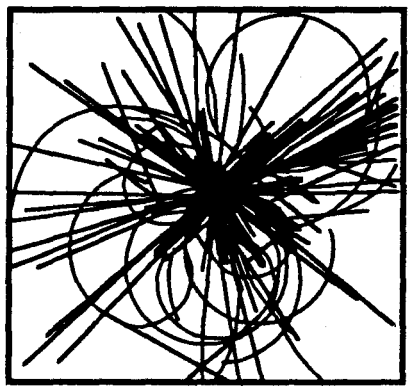
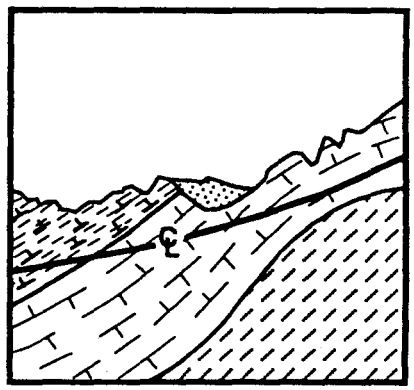
SSCL-SR-1090

SSCL-SR-1090
Project No. 87-888-0017
June 1990
GR - 31
GR-31

Data Report for Corehole BE 10





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: BE 10

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

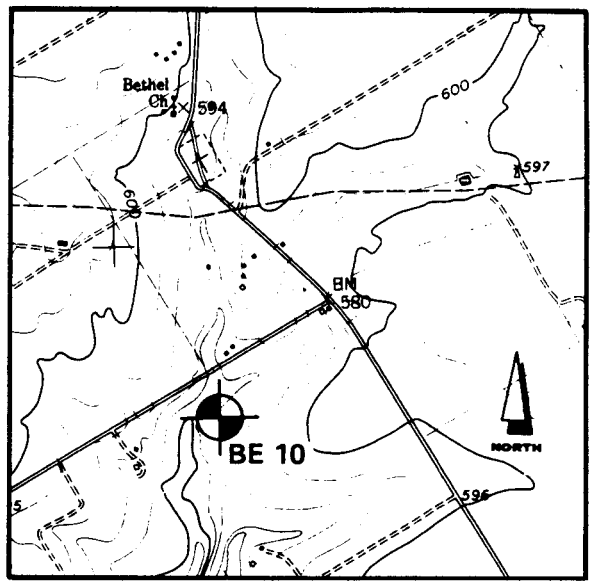
Location:

North 225,960 feet

East 2,181,380 feet

Surface Elevation 560.8 feet

BE 10 is located on the western side of the proposed tunnel alignment, about 3 miles north of State Route 876.



SCALE 1:24,000

1000 0 1000 2000 3000 FEET

CONTOUR INTERVAL 10 FEET

Scope and Schedule:

Coring (full depth)	January 11, 1990
Wire-line Logging	January 12, 1990
Hydrologic Testing	January 12, 1990
Laboratory Testing	January 15 to March 10, 1990
Well Construction	January 12 to 13, 1990

Conditions Encountered: (see lithologic log, Appendix A)

Total Hole Depth:	128.0 feet
Soil:	0.0 to 2.5 feet
Weathered Austin Chalk:	2.5 to 4.7 feet
Austin Chalk:	4.7 to 128.0 feet (bottom of hole)
Static Water Level:	Measured at 553.6 feet above MSL (7.2 feet below ground surface) on April 5, 1990, 77 days after the well was bailed to 472.9 feet above MSL. Results of repeated measurements indicate that the water level in the boring has probably reached static condition.

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)
95.3-116.4	100	20	Austin Chalk	$<9.0 \times 10^{-8}$

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

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)
28	Austin Chalk	12	126	712	1.83	
34	Austin Chalk	12-13	122-123	1688	5.00	
44-45	Austin Chalk	13-14	118-120	2730	5.88	
58-59	Austin Chalk	11-13	123-129	897-2951 (100)	1.98-8.00 (100)	
78-79	Austin Chalk	10-13	120-130	2196	2.78	245
96-97	Austin Chalk	12	120-121	2787	3.73	
112	Austin Chalk	10-11	129	3659	6.39	
121	Austin Chalk	8-10	131-135	3090	8.06	

* UU triaxial test indicated by confining pressure in parentheses.

Hole Status: An observation well was constructed in the boring on January 13, 1990 (see Appendix E).

APPENDIX A

LITHOLOGIC LOG

LOG OF BORING

BORING NO: BE 10 PG 1 OF 4

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 17

LOCATION: N 225,960 feet, E 2,181,380 feet

GROUND EL: 560.8 feet

DATE: 1-11-90 TYPE: Nx-Core CASED TO: 3.5' CONTRACTOR: MJA

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.
			4.0	9.0	99	99			
			9.0	14.0	100	100			
			14.0	23.0	99	99			
			23.0	33.0	100	100			
			33.0		99	99			

SAMPLE LEGEND

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

WATER INFORMATION

Wet Rotary Core Hole
Water level not determinable
Observation well installed for monitoring of water level

DESCRIPTION OF STRATUM

CLAY (Residual Soil), silty

2.5g
LIMESTONE (Austin Chalk), mod. wea., soft to med. hd., med. bedded, tan, sli. fossil., w/thin to med. argill. and thin to very thin shale interbeds

4.7s
LIMESTONE (Austin Chalk), fresh, med. to mod. hd., sli. fossil., lt. gray, w/0.1 to 1.5 ft. thick sli. argill. to shaly interbeds spaced from 1.0 to 4.4 ft. apart

4.3g-5.3s Thin, mod. argill., med. hd., dk. gray bed
8.15s-9.0g Thin, mod. argill., med. hd., dk. gray bed
11.6s-12.4g Thin, mod. to v. argill., med. hd., dk. gray bed
14.3s-15.1g Thin, mod. to v. argill., med. hd., dk. gray bed
17.3g-17.55s Thin, mod. to v. argill., med. hard, dk. gray bed
19.9g-21.4g Med.thick,mod.argill.,med.hard,dk.gray bed
22.8g-23.7g Thin, sli. argill., med. gray bed
24.8g-25.6g Thin, sli. argill., med. gray bed
27.6s-27.7s Very thin, shaly, soft, dk. gray bed
32.1g-32.3g Very thin, shaly, soft, dk. gray bed
33.3g-33.6g Thin, sli. argill., med. gray bed
34.8g-36.05s Med.thick,mod.to v.argill.,soft to med.hard, dk.gray bed
38.65g-39.85g Thin, v. argill., soft to med. hard, dk. gray bed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark Thomas CHECKED BY W. D. Flanigan

Rev. 3/22/90

LOG OF BORING

BORING NO: BE 10 PG 2 OF 4

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 17

LOCATION: N 225,960 feet
E 2,181,380 feet

GROUND EL: 560.8 feet

DATE: 1-11-90 TYPE: Nx-Core CASED TO: 3.5' CONTRACTOR: MJA

SAMPLE LEGEND	WATER INFORMATION
S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	Wet Rotary Core Hole Water level not determinable Observation well installed for monitoring of water level

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
		C5		43.0	99	99				LIMESTONE (Austin Chalk), fresh, med. to mod. hd., sli. fossil., lt. gray w/0.05 to 4.3 ft. thick sli. argill. to shaly and bentonitic interbeds spaced from 0.8 to 6.15 ft. apart
45		C6	43.0	53.0	100	100				44.1g-45.5g Med.thick,v.argill.,med.hd.,dk.gray bed 47.1g-48.25g Med.thick,v.argill.,med.hd.,dk.gray bed 50.0g-50.6s Thin, mod. to v. argill, med. hd., dk. gray bed 52.0-53.0 75° fracture, non-slickensided, rough, narrow separation, pyrite crystals on surface, fresh
50										
55		C7	53.0	63.0	100	100				53.7g-54.6g Thin, v. argill., med. hd., dk. gray bed 55.4g-55.7g Thin, mod. argill., med. hd., dk. gray bed 58.2g-58.7g Thin, mod. argill., med. hd., dk. gray bed 60.0g-61.1g Med.thick,sli.argill.,med.gray bed 63.25g-63.3s Very thin bentonitic clay, v. soft, bluish-gray bed
60										
65		C8	63.0	73.0	100	100				63.1g-63.5g Thin, v. argill., med. hd., dk. gray bed 65.6g-66.1g Thin, v. argill., med. hd., dk. gray bed 68.8g-69.8g Thin, sli. argill., med. gray bed 69.8g-73.0g Thick, mod. argill., med. hd., med. to dk. gray bed 74.8g-77.0g Med.thick,mod.to v.argill.,dk.gray bed
70										
75		C9	73.0		100	100				77.0g-81.3g Thick, mod. argill., med. hd., dk. gray bed 81.3g-81.55g Thin, shaly, soft, dk. gray bed
80										

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark Thomas CHECKED BY W. D. Flanigan

Rev. 3/22/90

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 17

BORING NO: BE 10 PG 3 OF 4

LOCATION: N 225,960 feet
E 2,181,380 feet

GROUND EL: 560.8 feet

DATE: 1-11-90 TYPE: Nx-Core CASED TO: 3.5' CONTRACTOR: MJA

SAMPLE LEGEND

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

WATER INFORMATION

Wet Rotary Core Hole
Water level not determinable
Observation well installed for monitoring of water level

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.
		C9		83.0					
85		C10	83.0	93.0	99	99			
90									
95		C11	93.0	103.0	100	100			
100									
105		C12	103.0	113.0	99	99			
110									
115		C13	113.0		100	100			
120									

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), fresh, med. to mod. hd., sli. fossil., lt. gray w/0.15 to 1.6 ft. thick sli. argill. to shaly and bentonitic interbeds spaced 0.55 to 6.15 ft. apart

87.7s-89.0g Med.thick,mod.to v.argill.,med.hd.,dk.gray bed

90.0g-90.8g Thin, mod. to v. argill., med. hd., dk. gray bed

92.0g-93.0g Thin, mod. to v. argill., med. hd., dk. gray bed

94.4g-95.1s Thin, mod. argill., med. hd., med. to dk. gray bed

96.0g-97.6g Med.thick,mod.argill.,med.hd.,med.to dk. gray bed

99.8g-101.0g Med.thick,mod.argill.,med.hd.,dk. gray bed

102.0g-103.3g Med.thick,v.argill.,med.hd.,dk.gray bed

104.8g-105.4s Thin, v. argill., med. hd., dk.gray bed

106.35s-106.5s Very thin, shaly, soft, dk. gray bed

108.1g-108.6g Thin, v. argill./shaly, soft, dk. gray bed

108.6g-109.35s Thin, bentonitic clay, very soft, bluish-gray, nonlaminated, waxy bed

109.8g-111.4g Med.thick,sli.argill.,med.gray bed

113.3g-114.1g Med.thick,sli-mod.argill.,med.hard,med. gray bed

114.8g-116.0g Med.thick,sli.argill.,med.gray bed

116.55s-117.2g Thin, mod. to v. argill., med. hard, dk. gray bed

118.5g-119.1g Thin, sli. argill., med. gray bed

120.8g-121.8g Thin, sli. to mod. argill., med. hard, dk. gray bed

122.2g-122.7g Thin, sli. to mod. argill., med. hard, dk. gray bed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark Thomas CHECKED BY W. D. Flanigan

Rev. 3/22/90

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 17

BORING NO: BE 10 PG 4 OF 4

LOCATION: N 225,960 feet
E 2,181,380 feet

GROUND EL: 560.8 feet

DATE: 1-11-90 TYPE: Nx-Core CASED TO: 3.5' CONTRACTOR: MJA

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT ROD.	STANDARD PENETRATION TEST PER 6 INCHES		HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C13		123.0						LIMESTONE (Austin Chalk). fresh, med. to mod. hard, sli. fossil., lt. gray w/0.5 to 1.2 ft. thick mod. argill. to shaly interbeds spaced from 0.4 -1.7 ft.apart 123.9s-124.4g Thin, shaly/v. argill., soft, dk. gray bed
		C14	123.0	128.0	100	100				125.8g-127.0g Med.thick,mod.argill.,med.hard,dk.gray bed
125										
130										Total Depth: 128.0' 1-11-90 (1) Wash bored to 4.0' w/o sampling (2) Wireline logged 1/12/90 (3) Hydrotested 1/12/90 (4) Borehole reamed to 6 3/4" down to 103.0' 1/12/90 & (5) Well construction completed 1/13/90 1/13/90
135										
140										
145										
150										
155										
160										

SAMPLE LEGEND

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

WATER INFORMATION

Wet Rotary Core Hole
Water level not determinable
Observation well installed for monitoring of water level

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark Thomas CHECKED BY W. D. Flanigan

Rev. 3/22/90

APPENDIX B

WIRE-LINE LOGS

WIRE-LINE LOGGING PARAMETERS

Hole No. BE 10 **Log Measured From:** Ground Level

Drilling Parameters

Depth 128.0 feet

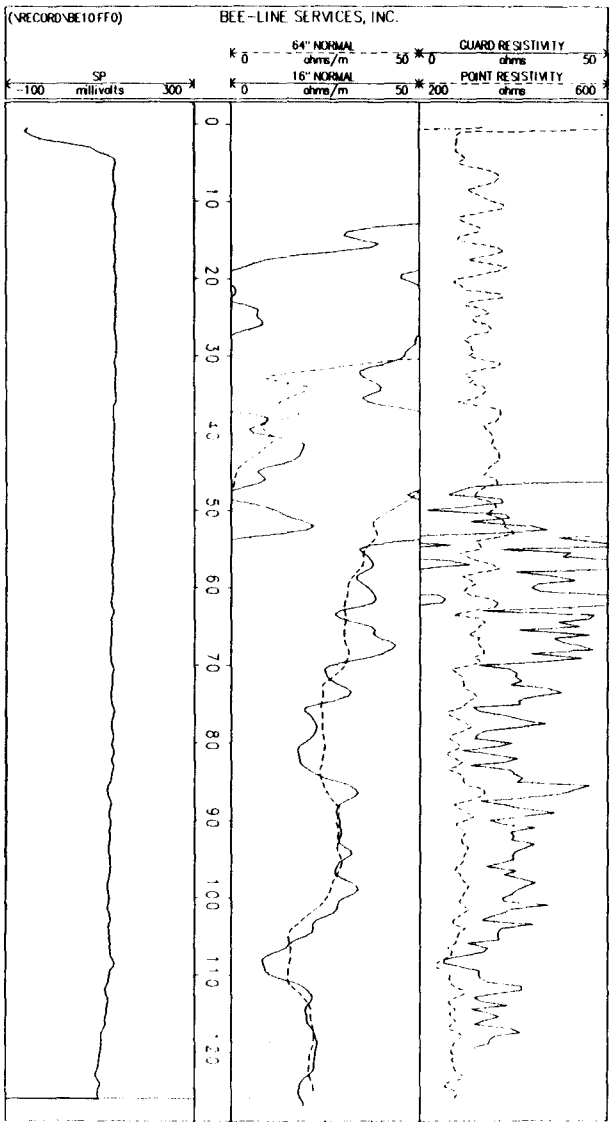
Bit Diameter 3.125 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	January 12, 1990	January 12, 1990	January 12, 1990
Bottom Log Interval	127.0 feet	125.0 feet	121.4 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling fluid	drilling fluid	drilling fluid
Time Since Circulation Stop	14.5 hours	14.5 hours	14.5 hours
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

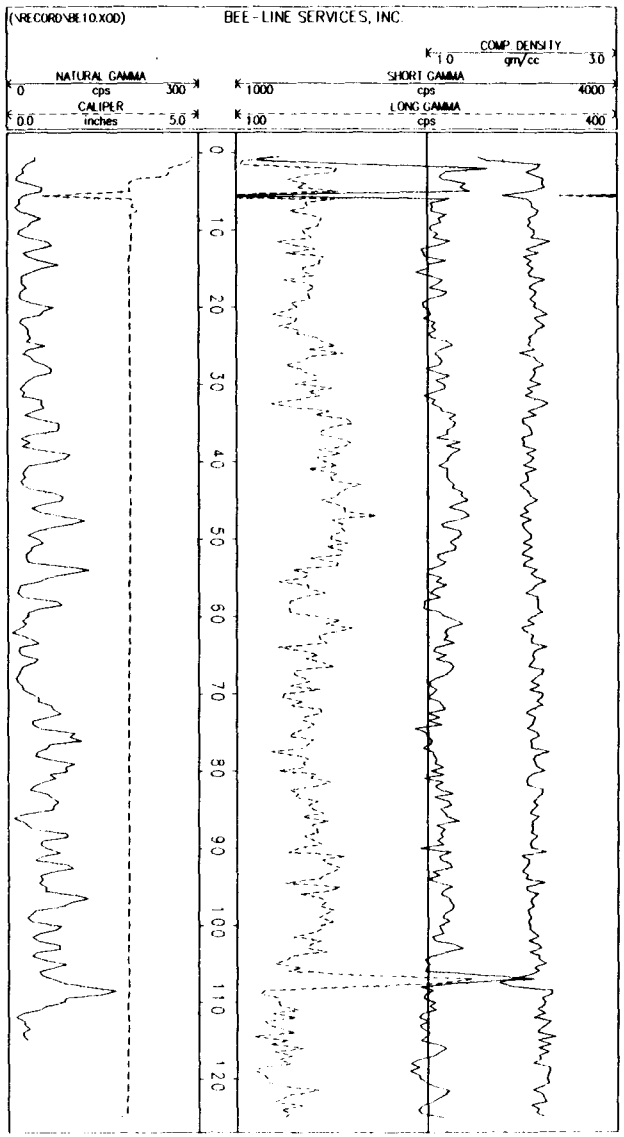
Logged by: **BEE-LINE SERVICES, INC.**
P. O. Box 2096
Corsicana, TX 75151

BE 10 Wire-line logs run January 12, 1990. Surface elevation 560.8 feet.

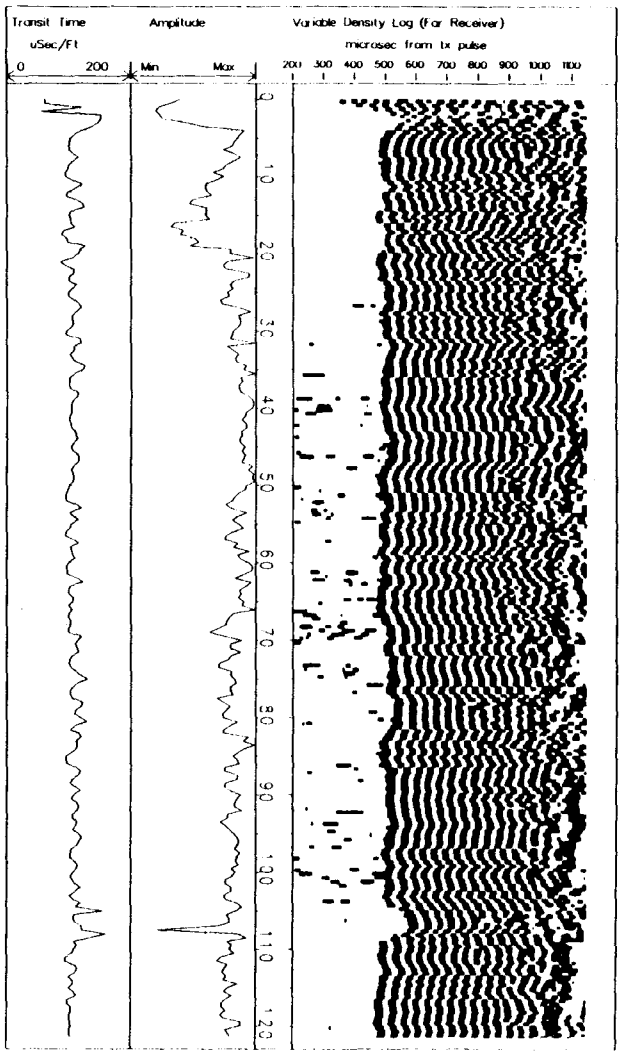
ELECTRICAL LOG



GAMMA LOG



SONIC LOG



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 Depth to Static Water Level (feet)
95.3-116.4	100	20	Austin Chalk	$<9.0 \times 10^{-8}$	7.0

At boring BE 10, one test interval was selected based on an inspection of the rock core and a review of the lithologic and wire-line logs. The test was done in an area of unfractured Austin Chalk at about the tunnel elevation. Testing generally followed the procedures outlined above. Packer and gauge pressures are given in the table above, along with the calculated hydraulic conductivity based on an approximate static water level.

APPENDIX D

LABORATORY RESULTS

GEOMECHANICAL TEST RESULTS - BORING BE 10

GENERAL LITHOLOGY	BORING DEPTH feet	MOISTURE CONTENT percent	DRY DENSITY pcf	SPECIFIC GRAVITY	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	FRACTION FINER THAN # 200 SIEVE percent	CARBONATE CONTENT percent	SAMPLE DIMENSION RATIO L/D	SAMPLE FAILURE MODE/ DEGREES *	UNCONFINED COMPRESSIVE STRENGTH psi	TRIAXIAL COMPRESSION CONFINING PRESSURE σ_3 psi	TRIAXIAL COMPRESSION DEVIATOR STRESS $\sigma_1 - \sigma_3$ psi	FAILURE STRAIN percent	TANGENT YOUNG'S MODULUS E50 (psi)x10E5	TANGENT YOUNG'S MODULUS UNLOAD/ RELOAD (psi)x10E5	TANGENT YOUNG'S MODULUS σ_3 psi	POISSON'S RATIO	BRAZIL TENSILE STRENGTH psi	2ND CYCLE SLAKE DURABILITY INDEX percent	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX psi	COMMENTS
AUSTIN CHALK	27.7	11.6	125.6						2.3	D	712			0.47	1.83		0						SHALY, NOTE 1
AUSTIN CHALK	28.1	11.8	125.8																				
AUSTIN CHALK	33.6	12.4	123.2						2.2	D & E	1688			0.37	5.00		0						
AUSTIN CHALK	34.0	13.2	122.0																				
AUSTIN CHALK	44.2	13.0	119.7						2.4	D & E	2730			0.73	5.88		0						
AUSTIN CHALK	44.7	14.3	118.4																				
AUSTIN CHALK	57.9	12.3	125.1																				
AUSTIN CHALK	58.4	10.7	126.8						2.3	D	897			0.50	1.98		0						
AUSTIN CHALK	58.8	11.2	128.6	2.65					2.4	D		50	2532	0.62	3.95		50						
AUSTIN CHALK	58.8														5.14			0.31					NOTE 2
AUSTIN CHALK	59.2	12.7	123.3						2.2	B-1/20		100	2951	0.61	5.81		100						
AUSTIN CHALK	59.2														8.00			0.14					NOTE 2
AUSTIN CHALK	77.9	12.6	120.2																				
AUSTIN CHALK	78.5	10.2	129.8						2.4	D	2196			1.02	2.78		0						
AUSTIN CHALK	78.9	11.2	127.9																				
AUSTIN CHALK	79.3								0.5										245				
AUSTIN CHALK	96.5	12.1	120.8						2.4	E	2787			1.08	3.73		0						
AUSTIN CHALK	96.9	12.4	120.2																				
AUSTIN CHALK	111.6	10.5																					
AUSTIN CHALK	111.7	10.6	129.4						2.3	D	3660			0.61	6.39		0						NOTE 3
AUSTIN CHALK	112.1																				0.326		
AUSTIN CHALK	120.9	8.5	135.0						2.2	D	3090			0.70	8.06		0						
AUSTIN CHALK	121.4	10.0	131.0																				
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-4318		ASTM-D422				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

BE10PR21.WK1
REVISION 2.1
DATE: 06/05/90

* 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

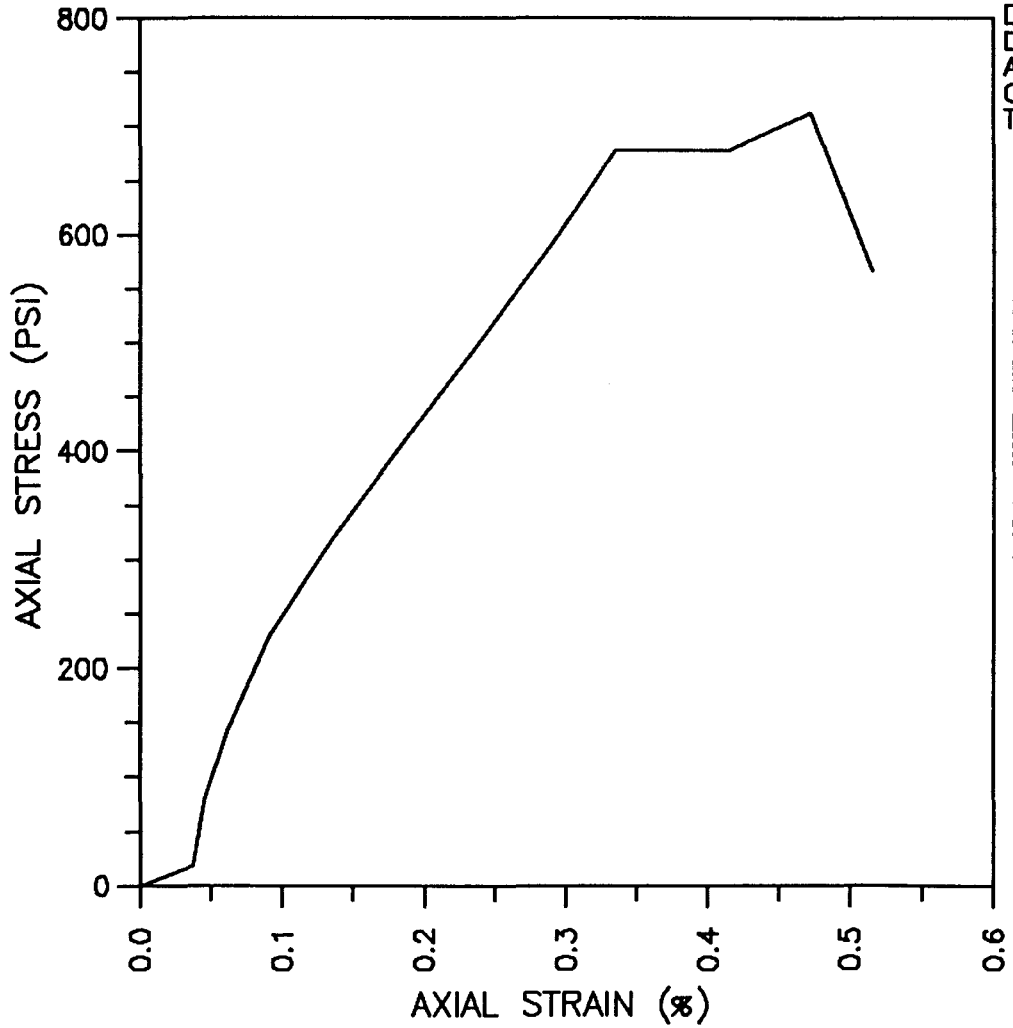
NOTES:

1) All moduli calculated from axial strains using a dial gage 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.

3) Load frame capacity exceeded. Sample not taken to failure. Modulus taken at 50 % of maximum stress.

BORING NO.: BE10
DEPTH (FT): 27.7
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.6
DRY UNIT WEIGHT (PCF): 125.6
DEG. OF SATURATION (%): 92.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: BE100277 DATE: 05-30-90 CAL: MCU2

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.833 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

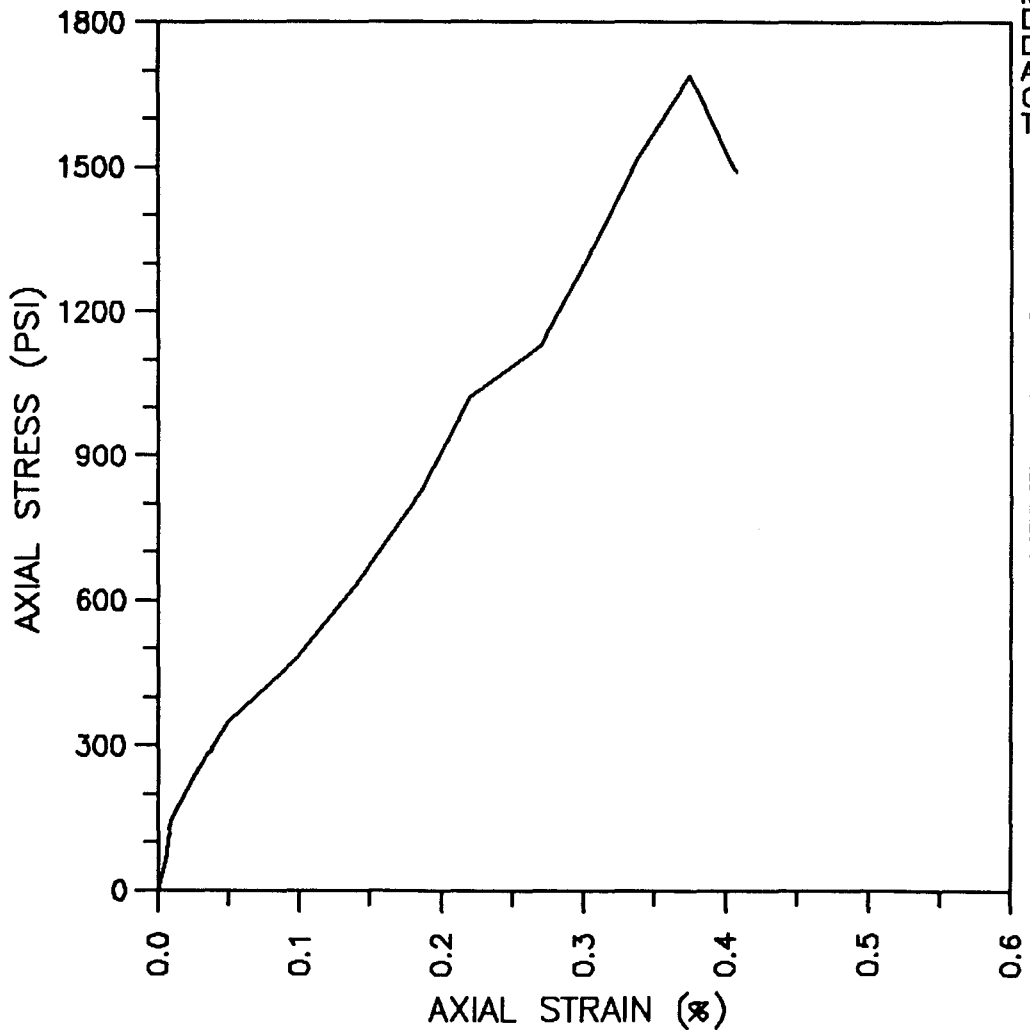
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.17

FIGURE

BORING NO.: BE10
DEPTH (FT): 33.6
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.4
DRY UNIT WEIGHT (PCF): 123.2
DEG. OF SATURATION (%): 91.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: BE100336 DATE: 05-31-90 CAL: MCU3

TANGENT MODULUS AT 50%
MAXIMUM STRESS:
5.000 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING W/
CONICAL FAILURE

TEXAS SSC SITE

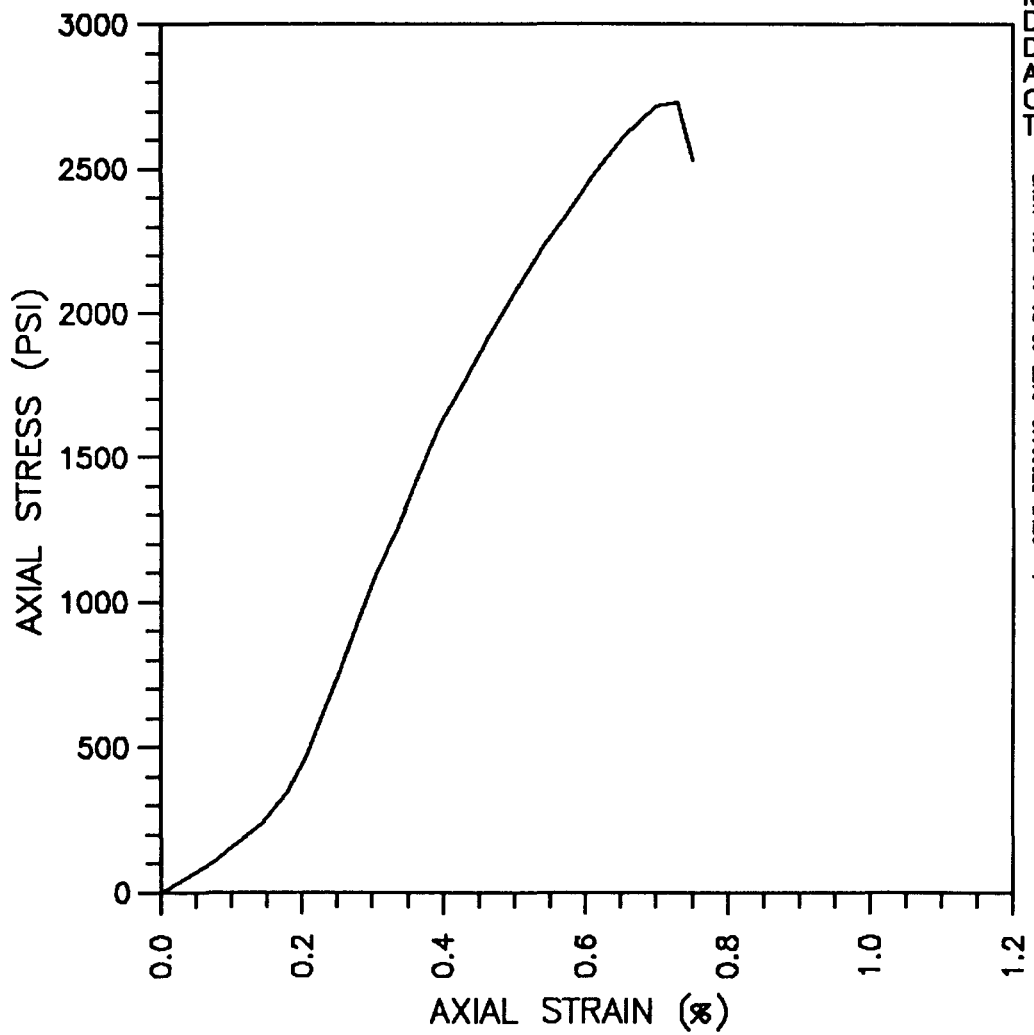
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.17

FIGURE

BORING NO.: BE10
DEPTH (FT): 44.2
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.0
DRY UNIT WEIGHT (PCF): 119.7
DEG. OF SATURATION (%): 86.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

BFILE: BE100442 DATE: 05-31-90 CAL: MCU3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
5.882 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING W/
CONICAL FAILURE

TEXAS SSC SITE

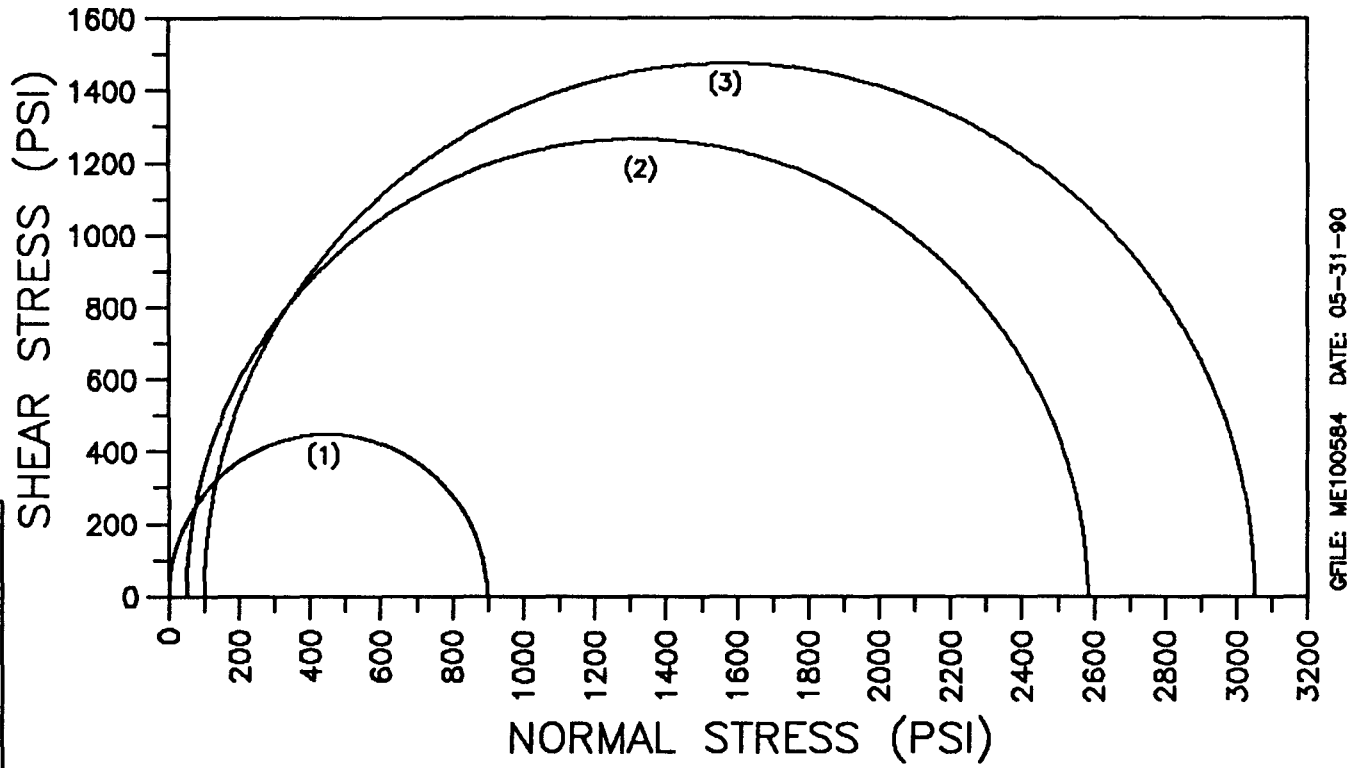
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.17

FIGURE

BORING NO.: BE10
DEPTH RANGE (FT): 58.4–59.6
AUSTIN CHALK LIMESTONE



GFILE: ME100584 DATE: 05–31–90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 58.4
(2) DEPTH (FT): 58.8
(3) DEPTH (FT): 59.2

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

TEXAS SSC SITE

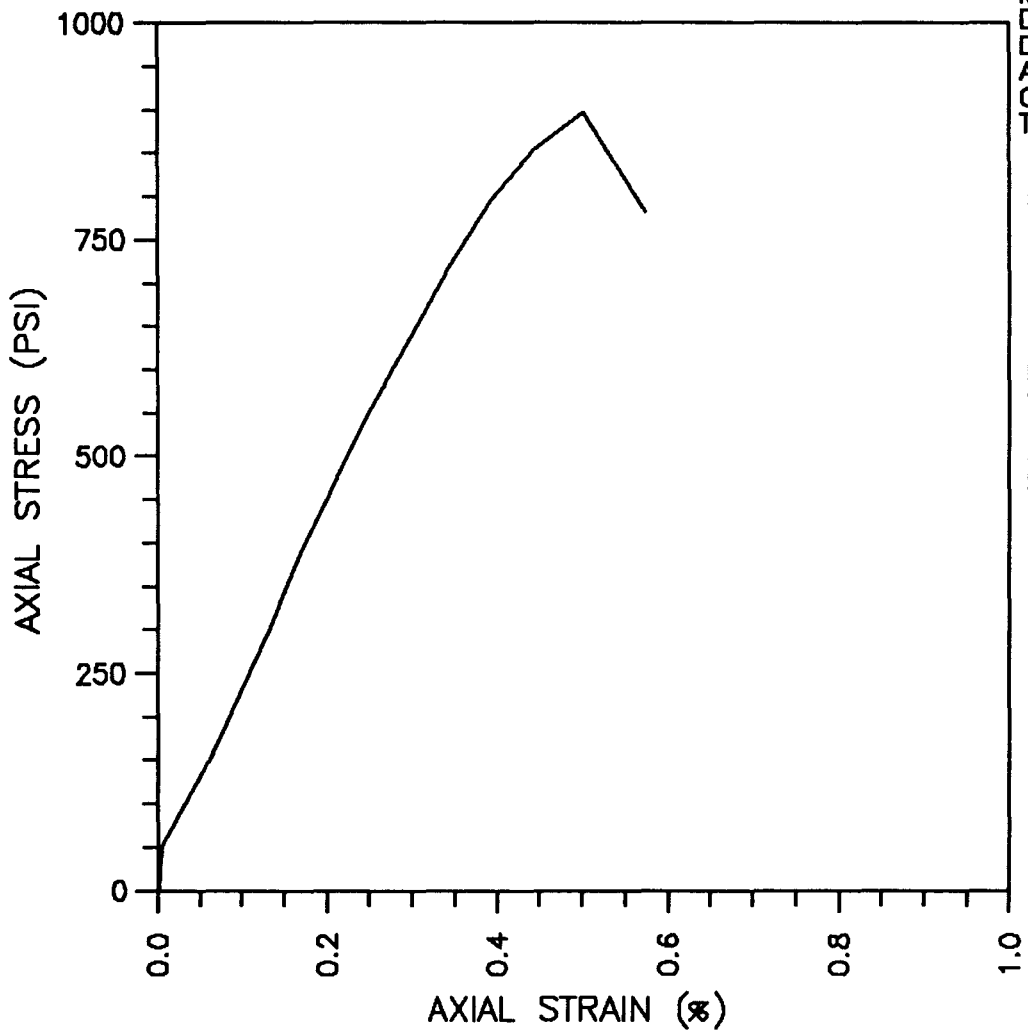
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.17

FIGURE

BORING NO.: BE10
DEPTH (FT): 58.4
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.7
DRY UNIT WEIGHT (PCF): 126.8
DEG. OF SATURATION (%): 88.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: BE100584 DATE: 05-31-90 CAL: MCU2

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.975 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

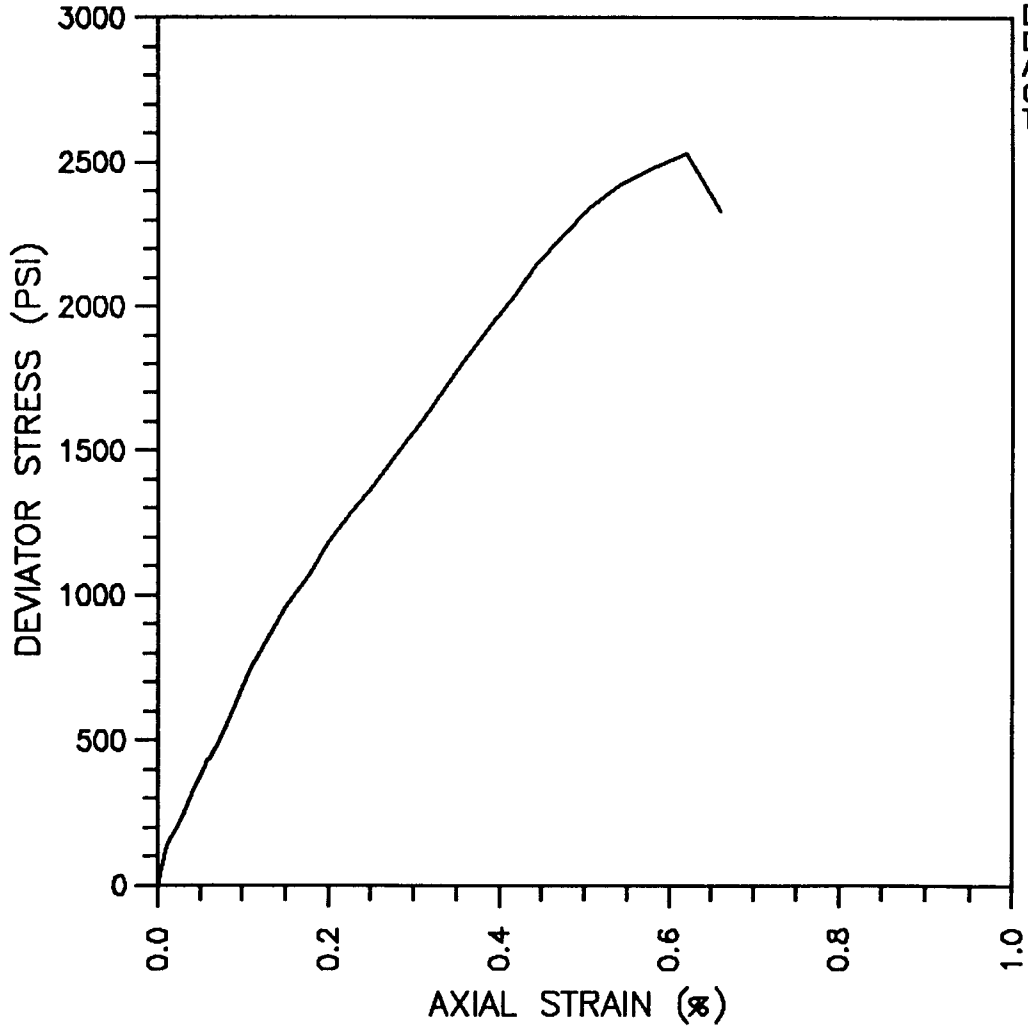
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.17

FIGURE

BORING NO.: BE10
DEPTH (FT): 58.8
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.2
DRY UNIT WEIGHT (PCF): 128.6
DEG. OF SATURATION (%): 97.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

BFILE: BE100588 DATE: 05-31-90 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.947 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

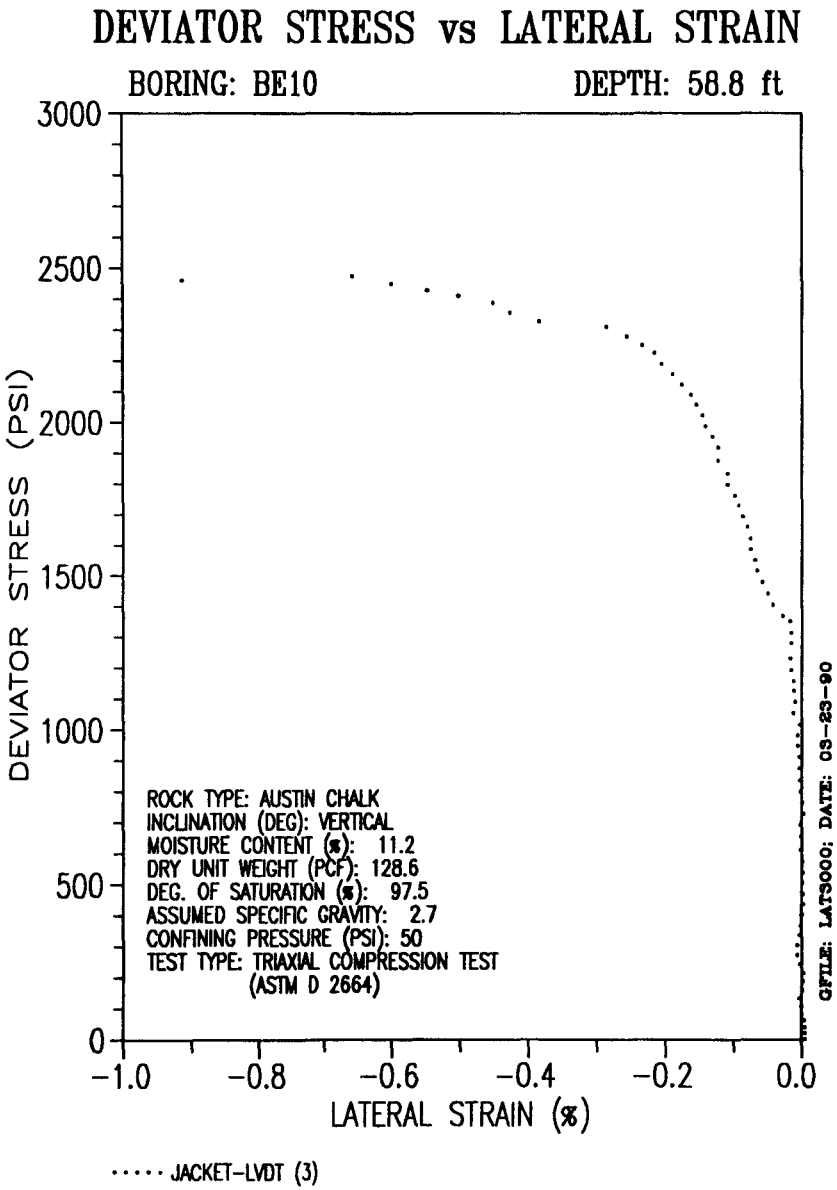
TEXAS SSC SITE

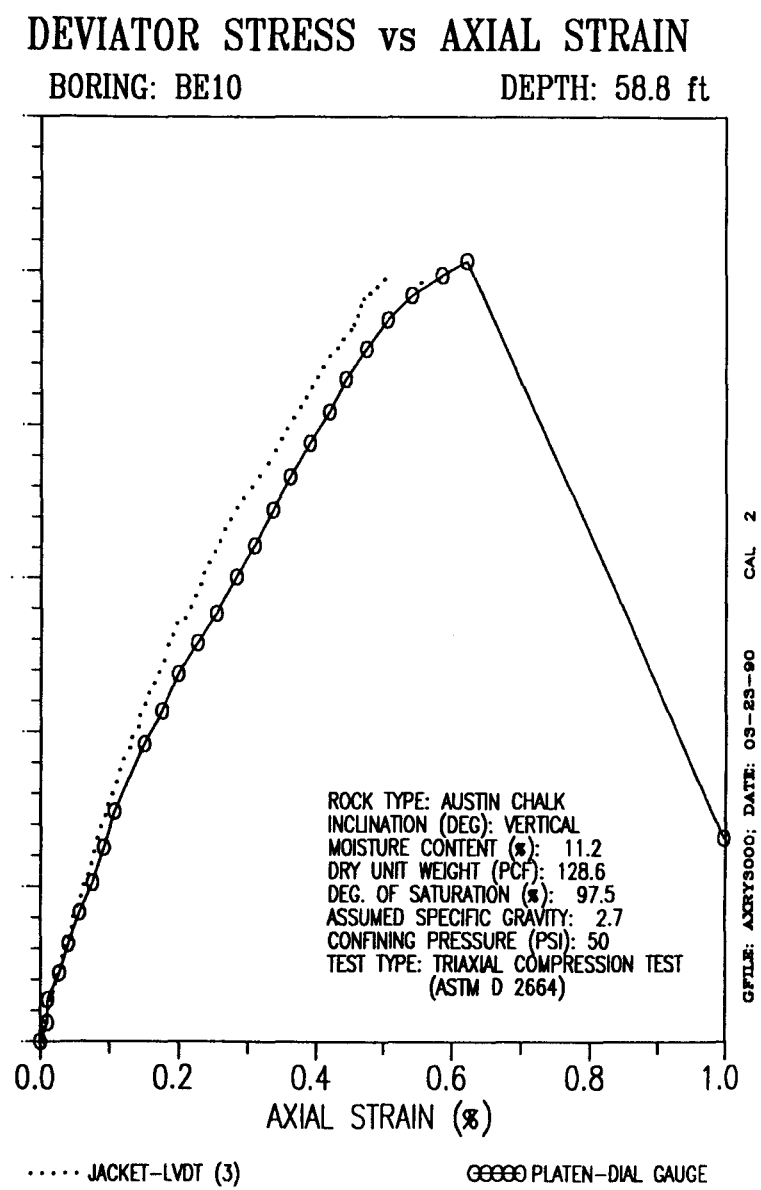
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

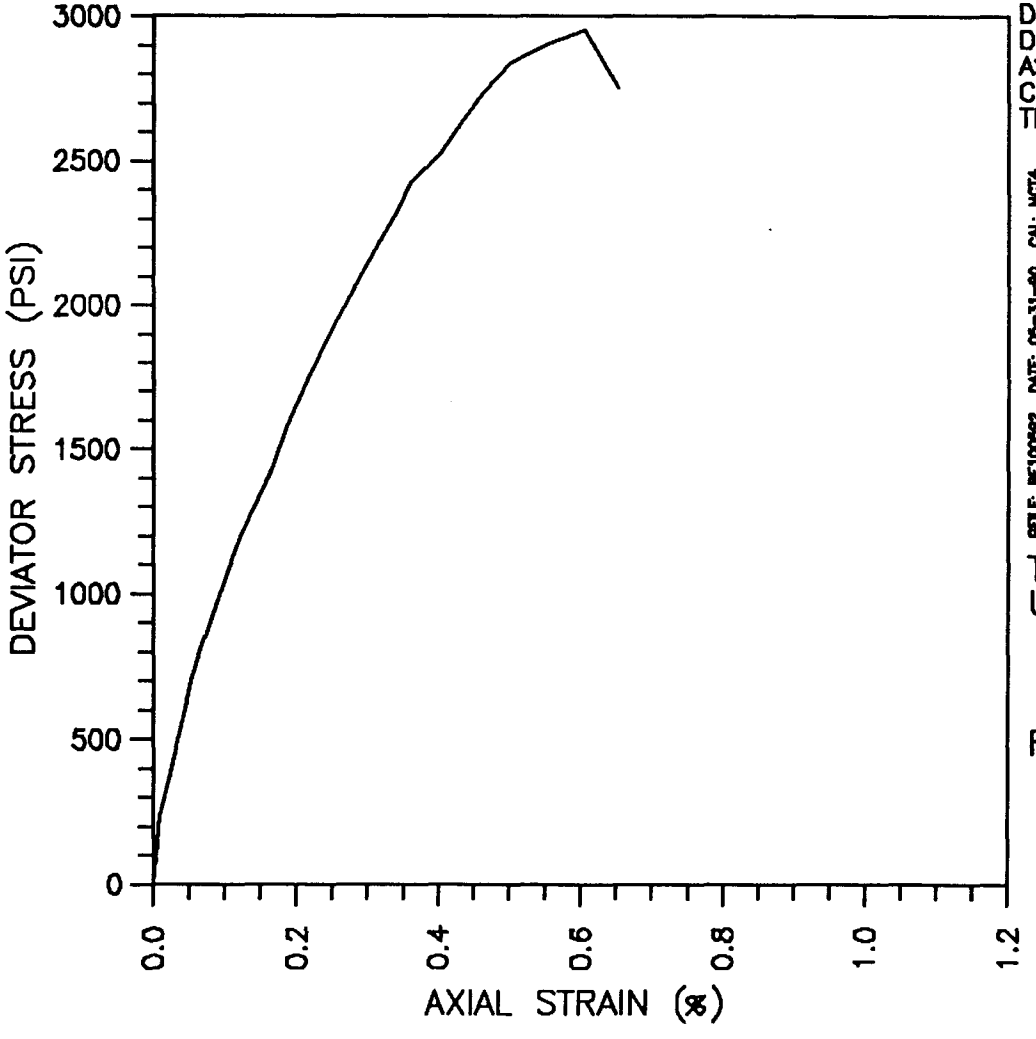
JOB NO.: 5530.17

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BE10
DEPTH: 58.8 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.2
DRY UNIT WEIGHT (PCF): 128.6
DEG. OF SATURATION (%): 97.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT3000; DATE: 03-23-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BE10
DEPTH: 58.8 ft
0.0
0.2
0.4
0.6
0.8
1.0
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.2
DRY UNIT WEIGHT (PCF): 128.6
DEG. OF SATURATION (%): 97.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY3000; DATE: 03-23-90
CAL 2
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BE10
DEPTH (FT): 59.2
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.7
DRY UNIT WEIGHT (PCF): 123.3
DEG. OF SATURATION (%): 93.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: BE100592 DATE: 05-31-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
5.814 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 20 DEG.

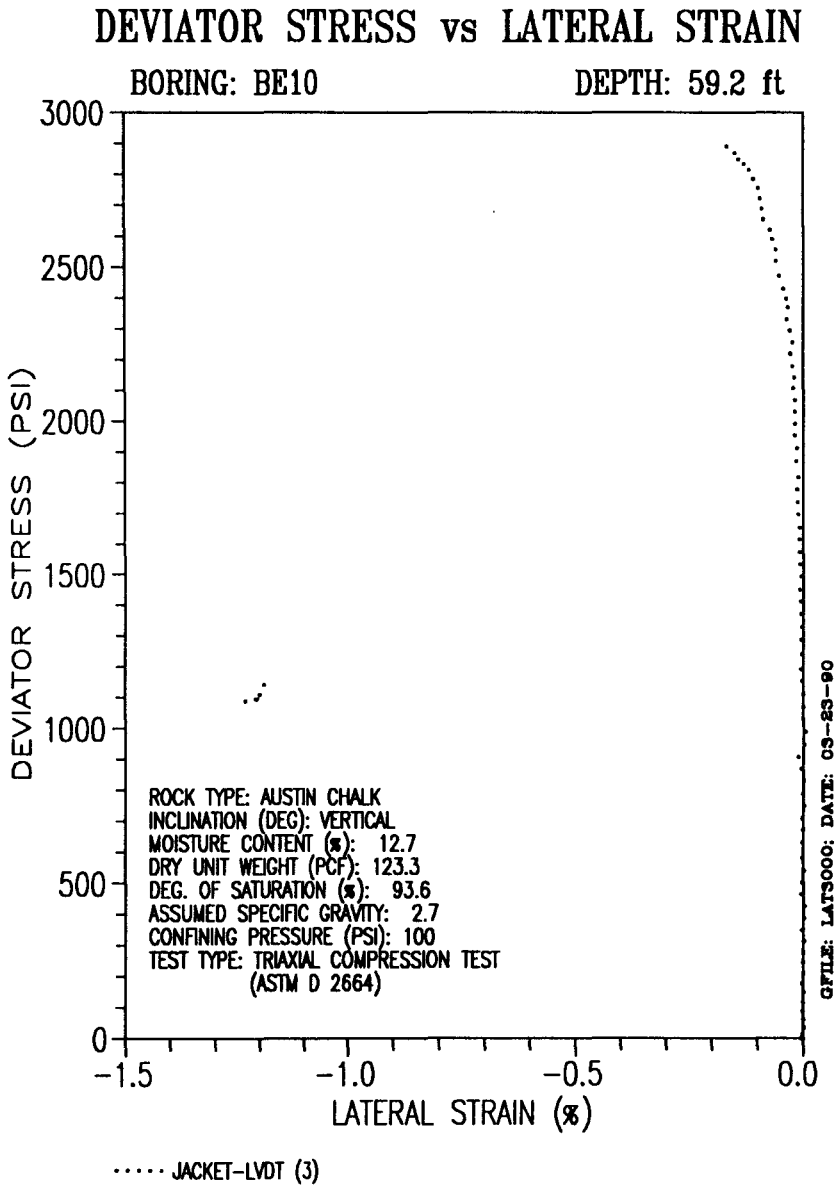
TEXAS SSC SITE

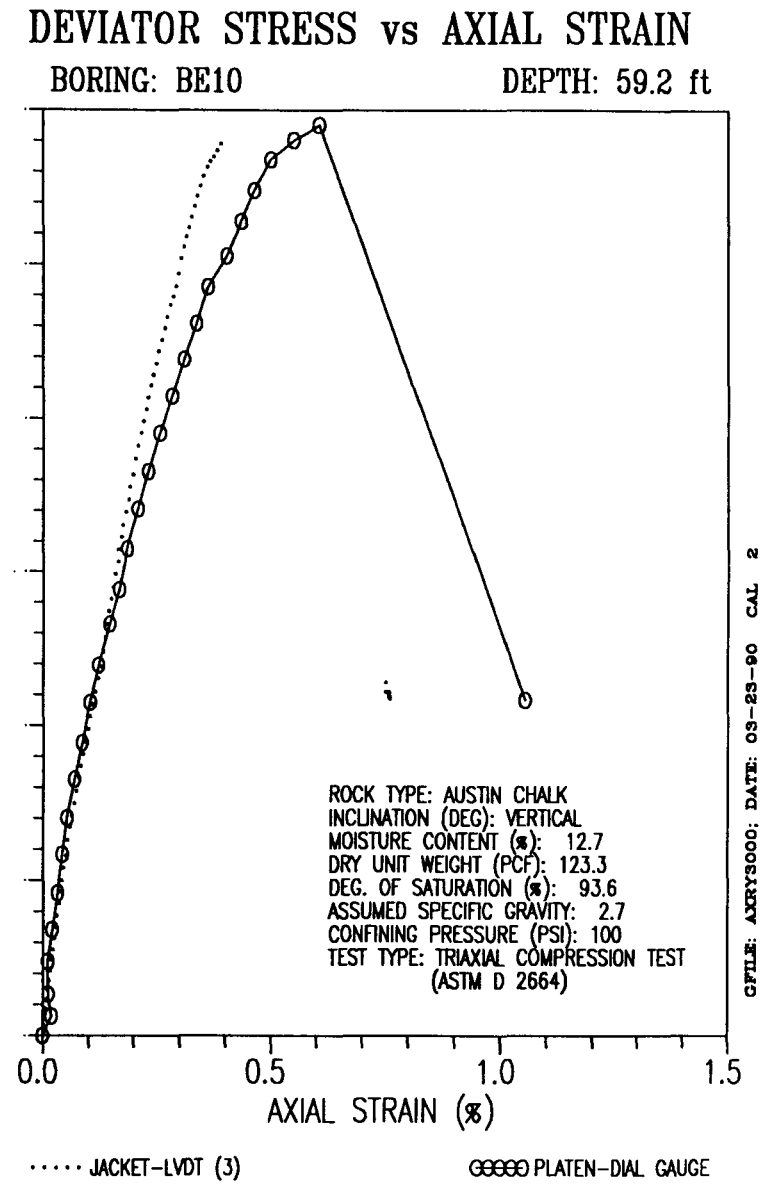
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

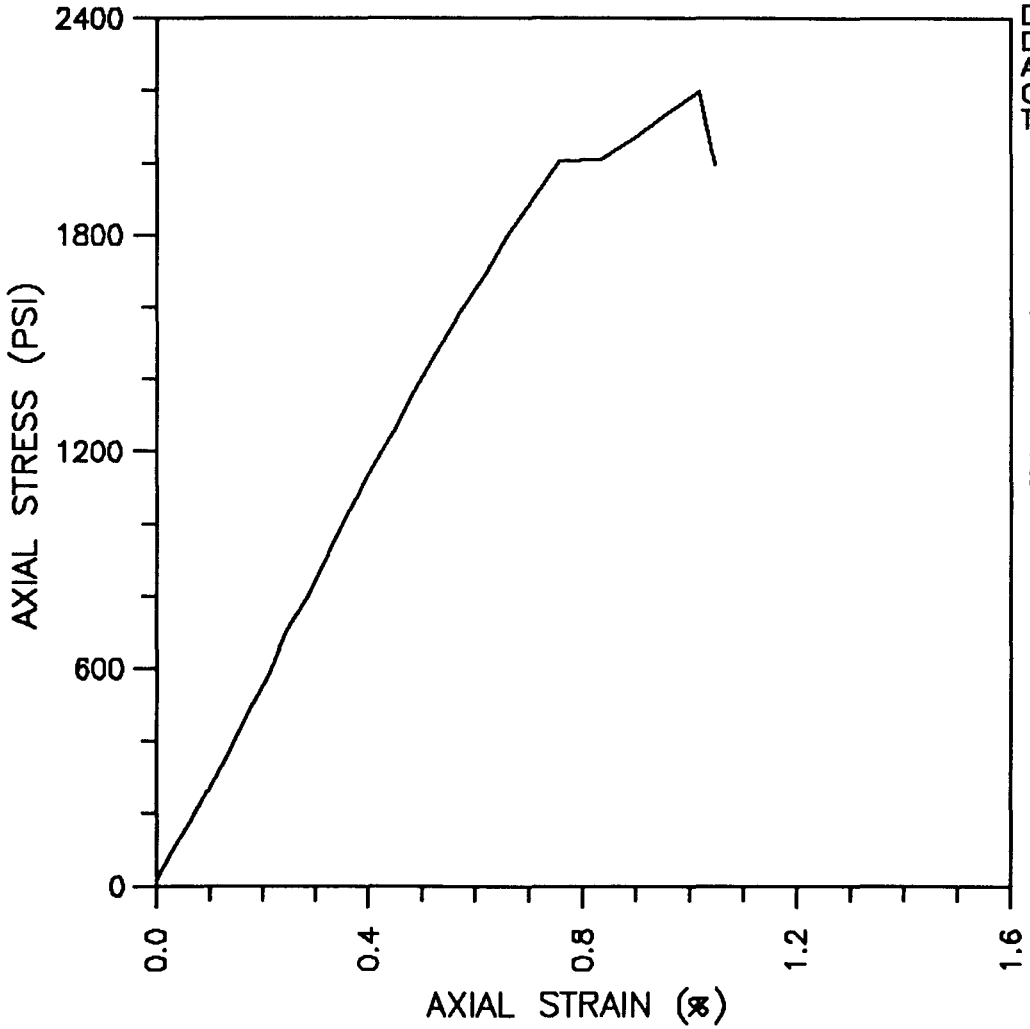
JOB NO.: 5530.17

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BE10
DEPTH: 59.2 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-1.5
-1.0
-0.5
0.0
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.7
DRY UNIT WEIGHT (PCF): 123.3
DEG. OF SATURATION (%): 93.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LATS000; DATE: 03-23-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BE10
DEPTH: 59.2 ft
0.0
0.5
1.0
1.5
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.7
DRY UNIT WEIGHT (PCF): 123.3
DEG. OF SATURATION (%): 93.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRYS000; DATE: 03-23-90 CAL 2
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BE10
DEPTH (FT): 78.5
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.2
DRY UNIT WEIGHT (PCF): 129.8
DEG. OF SATURATION (%): 92.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: BE100785 DATE: 06-31-90 CAL: MCLJ

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.778 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

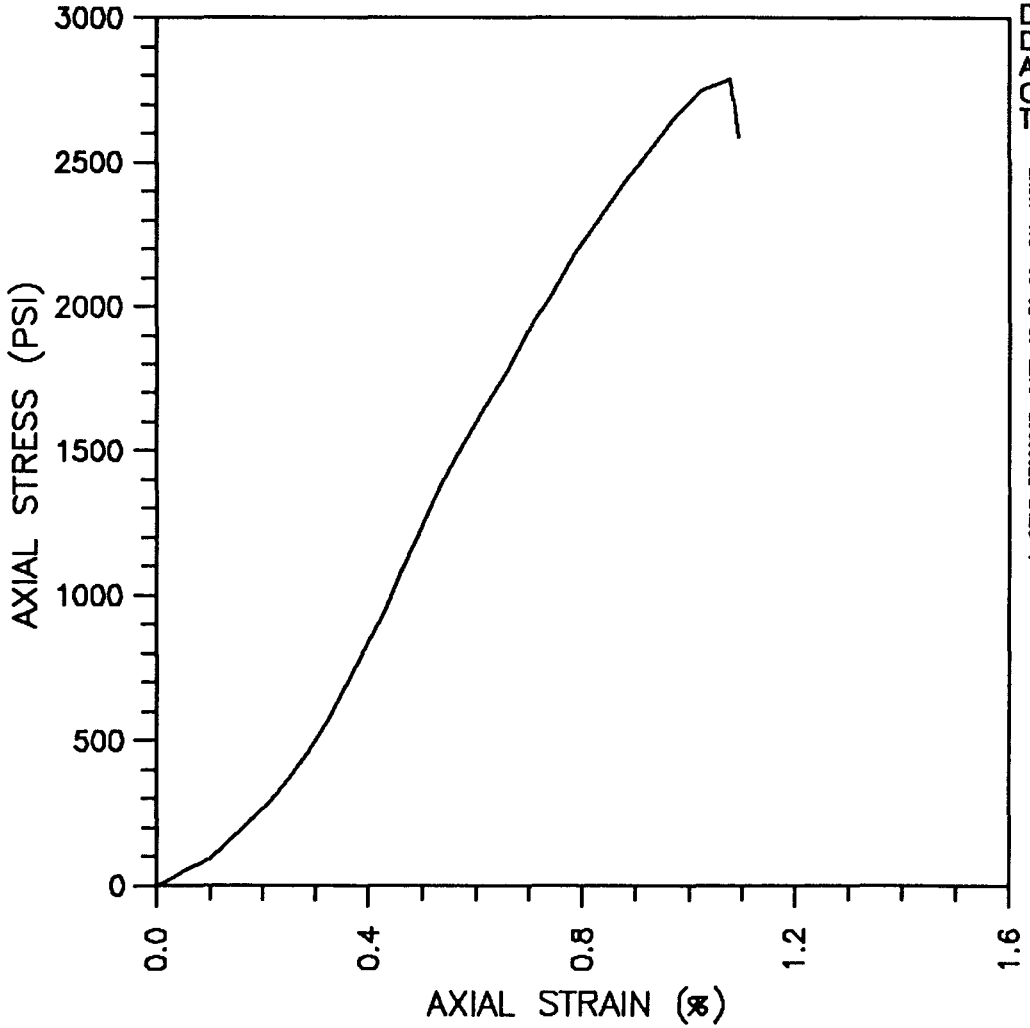
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.17

FIGURE

BORING NO.: BE10
DEPTH (FT): 96.5
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.1
DRY UNIT WEIGHT (PCF): 120.8
DEG. OF SATURATION (%): 83.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

DFILE: BE100965 DATE: 05-31-90 CAL: MCLS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.731 x10E5 PSI

FAILURE MODE:
CONICAL FAILURE

TEXAS SSC SITE

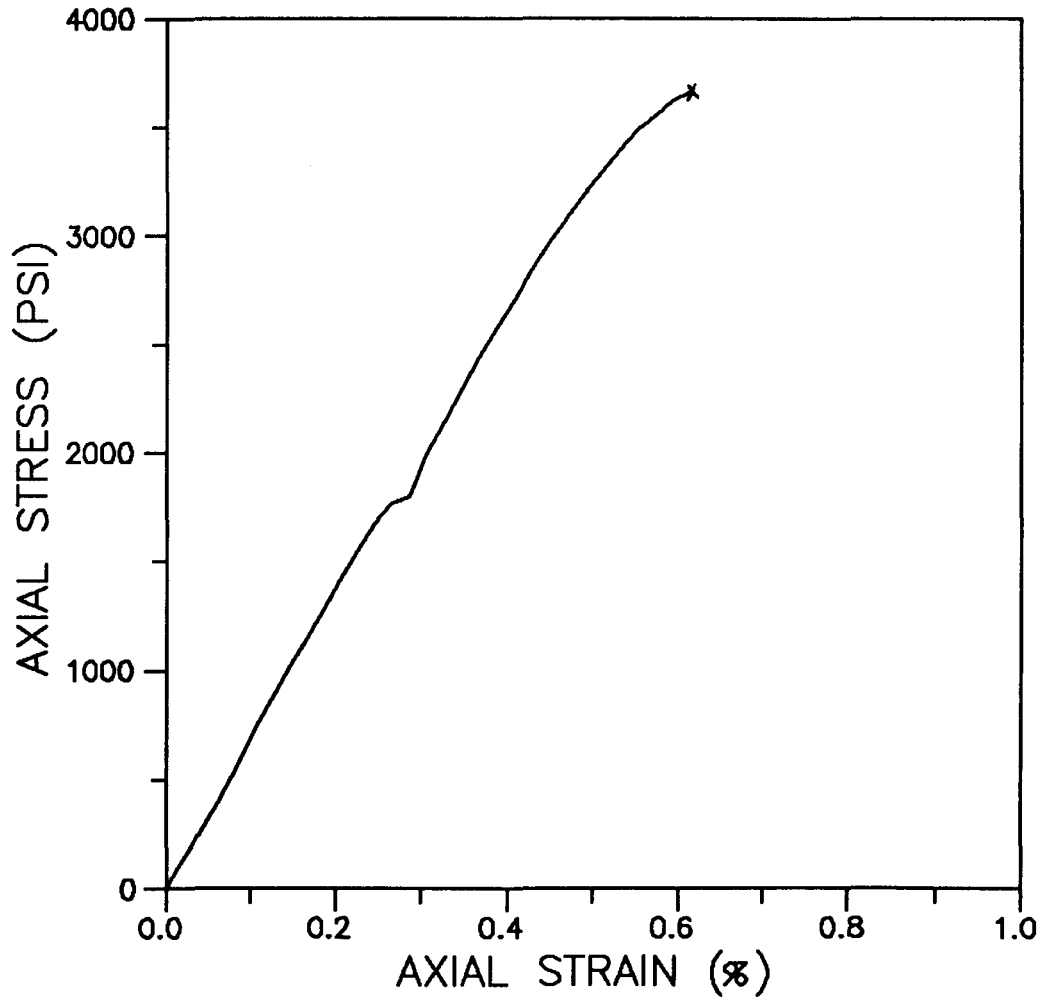
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.17

FIGURE

BORING NO: BE10
DEPTH (FT): 111.7
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.6
DRY UNIT WEIGHT (PCF): 129.4
DEG. OF SATURATION (%): 94.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

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

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

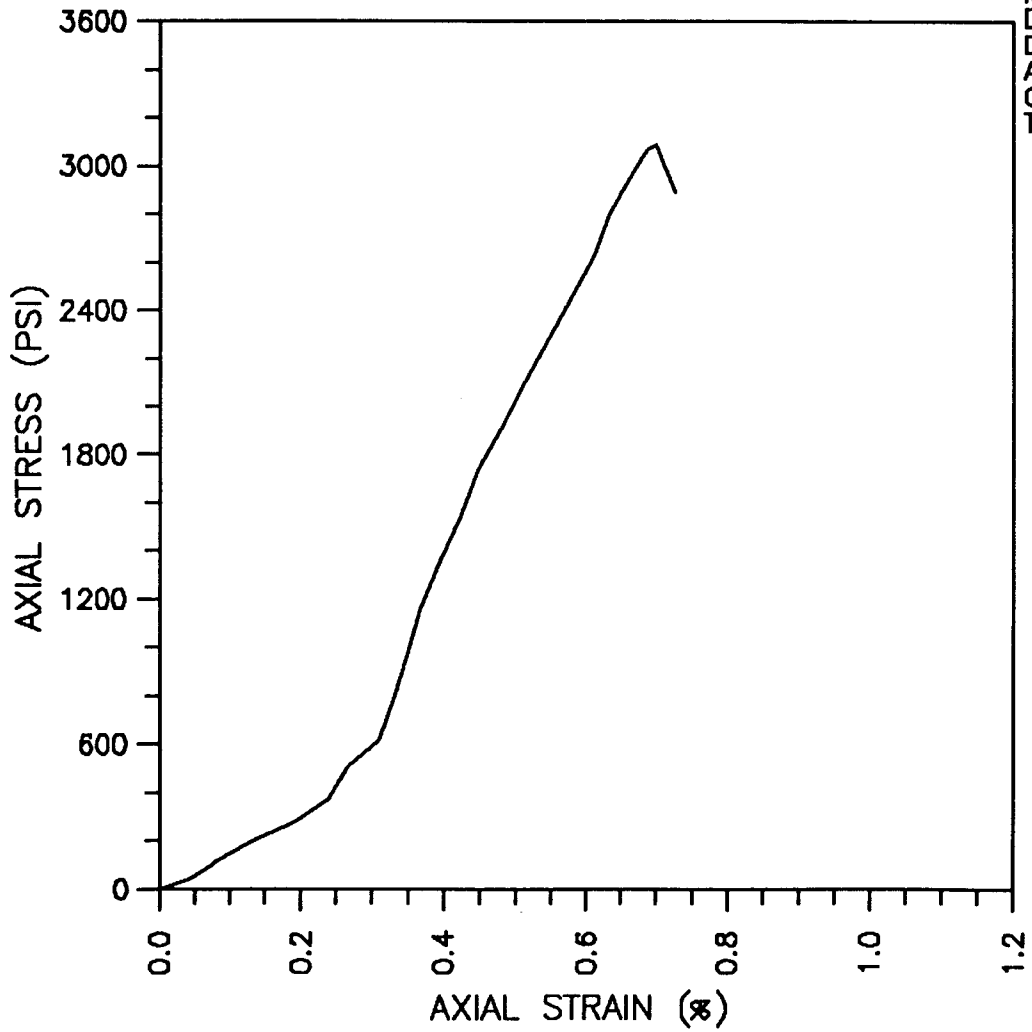
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: BE10
DEPTH (FT): 120.9
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 8.5
DRY UNIT WEIGHT (PCF): 135.0
DEG. OF SATURATION (%): 92.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

BFILE: BE1001209 DATE: 05-31-90 CAL: MCU3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
8.060 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

STRESS-STRAIN PLOT

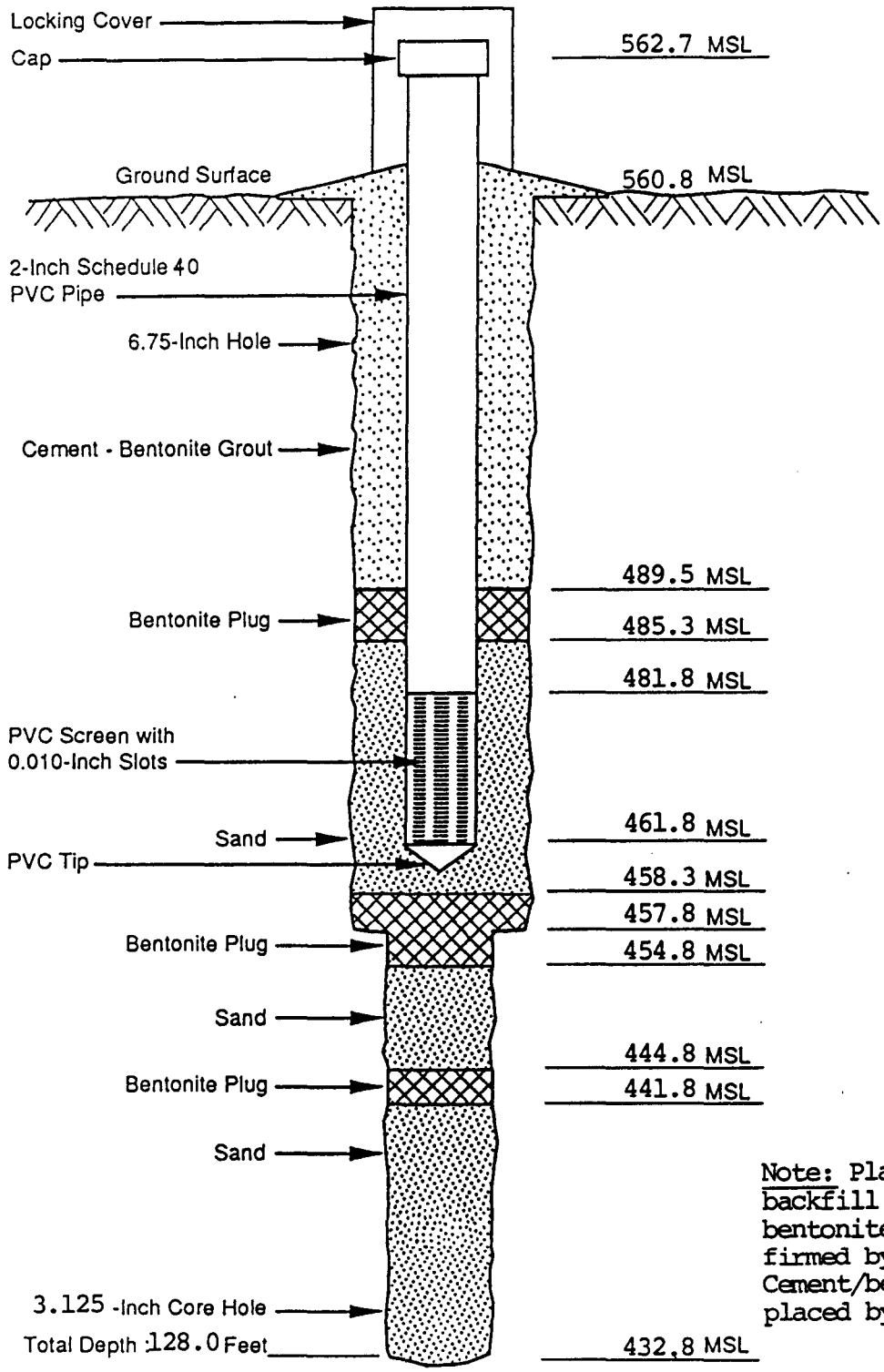
MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.17

FIGURE

APPENDIX E

WELL AS-BUILT DIAGRAM



Note: Placement depths of backfill materials (sand & bentonite pellets) were confirmed by manual measurement. Cement/bentonite slurry was placed by tremie.

NOT TO SCALE

Boring: BE 10
Location: N 225,960
E 2,181,380
Date(s) Installed: 1/12/90-1/13/90
Well Construction
Supervising Geologist: Scott Lesikar
Approved By: W.D. Flanigan Date: 5/15/90

Observation Well
No. BE 10

5/90 Figure