DCK PERREAULT
3/12/90

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT
Design Section 6
East Papago- Hohokam-Sky Harbor Freeways
ADOT Project No. 202L MA H 0855 01D
Arizona Department of Transportation
Maricopa County, Arizona

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SHB Job No. E87-56
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February 12, 1990

DMJM
Suite 335
300 West Clarendon Avenue
Phoenix, Arizona 85013-3499

SHB Job No. E87-56
Letter No. 523

Attention: Thomas M. Monchak, P.E.
Project Manager

ENGINEERING DIVISION
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Re: East Papago - Hohokam -
Sky Harbor Freeways
ADOT Project No. 202L MA H 0855 01D
Arizona Department of Transportation
Maricopa County, Arizona

Gentlemen:

Our Preliminary Geotechnical Investigation Report for Design Section 6 of the referenced project is submitted herewith. The report includes results of test drilling, laboratory analysis and recommendations for the design of foundations, retaining walls and embankments.

Should any questions arise concerning this report, we would be pleased to discuss them with you.

Respectfully submitted,
Sergent, Hauskins & Beckwith Engineers

By _____
Anwar Hirany, Ph.D., P.E.
Project Manager

Reviewed by _____
George H. Beckwith, P.E.

Copies: Addressee (2)

klp/87J-6/2-12-90

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1. INTRODUCTION

This report presents the results of our preliminary geotechnical investigations for Design Section 6 of the East Papago-Hohokam-Sky Harbor Freeways project and provides preliminary guidelines for the design of bridge foundations, retaining walls, and embankments. It should be noted that our preliminary geotechnical investigation will have to be complemented with a supplementary investigation by the Section Designer for the final design of the structure foundations.

The following reports submitted by Sergent, Hauskins & Beckwith Geotechnical Engineers, Inc. (SHB), to DMJM complement this report:

Interim Environmental Evaluation Report, SRP-75 & SRP-78 Landfills (Letter No. 485, 1/24/90).

Environmental and Hydrogeological Characterization of the Old Tempe Landfill Area (Draft Report, Letter No. 314, 1/6/89).

Geotechnical Engineering Guidelines Manual (Final Draft Report, Letter No. 280, 9/23/88).

Comparison of Three Alternative Alignments for Design Section 6 (Letter No. 238, 7/6/88).

2. PROJECT DESCRIPTION

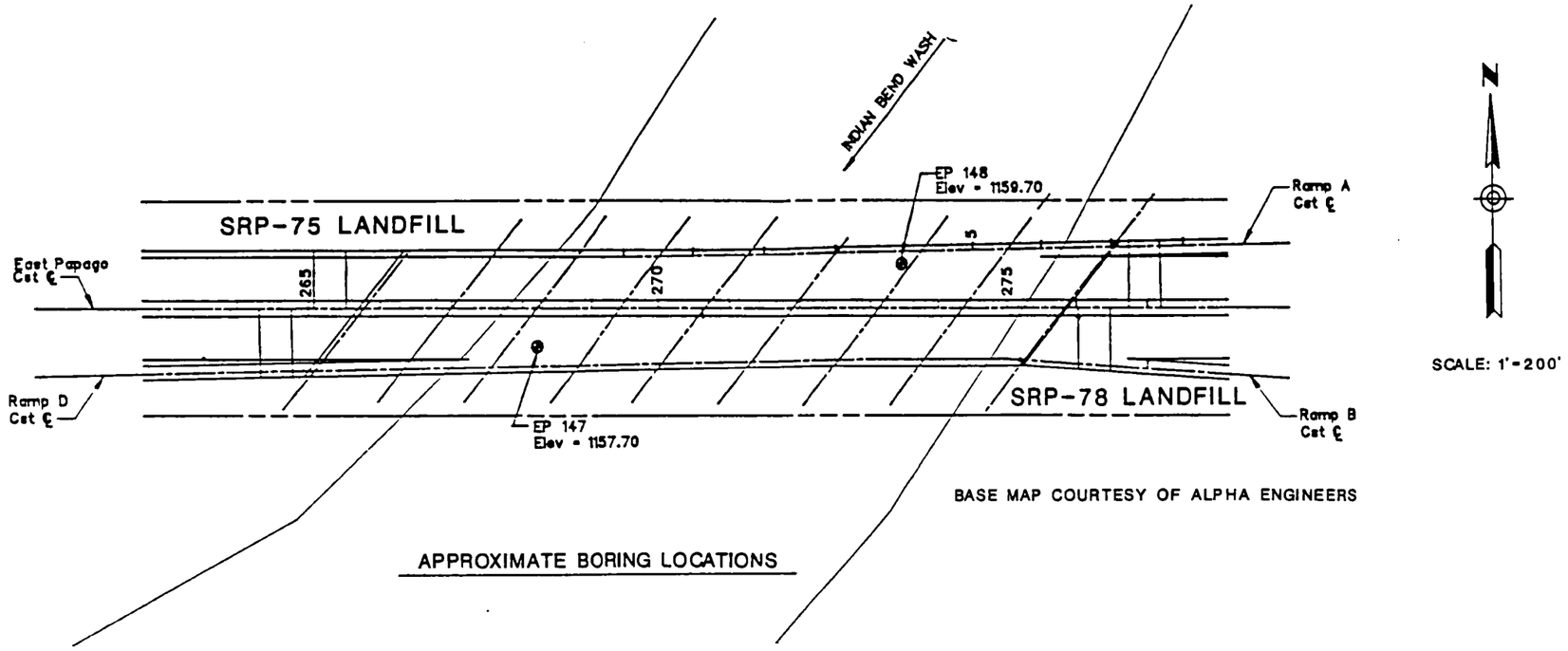
Preliminary details of Design Section 6 of the East

Papago-Hohokam-Sky Harbor Freeways project were provided by DMJM and Gannett Fleming Engineers and Planners.

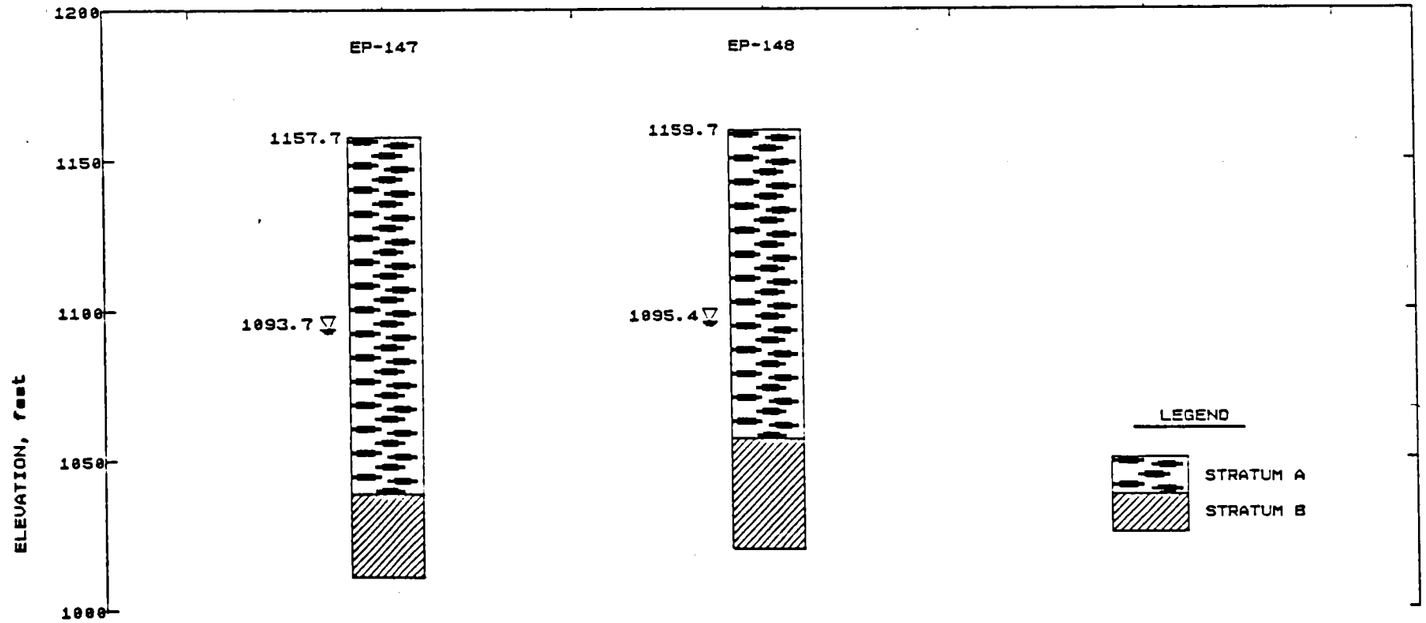
Design Section 6 of the project includes the East Papago Freeway between Indian Bend Wash and the Outer Loop Traffic Interchange (Red Mountain TI). Two bridge structures are proposed in Design Section 6, one at Indian Bend Wash and one at Hayden Road (Salt River Bridge). The approximate locations of the bridges are shown in Figure 1.

Apart from the two bridges, the East Papago Freeway in Design Section 6 is proposed to be constructed almost exclusively on fill. West of Indian Bend Wash the fill height will be about 18 feet, and it will vary from approximately 20 feet at the east end of the Indian Bend Wash Bridge to approximately 50 feet at the west end of the Salt River Bridge.

According to DMJM, embankment volumes have been estimated at approximately 0.75 million cubic yards. Although a borrow source has not been designated at the present time, we have been informed by DMJM that excavation from the Salt River will most likely provide borrow for the embankments.



APPROXIMATE BORING LOCATIONS



GENERALIZED SOIL PROFILE

FIGURE 1a

INDIAN BEND WASH BRIDGE

East Papago - Hohokam -
Sky Harbor Freeways
ADOT Project No. 202L MA H 0855 01D
Arizona Department of Transportation
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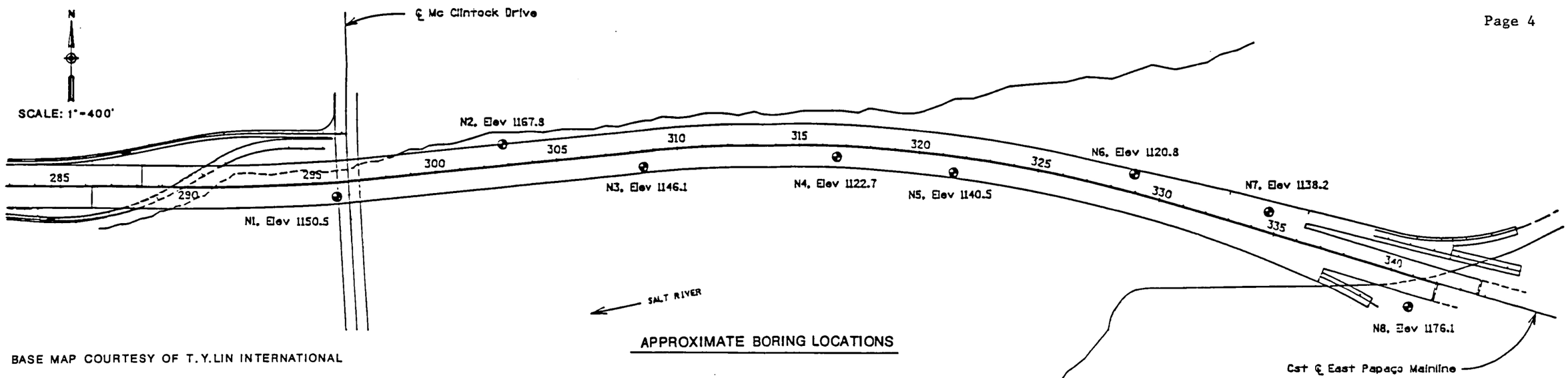
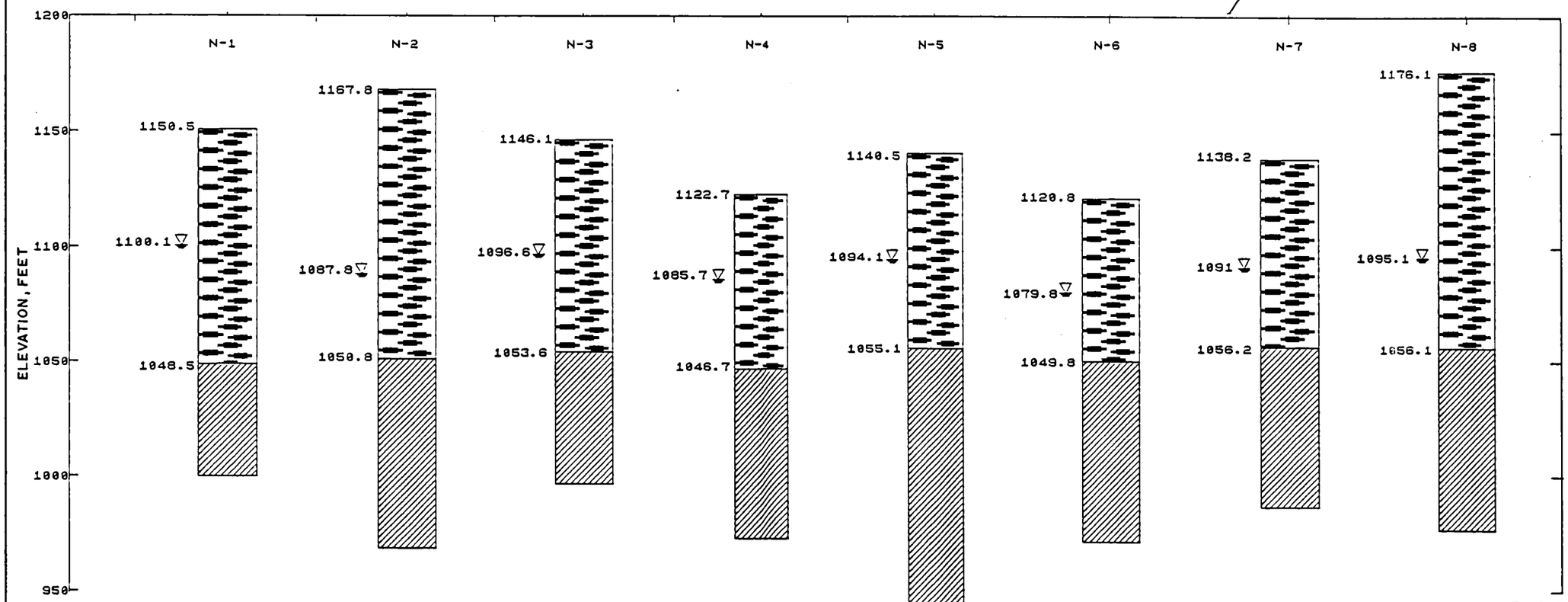


APPROXIMATE BORING LOCATIONS

BASE MAP COURTESY OF T.Y.LIN INTERNATIONAL



GENERALIZED SOIL PROFILE

LEGEND

STRATUM A

STRATUM B

FIGURE 1b

SALT RIVER BRIDGE

East Papago - Hohokam -
Sky Harbor Freeways
ADOT Project No. 202L MA H 0855 01D
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Maricopa County, Arizona
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3. INVESTIGATION

3.1 Review of Existing Data

Existing geologic, geotechnical and hydrologic data pertaining to Design Section 6 were reviewed. Included in the review were U.S. Geologic Survey topographic maps, aerial photographs, geologic and geotechnical feasibility studies performed for the referenced project by the Earth Technology Corporation and previous geotechnical investigations performed in the general area by SHB.

3.2 Subsurface Exploration

A total of ten test borings were drilled by SHB and Layne Environmental for the preliminary geotechnical investigation along the final alignment of the two-bridge structures in Design Section 6. Test Borings EP-147, EP-148, N-1, N-3, N-5, N-7 and N-8 were advanced to depths ranging from 140 to 200 feet by SHB utilizing a Schramm Rotadrill. Borings N-2, N-4 and N-6 were advanced to depths ranging from 149.7 to 200 feet by Layne Environmental with an AP 1000 Percussion Hammer rig, which is similar to the Becker Drill described in Appendix A. A brief description of the Schramm Rotadrill is also given in Appendix A.

Logs of all borings are presented in Appendix A. Appendix A also includes a brief description of drilling and sampling equipment and procedures. Boring locations are shown on Drawing 541 (six sheets in map pocket). The coordinates defining the hole locations and the top of boring elevations were provided by Johannessen and Girand Consulting Engineers, Inc.; these are shown on the boring logs and are also tabulated in Appendix A. Approximate locations of borings for the bridge structures are also shown in Figure 1.

Prior to the selection of the final north alignment east of Hayden Road for Design Section 6, six borings (EP-153 through EP-158) were drilled by SHB along the proposed southern alignment for the Salt River bridge. These borings were drilled by the ODEX method (overburden drilling by the eccentric method) to depths ranging from 123.9 to 154.4 feet. Logs of these borings are presented in Appendix C. The coordinates defining the hole locations and the top of boring elevations were provided by DMJM; these are shown on the boring logs and are also tabulated in Appendix C.

Five pressuremeter tests were performed in Borings EP-153 and EP-154. Results of these tests are given in Appendix E.

3.3 Laboratory Analysis

The following laboratory tests were performed on selected soil samples obtained from the test pits and borings:

grain-size distribution
moisture content
Atterberg limits
consolidation
unconfined compression
unconsolidated undrained (UU) triaxial

Moisture content and dry density test results are reported on the boring logs in Appendix A, while Atterberg limits, grain-size distributions, consolidation, unconfined compression and UU triaxial test results for Borings EP-147, EP-148 and N-1 through N-8 are presented in Appendix B. A summary of the laboratory test results performed on selected samples obtained from these borings is given in Table 1.

Laboratory test results for Borings EP-153 through EP-158 are reported in Appendix D. Table 2 gives a summary of these test results.

TABLE 1
SUMMARY OF LABORATORY TESTS FOR FINAL ALIGNMENT

BORING NO	DEPTH (ft)	ELEV. (ft)	SOIL CLASS.	LL (%)	PI (%)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	UNCONFINED COMP. STRENGTH (tsf)	UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (tsf)						CONSOLIDATION	
									(σ3)	(σ1-σ3)	(σ3)	(σ1-σ3)	(σ3)	(σ1-σ3)	PRECOMP. STRESS (tsf)	Cc/(1+eo)
N-1	104.5	1046	CL	46	22	30.5										
N-1	128	1022.5	CH	60	36	33.8	88.1	2.7							10	0.19
N-1	149.5	1001	CH	65	42	27.8										
N-2	129.5	1038.3	CH	55	32	33.1	89.2									
N-2	149	1018.8	ML	41	15	27.4	95.5		7	7.4						
N-2	169	998.8	ML	35	10	21.3	106.5		7	10.2					6	0.09
N-3	92.3	1053.8	ML	34	6	28.7	90.3	1.4							9	0.11
N-3	117.7	1028.4	CL	37	13	25.6	90.9	0.3							8	0.14
N-3	139	1007.1	CL	44	25	26.6	86.2									
N-4	89	1033.7	ML	32	6	28.1	96.1									
N-4	109	1013.7	ML	38	12	24.4	97.9		4.5	5.8						
N-4	129	993.7	CL	36	14	25.3	99.9	1.2								
N-5	153	987.5	CH	58	36	26.2	96.2	4.8							8	0.15
N-5	173	967.5	CH	55	30	30.3	91.6	2.4							7	0.18
N-6	89	1031.8	CL	45	24	26.3	98.7	1.7	3.5	1.9	7	2.6			2.5	0.12
N-6	109	1011.8	CH	56	34	25.1	97.1		4.5	4.7						
N-6	129	991.8	CL	46	27	18.1	110.5	2.5	5	3.8					5	0.15
N-7	89	1049.2	CH	53	29	29.8	101.4		1.2	2.4	2.4	2.1	3.6	1.9	7	0.22
N-7	110	1028.2	SP-SM	NV	NP	20.4	103.8		1.2	4.8						
N-7	120	1018.2	ML	31	4	22.7	102		2.4	5.8						
N-7	134.5	1003.7	CH	51	30	22	104		5	7.6					8	0.11
N-8	129	1047.1	ML	33	9	27.6	92									
N-8	139	1037.1	CL	30	8	20.5	107.7		7	3.3						
N-8	154	1022.1	CL	46	24	21.8	105.6		7	7.8					9	0.1
N-8	164	1012.1	CH	59	33	36.1	85.4	2.5							9	0.26
N-8	165	1011.1	ML	34	9	36.2	80.1		2	3	3.5	2.8	7	5.2		
N-8	190	986.1	CL	30	11	18.8	110.3									
EP-147	120.5	1037.2	ML	36	11	17.7	110	1.8							2.5	0.16
EP-147	145	1012.7	SM	NV	NP	17	102.6	0.7							12.5	0.21
EP-148	107	1052.7	CL	43	20	26	78.6	1								
EP-148	123	1036.7	CL	58	35	33.7	81.3	0.6							1.5	0.19
EP-148	131.5	1028.2	SC	43	26	35.3	86.2								1.3	0.16

TABLE 2

SUMMARY OF LABORATORY TESTS FOR EP-153 THROUGH EP-158

BORING NO	DEPTH (ft)	ELEV. (ft)	SOIL CLASS.	LL (%)	PI (%)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	UNCONFINED COMP. STRENGTH (tsf)	CONSOLIDATION PRECOMP. STRESS (tsf)	CONSOLIDATION Cc/(1+eo)
EP-153	10	1142.4	GW	NV	NP					
EP-153	113	1039.4	CL	45	23	26.5	96.3	1.9	5.5	0.14
EP-153	132.5	1019.9	ML	37	9	22.5	102.8	1.9	5.5	0.08
EP-153	146.5	1005.9	CH	88	64	40.3	72.7	0.5	3.4	0.35
EP-154	10	1140.9	GP	NV	NP				3.0	0.19
EP-154	114	1036.9	ML	NV	NP	26.1	97	1.1	3.9	0.15
EP-154	147	1003.9	CH	57	36					
EP-155	55	1097.8	SP	NV	NP					
EP-155	96	1056.8	SP	NV	NP					
EP-155	106	1046.8	CL	43	19					
EP-155	123	1029.8	CL	42	19	30.1	90.5	1.76		
EP-156	49	1090.4	GP	NV	NP					
EP-156	91.8	1047.6	CH	50	29					
EP-156	100	1039.4	CH	51	31					
EP-156	117	1022.4	ML	40	14					
EP-157	46	1112.1	GW	NV	NP					
EP-157	81	1077.1	GW	NV	NP					
EP-157	106	1052.1	CH	73	52	44.1	77.3	0.43		
EP-157	127	1031.1	CL	47	27				DIST.SAM	
EP-158	102	1051.6	CH	55	32	23.1	89.8	2.3	5.5	0.14
EP-158	118	1035.6	CH	70	42	34	86.4	1.3	5.5	0.17
EP-158	133	1020.6	CH	50	26	30.5	81.8	1.1	1.9	0.24

4. SITE CONDITIONS & GEOTECHNICAL PROFILE

4.1 Topography & Surface Features

Our Letter Nos. 238 and 314 give a detailed description of surface features and land use on the east side of Hayden Road in Design Section 6. A detailed description of surface features and land use on the west side of Hayden Road will be given in our final report on environmental site characterization for the SRP-75 and SRP-78 landfills, which is under preparation. A brief description of the surface features and land use is given below.

Design Section 6 will generally traverse the north side of the Salt River. Two landfills, SRP-75 and SRP-78, are located on the west and east side, respectively, of the Indian Bend Wash (see Figure 2 and Sheets 1 through 3 of Drawing 541). The east and west abutments of the Indian Bend Wash Bridge will be located within these landfills.

The surface of these two landfills is relatively level. Preliminary investigations performed by SHB show that the landfills contain predominantly construction debris, with lesser amounts of yard and tree trimmings, timber, logs, wooden reels and water treatment sludge. The SRP-75 landfill is estimated to be approximately 30

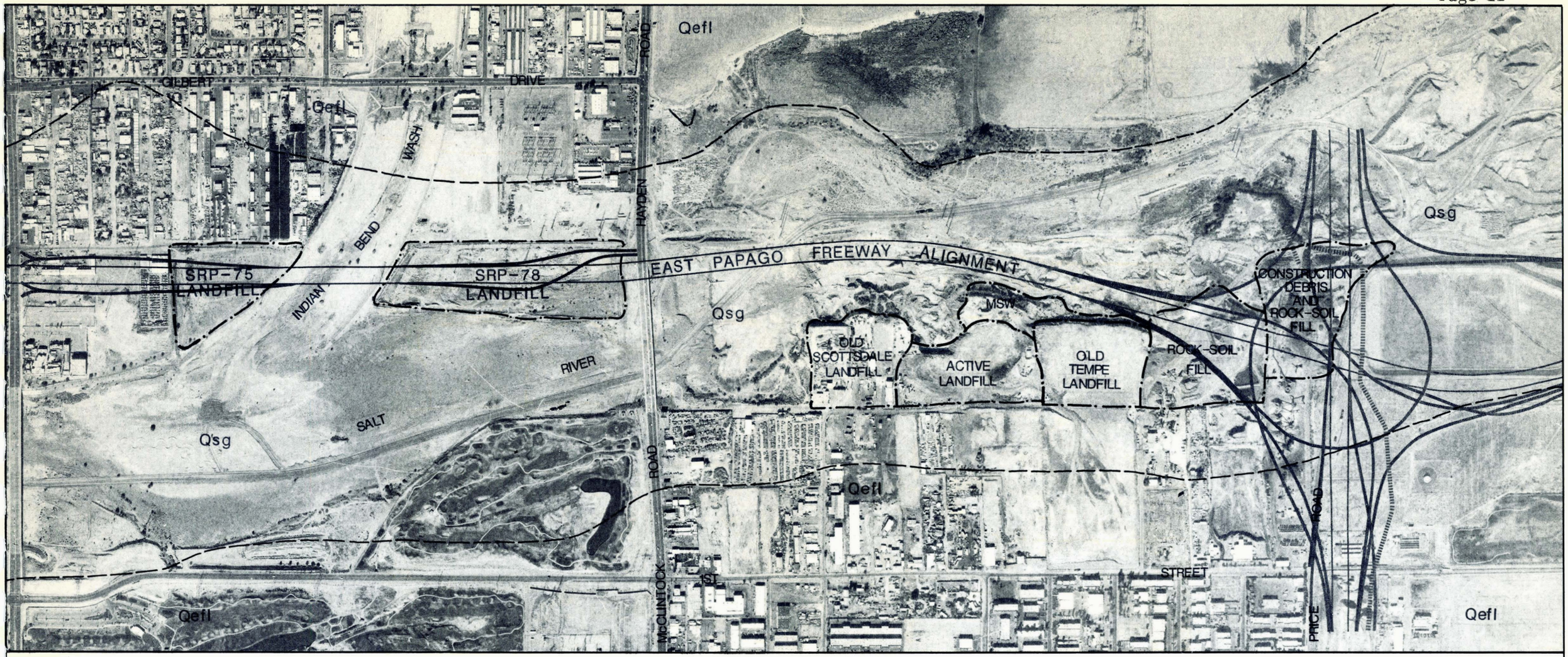
feet deep while the SRP-78 landfill is estimated to be 15 feet deep. These estimated depths and the landfill composition will be confirmed after completion of our test borings within the two landfills.

The area on the east side of Hayden Road is used for mining sand and gravel from the river, disposing reject material from the mining operations and disposing of household, commercial and industrial refuse. A significant number of deep excavations (some deeper than 40 feet) are located within the right of way of Design Section 6. The uneven topography along the proposed Salt River bridge is evident from the top of boring elevations (see Figure 1b), which varied from 1176.1 to 1120.8 feet.

4.2 Site Geology

The project site lies within the Arizona Basin and Range Physiographic Province. This province is characterized by elongated, fault-block mountains bounding broad alluvium filled basins. The site lies within the East Salt River Valley (ESRV); an alluvial filled basin.

The geologic units exposed and encountered in boreholes at the site consist of a thick sequence of various unconsolidated alluvial deposits of late Tertiary to Quaternary age locally covered with man-made fill. The surficial distribution of the unconsolidated alluvial deposits and man-made fill is shown in Figure 2.



NOTE: GEOLOGY MODIFIED FROM PEWE AND OTHERS, 1986

FIGURE 2

GENERAL GEOLOGIC MAP FOR DESIGN SECTION 6

0 1000'

SCALE, FEET

LEGEND

Qsg	SALT RIVER SAND AND GRAVEL
Qefl	EXTREMELY FINE ALLUVIUM
— — —	APPROXIMATE GEOLOGIC CONTACT
—·—·—	APPROXIMATE BOUNDARY FOR LANDFILLS, POSSIBLE LANDFILLLS, POSSIBLE CONTAMINATED AREAS OR DISTURBED AREAS
MSW	MUNICIPAL SOLID WASTE

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4.2.1 Unconsolidated Alluvium

The unconsolidated alluvium includes both coarse and fine grained deposits. The coarser materials are deposited within the higher energy stream channels whereas the finer materials are deposited on adjacent lower energy flood plains and on flat alluvial plains formed from outwash from adjacent mountains.

Flood plain deposits of extremely fine alluvium occur adjacent to the active Salt River channel in the form of a terrace. In part, the flood plain deposit has been mapped as the Lehi Terrace by Pewe (1986). The extremely fine alluvium consists predominantly of light brown weakly cemented to uncemented silt with some interbedded fine grained sand. Although no boreholes penetrated these deposits, it is likely that they occur as thin sheets overlying coarser deposits of the Salt River.

Coarse deposits of the Salt River are exposed within the present active channel of the Salt River and likely underlie adjacent exposures of the extremely fine alluvium. The coarse deposits, referred to herein as Stratum A (see Figure 1), consist of sand, gravel and cobbles, with some boulders. Thin interbedded layers and discontinuous lenses of silt and clay are present locally within the Stratum A deposits. A detailed description of this stratum is given in Section 4.4 of this report.

A sequence of fine-grained alluvial sediments underlie the coarser Salt River deposits at the site. The fine grain sequence is referred to herein as Stratum B. The Stratum B deposit represents a low energy depositional environment associated with flood plains or basin infilling away from mountain fronts. The Stratum B deposit consists of thin interbedded layers of clay, silt and fine grained sand with localized horizontally discontinuous lenses of sand and gravel. The Stratum B deposit was encountered to the full depth of the deep borings completed for the project.

4.2.2 Man-Made Fill

Man-made fill within the SRP-75 and SRP-78 landfills consists of soil deposits overlying construction debris and refuse. These soil deposits include poorly graded sand, well graded silty sand and gravel, and well graded, sand, gravel and cobbles. The soil was encountered to depths ranging from about 2.5 to 13 feet in the test pits. The refuse in the landfills consist predominantly of wood, concrete, asphalt, tree trimmings, wire, metal, plastic, and brick. Minor amounts of municipal solid waste (MSW) and canal sludge also appears to be present within the SRP-75 landfill. Layers of concentrated refuse encountered in the test pits are about 2 to 8 feet thick. Construction debris encountered in the test pits is commonly mixed with soil.

Man-made fill within the freeway alignment between Hayden and Price Roads consists of soil and rock material, construction debris, and municipal solid waste. Concentrated deposits of MSW are present north and northwest of the Old Tempe Landfill, and are typically about 2 to 8 feet thick. The MSW deposit is generally covered with 2 to 5 feet of well graded sand, gravel and cobbles with some boulders. Construction debris fill is present mainly within an old gravel pit excavation in the northwest area of the proposed Red Mountain Interchange and is mixed with large amounts of soil and rock fill. The construction debris consists predominantly of concrete, metal, wire and asphalt, with some wood and plastic. The thickness of the construction debris fill is estimated to be about 35 feet. The vast majority of the fill within the Old Tempe Landfill adjacent to the freeway corridor consists of rock reject from gravel processing operations. These deposits generally contain cobbles and boulders up to 2 1/2 feet in diameter and are typically mixed with silty sand and gravel with some concrete fragments.

The areas containing construction debris fill within the SRP-75, SRP-78 and Old Tempe Landfill portions of the freeway alignment may contain potentially hazardous substances. The deposits of MSW may also contain potential hazardous contaminants. Localized fuel, oil and solvent spills within portions of the

Red Mountain Interchange have resulted in surface and shallow subsurface contamination of native soils and fill deposits. Although preliminary environmental investigations have not indicated major areas of contamination, large-scale excavation of the fill areas may reveal additional sources of potential contaminants.

4.3 Hydrogeologic Conditions

Prior to extensive groundwater development, the Salt River Valley was part of a region of groundwater discharge. Groundwater moved towards the river from the north and south, then flowed parallel to the river channel. Under natural conditions, the Salt River was a perennial stream flowing westward from its headwaters in the White Mountains in eastern Arizona. The Salt River Project currently operates four water conservation reservoirs on the Salt River, which are, in upstream to downstream order: Roosevelt Lake, Apache Lake, Canyon Lake and Saguaro Lake. The Granite Reef Dam was built below Saguaro Lake, past the confluence of the Verde and Salt Rivers. This dam diverts water into canals for agricultural, industrial and municipal use throughout the Salt River Valley. Flows in the Verde River are regulated by the Horseshoe and Bartlett Dams. Except for periods of major floods and periodic controlled releases from the reservoir system, the Salt River Channel is dry for the major part of the year.

4.3.1 Groundwater Level Fluctuations

Ground water elevations observed in test borings conducted by SHB for the two bridges are shown in Figure 1 and on the boring logs in Appendix A.

During periods of flow in the Salt River, the groundwater system of the Salt River Valley is recharged. This recharge process creates a water table mound below the river bed near the Mill Avenue bedrock high, with components of flow to the north and south.

In general, historic water table fluctuations have occurred because of pumping, irrigation seepage, canal seepage and periodic releases from the reservoir system into the Salt River. Since 1965, periodic flooding of the Salt River has caused the water table near 44th Street and University Drive to fluctuate between about 20 and 80 feet below ground surface. Groundwater depths measured in test borings conducted within the roadway alignment in Design Section 6 varied between 37 and 81 feet below existing grade. Groundwater elevations varied between 1079.8 and 1100.1 feet. It should be noted that groundwater fluctuations of as much as 40 feet can be expected within the flood plain because of the reasons cited above.

Isolated zones of perched water occur within the SGC (Stratum A in figure 1) at elevations higher than the groundwater levels shown on the boring logs and in Figure 1. Observations by field personnel indicate that artesian conditions may exist in the sand and gravel lenses within the fine grained unit (Stratum B in Figure 1) encountered below the SGC. These conditions should be confirmed during the final geotechnical investigations by the Section Designer.

4.4 Geotechnical Characteristics of Soils

The subsurface profile can be simplified into two strata, A and B, as shown in Figure 1. Stratum A consists of dense to very dense sand, gravel and cobble (SGC) mixtures with some boulders and occasional lenses of silty and clayey gravel.

The gravel and cobble-sized particles in Stratum A generally are subrounded to rounded, while the sand fraction is angular to subangular. Because these materials are composed primarily of quartzite, granitics, volcanics and other metamorphic rock particles, they are very hard and durable. The deposit contains numerous cobbles of up to about 12 inches in nominal diameter and occasional boulders of up to as much as 24 inches maximum dimension. Because of the predominance of quartzite, the particles tend to be relatively elongated with the greatest dimension being two to three times the smallest dimension.

Geotechnical investigations for bridges generally have indicated that, for the SGC beneath the Salt River channel, the upper 20 to 30 feet of SGC materials are uncemented or weakly cemented and are relatively clean. The SGC materials contain more silt and clay below about 30 feet which generally are weakly cemented. Strongly cemented material was not encountered in any of the borings or test pits conducted in the flood plain

A fine grained stratum (Stratum B in Figure 1) occurs below the SGC. This stratum consists predominantly of medium to high plasticity clayey silt and silty clay with occasional layers of sand and fine gravel, and was encountered in all of the borings conducted for the two bridges. Stratum B was generally encountered between approximate elevations 1047 and 1057, but in Boring EP-147 and EP-153 it was encountered at approximate elevation 1038.

Although Stratum B generally can be classified as stiff to hard (or dense to very dense), numerous softer zones were encountered within this stratum in the test borings.

5. DISCUSSION & RECOMMENDATIONS

5.1 In situ and Laboratory Tests

Table 3 gives a summary of the in situ Standard Penetration Tests (SPT) performed within Stratum B in Borings

TABLE 3

SUMMARY OF IN-SITU AND LABORATORY SHEAR TESTS (FINAL ALIGNMENT)

BORING NO	DEPTH (ft)	SOIL CLASS.	SPT (BLOWS/FT) *	UNCONFINED COMP. STRENGTH (tsf)	UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (tsf)		
					(σ3) : (σ1-σ3)	(σ3) : (σ1-σ3)	(σ3) : (σ1-σ3)
N-1	128	CH		2.7	:	:	:
N-1	140.5	CH	88/11"		:	:	:
					:	:	:
N-2	119	ML	40		:	:	:
N-2	129.5	CH	31 (R)		:	:	:
N-2	139.5	ML	49		:	:	:
N-2	149	ML	69 (R)		7 : 7.4	:	:
N-2	159.5	ML	51		:	:	:
N-2	169	ML	62 (R)		7 : 10.2	:	:
N-2	179.5	SP	108/9"		:	:	:
N-2	189.5	SP	59		:	:	:
N-2	199	ML	50/6"		:	:	:
					:	:	:
N-3	92.3	ML		1.4	:	:	:
N-3	95	CL	50/4"		:	:	:
N-3	107.7	CL	35		:	:	:
N-3	117.7	CL		0.3	:	:	:
N-3	119.7	CL	51		:	:	:
N-3	127.7	CL	50/5"		:	:	:
N-3	141	CL	90/9"		:	:	:
N-3	149.5	CL	90/7"		:	:	:
					:	:	:
N-4	79	ML	73		:	:	:
N-4	89	ML	43 (R)		:	:	:
N-4	99	ML	71		:	:	:
N-4	109	ML	30 (R)		4.5 : 5.8	:	:
N-4	119	CL/ML	21		:	:	:
N-4	129	CL	32 (R)	1.2	:	:	:
N-4	139	SM	50/5"		:	:	:
N-4	149	SM	69		:	:	:
					:	:	:
N-5	90.5	CL	31		:	:	:
N-5	100.5	CL	48		:	:	:
N-5	109.5	SM	50/6"		:	:	:
N-5	134	CH	92/10"		:	:	:
N-5	143	CH	50/3"		:	:	:
N-5	153	CH	50/5"	4.8	:	:	:
N-5	173	CH	100/11"(R)	2.4	:	:	:

TABLE 3 (Cont.)

BORING NO	DEPTH (ft)	SOIL CLASS.	SPT (BLOWS/FT) *	UNCONFINED COMP. STRENGTH (tsf)	UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (tsf)					
					($\sigma3$)	($\sigma1-\sigma3$)	($\sigma3$)	($\sigma1-\sigma3$)	($\sigma3$)	($\sigma1-\sigma3$)
N-6	79	CL/CH	36		:		:		:	
N-6	89	CH	95/18"(R)	1.7	3.5	1.9	7	2.6	:	
N-6	99	CL/CH	26		:		:		:	
N-6	109	CH	100/7"(R)		4.5	4.7	:		:	
N-6	119	CH	46		:		:		:	
N-6	129	CL	30/12"(R)	2.5	5	3.8	:		:	
N-6	139	CL	39		:		:		:	
N-6	149	SP	50/2"		:		:		:	
					:		:		:	
N-7	89	CH			1.2	2.4	2.4	2.1	3.6	1.9
N-7	100	CL/CH	100/3 1/2"(R)		:		:		:	
N-7	110	SP-SM	100/5 1/2"(R)		1.2	4.8	:		:	
N-7	120	ML	100/6 1/2"(R)		2.4	5.8	:		:	
N-7	134.5	CH	100/7"(R)		5	7.6	:		:	
N-7	151	SM	100/11 1/2"(R)		:		:		:	
					:		:		:	
N-8	130	CL/ML	50/4"		:		:		:	
N-8	139	CL	100/7 1/2"(R)		7	3.3	:		:	
N-8	154	CL	100/8"(R)		7	7.8	:		:	
N-8	164	CH	45 (R)	2.5	:		:		:	
N-8	165	ML			2	3	3.5	2.8	7	5.2
N-8	178	CL	100/7"(R)		:		:		:	
N-8	190	CL	100/ 4 1/2"(R)		:		:		:	
					:		:		:	
EP-147	120.5	ML		1.8	:		:		:	
EP-147	145	SM		0.7	:		:		:	
					:		:		:	
EP-148	107	CL		1	:		:		:	
EP-148	123	CL		0.6	:		:		:	

* R - RING SAMPLE

EP-147, EP-148, and N-1 through N-8 and laboratory unconfined compression and UU triaxial tests performed on selected soil samples retrieved from Stratum B from these borings. As can be seen from the table, the SPT values generally are greater than 30 blows per foot. Although the SPT generally is best suited for cohesionless material (sand), it gives an indication of the relative consistency or strength of cohesive materials. According to Terzaghi and Peck (1967), SPT values greater than 30 blows per foot in a cohesive material indicate that the unconfined compressive strength of the material would generally be greater than 4 tsf. However, as shown in Table 3, laboratory unconfined compressive strengths were significantly less than 4 tsf.

Table 4 gives a summary of the SPT, unconfined compressive strengths estimated from pressuremeter tests (PMT) and laboratory unconfined compressive strengths for Borings EP-153 through EP-158. Unconfined compressive strength from the PMT data were estimated in accordance with the procedure outlined in Briaud and others (1985). The PMT and SPT results indicate that the unconfined compressive strengths are significantly greater than those observed in laboratory tests.

The discrepancy between the field and laboratory results may either be caused by disturbance of the soil during sampling or because of biased sampling. Two different

TABLE 4

SUMMARY OF IN-SITU AND LABORATORY SHEAR TESTS (BORINGS EP-153 THROUGH EP-158)

BORING NO	DEPTH (ft)	SOIL CLASS.	SPT (blows/ft) *	PMT LIMIT PRESS. (bars)	UNCONFINED COMP. STRENGTH (tsf) FROM PMT	FROM LAB RESULTS *
EP-153	113	CL				1.9 (D)
EP-153	115	CL		45.3	7.3	
EP-153	119	SC	50/4"			
EP-153	132	ML				1.9 (D)
EP-153	134	ML	50/5 1/2"			
EP-153	136	ML		64.4	9.6	
EP-153	146	CH				0.5 (D)
EP-153	149	CH/SC	60			
EP-153	153	SC/CH		33.7	5.9	
EP-154	114	ML				1.1 (D)
EP-154	118	SP-SM	60/3"			
EP-154	127.5	CL	50/5"			
EP-154	129			26.8	5	
EP-154	132.5	CL	50/1/2"			
EP-154	147	CH	28			
EP-154	149			26.9	5	
EP-155	106	CL	100/11" (R)			
EP-155	107	CL	48			
EP-155	123	CL	100/11 1/2"(R)			1.8 (R)
EP-156	91	CH	100/10" (R)			
EP-156	92	CH	60			
EP-156	117	ML	50/3 1/2"			
EP-156	127	ML/SP	90/10"			
EP-157	106	CH	100/6" (R)			0.4 (R)
EP-157	127	CL	100/7" (R)			
EP-158	103.5	CH	47			
EP-158	119.5	CH	50/5 1/2"			
EP-158	133.5	CH	50/3 1/2"			
EP-158	144.5	SP	50/4"			

* D - DENNISON SAMPLE
R - RING SAMPLE (3.0" O.D., 2.42" I.D.)

procedures were used to obtain samples from the test borings. The first method employed driving an open-ended tube lined with brass rings (ring sampler) with a 140-pound hammer. The second method employed the use of a Dennison Sampler. The Dennison Sampler consists of a rotating outer barrel equipped with a cutting bit and a fixed inner barrel with a liner.

The Dennison Sampler could only be used in relatively soft zones and, therefore, laboratory tests performed on these samples gave low values of the unconfined compressive strength, as expected. Samples obtained by the ring sampler probably were disturbed by the hammer blows and, therefore, the laboratory test results on these samples would not be representative of the in situ conditions.

Observations made by SHB field personnel during borehole drilling indicate that there are some soft zones interbedded with the generally stiff to hard Stratum B.

Quantification and delineation of the soft zones in Stratum B may be possible by performing cone penetration tests (CPT) within this stratum. A significant savings in the foundation costs would be achieved if the CPT determines that the soft zones occur in relatively thin isolated areas within Stratum B. We recommend that a pilot CPT program be initiated as soon as possible to ascertain the feasibility of performing the CPT in Stratum B.

5.2 Foundation Design Alternatives

The foundations for the intermediate piers of the Salt River and the Indian Bend Wash bridges will be subject to scour. The abutments of the Indian Bend Wash Bridge will be located within the SRP-75 and SRP-78 landfills. The west abutment of the Salt River Bridge will be located within the SRP-78 Landfill. It is our opinion that straight-sided drilled piers will be the most feasible foundation system for the two bridges. The use of straight, machine-cleaned, drilled, cast-in-place concrete piers installed with bentonite slurry has the advantage of very rapid construction, and, for intermediate bridge piers, each column can be supported on a single pier, eliminating the need for a cap.

In areas where the foundations will be protected from scour and will not be located within a deep landfill, conventional spread-type footings bearing on native soil may be used to support the structures.

To better define fluctuations of the water table and artesian conditions, it is recommended that piezometers be installed at each bridge location during the final geotechnical investigation by the Section Designer. These piezometers should be read monthly until the time of the award of the construction contract.

5.2.1 Drilled Pier Foundations

5.2.1.1 Estimated Scour

Foundations for the Indian Bend Wash and Salt River bridges will be subject to scour. As reported by Simons, Li and Associates, Inc., (SLA), in their letter of January 26, 1990, to DMJM, local scour of 41 feet is expected in the Salt River for a drilled pier having a design diameter of 10 feet (with one foot overbreak during drilled pier construction and two feet on either side for debris build up, effective width = 15 feet). For an 8-foot diameter pier, the local scour is expected to be about 36 feet.

Anticipated scour depths for the Indian Bend Wash bridge have not been finalized to date.

5.2.1.2 Vertical Capacity & Settlement

We recommend that the Indian Bend Wash and Salt River bridges be founded on drilled piers. The drilled piers can derive support from the SGC and the fine grained layer. Figures 3 and 4 show the safe downward capacities of straight, drilled piers penetrating into Stratum B. Capacities shown in Figure 3 are based on 60 feet of maximum total scour and those shown in Figure 4 are for 40 feet of

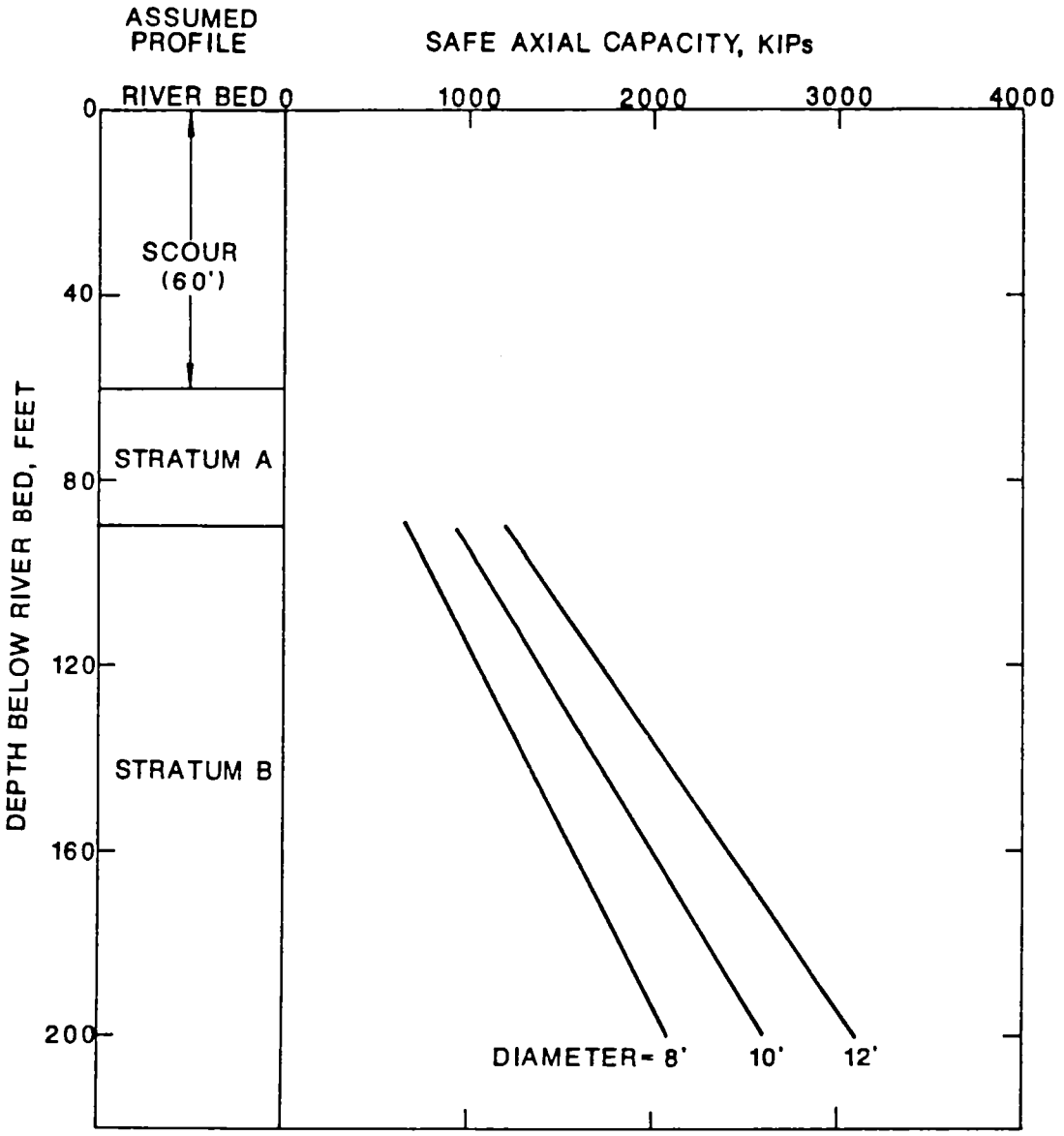

FIGURE 3

ESTIMATED SAFE AXIAL CAPACITY OF
DRILLED PIERS IN COMPRESSION
(60' SCOUR)

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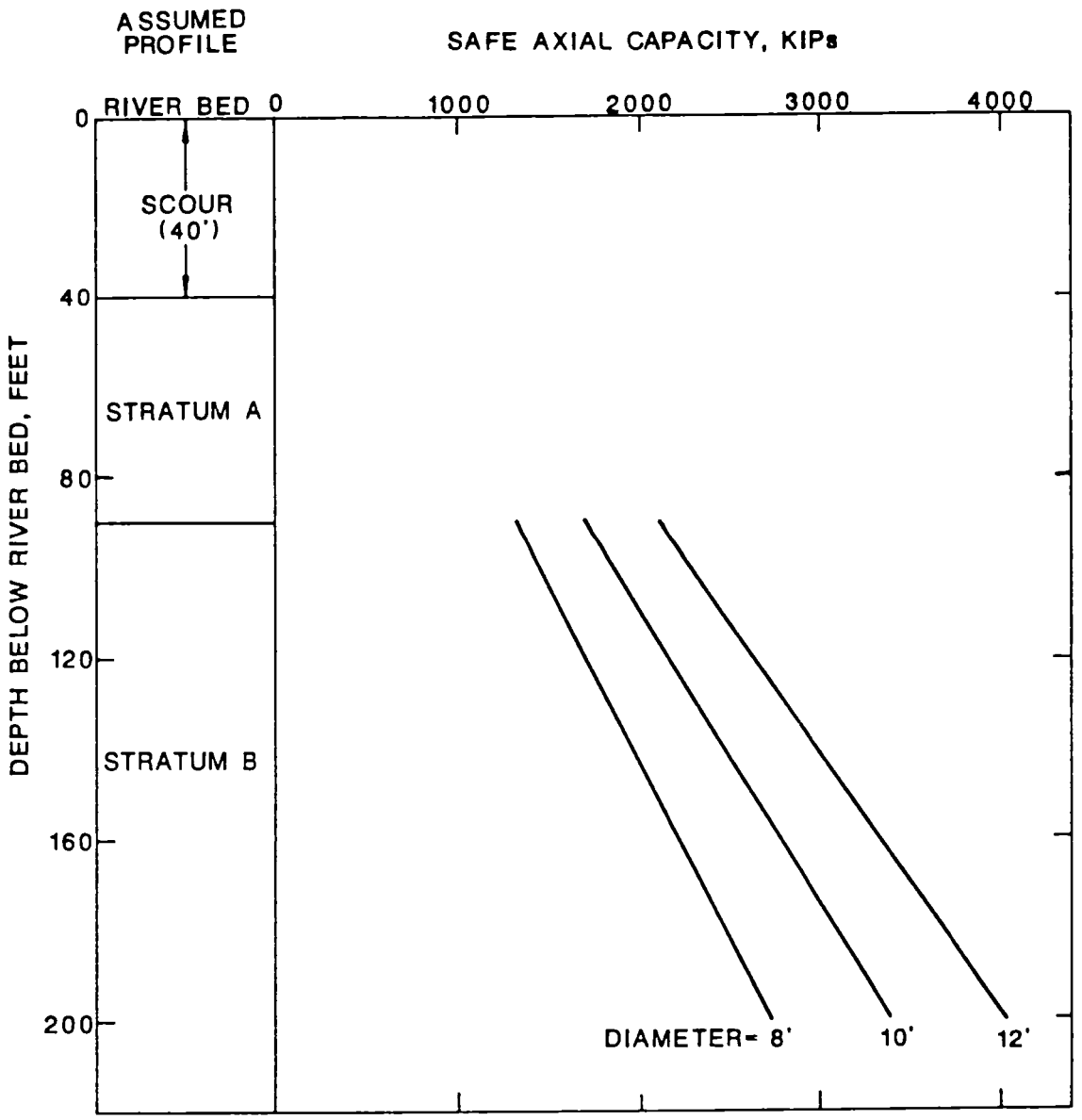

FIGURE 4

ESTIMATED SAFE AXIAL CAPACITY OF DRILLED PIERS IN COMPRESSION (40' SCOUR)

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maximum total scour. Figures 3 and 4 supercede all previous estimated drilled shaft capacities submitted to DMJM for Design Section 6. The following assumptions and soil parameters were used to develop the curves shown in Figures 3 and 4:

Finished Grade at El. 1140
Bottom of scour for Figure 3 at El. 1080
Bottom of scour for Figure 4 at El. 1100
Bottom of Stratum A at El. 1050
Factor of safety against side resistance = 2.0
Factor of safety against end-bearing = 3.0
Overbreak in SGC = 10 % of diameter
Soil Parameters:
Stratum A:
Average submerged unit weight = 70 pcf
Effective stress friction angle = 42 deg.
Coefficient of at-rest earth pressure = 1.0
Stratum B:
Average submerged unit weight = 60 pcf
Undrained shear strength (side) = 2.5 ksf
Ultimate end-bearing (tip) pressure = 18 ksf

The capacities shown in Figures 3 and 4 shall be revised if any of the assumptions and soil parameters listed above are changed during final design of the bridges. It should be noted that a factor of safety of 2.0 against side resistance has been used to develop the curves in Figures 3 and 4. This

factor of safety is less than the 2.5 recommended by ADOT. This lower factor of safety was allowed by ADOT under the conditions that a significant number of field and laboratory tests will be performed by the Section Designer to accurately define the shear strength parameters of the soils encountered, and that strict quality assurance and quality control guidelines will be developed and followed during the construction of the drilled shafts.

With the above recommended values of foundation depth and bearing pressures, we estimate that the settlements will be less than one inch.

5.2.1.3 Foundation Treatment Alternatives

In the event that the required design axial compression load carrying capacity is not developed within the depths of penetration practicable for the construction of the drilled pier, foundation end-bearing (tip) capacity may be enhanced by pressure grouting below the foundation. Successful attempts at increasing the foundation tip capacity by pressure grouting have been reported by Bruce (1986a, 1986b).

5.2.1.4 Foundation Load Testing

The axial capacities shown in Figures 3 and 4 are based on conservative soil shear strength parameters

assigned to Stratum B. A better estimate of the side shear and end resistance within Stratum B may be obtained by performing load tests on small diameter drilled piers constructed such that they are isolated from Stratum A.

5.2.1.5 Resistance to Lateral Loads

The behavior of the soil surrounding a laterally loaded deep foundation can be described by lateral load-transfer functions referred to as p-y (soil reaction-displacement) curves. In this model, the soil reaction p is related to the foundation deflection y at various depths below the ground surface. In general, these curves are nonlinear and depend on the foundation diameter, depth, and soil shear strength parameters. The soil parameters necessary for the evaluation of these curves are given below:

Stratum A:

Average submerged unit weight = 70 pcf
Effective stress friction angle = 42 deg.
Coefficient of subgrade modulus = 250 pci

Stratum B:

Average submerged unit weight = 60 pcf
Undrained shear strength (side) = 3.5 ksf

The above values are based on our preliminary geotechnical investigation and can be used for preliminary estimates of the lateral load-deflection response of the foundations in the Salt River.

The ultimate lateral soil bearing pressures for determining the ultimate lateral resistance used in p-y curve construction are shown in Figure 5. The expression developed by Hansen (1961) and the soil parameters given above were used to evaluate the variation of ultimate lateral soil bearing pressure with depth. The curve shown in Figure 5 is for pier diameters of 8 to 10 feet and a scour depth of 60 feet. The soil profile shown in Figure 3 was used to develop the curve.

Assuming an uncracked section and the soil profile and elevations given in Section 5.2.1.2 for a scour depth of 60 feet, we estimate that a 10-foot diameter drilled pier would deflect about 0.3 inch laterally at the scour line for a scour line moment of approximately 17,000 kip-ft. Computer code LPILE developed by Suang S. Cheng, P.E., of SHB was used to estimate the lateral deflection. The analysis procedure used in LPILE is similar to COM624G (Reese and others, 1984).

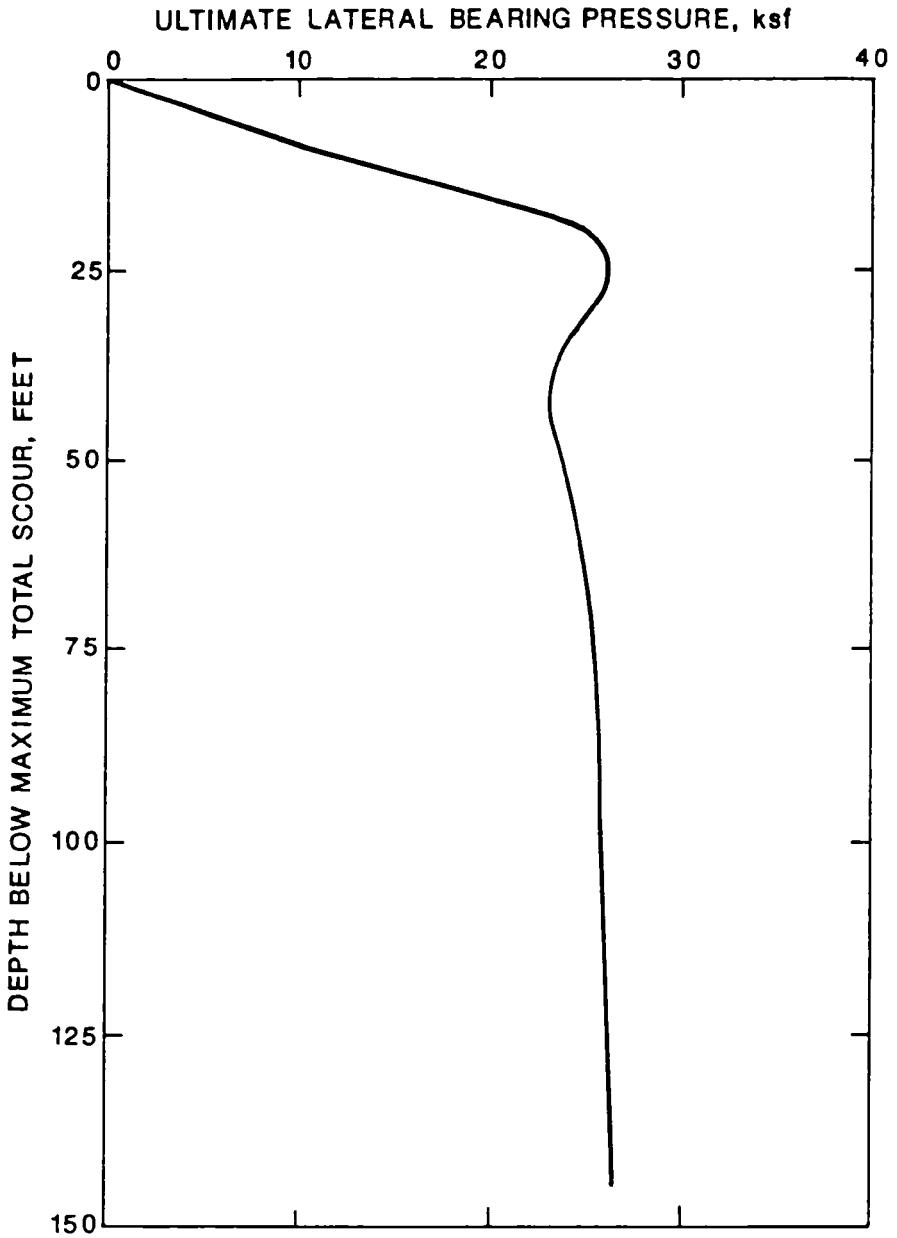

FIGURE 5

ESTIMATED ULTIMATE LATERAL SOIL BEARING PRESSURE FOR 8- TO 10-FOOT DIAMETER DRILLED PIERS (60' SCOUR)

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5.2.1.6 Drilled Pier Construction

For the foundations within the Salt River flood plain, we anticipate that the drill holes will require stabilization during the excavation process. This should be achieved by slurry assisted construction. The use of casing does not provide a practical alternative to slurry assisted construction in the very coarse granular deposits involved. Casing cannot be pushed or vibrated below the bottom of the excavations because of the large amount of cobbles and boulders.

The greatest risk of failure of a drilled pier constructed under these conditions is a cutoff (necking) within the pier caused by sloughing of soil into the excavation and significantly reducing the diameter of the pier at isolated sections. This greatly reduces the lateral resistance of the pier. Thus, nondestructive testing during construction employing gamma ray back scattering and downhole seismic methods to ascertain the integrity of the pier should be specified (Rucker, 1990).

5.2.2 Spread-Type Foundations

In areas where foundations for the ramps will be protected from scour and will not be located within a deep landfill, spread-type foundations bearing on

native dense SGC can be used to support the structures. A safe bearing capacity of 10 ksf can be used, but the foundations should be located at least 4 feet below finished grade. Estimated settlements for spread-type footings with a soil bearing stress of 10 ksf are given in Figure 6.

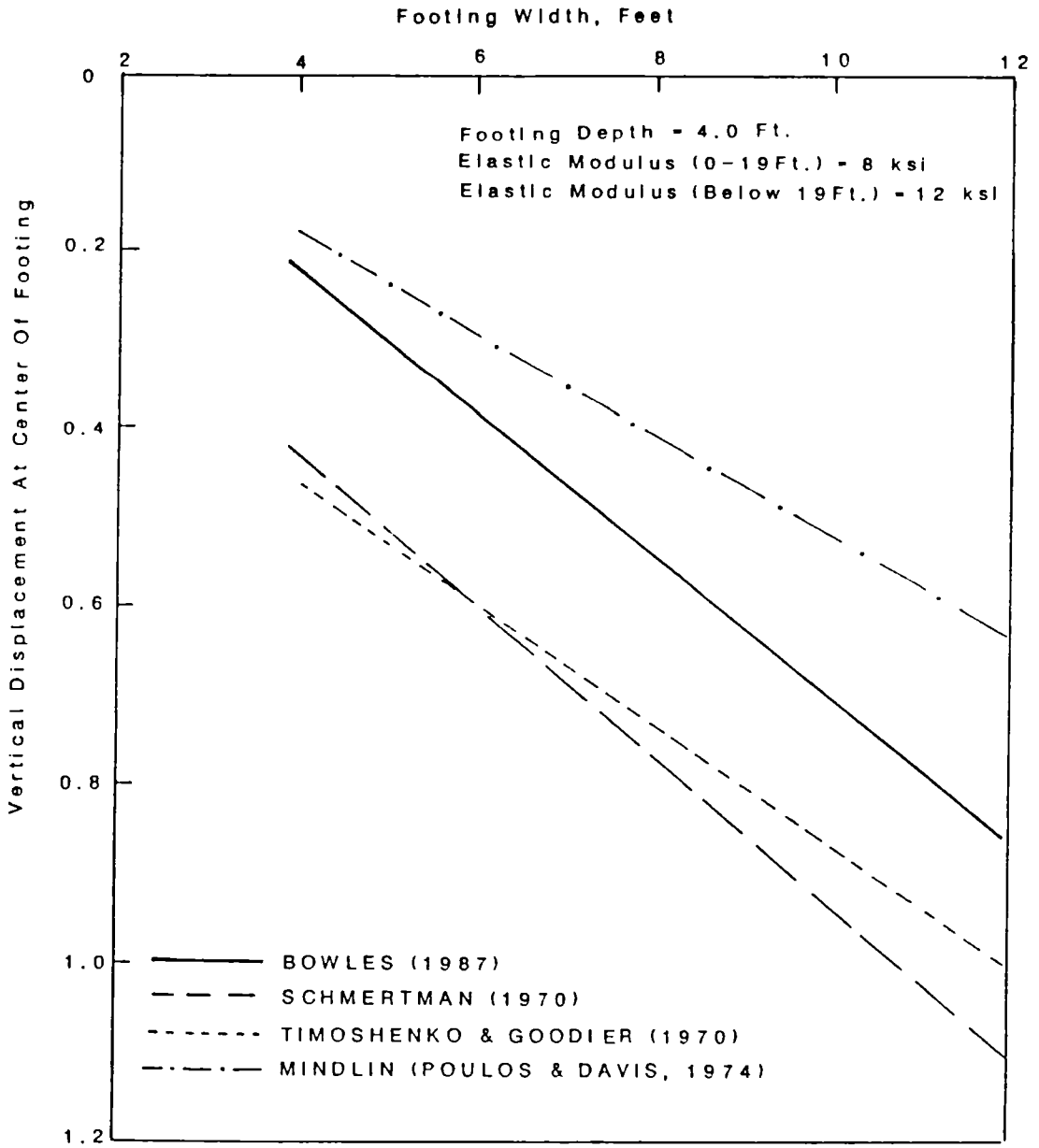
5.3 Earth Retaining Structures & Abutments

Conventional cantilever retaining walls probably will be most efficient for shallow walls. Where this type of wall system is supported on spread-type foundations and is free to rotate at the top during backfilling, an equivalent fluid pressure of 35 pounds per cubic foot is typically used for design. For restrained walls where little or no movement can occur, an at rest equivalent fluid pressure of 50 pcf is typically used for the granular materials. These values apply to horizontal backfill and must be adjusted for sloping backfill.

For the moisture and drainage conditions involved for raised embankments, it has been found acceptable to utilize finer grained backfill with a geomatrix drain system. These types of embankments ordinarily remain dry; only a small amount of moisture could potentially seep behind the walls from irrigation of landscaping. The sand, gravel and cobble materials from the Salt River channelization excavation would provide a more free-draining backfill behind conventional cantilever retaining walls.

FIGURE 6

ESTIMATED SETTLEMENT FOR SQUARE FOOTINGS (q = 10 ksf)



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Alternative wall systems that are feasible for the project include the reinforced earth system utilizing metal strips (a proprietary product of the Reinforced Earth Company), the patented Tensar high-density polyethylene grid reinforcement system and other systems employing wire mesh and geotextile materials. The granular alluvial deposits which will be excavated for the Salt River channelization would provide acceptable fill materials for construction of these types of walls, though screening of the coarser particles will be required.

Drainage for the types of wall systems discussed above can be efficiently provided with geomatrix drain strips and weep holes. This kind of drainage system is adequate to handle the small amount of landscape or incidental water that might intrude behind the walls.

5.4 Embankments & Borrow Materials

According to DMJM, excavation from the Salt River will most likely provide borrow for the embankments. The proposed embankment between the Indian Bend Wash and Salt River Bridges will be placed over the SRP-78 landfill. All man-made fill material will have to be excavated and removed prior to placing fill for the embankment. Estimates of the amount of material to be removed will be given after our field investigations for the SRP-75 and SRP-78 landfills are completed.

The SGC materials that may be available from the Salt River will provide excellent materials for embankments. However, these soils are susceptible to severe caving, so it would be impractical to construct drilled piers through fills constructed with SGC. Because the SGC contains numerous particles up to about 12 inches in dimension and scattered particles up to 24 inches, embankment slopes made of these materials are not subject to significant erosion. The SGC provides very stiff subgrade support which is not weakened by moisture increases. Where finer grained alluvial soils are used for the main part of the embankment, there is an advantage of placing SGC on the slopes and in the upper 2 or 3 feet of subgrade.

The placement and compaction of all fill material for the embankments should conform to Section 203-10.03 of the ADOT Standard Specifications (ADOT, 1987).

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TEST DRILLING EQUIPMENT & PROCEDURES

Description of Subsurface Exploration Methods

Auger Boring Drilling through overburden soils is performed with 6 5/8" O.D., 3 1/4" I.D. hollow stem auger or 4" solid stem continuous flight auger. Carbide insert teeth are normally used on bits so they can penetrate soft rock or very strongly cemented soils.

Generally, refusal to penetration of the auger is adopted as top of the SGC or river-run material, which normally requires other techniques for penetration. Grab samples or auger cuttings may be taken as necessary. Standard penetration tests or 2.42" diameter ring samples were taken in conjunction with the auger borings, as needed, with sampling interval and type indicated on the boring logs.

Becker Drill Drilling with the Becker Hammer drill is accomplished by advancing a double-walled drive casing with a link-belt 180 diesel pile driving hammer, having a rated energy of 8,100 foot-pounds per blow. Where noted, the hammer is equipped with a supercharger which can boost the energy to approximately 12,000 foot-pounds per blow. The supercharger was used only as noted in portions of the boring where blow counts were relatively high. Cuttings are removed with compressed air by a reverse circulation process, and are collected in a cyclone from which grab samples are obtained. The drive casing used was either 5 1/2" O.D. by 3/4" I.D., or 6 5/8" O.D. by 4" I.D., and employed an expendable bit of slightly larger diameter than the O.D. of the casing. Hammer blows required to advance the drive casing were recorded in 6" or 1' increments, as noted on the boring log. Standard penetration tests were taken where noted on the boring logs.

Odex System The Odex (overburden drilling with the eccentric method) system, also referred to as DTH (down-the-hole hammer) system, consists of a pneumatic-rotary percussion down-the-hole hammer operating at the bottom of the hole being drilled through a 5" diameter steel casing. The eccentric button percussion bit overreams the boreholes and allows advancement of the casing. The same compressed air or air-detergent (foam) mixture that operates the hammer also serves to expel the cuttings from the borehole, where they can be collected as grab samples. Retraction of the eccentric drill bit allows removal of the hammer from the center of the casing to facilitate standard penetration testing (ASTM D1586) where noted on the boring logs.

Schramm Rotadrill The Schramm T 685H truck-mounted drill rig is a top drive rotary rig capable of up to 85,500 in/lbs of torque with a pulldown capacity of 35,000 lbs. Drilling is performed with either 8" or 5 5/8" diameter Tricone roller bits. Cutting removal is facilitated by compressed air or air/water mixture. Where noted, grab samples of the cuttings were collected. When casing is required to stabilize the borehole, a Hammerhawk drill through casing hammer is utilized, permitting simultaneous rotary Tricone drilling, and driving of the casing. Casing penetration is recorded on the boring logs in feet per minute.

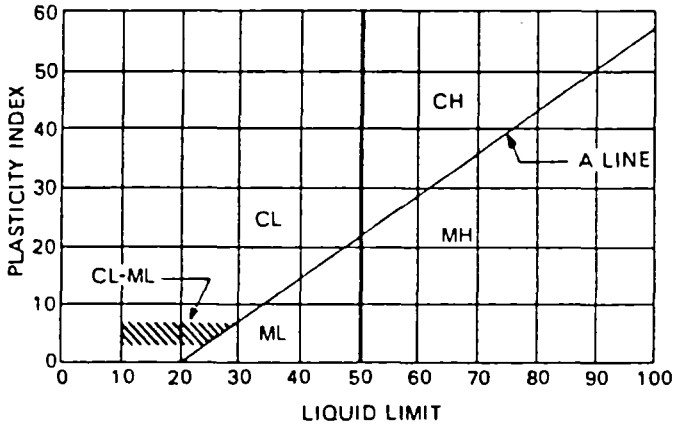
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
					GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 seive)			SW	Well graded sands, gravelly sands.
					SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)			ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)			MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CLAYS (LIMITS PLOT ABOVE "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)			CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY, CONSISTENCY OR FIRMNESS OF SOILS

The terminology used on the boring logs to describe the relative density, consistency or firmness of soils relative to the standard penetration resistance is presented below. The standard penetration resistance (N) in blows per foot is obtained by the ASTM D1586 procedure using 2" O.D., 1 3/8" I.D. samplers.

1. Relative Density. Terms for description of relative density of cohesionless, uncemented sands and sand-gravel mixtures.

N	Relative Density
0-4	Very loose
5-10	Loose
11-30	Medium dense
31-50	Dense
50+	Very dense

2. Relative Consistency. Terms for description of clays which are saturated or near saturation.

N	Relative Consistency	Remarks
0-2	Very soft	Easily penetrated several inches with fist.
3-4	Soft	Easily penetrated several inches with thumb.
5-8	Medium stiff	Can be penetrated several inches with thumb with moderate effort.
9-15	Stiff	Readily indented with thumb, but penetrated only with great effort.
16-30	Very stiff	Readily indented with thumbnail.
30+	Hard	Indented only with difficulty by thumbnail.

3. Relative Firmness. Terms for description of partially saturated and/or cemented soils which commonly occur in the Southwest including clays, cemented granular materials, silts and silty and clayey granular soils.

N	Relative Firmness
0-4	Very soft
5-8	Soft
9-15	Moderately firm
16-30	Firm
31-50	Very firm
50+	Hard

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LOG OF TEST BORING NO. EP-147

JOB NO. E87-56 DATE 10-11-89 to 10-16-89

RIG TYPE Schramm T-64H
BORING TYPE Dual Wall - Percussion Hammer
SURFACE ELEV. 1157.7'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SP	slightly moist	**GRAVELLY SAND**, some silt, trace of clay, predominantly fine grained, weakly lime cemented, low plasticity, brown
	2.00									
5	1.25			A						**SAND & GRAVEL**, (SP/GP), trace of silt & clay, some cobbles, predominantly medium grained subangular to angular sand, predominantly fine grained subrounded to angular gravel, nonplastic, brown
								SP/ GP	slightly moist	Interbedded with: **SAND, GRAVEL & COBBLES**, (GP), occasional boulders, trace of silt & clay, predominantly fine to medium grained subrounded to angular sand, predominantly coarse grained subrounded to rounded gravel & cobbles, nonplastic to low plasticity, brown
10										
	6.10									
15										note: thin lens of moist clayey sand at 5'
	40.00									
20								GP		note: considerable boulders from 15' to 20'
25	3.00									
30										
	2.60									
35				A						
	3.20							SP/ GP		
40										
	2.70							GP		
45										
	3.20									
50										

GROUNDWATER

DEPTH	HOUR	DATE
64.0	12:15p	10-16-89
64.0	12:15p	10-18-89

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
D - Dennison Tube

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LOG OF TEST BORING NO. EP-147

JOB NO. E87-56 DATE 10-11-89 to 10-16-89

RIG TYPE Schramm T-64H
BORING TYPE Dual Wall - Percussion Hammer
SURFACE ELEV. 1157.7'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	13.50		-	A						
	15.00							GP	moist to saturated below 65'	note: considerable boulders from 50' to 58'
	10.00									note: considerable clay from 50' to 65'
55	9.00									note: moderately cemented from 90' to 95' and 115' to 119'
								SP/		
60	6.50		-	A				GP		note: medium plasticity clayey sand & gravel (GC) with some cobbles from 65' to 82'
▼	5.50									
65	2.50									
	3.30		-	A						
70	4.00									
75								GC		
	3.80									
80			-	A						
	2.20									
85								GP		
	0.50		-	A						
90										
95	2.00							SP/ GP		
	1.80		-	A						
100										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	64.0	12:15p	10-16-89
▼	64.0	12:15p	10-18-89

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LOG OF TEST BORING NO. EP-147

JOB NO. E87-56 DATE 10-11-89 to 10-16-89

RIG TYPE Schramm T-6411
BORING TYPE Dual Wall - Percussion Hammer
SURFACE ELEV. 1157.7'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100									saturated	note: considerable black silts in lenses below 95'
	2.60							GP		
105										
	3.00			A						
110										
	3.50									
115										
	3.80			A						
120				D						**CLAYEY SILT**, some sand, trace of gravel, noncemented to interbedded with moderately lime cemented layers, low to medium plasticity, brown
						110	18	ML		note: occasional thin lens of silty sand
125										
130				D				SM		**SILTY SAND**, considerable clay, fine grained, weakly lime cemented, low plasticity to nonplastic, brown
										note: occasional thin lens of clayey silt
135										
140										Stopped Drilling at 145' Sampler stopped at 147'
										note: downhole hammer advanced to 120', gearbit below 120', outer casing driven to 120'
145				D						
						103	17			
150										

GROUNDWATER

DEPTH	HOUR	DATE
64.0	12:15p	10-16-89
64.0	12:15p	10-18-89

SAMPLE TYPE

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LOG OF TEST BORING NO. EP-148

JOB NO. E87-56 DATE 10-19-89 to 10-20-89

RIG TYPE Schramm T-64H
BORING TYPE Dual Wall - Percussion Hammer
SURFACE ELEV. 1159.7'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			•	A					slightly moist	**SILTY SAND**, some gravel, small amount of clay, predominantly fine grained, weakly lime cemented, low plasticity, brown
	0.3							SM		note: some fill (mostly asphalt) at surface
5										
	0.8									
10			•	A					slightly moist	**SAND, GRAVEL & COBBLES**, (GP), trace of silt & clay, predominantly medium to coarse grained subangular to angular sand, predominantly coarse grained subrounded to rounded gravel, subrounded to rounded cobbles up to 6" to 8" in diameter, nonplastic, brown
	0.8		•							
15								SP		Interbedded with **GRAVELLY SAND**, (SP), trace of silt, trace of cobbles, predominantly medium grained subangular sand, nonplastic, brown
	2.3									
20			•	A						
	1.1									note: considerable boulders from 30' to 33'diameter
25										
	1.7									note: some quartzite boulders (up to 18" in diameter) from 48' to 50'
30			•	A						
	4.6									
35								GP		
	3.7									
40			•	A						
	2.2									
45										
	2.0									
50	20.0									

GROUNDWATER

DEPTH	HOUR	DATE
67.0	9:47a	10-23-89
64.3	8:10a	10-25-89

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
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LOG OF TEST BORING NO. EP-148

JOB NO. E87-56 DATE 10-19-89 to 10-20-89

RIG TYPE Schramm T-64H
BORING TYPE Dual Wall - Percussion Hammer
SURFACE ELEV. 1159.7'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50				A					moist to saturated below 65'	note: some thin clayey sand layers at 60'
	3.0									note: predominantly coarse grained gravel & cobbles and decrease in amount of sand from 65' to 72', 85' to 90'
55	12.0									
	15.0									
	4.0									considerable black silt from 80' to 100'
60				A				GP		
	3.0									note: increase in amount of clay below 88'
65										note: thin sandy clay layer from 98' to 99'
	2.8									
70				A						
	2.0									
75								SP		
	2.0									
80				A						
	2.5							GP		
85										
	3.7									
90				A				SP		
	2.4									
95										
	2.0									
100										

GROUNDWATER

DEPTH	HOUR	DATE
67.0	9:47a	10-23-89
64.3	8:10a	10-25-89

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JOB NO. E87-56 DATE 10-19-89 to 10-20-89

RIG TYPE Schramm T-64H
BORING TYPE Dual Wall - Percussion Hammer
SURFACE ELEV. 1159.7'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100			•	A				SP		
105	3.5		• •	D		79	26	CL	very soft saturated	**SILTY CLAY**, some sand, medium plasticity, brown note: some thin silty sand layers
110	5.2							SP	saturated	**GRAVELLY SAND**, some silt & clay, predominantly fine to medium subangular sand, well graded, subrounded to rounded gravel, nonplastic, brown
115	4.9									
120			• •	D		81	34	CL	saturated	**SILTY CLAY**, some sand, medium plasticity, brown note: some thin silty sand layers
125										
130			•	D		86	35	SC	saturated	**CLAYEY SAND**, some silt, some coarse grained rounded gravel, predominantly medium grained, subrounded, weakly lime cemented, medium plasticity, brown note: considerable black silt below 137'
135										
140										Stopped Drilling at 140' note: downhole hammer advanced to 100', gearbit below 100', outer casing driven to 120'
145										
150										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	67.0	9:47a	10-23-89
▼	64.3	8:10a	10-25-89

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LOG OF TEST BORING NO. N-1

JOB NO. E87-56 DATE 11-27-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1150.5'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	0.24								slightly moist	**SAND, GRAVEL & COBBLES.** trace of silt, fine grained subangular sand, predominantly coarse grained subrounded gravel, nonplastic, brown
5								GP		
	6.00									
	2.50									
10										
15								SP	slightly moist	**GRAVELLY SAND,** predominantly fine to medium grained subangular sand, coarse grained rounded to rounded gravel, nonplastic, gray
	3.30									
20										
	9.20								slightly moist	**SAND, GRAVEL & COBBLES.** trace of silt, occasional boulders, fine to medium grained subangular sand, coarse grained subrounded gravel, nonplastic, brown note: boulders at 30'6", 32', 35' note: decrease in amount of cobbles below 37'
25								GP		
30	14.60									
35										
	6.60									
40										
45								GP	slightly moist to saturated below 50'	**SAND & GRAVEL,** some cobbles, well graded, subangular sand, predominantly fine grained subrounded gravel, nonplastic, brown
50										

GROUNDWATER

DEPTH	HOUR	DATE
68.0	9:30a	11-28-89
50.4	8:05a	11-30-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
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LOG OF TEST BORING NO. N-1

JOB NO. E87-56 DATE 11-27-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1150.5'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	2.70							GP	slightly moist to moist	
55								SP	moist	GRAVELLY SAND, predominantly fine grained subangular sand, nonplastic, light brown
60	7.40									
65								GP	saturated	SAND & GRAVEL, well graded, sabangular sand, to coarse grained subrounded to rounded gravel, nonplastic, brown note: considerable cobbles from 65'6" to 67'6" note: decrease in amount of coarse grained gravel below 73'
70	1.90									
75										
80	2.20									
								SP	saturated	GRAVELLY SAND, predominantly fine grained angular sand, fine grained rounded gravel, nonplastic, light brown
85										
90	2.80			S				GP	saturated	SAND & GRAVEL, well graded, subangular to subrounded sand, predominantly fine grained subrounded to rounded gravel, nonplastic, brown
95										
100										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	68.0	9:30a	11-28-89
▼	50.4	8:05a	11-30-89

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LOG OF TEST BORING NO. N-1

JOB NO. E87-56 DATE 11-27-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1150.5'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100										
105				D			31			**SILTY CLAY**, trace of fine grained sand, medium plasticity, brown note: high plasticity below 128'
				S						
110	2.70							CL	saturated	
115										
120				S						
125										
				D		88	34			
130	5.00			S						
135								ML	saturated	**CLAYEY SILT**, some fine grained sand, low plasticity, brown note: some lime cemented nodules
140	2.30			S	6-45-43/5"					**SILTY CLAY**, slightly to moderately lime cemented in zones, high plasticity, brown
145								CH	saturated	
150										

GROUNDWATER

DEPTH	HOUR	DATE
68.0	9:30a	11-28-89
50.4	8:05a	11-30-89

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LOG OF TEST BORING NO. N-1

JOB NO. E87-56 DATE 11-27-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1150.5'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
150				D			28			
										Dennison stopped at 151'
										note: advanced hole by the down hole hammer methods to 106', stopped outer casing at 106' and completed hole from 106' to 149.5' by gearbit methods
155										
160										
165										
170										
175										
180										
185										
190										
195										
200										

GROUNDWATER

DEPTH	HOUR	DATE
68.0	9:30a	11-28-89
50.4	8:05a	11-30-89

SAMPLE TYPE

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LOG OF TEST BORING NO. N-2

JOB NO. E87-56 DATE 1-4-90

RIG TYPE Drill Systems Hammer
BORING TYPE 9 1/2" O.D. Dual Wall Pipe
SURFACE ELEV. 1167.8'
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										
	2							SP	dry to slightly moist	**GRAVELLY SAND**, some silt, fine to medium grained sand, gap graded gravel, nonplastic, light brown
	3							GP		
	3									
5										note: locally grades to sandy gravel
	7									
	8									
	8									**SILTY SAND & GRAVEL**, some cobbles, fine to medium grained sand, predominantly coarse grained subrounded gravel, nonplastic, light reddish gray
	9									
10	10							GM-GP	dry to slightly moist	
	14									
	16									
	17									
	20								medium dense to very dense	note: considerable cobbles below 19'
15	9									
	10									
	10									
	16									
	35									
20	25									
	23									
	28									
	37									
	22									
25	19									
	23									**CLAYEY SAND, GRAVEL & COBBLES**, fine to medium grained sand, predominantly coarse grained subrounded gravel, low to medium plasticity, brown
	29								moist to very moist	
	34									
	67									
30	71							GC	hard	
	45									
	52									
	53									
	61									
35	68									
	53									
	65									
	88									
40	103									**SILTY SAND, GRAVEL & COBBLES**, predominantly fine to medium grained sand, gap graded subrounded gravel, nonplastic, light brown
	96									
	57								dry to slightly moist to very moist below 56'	
	52									
	63							GM-GP		
45	168									
	47									note: small boulders at 44' to 12" in diameter, rounded
	59									
	61								hard	
	78									
50	71									

GROUNDWATER

DEPTH	HOUR	DATE
80.0	9:37a	1-4-90

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
NR - No Recovery

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PROJECT East Papago - Hohokam - Sky Harbor Freeways

LOG OF TEST BORING NO. N-2

JOB NO. E87-56 DATE 1-4-90

RIG TYPE Drill Systems Hammer
BORING TYPE 9 1/2" O.D. Dual Wall Pipe
SURFACE ELEV. 1167.8'
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	43									**SILTY SAND, GRAVEL & COBBLES**, continued
	65								dry to slightly moist to very moist below 56'	
	74							GM-GP		note: boulders at 57' to 18" in diameter, rounded
	76									
	59									
55	65									
	68									
	123								hard	
	328									
	73									
60	85									**CLAYEY SAND, GRAVEL & COBBLES**, medium to coarse grained sand, predominantly coarse grained gravel, predominantly subrounded, medium plasticity, brown
	79									
	80									
	87									
	96									
65	92								very moist to saturated below 80'	
	108									
	90									
	88									
	77								hard	
70	76							GC		
	74									
	87									
	75									
	83									
75	68									
	70									
	75									
	62									
	73									
80	78									
	75									
	81									
	80									
	95									
85	72									
	67									
	68									
	70									
	88									
90	93									
	79									
	80									
	86									
	75									
95	79									
	80									
	70									
	83									
	95									
100										

GROUNDWATER

DEPTH	HOUR	DATE
80.0	9:37a	1-4-90

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
NR - No Recovery

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PROJECT East Papago - Hohokam - Sky Harbor Freeways

LOG OF TEST BORING NO. N-2

JOB NO. E87-56 DATE 1-4-90

RIG TYPE Drill Systems Hammer
BORING TYPE 9 1/2" O.D. Dual Wall Pipe
SURFACE ELEV. 1167.8'
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100	60									CLAYEY SAND, GRAVEL & COBBLES, continued
	65									
	72							GC		
	68								saturated	
	72									
105	75									
	77									
	73									
	69									SAND & GRAVEL, some cobbles, predominantly coarse grained sand, gap graded gravel, predominantly subrounded, nonplastic, brown
	58									
110	58								saturated	
	63									
	57							GP	very dense	
	60									
	53									
115	62									
	67									
	71									CLAYEY SILT, some fine grained sand, weakly cemented, low to medium plasticity, light brown
	73									
120				S	17-24-16					note: occasional thin interbedded lens of high plasticity silty clay, and nonplastic, silty sand
125									saturated	note: considerable fine grained sand at 150'
									hard	
130				U	31/12"	89	33	ML		
135										
140				S	9-23-26					
145										
150				U	69/12"	96	27			

GROUNDWATER

DEPTH	HOUR	DATE
80.0	9:37a	1-4-90

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
NR - No Recovery

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LOG OF TEST BORING NO. N-2

JOB NO. E87-56 DATE 1-4-90

RIG TYPE Drill Systems Hammer
BORING TYPE 9 1/2" O.D. Dual Wall Pipe
SURFACE ELEV. 1167.8'
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
150										CLAYEY SILT, continued
155								ML	saturated to very moist hard	
160				S	10-19-32					
165										
170				U	62/12"	107	21			CLAYEY SILT, some fine grained sand, moderately cemented, low to medium plasticity, brown
								ML	very moist to saturated hard	
175										
180				S	26-58-50/3"					SAND, fine to medium grained, nonplastic, brown
185								SP	saturated very dense	
190				S	20-31-28					CLAYEY SILT, some fine grained sand, moderately cemented, low to medium plasticity, brown
195								ML	saturated hard	Hammer stopped at 199' Sampler refused at 200'
200				S	48-50/6"					

GROUNDWATER

DEPTH	HOUR	DATE
80.0	9:37a	1-4-90

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
NR - No Recovery

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LOG OF TEST BORING NO. N-3

JOB NO. E87-56 DATE 12-1-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1146.1'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	2.20									**SAND, GRAVEL & COBBLES,** trace of silt & clay, some boulders to 18" in size, fine to medium grained subangular to angular sand, predominantly coarse grained subrounded to rounded gravel, nonplastic, gray
5									slightly moist	
									dense to very dense	note: considerable coarse grained sand & fine grained gravel below 10'
10	3.20							GP		
										note: boulders from 15'6" to 17' and from 21' to 25'
15										
20	4.70									
25										
30										
	1.70									
35										
40										
	1.10									
45										
	3.00									
50	0.60									

GROUNDWATER

DEPTH	HOUR	DATE
49.5	8:30a	12-6-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
D - Dennison Tube

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LOG OF TEST BORING NO. N-3

JOB NO. E87-56 DATE 12-1-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1146.1'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	0.60							GP		**SAND, GRAVEL & COBBLES.** continued
55	1.00			S	50 1/4"			SP	dense to very dense	**GRAVELLY SAND**, small amount of silt & clay, predominantly medium grained sand, predominantly coarse grained gravel, angular, nonplastic, light brown
60										
65	1.70								dense to very dense	**SAND, GRAVEL & COBBLES.** small amount of silt, trace of clay, predominantly fine grained subangular to angular sand, predominantly coarse grained subrounded to rounded gravel, cobbles up to 6" in diameter, nonplastic, brown
70								GP		note: some to considerable clay below 90'
75										
80										
85	1.20									
90										
				D		90	29		saturated	**SILTY CLAY**, trace of fine grained sand, weakly lime cemented, medium plasticity, light brown
95	2.70			S	28-50/4"			CL	hard	note: occasional clayey silt lens
100										

GROUNDWATER

DEPTH	HOUR	DATE
49.5	8:30a	12-6-89

SAMPLE TYPE

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S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
D - Dennison Tube

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LOG OF TEST BORING NO. N-3

JOB NO. E87-56 DATE 12-1-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1146.1'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100									saturated hard to very firm	**SILTY CLAY**, trace of fine grained sand, weakly lime cemented, medium plasticity, light brown
	2.70									note: some moderately cemented lenses
105								CL		
				S	8-14-21					note: occasional high plasticity lenses
110										note: interbedded hard and soft zones
	1.80									note: some medium grained sand in layers below 115'
115										note: considerable fine to medium grained sand in layers below 130'
				D		91	26			
120				S	8-13-38					
	1.40									
125										**SANDY CLAY**, some silt, fine to medium grained sand, weakly lime cemented, medium plasticity, light brown to tan
				S	50/5"					
130										note: interbedded with some fine grained sand (SP) layers
	1.60								saturated	note: decrease in sand below 145'
135									hard	note: weakly to moderately lime cemented below 145
				D		86	27			
140				S	28-40-50/3"					
										Stopped drilling at 149 1/2' Sampler refused at 150'7"
145								CL		note: advanced hole by the down hole hammer method to 96', stopped outer casing at 93' and completed hole from 96' to 149 1/2' by gear bit method
					14-40					
150				S	50/1"					

GROUNDWATER

DEPTH	HOUR	DATE
49.5	8:30a	12-6-89

SAMPLE TYPE
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S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
D - Dennison Tube

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LOG OF TEST BORING NO. N-4

JOB NO. E87-56 DATE 1-5-90

RIG TYPE Drill Systems Hammer
BORING TYPE 9 1/2" O.D. Dual Wall Pipe
SURFACE ELEV. 1122.7'
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	25, 21							GC	saturated	
	20, 28, 27, 24							GP	saturated	**SAND, GRAVEL & COBBLES**, fine to coarse grained sand, coarse to subrounded gravel, nonplastic, brown
55	19, 15, 19, 16							SP	saturated, medium dense to dense	**GRAVELLY SAND**, predominantly fine, nonplastic, light brown
60	21, 22, 26, 26, 29							GP	saturated, dense to very dense	**SAND, GRAVEL AND COBBLES**, fine grained gravel, dense to very dense sand, predominantly subrounded, nonplastic, brown
65	32, 36, 38, 35, 70									
70	30, 31, 27, 27, 31, 35							GC	saturated, hard	**CLAYEY SAND, GRAVEL & COBBLES**, predominantly fine to medium sand, gap graded gravel, low to medium plasticity, brown
75	28, 29, 31			S	7-10-63			SM/ML	hard, saturated	**SILTY SAND TO SANDY SILT**, fine grained sand, weakly to moderately cemented, nonplastic, brown
80								CL	hard, very moist to saturated	**SANDY CLAY**, fine grained sand, medium plasticity, brown
85										
90				U	43	96	28	ML	very moist to saturated, hard	**SANDY SILT**, some clay, fine grained sand, wholly cemented, low plasticity, brown
95										
100				S	7-27-44					

GROUNDWATER

DEPTH	HOUR	DATE
37.0	2:08p	1-5-90

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
NR - No Recovery

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PROJECT East Papago - Hohokam - Sky Harbor Freeways

LOG OF TEST BORING NO. N-4

JOB NO. E87-56 DATE 1-5-90

RIG TYPE Drill Systems Hammer
BORING TYPE 9 1/2" O.D. Dual Wall Pipe
SURFACE ELEV. 1122.7'
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	21									
	23							SC/		
	27							GC	moist	CLAYEY SAND & GRAVEL, fine to medium grained sand, predominantly coarse grained gravel, low to medium plasticity, dark brown
	28									
	36									
5	41									
	28									
	46							GM-	slightly moist to moist	SILTY SAND, GRAVEL & COBBLES, fine to medium grained sand, predominantly coarse grained gravel, subangular to subrounded, nonplastic, brown
	49							GP		
	30									
10	49									
	61									
	68									
	50							GC		
	39									
15	61									
	45								moist	CLAYEY SAND, GRAVEL & COBBLES, predominantly medium grained sand, predominantly coarse grained gravel, low to medium plasticity, brown
	48									
	43								hard	
	39									
20	32							GM-		
	43							GP		
	38									
	35								slightly moist	SILTY SAND, GRAVEL & COBBLES, fine to medium grained sand, predominantly coarse grained subrounded gravel, nonplastic, light brown
25	32									
	43								hard	
	43									
	38									
	27									
	29									
30	30							GC		CLAYEY SAND, GRAVEL & COBBLES, fine to medium grained subangular sand, predominantly coarse to sub-rounded gravel, low to medium plasticity, brown
	30									
	35								moist to very moist to saturated below 37'	
	32									
35	31									
	37									
	30									
	22								hard	
	22									
	25									
40	26									
	24									
	29									
	38									
	48									
45	42									
	49									
	52									
	60									
50	37									

GROUNDWATER

DEPTH	HOUR	DATE
37.0	2:08p	1-5-90

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
NR - No Recovery

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LOG OF TEST BORING NO. N-4

JOB NO. E87-56 DATE 1-5-90

RIG TYPE Drill Systems Hammer
BORING TYPE 9 1/2" O.D. Dual Wall Pipe
SURFACE ELEV. 1122.7'
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100								ML	very moist to saturated	
105										**CLAYEY SILT**, some fine grained sand, low to medium plasticity brown
				U	30/12"	98	24			note: locally grades to silty clay
110									very moist to saturated	note: considerable sand grading to sandy clay below 129'
									very stiff to hard	
115								CL/ ML		
120				S	5-11-10					
125										
130				U	32/12"	100	25			
135										
										SILTY SAND, fine grained, nonplastic, light brown
140				S	50/5"			SM	saturated	
									hard	
145										
					13-36-33					Hammer stopped at 149' Sampler stopped at 150'6"
150				S						

GROUNDWATER

DEPTH	HOUR	DATE
37.0	2:08p	1-5-90

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
NR - No Recovery

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LOG OF TEST BORING NO. N-5

JOB NO. E87-56 DATE 12-8-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1140.5'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**SAND, GRAVEL & COBBLES,** trace to some silt, predominantly fine to medium grained sand, predominantly coarse grained gravel, subrounded to rounded, nonplastic, light grayish brown
	1.90									
5									slightly moist to moist	note: occasional 6" to 1' thick sand (SP) layers from 15' to 30'
10								GP		note: occasional small 1' to 1 1/2' diameter boulders below 35'
	1.10									
15										
20										
	0.90									
25										
30										
	1.40									
35										
40										
	1.50									
45										
50	1.00									

GROUNDWATER

DEPTH	HOUR	DATE
46.4	8:30a	12-12-89

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
D - Dennison Tube

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LOG OF TEST BORING NO. N-5

JOB NO. E87-56 DATE 12-8-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1140.5'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50										**SAND, GRAVEL & COBBLES**, trace to some silt, predominantly fine to medium grained sand, predominantly coarse grained gravel, subrounded to rounded, nonplastic, light grayish brown
	1.00									
55								GP	slightly moist to moist below 56'	note: some to considerable fine grained sand & silt in thin layers from 72' to 74'
60										note: considerable clay from 75' to 77'
	1.50									
65										note: some to considerable clay below 84'
70										
	2.50									
75										
80										
	1.90									
85									very moist to saturated	**SANDY CLAY**, some silt, fine grained sand, weakly lime cemented, medium plasticity, light brown
				D						
90				S	7-11-19			CL	very firm	note: interbedded with some moderately to strongly lime cemented zones from 85' to 88'
	2.10									note: no lime cementation to weakly lime cemented below 90'
95										note: white high plasticity clay in lenses
100										

GROUNDWATER

DEPTH	HOUR	DATE
46.4	8:30a	12-12-89

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
D - Dennison Tube

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LOG OF TEST BORING NO. N-5

JOB NO. E87-56 DATE 12-8-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1140.5'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100	2.10			S	14-14-34			CL	very moist to saturated very firm	**SANDY CLAY**, some silt, fine grained sand, weakly lime cemented, medium plasticity, light brown
105	1.70			D				CH	very moist to saturated very firm	**SILTY CLAY**, trace of fine grained sand, locally weakly lime cemented, high to medium plasticity, brown note: some strongly lime cemented lenses below 107'
110	0.60			S	11-50/6"			SM	very moist to saturated	**SILTY SAND**, trace of clay, fine grained, nonplastic to low plasticity, light brown to brown note: considerable medium to high plasticity clay in lenses
115				A				SP	saturated	**SAND**, trace to some fine grained gravel, predominantly medium to coarse grained, subangular to angular, nonplastic, light grayish brown note: slightly increase in fine grained gravel with depth below 115'
120	3.00									
125	1.90							GP	saturated	**SAND & GRAVEL**, trace of silt, well graded sand, predominantly fine grained gravel, subangular to rounded, nonplastic, light grayish brown note: decrease in gravel below 131', graded to (SP) note: considerable clay below 127.5'
130				A						
				D						
135	1.50			S	28-42-50/4"					
140				A				CH	very moist to saturated hard	**SILTY CLAY**, trace of fine grained sand, weakly lime cemented, medium to high plasticity, brown to light brown note: interbedded with sand (SP) layers from 133' to 140' note: some white moderately lime cemented layers below 140'
145	0.90			S	21-50/3"					
150										

GROUNDWATER

DEPTH	HOUR	DATE
46.4	8:30a	12-12-89

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
D - Dennison Tube

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CONSULTING GEOTECHNICAL ENGINEERS
PHOENIX · ALBUQUERQUE · SANTA FE
SALT LAKE CITY · EL PASO · TUCSON · RENO/SPARKS

PROJECT East Papago - Hohokam - Sky Harbor Freeways

LOG OF TEST BORING NO. N-5

JOB NO. E87-56 DATE 12-8-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1140.5'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
150	0.90							CH	very moist to saturated	**SILTY CLAY**, trace of fine grained sand, weakly lime cemented, medium to high plasticity, light brown to brown
			•	D		96	26			
155	0.60			S	29-50/5"				saturated very dense	**SAND**, trace to some fine grained gravel, predominantly fine to medium grained, nonplastic, light reddish brown
			•	A						
160								SP		note: some silt & clay from 155' to 156'
										note: some to considerable fine grained gravel in layers
165	1.60			S						note: some clay below 159'
170	2.50								very moist to saturated hard	**SANDY CLAY**, some silt, predominantly fine to medium grained sand, weakly to moderately lime cemented, medium to high plasticity, light brown
			•	A						
				U	100/11"	92	30			
175								CH		note: some black manganese oxide staining in moderately cemented layers predominantly from 170' to 173'
180										note: grades to silty clay below 175'
	1.50									
185								SP	saturated	**SAND**, trace to some predominantly fine grained gravel, predominantly fine to medium grained, nonplastic, light brown note: trace to some silt below 195'
190	1.00		•	A						
195										Stopped Gearbit at 200' note: advanced hole by down the hole hammer methods to 88' and by gearbit methods from 88' to 200', outer casing advanced to 173'
200										

GROUNDWATER

DEPTH	HOUR	DATE
46.4	8:30a	12-12-89

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
D - Dennison Tube

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PROJECT East Papago - Hohokam - Sky Harbor Freeways

LOG OF TEST BORING NO. N-6

JOB NO. E87-56 DATE 1-9-90

RIG TYPE Drill Systems Hammer
BORING TYPE 9 1/2" O.D. Dual Wall Pipe
SURFACE ELEV. 1120.8'
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								CL	slightly moist	**SILTY CLAY**, some fine grained sand, low to medium plasticity, light brown
	3									
	17									
	14									
	16							GP		
5	15									
	10								slightly moist	**SAND & GRAVEL**, some cobbles & silt, medium to fine grained subangular sand, predominantly coarse grained subrounded gravel, nonplastic, brown
	35									
	32							GP		
	28									
10	29									
	46									
	31									
	35								slightly moist to dry	**SAND, GRAVEL & COBBLES**, small amount of silt, predominantly fine to medium grained subangular sand, coarse grained subrounded gravel, nonplastic, light reddish gray
	30									
15	27									
	38									
	46									
	29									
	35									
20	48							GP		
	42									
	73									
	75									
	68								slightly moist to very moist to saturated below 41'	**SAND, GRAVEL & COBBLES**, some clay, predominantly fine to medium grained subangular sand, coarse grained subrounded gravel, low plasticity, brown
25	71									
	70									note: considerable coarse grained sand below 20'
	55									
	31									
	36									
30	42									note: considerable clay coated grains and occasional clayey sand, gravel & cobble lenses
	46									
	45									
	45									
	32									
35	48									
	27									
	46									
	42									
	42									
40	38									
	26									
	22									
	29									
	32									
45	37									
	23									
	29									
	40									
50	26									

GROUNDWATER

DEPTH	HOUR	DATE
41.0	9:42a	1-9-90

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
NR - No Recovery

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JOB NO. E87-56 DATE 1-9-90

RIG TYPE Drill Systems Hammer
BORING TYPE 9 1/2" O.D. Dual Wall Pipe
SURFACE ELEV. 1120.8'
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	51									
	60									SAND, GRAVEL & COBBLES, predominantly coarse grained sand, coarse grained rounded gravel, nonplastic, brown
	47									
	32									
	27									
55	22							GP	saturated	
	28									
	25									
	22									
	28									
60	31									
	15									
	21									
	32									
	19									
65	24									
	34									
	32									
	30									
	31									
70	26									
	28									SILTY CLAY, some fine grained sand, weakly cemented in zones, medium to occasional high plasticity, light brown
	33									
	35									
	29									
75	27								very moist to saturated	
	30									note: occasional thin clayey silt lens
	32									
	35								hard	
80				S	3-11-25			CL/CH		
85	26									
	28									
	23									
	23									
90				U	95/18"	99	26			
95										
100				S	2-5-21					

GROUNDWATER

DEPTH	HOUR	DATE
41.0	9:42a	1-9-90

SAMPLE TYPE

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U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
NR - No Recovery

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JOB NO. E87-56 DATE 1-9-90

RIG TYPE Drill Systems Hammer
BORING TYPE 9 1/2" O.D. Dual Wall Pipe
SURFACE ELEV. 1120.8'
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100	32									
	47									
	51									
	50									
	51									
105	46							CL/	saturated to	
	32							CH	very moist	
	41									
	58								hard	
	52		T	U	100/7"	97	25			
110	63									
	31									
	30									
	53									
	37									
115	42									
	80									SILTY CLAY, some fine grained sand, weakly lime cemented, high plasticity, light brown to tan
	71									
	39								very moist	
				S	8-22-				to saturated	
120					24			CH		
									hard	
	72									
	68									
125	42									SILTY CLAY, some fine grained sand, weakly cemented, medium plasticity, brown
	38									
	49									
	56									
	39			U	30/12"	110	18			note: occasional clayey silt lens
130	42							CL	saturated	and some moderately cemented
	37									zones
	36								hard	
	41									
	72									
135	36									
	40									
	45									
	39									
				S	12-19-					
140					20					SAND, fine to medium grained, subangular to subrounded,
	76								saturated	nonplastic, brown
	82									
	179								very dense	note: some clay in lenses
145	128									
	85									
	48									
	32				12-			SP		Stopped Hammer at 149'
				S	50/2"					Sampler refused at 149'8"
150										

GROUNDWATER

DEPTH	HOUR	DATE
41.0	9:42a	1-9-90

SAMPLE TYPE

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U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
NR - No Recovery

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LOG OF TEST BORING NO. N-7

JOB NO. E87-56 DATE 12-18-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1138.2'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										**SAND, GRAVEL & COBBLES.** considerable silt, some boulders up to 16" in diameter, trace of clay, predominantly fine to medium grained angular sand, predominantly coarse grained gravel, subrounded to rounded gravel & cobbles, weakly lime cemented, nonplastic, brown
5	1.60									
10										note: decrease in cobbles, predominantly well graded sand, fine grained gravel from 49' to 52'
	1.70									
15								GP	slightly moist to moist	
	3.00									
20										
	2.00									
25										
	1.50									
30	2.30									
35	1.70									
40										
	1.60									
45										
50	1.80									

GROUNDWATER

DEPTH	HOUR	DATE
49.0	3:40p	12-19-89
47.2	8:00a	12-20-89

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
D - Dennison Tube

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LOG OF TEST BORING NO. N-7

JOB NO. E87-56 DATE 12-18-89

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1138.2'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50									moist to saturated below 50'	note: some black silt & fine grained sand at 56' note: small amount of clay at 73', moderately cemented sand at 74'
55	1.80							GP		
60										
	2.30									
65										
70										
	2.10									
75										
80	1.80									
85	2.30							CL CH	very moist to saturated	**SILTY CLAY**, (CL/CH), some fine grained sand, weakly to moderately lime cemented, medium to high plasticity, brown Interbedded with: **SILTY SAND**, (SM), trace of fine grained gravel, some clay, predominantly fine to medium grained, subangular to angular, nonplastic to low plasticity, brown
90				D		93	29	SM	hard	
95	1.00							CL CH		Interbedded with: **SANDY TO CLAYEY SILT**, (ML), fine grained sand, weakly to moderately lime cemented, low plasticity, brown
100										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	49.0	3:40p	12-19-89
▼	47.2	8:00a	12-20-89

SAMPLE TYPE
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S - 2" O.D. 1.38" I.D. tube sample.
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PROJECT East Papago - Hohokam - Sky Harbor Freeways

LOG OF TEST BORING NO. N-8

JOB NO. E87-56 DATE 1-8-90

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1176.1'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100										**SAND, GRAVEL & COBBLES.** continued
	1.20									note: some cemented sand in lenses below 113'
105	1.70							GP	saturated	note: considerable silt & clay from 114' to 115'
110	1.70									
115	2.10									
120	2.90									**CLAYEY SILT & SILTY CLAY.** some fine grained sand, small amount of localized fine grained gravel, moderately lime cemented, medium plasticity, brown
125	3.90							CL/ ML	saturated hard	
130				D S	(9") 32-50/4"	92	28			
135	1.60								saturated very dense	**SAND**, small amount of silt & clay, predominantly fine grained, subangular to angular, weakly lime cemented, nonplastic, brown
						108	20			
140				U	100/ 7 1/2"					**SAND & GRAVEL**, some silt & cobbles, predominantly medium to coarse grained, subangular sand, predominantly coarse subangular gravel, nonplastic, brown
	1.20							SP	saturated	
145	1.40									
150								GP		

GROUNDWATER

DEPTH	HOUR	DATE
84.0	8:30a	1-10-90
81.0	8:30a	1-12-90

SAMPLE TYPE
A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
D - Dennison Tube

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LOG OF TEST BORING NO. N-8

JOB NO. E87-56 DATE 1-8-90

RIG TYPE Schramm T-64H
BORING TYPE 6" Hammer, 4 1/2" Gearbit
SURFACE ELEV. 1176.1'
DATUM

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Counts	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
150								GP	saturated	SAND & GRAVEL, continued
	1.50									SILTY CLAY, some fine grained sand, moderately lime cemented, medium to high plasticity, brown
				U	100/8"	106	22			
155								CL	very moist to saturated	note: high plasticity at 164'
									hard	note: increase in amount of cementation below 165'
160	2.10									
				U	45	85	36			
165	2.00			D	(15")	80	36			
										SILTY CLAY, trace of gravel, some fine to medium grained sand, moderately to strongly lime cemented, medium plasticity, brown
170									saturated	
	2.50								hard	note: thin lens of gravelly sand at 167'
175								CL		
	2.30									
				U	100/7"					
180										GRAVELLY SAND, some clay, small amount of silt, predominantly medium grained, subangular, nonplastic, brown
185	2.60									
									saturated	Stopped Drilling at 200' 6" outer casing driven to 174', 4 1/2" down hole hammer advanced to 129', gear bit advanced from 129' to 200'
190				U	100/ 4 1/2"	110	19		very dense	
195										
								SP		
200										

GROUNDWATER

DEPTH	HOUR	DATE
84.0	8:30a	1-10-90
81.0	8:30a	1-12-90

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
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PAPAGO EAST - COORDINATES & ELEV.'S FOR TEST HOLES

Pt. No.	North	East	Elevation
N1	886,233.814	502,407.462	1150.53
N2	886,441.004	503,080.470	1167.82
N3	886,350.975	503,658.977	1146.14
N4	886,390.997	504,461.156	1122.72
N5	886,330.004	504,942.015	1140.46
N6	886,324.230	505,683.049	1120.78
N7	886,172.920	506,241.664	1138.19
N8	885,797.835	506,819.115	1176.14
EP 148	886,339.81	500,154.37	1159.70
EP 147	886,228.33	499,628.04	1157.70

LABORATORY TESTING PROCEDURES

Consolidation Tests Soiltest or Clockhouse apparatus of the "floating-ring" type are employed for the one-dimensional consolidation tests. They are designed to receive one inch high 2.5 inch O.D. brass liner rings with soil specimens as secured in the field. Procedures for the tests generally are those outlined in ASTM D2435. Loads are applied in several increments to the upper surface of the test specimen and the resulting deformations are recorded at selected time intervals for each increment. For soils which are essentially saturated, each increment of load is maintained until the deformation versus log of time curve indicates completion of primary consolidation. For partially saturated soils, each increment of load is maintained until the rate of deformation is equal or less than 1/10,000 inch per hour. Applied loads are such that each new increment is equal to the total previously applied loading. Porous stones are placed in contact with the top and bottom of the specimens to permit free addition or expulsion of water. For partially saturated soils, the tests are normally performed at in situ moisture conditions until consolidation is complete under stresses approximately equal to those which will be imposed by the combined overburden and foundation loads. The samples are then submerged to show the effect of moisture increase and the tests continued under higher loadings. Generally, the tests are continued to about twice the anticipated curve due to overburden and structural loads with a rebound curve then being established by releasing loads.

Expansion Tests The same type of consolidometer apparatus described above is used in expansion testing. Undisturbed samples contained in brass liner rings are placed in the consolidometers, subjected to appropriate surcharge loads and submerged. The loads are maintained until the expansion versus log of time curve indicates the completion of "primary swell".

Direct Shear Tests Direct shear tests are run using a Clockhouse or Soiltest apparatus of the strain-control of approximately 0.05 inches per minute. The machine is designed to receive one of the one inch high 2.42 inch diameter specimens obtained by tube sampling. Generally, each sample is sheared under a normal load equivalent to the effective overburden pressure at the point of sampling. In some instances, samples are sheared at several normal loads to obtain the cohesion and angle of internal friction. When necessary, samples are saturated and/or consolidated before shearing in order to approximate the anticipated controlling field loading conditions.

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TABULATION OF TEST RESULTS

Job No. E87-56

HOLE NO	DEPTH	UNIFIED CLASS	L.L.	P.I.	SIEVE ANALYSIS-ACCUM % PASSING #200 .75"	#100 1"	#50 1.5"	#40 2"	#30 2.5"	#16 3"	#10 3.5"	#8 4"	#4 6"	.25" 8"	.375" 10"	.5" 12"	LAB NO
EP-147	120'6"-122'6"	ML	36	11	81	86	87	87	87	88	90	90	93	94	97	98	
					100												7-56-1347
EP-147	145'-147'	SM	NV	NP	47	85	99										7-56-1349
EP-148	107'-109'	CL	43	20	82	97	100										7-56-1361
EP-148	123'-125'	CH	58	35	85	95	100										7-56-1363
EP-148	131'6"-132'6"	SC	43	26	42	43	50	62	79	96	99	99	100				7-56-1364
N-1	104'6"-105'6"	CL	46	22	94	97	97	97	98	98	99	99	100				7-56-1369
N-1	128'-130'	CH	60	36	92	96	99	99									7-56-1370
N-1	149'6"-151'	CH	65	42	96	98	99	99	99	99	99	99	99	99	100		7-56-1371
N-2	129'6"-130'6"	CH	55	32	92	95	98	99									7-56-1407
N-2	149'-150'	ML	41	15	84	94	99										7-56-1409
N-2	169'-170'	ML	35	10	77	81	82	82	83	84	86	87	90	92	96	97	
					100												7-56-1411
N-3	92'4"-94'4"	ML	34	6	86	98	99	99	100								7-56-1374
N-3	117'8"-119'8"	CL	37	13	59	67	70	71	73	76	78	79	82	85	89	92	
					100												7-56-1377
N-3	139'-139'6"	CL	44	25	79	90	97	98	99	99	99	99	99	100			7-56-1380
N-4	89'-90'	ML	32	6	79	93	99	100									7-56-1416
N-4	109'-110'	ML	38	12	76	92	97	98	98	98	98	98	98	98	100		7-56-1418
N-4	129'-130'	CL	36	14	59	73	77	78	79	79	80	80	82	83	86	89	
					95	100											7-56-1420
N-5	153'-154'6"	CH	58	36	89	92	93	93	94	95	95	96	97	99	100		7-56-1392
N-5	173'-173'11"	CH	55	30	94	96	96	97	97	97	97	97	98	98	99	100	
																	7-56-1397

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TABULATION OF TEST RESULTS

Job No. EB7-56

HOLE NO	DEPTH	UNIFIED CLASS	L.L.	P.I.	#200 .75"	#100 1"	#50 1.5"	#40 2"	#30 2.5"	#16 3"	#10 3.5"	#8 4"	#4 6"	.25" 8"	.375" 10"	.5" 12"	LAB NO
							SIEVE ANALYSIS-ACCUM % PASSING										
N-6	89'-90'6"	CL	45	24	83	90	92	92	93	93	94	94	94	94	96	97	
					100												7-56-1425
N-6	109'-109'7"	CH	56	34	88	94	96	96	96	96	97	97	98	98	99	100	7-56-1427
N-6 (CEMENTATION)	129'-130'1"	GC	49	30	42	48	50	51	52	53	53	54	54	54	54	55	
					59	68	100										7-56-1429
N-6	129'-130'1"	CL	46	27	79	90	96	98	99	99	99	100					7-56-1429A
N-7	89'-90'6"	CH	53	29	89	98	99	100									7-56-1399
N-7	110'-110'5.5"	SP-SM	NV	NP	7.9	16	43	65	82	96	98	99	100				7-56-1401
N-7	120'-120'6.5"	ML	31	4	63	82	87	87	87	87	87	87	87	88	89	89	
					93	100											7-56-1402
N-7	134'6"-135'1"	CH	51	30	85	87	89	89	90	91	93	94	96	98	98	100	7-56-1403
N-8	129'-129'9"	ML	33	9	69	95	100										7-56-1432
N-8	139'-139'7.5"	CL	30	8	70	74	81	88	92	97	98	99	100				7-56-1434
N-8	154'-154'8"	CL	46	24	81	86	89	89	89	90	90	90	91	92	94	95	
					100												7-56-1435
N-8	164'-165'	CH	59	33	83	92	98										7-56-1436
N-8	165'-166'3"	ML	34	9	70	78	87	90	92	94	95	95	96	97	98	100	7-56-1437
N-8	190'-190'4.5"	CL	30	11	96	99											7-56-1439

SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: #147 @ 120'6" TO 122'6'

JOB # E89-56
DATE 11/27/89
W.O. # 62
LAB # 1347

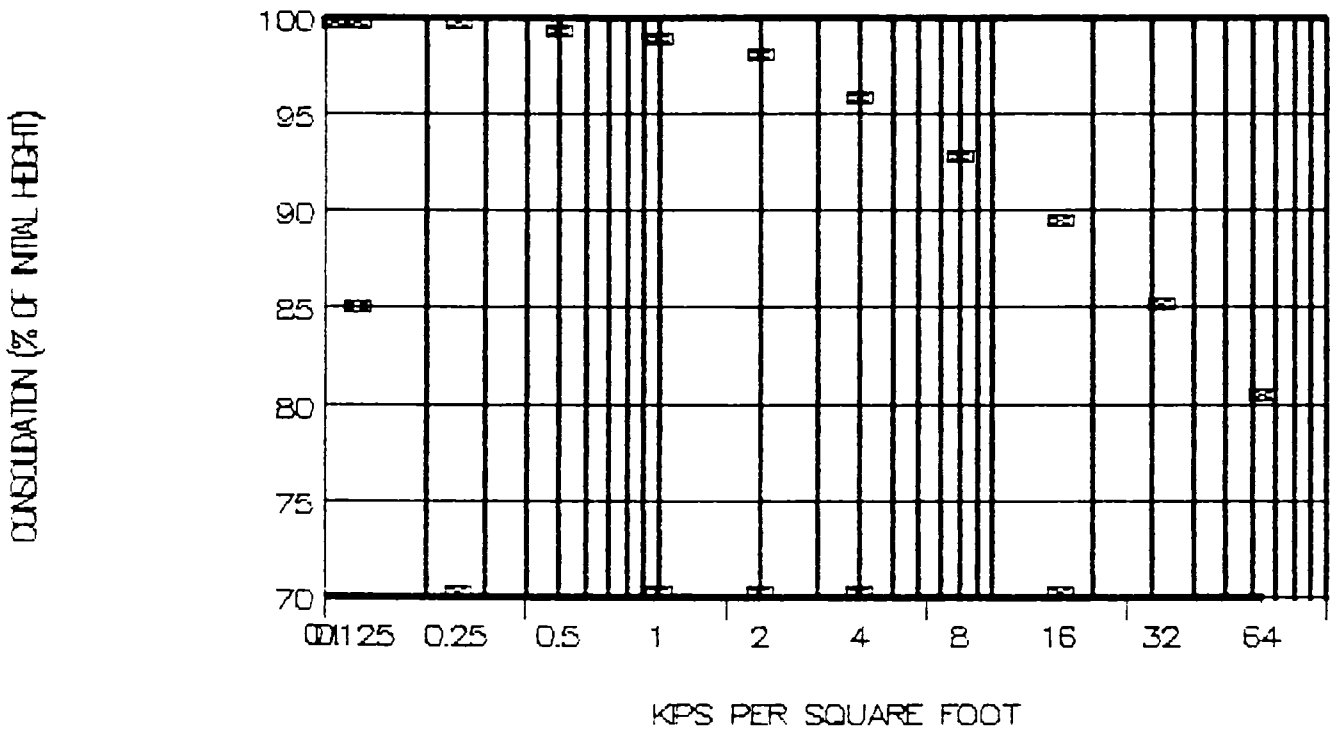
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	25.7%
INUNDATED MOIST. CONT.	24.1%
MOISTURE PICK-UP	-1.6%
DRY DENSITY	87.7 pcf

CONSOLIDATION TEST

#147 @ 120'6" TO 122'6"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: #147 @ 145' TO 147'

JOB # E89-56
DATE 11/27/89
W.O. # 62
LAB # 1349

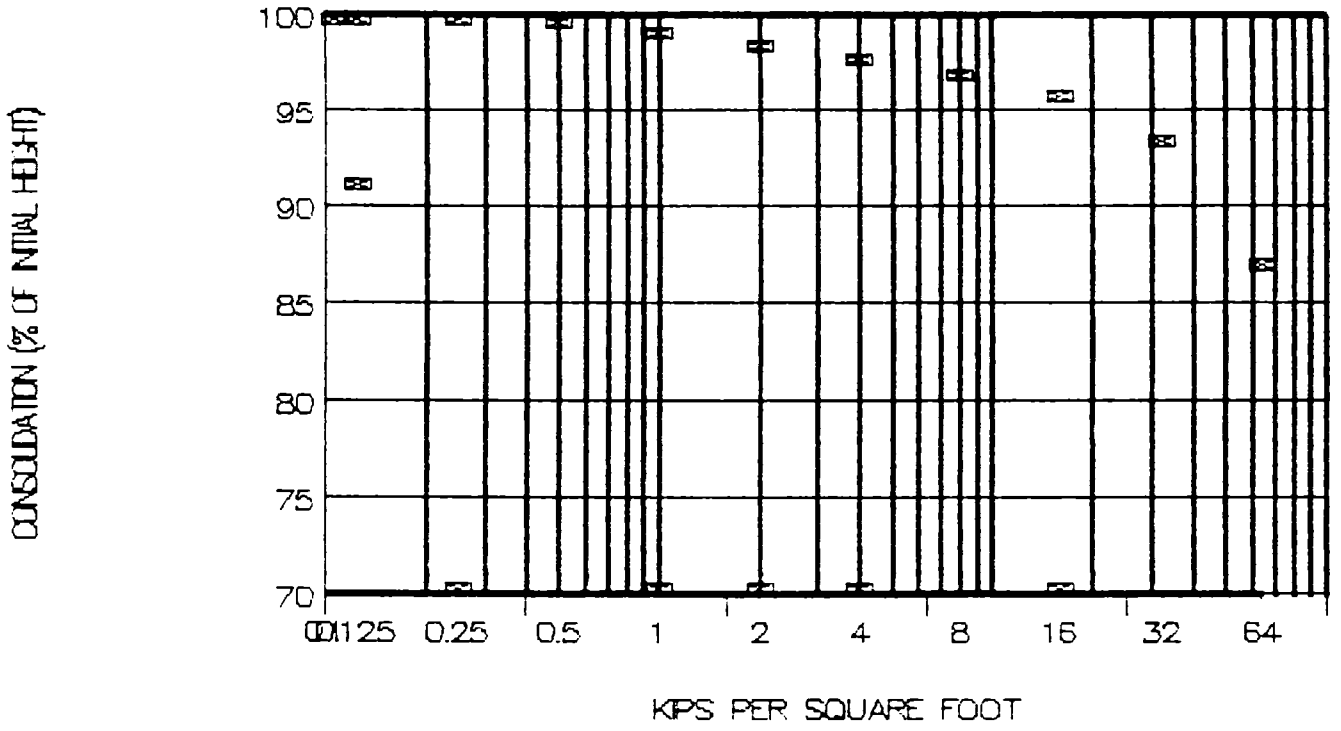
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	13.2%
INUNDATED MOIST. CONT.	21.9%
MOISTURE PICK-UP	8.7%
DRY DENSITY	99.3 pcf

CONSOLIDATION TEST

#147 @ 145' TO 147'



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: #148 @ 123' TO 125'

JOB # E89-56
DATE 11/27/89
W.O. # 62
LAB # 1363

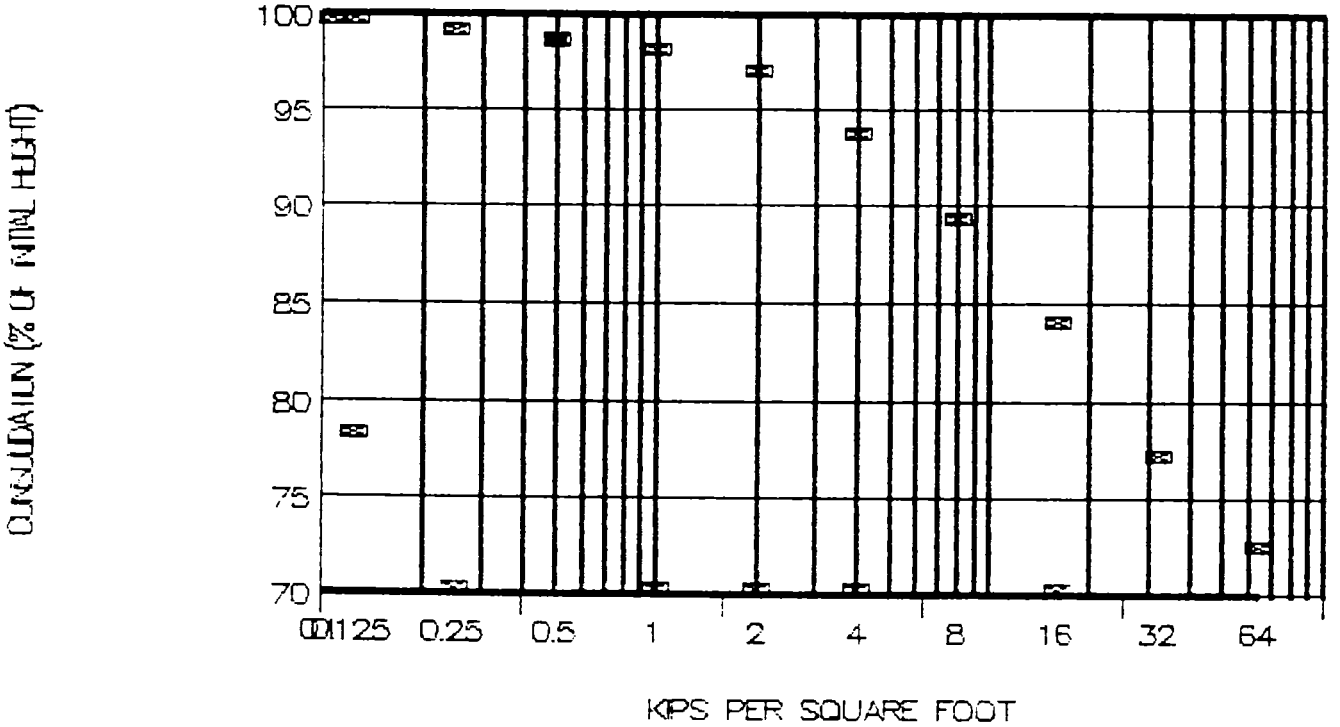
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	46.3%
INUNDATED MOIST. CONT.	39.0%
MOISTURE PICK-UP	-7.3%
DRY DENSITY	66.8 pcf

CONSOLIDATION TEST

#148 @ 123' TO 125'



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: #148 @ 131'6" TO 132'6"

JOB # E89-56
DATE 11/27/89
W.O. # 62
LAB # 1364

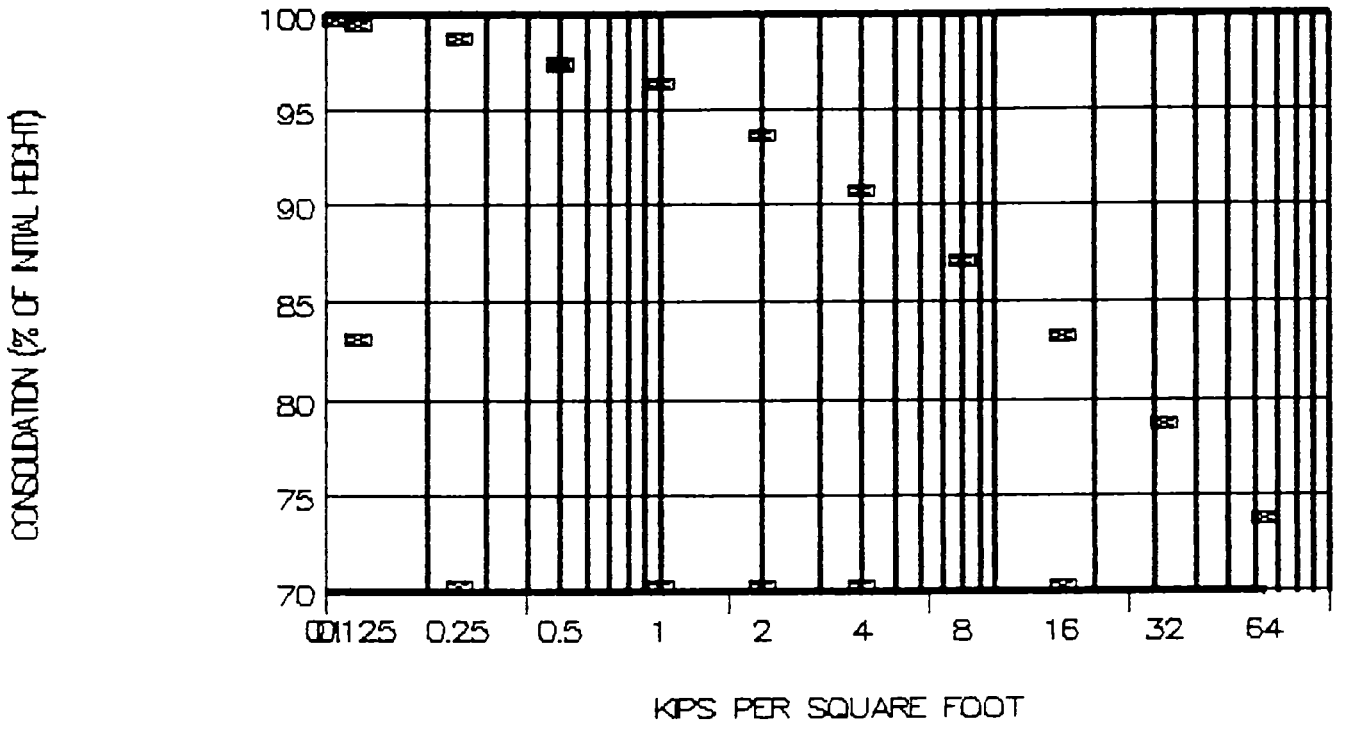
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	35.3%
INUNDATED MOIST. CONT.	27.7%
MOISTURE PICK-UP	-7.6%
DRY DENSITY	86.2 pcf

CONSOLIDATION TEST

#148 @ 131'6" TO 132'6"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: N-1 @ 128' TO 130'

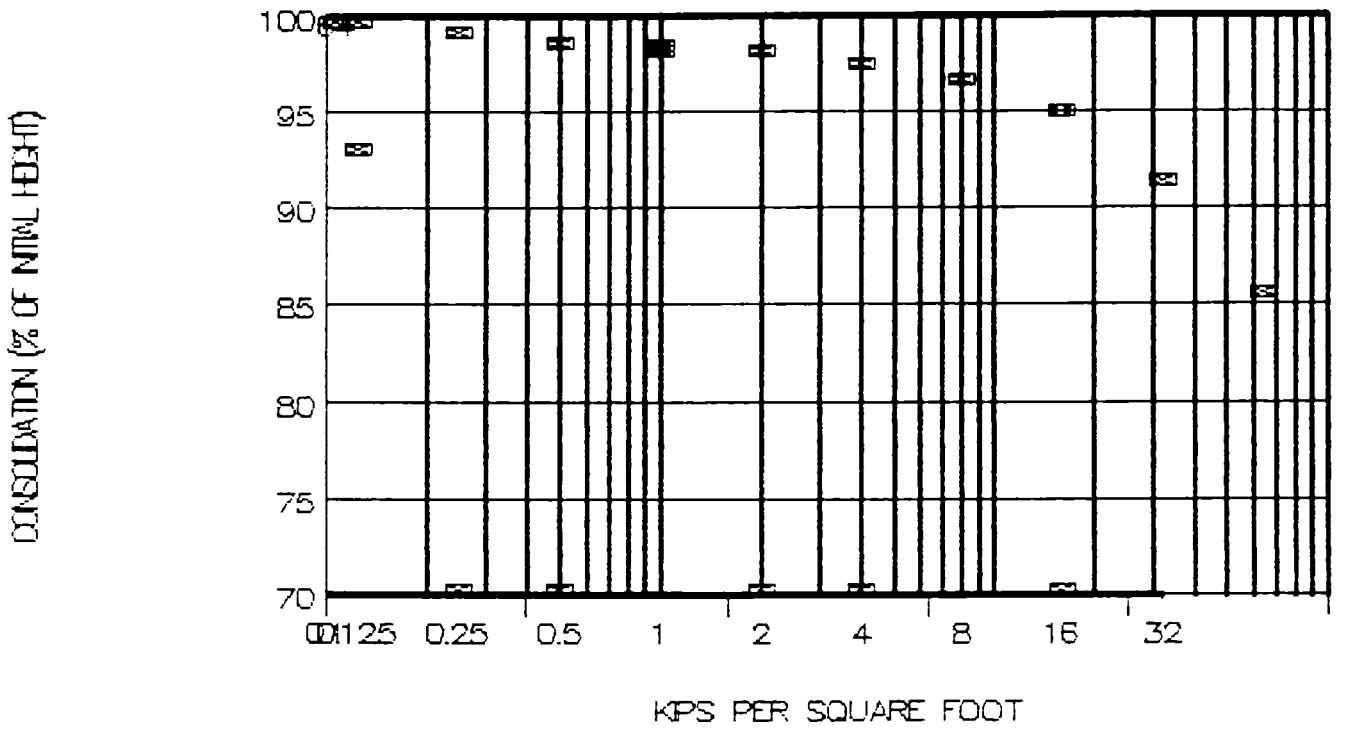
JOB # E87-56
DATE 12/15/89
W.O. # 63
LAB # 1370

CONSOLIDATION TEST

INSITU MOIST. CONTENT	33.5%
INUNDATED MOIST. CONT.	31.5%
MOISTURE PICK-UP	-2.1%
DRY DENSITY	85.7 pcf

CONSOLIDATION TEST

N-1 @ 128' TO 130'



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: N-2 @ 169' TO 170'

JOB # E87-56
DATE 1/15/90
W.O. # 67
LAB # 1411

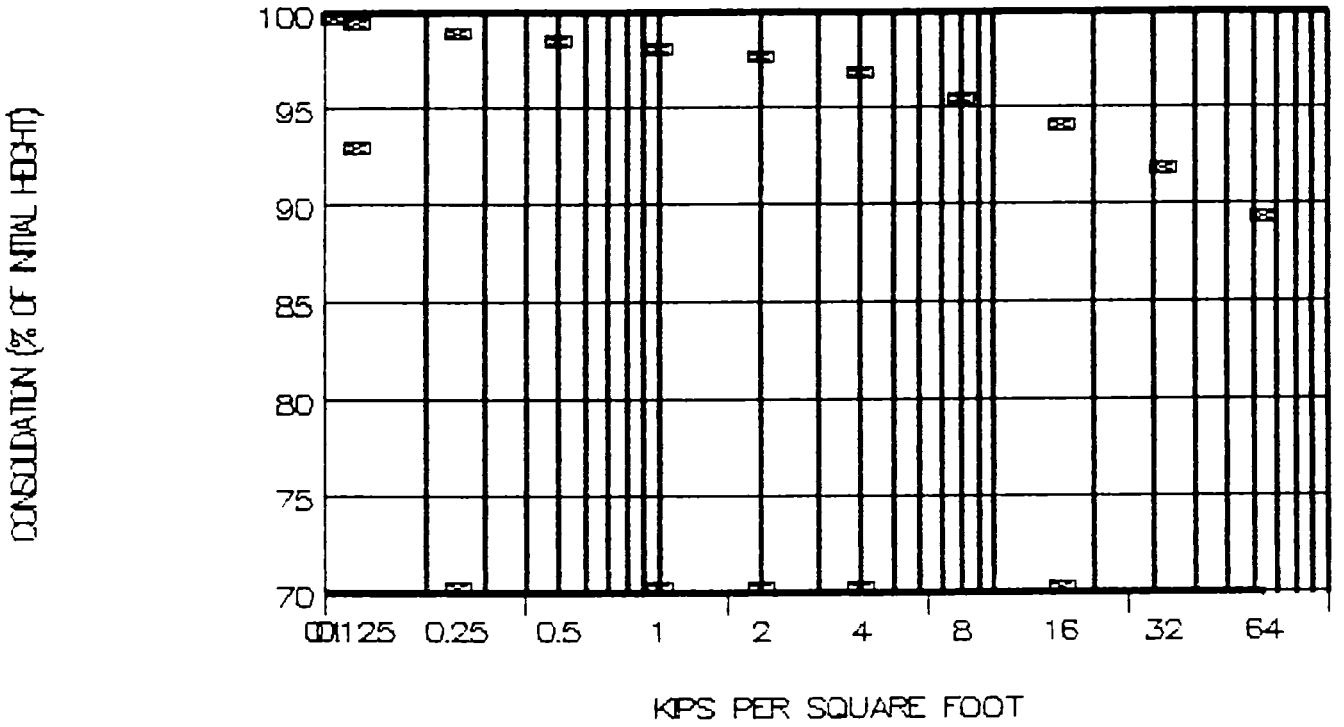
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	20.5%
INUNDATED MOIST. CONT.	18.4%
MOISTURE PICK-UP	-2.1%
DRY DENSITY	107.0 pcf

CONSOLIDATION TEST

N-2 @ 169' TO 170'



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: N-3 @ 92'4" TO 94'4"

JOB # E87-56
DATE 12/22/89
W.O. # 64
LAB # 1374

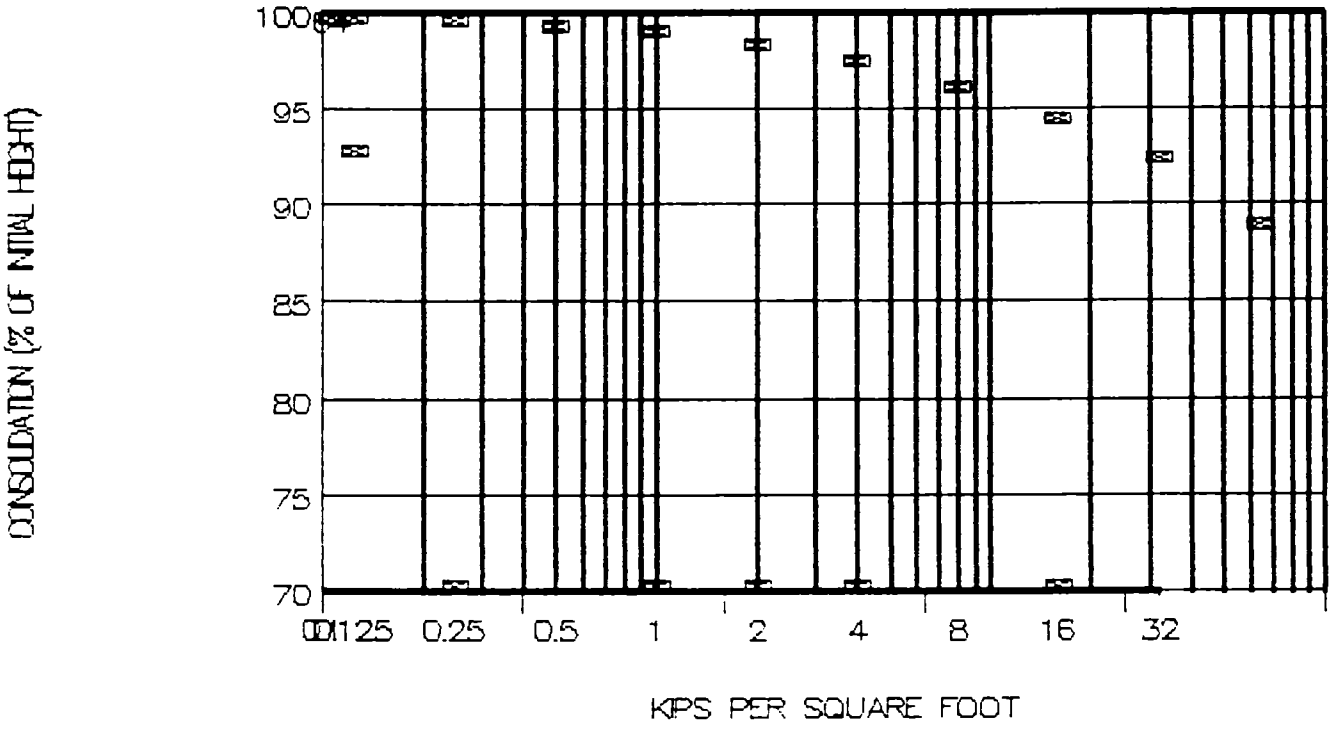
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	25.3%
INUNDATED MOIST. CONT.	22.5%
MOISTURE PICK-UP	-2.7%
DRY DENSITY	97.8 pcf

CONSOLIDATION TEST

N-3 @ 92'4" TO 94'4"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: N-3 @ 117'8" TO 119'8"

JOB # E87-56
DATE 12/22/89
W.O. # 64
LAB # 1377

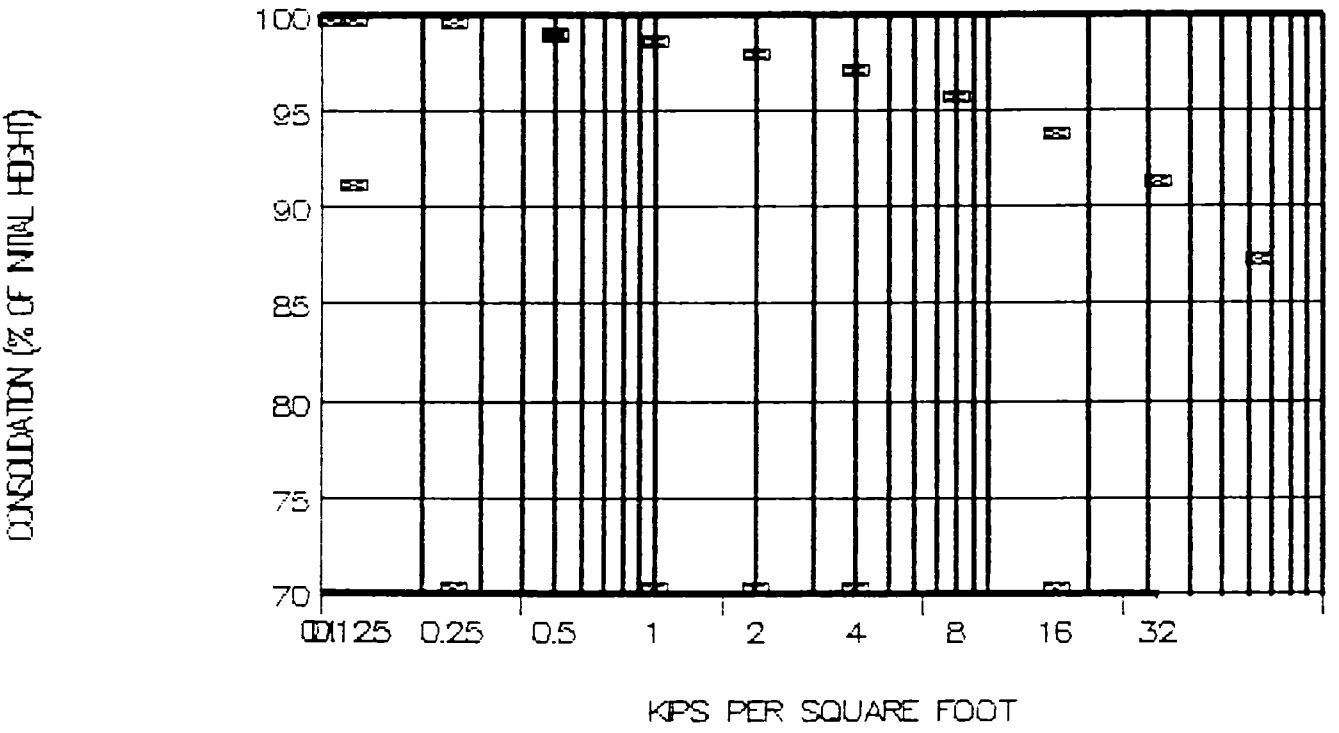
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	20.2%
INUNDATED MOIST. CONT.	19.8%
MOISTURE PICK-UP	-0.4%
DRY DENSITY	100.4 pcf

CONSOLIDATION TEST

N-3 @ 117'8" TO 119'8"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO FREEWAY
SAMPLE: N-5 @ 153' TO 154'6"

JOB # E87-56
DATE 12/29/89
W.O. # 65
LAB # 1392

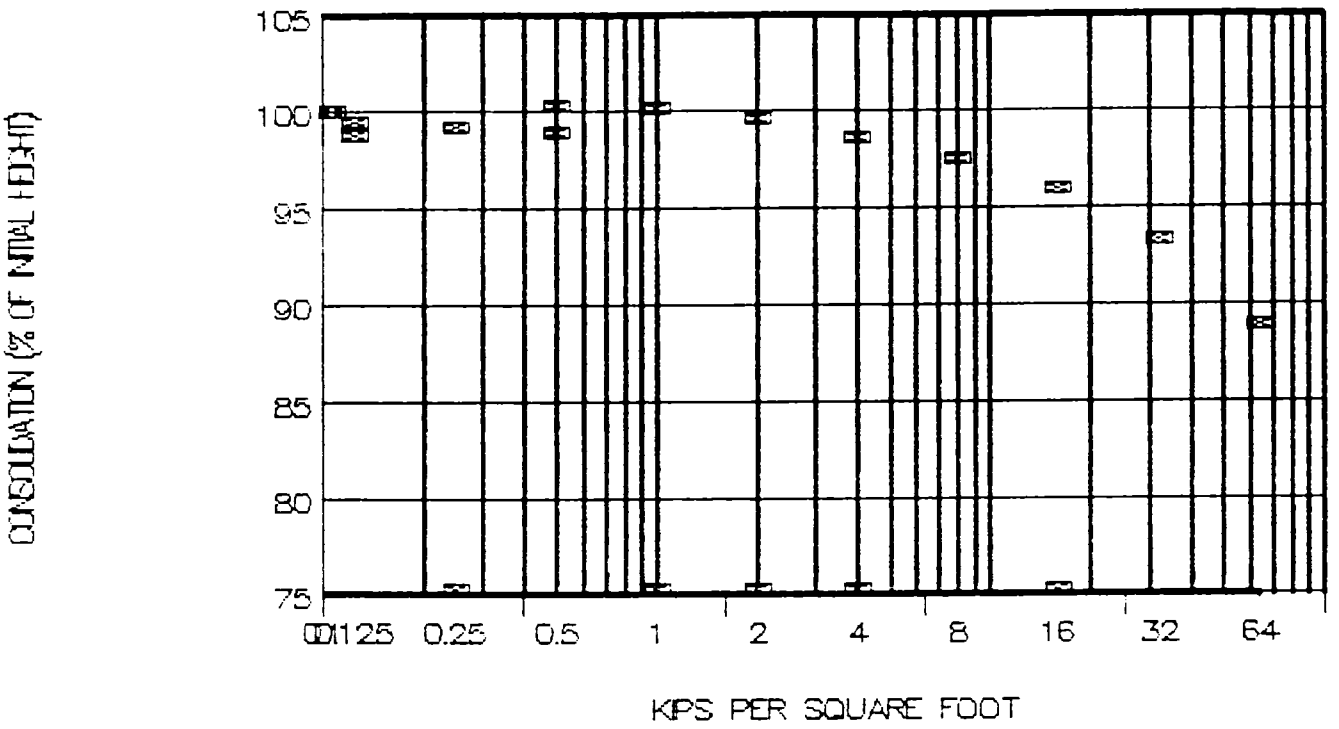
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	23.4%
INUNDATED MOIST. CONT.	26.5%
MOISTURE PICK-UP	3.0%
DRY DENSITY	99.7 pcf

CONSOLIDATION TEST

N-5 @ 153' TO 154'6"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO FREEWAY
SAMPLE: N-5 @ 173' TO 173'11"

JOB # E87-56
DATE 12/29/89
W.O. # 65
LAB # 1397

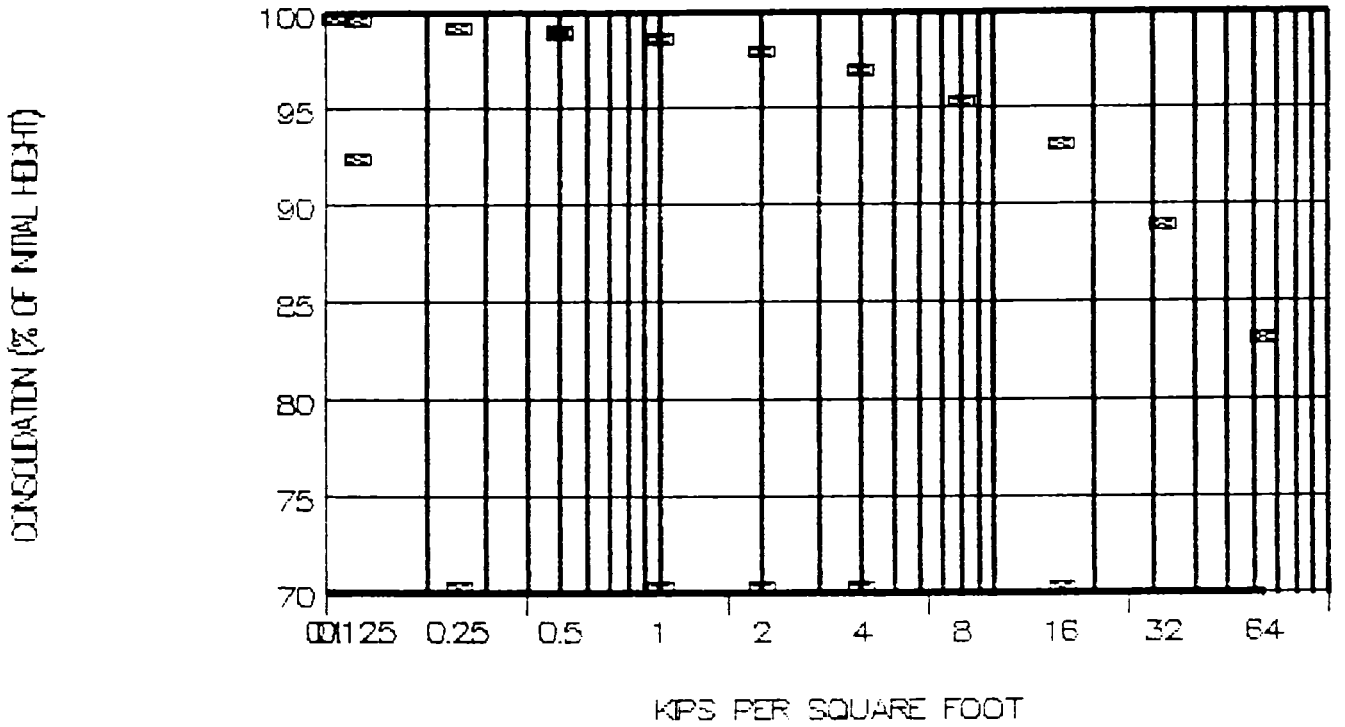
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	34.7%
INUNDATED MOIST. CONT.	31.3%
MOISTURE PICK-UP	-3.4%
DRY DENSITY	86.4 pcf

CONSOLIDATION TEST

N-5 @ 173' TO 173'11"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO FREEWAY
SAMPLE: N-7 @ 89' TO 90'6"

JOB # E87-56
DATE 1/8/90
W.O. # 66
LAB # 1399

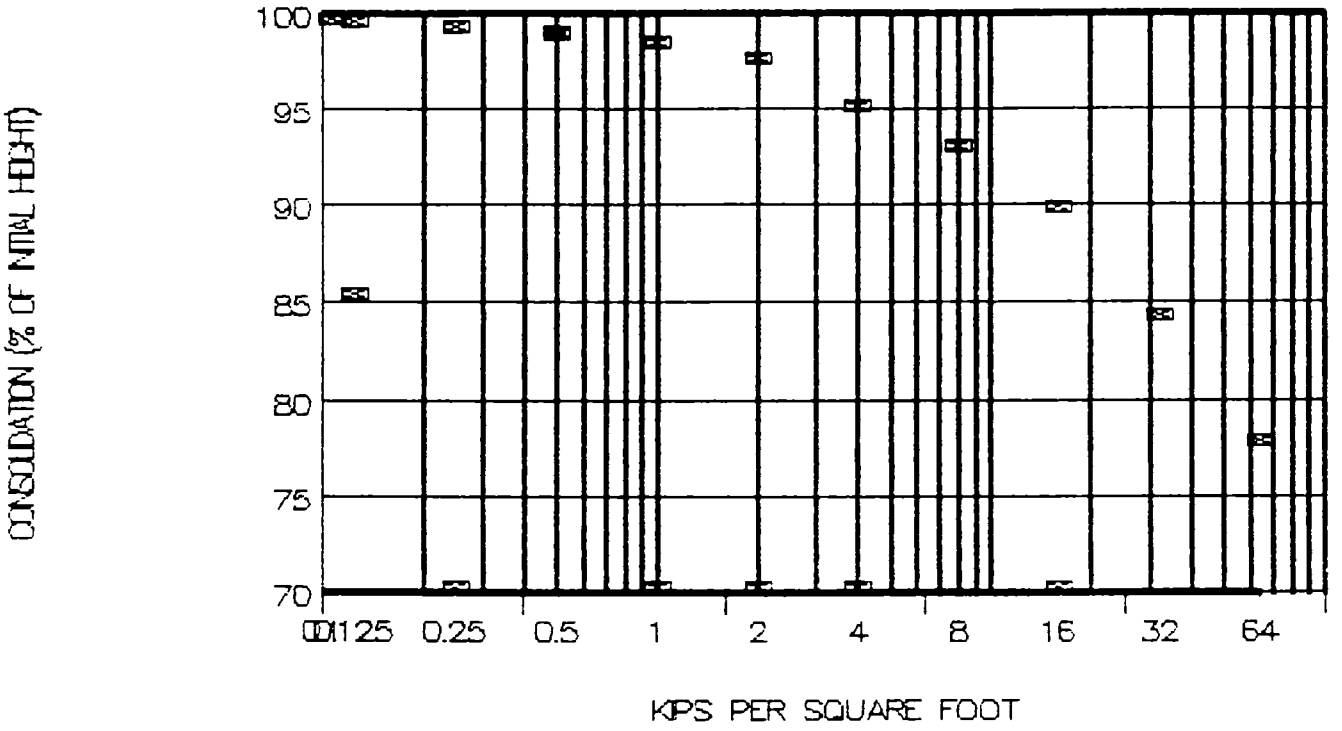
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	36.6%
INUNDATED MOIST. CONT.	29.2%
MOISTURE PICK-UP	-7.5%
DRY DENSITY	82.0 pcf

CONSOLIDATION TEST

N-7 @ 89' TO 90'6"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO FREEWAY
SAMPLE: N-7 @ 134'6" TO 135'1"

JOB # E87-56
DATE 1/8/90
W.O. # 66
LAB # 1403

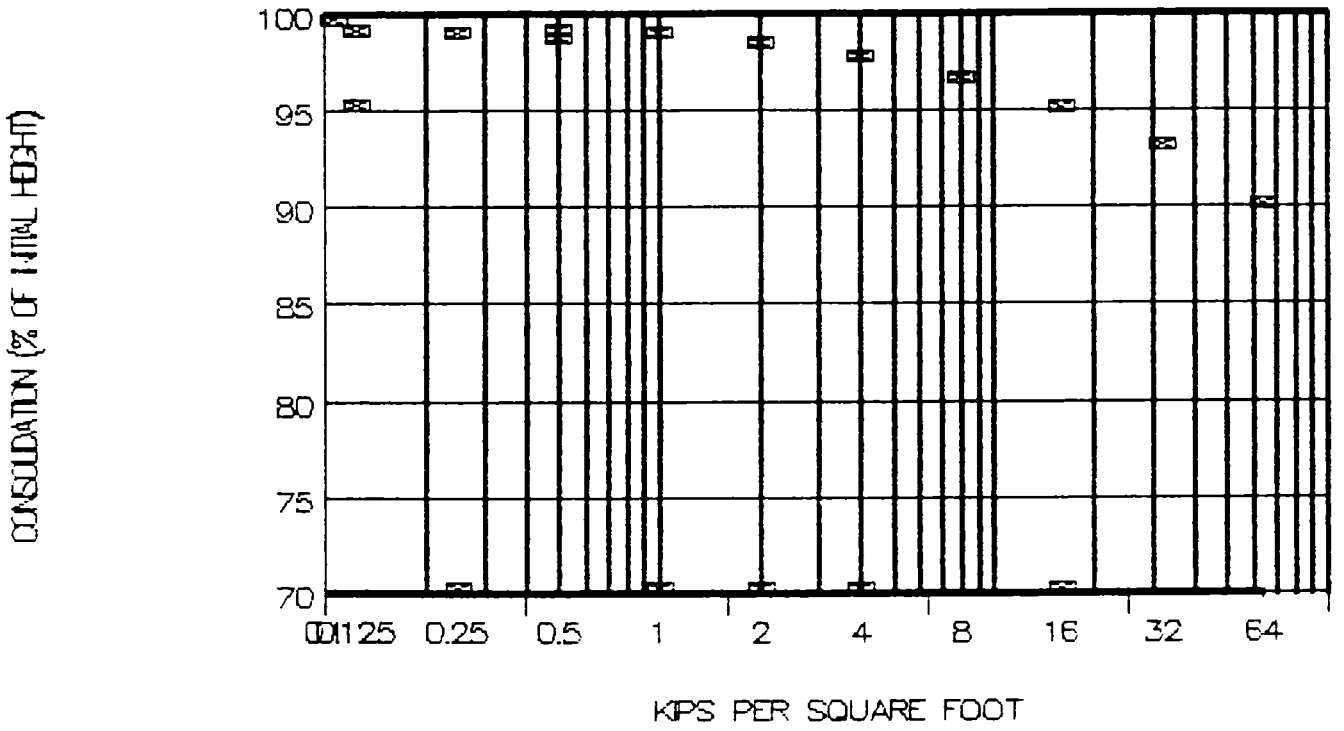
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	21.3%
INUNDATED MOIST. CONT.	21.0%
MOISTURE PICK-UP	-0.3%
DRY DENSITY	104.3 pcf

CONSOLIDATION TEST

N-7 @ 134'6" TO 135'1"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: N-6 @ 89' TO 90'6"

JOB # E87-56
DATE 1/19/90
W.O. # 68
LAB # 1425

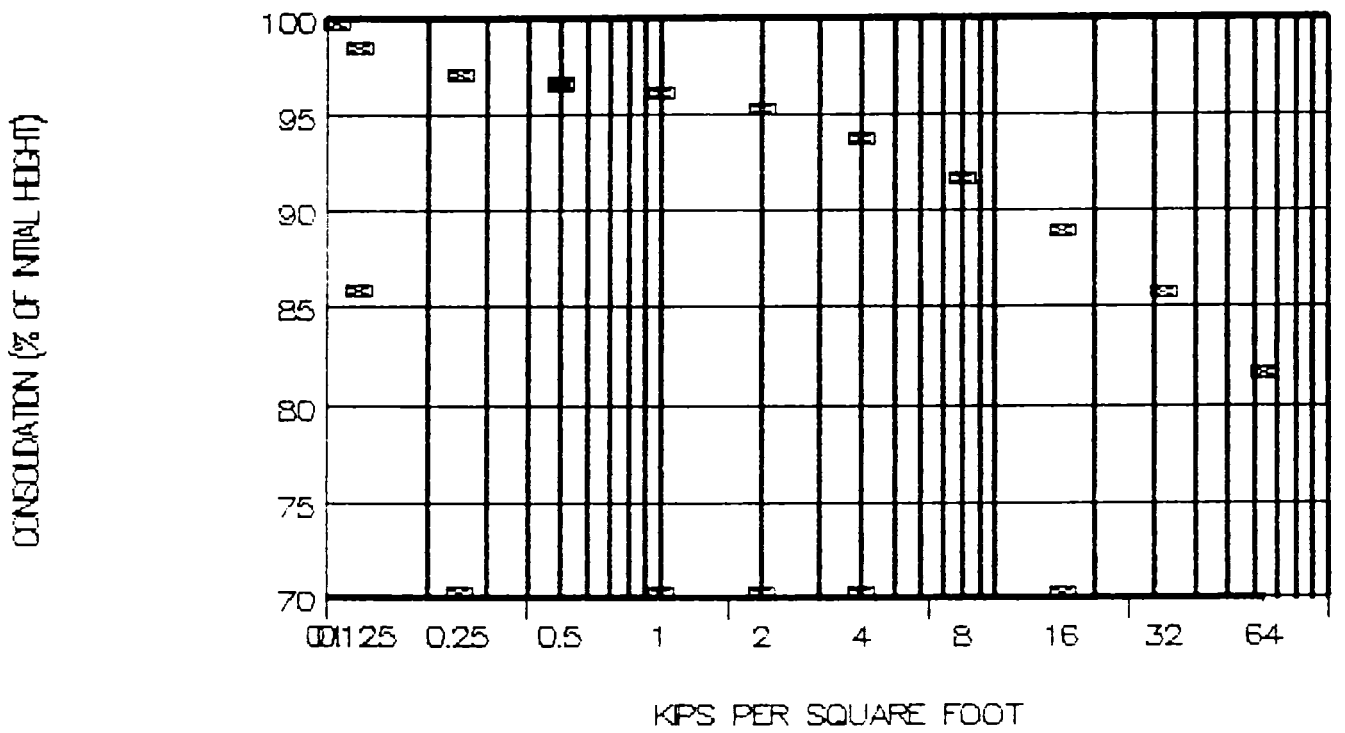
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	29.0%
INUNDATED MOIST. CONT.	22.6%
MOISTURE PICK-UP	-6.4%
DRY DENSITY	93.5 pcf

CONSOLIDATION TEST

N-6 @ 89' TO 90'6"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: N-6 @ 129' TO 130'1"

JOB # E87-56
DATE 1/19/90
W.O. # 68
LAB # 1429

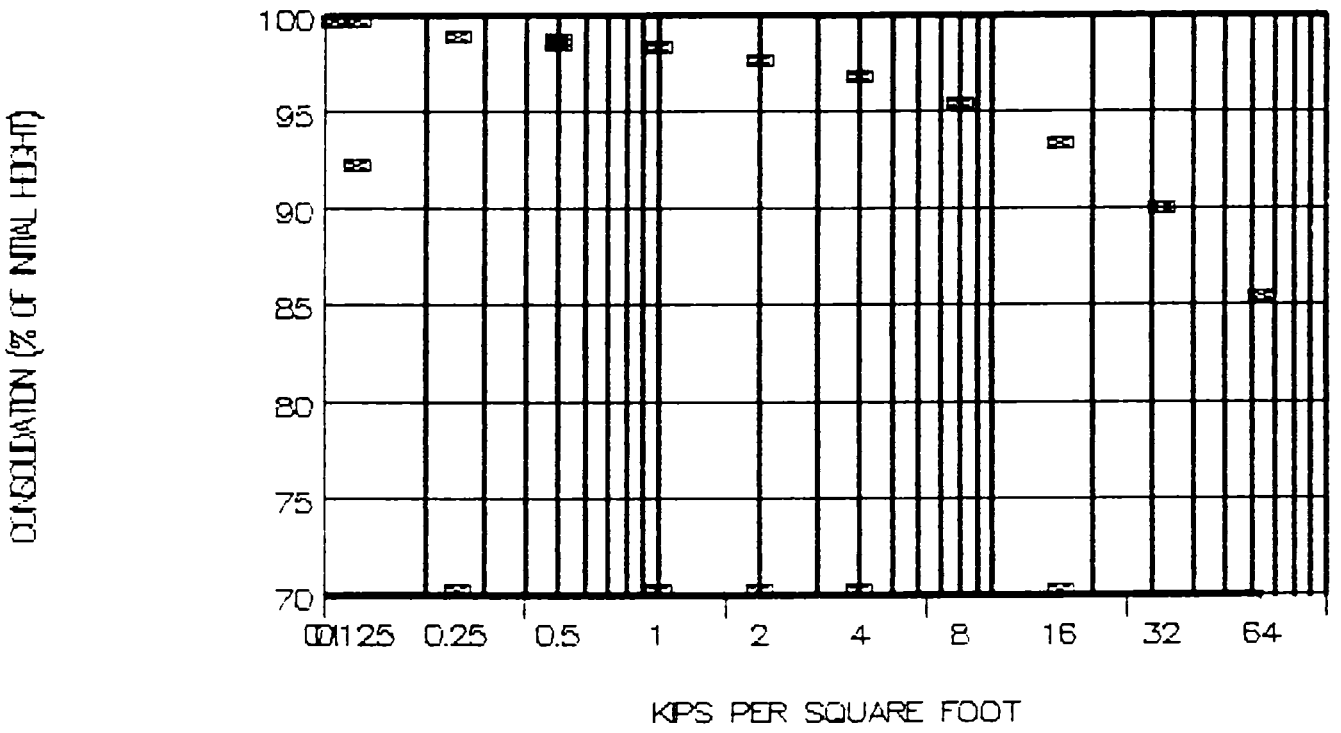
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	23.6%
INUNDATED MOIST. CONT.	21.7%
MOISTURE PICK-UP	-1.8%
DRY DENSITY	101.5 pcf

CONSOLIDATION TEST

N-6 @ 129' TO 130'1"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: N-8 @ 154' TO 154'8"

JOB # E87-56
DATE 1/19/90
W.O. # 68
LAB # 1435

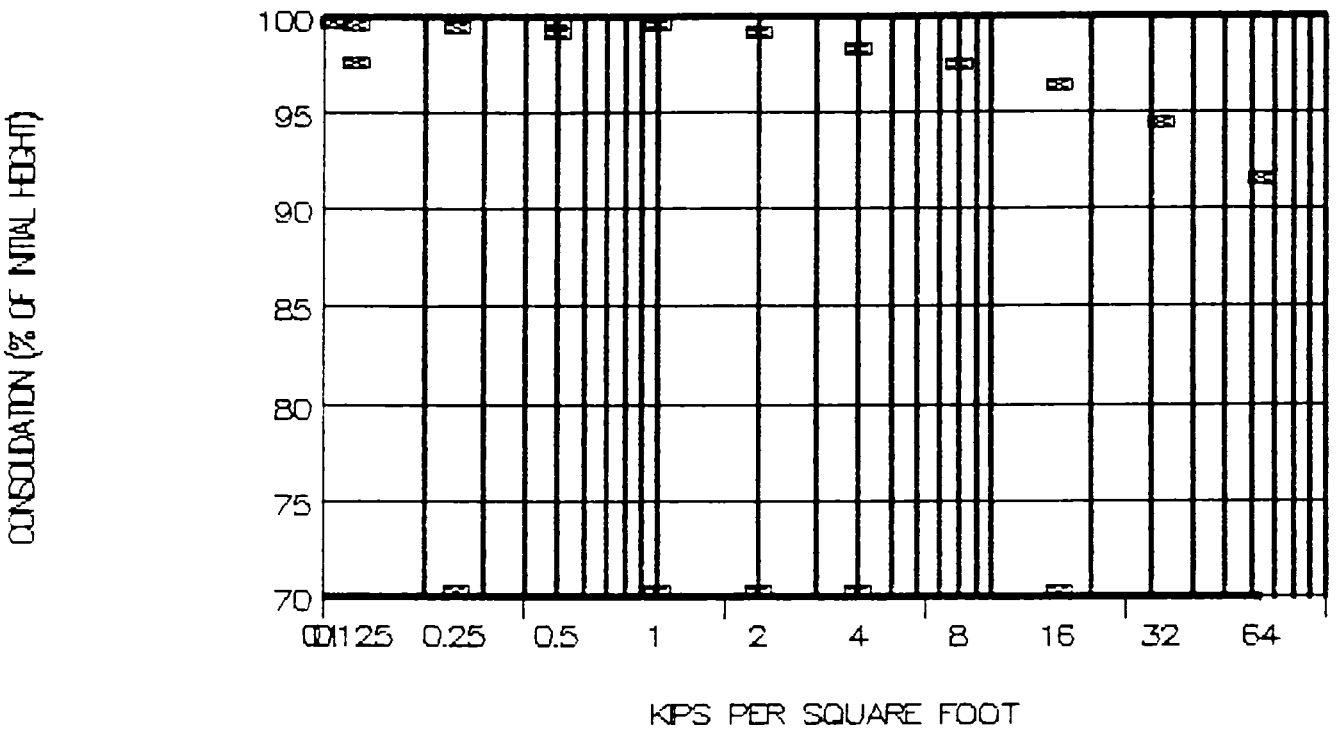
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	21.5%
INUNDATED MOIST. CONT.	21.8%
MOISTURE PICK-UP	0.3%
DRY DENSITY	104.5 pcf

CONSOLIDATION TEST

N-8 @ 154' TO 154'8"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: N-8 @ 164' TO 165'

JOB # E87-56
DATE 1/19/90
W.O. # 68
LAB # 1436

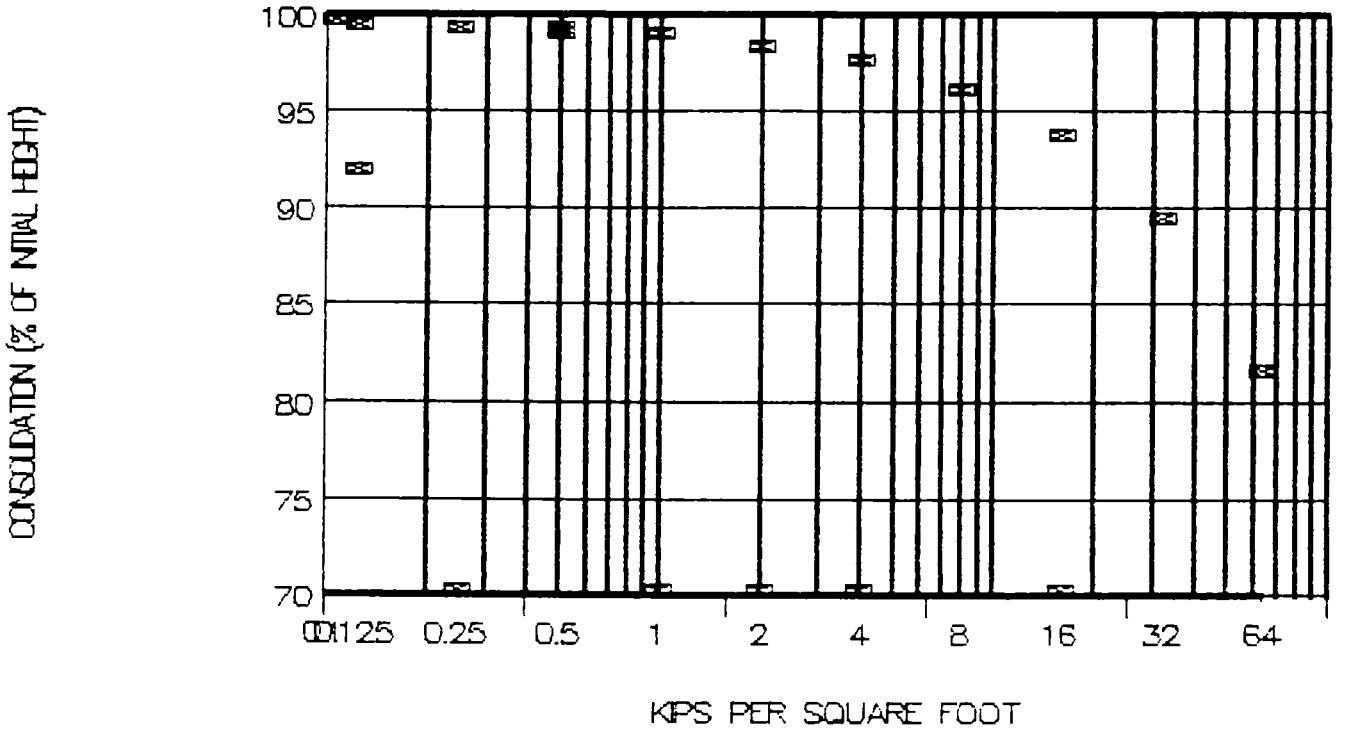
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	41.0%
INUNDATED MOIST. CONT.	36.9%
MOISTURE PICK-UP	-4.2%
DRY DENSITY	79.8 pcf

CONSOLIDATION TEST

N-8 @ 164' TO 165'



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/15/90
W.O. NO. 67
LAB # 1409

PROJECT EAST PAPAGO
BORING N-2 @ 149' TO 150'
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 12.78
WET WT 739.49
DRY WT 580.58
DIAMETER 6.15

AREA 29.706 CM
VOLUME 379.639 CC
WET DENS 121.6 LB/CU FT
% MOIST 27.4%
DRY DENS 95.5 LB/CU FT

MAXIMUM STRESS= 7.4 T/SQ FT
AT STRAIN = 20 %

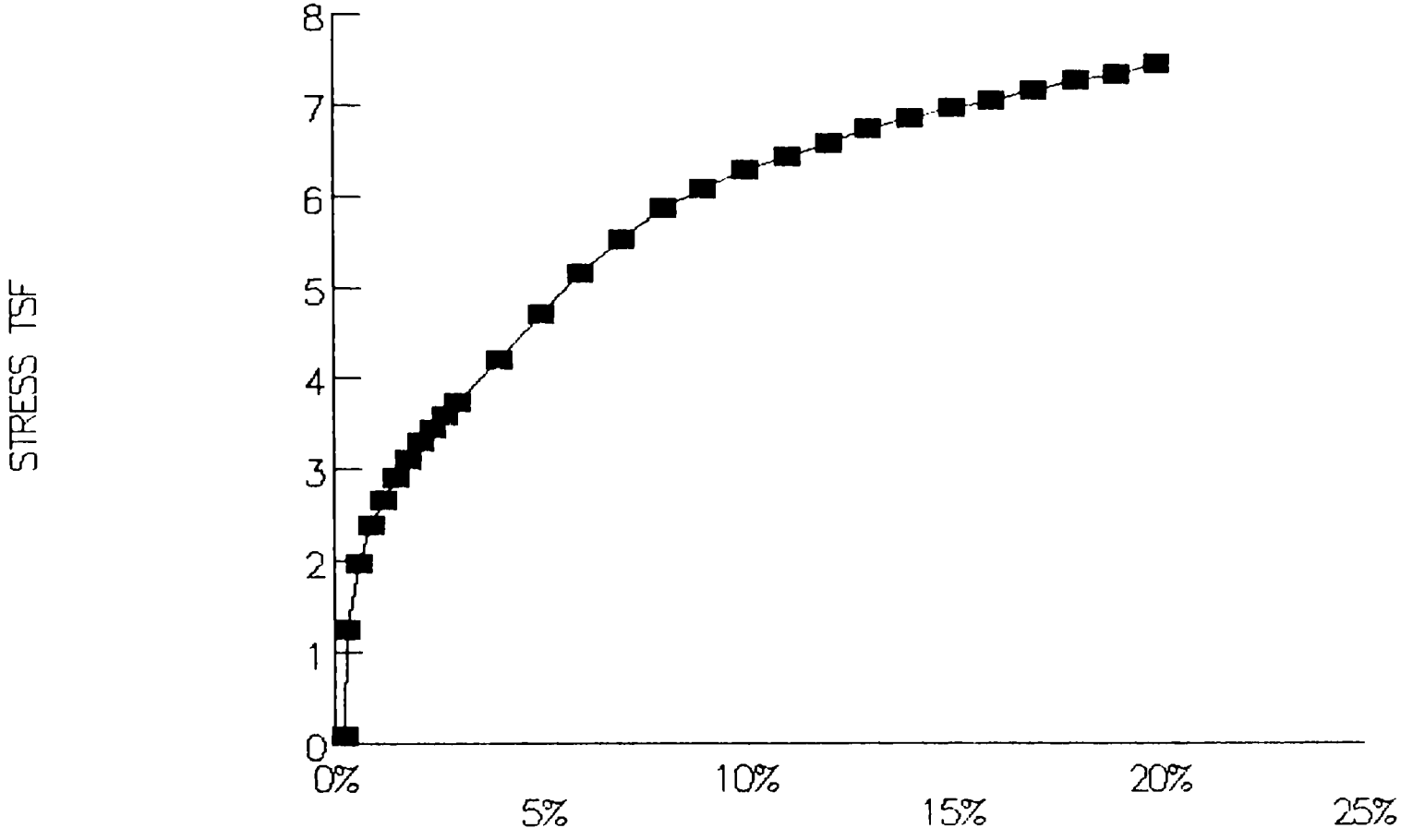
CONFINING PRESSURE 7 TSF

TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.015 IN	79 LB	1.2 TON/SQ FT	0.3%
	0.030	126	2.0	0.6%
822	0.045	153	2.4	0.9%
	0.060	171	2.7	1.2%
	0.075	187	2.9	1.5%
823	0.091	200	3.1	1.8%
	0.106	212	3.3	2.1%
	0.121	222	3.4	2.4%
824	0.136	232	3.6	2.7%
	0.151	242	3.7	3.0%
825	0.201	273	4.2	4.0%
826	0.252	307	4.7	5.0%
827	0.302	338	5.2	6.0%
828	0.352	364	5.5	7.0%
829	0.403	387	5.9	8.0%
830	0.453	403	6.1	9.0%
831	0.503	419	6.3	10.0%
832	0.553	430	6.4	11.0%
833	0.604	442	6.6	12.0%
834	0.654	454	6.7	13.0%
835	0.704	464	6.9	14.0%
836	0.755	474	7.0	15.0%
837	0.805	481	7.0	16.0%
838	0.855	491	7.2	17.0%
839	0.906	501	7.3	18.0%
840	0.956	507	7.3	19.0%
841	1.006	517	7.4	20.0%

TRIAXIAL SHEAR U.U.

N-2 @ 149' TO 150'



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/15/90
W.O. NO. 67
LAB # 1411

PROJECT EAST PAPAGO
BORING N-2 @ 169' TO 170'
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 12.7
WET WT 770.03
DRY WT 634.98
DIAMETER 6.11

AREA 29.321 CM
VOLUME 372.371 CC
WET DENS 129.1 LB/CU FT
% MOIST 21.3%
DRY DENS 106.5 LB/CU FT

MAXIMUM STRESS= 10.2 T/SQ FT
AT STRAIN = 20 %

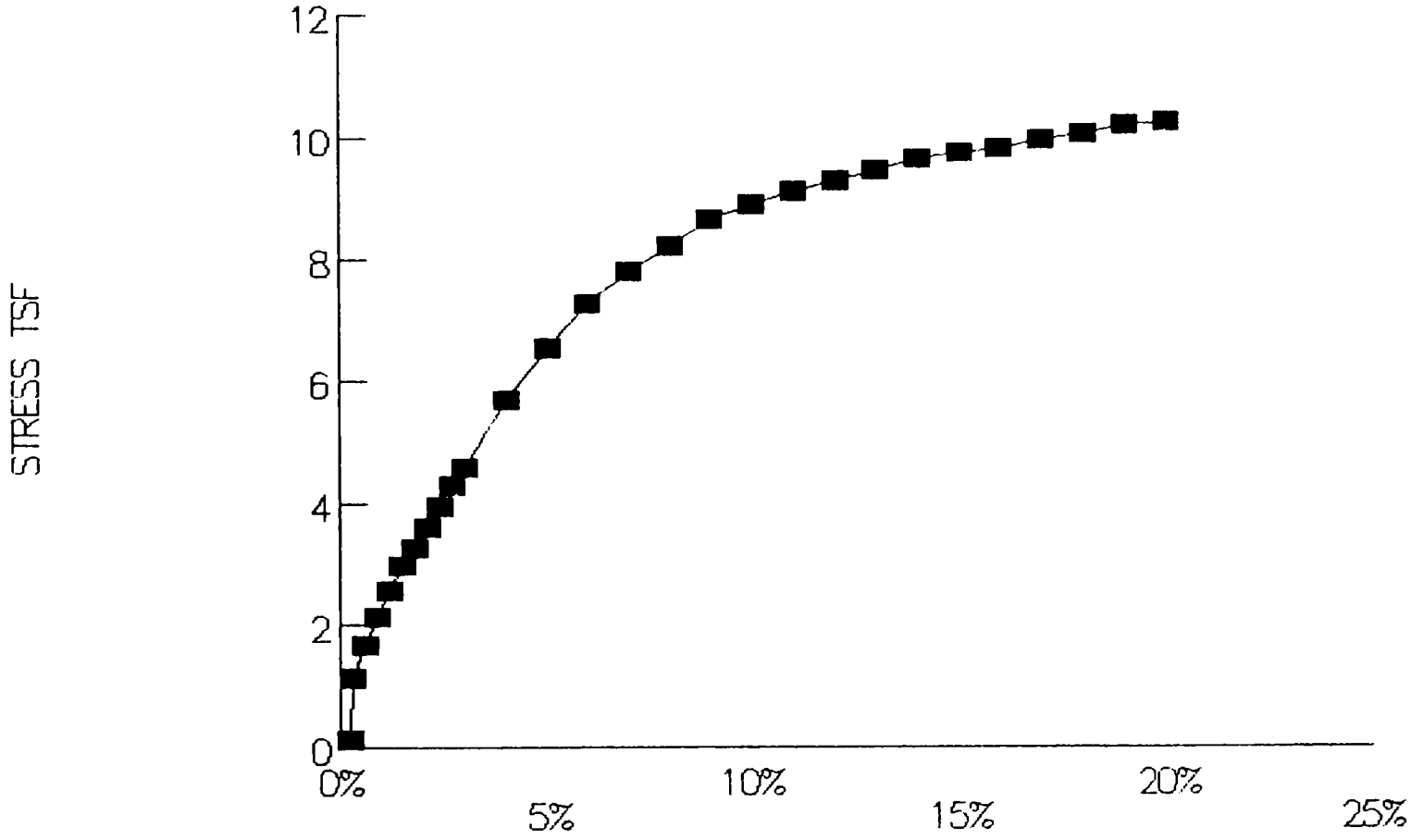
CONFINING PRESSURE 7 TSF

TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.015 IN	71 LB	1.1 TON/SQ FT	0.3%
	0.030	106	1.7	0.6%
822	0.045	134	2.1	0.9%
	0.060	163	2.6	1.2%
	0.075	189	3.0	1.5%
823	0.090	208	3.3	1.8%
	0.105	230	3.6	2.1%
	0.120	252	4.0	2.4%
824	0.135	273	4.3	2.7%
	0.150	293	4.6	3.0%
825	0.200	365	5.7	4.0%
826	0.250	422	6.6	5.0%
827	0.300	470	7.3	6.0%
828	0.350	507	7.8	7.0%
829	0.400	536	8.2	8.0%
830	0.450	566	8.6	9.0%
831	0.500	584	8.9	10.0%
832	0.550	601	9.1	11.0%
833	0.600	615	9.3	12.0%
834	0.650	629	9.5	13.0%
835	0.700	645	9.7	14.0%
836	0.750	654	9.7	15.0%
837	0.800	662	9.8	16.0%
838	0.850	674	10.0	17.0%
839	0.900	684	10.1	18.0%
840	0.950	696	10.2	19.0%
841	1.000	702	10.2	20.0%

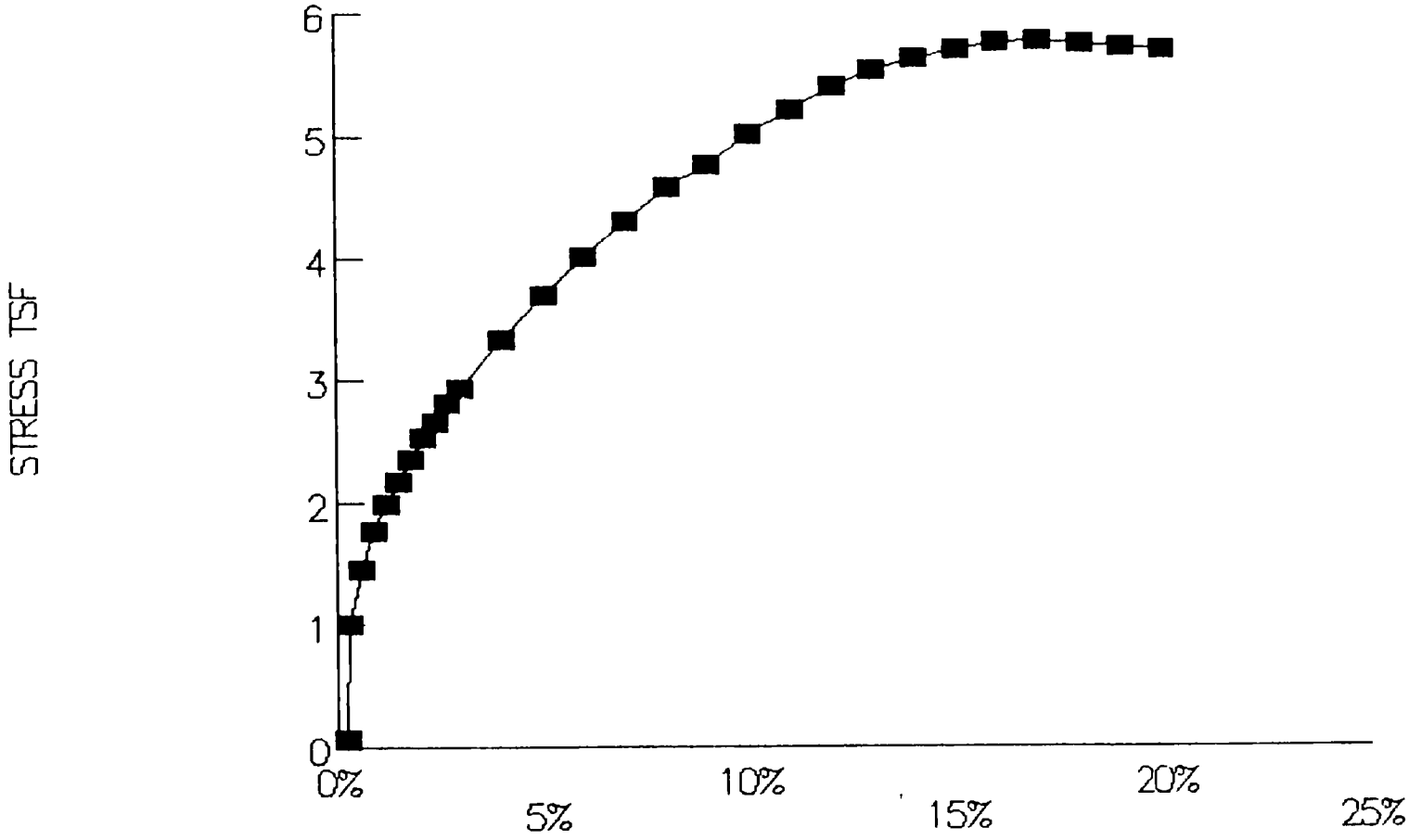
TRIAXIAL SHEAR U.U.

N-2 @ 169' TO 170'



TRIAXIAL SHEAR U.U.

N-4 @ 109' TO 110'



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/19/90
W.O. NO. 68
LAB # 1425

PROJECT EAST PAPAGO
BORING N-6 @ 89' TO 90'6"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 14.825
WET WT 884.41
DRY WT 701.89
DIAMETER 6.15

MAXIMUM STRESS= 1.9 T/SQ FT
AT STRAIN = 20 %

AREA 29.706 CM
VOLUME 440.387 CC
WET DENS 125.4 LB/CU FT
% MOIST 26.0%
DRY DENS 99.5 LB/CU FT

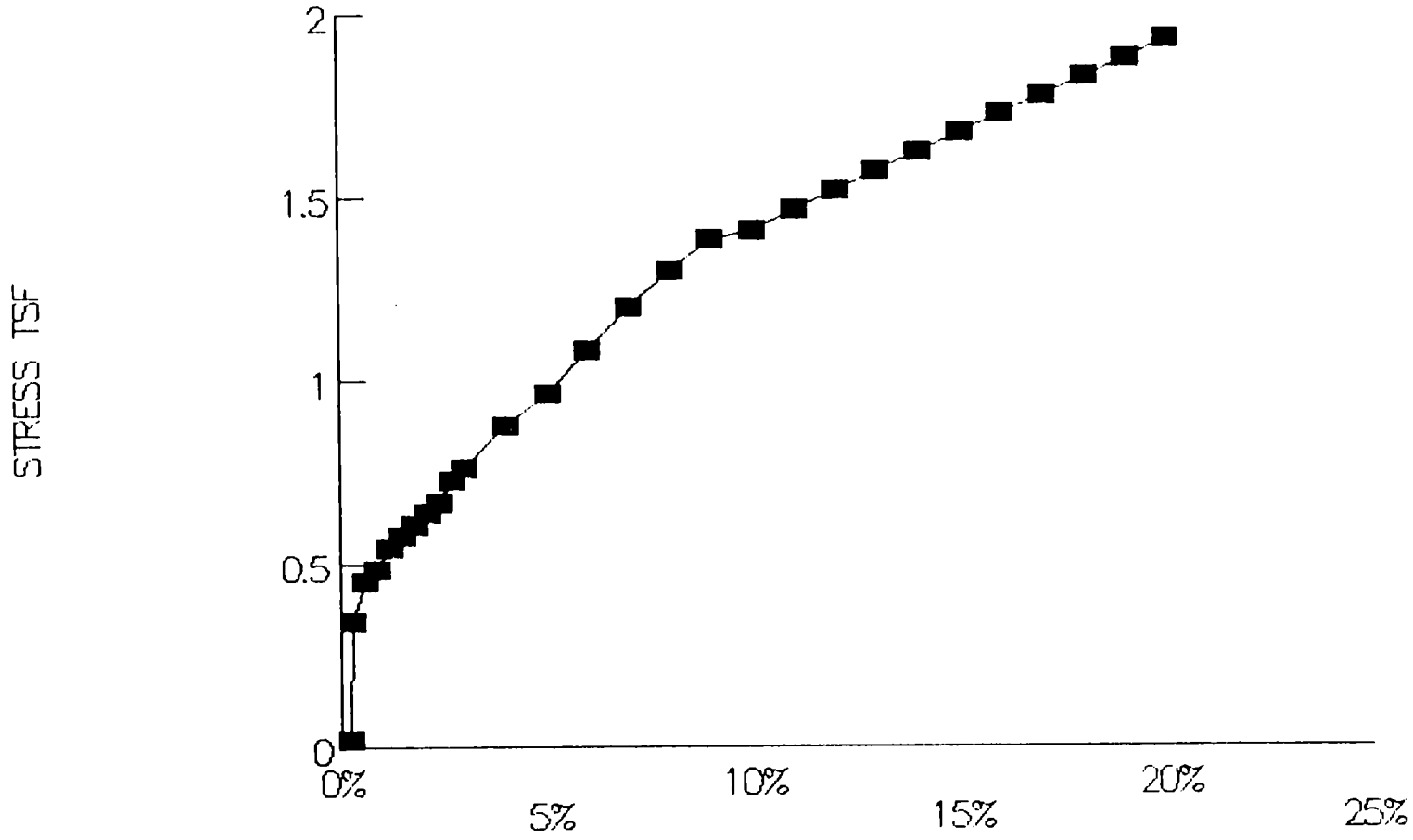
CONFINING PRESSURE 3.5 TSF

TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.018 IN	22 LB	0.3 TON/SQ FT	0.3%
	0.035	29	0.5	0.6%
822	0.053	31	0.5	0.9%
	0.070	35	0.5	1.2%
	0.088	37	0.6	1.5%
823	0.105	39	0.6	1.8%
	0.123	41	0.6	2.1%
	0.140	43	0.7	2.4%
824	0.158	47	0.7	2.7%
	0.175	49	0.8	3.0%
825	0.233	57	0.9	4.0%
826	0.292	63	1.0	5.0%
827	0.350	71	1.1	6.0%
828	0.409	79	1.2	7.0%
829	0.467	86	1.3	8.0%
830	0.525	92	1.4	9.0%
831	0.584	94	1.4	10.0%
832	0.642	98	1.5	11.0%
833	0.700	102	1.5	12.0%
834	0.759	106	1.6	13.0%
835	0.817	110	1.6	14.0%
836	0.875	114	1.7	15.0%
837	0.934	118	1.7	16.0%
838	0.992	122	1.8	17.0%
839	1.051	126	1.8	18.0%
840	1.109	130	1.9	19.0%
841	1.167	134	1.9	20.0%

TRIAXIAL SHEAR U.U.

N-6 @ 89' TO 90'6"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/19/90
W.O. NO. 68
LAB # 1425

PROJECT EAST PAPAGO
BORING N-6 @ 89' TO 90'6"
TEST TYPE UNCONSOLIDATED, UNDRAINED

==========

SAMPLE HT 14.06
WET WT 853.13
DRY WT 690.27
DIAMETER 6.15

AREA 29.706 CM
VOLUME 417.662 CC
WET DENS 127.5 LB/CU FT
% MOIST 23.6%
DRY DENS 103.2 LB/CU FT

MAXIMUM STRESS= 2.6 T/SQ FT
AT STRAIN = 20 %

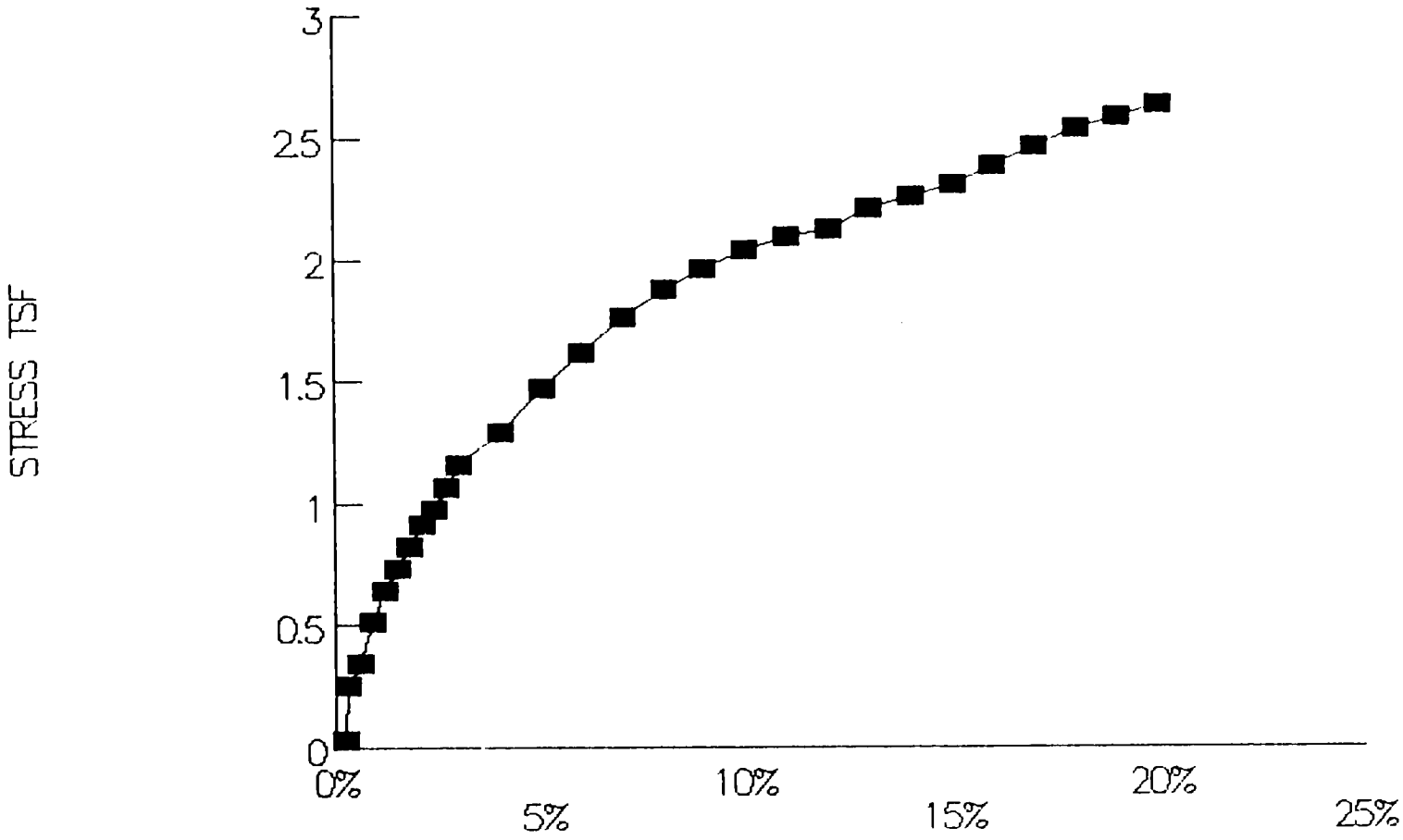
CONFINING PRESSURE 7.0 TSF

TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.017 IN	16 LB	0.2 TON/SQ FT	0.3%
	0.033	22	0.3	0.6%
822	0.050	33	0.5	0.9%
	0.066	41	0.6	1.2%
	0.083	47	0.7	1.5%
823	0.100	53	0.8	1.8%
	0.116	59	0.9	2.1%
	0.133	63	1.0	2.4%
824	0.149	69	1.1	2.7%
	0.166	75	1.2	3.0%
825	0.221	84	1.3	4.0%
826	0.277	96	1.5	5.0%
827	0.332	106	1.6	6.0%
828	0.387	116	1.8	7.0%
829	0.443	124	1.9	8.0%
830	0.498	130	2.0	9.0%
831	0.554	136	2.0	10.0%
832	0.609	140	2.1	11.0%
833	0.664	143	2.1	12.0%
834	0.720	149	2.2	13.0%
835	0.775	153	2.3	14.0%
836	0.830	157	2.3	15.0%
837	0.886	163	2.4	16.0%
838	0.941	169	2.5	17.0%
839	0.996	175	2.5	18.0%
840	1.052	179	2.6	19.0%
841	1.107	183	2.6	20.0%

TRIAXIAL SHEAR U.U.

N-6 @ 89' TO 90'6"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/19/90
W.O. NO. 68
LAB # 1427

PROJECT EAST PAPAGO
BORING N-6 @ 109' TO 109'7"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 13.265
WET WT 766.92
DRY WT 613.07
DIAMETER 6.15

AREA 29.706 CM
VOLUME 394.046 CC
WET DENS 121.5 LB/CU FT
% MOIST 25.1%
DRY DENS 97.1 LB/CU FT

MAXIMUM STRESS= 4.7 T/SQ FT
AT STRAIN = 20 %

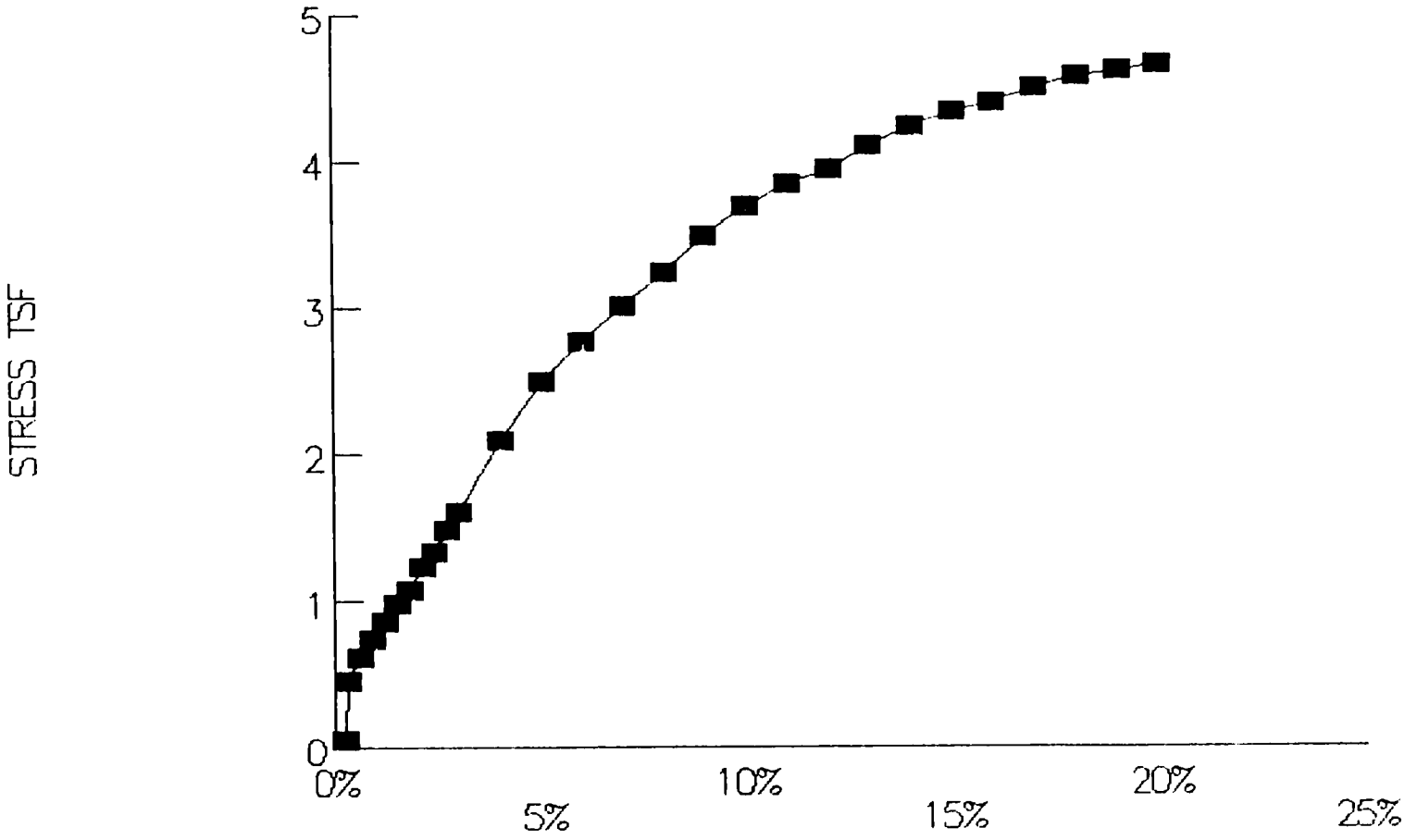
CONFINING PRESSURE 4.5 TSF

TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.016 IN	29 LB	0.5 TON/SQ FT	0.3%
	0.031	39	0.6	0.6%
822	0.047	47	0.7	0.9%
	0.063	55	0.9	1.2%
	0.078	63	1.0	1.5%
823	0.094	69	1.1	1.8%
	0.110	79	1.2	2.1%
	0.125	86	1.3	2.4%
824	0.141	96	1.5	2.7%
	0.157	104	1.6	3.0%
825	0.209	136	2.1	4.0%
826	0.261	163	2.5	5.0%
827	0.313	181	2.8	6.0%
828	0.366	198	3.0	7.0%
829	0.418	214	3.2	8.0%
830	0.470	232	3.5	9.0%
831	0.522	246	3.7	10.0%
832	0.574	257	3.8	11.0%
833	0.627	265	3.9	12.0%
834	0.679	277	4.1	13.0%
835	0.731	287	4.2	14.0%
836	0.783	295	4.3	15.0%
837	0.836	301	4.4	16.0%
838	0.888	309	4.5	17.0%
839	0.940	316	4.6	18.0%
840	0.992	320	4.6	19.0%
841	1.044	324	4.7	20.0%

TRIAXIAL SHEAR U.U.

N-6 @ 109' TO 109'7"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/19/90
W.O. NO. 68
LAB # 1429

PROJECT EAST PAPAGO
BORING N-6 @ 129' TO 130'1"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 12.24
WET WT 709.21
DRY WT 555.13
DIAMETER 6.15

AREA 29.706 CM
VOLUME 363.598 CC
WET DENS 121.8 LB/CU FT
% MOIST 27.8%
DRY DENS 95.3 LB/CU FT

MAXIMUM STRESS= 3.8 T/SQ FT
AT STRAIN = 20 %

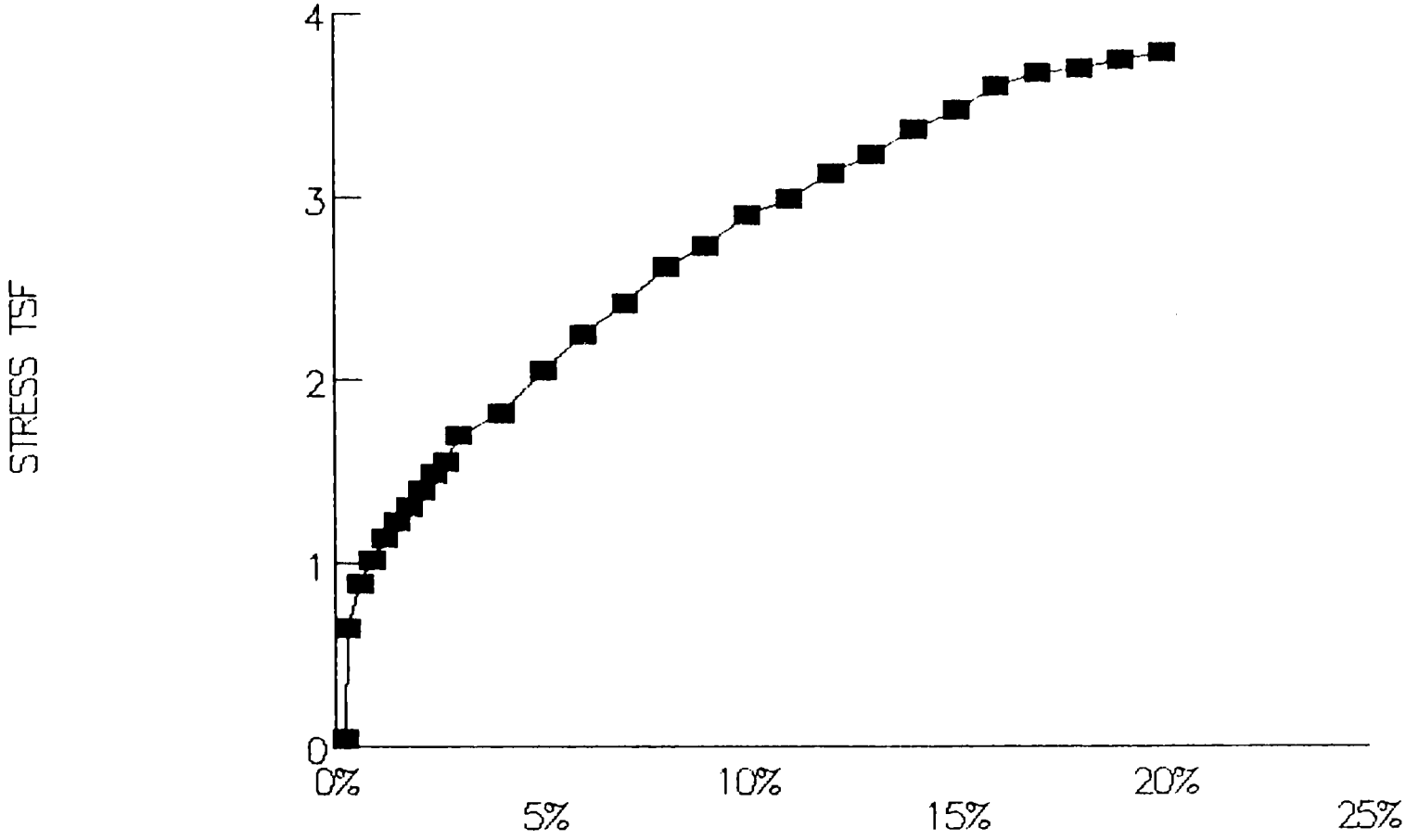
CONFINING PRESSURE 5.0 TSF

TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.014 IN	41 LB	0.6 TON/SQ FT	0.3%
	0.029	57	0.9	0.6%
822	0.043	65	1.0	0.9%
	0.058	73	1.1	1.2%
	0.072	79	1.2	1.5%
823	0.087	84	1.3	1.8%
	0.101	90	1.4	2.1%
	0.116	96	1.5	2.4%
824	0.130	100	1.5	2.7%
	0.145	110	1.7	3.0%
825	0.193	118	1.8	4.0%
826	0.241	134	2.1	5.0%
827	0.289	147	2.2	6.0%
828	0.337	159	2.4	7.0%
829	0.386	173	2.6	8.0%
830	0.434	181	2.7	9.0%
831	0.482	193	2.9	10.0%
832	0.530	200	3.0	11.0%
833	0.578	210	3.1	12.0%
834	0.626	218	3.2	13.0%
835	0.675	228	3.4	14.0%
836	0.723	236	3.5	15.0%
837	0.771	246	3.6	16.0%
838	0.819	252	3.7	17.0%
839	0.867	255	3.7	18.0%
840	0.916	259	3.7	19.0%
841	0.964	263	3.8	20.0%

TRIAXIAL SHEAR U.U.

N-6 @ 129' TO 130'1"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/8/90
W.O. NO. 66
LAB # 1399

PROJECT EAST PAPAGO
BORING N-7 @ 89' TO 90'6"
TEST TYPE UNCONSOLIDATED, UNDRAINED

==========

SAMPLE HT 13.085
WET WT 1074.34
DRY WT 882.39
DIAMETER 7.27

AREA 41.511 CM
VOLUME 543.166 CC
WET DENS 123.5 LB/CU FT
% MOIST 21.8%
DRY DENS 101.4 LB/CU FT

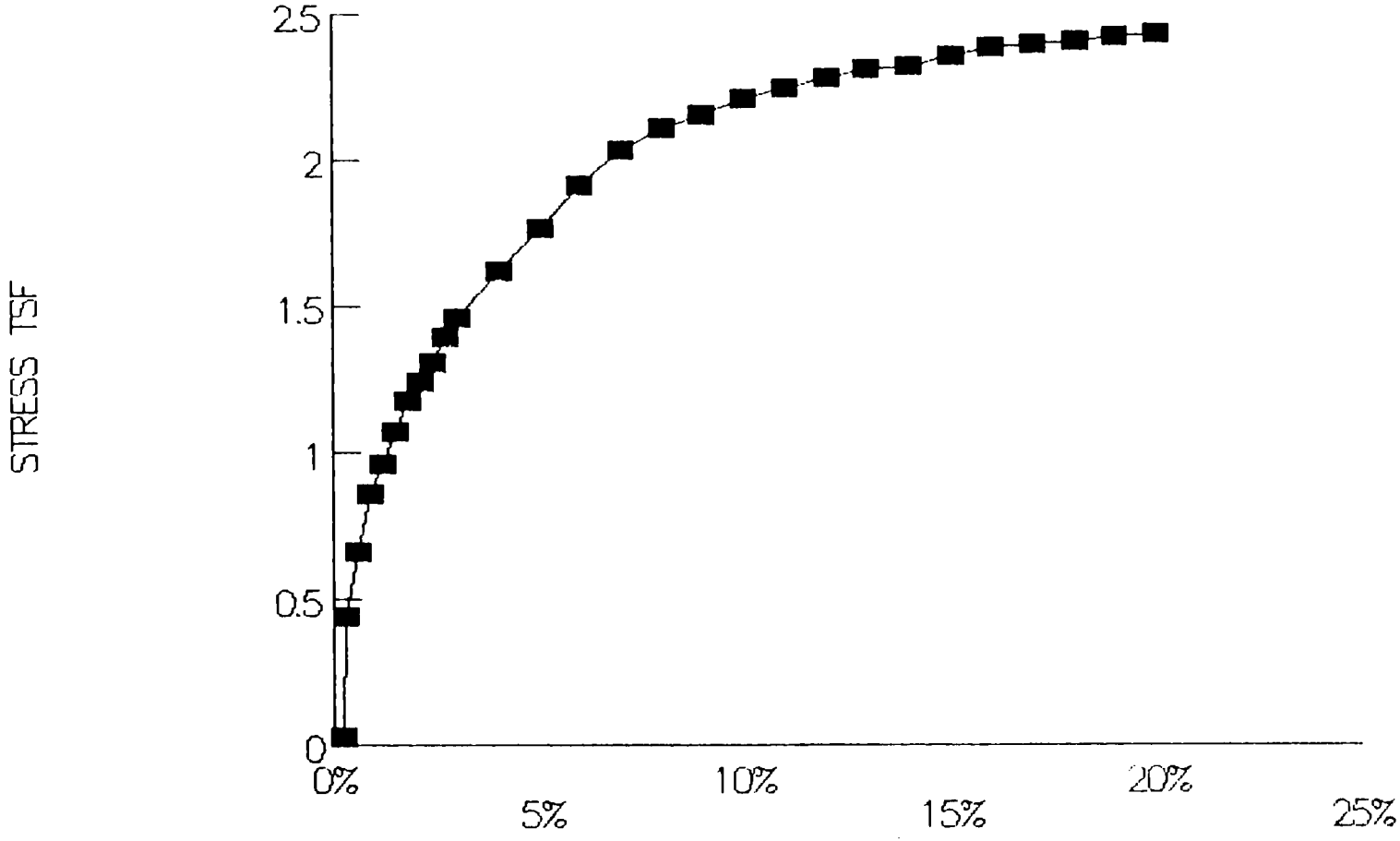
MAXIMUM STRESS 2.4 T/SQ FT
AT STRAIN = 20 %

CONFINING PRESSURE 1.2 TSF
TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.015 IN	39 LB	0.4 TON/SQ FT	0.3%
	0.031	59	0.7	0.6%
822	0.046	77	0.9	0.9%
	0.062	86	1.0	1.2%
	0.077	96	1.1	1.5%
823	0.093	106	1.2	1.8%
	0.108	112	1.2	2.1%
	0.124	118	1.3	2.4%
824	0.139	126	1.4	2.7%
	0.155	132	1.5	3.0%
825	0.206	147	1.6	4.0%
826	0.258	161	1.8	5.0%
827	0.309	175	1.9	6.0%
828	0.361	187	2.0	7.0%
829	0.412	195	2.1	8.0%
830	0.464	200	2.2	9.0%
831	0.515	206	2.2	10.0%
832	0.567	210	2.2	11.0%
833	0.618	214	2.3	12.0%
834	0.670	218	2.3	13.0%
835	0.721	220	2.3	14.0%
836	0.773	224	2.4	15.0%
837	0.824	228	2.4	16.0%
838	0.876	230	2.4	17.0%
839	0.927	232	2.4	18.0%
840	0.979	234	2.4	19.0%
841	1.030	236	2.4	20.0%

TRIAXIAL SHEAR U.U.

N-7 @ 89' TO 90'6"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/8/90
W.O. NO. 66
LAB # 1399

PROJECT EAST PAPAGO
BORING N-7 @ 89' TO 90'6"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 14.615
WET WT 1138.91
DRY WT 884.94
DIAMETER 7.21

AREA 40.828 CM
VOLUME 596.704 CC
WET DENS 119.2 LB/CU FT
% MOIST 28.7%
DRY DENS 92.6 LB/CU FT

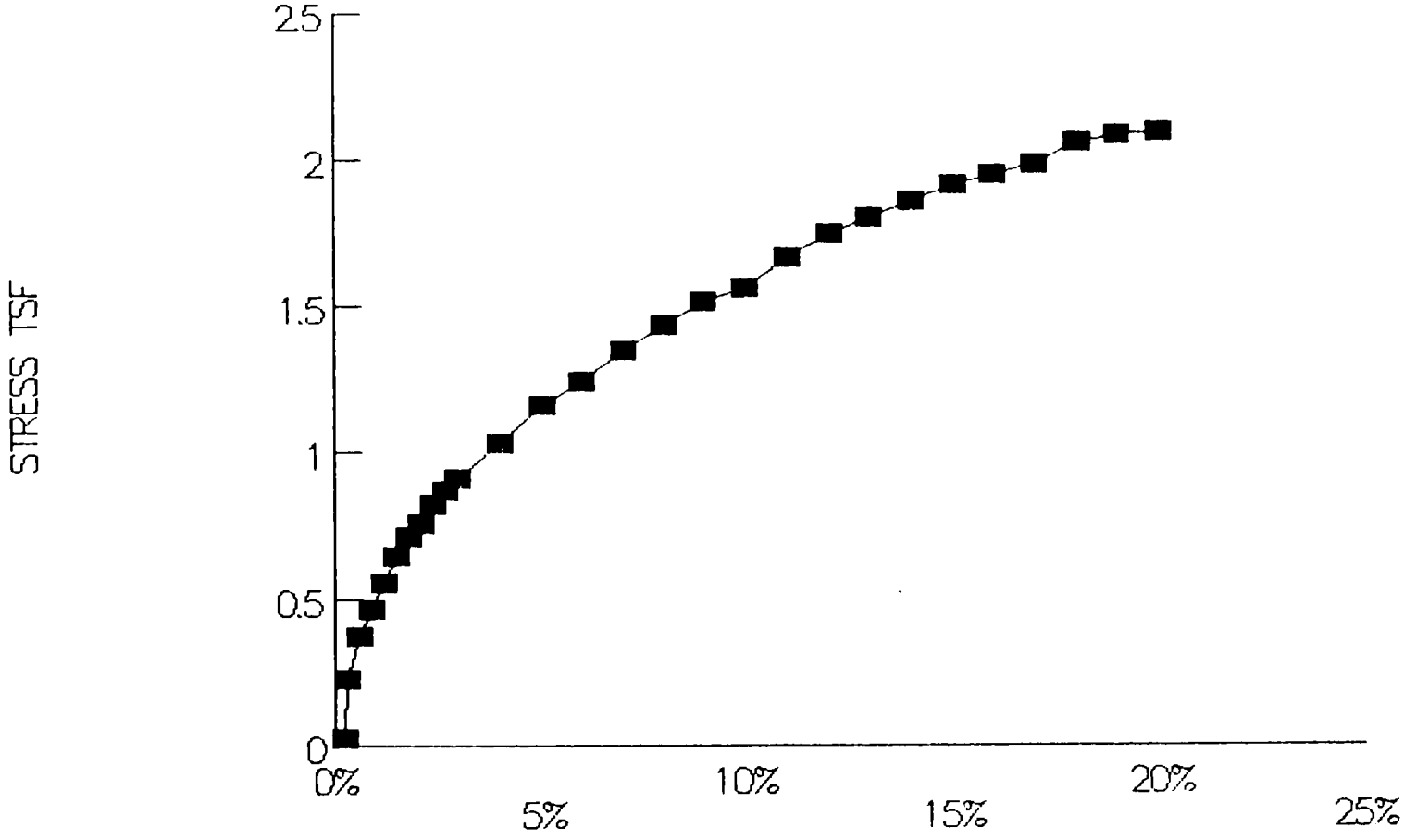
MAXIMUM STRESS 2.1 T/SQ FT
AT STRAIN = 20 %

CONFINING PRESSURE 2.4 TSF
TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.017 IN	20 LB	0.2 TON/SQ FT	0.3%
	0.035	33	0.4	0.6%
822	0.052	41	0.5	0.9%
	0.069	49	0.6	1.2%
	0.086	57	0.6	1.5%
823	0.104	63	0.7	1.8%
	0.121	67	0.8	2.1%
	0.138	73	0.8	2.4%
824	0.155	77	0.9	2.7%
	0.173	81	0.9	3.0%
825	0.230	92	1.0	4.0%
826	0.288	104	1.2	5.0%
827	0.345	112	1.2	6.0%
828	0.403	122	1.3	7.0%
829	0.460	130	1.4	8.0%
830	0.518	138	1.5	9.0%
831	0.575	143	1.6	10.0%
832	0.633	153	1.7	11.0%
833	0.690	161	1.7	12.0%
834	0.748	167	1.8	13.0%
835	0.806	173	1.9	14.0%
836	0.863	179	1.9	15.0%
837	0.921	183	2.0	16.0%
838	0.978	187	2.0	17.0%
839	1.036	195	2.1	18.0%
840	1.093	198	2.1	19.0%
841	1.151	200	2.1	20.0%

TRIAXIAL SHEAR U.U.

N-7 @ 89' TO 90'6"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/8/90
W.O. NO. 66
LAB # 1399

PROJECT EAST PAPAGO
BORING N-7 @ 89' TO 90'6"
TEST TYPE UNCONSOLIDATED, UNDRAINED

==========

SAMPLE HT 15.145
WET WT 1193.75
DRY WT 924
DIAMETER 7.23

AREA 41.055 CM
VOLUME 621.778 CC
WET DENS 119.9 LB/CU FT
% MOIST 29.2%
DRY DENS 92.8 LB/CU FT

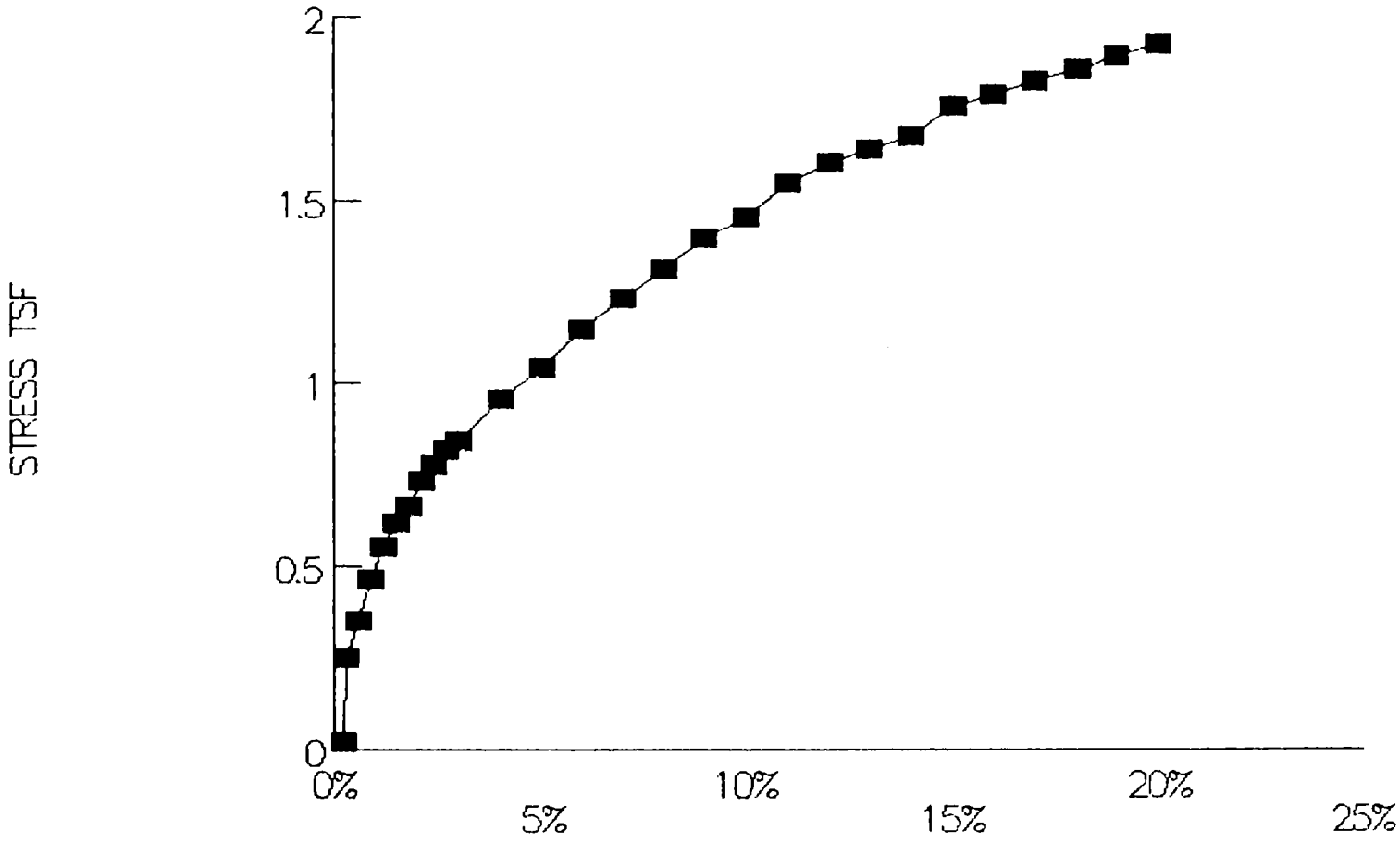
MAXIMUM STRESS 1.9 T/SQ FT
AT STRAIN = 20 %

CONFINING PRESSURE 3.6 TSF
TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.018 IN	22 LB	0.2 TON/SQ FT	0.3%
	0.036	31	0.3	0.6%
822	0.054	41	0.5	0.9%
	0.072	49	0.6	1.2%
	0.089	55	0.6	1.5%
823	0.107	59	0.7	1.8%
	0.125	65	0.7	2.1%
	0.143	69	0.8	2.4%
824	0.161	73	0.8	2.7%
	0.179	75	0.8	3.0%
825	0.239	86	1.0	4.0%
826	0.298	94	1.0	5.0%
827	0.358	104	1.1	6.0%
828	0.417	112	1.2	7.0%
829	0.477	120	1.3	8.0%
830	0.537	128	1.4	9.0%
831	0.596	134	1.5	10.0%
832	0.656	143	1.5	11.0%
833	0.716	149	1.6	12.0%
834	0.775	153	1.6	13.0%
835	0.835	157	1.7	14.0%
836	0.894	165	1.8	15.0%
837	0.954	169	1.8	16.0%
838	1.014	173	1.8	17.0%
839	1.073	177	1.9	18.0%
840	1.133	181	1.9	19.0%
841	1.193	185	1.9	20.0%

TRIAXIAL SHEAR U.U.

N-7 @ 89' TO 90'6"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/8/90
W.O. NO. 66
LAB # 1401

PROJECT EAST PAPAGO
BORING N-7 @ 110' TO 110'5.5"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 10.01
WET WT 587.17
DRY WT 487.8
DIAMETER 6.11

AREA 29.321 CM
VOLUME 293.499 CC
WET DENS 124.9 LB/CU FT
% MOIST 20.4%
DRY DENS 103.8 LB/CU FT

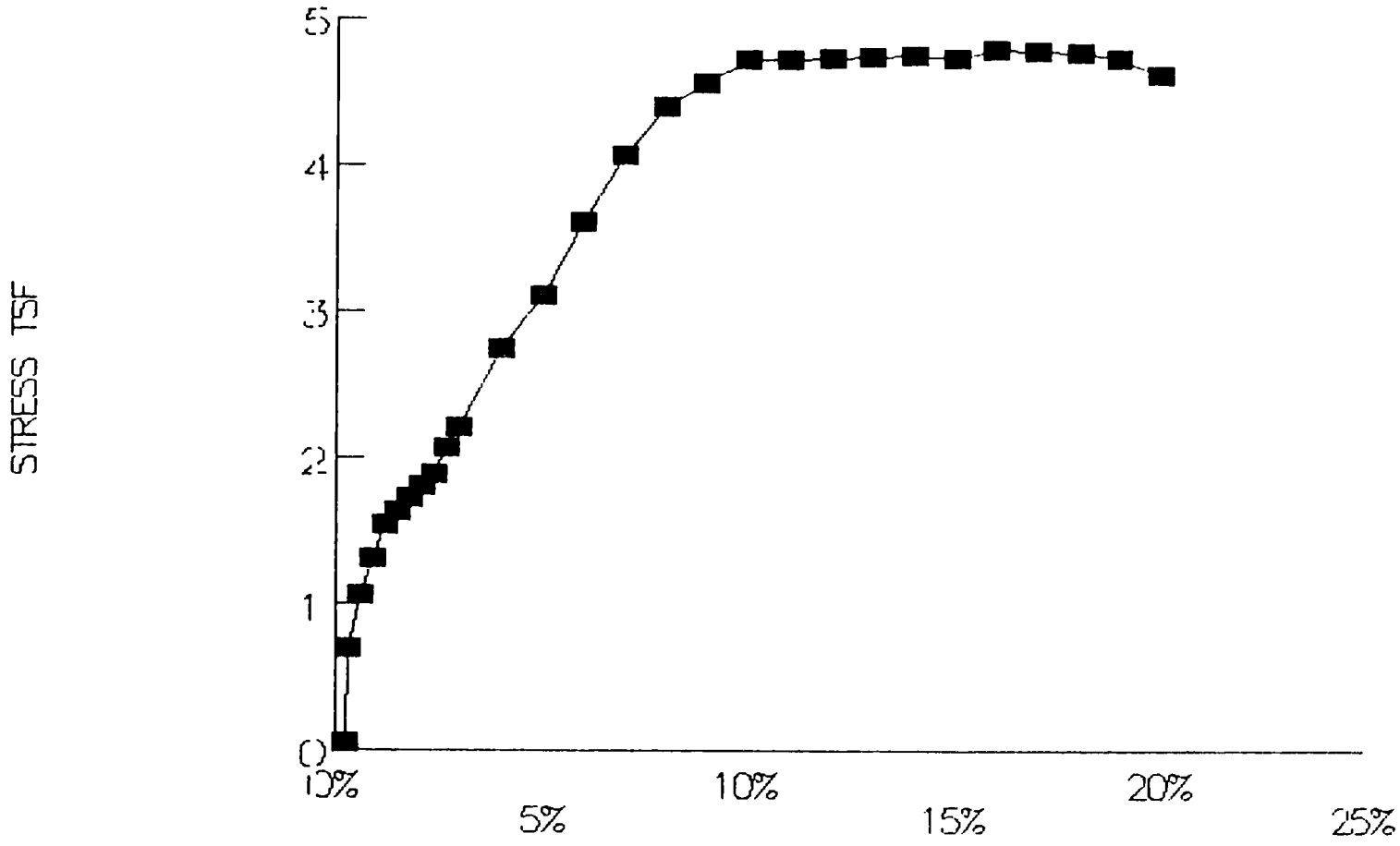
MAXIMUM STRESS 4.8 T/SQ FT
AT STRAIN = 16 %

CONFINING PRESSURE 1.2 TSF
TYPE OF FAILURE= SHEAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.012 IN	44 LB	0.7 TON/SQ FT	0.3%
	0.024	67	1.1	0.6%
822	0.035	83	1.3	0.9%
	0.047	98	1.5	1.2%
	0.059	104	1.6	1.5%
823	0.071	110	1.7	1.8%
	0.083	115	1.8	2.1%
	0.095	120	1.9	2.4%
824	0.106	132	2.1	2.7%
	0.118	141	2.2	3.0%
825	0.158	176	2.7	4.0%
826	0.197	200	3.1	5.0%
827	0.236	234	3.6	6.0%
828	0.276	264	4.1	7.0%
829	0.315	287	4.4	8.0%
830	0.355	299	4.6	9.0%
831	0.394	311	4.7	10.0%
832	0.434	312	4.7	11.0%
833	0.473	314	4.7	12.0%
834	0.512	316	4.7	13.0%
835	0.552	318	4.8	14.0%
836	0.591	318	4.7	15.0%
837	0.631	323	4.8	16.0%
838	0.670	324	4.8	17.0%
839	0.709	325	4.8	18.0%
840	0.749	323	4.7	19.0%
841	0.788	317	4.6	20.0%

TRIAXIAL SHEAR U.U.

N-7 @ 110' TO 110'5.5''



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/8/90
W.O. NO. 66
LAB # 1402

PROJECT EAST PAPAGO
BORING N-7 @ 120' TO 120'6.5"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 12.495
WET WT 734.69
DRY WT 598.8
DIAMETER 6.11

AREA 29.321 CM
VOLUME 366.360 CC
WET DENS 125.2 LB/CU FT
% MOIST 22.7%
DRY DENS 102.0 LB/CU FT

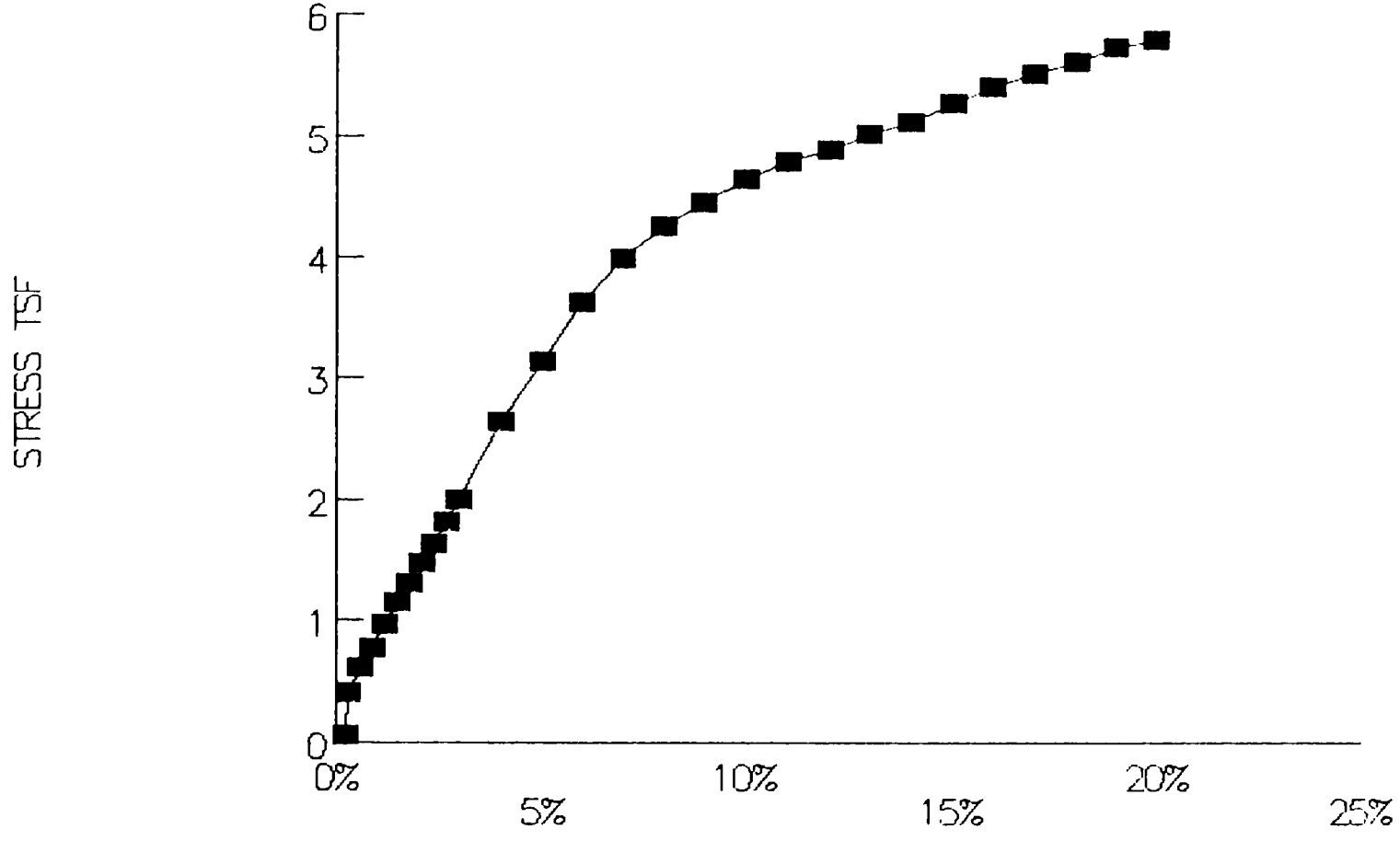
MAXIMUM STRESS 5.8 T/SQ FT
AT STRAIN = 20 %

CONFINING PRESSURE 2.4 TSF
TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.015 IN	26 LB	0.4 TON/SQ FT	0.3%
	0.030	39	0.6	0.6%
822	0.044	49	0.8	0.9%
	0.059	61	1.0	1.2%
	0.074	73	1.1	1.5%
823	0.089	83	1.3	1.8%
	0.103	94	1.5	2.1%
	0.118	104	1.6	2.4%
824	0.133	116	1.8	2.7%
	0.148	128	2.0	3.0%
825	0.197	169	2.6	4.0%
826	0.246	202	3.1	5.0%
827	0.295	234	3.6	6.0%
828	0.344	259	4.0	7.0%
829	0.394	277	4.3	8.0%
830	0.443	291	4.4	9.0%
831	0.492	305	4.6	10.0%
832	0.541	316	4.8	11.0%
833	0.590	324	4.9	12.0%
834	0.640	334	5.0	13.0%
835	0.689	342	5.1	14.0%
836	0.738	354	5.3	15.0%
837	0.787	364	5.4	16.0%
838	0.836	373	5.5	17.0%
839	0.885	381	5.6	18.0%
840	0.935	391	5.7	19.0%
841	0.984	397	5.8	20.0%

TRIAXIAL SHEAR U.U.

N-7 @ 120' TO 120'6.5"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/8/90
W.O. NO. 66
LAB # 1403

PROJECT EAST PAPAGO
BORING N-7 @ 134'6" TO 135'1"
TEST TYPE UNCONSOLIDATED, UNDRAINED

==========

SAMPLE HT 12.84
WET WT 767.74
DRY WT 629.05
DIAMETER 6.12

AREA 29.417 CM
VOLUME 377.709 CC
WET DENS 126.9 LB/CU FT
% MOIST 22.0%
DRY DENS 104.0 LB/CU FT

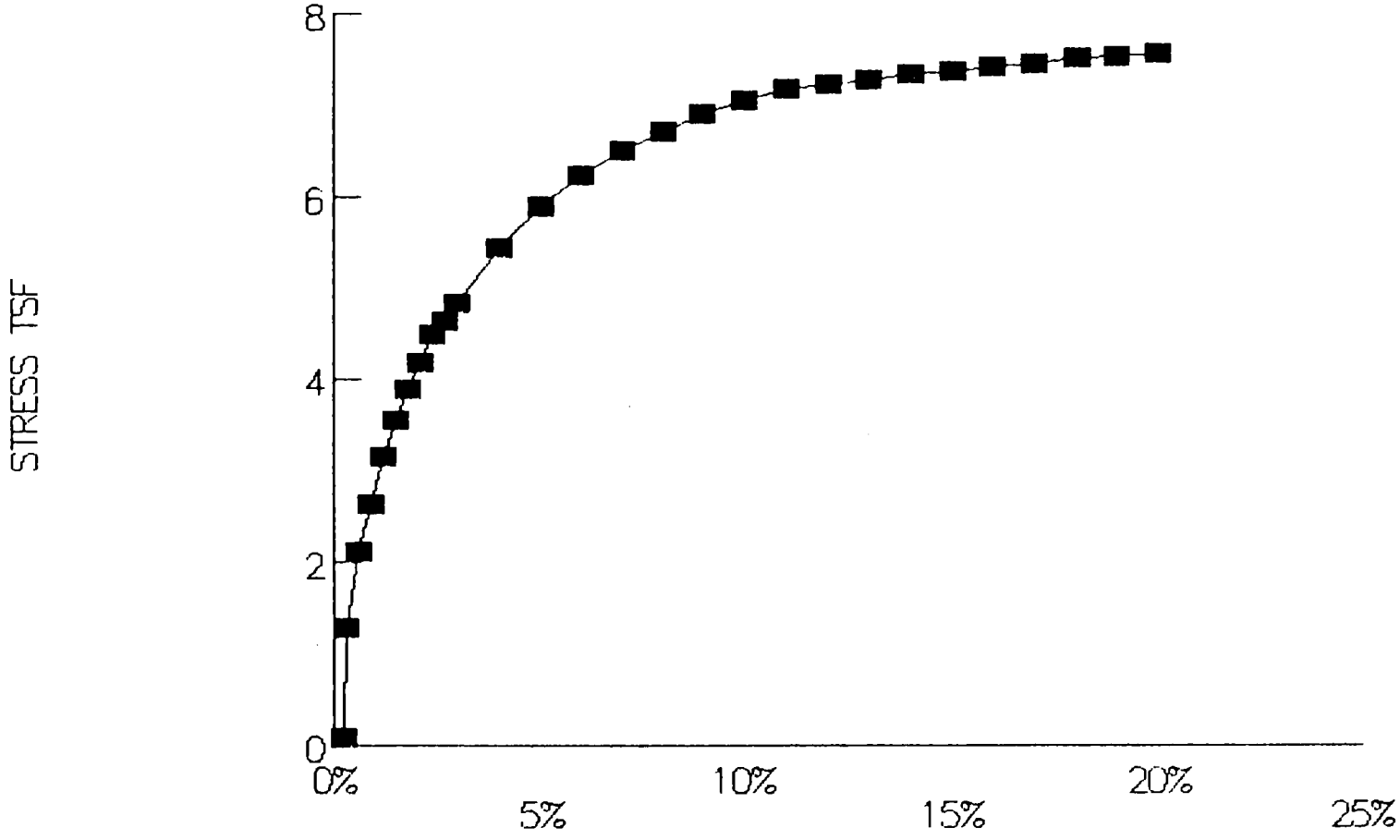
MAXIMUM STRESS 7.6 T/SQ FT
AT STRAIN = 20 %

CONFINING PRESSURE 5 TSF
TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.015 IN	81 LB	1.3 TON/SQ FT	0.3%
	0.030	134	2.1	0.6%
822	0.045	167	2.6	0.9%
	0.061	200	3.1	1.2%
	0.076	226	3.5	1.5%
823	0.091	248	3.9	1.8%
	0.106	267	4.2	2.1%
	0.121	287	4.5	2.4%
824	0.136	297	4.6	2.7%
	0.152	310	4.8	3.0%
825	0.202	350	5.4	4.0%
826	0.253	381	5.9	5.0%
827	0.303	405	6.2	6.0%
828	0.354	424	6.5	7.0%
829	0.404	440	6.7	8.0%
830	0.455	454	6.9	9.0%
831	0.506	466	7.1	10.0%
832	0.556	476	7.2	11.0%
833	0.607	481	7.2	12.0%
834	0.657	487	7.3	13.0%
835	0.708	493	7.4	14.0%
836	0.758	497	7.4	15.0%
837	0.809	503	7.4	16.0%
838	0.859	507	7.5	17.0%
839	0.910	513	7.5	18.0%
840	0.960	517	7.6	19.0%
841	1.011	521	7.6	20.0%

TRIAXIAL SHEAR U.U.

N-7 @ 134'6" TO 135'1"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/19/90
W.O. NO. 69
LAB # 1434

PROJECT EAST PAPAGO
BORING N-8 @ 139' TO 139'7.5"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 12.795
WET WT 778.64
DRY WT 646.08
DIAMETER 6.105

AREA 29.273 CM
VOLUME 374.543 CC
WET DENS 129.8 LB/CU FT
% MOIST 20.5%
DRY DENS 107.7 LB/CU FT

MAXIMUM STRESS= 3.3 T/SQ FT
AT STRAIN = 20 %

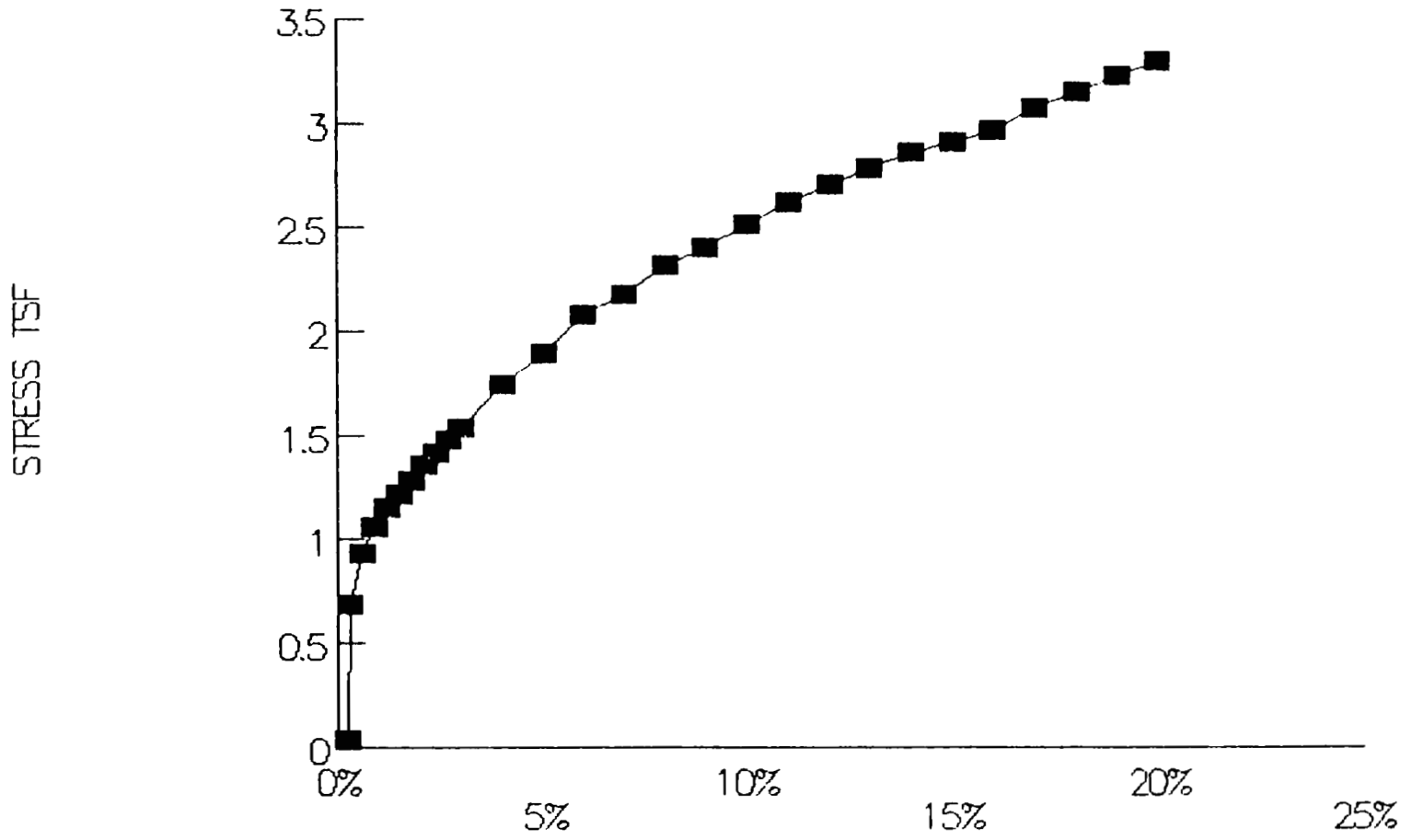
CONFINING PRESSURE 7 TSF

TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.015 IN	43 LB	0.7 TON/SQ FT	0.3%
	0.030	59	0.9	0.6%
822	0.045	67	1.1	0.9%
	0.060	73	1.2	1.2%
	0.076	77	1.2	1.5%
823	0.091	81	1.3	1.8%
	0.106	86	1.4	2.1%
	0.121	90	1.4	2.4%
824	0.136	94	1.5	2.7%
	0.151	98	1.5	3.0%
825	0.201	112	1.7	4.0%
826	0.252	122	1.9	5.0%
827	0.302	134	2.1	6.0%
828	0.353	141	2.2	7.0%
829	0.403	151	2.3	8.0%
830	0.453	157	2.4	9.0%
831	0.504	165	2.5	10.0%
832	0.554	173	2.6	11.0%
833	0.604	179	2.7	12.0%
834	0.655	185	2.8	13.0%
835	0.705	191	2.9	14.0%
836	0.756	195	2.9	15.0%
837	0.806	200	3.0	16.0%
838	0.856	208	3.1	17.0%
839	0.907	214	3.2	18.0%
840	0.957	220	3.2	19.0%
841	1.007	226	3.3	20.0%

TRIAXIAL SHEAR U.U.

N-8 @ 139' TO 139'7.5''



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/19/90
W.O. NO. 69
LAB # 1435

PROJECT EAST PAPAGO
BORING N-8 @ 154' TO 154'8"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 12.555
WET WT 756.08
DRY WT 620.95
DIAMETER 6.1

MAXIMUM STRESS= 7.8 T/SQ FT
AT STRAIN = 9 %

AREA 29.225 CM
VOLUME 366.916 CC
WET DENS 128.6 LB/CU FT
% MOIST 21.8%
DRY DENS 105.7 LB/CU FT

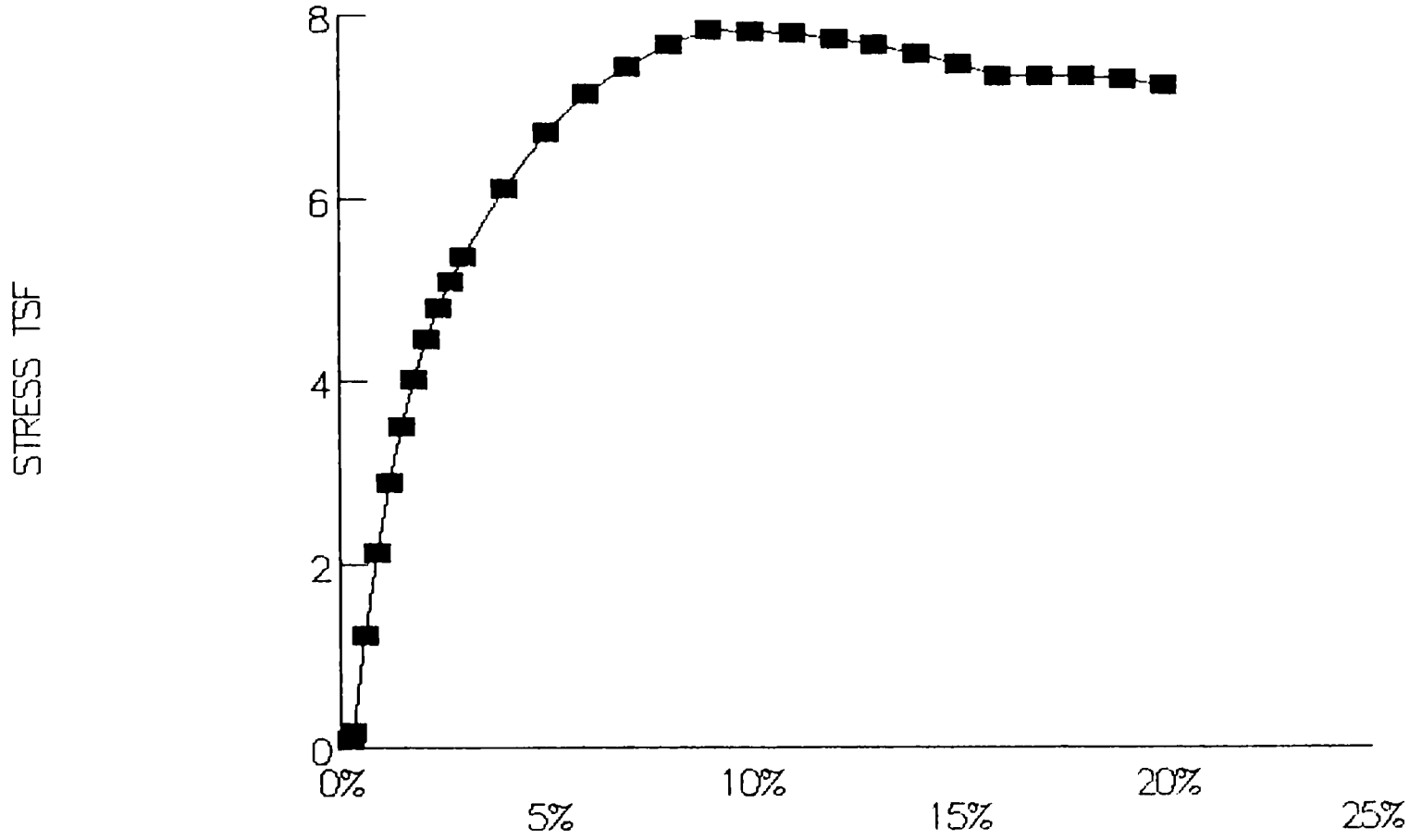
CONFINING PRESSURE 7 TSF

TYPE OF FAILURE= SHEAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.015 IN	10 LB	0.2 TON/SQ FT	0.3%
	0.030	77	1.2	0.6%
822	0.044	134	2.1	0.9%
	0.059	183	2.9	1.2%
	0.074	222	3.5	1.5%
823	0.089	255	4.0	1.8%
	0.104	283	4.5	2.1%
	0.119	305	4.8	2.4%
824	0.133	324	5.1	2.7%
	0.148	342	5.4	3.0%
825	0.198	391	6.1	4.0%
826	0.247	432	6.7	5.0%
827	0.297	460	7.1	6.0%
828	0.346	481	7.4	7.0%
829	0.395	499	7.7	8.0%
830	0.445	511	7.8	9.0%
831	0.494	513	7.8	10.0%
832	0.544	513	7.8	11.0%
833	0.593	511	7.7	12.0%
834	0.643	509	7.7	13.0%
835	0.692	505	7.6	14.0%
836	0.741	499	7.5	15.0%
837	0.791	493	7.3	16.0%
838	0.840	495	7.3	17.0%
839	0.890	497	7.3	18.0%
840	0.939	497	7.3	19.0%
841	0.989	495	7.2	20.0%

TRIAXIAL SHEAR U.U.

N-8 @ 154' TO 154'8"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/19/90
W.O. NO. 69
LAB # 1437

PROJECT EAST PAPAGO
BORING N-8 @ 165' TO 166'3"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 9.365
WET WT 354.21
DRY WT 260.08
DIAMETER 5.25

AREA 21.648 CM
VOLUME 202.729 CC
WET DENS 109.1 LB/CU FT
% MOIST 36.2%
DRY DENS 80.1 LB/CU FT

MAXIMUM STRESS= 3.0 T/SQ FT
AT STRAIN = 20 %

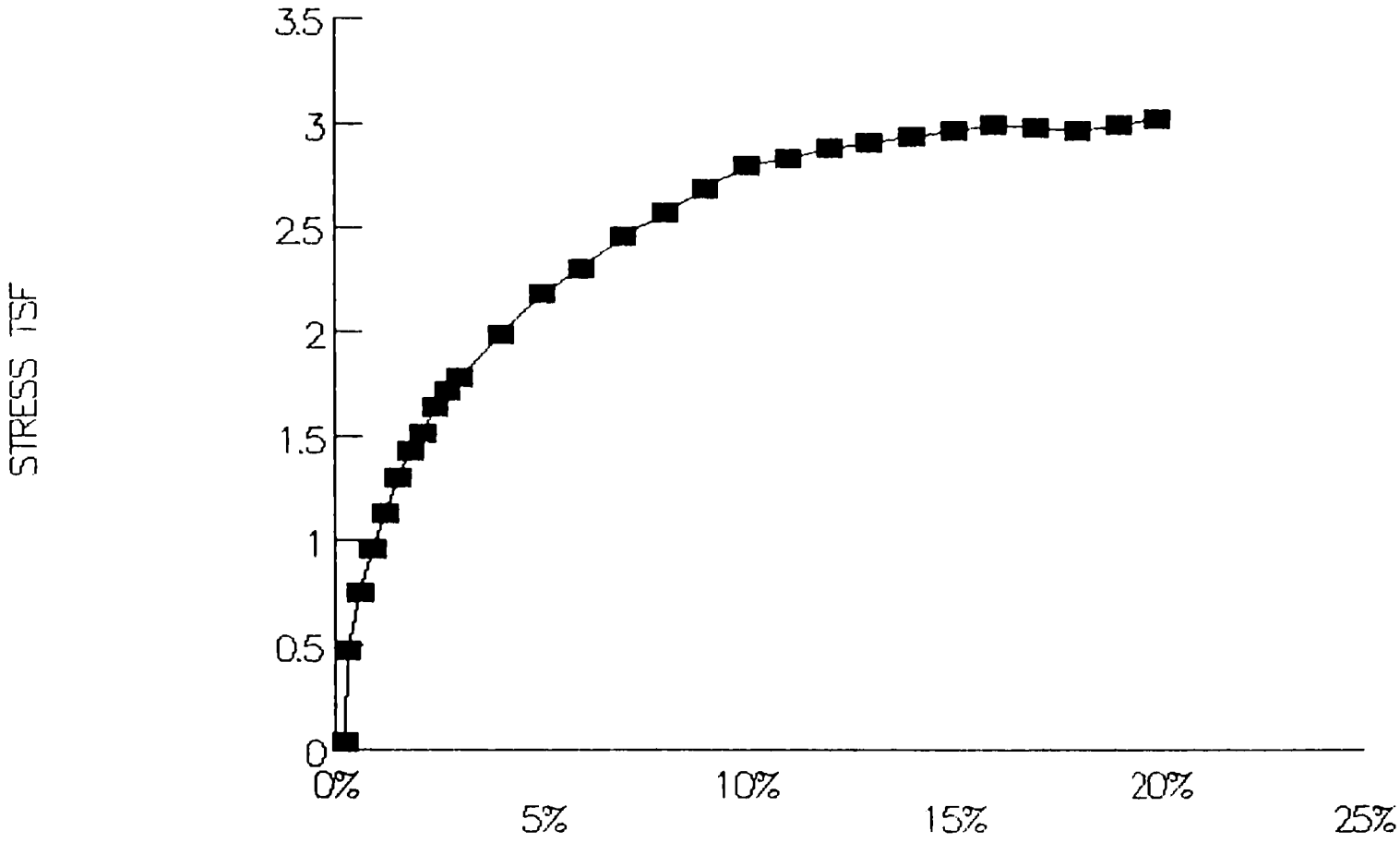
CONFINING PRESSURE 2 TSF

TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.011 IN	22 LB	0.5 TON/SQ FT	0.3%
	0.022	35	0.7	0.6%
822	0.033	45	1.0	0.9%
	0.044	53	1.1	1.2%
	0.055	61	1.3	1.5%
823	0.066	67	1.4	1.8%
	0.077	71	1.5	2.1%
	0.088	77	1.6	2.4%
824	0.100	81	1.7	2.7%
	0.111	84	1.8	3.0%
825	0.147	94	2.0	4.0%
826	0.184	104	2.2	5.0%
827	0.221	110	2.3	6.0%
828	0.258	118	2.5	7.0%
829	0.295	124	2.6	8.0%
830	0.332	130	2.7	9.0%
831	0.369	136	2.8	10.0%
832	0.406	138	2.8	11.0%
833	0.442	141	2.9	12.0%
834	0.479	143	2.9	13.0%
835	0.516	145	2.9	14.0%
836	0.553	147	3.0	15.0%
837	0.590	149	3.0	16.0%
838	0.627	149	3.0	17.0%
839	0.664	149	3.0	18.0%
840	0.701	151	3.0	19.0%
841	0.737	153	3.0	20.0%

TRIAXIAL SHEAR U.U.

N-8 @ 165' TO 166'3"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/19/90
W.O. NO. 69
LAB # 1437

PROJECT EAST PAPAGO
BORING N-8 @ 165' TO 166'3"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 14.38
WET WT 1114.95
DRY WT 830.93
DIAMETER 7.205

AREA 40.772 CM
VOLUME 586.296 CC
WET DENS 118.7 LB/CU FT
% MOIST 34.2%
DRY DENS 88.5 LB/CU FT

MAXIMUM STRESS= 2.8 T/SQ FT
AT STRAIN = 20 %

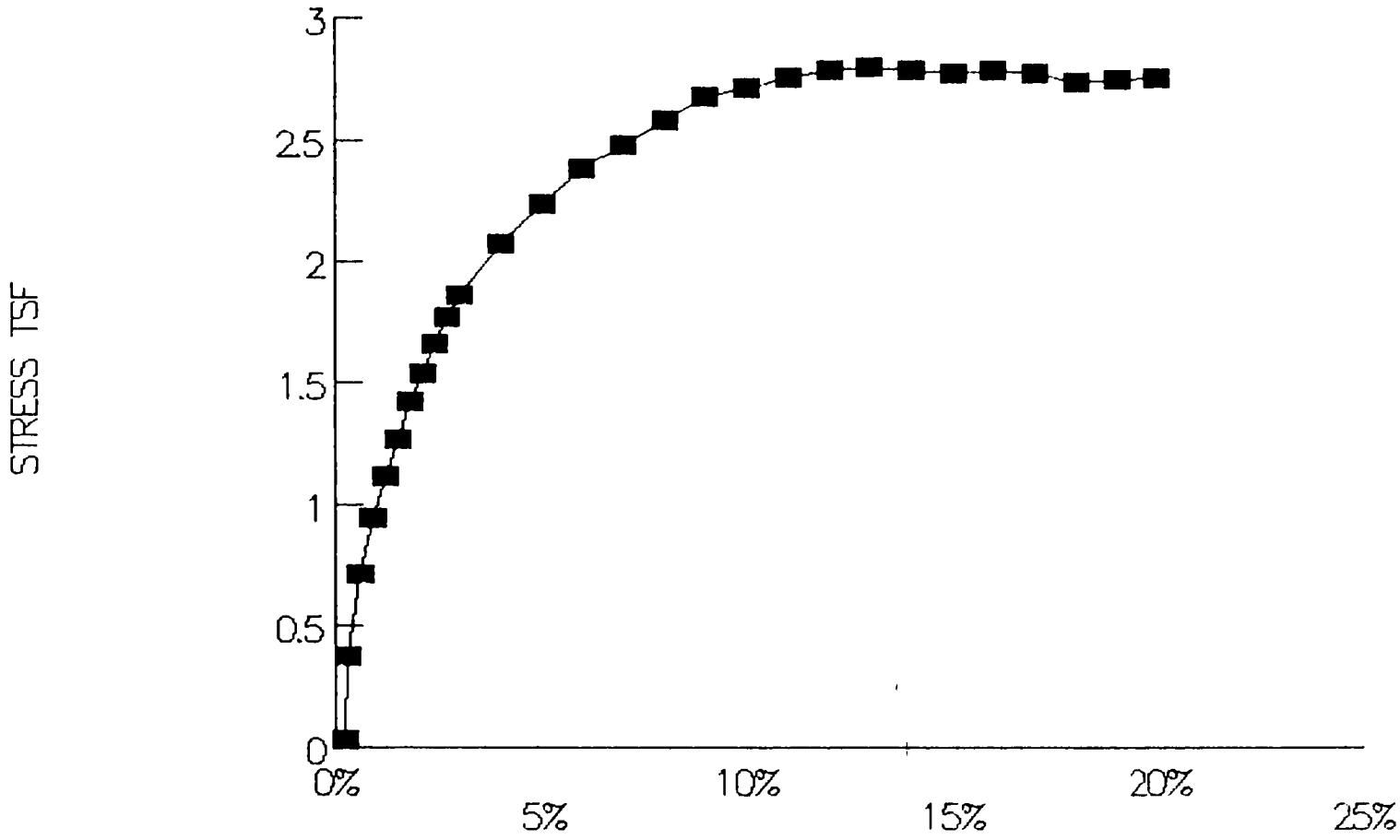
CONFINING PRESSURE 3.5 TSF

TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.017 IN	33 LB	0.4 TON/SQ FT	0.3%
	0.034	63	0.7	0.6%
822	0.051	83	0.9	0.9%
	0.068	98	1.1	1.2%
	0.085	112	1.3	1.5%
823	0.102	126	1.4	1.8%
	0.119	136	1.5	2.1%
	0.136	147	1.7	2.4%
824	0.153	157	1.8	2.7%
	0.170	165	1.9	3.0%
825	0.226	185	2.1	4.0%
826	0.283	200	2.2	5.0%
827	0.340	214	2.4	6.0%
828	0.396	224	2.5	7.0%
829	0.453	234	2.6	8.0%
830	0.510	244	2.7	9.0%
831	0.566	248	2.7	10.0%
832	0.623	253	2.8	11.0%
833	0.679	257	2.8	12.0%
834	0.736	259	2.8	13.0%
835	0.793	259	2.8	14.0%
836	0.849	259	2.8	15.0%
837	0.906	261	2.8	16.0%
838	0.962	261	2.8	17.0%
839	1.019	259	2.7	18.0%
840	1.076	261	2.8	19.0%
841	1.132	263	2.8	20.0%

TRIAXIAL SHEAR U.U.

N-8 @ 165' TO 166'3"



SERGENT, HAUSKINS & BECKWITH

TRIAXIAL TEST

JOB NO E87-56
DATE 1/19/90
W.O. NO. 69
LAB # 1437

PROJECT EAST PAPAGO
BORING N-8 @ 165' TO 166'3"
TEST TYPE UNCONSOLIDATED, UNDRAINED

SAMPLE HT 14.55
WET WT 1114.81
DRY WT 845.3
DIAMETER 7.2

AREA 40.715 CM
VOLUME 592.404 CC
WET DENS 117.5 LB/CU FT
% MOIST 31.9%
DRY DENS 89.1 LB/CU FT

MAXIMUM STRESS= 5.2 T/SQ FT
AT STRAIN = 20 %

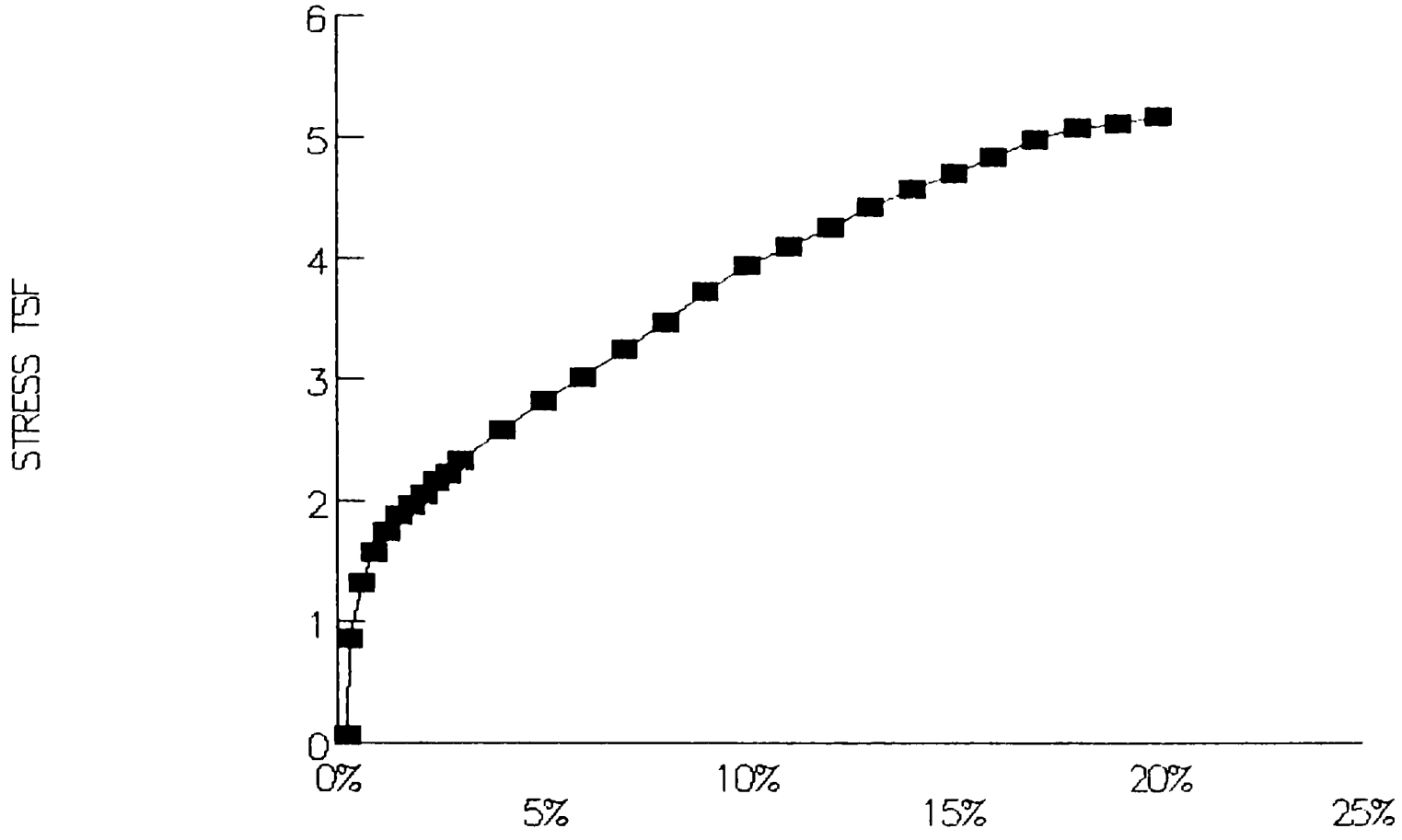
CONFINING PRESSURE 7 TSF

TYPE OF FAILURE= BULDGE

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
	0.017 IN	75 LB	0.9 TON/SQ FT	0.3%
	0.034	116	1.3	0.6%
822	0.052	138	1.6	0.9%
	0.069	153	1.7	1.2%
	0.086	165	1.9	1.5%
823	0.103	173	2.0	1.8%
	0.120	181	2.0	2.1%
	0.137	191	2.2	2.4%
824	0.155	196	2.2	2.7%
	0.172	206	2.3	3.0%
825	0.229	230	2.6	4.0%
826	0.286	252	2.8	5.0%
827	0.344	271	3.0	6.0%
828	0.401	293	3.3	7.0%
829	0.458	314	3.5	8.0%
830	0.516	338	3.7	9.0%
831	0.573	360	3.9	10.0%
832	0.630	375	4.1	11.0%
833	0.687	391	4.3	12.0%
834	0.745	409	4.4	13.0%
835	0.802	424	4.6	14.0%
836	0.859	438	4.7	15.0%
837	0.917	452	4.8	16.0%
838	0.974	468	5.0	17.0%
839	1.031	479	5.1	18.0%
840	1.088	485	5.1	19.0%
841	1.146	493	5.2	20.0%

TRIAXIAL SHEAR U.U.

N-8 @ 165' TO 166'3"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E89-56
DATE 11/27/89
W.O. NO. 62
LAB # 1347

PROJECT EAST PAPAGO
BORING EP-147 @ 120'6' TO 122'6'

SAMPLE HT 13.46
WET WT 1156.58
DRY WT 983.02
DIAMETER 7.265

AREA 41.453 CM
VOLUME 557.964 CC
WET DENS 129.4 LB/CU FT
% MOIST 17.7%
DRY DENS 110.0 LB/CU FT

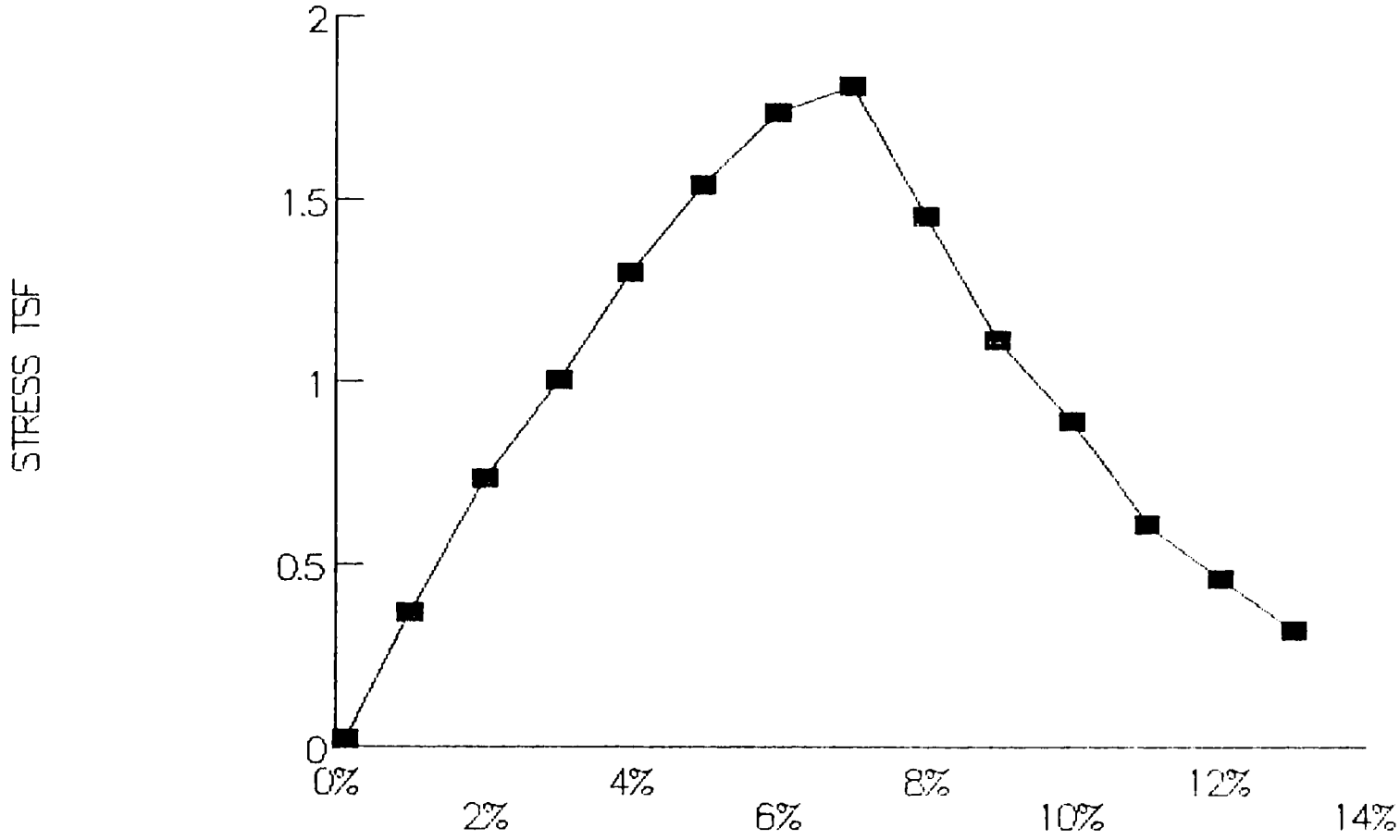
MAXIMUM STRESS 1.8 T/SQ FT
AT STRAIN = 7 %

TYPE OF FAILURE= COLUMNAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.053 IN	33 LB	0.4 TON/SQ FT	1.0%
823	0.106	66	0.7	2.0%
824	0.159	91	1.0	3.0%
825	0.212	118	1.3	4.0%
826	0.265	140	1.5	5.0%
827	0.318	159	1.7	6.0%
828	0.371	166	1.8	7.0%
829	0.424	134	1.5	8.0%
830	0.477	103	1.1	9.0%
831	0.530	83	0.9	10.0%
832	0.583	57	0.6	11.0%
833	0.636	43	0.5	12.0%
834	0.689	30	0.3	13.0%

UNCONFINED COMPRESSION

EP-147 @ 120'6" TO 122'6"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E89-56
DATE 11/27/89
W.O. NO. 62
LAB # 1349

PROJECT EAST PAPAGO
BORING EP-147 @ 145' TO 147'

SAMPLE HT 13.745
WET WT 1093.18
DRY WT 934.71
DIAMETER 7.26

AREA 41.396 CM
VOLUME 568.994 CC
WET DENS 119.9 LB/CU FT
% MOIST 17.0%
DRY DENS 102.6 LB/CU FT

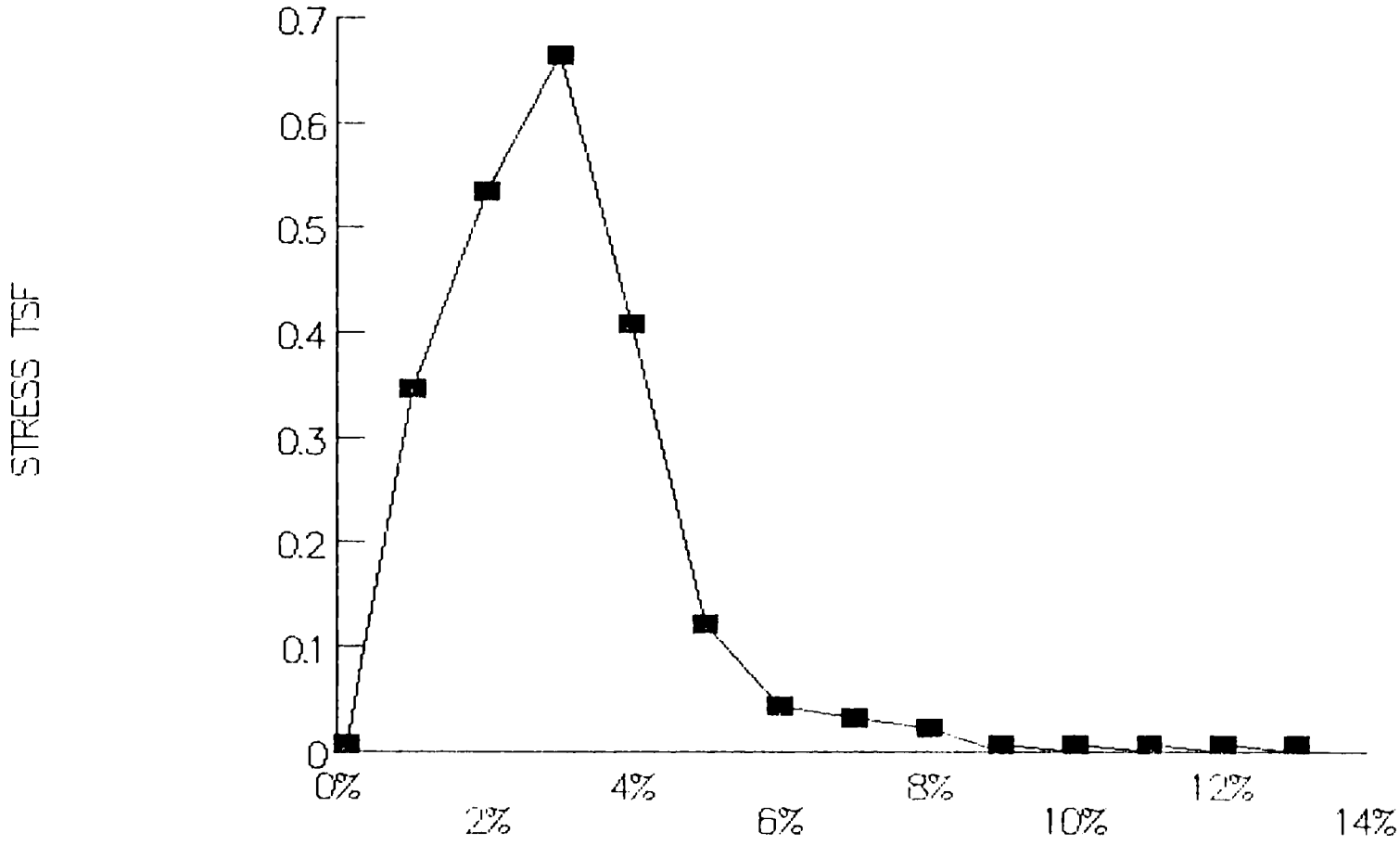
MAXIMUM STRESS 0.7 T/SQ FT
AT STRAIN = 3 %

TYPE OF FAILURE= COLUMNAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.054 IN	31 LB	0.3 TON/SQ FT	1.0%
823	0.108	48	0.5	2.0%
824	0.162	60	0.7	3.0%
825	0.216	37	0.4	4.0%
826	0.271	11	0.1	5.0%
827	0.325	4	0.0	6.0%
828	0.379	3	0.0	7.0%
829	0.433	2	0.0	8.0%
830	0.487	0	0.0	9.0%
831	0.541	0	0.0	10.0%
832	0.595	0	0.0	11.0%
833	0.649	0	0.0	12.0%
834	0.703	0	0.0	13.0%

UNCONFINED COMPRESSION

EP-147 @ 145' TO 147'



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E89-56
DATE 11/27/89
W.O. NO. 62
LAB # 1361

PROJECT EAST PAPAGO
BORING EP-148 @ 107' TO 109'

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SAMPLE HT 15.335
WET WT 1009.29
DRY WT 801.31
DIAMETER 7.27

AREA 41.511 CM
VOLUME 636.564 CC
WET DENS 99.0 LB/CU FT
% MOIST 26.0%
DRY DENS 78.6 LB/CU FT

MAXIMUM STRESS 1.0 T/SQ FT
AT STRAIN = 6 %

TYPE OF FAILURE= SHEAR-CON

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.060 IN	28 LB	0.3 TON/SQ FT	1.0%
823	0.121	49	0.5	2.0%
824	0.181	67	0.7	3.0%
825	0.241	79	0.9	4.0%
826	0.302	86	0.9	5.0%
827	0.362	90	1.0	6.0%
828	0.423	83	0.9	7.0%
829	0.483	47	0.5	8.0%
830	0.543	18	0.2	9.0%
831	0.604	2	0.0	10.0%
832	0.664	2	0.0	11.0%
833	0.724	2	0.0	12.0%
834	0.785	2	0.0	13.0%

SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E89-56
DATE 11/27/89
W.O. NO. 62
LAB # 1363

PROJECT EAST PAPAGO
BORING EP-148 @ 123' TO 125'

SAMPLE HT 13.86
WET WT 1000.03
DRY WT 748.19
DIAMETER 7.265

AREA 41.453 CM
VOLUME 574.545 CC
WET DENS 108.7 LB/CU FT
% MOIST 33.7%
DRY DENS 81.3 LB/CU FT

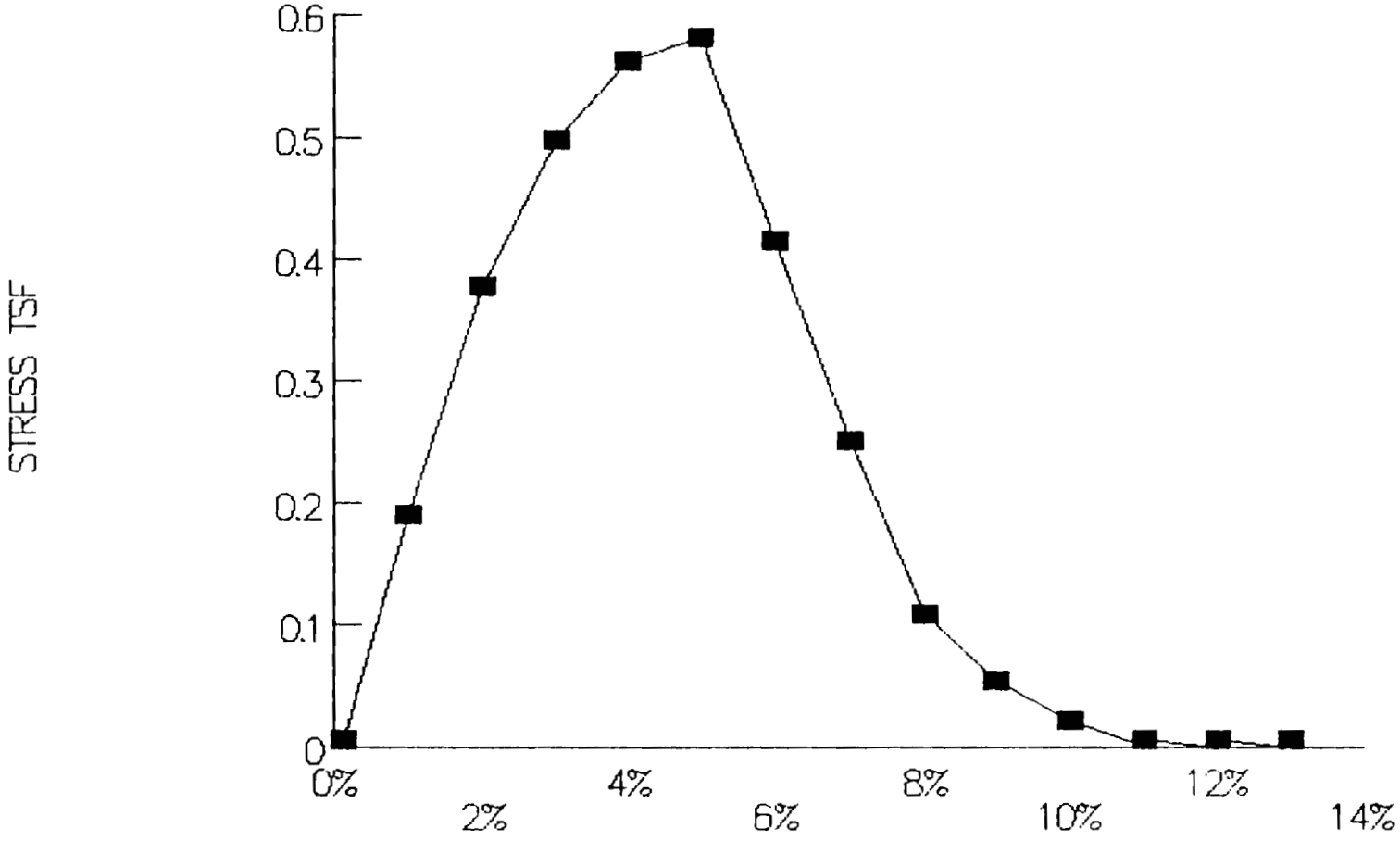
MAXIMUM STRESS 0.6 T/SQ FT
AT STRAIN = 5 %

TYPE OF FAILURE= COLUMNAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.055 IN	17 LB	0.2 TON/SQ FT	1.0%
823	0.109	34	0.4	2.0%
824	0.164	45	0.5	3.0%
825	0.218	51	0.6	4.0%
826	0.273	53	0.6	5.0%
827	0.327	38	0.4	6.0%
828	0.382	23	0.3	7.0%
829	0.437	10	0.1	8.0%
830	0.491	5	0.1	9.0%
831	0.546	2	0.0	10.0%
832	0.600	0	0.0	11.0%
833	0.655	0	0.0	12.0%
834	0.709	0	0.0	13.0%

UNCONFINED COMPRESSION

EP-148 @ 123' TO 125'



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 12/15/89
W.O. NO. 63
LAB # 1370

PROJECT EAST PAPAGO
BORING N-1 @ 128' TO 130'

SAMPLE HT 15.85
WET WT 1237.8
DRY WT 925.16
DIAMETER 7.255

AREA 41.339 CM
VOLUME 655.230 CC
WET DENS 117.9 LB/CU FT
% MOIST 33.8%
DRY DENS 88.1 LB/CU FT

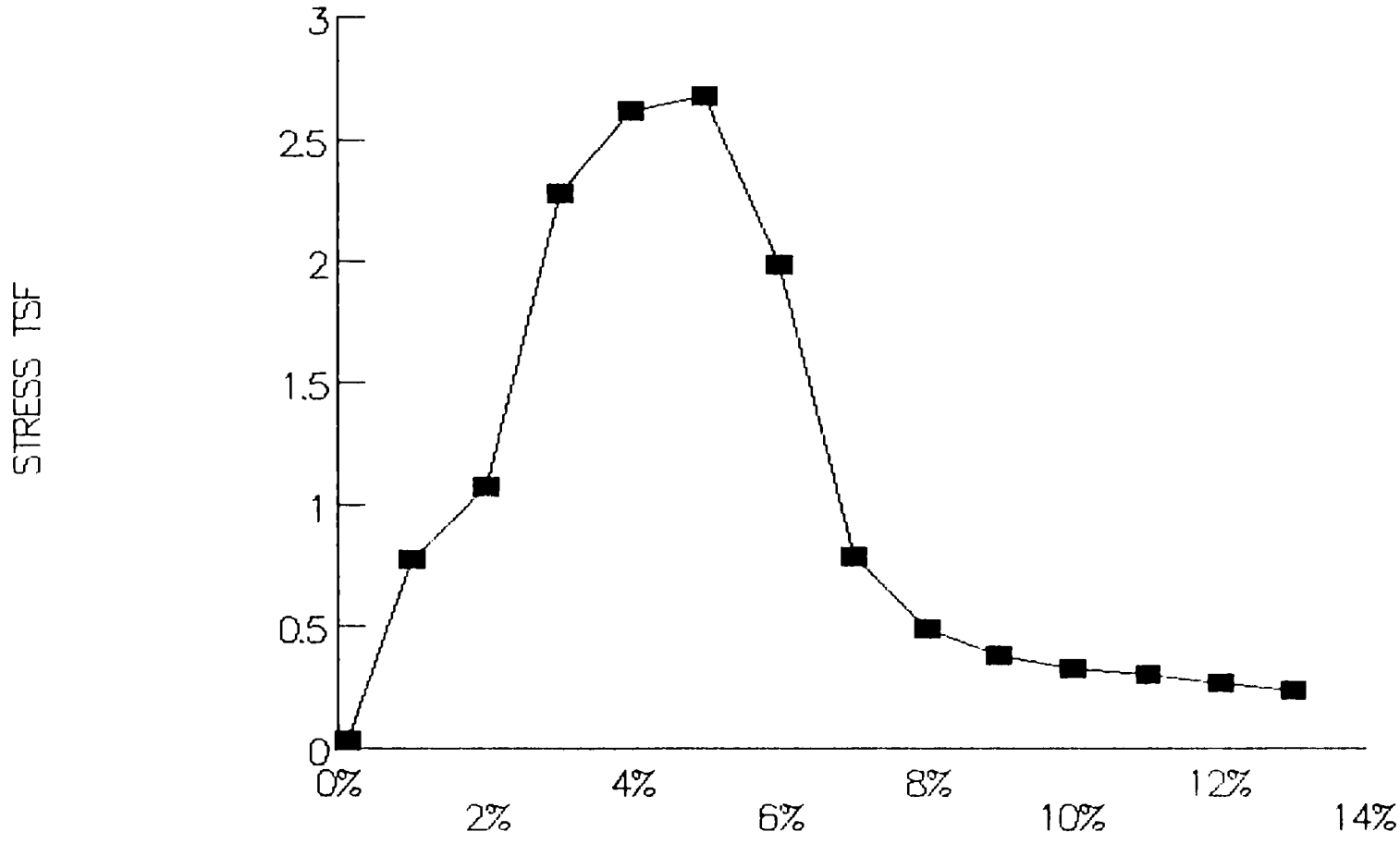
MAXIMUM STRESS 2.7 T/SQ FT
AT STRAIN = 5 %

TYPE OF FAILURE= COLUMNAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.062 IN	69 LB	0.8 TON/SQ FT	1.0%
823	0.125	96	1.1	2.0%
824	0.187	205	2.3	3.0%
825	0.250	237	2.6	4.0%
826	0.312	243	2.7	5.0%
827	0.374	181	2.0	6.0%
828	0.437	72	0.8	7.0%
829	0.499	45	0.5	8.0%
830	0.562	35	0.4	9.0%
831	0.624	30	0.3	10.0%
832	0.686	28	0.3	11.0%
833	0.749	25	0.3	12.0%
834	0.811	22	0.2	13.0%

UNCONFINED COMPRESSION

N-1 @ 128' TO 130'



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 12/22/89
W.O. NO. 64
LAB # 1374

PROJECT EAST PAPAGO
BORING N-3 @ 92'4" TO 94'4"

SAMPLE HT 15.97
WET WT 1247.63
DRY WT 969.62
DIAMETER 7.31

AREA 41.969 CM
VOLUME 670.239 CC
WET DENS 116.2 LB/CU FT
% MOIST 28.7%
DRY DENS 90.3 LB/CU FT

MAXIMUM STRESS 1.4 T/SQ FT
AT STRAIN = 6 %

TYPE OF FAILURE= SHEAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.063 IN	38 LB	0.4 TON/SQ FT	1.0%
823	0.126	64	0.7	2.0%
824	0.189	87	1.0	3.0%
825	0.251	111	1.2	4.0%
826	0.314	119	1.3	5.0%
827	0.377	127	1.4	6.0%
828	0.440	115	1.2	7.0%
829	0.503	66	0.7	8.0%
830	0.566	35	0.4	9.0%
831	0.629	24	0.3	10.0%
832	0.692	19	0.2	11.0%
833	0.754	14	0.1	12.0%
834	0.817	12	0.1	13.0%

SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 12/22/89
W.O. NO. 64
LAB # 1377

PROJECT EAST PAPAGO
BORING N-3 @ 117'8" TO 119'8"

SAMPLE HT 15.99
WET WT 1215.25
DRY WT 967.8
DIAMETER 7.275

AREA 41.568 CM
VOLUME 664.667 CC
WET DENS 114.1 LB/CU FT
% MOIST 25.6%
DRY DENS 90.9 LB/CU FT

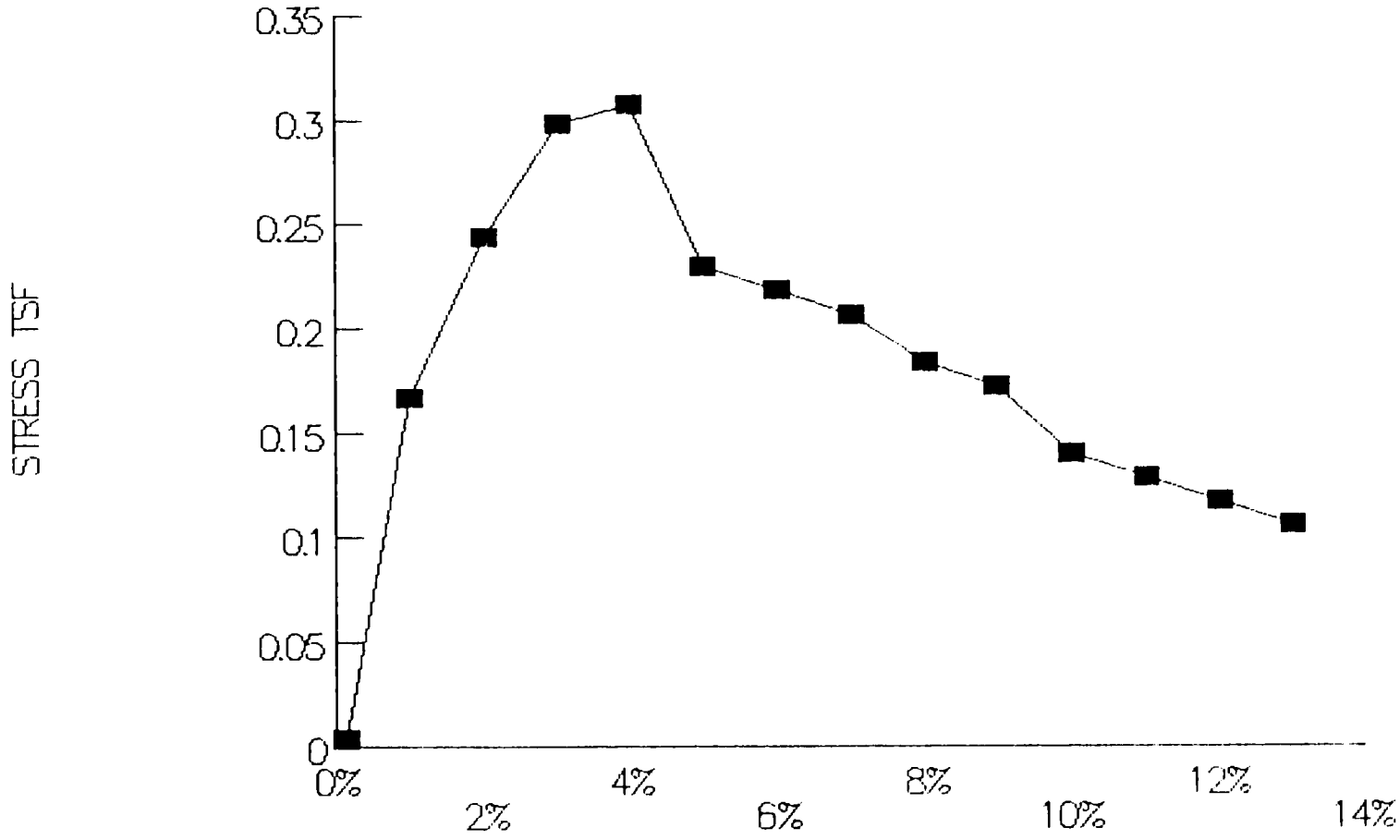
MAXIMUM STRESS 0.3 T/SQ FT
AT STRAIN = 4 %

TYPE OF FAILURE= SHEAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.063 IN	15 LB	0.2 TON/SQ FT	1.0%
823	0.126	22	0.2	2.0%
824	0.189	27	0.3	3.0%
825	0.252	28	0.3	4.0%
826	0.315	21	0.2	5.0%
827	0.378	20	0.2	6.0%
828	0.441	19	0.2	7.0%
829	0.504	17	0.2	8.0%
830	0.567	16	0.2	9.0%
831	0.630	13	0.1	10.0%
832	0.692	12	0.1	11.0%
833	0.755	11	0.1	12.0%
834	0.818	10	0.1	13.0%

UNCONFINED COMPRESSION

N-3 @ 117'8" TO 119'8"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 1/15/90
W.O. NO. 67
LAB # 1420

PROJECT EAST PAPAGO
BORING N-4 @ 129' TO 130'

==========

SAMPLE HT 12.675
WET WT 747.44
DRY WT 596.72
DIAMETER 6.12

AREA 29.417 CM
VOLUME 372.856 CC
WET DENS 125.1 LB/CU FT
% MOIST 25.3%
DRY DENS 99.9 LB/CU FT

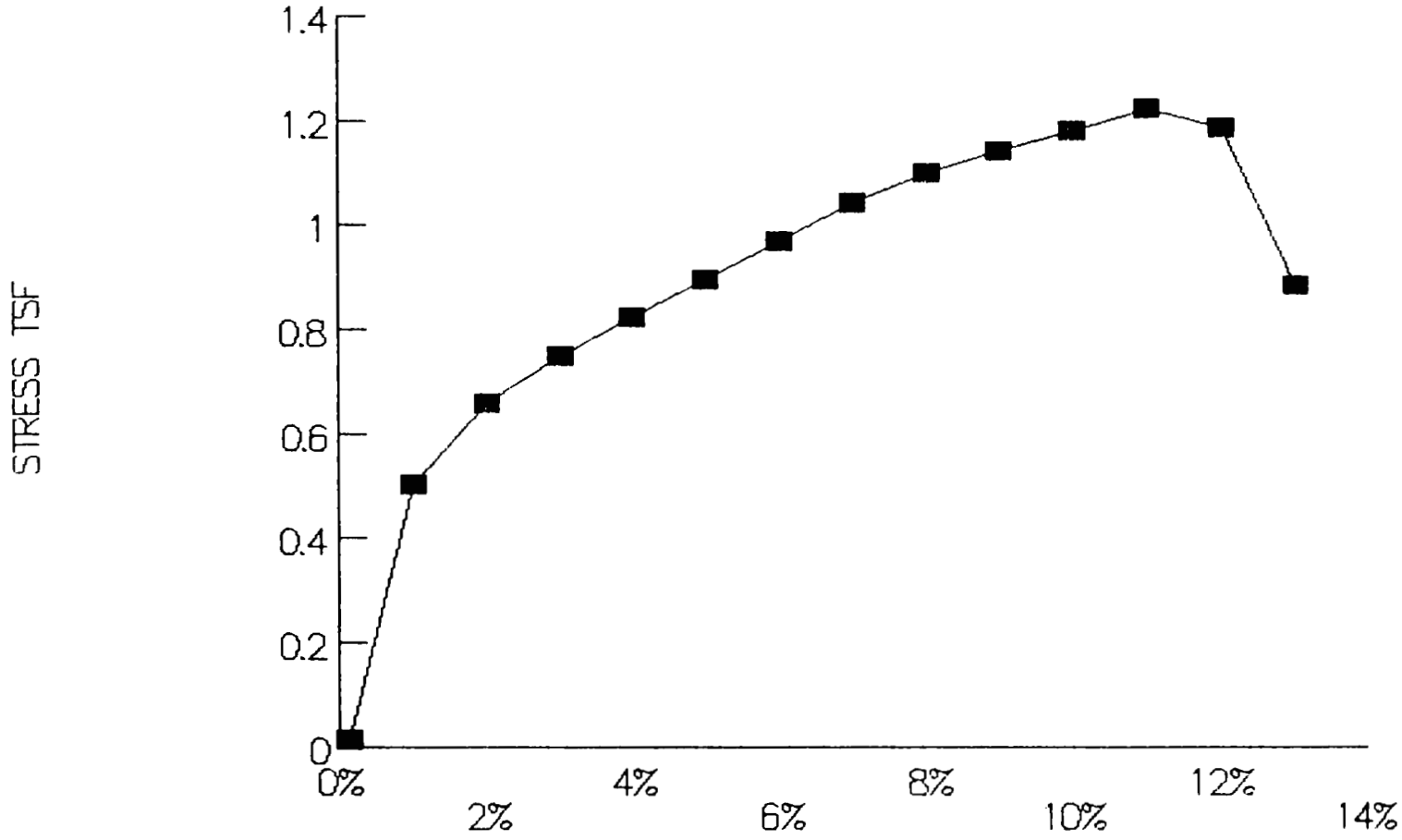
MAXIMUM STRESS 1.2 T/SQ FT
AT STRAIN = 11 %

TYPE OF FAILURE= SHEAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.050 IN	32 LB	0.5 TON/SQ FT	1.0%
823	0.100	42	0.7	2.0%
824	0.150	48	0.7	3.0%
825	0.200	53	0.8	4.0%
826	0.250	58	0.9	5.0%
827	0.299	63	1.0	6.0%
828	0.349	68	1.0	7.0%
829	0.399	72	1.1	8.0%
830	0.449	75	1.1	9.0%
831	0.499	78	1.2	10.0%
832	0.549	81	1.2	11.0%
833	0.599	79	1.2	12.0%
834	0.649	59	0.9	13.0%

UNCONFINED COMPRESSION

N-4 @ 129' TO 130'



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 12/29/89
W.O. NO. 65
LAB # 1392

PROJECT EAST PAPAGO FREEWAY
BORING N-5 @ 153' TO 154'6"

SAMPLE HT 17.915
WET WT 1466.55
DRY WT 1161.82
DIAMETER 7.32

AREA 42.084 CM
VOLUME 753.926 CC
WET DENS 121.4 LB/CU FT
% MOIST 26.2%
DRY DENS 96.2 LB/CU FT

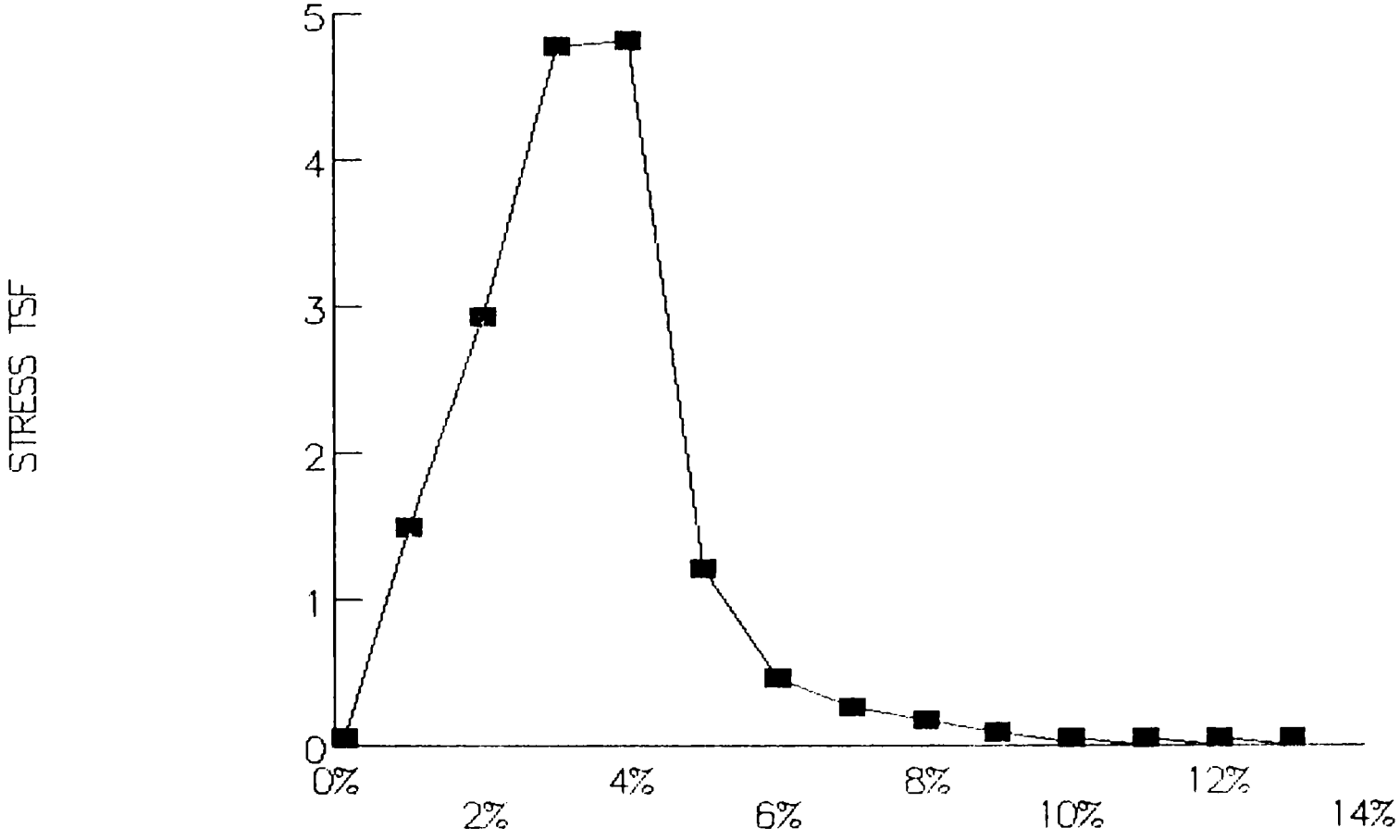
MAXIMUM STRESS 4.8 T/SQ FT
AT STRAIN = 4 %

TYPE OF FAILURE= SHEAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.071 IN	136 LB	1.5 TON/SQ FT	1.0%
823	0.141	267	2.9	2.0%
824	0.212	438	4.8	3.0%
825	0.282	444	4.8	4.0%
826	0.353	112	1.2	5.0%
827	0.423	43	0.5	6.0%
828	0.494	24	0.3	7.0%
829	0.564	16	0.2	8.0%
830	0.635	8	0.1	9.0%
831	0.705	2	0.0	10.0%
832	0.776	0	0.0	11.0%
833	0.846	0	0.0	12.0%
834	0.917	0	0.0	13.0%

UNCONFINED COMPRESSION

N-5 @ 153' TO 154'6"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 12/29/89
W.O. NO. 65
LAB # 1397

PROJECT EAST PAPAGO FREEWAY
BORING N-5 @ 173' TO 173'11"

SAMPLE HT 12.245
WET WT 690.76
DRY WT 530.25
DIAMETER 6.13

AREA 29.513 CM
VOLUME 361.385 CC
WET DENS 119.3 LB/CU FT
% MOIST 30.3%
DRY DENS 91.6 LB/CU FT

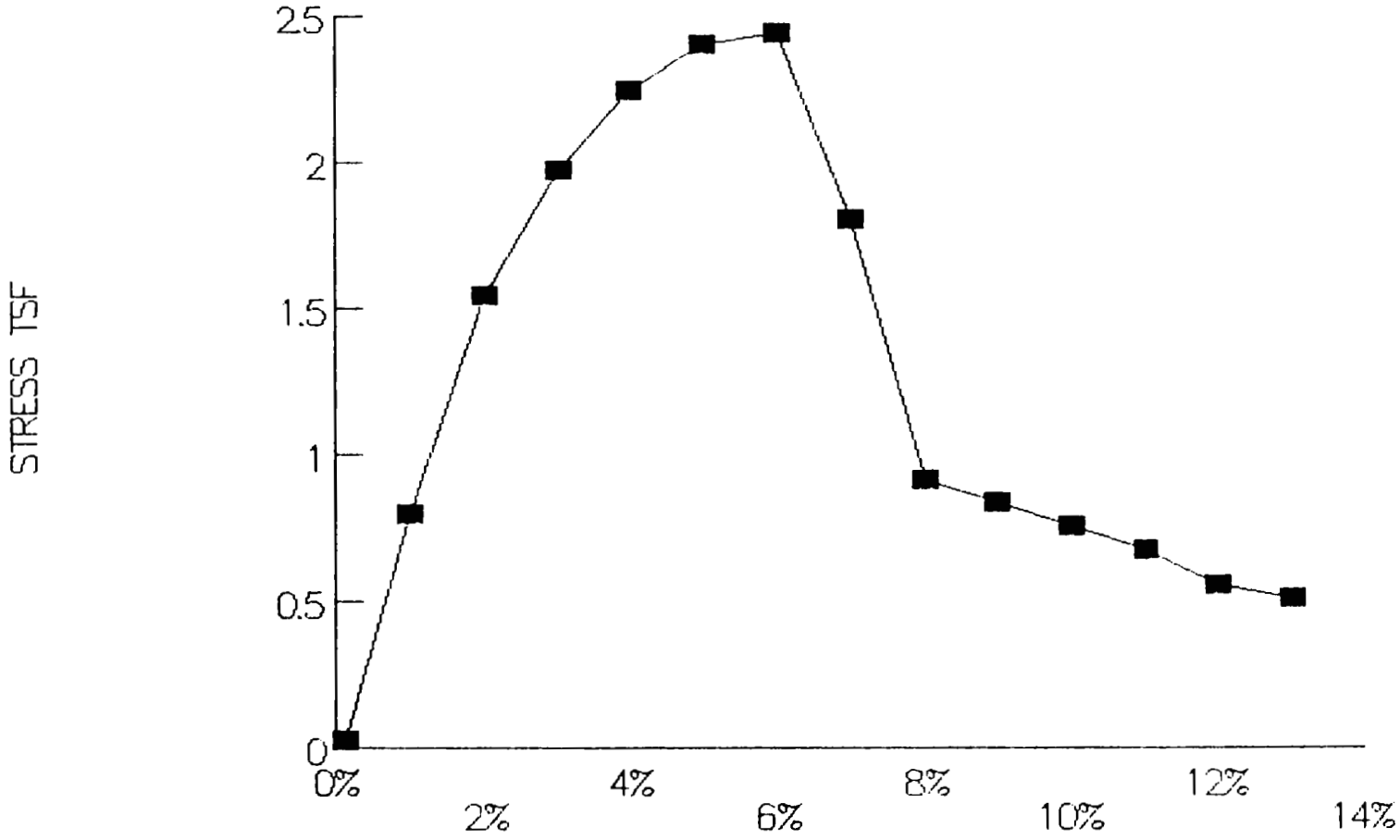
MAXIMUM STRESS 2.4 T/SQ FT
AT STRAIN = 6 %

TYPE OF FAILURE= SHEAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.048 IN	51 LB	0.8 TON/SQ FT	1.0%
823	0.096	99	1.5	2.0%
824	0.145	127	2.0	3.0%
825	0.193	145	2.2	4.0%
826	0.241	156	2.4	5.0%
827	0.289	159	2.4	6.0%
828	0.337	118	1.8	7.0%
829	0.386	60	0.9	8.0%
830	0.434	55	0.8	9.0%
831	0.482	50	0.8	10.0%
832	0.530	45	0.7	11.0%
833	0.579	37	0.6	12.0%
834	0.627	34	0.5	13.0%

UNCONFINED COMPRESSION

N-5 @ 173' TO 173'11"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 1/19/90
W.O. NO. 68
LAB # 1425

PROJECT EAST PAPAGO
BORING N-6 @ 89' TO 90'6"

==========

SAMPLE HT 12.585
WET WT 743.77
DRY WT 589
DIAMETER 6.14

AREA 29.609 CM
VOLUME 372.632 CC
WET DENS 124.6 LB/CU FT
% MOIST 26.3%
DRY DENS 98.7 LB/CU FT

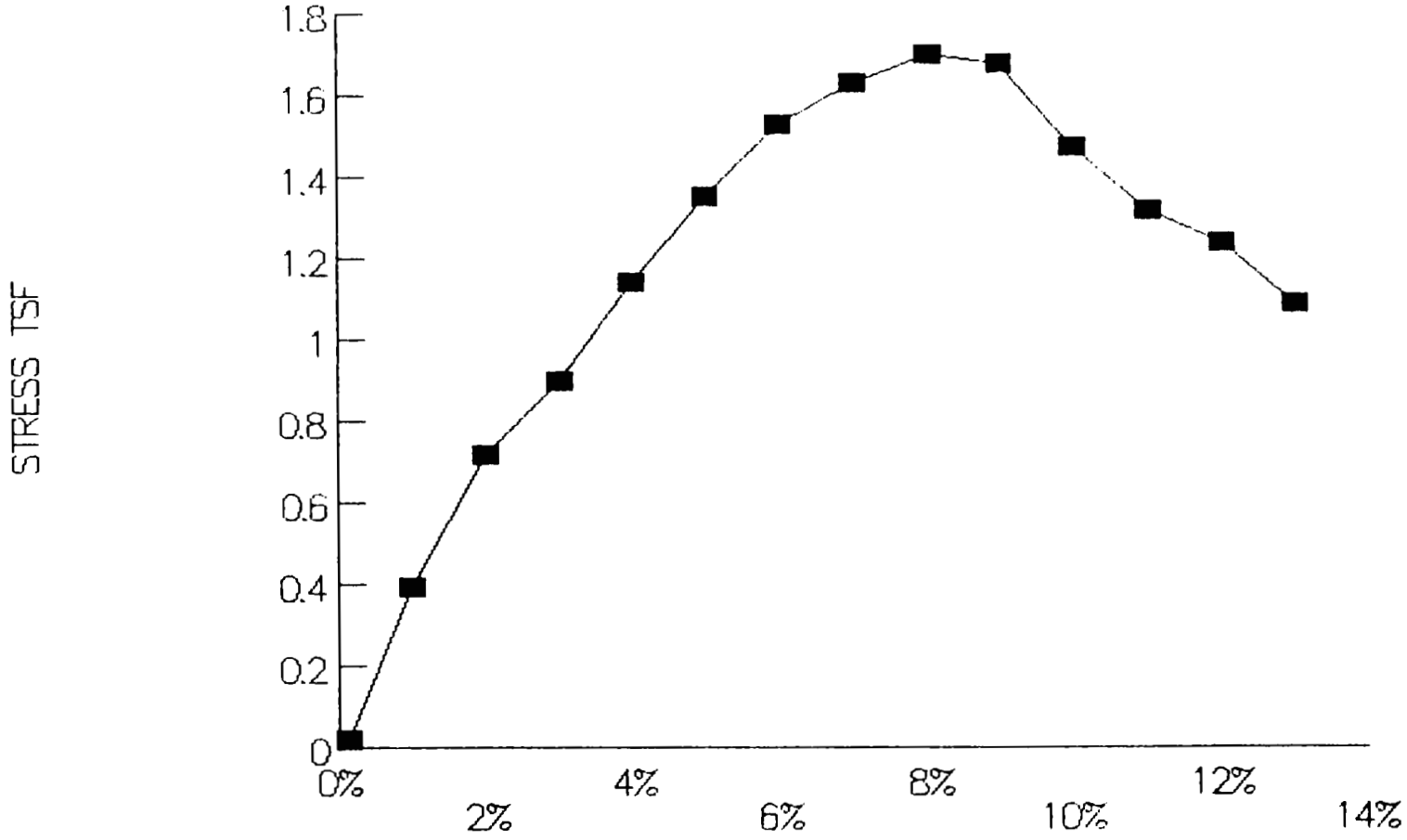
MAXIMUM STRESS 1.7 T/SQ FT
AT STRAIN = 8 %

TYPE OF FAILURE= COLUMNAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.050 IN	25 LB	0.4 TON/SQ FT	1.0%
823	0.099	46	0.7	2.0%
824	0.149	58	0.9	3.0%
825	0.198	74	1.1	4.0%
826	0.248	88	1.4	5.0%
827	0.297	100	1.5	6.0%
828	0.347	107	1.6	7.0%
829	0.396	112	1.7	8.0%
830	0.446	111	1.7	9.0%
831	0.495	98	1.5	10.0%
832	0.545	88	1.3	11.0%
833	0.595	83	1.2	12.0%
834	0.644	73	1.1	13.0%

UNCONFINED COMPRESSION

N-6 @ 89' TO 90'6"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 1/19/90
W.O. NO. 68
LAB # 1429

PROJECT EAST PAPAGO
BORING N-6 @ 129' TO 130'1"

==========

SAMPLE HT 12.56
WET WT 777.6
DRY WT 658.23
DIAMETER 6.14

AREA 29.609 CM
VOLUME 371.891 CC
WET DENS 130.5 LB/CU FT
% MOIST 18.1%
DRY DENS 110.5 LB/CU FT

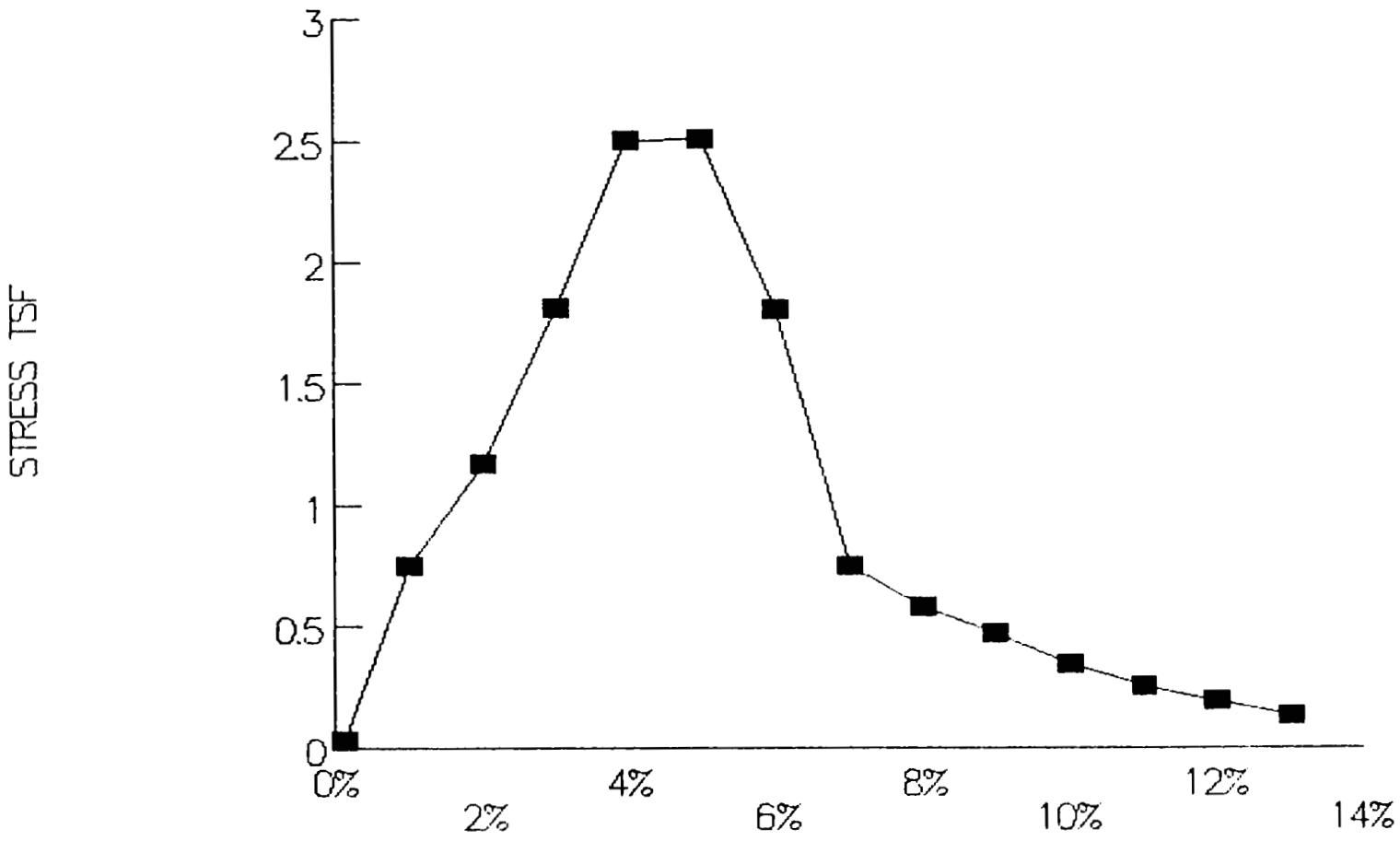
MAXIMUM STRESS 2.5 T/SQ FT
AT STRAIN = 4 %

TYPE OF FAILURE= SHEAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.049 IN	48 LB	0.8 TON/SQ FT	1.0%
823	0.099	75	1.2	2.0%
824	0.148	117	1.8	3.0%
825	0.198	162	2.5	4.0%
826	0.247	163	2.5	5.0%
827	0.297	118	1.8	6.0%
828	0.346	49	0.7	7.0%
829	0.396	38	0.6	8.0%
830	0.445	31	0.5	9.0%
831	0.494	23	0.3	10.0%
832	0.544	17	0.3	11.0%
833	0.593	13	0.2	12.0%
834	0.643	9	0.1	13.0%

UNCONFINED COMPRESSION

N-6 @ 129' TO 130'1"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 1/19/90
W.O. NO. 69
LAB # 1436

PROJECT EAST PAPAGO
BORING N-8 @ 164' TO 165'

SAMPLE HT 12.76
WET WT 694.47
DRY WT 510.15
DIAMETER 6.1

AREA 29.225 CM
VOLUME 372.907 CC
WET DENS 116.3 LB/CU FT
% MOIST 36.1%
DRY DENS 85.4 LB/CU FT

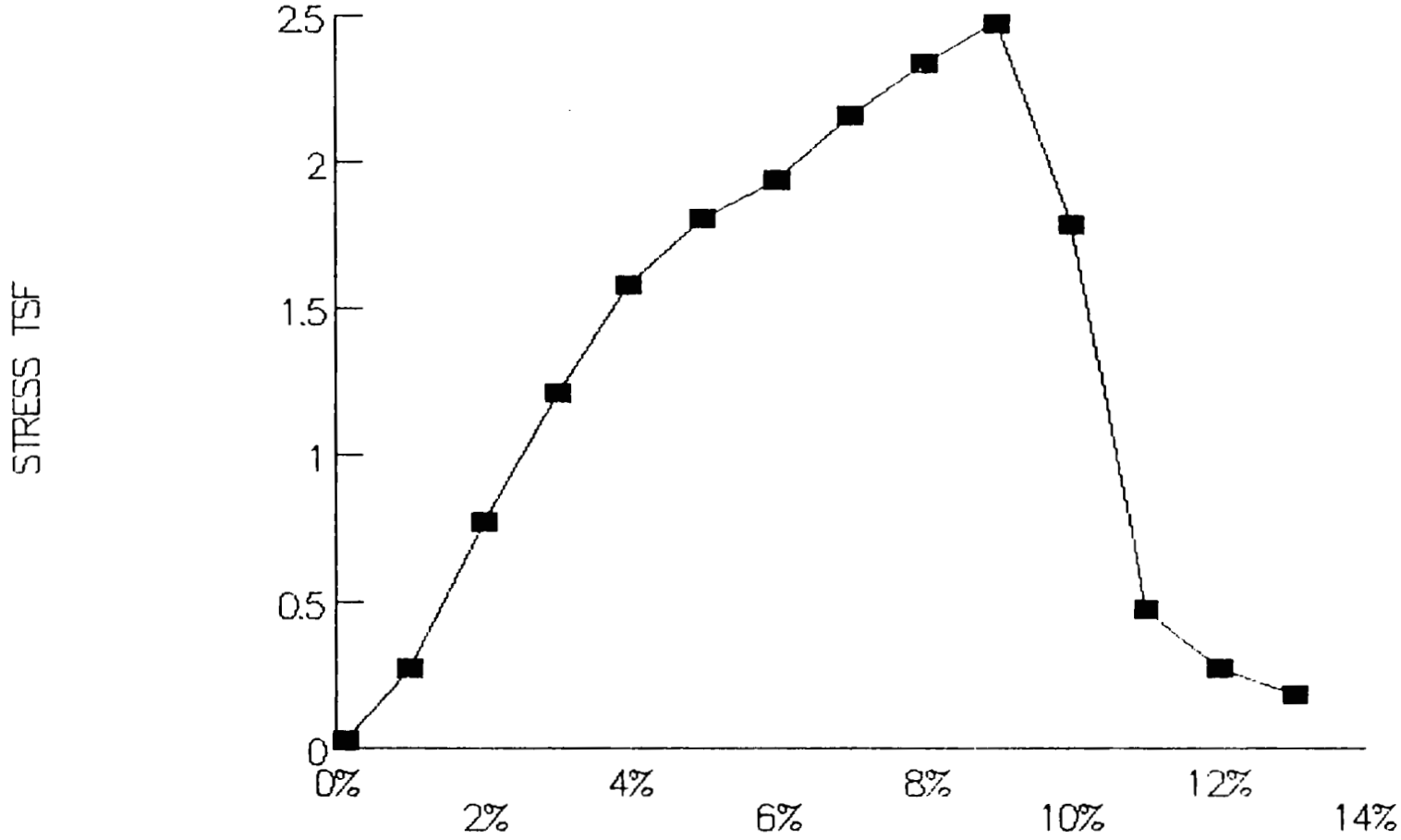
MAXIMUM STRESS 2.5 T/SQ FT
AT STRAIN = 8 %

TYPE OF FAILURE= SHEAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
821	0	0	0	0.0%
822	0.050 IN	17 LB	0.3 TON/SQ FT	1.0%
823	0.100	49	0.8	2.0%
824	0.151	77	1.2	3.0%
825	0.201	101	1.6	4.0%
826	0.251	116	1.8	5.0%
827	0.301	125	1.9	6.0%
828	0.352	140	2.2	7.0%
829	0.402	152	2.3	8.0%
830	0.452	162	2.5	9.0%
831	0.502	117	1.8	10.0%
832	0.553	31	0.5	11.0%
833	0.603	18	0.3	12.0%
834	0.653	12	0.2	13.0%

UNCONFINED COMPRESSION

N-8 @ 164' TO 165'



PROJECT E. Papago - Hohokam - Sky Harbor
Sky Harbor Freeways

LOG OF TEST BORING NO. EP-153

JOB NO. E87-56 DATE 6-12-89

RIG TYPE CME-75
BORING TYPE 6" ODEX & 4 1/2" Gear Bit
SURFACE ELEV. 1152.4'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										SAND, GRAVEL & COBBLES, trace of silt & clay, some small boulders, predominantly medium to coarse grained subrounded to angular sand, predominantly coarse grained subrounded to rounded gravel, predominantly well graded cobbles, weakly lime cemented, nonplastic, brown
	1.5									
5										
	3.5									
	5.0									
	3.0									
10	16.0		•	A				GP		note: predominantly small cobbles from 31' to 46'
	3.0									
	20.0									note: occassionally moderately lime cemented layers
	2.5									
15	5.0								slightly moist to moist	
	1.0									
	17.5									
	4.5								dense to very dense	
20	9.5									
	15.0									
	9.0									
	1.8									
25										
	4.0									
	7.5									
	12.0									
30										
	5.0									
	13.0									
35	4.5									
	7.5									
40	1.7									
	5.0									
	10.0									
45	7.0									
	4.0									
	7.0									
50	3.5									

GROUNDWATER

	DEPTH	HOUR	DATE
▽	54.0	8:57a	6-13-89
▽	52.2	8:21a	6-14-89
▼	51.8	3:15a	6-16-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

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PROJECT E. Papago - Hohokam - Sky Harbor Sky Harbor Freeways

LOG OF TEST BORING NO. EP-153

JOB NO. E87-56 DATE 6-12-89

RIG TYPE CME-75
BORING TYPE 6" ODEX & 4 1/2" Gear Bit
SURFACE ELEV. 1152.4'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	3.0			A						**SAND, GRAVEL & COBBLES.** trace of silt & clay, some small boulders, predominantly medium to coarse grained subrounded to angular sand, predominantly coarse grained subrounded to rounded gravel, predominantly well graded cobbles, weakly lime cemented, nonplastic, brown
	5.5									
55	9.7								moist to saturated below 54'	
	7.0									
60								GP	dense to very dense	note: considerable silt & clay from 50' to 53'
	4.8									
65										
	6.2									
70										
	11.0									
	10.4									**GRAVELLY SAND**, rare cobbles, fine to medium grained sand, gap graded gravel, subrounded, nonplastic, light brown to brown
80								SP	saturated	
									dense to very dense	
	13.6									
85										
	9.8									
90								GP	saturated	**SANDY GRAVEL**, some cobbles, poorly graded, fine to medium grained sand, subrounded, nonplastic, brownish-gray
	5.8								very dense	
95								SP		**GRAVELLY SAND**, fine to medium grained sand, gap graded gravel, subrounded, nonplastic, light brown
	16.4								saturated	
100										

GROUNDWATER

DEPTH	HOUR	DATE
54.0	8:57a	6-13-89
52.2	8:21a	6-14-89
51.8	3:15a	6-16-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

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PROJECT E. Papago - Hohokam - Sky Harbor
Sky Harbor Freeways

LOG OF TEST BORING NO. EP-153

JOB NO. E87-56 DATE 6-12-89

RIG TYPE CME-75
BORING TYPE 6" ODEX & 4 1/2" Gear Bit
SURFACE ELEV. 1152.4'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100	16.4									**GRAVELLY SAND**, continued
	4.0									note: considerably very thin clay lenses from 92' to 99'
105	2.8							SP	saturated	note: considerable clay from 99' to 110
110	2.8									note: considerably interbedded reddish-brown high plasticity and strongly lime cemented clay lenses after 110'
				D						
115							25	CL	saturated hard	**SILTY CLAY**, trace of fine grained sand, medium plasticity, light brown
				P						
120				S	50/4"			SC		**CLAYEY SAND**, predominantly medium grained sand, medium plasticity, light brown to brown
125	2.0								saturated hard	
130	2.4							ML	saturated hard	**SANDY SILT**, some clay, fine grained , low plasticity, brown
				D			23			
135				S	50/5 1/2"					
				P						
140	3.0									
145								CH	saturated	**SILTY CLAY**, trace of fine grained sand, weakly lime cemented, high plasticity, light brown
				D			45		hard	note: some thinly interbedded clayey sand lenses
				S	28-32-28					
150										

GROUNDWATER

DEPTH	HOUR	DATE
54.0	8:57a	6-13-89
52.2	8:21a	6-14-89
51.8	3:15a	6-16-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

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Sky Harbor Freeways

LOG OF TEST BORING NO. EP-153

JOB NO. E87-56 DATE 6-12-89

RIG TYPE CME-75
BORING TYPE 6" ODEX & 4 1/2" Gear Bit
SURFACE ELEV. 1152.4'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
150			--	P				CH	saturated hard	note: some lime cemented nodules
155										Stopped Gear Bit at 154'5"
160										
165										
170										
175										
180										
185										
190										
195										
200										

GROUNDWATER

DEPTH	HOUR	DATE
54.0	8:57a	6-13-89
52.2	8:21a	6-14-89
51.8	3:15a	6-16-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

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LOG OF TEST BORING NO. EP-154

JOB NO. E87-56 DATE 6-7-89

RIG TYPE CME-75
BORING TYPE 6" ODEX & 4 1/2" Gear Bit
SURFACE ELEV. 1150.9'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										SAND, GRAVEL & COBBLES, trace of silt & clay, rare small boulders up to 1 1/2' in diameter, predominantly medium to coarse grained angular sand, well graded, subrounded to rounded gravel, predominantly small cobbles, small amount of lime, nonplastic to low plasticity, brown to reddish-brown
5	1.7									
	22.0									
	6.5									
	4.0									
10	6.0		•	A					slightly moist to moist	note: thin clay seam from 2" to 4" thick at 18'
15	3.0								dense to very dense	note: considerable clay from 32' to 74'
	1.5									
	8.5									
20	5.0							GP		
	3.0									
25										
	2.0									
	6.5									
30	2.0									
35	3.5									
	2.5									
	7.5									
40	1.5									
45	22.0									
			•	A						
	3.5									
50										

GROUNDWATER

DEPTH	HOUR	DATE
53.0	9:30a	6-5-89
52.7	8:20a	6-8-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

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PROJECT E. Papago - Hohokam - Sky Harbor Sky Harbor Freeways

LOG OF TEST BORING NO. EP-154

JOB NO. E87-56 DATE 6-7-89

RIG TYPE CME-75
BORING TYPE 6" ODEX & 4 1/2" Gear Bit
SURFACE ELEV. 1150.9'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	3.5									SAND, GRAVEL & COBBLES, trace of silt & clay, rare small boulders up to 1 1/2' in diameter, predominantly medium to coarse grained angular sand, well graded subrounded to rounded gravel, predominantly small cobbles, small amount of lime, nonplastic to low plasticity, brown to redddish-brown
55	2.0								moist to saturated below 60'	
60								GP	dense to very dense	
	6.0									
65	3.0									
	2.0									
70										
75	2.5									SAND & GRAVEL, trace of silt & clay, rare cobbles, predominantly medium to coarse grained angular to subangular sand, predominantly fine subrounded to rounded gravel, weakly to moderately silica cemented sands, nonplastic, brown
	3.5								saturated	
80								GP	very dense to dense	
	2.0									
85										
	1.7									
90	3.0									
	4.0									
95	6.5									
	8.0									
100										

GROUNDWATER

DEPTH	HOUR	DATE
53.0	9:30a	6-5-89
52.7	8:20a	6-8-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

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PROJECT E. Papago - Hohokam - Sky Harbor Sky Harbor Freeways

LOG OF TEST BORING NO. EP-154

JOB NO. E87-56 DATE 6-7-89

RIG TYPE CME-75
BORING TYPE 6" ODEX & 4 1/2" Gear Bit
SURFACE ELEV. 1150.9'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100	13.0									**SILTY CLAY**, some fine grained angular sand, trace of fine grained gravel, moderately lime cemented, medium plasiticity, brown
	20.0							CL-ML		
105	10.0									note: interbedded with sandy silt, trace of clay & gravel, fine grained sand, weakly lime cemented, low plasticity, brown to light brown
	20.0									
			-	A					saturated	
110										note: medium grained sand lenses with trace of silt & some gravel at 118'
	0.5		-	D	NR				hard	
			-							
115			-	D			23			note: thin lenses of coarse grained gravel, from 119' to 120'
			-	D	NR					
				S	60-60/3"					
120	0.9									
125	0.7									
				S	50/5"					
	2.0		--	P						
130	4.2									
				S	50/1/2"					**SILTY CLAY**, some to trace of fine grained gravel, weakly lime cemented, medium to high plasticity, brown
			-	D	NR					
135	1.5									
	0.8							CH		note: considerable lime stringers at 147"
140	0.2								saturated	
									firm to hard	
145	0.7									
				S	9-11-17		35			Stopped Gear Bit at 150'
			--	P						
150										

GROUNDWATER

DEPTH	HOUR	DATE
53.0	9:30a	6-5-89
52.7	8:20a	6-8-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

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PROJECT E. Papago - Hohokam - Sky Harbor
Sky Harbor Freeways

LOG OF TEST BORING NO. EP-155

JOB NO. E87-56 DATE 4-3-89

RIG TYPE CME-75
BORING TYPE ODEX, Gear Bit
SURFACE ELEV. 1152.8'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	5.0							SP	slightly moist	**GRAVELLY SAND**, considerable cobbles, trace of silt, predominantly medium grained sand, subangular to angular, nonplastic, light brown
	20.0									
5	60.0								slightly moist to moist	**SAND, GRAVEL & COBBLES**, some silt, some boulders, poorly graded gravel & cobbles, well graded sand, subrounded to rounded, nonplastic, brown
	50.0							GP		
10	12.0									note: gravelly sand lens from 13' to 13'6"
	6.0									
15	6.5									
	2.5								saturated very dense	**SANDY GRAVEL**, considerable cobbles in lenses, trace of clay, trace of boulder, some silt, predominantly coarse, rounded gravels, predominantly coarse, angular sand, nonplastic to low plasticity, brown
20	10.0									
	2.5							GP		
25	7.0									note: considerable reddish-brown clay from 23' to 24'
	3.5			S	40-50/1"					
	7.0									note: predominantly small cobbles with well graded cobbles from 36' to 41', 56' to 66', and 76' to 81'
30	3.5									
	3.0									
35	6.0									
	20.0									
	3.5									
40										
	2.5									
45	5.5									
	3.0									
50										

GROUNDWATER

DEPTH	HOUR	DATE
55.0	8:45am	3-31-89
55.0	9:30am	4-3-89
53.7	8:10am	4-4-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
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Sky Harbor Freeways

LOG OF TEST BORING NO. EP-155

JOB NO. E87-56 DATE 4-3-89

RIG TYPE CME-75
BORING TYPE ODEX, Gear Bit
SURFACE ELEV. 1152.8'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50									saturated	**SANDY GRAVEL**, considerable cobbles in lenses, trace of clay, trace of boulder, some silt, predominantly coarse, rounded gravels, predominantly coarse, angular sand, nonplastic to low plasticity, brown
	4.5									
	7.0									
▼ 55	4.0								very dense	
	7.0		•	A			3			
	18.0		•							
										note: occasional gravelly sand lens
60	4.5									note: increase in sand from 65' to 80'
	12.0									
										note: boulders up 16" in diameter from 56' to 66'
65	2.5							GP		
			•	A						
	3.5									
70	5.0									
	4.0									
75	5.0									
	4.5									
80			•	A						
	14.0		•							
	10.0									
	5.0									
85	7.5									
	5.5									
90			•	A						
	8.0			S	50/4"					
					NR				saturated	**GRAVELLY SAND**, trace of cobbles, trace of silt, predominantly medium coarse, subangular to angular sand, predominantly fine, subrounded to rounded gravel, strongly silica cemented, nonplastic, brown
95	20.0									
			•	A			12		very dense	
								SP		
	20.0									
100										

GROUNDWATER

DEPTH	HOUR	DATE
55.0	8:45am	3-31-89
55.0	9:30am	4-3-89
53.7	8:10am	4-4-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
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LOG OF TEST BORING NO. EP-155

JOB NO. E87-56 DATE 4-3-89

RIG TYPE CME-75
BORING TYPE ODEX, Gear Bit
SURFACE ELEV. 1152.8'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100	20.0								saturated	**GRAVELLY SAND**, trace of cobbles, trace of silt, predominantly medium coarse, subangular to angular sand, predominantly fine, subrounded to rounded gravels, strongly silica cemented, nonplastic, brown
								SP	note: Gear Bit 106' to 123'	
105	1.5			U	100/					
				S	11" NR			CL		
					14-8-40					note: lenses of sandy clay from 103' to 104'
110	3.0									
									moist	**SANDY CLAY**, predominantly fine sand, weakly lime cemented, medium plasticity, brown
115	2.0								very firm to hard	note: sand lens from 117' to 119'
	0.5									
120	2.0									
				U	100/		30			
					11 1/2"					
125										Stopped gear bit at 123' Sampler refused at 123'11 1/2"
130										
135										
140										
145										
150										

GROUNDWATER

DEPTH	HOUR	DATE
55.0	8:45am	3-31-89
55.0	9:30am	4-3-89
53.7	8:10am	4-4-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

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LOG OF TEST BORING NO. EP-156

JOB NO. E87-56 DATE 4-10-89

RIG TYPE CME-75
BORING TYPE ODEX, Gear Bit
SURFACE ELEV. 1139.4'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	0.5								slightly moist	**SILTY SAND**, some clay & gravel, predominantly medium grained, subangular, weakly lime cemented, nonplastic to low plasticity, light brown
	5.0							SM	moderately firm to hard	note: considerable clay, rounded gravels & cobbles at surface
5	12.0									
	7.0									
10								SC	slightly moist	**CLAYEY SAND**, some silt, considerable gravel, predominantly medium grained, subangular to angular, medium plasticity, light brown
	6.0								hard	note: lens of gravel & small cobbles from 4' to 6'
15	7.0									
	22.0									
20	12.0									
	9.0									
25	10.0								very dense	**SAND, GRAVEL & COBBLES**, trace of silt & clay, predominantly coarse, angular sand, poorly graded, subrounded to rounded gravel & cobbles, low plasticity to nonplastic, brown
	4.0							GP	moist to saturated below 40'	note: clayey sand lens from 25' to 27'
30	2.0			S	50/6"					note: predominantly small cobbles
	3.0									
35	6.0									
40	2.5									
	2.0									
45	1.5									
	4.0									
50	2.0			A			5			

GROUNDWATER

DEPTH	HOUR	DATE
39.9	8:10a	4-6-89
41.0	9:20a	4-7-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

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PROJECT E. Papago - Hohokam - Sky Harbor Sky Harbor Freeways

LOG OF TEST BORING NO. EP-156

JOB NO. E87-56 DATE 4-10-89

RIG TYPE CME-75
BORING TYPE ODEX, Gear Bit
SURFACE ELEV. 1139.4'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50										SAND, GRAVEL & COBBLES, trace of silt & clay, predominantly coarse, angular sand, poorly graded, subrounded to rounded gravel & cobbles, low plasticity to nonplastic, brown
	2.0								saturated	
	4.5									
55									very dense	
				S	50/2"					
	2.0							GP		note: clayey gravel lens from 53' to 55'
60	1.5									note: decrease in cobbles from 75' to 85'
	2.0									
65	5.0									
	2.3									
70										
	3.0									
	5.5									
75	3.5									
	5.0									
	4.0									
80										
	2.0									
				A						
85	4.5									
	8.0									
90	15.0								hard	SANDY CLAY, considerable silt, some gravel, predominantly fine sand, weakly lime cemented, medium to high plasticity, brown
				U	100/					
				S	10" NR				saturated	
	4.3				23-28-32					
95								CH	note: Gear Bit to 91'	
	2.5									
100										

GROUNDWATER

DEPTH	HOUR	DATE
39.9	8:10a	4-6-89
41.0	9:20a	4-7-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

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LOG OF TEST BORING NO. EP-156

JOB NO. E87-56 DATE 4-10-89

RIG TYPE CME-75
BORING TYPE ODEX, Gear Bit
SURFACE ELEV. 1139.4'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100	2.5		•	A			33		hard	**SANDY CLAY**, considerable silt, some gravel, predominantly fine grained sand, weakly lime cemented, medium to high plasticity, brown
			•						saturated	
	1.5							CH		
105	0.3		•	A						note: sand lens from 104' to 105', moderately lime cemented in layers
	6.5									
110	2.5								hard	**SANDY SILT**, some to considerable clay, fine grained sand, weakly cemented, low to medium plasticity, brown
									saturated	
115	3.5							ML-SP		INTERBEDDED WITH
				S	15-50/3 1/2"					**SAND**, trace of silt, trace of fine grained gravel, predominantly medium grained, subrounded, nonplastic, brown
120	3.0									
125	3.0									
				S	9-40-50/4"					
130										Stopped gear bit at 127' Sampler refused 128'4"
135										
140										
145										
150										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	39.9	8:10a	4-6-89
▼	41.0	9:20a	4-7-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
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Sky Harbor Freeways

LOG OF TEST BORING NO. EP-157

JOB NO. E87-56 DATE 4-14-89

RIG TYPE CME-75
BORING TYPE ODEX, Gear Bit
SURFACE ELEV. 1158.1'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									slightly moist	**SANDY SILT**, some clay, predominantly fine grained sand, subangular to angular, weakly lime cemented, low plasticity, brown
	1.5								moderately firm to hard	
5								ML		
	1.0									
	5.0									
10									slightly moist	**SANDY GRAVEL**, some clay & silt, considerable cobbles up to 8" in diameter, predominantly poorly graded, subrounded gravel, well graded angular sand, low plasticity, brown to reddish-brown
	25.0									
	15.0									
			•	A					very dense	
15	8.5							GP		
	9.0									
	6.0									
20									very dense	**SAND, GRAVEL & COBBLES**, trace of silt & clay, predominantly medium coarse angular sand, poorly graded, subrounded to rounded gravel & cobbles, low plasticity to nonplastic, brown
	25.0									
	12.0								slightly moist	
	2.0									
25	9.0									
	5.0									note: considerable clay from 27'6" to 28" & 35' to 37'
	11.0									
30										note: 3" thick clay seam at 33'
	7.5							GW		
	10.0									note: predominantly small cobbles and very small boulders
	3.5									
	30.0									note: well graded cobbles from 26' to 36' & 56' to 61'
35	7.0									
	9.5									
40										
	24.0									
	20.0									
	3.5									
	9.5									
	15.0									
45										
	4.0		•	A			4			
	15.0									
	9.5									
50										

GROUNDWATER

DEPTH	HOUR	DATE
61.0	2:40p	4-12-89
59.0	9:35a	4-13-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
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LOG OF TEST BORING NO. EP-157

JOB NO. E87-56 DATE 4-14-89

RIG TYPE CME-75
BORING TYPE ODEX, Gear Bit
SURFACE ELEV. 1158.1'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	30.0								dense to very dense	**SAND, GRAVEL & COBBLES**, trace of silt & clay, predominantly medium coarse angular sand, poorly graded, subrounded to rounded gravel & cobbles, low plasticity to nonplastic, brown
	13.0									
									moist to saturated below 59'	
	7.5		•	A						
55								GW		
				U	100/2"					note: considerable clay from 51' to 53' & 59' to 61'
	20.0									
▼										
60	5.5									note: clayey sand lens from 53' to 55'6"
	11.0									
65	5.0									
	12.0									
	6.5									
70	10.5									
									dense to very dense	**SAND & GRAVEL**, trace of silt, some cobbles up to 5" in diameter, well graded subangular to angular sand, predominantly poorly graded subrounded to rounded gravel, nonplastic, brown
75	3.0									
									saturated	
								GW		
	2.5									note: occasional moderately lime cemented sand lens
80										
			•	A			7			note: 3" thick seam of clayey sand at 92'
	3.0									
85										note: increase in cementation below 92'
	3.0									
90										
	6.0									
95	11.5									
	6.0									
	4.0									
100	7.0									

GROUNDWATER

	DEPTH	HOUR	DATE
▽	61.0	2:40p	4-12-89
▼	59.0	9:35a	4-13-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
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LOG OF TEST BORING NO. EP-157

JOB NO. E87-56 DATE 4-14-89

RIG TYPE CME-75
BORING TYPE ODEX, Gear Bit
SURFACE ELEV. 1158.1'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100	17.5							GW	dense to very dense	**SAND & GRAVEL**, trace of silt, some cobbles up to 5" in diameter, well graded subangular to angular sand, predominantly poorly graded, subrounded to rounded gravel, nonplastic, brown
	6.0									
	11.0								saturated	
105	16.0									
	35.0			U	100/6"		44			
	1.4								saturated	**SILTY CLAY**, some fine grained sand, some gravel, moderately lime cemented, high plasticity, light brown
110								CH	hard	note: decrease in plasticity with depth
									note: Gear Bit 107' to 127'	
115	2.0									
120	1.9									
125	2.1									
				U	100/7"		30			
130										Stooped gear bit at 127' Sampler refused at 127'7"
135										
140										
145										
150										

GROUNDWATER

DEPTH	HOUR	DATE
61.0	2:40p	4-12-89
59.0	9:35a	4-13-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
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LOG OF TEST BORING NO. EP-158

JOB NO. E87-56 DATE 6-19-89 to 6-21-89

RIG TYPE CME-75
BORING TYPE 6" ODEX & 4 1/2" Gear Bit
SURFACE ELEV. 1153.6'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									slightly moist to dry	**GRAVELLY SAND**, predominantly fine grained sand, gap graded gravel, nonplastic, gray
5	0.8							SP/ GP	loose to medium dense	
10										
15	5.6							GP	slightly moist	**SAND, GRAVEL & COBBLES**, rare small boulders, predominantly fine to medium grained sand, gap graded gravel, subrounded, nonplastic, gray to reddish-gray
20	2.6								very dense to dense	
25	3.6									
30	4.2									
35	5.8							GC	slightly moist	**CLAYEY SAND & GRAVEL**, some cobbles, fine to medium grained sand, well graded gravel, low plasticity, brown
									very firm to hard	
	5.0							GP	slightly moist	**SAND, GRAVEL & COBBLES**, predominantly fine to medium grained sand, well graded gravel, subrounded, nonplastic, gray
40								SC	very dense	note: some clay coated particles from 39' to 40'
45	5.2							GP	moist	**CLAYEY SAND**, medium grained sand, some gap graded gravel, medium plasticity, light brown
50	4.4								very firm to hard	

GROUNDWATER

DEPTH	HOUR	DATE
55.6	9:00a	6-21-89
55.2	8:15a	6-22-89
63.0	12:30p	6-20-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
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PROJECT E. Papago - Hohokam - Sky Harbor Sky Harbor Freeways

LOG OF TEST BORING NO. EP-158

JOB NO. E87-56 DATE 6-19-89 to 6-21-89

RIG TYPE CME-75
BORING TYPE 6" ODEX & 4 1/2" Gear Bit
SURFACE ELEV. 1153.6'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50										**SAND, GRAVEL & COBBLES.** rare small boulders, poorly graded, fine to medium grained sand, subrounded, nonplastic, gray
									moist to saturated below 63'	
55	4.2							GP	very dense to dense	
60										
	5.2									
65										
	2.0									
70										
	3.6									
75										
										GRAVELLY SAND, predominantly fine to medium grained sand, gap graded gravel, nonplastic, light brown
	2.4							SP/ GP	saturated	
80									dense	
	3.6									
85										
	3.2									
90										
	5.6									
95										
	5.2							CH	saturated very firm to hard	**SILTY CLAY,** medium to high plasticity, weakly to moderately lime cemented, brown with some black mottling
100										

GROUNDWATER

DEPTH	HOUR	DATE
55.6	9:00a	6-21-89
55.2	8:15a	6-22-89
63.0	12:30p	6-20-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.
P - Pressuremeter Test

SERGENT, HAUSKINS & BECKWITH
CONSULTING GEOTECHNICAL ENGINEERS
PHOENIX · ALBUQUERQUE · SANTA FE
SALT LAKE CITY · EL PASO · TUCSON · RENO/SPARKS

PROJECT E. Papago - Hohokam - Sky Harbor Sky Harbor Freeways

LOG OF TEST BORING NO. EP-158

JOB NO. E87-56 DATE 6-19-89 to 6-21-89

RIG TYPE CME-75
BORING TYPE 6" ODEX & 4 1/2" Gear Bit
SURFACE ELEV. 1153.6'
DATUM

Depth in Feet	Drill Rate (Min/Ft)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100										**SILTY CLAY**, medium to high plasticity, weakly to moderately lime cemented, brown with some black mottling
			•	D			28			
				S	40-25 22-47			CH	saturated	
105									very firm to hard	note: occasional thinly interbedded sand lenses
			--	P						
110	2.8									
115	1.8									
			•	D			34			
120				S	34-50/ 5 1/2"					
			--	P						
125	1.6									
130	2.4									
			•	D			24			
135				S	50/ 3 1/2"					
140	2.6							SP	saturated	**SAND**, some silt, fine to medium grained sand, nonplastic, light brown to brown
			•	D					very dense to dense	
145				S	50/4"					Stopped Gear Bit at 153'
150										

GROUNDWATER

DEPTH	HOUR	DATE
55.6	9:00a	6-21-89
55.2	8:15a	6-22-89
63.0	12:30p	6-20-89

SAMPLE TYPE

A - Drill cuttings. B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
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East Papago Freeway

Boring Number	Northing	Easting	Elevation
EP-153	885930.5	502543.0	1152.4
EP-154	885807.9	502922.7	1150.9
EP-155	885872.9	502687.3	1152.8
EP-156	885730.2	503123.6	1139.4
EP-157	885438.5	503561.1	1158.1
EP-158	885550.0	503453.8	1153.6

SERGENT, HAUSKINS & BECKWITH

TABULATION OF TEST RESULTS

Job No. E87-56
W/O 60

HOLE NO	DEPTH	UNIFIED CLASS	L.L.	P.I.	#200	#100	#50	#40	#30	#16	#10	#8	#4	.25"	.375"	.5"	LAB NO
					.75"	1"	1.5"	2"	2.5"	3"	3.5"	4"	6"	8"	10"	12"	
EP-153	10'-11'	GW	NV	NP	1.2	2	2	3	4	10	19	24	48	60	87	97	
					100												7-56-1323
EP-153	113'-115'	CL	45	23	95	99											7-56-1325
EP-153	132'6"-134'6"	ML	37	9	77	93	97	97	97	98	98	98	98	98	100		7-56-1327
EP-153	146'6"-148'6"	CH	88	64	96	99	99	99	99								7-56-1329

SERGENT, HAUSKINS & BECKWITH

TABULATION OF TEST RESULTS

Job No. E87-56
W/O 58

HOLE NO	DEPTH	UNIFIED CLASS	L.L.	P.I.	SIEVE ANALYSIS-ACCUM % PASSING #200 .75"	#100 1"	#50 1.5"	#40 2"	#30 2.5"	#16 3"	#10 3.5"	#8 4"	#4 6"	.25" 8"	.375" 10"	.5" 12"	LAB NO
EP 154	10'-11'	GP	NV	NP	0.1	0	0	0	0	0	1	2	21	47	93	100	7-56-1303
EP 154	114'-115'	ML	NV	NP	88	94	97	97	97	98	98	98	98	98	98	100	7-56-1306
EP 154	147'-148'6"	CH	57	36	92	96	99	100									7-56-1311

SERGENT, HAUNS & BECKWITH

TABULATION OF TEST RESULTS

Job No. E87-56
W/O 54

HOLE NO	DEPTH	UNIFIED CLASS	L.L.	P.I.	#200 .75"	#100 1"	#50 1.5"	#40 2"	#30 2.5"	#16 3"	#10 3.5"	#8 4"	#4 6"	.25" 8"	.375" 10"	.5" 12"	LAB NO
					SIEVE ANALYSIS-ACCUM % PASSING												
EP-155	55'-57'	SP	NV	NP	0.1	0	[illegible]	0	1	1	6	[illegible]	55	85	95	100	7-56-1221
EP-155	96'-97'	SP	NV	NP	1.2 100	3	13	24	35	51	56	59	67	72	81	92	7-56-1226
EP-155	106'-107'6"	CL	43	19													7-56-1227
EP-155	123'-123'11.5"	CL	42	19													7-56-1228
EP-156	49'-50'	GP	NV	NP	1.1	2	5	8	9	12	15	18	29	41	77	100	7-56-1230
EP-156	91'10"-93'4"	CH	50	29													7-56-1233
EP-156	100'-102'	CH	51	31	79 100	81	83	83	84	85	86	87	90	92	95	96	7-56-1234
EP-156	117'-117'3"	ML	40	14													7-56-1236
EP-157	46'-47'	GW	NV	NP	3.0	4	7	8	9	12	18	22	42	54	82	100	7-56-1239
EP-157	81'-82'	GW	NV	NP	1.1 100	2	5	9	14	23	27	28	33	37	50	82	7-56-1242
EP-157	106'-106'6"	CH	70	52													7-56-1243
EP-157	127'-127'7"	CL	47	27													7-56-1244

SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO FREEWAY
SAMPLE: EP-153 @ 113' TO 115'

JOB # E87-56
DATE 6/29/89
W.O. # 60
LAB # 1325

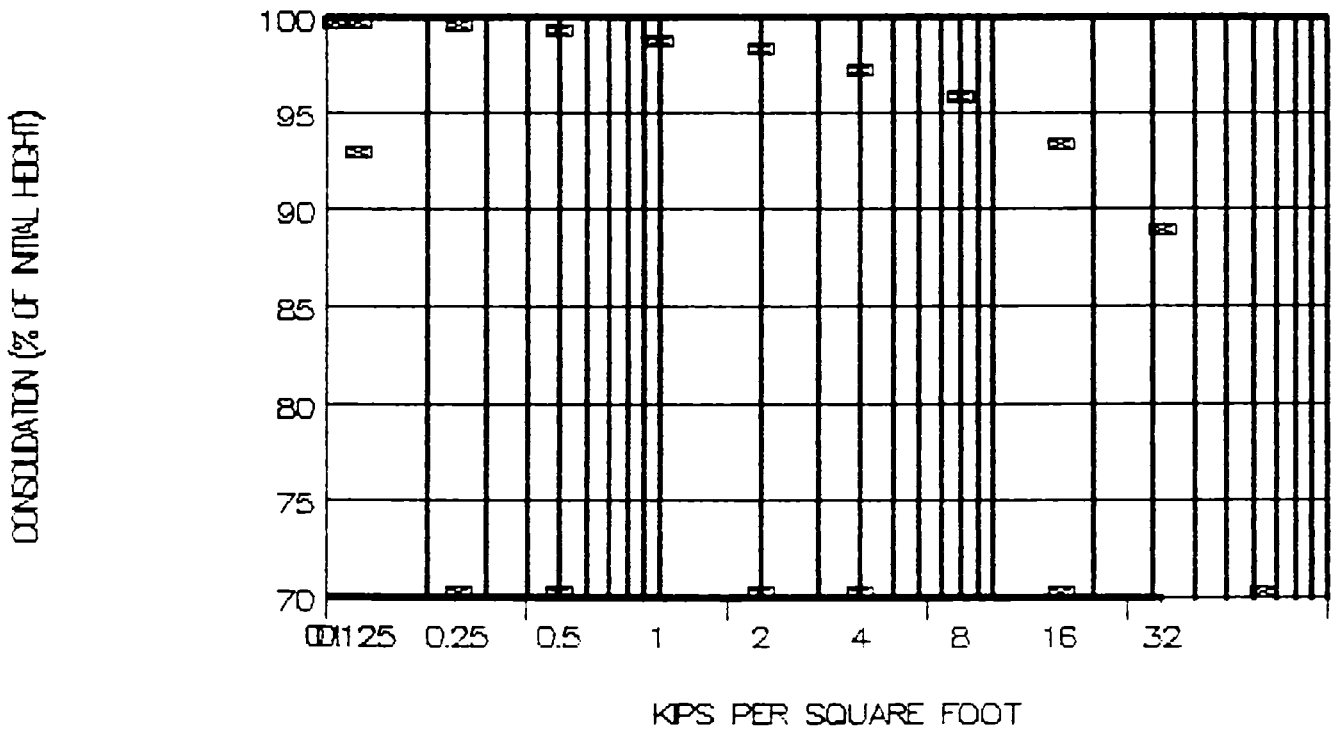
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	29.9%
INUNDATED MOIST. CONT.	28.5%
MOISTURE PICK-UP	-1.4%
DRY DENSITY	90.6 pcf

CONSOLIDATION TEST

EP-153 @ 113' TO 115'



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO FREEWAY
SAMPLE: EP-153 @ 132'6" TO 134'6"

JOB # E87-56
DATE 6/29/89
W.O. # 60
LAB # 1327

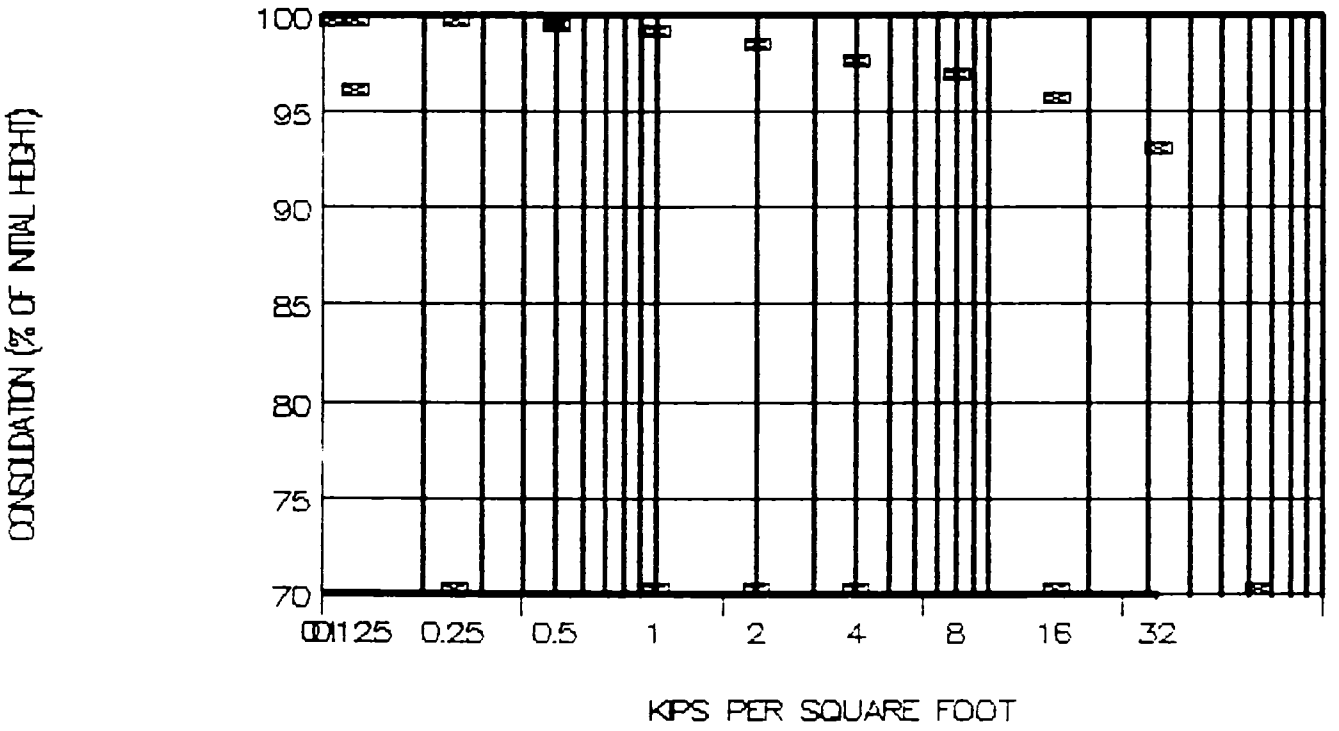
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	25.1%
INUNDATED MOIST. CONT.	25.6%
MOISTURE PICK-UP	0.5%
DRY DENSITY	94.5 pcf

CONSOLIDATION TEST

EP-153 @ 132'6' TO 134'6''



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO FREEWAY
SAMPLE: EP-153 @ 146'6" TO 148'6"

JOB # E87-56
DATE 6/29/89
W.O. # 60
LAB # 1329

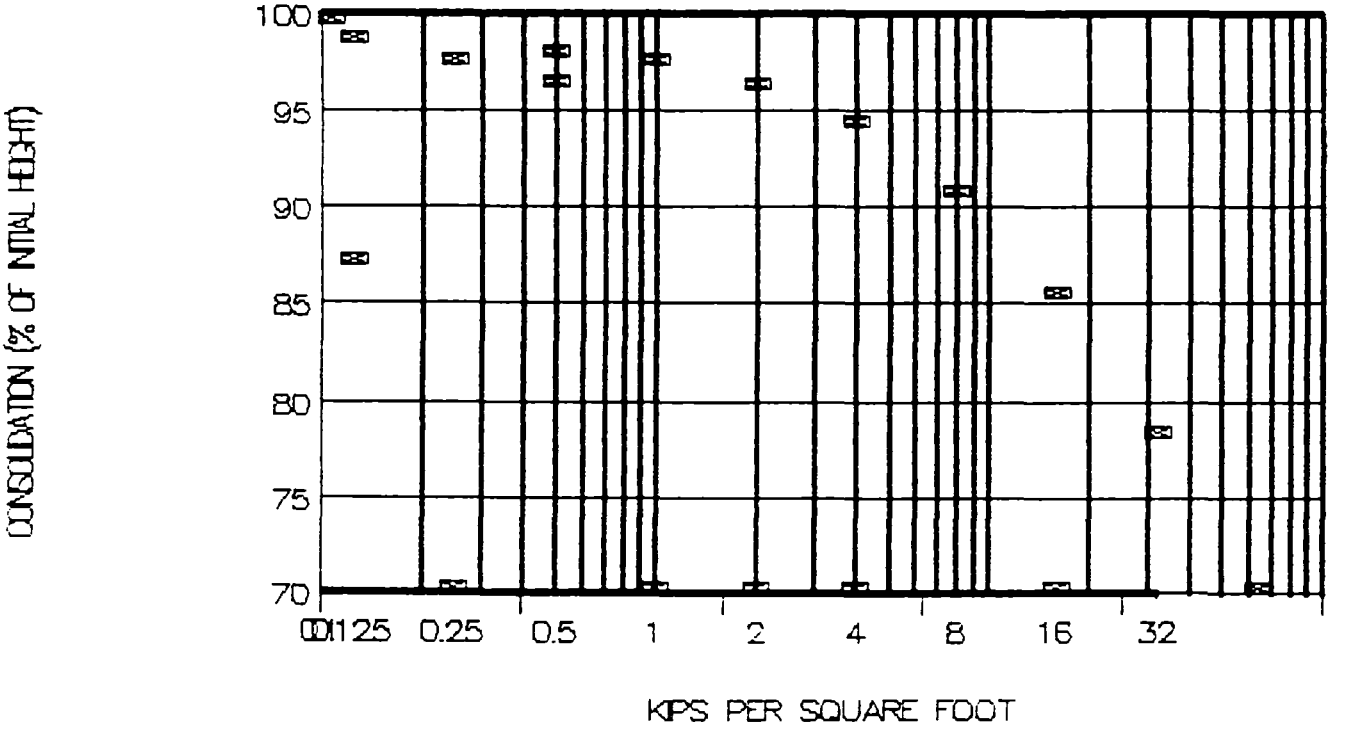
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	38.1%
INUNDATED MOIST. CONT.	32.6%
MOISTURE PICK-UP	-5.4%
DRY DENSITY	76.1 pcf

CONSOLIDATION TEST

EP-153 @ 146'6' TO 148'6''



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: EP 154 @ 114' TO 115'

JOB # E87-56
DATE 6/26/89
W.O. # 58
LAB # 1306

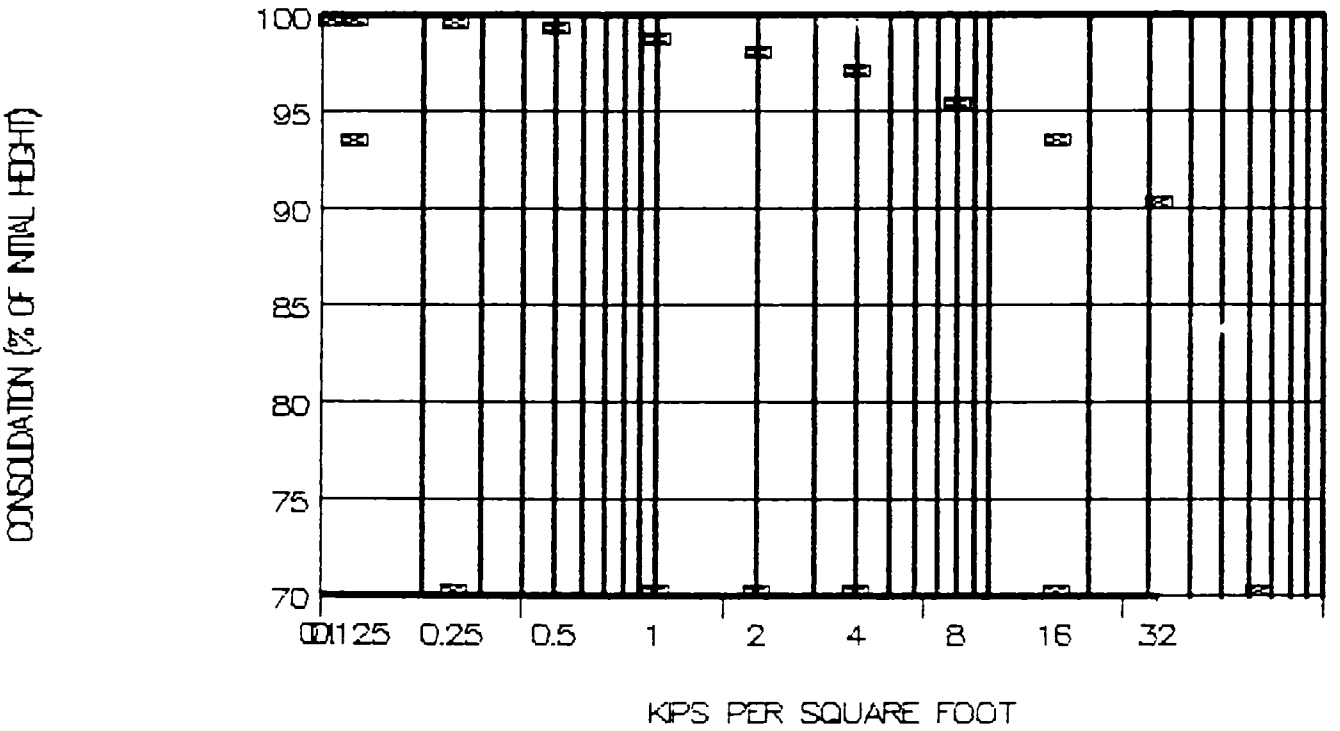
==========

CONSOLIDATION TEST

INSITU MOIST. CONTENT	28.1%
INUNDATED MOIST. CONT.	27.3%
MOISTURE PICK-UP	-0.8%
DRY DENSITY	93.3 pcf

CONSOLIDATION TEST

EP 154 @ 114' TO 115'



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: EP-155 @ 123' TO 123'11.5"

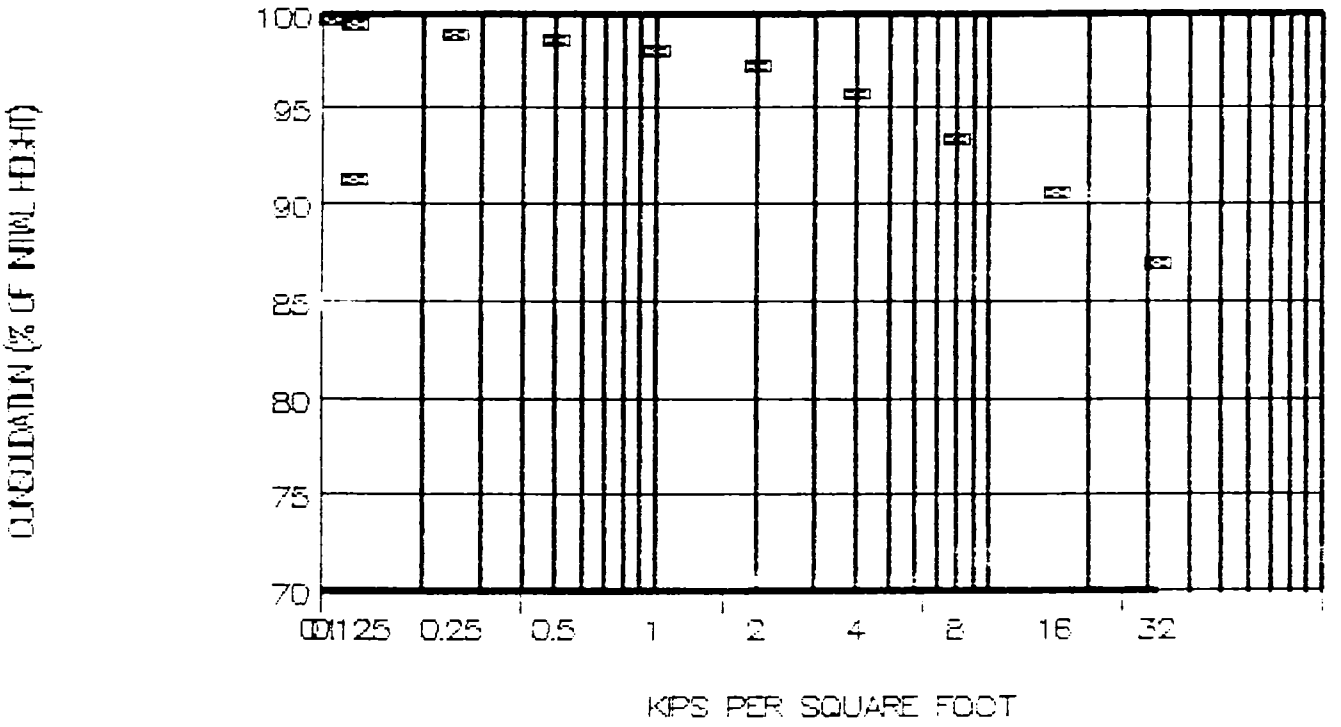
JOB # E878-56
DATE 4/19/89
W.O. # 54
LAB # 1228

CONSOLIDATION TEST

INSITU MOIST. CONTENT	30.3%
FINAL MOIST. CONTENT	25.8%
MOISTURE PICK-UP	-4.5%
DRY DENSITY	91.4 pcf

CONSOLIDATION TEST

EP155 @ 123' TO 123'11.5"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: EP-157 @ 127' TO 127'7"

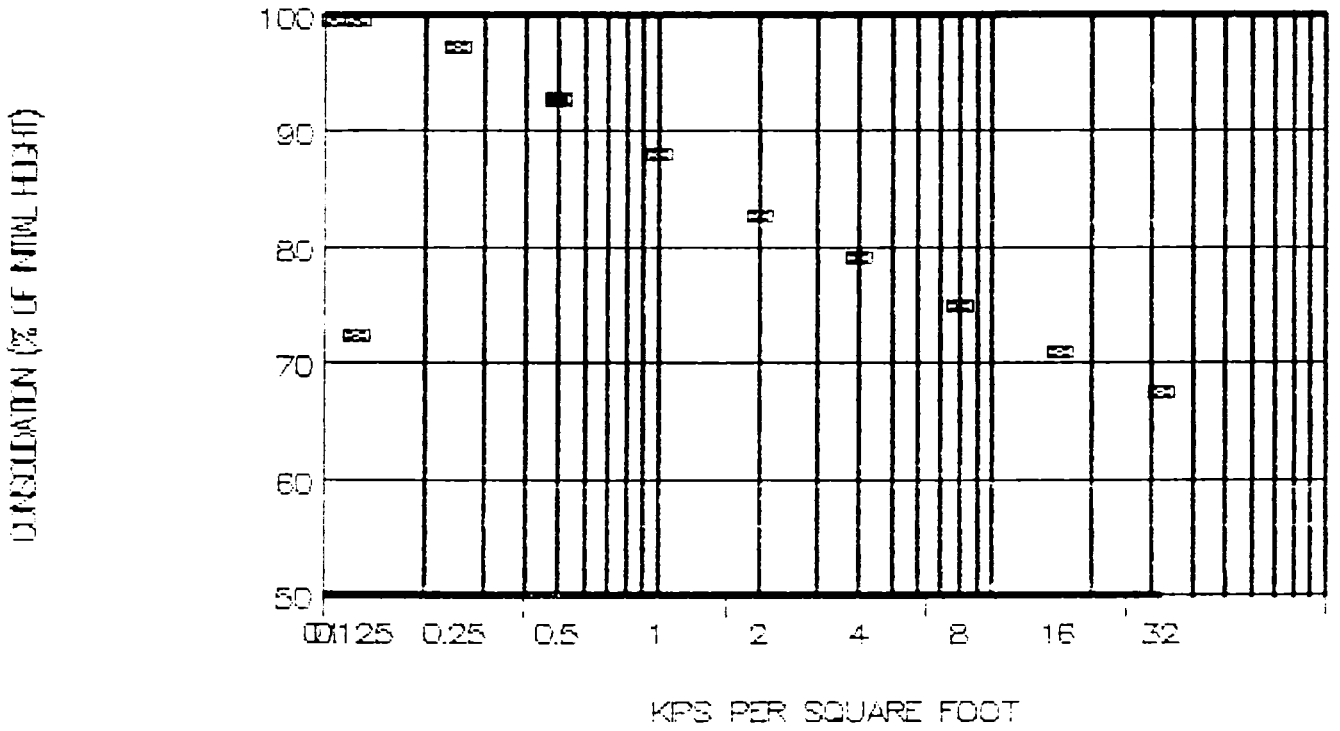
JOB # E878-56
DATE 4/19/89
W.O. # 54
LAB # 1244

CONSOLIDATION TEST

INSITU MOIST. CONTENT	54.1%
FINAL MOIST. CONTENT	24.6%
MOISTURE PICK-UP	-29.5%
DRY DENSITY	66.0 pcf

CONSOLIDATION TEST

EP157 @ 127' TO 127'7"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: EP-158 @ 102' TO 103'6"

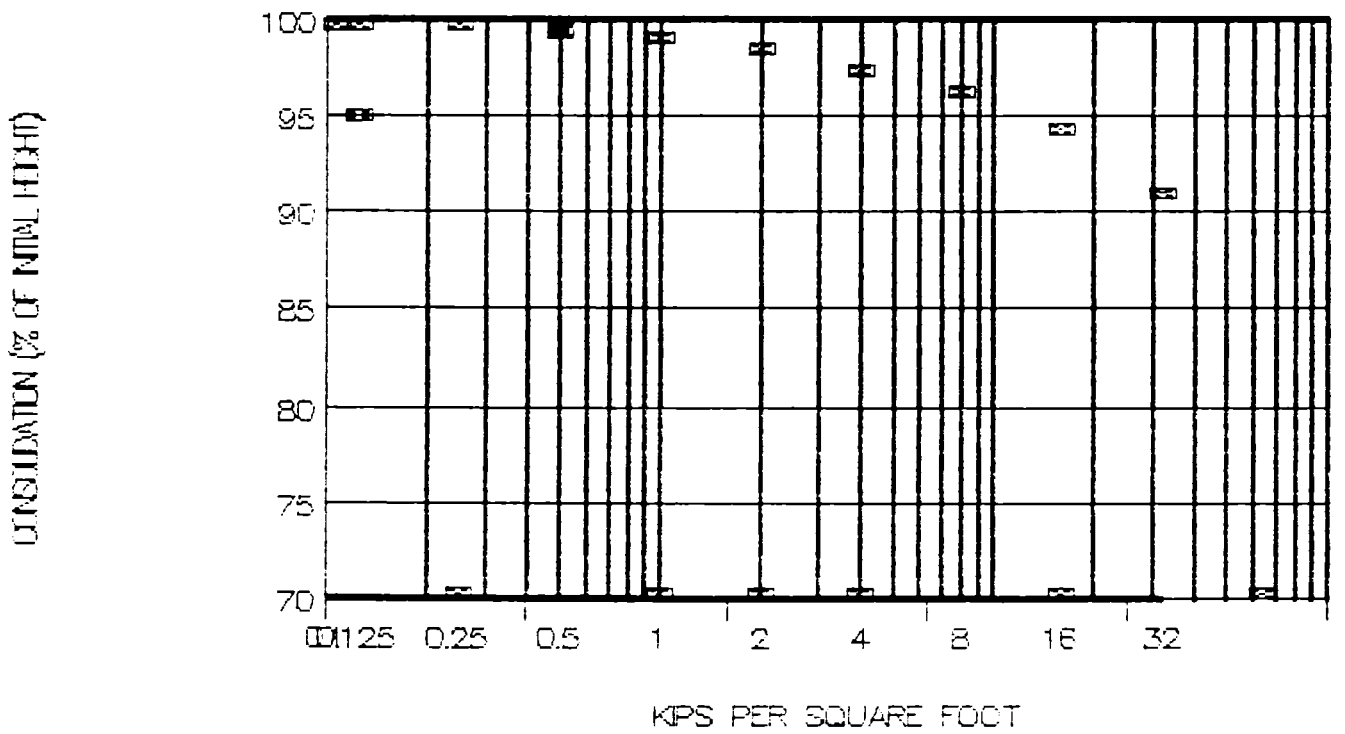
JOB # E87-56
DATE 7/19/89
W.O. # 61
LAB # 1335

CONSOLIDATION TEST

INSITU MOIST. CONTENT	30.0%
INUNDATED MOIST. CONT.	30.0%
MOISTURE PICK-UP	0.0%
DRY DENSITY	90.5 pcf

CONSOLIDATION TEST

EP-158 @ 102' TO 103'6"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST -60
SAMPLE: EP-158 @ 118' TO 119'3"

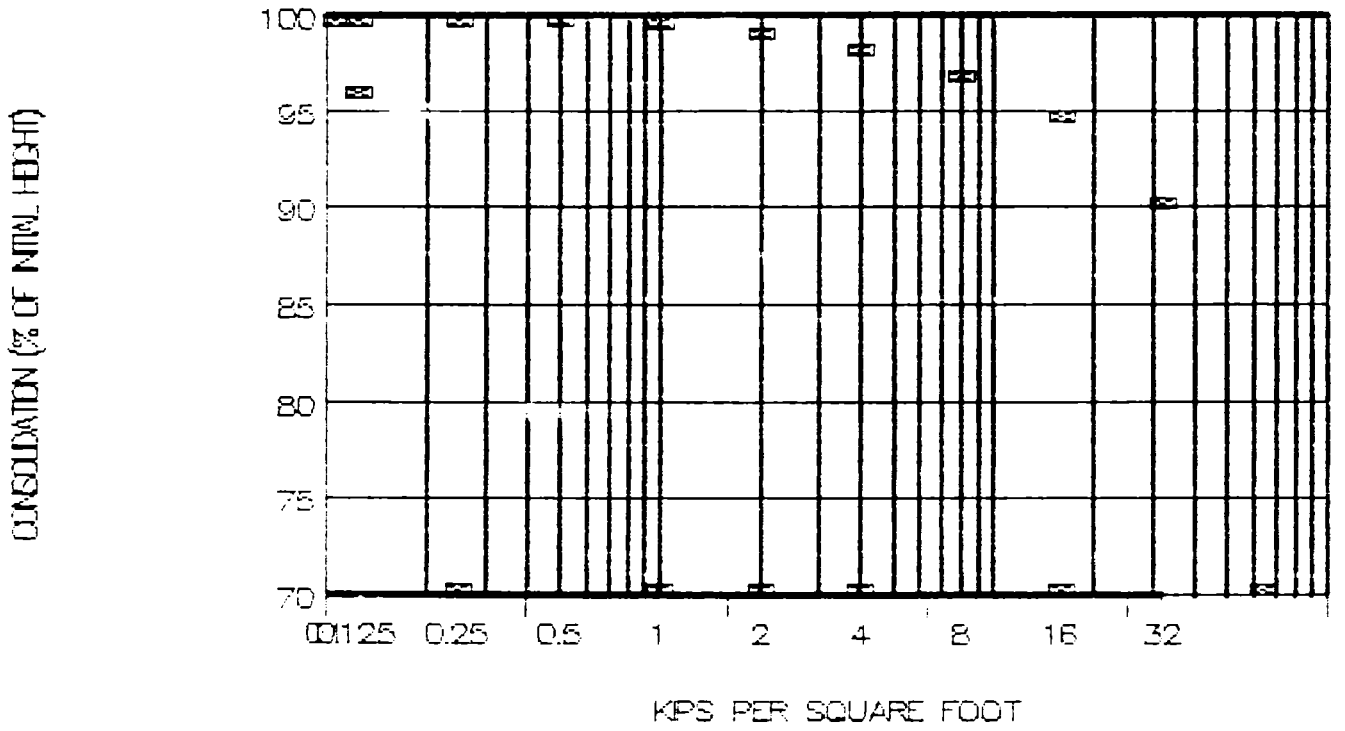
JOB # E87-56
DATE 7/19/89
W.O. # 61
LAB # 1336

CONSOLIDATION TEST

INSITU MOIST. CONTENT	33.8%
INUNDATED MOIST. CONT.	36.7%
MOISTURE PICK-UP	2.9%
DRY DENSITY	84.1 pcf

CONSOLIDATION TEST

EP-158 @ 118' TO 119'3"



SERGENT, HAUSKINS, & BECKWITH

GEOTECHNICAL ENGINEERS

PROJECT: EAST PAPAGO
SAMPLE: EP-158 @ 133' TO 134'6"

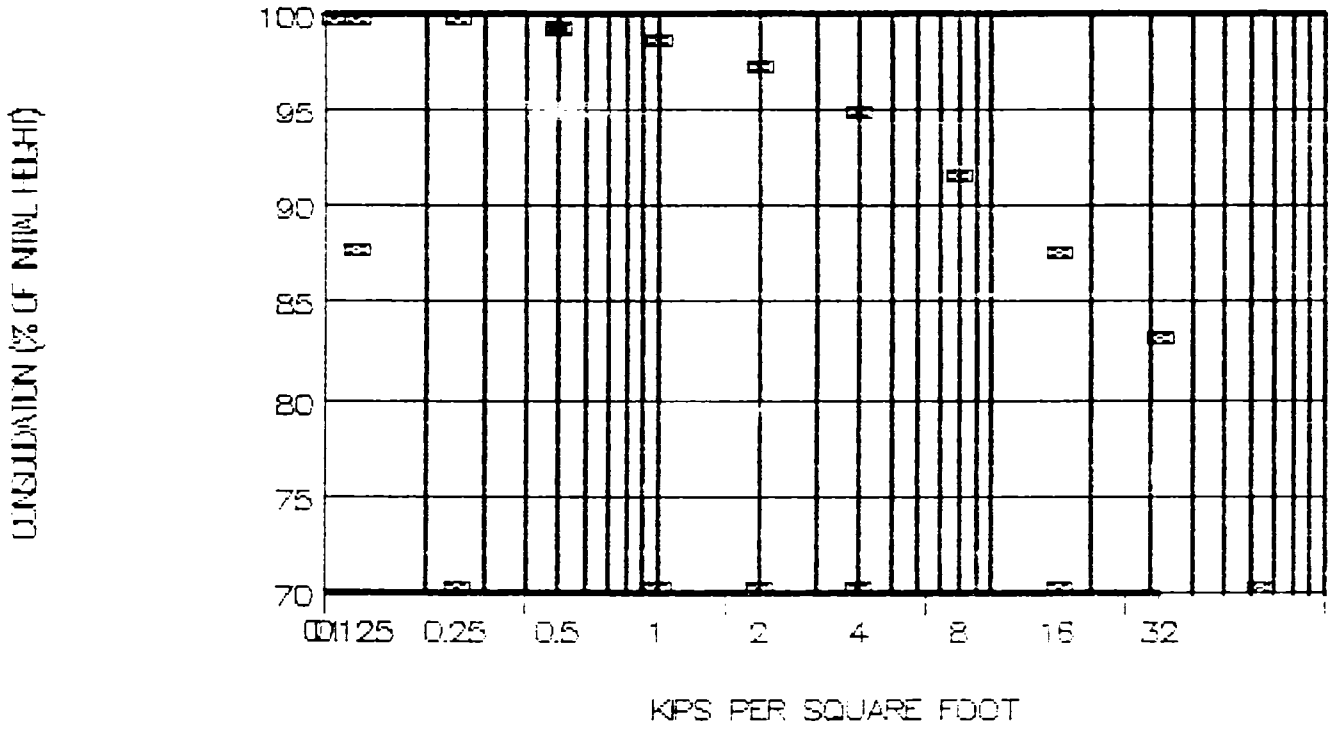
JOB # E87-56
DATE 7/19/89
W.O. # 61
LAB # 1337

CONSOLIDATION TEST

INSITU MOIST. CONTENT	26.6%
INUNDATED MOIST. CONT.	29.5%
MOISTURE PICK-UP	2.9%
DRY DENSITY	83.7 pcf

CONSOLIDATION TEST

EP-158 @ 133' TO 134'6"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 6/29/89
W.O. NO. 60
LAB # 1325

PROJECT EAST PAPAGO FREEWAY
BORING EP-153 @ 113' TO 115'

SAMPLE HT 10.915
WET WT 866.31
DRY WT 684.67
DIAMETER 7.195

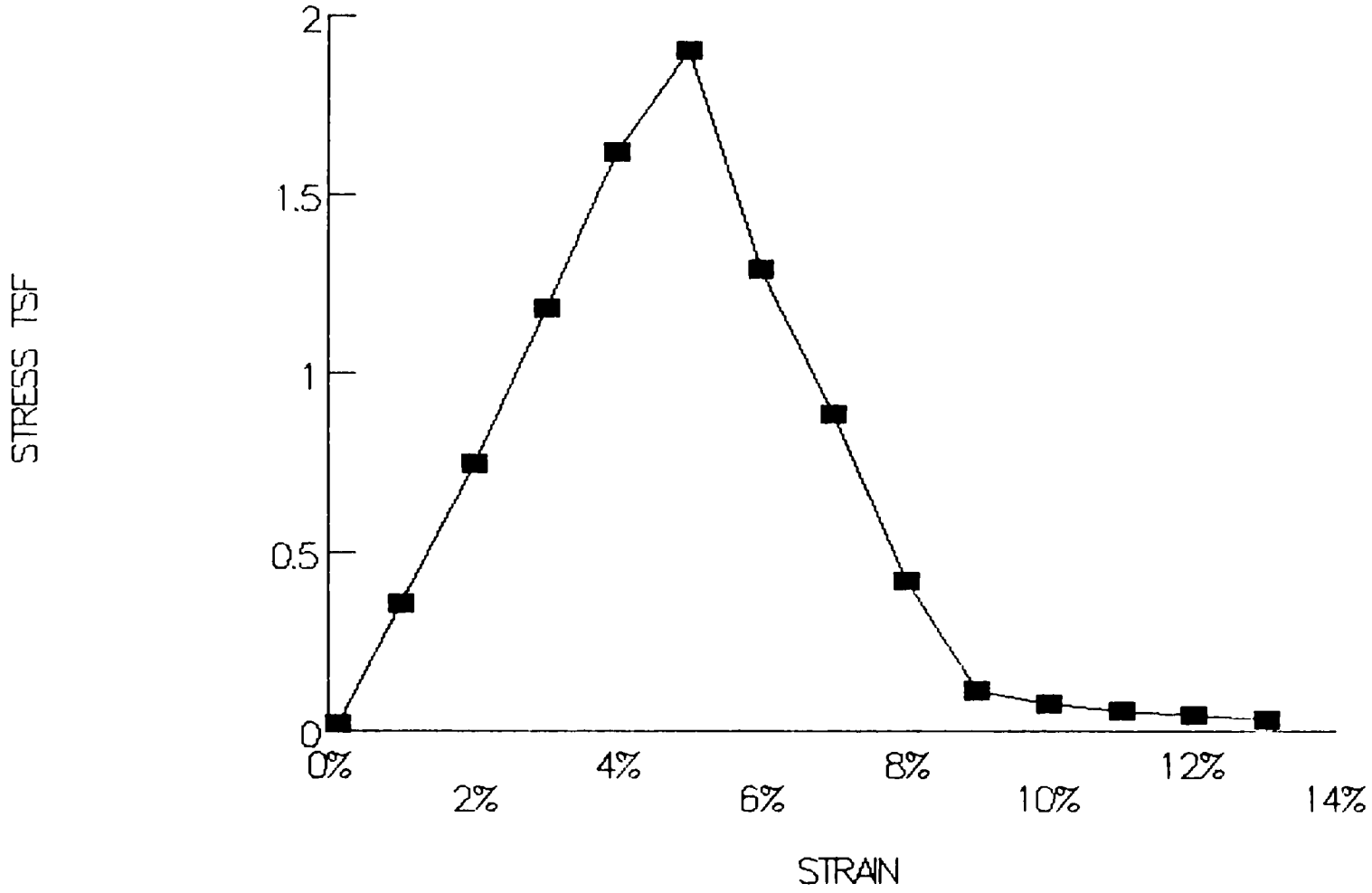
MAXIMUM STRESS 1.9 T/SQ FT
AT STRAIN = 5 %

AREA 40.659 CM
VOLUME 443.788 CC
WET DENS 121.9 LB/CU FT
% MOIST 26.5%
DRY DENS 96.3 LB/CU FT

TIME	DEFORMATION	LOAD	STRESS	STRAIN
	0	0	0	0.0%
	0.043 IN	31 LB	0.4 TON/SQ FT	1.0%
	0.086	66	0.7	2.0%
	0.129	105	1.2	3.0%
	0.172	144	1.6	4.0%
	0.215	170	1.9	5.0%
	0.258	116	1.3	6.0%
	0.301	80	0.9	7.0%
	0.344	38	0.4	8.0%
	0.387	10	0.1	9.0%
	0.430	7	0.1	10.0%
	0.473	5	0.1	11.0%
	0.516	4	0.0	12.0%
	0.559	3	0.0	13.0%

UNCONFINED COMPRESSION

EP-153 @ 113' TO 115'



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 6/29/89
W.O. NO. 60
LAB # 1327

PROJECT EAST PAPAGO FREEWAY
BORING EP-153 @ 132'6' TO 134'6'

==========

SAMPLE HT 14.43
WET WT 1222.42
DRY WT 997.59
DIAMETER 7.31

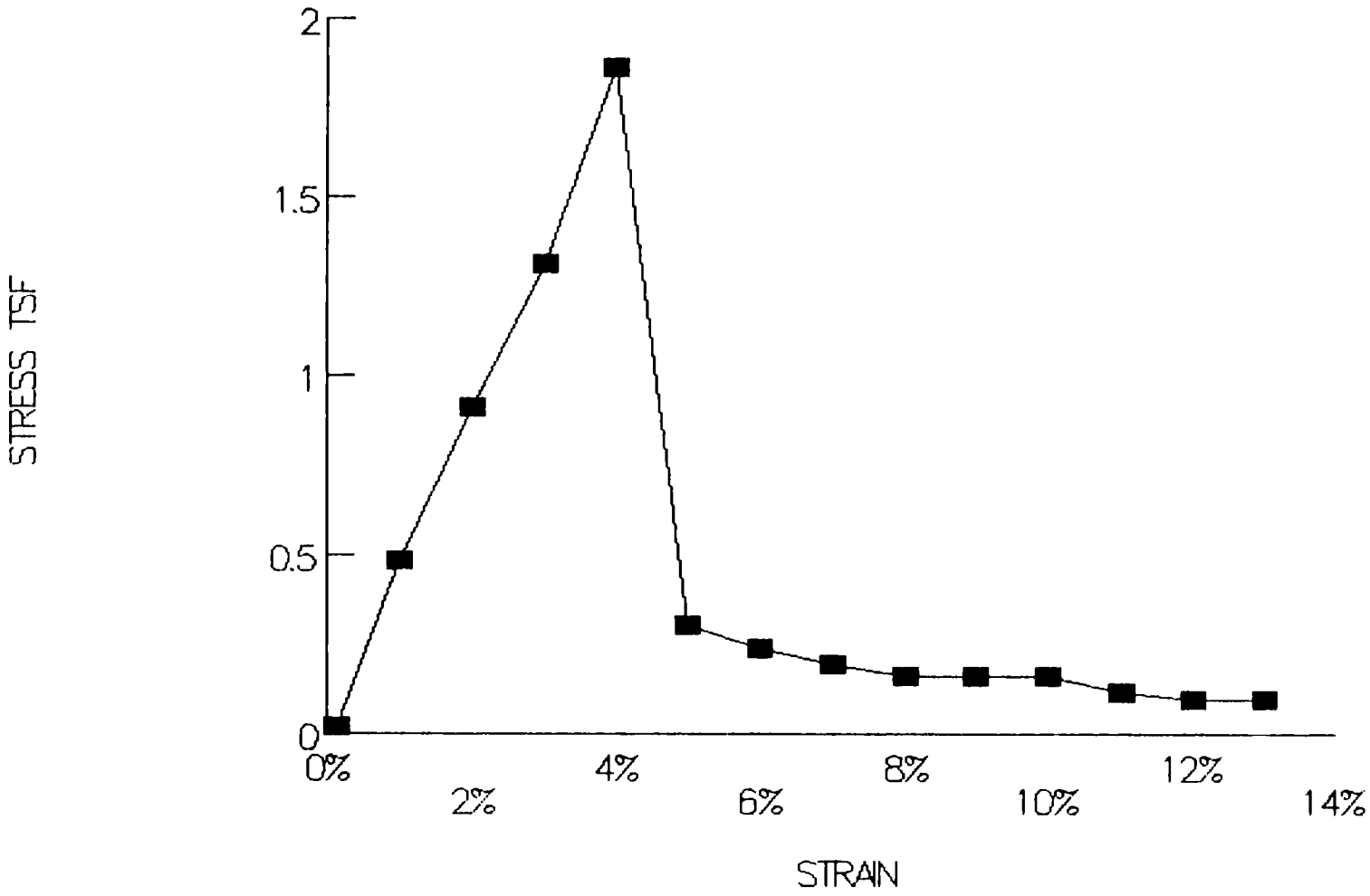
MAXIMUM STRESS 1.9 T/SQ FT
AT STRAIN = 4 %

AREA 41.969 CM
VOLUME 605.607 CC
WET DENS 126.0 LB/CU FT
% MOIST 22.5%
DRY DENS 102.8 LB/CU FT

TIME	DEFORMATION	LOAD	STRESS	STRAIN
	0	0	0	0.0%
	0.057 IN	44 LB	0.5 TON/SQ FT	1.0%
	0.114	83	0.9	2.0%
	0.170	120	1.3	3.0%
	0.227	171	1.9	4.0%
	0.284	28	0.3	5.0%
	0.341	22	0.2	6.0%
	0.398	18	0.2	7.0%
	0.454	15	0.2	8.0%
	0.511	15	0.2	9.0%
	0.568	15	0.2	10.0%
	0.625	11	0.1	11.0%
	0.682	9	0.1	12.0%
	0.739	9	0.1	13.0%

UNCONFINED COMPRESSION

EP-153 @ 132'6' TO 134'6''



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 6/29/89
W.O. NO. 60
LAB # 1329

PROJECT EAST PAPAGO FREEWAY
BORING EP-153 @ 146'6" TO 148'6"

SAMPLE HT 12.15
WET WT 827.26
DRY WT 589.64
DIAMETER 7.283

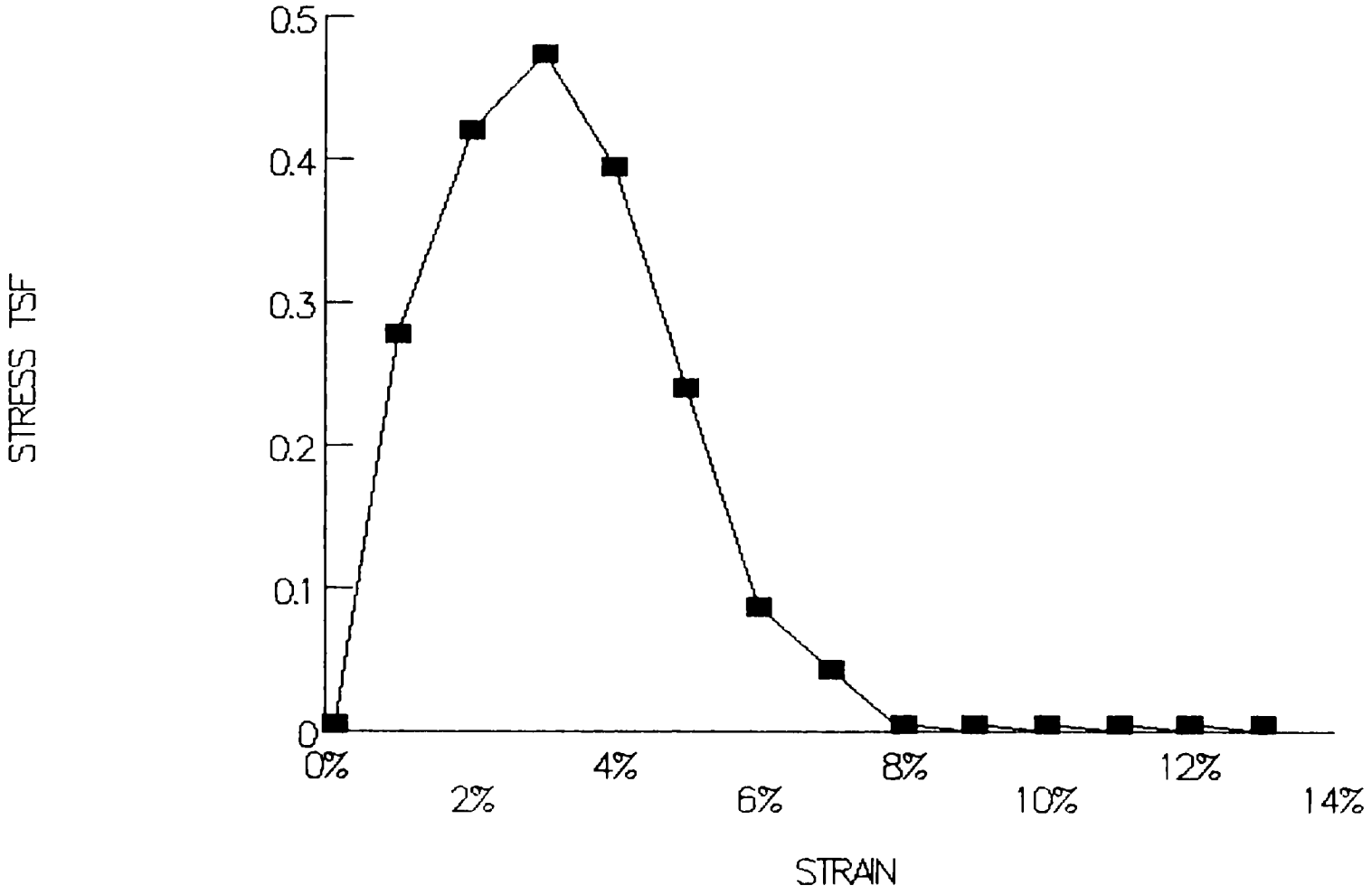
MAXIMUM STRESS 0.5 T/SQ FT
AT STRAIN = 3 %

AREA 41.659 CM
VOLUME 506.159 CC
WET DENS 102.0 LB/CU FT
% MOIST 40.3%
DRY DENS 72.7 LB/CU FT

TIME	DEFORMATION	LOAD	STRESS	STRAIN
	0	0	0	0.0%
	0.048 IN	25 LB	0.3 TON/SQ FT	1.0%
	0.096	38	0.4	2.0%
	0.144	43	0.5	3.0%
	0.191	36	0.4	4.0%
	0.239	22	0.2	5.0%
	0.287	8	0.1	6.0%
	0.335	4	0.0	7.0%
	0.383	0	0.0	8.0%
	0.431	0	0.0	9.0%
	0.478	0	0.0	10.0%
	0.526	0	0.0	11.0%
	0.574	0	0.0	12.0%
	0.622	0	0.0	13.0%

UNCONFINED COMPRESSION

EP-153 @ 146'6" TO 148'6"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 6/26/89
W.O. NO. 58
LAB # 1306

PROJECT EAST PAPAGO
BORING EP 154 @ 114' TO 115'

SAMPLE HT 13.085
WET WT 1057.04
DRY WT 838.06
DIAMETER 7.245

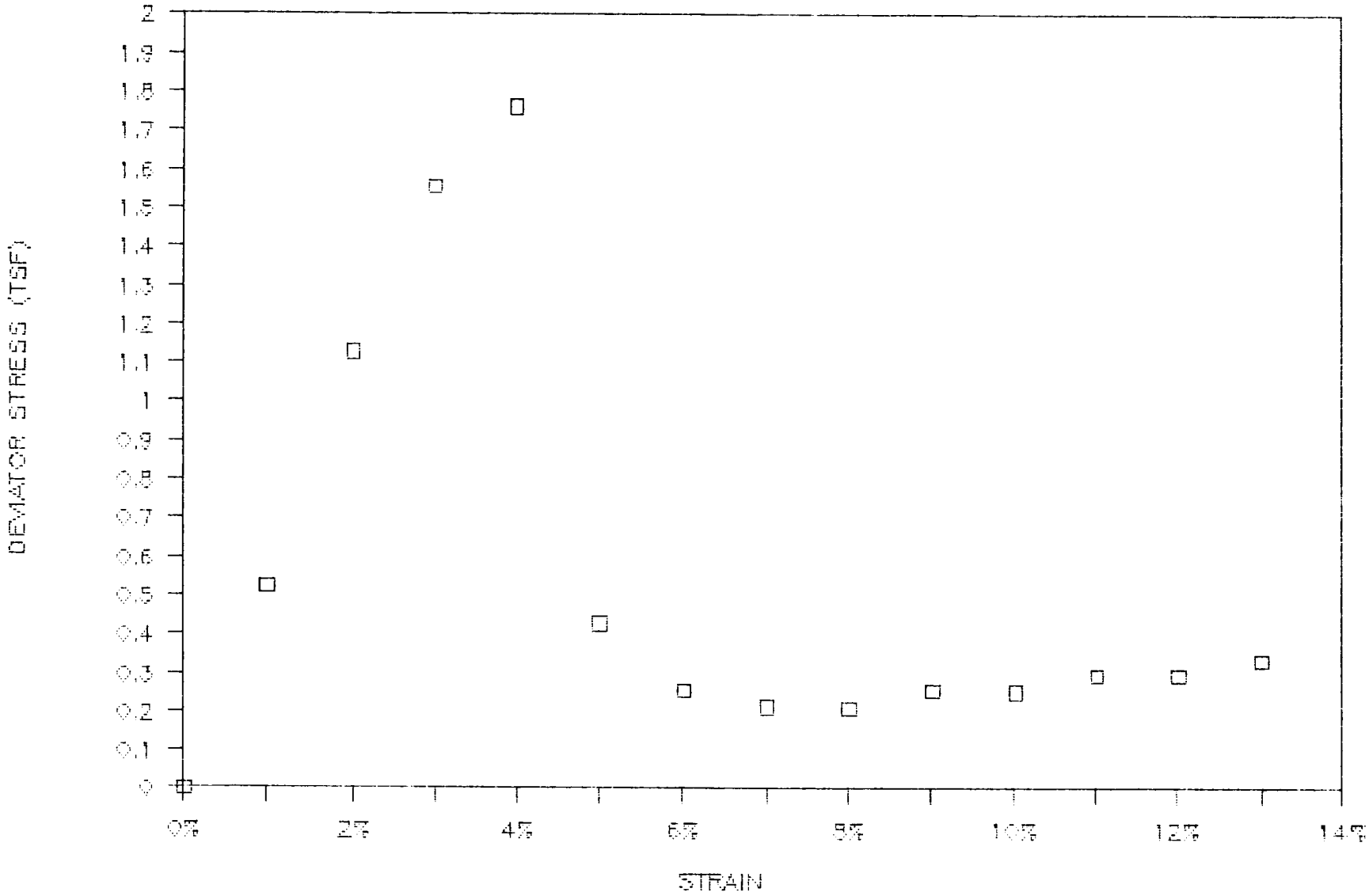
MAXIMUM STRESS 1.1 T/SQ FT
AT STRAIN = 4 %

AREA 41.226 CM
VOLUME 539.436 CC
WET DENS 122.3 LB/CU FT
% MOIST 26.1%
DRY DENS 97.0 LB/CU FT

TIME	DEFORMATION	LOAD	STRESS	STRAIN
	0	0	0	0.0%
	0.052 IN	21 LB	0.2 TON/SQ FT	1.0%
	0.104	45	0.5	2.0%
	0.156	77	0.9	3.0%
	0.208	102	1.1	4.0%
	0.260	63	0.7	5.0%
	0.312	10	0.1	6.1%
	0.364	6	0.1	7.1%
	0.416	6	0.1	8.1%
	0.468	6	0.1	9.1%
	0.520	5	0.1	10.1%
	0.572	5	0.1	11.1%
	0.624	5	0.1	12.1%
	0.676	5	0.1	13.1%

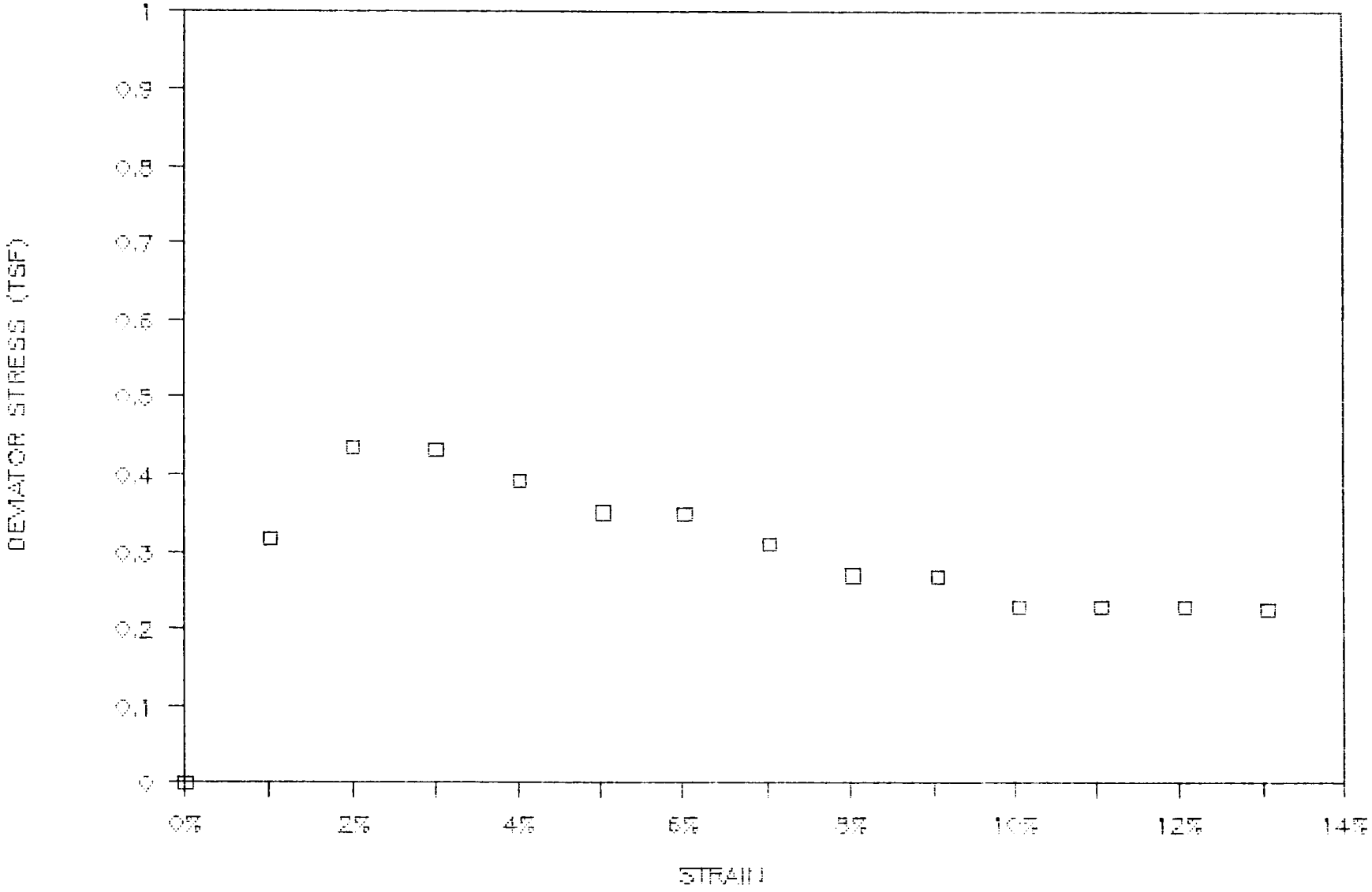
UNCONFINED COMPRESSION

EP-155 @ 123' TO 123'11.5"



UNCONFINED COMPRESSION

BP-157 @ 106' TO 106'6"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 7/19/89
W.O. NO. 61
LAB # 1336

PROJECT EAST PAPAGO
BORING EP-158 @ 118' TO 119'3"

==========

SAMPLE HT 13.36
WET WT 1032.97
DRY WT 770.87
DIAMETER 7.285

MAXIMUM STRESS 1.3 T/SQ FT
AT STRAIN = 4 %

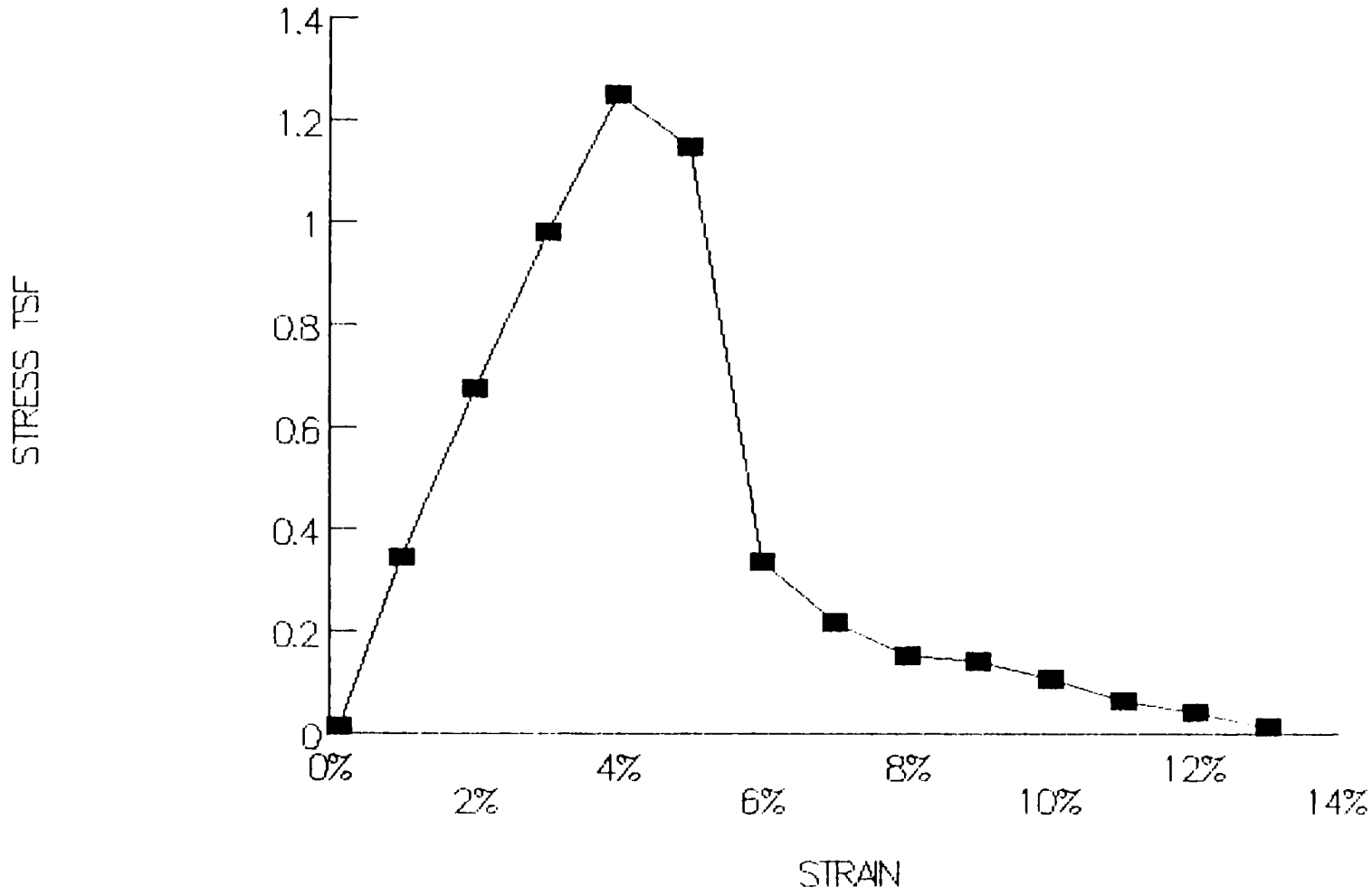
AREA 41.682 CM
VOLUME 556.872 CC
WET DENS 115.8 LB/CU FT
% MOIST 34.0%
DRY DENS 86.4 LB/CU FT

TYPE OF FAILURE COLUMNAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
	0	0	0	0.0%
	0.053 IN	31 LB	0.3 TON/SQ FT	1.0%
	0.105	61	0.7	2.0%
	0.158	89	1.0	3.0%
	0.210	114	1.3	4.0%
	0.263	105	1.1	5.0%
	0.316	31	0.3	6.0%
	0.368	20	0.2	7.0%
	0.421	14	0.2	8.0%
	0.473	13	0.1	9.0%
	0.526	10	0.1	10.0%
	0.579	6	0.1	11.0%
	0.631	4	0.0	12.0%
	0.684	1	0.0	13.0%

UNCONFINED COMPRESSION

EP-158 @ 118' TO 119'3"



SERGENT, HAUSKINS & BECKWITH

UNCONFINED COMPRESSION

JOB NO E87-56
DATE 7/19/89
W.O. NO. 61
LAB # 1337

PROJECT EAST PAPAGO
BORING EP-158 @ 133' TO 134'6"

SAMPLE HT 12.495
WET WT 610.23
DRY WT 467.45
DIAMETER 6.055

AREA 28.795 CM
VOLUME 359.794 CC
WET DENS 105.9 LB/CU FT
% MOIST 30.5%
DRY DENS 81.1 LB/CU FT

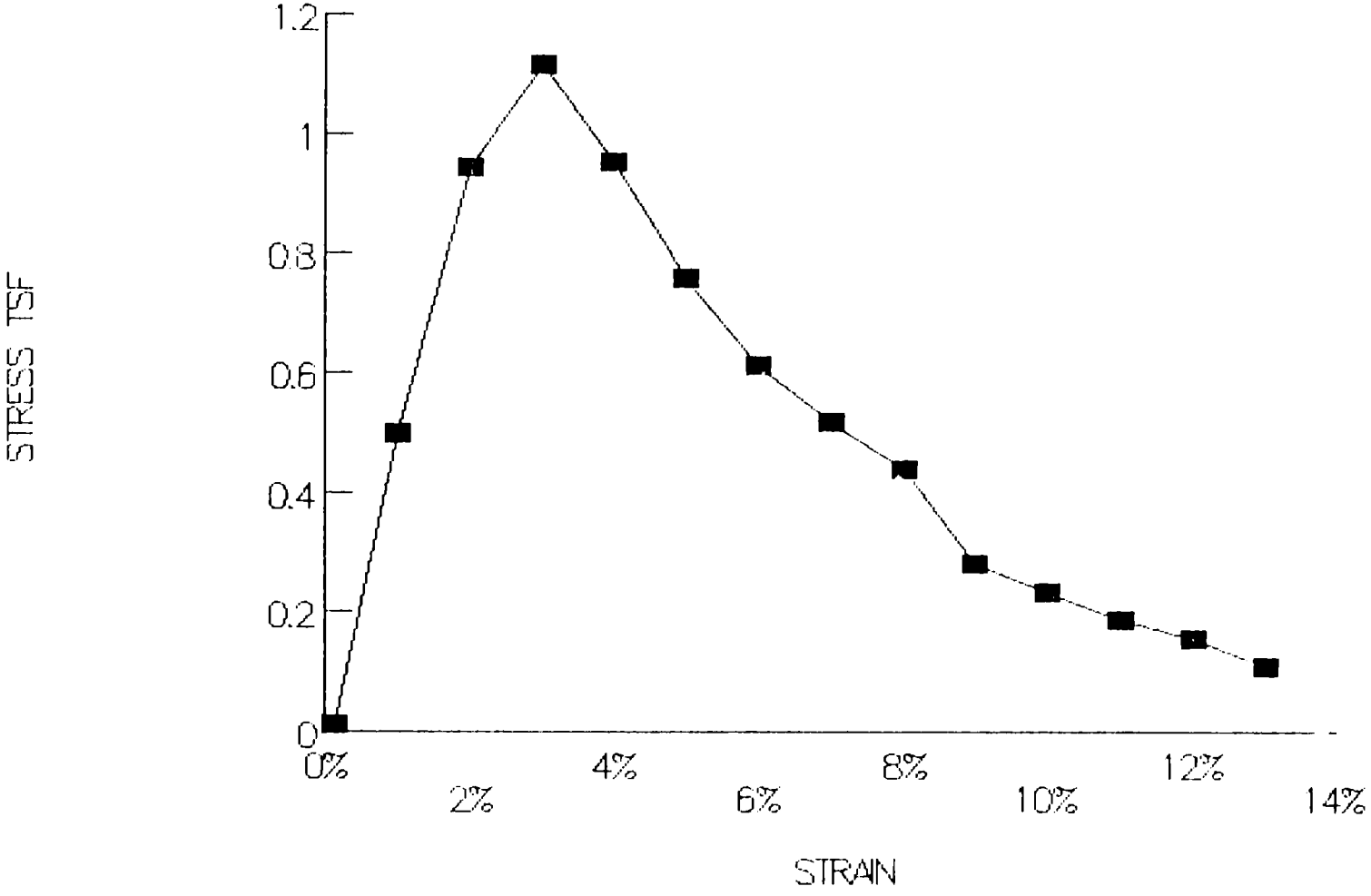
MAXIMUM STRESS 1.1 T/SQ FT
AT STRAIN = 3 %

TYPE OF FAILURE SHEAR

TIME	DEFORMATION	LOAD	STRESS	STRAIN
	0	0	0	0.0%
	0.049 IN	31 LB	0.5 TON/SQ FT	1.0%
	0.098	59	0.9	2.0%
	0.148	70	1.1	3.0%
	0.197	60	1.0	4.0%
	0.246	48	0.8	5.0%
	0.295	39	0.6	6.0%
	0.344	33	0.5	7.0%
	0.394	28	0.4	8.0%
	0.443	18	0.3	9.0%
	0.492	15	0.2	10.0%
	0.541	12	0.2	11.0%
	0.590	10	0.2	12.0%
	0.640	7	0.1	13.0%

UNCONFINED COMPRESSION

EP-158 @ 133' TO 134'6"



PRESSUREMETER TEST RESULTS

Boring EP-153

Depth 116.2

1) Volume Vo = 217.7 cm^3

2) Pressure Pom = 6.8 bars

3) Creep Pressure Pf = 20.98 bars

4) Volume Vf = 243.4 cm^3

5) Hydrostatic Water Pressure P= (ho + H)Γt/100(Kpa)= 1.67 bars

6) Limit Pressure = Pl = 2Vo + Vc = 2Vo + 786 =1221.4 cm^3;50 bars(estimated)

7) Pore Water Pressure u = Γw (z - hw)= 9.81(z - hw)= 1.92 bars

8) Horizontal at Rest Pressure = Po = (zΓ - u)Ko +u= 4.70 bars

9) Net Limit Pressure Pl = Pl - Po = 45.30 bars

10) Pressuremeter Modulus Em :

Em = 2.66(Vc +(Vf + Vo)/2)(Pf - Pom)/(Vf - Vo) = 1492 bars ; 3115.2 ksf

11) Pressuremeter Unload Modulus Em(-) : = 15426 bars ; 32209.0 ksf

12) Pressuremeter Reload Modulus Em(+) : = 5067 bars ; 10578.9 ksf

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PROJECT: EAST PAPAGO

TEST HOLE NO. : EP-153

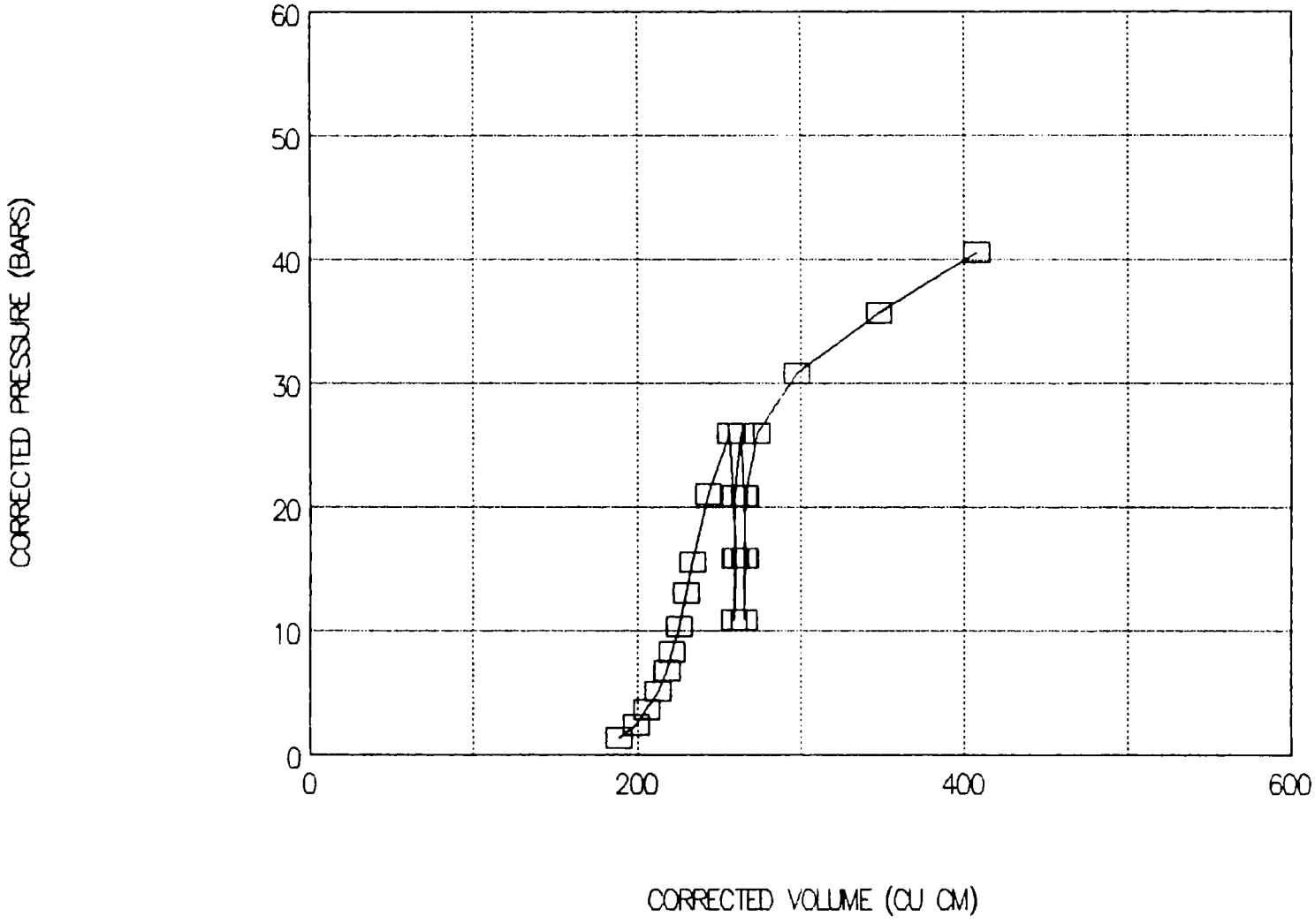
JOB NO.: E87-56

HOLE DEPTH : 116.2

Inc.	Pressure in Volumeter (Bars)	One Minute Volumeter Reading (cm³)	Plus Hydrostatic Pressure (Bars)	Volume Correction (cm³)	Corrected Volume (cm³)	Membrane Resistance (Bars)	Corrected Pressure (Bars)
1	0.25	190	1.92	1.1	188.9	0.54	1.38
2	1.25	201	2.92	1.7	199.3	0.57	2.35
3	2.5	208	4.17	2.4	205.6	0.59	3.58
4	4	216	5.67	3.3	212.7	0.61	5.06
5	5.75	222	7.42	4.3	217.7	0.62	6.80
6	7.25	226	8.92	5.2	220.8	0.63	8.29
7	9.25	232	10.92	6.3	225.7	0.64	10.28
8	12	238	13.67	7.9	230.1	0.65	13.02
9	14.5	243	16.17	9.4	233.6	0.66	15.51
10	20	256	21.67	12.6	243.4	0.69	20.98
11	25	272	26.67	15.5	256.5	0.73	25.94
12	20	271	21.67	12.6	258.4	0.73	20.94
13	15	270	16.67	9.7	260.3	0.74	15.93
14	10	266	11.67	6.8	259.2	0.73	10.94
15	15	269	16.67	9.7	259.3	0.73	15.94
16	20	272	21.67	12.6	259.4	0.73	20.94
17	25	279	26.67	15.5	263.5	0.75	25.92
18	20	278	21.67	12.6	265.4	0.75	20.92
19	15	276	16.67	9.7	266.3	0.75	15.92
20	10	272	11.67	6.8	265.2	0.75	10.92
21	15	275	16.67	9.7	265.3	0.75	15.92
22	20	279	21.67	12.6	266.4	0.75	20.92
23	25	289	26.67	15.5	273.5	0.77	25.90
24	30	316	31.67	18.4	297.6	0.83	30.84
25	35	369	36.67	21.3	347.7	0.95	35.72
26	40	432	41.67	24.2	407.8	1.09	40.58

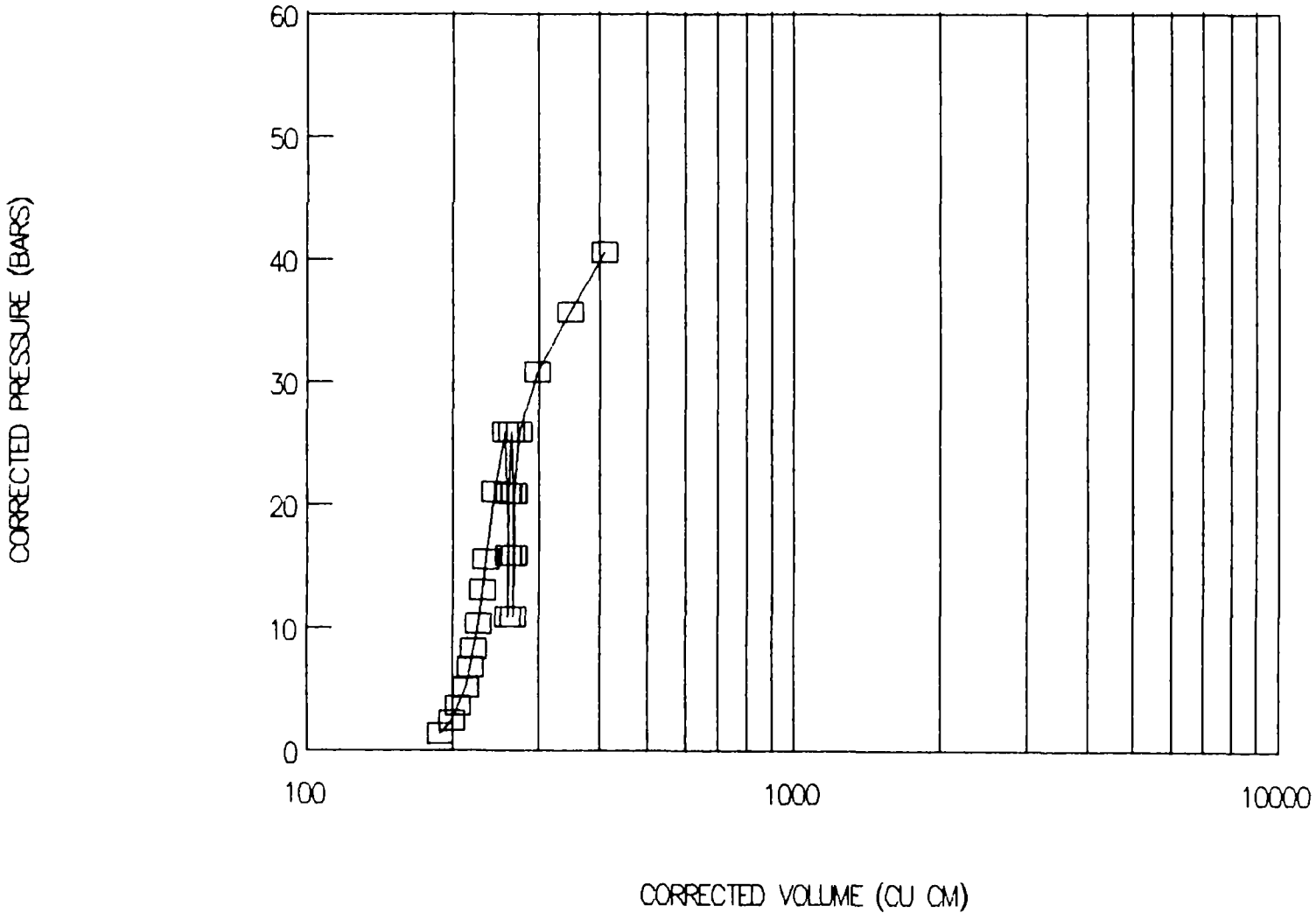
PRESSUREMETER TEST RESULTS

BORING EP-153



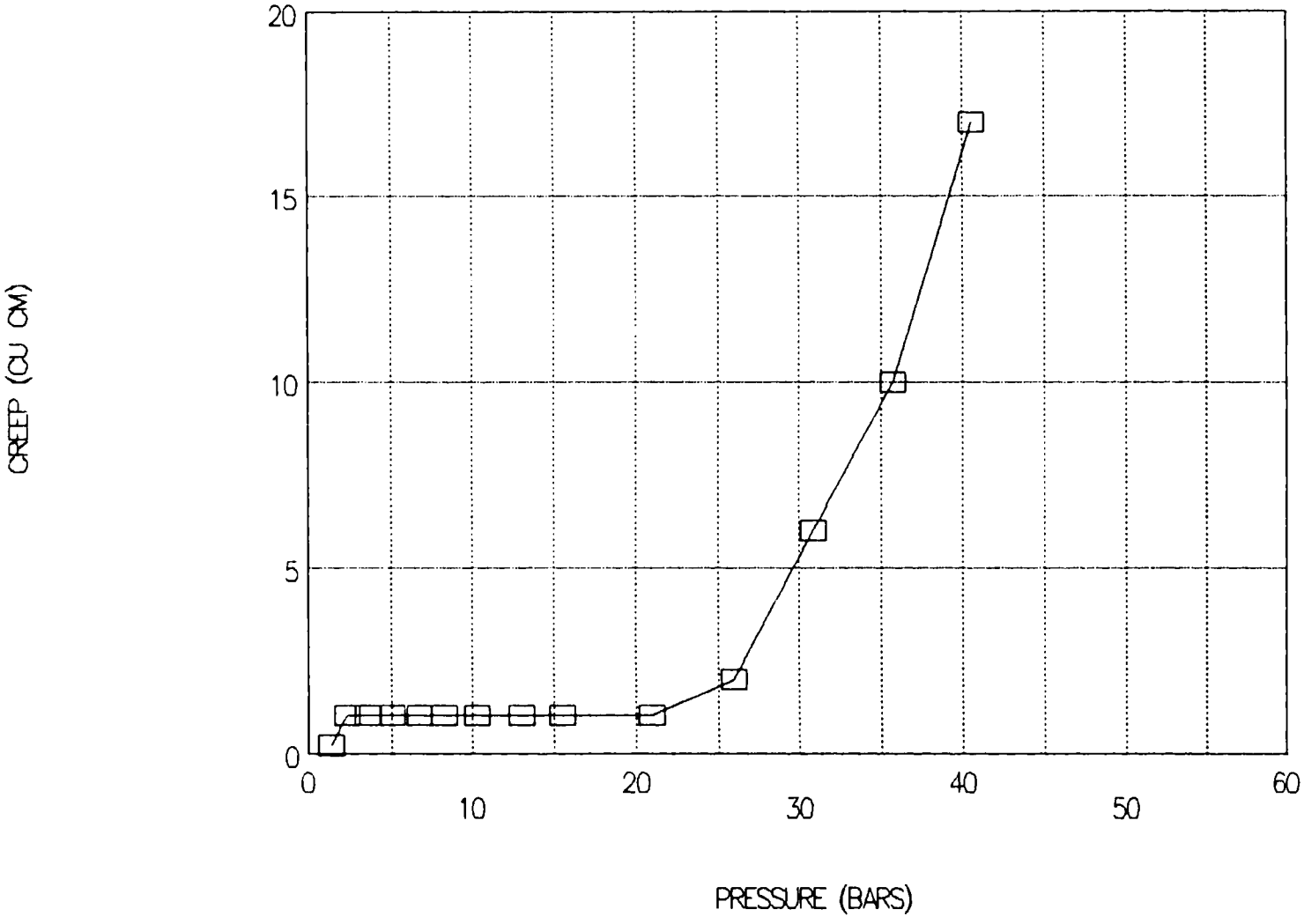
PRESSUREMETER TEST RESULTS

BORING EP-153



CREEP CURVE

BORING EP-153 AT 116.2



PRESSUREMETER TEST RESULTS

Boring EP-153

Depth 137

1) Volume Vo = 223.1 cm^3

2) Pressure Pom = 6.04 bars

3) Creep Pressure Pf = 25.97 bars

4) Volume Vf = 246.5 cm^3

5) Hydrostatic Water Pressure P= (ho + H)Γt/100(Kpa)= 1.67 bars

6) Limit Pressure = Pl = 2Vo + Vc = 2Vo + 786 =1232.2 cm^3;70 bars(estimated)

7) Pore Water Pressure u = Γw (z - hw)= 9.81(z - hw)= 2.54 bars

8) Horizontal at Rest Pressure = Po = (zΓ - u)Ko +u= 5.61 bars

9) Net Limit Pressure Pl = Pl - Po = 64.39 bars

10) Pressuremeter Modulus Em :

Em = 2.66(Vc +(Vf + Vo)/2)(Pf - Pom)/(Vf - Vo) = 2313 bars ; 4828.9 ksf

11) Pressuremeter Unload Modulus Em(-) : = 8945 bars ; 18676.8 ksf

12) Pressuremeter Reload Modulus Em(+) : = --- bars ; --- ksf

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PROJECT: EAST PARAGO

JOB NO.: E87-56

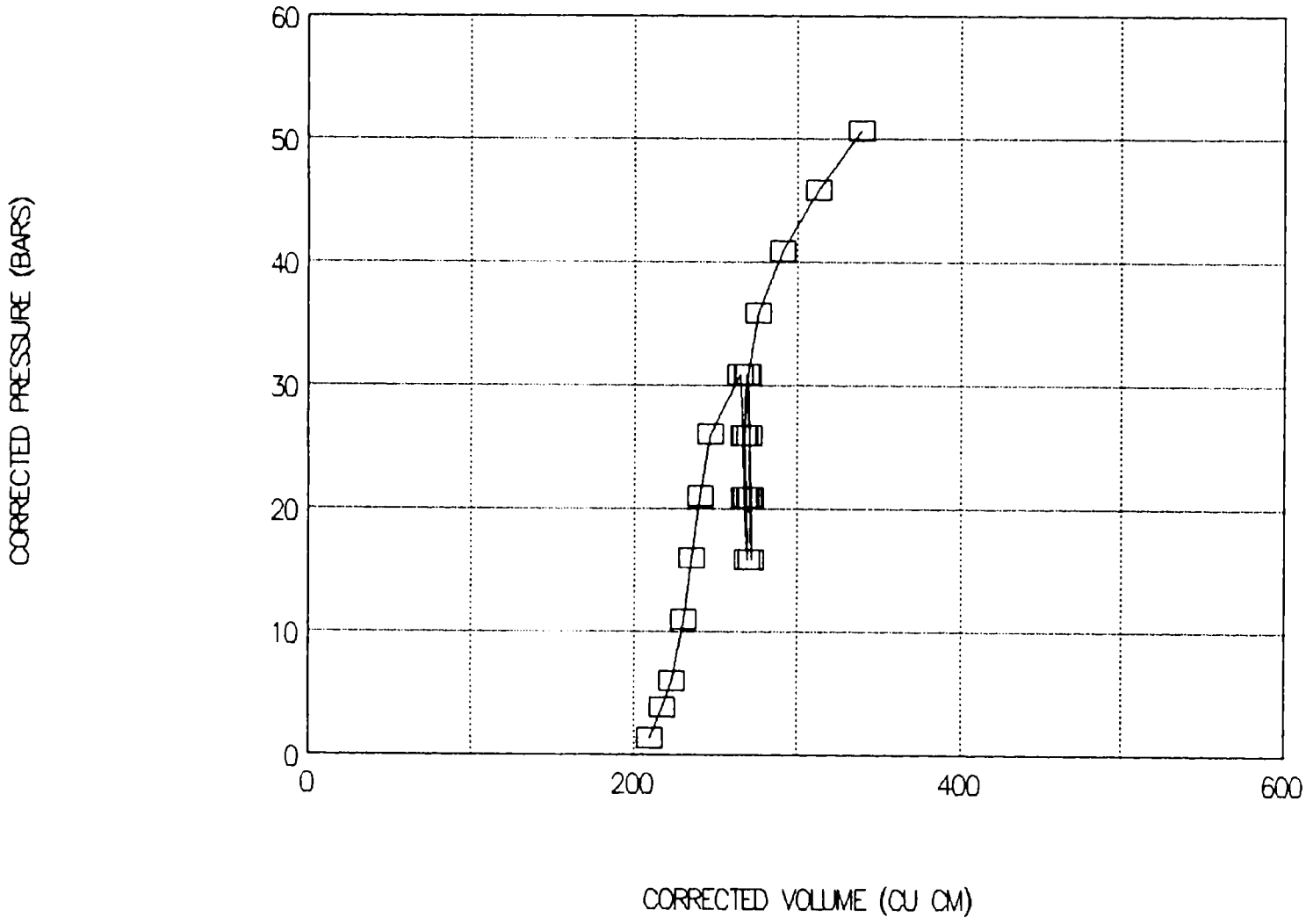
TEST HOLE NO. : EP-153

HOLE DEPTH : 137

Inc.	Pressure in Volumeter (Bars)	One Minute Volumeter Reading (cm^3)	Plus Hydrostatic Pressure (Bars)	Volume Correction (cm^3)	Corrected Volume (cm^3)	Membrane Resistance (Bars)	Corrected Pressure (Bars)
1	0.25	211	1.92	1.1	209.9	0.60	1.32
2	2.75	220	4.42	2.6	217.4	0.62	3.80
3	5	227	6.67	3.9	223.1	0.63	6.04
4	10	237	11.67	6.8	230.2	0.65	11.02
5	15	245	16.67	9.7	235.3	0.67	16.00
6	20	252	21.67	12.6	240.4	0.68	20.99
7	25	262	26.67	15.5	246.5	0.70	25.97
8	30	267	31.67	18.4	264.6	0.75	30.92
9	25	282	26.67	15.5	266.5	0.75	25.92
10	20	280	21.67	12.6	267.4	0.76	20.91
11	15	279	16.67	9.7	269.3	0.76	15.91
12	20	281	21.67	12.6	268.4	0.76	20.91
13	25	283	26.67	15.5	267.5	0.76	25.91
14	30	287	31.67	18.4	268.6	0.76	30.91
15	25	286	26.67	15.5	270.5	0.76	25.91
16	20	284	21.67	12.6	271.4	0.77	20.90
17	15	281	16.67	9.7	271.3	0.77	15.90
18	20	283	21.67	12.6	270.4	0.76	20.91
19	25	286	26.67	15.5	270.5	0.76	25.91
20	30	288	31.67	18.4	269.6	0.76	30.91
21	35	297	36.67	21.3	275.7	0.78	35.89
22	40	315	41.67	24.2	290.8	0.81	40.86
23	45	340	46.67	27.1	312.9	0.87	45.80
24	50	369	51.67	30.0	339.0	0.93	50.74

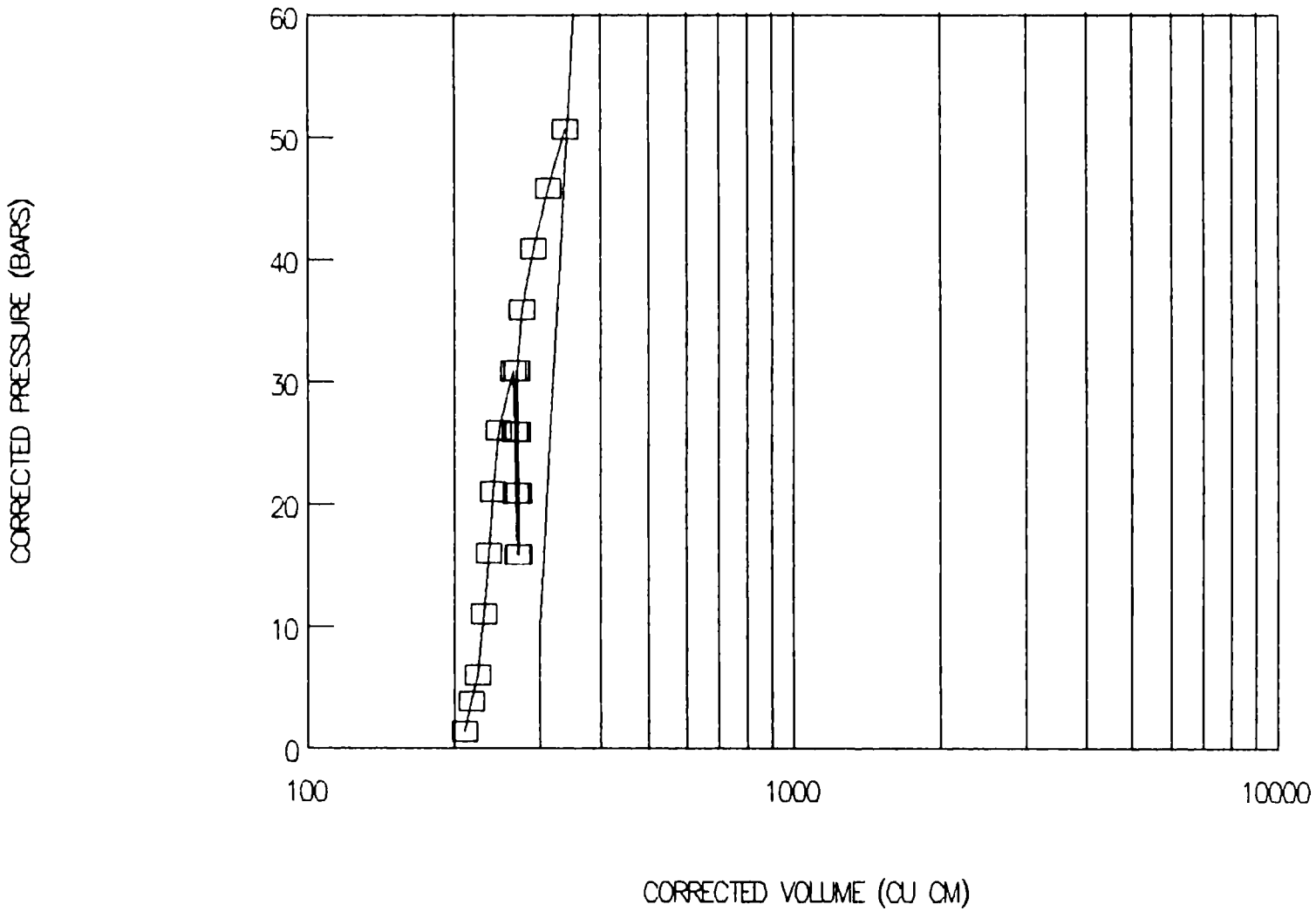
PRESSUREMETER TEST RESULTS

BORING EP-153



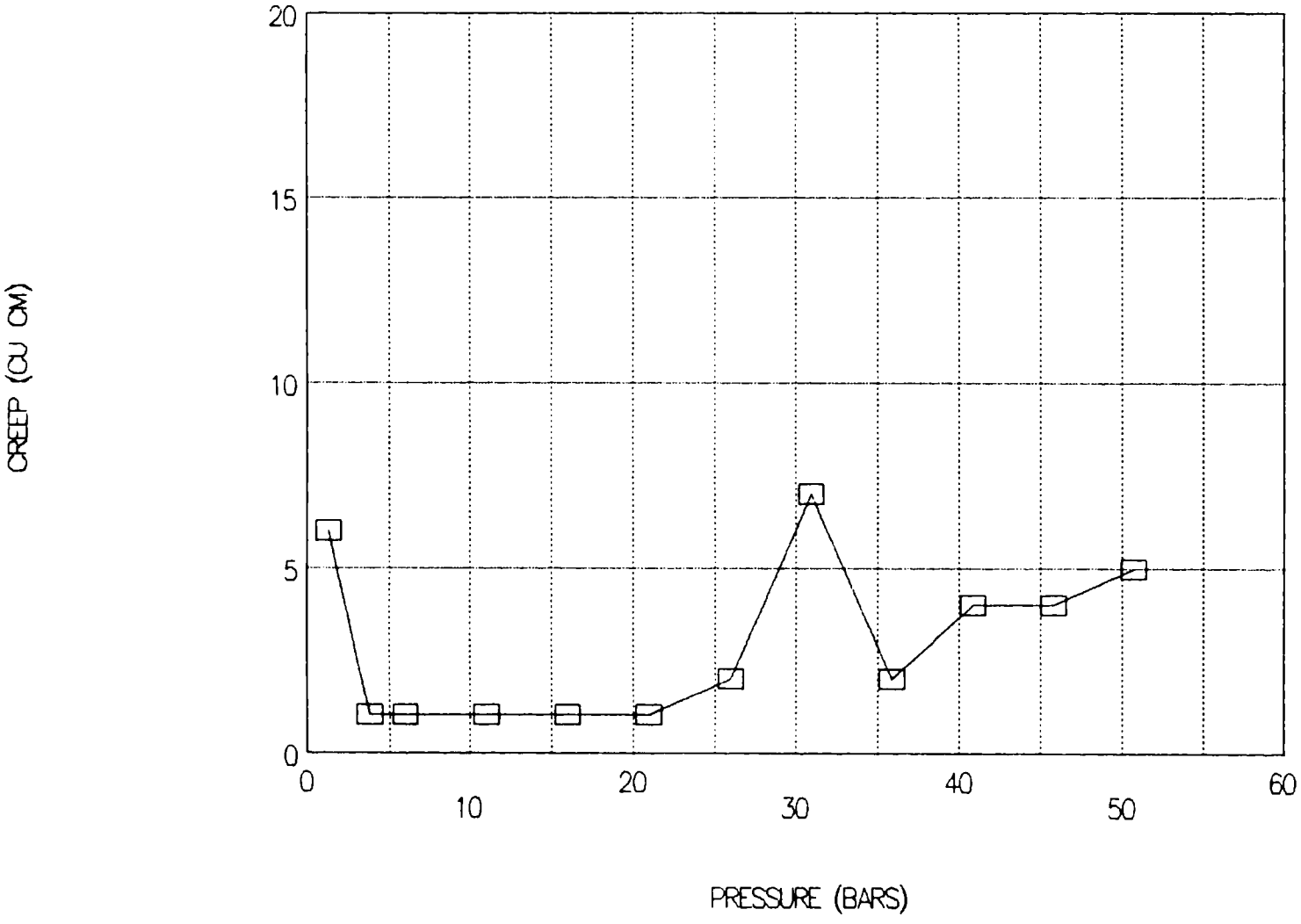
PRESSUREMETER TEST RESULTS

BORING EP-153



CREEP CURVE

BORING EP-153 AT 137



PRESSUREMETER TEST RESULTS

Boring EP-153

Depth 153.5

1) Volume Vo = 160.1 cm^3

2) Pressure Pom = 4.46 bars

3) Creep Pressure Pf = 19.36 bars

4) Volume Vf = 195.4 cm^3

5) Hydrostatic Water Pressure P= (ho + H)Γt/100(Kpa)= 1.67 bars

6) Limit Pressure = Pl = 2Vo + Vc = 2Vo + 786 =1106.2 cm^3;40 bars(estimated)

7) Pore Water Pressure u = Γw (z - hw)= 9.81(z - hw)= 3.03 bars

8) Horizontal at Rest Pressure = Po = (zΓ - u)Ko +u= 6.35 bars

9) Net Limit Pressure Pl = Pl - Po = 33.65 bars

10) Pressuremeter Modulus Em :

Em = 2.66(Vc +(Vf + Vo)/2)(Pf - Pom)/(Vf - Vo) = 1082 bars ; 2259.4 ksf

11) Pressuremeter Unload Modulus Em(-) : = 5694 bars ; 11888.6 ksf

12) Pressuremeter Reload Modulus Em(+) : = 8647 bars ; 18054.1 ksf

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PRESSUREMETER TEST RESULTS

Boring EP-153

Depth 153.5

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2) Pressure Pom = 4.46 bars

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5) Hydrostatic Water Pressure P= (ho + H)Γt/100(Kpa)= 1.67 bars

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PROJECT: EAST PARAGO

TEST HOLE NO. : EF-153

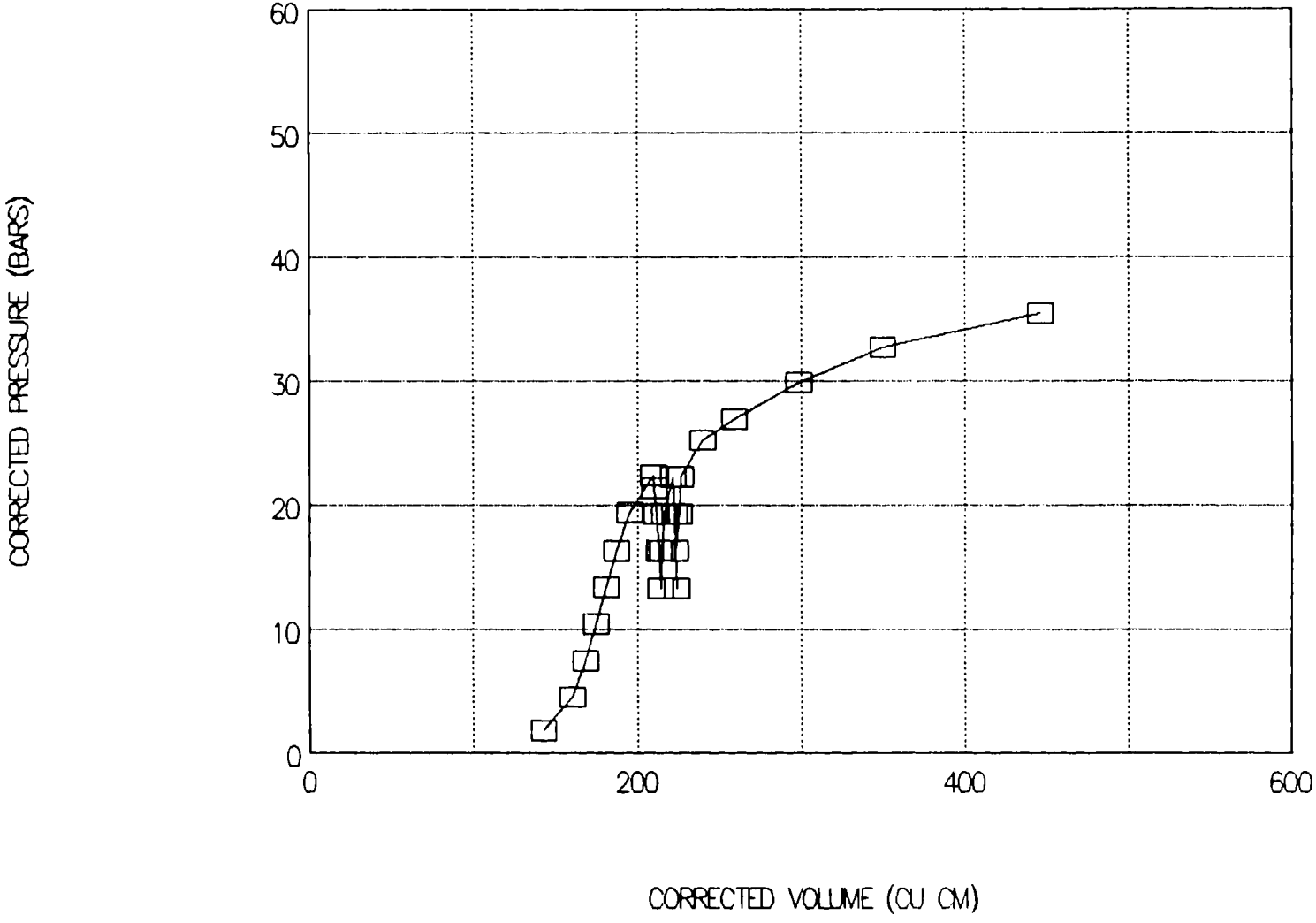
JOB NO.: E87-56

HOLE DEPTH : 153.5

Inc.	Pressure in Volumeter (Bars)	One Minute Volumeter Reading (cm^3)	Plus Hydrostatic Pressure (Bars)	Volume Correction (cm^3)	Corrected Volume (cm^3)	Membrane Resistance (Bars)	Corrected Pressure (Bars)
1	0.5	144	2.17	1.3	142.7	0.42	1.75
2	3.25	163	4.92	2.9	160.1	0.46	4.46
3	6.25	173	7.92	4.6	168.4	0.48	7.44
4	9.25	181	10.92	6.3	174.7	0.50	10.42
5	12.25	189	13.92	8.1	180.9	0.52	13.40
6	15.25	197	16.92	9.8	187.2	0.54	16.38
7	18.25	207	19.92	11.6	195.4	0.56	19.36
8	21.25	227	22.92	13.3	209.7	0.60	22.32
9	20.25	223	21.92	12.7	210.3	0.60	21.32
10	18.25	223	19.92	11.6	211.4	0.60	19.32
11	15.25	223	16.92	9.8	213.2	0.61	16.31
12	12.25	222	13.92	8.1	213.9	0.61	13.31
13	15.25	225	16.92	9.8	215.2	0.61	16.31
14	18.25	228	19.92	11.6	216.4	0.62	19.30
15	21.25	235	22.92	13.3	221.7	0.63	22.29
16	18.25	234	19.92	11.6	222.4	0.63	19.29
17	15.25	233	16.92	9.8	223.2	0.64	16.28
18	12.25	232	13.92	8.1	223.9	0.64	13.28
19	15.25	233	16.92	9.8	223.2	0.64	16.28
20	18.25	237	19.92	11.6	225.4	0.64	19.28
21	21.25	240	22.92	13.3	226.7	0.64	22.28
22	24.25	255	25.92	15.0	240.0	0.68	25.24
23	26	275	27.67	16.0	259.0	0.73	26.94
24	29	316	30.67	17.8	298.2	0.83	29.84
25	32	369	33.67	19.5	349.5	0.95	32.72
26	35	467	36.67	21.3	445.7	1.17	35.50

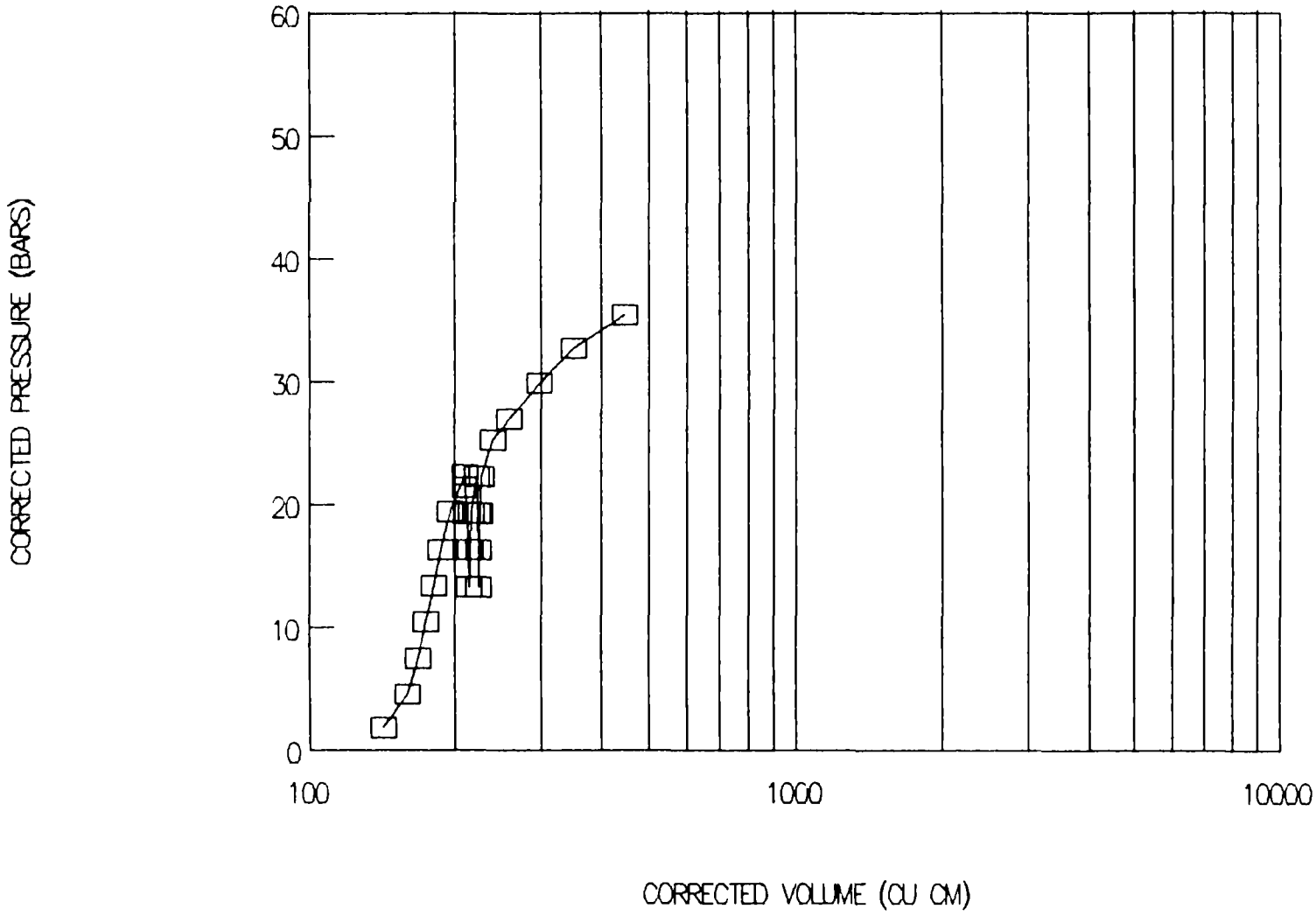
PRESSUREMETER TEST RESULTS

BORING EP-153



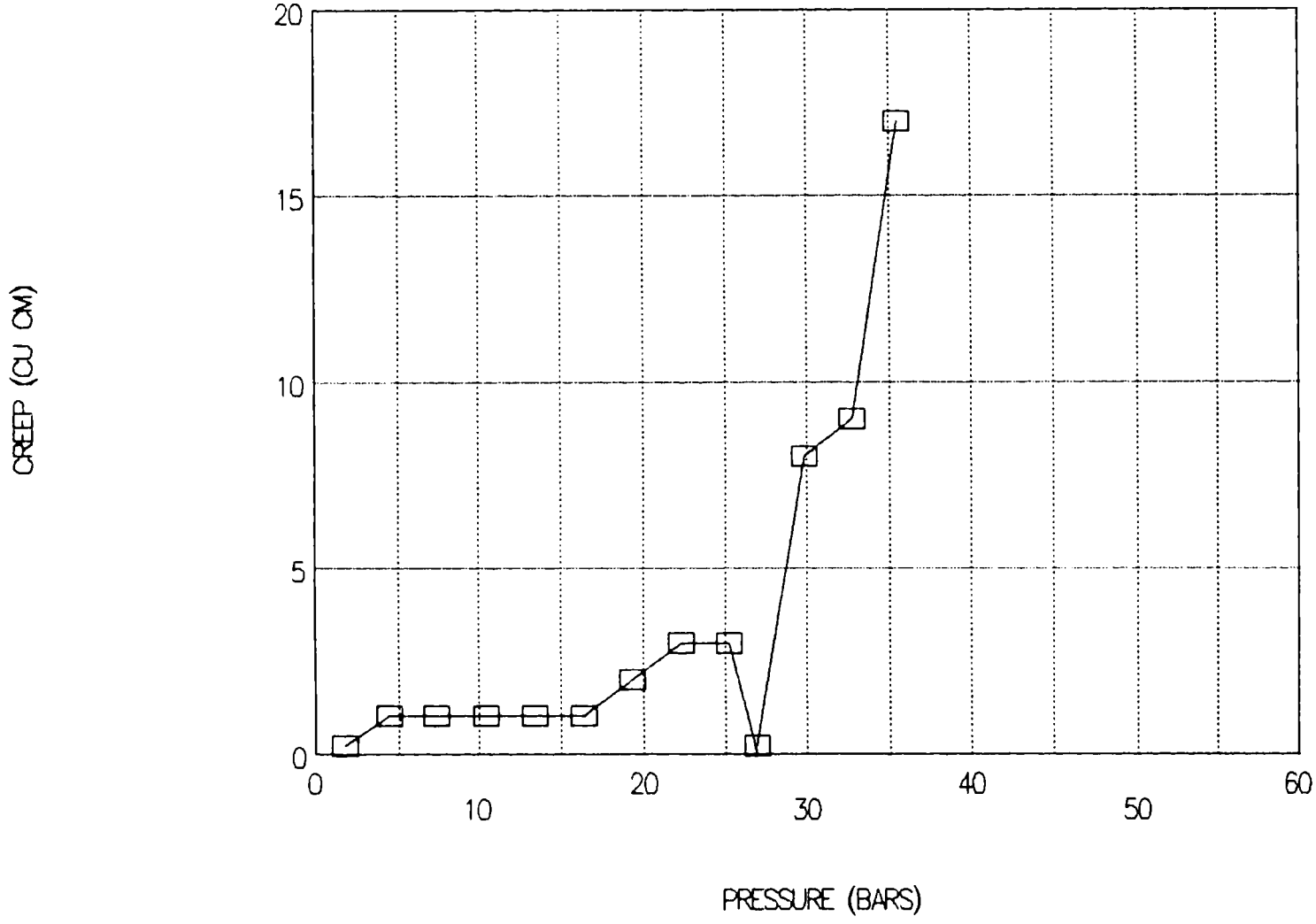
PRESSUREMETER TEST RESULTS

BORING EP-153



CREEP CURVE

BORING EP-153 AT 153.5



PRESSUREMETER TEST RESULTS

Boring EP-154

Depth 129

1) Volume Vo = 360.4 cm^3

2) Pressure Pom = 3.49 bars

3) Creep Pressure Pf = 10.67 bars

4) Volume Vf = 392.2 cm^3

5) Hydrostatic Water Pressure P= (ho + H)Γt/100(Kpa)= 1.72 bars

6) Limit Pressure = Pl = 2Vo + Vc = 2Vo + 786 =1506.8 cm^3;32 bars(estimated)

7) Pore Water Pressure u = Γw (z - hw)= 9.81(z - hw)= 2.27 bars

8) Horizontal at Rest Pressure = Po = (zΓ - u)Ko +u= 5.24 bars

9) Net Limit Pressure Pl = Pl - Po = 26.76 bars

10) Pressuremeter Modulus Em :

Em = 2.66(Vc +(Vf + Vo)/2)(Pf - Pom)/(Vf - Vo) = 698.1 bars ; 1457.6 ksf

11) Pressuremeter Unload Modulus Em(-) : = --- bars ; --- ksf

12) Pressuremeter Reload Modulus Em(+) : =3146.5 bars ; 6569.8 ksf

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PRESSUREMETER TEST RESULTS

Boring EP-154

Depth 129

1) Volume Vo = 360.4 cm^3

2) Pressure Pom = 3.49 bars

3) Creep Pressure Pf = 10.67 bars

4) Volume Vf = 392.2 cm^3

5) Hydrostatic Water Pressure P= (ho + H)Γt/100(Kpa)= 1.72 bars

6) Limit Pressure = Pl = 2Vo + Vc = 2Vo + 786 =1506.8 cm^3;32 bars(estimated)

7) Pore Water Pressure u = Γw (z - hw)= 9.81(z - hw)= 2.27 bars

8) Horizontal at Rest Pressure = Po = (zΓ - u)Ko +u= 5.24 bars

9) Net Limit Pressure Pl = Pl - Po = 26.76 bars

10) Pressuremeter Modulus Em :

Em = 2.66(Vc +(Vf + Vo)/2)(Pf - Pom)/(Vf - Vo) = 698.1 bars ; 1457.6 ksf

11) Pressuremeter Unload Modulus Em(-) : = --- bars ; --- ksf

12) Pressuremeter Reload Modulus Em(+) : =3146.5 bars ; 6569.8 ksf

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PROJECT: EAST PARAGO

TEST HOLE NO. : [illegible]

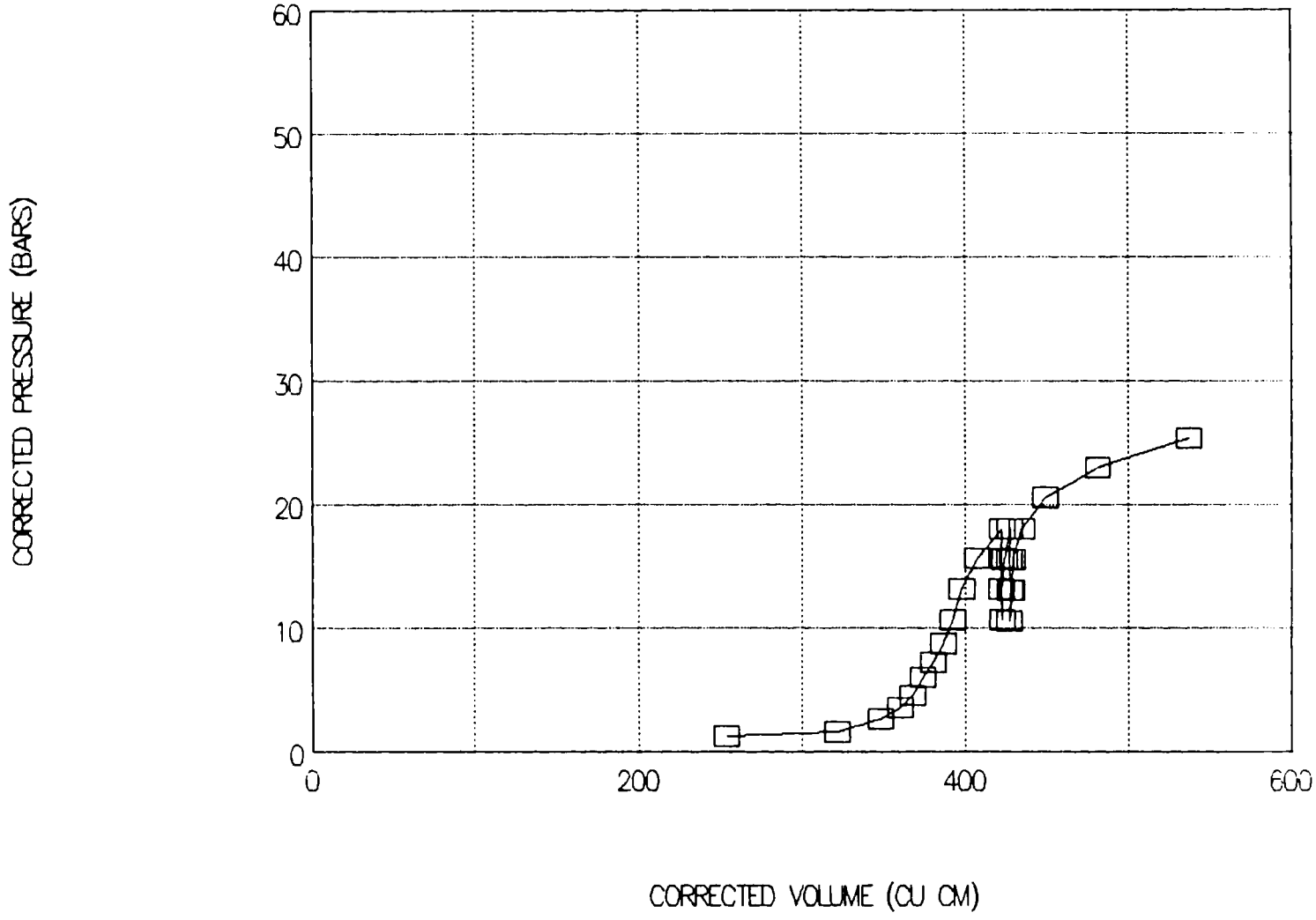
JOB NO.: E87-56

HOLE DEPTH : 125

Inc.	Pressure in Volumeter (Bars)	One Minute Volumeter Reading (cm^3)	Plus Hydrostatic Pressure (Bars)	Volume Correction (cm^3)	Corrected Volume cm^3	Membrane Resistance (Bars)	Corrected Pressure (Bars)
1	0.25	255	1.97	1.1	253.9	0.72	1.25
2	0.7	323	2.42	1.4	321.6	0.89	1.57
3	1.75	350	3.47	2.1	348.0	0.95	2.52
4	2.75	362	4.47	2.6	360.4	0.98	3.49
5	3.5	371	5.22	3.2	367.8	1.00	4.22
6	5.25	378	6.97	4.0	374.0	1.01	5.96
7	6.5	385	8.22	4.8	381.2	1.02	7.2
8	8	392	9.72	5.6	386.4	1.04	8.68
9	10	399	11.72	6.8	392.2	1.05	10.67
10	12.5	406	14.22	8.2	397.8	1.06	13.16
11	15	417	16.72	9.7	407.3	1.08	15.64
12	17.5	433	19.22	11.1	421.9	1.12	18.10
13	15	431	16.72	9.7	421.3	1.11	15.61
14	12.5	430	14.22	8.2	421.8	1.12	13.10
15	10	429	11.72	6.8	422.2	1.12	10.60
16	12.5	430	14.22	8.2	421.8	1.12	13.10
17	15	433	16.72	9.7	423.3	1.12	15.60
18	17.5	438	19.22	11.1	426.9	1.13	18.09
19	15	436	16.72	9.7	426.3	1.13	15.59
20	12.5	435	14.22	8.2	426.8	1.13	13.09
21	10	433	11.72	6.8	426.2	1.13	10.59
22	12.5	436	14.22	8.2	427.8	1.13	13.09
23	15	438	16.72	9.7	428.3	1.13	15.59
24	17.5	445	19.22	11.1	433.9	1.14	18.08
25	20	461	21.72	12.6	448.4	1.17	20.55
26	22.5	495	24.22	14.0	481.0	1.25	22.97
27	25	553	26.72	15.5	537.5	1.37	25.35

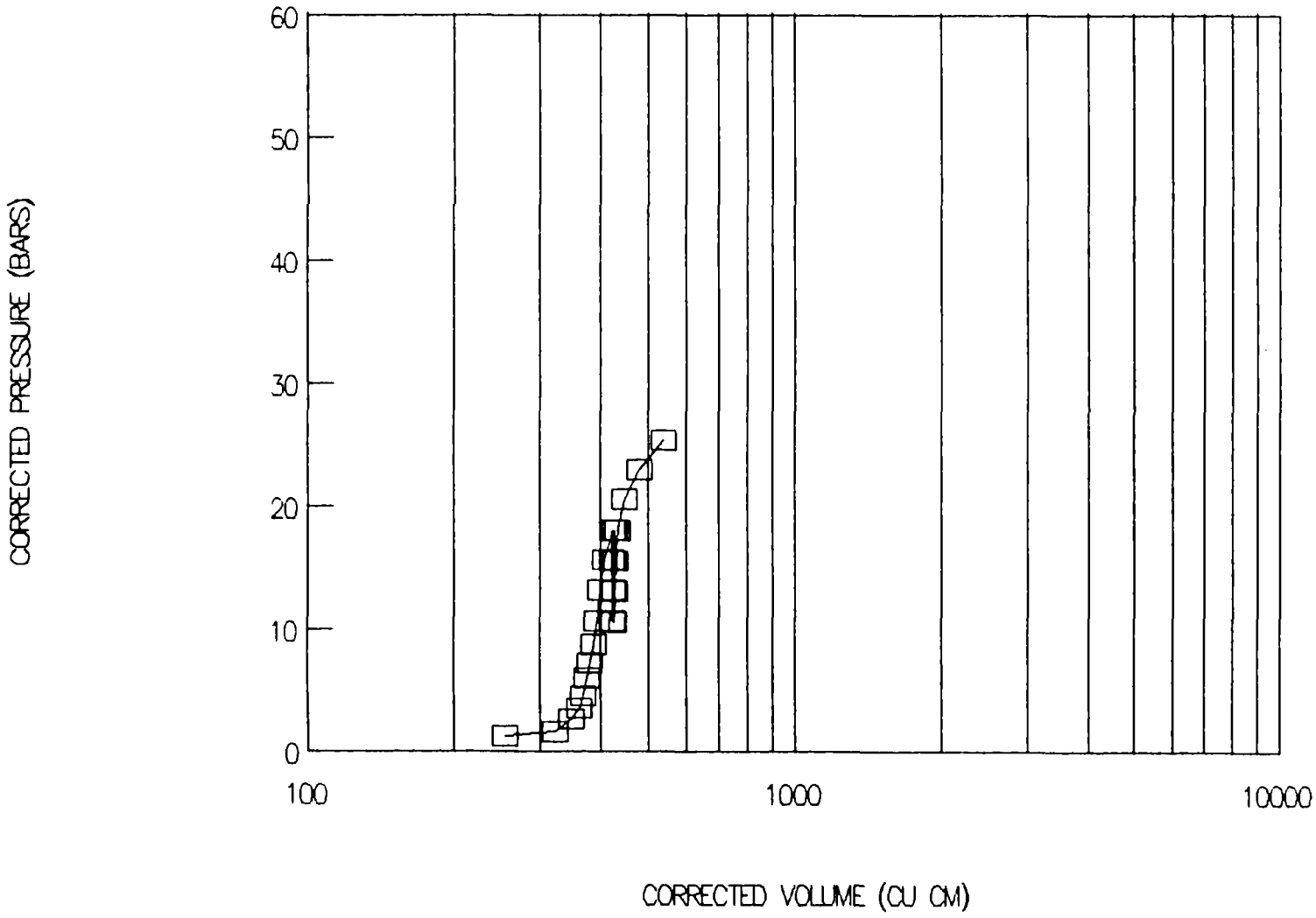
PRESSUREMETER TEST RESULTS

BORING EP-154



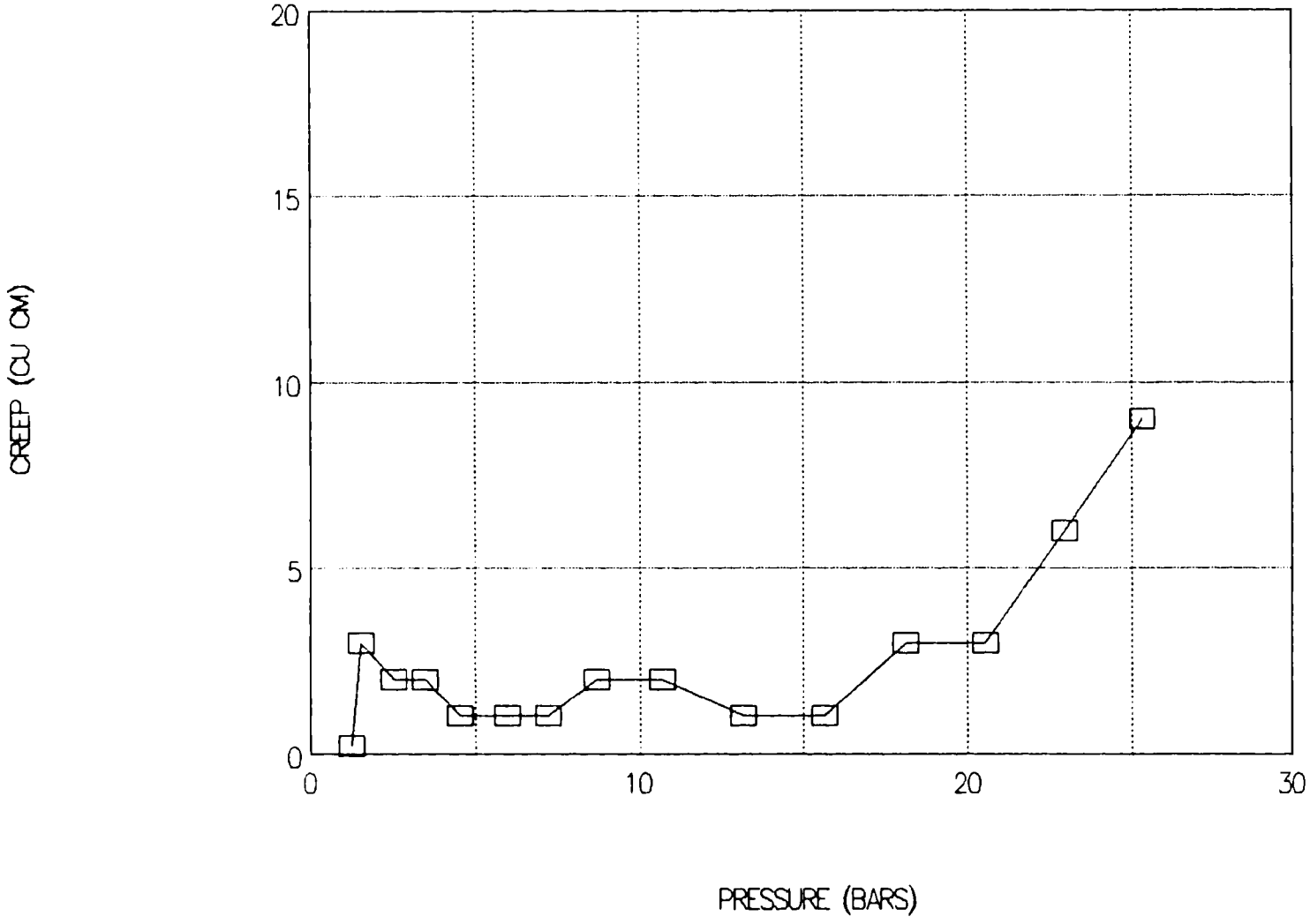
PRESSUREMETER TEST RESULTS

BORING EP-154



CREEP CURVE

BORING EP-154



PRESSUREMETER TEST RESULTS

Boring EP-154

Depth 149

1) Volume Vo = 316.8 cm^3

2) Pressure Pom = 6.35 bars

3) Creep Pressure Pf = 20.9 bars

4) Volume Vf = 402.9 cm^3

5) Hydrostatic Water Pressure P= (ho + H)Γt/100(Kpa)= 1.72 bars

6) Limit Pressure = Pl = 2Vo + Vc = 2Vo + 786 =1419.6 cm^3;33 bars(estimated)

7) Pore Water Pressure u = Γw (z - hw)= 9.81(z - hw)= 2.87 bars

8) Horizontal at Rest Pressure = Po = (zΓ - u)Ko +u= 6.13 bars

9) Net Limit Pressure Pl = Pl - Po = 26.87 bars

10) Pressuremeter Modulus Em :

Em = 2.66(Vc +(Vf + Vo)/2)(Pf - Pom)/(Vf - Vo) = 515 bars ; 1075.5 ksf

11) Pressuremeter Unload Modulus Em(-) : = --- bars ; --- ksf

12) Pressuremeter Reload Modulus Em(+) : = 7658 bars ; 15989.5 ksf

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PROJ:

TEST HOLE NO. : E7-104

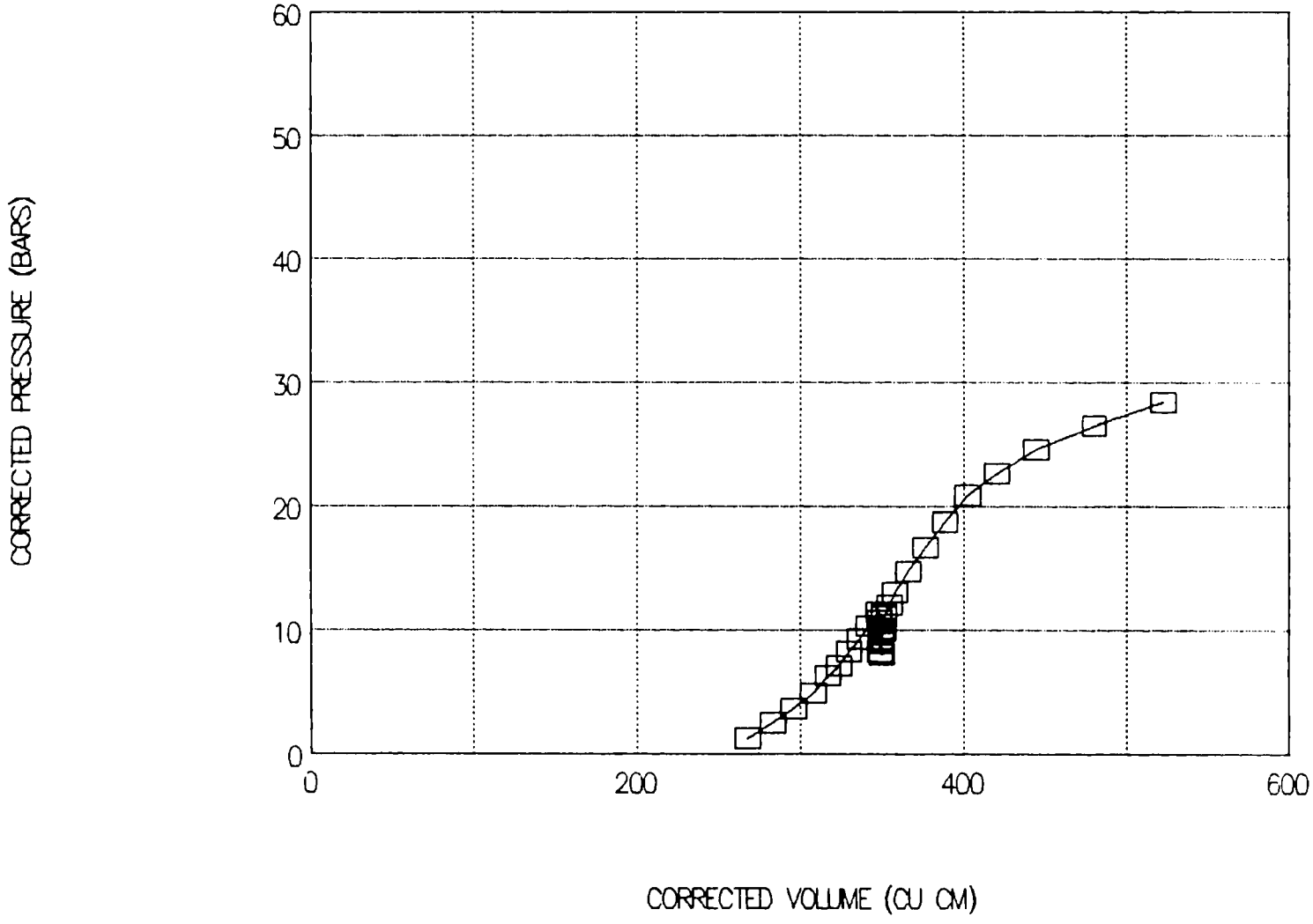
JOB NO.: E87-5c

HOLE DEPTH : [illegible]

Inc.	Pressure in Volumeter (Bars)	One Minute Volumeter Reading (cm^3)	Plus Hydrostatic Pressure (Bars)	Volume Correction (cm^3)	Corrected Volume (cm^3)	Membrane Resistance (Bars)	Corrected Pressure (Bars)
1	0.5	269	2.02	1.2	267.8	0.76	1.26
2	1.5	295	3.02	1.9	283.1	0.79	2.21
3	2.7	298	4.42	2.6	295.4	0.82	3.6
4	4	311	5.72	3.3	307.7	0.85	4.87
5	5.5	321	7.22	4.2	316.5	0.87	6.35
6	6.25	328	7.97	4.6	323.4	0.89	7.1
7	7.5	335	9.22	5.3	329.7	0.91	8.31
8	8.5	342	10.22	5.9	336.1	0.92	9.32
9	9.5	348	11.22	6.5	341.5	0.93	10.27
10	10.65	355	12.37	7.0	347.8	0.95	11.42
11	10	355	11.72	6.8	348.2	0.95	11.77
12	8.5	355	10.22	5.9	349.1	0.95	9.27
13	7.5	354	9.22	5.3	348.7	0.95	8.27
14	8.35	355	10.07	5.8	349.2	0.95	9.12
15	9.35	356	11.07	6.4	349.6	0.95	10.12
16	10.5	358	12.22	7.1	350.9	0.96	11.26
17	9.25	356	10.97	6.4	349.6	0.95	10.02
18	8.25	355	9.97	5.8	349.2	0.95	9.02
19	7.25	355	8.97	5.2	349.8	0.95	8.02
20	8.2	355	9.92	5.8	349.2	0.95	8.97
21	9.2	357	10.92	6.3	350.7	0.96	9.96
22	10.3	358	12.02	7.0	351.0	0.96	11.06
23	11.25	362	12.97	7.5	354.5	0.97	12.00
24	12.25	366	13.97	8.1	357.9	0.97	13.0[illegible]
25	14	375	15.72	9.1	365.9	0.99	14.73
26	16	387	17.72	10.3	376.7	1.02	16.70
27	18	400	19.72	11.4	388.6	1.04	18.68
28	20.25	415	21.97	12.7	402.3	1.07	20.9[illegible]
29	22	424	23.72	13.8	410.2	1.11	22.6
30	24	459	25.72	14.9	444.1	1.16	24.56
31	26	496	27.72	16.1	479.9	1.24	26.48
32	28	540	29.72	17.2	522.8	1.34	28.38

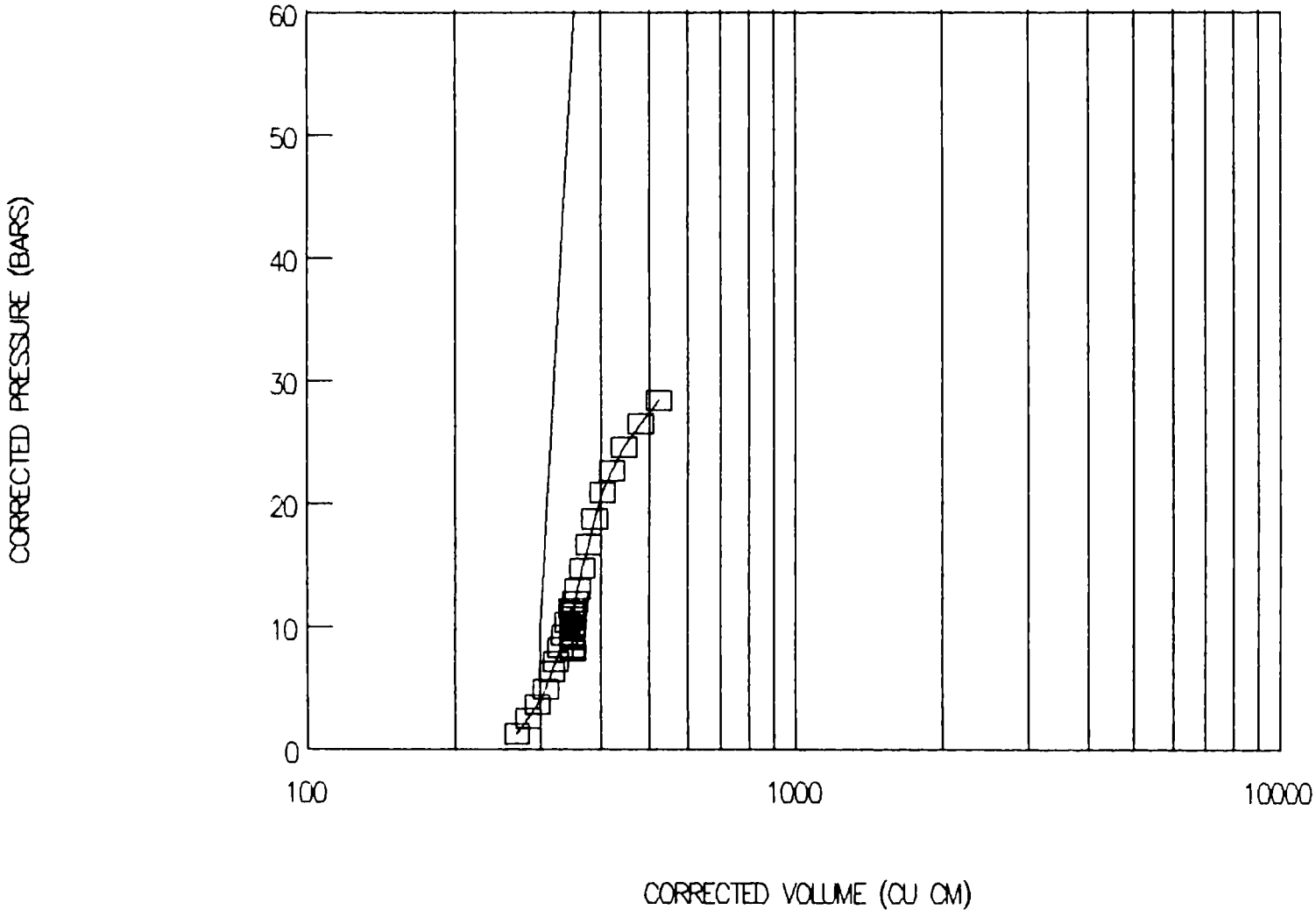
PRESSUREMETER TEST RESULTS

BORING EP-154



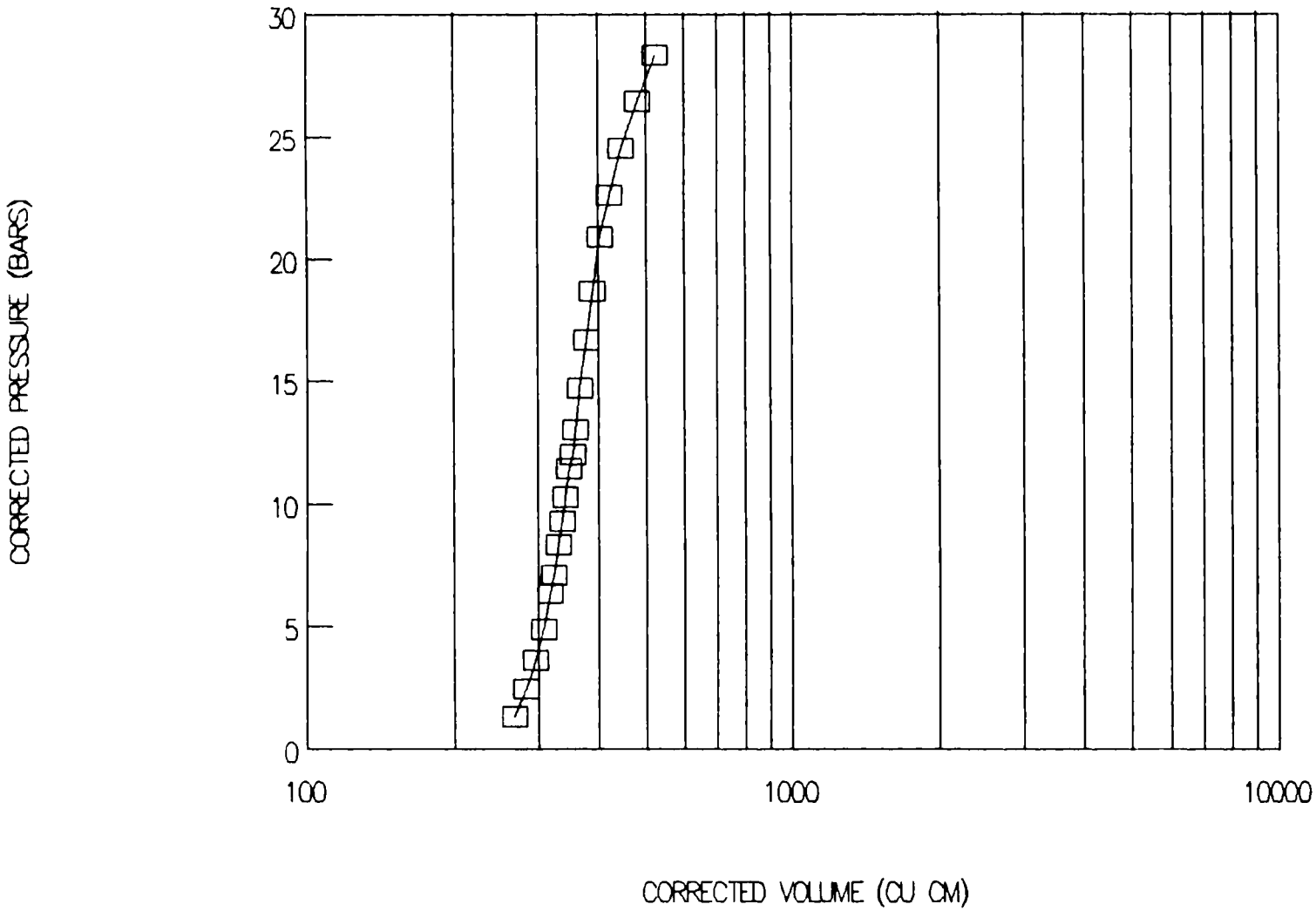
PRESSUREMETER TEST RESULTS

BORING EP-154



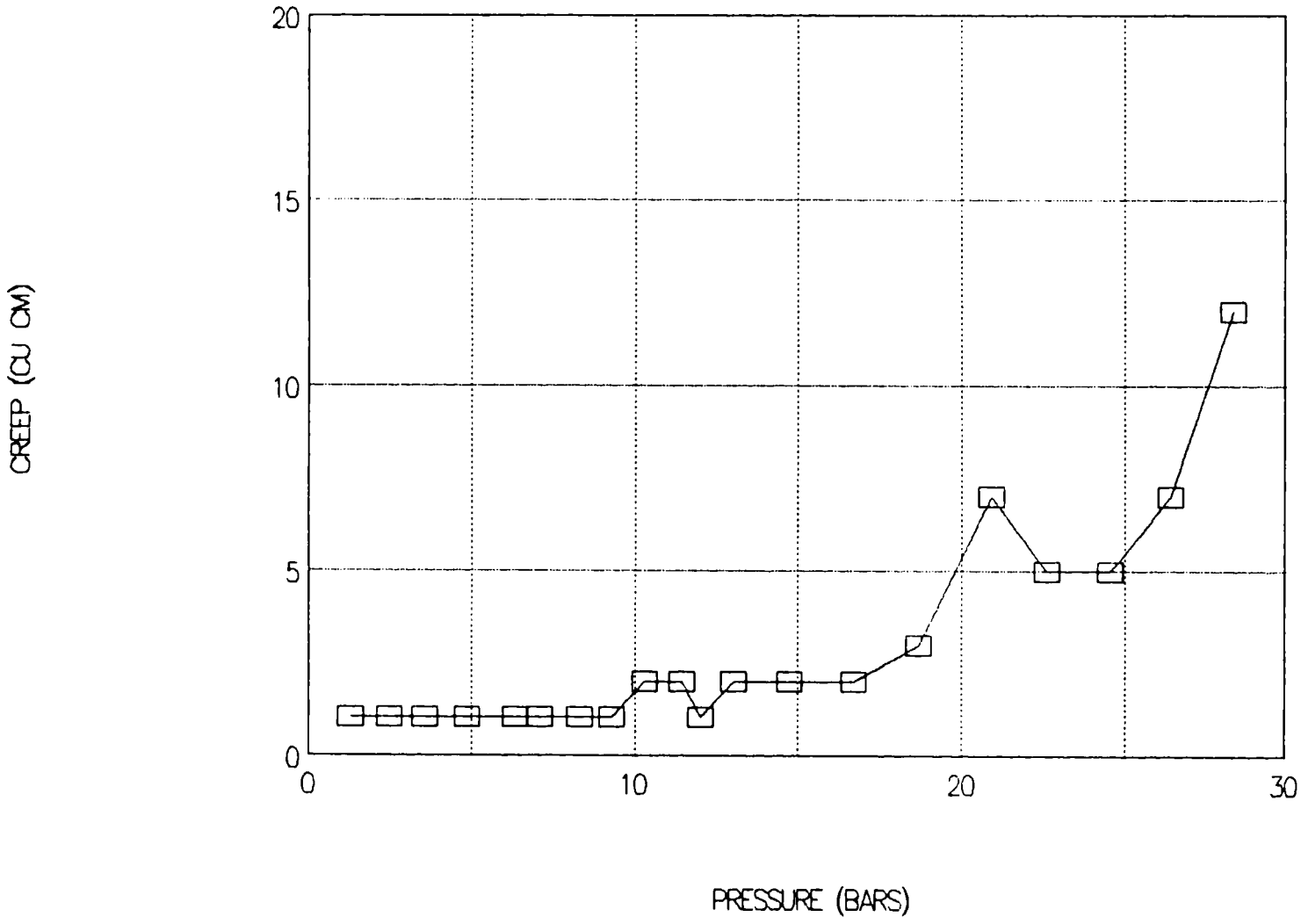
PRESSUREMETER TEST RESULTS

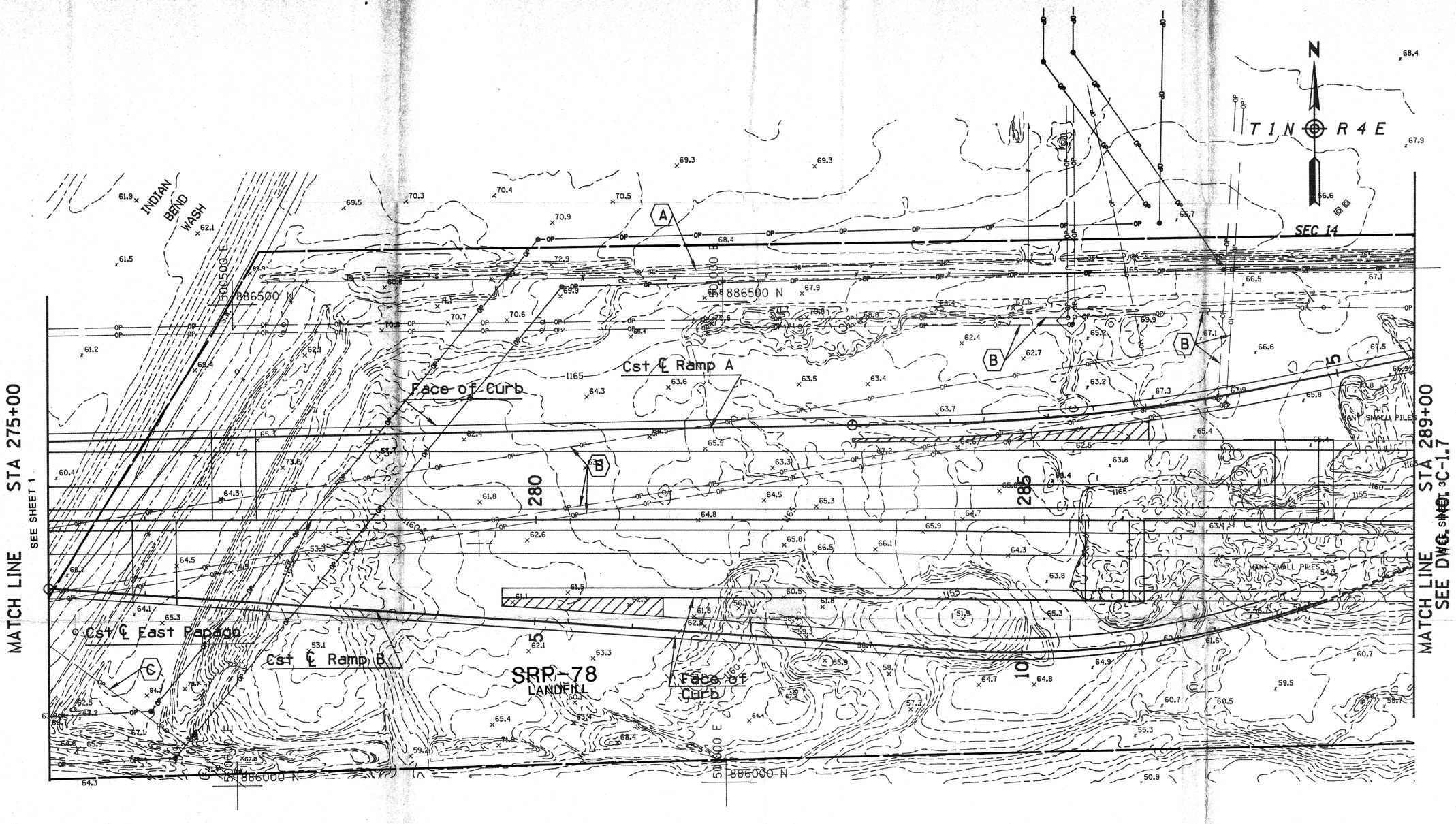
BORING EP-154 AT 149



CREEP CURVE

BORING EP-154 AT 149





LEGEND

PRELIMINARY ESTIMATE OF LANDFILL BOUNDARY

0 50' 100' 150'
SCALE, FEET

NOTE: BASE MAP FROM GANNETT FLEMING, JAN. 1990

NO.	DESCRIPTION	DATE

REVISIONS

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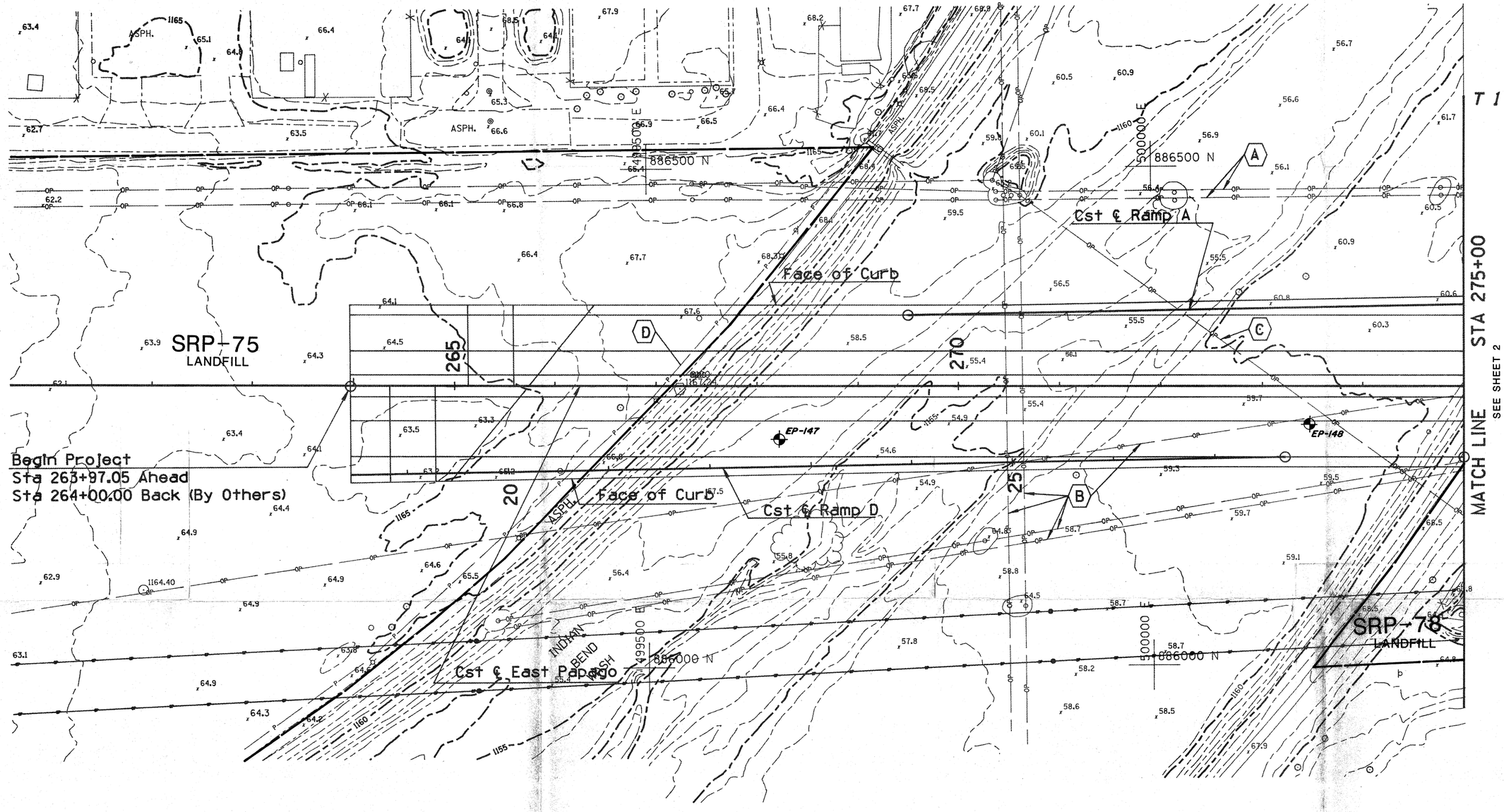
CONSULTING GEOTECHNICAL ENGINEERS

DESIGN SECTION 6
BORING LOCATION PLAN

JOB NO.	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	SHEET NO
E87-56	2/90	AH	TMP	AH	2 OF 6

541



LEGEND

PRELIMINARY ESTIMATE OF LANDFILL BOUNDARY

0 50' 100' 150'
SCALE, FEET

NOTE: BASE MAP FROM GANNETT FLEMING, JAN. 1990

NO.	DESCRIPTION	DATE

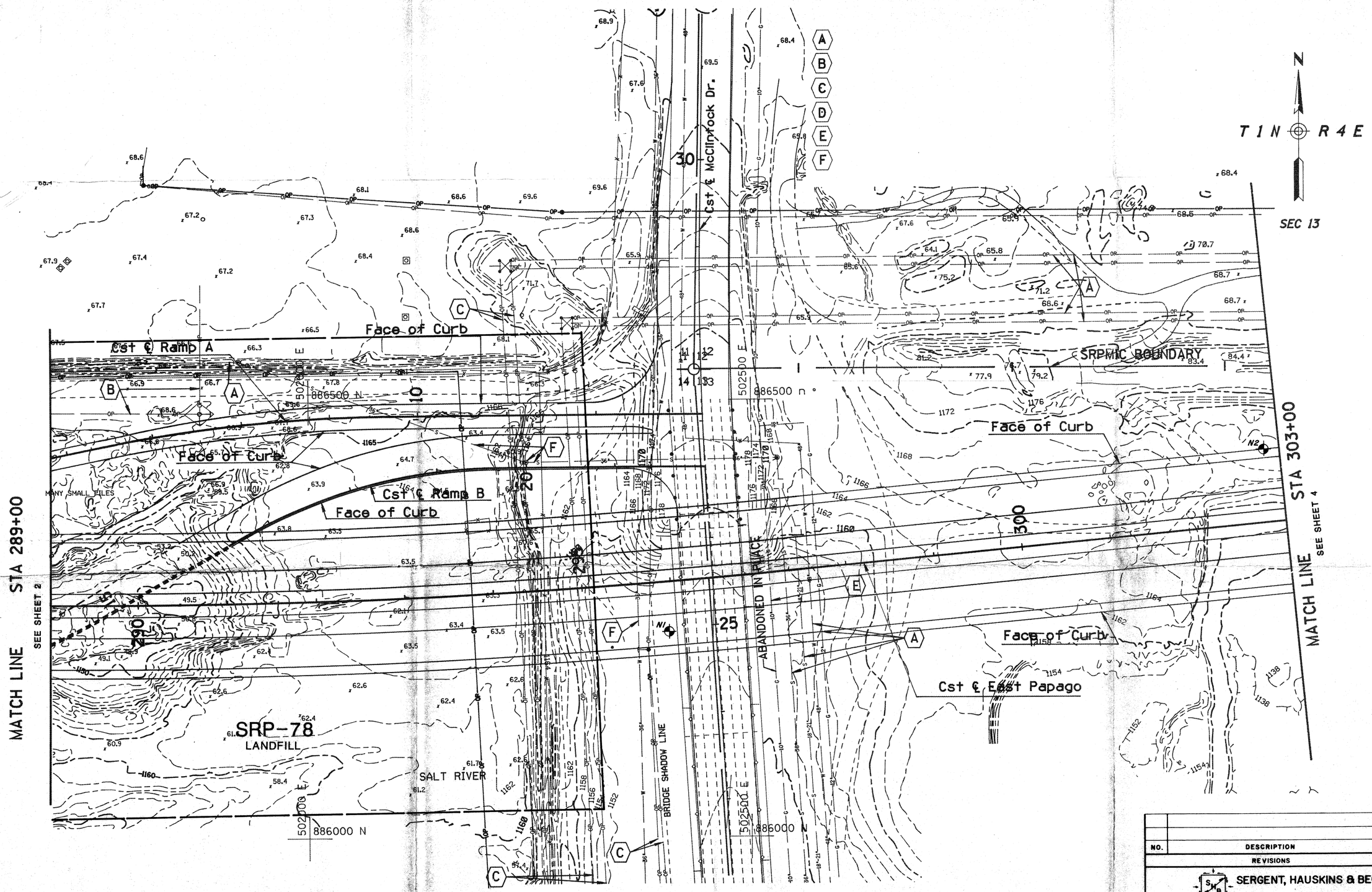
REVISIONS

SERGENT, HAUSKINS & BECKWITH
CONSULTING GEOTECHNICAL ENGINEERS

DESIGN SECTION 8
BORING LOCATION PLAN

JOB NO.	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	SHEET NO
E87-56	2-90	AH	TMP	AH	1 OF 8

541



NO.	DESCRIPTION	DATE

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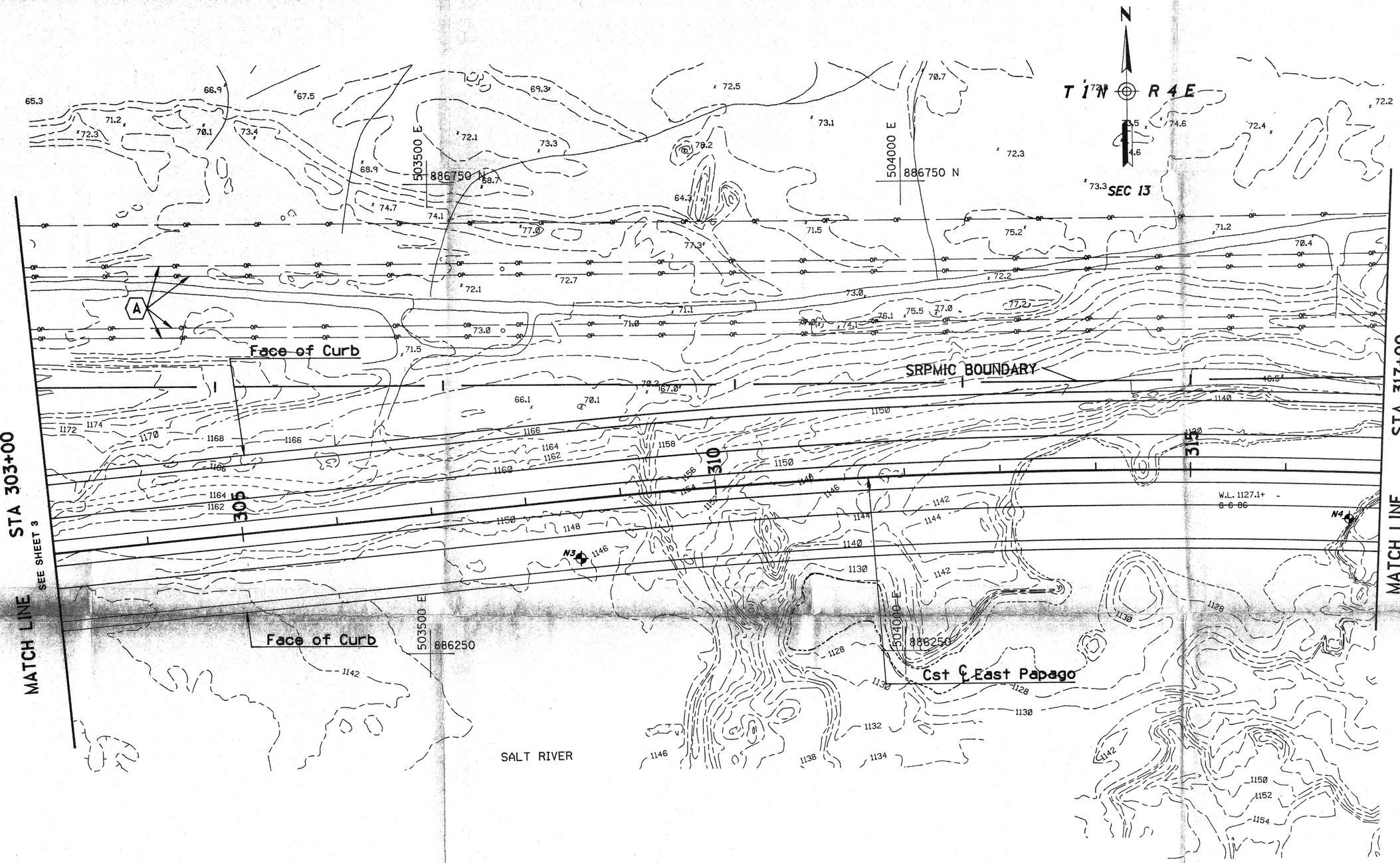
DESIGN SECTION 8
BORING LOCATION PLAN

JOB NO.	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	SHEET NO
E87-56	2/90	AH	TMP	AH	3 OF 6



0 50' 100' 150'
SCALE, FEET

NOTE: BASE MAP FROM GANNETT FLEMING, JAN. 1990

NO.	DESCRIPTION	DATE

REVISIONS

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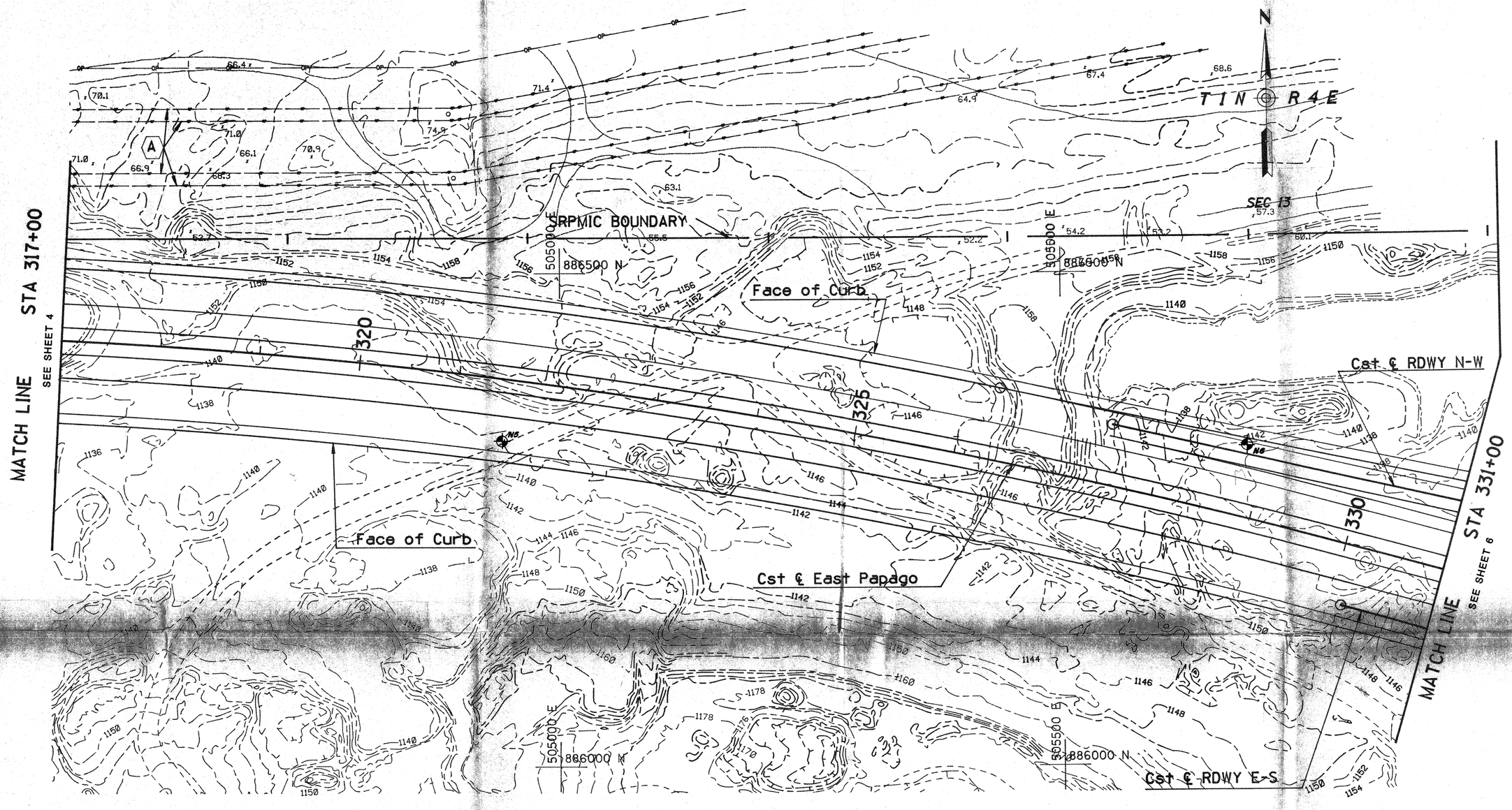
DESIGN SECTION S
BORING LOCATION PLAN

JOB NO.	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	SHEET NO
E87-56	2/90	AH	TMP	AH	4 OF 6



0 50' 100' 150'
SCALE, FEET

NOTE: BASE MAP FROM GANNETT FLEMING, JAN. 1990

NO.	DESCRIPTION	DATE

REVISIONS

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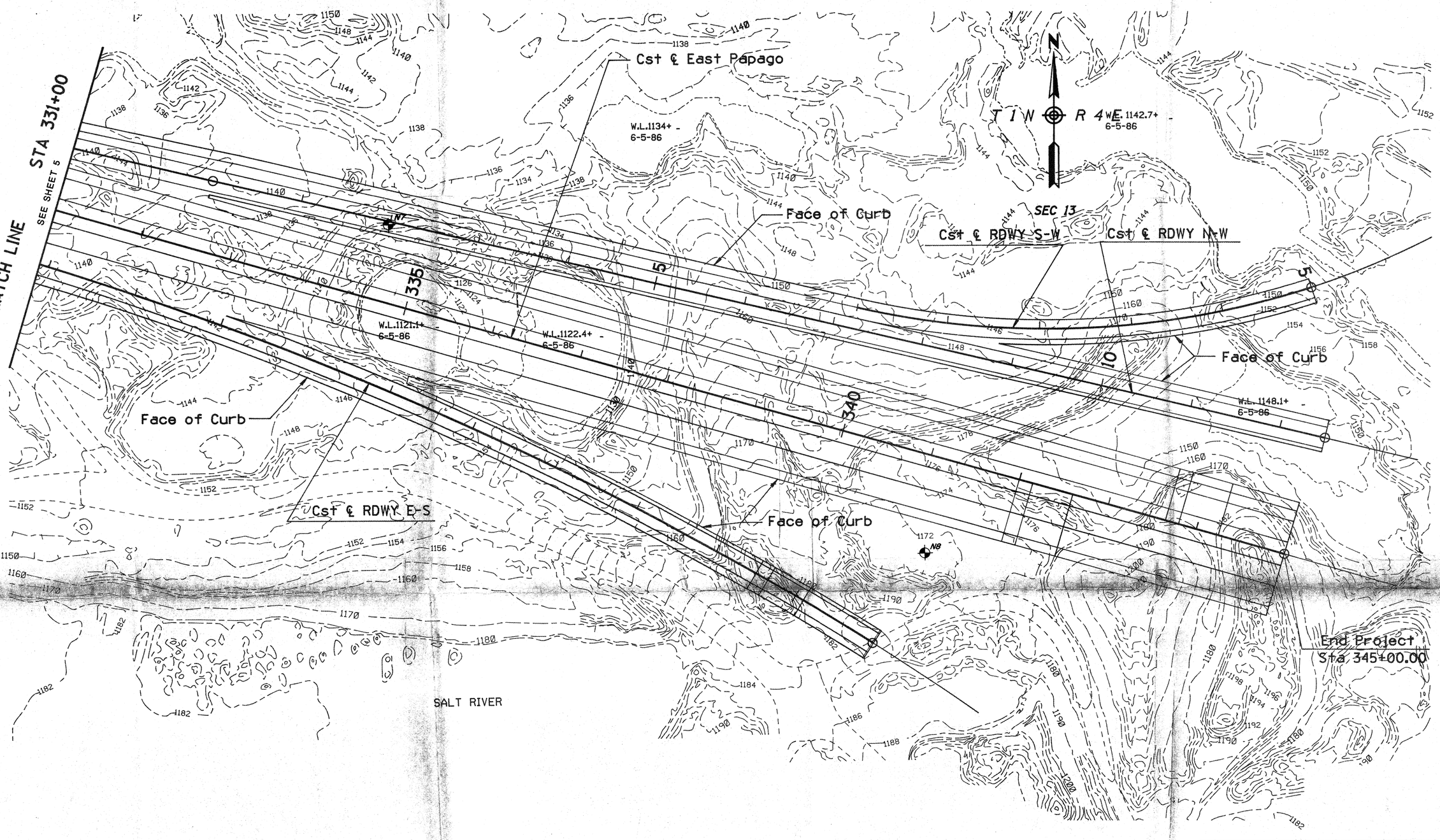
DESIGN SECTION 8
BORING LOCATION PLAN

JOB NO.	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	SHEET NO
E87-56	2/90	AH	TMP	AH	5 OF 6



0 50' 100' 150'
SCALE, FEET

NOTE: BASE MAP FROM GANNETT FLEMING, JAN. 1990

NO.	DESCRIPTION	DATE

REVISIONS

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DESIGN SECTION 8
BORING LOCATION PLAN

JOB NO.	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	SHEET NO
E87-56	2/90	AH	TMP	AH	6 OF 6

541