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NSA MID SOUTH
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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT
ASSEMBLY E FOR SOLID WASTE MANAGMENT UNITS 2, 9, 14, 38, 59 AND 65
MILLINGTON SUPPACT TN
6/13/1997
NAVFAC SOUTHERN

RCRA FACILITY INVESTIGATION REPORT
ASSEMBLY E
NAVAL SUPPORT ACTIVITY MEMPHIS

SWMUs 2, 9, 14, 38, 59, and 65

VOLUME II
ATTACHMENTS 1-7

CTO-106

SOUTHNAVFACENGCOM
CONTRACT NUMBER: N62467-89-D-0318

Revision: 0

Prepared for:

Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

June 13, 1997

RCRA FACILITY INVESTIGATION REPORT
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ATTACHMENT 1

TOPOGRAPHIC MAP – NSA MEMPHIS SOUTHSIDE

ATTACHMENT 3

DPT PIEZOCONE SOUNDINGS AND HYDROCONE PLOTS

Table 3-1
Summary of Horizontal Hydraulic Conductivity Estimates From Hydrocone Data
Assembly E DPT Investigation
NSA Memphis — Millington, Tennessee

Sample ID	Horizontal Hydraulic Conductivity (cm/sec)	Horizontal Hydraulic Conductivity (feet/day)
	SWMU 2 Upper Alluvium DPT Points	
002G001327	6.19e-06	0.01
002G001427	1.59e-05	0.04
002G001527	5.05e-06	0.01
002G001627	2.35e-06	< 0.01
002G001725	5.60e-06	0.01
002G001825	3.35e-06	< 0.01
002G001926	1.36e-05	0.03
002G002130	1.07e-06	< 0.01
002G002323	3.36e-06	< 0.01
002G002527	1.92e-06	< 0.01
002G002627	1.10e-07	< 0.01
002G002727	8.58e-07	< 0.01
AVERAGE	***4.95e-06***	***0.01***
	SWMU 2 Deeper Alluvium	
002G001337	7.53e-04	2.13
002G001440	7.22e-06	0.02
002G001540	3.25e-05	0.09
002G001639	6.97e-06	0.01
002G001736	9.25e-05	0.26
002G001836	1.49e-04	0.42
002G001939	1.13e-04	0.32
002G002039	7.90e-06	0.02
002G002149	4.99e-04	1.41
002G002249	1.18e-03	3.34
002G002336	2.90e-04	0.82
002G002436	9.87e-07	< 0.01
002G002540	2.36e-04	0.66
002G002643	2.26e-05	0.06
002G002741	8.81e-05	0.24
AVERAGE	***2.32e-04***	***0.65***

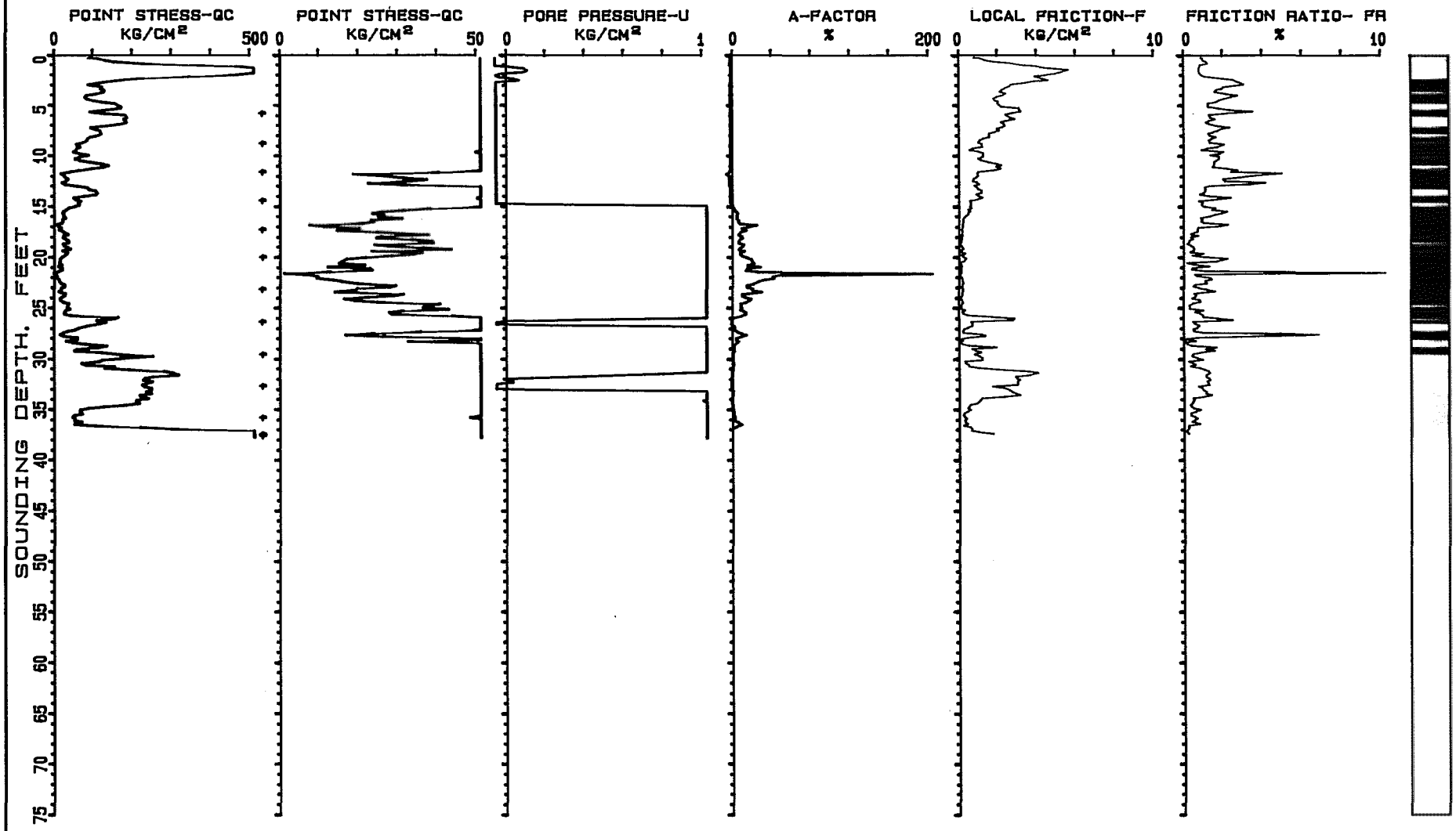
Table 3-1
Summary of Horizontal Hydraulic Conductivity Estimates From Hydrocone Data
Assembly E DPT Investigation
NSA Memphis — Millington, Tennessee

Sample ID	Horizontal Hydraulic Conductivity (cm/sec)	Horizontal Hydraulic Conductivity (feet/day)
SWMU 9 Deeper Alluvium DPT Points		
009G000946	2.15e-05	0.06
009G001046	2.39e-04	0.67
009G001150	6.36e-05	0.18
009G001246	9.97e-05	0.28
009G001348	2.19e-05	0.06
009G001445	1.30e-05	0.03
009G001547	1.00e-03	2.85
009G001644	5.43e-05	0.15
009G001747	5.07e-06	0.01
009G001852	1.57e-04	0.44
009G002142	3.47e-06	< 0.01
009G002244	1.63e-05	0.04
009G002347	5.28e-06	0.01
AVERAGE	***1.31e-04***	***0.37***
SWMU 14 Loess DPT Points		
014G000512	1.53e-05	0.04
014G000711	4.88e-05	0.13
014G000811	1.37e-05	0.03
014G000911	2.68e-05	0.07
014G001110	7.83e-06	0.02
014G001211	2.07e-06	0.01
014G001313	2.36e-05	0.06
014G001411	1.37e-04	0.39
AVERAGE	***3.44e-05***	***0.09***
SWMU 14 Upper Fluvial Deposits DPT Points		
014G000545	1.81e-04	0.51
014G000743	2.50e-05	0.07
014G000840	7.36e-06	0.02
014G000943	6.28e-05	0.17
014G001043	2.70e-05	0.07
014G001143	1.22e-05	0.03
014G001239	6.39e-07	< 0.01
014G001543	2.10e-06	< 0.01
AVERAGE	***3.98e-05***	***0.11***

SWMU 2

DPT SCREENING INVESTIGATION RESULTS

PIEZOCONE SOUNDING



* PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 02-P13
TEST DATE 11-07-1995 13: 13: 49

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 02-P13

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	SILTY FINE SAND	196.6	2.62	49	49	.03	>90%	>48	432	--	--	--	--
2	DENSE OR CEMENTED S.	541.7	4.69	90	90	.067	>90%	>48	1191	--	--	--	--
3	SILTY FINE SAND	222.6	3.58	55	55	.098	>90%	>48	489	--	--	--	--
4	SILTY TO CLAYEY F.S.	117	2.3	39	39	.128	>90%	>48	257	--	--	--	--
5	SILTY TO CLAYEY F.S.	112.8	2	37	37	.159	80%-90%	>48	248	--	--	--	--
6	SILTY TO CLAYEY F.S.	148.4	2.76	49	49	.19	>90%	>48	326	--	--	--	--
7	SILTY FINE SAND	183.1	2.46	45	45	.221	>90%	>48	402	--	--	--	--
8	SILTY FINE SAND	123.8	1.92	30	30	.251	80%-90%	46-48	272	--	--	--	--
9	SILTY FINE SAND	89.4	1.24	22	22	.282	70%-80%	44-46	196	--	--	--	--
10	SILTY TO CLAYEY F.S.	64.5	1.03	21	21	.313	60%-70%	44-46	141	--	--	--	--
11	SILTY TO CLAYEY F.S.	91.5	1.55	30	30	.344	70%-80%	44-46	201	--	--	--	--
12	SILTY TO CLAYEY F.S.	73.9	1.38	24	24	.375	70%-80%	42-44	162	--	--	--	--
13	CLAYEY FINE SAND	34.7	.85	13	13	.405	40%-50%	40-42	76	--	--	--	--
14	SILTY FINE SAND	92.4	1.05	23	23	.436	70%-80%	44-46	203	--	--	--	--
15	SILTY TO CLAYEY F.S.	63.1	.73	21	21	.467	60%-70%	42-44	138	--	--	--	--
16	SILTY TO CLAYEY F.S.	32.2	.45	10	10	.498	<40%	38-40	70	--	--	--	--
17	CLAYEY FINE SAND	20.5	.21	8	8	.528	<40%	36-38	45	--	--	--	--
18	SILTY TO CLAYEY F.S.	22.6	.14	7	7	.559	<40%	36-38	49	--	--	--	--
19	SILTY TO CLAYEY F.S.	31.3	.13	10	10	.59	<40%	36-38	68	--	--	--	--
20	SILTY TO CLAYEY F.S.	32	.22	10	10	.621	<40%	36-38	70	--	--	--	--
21	CLAYEY FINE SAND	17.2	.17	6	6	.651	<40%	32-34	37	--	--	--	--
22	CLAYEY FINE SAND	13	.08	5	5	.682	<40%	30-32	28	--	--	--	--
23	CLAYEY FINE SAND	18.4	.17	7	7	.713	<40%	32-34	40	--	--	--	--
24	SILTY TO CLAYEY F.S.	22.8	.17	7	7	.744	<40%	34-36	50	--	--	--	--
25	SILTY TO CLAYEY F.S.	28.2	.14	9	9	.775	<40%	36-38	62	--	--	--	--
26	SILTY TO CLAYEY F.S.	53.9	.84	17	17	.805	40%-50%	38-40	118	--	--	--	--
27	FINE SAND	119.3	1.19	23	23	.838	60%-70%	42-44	262	--	--	--	--
28	SILTY TO CLAYEY F.S.	40.9	.52	13	13	.869	<40%	36-38	89	--	--	--	--
29	SILTY FINE SAND	78	.43	19	19	.9	50%-60%	40-42	171	--	--	--	--
30	FINE SAND	135.6	.98	27	27	.933	70%-80%	42-44	298	--	--	--	--

02-P13 CONTINUED ENSAFE

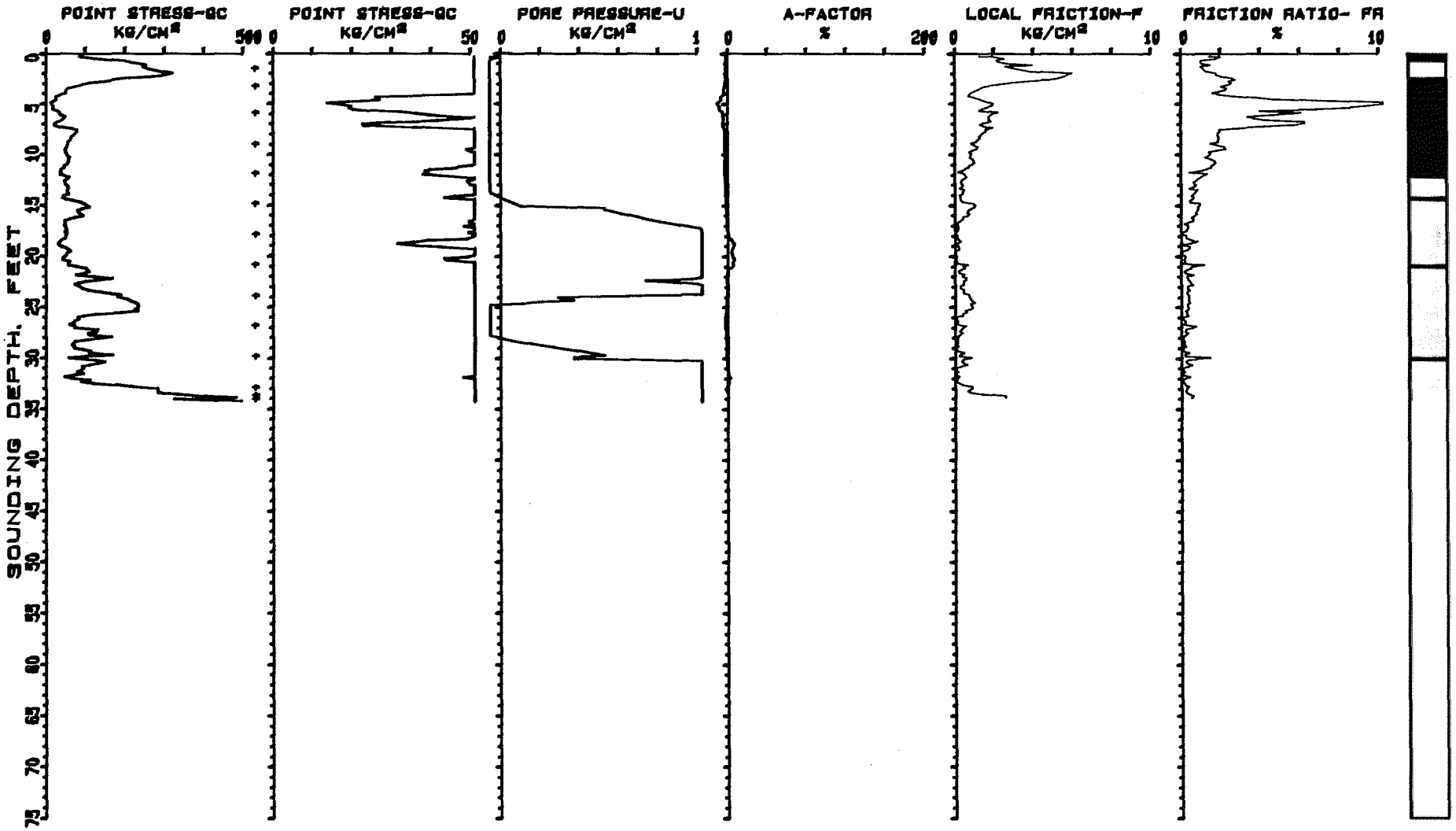
DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	FINE SAND	121.4	.85	24	24	.966	60%-70%	40-42	267	--	--	--	--
32	FINE SAND	245.6	3.17	49	49	1	>90%	44-46	540	--	--	--	--
33	FINE SAND	237	2.66	47	47	1.033	>90%	44-46	521	--	--	--	--
34	FINE SAND	238.7	2.26	47	47	1.066	>90%	44-46	525	--	--	--	--
35	FINE SAND	182.6	.71	36	36	1.099	70%-80%	42-44	401	--	--	--	--
36	SILTY FINE SAND	64.1	.33	16	16	1.13	40%-50%	38-40	141	--	--	--	--
37	FINE SAND	123.7	.45	24	24	1.163	60%-70%	40-42	272	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBERTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

ADDITIONAL LOCAL CORRELATIONS DEVELOPED BY IN-SITU TECHNOLOGY HAVE ALSO BEEN USED IN COMPUTING THE ABOVE DATA. IT IS THE POLICY OF IN-SITU TECHNOLOGY TO CONTINUALLY UPGRADE AND MODIFY C.P.T CORRELATIONS AS PUBLISHED RESEARCH AND LOCAL EXPERIENCE GROWS.

PIEZOCONE SOUNDING



* PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 02-P20
TEST DATE 11-08-1995 14:40:57

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 02-P20

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	SILTY FINE SAND	179.6	2.76	44	44	.03	>90%	>48	395	--	--	--	--
2	SILTY FINE SAND	272	4.23	68	68	.061	>90%	>48	598	--	--	--	--
3	SILTY FINE SAND	219.9	4.35	54	54	.092	>90%	>48	483	--	--	--	--
4	SILTY TO CLAYEY F.S.	70	1.28	23	23	.123	70%-80%	>48	154	--	--	--	--
5	SILTY CLAY TO CLAY	28.9	1.28	19	19	.15	--	--	--	1.78	2.2	UD	>6
6	CLAY	22.7	1.76	22	22	.175	--	--	--	1.39	1.2	UD	>6
7	SILTY CLAY TO CLAY	38.3	1.67	25	25	.202	--	--	--	2.36	2.2	UD	>6
8	CLAYEY FINE SAND	55.1	1.52	22	22	.233	60%-70%	44-46	121	--	--	--	--
9	SILTY TO CLAYEY F.S.	64.3	1.12	21	21	.264	70%-80%	44-46	141	--	--	--	--
10	SILTY TO CLAYEY F.S.	52.9	.94	17	17	.294	60%-70%	42-44	116	--	--	--	--
11	SILTY TO CLAYEY F.S.	57.5	.88	19	19	.325	60%-70%	42-44	126	--	--	--	--
12	SILTY TO CLAYEY F.S.	43.4	.53	14	14	.356	50%-60%	40-42	95	--	--	--	--
13	SILTY FINE SAND	51	.44	12	12	.387	60%-70%	42-44	112	--	--	--	--
14	SILTY FINE SAND	56.1	.37	14	14	.418	60%-70%	42-44	123	--	--	--	--
15	SILTY FINE SAND	70.8	.58	17	17	.448	60%-70%	42-44	155	--	--	--	--
16	SILTY FINE SAND	95.3	.72	23	23	.479	70%-80%	42-44	209	--	--	--	--
17	SILTY FINE SAND	62	.26	15	15	.51	50%-60%	40-42	136	--	--	--	--
18	SILTY FINE SAND	52.5	.04	13	13	.541	50%-60%	40-42	115	--	--	--	--
19	SILTY FINE SAND	40.6	.05	10	10	.571	40%-50%	38-40	89	--	--	--	--
20	SILTY FINE SAND	54	.04	13	13	.602	50%-60%	40-42	118	--	--	--	--
21	SILTY FINE SAND	56.8	.18	14	14	.633	50%-60%	40-42	124	--	--	--	--
22	FINE SAND	101	.41	20	20	.666	60%-70%	42-44	222	--	--	--	--
23	FINE SAND	111.2	.45	22	22	.699	70%-80%	42-44	244	--	--	--	--
24	FINE SAND	138.1	.57	27	27	.733	70%-80%	42-44	303	--	--	--	--
25	DENSE OR CEMENTED S.	220.6	.89	36	36	.769	>90%	44-46	485	--	--	--	--
26	FINE SAND	170.9	.42	34	34	.802	80%-90%	44-46	375	--	--	--	--
27	SILTY FINE SAND	74.3	.26	18	18	.833	50%-60%	40-42	163	--	--	--	--
28	FINE SAND	123.4	.24	24	24	.866	70%-80%	42-44	271	--	--	--	--
29	FINE SAND	85.2	.08	17	17	.9	50%-60%	40-42	187	--	--	--	--
30	FINE SAND	104	.33	20	20	.933	60%-70%	40-42	228	--	--	--	--

2-P20 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	FINE SAND	109.9	.29	21	21	.966	60%-70%	40-42	241	--	--	--	--
32	FINE SAND	78.5	.07	15	15	.999	50%-60%	38-40	172	--	--	--	--
33	FINE SAND	154.6	.43	30	30	1.032	70%-80%	42-44	340	--	--	--	--

N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
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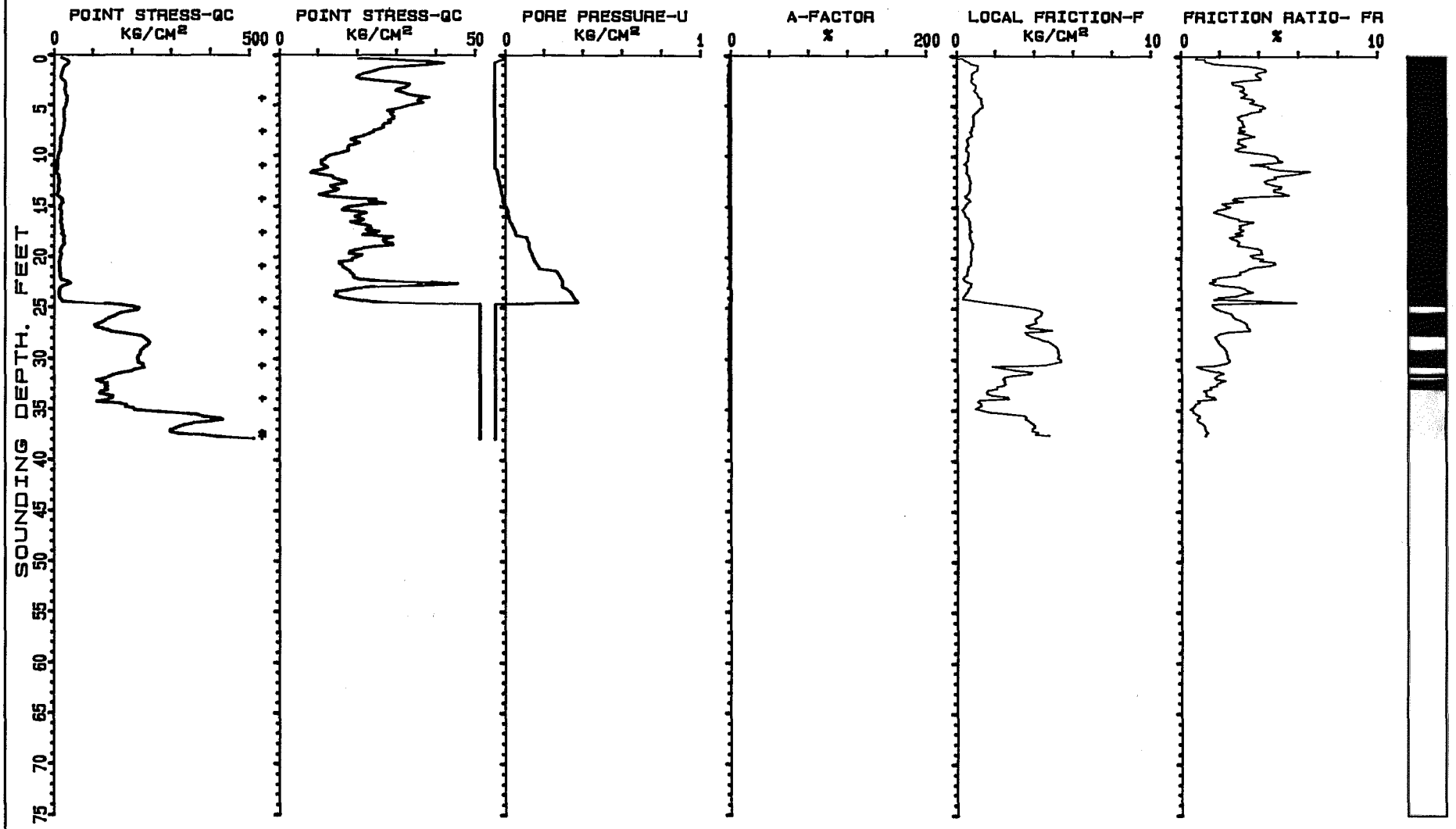
PIEZOCONE SOUNDING



* PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 02-P23
TEST DATE 12-01-1995 10: 28: 43

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 02-P23

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N' VALUES	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%)	FRICTION ANGLE (DEGREES)	YOUNGS MODULUS (KG/CM2)	UNDRAINED SHEAR STRENGTH (KG/CM2)	SENSITIVITY	COMP.	OCR
				#			*	**	***	****			
1	CLAYEY FINE SAND	35.6	.85	14	14	.03	60%-70%	>48	78	.97	3.7	.01	6
2	SANDY CLAY	26.2	.97	13	13	.058	--	--	--	1.63	2.6	.02	>6
3	SANDY CLAY	25.3	.87	12	12	.085	--	--	--	1.57	2.9	.02	>6
4	SANDY CLAY	32	1.05	16	16	.112	--	--	--	1.98	3	.01	>6
5	SANDY CLAY	35.5	1.31	17	17	.14	--	--	--	2.2	2.7	.01	>6
6	SANDY CLAY	29.7	1.06	14	14	.167	--	--	--	1.83	2.7	.01	>6
7	SANDY CLAY	28	.85	14	14	.194	--	--	--	1.72	3.2	.02	>6
8	SANDY CLAY	24.4	.74	12	12	.222	--	--	--	1.49	3.2	.02	>6
9	SANDY CLAY	19.4	.57	9	9	.249	--	--	--	1.17	3.3	.01	>6
10	SILTY CLAY TO CLAY	16.3	.57	10	10	.276	--	--	--	.98	2.8	.01	6
11	CLAY	11.5	.52	11	11	.301	--	--	--	.67	2.1	.02	6
[illegible]	CLAY	10.9	.58	10	10	.326	--	--	--	.63	1.8	.02	6
13	CLAY	15.1	.7	15	15	.351	--	--	--	.89	2.1	.01	6
14	CLAY	13.1	.61	13	13	.376	--	--	--	.76	2.1	.01	6
15	SANDY CLAY	20.7	.53	10	10	.403	--	--	--	1.23	3.8	.02	6
16	SANDY CLAY	18.9	.41	9	9	.431	--	--	--	1.12	4.5	.01	6
17	SANDY CLAY	20.7	.66	10	10	.458	--	--	--	1.23	3.1	.02	6
18	SANDY CLAY	24.1	.7	12	12	.485	--	--	--	1.44	3.4	.02	6
19	SANDY CLAY	27.5	.8	13	13	.513	--	--	--	1.65	3.4	.02	6
20	SILTY CLAY TO CLAY	20.2	.76	13	13	.54	--	--	--	1.19	2.6	UD	6
21	SILTY CLAY TO CLAY	17.2	.7	11	11	.567	--	--	--	.99	2.4	.01	6
22	SANDY CLAY	18.1	.5	9	9	.595	--	--	--	1.05	3.5	.01	6
23	CLAYEY FINE SAND	29.7	.6	11	11	.626	<40%	36-38	65	--	--	--	--
24	SANDY CLAY	17	.45	8	8	.653	--	--	--	.97	3.7	.01	6
25	SILTY TO CLAYEY F.S.	101.3	2.4	33	33	.684	60%-70%	42-44	222	--	--	--	--
26	SILTY TO CLAYEY F.S.	179.6	4.2	59	59	.714	80%-90%	44-46	395	--	--	--	--
27	CLAYEY FINE SAND	121.8	4.06	48	48	.745	70%-80%	42-44	267	--	--	--	--
28	SILTY TO CLAYEY F.S.	175.7	4.06	58	58	.776	80%-90%	44-46	386	--	--	--	--
29	SILTY FINE SAND	239.7	4.87	59	59	.807	>90%	44-46	527	--	--	--	--
30	SILTY TO CLAYEY F.S.	222.5	5.22	74	74	.838	>90%	44-46	489	--	--	--	--

02-P23 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SILTY FINE SAND	222.2	3.92	55	55	.868	>90%	44-46	488	--	--	--	--
32	SILTY FINE SAND	176.1	2.93	44	44	.899	80%-90%	42-44	387	--	--	--	--
33	SILTY FINE SAND	127.5	2.17	31	31	.93	70%-80%	42-44	280	--	--	--	--
34	SILTY FINE SAND	135.1	1.81	33	33	.961	70%-80%	42-44	297	--	--	--	--
35	FINE SAND	169.2	1.19	33	33	.994	70%-80%	42-44	372	--	--	--	--
36	FINE SAND	347.2	3.18	69	69	1.027	>90%	46-48	763	--	--	--	--
37	FINE SAND	350.3	3.93	70	70	1.06	>90%	46-48	770	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBERTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

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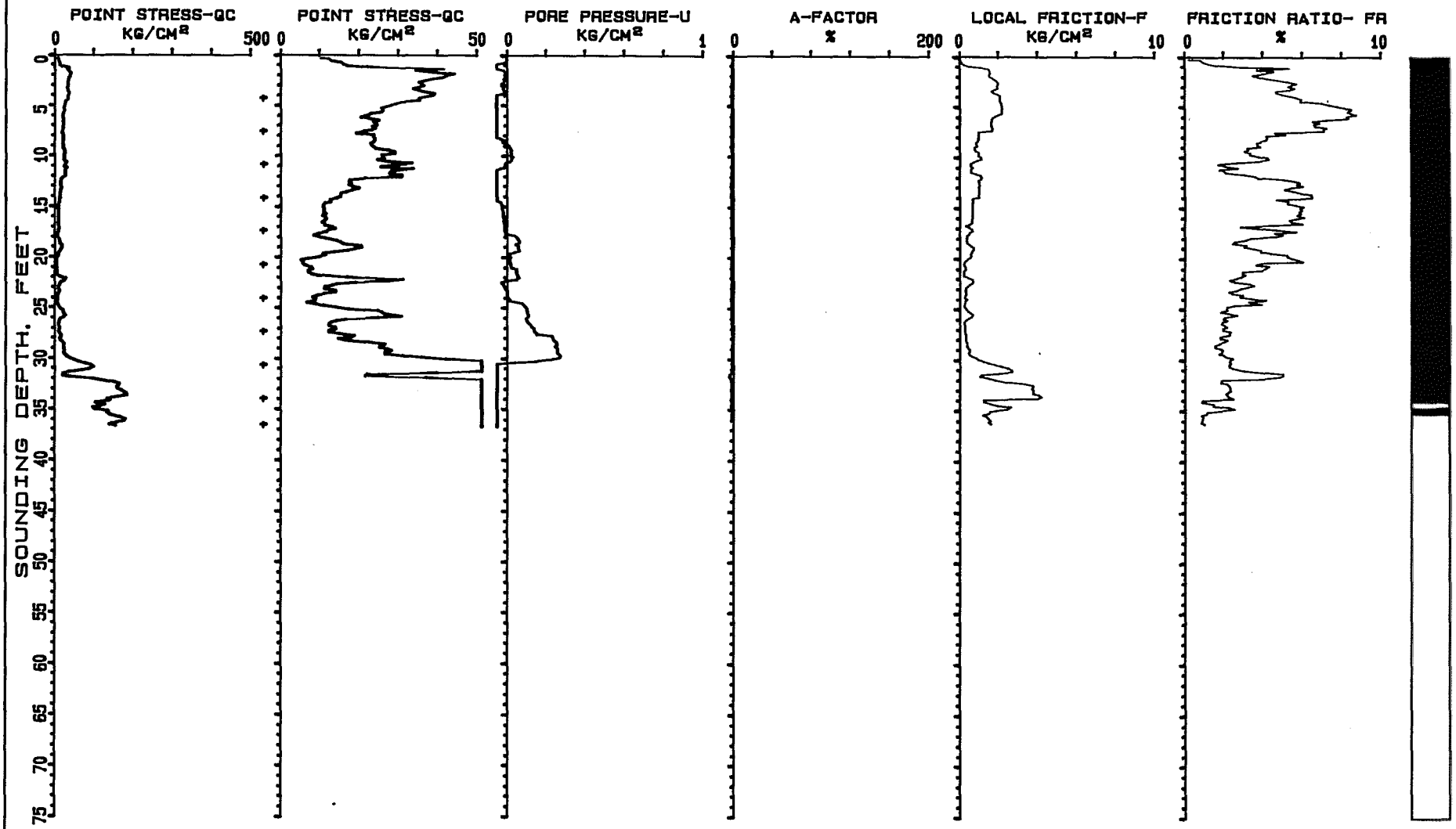
PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 02-P24
TEST DATE 12-01-1995 17:50:46

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 02-P24

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N' VALUES #	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	SANDY CLAY	15	.45	7	7	.027	--	--	--	.93	3.3	.01	>6
2	SILTY CLAY TO CLAY	34.5	1.52	23	23	.054	--	--	--	2.14	2.2	UD	>6
3	CLAY	38	1.91	38	38	.079	--	--	--	2.36	1.9	UD	>6
4	CLAY	36.6	1.9	36	36	.104	--	--	--	2.27	1.9	UD	>6
5	CLAY	33.5	2.15	33	33	.129	--	--	--	2.07	1.5	UD	>6
6	CLAY	25.3	2.02	25	25	.154	--	--	--	1.56	1.2	UD	>6
7	CLAY	23.3	1.64	23	23	.179	--	--	--	1.43	1.4	UD	>6
8	CLAY	22.8	1.28	22	22	.204	--	--	--	1.39	1.7	UD	>6
9	SILTY CLAY TO CLAY	23.7	.9	15	15	.231	--	--	--	1.44	2.6	UD	>6
10	SANDY CLAY	26.2	.91	13	13	.258	--	--	--	1.6	2.8	.02	>6
11	SANDY CLAY	27.4	.81	13	13	.286	--	--	--	1.67	3.3	.02	>6
12	CLAYEY FINE SAND	29.1	.8	11	11	.316	40%-50%	40-42	64	--	--	--	--
13	CLAY	21.5	1.04	21	21	.341	--	--	--	1.29	2	UD	6
14	CLAY	17.1	.95	17	17	.366	--	--	--	1.01	1.7	.01	6
15	CLAY	12.5	.65	12	12	.391	--	--	--	.72	1.9	.02	6
16	CLAY	11.1	.65	11	11	.416	--	--	--	.63	1.7	.02	6
17	CLAY	11.6	.55	11	11	.441	--	--	--	.66	2	.02	6
18	CLAY	11.3	.49	11	11	.466	--	--	--	.64	2.3	.02	6
19	SILTY CLAY TO CLAY	15.5	.52	10	10	.493	--	--	--	.9	2.9	.01	6
20	SILTY CLAY TO CLAY	14.7	.59	9	9	.521	--	--	--	.84	2.4	.01	6
21	CLAY	6.8	.29	6	6	.545	--	--	--	.35	2.2	.03	3
22	CLAY	9.3	.34	9	9	.57	--	--	--	.5	2.6	.02	3
23	SANDY CLAY	19.1	.51	9	9	.598	--	--	--	1.11	3.7	.01	6
24	SANDY CLAY	11.3	.31	5	5	.625	--	--	--	.62	3.6	.02	3
25	SILTY CLAY TO CLAY	9.7	.29	6	6	.652	--	--	--	.51	3.2	.02	3
26	CLAYEY FINE SAND	23.6	.51	9	9	.683	<40%	34-36	51	--	--	--	--
27	CLAYEY FINE SAND	15.3	.27	6	6	.714	<40%	32-34	33	--	--	--	--
28	SANDY CLAY	15	.3	7	7	.741	--	--	--	.83	4.8	.01	6
29	CLAYEY FINE SAND	22	.42	8	8	.772	<40%	34-36	48	--	--	--	--
30	CLAYEY FINE SAND	31.2	.75	12	12	.803	<40%	36-38	68	--	--	--	--

02-P24 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	CLAYEY FINE SAND	75.3	2.08	30	30	.834	50%-60%	40-42	165	--	--	--	--
32	CLAYEY FINE SAND	53.8	1.78	21	21	.864	40%-50%	38-40	118	--	--	--	--
33	SILTY TO CLAYEY F.S.	148.7	3.52	49	49	.895	70%-80%	42-44	327	--	--	--	--
34	SILTY FINE SAND	169.3	3.19	42	42	.926	80%-90%	42-44	372	--	--	--	--
35	SILTY FINE SAND	118.9	1.9	29	29	.957	60%-70%	40-42	261	--	--	--	--
36	FINE SAND	144.9	1.43	28	28	.99	70%-80%	42-44	318	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
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*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
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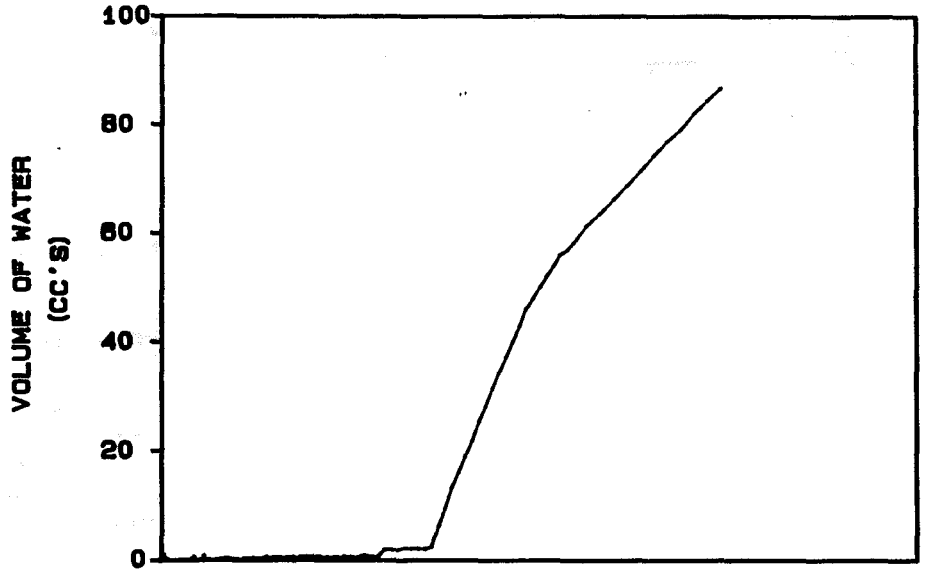
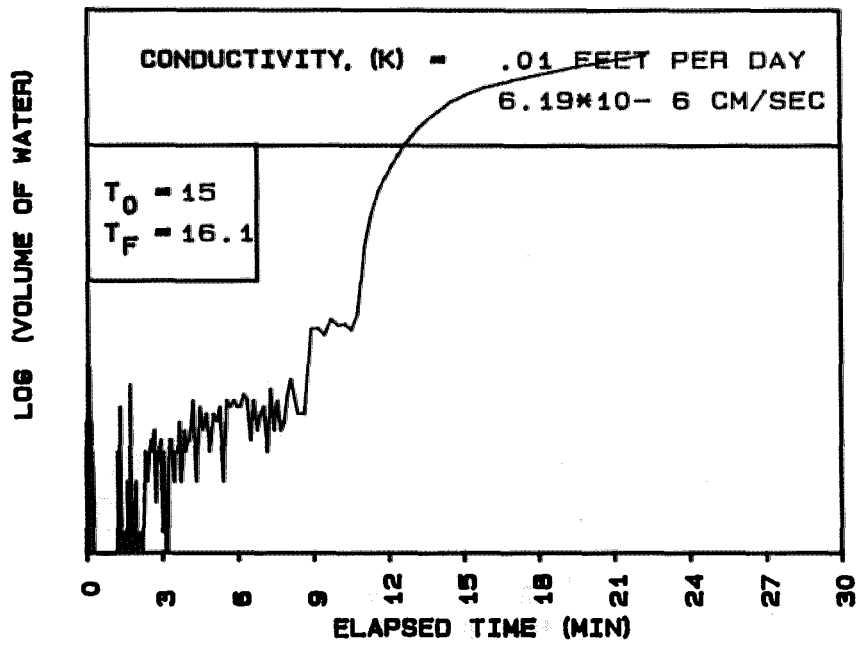
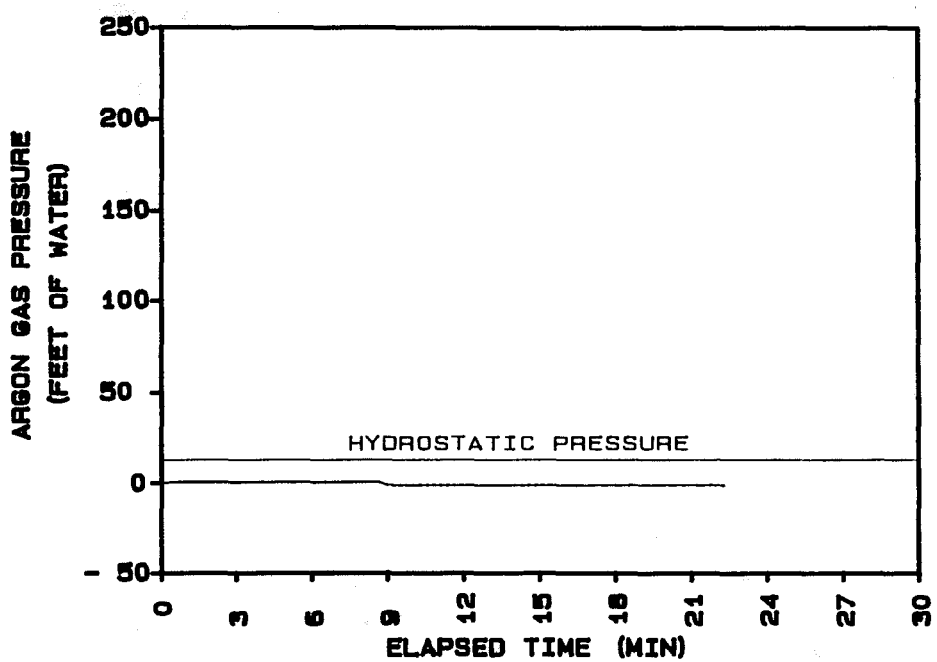
HYDROCONE TEST



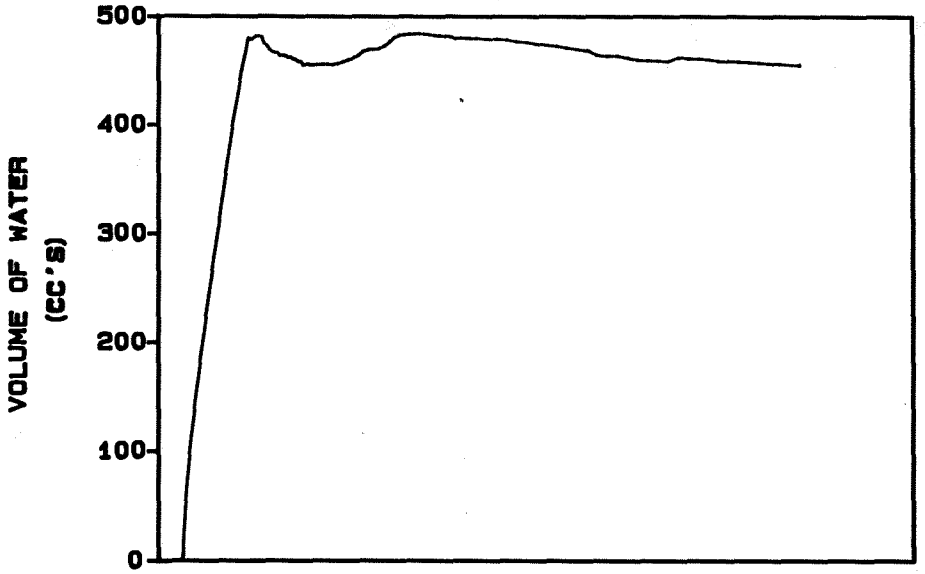


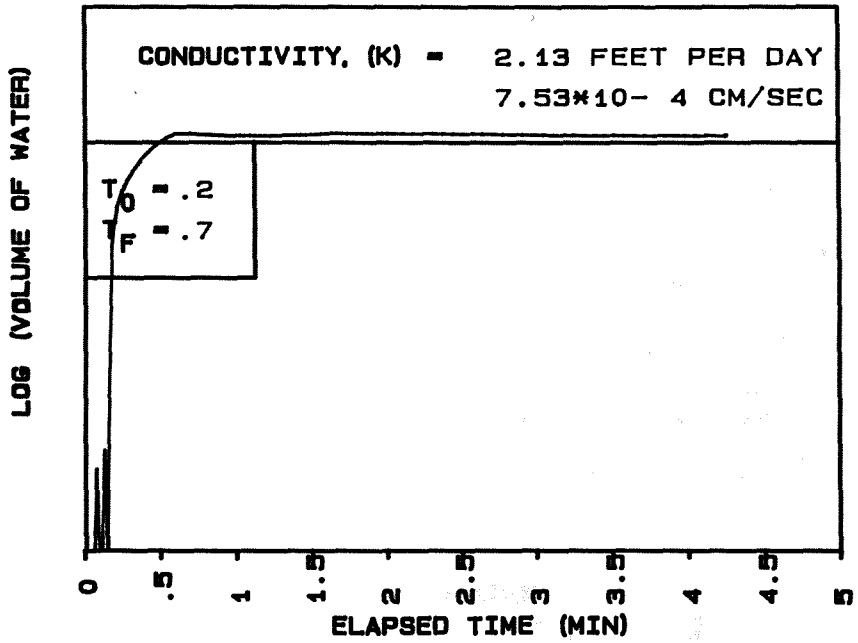


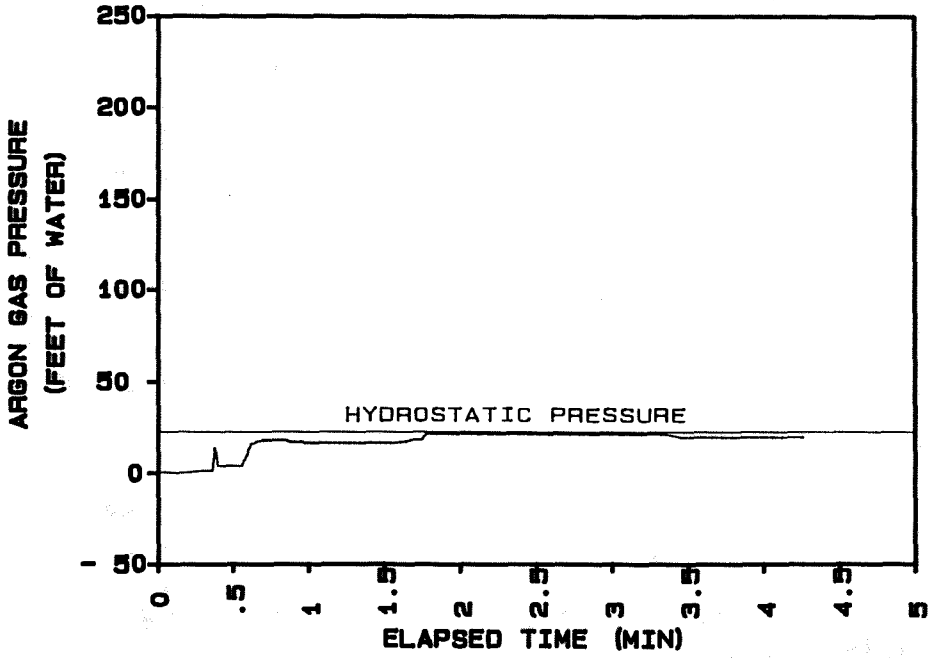
ENSAFE MEMPHIS NSA
LOCATION... 02H1327
TEST DATE
18: 12: 10 12-11-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



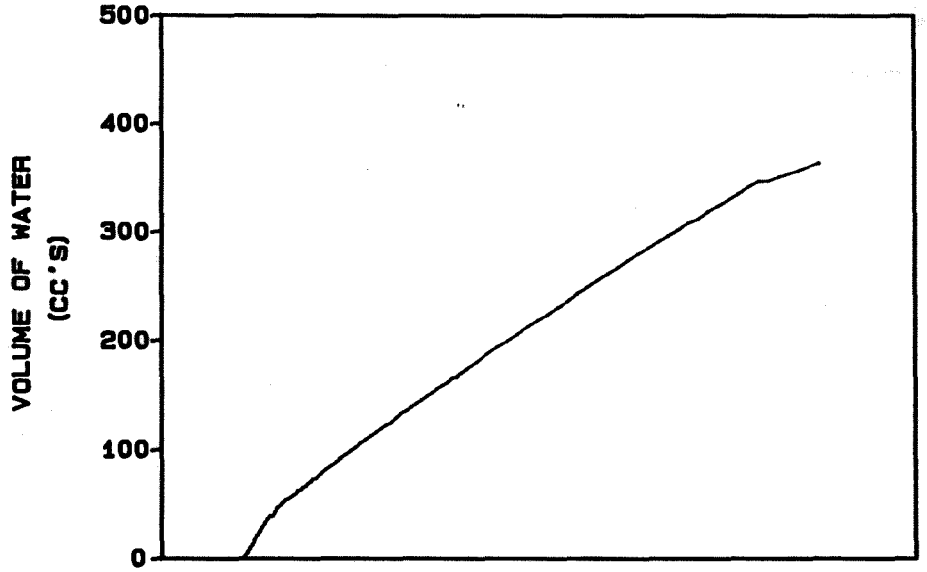


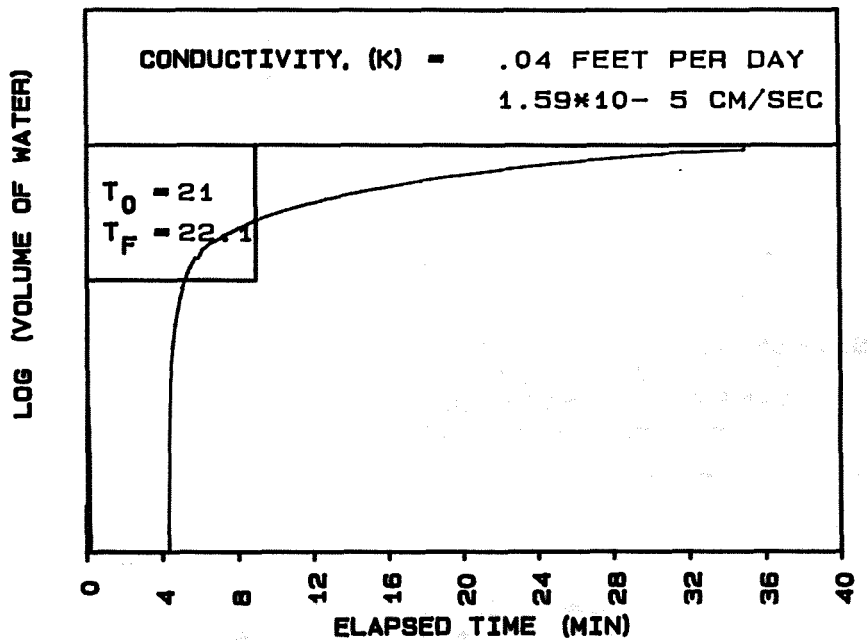


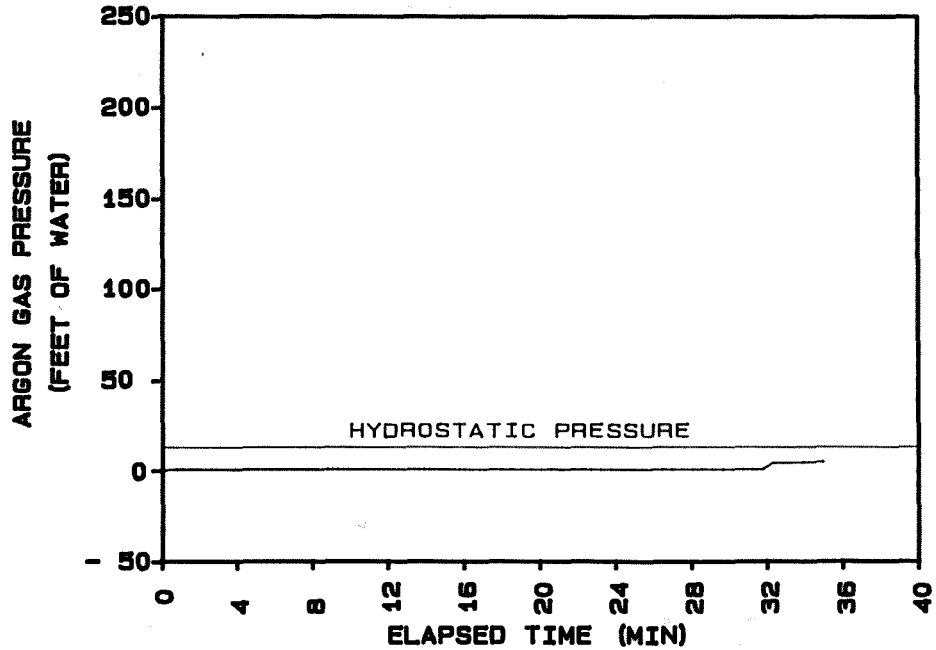
ENSAFE MEMPHIS NSA
LOCATION... 02H1337
TEST DATE
10: 05: 34 12-12-1995

SAMPLE DEPTH (FT) 37
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



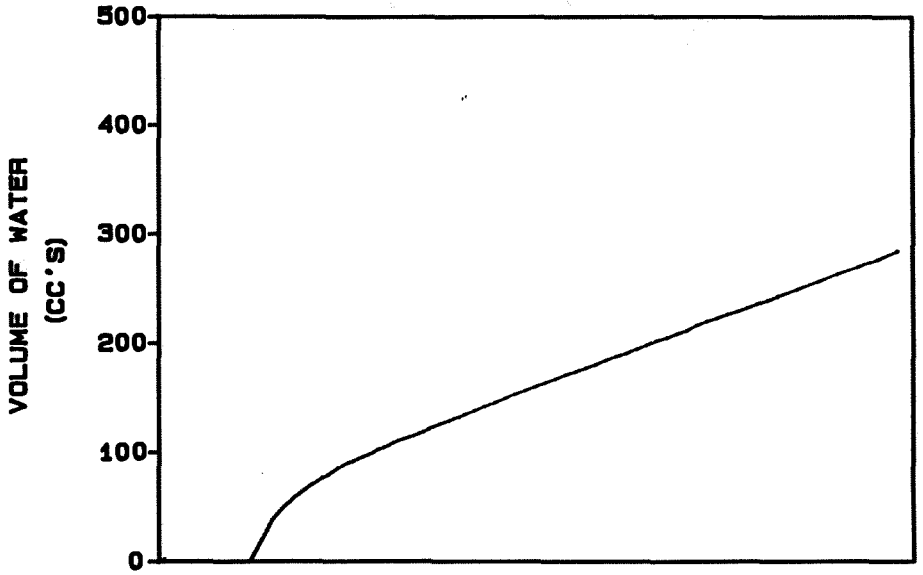


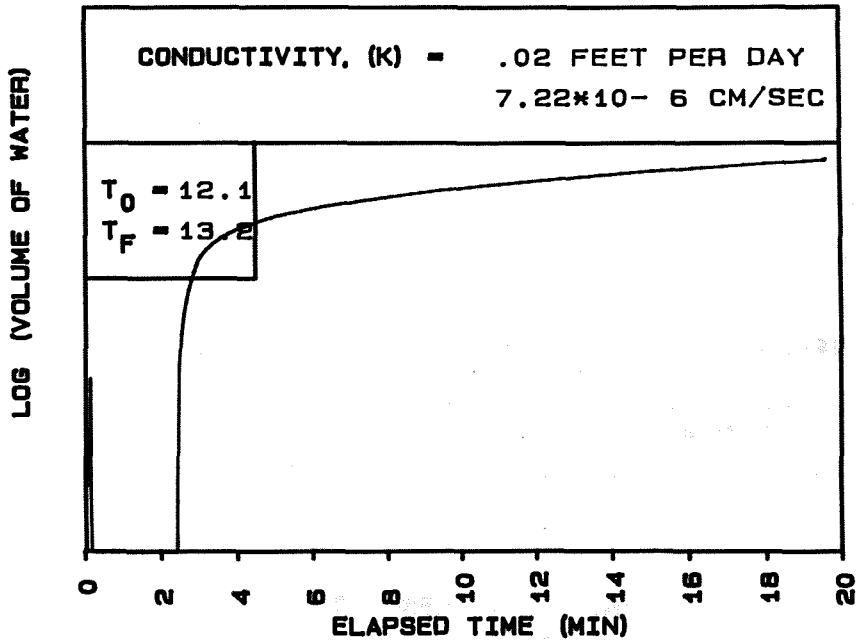


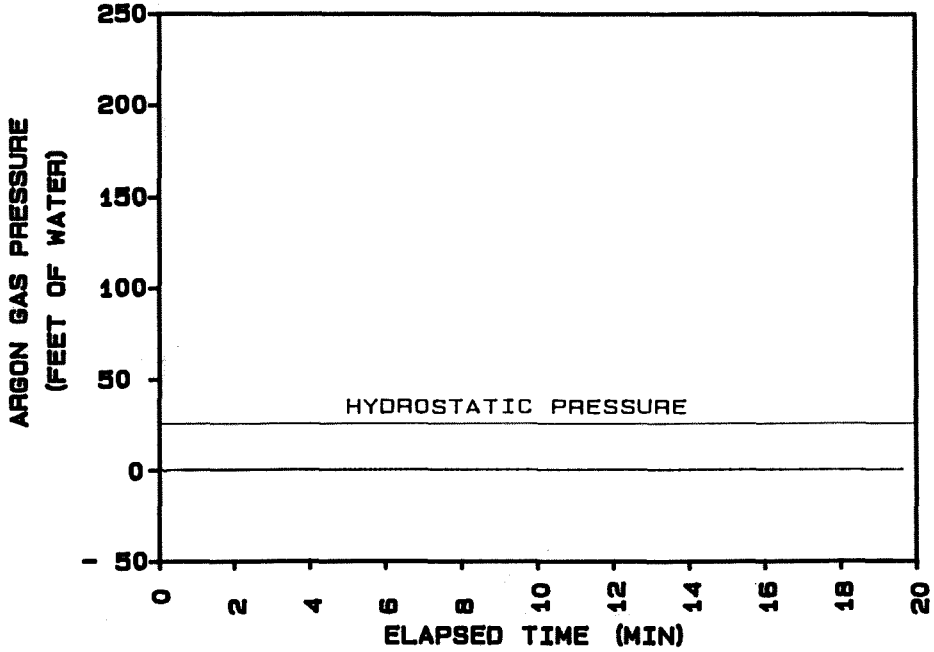
ENSAFE MEMPHIS NSA
LOCATION... 02H1427
TEST DATE
15: 59: 18 12-12-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



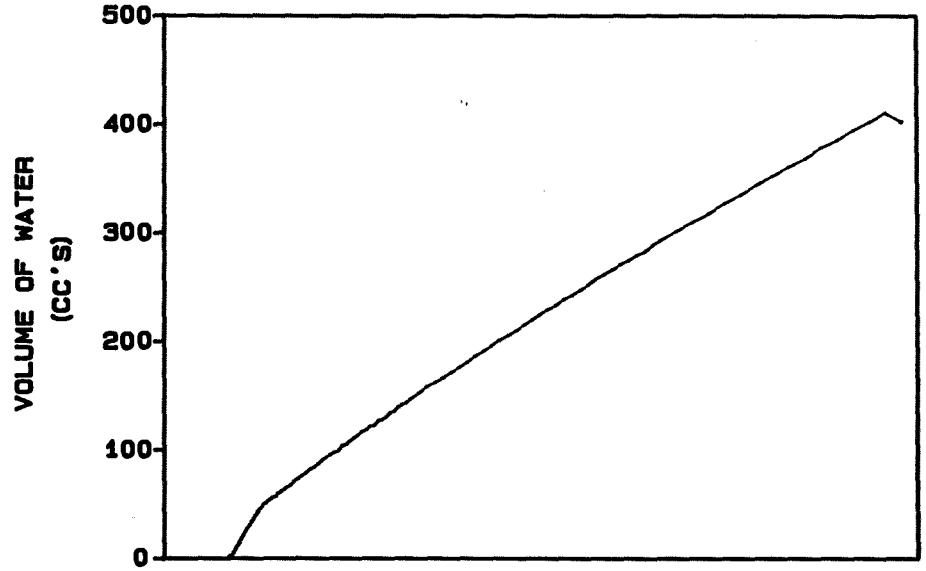


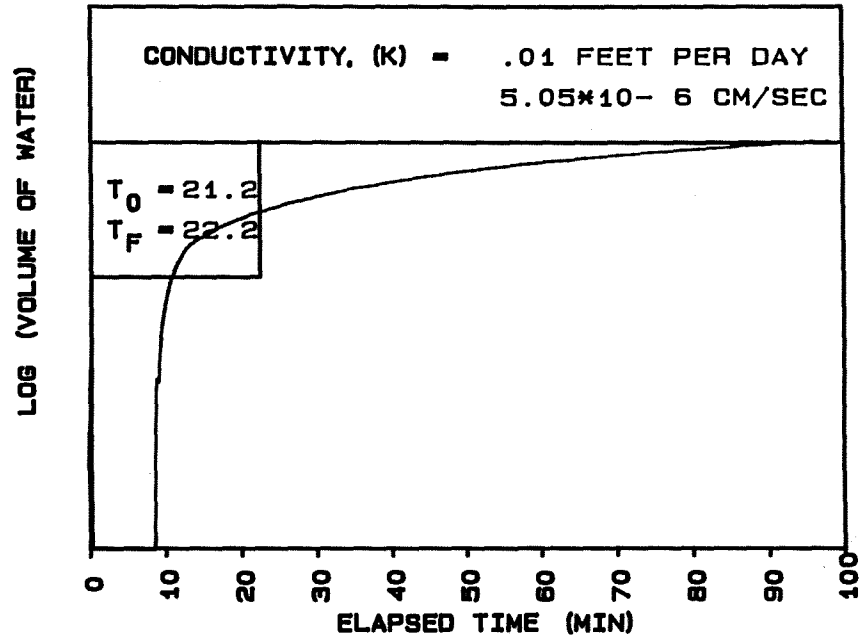


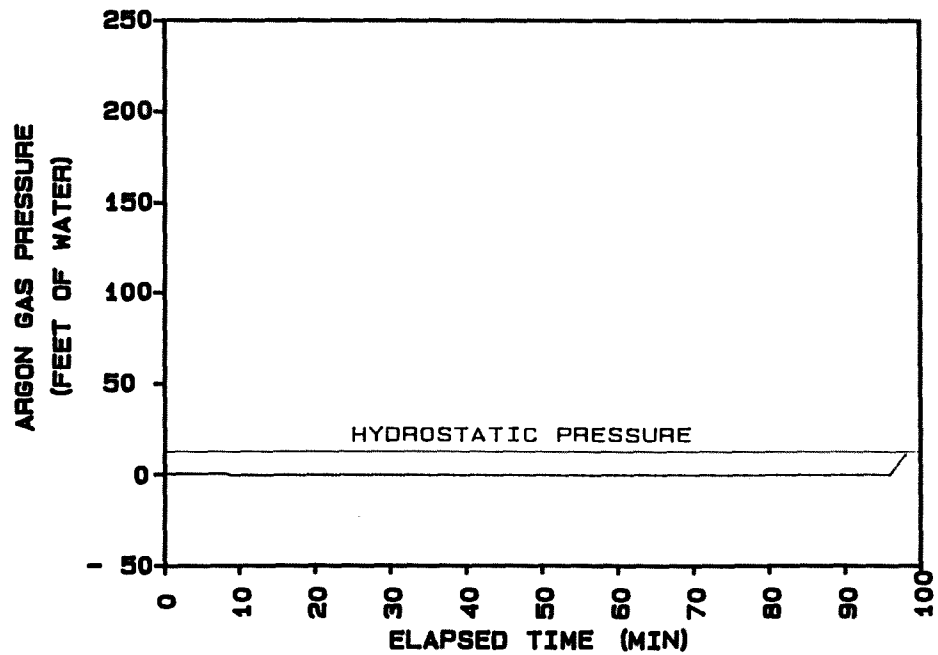
ENSAFE MEMPHIS NSA
LOCATION... 02H1440
TEST DATE
17: 28: 15 12-12-1995

SAMPLE DEPTH (FT) 40
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



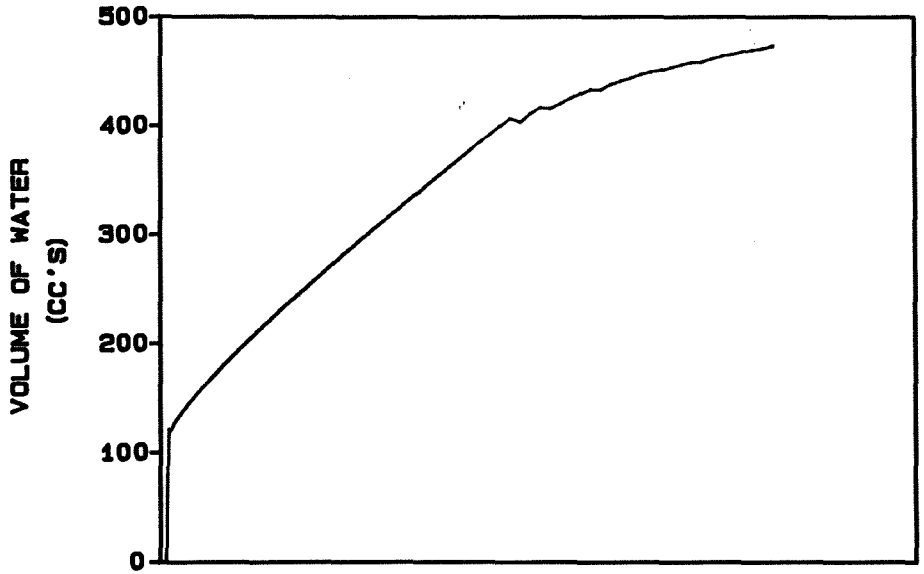


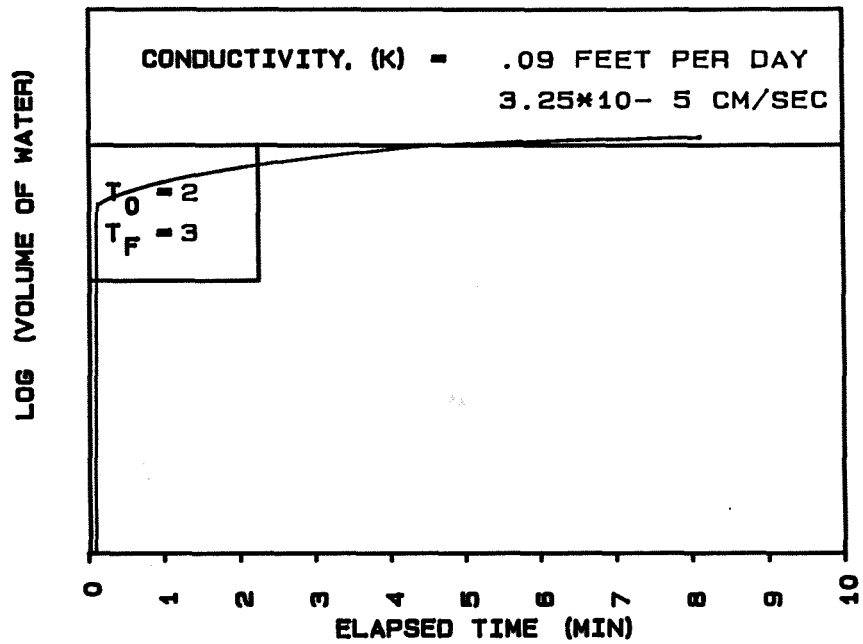


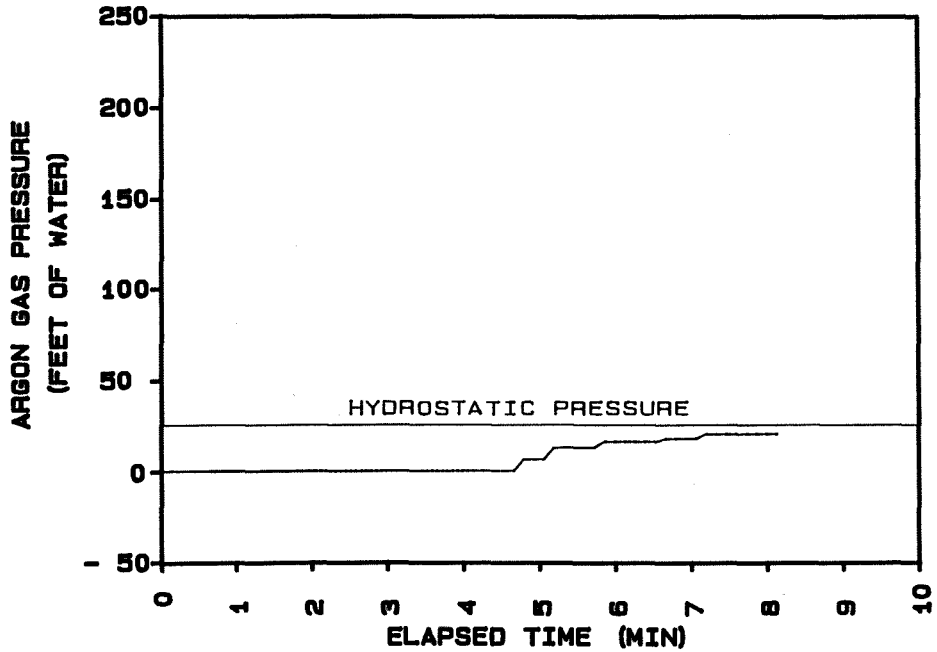
ENSAFE MEMPHIS NSA
LOCATION... 02H1527
TEST DATE
11: 01: 55 12-13-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



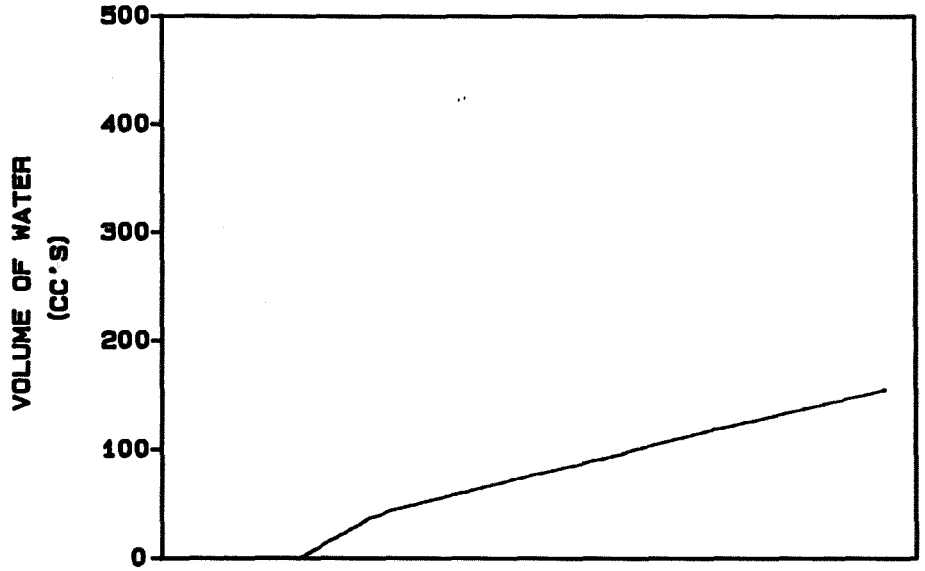


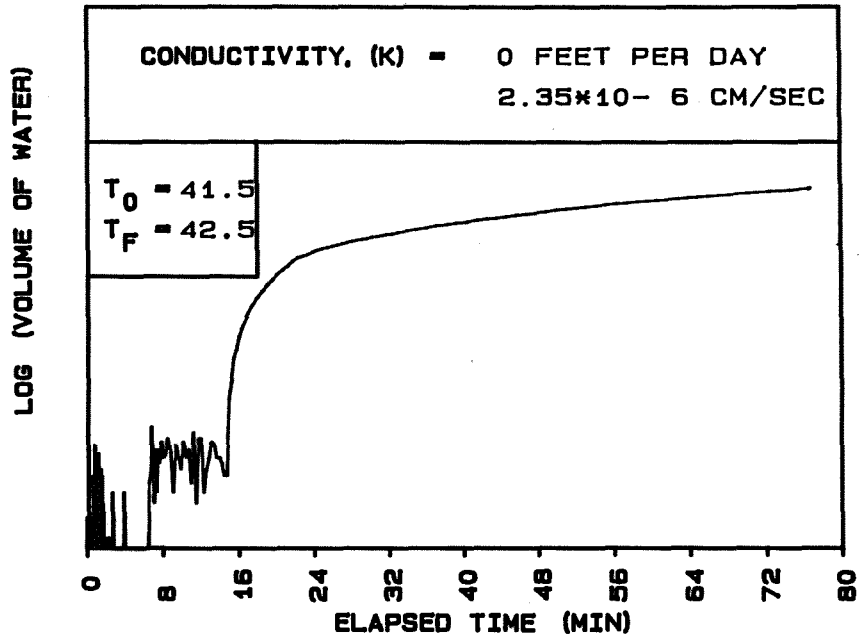


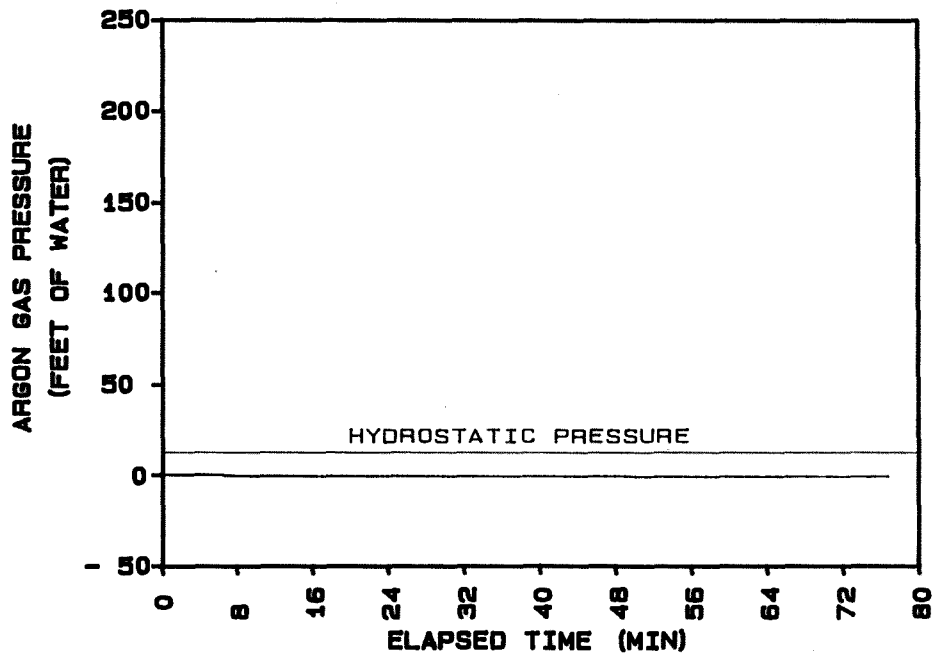
ENSAFE MEMPHIS NSA
LOCATION... 02H1540
TEST DATE
15: 26: 45 12-13-1995

SAMPLE DEPTH (FT) 40
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



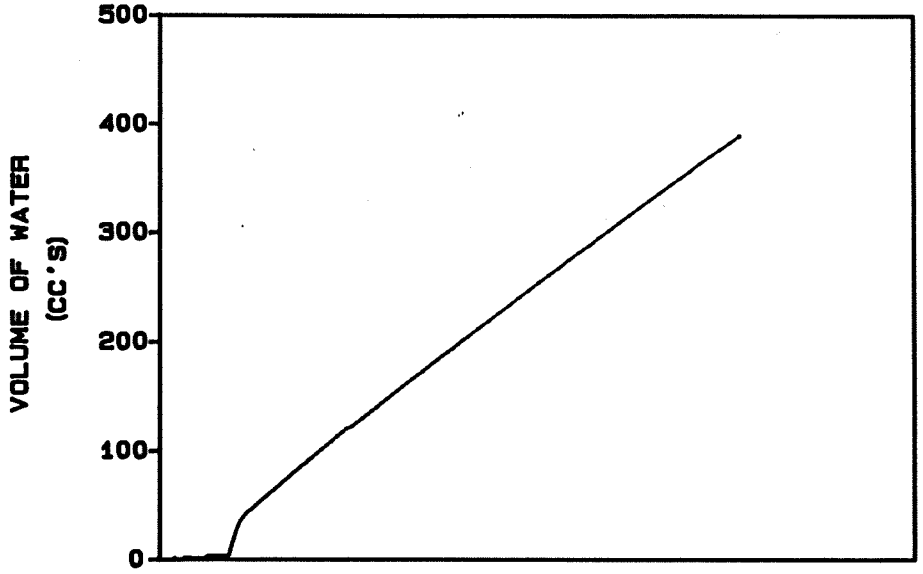


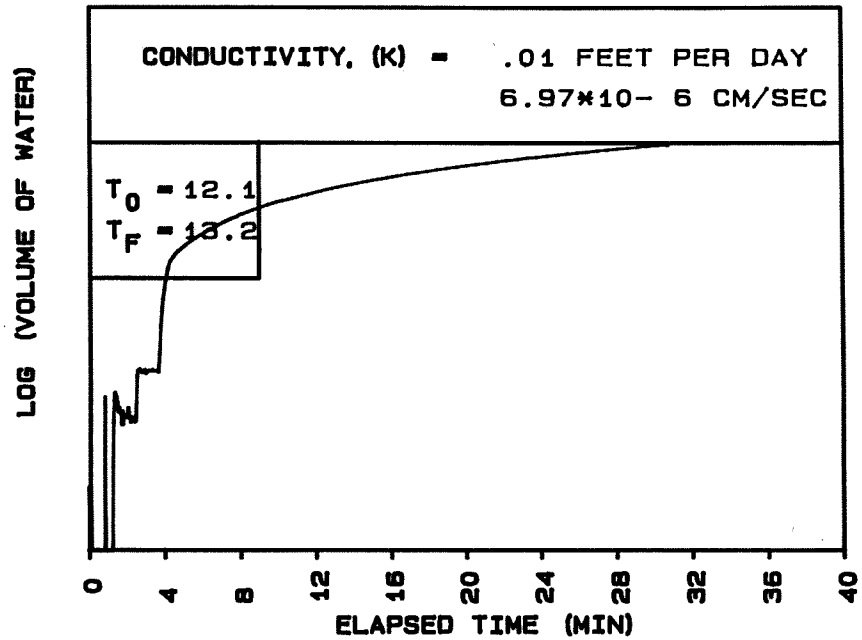


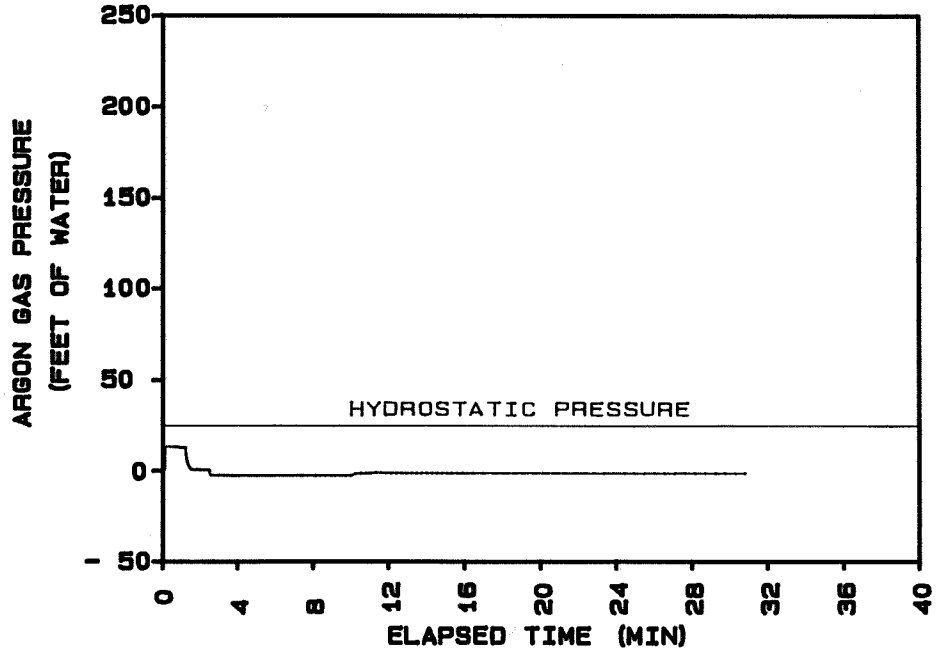
ENSAFE MEMPHIS NSA
LOCATION... 02H1627
TEST DATE
08: 31: 33 12-14-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



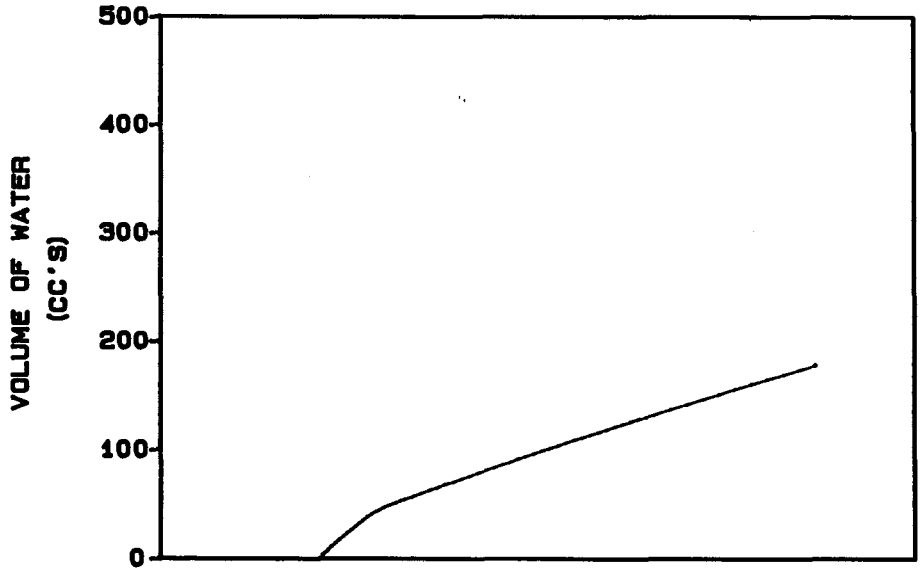


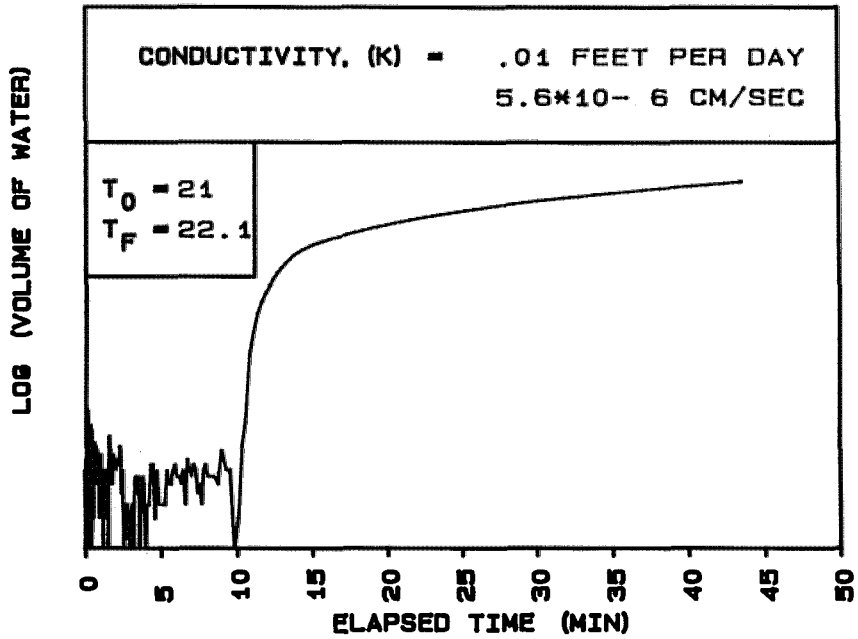


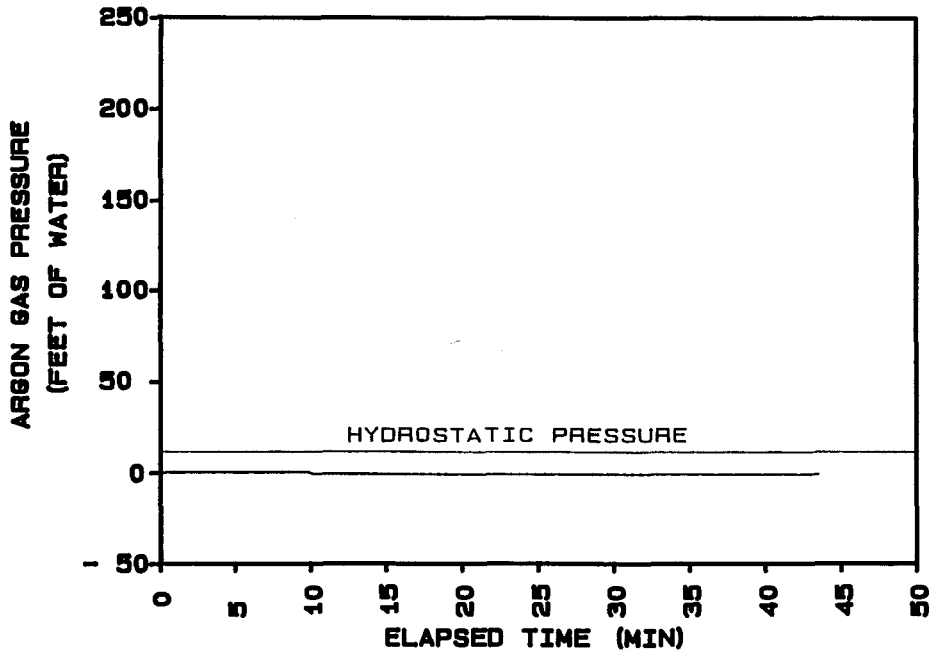
ENSAFE MEMPHIS NSA
LOCATION... 02H1639
TEST DATE
17: 14: 51 12-13-1995

SAMPLE DEPTH (FT) 39
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



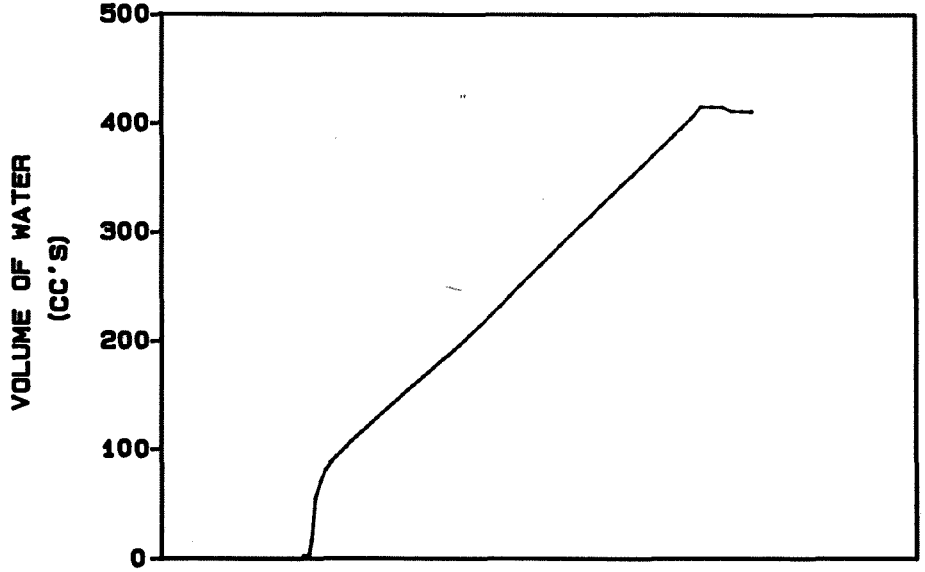


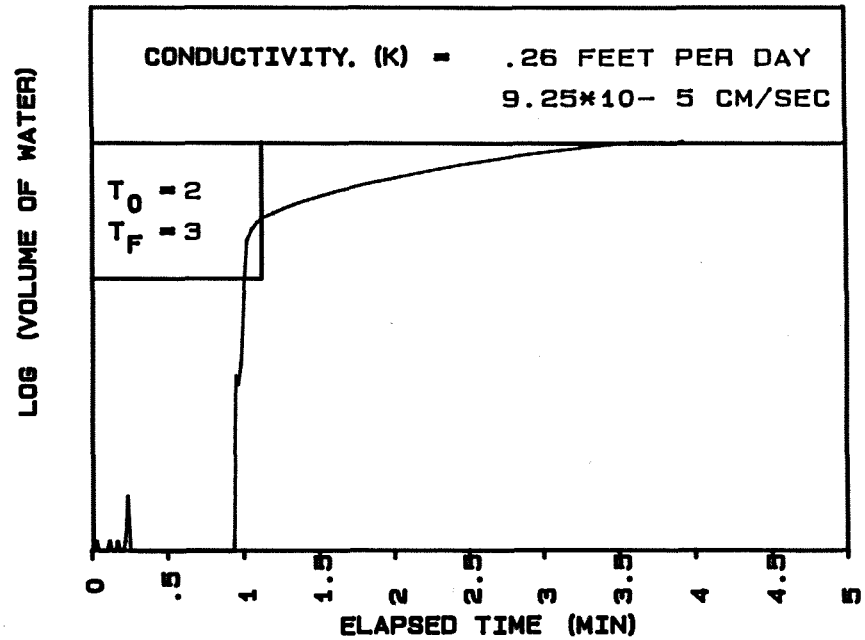


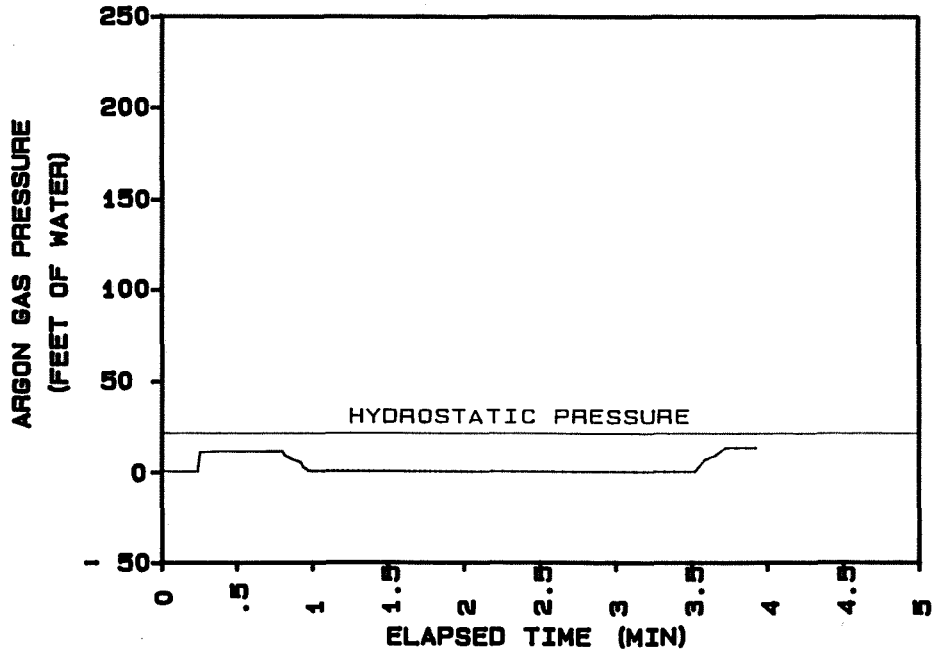
ENSAFE MEMPHIS NSA
LOCATION... 02H1726
TEST DATE
16: 59: 26 12-15-1995

SAMPLE DEPTH (FT) 26
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



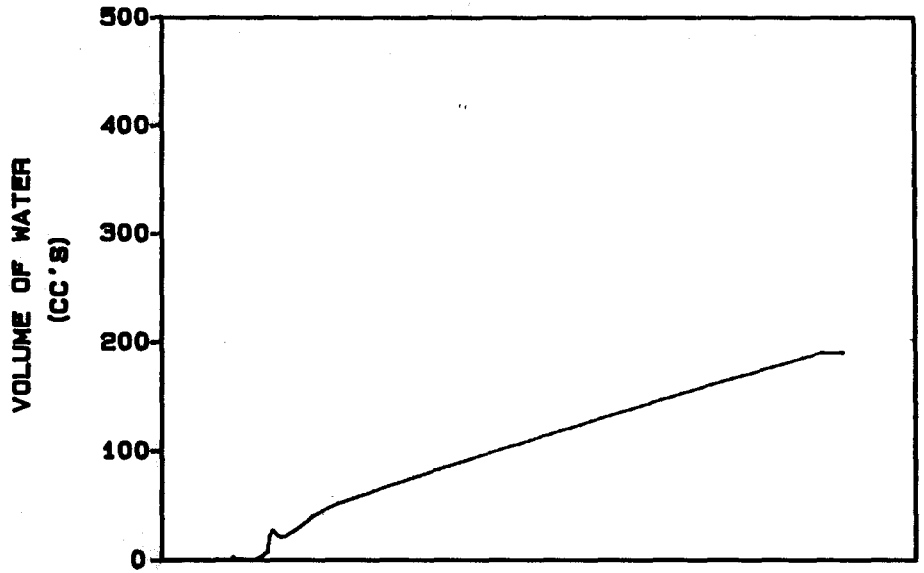


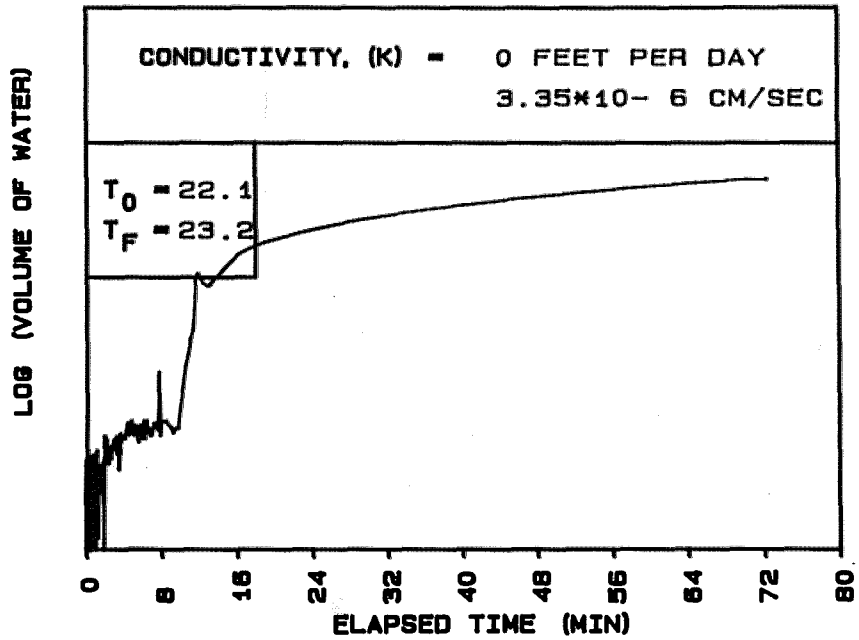


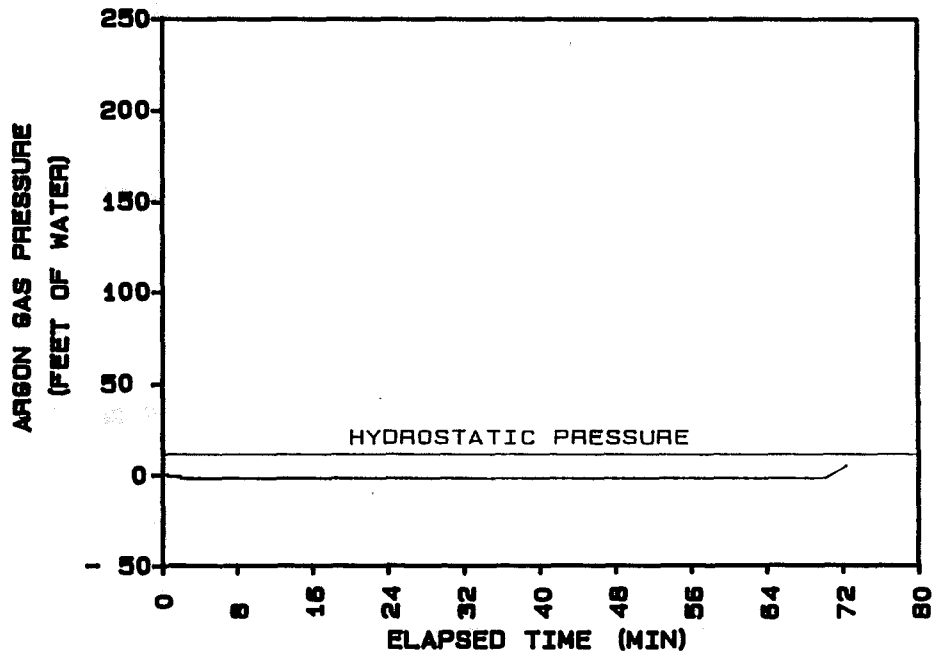
ENSAFE MEMPHIS NSA
LOCATION... 02H1736
TEST DATE
18: 44: 27 12-15-1995

SAMPLE DEPTH (FT) 36
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



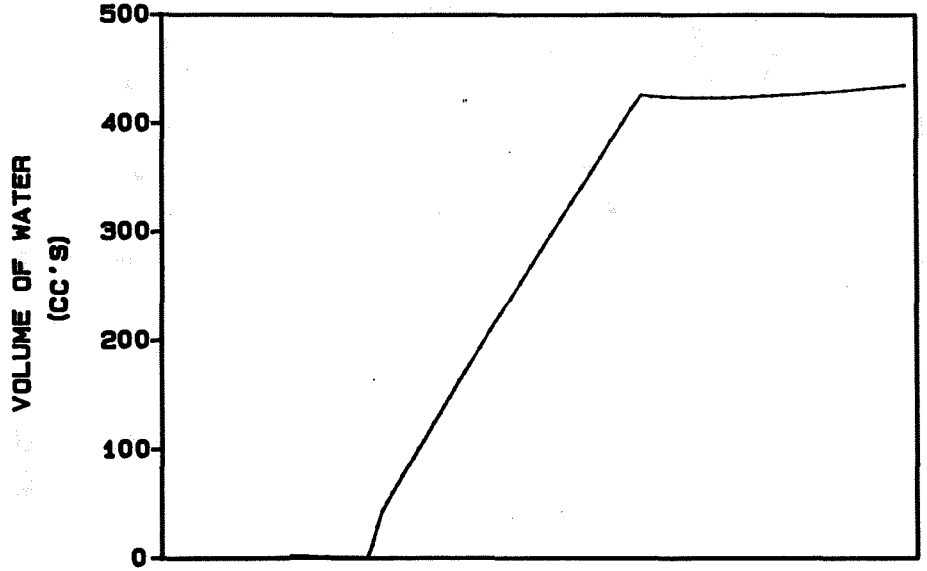


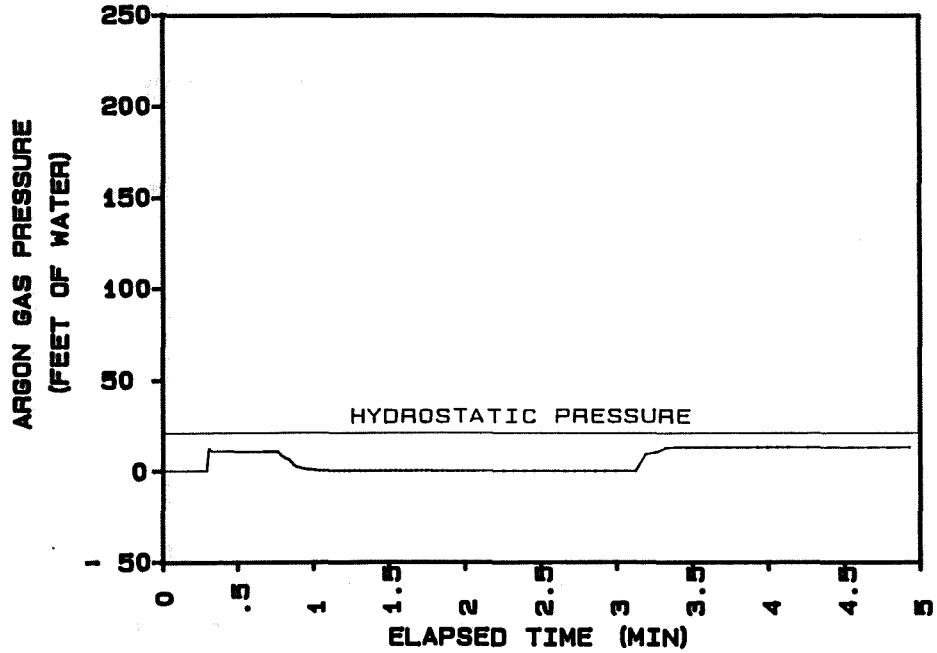


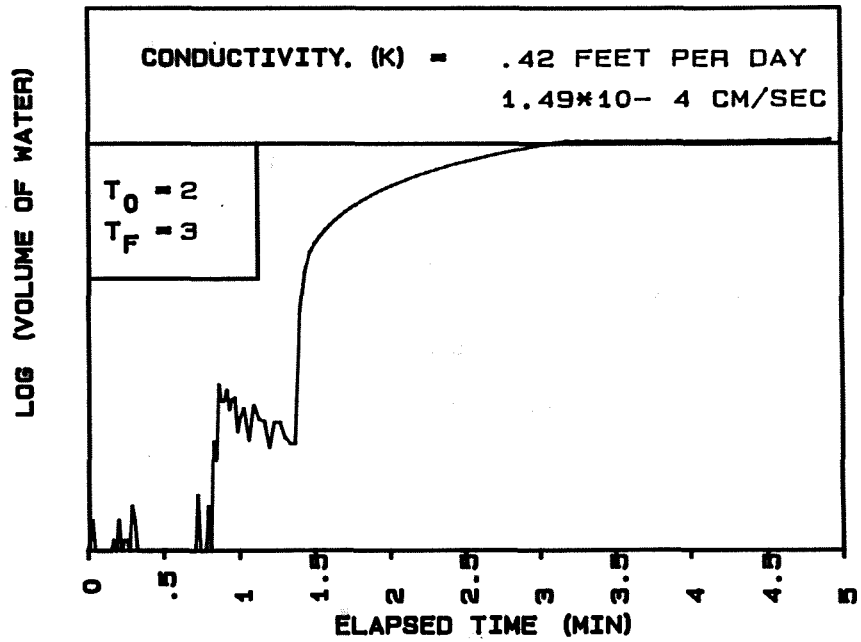
ENSAFE MEMPHIS NSA
LOCATION... 02H1826
TEST DATE
09: 10: 31 12-16-1995

SAMPLE DEPTH (FT) 26
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



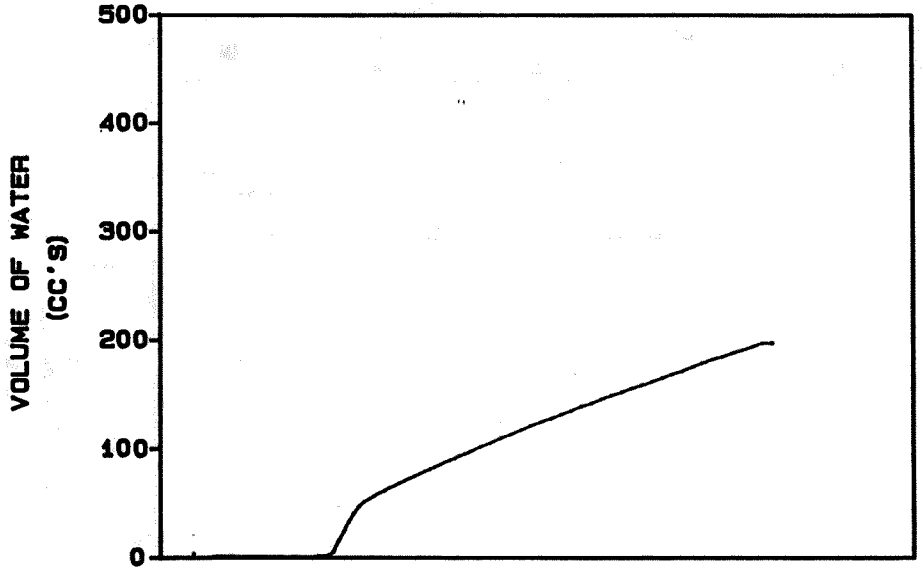


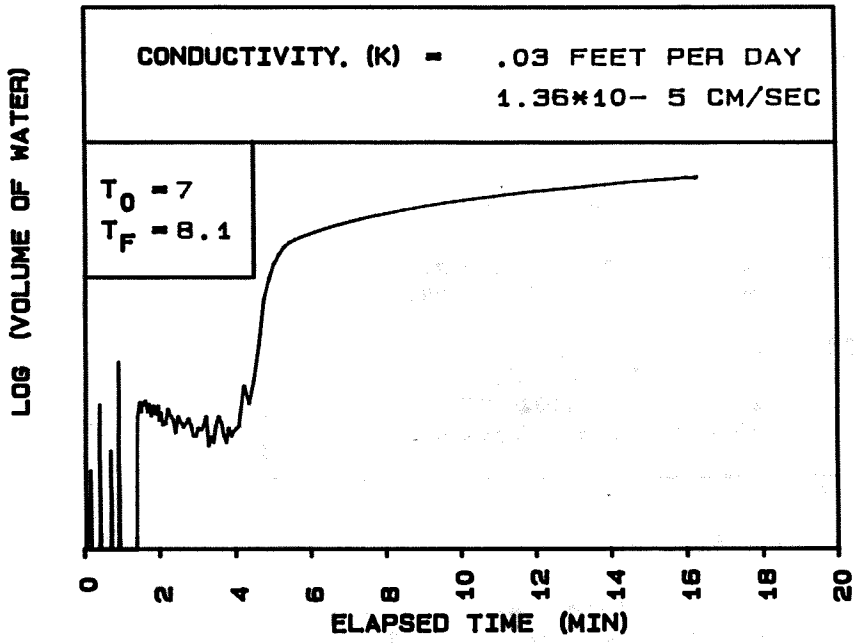


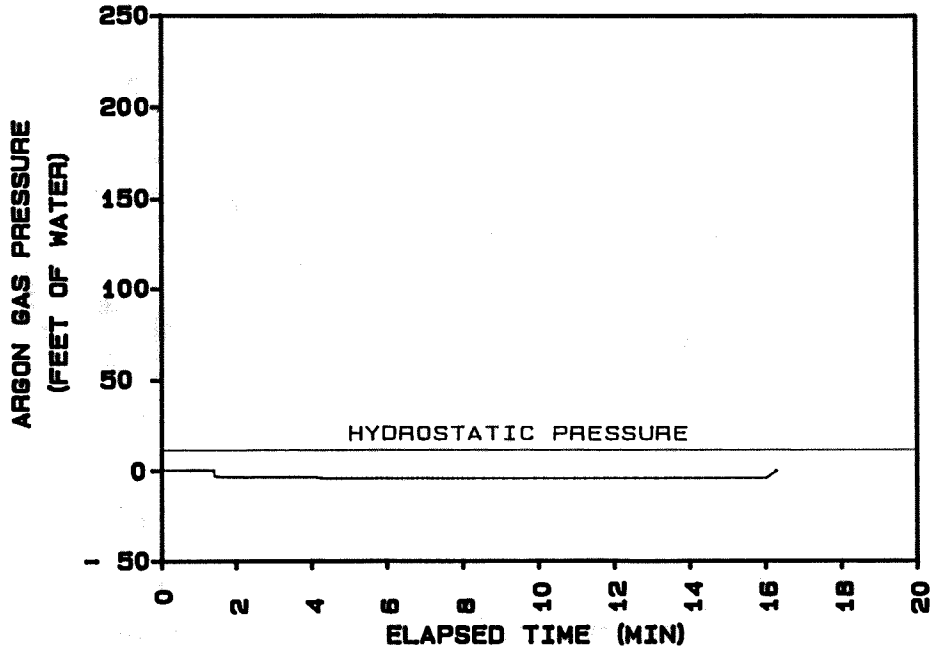
ENSAFE MEMPHIS NSA
LOCATION... 02H1836
TEST DATE
11: 37: 04 12-16-1995

SAMPLE DEPTH (FT) 36
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



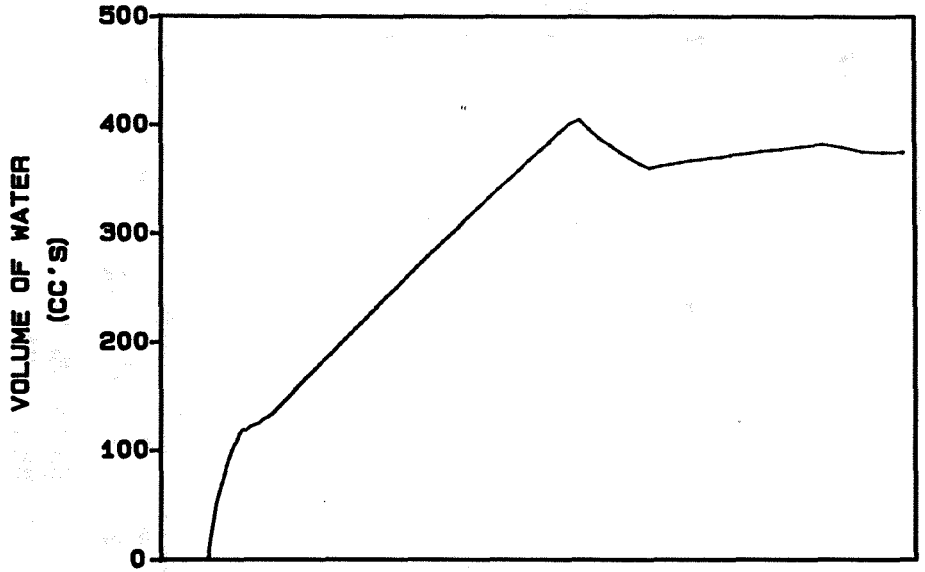


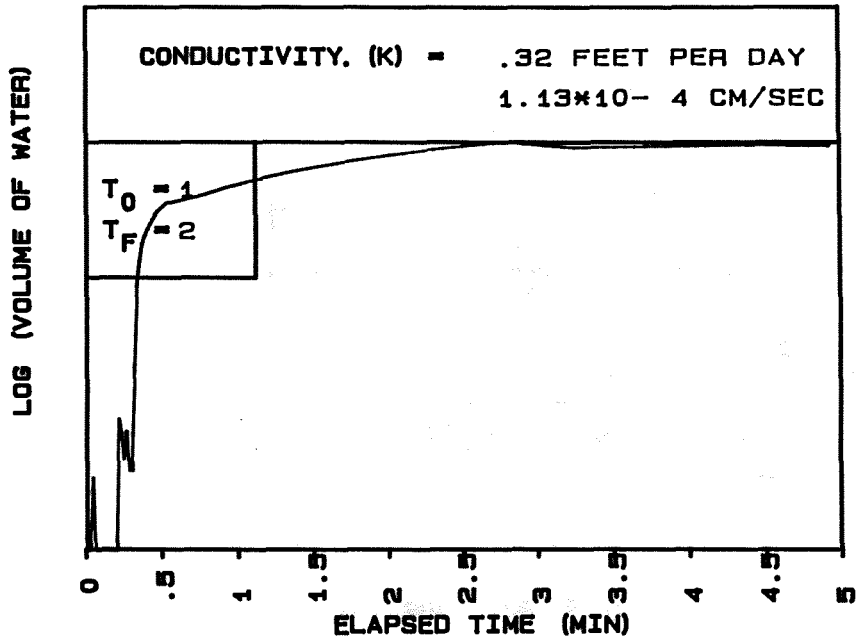


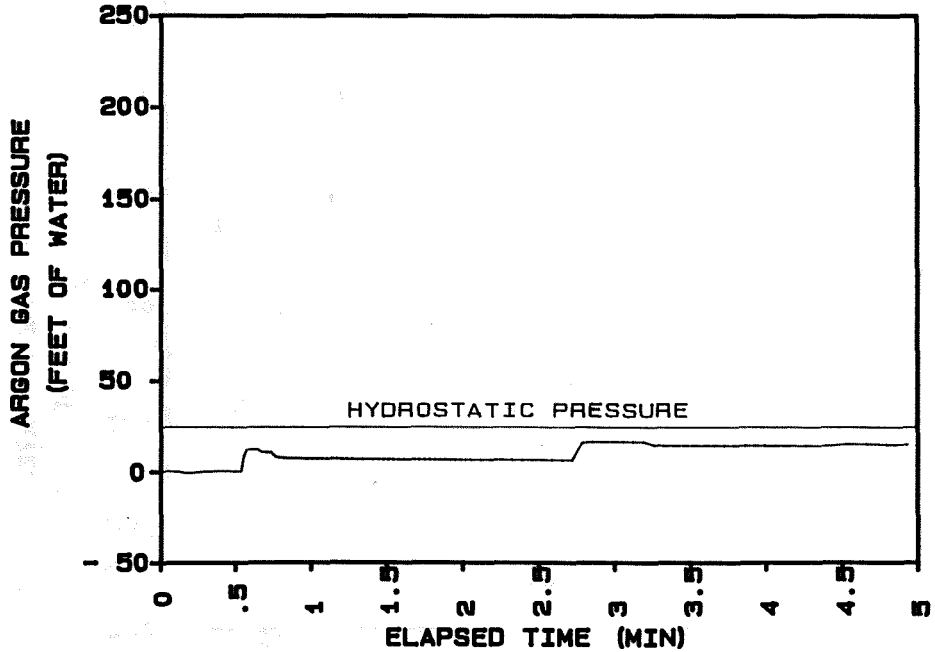
ENSAFE MEMPHIS NSA
LOCATION... 02H1926
TEST DATE
13: 14: 16 12-16-1995

SAMPLE DEPTH (FT) 26
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST







ENSAFE MEMPHIS NSA
LOCATION... 02H1939
TEST DATE
14: 52: 42 12-16-1995

SAMPLE DEPTH (FT) 39
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST

VOLUME OF WATER (CC'S)

DATA NOT AVAILABLE

LOG (VOLUME OF WATER)

CONDUCTIVITY. (K) =

T_O =
T_F =

DATA NOT AVAILABLE

ELAPSED TIME (MIN)

ARGON GAS PRESSURE (FEET OF WATER)

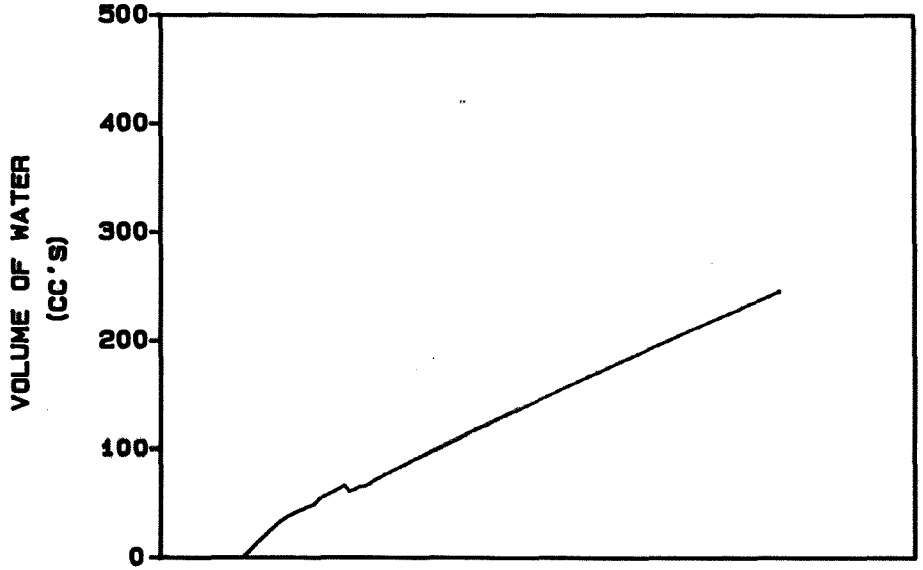
DATA NOT AVAILABLE

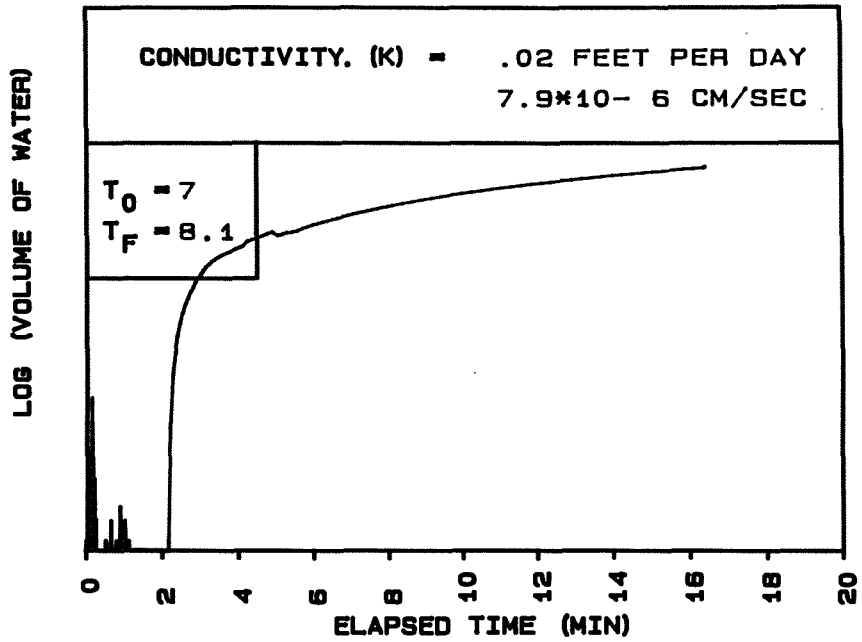
ELAPSED TIME (MIN)

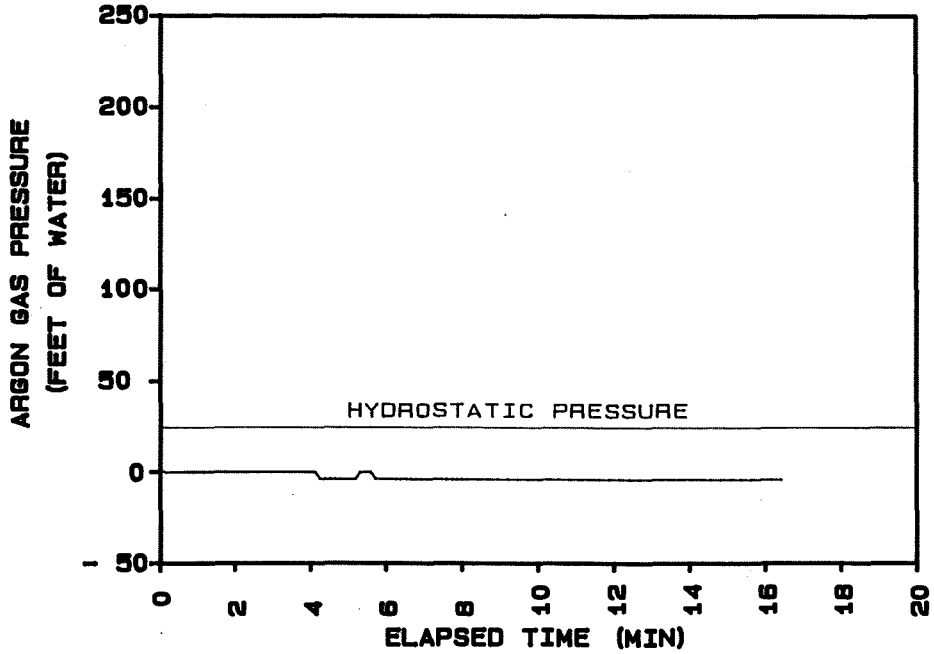
ENSAFE MEMPHIS NSA
LOCATION... 02H2022

DATA NOT AVAILABLE

HYDROCONE TEST



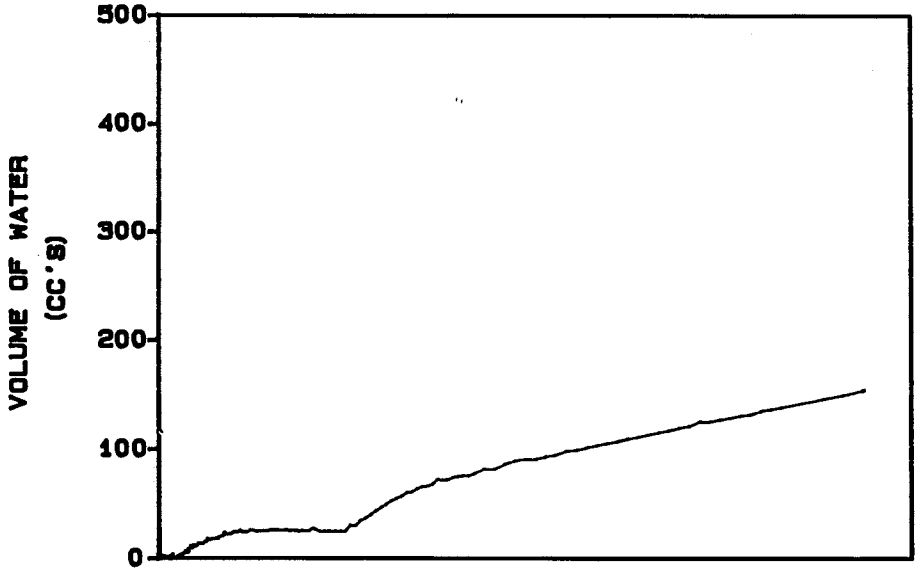


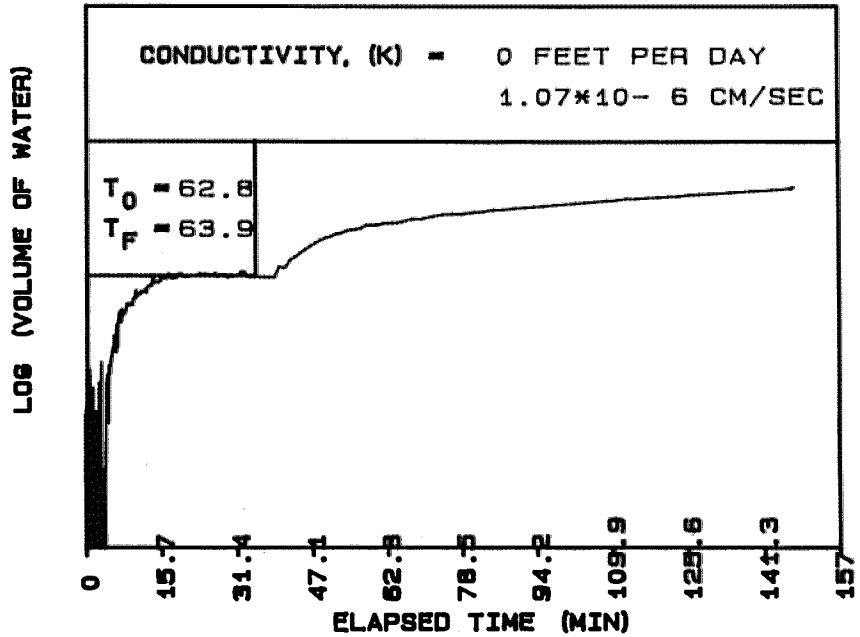


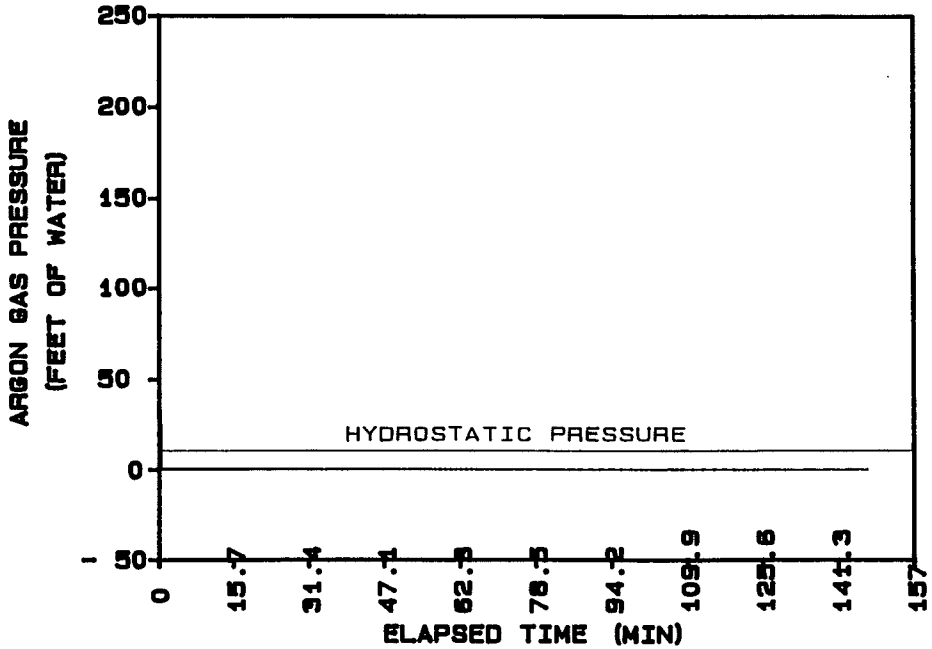
ENSAFE MEMPHIS NSA
LOCATION... 02H2039
TEST DATE
16: 58: 12 12-16-1995

SAMPLE DEPTH (FT) 39
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



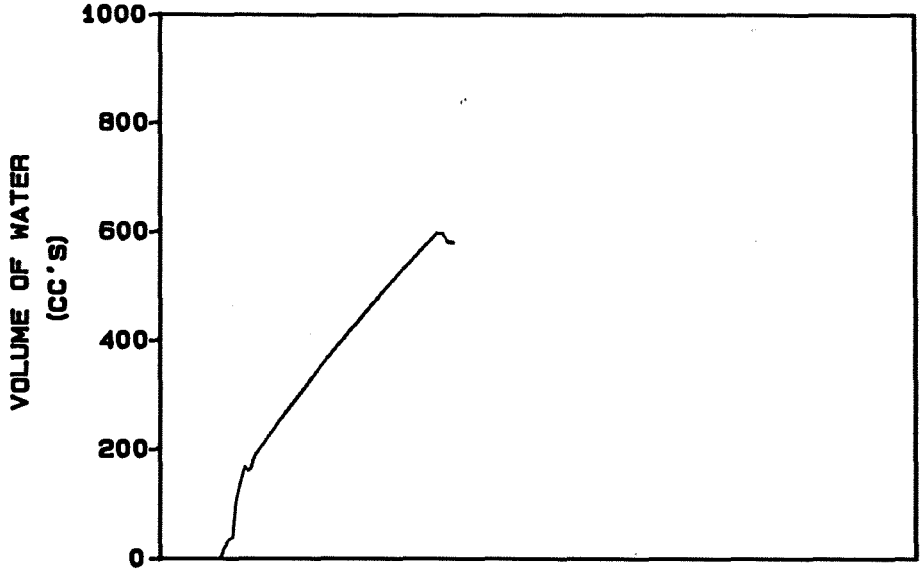


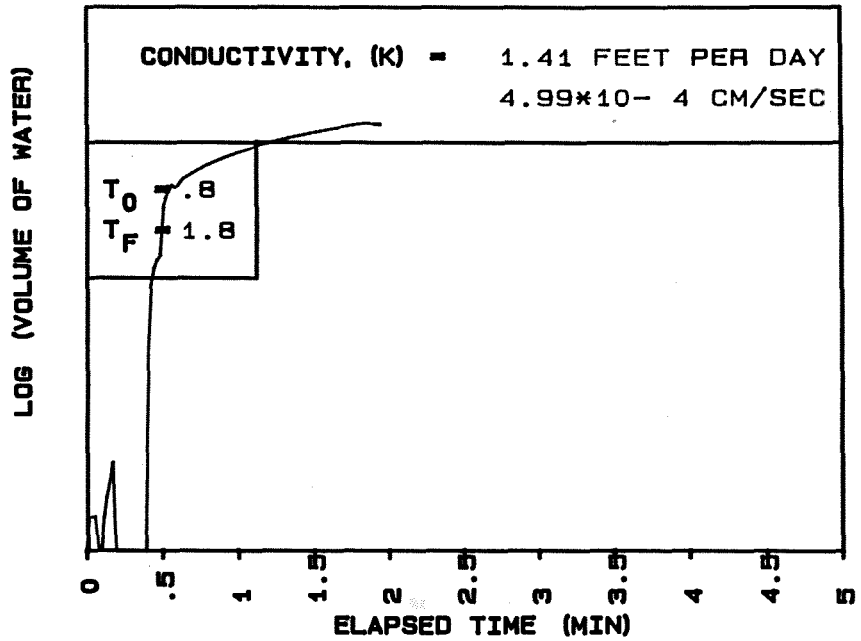


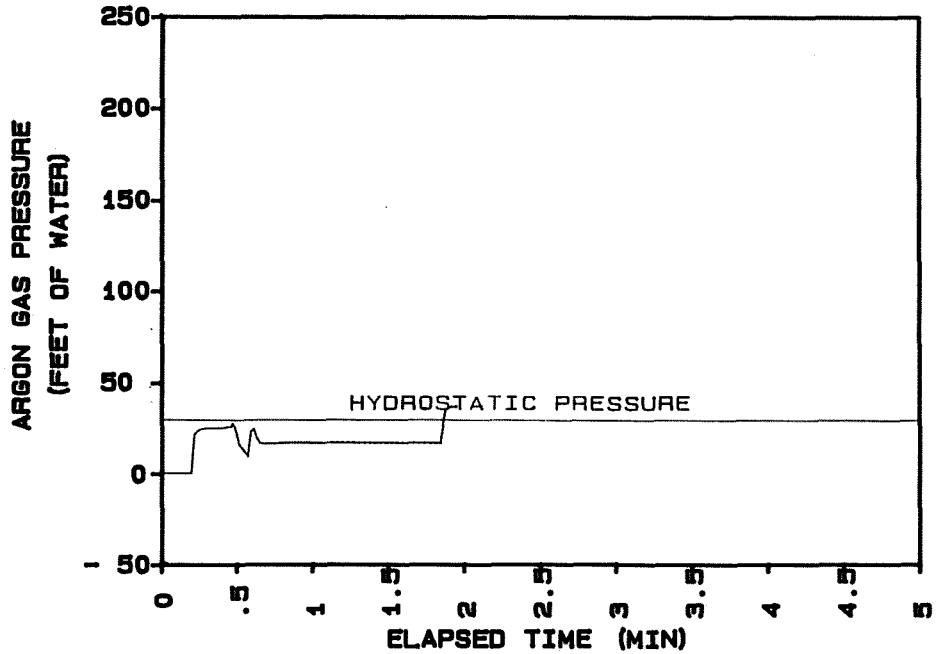
ENSAFE MEMPHIS NSA
LOCATION... 02H2130
TEST DATE
14: 55: 42 12-05-1995

SAMPLE DEPTH (FT) 30
GROUNDWATER DEPTH (FT) 20

HYDROCONE TEST



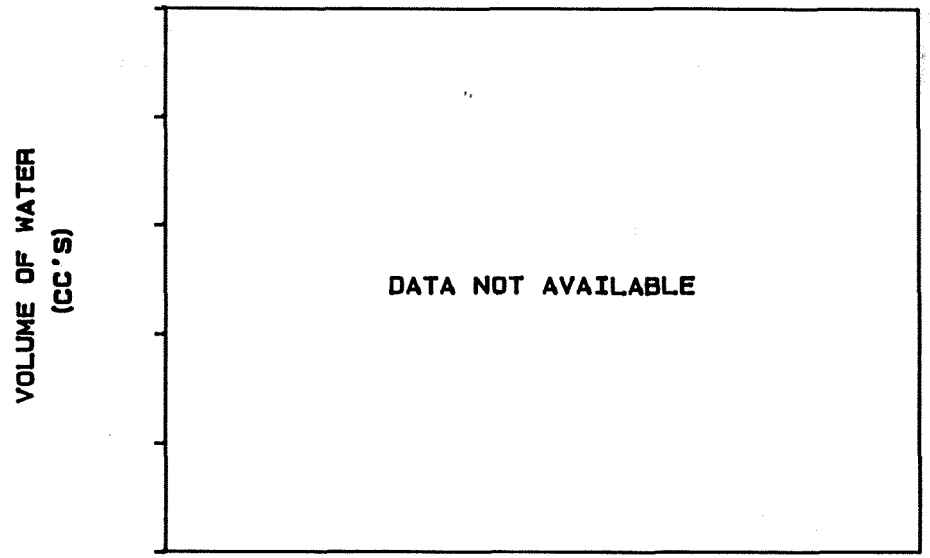


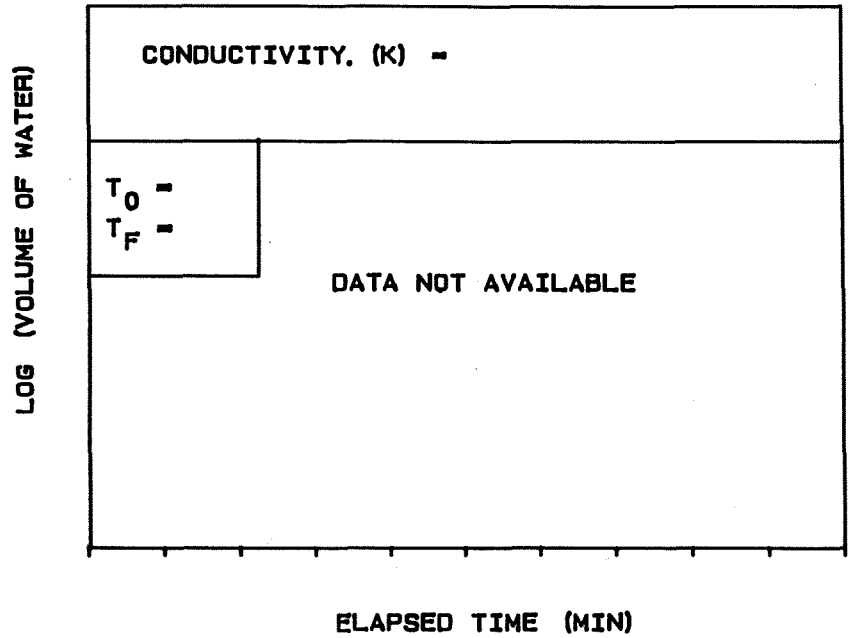


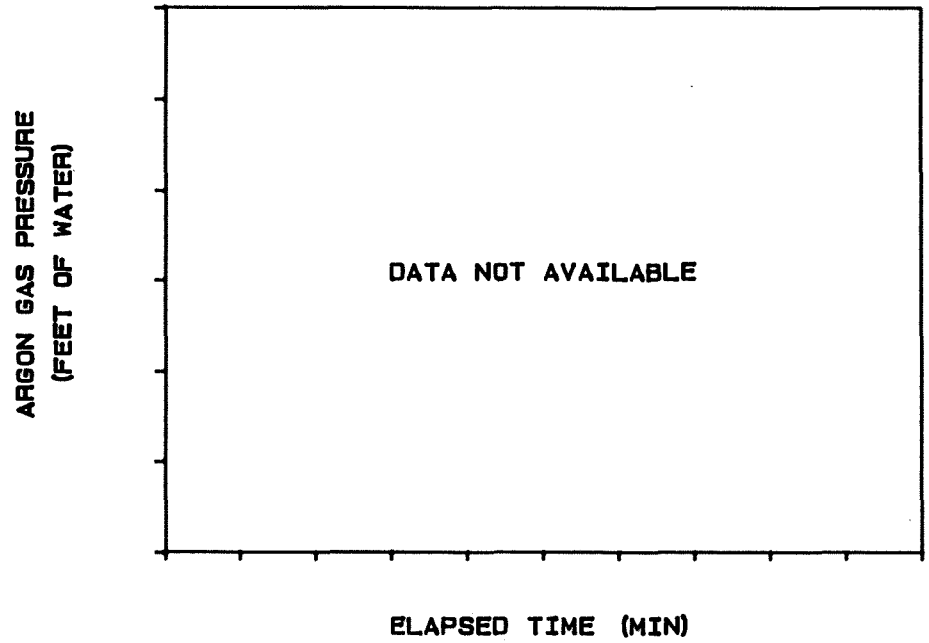
ENSAFE MEMPHIS NSA
LOCATION... 02H2149
TEST DATE
18: 24: 50 12-05-1995

SAMPLE DEPTH (FT) 49
GROUNDWATER DEPTH (FT) 20

HYDROCONE TEST



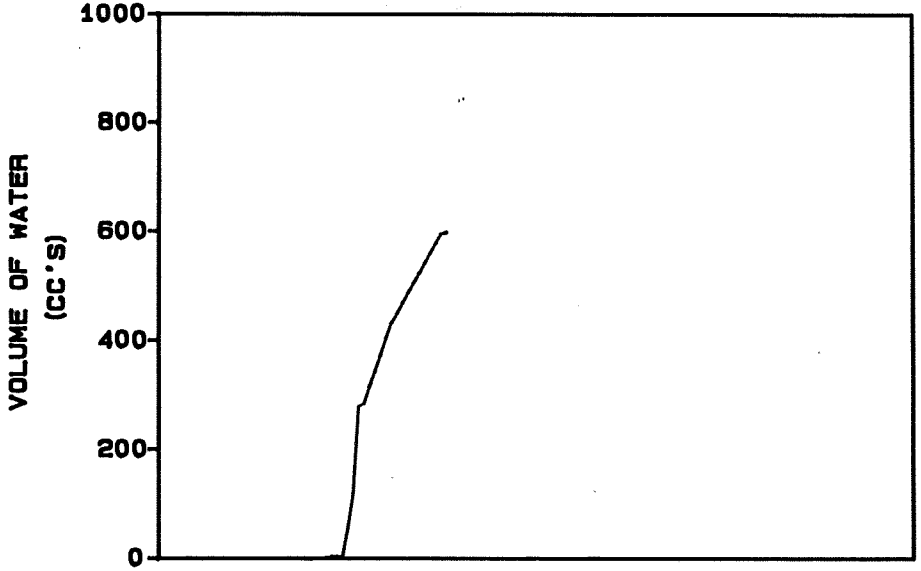


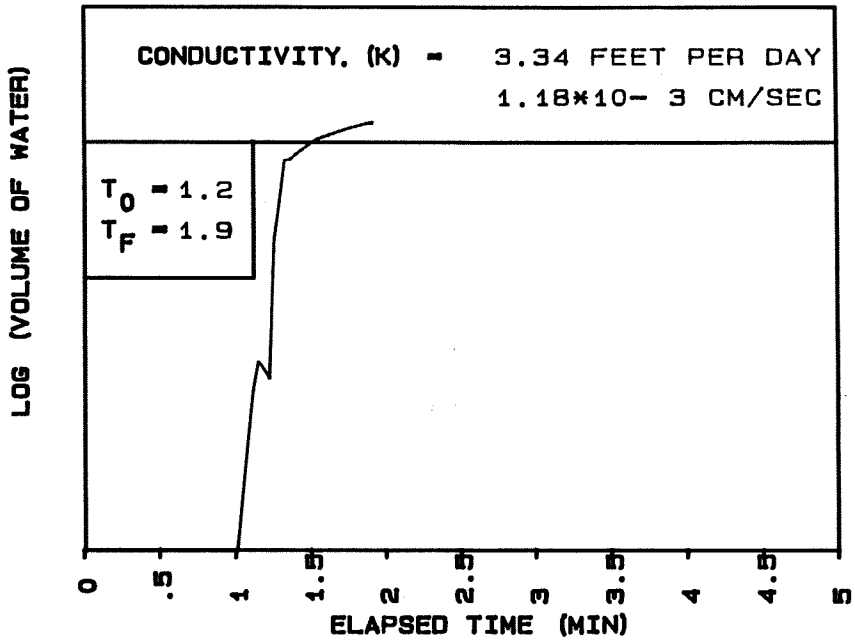


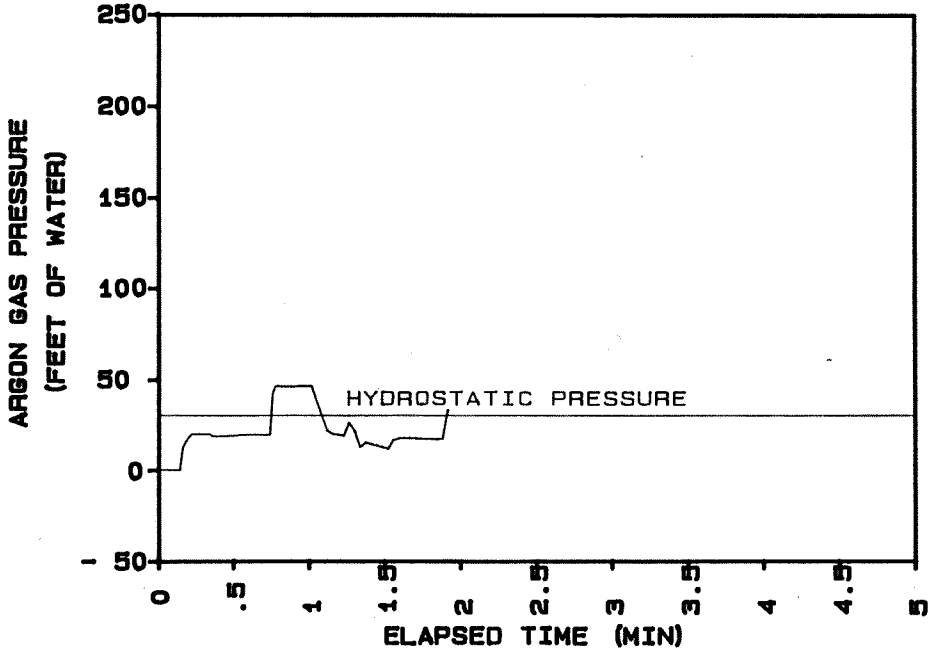
ENSAFE MEMPHIS NSA
LOCATION... 02H2229

DATA NOT AVAILABLE

HYDROCONE TEST



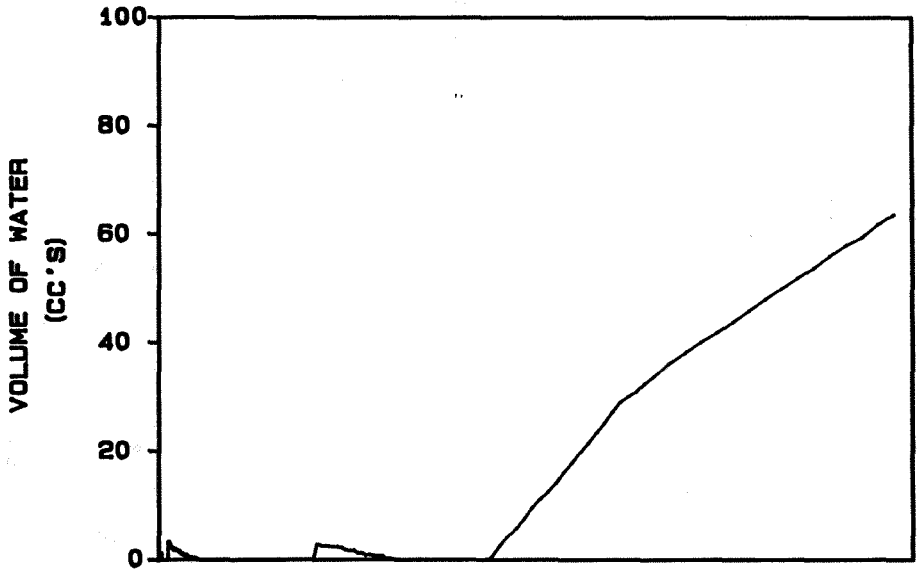


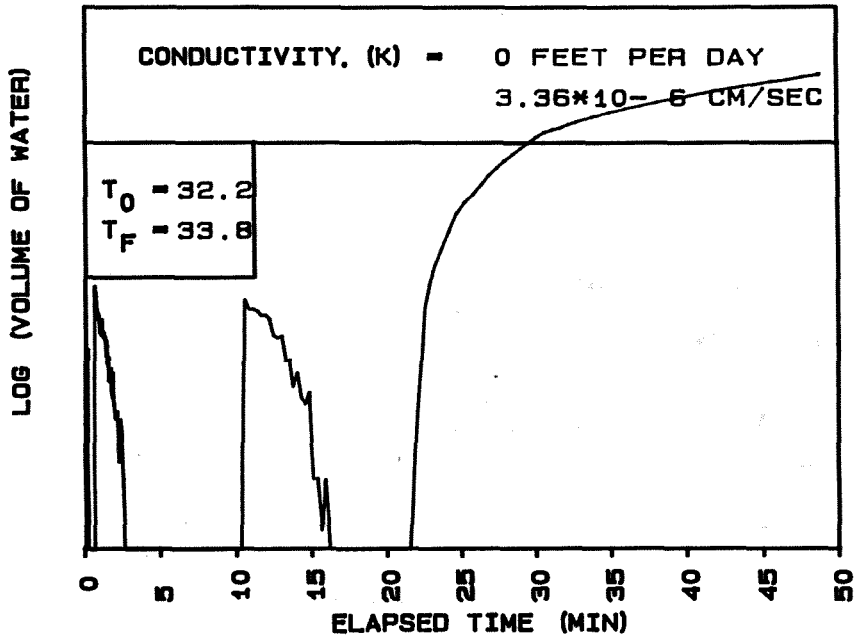


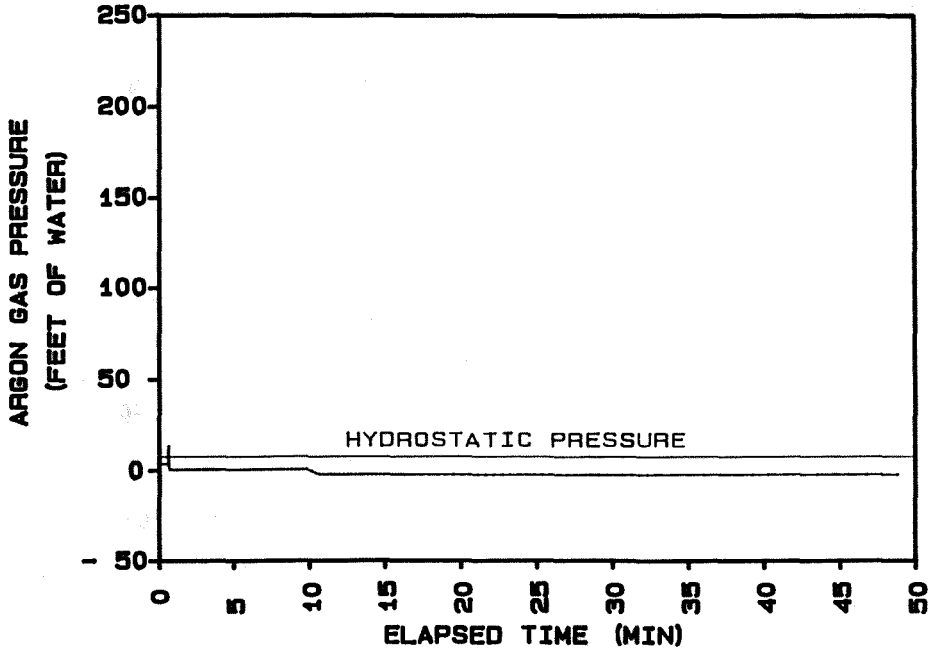
ENSAFE MEMPHIS NSA
LOCATION... 02H2249
TEST DATE
14: 14: 24 12-06-1995

SAMPLE DEPTH (FT) 49
GROUNDWATER DEPTH (FT) 19

HYDROCONE TEST



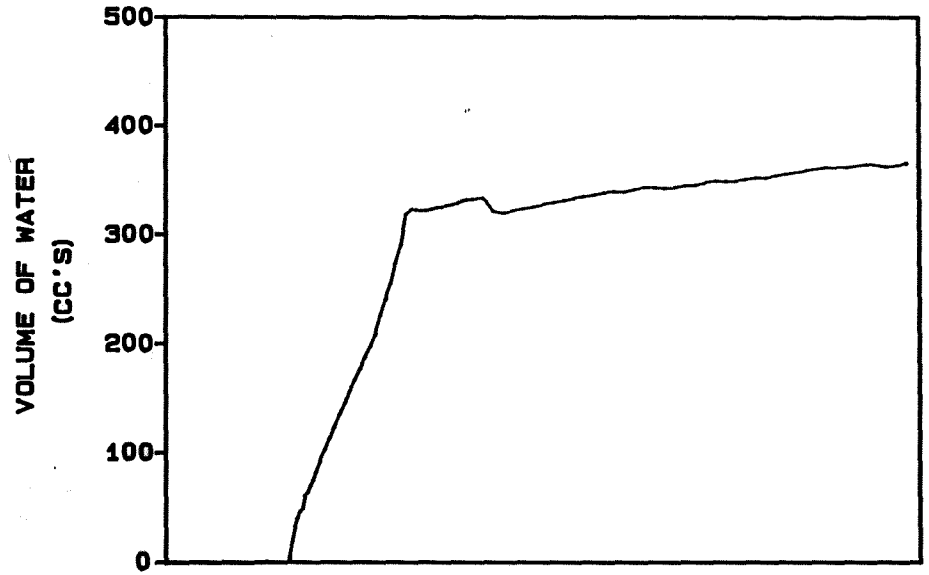


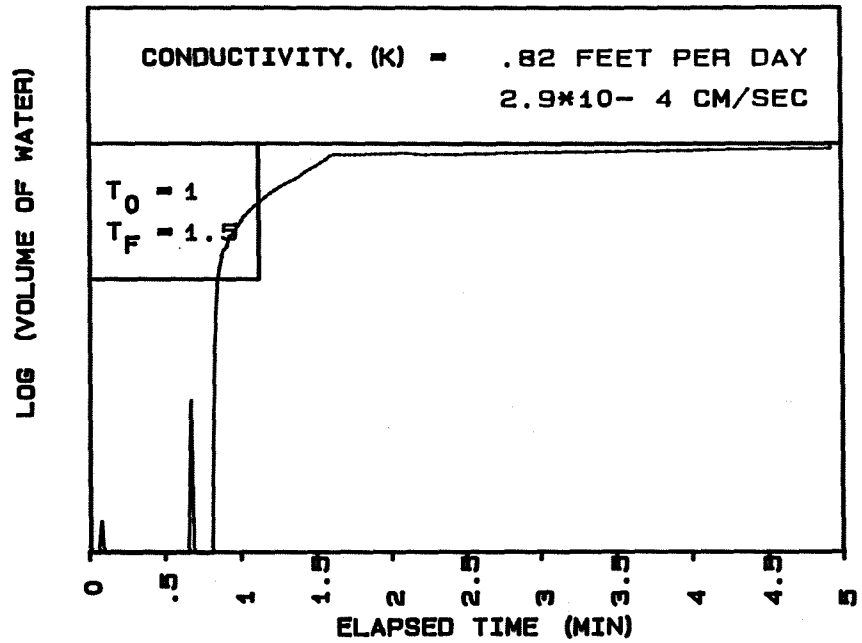


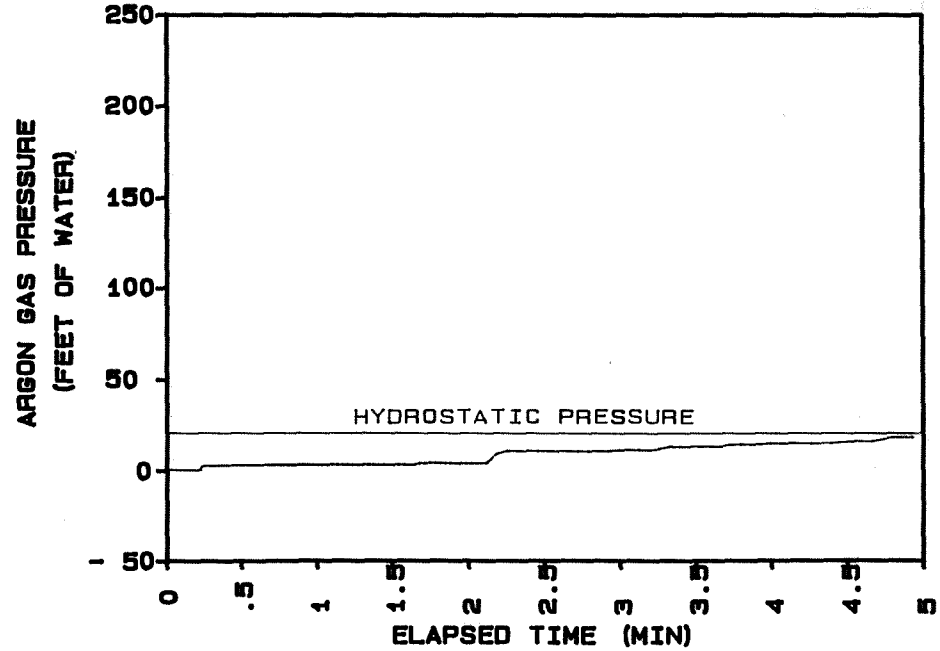
ENSAFE MEMPHIS NSA
LOCATION... 02H2323
TEST DATE
13: 25: 32 12-01-1995

SAMPLE DEPTH (FT) 23
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



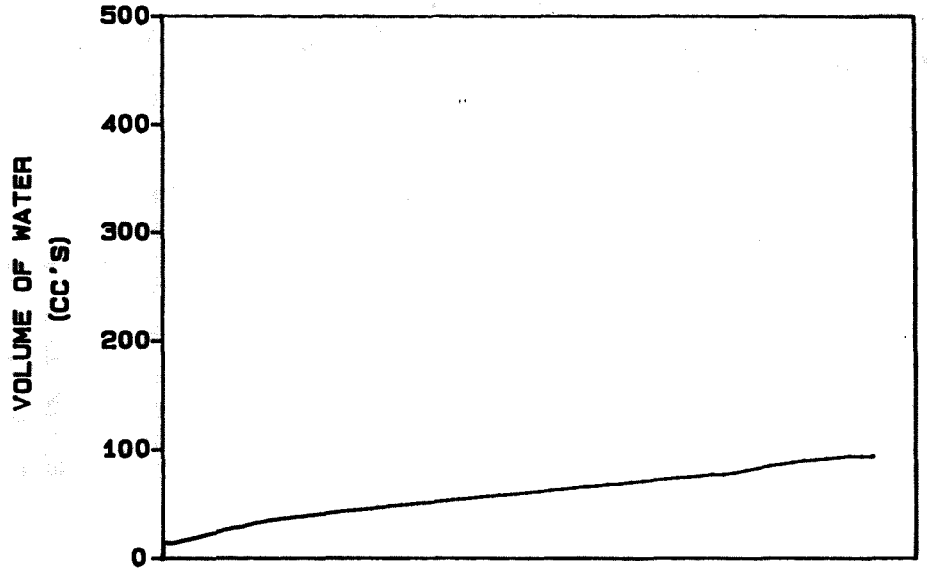


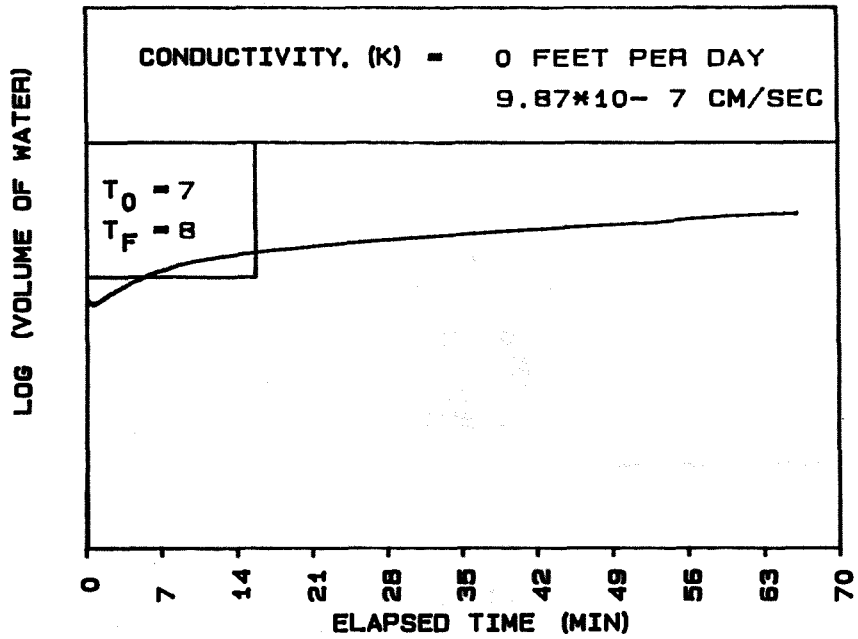


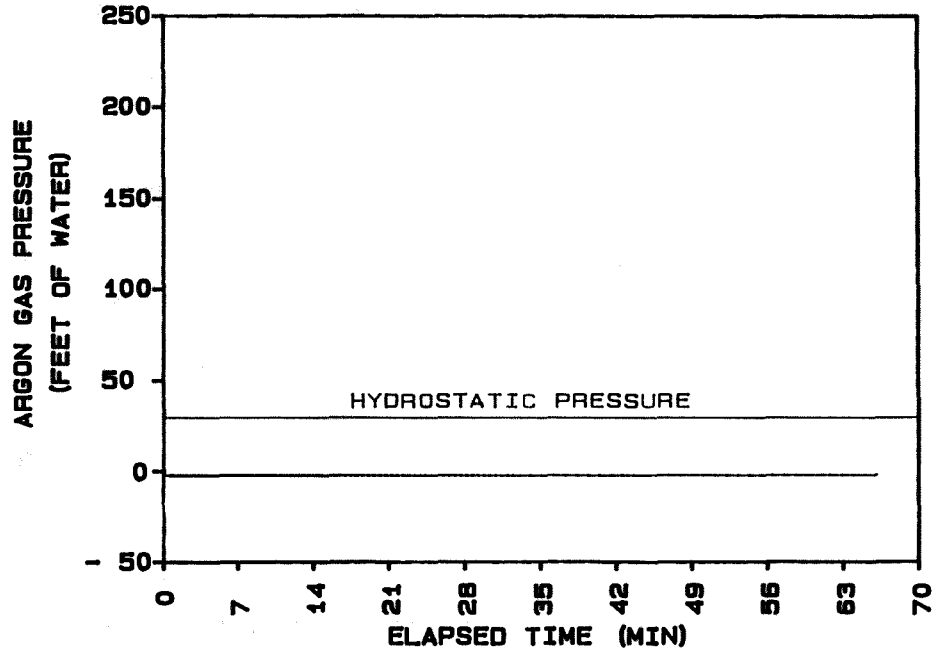
ENSAFE MEMPHIS NSA
LOCATION... 02H2336
TEST DATE
15: 35: 12 12-01-1995

SAMPLE DEPTH (FT) 36
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



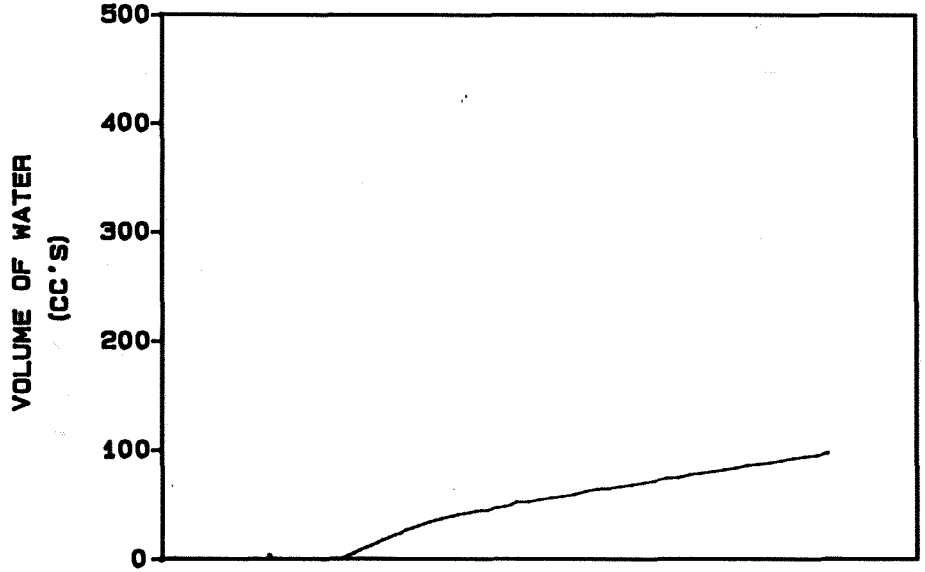


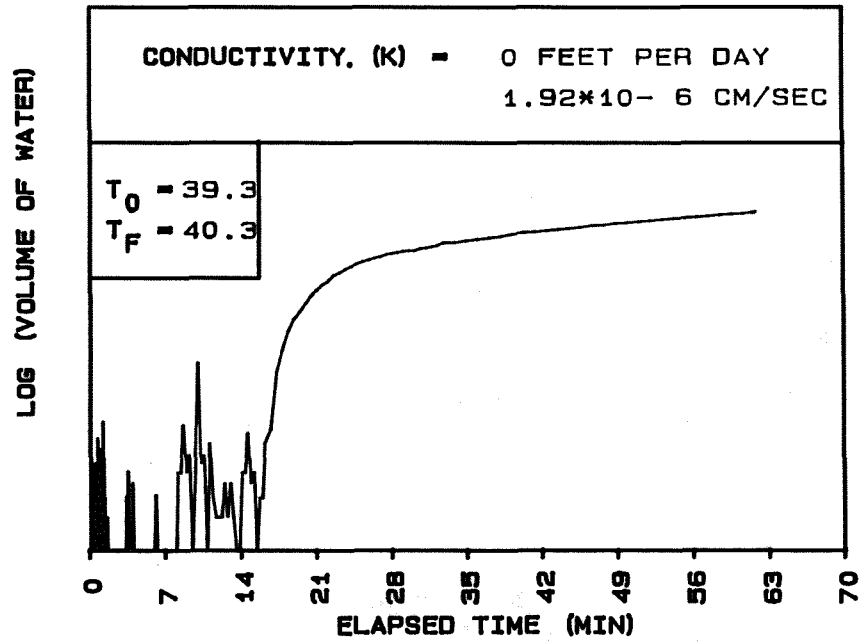


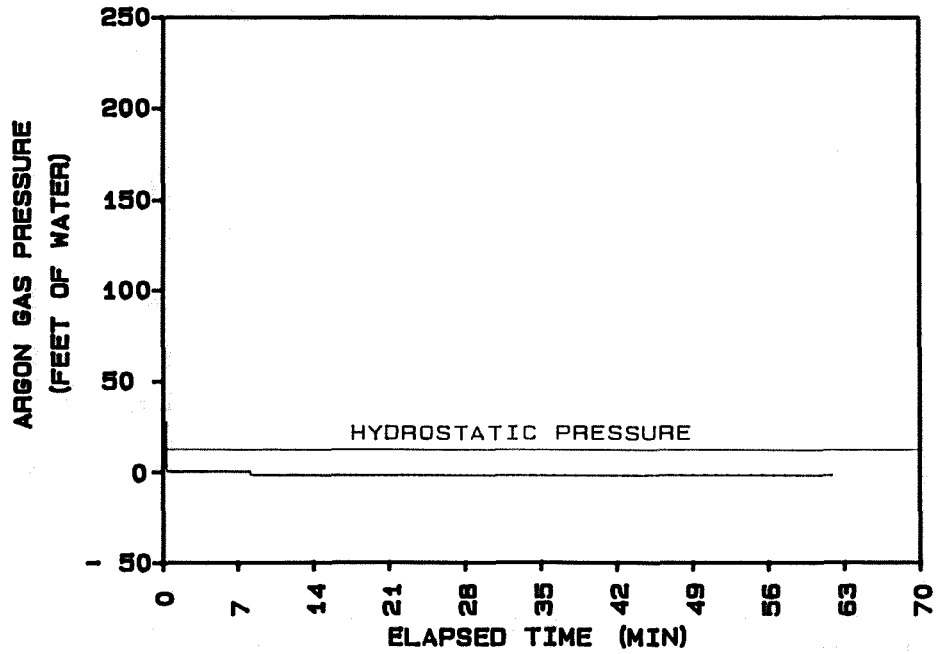
ENSAFE MEMPHIS NSA
LOCATION... 02H2436
TEST DATE
10: 23: 14 12-02-1995

SAMPLE DEPTH (FT) 37
GROUNDWATER DEPTH (FT) 8

HYDROCONE TEST



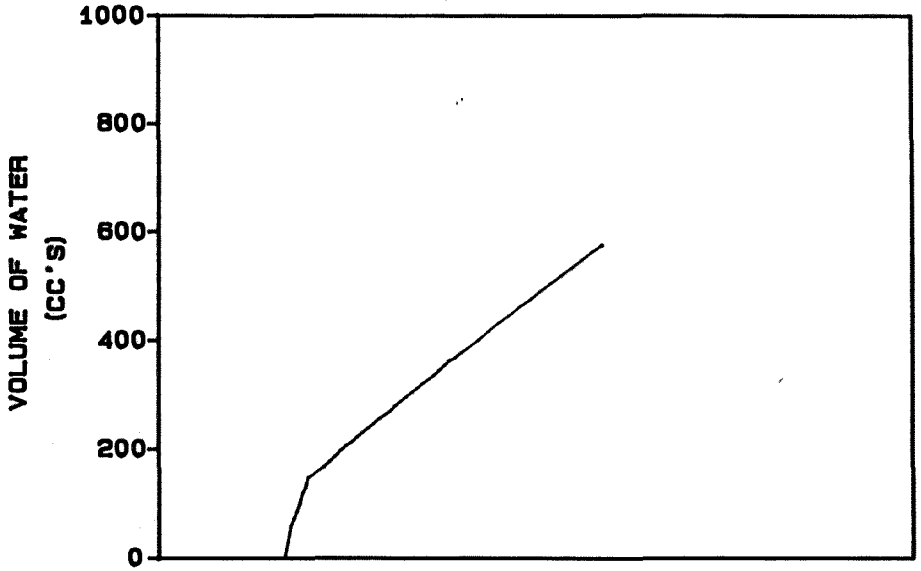


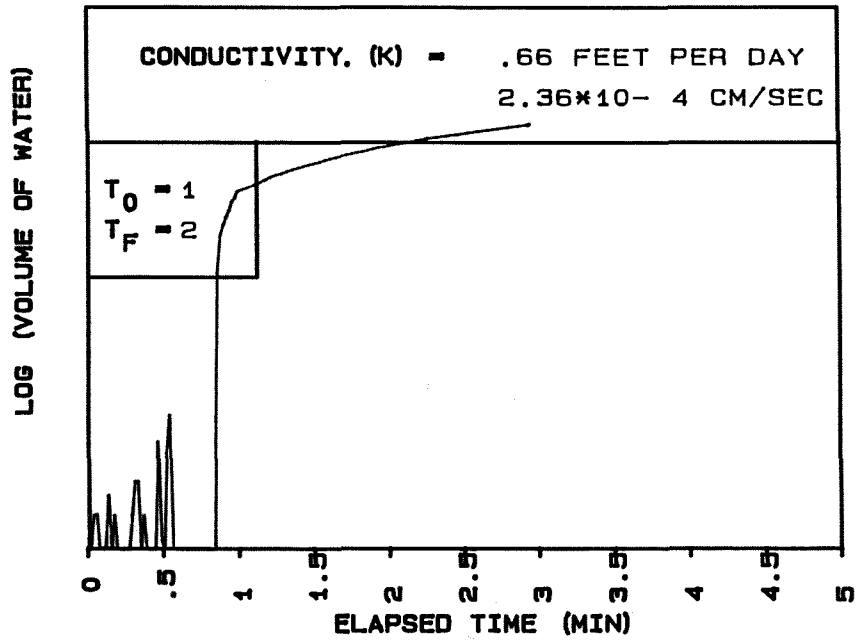


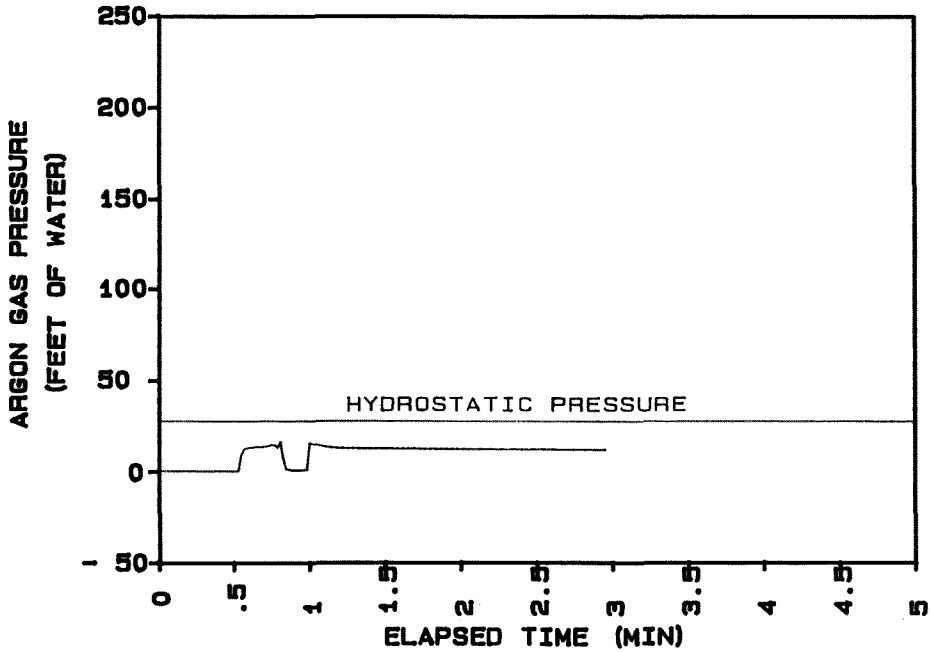
ENSAFE MEMPHIS NSA
LOCATION... 02H2527
TEST DATE
19: 19: 10 12-04-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



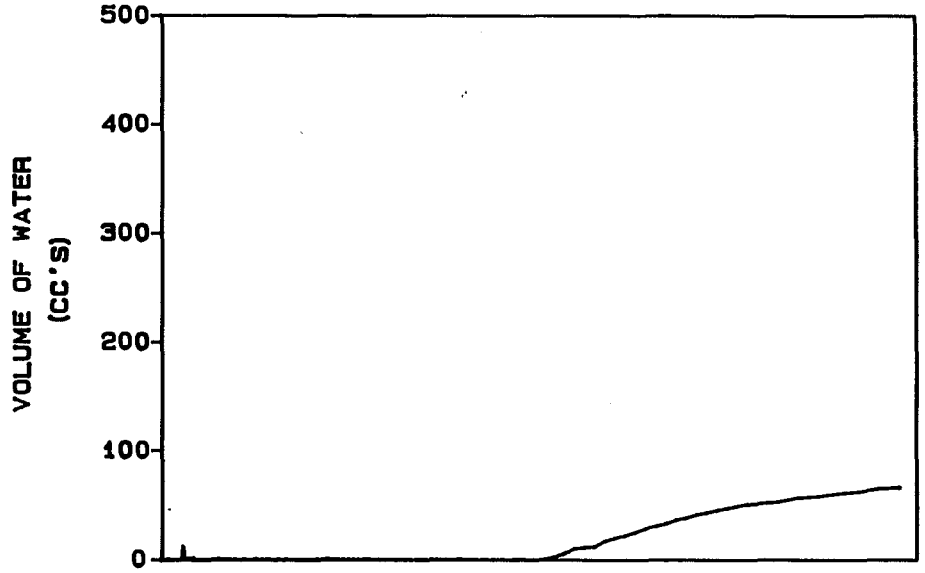


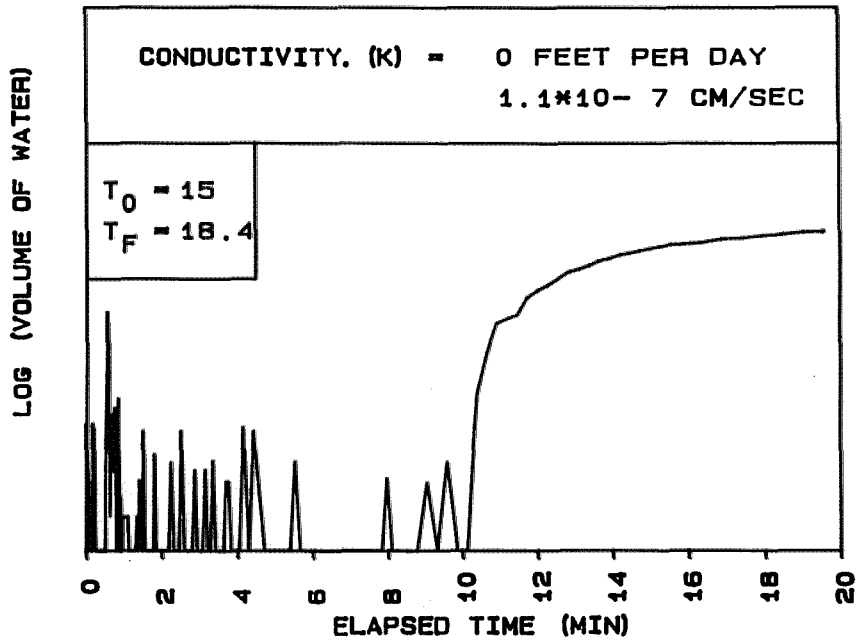


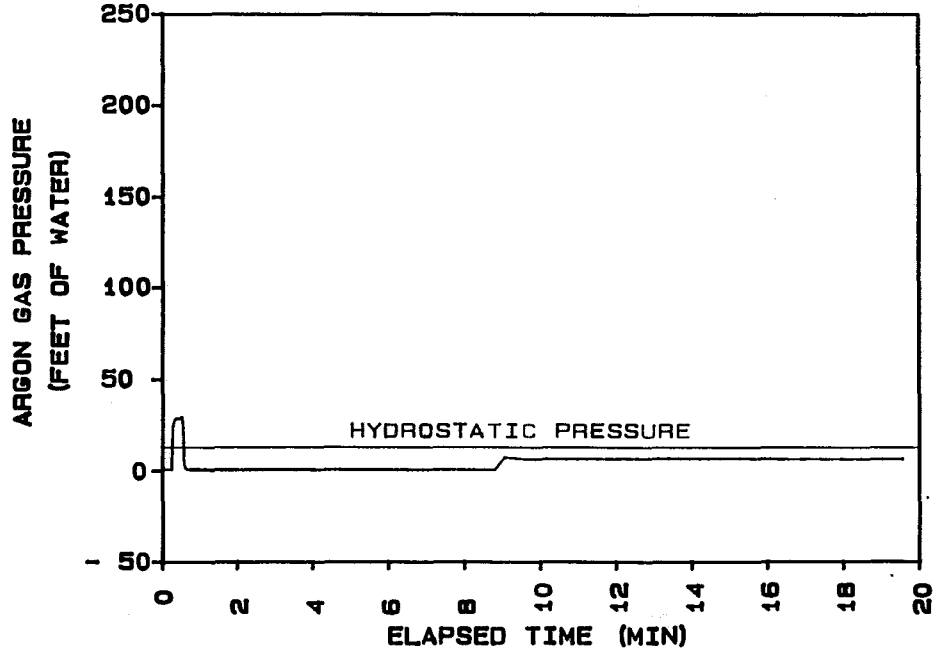
ENSAFE MEMPHIS NSA
LOCATION... 02H2540
TEST DATE
12: 47: 38 12-05-1995

SAMPLE DEPTH (FT) 40
GROUNDWATER DEPTH (FT) 13

HYDROCONE TEST



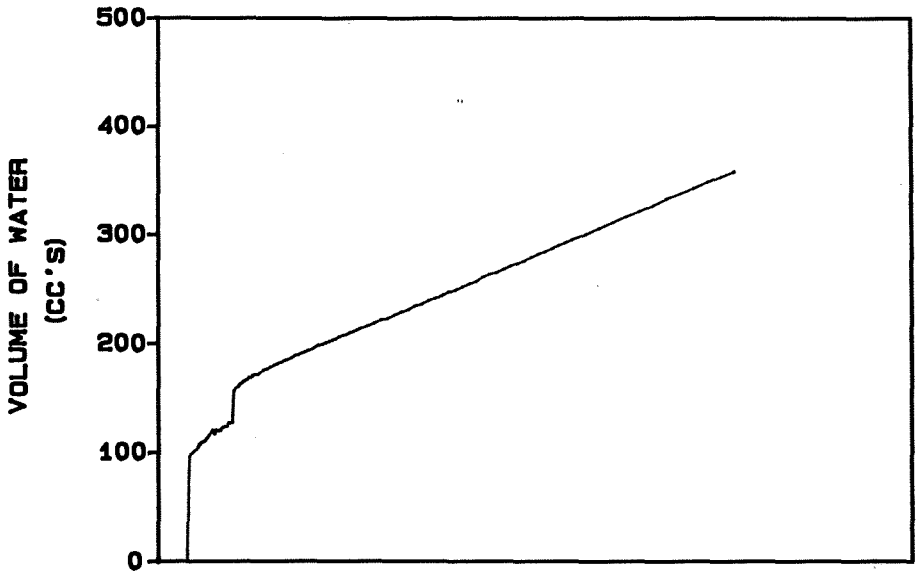


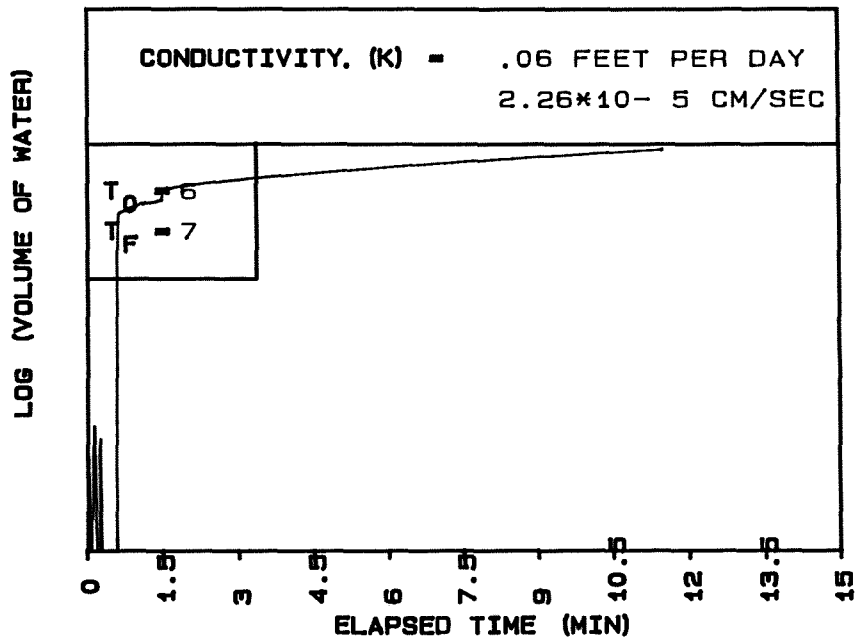


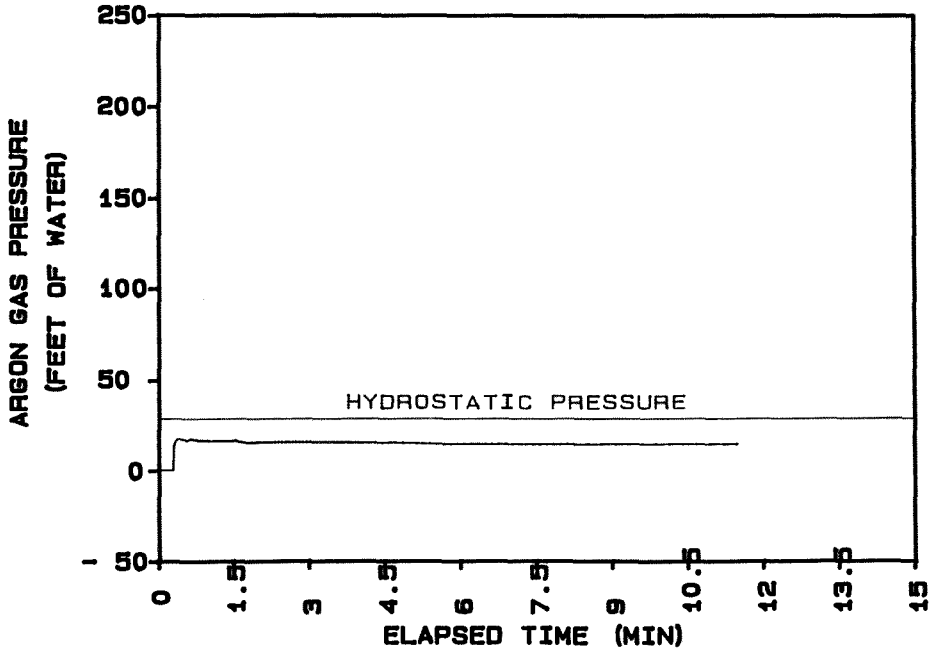
ENSAFE MEMPHIS NSA
LOCATION... 02H2627
TEST DATE
12: 35: 47 12-03-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



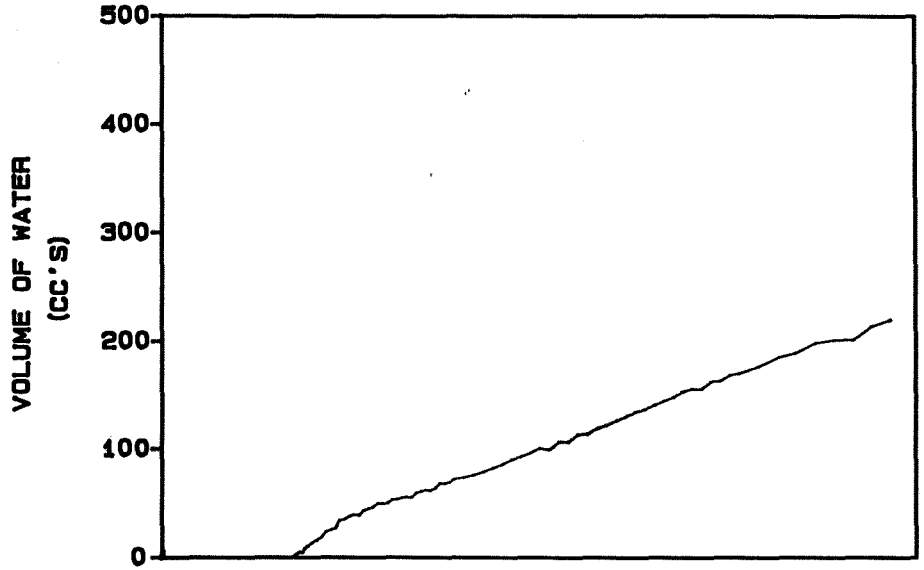


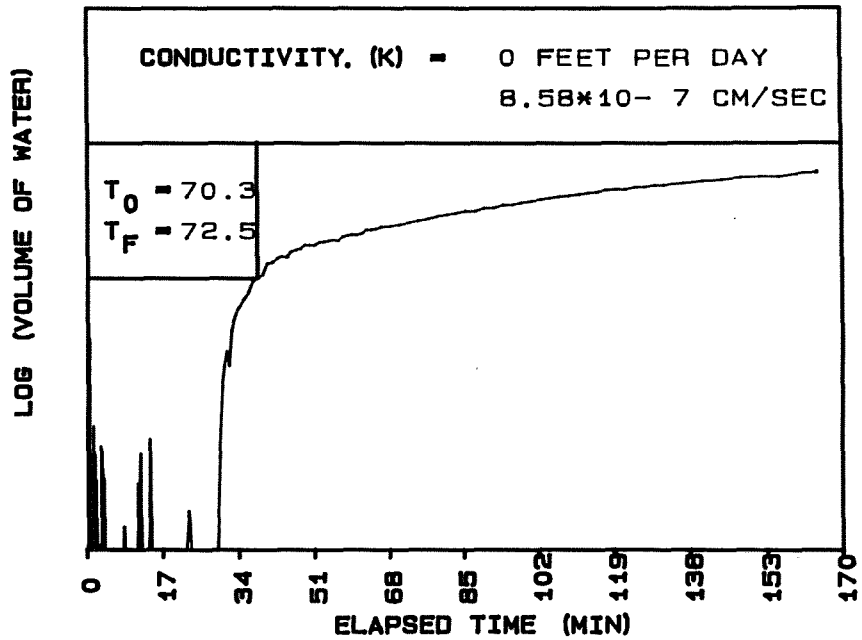


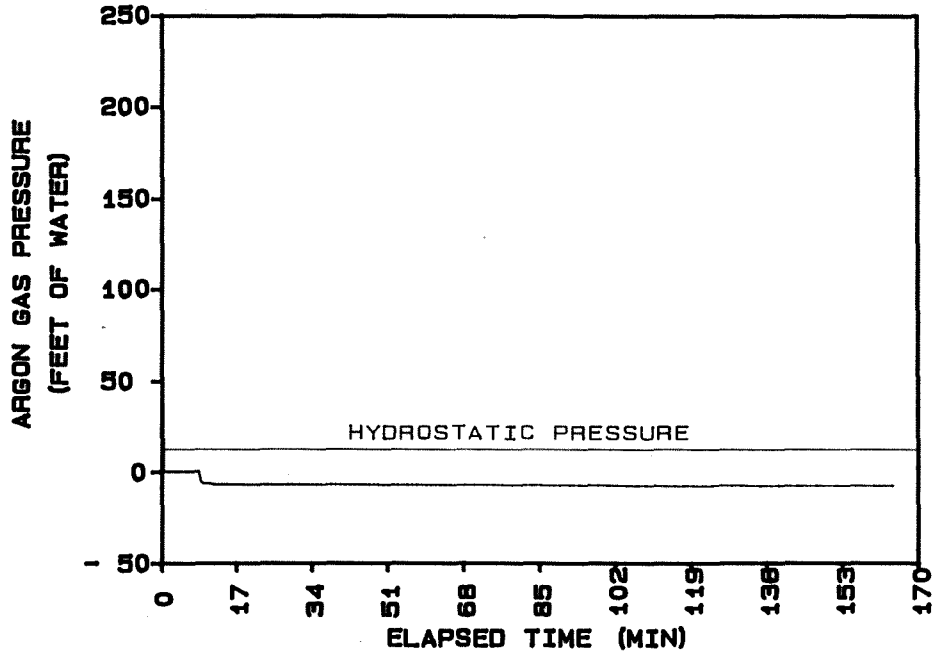
ENSAFE MEMPHIS NSA
LOCATION... 02H2643
TEST DATE
14: 44: 15 12-03-1995

SAMPLE DEPTH (FT) 43
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



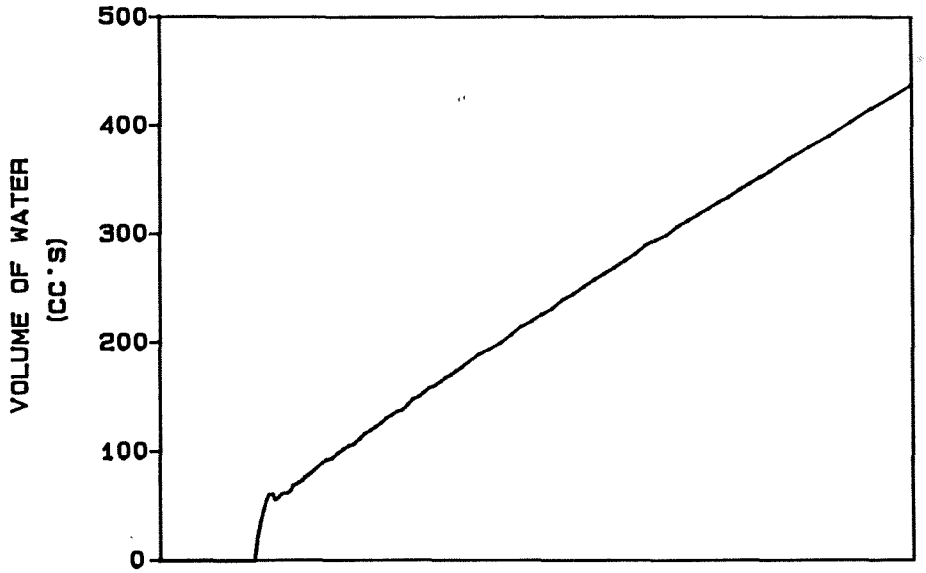


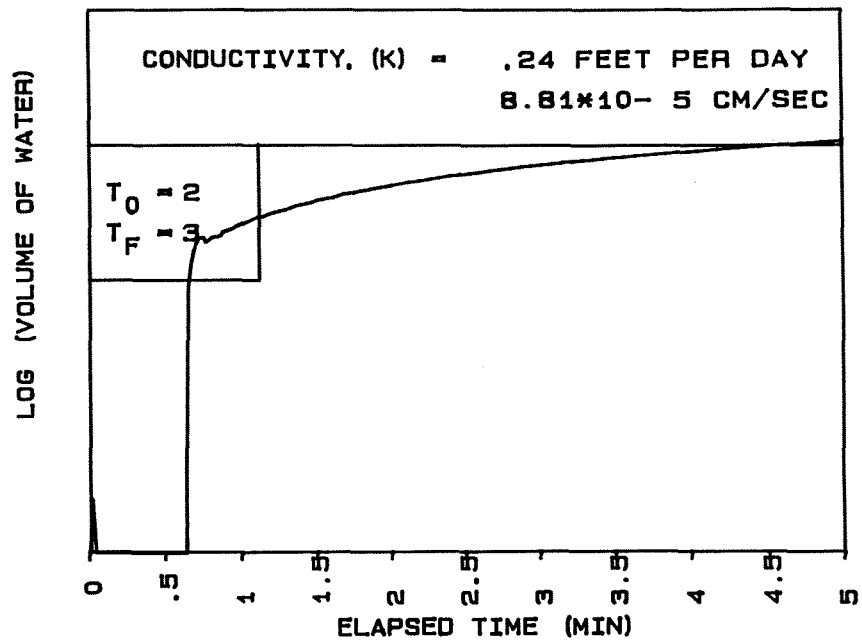


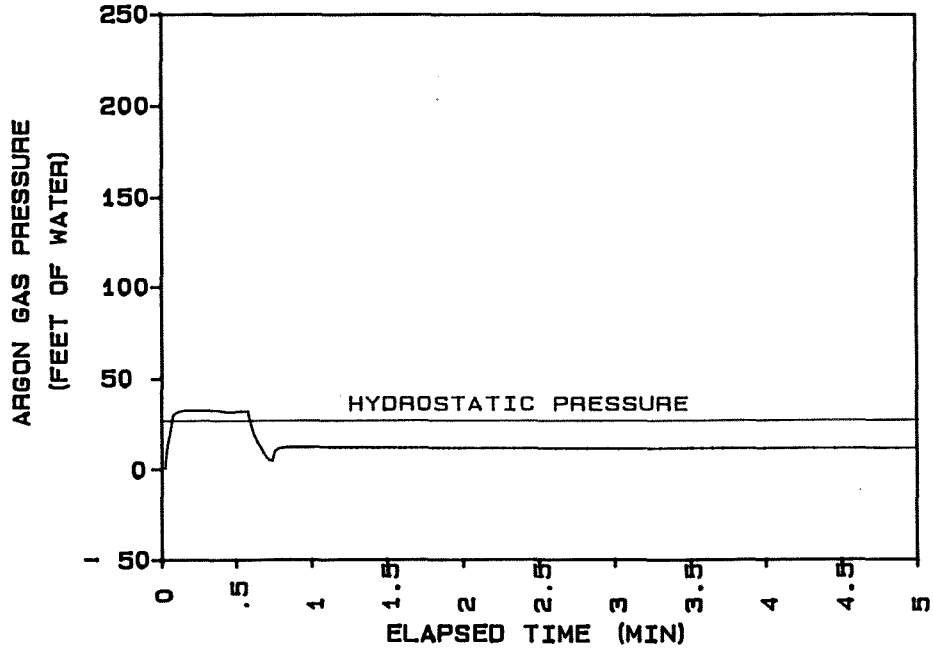
ENSAFE MEMPHIS NSA
LOCATION... 02H2727
TEST DATE
17: 31: 01 12-03-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST







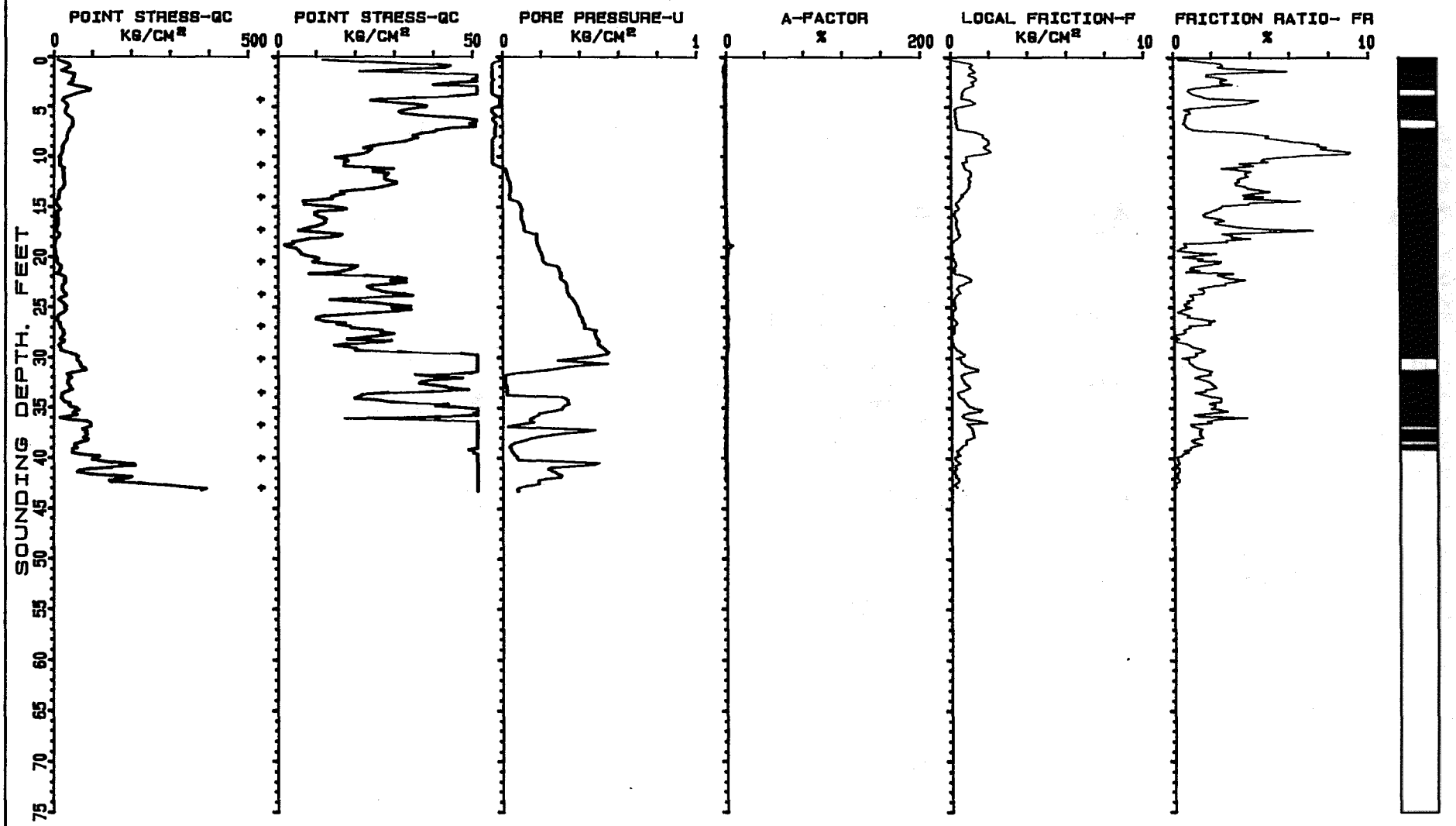
ENSAFE MEMPHIS NSA
LOCATION... 02H2741
TEST DATE
18: 07: 39 12-04-1995

SAMPLE DEPTH (FT) 41
GROUNDWATER DEPTH (FT) 15

SWMU 9

DPT SCREENING INVESTIGATION RESULTS

PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 09-P09
TEST DATE 12-17-1995 13: 49: 14

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 09-P09

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	CLAYEY FINE SAND	34	.95	13	13	.03	60%-70%	>48	74	--	--	--	--
2	CLAYEY FINE SAND	41.9	1.11	16	16	.061	60%-70%	>48	92	--	--	--	--
3	CLAYEY FINE SAND	51.1	1.2	20	20	.092	60%-70%	>48	112	--	--	--	--
4	SILTY FINE SAND	73.1	.69	18	18	.123	70%-80%	>48	160	--	--	--	--
5	CLAYEY FINE SAND	34.8	.79	13	13	.153	50%-60%	44-46	76	--	--	--	--
6	SILTY TO CLAYEY F.S.	35	.26	11	11	.184	50%-60%	42-44	77	--	--	--	--
7	SILTY FINE SAND	49	.3	12	12	.215	60%-70%	44-46	107	--	--	--	--
8	CLAYEY FINE SAND	41.1	1.05	16	16	.246	60%-70%	42-44	90	--	--	--	--
9	CLAY	31.1	1.85	31	31	.271	--	--	--	1.9	1.6	UD	>6
10	CLAY	22.2	1.63	22	22	.295	--	--	--	1.34	1.3	UD	>6
11	CLAY	17.1	.75	17	17	.32	--	--	--	1.02	2.2	.01	[illegible]
12	SANDY CLAY	25.7	.94	12	12	.348	--	--	--	1.56	2.7	.02	>6
13	SANDY CLAY	28.5	.96	14	14	.375	--	--	--	1.73	2.9	.02	>6
14	SILTY CLAY TO CLAY	19	.71	12	12	.402	--	--	--	1.13	2.6	.01	6
15	SILTY CLAY TO CLAY	10.3	.37	6	6	.43	--	--	--	.58	2.7	.02	6
16	SANDY CLAY	12.5	.23	6	6	.457	--	--	--	.72	5.2	.02	6
17	SANDY CLAY	11.5	.27	5	5	.484	--	--	--	.65	4.1	.02	6
18	SILTY CLAY TO CLAY	11	.37	7	7	.512	--	--	--	.62	2.9	.02	6
19	SANDY CLAY	5.6	.08	2	2	.539	--	--	--	.28	6.3	.03	3
20	SENSITIVE FINE GRAIN	6	0	3	3	.561	--	--	--	.3	80.8	.03	3
21	CLAYEY FINE SAND	13.2	.2	5	5	.592	<40%	32-34	29	--	--	--	--
22	SANDY CLAY	18.9	.42	9	9	.619	--	--	--	1.1	4.4	.01	6
23	CLAYEY FINE SAND	29.1	.74	11	11	.65	<40%	36-38	64	--	--	--	--
24	SILTY TO CLAYEY F.S.	28	.35	9	9	.681	<40%	36-38	61	--	--	--	--
25	SILTY TO CLAYEY F.S.	25.5	.18	8	8	.712	<40%	34-36	56	--	--	--	--
26	SILTY TO CLAYEY F.S.	22.8	.1	7	7	.742	<40%	34-36	50	--	--	--	--
27	CLAYEY FINE SAND	14.5	.2	5	5	.773	<40%	30-32	31	--	--	--	--
28	SILTY TO CLAYEY F.S.	25.2	.08	8	8	.804	<40%	34-36	55	--	--	--	--
29	SILTY TO CLAYEY F.S.	21	.11	7	7	.835	<40%	32-34	46	--	--	--	--
30	SILTY TO CLAYEY F.S.	37.3	.45	12	12	.865	<40%	36-38	82	--	--	--	--

9-P09 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SILTY FINE SAND	69.5	.74	17	17	.896	40%-50%	38-40	152	--	--	--	--
32	SILTY TO CLAYEY F.S.	58.4	.84	19	19	.927	40%-50%	38-40	128	--	--	--	--
33	CLAYEY FINE SAND	40.8	.76	16	16	.958	<40%	36-38	89	--	--	--	--
34	SILTY TO CLAYEY F.S.	33.9	.47	11	11	.988	<40%	34-36	74	--	--	--	--
35	CLAYEY FINE SAND	35.5	.88	14	14	1.019	<40%	34-36	78	--	--	--	--
36	SILTY TO CLAYEY F.S.	50.3	.95	16	16	1.05	<40%	36-38	110	--	--	--	--
37	SILTY TO CLAYEY F.S.	72.9	1.16	24	24	1.081	40%-50%	38-40	160	--	--	--	--
38	SILTY FINE SAND	84.8	1.11	21	21	1.111	50%-60%	38-40	186	--	--	--	--
39	SILTY FINE SAND	71.7	.68	17	17	1.142	40%-50%	38-40	157	--	--	--	--
40	SILTY FINE SAND	73.3	.3	18	18	1.173	40%-50%	38-40	161	--	--	--	--
41	FINE SAND	155.1	.25	31	31	1.206	70%-80%	42-44	341	--	--	--	--
42	FINE SAND	123.9	.22	24	24	1.239	60%-70%	40-42	272	--	--	--	--

N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBERTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

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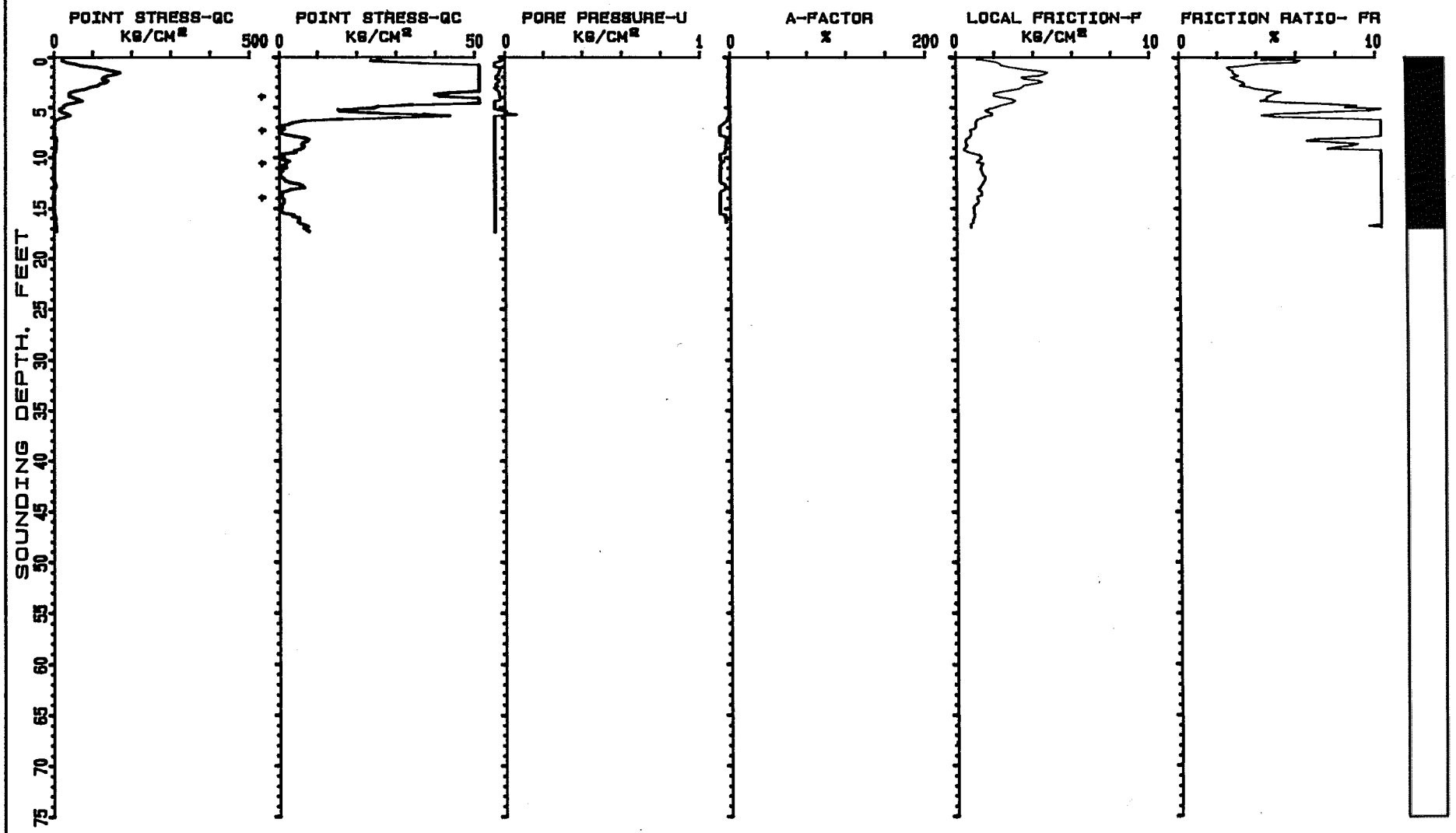
PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 09-P14
TEST DATE 11-21-1995 16:21:26

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 09-P14

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N' #	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	CLAY	46.4	2.37	46	46	.024	--	--	--	2.89	1.9	UD	>6
2	SILTY TO CLAYEY F.S.	134.8	3.94	44	44	.055	>90%	>48	296	--	--	--	--
3	SILTY TO CLAYEY F.S.	128.2	3.79	42	42	.086	>90%	>48	282	--	--	--	--
4	CLAYEY FINE SAND	67.2	2.54	26	26	.117	70%-80%	>48	147	--	--	--	--
5	CLAY	45.8	2.48	45	45	.142	--	--	--	2.84	1.8	UD	>6
6	CLAY	27	1.61	27	27	.167	--	--	--	1.66	1.6	UD	>6
7	SOFT CLAY	8.7	1.04	8	8	.183	--	--	--	.51	.8	UD	6
8	SOFT CLAY	1.4	.73	1	1	.199	--	--	--	.05	.1	UD	1-1.5
9	CLAY	6.7	.5	6	6	.224	--	--	--	.38	1.3	.03	6
10	SOFT CLAY	2.6	.87	2	2	.24	--	--	--	.12	.3	UD	1-1.5
[illegible]	SOFT CLAY	1.3	1.25	1	1	.256	--	--	--	.04	.1	UD	1
[illegible]	SOFT CLAY	.4	1.39	0	0	.272	--	--	--	-.02	0	UD	<1
13	SOFT CLAY	3.5	1.35	3	3	.288	--	--	--	.17	.2	UD	3
14	SOFT CLAY	2.1	1.21	2	2	.304	--	--	--	.08	.1	UD	1-1.5
15	SOFT CLAY	.2	1.01	0	0	.32	--	--	--	-.04	0	UD	<1
16	SOFT CLAY	2.2	.9	2	2	.336	--	--	--	.08	.2	UD	1

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
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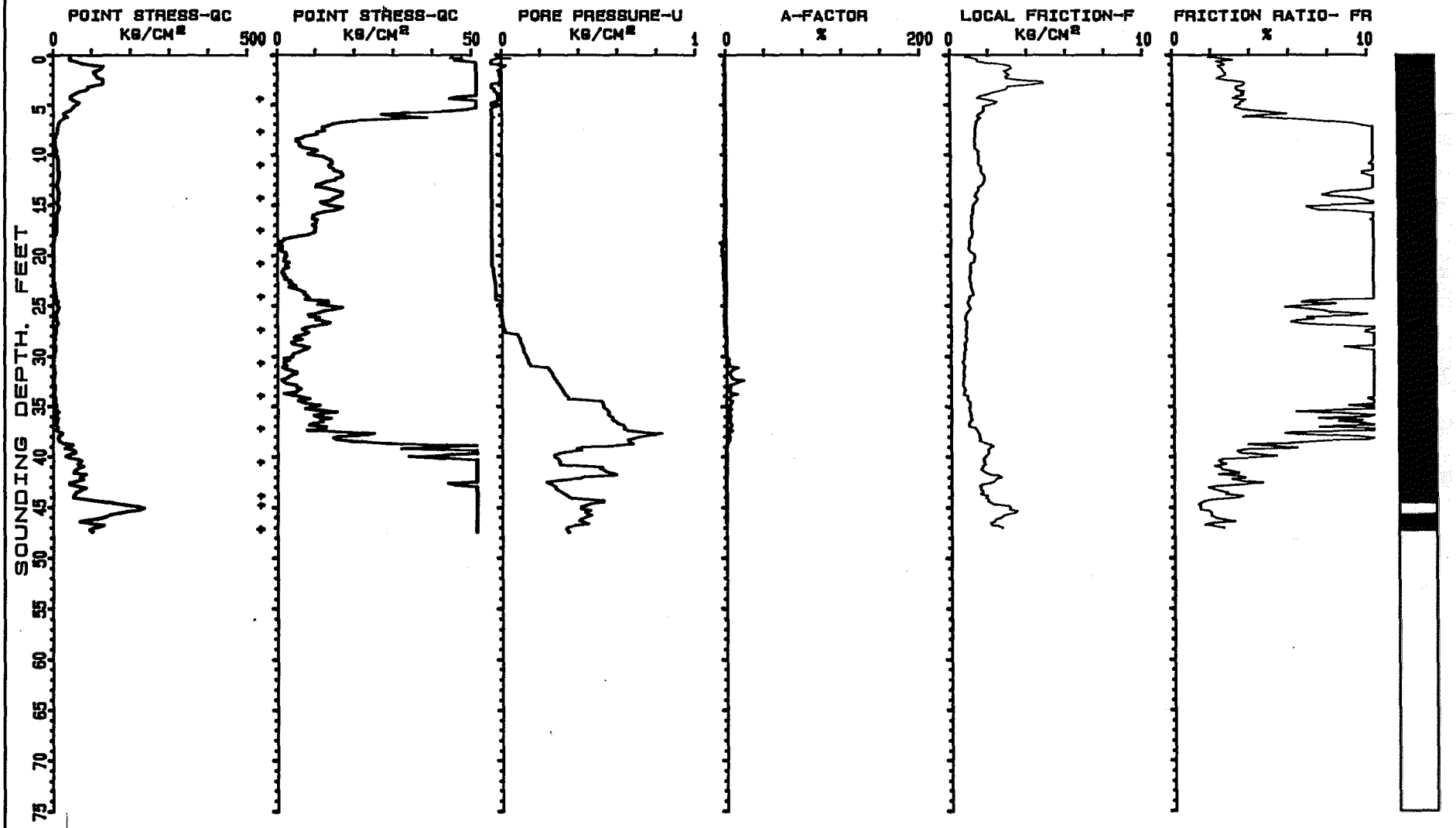
PIEZOCONE SOUNDING



* PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 09-P14A
TEST DATE 11-27-1995 12:13:33

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 09-P14A

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	CLAYEY FINE SAND	66.7	2.15	26	26	.03	70%-80%	>48	146	--	--	--	--
2	SILTY TO CLAYEY F.S.	114.3	3.04	38	38	.061	>90%	>48	251	--	--	--	--
3	CLAYEY FINE SAND	121.5	3.73	48	48	.092	>90%	>48	267	--	--	--	--
4	CLAYEY FINE SAND	90	2.74	36	36	.123	70%-80%	>48	198	--	--	--	--
5	CLAYEY FINE SAND	55.4	1.91	22	22	.153	60%-70%	46-48	121	--	--	--	--
6	SANDY CLAY	47.1	1.66	23	23	.181	--	--	--	2.92	2.8	.01	>6
7	CLAY	24.9	1.38	24	24	.206	--	--	--	1.53	1.7	UD	>6
8	CLAY	12	1.27	12	12	.23	--	--	--	.72	.9	.02	6
9	SOFT CLAY	6.5	1.26	6	6	.247	--	--	--	.37	.5	UD	6
10	SOFT CLAY	8	1.36	8	8	.263	--	--	--	.46	.5	UD	6
[illegible]	SOFT CLAY	12.2	1.44	12	12	.279	--	--	--	.72	.8	UD	6
[illegible]	CLAY	14.8	1.59	14	14	.304	--	--	--	.88	.9	.01	6
13	SOFT CLAY	14.4	1.71	14	14	.32	--	--	--	.85	.8	UD	6
14	CLAY	14.1	1.39	14	14	.345	--	--	--	.83	1	.01	6
15	CLAY	13.9	1.26	13	13	.37	--	--	--	.81	1	.01	6
16	CLAY	13.3	1.11	13	13	.395	--	--	--	.77	1.1	.01	6
17	SOFT CLAY	9.6	1.06	9	9	.411	--	--	--	.54	.9	UD	6
18	SOFT CLAY	9.4	1.1	9	9	.427	--	--	--	.52	.8	UD	6
19	SOFT CLAY	3.1	.99	3	3	.443	--	--	--	.12	.3	UD	1-1.5
20	SOFT CLAY	1.4	1.03	1	1	.459	--	--	--	.02	.1	UD	<1
21	SOFT CLAY	2.3	1.16	2	2	.475	--	--	--	.07	.2	UD	1
22	SOFT CLAY	1.9	1.01	1	1	.491	--	--	--	.04	.1	UD	<1
23	SOFT CLAY	3.1	1	3	3	.507	--	--	--	.11	.3	UD	1
24	SOFT CLAY	5.8	1.08	5	5	.524	--	--	--	.28	.5	UD	3
25	CLAY	10.5	.91	10	10	.548	--	--	--	.57	1.1	.02	6
26	CLAY	12	.87	12	12	.573	--	--	--	.66	1.3	.02	6
27	CLAY	11	.77	11	11	.598	--	--	--	.59	1.4	.02	3
28	SOFT CLAY	7.3	.76	7	7	.614	--	--	--	.36	.9	UD	3
29	SOFT CLAY	4.9	.74	4	4	.63	--	--	--	.21	.6	UD	1-1.5
30	SOFT CLAY	6.1	.7	6	6	.647	--	--	--	.28	.8	UD	1-1.5

09-P14A CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SOFT CLAY	2.7	.65	2	2	.663	--	--	--	.06	.4	UD	<1
32	SOFT CLAY	3.2	.65	3	3	.679	--	--	--	.09	.5	UD	1
33	SOFT CLAY	3	.62	3	3	.695	--	--	--	.08	.4	UD	1
34	SOFT CLAY	4.8	.73	4	4	.711	--	--	--	.19	.6	UD	1-1.5
35	SOFT CLAY	7.9	.93	7	7	.727	--	--	--	.38	.8	UD	3
36	CLAY	10.6	.98	10	10	.752	--	--	--	.54	1	.02	3
37	CLAY	11.1	1.02	11	11	.777	--	--	--	.57	1	.02	3
38	CLAY	16.1	1.4	16	16	.802	--	--	--	.88	1.1	.01	6
39	CLAY	26.9	1.78	26	26	.827	--	--	--	1.55	1.5	UD	6
40	SILTY CLAY TO CLAY	46	1.87	30	30	.854	--	--	--	2.74	2.4	UD	6
41	CLAYEY FINE SAND	61.5	1.66	24	24	.885	40%-50%	38-40	135	--	--	--	--
42	CLAYEY FINE SAND	68.1	1.93	27	27	.916	40%-50%	38-40	149	--	--	--	--
43	CLAYEY FINE SAND	63	1.95	25	25	.946	40%-50%	38-40	138	--	--	--	--
44	CLAYEY FINE SAND	66.4	1.62	26	26	.977	40%-50%	38-40	146	--	--	--	--
45	SILTY TO CLAYEY F.S.	127.3	2.27	42	42	1.008	60%-70%	42-44	280	--	--	--	--
46	SILTY FINE SAND	189.1	2.97	47	47	1.039	80%-90%	42-44	416	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
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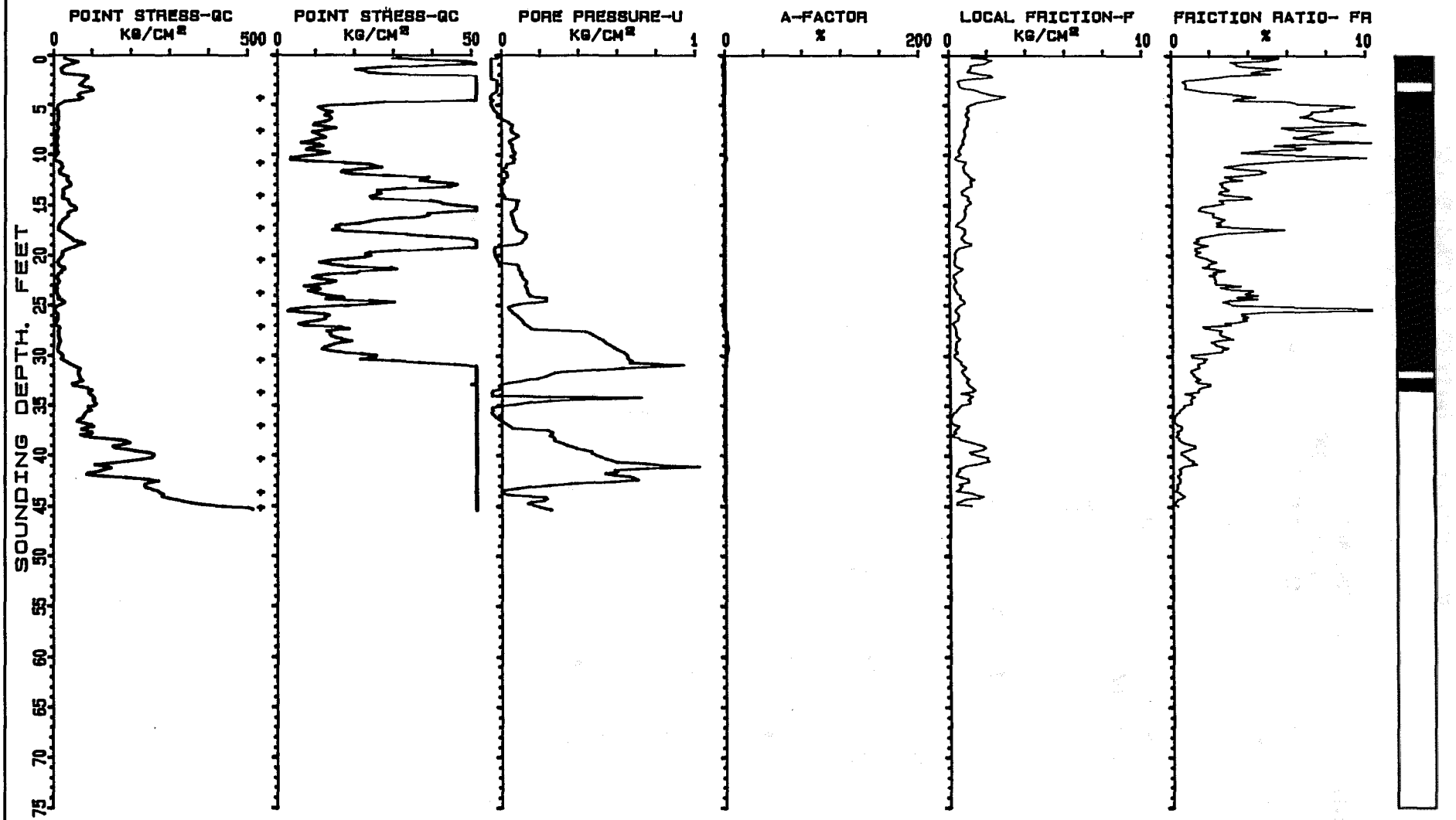
PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 09-P17
TEST DATE 12-17-1995 09: 18: 17

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 09-P17

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	SANDY CLAY	47.5	1.72	23	23	.027	--	--	--	2.96	2.7	.01	>6
2	CLAY	27	1.31	27	27	.052	--	--	--	1.68	2	UD	>6
3	SILTY TO CLAYEY F.S.	73.4	1.15	24	24	.083	70%-80%	>48	161	--	--	--	--
4	SILTY TO CLAYEY F.S.	83.9	1.28	27	27	.113	70%-80%	>48	184	--	--	--	--
5	CLAYEY FINE SAND	56.3	2.04	22	22	.144	60%-70%	46-48	123	--	--	--	--
6	CLAY	13.6	.98	13	13	.169	--	--	--	.82	1.3	.01	>6
7	CLAY	12.2	.95	12	12	.194	--	--	--	.73	1.2	.02	6
8	CLAY	11.6	.82	11	11	.219	--	--	--	.69	1.4	.02	6
9	CLAY	10.1	.72	10	10	.244	--	--	--	.59	1.4	.02	6
10	CLAY	10.6	.53	10	10	.269	--	--	--	.62	1.9	.02	6
11	CLAY	10.5	.58	10	10	.293	--	--	--	.61	1.8	.02	6
12	SILTY CLAY TO CLAY	20.9	.82	13	13	.321	--	--	--	1.26	2.5	UD	[illegible]
13	CLAYEY FINE SAND	36.5	1.13	14	14	.352	50%-60%	40-42	80	--	--	--	--
14	CLAYEY FINE SAND	32.5	.82	13	13	.382	40%-50%	40-42	71	--	--	--	--
15	CLAYEY FINE SAND	34.9	.99	13	13	.413	40%-50%	40-42	76	--	--	--	--
16	SILTY TO CLAYEY F.S.	48.9	.82	16	16	.444	50%-60%	40-42	107	--	--	--	--
17	CLAYEY FINE SAND	27.8	.58	11	11	.475	<40%	38-40	61	--	--	--	--
18	SANDY CLAY	20.3	.71	10	10	.502	--	--	--	1.2	2.8	.02	6
19	SILTY TO CLAYEY F.S.	54.9	.84	18	18	.533	50%-60%	40-42	120	--	--	--	--
20	SILTY TO CLAYEY F.S.	37.1	.41	12	12	.564	<40%	38-40	81	--	--	--	--
21	CLAYEY FINE SAND	17.1	.29	6	6	.594	<40%	34-36	37	--	--	--	--
22	CLAYEY FINE SAND	21	.42	8	8	.625	<40%	34-36	46	--	--	--	--
23	SANDY CLAY	11.3	.25	5	5	.652	--	--	--	.62	4.4	.02	3
24	CLAY	10.1	.41	10	10	.677	--	--	--	.54	2.4	.02	3
25	SANDY CLAY	20.2	.63	10	10	.705	--	--	--	1.17	3.1	.02	6
26	CLAY	9.3	.41	9	9	.73	--	--	--	.48	2.2	.02	3
27	SILTY CLAY TO CLAY	9.8	.31	6	6	.757	--	--	--	.51	3.1	.02	3
28	SANDY CLAY	13.7	.33	6	6	.784	--	--	--	.75	4	.02	3
29	SANDY CLAY	15.7	.38	7	7	.812	--	--	--	.87	4.1	.01	6
30	SANDY CLAY	16.3	.32	8	8	.839	--	--	--	.9	4.9	.01	6

09-P17 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	CLAYEY FINE SAND	34.1	.55	13	13	.87	<40%	36-38	75	--	--	--	--
32	SILTY TO CLAYEY F.S.	65	.75	21	21	.901	40%-50%	38-40	143	--	--	--	--
33	SILTY TO CLAYEY F.S.	64.9	.97	21	21	.931	40%-50%	38-40	142	--	--	--	--
34	SILTY FINE SAND	86	1.09	21	21	.962	50%-60%	40-42	189	--	--	--	--
35	FINE SAND	105.7	.9	21	21	.995	60%-70%	40-42	232	--	--	--	--
36	FINE SAND	91	.27	18	18	1.028	50%-60%	40-42	200	--	--	--	--
37	FINE SAND	77.5	.15	15	15	1.062	40%-50%	38-40	170	--	--	--	--
38	FINE SAND	90.4	.28	18	18	1.095	50%-60%	40-42	198	--	--	--	--
39	FINE SAND	145.3	.9	29	29	1.128	70%-80%	42-44	319	--	--	--	--
40	FINE SAND	199.2	1.47	39	39	1.161	80%-90%	42-44	438	--	--	--	--
41	FINE SAND	207.1	1.59	41	41	1.195	80%-90%	42-44	455	--	--	--	--
42	FINE SAND	118.3	.48	23	23	1.228	60%-70%	40-42	260	--	--	--	--
43	DENSE OR CEMENTED S.	220.1	.73	36	36	1.264	80%-90%	42-44	484	--	--	--	--
44	DENSE OR CEMENTED S.	262.9	.96	43	43	1.301	>90%	44-46	578	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBERTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

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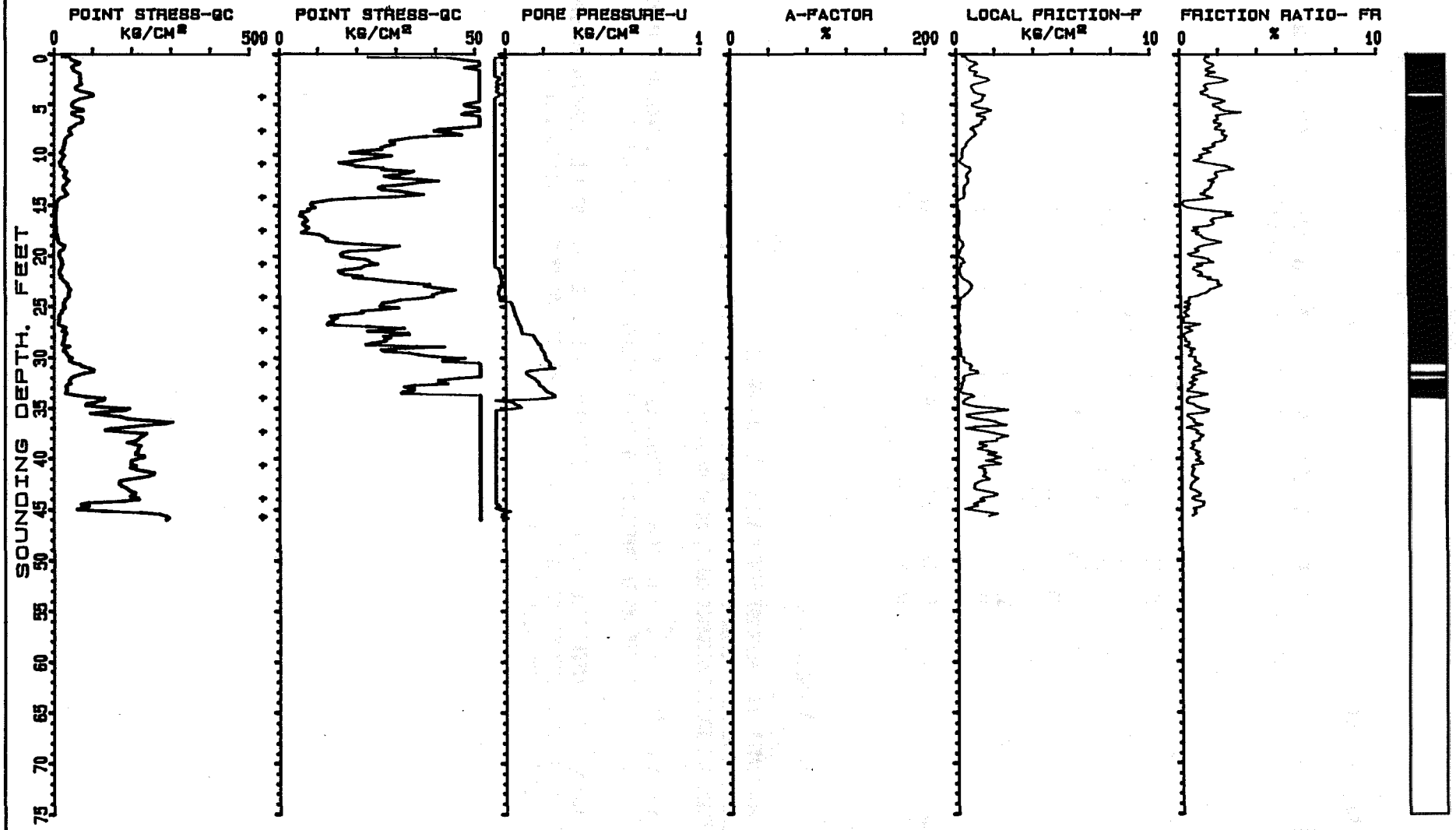
PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 09-P21
TEST DATE 11-30-1995 14:27:51

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 09-P21

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	SILTY TO CLAYEY F.S.	56.1	.89	18	18	.03	70%-80%	>48	123	--	--	--	--
2	SILTY TO CLAYEY F.S.	54.8	.88	18	18	.061	70%-80%	>48	120	--	--	--	--
3	SILTY TO CLAYEY F.S.	69	1.23	23	23	.092	70%-80%	>48	151	--	--	--	--
4	SILTY TO CLAYEY F.S.	72.7	.98	24	24	.123	70%-80%	>48	159	--	--	--	--
5	SILTY TO CLAYEY F.S.	73.5	1.17	24	24	.153	70%-80%	46-48	161	--	--	--	--
6	CLAYEY FINE SAND	56.7	1.28	22	22	.184	60%-70%	44-46	124	--	--	--	--
7	SILTY TO CLAYEY F.S.	65.9	1.28	21	21	.215	70%-80%	44-46	144	--	--	--	--
8	SILTY TO CLAYEY F.S.	47.2	.93	15	15	.246	60%-70%	42-44	103	--	--	--	--
9	CLAYEY FINE SAND	33.5	.64	13	13	.276	50%-60%	40-42	73	--	--	--	--
10	CLAYEY FINE SAND	24.6	.34	9	9	.307	40%-50%	38-40	54	--	--	--	--
[illegible]	CLAYEY FINE SAND	21.7	.27	8	8	.338	<40%	38-40	47	--	--	--	--
[illegible]	CLAYEY FINE SAND	27	.61	10	10	.369	40%-50%	38-40	59	--	--	--	--
13	CLAYEY FINE SAND	32.8	.54	13	13	.399	40%-50%	40-42	72	--	--	--	--
14	SILTY TO CLAYEY F.S.	30	.4	10	10	.43	40%-50%	38-40	66	--	--	--	--
15	CLAYEY FINE SAND	18.2	.12	7	7	.461	<40%	36-38	40	--	--	--	--
16	SANDY CLAY	7.5	.09	3	3	.488	--	--	--	.4	7.7	.03	3
17	SANDY CLAY	6.4	.1	3	3	.516	--	--	--	.33	5.8	.02	3
18	SENSITIVE FINE GRAIN	7.9	.04	3	3	.538	--	--	--	.42	17.1	.02	3
19	CLAYEY FINE SAND	16.3	.26	6	6	.568	<40%	34-36	35	--	--	--	--
20	SILTY TO CLAYEY F.S.	21.4	.15	7	7	.599	<40%	34-36	47	--	--	--	--
21	CLAYEY FINE SAND	21.3	.26	8	8	.63	<40%	34-36	46	--	--	--	--
22	CLAYEY FINE SAND	18.3	.17	7	7	.661	<40%	34-36	40	--	--	--	--
23	CLAYEY FINE SAND	28.7	.59	11	11	.692	<40%	36-38	63	--	--	--	--
24	SILTY TO CLAYEY F.S.	40.5	.5	13	13	.722	<40%	38-40	89	--	--	--	--
25	SILTY TO CLAYEY F.S.	30.4	.11	10	10	.753	<40%	36-38	66	--	--	--	--
26	SILTY TO CLAYEY F.S.	21.7	.01	7	7	.784	<40%	34-36	47	--	--	--	--
27	CLAYEY FINE SAND	14.5	.04	5	5	.815	<40%	30-32	31	--	--	--	--
28	SILTY TO CLAYEY F.S.	28.1	.07	9	9	.845	<40%	34-36	61	--	--	--	--
29	SILTY TO CLAYEY F.S.	28.5	.09	9	9	.876	<40%	34-36	62	--	--	--	--
30	SILTY TO CLAYEY F.S.	34.2	.21	11	11	.907	<40%	36-38	75	--	--	--	--

09-P21 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SILTY FINE SAND	59.2	.53	14	14	.938	40%-50%	38-40	130	--	--	--	--
32	SILTY FINE SAND	77.8	.61	19	19	.968	50%-60%	40-42	171	--	--	--	--
33	SILTY TO CLAYEY F.S.	38.6	.21	12	12	.999	<40%	36-38	84	--	--	--	--
34	SILTY FINE SAND	57	.42	14	14	1.03	<40%	38-40	125	--	--	--	--
35	FINE SAND	121.9	.99	24	24	1.063	60%-70%	40-42	268	--	--	--	--
36	FINE SAND	156	1.28	31	31	1.096	70%-80%	42-44	343	--	--	--	--
37	FINE SAND	226.6	1.49	45	45	1.13	80%-90%	44-46	498	--	--	--	--
38	FINE SAND	190.4	1.86	38	38	1.163	80%-90%	42-44	418	--	--	--	--
39	FINE SAND	211.5	1.43	42	42	1.196	80%-90%	42-44	465	--	--	--	--
40	FINE SAND	217.4	1.79	43	43	1.229	80%-90%	42-44	478	--	--	--	--
41	FINE SAND	201.6	1.56	40	40	1.262	80%-90%	42-44	443	--	--	--	--
42	FINE SAND	225.4	1.39	45	45	1.296	80%-90%	42-44	495	--	--	--	--
43	FINE SAND	177.5	1.01	35	35	1.329	70%-80%	42-44	390	--	--	--	--
44	FINE SAND	204.3	1.55	40	40	1.362	70%-80%	42-44	449	--	--	--	--
45	FINE SAND	111.7	.88	22	22	1.395	50%-60%	40-42	245	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
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*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
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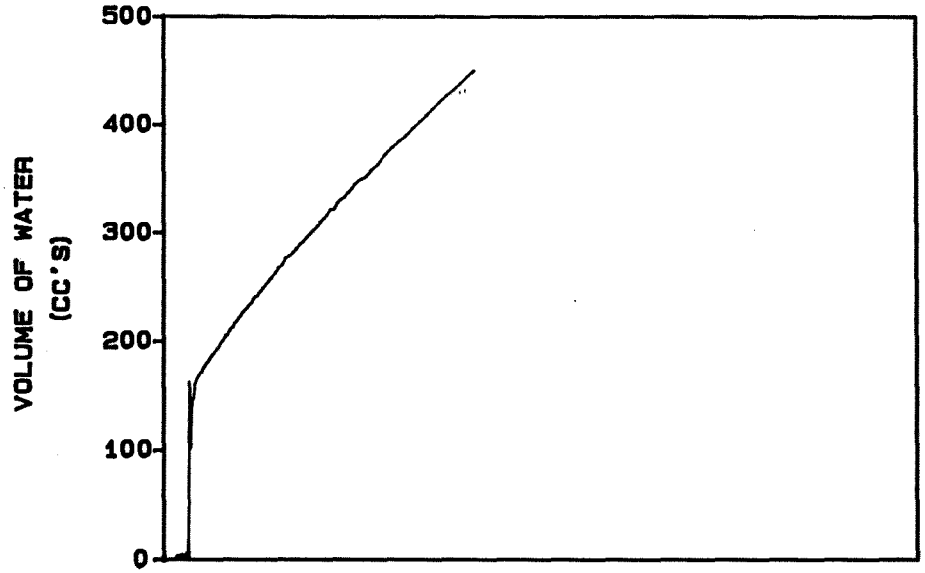
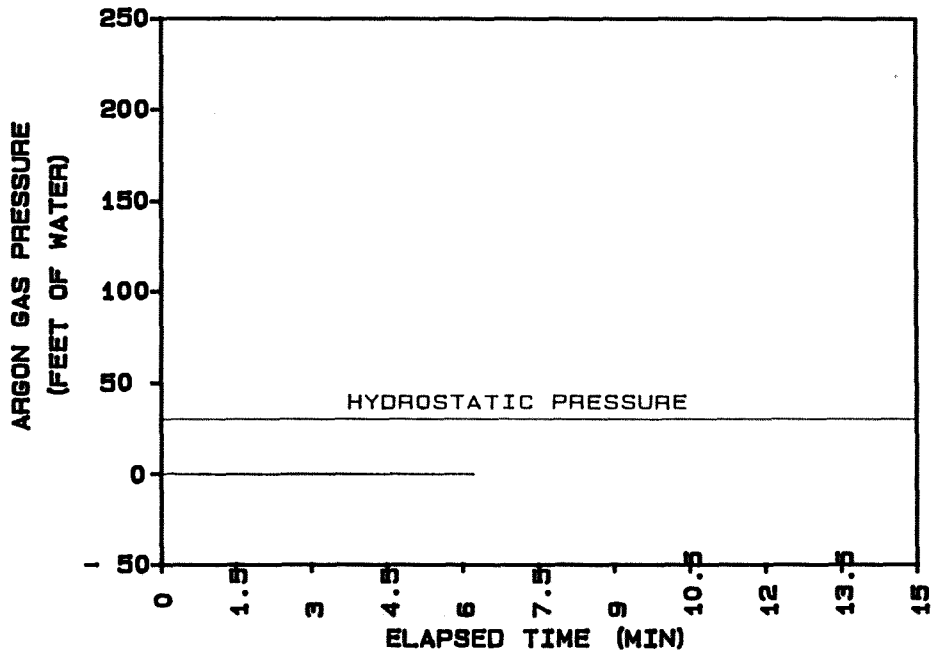
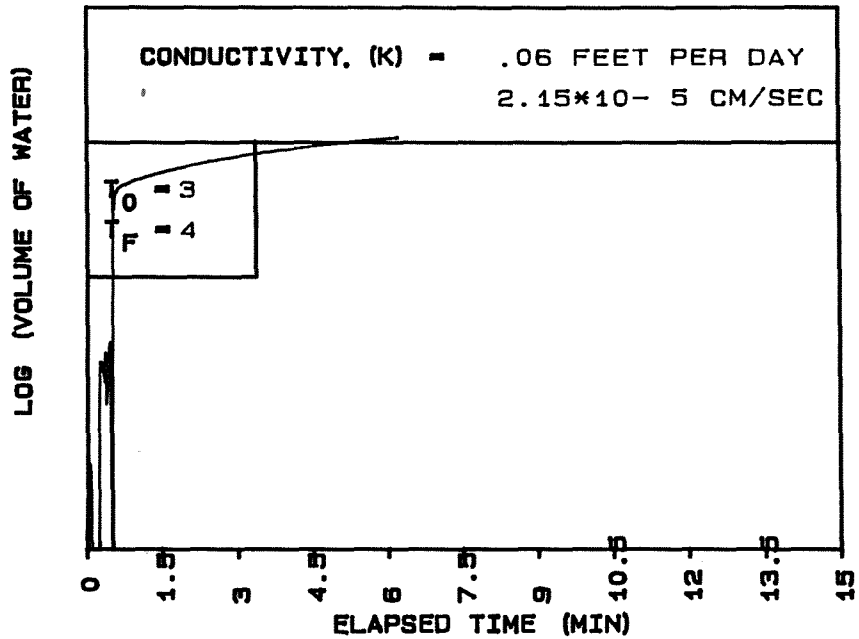
HYDROCONE TEST







ENSAFE MEMPHIS NSA
LOCATION... 09H0946
TEST DATE
20: 37: 54 12-01-1995

SAMPLE DEPTH (FT) 46
GROUNDWATER DEPTH (FT) 16

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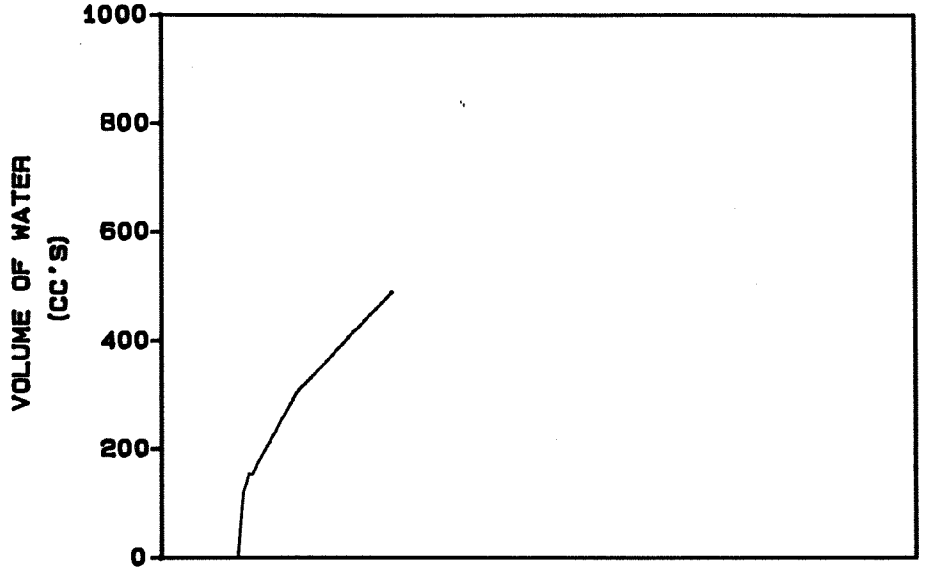

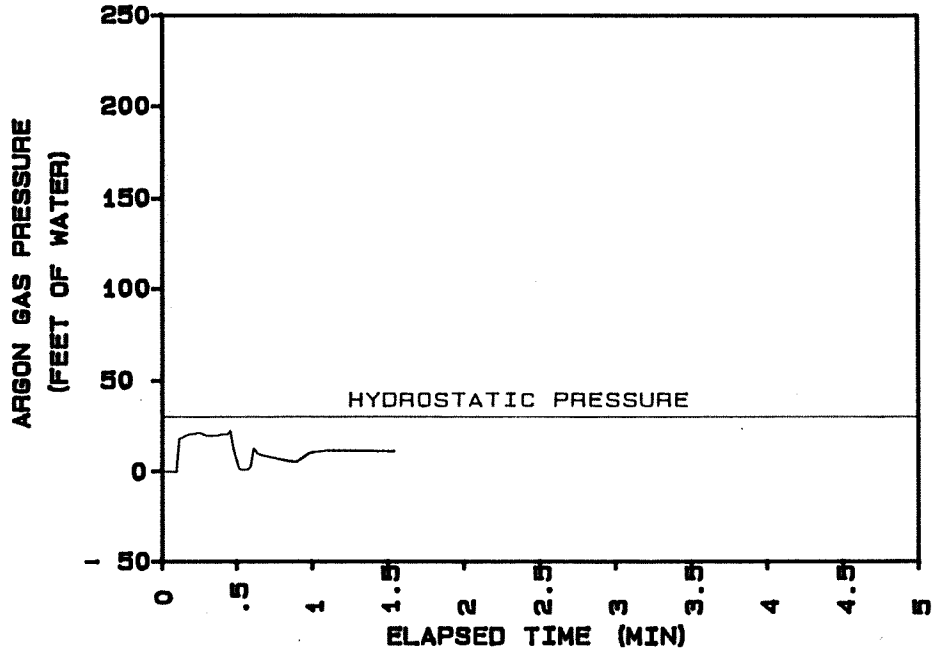

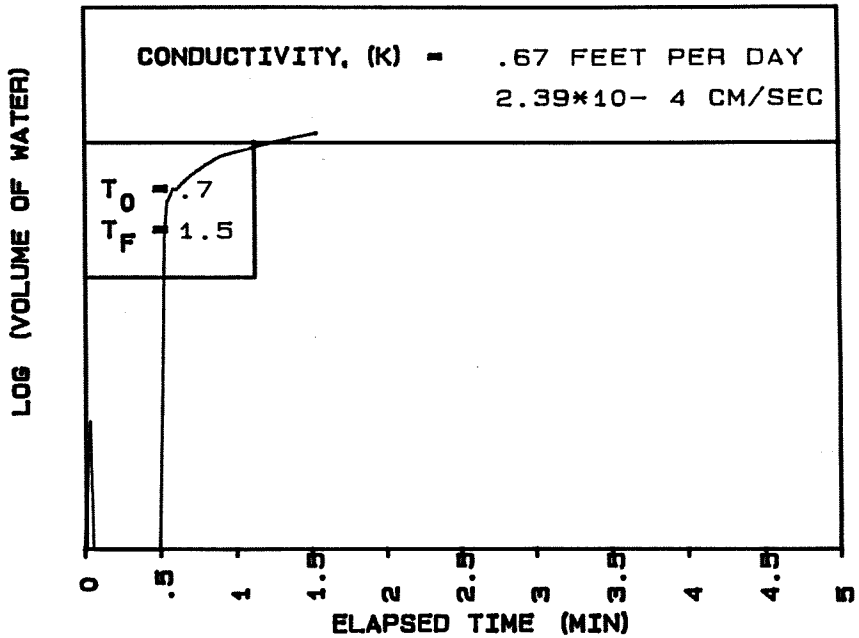

ENSAFE MEMPHIS NSA
LOCATION... 09H1046
TEST DATE
13: 01: 36 12-02-1995

SAMPLE DEPTH (FT) 46
GROUNDWATER DEPTH (FT) 16

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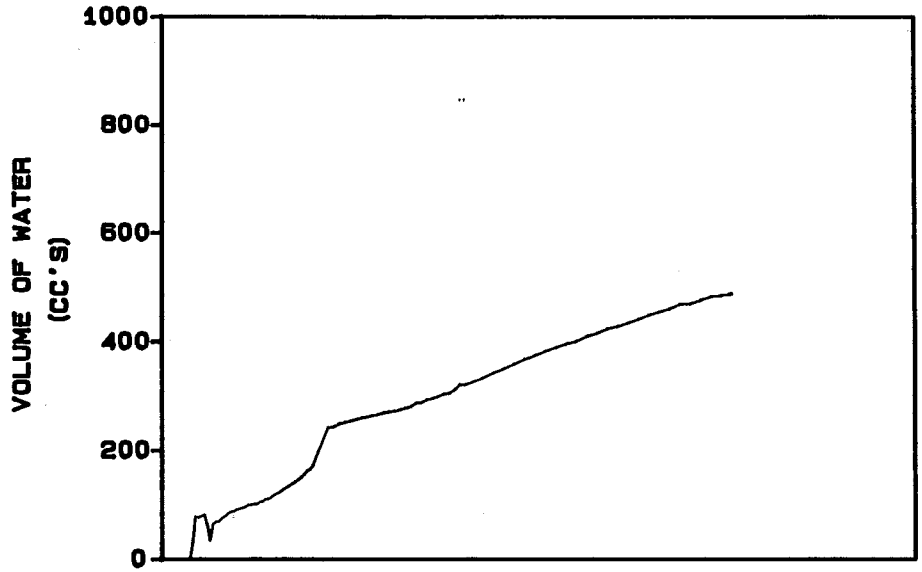
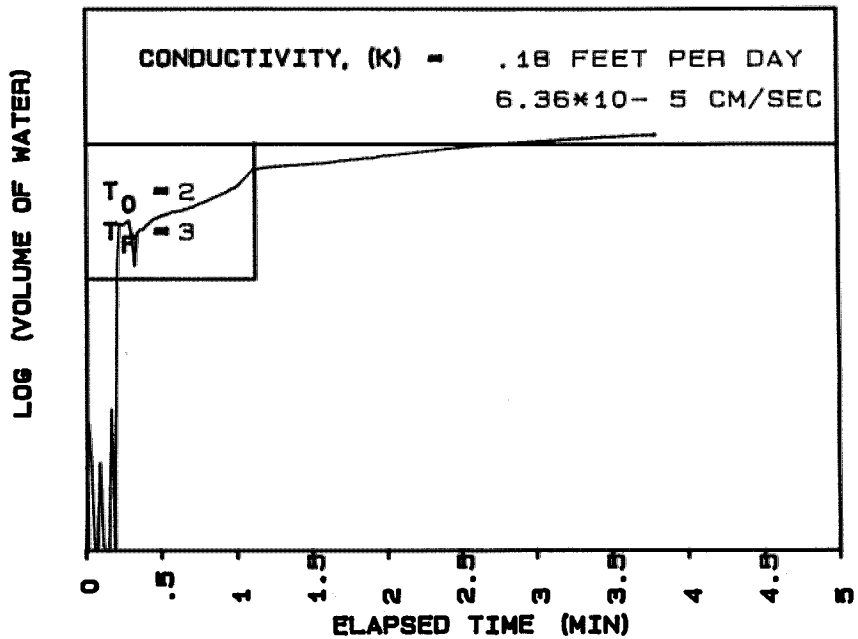
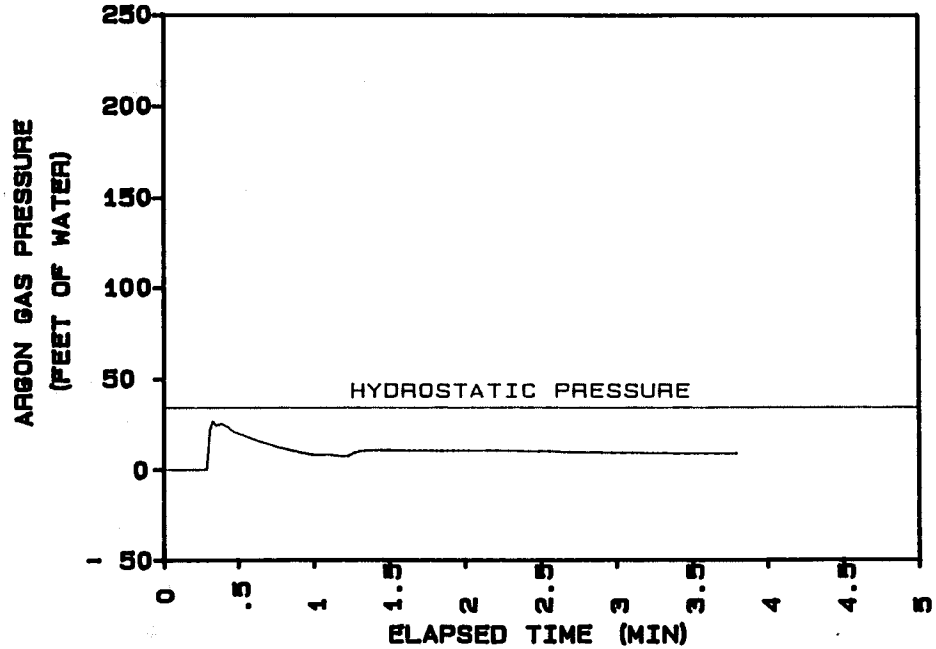


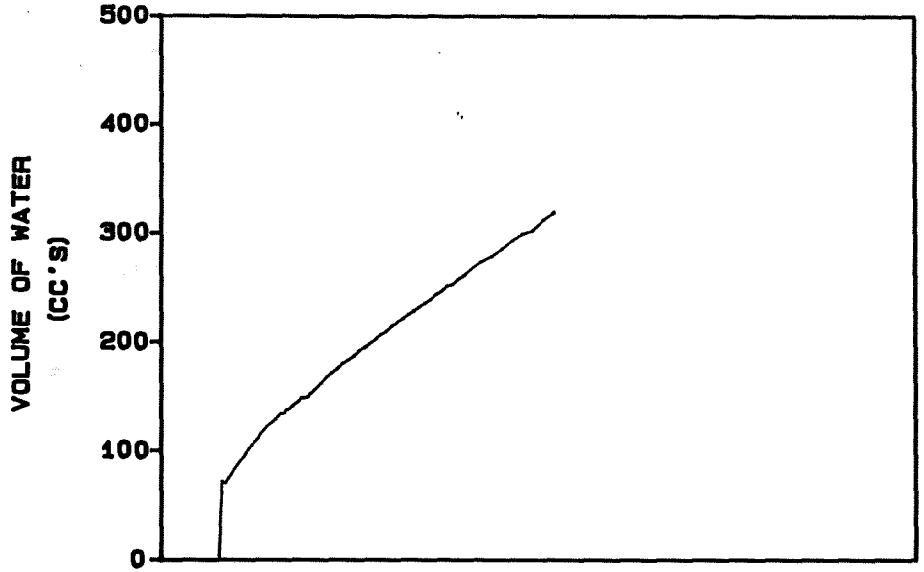


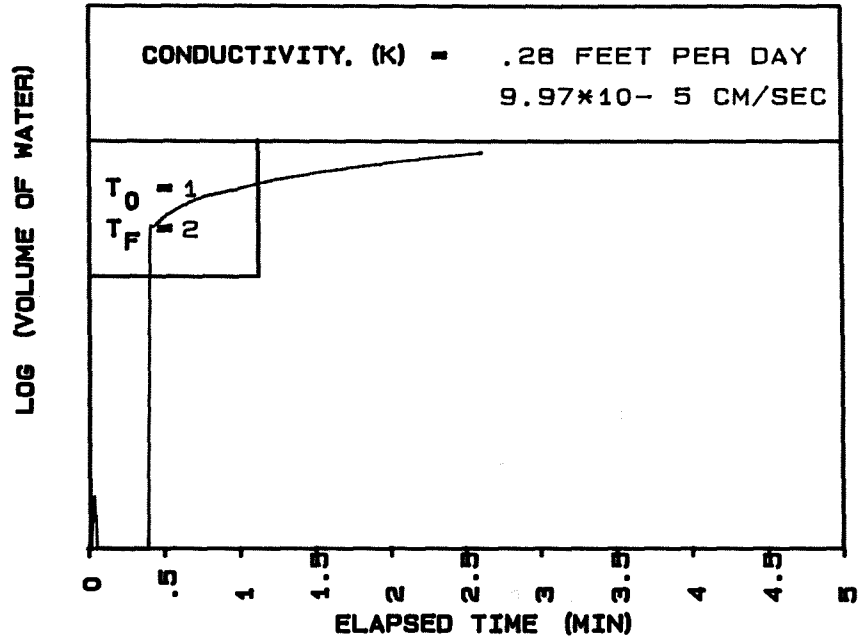


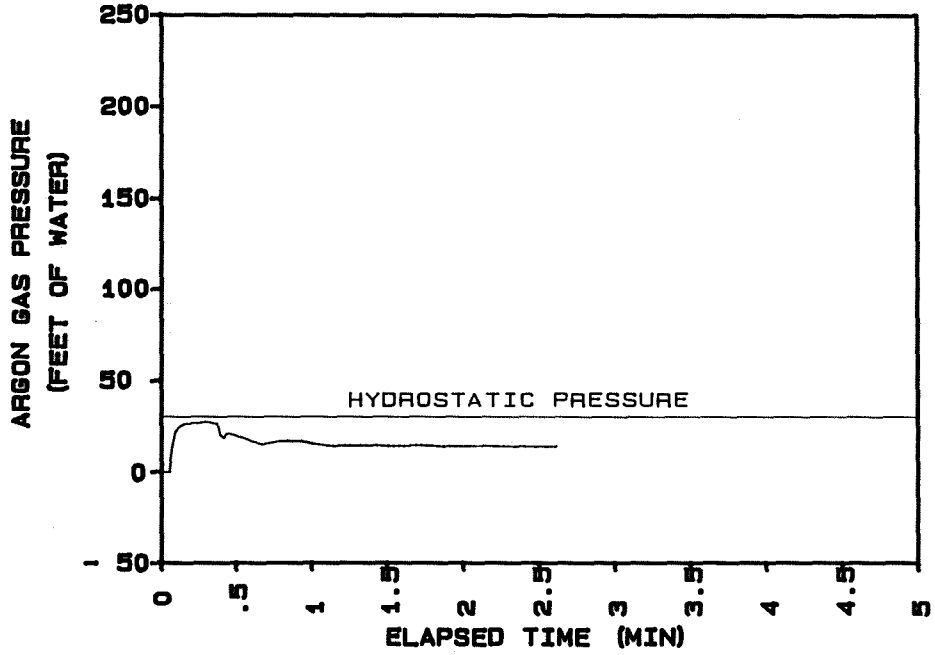
ENSAFE MEMPHIS NSA
LOCATION... 09H1150
TEST DATE
15: 38: 51 12-02-1995

SAMPLE DEPTH (FT) 50
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



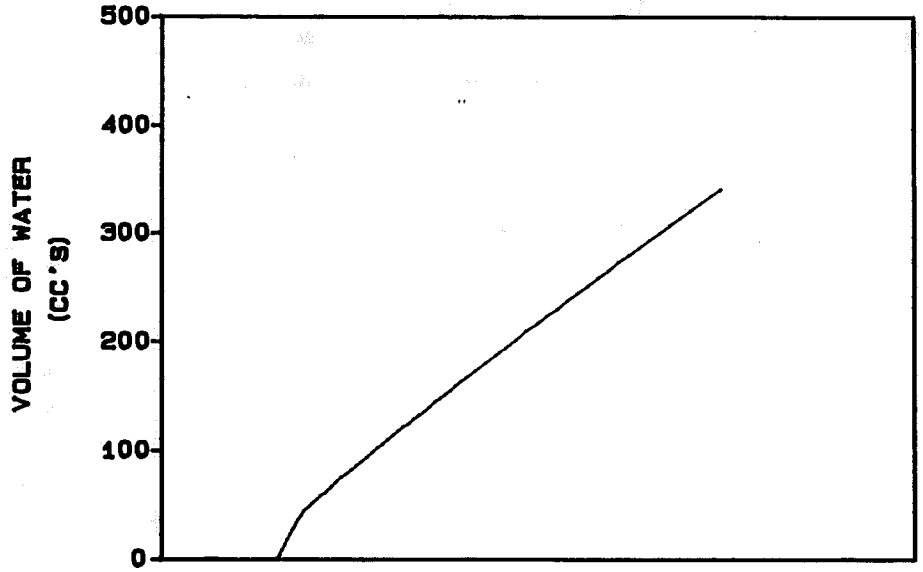


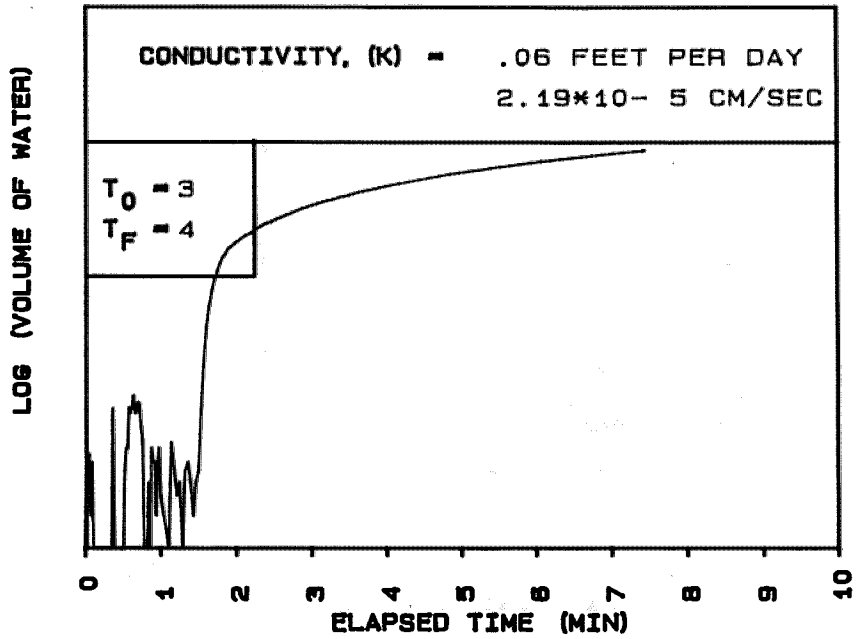


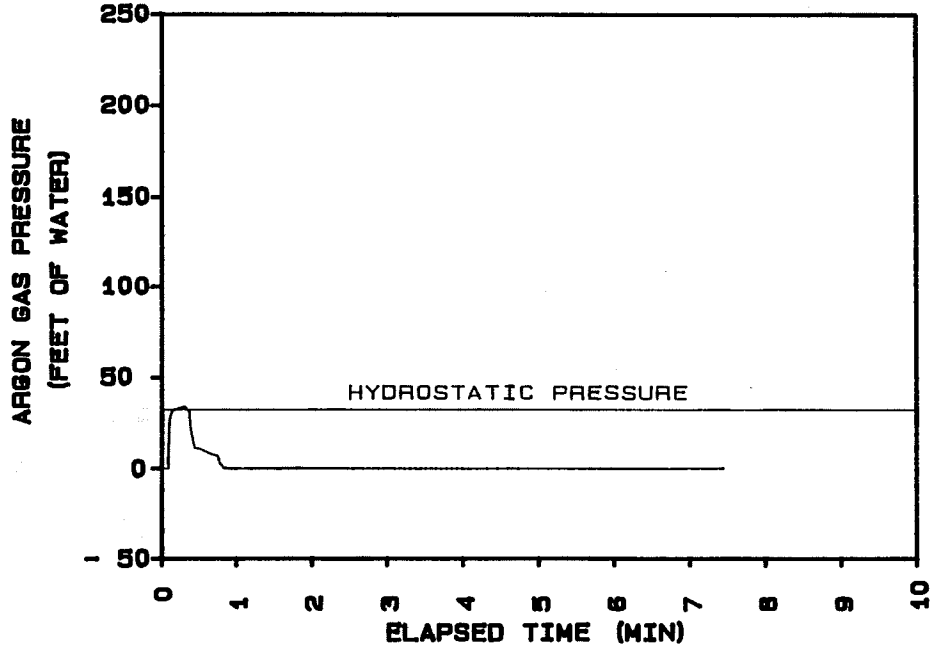
ENSAFE MEMPHIS NSA
LOCATION... 09H1246
TEST DATE
17: 44: 45 12-02-1995

SAMPLE DEPTH (FT) 46
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



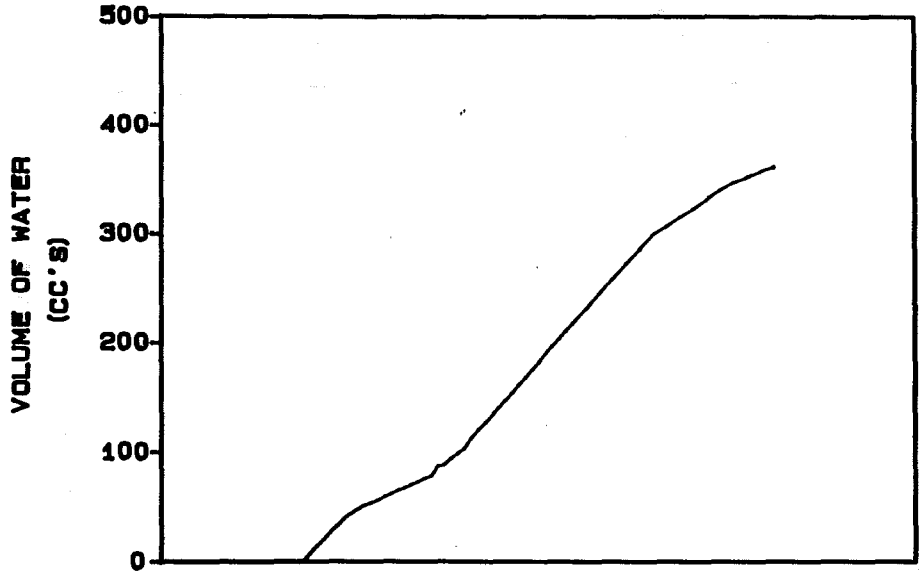


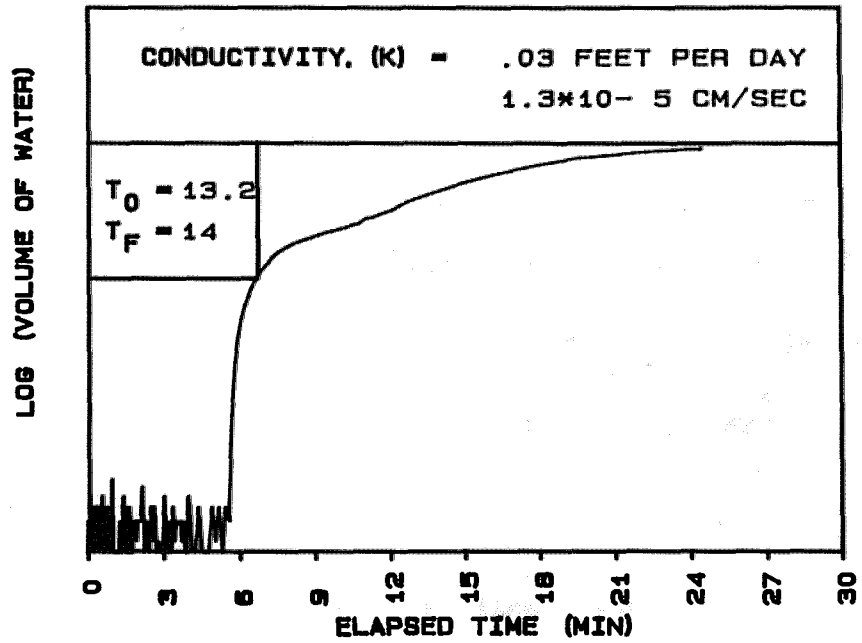


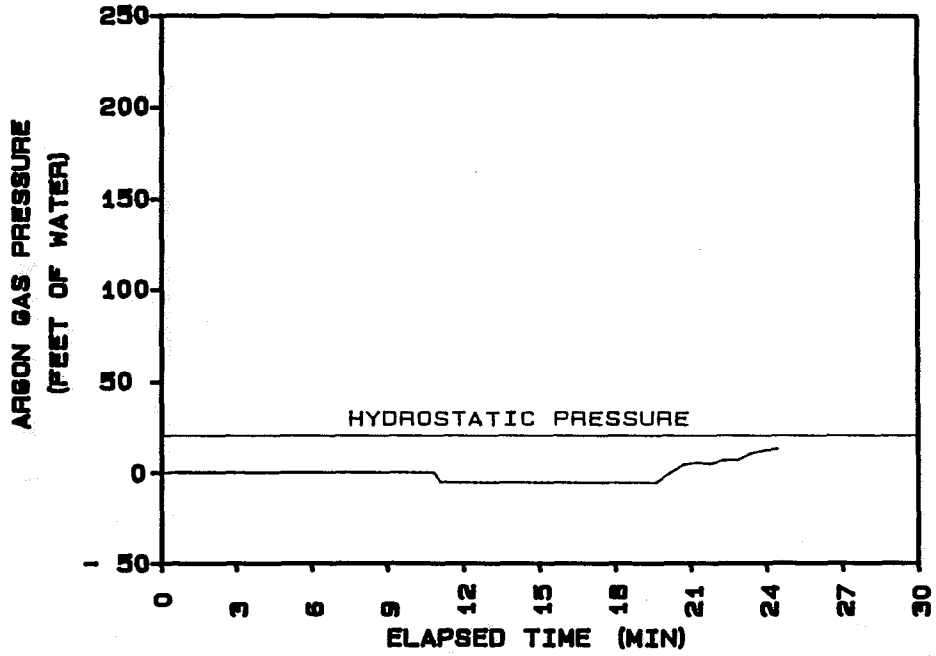
ENSAFE MEMPHIS NSA
LOCATION... 09H1348
TEST DATE
18: 44: 13 12-02-1995

SAMPLE DEPTH (FT) 48
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



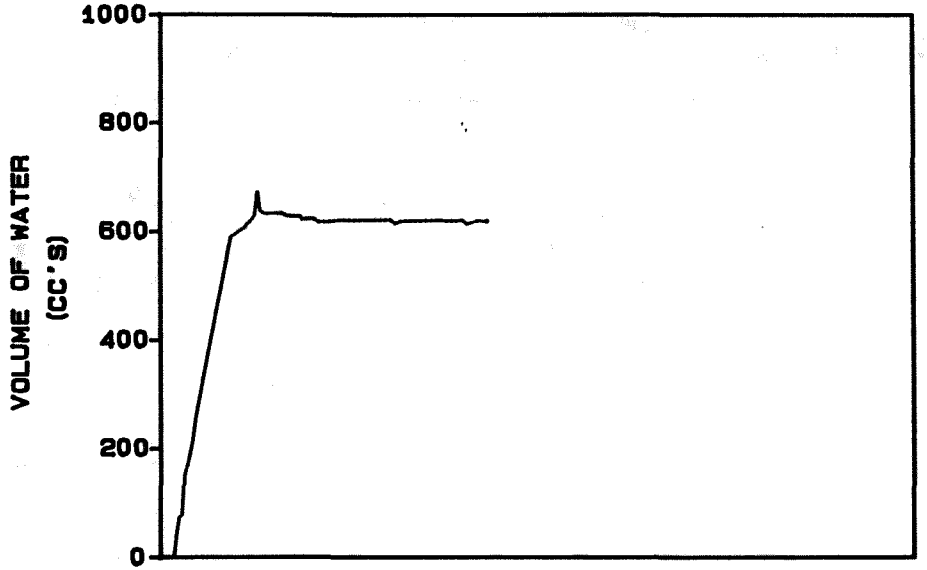


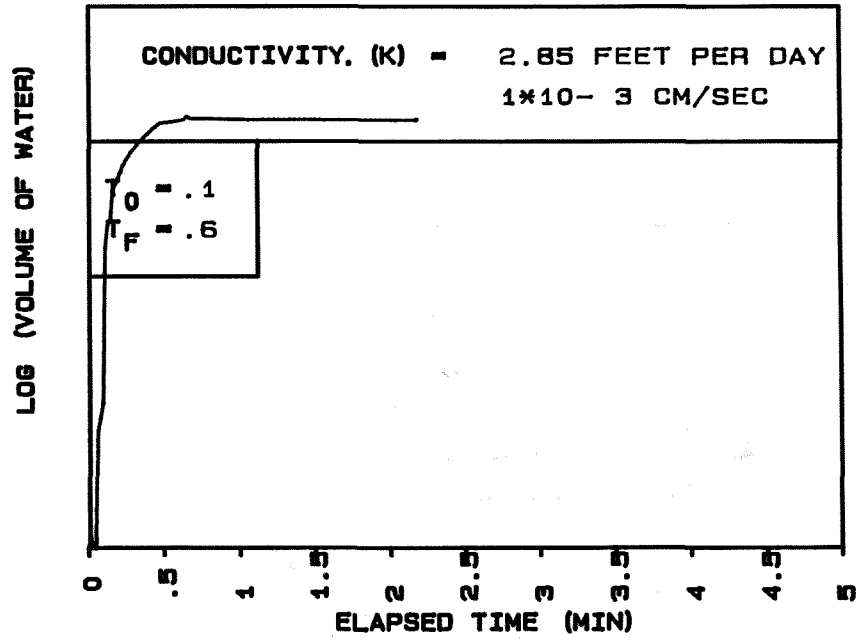


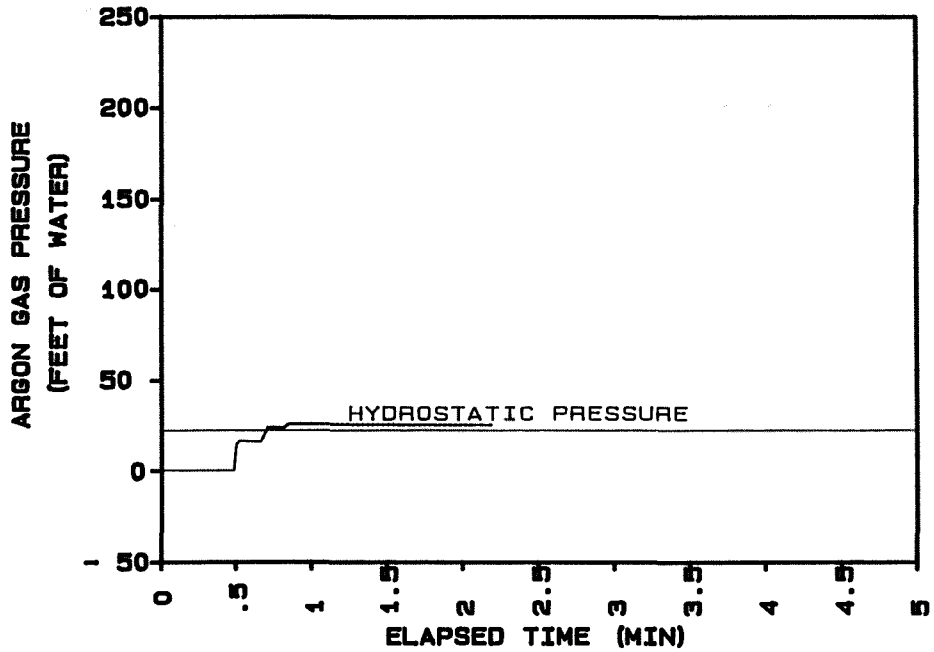
ENSAFE MEMPHIS NSA
LOCATION... 09H1445
TEST DATE
18: 12: 04 11-27-1995

SAMPLE DEPTH (FT) 45
GROUNDWATER DEPTH (FT) 25

HYDROCONE TEST



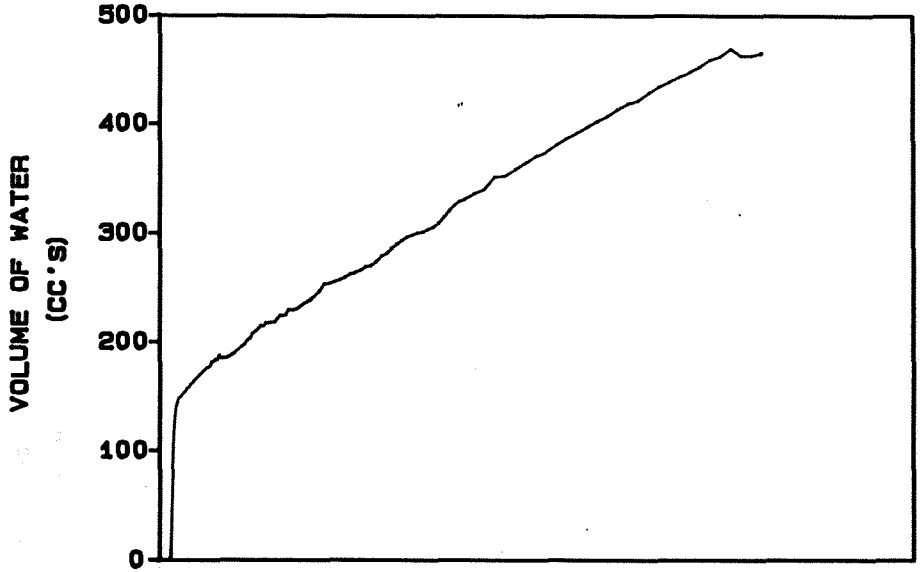


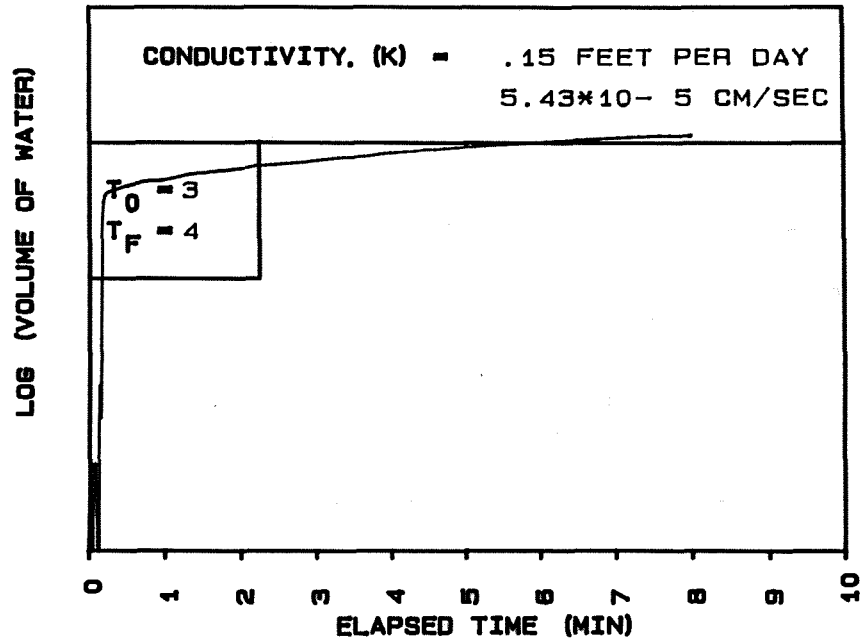


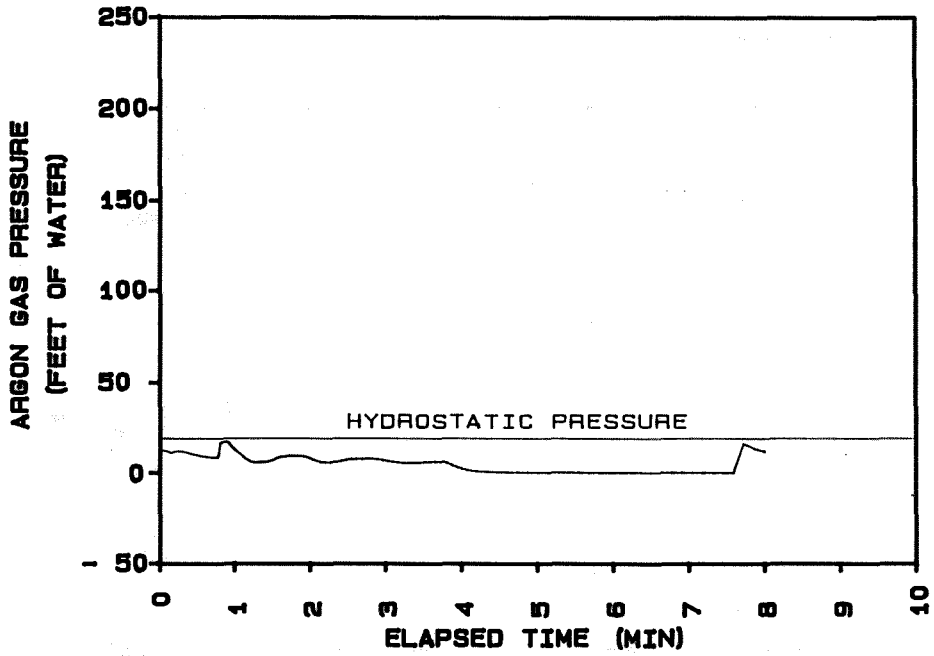
ENSAFE MEMPHIS NSA
LOCATION... 09H1547
TEST DATE
10: 49: 26 11-28-1995

SAMPLE DEPTH (FT) 47
GROUNDWATER DEPTH (FT) 25

HYDROCONE TEST



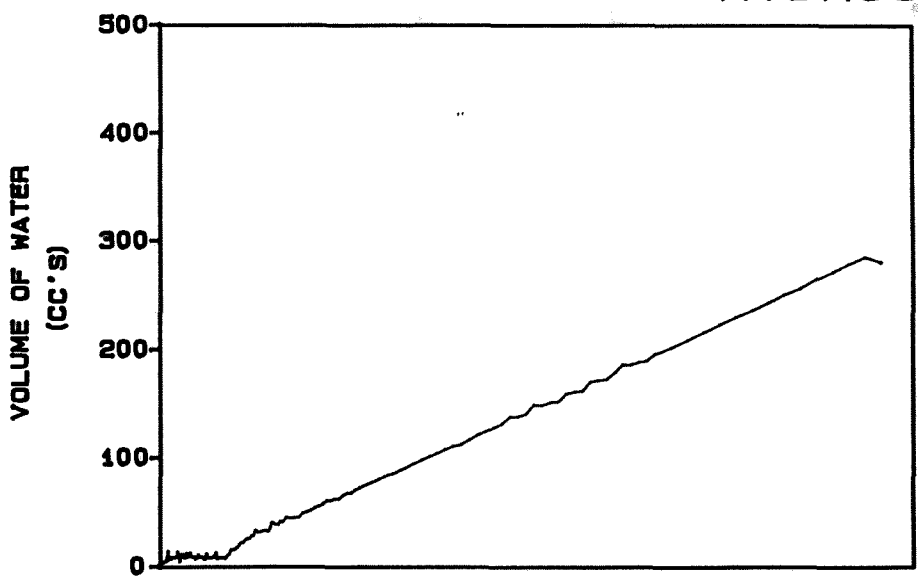


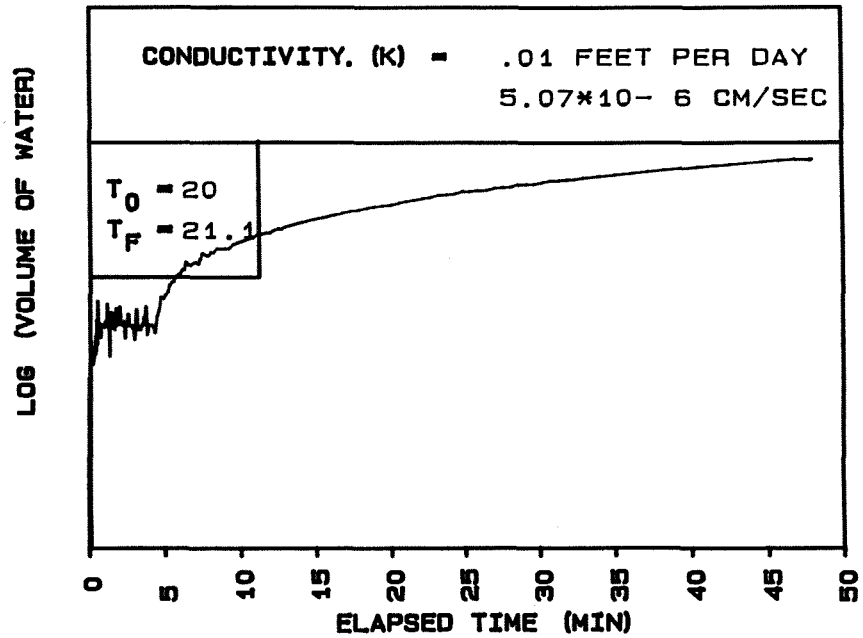


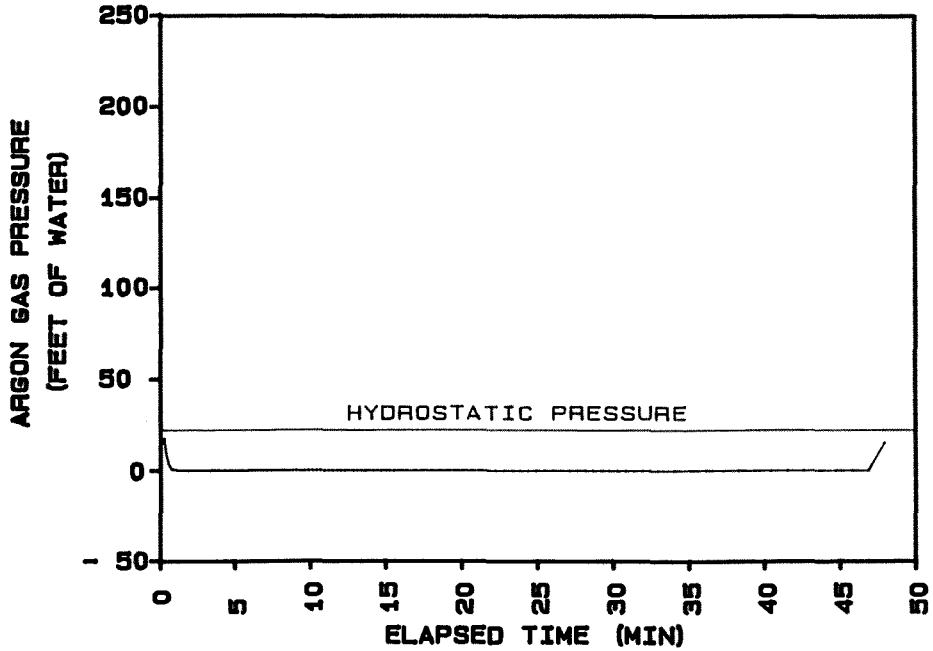
ENSAFE MEMPHIS NSA
LOCATION... 09H1644
TEST DATE
14: 51: 31 11-29-1995

SAMPLE DEPTH (FT) 44
GROUNDWATER DEPTH (FT) 25

HYDROCONE TEST



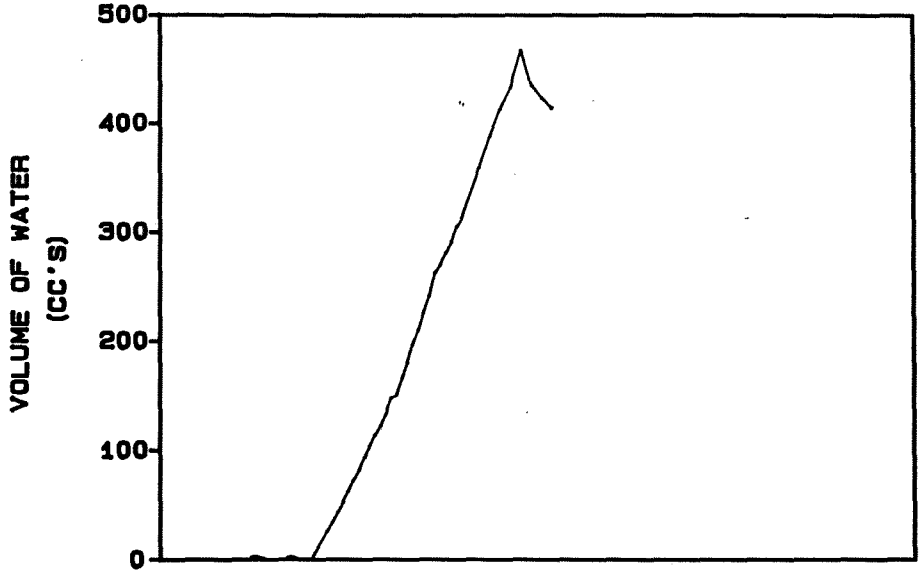


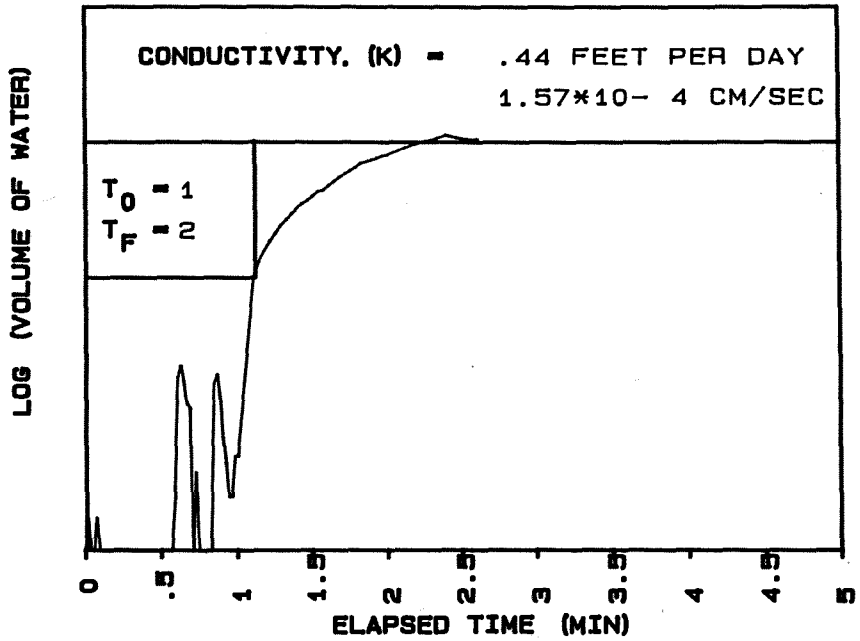


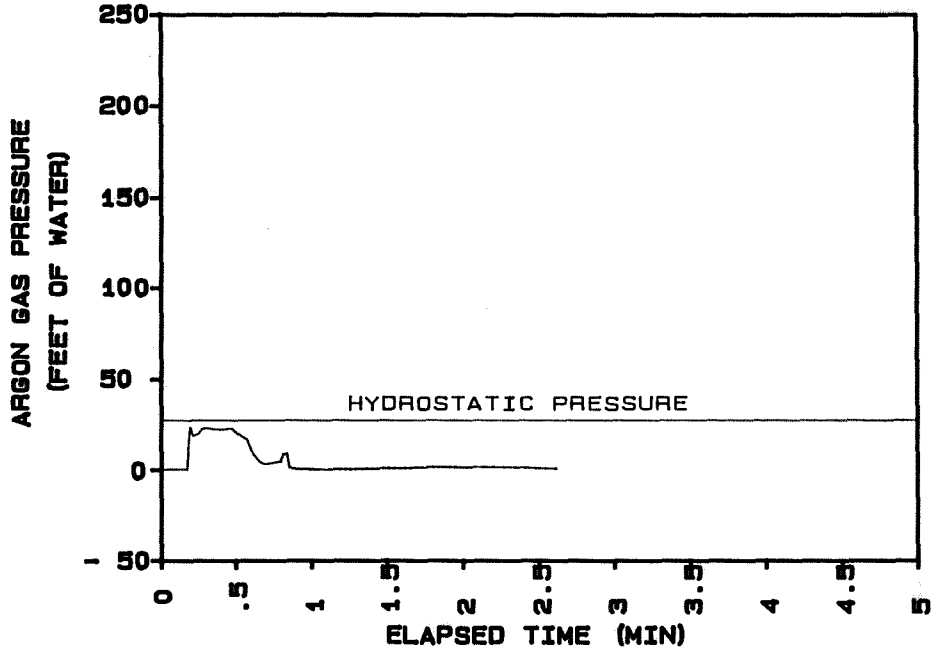
ENSAFE MEMPHIS NSA
LOCATION... 09H1747
TEST DATE
17: 19: 10 11-29-1995

SAMPLE DEPTH (FT) 47
GROUNDWATER DEPTH (FT) 25

HYDROCONE TEST







ENSAFE MEMPHIS NSA
LOCATION... 09H1852
TEST DATE
20: 17: 48 11-29-1995

SAMPLE DEPTH (FT) 52
GROUNDWATER DEPTH (FT) 25

HYDROCONE TEST

VOLUME OF WATER (CC'S)

DATA NOT AVAILABLE

LOG (VOLUME OF WATER)

CONDUCTIVITY, (K) =

T_0 =
T_F =

DATA NOT AVAILABLE

ELAPSED TIME (MIN)

ARGON GAS PRESSURE (FEET OF WATER)

DATA NOT AVAILABLE

ELAPSED TIME (MIN)

ENSAFE MEMPHIS NSA
LOCATION... 09H1946

DATA NOT AVAILABLE

HYDROCONE TEST

VOLUME OF WATER (CC'S)

DATA NOT AVAILABLE

LOG (VOLUME OF WATER)

CONDUCTIVITY. (K) =

T_0 =
T_F =

DATA NOT AVAILABLE

ELAPSED TIME (MIN)

ARGON GAS PRESSURE (FEET OF WATER)

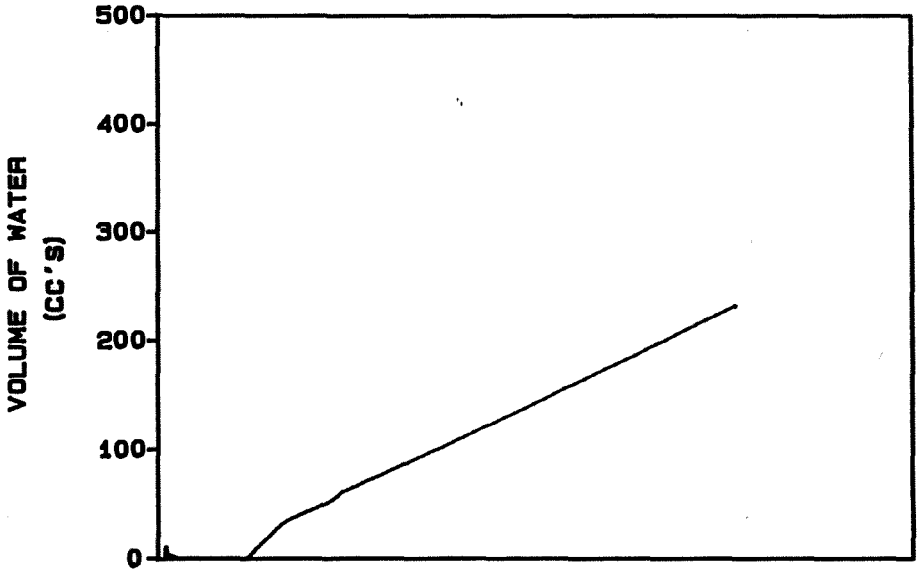
DATA NOT AVAILABLE

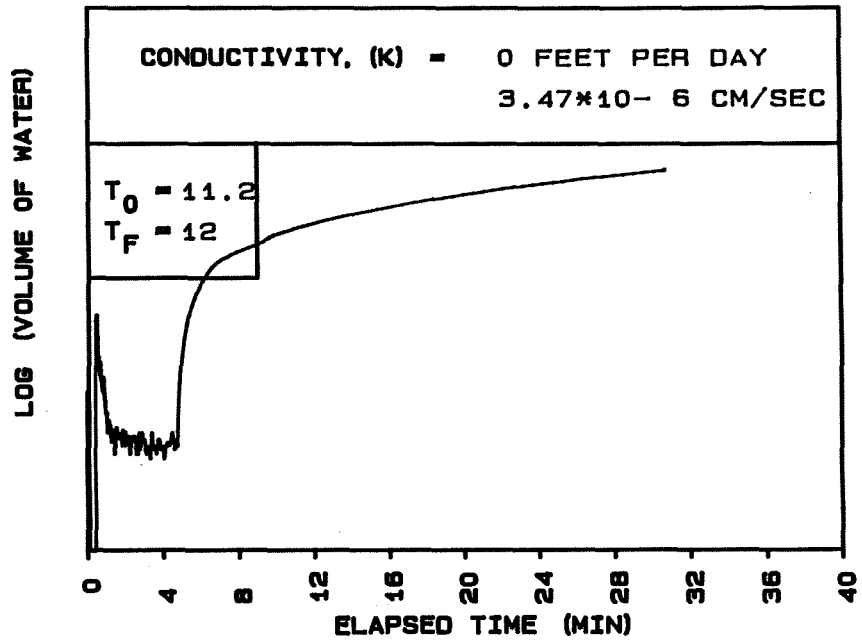
ELAPSED TIME (MIN)

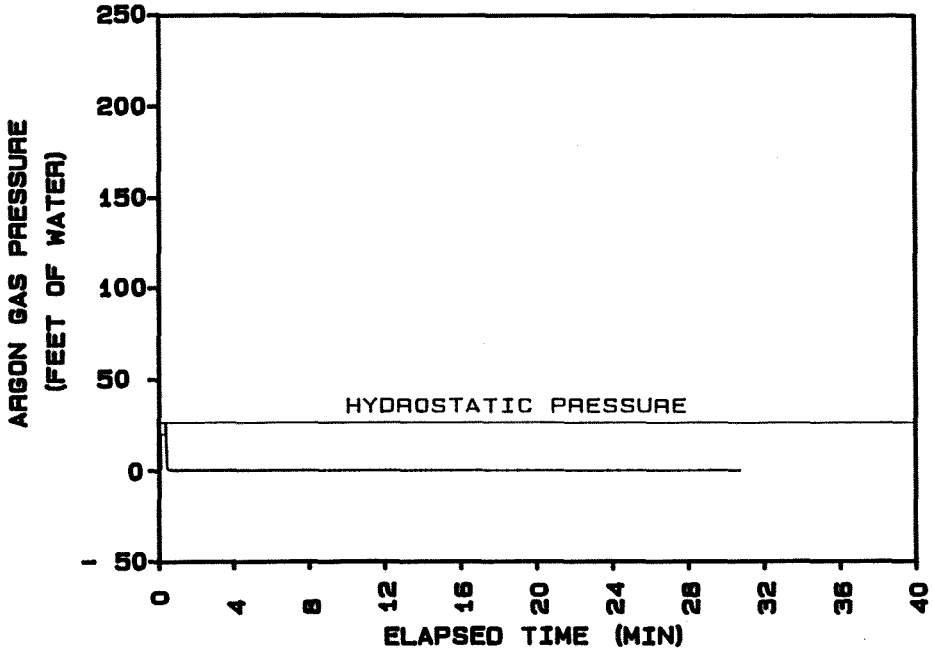
ENSAFE MEMPHIS NSA
LOCATION... 09H2052

DATA NOT AVAILABLE

HYDROCONE TEST



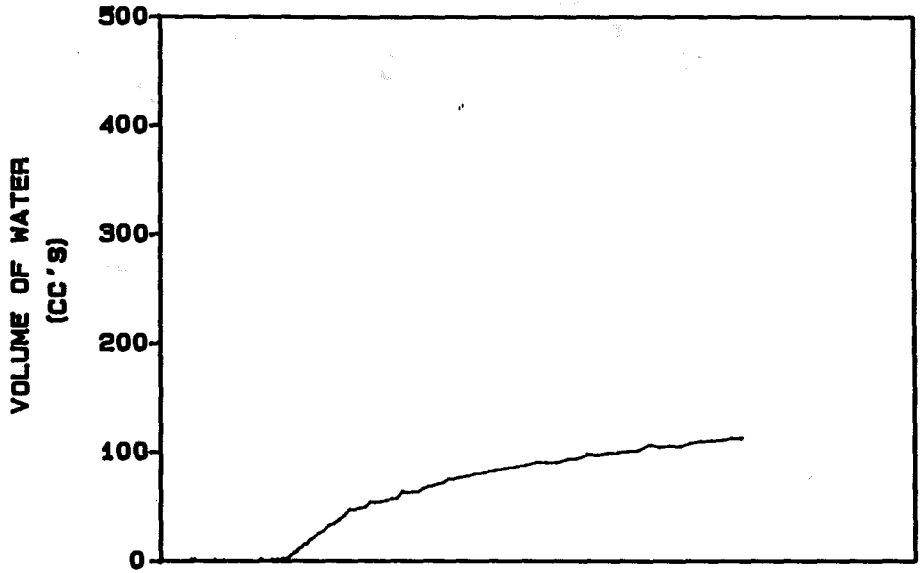


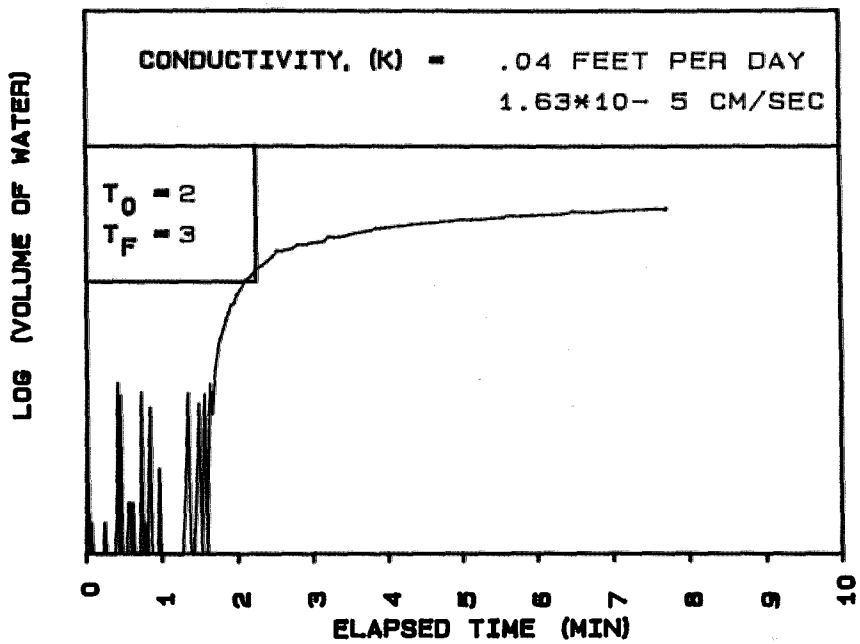


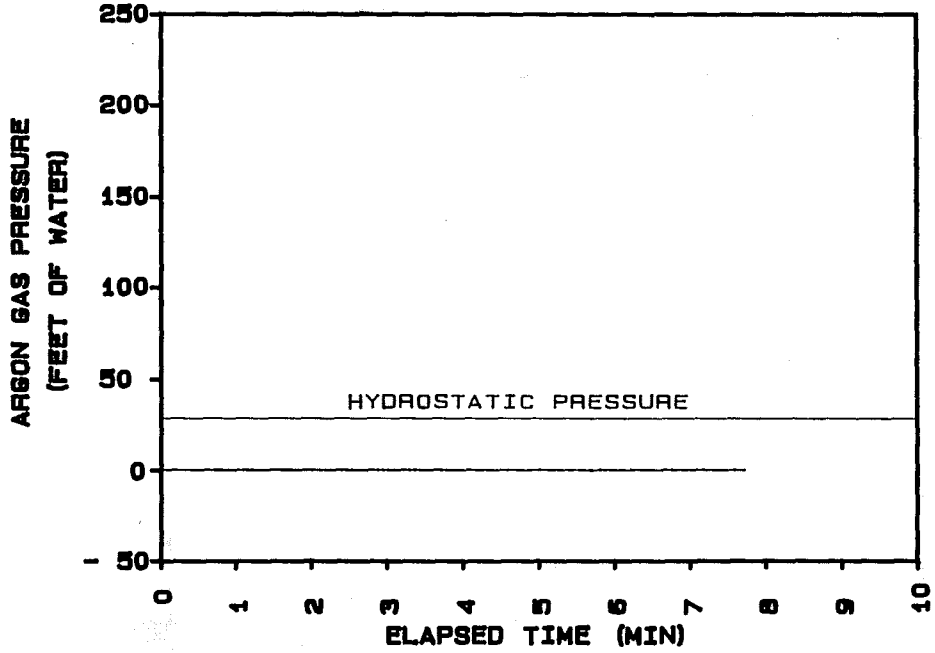
ENSAFE MEMPHIS NSA
LOCATION... 09H2142
TEST DATE
16: 30: 33 11-30-1995

SAMPLE DEPTH (FT) 42
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



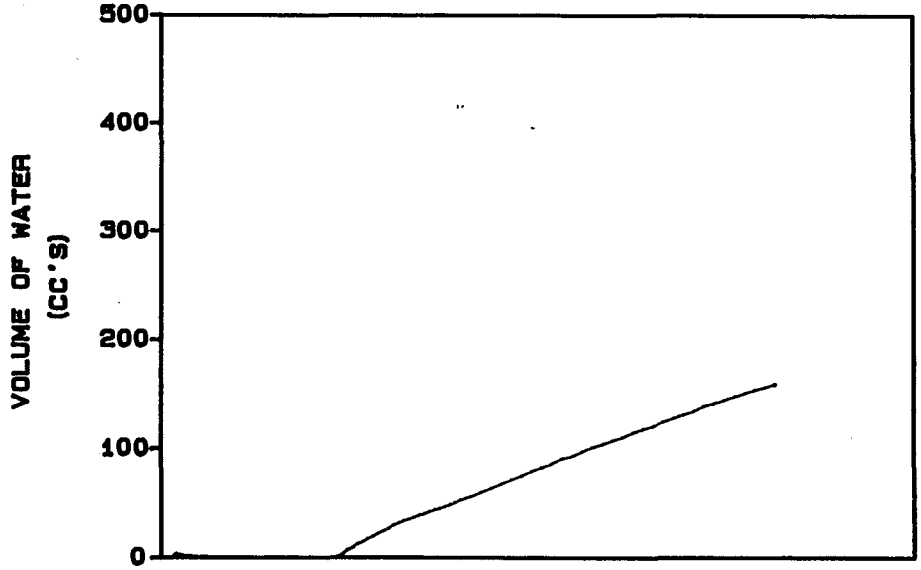


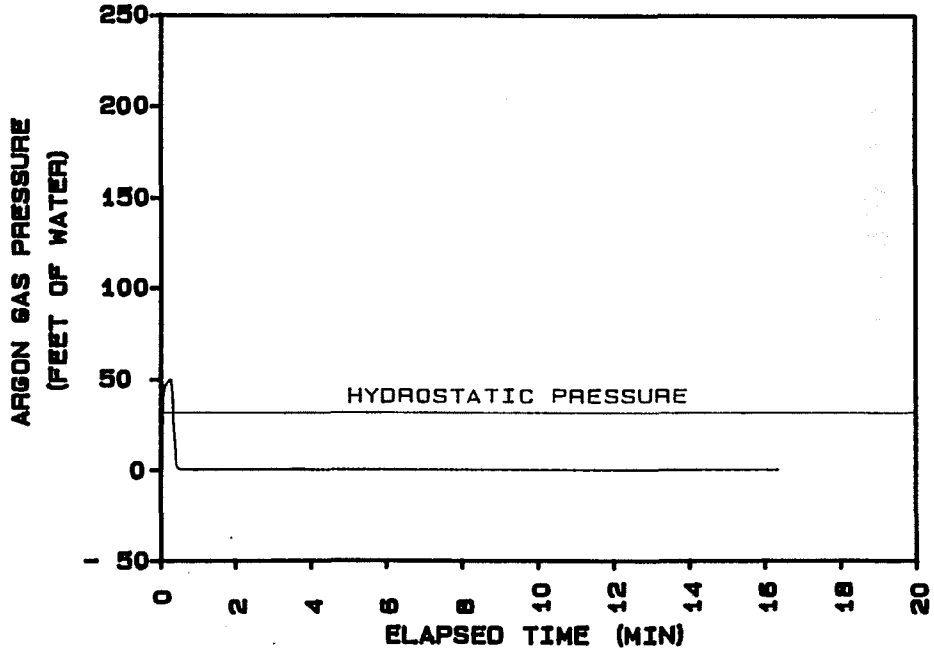


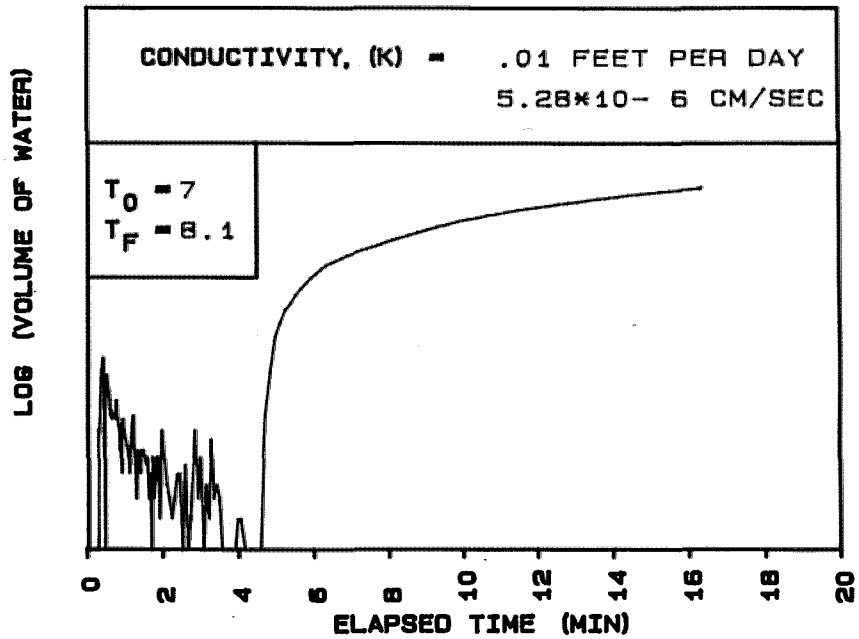
ENSAFE MEMPHIS NSA
LOCATION... 09H2244
TEST DATE
15: 01: 42 12-01-1995

SAMPLE DEPTH (FT) 44
GROUNDWATER DEPTH (FT) 18

HYDROCONE TEST







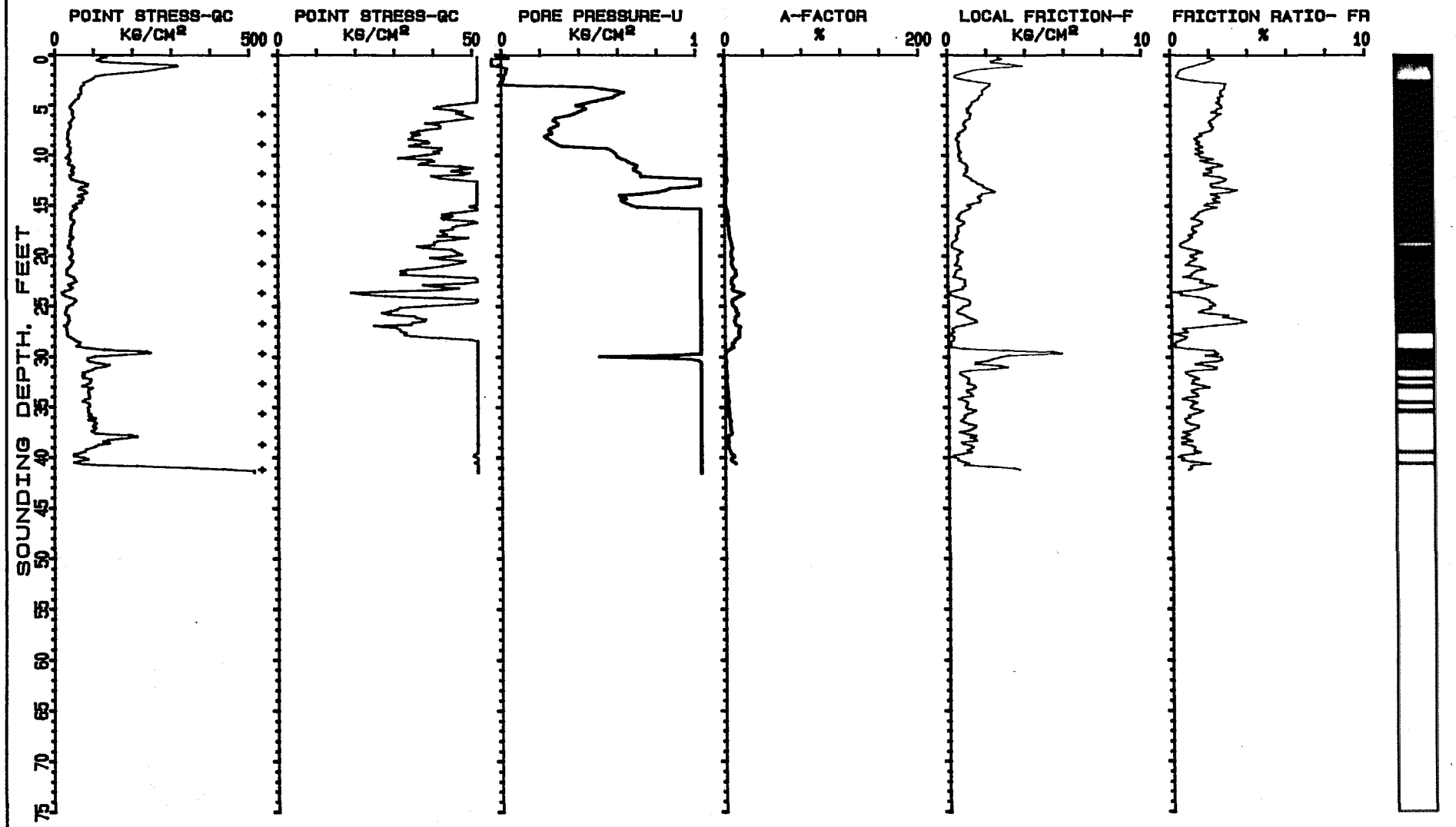
ENSAFE MEMPHIS NSA
LOCATION... 09H2347
TEST DATE
17: 35: 56 12-01-1995

SAMPLE DEPTH (FT) 47
GROUNDWATER DEPTH (FT) 16

SWMU 14

DPT SCREENING INVESTIGATION RESULTS

PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 14-P05
TEST DATE 11-07-1995 16:06:55

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 14-P05

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N' VALUES	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%)	FRICTION ANGLE (DEGREES)	YOUNGS MODULUS (KG/CM2)	UNDRAINED SHEAR STRENGTH (KG/CM2)	SENSITIVITY	COMP.	OCR
				#			*	**	***	****			
1	SILTY FINE SAND	175.2	2.9	43	43	.03	>90%	>48	385	--	--	--	--
2	DENSE OR CEMENTED S.	246	1.23	41	41	.067	>90%	>48	541	--	--	--	--
3	SILTY FINE SAND	96.1	1.38	24	24	.098	80%-90%	>48	211	--	--	--	--
4	CLAYEY FINE SAND	70.2	1.8	28	28	.128	70%-80%	>48	154	--	--	--	--
5	CLAYEY FINE SAND	57.1	1.35	22	22	.159	60%-70%	46-48	125	--	--	--	--
6	CLAYEY FINE SAND	44.4	1.07	17	17	.19	60%-70%	44-46	97	--	--	--	--
7	CLAYEY FINE SAND	44.2	.9	17	17	.221	60%-70%	42-44	97	--	--	--	--
8	CLAYEY FINE SAND	38.5	.68	15	15	.251	50%-60%	42-44	84	--	--	--	--
9	SILTY TO CLAYEY F.S.	36	.49	12	12	.282	50%-60%	42-44	79	--	--	--	--
10	SILTY TO CLAYEY F.S.	39.1	.56	13	13	.313	50%-60%	40-42	86	--	--	--	--
11	CLAYEY FINE SAND	36.7	.77	14	14	.344	50%-60%	40-42	80	--	--	--	--
12	SILTY TO CLAYEY F.S.	45.9	.92	15	15	.375	50%-60%	40-42	100	--	--	--	--
13	CLAYEY FINE SAND	55.9	1.42	22	22	.405	60%-70%	42-44	122	--	--	--	--
14	SILTY TO CLAYEY F.S.	77	1.9	25	25	.436	70%-80%	42-44	169	--	--	--	--
15	SILTY TO CLAYEY F.S.	67.8	1.41	22	22	.467	60%-70%	42-44	149	--	--	--	--
16	SILTY TO CLAYEY F.S.	50.4	.79	16	16	.498	50%-60%	40-42	110	--	--	--	--
17	SILTY TO CLAYEY F.S.	46	.62	15	15	.528	40%-50%	40-42	101	--	--	--	--
18	SILTY TO CLAYEY F.S.	44.6	.47	14	14	.559	40%-50%	38-40	98	--	--	--	--
19	SILTY TO CLAYEY F.S.	42.9	.3	14	14	.59	40%-50%	38-40	94	--	--	--	--
20	SILTY TO CLAYEY F.S.	42.4	.47	14	14	.621	40%-50%	38-40	93	--	--	--	--
21	SILTY TO CLAYEY F.S.	44.6	.49	14	14	.651	40%-50%	38-40	98	--	--	--	--
22	SILTY TO CLAYEY F.S.	35	.4	11	11	.682	<40%	36-38	77	--	--	--	--
23	SILTY TO CLAYEY F.S.	44.9	.72	14	14	.713	40%-50%	38-40	98	--	--	--	--
24	SILTY TO CLAYEY F.S.	32.1	.31	10	10	.744	<40%	36-38	70	--	--	--	--
25	CLAYEY FINE SAND	44.4	.89	17	17	.775	<40%	38-40	97	--	--	--	--
26	CLAYEY FINE SAND	31.2	.69	12	12	.805	<40%	36-38	68	--	--	--	--
27	CLAYEY FINE SAND	34.1	.91	13	13	.836	<40%	36-38	75	--	--	--	--
28	SILTY FINE SAND	31	0	7	7	.867	<40%	34-36	68	--	--	--	--
29	SILTY FINE SAND	51.9	0	12	12	.898	<40%	38-40	114	--	--	--	--
30	SILTY TO CLAYEY F.S.	148.4	3.21	49	49	.928	70%-80%	42-44	326	--	--	--	--

14-P05 CONTINUED ENSAFE

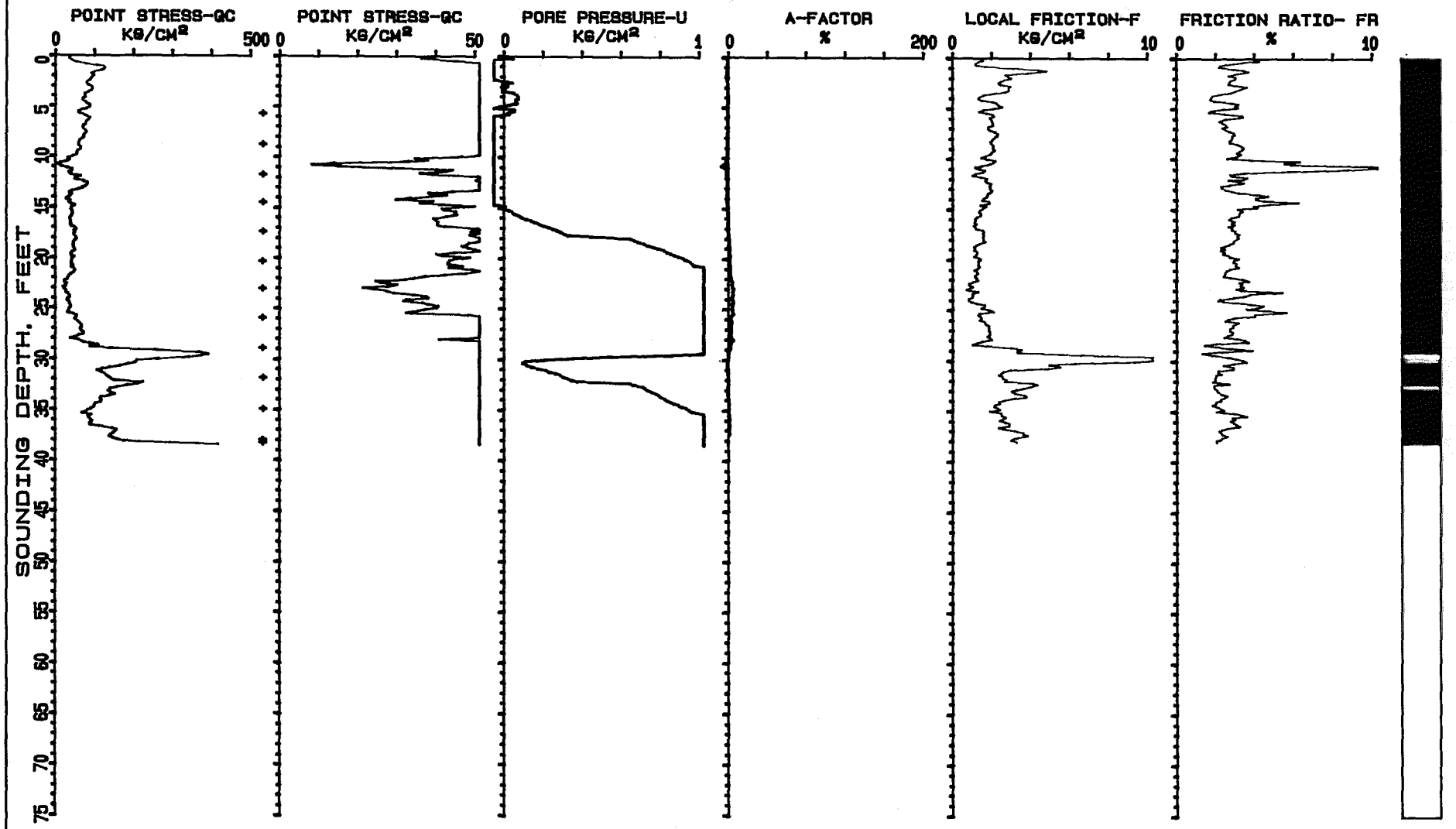
DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SILTY TO CLAYEY F.S.	107	2.12	35	35	.959	60%-70%	40-42	235	--	--	--	--
32	SILTY FINE SAND	92	1.01	23	23	.99	50%-60%	40-42	202	--	--	--	--
33	SILTY TO CLAYEY F.S.	82.8	1.12	27	27	1.021	50%-60%	40-42	182	--	--	--	--
34	SILTY FINE SAND	87.6	.92	21	21	1.051	50%-60%	40-42	192	--	--	--	--
35	SILTY FINE SAND	85.7	.82	21	21	1.082	50%-60%	38-40	188	--	--	--	--
36	SILTY FINE SAND	88.4	.96	22	22	1.113	50%-60%	38-40	194	--	--	--	--
37	SILTY FINE SAND	99.2	.99	24	24	1.144	50%-60%	40-42	218	--	--	--	--
38	FINE SAND	130.6	1.05	26	26	1.177	60%-70%	40-42	287	--	--	--	--
39	FINE SAND	144.5	1.04	28	28	1.21	60%-70%	40-42	317	--	--	--	--
40	SILTY FINE SAND	73.4	.57	18	18	1.241	40%-50%	38-40	161	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBERTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

ADDITIONAL LOCAL CORRELATIONS DEVELOPED BY IN-SITU TECHNOLOGY HAVE ALSO BEEN USED IN COMPUTING THE ABOVE DATA. IT IS THE POLICY OF IN-SITU TECHNOLOGY TO CONTINUALLY UPGRADE AND MODIFY C.P.T CORRELATIONS AS PUBLISHED RESEARCH AND LOCAL EXPERIENCE GROWS.

PIEZOCONE SOUNDING



* PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 14-P06
TEST DATE 11-07-1995 17:29:26

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 14-P06

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N' #	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	CLAYEY FINE SAND	63.7	2.28	25	25	.03	70%-80%	>48	140	--	--	--	--
2	CLAYEY FINE SAND	112	3.46	44	44	.061	>90%	>48	246	--	--	--	--
3	CLAYEY FINE SAND	89.8	2.68	35	35	.092	80%-90%	>48	197	--	--	--	--
4	SILTY TO CLAYEY F.S.	89.4	2.02	29	29	.123	70%-80%	>48	196	--	--	--	--
5	SILTY TO CLAYEY F.S.	78	1.97	26	26	.153	70%-80%	46-48	171	--	--	--	--
6	SILTY TO CLAYEY F.S.	75.6	1.81	25	25	.184	70%-80%	46-48	166	--	--	--	--
7	SILTY TO CLAYEY F.S.	81.7	1.96	27	27	.215	70%-80%	46-48	179	--	--	--	--
8	CLAYEY FINE SAND	75.8	2.12	30	30	.246	70%-80%	44-46	166	--	--	--	--
9	CLAYEY FINE SAND	68.3	2.06	27	27	.276	70%-80%	44-46	150	--	--	--	--
10	CLAYEY FINE SAND	61	1.84	24	24	.307	60%-70%	42-44	134	--	--	--	--
11	CLAY	31	1.71	31	31	.332	--	--	--	1.89	1.8	UD	[illegible]
12	SANDY CLAY	40.3	1.49	20	20	.359	--	--	--	2.47	2.6	.01	>6
13	CLAYEY FINE SAND	69.3	1.88	27	27	.39	60%-70%	42-44	152	--	--	--	--
14	CLAYEY FINE SAND	53.8	1.78	21	21	.421	60%-70%	42-44	118	--	--	--	--
15	SILTY CLAY TO CLAY	38.4	1.62	25	25	.448	--	--	--	2.34	2.3	UD	>6
16	CLAYEY FINE SAND	44.6	1.32	17	17	.479	50%-60%	40-42	98	--	--	--	--
17	CLAYEY FINE SAND	40.8	1.2	16	16	.51	40%-50%	38-40	89	--	--	--	--
18	CLAYEY FINE SAND	49.3	1.57	19	19	.541	40%-50%	40-42	108	--	--	--	--
19	CLAYEY FINE SAND	50.3	1.3	20	20	.571	40%-50%	40-42	110	--	--	--	--
20	CLAYEY FINE SAND	46.5	1.25	18	18	.602	40%-50%	38-40	102	--	--	--	--
21	CLAYEY FINE SAND	44.8	1.28	17	17	.633	40%-50%	38-40	98	--	--	--	--
22	CLAYEY FINE SAND	43.8	1.19	17	17	.664	40%-50%	38-40	96	--	--	--	--
23	SANDY CLAY	28.2	.95	14	14	.691	--	--	--	1.67	2.9	.02	6
24	SANDY CLAY	30.3	.99	15	15	.718	--	--	--	1.8	3	.01	6
25	SILTY CLAY TO CLAY	36.8	1.53	24	24	.746	--	--	--	2.2	2.4	UD	6
26	SANDY CLAY	43.5	1.53	21	21	.773	--	--	--	2.62	2.8	.01	6
27	CLAYEY FINE SAND	61.1	1.79	24	24	.804	40%-50%	38-40	134	--	--	--	--
28	CLAYEY FINE SAND	66.5	1.84	26	26	.835	40%-50%	38-40	146	--	--	--	--
29	CLAYEY FINE SAND	74.8	2.19	29	29	.865	50%-60%	40-42	164	--	--	--	--
30	DENSE CLAYEY F. S.	281.6	8.01	140	140	.899	>90%	44-46	619	--	--	--	--

14-P06 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SILTY TO CLAYEY F.S.	218.4	5.26	72	72	.929	>90%	44-46	480	--	--	--	--
32	SILTY TO CLAYEY F.S.	127.3	2.56	42	42	.96	60%-70%	42-44	280	--	--	--	--
33	SILTY TO CLAYEY F.S.	170.6	3.54	56	56	.991	70%-80%	42-44	375	--	--	--	--
34	SILTY TO CLAYEY F.S.	136.6	3.05	45	45	1.022	70%-80%	42-44	300	--	--	--	--
35	SILTY TO CLAYEY F.S.	107.8	2.25	35	35	1.052	60%-70%	40-42	237	--	--	--	--
36	CLAYEY FINE SAND	86.1	2.56	34	34	1.083	50%-60%	38-40	189	--	--	--	--
37	CLAYEY FINE SAND	102.2	2.88	40	40	1.114	50%-60%	40-42	224	--	--	--	--
38	SILTY TO CLAYEY F.S.	148.4	3.41	49	49	1.145	70%-80%	42-44	326	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

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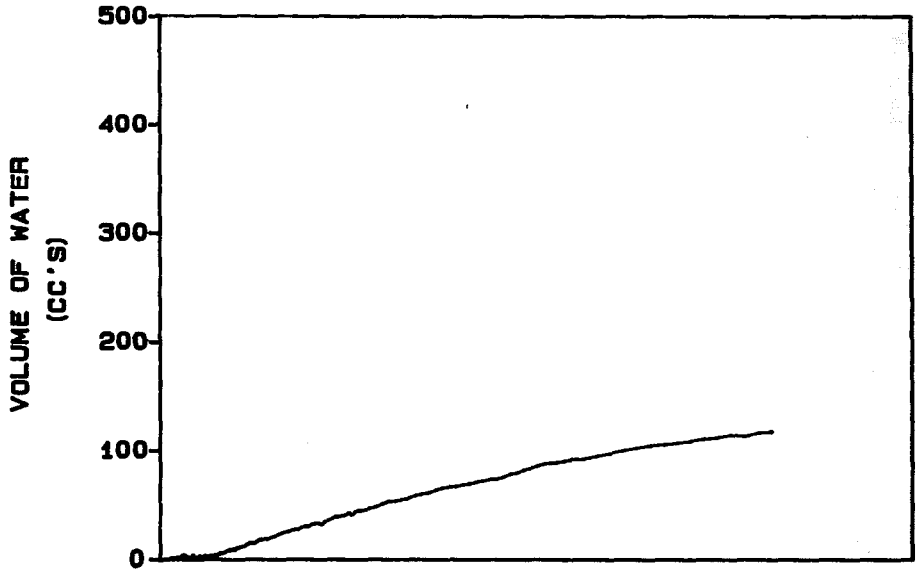
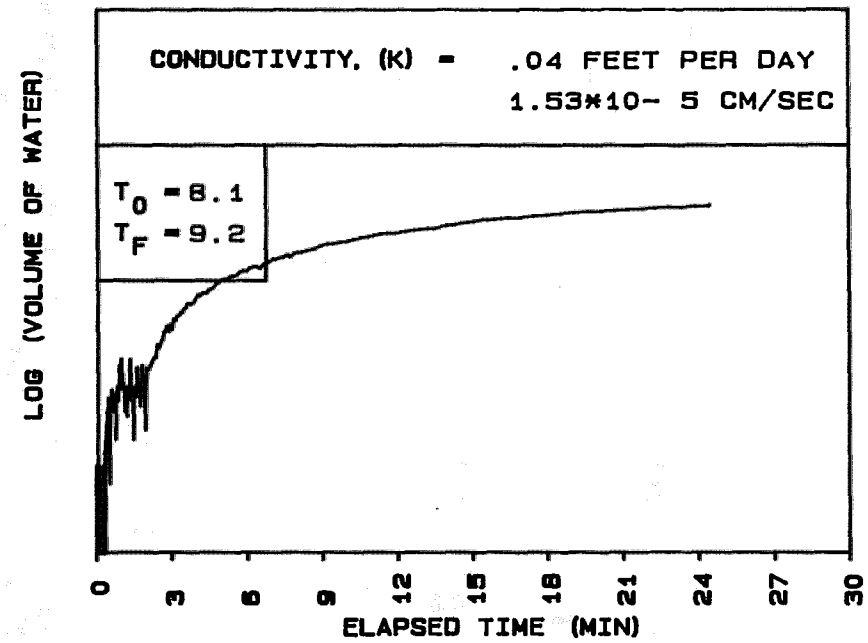
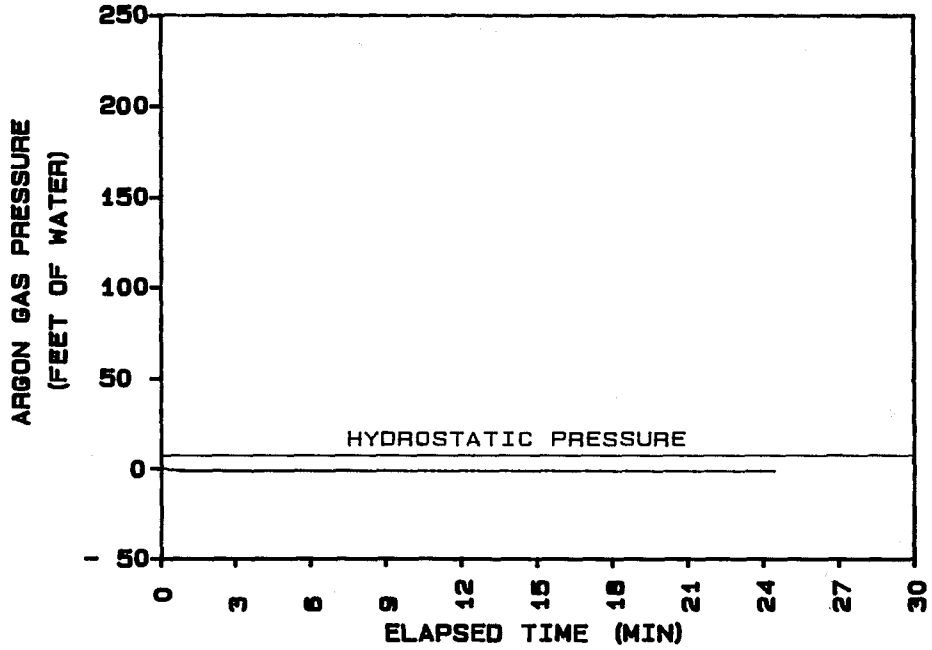
HYDROCONE TEST



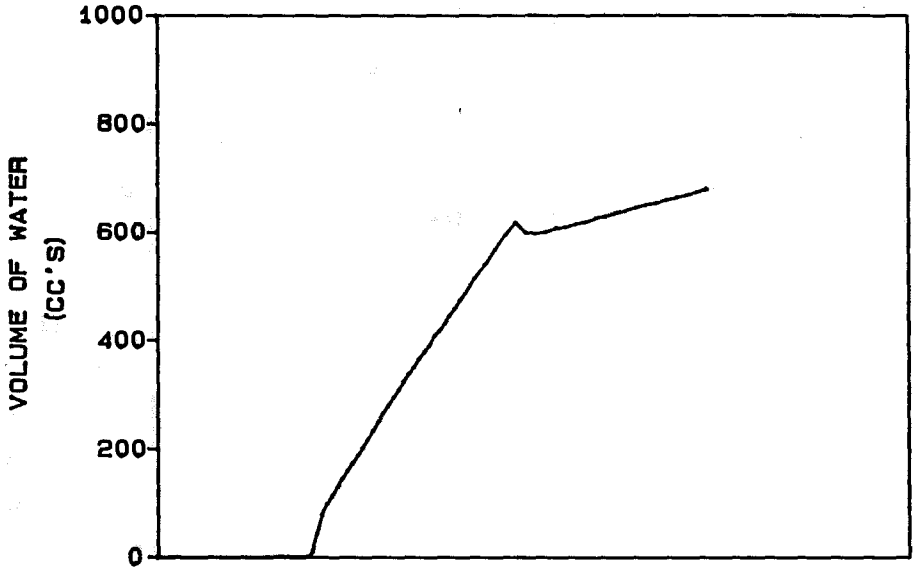


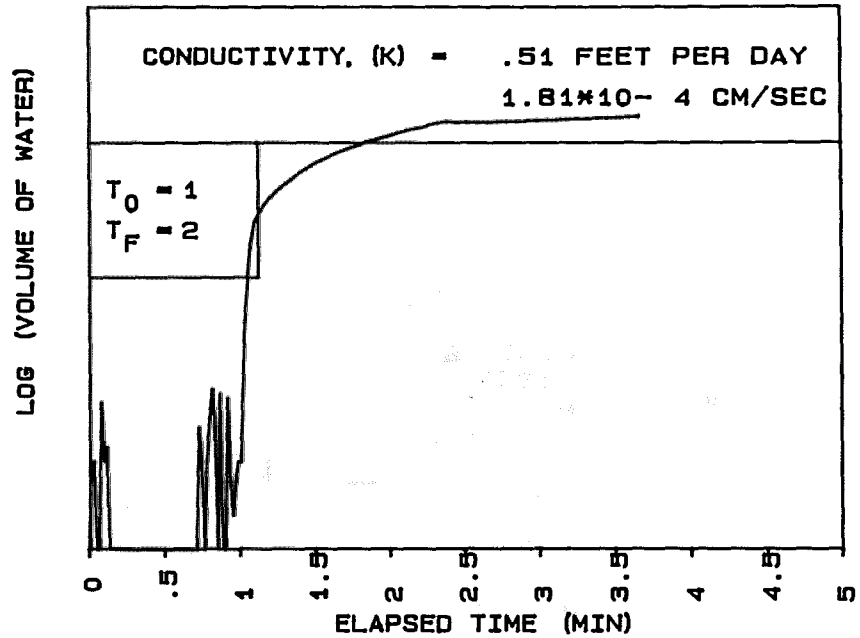


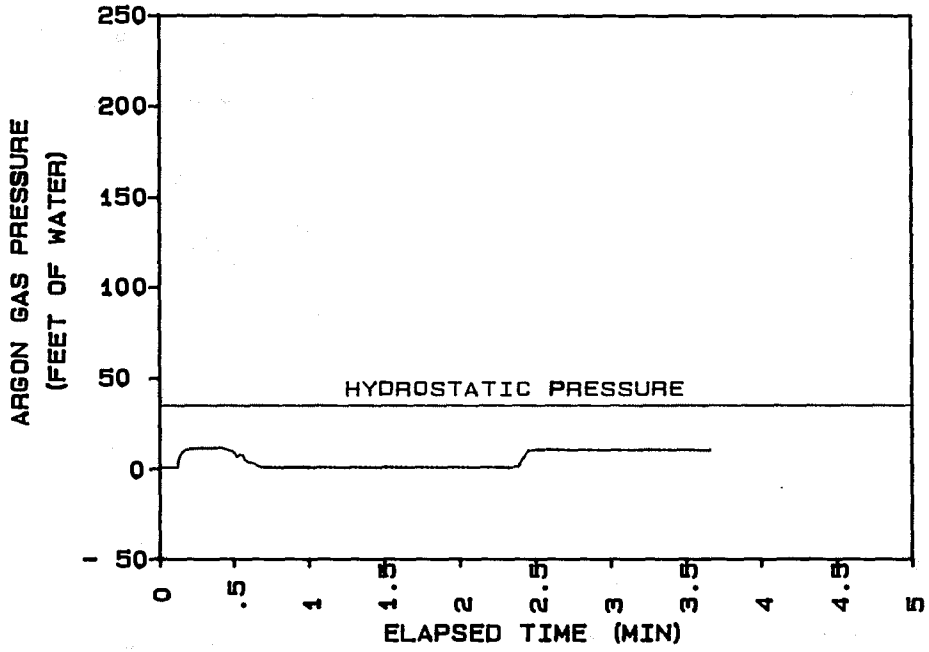
ENSAFE MEMPHIS NSA
LOCATION... 14H0512
TEST DATE
14: 49: 58 11-13-1995

SAMPLE DEPTH (FT) 12
GROUNDWATER DEPTH (FT) 5

HYDROCONE TEST



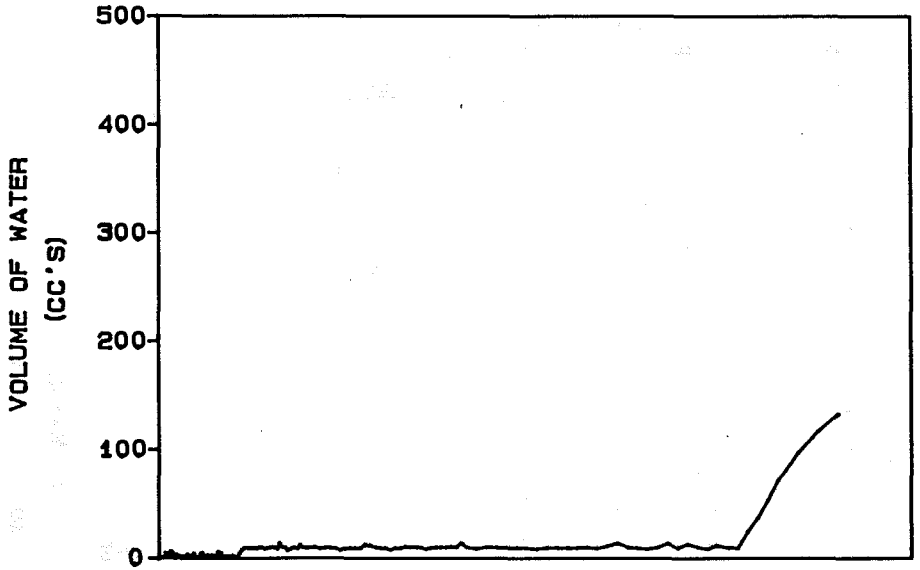


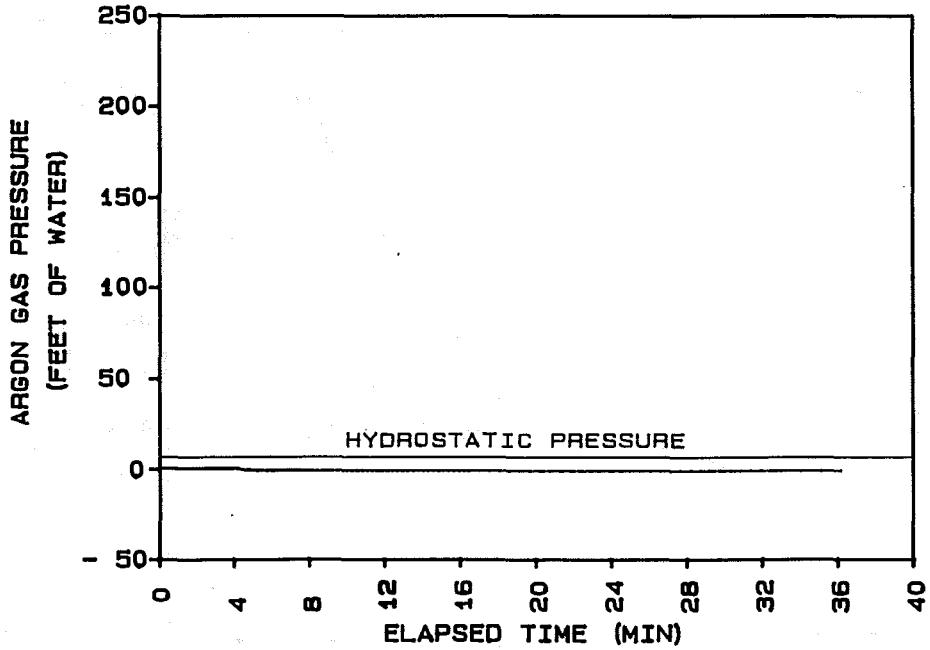


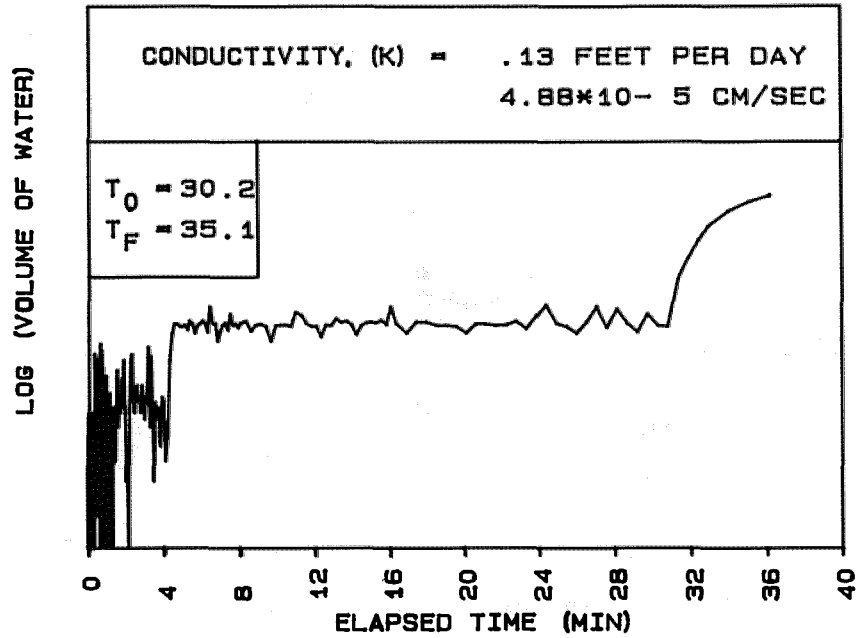
ENSAFE MEMPHIS NSA
LOCATION... 14H0545
TEST DATE
16: 41: 24 11-13-1995

SAMPLE DEPTH (FT) 45
GROUNDWATER DEPTH (FT) 11

HYDROCONE TEST







ENSAFE MEMPHIS NSA
LOCATION... 14H0711
TEST DATE
15: 41: 32 11-14-1995

SAMPLE DEPTH (FT) 11
GROUNDWATER DEPTH (FT) 5

RCRA FACILITY INVESTIGATION REPORT
ASSEMBLY E
NAVAL SUPPORT ACTIVITY MEMPHIS

SWMUs 2, 9, 14, 38, 59, and 65

VOLUME II
ATTACHMENTS 1-7

CTO-106

SOUTHNAVFACENGCOM
CONTRACT NUMBER: N62467-89-D-0318

Revision: 0

Prepared for:

Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

June 13, 1997

RCRA FACILITY INVESTIGATION REPORT
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ATTACHMENT 1

TOPOGRAPHIC MAP – NSA MEMPHIS SOUTHSIDE

ATTACHMENT 3

DPT PIEZOCONE SOUNDINGS AND HYDROCONE PLOTS

Table 3-1
Summary of Horizontal Hydraulic Conductivity Estimates From Hydrocone Data
Assembly E DPT Investigation
NSA Memphis — Millington, Tennessee

Sample ID	Horizontal Hydraulic Conductivity (cm/sec)	Horizontal Hydraulic Conductivity (feet/day)
	SWMU 2 Upper Alluvium DPT Points	
002G001327	6.19e-06	0.01
002G001427	1.59e-05	0.04
002G001527	5.05e-06	0.01
002G001627	2.35e-06	< 0.01
002G001725	5.60e-06	0.01
002G001825	3.35e-06	< 0.01
002G001926	1.36e-05	0.03
002G002130	1.07e-06	< 0.01
002G002323	3.36e-06	< 0.01
002G002527	1.92e-06	< 0.01
002G002627	1.10e-07	< 0.01
002G002727	8.58e-07	< 0.01
AVERAGE	***4.95e-06***	***0.01***
	SWMU 2 Deeper Alluvium	
002G001337	7.53e-04	2.13
002G001440	7.22e-06	0.02
002G001540	3.25e-05	0.09
002G001639	6.97e-06	0.01
002G001736	9.25e-05	0.26
002G001836	1.49e-04	0.42
002G001939	1.13e-04	0.32
002G002039	7.90e-06	0.02
002G002149	4.99e-04	1.41
002G002249	1.18e-03	3.34
002G002336	2.90e-04	0.82
002G002436	9.87e-07	< 0.01
002G002540	2.36e-04	0.66
002G002643	2.26e-05	0.06
002G002741	8.81e-05	0.24
AVERAGE	***2.32e-04***	***0.65***

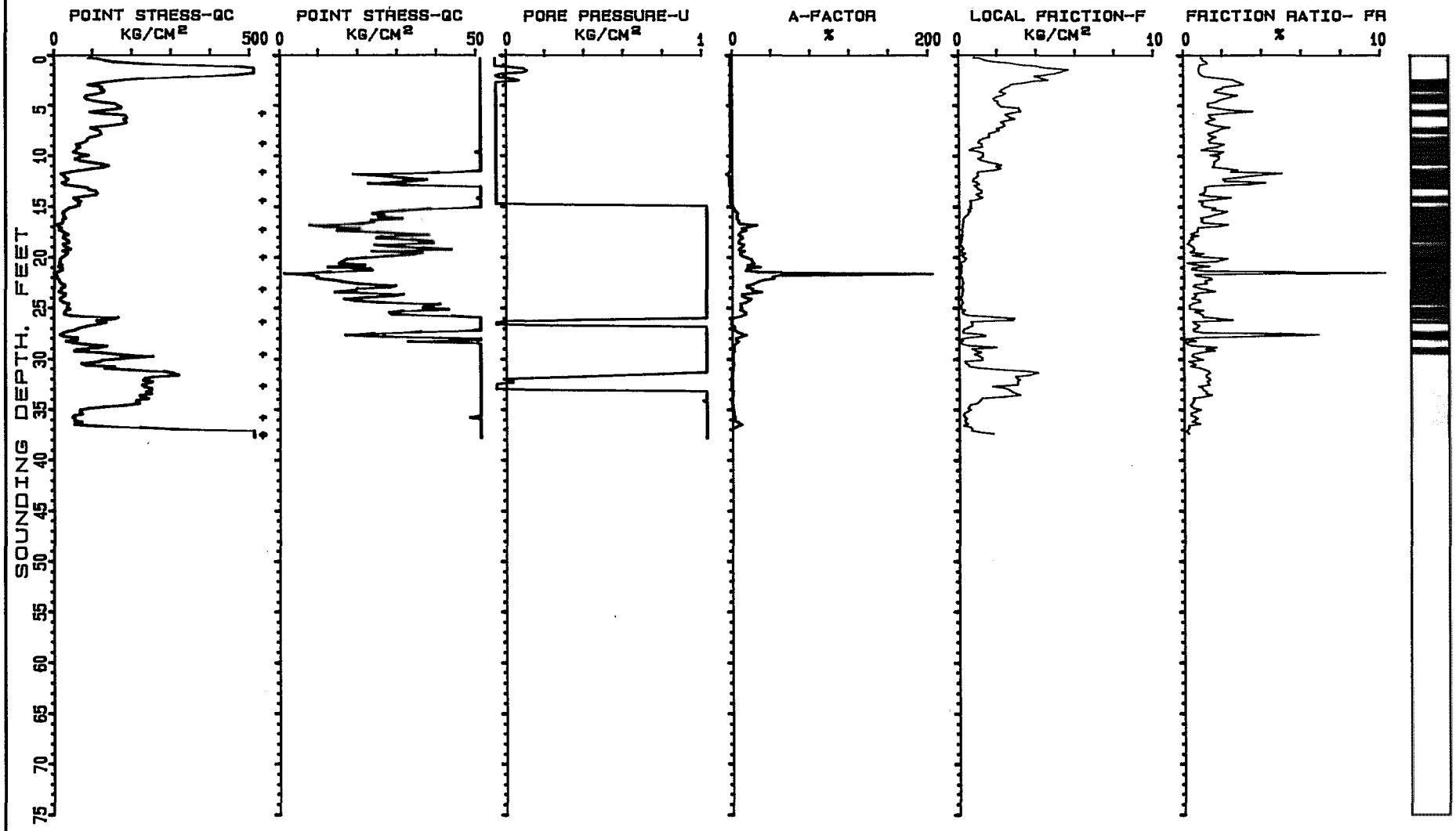
Table 3-1
Summary of Horizontal Hydraulic Conductivity Estimates From Hydrocone Data
Assembly E DPT Investigation
NSA Memphis — Millington, Tennessee

Sample ID	Horizontal Hydraulic Conductivity (cm/sec)	Horizontal Hydraulic Conductivity (feet/day)
SWMU 9 Deeper Alluvium DPT Points		
009G000946	2.15e-05	0.06
009G001046	2.39e-04	0.67
009G001150	6.36e-05	0.18
009G001246	9.97e-05	0.28
009G001348	2.19e-05	0.06
009G001445	1.30e-05	0.03
009G001547	1.00e-03	2.85
009G001644	5.43e-05	0.15
009G001747	5.07e-06	0.01
009G001852	1.57e-04	0.44
009G002142	3.47e-06	< 0.01
009G002244	1.63e-05	0.04
009G002347	5.28e-06	0.01
AVERAGE	***1.31e-04***	***0.37***
SWMU 14 Loess DPT Points		
014G000512	1.53e-05	0.04
014G000711	4.88e-05	0.13
014G000811	1.37e-05	0.03
014G000911	2.68e-05	0.07
014G001110	7.83e-06	0.02
014G001211	2.07e-06	0.01
014G001313	2.36e-05	0.06
014G001411	1.37e-04	0.39
AVERAGE	***3.44e-05***	***0.09***
SWMU 14 Upper Fluvial Deposits DPT Points		
014G000545	1.81e-04	0.51
014G000743	2.50e-05	0.07
014G000840	7.36e-06	0.02
014G000943	6.28e-05	0.17
014G001043	2.70e-05	0.07
014G001143	1.22e-05	0.03
014G001239	6.39e-07	< 0.01
014G001543	2.10e-06	< 0.01
AVERAGE	***3.98e-05***	***0.11***

SWMU 2

DPT SCREENING INVESTIGATION RESULTS

PIEZOCONE SOUNDING



* PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 02-P13
TEST DATE 11-07-1995 13: 13: 49

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 02-P13

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	SILTY FINE SAND	196.6	2.62	49	49	.03	>90%	>48	432	--	--	--	--
2	DENSE OR CEMENTED S.	541.7	4.69	90	90	.067	>90%	>48	1191	--	--	--	--
3	SILTY FINE SAND	222.6	3.58	55	55	.098	>90%	>48	489	--	--	--	--
4	SILTY TO CLAYEY F.S.	117	2.3	39	39	.128	>90%	>48	257	--	--	--	--
5	SILTY TO CLAYEY F.S.	112.8	2	37	37	.159	80%-90%	>48	248	--	--	--	--
6	SILTY TO CLAYEY F.S.	148.4	2.76	49	49	.19	>90%	>48	326	--	--	--	--
7	SILTY FINE SAND	183.1	2.46	45	45	.221	>90%	>48	402	--	--	--	--
8	SILTY FINE SAND	123.8	1.92	30	30	.251	80%-90%	46-48	272	--	--	--	--
9	SILTY FINE SAND	89.4	1.24	22	22	.282	70%-80%	44-46	196	--	--	--	--
10	SILTY TO CLAYEY F.S.	64.5	1.03	21	21	.313	60%-70%	44-46	141	--	--	--	--
11	SILTY TO CLAYEY F.S.	91.5	1.55	30	30	.344	70%-80%	44-46	201	--	--	--	--
12	SILTY TO CLAYEY F.S.	73.9	1.38	24	24	.375	70%-80%	42-44	162	--	--	--	--
13	CLAYEY FINE SAND	34.7	.85	13	13	.405	40%-50%	40-42	76	--	--	--	--
14	SILTY FINE SAND	92.4	1.05	23	23	.436	70%-80%	44-46	203	--	--	--	--
15	SILTY TO CLAYEY F.S.	63.1	.73	21	21	.467	60%-70%	42-44	138	--	--	--	--
16	SILTY TO CLAYEY F.S.	32.2	.45	10	10	.498	<40%	38-40	70	--	--	--	--
17	CLAYEY FINE SAND	20.5	.21	8	8	.528	<40%	36-38	45	--	--	--	--
18	SILTY TO CLAYEY F.S.	22.6	.14	7	7	.559	<40%	36-38	49	--	--	--	--
19	SILTY TO CLAYEY F.S.	31.3	.13	10	10	.59	<40%	36-38	68	--	--	--	--
20	SILTY TO CLAYEY F.S.	32	.22	10	10	.621	<40%	36-38	70	--	--	--	--
21	CLAYEY FINE SAND	17.2	.17	6	6	.651	<40%	32-34	37	--	--	--	--
22	CLAYEY FINE SAND	13	.08	5	5	.682	<40%	30-32	28	--	--	--	--
23	CLAYEY FINE SAND	18.4	.17	7	7	.713	<40%	32-34	40	--	--	--	--
24	SILTY TO CLAYEY F.S.	22.8	.17	7	7	.744	<40%	34-36	50	--	--	--	--
25	SILTY TO CLAYEY F.S.	28.2	.14	9	9	.775	<40%	36-38	62	--	--	--	--
26	SILTY TO CLAYEY F.S.	53.9	.84	17	17	.805	40%-50%	38-40	118	--	--	--	--
27	FINE SAND	119.3	1.19	23	23	.838	60%-70%	42-44	262	--	--	--	--
28	SILTY TO CLAYEY F.S.	40.9	.52	13	13	.869	<40%	36-38	89	--	--	--	--
29	SILTY FINE SAND	78	.43	19	19	.9	50%-60%	40-42	171	--	--	--	--
30	FINE SAND	135.6	.98	27	27	.933	70%-80%	42-44	298	--	--	--	--

02-P13 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	FINE SAND	121.4	.85	24	24	.966	60%-70%	40-42	267	--	--	--	--
32	FINE SAND	245.6	3.17	49	49	1	>90%	44-46	540	--	--	--	--
33	FINE SAND	237	2.66	47	47	1.033	>90%	44-46	521	--	--	--	--
34	FINE SAND	238.7	2.26	47	47	1.066	>90%	44-46	525	--	--	--	--
35	FINE SAND	182.6	.71	36	36	1.099	70%-80%	42-44	401	--	--	--	--
36	SILTY FINE SAND	64.1	.33	16	16	1.13	40%-50%	38-40	141	--	--	--	--
37	FINE SAND	123.7	.45	24	24	1.163	60%-70%	40-42	272	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBERTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

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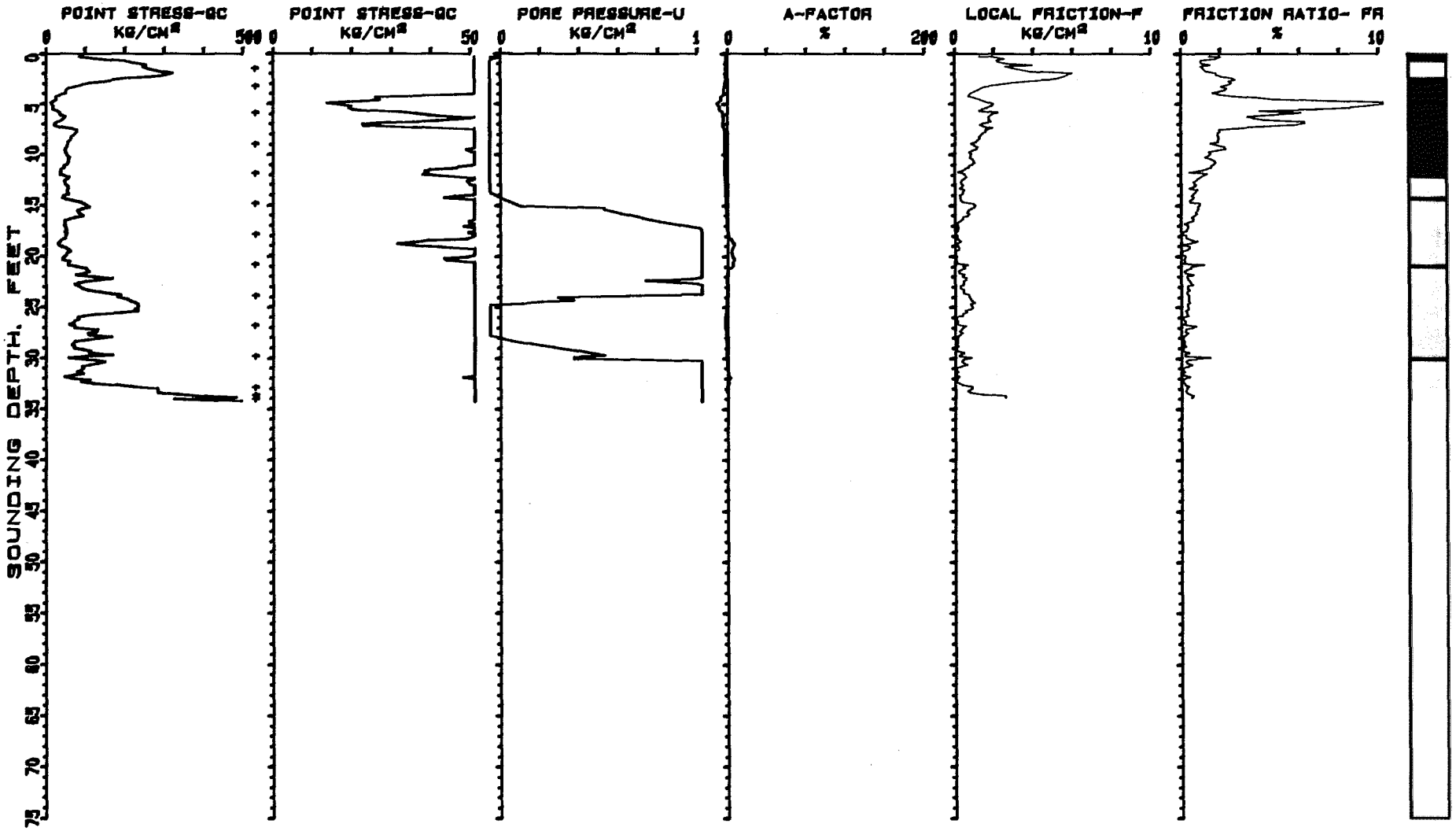
PIEZOCONE SOUNDING



* PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 02-P20
TEST DATE 11-08-1995 14:40:57

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 02-P20

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	SILTY FINE SAND	179.6	2.76	44	44	.03	>90%	>48	395	--	--	--	--
2	SILTY FINE SAND	272	4.23	68	68	.061	>90%	>48	598	--	--	--	--
3	SILTY FINE SAND	219.9	4.35	54	54	.092	>90%	>48	483	--	--	--	--
4	SILTY TO CLAYEY F.S.	70	1.28	23	23	.123	70%-80%	>48	154	--	--	--	--
5	SILTY CLAY TO CLAY	28.9	1.28	19	19	.15	--	--	--	1.78	2.2	UD	>6
6	CLAY	22.7	1.76	22	22	.175	--	--	--	1.39	1.2	UD	>6
7	SILTY CLAY TO CLAY	38.3	1.67	25	25	.202	--	--	--	2.36	2.2	UD	>6
8	CLAYEY FINE SAND	55.1	1.52	22	22	.233	60%-70%	44-46	121	--	--	--	--
9	SILTY TO CLAYEY F.S.	64.3	1.12	21	21	.264	70%-80%	44-46	141	--	--	--	--
10	SILTY TO CLAYEY F.S.	52.9	.94	17	17	.294	60%-70%	42-44	116	--	--	--	--
11	SILTY TO CLAYEY F.S.	57.5	.88	19	19	.325	60%-70%	42-44	126	--	--	--	--
12	SILTY TO CLAYEY F.S.	43.4	.53	14	14	.356	50%-60%	40-42	95	--	--	--	--
13	SILTY FINE SAND	51	.44	12	12	.387	60%-70%	42-44	112	--	--	--	--
14	SILTY FINE SAND	56.1	.37	14	14	.418	60%-70%	42-44	123	--	--	--	--
15	SILTY FINE SAND	70.8	.58	17	17	.448	60%-70%	42-44	155	--	--	--	--
16	SILTY FINE SAND	95.3	.72	23	23	.479	70%-80%	42-44	209	--	--	--	--
17	SILTY FINE SAND	62	.26	15	15	.51	50%-60%	40-42	136	--	--	--	--
18	SILTY FINE SAND	52.5	.04	13	13	.541	50%-60%	40-42	115	--	--	--	--
19	SILTY FINE SAND	40.6	.05	10	10	.571	40%-50%	38-40	89	--	--	--	--
20	SILTY FINE SAND	54	.04	13	13	.602	50%-60%	40-42	118	--	--	--	--
21	SILTY FINE SAND	56.8	.18	14	14	.633	50%-60%	40-42	124	--	--	--	--
22	FINE SAND	101	.41	20	20	.666	60%-70%	42-44	222	--	--	--	--
23	FINE SAND	111.2	.45	22	22	.699	70%-80%	42-44	244	--	--	--	--
24	FINE SAND	138.1	.57	27	27	.733	70%-80%	42-44	303	--	--	--	--
25	DENSE OR CEMENTED S.	220.6	.89	36	36	.769	>90%	44-46	485	--	--	--	--
26	FINE SAND	170.9	.42	34	34	.802	80%-90%	44-46	375	--	--	--	--
27	SILTY FINE SAND	74.3	.26	18	18	.833	50%-60%	40-42	163	--	--	--	--
28	FINE SAND	123.4	.24	24	24	.866	70%-80%	42-44	271	--	--	--	--
29	FINE SAND	85.2	.08	17	17	.9	50%-60%	40-42	187	--	--	--	--
30	FINE SAND	104	.33	20	20	.933	60%-70%	40-42	228	--	--	--	--

2-P20 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	FINE SAND	109.9	.29	21	21	.966	60%-70%	40-42	241	--	--	--	--
32	FINE SAND	78.5	.07	15	15	.999	50%-60%	38-40	172	--	--	--	--
33	FINE SAND	154.6	.43	30	30	1.032	70%-80%	42-44	340	--	--	--	--

N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

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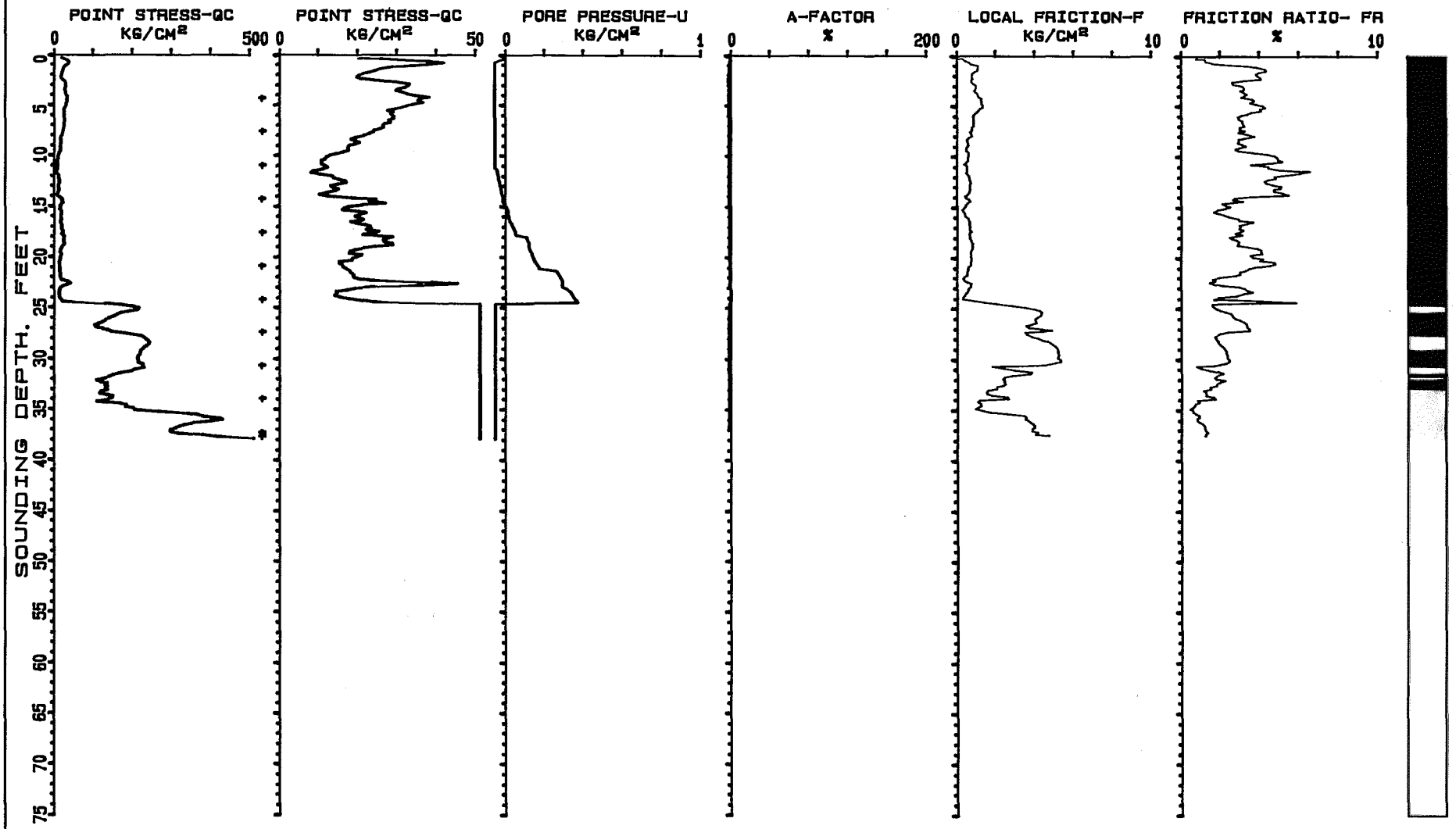
PIEZOCONE SOUNDING



* PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 02-P23
TEST DATE 12-01-1995 10: 28: 43

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 02-P23

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N' VALUES	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%)	FRICTION ANGLE (DEGREES)	YOUNGS MODULUS (KG/CM2)	UNDRAINED SHEAR STRENGTH (KG/CM2)	SENSITIVITY	COMP.	OCR
				#			*	**	***	****			
1	CLAYEY FINE SAND	35.6	.85	14	14	.03	60%-70%	>48	78	.97	3.7	.01	6
2	SANDY CLAY	26.2	.97	13	13	.058	--	--	--	1.63	2.6	.02	>6
3	SANDY CLAY	25.3	.87	12	12	.085	--	--	--	1.57	2.9	.02	>6
4	SANDY CLAY	32	1.05	16	16	.112	--	--	--	1.98	3	.01	>6
5	SANDY CLAY	35.5	1.31	17	17	.14	--	--	--	2.2	2.7	.01	>6
6	SANDY CLAY	29.7	1.06	14	14	.167	--	--	--	1.83	2.7	.01	>6
7	SANDY CLAY	28	.85	14	14	.194	--	--	--	1.72	3.2	.02	>6
8	SANDY CLAY	24.4	.74	12	12	.222	--	--	--	1.49	3.2	.02	>6
9	SANDY CLAY	19.4	.57	9	9	.249	--	--	--	1.17	3.3	.01	>6
10	SILTY CLAY TO CLAY	16.3	.57	10	10	.276	--	--	--	.98	2.8	.01	6
11	CLAY	11.5	.52	11	11	.301	--	--	--	.67	2.1	.02	6
[illegible]	CLAY	10.9	.58	10	10	.326	--	--	--	.63	1.8	.02	6
13	CLAY	15.1	.7	15	15	.351	--	--	--	.89	2.1	.01	6
14	CLAY	13.1	.61	13	13	.376	--	--	--	.76	2.1	.01	6
15	SANDY CLAY	20.7	.53	10	10	.403	--	--	--	1.23	3.8	.02	6
16	SANDY CLAY	18.9	.41	9	9	.431	--	--	--	1.12	4.5	.01	6
17	SANDY CLAY	20.7	.66	10	10	.458	--	--	--	1.23	3.1	.02	6
18	SANDY CLAY	24.1	.7	12	12	.485	--	--	--	1.44	3.4	.02	6
19	SANDY CLAY	27.5	.8	13	13	.513	--	--	--	1.65	3.4	.02	6
20	SILTY CLAY TO CLAY	20.2	.76	13	13	.54	--	--	--	1.19	2.6	UD	6
21	SILTY CLAY TO CLAY	17.2	.7	11	11	.567	--	--	--	.99	2.4	.01	6
22	SANDY CLAY	18.1	.5	9	9	.595	--	--	--	1.05	3.5	.01	6
23	CLAYEY FINE SAND	29.7	.6	11	11	.626	<40%	36-38	65	--	--	--	--
24	SANDY CLAY	17	.45	8	8	.653	--	--	--	.97	3.7	.01	6
25	SILTY TO CLAYEY F.S.	101.3	2.4	33	33	.684	60%-70%	42-44	222	--	--	--	--
26	SILTY TO CLAYEY F.S.	179.6	4.2	59	59	.714	80%-90%	44-46	395	--	--	--	--
27	CLAYEY FINE SAND	121.8	4.06	48	48	.745	70%-80%	42-44	267	--	--	--	--
28	SILTY TO CLAYEY F.S.	175.7	4.06	58	58	.776	80%-90%	44-46	386	--	--	--	--
29	SILTY FINE SAND	239.7	4.87	59	59	.807	>90%	44-46	527	--	--	--	--
30	SILTY TO CLAYEY F.S.	222.5	5.22	74	74	.838	>90%	44-46	489	--	--	--	--

02-P23 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SILTY FINE SAND	222.2	3.92	55	55	.868	>90%	44-46	488	--	--	--	--
32	SILTY FINE SAND	176.1	2.93	44	44	.899	80%-90%	42-44	387	--	--	--	--
33	SILTY FINE SAND	127.5	2.17	31	31	.93	70%-80%	42-44	280	--	--	--	--
34	SILTY FINE SAND	135.1	1.81	33	33	.961	70%-80%	42-44	297	--	--	--	--
35	FINE SAND	169.2	1.19	33	33	.994	70%-80%	42-44	372	--	--	--	--
36	FINE SAND	347.2	3.18	69	69	1.027	>90%	46-48	763	--	--	--	--
37	FINE SAND	350.3	3.93	70	70	1.06	>90%	46-48	770	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBERTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

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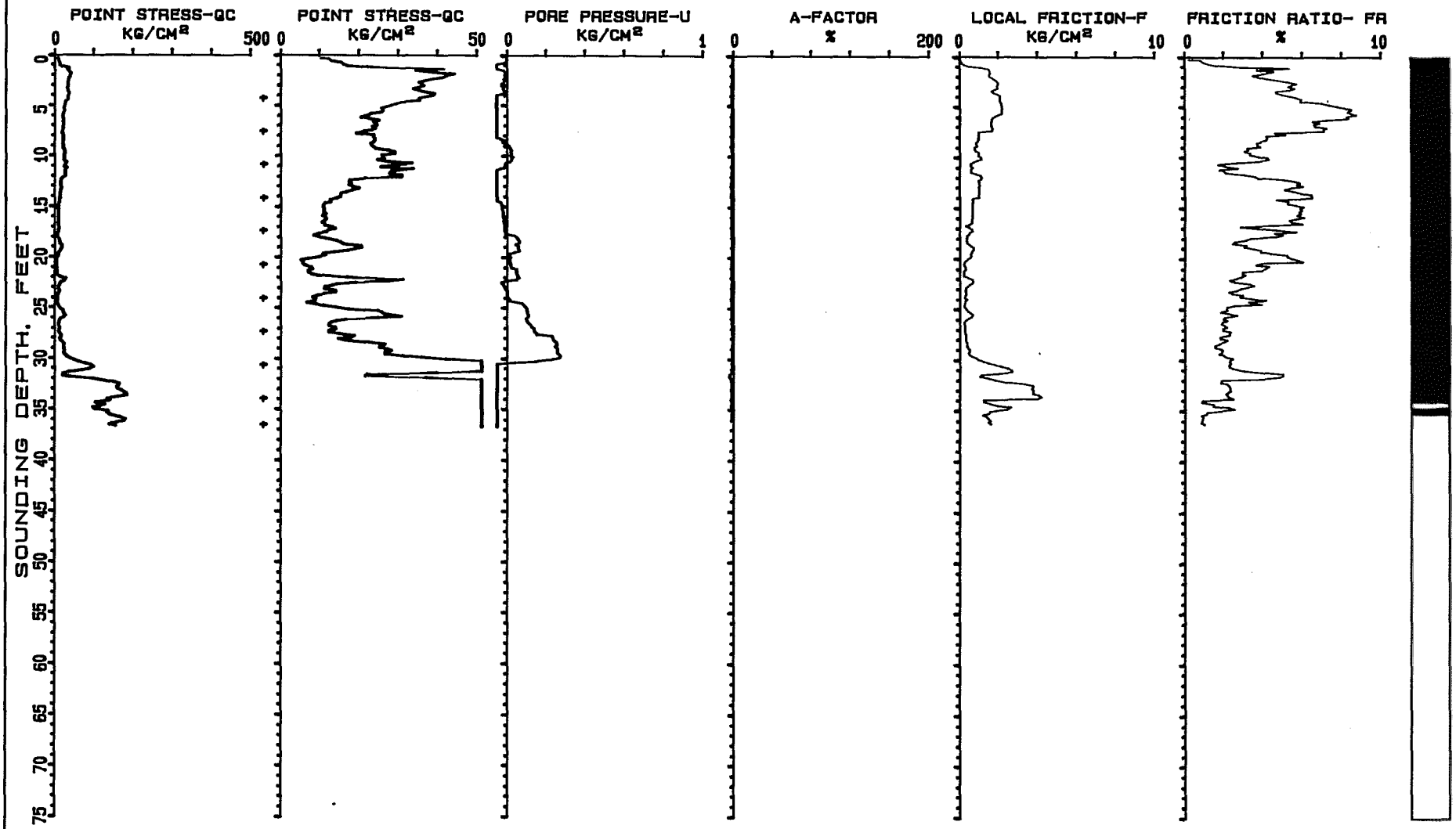
PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 02-P24
TEST DATE 12-01-1995 17:50:46

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 02-P24

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N' VALUES #	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	SANDY CLAY	15	.45	7	7	.027	--	--	--	.93	3.3	.01	>6
2	SILTY CLAY TO CLAY	34.5	1.52	23	23	.054	--	--	--	2.14	2.2	UD	>6
3	CLAY	38	1.91	38	38	.079	--	--	--	2.36	1.9	UD	>6
4	CLAY	36.6	1.9	36	36	.104	--	--	--	2.27	1.9	UD	>6
5	CLAY	33.5	2.15	33	33	.129	--	--	--	2.07	1.5	UD	>6
6	CLAY	25.3	2.02	25	25	.154	--	--	--	1.56	1.2	UD	>6
7	CLAY	23.3	1.64	23	23	.179	--	--	--	1.43	1.4	UD	>6
8	CLAY	22.8	1.28	22	22	.204	--	--	--	1.39	1.7	UD	>6
9	SILTY CLAY TO CLAY	23.7	.9	15	15	.231	--	--	--	1.44	2.6	UD	>6
10	SANDY CLAY	26.2	.91	13	13	.258	--	--	--	1.6	2.8	.02	>6
11	SANDY CLAY	27.4	.81	13	13	.286	--	--	--	1.67	3.3	.02	>6
12	CLAYEY FINE SAND	29.1	.8	11	11	.316	40%-50%	40-42	64	--	--	--	--
13	CLAY	21.5	1.04	21	21	.341	--	--	--	1.29	2	UD	6
14	CLAY	17.1	.95	17	17	.366	--	--	--	1.01	1.7	.01	6
15	CLAY	12.5	.65	12	12	.391	--	--	--	.72	1.9	.02	6
16	CLAY	11.1	.65	11	11	.416	--	--	--	.63	1.7	.02	6
17	CLAY	11.6	.55	11	11	.441	--	--	--	.66	2	.02	6
18	CLAY	11.3	.49	11	11	.466	--	--	--	.64	2.3	.02	6
19	SILTY CLAY TO CLAY	15.5	.52	10	10	.493	--	--	--	.9	2.9	.01	6
20	SILTY CLAY TO CLAY	14.7	.59	9	9	.521	--	--	--	.84	2.4	.01	6
21	CLAY	6.8	.29	6	6	.545	--	--	--	.35	2.2	.03	3
22	CLAY	9.3	.34	9	9	.57	--	--	--	.5	2.6	.02	3
23	SANDY CLAY	19.1	.51	9	9	.598	--	--	--	1.11	3.7	.01	6
24	SANDY CLAY	11.3	.31	5	5	.625	--	--	--	.62	3.6	.02	3
25	SILTY CLAY TO CLAY	9.7	.29	6	6	.652	--	--	--	.51	3.2	.02	3
26	CLAYEY FINE SAND	23.6	.51	9	9	.683	<40%	34-36	51	--	--	--	--
27	CLAYEY FINE SAND	15.3	.27	6	6	.714	<40%	32-34	33	--	--	--	--
28	SANDY CLAY	15	.3	7	7	.741	--	--	--	.83	4.8	.01	6
29	CLAYEY FINE SAND	22	.42	8	8	.772	<40%	34-36	48	--	--	--	--
30	CLAYEY FINE SAND	31.2	.75	12	12	.803	<40%	36-38	68	--	--	--	--

02-P24 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	CLAYEY FINE SAND	75.3	2.08	30	30	.834	50%-60%	40-42	165	--	--	--	--
32	CLAYEY FINE SAND	53.8	1.78	21	21	.864	40%-50%	38-40	118	--	--	--	--
33	SILTY TO CLAYEY F.S.	148.7	3.52	49	49	.895	70%-80%	42-44	327	--	--	--	--
34	SILTY FINE SAND	169.3	3.19	42	42	.926	80%-90%	42-44	372	--	--	--	--
35	SILTY FINE SAND	118.9	1.9	29	29	.957	60%-70%	40-42	261	--	--	--	--
36	FINE SAND	144.9	1.43	28	28	.99	70%-80%	42-44	318	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

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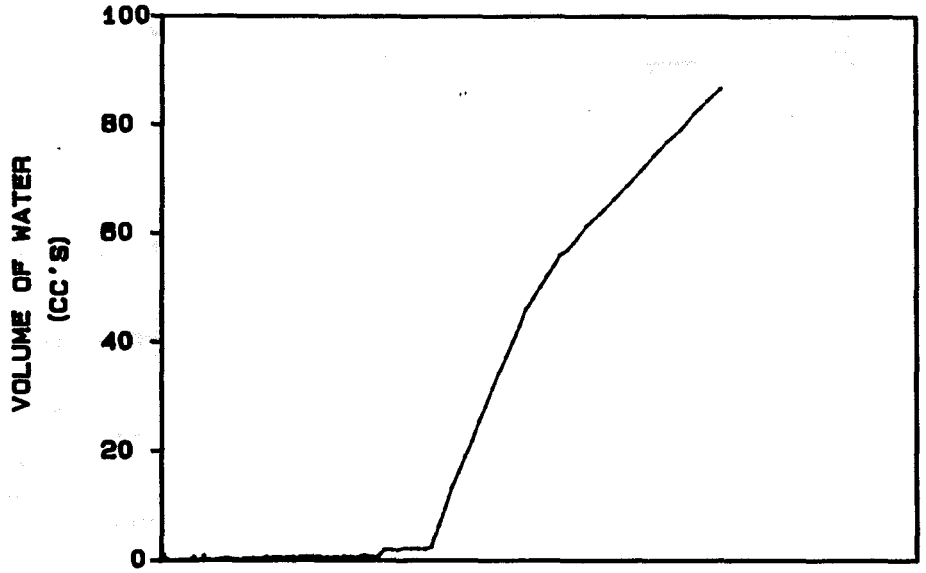
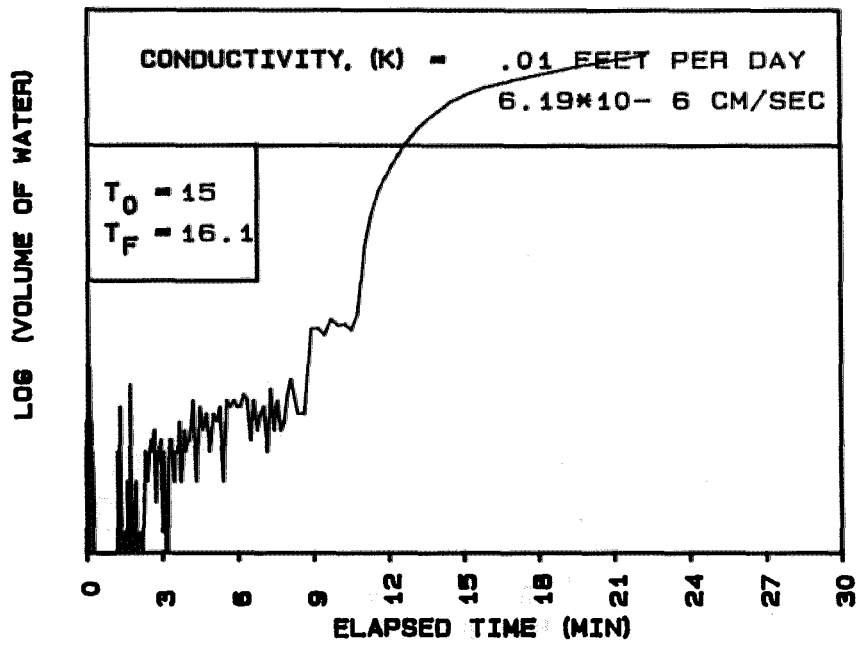
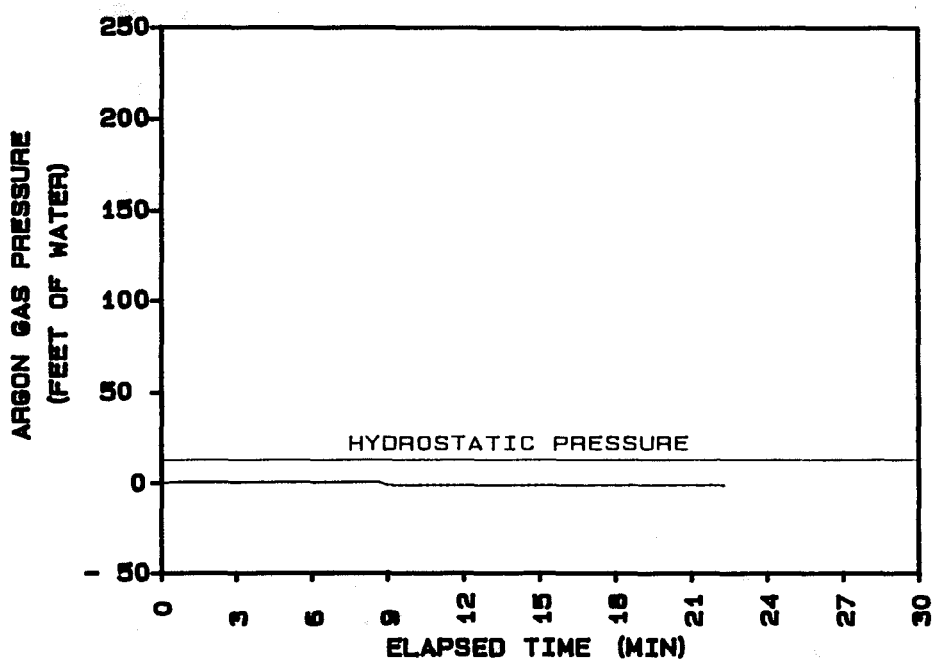
HYDROCONE TEST



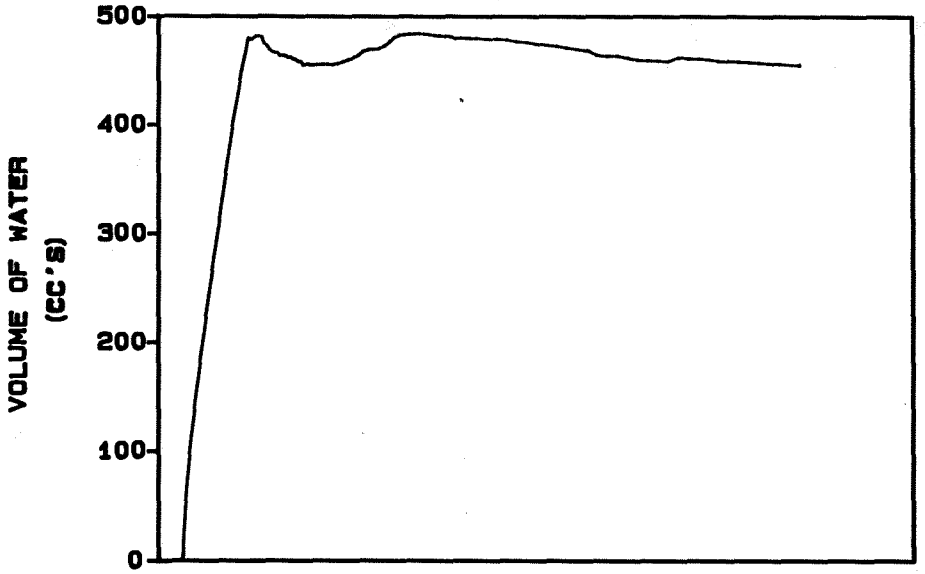


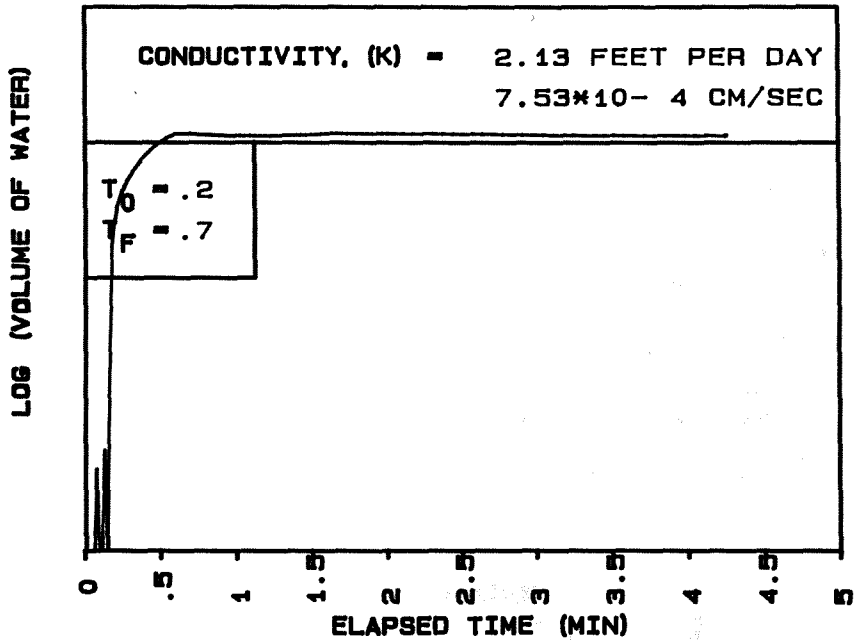


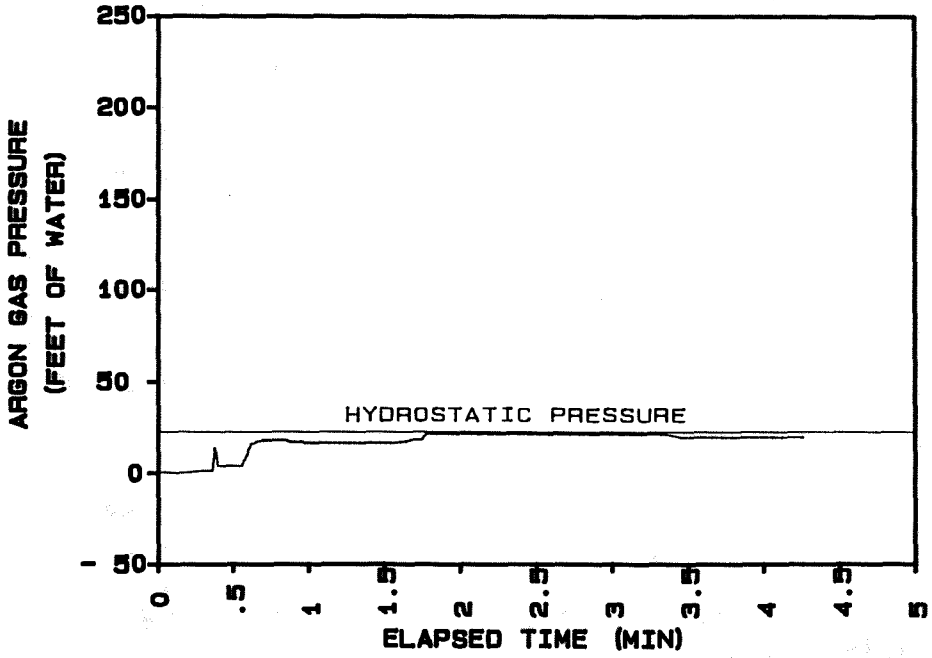
ENSAFE MEMPHIS NSA
LOCATION... 02H1327
TEST DATE
18: 12: 10 12-11-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



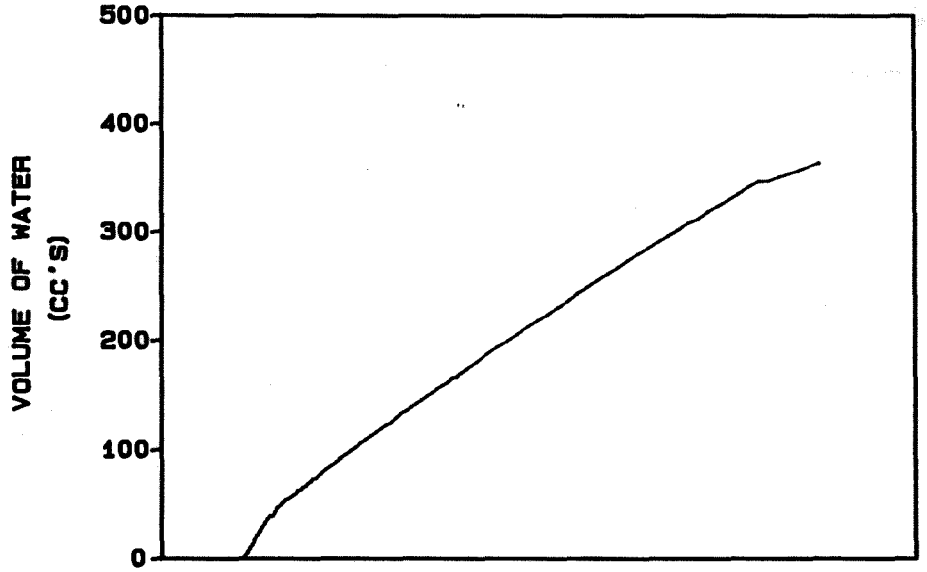


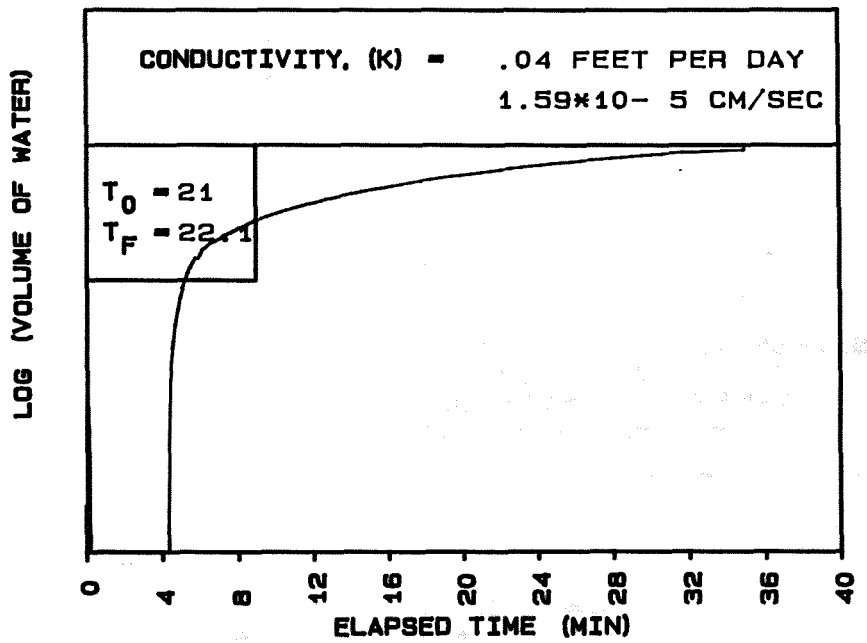


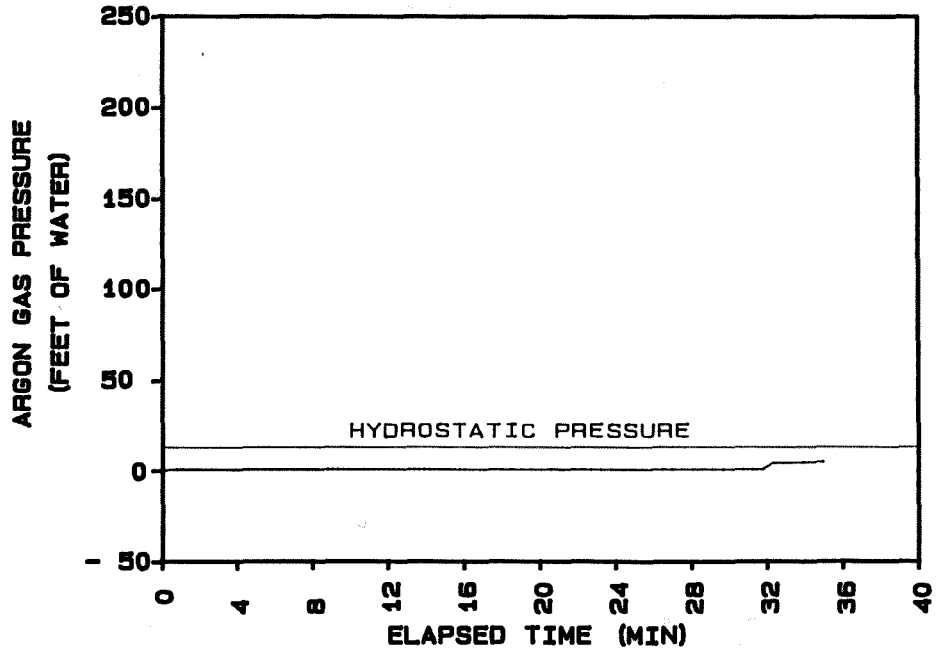
ENSAFE MEMPHIS NSA
LOCATION... 02H1337
TEST DATE
10: 05: 34 12-12-1995

SAMPLE DEPTH (FT) 37
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



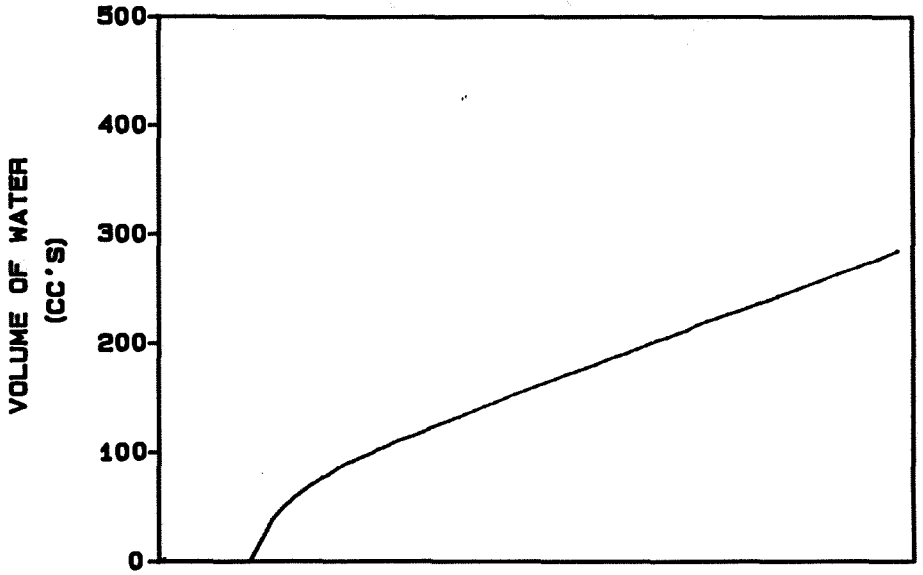


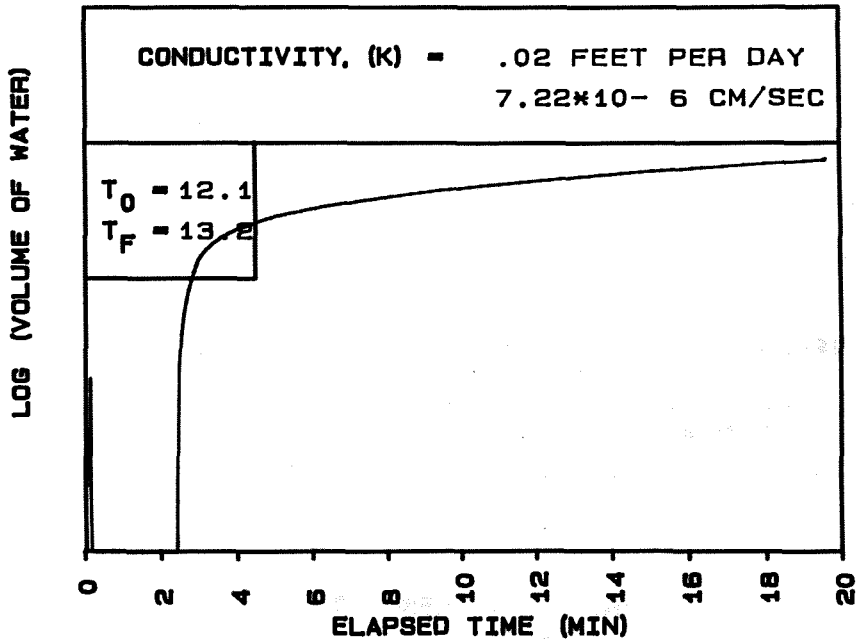


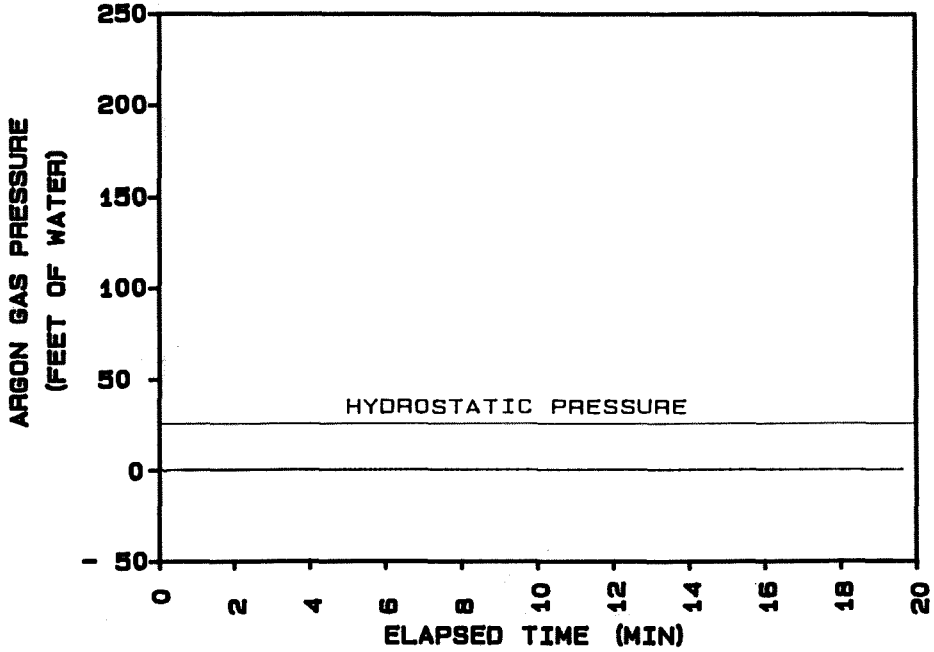
ENSAFE MEMPHIS NSA
LOCATION... 02H1427
TEST DATE
15: 59: 18 12-12-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



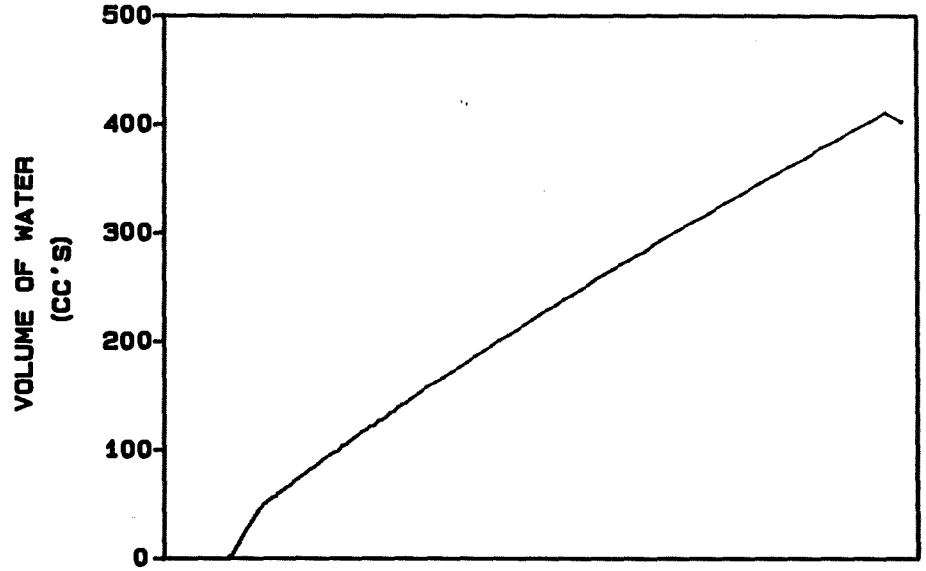


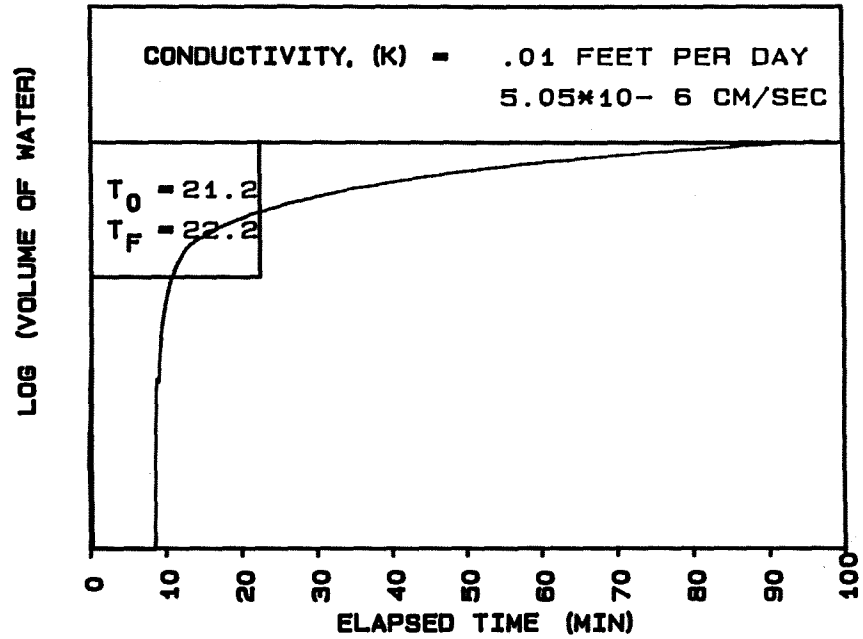


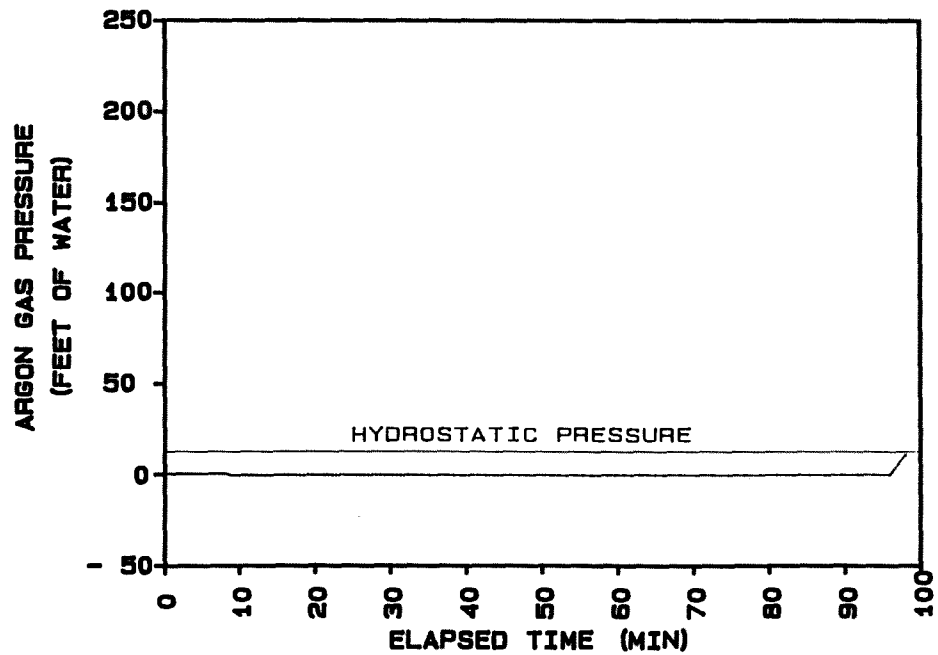
ENSAFE MEMPHIS NSA
LOCATION... 02H1440
TEST DATE
17: 28: 15 12-12-1995

SAMPLE DEPTH (FT) 40
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



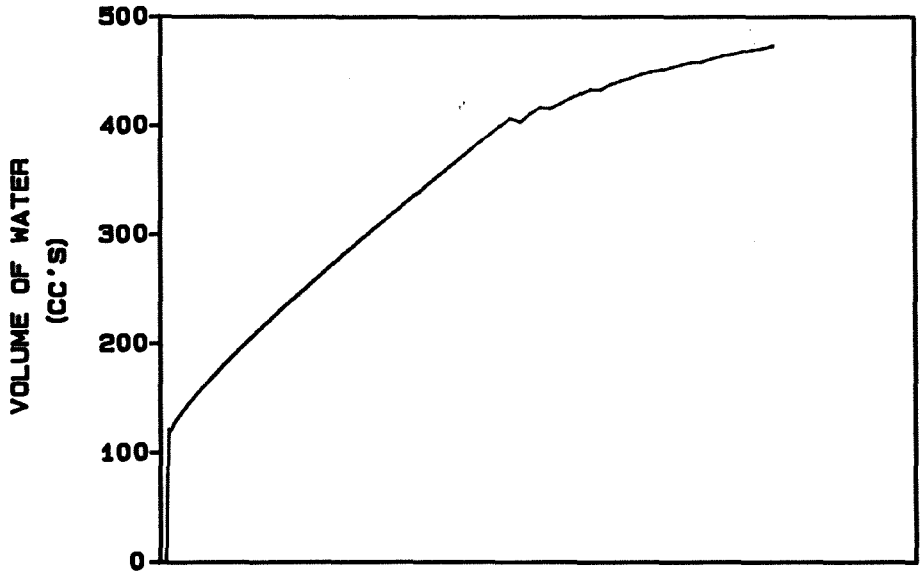


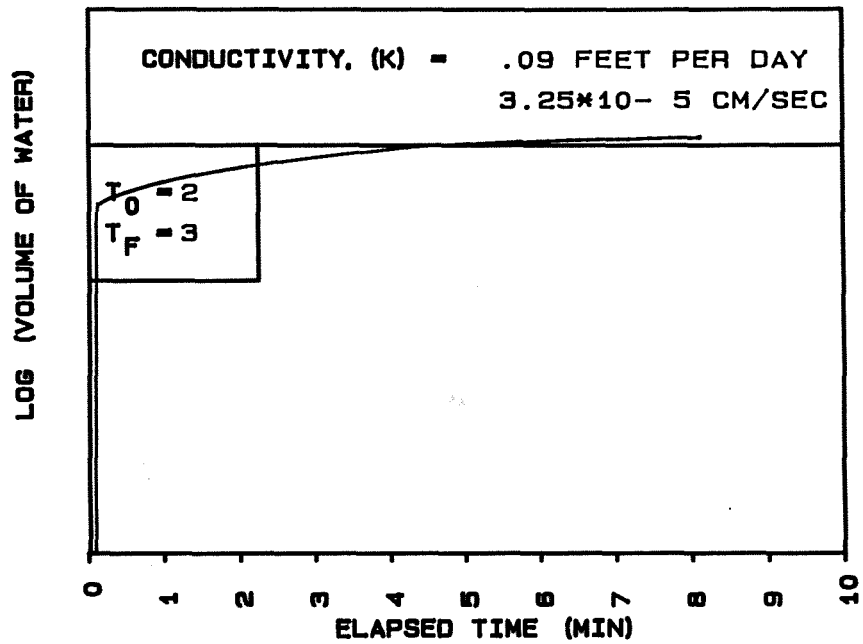


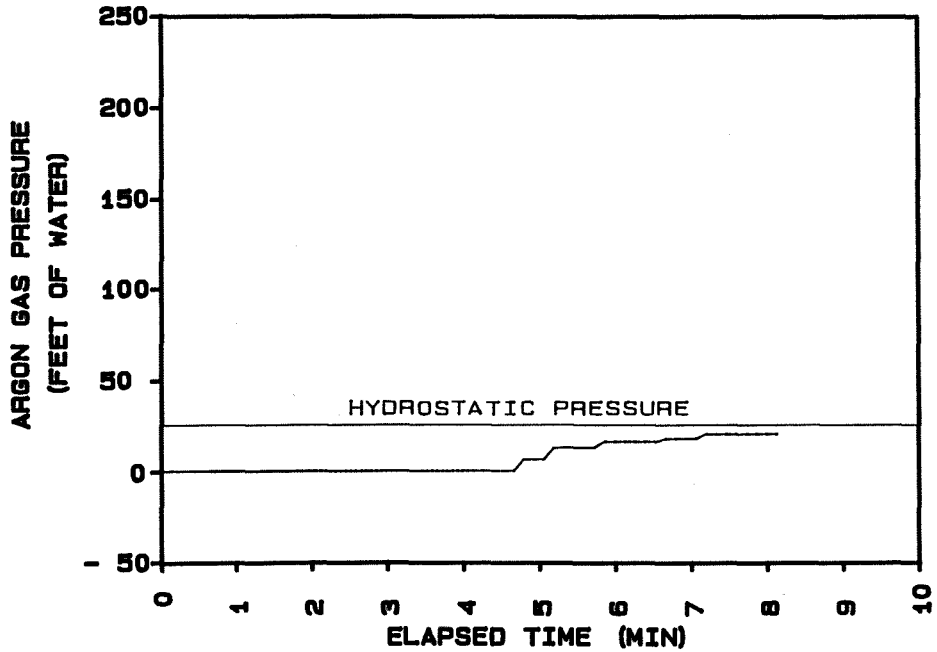
ENSAFE MEMPHIS NSA
LOCATION... 02H1527
TEST DATE
11: 01: 55 12-13-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



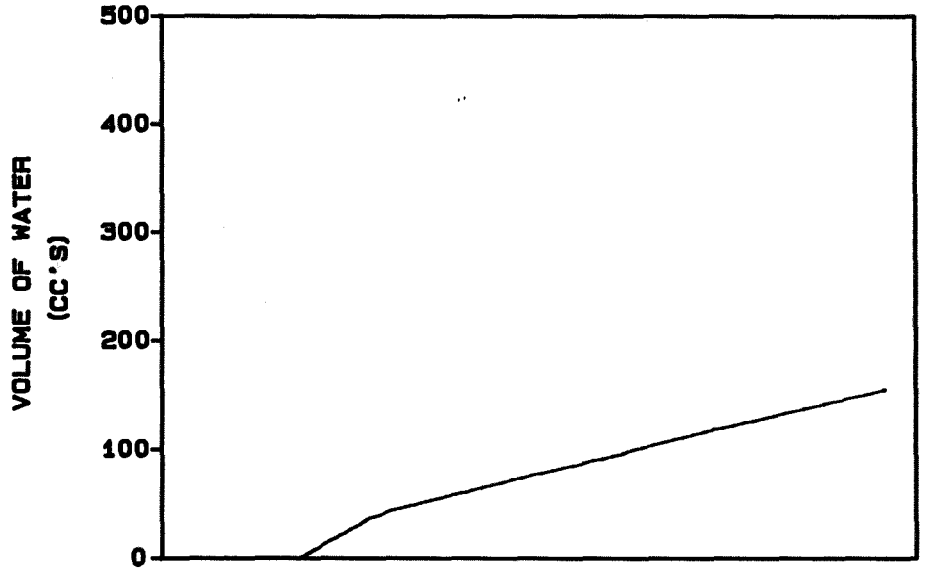


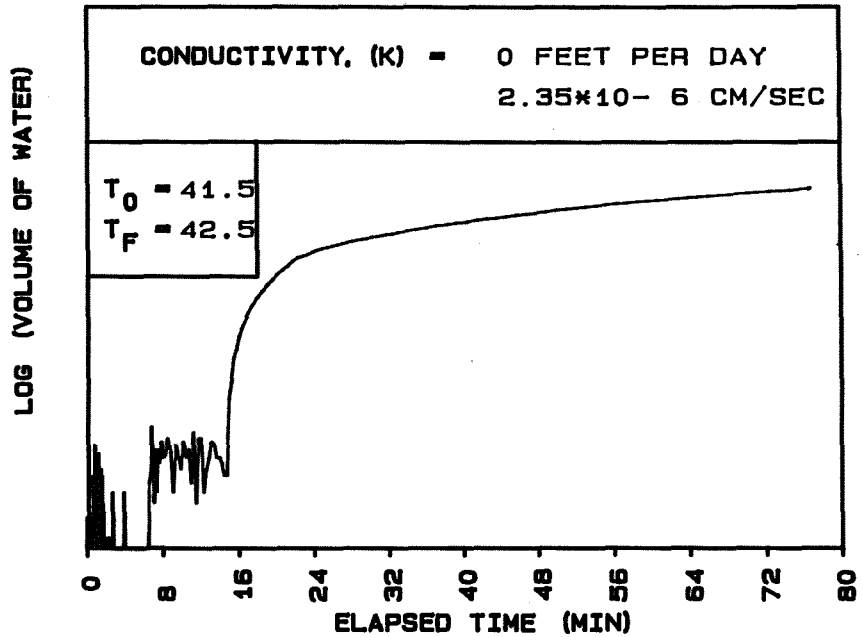


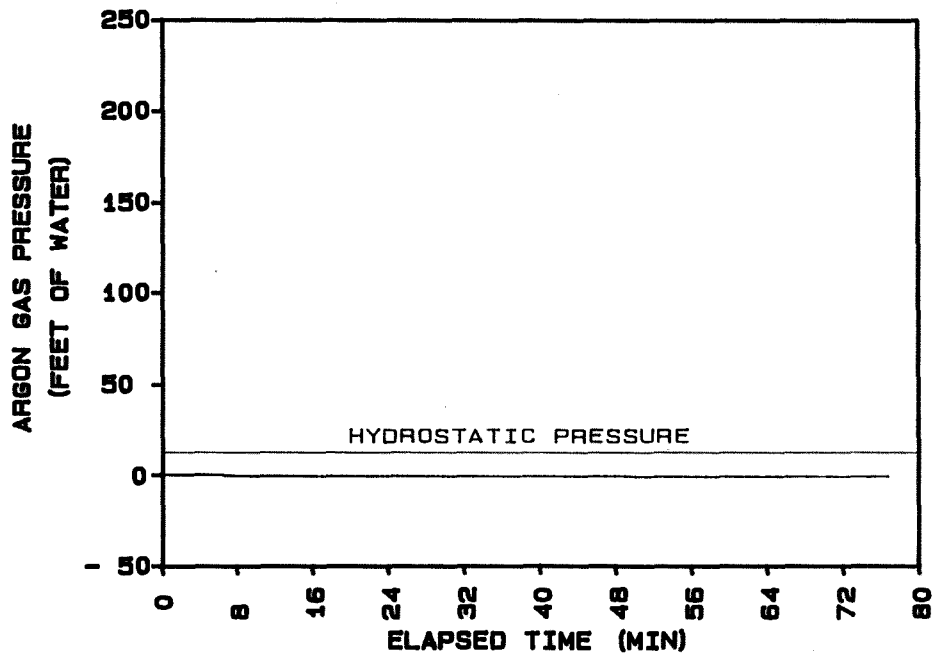
ENSAFE MEMPHIS NSA
LOCATION... 02H1540
TEST DATE
15: 26: 45 12-13-1995

SAMPLE DEPTH (FT) 40
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



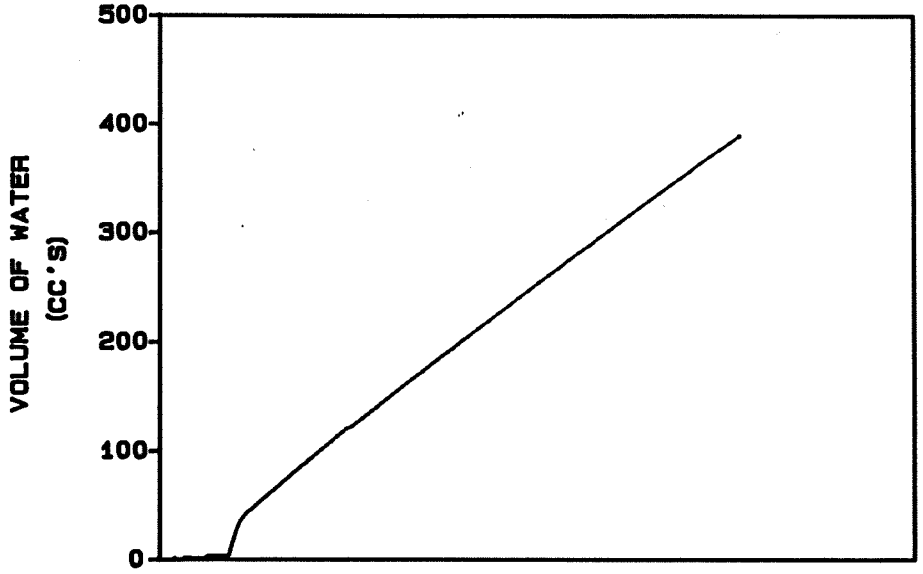


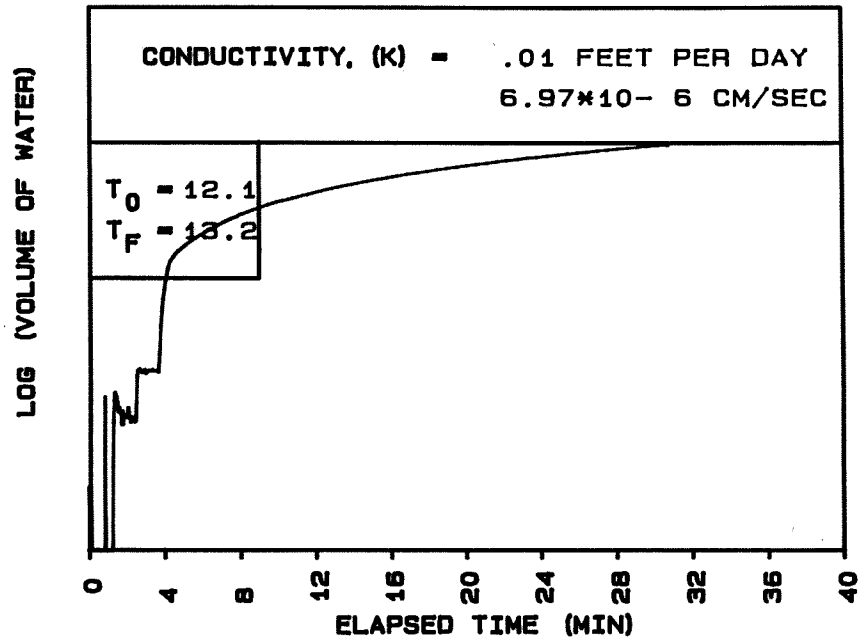


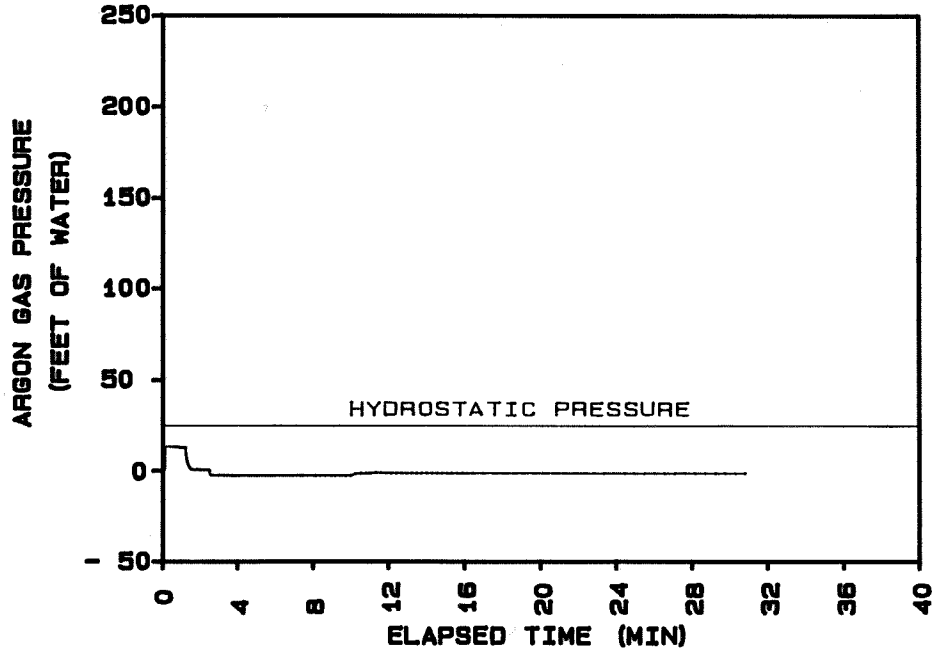
ENSAFE MEMPHIS NSA
LOCATION... 02H1627
TEST DATE
08: 31: 33 12-14-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



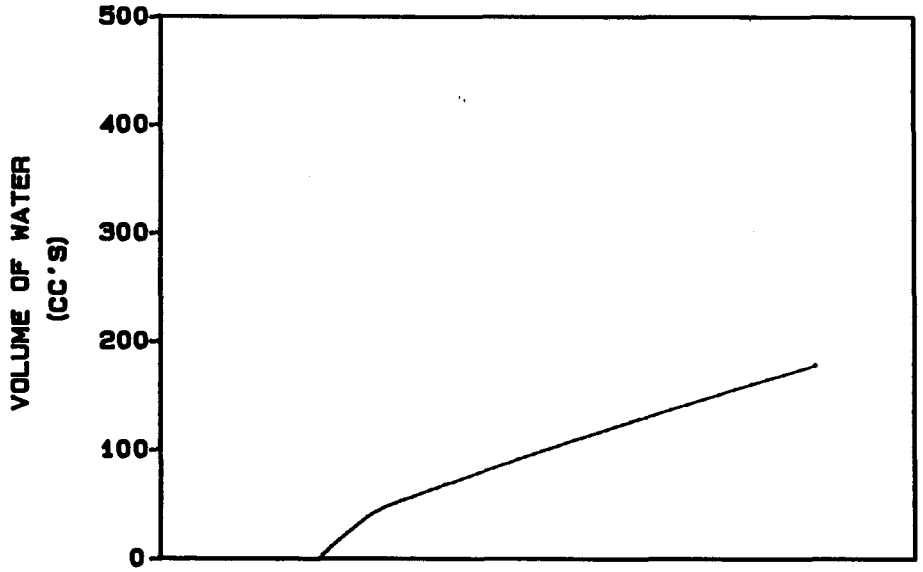


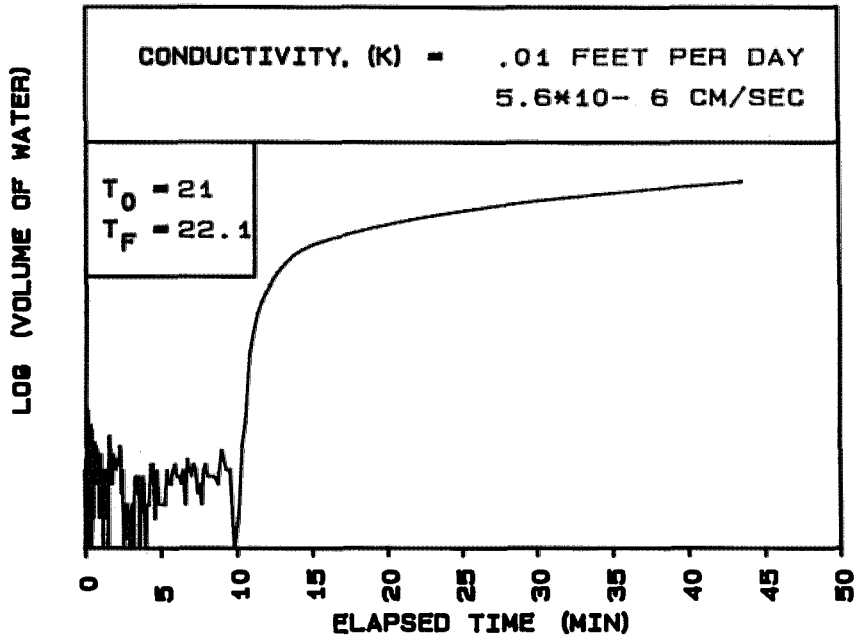


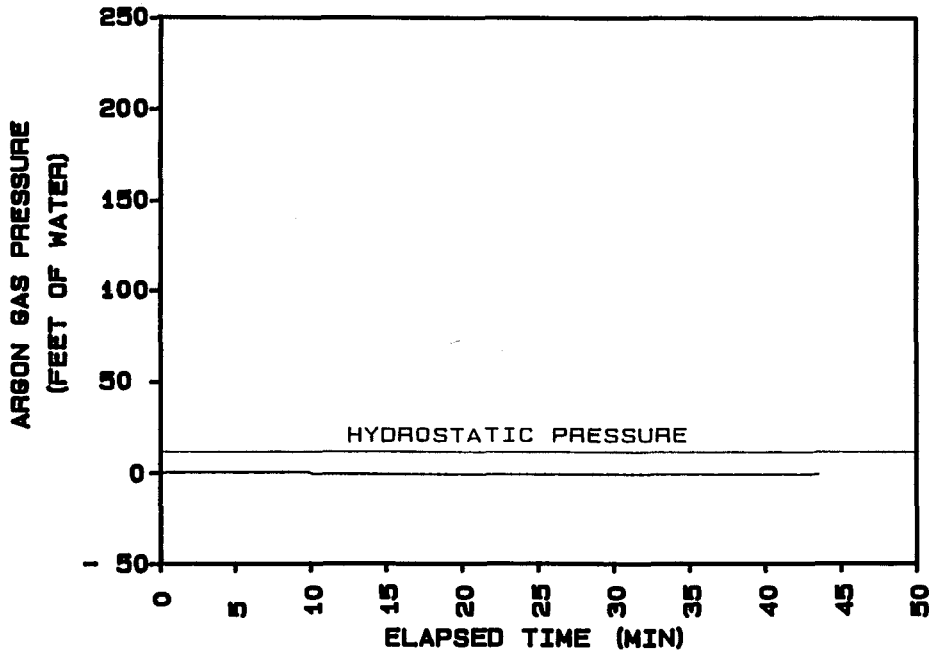
ENSAFE MEMPHIS NSA
LOCATION... 02H1639
TEST DATE
17: 14: 51 12-13-1995

SAMPLE DEPTH (FT) 39
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



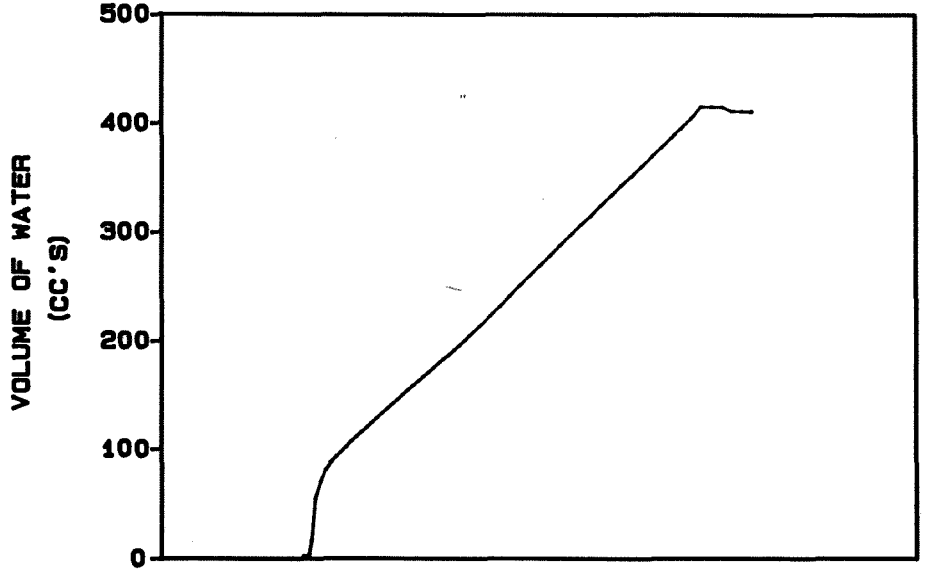


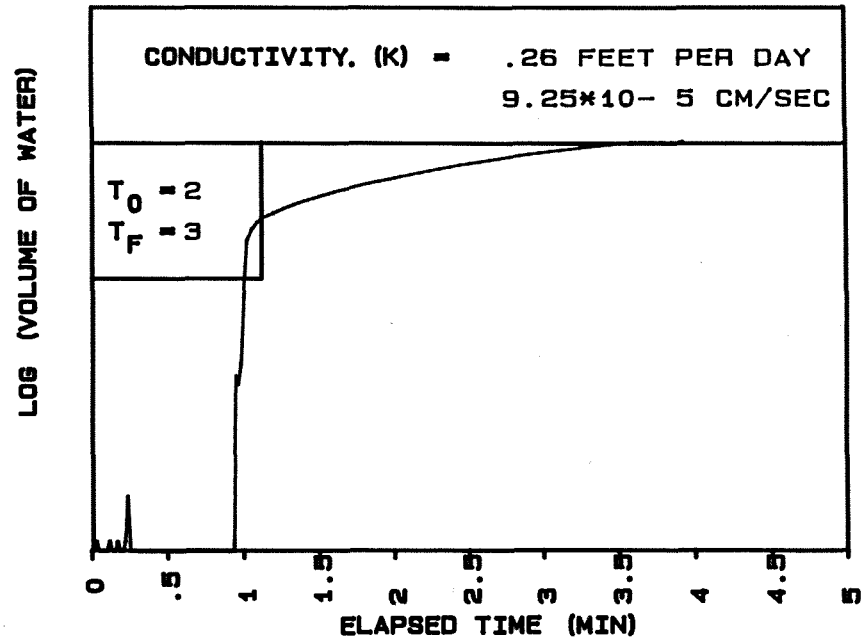


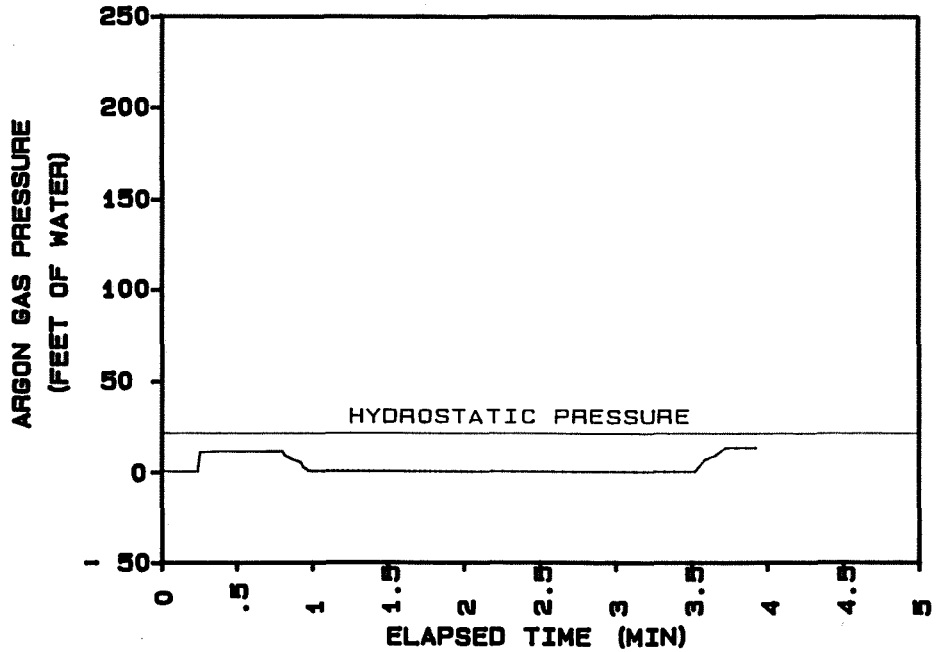
ENSAFE MEMPHIS NSA
LOCATION... 02H1726
TEST DATE
16: 59: 26 12-15-1995

SAMPLE DEPTH (FT) 26
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



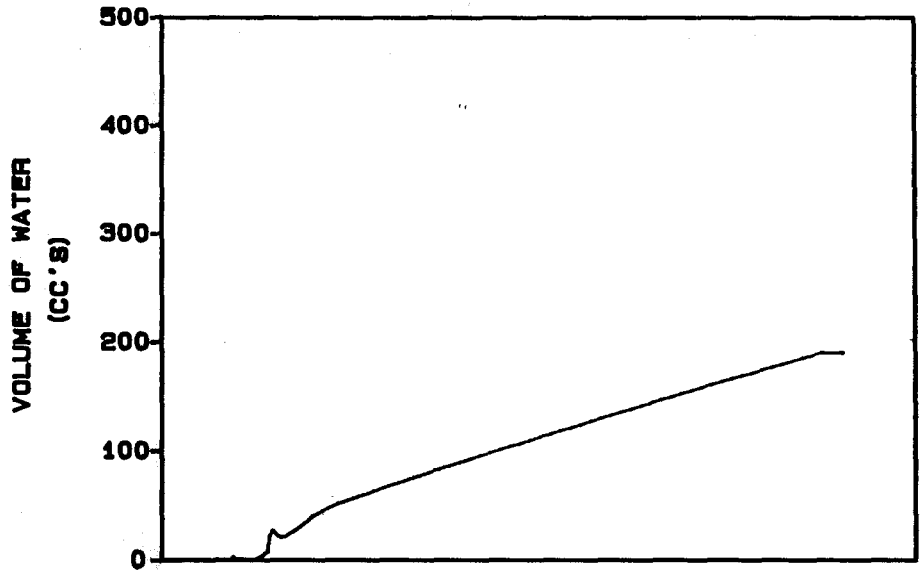


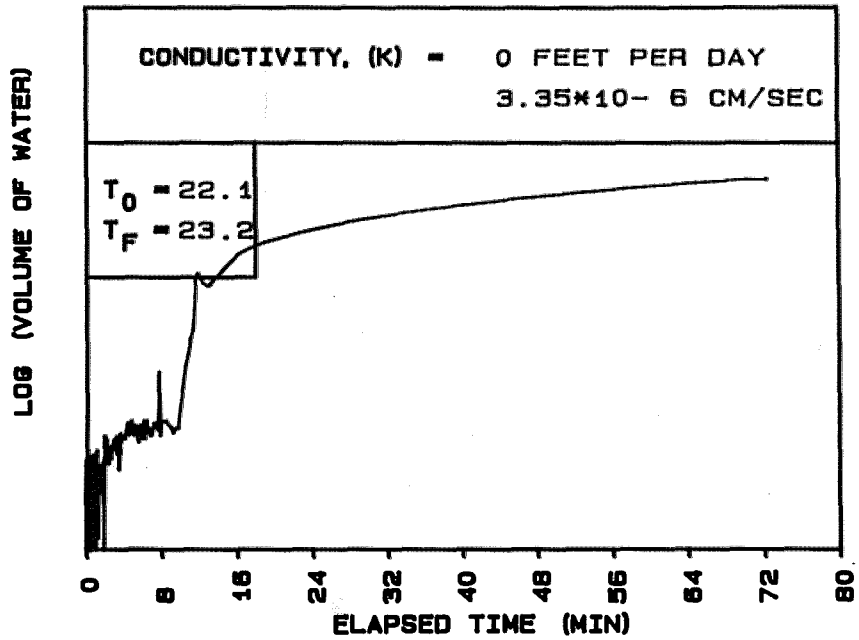


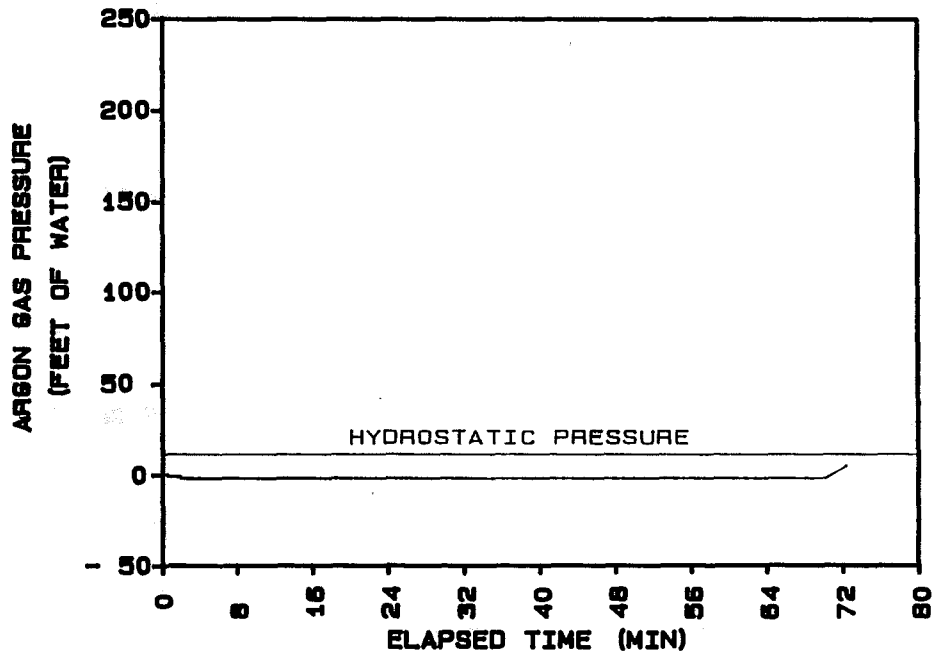
ENSAFE MEMPHIS NSA
LOCATION... 02H1736
TEST DATE
18: 44: 27 12-15-1995

SAMPLE DEPTH (FT) 36
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



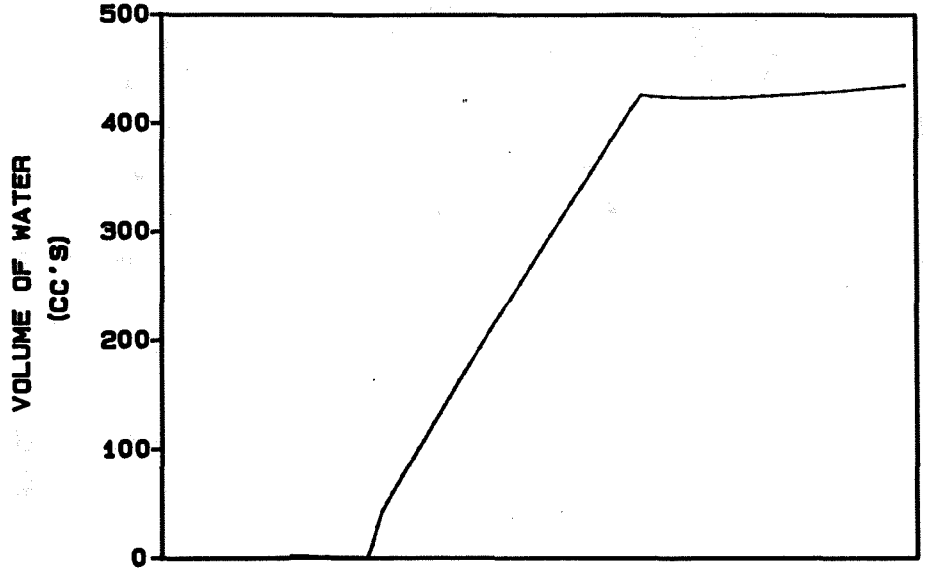


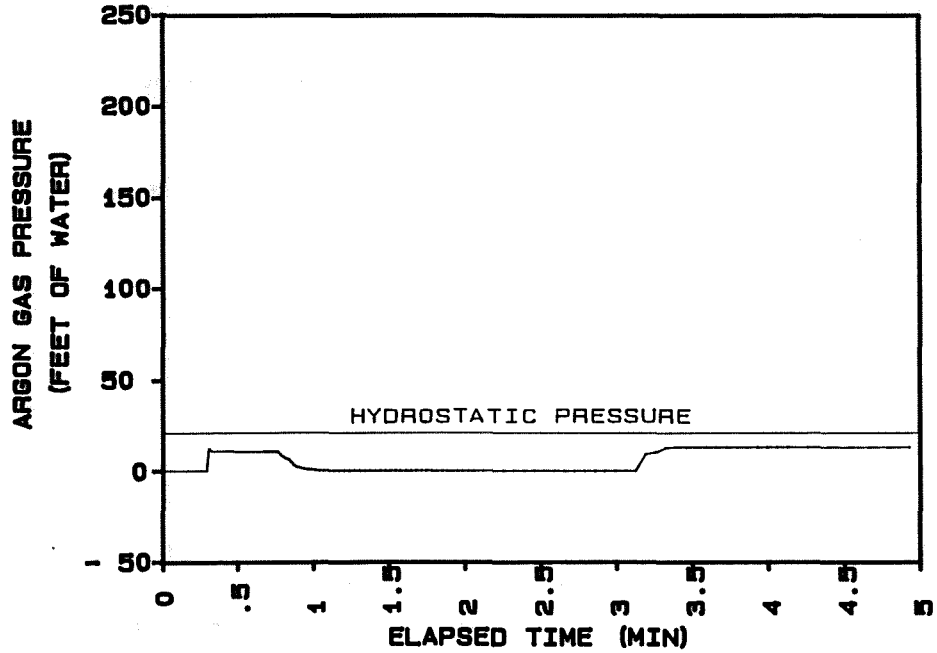


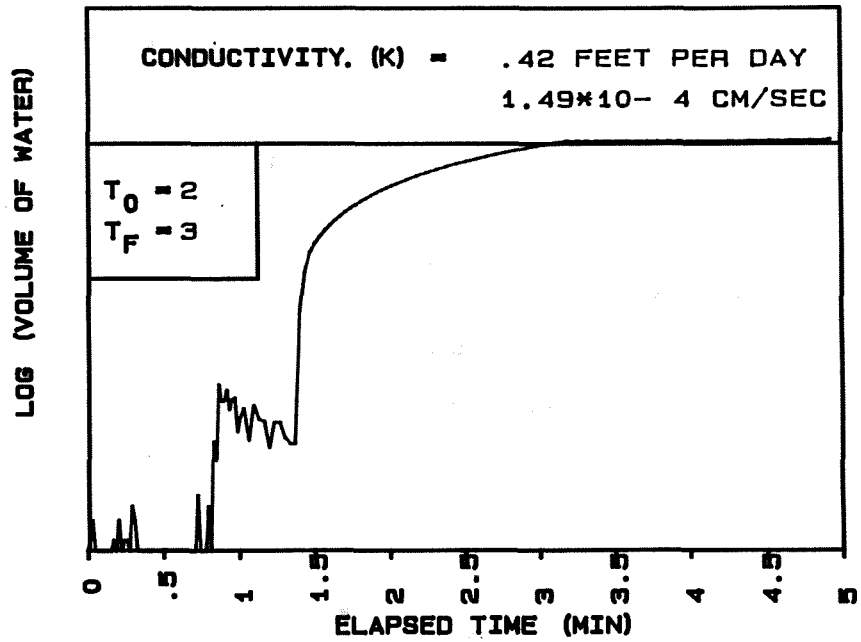
ENSAFE MEMPHIS NSA
LOCATION... 02H1826
TEST DATE
09: 10: 31 12-16-1995

SAMPLE DEPTH (FT) 26
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



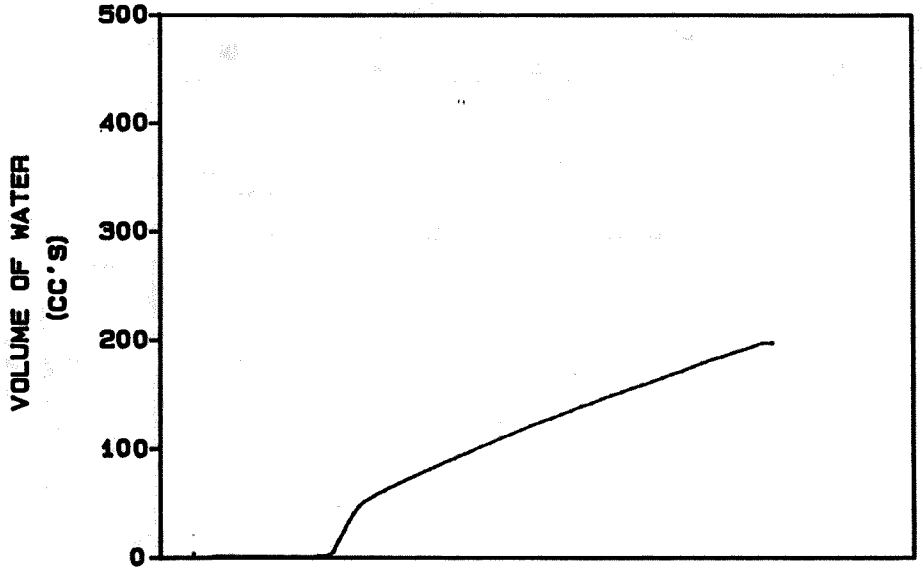


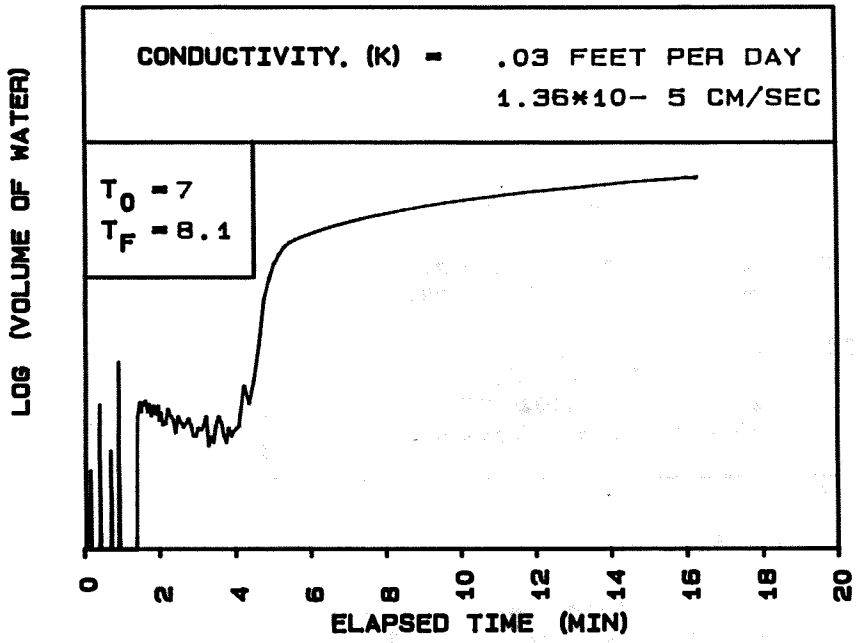


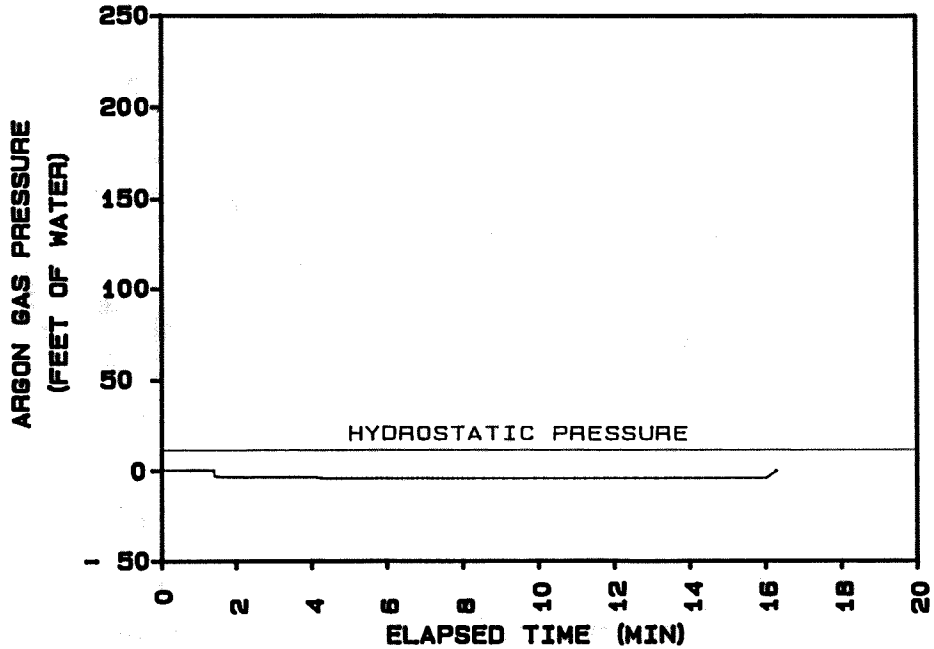
ENSAFE MEMPHIS NSA
LOCATION... 02H1836
TEST DATE
11: 37: 04 12-16-1995

SAMPLE DEPTH (FT) 36
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



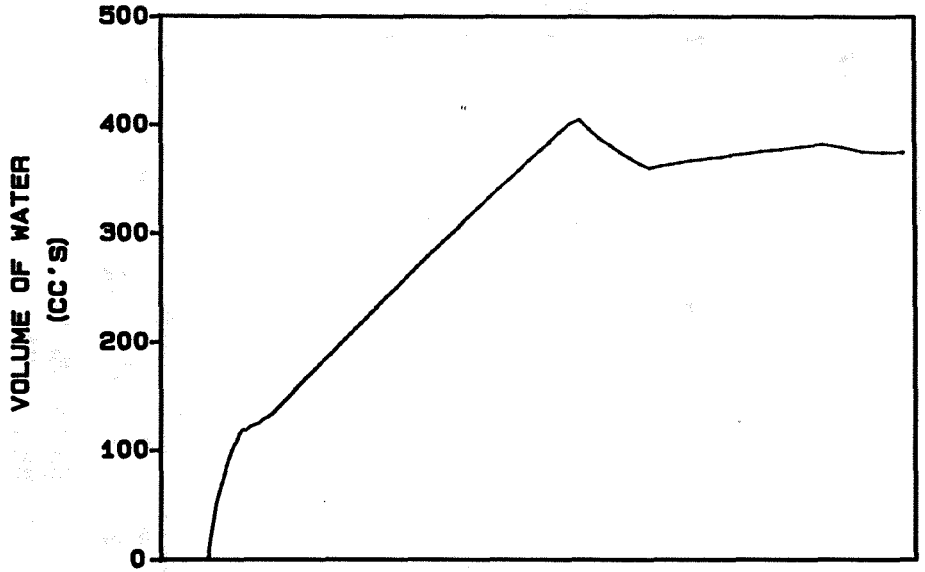


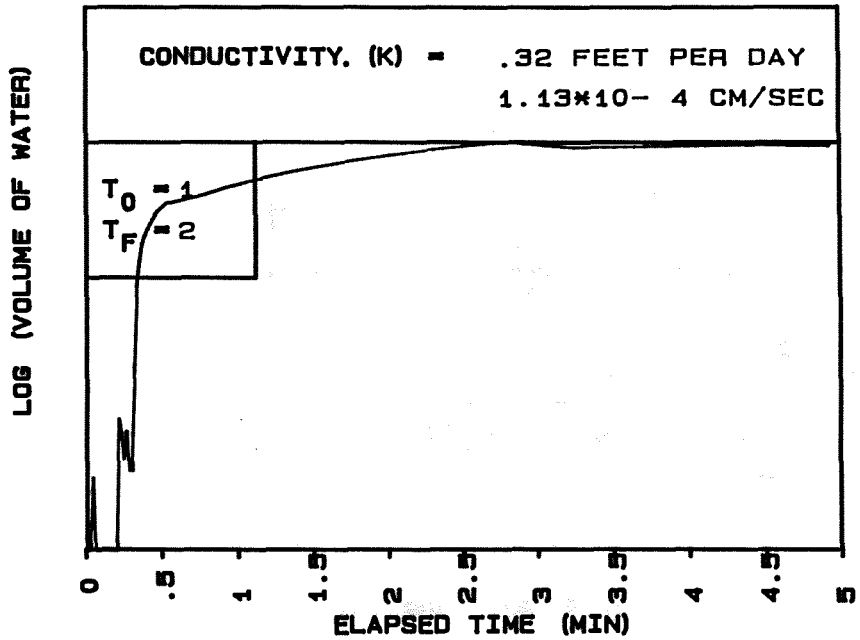


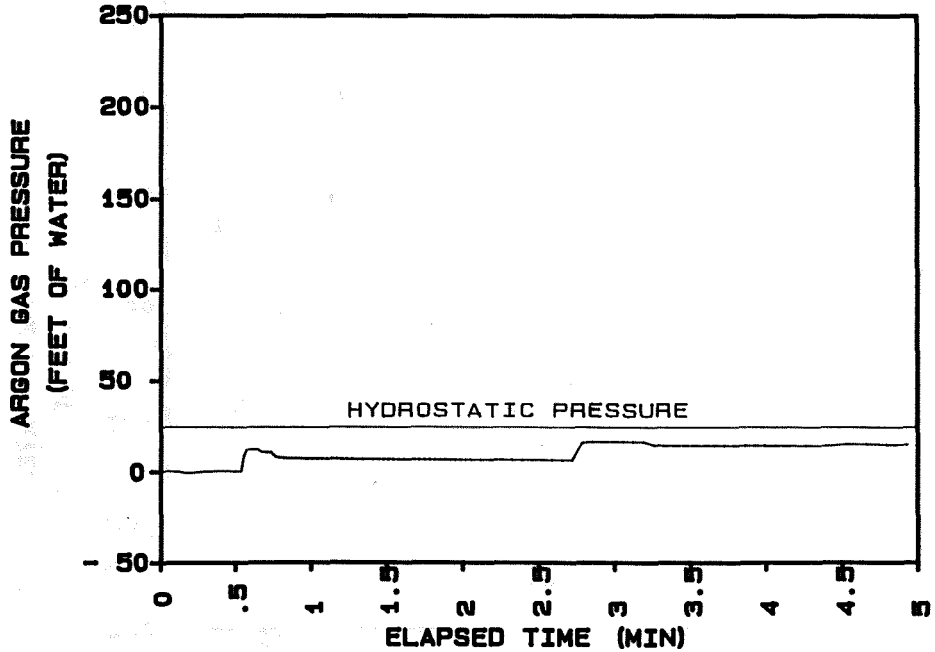
ENSAFE MEMPHIS NSA
LOCATION... 02H1926
TEST DATE
13: 14: 16 12-16-1995

SAMPLE DEPTH (FT) 26
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST







ENSAFE MEMPHIS NSA
LOCATION... 02H1939
TEST DATE
14: 52: 42 12-16-1995

SAMPLE DEPTH (FT) 39
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST

VOLUME OF WATER (CC'S)

DATA NOT AVAILABLE

LOG (VOLUME OF WATER)

CONDUCTIVITY. (K) =

T_O =
T_F =

DATA NOT AVAILABLE

ELAPSED TIME (MIN)

ARGON GAS PRESSURE (FEET OF WATER)

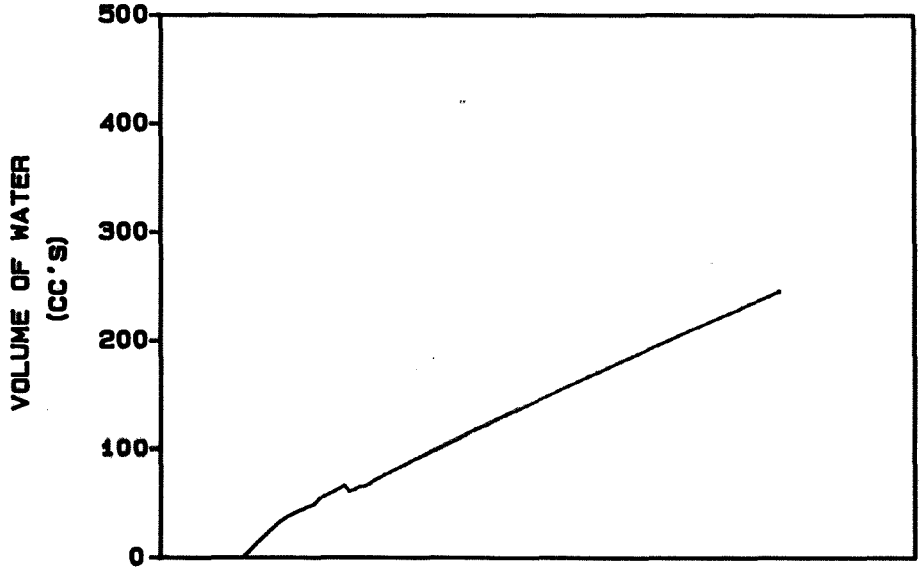
DATA NOT AVAILABLE

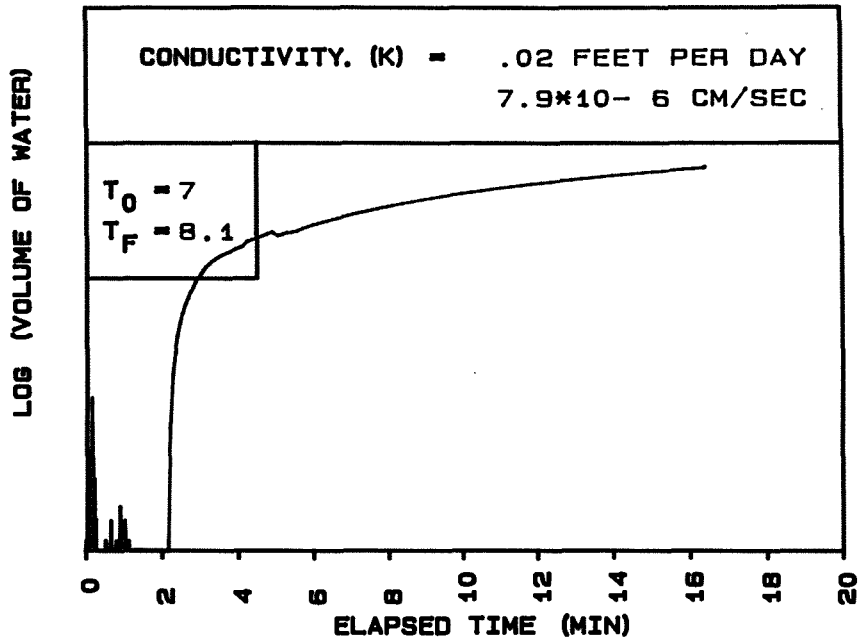
ELAPSED TIME (MIN)

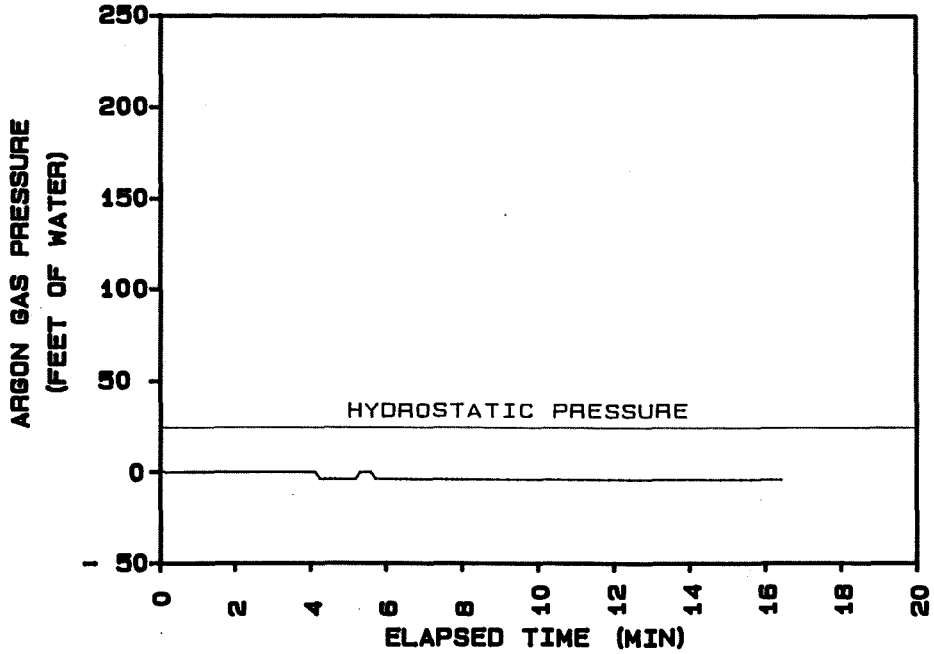
ENSAFE MEMPHIS NSA
LOCATION... 02H2022

DATA NOT AVAILABLE

HYDROCONE TEST



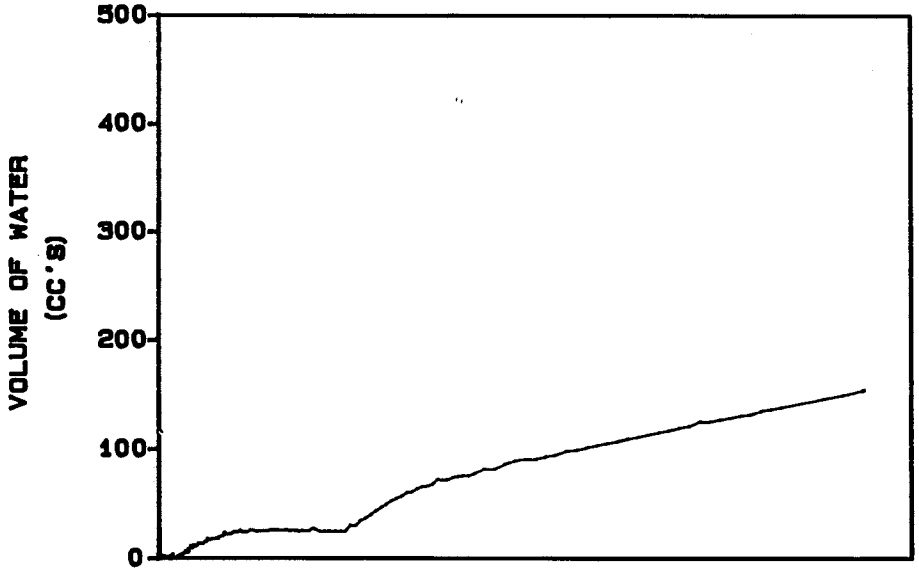


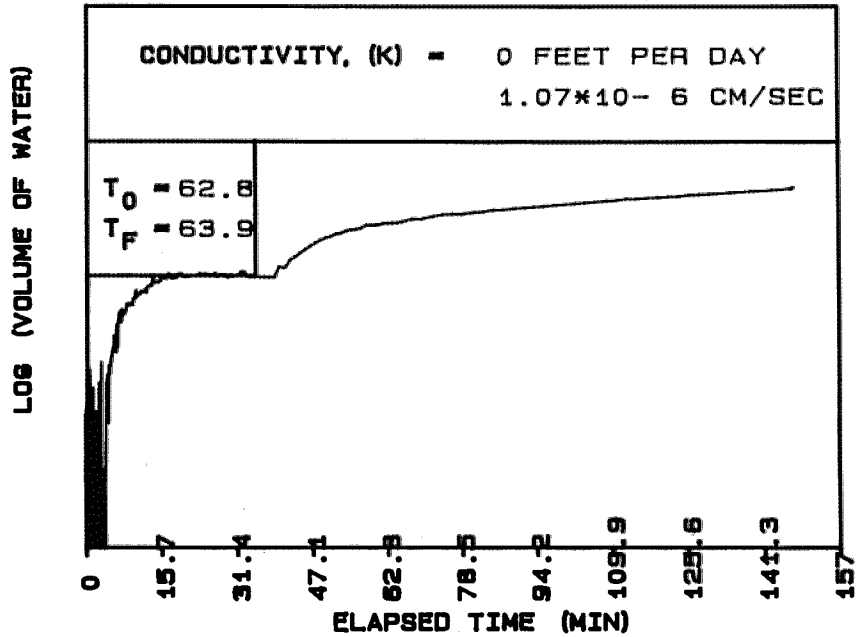


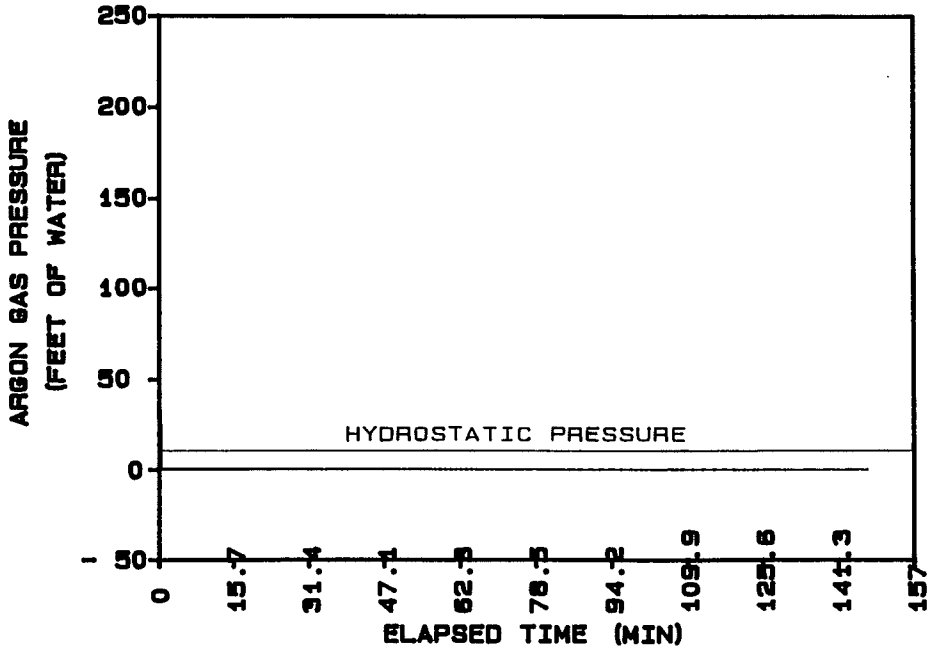
ENSAFE MEMPHIS NSA
LOCATION... 02H2039
TEST DATE
16: 58: 12 12-16-1995

SAMPLE DEPTH (FT) 39
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



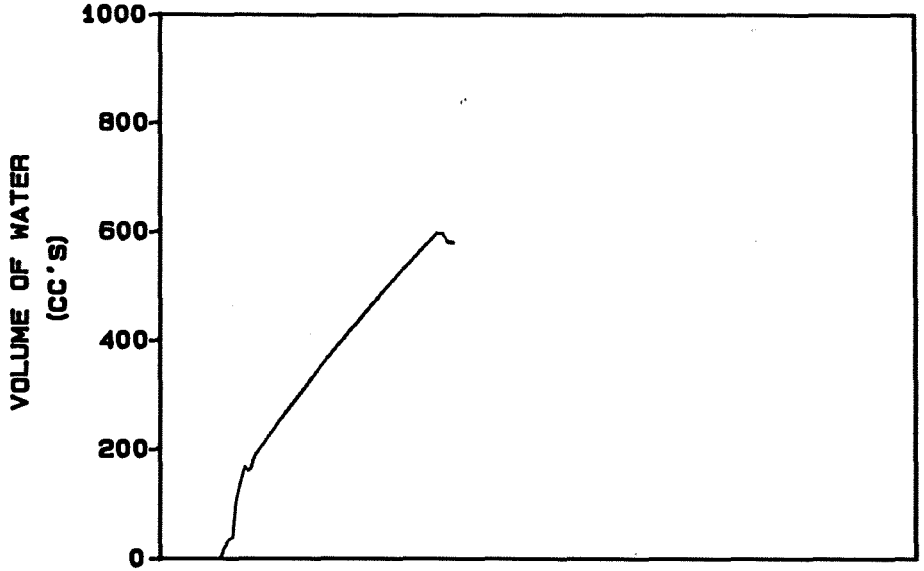


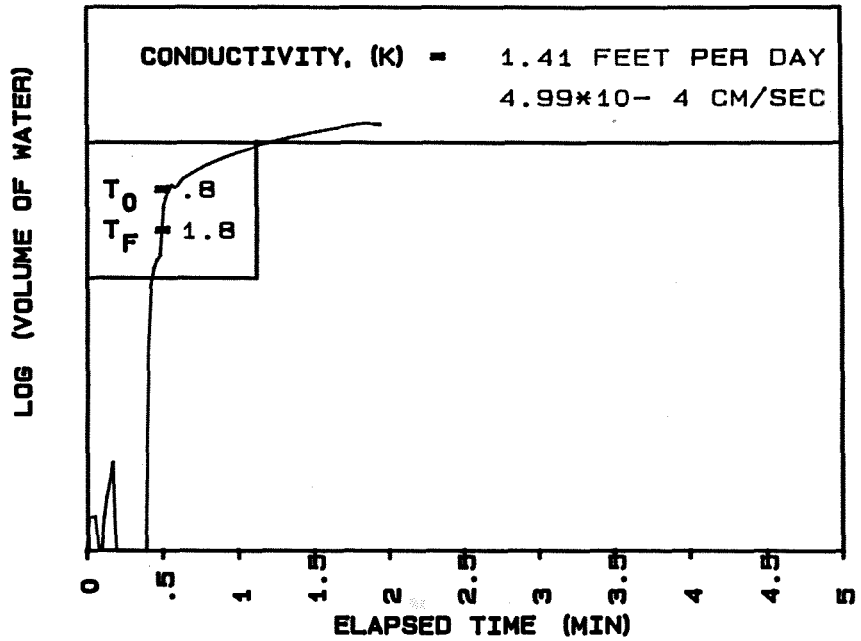


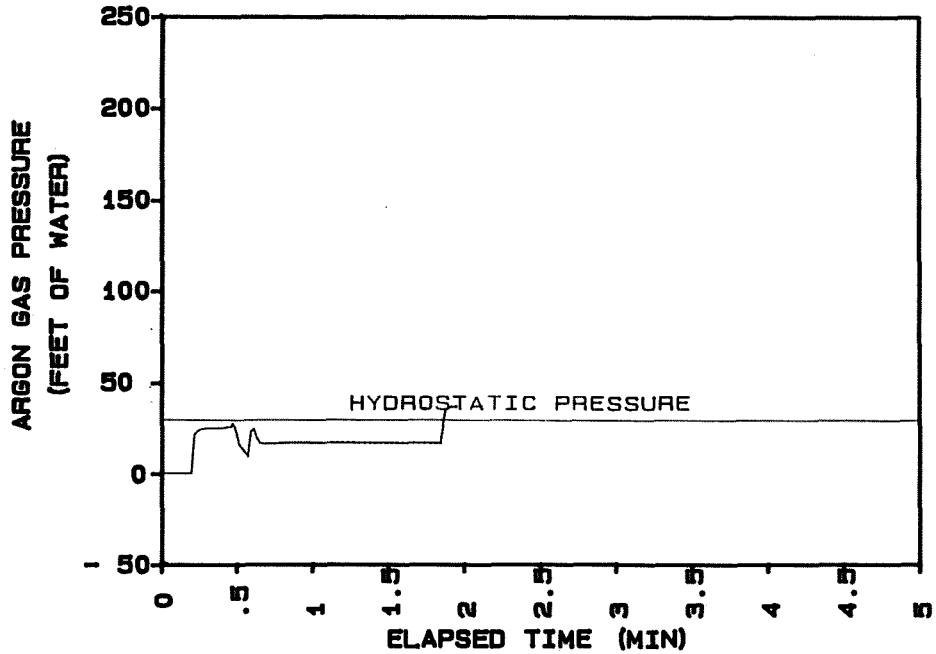
ENSAFE MEMPHIS NSA
LOCATION... 02H2130
TEST DATE
14: 55: 42 12-05-1995

SAMPLE DEPTH (FT) 30
GROUNDWATER DEPTH (FT) 20

HYDROCONE TEST



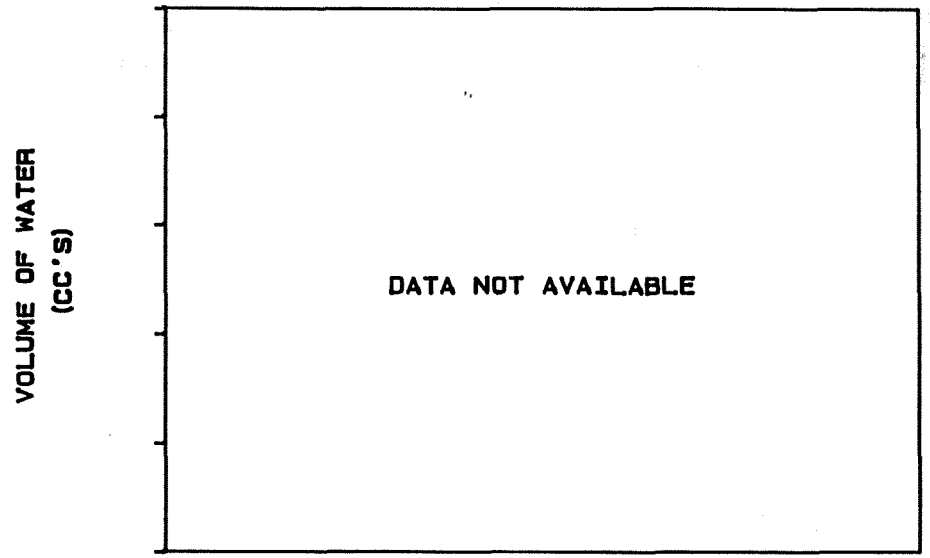


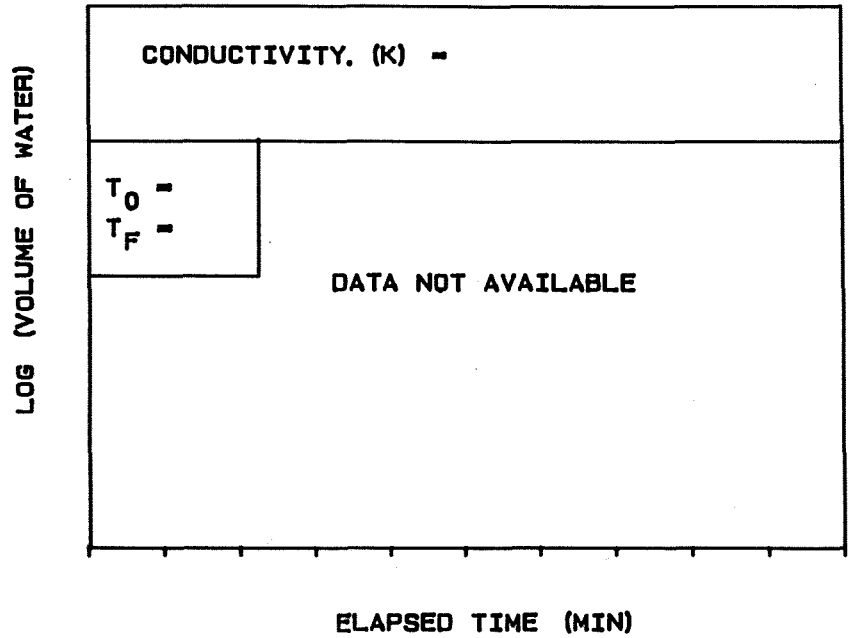


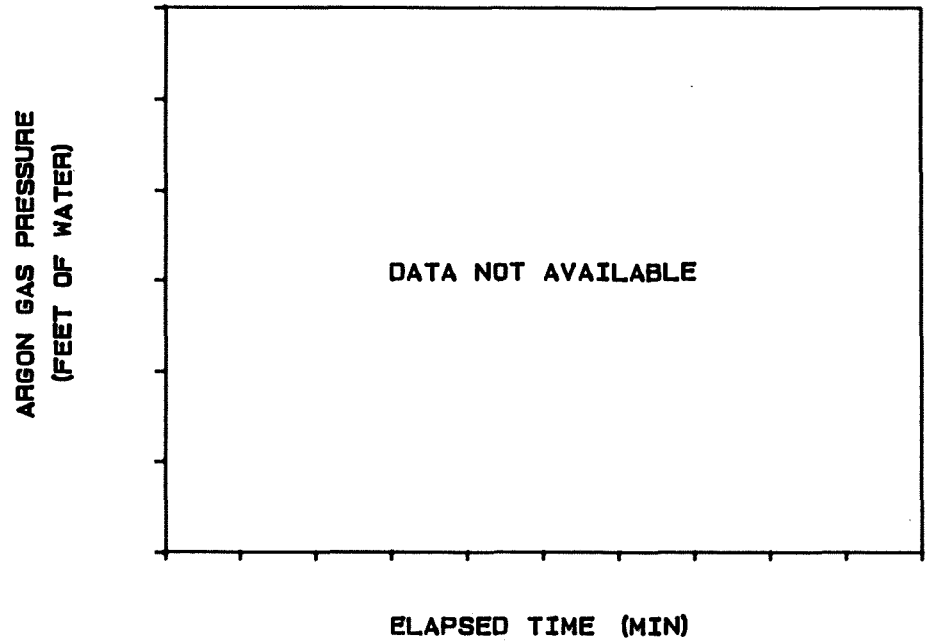
ENSAFE MEMPHIS NSA
LOCATION... 02H2149
TEST DATE
18: 24: 50 12-05-1995

SAMPLE DEPTH (FT) 49
GROUNDWATER DEPTH (FT) 20

HYDROCONE TEST



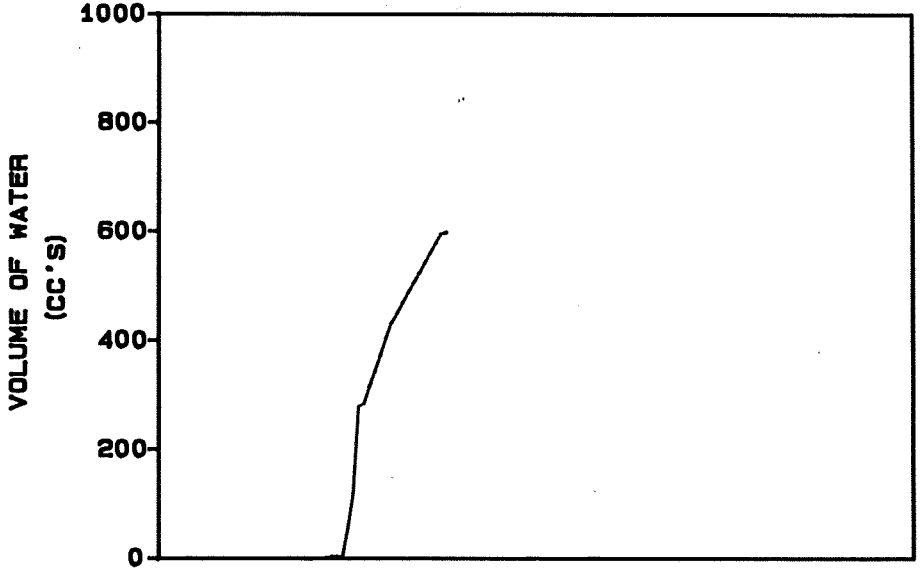


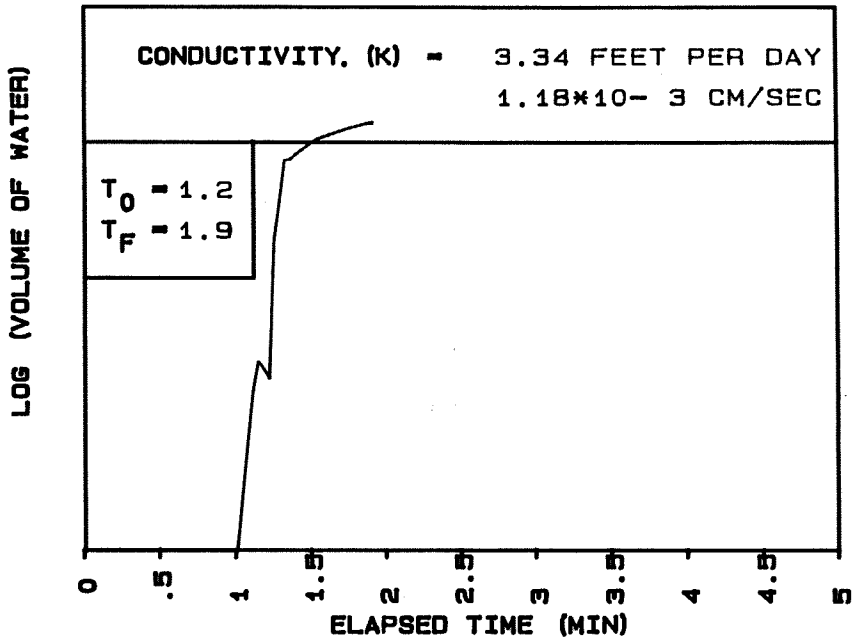


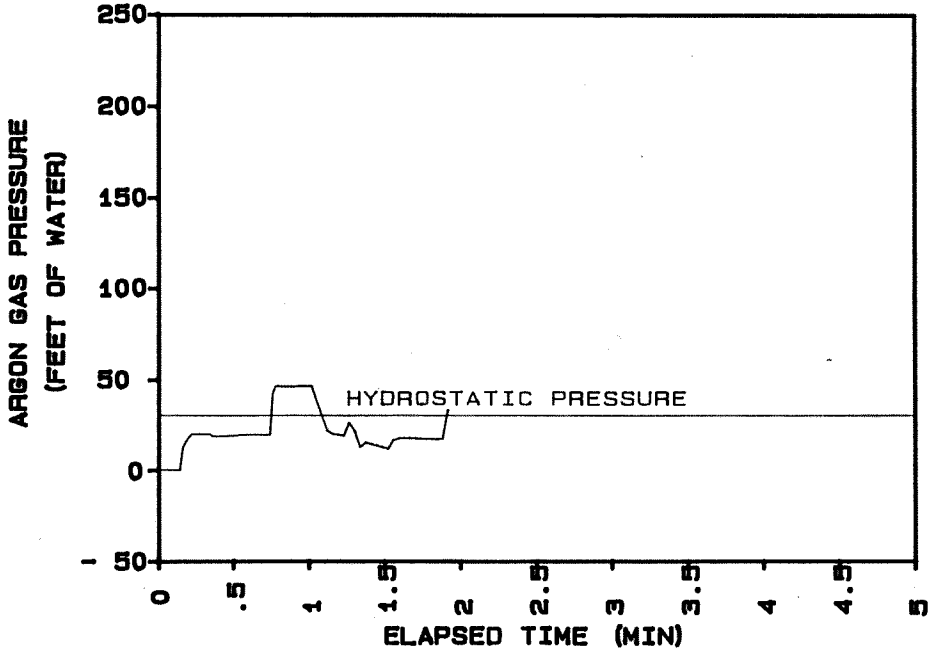
ENSAFE MEMPHIS NSA
LOCATION... 02H2229

DATA NOT AVAILABLE

HYDROCONE TEST



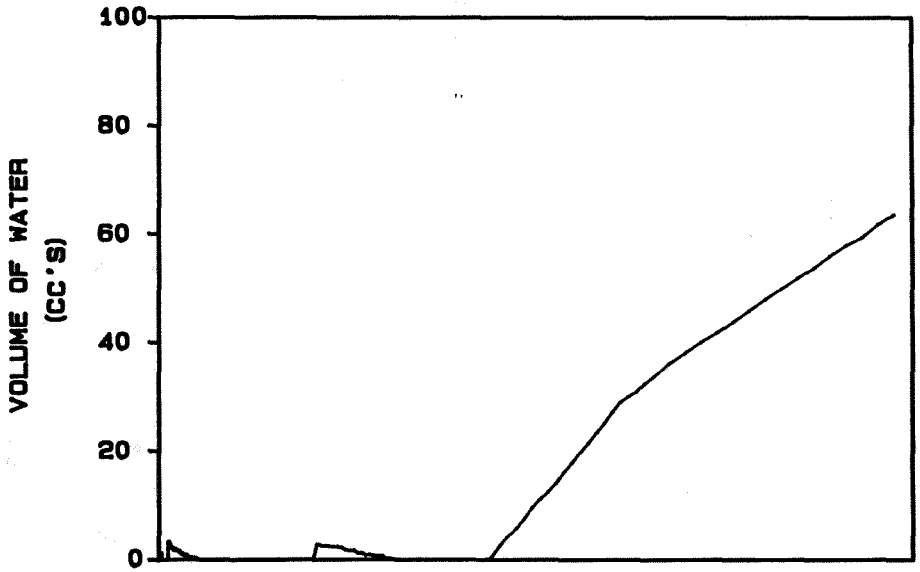


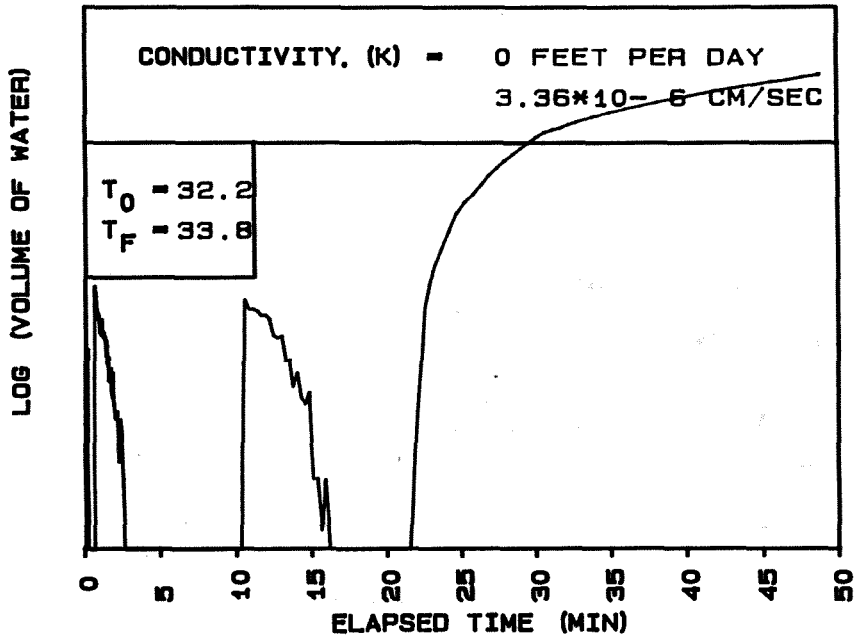


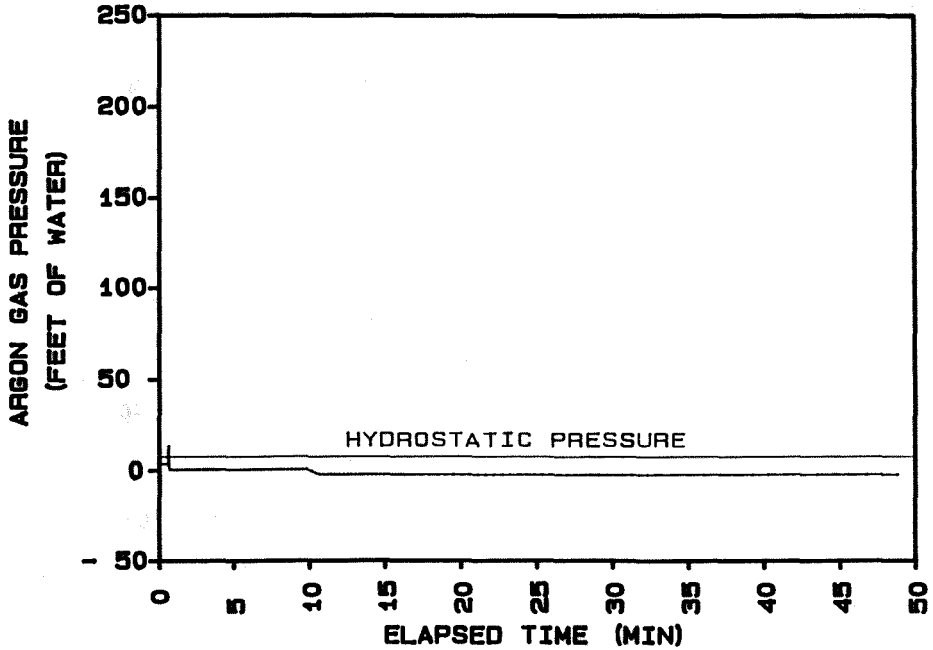
ENSAFE MEMPHIS NSA
LOCATION... 02H2249
TEST DATE
14: 14: 24 12-06-1995

SAMPLE DEPTH (FT) 49
GROUNDWATER DEPTH (FT) 19

HYDROCONE TEST



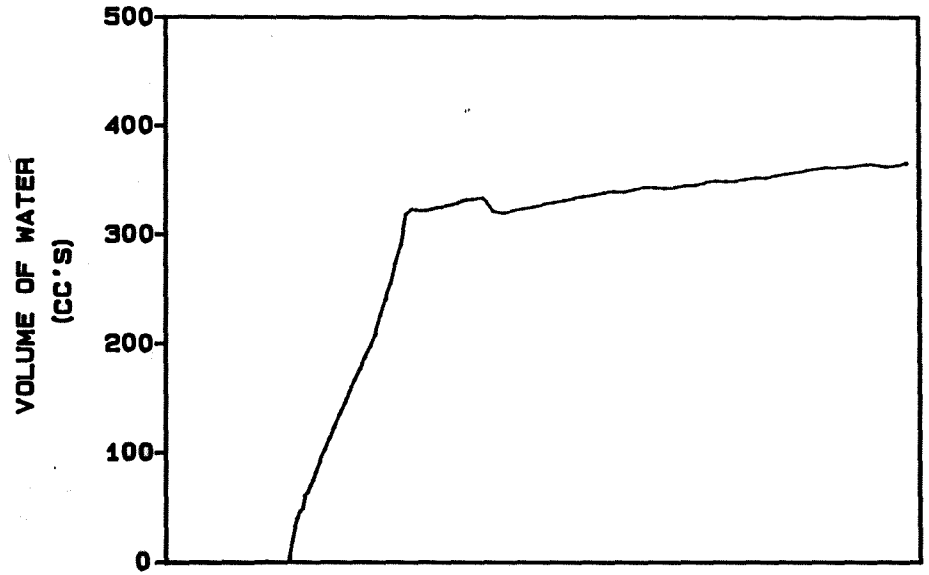


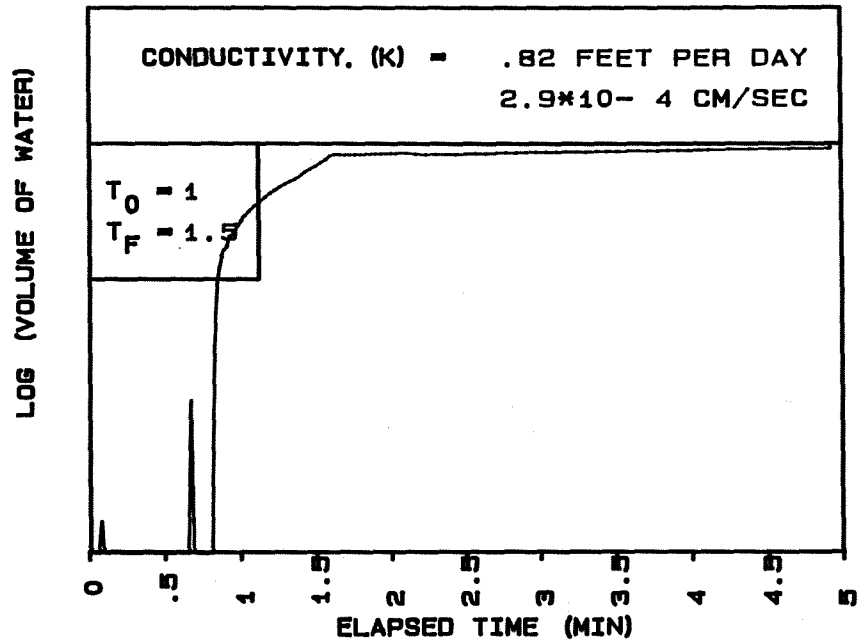


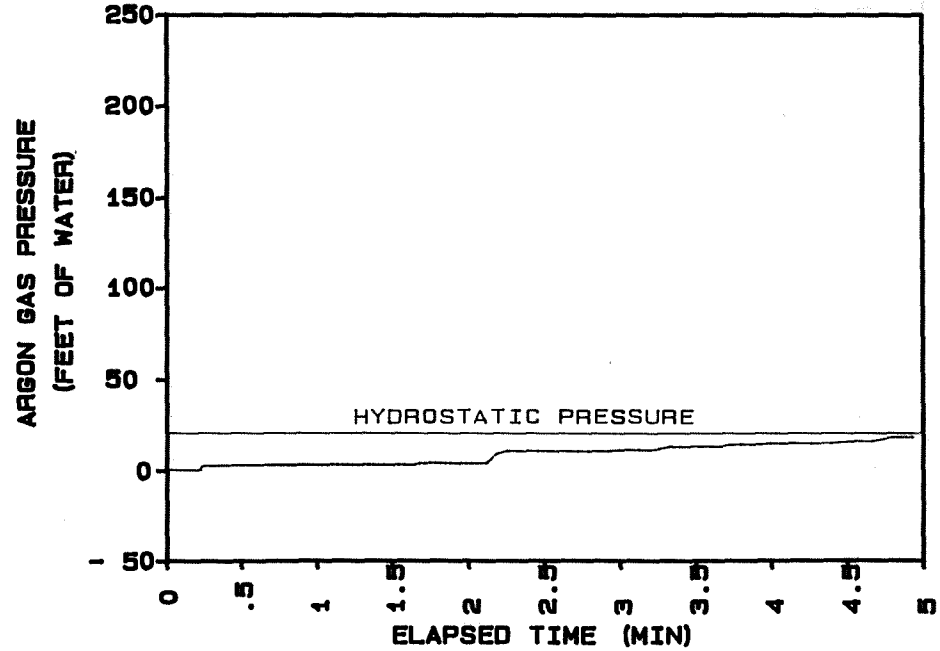
ENSAFE MEMPHIS NSA
LOCATION... 02H2323
TEST DATE
13: 25: 32 12-01-1995

SAMPLE DEPTH (FT) 23
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



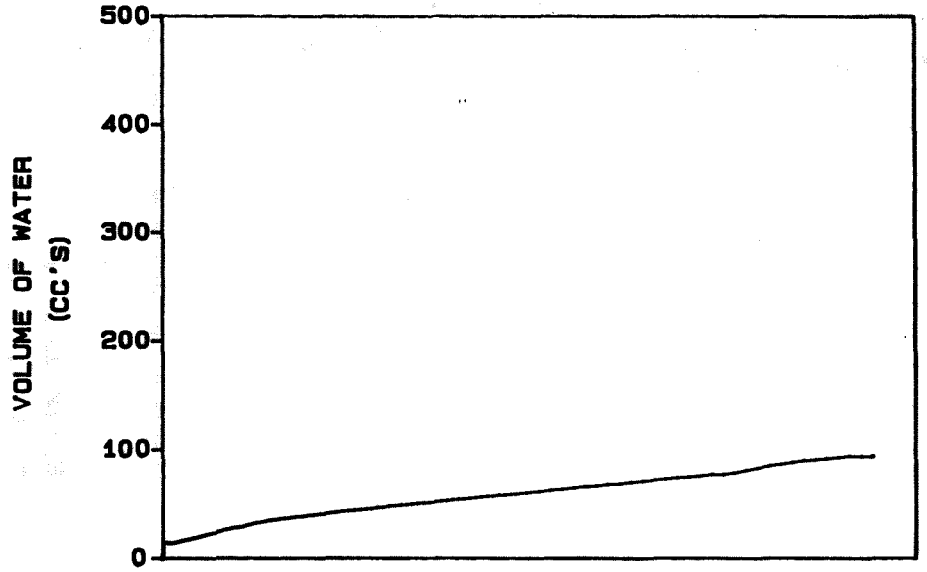


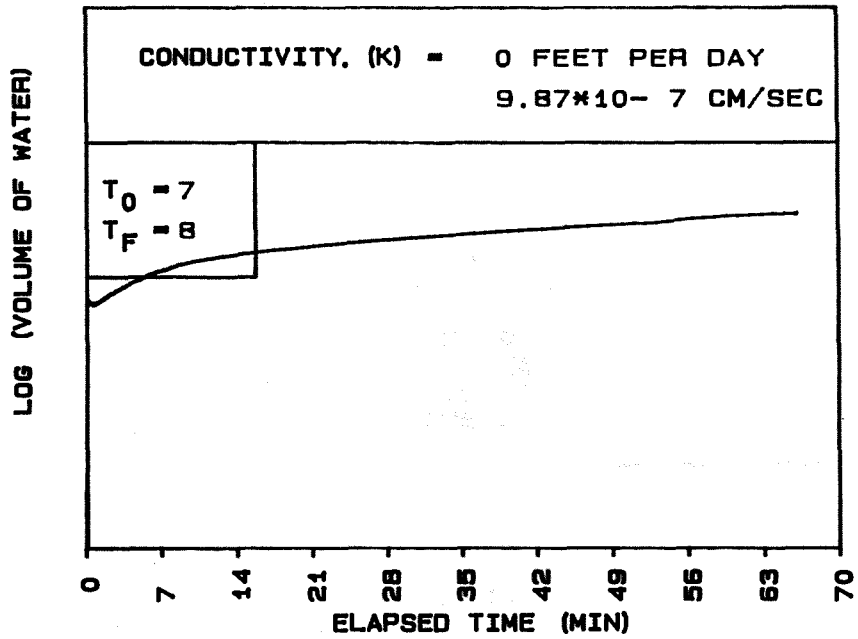


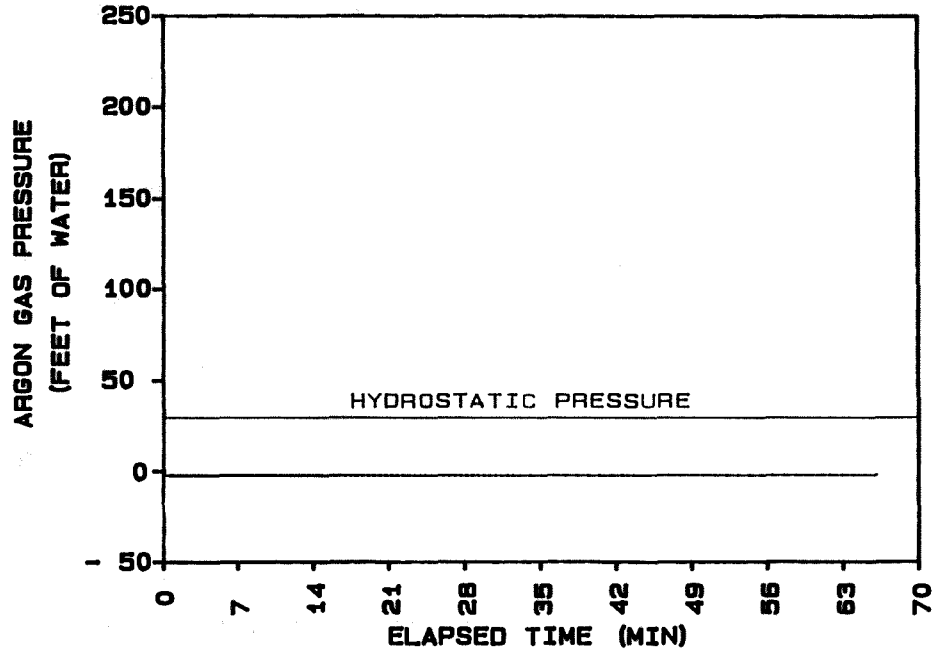
ENSAFE MEMPHIS NSA
LOCATION... 02H2336
TEST DATE
15: 35: 12 12-01-1995

SAMPLE DEPTH (FT) 36
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



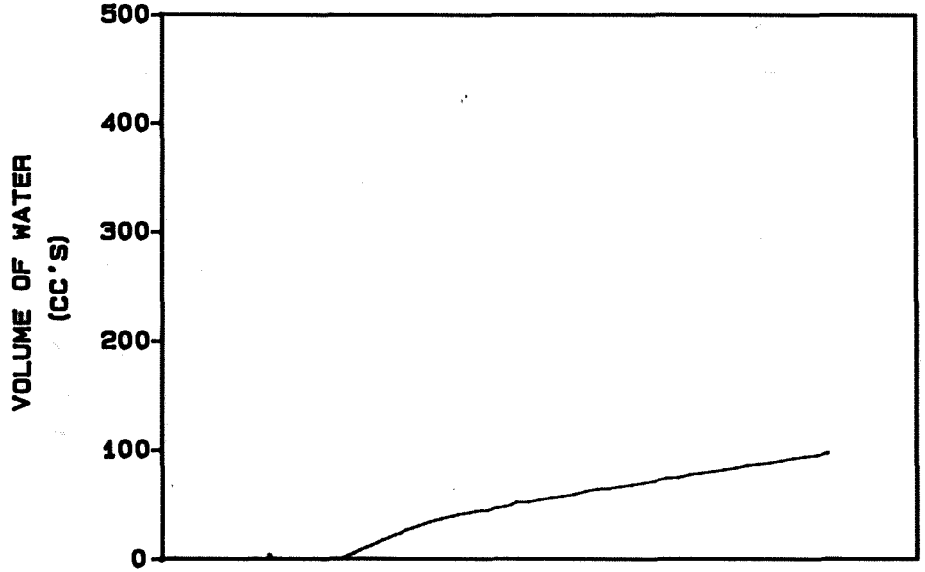


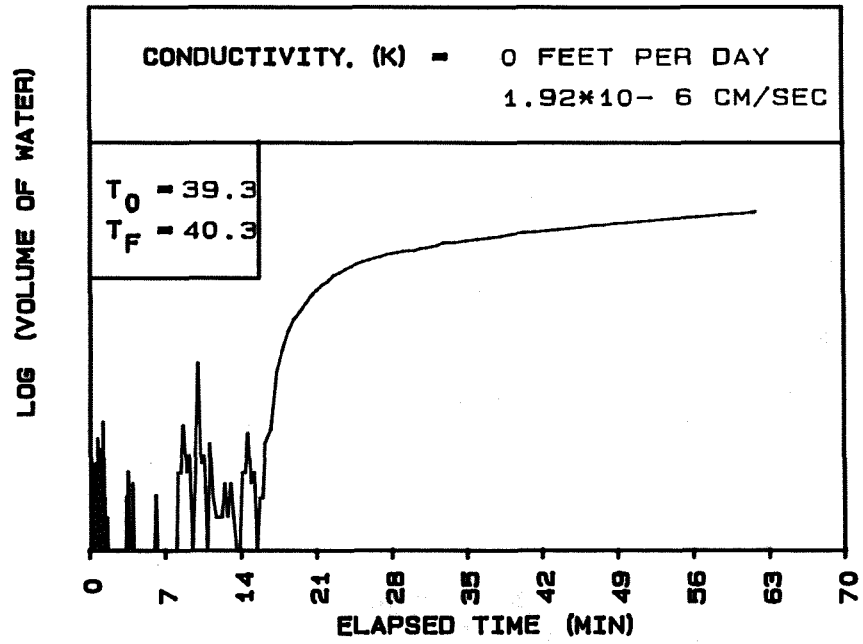


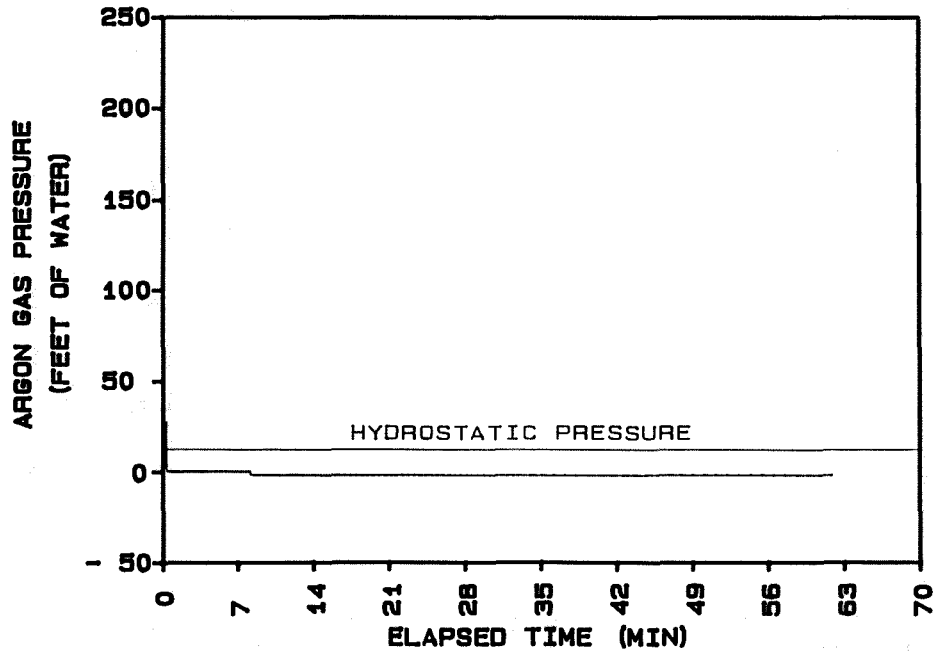
ENSAFE MEMPHIS NSA
LOCATION... 02H2436
TEST DATE
10: 23: 14 12-02-1995

SAMPLE DEPTH (FT) 37
GROUNDWATER DEPTH (FT) 8

HYDROCONE TEST



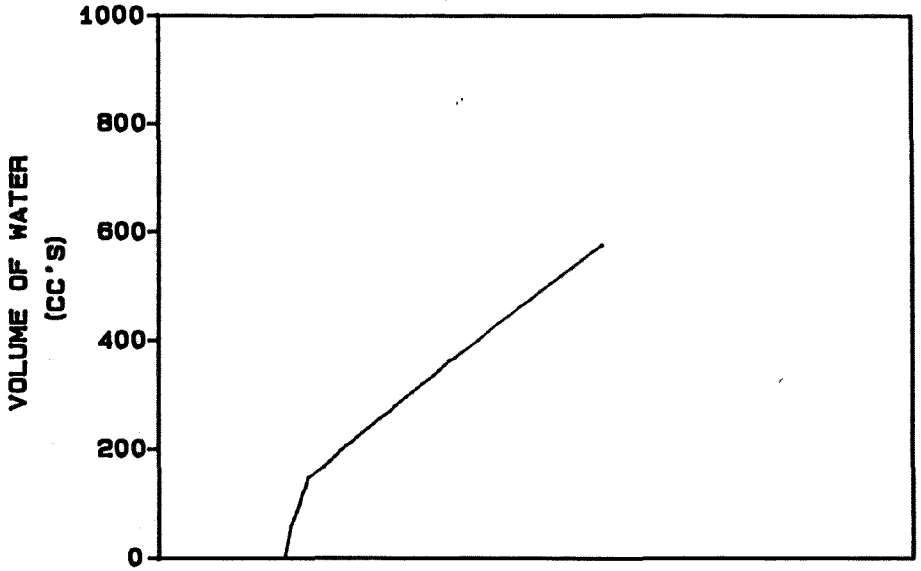


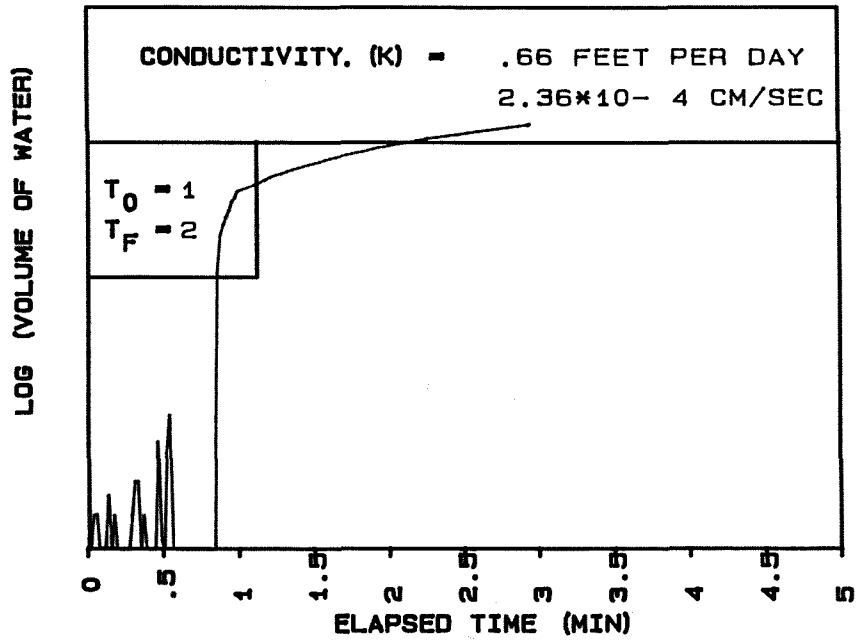


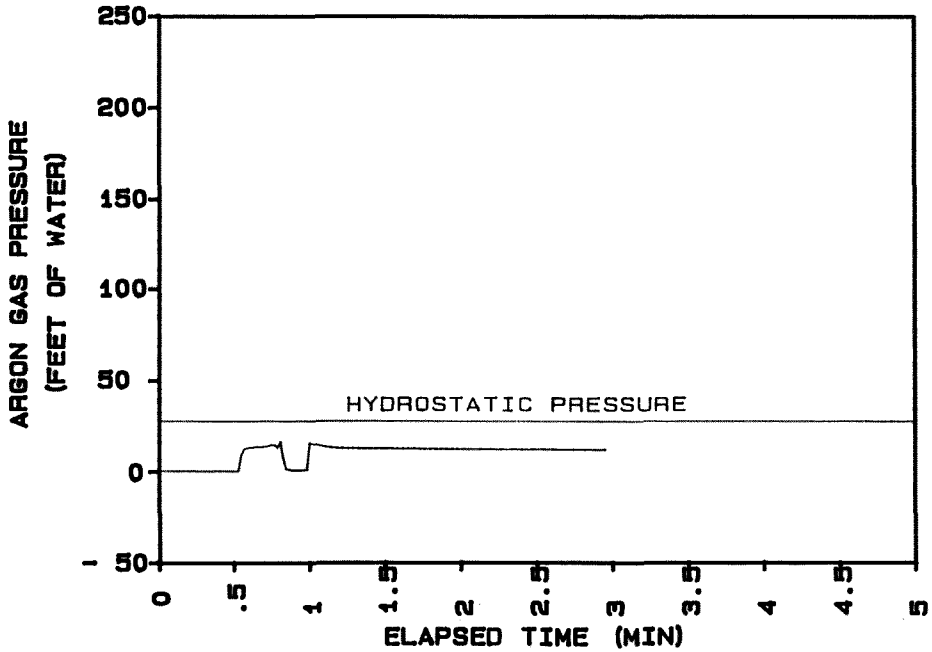
ENSAFE MEMPHIS NSA
LOCATION... 02H2527
TEST DATE
19: 19: 10 12-04-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



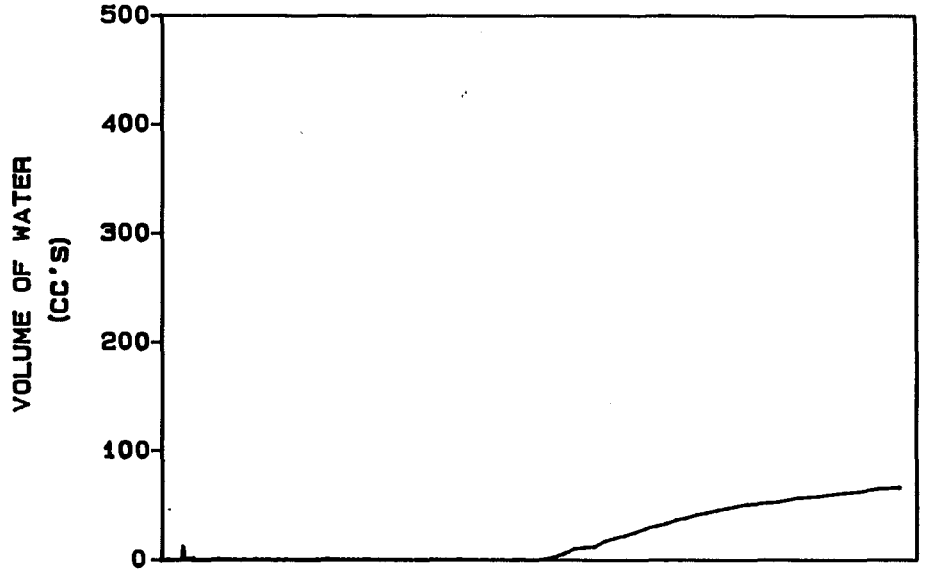


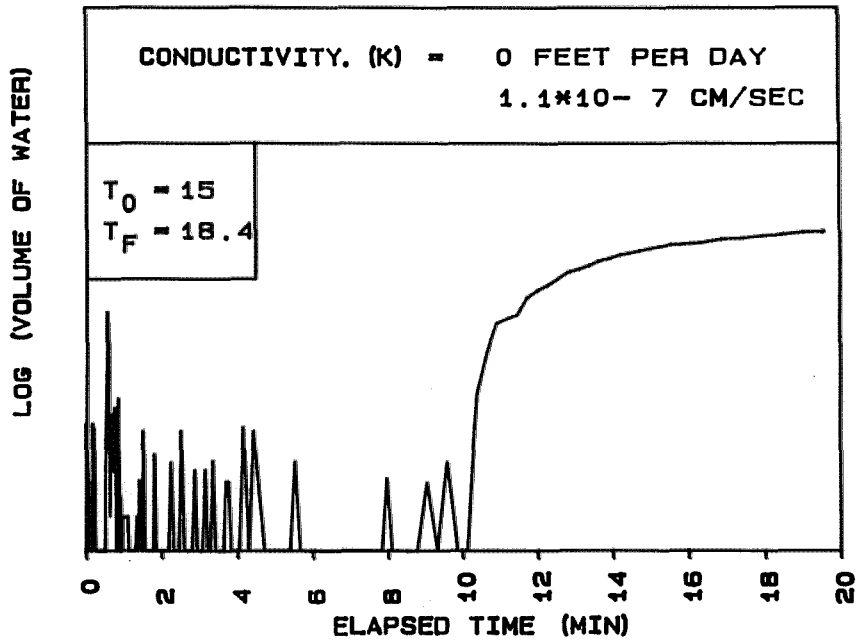


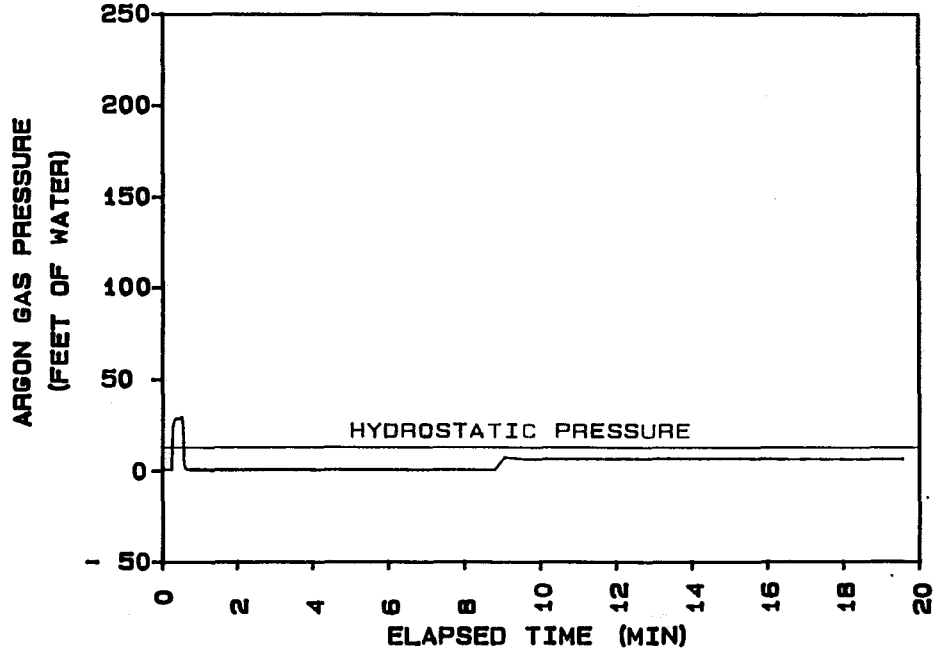
ENSAFE MEMPHIS NSA
LOCATION... 02H2540
TEST DATE
12: 47: 38 12-05-1995

SAMPLE DEPTH (FT) 40
GROUNDWATER DEPTH (FT) 13

HYDROCONE TEST



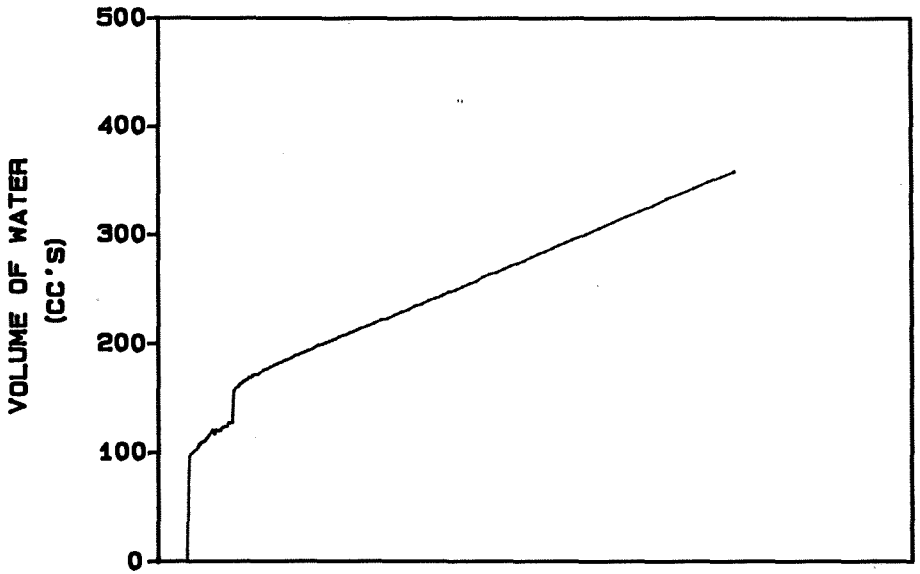


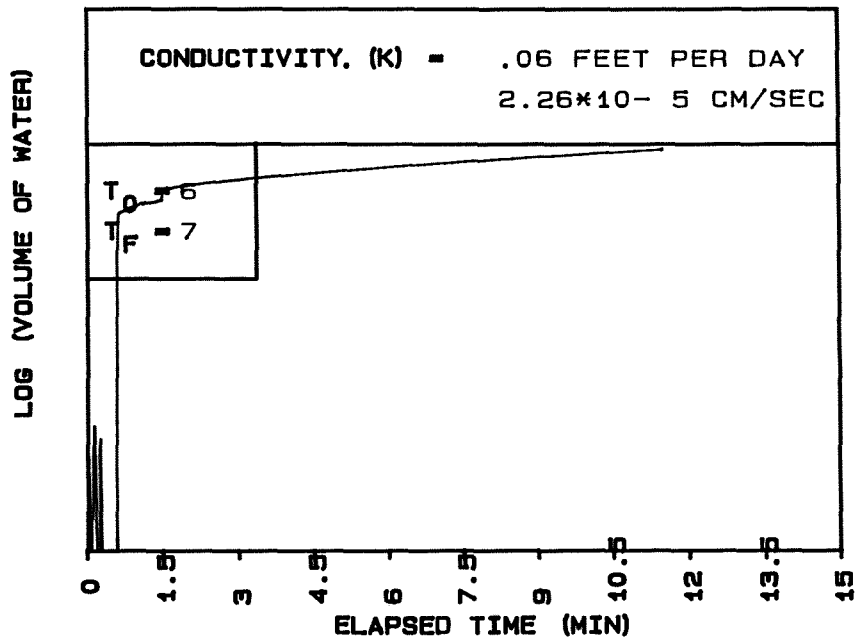


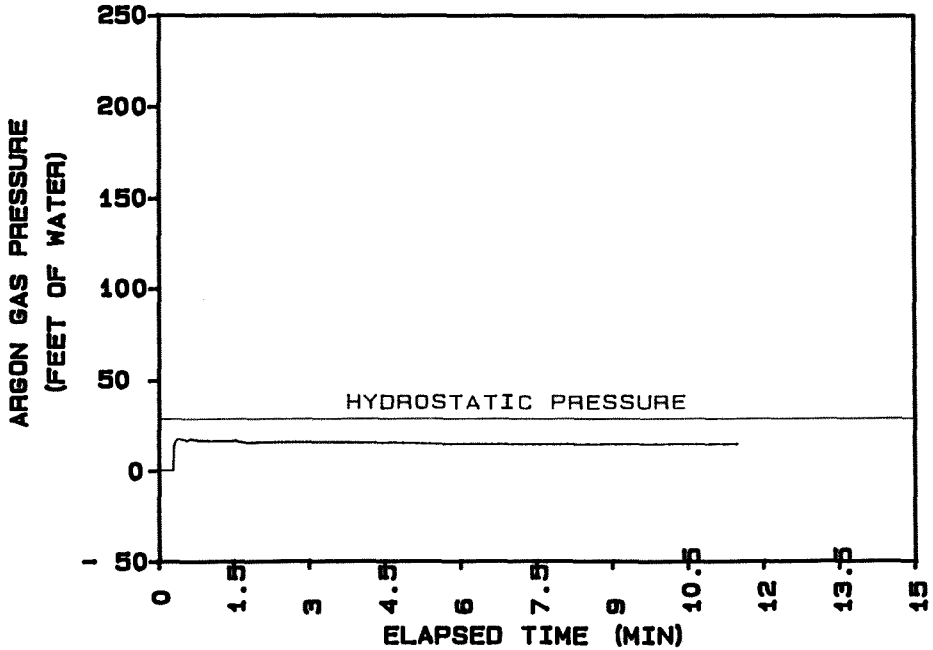
ENSAFE MEMPHIS NSA
LOCATION... 02H2627
TEST DATE
12: 35: 47 12-03-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



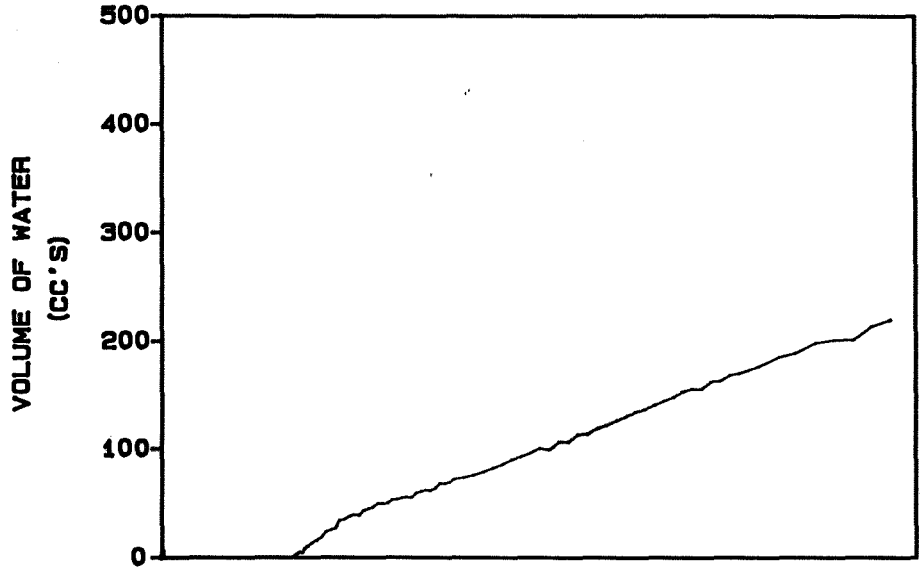


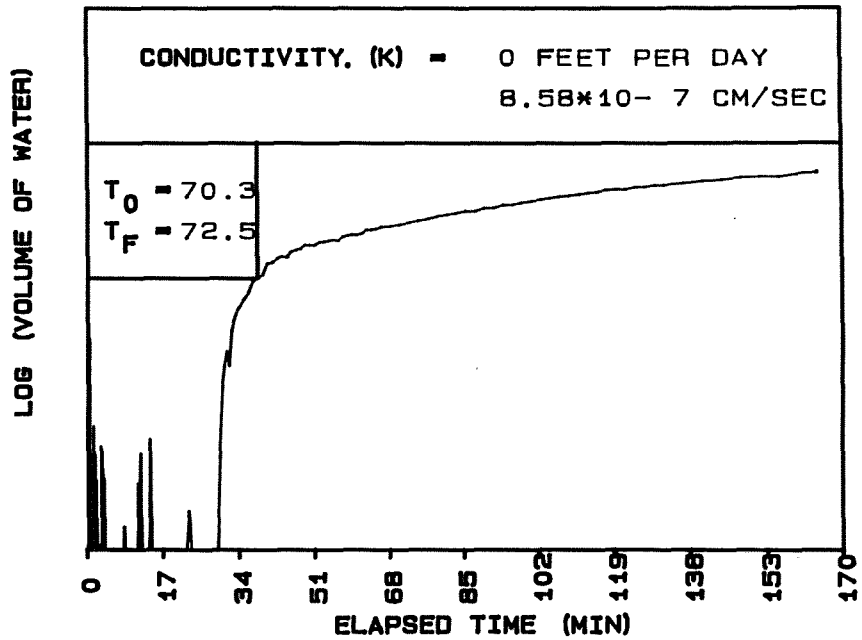


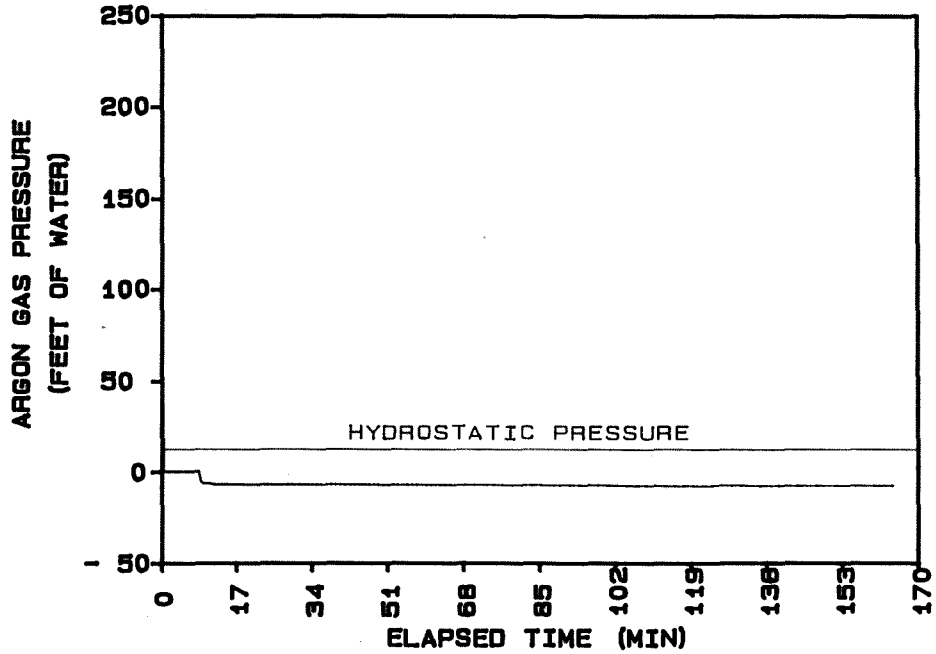
ENSAFE MEMPHIS NSA
LOCATION... 02H2643
TEST DATE
14: 44: 15 12-03-1995

SAMPLE DEPTH (FT) 43
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST



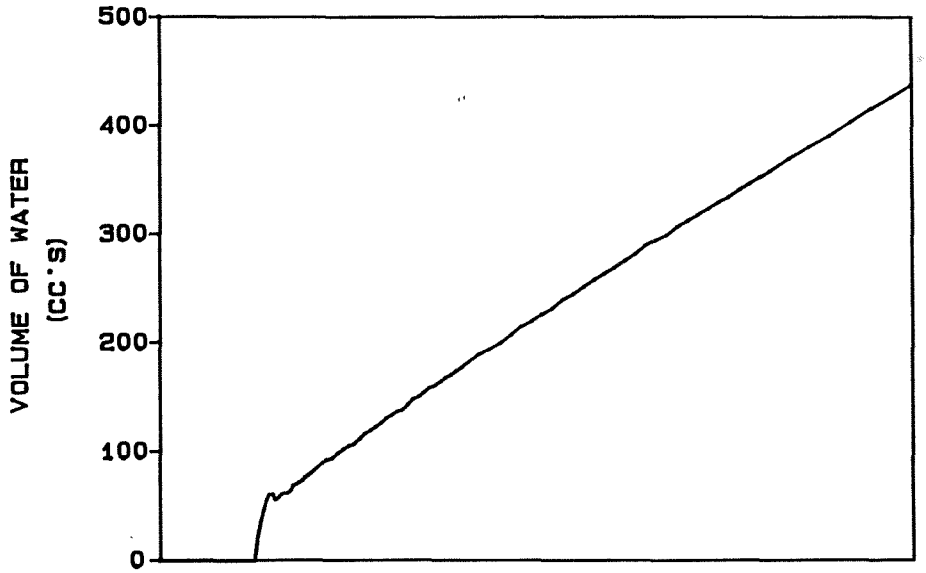


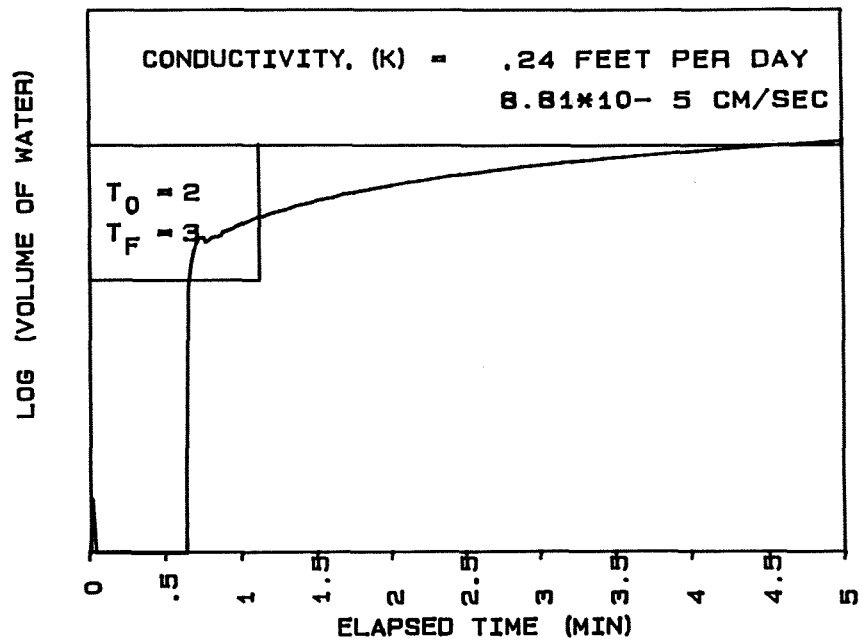


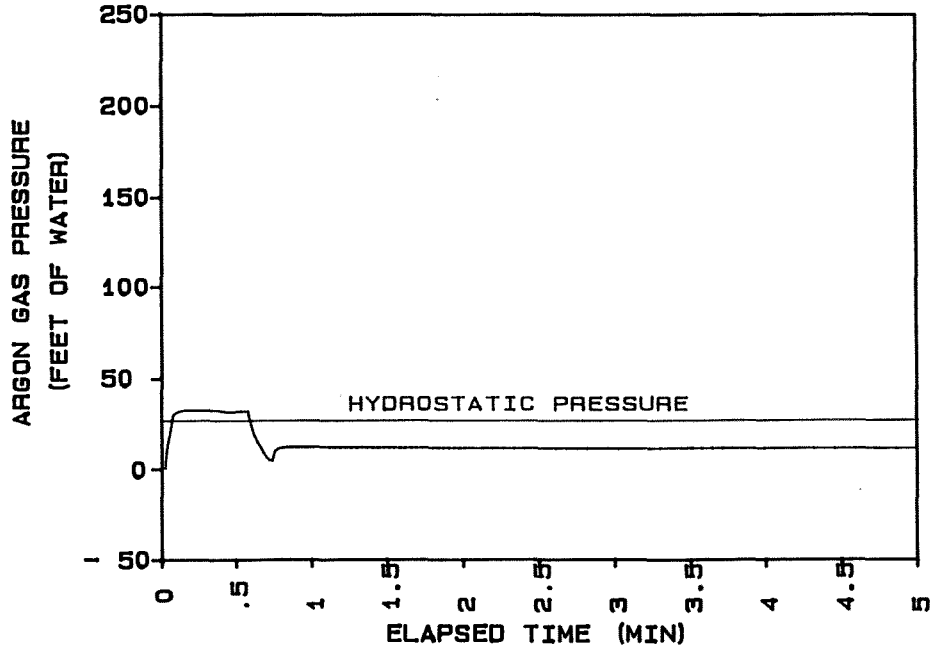
ENSAFE MEMPHIS NSA
LOCATION... 02H2727
TEST DATE
17: 31: 01 12-03-1995

SAMPLE DEPTH (FT) 27
GROUNDWATER DEPTH (FT) 15

HYDROCONE TEST







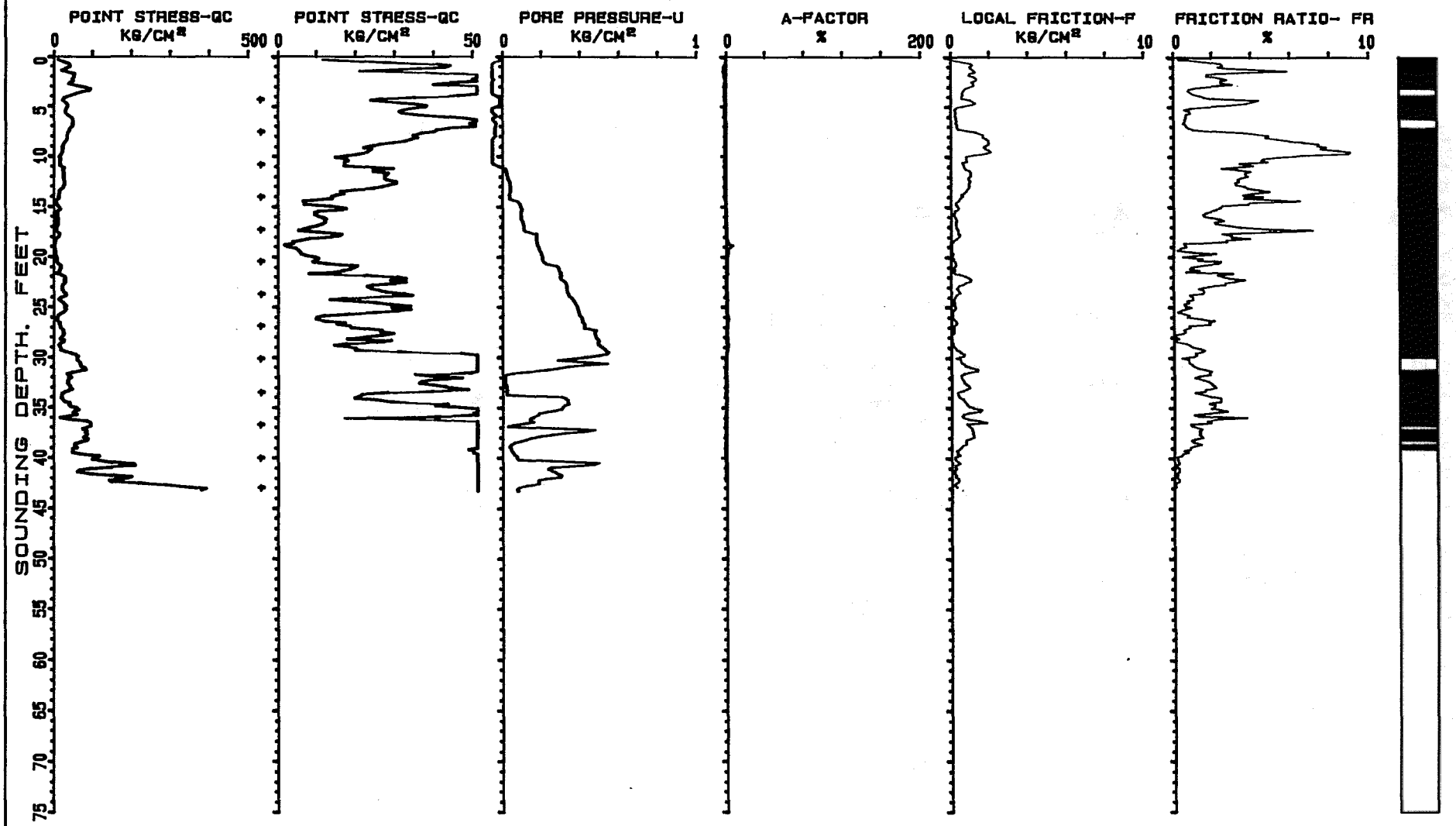
ENSAFE MEMPHIS NSA
LOCATION... 02H2741
TEST DATE
18: 07: 39 12-04-1995

SAMPLE DEPTH (FT) 41
GROUNDWATER DEPTH (FT) 15

SWMU 9

DPT SCREENING INVESTIGATION RESULTS

PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 09-P09
TEST DATE 12-17-1995 13: 49: 14

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 09-P09

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	CLAYEY FINE SAND	34	.95	13	13	.03	60%-70%	>48	74	--	--	--	--
2	CLAYEY FINE SAND	41.9	1.11	16	16	.061	60%-70%	>48	92	--	--	--	--
3	CLAYEY FINE SAND	51.1	1.2	20	20	.092	60%-70%	>48	112	--	--	--	--
4	SILTY FINE SAND	73.1	.69	18	18	.123	70%-80%	>48	160	--	--	--	--
5	CLAYEY FINE SAND	34.8	.79	13	13	.153	50%-60%	44-46	76	--	--	--	--
6	SILTY TO CLAYEY F.S.	35	.26	11	11	.184	50%-60%	42-44	77	--	--	--	--
7	SILTY FINE SAND	49	.3	12	12	.215	60%-70%	44-46	107	--	--	--	--
8	CLAYEY FINE SAND	41.1	1.05	16	16	.246	60%-70%	42-44	90	--	--	--	--
9	CLAY	31.1	1.85	31	31	.271	--	--	--	1.9	1.6	UD	>6
10	CLAY	22.2	1.63	22	22	.295	--	--	--	1.34	1.3	UD	>6
11	CLAY	17.1	.75	17	17	.32	--	--	--	1.02	2.2	.01	[illegible]
12	SANDY CLAY	25.7	.94	12	12	.348	--	--	--	1.56	2.7	.02	>6
13	SANDY CLAY	28.5	.96	14	14	.375	--	--	--	1.73	2.9	.02	>6
14	SILTY CLAY TO CLAY	19	.71	12	12	.402	--	--	--	1.13	2.6	.01	6
15	SILTY CLAY TO CLAY	10.3	.37	6	6	.43	--	--	--	.58	2.7	.02	6
16	SANDY CLAY	12.5	.23	6	6	.457	--	--	--	.72	5.2	.02	6
17	SANDY CLAY	11.5	.27	5	5	.484	--	--	--	.65	4.1	.02	6
18	SILTY CLAY TO CLAY	11	.37	7	7	.512	--	--	--	.62	2.9	.02	6
19	SANDY CLAY	5.6	.08	2	2	.539	--	--	--	.28	6.3	.03	3
20	SENSITIVE FINE GRAIN	6	0	3	3	.561	--	--	--	.3	80.8	.03	3
21	CLAYEY FINE SAND	13.2	.2	5	5	.592	<40%	32-34	29	--	--	--	--
22	SANDY CLAY	18.9	.42	9	9	.619	--	--	--	1.1	4.4	.01	6
23	CLAYEY FINE SAND	29.1	.74	11	11	.65	<40%	36-38	64	--	--	--	--
24	SILTY TO CLAYEY F.S.	28	.35	9	9	.681	<40%	36-38	61	--	--	--	--
25	SILTY TO CLAYEY F.S.	25.5	.18	8	8	.712	<40%	34-36	56	--	--	--	--
26	SILTY TO CLAYEY F.S.	22.8	.1	7	7	.742	<40%	34-36	50	--	--	--	--
27	CLAYEY FINE SAND	14.5	.2	5	5	.773	<40%	30-32	31	--	--	--	--
28	SILTY TO CLAYEY F.S.	25.2	.08	8	8	.804	<40%	34-36	55	--	--	--	--
29	SILTY TO CLAYEY F.S.	21	.11	7	7	.835	<40%	32-34	46	--	--	--	--
30	SILTY TO CLAYEY F.S.	37.3	.45	12	12	.865	<40%	36-38	82	--	--	--	--

9-P09 CONTINUED ENSAFE

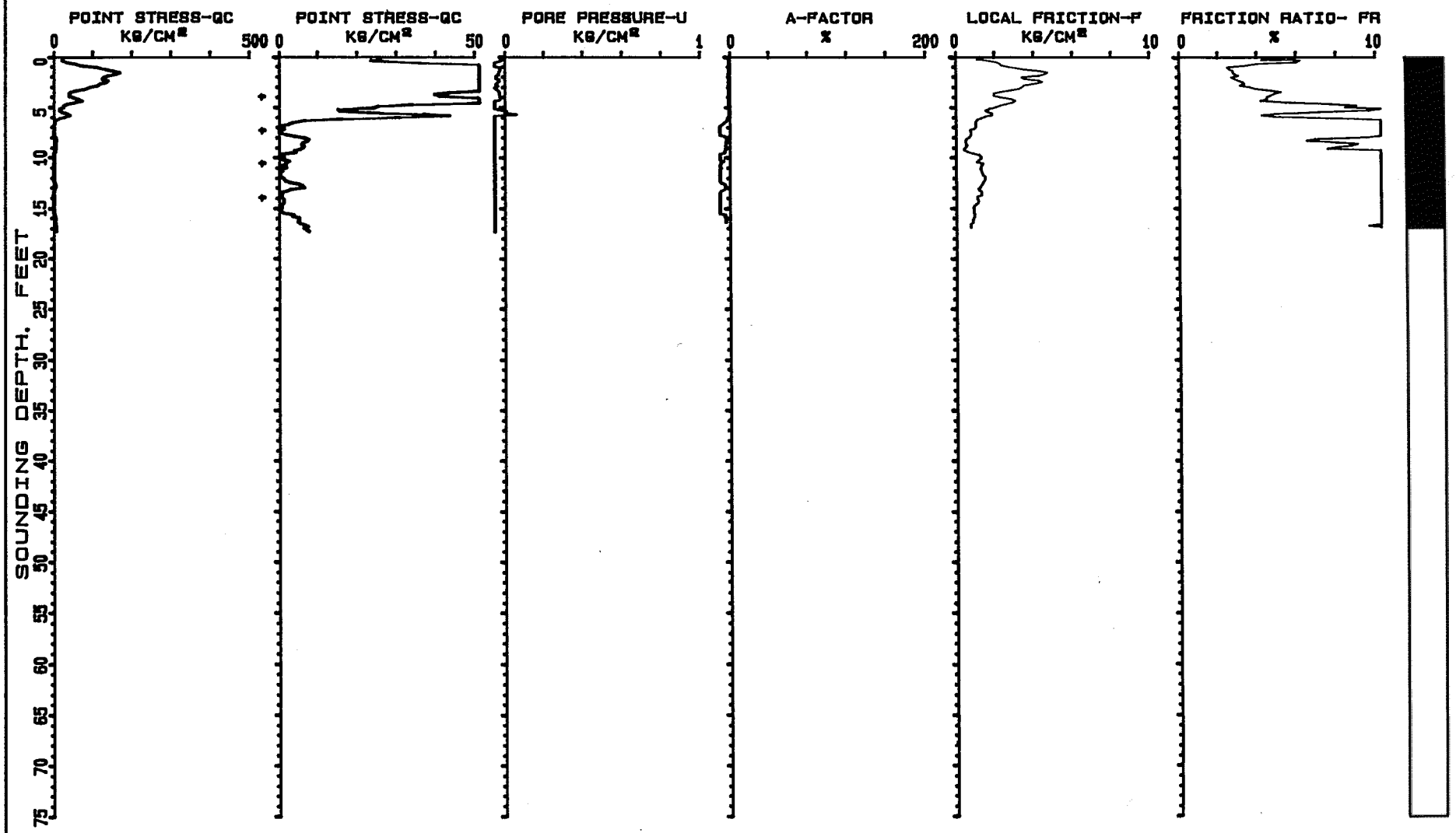
DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SILTY FINE SAND	69.5	.74	17	17	.896	40%-50%	38-40	152	--	--	--	--
32	SILTY TO CLAYEY F.S.	58.4	.84	19	19	.927	40%-50%	38-40	128	--	--	--	--
33	CLAYEY FINE SAND	40.8	.76	16	16	.958	<40%	36-38	89	--	--	--	--
34	SILTY TO CLAYEY F.S.	33.9	.47	11	11	.988	<40%	34-36	74	--	--	--	--
35	CLAYEY FINE SAND	35.5	.88	14	14	1.019	<40%	34-36	78	--	--	--	--
36	SILTY TO CLAYEY F.S.	50.3	.95	16	16	1.05	<40%	36-38	110	--	--	--	--
37	SILTY TO CLAYEY F.S.	72.9	1.16	24	24	1.081	40%-50%	38-40	160	--	--	--	--
38	SILTY FINE SAND	84.8	1.11	21	21	1.111	50%-60%	38-40	186	--	--	--	--
39	SILTY FINE SAND	71.7	.68	17	17	1.142	40%-50%	38-40	157	--	--	--	--
40	SILTY FINE SAND	73.3	.3	18	18	1.173	40%-50%	38-40	161	--	--	--	--
41	FINE SAND	155.1	.25	31	31	1.206	70%-80%	42-44	341	--	--	--	--
42	FINE SAND	123.9	.22	24	24	1.239	60%-70%	40-42	272	--	--	--	--

N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBERTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

ADDITIONAL LOCAL CORRELATIONS DEVELOPED BY IN-SITU TECHNOLOGY HAVE ALSO BEEN USED IN COMPUTING THE ABOVE DATA. IT IS THE POLICY OF IN-SITU TECHNOLOGY TO CONTINUALLY UPGRADE AND MODIFY C.P.T CORRELATIONS AS PUBLISHED RESEARCH AND LOCAL EXPERIENCE GROWS.

PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 09-P14
TEST DATE 11-21-1995 16:21:26

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 09-P14

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N' #	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	CLAY	46.4	2.37	46	46	.024	--	--	--	2.89	1.9	UD	>6
2	SILTY TO CLAYEY F.S.	134.8	3.94	44	44	.055	>90%	>48	296	--	--	--	--
3	SILTY TO CLAYEY F.S.	128.2	3.79	42	42	.086	>90%	>48	282	--	--	--	--
4	CLAYEY FINE SAND	67.2	2.54	26	26	.117	70%-80%	>48	147	--	--	--	--
5	CLAY	45.8	2.48	45	45	.142	--	--	--	2.84	1.8	UD	>6
6	CLAY	27	1.61	27	27	.167	--	--	--	1.66	1.6	UD	>6
7	SOFT CLAY	8.7	1.04	8	8	.183	--	--	--	.51	.8	UD	6
8	SOFT CLAY	1.4	.73	1	1	.199	--	--	--	.05	.1	UD	1-1.5
9	CLAY	6.7	.5	6	6	.224	--	--	--	.38	1.3	.03	6
10	SOFT CLAY	2.6	.87	2	2	.24	--	--	--	.12	.3	UD	1-1.5
[illegible]	SOFT CLAY	1.3	1.25	1	1	.256	--	--	--	.04	.1	UD	1
[illegible]	SOFT CLAY	.4	1.39	0	0	.272	--	--	--	-.02	0	UD	<1
13	SOFT CLAY	3.5	1.35	3	3	.288	--	--	--	.17	.2	UD	3
14	SOFT CLAY	2.1	1.21	2	2	.304	--	--	--	.08	.1	UD	1-1.5
15	SOFT CLAY	.2	1.01	0	0	.32	--	--	--	-.04	0	UD	<1
16	SOFT CLAY	2.2	.9	2	2	.336	--	--	--	.08	.2	UD	1

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
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*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
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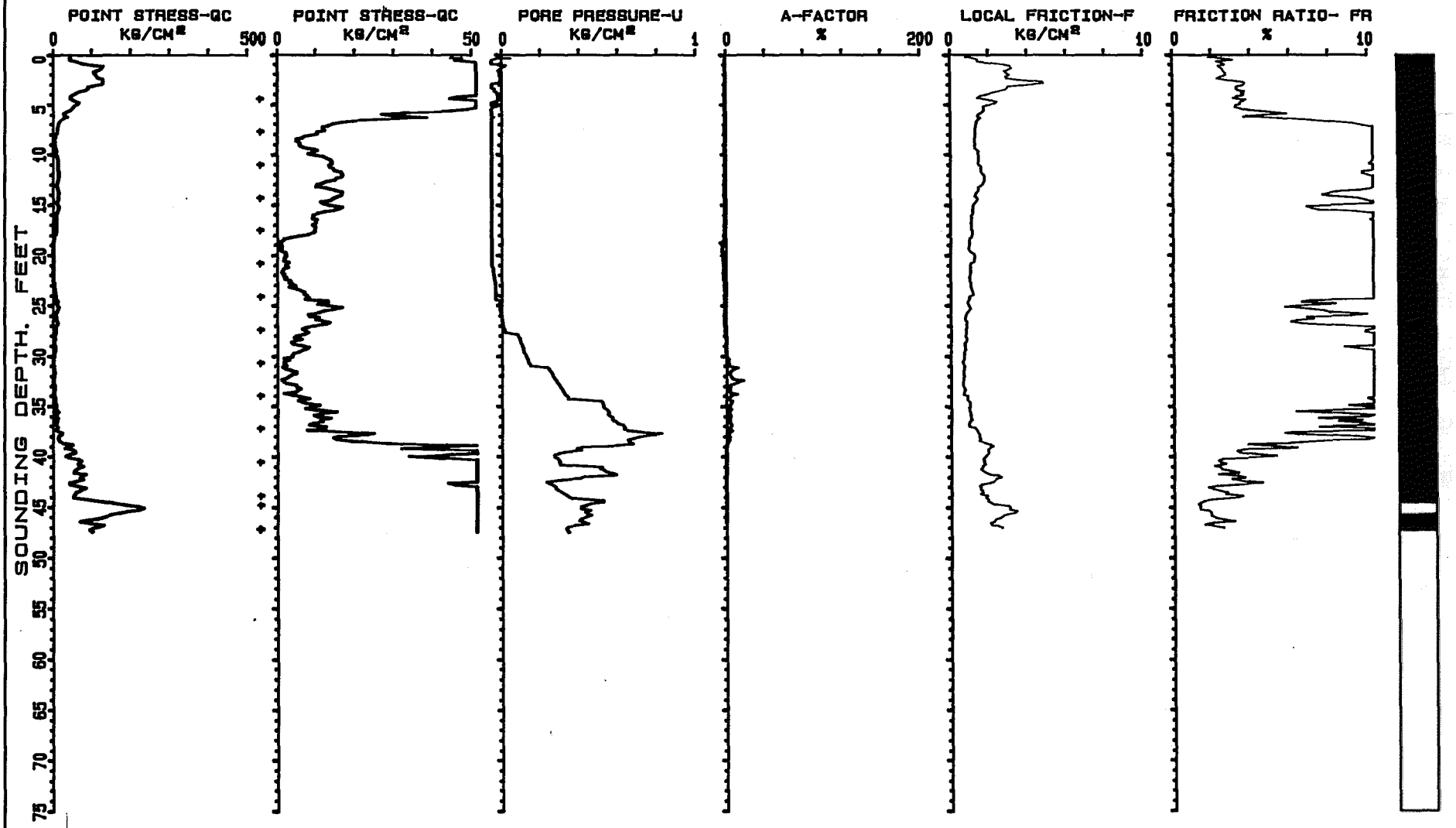
PIEZOCONE SOUNDING



* PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 09-P14A
TEST DATE 11-27-1995 12:13:33

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 09-P14A

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	CLAYEY FINE SAND	66.7	2.15	26	26	.03	70%-80%	>48	146	--	--	--	--
2	SILTY TO CLAYEY F.S.	114.3	3.04	38	38	.061	>90%	>48	251	--	--	--	--
3	CLAYEY FINE SAND	121.5	3.73	48	48	.092	>90%	>48	267	--	--	--	--
4	CLAYEY FINE SAND	90	2.74	36	36	.123	70%-80%	>48	198	--	--	--	--
5	CLAYEY FINE SAND	55.4	1.91	22	22	.153	60%-70%	46-48	121	--	--	--	--
6	SANDY CLAY	47.1	1.66	23	23	.181	--	--	--	2.92	2.8	.01	>6
7	CLAY	24.9	1.38	24	24	.206	--	--	--	1.53	1.7	UD	>6
8	CLAY	12	1.27	12	12	.23	--	--	--	.72	.9	.02	6
9	SOFT CLAY	6.5	1.26	6	6	.247	--	--	--	.37	.5	UD	6
10	SOFT CLAY	8	1.36	8	8	.263	--	--	--	.46	.5	UD	6
[illegible]	SOFT CLAY	12.2	1.44	12	12	.279	--	--	--	.72	.8	UD	6
[illegible]	CLAY	14.8	1.59	14	14	.304	--	--	--	.88	.9	.01	6
13	SOFT CLAY	14.4	1.71	14	14	.32	--	--	--	.85	.8	UD	6
14	CLAY	14.1	1.39	14	14	.345	--	--	--	.83	1	.01	6
15	CLAY	13.9	1.26	13	13	.37	--	--	--	.81	1	.01	6
16	CLAY	13.3	1.11	13	13	.395	--	--	--	.77	1.1	.01	6
17	SOFT CLAY	9.6	1.06	9	9	.411	--	--	--	.54	.9	UD	6
18	SOFT CLAY	9.4	1.1	9	9	.427	--	--	--	.52	.8	UD	6
19	SOFT CLAY	3.1	.99	3	3	.443	--	--	--	.12	.3	UD	1-1.5
20	SOFT CLAY	1.4	1.03	1	1	.459	--	--	--	.02	.1	UD	<1
21	SOFT CLAY	2.3	1.16	2	2	.475	--	--	--	.07	.2	UD	1
22	SOFT CLAY	1.9	1.01	1	1	.491	--	--	--	.04	.1	UD	<1
23	SOFT CLAY	3.1	1	3	3	.507	--	--	--	.11	.3	UD	1
24	SOFT CLAY	5.8	1.08	5	5	.524	--	--	--	.28	.5	UD	3
25	CLAY	10.5	.91	10	10	.548	--	--	--	.57	1.1	.02	6
26	CLAY	12	.87	12	12	.573	--	--	--	.66	1.3	.02	6
27	CLAY	11	.77	11	11	.598	--	--	--	.59	1.4	.02	3
28	SOFT CLAY	7.3	.76	7	7	.614	--	--	--	.36	.9	UD	3
29	SOFT CLAY	4.9	.74	4	4	.63	--	--	--	.21	.6	UD	1-1.5
30	SOFT CLAY	6.1	.7	6	6	.647	--	--	--	.28	.8	UD	1-1.5

09-P14A CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SOFT CLAY	2.7	.65	2	2	.663	--	--	--	.06	.4	UD	<1
32	SOFT CLAY	3.2	.65	3	3	.679	--	--	--	.09	.5	UD	1
33	SOFT CLAY	3	.62	3	3	.695	--	--	--	.08	.4	UD	1
34	SOFT CLAY	4.8	.73	4	4	.711	--	--	--	.19	.6	UD	1-1.5
35	SOFT CLAY	7.9	.93	7	7	.727	--	--	--	.38	.8	UD	3
36	CLAY	10.6	.98	10	10	.752	--	--	--	.54	1	.02	3
37	CLAY	11.1	1.02	11	11	.777	--	--	--	.57	1	.02	3
38	CLAY	16.1	1.4	16	16	.802	--	--	--	.88	1.1	.01	6
39	CLAY	26.9	1.78	26	26	.827	--	--	--	1.55	1.5	UD	6
40	SILTY CLAY TO CLAY	46	1.87	30	30	.854	--	--	--	2.74	2.4	UD	6
41	CLAYEY FINE SAND	61.5	1.66	24	24	.885	40%-50%	38-40	135	--	--	--	--
42	CLAYEY FINE SAND	68.1	1.93	27	27	.916	40%-50%	38-40	149	--	--	--	--
43	CLAYEY FINE SAND	63	1.95	25	25	.946	40%-50%	38-40	138	--	--	--	--
44	CLAYEY FINE SAND	66.4	1.62	26	26	.977	40%-50%	38-40	146	--	--	--	--
45	SILTY TO CLAYEY F.S.	127.3	2.27	42	42	1.008	60%-70%	42-44	280	--	--	--	--
46	SILTY FINE SAND	189.1	2.97	47	47	1.039	80%-90%	42-44	416	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
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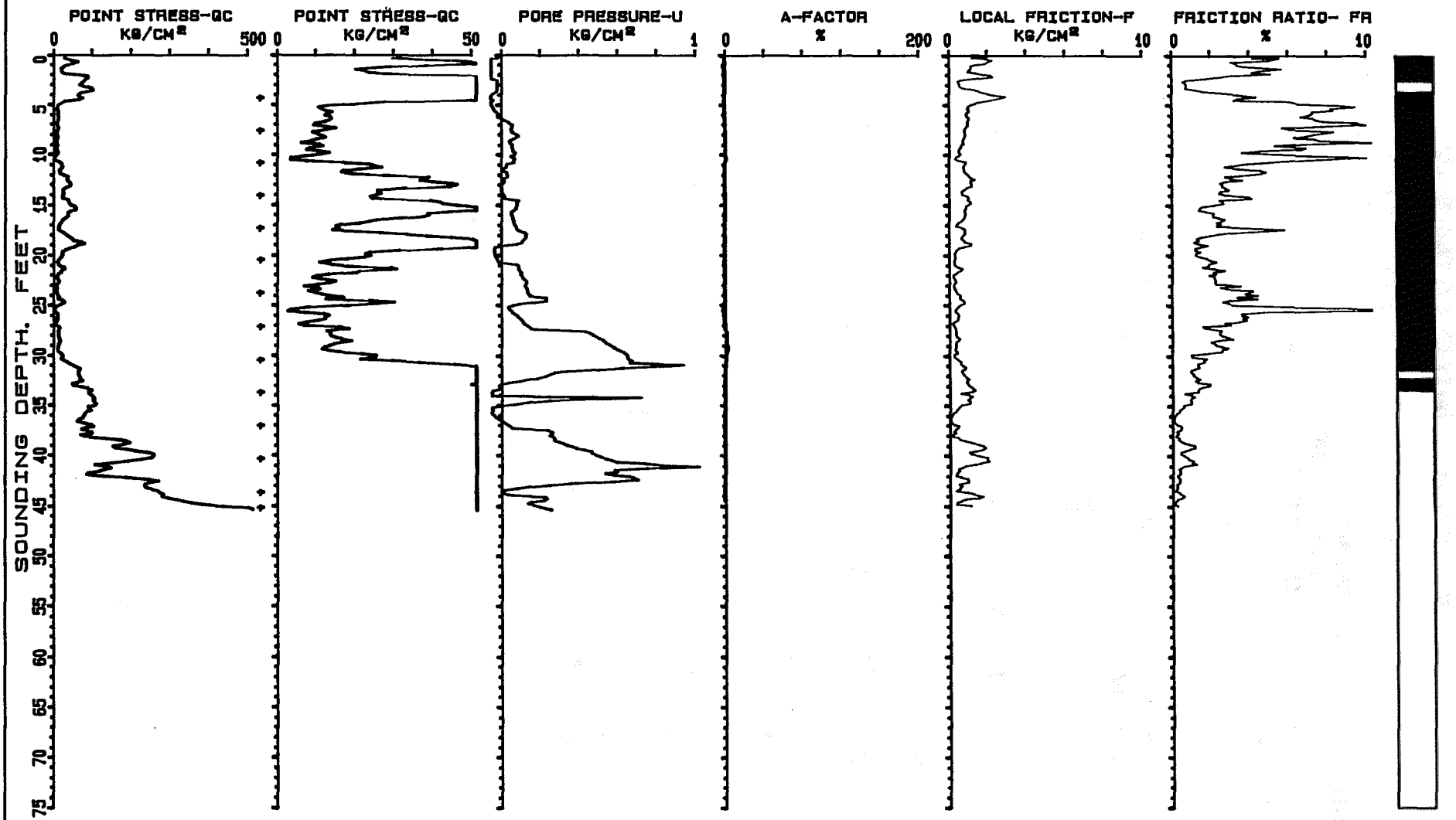

+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 09-P17
TEST DATE 12-17-1995 09: 18: 17

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 09-P17

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	SANDY CLAY	47.5	1.72	23	23	.027	--	--	--	2.96	2.7	.01	>6
2	CLAY	27	1.31	27	27	.052	--	--	--	1.68	2	UD	>6
3	SILTY TO CLAYEY F.S.	73.4	1.15	24	24	.083	70%-80%	>48	161	--	--	--	--
4	SILTY TO CLAYEY F.S.	83.9	1.28	27	27	.113	70%-80%	>48	184	--	--	--	--
5	CLAYEY FINE SAND	56.3	2.04	22	22	.144	60%-70%	46-48	123	--	--	--	--
6	CLAY	13.6	.98	13	13	.169	--	--	--	.82	1.3	.01	>6
7	CLAY	12.2	.95	12	12	.194	--	--	--	.73	1.2	.02	6
8	CLAY	11.6	.82	11	11	.219	--	--	--	.69	1.4	.02	6
9	CLAY	10.1	.72	10	10	.244	--	--	--	.59	1.4	.02	6
10	CLAY	10.6	.53	10	10	.269	--	--	--	.62	1.9	.02	6
11	CLAY	10.5	.58	10	10	.293	--	--	--	.61	1.8	.02	6
12	SILTY CLAY TO CLAY	20.9	.82	13	13	.321	--	--	--	1.26	2.5	UD	[illegible]
13	CLAYEY FINE SAND	36.5	1.13	14	14	.352	50%-60%	40-42	80	--	--	--	--
14	CLAYEY FINE SAND	32.5	.82	13	13	.382	40%-50%	40-42	71	--	--	--	--
15	CLAYEY FINE SAND	34.9	.99	13	13	.413	40%-50%	40-42	76	--	--	--	--
16	SILTY TO CLAYEY F.S.	48.9	.82	16	16	.444	50%-60%	40-42	107	--	--	--	--
17	CLAYEY FINE SAND	27.8	.58	11	11	.475	<40%	38-40	61	--	--	--	--
18	SANDY CLAY	20.3	.71	10	10	.502	--	--	--	1.2	2.8	.02	6
19	SILTY TO CLAYEY F.S.	54.9	.84	18	18	.533	50%-60%	40-42	120	--	--	--	--
20	SILTY TO CLAYEY F.S.	37.1	.41	12	12	.564	<40%	38-40	81	--	--	--	--
21	CLAYEY FINE SAND	17.1	.29	6	6	.594	<40%	34-36	37	--	--	--	--
22	CLAYEY FINE SAND	21	.42	8	8	.625	<40%	34-36	46	--	--	--	--
23	SANDY CLAY	11.3	.25	5	5	.652	--	--	--	.62	4.4	.02	3
24	CLAY	10.1	.41	10	10	.677	--	--	--	.54	2.4	.02	3
25	SANDY CLAY	20.2	.63	10	10	.705	--	--	--	1.17	3.1	.02	6
26	CLAY	9.3	.41	9	9	.73	--	--	--	.48	2.2	.02	3
27	SILTY CLAY TO CLAY	9.8	.31	6	6	.757	--	--	--	.51	3.1	.02	3
28	SANDY CLAY	13.7	.33	6	6	.784	--	--	--	.75	4	.02	3
29	SANDY CLAY	15.7	.38	7	7	.812	--	--	--	.87	4.1	.01	6
30	SANDY CLAY	16.3	.32	8	8	.839	--	--	--	.9	4.9	.01	6

09-P17 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	CLAYEY FINE SAND	34.1	.55	13	13	.87	<40%	36-38	75	--	--	--	--
32	SILTY TO CLAYEY F.S.	65	.75	21	21	.901	40%-50%	38-40	143	--	--	--	--
33	SILTY TO CLAYEY F.S.	64.9	.97	21	21	.931	40%-50%	38-40	142	--	--	--	--
34	SILTY FINE SAND	86	1.09	21	21	.962	50%-60%	40-42	189	--	--	--	--
35	FINE SAND	105.7	.9	21	21	.995	60%-70%	40-42	232	--	--	--	--
36	FINE SAND	91	.27	18	18	1.028	50%-60%	40-42	200	--	--	--	--
37	FINE SAND	77.5	.15	15	15	1.062	40%-50%	38-40	170	--	--	--	--
38	FINE SAND	90.4	.28	18	18	1.095	50%-60%	40-42	198	--	--	--	--
39	FINE SAND	145.3	.9	29	29	1.128	70%-80%	42-44	319	--	--	--	--
40	FINE SAND	199.2	1.47	39	39	1.161	80%-90%	42-44	438	--	--	--	--
41	FINE SAND	207.1	1.59	41	41	1.195	80%-90%	42-44	455	--	--	--	--
42	FINE SAND	118.3	.48	23	23	1.228	60%-70%	40-42	260	--	--	--	--
43	DENSE OR CEMENTED S.	220.1	.73	36	36	1.264	80%-90%	42-44	484	--	--	--	--
44	DENSE OR CEMENTED S.	262.9	.96	43	43	1.301	>90%	44-46	578	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBERTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

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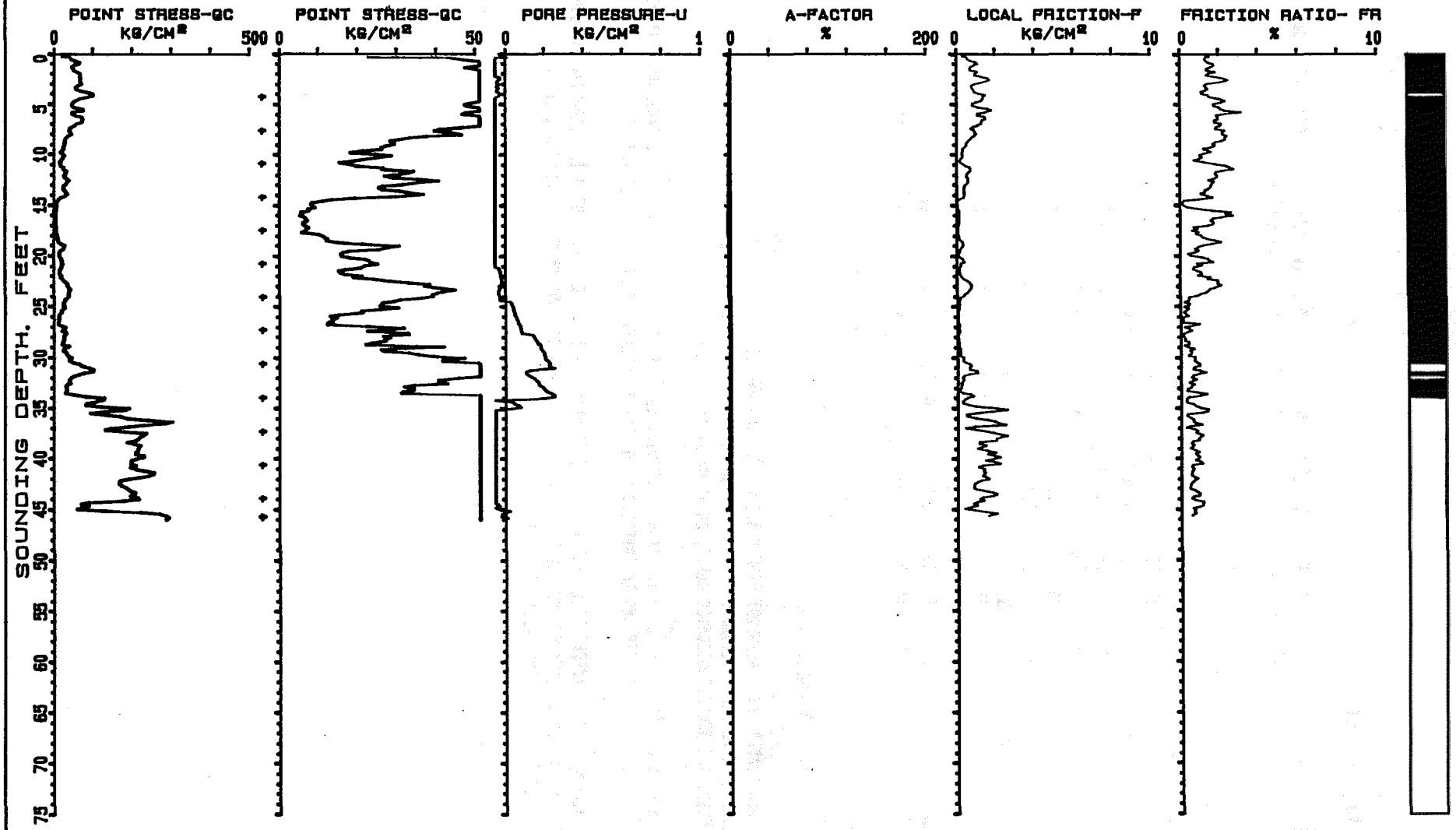
PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 09-P21
TEST DATE 11-30-1995 14:27:51

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 09-P21

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES #	N'	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	SILTY TO CLAYEY F.S.	56.1	.89	18	18	.03	70%-80%	>48	123	--	--	--	--
2	SILTY TO CLAYEY F.S.	54.8	.88	18	18	.061	70%-80%	>48	120	--	--	--	--
3	SILTY TO CLAYEY F.S.	69	1.23	23	23	.092	70%-80%	>48	151	--	--	--	--
4	SILTY TO CLAYEY F.S.	72.7	.98	24	24	.123	70%-80%	>48	159	--	--	--	--
5	SILTY TO CLAYEY F.S.	73.5	1.17	24	24	.153	70%-80%	46-48	161	--	--	--	--
6	CLAYEY FINE SAND	56.7	1.28	22	22	.184	60%-70%	44-46	124	--	--	--	--
7	SILTY TO CLAYEY F.S.	65.9	1.28	21	21	.215	70%-80%	44-46	144	--	--	--	--
8	SILTY TO CLAYEY F.S.	47.2	.93	15	15	.246	60%-70%	42-44	103	--	--	--	--
9	CLAYEY FINE SAND	33.5	.64	13	13	.276	50%-60%	40-42	73	--	--	--	--
10	CLAYEY FINE SAND	24.6	.34	9	9	.307	40%-50%	38-40	54	--	--	--	--
[illegible]	CLAYEY FINE SAND	21.7	.27	8	8	.338	<40%	38-40	47	--	--	--	--
[illegible]	CLAYEY FINE SAND	27	.61	10	10	.369	40%-50%	38-40	59	--	--	--	--
13	CLAYEY FINE SAND	32.8	.54	13	13	.399	40%-50%	40-42	72	--	--	--	--
14	SILTY TO CLAYEY F.S.	30	.4	10	10	.43	40%-50%	38-40	66	--	--	--	--
15	CLAYEY FINE SAND	18.2	.12	7	7	.461	<40%	36-38	40	--	--	--	--
16	SANDY CLAY	7.5	.09	3	3	.488	--	--	--	.4	7.7	.03	3
17	SANDY CLAY	6.4	.1	3	3	.516	--	--	--	.33	5.8	.02	3
18	SENSITIVE FINE GRAIN	7.9	.04	3	3	.538	--	--	--	.42	17.1	.02	3
19	CLAYEY FINE SAND	16.3	.26	6	6	.568	<40%	34-36	35	--	--	--	--
20	SILTY TO CLAYEY F.S.	21.4	.15	7	7	.599	<40%	34-36	47	--	--	--	--
21	CLAYEY FINE SAND	21.3	.26	8	8	.63	<40%	34-36	46	--	--	--	--
22	CLAYEY FINE SAND	18.3	.17	7	7	.661	<40%	34-36	40	--	--	--	--
23	CLAYEY FINE SAND	28.7	.59	11	11	.692	<40%	36-38	63	--	--	--	--
24	SILTY TO CLAYEY F.S.	40.5	.5	13	13	.722	<40%	38-40	89	--	--	--	--
25	SILTY TO CLAYEY F.S.	30.4	.11	10	10	.753	<40%	36-38	66	--	--	--	--
26	SILTY TO CLAYEY F.S.	21.7	.01	7	7	.784	<40%	34-36	47	--	--	--	--
27	CLAYEY FINE SAND	14.5	.04	5	5	.815	<40%	30-32	31	--	--	--	--
28	SILTY TO CLAYEY F.S.	28.1	.07	9	9	.845	<40%	34-36	61	--	--	--	--
29	SILTY TO CLAYEY F.S.	28.5	.09	9	9	.876	<40%	34-36	62	--	--	--	--
30	SILTY TO CLAYEY F.S.	34.2	.21	11	11	.907	<40%	36-38	75	--	--	--	--

09-P21 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SILTY FINE SAND	59.2	.53	14	14	.938	40%-50%	38-40	130	--	--	--	--
32	SILTY FINE SAND	77.8	.61	19	19	.968	50%-60%	40-42	171	--	--	--	--
33	SILTY TO CLAYEY F.S.	38.6	.21	12	12	.999	<40%	36-38	84	--	--	--	--
34	SILTY FINE SAND	57	.42	14	14	1.03	<40%	38-40	125	--	--	--	--
35	FINE SAND	121.9	.99	24	24	1.063	60%-70%	40-42	268	--	--	--	--
36	FINE SAND	156	1.28	31	31	1.096	70%-80%	42-44	343	--	--	--	--
37	FINE SAND	226.6	1.49	45	45	1.13	80%-90%	44-46	498	--	--	--	--
38	FINE SAND	190.4	1.86	38	38	1.163	80%-90%	42-44	418	--	--	--	--
39	FINE SAND	211.5	1.43	42	42	1.196	80%-90%	42-44	465	--	--	--	--
40	FINE SAND	217.4	1.79	43	43	1.229	80%-90%	42-44	478	--	--	--	--
41	FINE SAND	201.6	1.56	40	40	1.262	80%-90%	42-44	443	--	--	--	--
42	FINE SAND	225.4	1.39	45	45	1.296	80%-90%	42-44	495	--	--	--	--
43	FINE SAND	177.5	1.01	35	35	1.329	70%-80%	42-44	390	--	--	--	--
44	FINE SAND	204.3	1.55	40	40	1.362	70%-80%	42-44	449	--	--	--	--
45	FINE SAND	111.7	.88	22	22	1.395	50%-60%	40-42	245	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
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*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
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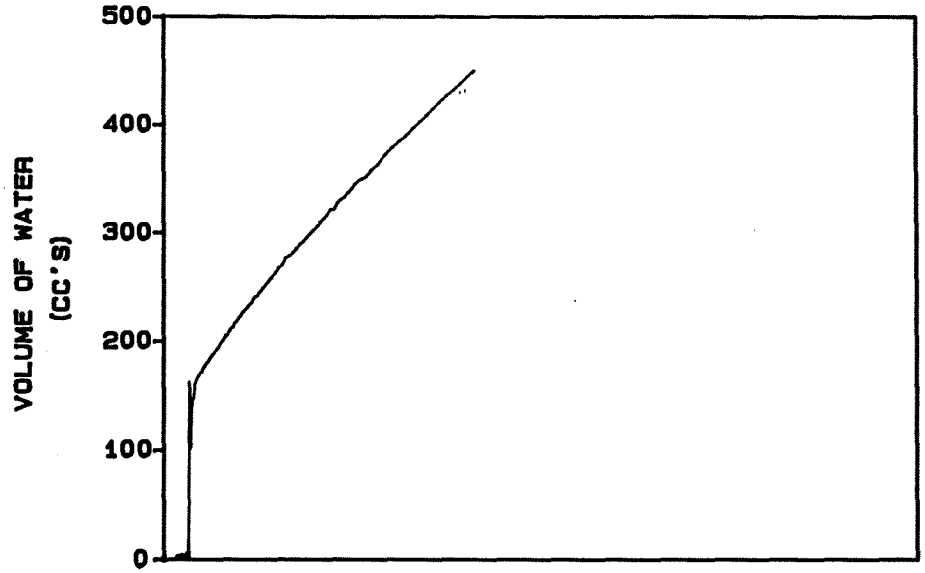
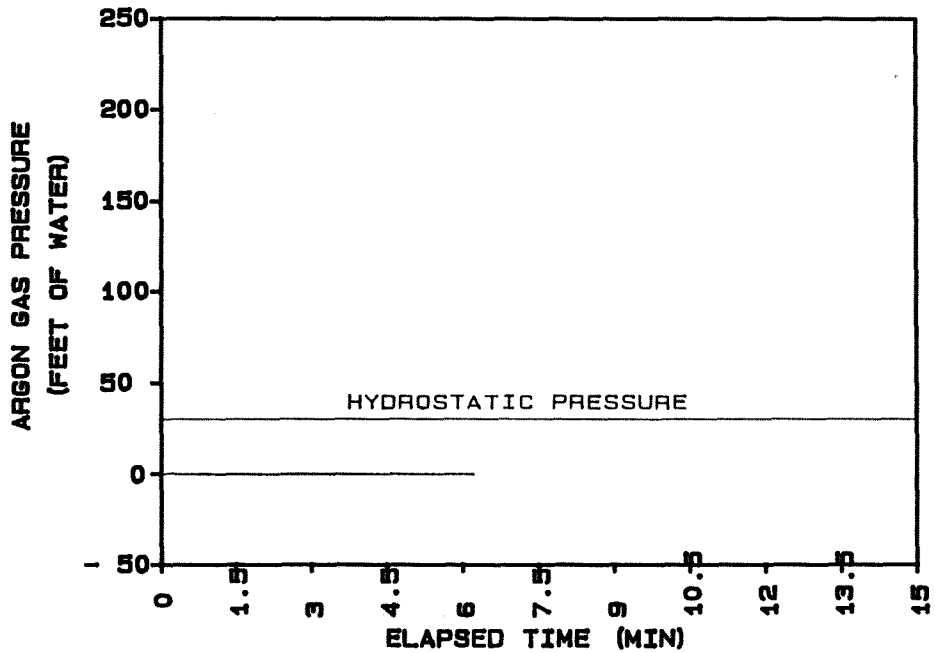
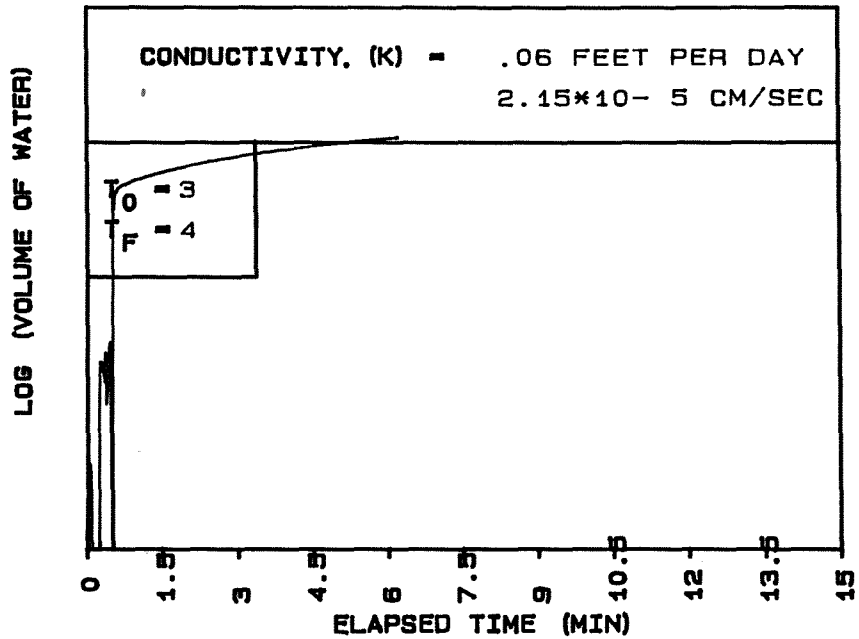
HYDROCONE TEST







ENSAFE MEMPHIS NSA
LOCATION... 09H0946
TEST DATE
20: 37: 54 12-01-1995

SAMPLE DEPTH (FT) 46
GROUNDWATER DEPTH (FT) 16

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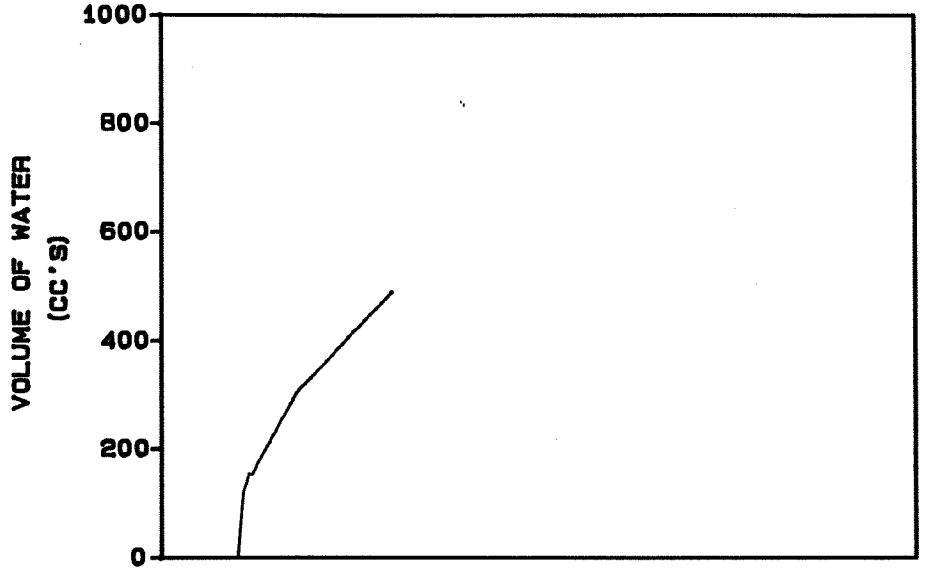
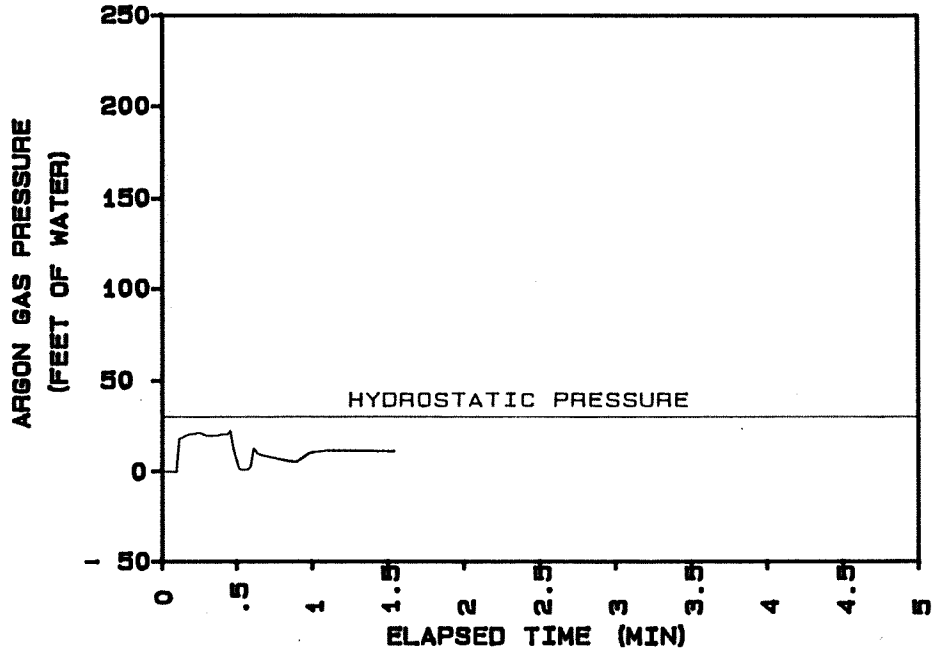
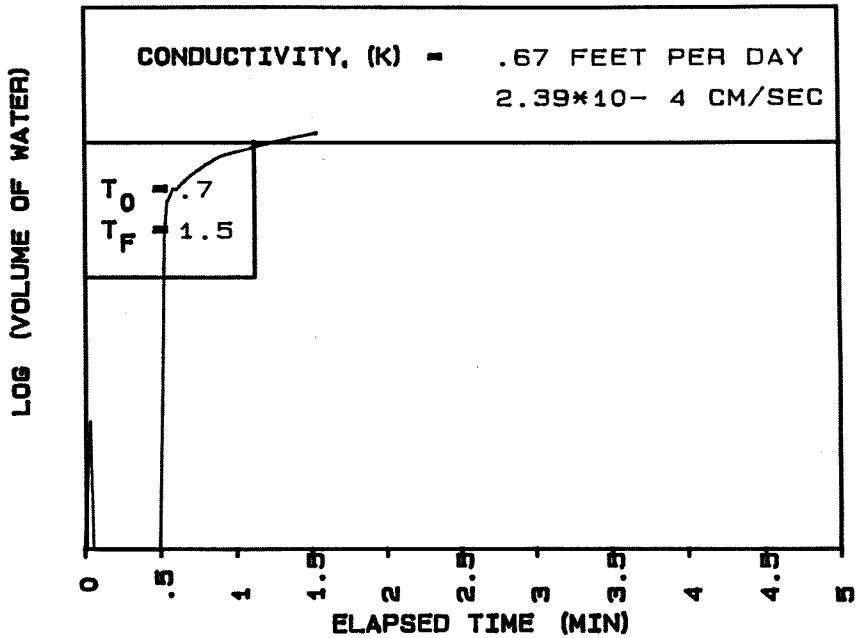


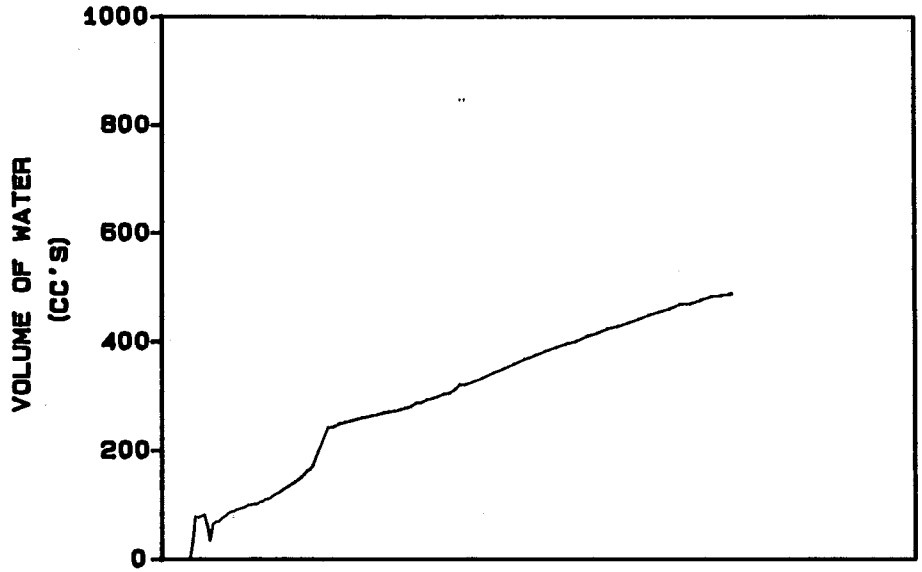


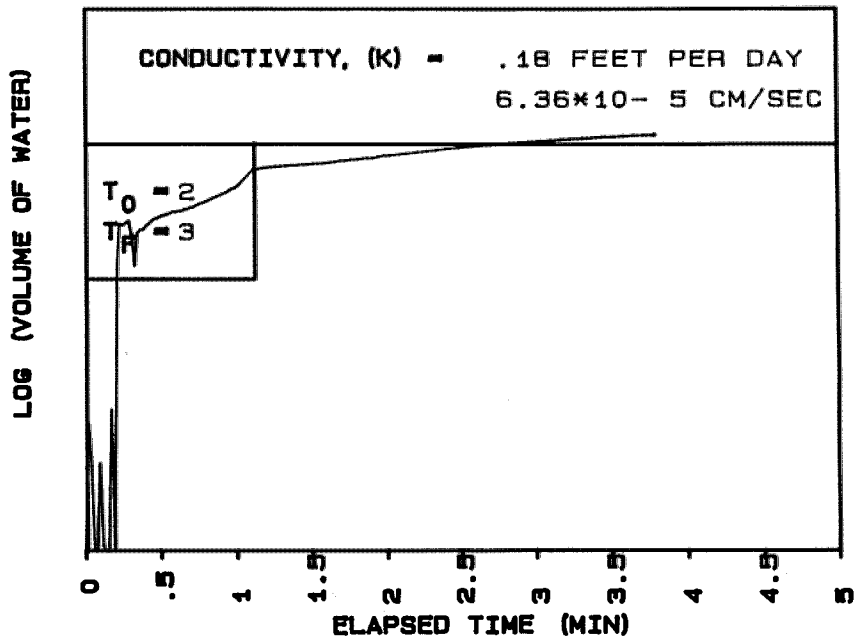


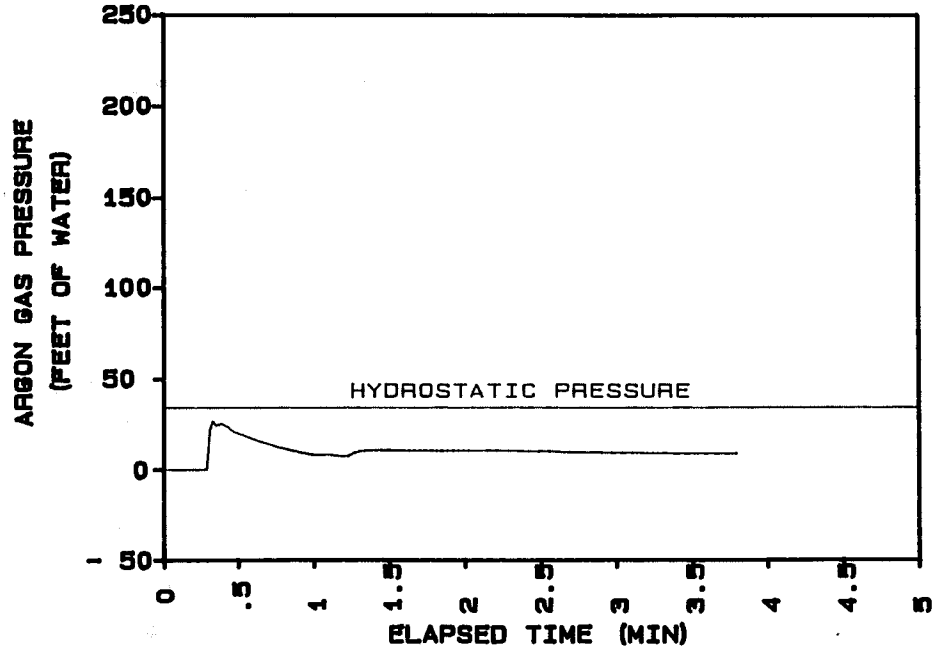
ENSAFE MEMPHIS NSA
LOCATION... 09H1046
TEST DATE
13: 01: 36 12-02-1995

SAMPLE DEPTH (FT) 46
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



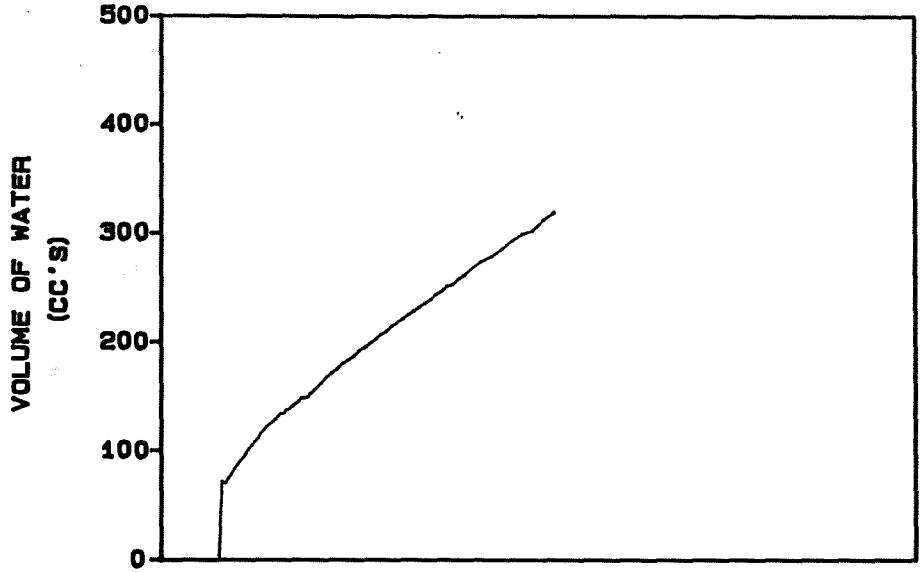


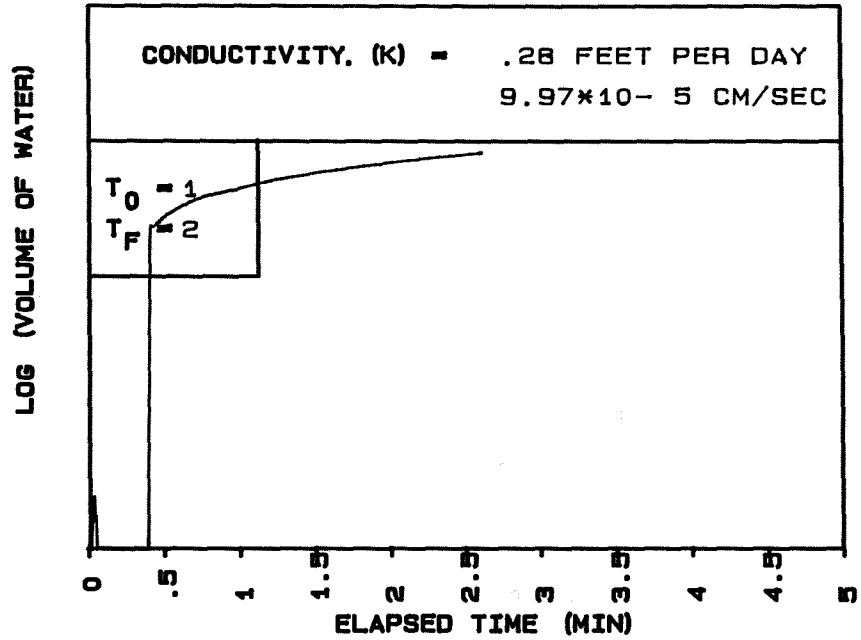


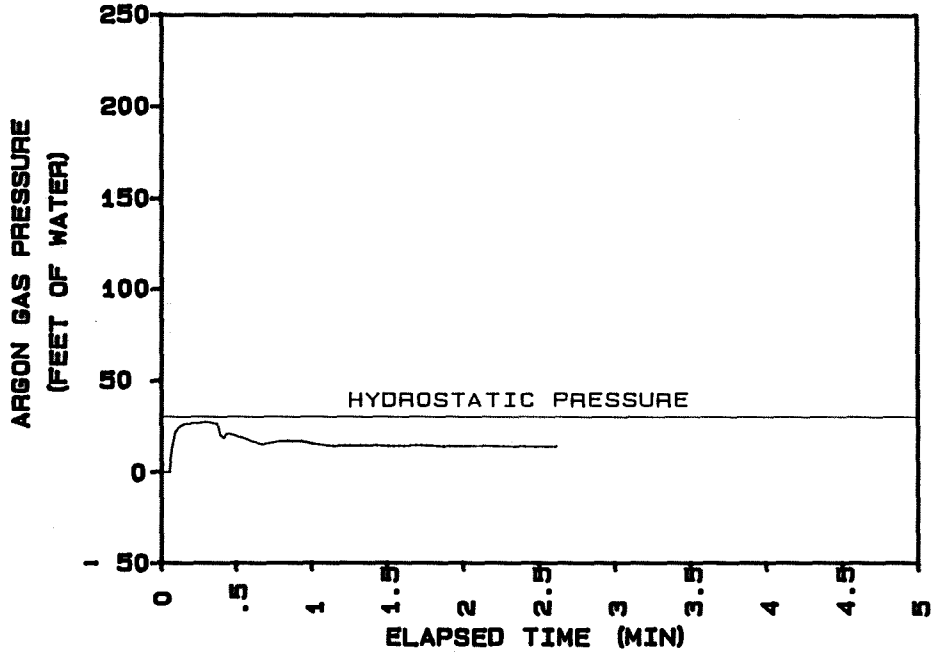
ENSAFE MEMPHIS NSA
LOCATION... 09H1150
TEST DATE
15: 38: 51 12-02-1995

SAMPLE DEPTH (FT) 50
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



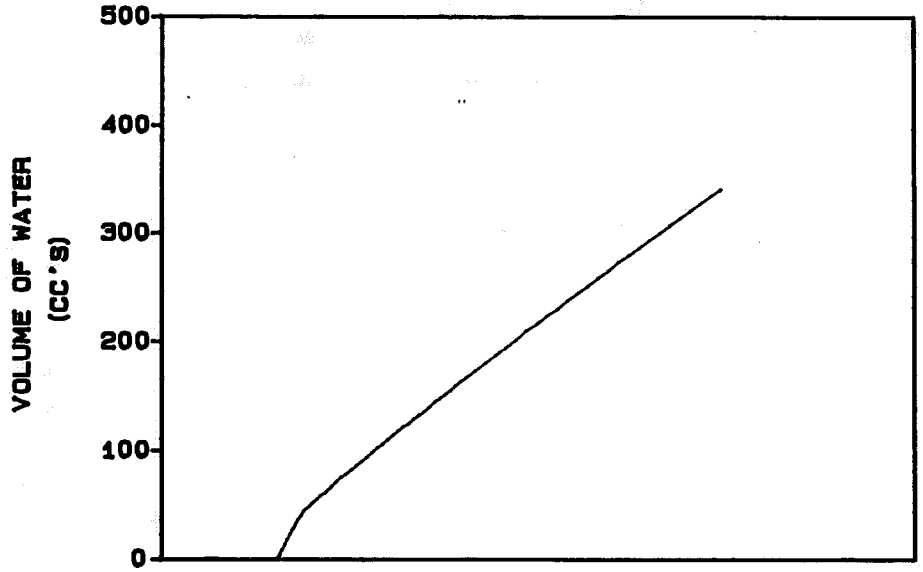


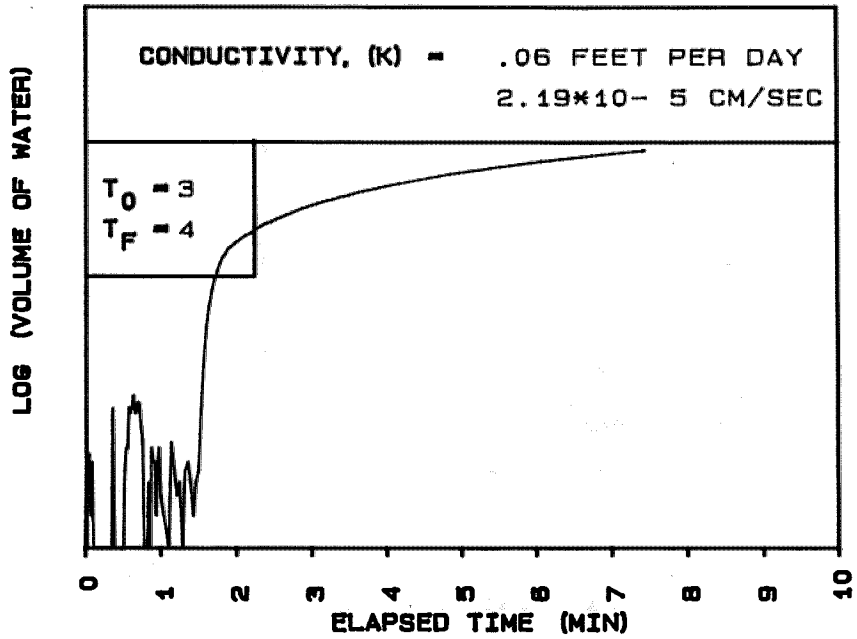


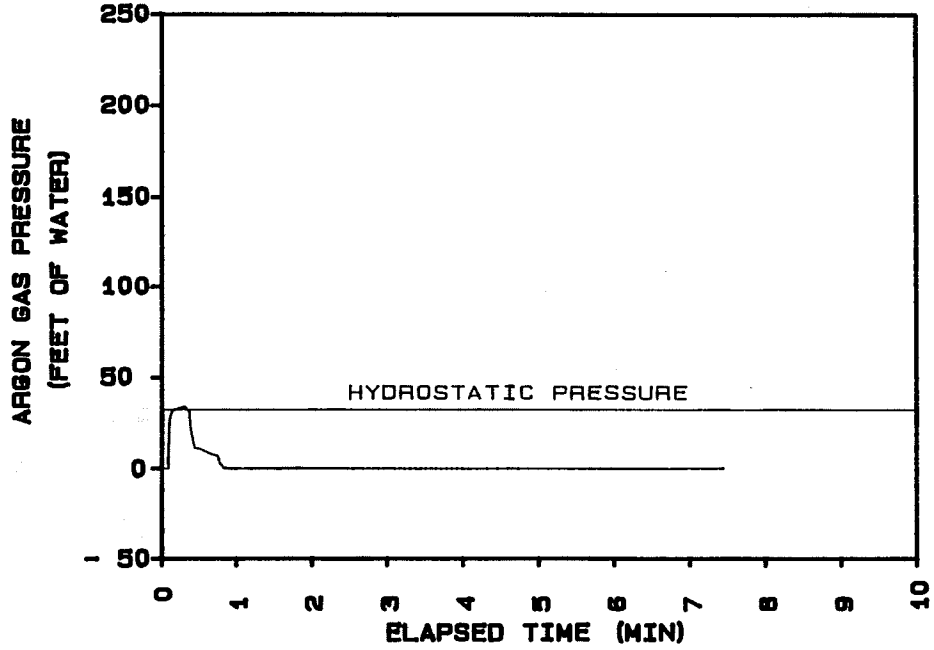
ENSAFE MEMPHIS NSA
LOCATION... 09H1246
TEST DATE
17: 44: 45 12-02-1995

SAMPLE DEPTH (FT) 46
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



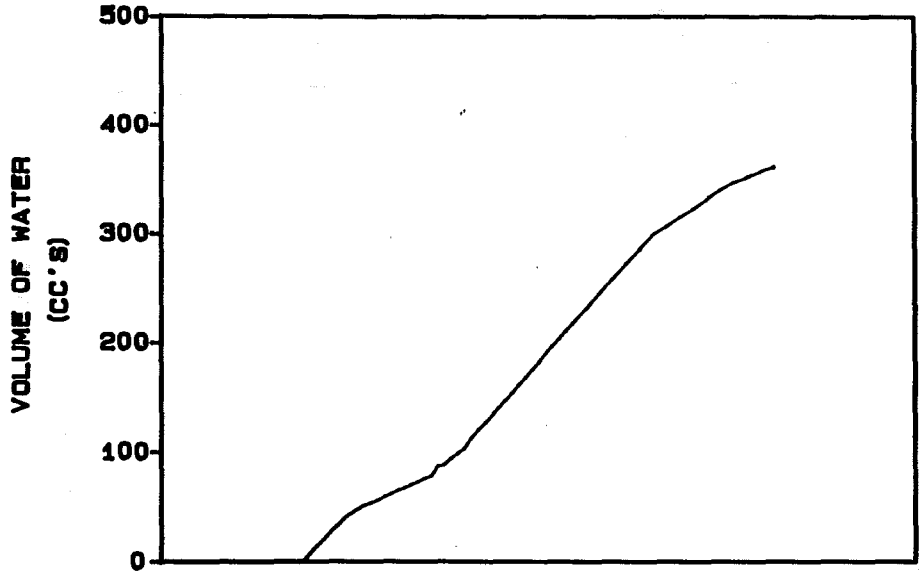


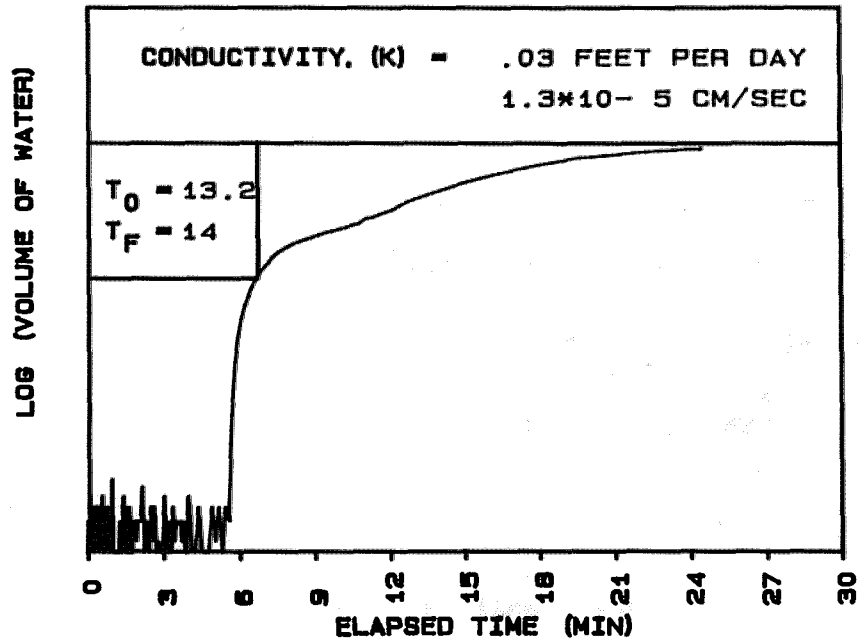


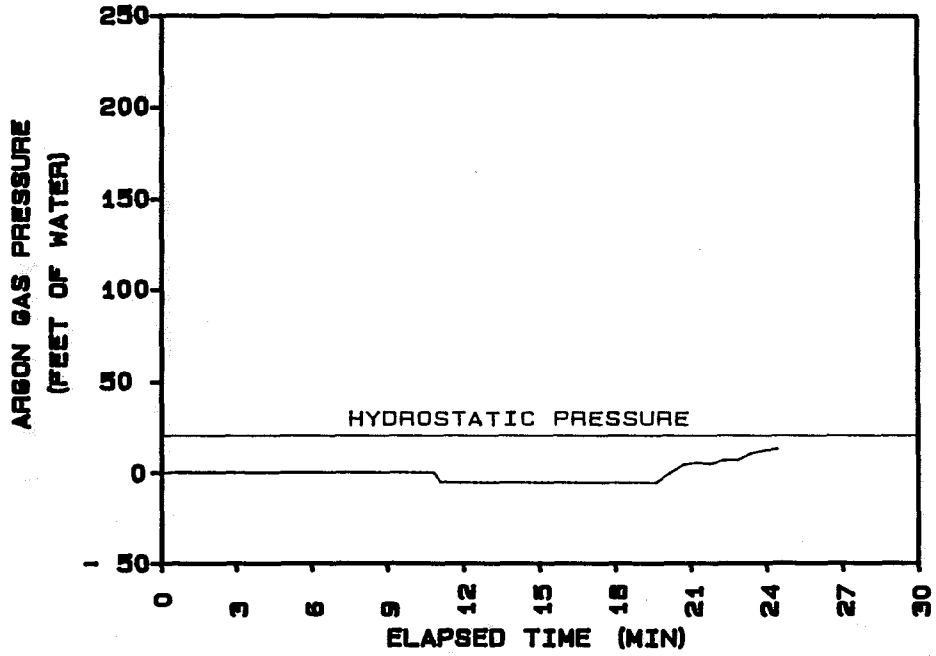
ENSAFE MEMPHIS NSA
LOCATION... 09H1348
TEST DATE
18: 44: 13 12-02-1995

SAMPLE DEPTH (FT) 48
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



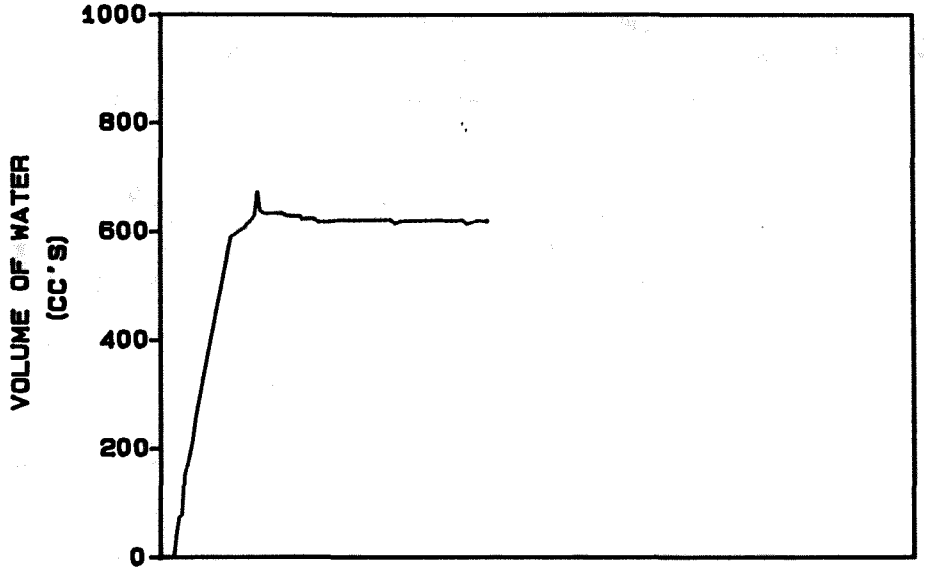


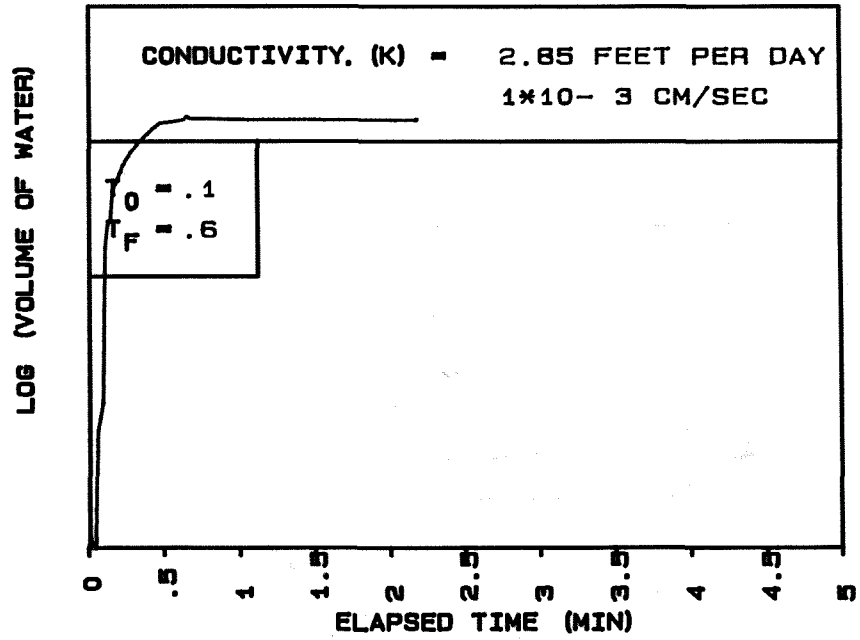


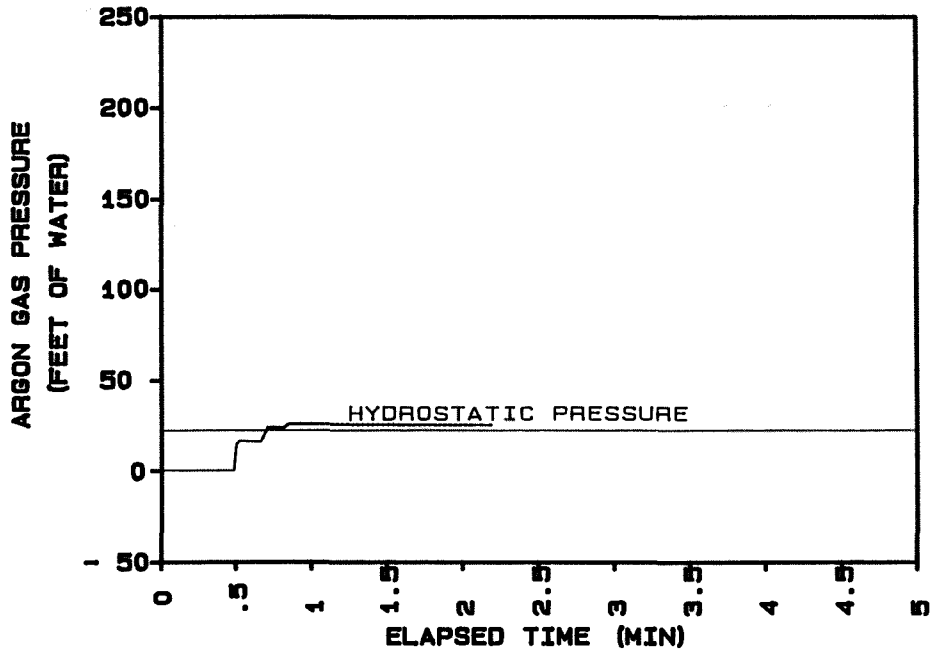
ENSAFE MEMPHIS NSA
LOCATION... 09H1445
TEST DATE
18: 12: 04 11-27-1995

SAMPLE DEPTH (FT) 45
GROUNDWATER DEPTH (FT) 25

HYDROCONE TEST



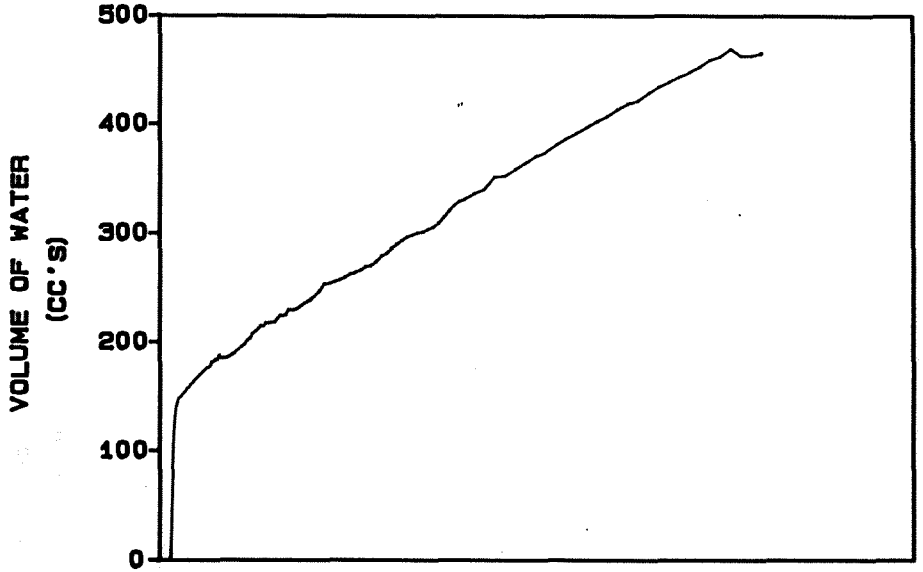


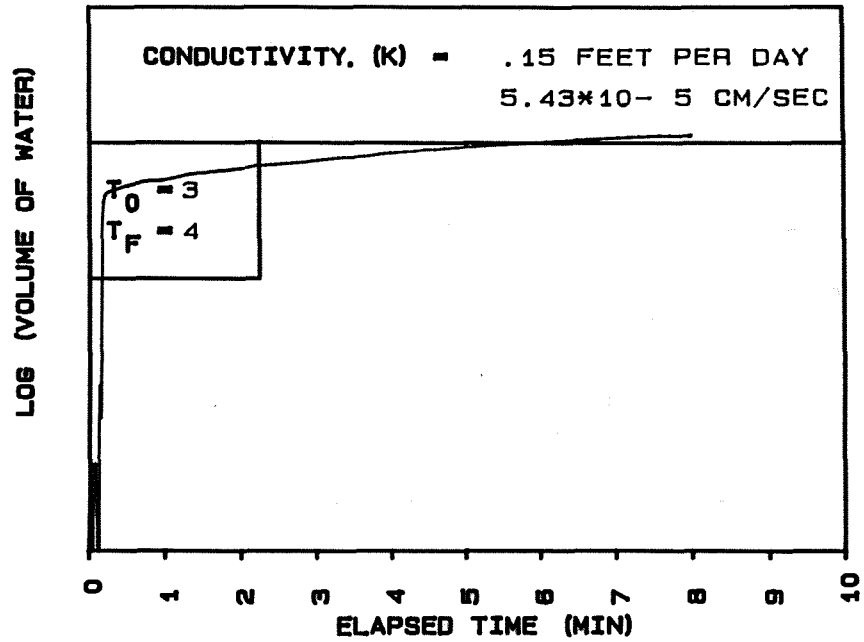


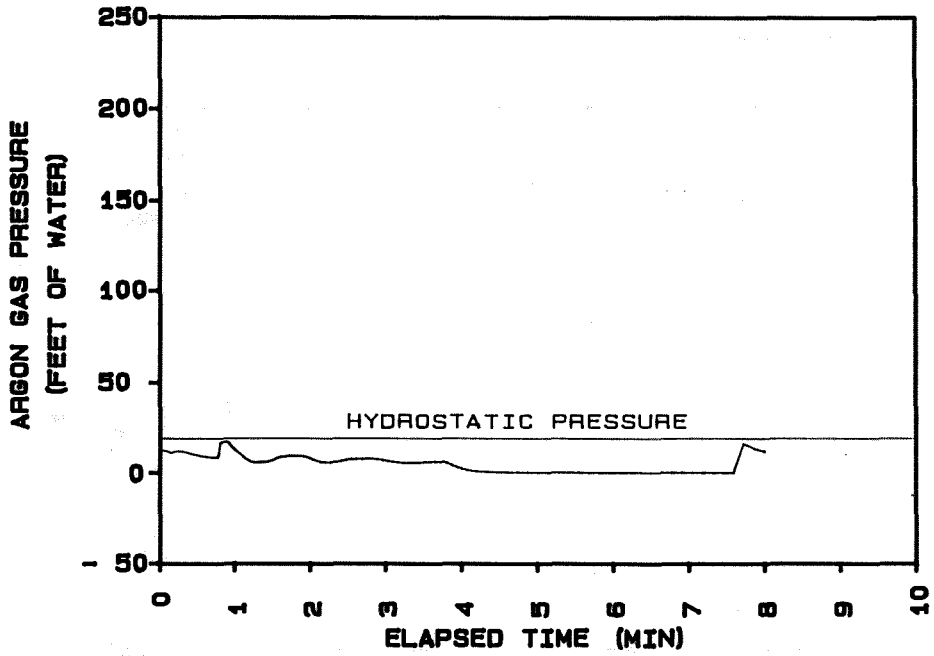
ENSAFE MEMPHIS NSA
LOCATION... 09H1547
TEST DATE
10: 49: 26 11-28-1995

SAMPLE DEPTH (FT) 47
GROUNDWATER DEPTH (FT) 25

HYDROCONE TEST



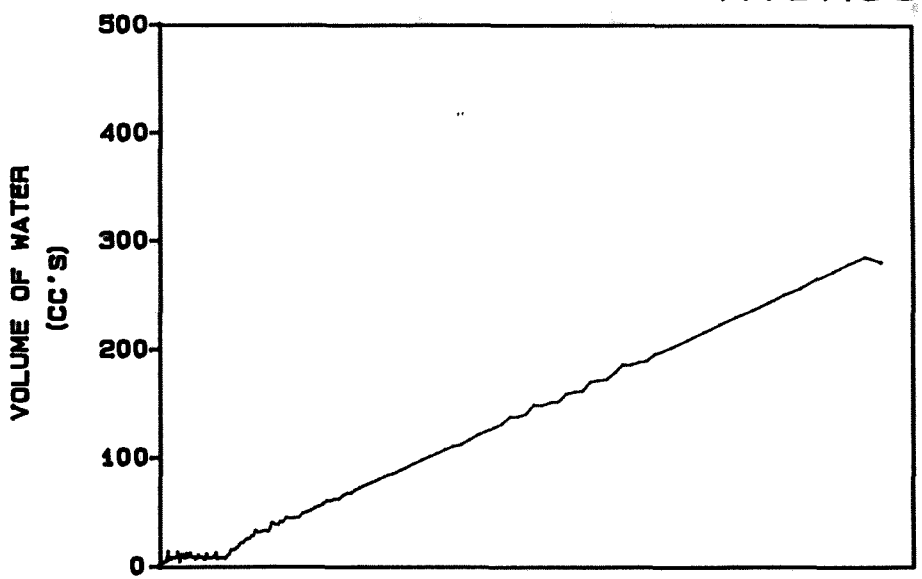


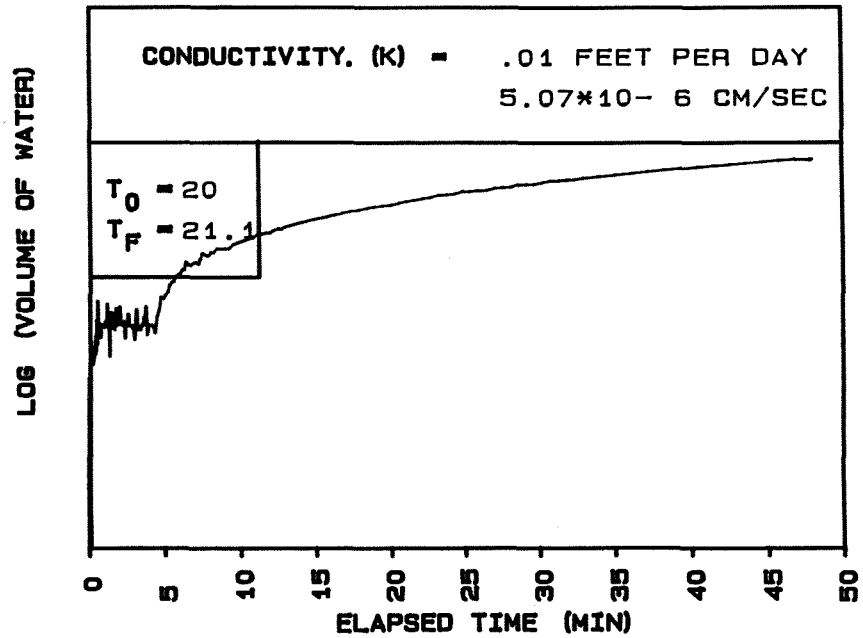


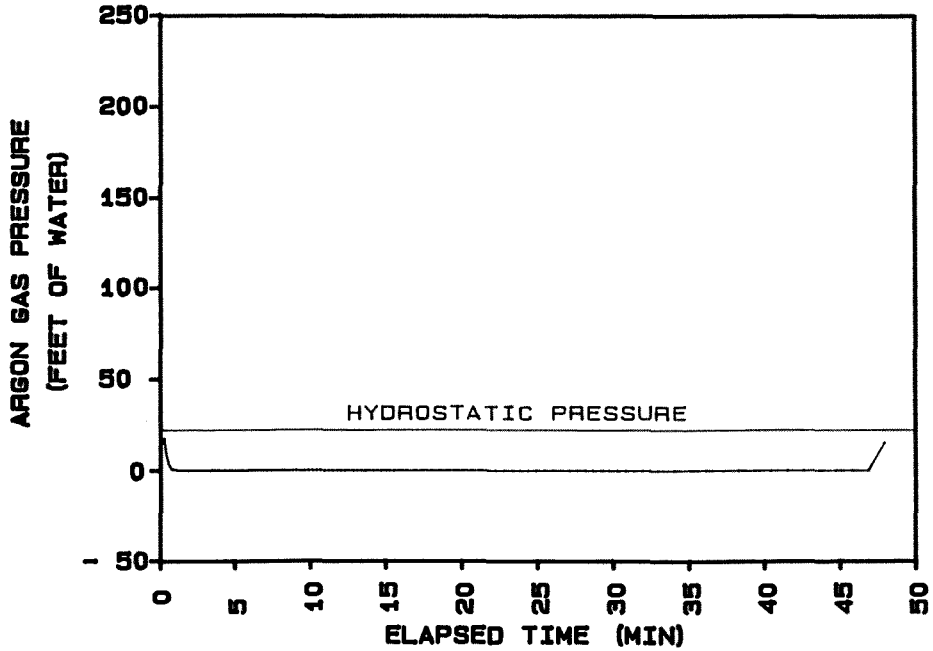
ENSAFE MEMPHIS NSA
LOCATION... 09H1644
TEST DATE
14: 51: 31 11-29-1995

SAMPLE DEPTH (FT) 44
GROUNDWATER DEPTH (FT) 25

HYDROCONE TEST



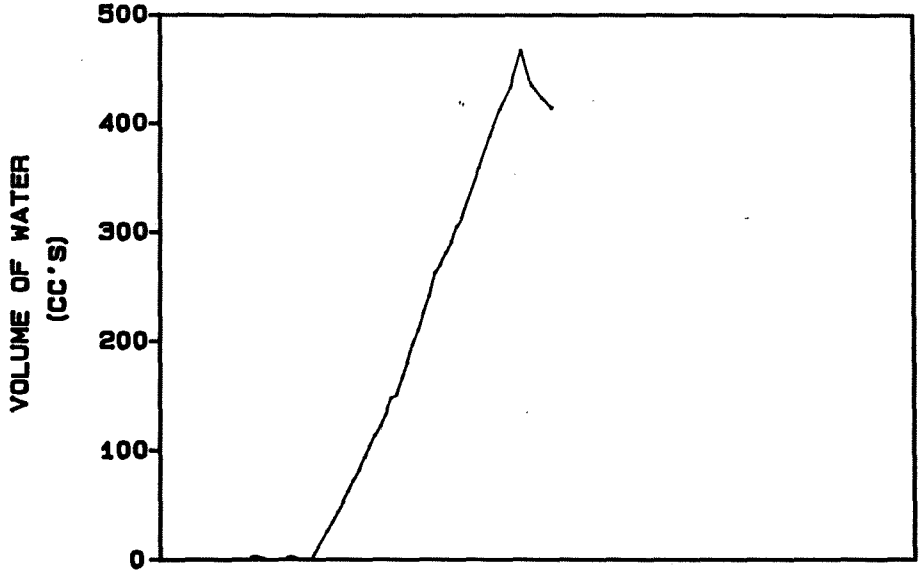


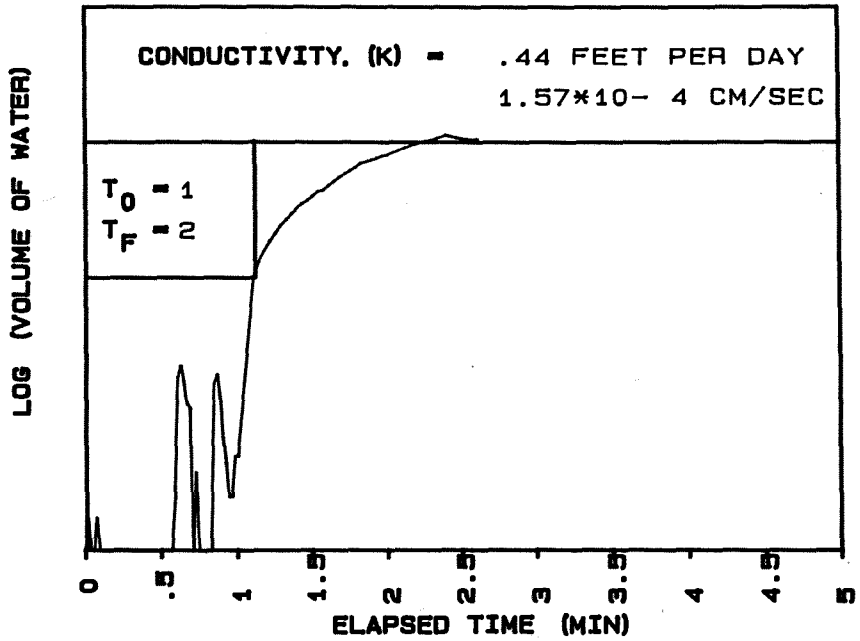


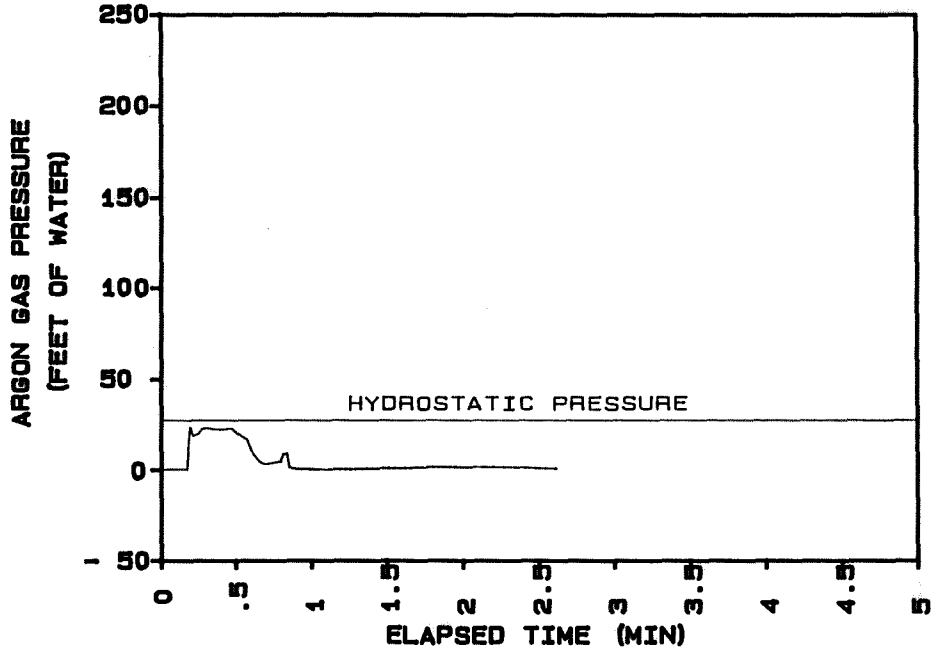
ENSAFE MEMPHIS NSA
LOCATION... 09H1747
TEST DATE
17: 19: 10 11-29-1995

SAMPLE DEPTH (FT) 47
GROUNDWATER DEPTH (FT) 25

HYDROCONE TEST







ENSAFE MEMPHIS NSA
LOCATION... 09H1852
TEST DATE
20: 17: 48 11-29-1995

SAMPLE DEPTH (FT) 52
GROUNDWATER DEPTH (FT) 25

HYDROCONE TEST

VOLUME OF WATER (CC'S)

DATA NOT AVAILABLE

LOG (VOLUME OF WATER)

CONDUCTIVITY, (K) =

T_0 =
T_F =

DATA NOT AVAILABLE

ELAPSED TIME (MIN)

ARGON GAS PRESSURE (FEET OF WATER)

DATA NOT AVAILABLE

ELAPSED TIME (MIN)

ENSAFE MEMPHIS NSA
LOCATION... 09H1946

DATA NOT AVAILABLE

HYDROCONE TEST

VOLUME OF WATER (CC'S)

DATA NOT AVAILABLE

LOG (VOLUME OF WATER)

CONDUCTIVITY. (K) =

T_0 =
T_F =

DATA NOT AVAILABLE

ELAPSED TIME (MIN)

ARGON GAS PRESSURE (FEET OF WATER)

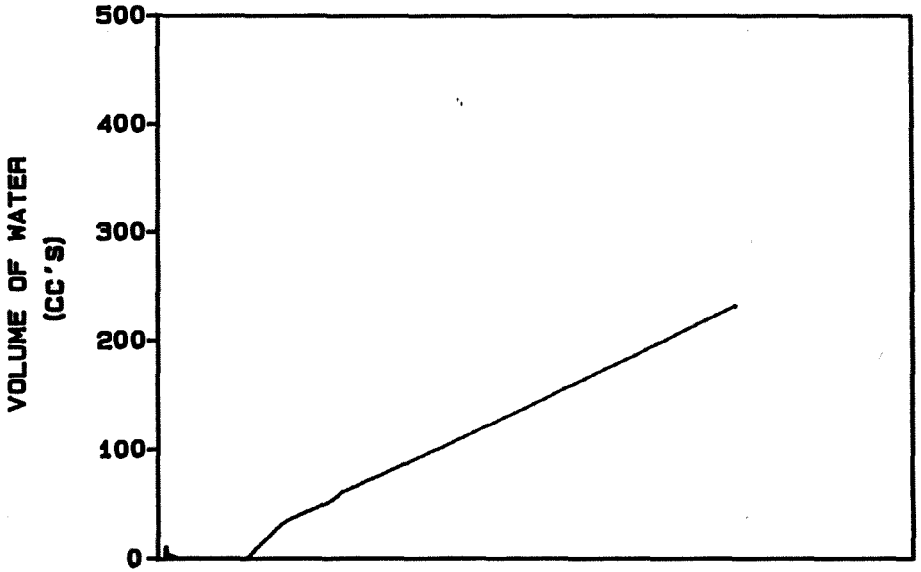
DATA NOT AVAILABLE

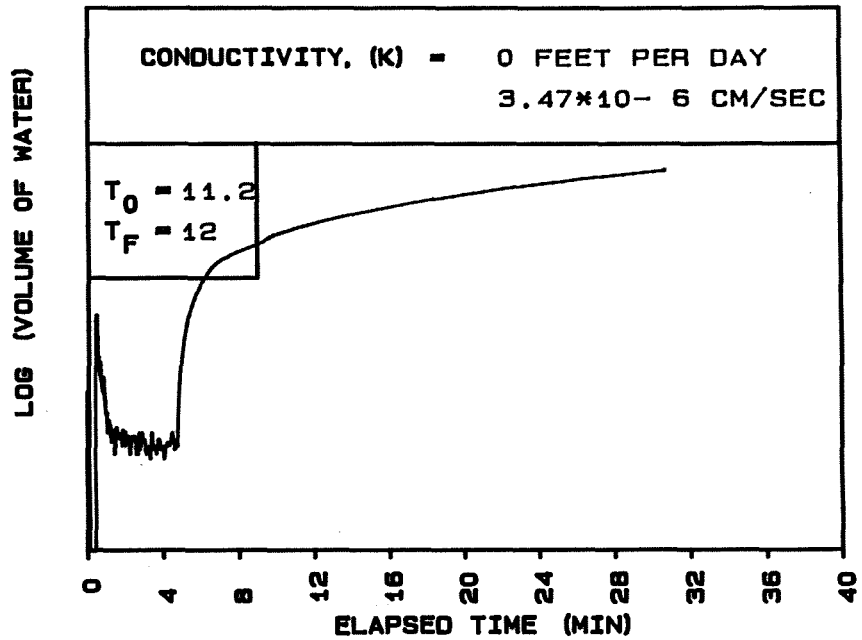
ELAPSED TIME (MIN)

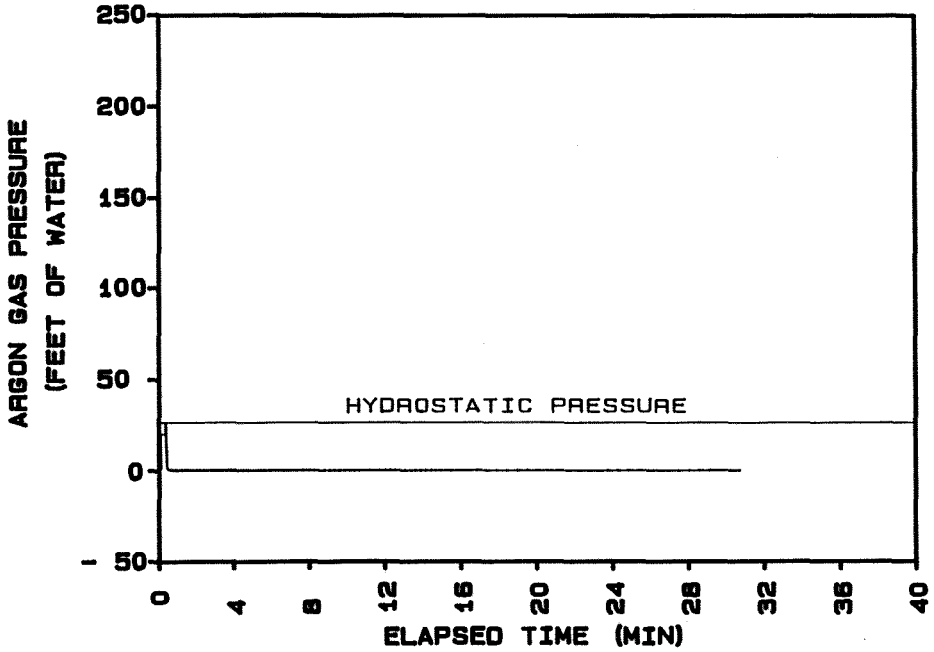
ENSAFE MEMPHIS NSA
LOCATION... 09H2052

DATA NOT AVAILABLE

HYDROCONE TEST



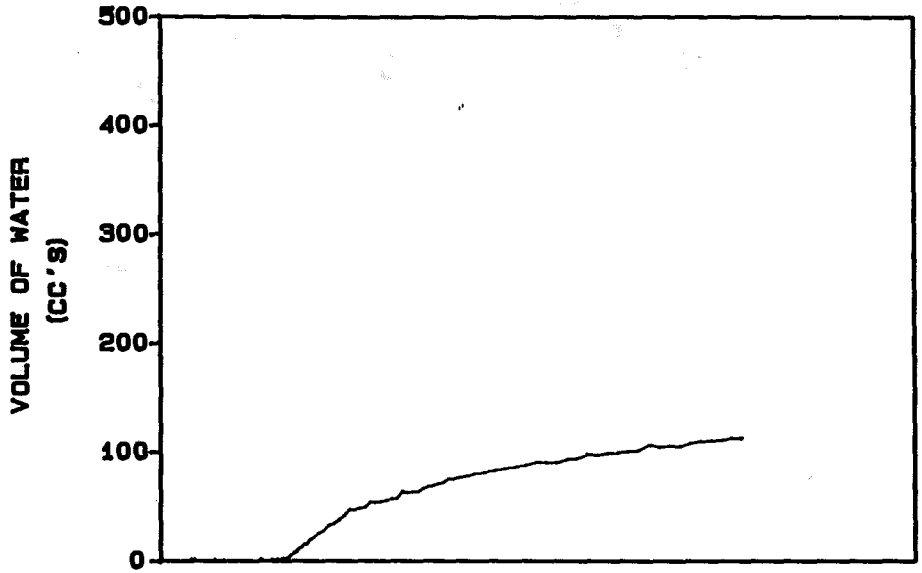


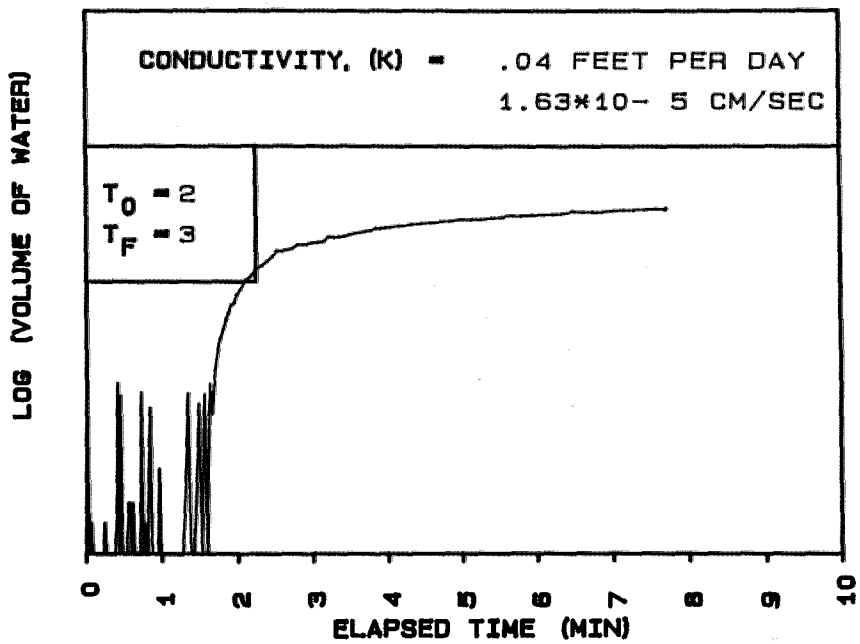


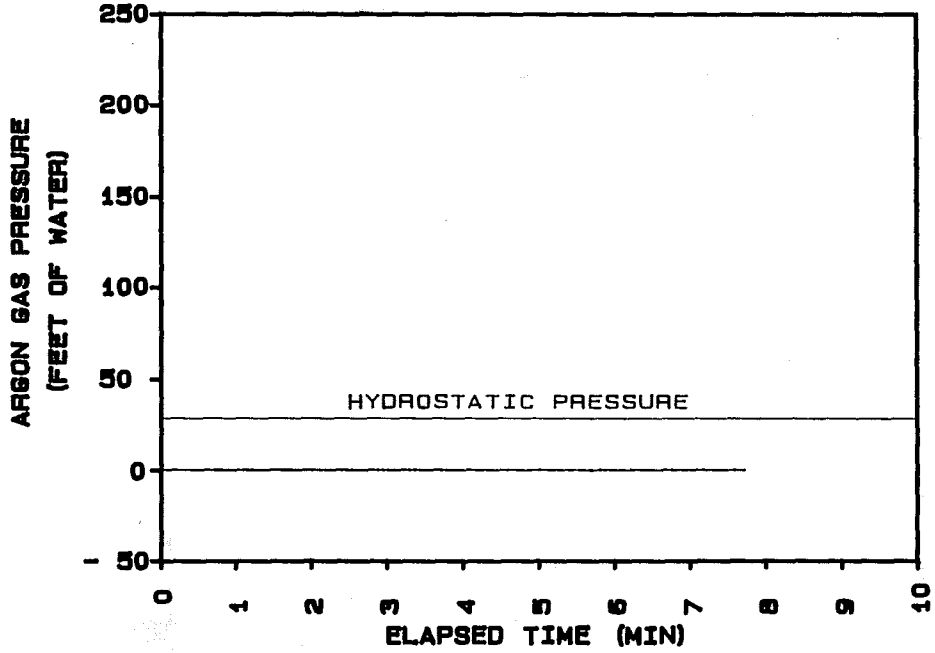
ENSAFE MEMPHIS NSA
LOCATION... 09H2142
TEST DATE
16: 30: 33 11-30-1995

SAMPLE DEPTH (FT) 42
GROUNDWATER DEPTH (FT) 16

HYDROCONE TEST



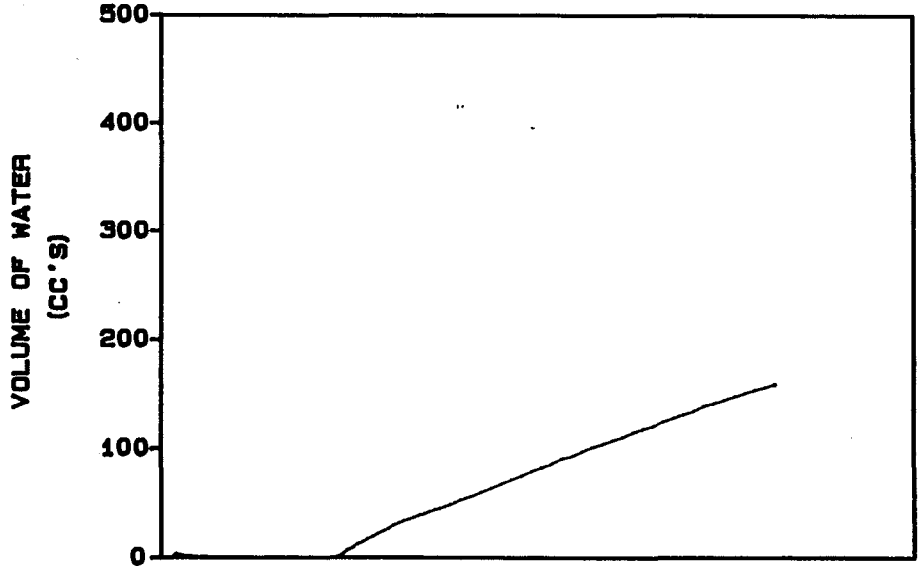


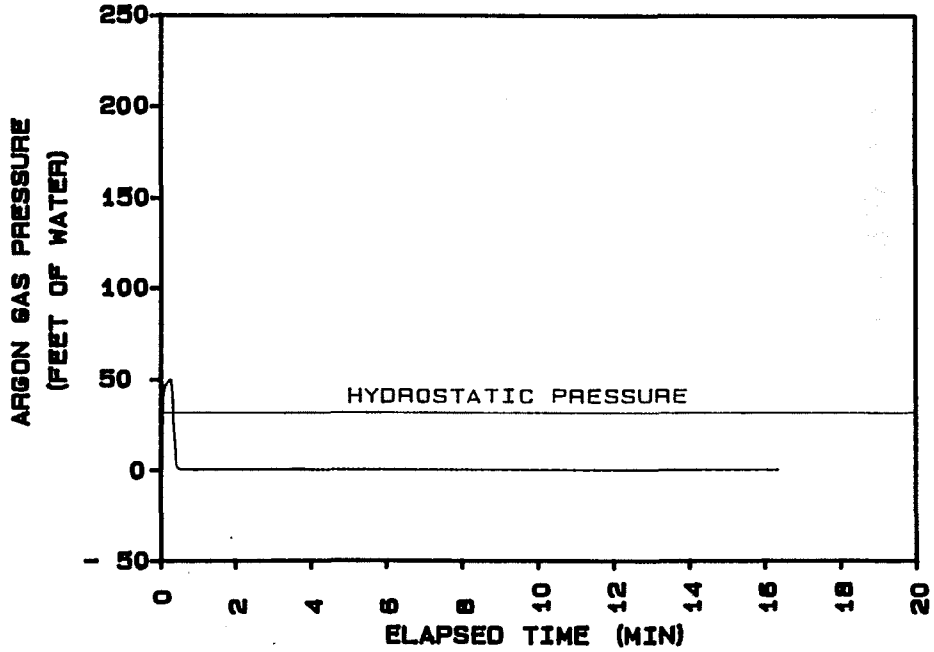


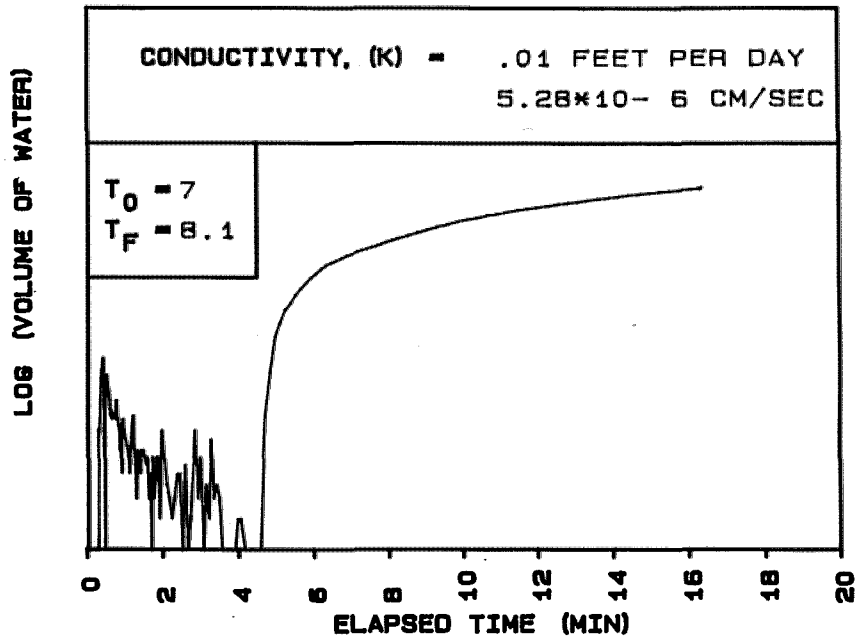
ENSAFE MEMPHIS NSA
LOCATION... 09H2244
TEST DATE
15: 01: 42 12-01-1995

SAMPLE DEPTH (FT) 44
GROUNDWATER DEPTH (FT) 18

HYDROCONE TEST







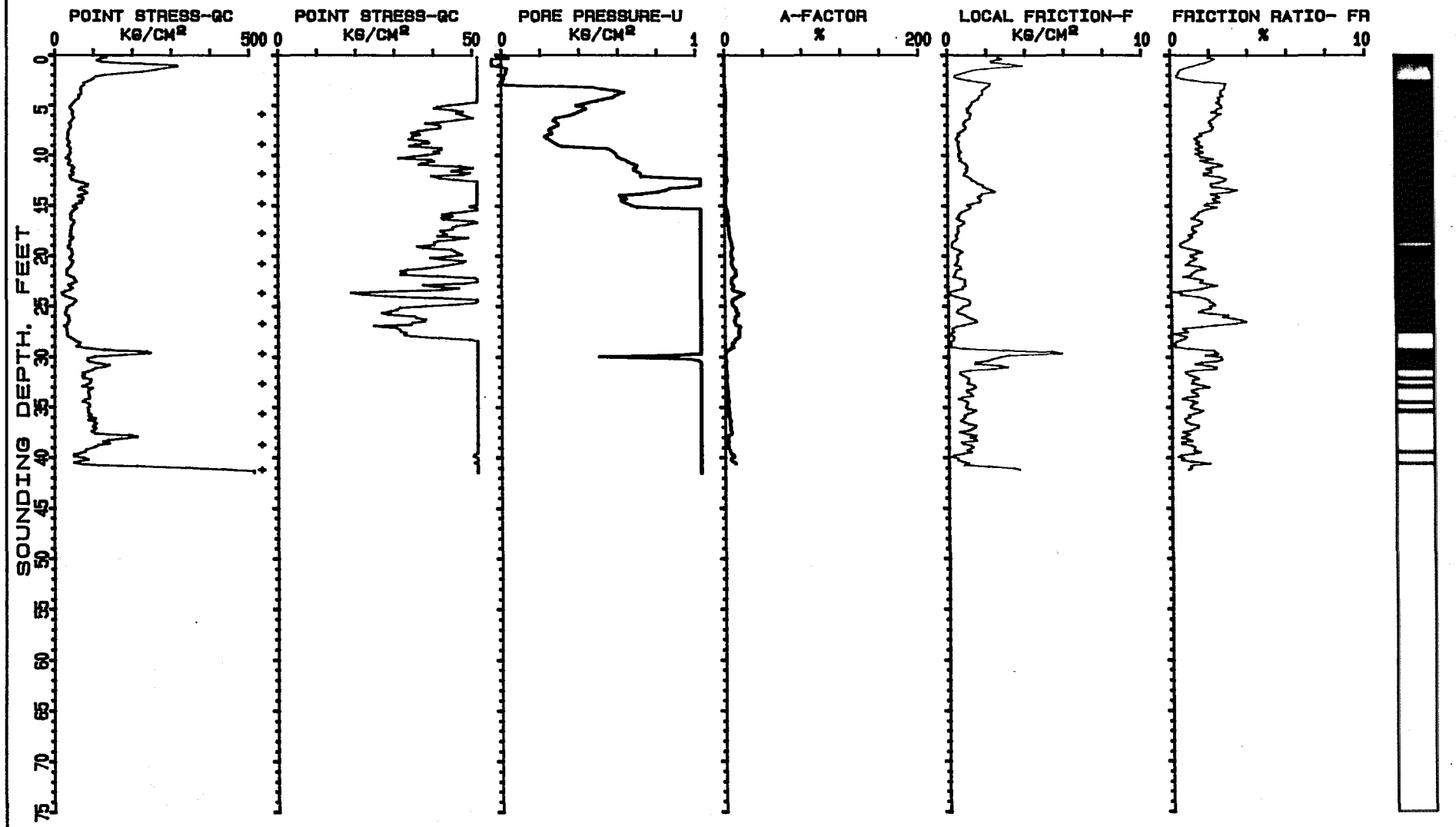
ENSAFE MEMPHIS NSA
LOCATION... 09H2347
TEST DATE
17: 35: 56 12-01-1995

SAMPLE DEPTH (FT) 47
GROUNDWATER DEPTH (FT) 16

SWMU 14

DPT SCREENING INVESTIGATION RESULTS

PIEZOCONE SOUNDING



+ PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 14-P05
TEST DATE 11-07-1995 16:06:55

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 14-P05

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N' VALUES	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%)	FRICTION ANGLE (DEGREES)	YOUNGS MODULUS (KG/CM2)	UNDRAINED SHEAR STRENGTH (KG/CM2)	SENSITIVITY	COMP.	OCR
				#			*	**	***	****			
1	SILTY FINE SAND	175.2	2.9	43	43	.03	>90%	>48	385	--	--	--	--
2	DENSE OR CEMENTED S.	246	1.23	41	41	.067	>90%	>48	541	--	--	--	--
3	SILTY FINE SAND	96.1	1.38	24	24	.098	80%-90%	>48	211	--	--	--	--
4	CLAYEY FINE SAND	70.2	1.8	28	28	.128	70%-80%	>48	154	--	--	--	--
5	CLAYEY FINE SAND	57.1	1.35	22	22	.159	60%-70%	46-48	125	--	--	--	--
6	CLAYEY FINE SAND	44.4	1.07	17	17	.19	60%-70%	44-46	97	--	--	--	--
7	CLAYEY FINE SAND	44.2	.9	17	17	.221	60%-70%	42-44	97	--	--	--	--
8	CLAYEY FINE SAND	38.5	.68	15	15	.251	50%-60%	42-44	84	--	--	--	--
9	SILTY TO CLAYEY F.S.	36	.49	12	12	.282	50%-60%	42-44	79	--	--	--	--
10	SILTY TO CLAYEY F.S.	39.1	.56	13	13	.313	50%-60%	40-42	86	--	--	--	--
11	CLAYEY FINE SAND	36.7	.77	14	14	.344	50%-60%	40-42	80	--	--	--	--
12	SILTY TO CLAYEY F.S.	45.9	.92	15	15	.375	50%-60%	40-42	100	--	--	--	--
13	CLAYEY FINE SAND	55.9	1.42	22	22	.405	60%-70%	42-44	122	--	--	--	--
14	SILTY TO CLAYEY F.S.	77	1.9	25	25	.436	70%-80%	42-44	169	--	--	--	--
15	SILTY TO CLAYEY F.S.	67.8	1.41	22	22	.467	60%-70%	42-44	149	--	--	--	--
16	SILTY TO CLAYEY F.S.	50.4	.79	16	16	.498	50%-60%	40-42	110	--	--	--	--
17	SILTY TO CLAYEY F.S.	46	.62	15	15	.528	40%-50%	40-42	101	--	--	--	--
18	SILTY TO CLAYEY F.S.	44.6	.47	14	14	.559	40%-50%	38-40	98	--	--	--	--
19	SILTY TO CLAYEY F.S.	42.9	.3	14	14	.59	40%-50%	38-40	94	--	--	--	--
20	SILTY TO CLAYEY F.S.	42.4	.47	14	14	.621	40%-50%	38-40	93	--	--	--	--
21	SILTY TO CLAYEY F.S.	44.6	.49	14	14	.651	40%-50%	38-40	98	--	--	--	--
22	SILTY TO CLAYEY F.S.	35	.4	11	11	.682	<40%	36-38	77	--	--	--	--
23	SILTY TO CLAYEY F.S.	44.9	.72	14	14	.713	40%-50%	38-40	98	--	--	--	--
24	SILTY TO CLAYEY F.S.	32.1	.31	10	10	.744	<40%	36-38	70	--	--	--	--
25	CLAYEY FINE SAND	44.4	.89	17	17	.775	<40%	38-40	97	--	--	--	--
26	CLAYEY FINE SAND	31.2	.69	12	12	.805	<40%	36-38	68	--	--	--	--
27	CLAYEY FINE SAND	34.1	.91	13	13	.836	<40%	36-38	75	--	--	--	--
28	SILTY FINE SAND	31	0	7	7	.867	<40%	34-36	68	--	--	--	--
29	SILTY FINE SAND	51.9	0	12	12	.898	<40%	38-40	114	--	--	--	--
30	SILTY TO CLAYEY F.S.	148.4	3.21	49	49	.928	70%-80%	42-44	326	--	--	--	--

14-P05 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SILTY TO CLAYEY F.S.	107	2.12	35	35	.959	60%-70%	40-42	235	--	--	--	--
32	SILTY FINE SAND	92	1.01	23	23	.99	50%-60%	40-42	202	--	--	--	--
33	SILTY TO CLAYEY F.S.	82.8	1.12	27	27	1.021	50%-60%	40-42	182	--	--	--	--
34	SILTY FINE SAND	87.6	.92	21	21	1.051	50%-60%	40-42	192	--	--	--	--
35	SILTY FINE SAND	85.7	.82	21	21	1.082	50%-60%	38-40	188	--	--	--	--
36	SILTY FINE SAND	88.4	.96	22	22	1.113	50%-60%	38-40	194	--	--	--	--
37	SILTY FINE SAND	99.2	.99	24	24	1.144	50%-60%	40-42	218	--	--	--	--
38	FINE SAND	130.6	1.05	26	26	1.177	60%-70%	40-42	287	--	--	--	--
39	FINE SAND	144.5	1.04	28	28	1.21	60%-70%	40-42	317	--	--	--	--
40	SILTY FINE SAND	73.4	.57	18	18	1.241	40%-50%	38-40	161	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

THE ABOVE DATA WAS COMPUTED FOLLOWING 'BASIC' GUIDELINES BY P. K. ROBERTSON AND R. G. CAMPANELLA IN THE HANDBOOK 'GUIDELINES FOR USE AND INTERPERTATION OF THE ELECTRONIC CONE PENETRATION TEST'

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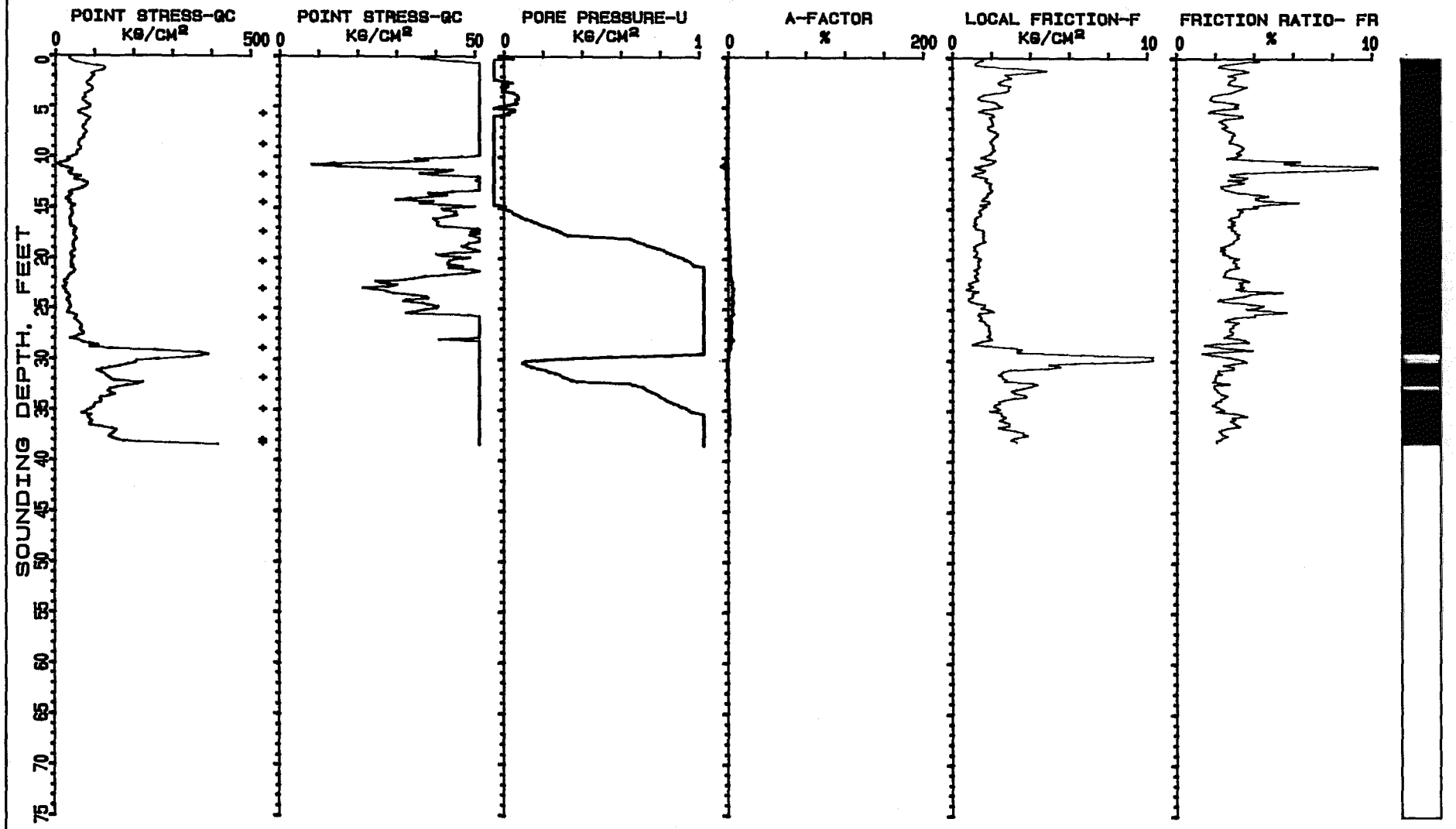
PIEZOCONE SOUNDING



* PUSH INTERRUPTED TO ADD ROD
PORE PRESSURE DECAY DATA MAY BE AVAILABLE

FILE #..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
SOUNDING # 14-P06
TEST DATE 11-07-1995 17:29:26

IN-SITU TECHNOLOGY SOIL BEHAVIOR TABLE
FOR SOUTHEASTERN UNITED STATES SOILS

JOB NAME ..... ENSAFE
MEMPHIS NSA
MILLINGTON TENNESSEE
FILE NAME..... 14-P06

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N' #	VERTICAL EFFECTIVE STRESS (KG/CM2)	RELATIVE DENSITY (%) *	FRICTION ANGLE (DEGREES) **	YOUNGS MODULUS (KG/CM2) ***	UNDRAINED SHEAR STRENGTH (KG/CM2) ****	SENSITIVITY	COMP.	OCR
1	CLAYEY FINE SAND	63.7	2.28	25	25	.03	70%-80%	>48	140	--	--	--	--
2	CLAYEY FINE SAND	112	3.46	44	44	.061	>90%	>48	246	--	--	--	--
3	CLAYEY FINE SAND	89.8	2.68	35	35	.092	80%-90%	>48	197	--	--	--	--
4	SILTY TO CLAYEY F.S.	89.4	2.02	29	29	.123	70%-80%	>48	196	--	--	--	--
5	SILTY TO CLAYEY F.S.	78	1.97	26	26	.153	70%-80%	46-48	171	--	--	--	--
6	SILTY TO CLAYEY F.S.	75.6	1.81	25	25	.184	70%-80%	46-48	166	--	--	--	--
7	SILTY TO CLAYEY F.S.	81.7	1.96	27	27	.215	70%-80%	46-48	179	--	--	--	--
8	CLAYEY FINE SAND	75.8	2.12	30	30	.246	70%-80%	44-46	166	--	--	--	--
9	CLAYEY FINE SAND	68.3	2.06	27	27	.276	70%-80%	44-46	150	--	--	--	--
10	CLAYEY FINE SAND	61	1.84	24	24	.307	60%-70%	42-44	134	--	--	--	--
11	CLAY	31	1.71	31	31	.332	--	--	--	1.89	1.8	UD	[illegible]
12	SANDY CLAY	40.3	1.49	20	20	.359	--	--	--	2.47	2.6	.01	>6
13	CLAYEY FINE SAND	69.3	1.88	27	27	.39	60%-70%	42-44	152	--	--	--	--
14	CLAYEY FINE SAND	53.8	1.78	21	21	.421	60%-70%	42-44	118	--	--	--	--
15	SILTY CLAY TO CLAY	38.4	1.62	25	25	.448	--	--	--	2.34	2.3	UD	>6
16	CLAYEY FINE SAND	44.6	1.32	17	17	.479	50%-60%	40-42	98	--	--	--	--
17	CLAYEY FINE SAND	40.8	1.2	16	16	.51	40%-50%	38-40	89	--	--	--	--
18	CLAYEY FINE SAND	49.3	1.57	19	19	.541	40%-50%	40-42	108	--	--	--	--
19	CLAYEY FINE SAND	50.3	1.3	20	20	.571	40%-50%	40-42	110	--	--	--	--
20	CLAYEY FINE SAND	46.5	1.25	18	18	.602	40%-50%	38-40	102	--	--	--	--
21	CLAYEY FINE SAND	44.8	1.28	17	17	.633	40%-50%	38-40	98	--	--	--	--
22	CLAYEY FINE SAND	43.8	1.19	17	17	.664	40%-50%	38-40	96	--	--	--	--
23	SANDY CLAY	28.2	.95	14	14	.691	--	--	--	1.67	2.9	.02	6
24	SANDY CLAY	30.3	.99	15	15	.718	--	--	--	1.8	3	.01	6
25	SILTY CLAY TO CLAY	36.8	1.53	24	24	.746	--	--	--	2.2	2.4	UD	6
26	SANDY CLAY	43.5	1.53	21	21	.773	--	--	--	2.62	2.8	.01	6
27	CLAYEY FINE SAND	61.1	1.79	24	24	.804	40%-50%	38-40	134	--	--	--	--
28	CLAYEY FINE SAND	66.5	1.84	26	26	.835	40%-50%	38-40	146	--	--	--	--
29	CLAYEY FINE SAND	74.8	2.19	29	29	.865	50%-60%	40-42	164	--	--	--	--
30	DENSE CLAYEY F. S.	281.6	8.01	140	140	.899	>90%	44-46	619	--	--	--	--

14-P06 CONTINUED ENSAFE

DEPTH FEET	SOIL BEHAVIOR TYPE	PT (KG/CM2)	LF (KG/CM2)	N VALUES	N'	VERTICAL STRESS	RELATIVE DENSITY	FRICTION ANGLE	YOUNGS MODULUS	UNDRAINED SHEAR ST	SENSITIVITY	COMP.	OCR
31	SILTY TO CLAYEY F.S.	218.4	5.26	72	72	.929	>90%	44-46	480	--	--	--	--
32	SILTY TO CLAYEY F.S.	127.3	2.56	42	42	.96	60%-70%	42-44	280	--	--	--	--
33	SILTY TO CLAYEY F.S.	170.6	3.54	56	56	.991	70%-80%	42-44	375	--	--	--	--
34	SILTY TO CLAYEY F.S.	136.6	3.05	45	45	1.022	70%-80%	42-44	300	--	--	--	--
35	SILTY TO CLAYEY F.S.	107.8	2.25	35	35	1.052	60%-70%	40-42	237	--	--	--	--
36	CLAYEY FINE SAND	86.1	2.56	34	34	1.083	50%-60%	38-40	189	--	--	--	--
37	CLAYEY FINE SAND	102.2	2.88	40	40	1.114	50%-60%	40-42	224	--	--	--	--
38	SILTY TO CLAYEY F.S.	148.4	3.41	49	49	1.145	70%-80%	42-44	326	--	--	--	--

\# N'=POINT STRESS*(.2+.04*FRICTION RATIO)
* NORMALLY CONSOLIDATED SANDS
** FOR OVERCONSOLIDATED SANDS,SLIGHTLY REDUCE ABOVE FRICTION ANGLES
*** FOR OVERCONSOLIDATED SANDS, YOUNG'S MODULUS MAY BE AS MUCH AS 3 TO 6 TIMES HIGHER
**** NK OF 16 USED. FOR OVERCONSOLIDATED CLAYS, AN NK OF 17 IS SUGGESTED

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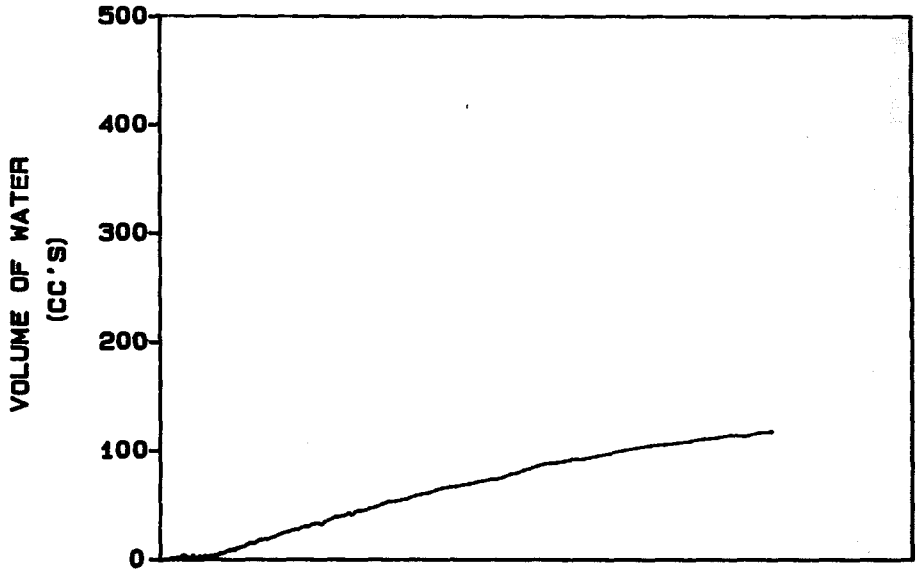
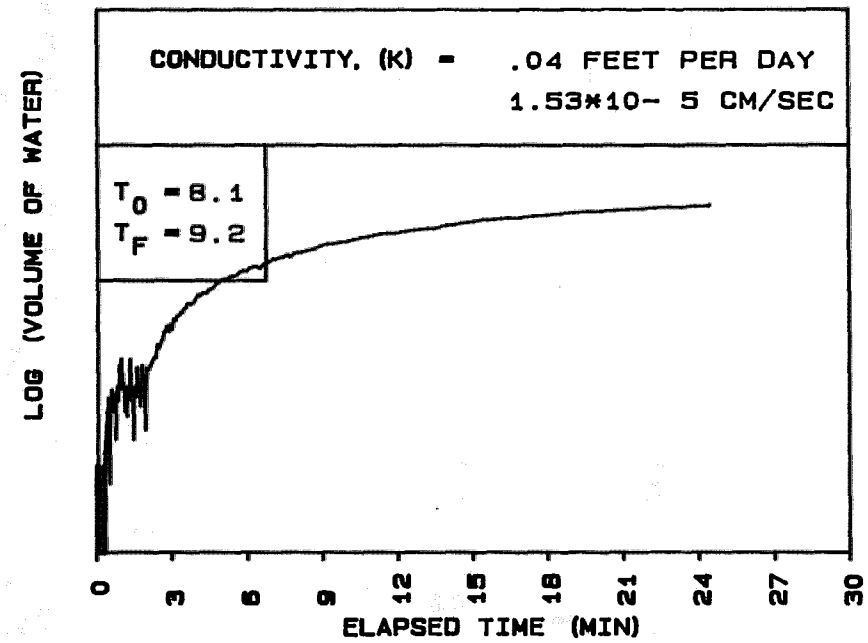
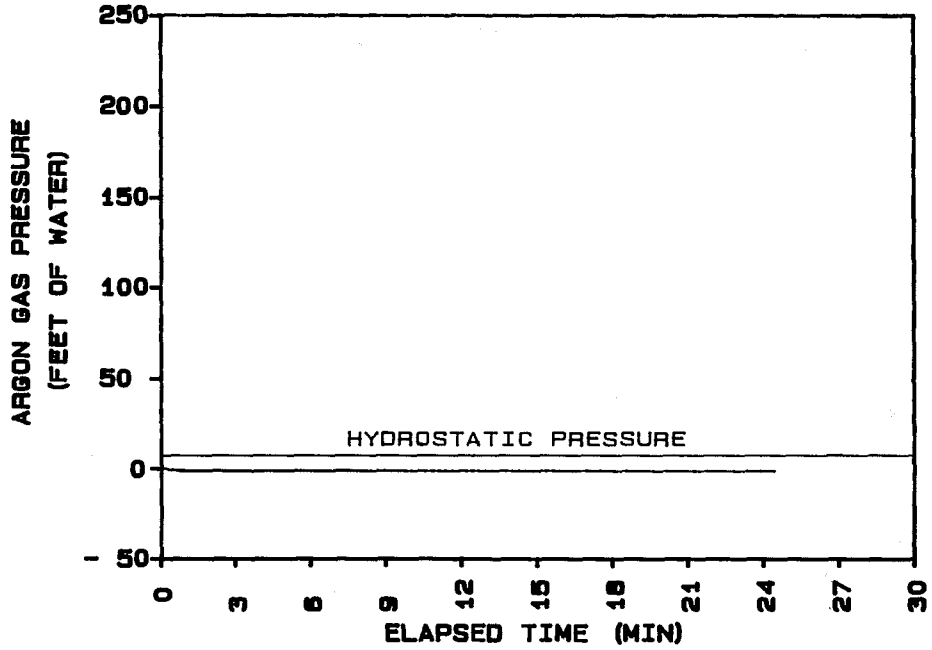
HYDROCONE TEST



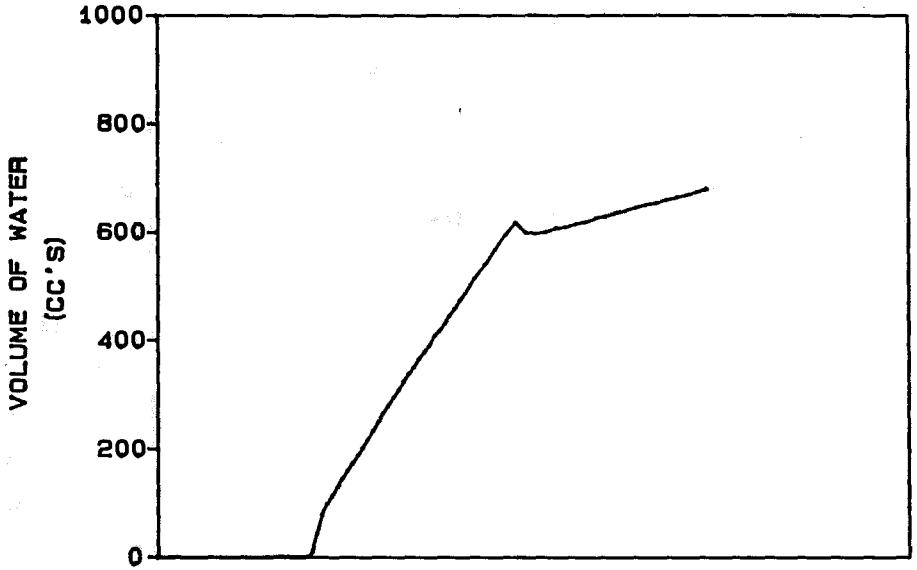


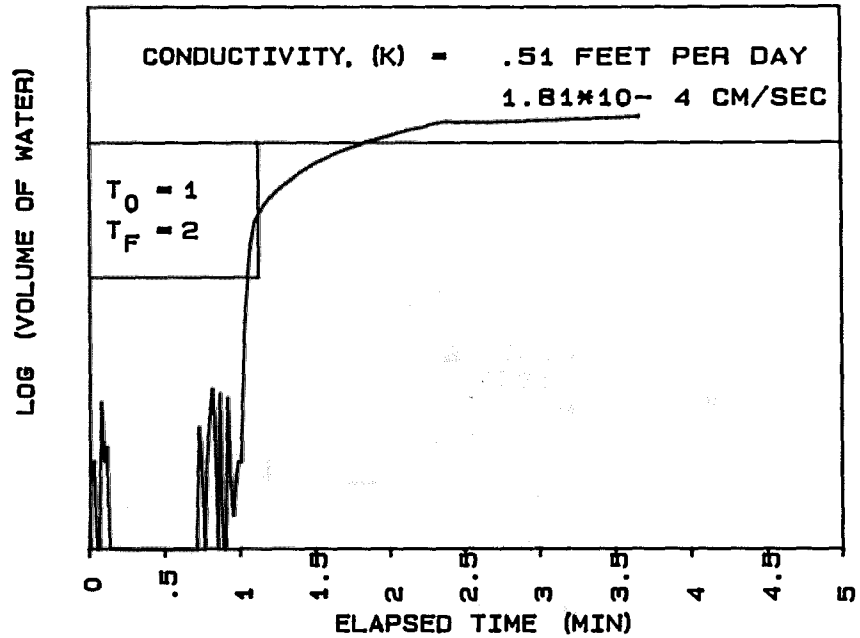


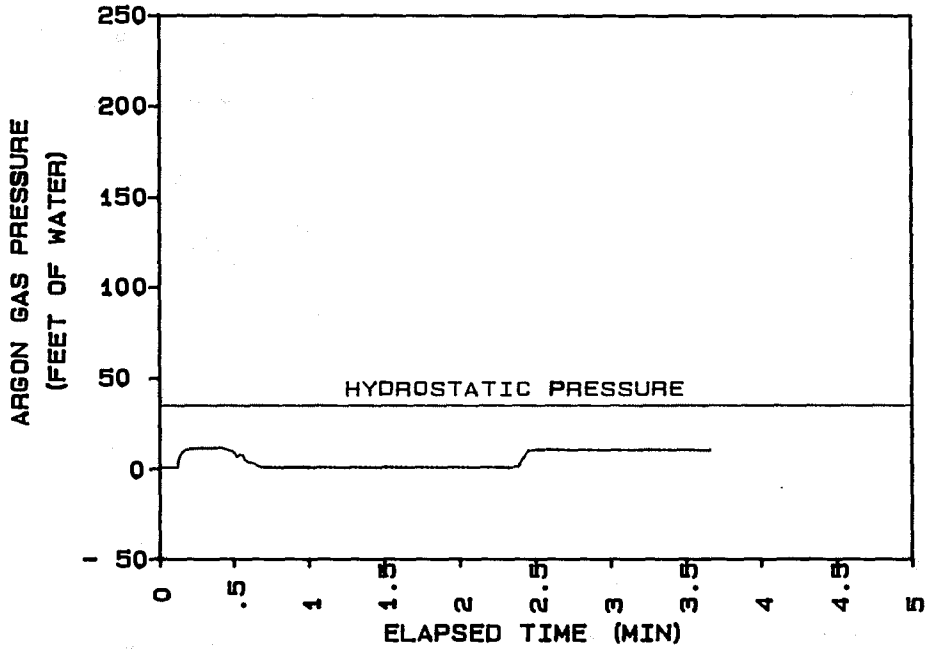
ENSAFE MEMPHIS NSA
LOCATION... 14H0512
TEST DATE
14: 49: 58 11-13-1995

SAMPLE DEPTH (FT) 12
GROUNDWATER DEPTH (FT) 5

HYDROCONE TEST



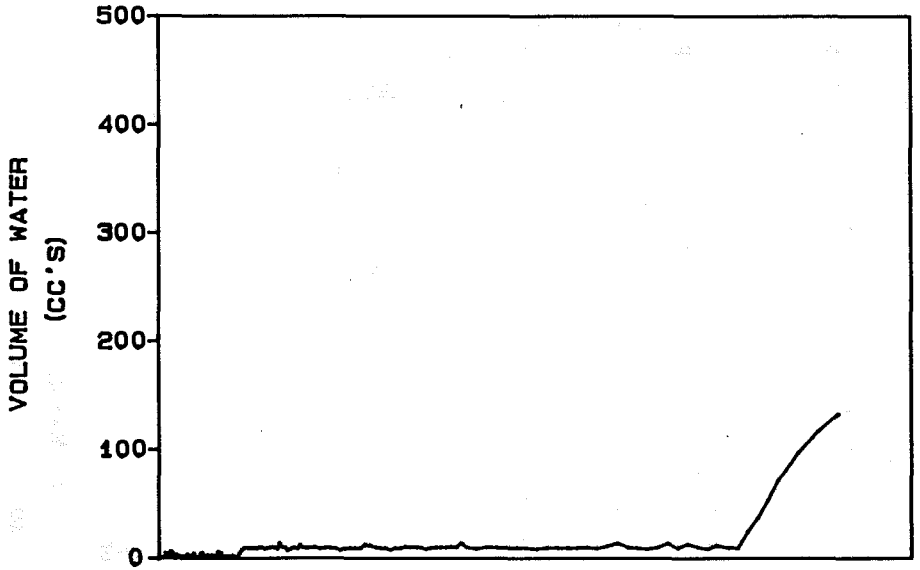


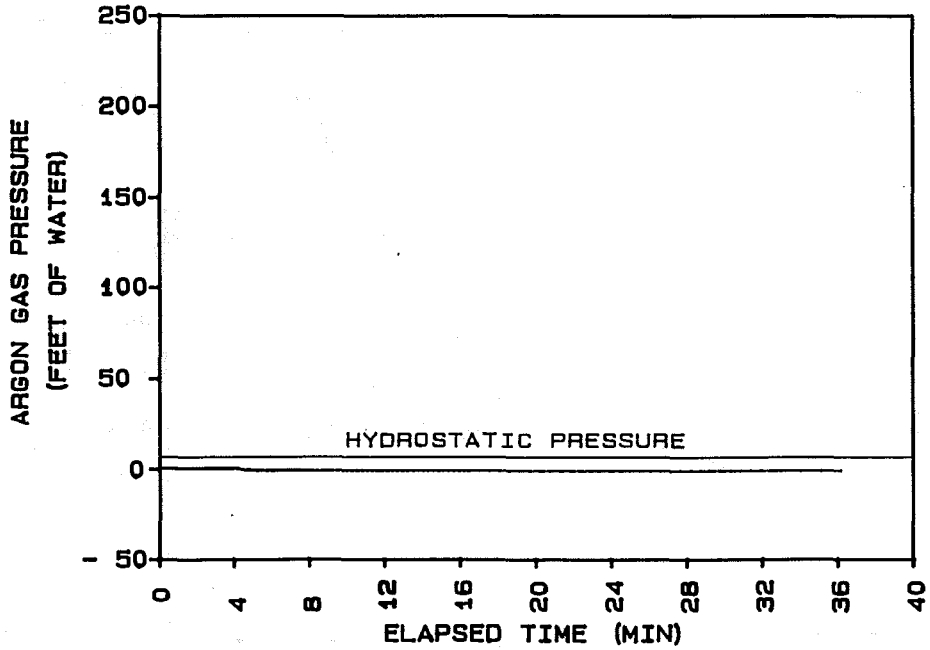


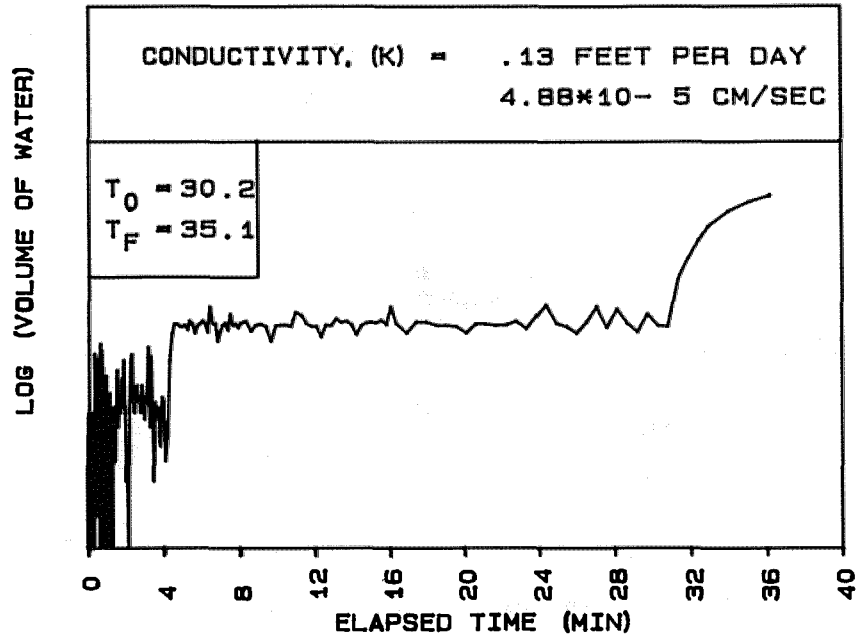
ENSAFE MEMPHIS NSA
LOCATION... 14H0545
TEST DATE
16: 41: 24 11-13-1995

SAMPLE DEPTH (FT) 45
GROUNDWATER DEPTH (FT) 11

HYDROCONE TEST







ENSAFE MEMPHIS NSA
LOCATION... 14H0711
TEST DATE
15: 41: 32 11-14-1995

SAMPLE DEPTH (FT) 11
GROUNDWATER DEPTH (FT) 5

TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 02/29/96 Project No.: E-3-157

Client's Project No.: 0106090000

Sample I.D.: 009S01DA18

Soil Description: Tan & Light Gray Silty Clay

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	122.1	120.5
Dry Density (Lbs/ft^3)	91.3	91.0
Moisture (% Dry Wt)	33.8	32.4
Porosity (n)	.43	.44
Degree of Saturation (%)	1.0	1.0
Specific Gravity (ASTM D-854)	2.59	---

Permeability

Temperature Correction, R_t = 1.043

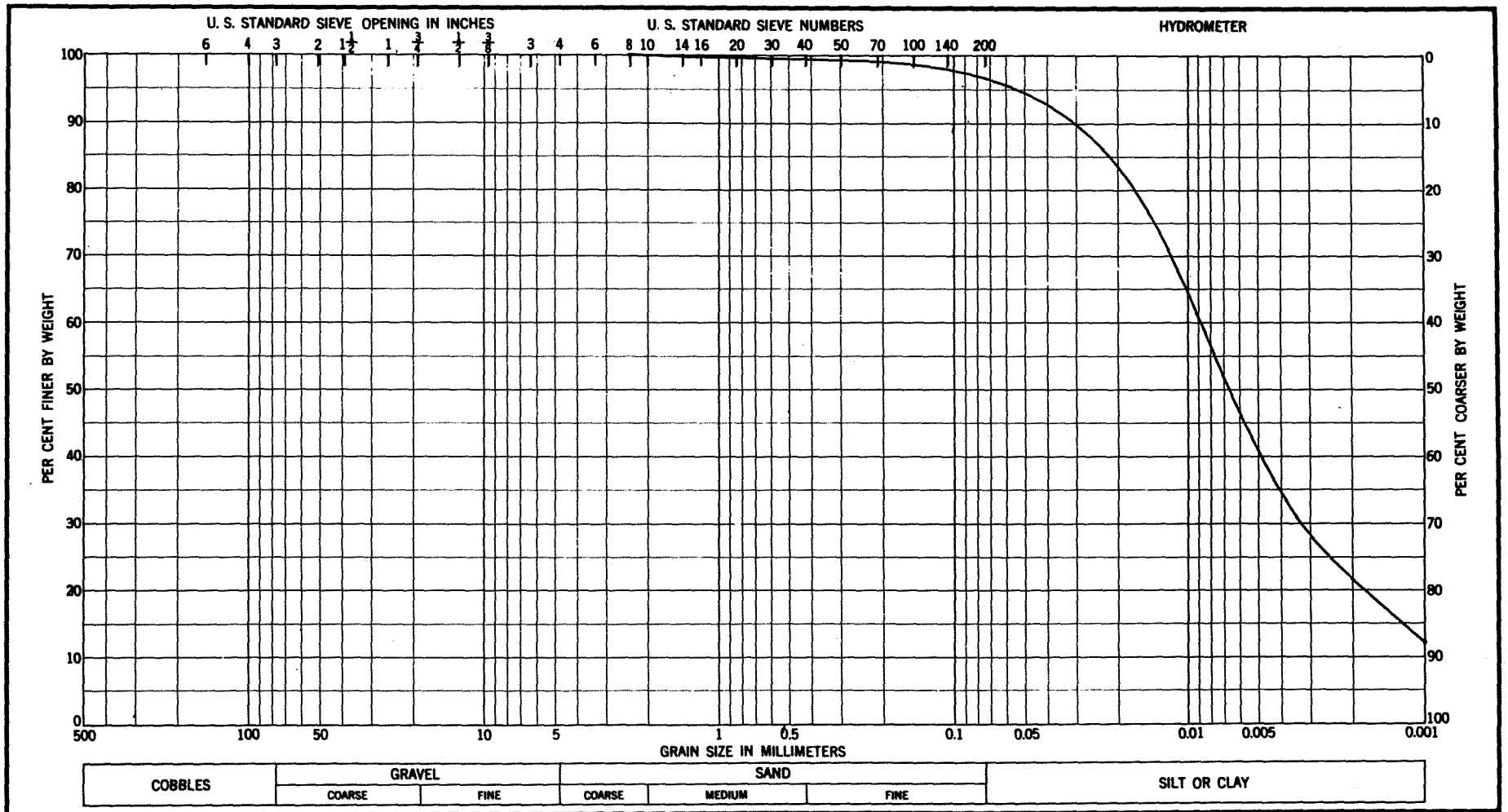
$K_1 = 9.0 \times 10^{-7}$ cm/sec
$K_2 = 8.5 \times 10^{-7}$ cm/sec
$K_3 = 9.4 \times 10^{-7}$ cm/sec
$K_4 = 9.9 \times 10^{-7}$ cm/sec

Coefficient of Permeability, $K_{20} = 9.6 \times 10^{-7}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-011 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 Fax 901-386-6614



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
009S01DA18	16'-18'		34			

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 02/29/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC.

SWMU 14

SOIL BORING/MONITORING WELL LOGS
AND
GEOTECHNICAL LABORATORY RESULTS

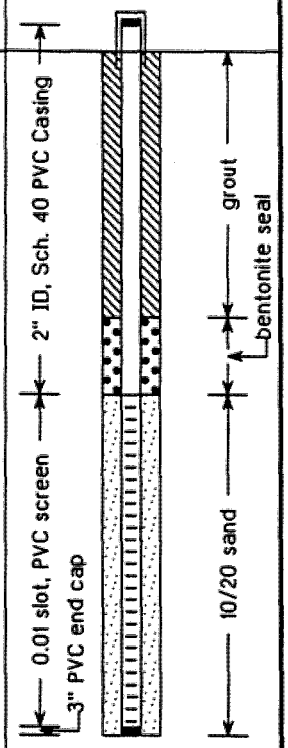
EnSafe/Allen & Hoshall

Monitoring Well 014G01LS

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *267.37 feet msl*
Started at *1030 on 1-29-96*	TOC Elevation: *269.17 feet msl*
Completed at *1245 on 1-29-96*	Depth to Groundwater: *6.79 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *262.38 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.59 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *10.34 to 20.34 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
		■	1				OL GW	(0-1') Soil and gravel.	266.4
							ML	(1-3.5') Silt and clay (see descriptions below). (1-2') Clayey silt. Dark yellowish-brown to dusky yellowish-brown in in color.	263.9
5		■	2				CL	(2-3.5') Silty clay. Dark yellowish-brown to dusky yellowish-brown in in color.	260.4
								(3.5-7') Clay, silty, pale yellowish-brown, mottled with light olive gray-colored material.	
		■	3					Collected Shelby Tube from 7' to 10'. No sample for description.	257.4
10							CL	(10-16') Clay and silt (see descriptions below). (10-15.5') Clay, silty, moderate yellowish-brown in color, mottled with light olive gray-colored silt. Iron-staining and iron-manganese nodules present near 15'.	
15							ML	(15.5-16') Clayey silt, moderate yellowish-brown in color mottled with light olive gray to greenish-gray. Iron-manganese nodules and iron staining present.	251.4
20								(16-20.5') Clayey silt, greenish-gray mottled with moderate yellowish-brown material near 18'. Iron staining increases with depth.	246.8
25								Soil boring terminated at approximately 20.5'. Note: No samples were collected for lithologic description. These descriptions were transferred from the log of adjacent monitoring well 014G01LF.	
30									
35									
40									

WELL DIAGRAM



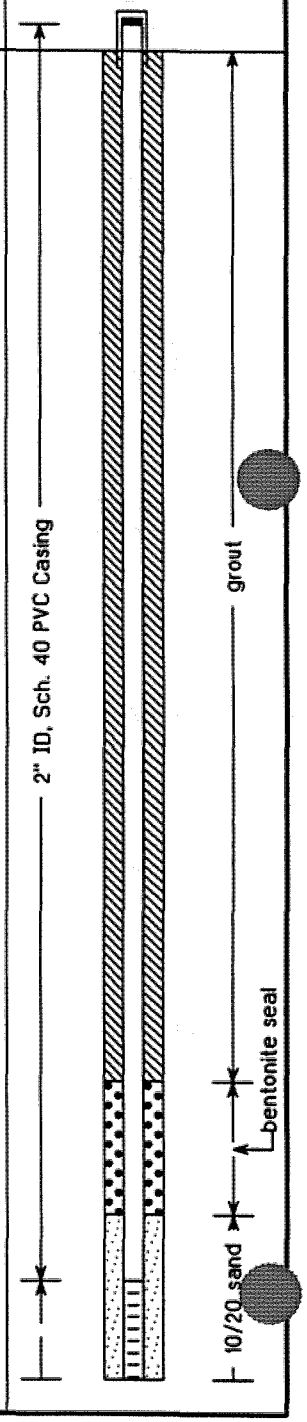
EnSafe/Allen & Hoshall

Monitoring Well 014G01LF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *267.24 feet msl*
Started at *1320 on 1-29-96*	TOC Elevation: *269.11 feet msl*
Completed at *1530 on 1-29-96*	Depth to Groundwater: *7.46 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *261.65 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *51 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *37 to 47 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					BG	OL GW	(0-1') Soil and gravel.	266.2
						ML	(1-3.5') Silt and clay (see descriptions below).	
			1	100	BG	CL	(1-2') Clayey silt. Dark yellowish-brown to dusky yellowish-brown in color.	263.7
5					5		(2-3.5') Silty clay. Dark yellowish-brown to dusky yellowish-brown in color.	
					4		(3.5-7') Clay, silty, pale yellowish-brown, mottled with light olive gray-colored material.	260.2
			2	83	3		No description available; collected a Shelby tube sample from 7' to 10' for geotechnical analysis.	257.2
10					BG		(10-16') Clay and silt (see descriptions below).	
			3	155	BG 4	CL	(10-15.5') Clay, silty, moderate yellowish-brown in color, mottled with light olive gray-colored silt. Iron-staining and iron-manganese nodules present near 15'.	
15					BG		(15.5-16') Clayey silt, moderate yellowish-brown in color mottled with light olive gray to greenish-gray. Iron-manganese nodules and iron staining present.	251.2
					BG			
20			4	97	BG BG	ML	(16-26) Clayey silt, greenish-gray mottled with moderate yellowish-brown material near 16'. Iron staining increases with depth.	
					BG			
25					BG		Iron-manganese nodules present near 26'.	
					BG		(27-32') Silt, clayey, moderate yellowish-brown in color, mottled with light olive gray to very light gray-colored material, with some hard siliceous clayey material, contains a large siliceous clay concretion at 27'.	240.2
30			5	135	BG	ML		
					BG	ML	(32-35') Clayey silt, moderate yellowish-brown mottled slightly with light olive gray to very light gray-colored material.	235.2
35					BG		(35-47') Fluvial Deposits (see descriptions below).	232.2
			6	113	BG	ML SC	(35-40') Silt, clay, and sand, with some scattered gravel, dusky yellow color mottled with light olive gray to very light gray material, moist.	
40					BG			227.2

WELL DIAGRAM



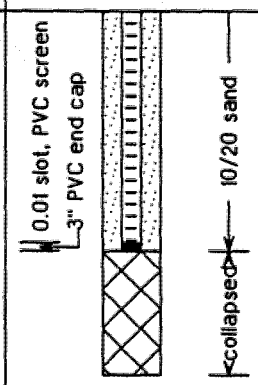
EnSafe/Allen & Hoshall

Monitoring Well 014G01LF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *267.24 feet msl*
Started at *1320 on 1-29-96*	TOC Elevation: *269.11 feet msl*
Completed at *1530 on 1-29-96*	Depth to Groundwater: *7.46 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *261.65 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *51 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *37 to 47 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
			7	93				No description available; collected a Shelby tube sample from 40' to 43' for geotechnical analysis.	227.2
			8	125	BG		SM GW	(43-43.5') Silt, sand, and gravel (up to 1" in longest dimension), very light gray, wet.	224.2 / 223.7
45					BG		SW GW	(43.5-47') Sand and gravel. Sand is fine to very coarse-grained, and gravel (up to 1.5" in longest dimension) from 44' to 45'. Moderate yellowish-brown to light gray, wet. Longest dimension of gravel increases to up to 3.5" at 47'.	220.2
					BG				
			9	142	BG		SP CL		
					BG				
50					BG			(47-51') Cockfield Formation: Very fine-grained sand, silt, and clay. Dusky yellowish-brown mottled with light olive gray near 47'.	216.2
								Soil boring terminated at 51'.	
55									
60									
65									
70									
75									
80									

WELL DIAGRAM



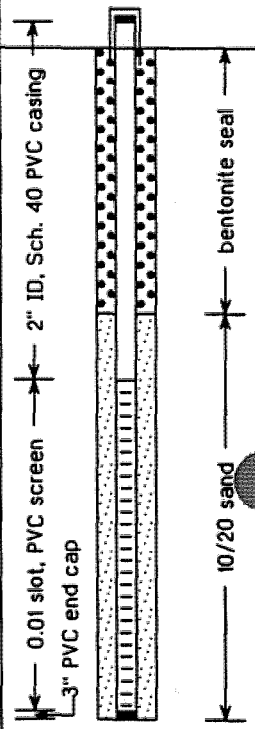
EnSafe/Allen & Hoshall

Monitoring Well 014G02LS

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *268.44 feet msl*
Started at *0850 on 2-14-96*	TOC Elevation: *270.12 feet msl*
Completed at *0915 on 2-14-96*	Depth to Groundwater: *7.61 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *262.51 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.25 feet*
Geologist: *A. Choate, C. Ivey*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
							ML GC	(0-3') Gravel, silt, clay, and bricks from 0' to 3' (fill).	
									265.4
5			1	100	BG		CL	(3-6') Clay, brownish-gray in color	
									262.4
10							ML CL	Silt and clay, light olive gray to dark yellowish-brown in color from 6' to 9'. Silt and clay, yellowish-gray to yellowish-brown in color from 9' to 20'. Moist, with iron-staining and specks of organic material.	
15			2	120	BG				
20									248.4
25								Soil boring terminated at 20'. Note: This is a replacement well. The original well was installed a few feet away on 1/23/96 but was subsequently abandoned due to faulty construction. Analytical samples indicated on this boring log were collected from the soil boring associated with the original well.	
30									
35									
40									

WELL DIAGRAM



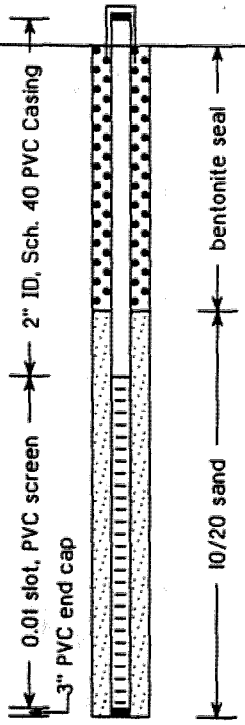
EnSafe/Allen & Hoshall

Monitoring Well 014G03LS

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *268.64 feet msl*
Started at *0745 on 2-14-96*	TOC Elevation: *271.09 feet msl*
Completed at *0815 on 2-14-96*	Depth to Groundwater: *8.39 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *262.70 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.25 feet*
Geologist: *J.A. Kingsbury*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					BG			(0-8') Clay with some silt, dark brown to brownish-gray in color.	
					5		CL ML		
5			1	70	5				
					6				260.6
					6			(8-20') Silt, light yellowish-brown to yellowish-gray in color with dark orangish-yellow mottling and specks of organic material. Moist.	
10					6				
					5		ML		
15			2	90	5			Small concretion present at 15'.	
					5				
					5				
20									248.6
								Soil boring terminated at 20'.	
25									
30									
35									
40									

WELL DIAGRAM



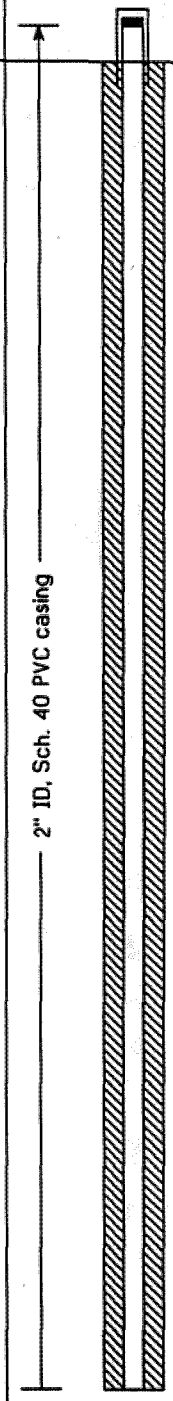
EnSafe/Allen & Hoshall

Monitoring Well 014G04LF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *268.82 feet msl*
Started at *1330 on 1-23-96*	TOC Elevation: *270.88 feet msl*
Completed at *1530 on 1-23-96*	Depth to Groundwater: *8.79 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *262.09 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *55 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *39 to 49 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					BG		OL GW	(0-2.5') Soil, gravel, brick, grass and roots (fill material).	
			1	46	BG		CL	(2.5-5') Silty clay. Dark yellowish-brown in color.	266.3
5					BG		ML	(5-20.5') Clayey silt. Moderate yellowish-brown to light olive gray in color. Mottled with light olive gray and olive gray-colored material. Iron-manganese nodules near 5'.	263.8
					BG				
					BG			Moist near 7.5'.	
10			2	107	BG			(10-12') Very moist.	
					8			Iron-manganese nodules near 11'.	
					8				
15					6				
					6				
					6				
20			3	121	6		ML	(20.5-23') Clayey silt is light olive gray in color with considerable dark yellowish-orange to moderate yellowish-brown colored iron staining. Some iron/manganese nodules are present.	248.3
					6.5		CL	(23-30') Silty clay, greenish-gray in color with some dark yellowish- orange to moderate yellowish-brown iron-staining near 23'. Iron-staining and mottled light olive brown in color near 30'.	245.8
25					6.5				
					6.5				
					5			Fluvial Deposits (30-50') contact estimated at 30'.	
30							SP		238.8

WELL DIAGRAM



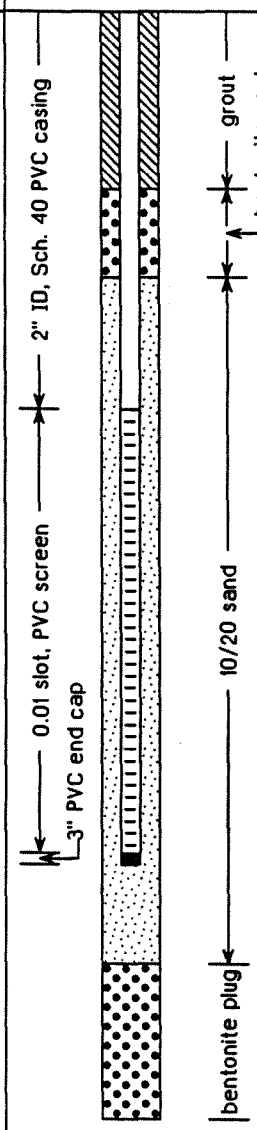
EnSafe/Allen & Hoshall

Monitoring Well 014G04LF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *268.82 feet msl*
Started at *1330 on 1-23-96*	TOC Elevation: *270.88 feet msl*
Completed at *1530 on 1-23-96*	Depth to Groundwater: *8.79 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *262.09 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *55 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *39 to 49 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
									238.8
			4	127	5		SP	(30-32') Sand, very fine-grained, moderate yellowish-brown in color mottled light gray-colored material.	236.8
					5		SM SC	(32-35') Sand (very fine to coarse-grained), silt, and clay. Moderate yellowish-brown in color mottled with light gray material. Moist near 34'. Becomes mostly very fine-grained sand and silt near 35'.	233.8
35					5		ML CL	(35-37') Silt and clay, greenish-gray in color mottled with moderate yellowish-brown material.	231.8
					4.5		SM SC	(37-38') Sand, silt, and clay. Olive gray to light brownish-gray in color.	230.8
					5.5		SC GM	(38-39') Silty and clayey sand and gravel. Light olive gray to moderate yellowish-brown in color. Wet.	229.8
40			5	113	5		GW GC	(39-42.5') Gravel, sand, and clay. Light olive gray in color, mottled with moderate yellowish-brown and dark yellowish-orange-colored material. Very cohesive and moist.	226.3
					5		SW GW	(42.5-46.5') Sand (medium to coarse-grained) and gravel (up to 1" in longest dimension. Light gray in color mottled with moderate yellowish-brown material. Wet.	
45					5				
			6	95	4				
					5		GW	(46.5-48') Sand is medium to very coarse-grained. Moderate yellowish-brown to dark yellowish-orange, wet.	220.8
50					5			(48-49.5') Gravel (up to 4" in longest dimension) with sand. Moderate yellowish-brown in color. Wet.	218.8
			7	163	4.5		SP SM	(50-55') Cockfield Formation (see description below).	
55					5			Very fine-grained silty sand, moderate yellowish-brown to dusky yellowish brown with light olive gray laminations.	213.8
								Soil boring terminated at 55'.	
60									

WELL DIAGRAM



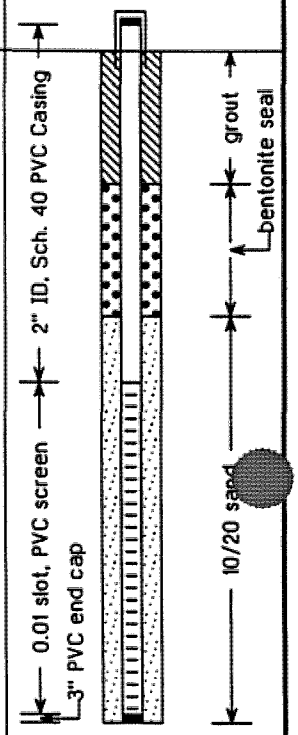
EnSafe/Allen & Hoshall

Monitoring Well 014G05LS

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *268.24 feet msl*
Started at *1445 on 1-21-96*	TOC Elevation: *270.12 feet msl*
Completed at *1605 on 1-21-96*	Depth to Groundwater: *9.84 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *260.28 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.25 feet*
Geologist: *A. Choate, C. Ivey*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
							OL	(0-1.5') Soil and grass.	266.7
			1	108	BG		ML CL	(1.5-20') Silt and clay (see descriptions below). (1.5-6') Silt and clay, dark yellowish-brown in color, becoming dark yellowish-brown to pale yellowish-brown in color near 6'. Dry.	
5									
10			2	118	BG			Clayey silt, dark yellowish-brown to dark yellowish-orange in color mottled with medium light gray-colored material. Slightly moist. Contains iron-manganese nodules.	
15								Wet from 15' to 16'. The percentage of iron-manganese nodules increases near 16'.	
			3	142	BG			(16-20') Very clayey silt, light olive gray in color mottled with dark yellowish-brown to dark yellowish-orange material. The percentage of mottled material decreases with depth. Very moist. Contains iron-manganese nodules.	248.2
20								Terminated soil boring at 20'.	
25									
30									
35									
40									

WELL DIAGRAM



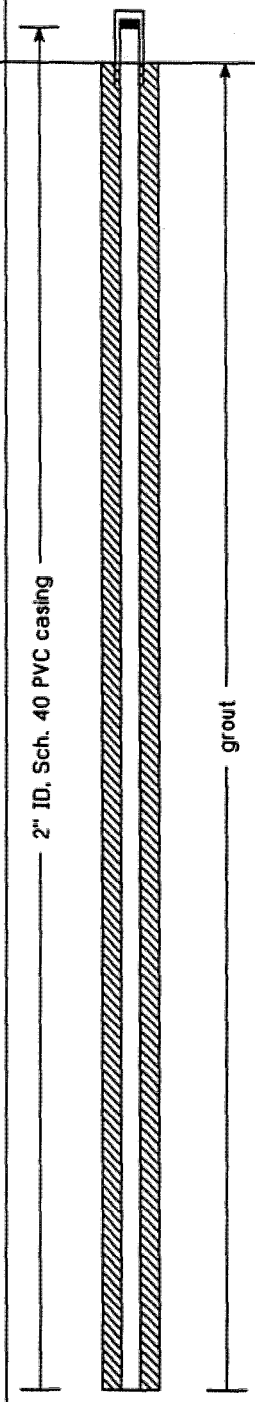
EnSafe/Allen & Hoshall

Monitoring Well 014G06LF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *268.62 feet msl*
Started at *1450 on 1-20-96*	TOC Elevation: *270.57 feet msl*
Completed at *0850 on 1-21-96*	Depth to Groundwater: *10.32 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *260.25 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *56 feet*
Geologist: *A. Choate, C. Ivey*	Well Screen: *39 to 49 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					BG		OL	(0-2') Soil, roots, and brick fragments. Soil is dark yellowish-brown to moderate yellowish-brown.	266.6
			1	72	BG		ML CL	(2-17') Clayey silt and silty clay (see descriptions below).	
5					BG			(2-6.5') Very clayey silt. Moderate yellowish-brown to dark yellowish- brown in color. Color becomes lighter near 6.5'.	
					BG			(6.5-17') Silty clay. Moderate yellowish-brown in color mottled with yellowish-gray-colored material. Contains iron-manganese nodules. Slightly moist, becoming more moist, oxidized, and stained dark yellowish-orange near 11'.	
					BG				
10					BG				
			2	89	BG				
					BG				
15					BG				
					BG				251.6
					BG			(17-37') Silt, clayey (see descriptions below).	
					BG			(17-26') Clayey silt. Light olive gray to greenish-gray in color. Slightly moist. Becoming stiff near 26'.	
20			3	95	BG				
					BG		ML		
25					BG				
					BG			(26-32') Clayey silt, moderate yellowish-brown in color mottled with light olive-gray material. The percentage of light olive gray material progressively decreases from 26' to 32'. Iron concretions are present near 26'. Slightly moist at 26' becoming more moist near 32'.	
					BG				
30									

WELL DIAGRAM



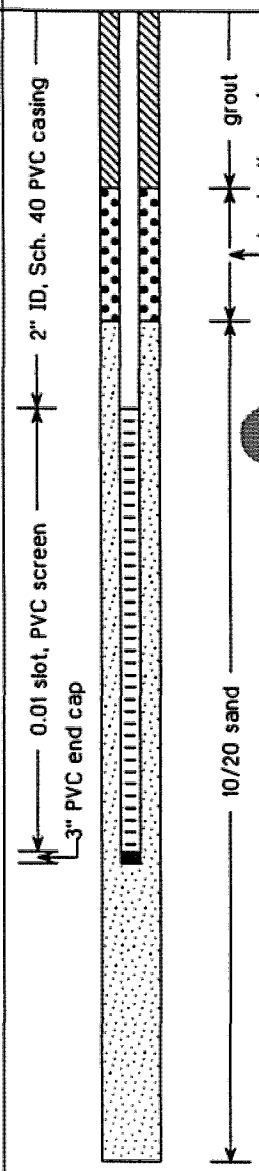
EnSafe/Allen & Hoshall

Monitoring Well 014G06LF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *268.62 feet msl*
Started at *1450 on 1-20-96*	TOC Elevation: *270.57 feet msl*
Completed at *0850 on 1-21-96*	Depth to Groundwater: *10.32 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *260.25 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *56 feet*
Geologist: *A. Choate, C. Ivey*	Well Screen: *39 to 49 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
			4	113	BG				
					BG		ML	(32-36') Silt, clayey, moderate yellowish-brown in color and slightly moist.	
35					BG				
					BG			(36-37') Clayey silt, moderate yellowish-brown in color mottled with light olive gray material, slightly moist.	231.6
					BG			(37-49') Fluvial Deposits (see descriptions below). (37-49') Sand and gravel (see descriptions below).	
40			5	97	BG			(37-38') Fine-grained sand and silt with gravel (up to 2" in longest dimension). Moderate yellowish-brown.	
					BG		SM GW	(38-42') Sand, fine, and gravel (up to 2" in longest dimension), silty, moderate brown mottled with pale yellowish-brown material.	
45					BG			(42-45') Sand (fine to coarse-grained) and gravel (up to 2" in longest dimension). Moderate brown to dark yellowish-orange in color. Wet.	
					BG			(45-49') Sand, medium to coarse, and gravel (up to 2" in longest dimension), moderate yellowish-brown to dark yellowish-orange. Wet.	
					BG			(49-56') Cockfield Formation (see description below).	219.6
50			6	114	BG			Silty, very fine-grained sand with silty clay laminations. Sand is dusky yellowish brown in color; clay laminations are light gray in color.	
					BG		SM CL		
55					BG			Becoming waxy near 56'.	
								Soil boring terminated at 56'.	212.6
60									

WELL DIAGRAM



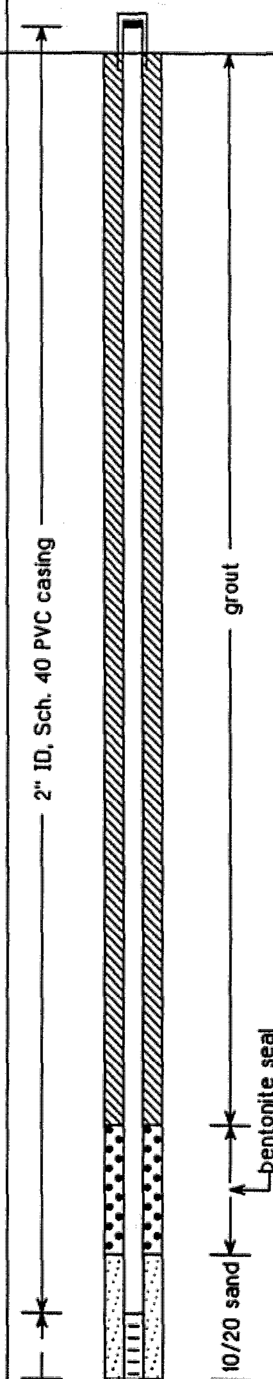
EnSafe/Allen & Hoshall

Monitoring Well 014G07LF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *268.88 feet msl*
Started at *1000 on 1-22-96*	TOC Elevation: *270.63 feet msl*
Completed at *1145 on 1-22-96*	Depth to Groundwater: *9.30 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *261.33 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *50 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *38 to 48 feet*

Depth in Feet	Analytical Sample	Sample No.	% Recovery	PID (ppm)	Soil Class	Geologic Description	Elev. (ft-msl)
0–5	■ ■	1	50	BG BG BG BG	OL	(0-5') Soil, concrete, and rubble (fill). Note: Concrete was encountered at 2' below ground surface.	263.9
5–22	■	2 3	 139	BG BG BG BG BG BG BG BG	CL/ML	(5-22') Clay and silt (see descriptions below). (5-12') Silty clay. Dark yellowish-brown in color mottled with moderate yellowish-brown to dark yellowish-orange-colored material. Mottling increases in content progressively near 12'. Hard from 4' to 7'. Silt content increases near 11'. (12-16') Silty clay, olive gray to light olive gray in color mottled with moderate yellowish-brown to dark yellowish-orange-colored material. Contains iron-manganese nodules, increasing in percentage around 16'. (16-22') Clayey silt. Moderate yellowish-brown in color mottled with light olive gray-colored material. Contains scattered iron- manganese nodules. Dark yellowish-orange staining near 21'.	246.9
22–32.5		4	118	BG BG BG BG BG	ML	(22-32.5') Silt (see descriptions below). (22-25') Silt, medium dark gray to medium gray, mottled with some moderate yellowish-brown material near 22' where a few scattered iron-manganese nodules are located. (25-31.5') Silt, olive gray to greenish-gray in color, mottled with moderate yellowish-brown near 32.5'. Contains iron staining and iron-manganese nodules mostly near 29'. (31.5-32.5') Silt, moderate yellowish-brown mottled with light gray.	236.4
32.5–36				BG BG	ML	(32.5-36') Clayey silt, moderate yellowish-brown in color. Mottled with light gray material near 34'.	232.9
36–40				BG BG	SM/GW	(36-48') Fluvial Deposits (see descriptions below). (36-43.5') Sand, silty, with gravel (see descriptions below). (36-37.5') Silty sand (very fine-grained) with gravel. Moderate yellowish-brown in color.	

WELL DIAGRAM



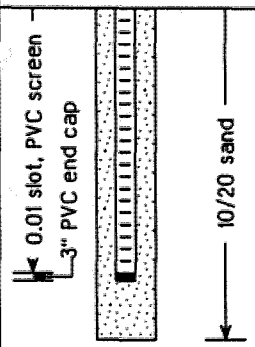
EnSafe/Allen & Hoshall

Monitoring Well 014G07LF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *268.88 feet msl*
Started at *1000 on 1-22-96*	TOC Elevation: *270.63 feet msl*
Completed at *1145 on 1-22-96*	Depth to Groundwater: *9.30 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *261.33 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *50 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *38 to 48 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
			5	107	BG		SM/GW	Very silty sand (fine to coarse-grained) and gravel (up to 2" in longest dimension) subangular to rounded. Moderate yellowish-brown in color mottled with light olive gray and some dark yellowish- orange-colored material. From 37.5' to 41.5', sample is very difficult to split.	225.4
					BG				
45					BG		SW/GW	(43.5-48') Sand and gravel, gravel and sand (see descriptions below).	
					BG				
			6	120	BG		SM	(43.5-46') Sand (medium to coarse-grained) and gravel (up to 2" in longest dimension). Dark yellowish-orange to moderate yellowish- brown in color. Wet.	220.9
50								(46-48') Gravel and sand, dark yellowish-orange to moderate yellowish- brown. Wet.	218.9
55								(48-50') Cockfield Formation (see description below).	
								Very fine-grained silty sand. Mottled with gray to light gray-colored very fine-grained sand, which decreases with depth. Becomes clayey near 50'.	
60								Soil boring terminated at 50'.	
65									
70									
75									
80									

WELL DIAGRAM



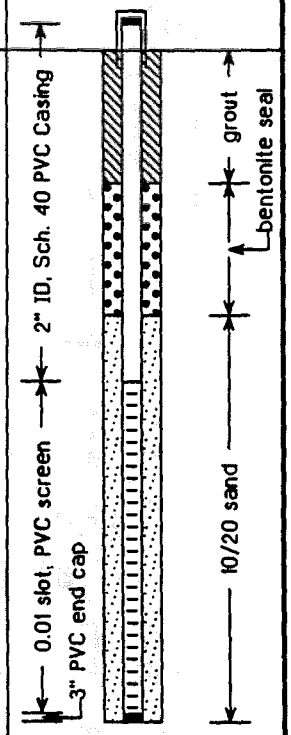
EnSafe/Allen & Hoshall

Monitoring Well 014G08LS

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)*
Project No.: *0106-08420*	Surface Elevation: *268.52 feet msl*
Started at *1500 on 1-22-96*	TOC Elevation: *268.14 feet msl*
Completed at *1530 on 1-22-96*	Depth to Groundwater: *6.48 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *261.66 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.25 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
			1	40	1 BG		OL	(0-5') Fill material: Soil, with bits of concrete and grass and roots.	
5					BG				263.5
					BG			(5-17') Clay and silt (see descriptions below).	
					BG			(5-7') Silty clay. Moderate yellowish-brown to dark yellowish-orange in color and mottled with light olive gray-colored material. Slightly moist.	
10			2	82	BG BG		CL ML	(7-16') Clayey silt. Moderate yellowish-brown to dark yellowish- orange in color mottled with light olive gray and some dark yellowish- orange material. Slightly moist.	
15					BG BG			Moisture content increases near 16'. Sparse iron-manganese nodules are present near 16'.	252.5
20			3	75	BG BG		ML	(16-17') Clayey silt moderate yellowish-brown to dark yellowish-orange in color and mottled with olive gray to light olive gray-colored material. Considerable iron staining. Contains iron-manganese nodules. Moist.	248.5
								(17-20') Silt, clayey, olive gray to light olive gray in color slightly mottled with dark yellowish-orange-colored material. Contains iron-manganese nodules, moist.	
25								Terminated soil boring at 20'.	
30									
35									
40									

WELL DIAGRAM



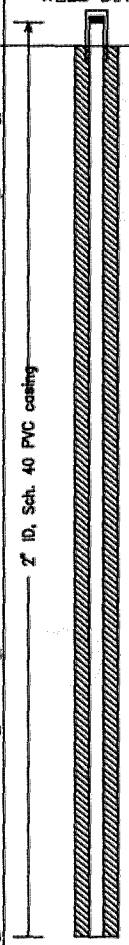
EnSafe/Allen & Hoshall

Monitoring Well 014G04LF

Project: NSA Memphis	Location: Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)
Project No.: 0106-08420	Surface Elevation: 268.82 feet msl
Started at 1330 on 1-23-96	TOC Elevation: 270.88 feet msl
Completed at 1530 on 1-23-96	Depth to Groundwater: 8.79 feet Measured: 4/8/96
Drilling Method: Rotasonic-4" inner core barrel/6" OD casing	Groundwater Elevation: 262.09 feet msl
Drilling Company: Alliance Environmental, Inc.	Total Depth: 55 feet
Geologist: D. Ladd, W. Parks	Well Screen: 39 to 49 feet

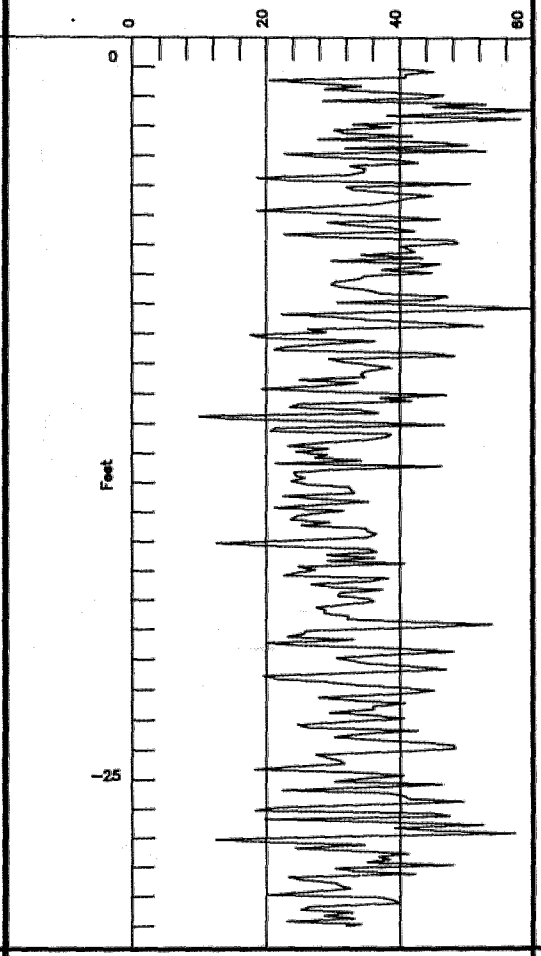
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					BG		OL GW	(0-2.5') Soil, gravel, brick, grass and roots (fill material).	
			1	46	BG		CL	(2.5-5') Silty clay. Dark yellowish-brown in color.	266.3
5					BG			(5-20.5') Clayey silt. Moderate yellowish-brown to light olive gray in color. Mottled with light olive gray and olive gray-colored material. Iron-manganese nodules near 5'.	263.8
					BG				
					BG			Moist near 7.5'.	
10			2	107	BG			(10-12') Very moist.	
					B			Iron-manganese nodules near 11'.	
					B		ML		
15					6				
					6				
					6				
20			3	121	6		ML	(20.5-23') Clayey silt is light olive gray in color with considerable dark yellowish-orange to moderate yellowish-brown colored iron staining. Some iron/manganese nodules are present	248.3
					6.5				245.8
25					6.5		CL	(23-30') Silty clay, greenish-gray in color with some dark yellowish- orange to moderate yellowish-brown iron-staining near 23'. Iron-staining and mottled light olive brown in color near 30'.	
					6.5				
					5			Fluvial Deposits (30-50') contact estimated at 30'.	
30							SP		238.8

WELL DIAGRAM



GAMMA RAY LOG

COUNTS PER SECOND



CASING TYPE: 2" PVC

TOP OF LOG = GROUND SURFACE

DATE LOGGED: 05/22/96

NOTES

RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

SWMU 14
BUILDING S-140 AND
SEVENTH AVENUE DRAINAGE DITCH

DWG DATE: 12/10/96

DWG NAME: 94GL144

LOGGED BY:
GEOLOGICAL LOGGING SYSTEMS

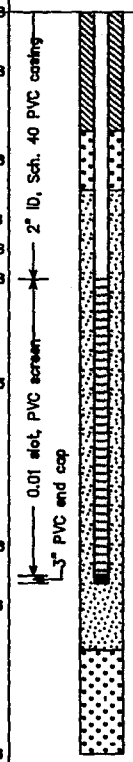
EnSafe/Allen & Hoshall

Monitoring Well 014G04LF

Project: NSA Memphis	Location: Millington, TN. SWMU #14 (S-140/7th Ave. Ditch)
Project No.: 0106-08420	Surface Elevation: 268.82 feet msl
Started at 1330 on 1-23-96	TOC Elevation: 270.88 feet msl
Completed at 1530 on 1-23-96	Depth to Groundwater 8.79 feet Measured: 4/8/96
Drilling Method: Rotosonic-4" inner core barrel/8" OD casing	Groundwater Elevation: 262.09 feet msl
Drilling Company: Alliance Environmental, Inc.	Total Depth: 55 feet
Geologist: D. Ladd, W. Parks	Well Screen: 39 to 49 feet

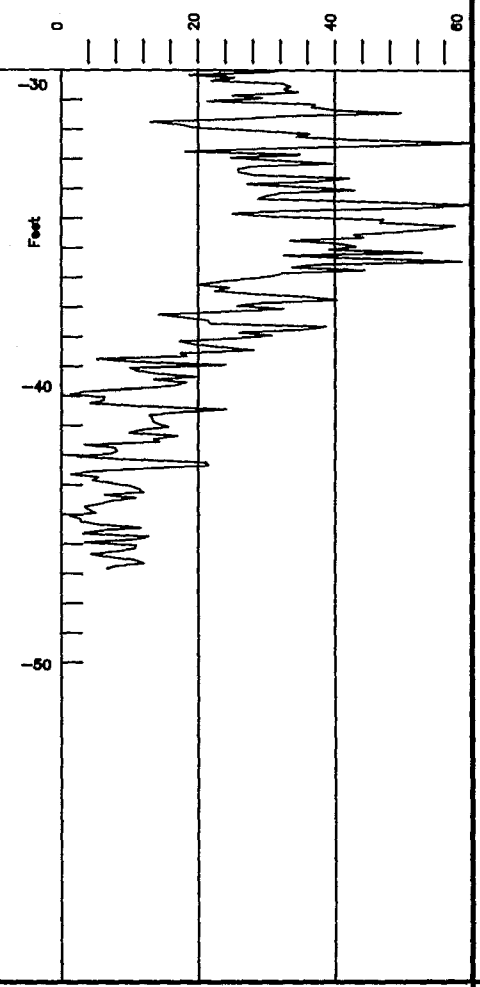
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
									238.8
			4	127	5		SP	(30-32') Sand, very fine-grained, moderate yellowish-brown in color mottled light gray-colored material.	236.8
					5		SM SC	(32-35') Sand (very fine to coarse-grained), silt, and clay. Moderate yellowish-brown in color mottled with light gray material. Moist near 34'. Becomes mostly very fine-grained sand and silt near 35'.	233.8
35					5		ML CL	(35-37') Silt and clay, greenish-gray in color mottled with moderate yellowish-brown material.	231.8
					4.5		SM SC	(37-38') Sand, silt, and clay. Olive gray to light brownish-gray in color.	230.8
					5.5		SC GM	(38-39') Silty and clayey sand and gravel. Light olive gray to moderate yellowish-brown in color. Wet.	229.8
40			5	113	5		GW GC	(39-42.5') Gravel, sand, and clay. Light olive gray in color, mottled with moderate yellowish-brown and dark yellowish-orange-colored material. Very cohesive and moist.	226.3
					5				
45					5		SW GW	(42.5-46.5') Sand (medium to coarse-grained) and gravel (up to 1" in longest dimension. Light gray in color mottled with moderate yellowish-brown material. Wet.	
					4				
			6	95				(46.5-48') Sand is medium to very coarse-grained. Moderate yellowish-brown to dark yellowish-orange, wet.	220.8
					5		GW		
50					5			(48-49.5') Gravel (up to 4" in longest dimension) with sand. Moderate yellowish-brown in color. Wet.	218.8
			7	163	4.5		SMS SM	(50-55') Cookfield Formation (see description below).	
55					5			Very fine-grained silty sand, moderate yellowish-brown to dusky yellowish brown with light olive gray laminations.	213.8
								Soil boring terminated at 55'.	
60									

WELL DIAGRAM



GAMMA RAY LOG

COUNTS PER SECOND



CASING TYPE: 2" PVC

TOP OF LOG = GROUND SURFACE

DATE LOGGED: 05/22/96

NOTES

RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

SWMU 14
BUILDING S-140 AND
SEVENTH AVENUE DRAINAGE DITCH

DWG DATE: 12/10/96

DWG NAME: 94GL144A

LOGGED BY:
GEOLOGICAL LOGGING SYSTEMS

TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 02/22/96 Project No.: E-3-157

Client's Project No.: 0106090000

Sample I.D.: 014S01LF10

Soil Description: Light Gray Clayey Silt

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	120.0	117.8
Dry Density (Lbs/ft^3)	90.8	92.6
Moisture (% Dry Wt)	32.1	27.2
Porosity (n)	.44	.43
Degree of Saturation (%)	1.00	.95
Specific Gravity (ASTM D-854)	2.59	---

Permeability

Temperature Correction, $R_t = 1.000$

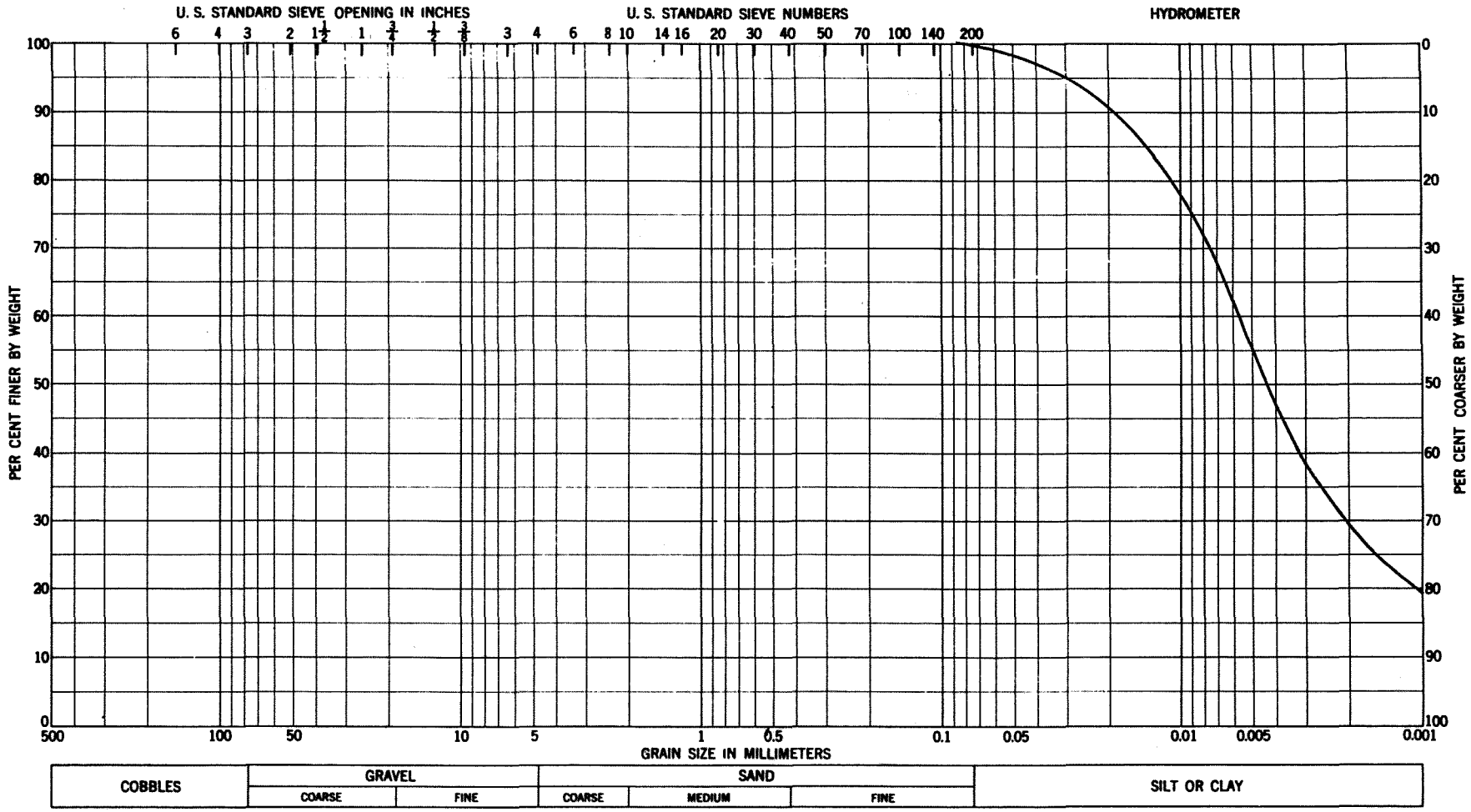
$K_1 = 4.4 \times 10^{-7}$ cm/sec
$K_2 = 3.9 \times 10^{-7}$ cm/sec
$K_3 = 4.0 \times 10^{-7}$ cm/sec
$K_4 = 4.3 \times 10^{-7}$ cm/sec

Coefficient of Permeability, $K_{20} = 4.2 \times 10^{-7}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-005 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 Fax 901-386-6614



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
014S01LF10	7-10'		32	--	--	--

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 02/23/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC.

TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 02/22/96 Project No.: E-3-157

Client's Project No.: 0106090000

Sample I.D.: 014S01LF43

Soil Description: Light Gray & Tan Silty Clay with Sand and small gravel

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	127.0	133.4
Dry Density (Lbs/ft^3)	105.2	113.5
Moisture (% Dry Wt)	20.7	17.5
Porosity (n)	.32	.26
Degree of Saturation (%)	1.0	1.20
Specific Gravity (ASTM D-854)	2.47	---

Permeability

Temperature Correction, $R_t = 1.010$

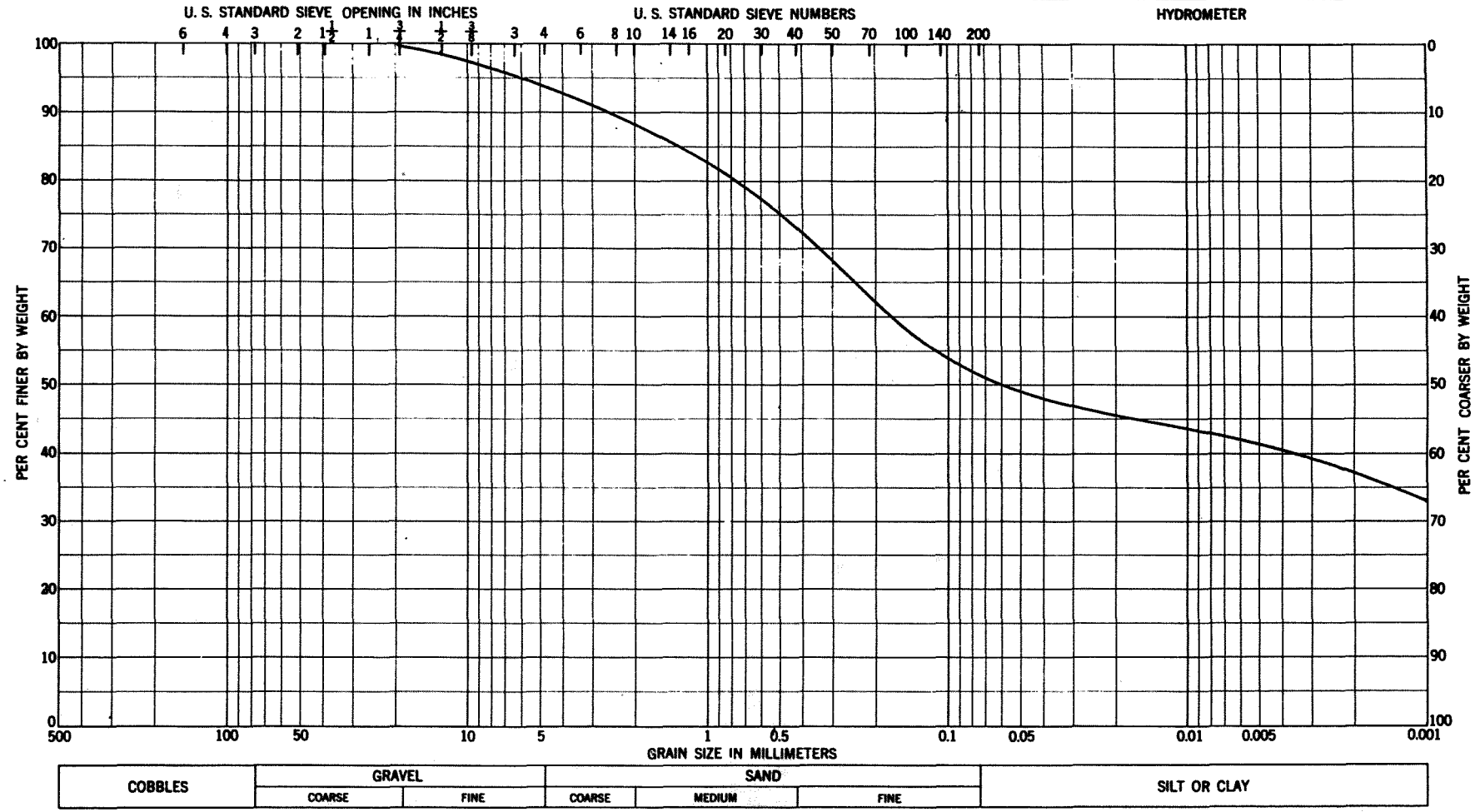
$K_1 = 3.7 \times 10^{-7}$ cm/sec
$K_2 = 4.0 \times 10^{-7}$ cm/sec
$K_3 = 4.2 \times 10^{-7}$ cm/sec
$K_4 = 4.1 \times 10^{-7}$ cm/sec

Coefficient of Permeability, $K_{20} = 4.0 \times 10^{-7}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-006 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 FAX 901-386-6614



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
014S01LF43	40-43'		21	--	--	--

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 02/23/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC.

SWMU 59

SOIL BORING/MONITORING WELL LOGS
AND
GEOTECHNICAL LABORATORY RESULTS

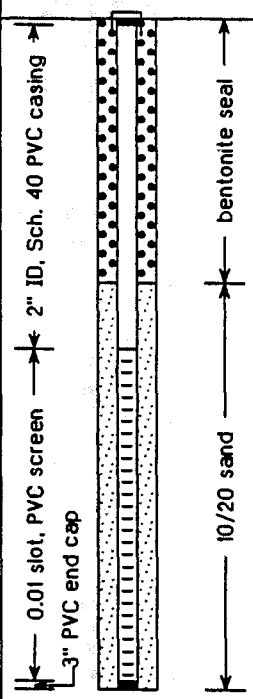
EnSafe/Allen & Hoshall

Monitoring Well 059G01LS

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #59 (Old Pesticide Shop)*
Project No.: *0106-08420*	Surface Elevation: *263.40 feet msl*
Started at *1000 on 3-4-96*	TOC Elevation: *263.24 feet msl*
Completed at *1046 on 3-4-96*	Depth to Groundwater: *7.55 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *255.69 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.25 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
			1	100			GW	(0-1') Asphalt and gravel fill.	262.4
			2	100			OL GW	(1-2') Soil and gravel fill.	261.4
			3	100			ML	(2-7') Clayey silt, olive gray in color, moist, with a trace of organic material.	
5					1.6				
			4	83	1.8				256.4
					2.4		CL	(7-11') Silty clay, olive gray in color. Contains organic material. Iron-staining from 9' to 11'.	
10					2.0				252.4
					1.6			(11-20') Clay, olive gray to light olive gray in color with dark yellowish-orange iron-staining. Contains abundant iron-manganese nodules.	
15			5	120	1.6		CL		
					1.8			Less dark yellowish-orange iron-staining from 16' to 17'.	
					2.0				
20								Terminated soil boring at 20'.	243.4
25									
30									
35									
40									

WELL DIAGRAM



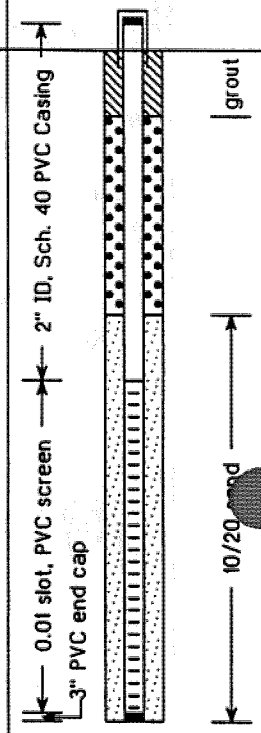
EnSafe/Allen & Hoshall

Monitoring Well 059G02LS

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #59 (Old Pesticide Shop)*
Project No.: *0106-08420*	Surface Elevation: *263.16 feet msl*
Started at *0822 on 3-2-96*	TOC Elevation: *265.18 feet msl*
Completed at *0900 on 3-2-96*	Depth to Groundwater: *10.14 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *255.04 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.25 feet*
Geologist: *D. Ladd, C. Ivey*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
							OL	(0-2') Soil, moderate yellowish-brown in color with roots.	261.2
							ML	(2-4.5') Silt, moderate yellowish-brown mottled with olive gray material, predominantly near 4.5'.	258.7
5			1	65			ML	(4.5-9') Clayey silt, olive gray in color. Contains iron-manganese nodules. Mottled with moderate yellowish-brown colored material near 9'. Moist from 5' to 6'. Dry and crumbly from 7' to 8'.	254.2
10							ML CL	(9-18.5') Silt and silty caly (see descriptions below). (9-10') Silt. Moderate yellowish-brown in color mottled with olive gray-colored material. Very common iron-manganese nodules.	
15			2	75				(10-18') Silty clay. Olive gray in color and mottled with moderate yellowish-brown-colored material, mostly moderate yellowish-brown near 10' and again at 18'. Very common iron-manganese nodules.	244.7
20							CL	(18-18.5') Silt. Moderate yellowish-brown in color mottled with olive gray-colored material. Dry. Contains common iron-manganese nodules.	243.2
								(18.5-20') Clay, olive gray in color, moist.	
25								Terminated soil boring at 20'. Note: Due to the potential for significant contamination in this soil boring, no samples were field screened for organic vapors so that the well could be completed in minimal time.	
30									
35									
40									

WELL DIAGRAM



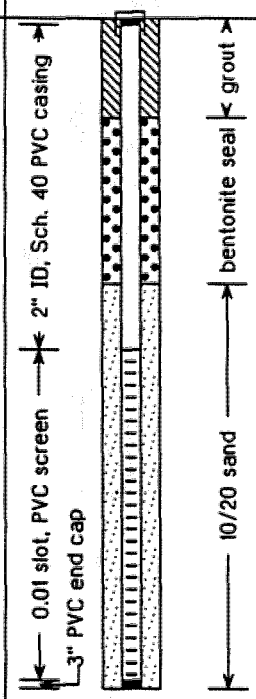
EnSafe/Allen & Hoshall

Monitoring Well 059G03LS

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #59 (Old Pesticide Shop)*
Project No.: *0106-08420*	Surface Elevation: *263.54 feet msl*
Started at *1237 on 3-4-96*	TOC Elevation: *263.35 feet msl*
Completed at *1330 on 3-4-96*	Depth to Groundwater: *9.50 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *253.85 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.25 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *10 to 10 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
			1				OL GW	(0-1') Asphalt, soil, and gravel fill.	262.5
5			2				ML	(1-12') Silt. Moderate yellowish-brown in color mottled with light olive gray material. Organic material and less light olive gray material from 2' to 12'. Moist from 7' to 10'.	
10			3					Very moist from 10' to 12'.	251.5
								No description available; collected a Shelby tube sample from 12' to 15'.	248.5
15							ML	(15-16') Silt, moderate yellowish-brown in color mottled with light olive gray material.	247.5
							ML	(16-20') Silt, light olive gray in color, mottled with a light moderate yellowish-brown material.	243.5
20								Terminated soil boring at 20'. Note: No samples were collected for lithologic description. These descriptions were transferred from the log for adjacent monitoring well 059G03UF.	
25									
30									
35									
40									

WELL DIAGRAM



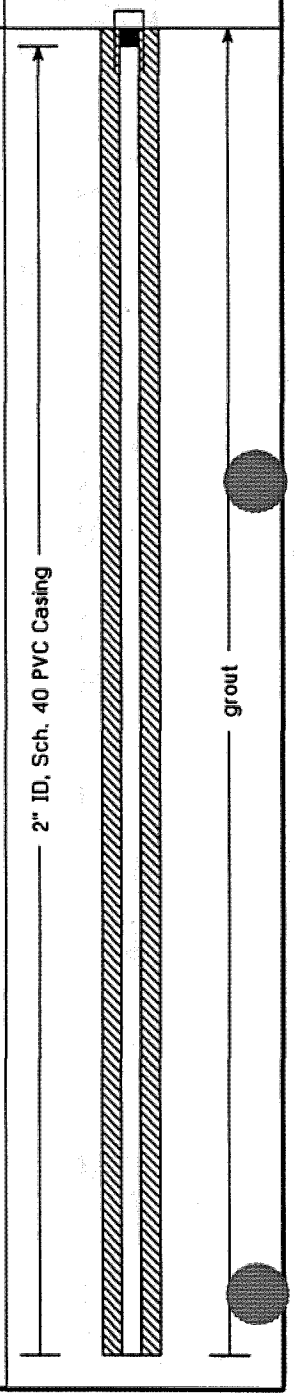
EnSafe/Allen & Hoshall

Monitoring Well 059G03UF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #59 (Old Pesticide Shop)*
Project No.: *0106-08420*	Surface Elevation: *263.51 feet msl*
Started at *1337 on 3-4-96*	TOC Elevation: *263.32 feet msl*
Completed at *1457 on 3-4-96*	Depth to Groundwater: *14.63 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - "4 inner core barrel/6" OD casing*	Groundwater Elevation: *248.69 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *56 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *44 to 54 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
	X		1	100			OL GW	(0-1') Asphalt, soil, and gravel fill.	
					.8				262.5
	X		2	100				(1-12') Silt, moderate yellowish-brown in color mottled with light olive gray-colored material. Contains organic and less light olive gray material from 2' to 12'.	
					1.0				
5					1.0				
							ML		
			3	95	2.2			Moist from 7' to 10'.	
					1.0				
10								Very moist from 10' to 12'.	
					1.2				
									251.5
								No description available; collected Shelby tube sample from 12' to 15'.	
			4	83					
15					.6		ML		248.5

WELL DIAGRAM



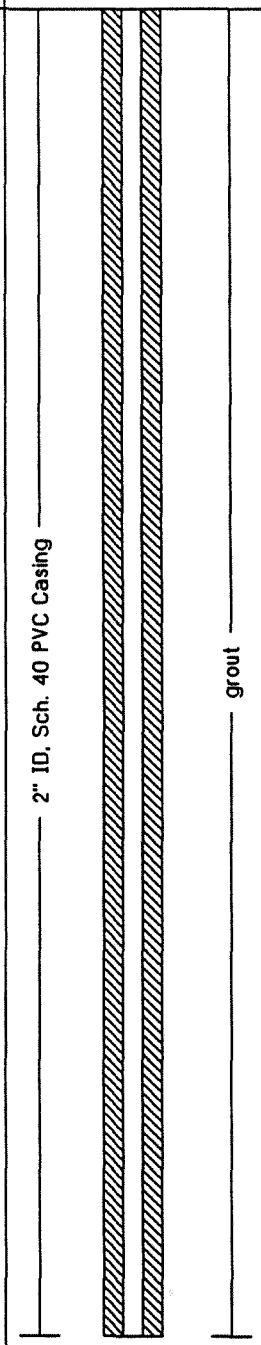
EnSafe/Allen & Hoshall

Monitoring Well 059G03UF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #59 (Old Pesticide Shop)*
Project No.: *0106-08420*	Surface Elevation: *263.51 feet msl*
Started at *1337 on 3-4-96*	TOC Elevation: *263.32 feet msl*
Completed at *1457 on 3-4-96*	Depth to Groundwater: *14.63 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - "4 inner core barrel/6" OD casing*	Groundwater Elevation: *248.69 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *56 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *44 to 54 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
							ML	(15-16') Silt, moderate yellowish-brown in color mottled with light olive gray-colored material.	248.5
					1.4		ML	(16-22') Silt, light olive gray in color, mottled with a light moderate yellowish-brown-colored material from 16' to around 20'.	247.5
					1.6				
20			5	82	2.0				
					1.4		ML	(22-26') Silt, moderate yellowish-brown to dusky yellow in color. Contains iron-staining and iron-manganese nodules.	241.5
25					0.8				
					1.2		ML	(26-31') Silt, moderate yellowish-brown to dark yellowish-orange in color mottled with dark yellowish-brown-colored material.	237.5
					1.4				
30									

WELL DIAGRAM



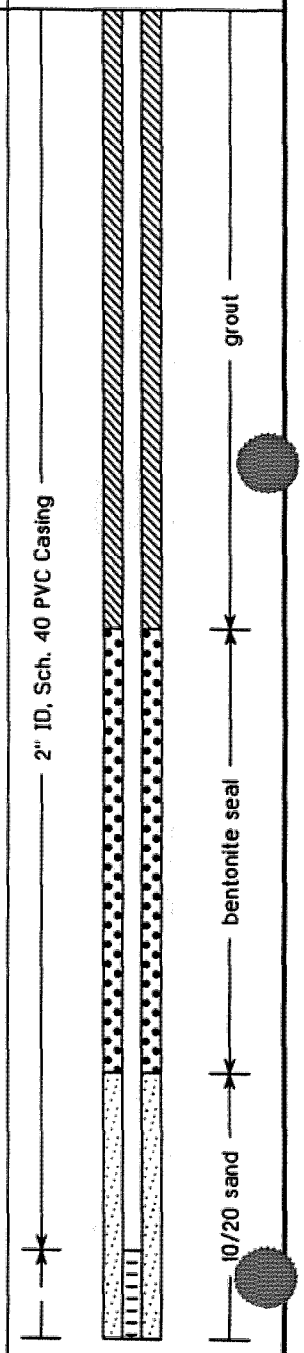
EnSafe/Allen & Hoshall

Monitoring Well 059G03UF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #59 (Old Pesticide Shop)*
Project No.: *0106-08420*	Surface Elevation: *263.51 feet msl*
Started at *1337 on 3-4-96*	TOC Elevation: *263.32 feet msl*
Completed at *1457 on 3-4-96*	Depth to Groundwater: *14.63 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - "4 inner core barrel/6" OD casing*	Groundwater Elevation: *248.69 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *56 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *44 to 54 feet*

DEPTH IN FEET	SAMPLE NO.	% RECOVERY	PID (ppm)	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
				ML		
	6	100	1.4			232.5
					(31-35') Silt, moderate yellowish-brown in color mottled with very fine, very light gray colored sand. Dark yellowish-orange staining and iron-manganese nodules are present near 35'.	
			1.4	ML		
35			1.4			228.5
				SW	(35-36.5') Sand, very fine-grained, very light gray in color mottled with dark yellowish-orange material. Wet.	
				SW GW	Contains some coarse dark yellowish-orange sand from 36' to 36.5'.	227
			2.4		(36.5-37') Sand (medium to very coarse-grained) and gravel. Moderate yellowish-brown to dark yellowish-orange in color.	226.5
	7	100		CL		
			2.6	SM	(37-39') Sandy clay, moderate yellowish-brown to dark yellowish- orange in color mottled with very light gray-colored material. Becomes mostly pale yellowish-brown in color near 39'.	224.5
40					Top of Fluvial Deposits estimated at 39'.	223.5
					(39-40') Silty sand, medium to coarse-grained, with scattered gravel. Moderate yellowish-brown to dark yellowish-orange. Wet.	
	8	100			No description available; collected a Shelby tube sample from 40' to 43'.	
			1.4			220.5
				SW GW	(43-44.5') Sand, fine to very coarse-grained, moderate yellowish-brown to dark yellowish-orange, and gravel, up to .75" in longest dimension, angular to rounded, composed of quartz and chert, wet.	
	9	125				219
45			1.2	SW GW		

WELL DIAGRAM



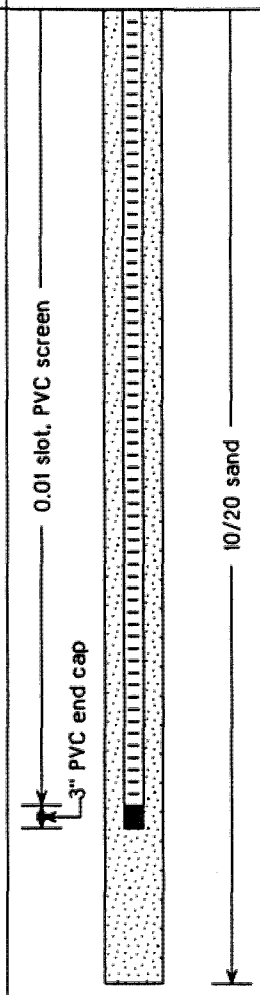
EnSafe/Allen & Hoshall

Monitoring Well 059G03UF

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #59 (Old Pesticide Shop)*
Project No.: *0106-08420*	Surface Elevation: *263.51 feet msl*
Started at *1337 on 3-4-96*	TOC Elevation: *263.32 feet msl*
Completed at *1457 on 3-4-96*	Depth to Groundwater: *14.63 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - "4 inner core barrel/6" OD casing*	Groundwater Elevation: *248.69 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *56 feet*
Geologist: *D. Ladd, W. Parks*	Well Screen: *44 to 54 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					1.2		SW/GW	(44.5-47.5') Sand, coarse to very coarse-grained, moderate yellowish- brown to dark yellowish-orange, and gravel, up to 2.5" in longest dimension, composed mostly of angular chert, wet.	216
							SW/GW	(47.5-48') Sand, fine to coarse-grained, very light gray and mottled with dark yellowish-orange, and gravel, up to 1.5" in longest dimension, composed mostly of angular to rounded quartz and chert, wet.	215.5
					1.0		SW		214.5
50							SW/GW	(48-49') Sand, fine to medium-grained, with rare quartz gravel. Yellowish-gray in color mottled with dark yellowish-orange material, slightly micaceous, wet.	
			10	130	1.6			(49-51.5') Sand (fine to coarse-grained) and gravel (mostly quartz and chert); dark yellowish-orange in color mottled with yellowish-gray material; micaceous; wet.	212
					1.6		SW/GW	(51.5-53.5') Sand, fine to very coarse-grained, and gravel (quartz and chert) is up to .75" in longest dimension; yellowish-gray and wet.	210
55					0.8		SW	(53.5-56') Sand, fine to medium-grained, with rare gravel. Yellowish- gray color, micacous, wet.	207.5
60								Terminated soil boring at 56'.	

WELL DIAGRAM



EnSafe/Allen & Hoshall

Monitoring Well 059G03UF

Project: NSA Memphis	Location: Millington,TN.SWMU #59 (Old Pesticide Shop)
Project No.: 0106-08420	Surface Elevation: 263.51 feet msl
Started at 1337 on 3-4-96	TOC Elevation: 263.32 feet msl
Completed at 1457 on 3-4-96	Depth to Groundwater:14.63 feet Measured: 4/8/96
Drilling Method: Rotosonic-4" inner core barrel/6" OD casing	Groundwater Elevation:248.69 feet msl
Drilling Company: Alliance Environmental, Inc.	Total Depth: 56 feet
Geologist: D. Ladd, W. Parks	Well Screen: 44 to 54 feet

GAMMA RAY LOG

COUNTS PER SECOND

CASING TYPE: 2" PVC

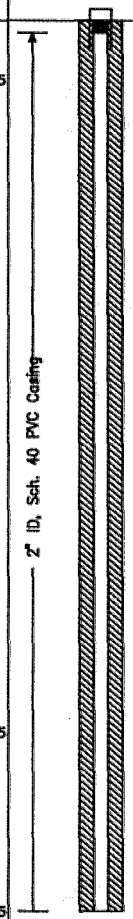
TOP OF LOG = GROUND SURFACE

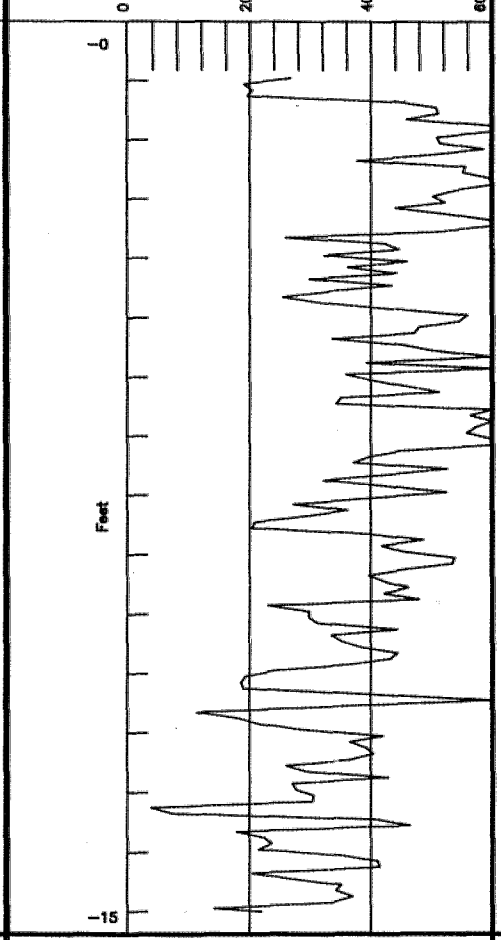
DATE LOGGED: 05/22/96

NOTES

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
	X		1	100	.8		OL GW	(0-1') Asphalt, soil, and gravel fill.	262.5
	X		2	100	1.0			(1-12') Silt, moderate yellowish-brown in color mottled with light olive gray-colored material. Contains organic and less light olive gray material from 2' to 12'.	
5					1.0				
			3	95	2.2		ML	Moist from 7' to 10'.	
					1.0				
10					1.2			Very moist from 10' to 12'.	
								No description available; collected Shelby tube sample from 12' to 15'.	251.5
15			4	83	.6		ML		248.5

WELL DIAGRAM





RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

SWMU 59
OLD PESTICIDE SHOP

DWG DATE: 12/10/96

DWG NAME: 94GL593

LOGGED BY:
GEOLOGICAL LOGGING SYSTEMS

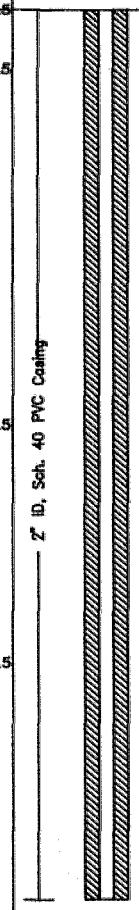
EnSafe/Allen & Hoshall

Monitoring Well 059G03UF

Project: NSA Memphis	Location: Millington, TN. SWMU #59 (Old Pesticide Shop)
Project No.: 0106-08420	Surface Elevation: 263.51 feet msl
Started at 1337 on 3-4-96	TOC Elevation: 263.32 feet msl
Completed at 1457 on 3-4-96	Depth to Groundwater: 14.63 feet Measured: 4/8/96
Drilling Method: Rotasonic-4" inner core barrel/6" OD casing	Groundwater Elevation: 248.69 feet msl
Drilling Company: Alliance Environmental, Inc.	Total Depth: 56 feet
Geologist: D. Ladd, W. Parks	Well Screen: 44 to 54 feet

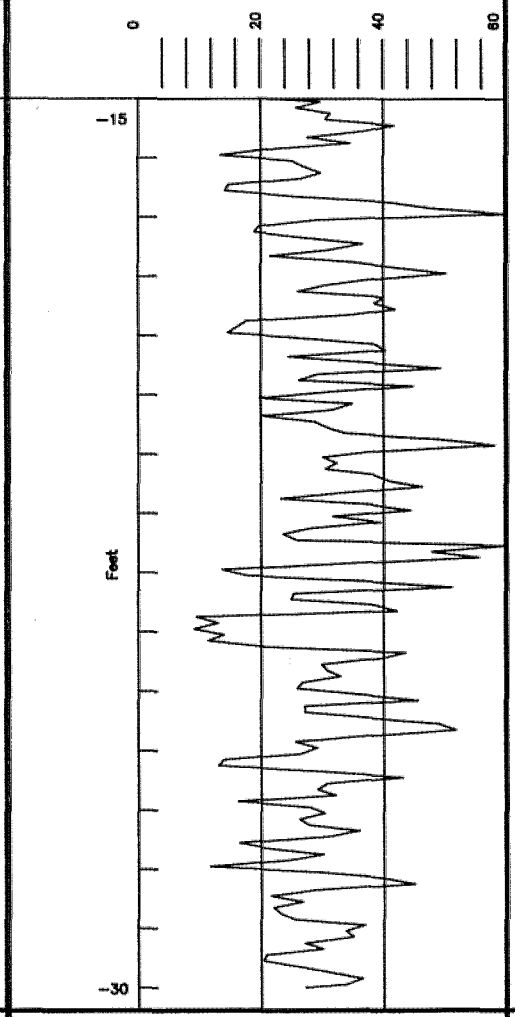
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
							ML	(15-16') Silt, moderate yellowish-brown in color mottled with light olive gray-colored material.	248.5
					1.4		ML	(16-22') Silt, light olive gray in color, mottled with a light moderate yellowish-brown-colored material from 16' to around 20'.	247.5
					1.6				
20			5	82	2.0				
					1.4		ML	(22-26') Silt, moderate yellowish-brown to dusky yellow in color. Contains iron-staining and iron-manganese nodules.	241.5
25					0.8				
					1.2		ML	(26-31') Silt, moderate yellowish-brown to dark yellowish-orange in color mottled with dark yellowish-brown-colored material.	237.5
					1.4				
30									

WELL DIAGRAM



GAMMA RAY LOG

COUNTS PER SECOND



CASING TYPE: 2" PVC

TOP OF LOG = GROUND SURFACE

DATE LOGGED: 05/22/96

NOTES

RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

SWMU 59
OLD PESTICIDE SHOP

DWG DATE: 12/10/96

DWG NAME: 94GL593A

LOGGED BY:
GEOLOGICAL LOGGING SYSTEMS

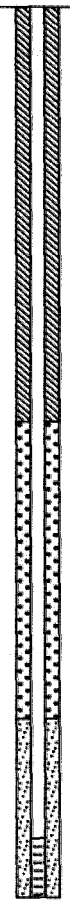
EnSafe/Allen & Hoshall

Monitoring Well 059G03UF

Project: NSA Memphis	Location: Millington,TN.SWMU #59(Old Pesticide Shop)
Project No.: 0106-08420	Surface Elevation: 263.51 feet msl
Started at 1337 on 3-4-96	TOC Elevation: 263.32 feet msl
Completed at 1457 on 3-4-96	Depth to Groundwater:14.63 feet Measured: 4/8/96
Drilling Method: Rotasonic-4" inner core barrel/8" OD casing	Groundwater Elevation:248.69 feet msl
Drilling Company: Alliance Environmental, Inc.	Total Depth: 56 feet
Geologist: D. Ladd, W. Parks	Well Screen: 44 to 54 feet

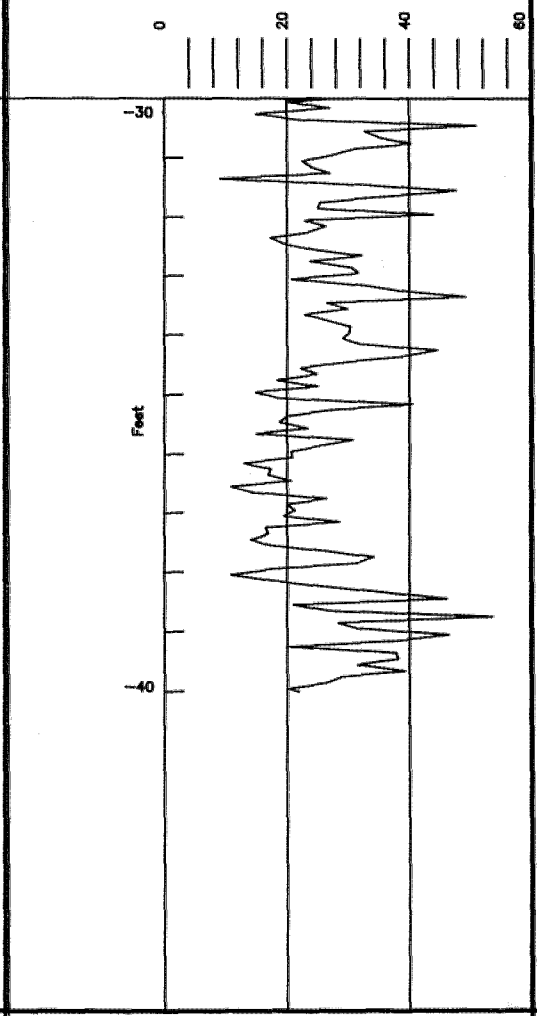
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
			6	100	1.4		ML	(31-35') Silt, moderate yellowish-brown in color mottled with very fine, very light gray colored sand. Dark yellowish-orange staining and iron-manganese nodules are present near 35'.	232.5
					1.4		ML		
35					1.4		SW	(35-36.5') Sand, very fine-grained, very light gray in color mottled with dark yellowish-orange material. Wet.	228.5
							SW GW	Contains some coarse dark yellowish-orange sand from 36' to 36.5'.	227
					2.4		CL	(36.5-37') Sand (medium to very coarse-grained) and gravel. Moderate yellowish-brown to dark yellowish-orange in color.	226.5
			7	100					
					2.6		SM	(37-39') Sandy clay, moderate yellowish-brown to dark yellowish- orange in color mottled with very light gray-colored material. Becomes mostly pale yellowish-brown in color near 39'.	224.5
40								Top of Fluvial Deposits estimated at 39'.	223.5
								(39-40') Silty sand, medium to coarse-grained, with scattered gravel. Moderate yellowish-brown to dark yellowish-orange. Wet.	
			8	100				No description available; collected a Shelby tube sample from 40' to 43'.	
					1.4		SW GW	(43-44.5') Sand, fine to very coarse-grained, moderate yellowish-brown to dark yellowish-orange, and gravel, up to .75" in longest dimension, angular to rounded, composed of quartz and chert, wet.	220.5
45			9	125	1.2		SW GW		219

WELL DIAGRAM



GAMMA RAY LOG

COUNTS PER SECOND



CASING TYPE: 2" PVC

TOP OF LOG = GROUND SURFACE

DATE LOGGED: 05/23/96

NOTES

RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

SWMU 59
OLD PESTICIDE SHOP

DWG DATE: 12/10/96

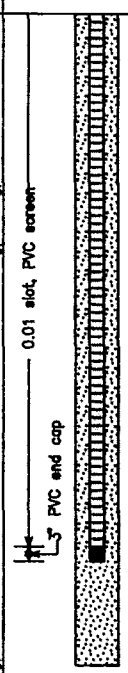
DWG NAME: 94GL593B

LOGGED BY:
GEOLOGICAL LOGGING SYSTEMS

EnSafe/Allen & Hoshall	Monitoring Well 059G03UF
Project: NSA Memphis	Location: Millington,TN.SWMU #59(Old Pesticide Shop)
Project No.: 0106-08420	Surface Elevation: 263.51 feet msl
Started at 1337 on 3-4-96	TOC Elevation: 263.32 feet msl
Completed at 1457 on 3-4-96	Depth to Groundwater:14.63 feet Measured: 4/8/96
Drilling Method: Rotosonic-4" inner core barrel/6" OD casing	Groundwater Elevation:248.69 feet msl
Drilling Company: Alliance Environmental, Inc.	Total Depth: 56 feet
Geologist: D. Ladd, W. Parks	Well Screen: 44 to 54 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					1.2		SW GW	(44.5-47.5') Sand, coarse to very coarse-grained, moderate yellowish- brown to dark yellowish-orange, and gravel, up to 2.5" in longest dimension, composed mostly of angular chert, wet.	216
					1.0		SW GW / SW	(47.5-48') Sand, fine to coarse-grained, very light gray and mottled with dark yellowish-orange, and gravel, up to 1.5" in longest dimension, composed mostly of angular to rounded quartz and chert, wet.	215.5 / 214.5
50							SW GW	(48-49') Sand, fine to medium-grained, with rare quartz gravel. Yellowish-gray in color mottled with dark yellowish-orange material, slightly micaceous, wet.	
			10	130	1.6			(49-51.5') Sand (fine to coarse-grained) and gravel (mostly quartz and chert); dark yellowish-orange in color mottled with yellowish-gray material; micaceous; wet.	212
					1.6		SW GW	(51.5-53.5') Sand, fine to very coarse-grained, and gravel (quartz and chert) is up to .75" in longest dimension; yellowish-gray and wet.	210
55					0.8		SW	(53.5-56') Sand, fine to medium-grained, with rare gravel. Yellowish- gray color, micaceous, wet.	
								Terminated soil boring at 56'.	207.5
60									

WELL DIAGRAM



GAMMA RAY LOG

COUNTS PER SECOND

CASING TYPE: 2" PVC

TOP OF LOG = GROUND SURFACE

DATE LOGGED: 05/23/96

NOTES

RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

SWMU 59
OLD PESTICIDE SHOP

DWG DATE: 12/10/96

DWG NAME: 94GL593C

LOGGED BY:
GEOLOGICAL LOGGING SYSTEMS

TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/22/96 Project No.: E-3-157

Client's Project No.: 0106090000

Sample I.D.: 0059S03UF15

Soil Description: Brown & Gray Clayey Silt

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	139.4	139.9
Dry Density (Lbs/ft^3)	107.6	107.7
Moisture (% Dry Wt)	29.5	29.9
Porosity (n)	.36	.34
Degree of Saturation (%)	.99	1.0
Specific Gravity (ASTM D-854)	2.66	---

Permeability

Temperature Correction, R_t = 1.008

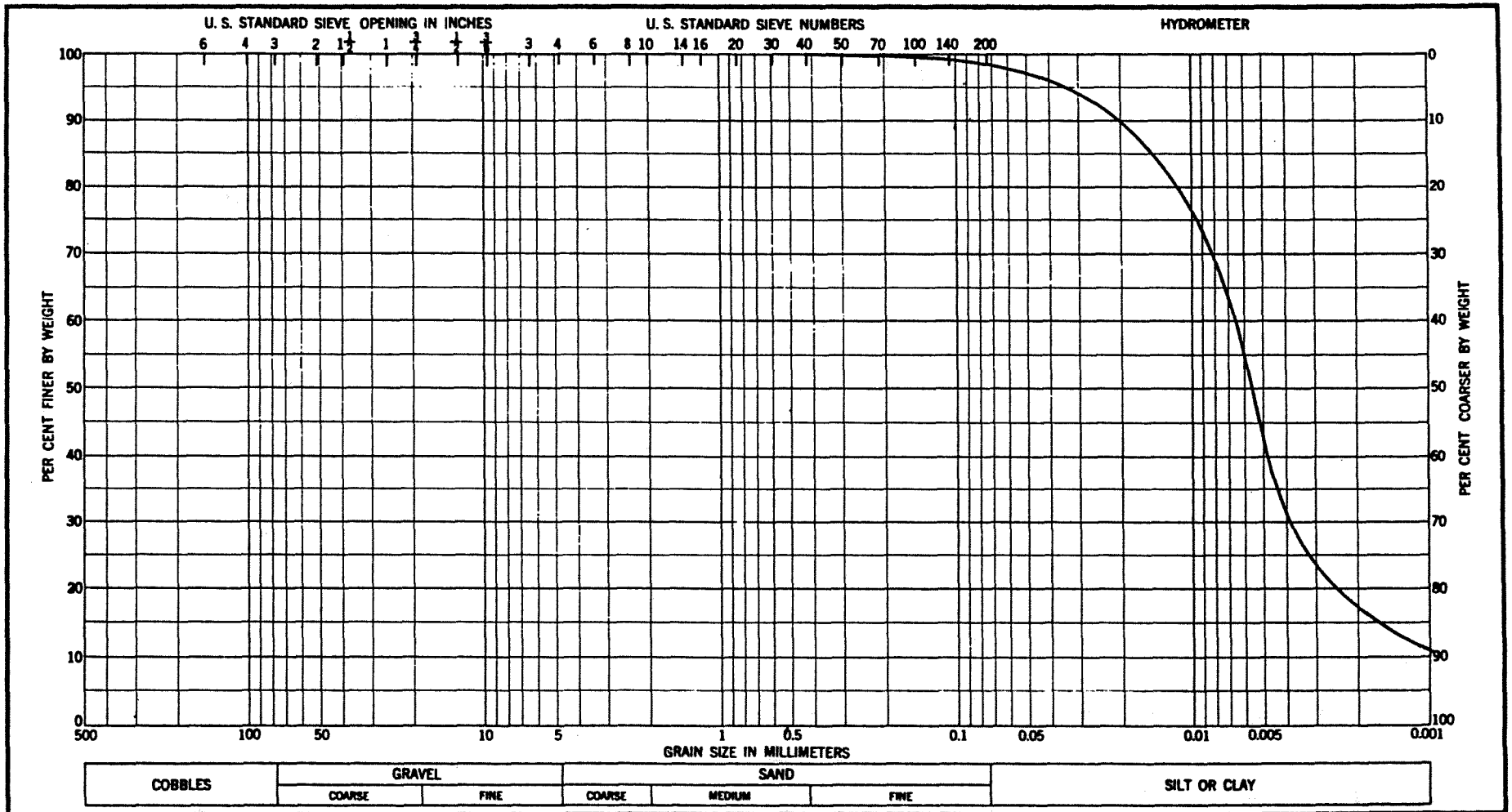
$K_1 = 6.0 \times 10^{-7}$ cm/sec
$K_2 = 4.1 \times 10^{-7}$ cm/sec
$K_3 = 7.2 \times 10^{-7}$ cm/sec
$K_4 = 5.5 \times 10^{-7}$ cm/sec

Coefficient of Permeability, $K_{20} = 5.7 \times 10^{-7}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-017 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 Fax 901-386-6614



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
059S03uF15			30	--	--	--

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 03/22/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC

TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/22/96 Project No.: E-3-157

Client's Project No.: 0106090000

Sample I.D.: 059S03UF43

Soil Description: Brown Sandy Gravel

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	136.7	148.7
Dry Density (Lbs/ft^3)	115.7	130.0
Moisture (% Dry Wt)	18.2	14.4
Porosity (n)	.30	.22
Degree of Saturation (%)	.97	1.0
Specific Gravity (ASTM D-854)	2.65	---

Permeability

Temperature Correction, $R_t = 1.043$

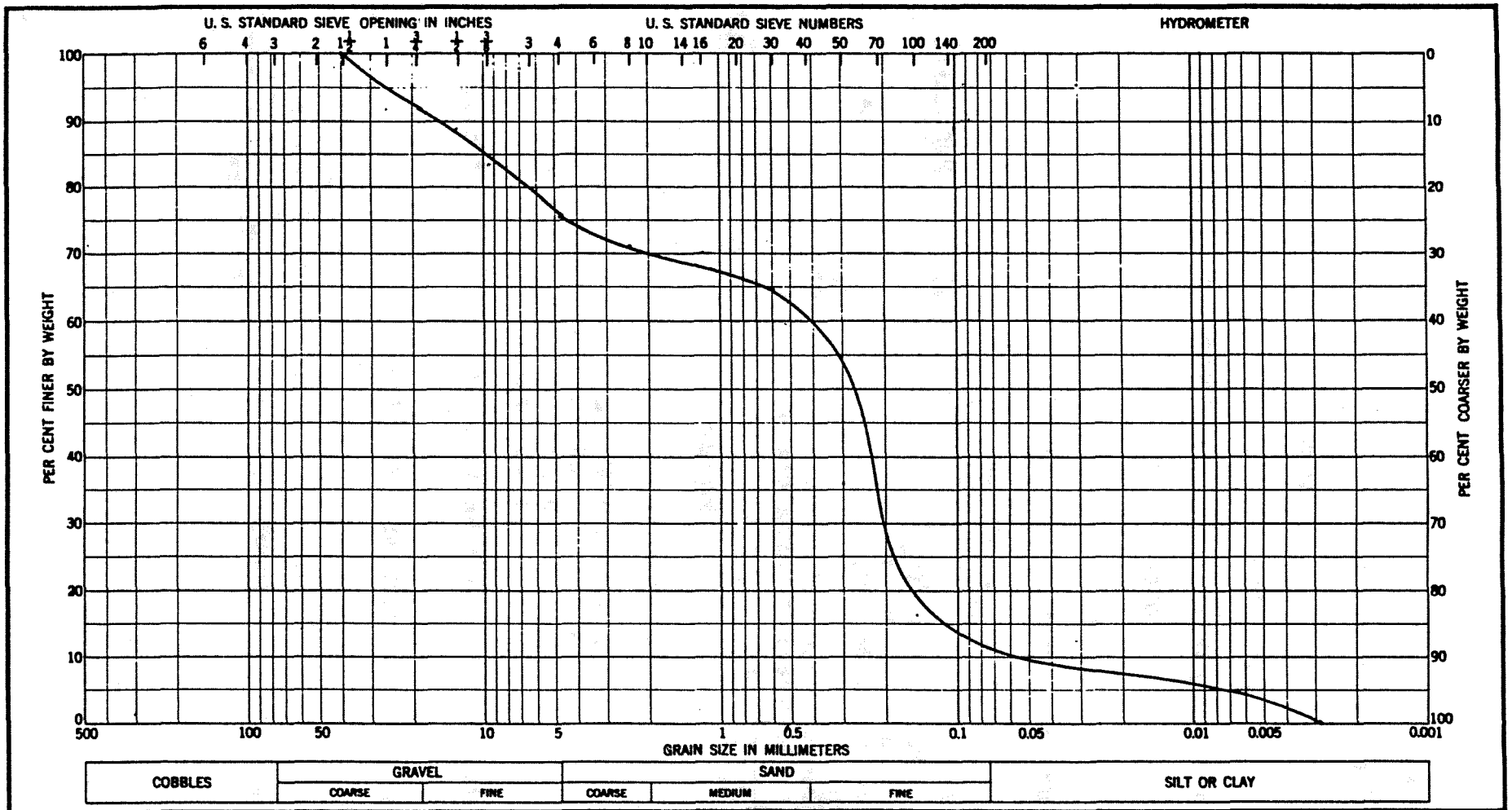
$K_1 = 1.4 \times 10^{-4}$ cm/sec
$K_2 = 2.7 \times 10^{-4}$ cm/sec
$K_3 = 4.3 \times 10^{-4}$ cm/sec
$K_4 = 1.5 \times 10^{-4}$ cm/sec

Coefficient of Permeability, $K_{20} = 2.6 \times 10^{-4}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-018 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 Fax 901-386-6614



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
059S03UF43	40-43'		18	--	--	--

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 03/22/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC.

NAVY CLEAN
ENSAFE/ALLEN & HOSHALL
(901) 383-9115

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

CLIENT EnSafe
ADDRESS 5724 Summer Trees Dr.
PROJECT NAME/NUMBER 0106 09000
MEDIA STATUS: (A, B, OR C)

PROJECT MANAGER A. Choate
TELEPHONE NO. 9013727962
FAX. NO. 3722454
SAMPLERS: (SIGNATURE) Alison Choate

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION TEMP.	PRESERVATION CHEMICAL	NO. OF CONTAINERS	Hydraulic Conductivity	Porosity	Bulk Density	Particle Size	Percent Moisture	Specific Grav	REMARKS
0595MW0315	3/4/96	1400	soil	3" dia. Shelby Tube	-	-	1	X	X	X	X	X	X	X	
0595MW0343	3/4/96	1422	soil	3" dia. Shelby T.	-	-	1	X	X	X	X	X	X	X	

RELINQUISHED BY:	DATE	RELINQUISHED BY:	DATE	RELINQUISHED BY:	DATE	RELINQUISHED BY:	DATE
SIGNATURE Alison Choate	3/4/96	SIGNATURE		SIGNATURE		SIGNATURE	
PRINTED Alison Choate	TIME	PRINTED	TIME	PRINTED	TIME	PRINTED	TIME
COMPANY EnSafe	1700	COMPANY		COMPANY		COMPANY	
REASON Analysis		REASON		REASON		REASON	

METHOD OF SHIPMENT: direct transport.
SHIPMENT NO.
SPECIAL INSTRUCTION:

COMMENTS:

AFTER ANALYSIS, SAMPLES ARE TO BE:
- ☐ DISPOSED OF (ADDITIONAL FEE)
- ☐ STORED (90 DAYS MAX)
- ☐ STORED OVER 90 DAYS (ADDITIONAL FEE)
- ☐ RETURNED TO CUSTOMER

SWMU 65

SOIL BORING/MONITORING WELL LOGS
AND
GEOTECHNICAL LABORATORY RESULTS

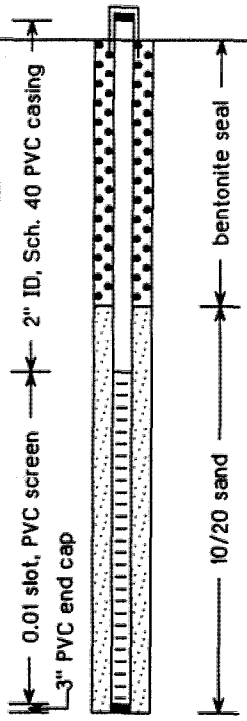
EnSafe/Allen & Hoshall

Monitoring Well 065G05UA

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #65 (Training Mock-Up Site)*
Project No.: *0106-08420*	Surface Elevation: *264.10 feet msl*
Started at *1230 on 2-17-96*	TOC Elevation: *266.04 feet msl*
Completed at *1320 on 2-17-96*	Depth to Groundwater: *3.99 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *262.05 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.25 feet*
Geologist: *J. Kingsbury*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					BG			(0-20') Upper Alluvium (see descriptions below).	
					BG		CL	Clay, brownish-gray in color, hard and dry.	
5			1	100	BG				259.1
					BG			Silt. From 5' to 8', is very light brown in color and moist.	
					BG			From 8' to 18', silt is yellowish-brown to yellowish-gray in color, with specks of organic material and some orangish-colored staining.	
10					BG				
					BG		ML		
15			2	70	BG				
					BG				
					BG			At 18', color changes to greenish-gray/olive gray. Very moist to wet with some snail shells present.	
20									244.1
								Terminated soil boring at 20'.	
25									
30									
35									
40									

WELL DIAGRAM



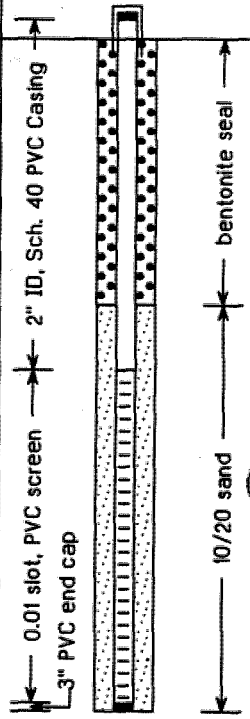
EnSafe/Allen & Hoshall

Monitoring Well 065G06UA

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #65 (Training Mock-Up Site)*
Project No.: *0106-08420*	Surface Elevation: *264.25 feet msl*
Started at *0930 on 2-17-96*	TOC Elevation: *266.28 feet msl*
Completed at *1045 on 2-17-96*	Depth to Groundwater: *4.90 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *261.38 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.25 feet*
Geologist: *J. Kingsbury*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
		◢	1				ML	(0-20') Upper Alluvium (see descriptions below).	
								Silt. Light brown to yellowish-brown in color.	262.2
							CL	Clay. Brownish-gray to light brown in color. Hard.	
5									258.2
		◢	2					Silt. Yellowish-gray to yellowish-brown in color. Rare organics with iron-stained haloes around them from 6' to 12'.	
10							ML		
		◢	3					From 12' to 14', increase in orange-colored iron staining and mottling. Silt is yellowish-brown to with some gray, and moist.	250.2
15								No description available; collected Shelby tube sample from 14' to 16' in 65MW06DA.	248.2
							ML	Silt, yellowish-brown with some gray, with orange-colored iron staining and mottling, moist to wet.	
20									244.2
								Terminated soil boring at 20'. Note: No samples were collected for lithologic description. These descriptions were transferred from the log of adjacent monitoring well 65MW06DA.	
25									
30									
35									
40									

WELL DIAGRAM



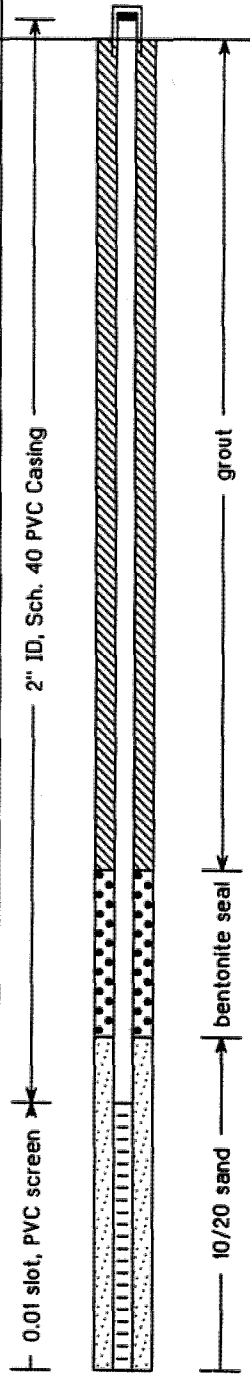
EnSafe/Allen & Hoshall

Monitoring Well 065G06DA

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #65 (Training Mock-Up Site)*
Project No.: *0106-08420*	Surface Elevation: *264.18 feet msl*
Started at *0815 on 2-17-96*	TOC Elevation: *266.12 feet msl*
Completed at *0930 on 2-17-96*	Depth to Groundwater: *9.62 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic – 4" inner core barrel/6" OD casing*	Groundwater Elevation: *256.50 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *46 feet*
Geologist: *J. Kingsbury*	Well Screen: *32 to 42 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					BG		ML	(0-29') Upper Alluvium (see descriptions below).	
			1	25	BG			Silt. Light brown to yellowish-brown in color.	262.2
5					BG		CL	Clay. Brownish-gray to light brown in color. Hard.	258.2
					BG			Silt. Yellowish-gray to yellowish-brown in color. Rare organics with iron-stained haloes around them from 6' to 12'.	
					BG				
10			2	120			ML		
					BG				
					BG			From 12' to 14', increase in orange-colored iron staining and mottling. Silt is yellowish-brown to with some gray, and moist.	250.2
15			3	100				No description available; collected Shelby tube sample from 14' to 16'.	248.2
					BG			Silt, yellowish-brown with some gray, with orange-colored iron staining and mottling, moist to wet.	
					BG				
20			4	90	BG			From 20' to 34', clayey silt, olive gray to brownish-gray, with some snail shells, moist.	
					BG				
25					BG		ML		
					BG				
					BG			With lenses of sand from 28' to 34'.	
30								Top of Deeper Alluvium deposits estimated at 29'.	
					BG				
			5	83	BG				
									230.2
35					BG		SW	Sand, dusky yellow to olive gray, with gravel up to 1" in longest dimension. Percentage of gravel increases with depth to 38'.	
					BG				228.2
			6	100				No description available; collected Shelby tube sample from 38' to 40'.	
40							SW/GW		224.2

WELL DIAGRAM



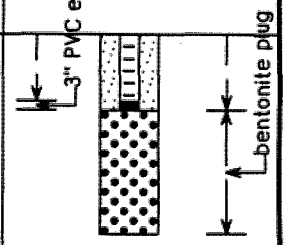
EnSafe/Allen & Hoshall

Monitoring Well 065G06DA

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #65 (Training Mock-Up Site)*
Project No.: *0106-08420*	Surface Elevation: *264.18 feet msl*
Started at *0815 on 2-17-96*	TOC Elevation: *266.12 feet msl*
Completed at *0930 on 2-17-96*	Depth to Groundwater: *9.62 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *256.50 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *46 feet*
Geologist: *J. Kingsbury*	Well Screen: *32 to 42 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					BG		SW GW	Sand and gravel.	224.2
			7	125	BG		CL	Cockfield Formation: Brown stiff clay with fine-grained sand interbeds.	222.2
45					BG				218.2
								Terminated soil boring at 46'.	
50									
55									
60									
65									
70									
75									
80									

WELL DIAGRAM



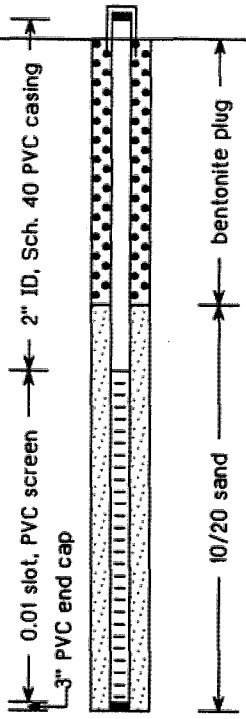
EnSafe/Allen & Hoshall

Monitoring Well 065G07UA

Project: *NSA Memphis*	Location: *Millington, TN. SWMU #65 (Training Mock-Up Site)*
Project No.: *0106-08420*	Surface Elevation: *262.85 feet msl*
Started at *1100 on 2-17-96*	TOC Elevation: *264.86 feet msl*
Completed at *on 2-17-96*	Depth to Groundwater: *4.13 feet* Measured: *4/8/96*
Drilling Method: *Rotasonic - 4" inner core barrel/6" OD casing*	Groundwater Elevation: *260.73 feet msl*
Drilling Company: *Alliance Environmental, Inc.*	Total Depth: *20.25 feet*
Geologist: *J. Kingsbury*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
					BG		ML	(0-20') Upper Alluvium (see descriptions below).	
					BG			Fill material is present from 0' to 2'. Silt with some gravel, brown in color.	260.9
5			1	100	BG		CL	Clay, brown in color, hard and dry.	
					BG				
					BG				253.9
10					BG			Silt, yellowish-gray to yellowish-brown in color, moist.	
					BG			Some mottling with dark yellowish-orange stained material from 10' to 20'.	
15			2	70	BG		ML		
					BG				
					BG			Silt exhibits a color change near 20' to olive gray/greenish-gray.	
20								Terminated soil boring at 20'.	242.9
25									
30									
35									
40									

WELL DIAGRAM



TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/01/96 Project No.: E-3-157

Client's Project No.: 010609000

Sample I.D.: 065S06DA16

Soil Description: Gray & Brown Clayey Silt

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	124.8	125.6
Dry Density (Lbs/ft^3)	96.5	97.6
Moisture (% Dry Wt)	29.3	28.7
Porosity (n)	.43	.42
Degree of Saturation (%)	1.0	1.0
Specific Gravity (ASTM D-854)	2.70	---

Permeability

Temperature Correction, R_t = 1.041

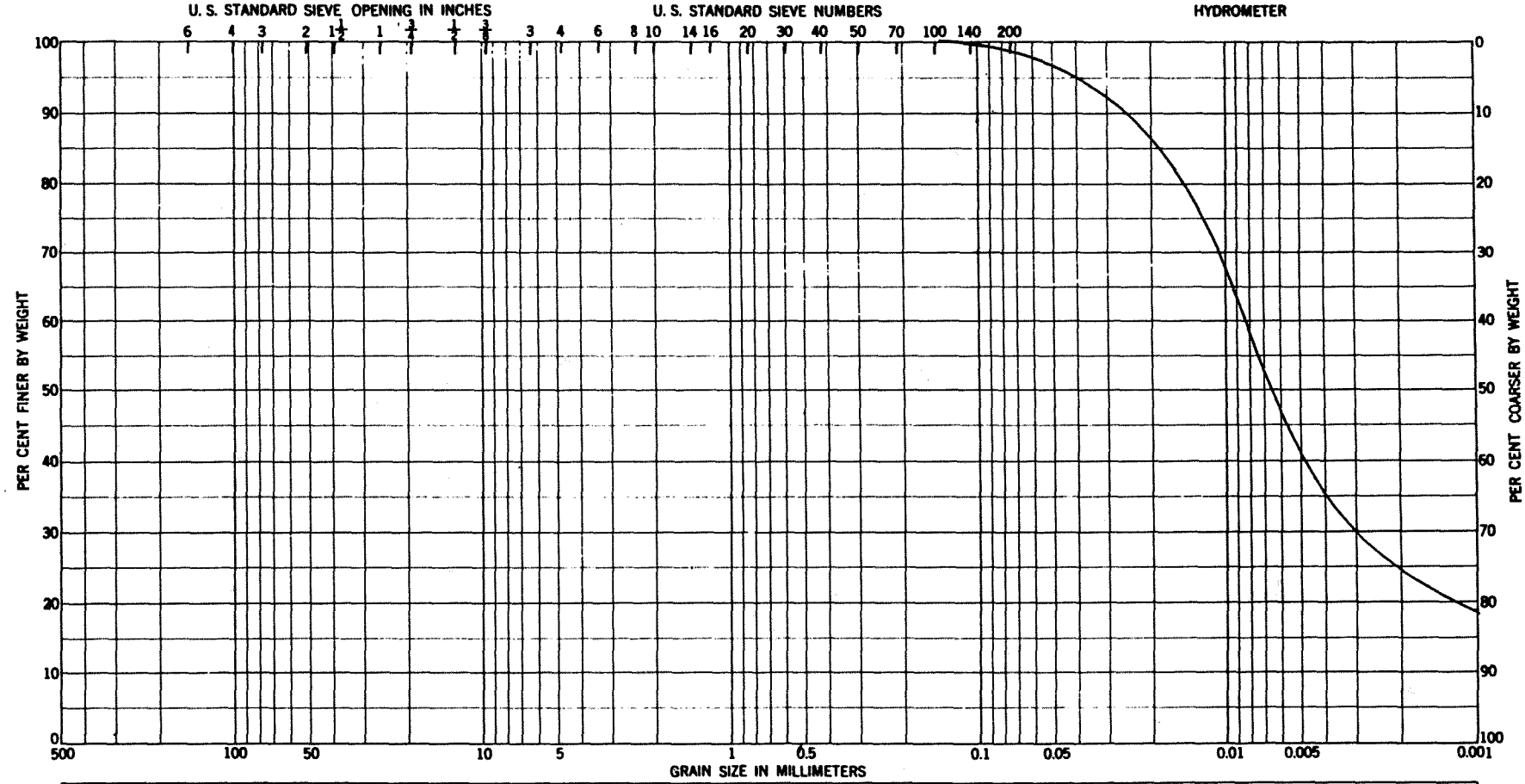
$K_1 = 4.6 \times 10^{-6}$ cm/sec
$K_2 = 4.0 \times 10^{-6}$ cm/sec
$K_3 = 5.1 \times 10^{-6}$ cm/sec
$K_4 = 4.7 \times 10^{-6}$ cm/sec

Coefficient of Permeability, $K_{20} = 4.8 \times 10^{-6}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-012 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 Fax 901-386-6614



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
065S06DA16			29			

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 03/01/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC.

TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/01/96 Project No.: E-3-157

Client's Project No.: 0106090000

Sample I.D.: 065S06DA40

Soil Description: Gray gravelly Sand with trace of silt

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	136.9	137.4
Dry Density (Lbs/ft^3)	127.8	120.6
Moisture (% Dry Wt)	7.1	13.9
Porosity (n)	.20	.24
Degree of Saturation (%)	.71	1.0
Specific Gravity (ASTM D-854)	2.57	---

Permeability

Temperature Correction, R_t = 1.000

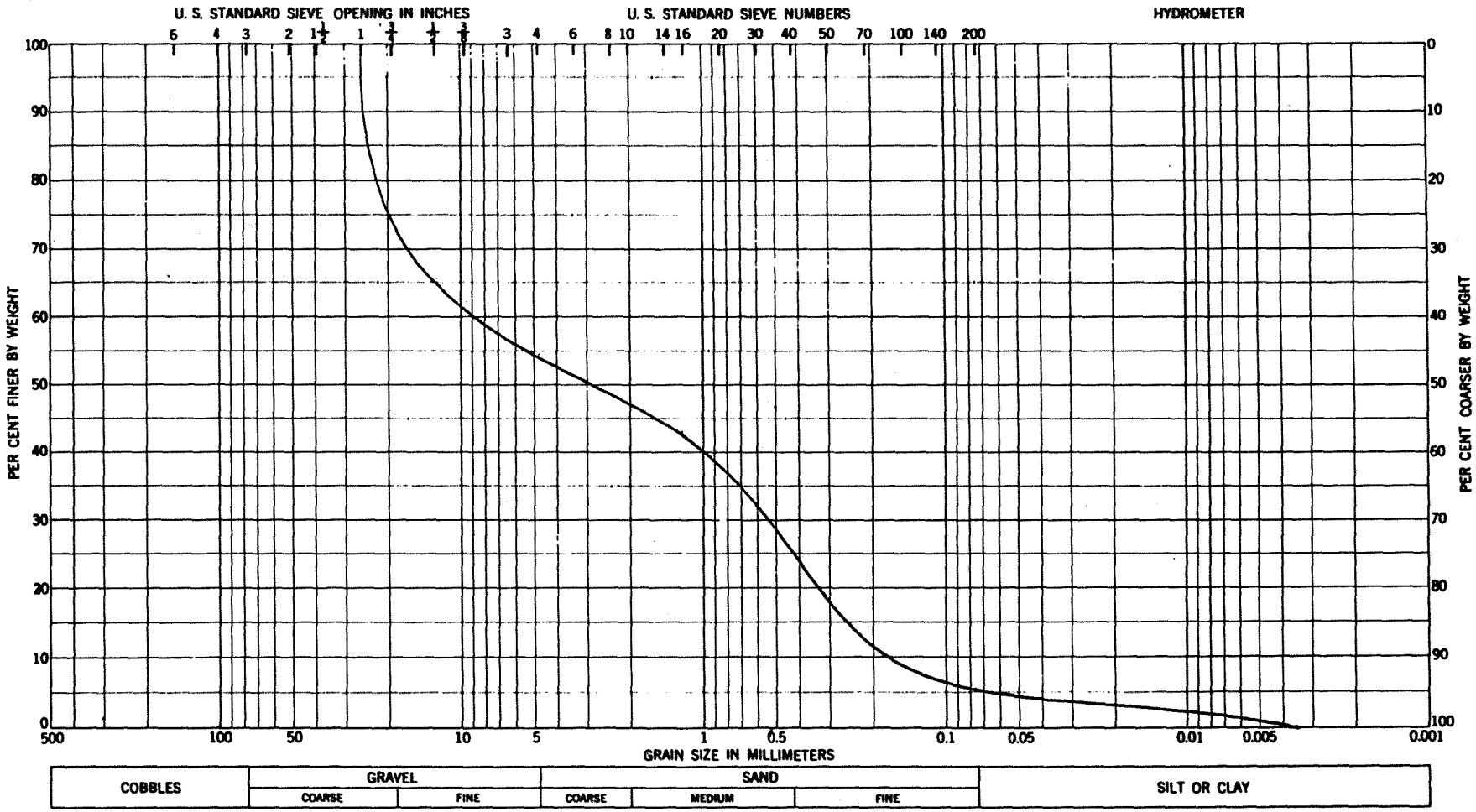
$K_1 = 1.9 \times 10^{-4}$ cm/sec
$K_2 = 2.0 \times 10^{-4}$ cm/sec
$K_3 = 1.1 \times 10^{-4}$ cm/sec
$K_4 = 1.8 \times 10^{-4}$ cm/sec

Coefficient of Permeability, $K_{20} = 1.8 \times 10^{-4}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-013 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 Fax 901-386-6614



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
065S06DA40			7			

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 03/01/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC.

BACKGROUND WELLS

SOIL BORING/MONITORING WELL LOGS

☆ Change BG log IDs

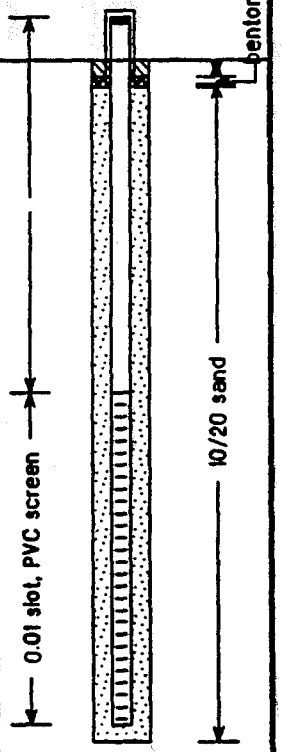
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-02-S~~ OBGG02LS

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #2*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *0745 on 1-12-95*	TOC Elevation: *feet msl*
Completed at *0845 on 1-12-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *20.0 feet*
Geologist: *Jack Carmichael and William Parks*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and roots.	
5			1	75	BG			Silt, clayey, yellow brown to gray brown, moist, soft.	
10			2	50	BG		ML	Silt, clayey, yellow gray to olive gray, stained yellow orange, laminated with orange to brown thin striations.	
15			3	87.5	BG				
20			4	75	BG			Log information taken form the boring for the lower fluvial well BG-2.	
25									
30									
35									
40									

WELL DIAGRAM



EnSafe (SM)

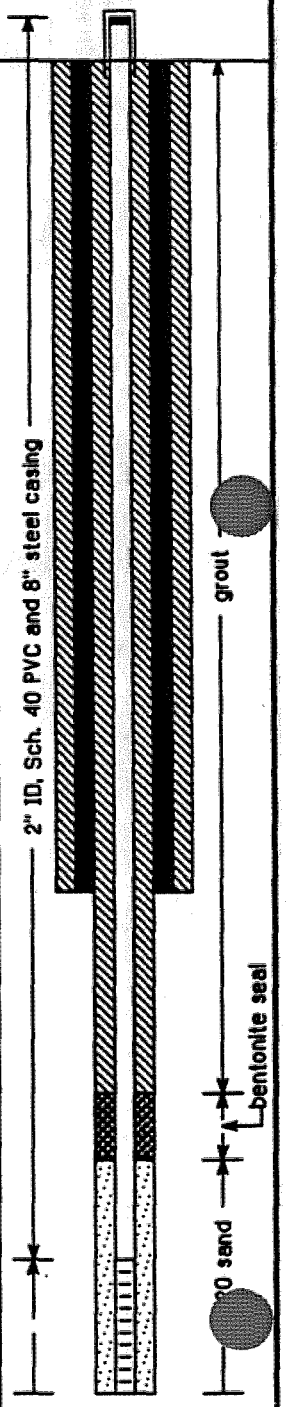
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-02-UF~~ OBGG02UF

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #2*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *0745 on 1-17-95*	TOC Elevation: *feet msl*
Completed at *0845 on 1-17-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *46.0 feet*
Geologist: *Jack Carmichael and William Parks*	Well Screen: *36 to 46 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and roots.	
			1	75	BG			Silt, clayey, yellow brown to gray brown, moist, soft.	
5									
10			2	50	BG			Silt, clayey, yellow gray to olive gray, stained yellow orange, laminated with orange to brown thin striations.	
15			3	87.5	BG		ML		
20			4	75	BG				
25			5	100	BG			Silt, clayey, light olive gray to yellow gray with iron staining, trace gravel. Silt, clayey, light olive gray, less iron staining.	
30								Sand, silty, trace clay, some gravel, yellow brown to gray brown. Sand, medium to coarse with gravel, orange brown to yellow.	
35			6	108	BG		GP	Sand, fine, with trace gravel, grayish pink to grayish orange, some yellow orange mottling.	
40									

WELL DIAGRAM



Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-02-UF~~ OBG02UF

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #2*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *0745 on 1-17-95*	TOC Elevation: *feet msl*
Completed at *0845 on 1-17-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *46.0 feet*
Geologist: *Jack Carmichael and William Parks*	Well Screen: *36 to 46 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
45			7	90	BG		GP	Same as above but dark yellowish orange.		10/20 sand
								Log information taken form the boring for the lower fluvial well BG-2.		
50										
55										
60										
65										
70										
75										
80										

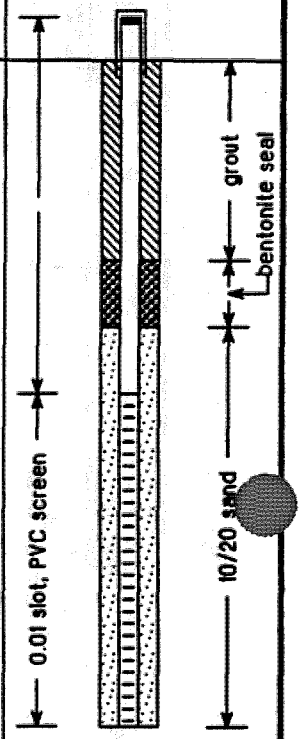
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-04-S~~ OBGG04LS

Project: *NAS Memphis*	Location: *Memphis, TN*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *1000 on 1-11-95*	TOC Elevation: *feet msl*
Completed at *1115 on 1-11-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *20.0 feet*
Geologist: *Jack Carmichael*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and debris.	
5			1	100	BG			Silty clay, pale olive with reddish brown mottling, stiff.	
10							ML	Clayey silt, yellow gray to yellow brown, mottled with reddish brown.	
			2	100	BG			Clayey silt, yellow gray to yellow brown mottled yellowish orange, laminated, low plasticity.	
15									
20			3	100	BG			Log information taken from the boring for the lower fluvial well bg-4.	
25									
30									
35									
40									

WELL DIAGRAM



EnSafe (SM)

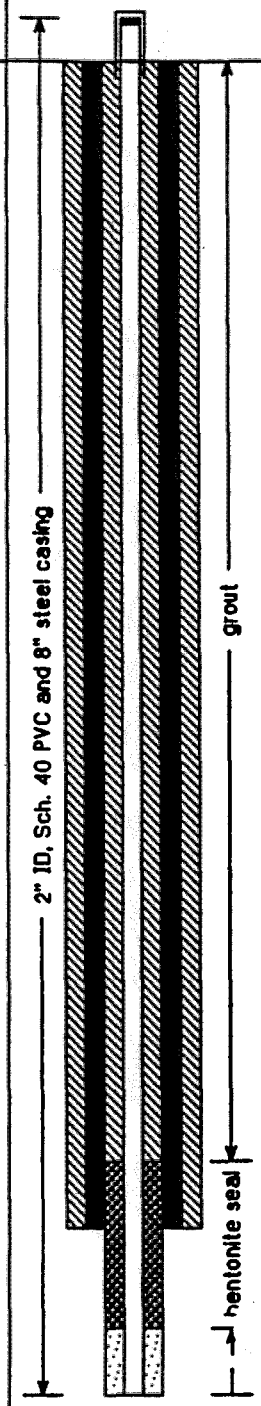
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-04-UF~~ CBGG04UF

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #4*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *1000 on 1-16-95*	TOC Elevation: *feet msl*
Completed at *1115 on 1-16-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *50.0 feet*
Geologist: *Jack Carmichael*	Well Screen: *40 to 50 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and debris.	
			1	100	BG			Silty clay, pale olive with reddish brown mottling, stiff.	
5									
10								Clayey silt, yellow gray to yellow brown, mottled with reddish brown.	
			2	100	BG			Clayey silt, yellow gray to yellow brown mottled yellowish orange, laminated, low plasticity.	
15									
20			3	100	BG		ML	Silt, medium gray, massive, low plasticity, traces of iron inclusions.	
25								Silt, clayey, medium gray stained yellowish orange, plastic.	
			4	100	BG				
30								Silt, clayey, yellow gray to olive gray.	
35			5	100	BG				
40							GP	Sand, silty, with gravel, yellowish gray to yellowish brown, mottled yellow orange, moist to wet.	

WELL DIAGRAM



TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/01/96 Project No.: E-3-157

Client's Project No.: 010609000

Sample I.D.: 065S06DA16

Soil Description: Gray & Brown Clayey Silt

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	124.8	125.6
Dry Density (Lbs/ft^3)	96.5	97.6
Moisture (% Dry Wt)	29.3	28.7
Porosity (n)	.43	.42
Degree of Saturation (%)	1.0	1.0
Specific Gravity (ASTM D-854)	2.70	---

Permeability

Temperature Correction, R_t = 1.041

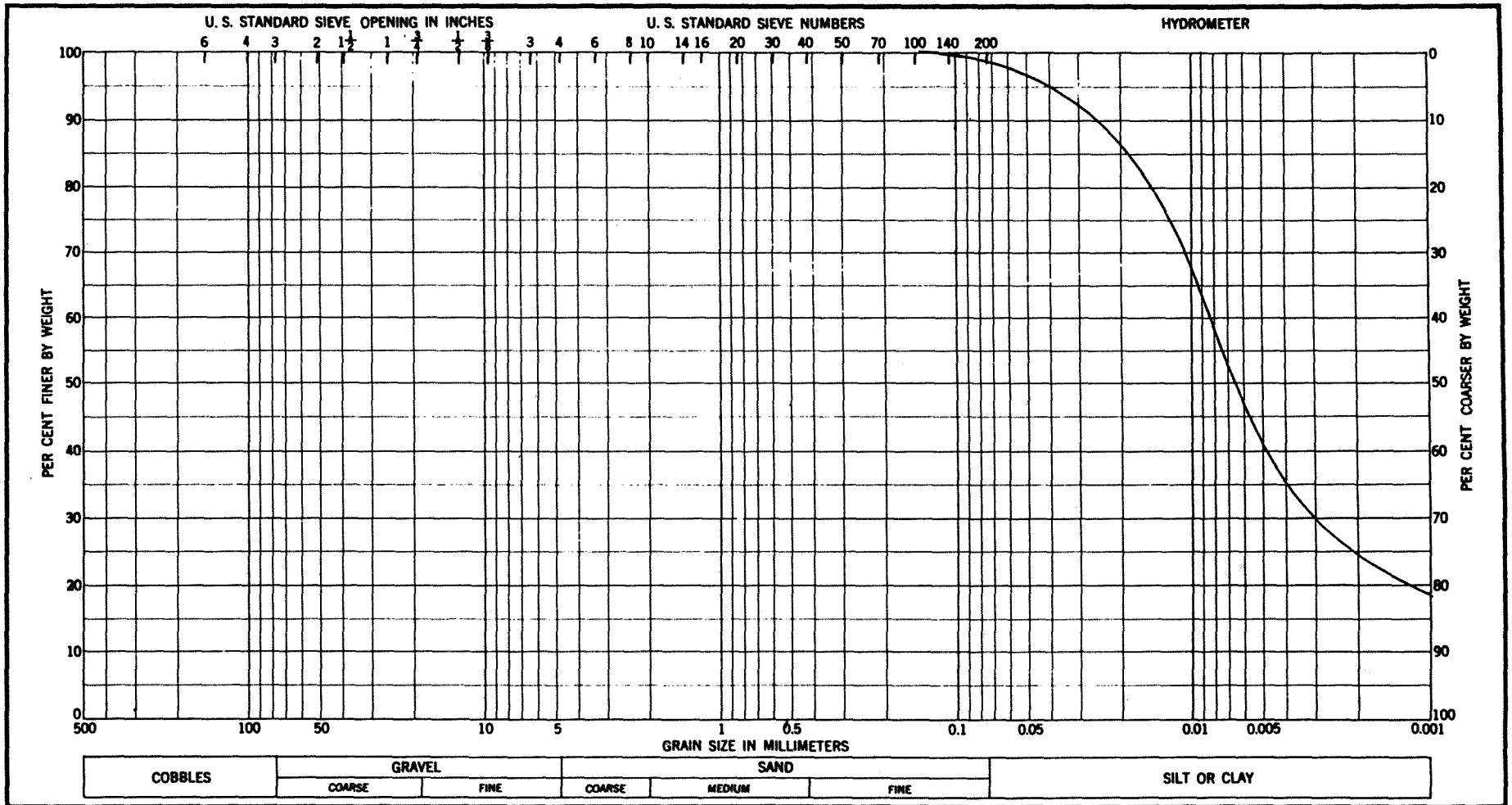
$K_1 = 4.6 \times 10^{-6}$ cm/sec
$K_2 = 4.0 \times 10^{-6}$ cm/sec
$K_3 = 5.1 \times 10^{-6}$ cm/sec
$K_4 = 4.7 \times 10^{-6}$ cm/sec

Coefficient of Permeability, $K_{20} = 4.8 \times 10^{-6}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-012 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 FAX 901-386-6614



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
065S06DA16			29			

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 03/01/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC.

TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/01/96 Project No.: E-3-157

Client's Project No.: 0106090000

Sample I.D.: 065S06DA40

Soil Description: Gray gravelly Sand with trace of silt

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	136.9	137.4
Dry Density (Lbs/ft^3)	127.8	120.6
Moisture (% Dry Wt)	7.1	13.9
Porosity (n)	.20	.24
Degree of Saturation (%)	.71	1.0
Specific Gravity (ASTM D-854)	2.57	---

Permeability

Temperature Correction, $R_t = 1.000$

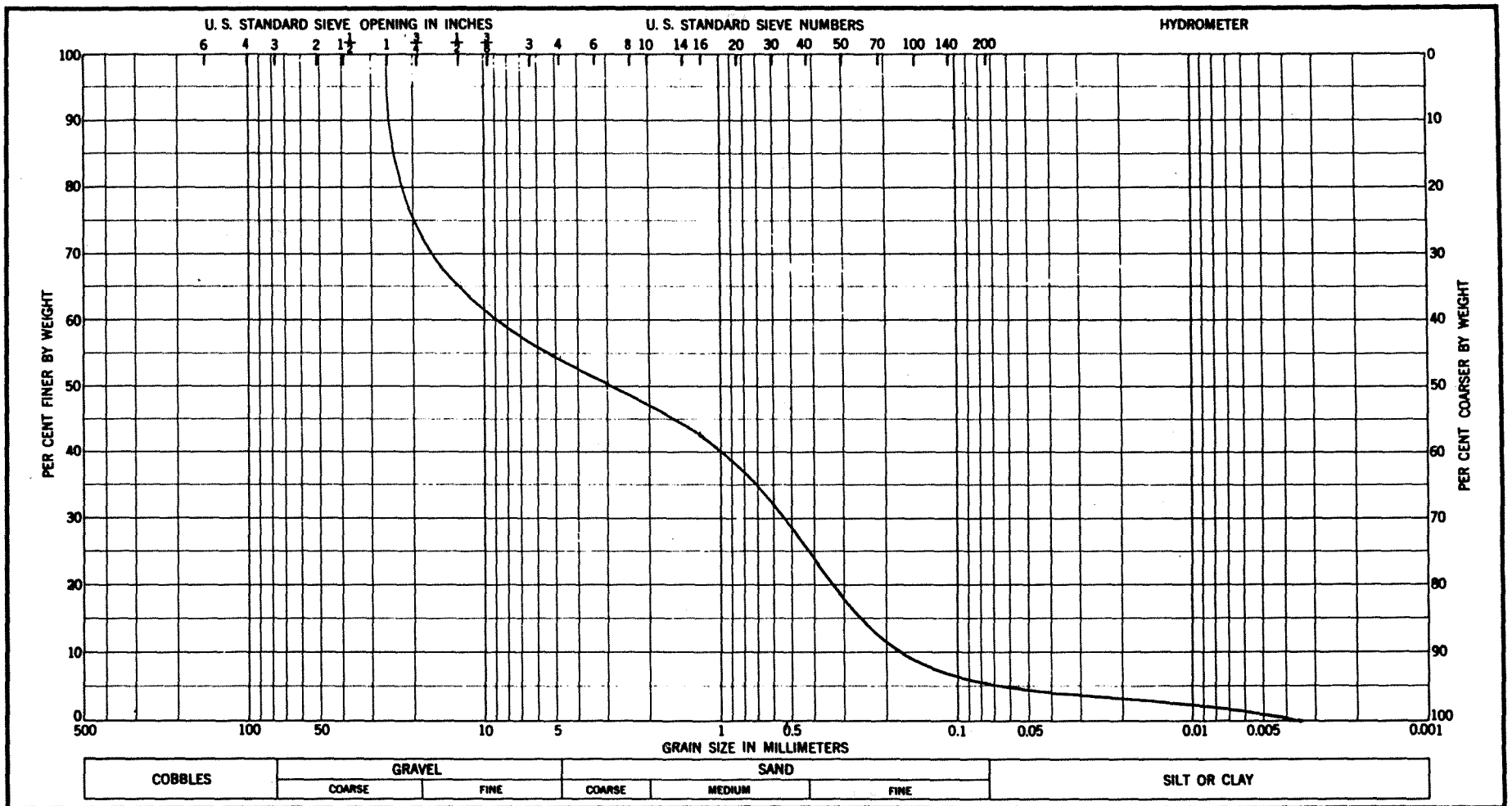
$K_1 = 1.9 \times 10^{-4}$ cm/sec
$K_2 = 2.0 \times 10^{-4}$ cm/sec
$K_3 = 1.1 \times 10^{-4}$ cm/sec
$K_4 = 1.8 \times 10^{-4}$ cm/sec

Coefficient of Permeability, $K_{20} = 1.8 \times 10^{-4}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-013 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 FAX 901-386-6614



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
065S06DA40			7			

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 03/01/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC.

BACKGROUND WELLS

SOIL BORING/MONITORING WELL LOGS

☆ Change BG log IDs

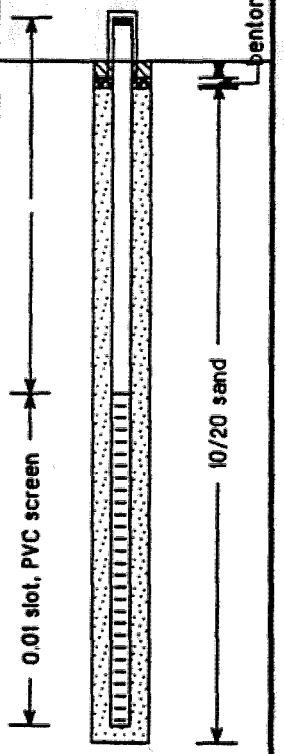
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-02-S~~ OBGG-02LS

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #2*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *0745 on 1-12-95*	TOC Elevation: *feet msl*
Completed at *0845 on 1-12-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *20.0 feet*
Geologist: *Jack Carmichael and William Parks*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and roots.	
			1	75	BG			Silt, clayey, yellow brown to gray brown, moist, soft.	
5									
10							ML	Silt, clayey, yellow gray to olive gray, stained yellow orange, laminated with orange to brown thin striations.	
			2	50	BG				
15									
			3	87.5	BG				
20			4	75	BG			Log information taken form the boring for the lower fluvial well BG-2.	
25									
30									
35									
40									

WELL DIAGRAM



EnSafe (SM)

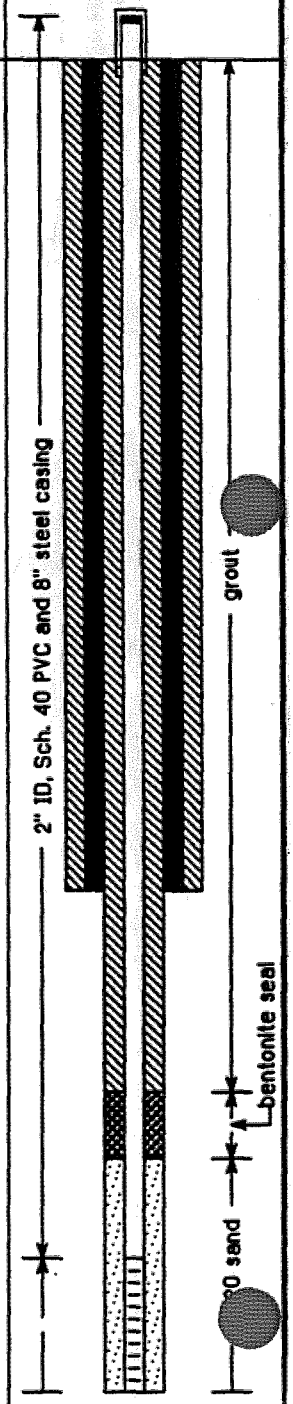
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-02-UF~~ OBGG02UF

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #2*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *0745 on 1-17-95*	TOC Elevation: *feet msl*
Completed at *0845 on 1-17-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *46.0 feet*
Geologist: *Jack Carmichael and William Parks*	Well Screen: *36 to 46 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and roots.	
			1	75	BG			Silt, clayey, yellow brown to gray brown, moist, soft.	
5									
10								Silt, clayey, yellow gray to olive gray, stained yellow orange, laminated with orange to brown thin striations.	
			2	50	BG				
15							ML		
			3	87.5	BG				
20			4	75	BG				
			5	100	BG			Silt, clayey, light olive gray to yellow gray with iron staining, trace gravel.	
25								Silt, clayey, light olive gray, less iron staining.	
30								Sand, silty, trace clay, some gravel, yellow brown to gray brown.	
								Sand, medium to coarse with gravel, orange brown to yellow.	
35							GP		
			6	108	BG			Sand, fine, with trace gravel, grayish pink to grayish orange, some yellow orange mottling.	
40									

WELL DIAGRAM



TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/01/96 Project No.: E-3-157

Client's Project No.: 010609000

Sample I.D.: 065S06DA16

Soil Description: Gray & Brown Clayey Silt

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	124.8	125.6
Dry Density (Lbs/ft^3)	96.5	97.6
Moisture (% Dry Wt)	29.3	28.7
Porosity (n)	.43	.42
Degree of Saturation (%)	1.0	1.0
Specific Gravity (ASTM D-854)	2.70	---

Permeability

Temperature Correction, R_t = 1.041

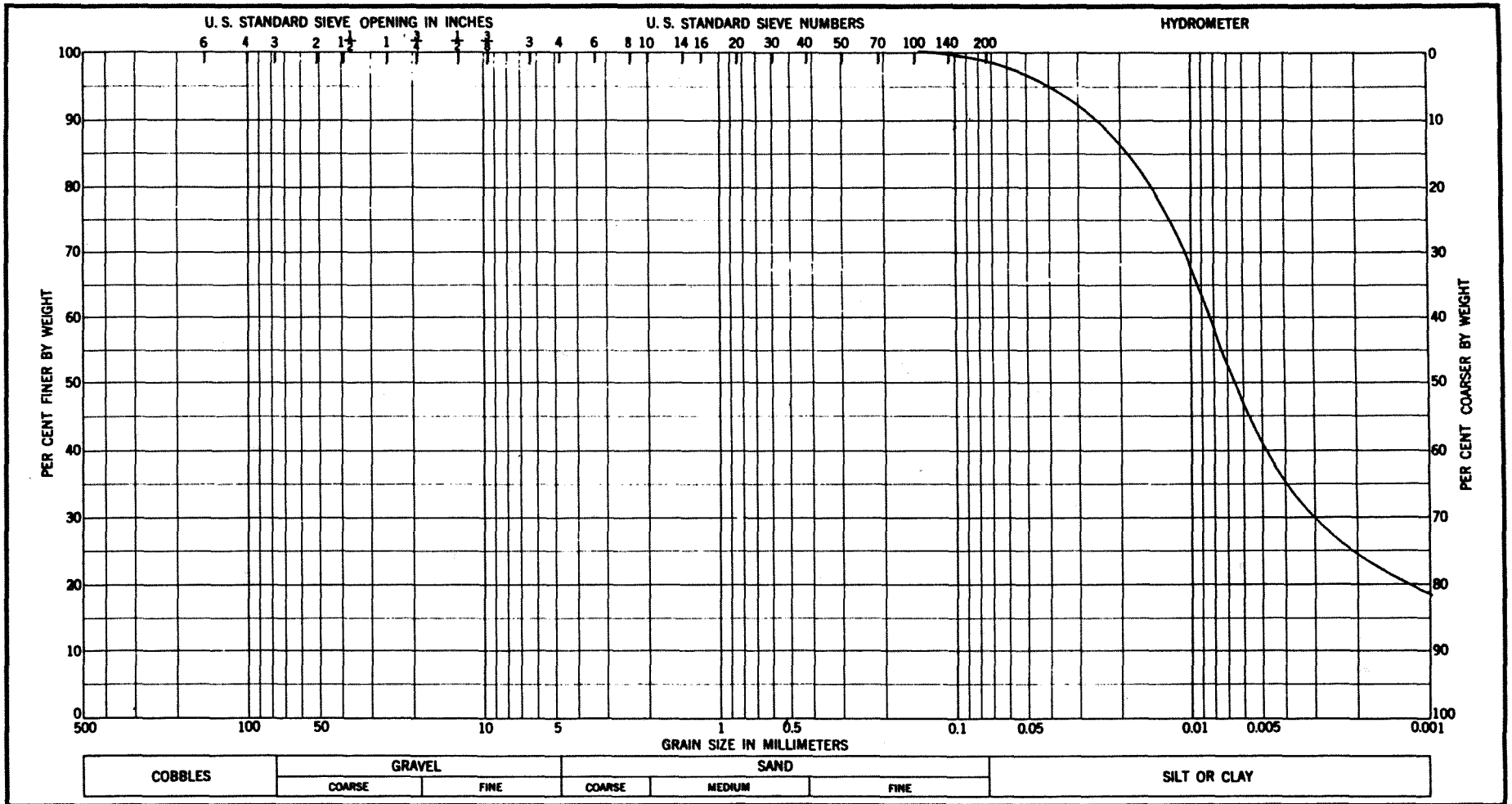
$K_1 = 4.6 \times 10^{-6}$ cm/sec
$K_2 = 4.0 \times 10^{-6}$ cm/sec
$K_3 = 5.1 \times 10^{-6}$ cm/sec
$K_4 = 4.7 \times 10^{-6}$ cm/sec

Coefficient of Permeability, $K_{20} = 4.8 \times 10^{-6}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-012 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 Fax 901-386-6614



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
065S06DA16			29			

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 03/01/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC.

TRI STATE
TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/01/96 Project No.: E-3-157

Client's Project No.: 0106090000

Sample I.D.: 065S06DA40

Soil Description: Gray gravelly Sand with trace of silt

Test Media: City of Memphis Water

	Pre-Test	Post Test
Wet Density (Lbs/ft^3)	136.9	137.4
Dry Density (Lbs/ft^3)	127.8	120.6
Moisture (% Dry Wt)	7.1	13.9
Porosity (n)	.20	.24
Degree of Saturation (%)	.71	1.0
Specific Gravity (ASTM D-854)	2.57	---

Permeability

Temperature Correction, R_t = 1.000

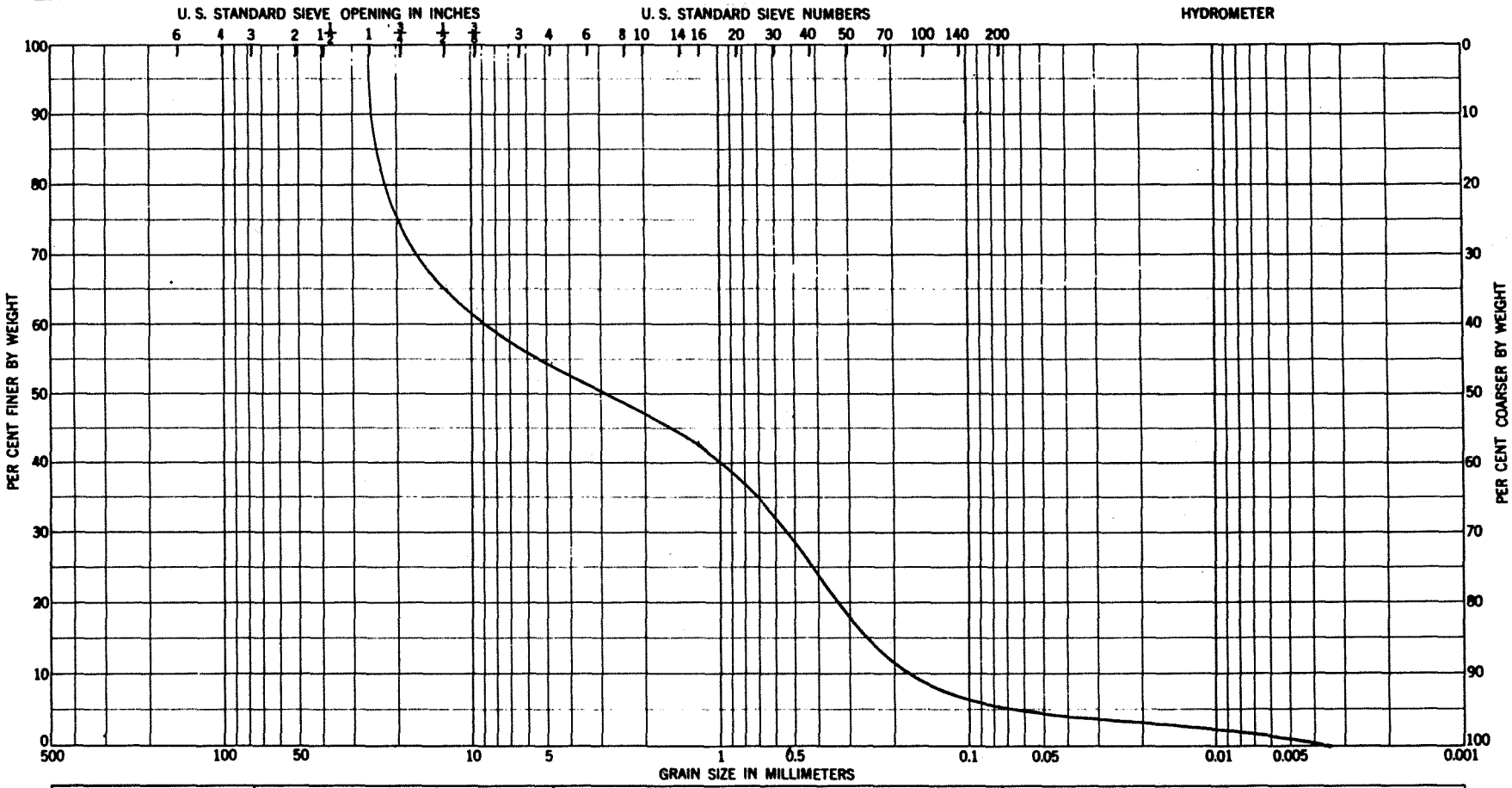
$K_1 = 1.9 \times 10^{-4}$ cm/sec
$K_2 = 2.0 \times 10^{-4}$ cm/sec
$K_3 = 1.1 \times 10^{-4}$ cm/sec
$K_4 = 1.8 \times 10^{-4}$ cm/sec

Coefficient of Permeability, $K_{20} = 1.8 \times 10^{-4}$ cm/sec

Tested in accordance with ASTM D-5084-90.

Lab No. P-96-013 Reviewed By: David D. McCray

6756 Buckles Cove Memphis, TN 38133 901-385-1199 Fax 901-386-6614



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
065S06DA40			7			

Project EnSafe/A&H # 010609000

Area

Boring No.

Date 03/01/96

GRADATION CURVES

TRI-STATE TESTING SERVICES, INC.

BACKGROUND WELLS

SOIL BORING/MONITORING WELL LOGS

☆ Change BG log IDs

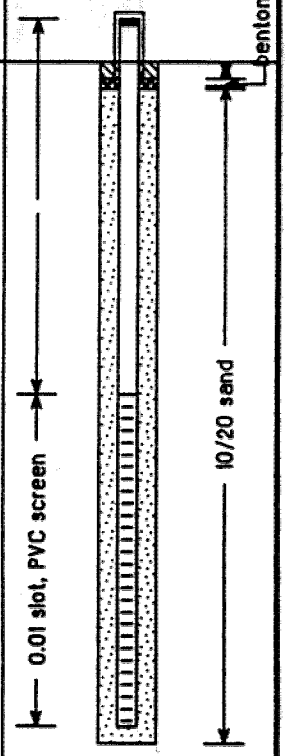
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-02-S~~ OBGG02LS

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #2*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *0745 on 1-12-95*	TOC Elevation: *feet msl*
Completed at *0845 on 1-12-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *20.0 feet*
Geologist: *Jack Carmichael and William Parks*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and roots.	
5			1	75	BG			Silt, clayey, yellow brown to gray brown, moist, soft.	
10			2	50	BG		ML	Silt, clayey, yellow gray to olive gray, stained yellow orange, laminated with orange to brown thin striations.	
15			3	87.5	BG				
20			4	75	BG			Log information taken form the boring for the lower fluvial well BG-2.	
25									
30									
35									
40									

WELL DIAGRAM



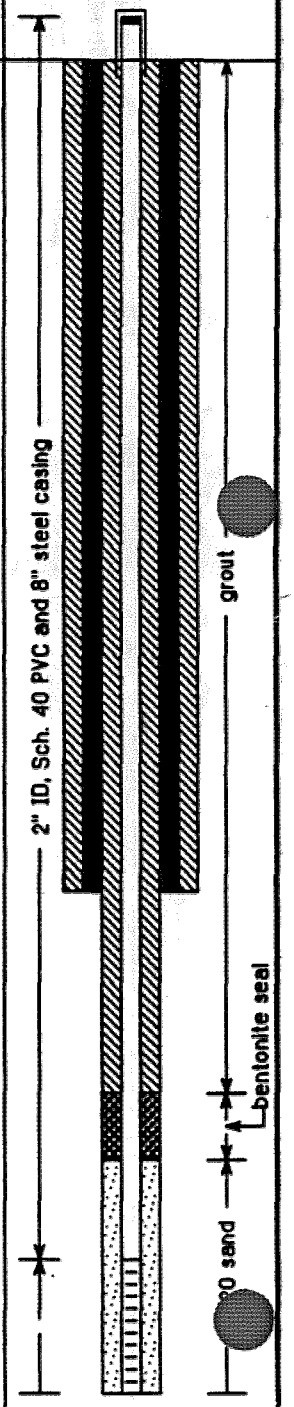
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-02-UF~~ OBGG02UF

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #2*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *0745 on 1-17-95*	TOC Elevation: *feet msl*
Completed at *0845 on 1-17-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *46.0 feet*
Geologist: *Jack Carmichael and William Parks*	Well Screen: *36 to 46 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and roots.	
5			1	75	BG			Silt, clayey, yellow brown to gray brown, moist, soft.	
10			2	50	BG			Silt, clayey, yellow gray to olive gray, stained yellow orange, laminated with orange to brown thin striations.	
15			3	87.5	BG		ML		
20			4	75	BG				
25			5	100	BG			Silt, clayey, light olive gray to yellow gray with iron staining, trace gravel. Silt, clayey, light olive gray, less iron staining.	
30								Sand, silty, trace clay, some gravel, yellow brown to gray brown. Sand, medium to coarse with gravel, orange brown to yellow.	
35			6	108	BG		GP	Sand, fine, with trace gravel, grayish pink to grayish orange, some yellow orange mottling.	
40									

WELL DIAGRAM



EnSafe (SM)

Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-02-UF~~ OBG02UF

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #2*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *0745 on 1-17-95*	TOC Elevation: *feet msl*
Completed at *0845 on 1-17-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *46.0 feet*
Geologist: *Jack Carmichael and William Parks*	Well Screen: *36 to 46 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
45							GP	Same as above but dark yellowish orange.		10/20 sand
			7	90	BG			Log information taken form the boring for the lower fluvial well BG-2.		
50										
55										
60										
65										
70										
75										
80										

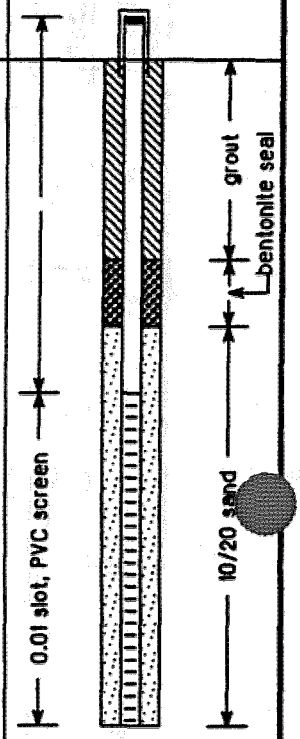
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-04-S~~ OBGG04LS

Project: *NAS Memphis*	Location: *Memphis, TN*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *1000 on 1-11-95*	TOC Elevation: *feet msl*
Completed at *1115 on 1-11-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *20.0 feet*
Geologist: *Jack Carmichael*	Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and debris.	
5			1	100	BG			Silty clay, pale olive with reddish brown mottling, stiff.	
10							ML	Clayey silt, yellow gray to yellow brown, mottled with reddish brown.	
			2	100	BG			Clayey silt, yellow gray to yellow brown mottled yellowish orange, laminated, low plasticity.	
15									
20			3	100	BG			Log information taken from the boring for the lower fluvial well bg-4.	
25									
30									
35									
40									

WELL DIAGRAM



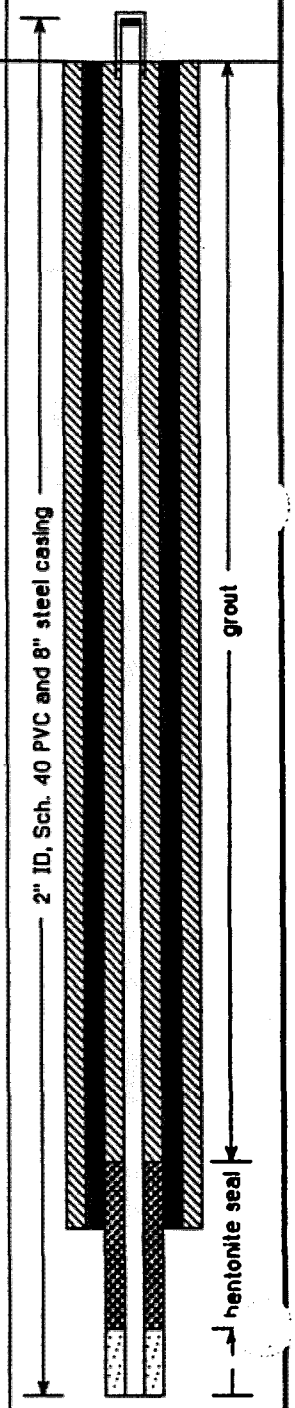
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-04-UF~~ CBGG04UF

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #4*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *1000 on 1-16-95*	TOC Elevation: *feet msl*
Completed at *1115 on 1-16-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *50.0 feet*
Geologist: *Jack Carmichael*	Well Screen: *40 to 50 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and debris.	
			1	100	BG			Silty clay, pale olive with reddish brown mottling, stiff.	
5									
10								Clayey silt, yellow gray to yellow brown, mottled with reddish brown.	
			2	100	BG			Clayey silt, yellow gray to yellow brown mottled yellowish orange, laminated, low plasticity.	
15									
20			3	100	BG		ML	Silt, medium gray, massive, low plasticity, traces of iron inclusions.	
25								Silt, clayey, medium gray stained yellowish orange, plastic.	
			4	100	BG				
30								Silt, clayey, yellow gray to olive gray.	
35									
			5	100	BG				
40							GP	Sand, silty, with gravel, yellowish gray to yellowish brown, mottled yellow orange, moist to wet	

WELL DIAGRAM



Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-04-UF~~ OBGG04UF

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #4*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *1000 on 1-16-95*	TOC Elevation: *feet msl*
Completed at *1115 on 1-16-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *50.0 feet*
Geologist: *Jack Carmichael*	Well Screen: *40 to 50 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
			6	108	BG			Gravel, sandy, fine to very coarse sand, traces of silt, wet, yellow gray.		0.01 slot, PVC screen; 10/20 sand
45			7	100	BG		GP			
50								Log information taken from the boring for the lower fluvial well bg-4.		
55			8	90	BG					
60										
65										
70										
75										
80										

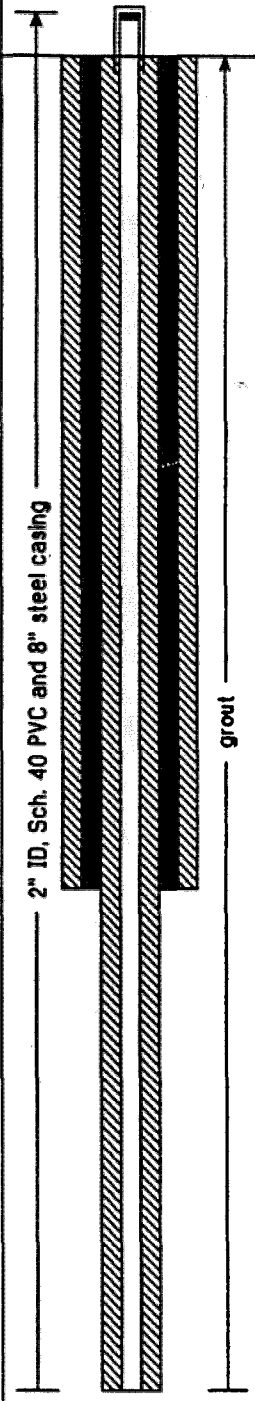
Environmental & Safety Designs, Inc.

Monitoring Well ~~BG-02-LF~~ OBGG02LF

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #2*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *0745 on 1-17-95*	TOC Elevation: *feet msl*
Completed at *0845 on 1-17-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *87.0 feet*
Geologist: *Jack Carmichael and William Parks*	Well Screen: *67 to 77 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
								Fill and roots.	
5			1	75	BG			Silt, clayey, yellow brown to gray brown, moist, soft.	
10			2	50	BG			Silt, clayey, yellow gray to olive gray, stained yellow orange, laminated with orange to brown thin striations.	
15			3	87.5	BG		ML		
20			4	75	BG				
25			5	100	BG			Silt, clayey, light olive gray to yellow gray with iron staining, trace gravel. Silt, clayey, light olive gray, less iron staining.	
30								Sand, silty, trace clay, some gravel, yellow brown to gray brown. Sand, medium to coarse with gravel, orange brown to yellow.	
35			6	108	BG		GP	Sand, fine, with trace gravel, grayish pink to grayish orange, some yellow orange mottling.	
40									

WELL DIAGRAM



EnSafe Environmental & Safety Designs, Inc.

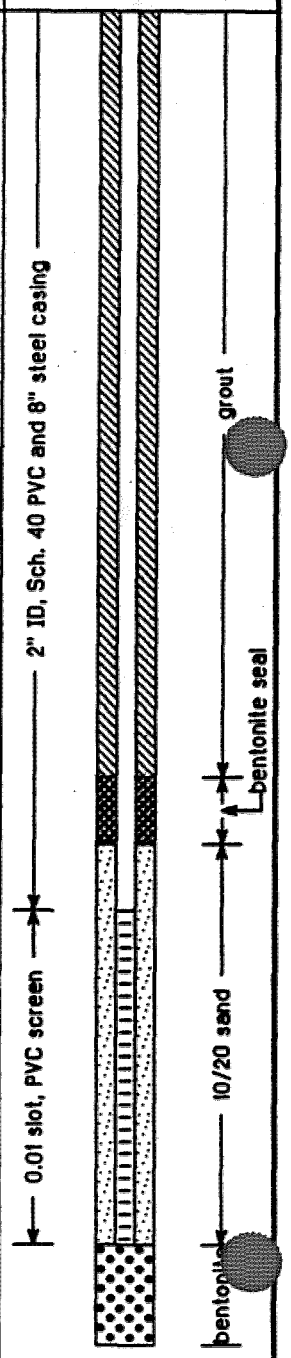
Monitoring Well BG-02-LF

0BGG02LF

Project: *NAS Memphis*	Location: *Millington, TN. Background Site #2*
Project No.: *N0094*	Surface Elevation: *feet msl*
Started at *0745 on 1-17-95*	TOC Elevation: *feet msl*
Completed at *0845 on 1-17-95*	Depth to Groundwater: *feet* Measured:
Drilling Method: *Rotasonic*	Groundwater Elevation: *feet msl*
Drilling Company: *North Star Drilling*	Total Depth: *87.0 feet*
Geologist: *Jack Carmichael and William Parks*	Well Screen: *67 to 77 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)
45			7	90	BG			Same as above but dark yellowish orange. Sand, gravelly, silty, dark yellowish orange, wet.	
50									
55			8	100	BG		GP	Sand, very fine to fine, silty, traces of clay, yellowish gray to grayish orange.	
60									
65			9	105	BG				
70									
75			10	120	BG		SC	Sand, fine, clayey and silty, moderate gray to brownish gray, laminated, soft to stiff.	
80									

WELL DIAGRAM

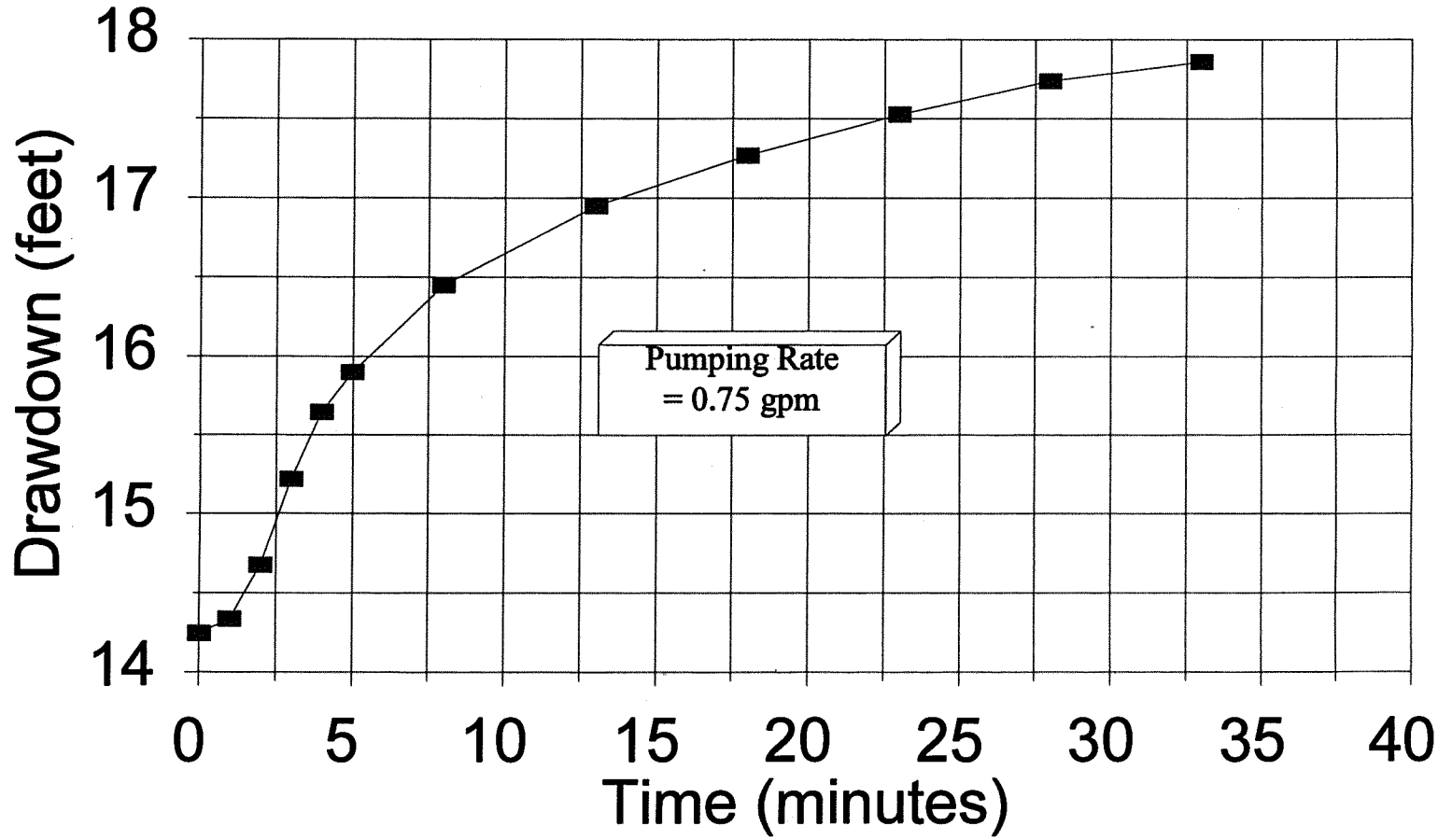


ATTACHMENT 5

ASSEMBLY E SPECIFIC CAPACITY TEST RESULTS AND DATA INPUT FILES

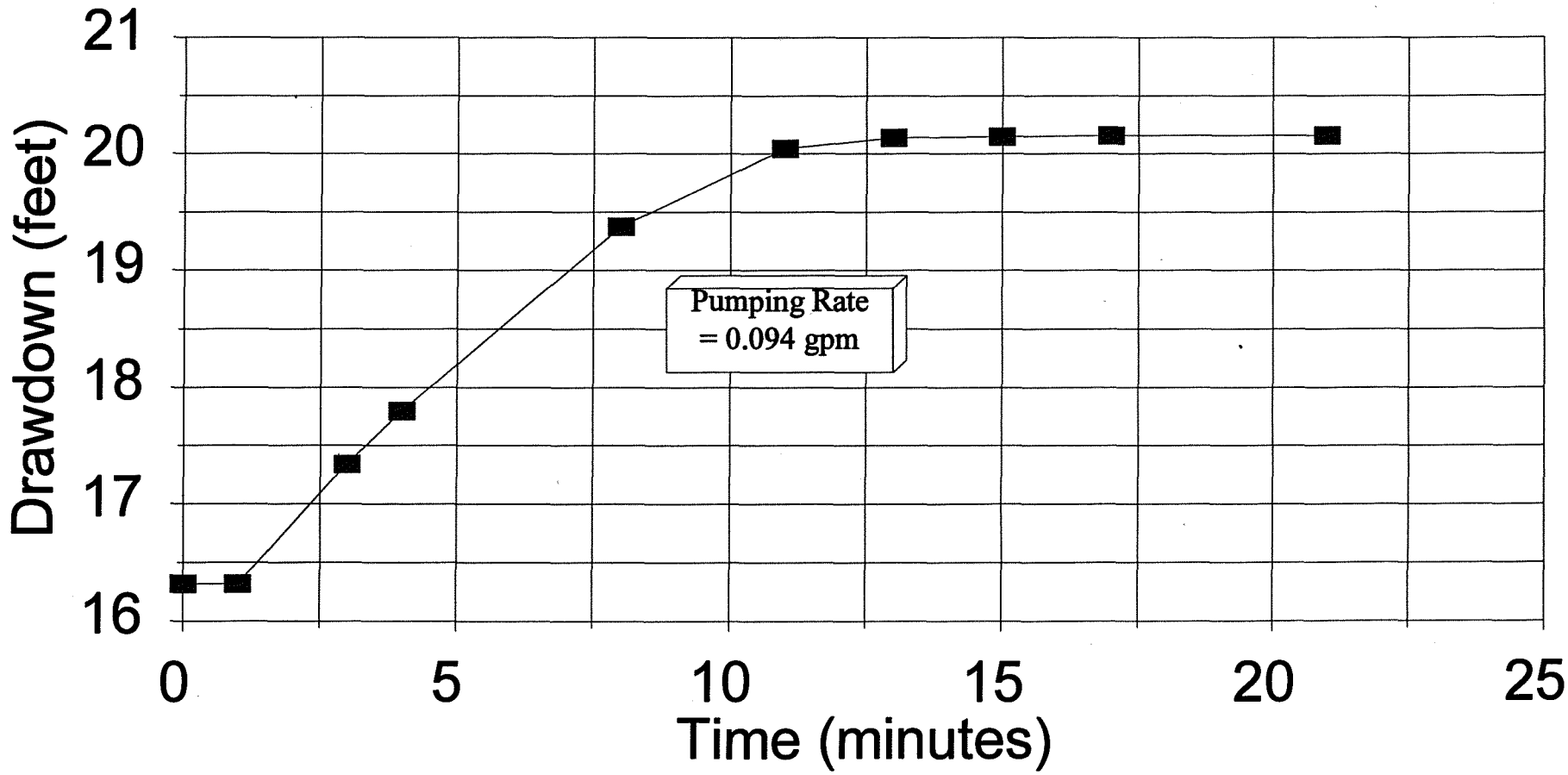
Specific Capacity Test

002G03DA



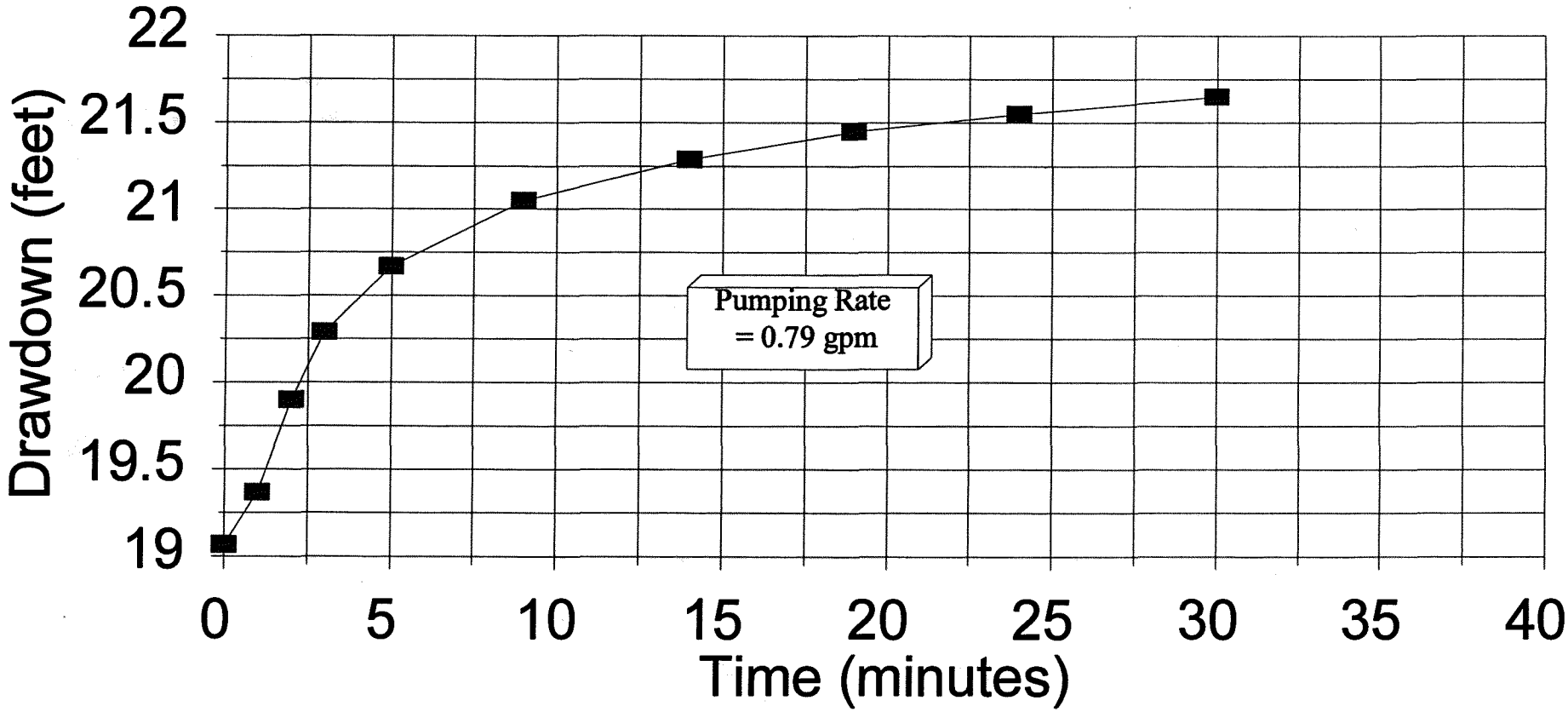
Specific Capacity Test

002G03UA



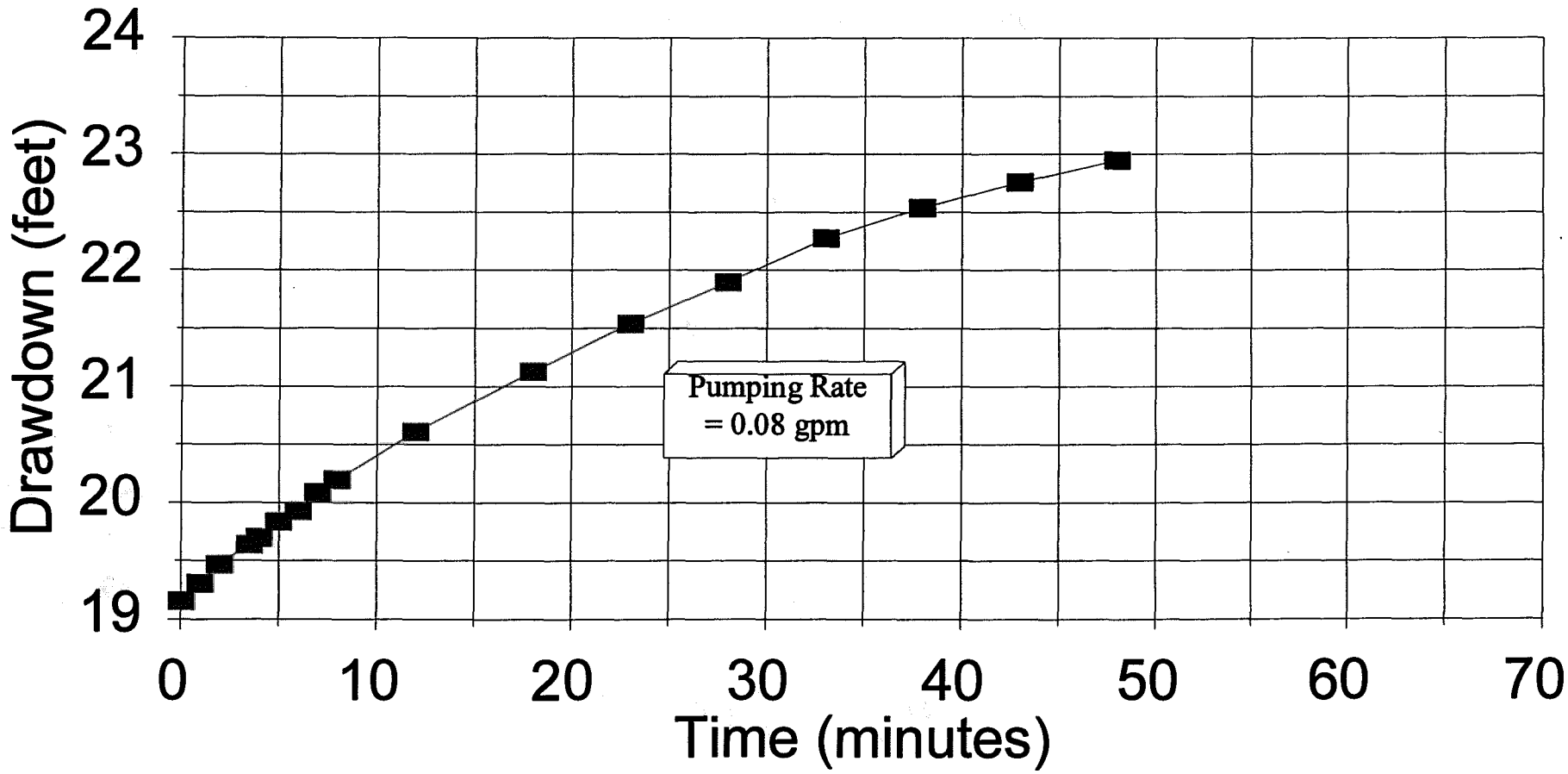
Specific Capacity Test

002G09DA



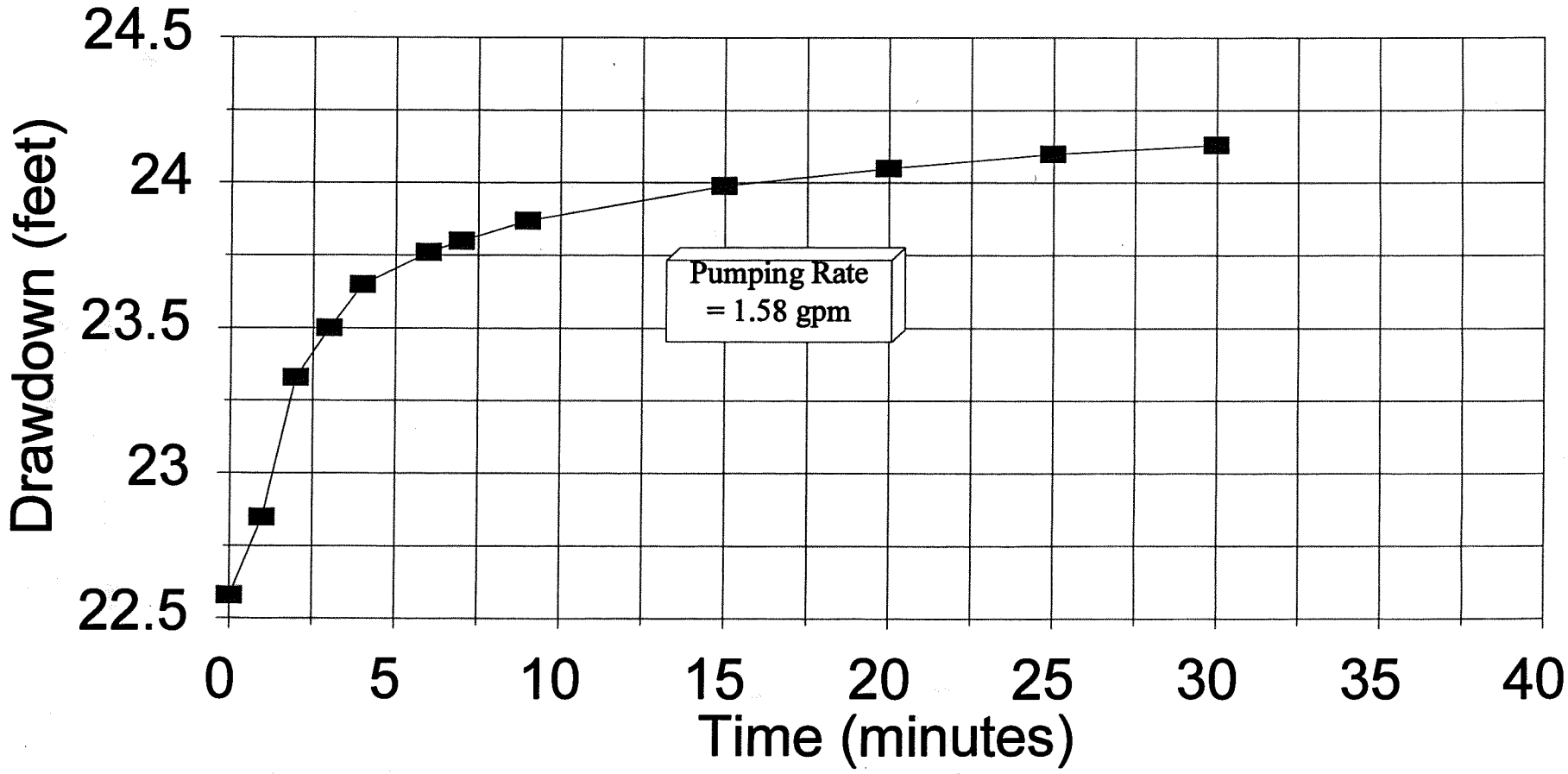
Specific Capacity Test

002G09UA



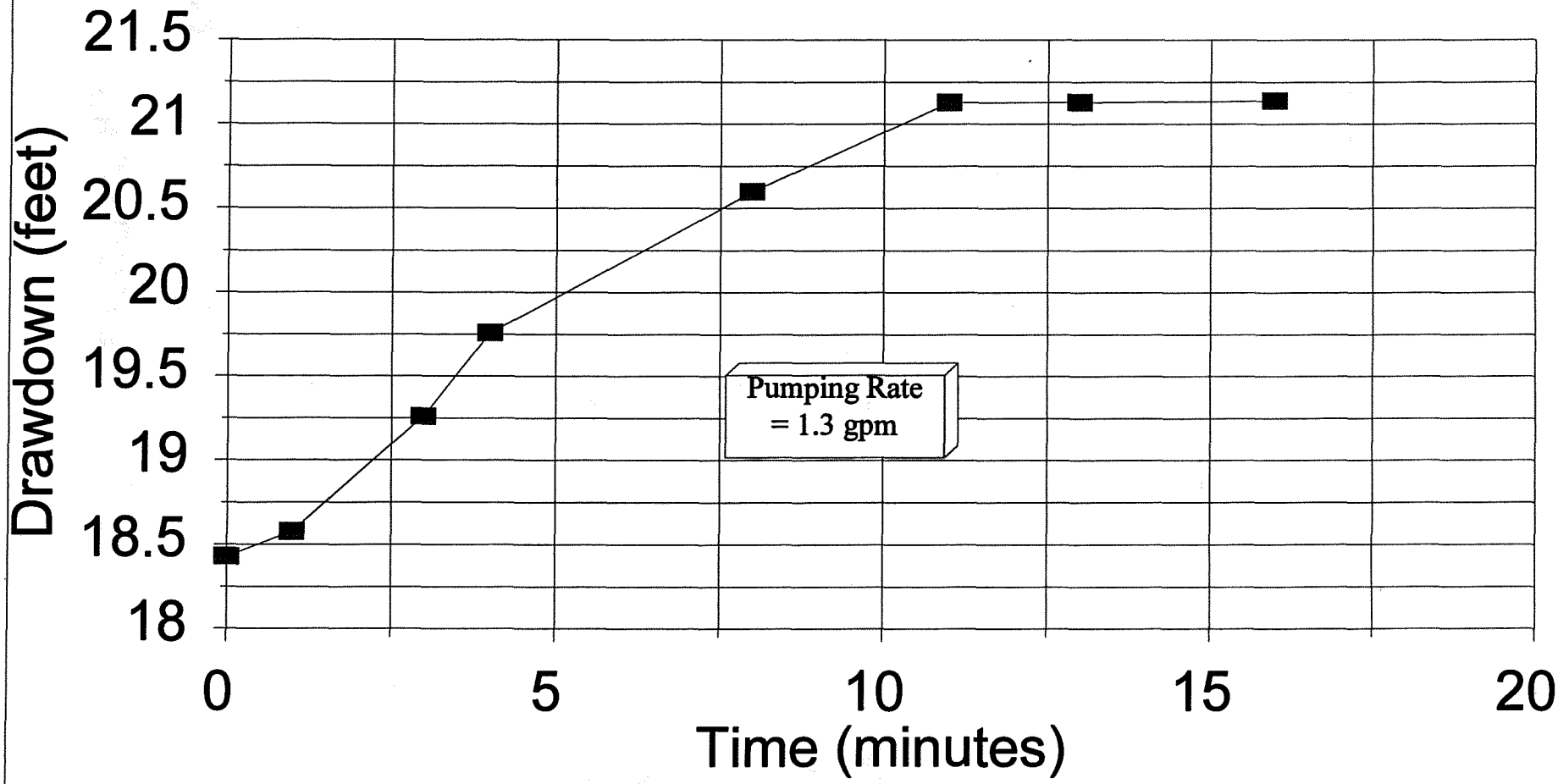
Specific Capacity Test

009G01DA



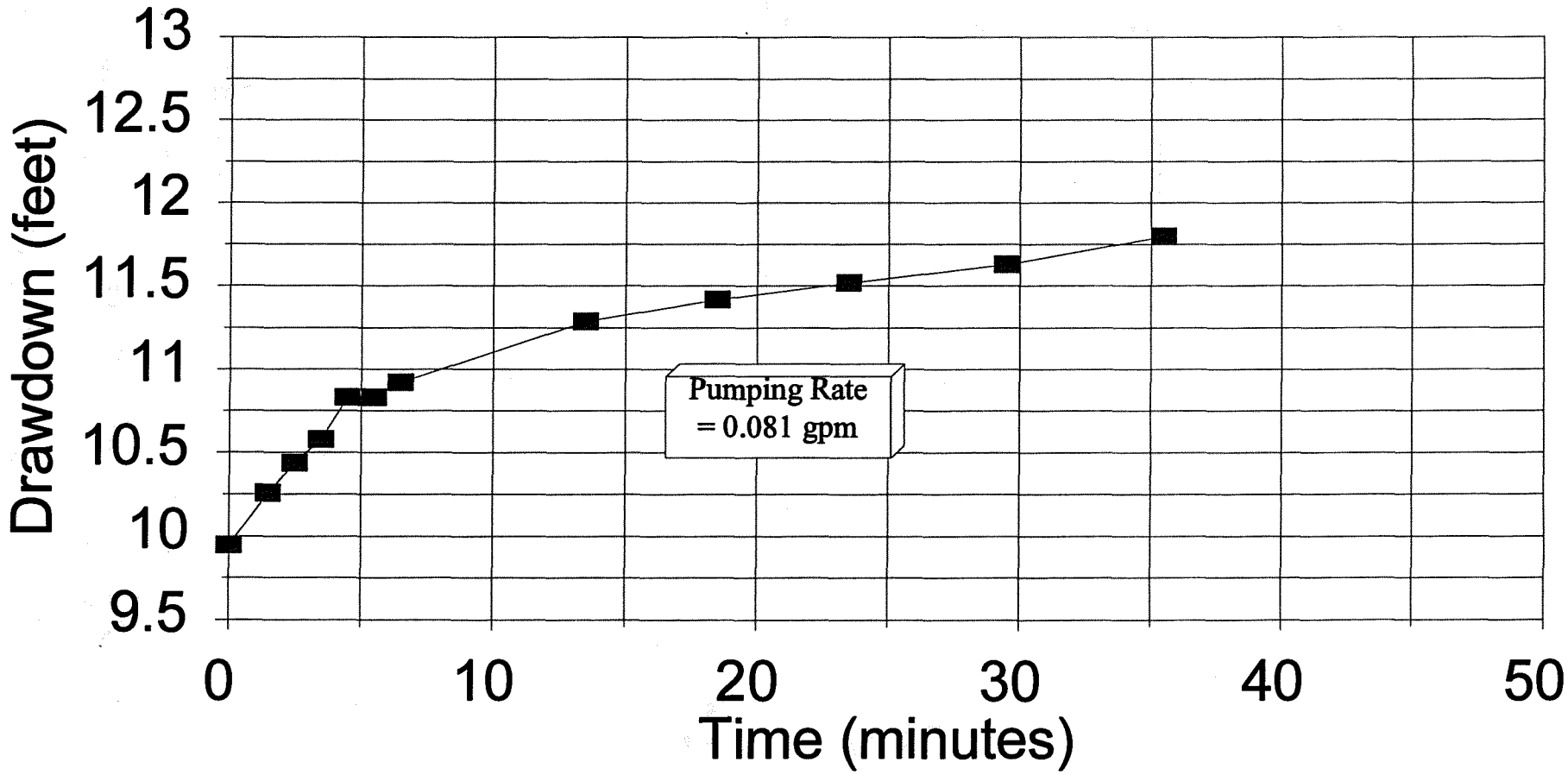
Specific Capacity Test

009G03DA



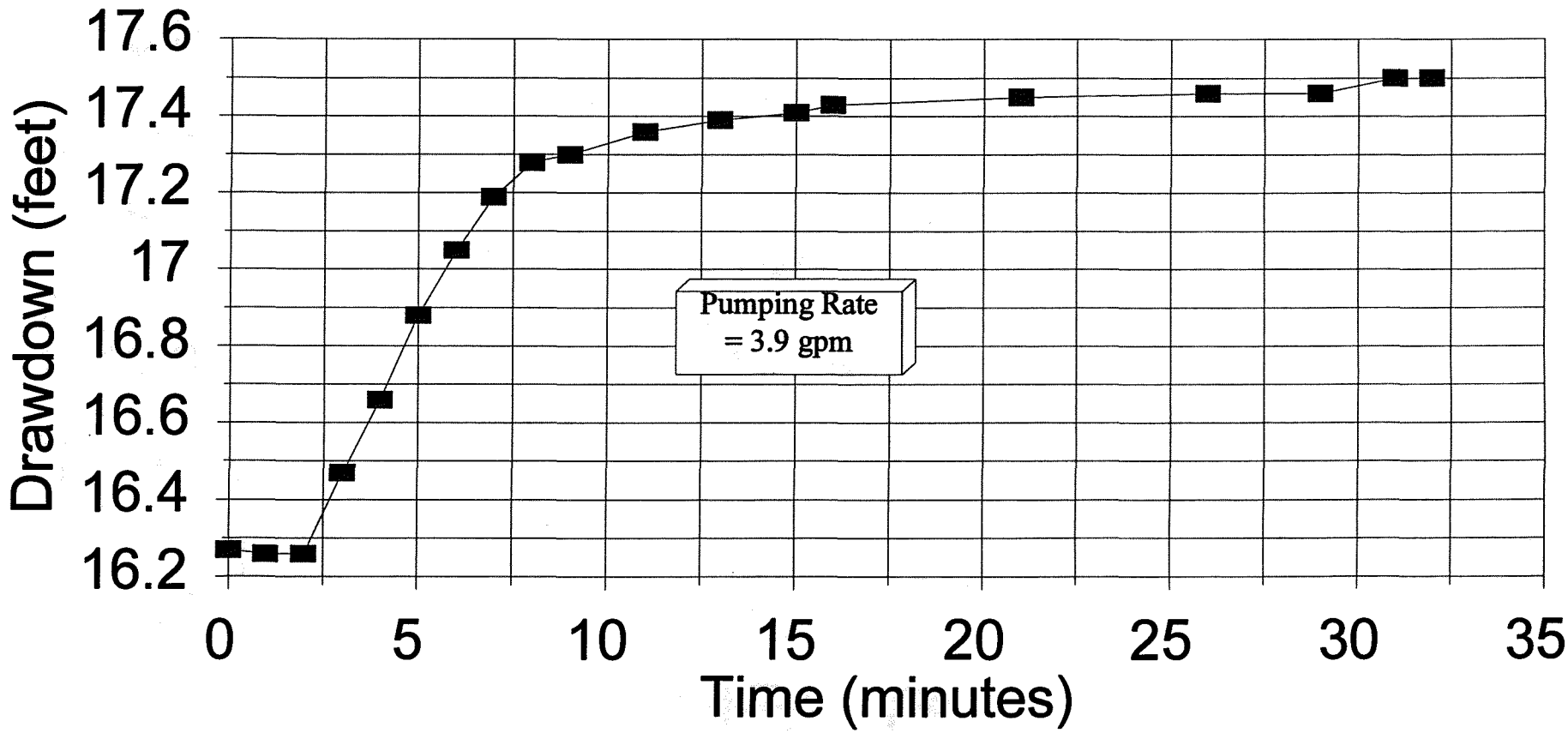
Specific Capacity Test

014G07LF



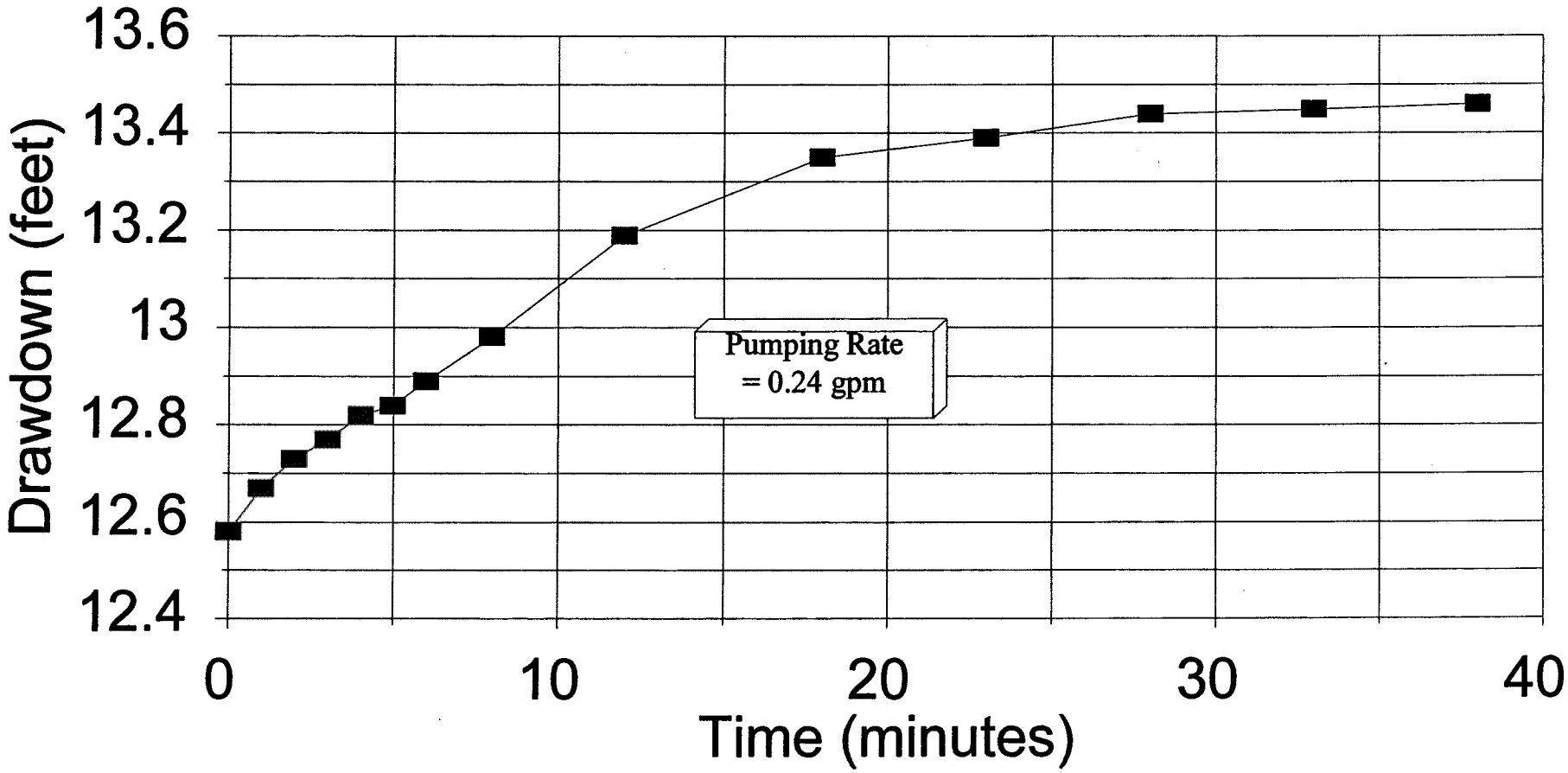
Specific Capacity Test

059G03UF



Specific Capacity Test

065G06DA



TGUESS -- Version 1.2

****

AQUIFER PROPERTIES AS DETERMINED BY ANALYSIS OF SPECIFIC CAPACITIES

****

WELL NUMBER.....= 2G03UA

INPUT DATA (English units):

WELL DIAMETER (IN OR M).....=	2
STATIC WATER LEVEL (FT OR M).....=	16.32
DEPTH TO WATER DURING TEST (FT OR M).....=	20.14
DURATION OF THE TEST (HRS).....=	.22
PUMPING RATE (GPM OR CUB.M/S).....=	.094
THICKNESS OF AQUIFER (FT OR M).....=	12
OPEN INTERVAL (SCREEN LENGTH; FT OR M)....=	10
STORAGE COEFFICIENT.....=	.000696
WELL LOSS COEFFICIENT.....=	1

RESULTS:

SPECIFIC CAPACITY (GPM/FT OR SQ.M/S).....=	2.460733E-02
TRANSMISSIVITY (SQ FT/SEC OR SQ.M/S).....=	4.77337E-05
HYDRAULIC CONDUCTIVITY (FT/SEC OR M/S)....=	3.977808E-06
NUMBER OF ITERATIONS.....=	3

WELL NUMBER.....= 2G03DA

INPUT DATA (English units):

WELL DIAMETER (IN OR M).....=	2
STATIC WATER LEVEL (FT OR M).....=	14.25
DEPTH TO WATER DURING TEST (FT OR M).....=	17.86
DURATION OF THE TEST (HRS).....=	.55
PUMPING RATE (GPM OR CUB.M/S).....=	.75
THICKNESS OF AQUIFER (FT OR M).....=	19
OPEN INTERVAL (SCREEN LENGTH; FT OR M)....=	10
STORAGE COEFFICIENT.....=	.0000228
WELL LOSS COEFFICIENT.....=	1

RESULTS:

SPECIFIC CAPACITY (GPM/FT OR SQ.M/S).....=	.2077564
TRANSMISSIVITY (SQ FT/SEC OR SQ.M/S).....=	8.833193E-04
HYDRAULIC CONDUCTIVITY (FT/SEC OR M/S)....=	4.649049E-05
NUMBER OF ITERATIONS.....=	3

WELL NUMBER.....= 2 G09UA

INPUT DATA (English units):

WELL DIAMETER (IN OR M).....=	2
STATIC WATER LEVEL (FT OR M).....=	19.16
DEPTH TO WATER DURING TEST (FT OR M).....=	23.5
DURATION OF THE TEST (HRS).....=	1.166
PUMPING RATE (GPM OR CUB.M/S).....=	.08
THICKNESS OF AQUIFER (FT OR M).....=	5
OPEN INTERVAL (SCREEN LENGTH; FT OR M)....=	5
STORAGE COEFFICIENT.....=	.000006
WELL LOSS COEFFICIENT.....=	1

RESULTS:

SPECIFIC CAPACITY (GPM/FT OR SQ.M/S).....=	1.843318E-02
TRANSMISSIVITY (SQ FT/SEC OR SQ.M/S).....=	5.3305E-05
HYDRAULIC CONDUCTIVITY (FT/SEC OR M/S)....=	1.0661E-05
NUMBER OF ITERATIONS.....=	2

WELL NUMBER.....= 2 G09DA

INPUT DATA (English units):

WELL DIAMETER (IN OR M).....=	2
STATIC WATER LEVEL (FT OR M).....=	19.07
DEPTH TO WATER DURING TEST (FT OR M).....=	21.65
DURATION OF THE TEST (HRS).....=	.5
PUMPING RATE (GPM OR CUB.M/S).....=	.79
THICKNESS OF AQUIFER (FT OR M).....=	15
OPEN INTERVAL (SCREEN LENGTH; FT OR M)....=	10
STORAGE COEFFICIENT.....=	.000018
WELL LOSS COEFFICIENT.....=	1

RESULTS:

SPECIFIC CAPACITY (GPM/FT OR SQ.M/S).....=	.3062019
TRANSMISSIVITY (SQ FT/SEC OR SQ.M/S).....=	1.132542E-03
HYDRAULIC CONDUCTIVITY (FT/SEC OR M/S)....=	7.550278E-05
NUMBER OF ITERATIONS.....=	3

WELL NUMBER.....= 9G01DA

INPUT DATA (English units):

WELL DIAMETER (IN OR M).....=	2
STATIC WATER LEVEL (FT OR M).....=	22.58
DEPTH TO WATER DURING TEST (FT OR M).....=	24.13
DURATION OF THE TEST (HRS).....=	.5
PUMPING RATE (GPM OR CUB.M/S).....=	1.58
THICKNESS OF AQUIFER (FT OR M).....=	17
OPEN INTERVAL (SCREEN LENGTH; FT OR M)....=	10
STORAGE COEFFICIENT.....=	.00002
WELL LOSS COEFFICIENT.....=	1

RESULTS:

SPECIFIC CAPACITY (GPM/FT OR SQ.M/S).....=	1.019364
TRANSMISSIVITY (SQ FT/SEC OR SQ.M/S).....=	4.302742E-03
HYDRAULIC CONDUCTIVITY (FT/SEC OR M/S)....=	2.531025E-04
NUMBER OF ITERATIONS.....=	3

WELL NUMBER.....= 9G03DA

INPUT DATA (English units):

WELL DIAMETER (IN OR M).....=	2
STATIC WATER LEVEL (FT OR M).....=	18.43
DEPTH TO WATER DURING TEST (FT OR M).....=	21.13
DURATION OF THE TEST (HRS).....=	.18
PUMPING RATE (GPM OR CUB.M/S).....=	1.3
THICKNESS OF AQUIFER (FT OR M).....=	21
OPEN INTERVAL (SCREEN LENGTH; FT OR M)....=	10
STORAGE COEFFICIENT.....=	.0000252
WELL LOSS COEFFICIENT.....=	1

RESULTS:

SPECIFIC CAPACITY (GPM/FT OR SQ.M/S).....=	.4814832
TRANSMISSIVITY (SQ FT/SEC OR SQ.M/S).....=	2.176555E-03
HYDRAULIC CONDUCTIVITY (FT/SEC OR M/S)....=	1.036455E-04
NUMBER OF ITERATIONS.....=	3

WELL NUMBER.....= 14 G07LF

INPUT DATA (English units):

WELL DIAMETER (IN OR M).....=	2
STATIC WATER LEVEL (FT OR M).....=	9.95
DEPTH TO WATER DURING TEST (FT OR M).....=	11.63
DURATION OF THE TEST (HRS).....=	.49
PUMPING RATE (GPM OR CUB.M/S).....=	.081
THICKNESS OF AQUIFER (FT OR M).....=	12
OPEN INTERVAL (SCREEN LENGTH; FT OR M)....=	10
STORAGE COEFFICIENT.....=	.0000144
WELL LOSS COEFFICIENT.....=	1

RESULTS:

SPECIFIC CAPACITY (GPM/FT OR SQ.M/S).....=	4.821428E-02
TRANSMISSIVITY (SQ FT/SEC OR SQ.M/S).....=	1.428461E-04
HYDRAULIC CONDUCTIVITY (FT/SEC OR M/S)....=	1.190384E-05
NUMBER OF ITERATIONS.....=	3

WELL NUMBER.....= 59 G03UF

INPUT DATA (English units):

WELL DIAMETER (IN OR M).....=	2
STATIC WATER LEVEL (FT OR M).....=	16.27
DEPTH TO WATER DURING TEST (FT OR M).....=	17.45
DURATION OF THE TEST (HRS).....=	.35
PUMPING RATE (GPM OR CUB.M/S).....=	3.9
THICKNESS OF AQUIFER (FT OR M).....=	33
OPEN INTERVAL (SCREEN LENGTH; FT OR M)....=	10
STORAGE COEFFICIENT.....=	.00004
WELL LOSS COEFFICIENT.....=	1

RESULTS:

SPECIFIC CAPACITY (GPM/FT OR SQ.M/S).....=	3.305295
TRANSMISSIVITY (SQ FT/SEC OR SQ.M/S).....=	2.299535E-02
HYDRAULIC CONDUCTIVITY (FT/SEC OR M/S)....=	6.968288E-04
NUMBER OF ITERATIONS.....=	4

WELL NUMBER.....= 65 G06 DA

INPUT DATA (English units):

WELL DIAMETER (IN OR M).....=	2
STATIC WATER LEVEL (FT OR M).....=	12.58
DEPTH TO WATER DURING TEST (FT OR M).....=	13.44
DURATION OF THE TEST (HRS).....=	.47
PUMPING RATE (GPM OR CUB.M/S).....=	.24
THICKNESS OF AQUIFER (FT OR M).....=	13
OPEN INTERVAL (SCREEN LENGTH; FT OR M)....=	10
STORAGE COEFFICIENT.....=	.0000156
WELL LOSS COEFFICIENT.....=	1

RESULTS:

SPECIFIC CAPACITY (GPM/FT OR SQ.M/S).....=	.27907
TRANSMISSIVITY (SQ FT/SEC OR SQ.M/S).....=	9.494165E-04
HYDRAULIC CONDUCTIVITY (FT/SEC OR M/S)....=	7.303204E-05
NUMBER OF ITERATIONS.....=	3

ATTACHMENT 6

ASSEMBLY E INVESTIGATIVE-DERIVED WASTE TECHNICAL MEMORANDUMS

EnSafe / Allen & Hoshall

a joint venture for professional services

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Fax (803) 856-0107

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rd, OH 45150
(513) 248-8449
13) 248-8447

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Fax (904) 479-9120

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Hampton, VA 23666
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Fax (804) 766-9558

Raleigh
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Raleigh, NC 27606
Phone (919) 851-1886
Fax (919) 851-4043

Nashville
311 Plus Park Blvd.
Suite 130
Nashville, TN 37217
Phone (615) 399-8800
Fax (615) 399-7467

r s
uller Drive
26
Irving, TX 75038
Phone (214) 791-3222
Fax (214) 791-0405

MEMORANDUM

TO: Rob Williamson
NSA Memphis Public Works Environmental Division

Mark Taylor
SOUTHNAVFACENGCOM

FROM: Robert Smith
EnSafe/Allen & Hoshall

SUBJECT: Characterization of Investigation-Derived Waste from Assembly E SWMUs: NSA Memphis RFI, Millington, Tennessee; CT0-106

DATE: October 14, 1996

Beginning in November 1995, EnSafe/Allen & Hoshall conducted a RCRA Facility Investigation at Naval Support Activity (NSA) Memphis. Investigation derived waste (IDW) was generated during the investigation.

The IDW consisted of two types of media: soil/formation material, and water. The water was generated from activities such as decontamination of soil and groundwater sampling equipment, development of groundwater monitoring wells, and purging of the monitoring wells prior to sampling. The water was contained in a 2,000 gallon polyethylene tank at Facility S-775. Each time the tank reached its capacity, a sample was collected by E/A&H for analysis by an offsite laboratory for waste characterization parameters. The analytical results from the IDW characterization were then submitted to the City of Millington's contracted engineer, Mr. James Cox of Fisher & Arnold Engineering for discharge approval. Upon receiving discharge approval from Mr. Cox, the contents of the tank were discharged to the sanitary sewer system via an onsite oil/water separator. The 2,000 gallon tank has been cycled a total of 13 times since the beginning of the Assembly E investigation.

The second media type, soil/formation material, was generated during drilling activities, which included drilling spoils and soil/mud generated during the decontamination of the drilling and sampling equipment. Formation material consisted of all subsurface material (sand, gravel, clay) brought to the surface during the drilling/sampling activities. All material generated was containerized in 168 DOT-approved, lined, 55-gallon drums, and were properly labeled and staged in the NSA Memphis IDW storage area (Facility N-1665), where they presently remain. During a recent inspection of the IDW containers, E/A&H found that all labels

placed on the drums have become illegible preventing the correlation of individual drums with specific boring locations. This IDW characterization has been conducted as a basis for disposal and is based the on the concentrations of compounds detected in the Assembly E soil borings.

CHARACTERIZATION

A total of 101 compounds were detected during the Assembly E RFI Investigation. Each compound has been characterized based on the U.S. Environmental Protection Agency (USEPA) Hazardous Waste Rules as outlined in Title 40 of the Code of Federal Regulations, Part 261 (40 CFR 261), and the guidelines set forth by Tennessee Department of Environment and Conservation (TDEC), Division of Solid Waste Management (DSWM).

Of the 101 compounds detected, the following six compounds were defined in 40 CFR 261.30 as being "F-listed" hazardous wastes. F-listed wastes, by definition, are compounds from specific sources, which have been listed due to their Hazard Code (i.e., Toxicity, Ignitability, Corrosivity). The criteria for the selection of these compounds, as well as the USEPA Region III Risk-Based Concentration (RBC) and pertinent ignitability data, is presented in Table 1:

Table 1

NSA Memphis RFI; Assembly E IDW Characterization

F-Listed Wastes

Compound	Hazardous Waste Code as defined in 40 CFR 261	Maximum Detected Concentration (µg/kg)	Residential RBC (µg/kg)	Flashpoint (ignitability) (°C/°F))	Selection Criteria as defined in 40 CFR 261
Trichloroethylene	F001	19.0	58,000	N/A	Toxicity
Methylene Chloride	F002	5.0	85,000	N/A	Toxicity
Tetrachloroethene	F002	23.0	12,000	N/A	Toxicity
4-methyl-2-pentanone (MIBK)	F003	170	N/A	17.8°C/64°F	Ignitability
Acetone	F003	48000	7,800,000	0°C/0°F	Ignitability
2-butanone (MEK)	F005	3600	47,000,000	-8.75°C/16°F	Ignitability, Toxicity

Notes:

N/A = Data not available

According to 40 CFR 261.3(a)(2)(iii), "A solid waste, as defined in § 261.2, is a hazardous waste if....it is a mixture of a solid waste and a hazardous waste that is listed in Subpart D of this part solely because it exhibits one or more of the characteristics of hazardous waste identified in subpart C of this part, ***unless the resultant mixture no longer exhibits any characteristics of hazardous waste identified in subpart C of this part.....***"

According to 40 CFR 261.30, the F001 and F002 wastes (trichloroethylene, methylene chloride, and tetrachloroethene) were listed due to their toxicity, and the F005 waste (MEK) was listed due to its toxicity and ignitability. Also, according to 40 CFR 261.30, the F003 (MIBK and Acetone)

wastes were listed due to their ignitability. Because of the low contaminant concentrations detected and the medium (i.e., soil) in which they are contained, soil found at the Assembly E SWMUs does not exhibit the ignitable characteristic. However, because toxicity cannot be physically defined as ignitability can, it would be difficult to prove that the soil/F001, soil/F002, and soil/F005 mixtures are not toxic.

The Land Disposal Restriction (LDR) Guide #5 provides the following discussion of the Contained-In Interpretation (USEPA Office of Solid Waste Management dated November 13, 1986). "The contained-in policy states that any mixture of a non-solid waste and a RCRA listed hazardous waste must be managed as a hazardous waste as long as the material contains (i.e., is above health based levels) the listed hazardous waste." The contained in policy was developed to address contaminated environmental media (i.e., soil, groundwater, surface water), as opposed to the mixture rule which governs mixtures of hazardous and solid wastes. E/A&H has previously confirmed that TDEC's DSWM concurs with and applies the USEPA contained-in policy using RBCs as health-based levels.

Characterization of the soil/formation material generated during the RFI will be based on the contained in policy. Past disposal of soil at NSA Memphis has also applied the contained-in policy in this situation (Memorandum, *Characterization of Investigation Derived Waste from Assembly A SWMUs;* CTO-094; June 6, 1995). A comparison of the soil boring data to the residential RBCs for soil (Table 1) shows that the maximum concentrations of the potentially listed hazardous wastes contained in the IDW do not exceed the health-based risk levels.

Petroleum Constituents

As part of the full scan analytical parameter list associated with the investigation, each sample collected was submitted for total petroleum hydrocarbon (TPH) analysis using the Tennessee-

modified USEPA methods 8015 for gasoline range organics (GRO) and diesel range organics (DRO). The maximum detected concentrations of TPH-GRO and TPH-DRO were 260 mg/kg and 650 mg/kg, respectively; however, the average detected concentrations of TPH-GRO and TPH-DRO were 7.5 mg/kg and 49.8 mg/kg, respectively; with 4% of the samples analyzed exceeding 100 mg/kg TPH. Because labels on the drums containing the IDW are illegible, individual sample results cannot be correlated to the representative IDW on a drum by drum basis. Therefore, all IDW must be characterized together as one unit; for this reason, the average of all detected results was used in the characterization process. Based on the low average concentration of petroleum constituents detected, and the infrequency of detections exceeding 100 mg/kg of TPH, the material would not meet the TDEC DSWM criteria for a petroleum contaminated soil of 100 mg/kg TPH.

NON-HAZARDOUS IDW DISPOSAL

Options for the disposal of the non-hazardous IDW include:

1. All soil and formation material can be spread or buried at an existing SWMU (e.g., Salvage Yard #2, SWMU 41) on property being retained by the Navy, preferably in a single, predetermined area to facilitate future locating and sampling of the material, if necessary. The spreading of this material at an existing SWMU would eliminate the potential for creating a future SWMU and material handling activities should blend the IDW, creating a more homogeneous mixture, which would be more representative of the average concentrations discussed previously.

2. All soil can be sent to a TDEC-approved, non-hazardous landfill.

EnSafe / Allen & Hoshall

a joint venture for professional services

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, uller Drive
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Fax (214) 791-0405

Memorandum

Date: January 24, 1997

To: NSA Memphis, BRAC Cleanup Team

From: Robert Smith, E/A&H RS

Re: Assembly E IDW Drum Screening Results

E/A&H has recently completed the drum screening activities associated with the NSA Memphis Assembly E investigation derived waste (IDW). The drum screening, conducted at the request of the BCT, was in response to the *Characterization of Investigation-Derived Waste from Assembly E SWMUs* memorandum (E/A&H, October 14, 1996) which stated that 4% of the samples collected during the Assembly E RFI contained petroleum hydrocarbon concentrations exceeding 100 mg/kg.

The screening activities were conducted following the procedures outlined in the *Drum Screening Procedures, Assembly E IDW* memorandum (E/A&H, December 9, 1996) presented to the BCT, with one procedural change made at the request of Mr. Jim Morrison (Tennessee Department of Environment and Conservation [TDEC]). In addition to collecting headspace data from each drum, a sample was also collected from each drum and placed in an air tight bag (i.e., zip-lock), and the contents of the bag were subsequently screened using a flame ionization detector (FID).

At the request of TDEC, their office was notified prior to beginning any screening activities; however, due to technical difficulties associated with the instruments (i.e, PID, FID), no work was performed while TDEC was on site.

The data, presented in the attached table and associated graph, indicate that 6 out of the 160 (3.75%) drums screened exhibited elevated organic vapor concentrations in relation to the rest of the drums. Due to varying factors associated with organic vapor readings and containerized soil (i.e., painted surfaces on the interior of the drum, moisture, etc.), the organic vapor levels detected may or may not be indicative of the petroleum concentration of the drum contents.

The available disposal options for the Assembly E IDW include onsite disposal (identical to the Assembly A IDW), however, the petroleum levels in the soil may need to be confirmed by collecting samples of the material contained in the 6 drums exhibiting elevated headspace readings. If the BCT decides the data is needed, composite samples will be collected from each drum using a stainless steel hand auger to allow the samplers to obtain material from 3 points within the material contained in each drum. These composite samples, a total of 6, would be submitted for total petroleum hydrocarbon analysis by EPA Method 418.1.

Should the analytical data indicate that the petroleum levels of any of the drums exceed the current TDEC definition of a petroleum contaminated soil (presently 100 ppm TPH), that drum will be segregated for disposal under the TDEC Special Waste Policy. The remaining soil may be spread onsite, at a location agreed upon by the NSA Memphis Public Works Office and the BCT.

Naval Support Activity Memphis RCRA Facility Investigation
Assembly E Investigation Derived Waste Drum Organic Vapor Screening Log (ppm)

Drum	Headspace	Baggie
1	73	2
2	**600**	**1600**
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	27	0
9	0	0
10	10	0
11	**4**	**3100**
12	0	0
13	0	0
14	0	< 1
15	0	0
16	**7700**	**0**
17	0	0
18	0	0
19	0	0
20	0	0
21	0	0
22	0	0
23	0	0
24	0	0
25	0	0
26	0	0
27	0	0
28	0	0
29	0	0
30	0	0
31	0	0
32	13	7
33	20	45
34	0	0
35	0	0
36	< 1	< 1

Naval Support Activity Memphis RCRA Facility Investigation
Assembly E Investigation Derived Waste Drum Organic Vapor Screening Log (ppm)

Drum	Headspace	Baggie
37	0	< 1
38	0	3
39	5	< 1
40	< 1	0
41	< 1	0
42	< 1	0
43	< 1	0
44	< 1	0
45	0	0
46	0	0
47	0	< 1
48	0	0
49	0	0
50	0	0
51	0	0
52	0	0
53	0	0
54	0	0
55	0	0
56	0	0
57	0	0
58	0	0
59	0	0
60	0	0
61	0	0
62	0	0
63	**0**	**4257**
64	0	0
65	0	0
66	0	0
67	0	0
68	0	0
69	**4651**	**217**
70	2	0
71	0	0
72	0	0
73	0	0

Naval Support Activity Memphis RCRA Facility Investigation
Assembly E Investigation Derived Waste Drum Organic Vapor Screening Log (ppm)

Drum	Headspace	Baggie
74	165	83
75	0	730
76	0	0
77	0	0
78	0	0
79	0	0
80	0	0
81	0	0
82	0	0
83	0	0
84	110	105
85	0	0
86	0	0
87	0	0
88	0	0
89	0	0
90	0	0
91	0	0
92	0	0
93	0	0
94	0	0
95	0	0
96	0	0
97	222	0
98	8	0
99	0	0
100	0	0
101	0	0
102	0	238
103	0	0
104	–	–
105	–	–
106	0	0
107	0	0
108	0	0
109	0	0
110	–	–

Naval Support Activity Memphis RCRA Facility Investigation
Assembly E Investigation Derived Waste Drum Organic Vapor Screening Log (ppm)

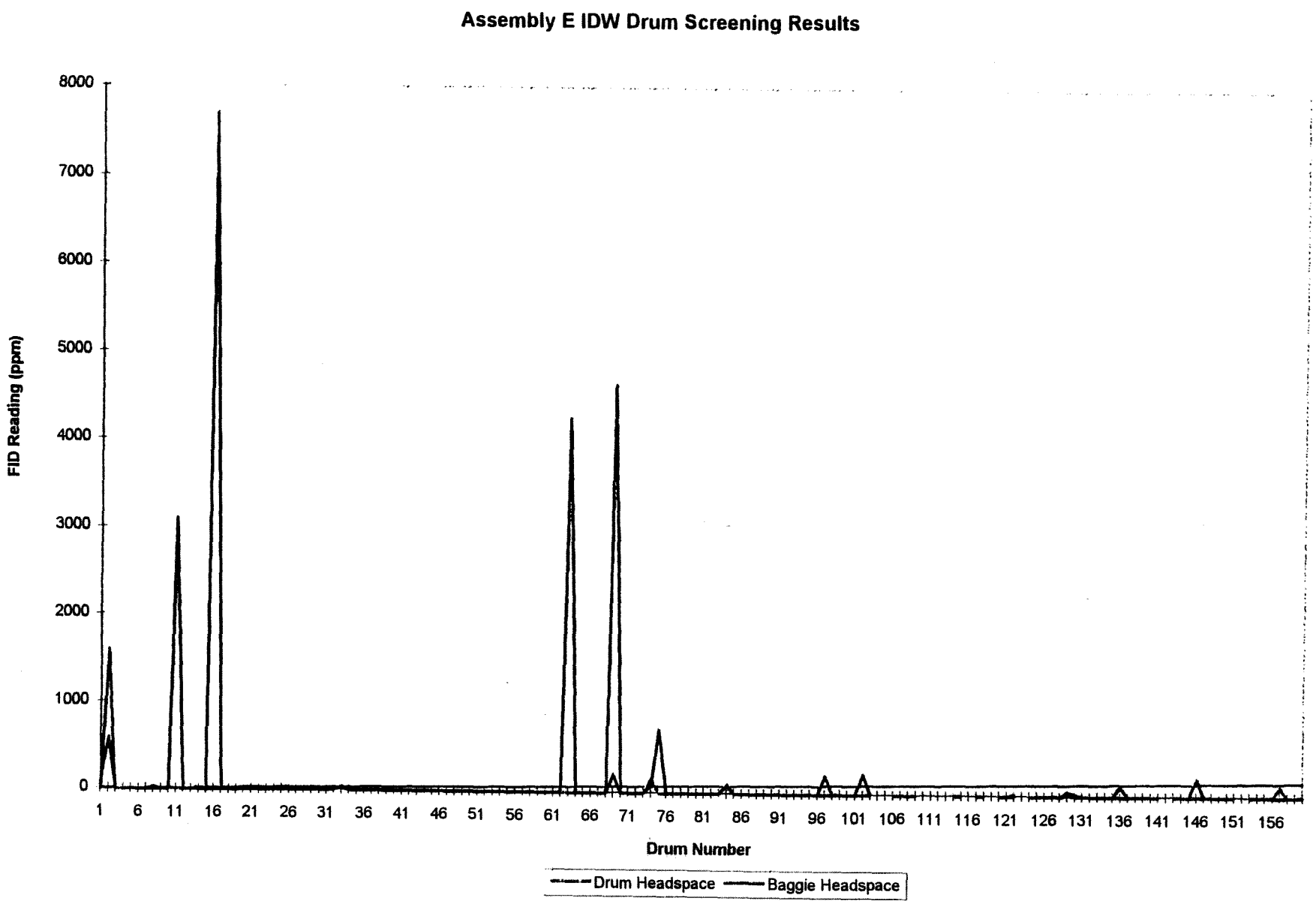
Drum	Headspace	Baggie
111	–	–
112	0	0
113	–	–
114	5	0
115	0	0
116	–	–
117	0	0
118	0	0
119	–	–
120	0	0
121	0	0
122	20	0
123	–	–
124	0	0
125	0	0
126	0	0
127	0	0
128	0	0
129	57	14
130	29	0
131	0	0
132	0	0
133	0	0
134	0	0
135	0	0
136	121	0
137	0	0
138	0	0
139	0	0
140	0	0
141	0	0
142	–	–
143	0	0
144	0	0
145	0	0
146	224	0
147	0	0

Naval Support Activity Memphis RCRA Facility Investigation
Assembly E Investigation Derived Waste Drum Organic Vapor Screening Log (ppm)

Drum	Headspace	Baggie
148	0	0
149	0	0
150	0	0
151	0	0
152	–	–
153	0	0
154	0	0
155	0	0
156	0	0
157	123	0
158	0	0
159	0	0
160	13	0

Notes:
– = Data not available due to inaccessibility to drum, or drum contained waste plastic sheeting.
Bolded items indicate elevated organic vapor readings, relative to all drums screened.

NSA Memphis Assembly E IDW Screening Results



ATTACHMENT 7

TECHNICAL MEMORANDUM
SURFACE SOIL (0 TO 1 FOOT) BACKGROUND DIELDRIN CONCENTRATIONS AT NSA MEMPHIS

TECHNICAL MEMORANDUM

TO: Mark Taylor/David Porter, SOUTHDIV
Tonya Barker/Rob Williamson, NSA Memphis
Jack Carmichael, USGS
Brian Donaldson, EPA
Jim Morrison, TDEC
Brenda Duggar, MSCHD
E/A&H Project Team

FROM: Brian Mulhearn, EnSafe/Allen & Hoshall

DATE: June 3, 1997

RE: Surface Soil (0 to 1 foot) Background Dieldrin Concentrations at NSA Memphis

During the July 24, 1996 BRAC Cleanup Team (BCT) meeting, the BCT decided that the June 2, 1995 *Soil Dieldrin Technical Memorandum* should be re-submitted and finalized to clarify how the anthropogenic background reference concentration (RC) will be used that should be considered when making risk management decisions involving dieldrin. This memo addresses USEPA and TDEC's comments on dieldrin memos submitted in the past. Two-times the arithmetic mean soil dieldrin concentrations, resulting in an RC of 0.262 mg/kg for dieldrin, will not be used to eliminate dieldrin as a chemical of potential concern in baseline risk assessments. Dieldrin will be retained as a chemical of potential concern in human health risk assessments unless it is eliminated based on comparisons to USEPA's risk-based screening concentrations. However, the maximum dieldrin concentration reported at a site will be compared to the RC, and exceedances will be discussed as appropriate. The dieldrin RC was determined as discussed in the June 2 memo, which is the source of the text below.

Chlorinated pesticides (specifically dieldrin) were used extensively in the 1950s and 1960s during a U.S. Department of Agriculture white fringed beetle quarantine. NSA Memphis has record that the agents were applied aerially for their intended purpose over the majority of the facility. During the RCRA Facility Investigation, dieldrin and other chlorinated pesticides were detected in most surface soil and some subsurface soil samples collected at both SWMUs and background locations. Due to the ubiquitous presence of dieldrin in site soil, the following assessment was

performed to support risk management decisions to be made by the BCT. Figure 1 shows reported surface soil dieldrin concentrations at the original NSA Memphis background locations.

Table 1 shows concentrations ranged from below quantitation limits to 0.311 mg/kg with a mean of 0.131 mg/kg at background locations. Standard risk assessment methods were used to evaluate the significance of the reported concentrations. Default assumptions for residential and occupational exposure scenarios were used to project dieldrin-related carcinogenic risk through incidental ingestion and dermal contact soil pathways, which were detailed in the November 15, 1996 Technical Memorandum, *General Human Health Risk Assessment (HHRA) Approach for NSA Memphis*. For each exposure scenario, risk was estimated using the maximum and mean SWMU-specific dieldrin concentrations. The results of this process are provided in Table 2, including concentrations at SWMUs ranging from below quantitation limits to 0.609 mg/kg (average of the duplicate results at SWMU 5, boring 4).

As shown in Table 2, SWMU 5 had the highest projected soil pathway risk associated with dieldrin at maximum concentrations (2.2E-5). The SWMU 5 risk estimate was approximately twice that of the corresponding background. When mean concentrations were used as the exposure point concentration, SWMU 8 dieldrin risk was found to be the highest although it did not differ appreciably from background. USEPA's generally acceptable range for carcinogenic risk is 1E-6 to 1E-4. In no instance (onsite or background) did dieldrin risk projections exceed 1E-4. This finding indicates that dieldrin concentrations reported at each SWMU do not necessitate remedial action in the absence of other significant carcinogenic risk contributors.

Soil dieldrin is not expected to pose a substantial threat to shallow groundwater at any SWMU or background location. This conclusion is based on the strong soil binding properties of the compound as well as empirical data for subsurface soil that show significant vertical migration has not occurred.

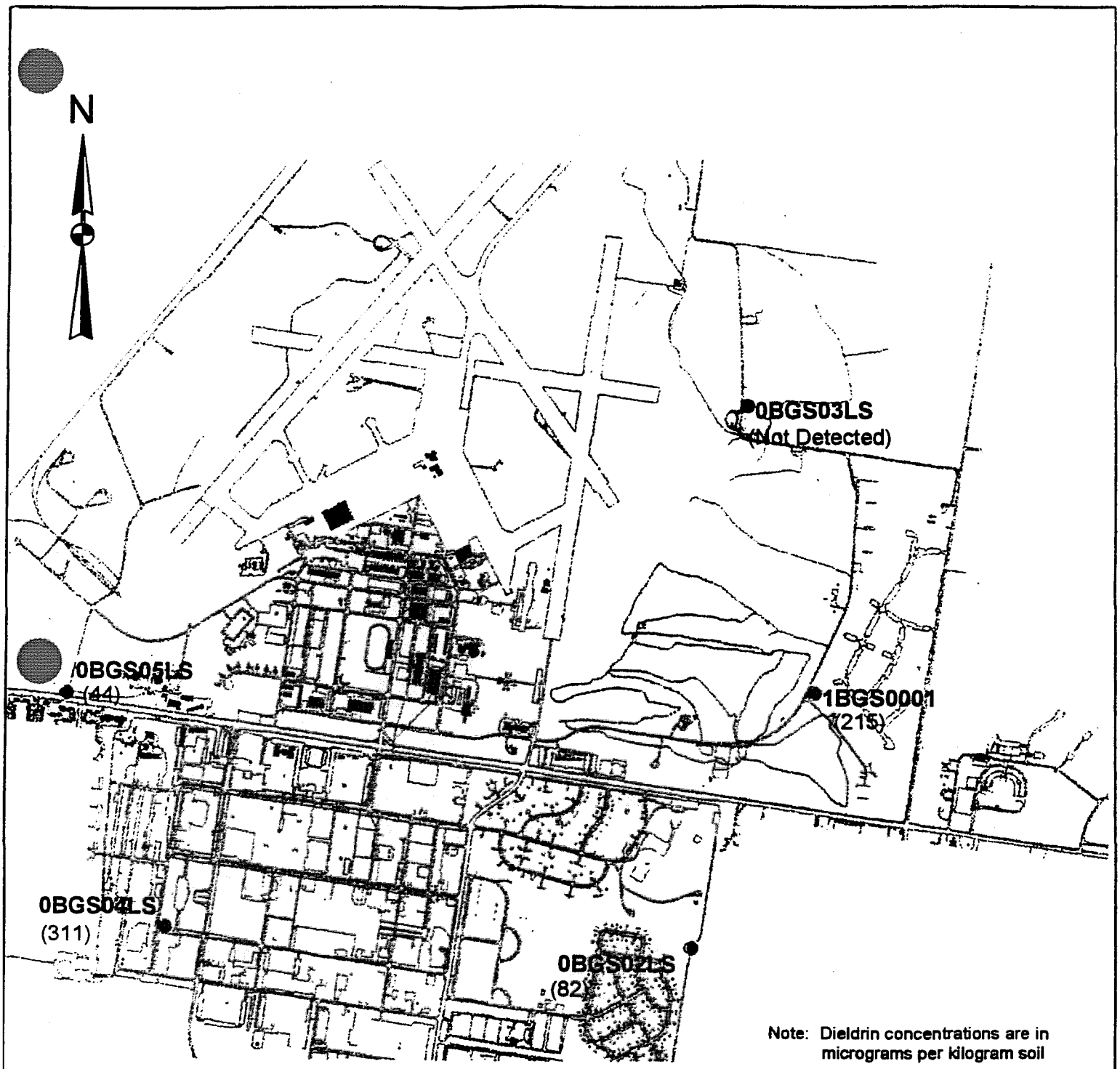


Figure 1

Surface Soil Dieldrin Concentrations Reported in Background Samples NSA Memphis

Table 1
Summary of Dieldrin Concentrations
Reported at NSA Memphis
Background Locations

Location	Concentration (mg/kg)	Qualifier
1BGS000101	0.215	D
OBGS02LS01	0.082	D
OBGS03LS01	0.004	U
OBGS04LS01	0.311	D
OBGS05LS01	0.044	

Notes:
D = sample diluted by Laboratory
U = analyte not detected
The arithmetic mean dieldrin concentration (i.e., 0.131 mg/kg) was calculated assuming one-half of the detection limit was present in sample 0BGS03LS01.

Table 2
NSA Memphis Dieldrin Risk Estimates

Location	Maximum Dieldrin (mg/kg)	Mean Dieldrin (mg/kg)	Residential Risk-Based Max.	Residential Risk-Based Mean	Occupational Risk-Based Max.	Occupational Risk-Based Mean
SWMU 1	0.192	NA	7.04E-6	NA	1.12E-6	NA
SWMU 3	0.023	0.0072	8.43E-7	2.64E-7	1.34E-7	4.19E-8
SWMU 5	0.609	0.126	2.23E-5	4.62E-6	3.54E-6	7.33E-7
SWMU 7	0.055	0.0095	2.02E-6	3.48E-7	3.20E-7	5.52E-8
SWMU 8	0.471	0.144	1.73E-5	5.28E-6	2.74E-6	8.37E-7
SWMU 60	0.069	0.0155	2.53E-6	5.68E-7	4.01E-7	9.01E-8
Background	0.311	0.131	1.14E-5	4.80E-6	1.81E-6	7.62E-7

Note:
The calculations above are based on a slope factor of 16 kg-day/mg.

A historical use discussion is also helpful to provide a frame of reference for evaluating reported soil dieldrin (and other chlorinated pesticide) concentrations. Information provided by NSA Memphis states that chlorinated pesticides (primarily chlordane) were previously used until

the late 1980's for termite control around buildings. Although chlordane was used as a single active ingredient application, mixtures including dieldrin, aldrin, and heptachlor were also common in the pest control trade. Standard application rates resulted in soil concentrations of 500 to 1,000 mg/kg total chlorinated pesticides. For comparison, a 10:1 chlordane:dieldrin mixture used for general subterranean termite control would have resulted in residual soil dieldrin concentrations of 50 to 100 mg/kg. These residual application concentrations are 50 to 100 times higher than the maximum soil dieldrin concentration reported in NSA Memphis surface soil.

This memo is intended to provide an RC for dieldrin and a risk-based framework for decision making regarding how the dieldrin issue is resolved. Although standard risk assessment techniques will be applied, final resolution of this issue will require a consensus risk management decision. Of paramount importance is the determination of what level of risk is acceptable in light of the extent of dieldrin. EnSafe/Allen & Hoshall as the contractor can only provide the facts and suggestions for a viable risk management strategy. The following paragraph outlines suggestions based on currently available information and the preceding risk evaluation.

Dieldrin was used at NSA Memphis as intended, which has been documented and has resulted in dieldrin's widespread extent. Consequently, institutional controls are considered to be the most appropriate means of dealing with the dieldrin issue from a human health perspective. These controls may include (but are not limited to) public/worker awareness, access restrictions and maintenance of adequate vegetative cover to minimize contact. The focus of future investigative efforts should center around prevention of further migration (i.e., surface runoff), and evaluation of sensitive ecological receptor points (i.e., terrestrial habitats, drainage systems, streams, and lakes.) These areas should be emphasized as little control can be exercised over the animals who use them.