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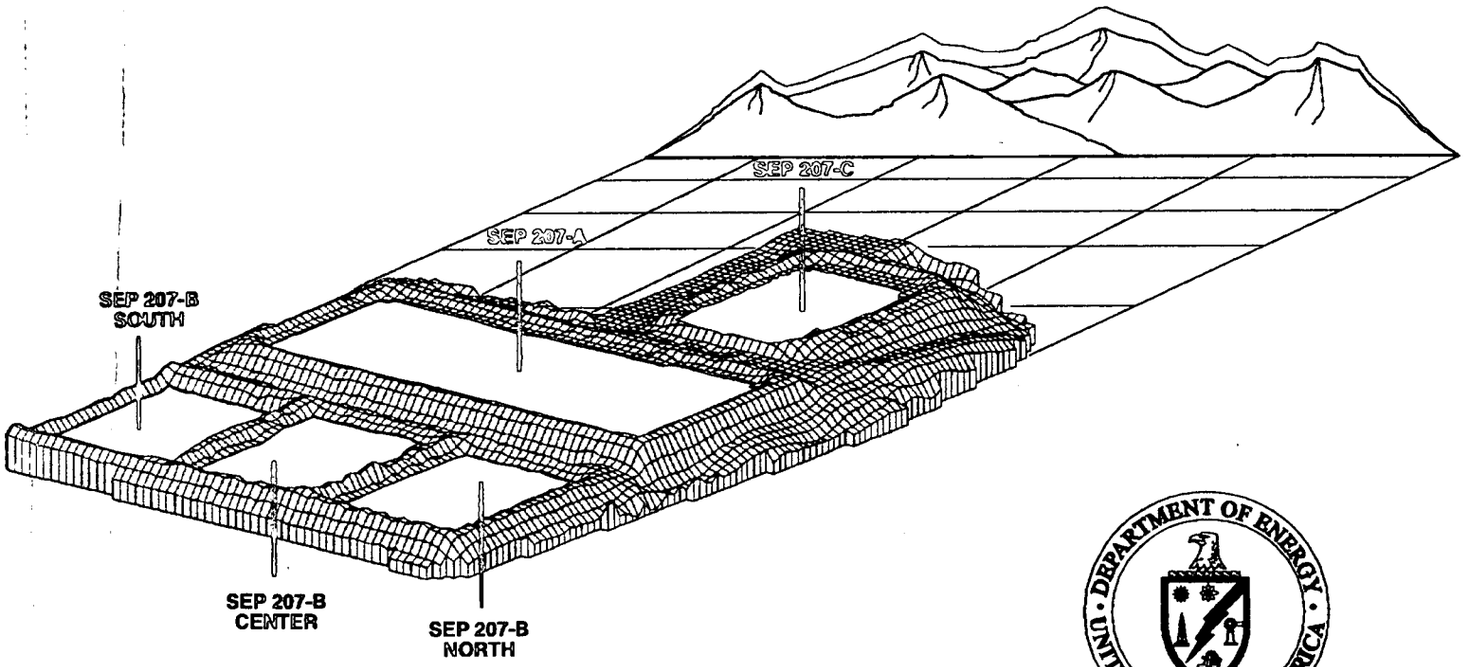
OU4 Solar Evaporation Ponds Interim Measure/Interim Remedial Action Environmental Assessment Decision Document

U.S. Department of Energy
Rocky Flats Environmental Technology Site
Golden, Colorado

February 1995

Revision: Proposed

Part II
Volume 6 - Appendices P through Q



ADMIN RECORD

A-Ou04-000719

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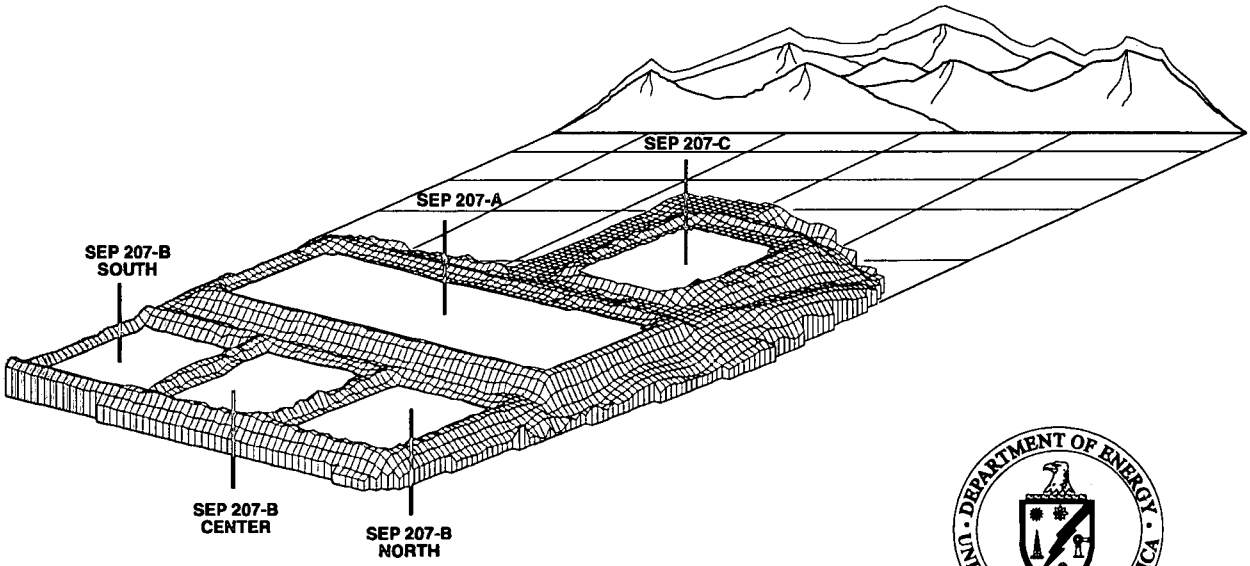

DOCUMENT ORGANIZATION

Operable Unit 4 Solar Evaporation Pond
Interim Measure/Interim Remedial Action -
Environmental Assessment Decision Document

Part I	-	Executive Summary and Introduction
Part II	-	Operable Unit 4 Phase I RCRA Facility Investigation/Remedial Investigation Report
		Volume 1 - Sections 1 through 8 (Figures for Section 3 are in Volume 2)
		Volume 2 - Section 3 Figures
		Volume 3 - Appendices A through G
		Volume 4 - Appendices H through L
		Volume 5 - Appendices M through O
		Volume 6 - Appendices P through Q
		Volume 7 - Appendices R through V
		Volume 8 - Appendices W through AA
Part III	-	Interim Measure/Interim Remedial Action Design Analysis
Part IV	-	Recommended Interim Measure/Interim Remedial Action Alternative
Part V	-	Post-Closure Monitoring and Assessment Plan

APPENDIX II.P

LABORATORY ANALYSES OF SOIL HYDRAULIC AND CHEMICAL PROPERTIES OF SOIL SAMPLES, D.B. STEPHENS AND ASSOCIATES, 1993

DANIEL B. STEPHENS & ASSOCIATES, INC.
ENVIRONMENTAL SCIENTISTS AND ENGINEERS

November 22, 1993

0953-3858-93

Mr. Richard Henry
Engineering Science, Inc.
1700 Broadway, Suite 900
Denver, CO 80290

Dear Mr. Henry:

Please find enclosed the final laboratory data report for tests on Rocky Flats soil samples as requested under your Project No. DE298.22.05 and Task Order MTS 343180GG. An invoice for this work will be submitted under separate cover.

All testing results were evaluated subjectively for consistency and reasonableness, and the results appear to be reasonably representative of the material tested. However, DBS&A does not assume any responsibility for interpretations or analyses based on the data enclosed, nor can we guarantee that these data are fully representative of the undisturbed materials at the field site. We recommend that careful evaluation of these laboratory results be made for your particular application.

We are pleased to provide this service to Engineering Science, Inc. and look forward to future laboratory testing on other projects. If you have any questions about the enclosed data report, please do not hesitate to call.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

for MDA

Mark D. Ankeny
Senior Scientist/Laboratory Manager

MDA/jt
Enclosures

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SUMMARY

The Hydrologic Testing Laboratory at Daniel B. Stephens & Associates, Inc. (DBS&A) has completed laboratory tests on Rocky Flats soil samples as specified by Mr. Richard Henry and summarized in Table 1. Tables 2 through 10 give the results of the specified analyses. Raw laboratory data and graphical plots of data (where appropriate) are contained in Appendices A through I. Appendix J lists the methods used in these analyses. A detailed description of each method is available upon request.

A chain of custody document did not accompany the samples arriving at DBS&A. We constructed a chain of custody using information taken from the labels on the sample liners. However, some of the labels were difficult to read.

At the request of Mr. Richard Henry of Engineering Science, Inc., we examined the ends of each core prior to sample preparation to evaluate gross morphology and suitability for testing (Table 2, Appendix A). Based on this examination a number of coarse-textured samples appeared to have insufficient fines to complete Atterberg tests. After consulting with Mr. Henry we opted to use the visual-manual methods prescribed by ASTM D 2488-90 to characterize the available fines in these questionable samples. Altogether, four samples were described by visual-manual methods: BH40612AE, BH40613AE, BH40405AE and BH40602AE.

Many samples contained insufficient material to perform a suitable saturated paste extract for electrical conductivity analysis. After consultation with Mr. Henry, we authorized the laboratory

performing the chemical analyses to use a 1:1 extract. The electrical conductivity results (Table 10) are presented in terms of equivalent mg KCl per kg soil. Appendix I contains raw electrical conductivity data presented as SI units of dS/m and also provides the soil dilution factors used to produce the extracts.

Results for several of the clay-textured samples showed discrepancies between calculated total porosity (Table 3) and observed saturated moisture values (Table 6). This anomalous behavior is common with samples containing significant portions of smectite clay minerals. On reaching saturation, these materials often swell beyond the confines of the testing ring. These materials may also lose some structural lattice moisture during oven-drying (at 105° C).

Overall, given the aforementioned caveats, the results appear reasonable and internally consistent. However, DBS&A cannot guarantee that these results are representative of the undisturbed materials at the field site, nor can we assume any responsibility for interpretations or analyses based on these data. We recommend that careful evaluation of these laboratory results be made for your particular application.

TABLE 1. SUMMARY OF TESTS PERFORMED

Laboratory Sample Number	Initial Examination of Core Samples	Initial Moisture Content	Dry Bulk Density	Calculated Porosity	Saturated Bulk Density	Saturated Hydraulic Conductivity	Moisture Characteristics		Particle Size Distribution		Atterberg Limits	Particle Density	Chemical Analysis
							Hanging Column	Pressure Plate	Sieve	Hydrometer			
BH40396AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40397AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40398AE	X	X	X	X	X	X		X	X	X	X	X	X
BH40401AE	X	X	X	X	X	X		X	X	X	X	X	X
BH40402AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40403AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40404AE	X	X	X	X	X	X		X	X	X	X	X	X
BH40405AE	X	X	X	X	X	X	X	X	X	X		X	X
BH40406AE	X	X	X	X	X	X		X	X	X	X	X	X
BH40407AE	X	X	X	X	X	X	X	X	X	X	X	X	X

TABLE 1. SUMMARY OF TESTS PERFORMED (CONTINUED)

Laboratory Sample Number	Initial Examination of Core Samples	Initial Moisture Content	Dry Bulk Density	Calculated Porosity	Saturated Bulk Density	Saturated Hydraulic Conductivity	Moisture Characteristics		Particle Size Distribution		Atterberg Limits	Particle Density	Chemical Analysis
							Hanging Column	Pressure Plate	Sieve	Hydrometer			
BH40408AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40600AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40601AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40602AE	X	X	X	X	X	X	X	X	X	X		X	X
BH40603AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40604AE	X	X	X	X	X	X		X	X	X	X	X	X
BH40605AE	X	X	X	X	X	X		X	X	X	X	X	X
BH40606AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40607AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40608AE	X	X	X	X	X	X	X	X	X	X	X	X	X

TABLE 1. SUMMARY OF TESTS PERFORMED (CONTINUED)

Laboratory Sample Number	Initial Examination of Core Samples	Initial Moisture Content	Dry Bulk Density	Calculated Porosity	Saturated Bulk Density	Saturated Hydraulic Conductivity	Moisture Characteristics		Particle Size Distribution		Atterberg Limits	Particle Density	Chemical Analysis
							Hanging Column	Pressure Plate	Sieve	Hydrometer			
BH40609AE	X	X	X	X	X	X	X	X	X	X	X	X	X
BH40610AE	X	X	X	X	X	X		X	X	X	X	X	X
BH40611AE	X	X	X	X	X	X		X	X	X	X	X	X
BH40612AE	X	X	X	X	X	X		X	X	X		X	X
BH40613AE	X	X	X	X	X	X	X	X	X	X		X	X

TABLE 2. SUMMARY OF INITIAL EXAMINATION OF CORE SAMPLES

Sample ID	Condition Codes[1]	Comments	Radiation Monitor[2] (cpm)
BH40396AE	Ts, L	Sandy gravelly, recombine.[3]	90
BH40397AE	L	Recombine.[3] Top: S+Si; bottom: gravelly and reddish clay.	110
BH40398AE	Tc/Tm, N	Recombine.[3]	100
BH40401AE	Ap, N, Tc/Tm	Prominent annulus in top only; rest of sample is free of annulus.	90
BH40402AE	L, Tc/Tm, C	Loose and more gray at top.	70
BH40403AE	L, Tm	Top: silty gravel; bottom: clayey sand. Recombine.[3]	
BH40404AE	L, Tc	Clay; bottom: dark brown; top: tan.	70
BH40405AE	L, Ts	Top: coarse sand; bottom: medium sand. Not enough fine material to run Atterberg test.	90
BH40406AE	N, Tc/Tm		100
BH40407AE	L, X, Gp-5	Bottom: tan silt; middle: mottled; top: with large gravel and void space.	60
BH40408AE	Tc/Tm, N	Loose, some voids. Gravelly, recombine.[3]	90
BH40600AE	Gp-3, Ts, N	Sandy with gravel.	60
BH40601AE	L	Top: clay; bottom: silty sand. Recombine.[3]	60
BH40602AE	X, Tm, Gp-2	May not be enough fine material to run Atterberg test.	60
BH40603AE	L, Gp-10,Tc	Use moisture retention subsample for particle size distribution; heavy gravel.	80

[1] Condition Codes:

N = Nominal
X = Liner not filled
L = Discontinuous lithology from top to bottom of core
Gp = Gravel protruding-size (cm)
As = Slight annulus (< 1 mm)
Ap = Prominent annulus (> 1 mm)
C = Internal cracks
Tc = Visual texture (clayey)
Tm = Visual texture (medium)
Ts = Visual texture (sandy)

[2] Samples scanned at either end of core with an Eberline E-120 Geiger counter and Eberline HP-260 pancake probe. Background at 60 counts per minute (cpm).

[3] Where sample quantity is limited, recombine moisture retention subsample with remaining sample for particle size distribution.

TABLE 2. SUMMARY OF INITIAL EXAMINATION OF CORE SAMPLES (CONTINUED)

Sample ID	Condition Codes[1]	Comments	Radiation Monitor[2] (cpm)
BH40604AE	Tc, Tm, N		80
BH40605AE	N, Tc/Tm		60
BH40606AE	Tm	May not be enough fine material to run Atterberg test. Use moisture retention subsample for particle size distribution.	80
BH40607AE	L, Tc/Tm	Siltier at bottom. Use moisture retention subsample for particle size distribution.	90
BH40608AE	As	Repack. Use moisture retention subsample for particle size distribution.	60
BH40609AE	N, Tm/Ts		60
BH40610AE	N, Tc/Tm		60
BH40611AE	Tc/Tm, Ap	Use moisture retention subsample for particle size distribution.	60
BH40612AE	Gp-2, Ts	Use moisture retention subsample for particle size distribution/particle density. Not enough fine material to run Atterberg test.	60
BH40613AE	L	Bottom: gravelly clay; top: silty sand. Not enough fine material to run Atterberg test.	100

[1] Condition Codes:

N = Nominal
X = Liner not filled
L = Discontinuous lithology from top to bottom of core
Gp = Gravel protruding-size (cm)
As = Slight annulus (< 1 mm)
Ap = Prominent annulus (> 1 mm)
C = Internal cracks
Tc = Visual texture (clayey)
Tm = Visual texture (medium)
Ts = Visual texture (sandy)

[2] Samples scanned at either end of core with an Eberline E-120 Geiger counter and Eberline HP-260 pancake probe. Background at 60 counts per minute (cpm).

[3] Where sample quantity is limited, recombine moisture retention subsample with remaining sample for particle size distribution.

TABLE 3. SUMMARY OF INITIAL MOISTURE CONTENT, DRY BULK DENSITY, AND CALCULATED POROSITY

Sample Number	Initial Moisture Content		Dry Bulk Density (g/cm^3)	Calculated Porosity (%)
	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)		
BH40396AE	9.4	16.6	1.76	33.5
BH40397AE	16.3	28.3	1.73	34.6
BH40398AE	18.2	29.0	1.59	39.9
BH40401AE	20.4	33.9	1.66	38.1
BH40402AE	24.2	36.7	1.52	43.6
BH40403AE	13.8	22.6	1.64	39.1
BH40404AE	25.1	39.3	1.57	42.6
BH40405AE	2.1	3.7	1.71	35.8
BH40406AE	15.5	28.5	1.84	31.7
BH40407AE	24.6	35.6	1.45	45.6
BH40408AE	20.4	33.5	1.64	39.2
BH40600AE	3.3	6.5	1.94	28.3
BH40601AE	14.4	24.4	1.70	35.3
BH40602AE	10.2	18.2	1.79	33.8
BH40603AE	20.2	31.4	1.55	41.6
BH40604AE	21.6	35.5	1.65	38.1

TABLE 3. SUMMARY OF INITIAL MOISTURE CONTENT, DRY BULK DENSITY, AND CALCULATED POROSITY (CONTINUED)

Sample Number	Initial Moisture Content		Dry Bulk Density (g/cm^3)	Calculated Porosity (%)
	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)		
BH40605AE	21.6	34.8	1.61	40.3
BH40606AE	13.5	23.2	1.72	35.4
BH40607AE	14.1	22.7	1.61	38.8
BH40608AE	6.5	12.6	1.95	26.1
BH40609AE	11.0	19.4	1.76	33.9
BH40610AE	18.6	31.2	1.68	38.3
BH40611AE	22.6	35.5	1.57	39.3
BH40612AE	10.0	17.9	1.79	31.8
BH40613AE	15.1	23.2	1.54	41.5

TABLE 4. SUMMARY OF SATURATED BULK DENSITY

Sample Number	Saturated Bulk Density (g/cc)
BH40396AE	2.08
BH40397AE	2.08
BH40398AE	2.01
BH40401AE	2.08
BH40402AE	1.98
BH40403AE	2.01
BH40404AE	2.08
BH40405AE	1.97
BH40406AE	2.22
BH40407AE	1.89
BH40408AE	2.09
BH40600AE	2.19
BH40601AE	2.05
BH40602AE	2.10
BH40603AE	1.98
BH40604AE	2.13
BH40605AE	2.03
BH40606AE	2.13

TABLE 4. SUMMARY OF SATURATED DRY BULK DENSITY (CONTINUED)

Sample Number	Saturated Bulk Density (g/cc)
BH40607AE	1.97
BH40608AE	2.22
BH40609AE	2.12
BH40610AE	2.08
BH40611AE	2.11
BH40612AE	2.11
BH40613AE	1.94

TABLE 5. SUMMARY OF SATURATED HYDRAULIC CONDUCTIVITY TESTS

Sample Number	K_{sat} (cm/sec)	Method of Analysis	
		Constant Head	Falling Head
BH40396AE	2.9×10^{-6}		X
BH40397AE	1.5×10^{-7}		X
BH40398AE	6.8×10^{-8}		X
BH40401AE[1]	3.0×10^{-9}		X
BH40402AE	1.6×10^{-8}		X
BH40403AE	1.1×10^{-6}		X
BH40404AE[1]	5.3×10^{-9}		X
BH40405AE	7.1×10^{-2}	X	
BH40406AE	5.1×10^{-9}		X
BH40407AE	1.2×10^{-6}		X
BH40408AE	1.3×10^{-7}		X
BH40600AE	2.0×10^{-3}		X
BH40601AE	1.2×10^{-5}		X
BH40602AE	5.7×10^{-6}		X
BH40603AE	1.0×10^{-7}		X
BH40604AE	4.3×10^{-9}		X

[1] No flow was observed during testing although the sample was saturated when removed from the permeameter.

TABLE 5. SUMMARY OF SATURATED HYDRAULIC CONDUCTIVITY TESTS (CONTINUED)

Sample Number	K_{sat} (cm/sec)	Method of Analysis	
		Constant Head	Falling Head
BH40605AE[1]	3.6×10^{-9}		X
BH40606AE	5.0×10^{-6}		X
BH40607AE	1.8×10^{-5}		X
BH40608AE*	1.4×10^{-3}		X
BH40609AE	1.8×10^{-5}		X
BH40610AE	1.0×10^{-7}		X
BH40611AE[1]	1.0×10^{-9}		X
BH40612AE	1.4×10^{-6}		X
BH40613AE*	1.1×10^{-4}		X

[1] No flow was observed during testing although the sample was saturated when removed from the permeameter.

TABLE 6. SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40396AE	0	32.1
	21	32.1
	82	30.0
	306	27.6
	1020	25.2
	3467	23.2
	15195	22.6
BH40397AE	0	34.7
	52	34.1
	204	32.4
	510	31.6
	1020	30.6
	5130	28.4
	14991	27.3
BH40398AE	0	41.5
	82	40.7
	316	37.4
	826	35.2
	1632	33.4
	5609	30.8
	14685	29.1
BH40401AE	0	42.4
	82	40.7
	316	37.7
	826	36.7
	1632	36.2
	5609	34.7
	14685	33.1

TABLE 6. SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40402AE	0	46.4
	55	45.8
	206	44.8
	510	43.6
	1020	41.8
	5130	38.6
	14991	35.9
BH40403AE	0	37.0
	22	36.8
	83	34.6
	306	32.5
	1020	29.8
	3467	26.9
	15195	24.1
BH40404AE	0	51.2
	82	50.5
	316	47.9
	826	45.1
	1632	43.0
	5609	38.1
	14685	34.6
BH40405AE	0	25.4
	6	24.4
	10	16.2
	51	4.3
	213	2.2
	1020	1.8
	15603	1.6

TABLE 6. SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40406AE	0	38.2
	82	37.7
	316	34.8
	826	33.2
	1632	32.1
	5609	30.0
	14685	27.8
BH40407AE	0	43.8
	21	42.6
	85	41.1
	306	38.9
	1020	36.2
	3467	32.3
	15195	27.4
BH40408AE	0	44.9
	52	43.3
	204	41.6
	510	40.2
	1020	38.4
	5130	34.0
	14991	30.8
BH40600AE	0	24.4
	9	14.8
	41	11.1
	121	9.2
	357	7.9
	1030	6.9
	14685	5.3

TABLE 6. SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40601AE	0	35.0
	21	32.9
	82	30.8
	306	28.3
	1020	25.9
	3467	22.5
	15195	18.6
BH40602AE	0	31.6
	19	27.4
	79	25.1
	204	23.5
	510	21.9
	1020	20.0
	5130	15.7
	14991	14.9
BH40603AE	0	43.2
	53	42.7
	204	40.7
	510	39.1
	1020	37.1
	5130	32.9
	14991	30.1
BH40604AE	0	48.4
	82	48.1
	316	45.7
	826	44.0
	1632	42.6
	5609	39.0
	14685	35.6

TABLE 6. SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40605AE	0	41.9
	82	39.9
	316	37.8
	826	36.0
	1632	34.6
	5609	31.0
	14685	31.0
BH40606AE	0	41.1
	21	39.9
	80	37.7
	306	34.7
	1020	31.4
	3467	28.8
	15195	26.2
BH40607AE	0	35.7
	20	34.2
	82	31.8
	306	28.9
	1020	25.9
	3467	23.3
	15195	20.9
BH40608AE	0	27.0
	13	20.1
	40	17.1
	122	15.1
	357	14.2
	1030	12.9
	14685	10.6

TABLE 6. SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40609AE	0	36.3
	22	34.4
	78	30.2
	306	23.4
	1020	19.9
	3467	18.3
	15195	16.6
BH40610AE	0	40.2
	82	39.3
	316	36.8
	826	34.1
	1632	32.1
	5609	27.8
	14685	25.8
BH40611AE	0	53.5
	82	53.8
	316	49.0
	826	46.1
	1632	44.7
	5609	41.3
	14685	38.8
BH40612AE	0	32.1
	82	30.0
	316	26.1
	826	24.5
	1632	23.6
	5609	22.8
	14685	21.4

TABLE 6. SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH406013AE	0	40.0
	21	38.0
	53	37.4
	125	36.5
	357	35.1
	1030	33.1
	14685	29.0

TABLE 7. SUMMARY OF PARTICLE SIZE CHARACTERISTICS

Sample Number	d_{10} (mm)	d_{50} (mm)	d_{60} (mm)	C_u (mm)	C_c (mm)	Classification
BH40396AE	*	0.088	0.20	--	--	Clayey sand with gravel
BH40397AE	*	0.15	0.55	--	--	Clayey sand with gravel
BH40398AE	*	0.049	0.18	--	--	Sandy lean clay with gravel
BH40401AE	*	0.0017	0.0033	--	--	Fat clay
BH40402AE	*	*	0.0020	--	--	Fat clay
BH40403AE	*	0.56	1.3	--	--	Silty sand with gravel
BH40404AE	*	*	0.0019	--	--	Fat clay
BH40405AE	0.24	1.1	1.6	6.7	0.85	Well-graded sand
BH40406AE	*	0.0039	0.0062	--	--	Lean clay
BH40407AE	*	0.0064	0.057	--	--	Sandy elastic silt
BH40408AE	*	0.0014	0.0026	--	--	Fat clay
BH40600AE	*	0.73	3.5	--	--	Clayey gravel with sand
BH40601AE	*	0.37	1.2	--	--	Silty sand with gravel
BH40602AE	0.0015	0.36	1.4	9.33	0.045	Silty gravel with sand

* d_{10} and/or d_{50} not reached with test specified

-- value dependent upon d_{10}

d_{50} = median particle diameter

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{(d_{30})^2}{(d_{10})(d_{60})}$$

TABLE 7. SUMMARY OF PARTICLE SIZE CHARACTERISTICS (CONTINUED)

Sample Number	d_{10} (mm)	d_{50} (mm)	d_{60} (mm)	C_u (mm)	C_c (mm)	Classification
BH40603AE	*	0.0014	0.0017	--	--	Lean clay
BH40604AE	*	0.0014	0.0025	--	--	Fat clay
BH40605AE	*	*	0.0018	--	--	Fat clay
BH40606AE	*	0.035	0.097	--	--	Gravelly lean clay with sand
BH40607AE	*	0.088	0.85	--	--	Clayey gravel with sand
BH40608AE	0.0040	11	17	4250	7.8	Clayey gravel with sand
BH40609AE	*	0.11	0.14	--	--	Silty sand
BH40610AE	*	0.0027	0.0047	--	--	Lean clay
BH40611AE	*	0.72	5.3	--	--	Clayey gravel with sand
BH40612AE	0.0048	7.4	12	2500	13	Clayey gravel with sand
BH40613AE	*	9.4	1.7	--	--	Clayey gravel with sand

* d_{10} and/or d_{50} not reached with test specified

-- value dependent upon d_{10}

d_{50} = median particle diameter

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{(d_{30})^2}{(d_{10})(d_{60})}$$

TABLE 8. SUMMARY OF ATTERBERG LIMITS

Sample Number	Liquid Limit (%, g/g)	Plastic Limit (%, g/g)	Plasticity Index (%, g/g)
BH40396AE	34	15	19
BH40397AE	49	26	23
BH40398AE	44	18	26
BH40401AE	61	26	35
BH40402AE	54	26	28
BH40403AE	50	17	32
BH40404AE	66	24	42
BH40405AE		NOT TESTED*	
BH40406AE	49	20	29
BH40407AE	79	38	41
BH40408AE	53	20	33
BH40600AE	30	20	10
BH40601AE	47	26	20
BH40602AE		NOT TESTED*	
BH40603AE	49	20	29
BH40604AE	79	24	55

* Not enough sample to run test

TABLE 8. SUMMARY OF ATTERBERG LIMITS (CONTINUED)

Sample Number	Liquid Limit (%, g/g)	Plastic Limit (%, g/g)	Plasticity Index (%, g/g)
BH40605AE	72	26	46
BH40606AE	43	22	21
BH40607AE	40	21	19
BH40608AE	31	17	13
BH40609AE	23	19	3
BH40610AE	48	23	25
BH40611AE	107	33	74
BH40612AE		NOT TESTED*	
BH40613AE		NOT TESTED*	

* Not enough sample to run test

TABLE 9. SUMMARY OF PARTICLE DENSITY TESTS

Sample Number	Particle Density (g/cm^3)
BH40396AE	2.65
BH40397AE	2.65
BH40398AE	2.65
BH40401AE	2.68
BH40402AE	2.69
BH40403AE	2.69
BH40404AE	2.73
BH40405AE	2.67
BH40406AE	2.69
BH40407AE	2.66
BH40408AE	2.70
BH40600AE	2.71
BH40601AE	2.62
BH40602AE	2.70
BH40603AE	2.66
BH40604AE	2.66

* Not enough samples to run test

TABLE 9. SUMMARY OF PARTICLE DENSITY TESTS (CONTINUED)

Sample Number	Particle Density (g/cm^3)
BH40605AE	2.70
BH40606AE	2.66
BH40607AE	2.64
BH40608AE	2.64
BH40609AE	2.66
BH40610AE	2.73
BH40611AE	2.59
BH40612AE	2.62
BH40613AE	2.64

* Not enough samples to run test

TABLE 10. SUMMARY OF CHEMICAL ANALYSIS

Sample Number	CEC (meq/100g)	EC (mg KCl/Kg soil)	TOC (ppm)
BH40396AE	4.5	88	210
BH40397AE	27	360	5800
BH40398AE	37	100	1200
BH40401AE	41	2500	2700
BH40402AE	51	2000	590
BH40403AE	27	190	290
BH40404AE	38	3100	750
BH40405AE	2.0	57	120
BH40406AE	37	130	380
BH40407AE	57	250	13000
BH40408AE	42	1000	360
BH40600AE	22	280	3000
BH40601AE	66	390	14000
BH40602AE	6.5	330	1000
BH40603AE	46	1100	700
BH40604AE	44	1900	2100
BH40605AE	51	1800	2000
BH40606AE	40	290	5500
BH40607AE	30	210	3400
BH40608AE	23	1800	5900
BH40609AE	13	1900	330
BH40610AE	27	2200	540
BH40611AE	63	1200	6900
BH40612AE	20	8600	5300
BH40613AE	20	8300	5000

APPENDIX A

INITIAL EXAMINATION OF CORE SAMPLES

SUMMARY OF INITIAL EXAMINATION OF CORE SAMPLES

Sample ID	Condition Codes[1]	Comments	Radiation Monitor[2] (cpm)
BH40396AE	Ts, L	Sandy gravelly, recombine.[3]	90
BH40397AE	L	Recombine.[3] Top: S+Si; bottom: gravelly and reddish clay.	110
BH40398AE	Tc/Tm, N	Recombine.[3]	100
BH40401AE	Ap, N, Tc/Tm	Prominent annulus in top only; rest of sample is free of annulus.	90
BH40402AE	L, Tc/Tm, C	Loose and more gray at top.	70
BH40403AE	L, Tm	Top: silty gravel; bottom: clayey sand. Recombine.[3]	
BH40404AE	L, Tc	Clay; bottom: dark brown; top: tan.	70
BH40405AE	L, Ts	Top: coarse sand; bottom: medium sand. Not enough fine material to run Atterberg test.	90
BH40406AE	N, Tc/Tm		100
BH40407AE	L, X, Gp-5	Bottom: tan silt; middle: mottled; top: with large gravel and void space.	60
BH40408AE	Tc/Tm, N	Loose, some voids. Gravelly, recombine.[3]	90
BH40600AE	Gp-3, Ts, N	Sandy with gravel.	60
BH40601AE	L	Top: clay; bottom: silty sand. Recombine.[3]	60
BH40602AE	X, Tm, Gp-2	May not be enough fine material to run Atterberg test.	60
BH40603AE	L, Gp-10,Tc	Use moisture retention subsample for particle size distribution; heavy gravel.	80

[1] Condition Codes:

N = Nominal
X = Liner not filled
L = Discontinuous lithology from top to bottom of core
Gp = Gravel protruding-size (cm)
As = Slight annulus (< 1 mm)
Ap = Prominent annulus (> 1 mm)
C = Internal cracks
Tc = Visual texture (clayey)
Tm = Visual texture (medium)
Ts = Visual texture (sandy)

[2] Samples scanned at either end of core with an Eberline E-120 Geiger counter and Eberline HP-260 pancake probe. Background at 60 counts per minute (cpm).

[3] Where sample quantity is limited, recombine moisture retention subsample with remaining sample for particle size distribution.

SUMMARY OF INITIAL EXAMINATION OF CORE SAMPLES (CONTINUED)

Sample ID	Condition Codes[1]	Comments	Radiation Monitor[2] (cpm)
BH40604AE	Tc, Tm, N		80
BH40605AE	N, Tc/Tm		60
BH40606AE	Tm	May not be enough fine material to run Atterberg test. Use moisture retention subsample for particle size distribution.	80
BH40607AE	L, Tc/Tm	Siltier at bottom. Use moisture retention subsample for particle size distribution.	90
BH40608AE	As	Repack. Use moisture retention subsample for particle size distribution.	60
BH40609AE	N, Tm/Ts		60
BH40610AE	N, Tc/Tm		60
BH40611AE	Tc/Tm, Ap	Use moisture retention subsample for particle size distribution.	60
BH40612AE	Gp-2, Ts	Use moisture retention subsample for particle size distribution/particle density. Not enough fine material to run Atterberg test.	60
BH40613AE	L	Bottom: gravelly clay; top: silty sand. Not enough fine material to run Atterberg test.	100

[1] Condition Codes:

N = Nominal
X = Liner not filled
L = Discontinuous lithology from top to bottom of core
Gp = Gravel protruding-size (cm)
As = Slight annulus (< 1 mm)
Ap = Prominent annulus (> 1 mm)
C = Internal cracks
Tc = Visual texture (clayey)
Tm = Visual texture (medium)
Ts = Visual texture (sandy)

[2] Samples scanned at either end of core with an Eberline E-120 Geiger counter and Eberline HP-260 pancake probe. Background at 60 counts per minute (cpm).

[3] Where sample quantity is limited, recombine moisture retention subsample with remaining sample for particle size distribution.

APPENDIX B

INITIAL MOISTURE CONTENT, DRY BULK DENSITY, AND CALCULATED POROSITY

SUMMARY OF INITIAL MOISTURE CONTENT, DRY BULK DENSITY, AND CALCULATED POROSITY

Sample Number	Initial Moisture Content		Dry Bulk Density (g/cm^3)	Calculated Porosity (%)
	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)		
BH40396AE	9.4	16.6	1.76	33.5
BH40397AE	16.3	28.3	1.73	34.6
BH40398AE	18.2	29.0	1.59	39.9
BH40401AE	20.4	33.9	1.66	38.1
BH40402AE	24.2	36.7	1.52	43.6
BH40403AE	13.8	22.6	1.64	39.1
BH40404AE	25.1	39.3	1.57	42.6
BH40405AE	2.1	3.7	1.71	35.8
BH40406AE	15.5	28.5	1.84	31.7
BH40407AE	24.6	35.6	1.45	45.6
BH40408AE	20.4	33.5	1.64	39.2
BH40600AE	3.3	6.5	1.94	28.3
BH40601AE	14.4	24.4	1.70	35.3
BH40602AE	10.2	18.2	1.79	33.8
BH40603AE	20.2	31.4	1.55	41.6
BH40604AE	21.6	35.5	1.65	38.1

SUMMARY OF INITIAL MOISTURE CONTENT, DRY BULK DENSITY, AND CALCULATED POROSITY (CONTINUED)

Sample Number	Initial Moisture Content		Dry Bulk Density (g/cm^3)	Calculated Porosity (%)
	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)		
BH40605AE	21.6	34.8	1.61	40.3
BH40606AE	13.5	23.2	1.72	35.4
BH40607AE	14.1	22.7	1.61	38.8
BH40608AE	6.5	12.6	1.95	26.1
BH40609AE	11.0	19.4	1.76	33.9
BH40610AE	18.6	31.2	1.68	38.3
BH40611AE	22.6	35.5	1.57	39.3
BH40612AE	10.0	17.9	1.79	31.8
BH40613AE	15.1	23.2	1.54	41.5

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40396AE
RING NUMBER: 396
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 488.55 (g)
TARE WEIGHT, RING: 83.05 (g)
TARE WEIGHT, CAP: 52.72 (g)
SAMPLE VOLUME: 182.99 (cc)
DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

DRY WEIGHT OF SAMPLE: 322.46 (g)
DRY BULK DENSITY: 1.76 (g/cc)
PARTICLE DENSITY: 2.65 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 33.5 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 16.6 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 9.4 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40397AE
RING NUMBER: 397
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 377.18 (g)
TARE WEIGHT, RING: 69.54 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 152.49 (cc)
DATE AND TIME INTO OVEN: 11/02 @ 0900
DATE AND TIME OUT OF OVEN: 11/03 @ 1300

DRY WEIGHT OF SAMPLE: 264.41 (g)
DRY BULK DENSITY: 1.73 (g/cc)
PARTICLE DENSITY: 2.65 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 34.6 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 28.3 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 16.3 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40398AE
RING NUMBER: 398
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 317.75 (g)
TARE WEIGHT, RING: 61.71 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 136.05 (cc)
DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

DRY WEIGHT OF SAMPLE: 216.53 (g)
DRY BULK DENSITY: 1.59 (g/cc)
PARTICLE DENSITY: 2.65 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 39.9 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 29.0 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 18.2 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40401AE
RING NUMBER: 401
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 304.77 (g)
TARE WEIGHT, RING: 56.44 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 124.28 (cc)
DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

DRY WEIGHT OF SAMPLE: 206.25 (g)
DRY BULK DENSITY: 1.66 (g/cc)
PARTICLE DENSITY: 2.68 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 38.1 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 33.9 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 20.4 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40402AE
RING NUMBER: 402
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 335.02 (g)
TARE WEIGHT, RING: 64.52 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 143.55 (cc)
DATE AND TIME INTO OVEN: 11/02 @ 0900
DATE AND TIME OUT OF OVEN: 11/03 @ 1300

DRY WEIGHT OF SAMPLE: 217.77 (g)
DRY BULK DENSITY: 1.52 (g/cc)
PARTICLE DENSITY: 2.69 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 43.6 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 36.7 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 24.2 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40403AE
RING NUMBER: 403
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 316.94 (g)
TARE WEIGHT, RING: 61.85 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 136.79 (cc)
DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

DRY WEIGHT OF SAMPLE: 224.12 (g)
DRY BULK DENSITY: 1.64 (g/cc)
PARTICLE DENSITY: 2.69 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 39.1 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 22.6 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 13.8 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/R. Hill
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40404AE
RING NUMBER: 404
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 291.16 (g)
TARE WEIGHT, RING: 54.12 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 120.98 (cc)
DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

DRY WEIGHT OF SAMPLE: 189.53 (g)
DRY BULK DENSITY: 1.57 (g/cc)
PARTICLE DENSITY: 2.73 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 42.6 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 39.3 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 25.1 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40405AE
RING NUMBER: 405
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 527.10 (g)
TARE WEIGHT, RING: 95.58 (g)
TARE WEIGHT, CAP: 52.76 (g)
SAMPLE VOLUME: 216.26 (cc)
DATE AND TIME INTO OVEN: 11/05 @ 1400
DATE AND TIME OUT OF OVEN: 11/12 @ 0800

DRY WEIGHT OF SAMPLE: 370.81 (g)
DRY BULK DENSITY: 1.71 (g/cc)
PARTICLE DENSITY: 2.67 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 35.8 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 3.7 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 2.1 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40406AE
RING NUMBER: 618
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 295.53 (g)
TARE WEIGHT, RING: 52.49 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 114.59 (cc)
DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

DRY WEIGHT OF SAMPLE: 210.39 (g)
DRY BULK DENSITY: 1.84 (g/cc)
PARTICLE DENSITY: 2.69 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 31.7 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 28.5 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 15.5 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40407AE
RING NUMBER: 407
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 267.76 (g)
TARE WEIGHT, RING: 53.85 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 118.57 (cc)
DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

DRY WEIGHT OF SAMPLE: 171.70 (g)
DRY BULK DENSITY: 1.45 (g/cc)
PARTICLE DENSITY: 2.66 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 45.6 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 35.6 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 24.6 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40408AE
RING NUMBER: 408
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 270.66 (g)
TARE WEIGHT, RING: 50.95 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 111.23 (cc)
DATE AND TIME INTO OVEN: 11/02 @ 0900
DATE AND TIME OUT OF OVEN: 11/03 @ 1300

DRY WEIGHT OF SAMPLE: 182.49 (g)
DRY BULK DENSITY: 1.64 (g/cc)
PARTICLE DENSITY: 2.70 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 39.2 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 33.5 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 20.4 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40600AE
RING NUMBER: 600
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 470.00 (g)
TARE WEIGHT, RING: 77.94 (g)
TARE WEIGHT, CAP: 52.71 (g)
SAMPLE VOLUME: 168.98 (cc)
DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

DRY WEIGHT OF SAMPLE: 328.42 (g)
DRY BULK DENSITY: 1.94 (g/cc)
PARTICLE DENSITY: 2.71 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 28.3 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 6.5 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 3.3 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40601AE
RING NUMBER: 601
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 280.31 (g)
TARE WEIGHT, RING: 53.39 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 116.99 (cc)
DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

DRY WEIGHT OF SAMPLE: 198.39 (g)
DRY BULK DENSITY: 1.70 (g/cc)
PARTICLE DENSITY: 2.62 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 35.3 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 24.4 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 14.4 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40602AE
RING NUMBER: 602
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 380.07 (g)
TARE WEIGHT, RING: 70.99 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 156.97 (cc)
DATE AND TIME INTO OVEN: 11/02 @ 0900
DATE AND TIME OUT OF OVEN: 11/03 @ 1300

DRY WEIGHT OF SAMPLE: 280.54 (g)
DRY BULK DENSITY: 1.79 (g/cc)
PARTICLE DENSITY: 2.70 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 33.8 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 18.2 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 10.2 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40603AE
RING NUMBER: 603
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 253.61 (g)
TARE WEIGHT, RING: 49.90 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 109.13 (cc)
DATE AND TIME INTO OVEN: 11/02 @ 0900
DATE AND TIME OUT OF OVEN: 11/03 @ 1300

DRY WEIGHT OF SAMPLE: 169.43 (g)
DRY BULK DENSITY: 1.55 (g/cc)
PARTICLE DENSITY: 2.66 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 41.6 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 31.4 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 20.2 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40604AE
RING NUMBER: 604
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 313.63 (g)
TARE WEIGHT, RING: 58.03 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 127.60 (cc)
DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

DRY WEIGHT OF SAMPLE: 210.24 (g)
DRY BULK DENSITY: 1.65 (g/cc)
PARTICLE DENSITY: 2.66 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 38.1 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 35.5 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 21.6 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40605AE
RING NUMBER: 605
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 273.81 (g)
TARE WEIGHT, RING: 51.44 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 113.40 (cc)
DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

DRY WEIGHT OF SAMPLE: 182.88 (g)
DRY BULK DENSITY: 1.61 (g/cc)
PARTICLE DENSITY: 2.70 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 40.3 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 34.8 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 21.6 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40606AE
RING NUMBER: 606
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 351.93 (g)
TARE WEIGHT, RING: 70.32 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 144.44 (cc)
DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

DRY WEIGHT OF SAMPLE: 248.10 (g)
DRY BULK DENSITY: 1.72 (g/cc)
PARTICLE DENSITY: 2.66 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 35.4 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 23.2 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 13.5 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: R. Hill
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40607AE
RING NUMBER: 607
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 313.28 (g)
TARE WEIGHT, RING: 61.56 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 136.64 (cc)
DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

DRY WEIGHT OF SAMPLE: 220.64 (g)
DRY BULK DENSITY: 1.61 (g/cc)
PARTICLE DENSITY: 2.64 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 38.8 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 22.7 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 14.1 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40608AE
RING NUMBER: 608
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 442.48 (g)
TARE WEIGHT, RING: 69.49 (g)
TARE WEIGHT, CAP: 52.74 (g)
SAMPLE VOLUME: 154.17 (cc)
DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

DRY WEIGHT OF SAMPLE: 300.81 (g)
DRY BULK DENSITY: 1.95 (g/cc)
PARTICLE DENSITY: 2.64 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 26.1 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 12.6 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 6.5 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40609AE
RING NUMBER: 609
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 295.53 (g)
TARE WEIGHT, RING: 55.94 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 122.68 (cc)
DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

DRY WEIGHT OF SAMPLE: 215.78 (g)
DRY BULK DENSITY: 1.76 (g/cc)
PARTICLE DENSITY: 2.66 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 33.9 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 19.4 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 11.0 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40610AE
RING NUMBER: 610
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 299.63 (g)
TARE WEIGHT, RING: 55.80 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 122.18 (cc)
DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

DRY WEIGHT OF SAMPLE: 205.65 (g)
DRY BULK DENSITY: 1.68 (g/cc)
PARTICLE DENSITY: 2.73 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 38.3 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 31.2 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 18.6 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40611AE
RING NUMBER: 611
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 257.80 (g)
TARE WEIGHT, RING: 49.09 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 108.24 (cc)
DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

DRY WEIGHT OF SAMPLE: 170.25 (g)
DRY BULK DENSITY: 1.57 (g/cc)
PARTICLE DENSITY: 2.59 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 39.3 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 35.5 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 22.6 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40612AE
RING NUMBER: 612
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 499.00 (g)
TARE WEIGHT, RING: 84.28 (g)
TARE WEIGHT, CAP: 52.74 (g)
SAMPLE VOLUME: 184.18 (cc)
DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

DRY WEIGHT OF SAMPLE: 329.06 (g)
DRY BULK DENSITY: 1.79 (g/cc)
PARTICLE DENSITY: 2.62 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 31.8 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 17.9 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 10.0 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR INITIAL MOISTURE CONTENT,
BULK DENSITY, AND POROSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40613AE
RING NUMBER: 613
DEPTH: N/A

FIELD WEIGHT OF SAMPLE (W/PAN AND RING): 428.72 (g)
TARE WEIGHT, RING: 87.33 (g)
TARE WEIGHT, CAP: 0.00 (g)
SAMPLE VOLUME: 192.82 (cc)
DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

DRY WEIGHT OF SAMPLE: 296.59 (g)
DRY BULK DENSITY: 1.54 (g/cc)
PARTICLE DENSITY: 2.63 (g/cc)
(METHOD: WATER PYCNOMETER)

CALCULATED POROSITY: 41.5 (% vol)

INITIAL MOISTURE CONTENT (VOLUMETRIC): 23.2 (% vol)

INITIAL MOISTURE CONTENT (GRAVIMETRIC): 15.1 (% g/g)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

APPENDIX C

SATURATED BULK DENSITY

SUMMARY OF SATURATED BULK DENSITY

Sample Number	Saturated Bulk Density (g/cc)
BH40396AE	2.08
BH40397AE	2.08
BH40398AE	2.01
BH40401AE	2.08
BH40402AE	1.98
BH40403AE	2.01
BH40404AE	2.08
BH40405AE	1.97
BH40406AE	2.22
BH40407AE	1.89
BH40408AE	2.09
BH40600AE	2.19
BH40601AE	2.05
BH40602AE	2.10
BH40603AE	1.98
BH40604AE	2.13
BH40605AE	2.03
BH40606AE	2.13

SUMMARY OF SATURATED DRY BULK DENSITY (CONTINUED)

Sample Number	Saturated Bulk Density (g/cc)
BH40607AE	1.97
BH40608AE	2.22
BH40609AE	2.12
BH40610AE	2.08
BH40611AE	2.11
BH40612AE	2.11
BH40613AE	1.94

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40396AE
RING NUMBER: 396
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 491.43 (g)
TARE WEIGHT, RING: 83.05 (g)
TARE WEIGHT, S&C: 27.13 (g)

SAMPLE VOLUME: 182.99 (cc)

DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

SATURATED BULK DENSITY: 2.08 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40397AE
RING NUMBER: 397
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 412.72 (g)
TARE WEIGHT, RING: 69.54 (g)
TARE WEIGHT, S&C: 25.89 (g)

SAMPLE VOLUME: 152.49 (cc)

DATE AND TIME INTO OVEN: 11/02 @ 0900
DATE AND TIME OUT OF OVEN: 11/03 @ 1300

SATURATED BULK DENSITY: 2.08 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40398AE
RING NUMBER: 398
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 359.85 (g)
TARE WEIGHT, RING: 61.71 (g)
TARE WEIGHT, S&C: 25.10 (g)

SAMPLE VOLUME: 136.05 (cc)

DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

SATURATED BULK DENSITY: 2.01 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40401AE
RING NUMBER: 401
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 341.97 (g)
TARE WEIGHT, RING: 56.44 (g)
TARE WEIGHT, S&C: 26.62 (g)

SAMPLE VOLUME: 124.28 (cc)

DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

SATURATED BULK DENSITY: 2.08 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS.

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40402AE
RING NUMBER: 402
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 375.29 (g)
TARE WEIGHT, RING: 64.52 (g)
TARE WEIGHT, S&C: 26.37 (g)

SAMPLE VOLUME: 143.55 (cc)

DATE AND TIME INTO OVEN: 11/02 @ 0900
DATE AND TIME OUT OF OVEN: 11/03 @ 1300

SATURATED BULK DENSITY: 1.98 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40403AE
RING NUMBER: 403
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 363.05 (g)
TARE WEIGHT, RING: 61.85 (g)
TARE WEIGHT, S&C: 26.51 (g)

SAMPLE VOLUME: 136.79 (cc)

DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

SATURATED BULK DENSITY: 2.01 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: R. Hill
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40404AE
RING NUMBER: 404
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 330.87 (g)
TARE WEIGHT, RING: 54.12 (g)
TARE WEIGHT, S&C: 25.33 (g)

SAMPLE VOLUME: 120.98 (cc)

DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

SATURATED BULK DENSITY: 2.08 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40405AE
RING NUMBER: 405
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 546.81 (g)
TARE WEIGHT, RING: 95.58 (g)
TARE WEIGHT, S&C: 25.51 (g)

SAMPLE VOLUME: 216.26 (cc)

DATE AND TIME INTO OVEN: 11/05 @ 1400
DATE AND TIME OUT OF OVEN: 11/12 @ 0800

SATURATED BULK DENSITY: 1.97 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40406AE
RING NUMBER: 618
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 332.90 (g)
TARE WEIGHT, RING: 52.49 (g)
TARE WEIGHT, S&C: 26.26 (g)

SAMPLE VOLUME: 114.59 (cc)

DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

SATURATED BULK DENSITY: 2.22 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40407AE
RING NUMBER: 407
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 302.71 (g)
TARE WEIGHT, RING: 53.85 (g)
TARE WEIGHT, S&C: 25.20 (g)

SAMPLE VOLUME: 118.57 (cc)

DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

SATURATED BULK DENSITY: 1.89 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40408AE
RING NUMBER: 408
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 308.95 (g)
TARE WEIGHT, RING: 50.95 (g)
TARE WEIGHT, S&C: 25.53 (g)

SAMPLE VOLUME: 111.23 (cc)

DATE AND TIME INTO OVEN: 11/02 @ 0900
DATE AND TIME OUT OF OVEN: 11/03 @ 1300

SATURATED BULK DENSITY: 2.09 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40600AE
RING NUMBER: 600
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 474.21 (g)
TARE WEIGHT, RING: 77.94 (g)
TARE WEIGHT, S&C: 26.59 (g)

SAMPLE VOLUME: 168.98 (cc)

DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

SATURATED BULK DENSITY: 2.19 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40601AE
RING NUMBER: 601
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 319.14 (g)
TARE WEIGHT, RING: 53.39 (g)
TARE WEIGHT, S&C: 26.38 (g)

SAMPLE VOLUME: 116.99 (cc)

DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

SATURATED BULK DENSITY: 2.05 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: R. Hill
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40602AE
RING NUMBER: 602
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 425.93 (g)
TARE WEIGHT, RING: 70.99 (g)
TARE WEIGHT, S&C: 24.82 (g)

SAMPLE VOLUME: 156.97 (cc)

DATE AND TIME INTO OVEN: 11/02 @ 0900
DATE AND TIME OUT OF OVEN: 11/03 @ 1300

SATURATED BULK DENSITY: 2.10 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40603AE
RING NUMBER: 603
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 292.54 (g)
TARE WEIGHT, RING: 49.90 (g)
TARE WEIGHT, S&C: 26.05 (g)

SAMPLE VOLUME: 109.13 (cc)

DATE AND TIME INTO OVEN: 11/02 @ 0900
DATE AND TIME OUT OF OVEN: 11/03 @ 1300

SATURATED BULK DENSITY: 1.98 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40604AE
RING NUMBER: 604
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 355.46 (g)
TARE WEIGHT, RING: 58.03 (g)
TARE WEIGHT, S&C: 25.45 (g)

SAMPLE VOLUME: 127.60 (cc)

DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

SATURATED BULK DENSITY: 2.13 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40605AE
RING NUMBER: 605
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 307.53 (g)
TARE WEIGHT, RING: 51.44 (g)
TARE WEIGHT, S&C: 25.70 (g)

SAMPLE VOLUME: 113.40 (cc)

DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

SATURATED BULK DENSITY: 2.03 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40606AE
RING NUMBER: 606
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 405.50 (g)
TARE WEIGHT, RING: 70.32 (g)
TARE WEIGHT, S&C: 27.71 (g)

SAMPLE VOLUME: 144.44 (cc)

DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

SATURATED BULK DENSITY: 2.13 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40607AE
RING NUMBER: 607
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 357.42 (g)
TARE WEIGHT, RING: 61.56 (g)
TARE WEIGHT, S&C: 26.49 (g)

SAMPLE VOLUME: 136.64 (cc)

DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

SATURATED BULK DENSITY: 1.97 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40608AE
RING NUMBER: 608
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 438.46 (g)
TARE WEIGHT, RING: 69.49 (g)
TARE WEIGHT, S&C: 26.56 (g)

SAMPLE VOLUME: 154.17 (cc)

DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

SATURATED BULK DENSITY: 2.22 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40609AE
RING NUMBER: 609
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 342.27 (g)
TARE WEIGHT, RING: 55.94 (g)
TARE WEIGHT, S&C: 26.07 (g)

SAMPLE VOLUME: 122.68 (cc)

DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

SATURATED BULK DENSITY: 2.12 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40610AE
RING NUMBER: 610
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 336.68 (g)
TARE WEIGHT, RING: 55.80 (g)
TARE WEIGHT, S&C: 26.16 (g)

SAMPLE VOLUME: 122.18 (cc)

DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

SATURATED BULK DENSITY: 2.08 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40611AE
RING NUMBER: 611
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 302.94 (g)
TARE WEIGHT, RING: 49.09 (g)
TARE WEIGHT, S&C: 25.67 (g)

SAMPLE VOLUME: 108.24 (cc)

DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

SATURATED BULK DENSITY: 2.11 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40612AE
RING NUMBER: 612
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 498.98 (g)
TARE WEIGHT, RING: 84.28 (g)
TARE WEIGHT, S&C: 26.61 (g)

SAMPLE VOLUME: 184.18 (cc)

DATE AND TIME INTO OVEN: 11/16 @ 0830
DATE AND TIME OUT OF OVEN: 11/17 @ 0900

SATURATED BULK DENSITY: 2.11 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

DATA FOR SATURATED BULK DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40613AE
RING NUMBER: 613
DEPTH: N/A

SATURATED WEIGHT OF SAMPLE (W/PAN AND RING): 486.45 (g)
TARE WEIGHT, RING: 87.33 (g)
TARE WEIGHT, S&C: 25.48 (g)

SAMPLE VOLUME: 192.82 (cc)

DATE AND TIME INTO OVEN: 10/19 @ 1100
DATE AND TIME OUT OF OVEN: 10/27 @ 1100

SATURATED BULK DENSITY: 1.94 (g/cc)

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

APPENDIX D

SATURATED HYDRAULIC CONDUCTIVITY

SUMMARY OF SATURATED HYDRAULIC CONDUCTIVITY TESTS

Sample Number	K_{sat} (cm/sec)	Method of Analysis	
		Constant Head	Falling Head
BH40396AE	2.9×10^{-6}		X
BH40397AE	1.5×10^{-7}		X
BH40398AE	6.8×10^{-8}		X
BH40401AE[1]	3.0×10^{-9}		X
BH40402AE	1.6×10^{-8}		X
BH40403AE	1.1×10^{-6}		X
BH40404AE[1]	5.3×10^{-9}		X
BH40405AE	7.1×10^{-2}	X	
BH40406AE	5.1×10^{-9}		X
BH40407AE	1.2×10^{-6}		X
BH40408AE	1.3×10^{-7}		X
BH40600AE	2.0×10^{-3}		X
BH40601AE	1.2×10^{-5}		X
BH40602AE	5.7×10^{-6}		X
BH40603AE	1.0×10^{-7}		X
BH40604AE	4.3×10^{-9}		X

[1] No flow was observed during testing although the sample was saturated when removed from the permeameter.

SUMMARY OF SATURATED HYDRAULIC CONDUCTIVITY TESTS (CONTINUED)

Sample Number	K_{sat} (cm/sec)	Method of Analysis	
		Constant Head	Falling Head
BH40605AE[1]	3.6×10^{-9}		X
BH40606AE	5.0×10^{-6}		X
BH40607AE	1.8×10^{-5}		X
BH40608AE*	1.4×10^{-3}		X
BH40609AE	1.8×10^{-5}		X
BH40610AE	1.0×10^{-7}		X
BH40611AE[1]	1.0×10^{-9}		X
BH40612AE	1.4×10^{-6}		X
BH40613AE*	1.1×10^{-4}		X

[1] No flow was observed during testing although the sample was saturated when removed from the permeameter.

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40396AE
RING NUMBER: 396
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.80 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 6.14 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
23-Sep-93	09:46:17		19.5	78.5	0.0		
23-Sep-93	17:19:19	27182	20.0	46.6	0.0	2.8E-06	2.8E-06
TEST # 2:							
23-Sep-93	17:19:19		20.0	46.6	0.0		
24-Sep-93	09:56:47	59848	20.0	14.7	0.0	2.8E-06	2.8E-06
TEST # 3:							
24-Sep-93	10:41:24		20.0	70.1	0.0		
24-Sep-93	16:44:07	21763	21.0	43.8	0.0	3.1E-06	3.1E-06

AVERAGE K SAT: 2.9E-06 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40397AE
RING NUMBER: 397
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.61 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 5.15 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
24-Sep-93	16:27:58		20.0	135.7	0.0		
27-Sep-93	10:48:59	238861	20.0	102.8	0.0	1.4E-07	1.4E-07
TEST # 2:							
27-Sep-93	10:50:20		20.0	149.4	0.0		
27-Sep-93	15:18:00	16060	21.0	146.1	0.0	1.7E-07	1.7E-07
TEST # 3:							
27-Sep-93	15:18:00		21.0	146.1	0.0		
28-Sep-93	10:12:00	68040	21.0	135.0	0.0	1.4E-07	1.4E-07

AVERAGE K SAT: 1.5E-07 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40398AE
RING NUMBER: 398
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.90 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 4.55 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
27-Sep-93	11:00:52		20.0	126.3	0.0		
27-Sep-93	15:19:00	15488	21.0	125.0	0.0	7.1E-08	7.0E-08
TEST # 2:							
27-Sep-93	15:19:00		21.0	125.0	0.0		
28-Sep-93	10:14:02	68102	21.0	119.8	0.0	6.6E-08	6.5E-08
TEST # 3:							
28-Sep-93	10:14:02		21.0	119.8	0.0		
29-Sep-93	09:21:00	83218	21.0	113.5	0.0	6.9E-08	6.8E-08

AVERAGE K SAT: 6.8E-08 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40401AE
RING NUMBER: 401
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.80 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 4.17 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
04-Oct-93	10:55:00		21.0	152.7	0.0		
07-Oct-93	11:27:36	261156	21.0	151.1	0.0	4.0E-09	3.9E-09
TEST # 2:							
07-Oct-93	11:27:36		21.0	151.1	0.0		
11-Oct-93	13:43:15	353739	21.0	149.8	0.0	2.4E-09	2.3E-09
TEST # 3:							
11-Oct-93	13:43:15		21.0	149.8	0.0		
15-Oct-93	08:07:50	325475	21.0	148.4	0.0	2.8E-09	2.8E-09

AVERAGE K SAT: 3.0E-09 (CM/SEC)

COMMENTS: No flow was observed during testing, although the sample was saturated when removed from the permeameter.

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40402AE
RING NUMBER: 402
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 30.09 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 4.77 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
04-Oct-93	10:56:20		21.0	134.0	0.0		
05-Oct-93	09:10:36	80056	21.0	132.4	0.0	1.7E-08	1.6E-08
TEST # 2:							
05-Oct-93	09:10:36		21.0	132.4	0.0		
05-Oct-93	16:27:56	26240	22.0	131.9	0.0	1.6E-08	1.5E-08
TEST # 3:							
05-Oct-93	16:27:56		22.0	131.9	0.0		
06-Oct-93	07:52:45	55489	20.0	130.8	0.0	1.7E-08	1.6E-08

AVERAGE K SAT: 1.6E-08 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: C. Pigman
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40403AE
RING NUMBER: 403
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.80 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 4.59 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
23-Sep-93	09:46:33		19.5	41.2	0.0		
23-Sep-93	17:20:34	27241	20.0	30.9	0.0	1.1E-06	1.1E-06
TEST # 2:							
23-Sep-93	17:21:17		20.0	75.9	0.0		
24-Sep-93	09:57:05	59748	20.0	37.2	0.0	1.3E-06	1.3E-06
TEST # 3:							
24-Sep-93	09:57:05		20.0	37.2	0.0		
24-Sep-93	16:44:40	24455	21.0	29.7	0.0	9.9E-07	9.8E-07

AVERAGE K SAT: 1.1E-06 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40404AE
RING NUMBER: BH40404AE
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 30.09 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 4.02 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
04-Oct-93	10:54:30		21.0	147.5	0.0		
06-Oct-93	07:51:20	161810	20.0	146.1	0.0	5.5E-09	5.4E-09
TEST # 2:							
06-Oct-93	07:51:20		20.0	146.1	0.0		
08-Oct-93	11:26:45	185725	21.0	144.7	0.0	4.8E-09	4.8E-09
TEST # 3:							
08-Oct-93	11:26:45		21.0	144.7	0.0		
15-Oct-93	08:06:40	592795	21.0	139.5	0.0	5.8E-09	5.6E-09

AVERAGE K SAT: 5.3E-09 (CM/SEC)

COMMENTS: No flow was observed during testing, although the sample was saturated when removed from the permeameter.

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

CONSTANT HEAD PERMEAMETER DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40405AE
RING NUMBER: 405
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE LENGTH: 7.14 (cm)
SAMPLE DIAMETER: 6.21 (cm)
SAMPLE X-SECTIONAL AREA: 30.29 (sq. cm)

DATE	TIME	TEMP (C)	HEAD (CM)	FLOW VOL(CC)	ELAPSED TIME(SEC)	K SAT (CM/SEC)	K SAT @ 20 (CM/SEC)
30-Sep-93	09:08:15	21.0	4.2	27.6	15	1.0E-01	1.0E-01
30-Sep-93	09:08:30						
30-Sep-93	12:44:10	21.5	4.4	11.7	50	1.3E-02	1.2E-02
30-Sep-93	12:45:00						
04-Oct-93	12:21:45	21.0	4.4	28.9	15	1.0E-01	1.0E-01
04-Oct-93	12:22:00						

AVERAGE K SAT: 7.1E-02 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik/R. Hill
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40406AE
RING NUMBER: 618
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 30.00 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 3.82 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
29-Sep-93	09:35:48		21.0	156.0	0.0		
05-Oct-93	09:11:04	516916	21.0	153.5	0.0	2.8E-09	2.7E-09
TEST # 2:							
05-Oct-93	09:11:04		21.0	153.5	0.0		
08-Oct-93	11:28:50	267466	21.0	152.8	0.0	1.5E-09	1.5E-09
TEST # 3:							
08-Oct-93	11:28:50		21.0	152.8	0.0		
10-Oct-93	11:59:42	174652	20.0	149.5	0.0	1.1E-08	1.1E-08

AVERAGE K SAT: 5.1E-09 (CM/SEC)

COMMENTS: No flow was observed during testing, although the sample was saturated when removed from the permeameter.

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40407AE
RING NUMBER: 407
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 30.09 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 3.94 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
22-Sep-93	16:49:14		19.0	64.2	0.0		
23-Sep-93	09:01:42	58348	19.5	29.5	0.0	1.2E-06	1.2E-06
TEST # 2:							
23-Sep-93	09:01:42		19.5	29.5	0.0		
23-Sep-93	15:52:50	24668	20.0	22.0	0.0	1.1E-06	1.1E-06
TEST # 3:							
23-Sep-93	16:11:56		20.0	81.0	0.0		
24-Sep-93	09:29:45	62269	19.5	37.5	0.0	1.1E-06	1.1E-06

AVERAGE K SAT: 1.2E-06 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40408AE
RING NUMBER: 408
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.90 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 3.72 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
23-Sep-93	10:35:34		20.0	114.9	0.0		
23-Sep-93	17:00:16	23082	20.0	110.9	0.0	1.3E-07	1.3E-07
TEST # 2:							
23-Sep-93	17:00:16		20.0	110.9	0.0		
24-Sep-93	09:43:49	60213	20.0	101.1	0.0	1.3E-07	1.3E-07
TEST # 3:							
24-Sep-93	09:43:49		20.0	101.1	0.0		
24-Sep-93	16:26:19	24150	21.0	97.4	0.0	1.3E-07	1.3E-07

AVERAGE K SAT: 1.3E-07 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40600AE
RING NUMBER: 600
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.80 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 5.67 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
22-Sep-93	16:26:09		20.0	30.0	0.0		
22-Sep-93	16:26:37	28	20.0	20.0	0.0	1.9E-03	1.9E-03
TEST # 2:							
23-Sep-93	09:44:21		19.5	50.0	0.0		
23-Sep-93	09:44:58	37	19.5	30.0	0.0	1.8E-03	1.9E-03
TEST # 3:							
23-Sep-93	17:18:18		20.0	43.0	0.0		
23-Sep-93	17:18:36	18	20.0	32.0	0.0	2.2E-03	2.2E-03

AVERAGE K SAT: 2.0E-03 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40601AE
RING NUMBER: 601
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 30.00 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 3.90 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
24-Sep-93	09:51:12		20.0	71.6	0.0		
24-Sep-93	10:45:57	3285	20.0	45.5	0.0	1.3E-05	1.3E-05
TEST # 2:							
27-Sep-93	11:13:46		20.5	75.5	0.0		
27-Sep-93	11:37:31	1425	20.5	61.3	0.0	1.3E-05	1.3E-05
TEST # 3:							
27-Sep-93	15:25:23		26.0	60.9	0.0		
27-Sep-93	16:00:13	2090	23.0	47.2	0.0	1.1E-05	1.0E-05

AVERAGE K SAT: 1.2E-05 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik/R. Hill
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40602AE
RING NUMBER: 602
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.90 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 5.25 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
04-Oct-93	11:06:56		21.0	67.7	0.0		
05-Oct-93	09:13:49	79613	21.0	6.1	0.0	3.7E-06	3.6E-06
TEST # 2:							
05-Oct-93	13:21:26		21.5	80.4	0.0		
05-Oct-93	16:11:16	10190	22.0	49.6	0.0	5.8E-06	5.6E-06
TEST # 3:							
05-Oct-93	16:11:16		22.0	49.6	0.0		
06-Oct-93	07:57:37	56781	20.0	1.2	0.0	8.1E-06	7.9E-06

AVERAGE K SAT: 5.7E-06 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: C. Pigman
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40603AE
RING NUMBER: 603
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.90 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 3.65 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
05-Oct-93	09:12:36		21.0	102.0	0.0		
05-Oct-93	16:29:35	26219	22.0	98.9	0.0	1.0E-07	9.7E-08
TEST # 2:							
05-Oct-93	16:29:35		22.0	98.9	0.0		
06-Oct-93	07:55:48	55573	20.0	92.0	0.0	1.1E-07	1.1E-07
TEST # 3:							
06-Oct-93	07:55:48		20.0	92.0	0.0		
07-Oct-93	09:57:53	93725	21.0	82.0	0.0	1.0E-07	1.0E-07

AVERAGE K SAT: 1.0E-07 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: C. Pigman
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40604AE
RING NUMBER: 604
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 30.09 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 4.24 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
04-Oct-93	10:57:25		21.0	147.5	0.0		
06-Oct-93	07:55:05	161860	20.0	146.9	0.0	2.5E-09	2.5E-09
TEST # 2:							
06-Oct-93	17:21:53		20.0	147.1	0.0		
08-Oct-93	11:29:28	151655	21.0	146.5	0.0	2.7E-09	2.6E-09
TEST # 3:							
20-Oct-93	14:31:42		21.5	170.5	0.0		
22-Oct-93	16:44:31	180769	21.0	168.0	0.0	8.1E-09	7.8E-09

AVERAGE K SAT: 4.3E-09 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40605AE
RING NUMBER: 605
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.61 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 3.83 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
04-Oct-93	10:53:36		21.0	137.1	0.0		
06-Oct-93	07:50:50	161834	20.0	136.5	0.0	2.5E-09	2.4E-09
TEST # 2:							
06-Oct-93	17:15:40		20.0	136.4	0.0		
10-Oct-93	11:55:37	326397	20.0	134.2	0.0	4.5E-09	4.5E-09
TEST # 3:							
10-Oct-93	11:55:37		20.0	134.2	0.0		
15-Oct-93	08:06:00	418223	21.0	131.8	0.0	3.9E-09	3.9E-09

AVERAGE K SAT: 3.6E-09 (CM/SEC)

COMMENTS: No flow was observed during testing, although the sample was saturated when removed from the permeameter.

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40606AE
RING NUMBER: 606
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 27.99 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 5.16 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
23-Sep-93	09:31:25		19.5	79.5	0.0		
23-Sep-93	16:50:12	26327	20.0	29.4	0.0	4.9E-06	4.9E-06
TEST # 2:							
23-Sep-93	16:51:24		20.0	80.3	0.0		
23-Sep-93	17:38:04	2800	20.5	69.4	0.0	6.7E-06	6.7E-06
TEST # 3:							
24-Sep-93	09:44:55		20.0	78.6	0.0		
24-Sep-93	14:10:18	15923	20.0	50.6	0.0	3.6E-06	3.6E-06

AVERAGE K SAT: 5.0E-06 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40607AE
RING NUMBER: 607
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.90 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 4.57 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
24-Sep-93	16:43:33		21.0	79.5	0.0		
24-Sep-93	17:33:14	2981	21.0	50.8	0.0	1.6E-05	1.6E-05
TEST # 2:							
27-Sep-93	11:36:50		20.5	60.4	0.0		
27-Sep-93	12:18:19	2489	20.5	38.8	0.0	1.9E-05	1.9E-05
TEST # 3:							
27-Sep-93	15:28:48		21.0	66.0	0.0		
27-Sep-93	16:01:36	1968	21.0	44.6	0.0	2.1E-05	2.1E-05

AVERAGE K SAT: 1.8E-05 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40608AE
RING NUMBER: 608
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.71 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 5.19 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
23-Sep-93	17:10:52		20.0	44.0	0.0		
23-Sep-93	17:11:22	30	20.0	32.0	0.0	1.3E-03	1.3E-03
TEST # 2:							
24-Sep-93	09:53:03		20.0	30.0	0.0		
24-Sep-93	09:53:37	34	20.0	20.0	0.0	1.5E-03	1.5E-03
TEST # 3:							
24-Sep-93	16:38:25		21.0	20.0	0.0		
24-Sep-93	16:39:25	60	21.0	10.0	0.0	1.4E-03	1.4E-03

AVERAGE K SAT: 1.4E-03 (CM/SEC)

COMMENTS: Elution of silts at first flow on 9/22.
Clean flow on 9/23.

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40609AE
RING NUMBER: 609
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.71 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 4.13 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
22-Sep-93	16:16:06		20.0	44.7	0.0		
22-Sep-93	17:40:38	5072	20.0	19.2	0.0	1.6E-05	1.6E-05
TEST # 2:							
23-Sep-93	09:33:21		19.5	80.0	0.0		
23-Sep-93	13:49:10	15349	19.5	4.8	0.0	1.8E-05	1.8E-05
TEST # 3:							
24-Sep-93	09:49:42		20.0	83.9	0.0		
24-Sep-93	10:43:12	3210	20.0	42.3	0.0	2.1E-05	2.1E-05

AVERAGE K SAT: 1.8E-05 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40610AE
RING NUMBER: 610
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.51 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 4.14 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
24-Sep-93	16:28:45		21.0	135.2	0.0		
27-Sep-93	10:58:35	239390	21.0	105.4	0.0	1.0E-07	1.0E-07
TEST # 2:							
27-Sep-93	10:59:48		20.0	152.2	0.0		
27-Sep-93	15:18:30	15522	21.0	149.4	0.0	1.2E-07	1.2E-07
TEST # 3:							
27-Sep-93	15:18:30		21.0	149.4	0.0		
28-Sep-93	10:19:23	68453	21.0	139.3	0.0	1.0E-07	9.8E-08

AVERAGE K SAT: 1.0E-07 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40611AE
RING NUMBER: 611
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.90 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 3.62 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
04-Oct-93	10:55:50		21.0	139.4	0.0		
07-Oct-93	09:54:59	255549	21.0	139.2	0.0	4.8E-10	4.6E-10
TEST # 2:							
07-Oct-93	09:54:59		21.0	139.2	0.0		
11-Oct-93	13:44:34	359375	21.0	138.4	0.0	1.4E-09	1.3E-09
TEST # 3:							
11-Oct-93	13:44:34		21.0	138.4	0.0		
15-Oct-93	08:09:40	325506	21.0	137.7	0.0	1.3E-09	1.3E-09

AVERAGE K SAT: 1.0E-09 (CM/SEC)

COMMENTS: No flow was observed during testing, although the sample was saturated when removed from the permeameter.

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40612AE
RING NUMBER: 612
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.90 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 6.16 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
27-Sep-93	15:27:12		21.0	46.8	0.0		
28-Sep-93	10:14:42	67650	21.0	17.0	0.0	2.2E-06	2.1E-06
TEST # 2:							
28-Sep-93	10:14:42		21.0	17.0	0.0		
29-Sep-93	12:09:10	93268	21.0	7.7	0.0	1.2E-06	1.2E-06
TEST # 3:							
29-Sep-93	12:11:00		21.0	68.3	0.0		
01-Oct-93	15:33:55	184975	22.0	18.4	0.0	1.0E-06	9.9E-07

AVERAGE K SAT: 1.4E-06 (CM/SEC)

COMMENTS:

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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FALLING HEAD TEST DATA

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40613AE
RING NUMBER: 613
DEPTH: N/A
TYPE OF WATER USED: TAP
SAMPLE X-SECTION AREA: 29.80 (sq. cm)
STANDPIPE X-SECTION AREA: 0.70 (sq. cm)
SAMPLE LENGTH: 6.47 (cm)

DATE	TIME	DEL T (SEC)	TEMP (C)	RESERVOIR HEAD(CM)	SAMPLE HEAD(CM)	K SAT (CM/SEC)	K SAT @ 20 C (CM/SEC)
TEST # 1:							
24-Sep-93	16:34:52		21.0	33.9	0.0		
24-Sep-93	16:45:55	663	21.0	19.0	0.0	1.3E-04	1.3E-04
TEST # 2:							
27-Sep-93	11:09:45		20.5	53.0	0.0		
27-Sep-93	11:25:12	927	20.5	26.0	0.0	1.2E-04	1.2E-04
TEST # 3:							
27-Sep-93	15:26:34		26.0	52.8	0.0		
27-Sep-93	16:00:45	2051	23.0	12.8	0.0	1.1E-04	9.5E-05

AVERAGE K SAT: 1.1E-04 (CM/SEC)

COMMENTS: Elution of yellow silts on 9/22.
Clean flow on 9/23.

LABORATORY ANALYSIS BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

APPENDIX E

MOISTURE CHARACTERISTICS

SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40396AE	0	32.1
	21	32.1
	82	30.0
	306	27.6
	1020	25.2
	3467	23.2
	15195	22.6
BH40397AE	0	34.7
	52	34.1
	204	32.4
	510	31.6
	1020	30.6
	5130	28.4
	14991	27.3
BH40398AE	0	41.5
	82	40.7
	316	37.4
	826	35.2
	1632	33.4
	5609	30.8
	14685	29.1
BH40401AE	0	42.4
	82	40.7
	316	37.7
	826	36.7
	1632	36.2
	5609	34.7
	14685	33.1

SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40402AE	0	46.4
	55	45.8
	206	44.8
	510	43.6
	1020	41.8
	5130	38.6
	14991	35.9
BH40403AE	0	37.0
	22	36.8
	83	34.6
	306	32.5
	1020	29.8
	3467	26.9
	15195	24.1
BH40404AE	0	51.2
	82	50.5
	316	47.9
	826	45.1
	1632	43.0
	5609	38.1
	14685	34.6
BH40405AE	0	25.4
	6	24.4
	10	16.2
	51	4.3
	213	2.2
	1020	1.8
	15603	1.6

SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40406AE	0	38.2
	82	37.7
	316	34.8
	826	33.2
	1632	32.1
	5609	30.0
	14685	27.8
BH40407AE	0	43.8
	21	42.6
	85	41.1
	306	38.9
	1020	36.2
	3467	32.3
	15195	27.4
BH40408AE	0	44.9
	52	43.3
	204	41.6
	510	40.2
	1020	38.4
	5130	34.0
	14991	30.8
BH40600AE	0	24.4
	9	14.8
	41	11.1
	121	9.2
	357	7.9
	1030	6.9
	14685	5.3

SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40601AE	0	35.0
	21	32.9
	82	30.8
	306	28.3
	1020	25.9
	3467	22.5
	15195	18.6
BH40602AE	0	31.6
	19	27.4
	79	25.1
	204	23.5
	510	21.9
	1020	20.0
	5130	15.7
	14991	14.9
BH40603AE	0	43.2
	53	42.7
	204	40.7
	510	39.1
	1020	37.1
	5130	32.9
	14991	30.1
BH40604AE	0	48.4
	82	48.1
	316	45.7
	826	44.0
	1632	42.6
	5609	39.0
	14685	35.6

SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40605AE	0	41.9
	82	39.9
	316	37.8
	826	36.0
	1632	34.6
	5609	31.0
	14685	31.0
BH40606AE	0	41.1
	21	39.9
	80	37.7
	306	34.7
	1020	31.4
	3467	28.8
	15195	26.2
BH40607AE	0	35.7
	20	34.2
	82	31.8
	306	28.9
	1020	25.9
	3467	23.3
	15195	20.9
BH40608AE	0	27.0
	13	20.1
	40	17.1
	122	15.1
	357	14.2
	1030	12.9
	14685	10.6

SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH40609AE	0	36.3
	22	34.4
	78	30.2
	306	23.4
	1020	19.9
	3467	18.3
	15195	16.6
BH40610AE	0	40.2
	82	39.3
	316	36.8
	826	34.1
	1632	32.1
	5609	27.8
	14685	25.8
BH40611AE	0	53.5
	82	53.8
	316	49.0
	826	46.1
	1632	44.7
	5609	41.3
	14685	38.8
BH40612AE	0	32.1
	82	30.0
	316	26.1
	826	24.5
	1632	23.6
	5609	22.8
	14685	21.4

SUMMARY OF MOISTURE CHARACTERISTICS OF THE INITIAL DRAINAGE CURVE (CONTINUED)

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
BH406013AE	0	40.0
	21	38.0
	53	37.4
	125	36.5
	357	35.1
	1030	33.1
	14685	29.0

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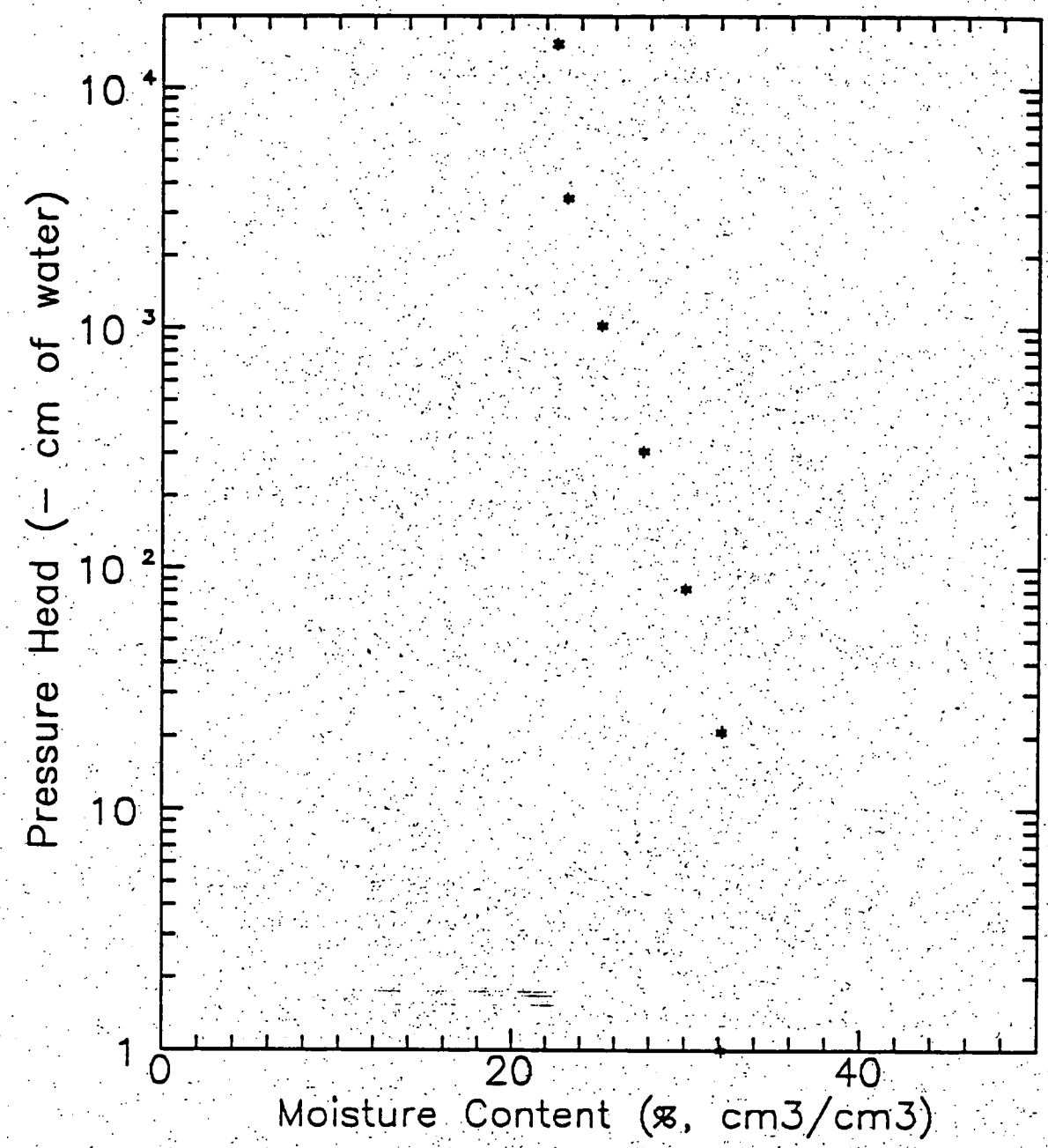
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40396AE
RING NUMBER: 396
DEPTH: N/A
SAMPLE VOLUME: 182.99 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 491.43 (g)
TARE RING: 83.05 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 27.13 (g)
DRY WEIGHT OF SAMPLE: 322.46 (g)
SATURATED MOISTURE CONTENT: 32.13 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 58.79 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
09/28	1300	0.0	--	--	491.43	--	--	32.1
09/30	1300	20.5	--	--	491.30	0.13	0.13	32.1
10/06	930	81.5	--	--	487.49	3.81	3.94	30.0
10/09	700	--	0.3	--	483.15	4.34	8.28	27.6
10/12	1000	--	1.0	--	478.69	4.46	12.74	25.2
10/15	1130	--	3.4	--	475.12	3.57	16.31	23.2
10/19	800	--	14.9	--	474.00	1.12	17.43	22.6

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40396AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

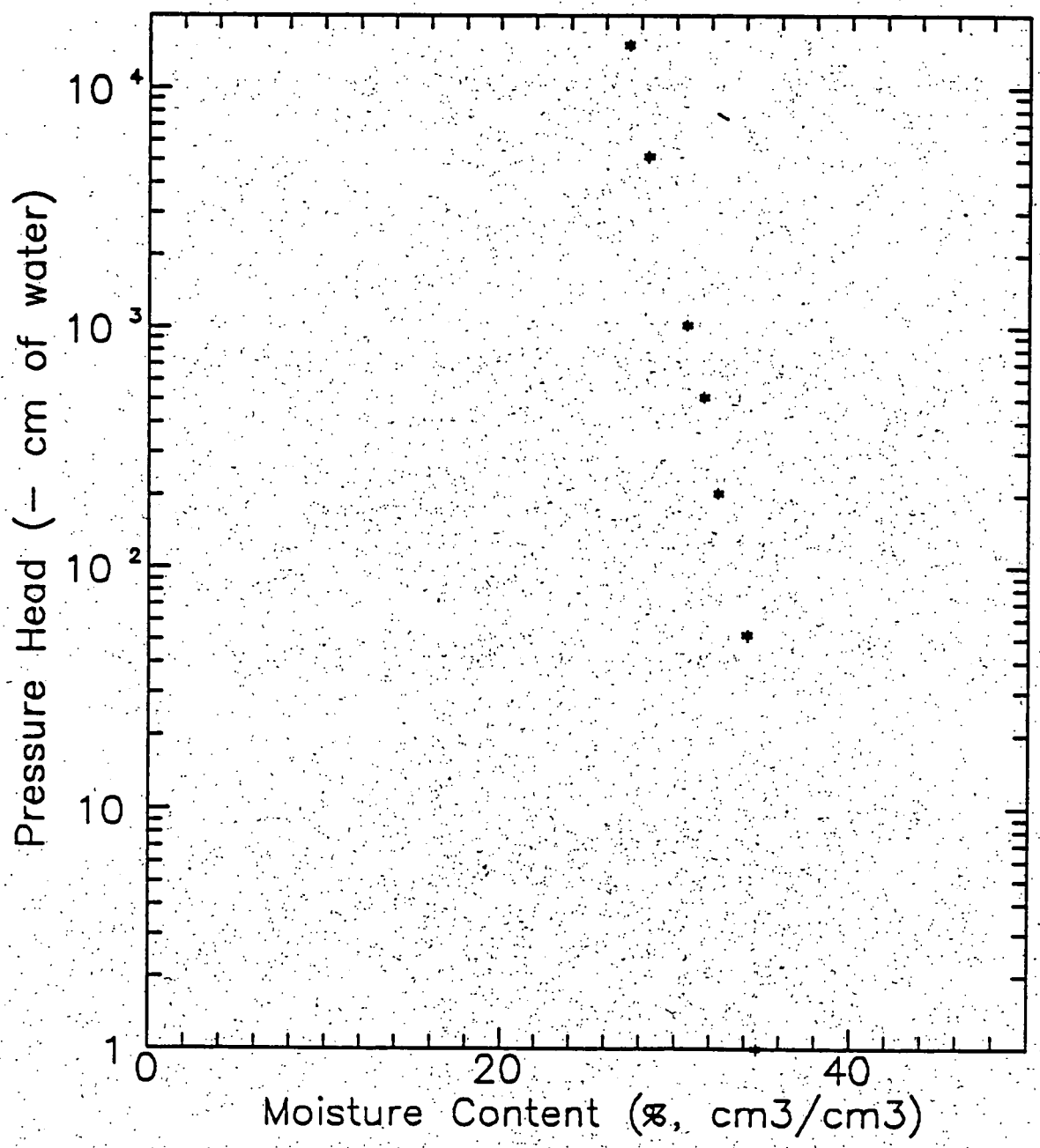
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40397AE
RING NUMBER: 397
DEPTH: N/A
SAMPLE VOLUME: 152.49 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 412.72 (g)
TARE RING: 69.54 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 25.89 (g)
DRY WEIGHT OF SAMPLE: 264.41 (g)
SATURATED MOISTURE CONTENT: 34.68 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 52.88 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/07	1130	0.0	--	--	412.72	--	--	34.7
10/12	1000	51.9	--	--	411.80	0.92	0.92	34.1
10/19	845	--	0.2	--	409.24	2.56	3.48	32.4
10/22	1030	--	0.5	--	408.02	1.22	4.70	31.6
10/26	900	--	1.0	--	406.45	1.57	6.27	30.6
10/29	1010	--	5.0	--	403.11	3.34	9.61	28.4
11/02	900	--	14.7	--	401.51	1.60	11.21	27.3

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: C. Pigman/M. Trenchik
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40397AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

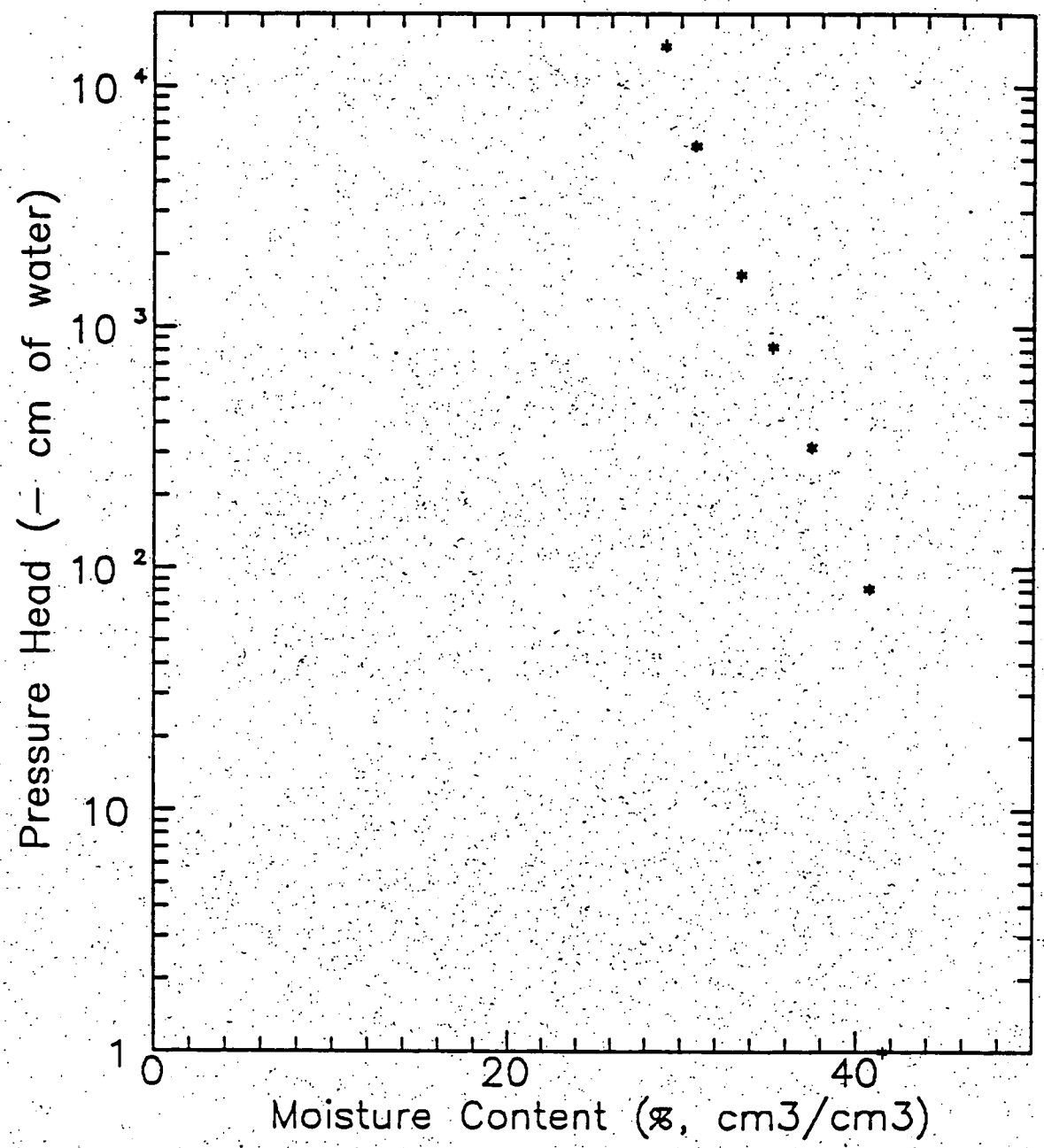
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40398AE
RING NUMBER: 398
DEPTH: N/A
SAMPLE VOLUME: 136.05 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 381.58 (g)
TARE RING: 61.71 (g)
TARE CAP: 21.73 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 25.10 (g)
DRY WEIGHT OF SAMPLE: 216.53 (g)
SATURATED MOISTURE CONTENT: 41.54 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 56.51 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/26	1145	--	0.0	--	381.58	--	--	41.5
10/29	1100	--	0.1	--	380.48	1.10	1.10	40.7
11/02	1300	--	0.3	--	376.02	4.46	5.56	37.4
11/05	1300	--	0.8	--	373.01	3.01	8.57	35.2
11/09	930	--	1.6	--	370.49	2.52	11.09	33.4
11/12	800	--	5.5	--	366.91	3.58	14.67	30.8
11/16	730	--	14.4	--	364.63	2.28	16.95	29.1

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40398AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

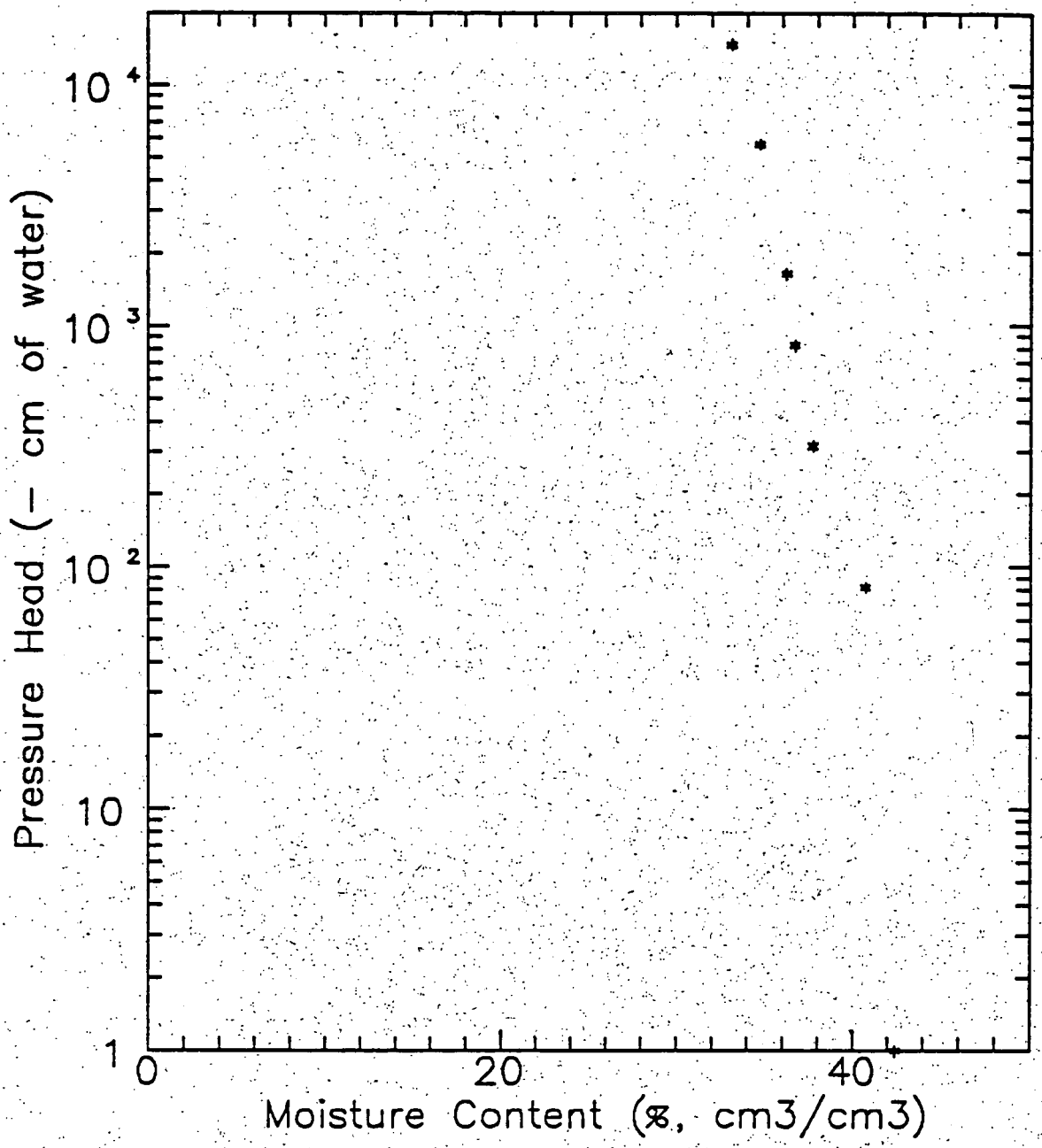
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40401AE
RING NUMBER: 401
DEPTH: N/A
SAMPLE VOLUME: 124.28 (cc)
SATURATED WEIGHT AT 0 CM TENSION (WITH CAP AND RING): 355.26 (g)
TARE RING: 56.44 (g)
TARE CAP: 13.29 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.62 (g)
DRY WEIGHT OF SAMPLE: 206.25 (g)
SATURATED MOISTURE CONTENT: 42.37 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 52.66 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/26	1145	--	0.0	--	355.26	--	--	42.4
10/29	1100	--	0.1	--	353.22	2.04	2.04	40.7
11/02	1300	--	0.3	--	349.41	3.81	5.85	37.7
11/05	1300	--	0.8	--	348.22	1.19	7.04	36.7
11/09	930	--	1.6	--	347.65	0.57	7.61	36.2
11/12	800	--	5.5	--	345.77	1.88	9.49	34.7
11/16	730	--	14.4	--	343.68	2.09	11.58	33.1

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40401AE

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

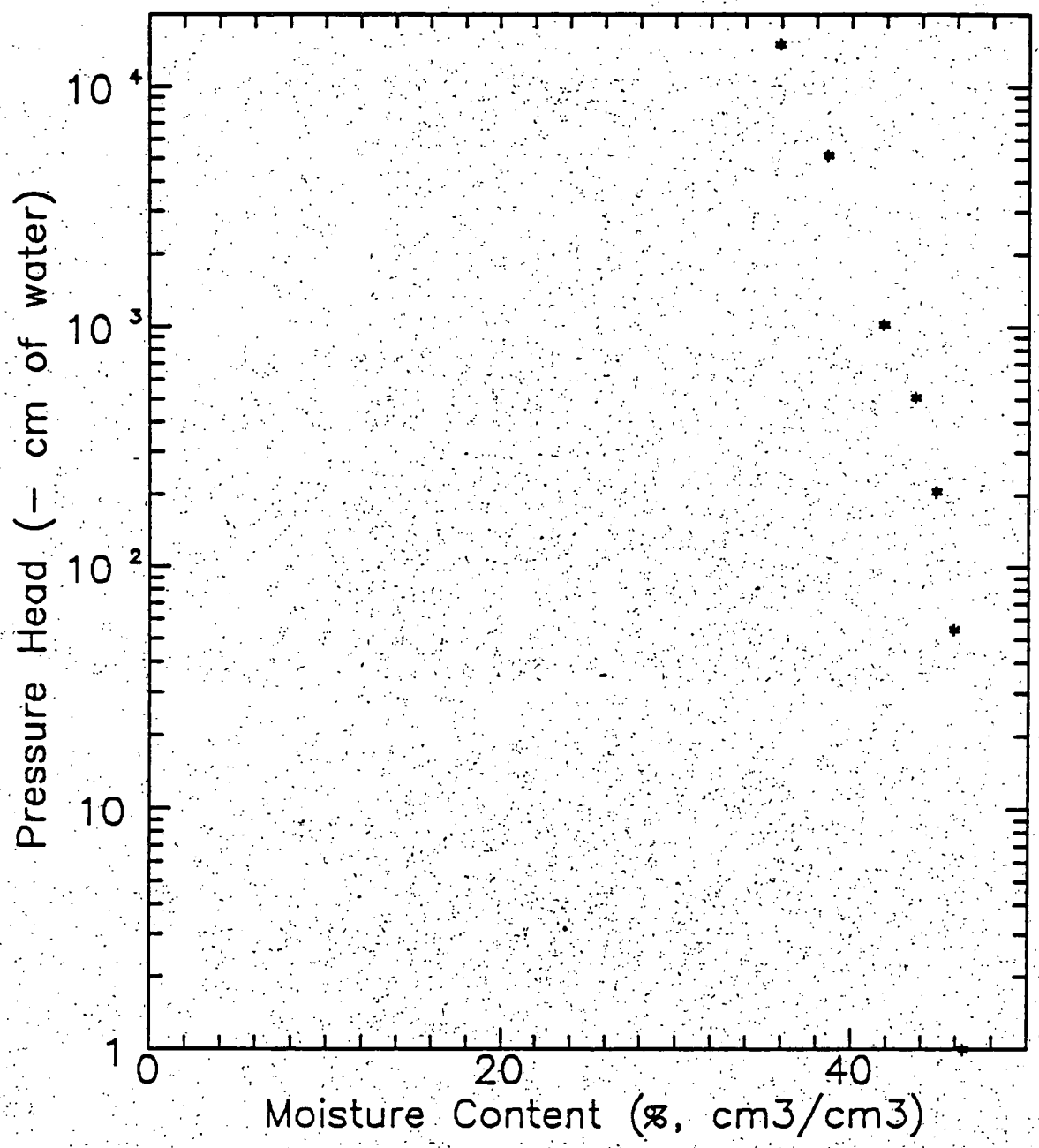
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40402AE
RING NUMBER: 402
DEPTH: N/A
SAMPLE VOLUME: 143.55 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 375.29 (g)
TARE RING: 64.52 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.37 (g)
DRY WEIGHT OF SAMPLE: 217.77 (g)
SATURATED MOISTURE CONTENT: 46.42 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 66.63 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/07	1130	0.0	--	--	375.29	--	--	46.4
10/12	1010	55.2	--	--	374.43	0.86	0.86	45.8
10/15	1300	206.0	--	--	373.02	1.41	2.27	44.8
10/22	1030	--	0.5	--	371.28	1.74	4.01	43.6
10/26	900	--	1.0	--	368.63	2.65	6.66	41.8
10/29	1010	--	5.0	--	364.13	4.50	11.16	38.6
11/02	900	--	14.7	--	360.21	3.92	15.08	35.9

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: C. Pigman/M. Trenchik
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40402AE

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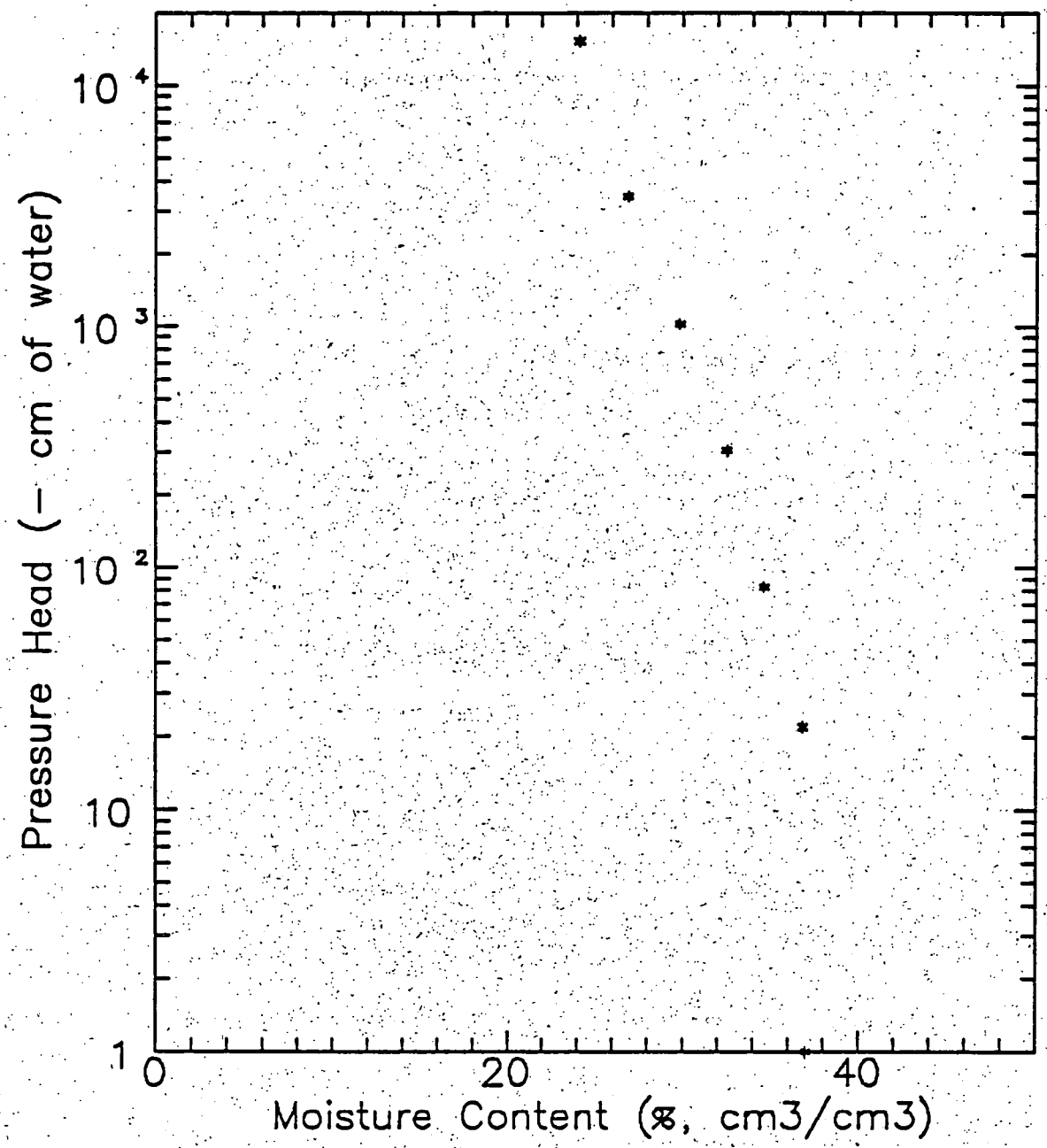
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40403AE
RING NUMBER: 403
DEPTH: N/A
SAMPLE VOLUME: 136.79 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 363.05 (g)
TARE RING: 61.85 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.51 (g)
DRY WEIGHT OF SAMPLE: 224.12 (g)
SATURATED MOISTURE CONTENT: 36.97 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 50.57 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
09/28	1300	0.0	--	--	363.05	--	--	37.0
09/30	1300	22.0	--	--	362.87	0.18	0.18	36.8
10/06	930	83.0	--	--	359.81	3.06	3.24	34.6
10/09	700	--	0.3	--	356.97	2.84	6.08	32.5
10/12	1000	--	1.0	--	353.29	3.68	9.76	29.8
10/15	1130	--	3.4	--	349.28	4.01	13.77	26.9
10/19	800	--	14.9	--	345.44	3.84	17.61	24.1

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content.
Sample No. BH40403AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

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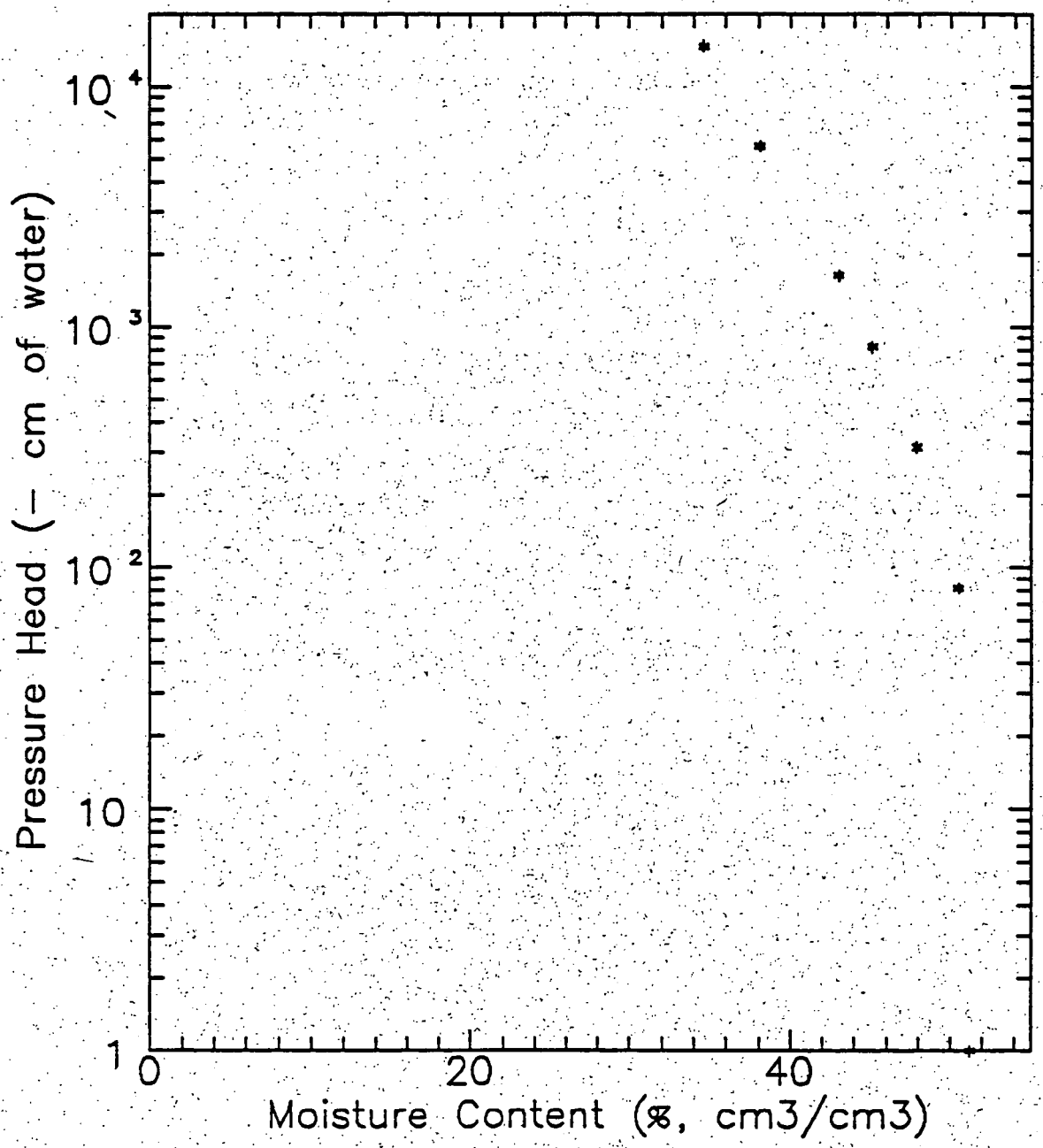
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40404AE
RING NUMBER: 404
DEPTH: N/A
SAMPLE VOLUME: 120.98 (cc)
SATURATED WEIGHT AT 0 CM TENSION (WITH CAP AND RING): 352.55 (g)
TARE RING: 54.12 (g)
TARE CAP: 21.68 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 25.33 (g)
DRY WEIGHT OF SAMPLE: 189.53 (g)
SATURATED MOISTURE CONTENT: 51.16 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 61.89 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/26	1145	--	0.0	--	352.55	--	--	51.2
10/29	1100	--	0.1	--	351.74	0.81	0.81	50.5
11/02	1300	--	0.3	--	348.57	3.17	3.98	47.9
11/05	1300	--	0.8	--	345.20	3.37	7.35	45.1
11/09	930	--	1.6	--	342.66	2.54	9.89	43.0
11/12	800	--	5.5	--	336.77	5.89	15.78	38.1
11/16	730	--	14.4	--	332.50	4.27	20.05	34.6

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40404AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

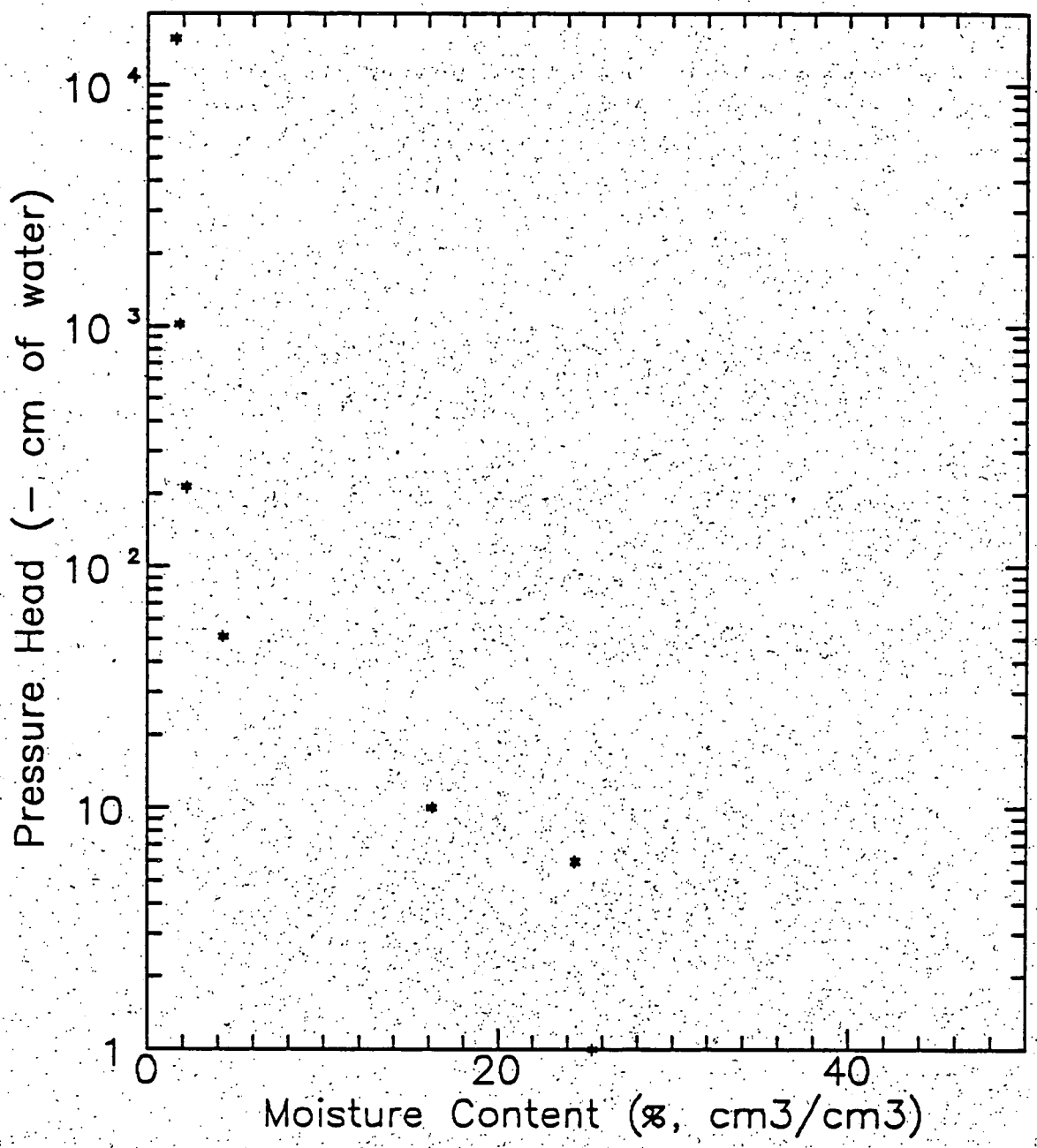
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40405AE
RING NUMBER: 405
DEPTH: N/A
SAMPLE VOLUME: 216.26 (cc)
SATURATED WEIGHT AT 0 CM TENSION (WITH CAP AND RING): 546.81 (g)
TARE RING: 95.58 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 25.51 (g)
DRY WEIGHT OF SAMPLE: 370.81 (g)
SATURATED MOISTURE CONTENT: 25.39 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 54.91 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/05	1650	0.0	--	--	546.81	--	--	25.4
10/08	1100	6.0	--	--	544.62	2.19	2.19	24.4
10/12	915	10.4	--	--	526.92	17.70	19.89	16.2
10/19	1430	50.5	--	--	501.17	25.75	45.64	4.3
10/29	1300	213.0	--	--	496.75	4.42	50.06	2.2
11/02	945	--	1.0	--	495.87	0.88	50.94	1.8
11/05	1330	--	15.3	--	495.28	0.59	51.53	1.6

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/M. Trenchik
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40405AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

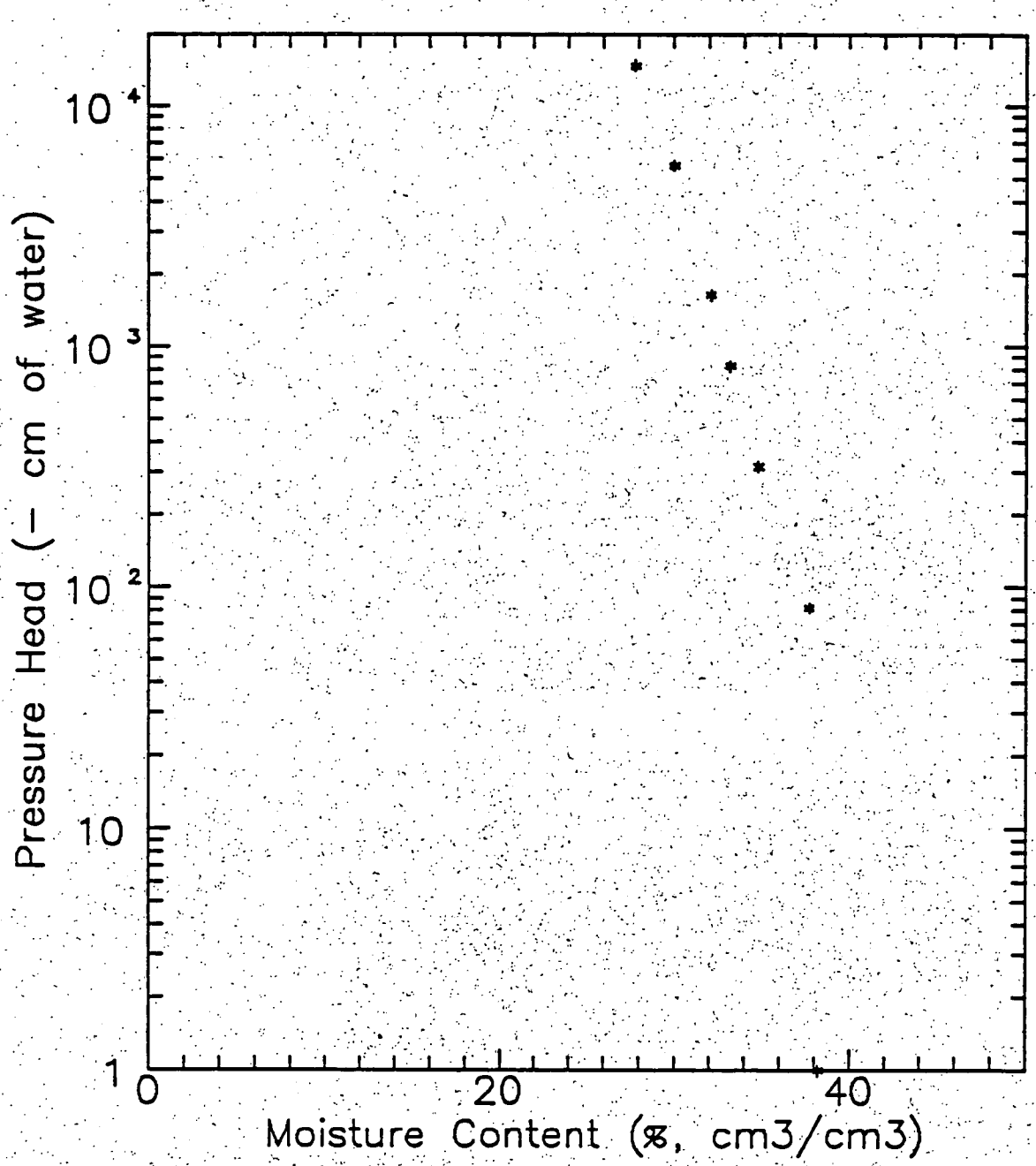
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40406AE
RING NUMBER: 618
DEPTH: N/A
SAMPLE VOLUME: 114.59 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 354.56 (g)
TARE RING: 52.49 (g)
TARE CAP: 21.66 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.26 (g)
DRY WEIGHT OF SAMPLE: 210.39 (g)
SATURATED MOISTURE CONTENT: 38.19 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 43.76 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/26	1145	--	0.0	--	354.56	--	--	38.2
10/29	1100	--	0.1	--	353.99	0.57	0.57	37.7
11/02	1300	--	0.3	--	350.67	3.32	3.89	34.8
11/05	1300	--	0.8	--	348.90	1.77	5.66	33.2
11/09	930	--	1.6	--	347.53	1.37	7.03	32.1
11/12	800	--	5.5	--	345.20	2.33	9.36	30.0
11/16	730	--	14.4	--	342.70	2.50	11.86	27.8

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40406AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

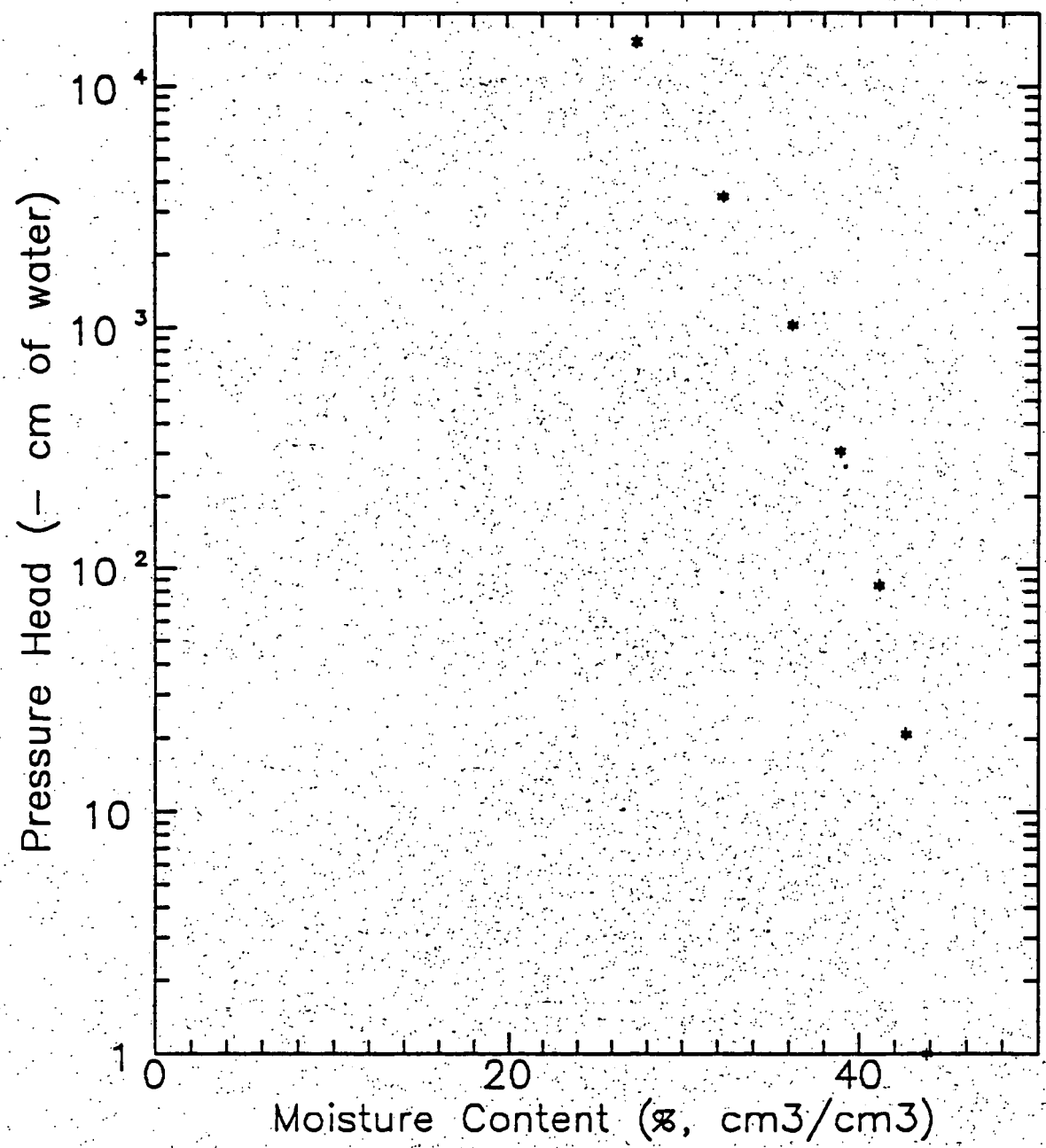
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40407AE
RING NUMBER: 407
DEPTH: N/A
SAMPLE VOLUME: 118.57 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 302.71 (g)
TARE RING: 53.85 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 25.20 (g)
DRY WEIGHT OF SAMPLE: 171.70 (g)
SATURATED MOISTURE CONTENT: 43.82 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 51.96 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
09/28	1300	0.0	--	--	302.71	--	--	43.8
09/30	1300	20.5	--	--	301.31	1.40	1.40	42.6
10/06	930	85.0	--	--	299.46	1.85	3.25	41.1
10/09	700	--	0.3	--	296.85	2.61	5.86	38.9
10/12	1000	--	1.0	--	293.67	3.18	9.04	36.2
10/15	1130	--	3.4	--	289.00	4.67	13.71	32.3
10/19	800	--	14.9	--	283.23	5.77	19.48	27.4

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40407AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

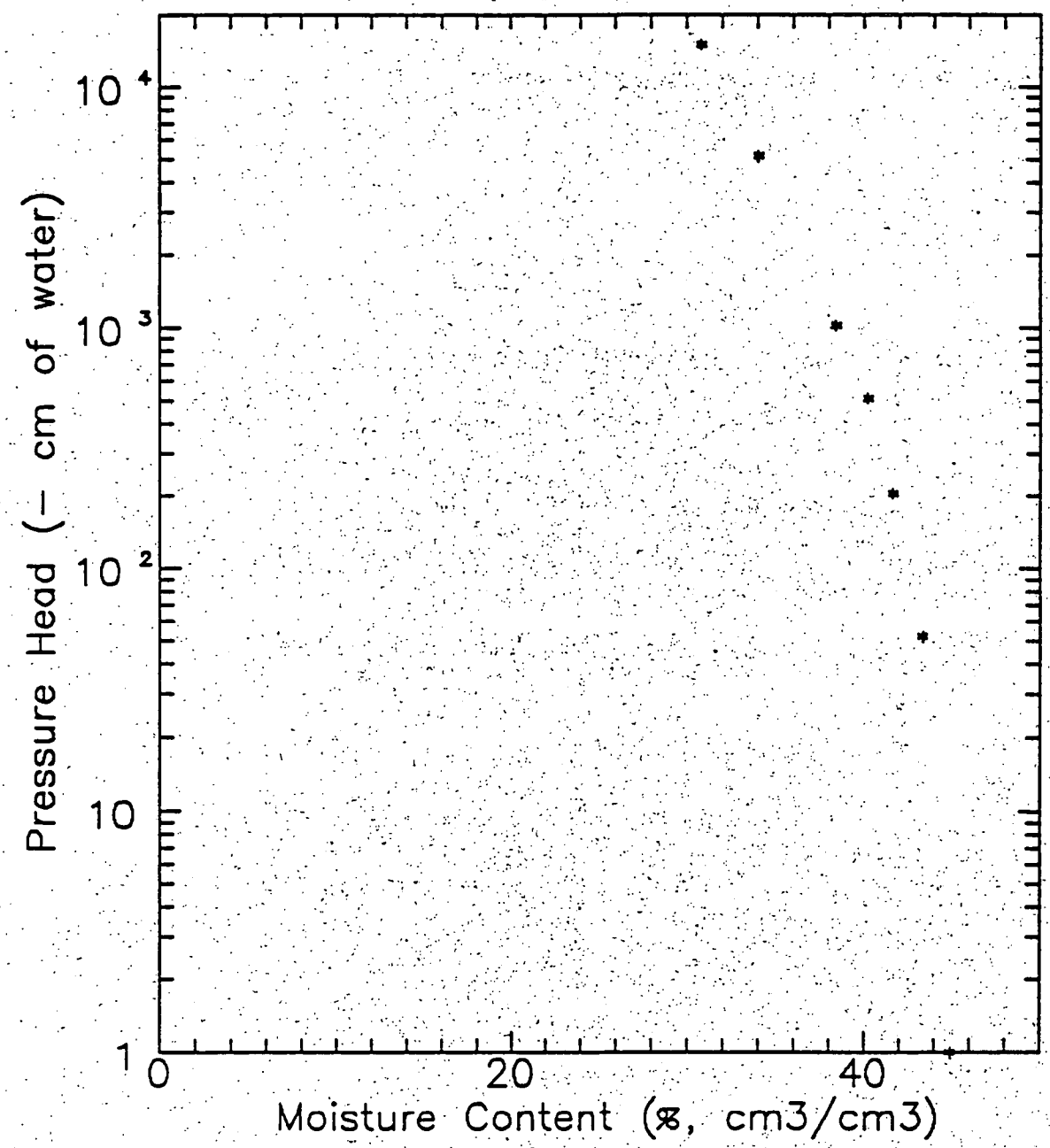
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40408AE
RING NUMBER: 408
DEPTH: N/A
SAMPLE VOLUME: 111.23 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 308.95 (g)
TARE RING: 50.95 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 25.53 (g)
DRY WEIGHT OF SAMPLE: 182.49 (g)
SATURATED MOISTURE CONTENT: 44.93 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 49.98 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/07	1130	0.0	--	--	308.95	--	--	44.9
10/12	1010	51.7	--	--	307.12	1.83	1.83	43.3
10/19	845	--	0.2	--	305.22	1.90	3.73	41.6
10/22	1030	--	0.5	--	303.71	1.51	5.24	40.2
10/26	900	--	1.0	--	301.64	2.07	7.31	38.4
10/29	1010	--	5.0	--	296.80	4.84	12.15	34.0
11/02	900	--	14.7	--	293.22	3.58	15.73	30.8

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: C. Pigman/M. Trenchik
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40408AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

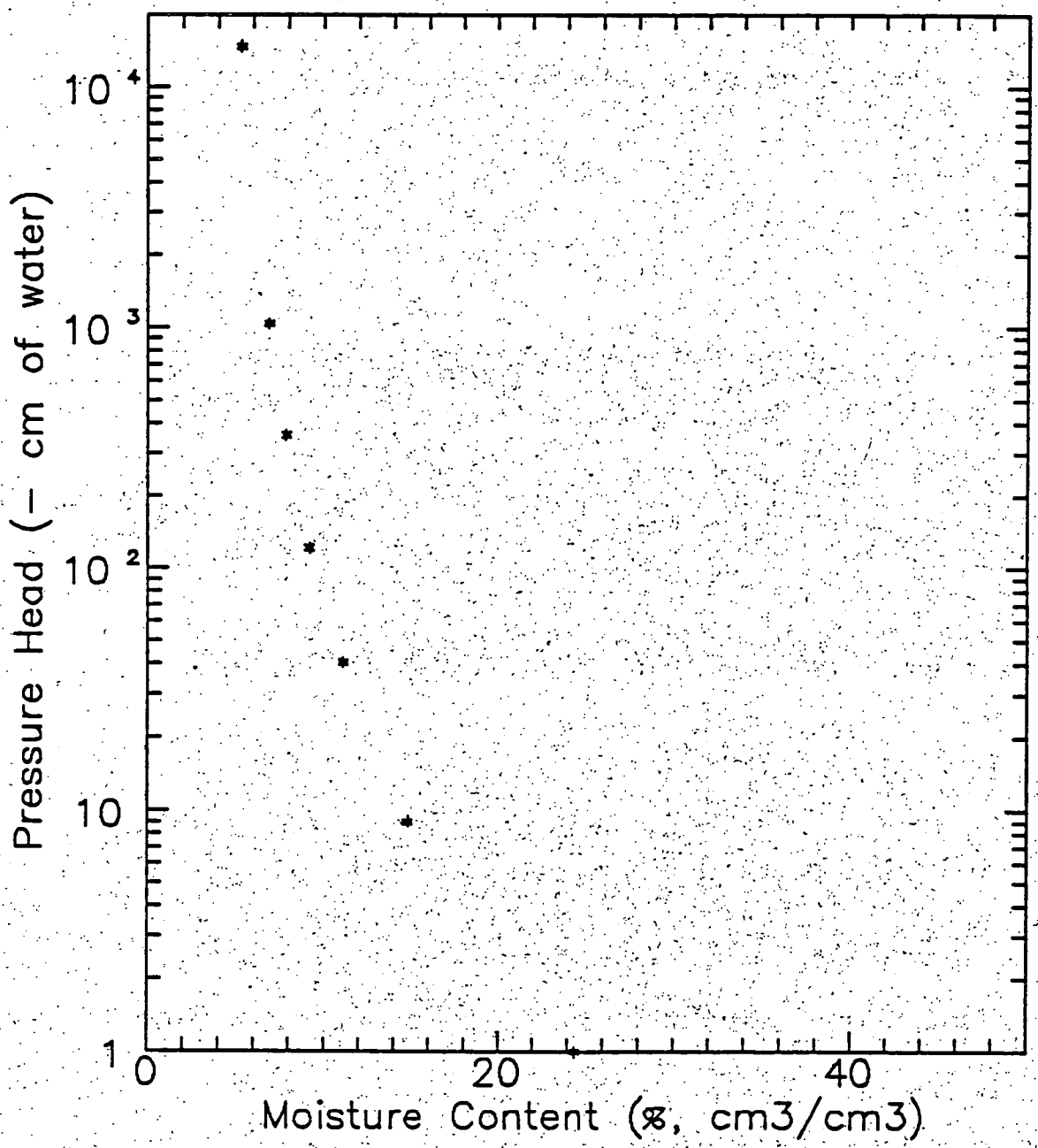
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40600AE
RING NUMBER: 600
DEPTH: N/A
SAMPLE VOLUME: 168.98 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 474.21 (g)
TARE RING: 77.94 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.59 (g)
DRY WEIGHT OF SAMPLE: 328.42 (g)
SATURATED MOISTURE CONTENT: 24.42 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 41.26 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
09/28	1300	0.0	--	--	474.21	--	--	24.4
09/30	1300	9.0	--	--	457.91	16.30	16.30	14.8
10/05	1340	40.6	--	--	451.79	6.12	22.42	11.1
10/08	1100	121.0	--	--	448.55	3.24	25.66	9.2
10/12	1030	--	0.4	--	446.26	2.29	27.95	7.9
10/15	1200	--	1.0	--	444.67	1.59	29.54	6.9
10/19	800	--	14.4	--	441.86	2.81	32.35	5.3

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40600AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

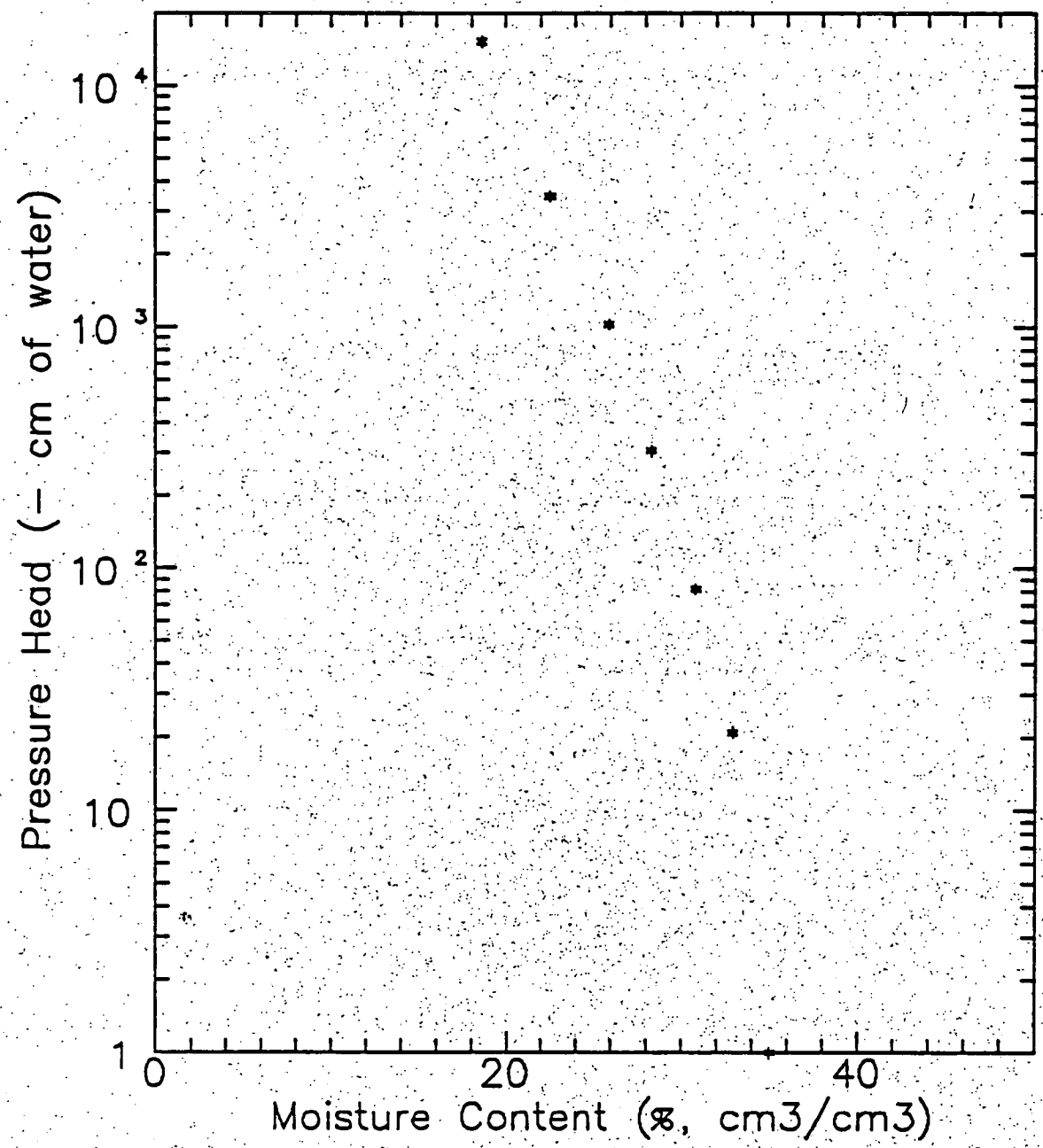
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40601AE
RING NUMBER: 601
DEPTH: N/A
SAMPLE VOLUME: 116.99 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 319.14 (g)
TARE RING: 53.39 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.38 (g)
DRY WEIGHT OF SAMPLE: 198.39 (g)
SATURATED MOISTURE CONTENT: 35.03 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 40.98 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
09/28	1300	0.0	--	--	319.14	--	--	35.0
09/30	1300	21.3	--	--	316.61	2.53	2.53	32.9
10/06	930	81.5	--	--	314.17	2.44	4.97	30.8
10/09	700	--	0.3	--	311.27	2.90	7.87	28.3
10/12	1000	--	1.0	--	308.50	2.77	10.64	25.9
10/15	1130	--	3.4	--	304.45	4.05	14.69	22.5
10/19	800	--	14.9	--	299.89	4.56	19.25	18.6

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40601AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

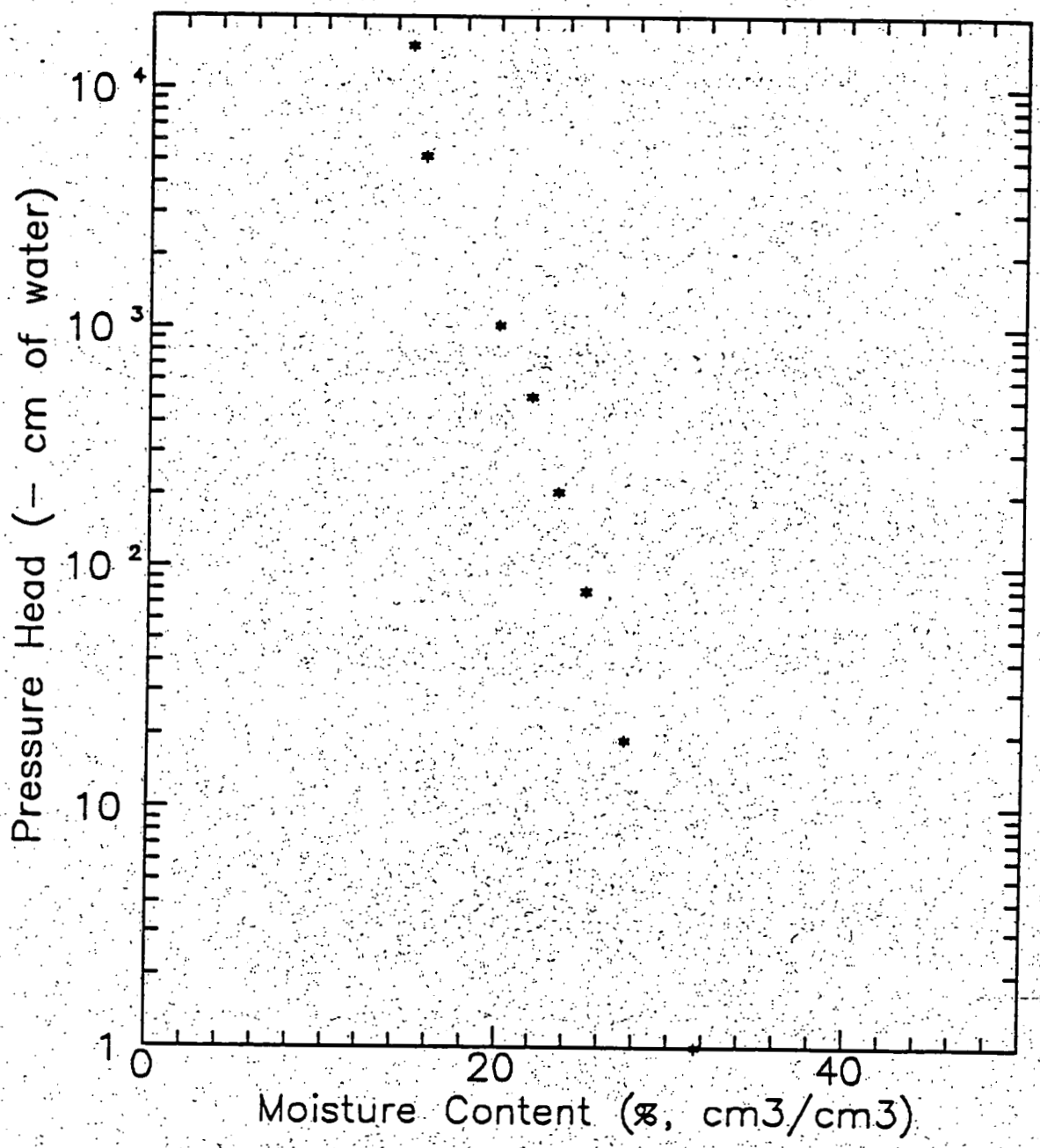
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40602AE
RING NUMBER: 602
DEPTH: N/A
SAMPLE VOLUME: 156.97 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 425.93 (g)
TARE RING: 70.99 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 24.82 (g)
DRY WEIGHT OF SAMPLE: 280.54 (g)
SATURATED MOISTURE CONTENT: 31.59 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 49.58 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/07	1100	0.0	--	--	425.93	--	--	31.6
10/12	940	18.7	--	--	419.43	6.50	6.50	27.4
10/15	1330	79.0	--	--	415.71	3.72	10.22	25.1
10/19	845	--	0.2	--	413.25	2.46	12.68	23.5
10/22	1030	--	0.5	--	410.65	2.60	15.28	21.9
10/26	900	--	1.0	--	407.71	2.94	18.22	20.0
10/29	1010	--	5.0	--	400.96	6.75	24.97	15.7
11/02	900	--	14.7	--	399.72	1.24	26.21	14.9

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: C. Pigman/M. Trenchik
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40602AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

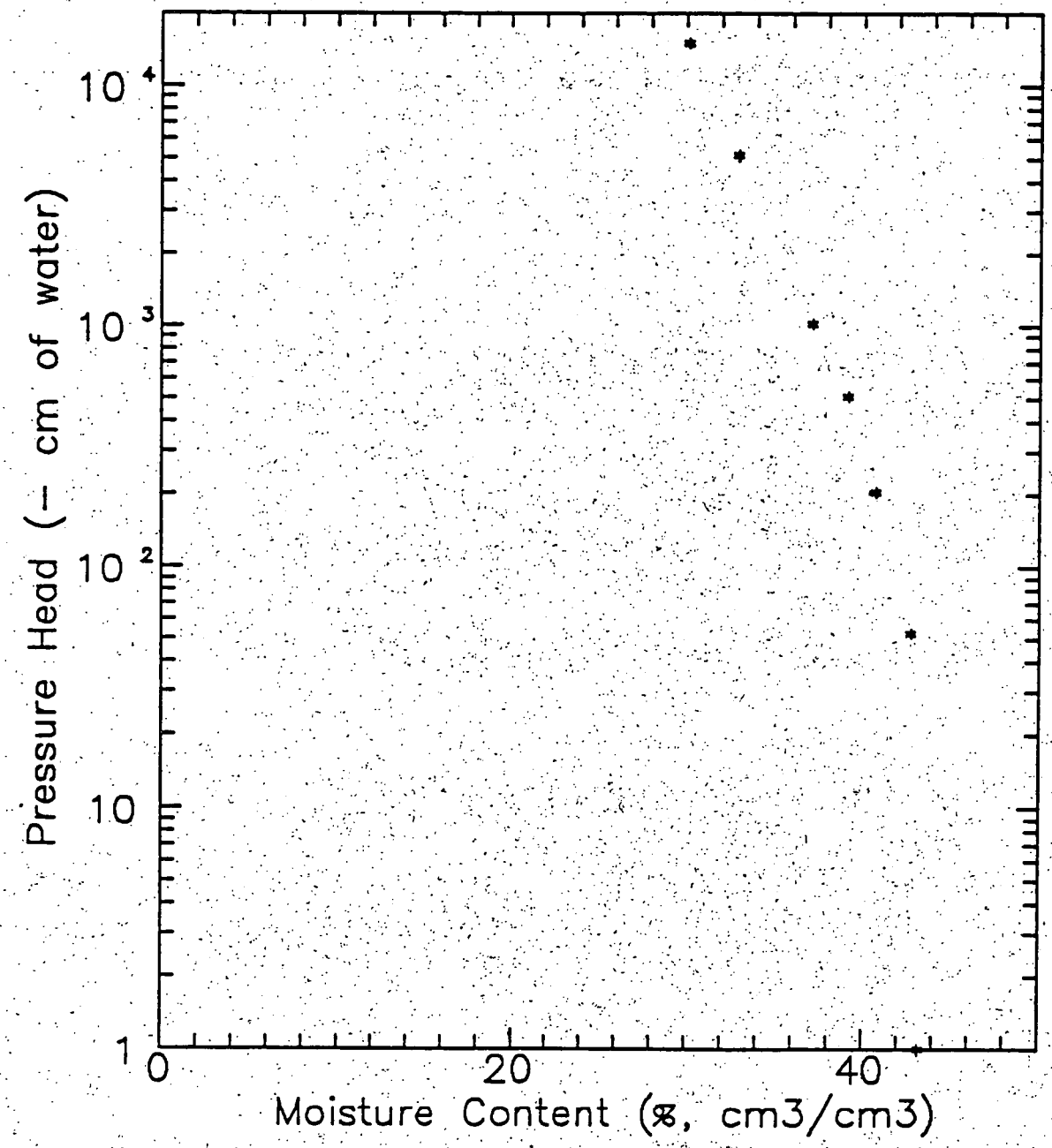
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40603AE
RING NUMBER: 603
DEPTH: N/A
SAMPLE VOLUME: 109.13 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 292.54 (g)
TARE RING: 49.90 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.05 (g)
DRY WEIGHT OF SAMPLE: 169.43 (g)
SATURATED MOISTURE CONTENT: 43.21 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 47.16 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/07	1130	0.0	--	--	292.54	--	--	43.2
10/12	1020	53.2	--	--	291.96	0.58	0.58	42.7
10/19	845	--	0.2	--	289.78	2.18	2.76	40.7
10/22	1030	--	0.5	--	288.07	1.71	4.47	39.1
10/26	900	--	1.0	--	285.90	2.17	6.64	37.1
10/29	1010	--	5.0	--	281.24	4.66	11.30	32.9
11/02	900	--	14.7	--	278.25	2.99	14.29	30.1

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: C. Pigman/M. Trenchik
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40603AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

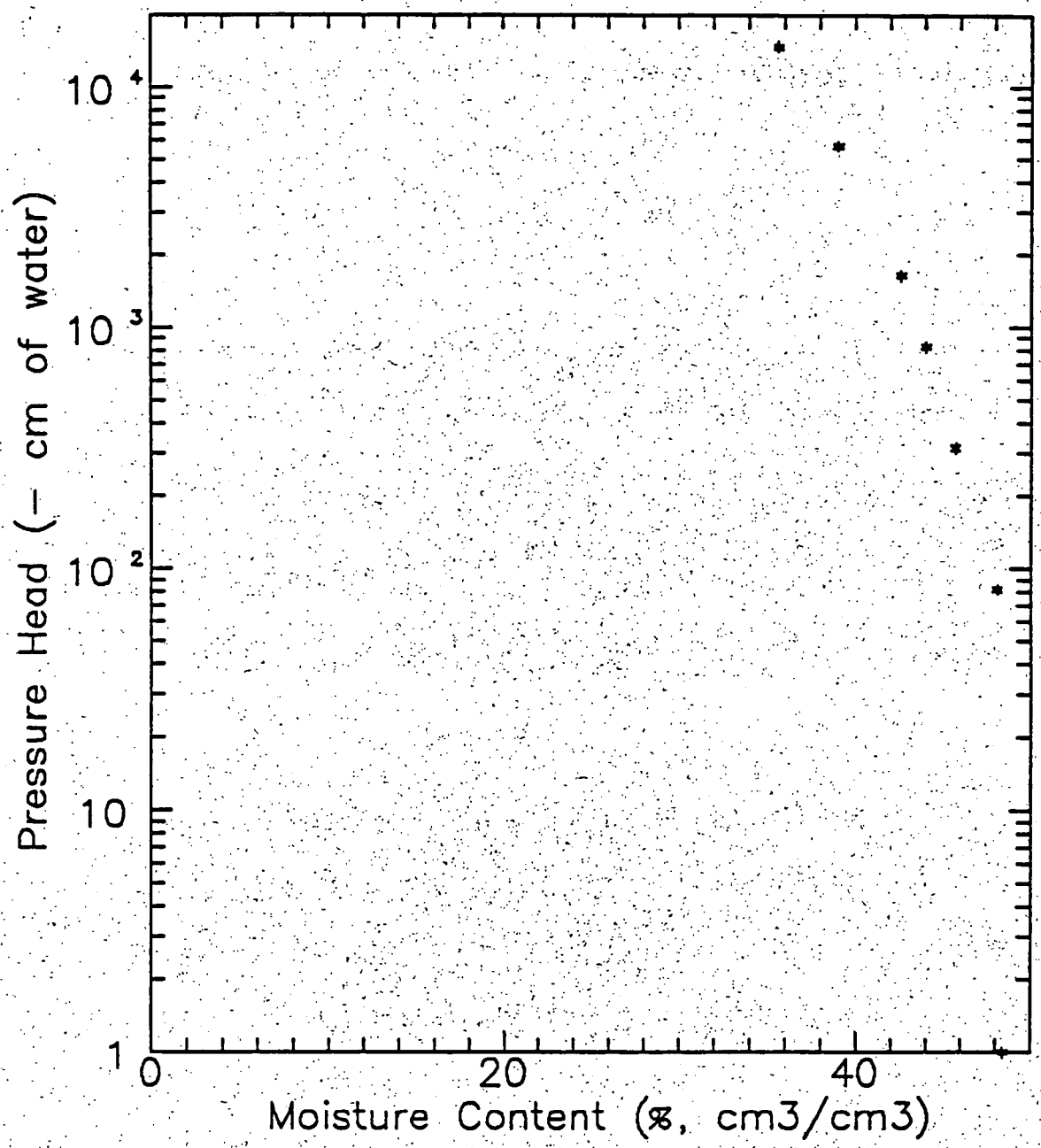
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40604AE
RING NUMBER: 604
DEPTH: N/A
SAMPLE VOLUME: 127.60 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 368.88 (g)
TARE RING: 58.03 (g)
TARE CAP: 13.42 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 25.45 (g)
DRY WEIGHT OF SAMPLE: 210.24 (g)
SATURATED MOISTURE CONTENT: 48.39 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 61.74 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/26	1145	--	0.0	--	368.88	--	--	48.4
10/29	1100	--	0.1	--	368.55	0.33	0.33	48.1
11/02	1300	--	0.3	--	365.43	3.12	3.45	45.7
11/05	1300	--	0.8	--	363.26	2.17	5.62	44.0
11/09	930	--	1.6	--	361.52	1.74	7.36	42.6
11/12	800	--	5.5	--	356.90	4.62	11.98	39.0
11/16	730	--	14.4	--	352.59	4.31	16.29	35.6

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40604AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

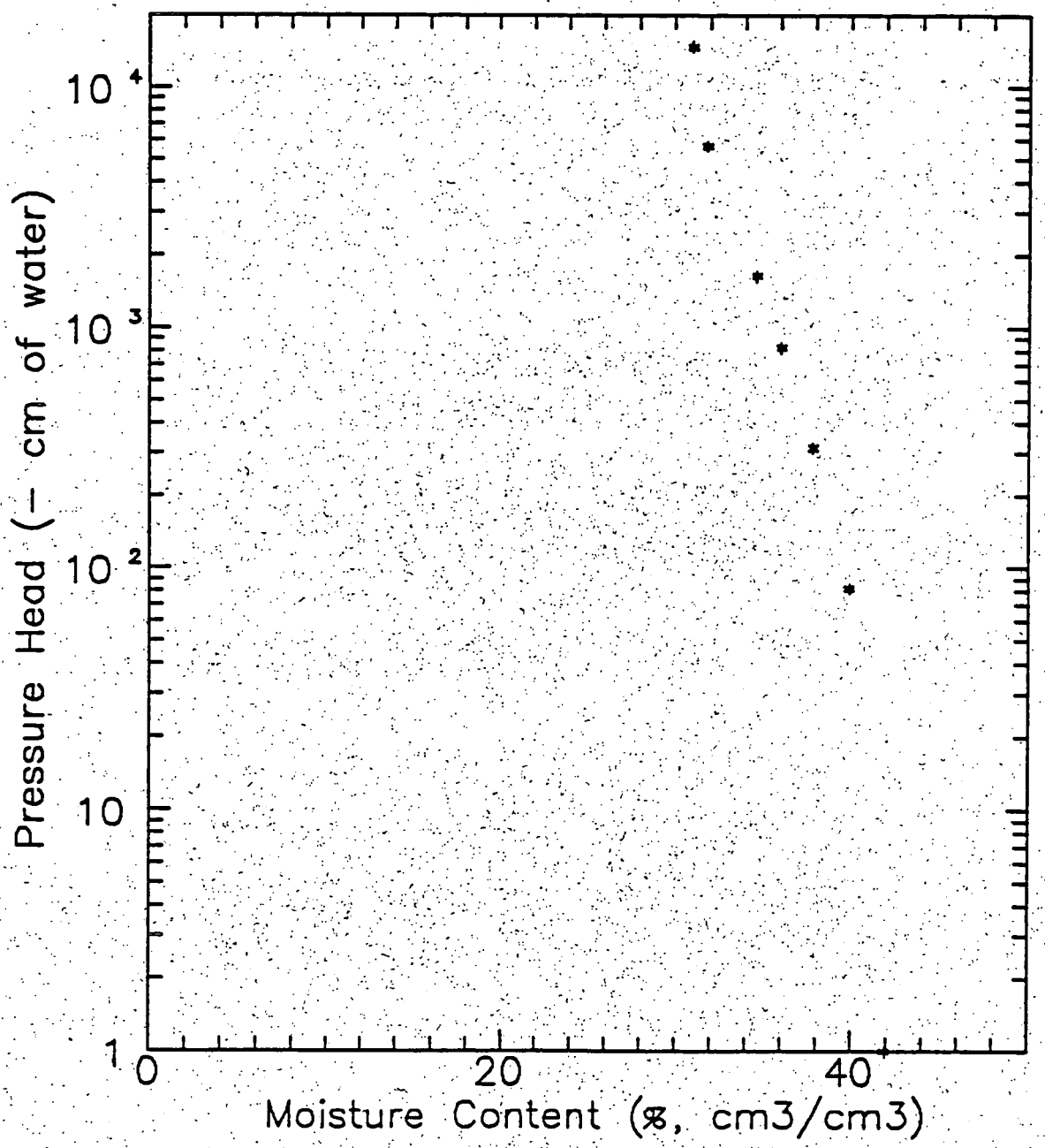
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40605AE
RING NUMBER: 605
DEPTH: N/A
SAMPLE VOLUME: 113.40 (cc)
SATURATED WEIGHT AT 0 CM TENSION (WITH CAP AND RING): 328.95 (g)
TARE RING: 51.44 (g)
TARE CAP: 21.42 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 25.70 (g)
DRY WEIGHT OF SAMPLE: 182.88 (g)
SATURATED MOISTURE CONTENT: 41.90 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 47.51 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/26	1145	--	0.0	--	328.95	--	--	41.9
10/29	1100	--	0.1	--	326.66	2.29	2.29	39.9
11/02	1300	--	0.3	--	324.30	2.36	4.65	37.8
11/05	1300	--	0.8	--	322.30	2.00	6.65	36.0
11/09	930	--	1.6	--	320.63	1.67	8.32	34.6
11/12	800	--	5.5	--	317.54	3.09	11.41	31.8
11/16	730	--	14.4	--	316.57	0.97	12.38	31.0

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content.
Sample No. BH40605AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

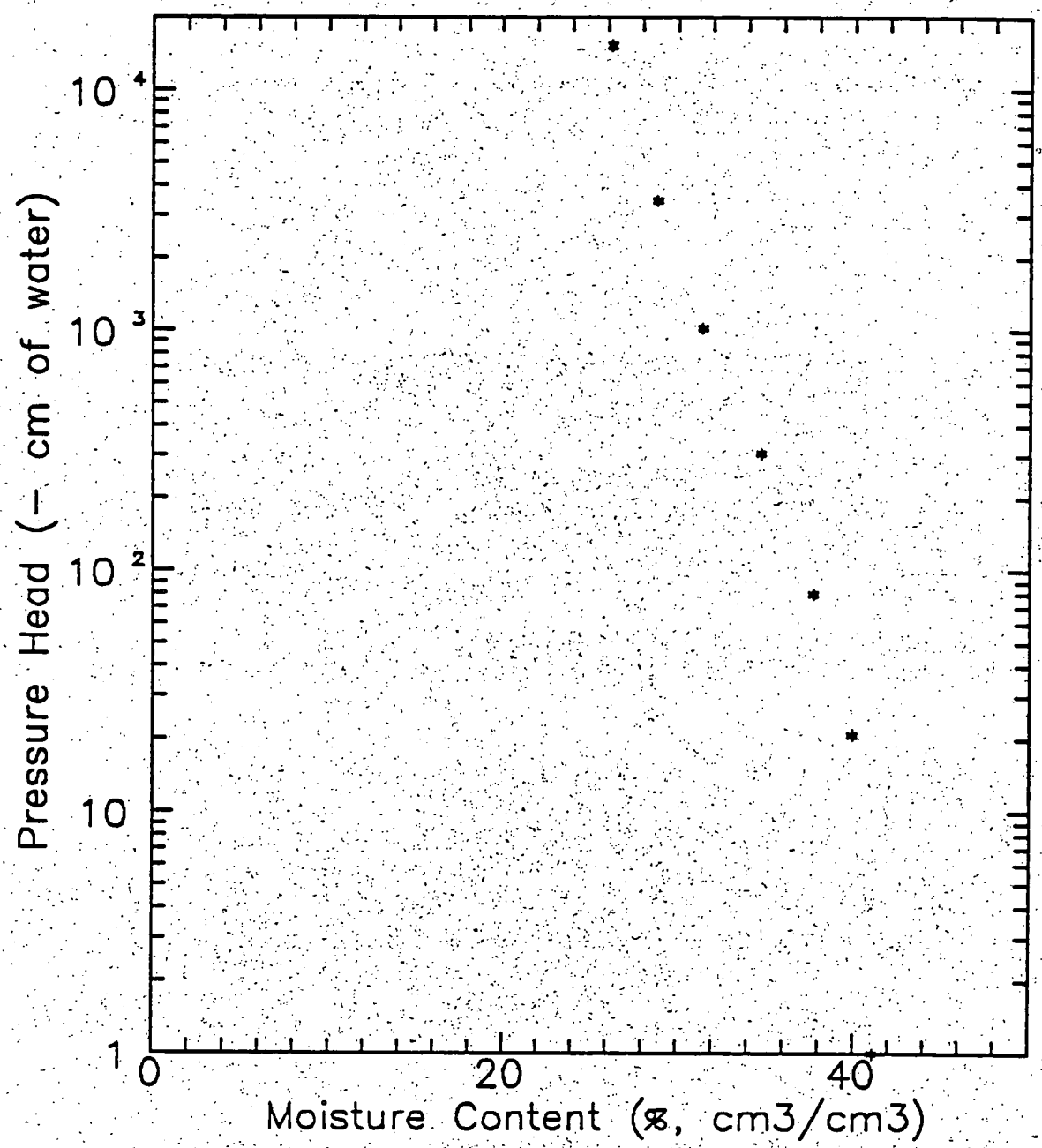
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40606AE
RING NUMBER: 606
DEPTH: N/A
SAMPLE VOLUME: 144.44 (cc)
SATURATED WEIGHT AT 0 CM TENSION (WITH CAP AND RING): 405.50 (g)
TARE RING: 70.32 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 27.71 (g)
DRY WEIGHT OF SAMPLE: 248.10 (g)
SATURATED MOISTURE CONTENT: 41.10 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 59.37 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
09/28	1300	0.0	--	--	405.50	--	--	41.1
09/30	1300	20.5	--	--	403.69	1.81	1.81	39.9
10/06	930	80.0	--	--	400.62	3.07	4.88	37.7
10/09	700	--	0.3	--	396.20	4.42	9.30	34.7
10/12	1000	--	1.0	--	391.52	4.68	13.98	31.4
10/15	1130	--	3.4	--	387.76	3.76	17.74	28.8
10/19	800	--	14.9	--	384.03	3.73	21.47	26.2

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content.
Sample No. BH40606AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

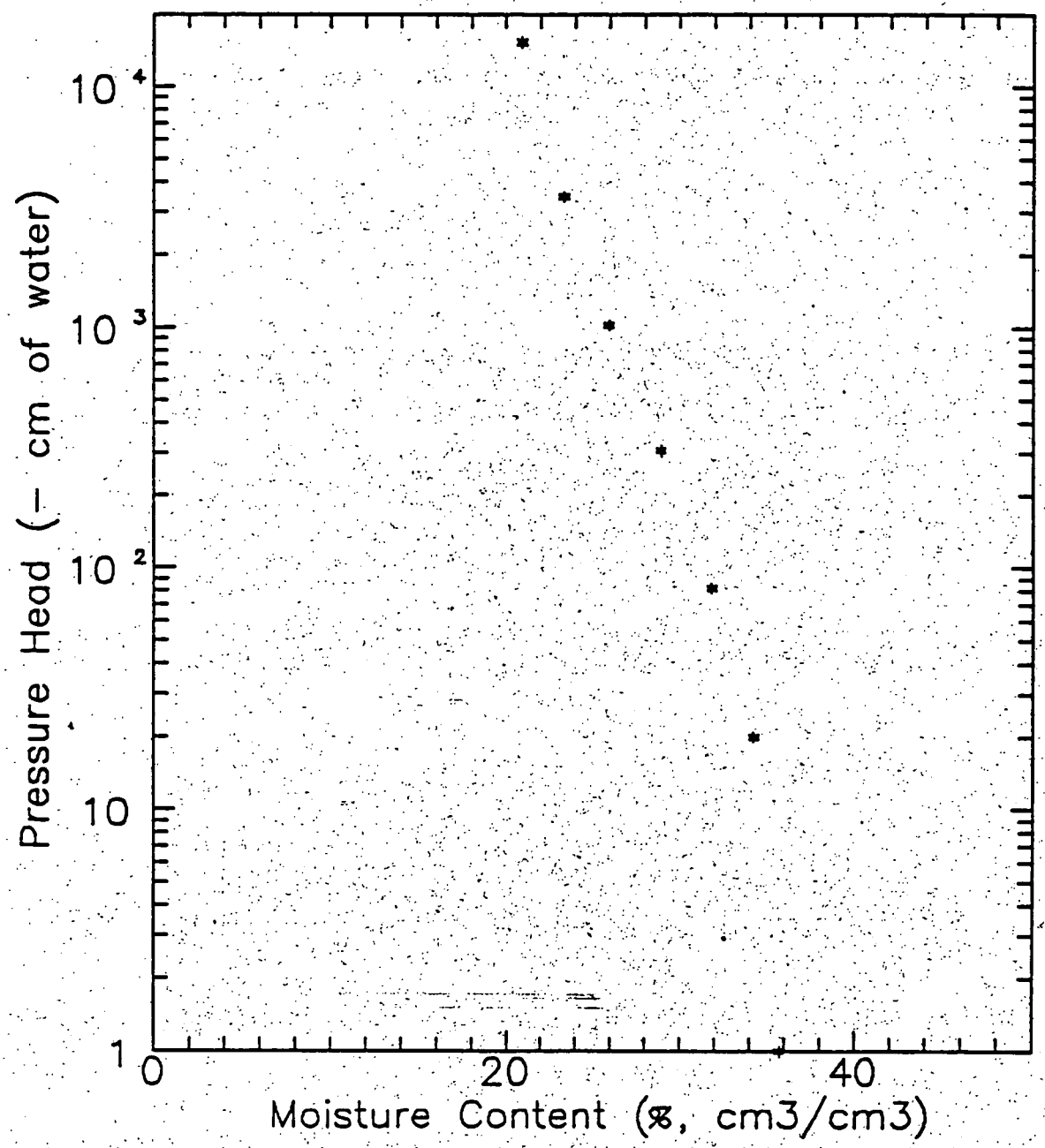
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40607AE
RING NUMBER: 607
DEPTH: N/A
SAMPLE VOLUME: 136.64 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 357.42 (g)
TARE RING: 61.56 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.49 (g)
DRY WEIGHT OF SAMPLE: 220.64 (g)
SATURATED MOISTURE CONTENT: 35.66 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 48.73 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
09/28	1300	0.0	--	--	357.42	--	--	35.7
09/30	1300	20.3	--	--	355.37	2.05	2.05	34.2
10/06	930	81.5	--	--	352.09	3.28	5.33	31.8
10/09	700	--	0.3	--	348.13	3.96	9.29	28.9
10/12	1000	--	1.0	--	344.04	4.09	13.38	25.9
10/15	1130	--	3.4	--	340.49	3.55	16.93	23.3
10/19	800	--	14.9	--	337.23	3.26	20.19	20.9

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40607AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

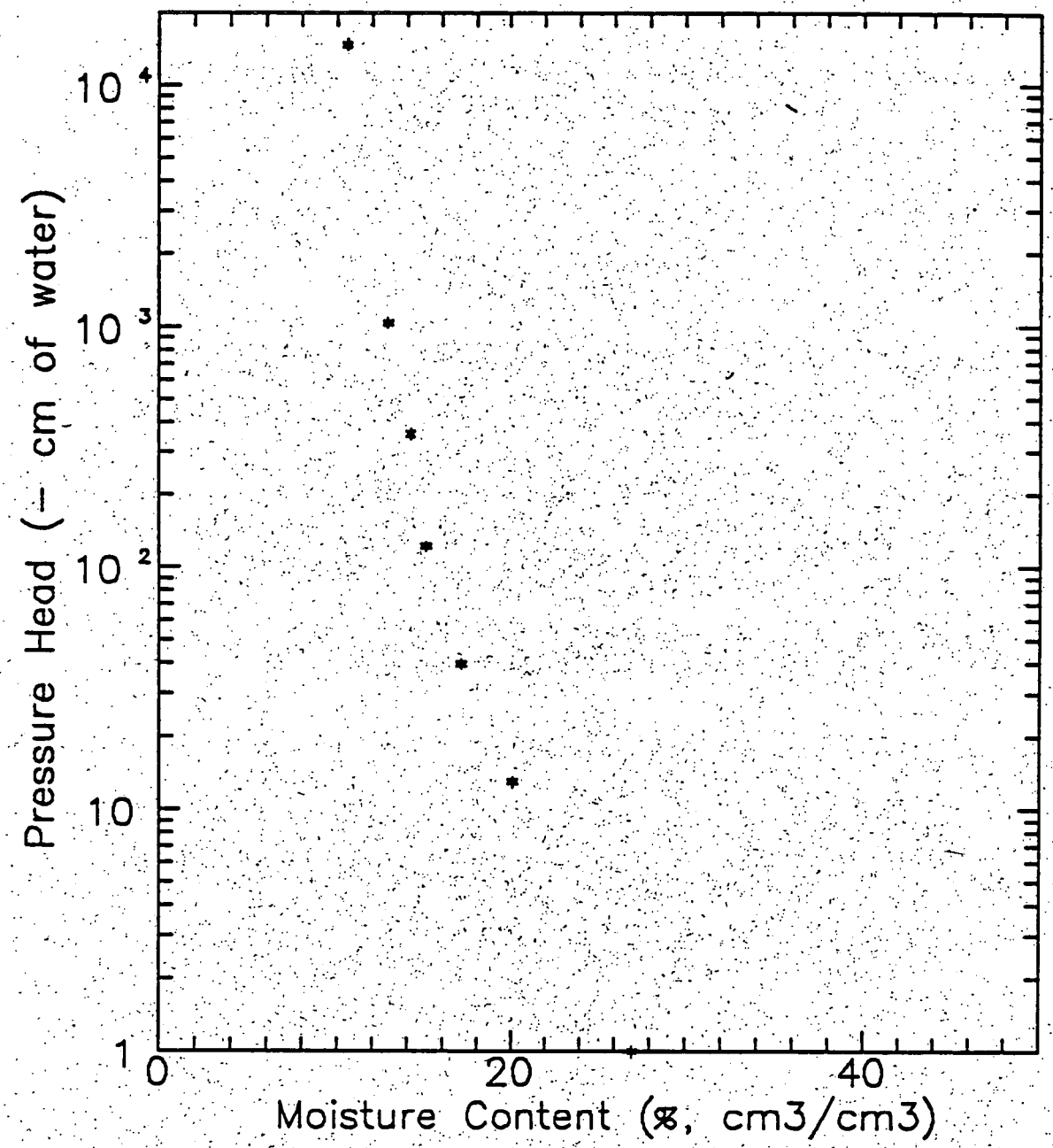
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40608AE
RING NUMBER: 608
DEPTH: N/A
SAMPLE VOLUME: 154.17 (cc)
SATURATED WEIGHT AT 0 CM TENSION (WITH CAP AND RING): 438.46 (g)
TARE RING: 69.49 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.56 (g)
DRY WEIGHT OF SAMPLE: 300.81 (g)
SATURATED MOISTURE CONTENT: 26.98 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 41.60 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
09/28	1300	0.0	--	--	438.46	--	--	27.0
09/30	1300	13.0	--	--	427.80	10.66	10.66	20.1
10/05	1340	39.6	--	--	423.15	4.65	15.31	17.1
10/08	1100	122.0	--	--	420.18	2.97	18.28	15.1
10/12	1030	--	0.4	--	418.71	1.47	19.75	14.2
10/15	1200	--	1.0	--	416.82	1.89	21.64	12.9
10/19	800	--	14.4	--	413.24	3.58	25.22	10.6

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content,
Sample No. BH40608AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

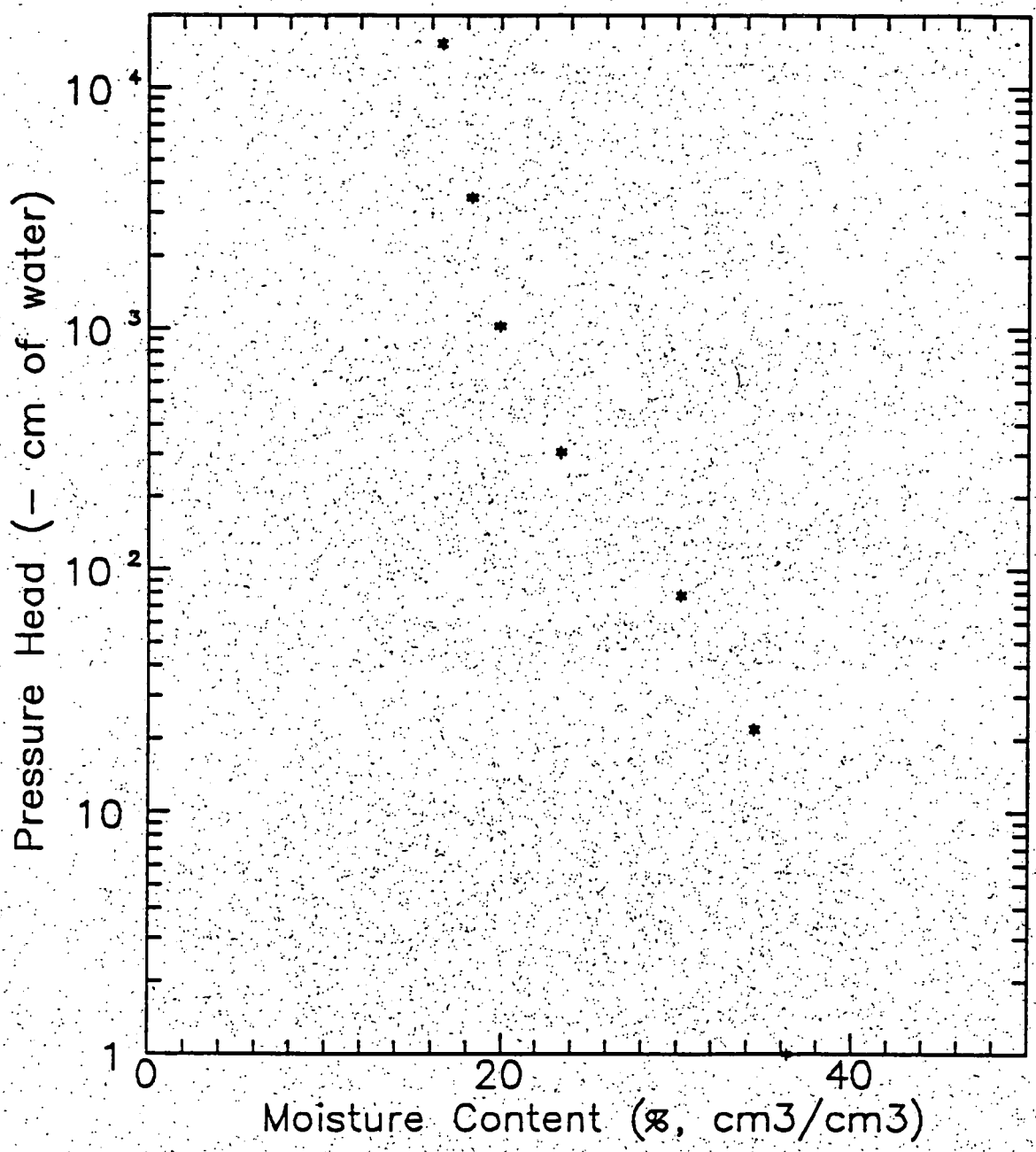
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40609AE
RING NUMBER: 609
DEPTH: N/A
SAMPLE VOLUME: 122.68 (cc)
SATURATED WEIGHT AT 0 CM TENSION (WITH CAP AND RING): 342.27 (g)
TARE RING: 55.94 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.07 (g)
DRY WEIGHT OF SAMPLE: 215.78 (g)
SATURATED MOISTURE CONTENT: 36.26 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 44.48 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
09/28	1300	0.0	--	--	342.27	--	--	36.3
09/30	1300	21.5	--	--	339.97	2.30	2.30	34.4
10/06	930	78.0	--	--	334.88	5.09	7.39	30.2
10/09	700	--	0.3	--	326.54	8.34	15.73	23.4
10/12	1000	--	1.0	--	322.23	4.31	20.04	19.9
10/15	1130	--	3.4	--	320.26	1.97	22.01	18.3
10/19	800	--	14.9	--	318.15	2.11	24.12	16.6

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content.
Sample No. BH40609AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

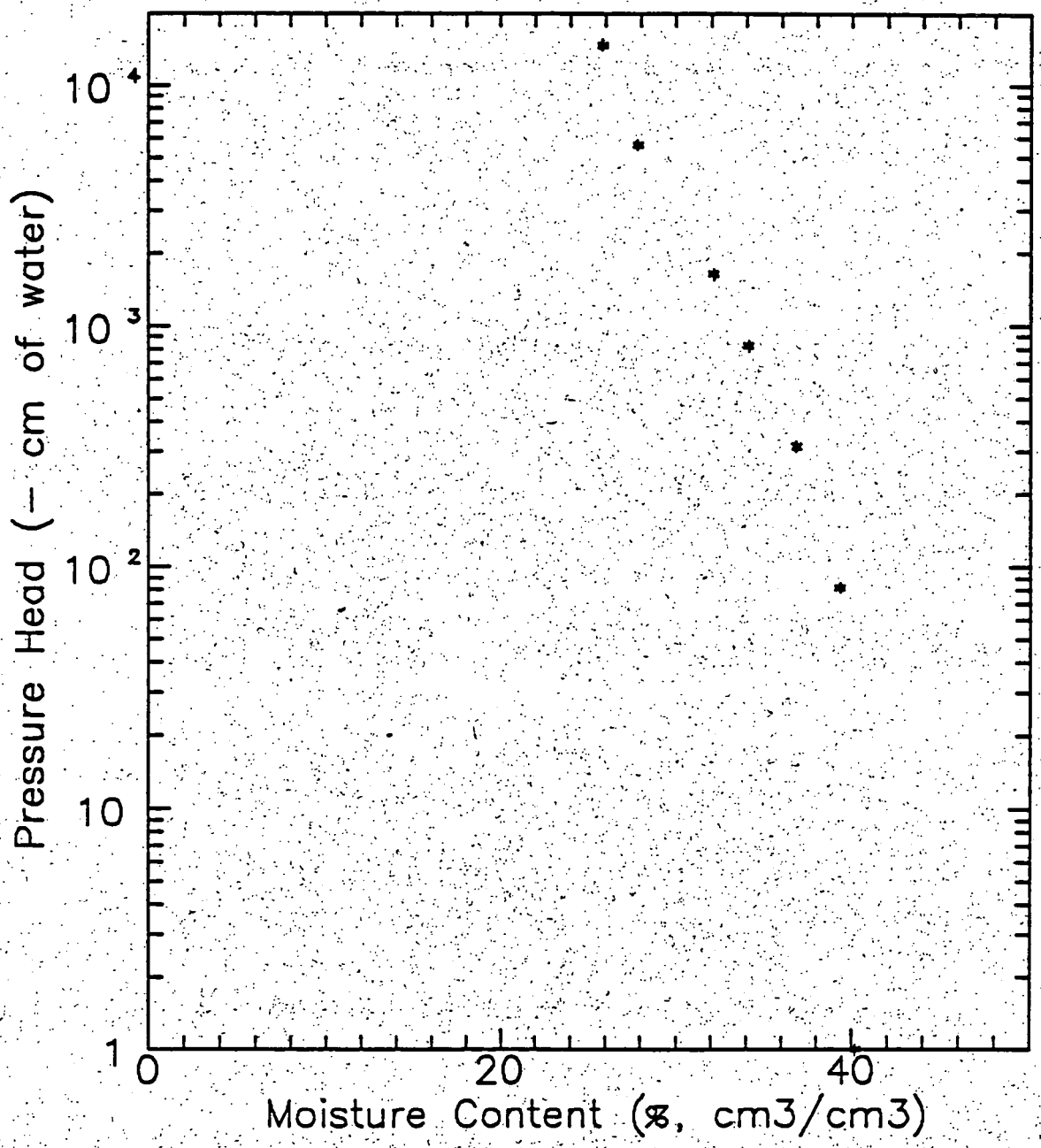
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40610AE
RING NUMBER: 610
DEPTH: N/A
SAMPLE VOLUME: 122.18 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 358.49 (g)
TARE RING: 55.80 (g)
TARE CAP: 21.81 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.16 (g)
DRY WEIGHT OF SAMPLE: 205.65 (g)
SATURATED MOISTURE CONTENT: 40.16 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 49.07 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/26	1145	--	0.0	--	358.49	--	--	40.2
10/29	1100	--	0.1	--	357.39	1.10	1.10	39.3
11/02	1300	--	0.3	--	354.41	2.98	4.08	36.8
11/05	1300	--	0.8	--	351.10	3.31	7.39	34.1
11/09	930	--	1.6	--	348.67	2.43	9.82	32.1
11/12	800	--	5.5	--	343.37	5.30	15.12	27.8
11/16	730	--	14.4	--	340.93	2.44	17.56	25.8

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content.
Sample No. BH40610AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

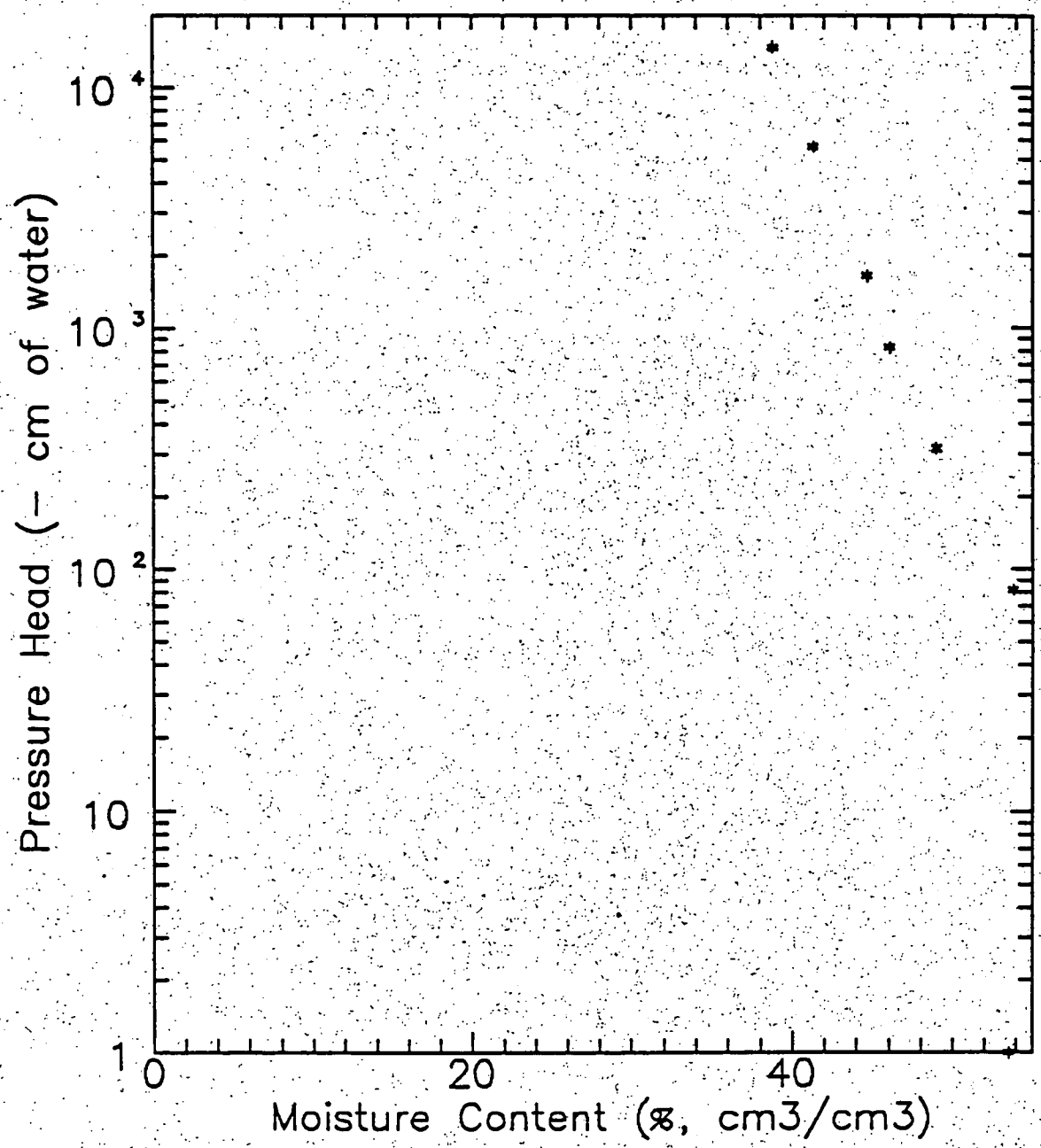
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40611AE
RING NUMBER: 611
DEPTH: N/A
SAMPLE VOLUME: 108.24 (cc)
SATURATED WEIGHT AT 0 CM TENSION (WITH CAP AND RING): 324.48 (g)
TARE RING: 49.09 (g)
TARE CAP: 21.54 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 25.67 (g)
DRY WEIGHT OF SAMPLE: 170.25 (g)
SATURATED MOISTURE CONTENT: 53.52 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 57.93 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/26	1145	--	0.0	--	324.48	--	--	53.5
10/29	1100	--	0.1	--	324.82	-0.34	-0.34	53.8
11/02	1300	--	0.3	--	319.60	5.22	4.88	49.0
11/05	1300	--	0.8	--	316.40	3.20	8.08	46.1
11/09	930	--	1.6	--	314.96	1.44	9.52	44.7
11/12	800	--	5.5	--	311.27	3.69	13.21	41.3
11/16	730	--	14.4	--	308.51	2.76	15.97	38.8

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content.
Sample No. BH40611AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

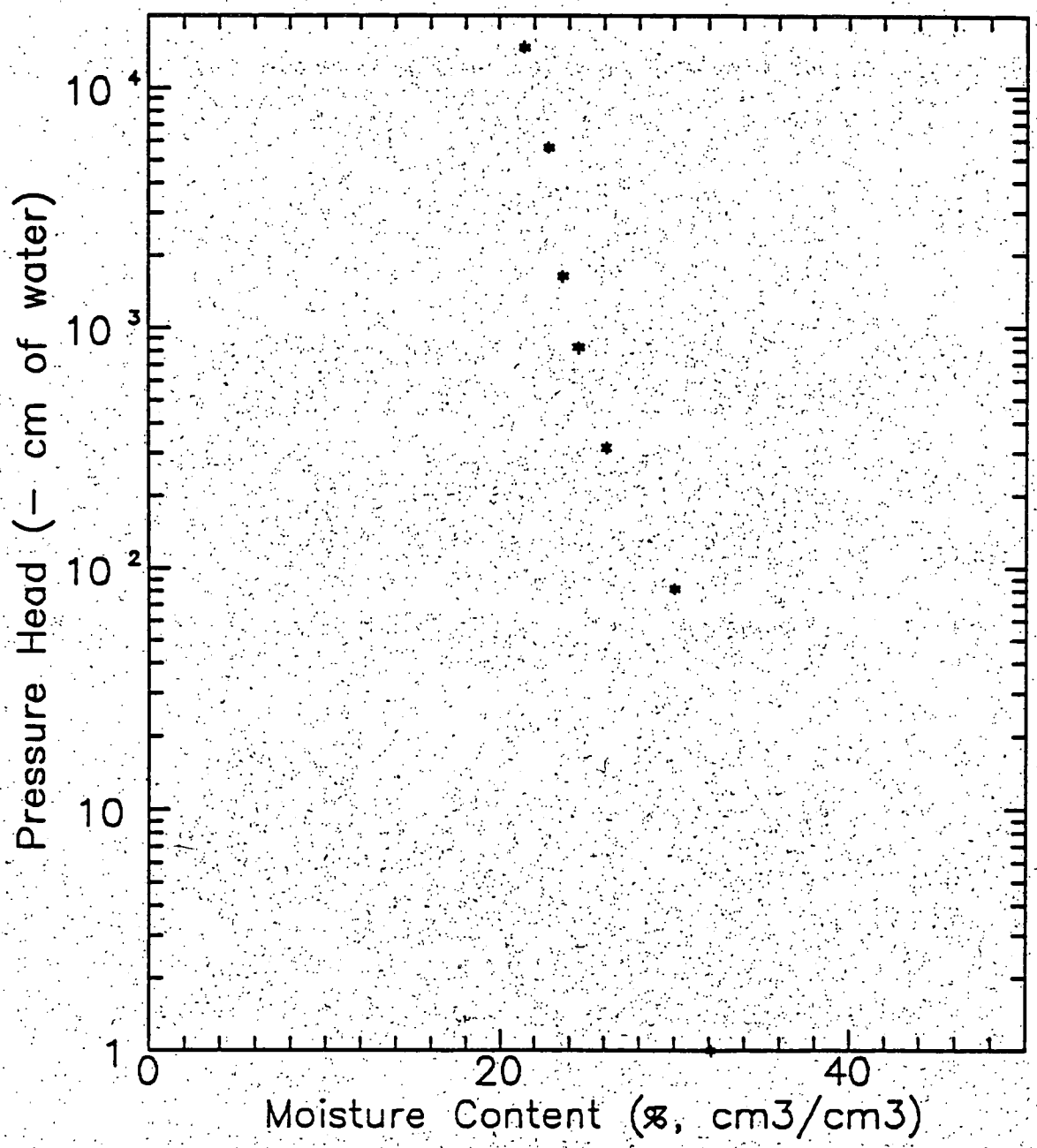
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40612AE
RING NUMBER: 612
DEPTH: N/A
SAMPLE VOLUME: 184.18 (cc)
SATURATED WEIGHT AT 0 CM TENSION
(WITH CAP AND RING): 520.73 (g)
TARE RING: 84.28 (g)
TARE CAP: 21.75 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 26.61 (g)
DRY WEIGHT OF SAMPLE: 329.06 (g)
SATURATED MOISTURE CONTENT: 32.05 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 59.03 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
10/26	1145	--	0.0	--	520.73	--	--	32.1
10/29	1100	--	0.1	--	516.89	3.84	3.84	30.0
11/02	1300	--	0.3	--	509.74	7.15	10.99	26.1
11/05	1300	--	0.8	--	506.75	2.99	13.98	24.5
11/09	930	--	1.6	--	505.08	1.67	15.65	23.6
11/12	800	--	5.5	--	503.69	1.39	17.04	22.8
11/16	730	--	14.4	--	501.12	2.57	19.61	21.4

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content.
Sample No. BH40612AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

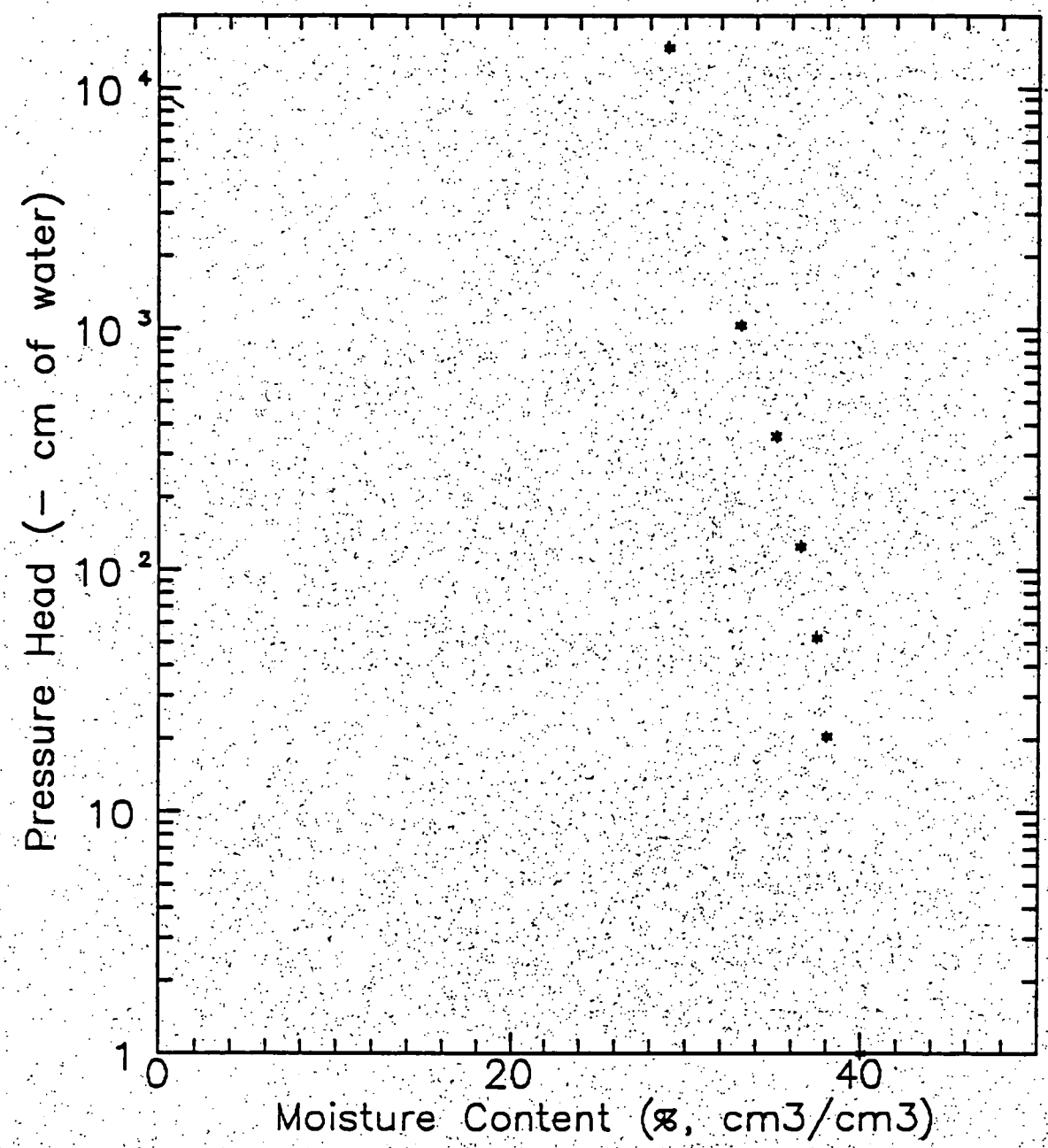
MOISTURE RETENTION DATA - HANGING COLUMN/15 BAR PRESSURE PLATE
(PORE SIZE DISTRIBUTION)

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40613AE
RING NUMBER: 613
DEPTH: N/A
SAMPLE VOLUME: 192.82 (cc)
SATURATED WEIGHT AT 0 CM TENSION (WITH CAP AND RING): 486.45 (g)
TARE RING: 87.33 (g)
TARE CAP: 0.00 (g)
TARE WEIGHT OF SCREEN AND CLAMP: 25.48 (g)
DRY WEIGHT OF SAMPLE: 296.59 (g)
SATURATED MOISTURE CONTENT: 39.96 (% vol)
VOLUME OF WATER IN SATURATED SAMPLE: 77.05 (cc)

DATE (1993)	TIME	HANGING COLUMN SUCTION (CM)	PRESSURE PLATE PRESSURE (BAR)	THERMO COUPLE POTENTIAL (BAR)	WEIGHT W/RING (G)	WEIGHT CHANGE (G)	TOTAL WEIGHT CHANGE (G)	MOISTURE CONTENT (% VOL)
09/28	1300	0.0	--	--	486.45	--	--	40.0
09/30	1300	20.5	--	--	482.73	3.72	3.72	38.0
10/05	1340	52.4	--	--	481.61	1.12	4.84	37.4
10/08	1100	125.0	--	--	479.77	1.84	6.68	36.5
10/12	1030	--	0.4	--	477.12	2.65	9.33	35.1
10/15	1200	--	1.0	--	473.30	3.82	13.15	33.1
10/19	800	--	14.4	--	465.23	8.07	21.22	29.0

COMMENTS: Assume density of water is 1.0 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATION MADE BY: R. Hill
CHECKED BY: M. Ankeny



Pressure Head vs. Moisture Content.
Sample No. BH40613AE

APPENDIX F

PARTICLE SIZE CHARACTERISTICS

SUMMARY OF PARTICLE SIZE CHARACTERISTICS

Sample Number	d_{10} (mm)	d_{50} (mm)	d_{60} (mm)	C_u (mm)	C_c (mm)	Classification
BH40396AE	*	0.088	0.20	--	--	Clayey sand with gravel
BH40397AE	*	0.15	0.55	--	--	Clayey sand with gravel
BH40398AE	*	0.049	0.18	--	--	Sandy lean clay with gravel
BH40401AE	*	0.0017	0.0033	--	--	Fat clay
BH40402AE	*	*	0.0020	--	--	Fat clay
BH40403AE	*	0.56	1.3	--	--	Silty sand with gravel
BH40404AE	*	*	0.0019	--	--	Fat clay
BH40405AE	0.24	1.1	1.6	6.7	0.85	Well-graded sand
BH40406AE	*	0.0039	0.0062	--	--	Lean clay
BH40407AE	*	0.0064	0.057	--	--	Sandy elastic silt
BH40408AE	*	0.0014	0.0026	--	--	Fat clay
BH40600AE	*	0.73	3.5	--	--	Clayey gravel with sand
BH40601AE	*	0.37	1.2	--	--	Silty sand with gravel
BH40602AE	0.0015	0.36	1.4	9.33	0.045	Silty gravel with sand

* d_{10} and/or d_{50} not reached with test specified

-- value dependent upon d_{10}

d_{50} = median particle diameter

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{(d_{30})^2}{(d_{10})(d_{60})}$$

SUMMARY OF PARTICLE SIZE CHARACTERISTICS (CONTINUED)

Sample Number	d_{10} (mm)	d_{50} (mm)	d_{60} (mm)	C_u (mm)	C_c (mm)	Classification
BH40603AE	*	0.0014	0.0017	--	--	Lean clay
BH40604AE	*	0.0014	0.0025	--	--	Fat clay
BH40605AE	*	*	0.0018	--	--	Fat clay
BH40606AE	*	0.035	0.097	--	--	Gravelly lean clay with sand
BH40607AE	*	0.088	0.85	--	--	Clayey gravel with sand
BH40608AE	0.0040	11	17	4250	7.8	Clayey gravel with sand
BH40609AE	*	0.11	0.14	--	--	Silty sand
40610AE	*	0.0027	0.0047	--	--	Lean clay
BH40611AE	*	0.72	5.3	--	--	Clayey gravel with sand
BH40612AE	0.0048	7.4	12	2500	13	Clayey gravel with sand
BH40613AE	*	9.4	1.7	--	--	Clayey gravel with sand

* d_{10} and/or d_{50} not reached with test specified

-- value dependent upon d_{10}

d_{50} = median particle diameter

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{(d_{30})^2}{(d_{10})(d_{60})}$$

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/08/93
SAMPLE NUMBER: BH40396AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 450.01 (g)
WEIGHT PASSING #10: 355.25 (g)
WEIGHT RETAINED #10: 94.76 (g)
WEIGHT OF HYDROMETER SAMPLE: 57.03 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 72.24 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	450.01	100.00
	1.5"	38.1	0.00	0.00	450.01	100.00
	3/4"	19.0	17.03	17.03	432.98	96.22
	3/8"	9.5	27.69	44.72	405.29	90.06
	4	4.75	27.31	72.03	377.98	83.99
	10	2.00	22.73	94.76	355.25	78.94
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	4.14	19.35	52.89	73.21
	40	0.425	3.52	22.87	49.37	68.34
	60	0.250	2.84	25.71	46.53	64.41
	140	0.106	8.90	34.61	37.63	52.09
	200	0.075	2.55	37.16	35.08	48.56
	dry pan		0.49	37.65	34.59	
	wet pan			34.59	0.00	

d10: -- (mm) d50: 0.088 (mm)
d16: -- (mm) d60: 0.20 (mm)
d30: 0.0074 (mm) d84: 4.8 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.088
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40396AE	INITIAL WT:	57.03 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	450.01 (g)
REACTION WITH H2O2:	SLIGHT	WT. PASSING #10:	355.25 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1104

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	42.0	4.0	38.0	9.4	0.08254	66.63160	52.60
	0.50	21.5	38.5	4.0	34.5	10.0	0.06012	60.49448	47.76
	1.00	21.5	35.5	4.0	31.5	10.5	0.04354	55.23409	43.60
	2.00	21.5	32.5	4.0	28.5	11.0	0.03150	49.97370	39.45
	5.00	21.5	30.0	4.0	26.0	11.4	0.02029	45.59004	35.99
	10	21.5	28.0	4.0	24.0	11.7	0.01455	42.08311	33.22
	21	21.5	27.0	4.0	23.0	11.9	0.01011	40.32965	31.84
	60	22.0	25.0	4.0	21.0	12.2	0.00603	36.82272	29.07
	120	22.0	23.5	4.0	19.5	12.4	0.00431	34.19253	26.99
	240	22.0	22.0	4.0	18.0	12.7	0.00307	31.56234	24.92
	407	22.0	21.0	4.0	17.0	12.9	0.00238	29.80887	23.53
11/12	1375	22.0	19.0	4.0	15.0	13.2	0.00131	26.30195	20.76

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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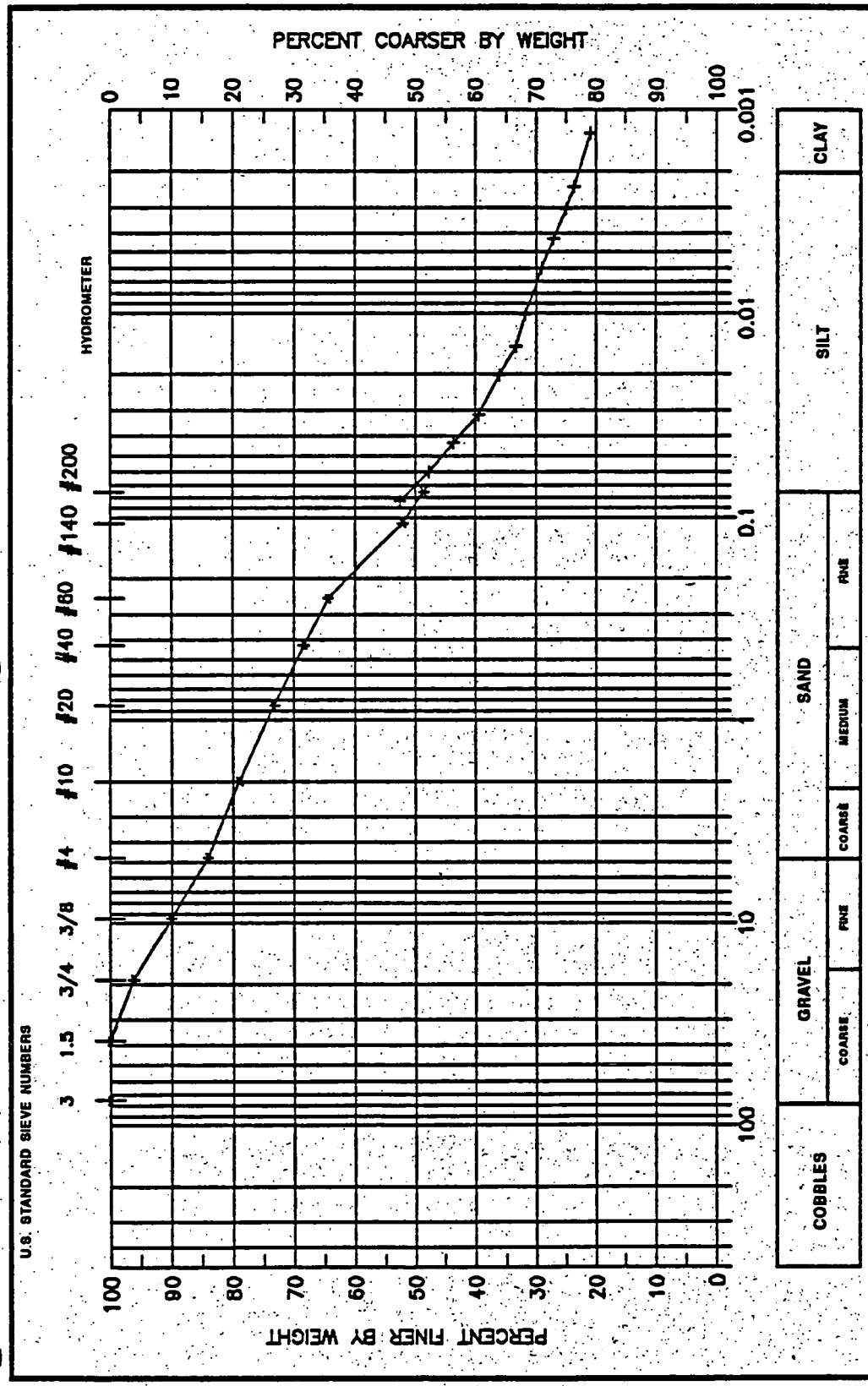


θ_I = 16.6 (%, vol)	d_{10} = --	d_{50} = 0.088	d_{60} = 0.20	Cu= --	Cc= --	
SAMPLE NUMBER	DEPTH	USCS CLASSIFICATION				
BH40396AE	N/A	Clayey sand with gravel				

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/08/93
SAMPLE NUMBER: BH40397AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 366.31 (g)
WEIGHT PASSING #10: 268.03 (g)
WEIGHT RETAINED #10: 98.28 (g)
WEIGHT OF HYDROMETER SAMPLE: 42.31 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 57.82 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	366.31	100.00
	1.5"	38.1	0.00	0.00	366.31	100.00
	3/4"	19.0	0.00	0.00	366.31	100.00
	3/8"	9.5	41.22	41.22	325.09	88.75
	4	4.75	28.94	70.16	296.15	80.85
	10	2.00	28.12	98.28	268.03	73.17
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	5.21	20.72	37.10	64.16
	40	0.425	3.37	24.09	33.73	58.33
	60	0.250	2.17	26.26	31.56	54.58
	140	0.106	3.98	30.24	27.58	47.70
	200	0.075	1.24	31.48	26.34	45.55
	dry pan		0.25	31.73	26.09	
	wet pan			26.09	0.00	

d10: -- (mm) d50: 0.15 (mm)
d16: -- (mm) d60: 0.55 (mm)
d30: 0.0020 (mm) d84: 6.6 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.15
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40397AE	INITIAL WT:	42.31 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	366.31 (g)
REACTION WITH H2O2:	SLIGHT	WT. PASSING #10:	268.03 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1122

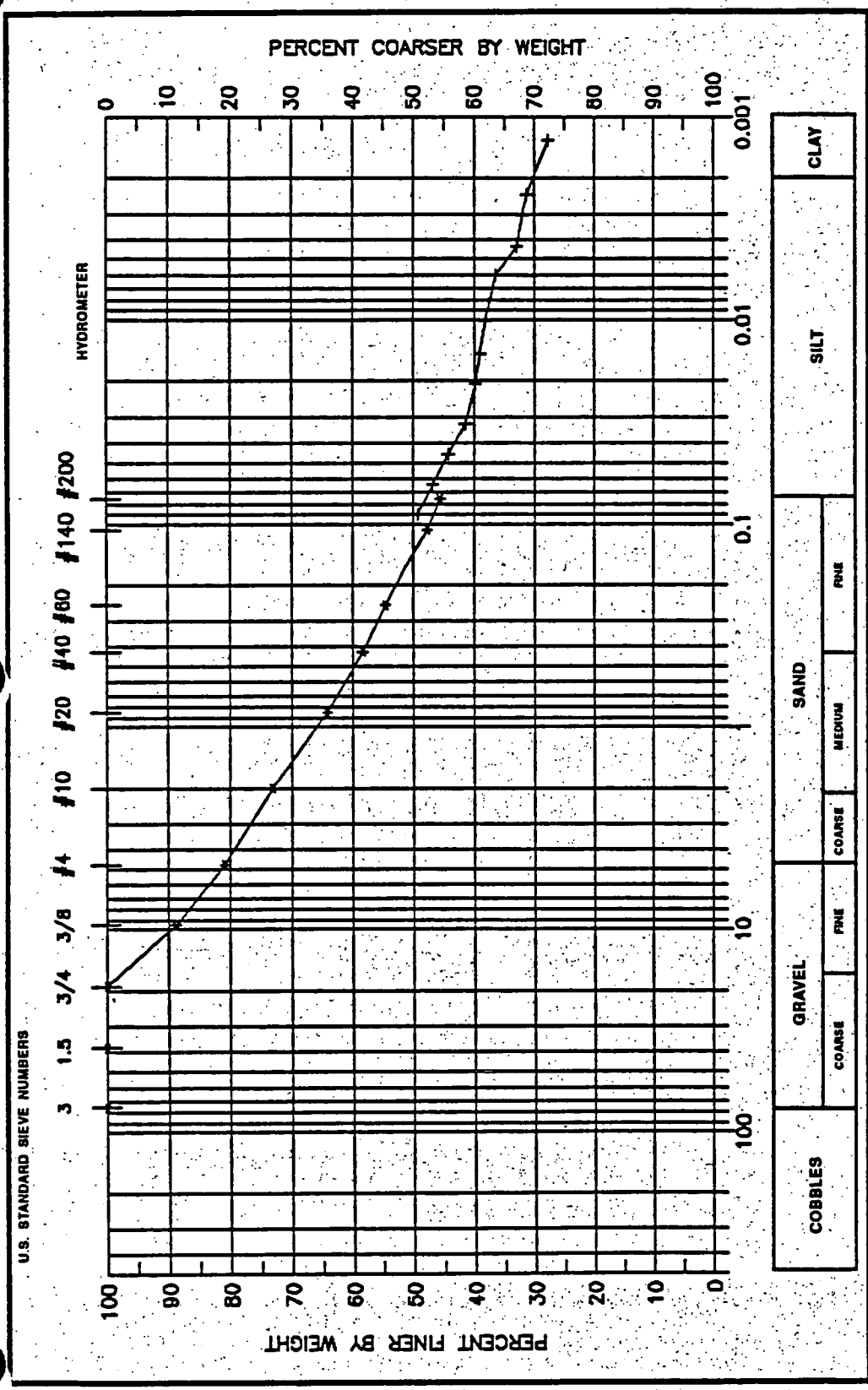
DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	32.5	4.0	28.5	11.0	0.08910	67.35996	49.29
	0.50	21.5	31.0	4.0	27.0	11.2	0.06371	63.81470	46.69
	1.00	21.5	29.5	4.0	25.5	11.5	0.04554	60.26944	44.10
	2.00	21.5	28.0	4.0	24.0	11.7	0.03255	56.72418	41.51
	5.00	21.5	27.0	4.0	23.0	11.9	0.02073	54.36067	39.78
	10	21.5	26.5	4.0	22.5	12.0	0.01471	53.17892	38.91
	21	21.5	26.0	4.0	22.0	12.0	0.01018	51.99716	38.05
	60	22.0	25.0	4.0	21.0	12.2	0.00603	49.63366	36.32
	120	22.0	23.0	4.0	19.0	12.5	0.00432	44.90664	32.86
	240	22.0	22.5	4.0	18.5	12.6	0.00306	43.72489	31.99
	392	22.0	22.0	4.0	18.0	12.7	0.00241	42.54313	31.13
11/12	1360	22.0	20.0	4.0	16.0	13.0	0.00131	37.81612	27.67

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



θ_I = 28.3 (%, vol)	d_{10} = ---	d_{50} = 0.15	d_{60} = 0.55	Cu= ---	Cc= ---	
SAMPLE NUMBER		DEPTH		USCS CLASSIFICATION		
BH40397AE		N/A		Clayey sand with gravel		

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/10/93
SAMPLE NUMBER: BH40398AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 114.88 (g)
WEIGHT PASSING #10: 87.62 (g)
WEIGHT RETAINED #10: 27.26 (g)
WEIGHT OF HYDROMETER SAMPLE: 45.31 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 59.41 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	114.88	100.00
	1.5"	38.1	0.00	0.00	114.88	100.00
	3/4"	19.0	14.80	14.80	100.08	87.12
	3/8"	9.5	5.03	19.83	95.05	82.74
	4	4.75	2.64	22.47	92.41	80.44
	10	2.00	4.79	27.26	87.62	76.27
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	3.74	17.84	41.57	69.98
	40	0.425	2.31	20.15	39.26	66.09
	60	0.250	1.50	21.65	37.76	63.56
	140	0.106	4.18	25.83	33.58	56.53
	200	0.075	1.89	27.72	31.69	53.34
	dry pan		0.63	28.35	31.06	
	wet pan			31.06	0.00	

d10: -- (mm) d50: 0.049 (mm)
d16: -- (mm) d60: 0.18 (mm)
d30: 0.0022 (mm) d84: 12 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.049
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40398AE	INITIAL WT:	45.31 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	114.88 (g)
REACTION WITH H202:	NONE	WT. PASSING #10:	87.62 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1058

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	38.0	4.0	34.0	10.1	0.08537	75.03862	57.23
	0.50	21.5	35.5	4.0	31.5	10.5	0.06158	69.52108	53.02
	1.00	21.5	33.0	4.0	29.0	10.9	0.04439	64.00353	48.82
	2.00	21.5	31.0	4.0	27.0	11.2	0.03185	59.58949	45.45
	5.00	21.5	29.5	4.0	25.5	11.5	0.02037	56.27897	42.92
	10	21.5	28.0	4.0	24.0	11.7	0.01455	52.96844	40.40
	21	21.5	27.0	4.0	23.0	11.9	0.01011	50.76142	38.72
	60	21.5	25.0	4.0	21.0	12.2	0.00607	46.34738	35.35
	120	22.0	25.0	4.0	21.0	12.2	0.00426	46.34738	35.35
	242	22.0	23.0	4.0	19.0	12.5	0.00304	41.93335	31.98
	411	22.0	22.0	4.0	18.0	12.7	0.00235	39.72633	30.30
11/12	1380	22.0	20.5	4.0	16.5	12.9	0.00129	36.41580	27.77

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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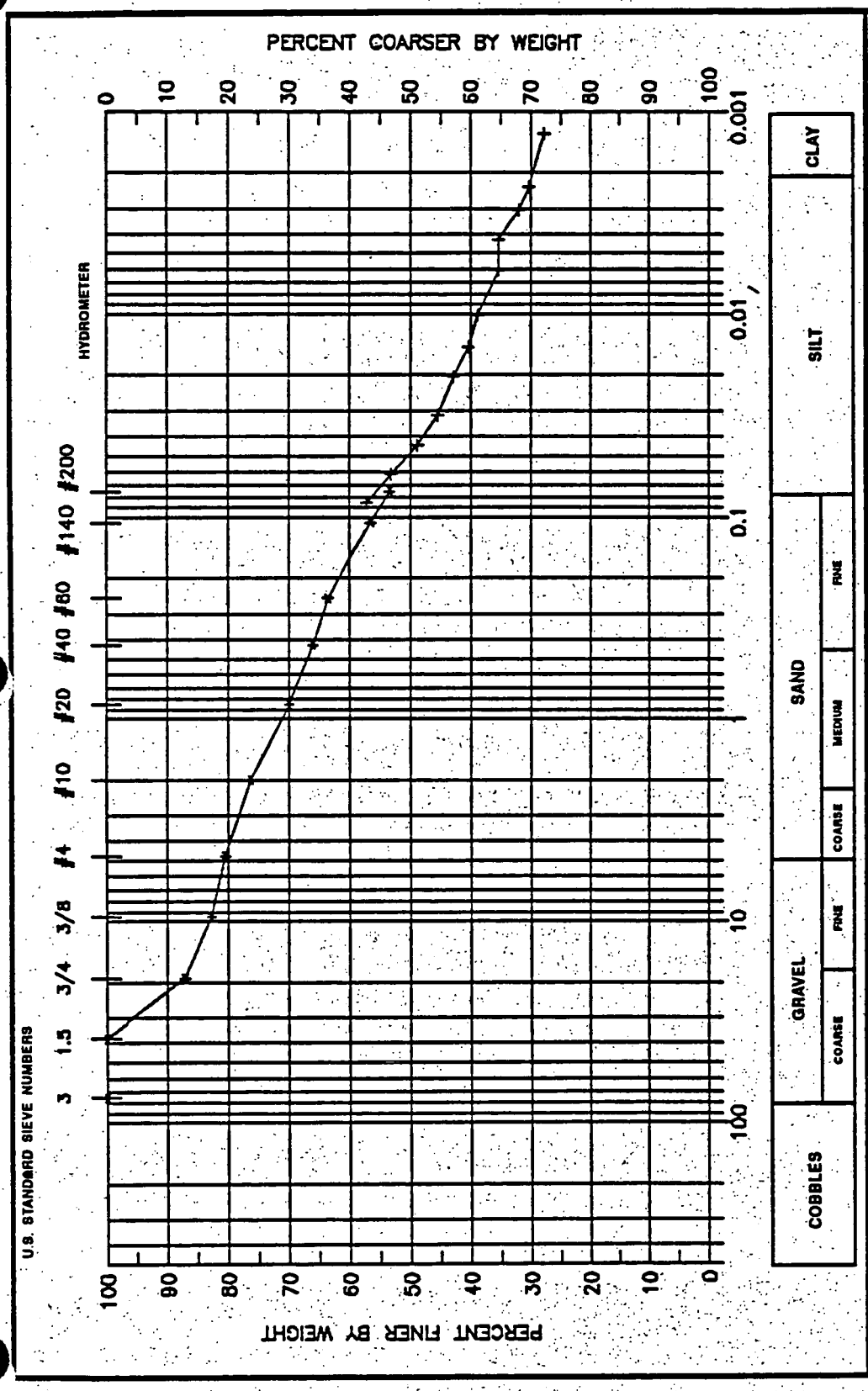
ENVIRONMENTAL SCIENTISTS AND ENGINEERS



θ_I = 29.0 (%, vol)	d_{10} = --	d_{50} = 0.049	d_{60} = 0.18	Cu= --	Cc= --	USCS CLASSIFICATION
SAMPLE NUMBER		DEPTH				Sandy lean clay with gravel
BH40398AE		N/A				

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40401AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 184.99 (g)
WEIGHT PASSING #10: 184.92 (g)
WEIGHT RETAINED #10: 0.07 (g)
WEIGHT OF HYDROMETER SAMPLE: 33.31 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 33.32 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	184.99	100.00
	1.5"	38.1	0.00	0.00	184.99	100.00
	3/4"	19.0	0.00	0.00	184.99	100.00
	3/8"	9.5	0.00	0.00	184.99	100.00
	4	4.75	0.00	0.00	184.99	100.00
	10	2.00	0.07	0.07	184.92	99.96
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.08	0.09	33.23	99.72
	40	0.425	0.06	0.15	33.17	99.54
	60	0.250	0.06	0.21	33.11	99.36
	140	0.106	0.37	0.58	32.74	98.25
	200	0.075	0.32	0.90	32.42	97.29
	dry pan		0.04	0.94	32.38	
	wet pan			32.38	0.00	

d10: -- (mm) d50: 0.0017 (mm)
d16: -- (mm) d60: 0.0033 (mm)
d30: -- (mm) d84: 0.0092 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.0017
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40401AE	INITIAL WT:	33.31 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	184.99 (g)
REACTION WITH H2O2:	MODERATE	WT. PASSING #10:	184.92 (g)
DISPERSANT:	(NaPO3)6	START TIME:	857

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
10/12	0.25	22.0	35.5	1.5	34.0	10.5	0.08657	102.07145	102.03
	0.50	22.0	34.5	1.5	33.0	10.6	0.06169	99.06935	99.03
	1.00	22.0	33.5	1.5	32.0	10.8	0.04396	96.06725	96.03
	3.00	22.0	32.0	1.5	30.5	11.1	0.02566	91.56409	91.53
	5.00	22.0	32.0	1.5	30.5	11.1	0.01988	91.56409	91.53
	10	22.0	31.0	1.5	29.5	11.2	0.01416	88.56199	88.53
	21	22.0	30.0	1.5	28.5	11.4	0.00984	85.55989	85.53
	60	22.0	27.0	1.5	25.5	11.9	0.00595	76.55359	76.52
	120	21.5	25.5	3.0	22.5	12.1	0.00427	67.54728	67.52
	240	21.5	23.0	3.5	19.5	12.5	0.00307	58.54098	58.52
	474	21.5	22.0	3.5	18.5	12.7	0.00220	55.53888	55.52
10/13	1421	21.0	19.0	3.5	15.5	13.2	0.00130	46.53257	46.51

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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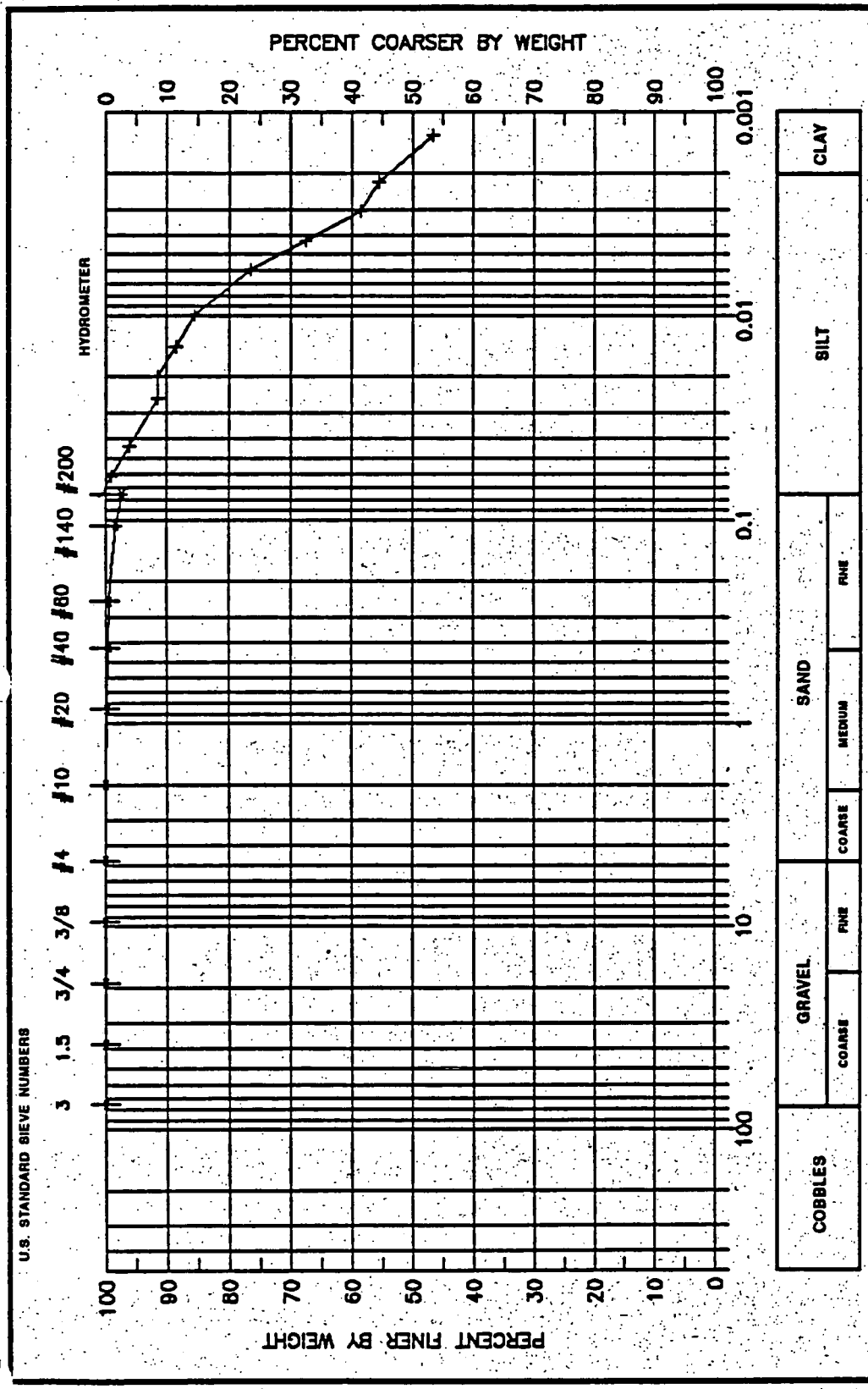
ENVIRONMENTAL SCIENTISTS AND ENGINEERS



θ_1 = 33.9 (%, vol)	d_{10} = --	d_{50} = 0.0017	d_{60} = 0.0033	Cu= --	Cc= --	
SAMPLE NUMBER		DEPTH		USCS CLASSIFICATION		
BH40401AE		N/A		Fat clay		

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40402AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 127.04 (g)
WEIGHT PASSING #10: 126.89 (g)
WEIGHT RETAINED #10: 0.15 (g)
WEIGHT OF HYDROMETER SAMPLE: 31.39 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 31.43 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	127.04	100.00
	1.5"	38.1	0.00	0.00	127.04	100.00
	3/4"	19.0	0.00	0.00	127.04	100.00
	3/8"	9.5	0.00	0.00	127.04	100.00
	4	4.75	0.00	0.00	127.04	100.00
	10	2.00	0.15	0.15	126.89	99.88
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.03	0.06	31.37	99.80
	40	0.425	0.02	0.09	31.34	99.73
	60	0.250	0.02	0.10	31.33	99.68
	140	0.106	0.04	0.14	31.29	99.55
	200	0.075	0.04	0.19	31.24	99.41
	dry pan		0.01	0.19	31.23	
	wet pan			31.23	0.00	

d10: -- (mm) d50: -- (mm)
d16: -- (mm) d60: 0.0020 (mm)
d30: -- (mm) d84: 0.0063 (mm)

MEDIAN PARTICLE DIAMETER (d50): --
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40402AE	INITIAL WT:	31.39 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	127.04 (g)
REACTION WITH H202:	MODERATE	WT. PASSING #10:	126.89 (g)
DISPERSANT:	(NaPO3)6	START TIME:	927

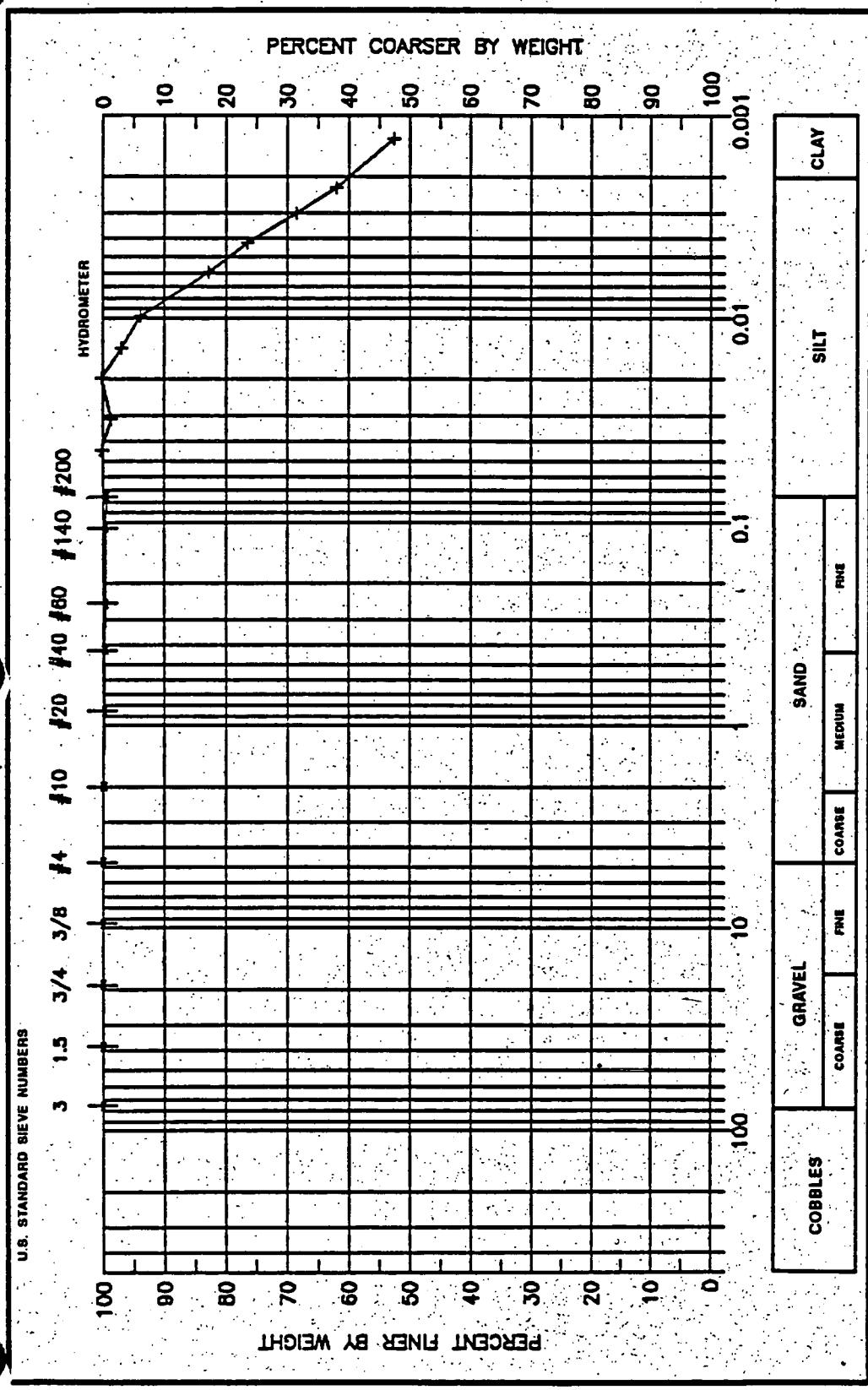
DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
10/12	0.25	22.0	34.0	1.5	32.5	10.7	0.08758	103.53616	103.41
	0.50	22.0	33.5	1.5	32.0	10.8	0.06216	101.94329	101.82
	1.00	22.0	33.0	1.5	31.5	10.9	0.04412	100.35043	100.23
	2.00	22.0	32.5	1.5	31.0	11.0	0.03132	98.75757	98.64
	5.00	22.0	33.0	1.5	31.5	10.9	0.01973	100.35043	100.23
	10	22.0	32.0	1.5	30.5	11.1	0.01406	97.16470	97.05
	21	22.0	31.0	1.5	29.5	11.2	0.00977	93.97897	93.87
	60	21.5	29.0	3.0	26.0	11.5	0.00590	82.82893	82.73
	120	21.5	27.0	3.0	24.0	11.9	0.00423	76.45747	76.37
	240	21.5	25.0	3.5	21.5	12.2	0.00303	68.49315	68.41
	449	21.5	23.0	3.5	19.5	12.5	0.00225	62.12169	62.05
10/13	1398	21.0	20.0	3.5	16.5	13.0	0.00131	52.56451	52.50

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



θ_i = 36.7 (%, VOL)	d_{10} = --	d_{50} = --	d_{60} = 0.0020	Cu= --	Cc= --	USCS CLASSIFICATION
SAMPLE NUMBER		DEPTH				
BH40402AE		N/A				Fat Clay

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/08/93
SAMPLE NUMBER: BH40403AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 352.68 (g)
WEIGHT PASSING #10: 236.92 (g)
WEIGHT RETAINED #10: 115.76 (g)
WEIGHT OF HYDROMETER SAMPLE: 46.99 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 69.95 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	352.68	100.00
	1.5"	38.1	0.00	0.00	352.68	100.00
	3/4"	19.0	20.07	20.07	332.61	94.31
	3/8"	9.5	32.49	52.56	300.12	85.10
	4	4.75	25.35	77.91	274.77	77.91
	10	2.00	37.85	115.76	236.92	67.18
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	8.81	31.77	38.18	54.58
	40	0.425	4.69	36.46	33.49	47.88
	60	0.250	2.73	39.19	30.76	43.97
	140	0.106	4.46	43.65	26.30	37.60
	200	0.075	1.27	44.92	25.03	35.78
	dry pan		0.49	45.41	24.54	
	wet pan			24.54	0.00	

d10: -- (mm) d50: 0.56 (mm)
d16: -- (mm) d60: 1.3 (mm)
d30: 0.015 (mm) d84: 8.8 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.56
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40403AE	INITIAL WT:	46.99 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	352.68 (g)
REACTION WITH H202:	MODERATE	WT. PASSING #10:	236.92 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1110

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	31.0	4.0	27.0	11.2	0.09010	57.45903	38.60
	0.50	21.5	31.0	4.0	27.0	11.2	0.06371	57.45903	38.60
	1.00	21.5	27.5	4.0	23.5	11.8	0.04619	50.01064	33.60
	2.00	21.5	26.0	4.0	22.0	12.0	0.03300	46.81847	31.45
	5.00	21.5	25.5	4.0	21.5	12.1	0.02094	45.75442	30.74
	10	21.5	25.0	4.0	21.0	12.2	0.01486	44.69036	30.02
	21	21.5	24.5	4.0	20.5	12.3	0.01029	43.62630	29.31
	60	22.0	23.0	4.0	19.0	12.5	0.00611	40.43413	27.16
	120	22.0	21.5	4.0	17.5	12.8	0.00436	37.24197	25.02
	240	22.0	20.5	4.0	16.5	12.9	0.00310	35.11385	23.59
	402	22.0	21.0	4.0	17.0	12.9	0.00239	36.17791	24.30
11/12	1370	22.0	19.0	4.0	15.0	13.2	0.00131	31.92169	21.44

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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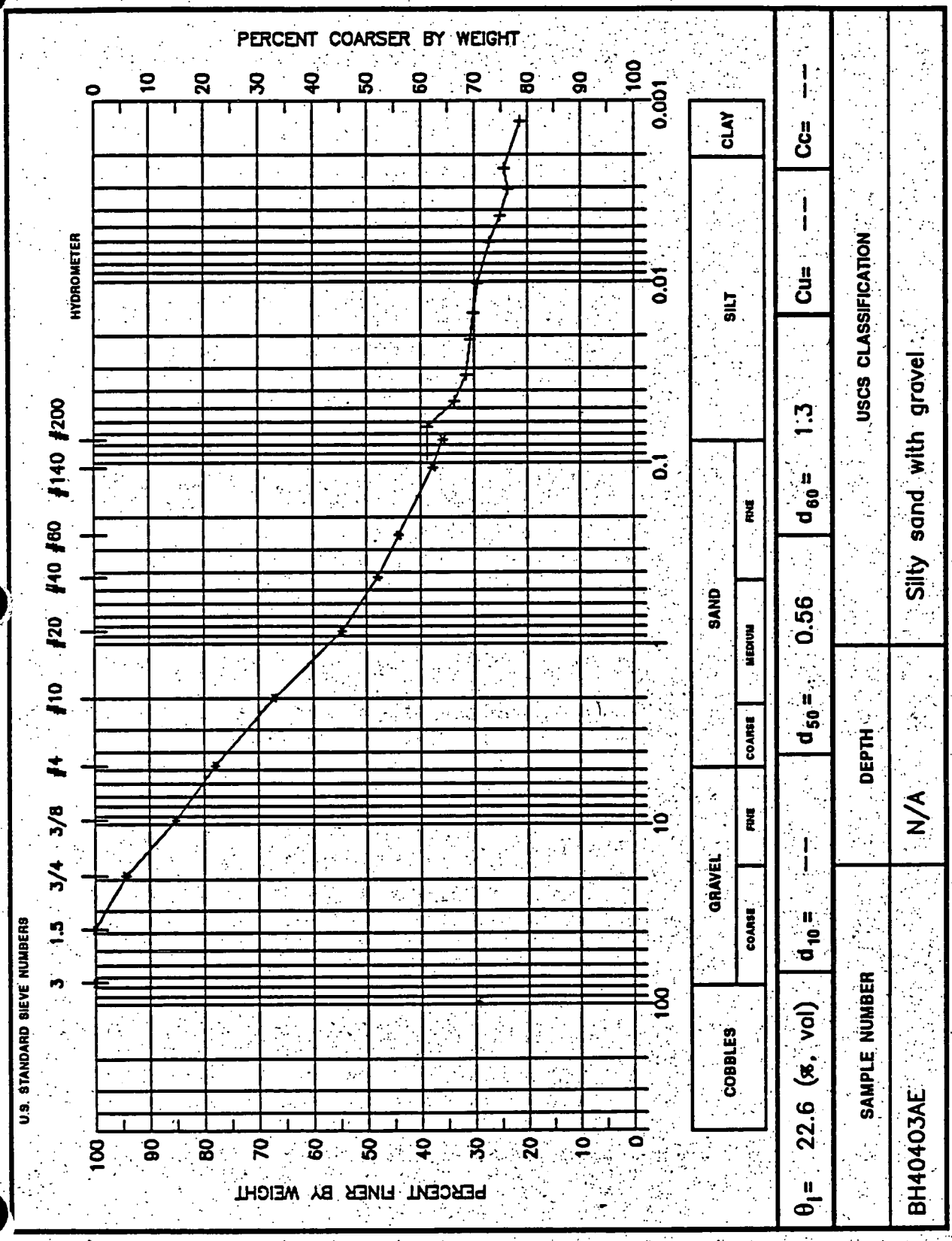

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40404AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 149.77 (g)
WEIGHT PASSING #10: 149.70 (g)
WEIGHT RETAINED #10: 0.07 (g)
WEIGHT OF HYDROMETER SAMPLE: 34.97 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 34.99 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	149.77	100.00
	1.5"	38.1	0.00	0.00	149.77	100.00
	3/4"	19.0	0.00	0.00	149.77	100.00
	3/8"	9.5	0.00	0.00	149.77	100.00
	4	4.75	0.00	0.00	149.77	100.00
	10	2.00	0.07	0.07	149.70	99.95
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.08	0.10	34.89	99.72
	40	0.425	0.04	0.14	34.85	99.61
	60	0.250	0.05	0.19	34.80	99.47
	140	0.106	0.07	0.26	34.73	99.27
	200	0.075	0.04	0.30	34.69	99.15
	dry pan		0.02	0.32	34.67	
	wet pan			34.67	0.00	

d10: -- (mm) d50: -- (mm)
d16: -- (mm) d60: 0.0019 (mm)
d30: -- (mm) d84: 0.0057 (mm)

MEDIAN PARTICLE DIAMETER (d50): --
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40404AE	INITIAL WT:	34.97 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	149.77 (g)
REACTION WITH H202:	MODERATE	WT. PASSING #10:	149.70 (g)
DISPERSANT:	(NaPO3)6	START TIME:	933

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
10/12	0.25	22.0	37.5	1.5	36.0	10.2	0.08520	102.94538	102.90
	0.50	22.0	37.0	1.5	35.5	10.2	0.06049	101.51558	101.47
	1.00	22.0	36.5	1.5	35.0	10.3	0.04294	100.08579	100.04
	2.00	22.0	36.5	1.5	35.0	10.3	0.03037	100.08579	100.04
	5.00	22.0	37.0	1.5	35.5	10.2	0.01913	101.51558	101.47
	10	22.0	36.5	1.5	35.0	10.3	0.01358	100.08579	100.04
	20	22.0	35.5	1.5	34.0	10.5	0.00968	97.22619	97.18
	60	21.5	32.5	3.0	29.5	11.0	0.00575	84.35802	84.32
	120	21.5	30.5	3.0	27.5	11.3	0.00413	78.63883	78.60
	240	21.5	27.5	3.5	24.0	11.8	0.00298	68.63025	68.60
	444	21.5	26.0	3.5	22.5	12.0	0.00221	64.34086	64.31
10/13	1393	21.0	21.5	3.5	18.0	12.8	0.00130	51.47269	51.45

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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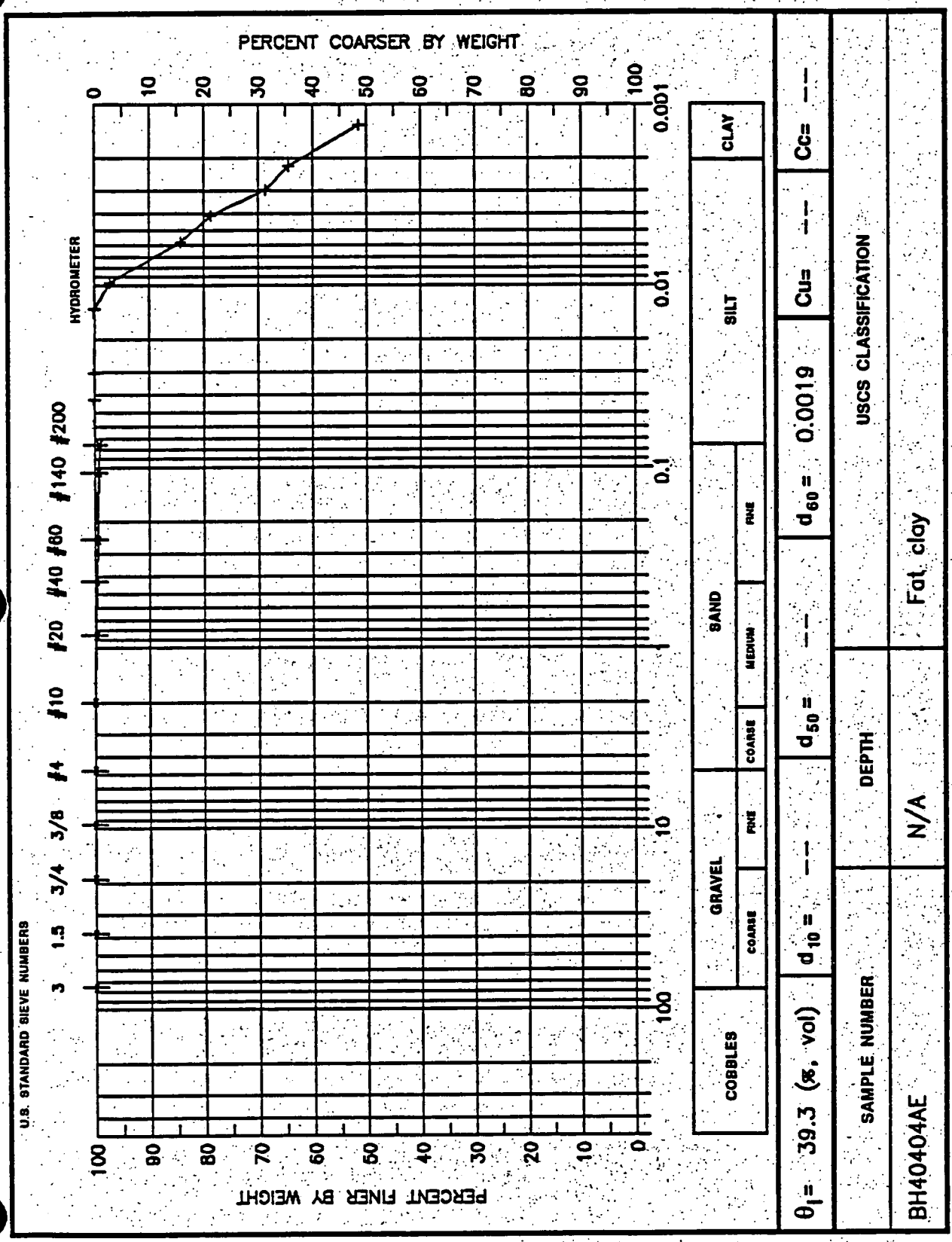

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40405AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 346.43 (g)
WEIGHT PASSING #10: 235.55 (g)
WEIGHT RETAINED #10: 110.88 (g)
WEIGHT OF HYDROMETER SAMPLE: 89.42 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 131.51 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	346.43	100.00
	1.5"	38.1	0.00	0.00	346.43	100.00
	3/4"	19.0	0.00	0.00	346.43	100.00
	3/8"	9.5	0.00	0.00	346.43	100.00
	4	4.75	25.60	25.60	320.83	92.61
	10	2.00	85.28	110.88	235.55	67.99
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	28.71	70.80	60.71	46.16
	40	0.425	32.32	103.12	28.39	21.59
	60	0.250	14.65	117.77	13.74	10.45
	140	0.106	9.44	127.21	4.30	3.27
	200	0.075	1.26	128.47	3.04	2.31
	dry pan		0.29	128.76	2.75	
	wet pan			2.75	0.00	

d10: 0.24 (mm) d50: 1.1 (mm)
d16: 0.34 (mm) d60: 1.6 (mm)
d30: 0.57 (mm) d84: 3.8 (mm)

MEDIAN PARTICLE DIAMETER (d50): 1.1
UNIFORMITY COEFFICIENT, Cu (d60/d10): 6.7
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: 0.85
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: 1.7

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40405AE	INITIAL WT:	89.42 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	346.43 (g)
REACTION WITH H2O2:	SLIGHT	WT. PASSING #10:	235.55 (g)
DISPERSANT:	(NaPO3)6	START TIME:	945

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
10/12	0.25	22.0	8.0	1.5	6.5	15.0	0.10352	7.26907	4.94
	0.50	22.0	6.0	1.5	4.5	15.3	0.07400	5.03243	3.42
	1.00	22.0	5.0	1.5	3.5	15.5	0.05260	3.91411	2.66
	2.00	22.0	5.0	1.5	3.5	15.5	0.03720	3.91411	2.66
	5.00	22.0	4.5	1.5	3.0	15.6	0.02359	3.35495	2.28
	10	22.0	4.5	1.5	3.0	15.6	0.01668	3.35495	2.28
	20	22.0	4.0	1.5	2.5	15.6	0.01182	2.79580	1.90
	60	21.5	4.0	3.0	1.0	15.6	0.00687	1.11832	0.76
	120	21.5	5.0	3.5	1.5	15.5	0.00483	1.67748	1.14
	235	21.5	4.0	3.5	0.5	15.6	0.00347	0.55916	0.38
	434	21.5	4.0	3.5	0.5	15.6	0.00255	0.55916	0.38
10/13	1383	21.0	4.0	3.5	0.5	15.6	0.00144	0.55916	0.38

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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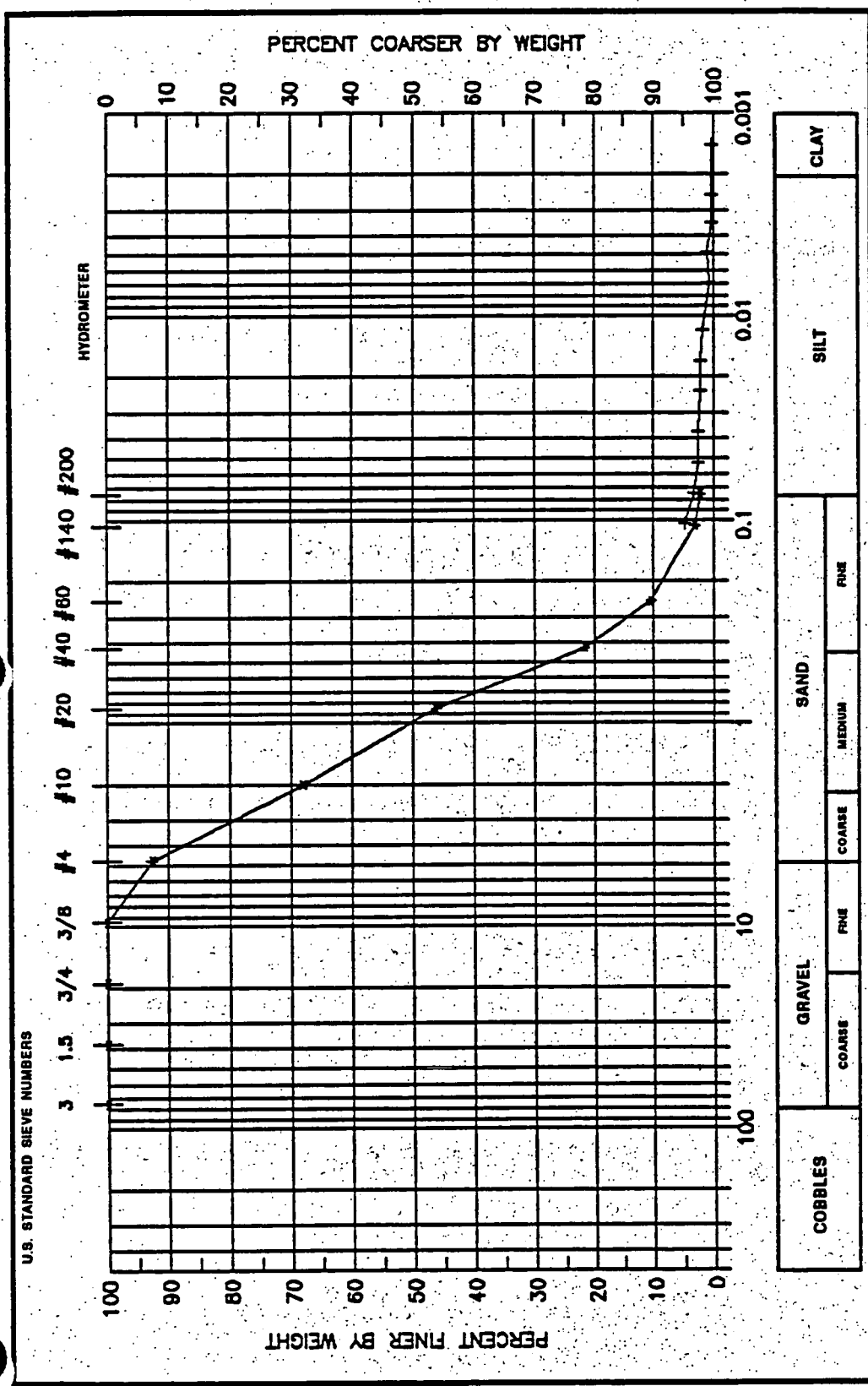

θ_1 = 3.7 (%,vol)	d_{10} = 0.24	d_{50} = 1.1	d_{60} = 1.6	Cu= 6.7	Cc= 0.85	USCS CLASSIFICATION
SAMPLE NUMBER			DEPTH			
BH40405AE			N/A			Well-graded sand

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40406AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 207.70 (g)
WEIGHT PASSING #10: 207.70 (g)
WEIGHT RETAINED #10: 0.00 (g)
WEIGHT OF HYDROMETER SAMPLE: 47.67 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 47.67 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	207.70	100.00
	1.5"	38.1	0.00	0.00	207.70	100.00
	3/4"	19.0	0.00	0.00	207.70	100.00
	3/8"	9.5	0.00	0.00	207.70	100.00
	4	4.75	0.00	0.00	207.70	100.00
	10	2.00	0.00	0.00	207.70	100.00
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.01	0.01	47.66	99.98
	40	0.425	0.01	0.02	47.65	99.96
	60	0.250	0.00	0.02	47.65	99.95
	140	0.106	0.18	0.20	47.47	99.57
	200	0.075	0.59	0.79	46.88	98.33
	dry pan		0.42	1.21	46.46	
	wet pan			46.46	0.00	

d10: -- (mm) d50: 0.0039 (mm)
d16: -- (mm) d60: 0.0062 (mm)
d30: -- (mm) d84: 0.021 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.0039
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40406AE	INITIAL WT:	47.67 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	207.70 (g)
REACTION WITH H202:	SLIGHT	WT. PASSING #10:	207.70 (g)
DISPERSANT:	(NaPO3)6	START TIME:	939

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
10/12	0.25	22.0	49.0	1.5	47.5	8.3	0.07689	99.64	99.64
	0.50	22.0	47.0	1.5	45.5	8.6	0.05543	95.45	95.45
	1.00	22.0	45.5	1.5	44.0	8.8	0.03975	92.30	92.30
	2.00	22.0	43.0	1.5	41.5	9.3	0.02875	87.06	87.06
	5.00	22.0	41.0	1.5	39.5	9.6	0.01851	82.86	82.86
	10	22.0	38.0	1.5	36.5	10.1	0.01342	76.57	76.57
	20	22.0	35.0	1.5	33.5	10.6	0.00972	70.27	70.27
	60	21.5	31.0	3.0	28.0	11.2	0.00582	58.74	58.74
	125	21.5	27.5	3.0	24.5	11.8	0.00413	51.40	51.40
	240	21.5	25.0	3.5	21.5	12.2	0.00303	45.10	45.10
	439	21.5	24.0	3.5	20.5	12.4	0.00226	43.00	43.00
10/13	1388	21.0	20.5	3.5	17.0	12.9	0.00131	35.66	35.66

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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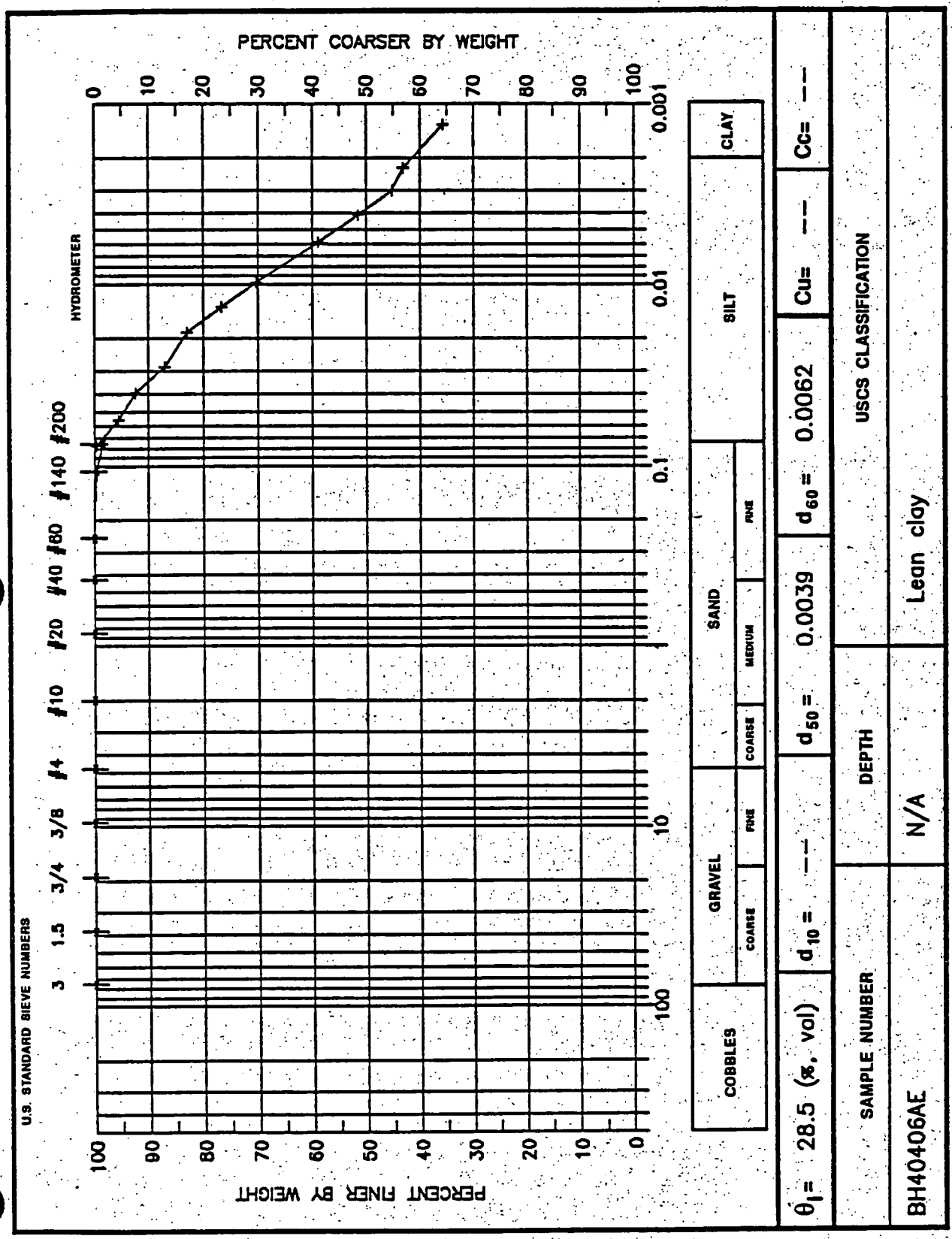

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/08/93
SAMPLE NUMBER: BH40407AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 172.26 (g)
WEIGHT PASSING #10: 152.47 (g)
WEIGHT RETAINED #10: 19.79 (g)
WEIGHT OF HYDROMETER SAMPLE: 44.62 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 50.41 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	172.26	100.00
	1.5"	38.1	0.00	0.00	172.26	100.00
	3/4"	19.0	0.00	0.00	172.26	100.00
	3/8"	9.5	2.67	2.67	169.59	98.45
	4	4.75	7.00	9.67	162.59	94.39
	10	2.00	10.12	19.79	152.47	88.51
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	2.30	8.09	42.32	83.95
	40	0.425	2.66	10.75	39.66	78.67
	60	0.250	2.54	13.29	37.12	73.63
	140	0.106	4.60	17.89	32.52	64.51
	200	0.075	1.19	19.08	31.33	62.15
	dry pan		0.20	19.28	31.13	
	wet pan			31.13	0.00	

d10: -- (mm) d50: 0.0064 (mm)
d16: -- (mm) d60: 0.057 (mm)
d30: -- (mm) d84: 0.86 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.0064
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS: -

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40407AE	INITIAL WT:	44.62 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	172.26 (g)
REACTION WITH H202:	SLIGHT	WT. PASSING #10:	152.47 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1140

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	38.0	4.0	34.0	10.1	0.08537	76.19901	67.44
	0.50	21.5	35.5	4.0	31.5	10.5	0.06158	70.59615	62.49
	1.00	21.5	33.5	4.0	29.5	10.8	0.04422	66.11385	58.52
	2.00	21.5	33.5	4.0	29.5	10.8	0.03127	66.11385	58.52
	5.00	21.5	32.5	4.0	28.5	11.0	0.01992	63.87270	56.53
	10	21.5	31.0	4.0	27.0	11.2	0.01425	60.51098	53.56
	20	22.0	30.5	4.0	26.5	11.3	0.01005	59.39041	52.57
	60	22.0	29.0	4.0	25.0	11.5	0.00587	56.02869	49.59
	120	22.0	28.0	4.0	24.0	11.7	0.00418	53.78754	47.61
	240	22.0	25.5	4.0	21.5	12.1	0.00300	48.18467	42.65
	382	22.0	25.0	4.0	21.0	12.2	0.00239	47.06410	41.66
11/12	1345	22.0	21.5	4.0	17.5	12.8	0.00130	39.22008	34.71

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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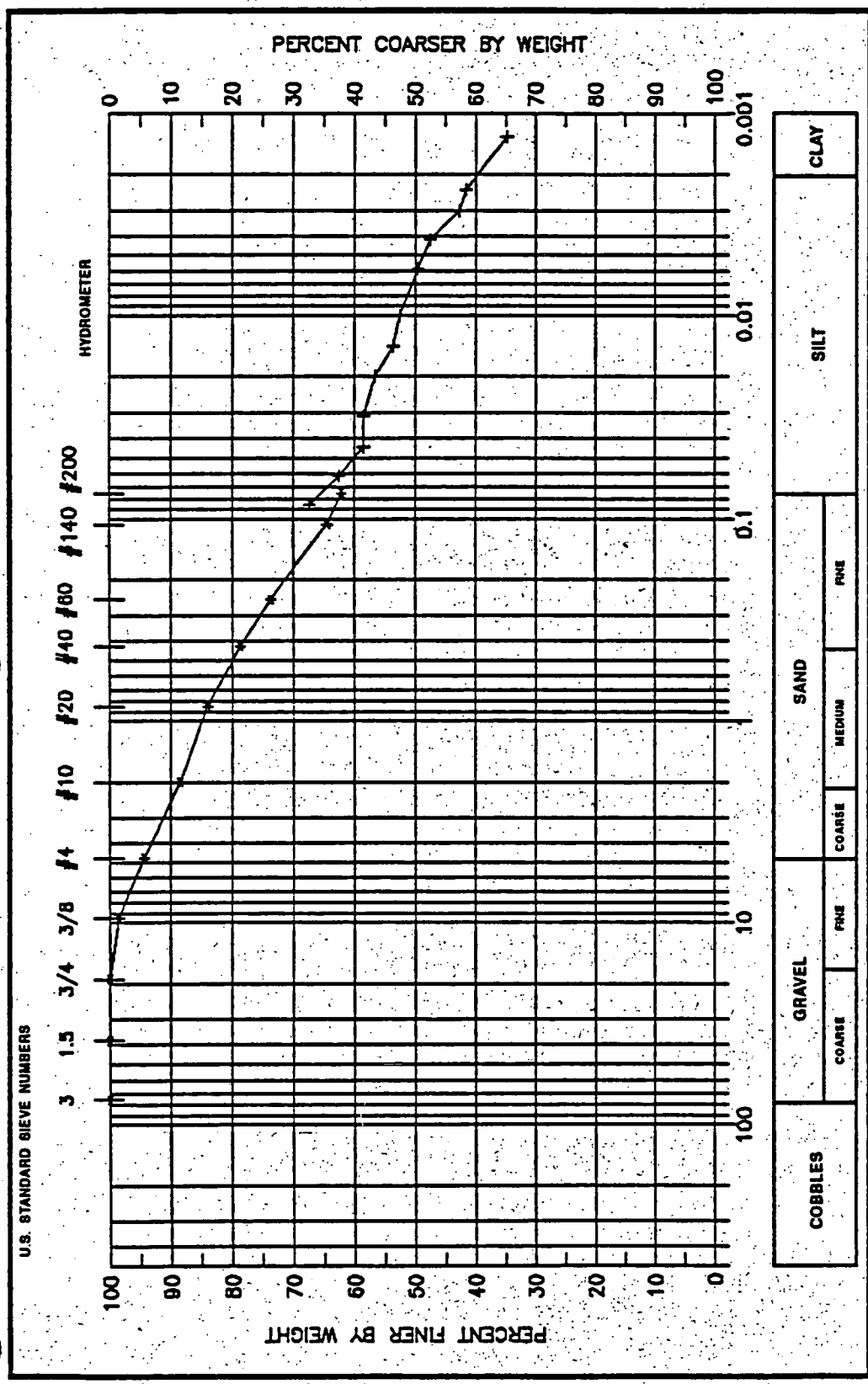


θ_l = 35.6 (%, vol)	d_{10} = ---	d_{50} = 0.0064	d_{60} = 0.057	Cu= ---	Cc= ---	USCS CLASSIFICATION
SAMPLE NUMBER		DEPTH				
BH40407AE		N/A				Sandy elastic silt

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40408AE	INITIAL WT:	33.67 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	130.26 (g)
REACTION WITH H2O2:	SLIGHT	WT. PASSING #10:	130.25 (g)
DISPERSANT:	(NaPO3)6	START TIME:	921

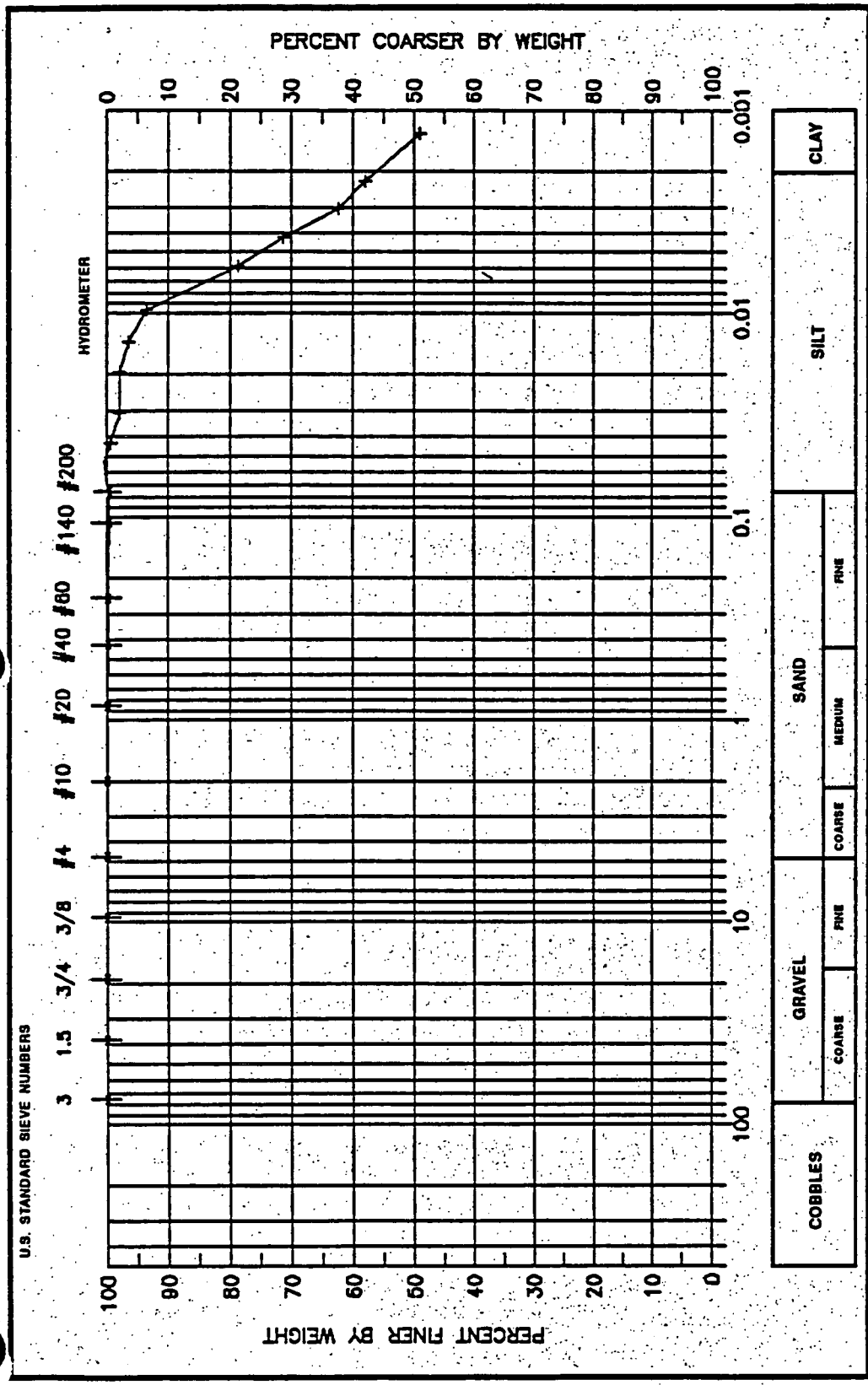
DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
10/12	0.25	22.0	35.5	1.5	34.0	10.5	0.08657	100.98010	100.97
	0.50	22.0	35.5	1.5	34.0	10.5	0.06121	100.98010	100.97
	1.00	22.0	35.0	1.5	33.5	10.6	0.04345	99.49510	99.49
	2.00	22.0	34.5	1.5	33.0	10.6	0.03084	98.01010	98.00
	5.00	22.0	34.5	1.5	33.0	10.6	0.01951	98.01010	98.00
	10	22.0	34.0	1.5	32.5	10.7	0.01385	96.52510	96.52
	21	22.0	33.0	1.5	31.5	10.9	0.00963	93.55509	93.55
	60	21.5	29.5	3.0	26.5	11.5	0.00588	78.70508	78.70
	120	21.5	27.0	3.0	24.0	11.9	0.00423	71.28007	71.27
	240	21.5	24.5	3.5	21.0	12.3	0.00304	62.37006	62.37
	454	21.5	23.0	3.5	19.5	12.5	0.00223	57.91506	57.91
10/13	1403	21.0	20.0	3.5	16.5	13.0	0.00130	49.00505	49.00

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



θ_1= 33.5 (%, vol)	d_{10}= ---	d_{50}= 0.0014	d_{60}= 0.0026	Cu= ---	Cc= ---	
SAMPLE NUMBER		DEPTH		USCS CLASSIFICATION		
BH40408AE		N/A		Fat clay		

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40600AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 253.39 (g)
WEIGHT PASSING #10: 142.29 (g)
WEIGHT RETAINED #10: 111.10 (g)
WEIGHT OF HYDROMETER SAMPLE: 36.28 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 64.61 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	253.39	100.00
	1.5"	38.1	0.00	0.00	253.39	100.00
	3/4"	19.0	28.57	28.57	224.82	88.72
	3/8"	9.5	39.12	67.69	185.70	73.29
	4	4.75	26.12	93.81	159.58	62.98
	10	2.00	17.29	111.10	142.29	56.15
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	3.18	31.51	33.10	51.23
	40	0.425	2.81	34.32	30.29	46.88
	60	0.250	2.22	36.54	28.07	43.45
	140	0.106	3.56	40.10	24.51	37.94
	200	0.075	0.90	41.00	23.61	36.54
	dry pan		0.06	41.06	23.55	
	wet pan			23.55	0.00	

d10: -- (mm) d50: 0.73 (mm)
d16: 0.0017 (mm) d60: 3.5 (mm)
d30: 0.0060 (mm) d84: 16 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.73
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: 5.6

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40408AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 130.26 (g)
WEIGHT PASSING #10: 130.25 (g)
WEIGHT RETAINED #10: 0.01 (g)
WEIGHT OF HYDROMETER SAMPLE: 33.67 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 33.67 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	130.26	100.00
	1.5"	38.1	0.00	0.00	130.26	100.00
	3/4"	19.0	0.00	0.00	130.26	100.00
	3/8"	9.5	0.00	0.00	130.26	100.00
	4	4.75	0.00	0.00	130.26	100.00
	10	2.00	0.01	0.01	130.25	99.99
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.03	0.03	33.64	99.90
	40	0.425	0.03	0.06	33.61	99.81
	60	0.250	0.02	0.08	33.59	99.75
	140	0.106	0.04	0.12	33.55	99.64
	200	0.075	0.02	0.14	33.53	99.58
	dry pan		0.01	0.15	33.52	
	wet pan			33.52	0.00	

d10: -- (mm) d50: 0.0014 (mm)
d16: -- (mm) d60: 0.0026 (mm)
d30: -- (mm) d84: 0.0072 (mm)

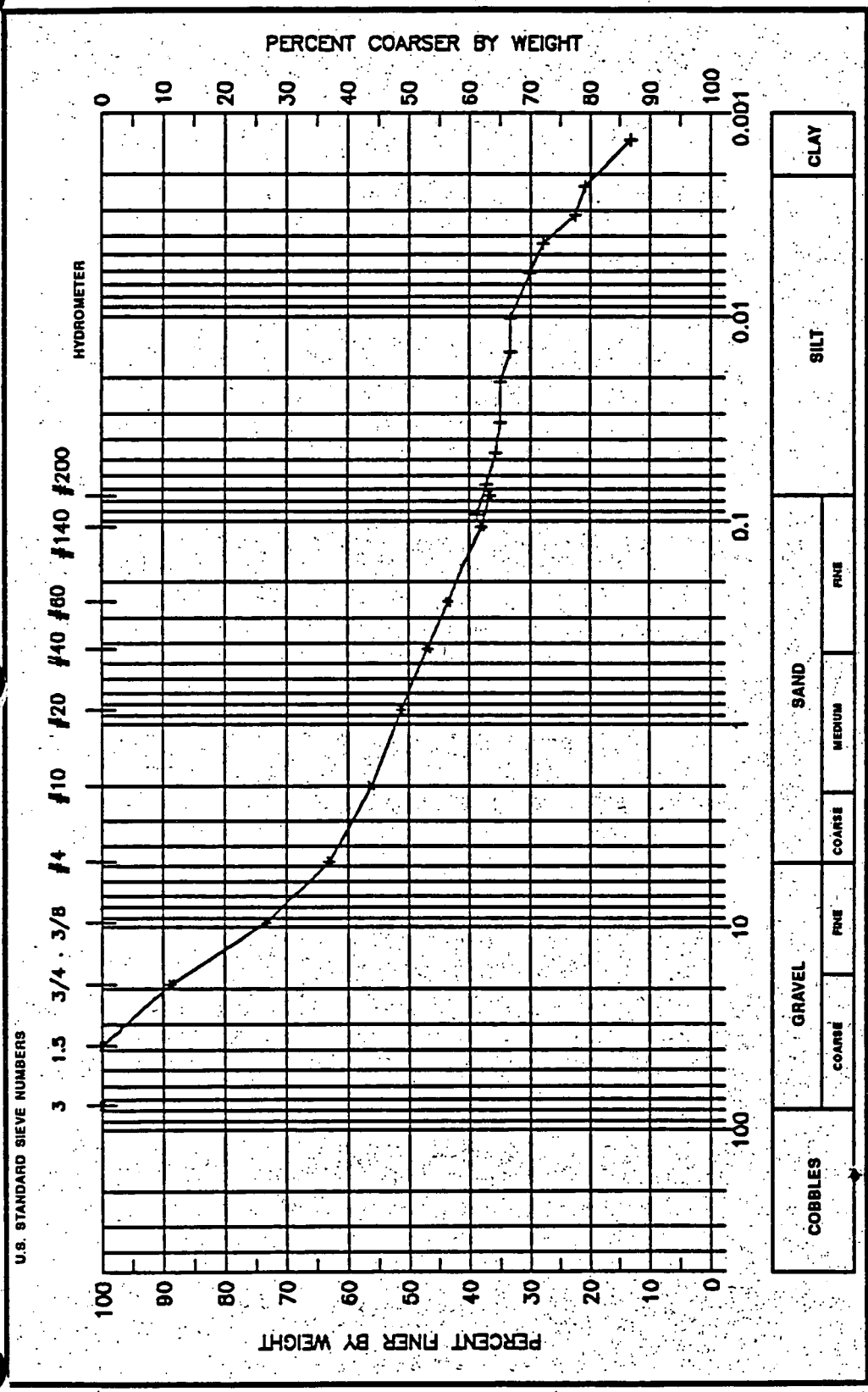
MEDIAN PARTICLE DIAMETER (d50): 0.0014
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



θ_l = 6.5 (%, vol)	d_{10} = --	d_{50} = 0.73	d_{60} = 3.5	Cu= --	Cc= --

SAMPLE NUMBER	DEPTH	USCS CLASSIFICATION
BH40600AE	N/A	Clayey gravel with sand

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40600AE	INITIAL WT:	36.28 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	253.39 (g)
REACTION WITH H2O2:	SLIGHT	WT. PASSING #10:	142.29 (g)
DISPERSANT:	(NaPO3)6	START TIME:	903

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
10/12	0.25	22.0	26.5	1.5	25.0	12.0	0.09246	68.90849	38.70
	0.50	22.0	25.5	1.5	24.0	12.1	0.06583	66.15215	37.15
	1.00	22.0	24.5	1.5	23.0	12.3	0.04686	63.39581	35.60
	2.00	22.0	24.0	1.5	22.5	12.4	0.03324	62.01764	34.83
	5.00	22.0	24.0	1.5	22.5	12.4	0.02103	62.01764	34.83
	10	22.0	23.0	1.5	21.5	12.5	0.01497	59.26130	33.28
	21	22.0	23.0	1.5	21.5	12.5	0.01033	59.26130	33.28
	60	22.0	21.0	1.5	19.5	12.9	0.00619	53.74862	30.18
	120	21.5	21.0	3.0	18.0	12.9	0.00440	49.61411	27.86
	240	21.5	18.0	3.5	14.5	13.3	0.00317	39.96692	22.44
	469	21.5	17.0	3.5	13.5	13.5	0.00228	37.21058	20.90
10/13	1416	21.0	12.0	3.5	8.5	14.3	0.00136	23.42889	13.16

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/08/93
SAMPLE NUMBER: BH40601AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 374.56 (g)
WEIGHT PASSING #10: 238.32 (g)
WEIGHT RETAINED #10: 136.24 (g)
WEIGHT OF HYDROMETER SAMPLE: 49.07 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 77.12 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	374.56	100.00
	1.5"	38.1	0.00	0.00	374.56	100.00
	3/4"	19.0	55.98	55.98	318.58	85.05
	3/8"	9.5	35.32	91.30	283.26	75.62
	4	4.75	22.48	113.78	260.78	69.62
	10	2.00	22.46	136.24	238.32	63.63
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	4.20	32.25	44.87	58.18
	40	0.425	5.20	37.45	39.67	51.44
	60	0.250	3.63	41.08	36.04	46.73
	140	0.106	5.39	46.47	30.65	39.74
	200	0.075	0.87	47.34	29.78	38.61
	dry pan		0.04	47.38	29.74	
	wet pan			29.74	0.00	

d10: -- (mm) d50: 0.37 (mm)
d16: 0.0014 (mm) d60: 1.2 (mm)
d30: 0.0060 (mm) d84: 18 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.37
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: 6.1

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40601AE	INITIAL WT:	49.07 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	374.56 (g)
REACTION WITH H2O2:	SLIGHT	WT. PASSING #10:	238.32 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1040

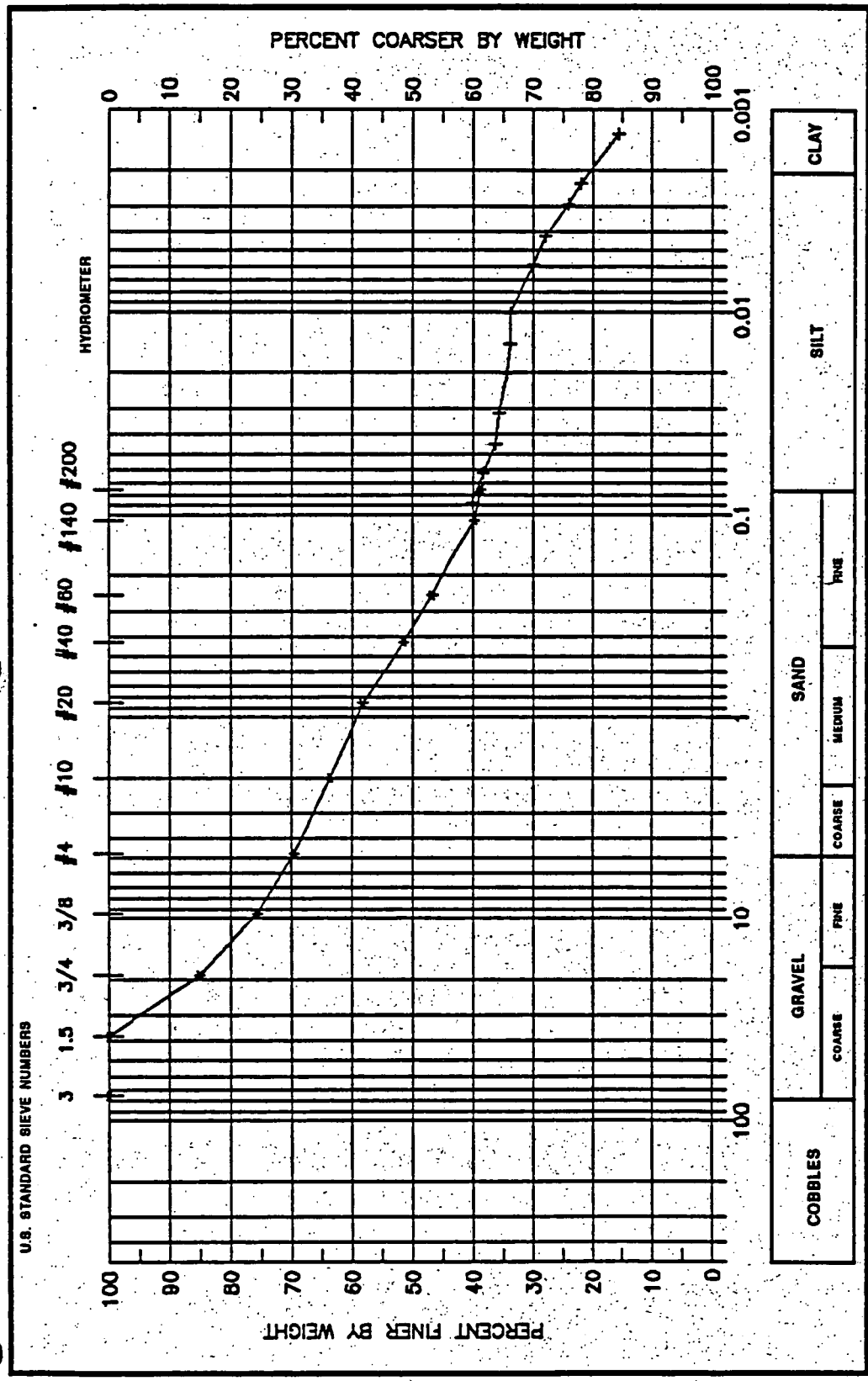
DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	35.0	4.0	31.0	10.6	0.08742	63.17506	40.20
	0.50	21.5	33.5	4.0	29.5	10.8	0.06253	60.11820	38.25
	1.00	21.5	32.0	4.0	28.0	11.1	0.04472	57.06134	36.31
	2.00	21.5	31.5	4.0	27.5	11.1	0.03174	56.04239	35.66
	5.00	21.5	30.5	4.0	26.5	11.3	0.02022	54.00448	34.36
	10	21.5	30.0	4.0	26.0	11.4	0.01435	52.98553	33.71
	20	21.5	30.0	4.0	26.0	11.4	0.01015	52.98553	33.71
	63	21.5	27.0	4.0	23.0	11.9	0.00584	46.87182	29.82
	120	22.0	25.5	4.0	21.5	12.1	0.00425	43.81496	27.88
	257	22.0	22.5	4.0	18.5	12.6	0.00296	37.70124	23.99
	424	22.0	21.0	4.0	17.0	12.9	0.00233	34.64439	22.04
11/12	1394	22.0	16.0	4.0	12.0	13.7	0.00132	24.45486	15.56

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



θ_l= 24.4 (%, vol)	d_{10}= --	d_{50}= 0.37	d_{60}= 1.2	Cu= --	Cc= --	USCS CLASSIFICATION	
SAMPLE NUMBER		DEPTH					
BH40601AE		N/A				Silty sand with gravel	

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/08/93
SAMPLE NUMBER: BH40602AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 447.37 (g)
WEIGHT PASSING #10: 282.36 (g)
WEIGHT RETAINED #10: 165.01 (g)
WEIGHT OF HYDROMETER SAMPLE: 45.48 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 72.06 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	447.37	100.00
	1.5"	38.1	0.00	0.00	447.37	100.00
	3/4"	19.0	82.40	82.40	364.97	81.58
	3/8"	9.5	33.28	115.68	331.69	74.14
	4	4.75	24.85	140.53	306.84	68.59
	10	2.00	24.48	165.01	282.36	63.12
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	4.44	31.02	41.04	56.95
	40	0.425	3.90	34.92	37.14	51.54
	60	0.250	2.99	37.91	34.15	47.39
	140	0.106	5.20	43.11	28.95	40.18
	200	0.075	1.12	44.23	27.83	38.62
	dry pan		0.20	44.43	27.63	
	wet pan			27.63	0.00	

d10: 0.0015 (mm) d50: 0.36 (mm)
d16: 0.0036 (mm) d60: 1.4 (mm)
d30: 0.0097 (mm) d84: 22 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.36
UNIFORMITY COEFFICIENT, Cu (d60/d10): 933
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: 0.045
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: 7.5

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40602AE	INITIAL WT:	45.48 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	447.37 (g)
REACTION WITH H2O2:	NONE	WT. PASSING #10:	282.36 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1134

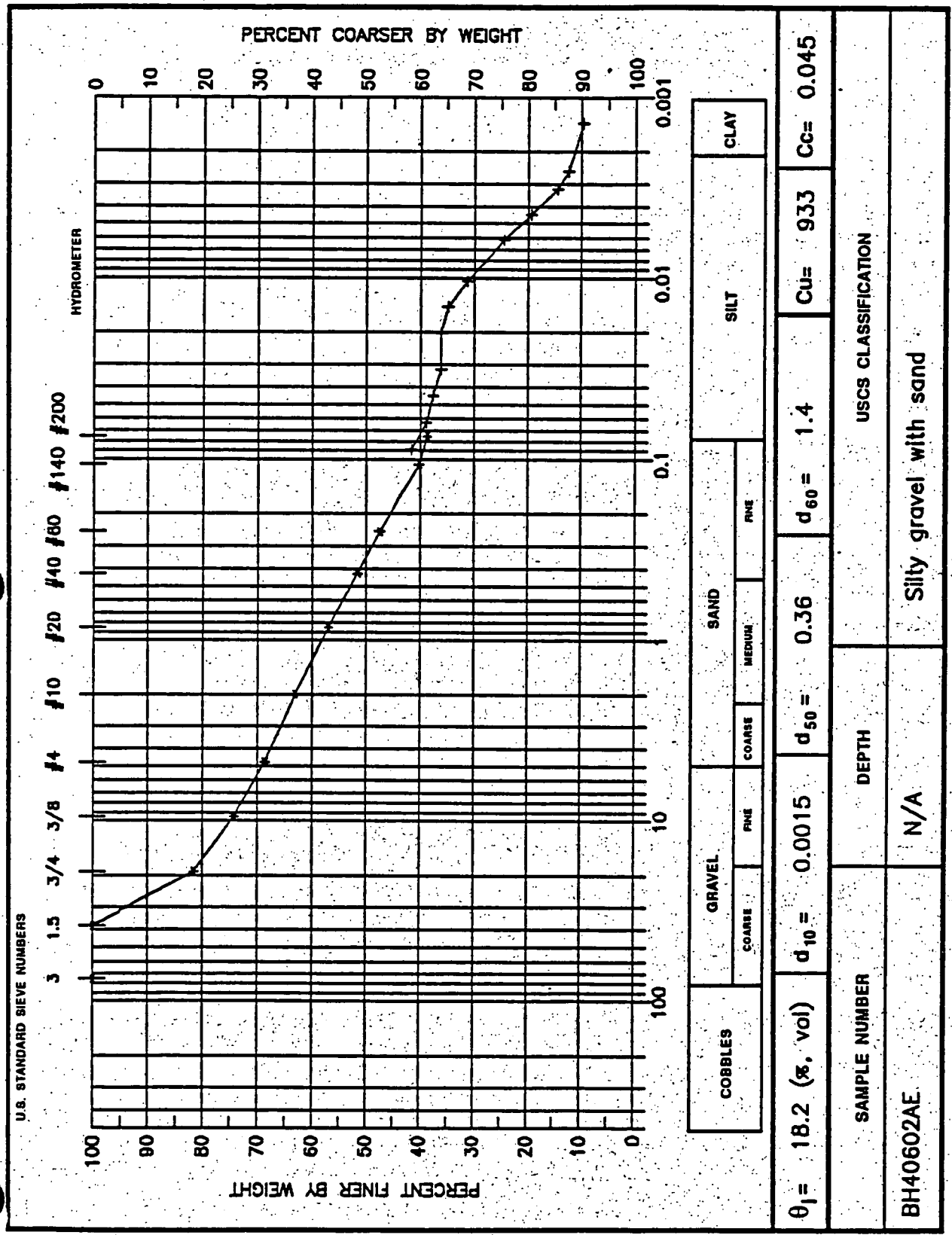
DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	34.0	4.0	30.0	10.7	0.08810	65.96306	41.63
	0.50	21.5	32.0	4.0	28.0	11.1	0.06324	61.56552	38.86
	1.00	21.5	31.0	4.0	27.0	11.2	0.04505	59.36675	37.47
	2.00	21.5	30.0	4.0	26.0	11.4	0.03209	57.16799	36.08
	5.00	21.5	30.0	4.0	26.0	11.4	0.02029	57.16799	36.08
	10	21.5	29.0	4.0	25.0	11.5	0.01445	54.96922	34.69
	20	21.5	26.5	4.0	22.5	12.0	0.01040	49.47230	31.22
	60	22.0	21.5	4.0	17.5	12.8	0.00617	38.47845	24.29
	120	22.0	18.0	4.0	14.0	13.3	0.00446	30.78276	19.43
	240	22.0	14.5	4.0	10.5	13.9	0.00322	23.08707	14.57
	387	22.0	13.0	4.0	9.0	14.2	0.00256	19.78892	12.49
11/12	1350	22.0	11.0	4.0	7.0	14.5	0.00139	15.39138	9.71

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/10/93
SAMPLE NUMBER: BH40603AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 168.71 (g)
WEIGHT PASSING #10: 168.35 (g)
WEIGHT RETAINED #10: 0.36 (g)
WEIGHT OF HYDROMETER SAMPLE: 50.63 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 50.74 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	168.71	100.00
	1.5"	38.1	0.00	0.00	168.71	100.00
	3/4"	19.0	0.00	0.00	168.71	100.00
	3/8"	9.5	0.00	0.00	168.71	100.00
	4	4.75	0.00	0.00	168.71	100.00
	10	2.00	0.36	0.36	168.35	99.79
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.16	0.27	50.47	99.47
	40	0.425	0.10	0.37	50.37	99.27
	60	0.250	0.08	0.45	50.29	99.12
	140	0.106	0.14	0.59	50.15	98.84
	200	0.075	0.07	0.66	50.08	98.70
	dry pan		0.03	0.69	50.05	
	wet pan			50.05	0.00	

d10: -- (mm) d50: 0.0014 (mm)
d16: -- (mm) d60: 0.0017 (mm)
d30: -- (mm) d84: 0.0076 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.0014
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40603AE	INITIAL WT:	50.63 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	168.71 (g)
REACTION WITH H202:	SLIGHT	WT. PASSING #10:	168.35 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1142

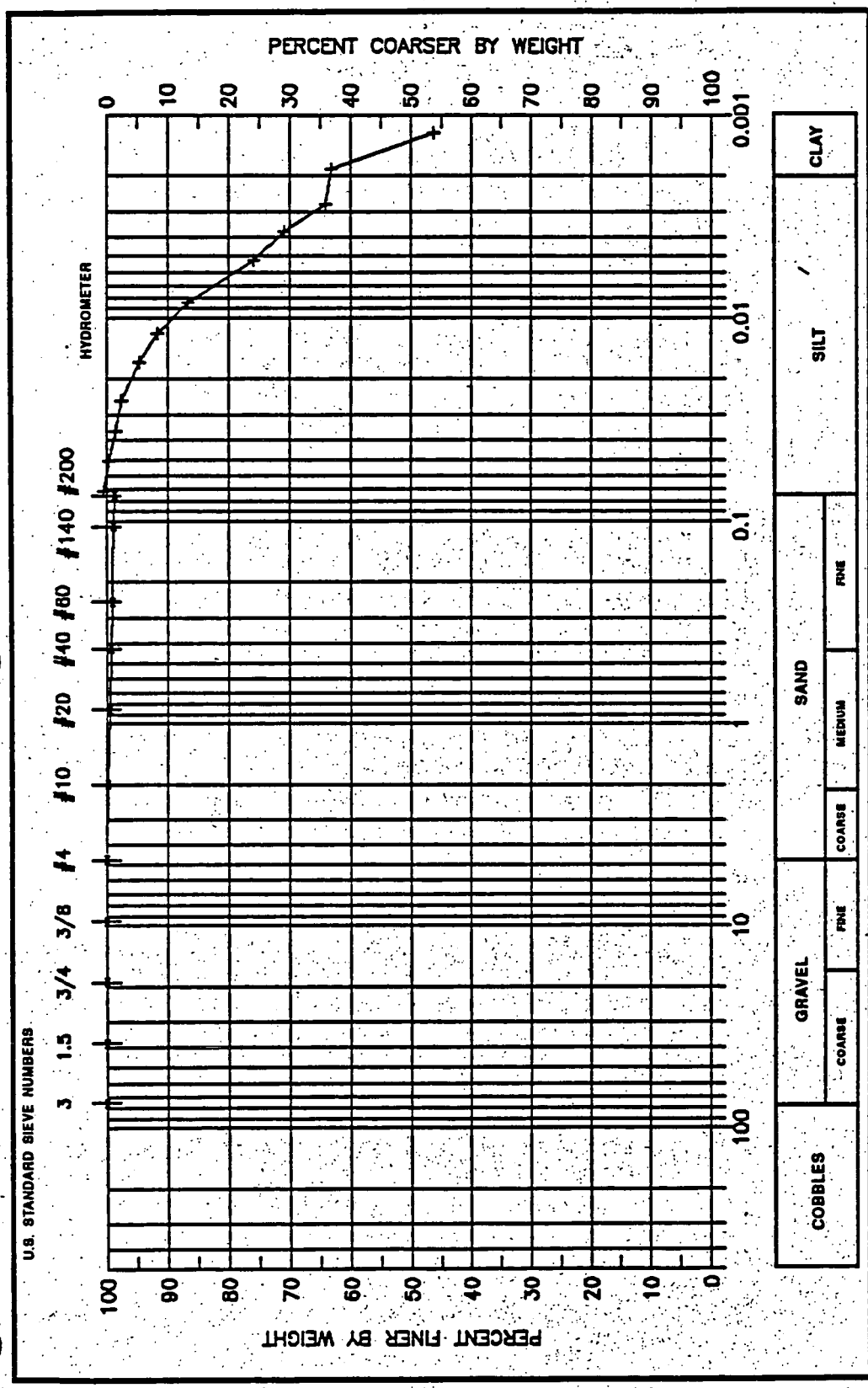
DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/15	0.25	23.0	54.5	3.5	51.0	7.4	0.07170	100.73079	100.52
	0.50	23.0	54.0	3.5	50.5	7.4	0.05098	99.74324	99.53
	1.00	23.0	53.5	3.5	50.0	7.5	0.03625	98.75568	98.54
	2.00	23.0	53.0	3.5	49.5	7.6	0.02577	97.76812	97.56
	5.00	23.0	51.5	3.5	48.0	7.9	0.01656	94.80545	94.60
	10	23.0	50.0	3.5	46.5	8.1	0.01189	91.84278	91.65
	21	23.0	47.5	3.5	44.0	8.5	0.00841	86.90500	86.72
	60	23.0	42.0	3.5	38.5	9.4	0.00523	76.04187	75.88
	120	23.0	39.5	3.5	36.0	9.8	0.00378	71.10409	70.95
	240	23.0	36.0	3.5	32.5	10.4	0.00275	64.19119	64.05
	528	23.0	36.0	4.0	32.0	10.4	0.00185	63.20363	63.07
11/16	1356	23.0	27.5	4.0	23.5	11.8	0.00123	46.41517	46.32

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



θ_1= 31.4 (%, vol)	d_{10}= --	d_{50}= 0.0014	d_{60}= 0.0017	Cu= --	Cc= --

SAMPLE NUMBER	DEPTH	USCS CLASSIFICATION
BH40603AE	N/A	Lean clay

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40604AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 170.41 (g)
WEIGHT PASSING #10: 170.41 (g)
WEIGHT RETAINED #10: 0.00 (g)
WEIGHT OF HYDROMETER SAMPLE: 29.88 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 29.88 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	170.41	100.00
	1.5"	38.1	0.00	0.00	170.41	100.00
	3/4"	19.0	0.00	0.00	170.41	100.00
	3/8"	9.5	0.00	0.00	170.41	100.00
	4	4.75	0.00	0.00	170.41	100.00
	10	2.00	0.00	0.00	170.41	100.00
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.01	0.01	29.87	99.98
	40	0.425	0.00	0.01	29.87	99.96
	60	0.250	0.03	0.04	29.84	99.86
	140	0.106	0.04	0.08	29.80	99.73
	200	0.075	0.02	0.10	29.78	99.66
	dry pan		0.01	0.11	29.77	
	wet pan			29.77	0.00	

d10: -- (mm) d50: 0.0014 (mm)
d16: -- (mm) d60: 0.0025 (mm)
d30: -- (mm) d84: 0.0061 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.0014
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: C. Pigman/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40604AE	INITIAL WT:	29.88
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	170.41
REACTION WITH H2O2:	MODERATE	WT. PASSING #10:	170.41
DISPERSANT:	(NaPO3)6	START TIME:	851

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)
10/12	0.25	22.0	32.5	1.5	31.0	11.0	0.08857	103.75
	0.50	22.0	32.0	1.5	30.5	11.1	0.06287	102.07
	1.00	22.0	31.5	1.5	30.0	11.1	0.04462	100.40
	2.00	22.0	31.0	1.5	29.5	11.2	0.03166	98.73
	5.00	22.0	30.5	1.5	29.0	11.3	0.02010	97.05
	10	22.0	30.5	1.5	29.0	11.3	0.01421	97.05
	21	22.0	29.5	1.5	28.0	11.5	0.00988	93.71
	60	22.0	26.5	1.5	25.0	12.0	0.00597	83.67
	120	21.5	24.5	3.0	21.5	12.3	0.00430	71.95
	240	21.5	22.5	3.5	19.0	12.6	0.00308	63.59
	479	21.5	21.0	3.5	17.5	12.9	0.00220	58.57
10/13	1425	21.0	18.0	3.5	14.5	13.3	0.00131	48.53

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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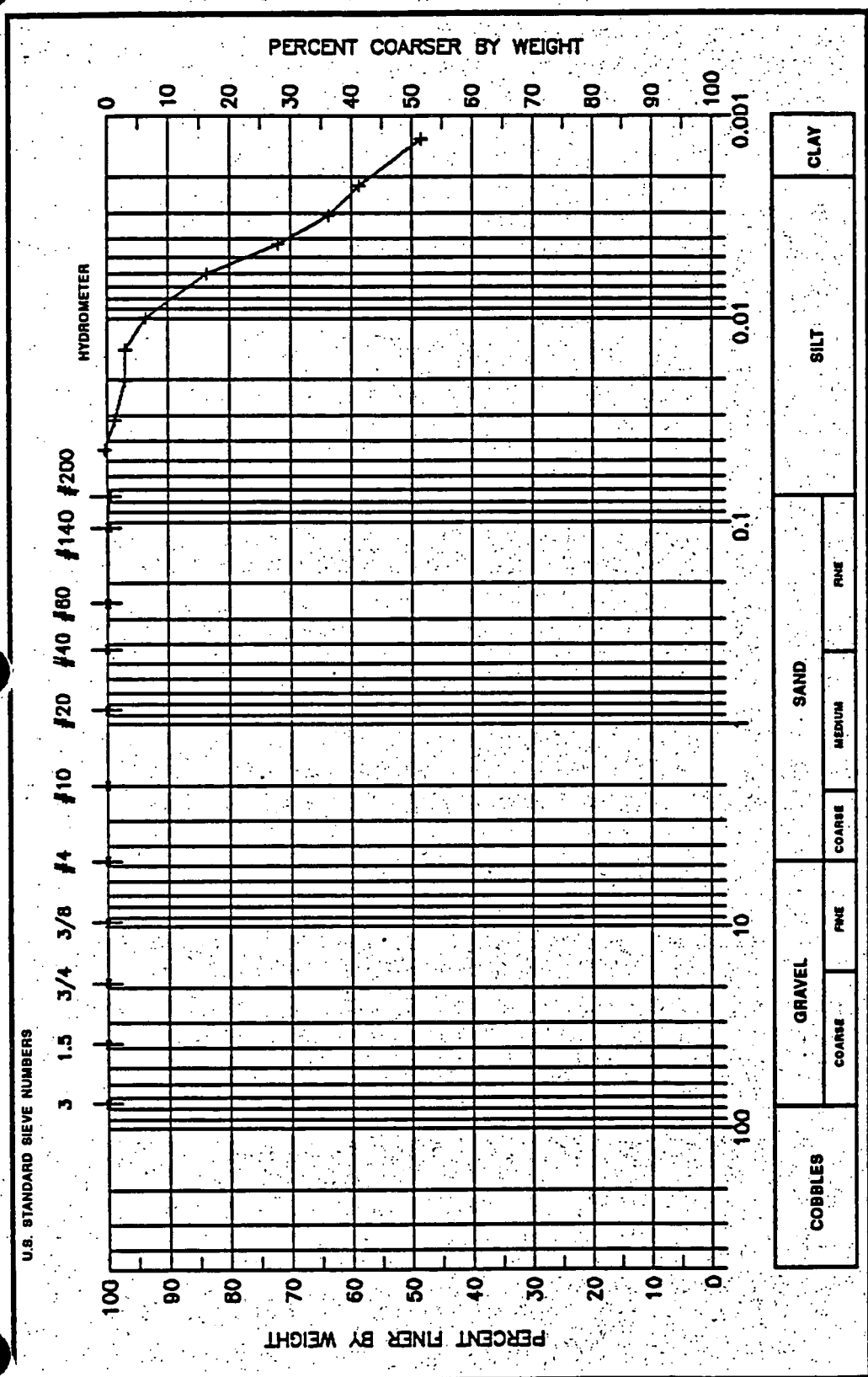
ENVIRONMENTAL SCIENTISTS AND ENGINEERS



θ_i = 35.5 (%, vol)	d_{10} = --	d_{50} = 0.0014	d_{60} = 0.0025	Cu= --	Cc= --	
SAMPLE NUMBER		DEPTH		USCS CLASSIFICATION		
BH40604AE		N/A		Fat clay		

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40605AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 179.94 (g)
WEIGHT PASSING #10: 178.52 (g)
WEIGHT RETAINED #10: 1.42 (g)
WEIGHT OF HYDROMETER SAMPLE: 42.19 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 42.53 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	179.94	100.00
	1.5"	38.1	0.00	0.00	179.94	100.00
	3/4"	19.0	0.00	0.00	179.94	100.00
	3/8"	9.5	0.00	0.00	179.94	100.00
	4	4.75	0.16	0.16	179.78	99.91
	10	2.00	1.26	1.42	178.52	99.21
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.51	0.85	41.68	98.01
	40	0.425	0.29	1.14	41.39	97.33
	60	0.250	0.47	1.61	40.92	96.22
	140	0.106	2.24	3.85	38.68	90.96
	200	0.075	0.44	4.29	38.24	89.92
	dry pan		0.10	4.39	38.14	
	wet pan			38.14	0.00	

d10: -- (mm) d50: -- (mm)
d16: -- (mm) d60: 0.0018 (mm)
d30: -- (mm) d84: 0.0082 (mm)

MEDIAN PARTICLE DIAMETER (d50): --
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40605AE	INITIAL WT:	42.19 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	179.94 (g)
REACTION WITH H202:	MODERATE	WT. PASSING #10:	178.52 (g)
DISPERSANT:	(NaPO3)6	START TIME:	909

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
10/12	0.25	22.0	42.0	1.5	40.5	9.4	0.08205	95.99431	95.24
	0.50	22.0	41.0	1.5	39.5	9.6	0.05852	93.62408	92.89
	1.00	22.0	40.5	1.5	39.0	9.7	0.04156	92.43897	91.71
	2.00	22.0	40.0	1.5	38.5	9.7	0.02951	91.25385	90.53
	5.00	22.0	40.0	1.5	38.5	9.7	0.01866	91.25385	90.53
	10	22.0	40.0	1.5	38.5	9.7	0.01320	91.25385	90.53
	21	22.0	38.5	1.5	37.0	10.0	0.00922	87.69851	87.01
	60	21.5	35.5	3.0	32.5	10.5	0.00562	77.03247	76.42
	120	21.5	33.5	3.0	30.5	10.8	0.00404	72.29201	71.72
	240	21.5	32.0	3.5	28.5	11.1	0.00289	67.55155	67.02
	464	21.5	30.0	3.5	26.5	11.4	0.00211	62.81109	62.32
10/13	1411	21.0	27.0	3.5	23.5	11.9	0.00124	55.70040	55.26

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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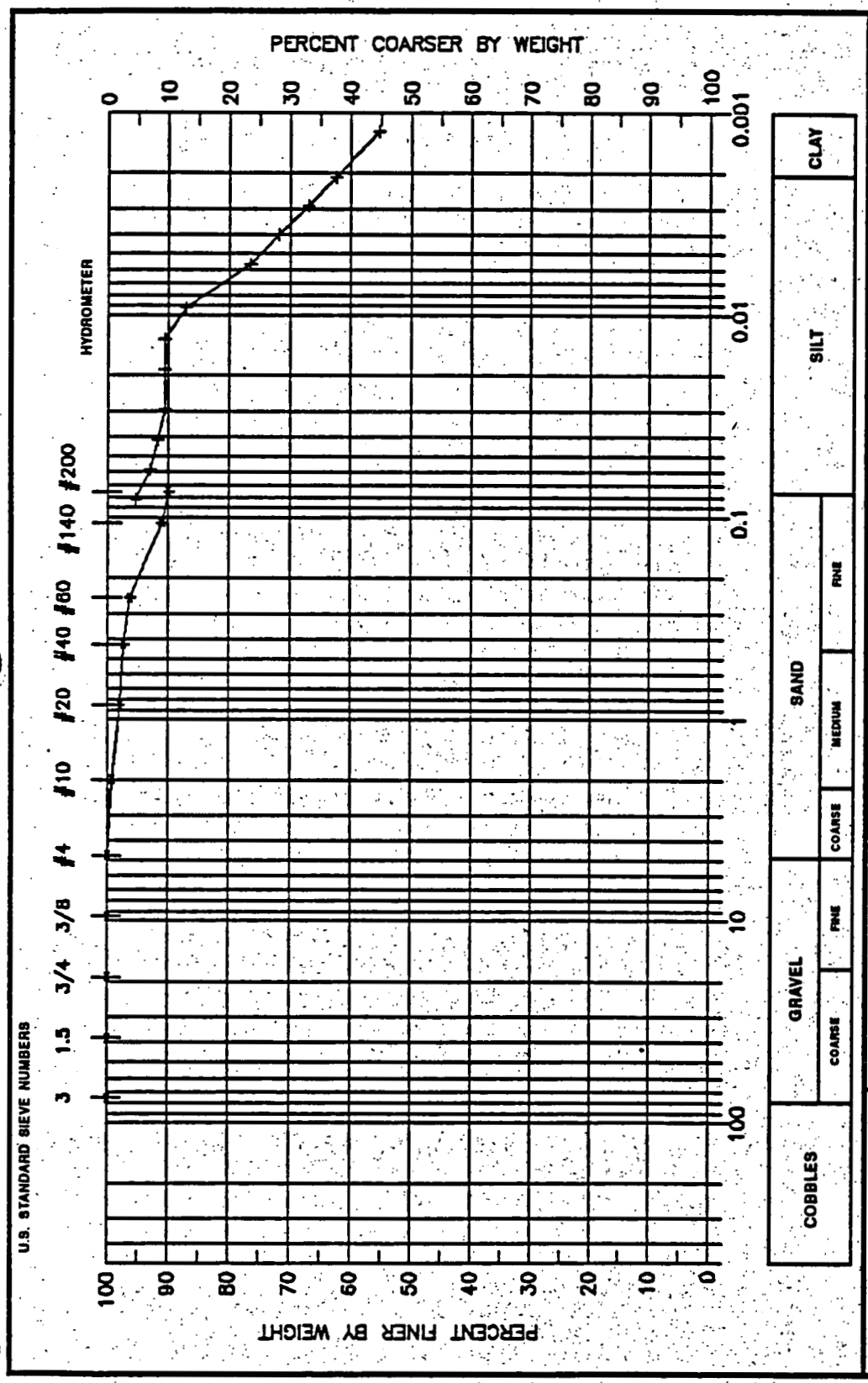

θ_l = 34.8 (%, vol)	d_{10} = --	d_{50} = --	d_{60} = 0.0018	Cu= --	Cc= --	USCS CLASSIFICATION	Fat clay
SAMPLE NUMBER		DEPTH					
BH40605AE		N/A					

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/08/93
SAMPLE NUMBER: BH40606AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 248.86 (g)
WEIGHT PASSING #10: 178.87 (g)
WEIGHT RETAINED #10: 69.99 (g)
WEIGHT OF HYDROMETER SAMPLE: 46.68 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 64.95 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	248.86	100.00
	1.5"	38.1	0.00	0.00	248.86	100.00
	3/4"	19.0	52.79	52.79	196.07	78.79
	3/8"	9.5	13.29	66.08	182.78	73.45
	4	4.75	0.54	66.62	182.24	73.23
	10	2.00	3.37	69.99	178.87	71.88
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.74	19.01	45.94	70.74
	40	0.425	0.68	19.69	45.26	69.69
	60	0.250	0.86	20.55	44.40	68.37
	140	0.106	4.79	25.34	39.61	60.99
	200	0.075	2.10	27.44	37.51	57.76
	dry pan		0.47	27.91	37.04	
	wet pan			37.04	0.00	

d10: -- (mm) d50: 0.035 (mm)
d16: -- (mm) d60: 0.097 (mm)
d30: 0.0027 (mm) d84: 24 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.035
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

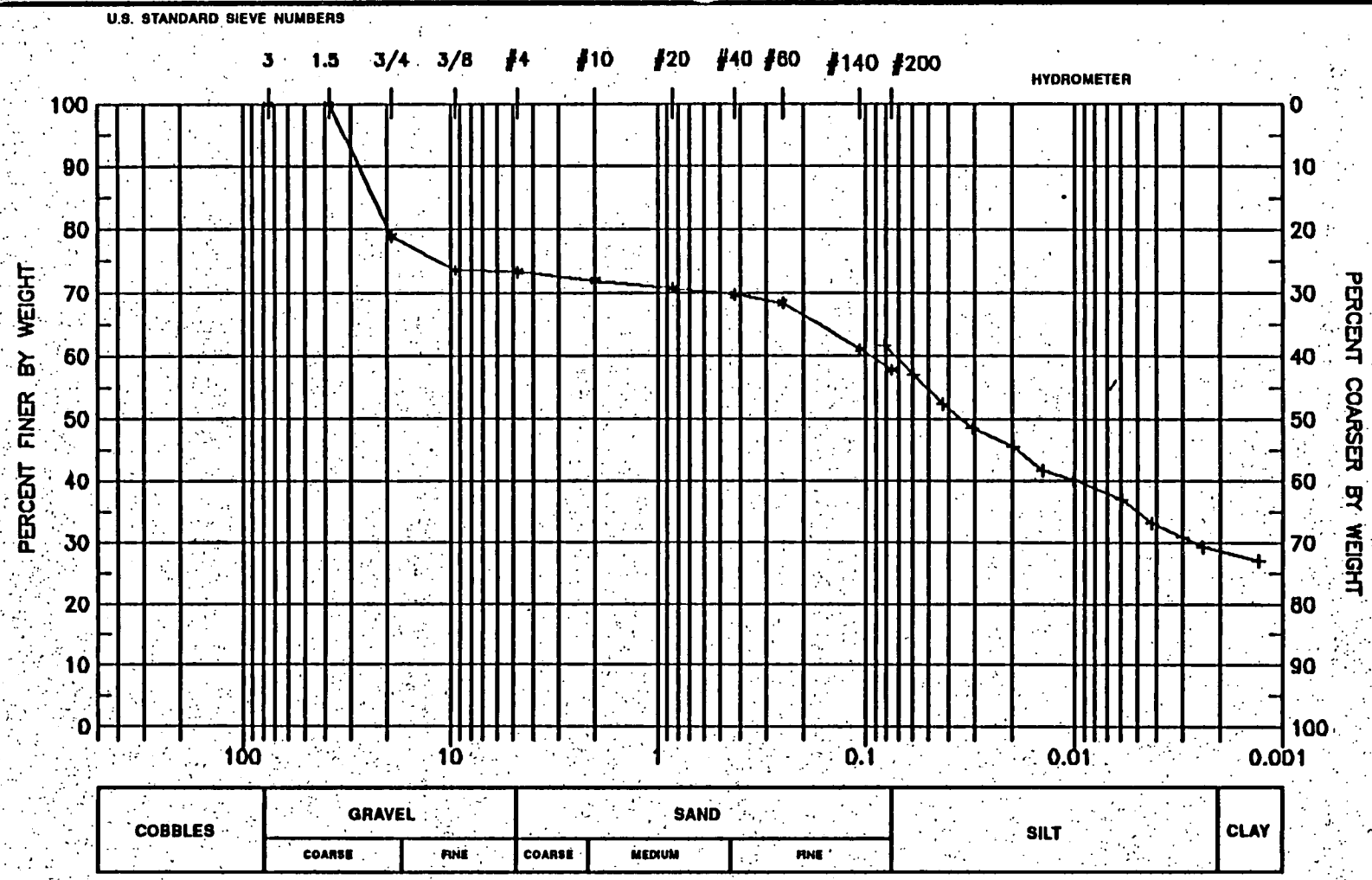
HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40606AE	INITIAL WT:	46.68 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	248.86 (g)
REACTION WITH H202:	MODERATE	WT. PASSING #10:	178.87 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1128

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	44.0	4.0	40.0	9.1	0.08109	85.68980	61.59
	0.50	21.5	41.0	4.0	37.0	9.6	0.05887	79.26307	56.97
	1.00	21.5	38.0	4.0	34.0	10.1	0.04268	72.83633	52.35
	2.00	21.5	35.5	4.0	31.5	10.5	0.03079	67.48072	48.50
	5.00	21.5	33.5	4.0	29.5	10.8	0.01978	63.19623	45.42
	10	21.5	31.0	4.0	27.0	11.2	0.01425	57.84062	41.57
	20	21.5	30.0	4.0	26.0	11.4	0.01015	55.69837	40.03
	60	22.0	28.0	4.0	24.0	11.7	0.00591	51.41388	36.95
	120	22.0	25.5	4.0	21.5	12.1	0.00425	46.05827	33.10
	240	22.0	24.0	4.0	20.0	12.4	0.00303	42.84490	30.80
	387	22.0	23.0	4.0	19.0	12.5	0.00241	40.70266	29.26
11/12	1355	22.0	21.5	4.0	17.5	12.8	0.00130	37.48929	26.95

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny



θ_l = 23.2 (%, vol)	d_{10} = --	d_{50} = 0.035	d_{60} = 0.097	Cu= --	Cc= --

SAMPLE NUMBER	DEPTH	USCS CLASSIFICATION
BH40606AE	N/A	Gravelly lean clay with sand

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

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WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/08/93
SAMPLE NUMBER: BH40607AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 344.00 (g)
WEIGHT PASSING #10: 221.34 (g)
WEIGHT RETAINED #10: 122.66 (g)
WEIGHT OF HYDROMETER SAMPLE: 48.42 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 75.25 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	344.00	100.00
	1.5"	38.1	0.00	0.00	344.00	100.00
	3/4"	19.0	11.47	11.47	332.53	96.67
	3/8"	9.5	68.92	80.39	263.61	76.63
	4	4.75	21.36	101.75	242.25	70.42
	10	2.00	20.91	122.66	221.34	64.34
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	3.28	30.11	45.14	59.98
	40	0.425	1.69	31.80	43.45	57.74
	60	0.250	1.26	33.06	42.19	56.06
	140	0.106	3.98	37.04	38.21	50.78
	200	0.075	1.02	38.06	37.19	49.42
	dry pan		0.11	38.17	37.08	
	wet pan			37.08	0.00	

d10: -- (mm) d50: 0.088 (mm)
d16: -- (mm) d60: 0.85 (mm)
d30: 0.0092 (mm) d84: 13 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.088
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40607AE	INITIAL WT:	48.42 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	344.00 (g)
REACTION WITH H202:	SLIGHT	WT. PASSING #10:	221.34 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1116

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	40.0	4.0	36.0	9.7	0.08396	74.34944	47.84
	0.50	21.5	37.5	4.0	33.5	10.2	0.06061	69.18629	44.52
	1.00	21.5	34.5	4.0	30.5	10.6	0.04388	62.99050	40.53
	2.00	21.5	32.0	4.0	28.0	11.1	0.03162	57.82734	37.21
	5.00	21.5	30.0	4.0	26.0	11.4	0.02029	53.69682	34.55
	10	21.5	28.5	4.0	24.5	11.6	0.01450	50.59893	32.56
	21	21.5	27.0	4.0	23.0	11.9	0.01011	47.50103	30.56
	60	22.0	25.0	4.0	21.0	12.2	0.00603	43.37051	27.91
	120	22.0	23.5	4.0	19.5	12.4	0.00431	40.27261	25.91
	240	22.0	22.0	4.0	18.0	12.7	0.00307	37.17472	23.92
	397	22.0	21.5	4.0	17.5	12.8	0.00240	36.14209	23.25
11/12	1365	22.0	19.5	4.0	15.5	13.1	0.00131	32.01157	20.60

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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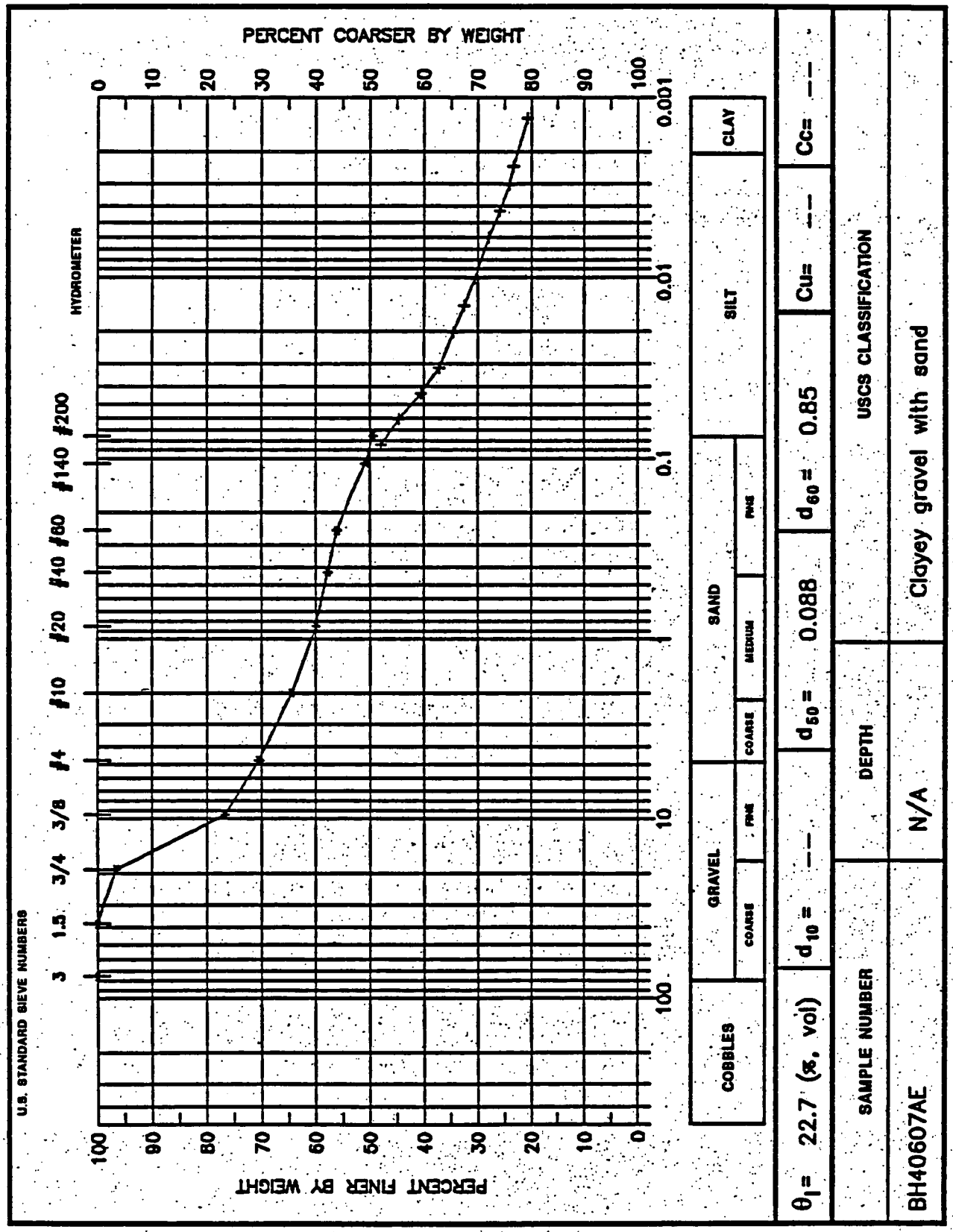

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ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/08/93
SAMPLE NUMBER: BH40608AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 300.06 (g)
WEIGHT PASSING #10: 104.17 (g)
WEIGHT RETAINED #10: 195.89 (g)
WEIGHT OF HYDROMETER SAMPLE: 42.73 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 123.08 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	300.06	100.00
	1.5"	38.1	0.00	0.00	300.06	100.00
	3/4"	19.0	111.67	111.67	188.39	62.78
	3/8"	9.5	43.41	155.08	144.98	48.32
	4	4.75	20.60	175.68	124.38	41.45
	10	2.00	20.21	195.89	104.17	34.72
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	4.84	85.19	37.89	30.78
	40	0.425	3.35	88.54	34.54	28.06
	60	0.250	2.64	91.18	31.90	25.92
	140	0.106	7.64	98.82	24.26	19.71
	200	0.075	2.70	101.52	21.56	17.52
	dry pan		0.56	102.08	21.00	
	wet pan			21.00	0.00	

d10: 0.0040 (mm) d50: 11 (mm)
d16: 0.045 (mm) d60: 17 (mm)
d30: 0.73 (mm) d84: 30 (mm)

MEDIAN PARTICLE DIAMETER (d50): 11
UNIFORMITY COEFFICIENT, Cu (d60/d10): 4250
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: 7.8
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: 14

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40608AE	INITIAL WT:	42.73 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	300.06 (g)
REACTION WITH H2O2:	MODERATE	WT. PASSING #10:	104.17 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1052

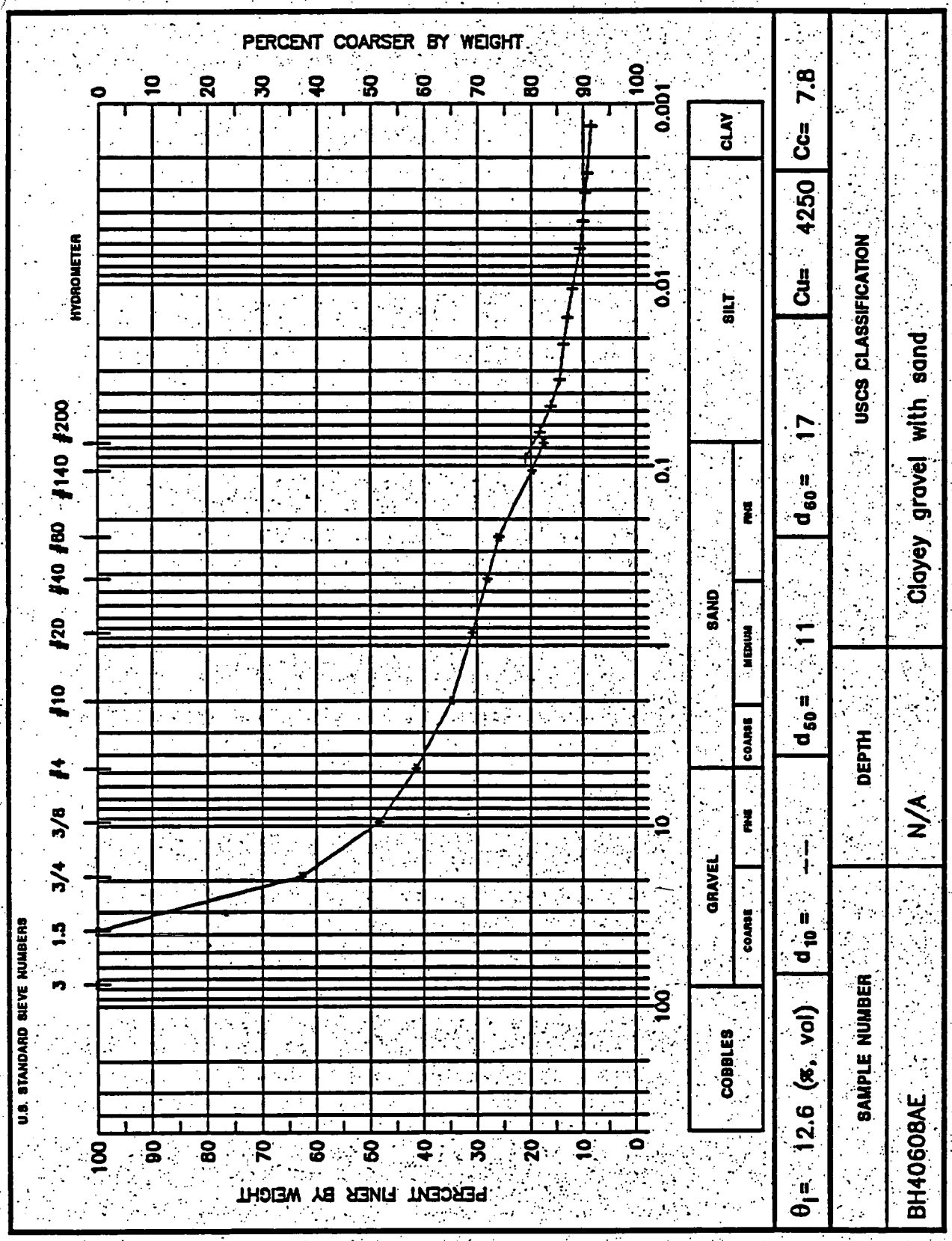
DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	30.0	4.0	26.0	11.4	0.09075	60.84718	21.12
	0.50	21.5	26.5	4.0	22.5	12.0	0.06577	52.65621	18.28
	1.00	21.5	24.0	4.0	20.0	12.4	0.04730	46.80552	16.25
	2.00	21.5	22.0	4.0	18.0	12.7	0.03388	42.12497	14.62
	5.00	21.5	21.0	4.0	17.0	12.9	0.02157	39.78469	13.81
	10	21.5	20.0	4.0	16.0	13.0	0.01535	37.44442	13.00
	21	21.5	19.0	4.0	15.0	13.2	0.01066	35.10414	12.19
	60	21.5	17.0	4.0	13.0	13.5	0.00638	30.42359	10.56
	120	22.0	16.5	4.0	12.5	13.6	0.00450	29.25345	10.16
	247	22.0	16.0	4.0	12.0	13.7	0.00315	28.08331	9.75
	416	22.0	15.5	4.0	11.5	13.8	0.00243	26.91318	9.34
11/12	1385	22.0	14.5	4.0	10.5	13.9	0.00134	24.57290	8.53

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40609AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 199.13 (g)
WEIGHT PASSING #10: 198.99 (g)
WEIGHT RETAINED #10: 0.14 (g)
WEIGHT OF HYDROMETER SAMPLE: 78.46 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 78.52 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	199.13	100.00
	1.5"	38.1	0.00	0.00	199.13	100.00
	3/4"	19.0	0.00	0.00	199.13	100.00
	3/8"	9.5	0.00	0.00	199.13	100.00
	4	4.75	0.00	0.00	199.13	100.00
	10	2.00	0.14	0.14	198.99	99.93
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.07	0.13	78.39	99.84
	40	0.425	0.47	0.60	77.92	99.24
	60	0.250	5.34	5.94	72.58	92.44
	140	0.106	34.91	40.85	37.67	47.98
	200	0.075	6.11	46.96	31.56	40.20
	dry pan		4.92	51.88	26.64	
	wet pan			26.64	0.00	

d10: -- (mm) d50: 0.11 (mm)
d16: 0.0039 (mm) d60: 0.14 (mm)
d30: 0.040 (mm) d84: 0.22 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.11
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: 0.11

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40609AE	INITIAL WT:	78.46 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	199.13 (g)
REACTION WITH H2O2:	MODERATE	WT. PASSING #10:	198.99 (g)
DISPERSANT:	(NaPO3)6	START TIME:	845

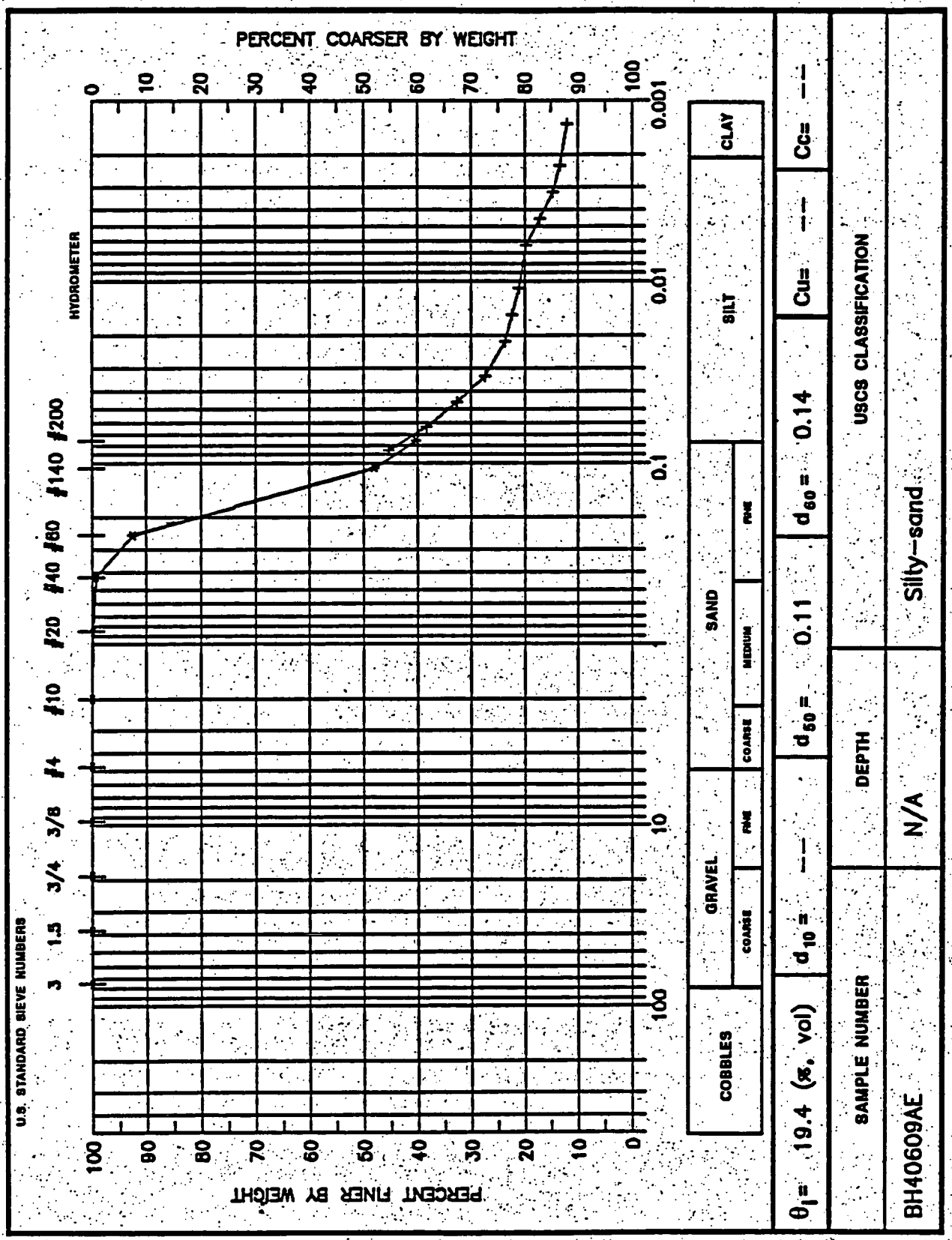
DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
10/12	0.25	22.0	37.0	1.5	35.5	10.2	0.08555	45.24599	45.21
	0.50	22.0	31.5	1.5	30.0	11.1	0.06310	38.23604	38.21
	1.00	22.0	27.0	1.5	25.5	11.9	0.04607	32.50064	32.48
	2.00	22.0	23.0	1.5	21.5	12.5	0.03346	27.40250	27.38
	5.00	22.0	20.0	1.5	18.5	13.0	0.02158	23.57889	23.56
	10	22.0	19.0	1.5	17.5	13.2	0.01535	22.30436	22.29
	20	22.0	18.0	1.5	16.5	13.3	0.01092	21.02982	21.02
	60	22.0	17.0	1.5	15.5	13.5	0.00635	19.75529	19.74
	121	21.5	16.5	3.0	13.5	13.6	0.00451	17.20622	17.19
	240	21.5	15.0	3.5	11.5	13.8	0.00323	14.65715	14.65
	483	21.5	14.0	3.5	10.5	14.0	0.00229	13.38262	13.37
10/13	1428	21.0	13.0	3.5	9.5	14.2	0.00135	12.10808	12.10

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 10/01/93
SAMPLE NUMBER: BH40610AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 134.87 (g)
WEIGHT PASSING #10: 134.03 (g)
WEIGHT RETAINED #10: 0.84 (g)
WEIGHT OF HYDROMETER SAMPLE: 32.38 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 32.58 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	134.87	100.00
	1.5"	38.1	0.00	0.00	134.87	100.00
	3/4"	19.0	0.00	0.00	134.87	100.00
	3/8"	9.5	0.00	0.00	134.87	100.00
	4	4.75	0.00	0.00	134.87	100.00
	10	2.00	0.84	0.84	134.03	99.38
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	0.32	0.52	32.06	98.40
	40	0.425	0.13	0.65	31.93	98.00
	60	0.250	0.09	0.74	31.84	97.72
	140	0.106	0.28	1.02	31.56	96.86
	200	0.075	0.38	1.40	31.18	95.69
	dry pan		0.23	1.63	30.95	
	wet pan			30.95	0.00	

d10: -- (mm) d50: 0.0027 (mm)
d16: -- (mm) d60: 0.0049 (mm)
d30: -- (mm) d84: 0.020 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.0027
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: N. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	10/08/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40610AE	INITIAL WT:	32.38 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	134.87 (g)
REACTION WITH H2O2:	MODERATE	WT. PASSING #10:	134.03 (g)
DISPERSANT:	(NaPO3)6	START TIME:	915

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
10/12	0.25	22.0	34.0	1.5	32.5	10.7	0.08758	100.37060	99.75
	0.50	22.0	33.0	1.5	31.5	10.9	0.06240	97.28227	96.68
	1.20	22.0	31.5	1.5	30.0	11.1	0.04073	92.64978	92.07
	2.00	22.0	30.0	1.5	28.5	11.4	0.03190	88.01729	87.47
	5.00	22.0	29.0	1.5	27.5	11.5	0.02032	84.92897	84.40
	10	22.0	28.0	1.5	26.5	11.7	0.01447	81.84064	81.33
	21	22.0	26.5	1.5	25.0	12.0	0.01009	77.20815	76.73
	60	21.5	24.0	3.0	21.0	12.4	0.00611	64.85485	64.45
	120	21.5	22.0	3.0	19.0	12.7	0.00437	58.67820	58.31
	240	21.5	20.5	3.5	17.0	12.9	0.00312	52.50154	52.17
	459	21.5	19.0	3.5	15.5	13.2	0.00228	47.86905	47.57
10/13	1407	21.0	17.0	3.5	13.5	13.5	0.00133	41.69240	41.43

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: R. Hill/J. Kelsey

CALCULATIONS MADE BY: R. Hill

CHECKED BY: M. Ankeny

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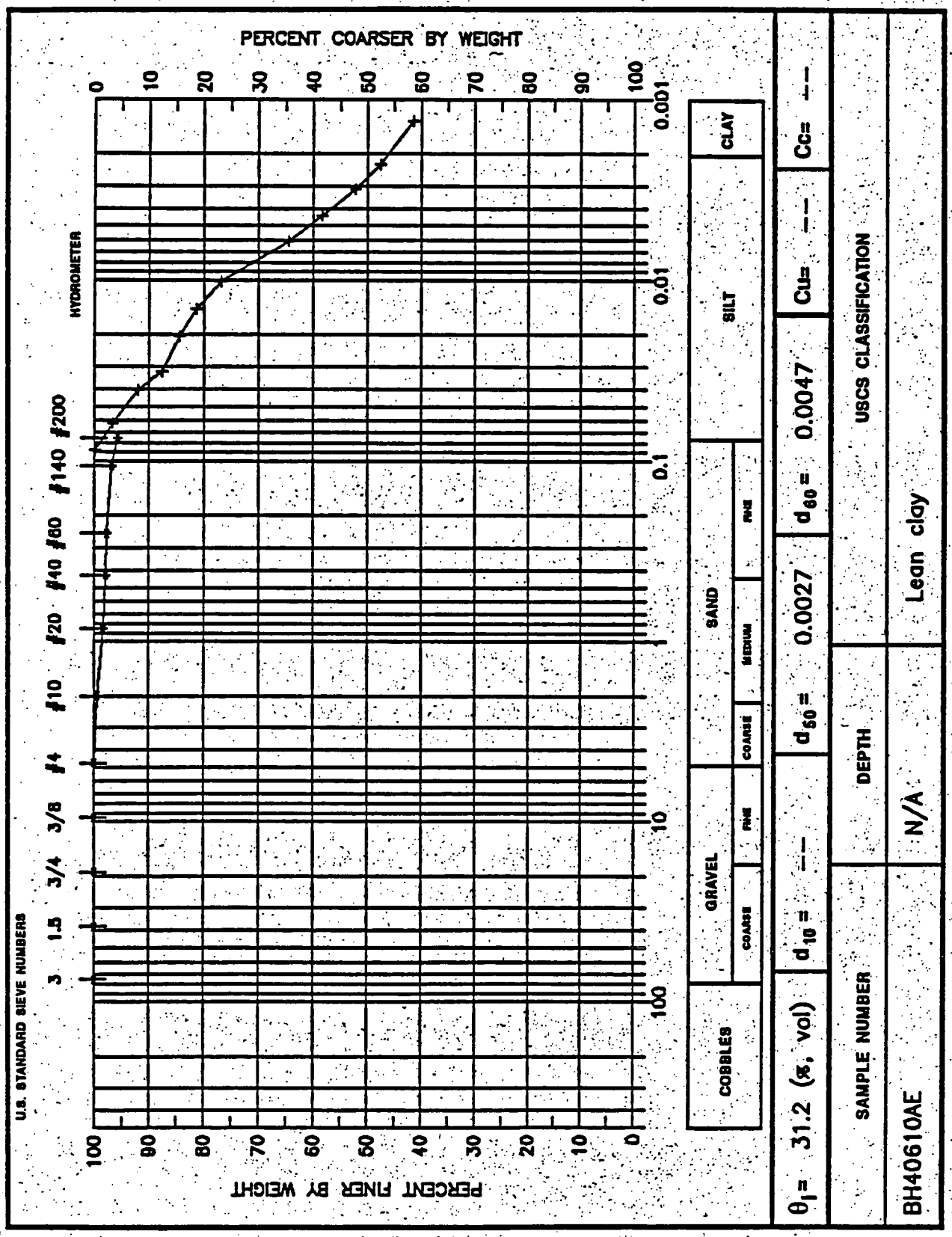

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/13/93
SAMPLE NUMBER: BH40611AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 117.63 (g)
WEIGHT PASSING #10: 64.48 (g)
WEIGHT RETAINED #10: 53.15 (g)
WEIGHT OF HYDROMETER SAMPLE: 42.66 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 77.82 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	117.63	100.00
	1.5"	38.1	0.00	0.00	117.63	100.00
	3/4"	19.0	39.00	39.00	78.63	66.85
	3/8"	9.5	3.12	42.12	75.51	64.19
	4	4.75	5.54	47.66	69.97	59.48
	10	2.00	5.49	53.15	64.48	54.82
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	3.37	38.53	39.29	50.49
	40	0.425	2.46	40.99	36.83	47.32
	60	0.250	1.72	42.71	35.11	45.11
	140	0.106	2.74	45.45	32.37	41.59
	200	0.075	0.76	46.21	31.61	40.62
	dry pan		0.06	46.27	31.55	
	wet pan			31.55	0.00	

d10: -- (mm) d50: 0.72 (mm)
d16: -- (mm) d60: 5.3 (mm)
d30: -- (mm) d84: 29 (mm)

MEDIAN PARTICLE DIAMETER (d50): 0.72
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: --

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/13/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40611AE	INITIAL WT:	42.66 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	117.63 (g)
REACTION WITH H202:	SLIGHT	WT. PASSING #10:	64.48 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1130

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/15	0.25	23.0	35.5	3.5	32.0	10.5	0.08553	75.01172	41.12
	0.50	23.0	34.5	3.5	31.0	10.6	0.06095	72.66760	39.83
	1.00	23.0	34.0	3.5	30.5	10.7	0.04326	71.49555	39.19
	2.00	23.0	33.0	3.5	29.5	10.9	0.03083	69.15143	37.91
	5.00	23.0	32.5	3.5	29.0	11.0	0.01957	67.97937	37.26
	10	23.0	32.0	3.5	28.5	11.1	0.01389	66.80731	36.62
	21	23.0	32.0	3.5	28.5	11.1	0.00958	66.80731	36.62
	60	23.0	31.0	3.5	27.5	11.2	0.00571	64.46320	35.34
	120	23.0	31.0	3.5	27.5	11.2	0.00404	64.46320	35.34
	240	23.0	31.0	3.5	27.5	11.2	0.00286	64.46320	35.34
	538	23.0	31.5	4.0	27.5	11.1	0.00190	64.46320	35.34
11/16	1360	23.0	31.0	4.0	27.0	11.2	0.00120	63.29114	34.69

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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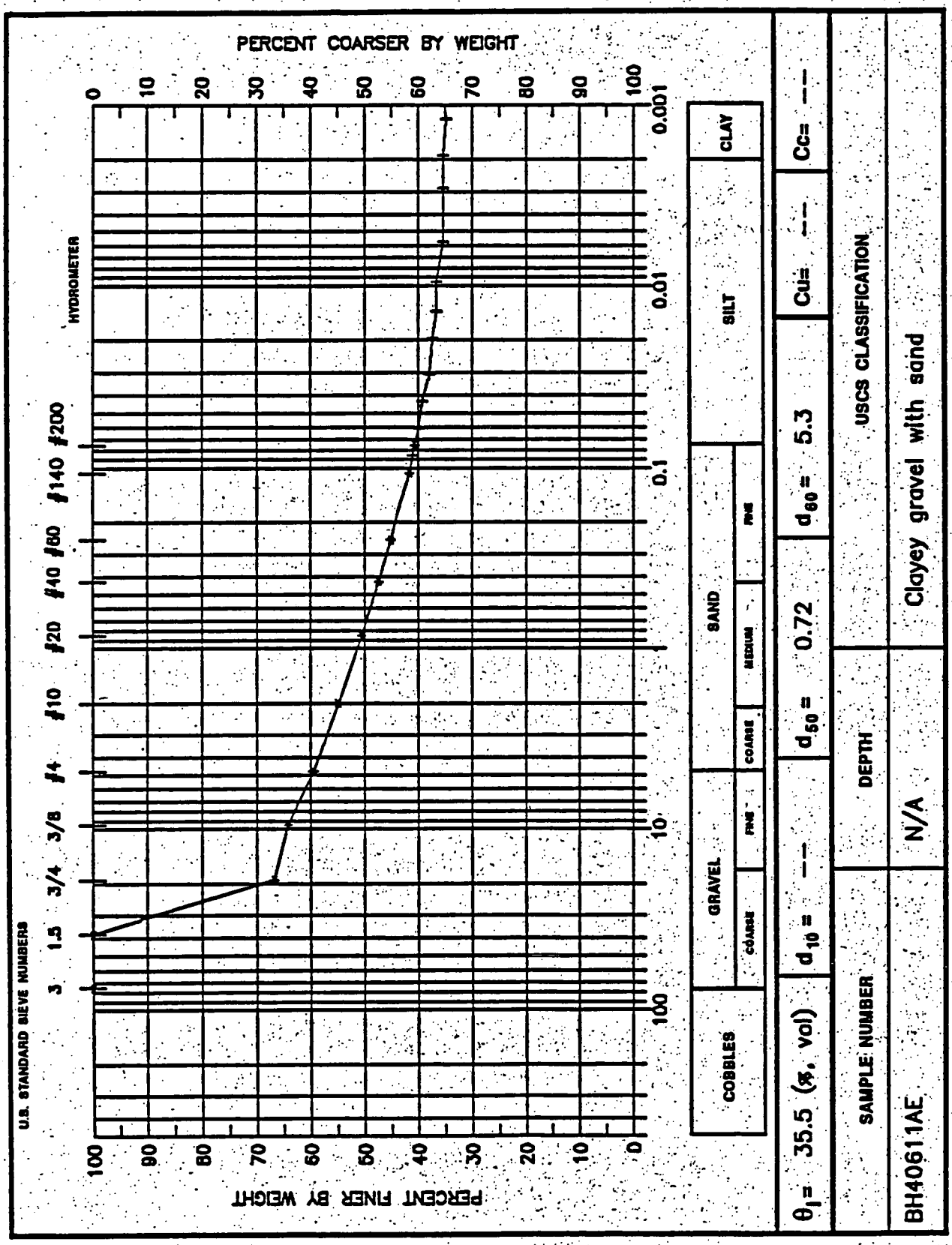
ENVIRONMENTAL SCIENTISTS AND ENGINEERS



DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/13/93
SAMPLE NUMBER: BH40612AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 404.26 (g)
WEIGHT PASSING #10: 145.97 (g)
WEIGHT RETAINED #10: 258.29 (g)
WEIGHT OF HYDROMETER SAMPLE: 53.11 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 147.09 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	404.26	100.00
	1.5"	38.1	0.00	0.00	404.26	100.00
	3/4"	19.0	92.45	92.45	311.81	77.13
	3/8"	9.5	89.12	181.57	222.69	55.09
	4	4.75	47.61	229.18	175.08	43.31
	10	2.00	29.11	258.29	145.97	36.11
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	8.93	102.91	44.18	30.04
	40	0.425	6.87	109.78	37.31	25.37
	60	0.250	4.31	114.09	33.00	22.44
	140	0.106	7.00	121.09	26.00	17.68
	200	0.075	2.11	123.20	23.89	16.24
	dry pan		1.97	125.17	21.92	
	wet pan			21.92	0.00	

d10: 0.0048 (mm) d50: 7.4 (mm)
d16: 0.070 (mm) d60: 12 (mm)
d30: 0.85 (mm) d84: 25 (mm)

MEDIAN PARTICLE DIAMETER (d50): 7.4
UNIFORMITY COEFFICIENT, Cu (d60/d10): 2500
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: 13
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: 11

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/13/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40612AE	INITIAL WT:	53.11 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	404.26 (g)
REACTION WITH H2O2:	SLIGHT	WT. PASSING #10:	145.97 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1136

DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/15	0.25	23.0	30.0	3.5	26.5	11.4	0.08913	49.89644	18.02
	0.50	23.0	28.5	3.5	25.0	11.6	0.06370	47.07211	17.00
	1.00	23.0	25.5	3.5	22.0	12.1	0.04599	41.42346	14.96
	2.00	23.0	24.5	3.5	21.0	12.3	0.03274	39.54058	14.28
	5.00	23.0	23.0	3.5	19.5	12.5	0.02091	36.71625	13.26
	10	23.0	21.5	3.5	18.0	12.8	0.01493	33.89192	12.24
	21	23.0	21.0	3.5	17.5	12.9	0.01034	32.95048	11.90
	60	23.0	19.0	3.5	15.5	13.2	0.00619	29.18471	10.54
	120	23.0	18.0	3.5	14.5	13.3	0.00441	27.30183	9.86
	240	23.0	17.0	3.5	13.5	13.5	0.00313	25.41894	9.18
	533	23.0	17.0	4.0	13.0	13.5	0.00210	24.47750	8.84
11/16	1358	23.0	15.0	4.0	11.0	13.8	0.00133	20.71173	7.48

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

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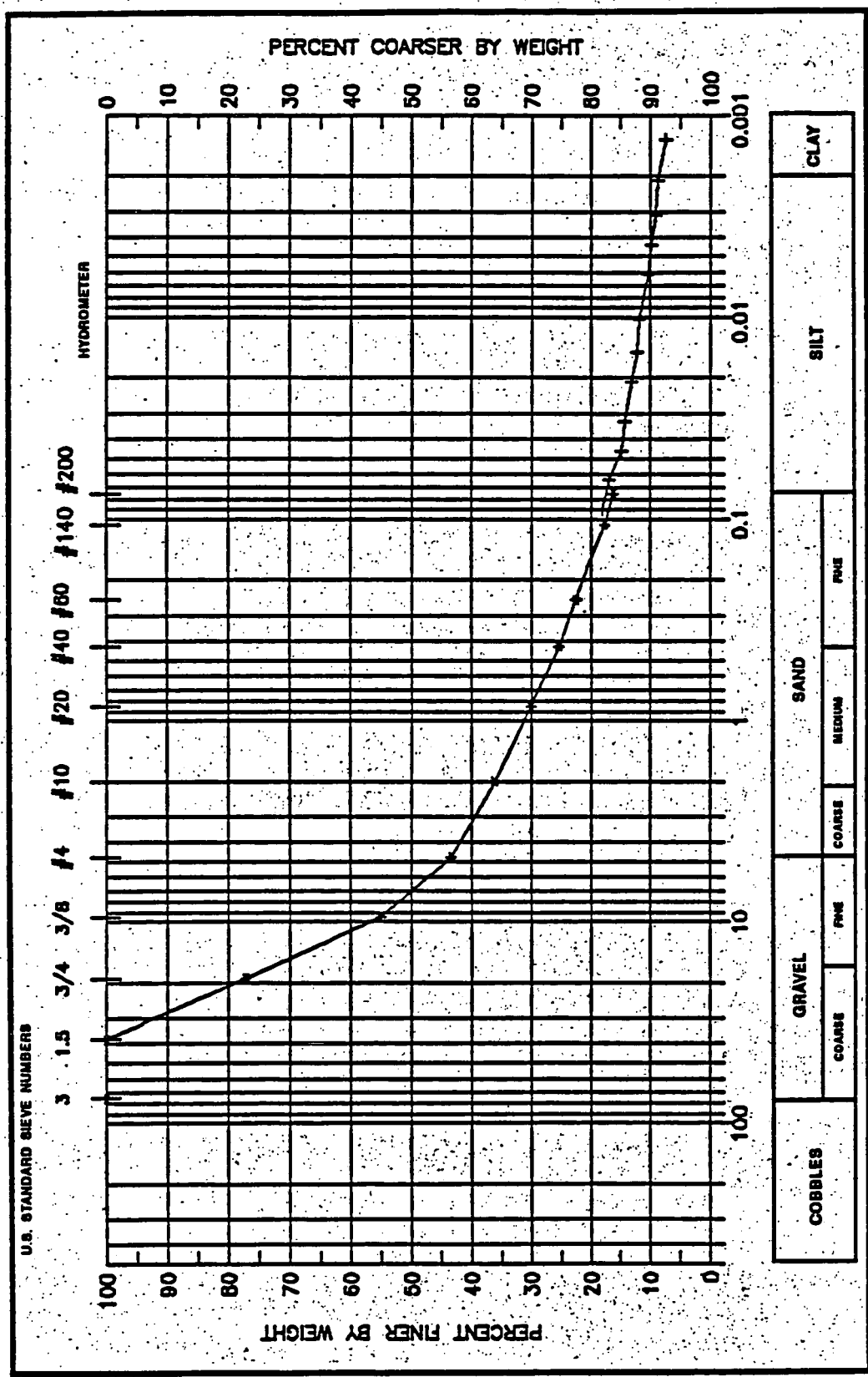


θ_l= 17.9 (%, vol)	d_{10}= 0.0048	d_{50}= 7.4	d_{60}= 12	Cu= 2500	Cc= 13		
SAMPLE NUMBER		DEPTH		USCS CLASSIFICATION			
BH40612AE		N/A		Clayey gravel with sand			

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

WET SIEVE ANALYSIS DATA

JOB NAME: ESI
JOB NUMBER: 3858
TEST DATE: 11/01/93
SAMPLE NUMBER: BH40613AE
DEPTH: N/A
INITIAL DRY WEIGHT OF SAMPLE: 312.58 (g)
WEIGHT PASSING #10: 99.42 (g)
WEIGHT RETAINED #10: 213.16 (g)
WEIGHT OF HYDROMETER SAMPLE: 79.82 (g)
CALCULATED WEIGHT OF SIEVE SAMPLE: 250.96 (g)

TEST FRACTION	SIEVE NUMBER	DIAMETER (mm)	WT. RETAINED	CUM WT. RETAINED	WT. PASSING	% PASSING
+10						
	3"	75	0.00	0.00	312.58	100.00
	1.5"	38.1	0.00	0.00	312.58	100.00
	3/4"	19.0	115.15	115.15	197.43	63.16
	3/8"	9.5	40.24	155.39	157.19	50.29
	4	4.75	30.11	185.50	127.08	40.66
	10	2.00	27.66	213.16	99.42	31.81
-10		(BASED ON CALCULATED SIEVE WT.)				
	20	0.85	9.59	180.73	70.23	27.98
	40	0.425	4.97	185.70	65.26	26.00
	60	0.250	4.48	190.18	60.78	24.22
	140	0.106	8.81	198.99	51.97	20.71
	200	0.075	2.80	201.79	49.17	19.59
	dry pan		0.72	202.51	48.45	
	wet pan			48.45	0.00	

d10: -- (mm) d50: 9.4 (mm)
d16: 0.0080 (mm) d60: 17 (mm)
d30: 1.5 (mm) d84: 30 (mm)

MEDIAN PARTICLE DIAMETER (d50): 9.4
UNIFORMITY COEFFICIENT, Cu (d60/d10): --
COEFFICIENT OF CURVATURE, Cc, [(d30)**2/(d10*d60)]: --
MEAN PARTICLE DIAMETER, [(d16+d50+d84)/3]: 13

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: N. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

HYDROMETER DATA

JOB NAME:	ESI	TEST DATE:	11/10/93
JOB NUMBER:	3858	DEPTH:	N/A
SAMPLE NUMBER:	BH40613AE	INITIAL WT:	79.82 (g)
TYPE OF WATER USED:	DISTILLED	TOTAL SAMPLE WT:	312.58 (g)
REACTION WITH H202:	NONE	WT. PASSING #10:	99.42 (g)
DISPERSANT:	(NaPO3)6	START TIME:	1046

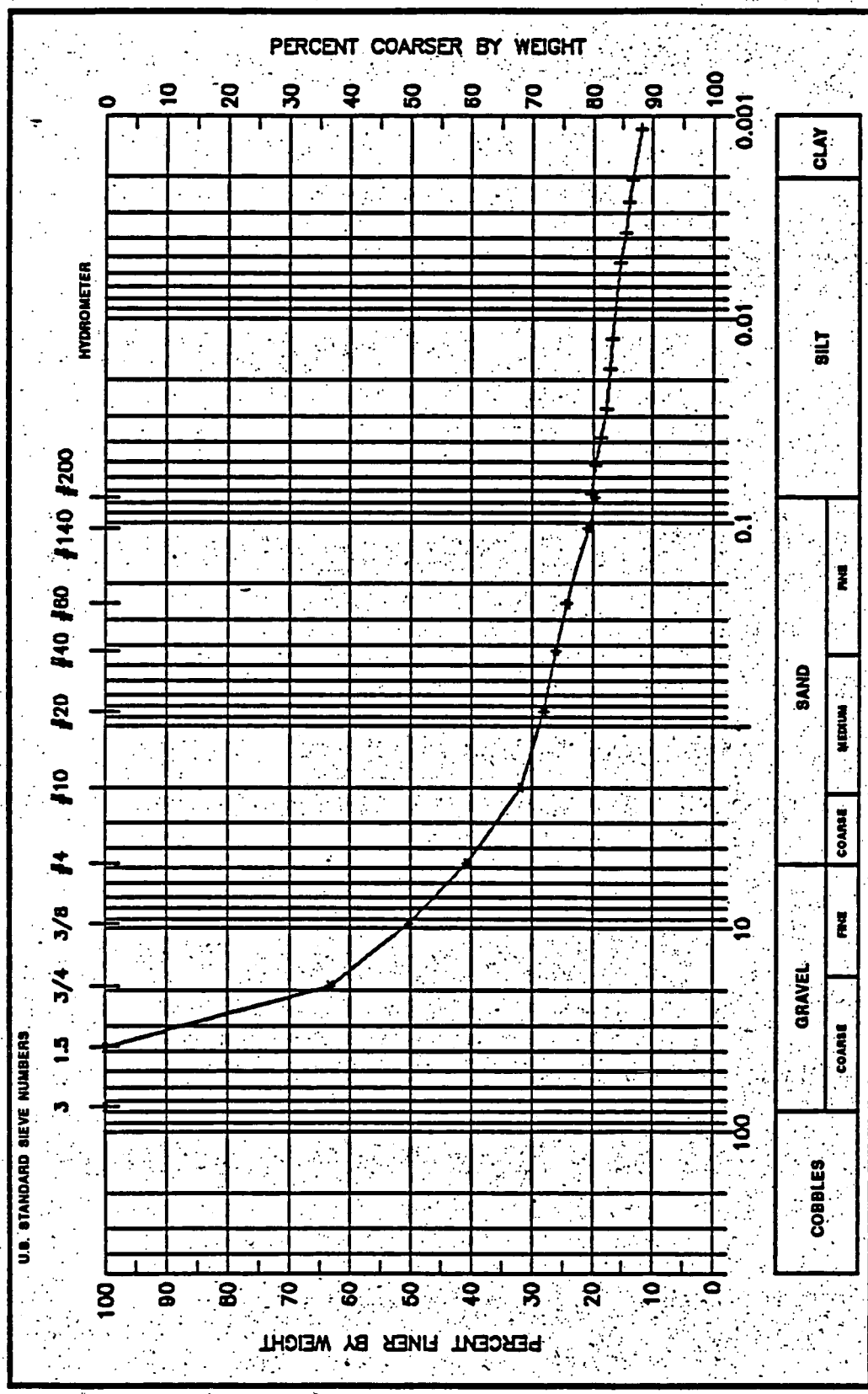
DATE	TIME (MIN)	TEMP (C)	R (g/l)	Rl (g/l)	Rcorr (g/l)	L (CM)	D (MM)	P (%)	%FINER
11/11	0.25	21.5	55.0	4.0	51.0	7.3	0.07260	63.89376	20.32
	0.50	21.5	53.0	4.0	49.0	7.6	0.05248	61.38812	19.53
	1.00	21.5	50.5	4.0	46.5	8.0	0.03809	58.25608	18.53
	2.00	21.5	48.5	4.0	44.5	8.3	0.02748	55.75044	17.73
	5.00	21.5	47.0	4.0	43.0	8.6	0.01763	53.87121	17.13
	10	21.5	46.0	4.0	42.0	8.8	0.01259	52.61839	16.74
	21	21.0	44.5	4.0	40.5	9.0	0.00886	50.73916	16.14
	60	21.0	43.0	4.0	39.0	9.3	0.00531	48.85993	15.54
	120	22.0	40.5	4.0	36.5	9.7	0.00379	45.72789	14.54
	252	22.0	39.0	4.0	35.0	9.9	0.00265	43.84866	13.95
	420	22.0	37.5	4.0	33.5	10.2	0.00208	41.96943	13.35
11/12	1390	22.0	34.0	4.0	30.0	10.7	0.00117	37.58457	11.95

COMMENTS: Assume mean particle density is 2.65 g/cc

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik/J. Kelsey
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



θ_i = 23.2 (%, vol)	d_{10} = ---	d_{50} = 9.4	d_{60} = 17	Cu= ---	Cc= ---	USCS CLASSIFICATION	Clayey gravel with sand
SAMPLE NUMBER		DEPTH					
BH40613AE		N/A					

APPENDIX G

ATTERBERG LIMITS

SUMMARY OF ATTERBERG LIMITS

Sample Number	Liquid Limit (%, g/g)	Plastic Limit (%, g/g)	Plasticity Index (%, g/g)
BH40396AE	34	15	19
BH40397AE	49	26	23
BH40398AE	44	18	26
BH40401AE	61	26	35
BH40402AE	54	26	28
BH40403AE	50	17	32
BH40404AE	66	24	42
BH40405AE		NOT TESTED*	
BH40406AE	49	20	29
BH40407AE	79	38	41
BH40408AE	53	20	33
BH40600AE	30	20	10
BH40601AE	47	26	20
BH40602AE		NOT TESTED*	
BH40603AE	49	20	29
BH40604AE	79	24	55

* Not enough sample to run test

SUMMARY OF ATTERBERG LIMITS (CONTINUED)

Sample Number	Liquid Limit (%, g/g)	Plastic Limit (%, g/g)	Plasticity Index (%, g/g)
BH40605AE	72	26	46
BH40606AE	43	22	21
BH40607AE	40	21	19
BH40608AE	31	17	13
BH40609AE	23	19	3
BH40610AE	48	23	25
BH40611AE	107	33	74
BH40612AE		NOT TESTED*	
BH40613AE		NOT TESTED*	

* Not enough sample to run test

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40396AE
DEPTH: N/A
TEST DATE: 10/27/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	30	22	14
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	15.30	14.52	14.90
WEIGHT OF PAN + DRY SOIL (g):	13.47	12.84	13.01
WEIGHT OF PAN (g):	7.96	7.94	7.74
WEIGHT OF WATER (g):	1.83	1.68	1.89
WEIGHT OF DRY SOIL (g):	5.51	4.90	5.27
GRAVIMETRIC MOISTURE CONTENT (%):	33.21	34.29	35.86

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 33.8 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	2	3
WEIGHT OF PAN + MOIST SOIL (g):	9.22	10.32
WEIGHT OF PAN + DRY SOIL (g):	9.04	10.01
WEIGHT OF PAN (g):	7.79	8.01
WEIGHT OF WATER (g):	0.18	0.31
WEIGHT OF DRY SOIL (g):	1.25	2.00
GRAVIMETRIC MOISTURE CONTENT (%):	14.40	15.50

PLASTIC LIMIT (%): 14.95

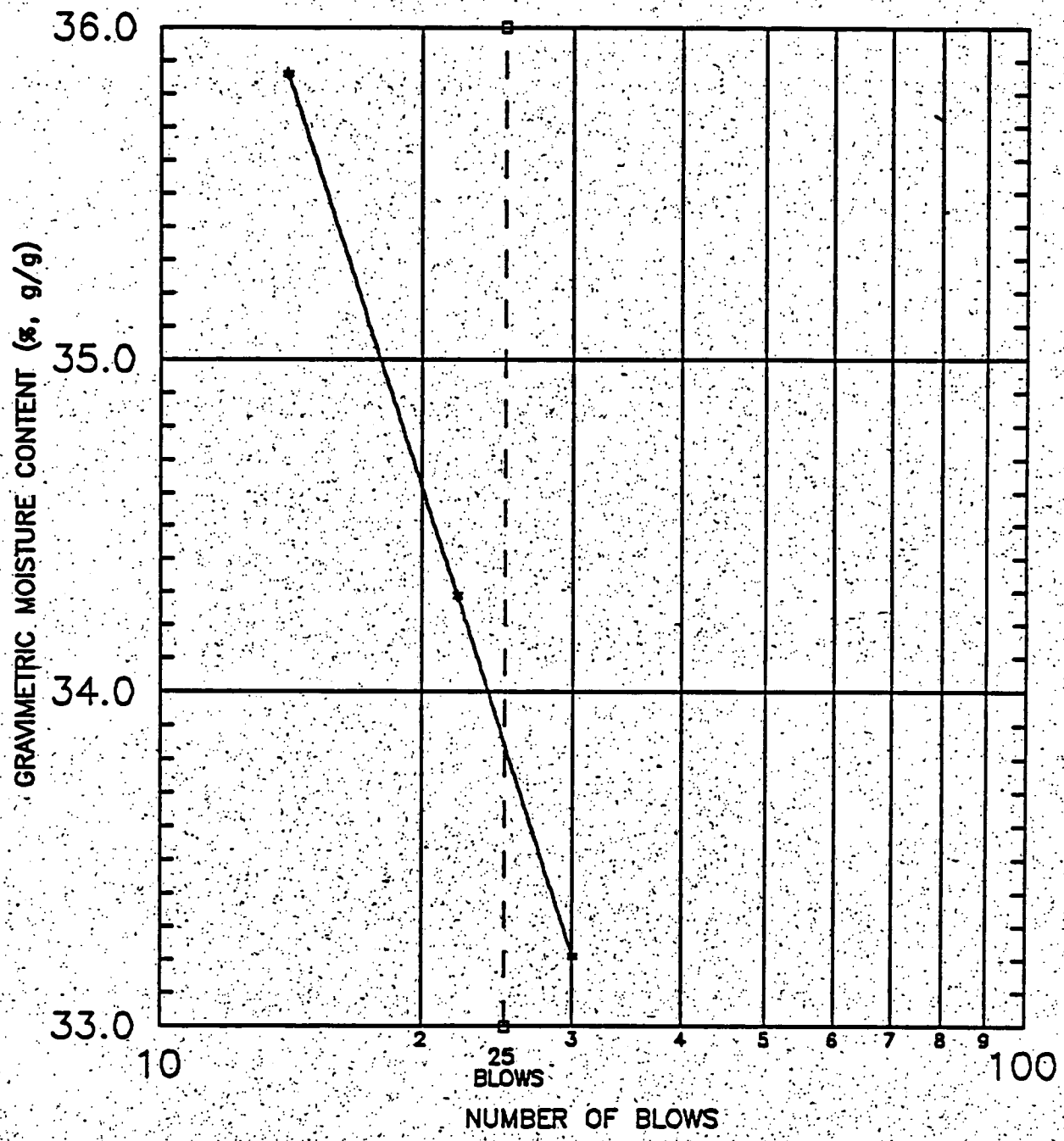
RESULTS

LIQUID LIMIT: 34 (%)
PLASTIC LIMIT: 15 (%)
PLASTICITY INDEX: 19 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40396AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40397AE
DEPTH: N/A
TEST DATE: 10/27/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	30	23	15
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	12.53	12.54	13.04
WEIGHT OF PAN + DRY SOIL (g):	11.09	11.01	11.31
WEIGHT OF PAN (g):	8.09	7.95	8.01
WEIGHT OF WATER (g):	1.44	1.53	1.73
WEIGHT OF DRY SOIL (g):	3.00	3.06	3.30
GRAVIMETRIC MOISTURE CONTENT (%):	48.00	50.00	52.42

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 49.3 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	2	3
WEIGHT OF PAN + MOIST SOIL (g):	9.41	9.65
WEIGHT OF PAN + DRY SOIL (g):	9.09	9.29
WEIGHT OF PAN (g):	7.89	7.87
WEIGHT OF WATER (g):	0.32	0.36
WEIGHT OF DRY SOIL (g):	1.20	1.42
GRAVIMETRIC MOISTURE CONTENT (%):	26.67	25.35

PLASTIC LIMIT (%): 26.01

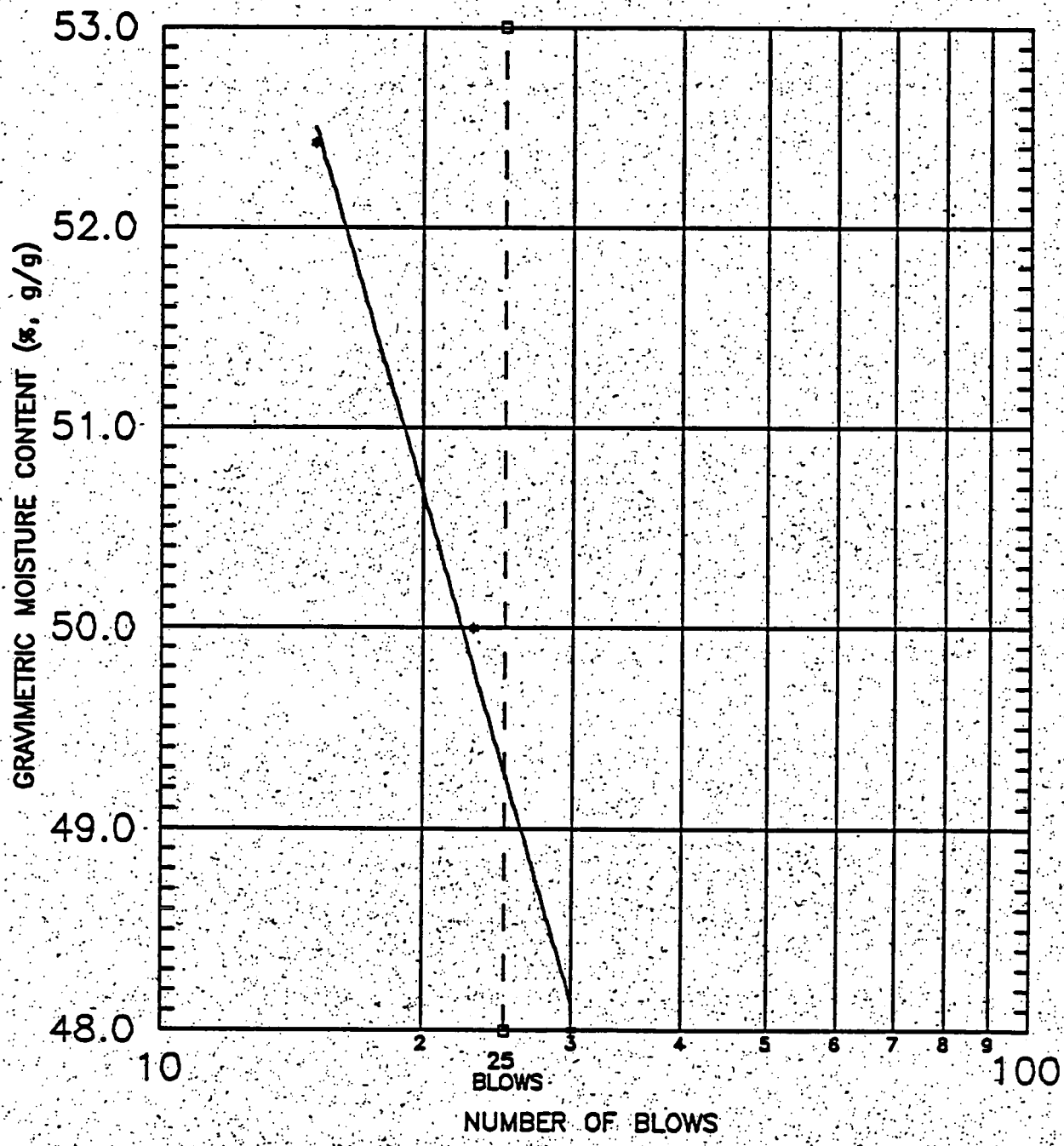
RESULTS

LIQUID LIMIT: 49 (%)
PLASTIC LIMIT: 26 (%)
PLASTICITY INDEX: 23 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40397AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40398AE
DEPTH: N/A
TEST DATE: 10/06/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	36	26	13
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	17.67	16.44	15.94
WEIGHT OF PAN + DRY SOIL (g):	14.79	13.82	13.42
WEIGHT OF PAN (g):	7.96	7.82	8.21
WEIGHT OF WATER (g):	2.88	2.62	2.52
WEIGHT OF DRY SOIL (g):	6.83	6.00	5.21
GRAVIMETRIC MOISTURE CONTENT (%):	42.17	43.67	48.37

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 44.2 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	10.05	9.57
WEIGHT OF PAN + DRY SOIL (g):	9.74	9.30
WEIGHT OF PAN (g):	8.04	7.86
WEIGHT OF WATER (g):	0.31	0.27
WEIGHT OF DRY SOIL (g):	1.70	1.44
GRAVIMETRIC MOISTURE CONTENT (%):	18.24	18.75

PLASTIC LIMIT (%): 18.49

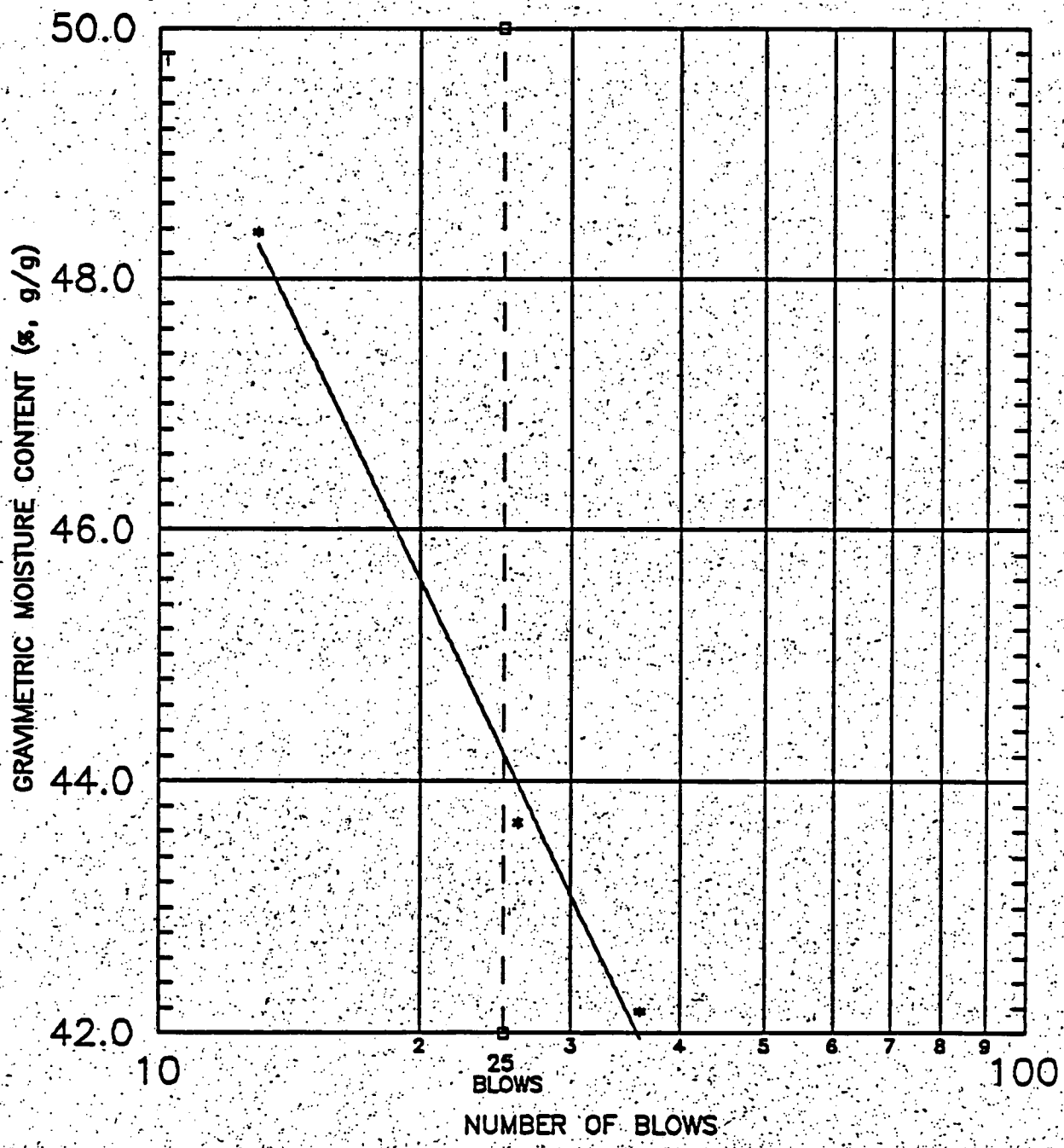
RESULTS

LIQUID LIMIT: 44 (%)
PLASTIC LIMIT: 18 (%)
PLASTICITY INDEX: 26 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40398AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40401AE
DEPTH: N/A
TEST DATE: 11/01/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	30	21	17
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	13.28	12.96	12.43
WEIGHT OF PAN + DRY SOIL (g):	11.28	10.97	10.66
WEIGHT OF PAN (g):	7.95	7.78	7.90
WEIGHT OF WATER (g):	2.00	1.99	1.77
WEIGHT OF DRY SOIL (g):	3.33	3.19	2.76
GRAVIMETRIC MOISTURE CONTENT (%):	60.06	62.38	64.13

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 61.3 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	3
WEIGHT OF PAN + MOIST SOIL (g):	9.17	9.37
WEIGHT OF PAN + DRY SOIL (g):	8.90	9.07
WEIGHT OF PAN (g):	7.87	7.92
WEIGHT OF WATER (g):	0.27	0.30
WEIGHT OF DRY SOIL (g):	1.03	1.15
GRAVIMETRIC MOISTURE CONTENT (%):	26.21	26.09

PLASTIC LIMIT (%): 26.15

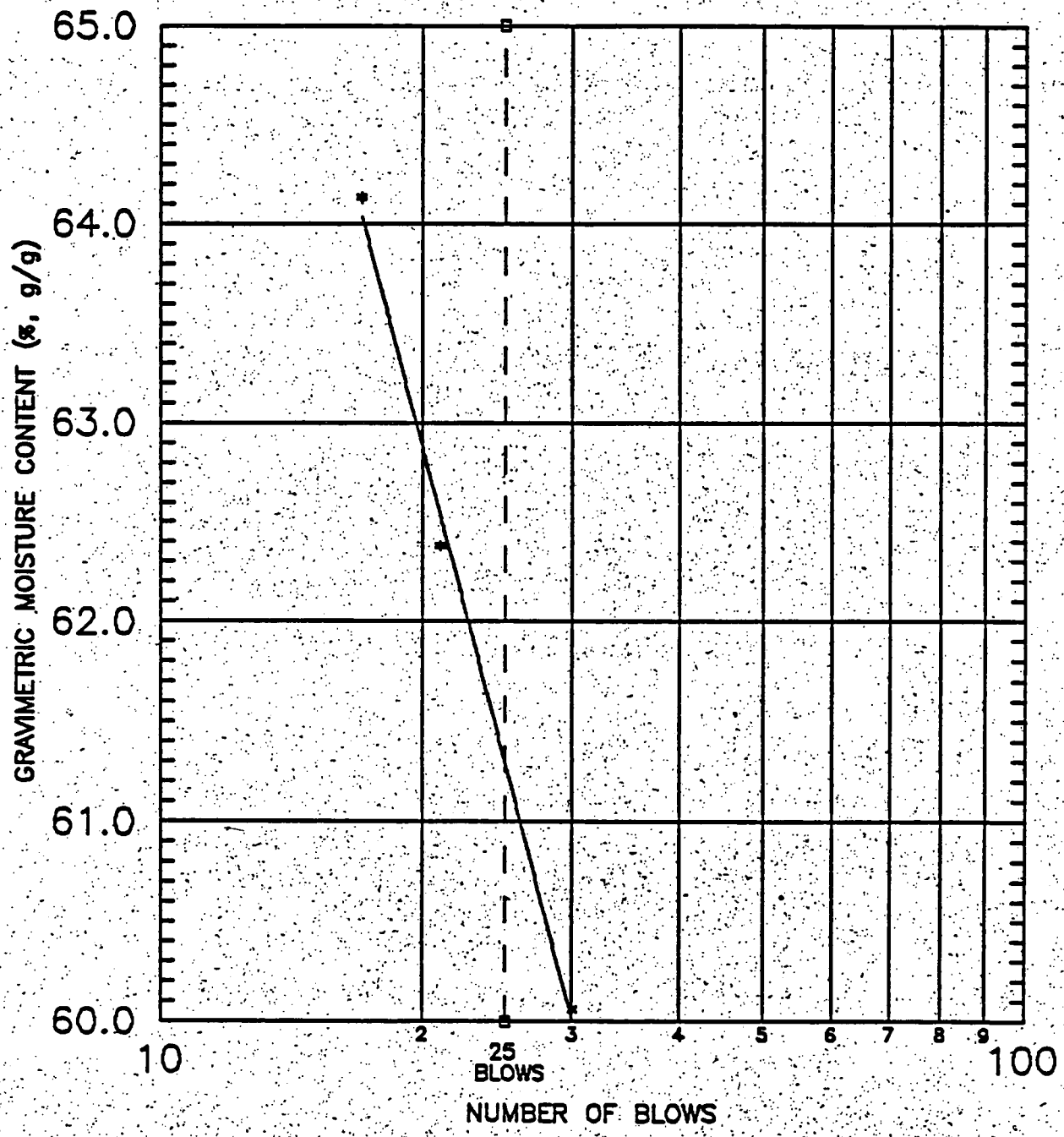
RESULTS

LIQUID LIMIT: 61 (%)
PLASTIC LIMIT: 26 (%)
PLASTICITY INDEX: 35 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40401AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40402AE
DEPTH: N/A
TEST DATE: 09/29/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	27	37	15
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	17.19	17.55	18.27
WEIGHT OF PAN + DRY SOIL (g):	14.04	14.26	14.56
WEIGHT OF PAN (g):	8.03	7.91	8.02
WEIGHT OF WATER (g):	3.15	3.29	3.71
WEIGHT OF DRY SOIL (g):	6.01	6.35	6.54
GRAVIMETRIC MOISTURE CONTENT (%):	52.41	51.81	56.73

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 53.6 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	9.59	9.84
WEIGHT OF PAN + DRY SOIL (g):	9.25	9.45
WEIGHT OF PAN (g):	7.93	7.93
WEIGHT OF WATER (g):	0.34	0.39
WEIGHT OF DRY SOIL (g):	1.32	1.52
GRAVIMETRIC MOISTURE CONTENT (%):	25.76	25.66

PLASTIC LIMIT (%): 25.71

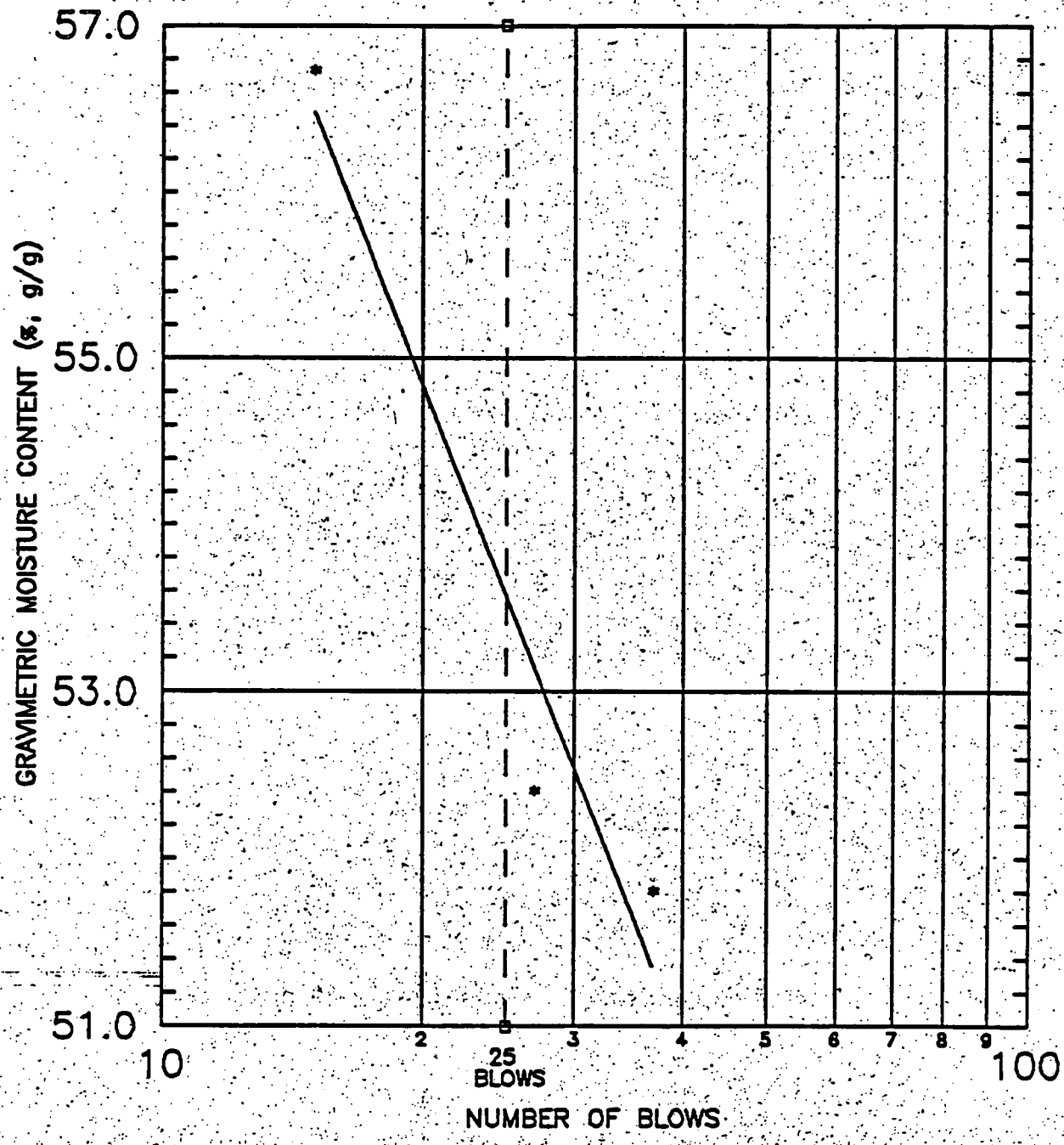
RESULTS

LIQUID LIMIT: 54 (%)
PLASTIC LIMIT: 26 (%)
PLASTICITY INDEX: 28 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40402AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40403AE
DEPTH: N/A
TEST DATE: 09/29/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	34	21	16
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	16.73	19.82	20.57
WEIGHT OF PAN + DRY SOIL (g):	13.97	15.88	16.12
WEIGHT OF PAN (g):	8.14	8.11	7.71
WEIGHT OF WATER (g):	2.76	3.94	4.45
WEIGHT OF DRY SOIL (g):	5.83	7.77	8.41
GRAVIMETRIC MOISTURE CONTENT (%):	47.34	50.71	52.91

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 49.5 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	9.50	9.63
WEIGHT OF PAN + DRY SOIL (g):	9.29	9.40
WEIGHT OF PAN (g):	8.08	8.02
WEIGHT OF WATER (g):	0.21	0.23
WEIGHT OF DRY SOIL (g):	1.21	1.38
GRAVIMETRIC MOISTURE CONTENT (%):	17.36	16.67

PLASTIC LIMIT (%): 17.01

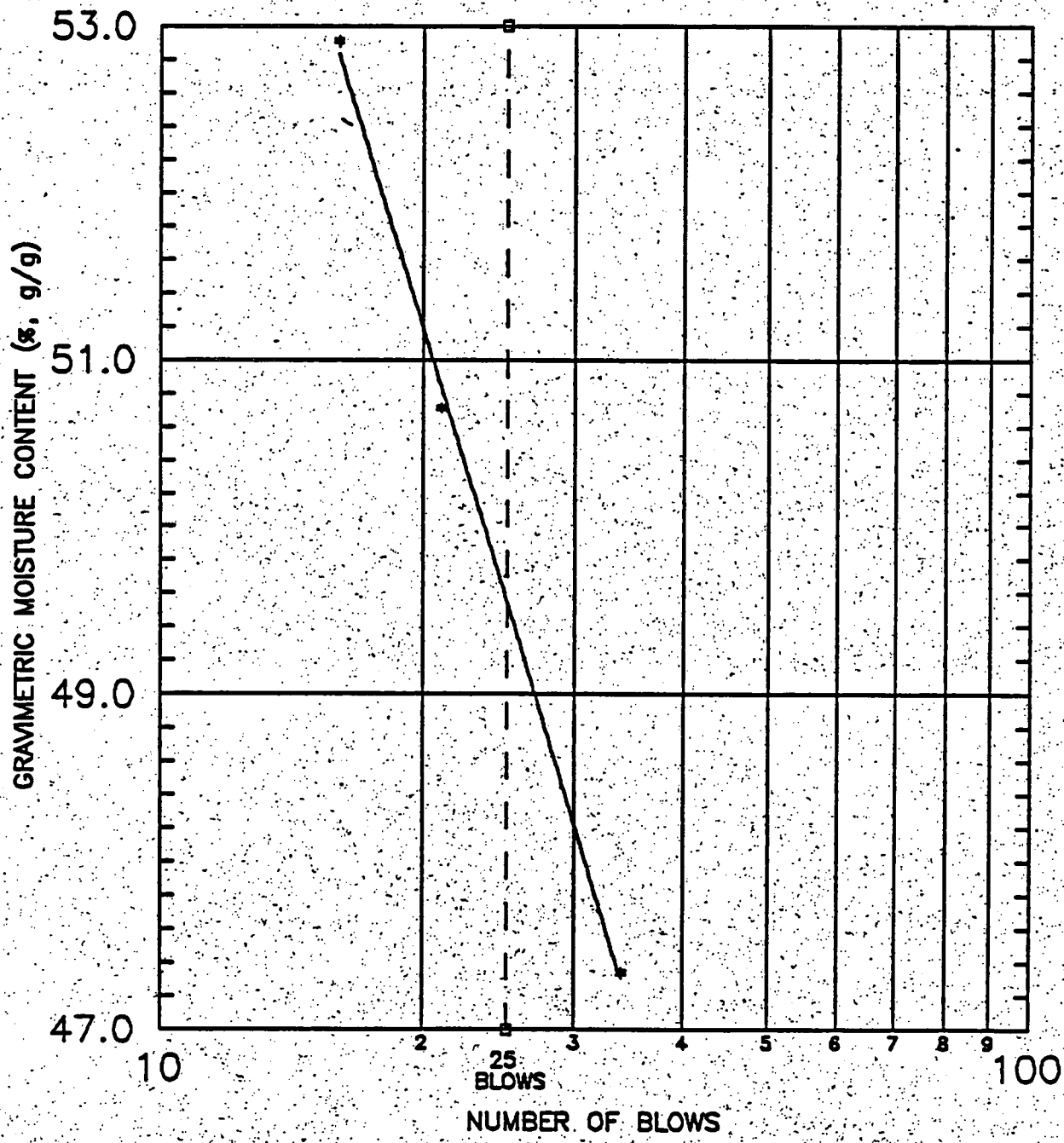
RESULTS

LIQUID LIMIT: 50 (%)
PLASTIC LIMIT: 17 (%)
PLASTICITY INDEX: 32 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40403AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40404AE
DEPTH: N/A
TEST DATE: 11/01/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	27	37	17
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	12.74	13.29	12.15
WEIGHT OF PAN + DRY SOIL (g):	10.83	11.22	10.37
WEIGHT OF PAN (g):	7.88	7.97	7.79
WEIGHT OF WATER (g):	1.91	2.07	1.78
WEIGHT OF DRY SOIL (g):	2.95	3.25	2.58
GRAVIMETRIC MOISTURE CONTENT (%):	64.75	63.69	68.99

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 66.0 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	3
WEIGHT OF PAN + MOIST SOIL (g):	8.42	8.88
WEIGHT OF PAN + DRY SOIL (g):	8.29	8.69
WEIGHT OF PAN (g):	7.73	7.94
WEIGHT OF WATER (g):	0.13	0.19
WEIGHT OF DRY SOIL (g):	0.56	0.75
GRAVIMETRIC MOISTURE CONTENT (%):	23.21	25.33

PLASTIC LIMIT (%): 24.27

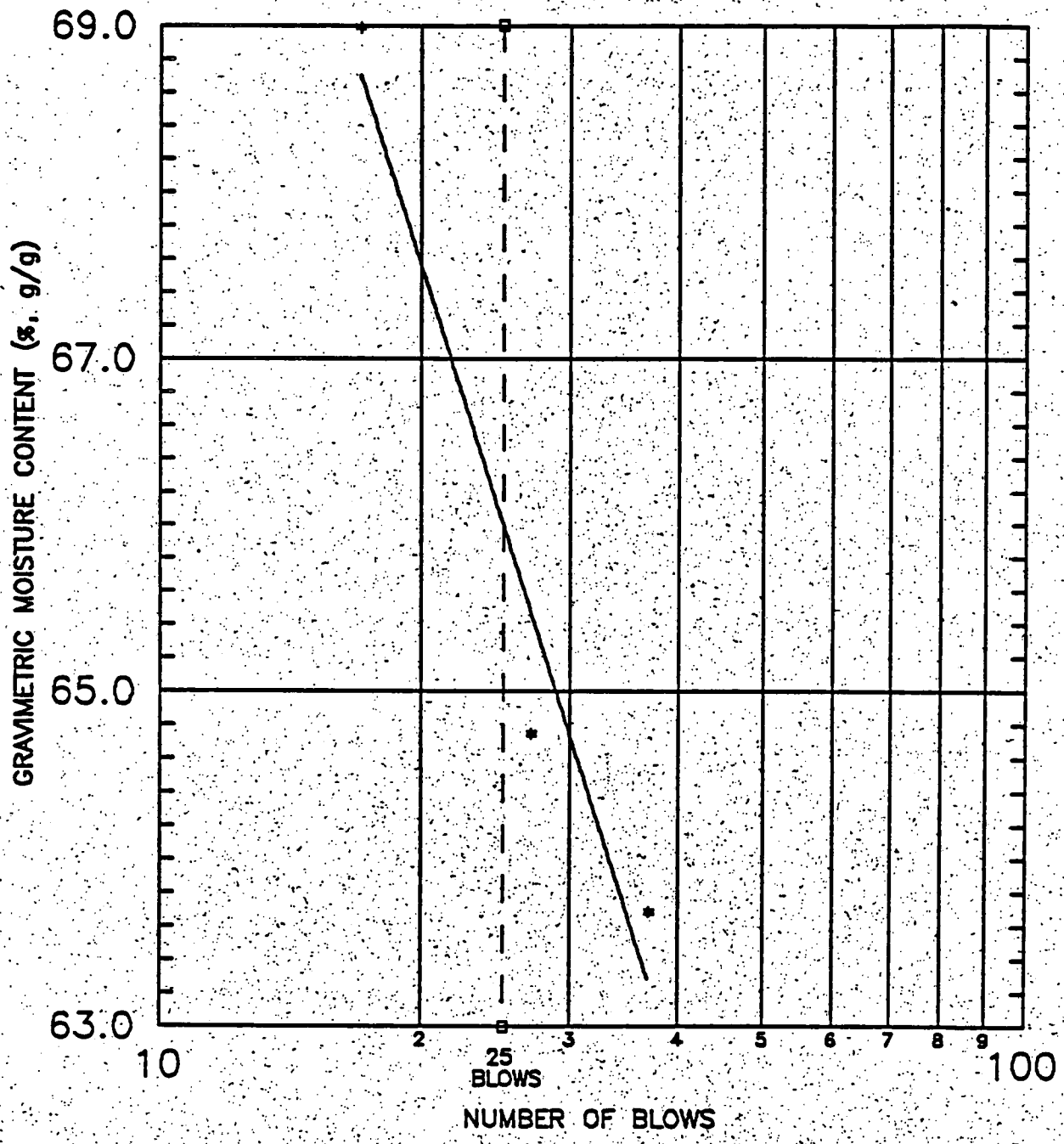
RESULTS

LIQUID LIMIT: 66 (%)
PLASTIC LIMIT: 24 (%)
PLASTICITY INDEX: 42 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40404AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40406AE
DEPTH: N/A
TEST DATE: 10/11/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	37	25	19
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	15.98	16.29	17.27
WEIGHT OF PAN + DRY SOIL (g):	13.39	13.56	14.17
WEIGHT OF PAN (g):	7.88	7.98	7.96
WEIGHT OF WATER (g):	2.59	2.73	3.10
WEIGHT OF DRY SOIL (g):	5.51	5.58	6.21
GRAVIMETRIC MOISTURE CONTENT (%):	47.01	48.92	49.92

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 48.8 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	9.59	9.12
WEIGHT OF PAN + DRY SOIL (g):	9.31	8.92
WEIGHT OF PAN (g):	7.87	7.90
WEIGHT OF WATER (g):	0.28	0.20
WEIGHT OF DRY SOIL (g):	1.44	1.02
GRAVIMETRIC MOISTURE CONTENT (%):	19.44	19.61

PLASTIC LIMIT (%): 19.53

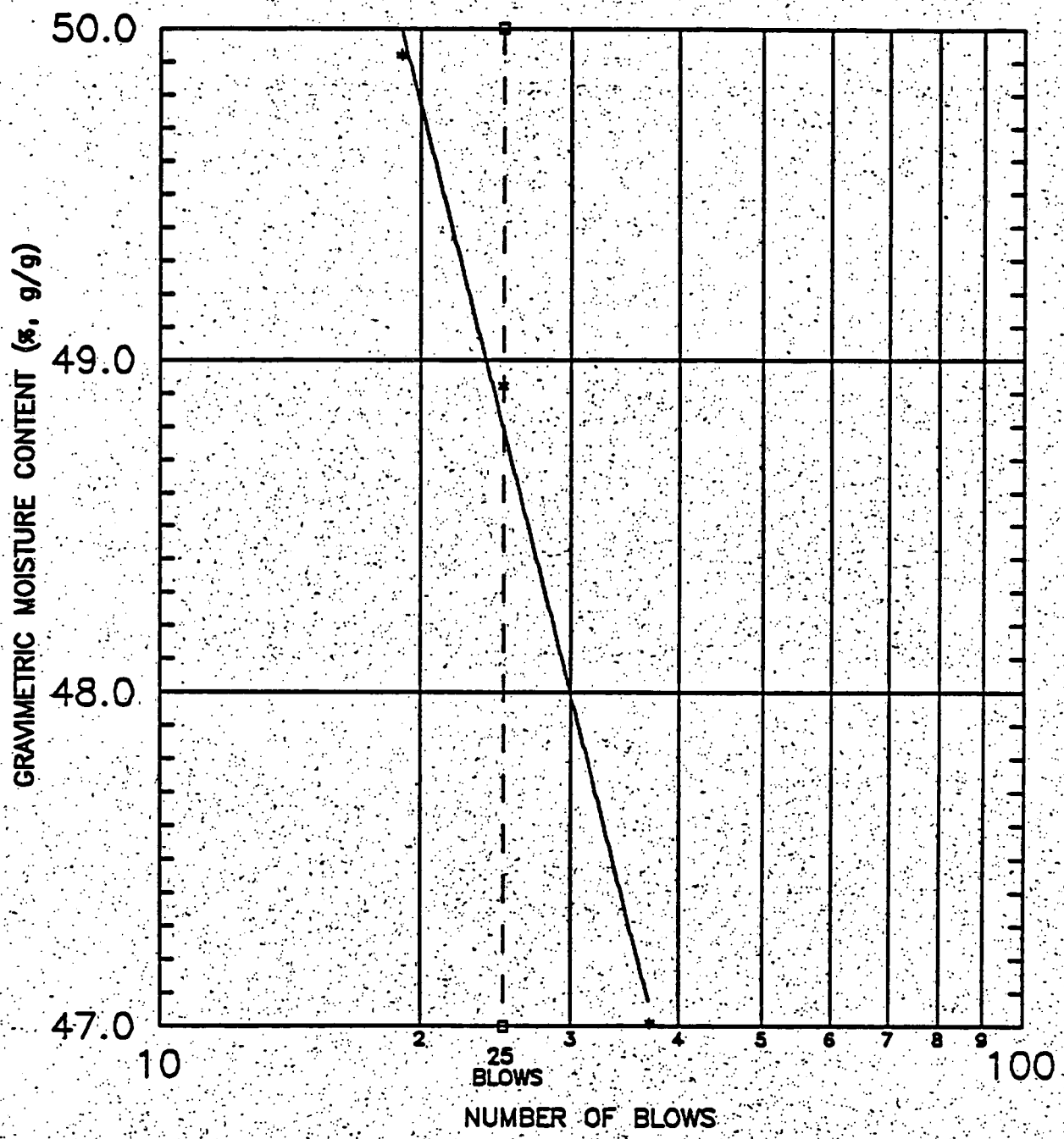
RESULTS

LIQUID LIMIT: 49 (%)
PLASTIC LIMIT: 20 (%)
PLASTICITY INDEX: 29 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40406AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40407AE
DEPTH: N/A
TEST DATE: 11/01/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	35	27	22
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	14.78	14.41	13.26
WEIGHT OF PAN + DRY SOIL (g):	11.82	11.56	10.84
WEIGHT OF PAN (g):	7.98	7.93	7.87
WEIGHT OF WATER (g):	2.96	2.85	2.42
WEIGHT OF DRY SOIL (g):	3.84	3.63	2.97
GRAVIMETRIC MOISTURE CONTENT (%):	77.08	78.51	81.48

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 79.0 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	3
WEIGHT OF PAN + MOIST SOIL (g):	9.29	9.59
WEIGHT OF PAN + DRY SOIL (g):	8.95	9.13
WEIGHT OF PAN (g):	8.04	7.91
WEIGHT OF WATER (g):	0.34	0.46
WEIGHT OF DRY SOIL (g):	0.91	1.22
GRAVIMETRIC MOISTURE CONTENT (%):	37.36	37.70

PLASTIC LIMIT (%): 37.53

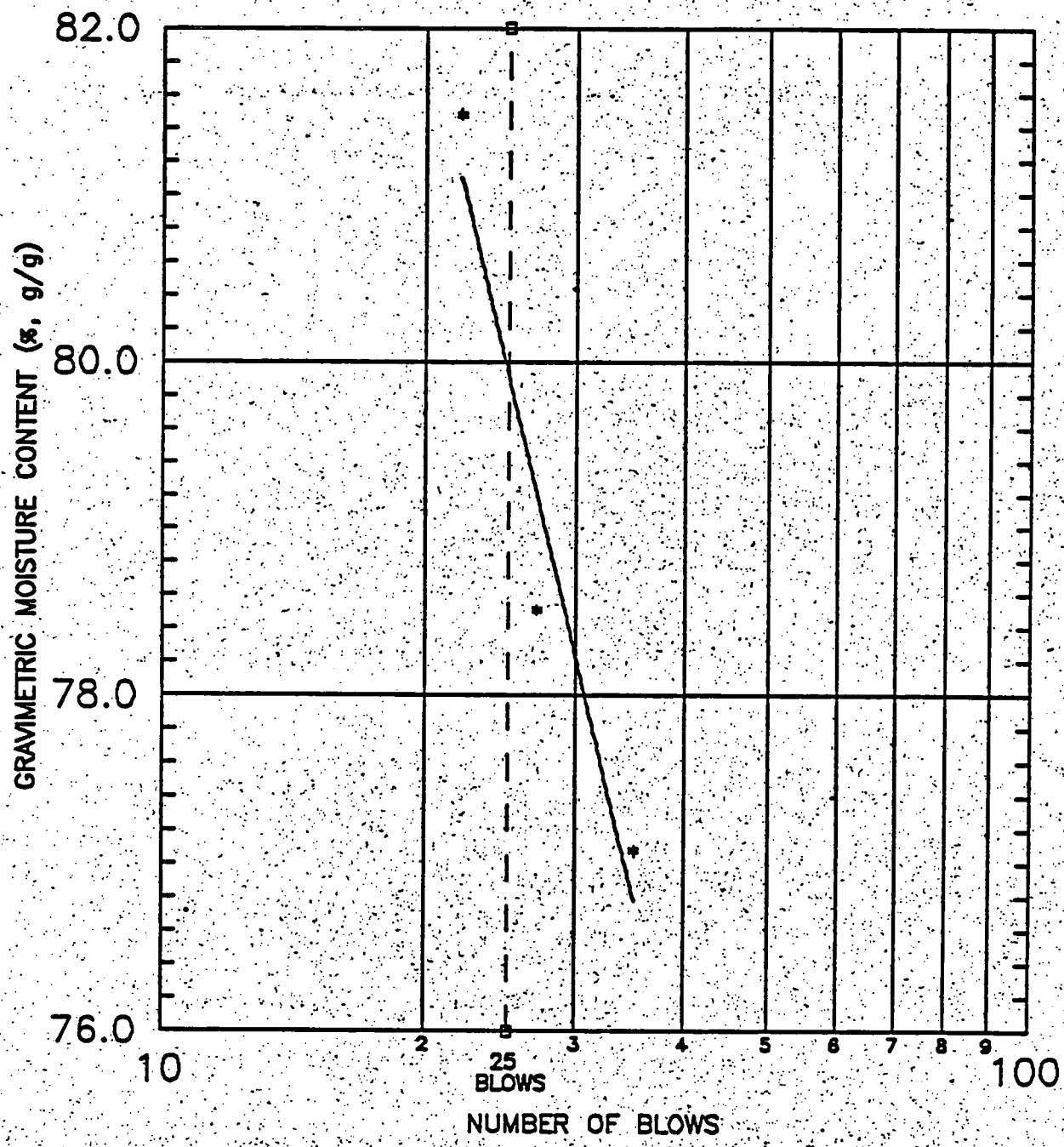
RESULTS

LIQUID LIMIT: 79 (%)
PLASTIC LIMIT: 38 (%)
PLASTICITY INDEX: 41 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40407AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40408AE
DEPTH: N/A
TEST DATE: 10/14/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	37	23	16
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	14.76	15.50	16.06
WEIGHT OF PAN + DRY SOIL (g):	12.49	12.81	13.16
WEIGHT OF PAN (g):	7.95	7.89	7.98
WEIGHT OF WATER (g):	2.27	2.69	2.90
WEIGHT OF DRY SOIL (g):	4.54	4.92	5.18
GRAVIMETRIC MOISTURE CONTENT (%):	50.00	54.67	55.98

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 53.2 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	2	3
WEIGHT OF PAN + MOIST SOIL (g):	9.70	9.78
WEIGHT OF PAN + DRY SOIL (g):	9.41	9.45
WEIGHT OF PAN (g):	7.95	7.87
WEIGHT OF WATER (g):	0.29	0.33
WEIGHT OF DRY SOIL (g):	1.46	1.58
GRAVIMETRIC MOISTURE CONTENT (%):	19.86	20.89

PLASTIC LIMIT (%): 20.37

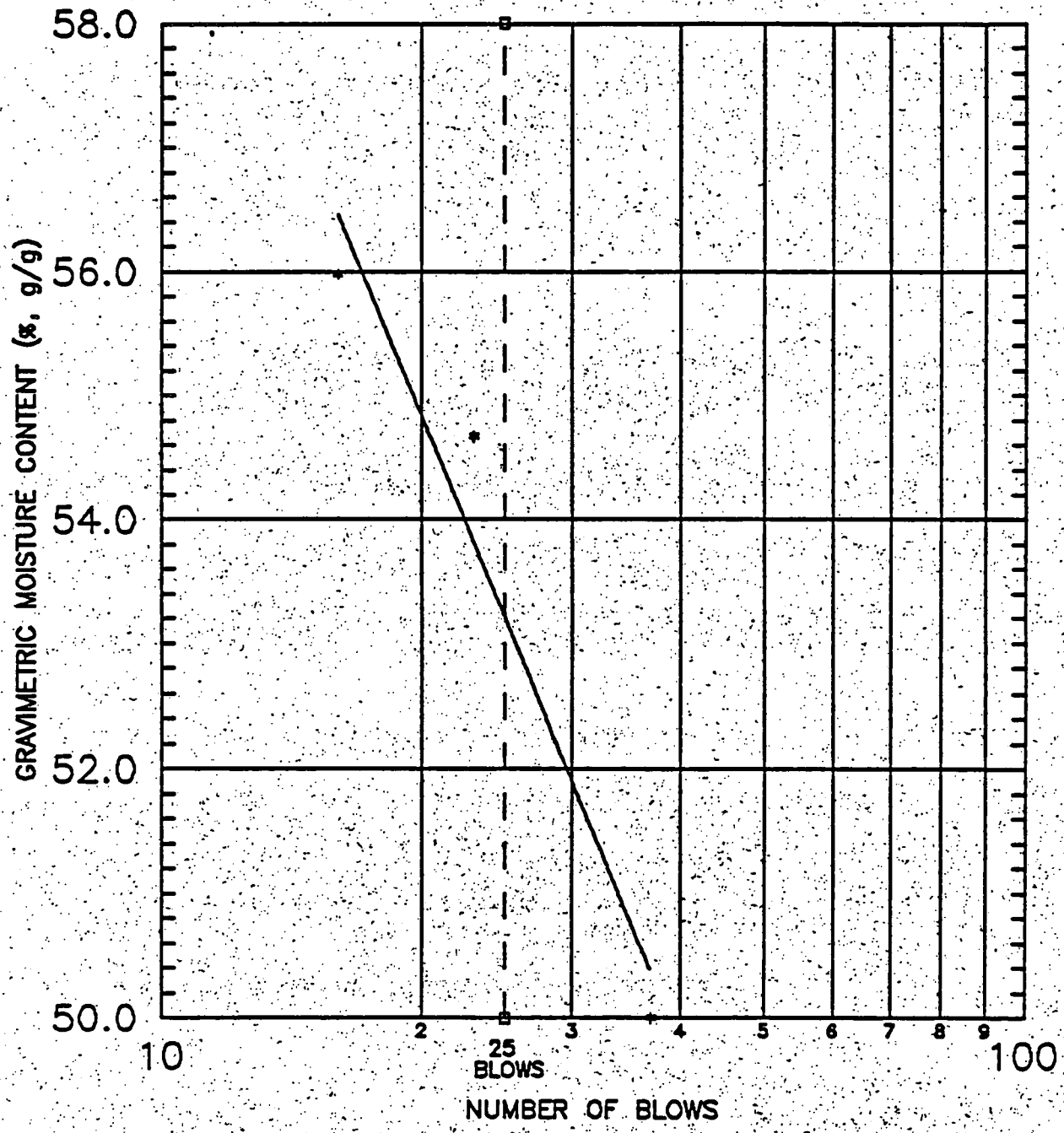
RESULTS

LIQUID LIMIT: 53 (%)
PLASTIC LIMIT: 20 (%)
PLASTICITY INDEX: 33 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40408AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40600AE
DEPTH: N/A
TEST DATE: 10/27/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	16	30	24
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	16.28	15.00	15.83
WEIGHT OF PAN + DRY SOIL (g):	13.20	14.09	13.67
WEIGHT OF PAN (g):	7.92	7.87	7.95
WEIGHT OF WATER (g):	3.08	0.91	2.16
WEIGHT OF DRY SOIL (g):	5.28	6.22	5.72
GRAVIMETRIC MOISTURE CONTENT (%):	58.33	14.63	37.76

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 30.0 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	3
WEIGHT OF PAN + MOIST SOIL (g):	10.23	9.64
WEIGHT OF PAN + DRY SOIL (g):	9.84	9.37
WEIGHT OF PAN (g):	7.90	8.03
WEIGHT OF WATER (g):	0.39	0.27
WEIGHT OF DRY SOIL (g):	1.94	1.34
GRAVIMETRIC MOISTURE CONTENT (%):	20.10	20.15
PLASTIC LIMIT (%):		20.13

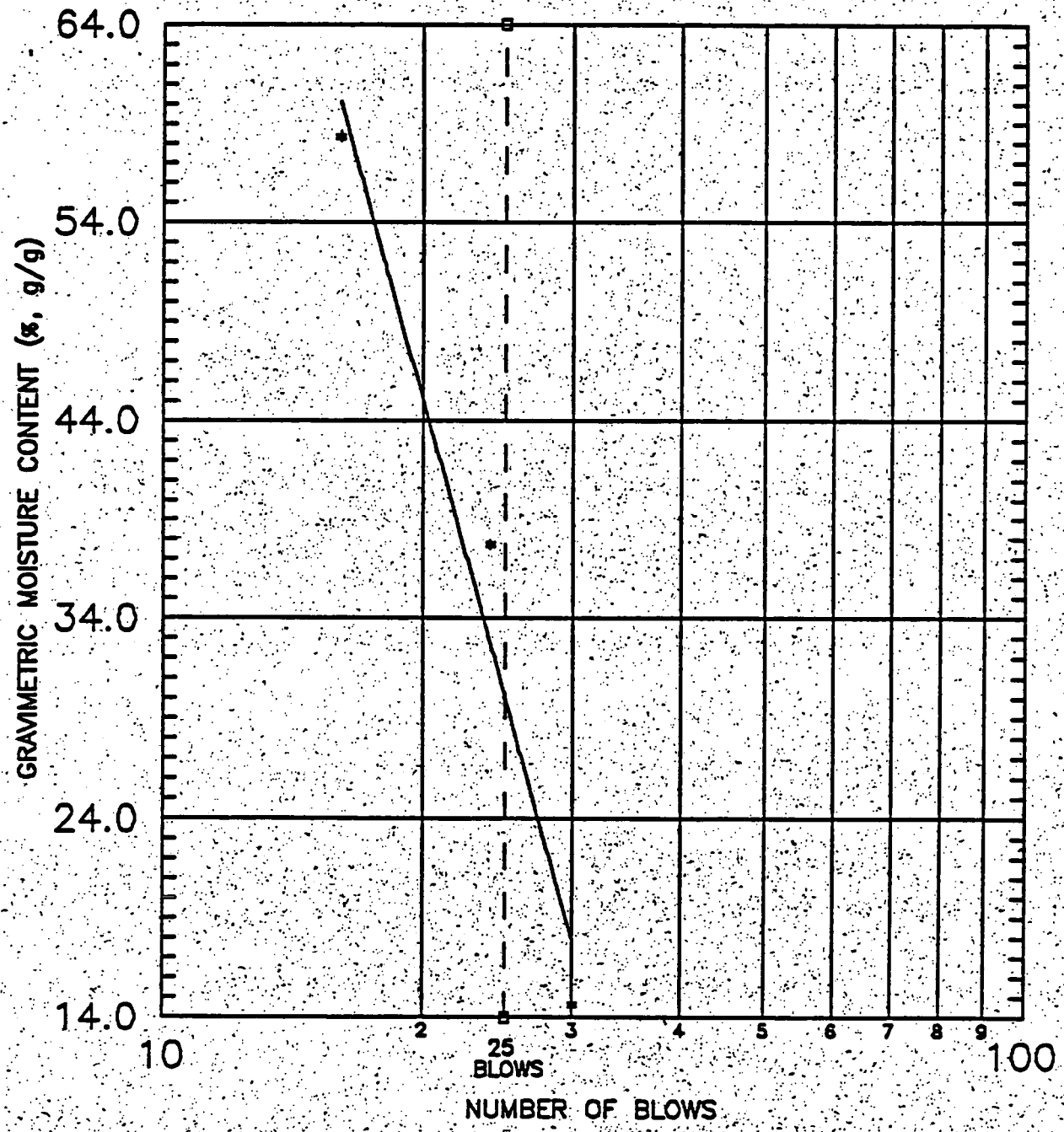
RESULTS

LIQUID LIMIT: 30 (%)
PLASTIC LIMIT: 20 (%)
PLASTICITY INDEX: 10 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40600AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40601AE
DEPTH: N/A
TEST DATE: 10/27/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	32	21	13
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	15.48	15.45	14.96
WEIGHT OF PAN + DRY SOIL (g):	13.10	13.08	12.61
WEIGHT OF PAN (g):	7.90	8.01	7.88
WEIGHT OF WATER (g):	2.38	2.37	2.35
WEIGHT OF DRY SOIL (g):	5.20	5.07	4.73
GRAVIMETRIC MOISTURE CONTENT (%):	45.77	46.75	49.68

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 46.6 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	9.87	10.04
WEIGHT OF PAN + DRY SOIL (g):	9.47	9.60
WEIGHT OF PAN (g):	7.98	7.88
WEIGHT OF WATER (g):	0.40	0.44
WEIGHT OF DRY SOIL (g):	1.49	1.72
GRAVIMETRIC MOISTURE CONTENT (%):	26.85	25.58

PLASTIC LIMIT (%): 26.21

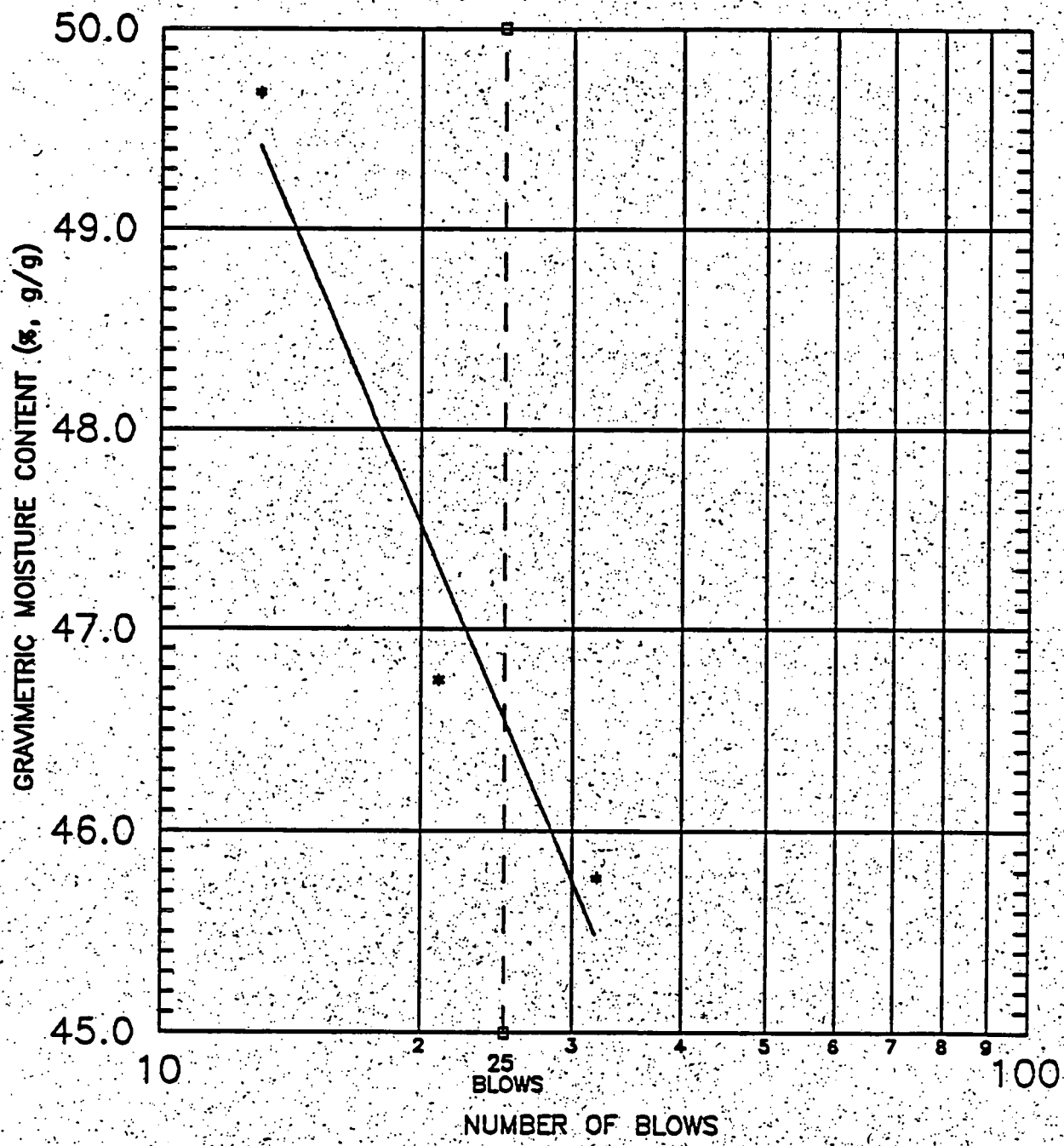
RESULTS

LIQUID LIMIT: 47 (%)
PLASTIC LIMIT: 26 (%)
PLASTICITY INDEX: 20 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40601AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40603AE
DEPTH: N/A
TEST DATE: 10/10/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	33	25	15
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	14.95	15.85	15.66
WEIGHT OF PAN + DRY SOIL (g):	12.72	13.20	13.02
WEIGHT OF PAN (g):	7.95	7.91	8.03
WEIGHT OF WATER (g):	2.23	2.65	2.64
WEIGHT OF DRY SOIL (g):	4.77	5.29	4.99
GRAVIMETRIC MOISTURE CONTENT (%):	46.75	50.09	52.91

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 49.4 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	9.61	9.67
WEIGHT OF PAN + DRY SOIL (g):	9.32	9.40
WEIGHT OF PAN (g):	7.90	8.03
WEIGHT OF WATER (g):	0.29	0.27
WEIGHT OF DRY SOIL (g):	1.42	1.37
GRAVIMETRIC MOISTURE CONTENT (%):	20.42	19.71

PLASTIC LIMIT (%): 20.07

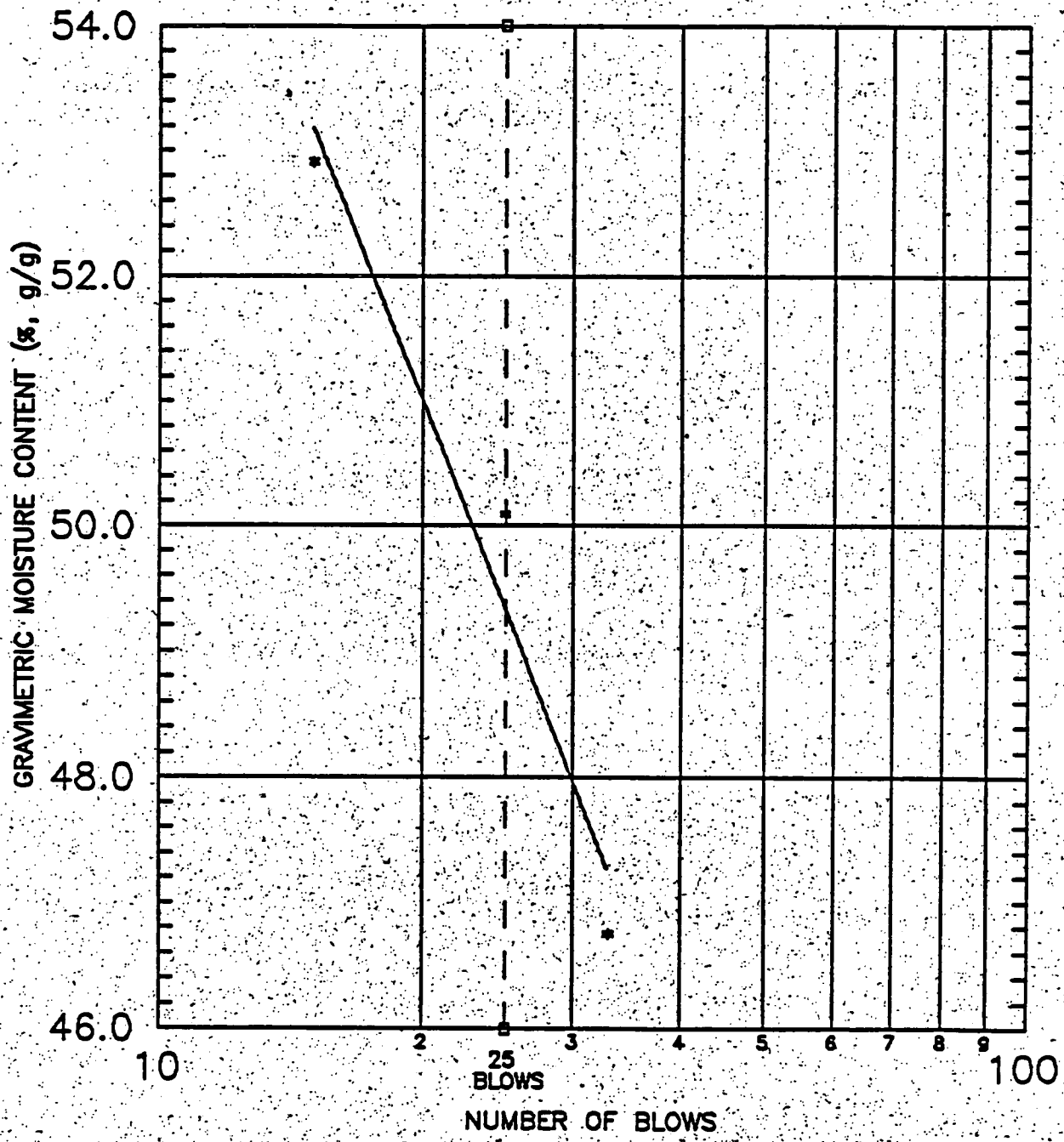
RESULTS

LIQUID LIMIT: 49 (%)
PLASTIC LIMIT: 20 (%)
PLASTICITY INDEX: 29 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40603AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40604AE
DEPTH: N/A
TEST DATE: 11/01/93

938IQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	34	27	19
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	14.18	14.47	13.68
WEIGHT OF PAN + DRY SOIL (g):	11.47	11.63	11.06
WEIGHT OF PAN (g):	7.87	8.00	7.87
WEIGHT OF WATER (g):	2.71	2.84	2.62
WEIGHT OF DRY SOIL (g):	3.60	3.63	3.19
GRAVIMETRIC MOISTURE CONTENT (%):	75.28	78.24	82.13

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 79.0 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	8.50	9.18
WEIGHT OF PAN + DRY SOIL (g):	8.39	8.91
WEIGHT OF PAN (g):	7.93	7.79
WEIGHT OF WATER (g):	0.11	0.27
WEIGHT OF DRY SOIL (g):	0.46	1.12
GRAVIMETRIC MOISTURE CONTENT (%):	23.91	24.11

PLASTIC LIMIT (%): 24.01

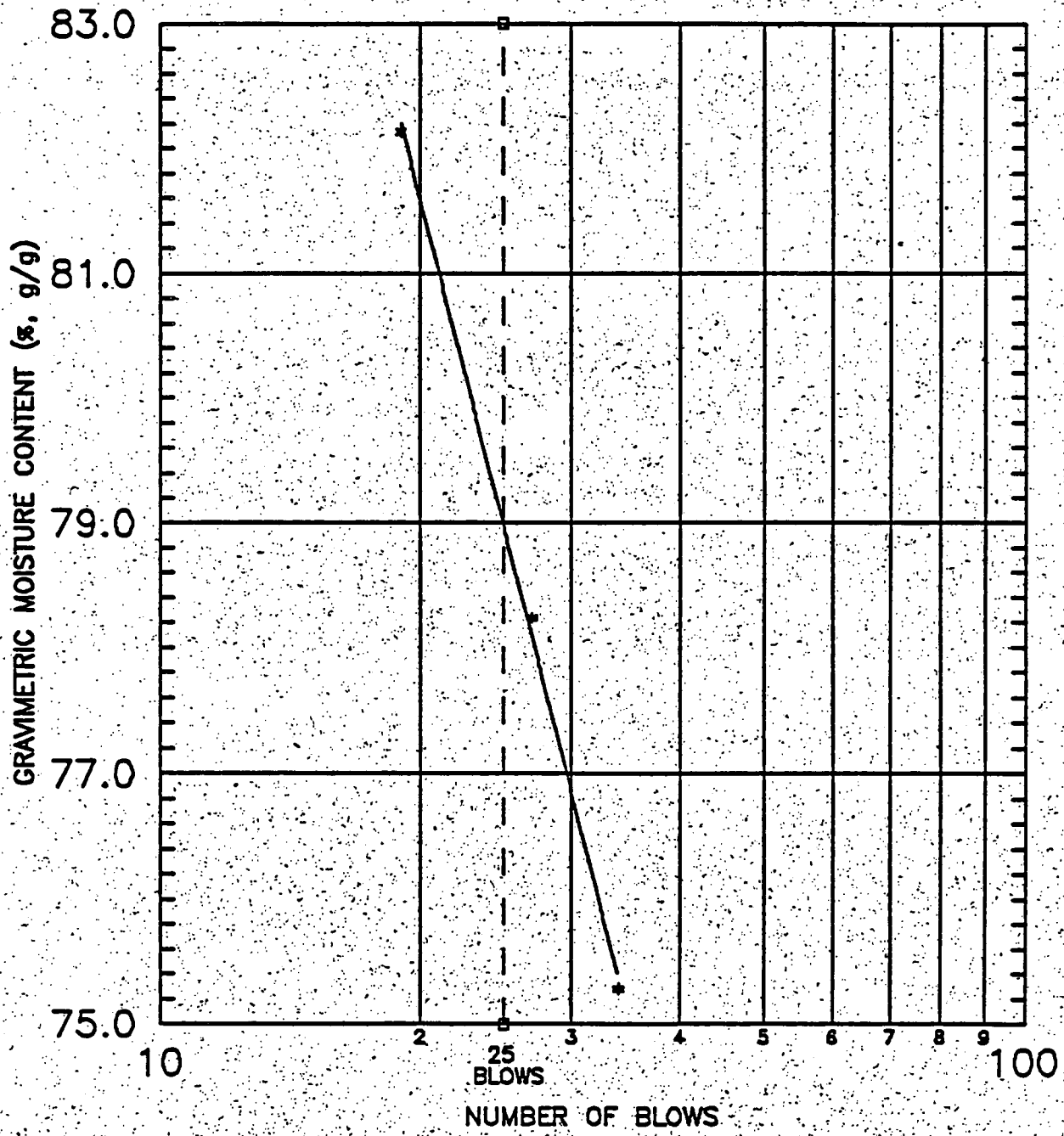
RESULTS

LIQUID LIMIT: 79 (%)
PLASTIC LIMIT: 24 (%)
PLASTICITY INDEX: 55 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40604AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40605AE
DEPTH: N/A
TEST DATE: 11/01/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	26	33	20
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	11.69	12.39	12.05
WEIGHT OF PAN + DRY SOIL (g):	10.13	10.59	10.29
WEIGHT OF PAN (g):	7.93	8.01	7.89
WEIGHT OF WATER (g):	1.56	1.80	1.76
WEIGHT OF DRY SOIL (g):	2.20	2.58	2.40
GRAVIMETRIC MOISTURE CONTENT (%):	70.91	69.77	73.33

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 71.5 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	3
WEIGHT OF PAN + MOIST SOIL (g):	9.42	9.25
WEIGHT OF PAN + DRY SOIL (g): 1190X9.11	9.11	8.98
WEIGHT OF PAN (g):	7.92	7.91
WEIGHT OF WATER (g):	0.31	0.27
WEIGHT OF DRY SOIL (g):	1.19	1.07
GRAVIMETRIC MOISTURE CONTENT (%):	26.05	25.23

PLASTIC LIMIT (%): 25.64

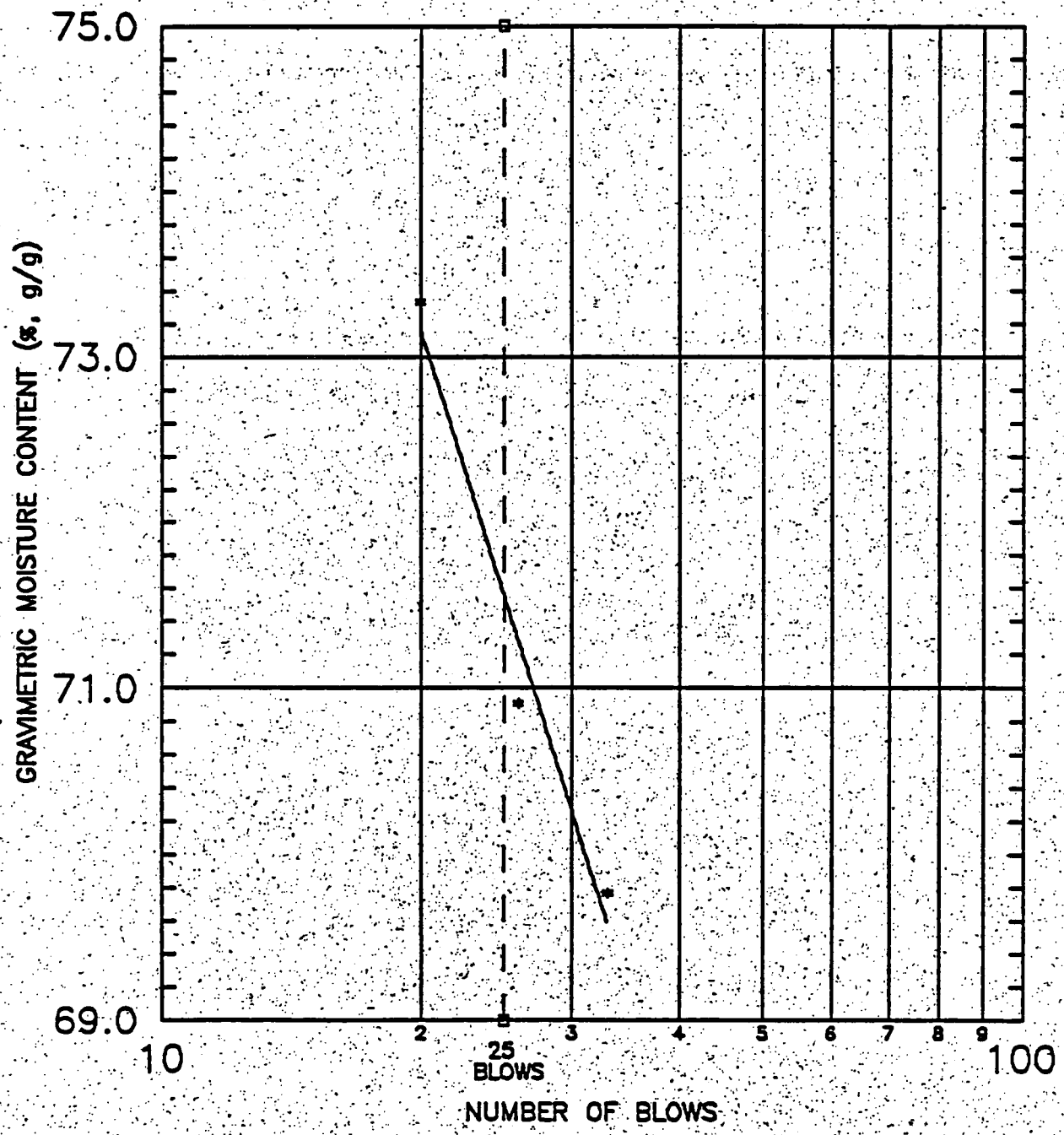
RESULTS

LIQUID LIMIT: 72 (%)
PLASTIC LIMIT: 26 (%)
PLASTICITY INDEX: 46 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40805AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40606AE
DEPTH: N/A
TEST DATE: 10/10/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	34	26	15
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	14.49	15.58	14.45
WEIGHT OF PAN + DRY SOIL (g):	12.54	13.27	12.46
WEIGHT OF PAN (g):	7.90	7.94	8.02
WEIGHT OF WATER (g):	1.95	2.31	1.99
WEIGHT OF DRY SOIL (g):	4.64	5.33	4.44
GRAVIMETRIC MOISTURE CONTENT (%):	42.03	43.34	44.82

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 43.1 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	10.15	9.62
WEIGHT OF PAN + DRY SOIL (g):	9.72	9.31
WEIGHT OF PAN (g):	7.78	7.92
WEIGHT OF WATER (g):	0.43	0.31
WEIGHT OF DRY SOIL (g):	1.94	1.39
GRAVIMETRIC MOISTURE CONTENT (%):	22.16	22.30
PLASTIC LIMIT (%):		22.23

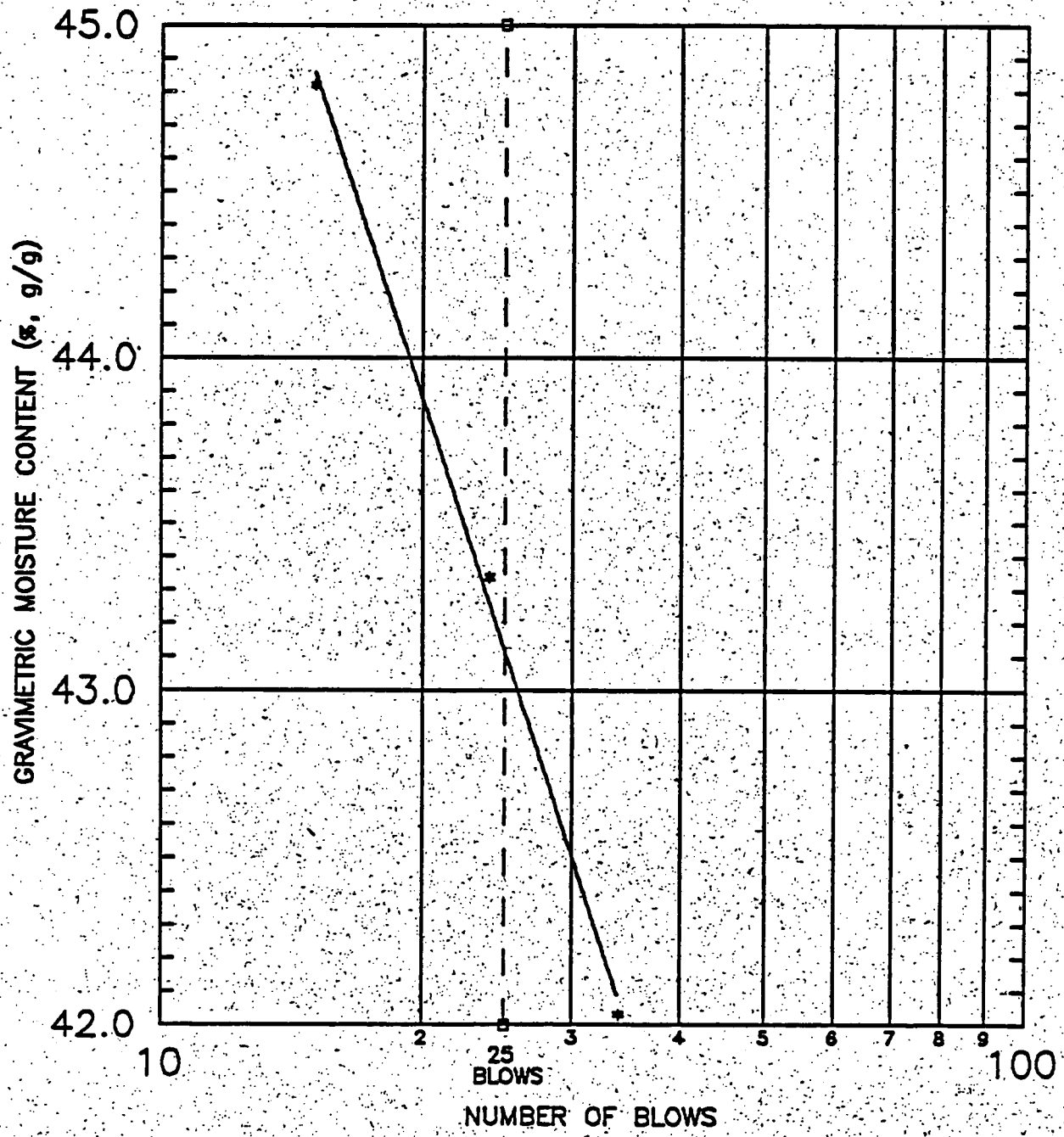
RESULTS

LIQUID LIMIT: 43 (%)
PLASTIC LIMIT: 22 (%)
PLASTICITY INDEX: 21 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40606AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40607AE
DEPTH: N/A
TEST DATE: 10/14/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	28	24	16
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	15.00	15.54	15.21
WEIGHT OF PAN + DRY SOIL (g):	12.98	13.38	13.02
WEIGHT OF PAN (g):	7.91	8.04	7.73
WEIGHT OF WATER (g):	2.02	2.16	2.19
WEIGHT OF DRY SOIL (g):	5.07	5.34	5.29
GRAVIMETRIC MOISTURE CONTENT (%):	39.84	40.45	41.40

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 40.2 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	2	3
WEIGHT OF PAN + MOIST SOIL (g):	10.01	10.04
WEIGHT OF PAN + DRY SOIL (g):	9.68	9.68
WEIGHT OF PAN (g):	8.10	8.01
WEIGHT OF WATER (g):	0.33	0.36
WEIGHT OF DRY SOIL (g):	1.58	1.67
GRAVIMETRIC MOISTURE CONTENT (%):	20.89	21.56

PLASTIC LIMIT (%): 21.22

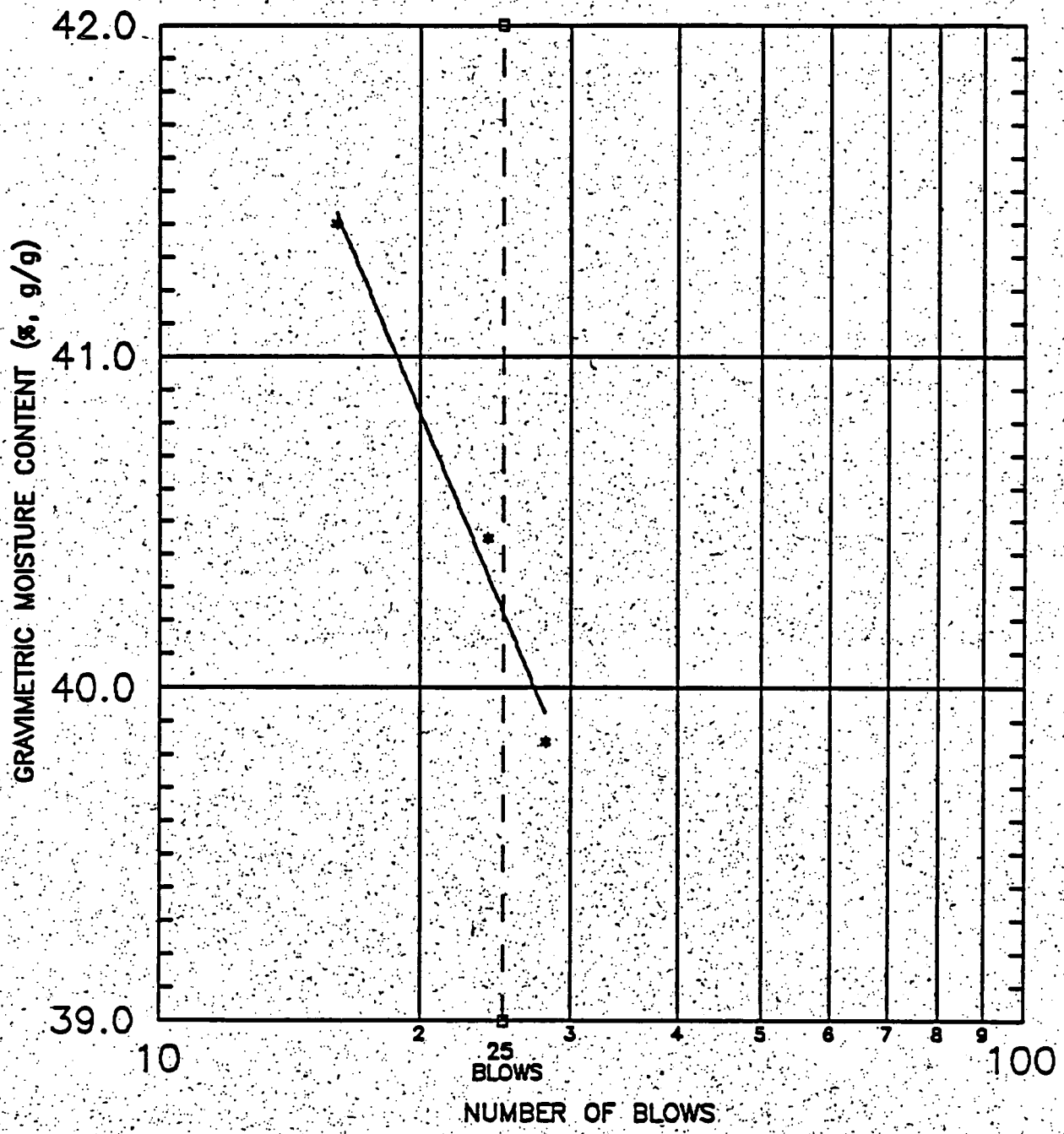
RESULTS

LIQUID LIMIT: 40 (%)
PLASTIC LIMIT: 21 (%)
PLASTICITY INDEX: 19 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40607AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40608AE
DEPTH: N/A
TEST DATE: 10/14/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	25	36	15
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	15.80	15.81	15.19
WEIGHT OF PAN + DRY SOIL (g):	14.01	14.07	13.42
WEIGHT OF PAN (g):	8.12	8.19	7.86
WEIGHT OF WATER (g):	1.79	1.74	1.77
WEIGHT OF DRY SOIL (g):	5.89	5.88	5.56
GRAVIMETRIC MOISTURE CONTENT (%):	30.39	29.59	31.83

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 30.5 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	3
WEIGHT OF PAN + MOIST SOIL (g):	10.40	9.70
WEIGHT OF PAN + DRY SOIL (g):	10.06	9.42
WEIGHT OF PAN (g):	8.05	7.83
WEIGHT OF WATER (g):	0.34	0.28
WEIGHT OF DRY SOIL (g):	2.01	1.59
GRAVIMETRIC MOISTURE CONTENT (%):	16.92	17.61

PLASTIC LIMIT (%): 17.26

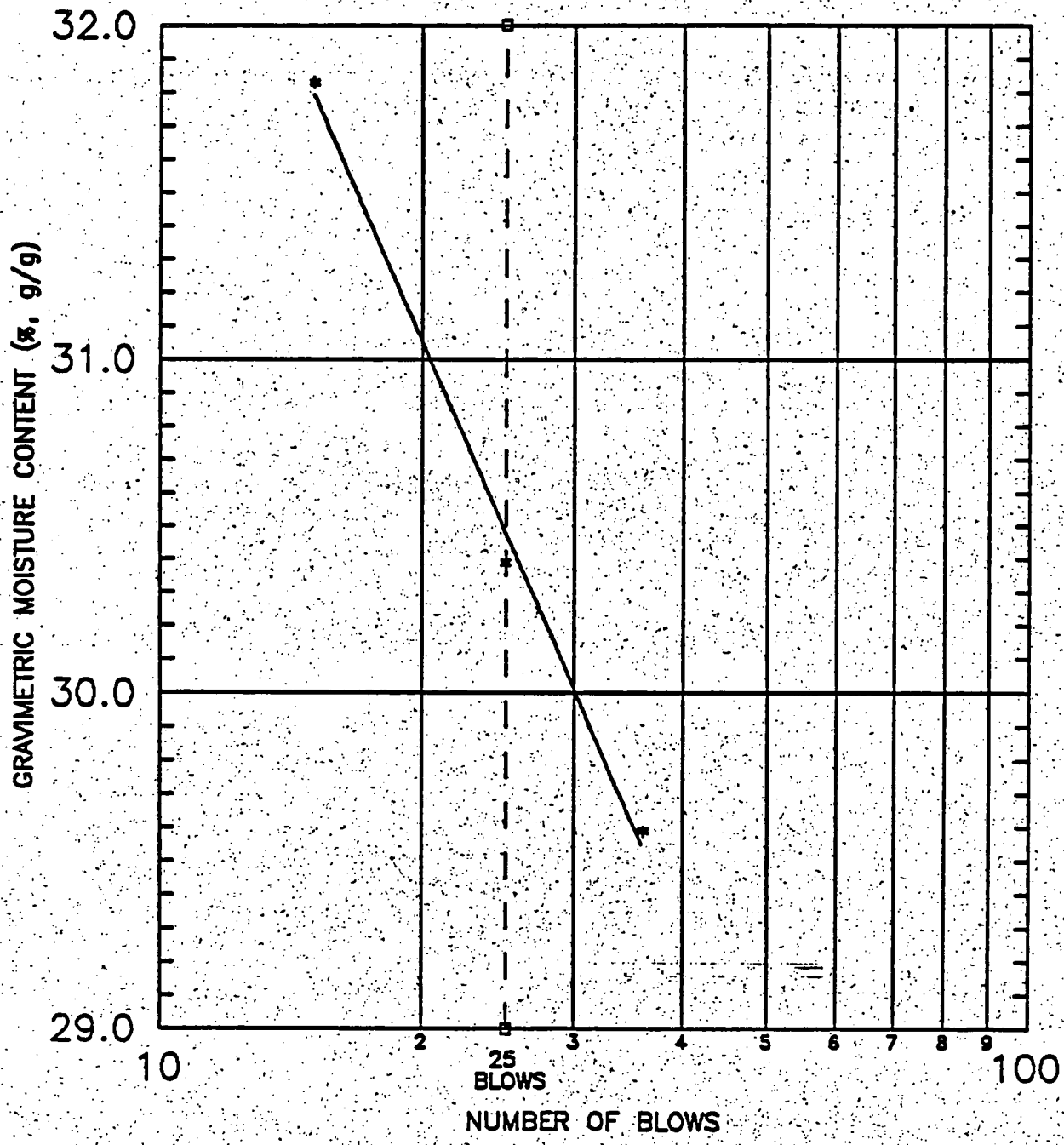
RESULTS

LIQUID LIMIT: 31 (%)
PLASTIC LIMIT: 17 (%)
PLASTICITY INDEX: 13 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40608AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40609AE
DEPTH: N/A
TEST DATE: 10/27/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	12	22	30
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	16.32	15.00	14.70
WEIGHT OF PAN + DRY SOIL (g):	14.68	13.67	13.47
WEIGHT OF PAN (g):	7.82	7.91	7.91
WEIGHT OF WATER (g):	1.64	1.33	1.23
WEIGHT OF DRY SOIL (g):	6.86	5.76	5.56
GRAVIMETRIC MOISTURE CONTENT (%):	23.91	23.09	22.12

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 22.6 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	10.83	10.52
WEIGHT OF PAN + DRY SOIL (g):	10.37	10.10
WEIGHT OF PAN (g):	8.03	7.92
WEIGHT OF WATER (g):	0.46	0.42
WEIGHT OF DRY SOIL (g):	2.34	2.18
GRAVIMETRIC MOISTURE CONTENT (%):	19.66	19.27
PLASTIC LIMIT (%):		19.46

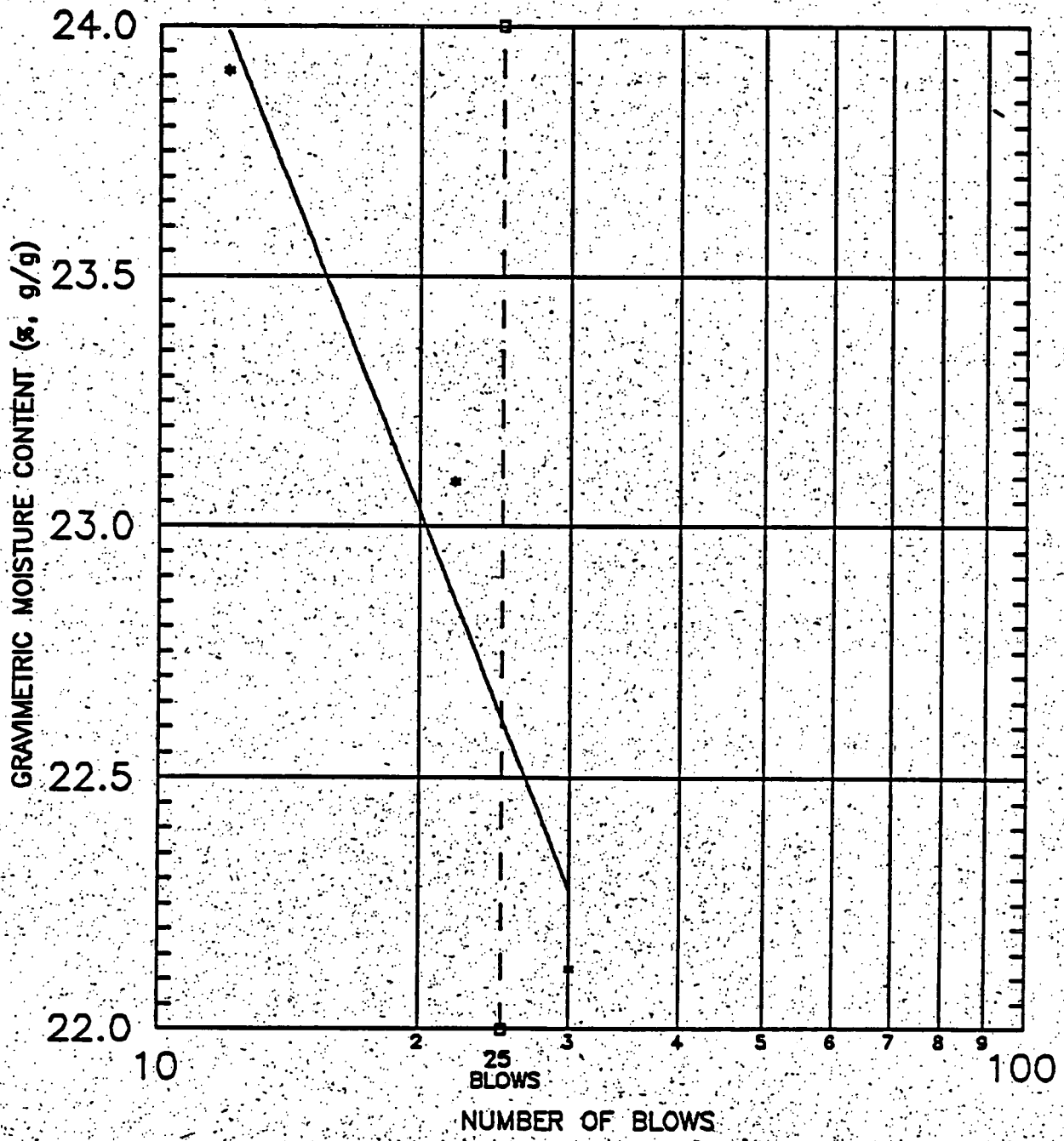
RESULTS

LIQUID LIMIT: 23 (%)
PLASTIC LIMIT: 19 (%)
PLASTICITY INDEX: 3 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40609AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40610AE
DEPTH: N/A
TEST DATE: 10/06/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	28	23	14
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	15.77	14.81	16.03
WEIGHT OF PAN + DRY SOIL (g):	13.25	12.54	13.19
WEIGHT OF PAN (g):	7.90	7.93	7.86
WEIGHT OF WATER (g):	2.52	2.27	2.84
WEIGHT OF DRY SOIL (g):	5.35	4.61	5.33
GRAVIMETRIC MOISTURE CONTENT (%):	47.10	49.24	53.28

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 48.2 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	9.64	10.25
WEIGHT OF PAN + DRY SOIL (g):	9.31	9.80
WEIGHT OF PAN (g):	7.86	7.89
WEIGHT OF WATER (g):	0.33	0.45
WEIGHT OF DRY SOIL (g):	1.45	1.91
GRAVIMETRIC MOISTURE CONTENT (%):	22.76	23.56

PLASTIC LIMIT (%): 23.16

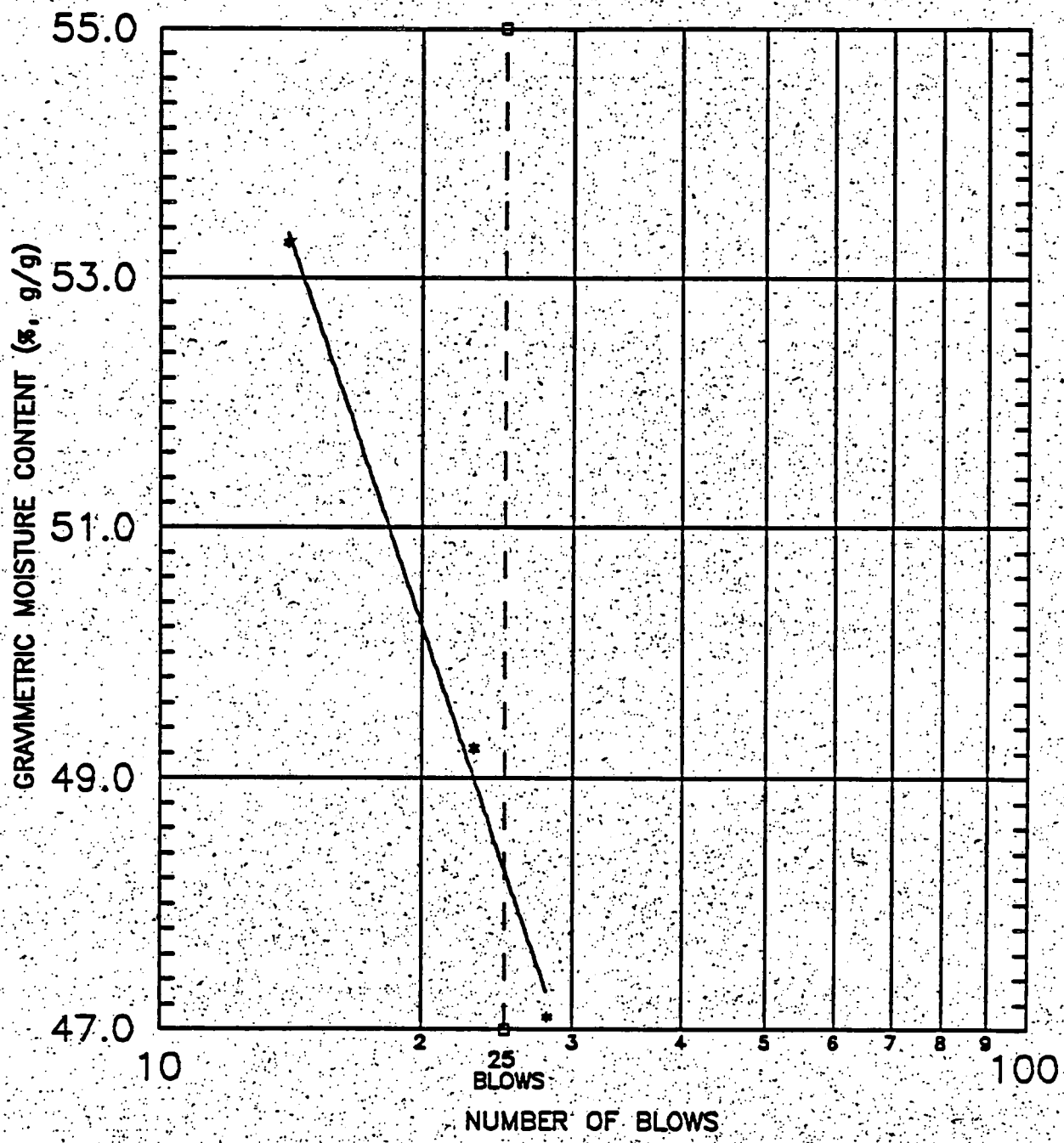
RESULTS

LIQUID LIMIT: 48 (%)
PLASTIC LIMIT: 23 (%)
PLASTICITY INDEX: 25 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

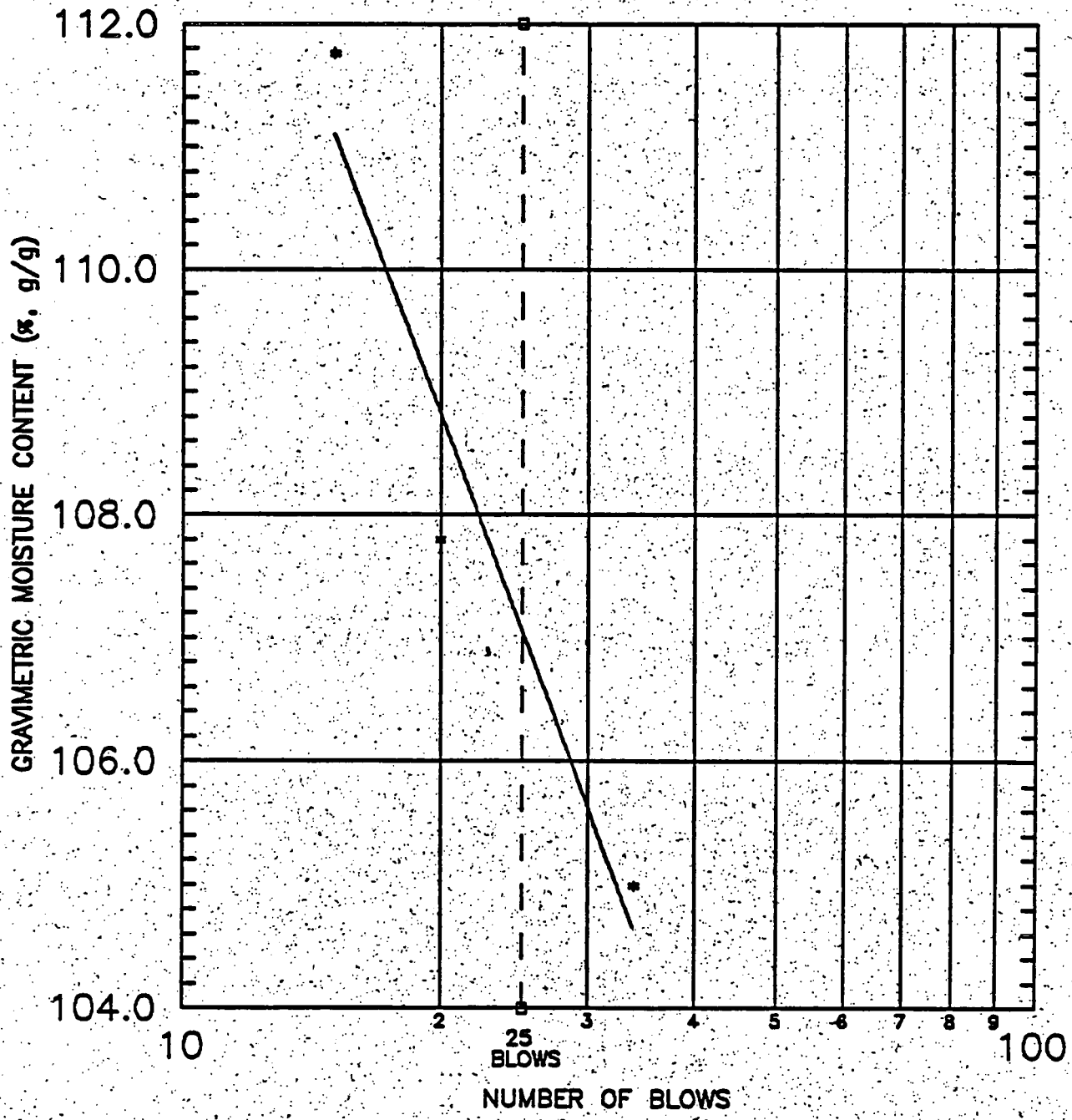
ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40810AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS



Liquid Limit Analysis for Sample No. BH40611AE

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

ATTERBERG LIMITS

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40611AE
DEPTH: N/A
TEST DATE: 10/11/93

LIQUID LIMIT

TRIAL NUMBER:	1	2	3
NUMBER OF DROPS:	34	20	15
PAN NUMBER:	LL 1	LL 2	LL 3
WEIGHT OF PAN + MOIST SOIL (g):	14.95	15.14	14.85
WEIGHT OF PAN + DRY SOIL (g):	11.37	11.41	11.24
WEIGHT OF PAN (g):	7.96	7.95	8.01
WEIGHT OF WATER (g):	3.58	3.73	3.61
WEIGHT OF DRY SOIL (g):	3.41	3.46	3.23
GRAVIMETRIC MOISTURE CONTENT (%):	104.99	107.80	111.76

FROM THE FLOW CURVE, THE LIQUID LIMIT IS: 107.0 (%)

PLASTIC LIMIT

TRIAL NUMBER:	1	2
PAN NUMBER:	1	2
WEIGHT OF PAN + MOIST SOIL (g):	8.90	8.82
WEIGHT OF PAN + DRY SOIL (g):	8.61	8.56
WEIGHT OF PAN (g):	7.73	7.79
WEIGHT OF WATER (g):	0.29	0.26
WEIGHT OF DRY SOIL (g):	0.88	0.77
GRAVIMETRIC MOISTURE CONTENT (%):	32.95	33.77

PLASTIC LIMIT (%): 33.36

RESULTS

LIQUID LIMIT: 107 (%)
PLASTIC LIMIT: 33 (%)
PLASTICITY INDEX: 74 (%)

LABORATORY ANALYSIS PERFORMED BY: J. Kelsey
CALCULATIONS PERFORMED BY: R. Hill
CHECKED BY: M. Ankeny

APPENDIX H

PARTICLE DENSITY

SUMMARY OF PARTICLE DENSITY TESTS

Sample Number	Particle Density (g/cm^3)
BH40396AE	2.65
BH40397AE	2.65
BH40398AE	2.65
BH40401AE	2.68
BH40402AE	2.69
BH40403AE	2.69
BH40404AE	2.73
BH40405AE	2.67
BH40406AE	2.69
BH40407AE	2.66
BH40408AE	2.70
BH40600AE	2.71
BH40601AE	2.62
BH40602AE	2.70
BH40603AE	2.66
BH40604AE	2.66

* Not enough samples to run test

SUMMARY OF PARTICLE DENSITY TESTS (CONTINUED)

Sample Number	Particle Density (g/cm^3)
BH40605AE	2.70
BH40606AE	2.66
BH40607AE	2.64
BH40608AE	2.64
BH40609AE	2.66
BH40610AE	2.73
BH40611AE	2.59
BH40612AE	2.62
BH40613AE	2.64

* Not enough samples to run test

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40396AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	104.48	113.65
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	148.48	154.83
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	380.64	388.16
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	353.03	362.63
OBSERVED TEMPERATURE (deg C):	27.0	27.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9965	0.9965
PARTICLE DENSITY (g/cc):	2.68	2.62
CORRECTION FACTOR, K:	0.9983	0.9983
PARTICLE DENSITY AT 20C (g/cc):	2.68	2.63

AVERAGE PARTICLE DENSITY (g/cc) = 2.65

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40397AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	108.29	100.76
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	146.17	146.23
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	380.28	377.50
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	356.62	349.16
OBSERVED TEMPERATURE (deg C):	33.0	33.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9947	0.9947
PARTICLE DENSITY (g/cc):	2.65	2.64
CORRECTION FACTOR, K:	0.9965	0.9965
PARTICLE DENSITY AT 20C (g/cc):	2.66	2.65

AVERAGE PARTICLE DENSITY (g/cc) = 2.65

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40398AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	108.25	102.64
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	156.12	151.18
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	386.74	381.42
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	356.91	351.21
OBSERVED TEMPERATURE (deg C):	29.5	30.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9958	0.9957
PARTICLE DENSITY (g/cc):	2.64	2.64
CORRECTION FACTOR, K:	0.9976	0.9975
PARTICLE DENSITY AT 20C (g/cc):	2.65	2.64

AVERAGE PARTICLE DENSITY (g/cc) = 2.65

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40401AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	108.28	102.66
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	150.51	149.27
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	383.86	380.88
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	357.39	351.63
OBSERVED TEMPERATURE (deg C):	24.0	24.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9973	0.9973
PARTICLE DENSITY (g/cc):	2.67	2.68
CORRECTION FACTOR, K:	0.9991	0.9991
PARTICLE DENSITY AT 20C (g/cc):	2.67	2.68

AVERAGE PARTICLE DENSITY (g/cc) = 2.68

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40402AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	100.96	104.49
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	143.46	149.54
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	376.51	381.02
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	349.89	352.59
OBSERVED TEMPERATURE (deg C):	26.0	33.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9968	0.9947
PARTICLE DENSITY (g/cc):	2.67	2.70
CORRECTION FACTOR, K:	0.9986	0.9965
PARTICLE DENSITY AT 20C (g/cc):	2.67	2.71

AVERAGE PARTICLE DENSITY (g/cc) = 2.69

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40403AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	108.39	100.84
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	153.05	151.00
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	385.21	380.88
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	357.08	349.45
OBSERVED TEMPERATURE (deg C):	29.0	30.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9960	0.9957
PARTICLE DENSITY (g/cc):	2.69	2.67
CORRECTION FACTOR, K:	0.9978	0.9975
PARTICLE DENSITY AT 20C (g/cc):	2.70	2.67

AVERAGE PARTICLE DENSITY (g/cc) = 2.69

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40404AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	100.96	104.47
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	144.31	144.11
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	376.38	377.49
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	349.05	352.24
OBSERVED TEMPERATURE (deg C):	37.0	37.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9934	0.9934
PARTICLE DENSITY (g/cc):	2.69	2.74
CORRECTION FACTOR, K:	0.9952	0.9952
PARTICLE DENSITY AT 20C (g/cc):	2.70	2.75

AVERAGE PARTICLE DENSITY (g/cc) = 2.73

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40405AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	100.86	104.03
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	159.73	176.46
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	386.47	397.94
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	349.47	352.69
OBSERVED TEMPERATURE (deg C):	30.0	30.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9957	0.9957
PARTICLE DENSITY (g/cc):	2.68	2.65
CORRECTION FACTOR, K:	0.9975	0.9975
PARTICLE DENSITY AT 20C (g/cc):	2.69	2.66

AVERAGE PARTICLE DENSITY (g/cc) = 2.67

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40406AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	100.75	103.90
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	146.39	155.64
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	378.41	385.60
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	349.76	352.96
OBSERVED TEMPERATURE (deg C):	24.0	24.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9973	0.9973
PARTICLE DENSITY (g/cc):	2.68	2.70
CORRECTION FACTOR, K:	0.9991	0.9991
PARTICLE DENSITY AT 20C (g/cc):	2.68	2.70

AVERAGE PARTICLE DENSITY (g/cc) = 2.69

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40407AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	104.48	113.56
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	147.41	151.59
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	379.76	385.98
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	352.81	362.32
OBSERVED TEMPERATURE (deg C):	30.0	30.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9957	0.9957
PARTICLE DENSITY (g/cc):	2.67	2.64
CORRECTION FACTOR, K:	0.9975	0.9975
PARTICLE DENSITY AT 20C (g/cc):	2.68	2.64

AVERAGE PARTICLE DENSITY (g/cc) = 2.66

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40408AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	100.86	104.42
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	141.23	152.71
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	375.30	383.76
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	349.94	353.17
OBSERVED TEMPERATURE (deg C):	24.0	24.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9973	0.9973
PARTICLE DENSITY (g/cc):	2.68	2.72
CORRECTION FACTOR, K:	0.9991	0.9991
PARTICLE DENSITY AT 20C (g/cc):	2.68	2.72

AVERAGE PARTICLE DENSITY (g/cc) = 2.70

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40600AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	108.40	102.74
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	151.51	155.28
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	383.58	383.70
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	356.37	350.48
OBSERVED TEMPERATURE (deg C):	38.0	40.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9930	0.9922
PARTICLE DENSITY (g/cc):	2.69	2.70
CORRECTION FACTOR, K:	0.9948	0.9940
PARTICLE DENSITY AT 20C (g/cc):	2.71	2.71

AVERAGE PARTICLE DENSITY (g/cc) = 2.71

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: N. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

PYC. WT:	103.99	100.97
CORFAC:	-0.02	-0.01
GRAPHWT:	352.87	349.85

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40601AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	103.97	100.96
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	147.58	146.57
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	379.80	378.06
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	352.85	349.84
OBSERVED TEMPERATURE (deg C):	27.0	27.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9965	0.9965
PARTICLE DENSITY (g/cc):	2.61	2.61
CORRECTION FACTOR, K:	0.9983	0.9983
PARTICLE DENSITY AT 20C (g/cc):	2.61	2.62

AVERAGE PARTICLE DENSITY (g/cc) = 2.62

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40602AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	103.99	100.91
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	142.32	148.94
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	376.66	379.89
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	352.60	349.55
OBSERVED TEMPERATURE (deg C):	31.0	31.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9954	0.9954
PARTICLE DENSITY (g/cc):	2.67	2.70
CORRECTION FACTOR, K:	0.9972	0.9972
PARTICLE DENSITY AT 20C (g/cc):	2.68	2.71

AVERAGE PARTICLE DENSITY (g/cc) = 2.70

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

PYC. WT:	102.76	100.84
CORFAC:	-0.03	0.01
GRAPHWT:	351.54	349.68

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40603AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	102.73	100.85
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	140.00	133.50
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	374.80	370.12
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	351.51	349.69
OBSERVED TEMPERATURE (deg C):	27.0	27.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9965	0.9965
PARTICLE DENSITY (g/cc):	2.66	2.66
CORRECTION FACTOR, K:	0.9983	0.9983
PARTICLE DENSITY AT 20C (g/cc):	2.66	2.67

AVERAGE PARTICLE DENSITY (g/cc) = 2.66

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40604AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	100.83	100.95
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	146.16	146.47
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	377.45	377.50
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	349.06	349.13
OBSERVED TEMPERATURE (deg C):	35.0	36.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9941	0.9937
PARTICLE DENSITY (g/cc):	2.66	2.64
CORRECTION FACTOR, K:	0.9959	0.9955
PARTICLE DENSITY AT 20C (g/cc):	2.67	2.65

AVERAGE PARTICLE DENSITY (g/cc) = 2.66

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40605AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	104.48	113.65
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	148.93	158.45
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	380.51	390.13
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	352.32	362.02
OBSERVED TEMPERATURE (deg C):	36.0	35.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9937	0.9941
PARTICLE DENSITY (g/cc):	2.72	2.67
CORRECTION FACTOR, K:	0.9955	0.9959
PARTICLE DENSITY AT 20C (g/cc):	2.73	2.68

AVERAGE PARTICLE DENSITY (g/cc) = 2.70

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

PYC. WT:	104.48	113.54
CORFAC:	-0.11	0.03
GRAPHWT:	352.58	362.09

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40606AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	104.37	113.57
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	144.08	158.09
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	377.42	389.75
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	352.47	362.12
OBSERVED TEMPERATURE (deg C):	33.0	33.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9947	0.9947
PARTICLE DENSITY (g/cc):	2.68	2.62
CORRECTION FACTOR, K:	0.9965	0.9965
PARTICLE DENSITY AT 20C (g/cc):	2.69	2.63

AVERAGE PARTICLE DENSITY (g/cc) = 2.66

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

PYC. WT:	103.99	100.97
CORFAC:	-0.08	-0.09
GRAPHWT:	352.27	349.08

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40607AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	103.91	100.88
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	153.26	150.15
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	382.90	379.61
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	352.19	348.99
OBSERVED TEMPERATURE (deg C):	35.0	37.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9941	0.9934
PARTICLE DENSITY (g/cc):	2.63	2.62
CORRECTION FACTOR, K:	0.9959	0.9952
PARTICLE DENSITY AT 20C (g/cc):	2.64	2.64

AVERAGE PARTICLE DENSITY (g/cc) = 2.64

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40608AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	108.35	108.42
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	161.36	161.14
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	390.28	389.35
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	357.30	356.57
OBSERVED TEMPERATURE (deg C):	26.0	35.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9968	0.9941
PARTICLE DENSITY (g/cc):	2.64	2.63
CORRECTION FACTOR, K:	0.9986	0.9959
PARTICLE DENSITY AT 20C (g/cc):	2.64	2.64

AVERAGE PARTICLE DENSITY (g/cc) = 2.64

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40609AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	100.83	103.98
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	157.17	152.77
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	384.13	382.74
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	348.97	352.17
OBSERVED TEMPERATURE (deg C):	36.0	36.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9937	0.9937
PARTICLE DENSITY (g/cc):	2.64	2.66
CORRECTION FACTOR, K:	0.9955	0.9955
PARTICLE DENSITY AT 20C (g/cc):	2.66	2.67

AVERAGE PARTICLE DENSITY (g/cc) = 2.66

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40610AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	108.40	102.77
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	150.95	149.99
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	383.38	381.02
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	356.47	351.03
OBSERVED TEMPERATURE (deg C):	36.0	34.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9937	0.9944
PARTICLE DENSITY (g/cc):	2.70	2.73
CORRECTION FACTOR, K:	0.9955	0.9962
PARTICLE DENSITY AT 20C (g/cc):	2.72	2.74

AVERAGE PARTICLE DENSITY (g/cc) = 2.73

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40611AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	100.75	100.84
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	134.11	132.78
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	369.26	369.11
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	348.72	349.49
OBSERVED TEMPERATURE (deg C):	38.0	30.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9930	0.9957
PARTICLE DENSITY (g/cc):	2.58	2.58
CORRECTION FACTOR, K:	0.9948	0.9975
PARTICLE DENSITY AT 20C (g/cc):	2.60	2.59

AVERAGE PARTICLE DENSITY (g/cc) = 2.59

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40612AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	104.47	113.66
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	162.40	171.45
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	388.78	398.08
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	352.73	362.50
OBSERVED TEMPERATURE (deg C):	31.0	29.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9954	0.9960
PARTICLE DENSITY (g/cc):	2.64	2.59
CORRECTION FACTOR, K:	0.9972	0.9977
PARTICLE DENSITY AT 20C (g/cc):	2.64	2.60

AVERAGE PARTICLE DENSITY (g/cc) = 2.62

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

DANIEL B. STEPHENS & ASSOCIATES, INC.

ENVIRONMENTAL SCIENTISTS AND ENGINEERS

PARTICLE DENSITY

JOB NAME: ESI
JOB NUMBER: 3858
SAMPLE NUMBER: BH40613AE
DEPTH: N/A

	TRIAL 1	TRIAL 2
WEIGHT OF PYCNOMETER FILLED W/ AIR (g):	108.37	102.75
WEIGHT OF PYCNOMETER FILLED W/ SOIL (g):	147.97	142.37
WEIGHT OF PYCNOMETER FILLED W/ SOIL & WATER (g):	381.44	375.51
WEIGHT OF PYCNOMETER FILLED W/ WATER (g):	356.79	350.94
OBSERVED TEMPERATURE (deg C):	32.0	35.0
DENSITY OF WATER AT OBSERVED TEMPERATURE (g/cc):	0.9951	0.9941
PARTICLE DENSITY (g/cc):	2.64	2.62
CORRECTION FACTOR, K:	0.9969	0.9959
PARTICLE DENSITY AT 20C (g/cc):	2.64	2.63

AVERAGE PARTICLE DENSITY (g/cc) = 2.64

COMMENTS:

LABORATORY ANALYSIS PERFORMED BY: M. Trenchik
CALCULATIONS MADE BY: R. Hill
CHECKED BY: M. Ankeny

APPENDIX I

CHEMICAL ANALYSIS

SUMMARY OF CHEMICAL ANALYSIS

Sample Number	CEC (meq/100g)	EC (mg KCl/Kg soil)	TOC (ppm)
BH40396AE	4.5	88	210
BH40397AE	27	360	5800
BH40398AE	37	100	1200
BH40401AE	41	2500	2700
BH40402AE	51	2000	590
BH40403AE	27	190	290
BH40404AE	38	3100	750
BH40405AE	2.0	57	120
BH40406AE	37	130	380
BH40407AE	57	250	13000
BH40408AE	42	1000	360
BH40600AE	22	280	3000
BH40601AE	66	390	14000
BH40602AE	6.5	330	1000
BH40603AE	46	1100	700
BH40604AE	44	1900	2100
BH40605AE	51	1800	2000
BH40606AE	40	290	5500
BH40607AE	30	210	3400
BH40608AE	23	1800	5900
BH40609AE	13	1900	330
BH40610AE	27	2200	540
BH40611AE	63	1200	6900
BH40612AE	20	8600	5300
BH40613AE	20	8300	5000

NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY
CHEMISTRY DEPARTMENT
M E M O R A N D U M

To: Joe Vinson
From: Donald Brandvold
Date: October 25, 1993
Re: Sample Analysis

Title: ESI Samples Analysis Results

Sample I.D.	CEC meQ Na^+ 100 g Soil	EC mg KCl Kg Soil	TOC mg Carbon Kg soil
BH40605AE	51	1800	2000
BH40404AE	38	3100	750
BH40407AE	57	250	13000
BH40401AE	41	2500	2700
BH40405AE	2.0	57	120
BH40601AE	66	390	14000
BH40607AE	30	210	3400
BH40612AE	20	8600	5300
BH40602AE	6.5	330	1000
BH40603AE	46	1100	700
BH40608AE	23	1800	5900
BH40408AE	42	1000	360
BH40610AE	27	2200	540
BH40606AE	40	290	5500
BH40609AE	13	1900	330
BH40604AE	44	1900	210
BH40611AE	63	1200	6900
BH40613AE	20	8300	5000
BH40618AE	37	130	380
BH40402AE	51	2000	590
BH40396AE	4.5	88	210
BH40398AE	37	100	1200
BH40397AE	27	360	5800
BH40403AE	27	190	290
BH40600AE	22	280	3000

+ Sample No. show[illegible] [illegible]-0406AE

Title: ESI Samples, Electrical Conductivity

Sample I.D.	Wt. Soil (g)	Wt. H20 (g)	dS/m
BH40605AE	10.70	20.05	1.85
	10.77	20.02	1.65
BH40404AE	10.01	19.98	2.83
	10.04	20.08	2.72
BH40407AE	10.00	20.13	0.268
	9.95	20.23	0.255
BH40401AE	10.72	20.78	2.38
	12.19	20.03	2.71
BH40405AE	10.03	19.98	0.059
	10.02	20.01	0.056
BH40601AE	10.09	20.12	0.338
	13.32	20.52	0.421
BH40607AE	11.80	20.94	0.232
	10.79	20.92	0.223
BH40612AE	9.98	20.47	7.29
	9.90	19.99	7.43
BH40602AE	10.09	19.99	0.326
	9.71	19.98	0.317
BH40603AE	8.02	20.21	0.797
	8.93	21.59	0.854
BH40608AE	10.01	20.18	1.64
	9.70	20.20	1.64
BH40408AE	10.14	19.97	0.977
	9.98	20.08	0.943
BH40610AE	9.95	19.98	2.00
	10.08	19.99	2.09

Title: ESI Samples, Electrical Conductivity (continued)

Sample I.D.	Wt. Soil (g)	Wt. H2O (g)	dS/m
BH40606AE	10.06	20.26	0.280
	9.98	20.03	0.272
BH40609AE	10.06	20.53	1.78
	10.04	19.97	1.77
BH40604AE	12.68	31.37	1.40
	13.46	32.08	1.54
BH40611AE	4.35	20.73	0.491
	4.58	21.53	0.479
BH40613AE	9.81	20.00	6.93
	10.02	20.17	7.41
BH40618AE	11.75	20.36	0.144
	11.53	21.02	0.143
BH40402AE	10.01	20.09	1.64
	9.91	19.97	2.00
BH40396AE	10.01	19.96	0.087
	10.02	20.11	0.090
BH40398AE	10.39	21.70	0.101
	9.94	20.94	0.098
BH40397AE	9.95	19.94	0.343
	10.00	20.07	0.349
BH40403AE	9.97	19.95	0.186
	10.07	20.25	0.183
BH40600AE	10.00	19.99	0.259
	8.30	20.45	0.231

APPENDIX J

LABORATORY METHODS

SUMMARY OF LABORATORY METHODS

Methods	Reference
Moisture Content	ASTM D 2216-90
Bulk Density	MOSA*, 1986. Chp. 13, pp. 363-367
Porosity	MOSA*, 1986. Chp. 18, pp. 444-445
Saturated Hydraulic Conductivity	
Constant Head	ASTM D 2434-68(74)
Falling Head	MOSA*, 1986. Chp. 28, pp. 700-703
Moisture Retention Characteristics	
Hanging Column	MOSA*, 1986. Chp. 26, pp. 637-639
Pressure Plate Extractor	ASTM D 2325-68(81)M MOSA*, 1986. Chp. 26, PP. 644-649
Particle Size Characteristics	
Sieve	ASTM D 422-63 (90)
Hydrometer	ASTM D 422-63 (90)
Atterberg Limits	ASTM D 4318-84
Particle Density	ASTM D 854-91
Chemical Analysis	
Mineralogical X-Ray Diffraction	ASTM D 934-80
Cation Exchange Capacity	USEPA SW-846 9081
Total Organic Carbon	ASTM D 2579-85
Total Inorganic Carbon	Page, A. (ed.) 1982. *Methods of Soil Analysis. Part 2.* 2nd ed. American Society of Agronomy, Madison, WI.
Electrical Conductivity (1:1 extract)	Page, A. (Ed.) 1982. *Methods of Soil Analysis. Part 2.* 2nd ed. American Society of Agronomy, Madison, WI.

* Klute, A. (ed.) 1986. *Methods of Soil Analysis. Part 1.* 2nd ed. American Society of Agronomy, Madison, WI.

APPENDIX II.Q

FIELD DATA AND RESULTS FOR BAT™ AND GUELPH TESTS

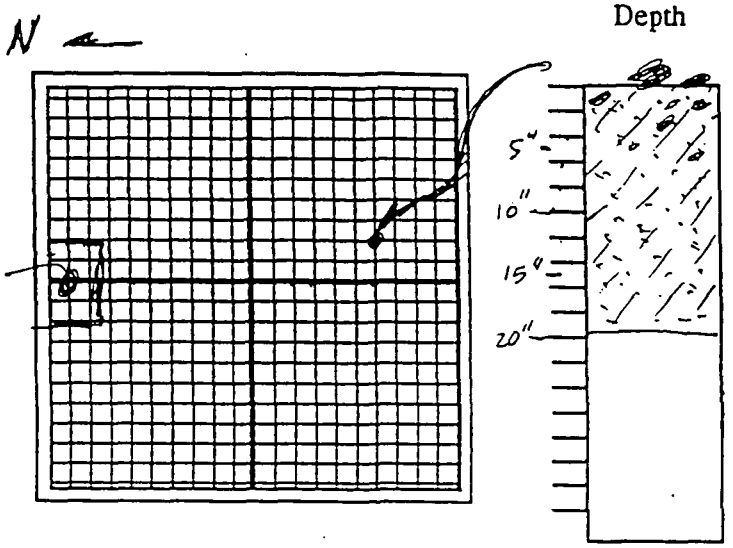
ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34A** **Site Information Rev. 0**

Date 4-14-93 Investigator MURRAY & A.M. Edwards

Site Location PA North hillside, north of POND 207A 15ft south of well 3186.

Dominant Soil Type(s) Clayey loam with surface Cobbles light buff color, moist.

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):

Depth	Description
	POWERED AUGERED Down to 19.5in. light buff colored silty clayey sandstone (weathered).

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Soil was moist, soft clayey & silty, but when I cleaned out the hole with the hand auger it spreared the walls pritty good so I reamed it out w/ the brush attatchment.

Comments and Notes (topography, slope, vegetation, etc.):

hillside north of Pond 207A near well 3186.

Location Code: 3186 #1

Name of Individual Authenticating Data (please print): CLAUDE D. MURRAY

Organization: A.E.

Signature and Date: Claude D. Murray 4/14/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

Date_____ Investigator _____ GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

The steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} (FIELD SATURATED HYDRAULIC CONDUCTIVITY) = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
(RESERVOIR CONSTANT; $\bar{R}_2$-STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_1$-STEADY STATE RATE OF FLOW)

Φm (MATRIC FLUX POTENTIAL) = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
(RESERVOIR CONSTANT; $\bar{R}_1$-STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_2$-STEADY STATE RATE OF FLOW)

α (ALPHA PARAMETER) = (_____)/(_____) = _____cm^{-1}
(K_{fs}; Φ_m)

$\Delta\theta$ (DELTA THETA) = (_____) - (_____) = _____cm^3/cm^3
(θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM; θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM)

S (SORPTIVITY) = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
($\Delta\theta$; Φ_m)

ESTIMATED	☐
MEASURED	☐

CHECK ONE

Location Code: 3186 #1

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust

Signature and Date: C. Murray 4/14/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 15' South of Well 3186

DATE: 4-14-93

INVESTIGATOR: CDM

DEPTH OF HOLE: 19.5" INCHES OR CM

TEST #1

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22

5 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0			1.4		
1		2	1.4	0	
2		5	1.4	0	
3		5	1.5	.1	.02
4		5	3.3	1.8	.36
5		5	4.7	1.4	.28
6		5	6.4	1.7	.34
7		5	8.6	2.2	.44
8		5	10.2	1.6	.32
9		5	12.7	2.5	.50
10		5	13.9	1.2	.24
11		5	15.8	1.9	.38
12		5	17.1	1.3	.26
13		5	19.4	2.3	.46
14		5	21.6	2.2	.44
15					
16					

* 2.22

.39 AVG. $\bar{R}_1$

R1 (cm/~~sec~~ min) .39 AVG

R2 (cm/~~sec~~ min) .52 AVG

$\bar{R}_1$ cm/sec = .39/60 = .0064

$\bar{R}_2$ = cm/sec = .52/60 = .0086

Kfs= 9.62×10^{-7}

PHIm= 3.69×10^{-4} 4.9×10^{-2}

* $K_{fs} = 2.6 \times 10^{-5}$

* $m_{fxp} = 2.1 \times 10^{-4}$

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,0,0		69		
1	0,2,0	2	69.7	.7	.35
2	0,4,0	2	71.0	1.3	.65
3	0,6,0	2	72.9	1.9	.95
4	0,8,0	2	73.8	.9	.45
5	0,10,0	2	74.6	.8	.40
6	0,12,0	2	76.0	1.4	.70
7					
8					
9					
10					
11					
12					
13					
14					
15					

.52 AVG.

REMARKS: Powered augered to 19.5" light buff colored sandstone w/ clay & silt. Soil was moist, soft, & clayey and silty. The soil should have better K values than this 'might' want to do another test.

* Single head sim calc.

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:4/14/93
BOREHOLE LOCATION: 3186#1

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	19.5
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0064
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 2.57E-05

mflx p(cm2/sec)= 0.000215

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34A

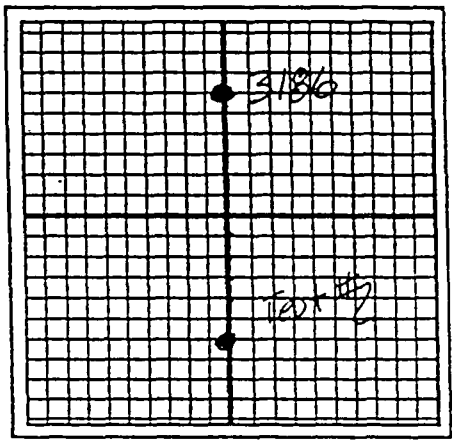
Site Information
Rev. 0

Date 4/22/93 Investigator C. Murray

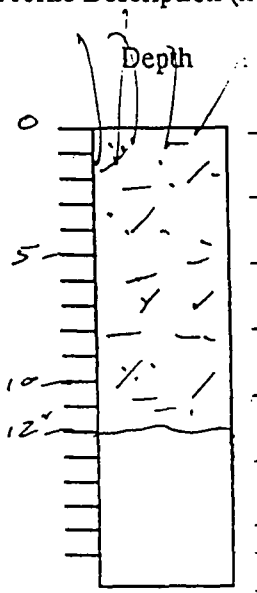
Site Location 12 ft. South of 3186 Test #2

Dominant Soil Type(s) Silty Clayey Sandstone.

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Description

Silty Cly Sandstone, lt. brn.

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Dry

Comments and Notes (topography, slope, vegetation, etc.):

moderate slope, ≤ Vegetation.

Location Code: 3186

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust E+I

Signature and Date: C. Murray 4/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT | FORM GT.34B Rev. 0 | Standardized Procedure For Permeameter Readings and Calculations

te 4/22/93 Investigator C. Murray GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X 35.55	cm^2
Inner Reservoir	Y 2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

he steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

or the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED	☐	CHECK ONE
MEASURED	☐	

cation Code: 3184

me of Individual Authenticating Data (please print): _____

Organization: PUST

Signature and Date: C. Murray 4/22/93

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:4/22/93
BOREHOLE LOCATION: 3186 #2

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	12
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0053
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 2.13E-05

mflx p(cm2/sec)= 0.000178

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 12 ft ~~North~~ South of Well 3186

DATE: 4-22-93

INVESTIGATOR: CDM

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22 ✓

DEPTH OF HOLE: 12" INCHES OR CM

#2

5 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	9:55:00	4	0.80		
1		4	1.10	.30	.075
2		4	2.00	.90	.225
3	0, 0, 00	4	3.00	1.0	.250
4	0, 4, 00	4	4.40	1.4	.350
5	0, 8, 00	4	5.60	1.2	.300
6	0, 12, 00	4	7.00	1.4	.350
7	0, 16, 00	4	8.60	1.6	.400
8	20, 00	4	9.70	1.1	.275
9	24, 00	4	10.8	1.1	.275
10	28, 00	4	12.0	1.2	.300
11	32, 00	4	13.3	1.3	.325
12	36, 00	4	14.5	1.2	.300
13	40, 00	4	15.9	1.4	.350
14	44.00	4	17.1	1.2	.300
15					
16					

1111
1111
111
STARTED STOP WATCH

4x9 = 36
4x8 = 32
4x7 = 29

4√30

AVG: .3188/60 = .0053

R1 (cm/sec) .0053
R2 (cm/sec) .0098

Kfs= -6.22E-5
PHIm= 6.66E-4

2.1 X 10^-5

Kfs (single head 5cm) = ~~6.35 x 10^-5~~ cm/sec.
~~Kfs (single head 10cm) = 8.88 x 10^-5~~ cm/sec
mf x p = 1.8 X 10^-4

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	10:52	0	61.2		
1	4:00	4	62.3	1.1	.275
2	8:00	4	64.0	1.7	.425
3	12:00	4	65.7	1.7	.425
4	16:00	4	67.8	2.1	.525
5	20:00	4	69.8	2.0	.500
6	24:00	4	73.2	3.4	.850
7	28:00	4	75.1	1.9	.475
8					
9					
10					
11					
12					
13					
14					
15					

AVG. = .5875/60 = .0098

REMARKS: 75°F, Dry Soil Conditions, Silty Clayey Sandstone, light brown Power Augered, Wtr Tube on hole bottom and centered in hole.

ENVIRONMENTAL MANAGEMENT DEPARTMENT

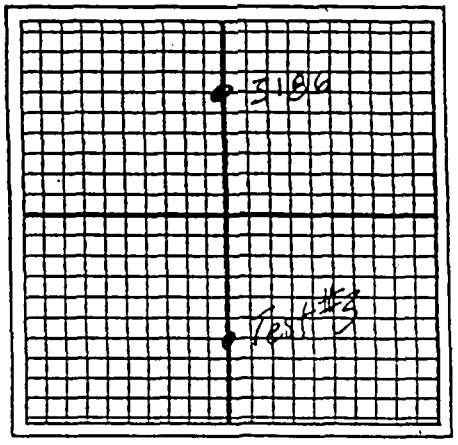
FORM GT.34A Site Information Rev. 0

Date 4/22/93 Investigator C. Murray

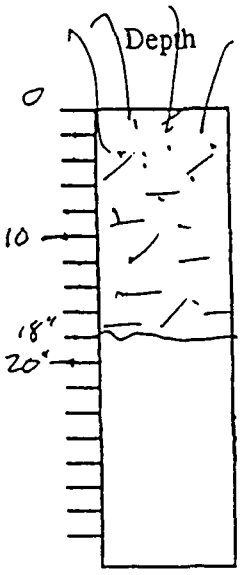
Site Location 3186 #3 Test 12 ft S. of 3186.

Dominant Soil Type(s) Silty clayey Sandstone

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Description

Silty Clayey Sandstone, buff color. Dry.

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

moderate vegetation & slope.

Location Code: 3186 #3

Name of Individual Authenticating Data (please print): J. WHLINGER

Organization: RUST E+I

Signature and Date: C. Murray 4/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

te 4/22/93 Investigator C. Murray

GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

he steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

or the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec

FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec

MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}

ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3

DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$

SORPTIVITY — $\Delta\theta$ — Φ_m

ESTIMATED		CHECK ONE
MEASURED		

ation Code: 3186 #3

ne of Individual Authenticating Data (please print): J. UHLINGER

Organization: RUST

Signature and Date: C. Murray 4/22/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: Inside PA 12 ft. South of Well 3186

DATE: 4-22-95

INVESTIGATOR: CDM

DEPTH OF HOLE: 1.5' 18" ~~INCHES~~ ft. OR CM

#3

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only)	2.22 ✓

5 cm head test → 5 cm HEAD TEST

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0:00	0	1.0		
1	2~~4~~:00	~~4~~ 2	1.0	0.	
2	6:00	4	1.0	0	
3	10:00	4	1.0	0	
4	14:00	4	2.3	1.3	.325
5	18:00	4	3.4	1.1	.275
6	22:00	4	5.4	2.0	.500
7	26:00	4	6.5	1.1	.275
8	30:00	4	7.4	0.9	.225
9	34:00	4	9.2	1.8	.450
10	38:00	4	10.3	1.1	.275
11	42:00	4	10.5	.2	.050
12	46:00	4	11.3	.8	.200
13	50:00	4	11.3	0	–
14	54:00	4	11.5	.2	.050
15	58:00	4	11.7	.2	.050
16	62	4	11.9	.2	.050

} .05/60sec. = .0008

R1 (cm/sec)	.0008
R2 (cm/sec)	.0081
Kfs=	6.33E-5
PHIm=	-3.18E-4

single head (5cm) = Kfs = 3.2×10^{-6} ✓
mfxp = 2.7×10^{-5} ✓

10 cm head test
12:30 → 10 cm Head Test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,00	0	55.3		
1	4,00	4	57.5	2.2	.550
2	8,00	4	59.4	1.9	.475
3	10,00	2	60.4	1.0	.500
4	12,00	2	61.3	0.9	.450
5	14,00	2	62.3	1.0	.500
6	16,00	2	62.9	0.6	.300
7	18,00	2			
8					
9					
10					
11					
12					
13					
14					
15					

} AVG = .483/60 = .0081

Test failed; started to bubble and loose water.

REMARKS: 75°F Dry soil conditions. Soil: Silty Clayey Sandstone light buff color

Steve Cullen G&M Santa Barbra

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:4/22/93
BOREHOLE LOCATION: 3186 #3

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	18
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0008
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 3.22E-06

mflx p(cm2/sec)= 2.68E-05

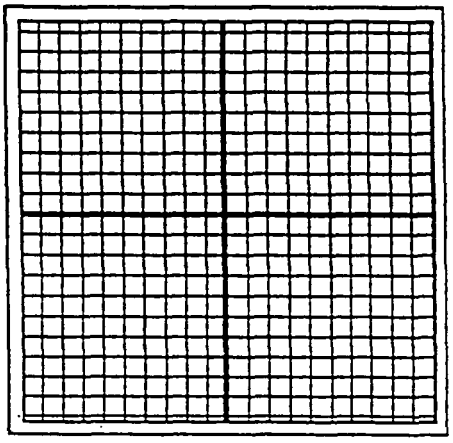
ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34A** **Site Information Rev. 0**

Date 3/22/93 Investigator B. NEWLIN / J. UHLINGER

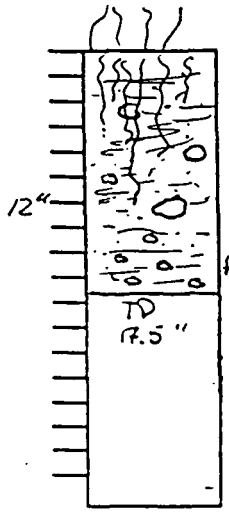
Site Location 40393 - 3ft east of 40393

Dominant Soil Type(s) Silty Sandy Gravelly Clay (RF ALLUVIUM)

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Description

ORGANIC Rich Silty Sandy clay

Dark Brown grading to orange Brown by 6"

Roots (Typically 1-2 mm), Dry

Orange Brown clay @10" w/silt & minor fine sand

few Roots and gravels (up to 5 cms)

Roots not frequent, Gravels are smaller

limonite pyrite oxide staining on 2-4 cm gravels

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

- orange grey clay is tighter than previously encountered - fewer gravels and more compacted (waxy looking)

Comments and Notes (topography, slope, vegetation, etc.):

North sloping location

17½" Deep Auger Refusal due to gravel

Location Code: 40393

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: RUST E&I

Signature and Date: [signature] 3/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT FORM GT.34B Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

1 of 2

Date 3/22/93 Investigator B. NEWLIN / J. UHLINGER GUELPH SERIAL # 10563

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X 35.55	cm^2
Inner Reservoir	Y 2.22	cm^2

☐ CHECK RESERVOIR USED ✓

Depth of Well Hole 17.5"

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME t_0=13:00:10	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)
1		0	0	—	
Change to inner Res		no change from 5.5 cm 5m			
1	T_0: 13:06:00	0	5.5		
2		0.75	7.0	—	—
3					
	No change - Switching to 70 cm/Head				

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME t_0 13:11:00	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)
1	13:11:00	0	48.6		
2		2.0	53.9	5.3	2.65
3		2.0	57.3	3.4	1.70
4		2.0	58.6	1.3	0.65
5		2.0	60.2	1.6	0.80
6		2.0	61.7	1.5	0.75
7		2.0	62.9	1.2	0.60
8		2.0	64.5	1.6	0.80
9		2.0	66.4	1.9	0.85
10		2.0	68.0	1.6	0.80
11					
12					
13					

Possibly Influenced By Rubber Tube Jo

57.13
53.9
3.4

57
60.12
58.6
1.6

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (.80)/60 = .0133 cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (____)/60 = ____ cm/sec

K_{fs} = [(.0041)(____)(____)] - [(.0054)(____)(____)] = ____ cm/sec

FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$ STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

* ~~3.2×10⁻⁴~~ cpm

Φm = [(.0572)(____)(____)] - [(.0237)(____)(____)] = ____ cm^2/sec

MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

* ~~2.7×10⁻⁴~~ cpm

α = (____)/(____) = ____ cm^{-1}

ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (____) - (____) = ____ cm^3/cm^3

DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(____)(____) = ____ cm $sec^{-1/2}$

SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED		CHECK ONE
MEASURED		

* single head calc.

Location Code: 40393 (3.0 ft east of borehole 40393)

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: RUST E&I

Signature and Date: [signature] 3/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

Date 3/22/93 Investigator J. UHLINGER

GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☑ CHECK RESERVOIR USED

Depth of Well Hole _____

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at ~~5 cm~~ 20 cm

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)
0	13:35		9.3	–	–
1	13:36	1.0	17.7	–	–
2	No change on large Res go to Inside				
3	13:40	0	17.7		
	13:45	5	17.3	-.4	
	See note Below				

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____ cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____ cm/sec

K_{fs} (FIELD SATURATED HYDRAULIC CONDUCTIVITY) = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____ cm/sec
(RESERVOIR CONSTANT; $\bar{R}_1$ STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_1$ STEADY STATE RATE OF FLOW)

Φm (MATRIC FLUX POTENTIAL) = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____ cm^2/sec
(RESERVOIR CONSTANT; $\bar{R}_1$ STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_2$ STEADY STATE RATE OF FLOW)

α (ALPHA PARAMETER) = (_____)/(_____) = _____ cm^{-1}
(K_{fs}; Φ_m)

$\Delta\theta$ (DELTA THETA) = (_____) - (_____) = _____ cm^3/cm^3
(θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM; θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM)

S (SORPTIVITY) = $\sqrt{2}$(_____)(_____) = _____ cm $sec^{-1/2}$
($\Delta\theta$; Φm)

ESTIMATED		CHECK ONE
MEASURED		

Results indicate $K_{fs} < 10^{-6}$ cm/sec

Location Code: 40393

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: RUST E&I

Signature and Date: [signature] 3/22/93

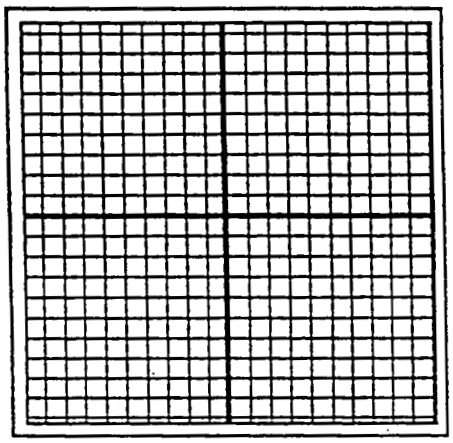
ENVIRONMENTAL MANAGEMENT DEPARTMENT | **FORM GT.34A** | **Site Information Rev. 0**

Date 3/22/93 Investigator B. NEWLIN / J. UHLINGER

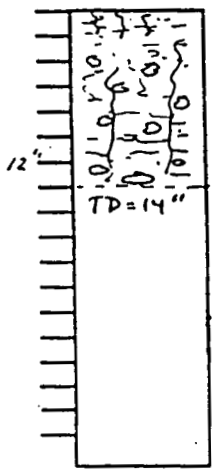
Site Location 40593

Dominant Soil Type(s) Brown Clay w/ small gravels (Rocky Flats ALLUVIUM)

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Silty Sandy gravelly clay
	small roots (1-2 m) @ surface to TD
	Dry gravels (3-5 cm)
	Attempted to Advance hole got to 23" Auger refusal (NO TEST)

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Dry
Roots

Comments and Notes (topography, slope, vegetation, etc.):

Flats on South side of North ~~Slopp~~ Sloping topography

Location Code: 2.25' North of Borehole 40593

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: RUST E&I

Signature and Date: [signature] 3/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34B Rev. 0** **Standardized Procedure For Permeameter Readings and Calculations**

Date 3/22/93 Investigator B. NEWLIN / J. UHLINGER GUELPH SERIAL # 10563

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

[✓] CHECK RESERVOIR USED

Depth of Well Hole 14.0"

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME t_0 = 10:53	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)
1		0	0.0	—	—
2		2.0	8.5	8.5	4.25
3		2.0	11.0	2.5	1.25
4		2.0	13.1	2.1	1.05
5		2.0	15.1	2.0	1.00
6		2.0	16.6	1.5	0.75
7		2.0	18.0	1.4	0.70
8		2.0	19.2	1.2	0.60
9		2.0	20.3	1.1	0.55
10		2.0	21.4	1.1	0.55 $\bar{R}_1$
11		2.0	22.5	1.1	0.55

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME t_0 = 11:17	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)
1		0	22.5	—	—
2		2.0	28.2	5.7	2.85
3		2.0	31.0	2.8	1.40
4		2.0	33.5	2.5	1.25
5		2.0	36.0	2.5	1.25
6		2.0	38.3	2.3	1.15
7		2.0	40.4	2.1	1.05 $\bar{R}_2$
8		2.0	42.5	2.1	1.05

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (0.55)/60 = 0.009 cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (1.05)/60 = 0.018 cm/sec

K_{fs} = [(.0041)(35.55)(0.018)] - [(.0054)(35.55)(0.009)] = 9.0×10^{-4} cm/sec

FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$ STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$ STEADY STATE RATE OF FLOW

Φm = [(.0572)(35.55)(0.009)] - [(.0237)(35.55)(0.018)] = 3.1×10^{-3} cm^2/sec

MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$ STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$ STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____ cm^{-1}

ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____ cm^3/cm^3

DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____ cm $sec^{-1/2}$

SORPTIVITY — $\Delta\theta$ — Φ_m

ESTIMATED		CHECK ONE
MEASURED		

Location Code: 40593 (2.25' North of 40593)

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: RUST E&F

Signature and Date: [signature] 3/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

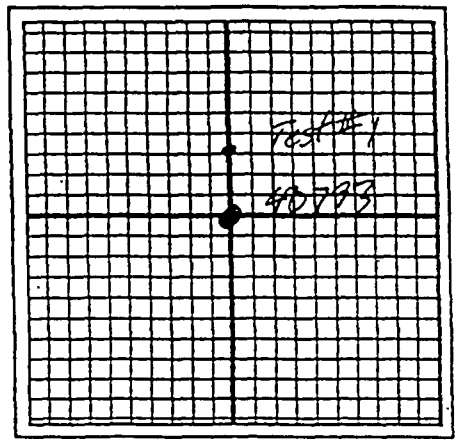
FORM GT.34A Site Information Rev. 0

Date 5/24/93 Investigator C. Murray

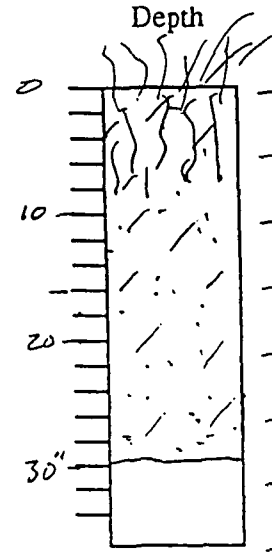
Site Location 40793 Test #1 3.2ft. N. of Well

Dominant Soil Type(s) Silty Loam

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Description

Dark brn. Silty loam

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

moderate slope, with high amt of vegetation.

Location Code: 40793#1

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust E+I

Signature and Date: C. Murray 5/24/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

te 5/24/93 Investigator C. Murray

GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

The steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED	☐
MEASURED	☐

CHECK ONE

ation Code: 40793 #1

ne of Individual Authenticating Data (please print): J. OHLINGER

Organization: RUST

Signature and Date: [signature] 5/24/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 40793 # 3.2 ft N of well

DATE: 5/24/93

INVESTIGATOR: CM / R.M.

Test #1

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22

5 cm head test

DEPTH OF HOLE: 2.4 ft. INCHES OR CM

29.0 in.

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,00	0	1.8		
1	4,00	4	1.8	0	
2	8,00	4	1.8	0	
3	10,00	2	2.1	0.3	.15
4	12,00	2	3.2	1.1	.55
5	14,00	2	4.2	1.0	.5
6	16,00	2	5.3	1.1	.55
7	18,00	2	6.5	1.2	.6
8	20,00	2	7.7	1.2	.6
9	22,00	2	8.8	1.1	.55
10	24,00	2	9.8	1.0	.50
11	26,00	2	10.8	1.0	.50
12	28,00	2	11.9	1.1	.55
13	30,00	2	13.0	1.1	.55
14	32,00	2	14.1	1.1	.55
15					
16					

.55/60 = .0092

R1 (cm/sec)	.0092
R2 (cm/sec)	.0167

Kfs= 4.17×10^{-5} cm/sec

PHIm= 2.9×10^{-4}

~~Kfs (single head 5cm) = 11×10^{-4}~~

~~Kfs (single head 10cm) = 1.52×10^{-4}~~

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,00	0	59.8		
1	2,00	2	63.0	3.2	1.6
2	3,00	1	64.3	1.3	1.3
3	4,00	1	65.3	1.0	1.0
4	5,00	1	66.3	1.0	1.0
5	6,00	1	67.5	1.2	1.2
6	7,00	1	68.5	1.0	1.0
7	8,00	1	69.5	1.0	1.0
8	9,00	1	70.8	1.3	1.3
9	10,00	1	72.9	2.1	2.1
10	11.00	1	73.9	1.0	1.0
11					
12					
13					
14					
15					

1.0/60 = .0167

REMARKS: Powered Augered to 2.4' with little trouble. Soil is dark brown with only small rocks, silty loam with some clay all the way to T.D. Green Tall grass at surface. Had to use Guelph w/o stand due to depth of hole.

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34A

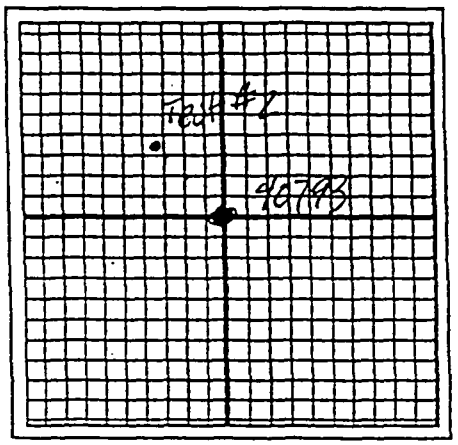
Site Information
Rev. 0

Date 5/24/93 Investigator C. Murray

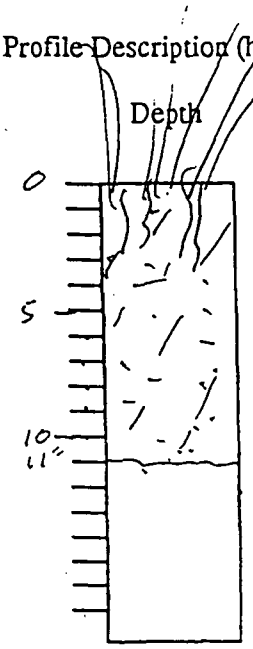
Site Location 40793#2 3.7' N west of 40793

Dominant Soil Type(s)

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Dk brn Silty loam, moist

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

moderate slope w/ plenty of vegetation.

Location Code: 40793

Name of Individual Authenticating Data (please print): J UHLINGER

Organization: Rust E+I

Signature and Date: C Murray 5/24/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT FORM GT.34B Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

ate 6/2/93 Investigator C. Murray GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X 35.55	cm^2
Inner Reservoir	Y 2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec

FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec

MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}

ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3

DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$

SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED	☐	CHECK ONE
MEASURED	☐	

Location Code: 40993

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust

Signature and Date: C. Murray 6/2/93

APPENDIX II.Q

FIELD DATA AND RESULTS FOR BAT™ AND GUELPH TESTS

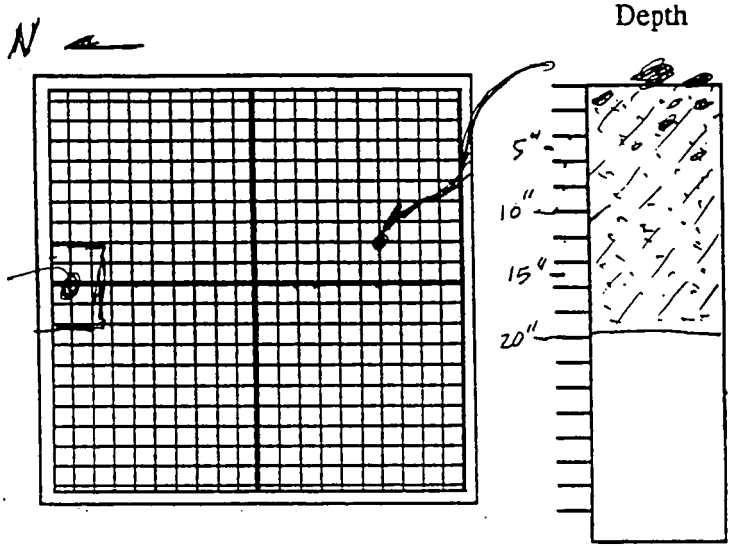
ENVIRONMENTAL MANAGEMENT DEPARTMENT | **FORM GT.34A** | **Site Information Rev. 0**

Date 4-14-93 Investigator MURRAY & A.M. Edwards

Site Location PA North hillside, north of POND 207A 15ft South of well 3186.

Dominant Soil Type(s) Clayey loam with surface Cobbles light buff color, moist.

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):

Depth	Description
	POWERED AUGERED Down to 19.5in. light buff colored silty clayey sandstone (weathered).

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Soil was moist, soft clayey & silty, but when I cleaned out the hole with the hand auger it smeared the walls pritty good so I reamed it out w/ the brush attatchment.

Comments and Notes (topography, slope, vegetation, etc.):

hillside north of Pond 207A near well 3186.

Location Code: 3186 #1

Name of Individual Authenticating Data (please print): CLAUDE D. MURRAY

Organization: A.E.

Signature and Date: Claude D. Murray 4/14/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

ate_____ Investigator _____ GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φ_m

ESTIMATED	☐
MEASURED	☐

CHECK ONE

Location Code: 3186 #1

Name of Individual Authenticating Data (please print): J. OHLINGER

Organization: Rust

Signature and Date: C. Nunnery 4/14/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 15' South of Well 3186

DATE: 4-14-93

INVESTIGATOR: CDM

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22

DEPTH OF HOLE: 19.5" INCHES OR CM

TEST #1

5 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0			1.4		
1		2	1.4	0	
2		5	1.4	0	
3		5	1.5	.1	.02
4		5	3.3	1.8	.36
5		5	4.7	1.4	.28
6		5	6.4	1.7	.34
7		5	8.6	2.2	.44
8		5	10.2	1.6	.32
9		5	12.7	2.5	.50
10		5	13.9	1.2	.24
11		5	15.8	1.9	.38
12		5	17.1	1.3	.26
13		5	19.4	2.3	.46
14		5	21.6	2.2	.44
15					
16					

* 2.22

.39 AVG. $\bar{R}_1$

R1 (cm/~~sec~~ min) .39 AVG

R2 (cm/~~sec~~ min) .52 AVG

$\bar{R}_1$ cm/sec = .39/60 = .0064

$\bar{R}_2$ = cm/sec = .52/60 = .0086

Kfs= 9.62×10^{-7}

PHIm= 3.69×10^{-4} 4.9×10^{-2}

*$K_{fs} = 2.6 \times 10^{-5}$

*$m_{fxp} = 2.1 \times 10^{-4}$

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,0,0		69		
1	0,2,0	2	69.7	.7	.35
2	0,4,0	2	71.0	1.3	.65
3	0,6,0	2	72.9	1.9	.95
4	0,8,0	2	73.8	.9	.45
5	0,10,0	2	74.6	.8	.40
6	0,12,0	2	76.0	1.4	.70
7					
8					
9					
10					
11					
12					
13					
14					
15					

.52 AVG.

REMARKS: Powered augered to 19.5" light buff colored sandstone w/ clay & silt. Soil was moist, soft & clayey and silty. The soil should have better K values than this 'might' want to do another test.

* Single head sim calc.

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:4/14/93
BOREHOLE LOCATION: 3186#1

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	19.5
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0064
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 2.57E-05

mflx p(cm2/sec)= 0.000215

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34A

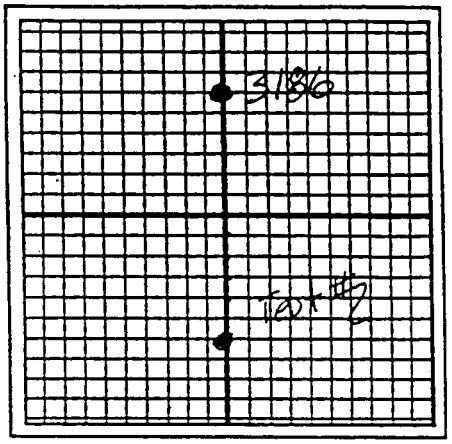
Site Information
Rev. 0

Date 4/22/93 Investigator C. Murray

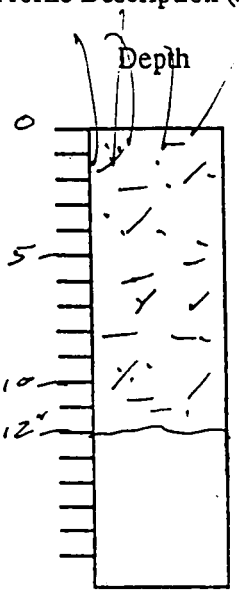
Site Location 12 ft. South of 3186 Test #2

Dominant Soil Type(s) Silty Clayey Sandstone.

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Silty Cly Sandstone, lt. brn.

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Dry

Comments and Notes (topography, slope, vegetation, etc.):

moderate slope, ≤ Vegetation.

Location Code: 3186

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust E+I

Signature and Date: C. Murray 4/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

ıte 4/22/93 Investigator C. Murray GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φ_m

ESTIMATED	☐	CHECK ONE
MEASURED	☐	

ıation Code: 3184

Name of Individual Authenticating Data (please print): _____

Organization: PUST

Signature and Date: C. Murray 4/22/93

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:4/22/93
BOREHOLE LOCATION: 3186 #2

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	12
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0053
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 2.13E-05

mflx p(cm2/sec)= 0.000178

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 12 ft ~~North~~ SOUTH of Well 3186

DATE: 4-22-93

INVESTIGATOR: CDM

#2

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22

DEPTH OF HOLE: 12" INCHES OR CM

5 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	9:55:00	4	0.80		
1		4	1.10	.30	.075
2		4	2.00	.90	.225
3	0, 0, 00	4	3.00	1.0	.250
4	0, 4, 00	4	4.40	1.4	.350
5	0, 8, 00	4	5.60	1.2	.300
6	0, 12, 00	4	7.00	1.4	.350
7	0, 16, 00	4	8.60	1.6	.400
8	20, 00	4	9.70	1.1	.275
9	24, 00	4	10.8	1.1	.275
10	28, 00	4	12.0	1.2	.300
11	32, 00	4	13.3	1.3	.325
12	36, 00	4	14.5	1.2	.300
13	40, 00	4	15.9	1.4	.350
14	44.00	4	17.1	1.2	.300
15					
16					

1111
1111
111
STARTED STOP WATCH

4×9 = 36
4×8 = 32
4×7 = 29

4/30

AVG: .3188/60 = .0053

R1 (cm/sec) .0053
R2 (cm/sec) .0098

Kfs= -6.22E-5
PHIm= 6.66E-4

Kfs (single head 5cm) = ~~6.35×10⁻⁵~~ 2.1×10⁻⁵ cm/sec.
~~Kfs (single head 10cm) = 8.80×10⁻⁵~~ cm/sec
mf×p = 1.8×10⁻⁴

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	10:52	0	61.2		
1	4:00	4	62.3	1.1	.275
2	8:00	4	64.0	1.7	.425
3	12:00	4	65.7	1.7	.425
4	16:00	4	67.8	2.1	.525
5	20:00	4	69.8	2.0	.500
6	24:00	4	73.2	3.4	.850
7	28:00	4	75.1	1.9	.475
8					
9					
10					
11					
12					
13					
14					
15					

AVG. = .5875/60 = .0098

REMARKS: 75°F, Dry Soil Conditions, Silty Clayey Sandstone, light brown
Power Augered, Wtr Tube on hole bottom and centered in hole.

ENVIRONMENTAL MANAGEMENT DEPARTMENT

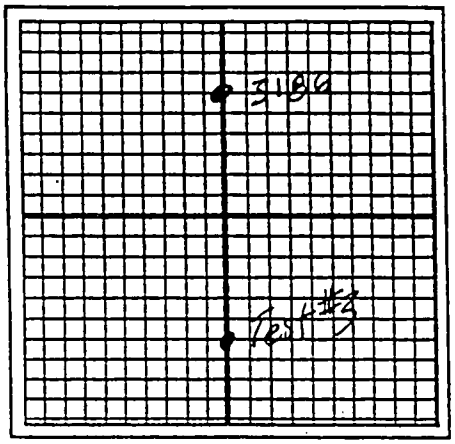
FORM GT.34A Site Information Rev. 0

Date 4/22/93 Investigator C. Murray

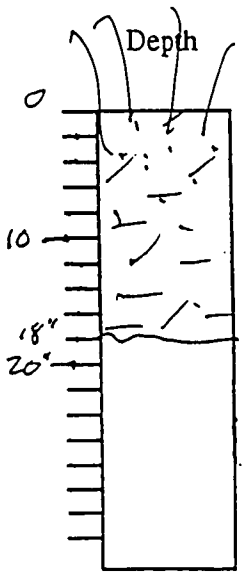
Site Location 3186 #3 Test 12 ft S. of 3186.

Dominant Soil Type(s) Silty clayey Sandstone

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Description

Silty Clayey Sandstone, buff color. Dry.

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

moderate vegetation & slope.

Location Code: 3186 #3

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust E+I

Signature and Date: C. Murray 4/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

:te 4/22/93 Investigator C. MURRAY GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1(CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2(CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

:he steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

:or the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED	☐	CHECK ONE
MEASURED	☐	

:ation Code: 3186 #3

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: RUST

Signature and Date: C. Murray 4/22/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: Inside PA, 12ft. South of Well 3186

DATE: 4-22-95

INVESTIGATOR: CDM

DEPTH OF HOLE: 1.5' ft. ~~INCHES~~ OR CM (18")

#3

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only)	2.22

5 cm head test → 5 cm HEAD TEST

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0:00	0	1.0		
1	2~~4~~:00	~~4~~2	1.0	0.	
2	6:00	4	1.0	0	
3	10:00	4	1.0	0	
4	14:00	4	2.3	1.3	.325
5	18:00	4	3.4	1.1	.275
6	22:00	4	5.4	2.0	.500
7	26:00	4	6.5	1.1	.275
8	30:00	4	7.4	0.9	.225
9	34:00	4	9.2	1.8	.450
10	38:00	4	10.3	1.1	.275
11	42:00	4	10.5	.2	.050
12	46:00	4	11.3	.8	.200
13	50:00	4	11.3	0	~
14	54:00	4	11.5	.2	.050
15	58:00	4	11.7	.2	.050
16	62	4	11.9	.2	.050

.05/60sec. = .0008

R1 (cm/sec)	.0008
R2 (cm/sec)	.0081
Kfs=	6.33E-5
PHIm=	-3.18E-4

single head (5cm) = $K_{fs} = 3.2 \times 10^{-6}$ ✓
$\phi_{mfxp} = 2.7 \times 10^{-5}$ ✓

10 cm head test
12:30 → 10 cm Head Test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,00	0	55.3		
1	4,00	4	57.5	2.2	.550
2	8,00	4	59.4	1.9	.475
3	10,00	2	60.4	1.0	.500
4	12,00	2	61.3	0.9	.450
5	14,00	2	62.3	1.0	.500
6	16,00	2	62.9	0.6	.300
7	18,00	2			
8					
9					
10					
11					
12					
13					
14					
15					

AVG = .483/60 = .0081

Test failed; started to bubble and loose water.

REMARKS: 75°F Dry Soil conditions. Soil: Silty Clayey Sandstone light buff color

Steve Cullen GEM Santa Barbara

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:4/22/93
BOREHOLE LOCATION: 3186 #3

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	18
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0008
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 3.22E-06

mflx p(cm2/sec)= 2.68E-05

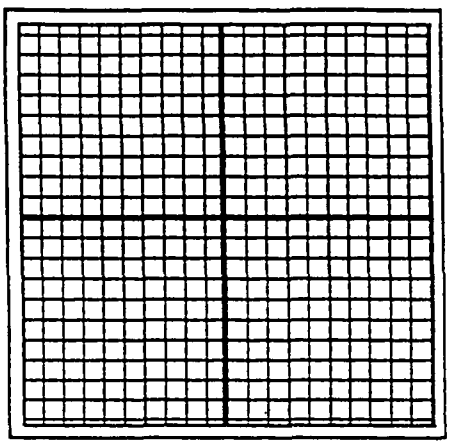
ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34A** **Site Information Rev. 0**

Date 3/22/93 Investigator B. NEWLIN / J. UHLINGER

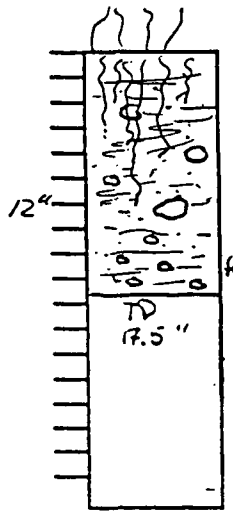
Site Location 40393 - 3ft east of 40393

Dominant Soil Type(s) Silty Sandy Gravelly Clay (RF ALLUVIUM)

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Description

ORGANIC Rich Silty Sandy clay

Dark Brown grading to orange Brown by 6"

Roots (Typically 1-2 mm), Dry

Orange Brown clay @10" w/silt & minor fine sand

few Roots and gravels (up to 5cm's)

Roots not frequent, Gravels are smaller

Limonite (Fe OXIDE) staining on 2+cm gravels

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

- orange grey clay is tighter than previously encountered - fewer gravels and more compacted (waxy looking)

Comments and Notes (topography, slope, vegetation, etc.):

North sloping location

17½" Deep Augur Refusal due to gravel

Location Code: 40393

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: RUST E&I

Signature and Date: [signature] 3/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34B Rev. 0** **Standardized Procedure For Permeameter Readings and Calculations** 1 of 2

Date 3/22/93 Investigator B. NEWLIN / J. UHLINGER GUELPH SERIAL # 10563

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X 35.55	cm^2
Inner Reservoir	Y 2.22	cm^2

☐ CHECK RESERVOIR USED ☑

Depth of Well Hole 17.5"

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME t_0 = 13:00:00	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)
1		0	0	—	—
Change to inner Res	5	No Change from 5.5 cm 5m			
1	T_0 = 13:06:00	0	5.5		
2		0.75	7.0	—	—
3					
	No Change		- Switching to		10 cm/Head

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME t_0 13:11:00	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)
1	13:11:00	0	48.6		
2		2.0	53.9	5.3	2.65
3		2.0	57.5	3.4	1.70
4		2.0	58.6	1.3	0.65
5		2.0	60.2	1.6	0.80
6		2.0	61.7	1.5	0.75
7		2.0	62.9	1.2	0.60
8		2.0	64.5	1.6	0.80
9		2.0	66.4	1.9	0.85
10		2.0	68.0	1.6	0.80
11					
12					
13					

Possibly Influenced By Rubber Tube Jo
57.13
53.9
3.4

57
60.12
58.6
1.6

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (.80)/60 = .0133 cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (____)/60 = ____ cm/sec

K_{fs} = [(.0041)(____)(____)] - [(.0054)(____)(____)] = ____ cm/sec

FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$ STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

* ~~3.2x10~~ cm

Φm = [(.0572)(____)(____)] - [(.0237)(____)(____)] = ____ cm^2/sec

MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

* ~~2.1x10~~ cm

α = (____)/(____) = ____ cm^{-1}

ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (____) - (____) = ____ cm^3/cm^3

DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(____)(____) = ____ cm $sec^{-1/2}$

SORPTIVITY — $\Delta\theta$ — Φ_m

ESTIMATED	☐	CHECK
MEASURED	☐	ONE

* single head calc.

Location Code: 40393 (3.0 ft east of borehole 40393)

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: RUST E&I

Signature and Date: [signature] 3/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34B Rev. 0** **Standardized Procedure For Permeameter Readings and Calculations**

Date 3/22/93 Investigator J. UHLINGER GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☑ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at ~~5 cm~~ 20 cm

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)
0	13:35		9.3	–	–
1	13:36	1.0	12.7	–	–
2	No Change on large Res go to Inside				
3	13:40	0	17.7		
	13:45	5	17.3	-.4	
	See note Below				

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED		CHECK ONE
MEASURED		

Results indicate $K_{fs} < 10^{-6}$ cm/sec

Location Code: 40393

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: RUST E&F

Signature and Date: [signature] 3/22/93

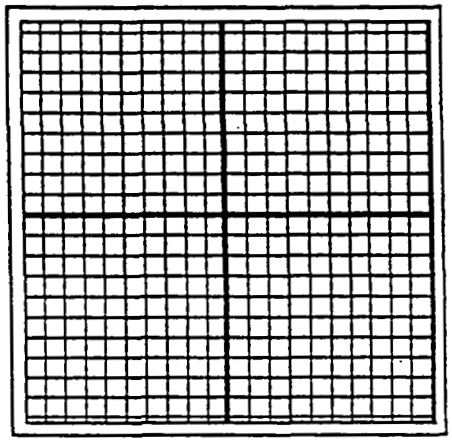
ENVIRONMENTAL MANAGEMENT DEPARTMENT | **FORM GT.34A** | **Site Information Rev. 0**

Date 3/22/93 Investigator B. NEWLIN / J. UHLINGER

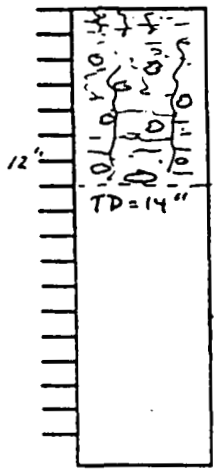
Site Location 40593

Dominant Soil Type(s) Brown Clay w/ small gravels (Rocky Flats ALLUVIUM)

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Silty Sandy gravelly clay
	small roots (1-2 cm) @ surface to TD
	Dry gravels (3-5 cm)
	Attempted to Advance hole got to 23" Auger refusal (NO TEST)

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Dry
Roots

Comments and Notes (topography, slope, vegetation, etc.):

Flats on South side of North ~~Slopp~~ Sloping topography

Location Code: 2.25' North of Borehole 40593

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: RUST E&I

Signature and Date: [signature] 3/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34B Rev. 0** **Standardized Procedure For Permeameter Readings and Calculations**

Date 3/22/93 Investigator B. NEWLIN / J. UHLINGER GUELPH SERIAL # 10563

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X 35.55	cm^2
Inner Reservoir	Y 2.22	cm^2

☑ CHECK RESERVOIR USED

Depth of Well Hole 14.0"

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME t_0 = 10:53	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)
1		0	0.0	—	—
2		2.0	8.5	8.5	4.25
3		2.0	11.0	2.5	1.25
4		2.0	13.1	2.1	1.05
5		2.0	15.1	2.0	1.00
6		2.0	16.6	1.5	0.75
7		2.0	18.0	1.4	0.70
8		2.0	19.2	1.2	0.60
9		2.0	20.3	1.1	0.55
10		2.0	21.4	1.1	0.55 $\bar{R}_1$
11		2.0	22.5	1.1	0.55

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME t_0 = 11:17	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)
1		0	22.5	—	—
2		2.0	28.2	5.7	2.85
3		2.0	31.0	2.8	1.40
4		2.0	33.5	2.5	1.25
5		2.0	36.0	2.5	1.25
6		2.0	38.3	2.3	1.15
7		2.0	40.4	2.1	1.05 $\bar{R}_2$
8		2.0	42.5	2.1	1.05

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (0.55)/60 = 0.009 cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (1.05)/60 = 0.018 cm/sec

K_{fs} (FIELD SATURATED HYDRAULIC CONDUCTIVITY) = [(.0041)(35.55)(0.018)] - [(.0054)(35.55)(0.009)] = 9.0×10^{-4} cm/sec

(RESERVOIR CONSTANT; $\bar{R}_2$ STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_1$ STEADY STATE RATE OF FLOW)

Φm (MATRIC FLUX POTENTIAL) = [(.0572)(35.55)(0.009)] - [(.0237)(35.55)(0.018)] = 3.1×10^{-3} cm^2/sec

(RESERVOIR CONSTANT; $\bar{R}_1$ STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_2$ STEADY STATE RATE OF FLOW)

α (ALPHA PARAMETER) = (_____)/(_____) = _____ cm^{-1}

(K_{fs}; Φ_m)

$\Delta\theta$ (DELTA THETA) = (_____) - (_____) = _____ cm^3/cm^3

(θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM; θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM)

S (SORPTIVITY) = $\sqrt{2}$(_____)(_____) = _____ cm $sec^{-1/2}$

($\Delta\theta$; Φ_m)

ESTIMATED		CHECK ONE
MEASURED		

Location Code: 40593 (2.25' North of 40593)

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: RUST E&F

Signature and Date: [signature] 3/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34A

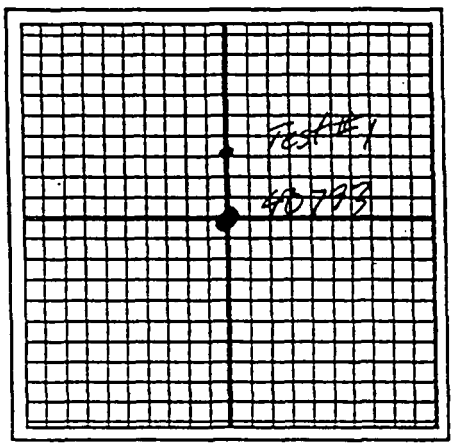
Site Information
Rev. 0

Date 5/24/93 Investigator C. Murray

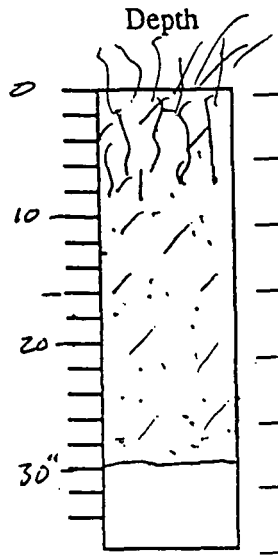
Site Location 40793 Test #1 3.2ft. N. of Well

Dominant Soil Type(s) Silty Loam

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Description

Dark brn. Silty loam

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

moderate slope, with high amt of vegetation.

Location Code: 40793#1

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust E+I

Signature and Date: C. Murray 5/24/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

te 5/24/93 Investigator C. Murray

GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1(CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2(CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

he steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

or the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings R_2 = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φ_m

ESTIMATED	☐
MEASURED	☐

CHECK ONE

ation Code: 40793 #1

ame of Individual Authenticating Data (please print): J. OHLINGER

Organization: RUST

Signature and Date: [signature] 5/24/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 40793 # 3.2 ft N of well

DATE: 5/24/93

INVESTIGATOR: Cm / R.m.

Test #1

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22

DEPTH OF HOLE: 2.4 ft. INCHES OR CM
29.0 in.

5 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,00	0	1.8		
1	4,00	4	1.8	0	
2	8,00	4	1.8	0	
3	10,00	2	2.1	0.3	.15
4	12,00	2	3.2	1.1	.55
5	14,00	2	4.2	1.0	.5
6	16,00	2	5.3	1.1	.55
7	18,00	2	6.5	1.2	.6
8	20,00	2	7.7	1.2	.6
9	22,00	2	8.8	1.1	.55
10	24,00	2	9.8	1.0	.50
11	26,00	2	10.8	1.0	.50
12	28,00	2	11.9	1.1	.55
13	30,00	2	13.0	1.1	.55
14	32,00	2	14.1	1.1	.55
15					
16					

.55/60 = .0092

R1 (cm/sec) .0092
R2 (cm/sec) .0167

Kfs= 4.17×10^{-5} cm/sec
PHIm= 2.9×10^{-4}

~~Kfs (single head 5cm) = 11×10^{-4}~~
~~Kfs (single head 10cm) = 1.52×10^{-4}~~

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,00	0	59.8		
1	2,00	2	63.0	3.2	1.6
2	3,00	1	64.3	1.3	1.3
3	4,00	1	65.3	1.0	1.0
4	5,00	1	66.3	1.0	1.0
5	6,00	1	67.5	1.2	1.2
6	7,00	1	68.5	1.0	1.0
7	8,00	1	69.5	1.0	1.0
8	9,00	1	70.8	1.3	1.3
9	10,00	1	72.9	2.1	2.1
10	11.00	1	73.9	1.0	1.0
11					
12					
13					
14					
15					

1.0 / 60 = .0167

REMARKS: Powered Augered to 2.4' with little trouble, soil is dark brown with only small rocks, silty loam with some clay all the way to T.D. Green Tall grass at surface. Had to use Guelph w/o stand due to depth of hole.

ENVIRONMENTAL MANAGEMENT DEPARTMENT

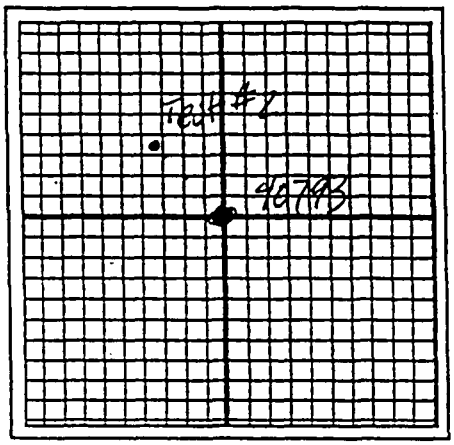
FORM GT.34A Site Information Rev. 0

Date 5/24/93 Investigator C. Murray

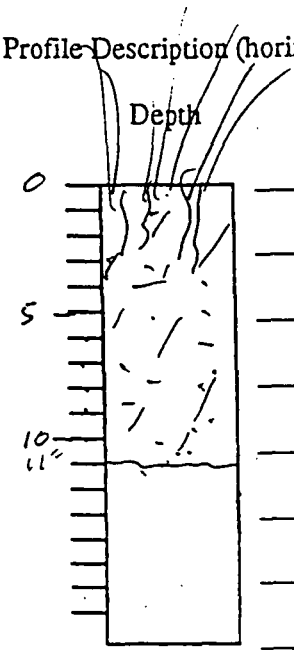
Site Location 40793#2 3.7' N west of 40793

Dominant Soil Type(s)

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Dk brn Silty loam, moist

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

moderate slope w/ plenty of vegetation.

Location Code: 40793

Name of Individual Authenticating Data (please print): J. OHLINGER

Organization: Rust E+I

Signature and Date: C Murray 5/24/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

Date 5/24/93 Investigator C. MURRAY GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

The steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED	☐
MEASURED	☐

CHECK ONE

Location Code: 40793 #2

Name of Individual Authenticating Data (please print): J. OHLINGER

Organization: RUST E&I

Signature and Date: C. Murray

Test #2

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 3.7' North West of 40793

DATE: 5/24/93

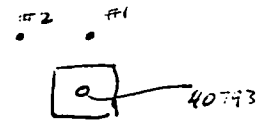
INVESTIGATOR: CM/RM

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22

5 cm head test

DEPTH OF HOLE: 11 inc. INCHES OR CM

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,00	0	5.2		
1	2,00	2	5.5	.3	.15
2	4,00	2	6.0	.5	.25
3	6,00	2	6.3	.3	.15
4	8,00	2	6.6	.3	.15
5	10,00	2	7.0	.4	.20
6	12,00	2	7.2	.2	.10
7	14,00	2	7.5	.3	.15
8	16,00	2	7.7	.2	.10
9	18,00	2	8.0	.3	.15
10	20,00	2	8.2	.2	.10
11	22,00	2	8.4	.2	.10
12	24,00	2	8.6	.2	.10
13	26,00				
14					
15					
16					



.10/60 = .0017

R1 (cm/sec)	.0017
R2 (cm/sec)	.0025

Kfs= 3.8×10^{-5} cm/sec

PHIm= 1.35×10^{-3} cm²/sec

Kfs (single head 5cm) = ~~3.26×10^{-4}~~

Kfs (single head 10cm) = ~~3.64×10^{-4}~~

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0	0	11.9		
1	2,00	2	12.2	.3	.15
2	4,00	2	12.5	.3	.15
3	6,00	2	12.9	.4	.20
4	8,00	2	13.1	.2	.10
5	10,00	2	13.4	.3	.15
6	12,00	2	13.7	.3	.15
7	14,00	2	13.9	.2	.10
8	16,00	2	14.1	.3	.15
9					
10					
11					
12					
13					
14					
15					

0.15/60 = .0025

REMARKS: Cool cloudy possible recent rain w/in 24 hr period. Soil developed dark brown silty loam very few rocks. well developed grass.

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34A

Site Information
Rev. 0

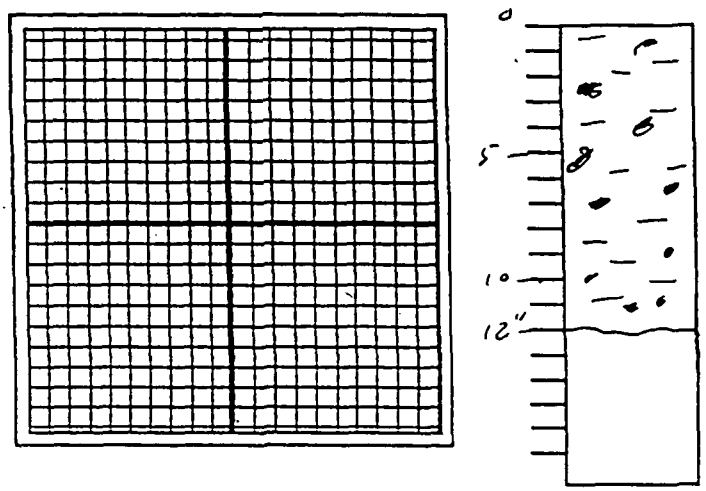
Date 6/2/93 Investigator CDMurray

Site Location 3 ft west of 40993

Dominant Soil Type(s) Clayey Gravel

Site Map:

Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Clayey Gravel, lt. brn. moist

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

compacted

Comments and Notes (topography, slope, vegetation, etc.):

no vegetation, on berm to 207 C Pond.

Location Code: 40993

Name of Individual Authenticating Data (please print):

Organization: Rust

Signature and Date: CD Murray 6/2/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34B Rev. 0** **Standardized Procedure For Permeameter Readings and Calculations**

Date 6/2/93 Investigator C. Murray GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

The steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED	☐
MEASURED	☐

CHECK ONE

Location Code: 40993

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust

Signature and Date: C. Murray 6/2/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 3 Ft. West of 40993

DATE: 8-2-93

INVESTIGATOR: CDM

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22 ✓

DEPTH OF HOLE: 12 in. INCHES OR CM

5 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0	0	1.8		
1	10,00	10,00	1.5	0	
2					
3					
4					
5					
6					
✓7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

no change

Low $K_{fs} \leq 10^{-7}$

1.0×10^{-7}

R1 (cm/sec)	
R2 (cm/sec)	
Kfs=	
PHIm=	

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0	0	63.3		
1	10,00	10,00	63.3	0	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

No WL change

Low K_{fs}

$\leq 10^{-7}$

REMARKS: Powered Augured to 12 inc. Very difficult, Soil is light brown clayey Gravel, mo.st. Cooler Temp Front Comming in Starting to Sprinkle lightly. 65°C Breezy.

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 3ft. East of 41293

DATE: 5-7-93

INVESTIGATOR: CDM/KM.

RESERVOIR CONSTANTS:	
X (combined)	35.55 ✓
Y (inner only	2.22 ✓

DEPTH OF HOLE: 12 INCHES OR CM

5 cm head test 8:32:40

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,0,0	0	2.0		
1	0,2,0	2	2.1	0.1	.05
2	0,4,0	2	2.3	0.2	.1
3	0,6,0	2	2.3	0	
4	0,8,0	2	2.4	0.1	.05
5	0,10,0	2	2.5	0.1	.05
6	0,12,0	2	2.5	0	
7	0,14,0	2	2.6	0.1	.05
8	0,16,0	2	2.6	0	
9	0,18,0	2	3.2	0.6	.3
10	0,20,0	2	3.5	0.3	.15
11	0,22,0	2	4.0	0.5	.25
12	0,24,0	2	4.5	0.5	.25
13	0,26,0	2	5.5	1.0	.5
14	0,28,0	2	6.2	0.7	.35
15	0,30,0	2	7.2	1.0	.5
16	0,32,0	2	7.6	0.4	.2
	0,34,0	2	8.1	0.5	.25

— switch to inner ring. 2.22 —

$R_1 = .28/60 = \boxed{.0047}$

R1 (cm/sec) .0047

R2 (cm/sec) .008

Kfs= -5.3×10^{-5} cm/sec

PHIm= 1.8×10^{-4} cm²/sec

* $Kf_s = 1.9 \times 10^{-5}$

* $Mf_{xp} = 1.6 \times 10^{-4}$

10 cm head test

2.22 RES. CONSTANT

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0	0	63.3		
1	2,00	2	63.4	.1	.05
2	4,00	2	63.4	0	
3	8,00	4	65.0	1.6	.4
4	12,00	4	66.2	1.2	.3
5	16,00	4	67.8	1.6	.4
6	20,00	4	69.2	1.4	.35
7	24,00	4	71.3	2.1	.53
8	28,00	4	73.5	2.2	.55
9	32,00	4	74.9	1.4	.35
10	34,	2	75.9	1.0	.5
11					
12					
13					
14					
15					

AVG. = .48

$R_2 = 0.48/60 = .008$

REMARKS: Cool and Breazy Advanced hole w/ Power Auger but could not get below 12". Soil was moist but had not raised in 24 hrs.
Dark brown Silty Clayey w/ Cobbles 2-4". next to gravel

* single head calc.

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

ite 4/12/93 Investigator C. Murray GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X 35.55	cm^2
Inner Reservoir	Y 2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings R_2 = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φ_m

ESTIMATED	☐
MEASURED	☐

CHECK ONE

ation Code: 41293

Name of Individual Authenticating Data (please print): _____

Organization: RUST

Signature and Date: Claude D. Murray 5/17/93

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:5/7/93
BOREHOLE LOCATION: 41293

SOIL TYPE: Silty-Clayey Gravel

FIELD DATA:

Borehole Depth (in):	12
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R .	0.0047
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 1.89E-05

mflx p(cm2/sec)= 0.000158

44393

BAT®

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: RFP - PA DATE: 2-5-93 TIME: 11:20
PIEZOMETER ID: 443~~0~~93 NAME: E. Lawrence

DEPTH (m): 1.7m TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm): 228.8

EXT CYL VOLUME (ml): 63 PORE PRESSURE (m): 0.38 DRIFT of +0.5 22.37
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): ~~-0.38~~ ~~DRIFT TO +.5~~
TOTAL SYS VOL (ml): 98 80% PRESS CHANGE (m): 4.78
INIT GAS VOLUME (ml): 78 MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H2O)	ELAPSED TIME (secs)	PRESSURE (m H2O)
1 0,0,30	17.95	16 0,25,0	14.99
2 0,1,0	15.51	17 0,30,0	14.97
3 0,1,30	15.13	18 END OF TEST ~~0,35,0~~	
4 0,2,0	15.12	19	
5 0,2,30	15.12	20	
6 0,3,0	15.11	21	
7 0,4,0	15.10	22	
8 0,5,0	15.09	23	
9 0,6,0	15.08	24	
10 0,7,0	15.07	25	
11 0,8,0	15.06	26	
12 0,9,0	15.06	27	
13 0,10,0	15.05	28	
14 0,15,0	15.03	29	
15 0,20,0	15.01	30	

~~Pore~~ TEMP/PRESS EQUILIBRATION

TIME min	PRESS
0	22.40
2	22.39
1	22.38
6	22.37

3.495
1.8
1.695

FASTEN

CALCULATION

PRINTOUTS

HERE

RUST ENVIRONMENT & INFRASTRUCTURE

QA Record No:_____ Page __ of __

QA Checked By: LRD Date 7/30/93

ACTUAL VOL CHANGE (ml): 20 ml vial was empty *
CALCULATED VOL CHANGE (ml): 22.8

PERMEABILITY ~~(m/s)~~: 3.1 x 10^{-7} cm/sec

COMMENTS: LITHOLOGY TESTED IS COARSE TO MED GRAINED SAND - POSSIBLY FILL
7.8 x 10^{-9} cm using all data
using only data to t3,0,0 - All water was already emptied from test container.
the hydraulic conductivity was computed to be 3.1 x 10^{-7} cms which seems very low for this type of media

GT.34B

GP FIELD DATA SHEET

SECTION 2: STANDARDIZED PROCEDURE FOR PERMEAMETER READINGS AND CALCULATIONS

Date 4/7/93 Investigator B. NEWLIN

GUELPH SERIAL = 41593 #1

Reservoir Constants: (See label on Permeamter)

Combined Reservoirs X 35.55 cm²	X	CHECK RESERVOIR USED
Inner Reservoir Y 2.22 cm²		

Depth of Well Hole 20 cm

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR, (CM)	WATER LEVEL CHANGE, (CM)	RATE OF WATER LEVEL CHANGE, R_1, (CM/MIN)
1	Ø	NA	2.7	NA	NA
2	0,2,0	2	3.1	0.4	0.2
3	0,4,0	2	3.4	0.3	0.15
4	0,6,0	2	3.6	0.2	0.10
5	0,8,0	2	3.8	0.2	0.10
6	0,10,0	2	3.9	0.1	0.05
7	0,12,0	2	3.9	Ø	Ø
8	0,22,0	10	4.7	0.8	0.08
9	0,32,0	10	5.1	0.4	0.04
10	0,42,0	10	5.5	0.4	0.04
11	0,52,0	10	5.9	0.4	0.04

$\bar{R}_1$

2nd Set of Readings with height of water in well (H_2) set at 10 cm

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR, (CM)	WATER LEVEL CHANGE, (CM)	RATE OF WATER LEVEL CHANGE, R_2, (CM/MIN)
1	Ø	NA	9.8	NA	NA
2	0,2,0	2	11.5	1.7	0.85
3	0,4,0	2	12.4	0.9	0.45
4	0,6,0	2	12.8	0.4	0.20
5	0,8,0	2	13.2	0.4	0.20
6	0,10,0	2	13.6	0.4	0.20

$\bar{R}_2$

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (0.04) / 60 = 0.00066 cm/sec
(R_1)

For the 2nd Set of Readings $\bar{R}_2$ = (0.2) / 60 = 0.0033 cm/sec
(R_2)

.00048
−.000126

K_{fs} = [(.0041)(35.55)(0.0033)] − [(.0054)(35.55)(0.00066)] = 3.5×10^{-4} cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$ - STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$ - STEADY STATE RATE OF FLOW

ϕ_m = [(.0572)(35.55)(.00066)] − [(.0237)(35.55)(.0033)] = 7.9×10^{-2} cm²/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$ STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$ STEADY STATE RATE OF FLOW

α = (_____) / (_____) = _____ cm⁻¹
ALPHA PARAMETER — K_{fs} — ϕ_m

$\Delta\Theta$ = (_____) − (_____) = _____ cm³ / cm³
DELTA THETA — θ_{fs}, FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i, AMBIENT WATER CONTENT OF SOIL, IN CM/CM

ESTIMATED		CHECK ONE
MEASURED		

S = $\sqrt{2(\_\_\_\_)(\_\_\_\_)}$ = _____ cm sec$^{-1/2}$
SORPTIVITY — ϕ_m — ϕ_m

LOC. RFP, 41593 #1
B. NEWLIN, BKN / GERAGHTY & MILLER, INC.
4/7/93

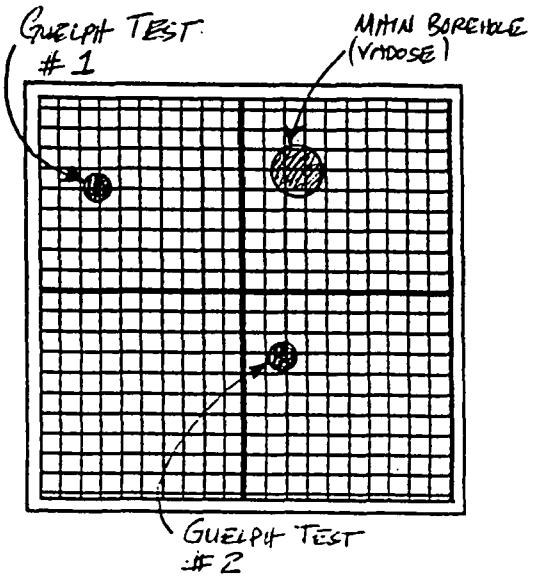
ENVIRONMENTAL MANAGEMENT DEPARTMENT | **FORM GT.34A** | **Site Information Rev. 0**

Date 4/7/93 Investigator B. NEWLIN BRN

Site Location ROCKY FLATS PLANT, BORING 41593 (#1)

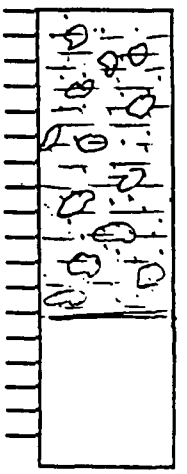
Dominant Soil Type(s) SANDY, GRAVELLY CLAY

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):

Depth (#1) Description



SANDY, GRAVELLY CLAY, REDDISH BROWN, CLAY: SLI-PLASTICITY; GRAVEL FINE-CS GRAIN, ANGULAR TO SUBROUNDED, DRY - SLI MOIST.

AUGER REFUSAL @ 20cm

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

NONE.

Comments and Notes (topography, slope, vegetation, etc.):

- GUELPH TEST PERFORMED ON FILL MATERIAL BENEATH ASPHALT POND LINER.
- FLAT SURFACE.
- GUELPH CENTERED IN HOLE.

Location Code: ROCKY FLATS (OU4) POND 207A

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: GERLAGHTY & MILLER, INC.

Signature and Date: Brad Newlin, 4/7/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

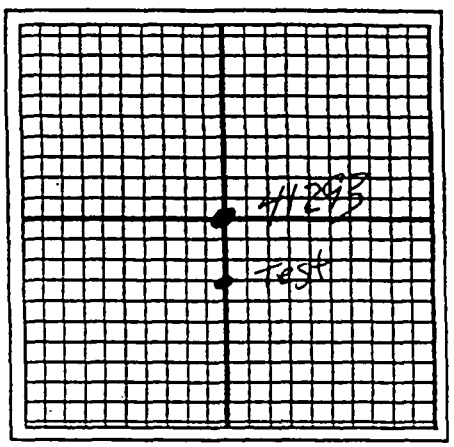
FORM GT.34A Site Information Rev. 0

Date 5-7-93 Investigator C. Murray

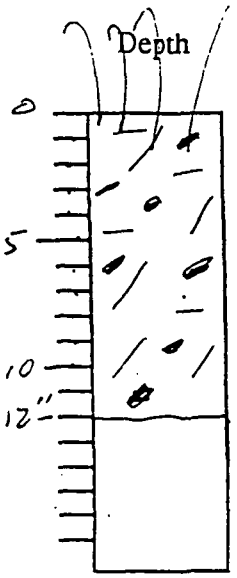
Site Location 3 ft. E of 41293

Dominant Soil Type(s) Silty Clayey Gravel

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Description

Silty Clayey Gravel, Dk brn. moist

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

moderate vegetation, & slope

Location Code: 41293

Name of Individual Authenticating Data (please print): J. UHLWGER

Organization: Rust E&I

Signature and Date: C. Murray 5-7-93

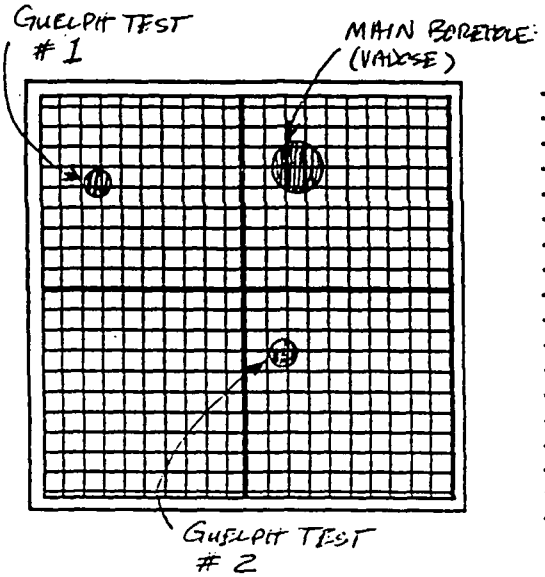
ENVIRONMENTAL MANAGEMENT DEPARTMENT | **FORM GT.34A** | **Site Information Rev. 0**

Date 4/8/93 Investigator B. NEWLIN BRN

Site Location ROCKY FLATS PLANT, BORING 41593 (#2)

Dominant Soil Type(s) SANDY, GRAVELLY CLAY

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):

Depth (#2)	Description
	SANDY, GRAVELLY CLAY, REDDISH BROWN, INCREASED % OF CLAY W/ DEPTH, SLI-PLASTICITY; GRAVEL: FINE-CS, ANGULAR-SUBROUNDED; DRY-SLI-MOIST.
	AUGER REFUSAL @ 20 cm

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

APPEARS TO BE INCREASED CLAY % TO SAND & GRAVEL ~~BAN~~ NEAR BASE OF AUGERED HOLE.

Comments and Notes (topography, slope, vegetation, etc.):

GUELPH TEST #2 PERFORMED ON FILL MATERIAL BENEATH ASPHALT POND LINER.

- FLAT SURFACE.
- GUELPH CENTERED IN HOLE.

Location Code: ROCKY FLATS (OUA), POND 207A

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: GEOTECHNICAL & MILLER, INC.

Signature and Date: Brad Newlin, 4/8/93

GT. 34B

GP FIELD DATA SHEET

SECTION 2: STANDARDIZED PROCEDURE FOR PERMEAMETER READINGS AND CALCULATIONS SITE 2 GUELPH SERIAL # 41593 #2

Date 4/8/93 Investigator B. NEWLIN

Reservoir Constants: (See label on Permeamter)

Combined Reservoirs X 35.55 cm²	X	CHECK RESERVOIR USED
Inner Reservoir Y 2.22 cm²		

Depth of Well Hole 20cm

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR, (CM)	WATER LEVEL CHANGE, (CM)	RATE OF WATER LEVEL CHANGE, R_1, (CM/MIN)
1	Ø	NA	2.7	NA	NA
2	0,2,0	2	2.75	0.05	0.025
3	0,4,0	2	2.80	0.05	0.025
4	0,6,0	2	2.80	Ø	Ø
5	0,16,0	10	2.85	0.05	0.005
6	0,26,0	10	2.90	0.05	0.005
7	0,36,0	10	2.95	0.05	0.005

$\bar{R}_1$

2nd Set of Readings with height of water in well (H_2) set at 10 cm

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR, (CM)	WATER LEVEL CHANGE, (CM)	RATE OF WATER LEVEL CHANGE, R_2, (CM/MIN)
1	Ø	NA	8.9	NA	NA
2	0,1,0	1	10.2	1.3	1.3
3	0,2,0	1	11.3	1.1	1.1
4	0,3,0	1	12.4	1.1	1.1
5	0,4,0	1	14.9	2.5	~~1.25~~ 2.5
6	0,5,0	1	19.7	4.8	4.8
7	0,6,0	1	24.9	5.2	5.2
8	0,7,0	1	30.7	5.8	5.8
9	0,8,0	1	36.8	6.1	6.1
10	0,9,0	1	42.5	5.7	5.7
11	0,10,0	1	48.7	6.2	6.2
12	0,11,0	1	55.0	6.3	6.3
13	0,12,0	1	61.2	6.2	6.2
NOTE: STOP TEST BECAUSE OF LEAKAGE AT MAIN BOREHOLE.					

SEE NOTE BELOW

$\bar{R}_2$

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (0.005 / R_1)/60 = 0.00008 cm/sec

0.002667 − 0.000015

For the 2nd Set of Readings $\bar{R}_2$ = (1.1 / R_2)/60 = 0.0183 cm/sec

K_{fs} (FIELD SATURATED HYDRAULIC CONDUCTIVITY) = [(.0041)(35.55 / RESERVOIR CONSTANT)(0.0183 / $\bar{R}_2$ - STEADY STATE RATE OF FLOW)] − [(.0054)(35.55 / RESERVOIR CONSTANT)(0.00008 / $\bar{R}_1$ - STEADY STATE RATE OF FLOW)] = 2.6×10^{-3} cm/sec

ϕ_m (MATRIC FLUX POTENTIAL) = [(.0572)(____ / RESERVOIR CONSTANT)(____ / $\bar{R}_1$ STEADY STATE RATE OF FLOW)] − [(.0237)(____ / RESERVOIR CONSTANT)(____ / $\bar{R}_2$ STEADY STATE RATE OF FLOW)] = -5.3×10^{-3} cm²/se

α (ALPHA PARAMETER) = (____ / K_{fs}) / (____ / ϕ_m) = ____ cm⁻¹

$\Delta\theta$ (DELTA THETA) = (____ / θ_{fs}, FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM) − (____ / θ_i, AMBIENT WATER CONTENT OF SOIL, IN CM/CM) = ____ cm³/cm³

ESTIMATED		CHECK ONE
MEASURED		

S (SORPTIVITY) = $\sqrt{2(\_\_\_\_ / \Delta\theta)(\_\_\_\_ / \phi_m)}$ = ____ cm sec$^{-1/2}$

* NOTE: $\bar{R}_2$ CALCULATED FROM 1.1 RDG. SINCE LEAKAGE OCCURRED @ MAIN BOREHOLE AND INFLUENCED LATER #S (#S 5-13)

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:4/8/93
BOREHOLE LOCATION: 41593#2

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	7.9
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.00008
Reservoir Constant, X:	35.55
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 5.15E-06

mflx p(cm2/sec)= 4.29E-05

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34A

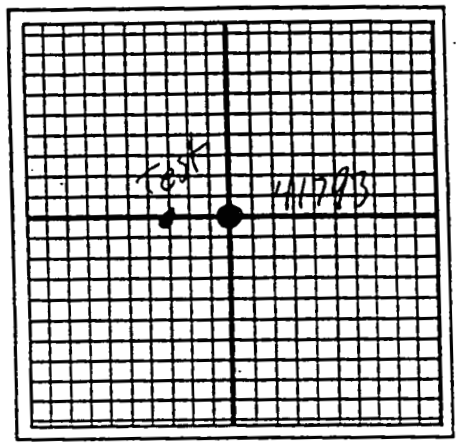
Site Information
Rev. 0

Date 5/7/93 Investigator C. Murray

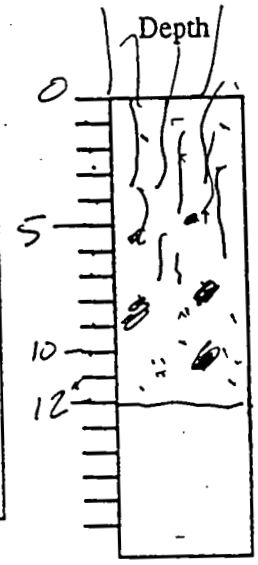
Site Location 3 Ft. W of 41793

Dominant Soil Type(s) OL

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Description

very organic sandy cobbles

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

lots of wood material

Location Code: 41793

Name of Individual Authenticating Data (please print): J. OHLINGER

Organization: RUST E+I

Signature and Date: C. Murray 5/7/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

Date 5/7/93 Investigator C. Murray GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

or the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED	☐	CHECK ONE
MEASURED	☐	

Location Code: 41793

Name of Individual Authenticating Data (please print): JAMES F UHLINGER

Organization: RUST E&T

Signature and Date: C. Murray 5/7/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: PA, NE of Pond 207 B North 3 Ft. WEST OF 41793

DATE: 5-7-93

INVESTIGATOR: CDM / KM

DEPTH OF HOLE: 12" INCHES OR CM

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22 ✓

5 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0	0	2.3		
1	4,00	4	2.6	0.3	.075
2	8,00	4	4.4	1.8	.45
3	10,00	2	5.6	1.2	.60
4	12,00	2	6.6	1.0	.50
5	14,00	2	7.4	0.8	.40
6	16,00	2	8.0	0.6	.30
7	18,00	2	8.8	0.8	.40
8	20,00	2	9.4	0.6	.30
9	22,00	2	9.8	0.4	.20
10	24,00	2	10.1	0.3	.15
11	26,00	2	10.6	0.5	.25
12	28,00	2	11.2	0.6	.30
13	30,00	2	11.5	0.3	.15
14	32,00	2	12.0	0.5	.25
15	34,00	2	12.6	0.6	.30
16					

— 2.22

AVG = .23/60 = .0039

R1 (cm/sec) .0039
R2 (cm/sec)

Kfs= 1.6×10^{-5} * single head calc.
PHIm= 1.3×10^{-4} * single head calc.

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

3'

REMARKS: 70°F cool & Dry, Soil was very organic w/ wood & plant material w/ some Cobbles.

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date: 5/7/93
BOREHOLE LOCATION: 41793

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	12
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0039
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 1.57E-05

mflx p(cm2/sec)= 0.000131

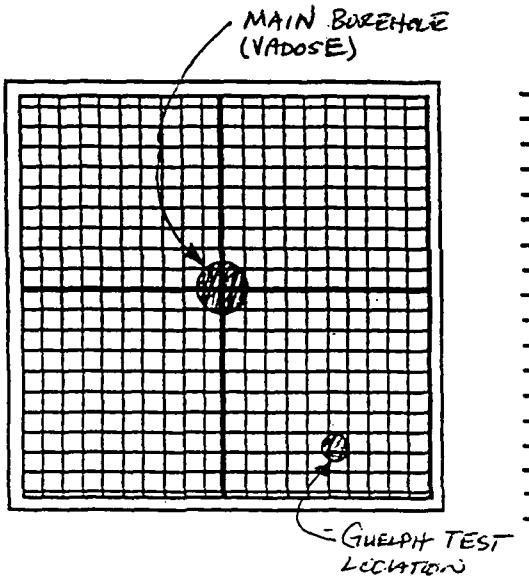
ENVIRONMENTAL MANAGEMENT DEPARTMENT | **FORM GT.34A** | **Site Information Rev. 0**

Date 4/7/93 Investigator C. MURRAY

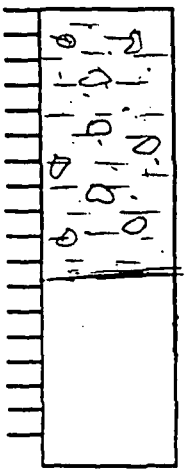
Site Location ROCKY FLATS PLANT, BORING @ 42493

Dominant Soil Type(s) SANDY, GRAVELLY CLAY

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	SANDY, GRAVELLY CLAY,
	RED-BROWN
	14cm (T.D.)

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

NONE

Comments and Notes (topography, slope, vegetation, etc.):

- GUELPH TEST PERFORMED ON FILL MATERIAL BENEATH ASPHALT LINER.
- FLAT SURFACE. - GUELPH CENTERED IN HOLE.

* MAY HAVE BEEN SLIGHT LEAKAGE TOWARDS MAIN BOREHOLE DURING 10cm HEAD HT.

Location Code: ROCKY FLATS (OU4) POND 207A

Name of Individual Authenticating Data (please print): BRAD NEWLIN, C. MURRAY

Organization: GERAGHTY & MILLER, INC., RUST ENV.

Signature and Date: Brad Newlin, 4/12/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34B Rev. 0** **Standardized Procedure For Permeameter Readings and Calculations**

Date 4-7-93 Investigator C. Murray GUELPH SERIAL # 42493

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs X	35.55	cm^2
Inner Reservoir Y	2.22	cm^2

[✓] CHECK RESERVOIR USED

Depth of Well Hole 14 cm

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)
1	0,0,0		4.1		
2	0,2,0		5.3	1.2	.6
3	0,4,0		6.1	1.8	.9
4	0,6,0		6.8	0.7	.35
5	0,8,0		7.5	0.7	.35
6	0,10,0		8.3	0.8	.40
7	0,12,0		9.0	0.7	.35
8	0,14,0		9.7	0.7	.35
9	0,16,0		10.4	0.7	.35

$\bar{R}_1$

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)
1	0,0,0		20.0		
2	0,2,0		25.0	5.0	2.5
3	0,4,0		29.7	4.7	2.35
4	0,6,0		35.0	5.3	2.65
5	0,8,0		39.6	4.6	2.30
6	0,10,0		44.8	5.2	2.6
7	0,12,0		50.8	6.0	3.0
8	0,14,0		55.5	4.7	2.35
9	0,16,0		60.4	4.9	2.45
10	0,18,0		64.8	4.4	2.20
11	0,20,0		69.1	4.3	2.15
12	0,22,0		74.8	4.7	2.35

$\bar{R}_2$ AVG. = 2.23

Ending time: 11:20

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (0.35)/60 = .0058 cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (2.23)/60 = .037 cm/sec

K_{fs} FIELD SATURATED HYDRAULIC CONDUCTIVITY = [(.0041)(35.55)(.037)] - [(.0054)(35.55)(.0058)] = 4.3×10^{-3} cm/sec

(RESERVOIR CONSTANT; $\bar{R}_2$ STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_1$ STEADY STATE RATE OF FLOW)

→ BASED ON AVG. FOR $\bar{R}_2$.

.0054 - .0011

Φm MATRIC FLUX POTENTIAL = [(.0572)(35.55)(.0058)] - [(.0237)(35.55)(.037)] = 0.68 cm^2/sec

(RESERVOIR CONSTANT; $\bar{R}_1$-STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_2$-STEADY STATE RATE OF FLOW)

α ALPHA PARAMETER = (_____)/(_____) = _____ cm^{-1}

(K_{fs}; Φ_m)

$\Delta\theta$ DELTA THETA = (_____) - (_____) = _____ cm^3/cm^3

(θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL IN CM/CM; θ_i AMBIENT WATER CONTENT OF SOIL IN CM/CM)

S SORPTIVITY = $\sqrt{2}$(_____)(_____) = _____ cm $sec^{-1/2}$

($\Delta\theta$; Φ_m)

ESTIMATED		CHECK ONE
MEASURED		

notes: cool & cloudy, soil was moist

Location Code: RFP BH42493

Name of Individual Authenticating Data (please print): Claude D. Murray

Organization: Rust E+I

Signature and Date: [signature] 4-7-93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34A **Site Information**
Rev. 0

BRN

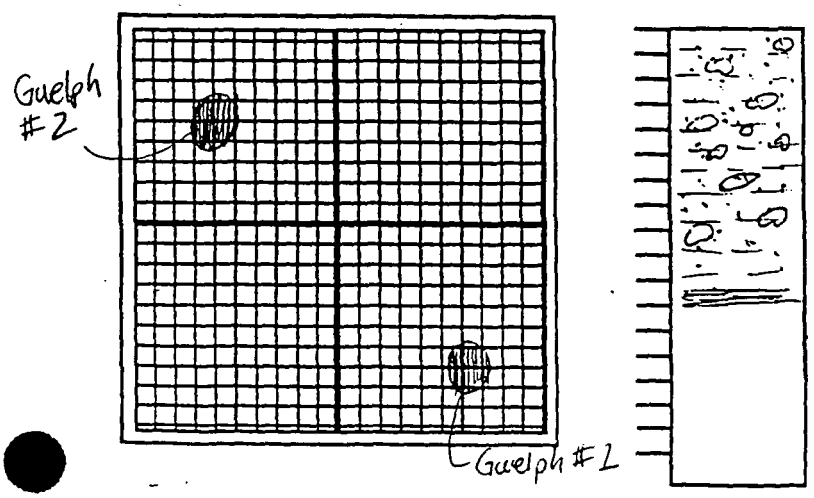
Date 4/8/93 Investigator B. NEWLIN

Site Location ROCKY FLATS, EAST POND 207A ADJACENT TO #42593

Dominant Soil Type(s) CLAY w/ SAND & GRAVEL

Site Map:

NOTE: NEW CUTOUT ADJACENT TO #42593



Soil Profile Description (horizon depth, texture, structure, color, etc.):

Depth	(#1) Description
	SANDY, GRAVELLY CLAY, REDDISH BROWN.
	AUGER REFUSAL @ 8" (20-21cm)

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

NONE

Comments and Notes (topography, slope, vegetation, etc.):

FLAT AREA.

* COMMENT: SUSPECT THAT WATER OUTLET FILTER AT BASE OF GUELPH WAS CLOGGED SINCE NO INFILTRATION WAS ~~AB~~ BN OBSERVED @ 10cm HEAD. COULD NOT CONTROL ~~BORE~~ BN BOREHOLE INTEGRITY (KEPT CAVING)

Location Code: ROCKY FLATS PLANT (OLD) POND 207A

Name of Individual Authenticating Data (please print): B. NEWLIN

Organization: GERAGHTY & MILLER, INC.

Signature and Date: Brad Newlin, 4/8/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34B Rev. 0** **Standardized Procedure For Permeameter Readings and Calculations**

Date 4/8/93 Investigator B. NEWLIN GUELPH SERIAL # 5' N. OF #42593 TEST SITE #1

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

[X] CHECK RESERVOIR USED

Depth of Well Hole 8"

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)
1	0	0	6.75	NA	NA
2	0,2,0	2	7.45	0.7	0.35
3	0,4,0	2	7.75	0.3	0.15
4	0,6,0	2	7.95	0.2	0.10
5	0,8,0	2	8.15	0.25	0.125
6	0,10,0	2	8.30	0.15	0.075
7	0,12,0	2	8.50	0.2	0.10
8	0,14,0	2	8.70	0.2	0.10
9	0,16,0	2	8.85	0.15	0.075
10	0,18,0	2	9.00	0.15	0.075
11	0,20,0	2	9.15	0.15	0.075

$\bar{R}_1$

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)
1	0	0	14.85	NA	NA
NO INFILTRATION OBSERVED @ 10 CM HEAD HT.					

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (.075)/60 = .0013 cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____ cm/sec

* K_{fs} = 8.4×10^{-5} cm/sec.

* $m_{f \times p}$ = .0007 cm^2/sec

K_{fs} FIELD SATURATED HYDRAULIC CONDUCTIVITY = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____ cm/sec
(RESERVOIR CONSTANT; $\bar{R}_1$-STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_1$-STEADY STATE RATE OF FLOW)

Φm MATRIC FLUX POTENTIAL = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____ cm^2/sec
(RESERVOIR CONSTANT; $\bar{R}_1$-STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_2$-STEADY STATE RATE OF FLOW)

α ALPHA PARAMETER = (_____)/(_____) = _____ cm^{-1}
(K_{fs}; Φ_m)

$\Delta\theta$ DELTA THETA = (_____) - (_____) = _____ cm^3/cm^3
(θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM; θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM)

S SORPTIVITY = $\sqrt{2}$(_____)(_____) = _____ cm $sec^{-1/2}$
($\Delta\theta$; Φm)

ESTIMATED		CHECK ONE
MEASURED		

* single head calc.

Location Code: ROCKY FLATS PLANT, EAST 207A ADJACENT TO 42593

Name of Individual Authenticating Data (please print): B. NEWLIN

Organization: GERAGHTY & MILLER, INC.

Signature and Date: Brad Newlin

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

ıte 5/21/93 Investigator C. Murray GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} FIELD SATURATED HYDRAULIC CONDUCTIVITY = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
(RESERVOIR CONSTANT; $\bar{R}_2$-STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_1$-STEADY STATE RATE OF FLOW)

Φm MATRIC FLUX POTENTIAL = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
(RESERVOIR CONSTANT; $\bar{R}_1$-STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_2$-STEADY STATE RATE OF FLOW)

α ALPHA PARAMETER = (_____)/(_____) = _____cm^{-1}
(K_{fs}; Φ_m)

$\Delta\theta$ DELTA THETA = (_____) - (_____) = _____cm^3/cm^3
(θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM; θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM)

S SORPTIVITY = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
($\Delta\theta$; Φ_m)

ESTIMATED		CHECK ONE
MEASURED		

ation Code: 43/93 - could not advance B.H. - NO TEST

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: PUST

Signature and Date: C. Murray 5/21/93 5/21/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 43193

DATE: 5/21/93

INVESTIGATOR: cdm

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22

DEPTH OF HOLE: _____ INCHES OR CM

5 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

R1 (cm/sec)	
R2 (cm/sec)	

Kfs=	
PHIm=	

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

REMARKS: Could not get hole deeper than 3" Attempted 9 holes.

ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34B Rev. 0** **Standardized Procedure For Permeameter Readings and Calculations**

Date 3/29/93 Investigator B. NEWLIN GUELPH SERIAL # 43693

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

[ ] CHECK RESERVOIR USED [X]

Depth of Well Hole 23"
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)
1	Ø	Ø		Ø	

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)
1	Ø	Ø		Ø	

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____ cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____ cm/sec

K_{fs} (FIELD SATURATED HYDRAULIC CONDUCTIVITY) = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____ cm/sec
(RESERVOIR CONSTANT; $\bar{R}_1$ STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_1$ STEADY STATE RATE OF FLOW)

Φm (MATRIC FLUX POTENTIAL) = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____ cm^2/sec
(RESERVOIR CONSTANT; $\bar{R}_1$ STEADY STATE RATE OF FLOW; RESERVOIR CONSTANT; $\bar{R}_2$ STEADY STATE RATE OF FLOW)

α (ALPHA PARAMETER) = (_____)/(_____) = _____ cm^{-1}
(K_{fs}; Φ_m)

$\Delta\theta$ (DELTA THETA) = (_____) - (_____) = _____ cm^3/cm^3
(θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM; θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM)

S (SORPTIVITY) = $\sqrt{2}$(_____)(_____) = _____ cm $sec^{-1/2}$
($\Delta\theta$; Φ_m)

ESTIMATED	
MEASURED	

CHECK ONE

NOTE: 1/2 HR @ 5 cm HEAD WITH NO INFILTRATION &
1/2 HR @ 10 cm HEAD WITH NO INFILTRATION.

Location Code: ROCKY FLATS POND 207A, BOREHOLE # 43693

Name of Individual Authenticating Data (please print): BRAD NEWLIN

Organization: GERAGHTY & MILLER, INC.

Signature and Date: Bradley Z. Newlin 3/29/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

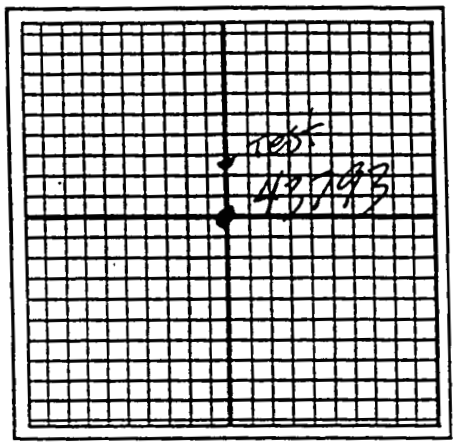
FORM GT.34A Site Information Rev. 0

Date 6/2/93 Investigator C. Murray

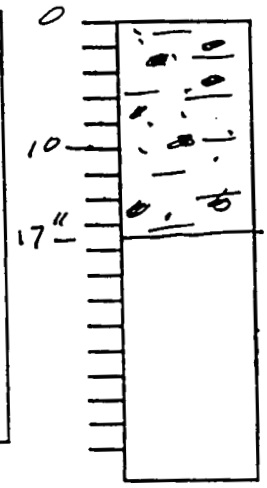
Site Location 32 inches N of 43793

Dominant Soil Type(s). Sdy, Cly, Gravel

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Sandy Clayey Gravel vy moist, DK. brn.

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

Test Failed, no WL change

Location Code: 43793

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust

Signature and Date: C. Murray 6/2/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

Date 6/2/93 Investigator C. Murray

GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X 35.55	cm^2
Inner Reservoir	Y 2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

. the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec

FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec

MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}

ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3

DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$

SORPTIVITY — $\Delta\theta$ — Φ_m

ESTIMATED	☐
MEASURED	☐

CHECK ONE

Station Code: 43793

Name of Individual Authenticating Data (please print): _____

Organization: RAST

Signature and Date: C. Murray 10/2/93

GUELPH WORK
ROCKY FLATS PLANT SITE

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22 ✓

LOCATION: 32 in. North of 43793

DATE: 6/2/93

INVESTIGATOR: EDM / Robin

DEPTH OF HOLE: 17 inc. INCHES OR CM

5 cm head test

10:06 am

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,00	0	2.4		
1	4,00	4	2.4	0	
2	8,00	4	2.4	0	
3	12,00	4	2.4	0	
4	16,00	4	2.4	0	
5	20,00	4	2.4	0	
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

no wl change in 20 min. at 5cm head!

R1 (cm/sec)	
R2 (cm/sec)	

Kfs=	
PHIm=	

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,00	0	53.6		
1	4,00	4	53.6	0	
2	8,00	4	53.6	0	
3	12,00	4	53.6	0	
4	16,00				
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

REMARKS:

Powered Augered to 17 in. without any problems. Soil is very moist Dark brown Sandy-clayey gravel. No vegitation on surface Temp. 70°F dry no rain in 24 hrs. Cleaned hole w/ Flat Auger and brush in good shape, centered rod in bottom.

ENVIRONMENTAL MANAGEMENT DEPARTMENT

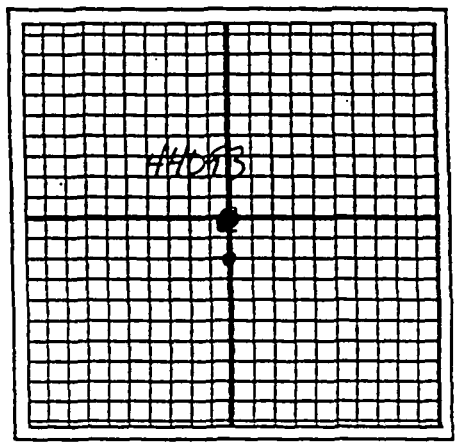
FORM GT.34A Site Information Rev. 0

Date 5/21/93 Investigator C. Murray & V. Rothman

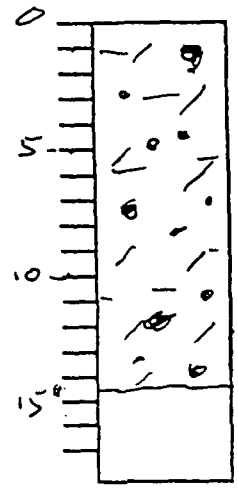
Site Location 2 ft. S. of 44093

Dominant Soil Type(s) Silty Clayey Gravel

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Silty Gravel w/ some clay light brwn. moist.

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

>24 hrs since last rain; Powers Augered.

Location Code: 44093

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust E+I

Signature and Date: [signature] 5/21/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

Date 5/21/93 Investigator C. Murray GUELPH SERIAL # _____

.eservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

$\bar{R}$ the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

or the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED		CHECK ONE
MEASURED		

Location Code: 44093

e of Individual Authenticating Data (please print): _____

Organization: Rust

Signature and Date: C. Murray 5/21/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: (2' south of) 44093

DATE: 5/21/93

INVESTIGATOR: CDM / V.R.

DEPTH OF HOLE: ~~14.5"~~ 14.5" INCHES OR CM

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22

5 cm head test

10:00 am

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0	~~0~~	1.1	~~1.9~~	
1	0,1,0,0	4	3.0	1.9	.475
2	0,8,00	4	4.3	1.3	.325
3	0,12,00	4	8.4	4.1	1.025
4	0,14,00	2	10.4	2.0	1.0
5	0,16,00	2	12.5	2.1	1.05
6	0,18,00	2	14.2	1.7	.85
7	0,20,00	2	16.7	2.5	1.25
8	0,22,00	2	18.7	2.0	1.0
9	0,24,00	2	20.2	1.5	.75
10	0,26,00	2	22.4	2.2	1.1
11	0,28,00	2	24.4	2.0	1.0
12	0,30,00	2	26.4	2.0	1.0
13	0,32,00	2	28.4	2.0	1.0
14					
15					
16					

1.0/60 sec = .0167

R1 (cm/sec) .0167

R2 (cm/sec) .0331

Kfs= -2.45×10^{-4} cm/sec

PHIm= 3.79×10^{-4} cm²/sec

Kfs = 6.7×10^{-5} } Single head formula

= 5.6×10^{-4}

~~Kfs (single head 5cm) = Kfs = 2.0 x10^-4~~

~~Kfs (single head 10cm) = Kfs = 3.01x10^-4~~

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0	~~0~~	3.5		
1	2,00	2	7.6	4.1	2.05
2	4,00	2	11.5	3.9	1.95
3	6,00	2	15.5	4.0	2.0
4	8,00	2	19.5	4.0	2.0
5	10,00	2	23.4	3.9	1.95
6	12,00	2	27.4	4.0	2.0
7	14,00	2	31.1	3.7	1.85
8	16,00	2	35.0	3.9	1.95
9	18,00	2	39.0	4.0	2.0
10	20,00	2	42.9	3.9	1.95
11	22,00	2	47.0	4.1	2.05
12					
13					
14					
15					

AVG 1.988 / 60sec = .0331

REMARKS: Clear and Warm (75°F) >24hrs since last rain., Power Augered to 14.5 inches with some difficultiy See Core Log for descriptions.

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:5/21/93
BOREHOLE LOCATION: 44093

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	14.5
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0167
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 6.72E-05

mflx p(cm2/sec)= 0.00056

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34A

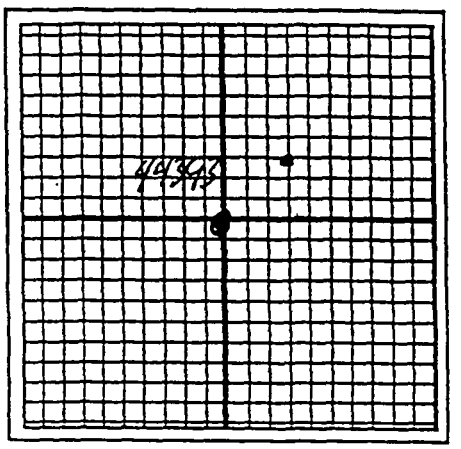
Site Information
Rev. 0

Date 5/28/93 Investigator C Murray & Nick

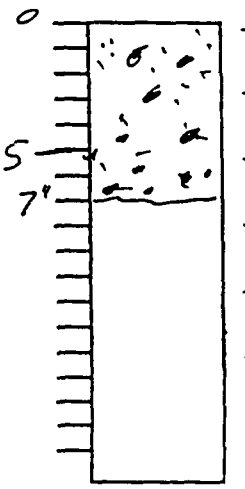
Site Location 3' northeast of 44393 #1

Dominant Soil Type(s) Sandy Clayey Grave

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Sandy Clayey Gravel
	light brn. moist

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

moist

Comments and Notes (topography, slope, vegetation, etc.):

Flat construction yard area

Location Code: 44393

Name of Individual Authenticating Data (please print): J UHLINGER

Organization: RUST E I

Signature and Date: C Murray 5/28/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

ate 5/28/93 Investigator C. MURRAY

GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X 35.55	cm^2
Inner Reservoir	Y 2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

or the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec

FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec

MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}

ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3

DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$

SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED	☐
MEASURED	☐

CHECK ONE

ation Code: 44393 #1

ne of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust

Signature and Date: C. Murray 5-28-93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: North east of 44393

DATE: 5/28/93

INVESTIGATOR: COM, NICK

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (inner only	2.22

DEPTH OF HOLE: .6' INCHES OR CM

#1

5 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0,00	0	2.5		
1	2,00	2	3.0	1.5	.75
2	4,00	2	3.3	.3	.15
3	6,00	2	3.5	.2	.10
4	8,00	2	3.9	.4	.20
5	10,00	2	4.2	.3	.15
6	12,00	2	4.4	.2	.10
7	16,00	2	4.6	.2	.10
8	18,00	2	4.8	.2	.10
9	20,00	2	5.0	.2	.10
10					
11					
12					
13					
14					
15					
16					

.10/60 = .0167

R1 (cm/sec) .0167

R2 (cm/sec) —

Kfs= 1.08×10^{-3} * Single head formula

PHIm= 8.9×10^{-3} *

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

REMARKS: Sandy Clayey Gravel, moist light brown Power Augered to only 0.6ft, would not get bellow that. Hot, 5% Clear 80°F

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:5/28/93
BOREHOLE LOCATION: 44393#1

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	7
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0167
Reservoir Constant, X:	35.55
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 0.001076

mflx p(cm2/sec)= 0.008965

ENVIRONMENTAL MANAGEMENT DEPARTMENT

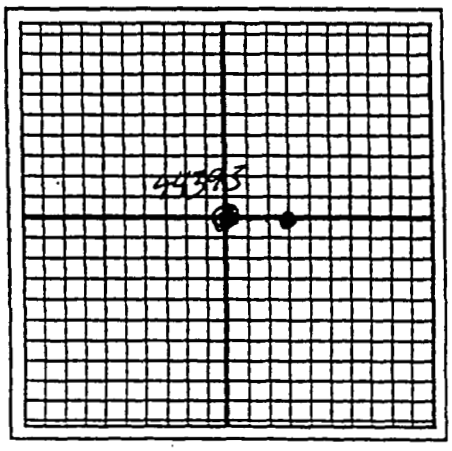
FORM GT.34A Site Information Rev. 0

Date 5/28/93 Investigator C Murray

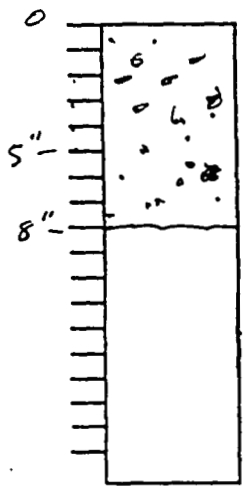
Site Location 3' E of 44393 #2

Dominant Soil Type(s) Sandy Gravel w/ some clay

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Sandy Gravel w/ Some Clay, Lt brn.

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

N/A

Comments and Notes (topography, slope, vegetation, etc.):

Power Augered to 8" only.

Location Code: 44393

Name of Individual Authenticating Data (please print):

Organization: Rust E&I

Signature and Date: Charles R. Murray 5/28/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

ate 5/28/93 Investigator C. Murray GUELPH SERIAL # _____ TEST #2

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED	☐
MEASURED	☐

CHECK ONE

ocation Code: 44393

ame of Individual Authenticating Data (please print): JAMES F UHLINGER

Organization: Rust

Signature and Date: C. Murray 5/28/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 3' East of 44393

DATE: 5/28/93
INVESTIGATOR: Dan / Nick

RESERVOIR CONSTANTS:	
X (combined)	35.55
Y (Inner only	2.22

5 cm head test

DEPTH OF HOLE: .7' INCHES OR CM

#2

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0	0	0	2.4		
1	2,00	2	5.4	3.0	1.5
2	4,00	2	7.4	2.0	1.0
3	6,00	2	8.9	1.5	.75
4	8,00	2	11.3	2.4	1.2
5	10,00	2	12.2	0.9	.45
6	12,00	2	14.7	2.5	1.25
7	14,00	2	15.6	0.9	.45
8	16,00	2	17.9	2.3	1.15
9	18,00	2	18.9	1.0	.5
10	20,00	2	20.5	1.6	.80
11	22,00	2	22.1	1.6	.80
12	24,00	2	23.7	1.6	.80
13	26,00	2	25.3	1.6	.80
14					
15					
16					

.8/60 = .0133

R1 (cm/sec) .0133
R2 (cm/sec)

Kfs= 5.4×10^{-5} * Single Head Formula
PHIm= 4.5×10^{-4} *

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min)
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

REMARKS: Powered Augered to 0.7' and could not get deeper, very sandy gravel w/ some clay. Light brown. Dry, Cool 75°F, Thunderstorms

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:5/28/93
BOREHOLE LOCATION: 44393#2

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	8
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0133
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 5.35E-05

mflx p(cm2/sec)= 0.000446

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34A

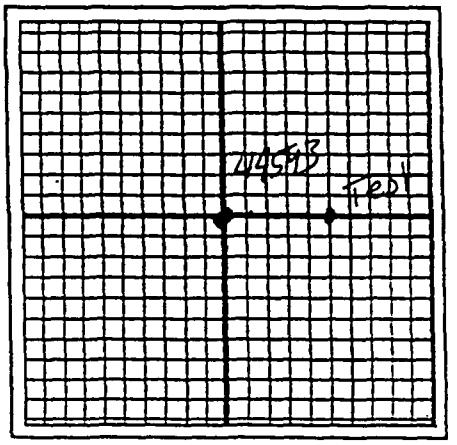
Site Information
Rev. 0

Date 4/22/93 Investigator C. Murray

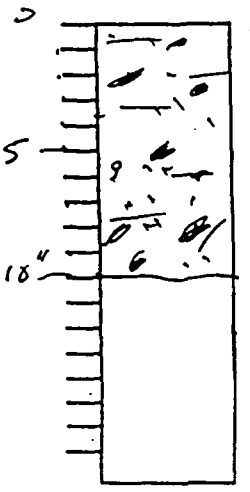
Site Location 5 ft. E of 44593

Dominant Soil Type(s) Clayey Gravel

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Clayey Gravel Drk. Brn.
	moist.

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

FLAT - ROAD BED AREA

Location Code: 44593

Name of Individual Authenticating Data (please print): J. OHLINGER

Organization: RUST E+I

Signature and Date: C. Murray 4/22/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34B
Rev. 0

Standardized Procedure For Permeameter Readings and Calculations

ıte 4/22/93 Investigator C. MURRAY

GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X	35.55	cm^2
Inner Reservoir	Y	2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φ_m

ESTIMATED	☐	CHECK ONE
MEASURED	☐	

ation Code: 44593

ame of Individual Authenticating Data (please print): JAMES F. UHLINGER

Organization: RUST

Signature and Date: C. Murray 4/22/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 5 ft East of BH44593

DATE: 4-22-93

INVESTIGATOR: CDM

RESERVOIR CONSTANTS:	
X (combined)	35.55 ✓
Y (inner only	2.22

DEPTH OF HOLE: 10 inch INCHES OR CM

5 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min) R1
0	0	0	5.6		
1	2,00	2	8.1	2.5	1.25
2	4,00	2	9.0	.9	.45
3	6,00	2	9.7	.7	.35
4	8,00	2	10.6	.9	.45
5	10,00	2	11.5	.9	.45
6	12,00	2	12.2	.7	.35
7	14,00	2	13.1	.9	.45
8	16,00	2	14.0	.9	.45
9	18,00	2	14.9	.9	.45
10					
11					
12					
13					
14					
15					
16					

0.45

$R_1 = \cancel{8}/60$ sec. = .0075

R1 (cm/sec) .0075

R2 (cm/sec) .0075

Kfs= ~~-2.16E-5~~ -3.47E-4

PHIm= ~~5.58E-4~~ 8.93E-3

Kfs (single head 5cm) = ~~1.44x10^-3~~ 4.8×10^{-4} *

~~Kfs (single head 10cm) = 1.09x10^-3~~

$Mf \times P = 4.03 \times 10^{-3}$

10 cm head test

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE (cm/min) R2
0	0	0	18.5		
1	2,00	2	19.8	1.3	.65
2	4,00	2	20.8	1.0	.5
3	6,00	2	21.8	1.0	.5
4	8,00	2	22.9	1.1	.55
5	10,00	2	24.0	1.1	.55
6	12,00	2	25.1	1.1	.55
7	14.00	2	26.0	.9	.45
8	16.00	2	26.9	.9	.45
9	18.00	2	27.8	.9	.45
10					
11					
12					
13					
14					
15					

.45 / 60 sec. = .0075

REMARKS: Dark Brown Clayey Gravel, moist. 75°F Clear. Just south of the sludge Drying Pits.

POWER Auger just about could not drill hole - stopped at 10 inches.

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:4/22/93
BOREHOLE LOCATION: 44593

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	10
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0075
Reservoir Constant, X:	35.55
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 0.000483

mflx p(cm2/sec)= 0.004026

ENVIRONMENTAL MANAGEMENT DEPARTMENT

FORM GT.34A

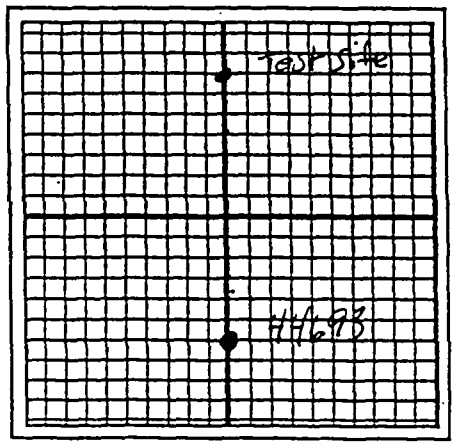
Site Information
Rev. 0

Date 4/16/93 Investigator C. Murray & J. Evans

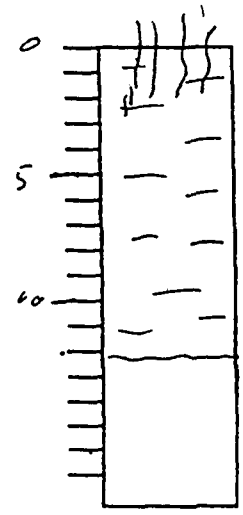
Site Location 13' North 44693

Dominant Soil Type(s) Claystone

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Depth	Description
	Claystone, lt. gray, moist.

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

Comments and Notes (topography, slope, vegetation, etc.):

Flat, light vegetation - dry to moist

Location Code: 44693

Name of Individual Authenticating Data (please print): J. UHLINGER

Organization: Rust E&I

Signature and Date: Chuck D. Murray 4/16/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34B Rev. 0** **Standardized Procedure For Permeameter Readings and Calculations**

Date 4/16/93 Investigator C. Murray GUELPH SERIAL # _____

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X 35.55	cm^2
Inner Reservoir	Y 2.22	cm^2

☐ CHECK RESERVOIR USED

Depth of Well Hole_____
Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)

SEE ATTACHED SPREAD SHEET FOR DATA & RESULTS

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (_____)/60 = _____cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (_____)/60 = _____cm/sec

K_{fs} = [(.0041)(_____)(_____)] - [(.0054)(_____)(_____)] = _____cm/sec
FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW

Φm = [(.0572)(_____)(_____)] - [(.0237)(_____)(_____)] = _____cm^2/sec
MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$-STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$-STEADY STATE RATE OF FLOW

α = (_____)/(_____) = _____cm^{-1}
ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____cm^3/cm^3
DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____cm $sec^{-1/2}$
SORPTIVITY — $\Delta\theta$ — Φm

ESTIMATED	☐	CHECK ONE
MEASURED	☐	

Location Code: 4/16/93

Name of Individual Authenticating Data (please print): JAMES F. UHLINGER

Organization: RUST

Signature and Date: Claude R. Murray 4/16/93

GUELPH WORK
ROCKY FLATS PLANT SITE

LOCATION: 13' North of 44693

DATE: 4-16-95

INVESTIGATOR: JCE & CDM

RESERVOIR CONSTANTS:		
X (combined)	35.55	0-5
Y (inner only	2.22	5-

DEPTH OF HOLE: 1.2 ft INCHES OR CM

12.2 in

5 cm head test 13:15

READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE R1 (cm/min)
0	0	0	1.5		
1	2	2	1.5		
2	4	~~4~~ 2	1.5		
3	6	~~5~~ 2	1.5		
4	~~8~~ 7	~~7~~ 2	2.1	0.6	0.3
5	9	~~9~~ 2	2.2	0.1	0.05
6	11	~~11~~ 2	2.7	0.5	0.25
7	13	2	2.7	0	0
8	15	2	3.2	0.5	0.25
9	19	4	3.7	0.5	0.125
10	23	4	4.2	0.5	0.125
11	27	4	4.7	0.5	0.125
12					
13					
14					
15					
16					

Res. constant.

35.55 ↑
2.22 ↓

R1 (cm/sec) 0.125 — 0.125/60 = .0021 cm/sec.

R2 (cm/sec) 0.10 — 0.10/60 = .0017 cm/sec

(single head formula)

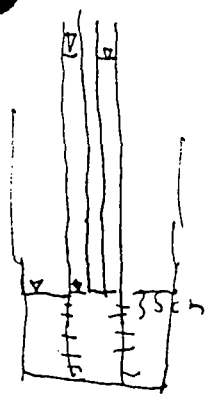
Kfs= ~~-9.7x10^-6~~ cm/sec.

PHIm= ~~1.8x10^-4~~ 1.6x10^-2 cm²/sec.

$kfs = 8.4 \times 10^{-6}$

$mfxp = 7.0 \times 10^{-5}$

10 cm head test



READING NUMBER	CLOCK TIME	TIME INTERVAL (minutes)	WL RESERVOIR (cm)	WL CHANGE (cm)	RATE OF CHANGE R2 (cm/min)
0	28.15	0	49.1	~~0.~~	
1	32.15	4	49.3	0.2	0.05
2	36.15	4	49.6	0.3	0.075
3	40.15	4	50.0	0.4	0.1
4	44.15	4	50.3	0.3	0.075
5	48.15	4	50.7	0.4	0.1
6	52.15	4	51.1	0.4	0.1
7	56.15	4	51.5	0.4	0.1
8					
9					
10					
11					
12					
13					
14					
15					

2.22 constant

REMARKS: cool breazy, soil has had 30 hrs to dry out from last percepitation. Soil is Claystone, light gray & moist.

GUELPH CALCULATION FOR ROCKY FLATS PLANT SITE

CALCULATIONS USING THE ONE-PONDED HEIGHT TECHNIQUE

Investigator: CDM Rust E.I.
Date:4/16/93
BOREHOLE LOCATION: 44693

SOIL TYPE:

FIELD DATA:

Borehole Depth (in):	12.2
Ponded Height (cm):	5
Radius of test hole (cm):	3
Steady State Rate of Fall (cm/sec): R	0.0021
Reservoir Constant, X:	2.22
alpha*	0.12
H/a ratio:	1.67
thus C=	0.8

THUS:

Kfs (cm/sec)= 8.45E-06

mflx p(cm2/sec)= 7.04E-05

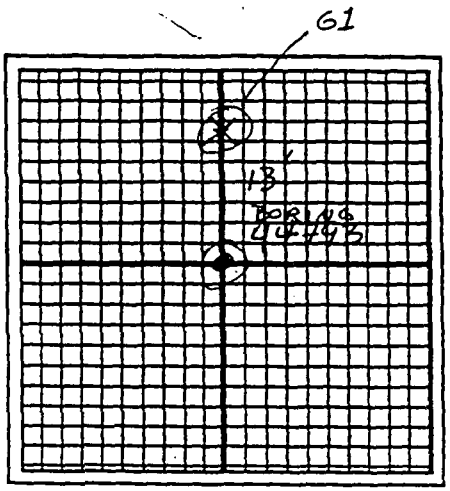
ENVIRONMENTAL MANAGEMENT DEPARTMENT | **FORM GT.34A** | **Site Information Rev. 0**

Date 3/10/93 Investigator J. UHLINGER / C. MURRAY

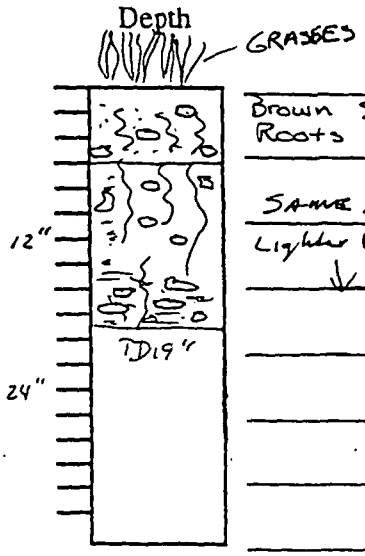
Site Location 13' NORTH OF 44793

Dominant Soil Type(s) SILTY SANDY GRAVELLY CLAY (RF ALLUVIUM)

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Description

Brown Silty Clay w/Gravel (upto 1") Roots .25-.5cm Diameter

SAME AS ABOVE

Lighter Brown Sandy silty clay - gravels increasing ↓ frequency Roots smaller & decreasing ↓ frequency

Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

GRAVELS (APPROX. 1-1.5") FREQUENTLY ENCOUNTERED DURING AUGERING

NO SATURATED SOILS ENCOUNTERED, TESTED MATERIALS APPEARED RELATIVELY SOFT & DRY. ROOTS (.25 cm DIAM.) WERE FREQUENTLY NEAR TOP OF BORING. TEST CONDUCTED @ 19" JUST ABOVE WXD BEDROCK ESTIMATED @ 2.5' (SEE LOG for 44793)

Comments and Notes (topography, slope, vegetation, etc.):

SITE LOCATED ON EASTERN SLOPE OF SE TO NW TRENDING DRAINAGE

SLIGHT SLOPE TO NW - COMPESATED FOR USING TRIPOD -

RELATIVELY THICK FIELDGRASSES REMOVED FROM TEST SITE PRIOR TO AUGERING

Location Code: 44793 (13' North of 44793

Name of Individual Authenticating Data (please print): CLAUDE MURRAY

Organization: RUST E&I

Signature and Date: 3/10/93

ENVIRONMENTAL MANAGEMENT DEPARTMENT **FORM GT.34B Rev. 0** **Standardized Procedure For Permeameter Readings and Calculations**

Date 3/10/93 Investigator J. UHLINGER / C. MURRAY GUELPH SERIAL # 10563

Reservoir Constants: (see Label on Permeameter)

Combined Reservoirs	X 35.55	cm^2
Inner Reservoir	Y 2.22	cm^2

[✓] CHECK RESERVOIR USED

Depth of Well Hole 19.0"

Note: In standardized procedure the radius of the well hole is always 3.0 cm

1st Set of Readings with height of water in well (H_1) set at 5 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_1 (CM/MIN)
1	12:11:00	0	7.0	—	—
2	12:13:00	2.0	12.0	5.0	2.50
3	12:15:00	2.0	15.3	3.3	1.65
4	12:17:00	2.0	17.8	2.5	1.25
5	12:19:00	2.0	20.0	2.2	1.10
6	12:21:00	2.0	22.0	2.0	1.00
7	12:23:00	2.0	23.9	1.9	0.95
8	12:25:00	2.0	25.9	2.0	1.00
9	12:27:00	2.0	27.6	1.7	0.85
10	12:29:00	2.0	29.4	1.8	0.90
11	12:31:00	2.0	30.9	1.5	0.75
12	12:32:00	2.0	32.5	1.6	0.80

$\bar{R}_1$

2nd Set of Readings with height of water in well (H_2) set at 10 cm)

READING NUMBER	TIME	TIME INTERVAL (MIN)	WATER LEVEL IN RESERVOIR (CM)	WATER LEVEL CHANGE (CM)	RATE OF WATER LEVEL CHANGE R_2 (CM/MIN)
1	12:35:00	0	38.0	—	—
2	12:37:00	2.0	42.5	4.5	2.25
3	12:39:00	2.0	46.4	3.9	1.95
4	12:41:00	2.0	50.3	3.9	1.95
5	12:43:00	2.0	54.0	3.7	1.85
6	12:45:00	2.0	57.8	3.8	1.90
7	12:47:00	2.0	61.6	3.8	1.90
8	12:49:00	2.0	65.4	3.8	1.90
9	12:51:00	2.0	69.2	3.8	1.90
10	12:53:00	2.0	73.1	3.9	1.95

$\bar{R}_2$

CALCULATIONS

$\bar{R}$, the steady state rate of flow, is achieved when R is the same in three consecutive time intervals.

For the 1st Set of Readings $\bar{R}_1$ = (0.98)/60 = 0.016 cm/sec

For the 2nd Set of Readings $\bar{R}_2$ = (1.90)/60 = 0.032 cm/sec

K_{fs} = [(.0041)(35.55)(0.032)] - [(.0054)(35.55)(0.016)] = 1.6×10^{-3} cm/sec

FIELD SATURATED HYDRAULIC CONDUCTIVITY — RESERVOIR CONSTANT — $\bar{R}_2$ STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_1$ STEADY STATE RATE OF FLOW

Φm = [(.0572)(35.55)(0.016)] - [(.0237)(35.55)(0.032)] = 5.6×10^{-3} cm^2/sec

MATRIC FLUX POTENTIAL — RESERVOIR CONSTANT — $\bar{R}_1$ STEADY STATE RATE OF FLOW — RESERVOIR CONSTANT — $\bar{R}_2$ STEADY STATE RATE OF FLOW

α = (1.6×10^{-3})/(5.6×10^{-3}) = 0.29 cm^{-1}

ALPHA PARAMETER — K_{fs} — Φ_m

$\Delta\theta$ = (_____) - (_____) = _____ cm^3/cm^3

DELTA THETA — θ_{fs} FIELD SATURATED WATER CONTENT OF SOIL, IN CM/CM — θ_i AMBIENT WATER CONTENT OF SOIL, IN CM/CM

S = $\sqrt{2}$(_____)(_____) = _____ cm $sec^{-1/2}$

SORPTIVITY — $\Delta\theta$ — Φ_m

ESTIMATED	
MEASURED	

CHECK ONE

Location Code: 44793 (13' North of 44793)

Name of Individual Authenticating Data (please print): CLAUDE MURRAY

Organization: RUST E&I

Signature and Date: 3/10/93

BAT®

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: 40293 - RFP - BUFFER ZONE DATE: 1-21-93 TIME: 10:27
PIEZOMETER ID: 40293 NAME: J. Kramer

DEPTH (m): 2.12 TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm): 228.77

EXT CYL VOLUME (ml): 63
INIT LIQUID VOL (ml): 20
TOTAL S/S VOL (ml): 98
INIT GAS VOLUME (ml): 78

PORE PRESSURE (m): -1.73
INITIAL PRESSURE (m): 38.40 * 38.09 Δ
80% PRESS CHANGE (m): 6.24
MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H2O)	ELAPSED TIME (secs)	PRESSURE (m H2O)
1 0,0,0	38.41	16 0,10,0	37.58
2 0,5,0	38.41	17 0,11,0	37.56
3 0,10,0	38.41	18 0,12,0	37.54
4 ABORT TEST		19 0,17,0	37.49
5 RESTART TEST WITH		20 0,22,0	37.46
6 PRESS OF	38.09	21 0,27,0	37.44
7 0,1,0	38.00	22 0,32,0	37.42
8 0,2,0	37.91	23 1,58,0	37.35
9 0,3,0	37.84	24 END OF	TEST
10 0,4,0	37.78	25	
11 0,5,0	37.73	26	
12 0,6,0	37.69	27	
13 0,7,0	37.65	28	
14 0,8,0	37.63	29	
15 0,9,0	37.60	30	

pressure decay was stable at 0.005/m/min over 12 minutes prior to start of permeability TEST

FASTEN
CALCULATION
PRINTOUTS
HERE

ACTUAL VOL CHANGE (ml): 1.0
CALCULATED VOL CHANGE (ml): 1.2

PERMEABILITY ~~(m/sec)~~: 3.1 x 10-10 cm/sec

COMMENTS: INITIAL TEST WAS ABORTED - SEPTUM WAS NOT FULLY PIERCED IN BAT PROBE TIP
TEST IS IN BEDROCK MATERIAL

```
****    ***   *****
*   *  *   *    *
****   *****    *
*   *  *   *    *
****   *   *    * R
```

IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 440293
FILTER DEPTH (m or ft) : 2.12

DATE: 1993-01-21 TIME: 10:27
NAME: jk

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): 63.0
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 78.0

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : -1.73
INITIAL TEST PRESS (m) : 38.09
80% RECOVERY PRESS (m) : 6.23
MIN FINAL PRESSURE (m) : 28.21

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s	NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	38.09		1	00:01:00	38.00	2.7x10 -8
2	00:02:00	37.91	2.2x10 -8	3	00:03:00	37.84	1.8x10 -8
4	00:04:00	37.78	1.5x10 -8	5	00:05:00	37.73	1.3x10 -8
6	00:06:00	37.69	1.0x10 -8	7	00:07:00	37.65	8.7x10 -9
8	00:08:00	37.63	7.2x10 -9	9	00:09:00	37.60	7.0x10 -9
10	00:10:00	37.58	6.1x10 -9	11	00:11:00	37.56	3.7x10 -9
[illegible]	00:12:00	37.54	2.7x10 -9	13	00:17:00	37.49	2.0x10 -9
	00:22:00	37.46	1.4x10 -9	15	00:27:00	37.44	3.1x10-10
	00:32:00	37.42	3.1x10-10	17	01:58:00	37.35	

NUMBER OF DATA POINTS : 17
CALC VOLUME CHANGE (ml): 1.2
ACTUAL VOL CHANGE (ml): 1.2

COMMENTS:
Test is in bedrock material

*** FINAL CALCULATED PERMEABILITY = 3.1 x 10-10 (cm/s) ***

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#ID- BAT(1) p1of2

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: RFP- BUFFER ZONE DATE: 1-30-93 TIME: 13:15
PIEZOMETER ID: 40393 NAME: EP. Lawrence, B. Newlin VERIFIED BY EPL
DEPTH (m): 1.64 (180 cm) TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm): 228.77

EXT CYL VOLUME (ml): 0.5 PORE PRESSURE (m): +1.32 DELPT = 0.0
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): 29.38
TOTAL SYS VOL (ml): 355 80% PRESS CHANGE (m): 6.93
INIT GAS VOLUME (ml): 155 MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m. H_2O)	ELAPSED TIME (secs)	PRESSURE (m. H_2O)
1 0,0,30	28.29	16 0,30,0	27.93
2 0,1,0	28.27	17 ~~0,35,~~	END OF TEST
3 0,1,30	28.26	18	
4 0,2,0	28.25	19	
5 0,3,0	28.22	20	
0,4,0	28.20	21	
7 0,5,0	28.18	22	
8 0,6,0	28.16	23	
9 0,7,0	28.14	24	
10 0,8,0	28.13	25	
11 0,9,0	28.12	26	
12 0,10,0	28.11	27	
13 0,15,0	28.05	28	
14 0,20,0	28.01	29	
15 0,25,0	27.97	30	

WITHAL ZONE PRESS

3.495
− 1.86
1.635

FASTEN CALCULATION PRINTOUTS HERE

ACTUAL VOL CHANGE (ml): 2.0
CALCULATED VOL CHANGE (ml): 0.6
PERMEABILITY ~~(m/s)~~ (cm/s): 9.1 x 10^{-10}

COMMENTS: TESTED CLAY MATERIAL IN ALLUVIUM - ATTEMPTED TO DRIVE PROBE IN SANDIER UNIT ABOVE UNSUCCESSFULLY

#ID-BAT(1) p2of2.

```
 ****    ***   *****
*   *  *   *    *
****   *****    *
*   *  *   *    *
****   *   *    * R
```

IN SITU PERMEABILITY TEST

SITE : RFP
TST ID: 40393.1
FILTER DEPTH (m or ft) : 1.64

DATE: 1993-01-30 TIME: 13:15
NAME: epl

FILTER: LENGTH (mm):	40.0	TEST TYPE: VAR HEAD, OUTFLOW	
DIAMETER (mm):	30.0	CALIBRATION SLOPE :	1.00
FLOW FACTOR (mm):	228.77	INTERCEPT :	.00
TEST CONTAINER VOL (ml):	35.0	LIQUID START LEVEL (m) :	.310
EXT CYLINDER VOL (ml):	.5	STATIC PORE PRESS (m) :	1.32
INITIAL LIQUID VOL (ml):	20.0	INITIAL TEST PRESS (m) :	29.38
CONTAINER X-AREA (cm2):	1.96	80% RECOVERY PRESS (m) :	6.93
INITIAL GAS VOL (ml):	15.5	MIN FINAL PRESSURE (m) :	7.01

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s	NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	29.38		1	00:00:30	28.29	4.4x10 -9
2	00:01:00	28.27	2.9x10 -9	3	00:01:30	28.26	2.8x10 -9
4	00:02:00	28.25	2.7x10 -9	5	00:03:00	28.22	2.6x10 -9
6	00:04:00	28.20	2.2x10 -9	7	00:05:00	28.18	2.2x10 -9
8	00:06:00	28.16	1.9x10 -9	9	00:07:00	28.14	1.5x10 -9
10	00:08:00	28.13	1.1x10 -9	11	00:09:00	28.12	1.3x10 -9
[illegible]	00:10:00	28.11	1.1x10 -9	13	00:15:00	28.05	1.0x10 -9
[illegible]	[illegible]:20:00	28.01	9.1x10-10	15	00:25:00	27.97	9.1x10-10
[illegible]	[illegible]0:30:00	27.93					

NUMBER OF DATA POINTS : 16
CALC VOLUME CHANGE (ml): .6
ACTUAL VOL CHANGE (ml): 2.0

COMMENTS:
Tested clay material in alluvium.
Attempted to drive probe in sandier unit above but unsuccessful.
Probe was driven 6 inches beyond bottom of borehole.

*** FINAL CALCULATED PERMEABILITY = 9.1 x 10-10 (cm/s) ***

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#ID BAT (2) p1 of 1

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: RFP Buffer Zone DATE: 1-30-93 TIME: 14:45
PIEZOMETER ID: 40393 NAME: E. Lawrence, B. Newlin VERIFIED EPPL

DEPTH (m): 3.76 TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm):

EXT CYL VOLUME (ml): 0.5 PORE PRESSURE (m): ~1.77 DRIFT=0.02
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): 33.9, 31.3, 29.50*
TOTAL SYS VOL (ml): 35.5 80% PRESS CHANGE (m):
INIT GAS VOLUME (ml): 15.6 MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H_2O)	ELAPSED TIME (secs)	PRESSURE (m H_2O)
1 0,0,30	32.81	16	
2 0,1,0	32.81	17	
3 STOP TEST RESET BAT IN PROBE TIP		18	
4 INITIAL 31.30		19	
5 0,1,0	31.19	20	
6 0,2,0	31.20	21	
7 0,3,0	31.26	22	
8 STOP TEST PULL INSTRUMENT		23	
9 CK FOR PLUGGED NEEDLES ETC		24	
10 RESTART WITH INITIAL PRESS = 29.50		25	
11 0,1,0	29.14	26	
12 0,2,0	29.14	27	
13 0,8,0	29.14	28	
14 0,19,0	29.15	29	
15 END TEST		30	

TEST ABORTED

FASTEN
CALCULATION
PRINTOUTS
HERE

ACTUAL VOL CHANGE (ml): —
CALCULATED VOL CHANGE (ml): —

PERMEABILITY (m/s): — x 10⁻ —

* TEST RESTARTED SEVERAL TIMES BECAUSE OF SUSPICION OF TOOL MALFUNCTION

COMMENTS: UNABLE TO OBTAIN OUTFLOW FROM BAT SYSTEM
PERMEABILITY OF TESTED MEDIA MAY BE TOO LOW TO MEASURE WITH THE BAT SYSTEM - TEST ABORTED

TEST WAS ATTEMPTED IN BEDROCK CLAYS - PROBE DRIVEN 6" BEYOND BOREHOLE TD

BAT®

Buck 2

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: RFP - Surface Zone DATE: 1-26-93 TIME:
PIEZOMETER ID: Bucket NAME: E. Lawrence

DEPTH (m): Ground Surface TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm):

EXT CYL VOLUME (ml): 63 PORE PRESSURE (m): 0
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): 24.80
TOTAL SYS VOL (ml): 98 80% PRESS CHANGE (m):
INIT GAS VOLUME (ml): 78 MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H2O)	ELAPSED TIME (secs)	PRESSURE (m H2O)
1 0,1,0	24.52	16	
2 0,1,30	21.95	17	
3 0,2,0	20.12	18	
4 0,2,30	18.31	19	
5 0,3,0	8.09	20	
6 0,3,30	2.08	21	
7 0,4,0	1.01	22	
8		23	
9		24	
10		25	
11		26	
12		27	
13		28	
14		29	
15		30	

2 obs below

NOTE

K suddenly speeds up after 0,2,30; perhaps filter was not fully saturated until 0,2,30

verified by BKN

FASTEN

CALCULATION

PRINTOUTS

HERE form #BGMS (1)

QA # FQT-JKH-032293-1
page 63 of 113116

① for pts. 3,4,5
② for pts 4,5 - MOST RELIABLE #
③ for pts 5,6, below the p80

ACTUAL VOL CHANGE (ml):
CALCULATED VOL CHANGE (ml): 70.8

PERMEABILITY (cm/s): 9.8×10^{-6} ①
5.6×10^{-6} ② ~~8.9 x 10^-5~~ ③ → 2.1×10^{-4}

COMMENTS:

TEST WAS RUN TO DETERMINE CONDUCTIVITY OF THE CERAMIC FILTER i.e. the upper limit for which the system is suitable for testing

The first reading was taken with only partial penetration of the septum. The situation was corrected by the time the second reading was collected (0,1,30)

BAT®

RUST ENVIRONMENT & INFRASTRUCTURE

QA Record No: FCT-JLN-C31241 Page 116 of 143

QA Checked By: FKH BIV Date 3/12/93

RFP

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: 40593 DATE: 1/26/93 TIME: 11:10
PIEZOMETER ID: 40593 NAME: JKromer

DEPTH (m): 3.81 TEST TYPE (IN/OUT): out
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm): 228.77

EXT CYL VOLUME (ml): 1.3 PORE PRESSURE (m): 0.40 or 0.18
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): 22.26
TOTAL SYS VOL (ml): 98 80% PRESS CHANGE (m):
INIT GAS VOLUME (ml): 78 MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H2O)	ELAPSED TIME (secs)	PRESSURE (m H2O)
1 0, 30	22.26	16	
2 0,0,30	17.91	17	
3 0,0,0	17.87	18	
4 0,2,0	17.79	19	
5 0,3,0	17.73	20	
6 0,4,0	17.67	21	
7 0,5,0	17.63	22	
8 1,6,0	17.15	23	
9 1,12,0	17.13	24	
10 1,18,0	17.10	25	
11		26	
12		27	
13		28	
14		29	
15		30	

verified by: BKN

Pore pressure tests

min:	
0	.25
2	.30
4	.32
6	.34
8	.36
10	.38
12	.38
14	.40
16	.40

FASTEN CALCULATION PRINTOUTS HERE

Note on pore pressure readings:
Pore pressure is greater than atmospheric, due to displacement of water when probe pushes into soils. We noted ~~unusual~~ unstable changes in pore pressure.

ACTUAL VOL CHANGE (ml): 1.0 ml
CALCULATED VOL CHANGE (ml): 14.7

Form # BGMS (1)

PERMEABILITY (m/s): 1.1 × 10^{-8} cm/sec at pore press of 0.40
1.1 × 10^{-6} cm/sec at pore press of 0.18

COMMENTS:

Rerun pore pressure test after permeability test. Pore pressure was +0.18 – (constant)

Lithology was clay (slumped bedrock material)

Thus equil prior to probe penetrating downhole system

0 –	22.12
2 –	22.18
4 –	22.21
6 –	22.23
8 –	22.25
10 –	22.26

```
****    ***   *****
*   *  *   *    *
****   *****    *
*   *  *   *    *
****   *   *    * R
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IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 40593.1
FILTER DEPTH (m or ft) : 3.81

DATE: 1993-01-26 TIME: 11:10
NAME: jk

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): 63.0
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 78.0

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : .40
INITIAL TEST PRESS (m) : 22.26
80% RECOVERY PRESS (m) : 4.77
MIN FINAL PRESSURE (m) : 15.61

verified by BKN

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s	NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	22.26		1	00:00:30	17.91	1.0x10 -7
2	00:01:00	17.87	9.6x10 -8	3	00:02:00	17.79	8.8x10 -8
4	00:03:00	17.73	7.3x10 -8	5	00:04:00	17.67	1.2x10 -8
6	00:05:00	17.63	1.1x10 -8	7	01:06:00	17.15	1.1x10 -8
8	01:12:00	17.13	1.1x10 -8	9	01:18:00	17.10	

NUMBER OF DATA POINTS : 9
CALC VOLUME CHANGE (ml): 14.7
L VOL CHANGE (ml): 1.0

QA # FQT-JKH-032293-1
page 62 of 113 116

COMMENTS:
Lithology was clay (slumped bedrock material)
Pore pressure was not stable and was positive

Form HGGWS (1)

*** FINAL CALCULATED PERMEABILITY = 1.1 x 10 -8 (cm/s) ***

BAT

BGMS (2)

DATA FILE 4062

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: ROCKY FLATS PLANT DATE: 1-27-93 TIME: 8:45
PIEZOMETER ID: 4059B NAME: E. LAWRENCE

DEPTH (m): 5.72 TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm): 228.77

EXT CYL VOLUME (ml): 63 PORE PRESSURE (m): 0.58
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): 26.46
TOTAL SYS VOL (ml): 83 80% PRESS CHANGE (m): 5.76
INIT GAS VOLUME (ml): 78 MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H2O)	ELAPSED TIME (secs)	PRESSURE (m H2O)
1 0,1,0	26.36	16	
2 0,2,0	26.31	17	
3 0,3,0	26.29	18	
4 0,4,0	26.27	19	
5 0,5,0	26.25	20	
0,6,0	26.23	21	
7 0,7,0	26.23	22	
8 0,8,0	26.22	23	
9 0,9,0	26.21	24	
10 0,10,0	26.20	25	
11 0,15,0	26.19	26	
12 0,20,0	26.19	27	
13 END OF TEST		28	
14		29	
15		30	

PORE PRESS MS MTC.
~~TIME (MIN) PRESS~~

0.58 PRIOR TO TEST

0.58 AFTER TEST

verified by: BKN

FASTEN
CALCULATION
PRINTOUTS
HERE

RUST ENVIRONMENT & INFRASTRUCTURE 116
QA Record No: RFI-Jr-0529 Page 62 of 113
QA Checked By: [illegible] Date 3/22/93

Form # BGMS(2)

TIME	PRESS
	26.33
2,30	26.30
4,00	26.29
6.00	26.28
8.00	26.27

PULLED OUT OF HOLE
CHECKED NEEDLE WENT BACK IN ~~PORE~~ PRESS. STABILIZED AT 26.46 PRIOR TO TEST

ACTUAL VOL CHANGE (ml): 2ml
CALCULATED VOL CHANGE (ml): 0.6

PERMEABILITY (m/s): 9.8 x 10^{-10} cm/s

COMMENTS:

Location is in buffer zone

TEST WAS RUN IN ORGANIC RICH, CLAYEY SOIL IMMEDIATELY BENEATH SLUMPED BEDROCK MATERIAL

```
****    ***   *****
*   *  *   *    *
****   *****    *
*   *  *   *    *
****   *   *    * R
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IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 40593.2
FILTER DEPTH (m or ft) : 5.72

DATE: 1993-01-27 TIME: 08:45
NAME: epl

FILTER: LENGTH (mm):	40.0	TEST TYPE: VAR HEAD, OUTFLOW	
DIAMETER (mm):	30.0	CALIBRATION SLOPE :	1.00
FLOW FACTOR (mm):	228.77	INTERCEPT :	.00
TEST CONTAINER VOL (ml):	35.0	LIQUID START LEVEL (m) :	.310
EXT CYLINDER VOL (ml):	63.0	STATIC PORE PRESS (m) :	.58
INITIAL LIQUID VOL (ml):	20.0	INITIAL TEST PRESS (m) :	26.46
CONTAINER X-AREA (cm2):	1.96	80% RECOVERY PRESS (m) :	5.76
INITIAL GAS VOL (ml):	78.0	MIN FINAL PRESSURE (m) :	18.95

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s	NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	26.46		1	00:01:00	26.36	3.0x10 -8
2	00:02:00	26.31	1.7x10 -8	3	00:03:00	26.29	1.2x10 -8
4	00:04:00	26.27	1.2x10 -8	5	00:05:00	26.25	8.4x10 -9
6	00:06:00	26.23	5.4x10 -9	7	00:07:00	26.23	4.2x10 -9
8	00:08:00	26.22	6.0x10 -9	9	00:09:00	26.21	2.3x10 -9
10	00:10:00	26.20	9.8x10-10	11	00:15:00	26.19	9.8x10-10
12	00:20:00	26.19					

BKN

OF DATA POINTS : 12
CALC VOLUME CHANGE (ml): .6
ACTUAL VOL CHANGE (ml): 2.0

COMMENTS:
Test was run in organic rich clay immediately beneath slumped bedrock mtl.

Form # BGWS (2)

*** FINAL CALCULATED PERMEABILITY = 9.8 x 10-10 (cm/s) ***

QA # FQT-JKH-032293-1
page 65 of ~~113~~ 116

BAT

DATA FILE 4053

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: RFP - Buffer zone DATE: 1-27-93 TIME: ~~10:55~~ 13:00
PIEZOMETER ID: 40593 NAME: E. Lawrence

DEPTH (m): 8.18 TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm): 228.77

EXT CYL VOLUME (ml): 0.5 PORE PRESSURE (m): 5.23
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): 33.69
TOTAL SYS VOL (ml): 35.5 80% PRESS CHANGE (m): 10.92
INIT GAS VOLUME (ml): 15.5 MAX PRESS CHANGE (m):

	ELAPSED TIME (secs)	PRESSURE (m H2O)		ELAPSED TIME (secs)	PRESSURE (m H2O)
1	0,1,0	33.46	16		
2	0,2,0	33.34	17		
3	0,3,0	33.23	18		
4	0,4,0	33.13	19		
5	0,5,0	33.06	20		
	0,6,0	32.98	21		
7	0,7,0	32.91	22		
8	0,8,0	32.84	23		
9	0,9,0	32.78	24		
10	0,10,0	32.72	25		
11	0,15,0	32.49	26		
12	0,20,0	32.29	27		
13	0,25,0	32.12	28		
14	0,30,0	31.98	29		
15	end of test.		30		

PORE PRESS
5.23 after 1 hour of equilibration time

verified by: BKN

FASTEN
CALCULATION
PRINTOUTS
HERE

Form # BGMS (3)
0.

RUST ENVIRONMENT & INFRASTRUCTURE
QA Record No: FGI-SCO-032743-1 Page 66 of 116
QA Checked By: BN Date 3/22/93

ACTUAL VOL CHANGE (ml): 2.0
CALCULATED VOL CHANGE (ml): 0.6

PERMEABILITY (cm/s): 3.5 x 10^{-9} cm/s

COMMENTS:

TEST was in bedrock - (clay) material
NOTE - CHANGED OVER TO SMALL VOLUME RESERVOIR FOR EXTENSION CYLINDER BECAUSE OF ANTICIPATED LOW HYDRAULIC CONDUCTIVITIES.

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****    ***   *****
*   *  *   *    *
****   *****    *
*   *  *   *    *
****   *   *    * R
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IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 40593.bd
FILTER DEPTH (m or ft) : 8.18

DATE: 1993-01-27 TIME: 13:00
NAME: epl

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): .5
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 15.5

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : 5.23
INITIAL TEST PRESS (m) : 33.69
80% RECOVERY PRESS (m) : 10.92
MIN FINAL PRESSURE (m) : 8.89

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	33.69	
2	00:02:00	33.34	1.0x10 -8
4	00:04:00	33.13	7.7x10 -9
6	00:06:00	32.98	6.9x10 -9
8	00:08:00	32.84	6.0x10 -9
10	00:10:00	32.72	4.3x10 -9
12	00:20:00	32.29	3.4x10 -9
[illegible]	[illegible]:30:00	31.98	

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
1	00:01:00	33.46	1.1x10 -8
3	00:03:00	33.23	8.7x10 -9
5	00:05:00	33.06	7.0x10 -9
7	00:07:00	32.91	6.4x10 -9
9	00:09:00	32.78	4.7x10 -9
11	00:15:00	32.49	4.0x10 -9
13	00:25:00	32.12	3.5x10 -9

NUMBER OF DATA POINTS : 14
CALC VOLUME CHANGE (ml): .6
ACTUAL VOL CHANGE (ml): 2.0

COMMENTS:
Test was run in bedrock clay
Test conducted using the small extension cylinder (0.5 cm3)

BKN

Form # BGMS (3)

QA # FQT-JKH-032293-1

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*** FINAL CALCULATED PERMEABILITY = 3.5 x 10 -9 (cm/s) ***

BAT

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

FILE NO. 40693.BD

SITE: RFP
PIEZOMETER ID: 40693
DATE: 2-26-93 TIME: 11:40
NAME: B. Newlin BN

DEPTH (m): 1.07
FILTER LENGTH (mm): 40
TEST TYPE (IN/OUT): OUT
DIAM (mm): 30 FACTOR (mm): 228.7

EXT CYL VOLUME (ml): 0.5
INIT LIQUID VOL (ml): 20
TOTAL SYS VOL (ml): 35.5
INIT GAS VOLUME (ml): 15.5
PORE PRESSURE (m): 1.75
INITIAL PRESSURE (m): 30.93
80% PRESS CHANGE (m):
MAX PRESS CHANGE (m):

	ELAPSED TIME (secs)	PRESSURE (m H2O)		ELAPSED TIME (secs)	PRESSURE (m H2O)
1	0,0,30	29.54	16		
2	0,1,0	27.34	17		
3	0,1,30	25.24	18		
4	0,2,0	23.89	19		
5	0,3,0	22.59	20	.59	
6	0,4,0	22.00	21		
7	0,5,0	21.65	22	.56	
8	0,10,0	21.09	23		.11
9	0,15,0	20.98	24	.04	
10	0,20,0	20.92	25		.07
11	0,30,0	20.85	26	.07	
12	0,40,0	20.78	27		
13	END OF TEST		28		
14	12:20		29		
15			30		

PORE PRESSURE
1.72
1.73 (4m)

Stickup ~~[illegible]~~ BN 2-26
1.43 m

2.50
1.43
1.07

FASTEN
CALCULATION
PRINTOUTS
HERE

CHECKED BY: E. Lawrence

Form BGMS
QA

ACTUAL VOL CHANGE (ml): 12
CALCULATED VOL CHANGE (ml):

PERMEABILITY (~~m/s~~): 1.9 x 10^{-9} cm/sec

COMMENTS: TEST IN BEDROCK MATERIAL (CLAYS)

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****    ***   *****
*   *  *   *    *
****   *****    *
*   *  *   *    *
****   *   *    * R
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IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 40693.bd
FILTER DEPTH (m or ft) : 1.07

DATE: 1993-02-26 TIME: 11:40
NAME: bkn

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): .5
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 15.5

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : 1.75
INITIAL TEST PRESS (m) : 30.93
80% RECOVERY PRESS (m) : 7.59
MIN FINAL PRESSURE (m) : 7.68

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	30.93	
2	00:01:00	27.24	5.3x10 -7
4	00:02:00	23.89	2.4x10 -7
6	00:04:00	22.00	4.1x10 -8
8	00:10:00	21.09	1.1x10 -8
10	00:20:00	20.92	1.9x10 -9
12	00:40:00	20.78	

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
1	00:00:30	29.54	5.3x10 -7
3	00:01:30	25.24	3.7x10 -7
5	00:03:00	22.59	1.5x10 -7
7	00:05:00	21.65	2.0x10 -8
9	00:15:00	20.98	2.8x10 -9
11	00:30:00	20.85	1.9x10 -9

NUMBER OF DATA POINTS : 12
CALC VOLUME CHANGE (ml): 5.1
ACTUAL VOL CHANGE (ml): 12.0

COMMENTS:
Test was conducted in bedrock clay

*** FINAL CALCULATED PERMEABILITY = 1.9 x 10 -9 (cm/s) ***

BAT®

FILE NO - 40793.1

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: 40793 RFP DATE: 3-1-93 TIME: 11:30
PIEZOMETER ID: 40793 NAME: E. Lawrence

DEPTH (m): 1.07 m TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm): 228.7

EXT CYL VOLUME (ml): 0.5 PORE PRESSURE (m): -5.12
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): 38.90
TOTAL SYS VOL (ml): 35.5 80% PRESS CHANGE (m):
INIT GAS VOLUME (ml): 15.0 MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H2O)	ELAPSED TIME (secs)	PRESSURE (m H2O)
1 0,0,30	33.48	16 0,16,0	22.69
2 0,1,0	31.94	17 0,18,0	22.25
3 0,1,30	30.93	18 0,20,0	21.86
4 0,2,0	30.12	19 0,25,0	21.05
5 ~~0,3,0~~ 0,2,30	29.45	20 0,30,0	20.30
6 0,3,0	28.94	21 0,35,0	19.68
7 0,4,0	27.85	22 END OF TEST	
8 0,5,0	27.05	23	
9 0,6,0	26.36	24	
10 0,7,0	25.70	25	
11 0,8,0	25.29	26	
12 0,9,0	24.86	27	
13 0,10,0	24.48	28	
14 0,12,0	23.80	29	
15 0,14,0	23.21	30	

DEPTH 2.50
−1.43
1.07m

PORE PRESS
TIME
0,13,00 - 4.91
0,16,00 - 4.98
0,20,00 - 5.07
0,22,00 - 5.11
0,24,00 - 5.11
0,26,00 - 5.12
DRIFT = +0.03

FASTEN

CALCULATION

PRINTOUTS

HERE

Time	Equilibrium
0,0,00	39.51
0,4,00	39.32
0,5,00	39.24
0,7,00	39.16
0,9,00	39.09
0,12,00	39.01
0,14,00	38.99
0,16,00	38.95
0,19,00	38.92
0,20,00	38.91
0,22,00	38.90
0,24,00	38.89

Checked by E. Lawrence

ACTUAL VOL CHANGE (ml): 12.0
CALCULATED VOL CHANGE (ml):

PERMEABILITY ~~(m/s):~~ 3.5×10^{-8} cm/s

COMMENTS: LOCATION IS ON NORTH DIPPING CLIFF (N. OF A POND)
GRASS COVERED. BAT TEST IS IN WEATHERED ~~BEDROCK~~ CLAYEY MATERIAL
ORGANIC RICH - SOME CALCITE VEINS

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****    ***   *****
*   *  *   *    *
****   *****    *
*   *  *   *    *
****   *   *    * R
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IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 40793.1
FILTER DEPTH (m or ft) : 1.07

DATE: 1993-03-01 TIME: 11:30
NAME: epl

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): .5
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 15.5

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : -5.12
INITIAL TEST PRESS (m) : 38.90
80% RECOVERY PRESS (m) : 3.68
MIN FINAL PRESSURE (m) : 11.16

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	38.90	
2	00:01:00	31.94	1.9x10 -7
4	00:02:00	30.12	1.4x10 -7
6	00:03:00	28.84	1.1x10 -7
8	00:05:00	27.05	9.0x10 -8
10	00:07:00	25.70	6.9x10 -8
12	00:09:00	24.86	5.6x10 -8
14	00:12:00	23.80	5.0x10 -8
[illegible]	00:16:00	22.69	4.2x10 -8
	00:20:00	21.86	3.3x10 -8
	00:30:00	20.30	3.5x10 -8

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
1	00:00:30	33.48	2.4x10 -7
3	00:01:30	30.93	1.5x10 -7
5	00:02:30	29.45	1.2x10 -7
7	00:04:00	27.85	9.8x10 -8
9	00:06:00	26.36	7.9x10 -8
11	00:08:00	25.29	6.0x10 -8
13	00:10:00	24.48	5.2x10 -8
15	00:14:00	23.21	4.6x10 -8
17	00:18:00	22.25	3.5x10 -8
19	00:25:00	21.05	3.2x10 -8
21	00:35:00	19.68	

NUMBER OF DATA POINTS : 21
CALC VOLUME CHANGE (ml): 9.9
ACTUAL VOL CHANGE (ml): 12.0

COMMENTS:
Test is in organic rich clay material (weathered appearance)
Test location is on steeply dipping slope (to the north)

*** FINAL CALCULATED PERMEABILITY = 3.5 x 10 -8 (cm/s) ***

```
****    ***   *****
*   *  *   *    *
****   *****    *
*   *  *   *    *
****   *   *    * R
```

IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 40793.bd
FILTER DEPTH (m or ft) : 4.12

DATE: 1993-03-02 TIME: 11:20
NAME: epl

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): .5
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 15.5

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : -3.29
INITIAL TEST PRESS (m) : 39.24
80% RECOVERY PRESS (m) : 5.22
MIN FINAL PRESSURE (m) : 11.31

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	39.24	
2	00:01:00	38.58	5.4x10 -9
4	00:02:00	38.49	3.7x10 -9
6	00:04:00	38.37	3.0x10 -9
8	00:06:00	38.27	2.5x10 -9
10	00:08:00	38.19	1.9x10 -9
12	00:10:00	38.12	1.7x10 -9
14	00:20:00	37.83	1.4x10 -9
16	00:35:00	37.49	

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
1	00:00:30	38.64	6.6x10 -9
3	00:01:30	38.54	4.2x10 -9
5	00:03:00	38.43	3.2x10 -9
7	00:05:00	38.32	2.8x10 -9
9	00:07:00	38.22	2.2x10 -9
11	00:09:00	38.15	1.7x10 -9
13	00:15:00	37.98	1.5x10 -9
15	00:28:00	37.65	1.4x10 -9

IBER OF DATA POINTS : 16
CALC VOLUME CHANGE (ml): .6
ACTUAL VOL CHANGE (ml): 3.0

COMMENTS:
Test conducted in bedrock claystone

*** FINAL CALCULATED PERMEABILITY = 1.4 x 10 -9 (cm/s) ***

BAT®

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: RFP - RCA
PIEZOMETER ID: 40993
DATE: 3-3-92
NAME: E. Lawrence
TIME: 12:00

DEPTH (m): 3.61
FILTER LENGTH (mm): 40
TEST TYPE (IN/OUT): OUT
DIAM (mm): 30
FACTOR (mm): 228.7

EXT CYL VOLUME (ml): 63
INIT LIQUID VOL (ml): 35
TOTAL SYS VOL (ml): 98
INIT GAS VOLUME (ml): 63
PORE PRESSURE (m): -1.08
INITIAL PRESSURE (m): 28.61
80% PRESS CHANGE (m):
MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H2O)	ELAPSED TIME (secs)	PRESSURE (m H2O)
1 0,0,30	27.36	16 0,25,0	21.81
2 0,1,0	27.17	17 0,30,0	21.15
3 0,1,30	26.97	18 0,35,0	20.55
4 0,2,0	26.77	19	
5 0,2,30	26.60	20	
6 0,3,0	26.45	21	
7 0,4,0	26.13	22	
8 0,5,0	25.82	23	
9 0,6,0	25.54	24	
10 0,7,0	25.25	25	
11 0,8,0	25.00	26	
12 0,9,0	24.73	27	
13 0,10,0	24.52	28	
14 0,15,0	23.48	29	
15 0,20,0	22.60	30	

DEPTH 2.50
1.91
3.61 m

PORE PRESSURE AFTER 20 MINUTE TIME	PRESS
0,0,0	-0.01
0,2,0	-0.08
0,4,0	-0.15
0,6,0	-0.22
0,8,0	-0.30
0,10,0	-0.36
0,12,0	-0.46
0,14,0	-0.53
0,18,0	-0.65
0,20,0	-0.70
0,22,0	-0.76
0,28,0	-0.90
0,30,0	-0.94
0,32,0	-0.98
0,34,0	-1.05
0,38,0	-1.08
0,40,0	-1.10

FASTEN CALCULATION PRINTOUTS HERE

TEMP EQUILIBRATION TIME	PRESS
0,0,0	28.71
0,2,0	28.65
0,5,0	28.63
0,7,0	28.62
0,9,0	28.61
0,11,0	28.60

Checked by E. Lawr

ACTUAL VOL CHANGE (ml): 34.5
CALCULATED VOL CHANGE (ml):

PERMEABILITY (m/s): 1.1 x 10^{-7} cm/sec

COMMENTS:

PORE PRESS. WOULD NOT STABILIZE AFTER 1 HOUR - RAN TEST

LITHOLOGY - BEDROCK - PER RIG GEOLOGIST'S CALL - WHITE SAND FINE TO MED GRAIN MOIST - NOT SATURATED

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IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 40993.bd
FILTER DEPTH (m or ft) : 3.61

DATE: 1993-03-03 TIME: 12:00
NAME: epl

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): 63.0
INITIAL LIQUID VOL (ml): 35.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 63.0

LIQUID START LEVEL (m) : .400
STATIC PORE PRESS (m) : -1.08
INITIAL TEST PRESS (m) : 28.61
80% RECOVERY PRESS (m) : 4.86
MIN FINAL PRESSURE (m) : 14.70

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	28.61	
2	00:01:00	27.17	1.8x10 -7
4	00:02:00	26.77	1.6x10 -7
6	00:03:00	26.45	1.5x10 -7
8	00:05:00	25.82	1.5x10 -7
10	00:07:00	25.25	1.4x10 -7
12	00:09:00	24.73	1.2x10 -7
14	00:15:00	23.48	1.2x10 -7
16	00:25:00	21.81	1.1x10 -7
	00:35:00	20.55	

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
1	00:00:30	27.36	1.7x10 -7
3	00:01:30	26.97	1.7x10 -7
5	00:02:30	26.60	1.5x10 -7
7	00:04:00	26.13	1.5x10 -7
9	00:06:00	25.54	1.4x10 -7
11	00:08:00	25.00	1.3x10 -7
13	00:10:00	24.52	1.2x10 -7
15	00:20:00	22.60	1.1x10 -7
17	00:30:00	21.15	1.1x10 -7

NUMBER OF DATA POINTS : 18
CALC VOLUME CHANGE (ml): 16.4
ACTUAL VOL CHANGE (ml): 19.5

COMMENTS:
Test conducted in bedrock-per rig geologist's call
Lithology is white sand, fine to medium grained, loose, non cemented, moist

*** FINAL CALCULATED PERMEABILITY = 1.1 x 10 -7 (cm/s) ***

BAT®

FILE NO 41293.BD

BAT GROUNDWATER MONITORING SYSTEM #BGMS1
Insitu Permeability Test Protocol

SITE: RFP DATE: 2-23-93 TIME: 13:40
PIEZOMETER ID: 41293 NAME: B. Neidlin

DEPTH (m): 1.7 m TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): DIAM (mm): FACTOR (mm):

EXT CYL VOLUME (ml): 0.5 PORE PRESSURE (m): 0.86
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): 32.24
TOTAL SYS VOL (ml): 35.5 80% PRESS CHANGE (m):
INIT GAS VOLUME (ml): 15.5 MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H2O)	ELAPSED TIME (secs)	PRESSURE (m H2O)
1 0,0,0	32.24	16	
2 0,0,30	31.85	17	
3 0,1,0	31.80	18	
4 0,1,30	31.78	19	
5 0,2,0	31.74	20	
6 0,3,0	31.71	21	
7 0,4,0	31.66	22	
8 0,5,0	31.62	23	
9 0,10,0	31.50	24	
10 0,15,0	31.43	25	
11 0,20,0	31.33	26	
12 0,30,0	31.15	27	
13 0,40,0	31.04	28	
14 END OF TEST		29	14:35
15		30	

PORE PRESSURE

0.46
0.47
0.49
0.86 10m

32.38
32.24 10m

FASTEN

CALCULATION

PRINTOUTS

HERE

Checked by E. Lawrence

RUST ENVIRONMENT & INFRASTRUCTURE

QA Record No: FQT-JKH-03/93/31 Page 35 of 53

QA Checked By: JKH Date 3/17/93

ACTUAL VOL CHANGE (ml): 18 ML
CALCULATED VOL CHANGE (ml):

PERMEABILITY ~~(cm/sec)~~: 1.4 $\times 10^{-9}$ cm/sec

COMMENTS: Bedrock clays, soft, sli-plastic, sli-moist

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****   *****    *
*   *  *   *    *
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INS PT(1)

IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 41293.bd
FILTER DEPTH (m or ft) : 1.7

DATE: 1993-02-23 TIME: 13:40
NAME: bkn

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): .5
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 15.5

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : .86
INITIAL TEST PRESS (m) : 32.24
80% RECOVERY PRESS (m) : 7.14
MIN FINAL PRESSURE (m) : 8.26

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	32.24	
2	00:01:00	31.80	6.1x10 -9
4	00:02:00	31.74	3.9x10 -9
6	00:04:00	31.66	2.5x10 -9
8	00:10:00	31.50	1.7x10 -9
10	00:20:00	31.33	1.4x10 -9
12	00:40:00	31.04	

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
1	00:00:30	31.85	8.6x10 -9
3	00:01:30	31.78	4.0x10 -9
5	00:03:00	31.71	3.6x10 -9
7	00:05:00	31.62	1.8x10 -9
9	00:15:00	31.43	1.6x10 -9
11	00:30:00	31.15	1.4x10 -9

UMBER OF DATA POINTS : 12
LC VOLUME CHANGE (ml): .4
CTUAL VOL CHANGE (ml): 18.0

COMMENTS:
test conducted in bedrock clays, solft, slight plasticity, slightly moist

*** FINAL CALCULATED PERMEABILITY = 1.4 x 10 -9 (cm/s) ***

RUST ENVIRONMENT & INFRASTRUCTURE
QA Record No: FPT-JKK-031993-1 Page 36 of 53
QA Checked By: [signature] Date 3/19/93

BAT®

43693.BD

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: RFP DATE: 3/25/93 TIME: 12:40
PIEZOMETER ID: 43693 NAME: B. NEWLIN

DEPTH (m): 4.04 TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm):

EXT CYL VOLUME (ml): 0.5 PORE PRESSURE (m): -1.12
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): 29.02
TOTAL S/S VOL (ml): 35.5 80% PRESS CHANGE (m):
INIT GAS VOLUME (ml): 15.5 MAX PRESS CHANGE (m):

	ELAPSED TIME (secs)	PRESSURE (m H_2O)	ELAPSED TIME (secs)	PRESSURE (m H_2O)
	1 0,0,30	27.80	16	
	2 0,1,0	27.70	17	
	3 0,1,30	27.63	18	
	4 0,2,0	27.56	19	
	5 0,2,30	27.52	20	
	0,3,0	27.47	21	
	7 0,5,0	27.26	22	
24	8 0,7,0	27.14	23	
	9 0,12,0	26.90	24	
18	10 0,17,0	26.72	25	
15	11 0,22,0	26.57	26	
.22	12 0,32,0	26.35	27	
).17	13 0,42,0	26.18	28	
).15	14 0,52,0	26.03	29	
).13	15 1,02,0	25.90	30	

FASTEN
CALCULATION
PRINTOUTS
HERE

ACTUAL VOL CHANGE (ml): 14 ml left
CALCULATED VOL CHANGE (ml):

PERMEABILITY ~~(m/s)~~ Cm/s: 1.8×10^{-9}

COMMENTS: TEST RUN IN BEDROCK (& CLAY)

BAT

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

FILE NO. 40793.BD

SITE: RFP
PIEZOMETER ID: 40793
DATE: 3-2-93
TIME: 11.20
NAME: E. Lawrence

DEPTH (m): 4.12m
FILTER LENGTH (mm): 40
TEST TYPE (IN/OUT): OUT
DIAM (mm): 30
FACTOR (mm): 229.7

EXT CYL VOLUME (ml): 0.5
INIT LIQUID VOL (ml): 20
TOTAL SYS VOL (ml): 35.5
INIT GAS VOLUME (ml): 15.5
PORE PRESSURE (m): -3.29
INITIAL PRESSURE (m): 39.24
80% PRESS CHANGE (m):
MAX PRESS CHANGE (m):

	ELAPSED TIME (secs)	PRESSURE (m H2O)		ELAPSED TIME (secs)	PRESSURE (m H2O)
1	0,0,30	38.64	16	0,35,0 ~~0,35,0~~	37.49
2	0,1,0	38.58	17	END OF TEST	
3	0,1,30	38.54	18		
4	0,2,0	38.49	19		
5	0,3,0	38.43	20		
6	0,4,0	38.37	21		
7	0,5,0	38.32	22		
8	0,6,0	38.27	23		
9	0,7,0	38.22	24		
10	0,8,0	38.19	25		
11	0,9,0	38.15	26		
12	0,10,0	38.12	27		
13	0,15,0	37.98	28		
14	0,20,0	37.83	29		
15	0,28,0	37.65	30		

5.50
1.38
4.12

PORE PRESS BEGAN MONITORING AFTER 20 MINUTES

TIME	PRESS
0,0,0	-3.00
0,1,0	-3.03
0,2,0	-3.06
0,3,0	-3.10
0,4,0	-3.13
0,5,0	-3.16
0,6,0	-3.19
0,9,0	-3.26
0,11,0	-3.29
0,12,0	-3.32
0,14,0	-3.35
0,16,0	-3.38
0,18,0	-3.41

FASTEN CALCULATION PRINTOUTS HERE

TEMP EQUILIB

TIME	PRESS
0,0,0	39.43
0,2,0	39.36
0,4,0	39.33
0,6,0	39.30
0,8,0	39.25
0,10,0	39.27
0,12,0	39.26

DRIFT IS +0.12

ACTUAL VOL CHANGE (ml): 3.ml
CALCULATED VOL CHANGE (ml):

Checked by E. Lawrence

PERMEABILITY ~~(m/s)~~: 1.04 x 10^{-9} cm/sec

COMMENTS: LITHOLOGY - BEDROCK - CLAYSTONE

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*   *  *   *    *
****   *****    *
*   *  *   *    *
****   *   *    * R
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IN SITU PERMEABILITY TEST

SITE : RFP
TST ID: 43693.bd
FILTER DEPTH (m or ft) : 4.04´

DATE: 1993-03-25 TIME: 12:40
NAME: bn

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): .5
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 15.5

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : -1.12
INITIAL TEST PRESS (m) : 29.02
80% RECOVERY PRESS (m) : 4.91
MIN FINAL PRESSURE (m) : 6.85

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s	NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	29.02		1	00:00:30	27.80	2.1x10 -8
2	00:01:00	27.70	1.7x10 -8	3	00:01:30	27.63	1.3x10 -8
4	00:02:00	27.56	1.1x10 -8	5	00:02:30	27.52	1.1x10 -8
6	00:03:00	27.47	9.3x10 -9	7	00:05:00	27.26	6.7x10 -9
8	00:07:00	27.14	5.0x10 -9	9	00:12:00	26.90	4.3x10 -9
10	00:17:00	26.72	3.1x10 -9	11	00:22:00	26.57	2.5x10 -9
12	00:32:00	26.35	2.1x10 -9	13	00:42:00	26.18	1.8x10 -9
14	00:52:00	26.03	1.8x10 -9	15	01:02:00	25.90	

.. . OF DATA POINTS : 15
CALC VOLUME CHANGE (ml): 1.3
ACTUAL VOL CHANGE (ml): 6.0

COMMENTS:
BAT test run in bedrock material

*** FINAL CALCULATED PERMEABILITY = 1.8 x 10 -9 (cm/s) ***

BAT®

Form BGMS

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: RFP - P17 DATE: 2-10-93 TIME: 13 00
PIEZOMETER ID: 44073 NAME: J Newlin

DEPTH (m): ~~6.10~~ 5.19 BN 2-10-93 TEST TYPE (IN/OUT): OUT
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm): 228.8

EXT CYL VOLUME (ml): 0.5 PORE PRESSURE (m): -1.35 DRIFT = 0.0
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): ~~30.01~~ — 30.18 BN 2-10-93
TOTAL SYS VOL (ml): 35.5 80% PRESS CHANGE (m): 4.96
INIT GAS VOLUME (ml): 15.5 MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H2O)	ELAPSED TIME (secs)	PRESSURE (m H2O)
1 0,0,30	30.42	16 0,37,0	29.97
2 0,1,0	30.40	17 0,47,0	29.89
3 0,1,30	30.40	18 0,57,0	29.85
4 0,2,0	30.40	19 END OF TEST	
5 0,3,0	30.40	20	
6 0,4,0	30.40	21	
7 0,5,0	30.46	22	
8 0,10,0	30.41	23	
9 END OF TEST		24	
10 0,0,0	30.18	25	
11 0,0,30	30.04	26	
12 0,1,0	30.04	27	
13 ~~0,10,0~~ 0,17,0	30.03	28	
14 0,17,0	30.00	29	
15 0,27,0	29.96	30	

PORE PRESS

TIME	PRESS
0	-.71
2	-1.02
4	-1.07
6	-1.18
8	-1.22
10	-1.27
12	-1.35

0.50
1.32
0.16

FASTEN

CALCULATION

PRINTOUTS

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RUST ENVIRONMENT & INFRASTRUCTURE
QA Record No: FQT-JKH-043093-1 Page 34 of 71
QA Checked By: JKH Date 5/5/93

ACTUAL VOL CHANGE (ml): 1.5 FOR 2 TESTS
CALCULATED VOL CHANGE (ml): 0.1

PERMEABILITY ~~(m/s)~~ (cm/s): 3.2×10^{-10} cm/s

COMMENTS:

LITHO - CLAY BEDROCK - PORE PRESSURE WAS STILL UNSTABLE AFTER 50 minutes
unsure if proper seating of needle in septum of probe tip
Restarted test after 10 minutes of no change in pressure

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*  *  *   *    *
****   *   *    * R
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IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 44393.1
FILTER DEPTH (m or ft) : 1.7

DATE: 1993-02-05 TIME: 11:20
NAME: epl, bkn

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): 63.0
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 78.0

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : .38
INITIAL TEST PRESS (m) : 22.37
80% RECOVERY PRESS (m) : 4.78
MIN FINAL PRESSURE (m) : 15.70

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s	NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	22.37		1	00:00:30	17.95	7.5x10 -6
2	00:01:00	15.51	3.3x10 -6	3	00:01:30	15.13	4.5x10 -7
4	00:02:00	15.12	2.3x10 -8	5	00:02:30	15.12	2.1x10 -8
6	00:03:00	15.11	2.2x10 -8	7	00:04:00	15.10	1.9x10 -8
8	00:05:00	15.09	1.9x10 -8	9	00:06:00	15.08	1.9x10 -8
10	00:07:00	15.07	1.4x10 -8	11	00:08:00	15.06	1.2x10 -8
[illegible]	[illegible]:09:00	15.06	8.7x10 -9	13	00:10:00	15.05	8.5x10 -9
[illegible]	[illegible]:15:00	15.03	7.8x10 -9	15	00:20:00	15.01	7.8x10 -9
16	00:25:00	14.99	7.8x10 -9	17	00:30:00	14.97	

NUMBER OF DATA POINTS : 17
CALC VOLUME CHANGE (ml): 22.8
ACTUAL VOL CHANGE (ml): 20.0

COMMENTS:
Vadose Zone Monitoring Borehole 44393
Rocky Flants - BAT Insis
Date Tested: 2-8-93 Testers: B.K.Newlin, E.P.Lawrence
Lithology tested is coarse-med grained sand (fill?) This test is aborted.

*** FINAL CALCULATED PERMEABILITY = 7.8 x 10 -9 (cm/s) ***

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*  *  *  *     *
****   *****    *
*  *  *  *     *
****   *  *     * R
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IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 44393.1a
FILTER DEPTH (m or ft) : 1.7

DATE: 1993-02-08 TIME: 11:20
NAME: epl.bd

FILTER: LENGTH (mm):	40.0	TEST TYPE: VAR HEAD, OUTFLOW	
DIAMETER (mm):	30.0	CALIBRATION SLOPE :	1.00
FLOW FACTOR (mm):	228.77	INTERCEPT :	.00
TEST CONTAINER VOL (ml):	35.0	LIQUID START LEVEL (m) :	.310
EXT CYLINDER VOL (ml):	63.0	STATIC PORE PRESS (m) :	.38
INITIAL LIQUID VOL (ml):	20.0	INITIAL TEST PRESS (m) :	22.37
CONTAINER X-AREA (cm2):	1.96	80% RECOVERY PRESS (m) :	4.78
INITIAL GAS VOL (ml):	78.0	MIN FINAL PRESSURE (m) :	15.70

NO	TIME hh:mm:ss	PRESS m H20	PERMEAB cm/s	NO	TIME hh:mm:ss	PRESS m H20	PERMEAB cm/s
0	00:00:00	22.37		1	00:00:30	17.95	7.5x10 -6
2	00:01:00	15.51	3.3x10 -6	3	00:01:30	15.13	3.1x10 -7
4	00:02:00	15.12	3.1x10 -7	5	00:03:00	15.11	

NUMBER OF DATA POINTS : 5
CALC VOLUME CHANGE (ml): 22.3
A[illegible]AL VOL CHANGE (ml): 20.0

[illegible]ENTS:
Vadose Zone Monitoring Borehole 44393
BAT Insitu Permeability Test - RFP
Date Tested: 2-5-93 Testers: B.K.Newlin, E.P.Lawrence
Lithology Tested: Course to medium grained sand-possibly fill

*** FINAL CALCULATED PERMEABILITY = 3.1 x 10 -7 (cm/s) ***

BAT

BAT GROUNDWATER MONITORING SYSTEM
Insitu Permeability Test Protocol

SITE: RFP-PA DATE: 2-8-93 TIME: 12:09
PIEZOMETER ID: 4433 NAME: B. Navl

DEPTH (m): 4.12 TEST TYPE (IN/OUT): OUTFLOW
FILTER LENGTH (mm): 40 DIAM (mm): 30 FACTOR (mm): 228.8

EXT CYL VOLUME (ml): ~~63~~ 0.5 PORE PRESSURE (m): 21.89 DRIFT: +0.01
INIT LIQUID VOL (ml): 20 INITIAL PRESSURE (m): 32.12
TOTAL SYS VOL (ml): ~~98~~ 35.5 80% PRESS CHANGE (m): 23.94
INIT GAS VOLUME (ml): ~~78~~ 15.5 MAX PRESS CHANGE (m):

ELAPSED TIME (secs)	PRESSURE (m H2O)	ELAPSED TIME (secs)	PRESSURE (m H2O)
1 0,0,30	30.56	16 ~~0,0,30~~	
2 0,1,0	30.32	17 0,36,0	29.66
3 0,1,30	30.22	18 0,41,0	29.64
4 0,2,0	30.21	19 END OF TEST	
5 0,2,30	30.02	20	
0,3,0	29.94	21	
7 0,3,30	29.90	22	
8 0,4,0	29.81	23	
9 0,5,0	29.79	24	
10 0,6,0	29.79	25	
11 0,11,0	29.78	26	
12 0,16,0	29.76	27	
13 0,21,0	29.73	28	
14 0,26,0	29.71	29	
15 0,31,0	29.68	30	

POSE PRESSURE

MIN	
0	21.88
2	21.90
4	21.90
6	21.87

initial pres - 32.12

5.50
1.38
4.12

FASTEN

CALCULATION

PRINTOUTS

HERE

RUST ENVIRONMENT & INFRASTRUCTURE

QA Record No: _____ Page ___ of ___

QA Checked By: LRD Date 2/30/93

ACTUAL VOL CHANGE (ml): 3.0
CALCULATED VOL CHANGE (ml): 1.0

PERMEABILITY (cm/s): 1.7×10^{-9} cm/s

COMMENTS: LITHOLOGY IS CLAY BEDROCK, LOST 3ml of wtr. out of vial

* From t start to t 0,5,0 - test may be biased due to hole deformation from insertion of probe.

```
****    ***   *****
*   *  *   *    *
****   *****    *
*   *  *   *    *
****   *   *    * R
```

IN SITU PERMEABILITY TEST

SITE : RFP
TST ID: 44393.8D
FILTER DEPTH (m or ft) : 4.12

DATE: 1993-02-08 TIME: 12:09
NAME: E.P.Lawrence, B.K.Newlin

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): .5
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 15.5

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : 21.89
INITIAL TEST PRESS (m) : 32.12
80% RECOVERY PRESS (m) : 23.94
MIN FINAL PRESSURE (m) : 8.20

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s	NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	32.12		1	00:00:30	30.56	1.6x10 -7
2	00:01:00	30.32	7.7x10 -8	3	00:01:30	30.22	6.1x10 -8
4	00:02:00	30.21	2.6x10 -7	5	00:02:30	30.02	2.9x10 -7
6	00:03:00	29.00					

NUMBER OF DATA POINTS : 6
CALC VOLUME CHANGE (ml): 1.2
'JAL VOL CHANGE (ml): 2.0

COMMENTS:
this is an incomplete test. output is kept for sensitivity analysis.

*** FINAL CALCULATED PERMEABILITY = 2.9 x 10 -7 (cm/s) ***

```
****    ***   *****
*  *  *  *    *
****   *****   *
*  *  *  *    *
****   *  *    * R
```

IN SITU PERMEABILITY TEST

SITE : rfp
TST ID: 44393.bd
FILTER DEPTH (m or ft) : 4.12

DATE: 1993-02-08 TIME: 12:09
NAME: epl, bkn

FILTER: LENGTH (mm): 40.0
DIAMETER (mm): 30.0
FLOW FACTOR (mm): 228.77

TEST TYPE: VAR HEAD, OUTFLOW
CALIBRATION SLOPE : 1.00
INTERCEPT : .00

TEST CONTAINER VOL (ml): 35.0
EXT CYLINDER VOL (ml): .5
INITIAL LIQUID VOL (ml): 20.0
CONTAINER X-AREA (cm2): 1.96
INITIAL GAS VOL (ml): 15.5

LIQUID START LEVEL (m) : .310
STATIC PORE PRESS (m) : 21.89
INITIAL TEST PRESS (m) : 32.12
80% RECOVERY PRESS (m) : 23.94
MIN FINAL PRESSURE (m) : 8.20

NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s	NO	TIME hh:mm:ss	PRESS m H2O	PERMEAB cm/s
0	00:00:00	32.12		1	00:00:30	30.56	1.6x10 -7
2	00:01:00	30.32	7.7x10 -8	3	00:01:30	30.22	6.1x10 -8
4	00:02:00	30.21	7.1x10 -8	5	00:02:30	30.02	7.1x10 -8
6	00:03:00	29.94	4.8x10 -8	7	00:03:30	29.90	2.8x10 -8
8	00:04:00	29.81	1.3x10 -8	9	00:05:00	29.79	1.2x10 -9
10	00:06:00	29.79	9.9x10-10	11	00:11:00	29.78	1.5x10 -9
12	00:16:00	29.76	1.8x10 -9	13	00:21:00	29.73	1.9x10 -9
	00:26:00	29.71	1.8x10 -9	15	00:31:00	29.68	1.7x10 -9
	00:36:00	29.66	1.7x10 -9	17	00:41:00	29.64	

NUMBER OF DATA POINTS : 17
CALC VOLUME CHANGE (ml): 1.0
ACTUAL VOL CHANGE (ml): 2.0

COMMENTS:
Vadose Zone Monitoring Borehole
44393 Rocky Flats OU4
Date Tested: 2-8-93 Testers: E.P.Lawrence, B.K.Newlin
Lithology tested: Clay bedrock

*** FINAL CALCULATED PERMEABILITY = 1.7 x 10 -9 (cm/s) ***