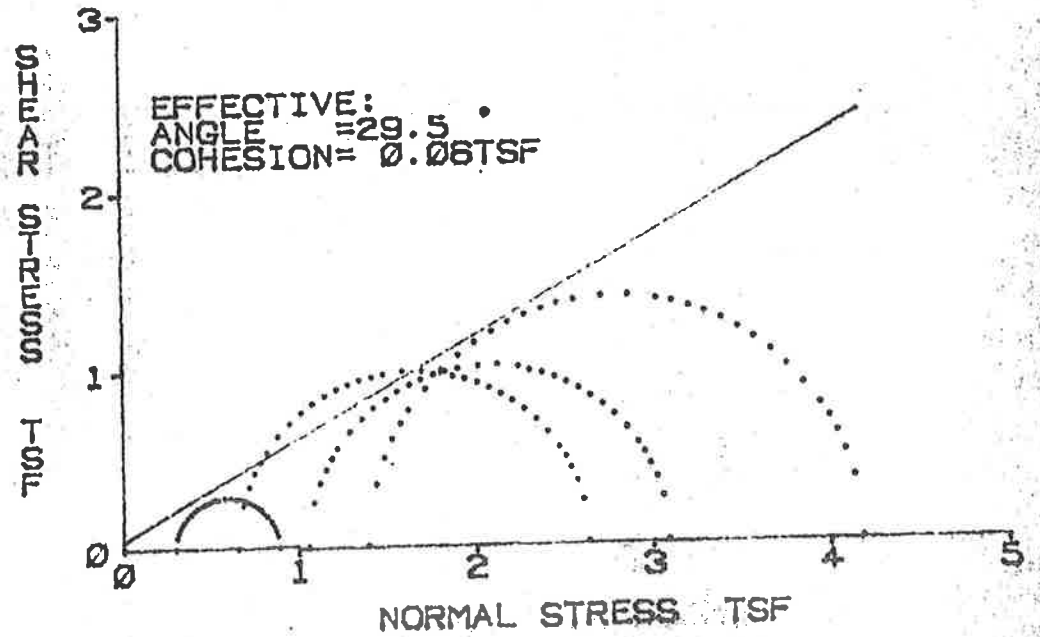
Shear Strength	Deg.	c(tsf)
Apparent	3.9	0.74
Effective	--	--

Remarks:

TVA SINGLETON MATERIALS ENGINEERING LABORATORY
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (R) TEST

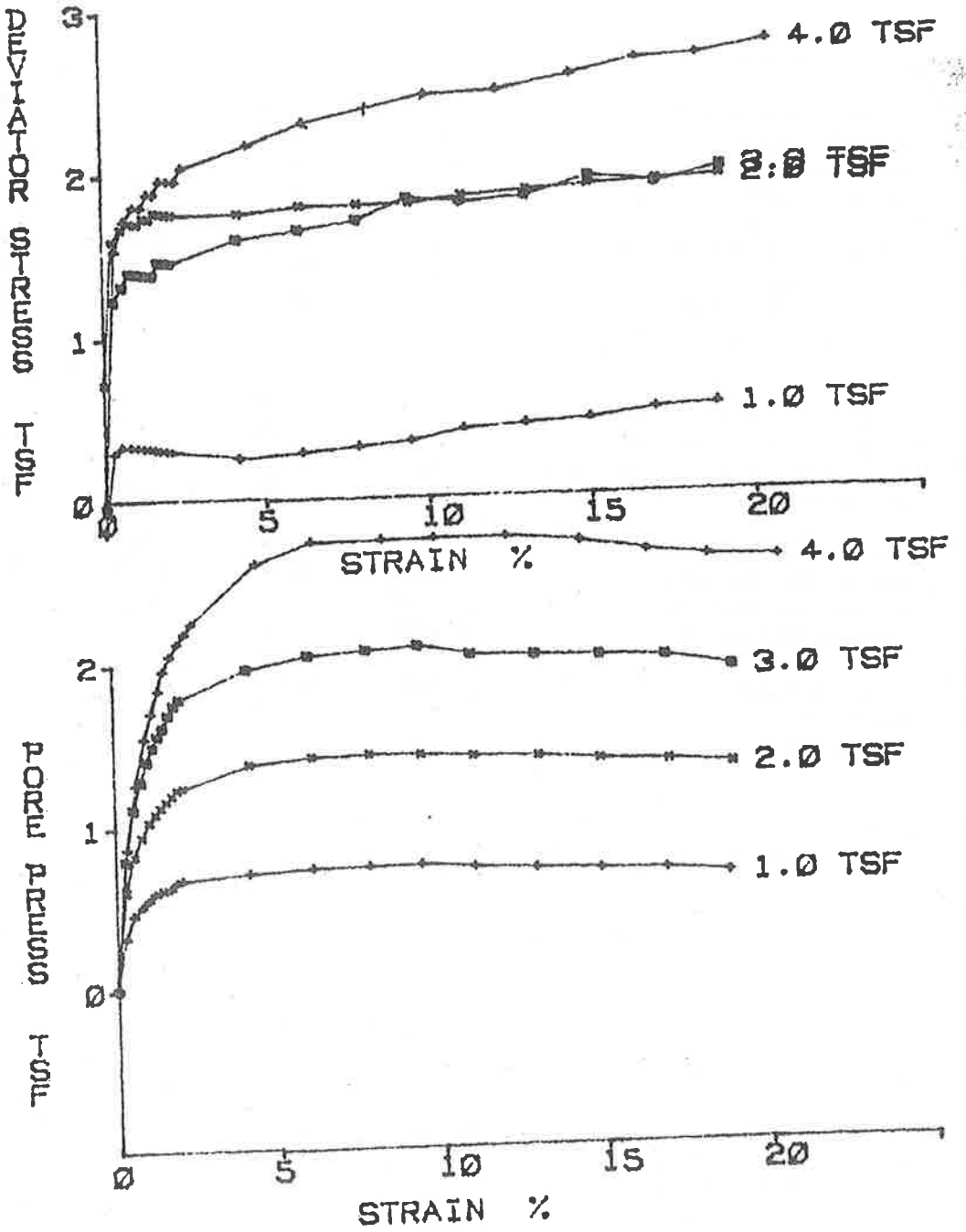
PROJECT:CUMBERLAND S.P.	EL. :
FEATURE:BORROW AREA D	SAMPLE :CLASS I
STATION:	PART :
RANGE :	SOIL SYM:CL
BORING :	DATE :6-5-81





TVA SINGLETON MATERIALS ENGINEERING LABORATORY
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (R) TEST

PROJECT: CUMBERLAND S.P. EL. :
FEATURE: BORROW AREA D SAMPLE :CLASS I
STATION: PART :
RANGE : SOIL SYM:CL
BORING : DATE :6-5-81



Tennessee Valley Authority
Singleton Materials Engineering Laboratory
Consolidated Undrained Triaxial Compression (R) Test

Project: CUMBERLAND S.P.
Feature: BORROW AREA D
Station:
Range :
Boring :

El. :
Sample: CLASS I
Part :

Tested By : TAL JHD
Computed By: MHD
Checked By : [illegible]
Report Date: 6-5-81

Soil Symbol= CL
Sp. Gr. = 2.7

L.L.(%)= 40
D10(mm)= 0

P.I.(%)= 21

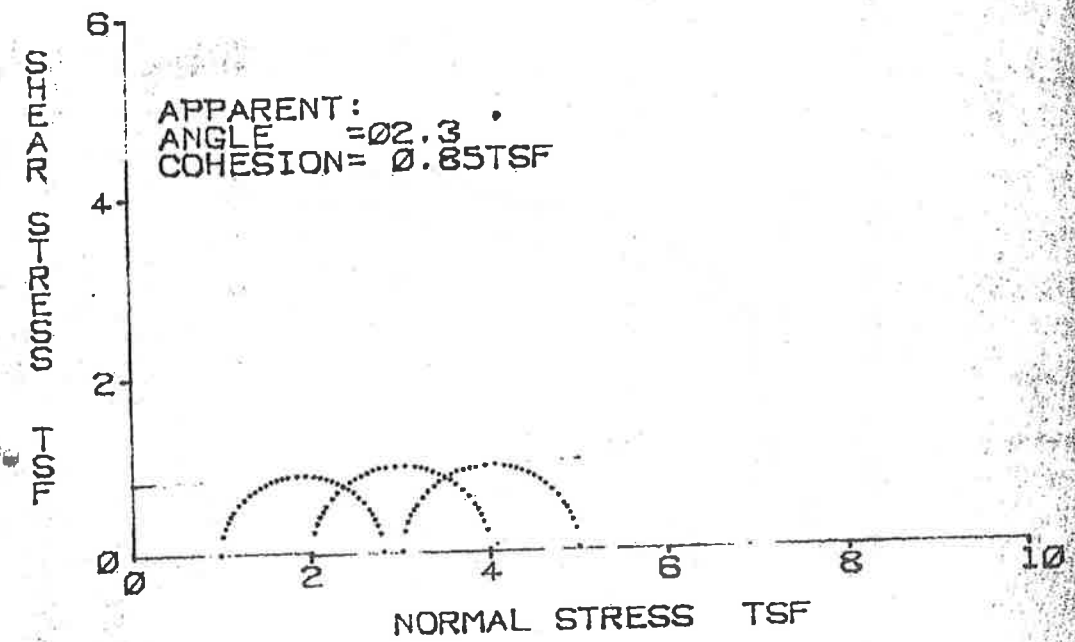
Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	14.8	14.7	14.7	14.9
Dry Density(pcf)	102.1	102.2	102.2	102.0
Void Ratio	0.650	0.649	0.649	0.653
Saturation(%)	61.6	61.3	61.3	61.7
Before Shearing:				
Moisture(%) (after satur.)	24.1	24.0	24.0	24.2
Saturation(%)	100.0	100.0	100.0	100.0
Moisture(%) (after cons.)	25.4	24.8	23.3	23.3
Void Ratio (after cons.)	0.685	0.670	0.629	0.575
Final Moisture Content(%)	24.4	22.5	21.5	21.2
Minor Principal Stress(tsf)	1.01	2.02	3.02	4.03
Major Principal Stress(tsf)	1.60	4.00	5.06	6.82
Eff. Minor Prin. Stress(tsf)	0.31	0.66	1.06	1.40
Eff. Major Prin. Stress(tsf)	0.90	2.64	3.09	4.18
Time to Failure(min.)	100	100	100	100
Rate of Strain(%/min.)	0.19	0.19	0.19	0.21
Specimen Height(in.)	3.15	3.15	3.15	3.15
Specimen Diameter(in.)	1.40	1.40	1.40	1.40

Shear Strength	Deg.	c(tsf)
Apparent	14.7	0.05
Effective	29.5	0.06

Remarks: Remolded at 3 (%) dry of optimum moisture and at 95 (%) of maximum unit weight.

TVA SINGLETON MATERIALS ENGINEERING LABORATORY
UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION(Q) TEST

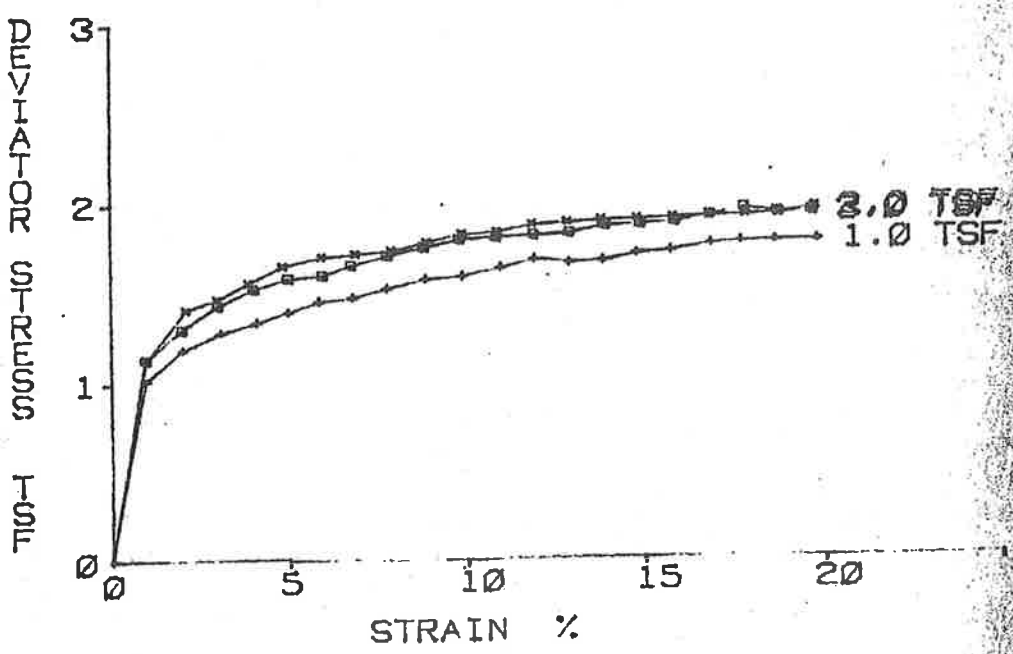
PROJECT:	CUMBERLAND S.P.	EL.	:
FEATURE:	BORROW AREA D	SAMPLE	: CLASS II
STATION:		PART	:
RANGE	:	SOIL SYM:	CH
BORING	:	DATE	: 6-8-81



TVA SINGLETON MATERIALS ENGINEERING LABORATORY

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION(Q) TEST

PROJECT:	CUMBERLAND S.P.	EL.	:
FEATURE:	BORROW AREA D	SAMPLE	: CLASS II
STATION:		PART	:
RANGE	:	SOIL SYM:	CH
BORING	:	DATE	: 6-8-81



Tennessee Valley Authority
Singleton Materials Engineering Laboratory
Unconsolidated Undrained Triaxial Compression (Q) Test

Project: CUMBERLAND S.P.
Feature: BORROW AREA D
Station:
Range :
Boring :

El. :
Sample: CLASS II
Part :

Tested By : RA
Computed By: MHD
Checked By : [illegible]
Report Date: 6-8-81

Soil Sybmbol= CH
Sp. Gr. = 2.72

L.L.(%)= 53
D10(mm)= 0

P.I.(%)= 34

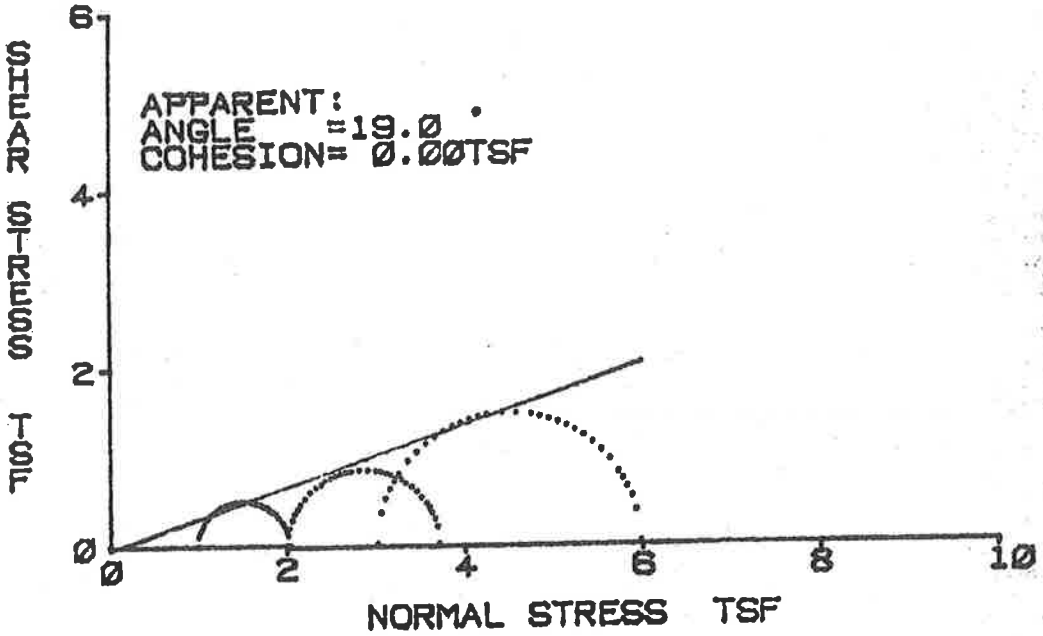
Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	22.8	22.6	22.7	0.0
Dry Density(pcf)	98.8	99.0	98.9	0.0
Void Ratio	0.719	0.715	0.716	0.000
Saturation(%)	86.4	85.8	86.0	0.0
Before Shearing:				
Moisture(%) (after satur.)	--	--	--	--
Saturation(%)	--	--	--	--
Moisture(%) (after cons.)	--	--	--	--
Void Ratio (after cons.)	--	--	--	--
Final Moisture Content(%)	22.8	22.6	22.6	0.0
Minor Principal Stress(tsf)	1.01	2.02	3.02	0.00
Major Principal Stress(tsf)	2.82	4.01	5.01	0.00
Eff. Minor Prin. Stress(tsf)	--	--	--	--
Eff. Major Prin. Stress(tsf)	--	--	--	--
Time to Failure(min.)	20	20	18	0
Rate of Strain(%/min.)	1.00	1.00	1.00	0.00
Specimen Height(in.)	3.15	3.15	3.15	3.15
Specimen Diameter(in.)	1.40	1.40	1.40	1.40

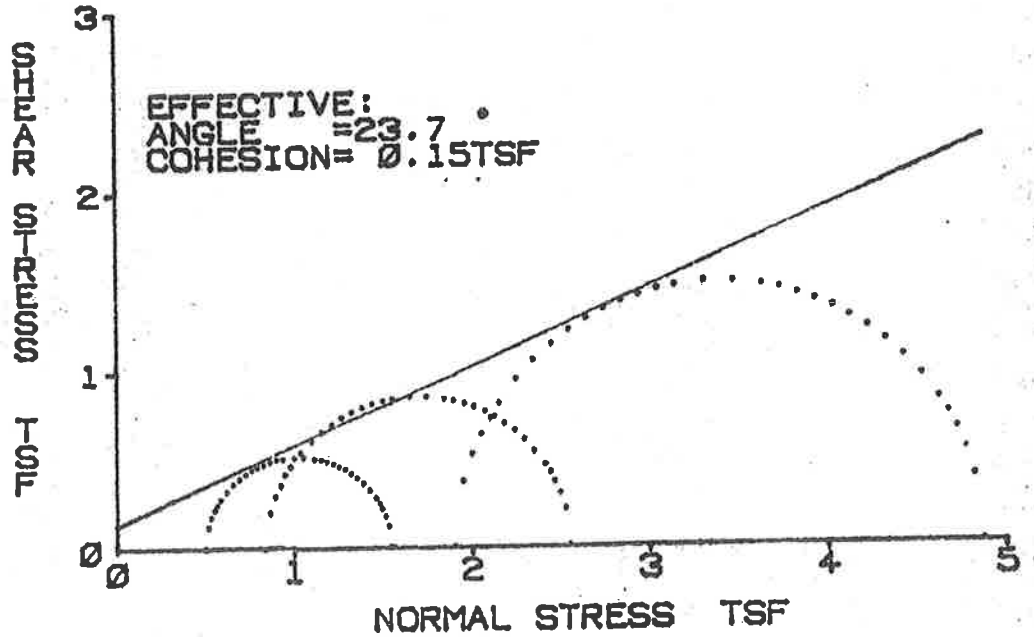
Shear Strength	Deg.	c(tsf)
Apparent	2.3	0.85
Effective	--	--

Remarks: Remolded at 3 (%) wet of optimum moisture and at 95 (%) of maximum unit weight.

TVA SINGLETON MATERIALS ENGINEERING LABORATORY
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (R) TEST

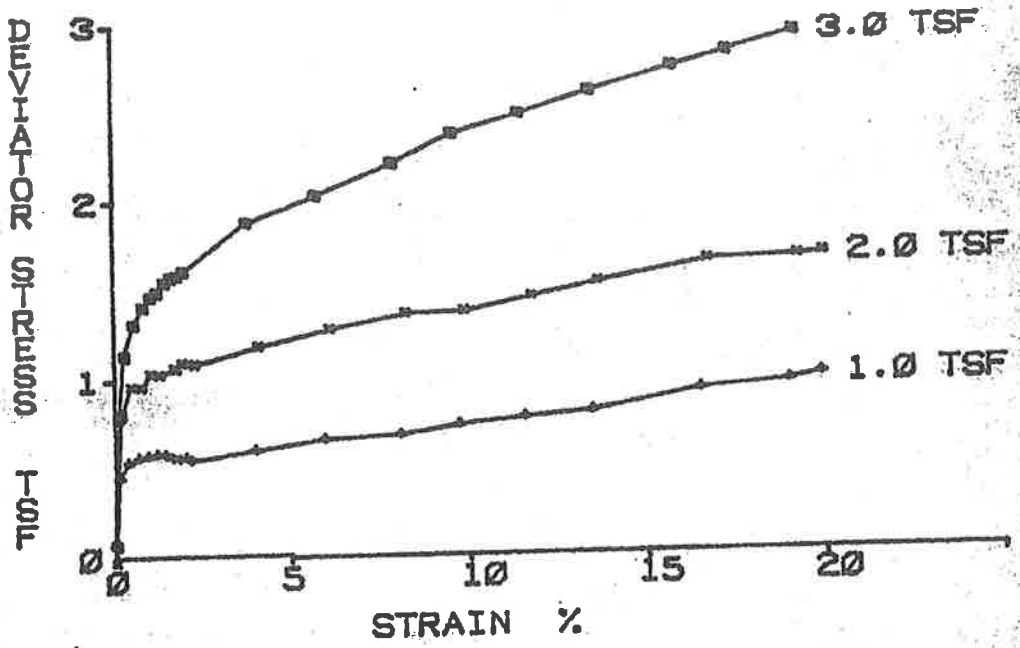
PROJECT:CUMBERLAND S.P.	EL. :
FEATURE:BORROW D	SAMPLE :CLASS II
STATION:	PART :
RANGE :	SOIL SYM:CL
BORING :	DATE :5-28-81

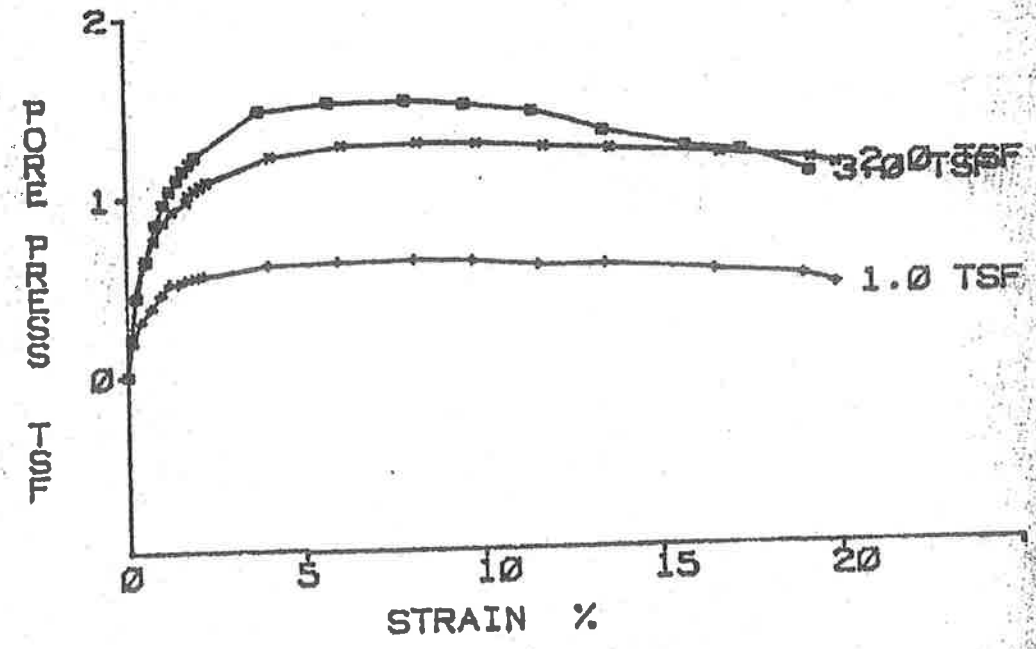




TVA SINGLETON MATERIALS ENGINEERING LABORATORY
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (R) TEST

PROJECT:CUMBERLAND S.P. EL. :
FEATURE:BORROW D SAMPLE :CLASS II
STATION: PART :
RANGE : SOIL SYM:CL
BORING : DATE :5-29-81





Tennessee Valley Authority
Singleton Materials Engineering Laboratory
Consolidated Undrained Triaxial Compression (R) Test

Project: CUMBERLAND S.P.
Feature: BORROW D
Station:
Range :
Boring :

El. :
Sample: CLASS II
Part :

Tested By : JHD
Computed By: MHD
Checked By : [illegible]
Report Date: 5-29-81

Soil Sybmbol= CL
Sp. Gr. = 2.72

L.L.(%)= 45
D10(mm)= 0

P.I.(%)= 26

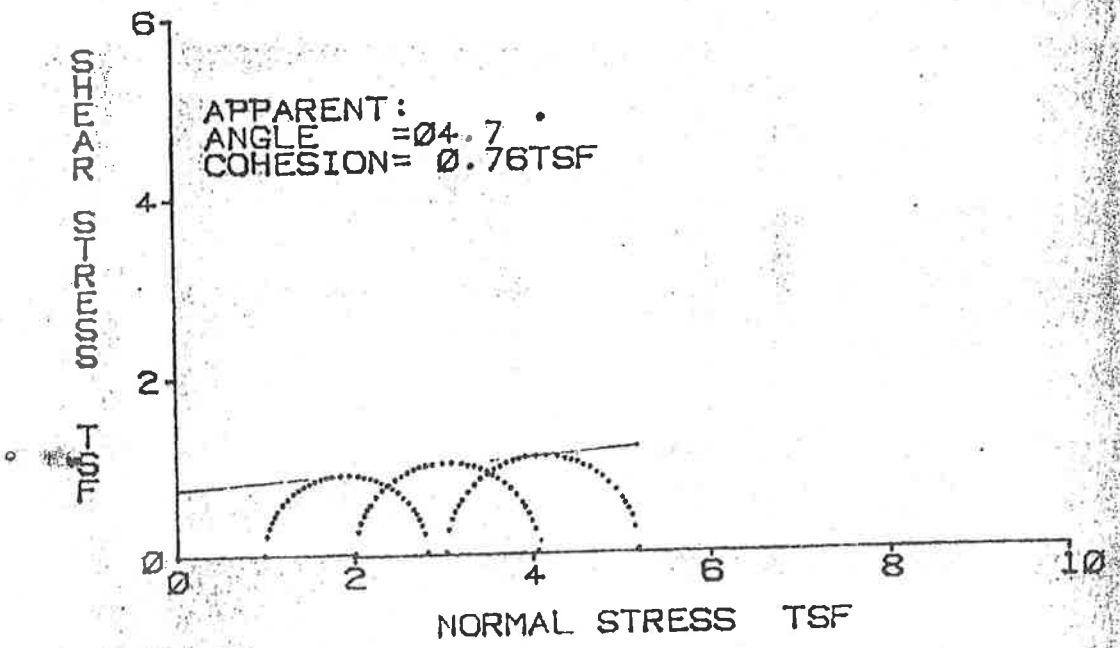
Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	17.1	16.9	16.9	0.0
Dry Density(pcf)	98.5	98.7	98.7	0.0
Void Ratio	0.723	0.720	0.720	0.000
Saturation(%)	64.4	63.9	63.9	0.0
Before Shearing:				
Moisture(%) (after satur.)	26.6	26.5	26.5	0.0
Saturation(%)	100.0	100.0	100.0	0.0
Moisture(%) (after cons.)	25.9	24.8	22.8	22.8
Void Ratio (after cons.)	0.704	0.673	0.619	0.000
Final Moisture Content(%)	25.4	23.7	22.1	0.0
Minor Principal Stress(tsf)	1.01	2.02	3.02	0.00
Major Principal Stress(tsf)	2.05	3.73	5.99	0.00
Eff. Minor Prin. Stress(tsf)	0.51	0.85	1.91	0.00
Eff. Major Prin. Stress(tsf)	1.55	2.56	4.87	0.00
Time to Failure(min.)	99	98	100	0
Rate of Strain(%/min.)	0.20	0.21	0.19	0.00
Specimen Height(in.)	3.15	3.15	3.15	3.15
Specimen Diameter(in.)	1.40	1.40	1.40	1.40

Shear Strength	Deg.	c(tsf)
Apparent	19.0	0.00
Effective	23.7	0.15

Remarks: Remolded at 3 (%) dry of optimum moisture and at 95 (%) of maximum unit weight.

TVA SINGLETON MATERIALS ENGINEERING LABORATORY
UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION(Q) TEST

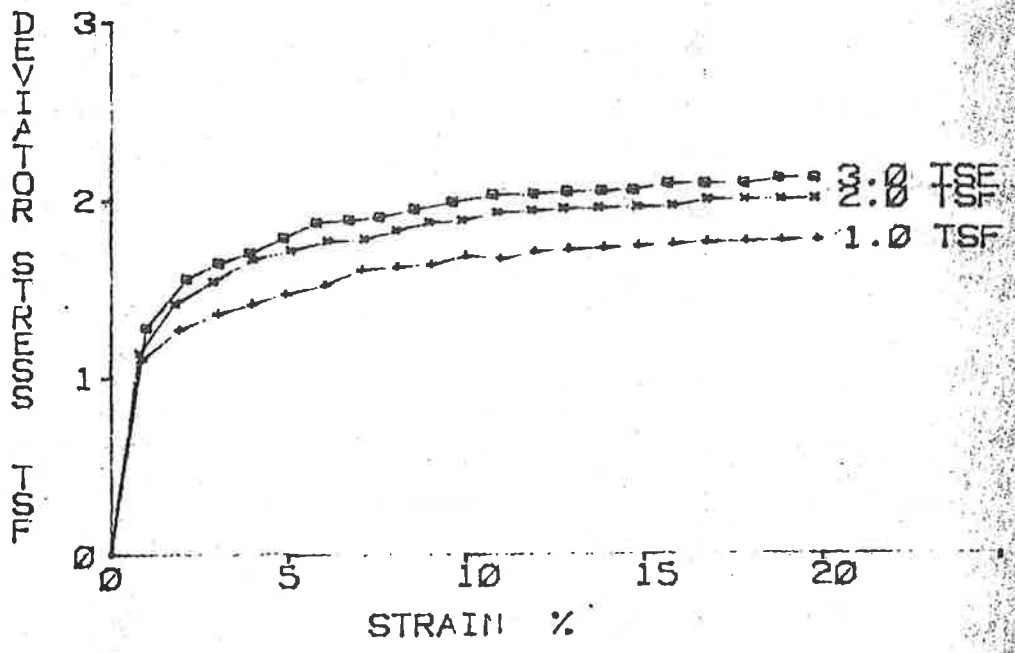
PROJECT:	CUMBERLAND S.P.	EL.	:
FEATURE:	BORROW AREA D	SAMPLE	: CLASS III
STATION:		PART	:
RANGE	:	SOIL SYM:	CH
BORING	:	DATE	: 6-8-81



T. A SINGLETON MATERIALS ENGINEERING LABORATORY

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION(Q) TEST

PROJECT:CUMBERLAND S.P.	EL. :
FEATURE:BORROW AREA D	SAMPLE :CLASS III
STATION:	PART :
RANGE :	SOIL SYM:CH
BORING :	DATE :6-8-81



Tennessee Valley Authority
Singleton Materials Engineering Laboratory
Unconsolidated Undrained Triaxial Compression (Q) Test

Project: CUMBERLAND S.P.
Feature: BORROW AREA D
Station:
Range :
Boring :

El. :
Sample: CLASS III
Part :

Tested By : RA
Computed By: MHD
Checked By : JBC
Report Date: 6-8-81

Soil Sybnbol= CH
Sp. Gr. = 2.74

L.L.(%)= 53
D10(mm)= 0

P.I.(%)= 34

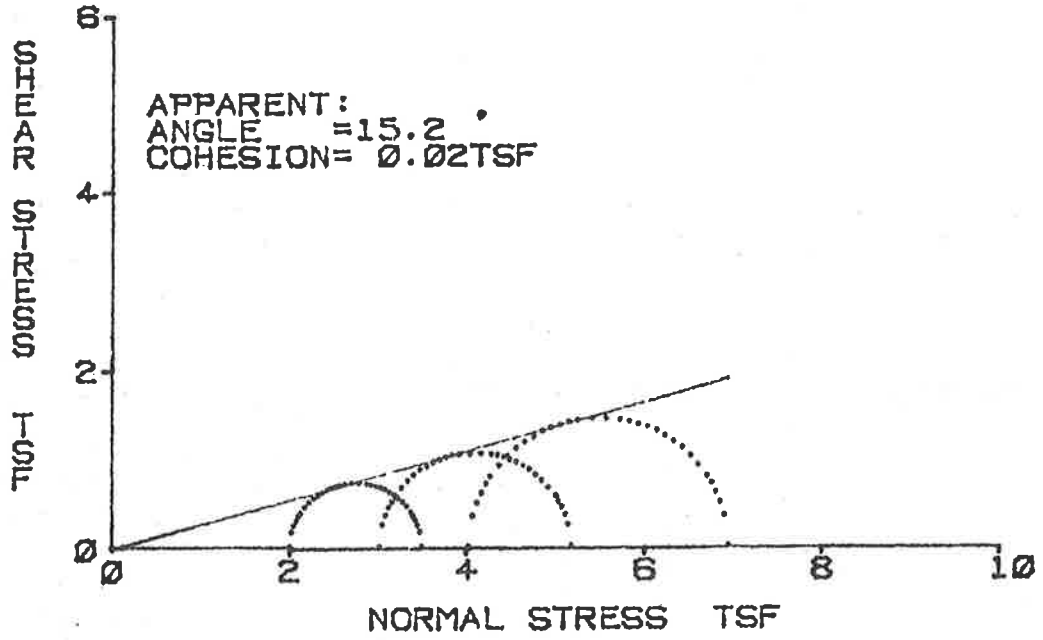
Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	25.4	25.2	24.9	0.0
Dry Density(pcf)	94.2	94.4	94.6	0.0
Void Ratio	0.815	0.812	0.807	0.000
Saturation(%)	85.5	85.1	84.6	0.0
Before Shearing:				
Moisture(%) (after satur.)	--	--	--	--
Saturation(%)	--	--	--	--
Moisture(%) (after cons.)	--	--	--	--
Void Ratio (after cons.)	--	--	--	--
Final Moisture Content(%)	25.4	25.2	24.8	0.0
Minor Principal Stress(tsf)	1.01	2.02	3.02	0.00
Major Principal Stress(tsf)	2.82	4.07	5.20	0.00
Eff. Minor Prin. Stress(tsf)	--	--	--	--
Eff. Major Prin. Stress(tsf)	--	--	--	--
Time to Failure(min.)	20	20	20	0
Rate of Strain(%/min.)	1.00	1.00	1.00	0.00
Specimen Height(in.)	3.15	3.15	3.15	3.15
Specimen Diameter(in.)	1.40	1.40	1.40	1.40

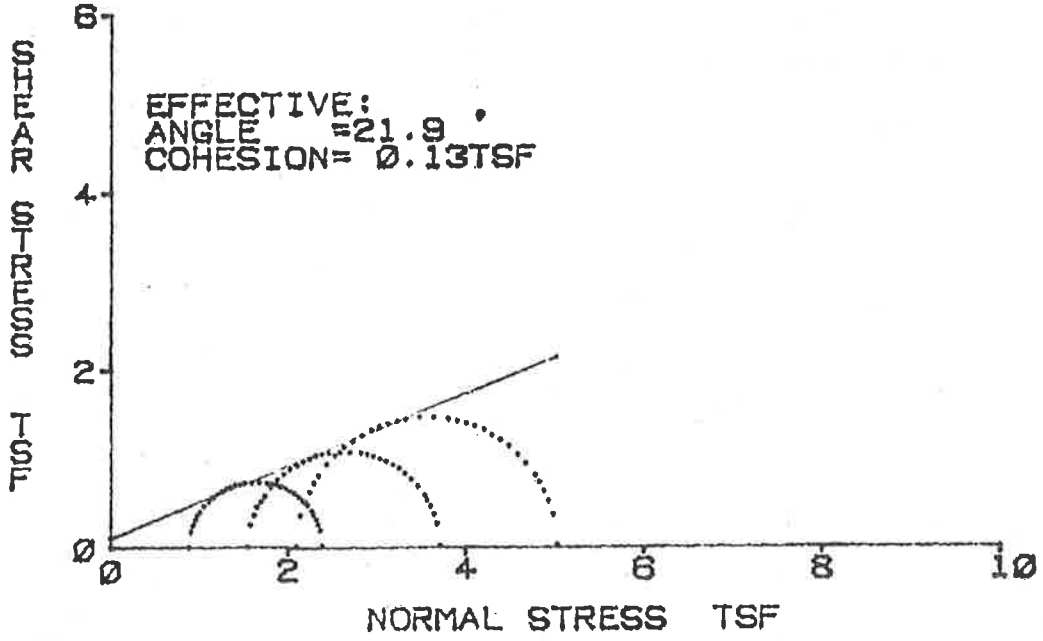
Shear Strength	Deg.	c(tsf)
Apparent	4.7	0.76
Effective	--	--

Remarks: Remolded at 3 (%) wet of optimum moisture and at 95 (%) of maximum unit weight.

TVA SINGLETON MATERIALS ENGINEERING LABORATORY
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (R) TEST

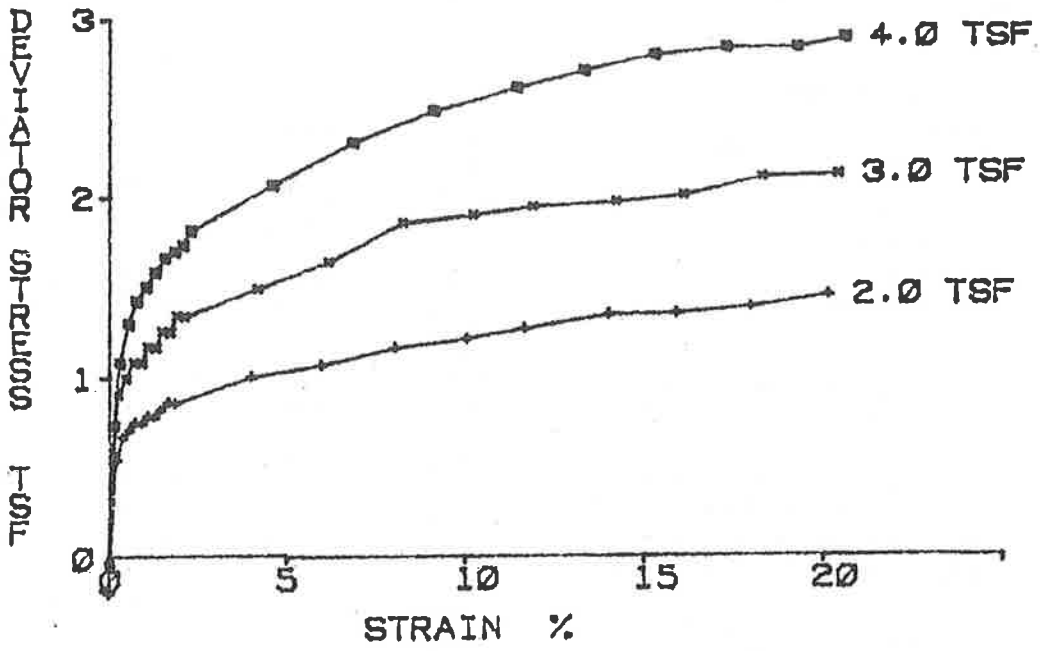
PROJECT:CUMBERLAND S.P.	EL. :
FEATURE:AREA D	SAMPLE :CLASS III
STATION:	PART :
RANGE :	SOIL SYM:CH
BORING :	DATE :6-3-81

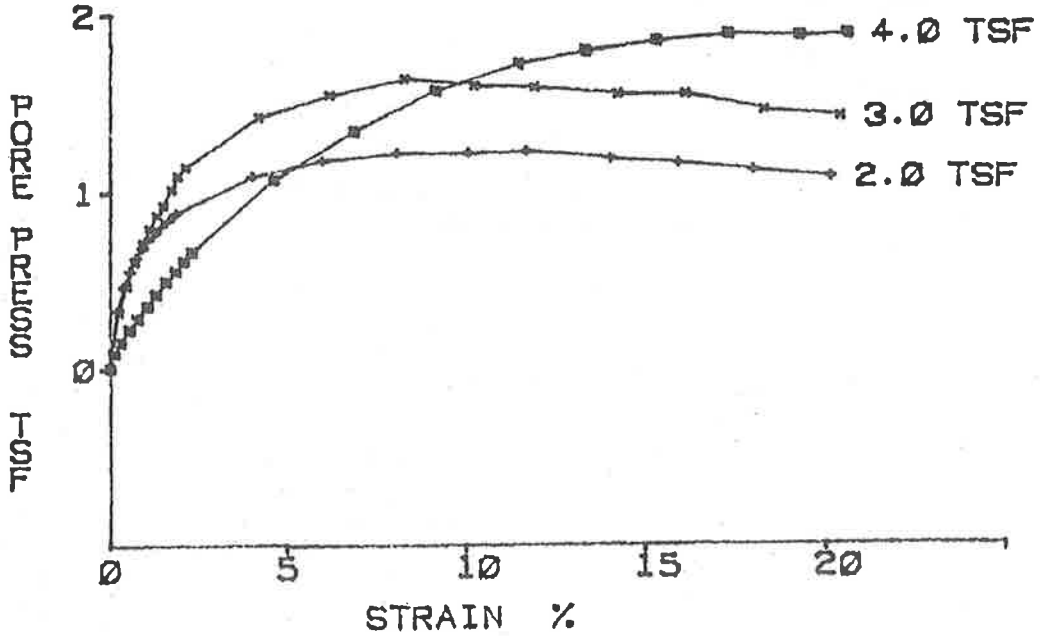




TVA SINGLETON MATERIALS ENGINEERING LABORATORY
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (R) TEST

PROJECT: CUMBERLAND S.P.	EL. :
FEATURE: AREA D	SAMPLE : CLASS III
STATION:	PART :
RANGE :	SOIL SYM: CH
BORING :	DATE : 6-3-81





Tennessee Valley Authority
Singleton Materials Engineering Laboratory
Consolidated Undrained Triaxial Compression (R) Test

Project: CUMBERLAND S.P.
Feature: AREA D
Station:
Range :
Boring :

El. :
Sample: CLASS III
Part :

Tested By : JHD
Computed By: MHD
Checked By :
Report Date: 6-3-81

Soil Symbol= CH
Sp. Gr. = 2.74

L.L.(%)= 53
D10(mm)= 0

P.I.(%)= 34

Specimen Number	1	2	3	4
Initial:				
Moisture Content(%)	19.3	19.4	19.2	0.0
Dry Density(pcf)	94.3	94.2	94.3	0.0
Void Ratio	0.813	0.815	0.813	0.000
Saturation(%)	65.0	65.2	64.7	0.0
Before Shearing:				
Moisture(%) (after satur.)	29.7	29.7	29.7	0.0
Saturation(%)	100.0	100.0	100.0	0.0
Moisture(%) (after cons.)	25.0	24.9	24.7	24.7
Void Ratio (after cons.)	0.684	0.684	0.676	0.000
Final Moisture Content(%)	26.4	25.7	24.7	0.0
Minor Principal Stress(tsf)	2.02	3.02	4.03	0.00
Major Principal Stress(tsf)	3.51	5.19	6.96	0.00
Eff. Minor Prin. Stress(tsf)	0.90	1.56	2.10	0.00
Eff. Major Prin. Stress(tsf)	2.40	3.72	5.03	0.00
Time to Failure(min.)	100	100	97	0
Rate of Strain(%/min.)	0.20	0.21	0.22	0.00
Specimen Height(in.)	3.15	3.15	3.15	3.15
Specimen Diameter(in.)	1.40	1.40	1.40	1.40

Shear Strength	Deg.	c(tsf)
Apparent	15.2	0.02
Effective	21.9	0.13

Remarks: Remolded at 3 (%) dry of optimum moisture and at 95 (%) of maximum unit weight.