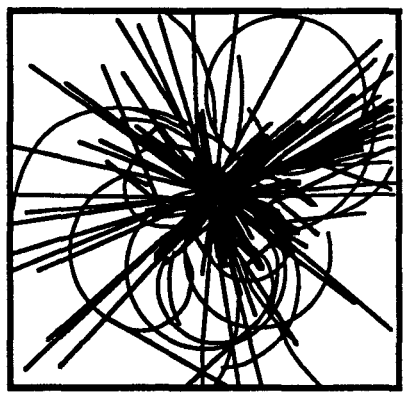
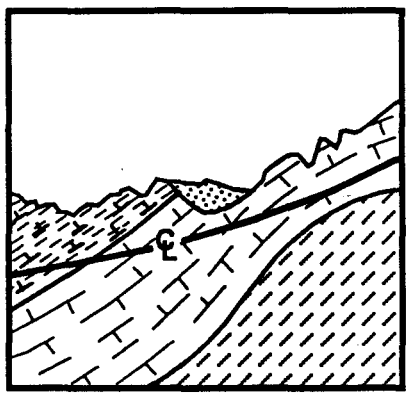
SSCL-SR-1106

SSCL-SR-1106
Project No. 87-888-0017
Report No. SSC-GR-47
July 1990
GR-47

Data Report for Corehole BF 3





Prepared by: The Earth Technology Corporation
Long Beach, California

Prepared for: RTK a joint venture
Oakland, California

FOREWORD

The goal of the geotechnical studies at the Texas Superconducting Super Collider (SSC) site is to allow the geologist and engineer to build their level of knowledge and confidence about the geologic structures and geotechnical properties of the site materials to the point at which there remains only a realistically small risk of encountering geotechnical conditions during construction that would significantly increase construction costs or delay construction schedules. To do this, a characterization program has been designed to meet the following objectives:

- To confirm the site's suitability and optimize the ring location (the "footprint") and hall positions on the ring
- To provide data for a preliminary structural design
- To provide a rational framework within which construction contracts and schedules can be formulated
- To maximize the use of the site-specific data already gathered by the proposer.

The geotechnical program to meet these objectives has been divided into the following three phases of study:

- Footprint location data
- Structure-specific data
- Global data.

This is one in a series of data reports prepared for the global data phase of geotechnical characterization at the SSC site. Data collection for this study phase focused on drillhole-based geological, geohydrological, geophysical, and geotechnical tests in the near vicinity of the E and F access shaft sites. The global data set has three key attributes: (1) uniform geographic distribution over the site footprint, (2) complete coverage of all of the strata through which the SSC tunnels and shafts will pass, and (3) consistency of the data from sampling site to sampling site throughout the SSC site. In combination with data from the other phases, these data will allow conceptual designs of construction methods. Each data report includes the results of both field and laboratory tests for specific drilling and sampling site(s).

DATA REPORT

Site Designator: BF 3

Objective: Drill a corehole at the proposed shaft location and determine geotechnical conditions through in-situ hydrological testing and laboratory geomechanical testing. The corehole was drilled to at least 35 feet below tunnel depth.

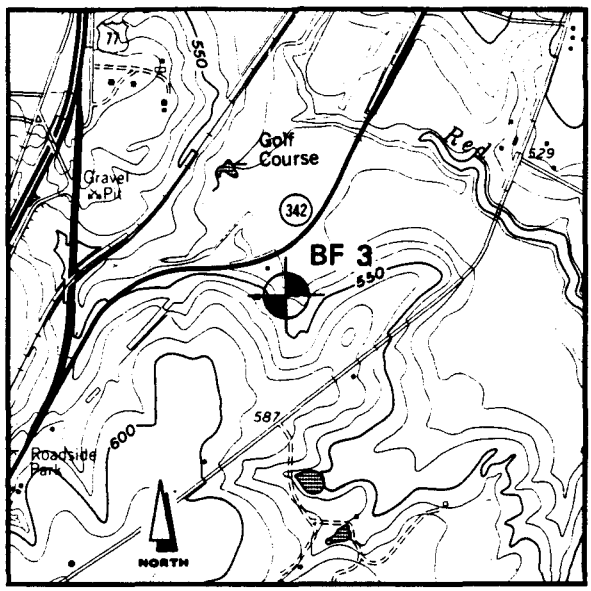
Location:

North 300,776 feet

East 2,211,027 feet

Surface Elevation 548.4 feet

BF 3 is located on the northern section of the proposed tunnel alignment, approximately 1.6 miles northeast of Sterrett, Texas.



SCALE 1:24000

1000 0 1000 2000 3000 FEET

CONTOUR INTERVAL 10 FEET

Scope and Schedule:

Coring (full depth)	February 6 to 7, 1990
Wire-line Logging	February 7, 1990
Hydrologic Testing	February 8, 1990
Laboratory Testing	February 9 to March 12, 1990
Well Construction	February 8 to 12, 1990

Conditions Encountered: (see lithologic log, Appendix A)

Total Hole Depth:	208.0 feet
Soil:	0.0 to 20.0 feet
Weathered Austin Chalk	20.0 TO 25.7 feet
Fresh Austin Chalk:	25.7 to 208.0 feet (bottom of hole)
Static Water Level:	Water level has probably reached static condition. It was measured at 575.4 feet above MSL (27.0 feet above ground surface) on April 13, 1990, 18 days after the well had been bailed to 517.2 feet above MSL.

Geophysical Logging: (see wire-line logs, Appendix B)

Spontaneous Potential (SP)
Normal Resistivity (short and long)
Guard Resistivity
Point Resistance
Natural Gamma
Short and Long Gamma
Compensated Density (caliper)
Sonic Velocity (full wave)

Hydrologic Test Results Summary: (see also Appendix C).

Vertical Depth (ft)	Packer Pressure (psi)	Gauge Pressure (psi)	Formation/ Lithology	Hydraulic Conductivity (cm/sec)
160.0-180.0	170	15	Austin Chalk (fractured)	$< 1.7 \times 10^{-7}$

Laboratory Geomechanical Test Results Summary: (see also Appendix D)

Vertical Depth (ft)	Formation/ Lithology	Moisture Content (%)	Dry Density (pcf)	*Compressive Strength (psi)	Tangent Young's Modulus E_{50} (psi x 10^5)	Brazil Tensile Strength (psi)
47	Austin Chalk	9	134	2957	3.51	
70-72	Austin Chalk	8	135-138	2064-2674 (100)	2.34 (100)-2.82	271
93	Austin Chalk	10-11	132	2131	1.85	
119-120	Austin Chalk	12	127			
121	Bentonite	28-29				
168-169	Austin Chalk	11-12	126-130	2523 (100)-3265 (200)	3.23 (100)-6.95 (200)	
178-179	Austin Chalk	14-16	117	1507	6.91	
200	Austin Chalk	11-14	127	2339	5.17	

* UU triaxial test indicated by confining pressure in parentheses.

Hole Status: A monitoring well was installed on February 12, 1990 (see Appendix E).

APPENDIX A

LITHOLOGIC LOG

LOG OF BORING

PROJECT: The Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 17

BORING NO: BF 3 PG 1 OF 6

LOCATION: N 300,776 feet
E 2,211,027 feet

GROUND EL: 548.4 feet

DATE: 2/6-7/90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Seepage at 18.0'. Begin using water at 21.0'. Unable to determine the parameters of subsurface water table below 21.0'

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									CLAY, silty, dark brown with roots and organic debris (3.0)
5, 10, 15									CLAY, silty, jointed, tan and brown (18.0)
20									CLAY, silty, embedded weathered limestone fragments, tan to light brown (20.0)
			21.0						(22.1) LIMESTONE (Austin Chalk), severely weathered moderately fractured, tan
25		C-1			90	60			(25.7) LIMESTONE (Austin Chalk), medium, fresh, sound, light gray with tan weathered limestone layers and occasional fossil partings
30				31.0					
			31.0						LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 2' to 3' thick moderately argillaceous to limestone interbeds 4' apart.
35		C-2			100	100			-moderately argillaceous layer, medium gray, gradational contact at 32.0' to sharp contact at 34.0'
40				41.0					-moderately argillaceous layer, medium gray, gradational contacts at 37.6'-41.2'

DRILLING GEOLOGIST M. Granger ASSISTANT K. Jones CHECKED BY C. Bommarito

Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 17

BORING NO: BF 3 PG 2 OF 6

LOCATION: N 300,776 feet
E 2,211,027 feet

GROUND EL: 548.4 feet

DATE: 2/6-7/90 TYPE: NXCore CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND:
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION: See P. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C-3	41.0	51.0	97	97			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 1' to 2' thick slightly, moderately argillaceous to shaly limestone interbeds 3' to 7' apart. Also fossil partings and traces of pyrite. -shaly limestone layer, dark gray, sharp contact at 45.0' to gradational contact at 46.4' -moderately argillaceous layer, medium gray, sharp contacts at 49.4'-50.7'
45 50									
		C-4	51.0	61.0	100	99			-pyrite nodules (1"), at 53.6' and 54.4' -slightly argillaceous layer, medium gray, gradational contacts at 56.7'-58.9'
55 60									
		C-5	61.0	71.0	100	100			-slightly argillaceous layer, medium gray, gradational contacts at 61.4'-62.1' -fossil partings at 63.2' and 64.6' -slightly argillaceous layer, medium gray, gradational contacts at 67.2'-68.1' -fossil partings at 69.0' and 77.1'
65 70									
		C-6	71.0	81.0	95	95			-slightly argillaceous layer, medium gray, gradational contacts at 75.0'-76.0'
75 80									

C. Bommarito

DRILLING GEOLOGIST M. Granger ASSISTANT K. Jones CHECKED BY Shawn Wood

(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 17

BORING NO: BF 3 PG 3 OF 6
LOCATION: N 300,776 feet
E 2,211,027 feet
GROUND EL: 548.4 feet

DATE: 2/6-7/90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND:
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
85, 90		C-7	81.0	91.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 1' to 3' thick moderately argillaceous to shaly limestone interbeds 1'-5' apart. Also bentonite layer, and traces of pyrite. -moderately argillaceous layer, medium gray, gradational contacts at 83.4'-84.2' -moderately argillaceous layer, medium gray, gradational contacts at 85.9'-87.2' -moderately argillaceous layer, medium gray, gradational contacts at 88.4'-90.2' -pyrite nodule (¼") at 89.2' -moderately argillaceous layer, medium gray, gradational contacts at 93.7'-96.2'
95, 100		C-8	91.0	101.0	98	98			
105, 110		C-9	101.0	111.0	99	99			-moderately argillaceous layer, medium gray, gradational contacts at 101.0'-102.6' -bentonite layer, soft, bluish-gray, sharp contacts at 104.2'-104.4' -moderately argillaceous layer, medium gray, gradational contacts at 109.4'-112.9'
115, 120		C-10	111.0	121.0	100	100			- shaly limestone layer, dark gray, gradational contact at 114.2' to sharp contact at 114.7' -moderately argillaceous layer, medium gray, gradational contacts at 115.6'-116.9' -moderately argillaceous layer, medium gray, sharp contacts at 118.9'-120.3'

DRILLING GEOLOGIST M. Granger ASSISTANT K. Jones CHECKED BY C. Bommarito Shawn Wood

(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 17

BORING NO: BF 3 PG 4 OF 6
LOCATION: N 300,776 feet, E 2,211,027 feet
GROUND EL: 548.4 feet

DATE: 2/6-7/90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION
See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									LIMESTONE Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.3' to 1' thick slightly, moderately argillaceous to shaly limestone interbeds 1' to 4' apart. Also fossil partings, bentonite layer, medium angle fractures, traces of pyrite.
125		C-11	121.0	131.0	100	98			-bentonite layer, soft, bluish gray, sharp contacts at 121.2'-121.5' with 40° slickensided fracture at 121.3' -moderately argillaceous layer, medium gray, sharp contact at 122.6 to gradational contact at 123.8' -moderately argillaceous layer, medium gray, gradational contact at 126.2' to sharp contact at 127.5'
130									
135		C-12	131.0	141.0	90	90			-moderately argillaceous layer, medium gray, sharp contacts at 130.1'-131.0' -pyrite nodule at 133.2' -moderately argillaceous layer, medium gray, sharp contacts at 135.6'-136.2' -moderately argillaceous layer, medium gray, sharp contacts at 139.5'-140.0'
140									
145		C-13	141.0	146.0	76	76			-shaly limestone layer, dark gray, sharp contacts at 144.1'-144.8' -shaly limestone layer, dark gray, sharp contacts at 147.7'-148.0' -shaly limestone layer, dark gray, sharp contacts at 148.6'-149.3'
150		C-14	146.0	156.0	92	92			-moderately argillaceous layer, medium gray, gradational contact at 151.2' to sharp contact 152.3' -moderately argillaceous layer, medium gray, sharp contacts at 154.0'-154.6' -fossil parting at 146.8' -moderately argillaceous layer, medium gray, sharp contacts at 156.4'-157.4'
155									
160		C-15	156.0		100	100			-moderately argillaceous layer, medium gray, sharp contacts at 158.3'-158.7' -fossil partings at 157.0', 158.3', and 159.4' -shaly limestone layer, dark gray, sharp contacts at 160.7'-161.6' -fossil partings at 161.6 and 162.9' -slightly argillaceous, moderately fossiliferous layer, gradational contacts at 162.5'-163.9'

DRILLING GEOLOGIST M. Granger ASSISTANT K. Jones CHECKED BY C. Bommarito

Shawn Wood
(3-7-90)

LOG OF BORING

BORING NO: BF 3 PG 5 OF 6

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corportion

TASK NO.: 17

LOCATION: N 300,776 feet
E 2,211,027 feet

GROUND EL: 548.4 feet

DATE: 2/6-7/90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SWL 89-192

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See P. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
165		C-15		166.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.3' to 3' thick moderately argillaceous to shaly limstone interbeds 1' to 7' apart. Also fossil partings, bentonite layer, medium angle fractures. -fossil parting at 164.9'
170		C-17	166.0	176.0	100	100			-moderately argillaceous layer, medium gray, sharp contact at 165.1' to gradational contact at 165.6' -fossil parting at 167.4' -shaly limestone layer, dark gray, sharp contact at 167.2' to gradational contact at 167.8' -moderately argillaceous layer, medium gray, gradational contact at 167.8' to sharp contact at 170.3' -shaly limestone layer, dark gray, gradational contact at 172.0' to sharp contact at 172.3' -shaly limestone layer, dark gray, sharp contact at 175.4' to gradational contact at 176.6'
175									
180		C-18	176.0	186.0	87	87			-two 40° transverse, insipient fractures at 176.2' -trace bentonite at 176.5' -shaly limestone layer, dark gray, sharp contacts at 178.8'-180.4' -shaly limestone layer, dark gray, sharp contacts at 184.1'-184.7' -moderately argillaceous layer, medium gray, sharp contacts at 187.1'-187.9' -moderately argillaceous layer, medium gray, sharp contacts at 189.0'-189.4'
185									
190		C-18	186.0	196.0	34	34			
195									-shaly limestone layer, dark gray, sharp contacts at 196.0'-196.6' -shaly limestone layer, dark gray, sharp contacts at 197.5'-197.7' -fossil partings 198.5' -shaly limestone layer, dark gray, gradational contact at 200.8' to sharp contact at 201.6'
200		C-19	196.0		100	100			

DRILLING GEOLOGIST M. Granger ASSISTANT K. Jones CHECKED BY C. Bommartio Shawn Wood

(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 17

BORING NO: BF 3 PG 6 OF 6
LOCATION: N 300,776 feet
E 2,211,027 feet
GROUND EL: 548.4 feet

DATE: 2/6-7/90 TYPE: NX Core CASED TO: CONTRACTOR: SwL 89-192

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES		HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C-19 cont.		206.0	100	100				LIMESTONE (Austin Chalk) medium, fresh, light gray
205		C-20	206.0	208.0	100	100				
210										Bottom of exploration at 208.0 feet
215										
220										
225										
230										
235										
240										

DRILLING GEOLOGIST M. Granger ASSISTANT K. Jones CHECKED BY C. Bommarito Shawn Wood

(3-7-90)

APPENDIX B

WIRE-LINE LOGS

WIRE-LINE LOGGING PARAMETERS

Hole No. BF 3 **Log Measured From:** Ground Level

Drilling Parameters

Depth 208.0 feet

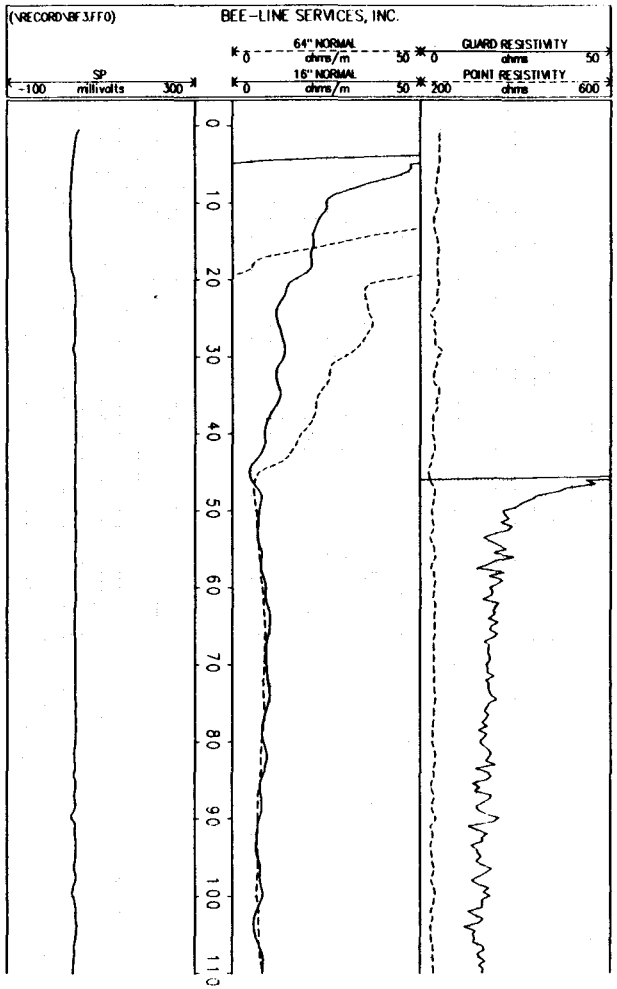
Bit Diameter 4.75 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	February 7, 1990	February 7, 1990	February 7, 1990
Bottom Log Interval	206.5 feet	204.5 feet	201.0 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling mud	drilling mud	drilling mud
Time Since Circulation Stop	30 minutes	30 minutes	30 minutes
Probe Type/S.N.	ALP-4979	XAP-4383	CLP-4877A
Module Type/S.N.	ALM-4979	XAM-4383	CLM-4877A
Logging Speed	40 feet/min.	20 feet/min.	20 feet/min.
Sample Interval	0.5 foot	0.5 foot	0.5 foot

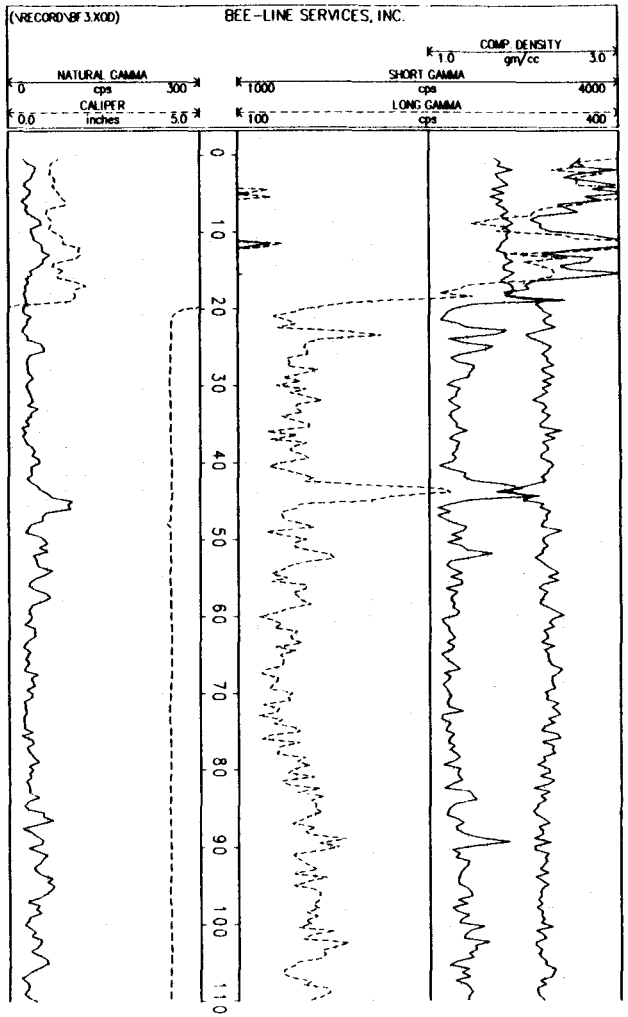
Logged by: BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

BF 3 Wire-line logs run February 7, 1990. Surface elevation 548.4 feet.

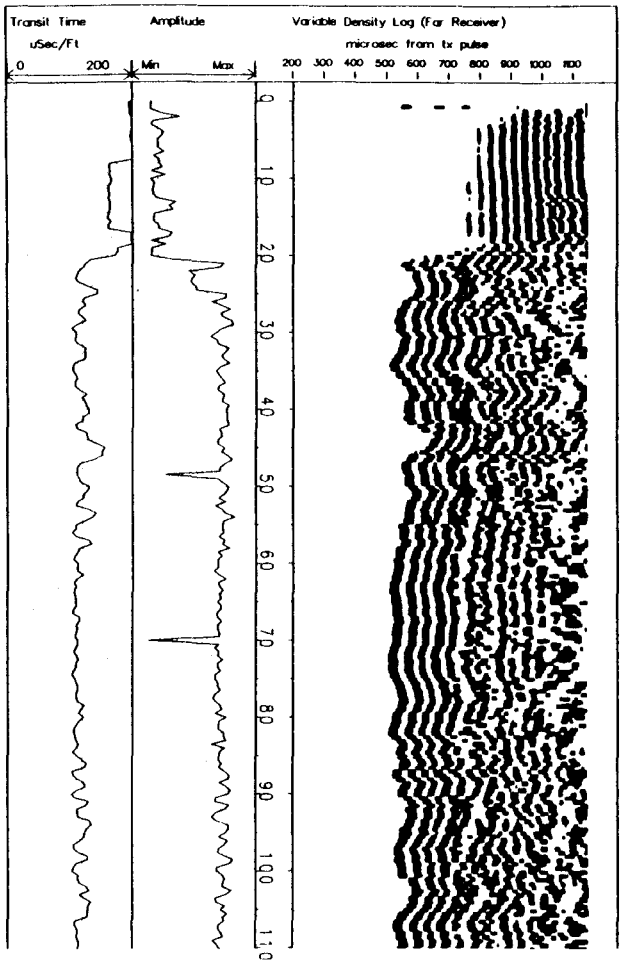
ELECTRICAL LOG



GAMMA LOG

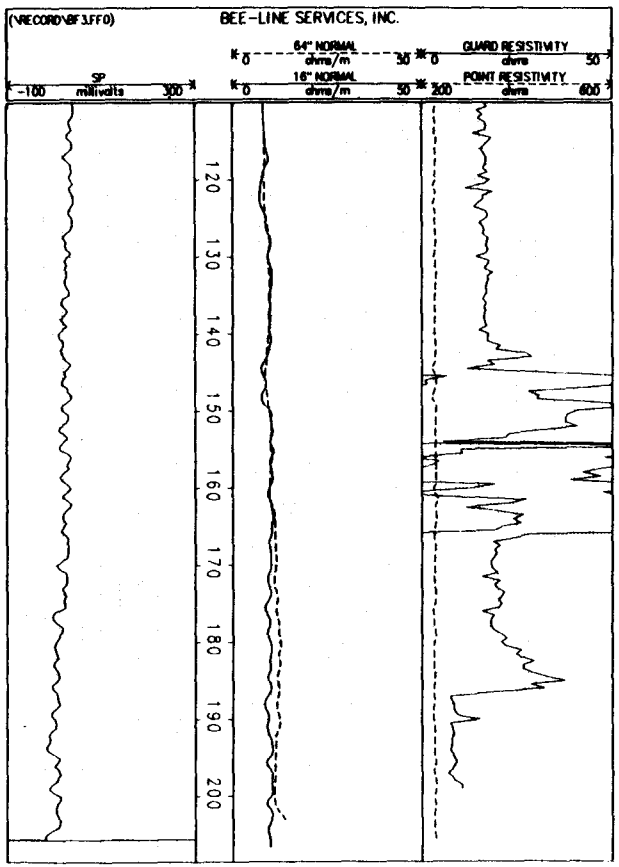


SONIC LOG



BF 3 Wire-line logs run February 7, 1990 (Continued). Surface elevation 548.4 feet.

ELECTRICAL LOG CONTINUED



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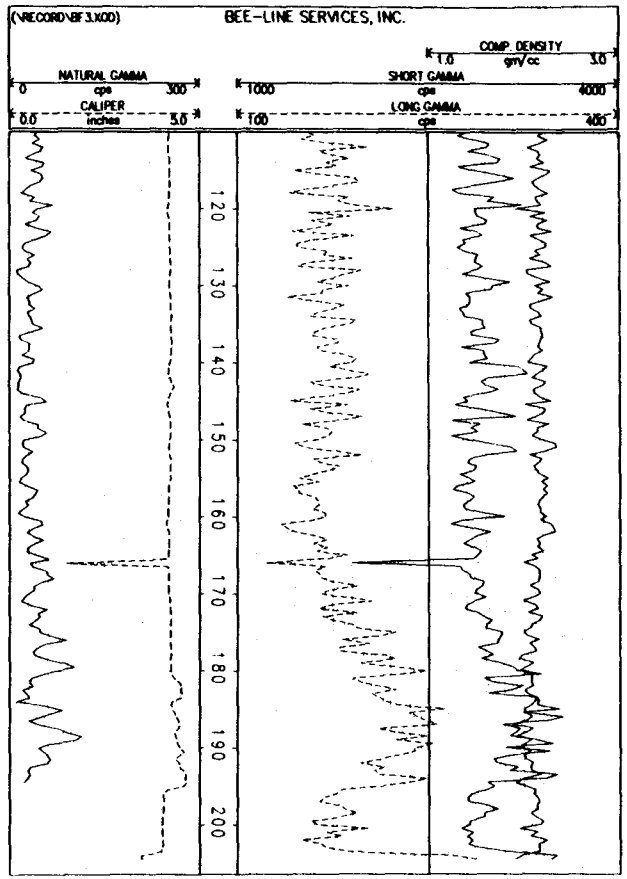
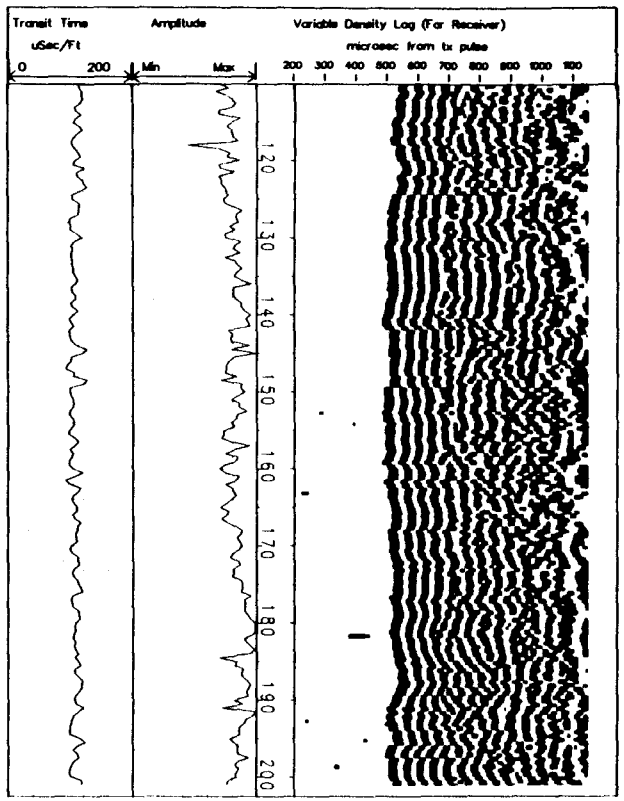


SONIC LOG CONTINUED



APPENDIX C

HYDROLOGIC TEST RESULTS

APPENDIX C

The objectives of the hydrologic (packer) tests were to provide estimates of the hydraulic conductivity within the Taylor Marl, Austin Chalk, and Eagle Ford Shale formations in unfractured zones, fractured or other suspected water-bearing zones, at the formation contacts, and at the tunnel elevation. Intervals within boreholes were selected for packer testing based on visual inspections of rock cores and the results of borehole geophysical testing. Sections of a borehole that exhibited increased frequency of fractures or bedding plane parting were commonly packer tested.

Standard procedures used to conduct these tests included lowering a pair of pneumatically operated rubber packers (in straddle-packer configuration) separated by a known length of perforated pipe into the drill hole to a predetermined depth. The packer interval was approximately 20 feet. The packers were then inflated to a precalculated pressure to seal against the rock side walls and water was pumped into the test interval at a selected pressure while the flow rate was measured with a cumulative flow meter. To improve the accuracy of measurements at low flow rates, water was pumped from a large container (e.g., a drum or section of casing) and the volume removed was recorded. In addition to monitoring the water pressure and flow rate at appropriate intervals, the height of the water pressure gauge above ground surface, as well as the diameter and length of water pipe used, were recorded. The tests were continued until five consecutive readings indicated a stabilization of the flow rate but for a minimum of at least 10 minutes. Standard forms were used for data records and the hydraulic conductivity was calculated using standard Bureau of Reclamation procedures.

STRADDLE PACKER TEST RESULTS

Test Depth (feet)	Packer Pressure (psi)	Gauge Pressure (psi)	Formation/ Lithology	Hydraulic Conductivity (cm/sec)	Approximate Static Water Level
160.0-180.0	170	15	Austin Chalk (fractured)	$<1.7\times10^{-7}$	27 feet above ground surface

At boring BF 3 one test interval was selected to provide hydrologic data for fractured Austin Chalk at the potential tunnel elevation. Hydrologic (packer) testing followed the general procedures outlined above. Packer and gauge pressures used during the testing along with the calculated hydraulic conductivities are listed in the table above. Flow volumes were measured using a calibrated container.

APPENDIX D

LABORATORY RESULTS

GEOMECHANICAL TEST RESULTS - BORING BF 3

GENERAL LITHOLOGY	BORING DEPTH	MOISTURE CONTENT	DRY DENSITY	SPECIFIC GRAVITY	ATTERBERG LIMITS		FRACTION FINER THAN	CARBONATE CONTENT	SAMPLE DIMENSION RATIO	SAMPLE FAILURE MODE/ DEGREES*	UNCONFINED COMPRESSIVE STRENGTH	TRIAXIAL COMPRESSION		FAILURE STRAIN	TANGENT YOUNG'S MODULUS			POISSON'S RATIO	BRAZIL TENSILE STRENGTH	2ND CYCLE SLAKE DURABILITY INDEX	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX	COMMENTS
					LL	PI	# 200 SIEVE					CONFINING PRESSURE σ_3	DEVIATOR STRESS $\sigma_1-\sigma_3$		E50	UNLOAD/ RELOAD	σ_3						
	feet	percent	pcf				percent	percent	L/D		psi	psi	psi	percent	(psi)x10E5	(psi)x10E5	psi		psi	percent		psi	
AUSTIN CHALK	47.1	9.4																					
AUSTIN CHALK	47.2	9.1	133.8						2.3	D	2957			1.08	3.51		0						NOTE 1
AUSTIN CHALK	70.3	7.9	135.4						2.3	D	2064			0.69	2.82		0						
AUSTIN CHALK	70.7	8.1	137.7	2.65					2.3	D		50	2452	1.01	2.40		50						
AUSTIN CHALK	70.7														2.77			0.36					NOTE 2
AUSTIN CHALK	71.1	8.4	135.5						2.3	D		100	2674	1.10	2.34		100						
AUSTIN CHALK	71.1														2.51			0.36					NOTE 2
AUSTIN CHALK	71.6	8.5	136.9																				
AUSTIN CHALK	72.0								0.5										271				
AUSTIN CHALK	93.0	10.3																					
AUSTIN CHALK	93.1	10.7	131.6						2.4	D	2131			1.27	1.85		0						
AUSTIN CHALK	119.0																				0.477		
AUSTIN CHALK	119.6	11.9	127.1																				
BENTONITE	121.4	29.4																					
BENTONITE	121.5	27.8			115	77	93.6																
AUSTIN CHALK	168.0	11.5	127.1						2.1	D & E	2930			0.71	4.17		0						
AUSTIN CHALK	168.4	10.8	129.6	2.66					2.3	D & E		100	2523	0.80	3.23		100						
AUSTIN CHALK	168.4														4.75			0.16					NOTE 2
AUSTIN CHALK	168.8	11.8	127.1						2.2	D		200	3265	0.80	4.92		200						
AUSTIN CHALK	168.8														6.95			0.02					NOTE 2
AUSTIN CHALK	169.2	11.7	126.4																				
AUSTIN CHALK	178.4	16.0	116.8						2.2	D	1507			0.60	6.91		0						
AUSTIN CHALK	178.8	14.4																					
AUSTIN CHALK	200.0	14.0																					
AUSTIN CHALK	200.2	10.7	127.5						2.2	B-1/30	2339			0.73	5.17		0						
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D1140				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

BF3PRT21.WK1
REVISION: 2.1
DATE: 06/21/99

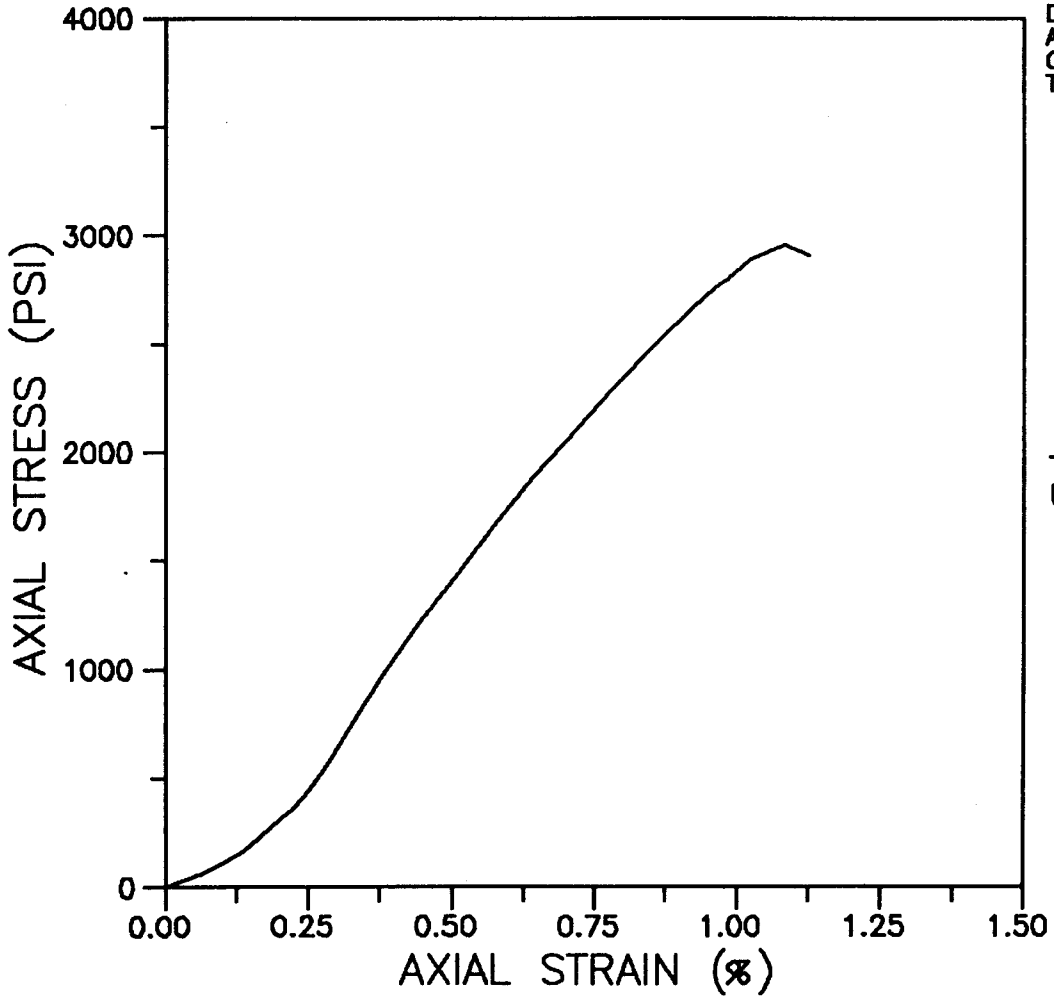
* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

Symbol	Failure Type	Symbol	Failure Type
A	No discernible failure plane	B-4	Combination
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core	C	Barreling/Bulging
B-1	Shear plane	D	Longitudinal (axial) splitting
B-2	Bedding plane shear.	E	Conical
B-3	Shear plane along pre-existing fracture, shear zone, etc.	F	No information

NOTES: 1) All moduli calculated from axial strains using a dial micrometer except where noted. Axial gage length is the sample length.

2) Modulus and Poisson's ratio calculated from axial and lateral strains measured using LVDTs. Axial gage length is 2.8 inches.

BORING NO: BF3
DEPTH (FT): 47.2
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 9.1
DRY UNIT WEIGHT (PCF): 133.8
DEG. OF SATURATION (%): 99.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.51 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

STRESS–STRAIN PLOT

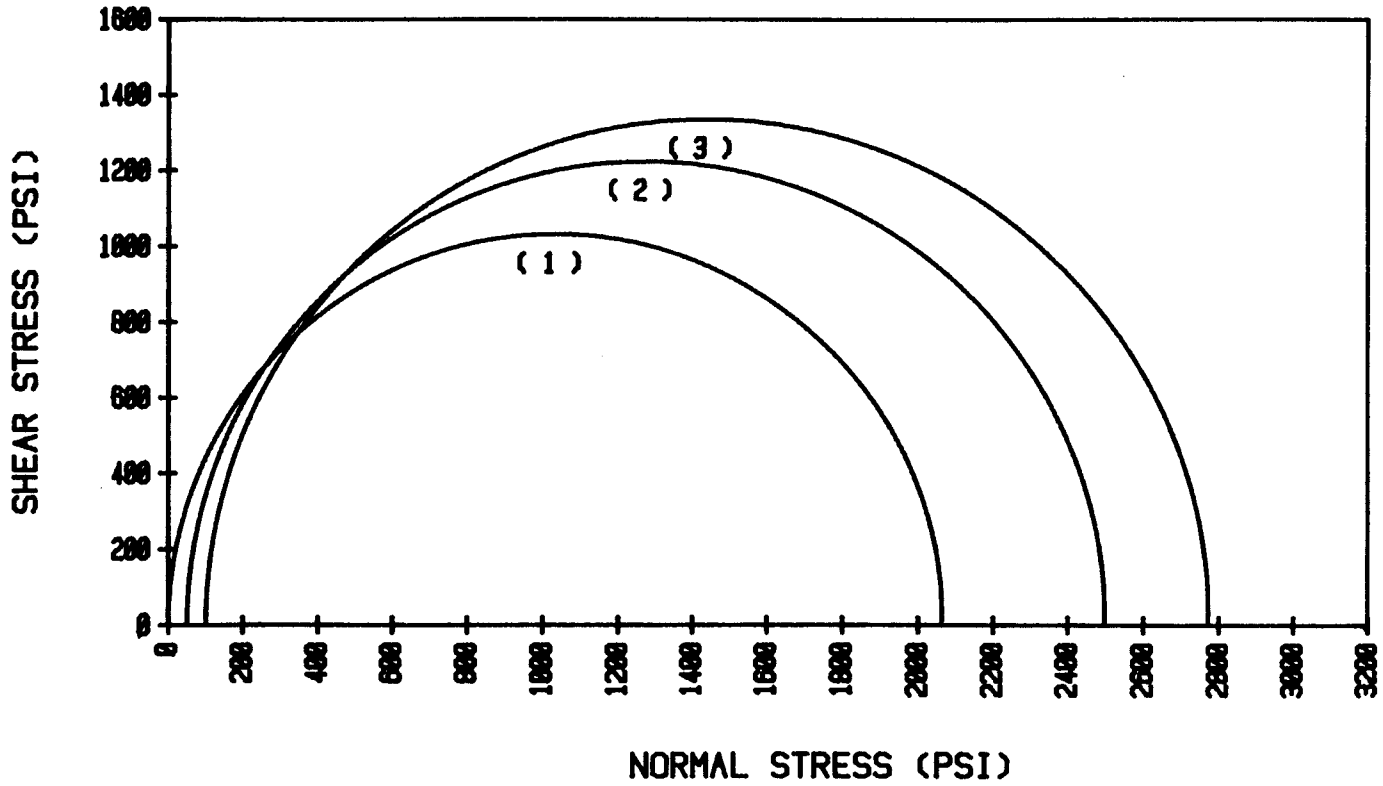
SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: BF3
DEPTH RANGE (FT): 70.3-71.5
AUSTIN CHALK LIMESTONE

BORING INCLINATION (DEG): VERTICAL
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)



SEE STRESS - STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 70.3
(2) DEPTH (FT): 70.7
(3) DEPTH (FT): 71.1

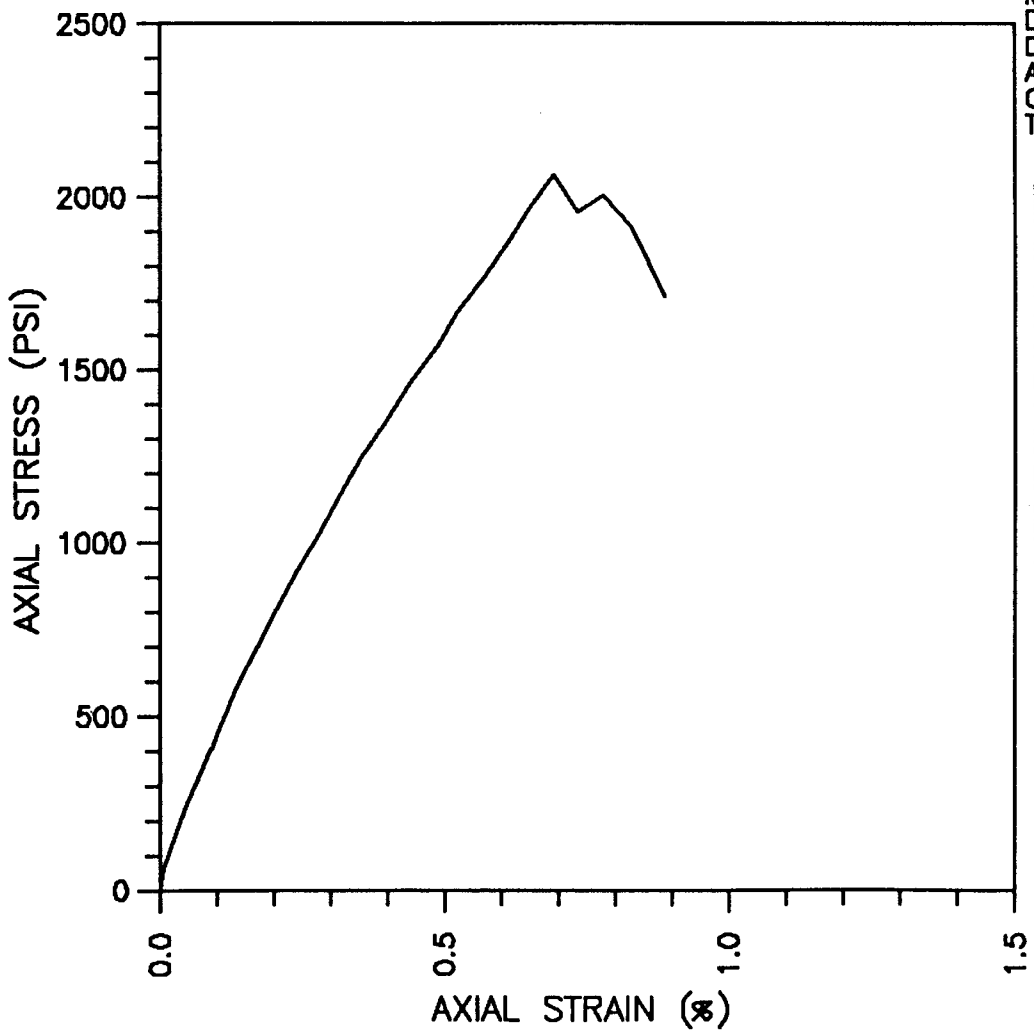
TEXAS SSC SITE

MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.17 | FIGURE

BORING NO.: BF3
DEPTH (FT): 70.3
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 7.9
DRY UNIT WEIGHT (PCF): 135.4
DEG. OF SATURATION (%): 87.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.817 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

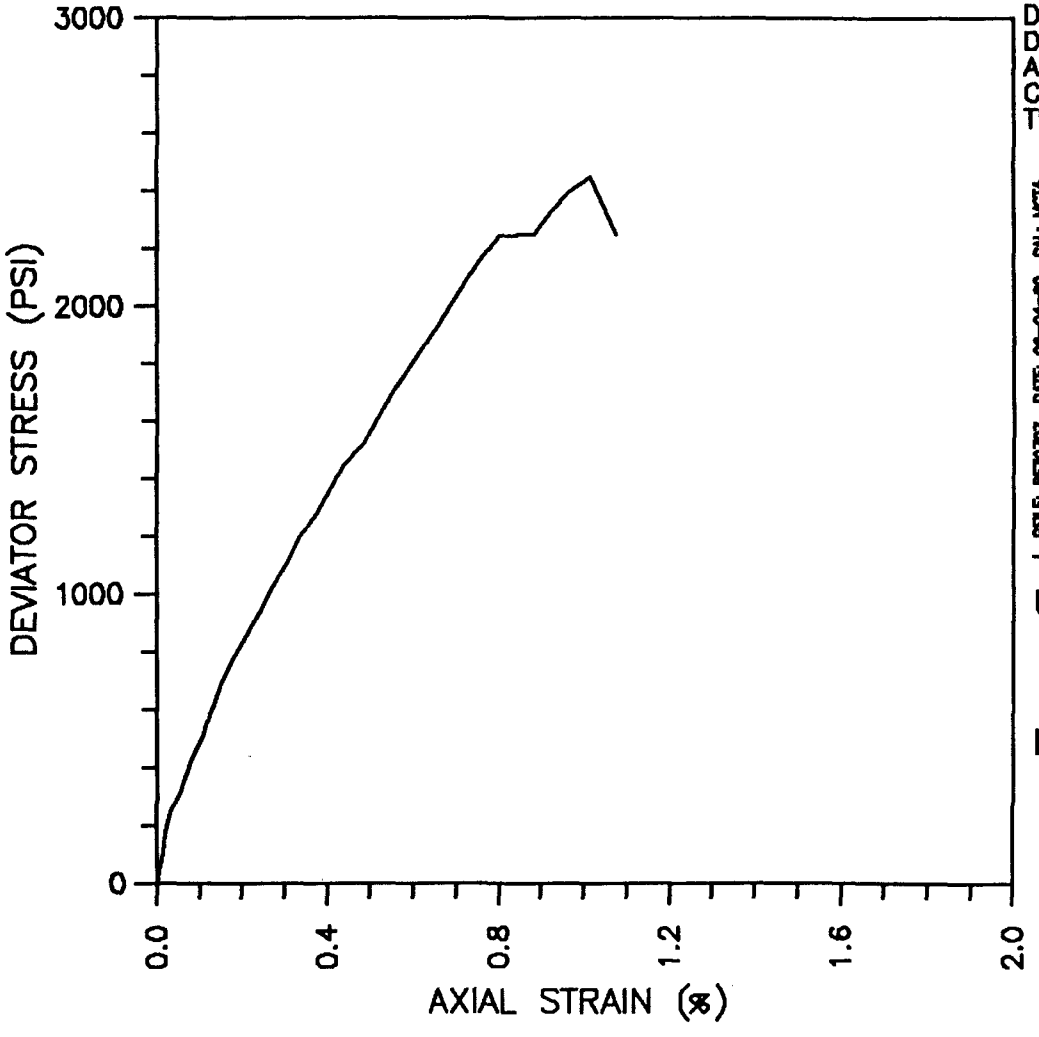
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.17

FIGURE

BORING NO.: BF3
DEPTH (FT): 70.7
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 8.1
DRY UNIT WEIGHT (PCF): 137.7
DEG. OF SATURATION (%): 98.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

DFILE: BF30707 DATE: 08-04-00 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.404 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

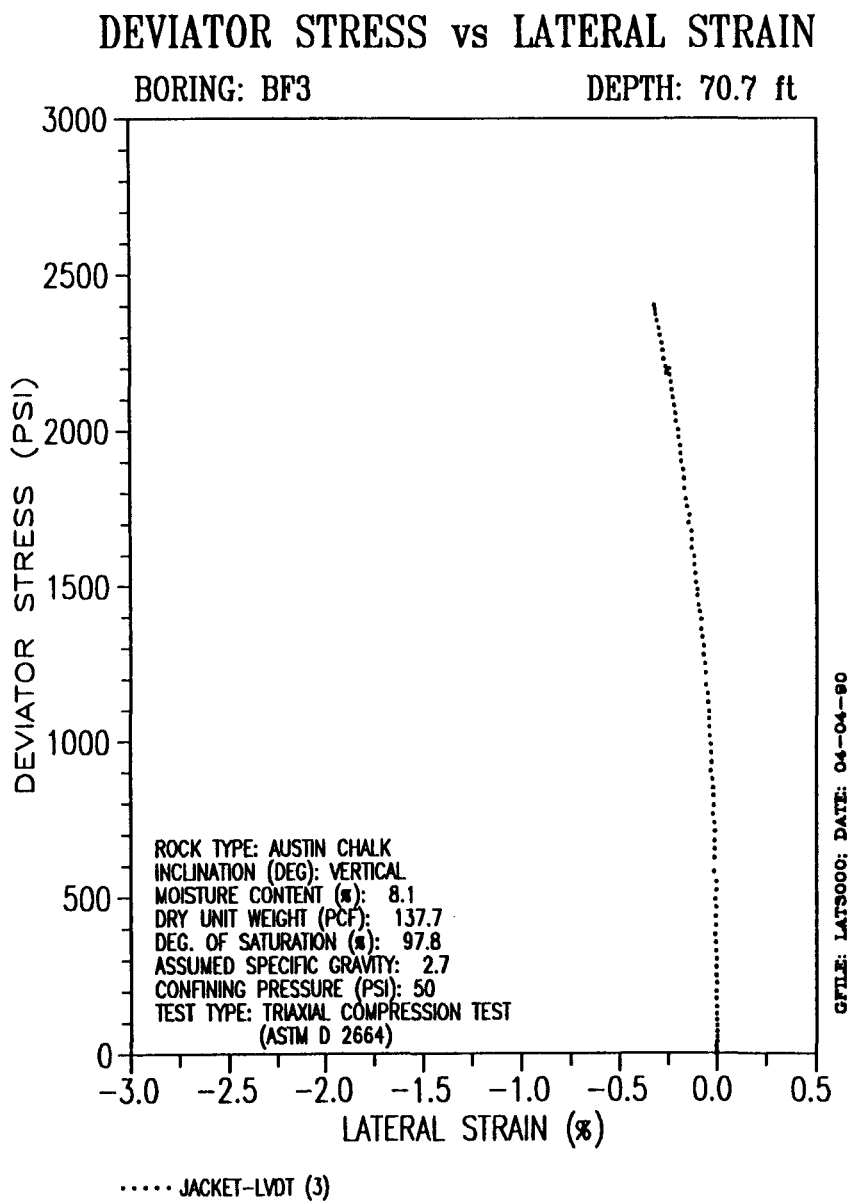
TEXAS SSC SITE

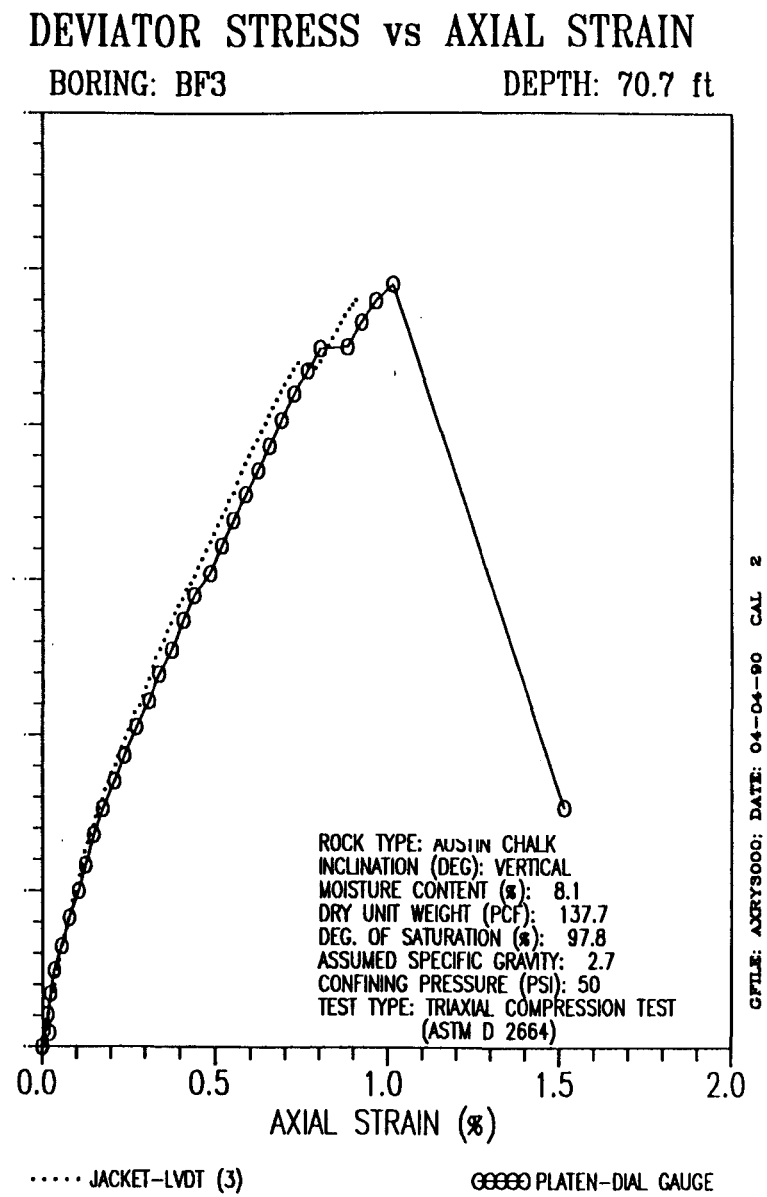
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

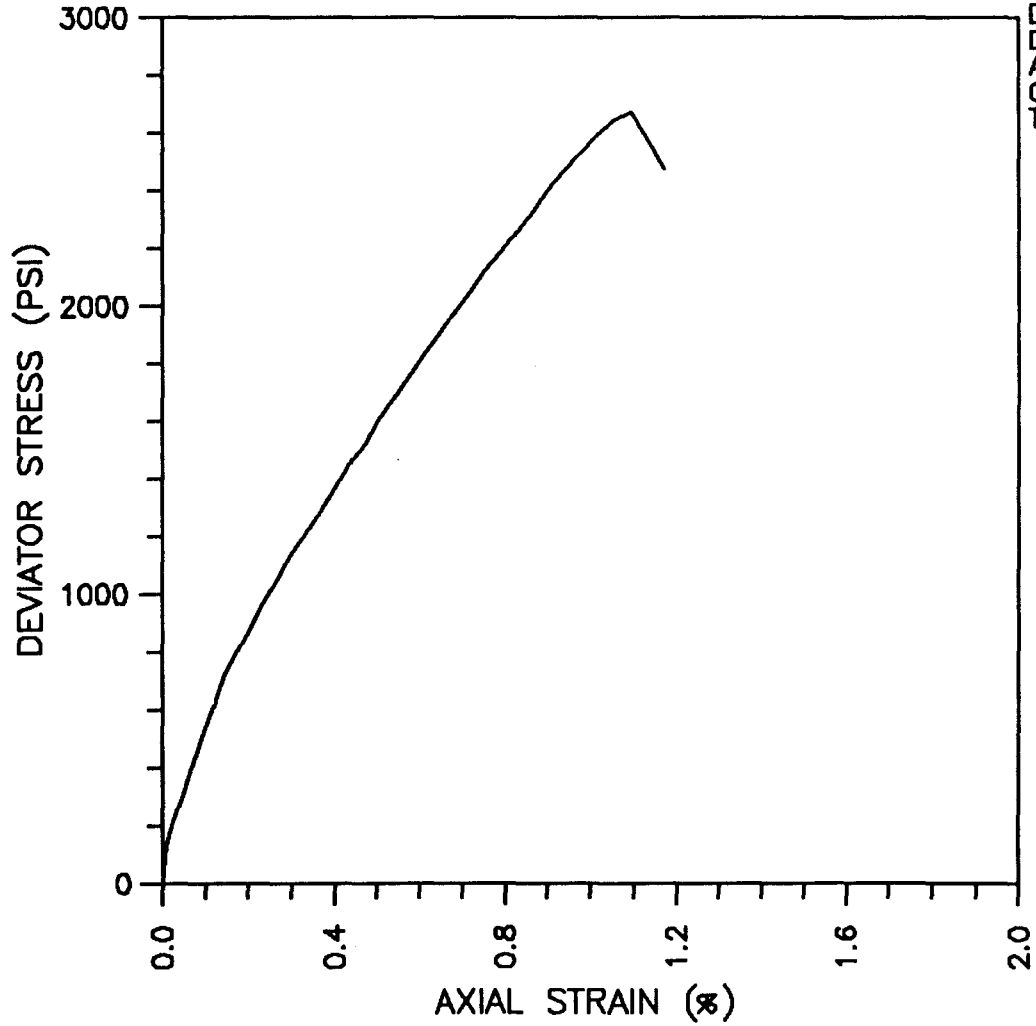
JOB NO.: 5530.17

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BF3
DEPTH: 70.7 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 8.1
DRY UNIT WEIGHT (PCF): 137.7
DEG. OF SATURATION (%): 97.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT3000; DATE: 04-04-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BF3
DEPTH: 70.7 ft
0.0
0.5
1.0
1.5
2.0
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 8.1
DRY UNIT WEIGHT (PCF): 137.7
DEG. OF SATURATION (%): 97.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY3000; DATE: 04-04-90 CAL 2
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BF3
DEPTH (FT): 71.1
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 8.4
DRY UNIT WEIGHT (PCF): 135.5
DEG. OF SATURATION (%): 93.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: BF30711 DATE: 06-04-90 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.336 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

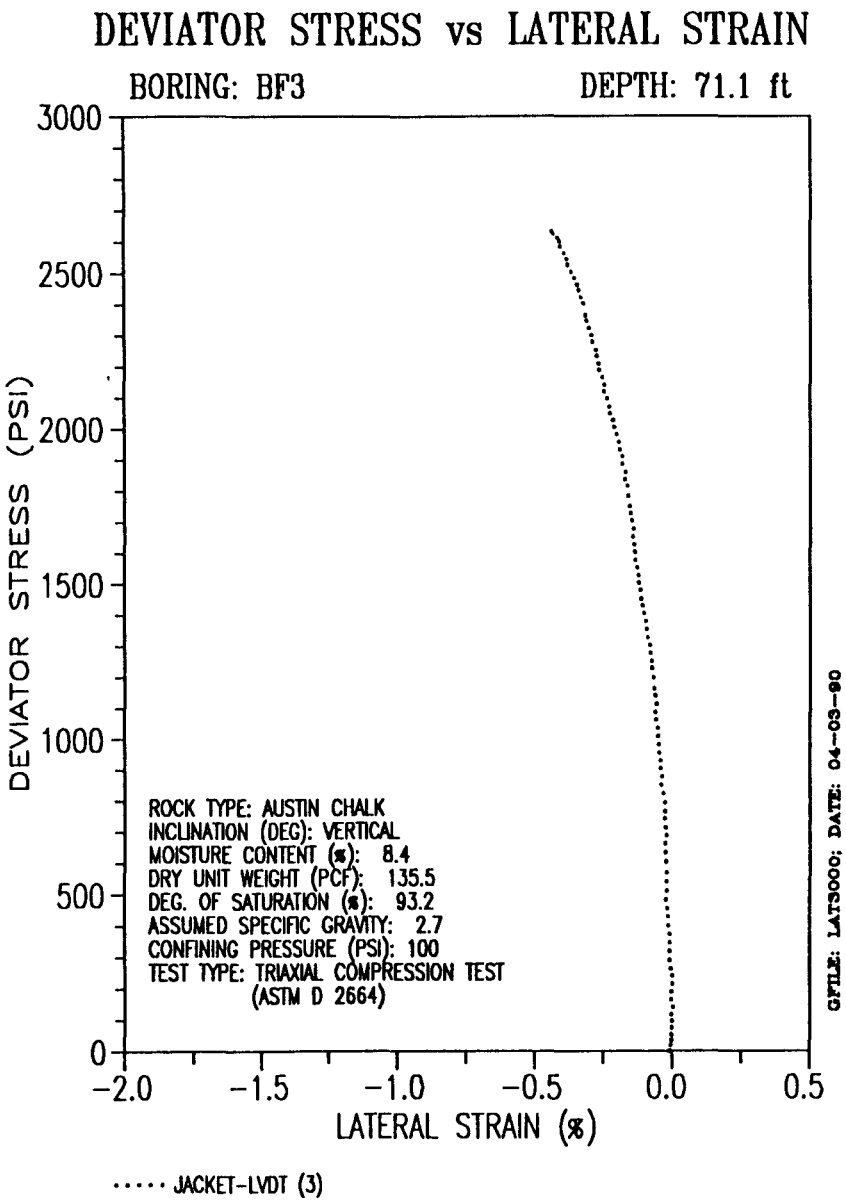
TEXAS SSC SITE

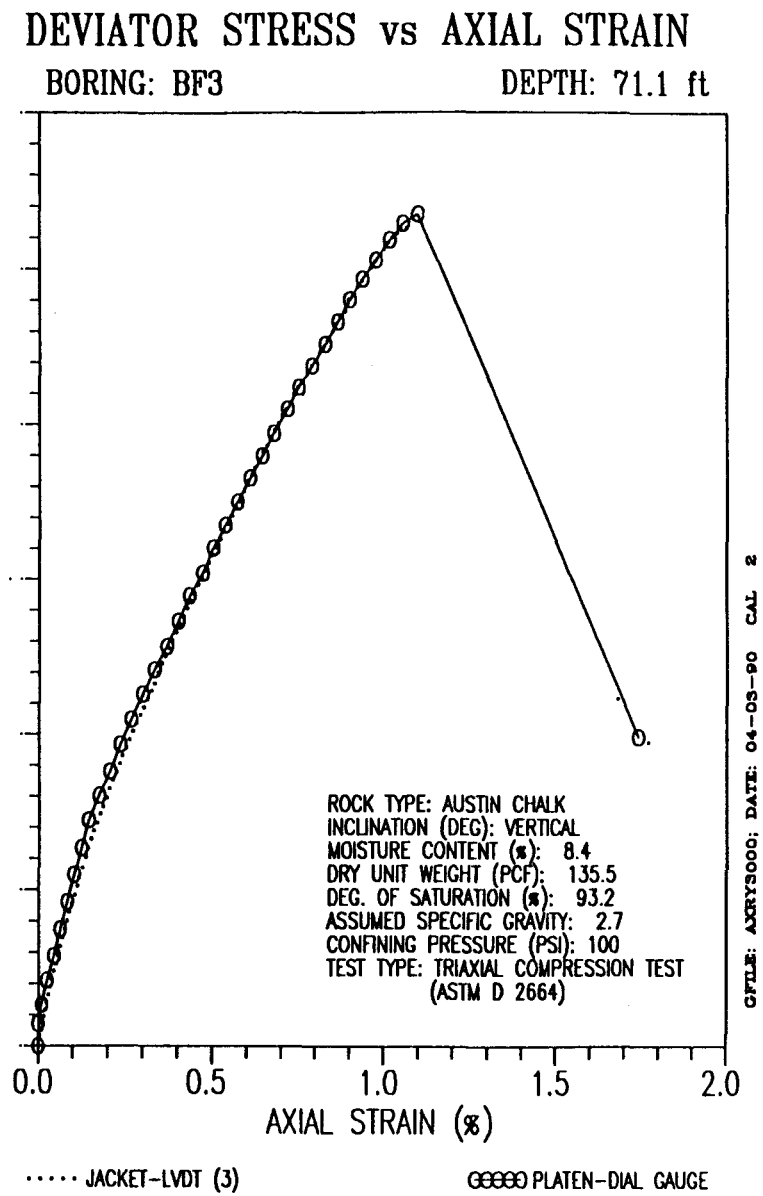
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

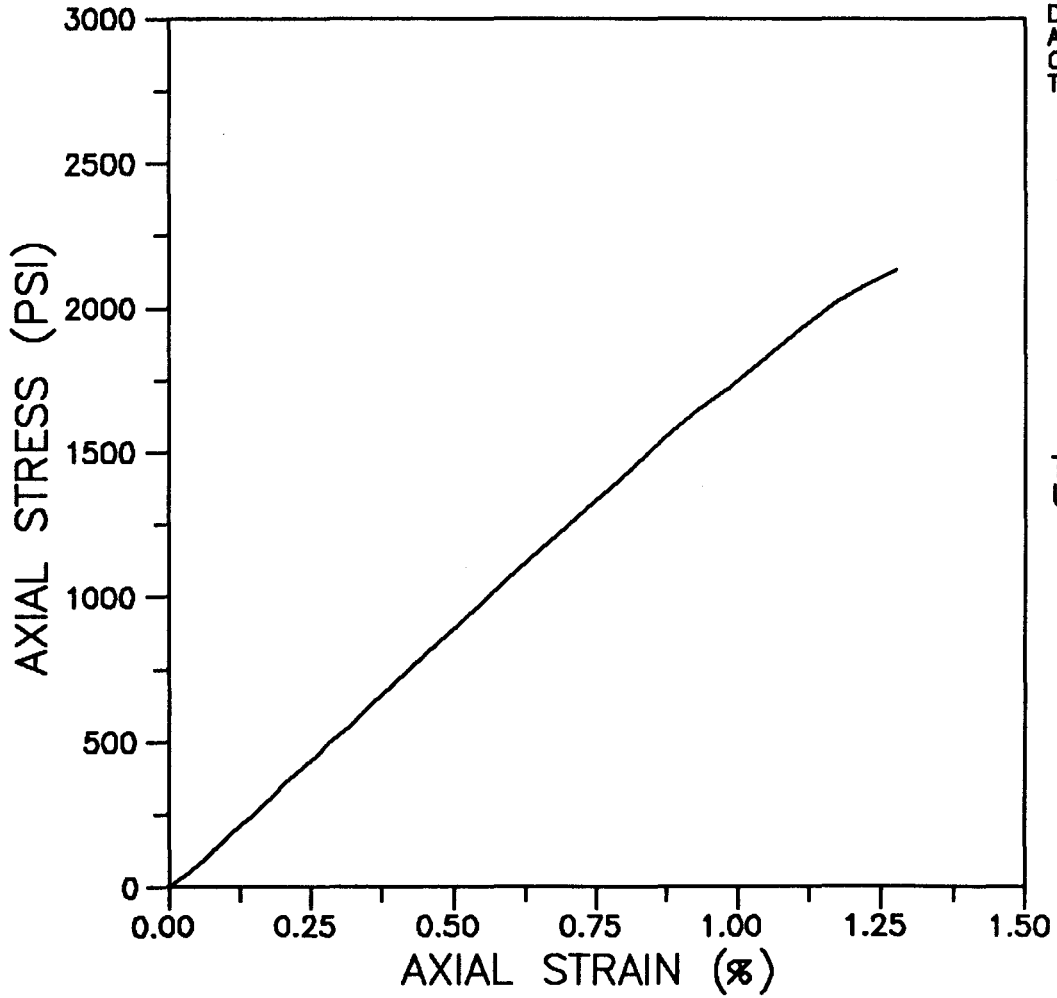
JOB NO.: 5530.17

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BF3
DEPTH: 71.1 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-2.0
-1.5
-1.0
-0.5
0.0
0.5
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 8.4
DRY UNIT WEIGHT (PCF): 135.5
DEG. OF SATURATION (%): 93.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT3000; DATE: 04-03-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BF3
DEPTH: 71.1 ft
0.0
0.5
1.0
1.5
2.0
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 8.4
DRY UNIT WEIGHT (PCF): 135.5
DEG. OF SATURATION (%): 93.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY3000; DATE: 04-03-90 CAL 2
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: BF3
DEPTH (FT): 93.1
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.7
DRY UNIT WEIGHT (PCF): 131.6
DEG. OF SATURATION (%): 103.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.85 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

STRESS–STRAIN PLOT

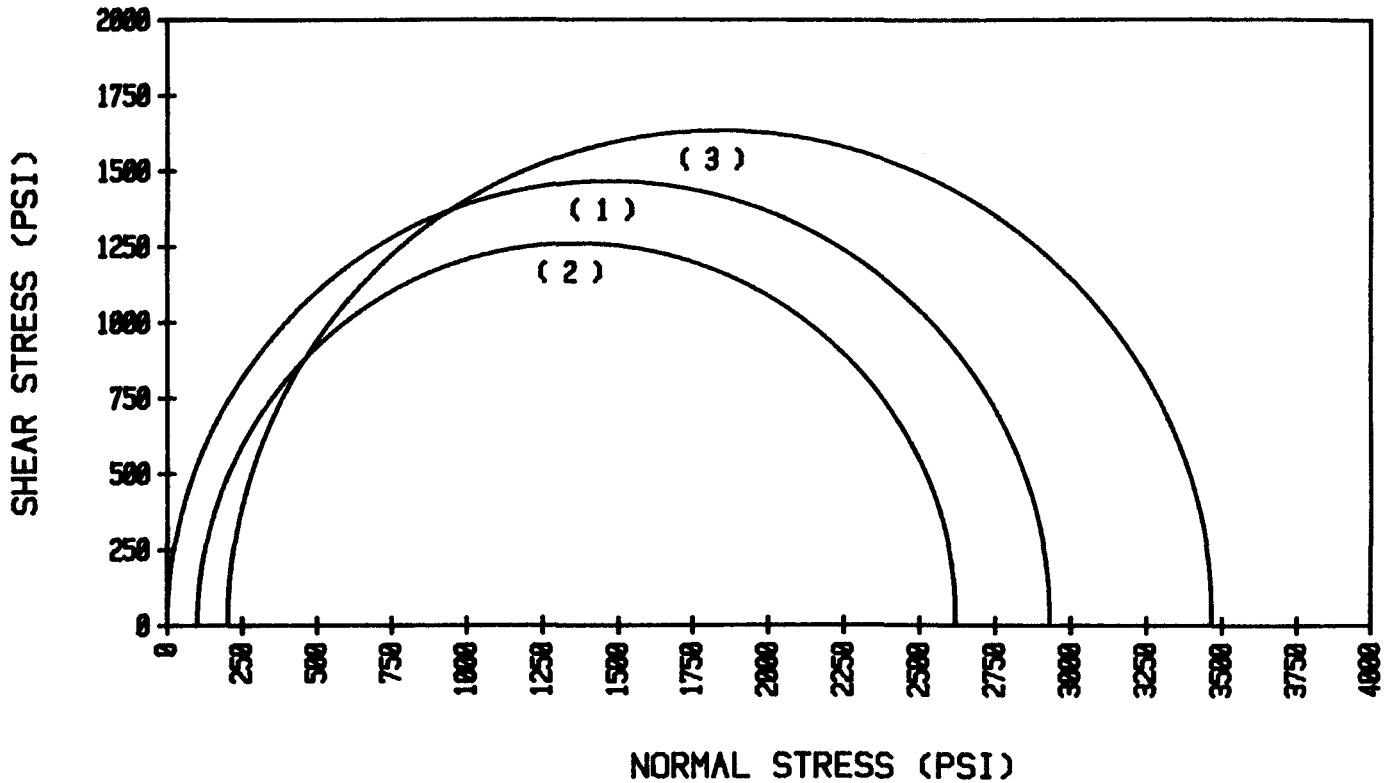
SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: BF3
DEPTH RANGE (FT): 168.0-169.2
AUSTIN CHALK LIMESTONE

BORING INCLINATION (DEG): VERTICAL
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)



SEE STRESS - STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 168.0
(2) DEPTH (FT): 168.4
(3) DEPTH (FT): 168.8

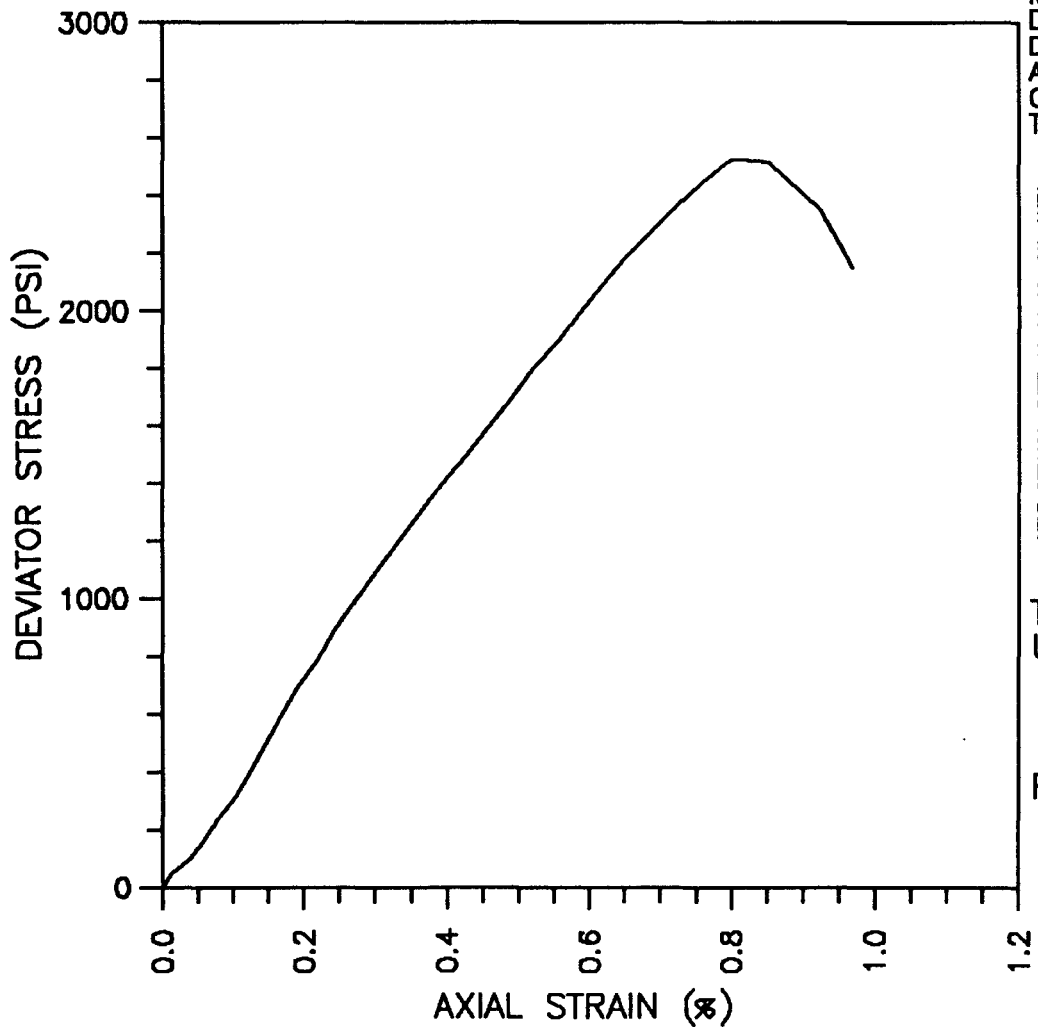
TEXAS SSC SITE

MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.17 | FIGURE

BORING NO.: BF3
DEPTH (FT): 168.4
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.8
DRY UNIT WEIGHT (PCF): 129.6
DEG. OF SATURATION (%): 97.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.226 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING
W/CONICAL AT TOP

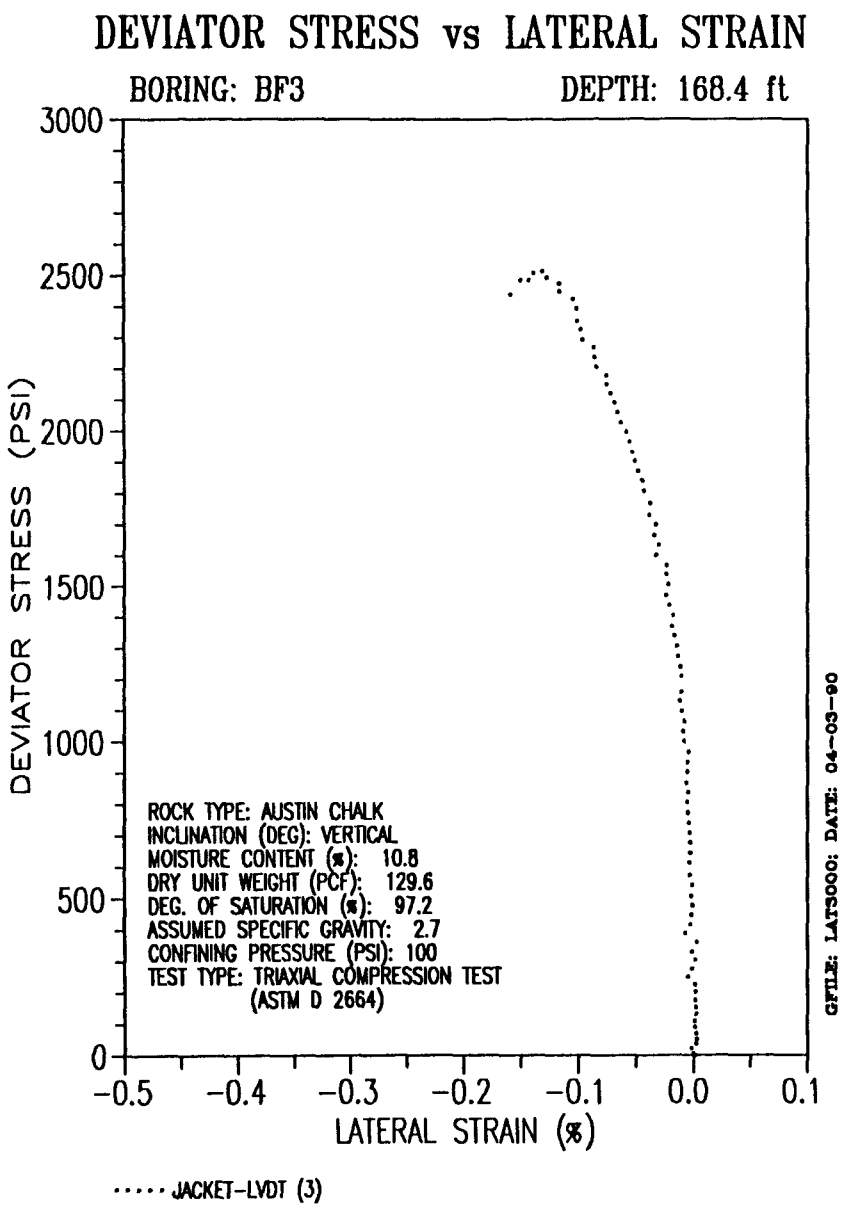
TEXAS SSC SITE

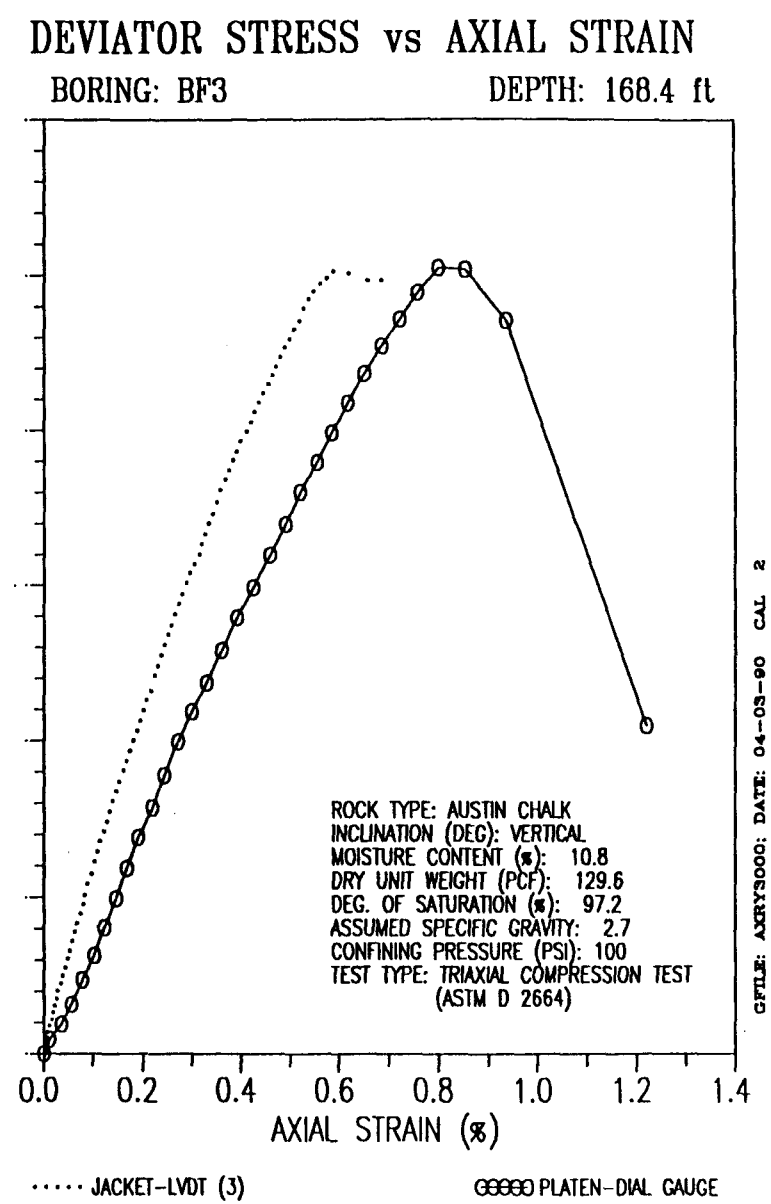
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

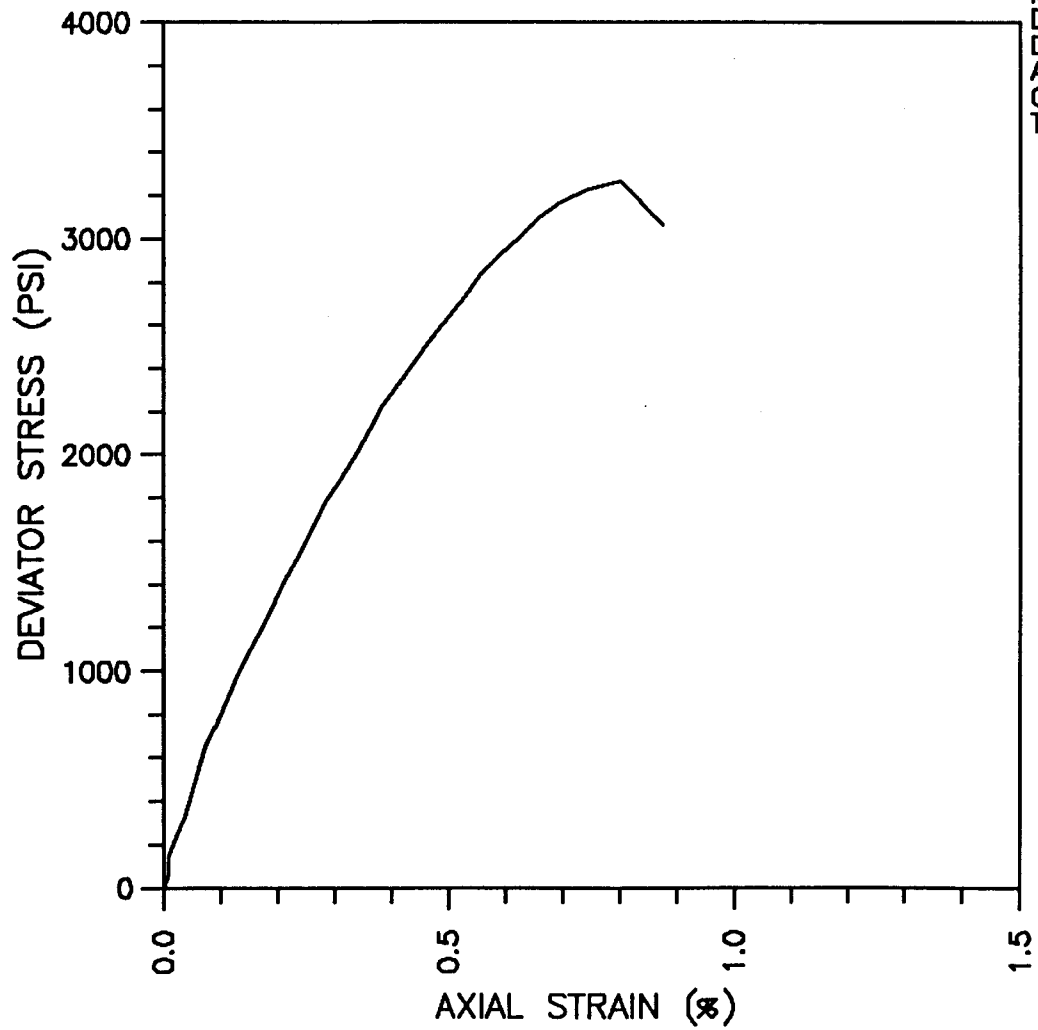
JOB NO.: 5530.17

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BF3
DEPTH: 168.4 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.5
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.8
DRY UNIT WEIGHT (PCF): 129.6
DEG. OF SATURATION (%): 97.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT3000; DATE: 04-03-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BF3
DEPTH: 168.4 ft
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.8
DRY UNIT WEIGHT (PCF): 129.6
DEG. OF SATURATION (%): 97.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY3000; DATE: 04-03-90 CAL 2
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BF3
DEPTH (FT): 168.8
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.8
DRY UNIT WEIGHT (PCF): 127.1
DEG. OF SATURATION (%): 97.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.918 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

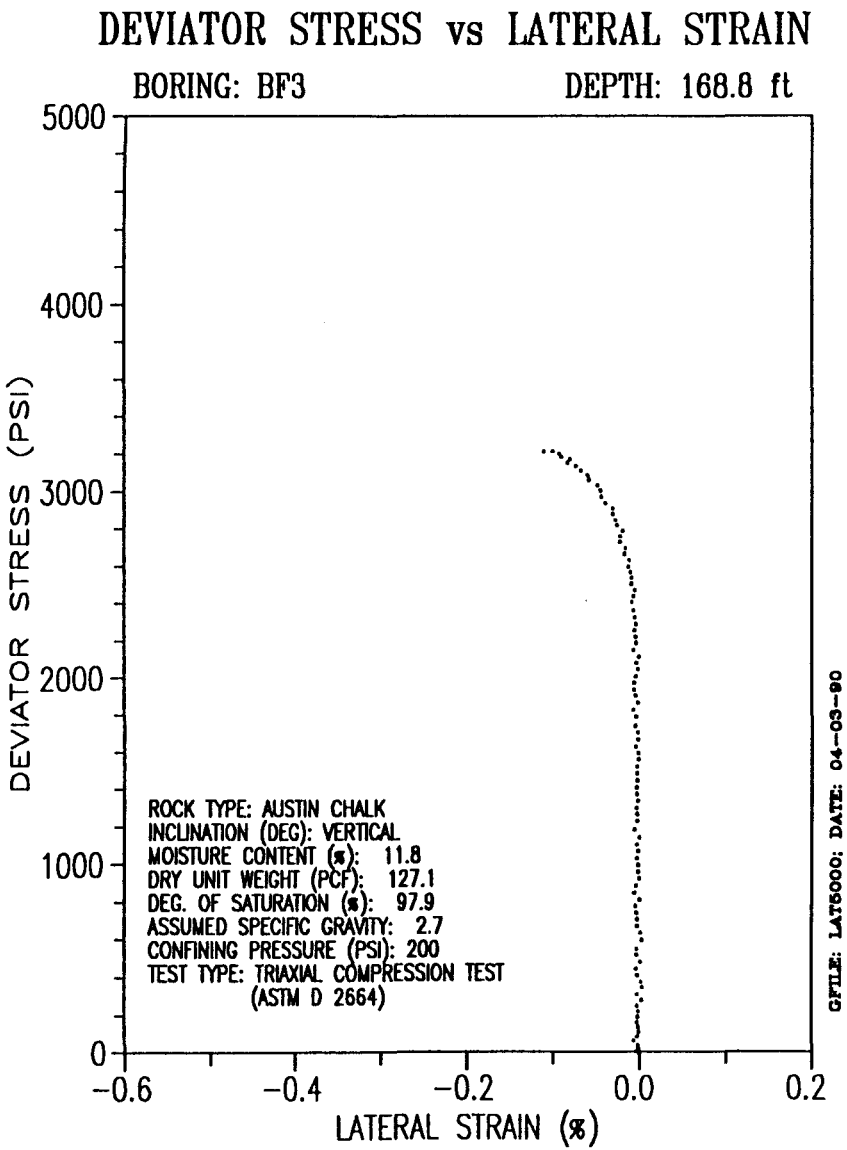
TEXAS SSC SITE

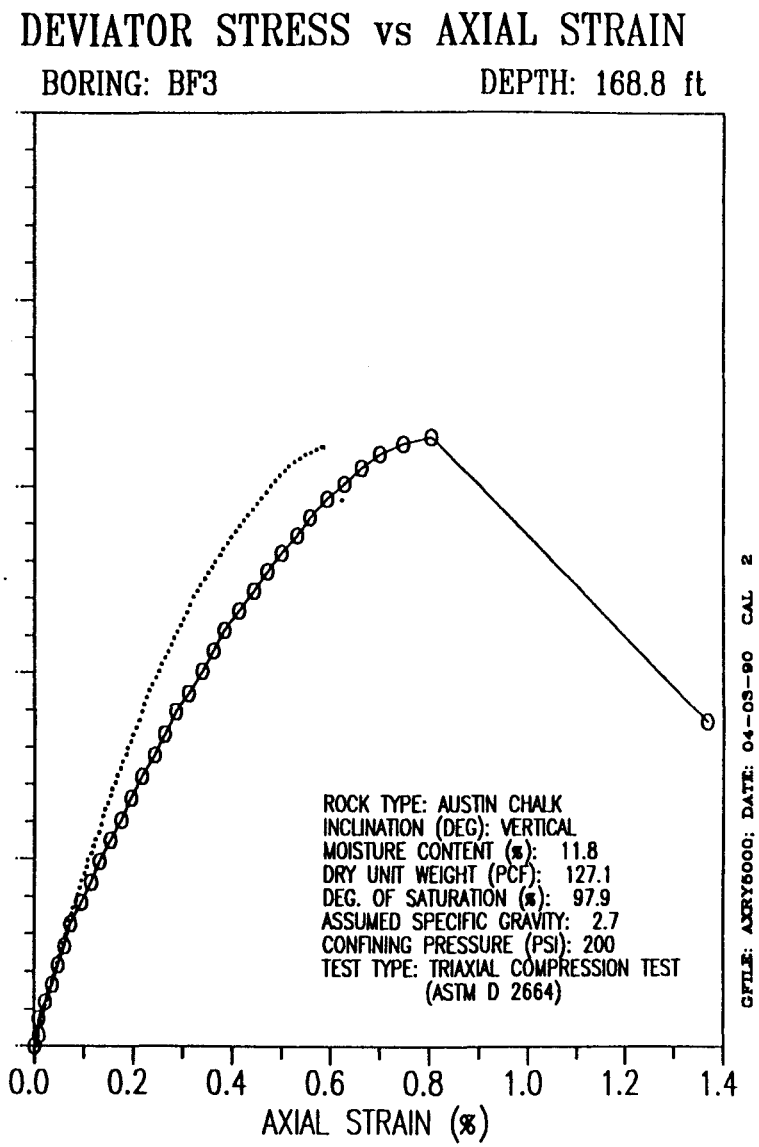
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

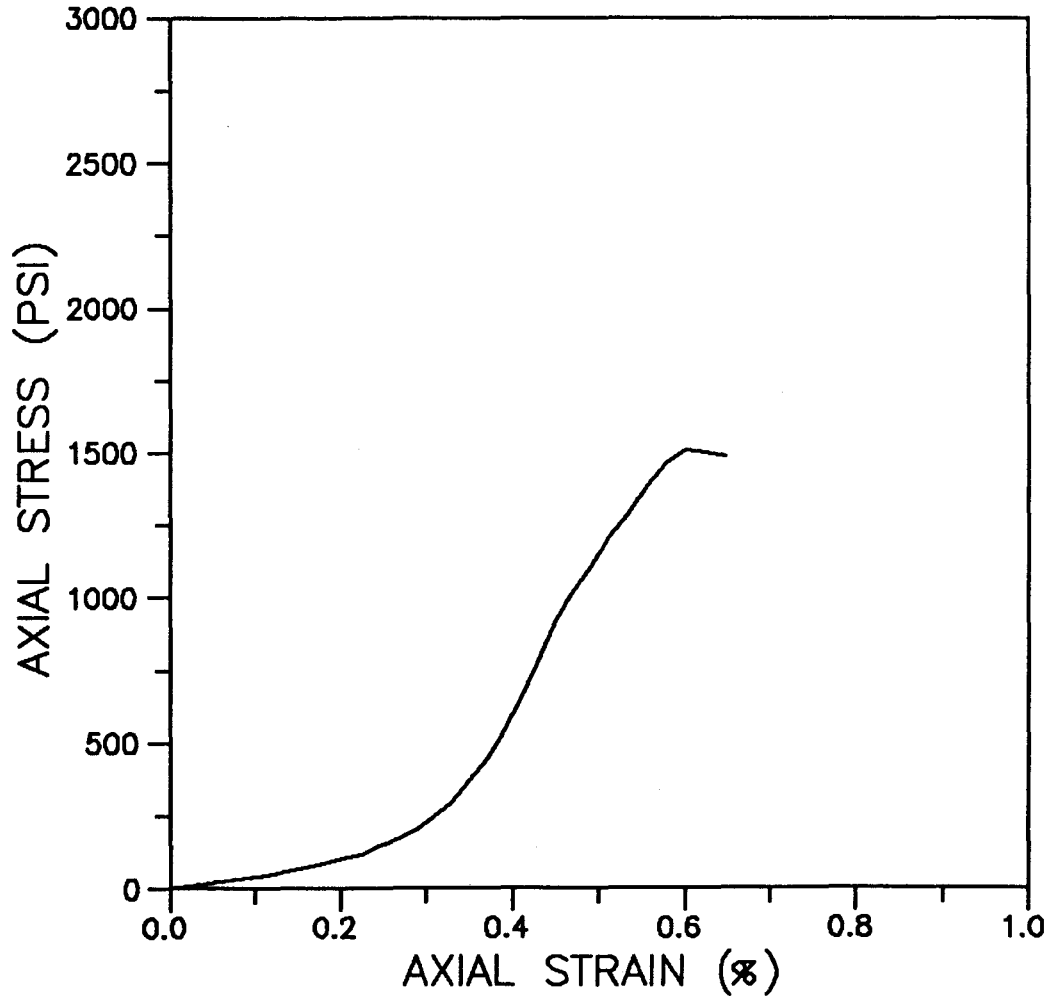
JOB NO.: 5530.17

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BF3
DEPTH: 168.8 ft
DEVIATOR STRESS (PSI)
5000
4000
3000
2000
1000
0
-0.6
-0.4
-0.2
0.0
0.2
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.8
DRY UNIT WEIGHT (PCF): 127.1
DEG. OF SATURATION (%): 97.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT5000; DATE: 04-03-90
····· JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BF3
DEPTH: 168.8 ft
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.8
DRY UNIT WEIGHT (PCF): 127.1
DEG. OF SATURATION (%): 97.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY5000; DATE: 04-03-90 CAL 2
····· JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: BF3
DEPTH (FT): 178.4
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.0
DRY UNIT WEIGHT (PCF): 116.8
DEG. OF SATURATION (%): 97.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.91 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

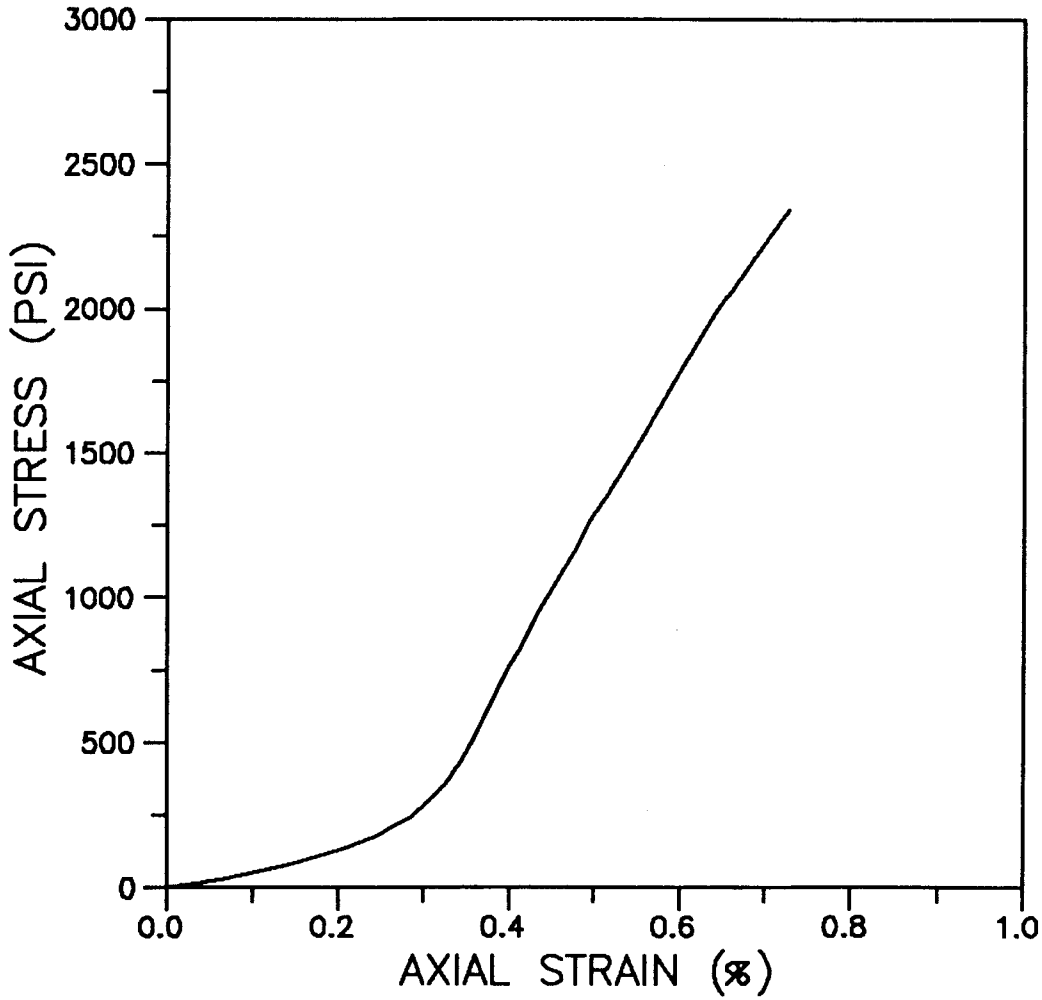
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO: BF3
DEPTH (FT): 200.2
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.7
DRY UNIT WEIGHT (PCF): 127.5
DEG. OF SATURATION (%): 89.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
5.17 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

STRESS-STRAIN PLOT

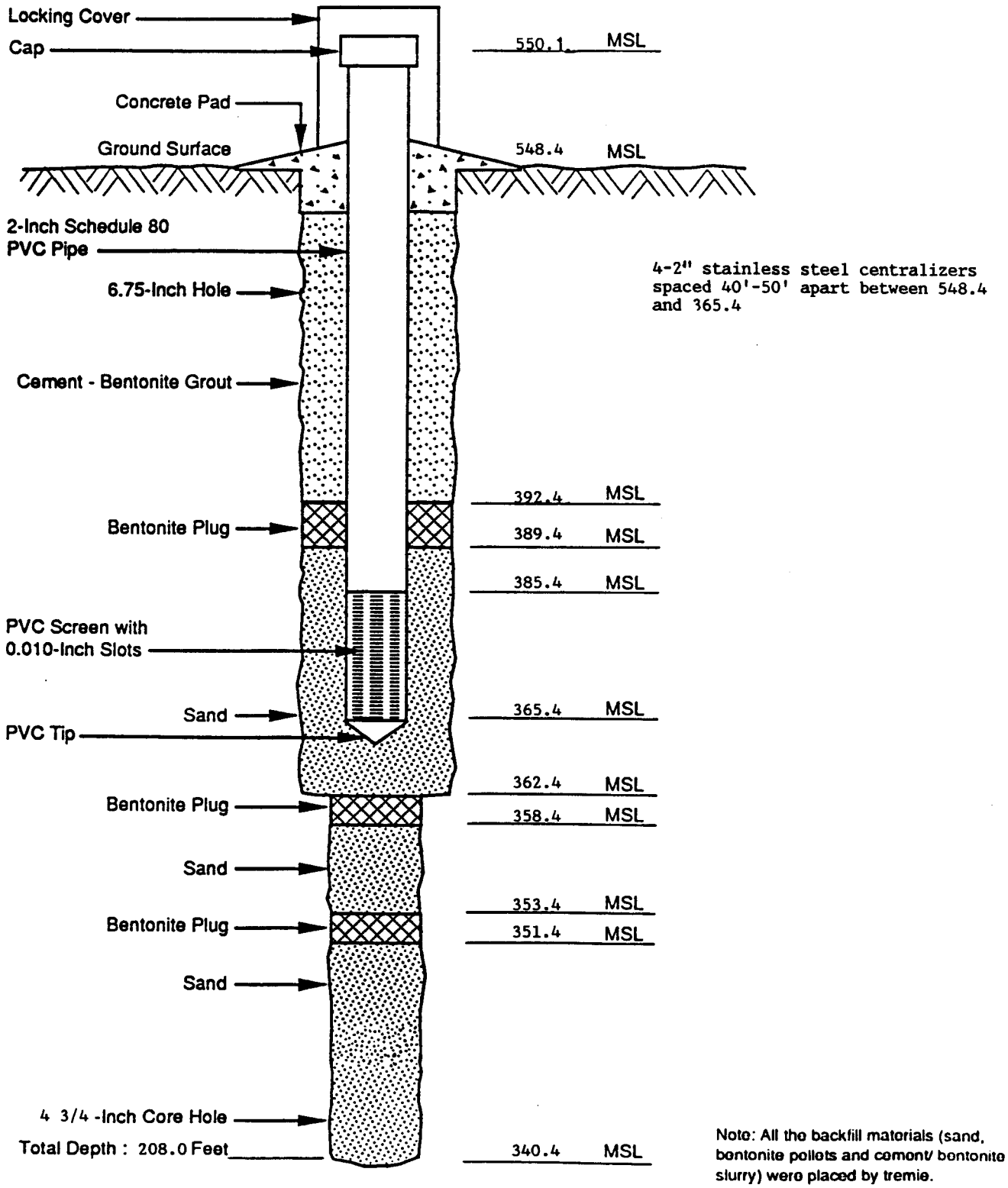
SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

APPENDIX E

WELL AS-BUILT DIAGRAM



Note: All the backfill materials (sand, bentonite pellets and cement/ bentonite slurry) were placed by tremie.

NOT TO SCALE

Boring: BF 3
Location: N 300,776
E 2,211,027
Date(s) Installed: 2-10-90
Well Construction
Supervising Geologist: Mike Granger
Approved By: Shawn Wood **Date:** 5-14-90

"As Built"
Well Construction Diagram
Observation Well
No.
BF 3

5/90 Figure