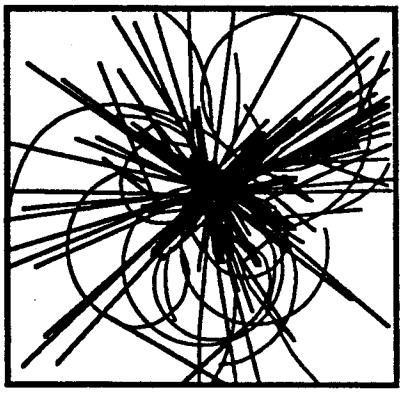
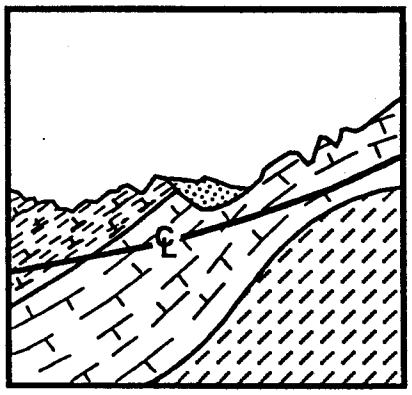
SSCL-SR-1120

SSCL-SR-1120
Project No. 87-888-0012
Report No. SSC-GR-61
July 1990

GR-61

Data Report for Structure Study Zone SE 5.2, Air Rotary Boreholes SE 5.2A, SE 5.2B, SE 5.2C, SE 5.2D, and Corehole SE 5.2E





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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. Additionally, several coreholes were drilled where the main tunnel is expected to penetrate geotechnically significant as well as possibly problematic stratigraphic and structural intervals. 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, (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

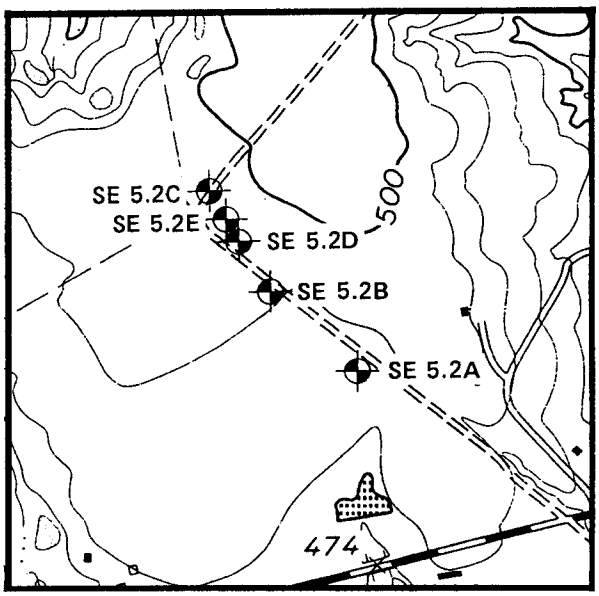
Site Designator: SE 5.2

Objective: The objectives for drilling at this location are to better define the location and nature of the geologic structure identified in surface geologic mapping and from previous borings and to determine geotechnical conditions through in-situ hydrological testing and laboratory geomechanical testing.

Structure Study Zone **SE 5.2** is located on the eastern side of the proposed tunnel alignment, approximately 2 miles west of Palmer, Texas.

SE 5.2A, SE 5.2B, SE 5.2C, and **SE 5.2D** are vertical air/water rotary borings.

SE 5.2E is an angled boring with a bearing of approximately S17°E, angled about 50° from horizontal.



SCALE 1:12,000

0 500 1000 1500 2000 Feet

CONTOUR INTERVAL 10 FEET

Boring Locations:

Boring	Northing (feet)	Easting (feet)	Surface Elevation (feet)
SE 5.2A	277,222	2,246,258	478
SE 5.2B	277,600	2,245,858	490.3
SE 5.2C	278,125	2,245,540	495
SE 5.2D	277,858	2,245,628	493
SE 5.2E	277,945	2,245,580	495

Scope and Schedule:

- Borings

Boring	Drilling	Wire-Line Logging	Down-Hole Photography	Hydrologic Testing	Laboratory Testing	Plugging
SE 5.2A	March 19, 1990	March 19, 1990	Not done	Not done	Not done	March 19, 1990
SE 5.2B	March 19, 1990	March 19, 1990	Not done	Not done	Not done	March 20, 1990
SE 5.2C	March 23 to 24, 1990	March 26, 1990	Not done	Not done	Not done	April 4, 1990
SE 5.2D	March 24, 1990	March 24, 1990	Not done	Not done	Not done	April 4, 1990
SE 5.2E	March 26 to 31, 1990	March 31, 1990	April 3, 1990	April 3, 1990	April 4, 1990	April 4, 1990

- Geologic Mapping - March 2 to March 12, 1990

Conditions Encountered: (see Lithologic Logs, Appendix A)

Boring No.	Total Depth (feet)	Soil (feet)	Weathered Taylor Marl (feet)	Taylor Marl (feet)	Austin Chalk
SE 5.2A	125.0	0.0 to 58.0	Undifferentiated	58.0 to 125.0	Not encountered
SE 5.2B	125.0	0.0 to 56.0	Undifferentiated	56.0 to 125.0	Not encountered
SE 5.2C	166.0	0.0 to 6.8	6.8 to 47.0	47.0 to 145.6	145.6 to 166.0
SE 5.2D	161.0	0.0 to 6.2	6.2 to 51.7	51.7 to 142.4	142.4 to 161.0
SE 5.2E	315.0 (inclined)	0.0 to 12.5	12.5 to 71.4	71.4 to 203.5	203.5 to 315.0
	251.8 (vertical)	0.0 to 9.6	9.6 to 55.6	55.6 to 159.8	159.8 to 251.8

Note: SE 5.2A through SE 5.2D were air/water rotary borings. SE 5.2E was rotary drilled for the top 50 feet and then cored for the remaining depth.

Geophysical Logging: (see Wire-line Logs, Appendix B)

Boring No.	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)	Other
SE 5.2A	X	X	X	X	X	X	X	Note 1	
SE 5.2B	X	X	X	X	X	X	X	Note 1	
SE 5.2C	X	X	X	X	X	X	X	X	
SE 5.2D	X	Note 2	X	X	X	X	X	X	
SE 5.2E	X	Note 3	X	X	X	X	X	X	Deviation

Note 1: Tool malfunction (electrical short circuit due to rain).
Note 2: Short (16") normal resistivity only.
Note 3: Tool malfunction.

Geologic Mapping Results Summary: (see also Appendix C)

Geologic mapping identified small exposures of severely weathered bedrock approximately 2,000 feet northeast and 1,800 feet southeast of boring SE 5.2B. Bedrock exposures are severely weathered but only moderately fractured where exposed. No evidence of faulting can be found because Quaternary terrace deposits and cultivated cropland/pastureland cover 90 percent of the area (see Appendix C).

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

Boring	Vertical Test Depth (ft)	Packer Pressure (psi)	Gauge Pressure (psi)	Formation/Lithology	Hydraulic Conductivity (cm/sec)
SE 5.2E	160.3-178.4	225	30	Austin Chalk (fractured)	4.2×10^{-7}
SE 5.2E	218.7-236.2	200	40	Austin Chalk (fractured)	1.5×10^{-6}

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

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)
		SE 5.2E				
204	Austin Chalk	10-11	128-129	2573	3.74	
219-221	Austin Chalk	9-13	125-132	3190-3632 (300)	4.17 (200)-9.26 (300)	361
223	Austin Chalk	9	134-135	2721	4.71	
229-230	Austin Chalk	8	134-138	3346	6.49	397
233	Austin Chalk	9	135			

* UU triaxial test indicated by confining pressure in parentheses.

Hole Status: (see also plugging reports, Appendix F). All holes were plugged with cement grout and abandoned.

APPENDIX A

LITHOLOGIC LOGS

LITHOLOGIC LOG

BORING SE 5.2A

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 5.2A PG 1 OF 4

LOCATION: N 277,222 ft.
E 2,246,258 ft.

GROUND EL: 478.0 ft.

DATE: 3-19-90 TYPE: Air/Water Rotary CASED TO: 10.0' CONTRACTOR: SwL 89-192

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, soft, silty, dark brown, roots
2.0										CLAY, soft, silty, dark brown, trace organics.
4.0										CLAY, soft, mottled tan and brown
5										
10										
15										
20										
25										
30										
35										
40										

SAMPLE LEGEND

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

WATER INFORMATION

Began drilling with Air/Water injection method at surface, therefore unable to determine parameters of groundwater.

DRILLING GEOLOGIST Dale Brown ASSISTANT _____ CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 5.2APG 2 OF 4

LOCATION: N 277,222 ft. E 2,246,258 ft.

GROUND EL: 478.0 ft.

DATE: 3-19-90 TYPE: Air/Water Rotary CASED TO: 10.0' CONTRACTOR: SwL 89-192

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, soft, silty, mottled tan and brown.
45									
50									
55									
									58.0
60									CALCAREOUS SHALE (Taylor Marl), soft, fresh, dark gray, with occasional fossil fragments.
65									
70									
75									
80									

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 4

DRILLING GEOLOGIST Dale Brown ASSISTANT _____ CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 5.2APG 3 OF 4

LOCATION: N 277,222 ft. E 2,246,258 ft.

GROUND EL: 478.0 ft.

DATE: 3-19-90 TYPE: Air/Water Rotary CASED TO: 10.0' CONTRACTOR: SwL 89-192

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
									CALCAREOUS SHALE (Taylor Marl), soft, fresh, dark gray with occasional fossil fragments.
85									
90									
95									
100									
105									
110									
115									
120									

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 4

DRILLING GEOLOGIST Dale Brown ASSISTANT _____ CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 12

BORING NO: SE 5.2APG 4 OF 4
LOCATION: N 277,222 ft. E 2,246,258 ft.
GROUND EL: 478.0 ft.

DATE: 3-19-90 TYPE: Air/Water Rotary CASED TO: 10.0' 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 4

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
										CALCAREOUS SHALE (Taylor Marl) soft, fresh, dark gray with occasional fossil fragments.
125										Bottom of Exploration at 125.0'
130										
135										
140										
145										
150										
155										
160										

DRILLING GEOLOGIST Dale Brown ASSISTANT _____ CHECKED BY Shawn Wood

LITHOLOGIC LOG

BORING SE 5.2B

LOG OF BORING

BORING NO: SE 5.2B PG 1 OF 4

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: N 277,600 ft. E 2,245,858 ft.

GROUND EL: 490.3 ft.

DATE: 3-19-90 TYPE: Air/Water Rotary CASED TO: 10.0' CONTRACTOR: SwL 89-192

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, soft, silty, dark gray to brown with some organics.
2.0									CLAY, soft, silty, dark gray.
4.0									CLAY, soft, silty, mottled tan, brown and gray.
5									
10									
15									
20									
25									
30									
35									
35.0									CLAY, soft, silty, light brown.
40									

SAMPLE LEGEND

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

WATER INFORMATION

Begin drilling with Air/Rotary injection method at 4.0' Therefore unable to determine groundwater parameters.

DRILLING GEOLOGIST Dale Brown ASSISTANT _____ CHECKED BY Shawn Wood

LOG OF BORING

BORING NO: SE 5.2B PG 2 OF 4

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: N 277,600 ft.
E 2,245,858 ft.

GROUND EL: 490.3 ft.

DATE: 3-19-90 TYPE: Air/Water Rotary CASED TO: 10.0' CONTRACTOR: SwL 89-192

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, soft, silty, tan to light brown.
45										
50										
55										56.0
										CALCAREOUS SHALE (Taylor Marl) soft, fresh, dark gray with occasional fossil fragments.
60										
65										
70										
75										
80										

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

WATER INFORMATION
See page 1 of 4

DRILLING GEOLOGIST Dale Brown ASSISTANT _____ CHECKED BY Shawn Wood

LOG OF BORING

BORING NO: SE 5.2B PG 3 OF 4

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: N 277,600 ft.
E 2,245,858 ft.

GROUND EL: 490.3 ft.

DATE: 3-19-90 TYPE: Air/Water Rotary CASED TO: 10.0' CONTRACTOR: SwL 89-192

SAMPLE LEGEND	WATER INFORMATION
S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	See p. 1 of 4

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
										CALCAREOUS SHALE (Taylor Marl), soft, fresh, dark gray with occasional fossil fragments.
85										
90										
95										
100										
105										
110										
115										
120										

DRILLING GEOLOGIST Dale Brown ASSISTANT _____ CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 12

BORING NO: SE 5.2B PG 4 OF 4
LOCATION: N 277,600 ft. E 2,245,858 ft.
GROUND EL: 490.3 ft.

DATE: 3-19-90 TYPE: Air/Water Rotary CASED TO: 10.0' CONTRACTOR: SwL 89-192

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
										CALCAREOUS SHALE (Taylor Marl), soft, fresh, dark gray with occasional fossil fragments.
125										Bottom of Exploration at 125.0'
130										
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
See p. 1 of 4

DRILLING GEOLOGIST Dale Brown ASSISTANT _____ CHECKED BY Shawn Wood

LITHOLOGIC LOG

BORING SE 5.2C

LOG OF BORING

BORING NO: SE 5.2C PG 1 OF 5

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 278,125 Feet
~E 2,245,540 Feet

GROUND EL: ~495 Feet

DATE: 3/23/90 TYPE: Rotary Wash CASED TO: 4.0' 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.	DESCRIPTION OF STRATUM
									CLAY (Residual Soil), silty, dark gray, very soft, very fine grained, plastic (CH)
5									6.8
									SHALE (Taylor Marl), highly weathered, soft, very fine grained, tan and brown, iron-stained, with caliche nodules
10									11.3 tan, brown, and gray
15									
20									
25									
									28.3 drilled harder, increasing gray shale content
30									
35									
40									
									43.2 gypsum crystal, medium sized

SAMPLE LEGEND

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

WATER INFORMATION

Rotary wash boring. Water level not determinable

DRILLING GEOLOGIST Jim Sansom ASSISTANT _____ CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 5.2C PG 2 OF 5

LOCATION: ~N 278,125 Feet
~E 2,245,540 Feet

GROUND EL: ~495 Feet

DATE: 3/23/90 TYPE: Rotary Wash CASED TO: 4.0' 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.	DESCRIPTION OF STRATUM
									SHALE (Taylor Marl), highly weathered, soft, very fine grained, tan and brown, iron-stained, increasing gray shale content
45									
									47.0
									SHALE (Taylor Marl), fresh, medium hard, very fine grained, dark gray
50									
55									55.4 hard layer 0.5' thick
60							Stopped Drilling 3-23-90		
							Started Drilling 3-24-90		
65									
70									
75									
80									

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

WATER INFORMATION
Rotary wash boring. Water level not determinable

DRILLING GEOLOGIST Jim Sansom ASSISTANT _____ CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SE 5.2C PG 3 OF 5

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 278,125 Feet
~E 2,245,540 Feet

GROUND EL: ~495 Feet

DATE: 3/24/90 TYPE: Rotary Wash CASED TO: 4.0' 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.	DESCRIPTION OF STRATUM
										SHALE(Taylor Marl),fresh,medium hard,very fine grained,dark gray.
85										
90										
95										
100										
105										
110										Hard layers ~0.1' thick @ 113.5',114.2',114.7',114.9',& 115.6'
115										
120										Hard layers~0.1' thick @ 123.0' & 123.9'

SAMPLE LEGEND

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

WATER INFORMATION

Rotary wash boring. Water level not determinable

DRILLING GEOLOGIST Jim Sansom ASSISTANT _____ CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SE 5.2C PG 4 OF 5

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

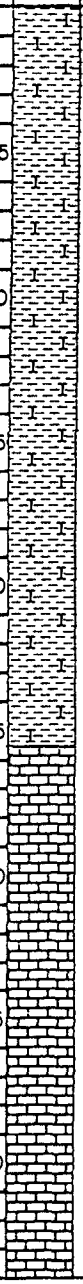
LOCATION: ~N 278,125 Feet
~E 2,245,540 Feet

GROUND EL: ~495 Feet

DATE: 3/24/90 TYPE: Rotary Wash CASED TO: 4.0' 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.	SAMPLE LEGEND	WATER INFORMATION
									S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	Rotary wash boring. Water level not determinable

DESCRIPTION OF STRATUM



SHALE (Taylor Marl), fresh, medium hard, very fine grained, dark gray

Hard layer from 125.2' to 125.4', tan and white cuttings w/ medium grained calcite particles

145.6

LIMESTONE (Austin Chalk), fresh, medium hard, light gray, with gray argillaceous interbeds.

DRILLING GEOLOGIST Jim Sansom ASSISTANT _____ CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SE 5.2C PG 5 OF 5

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 278,125 Feet
~E 2,245,540 Feet

GROUND EL: ~495 Feet

DATE: 2/24/90 TYPE: Rotary Wash CASED TO: 4.0' 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.	SAMPLE LEGEND	WATER INFORMATION
										S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	Rotary wash boring. Water level not determinable
										DESCRIPTION OF STRATUM	
165										LIMESTONE (Austin Chalk), fresh, medium hard, light gray, with gray argillaceous interbeds.	
170										Total Depth: 166.0' 3-24-90 (1) Wireline Logged: 3-26-90 (2) Boring Plugged: 4-4-90	
175											
180											
185											
190											
195											
200											

DRILLING GEOLOGIST Jim Sansom ASSISTANT _____ CHECKED BY W.D. Flanigan

LITHOLOGIC LOG

BORING SE 5.2D

LOG OF BORING

BORING NO: SE 5.2D PG 1 OF 4

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 277,858 Feet
~E 2,245,628 Feet

GROUND EL: ~493 Feet

DATE: 3/24/90 TYPE: Rotary Wash CASED TO: 4.0' 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.	DESCRIPTION OF STRATUM
									CLAY (Residual Soil), silty, dark gray, very soft, very fine grained, plastic. (CH)
5									6.2
									SHALE (Taylor Marl), highly weathered, soft, very fine grained, tan and brown, yellow iron-stains, with caliche nodules.
10									
									14.8 tan, brown, and gray
15									
20									
25									
30									31.0 increasing gray shale content with depth
35									
40									

SAMPLE LEGEND

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

WATER INFORMATION

Rotary wash boring. Water level not determinable
Approx. 30% drilling fluid loss from 121.0' to 141.0'

DRILLING GEOLOGIST Jim Sansom ASSISTANT _____ CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SE 5.2D PG 2 OF 4

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 277,858 Feet
~E 2,245,628 Feet

GROUND EL: ~493 Feet

DATE: 3/24/90 TYPE: Rotary Wash CASED TO: 4.0' 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.	DESCRIPTION OF STRATUM
										SHALE(Taylor Marl),highly weathered,soft very fine grained,tan and brown,yellow iron-stains,increasing gray shale content with depth.
45										
50										
										51.7
										SHALE(Taylor Marl),fresh,medium hard,very fine grained, dark gray
55										
60										
65										
70										
75										
80										

SAMPLE LEGEND

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

WATER INFORMATION

Rotary wash boring. Water level not determinable
Approx. 30% drilling fluid loss from 121.0' to 141.0'

DRILLING GEOLOGIST Jim Sansom ASSISTANT _____ CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SE 5.2D PG 3 OF 4

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 277,858 Feet
~E 2,245,628 Feet

GROUND EL: ~493 Feet

DATE: 3/24/90 TYPE: Rotary Wash CASED TO: 4.0' 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.	DESCRIPTION OF STRATUM
										SHALE(Taylor Marl),fresh,medium hard,very fine grained, dark gray.
85										
90										
95										
100										
105										
110										
115										
120										

SAMPLE LEGEND

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

WATER INFORMATION

Rotary wash boring. Water level not determinable
Approx. 30% drilling fluid loss from 121.0' to 141.0'

DRILLING GEOLOGIST Jim Sansom ASSISTANT _____ CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SE 5.2D PG 4 OF 4

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

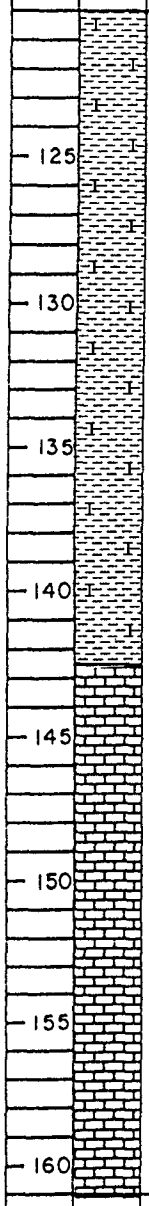
LOCATION: ~N 277,858 Feet
~E 2,245,628 Feet

GROUND EL: ~493 Feet

DATE: 3/24/90 TYPE: Rotary Wash CASED TO: 4.0' 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.	SAMPLE LEGEND	WATER INFORMATION
									S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	Rotary wash boring. Water level not determinable Approx. 30% drilling fluid loss from 121.0' to 141.0'

DESCRIPTION OF STRATUM



SHALE (Taylor Marl), fresh, med. hd., very fine grained, dk. gray

142.4

LIMESTONE (Austin Chalk), fresh, medium hard, light gray, with gray argillaceous interbeds.

Total Depth: 161.0' 3-24-90

(1) Wireline Logged: 3-24-90

(2) Boring Plugged: 4-4-90

DRILLING GEOLOGIST Jim Sansom ASSISTANT _____ CHECKED BY W.D. Flanigan

LITHOLOGIC LOG

BORING SE 5.2E

LOG OF BORING

BORING NO: SE 5.2E PG 1 OF 8

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 277,945 Feet
~E 2,245,580 Feet

GROUND EL: ~495 Feet

DATE: 3/26/90 TYPE: NX-Angle Core(1) CASED TO: 50.0' 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.	DESCRIPTION OF STRATUM
									CLAY (Residual Soil), silty, dark gray, very soft, very fine grained, plastic (CH)
5									
10									
									12.5
									SHALE (Taylor Marl), highly weathered, soft, very fine grained, tan and brown, iron stained, with caliche nodules
15									
20									
25									
30									
35									
40									
									43.0 Tan, brown and gray clay

SAMPLE LEGEND

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

WATER INFORMATION

Wash Boring 0.0' to 50.0'
Wet rotary wash/core hole
Water level not determinable

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary S. Kincaid CHECKED BY W.D. Flanigan

Rev. 4/24/90

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 5.2E PG 2 OF 8

LOCATION: ~N 277,945 Feet
~E 2,245,580 Feet

GROUND EL: ~495 Feet

DATE: 3/26/90 TYPE: NX-Angle Core(1) CASED TO: 50.0' CONTRACTOR: MJA

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

WATER INFORMATION
Wash Boring 0.0' to 50.0'
Wet rotary wash/core hole
Water level not determinable

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
45, 50							Stopped Drilling 3-26-90		SHALE(Taylor Marl),highly weathered,soft,very fine grained,tan,brown and gray,iron stained 50.0 SHALE(Taylor Marl),faintly weathered,soft,very thinly bedded,very fine grained,alternating tan and gray beds from 0.01'to 0.03' thick
50, 55		C1	50.0	55.0	100	100	Started Drilling 3-27-90		50.7 frac.,sli.rough,gypsum filled,wide,iron stained, sli.wea.50.3'to 51.05',(S70°W,16°SE) 52.65 frac.,sli.rough,gypsum filled,wide,iron stained, sli.wea.52.13'to 52.8',(S70°W,14°SE) 53.3 frac.,sli.rough,gypsum filled,wide,iron stained faintly wea.,(S70°W,14°SE)
55, 60, 65		C2	55.0	65.0	71	66			58.95 frac.,sli.rough,gypsum filled,wide,iron stained, sli.wea.58.9'to 59.1'(N85°W,86°SW) 59.65 frac.,sli.rough,closed,iron stained,faintly wea., (S85°W,18°SE) 60.45 frac.,sli.rough,gypsum filled,wide,iron stained, sli.wea.60.35'to 60.7'(S85°W,72°SE) 61.75 frac.,sli.rough,gypsum filled,iron stained,sli. wea.61.6'to 61.85',(S75°W,11°SE) 62.5 frac.,sli.rough,closed,iron stained,faintly wea., (S55°W,3°SE) 67.35 frac.,sli.rough,gypsum filled,wide,iron stained, faintly wea.67.15'to67.55',(S70°W,15°SE)
65, 70, 75		C3	65.0	75.0	92	90			68.2 frac.,sli.rough,closed,iron stained,faintly wea., 67.7'to68.4',(S70°W,15°SE) 70.7 frac.,sli.rough,gypsum filled,wide,iron stained faintly wea.70.45'to 71.0',(S70°W,40°SE) 71.28 frac.,sli.rough,gypsum filled,wide,iron stained faintly wea.on face,(N85°W,80°SW) 71.35s SHALE(Taylor Marl),fresh,soft to med.hard,very thinly bedded,very fine grained,dark gray 71.4 frac.,sli.rough,closed,faintly wea.on face, (S85°W,21°SE)
75, 80		C4	75.0		100	100			72.0 frac.,sli.rough,closed,faintly wea.on face, (S85°W,20°SE) 74.2 frac.,sli.rough,gypsum filled,wide,faintly wea., 74.05'to 74.75',(S87°W,16°SE) 75.5 frac.,smooth,clean,closed,(S85°W,33°SE) 76.1 frac.,smooth,clean,closed,faintly wea.75.75'to 76.2'(S85°W,83°SE) 76.6 frac.,smooth,clean,closed,iron stained,faintly wea.,(S75°W,83°SE)

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary S. Kincaid CHECKED BY W.D. Flanigan

Rev. 4/24/90

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 5.2E PG 3 OF 8

LOCATION: ~N 277,945 Feet
~E 2,245,580 Feet

GROUND EL: ~495 Feet

DATE: 3/27/90 TYPE: NX-Angle Core(1) CASED TO: 50.0' 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 wash/core hole
Water level not determinable

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
				85.0					SHALE(Taylor Marl),fresh,med.to mod.hard,very thinly bedded,very fine grained,dark gray,fissile,occ. fossiliferous
85		C5	85.0	95.0	100	100			
90									
95		C6	95.0	105.0	100	100			97.3 frac.,sli.rough,gypsum filled,wide,iron stained, faintly wea.,(N73°W,76°NE) 99.3 frac.,sli.rough,gypsum filled,wide,iron stained, faintly wea.,(N55°W,65°SW) 101.7 frac.,smooth,closed,iron stained,faintly wea., (S73°W,11°SE)
100									
105		C7	105.0	115.0	100	100			
110									
115		C8	115.0		100	100			
120									

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary S. Kincaid CHECKED BY W.D. Flanigan

Rev. 4/24/90

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 5.2E PG 4 OF 8

LOCATION: ~N 277,945 Feet
~E 2,245,580 Feet

GROUND EL: ~495 Feet

DATE: 3/27/90 TYPE: NX-Angle Core(1) CASED TO: 50.0' 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 wash/core hole
Water level not determinable

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
				125.0			Stopped Drilling 3-27-90			SHALE (Taylor Marl), fresh, med. to mod. hard, very thinly bedded, very fine grained, dark gray, fissile, occ. fossiliferous
125										
		C9	125.0	130.0	100	100	Started Drilling 3-28-90			
130										
		C10	130.0	135.0	98	98				
135										
		C11	135.0	145.0	96	96				
140										
145										
		C12	145.0	150.0	100	100				(Note: @150', Run C12, recovered 4.2' of 4.4' left in hole on Run C11)
150										
		C13	150.0	155.0	100	99				
155										
		C14	155.0		100	100				
160										

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary S. Kincaid CHECKED BY W.D. Flanigan

Rev. 4/24/90

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 5.2E PG 5 OF 8

LOCATION: ~N 277,945 Feet
~E 2,245,580 Feet

GROUND EL: ~495 Feet

DATE: 3/28/90 TYPE: NX-Angle Core (1) CASED TO: 50.0' 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 wash/core hole
Water level not determinable

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
				165.0					SHALE (Taylor Marl), fresh, med. to mod. hard, very thinly bedded, very fine grained, dark gray, fissile, occ. fossiliferous
165			165.0						
		C15			85	85			
170									
				175.0					
175			175.0						
		C16			100	100			
180									
				185.0			Stopped Drilling 3-28-90		
185			185.0				Started Drilling 3-29-90		
		C17			100	96			
190									
				195.0					
195			195.0						195.9s-196.02s v.thin siltstone bed, lt. gray
		C18			100	95			
200									
									202.5g-203.0g several v.thin siltstone beds from 0.01' to 0.1' thick, up to 0.45' apart
									203.5s

SEE DESCRIPTION P. 6

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary S. Kincaid CHECKED BY W.D. Flanigan

Rev. 4/24/90

LOG OF BORING

BORING NO: SE 5.2E PG 6 OF 8

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 277,945 Feet
~E 2,245,580 Feet

GROUND EL: ~495 Feet

DATE: 3/29/90 TYPE: NX-Angle Core(1) CASED TO: 50.0' 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 wash/core hole
Water level not determinable

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.
205				205.0				
		C19	205.0	215.0	100	97		
210								
215				215.0				
		C20	215.0	225.0	100	100	Stopped Drilling 3-29-90	
220								
225								
		C21	225.0	235.0	100	100	Started Drilling 3-30-90	
230								
235								
		C22	235.0		100	99		
240								

DESCRIPTION OF STRATUM

SHALE(Taylor Marl),fresh,med.to mod.hard,very thinly bedded,very fine grained,dark gray,fissile,occ. fossiliferous
203.5s

LIMESTONE(Austin Chalk),fresh,med.to mod.hard,lt.gray, sli.fossiliferous,w/ 0.5 to 3.7ft.thick mod.argill. interbeds spaced 1.55 to 15.95ft.apart and occ. calcite filled fractures

203.5s-204.06g fine sand,calcareous
205.0s-205.5s thin,mod.argill.,med.hard,med.gray bed
210.45 frac.,slks.,sli.rough,calcite filled, closed,fresh,(N85°W,53°NE)
214.1g-215.4g med.thick,mod.argill.,med.hard,med.gray bed
215.55 frac.,slks.,sli.rough,calcite filled, closed,fresh,(S70°W,67°NW)
217.1 frac.,slks.,sli.rough,calcite filled, closed fresh
217.4 frac.,smooth,clean,closed,fresh, (S72°W,69°NW)
218.25 frac.,slks.,sli.rough,calcite filled ~0.01'thick,narrow,fresh(S67°W,34°SE)
218.5g-221.55s thick,mod.argill.,med.hard,med.gray bed
220.85 frac.,slks.,sli.rough,calcite filled, closed,fresh,(S62°W,53°NW)
223.1g-225.0g med.thick,mod.argill.,med.hard,med.gray bed with siltstone interbeds from 0.01' to 0.03'thick
224.1 frac.,slks.,sli.rough,calcite filled, closed,fresh,(N75°E,56°NW)
225.0g-225.8g thin,mod.argill.,med.hard,med.gray bed
228.4-230.5 v.thin,mod.argill.interbeds ranging from 0.01'to 0.06'thick,med.hard,med. gray
242.4 frac.,slks,sli.rough,calcite filled, narrow,fresh,(N80°E,43°NW)
242.6 frac.,slks.,sli.rough,calcite filled, narrow,fresh(N85°E,63°NE)

DRILLING GEOLOGIST Jim Sansom ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

Rev. 4/24/90

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 5.2E PG 7 OF 8

LOCATION: ~N 277,945 Feet
~E 2,245,580 Feet

GROUND EL: ~495 Feet

DATE: 3/30/90 TYPE: NX-Angle Core(1) CASED TO: 50.0' 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 wash/core hole
Water level not determinable

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.
		C22		245.0				
245		C23	245.0	255.0	100	99		
250								
255		C24	255.0	265.0	100	97		
260								
265		C25	265.0	275.0	100	100		
270								
275		C26	275.0		100	100		
280								

DESCRIPTION OF STRATUM

LIMESTONE(Austin Chalk),fresh,med.to mod.hard,lt.gray, sli.fossil.,w/0.45 to 3.05 ft.thick mod.argill. interbeds spaced from 0.45' to 21.8ft.apart,and occ. calcite filled fractures

242.8 frac.,smooth,clean,closed,fresh (N74°E,52°NW)

243.0 frac.,smooth,clean,closed,fresh (N85°W,60°SE)

246.45g-249.5g thick,mod.argill.,med.hard,med.gray, fossil.bed

249.95g-250.92g v.thin,mod.argill.,med.hard,med.gray bed

258.5 frac.,slks.,sli.rough,calcite filled, wide,fresh,(N57°E,65°SE)

258.8 frac.,slks.,sli.rough,calcite filled, wide,fresh,(N55°W,4°SW)

259.2 frac.,slks.,sli.rough,argill.material filled,wide,fresh,(N35°E,68°NW)

265.15-265.6 thin(0.01'to 0.04')mod.argill.,med. hard,med.gray beds,interbedded w/chalk

265.75 frac.,slks.sli.rough,calcite filled, narrow,fresh,(N80°W,67°NE)

282.4 frac.,slks.,sli.rough,calcite filled, narrow,fresh,(N80°E,50°NW)

282.4-282.6 calcite veins in chalk 0.01'to 0.7'thick

282.55 frac.,slks.,sli.rough,calcite filled, narrow,fresh,(N72°E,48°NW)

282.7 frac.,slks.,sli.rough,calcite filled, narrow,fresh,(N80°E,37°SE)

DRILLING GEOLOGIST Jim Sansom ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

Rev. 4/24/90

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 5.2E PG 8 OF 8

LOCATION: ~N 277,945 Feet
~E 2,245,580 Feet

GROUND EL: ~495 Feet

DATE: 3/30/90 TYPE: NX-Angle Core(1) CASED TO: 50.0' 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.
285				285.0				
		C27	285.0	295.0	100	100	Stopped Drilling 3-30-90	
295			295.0				Started Drilling 3-31-90	
300		C28		305.0	100	100		
305			305.0					
310		C29		315.0	100	100		
315								
320								

SAMPLE LEGEND

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

WATER INFORMATION

Wet rotary wash/core hole
Water level not determinable

DESCRIPTION OF STRATUM

LIMESTONE(Austin Chalk),fresh,med.to mod.hard,lt.gray, sli.fossil.,w/0.4 to 1.3 ft.thick mod.argill.interbeds spaced 1.4 to 13.2 ft.apart and occ.calcite filled fractures

284.35-285.0 frac.,slks.,sli.rough,calcite filled, narrow,fresh,(N75°W,56°NE)

285.0-285.4 frac.,slks.,sli.rough,calcite filled, narrow,fresh,(S76°W,56°SE)

287.4g-288.7g med.thick,mod.argill.,soft to med.hard, med.gray bed

290.1g-290.5g thin,mod.argill.,med.hard,med.gray bed

300.96g-301.8g thin,mod.argill.,soft to med.hard, fissile,med.gray,interbeds 0.03'to 0.15' thick

304.55 frac.,slks.,sli.rough,clean,closed, fresh,(N85°W,51°SE)

304.7 frac.,smooth,clean,narrow,fresh, (N10°W,55°SW)

305.53 frac.,smooth,clean,closed,fresh, (S70°W,60°NW)

305.7 frac.,slks.,smooth,clean,closed,fresh, (S50°W,67°NW)

310.55 frac.,sli.rough,calcite filled 0.01'to 0.04'thick,(S28°W,79°NW)

(6) NX Angle Boring Plugged 4-4-90

NOTE: ALL FRACTURE ORIENTATIONS(IN PARENTHESES) ARE BASED ON FIELD AZIMUTH AND ASSUME HORIZONTAL BEDDING.

Total Depth 315.0' 3-31-90

(1) Angle Hole Field Azimuth: S21°E Plunge: 50°
(2) Rotary Wash Boring from 0.0'to 50.0';NX Angle Core Boring from 50.0'to 315.0'
(3) Wireline Logged 3-31-90
(4) Hydrotested 4-4-90
(5) NX casing extended to 71.5'on 4-2-90 and again to 111.0' on 4-3-90 in preparation for downhole bore-hole photography.Photographed interval between 200' and 288' on 4-3-90

DRILLING GEOLOGIST Jim Sansom ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

Rev. 4/24/90

APPENDIX B

WIRE-LINE LOGS

WIRE-LINE LOGGING PARAMETERS

Hole No. SE 5.2A Log Measured From: Ground Level

Drilling Parameters

Depth 125.0 feet

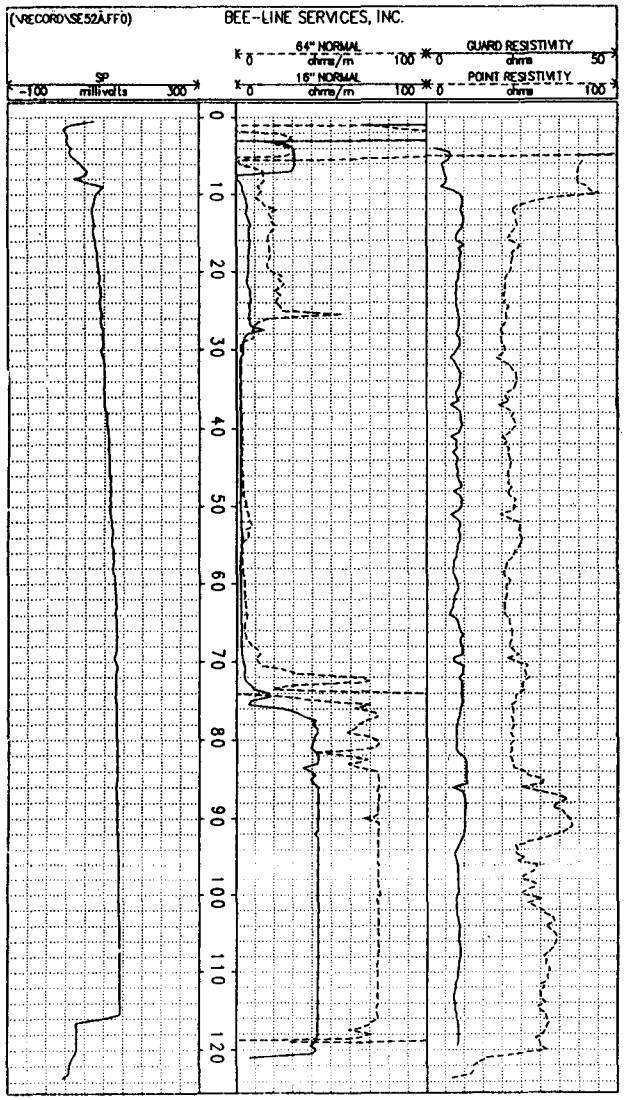
Bit Diameter 4.5 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	March 19, 1990	March 19, 1990	Tool Malfunction
Bottom Log Interval	123.5 feet	123.5 feet	
Top Log Interval	surface	surface	
Type of Fluid in Hole	clear water	clear water	
Time Since Circulation Stop	30 minutes	30 minutes	
Probe Type/S.N.	ALP-4979	XAP-4383	
Module Type/S.N.	ALM-4979	XAM-4383	
Logging Speed	40 feet/min.	20 feet/min.	
Sample Interval	0.5 foot	0.5 foot	

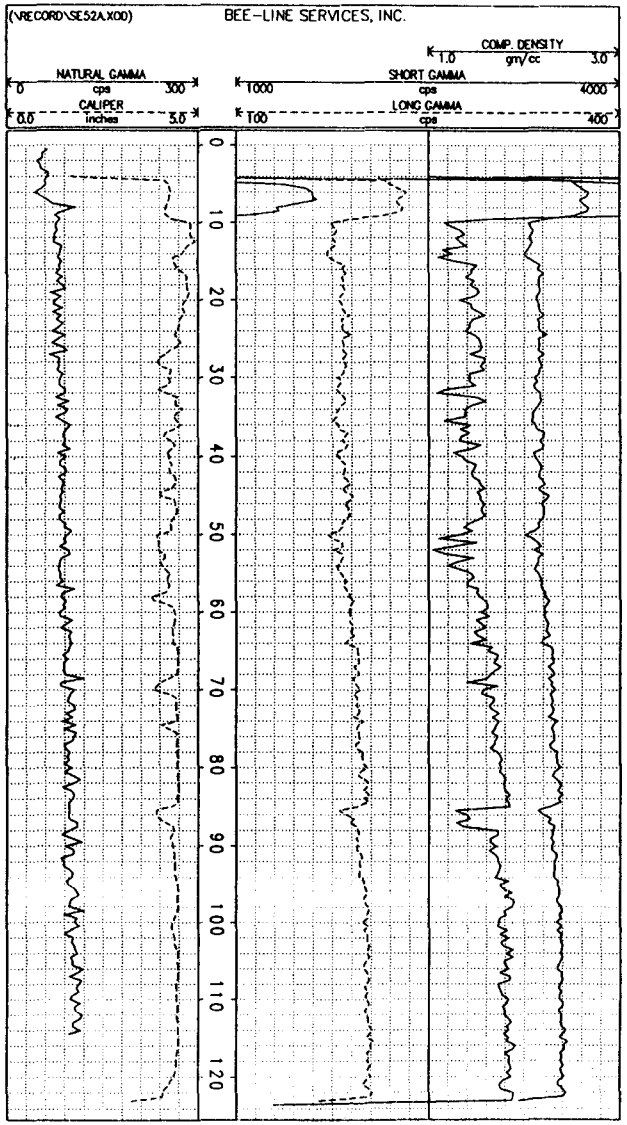
Logged by: BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

SE 5.2A Wire-line logs run March 19, 1990. Surface elevation 478.0 feet.

ELECTRICAL LOG



GAMMA LOG



WIRE-LINE LOGGING PARAMETERS

Hole No. SE 5.2B

Log Measured From: Ground Level

Drilling Parameters

Depth 125.0 feet

Bit Diameter 4.25 inches

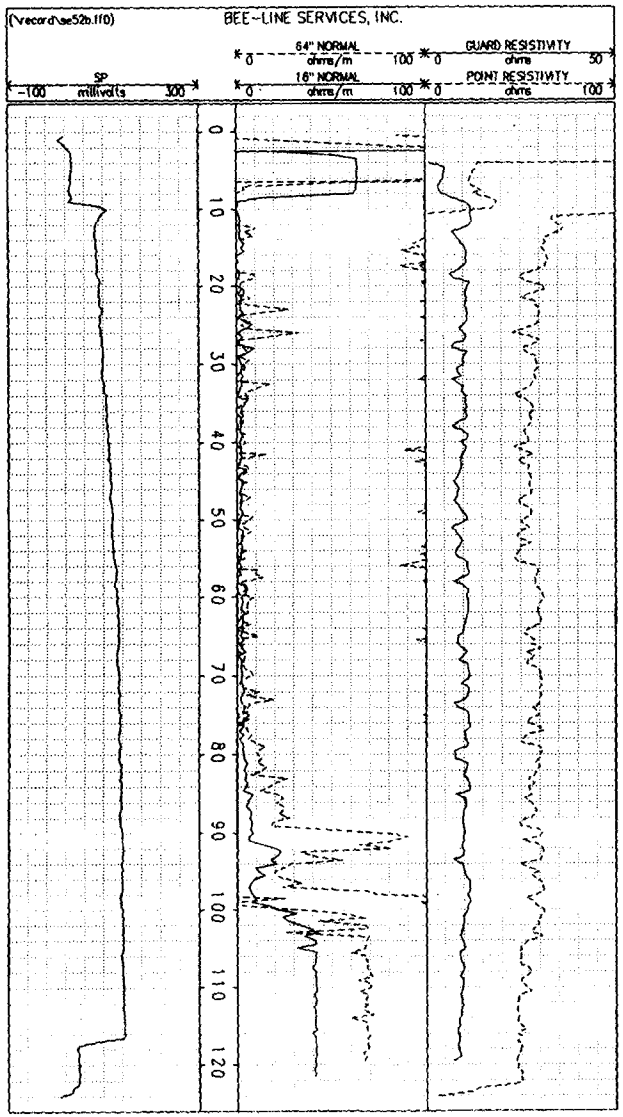
Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	March 19, 1990	March 19, 1990	Tool Malfunction
Bottom Log Interval	124.0 feet	123.5 feet	
Top Log Interval	surface	surface	
Type of Fluid in Hole	clear water	clear water	
Time Since Circulation Stop	1.5 hours	1.5 hours	
Probe Type/S.N.	ALP-4979	XAP-4383	
Module Type/S.N.	XAM-4383	XAM-4383	
Logging Speed	40 feet/min.	20 feet/min.	
Sample Interval	0.5 foot	0.5 foot	

Logged by:

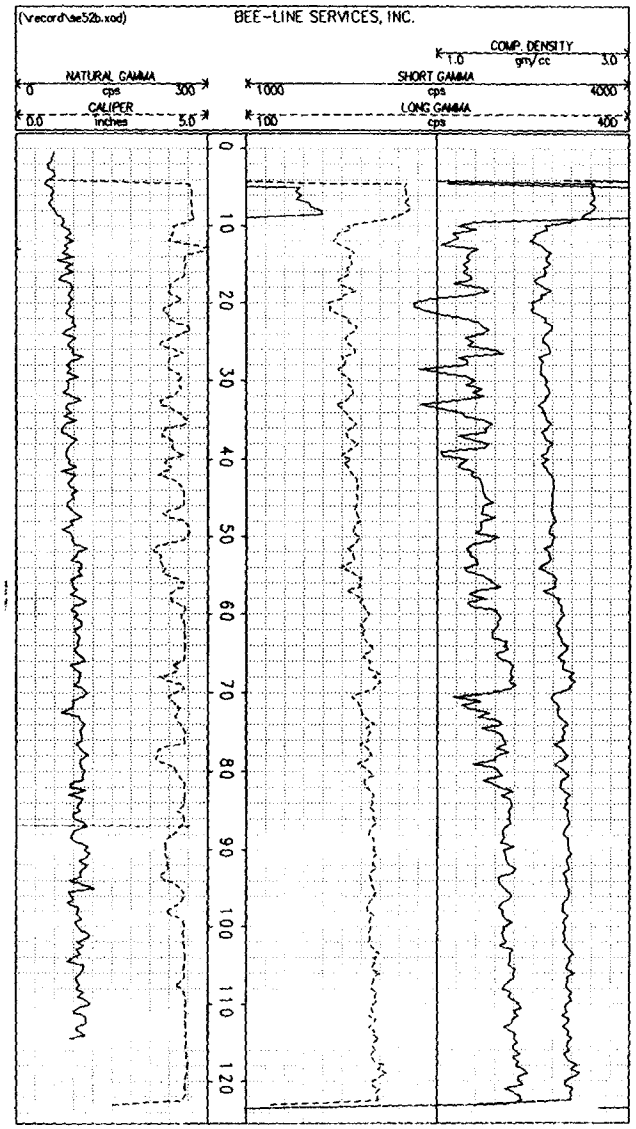
BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

SE 5.2B Wire-line logs run March 19, 1990. Surface elevation 490.3 feet.

ELECTRICAL LOG



GAMMA LOG



WIRE-LINE LOGGING PARAMETERS

Hole No. SE 5.2C **Log Measured From:** Ground Level

Drilling Parameters

Depth 166.0 feet

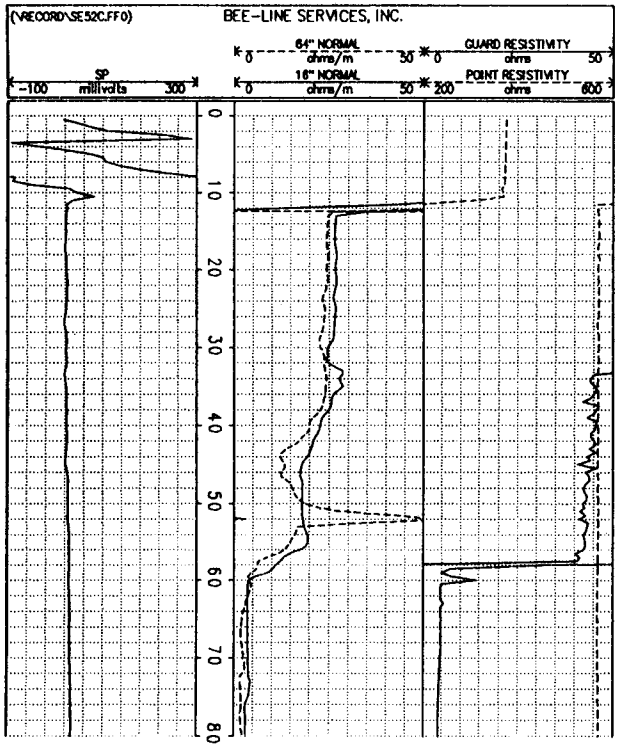
Bit Diameter 4.5 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	March 26, 1990	March 26, 1990	March 26, 1990
Bottom Log Interval	163.5 feet	163.0 feet	159.8 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling fluid	drilling fluid	drilling fluid
Time Since Circulation Stop	48 hours	48 hours	48 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

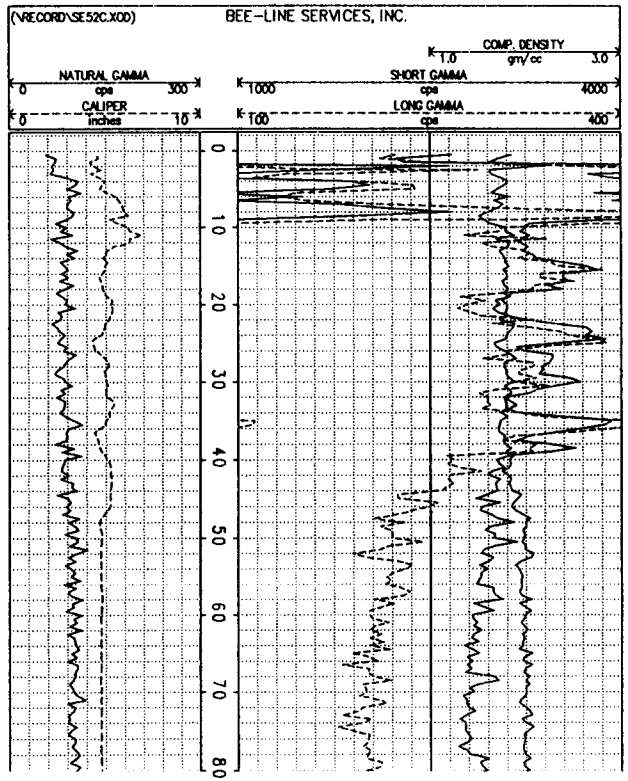
Logged by: **BEE-LINE SERVICES, INC.**
P. O. Box 2096
Corsicana, TX 75151

SE 5.2C Wire-line logs run March 23, 1990. Surface elevation 495.0 feet.

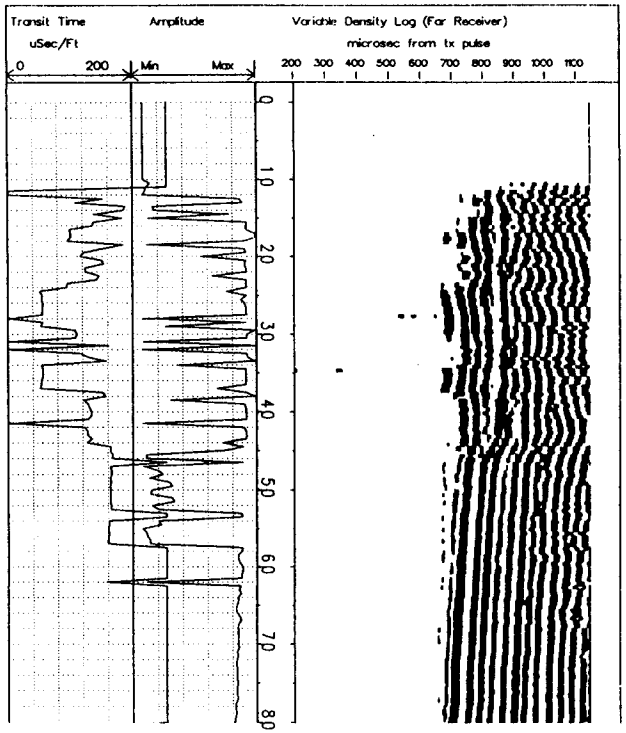
ELECTRICAL LOG



GAMMA LOG

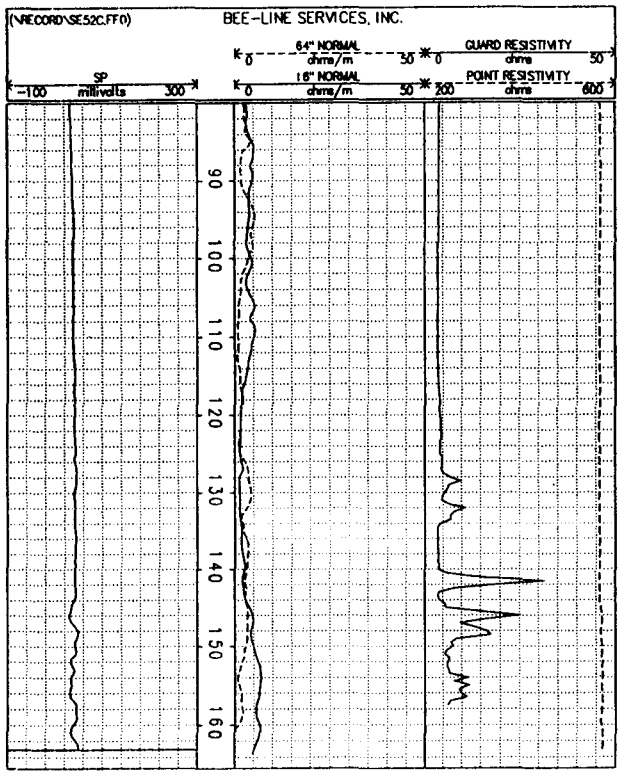


SONIC LOG

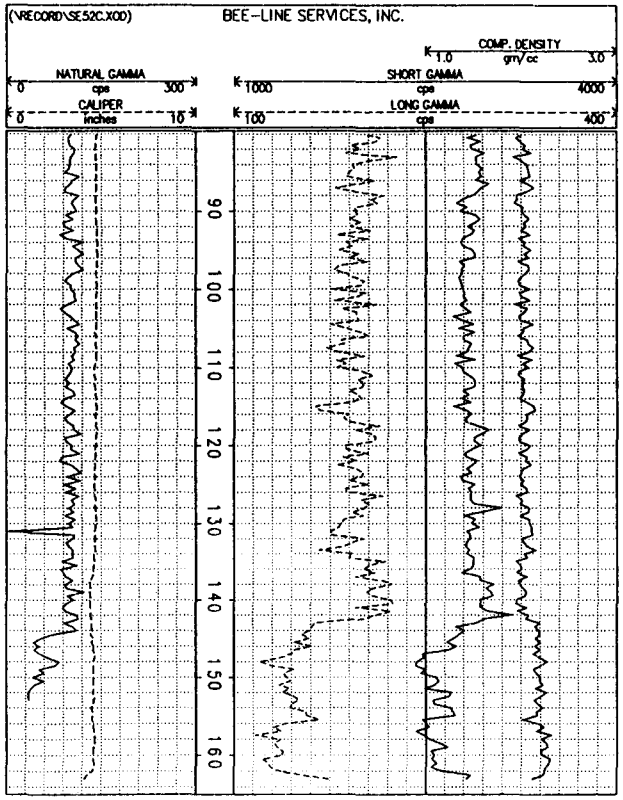


SE 5.2C Wire-line logs run March 23, 1990 (Continued). Surface elevation 495.0 feet.

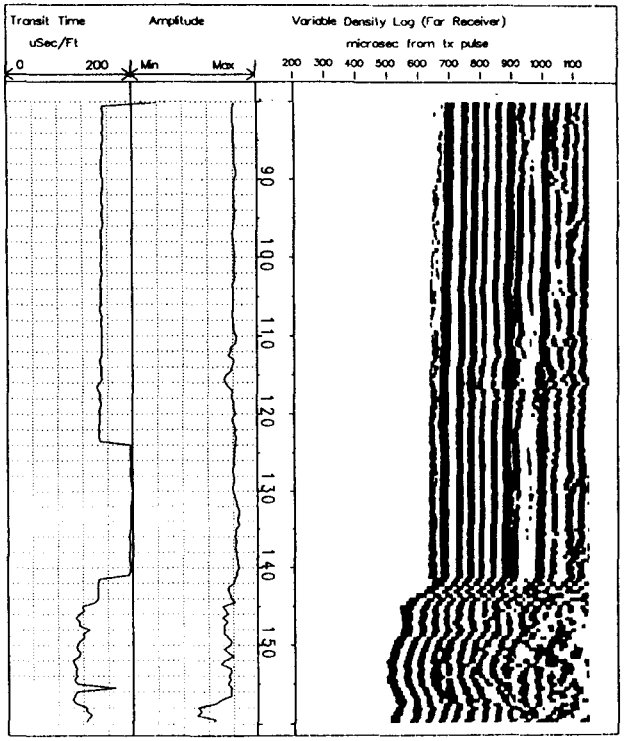
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



SONIC LOG CONTINUED



WIRE-LINE LOGGING PARAMETERS

Hole No. SE 5.2D **Log Measured From:** Ground Level

Drilling Parameters

Depth 161.0 feet

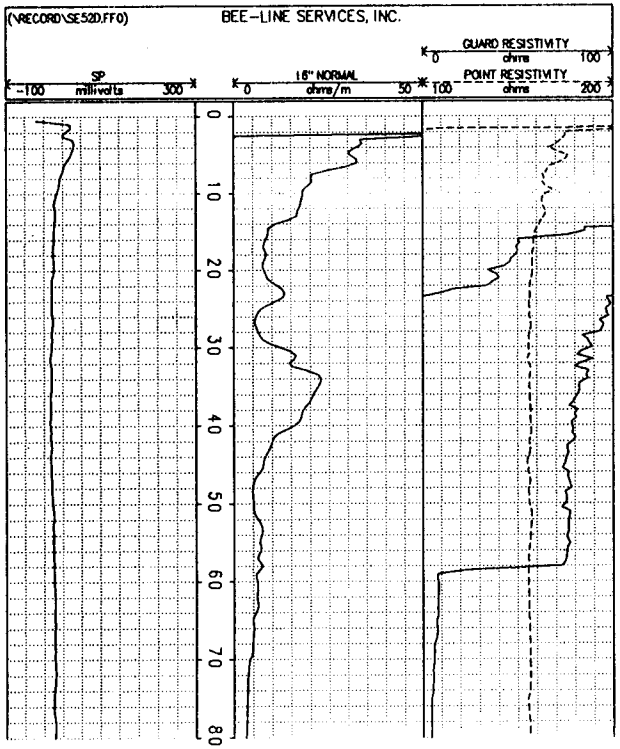
Bit Diameter 4.5 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	March 26, 1990	March 26, 1990	March 26, 1990
Bottom Log Interval	159.0 feet	159.0 feet	155.8 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling fluid	drilling fluid	drilling fluid
Time Since Circulation Stop	48 hours	48 hours	48 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

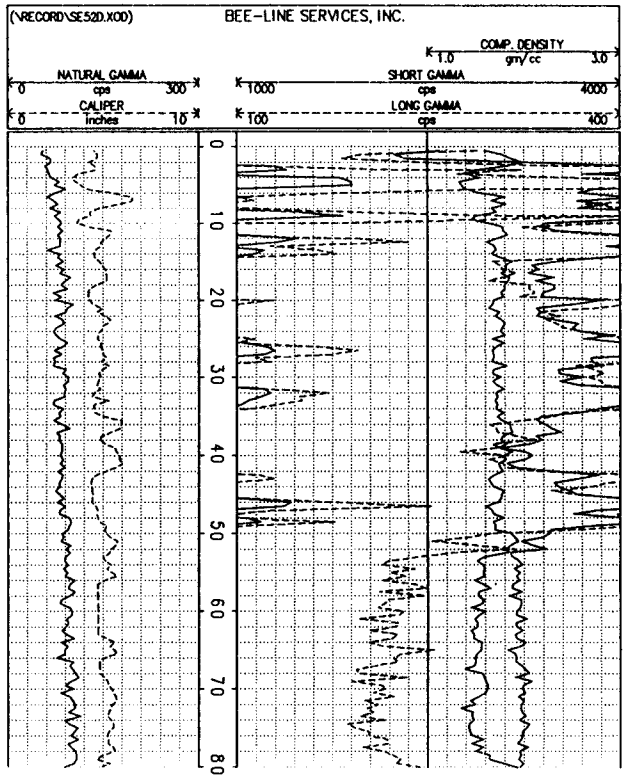
Logged by: **BEE-LINE SERVICES, INC.**
P. O. Box 2096
Corsicana, TX 75151

SE 5.2D Wire-line logs run March 26, 1990. Surface elevation 493.0 feet.

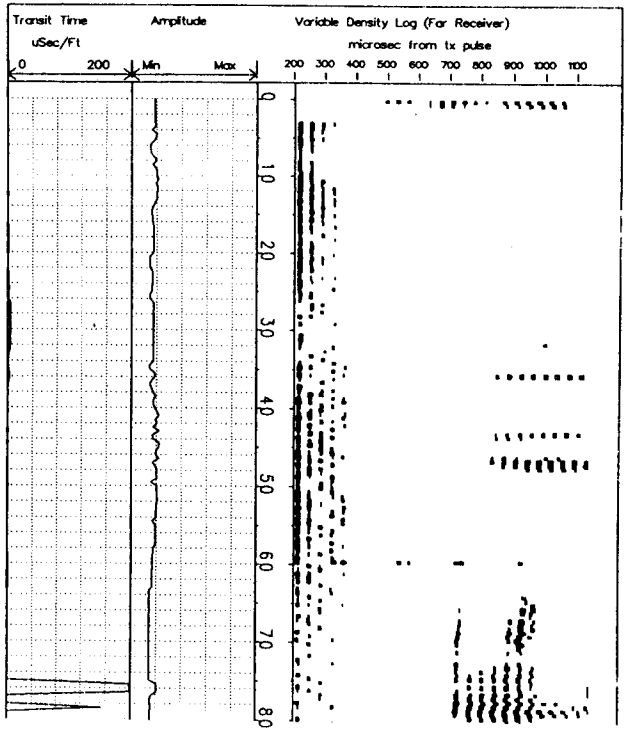
ELECTRICAL LOG



GAMMA LOG

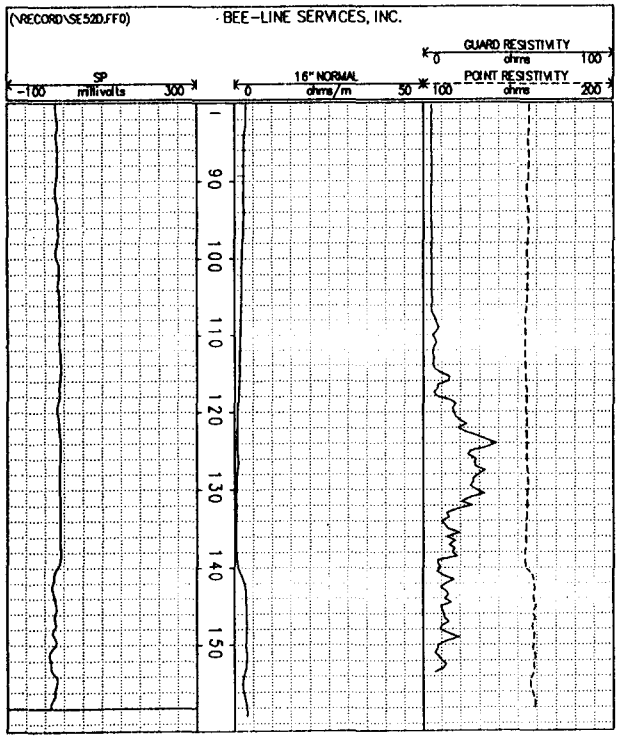


SONIC LOG

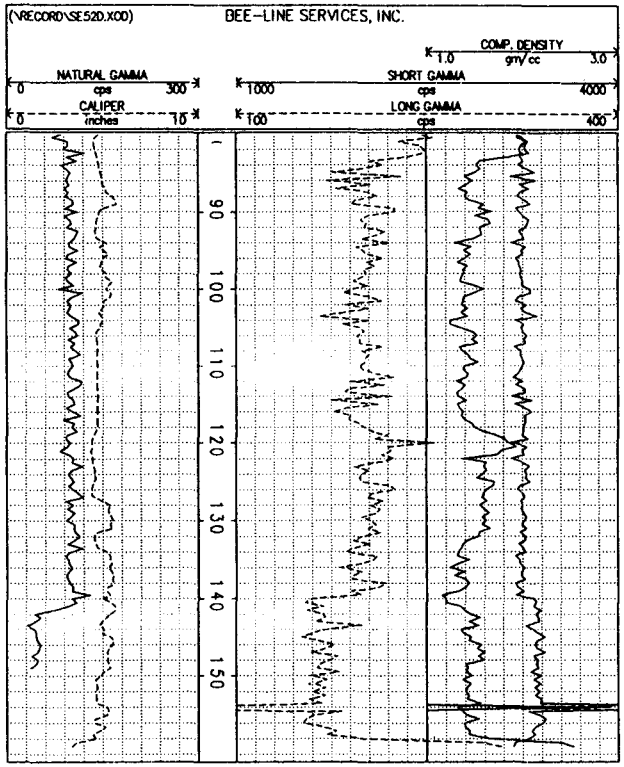


SE 5.2D Wire-line logs run March 26, 1990 (Continued). Surface elevation 493.0 feet.

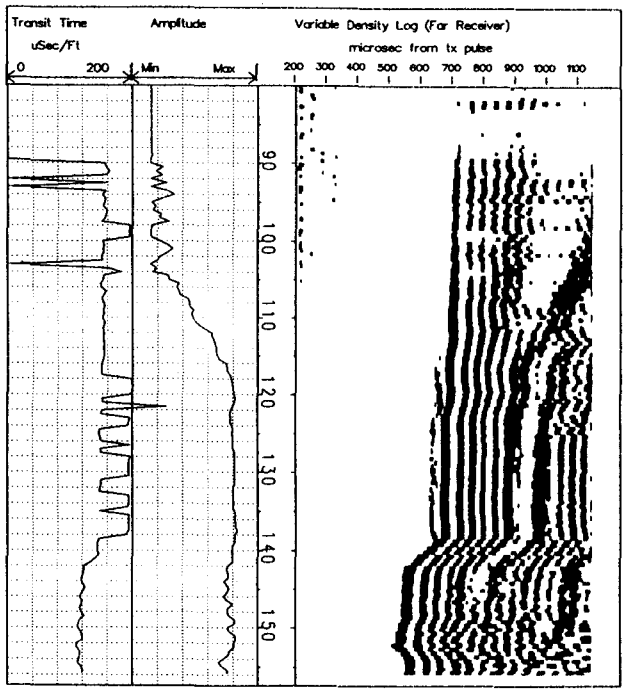
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



SONIC LOG CONTINUED



WIRE-LINE LOGGING PARAMETERS

Hole No. SE 5.2E Log Measured From: Ground Level

Drilling Parameters

Depth 315.0 feet

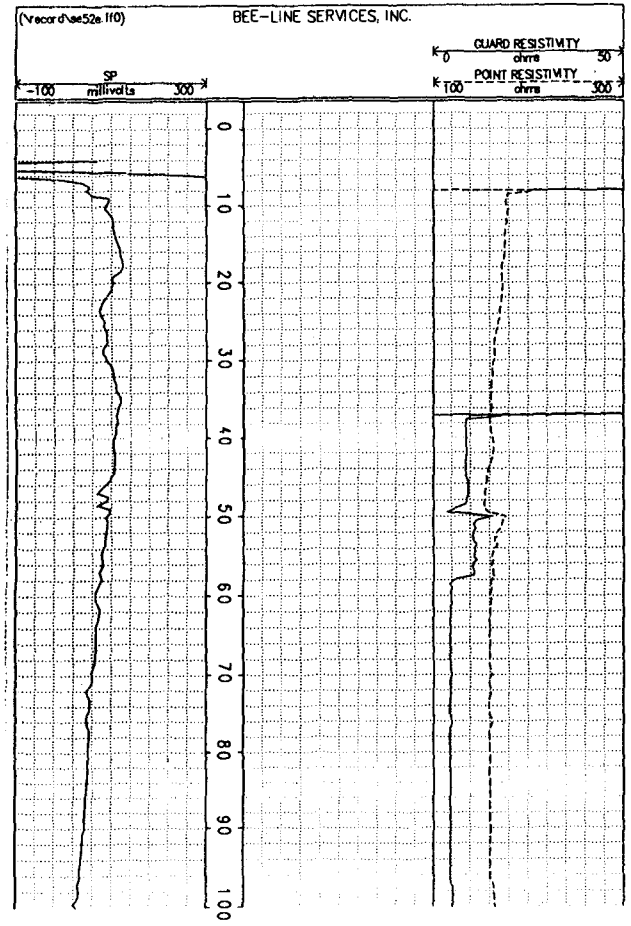
Bit Diameter 3.25 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log	Deviation Log
Date	March 31, 1990	March 31, 1990	March 31, 1990	March 31, 1990
Bottom Log Interval	308.5 feet	309.0 feet	303.8 feet	312.3 feet
Top Log Interval	surface	surface	49.0 feet	58.7 feet
Type of Fluid in Hole	drilling fluid	drilling fluid	drilling fluid	drilling fluid
Time Since Circulation Stop	4 hours	4 hours	4 hours	1 hour
Probe Type/S.N.	ALP-4979	XAP-4383	CLP-4877A	9055A/135
Module Type/S.N.	ALM-4979	XAM-4383	CLM-4877A	COMPU-LOG
Logging Speed	40 feet/min.	20 feet/min.	20 feet/min.	60 feet/min.
Sample Interval	0.5 foot	0.5 foot	0.5 foot	0.1 foot

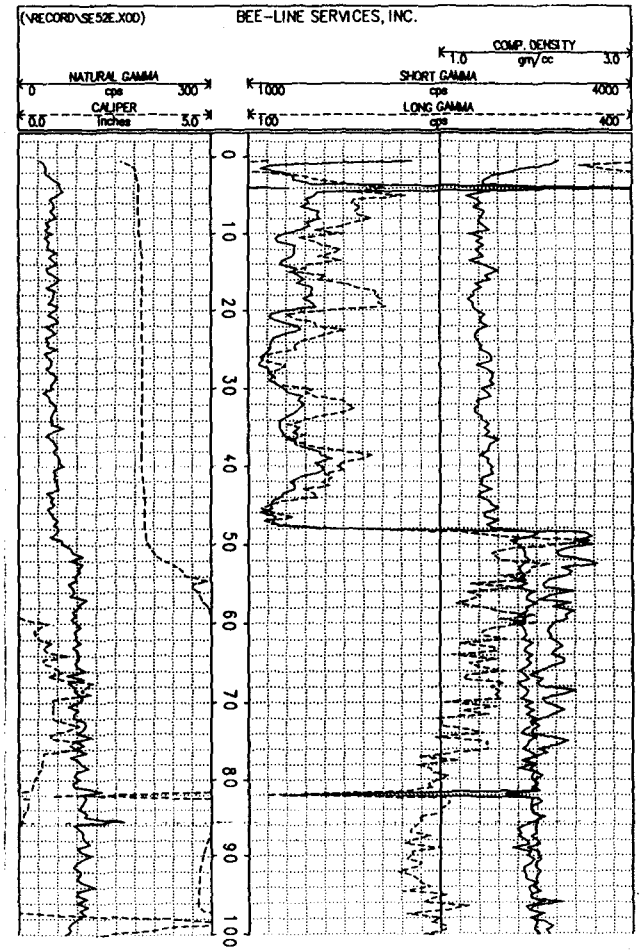
Logged by: **BEE-LINE SERVICES, INC.**
P. O. Box 2096
Corsicana, TX 75151

SE 5.2E Wire-line logs run March 31, 1990. Surface elevation approximately 495 feet.

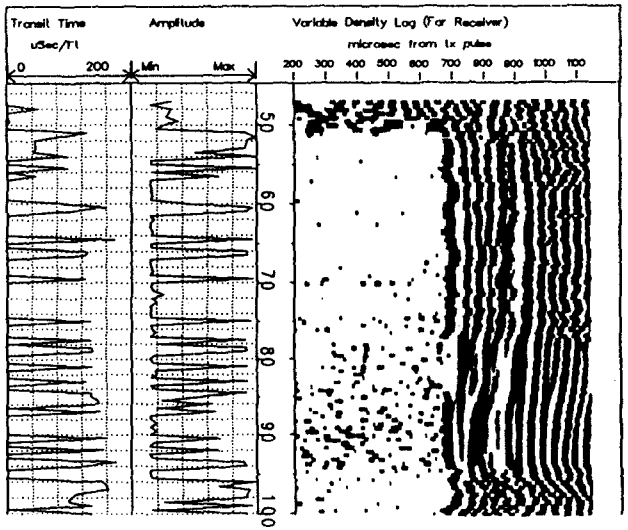
ELECTRICAL LOG



GAMMA LOG

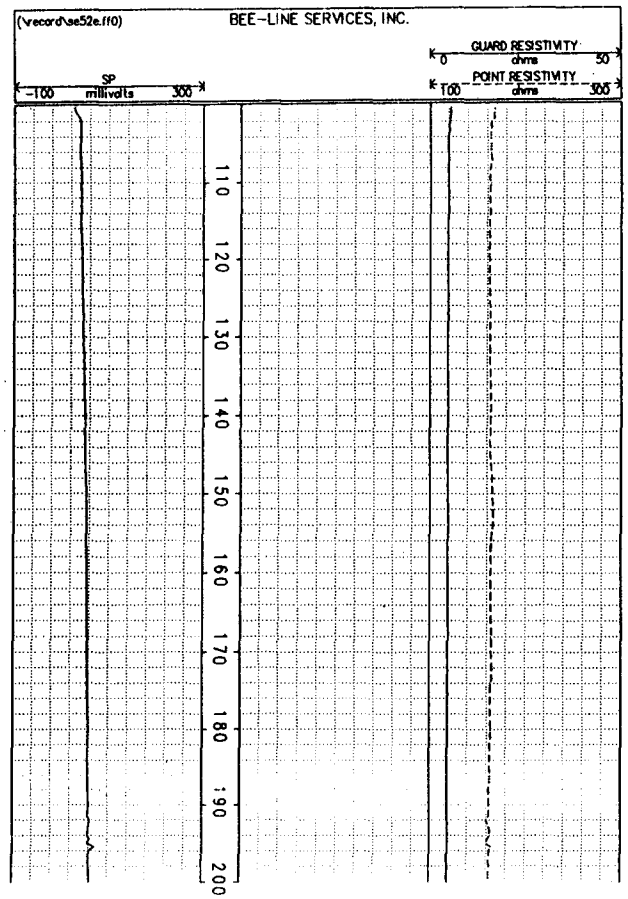


SONIC LOG

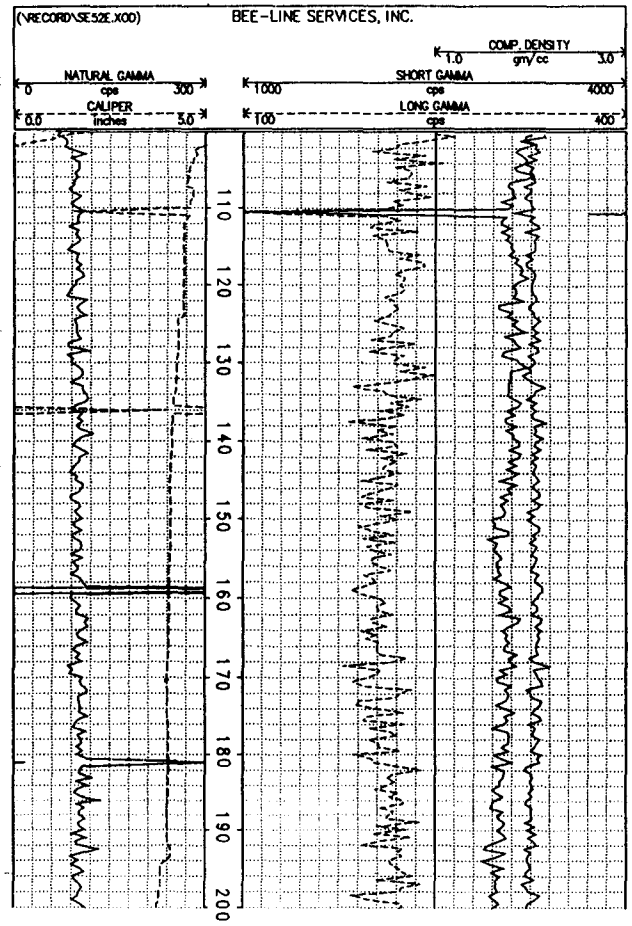


SE 5.2E Wire-line logs run March 31, 1990 (Continued). Surface elevation approximately 495 feet.

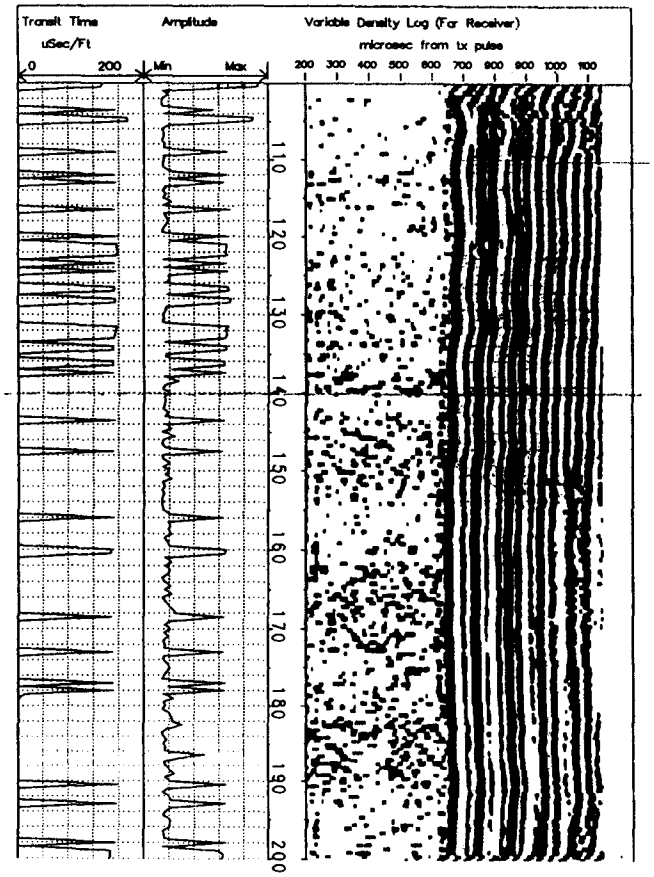
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED

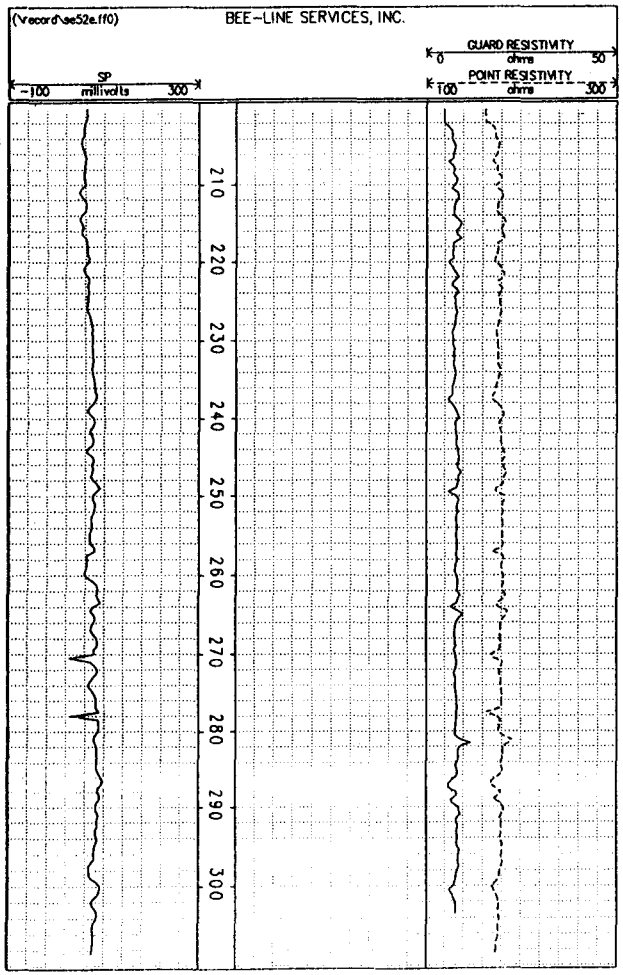


SONIC LOG CONTINUED

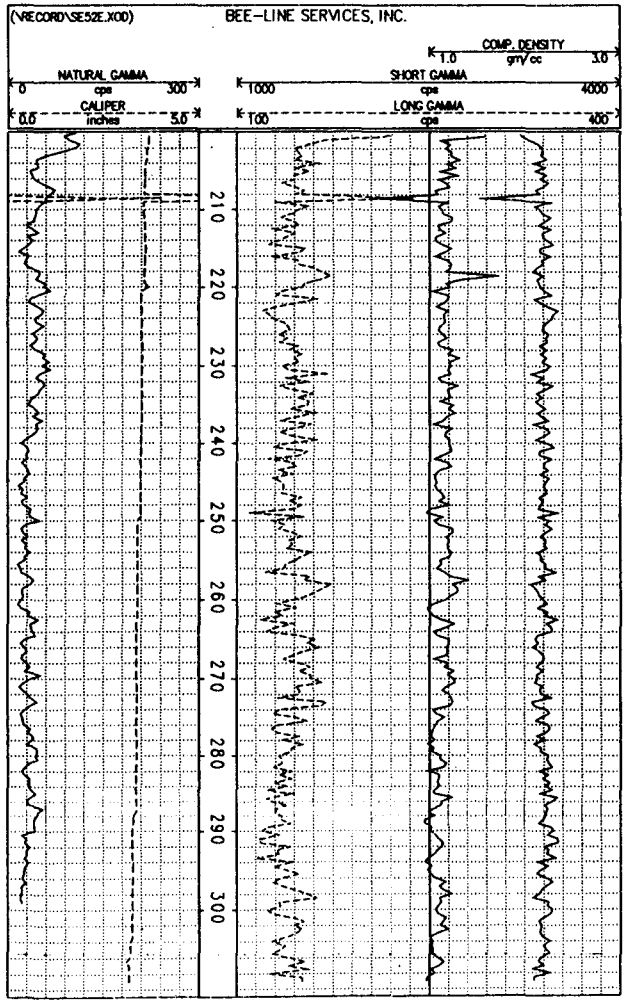


SE 5.2E Wire-line logs run March 31, 1990 (Continued). Surface elevation approximately 495 feet.

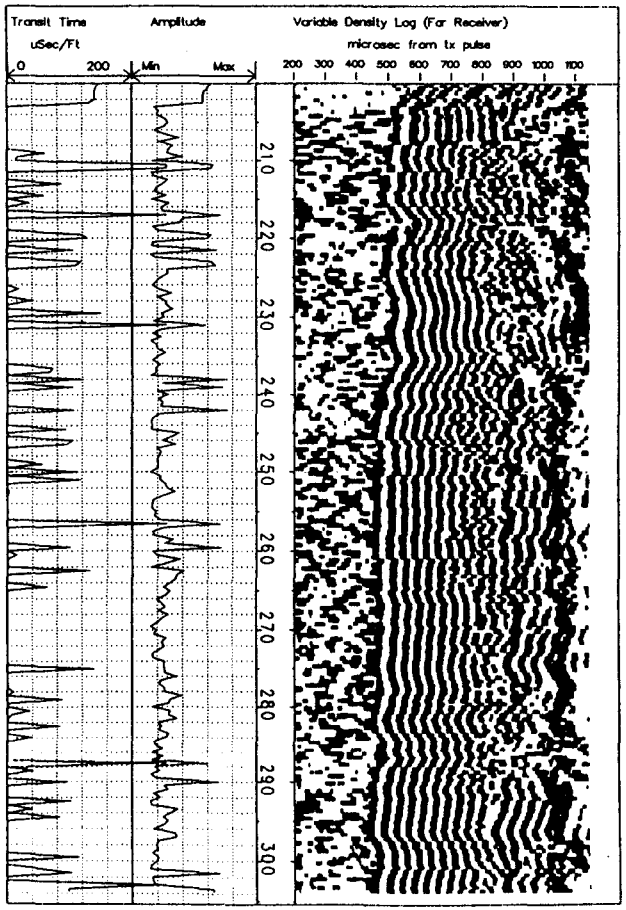
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



SONIC LOG CONTINUED



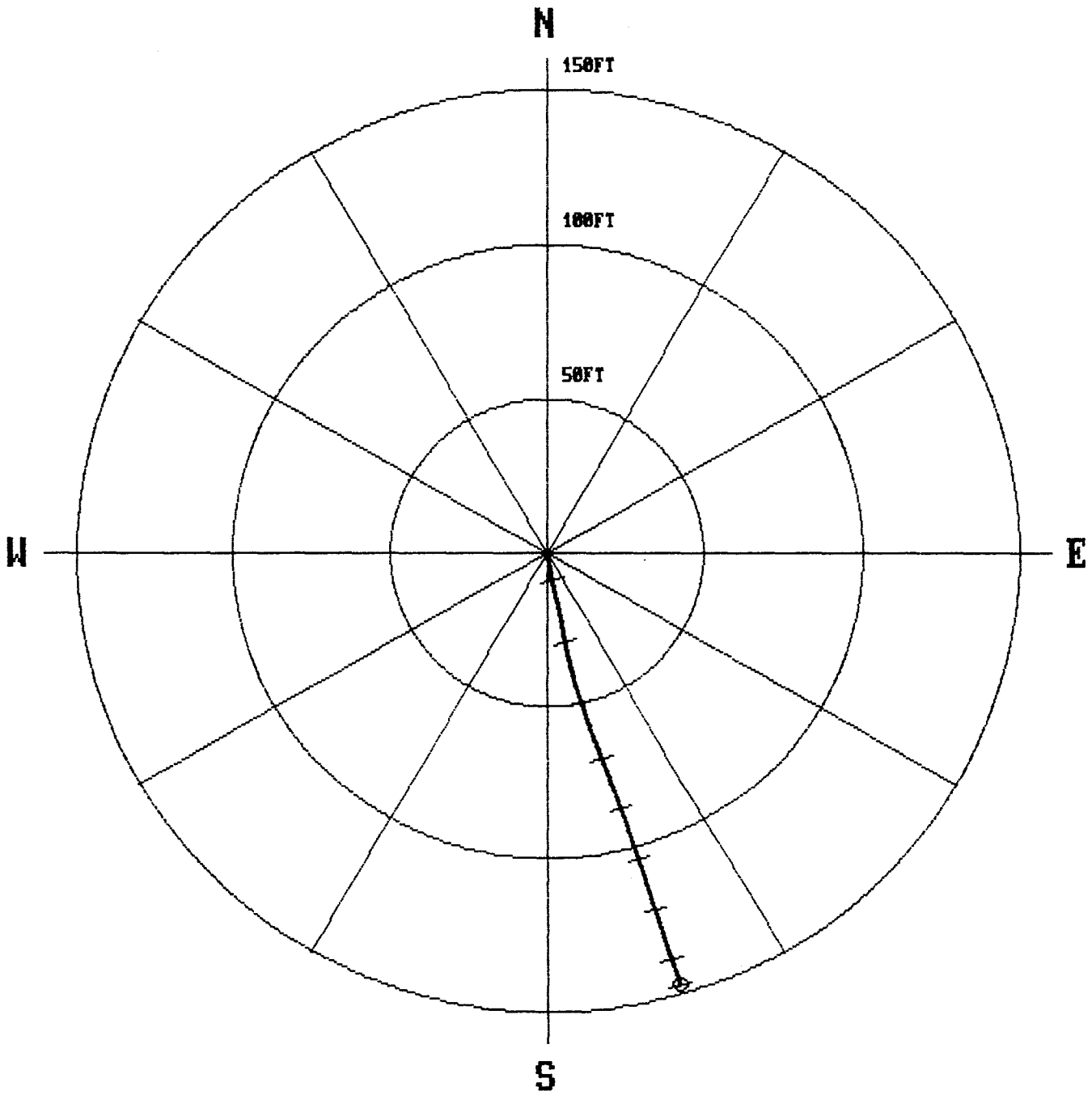
PLAN VIEW

COMPU-LOG DEVIATION

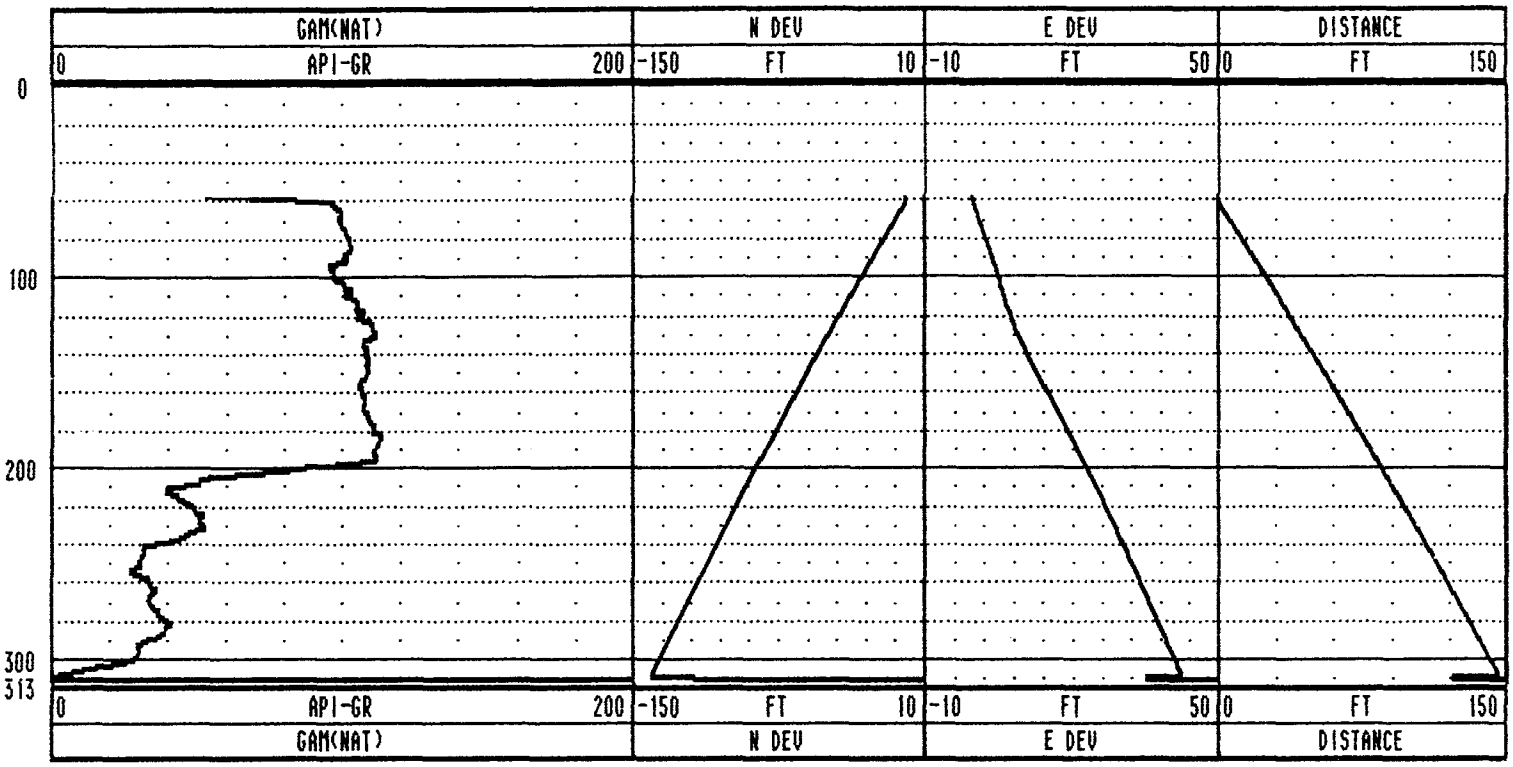
CLIENT: TETC
LOCATION: SSC
HOLE ID: SE 5.2E
DATE OF LOG: 03/31/90
PROBE: 9055A 249

MAG DECL: 7.0

SCALE: 50 FT/IN
TRUE DEPTH: 263.39 FT
AZIMUTH: 163.2
DISTANCE: 146.9 FT
+ = 25 FT INCR
○ = BOTTOM OF HOLE



Profile View
Compu-log Deviation Survey
SE 5.2E



CLIENT : TETC
FIELD OFFICE : CORSICANA
DATA FROM :
MAG. DECL. : 7.000

HOLE ID. : SE 5.2E
DATE OF LOG : 03/31/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
64.0	63.91	-0.25	0.04	0.3	170.3	38.8	169.8
65.0	64.70	-0.85	0.19	0.9	167.5	38.4	171.0
66.0	65.47	-1.46	0.31	1.5	167.9	39.3	166.6
67.0	66.25	-2.08	0.44	2.1	168.0	38.8	168.4
68.0	67.03	-2.69	0.55	2.7	168.4	38.5	177.7
69.0	67.81	-3.31	0.64	3.4	169.0	38.8	166.2
70.0	68.59	-3.92	0.78	4.0	168.7	38.9	166.6
71.0	69.37	-4.54	0.89	4.6	169.0	39.1	167.1
72.0	70.15	-5.16	1.01	5.3	168.9	39.0	168.5
73.0	70.92	-5.78	1.12	5.9	169.0	39.4	170.5
74.0	71.70	-6.39	1.25	6.5	169.0	39.1	167.5
75.0	72.48	-7.01	1.38	7.1	168.9	39.1	166.6
76.0	73.25	-7.63	1.51	7.8	168.8	39.2	167.2
77.0	74.03	-8.25	1.65	8.4	168.7	39.1	165.0
78.0	74.80	-8.86	1.79	9.0	168.6	39.3	167.4
79.0	75.58	-9.48	1.93	9.7	168.5	39.2	167.6
80.0	76.35	-10.10	2.04	10.3	168.6	39.4	167.7
81.0	77.12	-10.72	2.18	10.9	168.5	39.2	167.0
82.0	77.90	-11.34	2.30	11.6	168.5	39.4	168.0
83.0	78.67	-11.96	2.43	12.2	168.5	39.4	167.0
84.0	79.44	-12.58	2.57	12.8	168.5	39.4	166.7
85.0	80.21	-13.21	2.69	13.5	168.5	39.4	167.1
86.0	80.99	-13.83	2.82	14.1	168.5	39.4	167.4
87.0	81.76	-14.45	2.95	14.7	168.5	39.5	168.0
88.0	82.53	-15.07	3.08	15.4	168.5	39.4	167.8
89.0	83.30	-15.69	3.22	16.0	168.4	39.4	167.9
90.0	84.08	-16.31	3.35	16.7	168.4	39.4	167.4
91.0	84.85	-16.93	3.49	17.3	168.3	39.4	167.6
92.0	85.62	-17.55	3.63	17.9	168.3	39.3	167.5
93.0	86.40	-18.17	3.76	18.6	168.3	39.3	167.7
94.0	87.17	-18.79	3.90	19.2	168.3	39.3	167.9
95.0	87.94	-19.40	4.04	19.8	168.2	39.2	167.2
96.0	88.72	-20.02	4.17	20.5	168.2	39.2	167.3
97.0	89.50	-20.64	4.31	21.1	168.2	39.2	167.7
98.0	90.27	-21.25	4.44	21.7	168.2	39.0	169.7
99.0	91.05	-21.87	4.55	22.3	168.2	39.1	166.5
100.0	91.83	-22.49	4.69	23.0	168.2	39.0	168.4
101.0	92.60	-23.10	4.84	23.6	168.2	39.0	168.0
102.0	93.38	-23.72	4.94	24.2	168.2	39.2	172.4
103.0	94.16	-24.34	5.03	24.9	168.3	38.9	164.5
104.0	94.94	-24.94	5.19	25.5	168.2	39.0	167.6
105.0	95.72	-25.56	5.27	26.1	168.3	38.2	167.3
106.0	96.49	-26.17	5.41	26.7	168.3	40.6	173.5
107.0	97.27	-26.80	5.37	27.3	168.7	35.7	172.0
108.0	98.04	-27.41	5.51	28.0	168.6	39.0	168.6
109.0	98.82	-28.02	5.63	28.6	168.6	38.6	167.2
110.0	99.60	-28.64	5.76	29.2	168.6	39.1	167.0
111.0	100.38	-29.25	5.87	29.8	168.7	38.7	171.8
112.0	101.16	-29.86	5.97	30.5	168.7	38.8	157.3
113.0	101.94	-30.47	6.13	31.1	168.6	38.6	164.0
114.0	102.73	-31.06	6.27	31.7	168.6	37.9	165.8
115.0	103.52	-31.67	6.38	32.3	168.6	38.7	179.9

CLIENT : TETC
FIELD OFFICE : CORSICANA
DATA FROM :
MAG. DECL. : 7.000

HOLE ID. : SE 5.2E
DATE OF LOG : 03/31/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
116.0	104.30	-32.27	6.48	32.9	168.6	38.6	176.2
117.0	105.09	-32.88	6.56	33.5	168.7	38.3	176.9
118.0	105.87	-33.49	6.68	34.1	168.7	38.5	175.2
119.0	106.65	-34.09	6.84	34.8	168.7	38.5	166.1
120.0	107.43	-34.70	6.99	35.4	168.6	38.4	169.9
121.0	108.22	-35.30	7.15	36.0	168.6	38.5	166.8
122.0	109.00	-35.90	7.29	36.6	168.5	38.7	163.4
123.0	109.78	-36.50	7.46	37.3	168.4	38.4	168.8
124.0	110.57	-37.11	7.59	37.9	168.4	37.7	167.3
125.0	111.35	-37.67	7.82	38.5	168.3	39.3	170.1
126.0	112.14	-38.28	7.97	39.1	168.2	38.9	164.8
127.0	112.92	-38.88	8.11	39.7	168.2	39.4	167.9
128.0	113.70	-39.49	8.25	40.3	168.2	38.4	164.0
129.0	114.48	-40.09	8.41	41.0	168.1	38.1	166.8
130.0	115.27	-40.69	8.57	41.6	168.1	38.4	165.7
131.0	116.05	-41.29	8.73	42.2	168.1	38.4	160.2
132.0	116.83	-41.90	8.88	42.8	168.0	38.4	162.6
133.0	117.61	-42.49	9.05	43.4	168.0	38.2	165.6
134.0	118.40	-43.09	9.24	44.1	167.9	38.4	162.9
135.0	119.18	-43.68	9.43	44.7	167.8	38.5	161.5
136.0	119.96	-44.27	9.62	45.3	167.7	38.5	162.8
137.0	120.74	-44.87	9.80	45.9	167.7	38.5	161.4
138.0	121.53	-45.46	9.98	46.5	167.6	38.4	164.0
139.0	122.31	-46.06	10.15	47.2	167.6	38.5	161.9
140.0	123.10	-46.65	10.34	47.8	167.5	38.5	162.2
141.0	123.88	-47.24	10.52	48.4	167.4	38.7	161.9
142.0	124.66	-47.84	10.70	49.0	167.4	38.3	163.4
143.0	125.45	-48.43	10.87	49.6	167.3	38.2	164.1
144.0	126.23	-49.02	11.07	50.3	167.3	38.2	161.8
145.0	127.02	-49.61	11.25	50.9	167.2	38.6	162.6
146.0	127.81	-50.20	11.43	51.5	167.2	38.3	162.4
147.0	128.59	-50.79	11.63	52.1	167.1	38.3	162.9
148.0	129.38	-51.37	11.84	52.7	167.0	38.9	157.7
149.0	130.16	-51.96	12.03	53.3	167.0	38.1	160.6
150.0	130.95	-52.54	12.23	53.9	166.9	38.2	159.4
151.0	131.74	-53.13	12.43	54.6	166.8	38.0	161.5
152.0	132.52	-53.71	12.63	55.2	166.8	38.0	157.7
153.0	133.31	-54.29	12.81	55.8	166.7	37.6	160.6
154.0	134.11	-54.86	13.02	56.4	166.6	37.5	160.9
155.0	134.90	-55.44	13.21	57.0	166.6	37.8	164.8
156.0	135.69	-56.01	13.42	57.6	166.5	37.2	161.1
157.0	136.49	-56.59	13.61	58.2	166.5	37.5	160.2
158.0	137.28	-57.15	13.83	58.8	166.4	37.4	158.9
159.0	138.07	-57.72	14.05	59.4	166.3	37.4	159.3
160.0	138.87	-58.28	14.27	60.0	166.2	37.3	159.3
161.0	139.67	-58.85	14.48	60.6	166.2	37.2	160.5
162.0	140.46	-59.42	14.70	61.2	166.1	37.2	159.0
163.0	141.26	-59.98	14.91	61.8	166.0	37.0	159.9
164.0	142.06	-60.55	15.11	62.4	166.0	37.0	159.3
165.0	142.86	-61.11	15.32	63.0	165.9	37.0	159.2
166.0	143.66	-61.67	15.54	63.6	165.9	37.0	159.1
167.0	144.45	-62.24	15.75	64.2	165.8	37.0	158.8

CLIENT : TETC
FIELD OFFICE : CORSICANA
DATA FROM :
MAG. DECL. : 7.000

HOLE ID. : SE 5.2E
DATE OF LOG : 03/31/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
168.0	145.25	-62.80	15.97	64.8	165.7	37.2	160.5
169.0	146.05	-63.36	16.18	65.4	165.7	36.8	158.7
170.0	146.85	-63.92	16.39	66.0	165.6	36.9	159.4
171.0	147.66	-64.47	16.61	66.6	165.6	36.6	158.3
172.0	148.46	-65.04	16.81	67.2	165.5	36.6	159.9
173.0	149.26	-65.59	17.01	67.8	165.5	36.6	161.0
174.0	150.06	-66.15	17.23	68.4	165.4	36.7	160.0
175.0	150.87	-66.71	17.44	69.0	165.4	36.5	159.7
176.0	151.67	-67.27	17.63	69.5	165.3	36.2	164.0
177.0	152.48	-67.83	17.82	70.1	165.3	36.3	158.9
178.0	153.29	-68.38	18.04	70.7	165.2	36.4	160.0
179.0	154.09	-68.93	18.26	71.3	165.2	36.7	158.6
180.0	154.89	-69.49	18.46	71.9	165.1	36.5	160.4
181.0	155.70	-70.05	18.67	72.5	165.1	36.3	157.7
182.0	156.50	-70.61	18.86	73.1	165.0	36.3	160.6
183.0	157.31	-71.17	19.06	73.7	165.0	36.4	159.7
184.0	158.12	-71.72	19.27	74.3	165.0	36.0	160.6
185.0	158.92	-72.27	19.48	74.9	164.9	35.5	162.7
186.0	159.73	-72.82	19.67	75.4	164.9	36.0	160.5
187.0	160.54	-73.38	19.88	76.0	164.8	36.5	160.5
188.0	161.34	-73.93	20.10	76.6	164.8	36.1	162.3
189.0	162.15	-74.48	20.31	77.2	164.7	36.1	160.8
190.0	162.96	-75.03	20.51	77.8	164.7	36.1	160.3
191.0	163.77	-75.58	20.71	78.4	164.7	36.0	159.6
192.0	164.58	-76.13	20.91	79.0	164.6	36.0	160.8
193.0	165.39	-76.69	21.11	79.5	164.6	36.0	159.1
194.0	166.20	-77.24	21.31	80.1	164.6	35.9	161.5
195.0	167.01	-77.79	21.51	80.7	164.5	35.8	160.7
196.0	167.82	-78.34	21.71	81.3	164.5	35.9	159.9
197.0	168.63	-78.89	21.90	81.9	164.5	35.8	162.3
198.0	169.44	-79.44	22.10	82.5	164.5	35.6	161.2
199.0	170.25	-79.99	22.28	83.0	164.4	35.6	159.9
200.0	171.07	-80.54	22.49	83.6	164.4	35.5	160.6
201.0	171.88	-81.08	22.69	84.2	164.4	35.7	161.5
202.0	172.69	-81.63	22.89	84.8	164.3	35.4	162.9
203.0	173.51	-82.18	23.06	85.4	164.3	35.6	162.4
204.0	174.32	-82.73	23.27	85.9	164.3	35.5	160.5
205.0	175.14	-83.27	23.46	86.5	164.3	35.4	159.7
206.0	175.95	-83.82	23.65	87.1	164.2	35.4	161.0
207.0	176.77	-84.37	23.84	87.7	164.2	35.4	158.8
208.0	177.58	-84.92	24.04	88.3	164.2	35.5	160.3
209.0	178.39	-85.47	24.22	88.8	164.2	35.6	162.0
210.0	179.21	-86.02	24.41	89.4	164.2	35.5	161.8
211.0	180.02	-86.56	24.60	90.0	164.1	35.6	159.7
212.0	180.84	-87.11	24.80	90.6	164.1	35.4	160.5
213.0	181.65	-87.65	24.99	91.1	164.1	35.3	159.0
214.0	182.47	-88.19	25.21	91.7	164.0	35.7	160.1
215.0	183.28	-88.74	25.40	92.3	164.0	35.6	158.1
216.0	184.10	-89.28	25.59	92.9	164.0	34.9	163.4
217.0	184.92	-89.83	25.76	93.4	164.0	35.1	160.7
218.0	185.74	-90.37	25.96	94.0	164.0	35.1	159.4
219.0	186.56	-90.91	26.15	94.6	164.0	35.2	160.5

CLIENT : TETC
FIELD OFFICE : CORSICANA
DATA FROM :
MAG. DECL. : 7.000

HOLE ID. : SE 5.2E
DATE OF LOG : 03/31/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
220.0	187.38	-91.46	26.33	95.2	163.9	34.2	163.9
221.0	188.20	-92.00	26.49	95.7	163.9	34.1	159.2
222.0	189.02	-92.54	26.68	96.3	163.9	34.7	161.1
223.0	189.84	-93.08	26.85	96.9	163.9	35.0	162.0
224.0	190.66	-93.62	27.03	97.4	163.9	34.9	161.2
225.0	191.48	-94.16	27.21	98.0	163.9	34.5	162.6
226.0	192.30	-94.71	27.39	98.6	163.9	34.9	162.3
227.0	193.12	-95.25	27.56	99.2	163.9	35.0	161.9
228.0	193.95	-95.79	27.75	99.7	163.8	35.8	162.0
229.0	194.77	-96.33	27.95	100.3	163.8	34.9	161.0
230.0	195.58	-96.87	28.14	100.9	163.8	34.6	163.4
231.0	196.41	-97.40	28.33	101.4	163.8	33.8	160.6
232.0	197.23	-97.93	28.51	102.0	163.8	34.4	160.7
233.0	198.06	-98.47	28.69	102.6	163.8	34.7	162.9
234.0	198.88	-99.01	28.86	103.1	163.7	34.7	162.2
235.0	199.71	-99.55	29.04	103.7	163.7	34.6	161.9
236.0	200.53	-100.09	29.21	104.3	163.7	34.4	163.0
237.0	201.35	-100.63	29.40	104.8	163.7	34.6	161.2
238.0	202.18	-101.16	29.58	105.4	163.7	34.4	161.3
239.0	203.00	-101.70	29.75	106.0	163.7	34.7	162.0
240.0	203.82	-102.24	29.94	106.5	163.7	34.7	159.0
241.0	204.65	-102.78	30.12	107.1	163.7	34.7	161.8
242.0	205.47	-103.32	30.29	107.7	163.7	34.5	162.8
243.0	206.29	-103.86	30.46	108.2	163.7	34.6	163.2
244.0	207.12	-104.40	30.64	108.8	163.6	34.3	160.9
245.0	207.94	-104.93	30.81	109.4	163.6	34.3	163.2
246.0	208.77	-105.47	30.99	109.9	163.6	34.7	161.9
247.0	209.59	-106.01	31.16	110.5	163.6	34.5	159.4
248.0	210.42	-106.55	31.33	111.1	163.6	34.0	163.1
249.0	211.24	-107.08	31.52	111.6	163.6	34.4	160.7
250.0	212.06	-107.62	31.70	112.2	163.6	35.1	167.5
251.0	212.89	-108.15	31.91	112.8	163.6	34.7	160.0
252.0	213.71	-108.69	32.09	113.3	163.5	34.5	161.6
253.0	214.54	-109.23	32.25	113.9	163.5	33.9	160.6
254.0	215.36	-109.77	32.43	114.5	163.5	34.7	161.9
255.0	216.18	-110.31	32.61	115.0	163.5	34.9	157.7
256.0	217.00	-110.84	32.79	115.6	163.5	34.4	163.6
257.0	217.83	-111.38	32.96	116.2	163.5	34.2	163.7
258.0	218.65	-111.92	33.11	116.7	163.5	34.3	162.7
259.0	219.48	-112.45	33.33	117.3	163.5	34.4	158.1
260.0	220.30	-112.99	33.50	117.8	163.5	34.1	160.6
261.0	221.13	-113.52	33.67	118.4	163.5	34.0	166.9
262.0	221.95	-114.06	33.85	119.0	163.5	35.2	161.8
263.0	222.78	-114.59	34.04	119.5	163.5	33.7	162.9
264.0	223.60	-115.13	34.21	120.1	163.5	34.1	161.4
265.0	224.43	-115.67	34.37	120.7	163.5	34.4	158.1
266.0	225.26	-116.20	34.56	121.2	163.4	33.9	161.5
267.0	226.08	-116.73	34.73	121.8	163.4	34.1	158.2
268.0	226.91	-117.26	34.92	122.4	163.4	34.3	161.5
269.0	227.73	-117.80	35.08	122.9	163.4	34.5	165.4
270.0	228.56	-118.35	35.23	123.5	163.4	33.6	168.0
271.0	229.39	-118.87	35.40	124.0	163.4	33.5	163.7

CLIENT : TETC
FIELD OFFICE : CORSICANA
DATA FROM :
MAG. DECL. : 7.000

HOLE ID. : SE 5.2E
DATE OF LOG : 03/31/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
272.0	230.22	-119.41	35.57	124.6	163.4	35.3	171.2
273.0	231.04	-119.94	35.75	125.2	163.4	34.2	158.7
274.0	231.87	-120.47	35.94	125.7	163.4	34.2	160.9
275.0	232.70	-121.01	36.10	126.3	163.4	34.3	165.2
276.0	233.53	-121.54	36.26	126.8	163.4	34.2	160.7
277.0	234.35	-122.07	36.46	127.4	163.4	34.1	161.9
278.0	235.18	-122.60	36.64	128.0	163.4	34.2	162.4
279.0	236.01	-123.14	36.79	128.5	163.4	34.5	164.3
280.0	236.84	-123.67	36.97	129.1	163.4	34.0	154.9
281.0	237.67	-124.20	37.16	129.6	163.3	34.0	164.7
282.0	238.49	-124.73	37.32	130.2	163.3	33.9	161.4
283.0	239.32	-125.27	37.49	130.8	163.3	33.7	162.3
284.0	240.16	-125.80	37.64	131.3	163.3	36.4	162.8
285.0	240.98	-126.32	37.85	131.9	163.3	34.8	157.4
286.0	241.81	-126.84	38.05	132.4	163.3	33.5	155.0
287.0	242.64	-127.37	38.21	133.0	163.3	32.4	170.4
288.0	243.47	-127.91	38.34	133.5	163.3	34.8	162.2
289.0	244.30	-128.44	38.51	134.1	163.3	34.0	162.4
290.0	245.13	-128.97	38.69	134.7	163.3	34.0	159.6
291.0	245.96	-129.50	38.88	135.2	163.3	33.7	159.5
292.0	246.79	-130.03	39.05	135.8	163.3	33.5	161.9
293.0	247.62	-130.56	39.22	136.3	163.3	34.2	163.4
294.0	248.45	-131.09	39.41	136.9	163.3	33.3	158.0
295.0	249.27	-131.63	39.57	137.4	163.3	34.7	159.5
296.0	250.11	-132.14	39.76	138.0	163.3	33.9	162.1
297.0	250.94	-132.68	39.93	138.6	163.3	34.3	160.3
298.0	251.76	-133.20	40.11	139.1	163.2	34.0	162.4
299.0	252.59	-133.74	40.29	139.7	163.2	33.8	162.8
300.0	253.43	-134.26	40.44	140.2	163.2	34.3	162.6
301.0	254.25	-134.77	40.67	140.8	163.2	34.4	160.4
302.0	255.08	-135.30	40.89	141.3	163.2	34.3	156.1
303.0	255.91	-135.83	41.07	141.9	163.2	33.7	160.1
304.0	256.74	-136.36	41.20	142.5	163.2	34.9	165.5
305.0	257.57	-136.89	41.37	143.0	163.2	33.9	162.0
306.0	258.41	-137.42	41.54	143.6	163.2	34.0	161.2
307.0	259.24	-137.95	41.71	144.1	163.2	33.7	161.8
308.0	260.07	-138.48	41.88	144.7	163.2	33.9	161.8
309.0	260.90	-139.01	42.05	145.2	163.2	33.7	162.4
310.0	261.73	-139.54	42.22	145.8	163.2	33.9	161.1
311.0	262.56	-140.07	42.37	146.3	163.2	30.3	180.0
312.0	263.39	-140.61	42.47	146.9	163.2	33.8	163.1
312.3	263.49	-140.61	42.47	146.9	163.2	0.0	0.0

APPENDIX C

STRUCTURE STUDY ZONE

APPENDIX C
Structure Study Zone SE 5.2

Field mapping of the structure study zone consisted primarily of locating and noting areas of exposed rock and measuring the bearing of joints and fractures. Quaternary terrace deposits cover much of the area around SE 5.2 and limit the number of bedrock exposures available for study. Structure study zone SE 5.2 is adjacent to Red Oak Creek and erosion of the terraces provides the only exposed rock in the area (see Figure C-1).

Field mapping, aerial photographic interpretations, and analysis of boring logs and wire-line logs from previous borings (BE 5, K3-87, and oil exploration boring Pinkard No. 1) indicate that a fault with about 15 feet of-down-to-the-north offset is present in the area. Additional air and water-rotary borings (this report) were drilled to better constrain the location of the fault. Once the location of the fault was determined, an angled corehole was drilled to provide specific information regarding the geomechanical and hydrogeological properties of the fault itself.

- Name of Structure: SE 5.2
- Faults in Outcrop: None were observed.
- Trend: Quaternary terrace deposits cover much of the area and mask any surface expression of faulting or tonal anomalies associated with aerial photographic lineaments. Fractures in boring SE 5.2E show a general east-west trend (N85°W to S62°W).
- Offset in Borings: Correlation of wire-line and lithologic logs indicates that two faults were penetrated in angled boring SE 5.2 E. The first fault was encountered in the Taylor Marl at a boring depth of 50.7 to 76.6 feet (39.5 to 59.6 feet vertically). The boring is interpreted to penetrate a small antithetic fault dipping to the south. Wire-line data in the Taylor Marl are hard to correlate, but appear to indicate offset along this fault of less than 5 feet. A second fault penetrated the Austin Chalk at a depth of about 215 feet (boring depth), which shortened the Austin Chalk by about 13 feet. Correlation of wire-line units between SE 5.2B and SE 5.2D indicates 15 to 25 feet of down-to-the-north offset along this north-dipping fault. Analysis of wire-line logs from previous borings BE 5, the Pinkard No. 1, and SE 5.2C suggests that drag associated with the faulting may be present north of the fault. In addition, the down-thrown block has been rotated down to the south. The overall interpretation is a north-dipping main fault with about 15 feet of down-to-the-north offset surmounted by a smaller south-dipping antithetic fault with less than 5 feet of down-to-the-south offset (see Figure C-2). The two faults form a small graben where rocks inside the graben have been rotated down to the south.
- Mineralization/Alteration: Two noteworthy zones of fracturing were found in boring SE 5.2E that can be interpreted as faults. The upper-faulted interval in the Taylor Marl is from 50.7 to 76.6 feet (39.5 to 59.6 feet vertical depth). Fractures in this zone are typically gypsum filled, iron stained, and slightly weathered. The lower-faulted interval (in the Austin Chalk) is at a boring depth of 215.6 to 218.25 feet (119.7 to 171.8 feet vertical depth). Fractures in this second zone are typically unweathered and calcite filled. Several smaller fractured zones less than 2 feet thick (vertically) occur farther down the boring and are assumed to be associated with drag and fracturing on the main fault. These fractures are also unweathered and calcite filled where the fracture walls are separated.
- Dip Direction: Fractures associated with the upper fault (in Taylor Marl) have strikes that range from N85° W to S70° W and dip 11° to 86° south. Fractures associated with the lower main fault (in Austin Chalk) have strikes that range from N85° W to S62° W and dip 56° to 69° north.

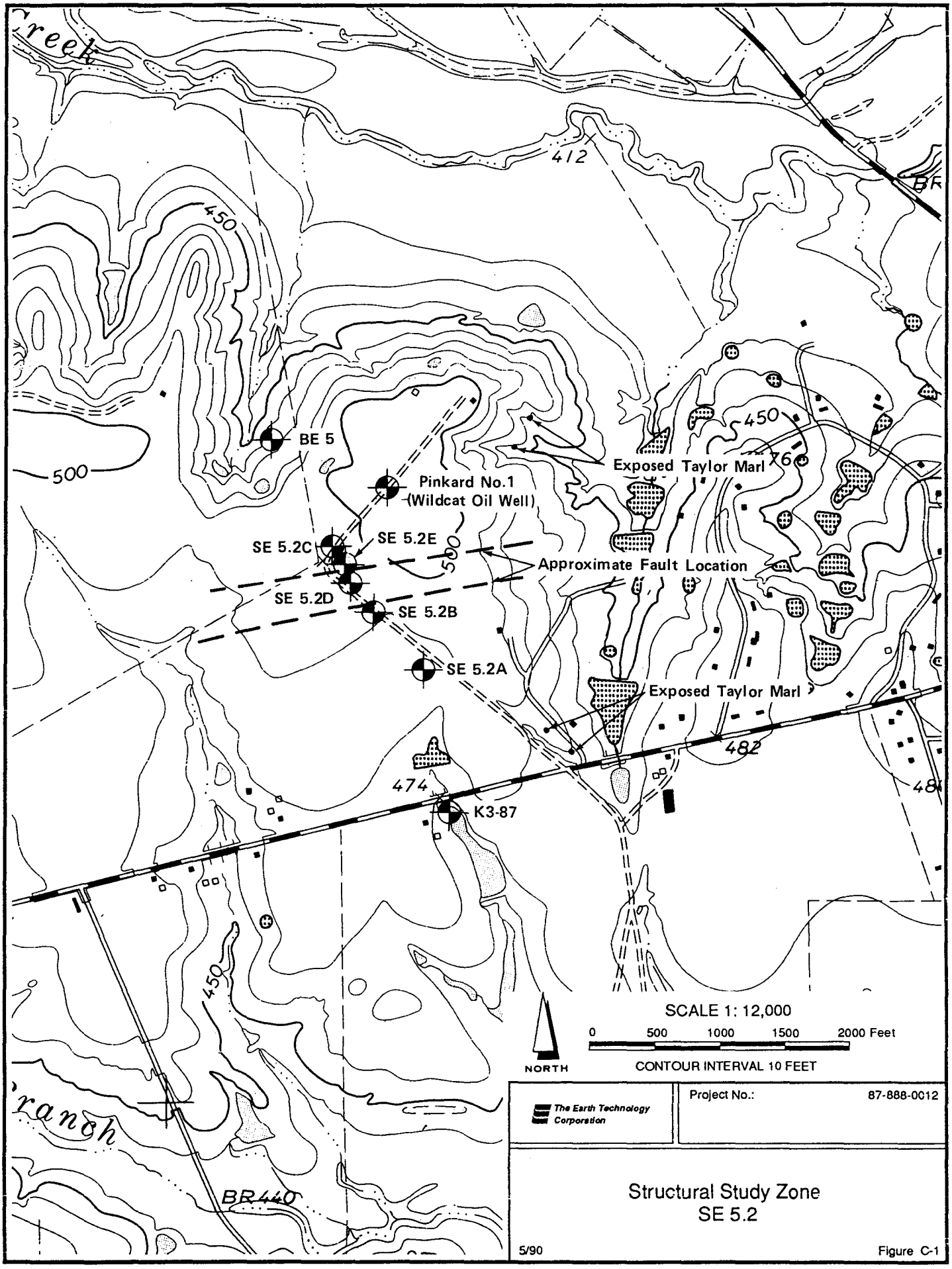
Downhole photography was made of the interval 200 feet to 288 feet. Cloudy borehole water inhibited view of borehole walls and detailed analysis was not possible (see Table C-1).

Fractures observed in exposed Taylor Marl 1,800 feet southeast of SE 5.2B and 2,000 feet northeast of SE 5.2B have strikes of N5° W to N30° E and dips of 40° to 69° southeast and 40° to 50° northwest. These exposures are severely weathered and iron stained.

- Fault Width: The width of the graben at the surface is estimated to be less than 570 feet based on the distance between borings SE 5.2E and SE 5.2B. A more precise width cannot be determined because Quaternary terrace deposits cover most of the area and the Taylor Marl does not provide an adequate number of exposures to be able to trace a fault on the surface.

  Assuming a 65° dip to the south on the small antithetic fault, the estimated fault thickness (in Taylor Marl) is about 3.2 feet. The main fault was encountered in the Austin Chalk and is assumed to dip about 65° to the north. The estimated thickness is about 2.4 feet.

- Fracture Spacing: Fracture spacing associated with the fault in the Taylor Marl ranges from 0.12 foot to 5.6 feet with an average of about 1.6 feet (±1.5 feet). Fracture spacing associated with the main fault in the Austin Chalk ranges from 0.3 foot to 3.25 feet with an average of 1.7 feet (±1.2 feet).



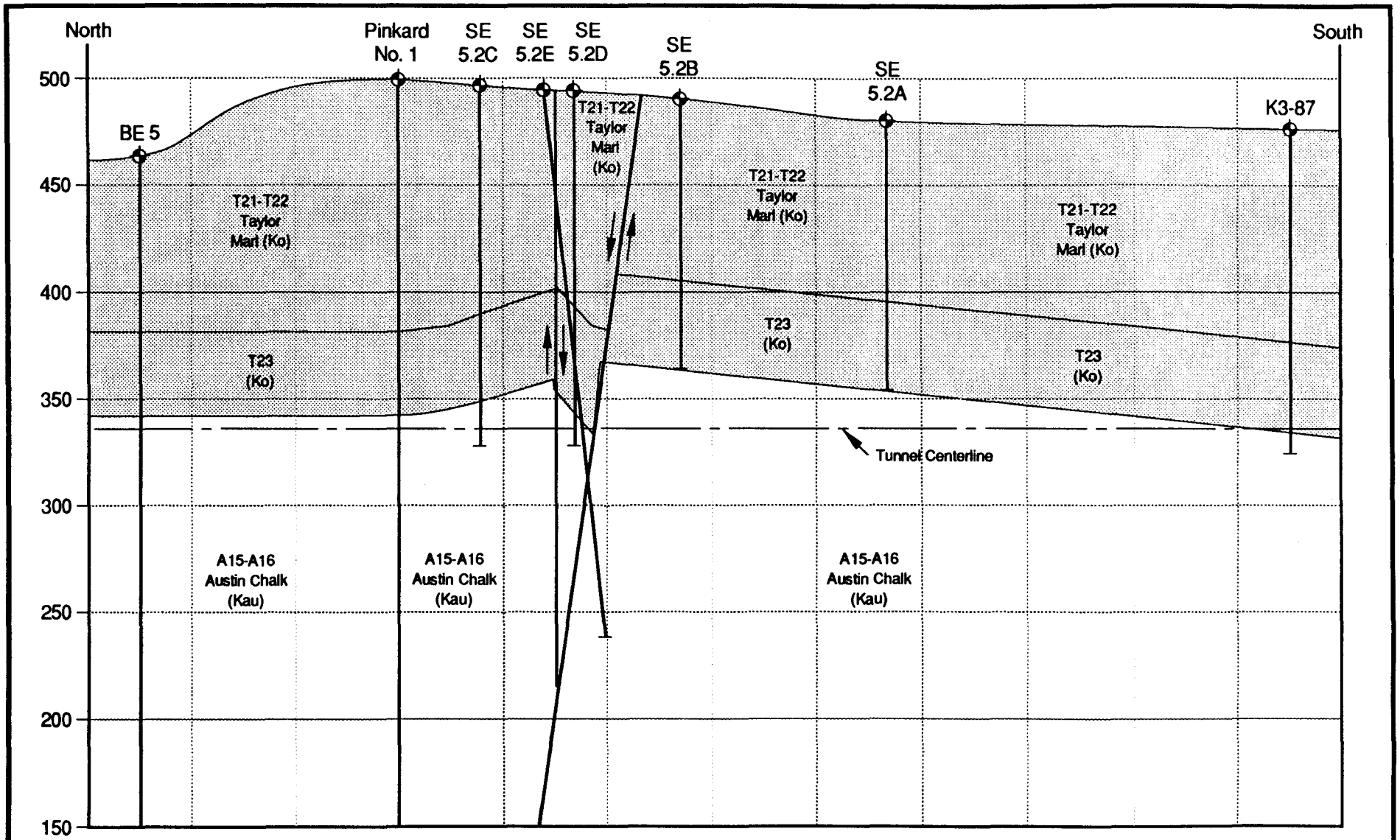
The Earth Technology Corporation

Project No.: 87-888-0012

Structural Study Zone
SE 5.2

5/90

Figure C-1



0 300 600 900 Feet
Horizontal Scale

0 50 100 150 Feet
Vertical Scale

The Earth Technology Corporation

Project No.: 87-888-0012

SE 5.2 Geologic Cross-Section

7/90

Figure C-2

DALLAS/FT. WORTH
SSC PROJECT

PHOTOGRAPHIC LOG

Boring No. SE 5.2E

Date Photographed: 4/3/90
Bearing: ~ S21°E
Vertical Angle: 40° (Plunge 50°)
Surface Elevation: 495'

Iris Setting: ~ 10.5
Boring Condition: Poor
Water Condition: Poor
Rock Section Photo: 200-288

Inclined Depth(ft)	Feature	Notes
200.0		Start Photography
288		Terminate Photography

Note: Cloudy borehole water inhibited view of borehole walls. Detailed analysis not possible.

TABLE C-1

APPENDIX D

HYDROLOGIC TEST RESULTS

APPENDIX D

HYDROLOGIC TEST RESULTS

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

Boring	Test Depth (feet)	Packer Pressure (psi)	Gauge Pressure (psi)	Formation/ Lithology	Hydraulic Conductivity (cm/sec)	Assumed Static Water Level* (feet)
SE 5.2E	204.1-226.3 (160.3-178.4 vertical depth)	225	30	Austin Chalk (fractured)	4.2×10^{-7}	9.6
SE 5.2E	275.1-296.3 (218.7-236.2 vertical depth)	200	40	Austin Chalk (fractured)	1.5×10^{-6}	9.6

* Static water level assumed to be at the top of weathered Taylor Marl.

At boring SE 5.2E two test intervals were selected based on a review of the lithologic and wire-line logs. The upper test interval was selected to provide hydrologic data for fractured Austin Chalk, near the top of the unit and at the potential tunnel elevation. The lower interval straddled an area of fractured Austin Chalk near the bottom of the boring. 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 flow meter; no calibrated container was used for the tests.

APPENDIX E

LABORATORY RESULTS

GEOMECHANICAL TEST RESULTS-BORING SE 5.2E

GENERAL LITHOLOGY	VERTICAL DEPTH	BORING DEPTH	MOISTURE CONTENT	DRY DENSITY	SPECIFIC GRAVITY	ATTERBERG LIMITS		FRACTION FINER THAN # 200 SIEVE	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 TABOR ABRASION/ HARDNESS INDEX	COMMENTS
						LL	PI						CONFINING PRESSURE	DEVIATOR STRESS		E50	UNLOAD/ RELOAD						
	feet	feet	percent	pcf				percent	percent	L/D		psi	σ_3 psi	σ_1-σ_3 psi	percent	(psi)x10E5	(psi)x10E5	σ_3 psi		psi	percent		
AUSTIN CHALK	204.0	257.3	10.9	127.8																			
AUSTIN CHALK	204.3	257.7	10.1	128.8						2.3	D	2573			0.83	3.74		0					
AUSTIN CHALK	219.0	275.5	10.6	130.0	2.67					2.3	D		200	3306	0.88	4.17		200					
AUSTIN CHALK	219.4	276.0	12.1	126.7						2.4	A		300	3632	0.98	4.62		300					NOTE 1
AUSTIN CHALK	219.4	276.0														9.26			0.16				NOTE 2
AUSTIN CHALK	219.8	276.4	12.6	124.7																			
AUSTIN CHALK	220.3	277.1	9.6	132.5																			
AUSTIN CHALK	220.7	277.5	9.7	132.3						2.4	D	3190			0.80	4.51		0					
AUSTIN CHALK	221.0	277.9	9.5	129.7						0.5										361			
AUSTIN CHALK	223.0	280.3	8.8	134.8																			
AUSTIN CHALK	223.3	280.7	9.4	133.9						2.3	D	2721			0.68	4.71		0					
AUSTIN CHALK	229.1	287.7	7.8	137.7																			
AUSTIN CHALK	229.5	288.1	8.3	134.3						0.6										397			
AUSTIN CHALK	229.8	288.5	8.4	136.0						2.3	D	3346			0.72	6.49		0					
AUSTIN CHALK	233.3	292.7	9.2	134.7																			
PROCEDURE			ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D422				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ISRM	ISRM	ISRM	

SE52EPRT.WK1
REVISION: 1.0
DATE: 5/2/90

PRELIMINARY
(Subject to Revision)

* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

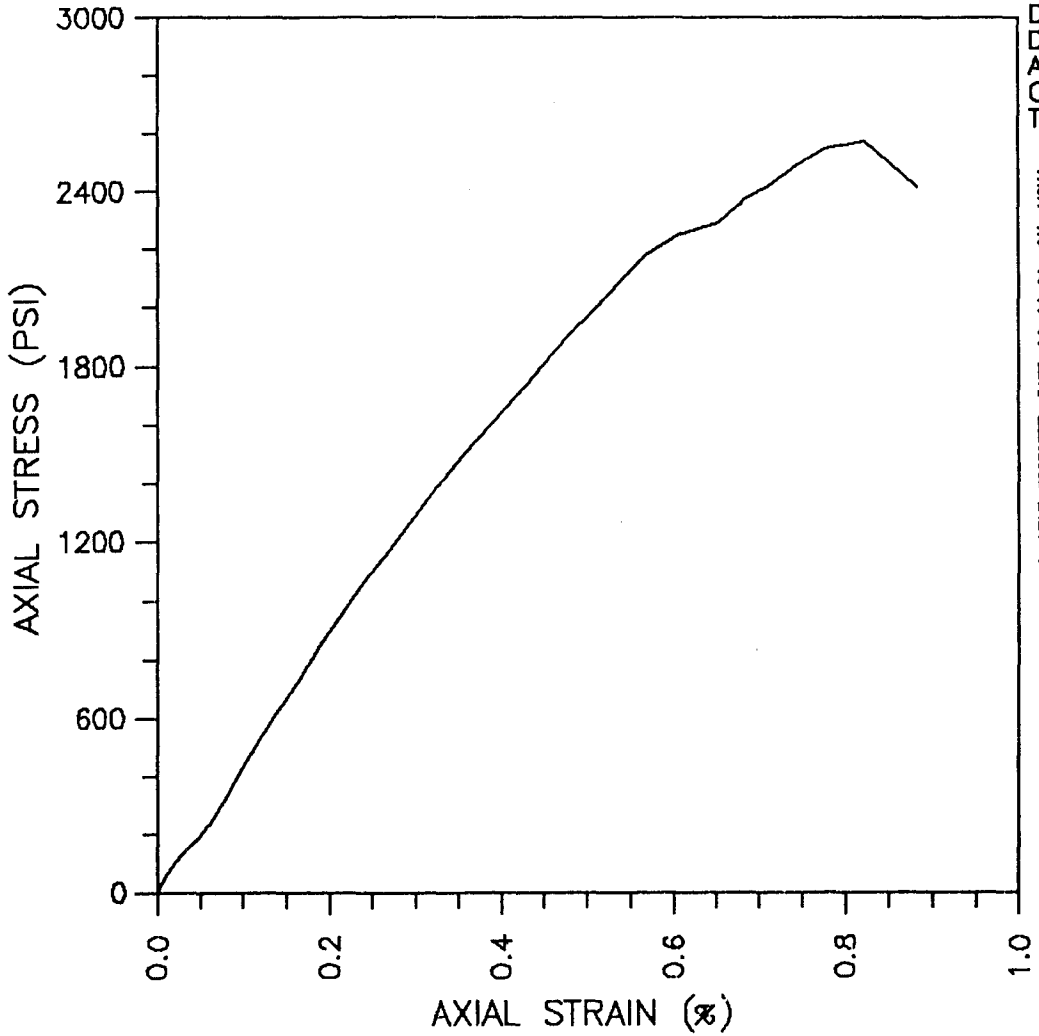
Symbol	Failure Type	Symbol	Failure Type
A	No discernible failure plane	B-4	Combination
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core	C	Barreling/Bulging
B-1	Shear plane	D	Longitudinal (axial) splitting
B-2	Bedding plane shear	E	Conical
B-3	Shear plane along pre-existing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

Note: Some values in this table may be revised based on reviews of test procedures and individual test results. The reader should refer to the latest revision of the gINT geotechnical data base (geotechnical report GR-70).

NOTES: 1) MODULUS WAS CALCULATED FROM AXIAL STRAINS MEASURED USING DIAL MICROMETER. AXIAL LENGTH IS THE SAMPLE LENGTH.

2) MODULII AND POISSON'S RATID WERE CALCULATED FROM AXIAL AND LATERAL STRAINS MEASURED USING AXIAL AND LATERAL LVDTS. AXIAL LENGTH IS 2.8 INCHES.

BORING NO.: SE 5.2E
BORING DEPTH: 257.7 FEET
VERTICAL DEPTH: 204.3 FEET
AUSTIN CHALK LIMESTONE



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 10.1
DRY UNIT WEIGHT (PCF): 128.8
DEG. OF SATURATION (%): 88.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION (ASTM D 2938)

GFILE: ES3E2577 DATE: 06-14-90 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.738 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

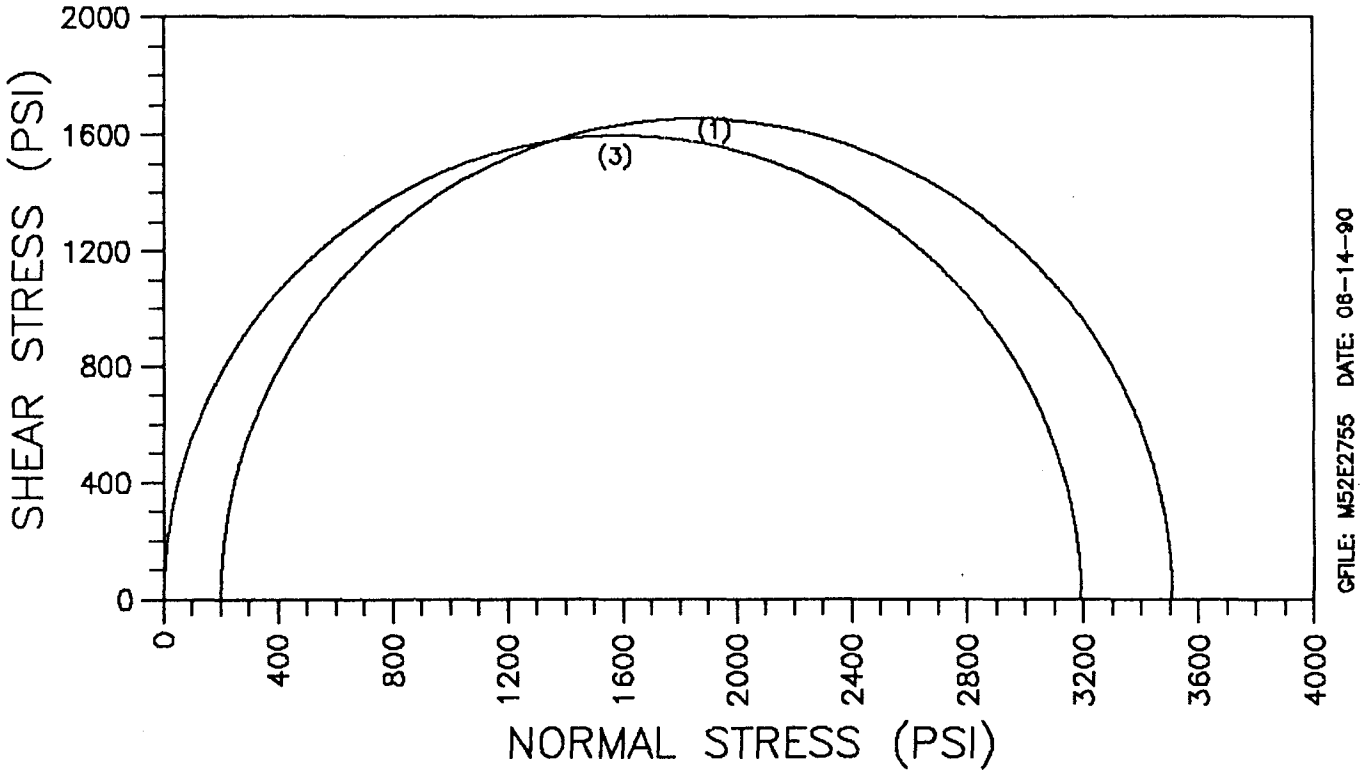
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE 5.2E
BORING DEPTH RANGE: 275.5-277.9 FEET
VERTICAL DEPTH RANGE: 219.0-221.0 FEET
AUSTIN CHALK LIMESTONE



GFILE: M52E2755 DATE: 08-14-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

INCL. (DEG. FROM VERT.): APPROX. 40
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)

(1) DEPTH (FT): 275.5
(2) DEPTH (FT): 276.0(THIS SAMPLE DID NOT FAIL-DELETED FROM MOHR CIRCLE PLOT)
(3) DEPTH (FT): 277.5

TEXAS SSC SITE

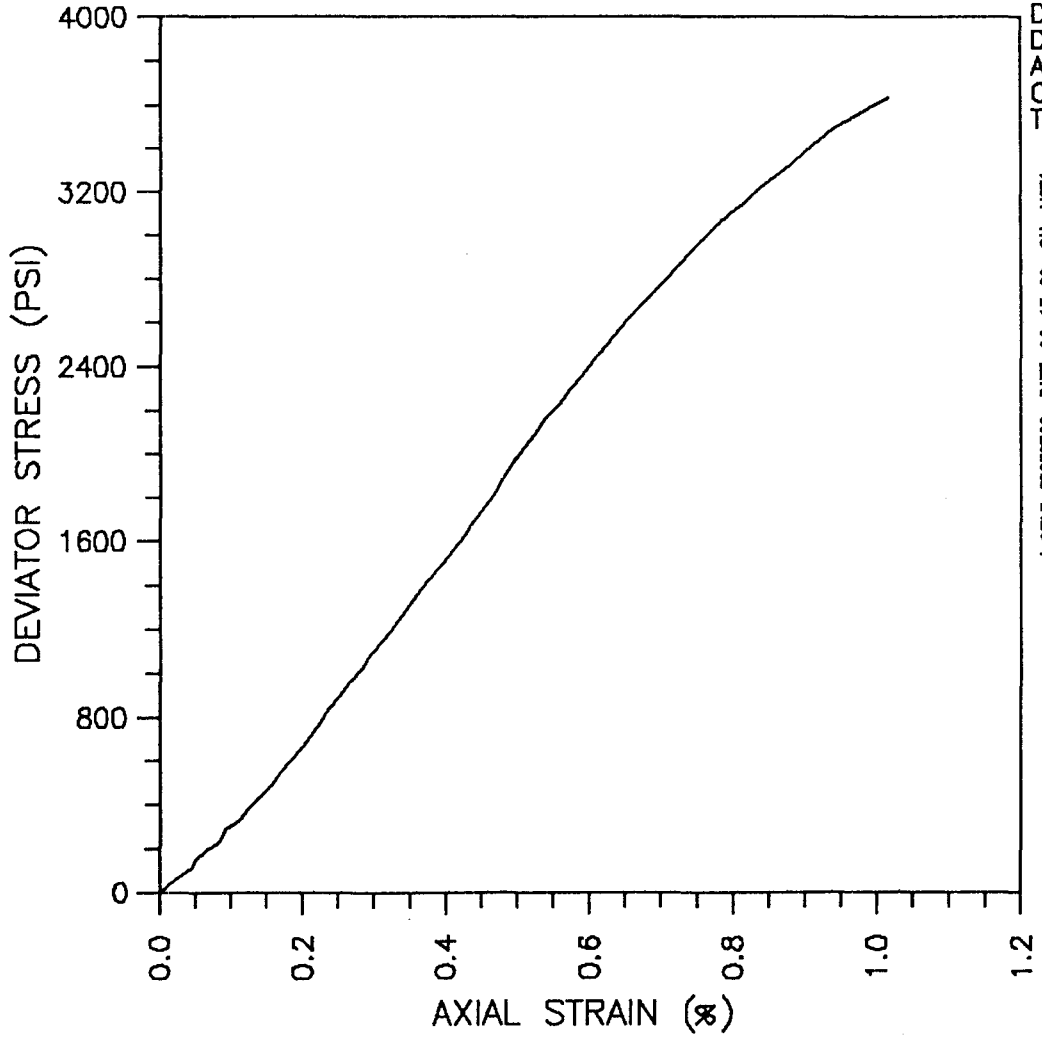
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE 5.2E
BORING DEPTH: 276.0 FEET
VERTICAL DEPTH: 219.4 FEET
AUSTIN CHALK LIMESTONE



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 12.1
DRY UNIT WEIGHT (PCF): 126.7
DEG. OF SATURATION (%): 98.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: E32E2760 DATE: 06-13-90 CAL: MCT4

TANGENT MODULUS AT 50%
MAXIMUM STRESS:
4.624 x10E5 PSI

FAILURE MODE:
LOADED TO 3632 PSI
W/O FAILURE

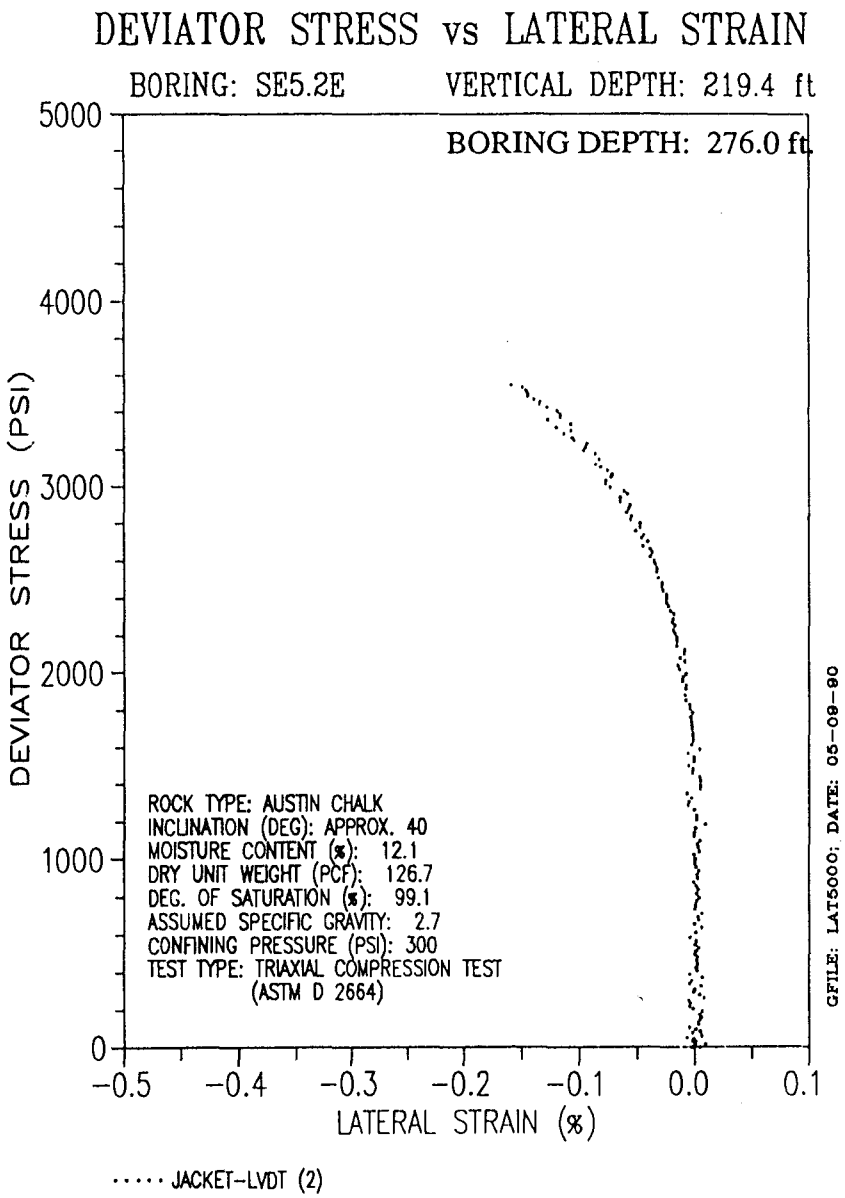
TEXAS SSC SITE

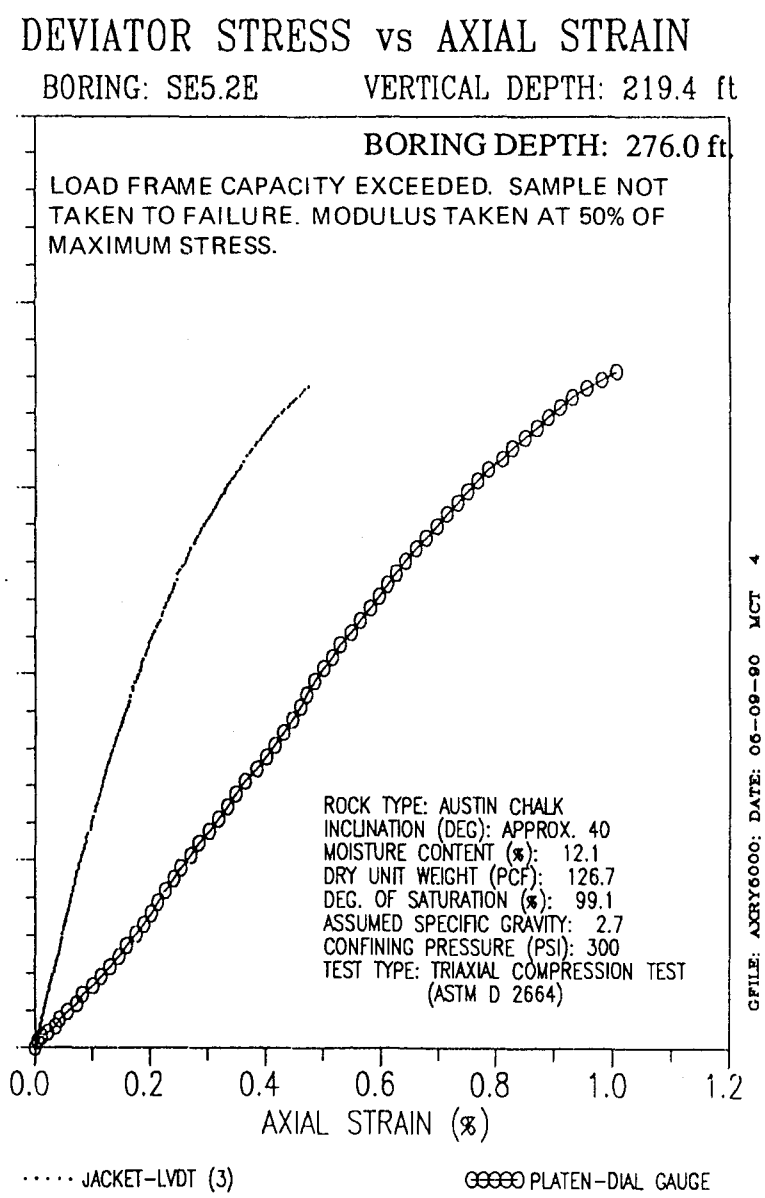
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

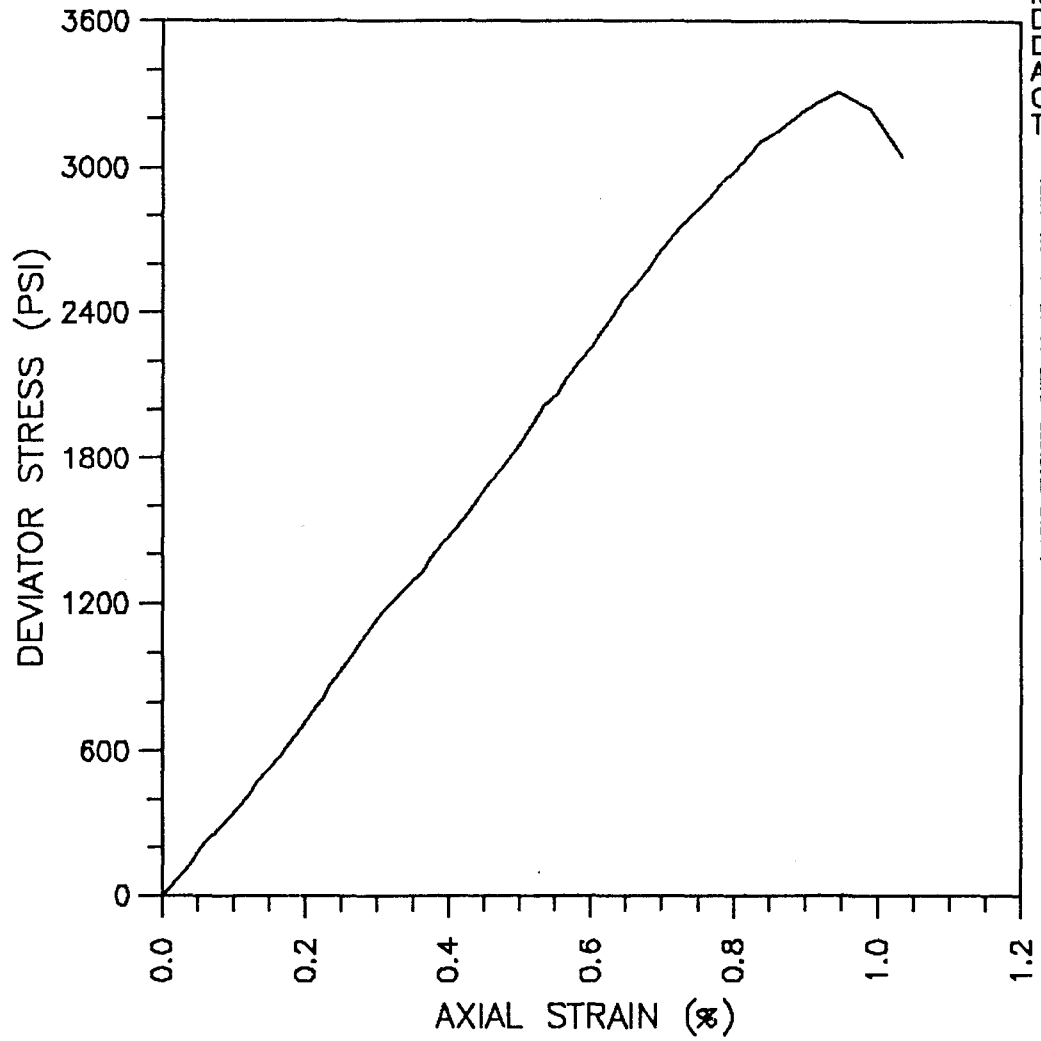
FIGURE





PRELIMINARY

BORING NO.: SE 5.2E
BORING DEPTH: 275.5 FEET
VERTICAL DEPTH: 219.0 FEET
AUSTIN CHALK LIMESTONE



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 10.6
DRY UNIT WEIGHT (PCF): 130.0
DEG. OF SATURATION (%): 96.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: E32E2756 DATE: 06-13-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.167 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

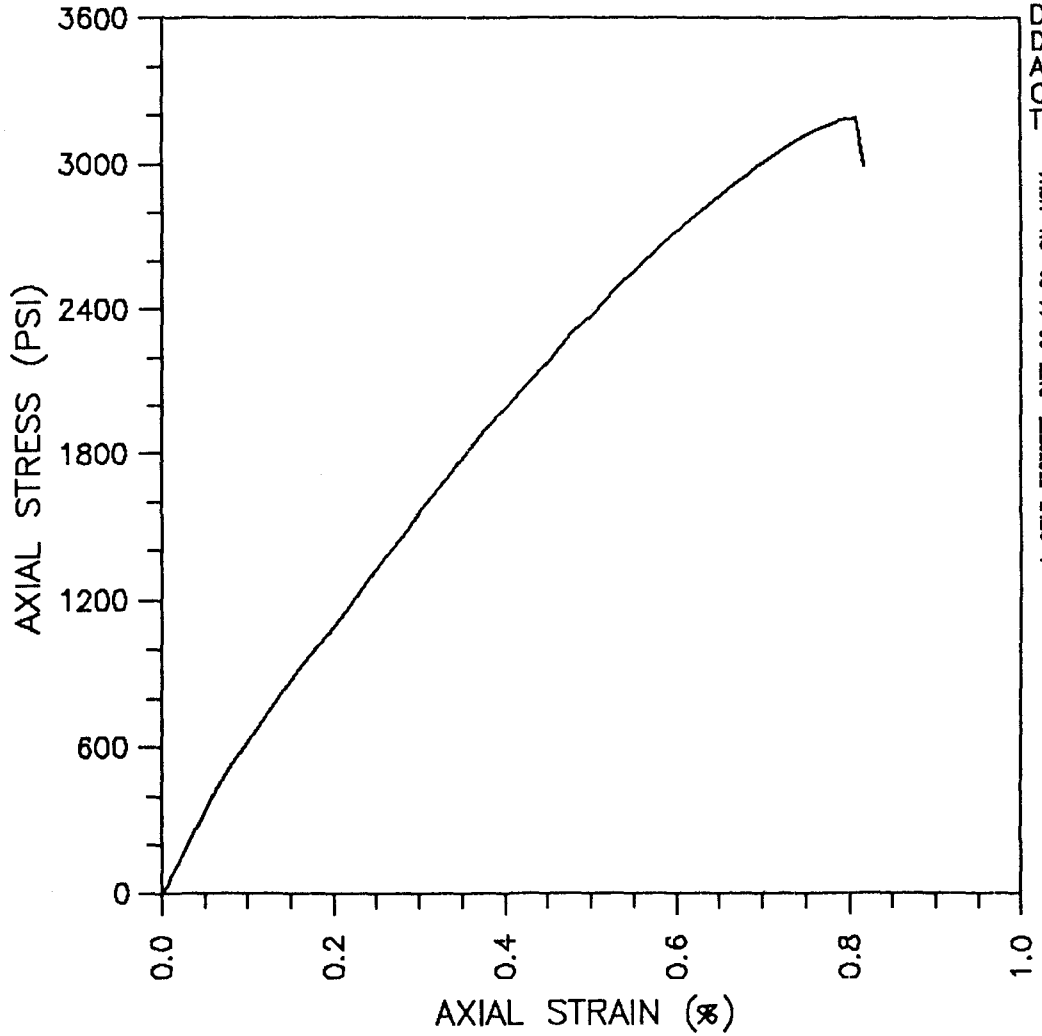
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE 5.2E
BORING DEPTH: 277.5 FEET
VERTICAL DEPTH: 220.7 FEET
AUSTIN CHALK LIMESTONE



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 9.7
DRY UNIT WEIGHT (PCF): 132.3
DEG. OF SATURATION (%): 95.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: E32E2775 DATE: 06-14-90 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.511 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

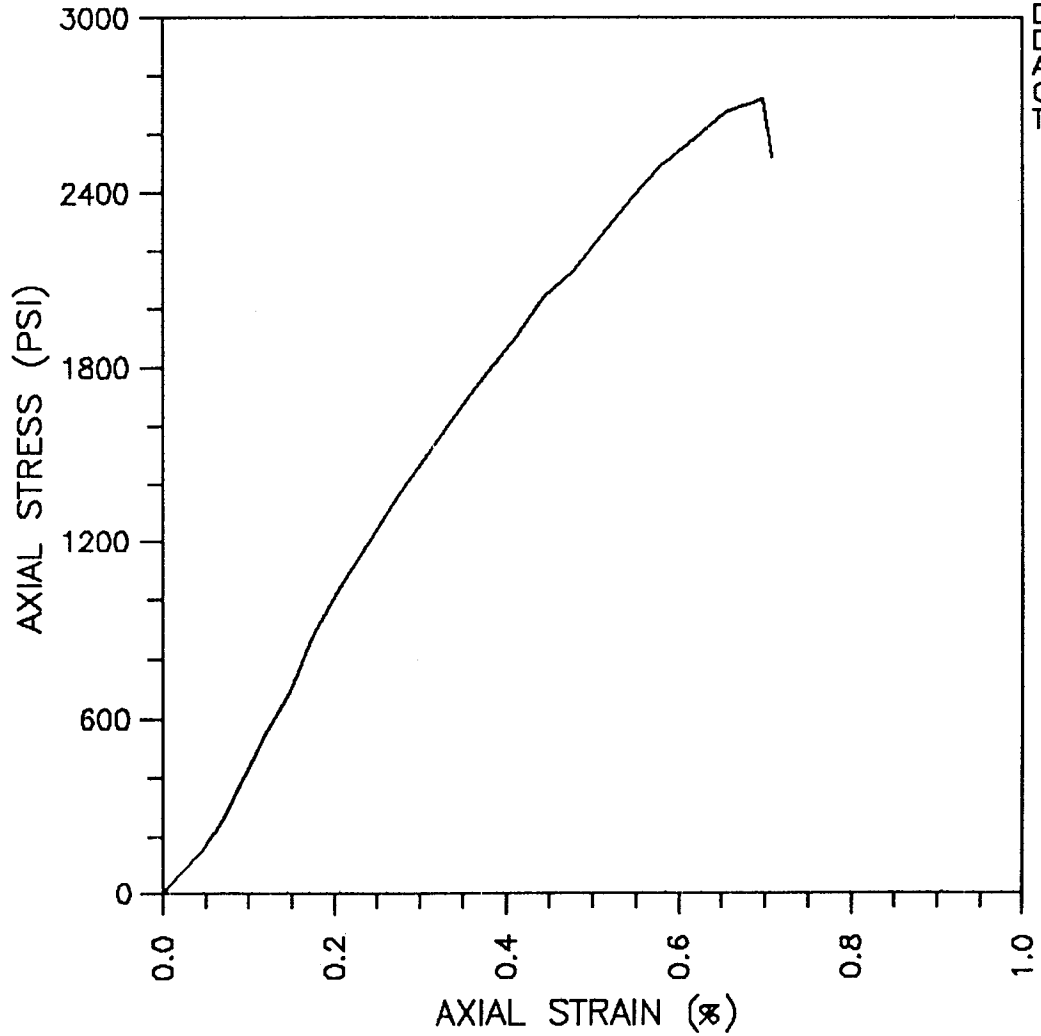
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE 5.2E
BORING DEPTH: 280.7 FEET
VERTICAL DEPTH: 223.3 FEET
AUSTIN CHALK LIMESTONE



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 9.4
DRY UNIT WEIGHT (PCF): 133.9
DEG. OF SATURATION (%): 98.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: E32E2807 DATE: 06-14-90 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.706 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

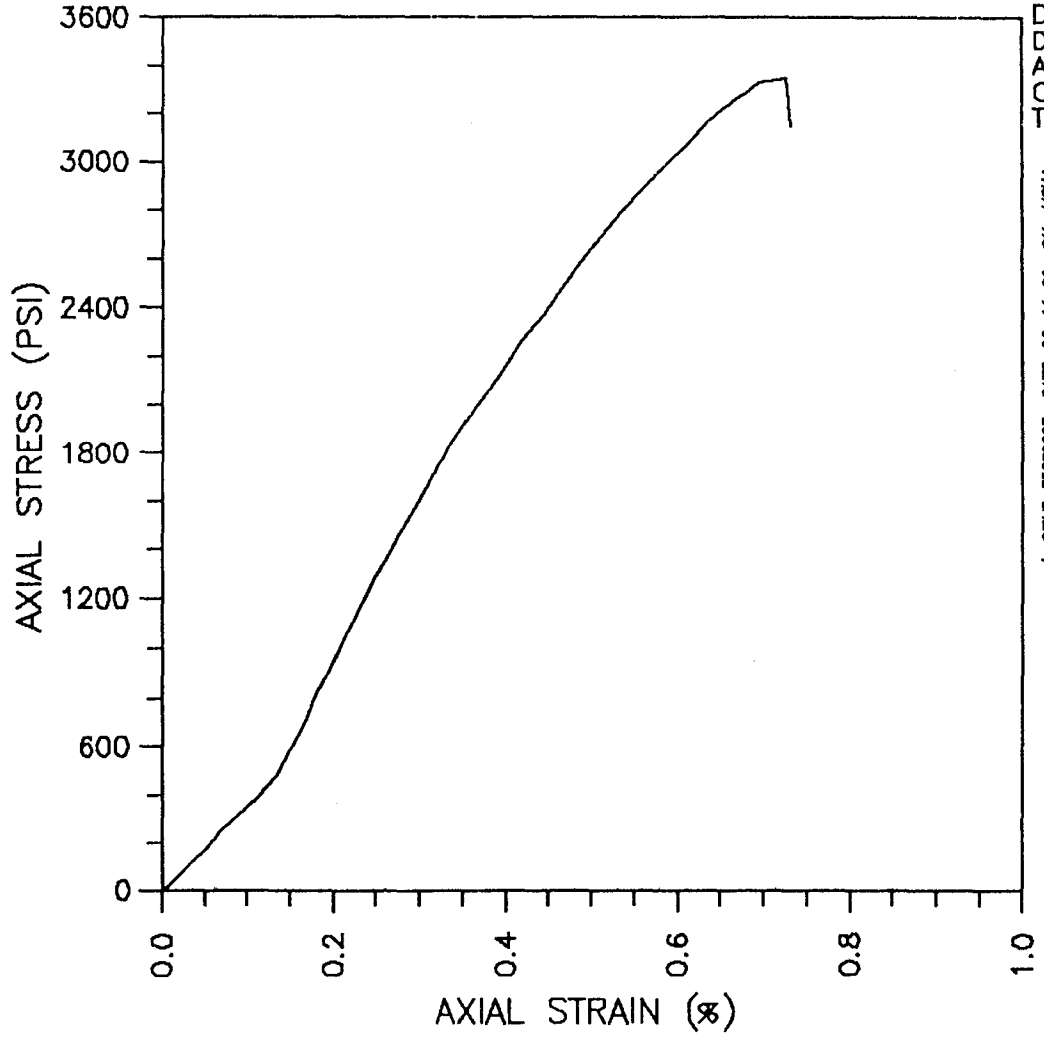
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE 5.2E
BORING DEPTH: 288.5 FEET
VERTICAL DEPTH: 229.8 FEET
AUSTIN CHALK LIMESTONE



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 8.4
DRY UNIT WEIGHT (PCF): 136.0
DEG. OF SATURATION (%): 95.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: E52E2885 DATE: 06-14-90 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.486 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

APPENDIX F

PLUGGING REPORTS

SSC BOREHOLE PLUGGING REPORT

Project No. 87-888

Task No. 12

Boring No. SE 5.2A

Texas Coordination Location: N 277,222 feet
E 2,246,258 feet

Surface Elevation: 478 feet

Total Boring Depth: 125.0 feet

Date Drilled: 3/19/90

Date plugged: 3/19/90

Time Completed: 5:30 p.m.

Remarks:

140 gallons of grout (tremie placed) was used to completely cement boring from bottom to top. Water/cement ratio was approximately 7 gallons per sack.

Drilling geologist: Dale Brown
Coordinator: Bruce Bailey
SwL Report No. 89-192

SSC BOREHOLE PLUGGING REPORT

Project No. 87-888

Task No. 12

Boring No. SE 5.2B

Texas Coordination Location: N 277,600 feet
E 2,245,858 feet

Surface Elevation: 490.3 feet

Total Boring Depth: 125.0 feet

Date Drilled: 3/19/90

Date Plugged: 3/20/90

Time Completed: 11:30 a.m.

Remarks:

183 gallons of grout (tremie placed) was used to completely cement boring from bottom to top. Water/cement ratio was approximately 7 gallons per sack.

Drilling geologist: Dale Brown
Coordinator: Bruce Bailey
SwL Report No. 89-192

SSC BOREHOLE PLUGGING REPORT

TETC Project No. 87-888-0012

Task No. 12

Boring No. SE 5.2C

Texas Coordinate Location:

~N278,125 Feet; ~E2,245,540 Feet

Surface Elevation: ~495 Feet

Total Boring Depth: 166.0 Feet

Plugging Remarks:

Borehole grouted through a tremie pipe. Grout mix consisted of water cement ratio approximately 8 to 8-1/2 gallons of water per sack of cement. One shovel of bentonite was added for each 2 sacks of cement. All casing was removed from the borehole.

Date Plugged: 4/04/90

Time Completed: 5:15 pm

Drilling Geologist: W.D. Flanigan
MJA Coordinator: W.D. Flanigan
MJA No.: 5530.12

SSC BOREHOLE PLUGGING REPORT

TETC Project No. 87-888-0012

Task No. 12

Boring No. SE 5.2D

Texas Coordinate Location:

~N277,858 Feet; ~E2,245,628 Feet

Surface Elevation: ~493 Feet

Total Boring Depth: 161.0 Feet

Plugging Remarks:

Unable to place tremie pipe past 50 feet. Borehole grouted through tremie pipe above this depth. Water cement ratio approximately 8 to 8-1/2 gallons of water per sack of cement. One shovel of bentonite added per 2 sacks of cement. All casing was removed from the borehole.

Date Plugged: 4/04/90

Time Completed: 4:15 pm

Drilling Geologist: W.D. Flanigan
MJA Coordinator: W.D. Flanigan
MJA No.: 5530.12

SSC BOREHOLE PLUGGING REPORT

TETC Project No. 87-888-0012

Task No. 12

Boring No. SE 5.2E

Texas Coordinate Location:

~N277,945 Feet; ~E2,245,580 Feet

Surface Elevation: ~495 Feet

Total Boring Depth: 315.0 Feet

Plugging Remarks:

Borehole grouted through tremie pipe. Grout mix consisted of 7.5 to 8.5 gallons of water per sack of cement. One shovel of bentonite was added per 2 sacks of cement. All casing was removed from the borehole.

Date Plugged: 4/04/90

Time Completed: 3:00 pm

Drilling Geologist: W.D. Flanigan
MJA Coordinator: W.D. Flanigan
MJA No.: 5530.12

Rev. 4/24/90