

APPENDIX E - SOIL WATER CHARACTERISTIC CURVE TEST DATA

Pressure Plate Extractor Test - Altamont - Composite Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	254-mm CMP-CL-3	Test Date	8/13/2008
WT of Sample Ring =	699.6 g		
WT of Sample Ring + Soil =	3920.8 g		
Water Content =	21.73 %		
Diameter of Sample Ring, D =	8.00 in		
Height of Sample Ring, L =	1.9 in		
Volume, V =	5.53E-02 ft ³	1565.0 cm ³	
Dry Unit Weight =	105.55 pcf	1.69 Mg/m ³	
Water WT =	575.11 g		
Solid WT =	2645.09 g		
Add Water for saturation =	115.4 g	Sr	119.67
Saturated Water Content =	26.10 %		
Tube Area, A =	20.268299 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	0.1	0.000	0.001	0.261	0.441
0.5	3	58.778	3.449	0.239	0.404
1	4.3	85.127	6.897	0.229	0.387
2	5.7	113.502	13.794	0.218	0.369
4	10.2	204.710	27.588	0.184	0.311
		Activity Meter Test	2090.00	0.129	0.219
			4280.00	0.105	0.177
			12100.00	0.081	0.136
			24000.00	0.069	0.117
			37600.00	0.062	0.106
			54600.00	0.056	0.094
			78700.00	0.048	0.081
			1870.00	0.124	0.209
			3730.00	0.106	0.180
			11200.00	0.080	0.135
			20800.00	0.069	0.117
			32900.00	0.062	0.105
			49000.00	0.055	0.094
			73600.00	0.048	0.081

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
2.09	18.4009	27.0626	26.0697	0.129	0.219
4.28	18.4009	26.8719	26.0697	0.105	0.177
12.1	18.4009	26.6879	26.0697	0.081	0.136
24	18.4009	26.6015	26.0697	0.069	0.117
37.6	18.4009	26.5488	26.0697	0.062	0.106
54.6	18.4009	26.4962	26.0697	0.056	0.094
78.7	18.4009	26.4384	26.0697	0.048	0.081
1.87	18.4205	26.2555	25.3938	0.124	0.209
3.73	18.4205	26.1359	25.3938	0.106	0.180
11.2	18.4205	25.9484	25.3938	0.080	0.135
20.8	18.4205	25.8741	25.3938	0.069	0.117
32.9	18.4205	25.8264	25.3938	0.062	0.105
49	18.4205	25.7796	25.3938	0.055	0.094
73.6	18.4205	25.7274	25.3938	0.048	0.081

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4371
$\alpha =$	0.1949
$n =$	1.1543
$m =$	0.1337

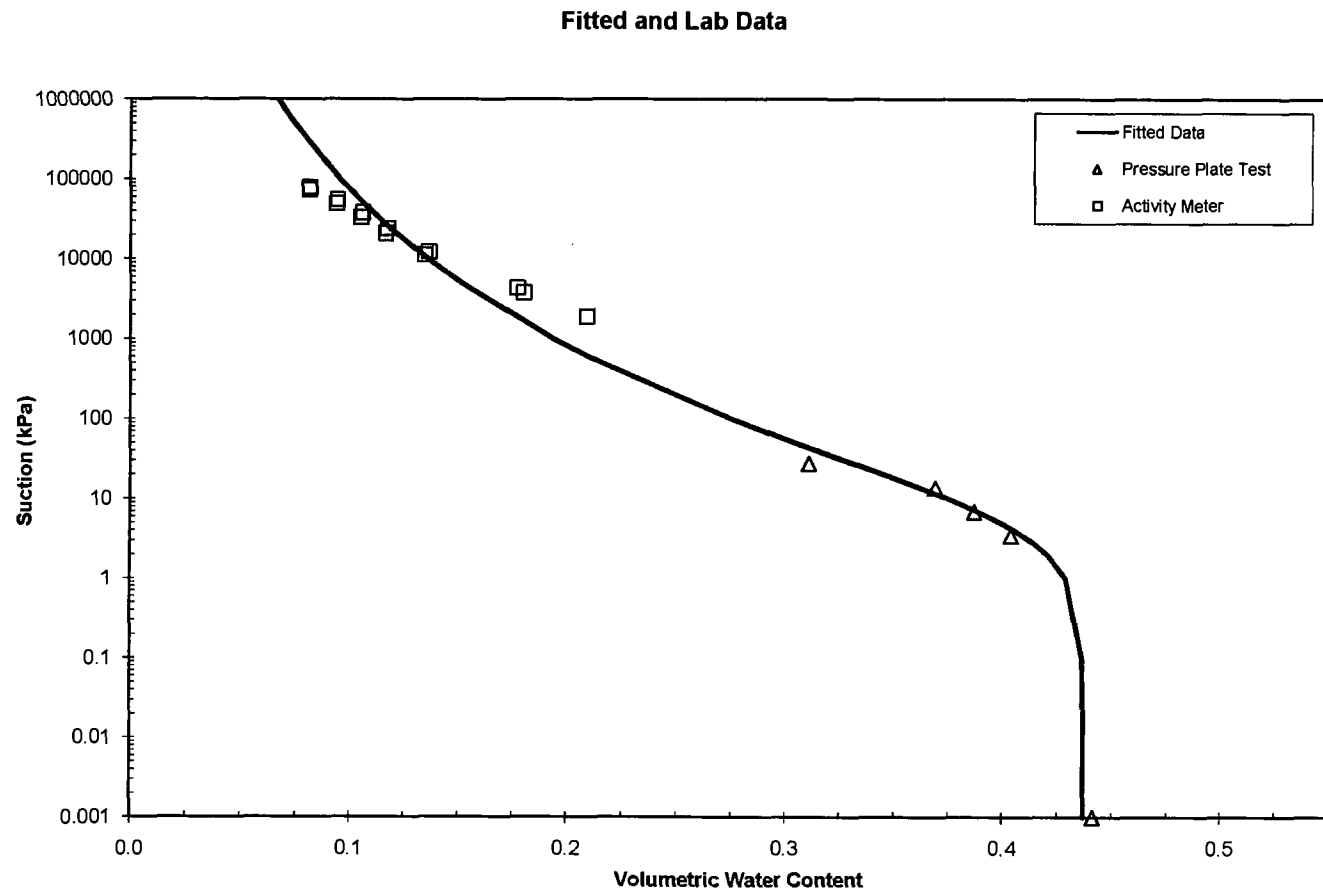
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4371
0.025	0.4370
0.05	0.4368
0.075	0.4367
0.1	0.4365
1	0.4289
2	0.4205
3	0.4126
4	0.4056
5	0.3992
6	0.3934
7	0.3881
8	0.3833
9	0.3789
10	0.3748
15	0.3580
20	0.3455
30	0.3274
40	0.3146
50	0.3047
60	0.2968
70	0.2902
80	0.2845
90	0.2796
100	0.2752
500	0.2154
1000	0.1937
5000	0.1511
10000	0.1358
25000	0.1179
5.00E+04	0.1059
1.00E+05	0.0952
5.00E+05	0.0742
7.50E+05	0.0697
1.00E+06	0.0667

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.441	0.4371	0.004	0.000
3.45	0.404	0.4094	-0.006	0.000
6.90	0.387	0.3887	-0.002	0.000
13.79	0.369	0.3616	0.007	0.000
27.59	0.311	0.3312	-0.021	0.000
4280.00	0.177	0.1548	0.022	0.000
12100.00	0.136	0.1318	0.005	0.000
24000.00	0.117	0.1186	-0.001	0.000
37600.00	0.106	0.1107	-0.005	0.000
54600.00	0.094	0.1045	-0.010	0.000
78700.00	0.081	0.0987	-0.017	0.000
1870.00	0.209	0.1758	0.033	0.001
3730.00	0.180	0.1581	0.022	0.000
11200.00	0.135	0.1334	0.001	0.000
20800.00	0.117	0.1213	-0.005	0.000
32900.00	0.105	0.1130	-0.008	0.000
49000.00	0.094	0.1062	-0.013	0.000
73600.00	0.081	0.0998	-0.019	0.000

Residual = 0.000203676



Pressure Plate Extractor Test - Altamont - Composite Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	CMP-CL-3	Test Date	4/9/2008
WT of Sample Ring =	70.16 g		
WT of Sample Ring + Soil =	288.93 g		
Water Content =	20.45 %		
Diameter of Sample Ring, D =	2.87 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.75E-03 ft ³	106.2	cm ³
Dry Unit Weight =	106.81 pcf	1.71	Mg/m ³
Water WT =	37.14 g		
Solid WT =	181.63 g		
Add Water for saturation =	1.22 g	Sr	100.05
Saturated Water Content =	21.12 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	20.7	0.000	0.001	0.211	0.362
0.5	35	2.717	3.449	0.196	0.336
1	36.3	2.964	6.897	0.195	0.334
2	37.8	3.249	13.794	0.193	0.331
4	42.9	4.218	27.588	0.188	0.322
8	48.5	5.282	55.176	0.182	0.312
16	57	6.897	110.352	0.173	0.297
30	65.8	8.569	206.910	0.164	0.281
60	73.3	9.994	413.820	0.156	0.267
90	83.5	11.932	620.730	0.146	0.249
		Activity Meter Test	47800.00	0.048	0.082
			1910.00	0.108	0.185
			21000.00	0.068	0.116
			5660.00	0.084	0.143

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
21	19.505	27.7869	27.2603	0.068	0.116
1.91	18.8021	27.3736	26.5357	0.108	0.185
47.8	48.9143	57.2121	56.8331	0.048	0.082
5.66	19.5261	28.1184	27.4542	0.084	0.143

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3615
$\alpha =$	0.0164
$n =$	1.1931
$m =$	0.1618

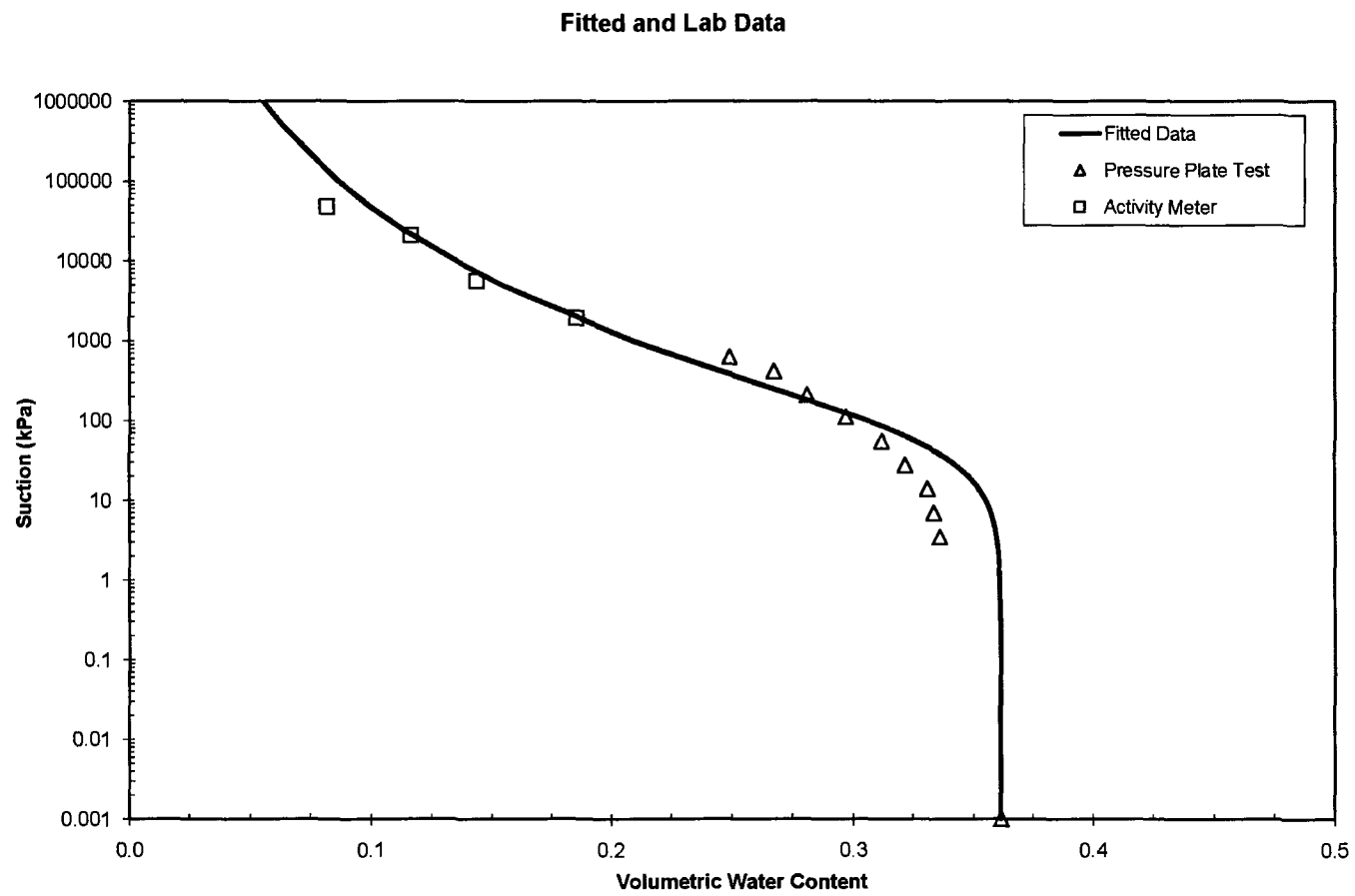
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3615
0.025	0.3615
0.05	0.3615
0.075	0.3615
0.1	0.3615
1	0.3611
2	0.3605
3	0.3599
4	0.3593
5	0.3586
6	0.3580
7	0.3573
8	0.3566
9	0.3559
10	0.3552
15	0.3516
20	0.3480
30	0.3412
40	0.3349
50	0.3290
60	0.3236
70	0.3187
80	0.3141
90	0.3099
100	0.3059
500	0.2377
1000	0.2094
5000	0.1542
10000	0.1350
25000	0.1131
5.00E+04	0.0989
1.00E+05	0.0865
5.00E+05	0.0634
7.50E+05	0.0587
1.00E+06	0.0555

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WVC (%)	$(\Delta$ WVC) ²
0.001	0.362	0.3615	0.000	0.000
3.45	0.336	0.3597	-0.024	0.001
6.90	0.334	0.3574	-0.024	0.001
13.79	0.331	0.3525	-0.022	0.000
27.59	0.322	0.3428	-0.021	0.000
55.18	0.312	0.3262	-0.014	0.000
110.35	0.297	0.3021	-0.006	0.000
206.91	0.281	0.2760	0.005	0.000
413.82	0.267	0.2458	0.021	0.000
620.73	0.249	0.2287	0.020	0.000
47800.00	0.082	0.0998	-0.018	0.000
1910.00	0.185	0.1854	0.000	0.000
21000.00	0.116	0.1170	-0.001	0.000
5680.00	0.143	0.1506	-0.007	0.000

Residual = 0.000253464



Pressure Plate Extractor Test - Altamont - Composite Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	CMP-SDRI	Test Date	4/9/2008
WT of Sample Ring =	71.33 g		
WT of Sample Ring + Soil =	291.45 g		
Water Content =	21.17 %		
Diameter of Sample Ring, D =	2.87 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.75E-03 ft ³	106.2	cm ³
Dry Unit Weight =	106.83 pcf	1.71	Mg/m ³
Water WT =	38.46 g		
Solid WT =	181.66 g		
Add Water for saturation =	1.31 g	Sr	103.75
Saturated Water Content =	21.89 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	11.5	0.000	0.001	0.219	0.375
0.5	24.1	2.394	3.449	0.206	0.352
1	28.2	3.173	6.897	0.201	0.345
2	30.9	3.686	13.794	0.199	0.340
4	32.35	3.962	27.588	0.197	0.337
8	36.3	4.712	55.176	0.193	0.330
16	41.95	5.786	110.352	0.187	0.320
30	48.3	6.992	206.910	0.180	0.309
60	54	8.075	413.820	0.174	0.299
90	62	9.595	620.730	0.166	0.284
		Activity Meter Test	2050.00	0.119	0.205
			53300.00	0.044	0.075
			5720.00	0.078	0.134
			840.00	0.153	0.262

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
5.72	18.4042	26.8033	26.1942	0.078	0.134
53.3	19.5051	27.7352	27.3908	0.044	0.075
2.05	19.4865	28.3213	27.3784	0.119	0.205
0.84	18.5042	27.4406	26.2528	0.153	0.262

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3748
$\alpha =$	0.0053
$n =$	1.2620
$m =$	0.2076

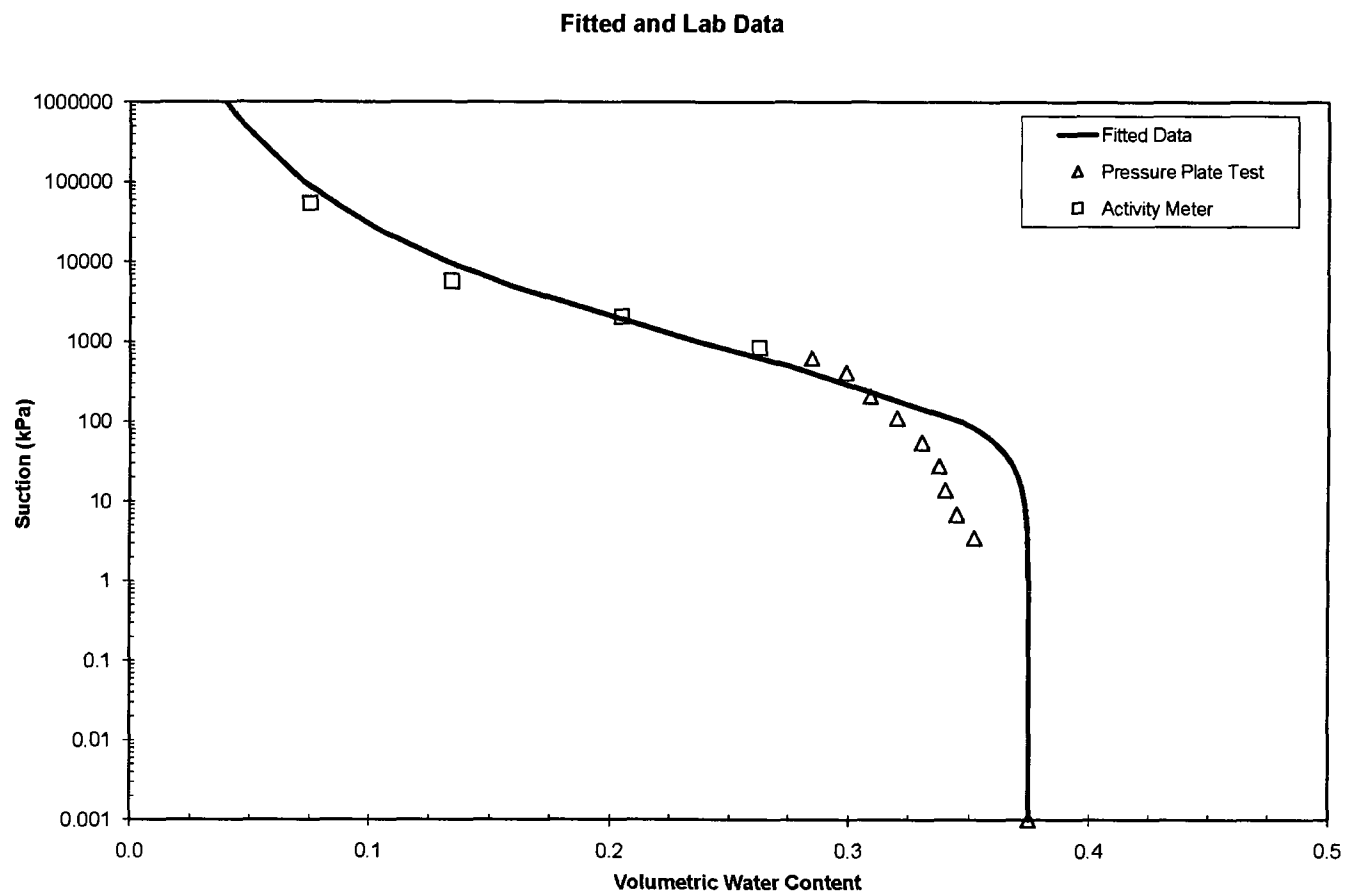
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3748
0.025	0.3748
0.05	0.3748
0.075	0.3748
0.1	0.3748
1	0.3747
2	0.3745
3	0.3743
4	0.3742
5	0.3740
6	0.3738
7	0.3736
8	0.3733
9	0.3731
10	0.3729
15	0.3717
20	0.3703
30	0.3675
40	0.3646
50	0.3616
60	0.3586
70	0.3557
80	0.3527
90	0.3498
100	0.3470
500	0.2752
1000	0.2363
5000	0.1582
10000	0.1322
25000	0.1041
5.00E+04	0.0868
1.00E+05	0.0724
5.00E+05	0.0475
7.50E+05	0.0427
1.00E+06	0.0396

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.375	0.3748	0.000	0.000
3.45	0.352	0.3743	-0.022	0.000
6.90	0.345	0.3736	-0.029	0.001
13.79	0.340	0.3720	-0.032	0.001
27.59	0.337	0.3682	-0.031	0.001
55.18	0.330	0.3601	-0.030	0.001
110.35	0.320	0.3441	-0.024	0.001
206.91	0.309	0.3205	-0.012	0.000
413.82	0.299	0.2856	0.013	0.000
620.73	0.284	0.2630	0.021	0.000
2050.00	0.205	0.1985	0.006	0.000
53300.00	0.075	0.0854	-0.011	0.000
5720.00	0.134	0.1528	-0.019	0.000
840.00	0.262	0.2460	0.016	0.000

Residual = 0.000447616



Pressure Plate Extractor Test - Altamont - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	254-mm ALT-ML-4	Test Date	8/8/2008
WT of Sample Ring =	881.7 g		
WT of Sample Ring + Soil =	6056.1 g		
Water Content =	25.11 %		
Diameter of Sample Ring, D =	10.00 in		
Height of Sample Ring, L =	2.0 in		
Volume, V =	9.09E-02 ft ³	2574.1 cm ³	
Dry Unit Weight =	100.30 pcf	1.61 Mg/m ³	
Water WT =	1038.50 g		
Solid WT =	4135.90 g		
Add Water for saturation =	91.02 g	Sr	109.69
Saturated Water Content =	27.31 %		
Tube Area, A =	20.26829916 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	2.3	0.000	0.001	0.273	0.439
0.5	5.6	66.885	3.449	0.257	0.413
1	7	95.261	6.897	0.250	0.402
2	8.1	117.556	13.794	0.245	0.393
4	10	156.066	27.588	0.235	0.378
8	13.2	220.924	55.176	0.220	0.353
15	15.8	273.622	103.455	0.207	0.333
30	19.5	348.615	206.910	0.189	0.304
60	23	419.554	413.820	0.172	0.276
		Activity Meter Test	2420.00	0.105	0.169
			4490.00	0.089	0.143
			12300.00	0.072	0.115
			30300.00	0.057	0.092
			61500.00	0.043	0.070
			61600.00	0.043	0.070

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
2.42	19.5173	27.8053	27.016	0.105	0.169
4.49	19.5516	27.7125	27.0477	0.089	0.143
12.3	18.801	26.8497	26.3116	0.072	0.115
30.3	19.484	27.4082	26.9784	0.057	0.092
61.5	18.1351	25.9697	25.6444	0.043	0.070
61.6	22.7621	30.5877	30.2625	0.043	0.070

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4136
$\alpha =$	0.0159
$n =$	1.2442
$m =$	0.1963

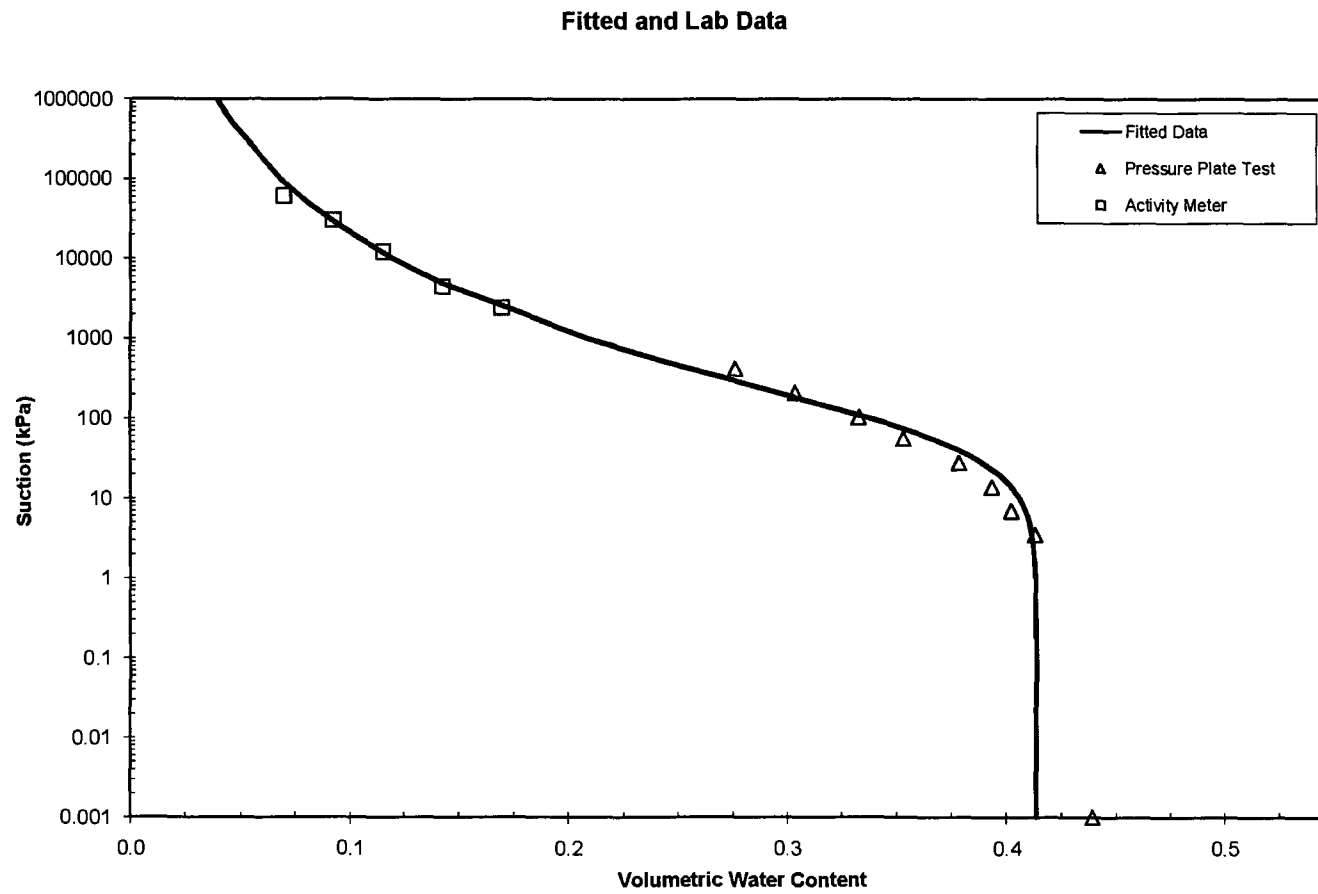
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4136
0.025	0.4136
0.05	0.4136
0.075	0.4136
0.1	0.4136
1	0.4131
2	0.4125
3	0.4118
4	0.4110
5	0.4102
6	0.4094
7	0.4085
8	0.4076
9	0.4067
10	0.4058
15	0.4011
20	0.3964
30	0.3872
40	0.3785
50	0.3704
60	0.3629
70	0.3560
80	0.3497
90	0.3438
100	0.3383
500	0.2456
1000	0.2091
5000	0.1419
10000	0.1198
25000	0.0958
5.00E+04	0.0809
1.00E+05	0.0683
5.00E+05	0.0461
7.50E+05	0.0418
1.00E+06	0.0389

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.439	0.4136	0.025	0.001
3.45	0.413	0.4114	0.002	0.000
6.90	0.402	0.4086	-0.007	0.000
13.79	0.393	0.4023	-0.009	0.000
27.59	0.378	0.3894	-0.011	0.000
55.18	0.353	0.3665	-0.013	0.000
103.46	0.333	0.3365	-0.004	0.000
206.91	0.304	0.2969	0.007	0.000
413.82	0.276	0.2563	0.020	0.000
2420.00	0.169	0.1692	0.000	0.000
4490.00	0.143	0.1456	-0.003	0.000
12300.00	0.115	0.1139	0.001	0.000
30300.00	0.092	0.0914	0.001	0.000
61500.00	0.070	0.0769	-0.007	0.000
61600.00	0.070	0.0769	-0.007	0.000

Residual = 0.000108804



Pressure Plate Extractor Test - Altamont - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	ALT-ML-4	Test Date	4/9/2008
WT of Sample Ring =	71.16	g	
WT of Sample Ring + Soil =	293.11	g	
Water Content =	18.94	%	
Diameter of Sample Ring, D =	2.87	in	
Height of Sample Ring, L =	1.0	in	
Volume, V =	3.75E-03	ft ³	106.2 cm ³
Dry Unit Weight =	109.73	pcf	1.76 Mg/m ³
Water WT =	35.34	g	
Solid WT =	186.61	g	
Add Water for saturation =	0.91	g	Sr 99.37
Saturated Water Content =	19.43	%	
Tube Area, A =	0.19	cm ²	

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	25	0.000	0.001	0.194	0.342
0.5	37.4	2.356	3.449	0.182	0.319
1	38.6	2.584	6.897	0.180	0.317
2	40.5	2.945	13.794	0.178	0.314
4	42.9	3.401	27.588	0.176	0.310
8	46.5	4.085	55.176	0.172	0.303
16	48.95	4.551	110.352	0.170	0.299
30	52.9	5.301	206.910	0.166	0.292
60	57	6.080	413.820	0.162	0.284
90	64	7.410	620.730	0.155	0.272
		Activity Meter Test	1240.00	0.151	0.265
			3640.00	0.099	0.173
			24200.00	0.059	0.103

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
3.64	22.0096	30.4257	29.6704	0.099	0.173
1.24	18.6204	27.3852	26.2368	0.151	0.265
24.2	19.7051	28.2719	27.7974	0.059	0.103

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3416
$\alpha =$	0.0041
$n =$	1.2284
$m =$	0.1860

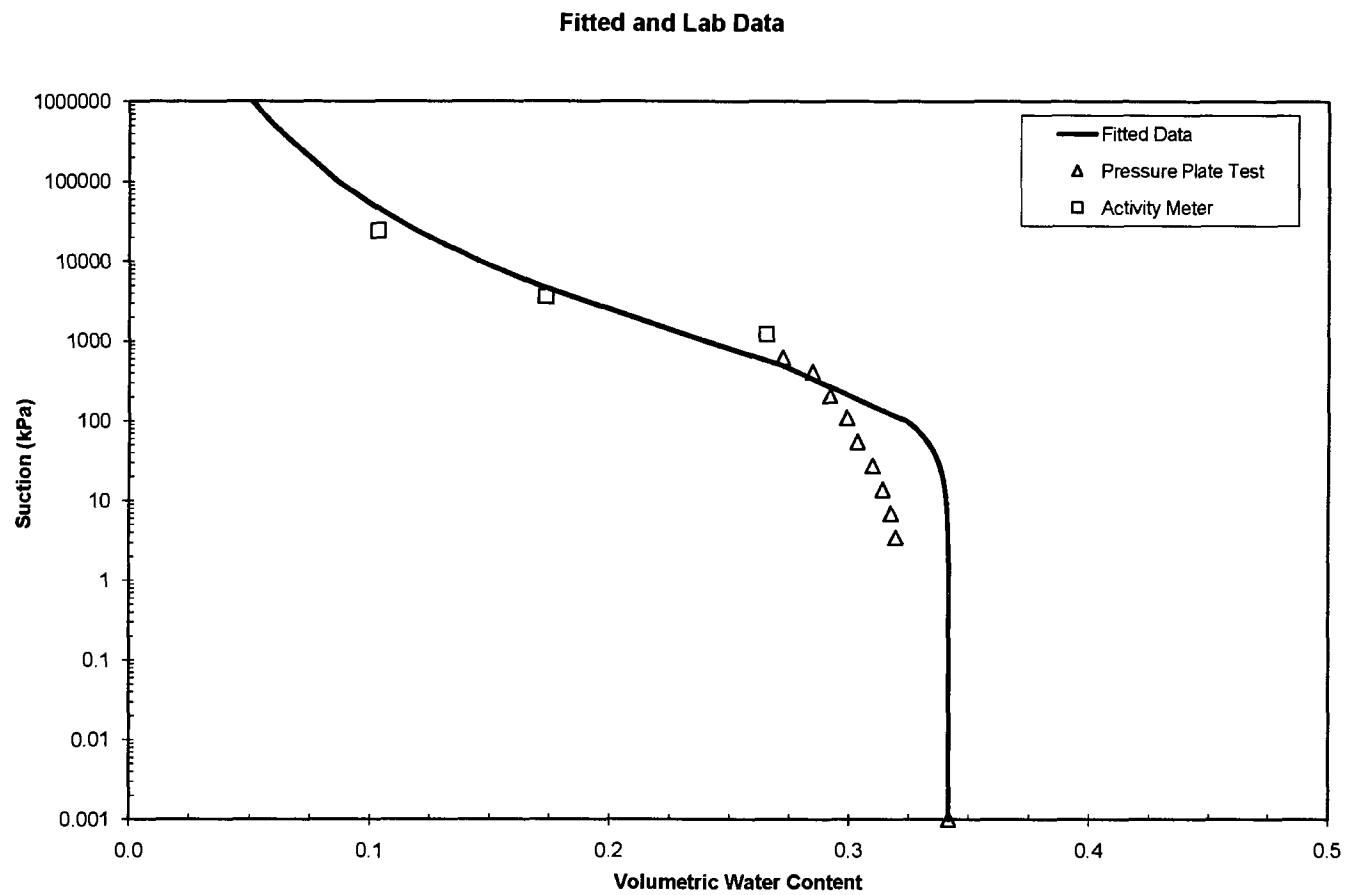
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3416
0.025	0.3416
0.05	0.3416
0.075	0.3416
0.1	0.3416
1	0.3416
2	0.3415
3	0.3414
4	0.3412
5	0.3411
6	0.3410
7	0.3408
8	0.3407
9	0.3405
10	0.3404
15	0.3396
20	0.3388
30	0.3370
40	0.3351
50	0.3332
60	0.3313
70	0.3294
80	0.3275
90	0.3256
100	0.3237
500	0.2717
1000	0.2399
5000	0.1704
10000	0.1459
25000	0.1185
5.00E+04	0.1011
1.00E+05	0.0863
5.00E+05	0.0598
7.50E+05	0.0545
1.00E+06	0.0510

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.342	0.3416	0.000	0.000
3.45	0.319	0.3413	-0.022	0.000
6.90	0.317	0.3409	-0.024	0.001
13.79	0.314	0.3398	-0.026	0.001
27.59	0.310	0.3374	-0.028	0.001
55.18	0.303	0.3322	-0.029	0.001
110.35	0.299	0.3218	-0.023	0.001
206.91	0.292	0.3056	-0.014	0.000
413.82	0.284	0.2799	0.004	0.000
620.73	0.272	0.2620	0.010	0.000
1240.00	0.265	0.2299	0.035	0.001
3640.00	0.173	0.1829	-0.009	0.000
24200.00	0.103	0.1193	-0.016	0.000

Residual = 0.000443069



Pressure Plate Extractor Test - Altamont - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	ALT-SL-1	Test Date	4/9/2008
WT of Sample Ring =	69.88 g		
WT of Sample Ring + Soil =	290.77 g		
Water Content =	20.35 %		
Diameter of Sample Ring, D =	2.87 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.75E-03 ft ³	106.2 cm ³	
Dry Unit Weight =	107.93 pcf	1.73 Mg/m ³	
Water WT =	37.35 g		
Solid WT =	183.54 g		
Add Water for saturation =	1.23 g	Sr	102.53
Saturated Water Content =	21.02 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water from sample	out soil	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)		(kPa)		
0	14.9	0.000		0.001	0.210	0.364
0.5	27.8	2.451		3.449	0.197	0.340
1	28.8	2.641		6.897	0.196	0.339
2	30	2.869		13.794	0.195	0.337
4	31.2	3.097		27.588	0.193	0.334
8	34.9	3.800		55.176	0.189	0.328
16	41.95	5.140		110.352	0.182	0.315
30	46	5.909		206.910	0.178	0.308
60	52.1	7.068		413.820	0.172	0.297
90	61	8.759		620.730	0.162	0.281
		Activity Meter Test		4700.00	0.085	0.147
				1060.00	0.139	0.240
				6260.00	0.081	0.141
				2320.00	0.104	0.179

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
1.06	22.0099	30.6383	29.5869	0.139	0.240
4.7	19.5515	27.8289	27.1785	0.085	0.147
6.26	19.5081	28.1293	27.4813	0.081	0.141
2.32	18.6818	27.4445	26.6225	0.104	0.179

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3636
$\alpha =$	0.0046
$n =$	1.2735
$m =$	0.2148

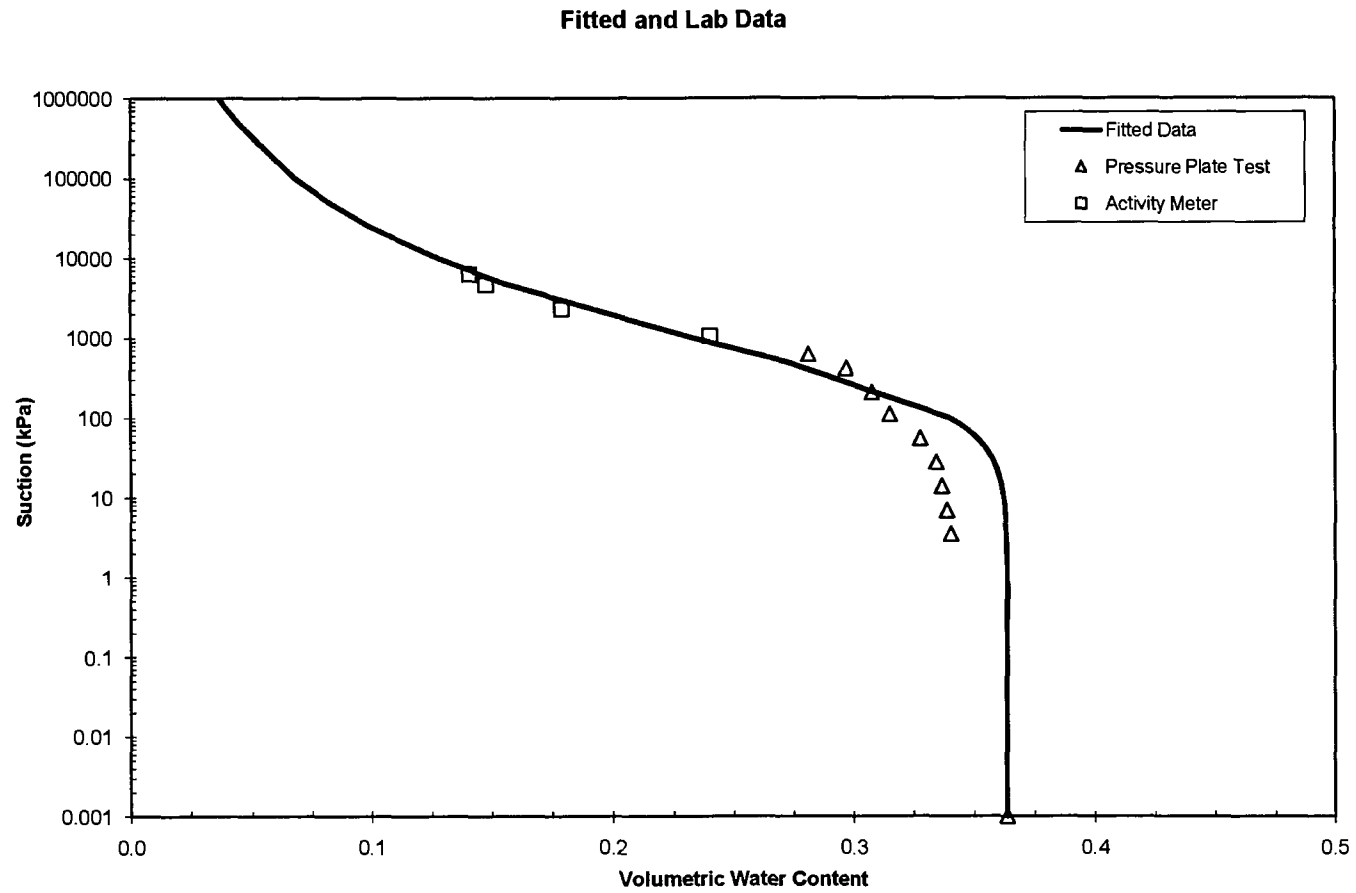
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3636
0.025	0.3636
0.05	0.3636
0.075	0.3636
0.1	0.3636
1	0.3635
2	0.3634
3	0.3632
4	0.3631
5	0.3629
6	0.3628
7	0.3626
8	0.3624
9	0.3622
10	0.3621
15	0.3611
20	0.3600
30	0.3576
40	0.3552
50	0.3527
60	0.3501
70	0.3475
80	0.3449
90	0.3424
100	0.3399
500	0.2720
1000	0.2331
5000	0.1539
10000	0.1276
25000	0.0994
5.00E+04	0.0823
1.00E+05	0.0681
5.00E+05	0.0438
7.50E+05	0.0392
1.00E+06	0.0363

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.364	0.3636	0.000	0.000
3.45	0.340	0.3632	-0.023	0.001
6.90	0.339	0.3626	-0.024	0.001
13.79	0.337	0.3613	-0.025	0.001
27.59	0.334	0.3582	-0.024	0.001
55.18	0.328	0.3513	-0.024	0.001
110.35	0.315	0.3373	-0.022	0.000
206.91	0.308	0.3156	-0.008	0.000
413.82	0.297	0.2822	0.015	0.000
620.73	0.281	0.2599	0.021	0.000
4700.00	0.147	0.1565	-0.009	0.000
1060.00	0.240	0.2298	0.010	0.000
6260.00	0.141	0.1448	-0.004	0.000
2320.00	0.179	0.1886	-0.010	0.000

Residual = 0.000309498



Pressure Plate Extractor Test - Apple Valley - Clay Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	254-mm AV-B-1-C	Test Date	3/4/2009
WT of Sample Ring =	887.9 g		
WT of Sample Ring + Soil =	6289.6 g		
Water Content =	21.38 %		
Diameter of Sample Ring, D =	10.00 in		
Height of Sample Ring, L =	2.0 in		
Volume, V =	9.09E-02 ft ³	2574.1 cm ³	
Dry Unit Weight =	107.93 pcf	1.73 Mg/m ³	
Water WT =	951.55 g		
Solid WT =	4450.15 g		
Add Water for saturation =	0 g	Sr	104.28
Saturated Water Content =	21.38 %		
Tube Area, A =	20.268299 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	23.2	0.000	0.001	0.214	0.370
0.5	27.8	93.234	3.449	0.193	0.334
1	29.4	125.663	6.897	0.186	0.321
2	30.3	143.905	13.794	0.181	0.314
3	31.1	160.120	20.691	0.178	0.308
4	31.9	176.334	27.588	0.174	0.301
Leak in gasket at application of 8 psi. Test was terminated early.					
		Activity Meter Test	1990.00	0.143	0.248
			19300.00	0.087	0.150
			29000.00	0.077	0.133
			43600.00	0.066	0.115
			64000.00	0.057	0.098
			3150.00	0.129	0.223
			28800.00	0.075	0.130
			40800.00	0.066	0.113
			1940.00	0.144	0.249
			10300.00	0.104	0.179
			17200.00	0.089	0.154

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
1.99	18.1354	23.2973	22.6502	0.143	0.248
19.3	18.1354	23.043	22.6502	0.087	0.150
29	18.1354	22.998	22.6502	0.077	0.133
43.6	18.1354	22.95	22.6502	0.066	0.115
64	18.1354	22.9069	22.6502	0.057	0.098
3.15	18.1346	23.7432	23.1029	0.129	0.223
28.8	18.1346	23.4757	23.1029	0.075	0.130
40.8	18.1346	23.4287	23.1029	0.066	0.113
1.94	18.5171	26.7201	25.6871	0.144	0.249
10.3	18.5171	26.4296	25.6871	0.104	0.179
17.2	18.5171	26.3246	25.6871	0.089	0.154

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3700
$\alpha =$	0.2004
$n =$	1.1060
$m =$	0.0958

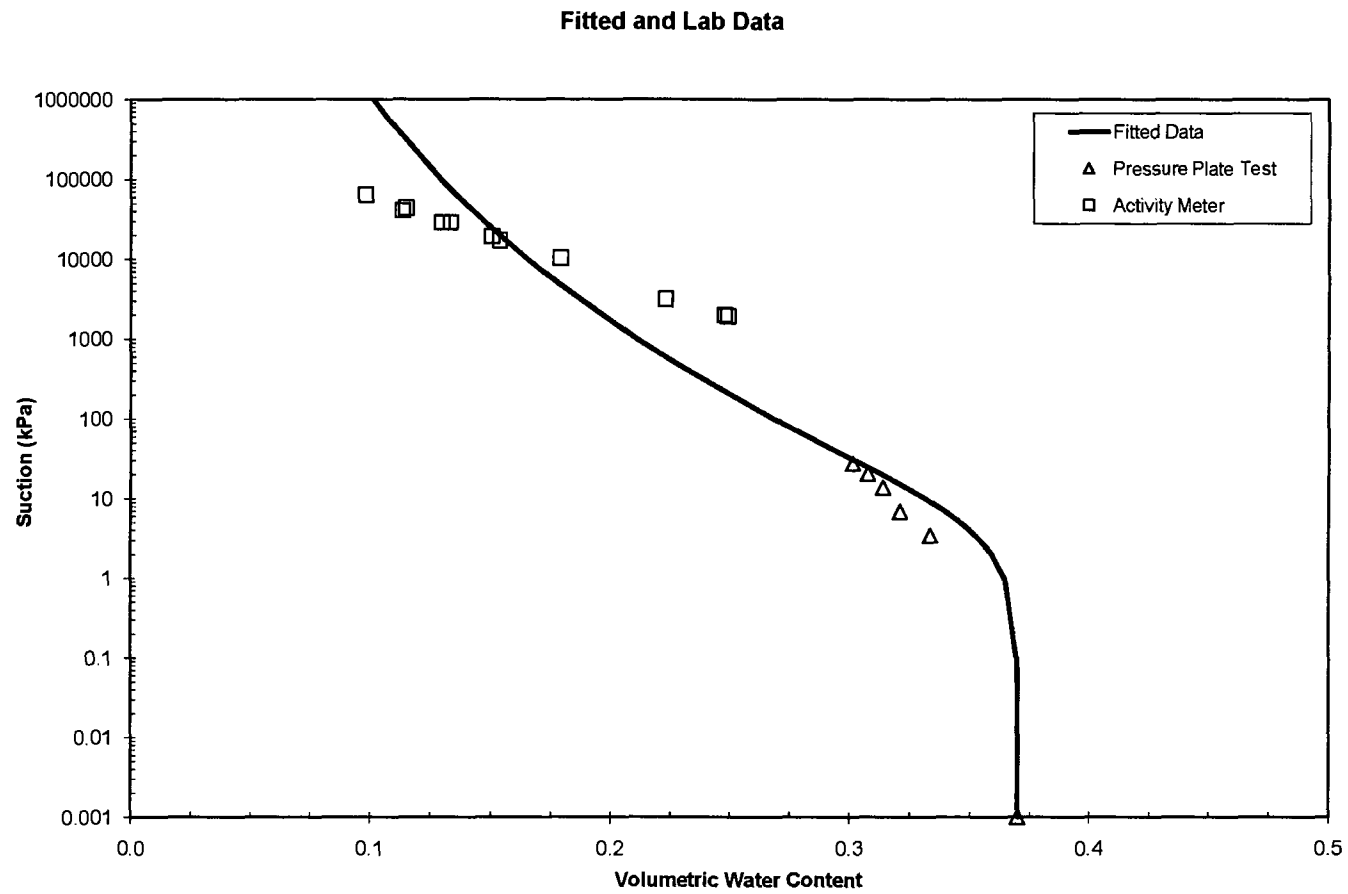
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3700
0.025	0.3699
0.05	0.3698
0.075	0.3697
0.1	0.3695
1	0.3645
2	0.3592
3	0.3544
4	0.3501
5	0.3462
6	0.3427
7	0.3395
8	0.3366
9	0.3339
10	0.3314
15	0.3212
20	0.3135
30	0.3022
40	0.2941
50	0.2877
60	0.2826
70	0.2783
80	0.2745
90	0.2713
100	0.2684
500	0.2269
1000	0.2109
5000	0.1779
10000	0.1653
25000	0.1500
5.00E+04	0.1394
1.00E+05	0.1295
5.00E+05	0.1092
7.50E+05	0.1046
1.00E+06	0.1015

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.370	0.3700	0.000	0.000
3.45	0.334	0.3524	-0.019	0.000
6.90	0.321	0.3398	-0.019	0.000
13.79	0.314	0.3234	-0.009	0.000
20.69	0.308	0.3125	-0.005	0.000
27.59	0.301	0.3045	-0.003	0.000
1990.00	0.248	0.1961	0.052	0.003
19300.00	0.150	0.1542	-0.004	0.000
29000.00	0.133	0.1477	-0.014	0.000
43600.00	0.115	0.1414	-0.027	0.001
64000.00	0.098	0.1358	-0.037	0.001
3150.00	0.223	0.1868	0.036	0.001
28800.00	0.130	0.1478	-0.018	0.000
40800.00	0.113	0.1424	-0.029	0.001
1940.00	0.249	0.1967	0.053	0.003
10300.00	0.179	0.1648	0.014	0.000
17200.00	0.154	0.1561	-0.002	0.000

Residual = 0.000663486



Pressure Plate Extractor Test - Apple Valley - Clay Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	150-mm AV-B-1-C	Test Date	9/19/2008
WT of Sample Ring =	274.6 g		
WT of Sample Ring + Soil =	1687 g		
Water Content =	24.83 %		
Diameter of Sample Ring, D =	5.90 in		
Height of Sample Ring, L =	1.5 in		
Volume, V =	2.37E-02 ft ³	672.0	cm ³
Dry Unit Weight =	105.11 pcf	1.68	Mg/m ³
Water WT =	280.94 g		
Solid WT =	1131.46 g		
Add Water for saturation =	0.1 g	Sr	112.62
Saturated Water Content =	24.84 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0		0.000	0.001	0.248	0.418
2		4.000	13.794	0.245	0.412
4		5.000	27.588	0.244	0.411
8		16.000	55.176	0.234	0.395
14.9		31.000	102.765	0.221	0.372
29.1		47.000	200.703	0.207	0.348
58.8		67.000	405.544	0.189	0.319
		Activity Meter Test	3770.00	0.112	0.189
			4060.00	0.110	0.186
			13800.00	0.081	0.137
			16800.00	0.077	0.130
			46000.00	0.054	0.091
			52400.00	0.052	0.087

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
3.77	20.4476	29.6817	28.7505	0.112	0.189
4.06	20.5238	29.3848	28.5057	0.110	0.186
13.8	19.552	28.157	27.5087	0.081	0.137
16.8	18.1355	26.5391	25.935	0.077	0.130
46	18.518	26.3943	25.9893	0.054	0.091
52.4	18.018	25.8285	25.4442	0.052	0.087

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4184
$\alpha =$	0.0063
$n =$	1.2550
$m =$	0.2032

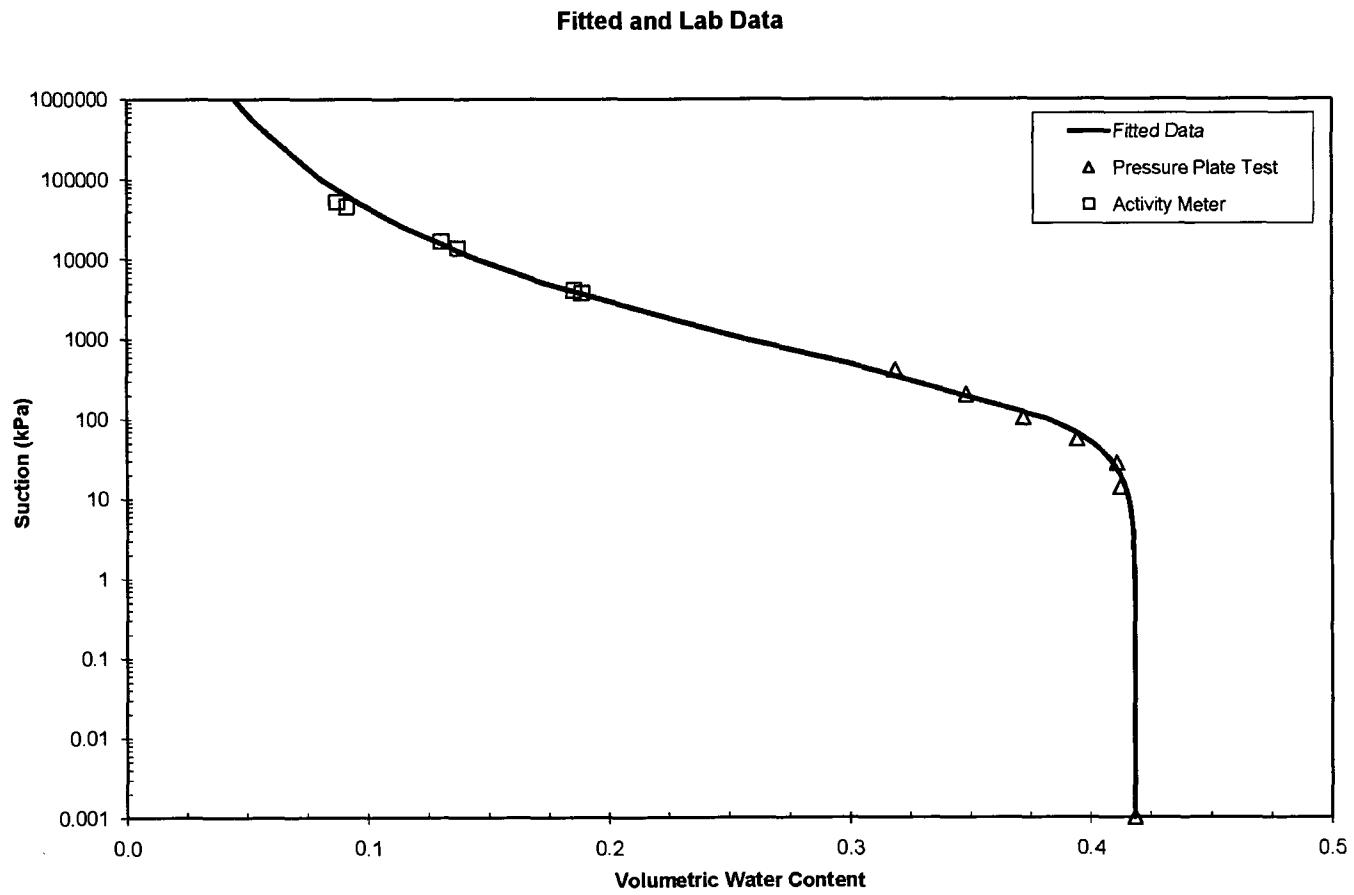
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4184
0.025	0.4184
0.05	0.4184
0.075	0.4184
0.1	0.4184
1	0.4182
2	0.4180
3	0.4178
4	0.4175
5	0.4173
6	0.4170
7	0.4167
8	0.4164
9	0.4161
10	0.4158
15	0.4141
20	0.4123
30	0.4085
40	0.4047
50	0.4008
60	0.3969
70	0.3931
80	0.3893
90	0.3857
100	0.3821
500	0.2988
1000	0.2564
5000	0.1730
10000	0.1452
25000	0.1150
5.00E+04	0.0964
1.00E+05	0.0808
5.00E+05	0.0536
7.50E+05	0.0483
1.00E+06	0.0449

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ VWC (%)	$(\Delta$ VWC) ²
0.001	0.418	0.4184	0.000	0.000
13.79	0.412	0.4145	-0.002	0.000
27.59	0.411	0.4095	0.001	0.000
55.18	0.395	0.3987	-0.004	0.000
102.77	0.372	0.3811	-0.009	0.000
200.70	0.348	0.3517	-0.003	0.000
405.54	0.319	0.3116	0.007	0.000
3770.00	0.189	0.1857	0.003	0.000
4060.00	0.186	0.1822	0.003	0.000
13800.00	0.137	0.1338	0.003	0.000
16800.00	0.130	0.1272	0.003	0.000
46000.00	0.091	0.0985	-0.007	0.000
52400.00	0.087	0.0952	-0.008	0.000

Residual = 2.4877E-05



Pressure Plate Extractor Test - Apple Valley - Clay Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	AV-B-1-C	Test Date	9/19/2008
WT of Sample Ring =	71.15 g		
WT of Sample Ring + Soil =	290.16 g		
Water Content =	20.34 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	107.92 pcf	1.73	Mg/m ³
Water WT =	37.01 g		
Solid WT =	182.00 g		
Add Water for saturation =	0.1 g	Sr	99.45
Saturated Water Content =	20.39 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	2.1	0.000	0.001	0.204	0.353
0.5	12.7	2.014	3.449	0.193	0.334
1	13.4	2.147	6.897	0.192	0.332
2	15	2.451	13.794	0.190	0.329
4	16.6	2.755	27.588	0.189	0.327
8	21.4	3.667	55.176	0.184	0.318
15	26.9	4.712	103.455	0.178	0.308
30	28.2	4.959	206.910	0.177	0.306
60	29.8	5.263	413.820	0.175	0.303
90	35.3	6.308	620.730	0.169	0.293
		Activity Meter Test	1950.00	0.146	0.252
			7110.00	0.119	0.206
			15800.00	0.096	0.166
			25200.00	0.084	0.144
			47100.00	0.067	0.116
			57600.00	0.061	0.106
			68000.00	0.058	0.100

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
1.95	18.1353	29.5873	28.1301	0.146	0.252
7.11	18.1353	29.323	28.1301	0.119	0.206
15.8	18.1353	29.0886	28.1301	0.096	0.166
25.2	18.1353	28.9648	28.1301	0.084	0.144
47.1	18.1353	28.7994	28.1301	0.067	0.116
57.6	18.1353	28.7413	28.1301	0.061	0.106
68	18.1353	28.7083	28.1301	0.05785008	0.10005361

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3527
$\alpha =$	0.0041
$n =$	1.1885
$m =$	0.1586

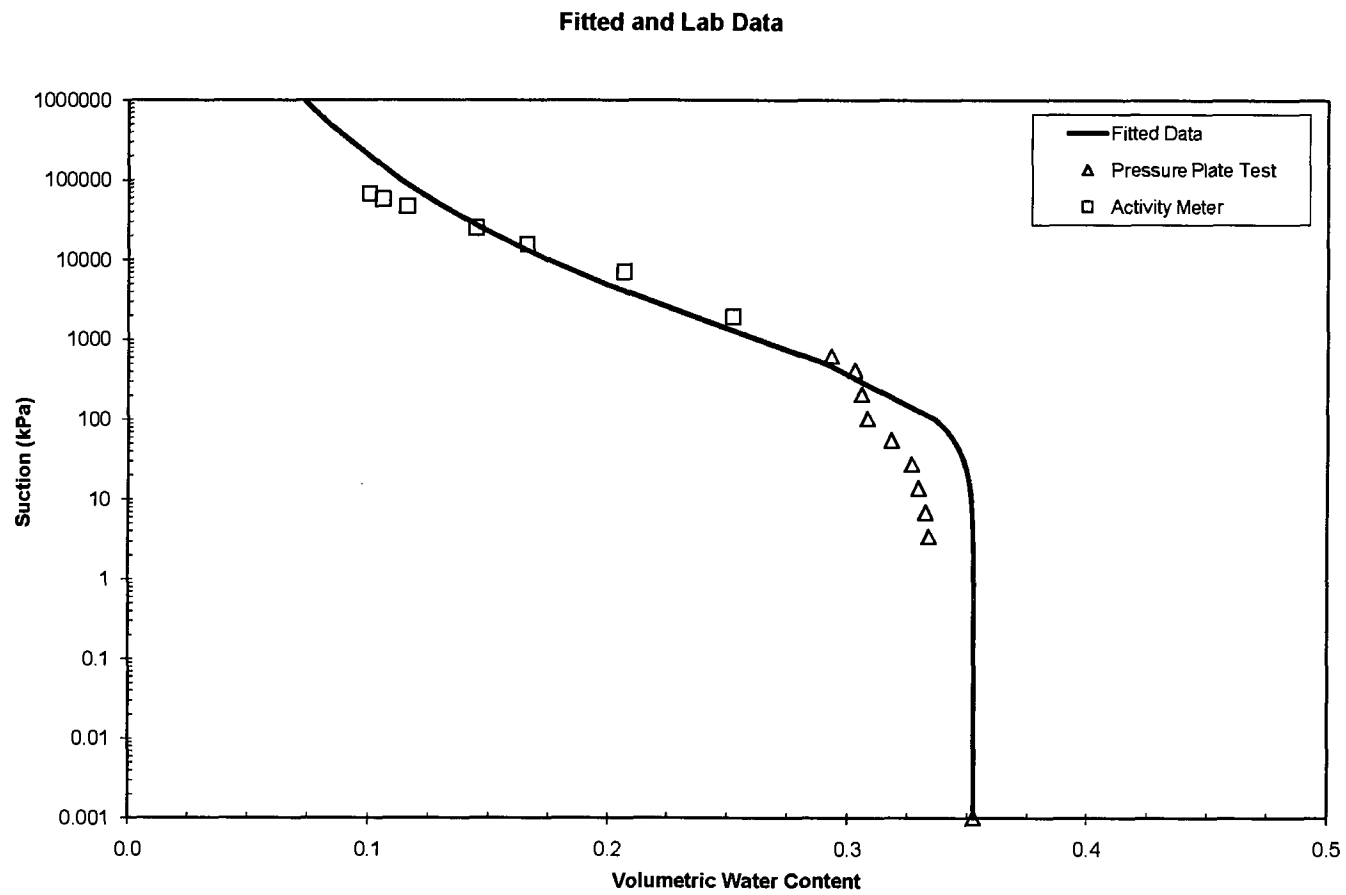
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3527
0.025	0.3527
0.05	0.3527
0.075	0.3527
0.1	0.3527
1	0.3526
2	0.3525
3	0.3524
4	0.3523
5	0.3521
6	0.3520
7	0.3519
8	0.3517
9	0.3516
10	0.3514
15	0.3507
20	0.3499
30	0.3482
40	0.3465
50	0.3448
60	0.3430
70	0.3413
80	0.3396
90	0.3379
100	0.3362
500	0.2907
1000	0.2626
5000	0.1983
10000	0.1744
25000	0.1469
5.00E+04	0.1290
1.00E+05	0.1132
5.00E+05	0.0836
7.50E+05	0.0774
1.00E+06	0.0733

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.353	0.3527	0.000	0.000
3.45	0.334	0.3523	-0.019	0.000
6.90	0.332	0.3519	-0.020	0.000
13.79	0.329	0.3509	-0.021	0.000
27.59	0.327	0.3486	-0.022	0.000
55.18	0.318	0.3439	-0.026	0.001
103.46	0.308	0.3357	-0.028	0.001
206.91	0.306	0.3203	-0.015	0.000
413.82	0.303	0.2979	0.005	0.000
620.73	0.293	0.2822	0.011	0.000
1950.00	0.252	0.2348	0.017	0.000
7110.00	0.206	0.1858	0.021	0.000
15800.00	0.166	0.1601	0.006	0.000
25200.00	0.144	0.1467	-0.002	0.000
47100.00	0.116	0.1304	-0.015	0.000
57600.00	0.106	0.1256	-0.020	0.000
68000.00	0.100	0.1217	-0.022	0.000

Residual = 0.000303468



Pressure Plate Extractor Test - Apple Valley - Clay Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	AV-B-4-C	Test Date	8/12/2008
WT of Sample Ring =	69.98 g		
WT of Sample Ring + Soil =	281.11 g		
Water Content =	22.42 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	102.27 pcf	1.64 Mg/m ³	
Water WT =	38.66 g		
Solid WT =	172.47 g		
Add Water for saturation =	3 g	Sr	101.92
Saturated Water Content =	24.15 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	2.5	0.000	0.001	0.242	0.396
0.5	7.8	1.007	3.449	0.236	0.386
1	8.7	1.178	6.897	0.235	0.385
2	10.4	1.501	13.794	0.233	0.382
4	13.2	2.033	27.588	0.230	0.377
8	16.5	2.660	55.176	0.226	0.371
15	29.9	5.206	103.455	0.211	0.346
30	34	5.985	206.910	0.207	0.339
60	42.8	7.657	413.820	0.197	0.323
90	48.3	8.702	620.730	0.191	0.313
		Activity Meter Test	1390.00	0.164	0.269
			4450.00	0.136	0.222
			11500.00	0.108	0.178
			18700.00	0.094	0.154
			34900.00	0.077	0.126
			44400.00	0.069	0.114
			55100.00	0.065	0.106
			66000.00	0.060	0.098

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
1.39	22.762	32.3461	30.9968	0.164	0.269
4.45	22.762	32.1134	30.9968	0.136	0.222
11.5	22.762	31.8902	30.9968	0.108	0.178
18.7	22.762	31.7729	30.9968	0.094	0.154
34.9	22.762	31.6291	30.9968	0.077	0.126
44.4	22.762	31.5677	30.9968	0.069	0.114
55.1	22.762	31.5291	30.9968	0.065	0.106
66	22.762	31.4874	30.9968	0.060	0.098
	22.762	31.439	30.9968	0.054	0.088

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3959
$\alpha =$	0.0070
$n =$	1.1763
$m =$	0.1499

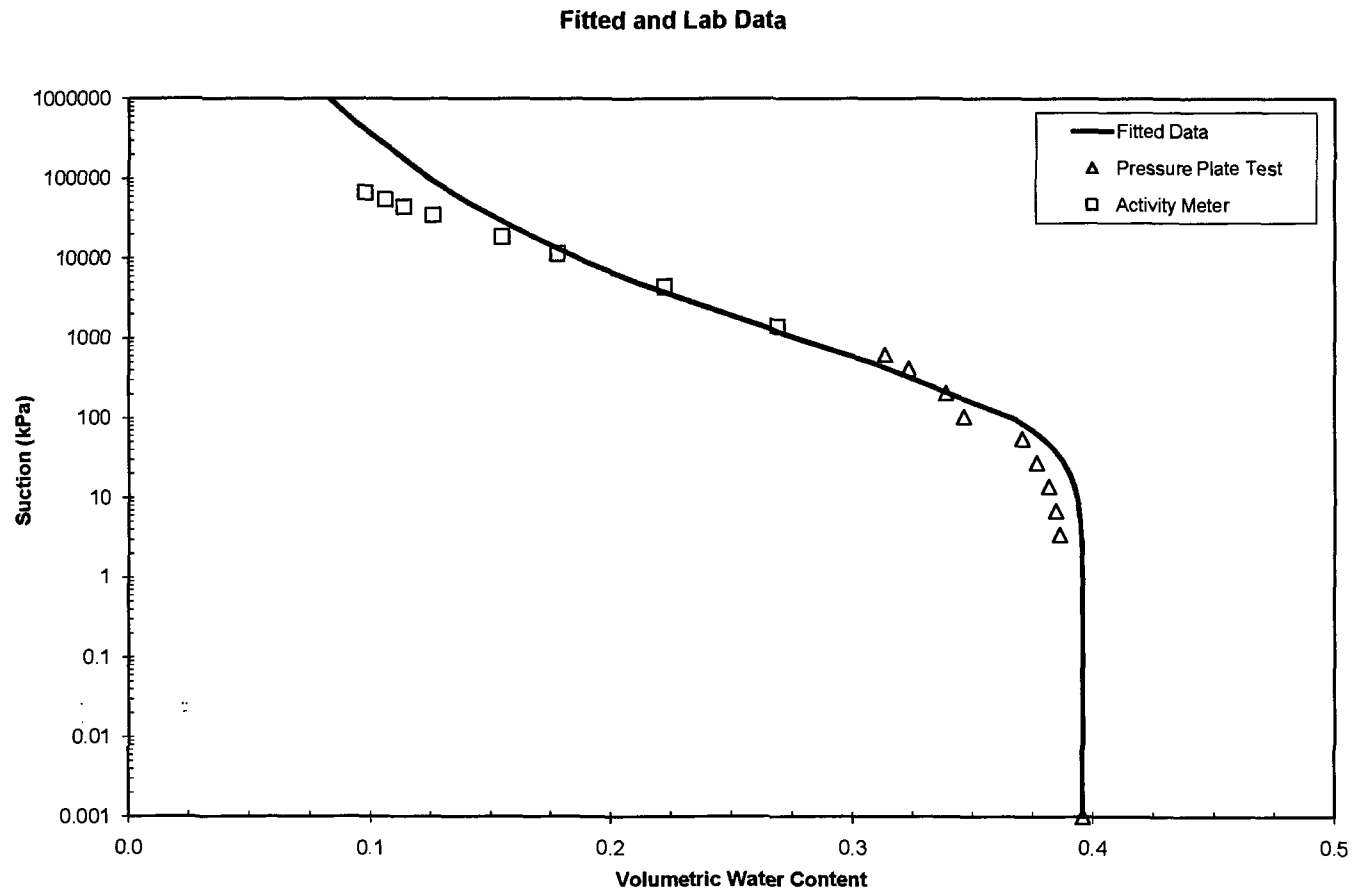
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3959
0.025	0.3959
0.05	0.3959
0.075	0.3959
0.1	0.3959
1	0.3957
2	0.3955
3	0.3953
4	0.3950
5	0.3948
6	0.3945
7	0.3942
8	0.3939
9	0.3936
10	0.3933
15	0.3918
20	0.3903
30	0.3872
40	0.3840
50	0.3809
60	0.3779
70	0.3750
80	0.3722
90	0.3695
100	0.3669
500	0.3075
1000	0.2767
5000	0.2109
10000	0.1868
25000	0.1591
5.00E+04	0.1408
1.00E+05	0.1246
5.00E+05	0.0939
7.50E+05	0.0874
1.00E+06	0.0831

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.396	0.3959	0.000	0.000
3.45	0.386	0.3952	-0.009	0.000
6.90	0.385	0.3942	-0.010	0.000
13.79	0.382	0.3922	-0.011	0.000
27.59	0.377	0.3879	-0.011	0.000
55.18	0.371	0.3794	-0.009	0.000
103.46	0.346	0.3660	-0.020	0.000
206.91	0.339	0.3440	-0.005	0.000
413.82	0.323	0.3158	0.007	0.000
620.73	0.313	0.2979	0.015	0.000
1390.00	0.269	0.2622	0.006	0.000
4450.00	0.222	0.2152	0.007	0.000
11500.00	0.178	0.1823	-0.005	0.000
18700.00	0.154	0.1674	-0.013	0.000
34900.00	0.126	0.1500	-0.024	0.001
44400.00	0.114	0.1438	-0.030	0.001
55100.00	0.106	0.1384	-0.032	0.001
66000.00	0.098	0.1341	-0.036	0.001

Residual = 0.000104174



Pressure Plate Extractor Test - Boardman - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	150-mm 6' Upper Slope Surface	Test Date
WT of Sample Ring =	0 g	
WT of Sample Ring + Soil =	1399 g	
Water Content =	33.09 %	
Diameter of Sample Ring, D =	5.90 in	
Height of Sample Ring, L =	1.5 in	
Volume, V =	2.37E-02 ft ³	672.0 cm ³
Dry Unit Weight =	97.65 pcf	1.56 Mg/m ³
Water WT =	347.86 g	
Solid WT =	1051.17 g	
Add Water for saturation =	0 g	Sr 124.45
Saturated Water Content =	33.09 %	
Tube Area, A =	0.19 cm ²	

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0		0.000	0.001	0.331	0.518
5		20.000	34.485	0.312	0.488
8.3		59.000	57.245	0.275	0.430
13.9		116.500	95.868	0.220	0.344
21.5		149.500	148.286	0.189	0.295
34.5		161.500	237.947	0.177	0.277
59.6		175.000	411.061	0.164	0.257
		Activity Meter Test	1380.00	0.069	0.108
			3490.00	0.047	0.073
			5510.00	0.039	0.061
			34100.00	0.025	0.039
			0.00	0.000	0.000

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
1.38	18.018	25.8126	25.3094	0.069	0.108
3.49	18.421	26.0578	25.7182	0.047	0.073
5.51	18.5184	26.0582	25.7765	0.039	0.061
34.1	20.5459	28.009	27.8285	0.025	0.039

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.5180
$\alpha =$	0.0174
$n =$	1.4500
$m =$	0.3103

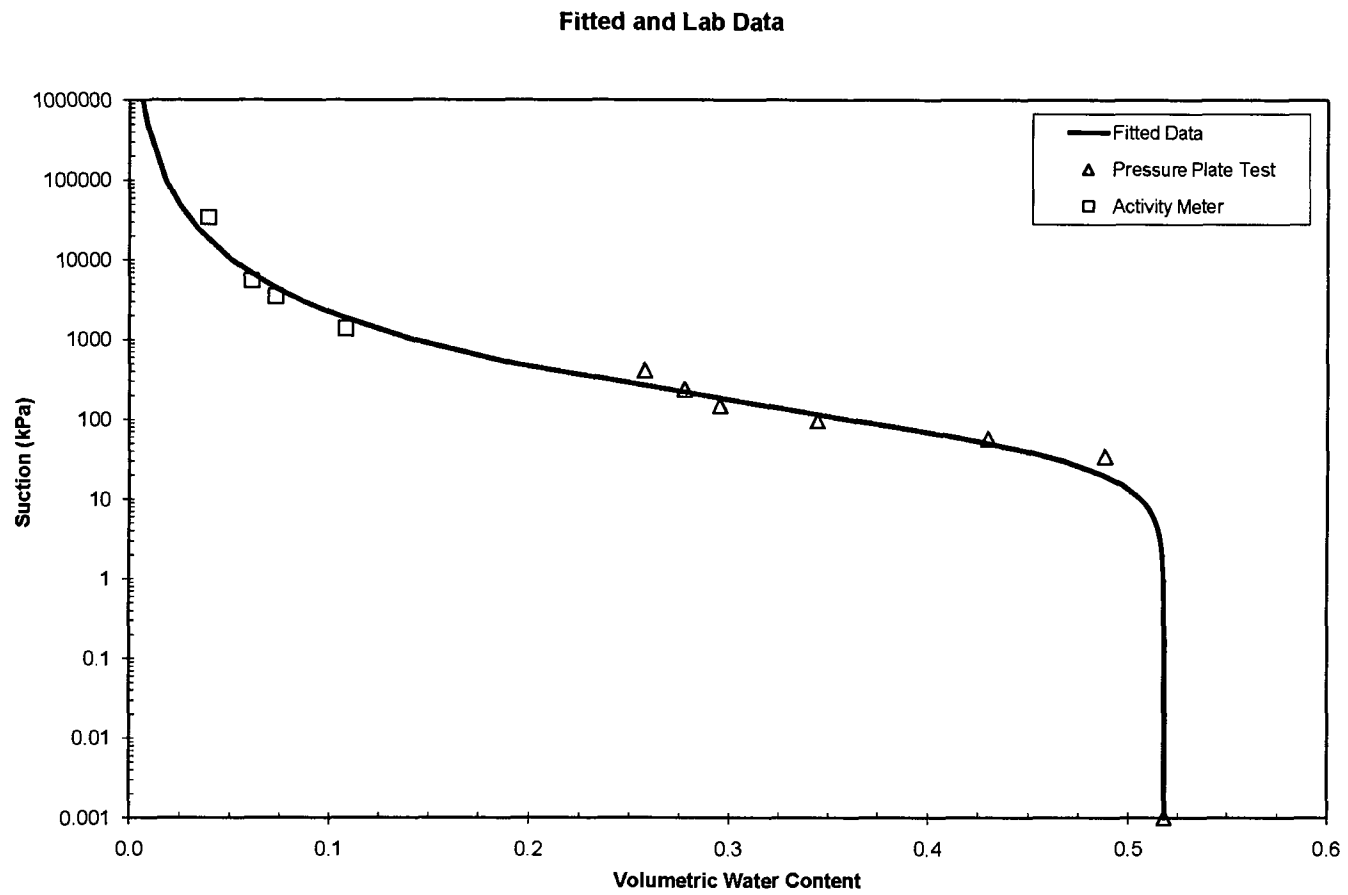
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.5180
0.025	0.5180
0.05	0.5180
0.075	0.5180
0.1	0.5180
1	0.5175
2	0.5168
3	0.5158
4	0.5147
5	0.5134
6	0.5121
7	0.5106
8	0.5091
9	0.5075
10	0.5058
15	0.4969
20	0.4874
30	0.4676
40	0.4483
50	0.4302
60	0.4134
70	0.3961
80	0.3841
90	0.3713
100	0.3597
500	0.1929
1000	0.1424
2000	0.1046
3000	0.0872
4000	0.0766
5000	0.0693
10000	0.0508
25000	0.0336
5.00E+04	0.0246
1.00E+05	0.0180
5.00E+05	0.0067
7.50E+05	0.0073
1.00E+06	0.0064

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.518	0.5180	0.000	0.000
34.49	0.488	0.4588	0.029	0.001
57.25	0.430	0.4179	0.012	0.000
95.87	0.344	0.3644	-0.020	0.000
148.29	0.295	0.3150	-0.020	0.000
237.95	0.277	0.2631	0.014	0.000
411.06	0.257	0.2098	0.048	0.002
1380.00	0.108	0.1234	-0.015	0.000
3490.00	0.073	0.0815	-0.009	0.000
5510.00	0.061	0.0664	-0.006	0.000
34100.00	0.039	0.0292	0.010	0.000

Residual = 0.000426278



Pressure Plate Extractor Test - Boardman - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	6" Upper Slope Surface	Test Date
WT of Sample Ring =	69.68 g	
WT of Sample Ring + Soil =	286.79 g	
Water Content =	22.62 %	
Diameter of Sample Ring, D =	2.86 in	
Height of Sample Ring, L =	1.0 in	
Volume, V =	3.72E-03 ft ³	105.3 cm ³
Dry Unit Weight =	104.99 pcf	1.68 Mg/m ³
Water WT =	40.06 g	
Solid WT =	177.05 g	
Add Water for saturation =	0 g	Sr 102.28
Saturated Water Content =	22.62 %	
Tube Area, A =	0.19 cm ²	

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	12	0.000	0.001	0.226	0.381
0.5	19.2	1.368	3.449	0.219	0.368
1	19.5	1.425	6.897	0.218	0.367
2	20.1	1.539	13.794	0.218	0.366
4	16.4	0.836	27.588	0.222	0.373
8	21.3	1.767	55.176	0.216	0.364
15	40.6	5.434	103.455	0.196	0.329
30	58.5	8.835	206.910	0.176	0.297
60	111.8	18.962	413.820	0.119	0.200
90	118.7	20.273	620.730	0.112	0.188
		Activity Meter Test	1290.00	0.063	0.106
			1570.00	0.058	0.098
			4830.00	0.041	0.069
			17200.00	0.029	0.049
			61800.00	0.021	0.035

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
1.29	18.6729	26.9807	26.4869	0.063	0.106
1.57	19.5189	27.8048	27.349	0.058	0.098
4.83	18.1361	26.314	25.9921	0.041	0.069
17.2	19.5513	27.6115	27.3843	0.029	0.049
61.8	19.4836	27.4826	27.3192	0.021	0.035

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta_s - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0356
$\theta_s =$	0.3715
$\alpha =$	0.0045
$n =$	1.8122
$m =$	0.4482

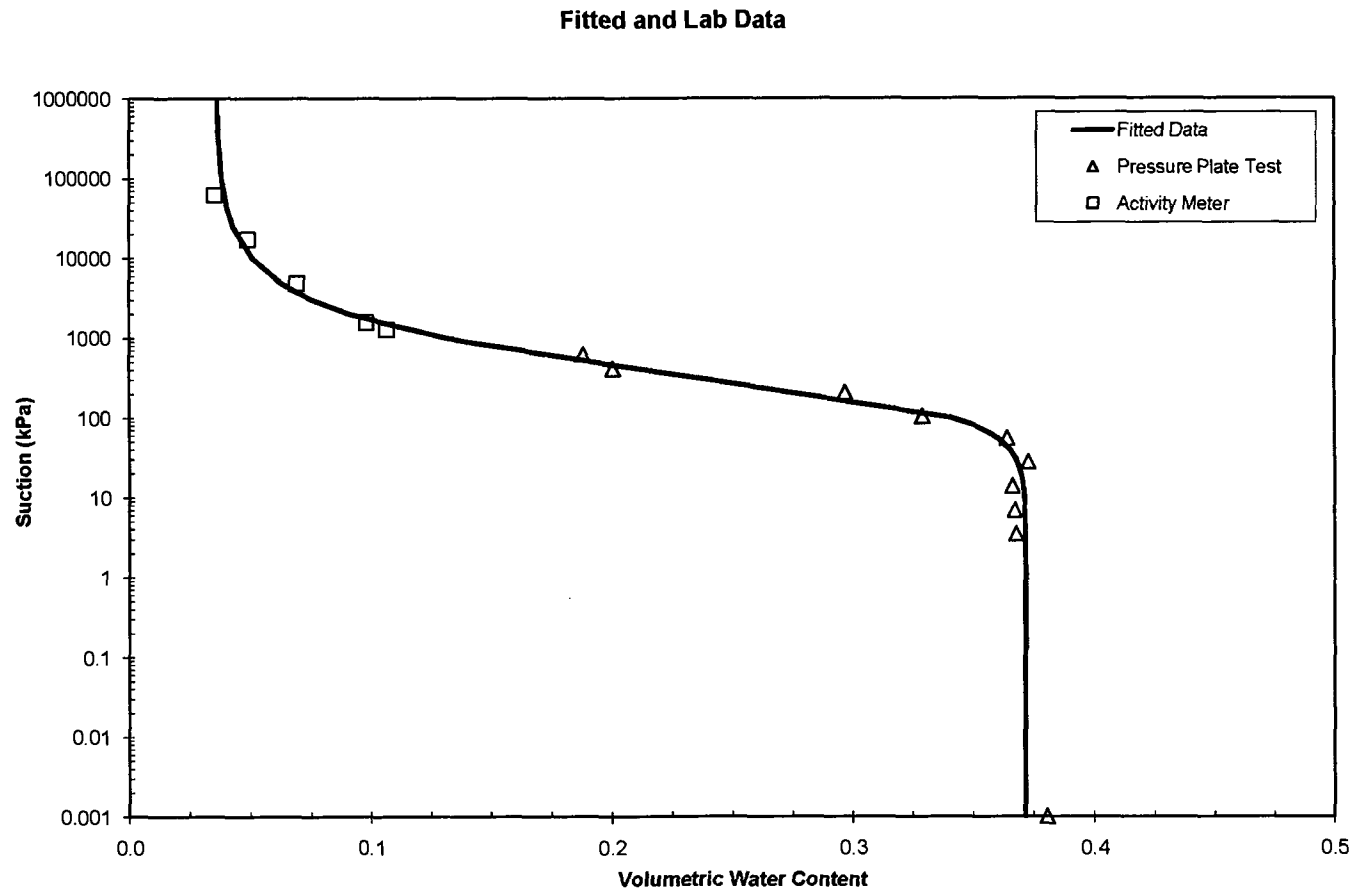
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3715
0.025	0.3715
0.05	0.3715
0.075	0.3715
0.1	0.3715
1	0.3715
2	0.3715
3	0.3715
4	0.3714
5	0.3714
6	0.3713
7	0.3713
8	0.3712
9	0.3711
10	0.3710
15	0.3704
20	0.3696
30	0.3676
40	0.3649
50	0.3618
60	0.3582
70	0.3542
80	0.3500
90	0.3455
100	0.3408
500	0.1932
1000	0.1312
2000	0.0912
3000	0.0757
4000	0.0674
5000	0.0622
10000	0.0508
25000	0.0428
5.00E+04	0.0397
1.00E+05	0.0380
5.00E+05	0.0363
7.50E+05	0.0361
1.00E+06	0.0360

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.381	0.3715	0.009	0.000
3.45	0.368	0.3715	-0.004	0.000
6.90	0.367	0.3713	-0.004	0.000
13.79	0.366	0.3706	-0.005	0.000
27.59	0.373	0.3681	0.005	0.000
55.18	0.364	0.3600	0.004	0.000
103.46	0.329	0.3391	-0.010	0.000
206.91	0.297	0.2880	0.009	0.000
413.82	0.200	0.2134	-0.013	0.000
620.73	0.188	0.1715	0.017	0.000
1290.00	0.106	0.1142	-0.008	0.000
1570.00	0.098	0.1029	-0.005	0.000
4830.00	0.069	0.0629	0.006	0.000
17200.00	0.049	0.0454	0.003	0.000
61800.00	0.035	0.0391	-0.004	0.000

Residual = 6.29606E-05



Pressure Plate Extractor Test - Boardman - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	Boardman -6'- Upper Slope- 3'-4'	Test Date	6/5/2008
WT of Sample Ring =	70.61 g		
WT of Sample Ring + Soil =	298.51 g		
Water Content =	20.34 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	112.30 pcf	1.80	Mg/m ³
Water WT =	38.52 g		
Solid WT =	189.38 g		
Add Water for saturation =	0 g	Sr	111.44
Saturated Water Content =	20.34 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	8.3	0.000	0.001	0.203	0.366
0.5	8.8	0.095	3.449	0.203	0.365
1	8.8	0.095	6.897	0.203	0.365
2	9.3	0.190	13.794	0.202	0.364
4	11.7	0.646	27.588	0.200	0.360
8	14.9	1.254	55.176	0.197	0.354
15	20.3	2.280	103.455	0.191	0.344
30	28.5	3.838	206.910	0.183	0.330
60	43.2	6.631	413.820	0.168	0.303
		Activity Meter Test	11400.00	0.031	0.055
			48700.00	0.019	0.034
			73800.00	0.016	0.029

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
11.4	18.8011	27.4672	27.2104	0.031	0.055
48.7	20.5239	29.0924	28.9325	0.019	0.034
73.8	18.8309	27.3813	27.244	0.016	0.029

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0119
$\theta_s =$	0.3660
$\alpha =$	0.0021
$n =$	1.6227
$m =$	0.3837

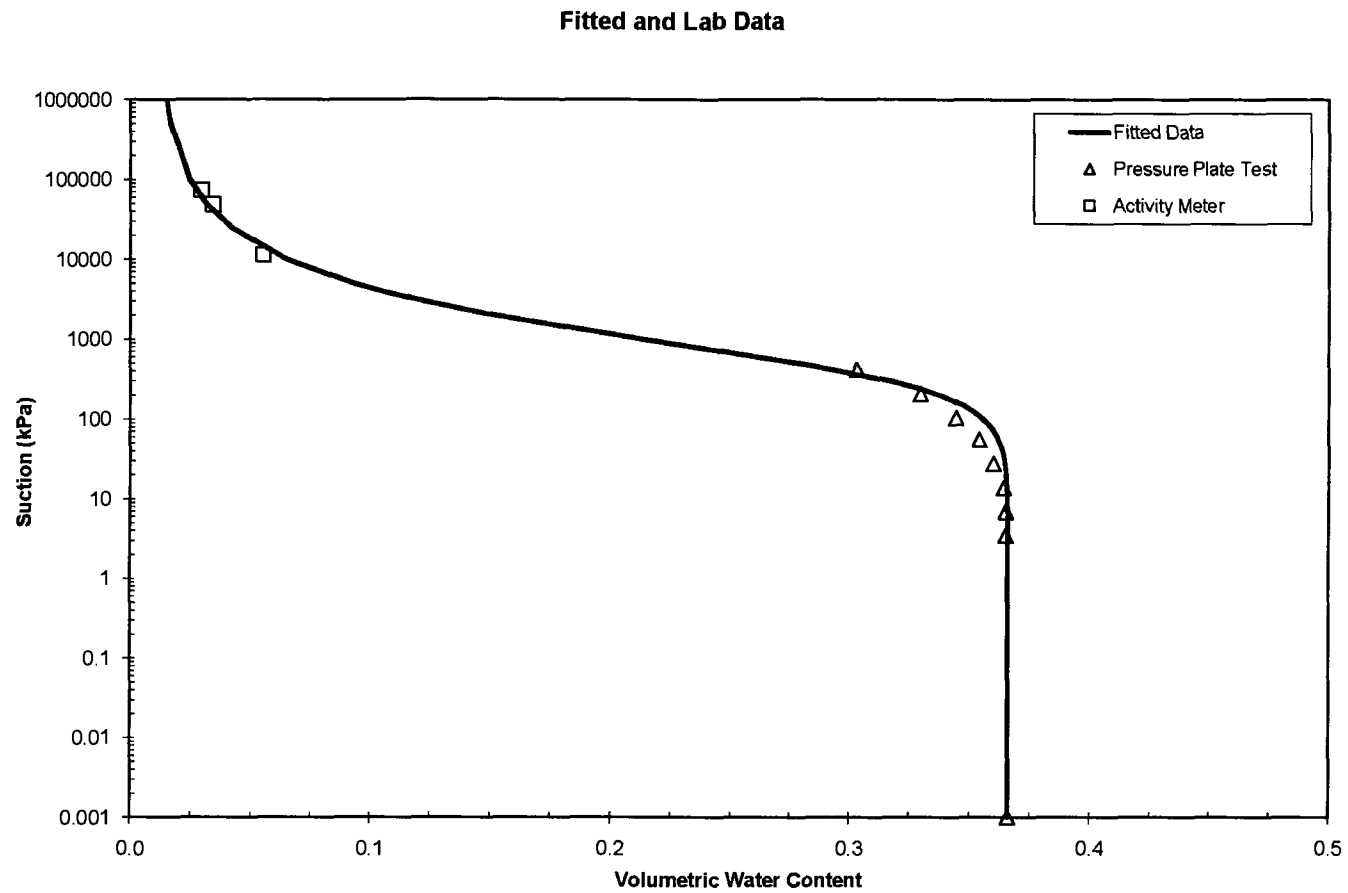
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3660
0.025	0.3660
0.05	0.3660
0.075	0.3660
0.1	0.3660
1	0.3660
2	0.3660
3	0.3660
4	0.3659
5	0.3659
6	0.3659
7	0.3659
8	0.3658
9	0.3658
10	0.3657
15	0.3655
20	0.3652
30	0.3645
40	0.3636
50	0.3626
60	0.3614
70	0.3601
80	0.3588
90	0.3573
100	0.3558
125	0.3517
150	0.3472
175	0.3424
200	0.3375
250	0.3274
300	0.3172
500	0.2793
1000	0.2138
2000	0.1518
3000	0.1225
4000	0.1050
5000	0.0932
10000	0.0650
25000	0.0419
5.00E+04	0.0314
1.00E+05	0.0246
5.00E+05	0.0165
7.50E+05	0.0155
1.00E+06	0.0149

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.366	0.3660	0.000	0.000
3.45	0.365	0.3660	-0.001	0.000
6.90	0.365	0.3659	-0.001	0.000
13.79	0.364	0.3656	-0.001	0.000
27.59	0.360	0.3647	-0.005	0.000
55.18	0.354	0.3620	-0.008	0.000
103.46	0.344	0.3552	-0.011	0.000
206.91	0.330	0.3362	-0.007	0.000
413.82	0.303	0.2949	0.008	0.000
11400.00	0.055	0.0608	-0.006	0.000
48700.00	0.034	0.0317	0.002	0.000
73800.00	0.029	0.0272	0.002	0.000

Residual = 3.00122E-05



Pressure Plate Extractor Test - Boardman - Store-and-Release Cover
ASTM D 6836 - 02 (Method B)

Sample I.D.	Boardman 6' Lower Slope-Surface	Test Date	6/5/2008
WT of Sample Ring =	70.8 g		
WT of Sample Ring + Soil =	293.15 g		
Water Content =	24.27 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	106.10 pcf	1.70	Mg/m ³
Water WT =	43.42 g		
Solid WT =	178.93 g		
Add Water for saturation =	0 g	Sr	112.88
Saturated Water Content =	24.27 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	16.9	0.000	0.001	0.243	0.413
0.5	25.4	1.615	3.449	0.234	0.397
1	25.8	1.691	6.897	0.233	0.397
2	26	1.729	13.794	0.233	0.396
4	18.2	0.247	27.588	0.241	0.410
8	20.2	0.627	55.176	0.239	0.407
15	26.7	1.862	103.455	0.232	0.395
30	39	4.199	206.910	0.219	0.373
60	47.3	5.776	413.820	0.210	0.358
90	104.8	16.701	620.730	0.149	0.254
Activity Meter Test			930.00	0.114	0.194
			1100.00	0.081	0.139
			2690.00	0.052	0.088
			20500.00	0.028	0.047
			59800.00	0.021	0.035

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
0.93	20.5234	29.2042	28.3157	0.114	0.194
1.1	20.4479	28.9174	28.2793	0.081	0.139
2.69	18.8005	27.0448	26.6394	0.052	0.088
20.5	19.5513	27.6018	27.3834	0.028	0.047
59.8	18.4024	26.3931	26.2316	0.021	0.035

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta_s - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0437
$\theta_s =$	0.4130
$\alpha =$	0.0018
$n =$	2.5856
$m =$	0.6132

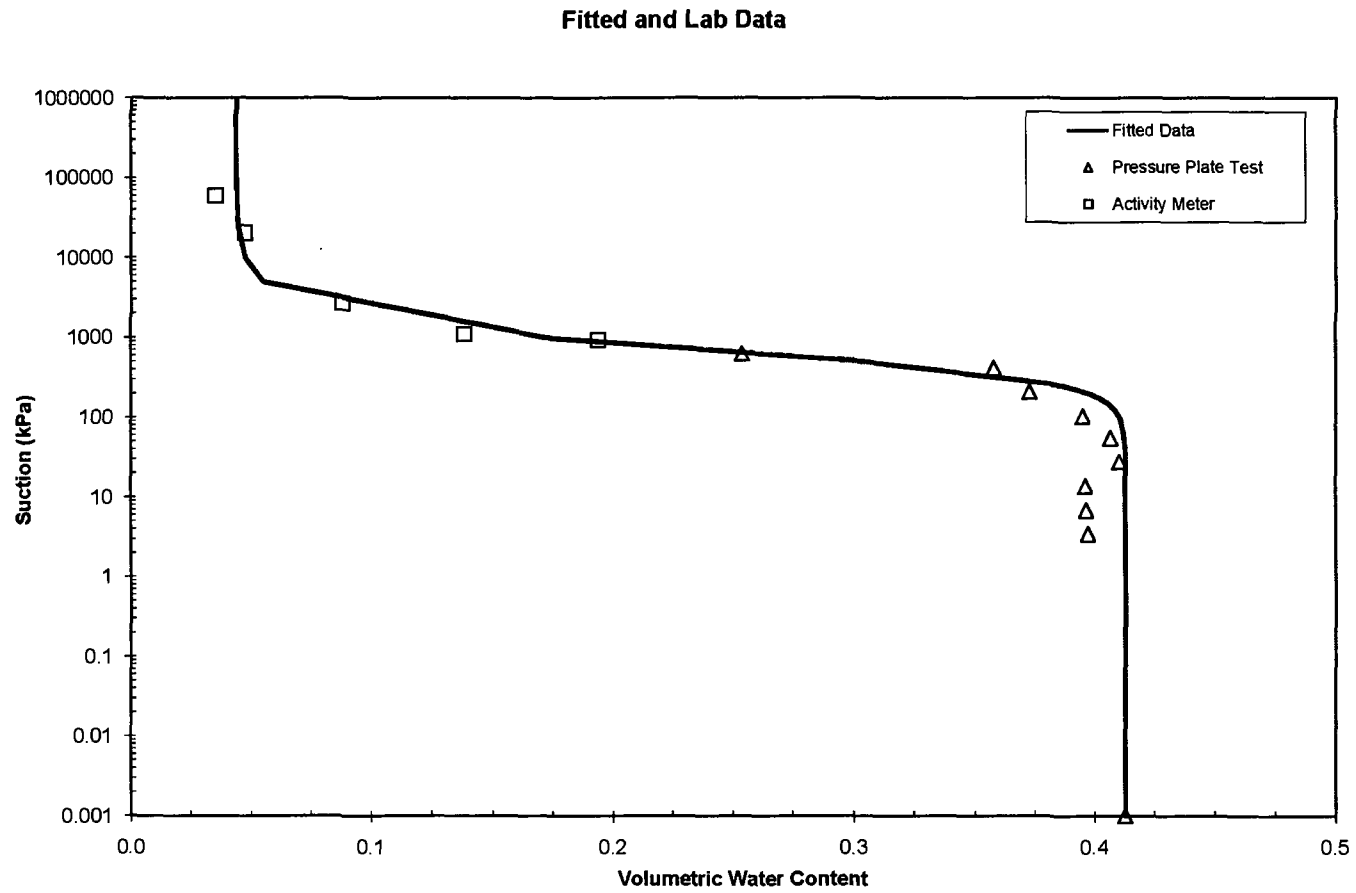
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4130
0.025	0.4130
0.05	0.4130
0.075	0.4130
0.1	0.4130
1	0.4130
2	0.4130
3	0.4130
4	0.4130
5	0.4130
6	0.4130
7	0.4130
8	0.4130
9	0.4130
10	0.4130
15	0.4130
20	0.4130
30	0.4129
40	0.4127
50	0.4125
60	0.4123
70	0.4119
80	0.4115
90	0.4110
100	0.4103
125	0.4083
150	0.4055
175	0.4019
200	0.3976
250	0.3867
500	0.3042
750	0.2251
1000	0.1720
5000	0.0549
10000	0.0474
25000	0.0446
5.00E+04	0.0440
1.00E+05	0.0438
5.00E+05	0.0437
7.50E+05	0.0437
1.00E+06	0.0437

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.413	0.4130	0.000	0.000
3.45	0.397	0.4130	-0.016	0.000
6.90	0.397	0.4130	-0.016	0.000
13.79	0.396	0.4130	-0.017	0.000
27.59	0.410	0.4129	-0.003	0.000
55.18	0.407	0.4124	-0.006	0.000
103.46	0.395	0.4101	-0.015	0.000
206.91	0.373	0.3963	-0.024	0.001
413.82	0.358	0.3353	0.022	0.001
620.73	0.254	0.2629	-0.009	0.000
930.00	0.194	0.1845	0.009	0.000
1100.00	0.139	0.1568	-0.018	0.000
2690.00	0.088	0.0735	0.014	0.000
20500.00	0.047	0.0449	0.003	0.000
59800.00	0.035	0.0439	-0.009	0.000

Residual = 0.000194786



Pressure Plate Extractor Test - Boardman - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	Boardman-6'-Lower Slope- 5'-6'	Test Date	5/7/2008
WT of Sample Ring =	69.35 g		
WT of Sample Ring + Soil =	283.12 g		
Water Content =	23.00 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	103.06 pcf	1.65 Mg/m ³	
Water WT =	39.97 g		
Solid WT =	173.80 g		
Add Water for saturation =	2.23 g	Sr	104.51
Saturated Water Content =	24.28 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	14.3	0.000	0.001	0.243	0.401
1	18.36	0.771	6.897	0.238	0.394
2	19	0.893	13.794	0.238	0.393
4	33.2	3.591	27.588	0.222	0.367
8	72.2	11.001	55.176	0.180	0.296
15	106.9	17.594	103.455	0.142	0.234
30	129.2	21.831	206.910	0.117	0.194
60	143.6	24.567	413.820	0.101	0.168
90	148.9	25.574	620.730	0.096	0.158
		Activity Meter Test	1070.00	0.065	0.108
			3120.00	0.042	0.070
			36300.00	0.022	0.037
			650.00	0.085	0.141
			23500.00	0.025	0.041

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
36.3	18.5001	26.3735	26.2028	0.022	0.037
3.12	19.485	27.4997	27.1757	0.042	0.070
1.07	19.5061	27.5888	27.0924	0.065	0.108
0.65	19.5533	27.7762	27.1293	0.085	0.141
23.5	22.01	29.822	29.634	0.025	0.041

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4010
$\alpha =$	0.0285
$n =$	1.3671
$m =$	0.2685

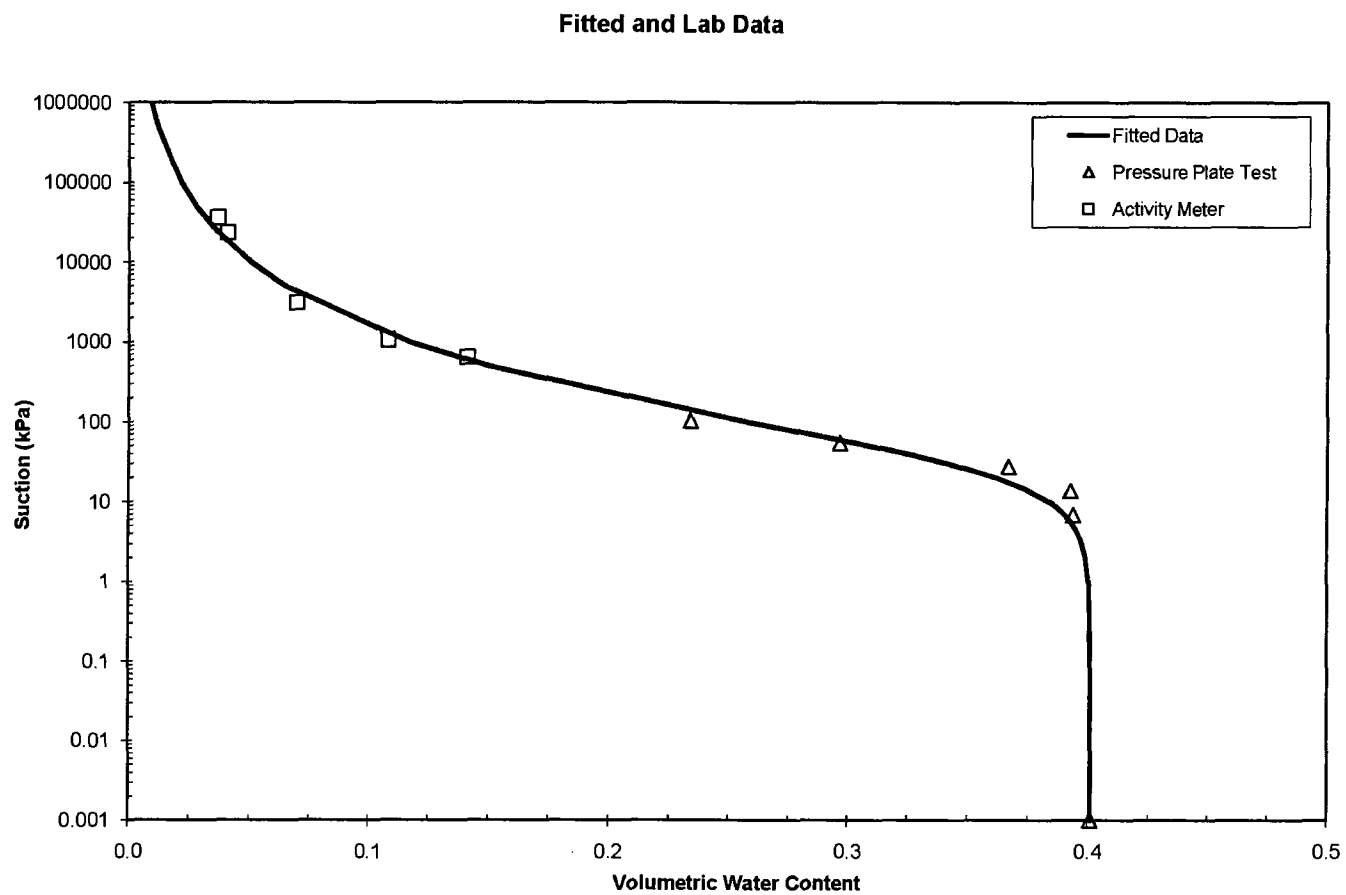
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4010
0.025	0.4010
0.05	0.4010
0.075	0.4010
0.1	0.4010
1	0.4002
2	0.3989
3	0.3974
4	0.3957
5	0.3939
6	0.3919
7	0.3899
8	0.3879
9	0.3858
10	0.3837
15	0.3728
20	0.3621
30	0.3422
40	0.3248
50	0.3097
60	0.2965
70	0.2851
80	0.2749
90	0.2659
100	0.2579
500	0.1503
1000	0.1170
5000	0.0650
10000	0.0504
25000	0.0360
5.00E+04	0.0279
1.00E+05	0.0216
5.00E+05	0.0120
7.50E+05	0.0103
1.00E+06	0.0093

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.401	0.4010	0.000	0.000
6.90	0.394	0.3901	0.004	0.000
13.79	0.393	0.3754	0.017	0.000
27.59	0.367	0.3468	0.020	0.000
55.18	0.296	0.3026	-0.006	0.000
103.46	0.234	0.2553	-0.021	0.000
206.91	0.194	0.2045	-0.011	0.000
413.82	0.168	0.1607	0.007	0.000
620.73	0.158	0.1390	0.019	0.000
1070.00	0.108	0.1142	-0.006	0.000
3120.00	0.070	0.0772	-0.008	0.000
36300.00	0.037	0.0314	0.005	0.000
650.00	0.141	0.1367	0.004	0.000
23500.00	0.041	0.0368	0.004	0.000

Residual = 0.000135062



Pressure Plate Extractor Test - Cedar Rapids - Clay Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	ICY1U	Test Date	12/1/2006
WT of Sample Ring =	69.21 g		
WT of Sample Ring + Soil =	306.39 g		
Water Content =	13.90 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	123.48 pcf	1.98	Mg/m ³
Water WT =	28.94 g		
Solid WT =	208.24 g		
Add Water for saturation =	0 g	Sr	105.14
Saturated Water Content =	13.90 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	22	0.000	0.001	0.139	0.275
0.5	22.4	0.076	3.449	0.139	0.274
1	22.5	0.095	6.897	0.139	0.274
2	20.1	-0.361	13.794	0.141	0.278
4	22.1	0.019	27.588	0.139	0.275
8	24.9	0.551	55.176	0.136	0.270
15	31.8	1.862	103.455	0.130	0.257
30	34.1	2.299	206.910	0.128	0.253
60	40.4	3.496	413.820	0.122	0.242
90	45	4.370	620.730	0.118	0.234
		Activity Meter Test	970.00	0.111	0.220
			3020.00	0.072	0.142
			11900.00	0.045	0.088

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
11.9	7.4819	17.0918	16.682	0.045	0.088
3.02	7.7149	17.3654	16.7197	0.072	0.142
0.97	7.7406	17.9713	16.9476	0.111	0.220

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.2751
$\alpha =$	0.0014
$n =$	1.4011
$m =$	0.2863

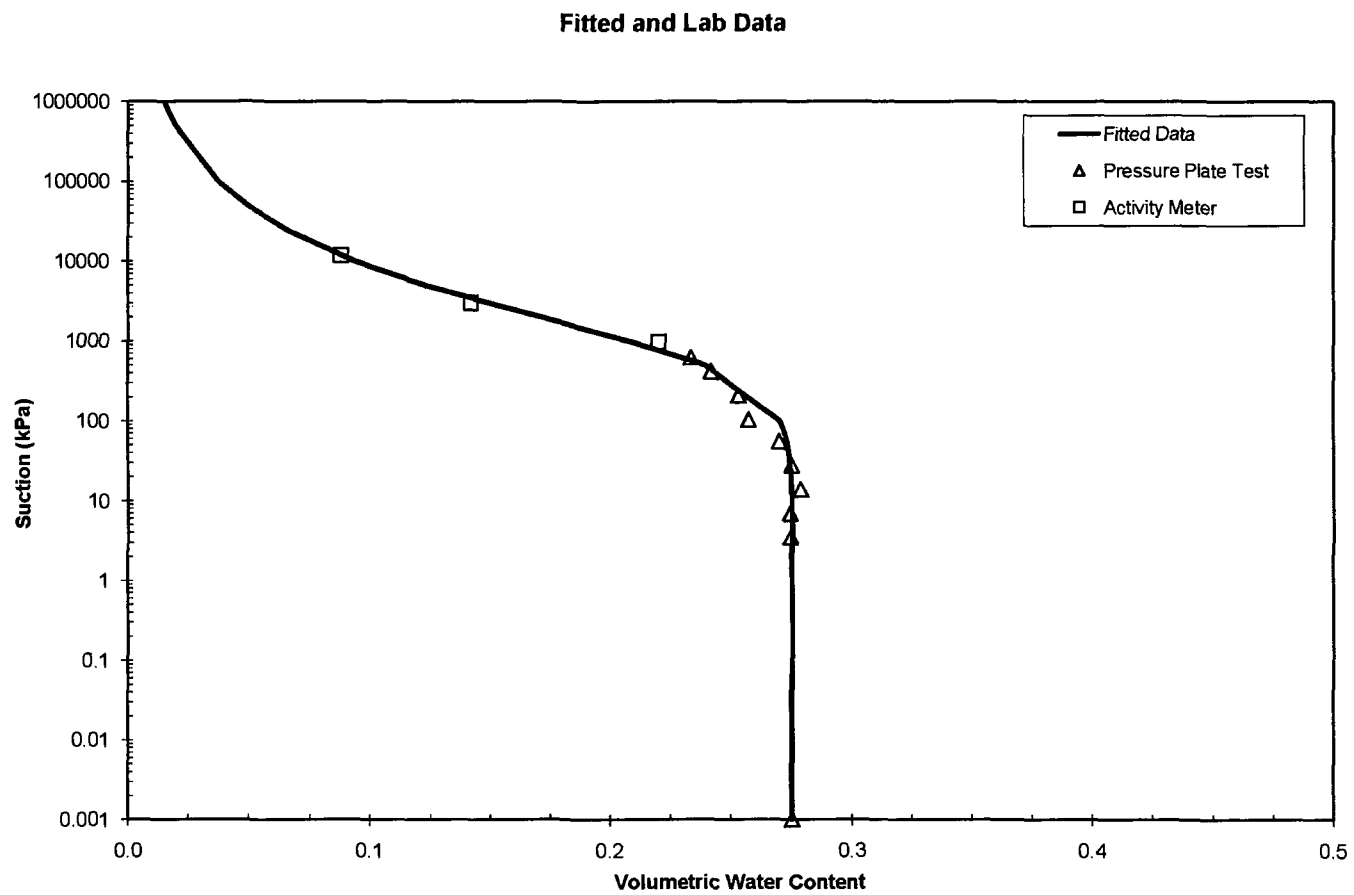
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.2751
0.025	0.2751
0.05	0.2751
0.075	0.2751
0.1	0.2751
1	0.2751
2	0.2750
3	0.2750
4	0.2750
5	0.2750
6	0.2750
7	0.2749
8	0.2749
9	0.2749
10	0.2749
15	0.2747
20	0.2745
30	0.2741
40	0.2736
50	0.2731
60	0.2726
70	0.2720
80	0.2714
90	0.2708
100	0.2701
500	0.2393
1000	0.2080
5000	0.1227
10000	0.0939
25000	0.0654
5.00E+04	0.0496
1.00E+05	0.0375
5.00E+05	0.0197
7.50E+05	0.0167
1.00E+06	0.0149

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.275	0.2751	0.000	0.000
3.45	0.274	0.2750	-0.001	0.000
6.90	0.274	0.2749	-0.001	0.000
13.79	0.278	0.2747	0.004	0.000
27.59	0.275	0.2742	0.001	0.000
55.18	0.270	0.2729	-0.003	0.000
103.46	0.257	0.2699	-0.013	0.000
206.91	0.253	0.2622	-0.009	0.000
413.82	0.242	0.2458	-0.004	0.000
620.73	0.234	0.2307	0.003	0.000
970.00	0.220	0.2096	0.010	0.000
3020.00	0.142	0.1477	-0.006	0.000
11900.00	0.088	0.0877	0.000	0.000

Residual = 3.29537E-05



Pressure Plate Extractor Test - Cedar Rapids - Clay Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	ICY2L	Test Date	7/1/2006
WT of Sample Ring =	70.85 g		
WT of Sample Ring + Soil =	304.11 g		
Water Content =	14.18 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	121.14 pcf	1.94	Mg/m ³
Water WT =	28.97 g		
Solid WT =	204.29 g		
Add Water for saturation =	0.04 g	Sr	100.04
Saturated Water Content =	14.20 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	62.5	0.000	0.001	0.142	0.276
0.5	69.6	1.349	3.449	0.135	0.263
1	66	0.665	6.897	0.139	0.269
2	65.5	0.570	13.794	0.139	0.270
4	64	0.285	27.588	0.141	0.273
8	66.3	0.722	55.176	0.138	0.269
15	69.3	1.292	103.455	0.136	0.263
30	71.5	1.710	206.910	0.134	0.259
60	72.6	1.919	413.820	0.133	0.257
90	77.4	2.831	620.730	0.128	0.249
		Activity Meter Test	13700.00	0.039	0.076
			720.00	0.133	0.258
			10000.00	0.042	0.081
			29200.00	0.029	0.056

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
10	7.6648	16.923	16.5506	0.042	0.081
0.72	7.9967	18.0311	16.854	0.133	0.258
13.7	8.6279	17.9553	17.6043	0.039	0.076
29.2	7.7438	16.92	16.6611	0.029	0.056

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0266
$\theta_s =$	0.2757
$\alpha =$	0.0007
$n =$	1.7105
$m =$	0.4154

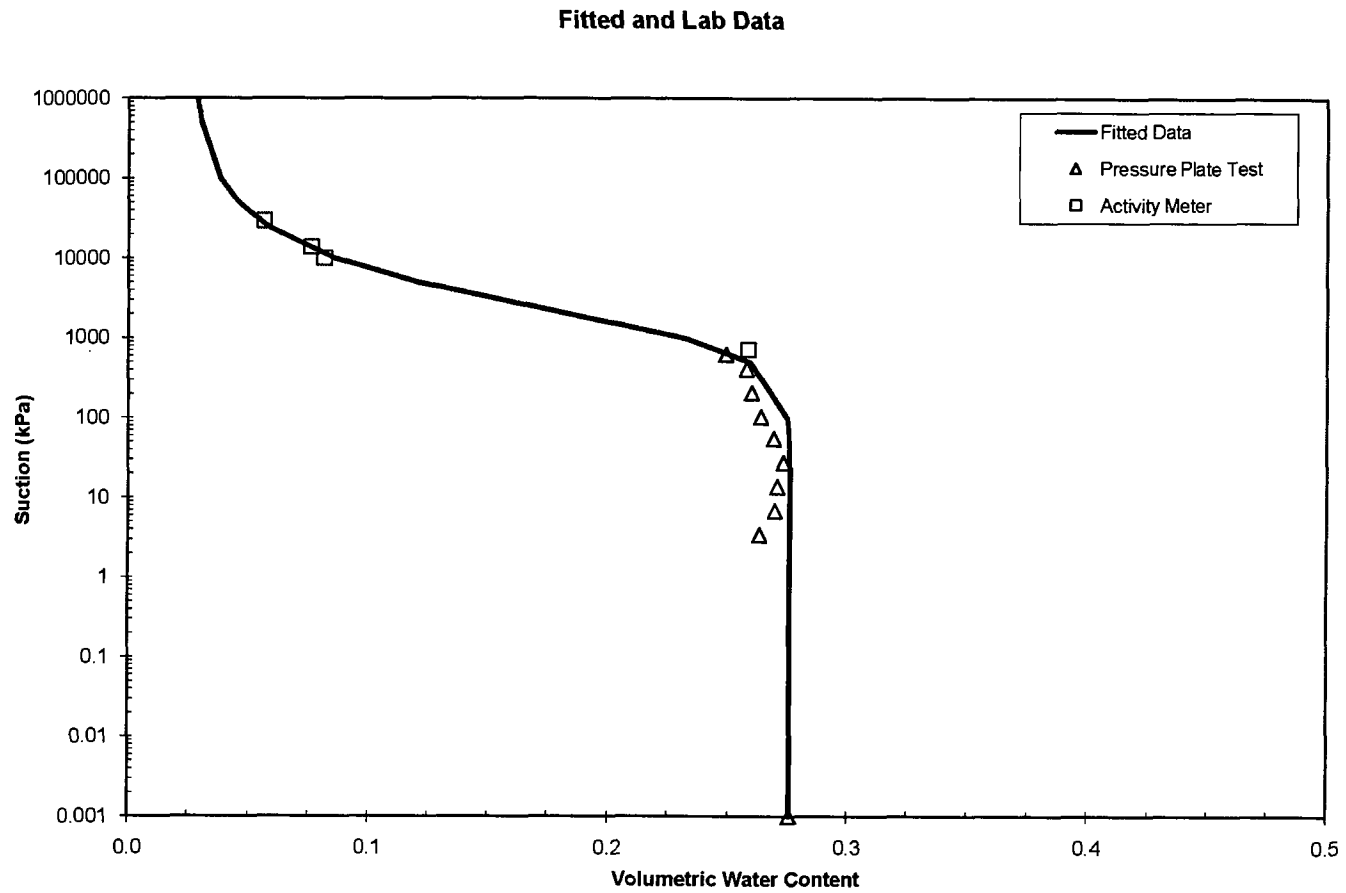
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.2757
0.025	0.2757
0.05	0.2757
0.075	0.2757
0.1	0.2757
1	0.2757
2	0.2757
3	0.2757
4	0.2757
5	0.2757
6	0.2757
7	0.2757
8	0.2757
9	0.2757
10	0.2757
15	0.2757
20	0.2756
30	0.2756
40	0.2755
50	0.2753
60	0.2752
70	0.2751
80	0.2749
90	0.2747
100	0.2745
500	0.2589
1000	0.2316
5000	0.1207
10000	0.0858
25000	0.0578
5.00E+04	0.0457
1.00E+05	0.0383
5.00E+05	0.0303
7.50E+05	0.0294
1.00E+06	0.0288

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.276	0.2757	0.000	0.000
3.45	0.263	0.2757	-0.013	0.000
6.90	0.269	0.2757	-0.006	0.000
13.79	0.270	0.2757	-0.005	0.000
27.59	0.273	0.2756	-0.003	0.000
55.18	0.269	0.2753	-0.006	0.000
103.46	0.263	0.2744	-0.011	0.000
206.91	0.259	0.2716	-0.012	0.000
413.82	0.257	0.2632	-0.006	0.000
620.73	0.249	0.2525	-0.004	0.000
0.00	0.000	0.2757	-0.276	0.076
13700.00	0.076	0.0742	0.002	0.000
720.00	0.258	0.2471	0.011	0.000
10000.00	0.081	0.0858	-0.004	0.000
29200.00	0.056	0.0545	0.002	0.000

Residual = 0.00511726



Pressure Plate Extractor Test - Cedar Rapids - Clay Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	ICY2U	Test Date	12/1/2006
WT of Sample Ring =	70.61 g		
WT of Sample Ring + Soil =	305.2 g		
Water Content =	14.66 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	121.32 pcf	1.94	Mg/m ³
Water WT =	29.99 g		
Solid WT =	204.60 g		
Add Water for saturation =	0 g	Sr	103.83
Saturated Water Content =	14.66 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	18.4	0.000	0.001	0.147	0.285
0.5	30.4	2.280	3.449	0.135	0.263
1	30.2	2.242	6.897	0.136	0.264
2	27.5	1.729	13.794	0.138	0.269
4	29.6	2.128	27.588	0.136	0.265
8	23.5	0.969	55.176	0.142	0.276
15	25.3	1.311	103.455	0.140	0.273
30	31.4	2.470	206.910	0.135	0.262
60	41.9	4.465	413.820	0.125	0.243
90	40.6	4.218	620.730	0.126	0.245
		Activity Meter Test	760.00	0.128	0.249
			33100.00	0.030	0.059
			54000.00	0.025	0.048

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
54	8.0014	17.249	17.0247	0.025	0.048
33.1	8.6299	17.8625	17.5909	0.030	0.059
0.76	7.7444	17.6593	16.5349	0.128	0.249

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.2850
$\alpha =$	0.0013
$n =$	1.4077
$m =$	0.2896

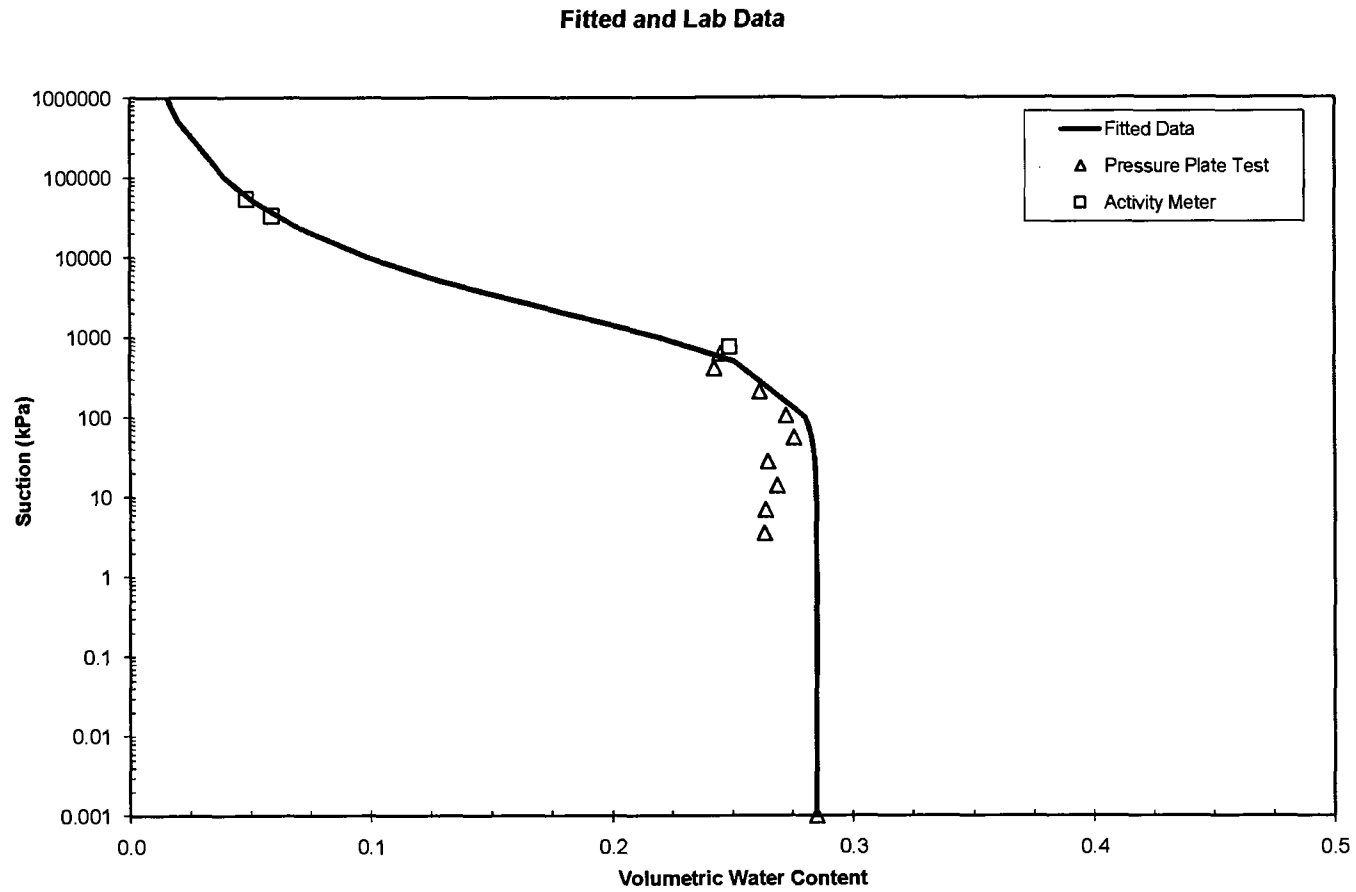
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.2850
0.025	0.2850
0.05	0.2850
0.075	0.2850
0.1	0.2850
1	0.2850
2	0.2850
3	0.2850
4	0.2850
5	0.2850
6	0.2849
7	0.2849
8	0.2849
9	0.2849
10	0.2848
15	0.2847
20	0.2845
30	0.2842
40	0.2837
50	0.2833
60	0.2828
70	0.2822
80	0.2817
90	0.2811
100	0.2805
500	0.2510
1000	0.2195
5000	0.1298
10000	0.0991
25000	0.0686
5.00E+04	0.0518
1.00E+05	0.0390
5.00E+05	0.0203
7.50E+05	0.0172
1.00E+06	0.0153

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.285	0.2850	0.000	0.000
3.45	0.263	0.2850	-0.022	0.000
6.90	0.264	0.2849	-0.021	0.000
13.79	0.269	0.2847	-0.016	0.000
27.59	0.265	0.2843	-0.019	0.000
55.18	0.276	0.2830	-0.007	0.000
103.46	0.273	0.2803	-0.008	0.000
206.91	0.262	0.2731	-0.012	0.000
413.82	0.243	0.2574	-0.015	0.000
620.73	0.245	0.2425	0.002	0.000
760.00	0.249	0.2334	0.015	0.000
33100.00	0.059	0.0612	-0.002	0.000
54000.00	0.048	0.0502	-0.002	0.000

Residual = 0.000174397



Pressure Plate Extractor Test - Cedar Rapids - Clay Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	ICYRL	Test Date	7/1/2005
WT of Sample Ring =	70.15 g		
WT of Sample Ring + Soil =	302.35 g		
Water Content =	14.70 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	120.05 pcf	1.92	Mg/m ³
Water WT =	29.76 g		
Solid WT =	202.44 g		
Add Water for saturation =	2.67 g	Sr	109.22
Saturated Water Content =	16.02 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
1	66	0.000	0.001	0.160	0.308
2	68.6	0.494	13.794	0.158	0.303
4	70.5	0.855	27.588	0.156	0.300
8	70.4	0.836	55.176	0.156	0.300
15	74.5	1.615	103.455	0.152	0.293
30	87.3	4.047	206.910	0.140	0.270
60	100.1	6.479	413.820	0.128	0.247
90	100.4	6.536	620.730	0.128	0.246
		Activity Meter Test	1790.00	0.082	0.157
			31100.00	0.031	0.059
			63500.00	0.023	0.045

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
63.5	7.744	16.8361	16.6285	0.023	0.045
31.1	8.0634	17.2023	16.9295	0.031	0.059
1.79	7.7181	17.0324	16.3294	0.082	0.157

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha\psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3082
$\alpha =$	0.0027
$n =$	1.3771
$m =$	0.2739

FOR GRAPHING

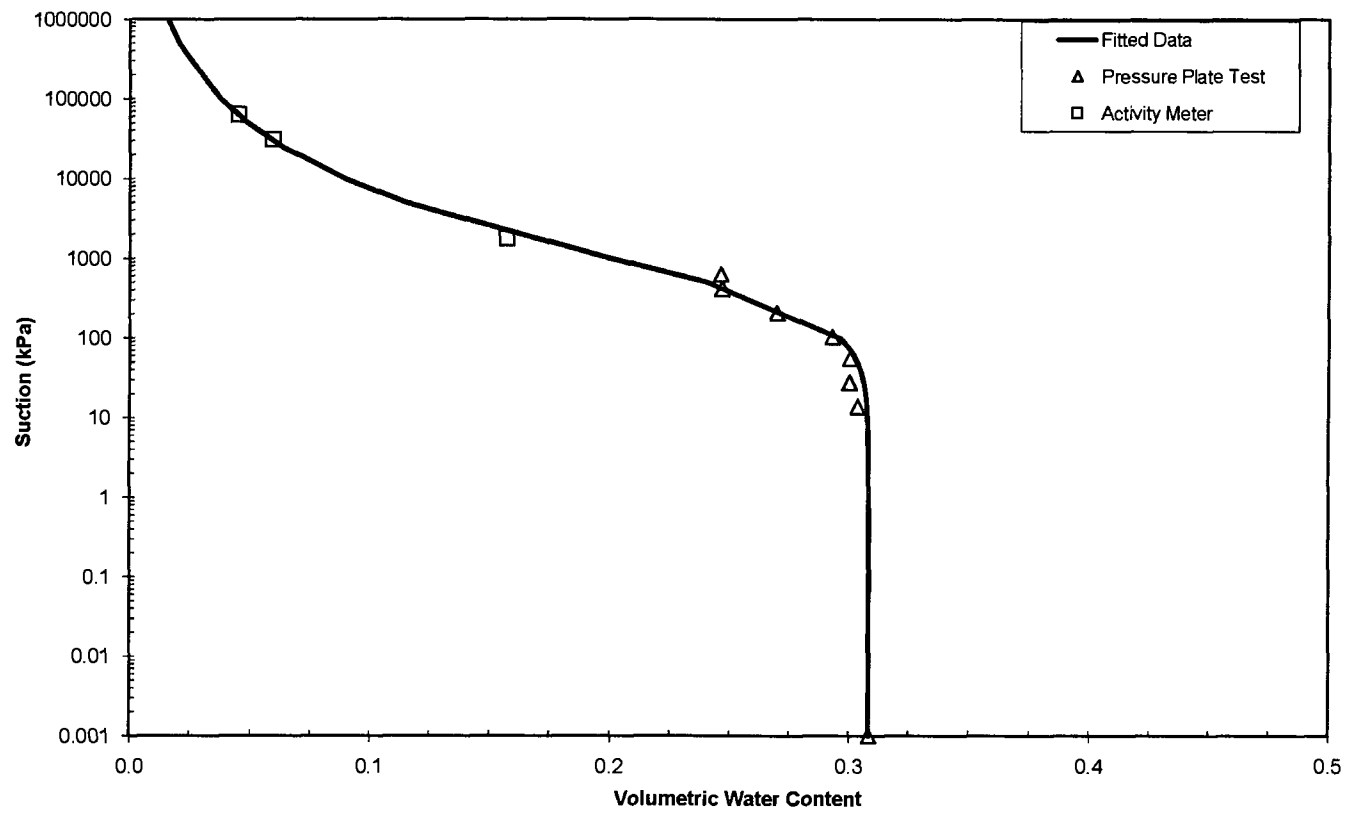
Suction (kPa)	VWC
0.001	0.3082
0.025	0.3082
0.05	0.3082
0.075	0.3082
0.1	0.3082
1	0.3082
2	0.3081
3	0.3081
4	0.3080
5	0.3080
6	0.3079
7	0.3078
8	0.3078
9	0.3077
10	0.3076
15	0.3072
20	0.3067
30	0.3056
40	0.3044
50	0.3031
60	0.3018
70	0.3003
80	0.2988
90	0.2973
100	0.2958
500	0.2403
1000	0.2000
5000	0.1152
10000	0.0891
25000	0.0632
5.00E+04	0.0487
1.00E+05	0.0375
5.00E+05	0.0204
7.50E+05	0.0175
1.00E+06	0.0157

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.308	0.3082	0.000	0.000
13.79	0.303	0.3073	-0.004	0.000
27.59	0.300	0.3059	-0.006	0.000
55.18	0.300	0.3024	-0.002	0.000
103.46	0.293	0.2953	-0.002	0.000
206.91	0.270	0.2789	-0.009	0.000
413.82	0.247	0.2502	-0.004	0.000
620.73	0.246	0.2282	0.018	0.000
1790.00	0.157	0.1660	-0.009	0.000
31100.00	0.059	0.0582	0.001	0.000
63500.00	0.045	0.0445	0.000	0.000

Residual = 5.05924E-05

Fitted and Lab Data



Pressure Plate Extractor Test - Cedar Rapids - Clay Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	ICYRU	Test Date	7/31/2006
WT of Sample Ring =	71.52 g		
WT of Sample Ring + Soil =	308.27 g		
Water Content =	13.90 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	123.26 pcf	1.97	Mg/m ³
Water WT =	28.89 g		
Solid WT =	207.86 g		
Add Water for saturation =	1.52 g	Sr	109.91
Saturated Water Content =	14.63 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	17.7	0.000	0.001	0.146	0.289
0.5	29.9	2.318	3.449	0.135	0.267
1	31.9	2.698	6.897	0.133	0.263
2	33	2.907	13.794	0.132	0.261
4	34.3	3.154	27.588	0.131	0.259
8	33.1	2.926	55.176	0.132	0.261
15	33.5	3.002	103.455	0.132	0.260
30	25	1.387	206.910	0.140	0.276
60	36.1	3.496	413.820	0.129	0.256
90	33.9	3.078	620.730	0.132	0.260
		Activity Meter Test	950.00	0.132	0.261
			15000.00	0.038	0.075
			1230.00	0.117	0.231

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
1.23	7.7044	17.5589	16.5271	0.117	0.231
15	7.7042	17.126	16.783	0.038	0.075
0.95	8.4794	18.6031	17.4206	0.132	0.261

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.2890
$\alpha =$	0.0008
$n =$	1.5302
$m =$	0.3465

FOR GRAPHING

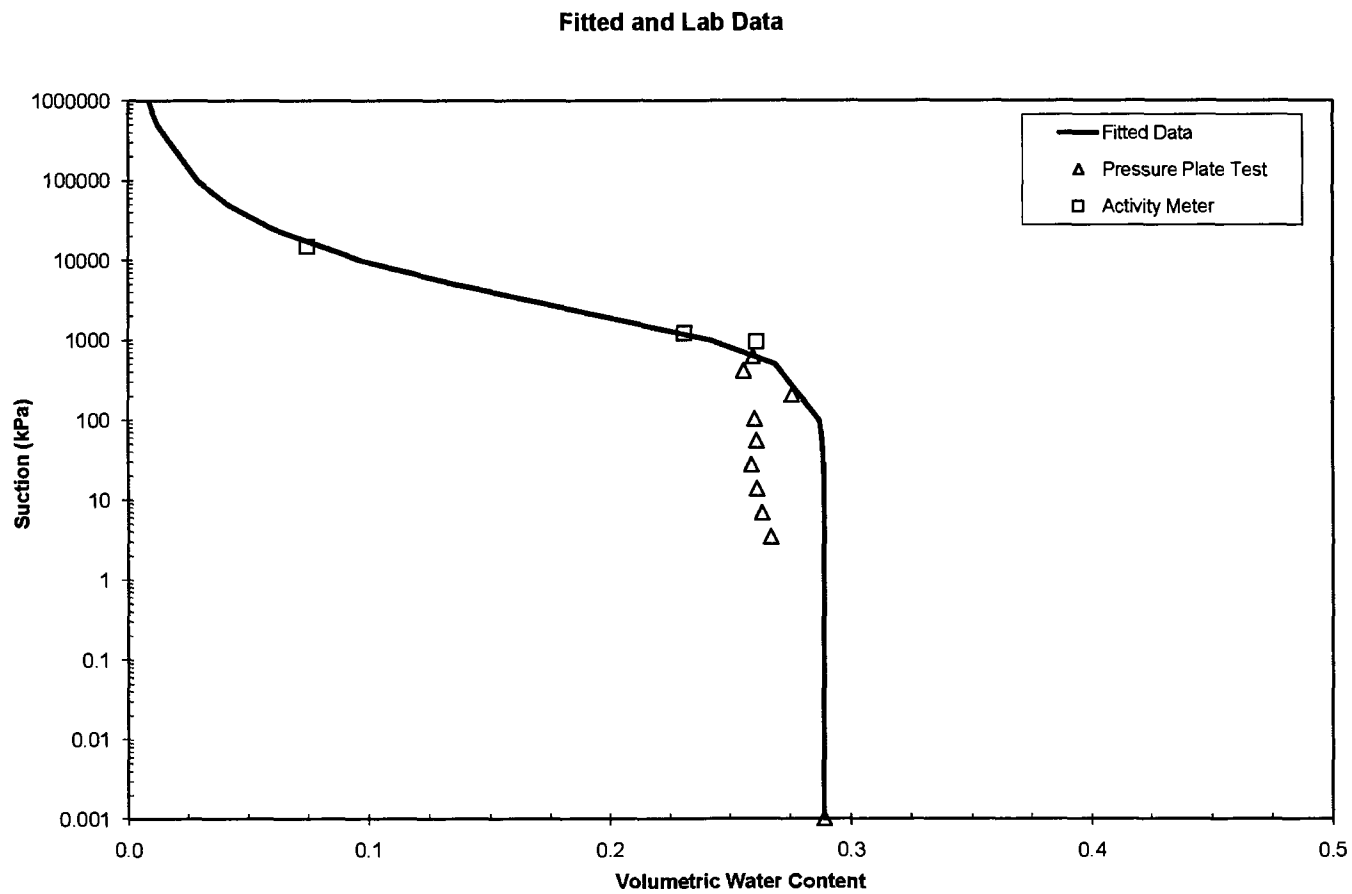
Suction (kPa)	VWC
0.001	0.2890
0.025	0.2890
0.05	0.2890
0.075	0.2890
0.1	0.2890
1	0.2890
2	0.2890
3	0.2890
4	0.2890
5	0.2890
6	0.2890
7	0.2890
8	0.2890
9	0.2890
10	0.2890
15	0.2889
20	0.2888
30	0.2887
40	0.2885
50	0.2883
60	0.2881
70	0.2879
80	0.2876
90	0.2874
100	0.2871
500	0.2690
1000	0.2422
5000	0.1360
10000	0.0967
25000	0.0602
5.00E+04	0.0418
1.00E+05	0.0289
5.00E+05	0.0123
7.50E+05	0.0100
1.00E+06	0.0085

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ VWC (%)	$(\Delta$ VWC) ²
0.001	0.289	0.2890	0.000	0.000
3.45	0.287	0.2890	-0.022	0.000
6.90	0.263	0.2890	-0.026	0.001
13.79	0.261	0.2889	-0.028	0.001
27.59	0.259	0.2887	-0.030	0.001
55.18	0.261	0.2882	-0.027	0.001
103.46	0.260	0.2870	-0.026	0.001
206.91	0.276	0.2833	-0.007	0.000
413.82	0.256	0.2735	-0.018	0.000
620.73	0.260	0.2625	-0.003	0.000
950.00	0.261	0.2448	0.016	0.000
15000.00	0.075	0.0785	-0.004	0.000
1230.00	0.231	0.2308	0.000	0.000

Residual = 0.000374985

E-60



Pressure Plate Extractor Test - Cedar Rapids - Composite Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	IOY1L	Test Date	7/1/2005
WT of Sample Ring =	70.68 g		
WT of Sample Ring + Soil =	303.3 g		
Water Content =	15.17 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	119.77 pcf	1.92 Mg/m ³	
Water WT =	30.64 g		
Solid WT =	201.98 g		
Add Water for saturation =	0.27 g	Sr	103.51
Saturated Water Content =	15.30 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	53.9	0.000	0.001	0.153	0.294
0.5	56.3	0.456	3.449	0.151	0.289
1	53.7	-0.038	6.897	0.153	0.294
2	55.6	0.323	13.794	0.151	0.291
4	52.2	-0.323	27.588	0.155	0.297
8	54.1	0.038	55.176	0.153	0.293
15	54.9	0.190	103.455	0.152	0.292
30	58.5	0.874	206.910	0.149	0.285
60	64.2	1.957	413.820	0.143	0.275
90	71.4	3.325	620.730	0.137	0.262
		Activity Meter Test	1100.00	0.122	0.233
			1690.00	0.086	0.166
			16200.00	0.042	0.081
			7540.00	0.055	0.105
			71400.00	0.023	0.045

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
16.2	8.0638	17.3326	16.9554	0.042	0.081
1.69	7.7186	17.3575	16.591	0.086	0.166
1.1	7.7446	17.6361	16.5638	0.122	0.233
7.54	7.7175	17.0967	16.6101	0.055	0.105
71.4	7.7441	16.9055	16.6952	0.023	0.045

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0433
$\theta_s =$	0.2938
$\alpha =$	0.0010
$n =$	1.7428
$m =$	0.4262

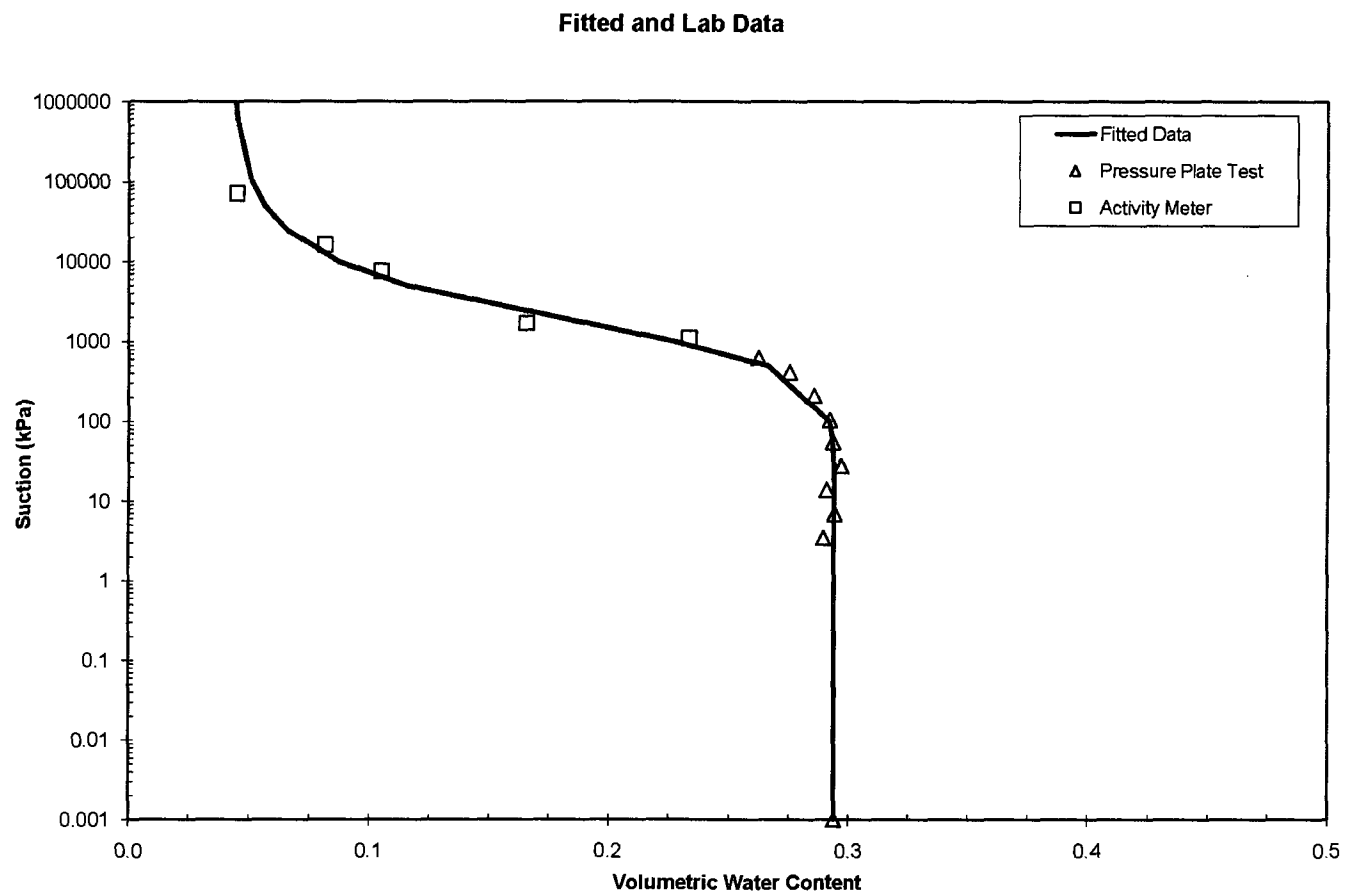
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.2938
0.025	0.2938
0.05	0.2938
0.075	0.2938
0.1	0.2938
1	0.2938
2	0.2938
3	0.2938
4	0.2937
5	0.2937
6	0.2937
7	0.2937
8	0.2937
9	0.2937
10	0.2937
15	0.2937
20	0.2936
30	0.2935
40	0.2933
50	0.2931
60	0.2929
70	0.2927
80	0.2924
90	0.2921
100	0.2917
500	0.2661
1000	0.2274
5000	0.1155
10000	0.0872
25000	0.0657
5.00E+04	0.0567
1.00E+05	0.0513
5.00E+05	0.0457
7.50E+05	0.0451
1.00E+06	0.0448

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.294	0.2938	0.000	0.000
3.45	0.289	0.2937	-0.004	0.000
6.90	0.294	0.2937	0.000	0.000
13.79	0.291	0.2937	-0.003	0.000
27.59	0.297	0.2935	0.003	0.000
55.18	0.293	0.2930	0.000	0.000
103.46	0.292	0.2916	0.000	0.000
206.91	0.285	0.2868	-0.001	0.000
413.82	0.275	0.2728	0.002	0.000
620.73	0.262	0.2564	0.006	0.000
1100.00	0.233	0.2205	0.013	0.000
1690.00	0.166	0.1877	-0.022	0.000
16200.00	0.081	0.0741	0.007	0.000
7540.00	0.105	0.0972	0.008	0.000
71400.00	0.045	0.0536	-0.008	0.000

Residual = 6.05708E-05



Pressure Plate Extractor Test - Cedar Rapids - Composite Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	IOY1U	Test Date	7/1/2005
WT of Sample Ring =	71.52 g		
WT of Sample Ring + Soil =	306.2 g		
Water Content =	13.91 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	122.17 pcf	1.96	Mg/m ³
Water WT =	28.65 g		
Solid WT =	206.03 g		
Add Water for saturation =	0.69 g	Sr	103.49
Saturated Water Content =	14.24 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	70.2	0.000	0.001	0.142	0.279
0.5	75	0.912	3.449	0.138	0.270
1	73.1	0.551	6.897	0.140	0.274
2	73.7	0.665	13.794	0.139	0.273
4	72	0.342	27.588	0.141	0.276
8	73.9	0.703	55.176	0.139	0.272
15	75.8	1.064	103.455	0.137	0.269
30	79	1.672	206.910	0.134	0.263
60	82.1	2.261	413.820	0.131	0.257
90	86	3.002	620.730	0.128	0.250
		Activity Meter Test	1030.00	0.103	0.203
			7380.00	0.053	0.103
			33100.00	0.031	0.060
			820.00	0.101	0.197
			34500.00	0.030	0.059

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
33.1	8.0013	17.3391	17.0598	0.031	0.060
7.38	8.6296	18.2361	17.7557	0.053	0.103
1.03	7.4871	17.5724	16.627	0.103	0.203
0.82	7.6659	17.6535	16.7389	0.101	0.197
34.5	8.0633	17.451	17.1743	0.030	0.059

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0316
$\theta_s =$	0.2788
$\alpha =$	0.0014
$n =$	1.5525
$m =$	0.3559

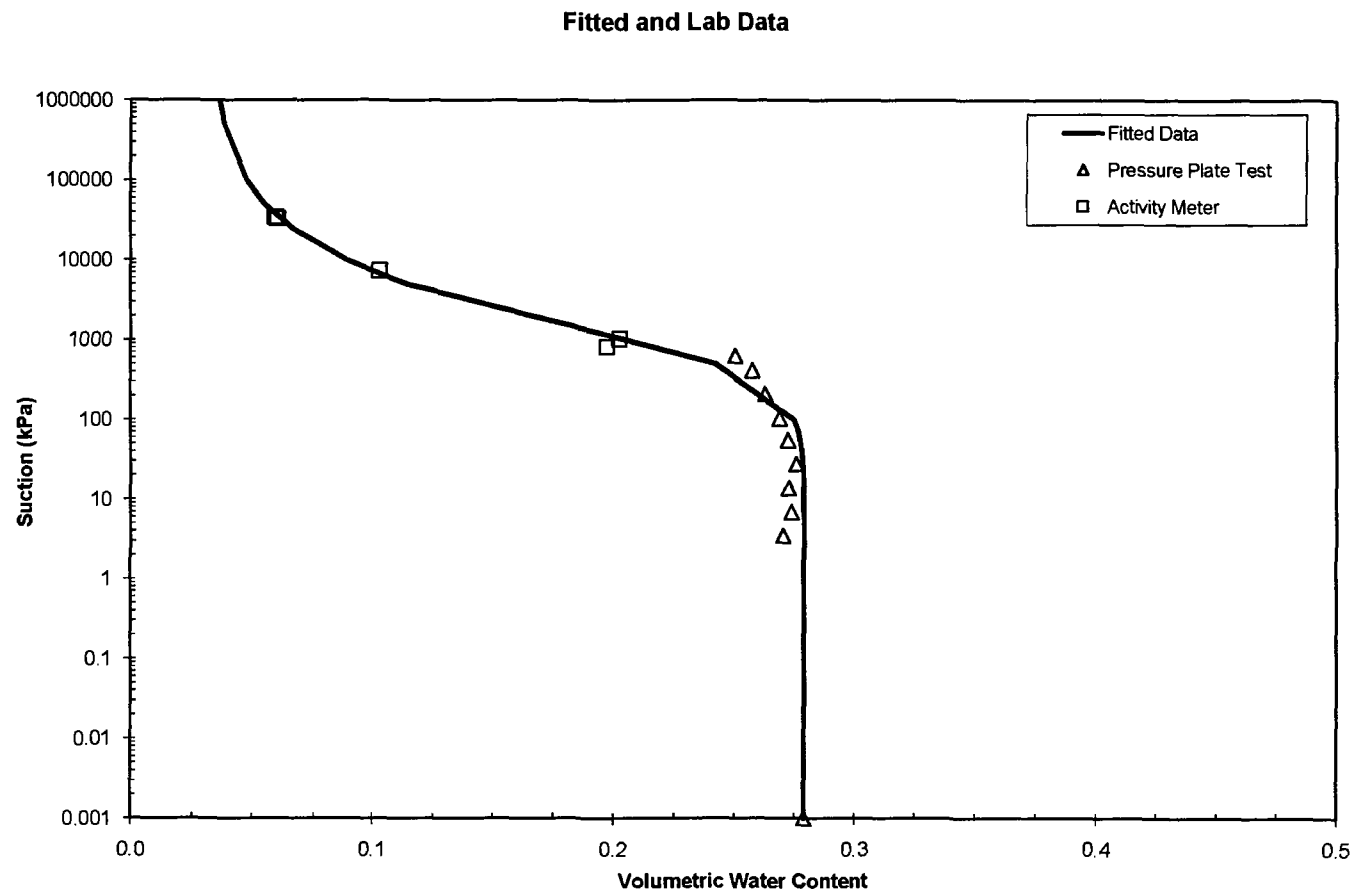
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.2788
0.025	0.2788
0.05	0.2788
0.075	0.2788
0.1	0.2788
1	0.2788
2	0.2788
3	0.2788
4	0.2788
5	0.2788
6	0.2788
7	0.2788
8	0.2788
9	0.2787
10	0.2787
15	0.2786
20	0.2785
30	0.2782
40	0.2778
50	0.2774
60	0.2770
70	0.2765
80	0.2760
90	0.2754
100	0.2748
500	0.2419
1000	0.2055
5000	0.1145
10000	0.0888
25000	0.0662
5.00E+04	0.0552
1.00E+05	0.0477
5.00E+05	0.0383
7.50E+05	0.0369
1.00E+06	0.0361

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.279	0.2788	0.000	0.000
3.45	0.270	0.2788	-0.009	0.000
6.90	0.274	0.2788	-0.005	0.000
13.79	0.273	0.2786	-0.006	0.000
27.59	0.276	0.2783	-0.003	0.000
55.18	0.272	0.2772	-0.005	0.000
103.46	0.269	0.2746	-0.006	0.000
206.91	0.263	0.2671	-0.004	0.000
413.82	0.257	0.2493	0.008	0.000
620.73	0.250	0.2319	0.018	0.000
1030.00	0.203	0.2037	-0.001	0.000
7380.00	0.103	0.0990	0.004	0.000
33100.00	0.060	0.0613	-0.001	0.000
820.00	0.197	0.2171	-0.020	0.000
34500.00	0.059	0.0606	-0.001	0.000

Residual = 6.90088E-05



Pressure Plate Extractor Test - Cedar Rapids - Composite Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	IOY2L	Test Date	12/1/2006
WT of Sample Ring =	70.72 g		
WT of Sample Ring + Soil =	308.46 g		
Water Content =	15.50 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	122.06 pcf	1.96	Mg/m ³
Water WT =	31.90 g		
Solid WT =	205.84 g		
Add Water for saturation =	0 g	Sr	112.24
Saturated Water Content =	15.50 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	27	0.000	0.001	0.155	0.303
0.5	35.5	1.615	3.449	0.147	0.288
1	35.6	1.634	6.897	0.147	0.288
2	31.9	0.931	13.794	0.150	0.294
4	33.3	1.197	27.588	0.149	0.292
8	36.2	1.748	55.176	0.147	0.287
15	35.3	1.577	103.455	0.147	0.288
30	39.9	2.451	206.910	0.143	0.280
60	56.4	5.586	413.820	0.128	0.250
90	56	5.510	620.730	0.128	0.251
		Activity Meter Test	2850.00	0.076	0.149
			17600.00	0.042	0.083
			42400.00	0.031	0.060

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
42.4	7.6662	17.1119	16.8309	0.031	0.060
17.6	7.4869	16.9528	16.5671	0.042	0.083
2.85	7.718	17.4463	16.7593	0.076	0.149

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3032
$\alpha =$	0.0022
$n =$	1.3559
$m =$	0.2625

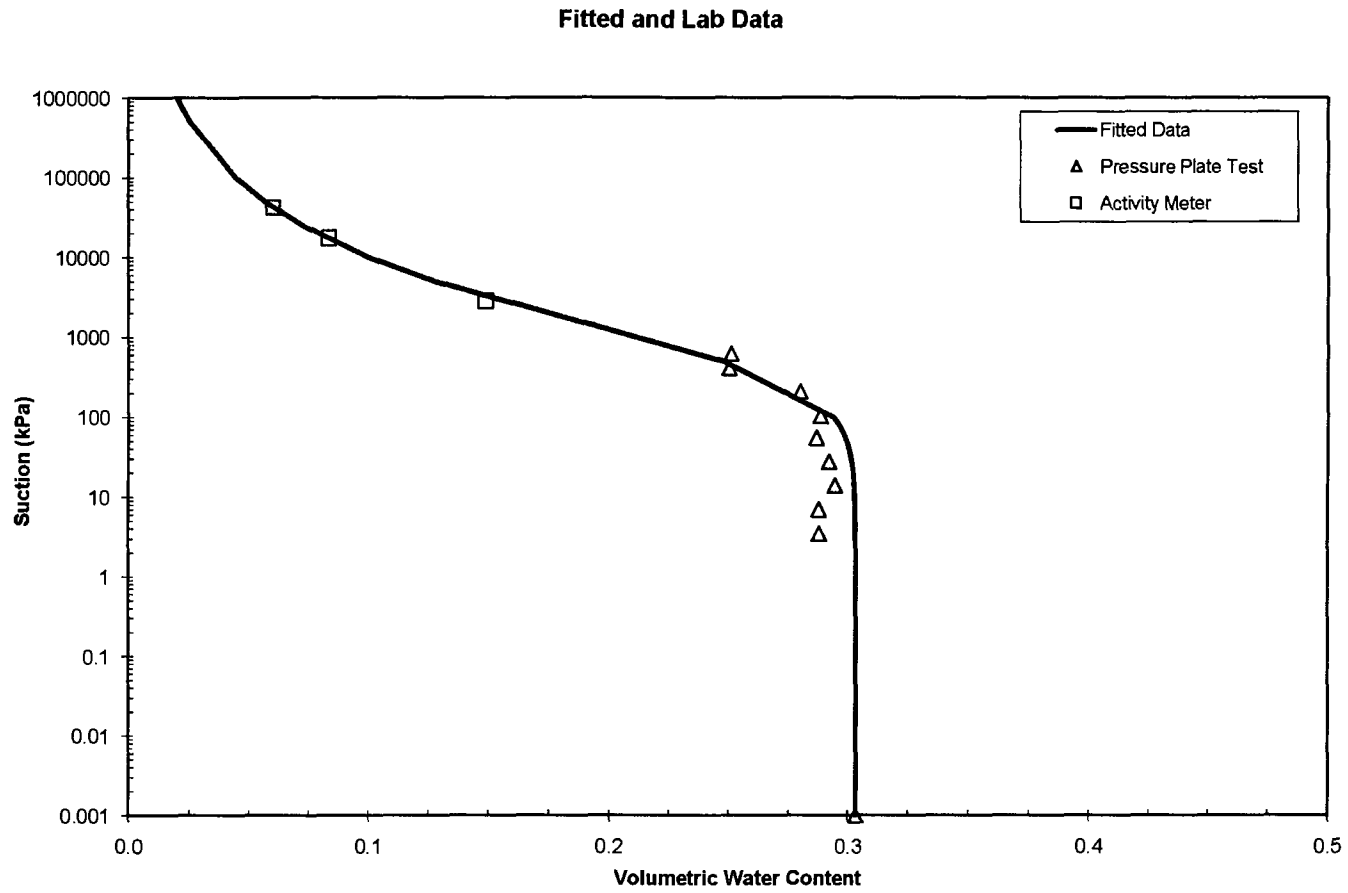
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3032
0.025	0.3032
0.05	0.3032
0.075	0.3032
0.1	0.3032
1	0.3032
2	0.3031
3	0.3031
4	0.3031
5	0.3030
6	0.3030
7	0.3029
8	0.3029
9	0.3028
10	0.3027
15	0.3024
20	0.3020
30	0.3012
40	0.3003
50	0.2993
60	0.2982
70	0.2971
80	0.2960
90	0.2948
100	0.2936
500	0.2479
1000	0.2114
5000	0.1274
10000	0.1002
25000	0.0725
5.00E+04	0.0567
1.00E+05	0.0443
5.00E+05	0.0250
7.50E+05	0.0216
1.00E+06	0.0195

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.303	0.3032	0.000	0.000
3.45	0.288	0.3031	-0.015	0.000
6.90	0.288	0.3029	-0.015	0.000
13.79	0.294	0.3025	-0.008	0.000
27.59	0.292	0.3014	-0.010	0.000
55.18	0.287	0.2987	-0.012	0.000
103.46	0.288	0.2932	-0.005	0.000
206.91	0.280	0.2803	0.000	0.000
413.82	0.250	0.2564	-0.006	0.000
620.73	0.251	0.2372	0.014	0.000
2850.00	0.149	0.1540	-0.005	0.000
17600.00	0.083	0.0821	0.001	0.000
42400.00	0.060	0.0601	0.000	0.000

Residual = 8.08391E-05



Pressure Plate Extractor Test - Cedar Rapids - Composite Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	IOY2U	Test Date	7/1/2005
WT of Sample Ring =	70.49 g		
WT of Sample Ring + Soil =	304.85 g		
Water Content =	14.82 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	121.04 pcf	1.94 Mg/m ³	
Water WT =	30.25 g		
Solid WT =	204.11 g		
Add Water for saturation =	2.23 g	Sr	111.73
Saturated Water Content =	15.91 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
1	40.5	0.000	0.001	0.159	0.309
2	40.1	-0.076	13.794	0.159	0.309
4	40.8	0.057	27.588	0.159	0.308
8	40.7	0.038	55.176	0.159	0.308
15	45.6	0.969	103.455	0.154	0.299
30	58.7	3.458	206.910	0.142	0.276
60	67.6	5.149	413.820	0.134	0.260
90	74.3	6.422	620.730	0.128	0.248
		Activity Meter Test	46800.00	0.023	0.045
			680.00	0.144	0.280
			6050.00	0.052	0.101

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
6.05	8.0635	17.4922	17.0243	0.052	0.101
0.68	7.4869	17.748	16.4554	0.144	0.280
46.8	7.7173	16.9492	16.7383	0.023	0.045

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3087
$\alpha =$	0.0014
$n =$	1.4827
$m =$	0.3255

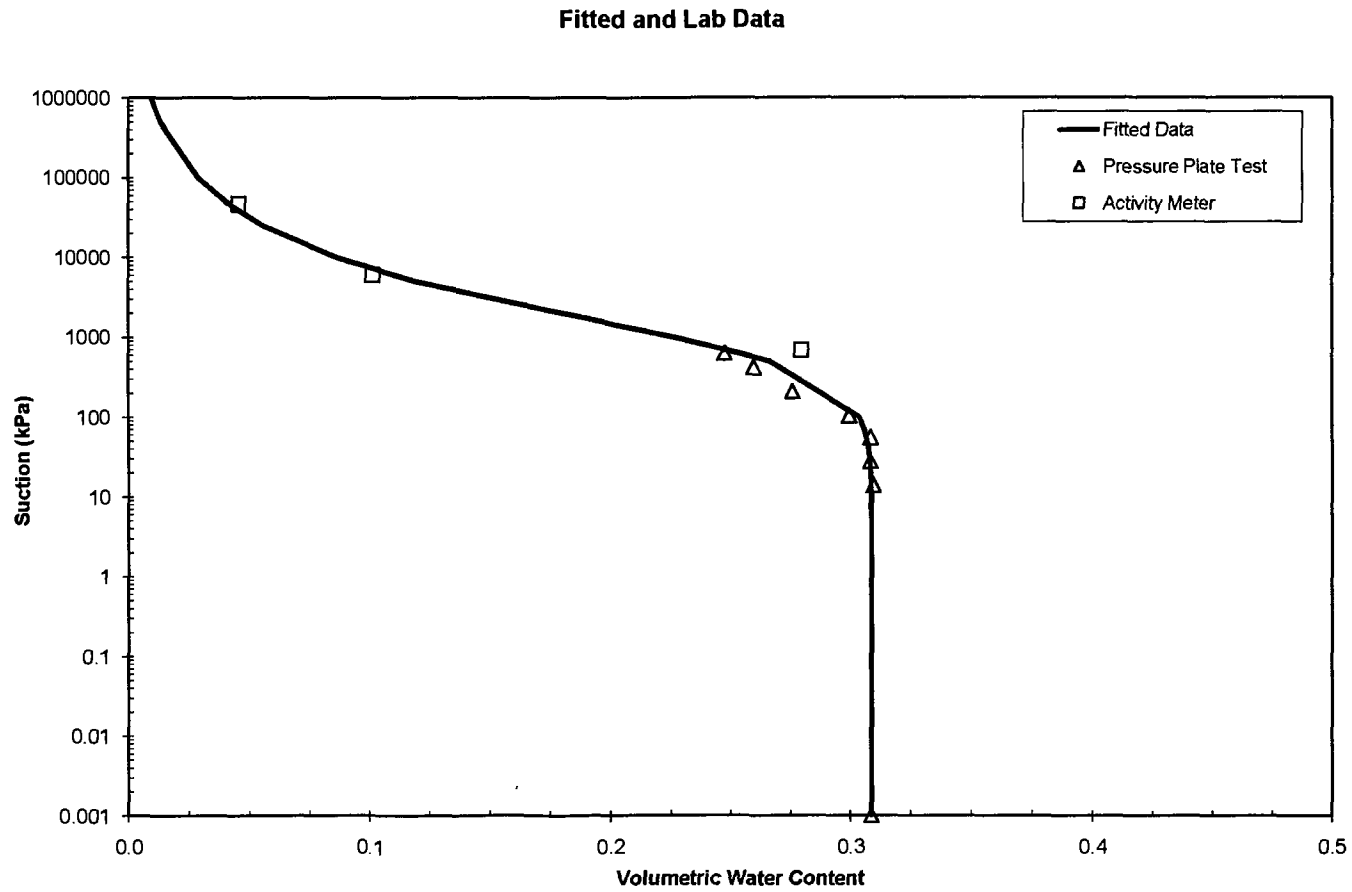
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3087
0.025	0.3087
0.05	0.3087
0.075	0.3087
0.1	0.3087
1	0.3086
2	0.3086
3	0.3086
4	0.3086
5	0.3086
6	0.3086
7	0.3085
8	0.3085
9	0.3085
10	0.3085
15	0.3083
20	0.3082
30	0.3078
40	0.3073
50	0.3068
60	0.3062
70	0.3056
80	0.3049
90	0.3042
100	0.3035
500	0.2661
1000	0.2258
5000	0.1193
10000	0.0864
25000	0.0558
5.00E+04	0.0400
1.00E+05	0.0286
5.00E+05	0.0132
7.50E+05	0.0108
1.00E+06	0.0094

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.309	0.3087	0.000	0.000
13.79	0.309	0.3084	0.001	0.000
27.59	0.308	0.3079	0.000	0.000
55.18	0.308	0.3065	0.002	0.000
103.46	0.299	0.3032	-0.004	0.000
206.91	0.276	0.2944	-0.019	0.000
413.82	0.260	0.2743	-0.015	0.000
620.73	0.248	0.2551	-0.007	0.000
46800.00	0.045	0.0412	0.004	0.000
680.00	0.280	0.2500	0.030	0.001
6050.00	0.101	0.1093	-0.008	0.000

Residual = 0.000144631



Pressure Plate Extractor Test - Cedar Rapids - Composite Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	IOYRL (LH-6)	Test Date	7/1/2005
WT of Sample Ring =	69.2 g		
WT of Sample Ring + Soil =	294.56 g		
Water Content =	14.50 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	116.71 pcf	1.87 Mg/m ³	
Water WT =	28.54 g		
Solid WT =	196.82 g		
Add Water for saturation =	2.42 g	Sr	97.39
Saturated Water Content =	15.73 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	23.5	0.000	0.001	0.157	0.294
0.5	37	2.565	3.449	0.144	0.270
1	38.6	2.869	6.897	0.143	0.267
2	39	2.945	13.794	0.142	0.266
4	40.8	3.287	27.588	0.141	0.263
8	39.2	2.983	55.176	0.142	0.266
15	40.3	3.192	103.455	0.141	0.264
30	39.5	3.040	206.910	0.142	0.265
60	43.1	3.724	413.820	0.138	0.259
90	60.9	7.106	620.730	0.121	0.227
		Activity Meter Test	2340.00	0.079	0.147
			5390.00	0.058	0.108
			46400.00	0.026	0.048
			800.00	0.125	0.233

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
46.4	7.5966	16.3603	16.1404	0.026	0.048
5.39	7.7043	16.6931	16.2019	0.058	0.108
2.34	8.4797	17.5482	16.8859	0.079	0.147
0.8	7.6402	16.9879	15.9512	0.125	0.233

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.2942
$\alpha =$	0.0024
$n =$	1.3773
$m =$	0.2740

FOR GRAPHING

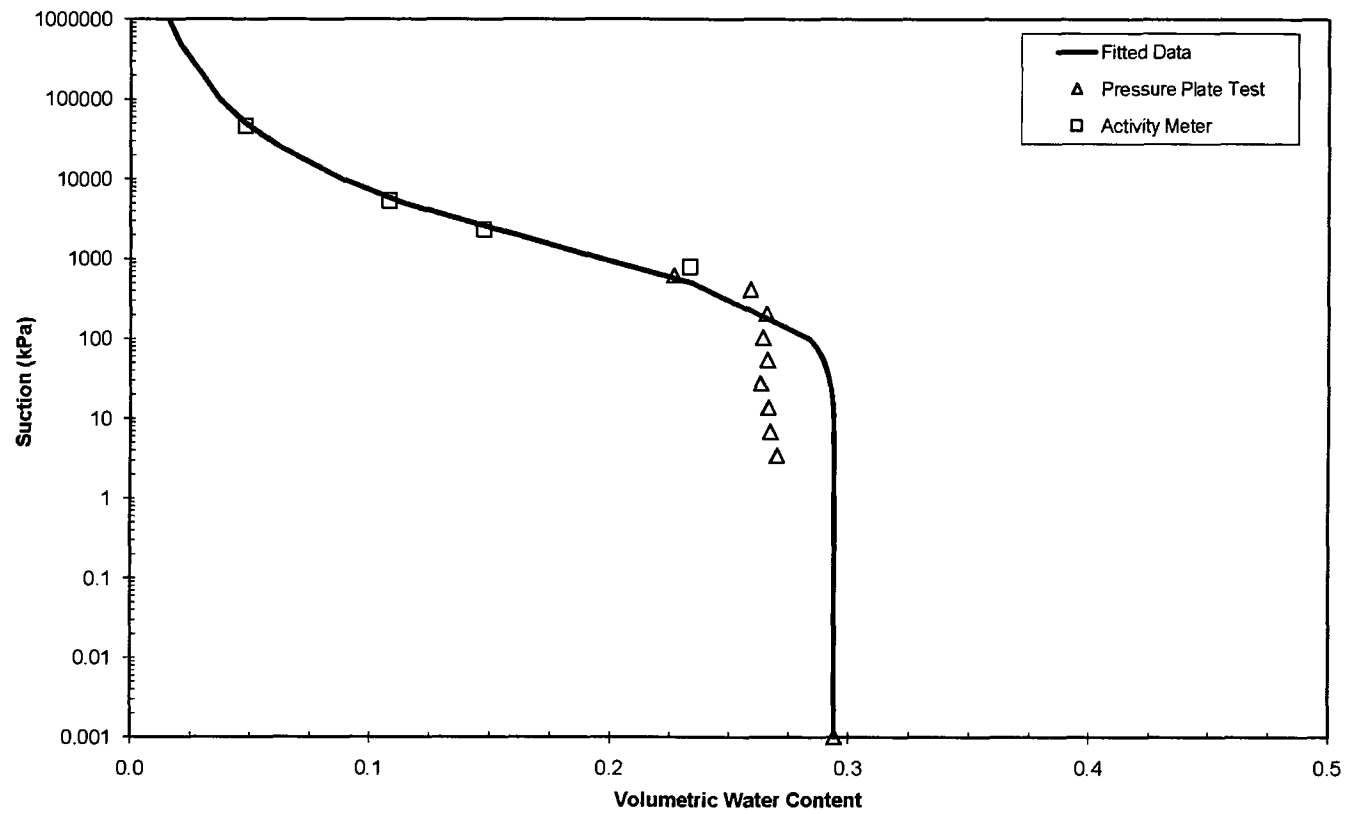
Suction (kPa)	VWC
0.001	0.2942
0.025	0.2942
0.05	0.2942
0.075	0.2942
0.1	0.2942
1	0.2942
2	0.2942
3	0.2941
4	0.2941
5	0.2940
6	0.2940
7	0.2939
8	0.2939
9	0.2938
10	0.2937
15	0.2934
20	0.2930
30	0.2921
40	0.2911
50	0.2900
60	0.2888
70	0.2876
80	0.2864
90	0.2851
100	0.2838
500	0.2344
1000	0.1965
5000	0.1140
10000	0.0882
25000	0.0626
5.00E+04	0.0482
1.00E+05	0.0371
5.00E+05	0.0202
7.50E+05	0.0174
1.00E+06	0.0156

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.294	0.2942	0.000	0.000
3.45	0.270	0.2941	-0.024	0.001
6.90	0.267	0.2939	-0.027	0.001
13.79	0.266	0.2935	-0.027	0.001
27.59	0.263	0.2923	-0.029	0.001
55.18	0.266	0.2894	-0.024	0.001
103.46	0.264	0.2833	-0.019	0.000
206.91	0.265	0.2692	-0.004	0.000
413.82	0.259	0.2434	0.015	0.000
620.73	0.227	0.2232	0.004	0.000
2340.00	0.147	0.1495	-0.002	0.000
5390.00	0.108	0.1109	-0.003	0.000
46400.00	0.048	0.0496	-0.001	0.000
800.00	0.233			

Residual = 0.000317666

Fitted and Lab Data



Pressure Plate Extractor Test - Cedar Rapids - Composite Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	IOYRU	Test Date	7/1/2005
WT of Sample Ring =	70.79 g		
WT of Sample Ring + Soil =	312.56 g		
Water Content =	14.30 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	125.43 pcf	2.01	Mg/m ³
Water WT =	30.25 g		
Solid WT =	211.52 g		
Add Water for saturation =	1.4 g	Sr	120.32
Saturated Water Content =	14.96 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
1	70.8	0.000	0.001	0.150	0.301
2	66.1	-0.893	13.794	0.154	0.309
4	66.5	-0.817	27.588	0.153	0.309
8	66.5	-0.817	55.176	0.153	0.309
15	68	-0.532	103.455	0.152	0.306
30	67.7	-0.589	206.910	0.152	0.306
60	73.1	0.437	413.820	0.148	0.297
90	78.3	1.425	620.730	0.143	0.287
		Activity Meter Test	3000.00	0.066	0.134
			9450.00	0.047	0.095
			49800.00	0.023	0.046

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
49.8	7.7178	17.2673	17.0522	0.023	0.046
9.45	7.7442	17.451	17.012	0.047	0.095
3	8.0633	17.8767	17.265	0.066	0.134

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0546
$\theta_s =$	0.3007
$\alpha =$	0.0007
$n =$	2.2418
$m =$	0.5539

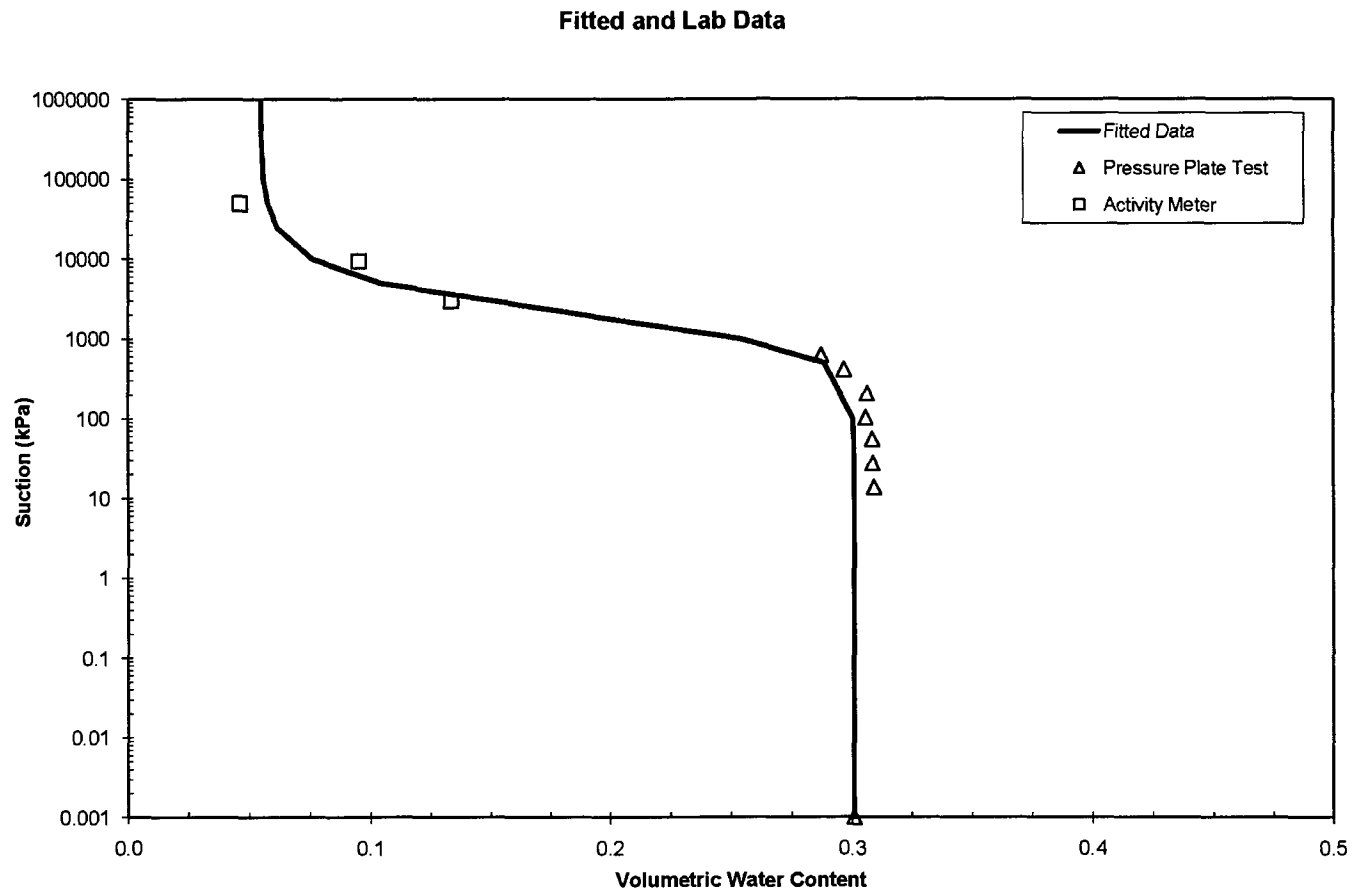
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3007
0.025	0.3007
0.05	0.3007
0.075	0.3007
0.1	0.3007
1	0.3007
2	0.3007
3	0.3007
4	0.3007
5	0.3007
6	0.3007
7	0.3007
8	0.3007
9	0.3007
10	0.3007
15	0.3007
20	0.3007
30	0.3007
40	0.3007
50	0.3007
60	0.3006
70	0.3006
80	0.3005
90	0.3005
100	0.3004
500	0.2883
1000	0.2539
5000	0.1041
10000	0.0760
25000	0.0615
5.00E+04	0.0575
1.00E+05	0.0559
5.00E+05	0.0548
7.50E+05	0.0547
1.00E+06	0.0547

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.301	0.3007	0.000	0.000
13.79	0.309	0.3007	0.008	0.000
27.59	0.309	0.3007	0.008	0.000
55.18	0.309	0.3006	0.008	0.000
103.46	0.306	0.3003	0.005	0.000
206.91	0.306	0.2989	0.007	0.000
413.82	0.297	0.2924	0.004	0.000
620.73	0.287	0.2814	0.006	0.000
3000.00	0.134	0.1422	-0.009	0.000
9450.00	0.095	0.0776	0.018	0.000
49800.00	0.046	0.0576	-0.011	0.000

Residual = 7.65783E-05



Pressure Plate Extractor Test - Helena - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	150-mm Helena Mid 1	Test Date	3/6/2009
WT of Sample Ring =	382.6 g		
WT of Sample Ring + Soil =	1642.8 g		
Water Content =	38.82 %		
Diameter of Sample Ring, D =	5.92 in		
Height of Sample Ring, L =	1.5 in		
Volume, V =	2.45E-02 ft ³	694.6 cm ³	
Dry Unit Weight =	81.58 pcf	1.31 Mg/m ³	
Water WT =	352.43 g		
Solid WT =	907.77 g		
Add Water for saturation =	5 g	Sr	100.51
Saturated Water Content =	39.37 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0		0.000	0.001	0.394	0.515
0.5		31.500	3.449	0.359	0.469
1		46.500	6.897	0.343	0.448
2		66.500	13.794	0.320	0.419
3		85.000	20.691	0.300	0.392
4		99.000	27.588	0.285	0.372
8		124.000	55.176	0.257	0.336
15		139.000	103.455	0.241	0.315

	Activity Meter Test	1200.00	0.221	0.288
		8160.00	0.158	0.206
		12400.00	0.147	0.192
		55600.00	0.099	0.129
		69900.00	0.092	0.120
		2010.00	0.195	0.254
		9550.00	0.147	0.192
		16100.00	0.130	0.170
		33400.00	0.108	0.141
		62000.00	0.090	0.117
		73700.00	0.084	0.110

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
1.2	18.7998	25.5458	24.3268	0.221	0.288
8.16	18.7998	25.1981	24.3268	0.158	0.206
12.4	18.7998	25.1372	24.3268	0.147	0.192
55.6	18.7998	24.8715	24.3268	0.099	0.129
69.9	18.7998	24.8335	24.3268	0.092	0.120
2.01	18.1342	24.5823	23.5322	0.195	0.254
9.55	18.1342	24.3243	23.5322	0.147	0.192
16.1	18.1342	24.2342	23.5322	0.130	0.170
33.4	18.1342	24.1155	23.5322	0.108	0.141
62	18.1342	24.0158	23.5322	0.090	0.117
73.7	18.1342	23.9877	23.5322	0.084	0.110

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.5148
$\alpha =$	0.3312
$n =$	1.1292
$m =$	0.1144

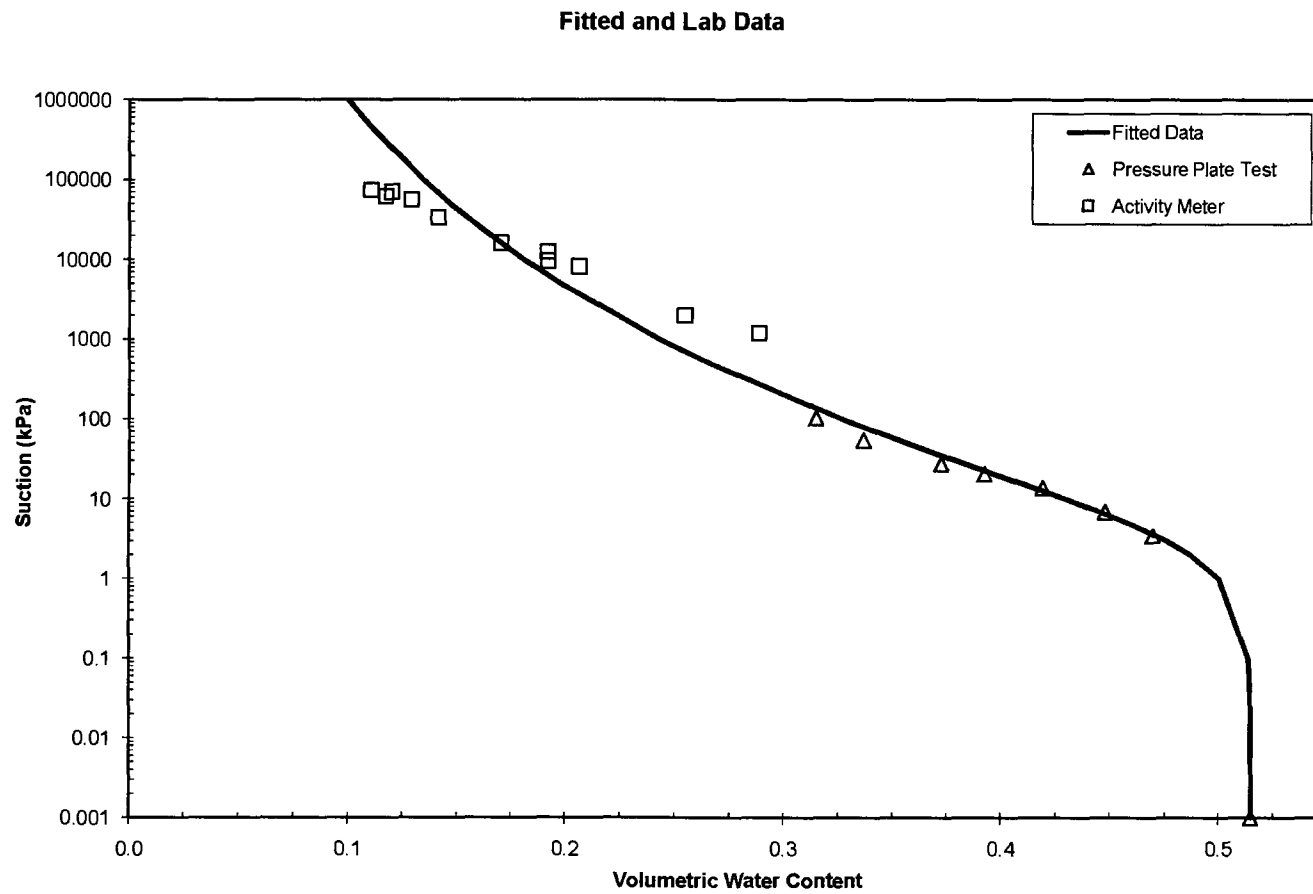
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.5148
0.025	0.5145
0.05	0.5142
0.075	0.5139
0.1	0.5135
1	0.5001
2	0.4869
3	0.4757
4	0.4663
5	0.4582
6	0.4511
7	0.4448
8	0.4392
9	0.4341
10	0.4295
15	0.4113
20	0.3981
30	0.3795
40	0.3665
50	0.3565
60	0.3485
70	0.3419
80	0.3362
90	0.3312
100	0.3268
500	0.2659
1000	0.2432
5000	0.1976
10000	0.1807
25000	0.1605
5.00E+04	0.1468
1.00E+05	0.1342
5.00E+05	0.1090
7.50E+05	0.1034
1.00E+06	0.0997

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.515	0.5148	0.000	0.000
3.45	0.469	0.4713	-0.002	0.000
6.90	0.448	0.4454	0.002	0.000
13.79	0.419	0.4151	0.004	0.000
20.69	0.392	0.3965	-0.004	0.000
27.59	0.372	0.3833	-0.011	0.000
55.18	0.336	0.3522	-0.016	0.000
103.46	0.315	0.3254	-0.011	0.000
1200.00	0.288	0.2376	0.051	0.003
8160.00	0.206	0.1855	0.021	0.000
12400.00	0.192	0.1757	0.016	0.000
55600.00	0.129	0.1448	-0.016	0.000
69900.00	0.120	0.1405	-0.021	0.000
2010.00	0.254	0.2223	0.032	0.001
9550.00	0.192	0.1817	0.010	0.000
16100.00	0.170	0.1699	0.000	0.000
33400.00	0.141	0.1546	-0.013	0.000
62000.00	0.117	0.1427	-0.026	0.001
73700.00	0.110	0.1396	-0.029	0.001

Residual = 0.000384189



Pressure Plate Extractor Test - Helena - Store-and-Release Cover
ASTM D 6836 - 02 (Method B)

Sample I.D.	Helena Mid 1	Test Date	1/29/2009
WT of Sample Ring =	69.35 g		
WT of Sample Ring + Soil =	248.39 g		
Water Content =	37.80 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3	cm ³
Dry Unit Weight =	77.05 pcf	1.23	Mg/m ³
Water WT =	49.11 g		
Solid WT =	129.93 g		
Add Water for saturation =	5.45 g	Sr	96.15
Saturated Water Content =	41.99 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	13.1	0.000	0.001	0.420	0.519
0.5	13.1	0.000	3.449	0.420	0.519
1	33.8	3.933	6.897	0.390	0.481
2	41.3	5.358	13.794	0.379	0.468
4	56.2	8.189	27.588	0.357	0.441
8	72.6	11.305	55.176	0.333	0.411
15	85.1	13.680	103.455	0.315	0.389
30	87.7	14.174	206.910	0.311	0.384
60	102.5	16.986	413.820	0.289	0.357
80	104.3	17.328	551.760	0.287	0.354

	Activity Meter Test	2210.00	0.235	0.290
		15300.00	0.153	0.189
		20900.00	0.140	0.173
		30900.00	0.131	0.162
		61100.00	0.095	0.117

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
2.21	3.1914	10.7371	9.3024433	0.235	0.290
15.3	3.1914	10.2358	9.3024433	0.153	0.189
20.9	3.1914	10.1587	9.3024433	0.140	0.173
30.9	3.1914	10.1041	9.3024433	0.131	0.162
61.1	3.1914	9.88	9.3024433	0.095	0.117

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.5190
$\alpha =$	0.0483
$n =$	1.1493
$m =$	0.1299

FOR GRAPHING

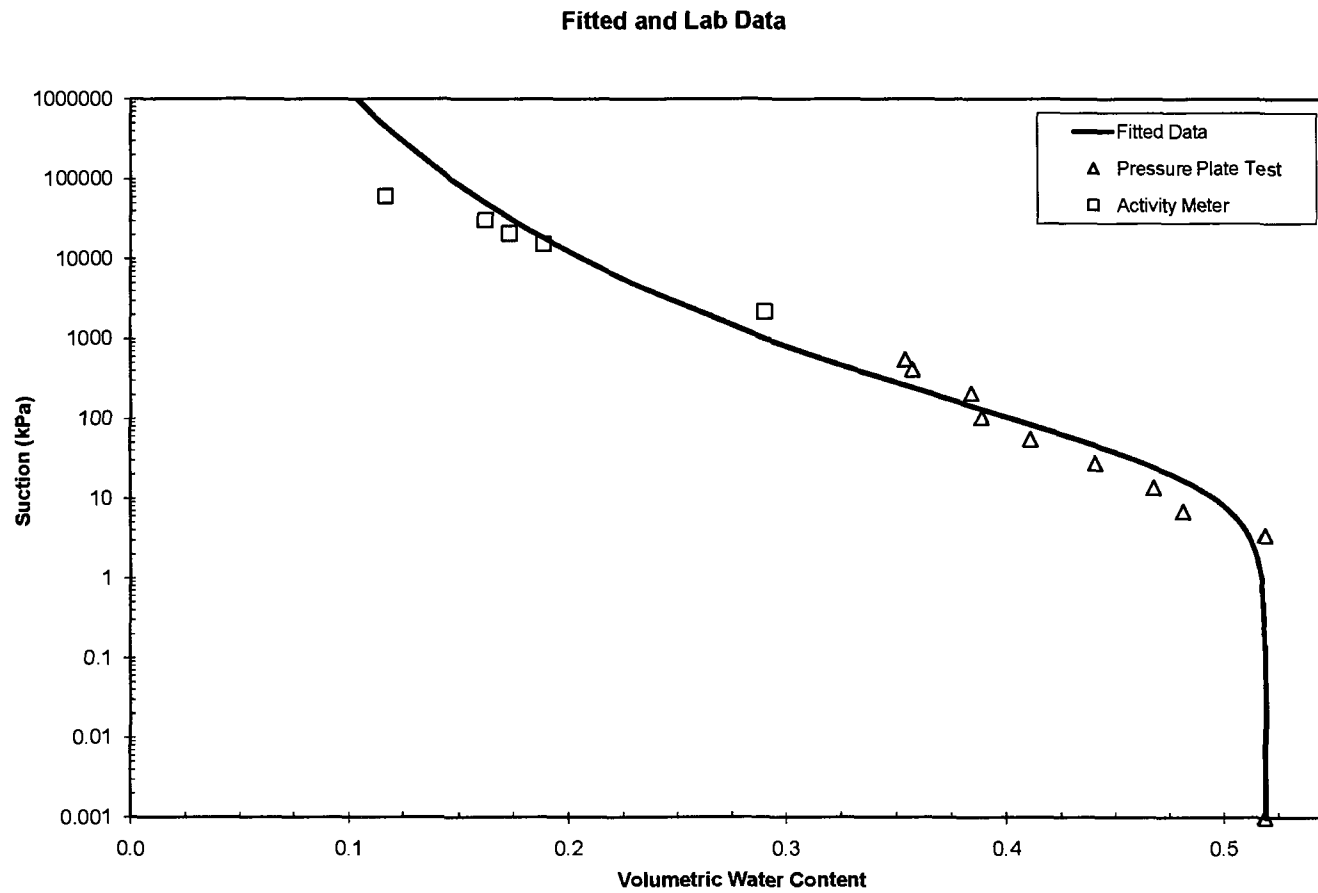
Suction (kPa)	VWC
0.001	0.5190
0.025	0.5190
0.05	0.5189
0.075	0.5189
0.1	0.5189
1	0.5170
2	0.5146
3	0.5121
4	0.5096
5	0.5071
6	0.5047
7	0.5022
8	0.4999
9	0.4976
10	0.4953
15	0.4848
20	0.4755
30	0.4600
40	0.4475
50	0.4371
60	0.4282
70	0.4205
80	0.4137
90	0.4077
100	0.4023
500	0.3216
1000	0.2905
5000	0.2287
10000	0.2063
25000	0.1799
5.00E+04	0.1622
1.00E+05	0.1463
5.00E+05	0.1150
7.50E+05	0.1083
1.00E+06	0.1037

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.519	0.5190	0.000	0.000
3.45	0.519	0.5110	0.008	0.000
6.90	0.481	0.5025	-0.021	0.000
13.79	0.468	0.4872	-0.020	0.000
27.59	0.441	0.4634	-0.023	0.001
55.18	0.411	0.4323	-0.021	0.000
103.46	0.389	0.4005	-0.012	0.000
206.91	0.384	0.3648	0.019	0.000
413.82	0.357	0.3305	0.027	0.001
551.76	0.354	0.3170	0.037	0.001
2210.00	0.290	0.2583	0.032	0.001
15300.00	0.189	0.1936	-0.005	0.000
20900.00	0.173	0.1848	-0.012	0.000
30900.00	0.162	0.1743	-0.012	0.000
61100.00	0.117	0.1574	-0.041	0.002

Residual = 0.000493924

E-84



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	150-mm	EAST NORTH TOP	Test Date	4/9/2008
WT of Sample Ring =	376.6	g		
WT of Sample Ring + Soil =	1607	g		
Water Content =	24.55	%		
Diameter of Sample Ring, D =	6.06	in		
Height of Sample Ring, L =	1.4	in		
Volume, V =	2.39E-02	ft ³	675.9	cm ³
Dry Unit Weight =	91.24	pcf	1.46	Mg/m ³
Water WT =	242.52	g		
Solid WT =	987.88	g		
Add Water for saturation =	58.4	g	Sr	98.03
Saturated Water Content =	30.46	%		
Tube Area, A =	0.19	cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0		0.000	0.001	0.305	0.445
0.5		19.000	3.449	0.285	0.417
1		31.000	6.897	0.273	0.400
2		49.000	13.794	0.255	0.373
4		79.000	27.588	0.225	0.328
8		112.500	55.176	0.191	0.279
15		136.500	103.455	0.166	0.243
30		154.500	206.910	0.148	0.217
60		163.500	413.820	0.139	0.203
		Activity Meter Test	1350.00	0.092	0.135
			17900.00	0.049	0.072
			24100.00	0.047	0.069

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
1.35	7.7255	15.0651	14.4444	0.092	0.135
17.9	8.0855	15.0824	14.7555	0.049	0.072
24.1	7.6806	14.7071	14.391	0.047	0.069

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4454
$\alpha =$	0.1168
$n =$	1.2285
$m =$	0.1860

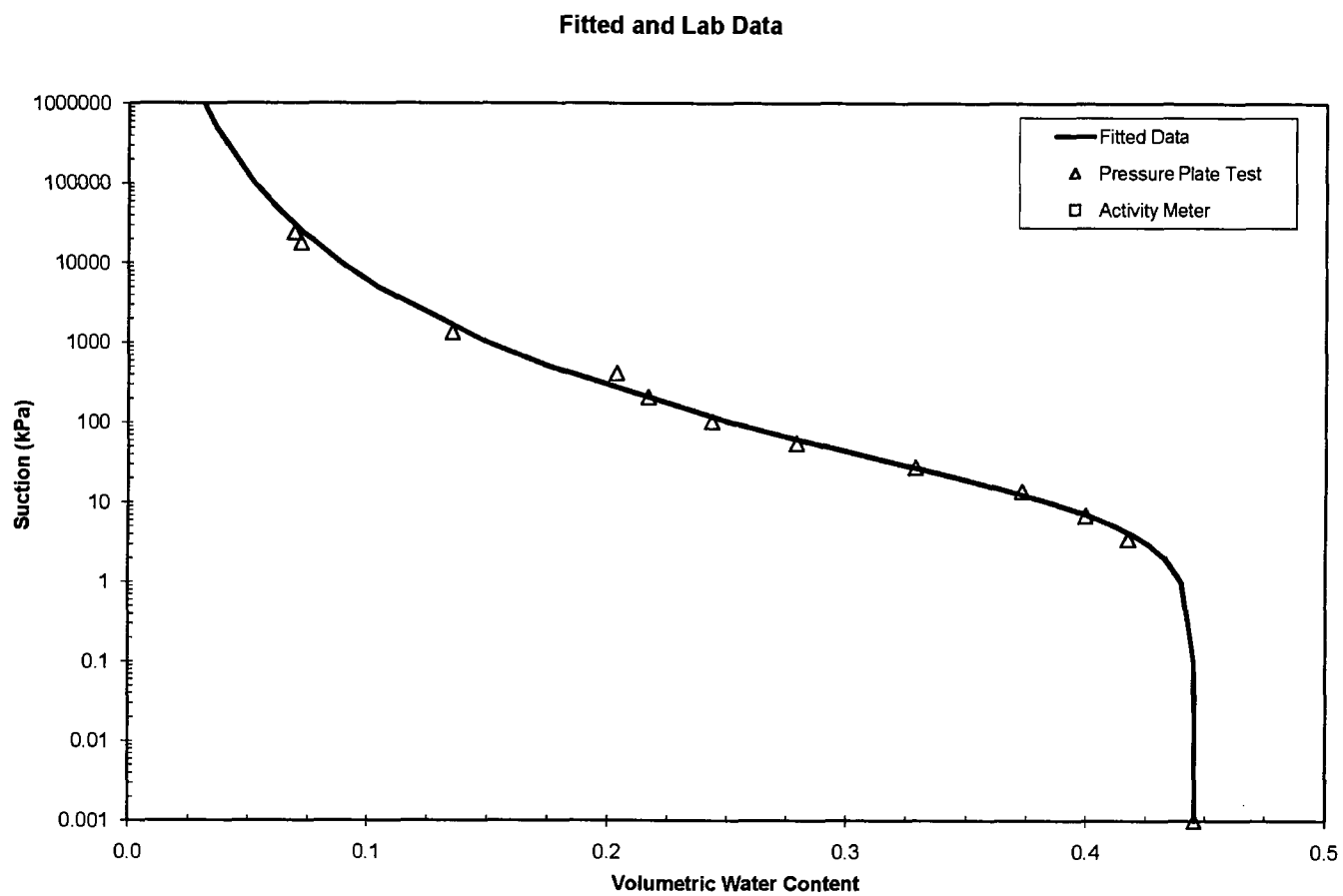
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4454
0.025	0.4454
0.05	0.4453
0.075	0.4452
0.1	0.4451
1	0.4397
2	0.4328
3	0.4257
4	0.4188
5	0.4122
6	0.4060
7	0.4001
8	0.3945
9	0.3893
10	0.3843
15	0.3633
20	0.3469
30	0.3226
40	0.3051
50	0.2917
60	0.2809
70	0.2719
80	0.2642
90	0.2576
100	0.2518
500	0.1757
1000	0.1500
5000	0.1039
10000	0.0887
25000	0.0720
5.00E+04	0.0614
1.00E+05	0.0524
5.00E+05	0.0363
7.50E+05	0.0331
1.00E+06	0.0310

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.445	0.4454	0.000	0.000
3.45	0.417	0.4226	-0.005	0.000
6.90	0.400	0.4007	-0.001	0.000
13.79	0.373	0.3679	0.005	0.000
27.59	0.328	0.3277	0.001	0.000
55.18	0.279	0.2858	-0.007	0.000
103.46	0.243	0.2499	-0.007	0.000
206.91	0.217	0.2144	0.002	0.000
413.82	0.203	0.1834	0.020	0.000
1350.00	0.135	0.1401	-0.005	0.000
17900.00	0.072	0.0777	-0.006	0.000
24100.00	0.069	0.0726	-0.004	0.000
		0.4454	-0.445	0.198

Residual = 5.23861E-05



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	East Side North Pit 0-30 cm	Test Date	1/10/2008
WT of Sample Ring =	69.9 g		
WT of Sample Ring + Soil =	293.5 g		
Water Content =	23.70 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	107.19 pcf	1.72 Mg/m ³	
Water WT =	42.84 g		
Solid WT =	180.76 g		
Add Water for saturation =	0 g	Sr	113.39
Saturated Water Content =	23.70 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	13.9	0.000	0.001	0.237	0.407
1	21.2	1.387	6.897	0.229	0.394
2	25.8	2.261	13.794	0.224	0.386
4	33.3	3.686	27.588	0.217	0.372
7.7	43.2	5.567	53.107	0.206	0.354
15	69.5	10.564	103.455	0.179	0.307
		Activity Meter Test	1150.00	0.113	0.194
			11800.00	0.063	0.108
			26100.00	0.051	0.088

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
26.1	20.44	28.82	28.4096	0.051	0.088
11.8	19.57	28.07	27.568	0.063	0.108
1.15	18.5	27.41	26.5059	0.113	0.194

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4071
$\alpha =$	0.0239
$n =$	1.2323
$m =$	0.1885

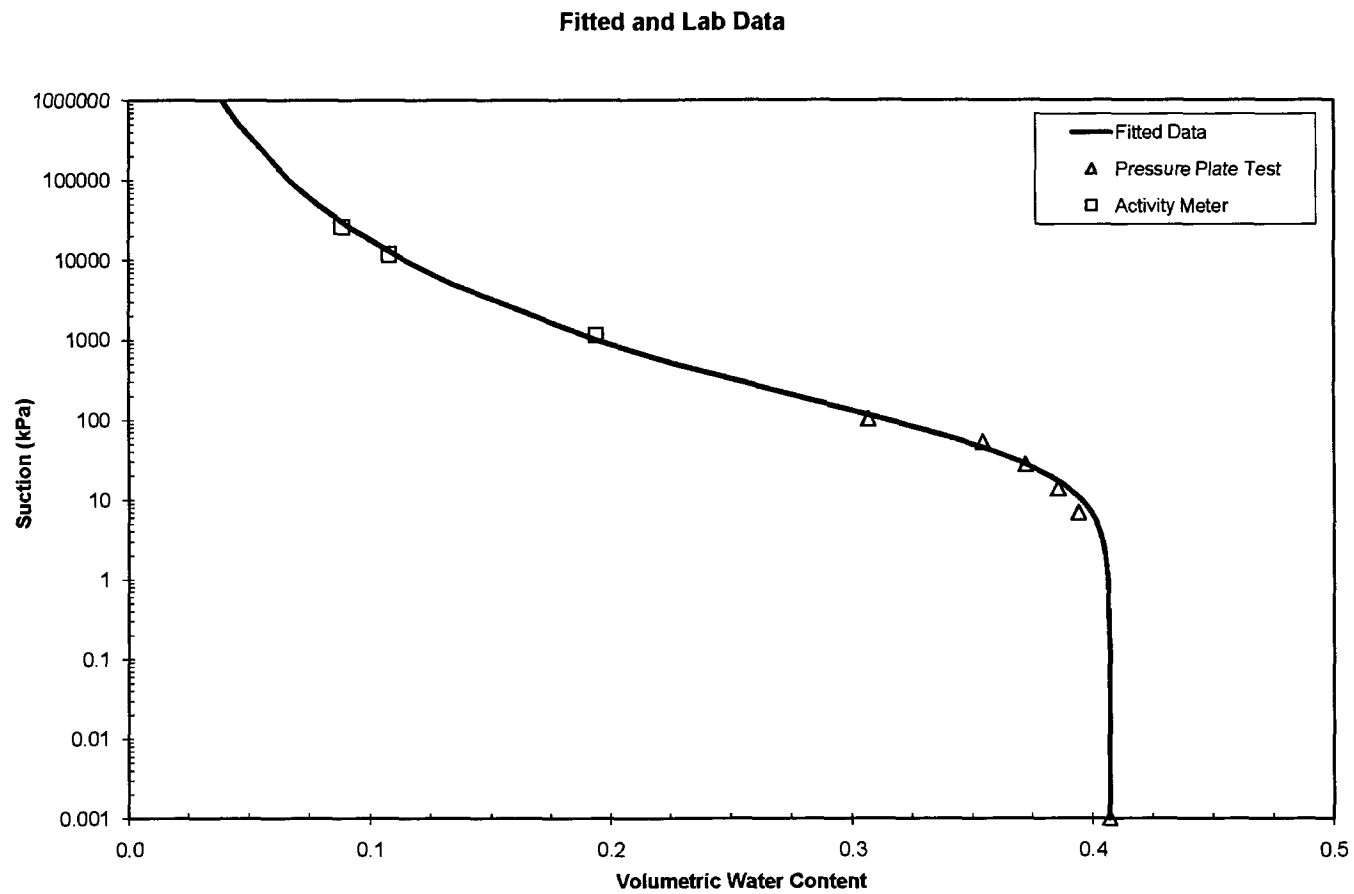
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4071
0.025	0.4071
0.05	0.4071
0.075	0.4071
0.1	0.4071
1	0.4063
2	0.4053
3	0.4042
4	0.4030
5	0.4018
6	0.4005
7	0.3992
8	0.3978
9	0.3965
10	0.3952
15	0.3885
20	0.3820
30	0.3699
40	0.3592
50	0.3496
60	0.3411
70	0.3335
80	0.3266
90	0.3204
100	0.3147
500	0.2269
1000	0.1941
5000	0.1340
10000	0.1141
25000	0.0922
5.00E+04	0.0785
1.00E+05	0.0668
5.00E+05	0.0460
7.50E+05	0.0418
1.00E+06	0.0391

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.407	0.4071	0.000	0.000
6.90	0.394	0.3993	-0.005	0.000
13.79	0.386	0.3901	-0.004	0.000
27.59	0.372	0.3727	-0.001	0.000
53.11	0.354	0.3469	0.007	0.000
103.46	0.307	0.3128	-0.006	0.000
1150.00	0.194	0.1880	0.006	0.000
11800.00	0.108	0.1098	-0.002	0.000
26100.00	0.088	0.0913	-0.003	0.000

Residual = 2.09061E-05



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	East Side North Pit 30-60 cm	Test Date	1/10/2008
WT of Sample Ring =	69.5 g		
WT of Sample Ring + Soil =	281.3 g		
Water Content =	24.81 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	100.63 pcf	1.61 Mg/m ³	
Water WT =	42.10 g		
Solid WT =	169.70 g		
Add Water for saturation =	0.6 g	Sr	101.89
Saturated Water Content =	25.16 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	10.2	0.000	0.001	0.252	0.406
1	13.7	0.665	6.897	0.248	0.399
2	13.4	0.608	13.794	0.248	0.400
4	13.2	0.570	27.588	0.248	0.400
8	23.7	2.565	55.176	0.237	0.381
16	31.8	4.104	110.352	0.227	0.367
		Activity Meter Test	690.00	0.135	0.217
			3040.00	0.077	0.124
			19400.00	0.046	0.075

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
19.4	18.619	26.4791	26.1316	0.046	0.075
3.04	19.4855	27.5518	26.9776	0.077	0.124
0.69	18.5505	27.0092	26.0063	0.135	0.217

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0434
$\theta_s =$	0.4058
$\alpha =$	0.0053
$n =$	1.5356
$m =$	0.3488

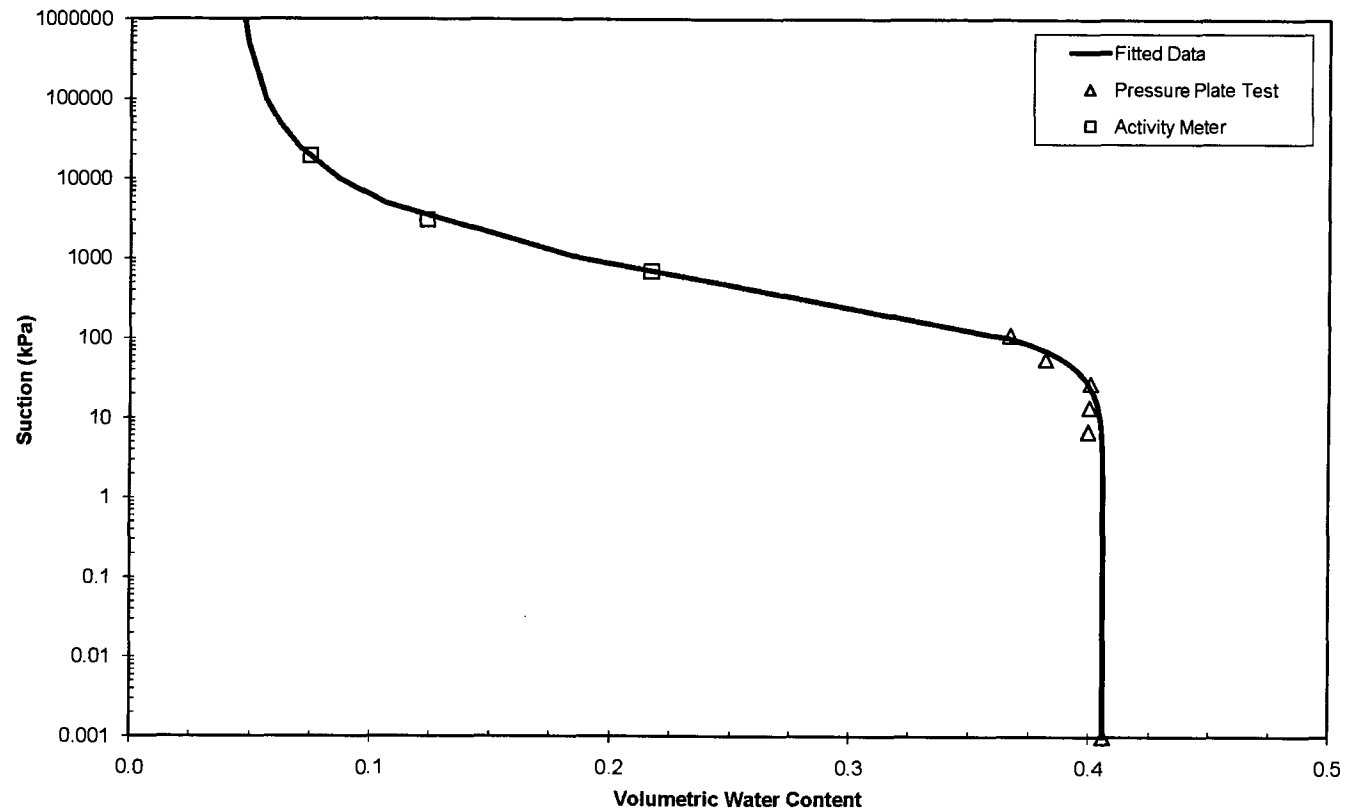
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4058
0.025	0.4058
0.05	0.4058
0.075	0.4058
0.1	0.4058
1	0.4058
2	0.4057
3	0.4056
4	0.4055
5	0.4053
6	0.4052
7	0.4050
8	0.4048
9	0.4046
10	0.4044
15	0.4033
20	0.4019
30	0.3986
40	0.3949
50	0.3907
60	0.3864
70	0.3818
80	0.3772
90	0.3724
100	0.3677
500	0.2441
1000	0.1882
5000	0.1060
10000	0.0866
25000	0.0699
5.00E+04	0.0617
1.00E+05	0.0560
5.00E+05	0.0487
7.50E+05	0.0477
1.00E+06	0.0470

FOR FITTING				
Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.406	0.4058	0.000	0.000
6.90	0.399	0.4050	-0.006	0.000
13.79	0.400	0.4036	-0.004	0.000
27.59	0.400	0.3995	0.001	0.000
55.18	0.381	0.3885	-0.007	0.000
110.35	0.367	0.3628	0.004	0.000
690.00	0.217	0.2167	0.000	0.000
3040.00	0.124	0.1249	-0.001	0.000
19400.00	0.075	0.0737	0.001	0.000

Residual = 1.25272E-05

Fitted and Lab Data



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	150-mm EAST SOUTH TOP	Test Date	4/9/2008
WT of Sample Ring =	385.6 g		
WT of Sample Ring + Soil =	2150.1 g		
Water Content =	26.60 %		
Diameter of Sample Ring, D =	6.04 in		
Height of Sample Ring, L =	2.0 in		
Volume, V =	3.33E-02 ft ³	943.8 cm ³	
Dry Unit Weight =	92.19 pcf	1.48 Mg/m ³	
Water WT =	370.74 g		
Solid WT =	1393.76 g		
Add Water for saturation =	37.5 g	Sr	96.44
Saturated Water Content =	29.29 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0		0.000	0.001	0.293	0.433
0.5		40.500	3.449	0.264	0.390
1		55.500	6.897	0.253	0.374
2		78.500	13.794	0.237	0.350
4		135.500	27.588	0.196	0.289
8		178.500	55.176	0.165	0.244
15		212.500	103.455	0.140	0.207
30		237.500	206.910	0.123	0.181
60		254.500	413.820	0.110	0.163
		Activity Meter Test	1730.00	0.072	0.107
			2530.00	0.063	0.092
			26700.00	0.040	0.058

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
1.73	8.2984	15.5346	15.0461	0.072	0.107
2.53	7.5862	14.8092	14.3843	0.063	0.092
26.7	8.6789	15.4027	15.1469	0.040	0.058

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0081
$\theta_s =$	0.4328
$\alpha =$	0.1515
$n =$	1.2608
$m =$	0.2069

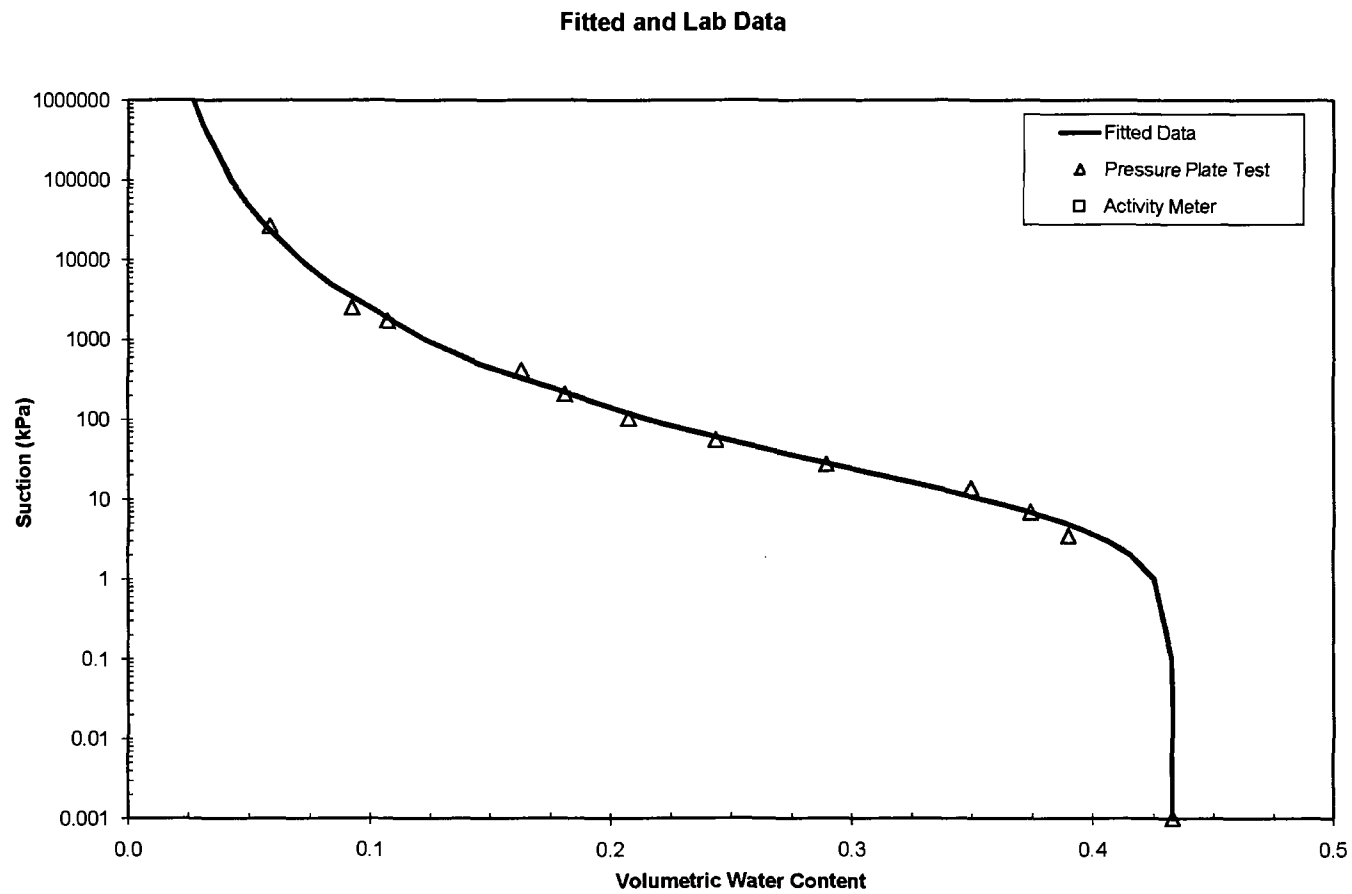
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4328
0.025	0.4327
0.05	0.4326
0.075	0.4324
0.1	0.4323
1	0.4250
2	0.4155
3	0.4060
4	0.3969
5	0.3884
6	0.3805
7	0.3732
8	0.3664
9	0.3601
10	0.3542
15	0.3300
20	0.3119
30	0.2862
40	0.2682
50	0.2547
60	0.2440
70	0.2351
80	0.2277
90	0.2213
100	0.2157
500	0.1453
1000	0.1227
5000	0.0834
10000	0.0710
25000	0.0576
5.00E+04	0.0494
1.00E+05	0.0426
5.00E+05	0.0307
7.50E+05	0.0285
1.00E+06	0.0270

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.433	0.4328	0.000	0.000
3.45	0.390	0.4018	-0.012	0.000
6.90	0.374	0.3739	0.000	0.000
13.79	0.350	0.3352	0.014	0.000
27.59	0.289	0.2915	-0.002	0.000
55.18	0.244	0.2488	-0.005	0.000
103.46	0.207	0.2140	-0.006	0.000
206.91	0.181	0.1805	0.000	0.000
413.82	0.163	0.1522	0.011	0.000
1730.00	0.107	0.1074	0.000	0.000
2530.00	0.092	0.0981	-0.006	0.000
26700.00	0.058	0.0567	0.002	0.000
0.00	0.000	0.4328	-0.433	0.187

Residual = 4.81003E-05



ASTM D 6836 - 02 (Method B)

Sample I.D.	East Side South Pit 0-30 cm	Test Date	1/10/2008
WT of Sample Ring =	69.1 g		
WT of Sample Ring + Soil =	276.9 g		
Water Content =	24.99 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	98.59 pcf	1.58 Mg/m ³	
Water WT =	41.55 g		
Solid WT =	166.25 g		
Add Water for saturation =	0.4 g	Sr	97.11
Saturated Water Content =	25.23 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	4.3	0.000	0.001	0.252	0.399
1	9.8	1.045	6.897	0.246	0.389
3.5	17.8	2.565	24.140	0.237	0.374
7.7	49.2	8.531	53.107	0.201	0.318
15.7	64.5	11.438	108.283	0.184	0.290
		Activity Meter Test	630.00	0.133	0.211
			2600.00	0.072	0.113
			8390.00	0.053	0.085

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
8.39	18.1381	25.8541	25.4623	0.053	0.085
2.6	18.521	26.3718	25.8468	0.072	0.113
0.63	19.5055	27.6341	26.678	0.133	0.211

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3986
$\alpha =$	0.0229
$n =$	1.2815
$m =$	0.2197

FOR GRAPHING

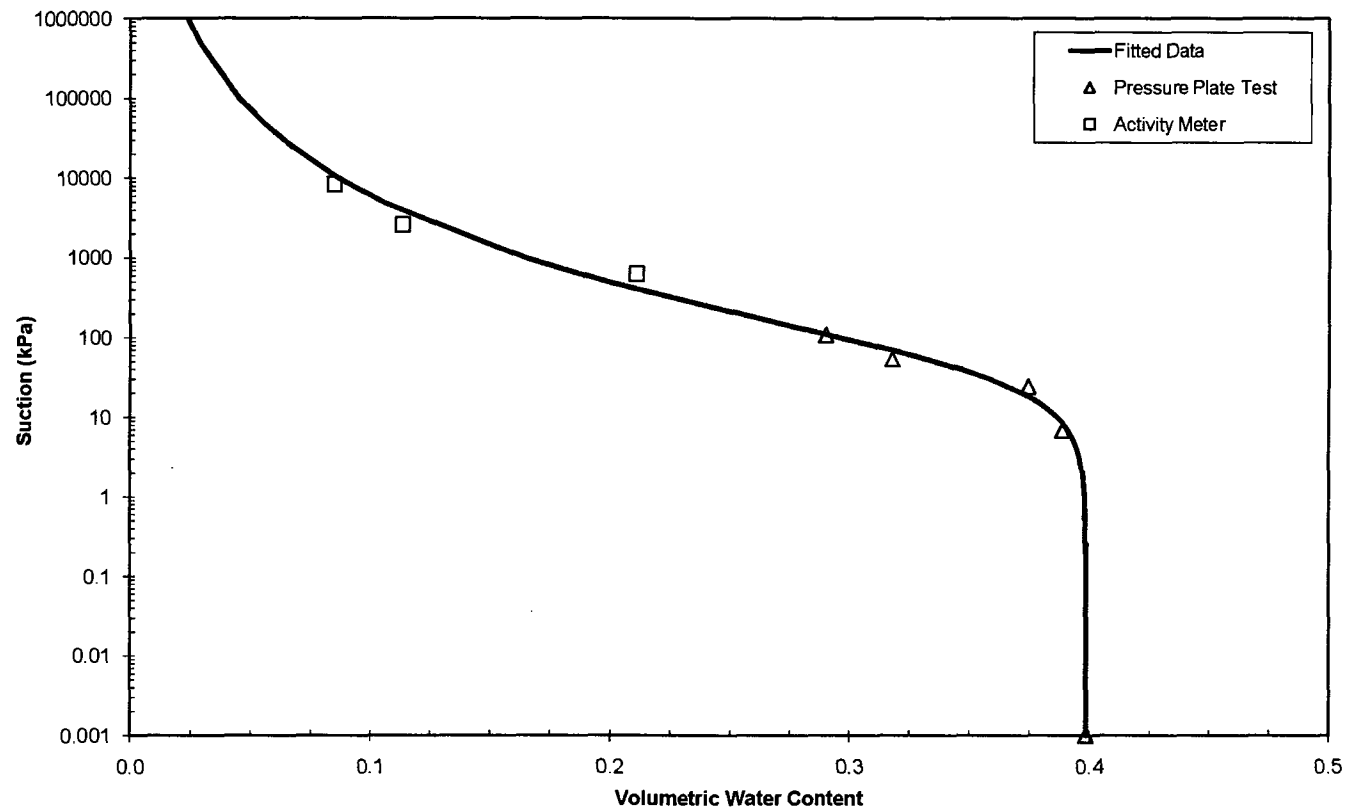
Suction (kPa)	VWC
0.001	0.3986
0.025	0.3986
0.05	0.3986
0.075	0.3986
0.1	0.3986
1	0.3979
2	0.3970
3	0.3958
4	0.3946
5	0.3934
6	0.3921
7	0.3907
8	0.3893
9	0.3879
10	0.3865
15	0.3793
20	0.3721
30	0.3587
40	0.3465
50	0.3356
60	0.3259
70	0.3172
80	0.3094
90	0.3023
100	0.2958
500	0.1988
1000	0.1645
5000	0.1049
10000	0.0863
25000	0.0667
5.00E+04	0.0549
1.00E+05	0.0452
5.00E+05	0.0287
7.50E+05	0.0256
1.00E+06	0.0236

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WVC (%)	$(\Delta$ WVC) ²
0.001	0.399	0.3986	0.000	0.000
6.90	0.389	0.3908	-0.002	0.000
24.14	0.374	0.3664	0.008	0.000
53.11	0.318	0.3325	-0.015	0.000
108.28	0.290	0.2908	-0.001	0.000
630.00	0.211	0.1867	0.024	0.001
2600.00	0.113	0.1260	-0.013	0.000
8390.00	0.085	0.0907	-0.006	0.000

Residual = 0.000132708

Fitted and Lab Data



ASTM D 6836 - 02 (Method B)

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha\psi)^n} \right]^m$$

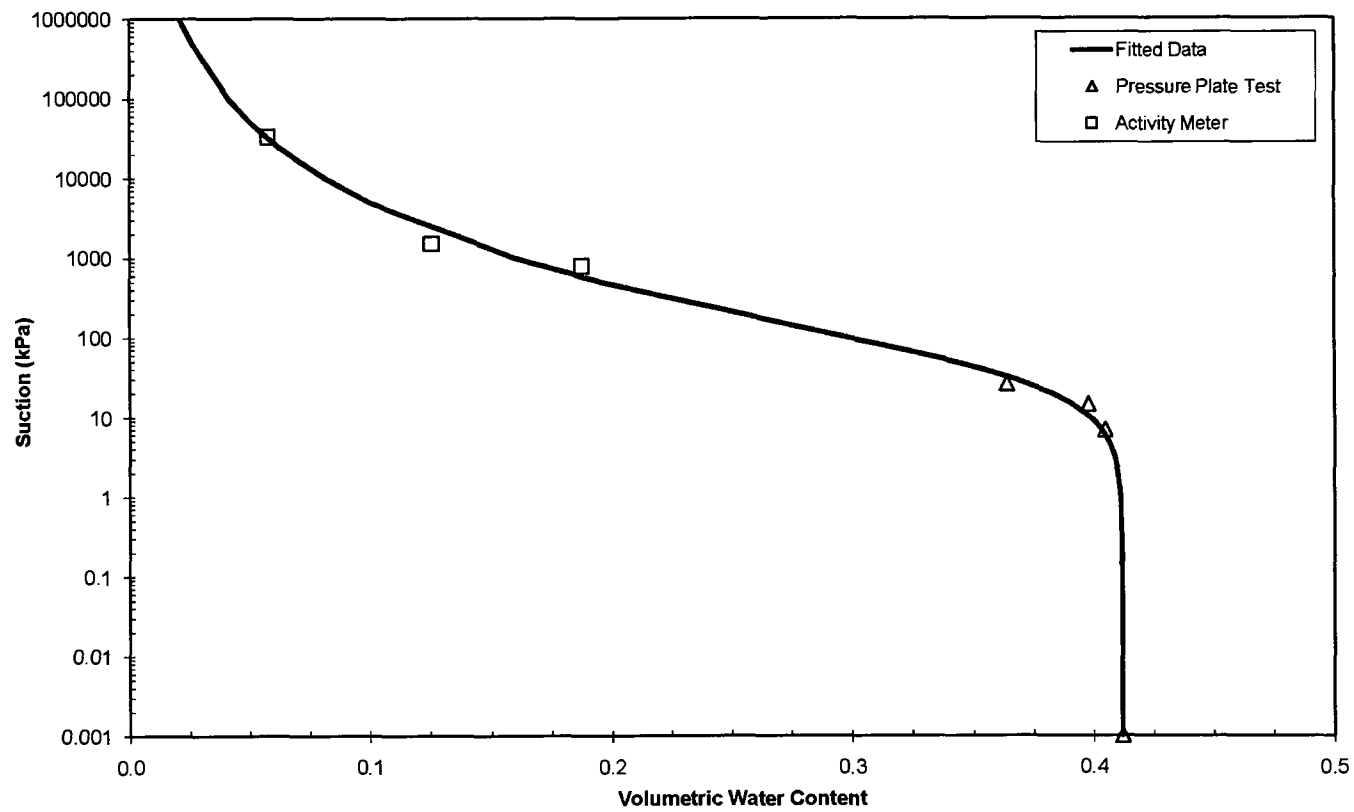
$\theta_r =$	0.0000
$\theta_s =$	0.4120
$\alpha =$	0.0242
$n =$	1.2954
$m =$	0.2280

FOR GRAPHING	
Suction (kPa)	VWC
0.001	0.4120
0.025	0.4120
0.05	0.4120
0.075	0.4120
0.1	0.4119
1	0.4112
2	0.4101
3	0.4089
4	0.4075
5	0.4061
6	0.4046
7	0.4031
8	0.4015
9	0.3999
10	0.3983
15	0.3901
20	0.3821
30	0.3669
40	0.3533
50	0.3413
60	0.3306
70	0.3211
80	0.3125
90	0.3048
100	0.2978
500	0.1954
1000	0.1601
5000	0.0998
10000	0.0814
25000	0.0621
5.00E+04	0.0506
1.00E+05	0.0412
5.00E+05	0.0256
7.50E+05	0.0227
1.00E+06	0.0209

FOR FITTING				
Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.412	0.4120	0.000	0.000
6.90	0.405	0.4032	0.002	0.000
14.48	0.398	0.3910	0.007	0.000
26.21	0.364	0.3725	-0.009	0.000
800.00	0.187	0.1708	0.016	0.000
1530.00	0.126	0.1414	-0.016	0.000
33200.00	0.058	0.0571	0.001	0.000

Residual = 9.19351E-05

Fitted and Lab Data



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	254-mm Caisson North Surface	Test Date	8/5/2008
WT of Sample Ring =	884.2 g		
WT of Sample Ring + Soil =	6515 g		
Water Content =	29.00 %		
Diameter of Sample Ring, D =	10.00 in		
Height of Sample Ring, L =	2.1 in		
Volume, V =	9.66E-02 ft ³	2735.0 cm ³	
Dry Unit Weight =	99.63 pcf	1.60 Mg/m ³	
Water WT =	1265.85 g		
Solid WT =	4364.95 g		
Add Water for saturation =	213.3 g	Sr	133.85
Saturated Water Content =	33.89 %		
Tube Area, A =	20.268299 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	2.3	0.000	0.001	0.339	0.541
0.5	5.9	72.966	3.449	0.322	0.514
1	10.3	162.146	6.897	0.302	0.482
2	15.1	259.434	13.794	0.279	0.446
3	18.7	332.400	20.691	0.263	0.419
4	22	399.285	27.588	0.247	0.395
8	29.2	545.217	55.176	0.214	0.342
15	36	683.042	103.455	0.182	0.291
30	41.1	786.410	206.910	0.159	0.253
60	47.8	922.208	413.820	0.128	0.204
		Activity Meter Test	930.00	0.122	0.195
			1120.00	0.108	0.172
			3080.00	0.084	0.133
			12300.00	0.065	0.104
			62000.00	0.040	0.064

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
0.93	20.5492	28.4406	27.5813	0.122	0.195
1.12	18.8023	27.239	26.4166	0.108	0.172
3.08	22.7633	30.9988	30.3634	0.084	0.133
12.3	18.832	26.8103	26.3235	0.065	0.104
62	19.5213	27.2954	26.9946	0.040	0.064

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0070
$\theta_s =$	0.5411
$\alpha =$	0.1160
$n =$	1.2418
$m =$	0.1947

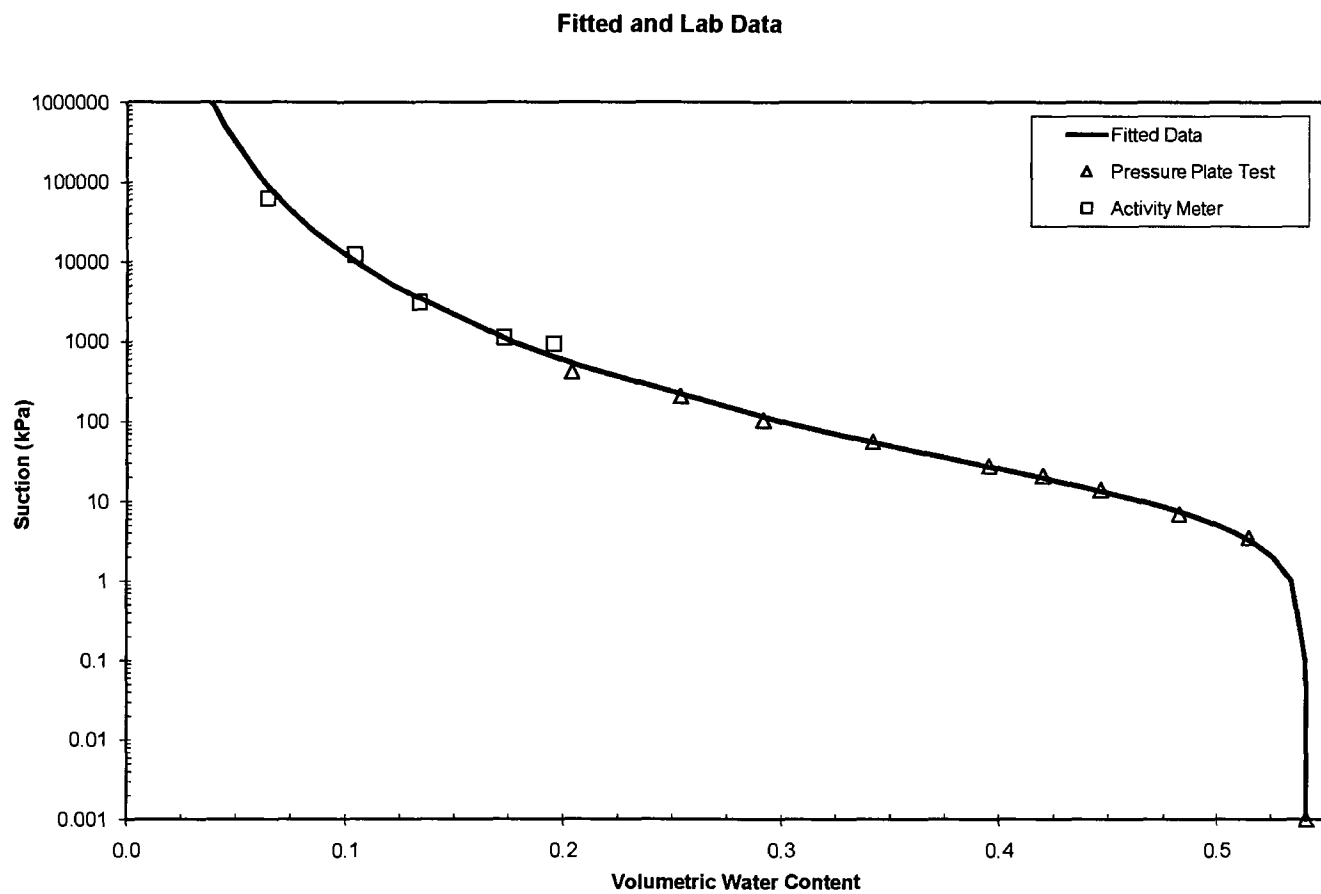
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.5411
0.025	0.5410
0.05	0.5409
0.075	0.5408
0.1	0.5407
1	0.5342
2	0.5256
3	0.5168
4	0.5082
5	0.5000
6	0.4921
7	0.4847
8	0.4778
9	0.4712
10	0.4649
15	0.4385
20	0.4179
30	0.3874
40	0.3656
50	0.3489
60	0.3355
70	0.3244
80	0.3149
90	0.3067
100	0.2995
500	0.2068
1000	0.1761
5000	0.1216
10000	0.1039
25000	0.0846
5.00E+04	0.0727
1.00E+05	0.0625
5.00E+05	0.0446
7.50E+05	0.0411
1.00E+06	0.0388

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.541	0.5411	0.000	0.000
3.45	0.514	0.5129	0.001	0.000
6.90	0.482	0.4855	-0.004	0.000
13.79	0.446	0.4442	0.002	0.000
20.69	0.419	0.4154	0.004	0.000
27.59	0.395	0.3938	0.001	0.000
55.18	0.342	0.3416	0.000	0.000
103.46	0.291	0.2973	-0.006	0.000
206.91	0.253	0.2537	0.000	0.000
413.82	0.204	0.2161	-0.012	0.000
930.00	0.195	0.1790	0.016	0.000
1120.00	0.172	0.1715	0.001	0.000
3080.00	0.133	0.1358	-0.002	0.000
12300.00	0.104	0.0992	0.005	0.000
62000.00	0.064	0.0693	-0.005	0.000

Residual = 3.58545E-05



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	150-mm NORTH CAISSON TOP	Test Date	4/9/2008
WT of Sample Ring =	387 g		
WT of Sample Ring + Soil =	1817.8 g		
Water Content =	31.08 %		
Diameter of Sample Ring, D =	6.03 in		
Height of Sample Ring, L =	1.7 in		
Volume, V =	2.73E-02 ft ³	772.2 cm ³	
Dry Unit Weight =	88.25 pcf	1.41 Mg/m ³	
Water WT =	339.25 g		
Solid WT =	1091.55 g		
Add Water for saturation =	31.2 g	Sr	101.62
Saturated Water Content =	33.94 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0		0.000	0.001	0.339	0.480
0.5		20.000	3.449	0.321	0.454
1		36.000	6.897	0.306	0.433
2		55.000	13.794	0.289	0.409
4		88.000	27.588	0.259	0.366
8		125.000	55.176	0.225	0.318
15		151.000	103.455	0.201	0.284
30		178.000	206.910	0.176	0.249
60		189.500	413.820	0.166	0.234
		Activity Meter Test	1380.00	0.088	0.125
			1620.00	0.081	0.115
			6880.00	0.058	0.082

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
1.38	7.7906	14.6633	14.1046	0.088	0.125
1.62	7.6997	14.6378	14.1172	0.081	0.115
6.88	8.2177	15.0395	14.6646	0.058	0.082

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_s =$	0.0000
$\theta_r =$	0.4800
$\alpha =$	0.0742
$n =$	1.2611
$m =$	0.2070

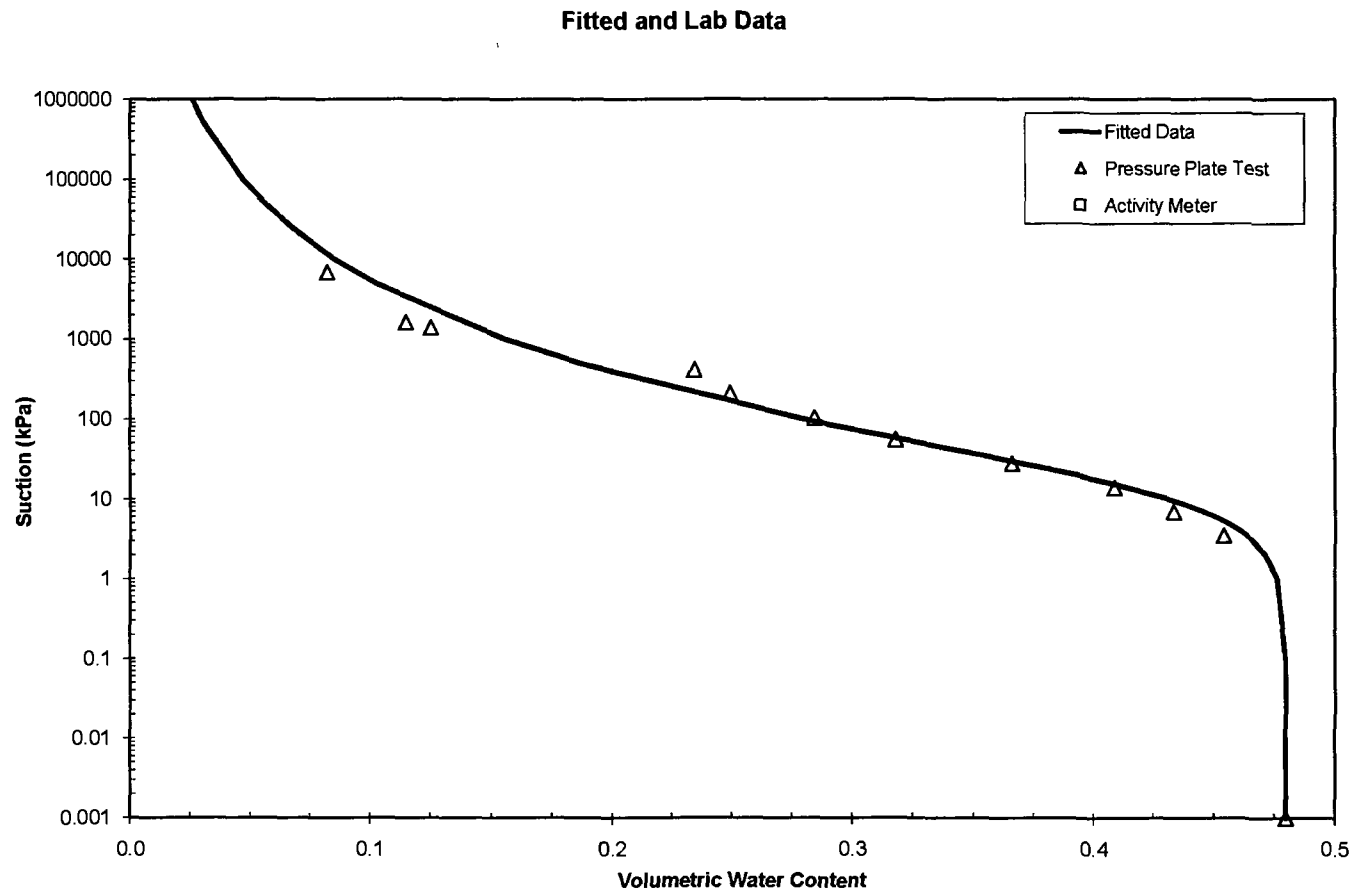
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4800
0.025	0.4799
0.05	0.4799
0.075	0.4798
0.1	0.4798
1	0.4763
2	0.4715
3	0.4662
4	0.4609
5	0.4556
6	0.4503
7	0.4452
8	0.4402
9	0.4354
10	0.4307
15	0.4098
20	0.3924
30	0.3652
40	0.3448
50	0.3287
60	0.3156
70	0.3046
80	0.2953
90	0.2871
100	0.2799
500	0.1864
1000	0.1558
5000	0.1024
10000	0.0855
25000	0.0673
5.00E+04	0.0562
1.00E+05	0.0469
5.00E+05	0.0308
7.50E+05	0.0277
1.00E+06	0.0257

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.480	0.4800	0.000	0.000
3.45	0.454	0.4639	-0.010	0.000
6.90	0.433	0.4457	-0.012	0.000
13.79	0.409	0.4145	-0.006	0.000
27.59	0.366	0.3710	-0.005	0.000
55.18	0.318	0.3216	-0.004	0.000
103.46	0.284	0.2776	0.007	0.000
206.91	0.249	0.2337	0.016	0.000
413.82	0.234	0.1958	0.039	0.001
1380.00	0.125	0.1433	-0.018	0.000
1620.00	0.115	0.1374	-0.023	0.001
6880.00	0.082	0.0942	-0.012	0.000
0.00	0.000	0.4800	-0.480	0.230

Residual = 0.000257788



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	North Caisson 30-60 cm	Test Date	1/10/2008
WT of Sample Ring =	70.21 g		
WT of Sample Ring + Soil =	279.4 g		
Water Content =	26.01 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	98.44 pcf	1.58 Mg/m ³	
Water WT =	43.18 g		
Solid WT =	166.01 g		
Add Water for saturation =	0 g	Sr	99.76
Saturated Water Content =	26.01 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	16.1	0.000	0.001	0.260	0.410
1.1	34.3	3.458	7.587	0.239	0.377
2	33.6	3.325	13.794	0.240	0.379
3.9	35.1	3.610	26.898	0.238	0.376
8	54.5	7.296	55.176	0.216	0.341
		Activity Meter	970.00	0.121	0.190
		Test	4160.00	0.073	0.115
			63700.00	0.033	0.053

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
63.7	20.5509	28.1818	27.9347	0.033	0.053
4.16	22.0099	29.8876	29.3512	0.073	0.115
0.97	18.423	26.4685	25.6017	0.121	0.190

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4103
$\alpha =$	0.0255
$n =$	1.2595
$m =$	0.2060

FOR GRAPHING

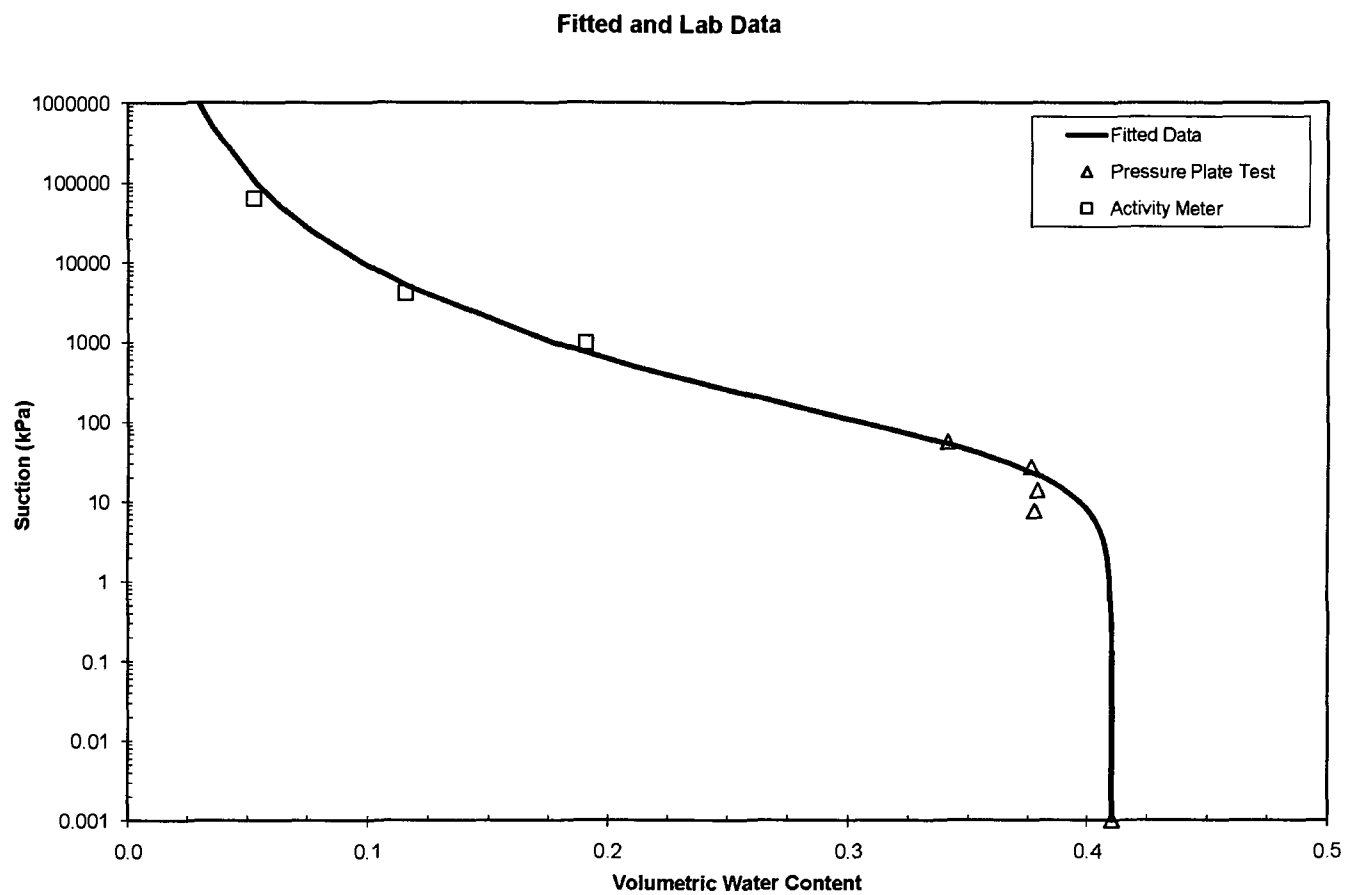
Suction (kPa)	VWC
0.001	0.4103
0.025	0.4103
0.05	0.4103
0.075	0.4103
0.1	0.4103
1	0.4095
2	0.4084
3	0.4071
4	0.4057
5	0.4043
6	0.4028
7	0.4013
8	0.3998
9	0.3982
10	0.3967
15	0.3889
20	0.3813
30	0.3673
40	0.3548
50	0.3439
60	0.3342
70	0.3256
80	0.3179
90	0.3109
100	0.3046
500	0.2103
1000	0.1785
5000	0.1166
10000	0.0974
25000	0.0768
5.00E+04	0.0642
1.00E+05	0.0536
5.00E+05	0.0353
7.50E+05	0.0318
1.00E+06	0.0295

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.410	0.4103	0.000	0.000
7.59	0.377	0.4004	-0.023	0.001
13.79	0.379	0.3907	-0.012	0.000
26.90	0.376	0.3714	0.005	0.000
55.18	0.341	0.3387	0.002	0.000
970.00	0.190	0.1779	0.013	0.000
4160.00	0.115	0.1223	-0.007	0.000
63700.00	0.053	0.0603	-0.007	0.000

Residual = 0.000120058

E-111



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover
ASTM D 6836 - 02 (Method B)

Sample I.D.	254-mm North Caisson Radon	Test Date	8/5/2008
WT of Sample Ring =	887.9 g		
WT of Sample Ring + Soil =	5709.1 g		
Water Content =	21.59 %		
Diameter of Sample Ring, D =	10.00 in		
Height of Sample Ring, L =	3.0 in		
Volume, V =	1.36E-01 ft ³	3861.1	cm ³
Dry Unit Weight =	64.11 pcf	1.03	Mg/m ³
Water WT =	856.20 g		
Solid WT =	3965.00 g		
Add Water for saturation =	373.9 g	Sr	51.69
Saturated Water Content =	31.02 %		
Tube Area, A =	20.268299 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	4.5	0.000	0.001	0.310	0.319
0.5	10.5	121.610	3.449	0.280	0.287
1	16	233.085	6.897	0.251	0.258
2	20.3	320.239	13.794	0.229	0.236
3	22.2	358.749	20.691	0.220	0.226
4	22.8	370.910	27.588	0.217	0.223
8	26	435.768	55.176	0.200	0.206
15	28	476.305	103.455	0.190	0.195
30	35.3	624.264	206.910	0.153	0.157
60	39.3	705.337	413.820	0.132	0.136
		Activity Meter Test	1610.00	0.099	0.101
			3680.00	0.083	0.086
			16000.00	0.058	0.059
			51400.00	0.040	0.042
			67100.00	0.038	0.039

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
1.61	18.5489	26.3966	25.6926	0.099	0.101
3.68	20.4466	28.19	27.5938	0.083	0.086
16	18.5383	26.1324	25.7191	0.058	0.059
51.4	18.4012	25.8415	25.5519	0.040	0.042
67.1	18.8332	26.2845	26.0101	0.038	0.039

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3190
$\alpha =$	0.2296
$n =$	1.1923
$m =$	0.1613

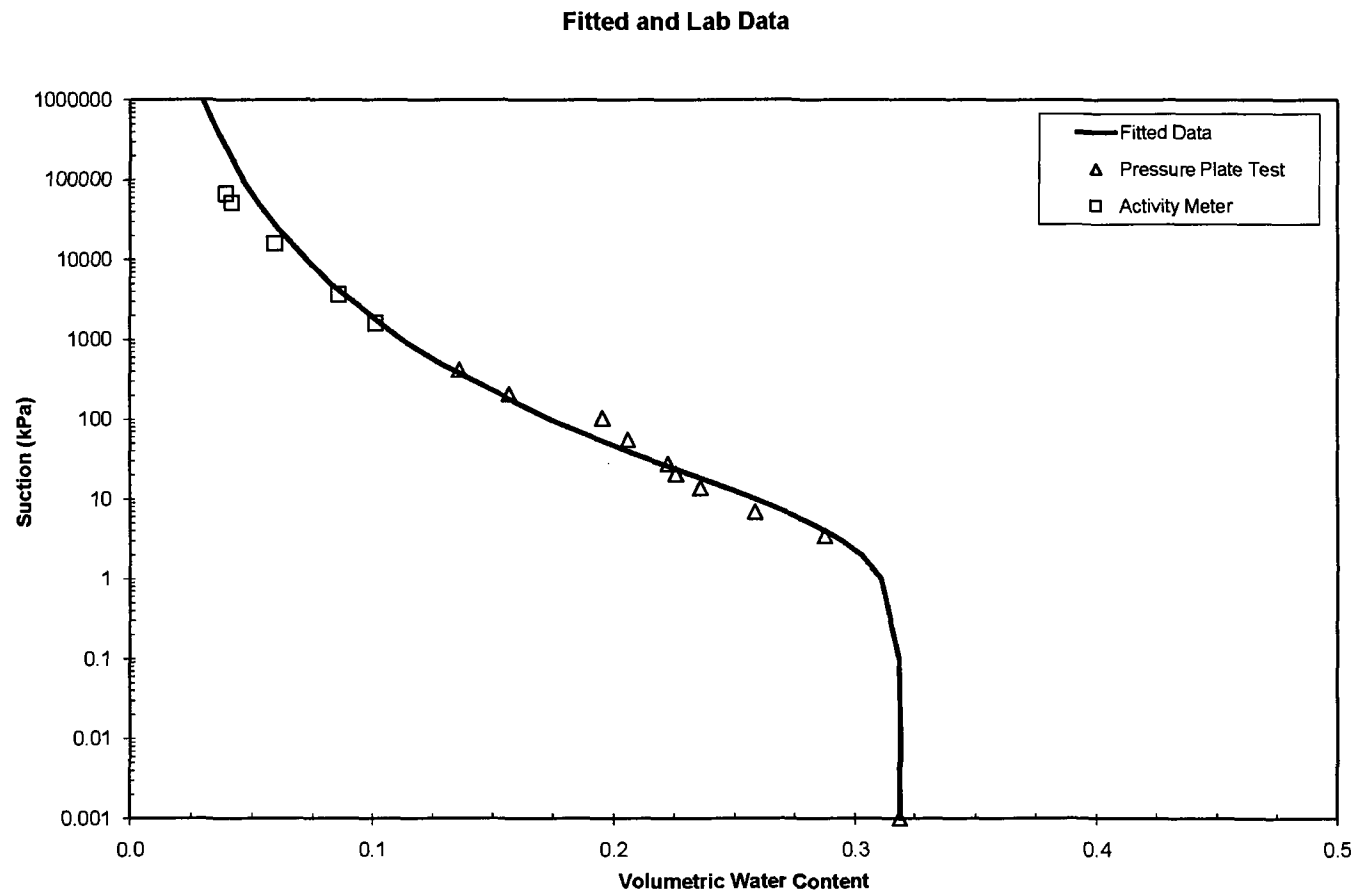
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3190
0.025	0.3189
0.05	0.3188
0.075	0.3186
0.1	0.3184
1	0.3109
2	0.3023
3	0.2945
4	0.2875
5	0.2813
6	0.2758
7	0.2708
8	0.2663
9	0.2622
10	0.2584
15	0.2433
20	0.2323
30	0.2168
40	0.2060
50	0.1978
60	0.1913
70	0.1860
80	0.1814
90	0.1774
100	0.1740
500	0.1281
1000	0.1121
5000	0.0823
10000	0.0720
25000	0.0604
5.00E+04	0.0529
1.00E+05	0.0463
5.00E+05	0.0340
7.50E+05	0.0314
1.00E+06	0.0297

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.319	0.3190	0.000	0.000
3.45	0.287	0.2913	-0.004	0.000
6.90	0.258	0.2713	-0.013	0.000
13.79	0.236	0.2465	-0.011	0.000
20.69	0.226	0.2310	-0.005	0.000
27.59	0.223	0.2199	0.003	0.000
55.18	0.208	0.1943	0.012	0.000
103.46	0.195	0.1729	0.022	0.001
206.91	0.157	0.1516	0.005	0.000
413.82	0.136	0.1328	0.003	0.000
1610.00	0.101	0.1023	-0.001	0.000
3680.00	0.086	0.0873	-0.002	0.000
16000.00	0.059	0.0658	-0.007	0.000
51400.00	0.042	0.0526	-0.011	0.000
67100.00	0.039	0.0500	-0.011	0.000

Residual = 8.61574E-05



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	150-mm RADON BARRIER TOP	Test Date	4/9/2008
WT of Sample Ring =	382 g		
WT of Sample Ring + Soil =	1899.6 g		
Water Content =	22.63 %		
Diameter of Sample Ring, D =	6.06 in		
Height of Sample Ring, L =	1.7 in		
Volume, V =	2.87E-02 ft ³	813.0 cm ³	
Dry Unit Weight =	95.03 pcf	1.52 Mg/m ³	
Water WT =	280.06 g		
Solid WT =	1237.54 g		
Add Water for saturation =	41.6 g	Sr	91.68
Saturated Water Content =	25.99 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0		0.000	0.001	0.260	0.396
0.5		19.000	3.449	0.245	0.372
1		28.000	6.897	0.237	0.361
2		45.000	13.794	0.224	0.340
4		82.000	27.588	0.194	0.295
8		112.000	55.176	0.169	0.258
15		132.000	103.455	0.153	0.233
30		147.000	206.910	0.141	0.215
60		165.000	413.820	0.127	0.193
		Activity Meter Test	1540.00	0.095	0.144
			3490.00	0.072	0.110
			18500.00	0.051	0.077

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
1.54	7.6695	15.2484	14.5921	0.095	0.144
3.49	7.8806	15.3258	14.8235	0.072	0.110
18.5	8.0124	15.3422	14.989	0.051	0.077

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3958
$\alpha =$	0.1188
$n =$	1.2009
$m =$	0.1673

FOR GRAPHING

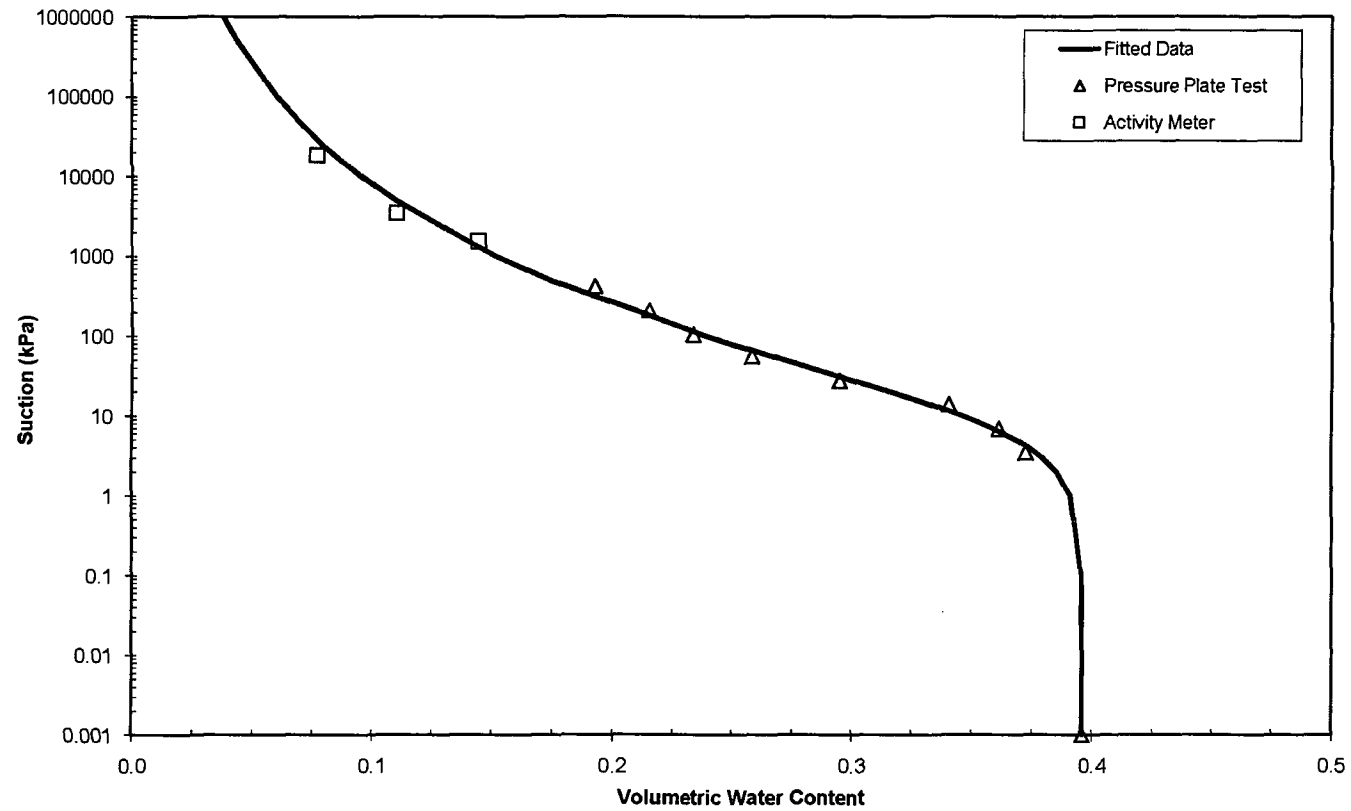
Suction (kPa)	VWC
0.001	0.3958
0.025	0.3958
0.05	0.3957
0.075	0.3956
0.1	0.3955
1	0.3909
2	0.3851
3	0.3793
4	0.3738
5	0.3685
6	0.3635
7	0.3587
8	0.3543
9	0.3501
10	0.3462
15	0.3294
20	0.3163
30	0.2967
40	0.2826
50	0.2717
60	0.2628
70	0.2554
80	0.2491
90	0.2436
100	0.2388
500	0.1741
1000	0.1515
5000	0.1097
10000	0.0955
25000	0.0794
5.00E+04	0.0691
1.00E+05	0.0601
5.00E+05	0.0435
7.50E+05	0.0401
1.00E+06	0.0379

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.396	0.3958	0.000	0.000
3.45	0.372	0.3768	-0.004	0.000
6.90	0.361	0.3592	0.002	0.000
13.79	0.340	0.3330	0.007	0.000
27.59	0.295	0.3008	-0.006	0.000
55.18	0.258	0.2669	-0.009	0.000
103.46	0.233	0.2372	-0.004	0.000
206.91	0.215	0.2073	0.008	0.000
413.82	0.193	0.1807	0.012	0.000
1540.00	0.144	0.1390	0.005	0.000
3490.00	0.110	0.1179	-0.008	0.000
18500.00	0.077	0.0844	-0.007	0.000

Residual = 4.60104E-05

Fitted and Lab Data



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	North Caisson Radon	Test Date	1/10/2008
WT of Sample Ring =	70.73 g		
WT of Sample Ring + Soil =	284.6 g		
Water Content =	20.93 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	104.87 pcf	1.68 Mg/m ³	
Water WT =	37.02 g		
Solid WT =	176.85 g		
Add Water for saturation =	0 g	Sr	94.33
Saturated Water Content =	20.93 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	13.6	0.000	0.001	0.209	0.352
1.1	33.2	3.724	7.587	0.188	0.316
2	36.3	4.313	13.794	0.185	0.311
		Activity Meter Test	940.00	0.120	0.202
			7930.00	0.072	0.122
			34500.00	0.048	0.081

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
34.5	18.5206	26.6611	26.2857	0.048	0.081
7.93	18.5009	26.8282	26.2653	0.072	0.122
0.94	18.405	27.126	26.1909	0.120	0.202

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3518
$\alpha =$	0.0912
$n =$	1.1561
$m =$	0.1350

FOR GRAPHING

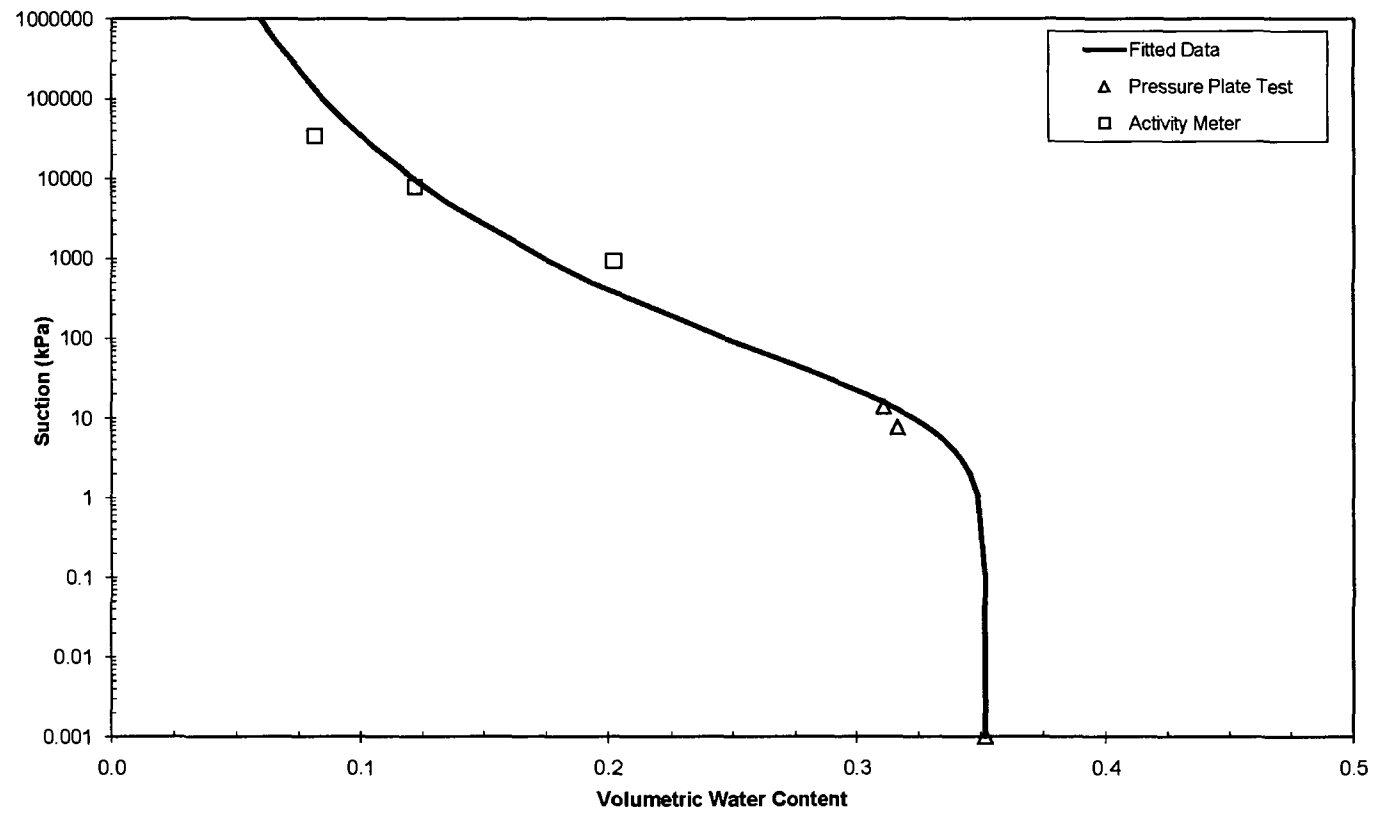
Suction (kPa)	VWC
0.001	0.3518
0.025	0.3517
0.05	0.3517
0.075	0.3516
0.1	0.3516
1	0.3489
2	0.3456
3	0.3423
4	0.3391
5	0.3360
6	0.3331
7	0.3303
8	0.3276
9	0.3250
10	0.3226
15	0.3119
20	0.3032
30	0.2898
40	0.2797
50	0.2717
60	0.2651
70	0.2595
80	0.2546
90	0.2504
100	0.2466
500	0.1935
1000	0.1738
5000	0.1352
10000	0.1214
25000	0.1052
5.00E+04	0.0944
1.00E+05	0.0847
5.00E+05	0.0659
7.50E+05	0.0619
1.00E+06	0.0592

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.352	0.3518	0.000	0.000
7.59	0.316	0.3287	-0.012	0.000
13.79	0.311	0.3143	-0.003	0.000
940.00	0.202	0.1754	0.026	0.001
7930.00	0.122	0.1259	-0.004	0.000
34500.00	0.081	0.1001	-0.019	0.000

Residual = 0.000205067

Fitted and Lab Data



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	South Caisson 0-30 cm	Test Date	1/10/2008
WT of Sample Ring =	71.1 g		
WT of Sample Ring + Soil =	282.8 g		
Water Content =	27.10 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	98.77 pcf	1.58 Mg/m ³	
Water WT =	45.14 g		
Solid WT =	166.56 g		
Add Water for saturation =	0 g	Sr	104.78
Saturated Water Content =	27.10 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	36.1	0.000	0.001	0.271	0.429
1	45.4	1.767	6.897	0.260	0.412
2	46.3	1.938	13.794	0.259	0.411
4	53.2	3.249	27.588	0.251	0.398
8	60.1	4.560	55.176	0.244	0.386
		Activity Meter Test	1130.00	0.121	0.191
			11300.00	0.067	0.106
			57500.00	0.043	0.068

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
57.5	18.4046	26.0699	25.7549	0.043	0.068
11.3	18.8333	26.618	26.1288	0.067	0.106
1.13	19.7076	27.8032	26.9301	0.121	0.191

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

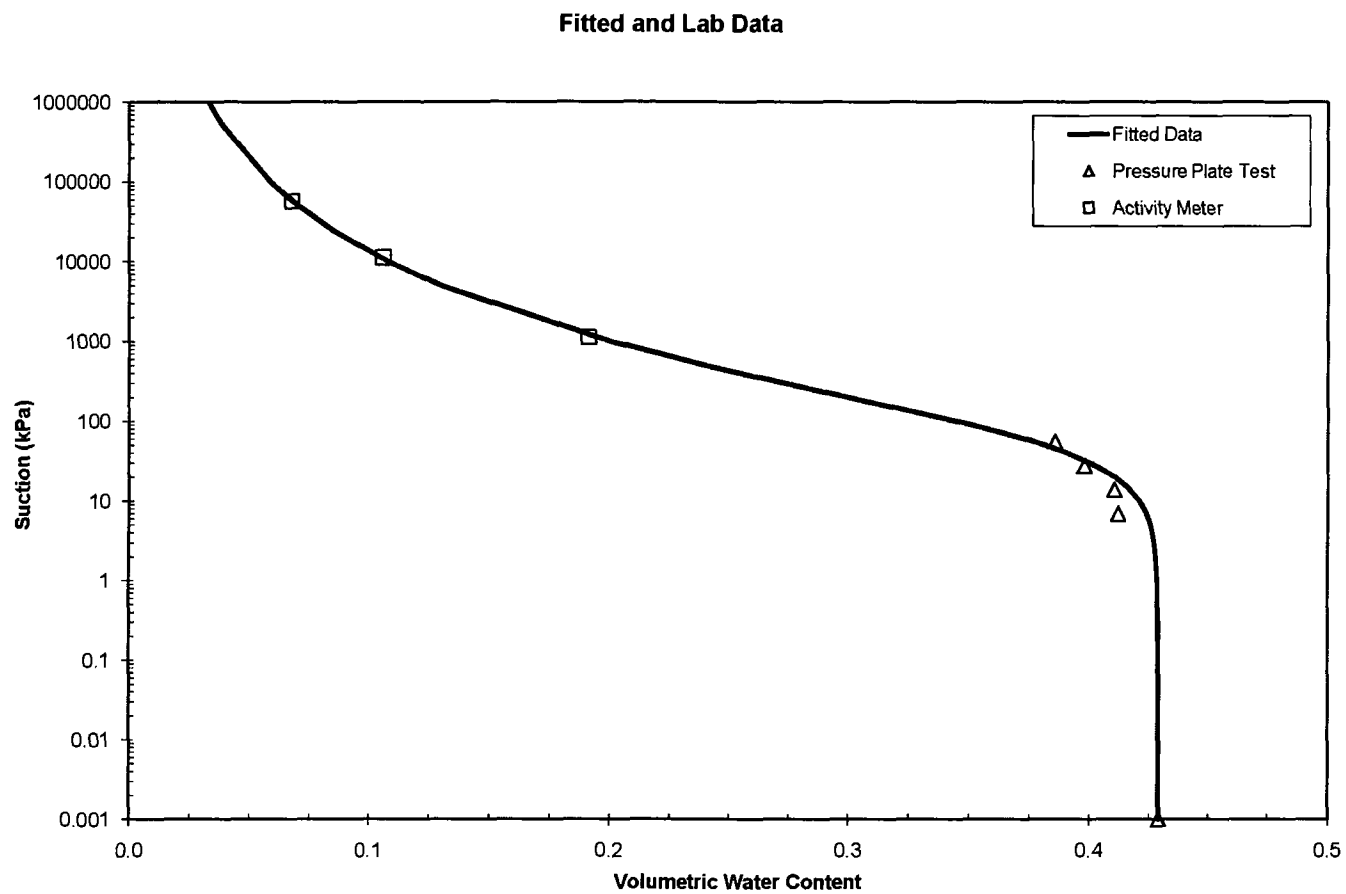
$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0044
$\theta_s =$	0.4290
$\alpha =$	0.0155
$n =$	1.2795
$m =$	0.2185

FOR GRAPHING	
Suction (kPa)	VWC
0.001	0.4290
0.025	0.4289
0.05	0.4289
0.075	0.4289
0.1	0.4289
1	0.4285
2	0.4279
3	0.4272
4	0.4264
5	0.4255
6	0.4246
7	0.4237
8	0.4228
9	0.4219
10	0.4209
15	0.4159
20	0.4107
30	0.4005
40	0.3907
50	0.3815
60	0.3730
70	0.3652
80	0.3579
90	0.3511
100	0.3449
500	0.2404
1000	0.2006
5000	0.1302
10000	0.1081
25000	0.0847
5.00E+04	0.0706
1.00E+05	0.0589
5.00E+05	0.0392
7.50E+05	0.0355
1.00E+06	0.0331

FOR FITTING				
Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.429	0.4290	0.000	0.000
6.90	0.412	0.4238	-0.012	0.000
13.79	0.411	0.4171	-0.007	0.000
27.59	0.398	0.4029	-0.005	0.000
55.18	0.386	0.3771	0.009	0.000
1130.00	0.191	0.1942	-0.003	0.000
11300.00	0.106	0.1046	0.001	0.000
57500.00	0.068	0.0680	0.000	0.000

Residual = 3.57724E-05



Pressure Plate Extractor Test - Monticello - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	South Caisson 30-60 cm	Test Date	1/10/2008
WT of Sample Ring =	68.3 g		
WT of Sample Ring + Soil =	275.6 g		
Water Content =	27.55 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	96.38 pcf	1.54 Mg/m ³	
Water WT =	44.78 g		
Solid WT =	162.52 g		
Add Water for saturation =	0 g	Sr	100.43
Saturated Water Content =	27.55 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	37.7	0.000	0.001	0.276	0.426
1.1	52.2	2.755	7.587	0.259	0.399
6.1	73.8	6.859	42.072	0.233	0.360
		Activity Meter	1080.00	0.126	0.195
		Test	10500.00	0.070	0.109
			31700.00	0.050	0.077

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
31.7	18.9869	26.5276	26.1681	0.050	0.077
10.5	19.5246	27.1874	26.6832	0.070	0.109
1.08	18.5538	26.6219	25.7169	0.126	0.195

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4255
$\alpha =$	0.0315
$n =$	1.2331
$m =$	0.1890

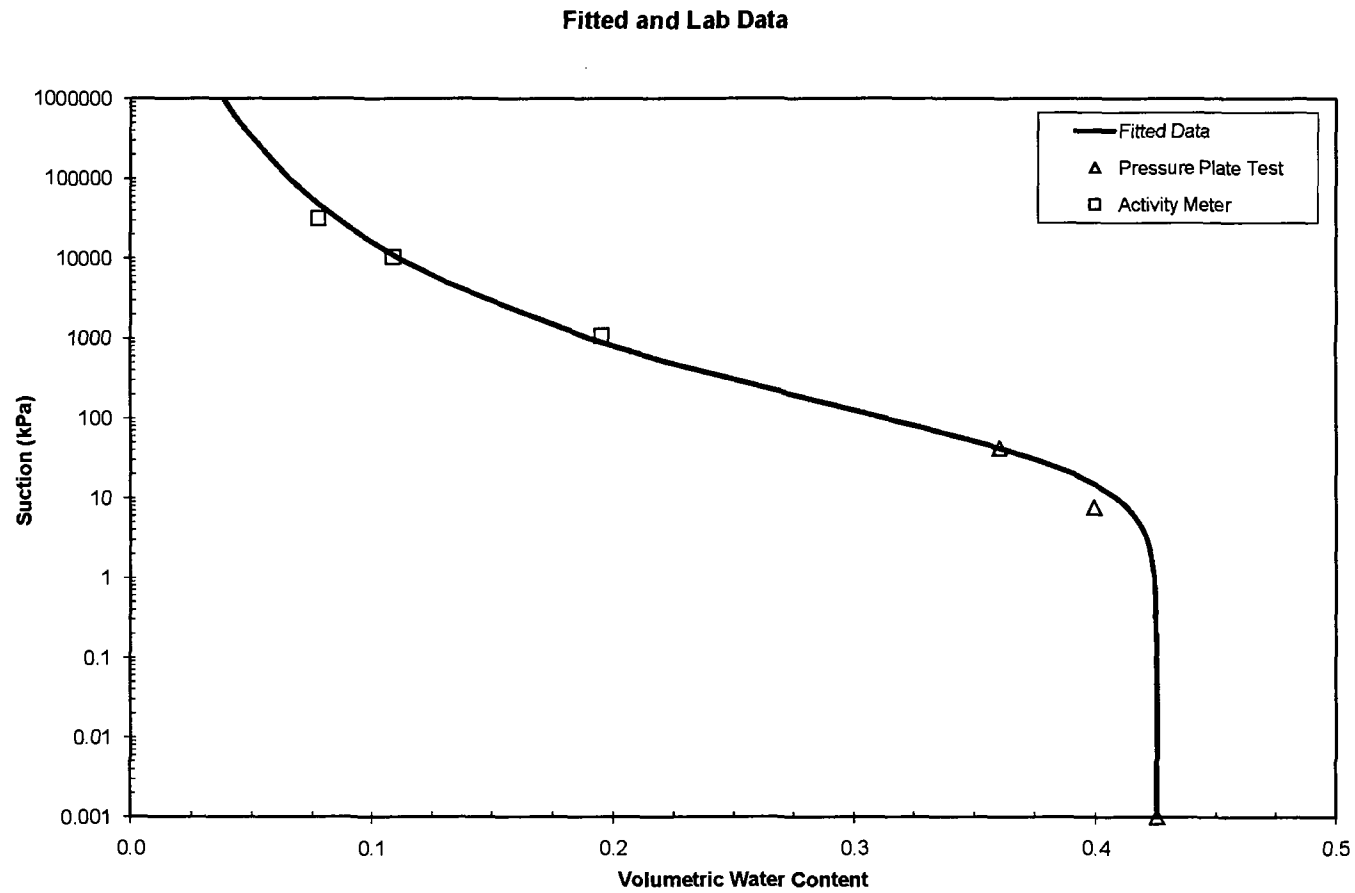
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4255
0.025	0.4255
0.05	0.4255
0.075	0.4255
0.1	0.4254
1	0.4244
2	0.4229
3	0.4213
4	0.4195
5	0.4177
6	0.4159
7	0.4141
8	0.4122
9	0.4104
10	0.4085
15	0.3995
20	0.3909
30	0.3757
40	0.3626
50	0.3514
60	0.3417
70	0.3331
80	0.3255
90	0.3187
100	0.3125
500	0.2224
1000	0.1899
5000	0.1308
10000	0.1113
25000	0.0899
5.00E+04	0.0765
1.00E+05	0.0651
5.00E+05	0.0447
7.50E+05	0.0407
1.00E+06	0.0380

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.426	0.4255	0.000	0.000
7.59	0.399	0.4130	-0.014	0.000
42.07	0.360	0.3602	0.000	0.000
1080.00	0.195	0.1865	0.009	0.000
10500.00	0.109	0.1100	-0.001	0.000
31700.00	0.077	0.0850	-0.008	0.000

Residual = 5.36214E-05



Pressure Plate Extractor Test - Omaha - Thin Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	A1 Shallow 1	Test Date	8/6/2008
WT of Sample Ring =	69.9 g	Ring 13	
WT of Sample Ring + Soil =	258.81 g		
Water Content =	31.89 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	0.9 in		
Volume, V =	3.49E-03 ft ³	99.0 cm ³	
Dry Unit Weight =	90.36 pcf	1.45 Mg/m ³	
Water WT =	45.68 g		
Solid WT =	143.23 g		
Add Water for saturation =	0 g	Sr	100.46
Saturated Water Content =	31.89 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Content	Water
(psi)	(cm)	(cc)	(kPa)			
0	8.3	0.000	0.001	0.319		0.462
0.5	11.4	0.589	3.449	0.315		0.456
1	12	0.703	6.897	0.314		0.455
2	14.2	1.121	13.794	0.311		0.450
4	26.4	3.439	27.588	0.295		0.427
8	41.6	6.327	55.176	0.275		0.398
15	58.9	9.614	103.455	0.252		0.365
30	74.4	12.559	206.910	0.231		0.335
60	79.2	13.471	413.820	0.225		0.326
90	84.3	14.440	620.730	0.218		0.316
		Activity Meter Test	1810.00	0.132		0.191
			7090.00	0.099		0.144
			30800.00	0.066		0.096
			75500.00	0.049		0.071

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Content	Water
(MPa)	(g)	(g)	(g)	(%)	(%)	
1.81	18.4016	25.5033	24.6743	0.132		0.191
7.09	18.4016	25.2963	24.6743	0.099		0.144
30.8	18.4016	25.0892	24.6743	0.066		0.096
75.5	18.4016	24.9835	24.6743	0.049		0.071

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4618
$\alpha =$	0.0128
$n =$	1.2499
$m =$	0.1999

FOR GRAPHING

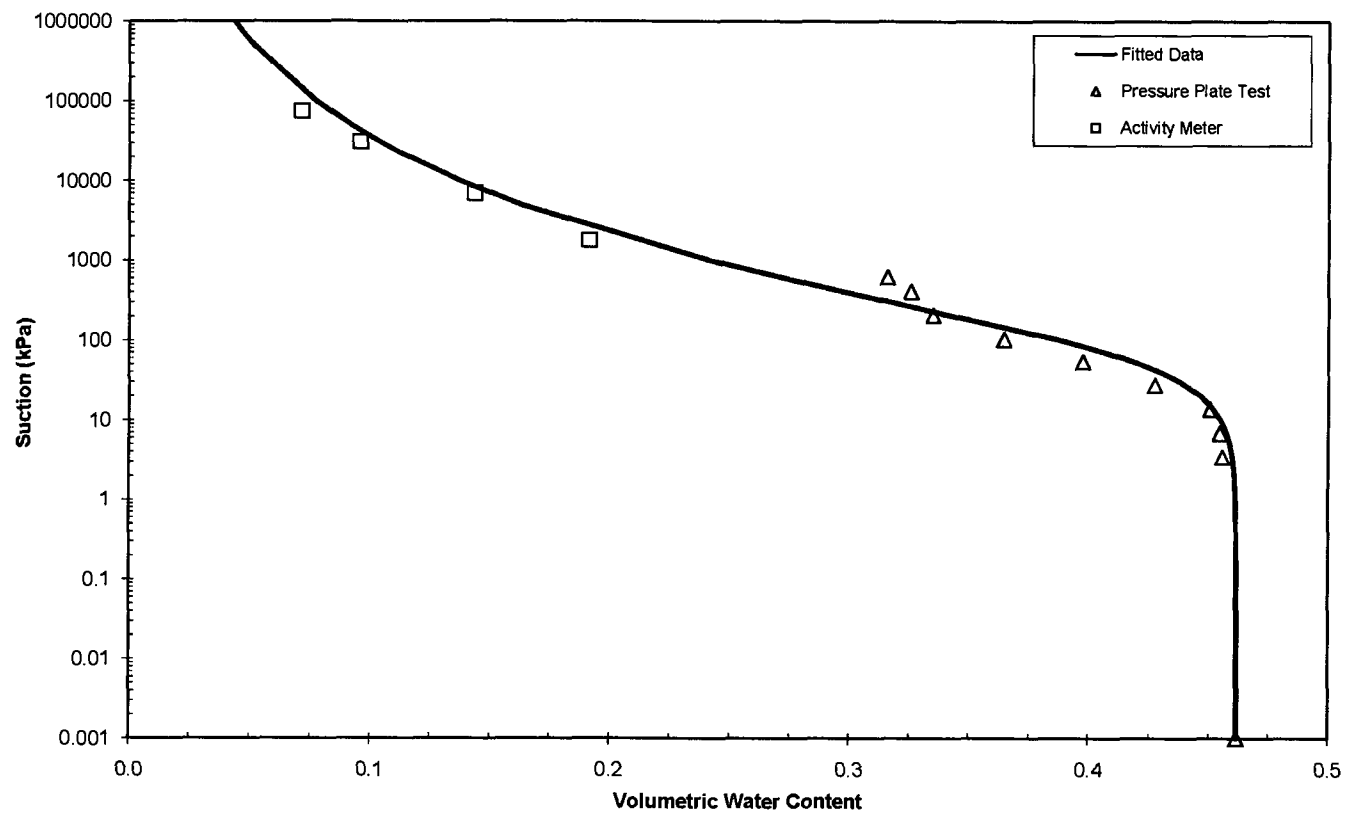
Suction (kPa)	VWC
0.001	0.4618
0.025	0.4618
0.05	0.4618
0.075	0.4618
0.1	0.4618
1	0.4614
2	0.4609
3	0.4603
4	0.4596
5	0.4589
6	0.4582
7	0.4574
8	0.4567
9	0.4559
10	0.4551
15	0.4509
20	0.4467
30	0.4381
40	0.4298
50	0.4219
60	0.4145
70	0.4075
80	0.4009
90	0.3948
100	0.3890
500	0.2851
1000	0.2423
5000	0.1632
10000	0.1374
25000	0.1093
5.00E+04	0.0919
1.00E+05	0.0773
5.00E+05	0.0517
7.50E+05	0.0467
1.00E+06	0.0435

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.462	0.4618	0.000	0.000
3.45	0.456	0.4600	-0.004	0.000
6.90	0.455	0.4575	-0.003	0.000
13.79	0.450	0.4519	-0.001	0.000
27.59	0.427	0.4401	-0.013	0.000
55.18	0.398	0.4180	-0.020	0.000
103.46	0.365	0.3871	-0.022	0.001
206.91	0.335	0.3439	-0.009	0.000
413.82	0.326	0.2975	0.028	0.001
620.73	0.316	0.2713	0.045	0.002
1810.00	0.191	0.2098	-0.018	0.000
7090.00	0.144	0.1497	-0.006	0.000
30800.00	0.096	0.1037	-0.008	0.000
75500.00	0.071	0.0829	-0.012	0.000

Residual = 0.000324346

Fitted and Lab Data



Pressure Plate Extractor Test - Omaha - Thick Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	A2 Top	Test Date	8/6/2008
WT of Sample Ring =	71.36 g	Ring: K#6	
WT of Sample Ring + Soil =	265.76 g		
Water Content =	33.88 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	86.10 pcf	1.38 Mg/m ³	
Water WT =	49.20 g		
Solid WT =	145.20 g		
Add Water for saturation =	2.41 g	Sr	101.10
Saturated Water Content =	35.54 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	7.6	0.000	0.001	0.355	0.490
0.5	16.6	1.710	3.449	0.344	0.474
1	21.5	2.641	6.897	0.337	0.465
2	32.3	4.693	13.794	0.323	0.446
4	51.3	8.303	27.588	0.298	0.412
8	68.4	11.552	55.176	0.276	0.381
15	73.8	12.578	103.455	0.269	0.371
30	85.6	14.820	206.910	0.253	0.350
60	91.9	16.017	413.820	0.245	0.338
90	93.4	16.302	620.730	0.180	0.249
		Activity Meter Test	2970.00	0.166	0.229
			11900.00	0.100	0.138
			15900.00	0.099	0.137
			78400.00	0.053	0.074

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
2.97	18.4203	20.7406	20.4104	0.166	0.229
11.9	18.1362	20.713	20.4792	0.100	0.138
15.9	18.4203	20.608	20.4104	0.099	0.137
78.4	18.1362	20.6042	20.4792	0.053	0.074
Too Dry	18.4203	20.5018	20.4104	0.046	0.063

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4904
$\alpha =$	0.0375
$n =$	1.1875
$m =$	0.1579

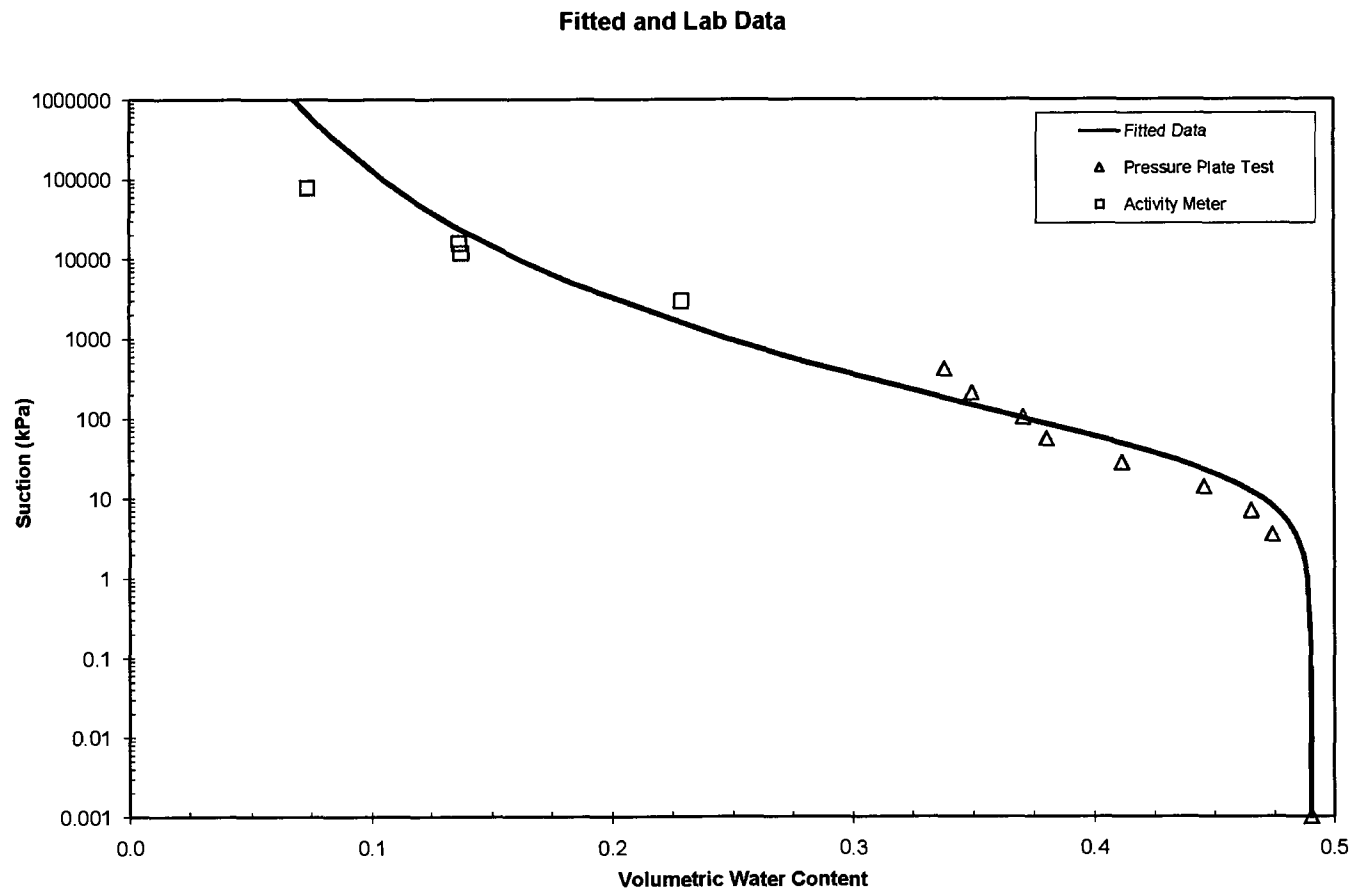
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4904
0.025	0.4904
0.05	0.4904
0.075	0.4904
0.1	0.4903
1	0.4889
2	0.4870
3	0.4849
4	0.4828
5	0.4806
6	0.4784
7	0.4763
8	0.4741
9	0.4720
10	0.4699
15	0.4598
20	0.4506
30	0.4346
40	0.4213
50	0.4100
60	0.4003
70	0.3918
80	0.3843
90	0.3776
100	0.3715
500	0.2817
1000	0.2480
5000	0.1837
10000	0.1614
25000	0.1359
5.00E+04	0.1193
1.00E+05	0.1048
5.00E+05	0.0775
7.50E+05	0.0718
1.00E+06	0.0681

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.490	0.4904	0.000	0.000
3.45	0.474	0.4839	-0.010	0.000
6.90	0.465	0.4765	-0.011	0.000
13.79	0.446	0.4621	-0.016	0.000
27.59	0.412	0.4382	-0.027	0.001
55.18	0.381	0.4048	-0.024	0.001
103.46	0.371	0.3696	0.001	0.000
206.91	0.350	0.3296	0.020	0.000
413.82	0.338	0.2915	0.047	0.002
2970.00	0.229	0.2025	0.026	0.001
11900.00	0.138	0.1562	-0.019	0.000
15900.00	0.137	0.1479	-0.011	0.000
78400.00	0.074	0.1097	-0.036	0.001

Residual = 0.000524792



Pressure Plate Extractor Test - Omaha - Thick Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	254-mm AO2-S2-Shallow	Test Date	2/21/2009
WT of Sample Ring =	885.2 g		
WT of Sample Ring + Soil =	5984.7 g		
Water Content =	29.29 %		
Diameter of Sample Ring, D =	10.00 in		
Height of Sample Ring, L =	2.0 in		
Volume, V =	9.14E-02 ft ³	2587.0 cm ³	
Dry Unit Weight =	95.18 pcf	1.52 Mg/m ³	
Water WT =	1155.22 g		
Solid WT =	3944.28 g		
Add Water for saturation =	5 g	Sr	104.14
Saturated Water Content =	29.42 %		
Tube Area, A =	20.268299 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Content	Water
(psi)	(cm)	(cc)	(kPa)			
0		0.000	0.001	0.294		0.449
0.5		91.207	3.449	0.271		0.413
1		152.012	6.897	0.256		0.390
2		212.817	13.794	0.240		0.366
3		261.461	20.691	0.228		0.348
4		322.266	27.588	0.212		0.324
8		484.412	55.176	0.171		0.261
15		589.808	103.455	0.145		0.221
30		646.559	206.910	0.130		0.199
		Activity Meter Test	27300.00	0.073		0.111
			51200.00	0.059		0.090
			71400.00	0.052		0.079
			17400.00	0.082		0.125
			31100.00	0.069		0.106
			56300.00	0.057		0.086

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Content	Water
(MPa)	(g)	(g)	(g)	(%)	(%)	
27.3	18.6161	24.1559	23.7801	0.073		0.111
51.2	18.6161	24.0849	23.7801	0.059		0.090
71.4	18.6161	24.0461	23.7801	0.052		0.079
17.4	3.278	10.2895	9.7569312	0.082		0.125
31.1	3.278	10.2071	9.7569312	0.069		0.106
56.3	3.278	10.1238	9.7569312	0.057		0.086

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4487
$\alpha =$	0.2567
$n =$	1.1730
$m =$	0.1475

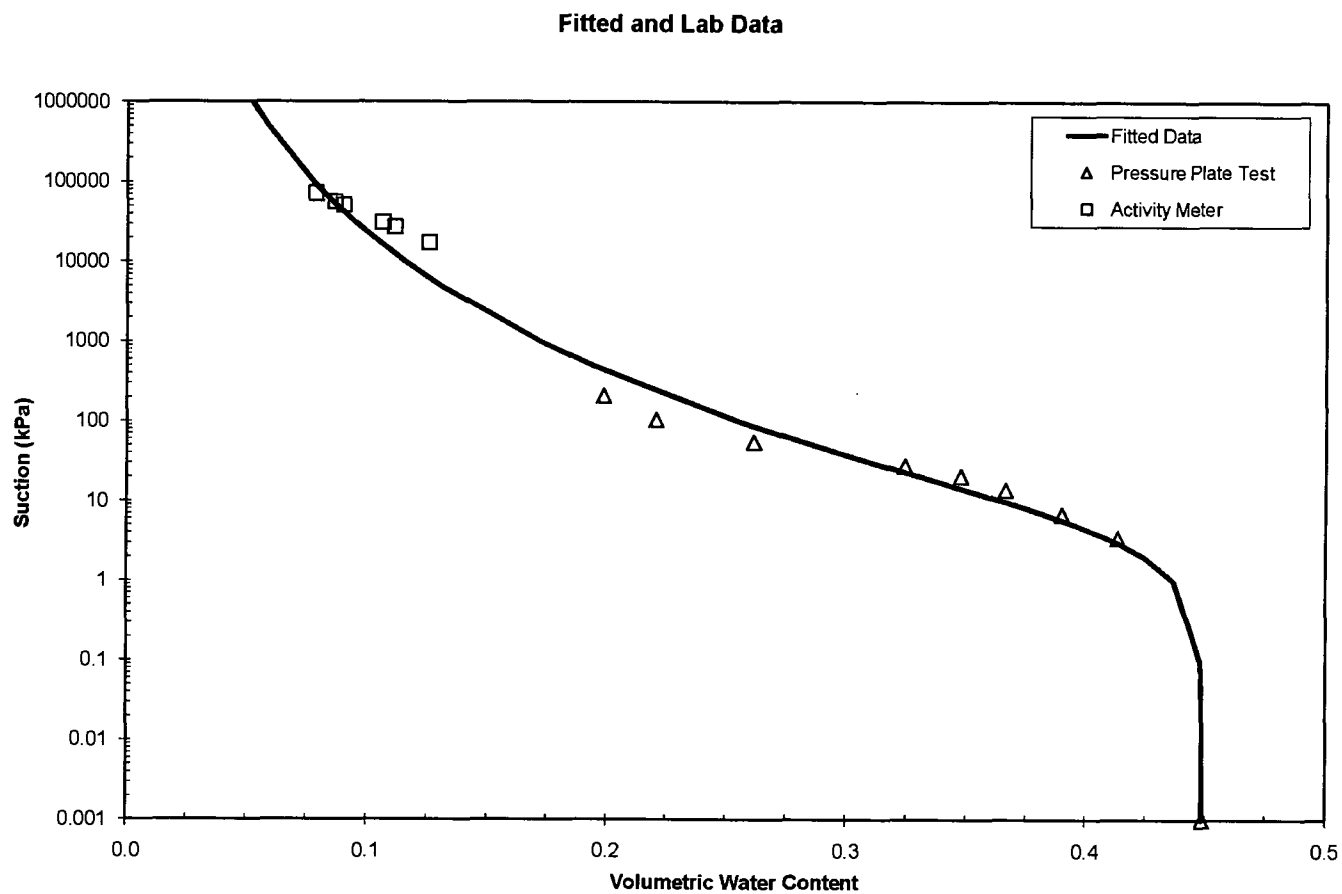
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4487
0.025	0.4485
0.05	0.4483
0.075	0.4480
0.1	0.4478
1	0.4366
2	0.4244
3	0.4136
4	0.4041
5	0.3958
6	0.3884
7	0.3818
8	0.3758
9	0.3704
10	0.3654
15	0.3457
20	0.3313
30	0.3112
40	0.2971
50	0.2865
60	0.2779
70	0.2709
80	0.2649
90	0.2597
100	0.2551
500	0.1936
1000	0.1718
5000	0.1301
10000	0.1154
25000	0.0985
5.00E+04	0.0873
1.00E+05	0.0775
5.00E+05	0.0587
7.50E+05	0.0547
1.00E+06	0.0520

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WVC (%)	$(\Delta$ WVC) ²
0.001	0.449	0.4487	0.000	0.000
3.45	0.413	0.4092	0.004	0.000
6.90	0.390	0.3824	0.007	0.000
13.79	0.366	0.3498	0.017	0.000
20.69	0.348	0.3296	0.018	0.000
27.59	0.324	0.3153	0.009	0.000
55.18	0.261	0.2818	-0.020	0.000
103.46	0.221	0.2536	-0.033	0.001
206.91	0.199	0.2254	-0.027	0.001
27300.00	0.111	0.0970	0.014	0.000
51200.00	0.090	0.0870	0.003	0.000
71400.00	0.079	0.0821	-0.004	0.000
17400.00	0.125	0.1048	0.021	0.000
31100.00	0.106	0.0948	0.011	0.000
56300.00	0.086	0.0856	0.001	0.000

Residual = 0.000249181



Pressure Plate Extractor Test - Omaha - Thick Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	150-mm AO2-S2-Shallow	Test Date	9/19/2008
WT of Sample Ring =	384.9 g		
WT of Sample Ring + Soil =	1708.7 g		
Water Content =	31.07 %		
Diameter of Sample Ring, D =	6.00 in		
Height of Sample Ring, L =	1.5 in		
Volume, V =	2.45E-02 ft ³	695.0 cm ³	
Dry Unit Weight =	90.72 pcf	1.45 Mg/m ³	
Water WT =	313.81 g		
Solid WT =	1009.99 g		
Add Water for saturation =	5 g	Sr	100.30
Saturated Water Content =	31.57 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Content	Water
(psi)	(cm)	(cc)	(kPa)			
0		0.000	0.001	0.316		0.459
2		4.000	13.794	0.312		0.453
3.8		16.000	26.209	0.300		0.436
7.9		54.000	54.486	0.262		0.381
14.9		98.500	102.765	0.218		0.317
29.1		130.000	200.703	0.187		0.272
59		138.500	406.923	0.179		0.260
		Activity Meter Test	2030.00	0.119		0.174
			2760.00	0.111		0.161
			19200.00	0.073		0.106
			36100.00	0.057		0.082
			41000.00	0.051		0.074
			70900.00	0.040		0.059

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Content	Water
(MPa)	(g)	(g)	(g)	(%)	(%)	
2.03	18.5508	25.0707	24.3752	0.119		0.174
2.76	18.4217	26.2543	25.4736	0.111		0.161
19.2	18.6724	26.1013	25.5977	0.073		0.106
36.1	19.4839	27.0004	26.5974	0.057		0.082
41	18.5372	25.7108	25.3624	0.051		0.074
70.9	18.4018	25.4397	25.1662	0.040		0.059

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

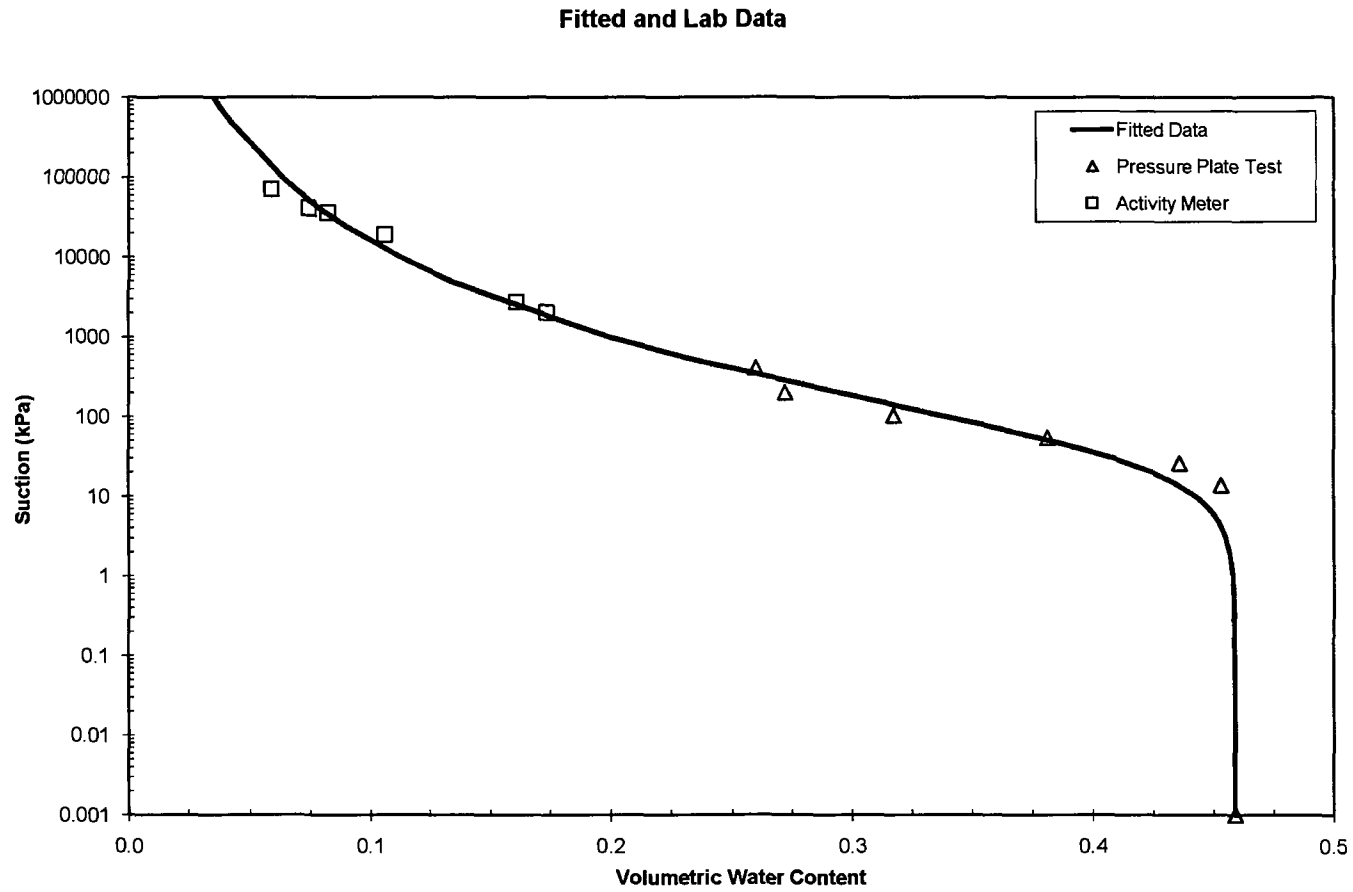
$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4589
$\alpha =$	0.0274
$n =$	1.2507
$m =$	0.2004

FOR GRAPHING	
Suction (kPa)	VWC
0.001	0.4589
0.025	0.4589
0.05	0.4589
0.075	0.4589
0.1	0.4589
1	0.4579
2	0.4565
3	0.4550
4	0.4533
5	0.4516
6	0.4498
7	0.4481
8	0.4462
9	0.4444
10	0.4426
15	0.4335
20	0.4247
30	0.4087
40	0.3947
50	0.3824
60	0.3717
70	0.3621
80	0.3536
90	0.3460
100	0.3390
500	0.2363
1000	0.1995
5000	0.1336
10000	0.1123
25000	0.0893
5.00E+04	0.0751
1.00E+05	0.0631
5.00E+05	0.0421
7.50E+05	0.0381
1.00E+06	0.0354

FOR FITTING				
Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.459	0.4589	0.000	0.000
13.79	0.453	0.4356	0.018	0.000
26.21	0.436	0.4145	0.021	0.000
54.49	0.381	0.3774	0.004	0.000
102.77	0.317	0.3372	-0.020	0.000
200.70	0.272	0.2926	-0.021	0.000
406.92	0.260	0.2483	0.011	0.000
2030.00	0.174	0.1673	0.006	0.000
2760.00	0.161	0.1550	0.006	0.000
19200.00	0.106	0.0954	0.010	0.000
36100.00	0.082	0.0814	0.001	0.000
41000.00	0.074	0.0789	-0.005	0.000
70900.00	0.059	0.0688	-0.010	0.000

Residual = 0.000157357



Pressure Plate Extractor Test - Omaha - Thick Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	AO2 S1 Deep	Test Date	8/6/2008
WT of Sample Ring =	71.19 g	Ring C	
WT of Sample Ring + Soil =	251.87 g		
Water Content =	30.67 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	0.9 in		
Volume, V =	3.42E-03 ft ³	96.9 cm ³	
Dry Unit Weight =	89.13 pcf	1.43 Mg/m ³	
Water WT =	42.41 g		
Solid WT =	138.27 g		
Add Water for saturation =	3.19 g	Sr	100.84
Saturated Water Content =	32.97 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Content	Water
(psi)	(cm)	(cc)	(kPa)			
0	12.3	0.000	0.001	0.330		0.471
0.5	15	0.513	3.449	0.326		0.466
1	17.4	0.969	6.897	0.323		0.461
2	23.4	2.109	13.794	0.314		0.449
4	41	5.453	27.588	0.290		0.415
8	58.3	8.740	55.176	0.267		0.381
15	72.4	11.419	103.455	0.247		0.353
30	85.8	13.965	206.910	0.229		0.327
60	90.1	14.782	413.820	0.223		0.318
90	91.4	15.029	620.730	0.221		0.316
		Activity Meter Test	3170.00	0.125		0.179
			9340.00	0.103		0.147
			16800.00	0.085		0.121
			39700.00	0.069		0.098
			68700.00	0.056		0.079

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Content	Water
(MPa)	(g)	(g)	(g)	(%)	(%)	(%)
3.17	22.762	27.191	26.6977	0.125		0.179
9.34	18.4008	22.2806	21.9176	0.103		0.147
16.8	22.762	27.031	26.6977	0.085		0.121
39.7	18.4008	22.1592	21.9176	0.069		0.098
68.7	18.4008	22.1133	21.9176	0.056		0.079
Final w%-1	22.762	26.871	26.6977	0.044		0.063

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4605
$\alpha =$	0.0180
$n =$	1.2211
$m =$	0.1810

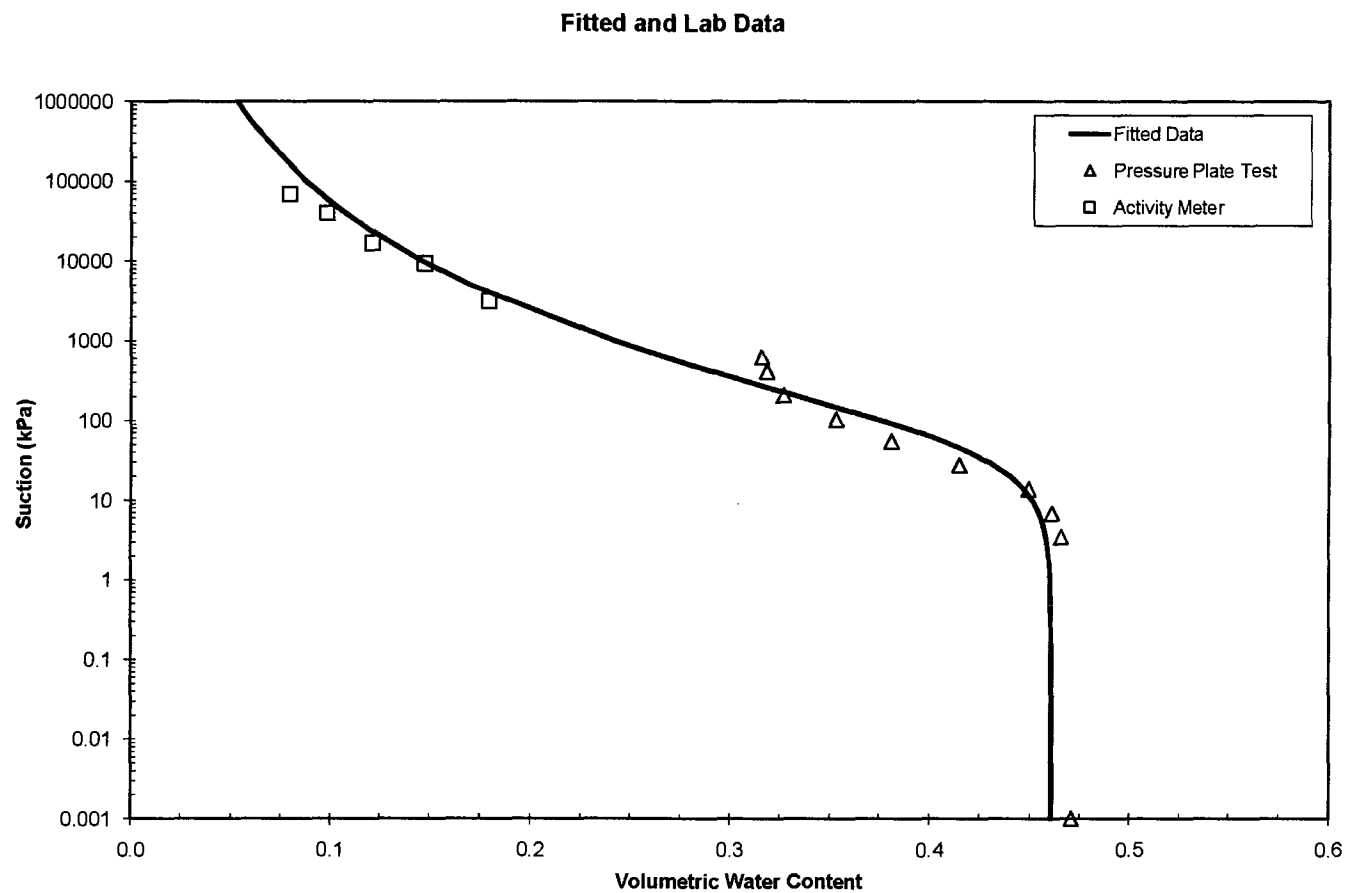
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4605
0.025	0.4605
0.05	0.4605
0.075	0.4605
0.1	0.4605
1	0.4599
2	0.4591
3	0.4582
4	0.4572
5	0.4562
6	0.4552
7	0.4542
8	0.4531
9	0.4520
10	0.4509
15	0.4454
20	0.4399
30	0.4294
40	0.4196
50	0.4107
60	0.4026
70	0.3951
80	0.3883
90	0.3820
100	0.3762
500	0.2798
1000	0.2417
5000	0.1701
10000	0.1460
25000	0.1192
5.00E+04	0.1023
1.00E+05	0.0878
5.00E+05	0.0615
7.50E+05	0.0562
1.00E+06	0.0528

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.471	0.4605	0.010	0.000
3.45	0.466	0.4578	0.008	0.000
6.90	0.461	0.4543	0.007	0.000
13.79	0.449	0.4467	0.002	0.000
27.59	0.415	0.4318	-0.017	0.000
55.18	0.381	0.4064	-0.026	0.001
103.46	0.353	0.3743	-0.021	0.000
206.91	0.327	0.3330	-0.006	0.000
413.82	0.318	0.2909	0.027	0.001
620.73	0.316	0.2675	0.048	0.002
3170.00	0.179	0.1880	-0.009	0.000
9340.00	0.147	0.1482	-0.001	0.000
16800.00	0.121	0.1302	-0.009	0.000
39700.00	0.098	0.1077	-0.010	0.000
68700.00	0.079	0.0954	-0.016	0.000

Residual = 0.00035061



Pressure Plate Extractor Test - Omaha - Thick Store-and-Release Cover
ASTM D 6836 - 02 (Method B)

Sample I.D.	AO2 S1 Deep	Test Date	8/6/2008
WT of Sample Ring =	70.2 g	Ring C	
WT of Sample Ring + Soil =	240.18 g		
Water Content =	33.38 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	0.9 in		
Volume, V =	3.35E-03 ft ³	94.7 cm ³	
Dry Unit Weight =	83.97 pcf	1.35 Mg/m ³	
Water WT =	42.54 g		
Solid WT =	127.44 g		
Add Water for saturation =	5.08 g	Sr	100.99
Saturated Water Content =	37.37 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Content	Water
(psi)	(cm)	(cc)	(kPa)			
0	15	0.000	0.001	0.374		0.503
0.5	24.1	1.729	3.449	0.360		0.485
1	28.1	2.489	6.897	0.354		0.477
2	36.1	4.009	13.794	0.342		0.461
4	57.1	7.999	27.588	0.311		0.418
8	73.6	11.134	55.176	0.286		0.385
15	89.7	14.193	103.455	0.262		0.353
30	99.4	16.036	206.910	0.248		0.334
60	107.7	17.613	413.820	0.235		0.317
90	109.1	17.879	620.730	0.233		0.314
			Activity Meter Test			
			1890.00	0.127		0.171
			5200.00	0.099		0.133
			13900.00	0.076		0.102
			44100.00	0.054		0.073
			54500.00	0.051		0.068
			55800.00	0.050		0.068

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Content	Water
(MPa)	(g)	(g)	(g)	(%)	(%)	(%)
1.89	22.7623	29.7686	28.9781	0.127		0.171
5.2	18.5505	25.3962	24.7809	0.099		0.133
13.9	18.9868	25.6918	25.2191	0.076		0.102
44.1	18.5373	25.1244	24.7843	0.054		0.073
54.5	18.5193	25.0984	24.7808	0.051		0.068
55.8	20.5466	27.0767	26.7641	0.050		0.068

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4780
$\alpha =$	0.0170
$n =$	1.2646
$m =$	0.2092

FOR GRAPHING

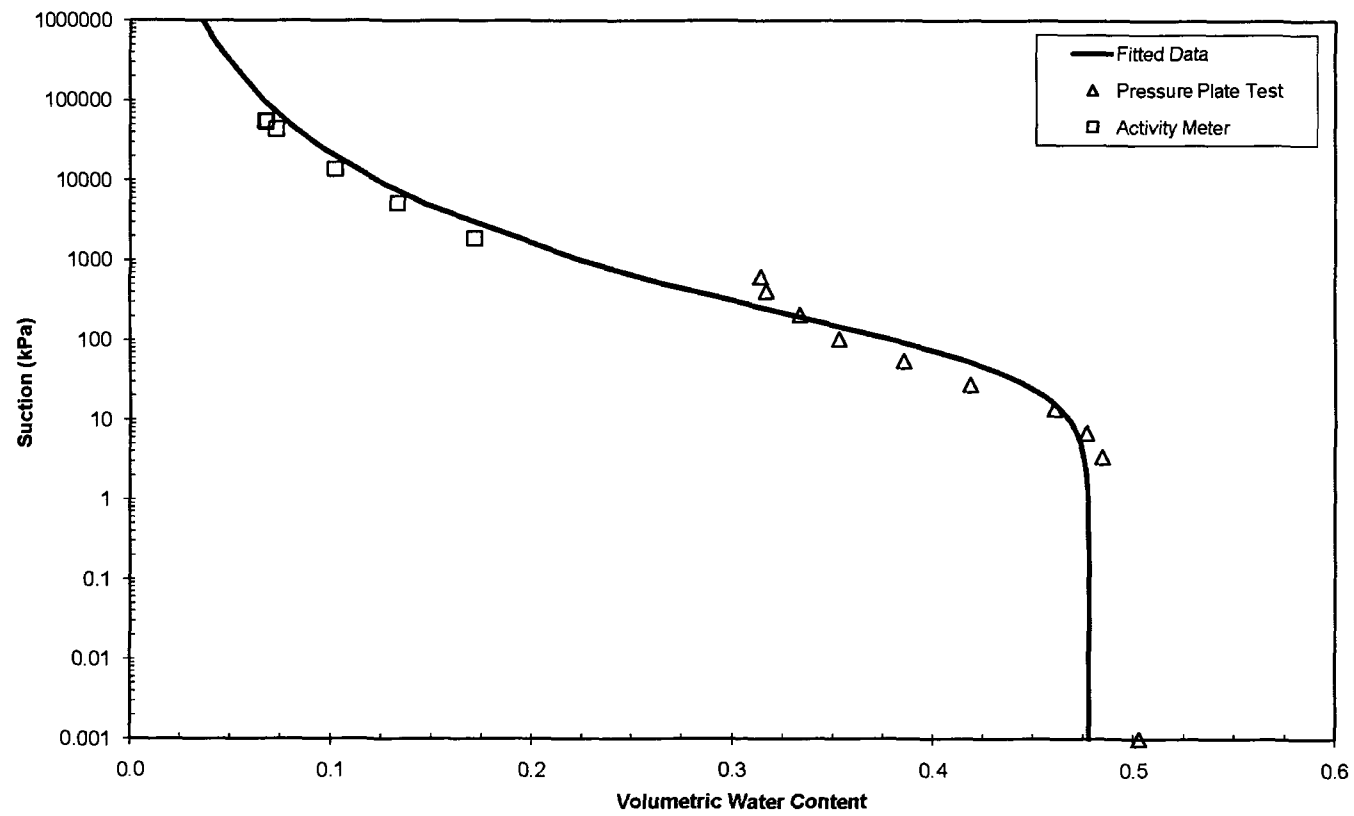
Suction (kPa)	VWC
0.001	0.4780
0.025	0.4780
0.05	0.4780
0.075	0.4779
0.1	0.4779
1	0.4774
2	0.4766
3	0.4757
4	0.4747
5	0.4736
6	0.4726
7	0.4714
8	0.4703
9	0.4691
10	0.4679
15	0.4618
20	0.4557
30	0.4436
40	0.4323
50	0.4218
60	0.4122
70	0.4034
80	0.3953
90	0.3878
100	0.3808
500	0.2675
1000	0.2244
5000	0.1473
10000	0.1227
25000	0.0963
5.00E+04	0.0802
1.00E+05	0.0667
5.00E+05	0.0436
7.50E+05	0.0392
1.00E+06	0.0363

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.503	0.4780	0.025	0.001
3.45	0.485	0.4752	0.009	0.000
6.90	0.477	0.4716	0.005	0.000
13.79	0.461	0.4633	-0.003	0.000
27.59	0.418	0.4465	-0.028	0.001
55.18	0.385	0.4168	-0.031	0.001
103.46	0.353	0.3785	-0.026	0.001
206.91	0.334	0.3294	0.004	0.000
413.82	0.317	0.2803	0.037	0.001
620.73	0.314	0.2534	0.061	0.004
1890.00	0.171	0.1902	-0.019	0.000
5200.00	0.133	0.1458	-0.013	0.000
13900.00	0.102	0.1125	-0.010	0.000
44100.00	0.073	0.0829	-0.010	0.000
54500.00	0.068	0.0784	-0.010	0.000
55800.00	0.068	0.0779	-0.010	0.000

Residual = 0.000571633

Fitted and Lab Data



Pressure Plate Extractor Test - Polson - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	Polson Alt Upper Silt 3	Test Date	1/29/2009
WT of Sample Ring =	72 g		
WT of Sample Ring + Soil =	266.85 g		
Water Content =	28.59 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	89.86 pcf	1.44 Mg/m ³	
Water WT =	43.32 g		
Solid WT =	151.53 g		
Add Water for saturation =	5.36 g	Sr	99.98
Saturated Water Content =	32.13 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	16	0.000	0.001	0.321	0.463
0.5	25.3	1.767	3.449	0.310	0.446
1	28.1	2.299	6.897	0.306	0.441
2	31.8	3.002	13.794	0.301	0.434
4	38	4.180	27.588	0.294	0.423
8	44.5	5.415	55.176	0.286	0.411
15	53.3	7.087	103.455	0.274	0.395
30	85.1	13.129	206.910	0.235	0.338
60	122.2	20.178	413.820	0.188	0.271
80	133.4	22.306	551.760	0.174	0.251
		Activity Meter Test	1020.00	0.172	0.247
			1200.00	0.143	0.206
			2140.00	0.108	0.156
			23500.00	0.033	0.047

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
1.02	3.2386	8.046	7.342	0.172	0.247
1.2	3.2386	7.9296	7.342	0.143	0.206
2.14	3.2386	7.786	7.342	0.108	0.156
23.5	3.2386	7.4757	7.342	0.033	0.047

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4626
$\alpha =$	0.0098
$n =$	1.3369
$m =$	0.2520

FOR GRAPHING

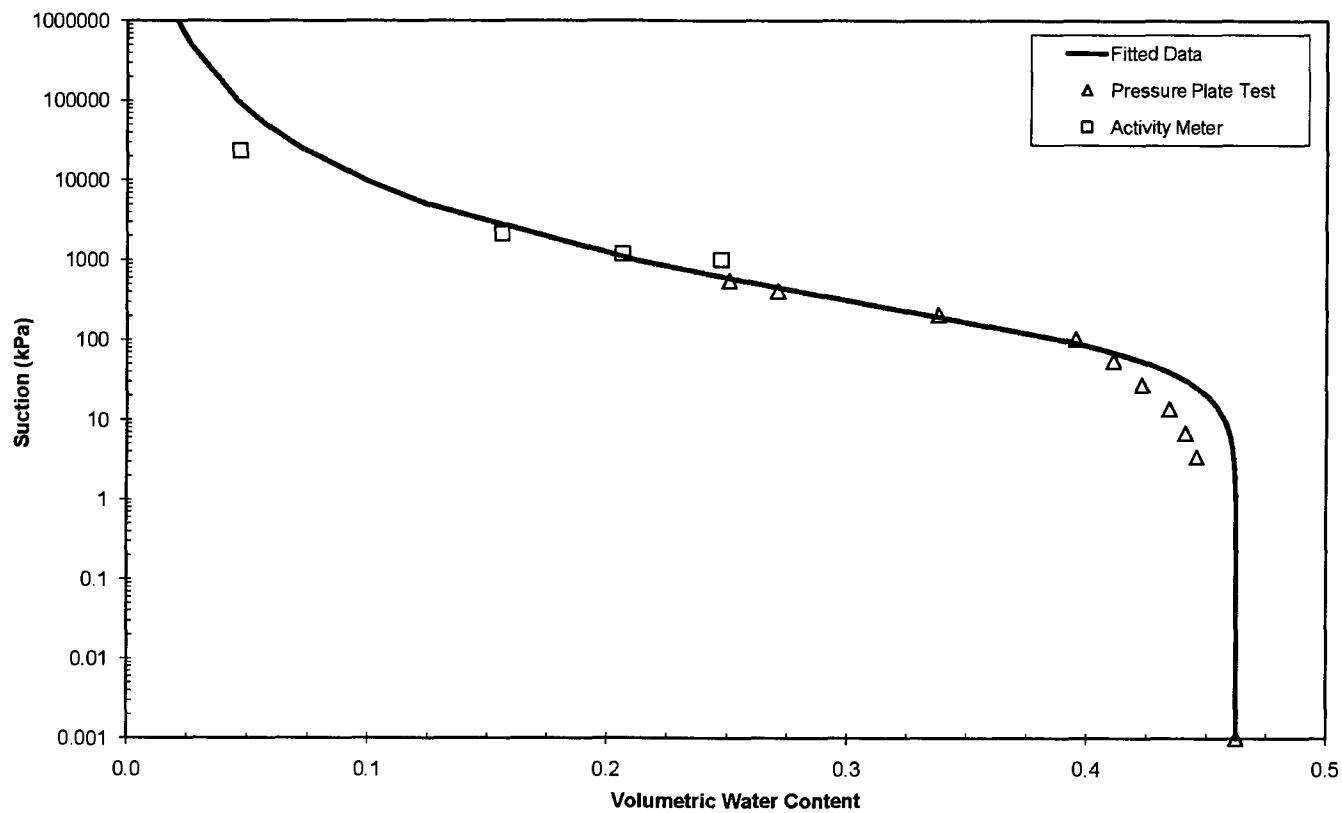
Suction (kPa)	VWC
0.001	0.4626
0.025	0.4626
0.05	0.4626
0.075	0.4626
0.1	0.4626
1	0.4624
2	0.4620
3	0.4616
4	0.4611
5	0.4606
6	0.4600
7	0.4594
8	0.4588
9	0.4582
10	0.4576
15	0.4541
20	0.4503
30	0.4424
40	0.4343
50	0.4263
60	0.4184
70	0.4109
80	0.4036
90	0.3966
100	0.3900
500	0.2635
1000	0.2122
5000	0.1247
10000	0.0988
25000	0.0726
5.00E+04	0.0575
1.00E+05	0.0455
5.00E+05	0.0265
7.50E+05	0.0231
1.00E+06	0.0209

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.463	0.4626	0.000	0.000
3.45	0.446	0.4614	-0.016	0.000
6.90	0.441	0.4595	-0.019	0.000
13.79	0.434	0.4549	-0.021	0.000
27.59	0.423	0.4444	-0.021	0.000
55.18	0.411	0.4222	-0.011	0.000
103.46	0.395	0.3878	0.007	0.000
206.91	0.338	0.3359	0.002	0.000
413.82	0.271	0.2787	-0.008	0.000
551.76	0.251	0.2558	-0.005	0.000
1020.00	0.247	0.2108	0.036	0.001
1200.00	0.206	0.2000	0.006	0.000
2140.00	0.156	0.1654	-0.010	0.000
23500.00	0.047	0.0741	-0.027	0.001

Residual = 0.000281372

Fitted and Lab Data



Pressure Plate Extractor Test ASTM D 6836 - 02 (Method B)					
Sample I.D.	SB-1 (K#1-S)		Test Date		
WT of Sample Ring =	71.33	g			
WT of Sample Ring + Soil =	293.83	g			
Water Content =	19.4	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	110.50	pcf	1.77	Mg/m ³	
Water WT =	36.15	g			
Solid WT =	186.35	g			
Add Water for saturation =	0.91	g	Sr	103.83	
Saturated Water Content =	19.89	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	8.5	0.000	0.001	0.199	0.352
0.5	11.6	0.589	3.4	0.196	0.347
1	13.8	1.007	6.9	0.193	0.343
2	21	2.375	13.8	0.186	0.330
4	32	4.465	27.6	0.175	0.310
8	45.5	7.030	55.2	0.161	0.285
15	54.6	8.759	103.5	0.152	0.269
30	61.5	10.070	206.9	0.145	0.257
60	68.4	11.381	413.8	0.138	0.244
95	72.8	12.217	655.2	0.133	0.236
120	90	15.485	827.6	0.116	0.205
150	95.2	16.473	1034.6	0.110	0.196
200	112.7	19.798	1379.4	0.093	0.164
		Activity Meter Test	11200.0	0.062	0.110
			77300.0	0.035	0.062
			315000.0	0.027	0.049

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
315	8.6301	16.9387	16.717	0.027	0.049
77.3	8.0011	16.4314	16.145	0.035	0.062
11.2	7.4184	16.0509	15.5447	0.062	0.110

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3522
$\alpha =$	0.0207
$n =$	1.2108
$m =$	0.1741

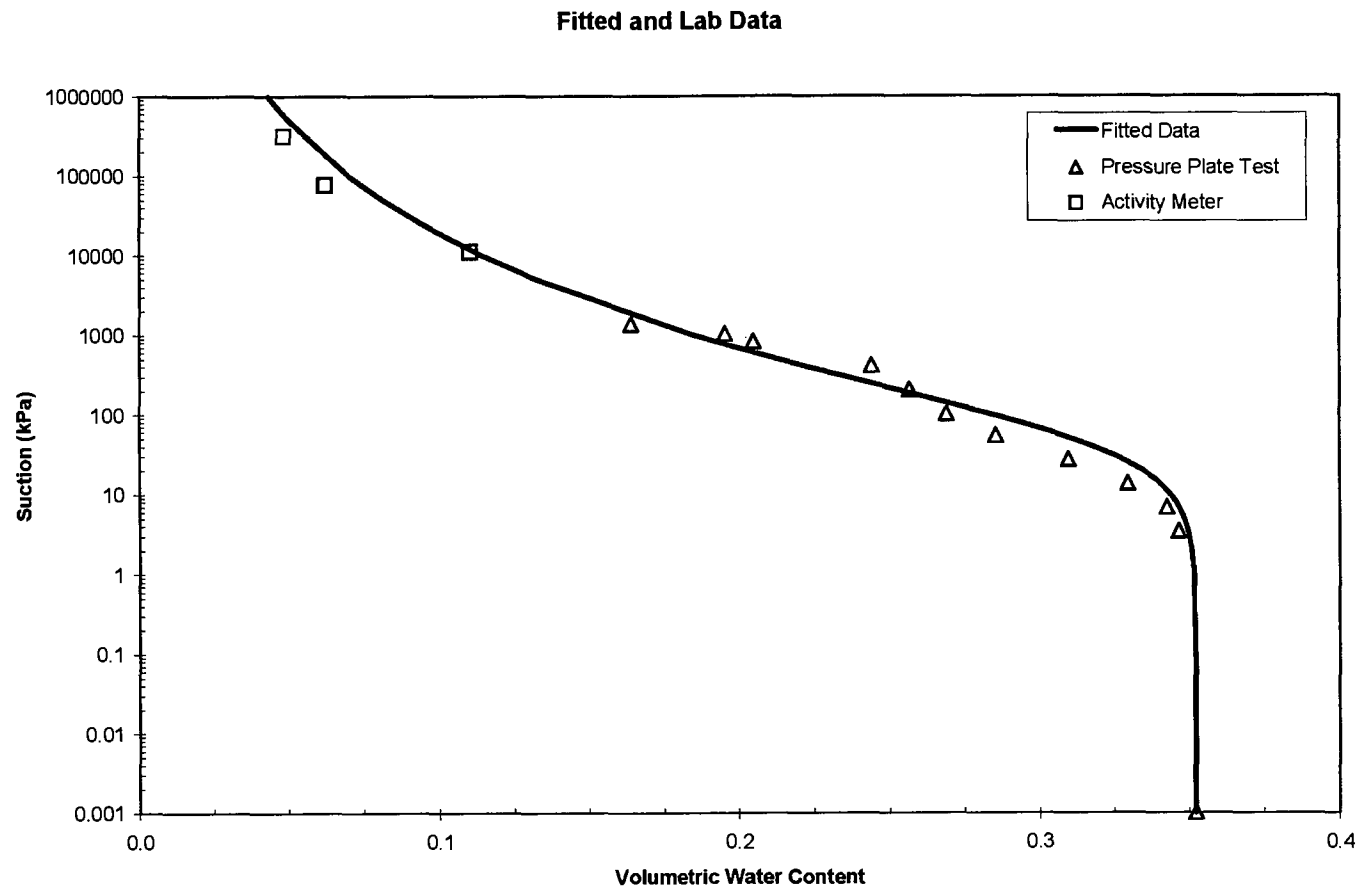
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3522
0.025	0.3522
0.05	0.3522
0.075	0.3522
0.1	0.3522
1	0.3516
2	0.3509
3	0.3501
4	0.3493
5	0.3484
6	0.3475
7	0.3466
8	0.3457
9	0.3447
10	0.3438
15	0.3391
20	0.3345
30	0.3259
40	0.3181
50	0.3110
60	0.3046
70	0.2989
80	0.2936
90	0.2888
100	0.2844
500	0.2130
1000	0.1851
5000	0.1323
10000	0.1144
25000	0.0943
5.00E+04	0.0815
1.00E+05	0.0704
5.00E+05	0.0502
7.50E+05	0.0460
1.00E+06	0.0433

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.352	0.3522	0.000	0.000
3.45	0.347	0.3497	-0.003	0.000
6.90	0.343	0.3467	-0.004	0.000
13.79	0.330	0.3403	-0.011	0.000
27.59	0.310	0.3279	-0.018	0.000
55.18	0.285	0.3076	-0.022	0.000
103.46	0.269	0.2830	-0.014	0.000
206.91	0.257	0.2521	0.004	0.000
413.82	0.244	0.2212	0.023	0.001
827.64	0.205	0.1732	-0.009	0.000
1034.55	0.196	0.1117	-0.001	0.000
1379.40	0.164	0.0743	-0.012	0.000
11200.00	0.110	0.1117	-0.001	0.000
77300.00	0.062	0.0743	-0.012	0.000
315000.00	0.049	0.0553	-0.007	0.000

Residual = 0.000141754



Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	SB-2 (K#2-S - S SWCC)		Test Date		2/15/2006
WT of Sample Ring =	71.52	g			
WT of Sample Ring + Soil =	270.97	g			
Water Content =	26.7	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	93.38	pcf	1.50	Mg/m ³	
Water WT =	41.98	g			
Solid WT =	157.47	g			
Add Water for saturation =	6.82	g	Sr	105.01	
Saturated Water Content =	30.99	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	11.5	0.000	0.001	0.310	0.464
0.5	19.8	1.577	3.449	0.300	0.449
1	30.4	3.591	6.897	0.287	0.430
2	43	5.985	13.794	0.272	0.407
4	64.1	9.994	27.588	0.246	0.369
8	75.1	12.084	55.176	0.233	0.349
16	90.8	15.067	110.352	0.214	0.321
30	105.1	17.784	206.910	0.197	0.295
60	117.2	20.083	413.820	0.182	0.273
95	125.4	21.641	655.215	0.172	0.258
		Activity	6650.00	0.113	0.170
		Meter	27000.00	0.083	0.125
		Test	180600.00	0.047	0.071

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
180.6	7.7601	14.9181	14.595	0.047	0.071
27	7.7173	15.1257	14.556	0.083	0.125
6.65	8.0011	15.5631	14.7934	0.113	0.170

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4638
$\alpha =$	0.0837
$n =$	1.1661
$m =$	0.1425

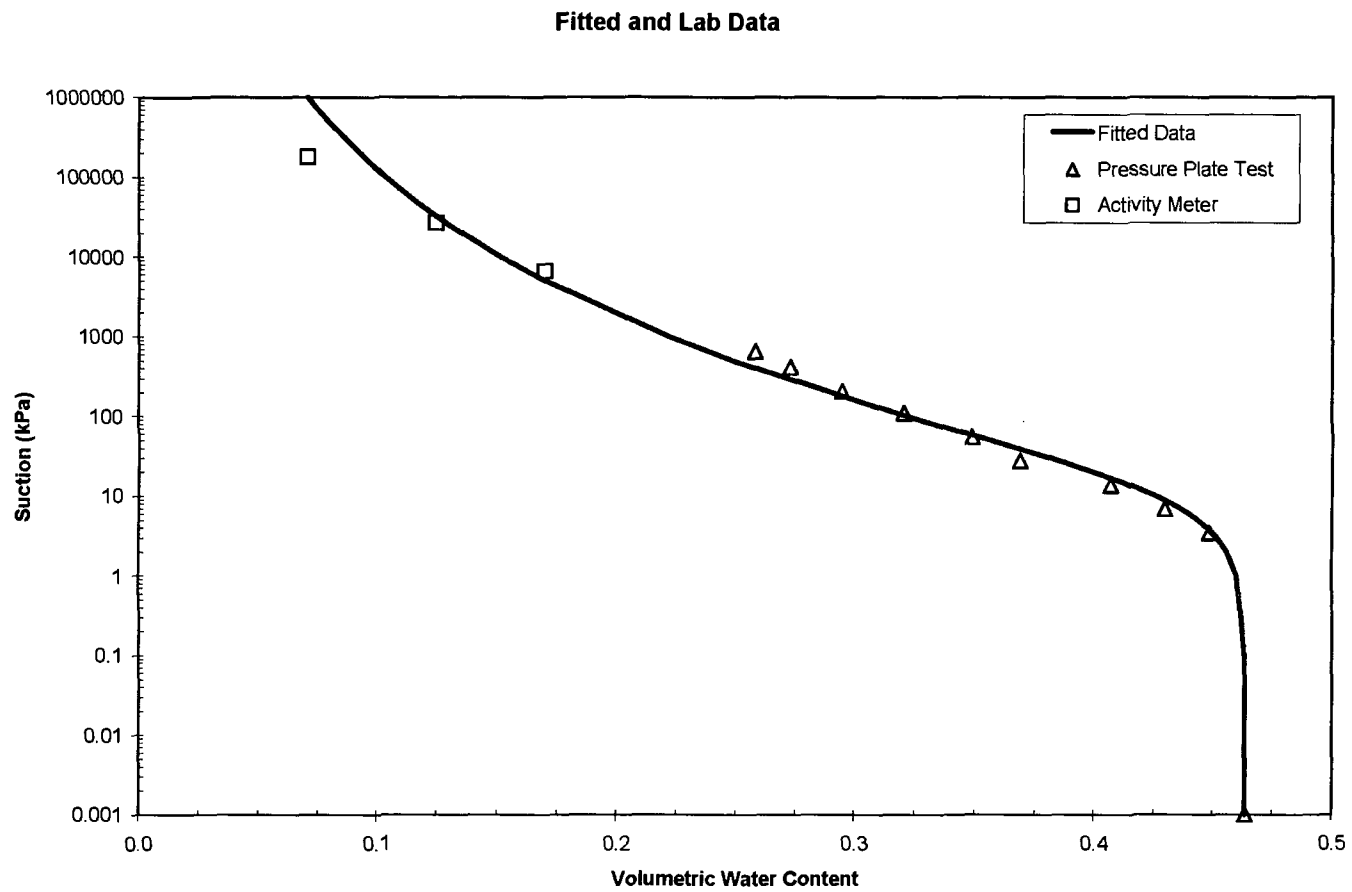
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4638
0.025	0.4637
0.05	0.4637
0.075	0.4636
0.1	0.4635
1	0.4602
2	0.4561
3	0.4519
4	0.4478
5	0.4438
6	0.4400
7	0.4363
8	0.4327
9	0.4293
10	0.4261
15	0.4118
20	0.4000
30	0.3817
40	0.3678
50	0.3568
60	0.3476
70	0.3399
80	0.3332
90	0.3274
100	0.3222
500	0.2490
1000	0.2221
5000	0.1701
10000	0.1516
25000	0.1302
5.00E+04	0.1161
1.00E+05	0.1034
5.00E+05	0.0792
7.50E+05	0.0740
1.00E+06	0.0706

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.464	0.4638	0.000	0.000
3.45	0.449	0.4500	-0.001	0.000
6.90	0.430	0.4366	-0.007	0.000
13.79	0.407	0.4150	-0.008	0.000
27.59	0.369	0.3856	-0.017	0.000
55.18	0.349	0.3518	-0.003	0.000
110.35	0.321	0.3173	0.003	0.000
206.91	0.295	0.2873	0.007	0.000
413.82	0.273	0.2568	0.016	0.000
655.22	0.258	0.2382	0.020	0.000
6650.00	0.170	0.1623	0.007	0.000
27000.00	0.125	0.1286	-0.004	0.000
180600.00	0.071	0.0938	-0.023	0.001

Residual = 0.000133104



Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	SB-3 (KF-3S)		Test Date		
WT of Sample Ring =	70.6	g			
WT of Sample Ring + Soil =	257.79	g			
Water Content =	38.7	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	80.03	pcf	1.28	Mg/m ³	
Water WT =	52.23	g			
Solid WT =	134.96	g			
Add Water for saturation =	3.54	g	Sr	101.64	
Saturated Water Content =	41.32	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	14.3	0.000	0.001	0.413	0.530
0.5	24.1	1.862	3.449	0.399	0.512
1	27.1	2.432	6.897	0.395	0.507
2	32.6	3.477	13.794	0.387	0.497
4	49.6	6.707	27.588	0.364	0.466
8	61.8	9.025	55.176	0.346	0.444
15	75.7	11.666	103.455	0.327	0.419
30	89.4	14.269	206.910	0.308	0.394
60	98	15.903	413.820	0.295	0.379
95	114.4	19.019	655.215	0.272	0.349
125	125.1	21.052	862.125	0.257	0.330
		Activity	3010.00	0.200	0.257
		Meter	46900.00	0.110	0.141
		Test	307800.00	0.074	0.095

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
307.8	8.2882	14.5635	14.1315	0.074	0.095
46.9	8.2953	14.7638	14.1244	0.110	0.141
3.01	7.4872	14.4628	13.2987	0.200	0.257

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.5300
$\alpha =$	0.0248
$n =$	1.1841
$m =$	0.1555

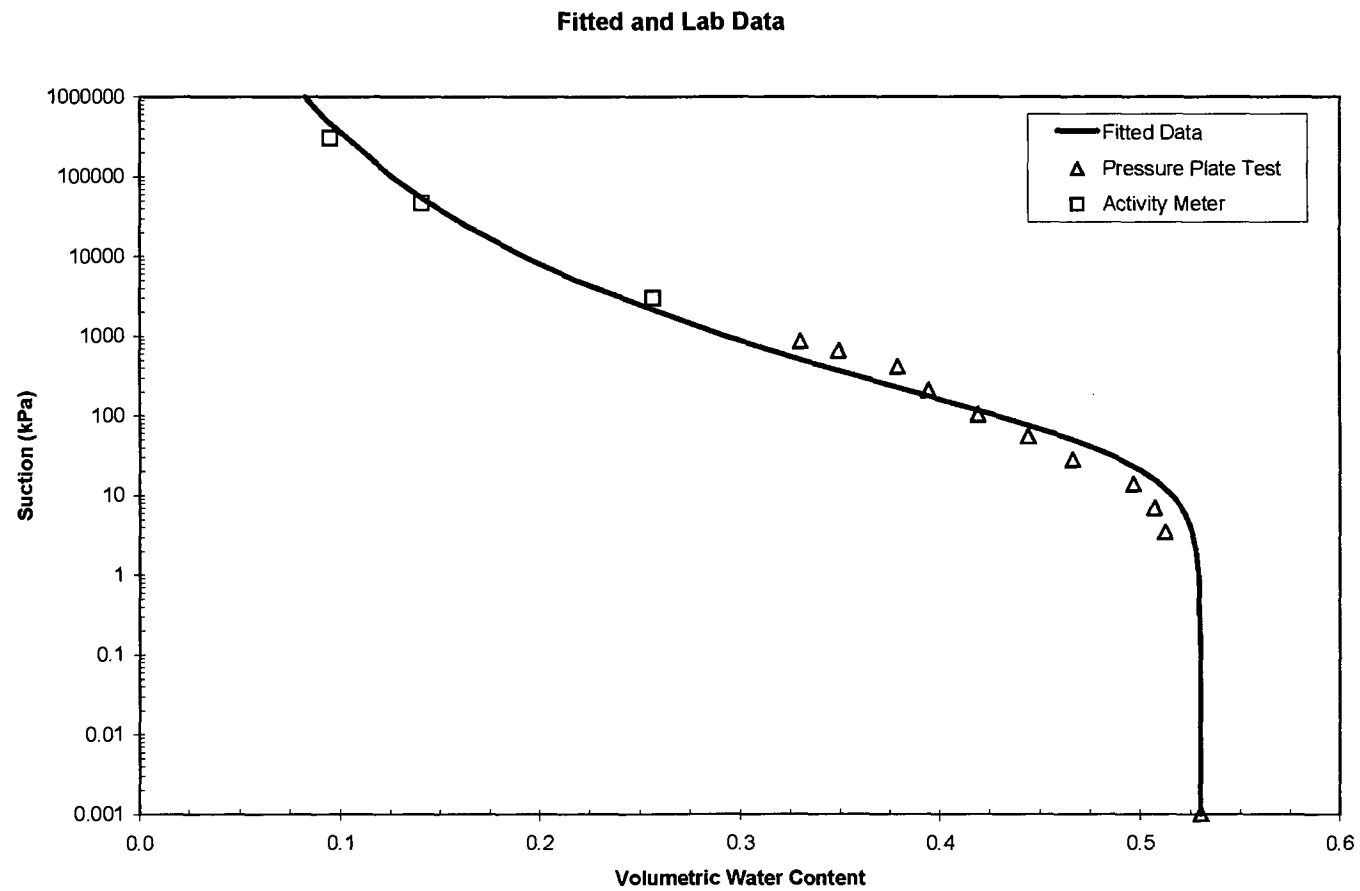
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.5300
0.025	0.5300
0.05	0.5300
0.075	0.5299
0.1	0.5299
1	0.5290
2	0.5277
3	0.5263
4	0.5248
5	0.5233
6	0.5218
7	0.5203
8	0.5188
9	0.5172
10	0.5157
15	0.5082
20	0.5010
30	0.4878
40	0.4761
50	0.4659
60	0.4567
70	0.4486
80	0.4412
90	0.4345
100	0.4283
500	0.3308
1000	0.2924
5000	0.2180
10000	0.1920
25000	0.1622
5.00E+04	0.1428
1.00E+05	0.1257
5.00E+05	0.0934
7.50E+05	0.0867
1.00E+06	0.0822

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.530	0.5300	0.000	0.000
3.45	0.512	0.5256	-0.013	0.000
6.90	0.507	0.5205	-0.014	0.000
13.79	0.497	0.5100	-0.013	0.000
27.59	0.466	0.4908	-0.025	0.001
55.18	0.444	0.4810	-0.017	0.000
103.46	0.419	0.4263	-0.007	0.000
206.91	0.394	0.3840	0.010	0.000
413.82	0.379	0.3419	0.037	0.001
655.22	0.349	0.3154	0.034	0.001
862.13	0.330	0.3003	0.030	0.001
3010.00	0.257	0.2393	0.018	0.000
46900.00	0.141	0.1445	-0.004	0.000
307800.00	0.095	0.1022	-0.007	0.000

Residual = 0.000382068



Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	SB-4 (K#4 - S)		Test Date		
WT of Sample Ring =	70.72	g			
WT of Sample Ring + Soil =	244	g			
Water Content =	32.7	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	77.43	pcf	1.24	Mg/m ³	
Water WT =	42.70	g			
Solid WT =	130.58	g			
Add Water for saturation =	8.19	g	Sr	90.06	
Saturated Water Content =	38.97	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	14.5	0.000	0.001	0.390	0.484
0.5	32.5	3.420	3.449	0.364	0.451
1	67.4	10.051	6.897	0.313	0.388
2	95	15.295	13.794	0.273	0.338
4	108	17.765	27.588	0.254	0.315
8	118	19.665	55.176	0.239	0.297
15	142	24.225	103.455	0.204	0.253
30	158	27.265	206.910	0.181	0.225
60	171.5	29.830	413.820	0.161	0.200
95	180.5	31.540	655.215	0.148	0.184
		Activity	8210.00	0.117	0.145
		Meter	10800.00	0.112	0.139
		Test	79500.00	0.083	0.102

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
79.5	8.6297	14.6584	14.1986	0.083	0.102
10.8	8.0015	14.2801	13.6494	0.112	0.139
8.21	7.4188	13.7489	13.0877	0.117	0.145

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0407
$\theta_s =$	0.4836
$\alpha =$	0.3464
$n =$	1.2016
$m =$	0.1678

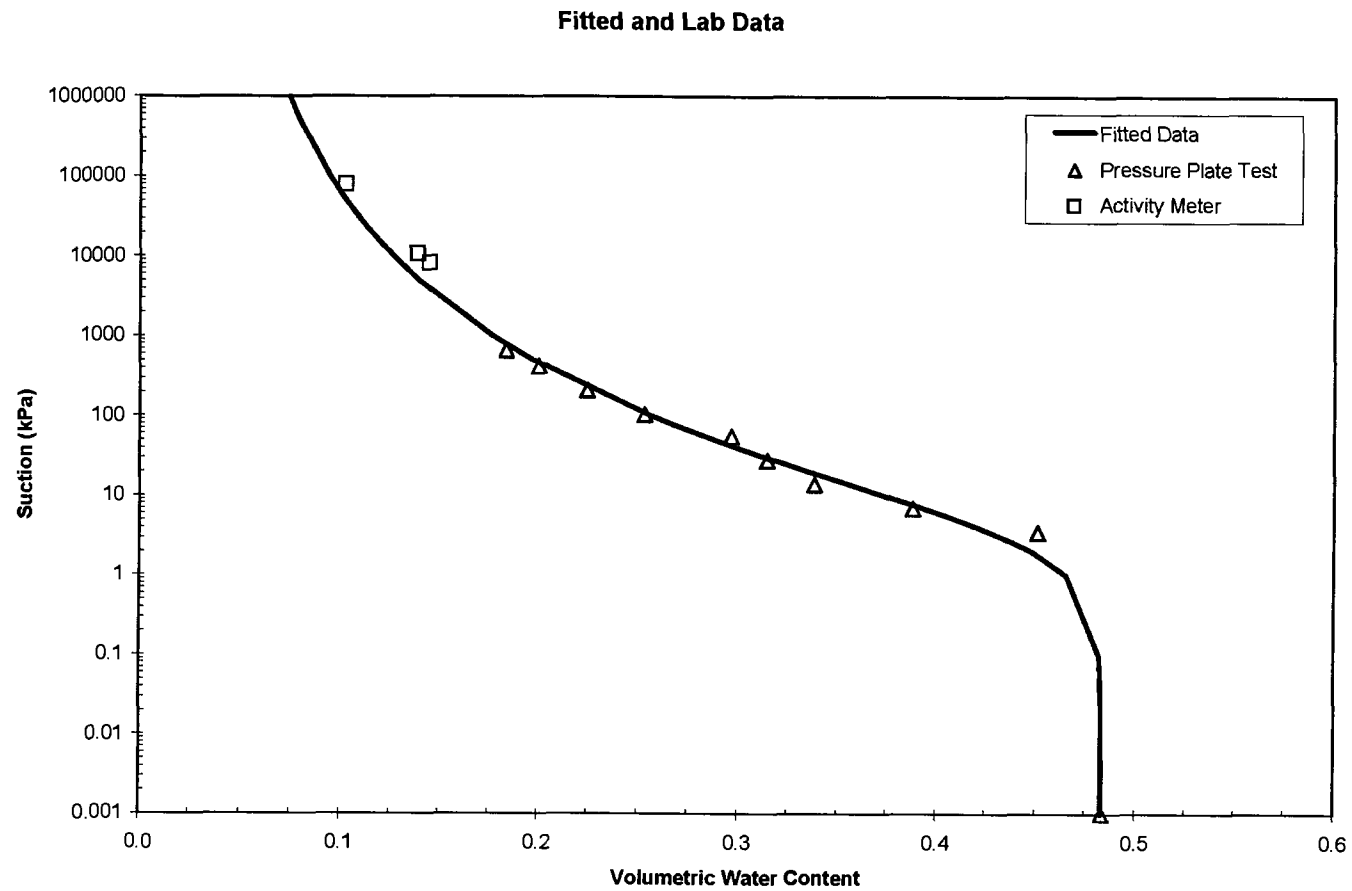
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4836
0.025	0.4834
0.05	0.4830
0.075	0.4827
0.1	0.4823
1	0.4657
2	0.4482
3	0.4334
4	0.4210
5	0.4104
6	0.4012
7	0.3932
8	0.3861
9	0.3797
10	0.3739
15	0.3516
20	0.3358
30	0.3143
40	0.2996
50	0.2886
60	0.2799
70	0.2727
80	0.2667
90	0.2615
100	0.2569
500	0.1973
1000	0.1769
5000	0.1392
10000	0.1263
25000	0.1119
5.00E+04	0.1026
1.00E+05	0.0945
5.00E+05	0.0796
7.50E+05	0.0766
1.00E+06	0.0745

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.484	0.4836	0.000	0.000
3.45	0.451	0.4276	0.023	0.001
6.90	0.388	0.3940	-0.006	0.000
13.79	0.338	0.3562	-0.018	0.000
27.59	0.315	0.3187	-0.004	0.000
55.18	0.297	0.2839	0.013	0.000
103.46	0.253	0.2555	-0.002	0.000
206.91	0.225	0.2277	-0.003	0.000
413.82	0.200	0.2034	-0.003	0.000
655.22	0.184	0.1890	-0.005	0.000
8210.00	0.145	0.1298	0.015	0.000
10800.00	0.139	0.1250	0.014	0.000
79500.00	0.102	0.0971	0.005	0.000

Residual = 0.00012128



Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	SB-5 (KF5-S - S SWCC)		Test Date	2/15/2006	
WT of Sample Ring =	70.18	g			
WT of Sample Ring + Soil =	264.18	g			
Water Content =	29.7	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	88.70	pcf	1.42	Mg/m ³	
Water WT =	44.42	g			
Solid WT =	149.58	g			
Add Water for saturation =	7.74	g	Sr	105.56	
Saturated Water Content =	34.87	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	10.5	0.000	0.001	0.349	0.496
0.5	18.4	1.501	3.449	0.339	0.481
1	33	4.275	6.897	0.320	0.455
2	42	5.985	13.794	0.309	0.439
4	56.5	8.740	27.588	0.290	0.413
8	67.1	10.754	55.176	0.277	0.394
16	77.5	12.730	110.352	0.264	0.375
30	86	14.345	206.910	0.253	0.359
60	99.8	16.967	413.820	0.235	0.334
95	113.3	19.532	655.215	0.218	0.310
125	125.1	21.774	862.125	0.203	0.289
195	141	24.795	1344.915	0.183	0.260
		Activity Meter Test	18600.00	0.125	0.178
			68800.00	0.085	0.121
			189000.00	0.069	0.098

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
189	7.7444	14.5943	14.1544	0.069	0.098
68.8	7.4873	14.5682	14.0131	0.085	0.121
18.6	8.6302	15.8933	15.0852	0.125	0.178

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4957
$\alpha =$	0.0438
$n =$	1.1628
$m =$	0.1400

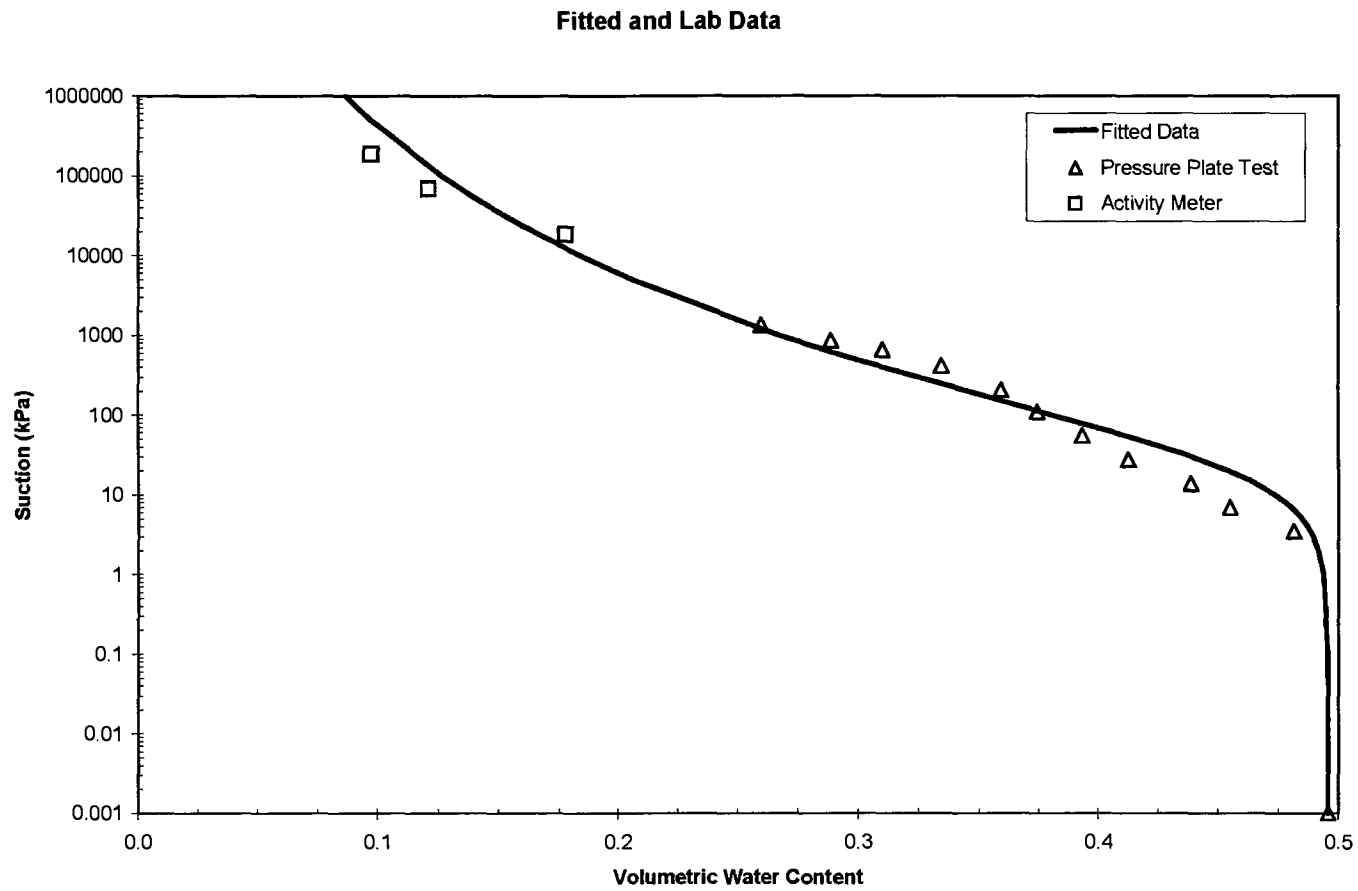
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4957
0.025	0.4957
0.05	0.4957
0.075	0.4956
0.1	0.4956
1	0.4939
2	0.4918
3	0.4895
4	0.4872
5	0.4849
6	0.4826
7	0.4803
8	0.4781
9	0.4759
10	0.4737
15	0.4636
20	0.4545
30	0.4392
40	0.4266
50	0.4161
60	0.4072
70	0.3993
80	0.3925
90	0.3863
100	0.3808
500	0.2987
1000	0.2674
5000	0.2061
10000	0.1841
25000	0.1586
5.00E+04	0.1417
1.00E+05	0.1265
5.00E+05	0.0874
7.50E+05	0.0912
1.00E+06	0.0870

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.496	0.4957	0.000	0.000
3.45	0.481	0.4885	-0.007	0.000
6.90	0.455	0.4805	-0.025	0.001
13.79	0.439	0.4659	-0.027	0.001
27.59	0.413	0.4426	-0.030	0.001
55.18	0.394	0.4113	-0.018	0.000
110.35	0.375	0.3756	-0.001	0.000
208.91	0.359	0.3426	0.017	0.000
413.82	0.334	0.3078	0.027	0.001
655.22	0.310	0.2862	0.024	0.001
862.13	0.289	0.2739	0.015	0.000
1344.92	0.260	0.2549	0.005	0.000
18600.00	0.178	0.1664	0.012	0.000
68800.00	0.121	0.1345	-0.014	0.000
189000.00	0.098	0.1141	-0.017	0.000

Residual = 0.000336758



Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	SB-6 (K#6 - S)		Test Date		
WT of Sample Ring =	69.18	g			
WT of Sample Ring + Soil =	249.32	g			
Water Content =	37.7	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	77.59	pcf	1.24	Mg/m ³	
Water WT =	49.29	g			
Solid WT =	130.85	g			
Add Water for saturation =	8.83	g	Sr	103.04	
Saturated Water Content =	44.42	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	17	0.000	0.001	0.444	0.552
0.5	31.5	2.755	3.449	0.423	0.526
1	46.9	5.681	6.897	0.401	0.498
2	55.5	7.315	13.794	0.388	0.483
4	67.5	9.595	27.588	0.371	0.461
8	81.9	12.331	55.176	0.350	0.435
15	94.1	14.649	103.455	0.332	0.413
30	107.8	17.252	206.910	0.312	0.388
60	119	19.380	413.820	0.296	0.368
95	133.1	22.059	655.215	0.276	0.343
		Activity	1180.00	0.228	0.284
		Meter	29500.00	0.128	0.160
		Test	159700.00	0.095	0.118

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
159.7	8.2885	14.4374	13.9027	0.095	0.118
29.5	8.2962	14.6181	13.8989	0.128	0.160
1.18	7.4876	14.2941	13.0297	0.228	0.284

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.5523
$\alpha =$	0.0617
$n =$	1.1540
$m =$	0.1335

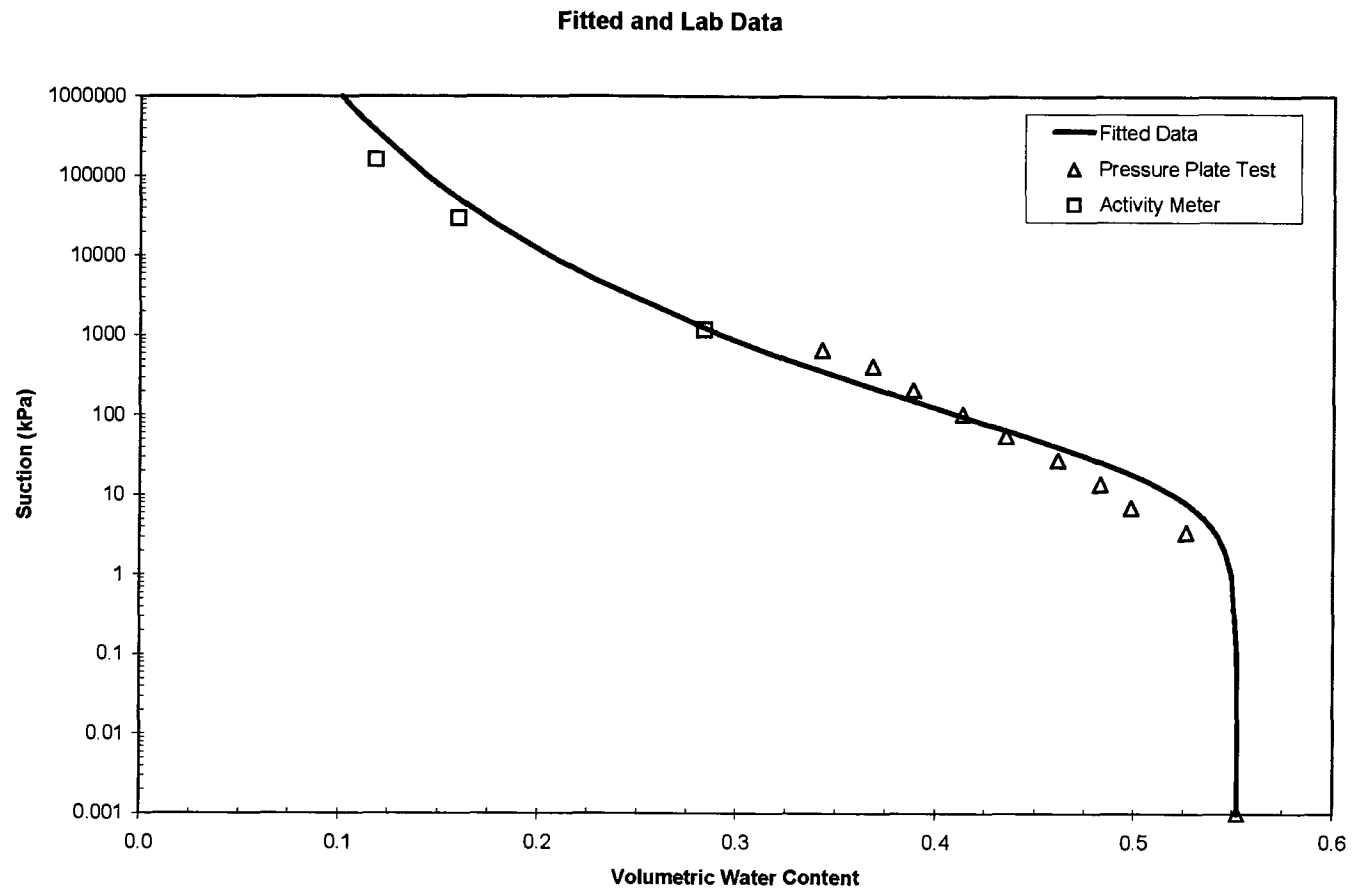
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.5523
0.025	0.5523
0.05	0.5522
0.075	0.5522
0.1	0.5521
1	0.5494
2	0.5460
3	0.5426
4	0.5391
5	0.5357
6	0.5324
7	0.5291
8	0.5259
9	0.5229
10	0.5199
15	0.5065
20	0.4949
30	0.4762
40	0.4616
50	0.4496
60	0.4396
70	0.4310
80	0.4235
90	0.4169
100	0.4109
500	0.3249
1000	0.2924
5000	0.2284
10000	0.2053
25000	0.1783
5.00E+04	0.1603
1.00E+05	0.1440
5.00E+05	0.1124
7.50E+05	0.1056
1.00E+06	0.1010

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.552	0.5523	0.000	0.000
3.45	0.526	0.5410	-0.015	0.000
6.90	0.498	0.5294	-0.031	0.001
13.79	0.483	0.5095	-0.027	0.001
27.59	0.461	0.4803	-0.019	0.000
55.18	0.435	0.4442	-0.009	0.000
103.46	0.413	0.4090	0.004	0.000
206.91	0.388	0.3705	0.018	0.000
413.82	0.368	0.3343	0.034	0.001
655.22	0.343	0.3118	0.031	0.001
1180.00	0.284	0.2851	-0.001	0.000
29500.00	0.160	0.1738	-0.014	0.000
159700.00	0.118	0.1340	-0.016	0.000

Residual = 0.000402493



Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	SB-7 (K#7 - S)		Test Date		
WT of Sample Ring =	70.66	g			
WT of Sample Ring + Soil =	250.03	g			
Water Content =	40.9	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	75.50	pcf	1.21	Mg/m ³	
Water WT =	52.05	g			
Solid WT =	127.32	g			
Add Water for saturation =	4.14	g	Sr	97.35	
Saturated Water Content =	44.13	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	19.2	0.000	0.001	0.441	0.534
0.5	35	3.002	3.449	0.418	0.505
1	51	6.042	6.897	0.394	0.477
2	68.4	9.348	13.794	0.368	0.445
4	87	12.882	27.588	0.340	0.412
8	103.5	16.017	55.176	0.316	0.382
15	117.3	18.639	103.455	0.295	0.357
30	131.7	21.375	206.910	0.273	0.331
60	145	23.902	413.820	0.254	0.307
95	153.4	25.498	655.215	0.241	0.292
		Activity Meter Test	5120.00	0.173	0.209
			7160.00	0.161	0.195
			107800.00	0.094	0.113

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
107.8	7.7173	13.6691	13.1601	0.094	0.113
7.16	8.0638	14.4217	13.5397	0.161	0.195
5.12	7.7444	14.1762	13.2271	0.173	0.209

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.5340
$\alpha =$	0.1598
$n =$	1.1454
$m =$	0.1269

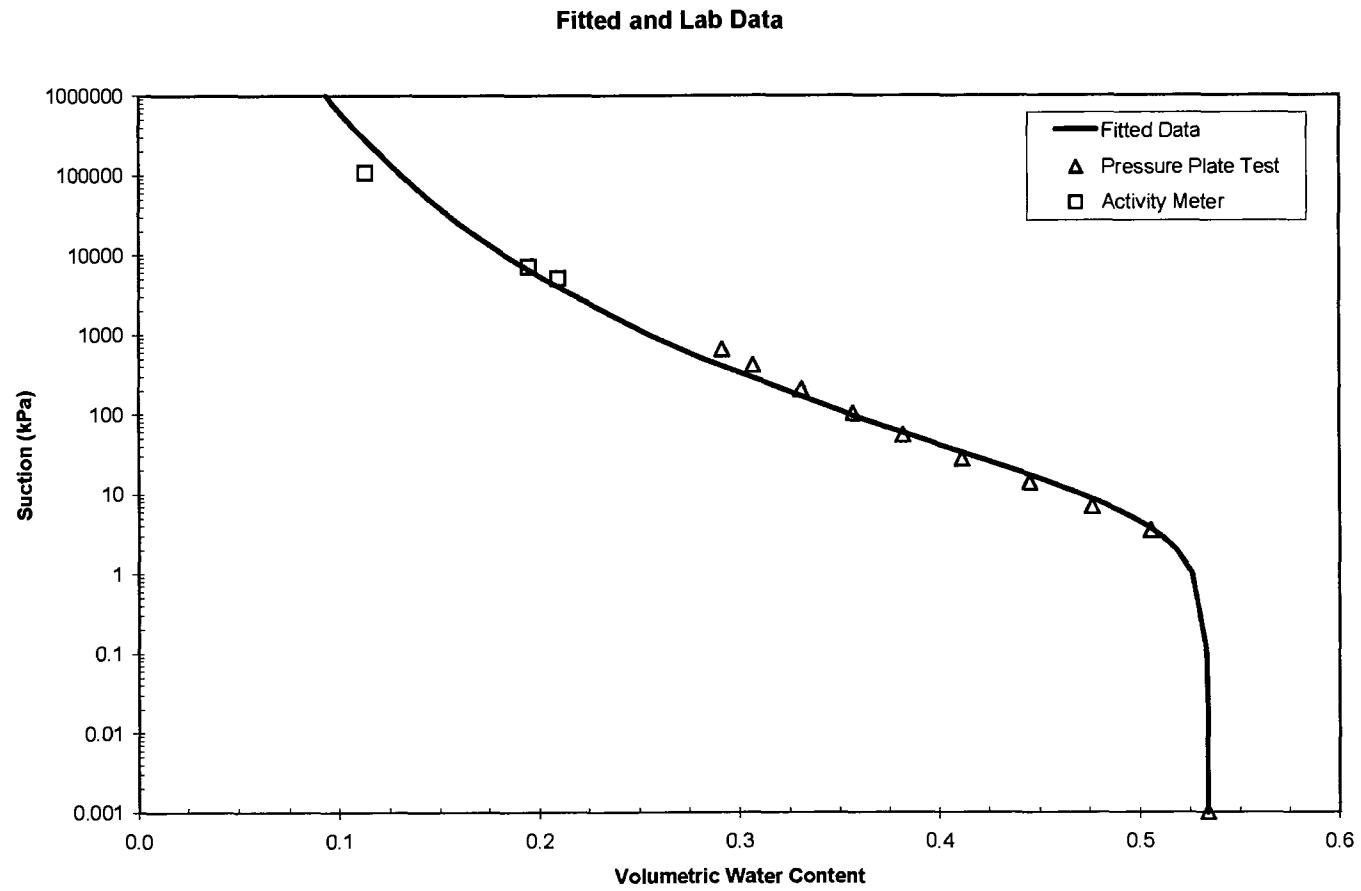
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.5340
0.025	0.5338
0.05	0.5337
0.075	0.5335
0.1	0.5334
1	0.5262
2	0.5180
3	0.5102
4	0.5031
5	0.4965
6	0.4905
7	0.4849
8	0.4797
9	0.4749
10	0.4705
15	0.4519
20	0.4377
30	0.4169
40	0.4019
50	0.3903
60	0.3809
70	0.3730
80	0.3662
90	0.3603
100	0.3550
500	0.2822
1000	0.2553
5000	0.2021
10000	0.1827
25000	0.1599
5.00E+04	0.1446
1.00E+05	0.1307
5.00E+05	0.1035
7.50E+05	0.0975
1.00E+06	0.0935

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.534	0.5340	0.000	0.000
3.45	0.505	0.5069	-0.002	0.000
6.90	0.477	0.4854	-0.009	0.000
13.79	0.445	0.4559	-0.011	0.000
27.59	0.412	0.4213	-0.010	0.000
56.18	0.382	0.3852	-0.003	0.000
103.46	0.357	0.3534	0.003	0.000
206.91	0.331	0.3204	0.010	0.000
413.82	0.307	0.2900	0.017	0.000
655.22	0.282	0.2714	0.020	0.000
5120.00	0.209	0.2014	0.008	0.000
7160.00	0.195	0.1918	0.003	0.000
107800.00	0.113	0.1293	-0.016	0.000

Residual = 0.000112057



Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	SB-8 (KF8 - S)		Test Date		
WT of Sample Ring =	69.1	g			
WT of Sample Ring + Soil =	249.61	g			
Water Content =	34.6	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	79.55	pcf	1.27	Mg/m ³	
Water WT =	46.36	g			
Solid WT =	134.15	g			
Add Water for saturation =	8.37	g	Sr	99.20	
Saturated Water Content =	40.80	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	14.9	0.000	0.001	0.408	0.520
0.5	26.8	2.261	3.449	0.391	0.499
1	41.1	4.978	6.897	0.371	0.473
2	57.5	8.094	13.794	0.348	0.443
4	71.0	10.659	27.588	0.329	0.419
8	80.0	12.369	55.176	0.316	0.403
15	89.8	14.231	103.455	0.302	0.385
30	102.5	16.644	206.910	0.284	0.362
60	113.0	18.639	413.820	0.269	0.343
95	122.2	20.387	655.215	0.256	0.326
120	131.2	22.097	827.640	0.243	0.310
150	142.4	24.225	1034.550	0.227	0.290
200	154.6	26.543	1379.400	0.210	0.268
		Activity	5900.00	0.160	0.204
		Meter	25600.00	0.122	0.156
		Test	78100.00	0.099	0.126

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
78.1	7.7174	13.903	13.3477	0.099	0.126
25.6	8.0635	14.3738	13.6857	0.122	0.156
5.9	7.7441	13.1203	12.3789	0.160	0.204

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.5201
$\alpha =$	0.0635
$n =$	1.1611
$m =$	0.1387

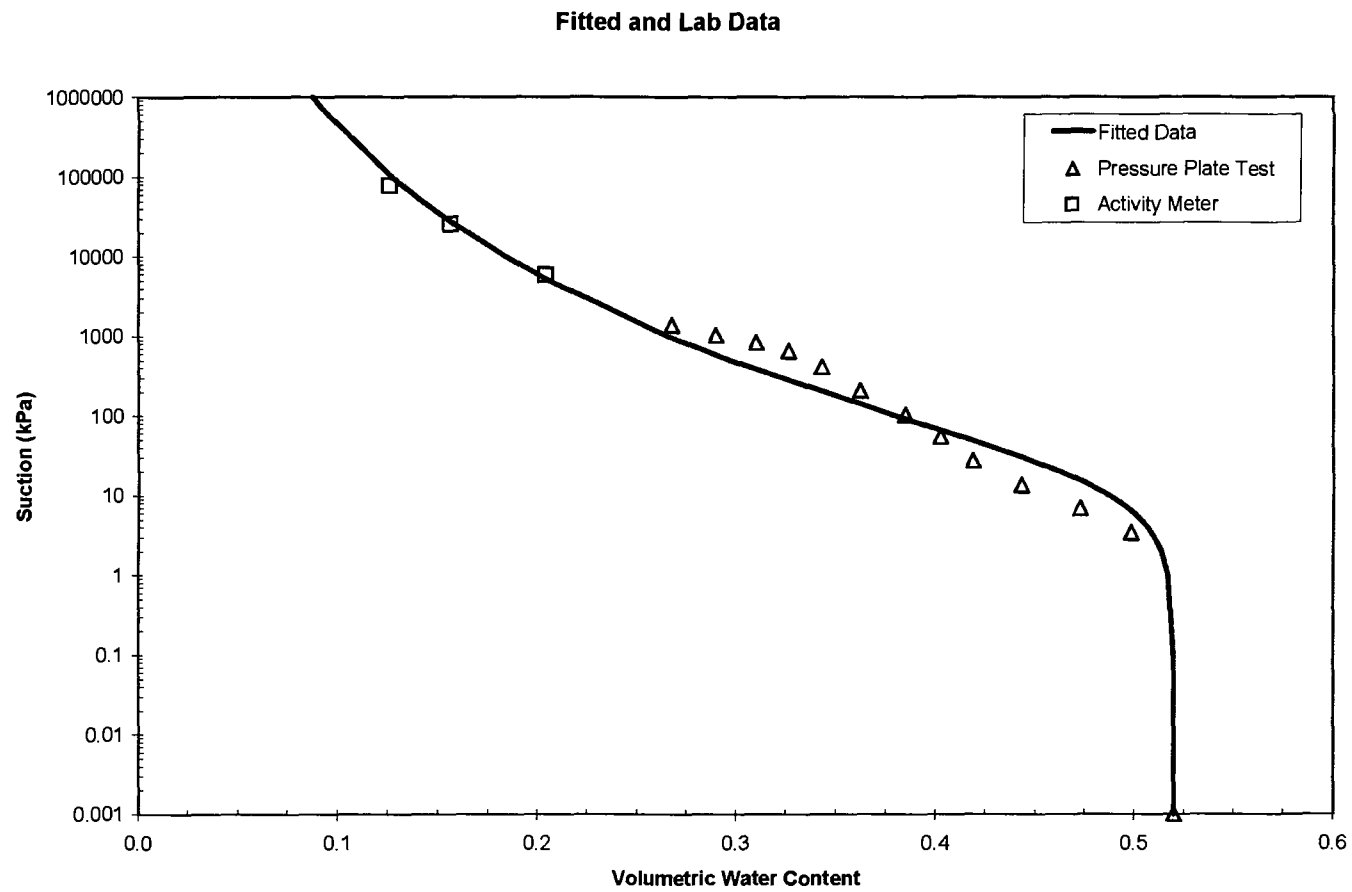
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.5201
0.025	0.5201
0.05	0.5200
0.075	0.5200
0.1	0.5199
1	0.5172
2	0.5139
3	0.5104
4	0.5069
5	0.5035
6	0.5001
7	0.4969
8	0.4937
9	0.4907
10	0.4877
15	0.4743
20	0.4628
30	0.4443
40	0.4298
50	0.4181
60	0.4083
70	0.3999
80	0.3926
90	0.3861
100	0.3803
500	0.2973
1000	0.2662
5000	0.2056
10000	0.1839
25000	0.1587
5.00E+04	0.1419
1.00E+05	0.1269
5.00E+05	0.0980
7.50E+05	0.0918
1.00E+06	0.0876

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.520	0.5201	0.000	0.000
3.45	0.499	0.5088	-0.010	0.000
6.90	0.473	0.4972	-0.024	0.001
13.79	0.443	0.4773	-0.034	0.001
27.59	0.419	0.4483	-0.029	0.001
55.18	0.403	0.4128	-0.010	0.000
103.46	0.385	0.3784	0.006	0.000
206.91	0.362	0.3412	0.021	0.000
413.82	0.343	0.3063	0.037	0.001
855.22	0.326	0.2848	0.042	0.002
827.64	0.310	0.2744	0.036	0.001
1034.55	0.290	0.2648	0.025	0.001
1379.40	0.268	0.2529	0.015	0.000
5900.00	0.204	0.2002	0.004	0.000
25600.00	0.156	0.1581	-0.002	0.000
78100.00	0.126	0.1321	-0.006	0.000

Residual = 0.000536292



Large Scale Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	LB-1 (K#1-L-S)		Test Date		
WT of Sample Ring =	70.7	g			
WT of Sample Ring + Soil =	297.99	g			
Water Content =	18.4	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	113.87	pcf	1.82	Mg/m ³	
Water WT =	35.26	g			
Solid WT =	192.03	g			
Add Water for saturation =	1.21	g	Sr	108.61	
Saturated Water Content =	18.99	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	15.5	0.000	0.001	0.190	0.347
0.5	13.2	-0.437	3.449	0.192	0.351
1	11.6	-0.741	6.897	0.194	0.354
2	10.5	-0.950	13.794	0.195	0.356
4	16.2	0.133	27.588	0.189	0.345
8	25.2	1.843	55.176	0.180	0.329
15	39.5	4.560	103.455	0.166	0.303
30	50	6.555	206.910	0.156	0.284
60	56.5	7.790	413.820	0.149	0.273
95	64.4	9.291	655.215	0.142	0.258
150	96	15.295	1034.550	0.110	0.201
200	112.1	18.354	1379.400	0.094	0.172
		Activity Meter Test	7050.00	0.072	0.131
			53800.00	0.041	0.076
			177900.00	0.031	0.056

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
177.9	7.4872	16.2436	15.9841	0.031	0.056
53.8	7.7443	16.6038	16.2517	0.041	0.076
7.05	8.0012	17.1607	16.5451	0.072	0.131

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.3466
$\alpha =$	0.0047
$n =$	1.2782
$m =$	0.2177

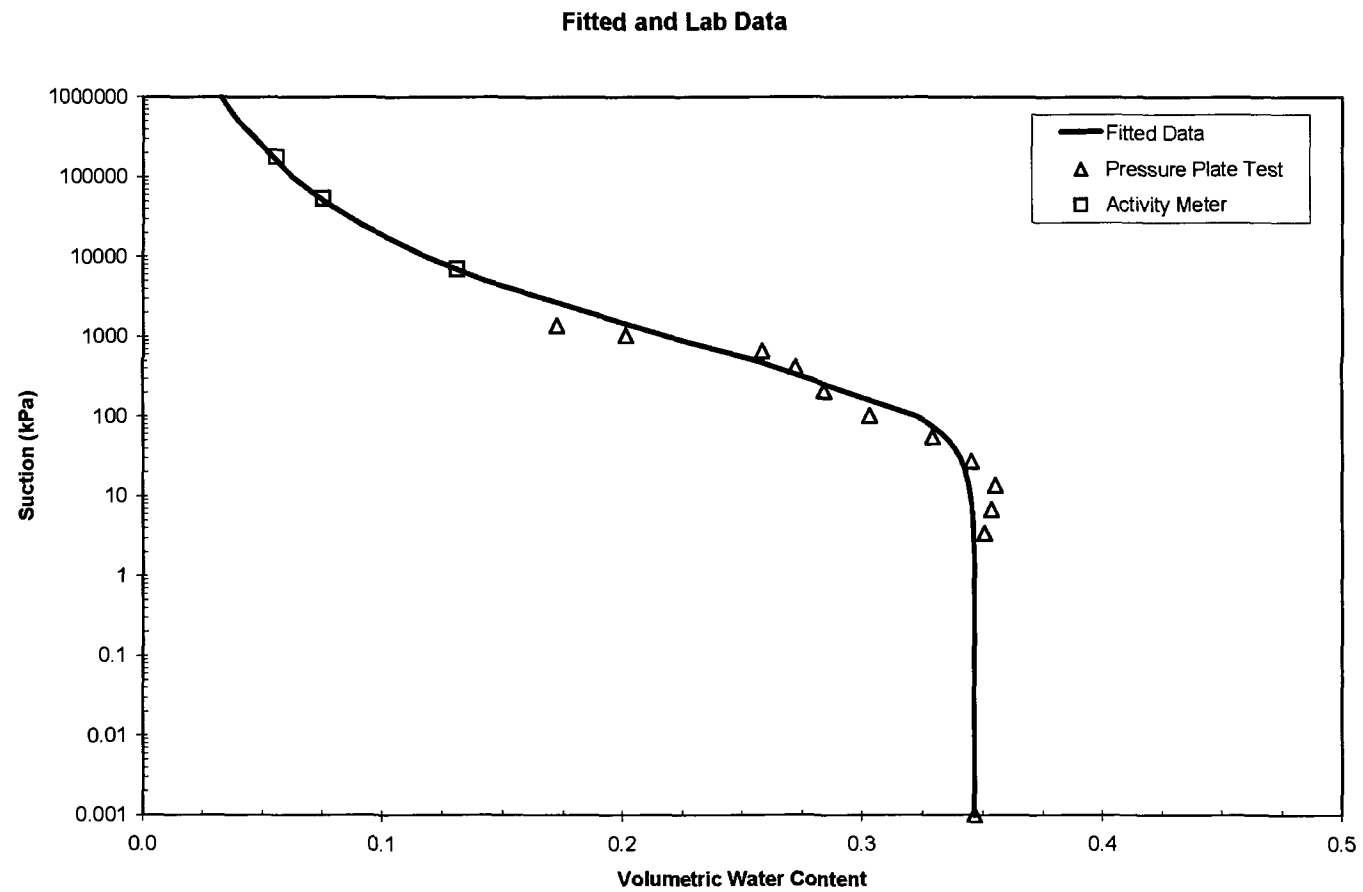
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3466
0.025	0.3466
0.05	0.3465
0.075	0.3465
0.1	0.3465
1	0.3465
2	0.3464
3	0.3462
4	0.3461
5	0.3459
6	0.3458
7	0.3456
8	0.3454
9	0.3452
10	0.3450
15	0.3440
20	0.3430
30	0.3406
40	0.3382
50	0.3357
60	0.3331
70	0.3305
80	0.3280
90	0.3254
100	0.3229
500	0.2563
1000	0.2188
5000	0.1432
10000	0.1184
25000	0.0918
5.00E+04	0.0757
1.00E+05	0.0625
5.00E+05	0.0399
7.50E+05	0.0357
1.00E+06	0.0329

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.347	0.3466	0.000	0.000
3.45	0.351	0.3462	0.005	0.000
6.90	0.354	0.3456	0.008	0.000
13.79	0.356	0.3443	0.011	0.000
27.59	0.345	0.3412	0.004	0.000
55.18	0.329	0.3343	-0.005	0.000
103.46	0.303	0.3220	-0.019	0.000
206.91	0.284	0.2989	-0.015	0.000
413.82	0.273	0.2863	0.006	0.000
655.22	0.258	0.2417	0.017	0.000
1034.55	0.201	0.2169	-0.016	0.000
1379.40	0.172	0.2018	-0.030	0.001
7050.00	0.131	0.1303	0.001	0.000
53800.00	0.076	0.0742	0.001	0.000
177900.00	0.056	0.0532	0.003	0.000

Residual = 0.000152112



Large Scale Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	LB-2 (K#2-L-S)		Test Date		
WT of Sample Ring =	70.59	g			
WT of Sample Ring + Soil =	278.16	g			
Water Content =	26.7	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	97.15	pcf	1.56	Mg/m ³	
Water WT =	43.74	g			
Solid WT =	163.83	g			
Add Water for saturation =	4.24	g	Sr	108.80	
Saturated Water Content =	29.29	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	15.7	0.000	0.001	0.293	0.456
0.5	16.8	0.209	3.449	0.292	0.454
1	23.7	1.520	6.897	0.284	0.442
2	27.8	2.299	13.794	0.279	0.434
4	36	3.857	27.588	0.269	0.419
8	43.4	5.263	55.176	0.261	0.406
15	56.6	7.771	103.455	0.245	0.382
30	71.1	10.526	206.910	0.229	0.356
60	79.5	12.122	413.820	0.219	0.341
95	93.2	14.725	655.215	0.203	0.316
125	105	16.967	862.125	0.189	0.295
150	111.1	18.126	1034.550	0.182	0.284
		Activity Meter Test	12300.00	0.092	0.143
			23700.00	0.078	0.122
			179700.00	0.036	0.056

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
179.7	7.717	15.2275	14.9657	0.036	0.056
23.7	7.7602	15.5457	14.9801	0.078	0.122
12.3	8.6298	16.4852	15.8258	0.092	0.143

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4560
$\alpha =$	0.0085
$n =$	1.2532
$m =$	0.2020

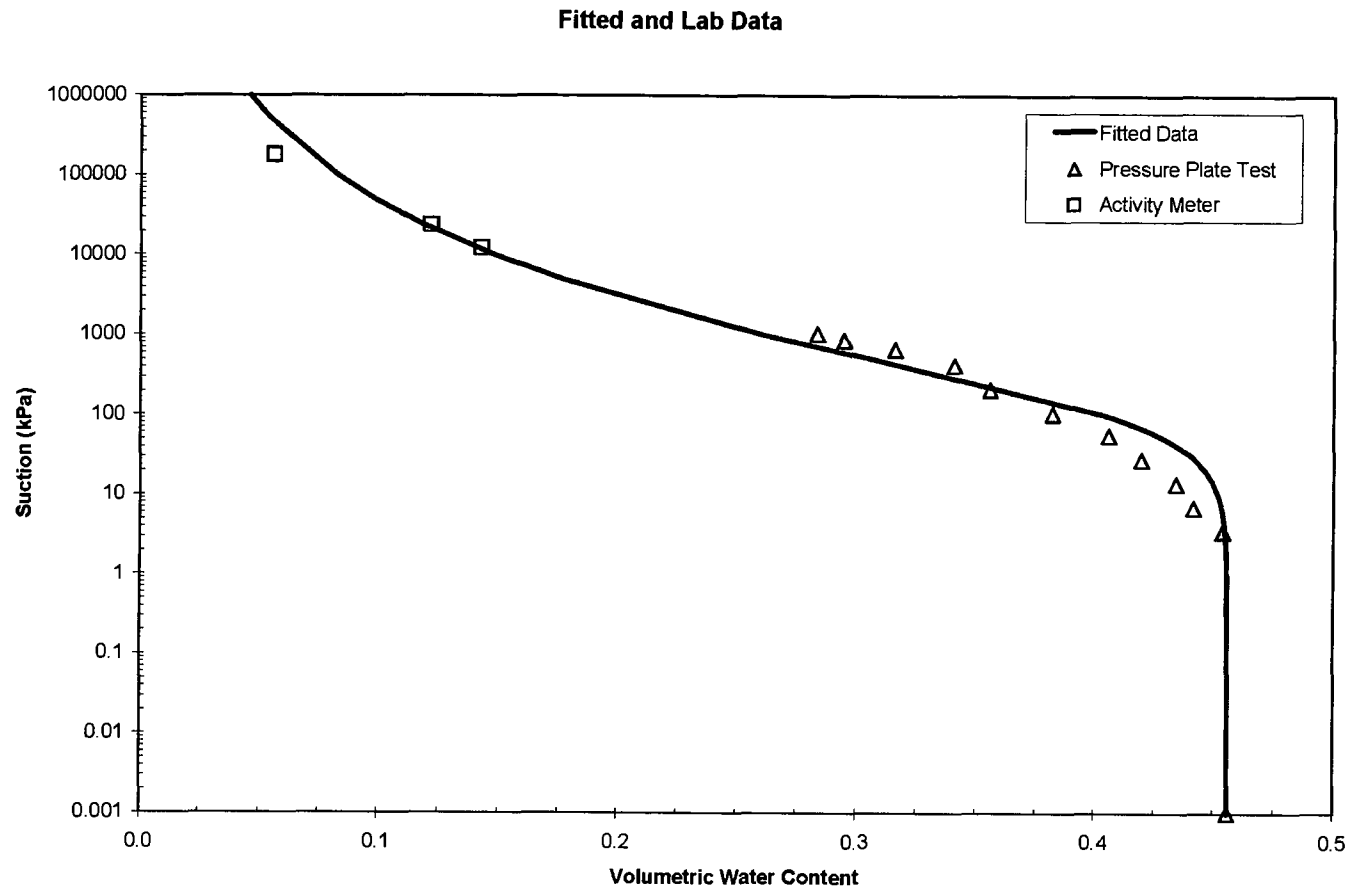
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4560
0.025	0.4560
0.05	0.4560
0.075	0.4560
0.1	0.4560
1	0.4557
2	0.4554
3	0.4551
4	0.4547
5	0.4542
6	0.4538
7	0.4534
8	0.4529
9	0.4524
10	0.4519
15	0.4493
20	0.4466
30	0.4410
40	0.4354
50	0.4298
60	0.4243
70	0.4191
80	0.4140
90	0.4091
100	0.4044
500	0.3069
1000	0.2620
5000	0.1764
10000	0.1481
25000	0.1175
5.00E+04	0.0986
1.00E+05	0.0828
5.00E+05	0.0551
7.50E+05	0.0497
1.00E+06	0.0462

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.456	0.4560	0.000	0.000
3.45	0.454	0.4549	-0.001	0.000
6.90	0.442	0.4534	-0.012	0.000
13.79	0.434	0.4500	-0.016	0.000
27.59	0.419	0.4424	-0.023	0.001
55.18	0.408	0.4269	-0.021	0.000
103.46	0.382	0.4028	-0.021	0.000
206.91	0.356	0.3648	-0.009	0.000
413.82	0.341	0.3196	0.021	0.000
655.22	0.316	0.2890	0.027	0.001
862.13	0.295	0.2713	0.023	0.001
1034.55	0.284	0.2599	0.024	0.001
12300.00	0.143	0.1406	0.002	0.000
23700.00	0.122	0.1191	0.003	0.000
179700.00	0.056	0.0714	-0.015	0.000

Residual = 0.000283926



Large Scale Pressure Plate Extractor Test

ASTM D 6836 - 02 (Method B)

Sample I.D.	LB-3 (K#3-L-S)	Test Date
WT of Sample Ring =	70.8 g	
WT of Sample Ring + Soil =	269.8 g	
Water Content =	22.7 %	
Diameter of Sample Ring, D =	2.86 in	
Height of Sample Ring, L =	1.0 in	
Volume, V =	3.72E-03 ft ³	105.3 cm ³
Dry Unit Weight =	96.21 pcf	1.54 Mg/m ³
Water WT =	36.76 g	
Solid WT =	162.24 g	
Add Water for saturation =	8 g	Sr 100.16
Saturated Water Content =	27.59 %	
Tube Area, A =	0.19 cm ²	

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	15.8	0.000	0.001	0.276	0.425
0.5	19	0.608	3.449	0.272	0.420
1	26.1	1.957	6.897	0.264	0.407
2	31.5	2.983	13.794	0.258	0.397
4	41.5	4.883	27.588	0.246	0.379
8	49.4	6.384	55.176	0.237	0.365
15	60.4	8.474	103.455	0.224	0.345
30	70.3	10.355	206.910	0.212	0.327
60	80.4	12.274	413.820	0.200	0.309
95	97	15.428	655.215	0.181	0.279
125	111.1	18.107	862.125	0.164	0.253
		Activity Meter Test	3100.00	0.108	0.166
			27000.00	0.067	0.104
			178000.00	0.036	0.055

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
178	7.715	15.2281	14.9701	0.036	0.055
27	7.7431	16.6108	16.0514	0.067	0.104
3.1	7.7178	15.8176	15.0313	0.108	0.166

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4254
$\alpha =$	0.0112
$n =$	1.2444
$m =$	0.1964

FOR GRAPHING

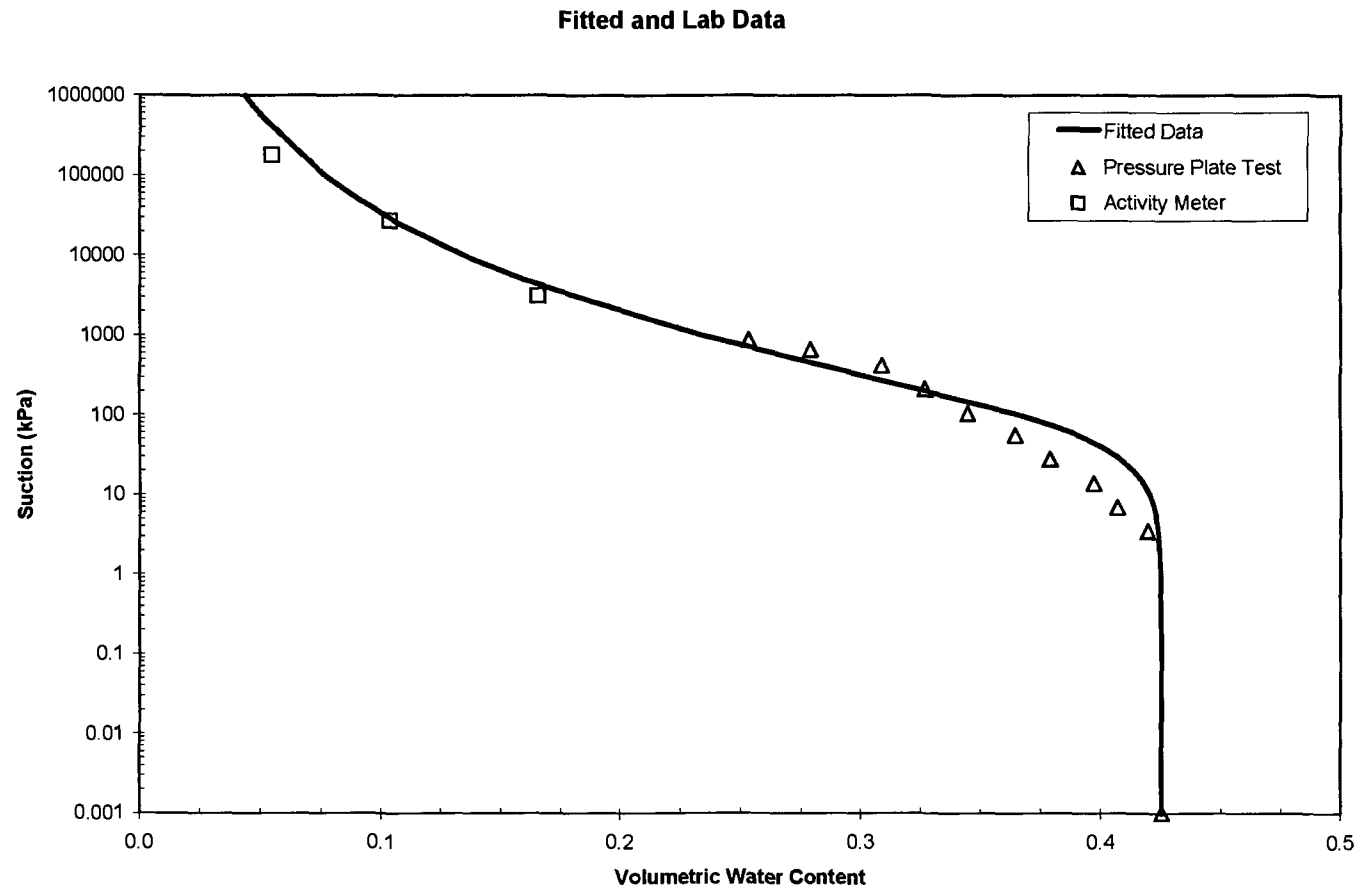
Suction (kPa)	VWC
0.001	0.4254
0.025	0.4254
0.05	0.4254
0.075	0.4254
0.1	0.4254
1	0.4251
2	0.4247
3	0.4242
4	0.4237
5	0.4231
6	0.4226
7	0.4220
8	0.4214
9	0.4208
10	0.4201
15	0.4169
20	0.4135
30	0.4068
40	0.4001
50	0.3937
60	0.3876
70	0.3818
80	0.3763
90	0.3711
100	0.3662
500	0.2734
1000	0.2337
5000	0.1590
10000	0.1343
25000	0.1074
5.00E+04	0.0907
1.00E+05	0.0765
5.00E+05	0.0516
7.50E+05	0.0468
1.00E+06	0.0436

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.425	0.4254	0.000	0.000
3.45	0.420	0.4240	-0.004	0.000
6.90	0.407	0.4220	-0.015	0.000
13.79	0.397	0.4177	-0.021	0.000
27.59	0.379	0.4084	-0.029	0.001
55.18	0.365	0.3905	-0.026	0.001
103.46	0.345	0.3645	-0.020	0.000
206.91	0.327	0.3267	0.000	0.000
413.82	0.309	0.2848	0.024	0.001
655.22	0.279	0.2575	0.021	0.000
862.13	0.253	0.2419	0.011	0.000
3100.00	0.168	0.1785	-0.013	0.000
27000.00	0.104	0.1054	-0.002	0.000
178000.00	0.055	0.0665	-0.012	0.000

Residual = 0.000289288

E-180



Large Scale Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	LB-5 (K#5-L-S)		Test Date		
WT of Sample Ring =	70.68	g			
WT of Sample Ring + Soil =	284.73	g			
Water Content =	28.9	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	98.47	pcf	1.58	Mg/m ³	
Water WT =	47.99	g			
Solid WT =	166.06	g			
Add Water for saturation =	0	g	Sr	110.92	
Saturated Water Content =	28.90	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	14.1	0.000	0.001	0.289	0.456
0.5	16.3	0.418	3.449	0.286	0.452
1	14.1	0.000	6.897	0.289	0.456
2	14.5	0.076	13.794	0.289	0.455
4	26.7	2.394	27.588	0.275	0.433
8	36.2	4.199	55.176	0.264	0.416
15	48.2	6.479	103.455	0.250	0.394
30	58.8	8.493	206.910	0.238	0.375
60	68.8	10.393	413.820	0.226	0.357
95	78.6	12.255	655.215	0.215	0.340
125	99	16.131	862.125	0.192	0.303
150	120	20.121	1034.550	0.168	0.265
200	133.5	22.686	1379.400	0.152	0.240
		Activity	4520.00	0.107	0.169
		Meter	32100.00	0.069	0.109
		Test	177000.00	0.036	0.058

Activity Meter Test					
Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
177	7.6899	15.3048	15.0367	0.036	0.058
32.1	7.6663	15.4882	14.9847	0.069	0.109
4.52	7.7178	15.8253	15.0414	0.107	0.169

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4561
$\alpha =$	0.0042
$n =$	1.3102
$m =$	0.2367

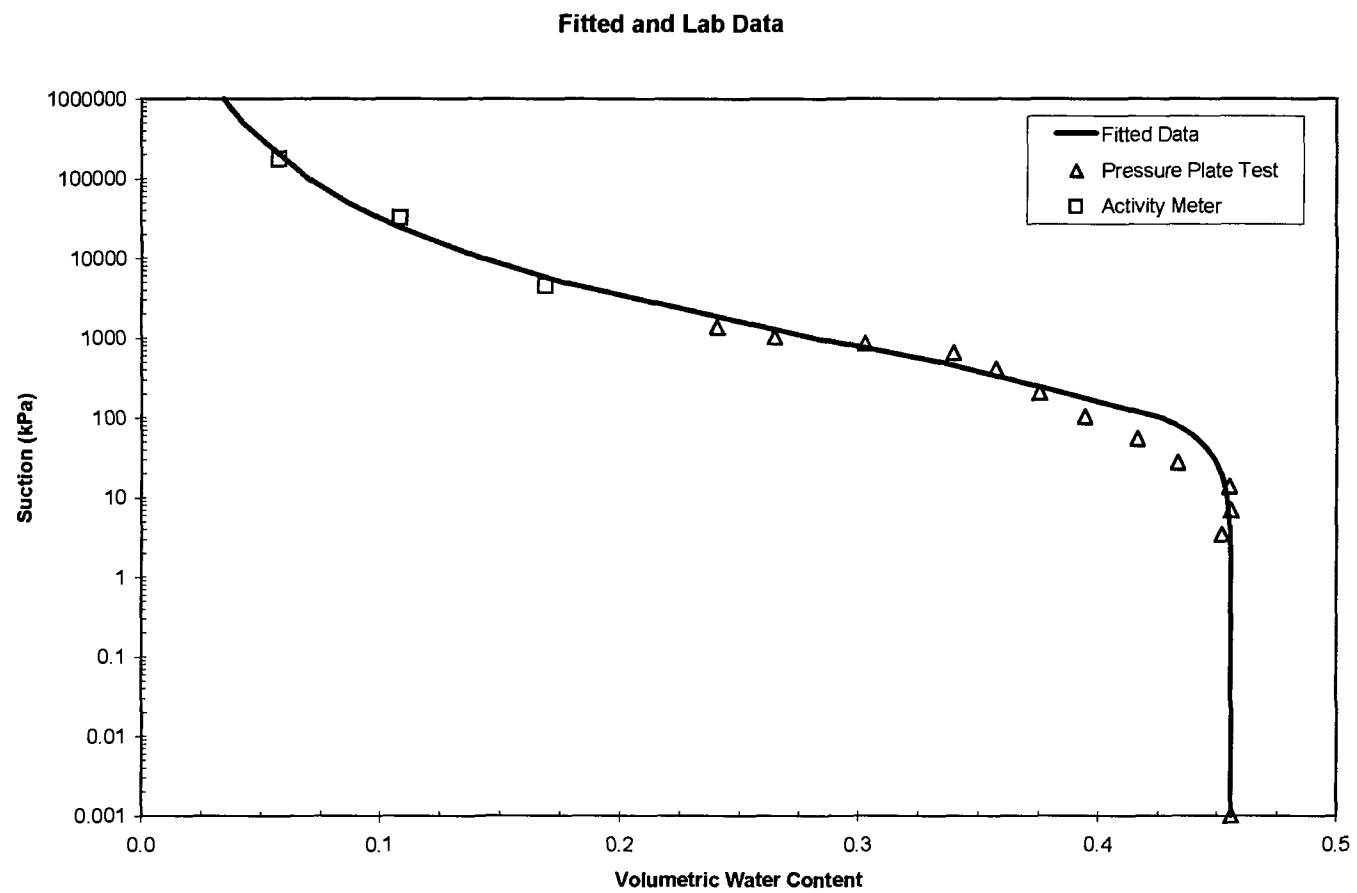
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4561
0.025	0.4561
0.05	0.4561
0.075	0.4561
0.1	0.4561
1	0.4560
2	0.4559
3	0.4557
4	0.4555
5	0.4554
6	0.4552
7	0.4550
8	0.4548
9	0.4546
10	0.4544
15	0.4532
20	0.4519
30	0.4491
40	0.4461
50	0.4429
60	0.4397
70	0.4365
80	0.4332
90	0.4299
100	0.4266
500	0.3350
1000	0.2817
5000	0.1760
10000	0.1423
25000	0.1072
5.00E+04	0.0865
1.00E+05	0.0698
5.00E+05	0.0424
7.50E+05	0.0374
1.00E+06	0.0342

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.456	0.4561	0.000	0.000
3.45	0.452	0.4556	-0.004	0.000
6.90	0.456	0.4550	0.001	0.000
13.79	0.455	0.4535	0.002	0.000
27.59	0.433	0.4498	-0.016	0.000
55.18	0.416	0.4413	-0.025	0.001
103.46	0.394	0.4255	-0.031	0.001
206.91	0.375	0.3946	-0.019	0.000
413.82	0.357	0.3491	0.008	0.000
655.22	0.340	0.3143	0.025	0.001
862.13	0.303	0.2931	0.010	0.000
1034.55	0.285	0.2792	-0.014	0.000
1379.40	0.240	0.2578	-0.017	0.000
4520.00	0.189	0.1815	-0.013	0.000
32100.00	0.109	0.0993	0.009	0.000
177000.00	0.058	0.0585	-0.001	0.000

Residual = 0.000237723



Large Scale Pressure Plate Extractor Test

ASTM D 6836 - 02 (Method B)

Sample I.D.	LB-6 (K#6-L-S)	Test Date
WT of Sample Ring =	71.33 g	
WT of Sample Ring + Soil =	271.93 g	
Water Content =	24.6 %	
Diameter of Sample Ring, D =	2.86 in	
Height of Sample Ring, L =	1.0 in	
Volume, V =	3.72E-03 ft ³	105.3 cm ³
Dry Unit Weight =	95.47 pcf	1.53 Mg/m ³
Water WT =	39.60 g	
Solid WT =	161.00 g	
Add Water for saturation =	4.87 g	Sr 98.49
Saturated Water Content =	27.62 %	
Tube Area, A =	0.19 cm ²	

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	17.2	0.000	0.001	0.276	0.423
0.5	22.6	1.026	3.449	0.270	0.413
1	31.4	2.698	6.897	0.259	0.397
2	34.8	3.344	13.794	0.255	0.391
4	46.1	5.491	27.588	0.242	0.370
8	54.7	7.125	55.176	0.232	0.355
15	67.5	9.557	103.455	0.217	0.332
30	82.8	12.464	206.910	0.199	0.304
60	91	14.022	413.820	0.189	0.289
95	101.4	15.998	655.215	0.177	0.271
		Activity Meter Test	7320.00	0.120	0.184
			27400.00	0.088	0.135
			179100.00	0.054	0.082

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
179.1	7.5965	15.0453	14.6664	0.054	0.082
27.4	8.0638	15.8657	15.2328	0.088	0.135
7.32	7.6393	15.6586	14.7972	0.120	0.184

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4226
$\alpha =$	0.0293
$n =$	1.1755
$m =$	0.1493

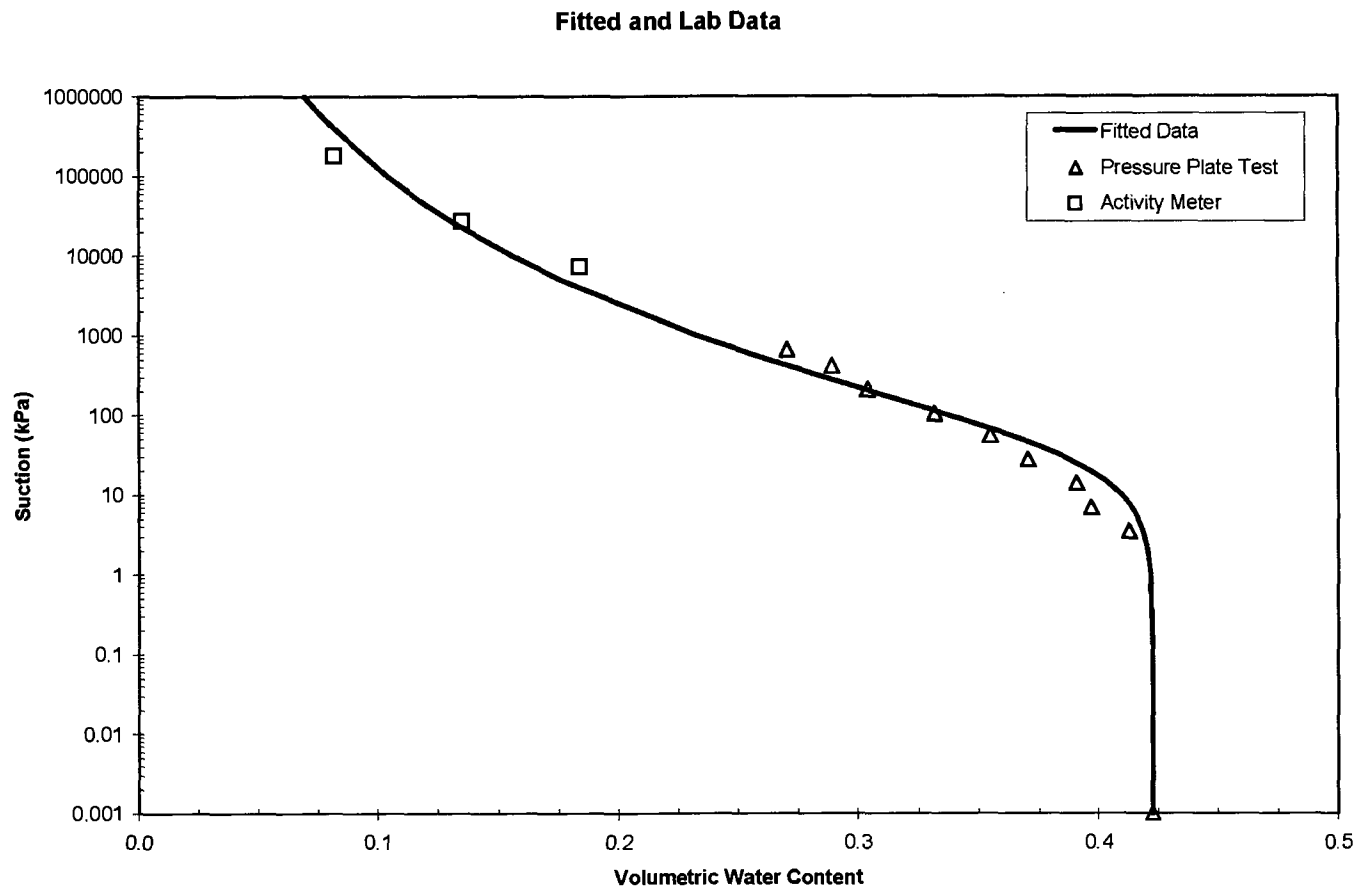
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4226
0.025	0.4226
0.05	0.4226
0.075	0.4226
0.1	0.4226
1	0.4217
2	0.4204
3	0.4191
4	0.4178
5	0.4164
6	0.4150
7	0.4136
8	0.4123
9	0.4109
10	0.4095
15	0.4028
20	0.3965
30	0.3853
40	0.3756
50	0.3672
60	0.3598
70	0.3533
80	0.3474
90	0.3421
100	0.3373
500	0.2623
1000	0.2330
5000	0.1761
10000	0.1560
25000	0.1328
5.00E+04	0.1176
1.00E+05	0.1041
5.00E+05	0.0785
7.50E+05	0.0731
1.00E+06	0.0695

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.423	0.4226	0.000	0.000
3.45	0.413	0.4185	-0.006	0.000
6.90	0.397	0.4138	-0.017	0.000
13.79	0.391	0.4044	-0.014	0.000
27.59	0.370	0.3879	-0.017	0.000
55.18	0.355	0.3633	-0.008	0.000
103.46	0.332	0.3357	-0.004	0.000
206.91	0.304	0.3029	0.001	0.000
413.82	0.289	0.2707	0.019	0.000
655.22	0.271	0.2505	0.020	0.000
7320.00	0.184	0.1647	0.019	0.000
27400.00	0.135	0.1307	0.004	0.000
179100.00	0.082	0.0940	-0.012	0.000

Residual = 0.000167432



Large Scale Pressure Plate Extractor Test					
ASTM D 6836 - 02 (Method B)					
Sample I.D.	LB-8 (K#8-L-S)		Test Date		
WT of Sample Ring =	69.21	g			
WT of Sample Ring + Soil =	268.48	g			
Water Content =	37.5	%			
Diameter of Sample Ring, D =	2.86	in			
Height of Sample Ring, L =	1.0	in			
Volume, V =	3.72E-03	ft ³	105.3	cm ³	
Dry Unit Weight =	85.94	pcf	1.38	Mg/m ³	
Water WT =	54.35	g			
Solid WT =	144.92	g			
Add Water for saturation =	0	g	Sr	106.24	
Saturated Water Content =	37.50	%			
Tube Area, A =	0.19	cm ²			

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	23.1	0.000	0.001	0.375	0.516
0.5	29.2	1.159	3.449	0.367	0.505
1	31.4	1.577	6.897	0.364	0.501
2	36	2.451	13.794	0.358	0.493
4	40.5	3.306	27.588	0.352	0.485
8	48.2	4.769	55.176	0.342	0.471
15	63.4	7.657	103.455	0.322	0.444
30	76.7	10.184	206.910	0.305	0.420
60	86	11.951	413.820	0.293	0.403
95	95.4	13.737	655.215	0.280	0.386
125	105.1	15.580	862.125	0.267	0.368
150	119.7	18.354	1034.550	0.248	0.342
200	131	20.501	1379.400	0.234	0.322
		Activity Meter	9260.00	0.133	0.183
		Test	41000.00	0.092	0.127
			178700.00	0.048	0.067

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(Mpa)	(g)	(g)	(g)	(%)	(%)
178.7	7.6703	14.4758	14.1621	0.048	0.067
41	7.6519	14.7161	14.1191	0.092	0.127
9.26	7.7038	14.9786	14.1245	0.133	0.183

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\Theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.5165
$\alpha =$	0.0056
$n =$	1.2678
$m =$	0.2112

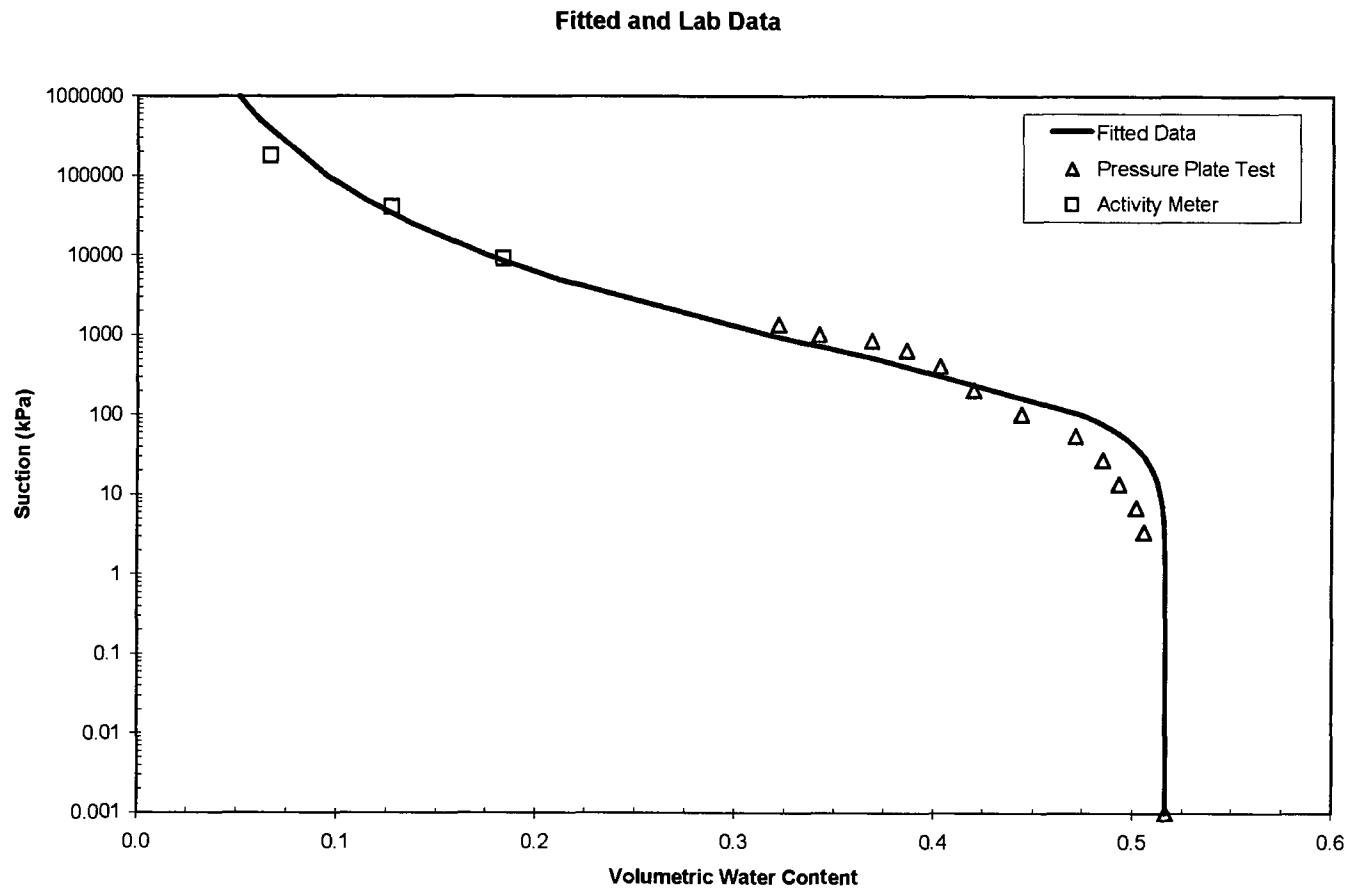
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.5165
0.025	0.5165
0.05	0.5165
0.075	0.5165
0.1	0.5164
1	0.5163
2	0.5161
3	0.5158
4	0.5156
5	0.5153
6	0.5150
7	0.5147
8	0.5144
9	0.5140
10	0.5137
15	0.5119
20	0.5099
30	0.5058
40	0.5015
50	0.4971
60	0.4927
70	0.4883
80	0.4839
90	0.4797
100	0.4755
500	0.3728
1000	0.3185
5000	0.2111
10000	0.1756
25000	0.1375
5.00E+04	0.1143
1.00E+05	0.0949
5.00E+05	0.0617
7.50E+05	0.0553
1.00E+06	0.0512

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.516	0.5165	0.000	0.000
3.45	0.505	0.5157	-0.010	0.000
6.90	0.501	0.5147	-0.013	0.000
13.79	0.493	0.5123	-0.019	0.000
27.59	0.485	0.5068	-0.022	0.000
55.18	0.471	0.4948	-0.024	0.001
103.46	0.444	0.4741	-0.030	0.001
206.91	0.420	0.4371	-0.017	0.000
413.82	0.403	0.3875	0.015	0.000
655.22	0.386	0.3515	0.034	0.001
862.13	0.368	0.3299	0.038	0.001
1034.55	0.342	0.3159	0.026	0.001
1379.40	0.322	0.2943	0.027	0.001
9260.00	0.183	0.1793	0.004	0.000
41000.00	0.127	0.1205	0.007	0.000
178700.00	0.067	0.0813	-0.015	0.000

Residual = 0.000489713



ASTM D 6836 - 02 (Method B)

Sample I.D.	150-mm CC5 Clay Bottom	Test Date	11/4/2008
WT of Sample Ring =	0 g		
WT of Sample Ring + Soil =	1017.1 g		
Water Content =	21.42 %		
Diameter of Sample Ring, D =	5.90 in		
Height of Sample Ring, L =	1.3 in		
Volume, V =	1.98E-02 ft ³	560.0	cm ³
Dry Unit Weight =	93.38 pcf	1.50	Mg/m ³
Water WT =	179.42 g		
Solid WT =	837.68 g		
Add Water for saturation =	33.4 g	Sr	86.09
Saturated Water Content =	25.41 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0		0.000	0.001	0.254	0.380
4.1		7.000	28.278	0.246	0.368
8.1		19.000	55.866	0.231	0.346
15.1		27.500	104.145	0.221	0.331
28.3		35.000	195.185	0.212	0.318
40		37.500	275.880	0.209	0.313
		Activity	2650.00	0.137	0.205
		Meter	8350.00	0.097	0.145
		Test	33700.00	0.058	0.087

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
2.65	18.8306	23.3799	22.8309	0.137	0.205
8.35	18.8306	23.2185	22.8309	0.097	0.145
33.7	18.8306	23.0628	22.8309	0.058	0.087
	18.8306	22.9753	22.8309	0.036	0.054

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha\psi)^n} \right]^m$$

$\theta_s =$	0.0000
$\theta_r =$	0.3802
$\alpha =$	0.0070
$n =$	1.2373
$m =$	0.1918

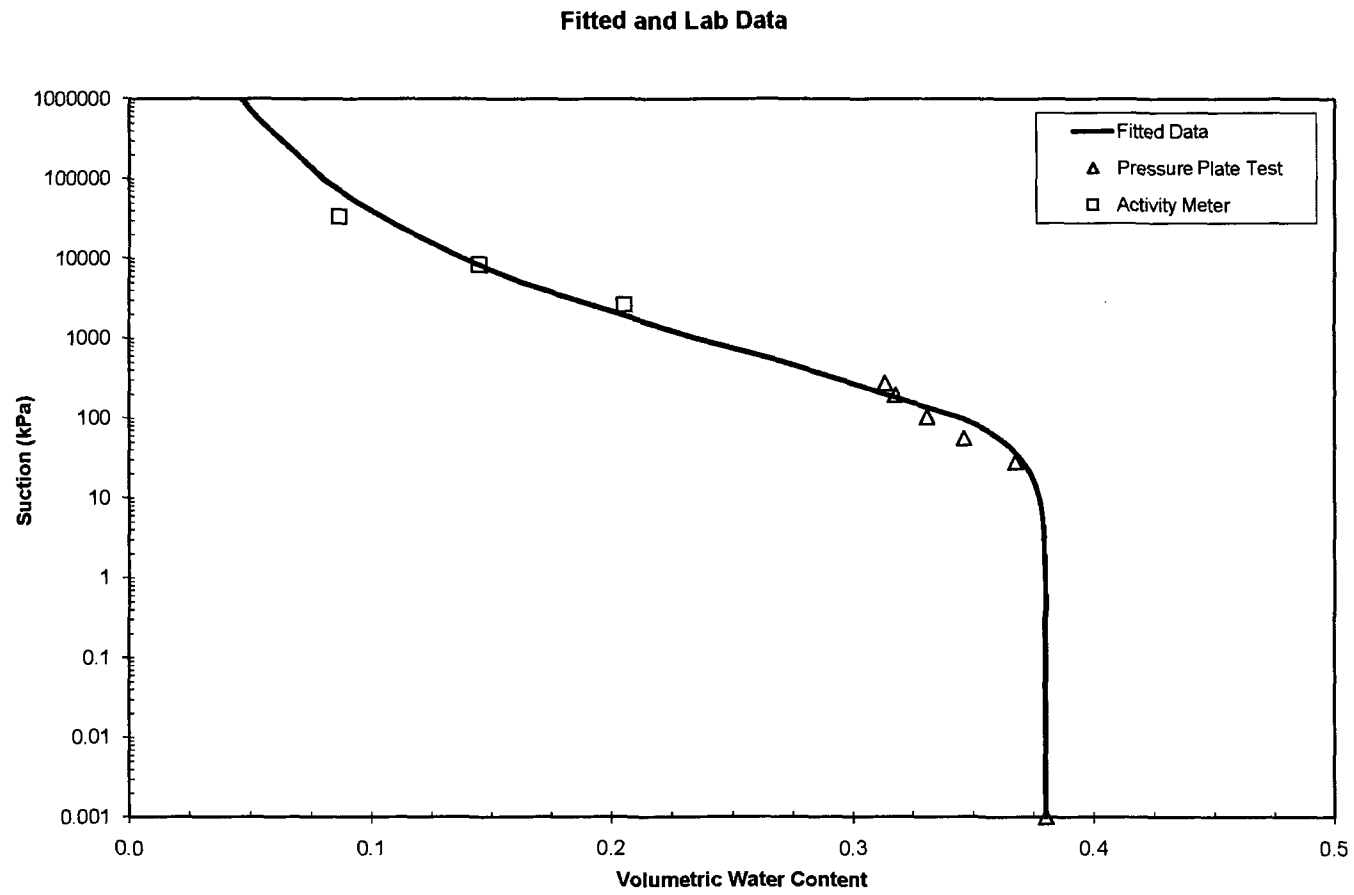
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.3802
0.025	0.3802
0.05	0.3802
0.075	0.3802
0.1	0.3802
1	0.3800
2	0.3798
3	0.3796
4	0.3793
5	0.3790
6	0.3787
7	0.3784
8	0.3781
9	0.3778
10	0.3775
15	0.3758
20	0.3740
30	0.3704
40	0.3666
50	0.3629
60	0.3592
70	0.3556
80	0.3521
90	0.3487
100	0.3454
500	0.2718
1000	0.2353
5000	0.1629
10000	0.1384
25000	0.1114
5.00E+04	0.0945
1.00E+05	0.0802
5.00E+05	0.0547
7.50E+05	0.0497
1.00E+06	0.0464

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	Δ WC (%)	$(\Delta$ WC) ²
0.001	0.380	0.3802	0.000	0.000
28.28	0.368	0.3710	-0.003	0.000
55.87	0.346	0.3607	-0.014	0.000
104.14	0.331	0.3441	-0.013	0.000
195.19	0.318	0.3193	-0.002	0.000
275.88	0.313	0.3028	0.010	0.000
0.00	0.000	0.3802	-0.380	0.145
2650.00	0.205	0.1889	0.017	0.000
8350.00	0.145	0.1444	0.001	0.000
33700.00	0.087	0.1038	-0.017	0.000
0.00	0.000	0.3802	-0.380	0.145
0.00	0.000	0.3802	-0.380	0.145
0.00	0.000	0.3802	-0.380	0.145

Residual = 0.014560318



Pressure Plate Extractor Test - Underwood - Thick Clay Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	CC5 Clay Bottom	Test Date	8/23/2008
WT of Sample Ring =	70 g		
WT of Sample Ring + Soil =	264.6 g		
Water Content =	26.00 %		
Diameter of Sample Ring, D =	2.86 in		
Height of Sample Ring, L =	1.0 in		
Volume, V =	3.72E-03 ft ³	105.3 cm ³	
Dry Unit Weight =	91.58 pcf	1.47 Mg/m ³	
Water WT =	40.16 g		
Solid WT =	154.44 g		
Add Water for saturation =	4.4 g	Sr	93.60
Saturated Water Content =	28.85 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Content	Water
(psi)	(cm)	(cc)	(kPa)			
0	10.5	0.000	0.001	0.288		0.423
0.5	3.9	-1.254	3.449	0.297		0.435
1	4.4	-1.159	6.897	0.296		0.434
2	9.5	-0.190	13.794	0.290		0.425
4	13.4	0.551	27.588	0.285		0.418
8	18	1.425	55.176	0.279		0.410
15	23.9	2.546	103.455	0.272		0.399
30	32.2	4.123	206.910	0.262		0.384
60	37.4	5.111	413.820	0.255		0.375
		Activity Meter Test	1040.00	0.176		0.259
			2030.00	0.156		0.229
			4030.00	0.137		0.201
			7150.00	0.105		0.154
			54900.00	0.051		0.075
			74300.00	0.043		0.063
			1170.00	0.173		0.254
			1820.00	0.153		0.224
			40200.00	0.059		0.086
			62900.00	0.045		0.067

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Content	Water
(MPa)	(g)	(g)	(g)	(%)	(%)	
1.04	18.0172	21.755	21.1952	0.176		0.259
2.03	18.0172	21.6918	21.1952	0.156		0.229
4.03	18.0172	21.6297	21.1952	0.137		0.201
7.15	18.0172	21.5288	21.1952	0.105		0.154
54.9	18.0172	21.3566	21.1952	0.051		0.075
74.3	18.0172	21.3321	21.1952	0.043		0.063
1.17	18.5173	24.4277	23.5556	0.173		0.254
1.82	18.5173	24.3254	23.5556	0.153		0.224
40.2	18.5173	23.8509	23.5556	0.059		0.086
62.9	18.5173	23.7848	23.5556	0.045		0.067

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4271
$\alpha =$	0.0030
$n =$	1.3422
$m =$	0.2550

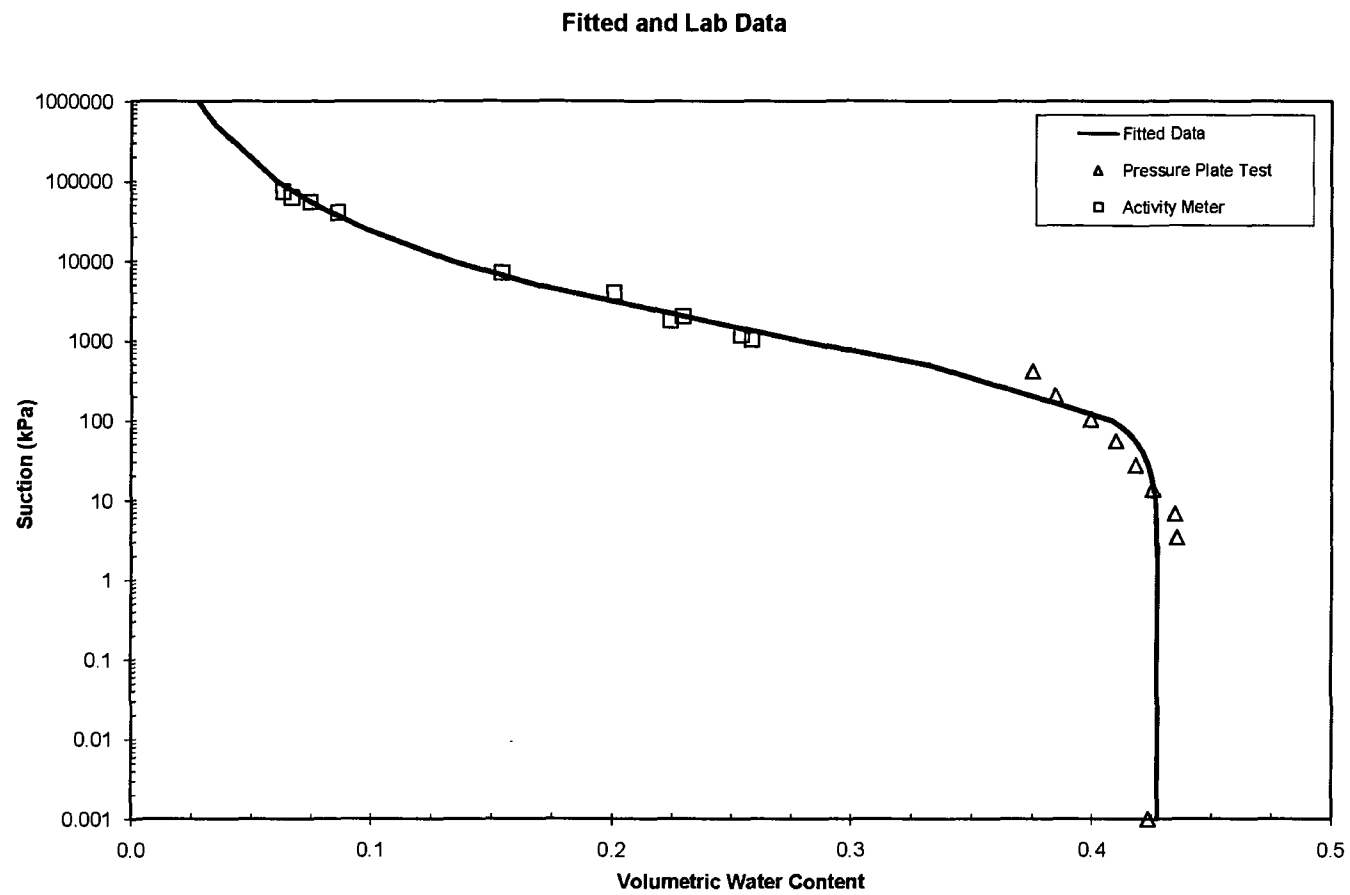
FOR GRAPHING

Suction (kPa)	WWC
0.001	0.4271
0.025	0.4271
0.05	0.4271
0.075	0.4271
0.1	0.4271
1	0.4271
2	0.4270
3	0.4270
4	0.4269
5	0.4268
6	0.4267
7	0.4266
8	0.4264
9	0.4263
10	0.4262
15	0.4255
20	0.4247
30	0.4230
40	0.4212
50	0.4192
60	0.4171
70	0.4149
80	0.4127
90	0.4105
100	0.4082
500	0.3320
1000	0.2795
5000	0.1688
10000	0.1337
25000	0.0979
5.00E+04	0.0773
1.00E+05	0.0610
5.00E+05	0.0352
7.50E+05	0.0306
1.00E+06	0.0277

FOR FITTING

Applied Suction (kPa)	Measured WWC	Predicted WWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.423	0.4271	-0.004	0.000
3.45	0.435	0.4269	0.008	0.000
6.90	0.434	0.4266	0.008	0.000
13.79	0.425	0.4257	0.000	0.000
27.59	0.418	0.4235	-0.005	0.000
55.18	0.410	0.4181	-0.008	0.000
103.46	0.399	0.4074	-0.008	0.000
206.91	0.384	0.3841	0.000	0.000
413.82	0.375	0.3451	0.030	0.001
1040.00	0.259	0.2764	-0.018	0.000
2030.00	0.229	0.2264	0.003	0.000
4030.00	0.201	0.1814	0.019	0.000
7150.00	0.154	0.1498	0.004	0.000
54900.00	0.075	0.0748	0.000	0.000
74300.00	0.063	0.0675	-0.004	0.000
1170.00	0.254	0.2674	-0.013	0.000
1820.00	0.224	0.2342	-0.010	0.000
40200.00	0.086	0.0833	0.003	0.000
62900.00	0.067	0.0714	-0.005	0.000

Residual = 0.000117941



Pressure Plate Extractor Test - Underwood - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	254-mm ET Soil Top 2	Test Date	2/24/2009
WT of Sample Ring =	888.4 g		
WT of Sample Ring + Soil =	6056.5 g		
Water Content =	29.43 %		
Diameter of Sample Ring, D =	10.00 in		
Height of Sample Ring, L =	2.0 in		
Volume, V =	9.09E-02 ft ³	2574.1 cm ³	
Dry Unit Weight =	96.84 pcf	1.55 Mg/m ³	
Water WT =	1175.23 g		
Solid WT =	3992.87 g		
Add Water for saturation =	4 g	Sr	108.88
Saturated Water Content =	29.53 %		
Tube Area, A =	20.268299 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Content	Water
(psi)	(cm)	(cc)	(kPa)			
0		0.000	0.001	0.295		0.458
0.5		97.288	3.449	0.271		0.421
1		176.334	6.897	0.251		0.390
2		279.703	13.794	0.225		0.350
3		338.481	20.691	0.211		0.327
4		385.098	27.588	0.199		0.309
8		535.083	55.176	0.161		0.250
15		555.351	103.455	0.156		0.242
		Activity	10300.00	0.090		0.140
		Meter	58100.00	0.053		0.082
		Test	72100.00	0.048		0.074

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Content	Water
(MPa)	(g)	(g)	(g)	(%)	(%)	
10.3	18.549	25.8731	25.2682	0.090		0.140
58.1	18.549	25.6228	25.2682	0.053		0.082
72.1	18.549	25.5882	25.2682	0.048		0.074

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4583
$\alpha =$	0.3230
$n =$	1.1732
$m =$	0.1476

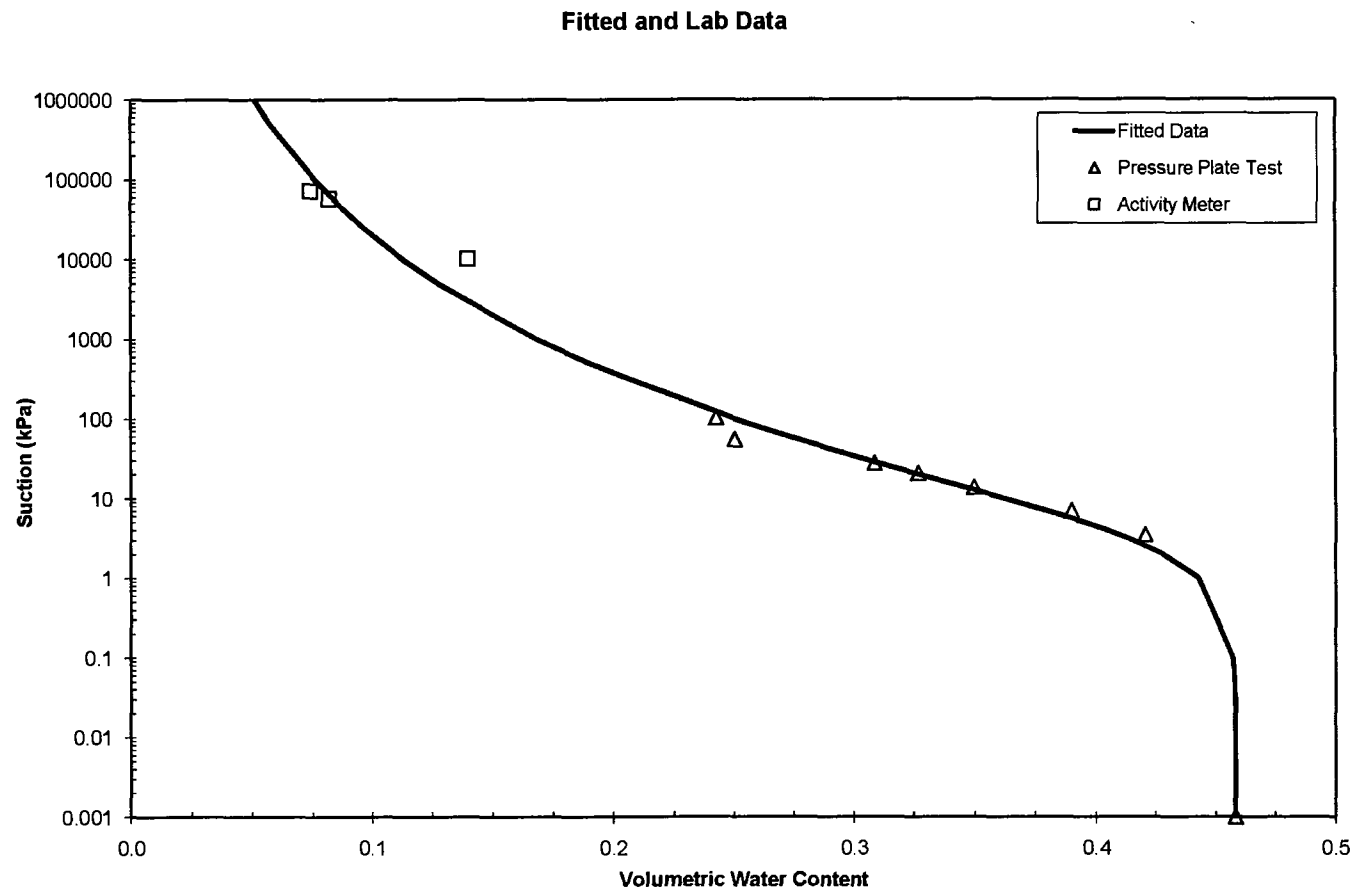
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4583
0.025	0.4581
0.05	0.4578
0.075	0.4575
0.1	0.4571
1	0.4427
2	0.4276
3	0.4149
4	0.4040
5	0.3946
6	0.3865
7	0.3793
8	0.3729
9	0.3671
10	0.3618
15	0.3413
20	0.3266
30	0.3062
40	0.2921
50	0.2815
60	0.2730
70	0.2660
80	0.2601
90	0.2549
100	0.2504
500	0.1899
1000	0.1684
5000	0.1275
10000	0.1131
25000	0.0965
5.00E+04	0.0855
1.00E+05	0.0759
5.00E+05	0.0574
7.50E+05	0.0535
1.00E+06	0.0509

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C$ (%)	$(\Delta W C)^2$
0.001	0.458	0.4583	0.000	0.000
3.45	0.421	0.4098	0.011	0.000
6.90	0.390	0.3800	0.010	0.000
13.79	0.350	0.3456	0.004	0.000
20.69	0.327	0.3249	0.002	0.000
27.59	0.309	0.3104	-0.002	0.000
55.18	0.250	0.2769	-0.027	0.001
103.46	0.242	0.2490	-0.006	0.000
10300.00	0.140	0.1125	0.027	0.001
58100.00	0.082	0.0834	-0.001	0.000
72100.00	0.074	0.0803	-0.006	0.000

Residual = 0.000160525



Pressure Plate Extractor Test - Underwood - Store-and-Release Cover

ASTM D 6836 - 02 (Method B)

Sample I.D.	150-mm ET Soil Top 2	Test Date	3/4/2009
WT of Sample Ring =	386.1 g		
WT of Sample Ring + Soil =	1502.6 g		
Water Content =	28.50 %		
Diameter of Sample Ring, D =	6.00 in		
Height of Sample Ring, L =	1.3 in		
Volume, V =	2.05E-02 ft ³	579.2 cm ³	
Dry Unit Weight =	93.65 pcf	1.50 Mg/m ³	
Water WT =	247.65 g		
Solid WT =	868.85 g		
Add Water for saturation =	17.7 g	Sr	104.17
Saturated Water Content =	30.54 %		
Tube Area, A =	0.19 cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Content	Water
(psi)	(cm)	(cc)	(kPa)			
0		0.000	0.001	0.305		0.458
0.5		19.000	3.449	0.284		0.426
1		24.500	6.897	0.277		0.416
2		34.000	13.794	0.266		0.400
3		42.000	20.691	0.257		0.386
4		50.000	27.588	0.248		0.372
8		70.000	55.176	0.225		0.337
15		88.000	103.455	0.204		0.306
30		112.000	206.910	0.176		0.265
		Activity Meter Test	1450.00	0.144		0.217
			3710.00	0.115		0.173
			18300.00	0.073		0.110
			35300.00	0.059		0.089
			65000.00	0.048		0.072

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Content	Water
(MPa)	(g)	(g)	(g)	(%)		(%)
1.45	18.6712	24.8746	24.0922	0.144		0.217
3.71	18.6712	24.7162	24.0922	0.115		0.173
18.3	18.6712	24.4906	24.0922	0.073		0.110
35.3	18.6712	24.4136	24.0922	0.059		0.089
65	18.6712	24.3524	24.0922	0.048		0.072

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4584
$\alpha =$	0.0886
$n =$	1.1833
$m =$	0.1549

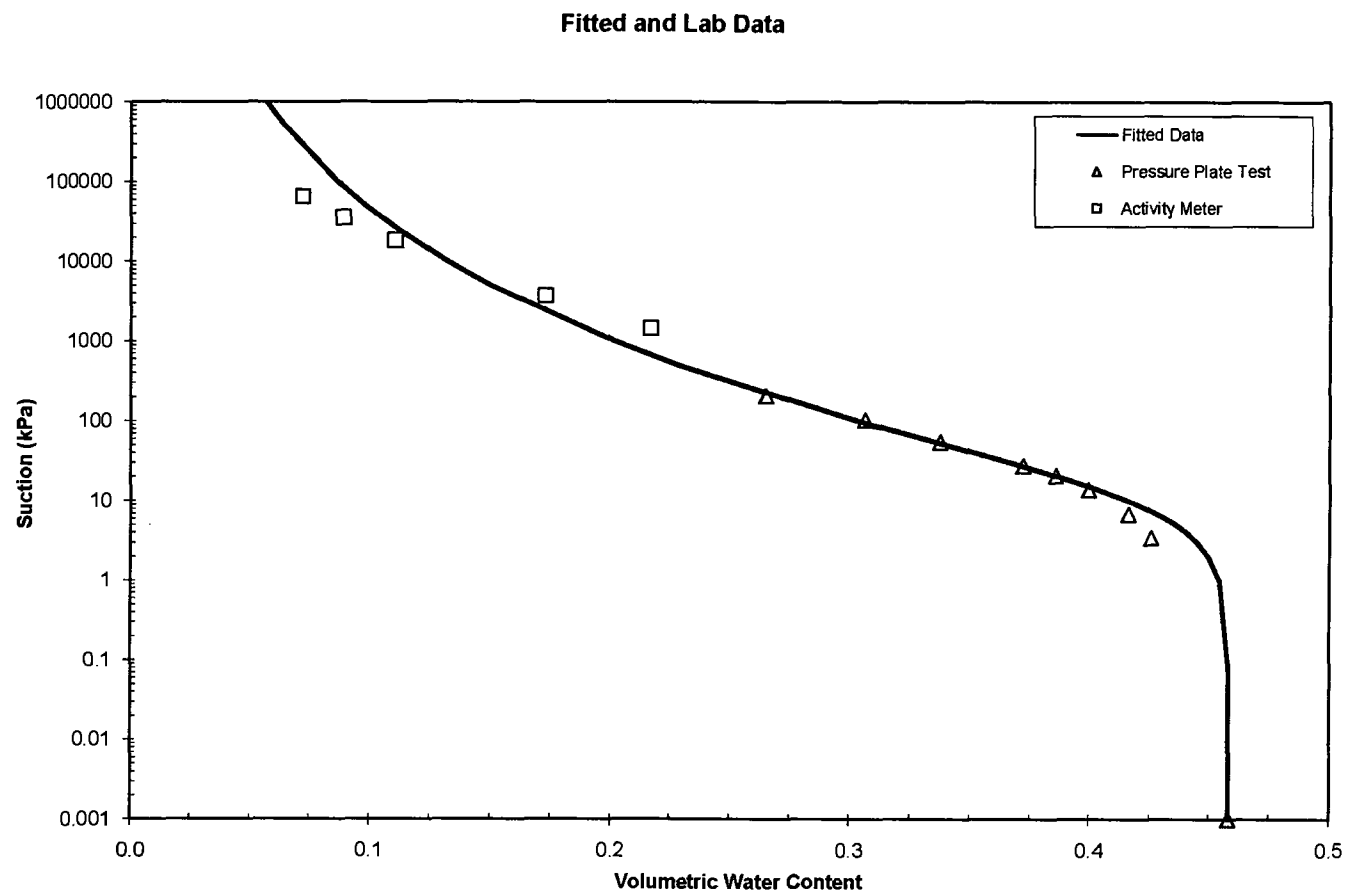
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4584
0.025	0.4583
0.05	0.4582
0.075	0.4582
0.1	0.4581
1	0.4544
2	0.4498
3	0.4451
4	0.4405
5	0.4360
6	0.4316
7	0.4275
8	0.4235
9	0.4197
10	0.4161
15	0.4002
20	0.3873
30	0.3673
40	0.3523
50	0.3404
60	0.3307
70	0.3225
80	0.3155
90	0.3093
100	0.3038
500	0.2284
1000	0.2013
5000	0.1500
10000	0.1321
25000	0.1117
5.00E+04	0.0984
1.00E+05	0.0866
5.00E+05	0.0645
7.50E+05	0.0599
1.00E+06	0.0568

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.458	0.4584	0.000	0.000
3.45	0.426	0.4430	-0.017	0.000
6.90	0.416	0.4279	-0.012	0.000
13.79	0.400	0.4037	-0.004	0.000
20.69	0.386	0.3857	0.000	0.000
27.59	0.372	0.3715	0.000	0.000
55.18	0.337	0.3352	0.002	0.000
103.46	0.306	0.3021	0.004	0.000
206.91	0.265	0.2676	-0.003	0.000
1450.00	0.217	0.1881	0.028	0.001
3710.00	0.173	0.1584	0.014	0.000
18300.00	0.110	0.1183	-0.008	0.000
35300.00	0.089	0.1049	-0.016	0.000
65000.00	0.072	0.0938	-0.022	0.000

Residual = 0.000164107



ASTM D 6836 - 02 (Method B)

Sample I.D.	ET-Soil Top 2		Test Date	8/23/2008
WT of Sample Ring =	70.7	g	Ring: K#6	
WT of Sample Ring + Soil =	276.03	g		
Water Content =	26.00	%		
Diameter of Sample Ring, D =	2.86	in		
Height of Sample Ring, L =	1.0	in		
Volume, V =	3.72E-03	ft ³	105.3	cm ³
Dry Unit Weight =	96.63	pcf	1.55	Mg/m ³
Water WT =	42.37	g		
Solid WT =	162.96	g		
Add Water for saturation =	1.71	g	Sr	99.23
Saturated Water Content =	27.05	%		
Tube Area, A =	0.19	cm ²		

Applied Pressure	Reading	Water out from soil sample	Suction	Water Content	Volumetric Water Content
(psi)	(cm)	(cc)	(kPa)		
0	3.2	0.000	0.001	0.270	0.419
0.6	6.6	0.646	4.138	0.267	0.413
1.2	8.3	0.969	8.276	0.265	0.410
2.1	11.2	1.520	14.484	0.261	0.404
4	16.8	2.584	27.588	0.255	0.394
8	24.3	4.009	55.176	0.246	0.381
15	36.2	6.270	103.455	0.232	0.359
30	43.9	7.733	206.910	0.223	0.345
60	53.3	9.519	413.820	0.212	0.328
		Activity Meter Test	1980.00	0.150	0.232
			3920.00	0.116	0.180
			9970.00	0.096	0.149
			25000.00	0.072	0.112
			37200.00	0.063	0.097
			48600.00	0.057	0.088
			62900.00	0.051	0.079

Activity Meter Test

Suction	Wt of Can	Wt of Can + Wet Soil	Wt of Can + Dry Soil	Gravimetric Water Content	Volumetric Water Content
(MPa)	(g)	(g)	(g)	(%)	(%)
1.98	18.8303	27.0099	25.9455	0.150	0.232
3.92	18.8303	26.7741	25.9455	0.116	0.180
9.97	18.8303	26.6309	25.9455	0.096	0.149
25	18.8303	26.46	25.9455	0.072	0.112
37.2	18.8303	26.3924	25.9455	0.063	0.097
48.6	18.8303	26.3495	25.9455	0.057	0.088
62.9	18.8303	26.3084	25.9455	0.051	0.079
	18.8303	26.2605	25.9455	0.044	0.069

Fit van Genuchten Eqn to SWCC Data

van Genuchten Eqn

$$\theta = \frac{\theta - \theta_r}{\theta_s - \theta_r} = \left[\frac{1}{1 + (\alpha \psi)^n} \right]^m$$

$\theta_r =$	0.0000
$\theta_s =$	0.4189
$\alpha =$	0.0065
$n =$	1.2559
$m =$	0.2038

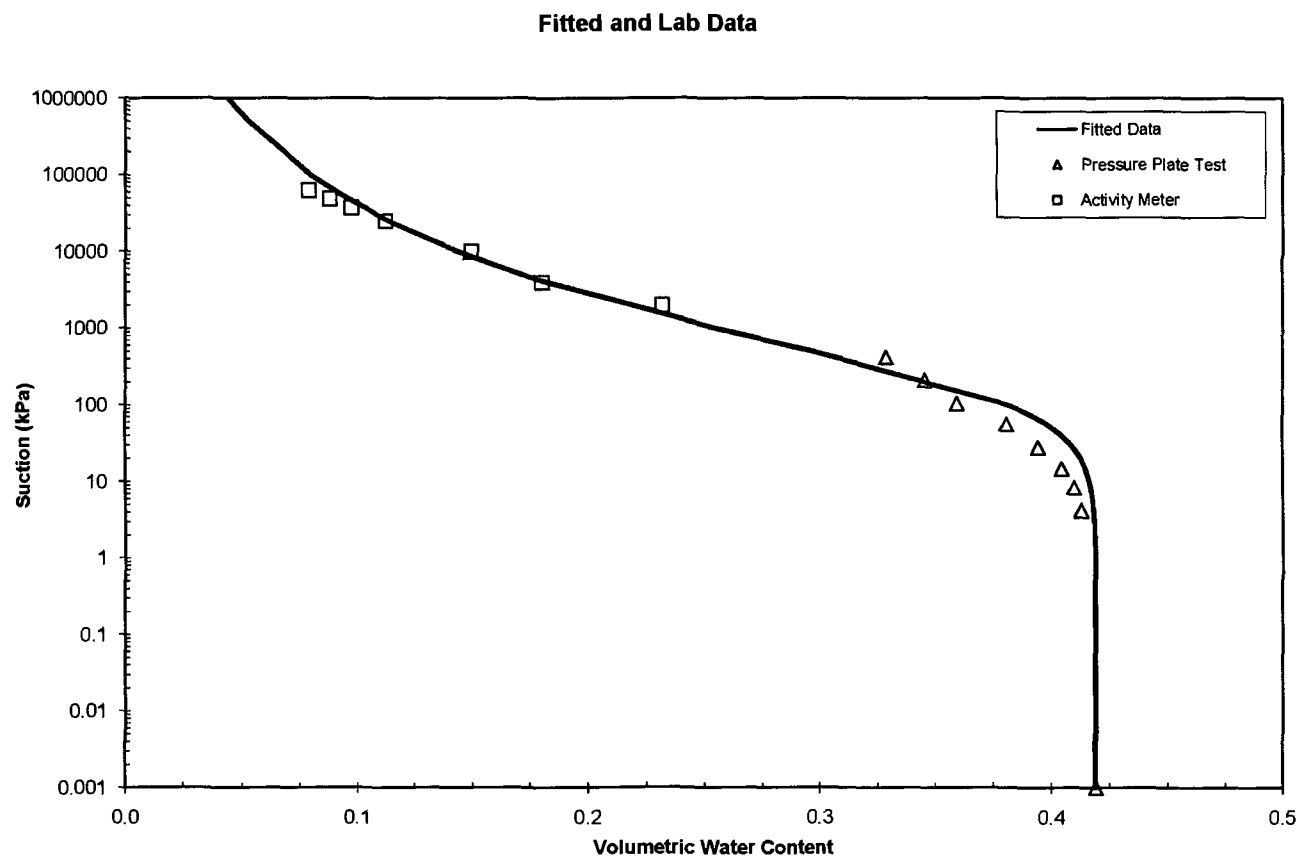
FOR GRAPHING

Suction (kPa)	VWC
0.001	0.4189
0.025	0.4189
0.05	0.4189
0.075	0.4189
0.1	0.4189
1	0.4187
2	0.4185
3	0.4183
4	0.4180
5	0.4177
6	0.4174
7	0.4171
8	0.4168
9	0.4165
10	0.4162
15	0.4144
20	0.4125
30	0.4086
40	0.4046
50	0.4005
60	0.3965
70	0.3926
80	0.3887
90	0.3849
100	0.3813
500	0.2967
1000	0.2543
5000	0.1711
10000	0.1435
25000	0.1136
5.00E+04	0.0952
1.00E+05	0.0797
5.00E+05	0.0528
7.50E+05	0.0476
1.00E+06	0.0442

FOR FITTING

Applied Suction (kPa)	Measured VWC	Predicted VWC	$\Delta W C (\%)$	$(\Delta W C)^2$
0.001	0.419	0.4189	0.000	0.000
4.14	0.413	0.4180	-0.005	0.000
8.28	0.410	0.4167	-0.007	0.000
14.48	0.404	0.4146	-0.010	0.000
27.59	0.394	0.4096	-0.015	0.000
55.18	0.381	0.3985	-0.018	0.000
103.46	0.359	0.3800	-0.021	0.000
206.91	0.345	0.3486	-0.003	0.000
413.82	0.328	0.3084	0.020	0.000
1980.00	0.232	0.2157	0.016	0.000
3920.00	0.180	0.1820	-0.002	0.000
9970.00	0.149	0.1437	0.006	0.000
25000.00	0.112	0.1136	-0.002	0.000
37200.00	0.097	0.1026	-0.005	0.000
48600.00	0.088	0.0959	-0.008	0.000
62900.00	0.079	0.0897	-0.011	0.000

Residual = 0.000128909



APPENDIX F - STATISTICAL ANALYSES OF HYDRAULIC CONDUCTIVITY DATA

Statistical Comparison of K_{SDRI} and K_{TSB}

Store-and-Release Covers

F-Test Two-Sample for Variances

	K_{SDRI}	K_{TSB}	
Mean	-14.5509	-13.0977	
Variance	1.448922	10.18088	
Observations	6	48	
df	5	47	
F	0.142318		
P(F<=f) one-tail	0.018632	P<0.05	Equal Variance
F Critical one-tail	0.224751		

t-Test: Two-Sample Assuming Equal Variances

	K_{SDRI}	K_{TSB}	
Mean	-14.5509	-13.0977	
Variance	1.448922	10.18088	
Observations	6	48	
Pooled Variance	9.341273		
Hypothesized Mean Difference	0		
df	52		
t Stat	-1.09798		
P(T<=t) one-tail	0.138635	P>0.05	Data are similar
t Critical one-tail	1.674689		
P(T<=t) two-tail	0.27727		
t Critical two-tail	2.006647		

Statistical Comparison of K_{SDRI} and K_{TSB}

Conventional Covers with Clay Barriers

F-Test Two-Sample for Variances

	K_{SDRI}	K_{TSB}	
Mean	-15.2366	14.0796	-
Variance	6.931005	9.05163	
Observations	3	18	
df	2	17	
F	0.765719		
P(F<=f) one-tail	0.519616		P>0.05 Not Equal Variance
F Critical one-tail	0.051448		

t-Test: Two-Sample Assuming Unequal Variances

	K_{SDRI}	K_{TSB}	
Mean	-15.2366	14.0796	-
Variance	6.931005	9.05163	
Observations	3	18	
Hypothesized Mean Difference	0		
df	3		
t Stat	-0.6898		
P(T<=t) one-tail	0.269946		P>0.05 Data Are Similar
t Critical one-tail	2.353363		
P(T<=t) two-tail	0.539893		
t Critical two-tail	3.182446		

Statistical Comparison of K_{SDRI} and K_{TSB}

Conventional Covers with Composite Barriers

F-Test Two-Sample for Variances

	K_{SDRI}	K_{TSB}	
	-		
Mean	17.28961744	-15.0984	
Variance	0.112905114	1.543798	
Observations	3	17	
df	2	16	
F	0.07313465		
P(F<=f) one-tail	0.070215445		P>0.05 Not Equal Variance
F Critical one-tail	0.051458084		

t-Test: Two-Sample Assuming Unequal Variances

	K_{SDRI}	K_{TSB}	
	-		
Mean	17.28961744	-15.0984	
Variance	0.112905114	1.543798	
Observations	3	17	
Hypothesized Mean Difference	0		
df	13		
t Stat	-6.11396806		
P(T<=t) one-tail	1.84806E-05		P<0.05 Data Are Not Similar
t Critical one-tail	1.770933383		
P(T<=t) two-tail	3.69612E-05		
t Critical two-tail	2.160368652		

Table F-1. Statistical comparison of different size laboratory hydraulic conductivity test

Site	K _{150-mm} to K _{75-mm}		K _{L-LS} to K _{L-SS}	
	P(T≤t) one-tail	Statistically Similar	P(T≤t) one-tail	Statistically Similar
Store-and-Release Covers				
Altamont	-	-	0.004	No
Apple Valley	-	-	-	-
Boardman	0.111	Yes	0.001	No
Cedar Rapids	-	-	-	-
Helena	0.111	Yes	0.292	Yes
Monticello	0.059	Yes	0.203	Yes
Omaha 1	-	-	0.237	Yes
Omaha 2	0.247	Yes	0.010	Yes
Polson	-	-	0.405	Yes
Underwood	-	-	0.192	Yes
Sacramento 1	0.463	Yes	0.003	No
Sacramento 2	-	-	0.124	Yes
Conventional Covers with Clay Barriers				
Albany	-	-	-	-
Apple Valley	0.137	Yes	0.097	Yes
Cedar Rapids	-	-	0.107	Yes
Underwood 5'	-	-	0.185	Yes
Underwood 3'	-	-	-	-
Conventional Covers with Composite Barriers				
Altamont	0.225	Yes	0.056	Yes
Cedar Rapids	-	-	0.495	Yes
Omaha	-	-	-	-
Polson	-	-	0.038	No

specimens using a two-sample t-Test assuming unequal variances.

Statistical Comparison of K_{si}/K_{sa} in Humid and Sub-Humid Climates to K_{si}/K_{sa} in Arid or Semi-Arid Climates

All Cover Types

F-Test Two-Sample for Variances

	<i>Humid and Sub-Humid</i>	<i>Arid and Semi-Arid</i>	
Mean	4.490021	4.531037	
Variance	2.160222	4.760167	
Observations	9	12	
df	8	11	
F	0.453812		
P(F<=f) one-tail	0.135818	P>0.05	Unequal variance
F Critical one-tail	0.301846		

t-Test: Two-Sample Assuming Unequal Variances

	<i>Humid and Sub-Humid</i>	<i>Arid and Semi-Arid</i>	
Mean	4.490021	4.531037	
Variance	2.160222	4.760167	
Observations	9	12	
Hypothesized Mean Difference	0		
df	19		
t Stat	-0.0514		
P(T<=t) one-tail	0.479771	P>0.05	Data are similar
t Critical one-tail	1.729133		
P(T<=t) two-tail	0.959542		
t Critical two-tail	2.093024		

Statistical Comparison of K_{si}/K_{sa} in Humid and Sub-Humid Climates to K_{si}/K_{sa} in Arid or Semi-Arid Climates

Conventional Covers Only

F-Test Two-Sample for Variances

	<i>Humid and Sub-Humid</i>	<i>Arid and Semi-Arid</i>	
Mean	4.574031	6.467112	
Variance	3.552464	4.28226	
Observations	5	4	
df	4	3	
F	0.829577		
P(F<=f) one-tail	0.415081		P > 0.05 Unequal variance
F Critical one-tail	0.151713		

t-Test: Two-Sample Assuming Unequal Variances

	<i>Humid and Sub-Humid</i>	<i>Arid and Semi-Arid</i>	
Mean	4.574031	6.467112	
Variance	3.552464	4.28226	
Observations	5	4	
Hypothesized Mean Difference	0		
df	6		
t Stat	-1.4185		
P(T<=t) one-tail	0.102917		P > 0.05 Data are similar
t Critical one-tail	1.94318		
P(T<=t) two-tail	0.205835		
t Critical two-tail	2.446912		

**APPENDIX G - METHODS USED IN CHEMICAL ANALYSIS FOR GEOSYNTHETIC CLAY
LINERS (GCLS)**

G-1. ICP METHOD

A Varian MPX ICP-OES equipped with an axial torch was used to analyze for concentrations of principle cations (Ca, K, Mg and Na). An attached Varian SPS 3 Autosampler was used to expedite analysis. Before sample analysis, the ICP was calibrated with dilution series of certified aqueous standards from High Purity standards (Charleston, North Carolina). Calibration dilution series were prepared with nitric acid or ammonia acetate matrix depending on the matrix of samples to be tested; with a nitric acid matrix used for subgrade batch elution and soluble cation samples, and an ammonia acetate matrix used for bound cation samples.

Quality control (QC) was performed following the guidelines detailed in US EPA procedure SW-846. Every 5 samples, continuing calibration verifications (CCV) and continuing calibration blanks (CCM) were analyzed. In addition, sample spikes and duplicates were analyzed every 10 samples. US EPA procedure SW-846 provides QC criteria for CCV, CCM, spiked and duplicate samples: CCVs must be within 10% of expected concentration, CCBs must be below concentration detection limits, spiked samples must have a recovery within 75-125% of the original sample and duplicate samples must demonstrate a concentration within 20% of the original sample. All US EPA Method SW-846 QC criteria were met for all calibrated wavelengths.

Calibration curve, quality control, and method detection limit (MDL) concentrations for subgrade soil batch elution and GCL bound and soluble cation tests are provided in Table G.1.

Table G. 1. Calibration curves, quality control and method detection limits for subgrade soil batch elution, soluble cation and bound cation tests.

		Cation Concentration (ppm)			
		Ca	K	Mg	Na
Method detection limit	Bound cations	2.2	0.3	0.7	3.6
	Soluble cations	0.17	0.01	0.04	0.16
	Subgrade batch	0.11	0.20	0.05	0.02
Calibration curve		0.5, 1, 5,	0.05, 0.1,	0.05, 0.1,	1, 5, 10, 50,
	Bound cations	10, 50,	0.5, 1, 5,	0.5, 1, 5,	100, 500,
		100, 500	10, 50	10, 50	1000
	Soluble cations	1, 5, 10,	1, 5, 10,	1, 5, 10,	10, 50, 100,
	Subgrade batch	50, 100,	50, 100,	50, 100,	300, 500,
		200	200	200	1000
CCV	Bound cations	10	10	1	50
	Soluble cations	50	50	50	100
	Subgrade batch				
Matrix spike	Bound cations	5	5	5	5
	Soluble cations				
	Subgrade batch	50	50	50	250

G-2. SALICYLATE METHOD AND SPECTROPHOTOMETRY

The proposed standard test method for determining bentonite CEC used in this study and contained in Appendix H requires the determination of ammonium concentration in an extract solution. The Hack DR/4000 salicylate method using high-range nitrogen NH_4^+ Test 'N Tube vials (Hach Company Method 10031) and a Spectronic 20 Genesys spectrophotometer were used to analyze the ammonium extract. The extract solution from CEC testing was diluted 1:10 for analyses. Additionally, method blanks, method spikes and CCVs were analyzed per the guidelines recommended in US EPA procedure SW-846. A calibration curve, CCV, and spike were prepared using certified air-dried ammonium sulfate $(\text{NH}_4)_2\text{SO}_4$ from Fisher Scientific (Hanover Park, Illinois) Ammonium concentrations used for the calibration curve and CCV are presented in Table G.2.

Table G.2. Calibration curve and CCV
Ammonium concentrations used
for CEC determination.

Ammonium concentration (ppm)	
Calibration curve	10, 20, 40, 60, 80
CCV	40

**APPENDIX H - TEST METHOD FOR MEASURING SOLUBLE CATIONS, BOUND
CATIONS, AND CATION EXCHANGE CAPACITY**

1 SCOPE

1.1 This test method describes the procedures for measuring the soluble and bound cations as well as the cation exchange capacity (CEC) of fine-grained inorganic soils. Clay minerals in fine-grained soils carry a negative surface charge that is balanced by bound cations near the mineral surface. These bound cations can be exchanged by other cations in the pore water, which are referred to as soluble cations. The cation exchange capacity is a measure of the negative surface charge on the mineral surface. The CEC generally is satisfied by calcium (Ca), sodium (Na), magnesium (Mg), and potassium (K), although other cations may be present depending on the environment in which the soil exists. This test method was developed from concepts described previously in Lavkulich (1981) and Rhoades (1982).

1.2 In this method, the soluble salts from the mineral surface are washed off with de-ionized water and then the concentration of soluble salts within the extract is measured. The bound cations of the clay are measured by using a solution containing an index ion that forces the existing cations in the bound layer into solution. The total concentrations of bound and soluble cations in this solution are measured. The CEC is measured by displacing the index ion with another salt solution and measuring the amount of the displaced index ion.

1.3 This method requires chemical analyses on aqueous samples. USEPA methods are specified for these chemical analyses. All chemical analyses shall conform to the quality control (QC) requirements in USEPA Method SW 846, Chapter One, Quality Control Guidelines.

1.4 This standard does not purport to address the safety problems associated with its use. The user of this standard is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

1.5 All observed and calculated values shall conform to the guide for significant digits and rounding established in Practice D 6026. The procedures in Practice D 6026 that are used to specify how data are collected, recorded, and calculated are regarded as the industry standard. In addition, they are representative of the significant digits that should generally be retained. The procedures do not consider material variation, purpose for obtaining the data, special purpose studies, or any considerations for the objectives of the user. Increasing or reducing the significant digits of reported data to be commensurate with these considerations is common practice. Consideration of the significant digits to be used in analysis methods for engineering design is beyond the scope of this standard.

2 REFERENCED DOCUMENTS

2.1 ASTM Standards:

D 1193 Specification for Reagent Water

E 145 Specification for Gravity-Convection and Forced Ventilation Ovens

D 2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

2.2 USEPA Methods:

Method 6010B, Inductively coupled plasma spectroscopy

Method 7000A, Atomic absorption methods

Method SW 846, Chapter One, Quality Control Guidelines

3 TERMINOLOGY

3.1 Definitions:

- 3.1.1 *Acid wash* - the process of initially rinsing equipment with tap water, followed by a rinse with 10% HNO₃ solution, and then finally rinsing 3 times with DI water.
 - 3.1.2 *Inorganic soils* – any soil with a loss of ignition (LOI) less than 1%.
 - 3.1.3 *Fine-grained soils* – any soil with more than 50% passing the No. 200 US standard sieve.
 - 3.1.4 *Bound cations (BC)* – cations that are adsorbed (bound) to mineral surfaces that may be exchanged.
 - 3.1.5 *Soluble cations (SC)* – cations in the soil that are not bound to the mineral surface.
 - 3.1.6 *Cation exchange capacity (CEC)* – the total negative charge on mineral surface to be satisfied by bound cations.
 - 3.1.7 *Exchange Complex* – the collection of bound cations satisfying the CEC
- 3.2 For definitions of other terms used in this standard, see ASTM D 653.

4 SIGNIFICANCE AND USE

- 4.1 Fine-grained soils are used in waste containment systems as barriers to flow and contaminant transport. Liquids contained by these barriers can contain ions that may interact with the mineral surfaces in fine-grained soils.
- 4.2 The liquid passing through the pores of fine-grained soil can interact with the mineral surface, and affect the physical and chemical characteristics of the soil. This method can be used as part of an evaluation of these interactions.

NOTE 1 – The quality of the result produced by this standard depends on the

competence of the personnel performing the test and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D 3740 are generally considered capable of competent and objective testing, sampling, inspection, etc. Users of this standard are cautioned that compliance with Practice D 3740 does not in itself ensure reliable results. Reliable results depend on many factors. Practice D 3740 provides a means of evaluating some of these factors.

5 APPARATUS

- 5.1 *Drying oven*, capable of maintaining a uniform temperature of $105 \pm 5^{\circ}\text{C}$ that meets the requirements of Specification E145.
- 5.2 *No. 10 U.S. standard sieve*.
- 5.3 *Desiccator*, containing silica gel.
- 5.4 *Laboratory balance*, 20 g capacity, ± 0.001 g accuracy and precision.
- 5.5 *Weighing paper*, or small weighing dish.
- 5.6 *End over end shaker*, capable of 30 rpm.
- 5.7 *Capped containers*, should tightly fit in the end over end shaker holding compartment with capacities larger than 40 mL.
- 5.8 *500 mL filtering flask*, connectable to low-pressure vacuum line, acid washed (Figure H.1).
- 5.9 *Flexible tubing*, appropriate size to connect filtering flask to the low-pressure vacuum line (Figure H.1).
- 5.10 *Buchner funnel*, 55 mm or 90 mm diameter, acid washed (Figure H.1).
- 5.11 *Wash bottle*, for dispensing solutions, new or acid washed.
- 5.12 *Graduated cylinder*, for measuring solution portions, acid washed.
- 5.13 *2.5 μm ashless filter paper* that covers the surface of Buchner funnel.
- 5.14 *250 mL volumetric flasks*, class A flask for precision and accuracy.

6 REAGENTS

- 6.1 *Reagent Water:* Use only ASTM Type I water as defined in D 1193.
- 6.2 *Ammonium Acetate, 1M:* dissolve 77.08 g of 99.9% pure NH_4OAc in Type II DI water (ASTM D 1193) and fill to volume in a 1000 mL volumetric flask. Adjust the pH of the solution to 7 with ammonium hydroxide or acetic acid. Approximately 1 L of NH_4OAc is needed per 6 samples.
- 6.3 *Isopropanol*
- 6.4 *Potassium Chloride, 1M:* dissolve 74.6 g of 99% pure KCl in Type II DI water and fill to volume in a 1000 mL volumetric flask. Approximately 1 L of KCl is needed per 6 samples.
- 6.5 *Ammonium sulfate:* dry 238 mg of ACS Certified $(\text{NH}_4)_2\text{SO}_4$ for 4 hr at 40°C. Make a 200 mg/L stock solution by dissolving the dried compound in 100 mL Type II DI water and fill to volume in a 250 mL volumetric flask. Prepare calibration standards by diluting the stock solution into concentrations of 10, 20, 40, 50, and 80 mg/L.
- 6.6 *Ca, Mg, K, and Na:* Use ICP-grade or AA-grade element standards in an HNO_3 matrix to prepare Ca, Mg, K, and Na calibration standards in a NH_4OAc matrix.

7 HAZARDS

- 7.1 This standard does not address all of the safety concerns associated with its use. The user of this standard is responsible for implementing proper safety precautions and should be aware of any possible health concerns and risks related with the materials and chemicals used while following this standard.

8 DETERMINATION OF REQUIRED AIR-DRIED MASS OF SOIL FOR ANALYSIS

- 8.1 Air dry 30 g of soil (12 g of solid is required for testing) according to the procedures described in ASTM D 2216.

- 8.2 Oven-dry 2 g of the air-dry soil to determine the water content following ASTM D 2216.
- 8.3 Determine total mass of air-dry soil needed to have 2 g of solid particles for determination of soluble cations.
- 8.4 Determine total mass of air-dry soil needed to have 10 g of solid particles for determination of bound cations.
- 8.5 Use the oven-dry weight (2 or 10 g) of the soil for all calculations.

Note 2 - Oven-dried soils should not be used for determining CEC, soluble cations, or bound cations because gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) is transformed to plaster of paris ($\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$) at high temperatures, and plaster of paris is more soluble in water than gypsum.

9 DETERMINATION OF SOLUBLE CATIONS

- 9.1 Use only air-dry soil that passes the No. 10 US Standard Sieve.
- 9.2 Add mass of air-dry soil corresponding to 2 g of oven-dry solid particles and 100 mL of Type II DI water to a covered container that fits tightly.
- 9.3 Place the containers in an end-over-end shaker and shake for 1 hr at 30 rpm.
- 9.4 Vacuum filter the mixture in each container using 2.5 μm ashless filter paper.
- 9.5 Transfer the extract to a 100 mL acid washed volumetric flask preserve with 1% HNO_3 and fill to volume.
- 9.6 Analyze each extract for cation concentration using EPA Method 6010B (inductively coupled plasma spectrometry) or Method 7000A (atomic absorption). Ensure that these analyses meet the quality control criteria in USEPA Method SW 846 (Chapter One, Quality Control Guidelines).

10 DETERMINATION OF BOUND CATIONS

- 10.1 Use only air-dry soil that passes the No. 10 US Standard Sieve.

- 10.2 Prepare a blank sample for analysis by placing 100 mL of DI water in a covered container.
- 10.3 Prepare a quality control sample for analysis by creating a duplicate or a spike and place in a covered container. Add determined mass of air-dried soil corresponding to 10.0 g of solid particles and 40 mL of 1 M NH_4OAc into 100 mL covered container (use a container which tightly fits into the end over end shaker).
- 10.4 Shake the covered containers for 5 minutes in an end over end shaker at 30 rpm. Agitate the container to rinse the particles from the side of the container and let the mixture stand for 24 h.
- 10.5 After 24 hours shake the container with the mixture for 15 minutes at 30 rpm in the end over end shaker.
- 10.6 Rinse the 500 mL filtering flask and Buchner funnel with NH_4OAc .
- 10.7 Place the Buchner funnel over the 500 mL filtering flask and line the Buchner funnel with 2.5 μm ashless filter paper (Fig. H.1).
- 10.8 Transfer the contents of the shaken container to the Buchner funnel.
- 10.9 Rinse the container and cap into the Buchner funnel using a squirt bottle containing 1 M NH_4OAc .
- 10.10 Apply low suction to the filtering flask (< 10 kPa).
- 10.11 Wash the soil in the Buchner funnel with four 30 mL portions of 1 M NH_4OAc . Add each 30 mL portion slowly and allow the entire 30 mL portion to drain before adding the next 30 mL portion. Do not allow the soil to crack between additions of NH_4OAc .
- 10.12 Turn the suction off to the filtering flask after the last washing. Leave the NH_4OAc washed soil in the Buchner funnel; this soil is to be used for determining the cation exchange capacity (CEC).
- 10.13 Rinse the 250 mL volumetric flask with 1 M NH_4OAc .
- 10.14 Transfer the filtered aqueous solution into the 250 mL volumetric flask. Preserve the solution to pH of 2 with ICP-grade nitric acid and fill the volumetric flask to volume with NH_4OAc .

- 10.15 Analyze the cations in the aqueous solution using USEPA Method 6010B (inductively coupled plasma spectrometry) or USEPA Method 7000A (atomic absorption). Ensure that these analyses meet the quality control criteria in USEPA Method SW 846 (Chapter One, Quality Control Guidelines).

11 DETERMINATION OF THE CATION EXCHANGE CAPACITY

- 11.1 Rinse an acid washed 500 mL filtering flask with isopropanol.
- 11.2 Place the Buchner funnel with the 1 M NH_4OAc washed sample onto the 500 mL filtering flask (Fig. H.1).
- 11.3 Apply low suction (< 10 kPa) to the filtering flask. Do not allow the soil to crack when suction is applied.
- 11.4 Wash the soil with three 40 mL portions of isopropanol. Allow each 40 mL portion to drain before adding the next portion. Washing with isopropanol removes residual NH_4OAc .
- 11.5 Turn off the suction to the filtering flask when free liquid is no longer visible.
- 11.6 Separate the Buchner funnel from the filtering flask. Discard the isopropanol collected in the 500 mL filtering flask and rinse the flask with Type II DI water three times.
- 11.7 Return the Buchner funnel containing the isopropanol washed soil to the rinsed filtering flask (Fig. H.1).
- 11.8 Apply suction to the filtering flask and wash the soil with four 50 mL portions of 1 M KCl solution. Allow each portion of the 1 M KCl solution to drain before adding the next portion. Do not allow the soil to crack between additions of KCl solution.
- 11.9 Rinse a 250 mL volumetric flask with 1 M KCl.
- 11.10 Transfer the extract into the 250 mL volumetric flask. Rinse the filtering flask with Type II DI water and transfer the contents into the volumetric flask.
- 11.11 Fill the volumetric flask to volume with water.

- 11.12 Analyze the KCl extract for nitrogen concentration using a spectrophotometer. Ensure that these analyses meet the quality control criteria in USEPA Method SW 846 (Chapter One, Quality Control Guidelines).

12 CALCULATIONS

- 12.1 Calculate the concentration of soluble cations as follows:

$$S = C \times \frac{0.100L}{M_o(g)} \times 1000 \frac{g}{kg}$$

where:

S = concentration of soluble cations (cmol⁺/kg) in the soil

C = concentration of cations (cmol⁺/L) in the DI water extract from 9.7

M_o = oven-dry mass of soil

- 12.2 Calculate the concentration of bound cations as follows:

$$M^+ = C \times \frac{0.25L}{M_o(g)} \times 1000 \frac{g}{kg} - S$$

where:

M⁺ = concentration of adsorbed cation (cmol⁺/kg) in soil

C = concentration of cation (cmol⁺/L) in the NH₄OAc extract from 10.15

- 12.3 Calculate the cation exchange capacity as follows:

$$CEC = N \times \frac{1cmol^+}{140mg} \times \frac{0.25L}{M_o(g)} \times 1000 \frac{g}{kg}$$

where:

CEC = concentration of cation exchange capacity (cmol⁺ / kg)

N = concentration of nitrogen (mg/L) from 11.12

13 REPORT

- 13.1 Report the following information:
- 13.1.1 Source and description of the soil.
 - 13.1.2 Source and description of all chemicals used to make mixtures and solutions.
 - 13.1.3 Dilution factor of aqueous samples prior to chemical analysis.
 - 13.1.4 Concentration of bound cations, concentration of soluble cations, and CEC in units of cmol^+/kg .
 - 13.1.5 Any modifications to this standard test method.

14 PRECISION AND BIAS

- 14.1 *Precision*—Test data on precision are not presented due to the nature of the soil or rock, or both materials tested by this standard. It is either not feasible or too costly at this time to have ten or more laboratories participate in a round-robin testing program. In addition, it is either not feasible or too costly to produce multiple specimens that have uniform physical properties. Any variation observed in the data is just as likely to be due to specimen variation as to operator or laboratory testing variation.
 - 14.1.1 Subcommittee D18.04 is seeking any pertinent data from users of these test methods that might be used to make a limited statement on precision.
 - 14.1.2 *Bias*—There is no accepted reference value for these test methods, therefore, bias cannot be determined.

15 FIGURES

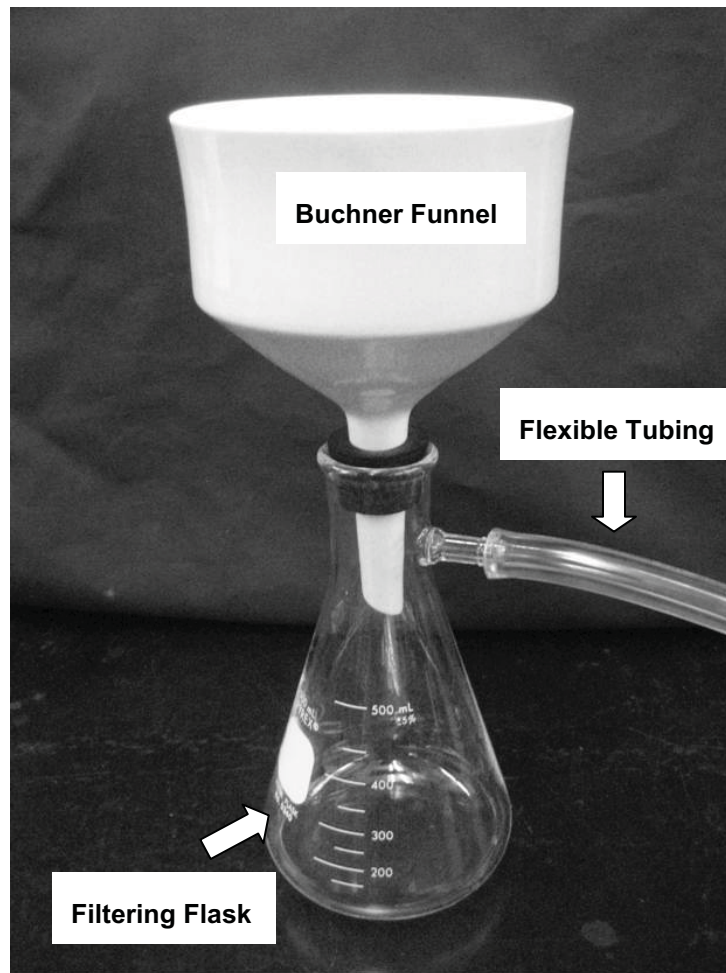


Fig. H. 1. Experimental setup for vacuum filtration.

16 REFERENCES

Lavkulich, L. (1981). Exchangeable Cations and Total Exchange Capacity by the Ammonium Acetate Method at pH 7.0. in *Soil Sampling and Methods of Analysis* (Martin R. Carter, editor). Canadian Society of Soil Science, Ottawa, Ontario, Canada, 173-175.

Rhoades, J. (1982). Soluble Salts. in *Methods of Soil Analysis*, Part 2. Chemical and Microbiological Properties, 2nd Edition (A. Page, R. Miller, D. Keeney, editors). Soil Science Society of America, Madison, Wisconsin, USA, 167-180.

**APPENDIX I - SCHEMATIC AND PHOTOGRAPH OF HYDRAULIC CONDUCTIVITY TEST
SETUP FOR GCLS**

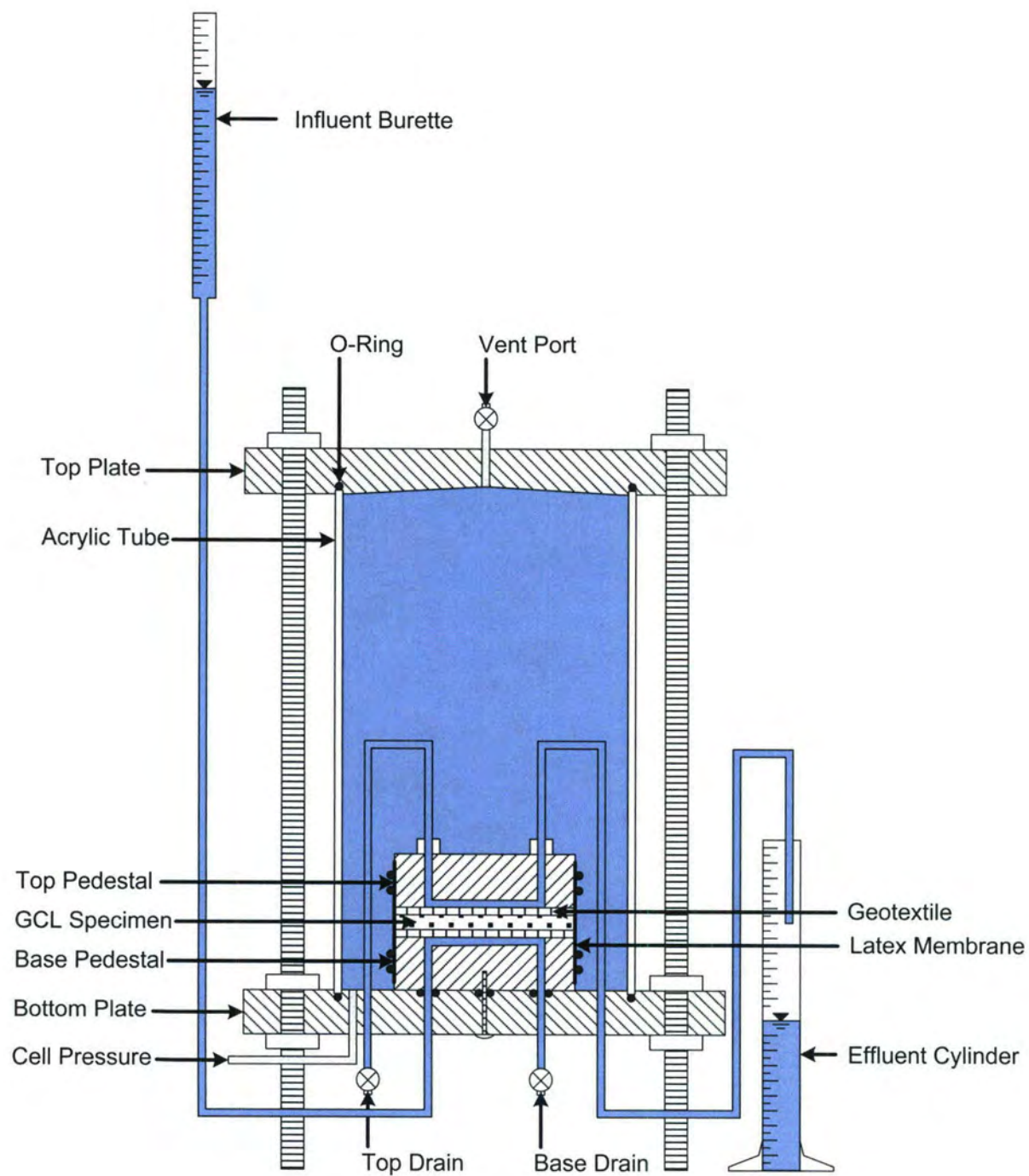


Fig. I. 1. Schematic of hydraulic conductivity test setup used in the laboratory.



Fig. I. 2. Photograph of hydraulic conductivity test setup in the laboratory.

APPENDIX J - EXHUMED SUBGRADE POREWATER CHEMISTRIES

Table J. 1. Site A exhumed subgrade soil water contents and chemical indicator parameters.

Site ID	Subgrade w (%)	Ionic strength (M)	RMD (M ^{0.5})
A-1	9.8	0.035	1.16
A-2	9.8	0.037	1.67
A-3	9.8	0.035	2.59
A-4	9.8	0.047	1.38
A-5	9.8	0.024	1.53
A-6	9.8	0.028	1.06
A-7	9.8	0.034	5.08
A-8	9.8	0.026	1.21
A*	9.8	0.033	1.96

*Geometric Mean

Table J. 2. Site B exhumed subgrade soil water contents and chemical indicator parameters.

Site ID	Subgrade w (%)	Ionic strength (M)	RMD (M ^{0.5})
B-1	2.8	0.141	5.86
B-2	2.5	0.141	5.86
B-3	2.1	0.137	5.06
B-4	2.2	0.137	5.06
B-5	2.2	0.137	5.06
B-6	2.4	0.156	6.42
B-7	2.4	0.152	5.12
B-8	2.4	0.152	5.12
B-9	2.3	0.152	5.12
B-10	2.2	0.143	3.93
B-11	2.1	0.143	3.93
B*	2.3	0.145	5.14

*Geometric Mean

Table J. 3. Site E exhumed subgrade soil water contents and chemical indicator parameters.

Site ID	Subgrade w (%)	Ionic strength (M)	RMD (M ^{0.5})
E-1	15.1	0.015	0.54
E-2	15.1	0.013	0.96
E-3	15.1	0.005	0.37
E-4	14.5	0.017	0.38
E-5	11.4	0.030	0.28
E-6	14.0	0.027	0.27
E-7	14.0	0.051	0.19
E-8	14.0	0.034	0.26
E-9	14.0	0.029	0.24
E-10	16.2	0.004	0.52
E-11	16.2	0.005	0.58
E-12	16.2	0.011	0.99
E Lower k*	15.5	0.010	0.62
E Higher k*	13.5	0.034	0.25

*Geometric Mean

Table J. 4. Site F exhumed subgrade soil water contents and chemical indicator parameters.

Site ID	Subgrade w (%)	Ionic strength (M)	RMD (M ^{0.5})
F-1	15.9	0.018	0.58
F-2	15.9	0.014	0.33
F-3	15.9	0.017	0.21
F-4	8.5	0.063	1.81
F-5	8.5	0.058	1.62
F-6	8.5	0.056	1.52
F TP1 *	15.9	0.016	0.37
F TP2 *	8.5	0.059	1.65

*Geometric Mean

**APPENDIX K - EXHUMED GCL WATER CONTENT, BOUND CATIONS, AND SOLUBLE
CATIONS**

Table K. 1. Site A exhumed GCL water content, swell index and soluble cations.

Site ID	Exhumed w (%)	Swell index (mL/2 g)	Soluble cations (cmol+/kg)				Soluble cations	
			Ca	K	Mg	Na	CMR	TCM
A-1	43.4	20.5	0.14	0.06	0.13	4.43	0.94	4.77
A-2	44.8	18.0	0.09	0.05	0.09	5.23	0.97	5.45
A-3	53.3	22.0	0.02	0.04	0.08	6.18	0.98	6.31
A-4	45.7	19.8	0.25	0.09	0.10	6.20	0.95	6.64
A-5	53.0	13.0	0.00	0.05	0.13	4.01	0.97	4.20
A-6	60.9	20.5	0.20	0.05	0.07	5.00	0.95	5.32
A-7	56.9	20.0	0.00	0.07	0.03	6.61	1.00	6.71
A-8	58.7	16.5	0.10	0.08	0.11	4.59	0.96	4.89
A*	52.1	18.8	0.10	0.06	0.09	5.28	0.96	5.54

*Arithmetic mean

Table K. 2. Site A exhumed GCL bound cations.

Site ID	Bound cations (cmol+/kg)				Bound cations		Bound cation (molar ratio)			
	Ca	K	Mg	Na	CMR	TCM	Ca	K	Mg	Na
A-1	29.5	0.71	11.3	19.7	0.33	15.3	0.48	0.01	0.18	0.32
A-2	34.9	0.81	12.0	23.5	0.34	17.8	0.49	0.01	0.17	0.33
A-3	25.9	0.83	10.1	24.0	0.41	15.2	0.43	0.01	0.17	0.39
A-4	31.8	0.60	11.1	23.7	0.36	16.8	0.47	0.01	0.16	0.35
A-5	38.9	0.68	11.7	17.3	0.26	17.1	0.57	0.01	0.17	0.25
A-6	28.7	0.65	10.6	17.3	0.31	14.3	0.50	0.01	0.19	0.30
A-7	29.0	0.68	10.7	16.5	0.30	14.2	0.51	0.01	0.19	0.29
A-8	32.8	0.60	11.0	22.5	0.35	16.7	0.49	0.01	0.16	0.34
A*	31.4	0.69	11.1	20.6	0.33	15.9	0.49	0.01	0.17	0.32

*Arithmetic mean

Table K. 3. Site B exhumed GCL water content, swell index and soluble cations.

Site ID	Exhumed w (%)	Swell index (mL/2 g)	Soluble cations (cmol+/kg)				Soluble cations	
			Ca	K	Mg	Na	CMR	TCM
B-1	21.5	12.0	0.03	0.07	0.10	10.1	0.99	10.3
B-2	21.4	14.0	0.02	0.06	0.12	9.09	0.98	9.30
B-3	21.4	19.0	0.05	0.06	0.10	9.72	0.98	9.94
B-4	21.1	20.0	0.05	0.38	0.12	10.2	0.98	10.8
B-5	20.9	16.5	0.04	0.11	0.04	8.27	0.99	8.47
B-6	17.3	16.0	0.03	0.06	0.13	8.68	0.98	8.90
B-7	19.6	14.0	0.02	0.06	0.08	9.53	0.99	9.69
B-8	18.3	17.0	0.12	0.12	0.08	8.33	0.98	8.65
B-9	18.6	13.0	0.01	0.57	0.12	8.85	0.99	9.55
B-10	19.6	15.0	0.01	0.00	0.00	8.74	1.00	8.76
B-11	21.2	18.0	0.03	0.05	0.08	8.34	0.99	8.50
B*	20.1	15.9	0.04	0.14	0.09	9.08	0.99	9.35

*Arithmetic mean

Table K. 4. Site B exhumed GCL bound cations.

Site ID	Bound cations (cmol+/kg)				Bound cations		Bound cation (molar ratio)			
	Ca	K	Mg	Na	CMR	TCM	Ca	K	Mg	Na
B-1	19.9	1.26	9.84	17.9	0.39	12.2	0.41	0.03	0.20	0.37
B-2	20.3	1.30	0.00	17.6	0.48	9.78	0.52	0.03	0.00	0.45
B-3	17.2	1.81	9.34	30.3	0.55	14.7	0.29	0.03	0.16	0.52
B-4	14.3	1.48	8.17	34.8	0.62	14.7	0.24	0.03	0.14	0.59
B-5	19.5	1.55	10.8	27.0	0.49	14.7	0.33	0.03	0.18	0.46
B-6	16.5	1.29	9.03	22.7	0.48	12.4	0.33	0.03	0.18	0.46
B-7	16.8	1.25	9.28	20.9	0.46	12.1	0.35	0.03	0.19	0.43
B-8	20.4	1.56	11.1	25.2	0.46	14.6	0.35	0.03	0.19	0.43
B-9	17.7	0.78	9.82	20.0	0.43	12.1	0.37	0.02	0.20	0.41
B-10	13.7	1.31	7.52	26.5	0.57	12.2	0.28	0.03	0.15	0.54
B-11	16.9	1.59	9.38	30.7	0.55	14.6	0.29	0.03	0.16	0.52
B*	17.5	1.38	8.58	24.9	0.50	13.1	0.33	0.03	0.16	0.47

*Arithmetic mean

Table K. 5.Site E exhumed GCL water content, swell index and soluble cations.

Site ID	Exhumed w (%)	Swell index (mL/2 g)	Soluble cations (cmol+/kg)				Soluble cations	
			Ca	K	Mg	Na	CMR	TCM
E-1	70.0	8.0	0.14	0.16	0.18	2.56	0.89	3.05
E-2	64.0	8.0	0.01	0.15	0.11	2.33	0.96	2.59
E-3	58.0	10.0	0.00	0.03	0.09	0.78	0.90	0.91
E-4	60.0	10.0	0.22	0.17	0.25	1.95	0.82	2.59
E-5	58.0	8.0	0.70	0.15	0.44	2.35	0.69	3.65
E-6	56.0	10.0	0.73	0.07	0.17	2.21	0.72	3.17
E-7	56.0	10.0	1.63	0.18	0.78	2.30	0.51	4.89
E-8	63.0	11.0	0.97	0.40	0.55	2.19	0.63	4.11
E-9	60.0	9.0	0.76	0.16	0.49	2.08	0.64	3.49
E-10	68.0	11.0	0.00	0.05	0.05	0.87	0.95	0.97
E-11	67.0	10.0	0.00	0.04	0.04	0.92	0.96	1.01
E-12	61.0	8.0	0.00	0.09	0.09	2.09	0.96	2.26
E lower k*	64.0	9.3	0.05	0.10	0.12	1.64	0.92	1.91
E higher k*	58.6	9.6	0.96	0.19	0.49	2.23	0.64	3.86

*Arithmetic mean

Table K. 6.Site E exhumed GCL bound cations.

Site ID	Bound cations (cmol+/kg)				Bound cations		Bound cation (molar ratio)			
	Ca	K	Mg	Na	CMR	TCM	Ca	K	Mg	Na
E-1	45.6	0.82	13.8	4.06	0.08	16.1	0.71	0.01	0.21	0.06
E-2	44.6	0.86	14.3	4.01	0.08	15.9	0.70	0.01	0.22	0.06
E-3	46.3	0.58	17.0	3.49	0.06	16.9	0.69	0.01	0.25	0.05
E-4	44.3	0.97	13.5	3.11	0.07	15.5	0.72	0.02	0.22	0.05
E-5	48.7	0.41	17.3	3.21	0.05	17.4	0.70	0.01	0.25	0.05
E-6	38.7	0.92	15.4	3.35	0.07	14.6	0.66	0.02	0.26	0.06
E-7	46.4	0.61	16.8	2.13	0.04	16.5	0.70	0.01	0.26	0.03
E-8	50.4	0.34	17.5	2.77	0.04	17.7	0.71	0.00	0.25	0.04
E-9	46.0	0.77	16.6	2.95	0.06	16.6	0.69	0.01	0.25	0.04
E-10	44.0	0.66	17.5	3.18	0.06	16.3	0.67	0.01	0.27	0.05
E-11	45.1	0.63	16.2	3.44	0.06	16.3	0.69	0.01	0.25	0.05
E-12	43.8	0.94	13.0	3.28	0.07	15.3	0.72	0.02	0.21	0.05
E lower k*	44.8	0.78	15.0	3.51	0.07	16.0	0.70	0.01	0.23	0.05
E higher k*	46.0	0.61	16.7	2.88	0.05	16.6	0.69	0.01	0.25	0.04

*Arithmetic mean

Table K. 7. Site F exhumed GCL water content, swell index and soluble cations.

Site ID	Exhumed w (%)	Swell index (mL/2 g)	Soluble cations (cmol+/kg)				Soluble cations	
			Ca	K	Mg	Na	CMR	TCM
F-1	60.7	8.0	0.20	0.08	0.11	2.72	0.70	3.10
F-2	60.7	10.0	0.21	0.05	0.21	1.77	0.71	2.23
F-3	64.9	10.0	0.38	0.06	0.37	1.52	0.68	2.32
F-4	42.8	13.0	0.21	0.03	0.18	8.24	0.95	8.67
F-5	46.3	12.0	0.23	0.03	0.20	8.05	0.95	8.51
F-6	45.3	13.0	0.22	0.03	0.22	7.51	0.94	7.98
F TP1 *	62.1	9.3	0.26	0.06	0.23	2.00	0.70	2.55
F TP2 *	44.8	12.7	0.22	0.03	0.20	7.93	0.95	8.39

*Arithmetic mean

Table K. 8. Site F exhumed GCL bound cations.

Site ID	Bound cations (cmol+/kg)				Bound cations		Bound cation (molar ratio)			
	Ca	K	Mg	Na	CMR	TCM	Ca	K	Mg	Na
F-1	34.6	0.91	0.00	0.99	0.05	9.13	0.95	0.03	0.00	0.03
F-2	31.8	0.84	0.00	0.40	0.04	8.26	0.96	0.03	0.00	0.01
F-3	35.0	0.81	0.00	0.44	0.03	9.07	0.97	0.02	0.00	0.01
F-4	32.2	1.30	0.00	5.49	0.17	9.74	0.83	0.03	0.00	0.14
F-5	32.0	1.36	0.00	5.35	0.17	9.69	0.83	0.04	0.00	0.14
F-6	33.7	1.24	0.00	5.00	0.16	9.98	0.84	0.03	0.00	0.13
F TP1 *	33.8	0.86	0.00	0.61	0.04	8.82	0.96	0.02	0.00	0.02
F TP2 *	32.6	1.30	0.00	5.28	0.17	9.80	0.83	0.03	0.00	0.13

*Arithmetic mean

APPENDIX L - HYDRAULIC CONDUCTIVITY RECORDS FOR EXHUMED GCLS

L-1 HYDRAULIC CONDUCTIVITY PROFILES FOR GCLS EXHUMED FROM SITE A.

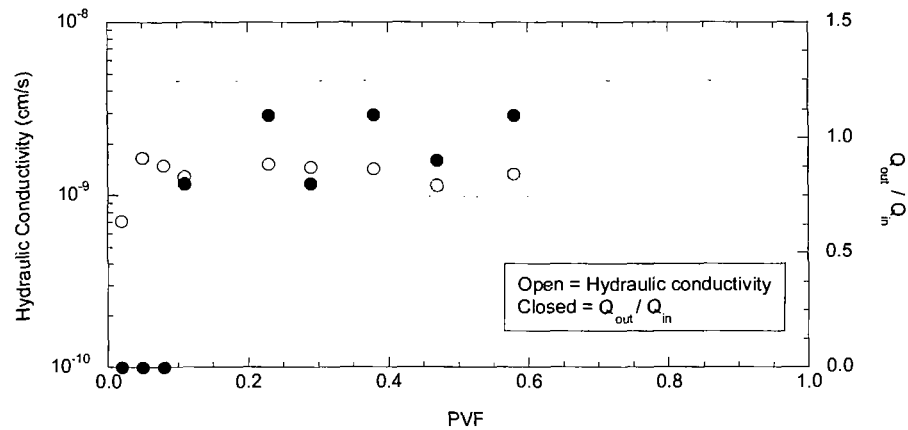


Fig. L. 1. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL A-1 permeated with SW.

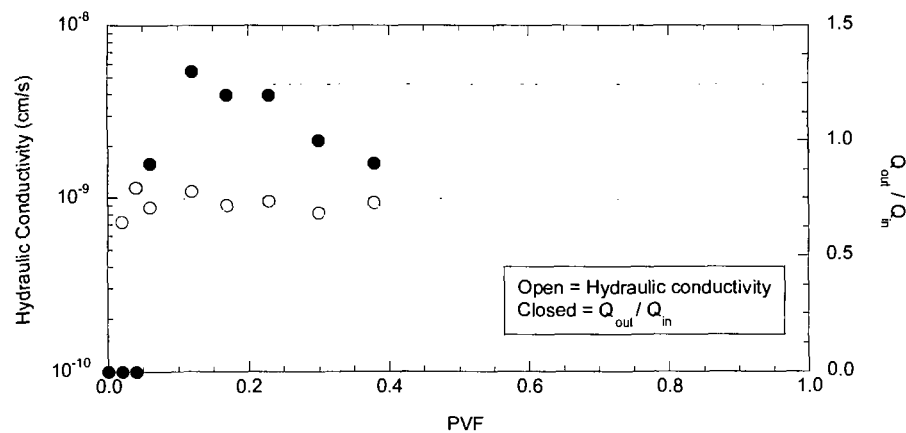


Fig. L. 2. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL A-2 permeated with SW.

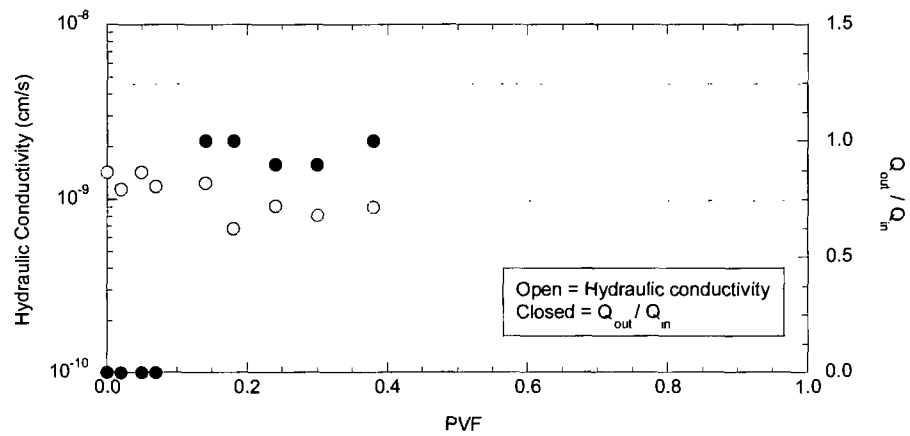


Fig. L. 3. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL A-3 permeated with SW.

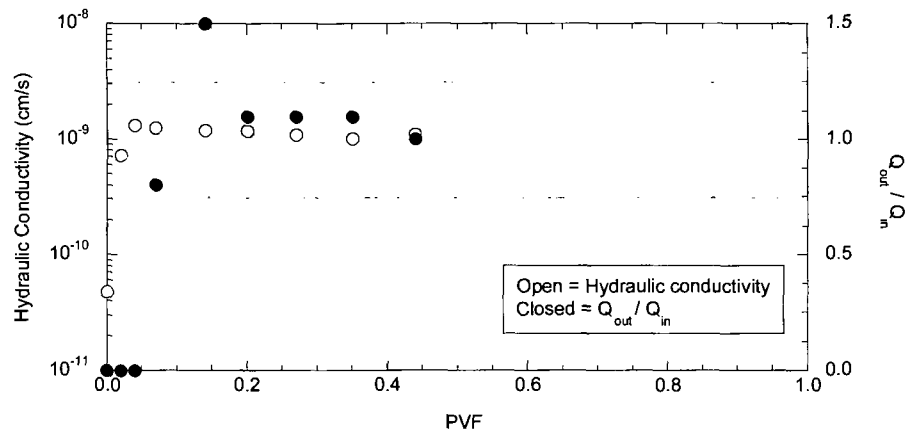


Fig. L. 4. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL A-4 permeated with SW.

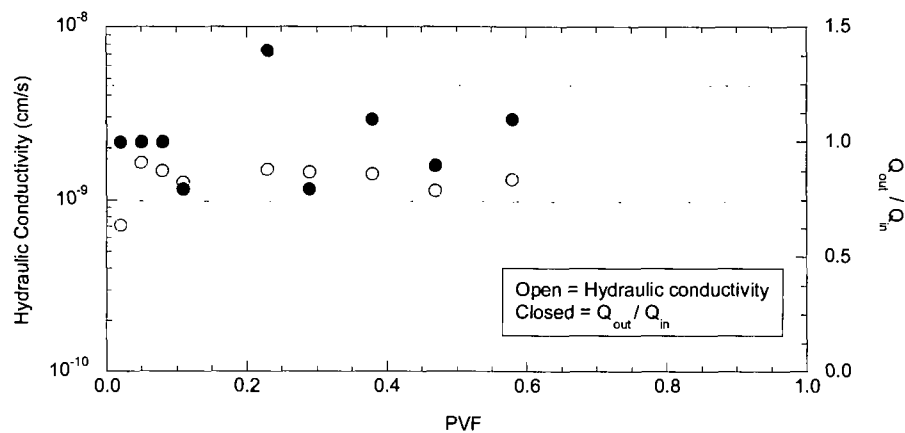


Fig. L. 5. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL A-5 permeated with SW.

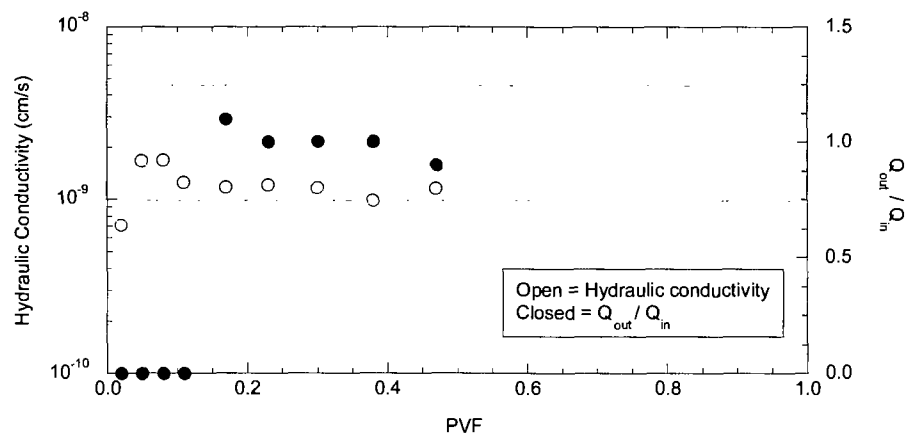


Fig. L. 6. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL A-6 permeated with SW.

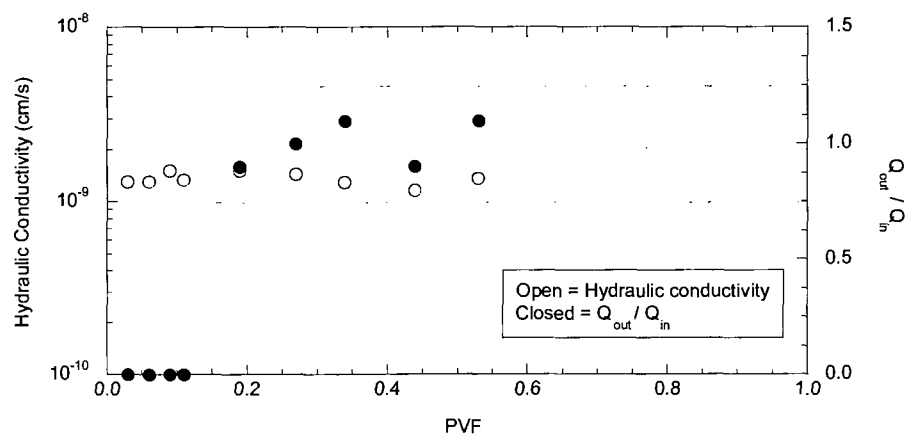


Fig. L. 7. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL A-7 permeated with SW.

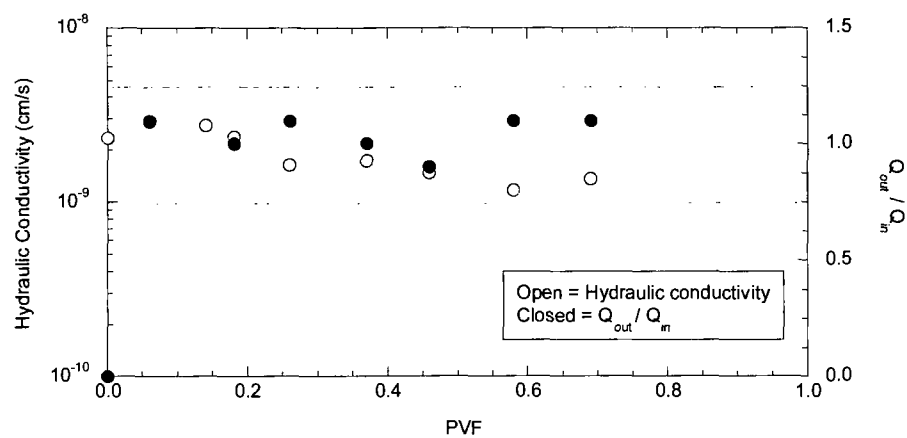


Fig. L. 8. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL A-8 permeated with SW.

L-2 HYDRAULIC CONDUCTIVITY PROFILES OF GCLS EXHUMED FROM SITE B.

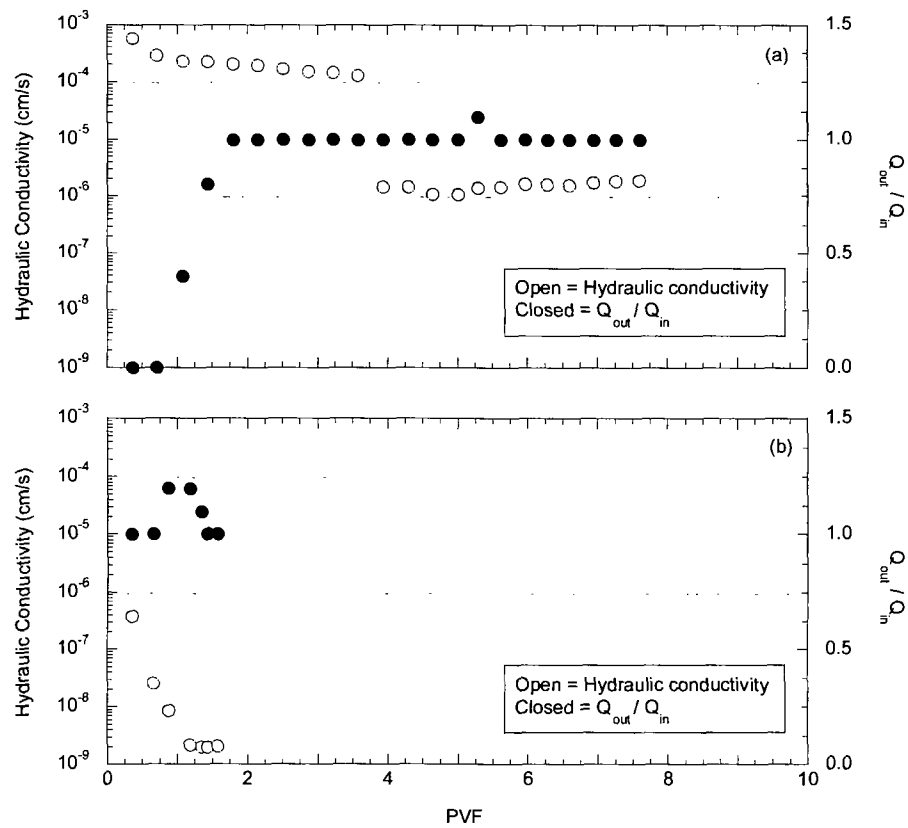


Fig. L. 9. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B-1 permeated with standard water (a), and average water (b).

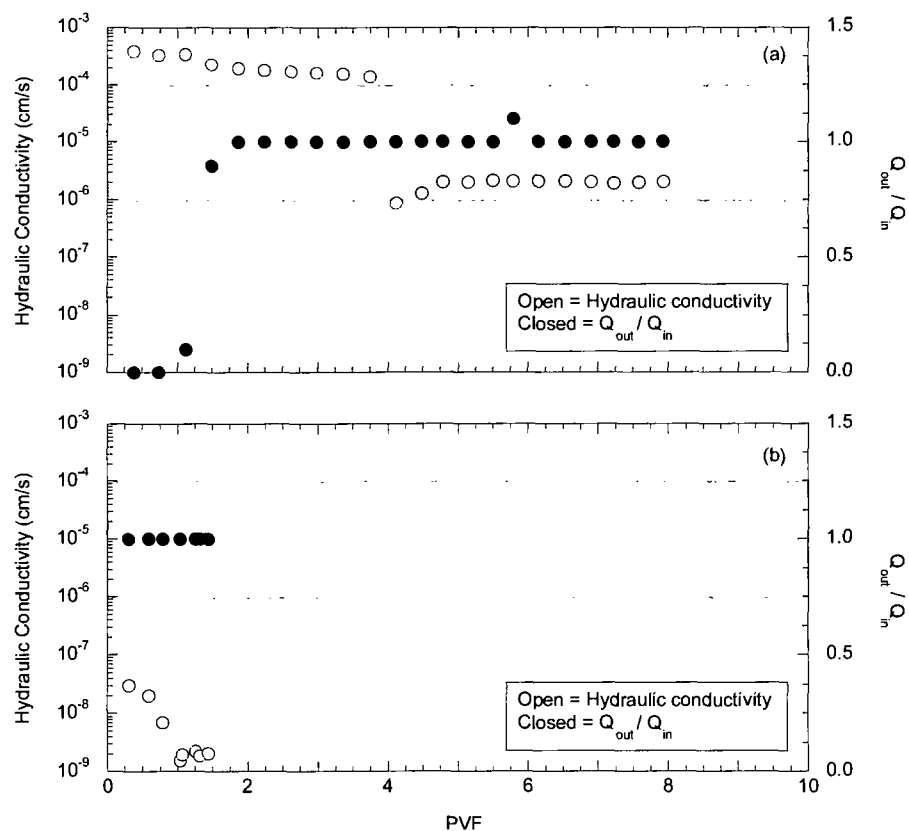


Fig. L. 10. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B-2 permeated with standard water (a), and average water (b).

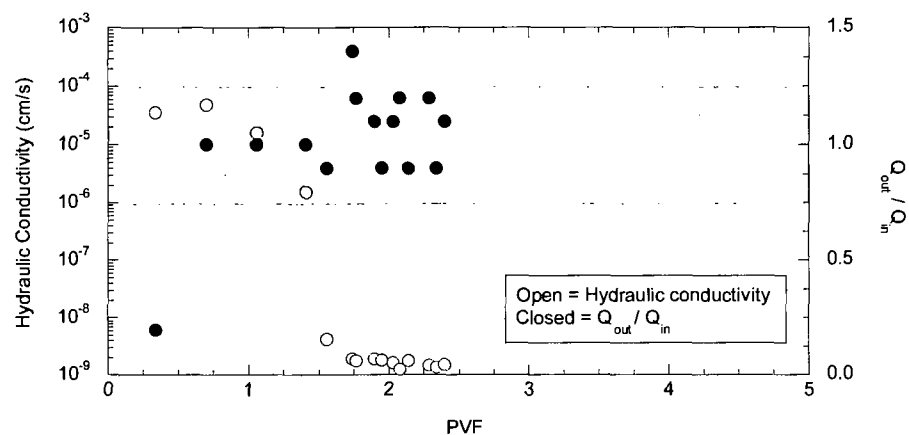


Fig. L. 11. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B-3 permeated with standard water.

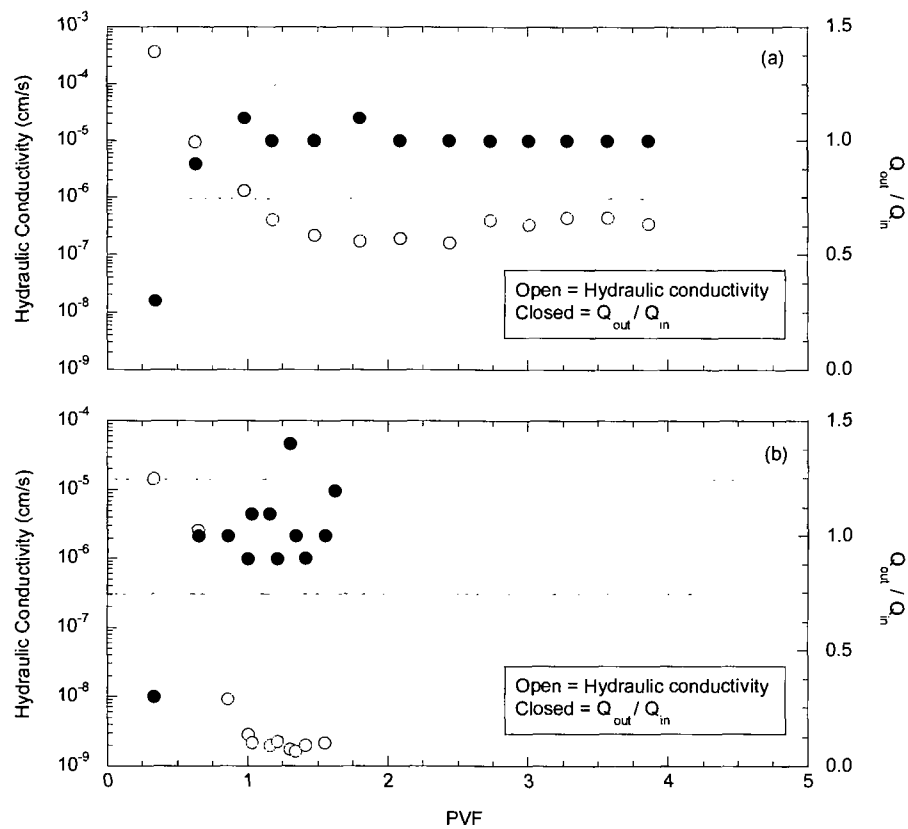


Fig. L. 12. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B4 permeated with standard water (a), and average water (b).

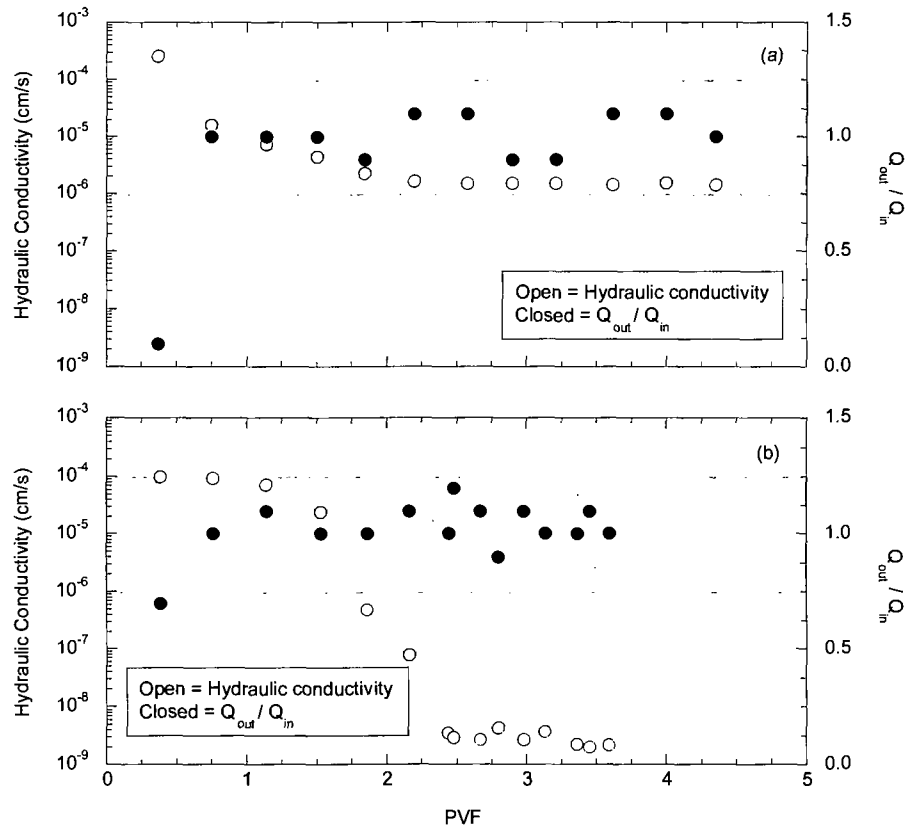


Fig. L. 13. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B-5 permeated with standard water (a), and average water (b).

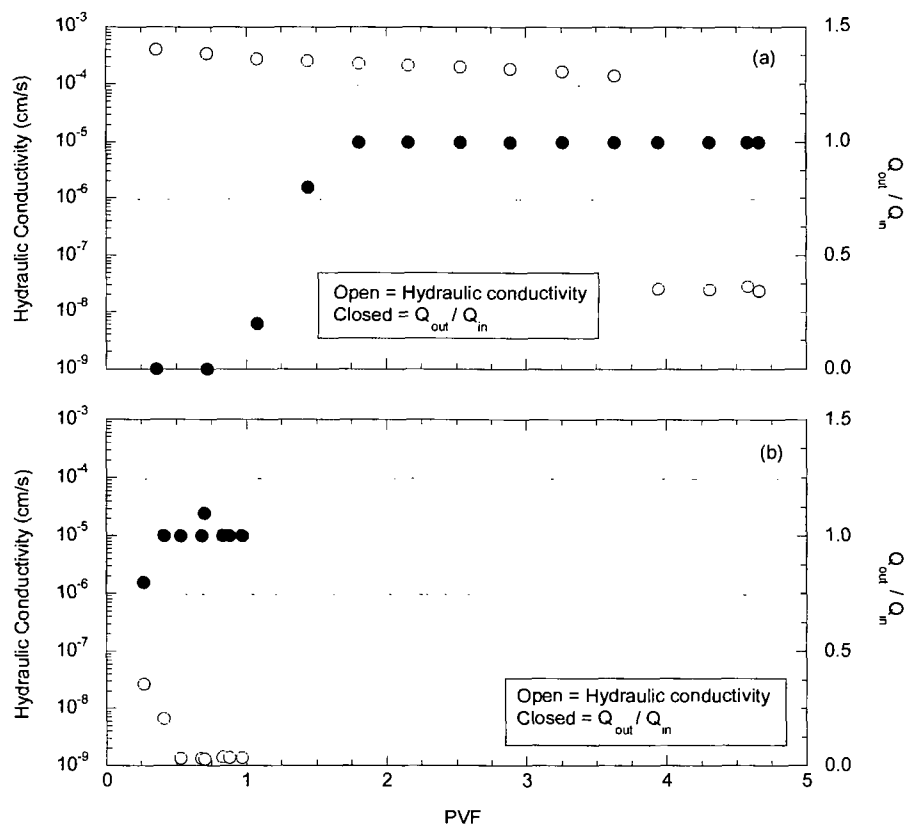


Fig. L. 14. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B-6 permeated with standard water (a), and average water (b).

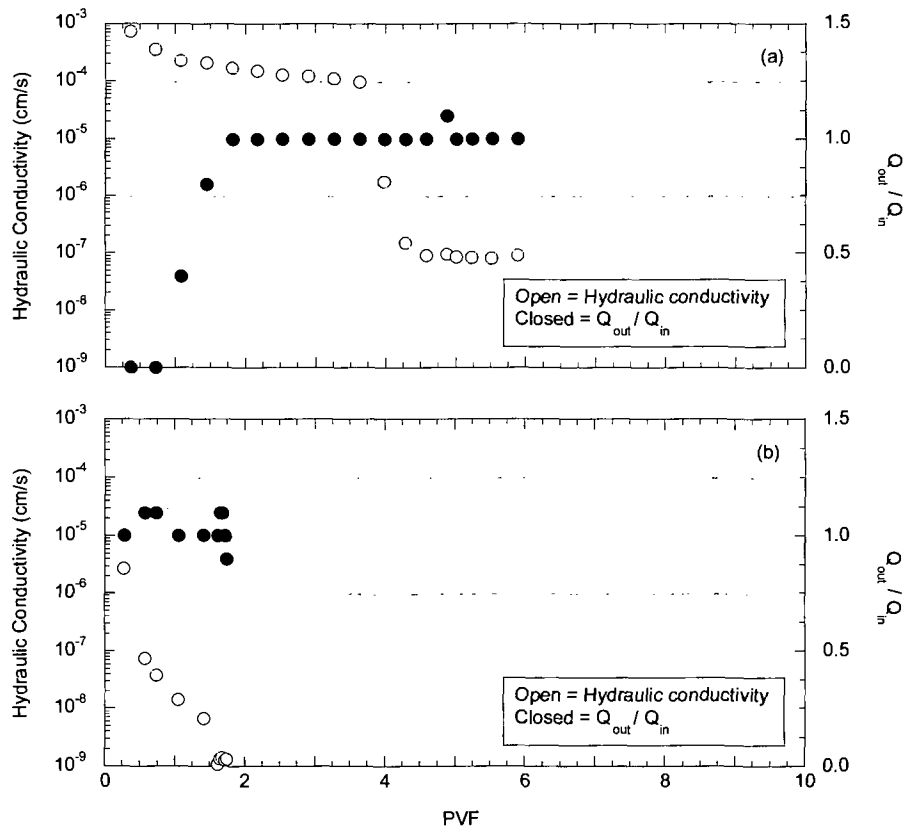


Fig. L. 15. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B-7 permeated with standard water (a), and average water (b).

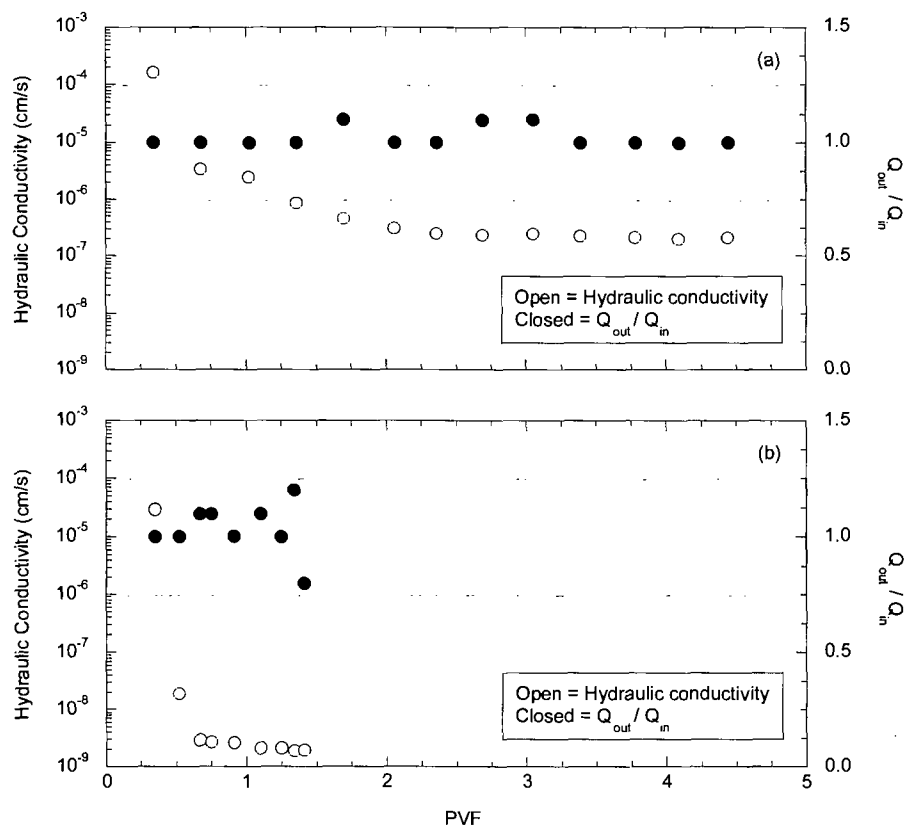


Fig. L. 16. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B-8 permeated with standard water (a), and de-ionized water (b).

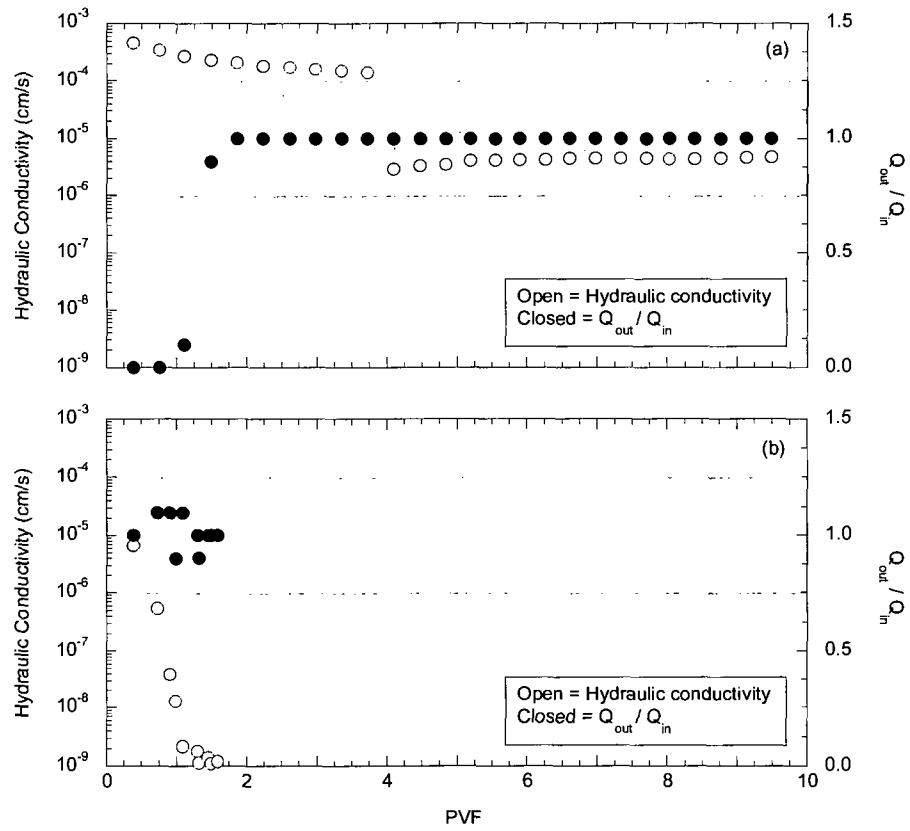


Fig. L. 17. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B-9 permeated with standard water (a), and average water (b).

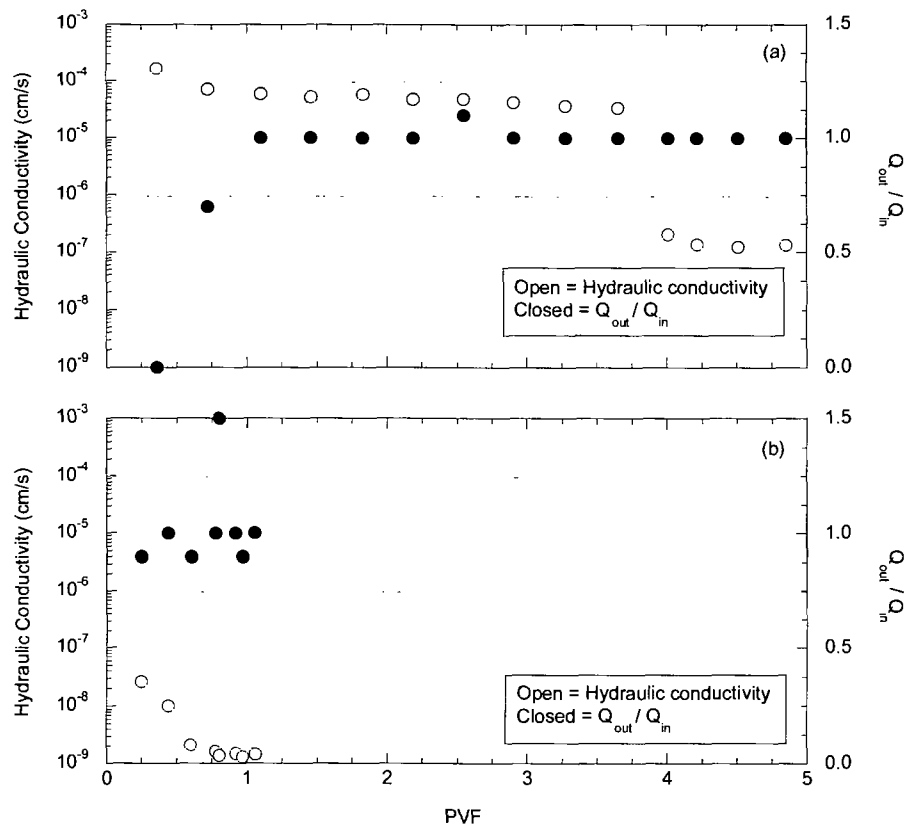


Fig. L. 18. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B-10 permeated with standard water (a), and average water (b).

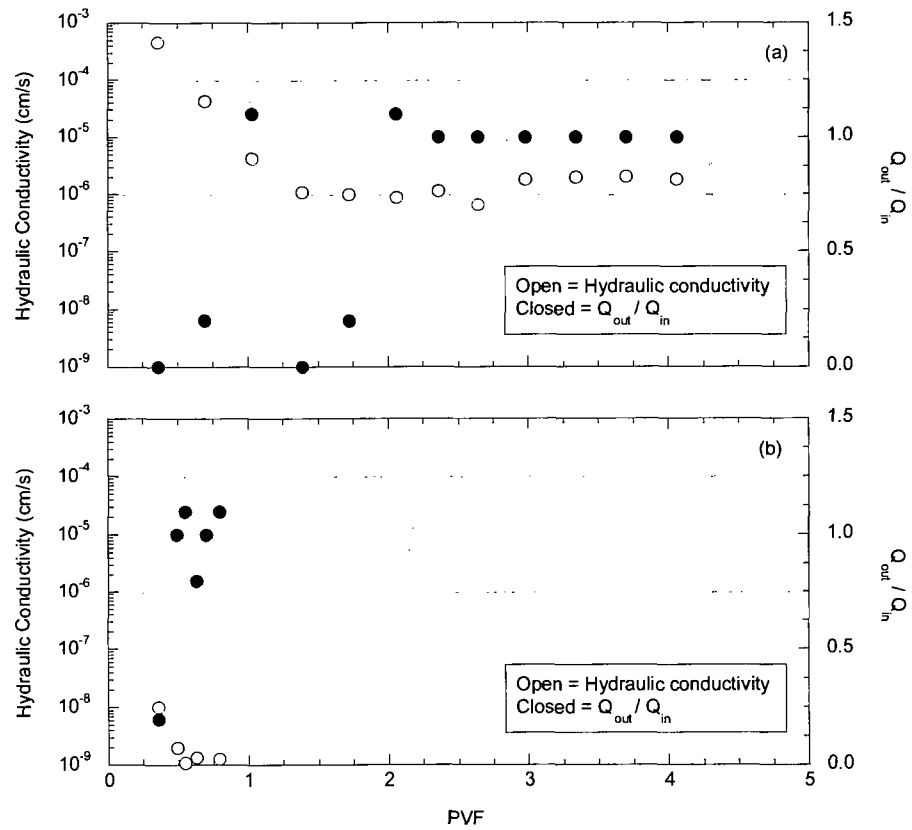


Fig. L. 19. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL B-11 permeated with standard water (a), and average water (b).

L-3 HYDRAULIC CONDUCTIVITY PROFILES OF GCLS EXHUMED FROM SITE E.

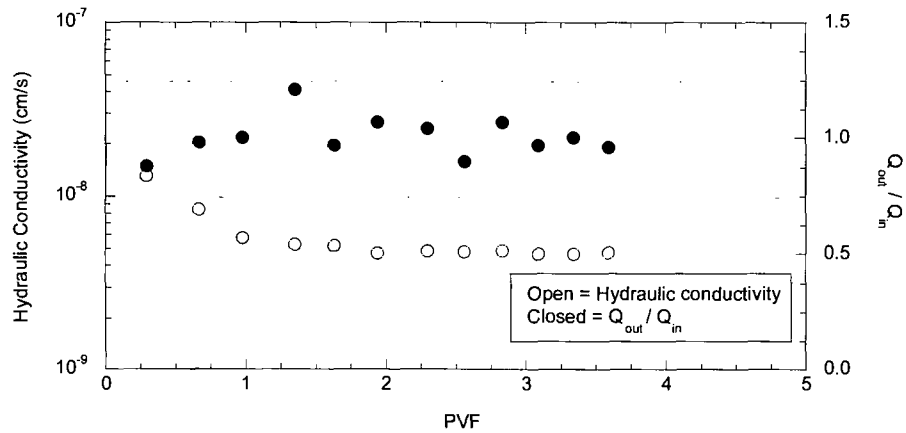


Fig. L. 20. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-1 permeated with standard water.

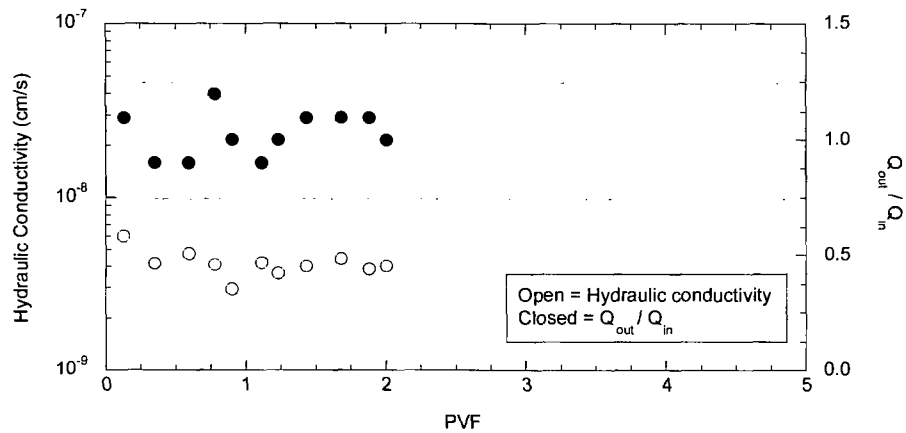


Fig. L. 21. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-2 permeated with standard water.

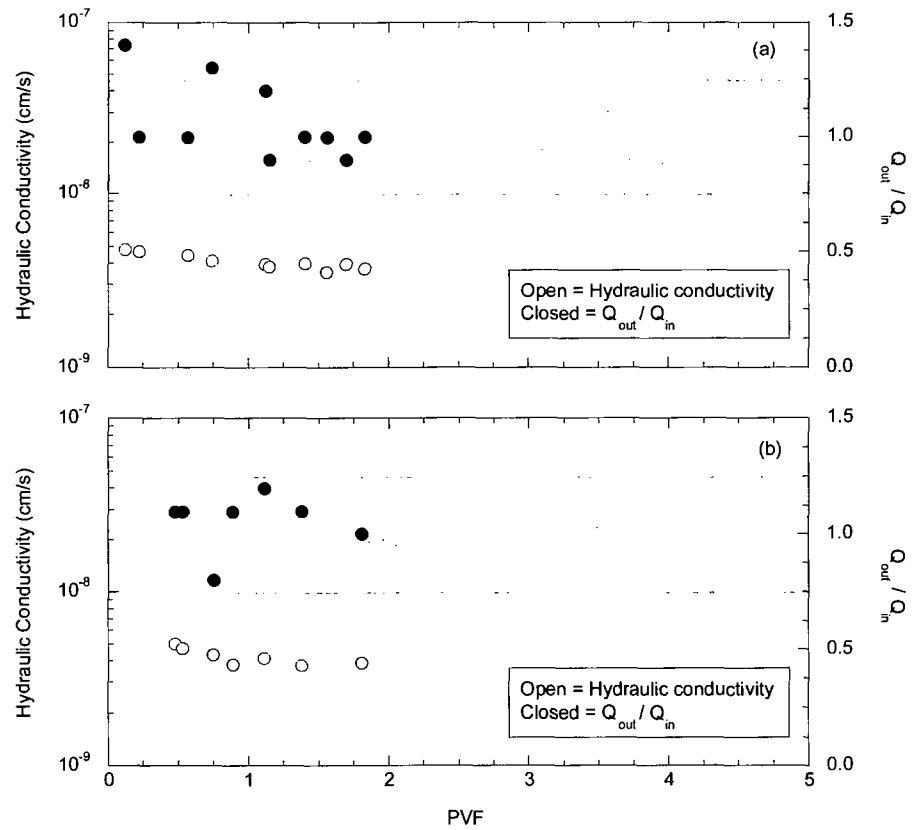


Fig. L. 22. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-3 with stress maintained (a) and no stress maintained (b) permeated with standard water.

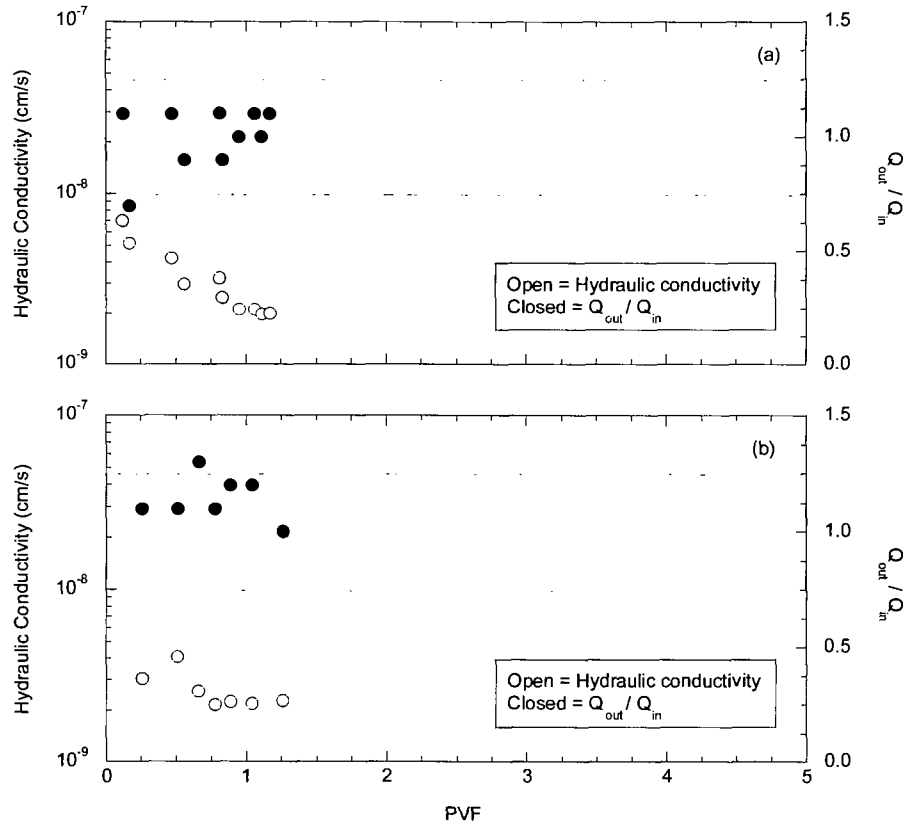


Fig. L. 23. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-4 with stress maintained (a) and no stress maintained (b) permeated with standard water.

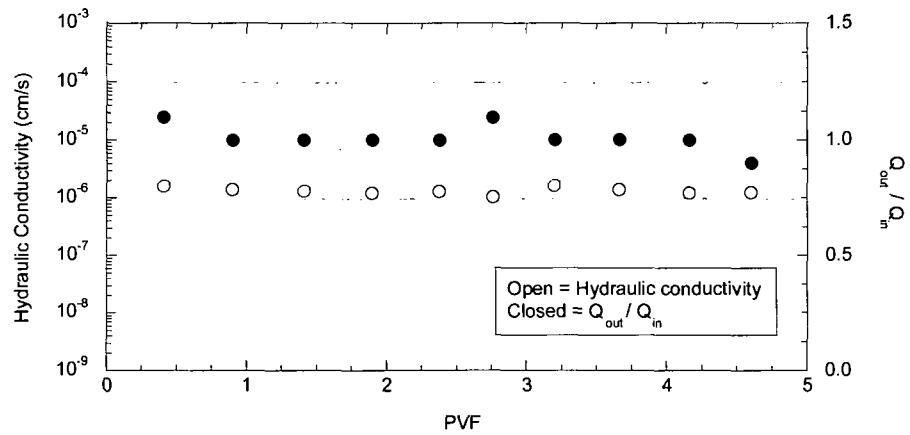


Fig. L. 24. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-5 permeated with standard water.

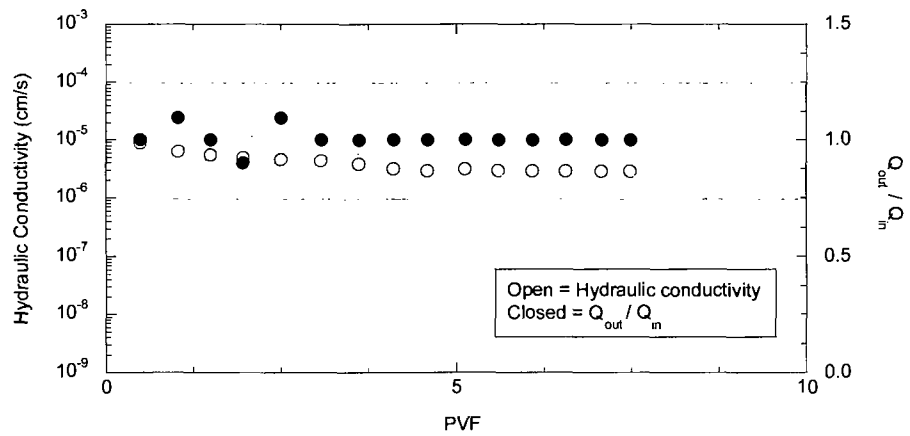


Fig. L. 25. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-6 with stress maintained (a) and no stress maintained (b) permeated with standard water.

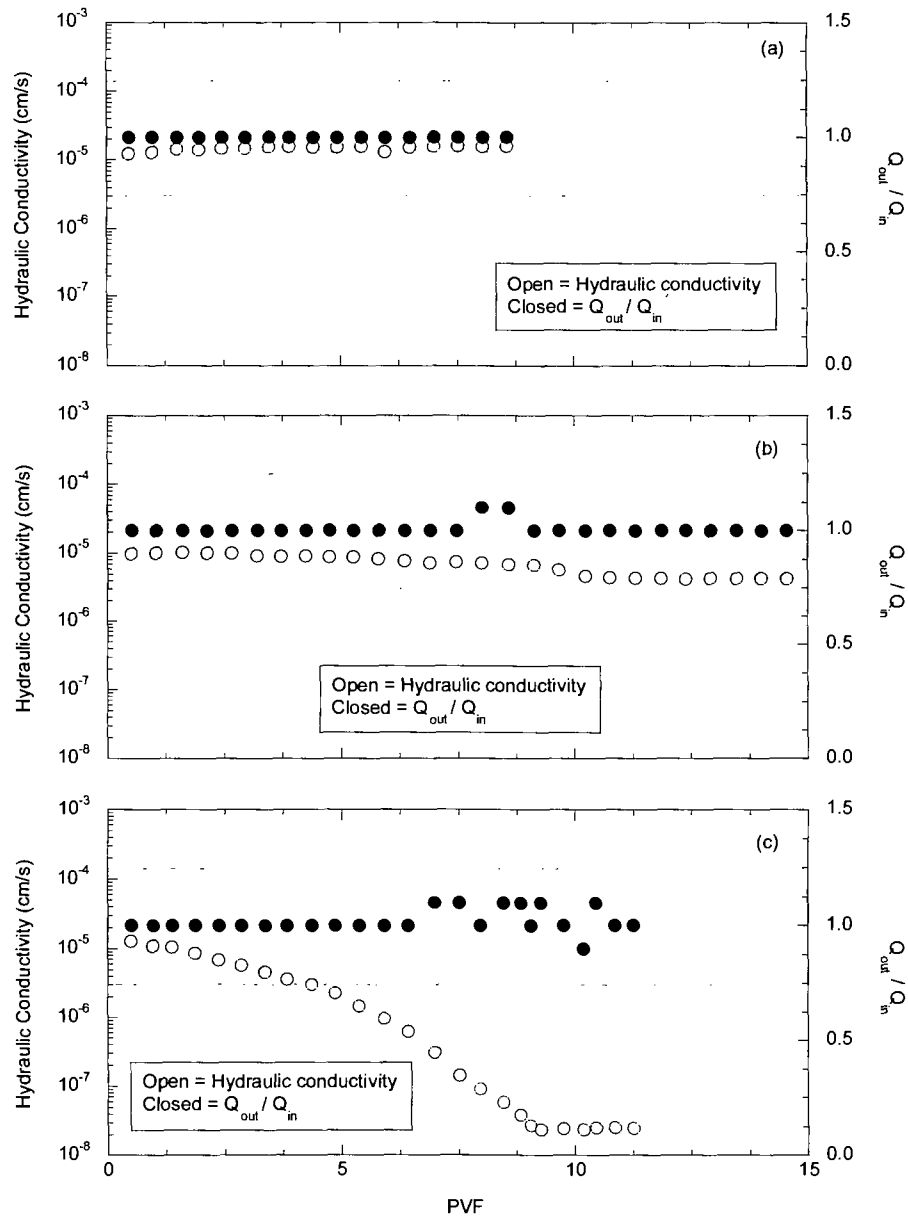


Fig. L. 26. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-7 permeated with standard water (a), average water (b), and de-ionized water (c).

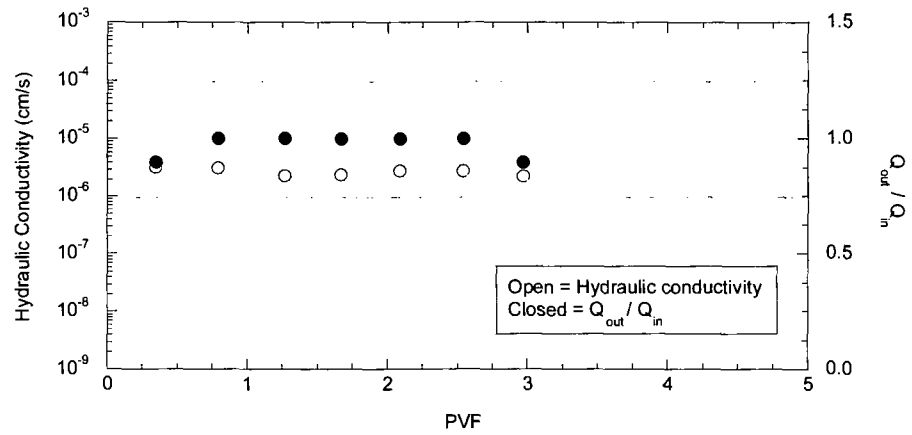


Fig. L. 27. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-8 permeated with standard water.

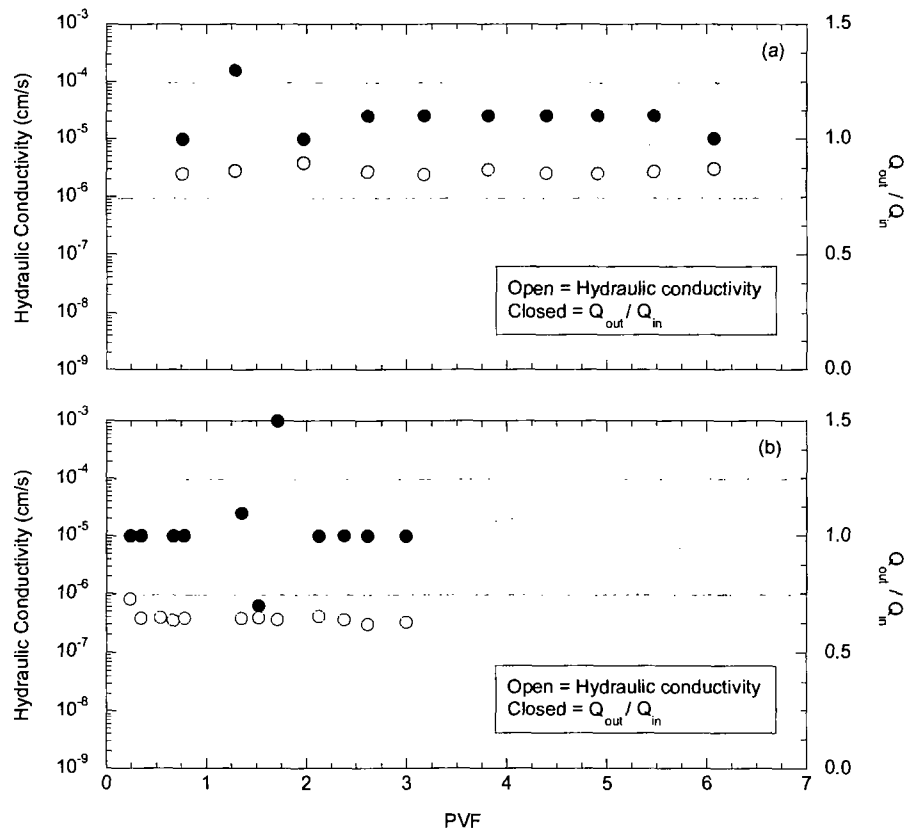


Fig. L. 28. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-9 with stress maintained (a) and no stress maintained (b) permeated with standard water.

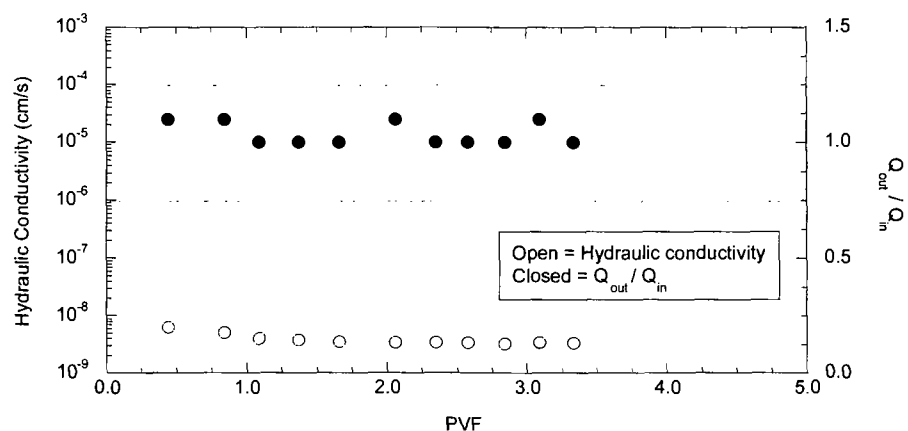


Fig. L. 29. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-10 permeated with standard water.

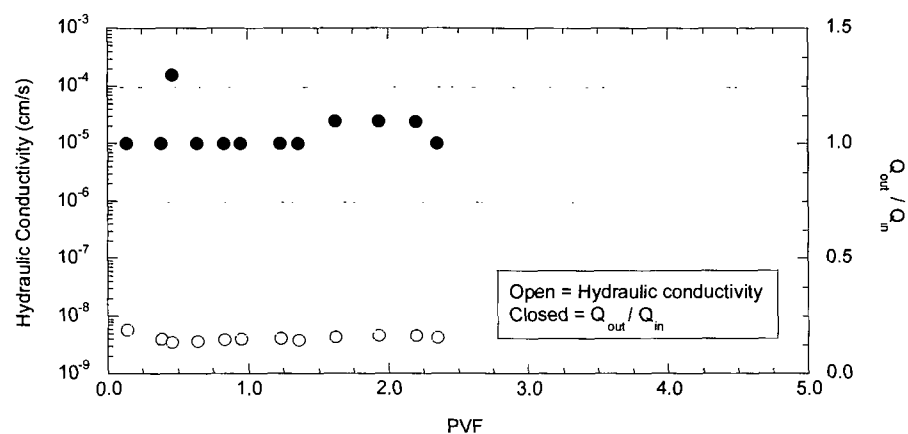


Fig. L. 30. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-11 permeated with standard water.

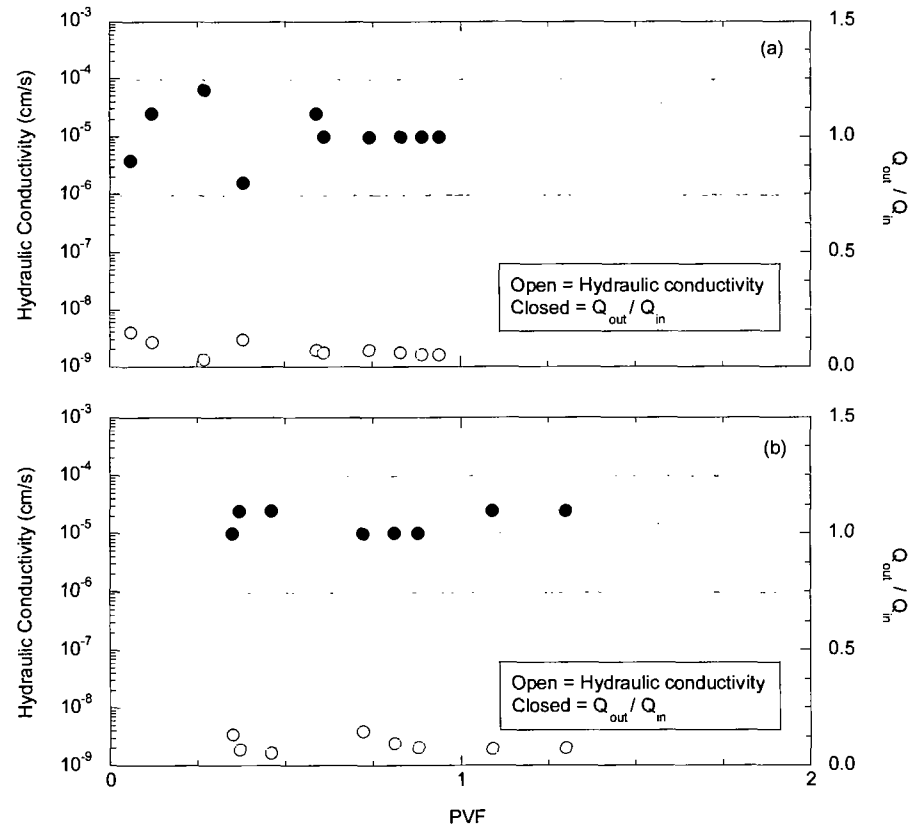


Fig. L. 31. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL E-12 with stress maintained (a) and no stress maintained (b) permeated with standard water.

L-4 HYDRAULIC CONDUCTIVITY PROFILES OF GCLS EXHUMED FROM SITE F.

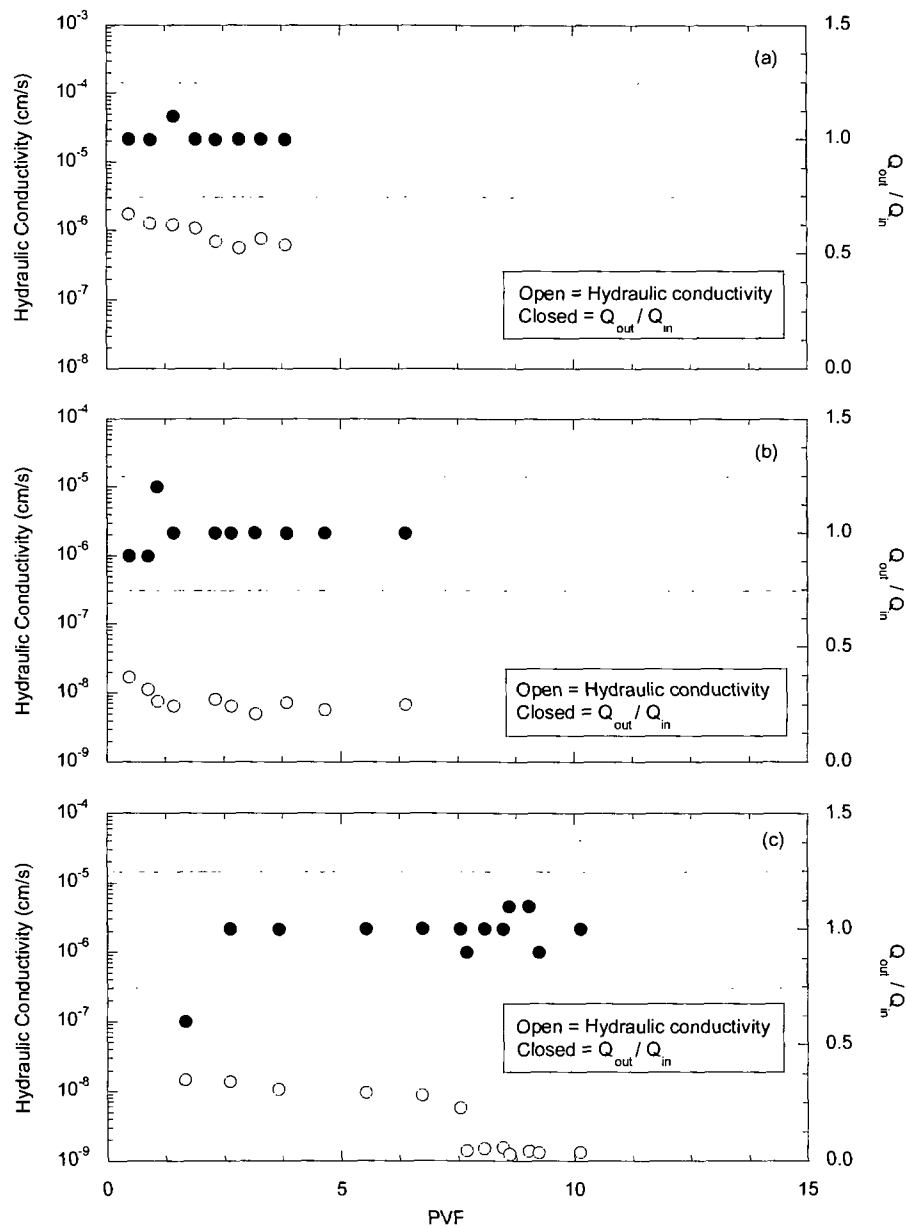


Fig. L. 32. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL F-1 permeated with standard water (a), average water (b), and de-ionized water (c).

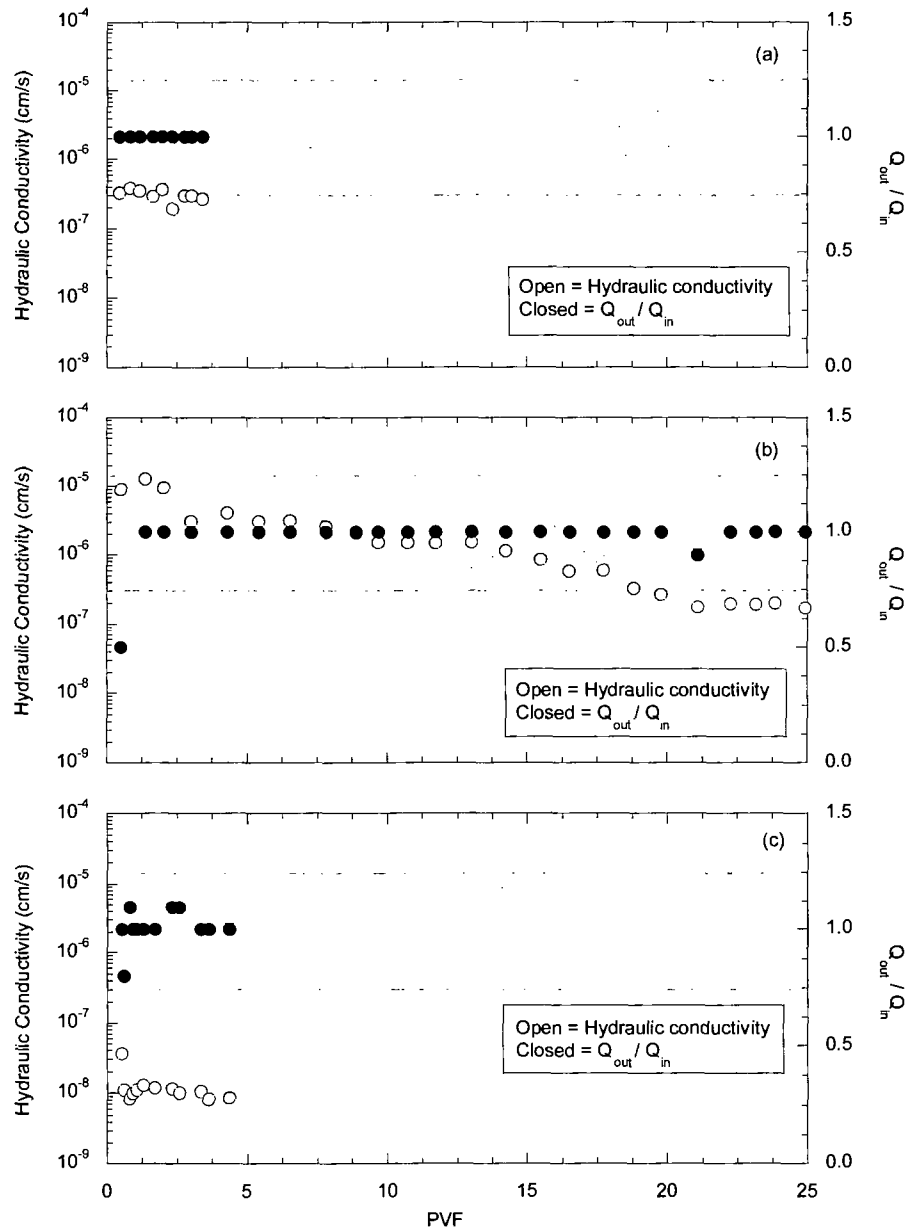


Fig. L. 33. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL F-2 permeated with standard water (a), average water (b), and de-ionized water (c).

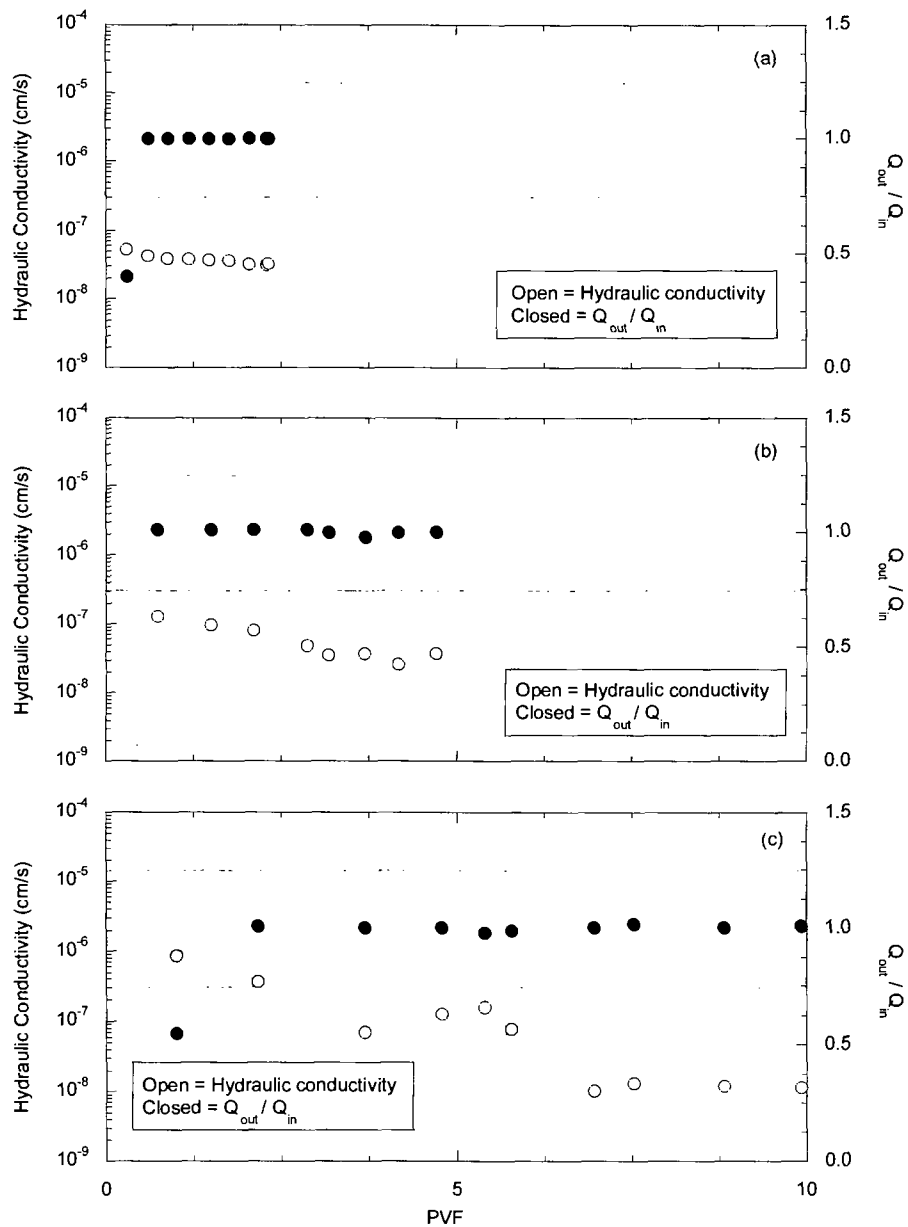


Fig. L. 34. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL F-3 permeated with standard water (a), average water (b), and de-ionized water (c).

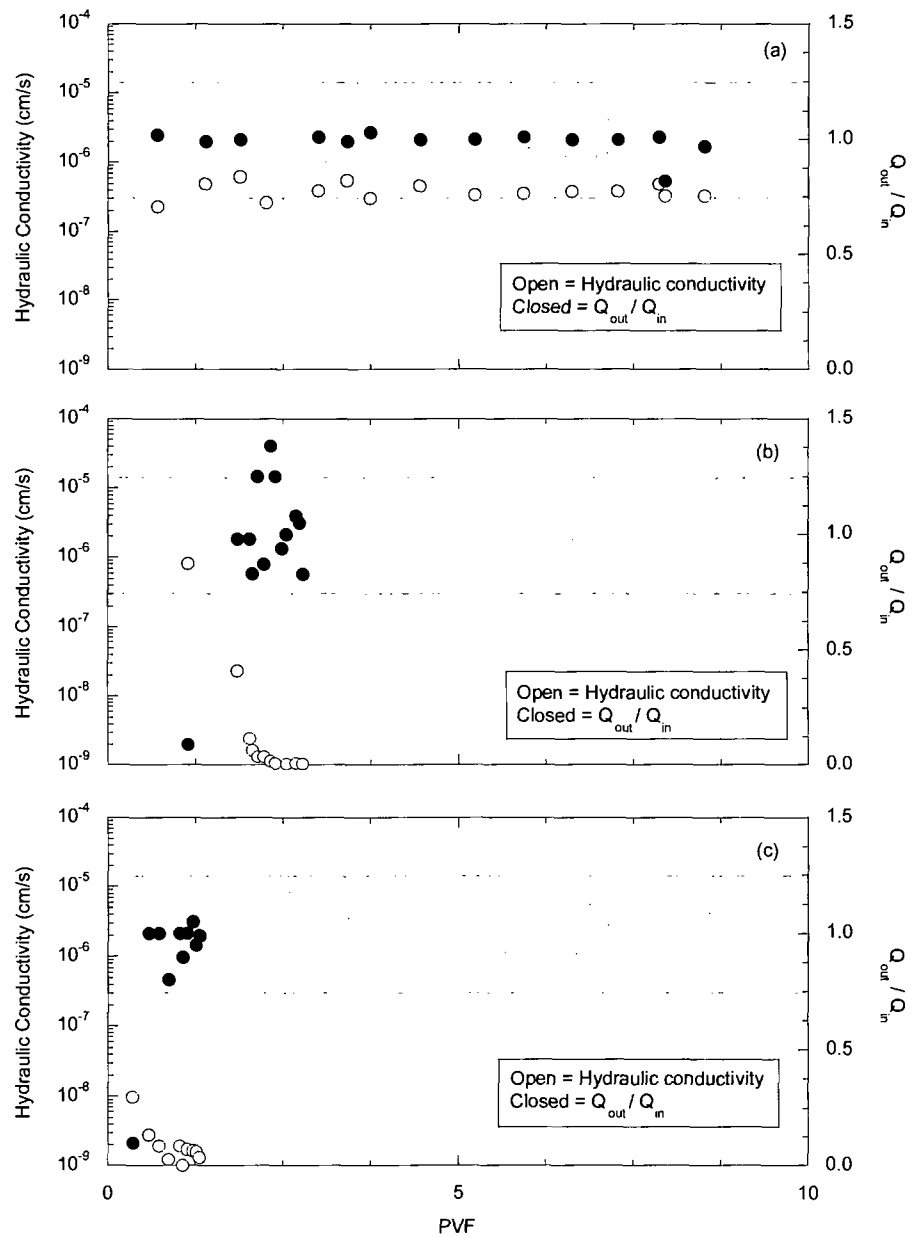


Fig. L. 35. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL F-4 permeated with standard water (a), average water (b), and de-ionized water (c).

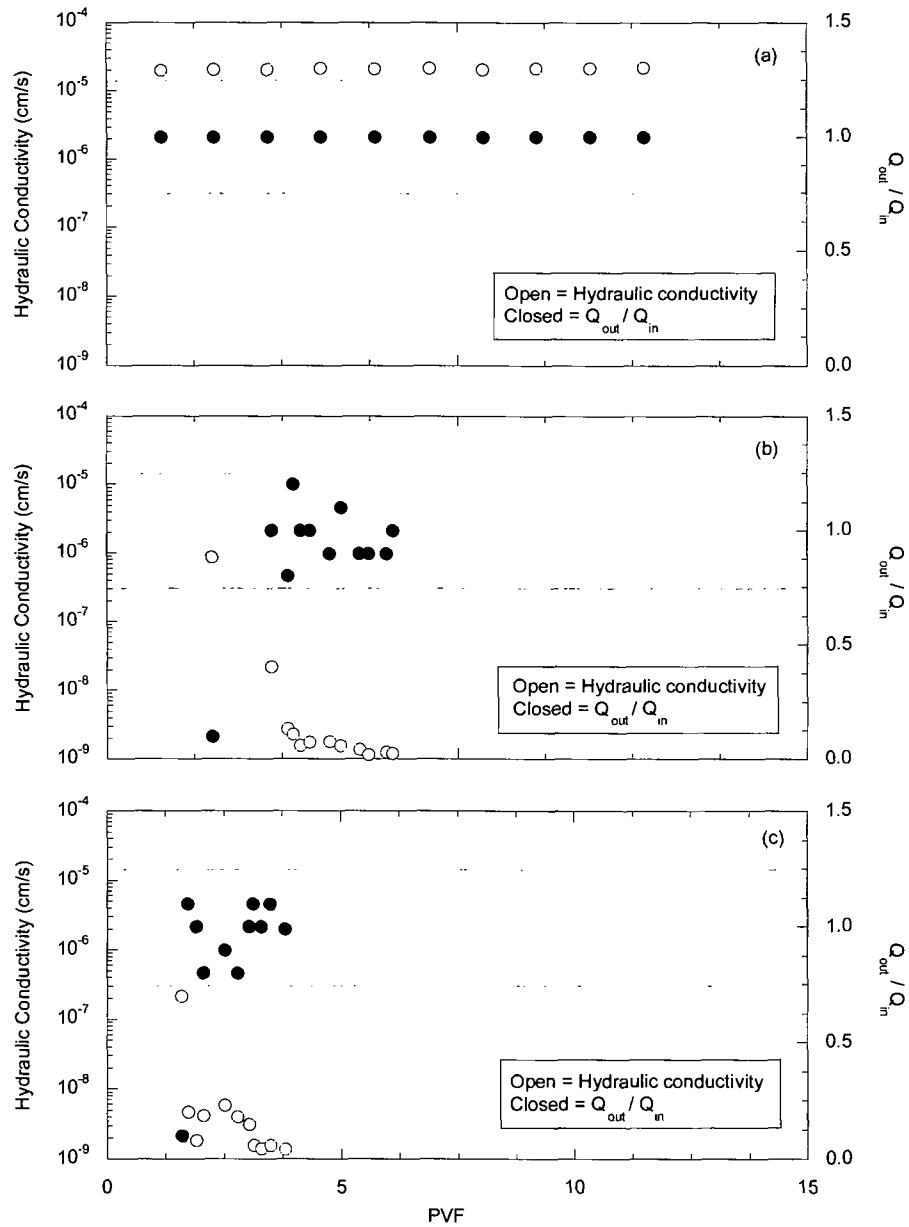


Fig. L. 36. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL F-5 permeated with standard water (a), average water (b), and de-ionized water (c).

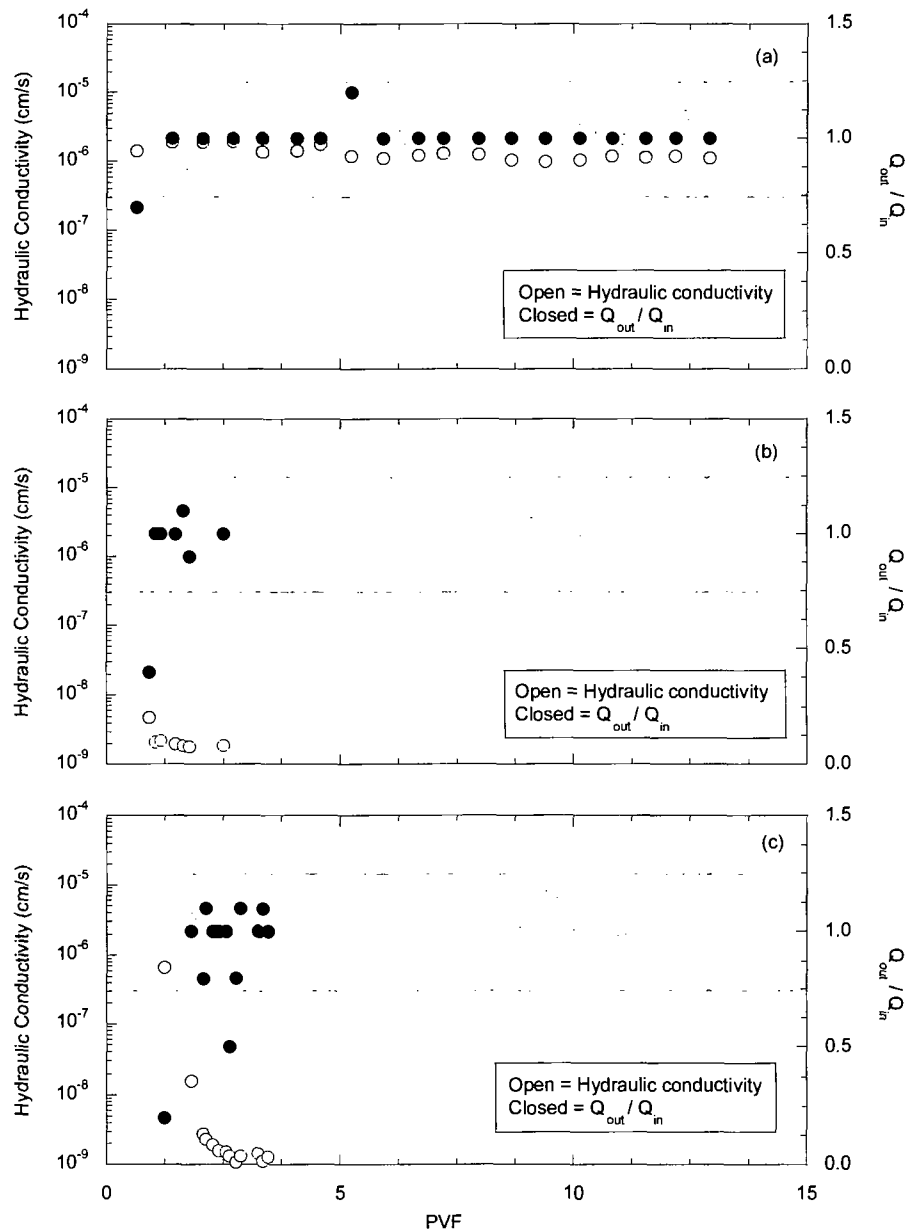


Fig. L. 37. Hydraulic conductivity and Q_{out} / Q_{in} as a function of pore volumes of flow for GCL F-6 permeated with standard water (a), average water (b), and de-ionized water (c).

APPENDIX M - FIELD EXHUMATION PHOTOGRAPY AND OBSERVATIONS

M-1 SITE B FIELD OBSERVATIONS



Fig. M. 1. Removing cover soils by hand at Site B.



Fig. M. 2. Rooting observed at GDL-GM interface but not at GDL overlaps.



Fig. M. 3. Minimal moisture observed at GDL-GM interface upon exposure.



Fig. M. 4. Installed whole in lysimeters GM exposed during exhumation.



Fig. M. 5. Cutting sample perimeters during GCL exhumation.



Fig. M. 6. Sliding rigid PVC plate under GCL sample during exhumation.



Fig. M. 7. GCL cross section on rigid PVC sampling plate immediately after exhumation.

M-2 SITE E FIELD OBSERVATIONS

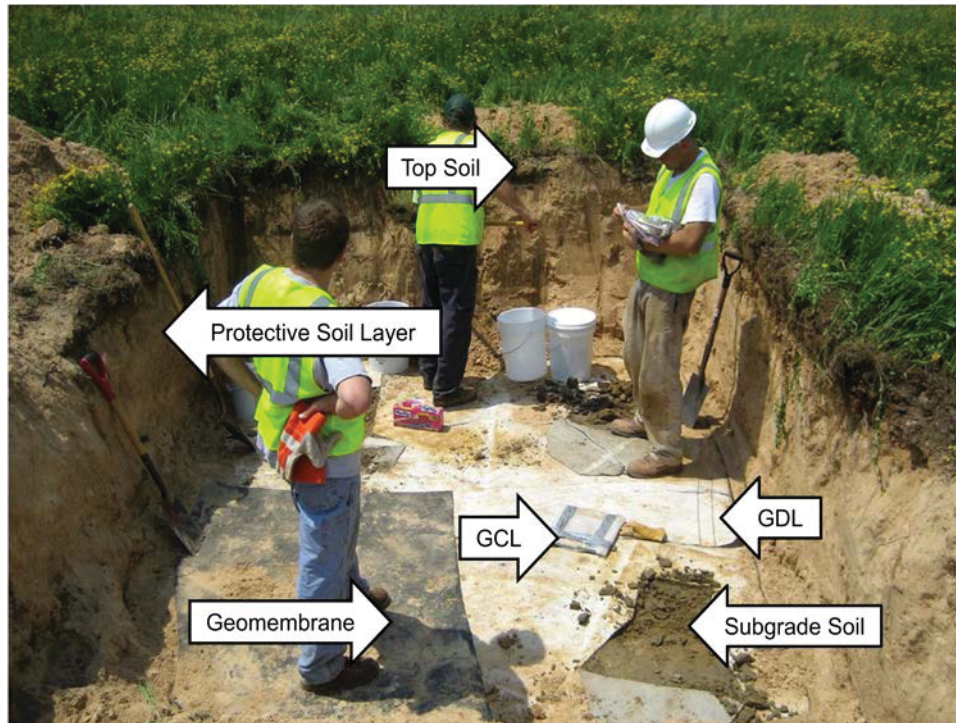


Fig. M. 8. Labeled schematic of GCL sampling test pit.



Fig. M. 9. Manual removal of soil layer overlying geocomposite barrier layer.



Fig. M. 10. Removal of GDL exposing GM.



Fig. M. 11. Moisture visible across GM immediately after GDL removal.

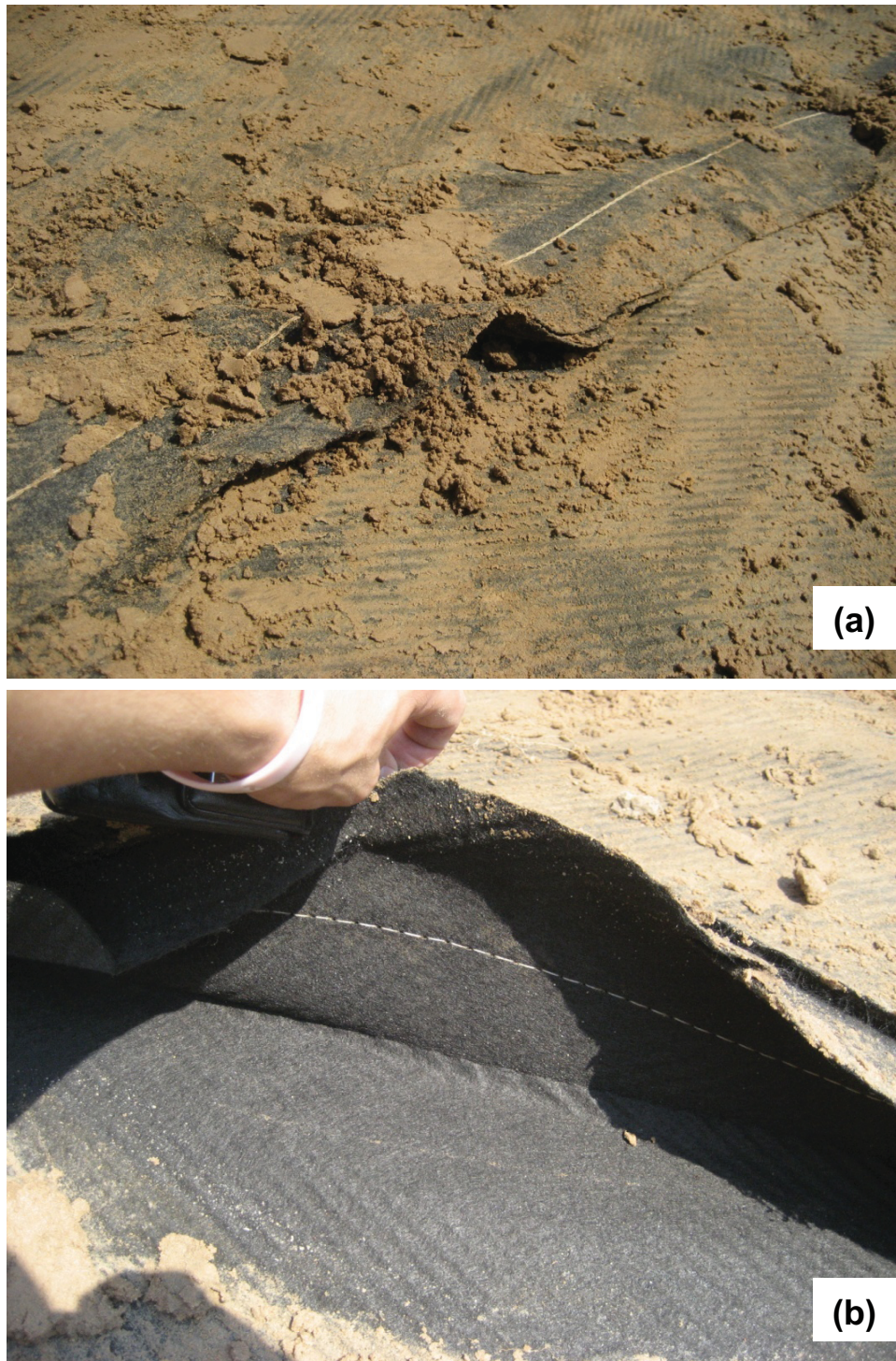


Fig. M. 12. Seam joining geotextiles in adjacent GDL panels in: (a) seam after removing cover soil (fish mouth in middle is due to disturbance during excavation) and (b) close up showing stitching of geotextiles and clean geotextiles in the overlap.

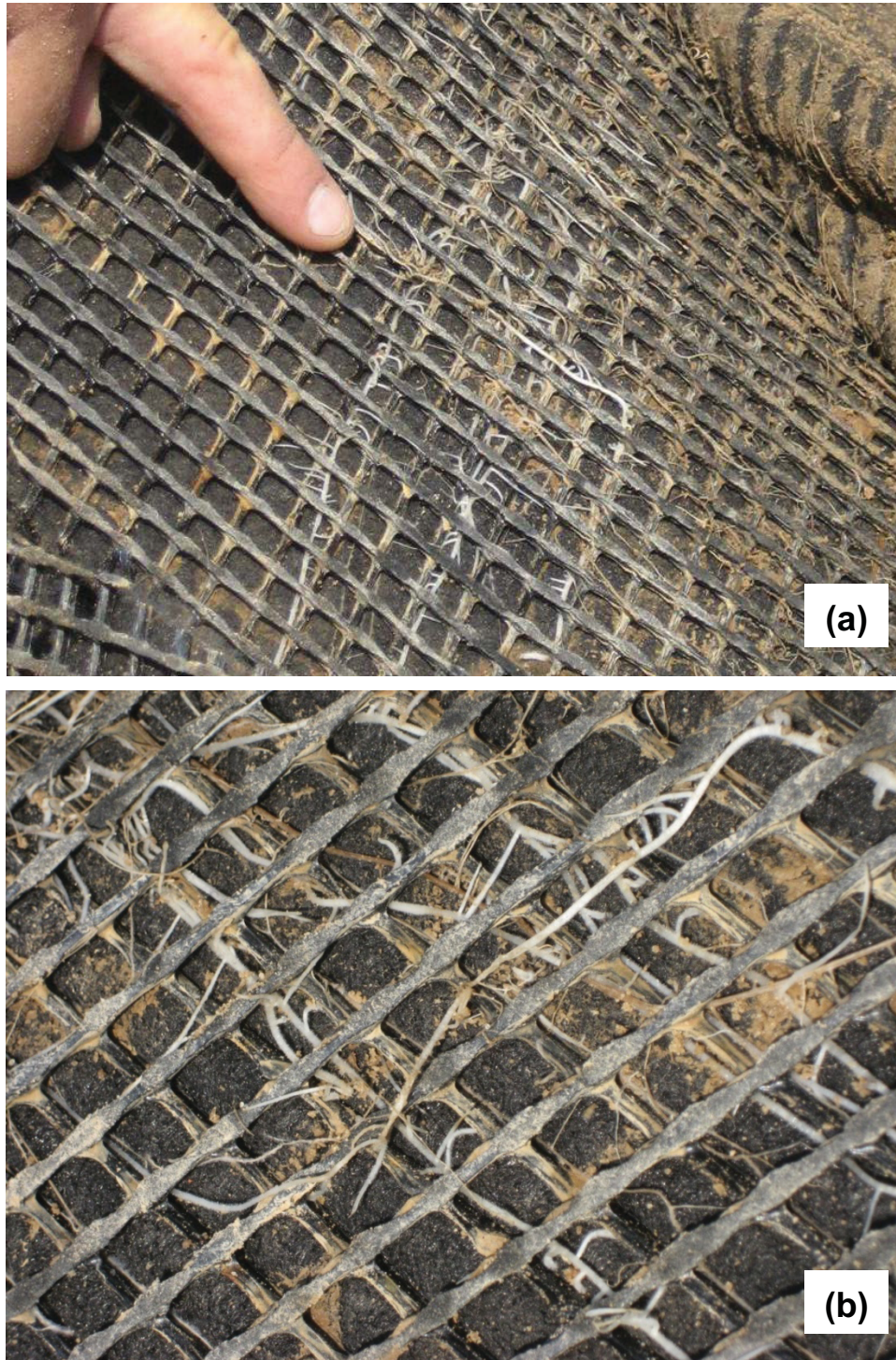


Fig. M. 13. Roots in the GDL and fines coating the ribs of the geonet in Test Pit 1: (a) overview and (b) close up.



Fig. M. 14. Examples of seams observed during exhumation: (a) dual-track wedge weld and (b) extrusion well to boot for gas well near Test Pit 4.

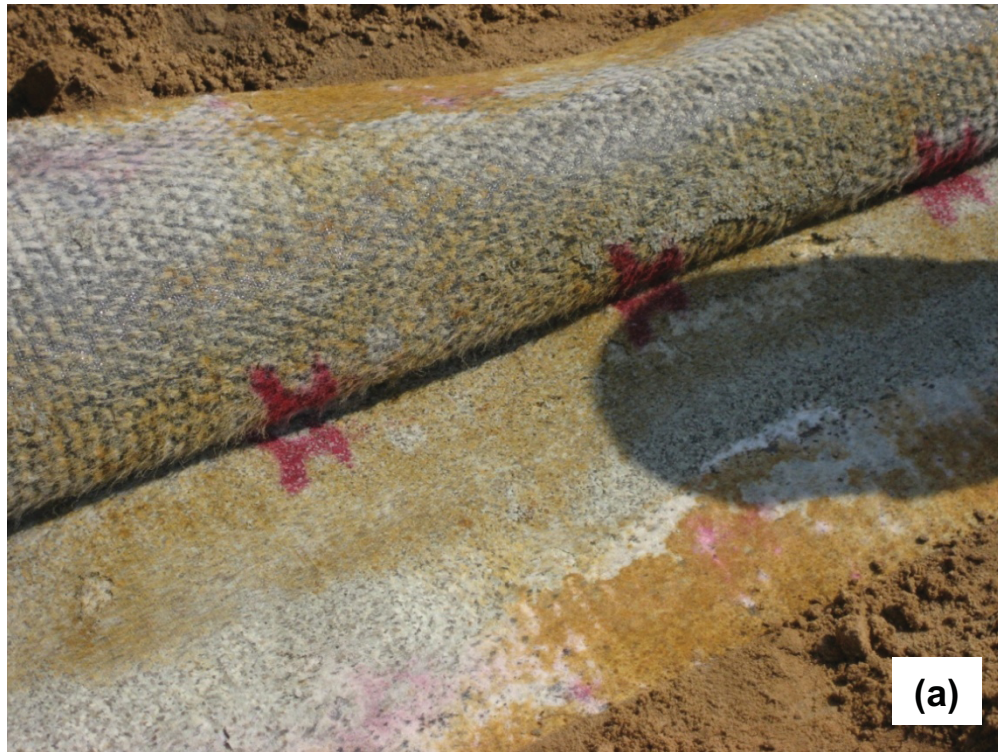


Fig. M. 15. GCL overlap: (a) match point along marks on original product and (b) close up showing hydrated bentonite granules in the overlap.



Fig. M. 16. Staining on GCL carrier nonwoven geotextiles.



Fig. M. 17. GCL sample with cut perimeter prior to sliding of sampling plate and removal.



Fig. M. 18. Black and rust colored staining underlying Site E GCL.



Fig. M. 19. Plastic bin used for GCL transport partially filled.

M-3 SITE F FIELD OBSERVATIONS

M-3.1 OBSERVATIONS DURING GCL EXHUMATION



Fig. M. 20. Test Pit 2 after removal of overlying soil layer.



Fig. M. 21. Cutting of GCL sample perimeters in Test Pit 2. Staining visible on GCL carrier geotextiles.



Fig. M. 22. Moisture seeping from GM while cutting through GM patch in Test Pit 1.



Fig. M. 23. Moisture visible on GCL after rupturing GM patch in Test Pit 1.



Fig. M. 24. Puncture visible in GCM patch weld in Test Pit 1.



Fig. M. 25. GM underlying GM patch. Hole in GM patch weld visible in upper right quadrant of the image.

M.3.2 GCL INSTALLATION OBSERVATIONS

Exhumation of GCL samples at Site F occurred coincident with installation of adjacent final cover at tie in points. The following photos represent observations made at Site F touring the installation of the adjacent composite barrier layer.



Fig. M. 26. Condensation on GM overlying GCL underside from solar heating.



Fig. M. 27. GM overlying GCL before placement of overlying soil layer. Condensation for solar heating was observed underlying.



Fig. M. 28. GCL instillation team between rolls.