U.S. ARMY CORPS OF ENGINEERS

BORING NO. 91-79 DATE: BEGIN 3-29-91 PAGE 1/1

JOB NO. 146448 COMPLETE 3-29-91 Thin Walled Tube

PROJECT Bray's Bayou ☐ 3" ☑ 6"

LOCATION Bray's Bayou South Bank

ELEVATION OF HOLE

MANUFACTURER'S DESIGNATION OF DRILL RIG Failing-36

GROUNDWATER: DEPTH 7'2" ft., ELEV. ____ ft., at end of Drilling

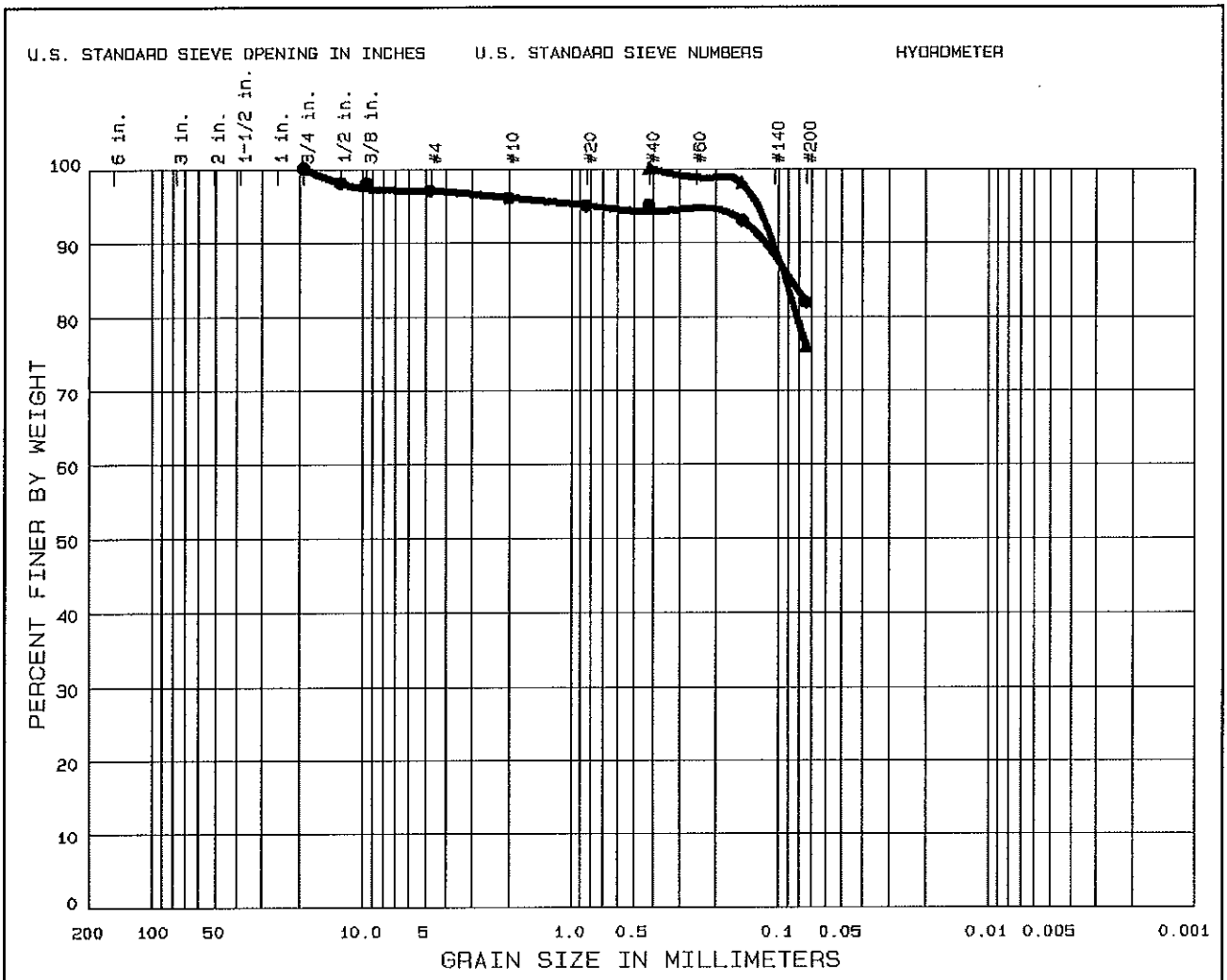
WEATHER Clear, Cool, Windy

DRILLER D. Mitchell LOGGER J. Berg

DEPTH, FEET	SAMPLE	SAMPLE NO.	PEN./TORVANE SPT.-BLOW COUNT	COLOR	MATERIAL TYPE	CONSISTENCY	SECONDARY CONSTITUENTS	STRUCTURAL FEATURES AND COMMENTS
0		1	[illegible]	Gray	Clay	Very [illegible]		
		2	3.75	"	"	"		
5		3	[illegible]	Gray + Tan	"	"		w/calc Nods
		4	2.0	"	"	"		w/calc Nods
		5	4.5+	"	"	hard		w/calc Nods.
10		6	[illegible]	Tan + Gray	Clay	Very Stiff		w/calc Nods.
		7	2.0	"	"	"		
15		8	1.0	[illegible]	[illegible]	Stiff	Silt	
		9	1.5	"	"	"	"	
		10	2.5	"	"	Very Stiff	"	
20		11	3.0	"	"	"		
		12	[illegible]	Tan + Gray	Clay	Very Stiff	Silt	
25		13	1.75	Gray + Tan	Clay	Stiff	Silt	
								Bottom of 91-79 (26')
30								
35								

DEPARTMENT OF THE ARMY, SOUTHWESTERN DIVISION LABORATORY
CORPS OF ENGINEERS, 4815 CASS STREET, DALLAS, TX 75235

W.O. No.
Req. No.
Contract No.



	% COBBLES	% GRAVEL	% SAND	% SILT OR CLAY
●	0.0	3.0	15.0	82.0
▲	0.0	0.0	24.0	76.0

	Sample No.	Elev or Depth	Nat W%	LL	PL	PI	C_C	C_U
●	91/2519	4.0-6.0	20.2	60	13	47		
▲	91/2520	18.0-20.0	18.3	35	12	23		

CLASSIFICATION

● FAT CLAY WITH SAND (CH)

▲ LEAN CLAY WITH SAND (CL)

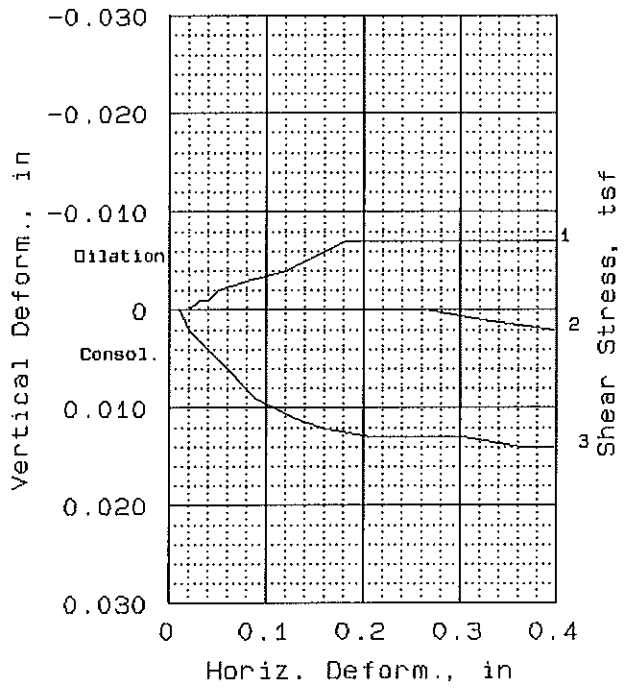
Remarks:

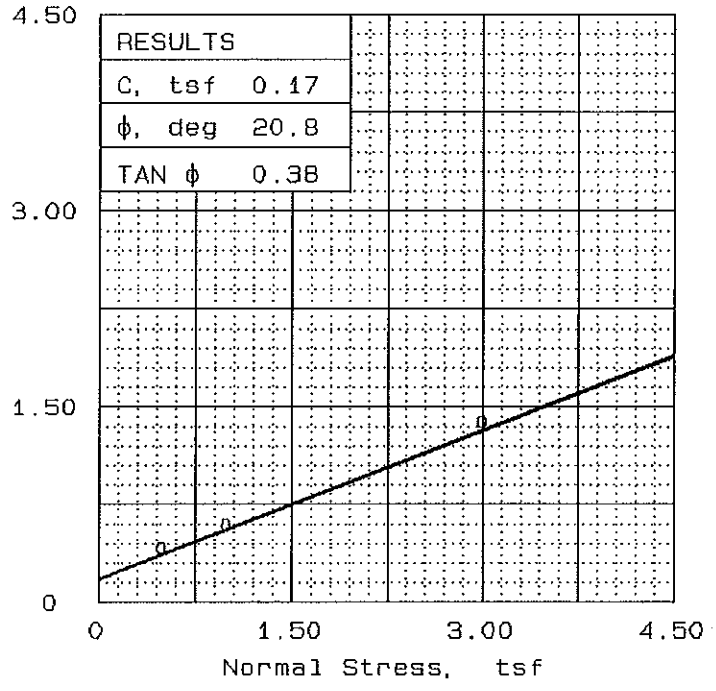
Project BRAYS BAYOU
FLOOD DAMAGE REDUCTION PROJECT
Lab No. SWDED-GL RPT NO. 15363

Area

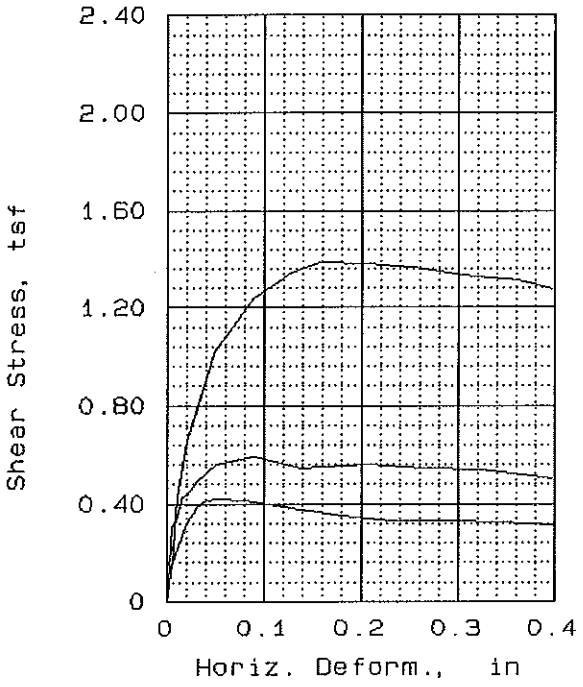
Boring No. 91-79 Date AUGUST 1991

GRADATION CURVES





RESULTS	
C, tsf	0.17
ϕ, deg	20.8
TAN ϕ	0.38



	SAMPLE NO.	1	2	3
INITIAL	WATER CONTENT, %	21.3	20.1	20.5
	DRY DENSITY, pcf	104.7	106.2	105.4
	SATURATION, %	94.5	92.1	92.4
	VOID RATIO	0.609	0.588	0.599
	SIDE LENGTH, in	3.00	3.00	3.00
	HEIGHT, in	1.00	1.00	1.00
AT TEST	WATER CONTENT, %	22.2	21.2	19.8
	DRY DENSITY, pcf	106.0	107.8	110.5
	SATURATION, %	101.6	101.7	101.5
	VOID RATIO	0.590	0.564	0.525
	SIDE LENGTH, in	3.39	3.39	3.39
	HEIGHT, in	0.99	0.99	0.95
NORMAL STRESS, tsf		0.50	1.00	3.00
MAX. SHEAR, tsf		0.42	0.59	1.39
STRAIN RATE, %/min.		0.002	0.002	0.002
ULT. SHEAR, tsf				

SAMPLE DATA

SAMPLE TYPE: UNDISTURBED

DESCRIPTION: FAT CLAY WITH SAND (CH)

LL= 60 PL= 13 PI= 47.0

SPECIFIC GRAVITY= 2.70

REMARKS: SPECIFIC GRAVITY ESTIMATED

FIG. NO.

CLIENT: US ARMY CORPS OF ENGINEERS
GALVESTON DISTRICT

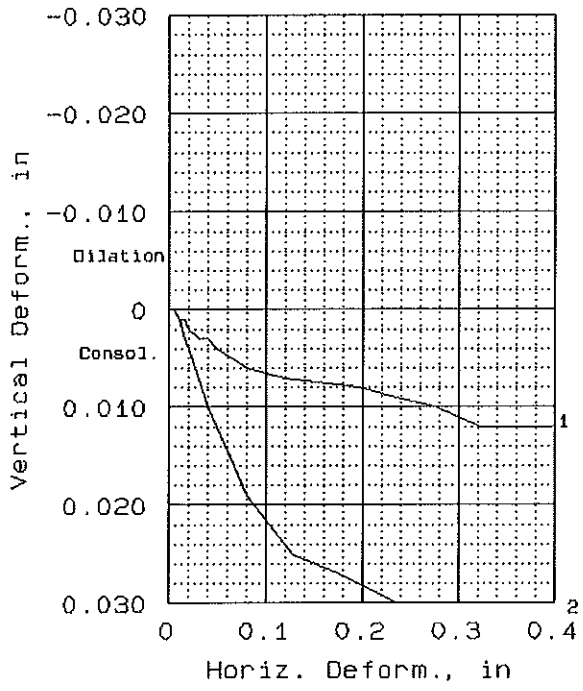
PROJECT: BRAYS BAYOU FLOOD DAMAGE REDUCTION PROJECT, HOUSTON, TX.

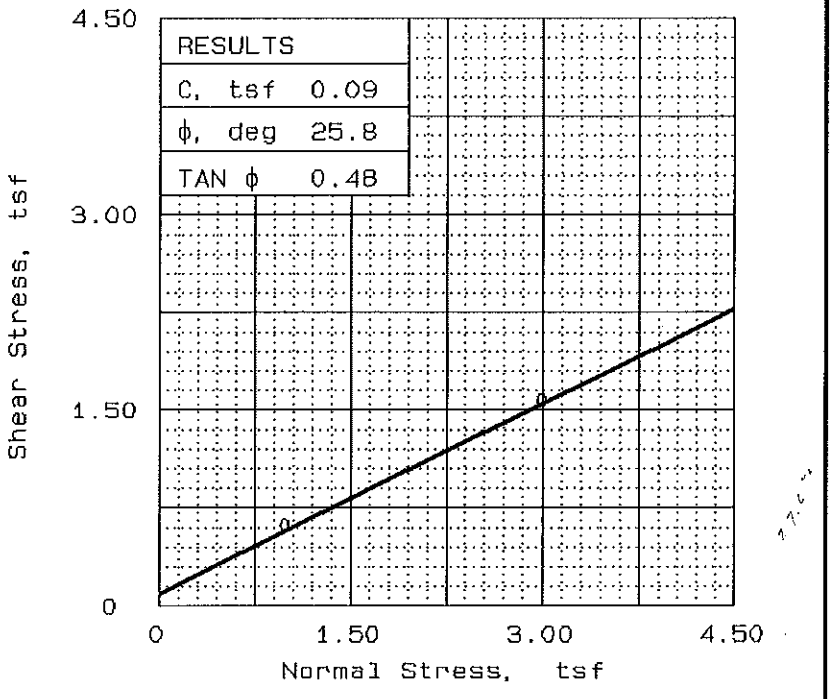
SAMPLE LOCATION: BORING: 91-79, CTN-3 5.1'-6.0', SWD LAB NO. 91/2519

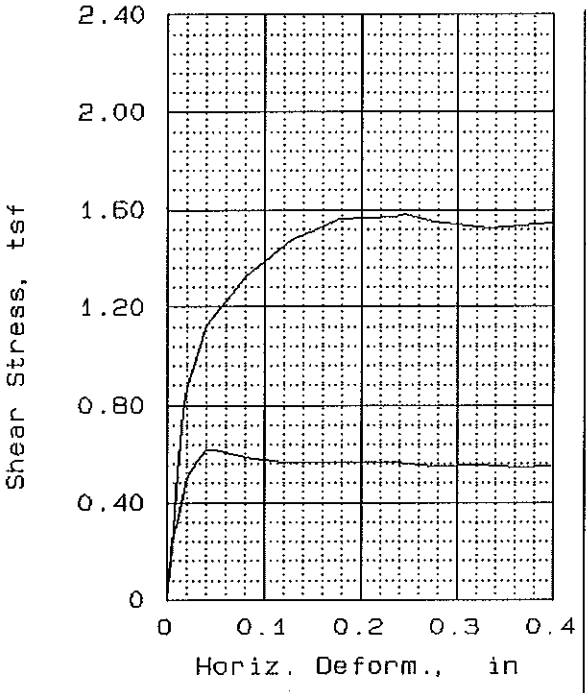
PROJ. NO.: 15363 DATE: JULY 1991

DIRECT SHEAR TEST

CORPS OF ENGINEERS - SOUTHWESTERN







SAMPLE NO.		1	2
INITIAL	WATER CONTENT, %	17.3	17.6
	DRY DENSITY, pcf	109.2	108.7
	SATURATION, %	86.1	86.4
	VOID RATIO	0.544	0.550
	SIDE LENGTH, in	3.00	3.00
	HEIGHT, in	1.00	1.00
AT TEST	WATER CONTENT, %	19.0	18.3
	DRY DENSITY, pcf	111.0	112.5
	SATURATION, %	98.9	99.1
	VOID RATIO	0.519	0.498
	SIDE LENGTH, in	3.39	3.39
	HEIGHT, in	0.98	0.97
NORMAL STRESS, tsf		1.00	3.00
MAX. SHEAR, tsf		0.62	1.58
STRAIN RATE, %/min.		0.002	0.002
ULT. SHEAR, tsf			

SAMPLE DATA

SAMPLE TYPE: UNDISTURBED

DESCRIPTION: LEAN CLAY WITH SAND (CL)

LL= 35 PL= 12 PI= 23.0

SPECIFIC GRAVITY= 2.70

REMARKS: SPECIFIC GRAVITY ESTIMATED, .5 TSF NORMAL LOAD SPECIMEN TEST ABORTED DUE EQUIPMENT PROBLEMS

FIG. NO.

CLIENT: US ARMY CORPS OF ENGINEERS
GALVESTON DISTRICT

PROJECT: BRAYS BAYOU FLOOD DAMAGE REDUCTION PROJECT, HOUSTON, TX.

SAMPLE LOCATION: BORING: 91-79, CTN-10 18.0'-20.0', SWD LAB NO. 91/2520

PROJ. NO.: 15363 DATE: JULY 1991

DIRECT SHEAR TEST

CORPS OF ENGINEERS - SOUTHWESTERN

TABLE 1

RESULTS OF TESTS OF DISTURBED AND UNDISTURBED SOIL SAMPLES

SWDED-GL REPORT NO. 15363 BRAYS BAYOU - FLOOD DAMAGE REDUCTION PROJECT

BORING	NO.	SWD NO. FLD NO.	DEPTH, FT	GR	SA	FI	LL	PL	PI	LS	WC, %	PCF	MAJOR TESTS	DESCRIPTION OF MATERIAL
91	77	91/2518 CTN-5	8.0 - 10.0	2	17	81	67	16	51		18.0	110	DS	CH - FAT CLAY WITH SAND, GRAYISH BROWN MOTTLED WITH BROWNISH GRAY AND GRAY, MOIST, HARD(>4.0), NON-CALCAREOUS, IRON-OXIDE DEPOSITS, CALCAREOUS POCKETS, CALCAREOUS NODULES TO 1/2" IN BOTTOM 2".
91	79	91/2519 CTN-3	4.0 - 6.0	3	15	82	60	13	47		20.2	106	DS	CH - FAT CLAY WITH SAND, LIGHT GRAYISH BROWN MOTTLED WITH YELLOW AND GRAY, MOIST, VERY STIFF(2.0-2.5), NON-CALCAREOUS, IRON-OXIDE DEPOSITS, CALCAREOUS NODULES THROUGHOUT.
91	79	91/2520 CTN-10	18.0 - 20.0	0	24	76	35	12	23		18.3	110	DS	CL - LEAN CLAY WITH SAND, REDDISH YELLOW, MOIST, VERY STIFF(2.25), NON-CALCAREOUS, POCKETS OF GRAY VERY FINE SILTY SAND.
91	82	91/2521 CTN-3	4.0 - 6.0	1	23	76	57	14	43		19.5	107	DS	CH - FAT CLAY WITH SAND, LIGHT GRAYISH BROWN MOTTLED WITH GRAY, MOIST, VERY STIFF(3.25), NON-CALCAREOUS, IRON-OXIDE DEPOSITS, CALCAREOUS NODULES AND GRAVELS TO 1".
91	82	91/2522 CTN-12	22.0 - 24.0	1	14	85	37	13	24		21.3	106	DS	CL - LEAN CLAY WITH SAND, LIGHT BROWN AND LIGHT GRAY, MOIST, VERY STIFF(2.25), NON-CALCAREOUS, A FEW GRAVELS, CALCAREOUS NODULES THROUGHOUT.
91	84	91/2523 CTN-8	14.0 - 16.0	0	17	83	39	13	26		25.3	98	DS	CL - LEAN CLAY WITH SAND, YELLOW AND GRAY, MOIST, SOFT(0.5), NON-CALCAREOUS, CALCAREOUS NODULES, SEAMS AND POCKETS THROUGHOUT, VERY SANDY IN TOP 1".
91	87	91/2524 CTN-3	4.0 - 6.0	1	10	89	95	22	73		39.1	80	DS	CH - FAT CLAY, GRAY, MOIST, STIFF(1.5), NON-CALCAREOUS, IRON-OXIDE DEPOSITS, CALCAREOUS NODULES.
91	87	91/2525 CTN-8	14.0 - 16.0	1	16	83	64	20	44		28.2	96	DS	CH - FAT CLAY WITH SAND, LIGHT GRAY AND BROWN AND OLIVE SPOTS, MOIST, VERY STIFF(2.25), NON-CALCAREOUS CALCAREOUS NODULES TO 1 1/2", IRON-OXIDE DEPOSITS, INDURATED THROUGHOUT.

Project : Brays and Sims bayou and Fondren Ditch, Houston, Texas
Contract No.DACW64-91-D-0001 Delivery Order No. 0016

SUMMARY OF LABORATORY TEST RESULTS

Boring No. 91-79

S #	Depth (ft)	P P (tsf)	SPT Blows per Foot	Visual Classification	U S C	M c (%)	Dry Unit Wt (pcf)	Wet Unit Wt (pcf)	L L (%)	P L (%)	Mechanical Analysis % Passing					Torvane Shear Strength (tsf)	q u (tsf)
											#4	#10	#40	#100	#200		
1	0-2	2.00		Dark gray, clay, very stiff, w/ ferrous nodules & roots	CH	25.5			59	24							
2	2-4	2.00		Olive gray & dark gray, clay, very stiff, w/ calcareous & ferrous nodules	CH	25.0											
3	4-6	2.00		Gray & tan, clay, very stiff, w/ calcareous nodules	CH												
4	6-8	2.25		Gray & yellowish brown, clay, very stiff, w/ calcareous & ferrous nodules	CH	21.8	98.8	120.4	54	23	99.5	99.1	98.6		89.1		1.15
5	8-10	4.5+		Gray & brown, clay, hard, silty, w/ calcareous nodules & ferrous stains	CL	18.3											
6	10-12	3.00		Red & gray, clay, very stiff, w/ calcareous nodules & ferrous stains, slickensided	CH	26.3											
7	12-14	2.75		Red & gray, clay, very stiff, w/ calcareous nodules & ferrous stains, slickensided	CH	25.6											
8	14-16	1.50		Red & gray, clay, stiff, silty	CL	23.8	104.3	129.1	23	12	100.0	99.9	99.9		89.6		0.44
9	16-18	1.50		Red & gray, clay, stiff, silty	CL	23.7											
10	18-20	3.50		Tan & gray, clay, very stiff, silty	CL												
11	20-22	3.00		Red & gray, clay, very stiff, silty, w/ calcareous nodules	CL	19.1			44								
12	22-24	2.50		Gray & brown, clay, very stiff, silty, w/ calcareous nodules	CL	19.1											
13	24-26	1.50		Gray & yellowish brown, clay, stiff, silty	CL	18.1											

S # : Sample Number, P P : Pocket Penetrometer Reading, U S C : Unified Soil Classification, M c : Moisture Content
q u : Unconfined Compressive Strength, W O H : Weight of hammer, W O P : Weight of pipe

JOB NO. 14G487 DATE 7/12/91

PROJECT BRAYS BAYOU, SIMS BAYOU AND FONDREN DITCH

BORING NO. 91-79 SAMPLE NO. 4 DEPTH 6-8 ft

SPECIMEN NO. 1

CLASSIFICATION
Gray & yellowish brown, clay, very stiff, w/ calcareous & ferrous nodules

Tare No.	D-20	Height	5.595 in.
Tare plus Wet Specimen	1154.55 gm	Average Diameter	2.830 in.
Tare plus Dry Specimen	955.50 gm	Initial Area	6.290 sq in.
Water Weight	199.05 gm	Volume	35.194 cu in.
Tare Weight	42.51 gm	Volume of Solids	cu in.
Wet Specimen	1112.04 gm	Void Ratio	
Dry Specimen	912.99 gm	Saturation	%
Water Content	21.80 %	Dry Density	98.8 lb/cu ft

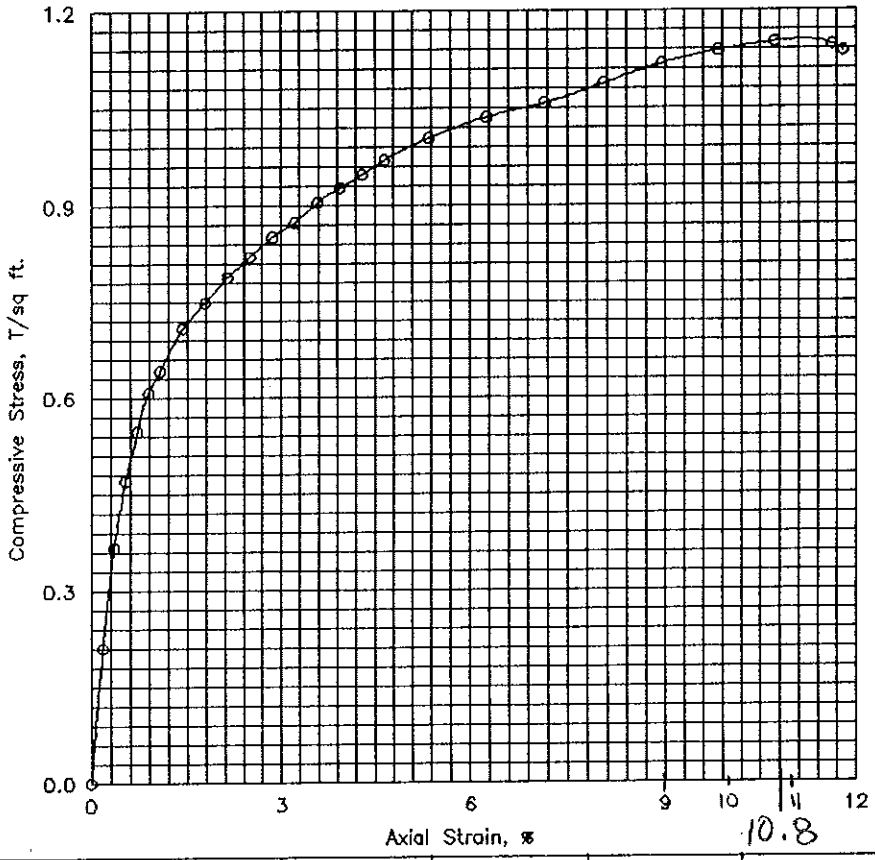
Specific Gravity of Solids
LL = 54 PL = 23 PI = 31

Proving Ring No. 10170
Proving Ring Constant, K = .766 lbs/div.

Elapsed Time min.	Dial Reading 0.001"	Cumulative Change in.	Proving Ring Dial Reading	Axial Load lb	Axial Strain	Area Corr. sq in.	Compr. Stress tsf
.0	0.	.000	.0	.0	.000	6.29	.000
.2	10.	.010	24.0	18.4	.002	6.30	.210
.4	20.	.020	42.0	32.2	.004	6.31	.367
.6	30.	.030	54.0	41.4	.005	6.32	.471
.8	40.	.040	63.0	48.3	.007	6.34	.548
1.0	50.	.050	70.0	53.6	.009	6.35	.608
1.1	60.	.060	74.0	56.7	.011	6.36	.642
1.5	80.	.080	82.0	62.8	.014	6.38	.709
1.8	100.	.100	87.0	66.6	.018	6.40	.749
2.2	120.	.120	92.0	70.5	.021	6.43	.789
2.5	140.	.140	96.0	73.5	.025	6.45	.821
2.8	160.	.160	100.0	76.6	.029	6.48	.852
3.1	180.	.180	103.0	78.9	.032	6.50	.874
3.5	200.	.200	107.0	82.0	.036	6.52	.905
3.8	220.	.220	110.0	84.3	.039	6.55	.927
4.1	240.	.240	113.0	86.6	.043	6.57	.948
4.4	260.	.260	116.0	88.9	.046	6.60	.970
5.1	300.	.300	121.0	92.7	.054	6.65	1.004
5.9	350.	.350	126.0	96.5	.063	6.71	1.036
6.1	400.	.400	130.0	99.6	.071	6.77	1.058
6.8	450.	.450	135.0	103.4	.080	6.84	1.088
7.6	500.	.500	140.0	107.2	.089	6.91	1.118
8.4	550.	.550	144.0	110.3	.098	6.98	1.138
9.2	600.	.600	147.0	112.6	.107	7.05	1.151
10.0	650.	.650	148.0	113.4	.116	7.12	1.147
10.1	660.	.660	147.0	112.6	.118	7.13	1.137

Job No. 14G487

Failure Sketches



☐ Controlled stress
☒ Controlled strain

Test No.			1			
Type of Specimen			Undisturbed			
Initial	Water content	w_o	21.8 %	%	%	%
	Void ratio	e_o				
	Saturation	S_o	%	%	%	%
	Dry density, lb/cu ft	γ_d	98.8			
Time to failure, min		t_f	9.18			
Unconfined compressive strength, T/sq ft		q_u	1.15			
Undrained shear strength, T/sq ft		S_u	.58			
Sensitivity ratio		S_t				
Initial specimen diameter, in.		D_o	2.830			
Initial specimen height, in.		H_o	5.595			

Classification Gray & yellowish brown, clay, very stiff, w/ calcareous & ferrous nodules

LL	54	PL	23	PI	31	G_s	

Remarks

Project BRAYS BAYOU, SIMS BAYOU AND FONDREN DITCH

Area Houston, Texas

Boring No. 91-79 | Sample No. 4

Depth 6-8 ft | Date 7/12/91

El

UNCONFINED COMPRESSION TEST REPORT

ENG FORM 3659
1 JUN 65

PLATE XI-2

Geotest Engineering, Inc.

PLATE

JOB NO. 14G487 DATE 7/12/91

PROJECT BRAYS BAYOU, SIMS BAYOU AND FONDREN DITCH

BORING NO. 91-79 SAMPLE NO. 8 DEPTH 14-16 ft

SPECIMEN NO. 1

CLASSIFICATION
Red gray, clay, stiff, silty

Tare No.	P-2	Height	5.595 in.
Tare plus Wet Specimen	1235.39 gm	Average Diameter	2.830 in.
Tare plus Dry Specimen	1006.12 gm	Initial Area	6.290 sq in.
Water Weight	229.27 gm	Volume	35.194 cu in.
Tare Weight	42.99 gm	Volume of Solids	cu in.
Wet Specimen	1192.40 gm	Void Ratio	
Dry Specimen	963.13 gm	Saturation	%
Water Content	23.80 %	Dry Density	104.3 lb/cu ft

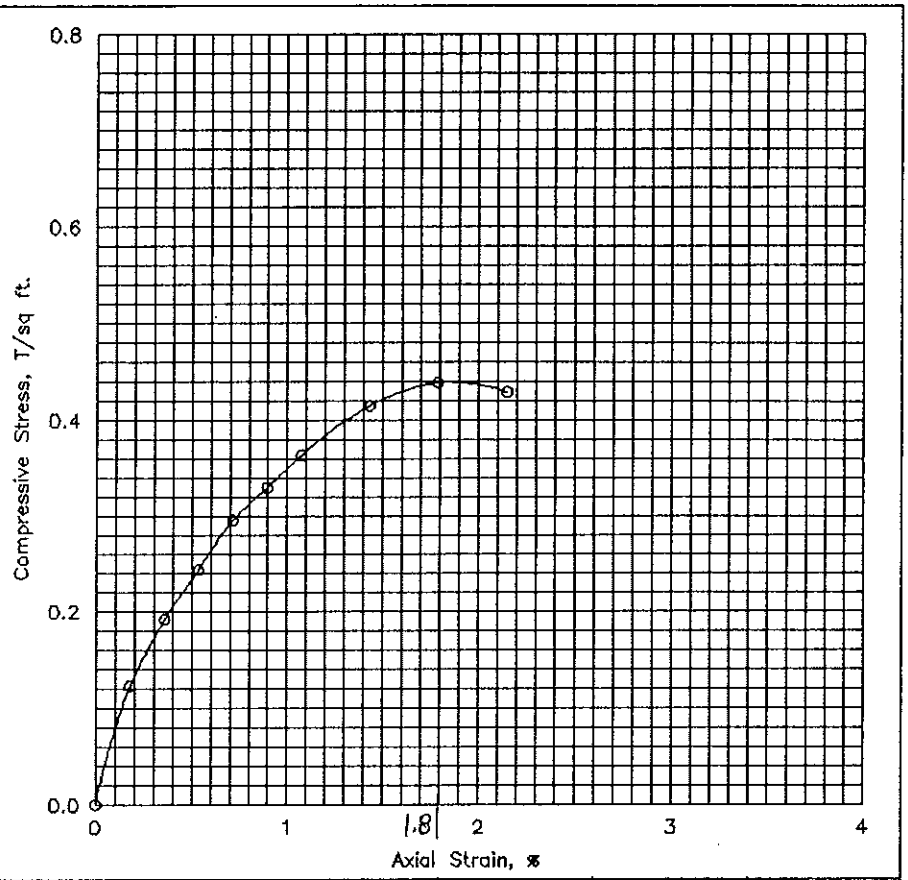
Specific Gravity of Solids
LL = 23 PL = 12 PI = 11

Proving Ring No. 10170
Proving Ring Constant, K = .766 lbs/div.

Elapsed Time min.	Dial Reading 0.001"	Cumulative Change in.	Proving Ring Dial Reading	Axial Load lb	Axial Strain	Area Corr. sq in.	Compr. Stress tsf
.0	0.	.000	.0	.0	.000	6.29	.000
.3	10.	.010	14.0	10.7	.002	6.30	.123
.5	20.	.020	22.0	16.9	.004	6.31	.192
.7	30.	.030	28.0	21.4	.005	6.32	.244
.9	40.	.040	34.0	26.0	.007	6.34	.296
1.1	50.	.050	38.0	29.1	.009	6.35	.330
1.4	60.	.060	42.0	32.2	.011	6.36	.364
1.8	80.	.080	48.0	36.8	.014	6.38	.415
2.3	100.	.100	51.0	39.1	.018	6.40	.439
2.7	120.	.120	50.0	38.3	.021	6.43	.429

Job No. 14G487

Failure Sketches



☐ Controlled stress
☒ Controlled strain

Test No.			1			
Type of Specimen			Undisturbed			
Initial	Water content	w_o	23.8 %	%	%	%
	Void ratio	e_o				
	Saturation	S_o	%	%	%	%
	Dry density, lb/cu ft	γ_d	104.3			
Time to failure, min		t_f	2.27			
Unconfined compressive strength, T/sq ft		q_u	.44			
Undrained shear strength, T/sq ft		S_u	.22			
Sensitivity ratio		S_t				
Initial specimen diameter, in.		D_o	2.830			
Initial specimen height, in.		H_o	5.595			

Classification Red gray, clay, stiff, silty

LL	PL	PI	G_s
23	12	11	

Remarks

Project BRAYS BAYOU, SIMS BAYOU AND FONDREN DITCH

Area Houston, Texas

Boring No. 91-79 | Sample No. 8

Depth El 14-16 ft | Date 7/12/91

UNCONFINED COMPRESSION TEST REPORT

ENG FORM 3659
1 JUN 65

PLATE XI-2