

## **Appendix F**

### **HEC-HMS – Inputs and Results – Upton Plant Site**

## **HEC-HMS – Inputs and Results Upton Plant Site**



CLIENT BD Geo Environmental

JOB NO. 2823-01

BORING NO. UCH-01  
DEPTH 26.78-28.15'  
SAMPLE NO. #1  
SOIL DESCR.  
LOCATION RER - Upton

SAMPLED  
TEST STARTED 06/11/12 DPM  
TEST FINISHED 06/13/12 DPM  
SETUP NO. ATT-17

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	LOAD (PSF)	CONSOL. (IN.)
Wt. Soil & Ring(s) (g)	343.3	344.7	64	0.0000
Wt. Ring(s) (g)	104.9	104.9	509	0.0032
Wt. Soil (g)	238.4	239.8	509	-0.0015
Wet Density PCF	126.7	128.6	1018	-0.0004
			2036	0.0028
Sample Diameter (in)	3.021	3.021	4073	0.0091
Sample Height (in)	1.000	0.991		
Wt. Wet Soil & Pan (g)	245.2	246.6		
Wt. Dry Soil & Pan (g)	214.0	214.0		
Wt. Lost Moisture (g)	31.2	32.6		
Wt. of Pan Only (g)	6.8	6.8		
Wt. of Dry Soil (g)	207.3	207.3		
Moisture Content %	15.0	15.7		
Dry Density PCF	110.2	111.2		
Max. Dry Density PCF				
Percent Compaction				

	LOAD (PSF)	LOG LOAD	CONSOL. (IN.)	DEFL. (IN.)
	64	1.806	0.0000	0.0000
	509	2.707	0.0032	-0.0032
Inundate	509	2.707	-0.0015	0.0015
	1018	3.008	-0.0004	0.0004
	2036	3.309	0.0028	-0.0028
	4073	3.610	0.0091	-0.0091

Data Entered By: DAW Date: 06/14/2012  
Data Checked By: *DPM* Date: *6/14/12*  
Filename: BDSW2678



CLIENT BD Geo Environmental

JOB NO. 2823-01

BORING NO. UCH-01  
DEPTH 26.78-28.15'  
SAMPLE NO. #1  
SOIL DESCR.

SAMPLED  
TEST STARTED 06/11/12 DPM  
TEST FINISHED 06/13/12 DPM  
SETUP NO. ATT-17

TIME READING DATA

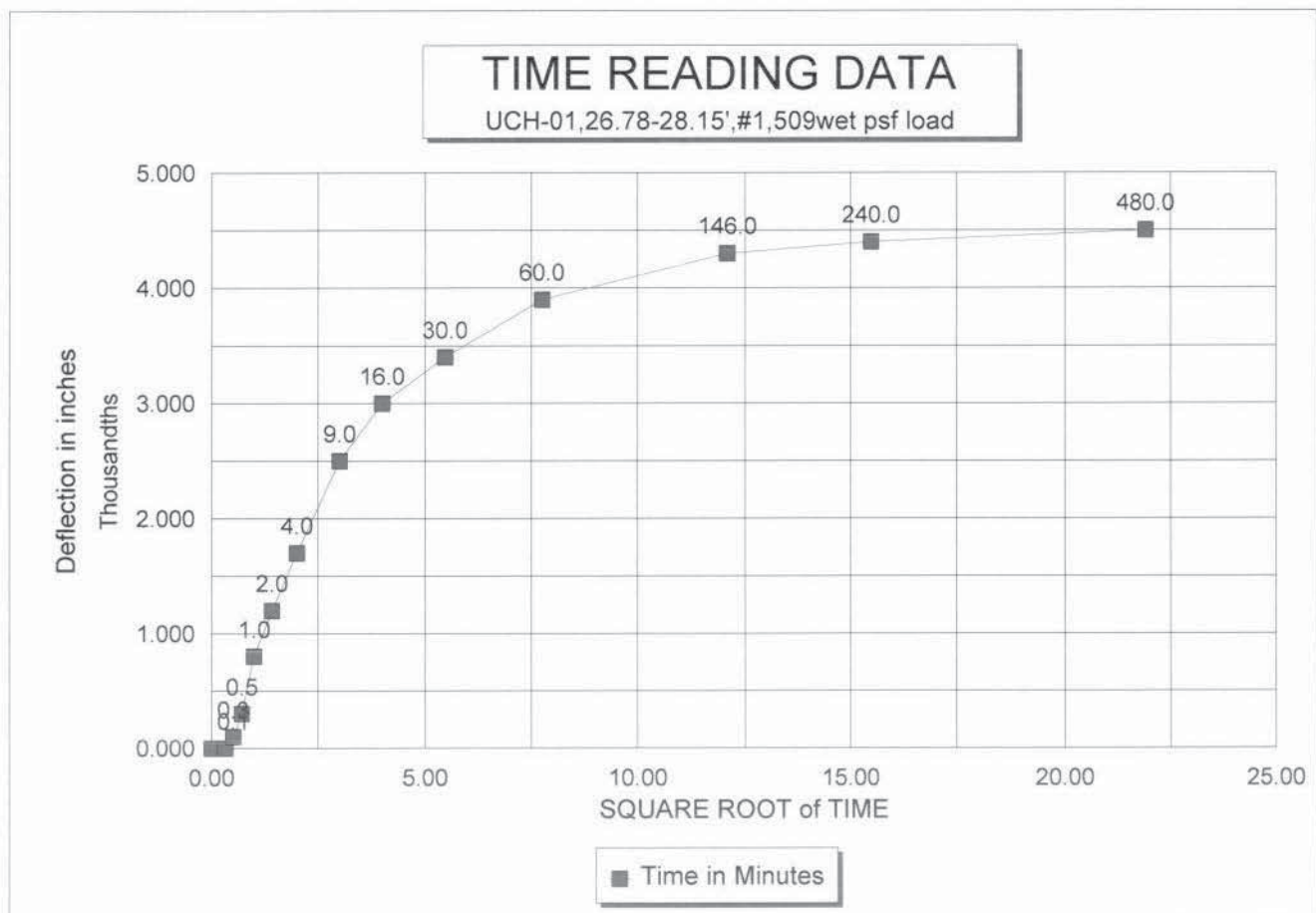
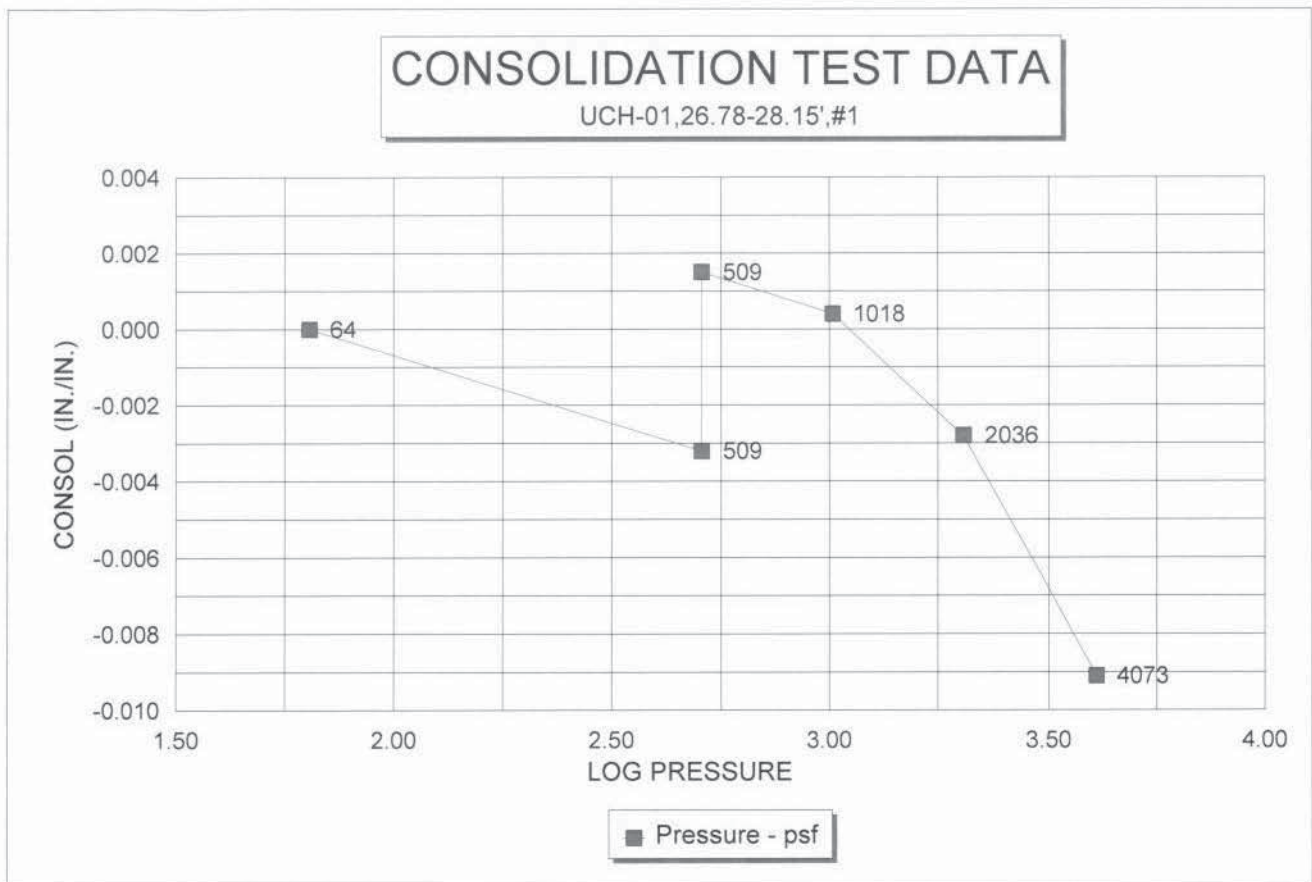
509 wet psf load

Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)	Defl. (in)
0.0	0.00	0.0050	0.0000
0.1	0.32	0.0050	0.0000
0.3	0.50	0.0049	0.0001
0.5	0.71	0.0047	0.0003
1.0	1.00	0.0042	0.0008
2.0	1.41	0.0038	0.0012
4.0	2.00	0.0033	0.0017
9.0	3.00	0.0025	0.0025
16.0	4.00	0.0020	0.0030
30.0	5.48	0.0016	0.0034
60.0	7.75	0.0011	0.0039
146.0	12.08	0.0007	0.0043
240.0	15.49	0.0006	0.0044
480.0	21.91	0.0005	0.0045

Data Entered By: DAW  
Data Checked By: *DPM*  
Filename: \_ BDSW2678

Date: 06/14/2012  
Date: *6/14/12*





CONSOLIDATION/SWELL TEST  
ASTM D 4546/METHOD B

CLIENT BD Geo Environmental

JOB NO. 2823-01

BORING NO. UCH-01  
DEPTH 49-58.25'  
SAMPLE NO. #2  
SOIL DESCR.  
LOCATION RER-Upton

SAMPLED  
TEST STARTED 06/08/12 DPM  
TEST FINISHED 06/12/12 DPM  
SETUP NO. ATT-16

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	LOAD (PSF)	CONSOL. (IN.)	CONSOL. (IN./IN.)
Wt. Soil & Ring(s) (g)	343.9	346.2	70	0.0000	0.0000
Wt. Ring(s) (g)	98.9	98.9	493	0.0026	0.0027
Wt. Soil (g)	245.0	247.3	493	-0.0182	-0.0186
Wet Density PCF	146.9	149.5	1126	-0.0178	-0.0182
			2252	-0.0163	-0.0166
Sample Diameter (in)	2.873	2.873	4503	-0.0123	-0.0126
Sample Height (in)	0.980	0.972	9007	-0.0072	-0.0073
			18014	-0.0010	-0.0010
Wt. Wet Soil & Pan (g)	251.7	254.0	36027	0.0081	0.0083
Wt. Dry Soil & Pan (g)	233.4	233.4			
Wt. Lost Moisture (g)	18.3	20.6			
Wt. of Pan Only (g)	6.7	6.7			
Wt. of Dry Soil (g)	226.7	226.7			
Moisture Content %	8.1	9.1			
Dry Density PCF	136.0	137.1			
Max. Dry Density PCF					
Percent Compaction					

	LOAD (PSF)	LOG LOAD	CONSOL. (IN./IN.)	DEFL. (IN./IN.)
	70	1.8451	0.0000	0.0000
	493	2.6928	0.0027	-0.0027
Inundate	493	2.6928	-0.0186	0.0186
	1126	3.0515	-0.0182	0.0182
	2252	3.3526	-0.0166	0.0166
	4503	3.6535	-0.0126	0.0126
	9007	3.9546	-0.0073	0.0073
	18014	4.2556	-0.0010	0.0010
	36027	4.5566	0.0083	-0.0083

Data Entered By: DAW Date: 06/15/2012  
Data Checked By: *[Signature]* Date: *6/15/12*  
Filename: BDC04958



CONSOLIDATION/SWELL TEST  
ASTM D 4546

CLIENT BD Geo Environmental

JOB NO. 2823-01

BORING NO. UCH-01  
DEPTH 49-58.25'  
SAMPLE NO. #2  
SOIL DESCR.SAMPLED  
TEST STARTED 06/08/12 DPM  
TEST FINISHED 06/12/12 DPM  
SETUP NO. ATT-16

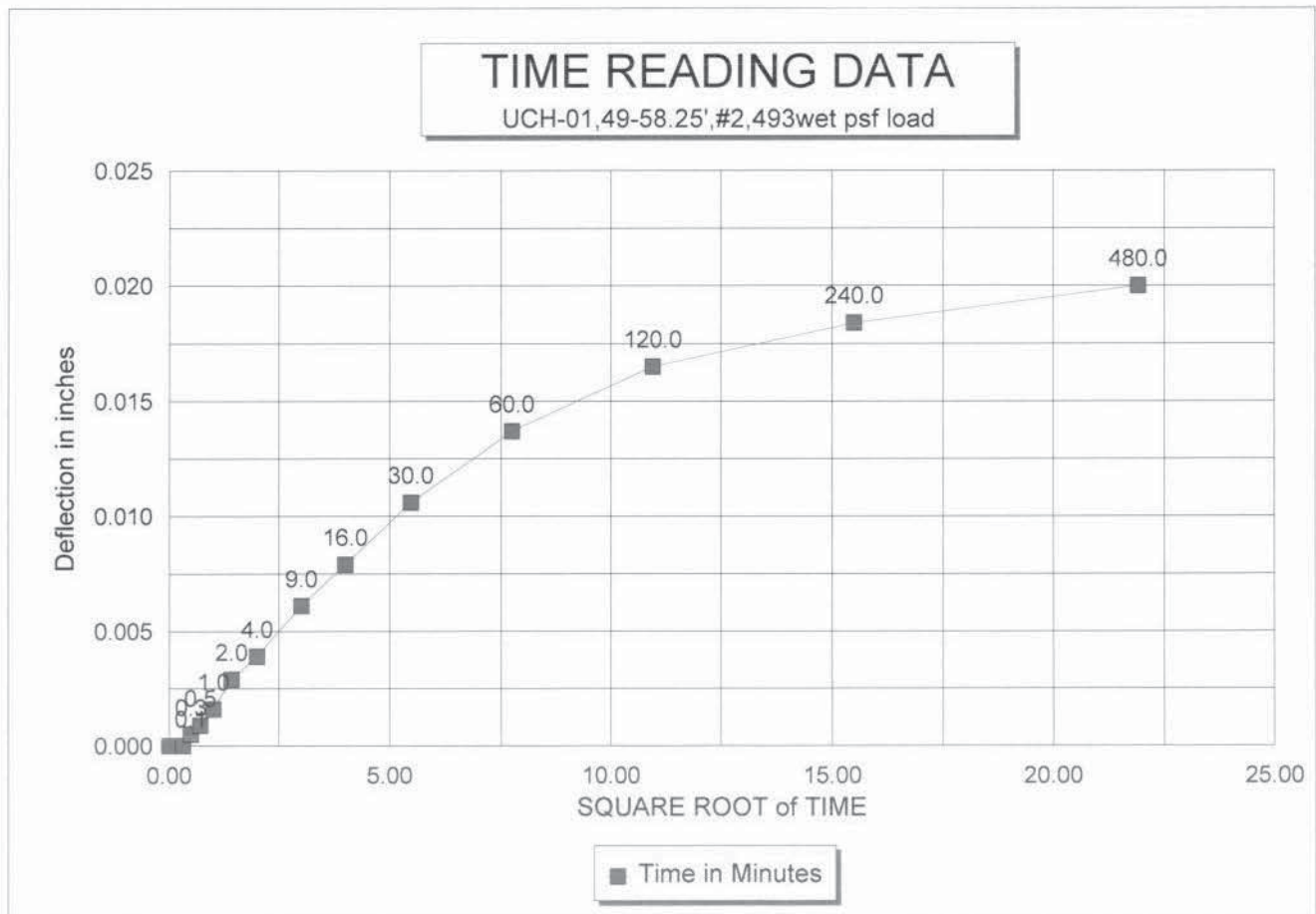
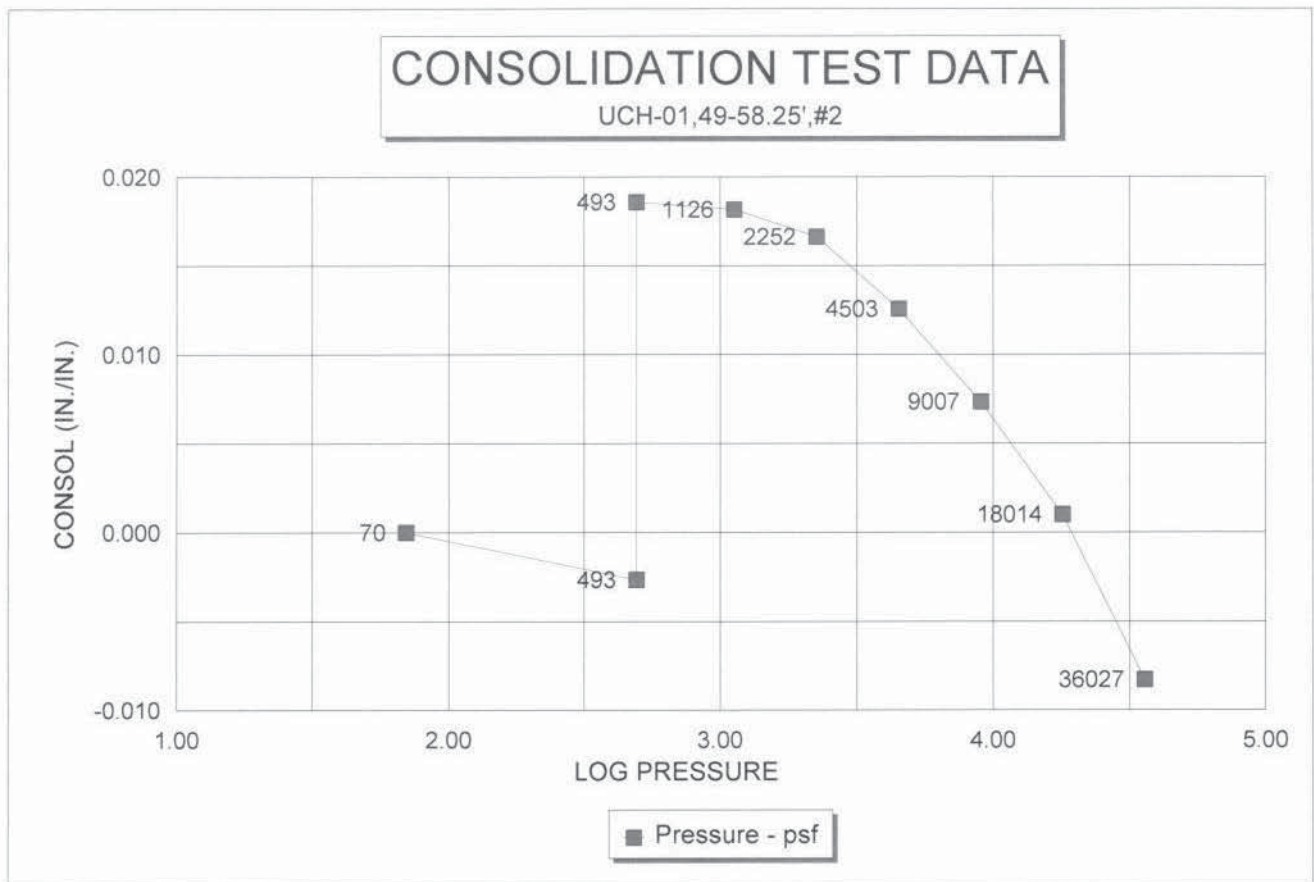
## TIME READING DATA

493 wet psf load

Elapsed Time (min)	SQRT Time (min)	Dial Reading (in)	Defl. (in)
0.0	0.00	0.0041	0.0000
0.1	0.32	0.0041	0.0000
0.3	0.50	0.0036	0.0005
0.5	0.71	0.0032	0.0009
1.0	1.00	0.0025	0.0016
2.0	1.41	0.0012	0.0029
4.0	2.00	0.0002	0.0039
9.0	3.00	-0.0020	0.0061
16.0	4.00	-0.0038	0.0079
30.0	5.48	-0.0065	0.0106
60.0	7.75	-0.0096	0.0137
120.0	10.95	-0.0124	0.0165
240.0	15.49	-0.0143	0.0184
480.0	21.91	-0.0159	0.0200

Data Entered By: DAW Date: 06/15/2012  
Data Checked By: \_\_\_\_\_ Date: \_\_\_\_\_  
Filename: BDC04958





PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD  
ASTM D 5084

CLIENT BD GeoEnvironmental

JOB NO. 2823-01

BORING NO. UCH-01

DEPTH 26.78-28.15'

SAMPLE NO. 1

SOIL DESCR.

LOCATION Core Samples UCH-01

CONF. PRES. PSF 3586

SAMPLED

TEST STARTED

06/09/12 CAL

TEST FINISHED

06/13/12 CAL

CELL NUMBER

8S

SATURATED TEST

Yes

TEST TYPE

TX/Pbp/Tap Water

MOISTURE/DENSITY  
DATA

BEFORE  
TEST

AFTER  
TEST

Wt. Soil + Moisture (g)	566.1	570.9
Wt. Wet Soil & Pan (g)	572.7	577.5
Wt. Dry Soil & Pan (g)	496.3	496.3
Wt. Lost Moisture (g)	76.4	81.2
Wt. of Pan Only (g)	6.7	6.7
Wt. of Dry Soil (g)	489.7	489.7
Moisture Content %	15.6	16.6
Wet Density PCF	130.6	135.6
Dry Density PCF	113.0	116.3

Init. Diameter (in)	2.981	(cm)	7.572
Init. Area (sq in)	6.979	(sq cm)	45.031
Init. Height (in)	2.365	(cm)	6.007
Vol. Bef. Consol. (cu ft)	0.00955		
Vol. After Consol. (cu ft)	0.00928		
Porosity %	30.91		

FLOW PUMP CALCULATIONS

Pump Setting	9
Velocity CM/Sec	5.91E-05
Q (cc/s)	1.89E-06
Height	2.324
Diameter	2.964
Pressure (psi)	2.020
Area after consol. (cm*cm)	44.512
Gradient	24.059
Permeability k (cm/s)	1.8E-09
Permeability k (m/s)	1.8E-11
Back Pressure (psi)	38.0
Cell Pressure (psi)	62.9
Ave. Effective Stress (psi)	23.890

Average temperature degree C: 24.5

NOTE: Short sample.

Data entry by: DAW Date: 06/14/2012

Checked by: DAW Date: 6/16/2012

FileName: BDP001S1



## TRIAxIAL COMPRESSION TEST DATA

CLIENT	BD GeoEnvironmental	JOB NO.	2823-01
BORING NO.	UCH-01	SAMPLED	
DEPTH	26.78-28.15'	TEST STARTED	06/09/12 CAL
SAMPLE NO.	1	TEST FINISHED	06/13/12 CAL
SOIL DESCR.		SETUP NO.	8S
LOCATION	Core Samples UCH-01	SATURATED TEST	Yes
CONF. PRES. PSF	3586	TEST TYPE	TX/Pbp/Tap Water

## SATURATION DATA

Cell Pres. (PSI)	Back Pres. (PSI)	Burette Reading (CC)		Pore Pressure (PSI)		Change	B
		Close	Open	Close	Open		
40.0	38.0	3.6	13.7				
50.0		13.8	13.8	39.5	49.2	9.7	0.97

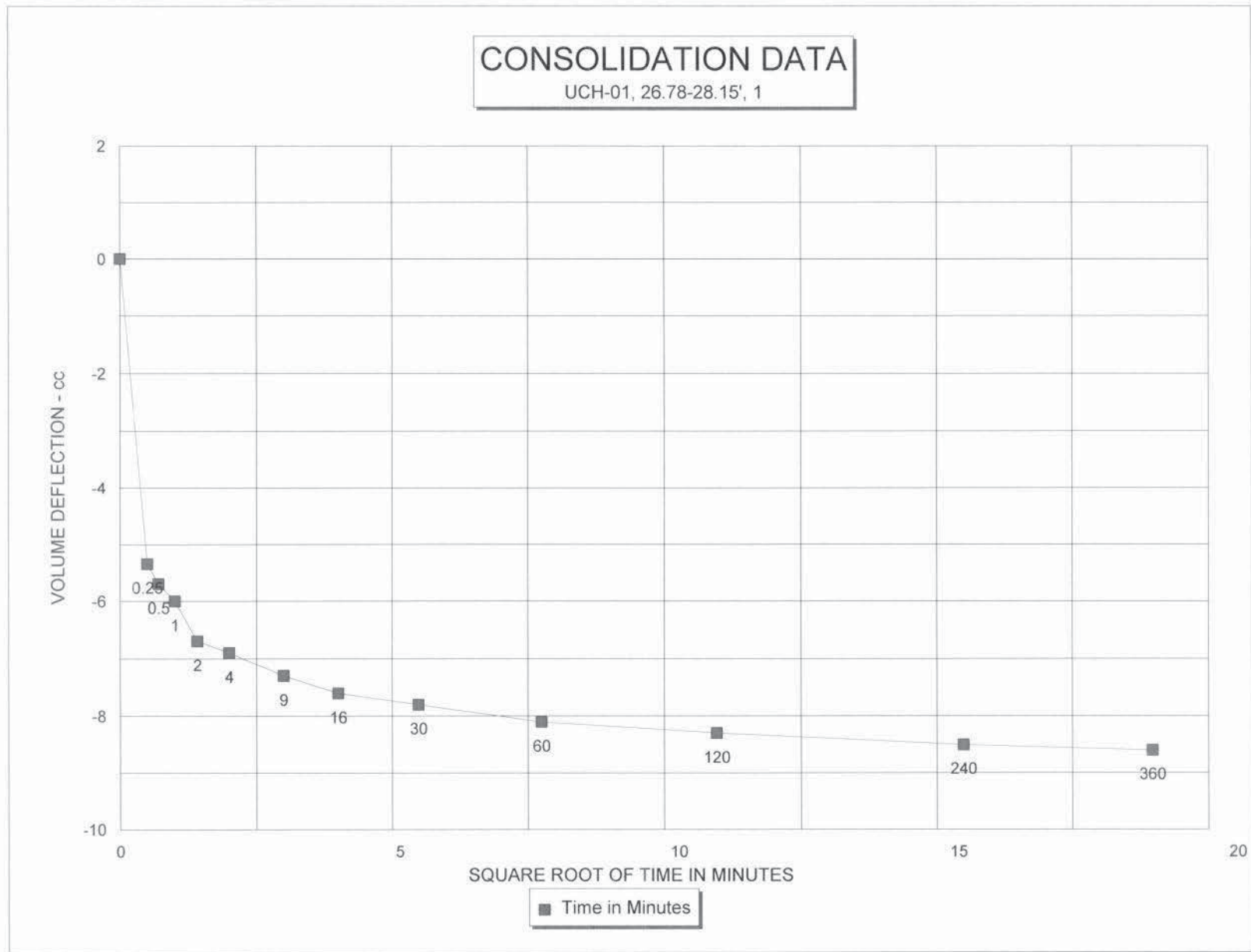
## CONSOLIDATION DATA

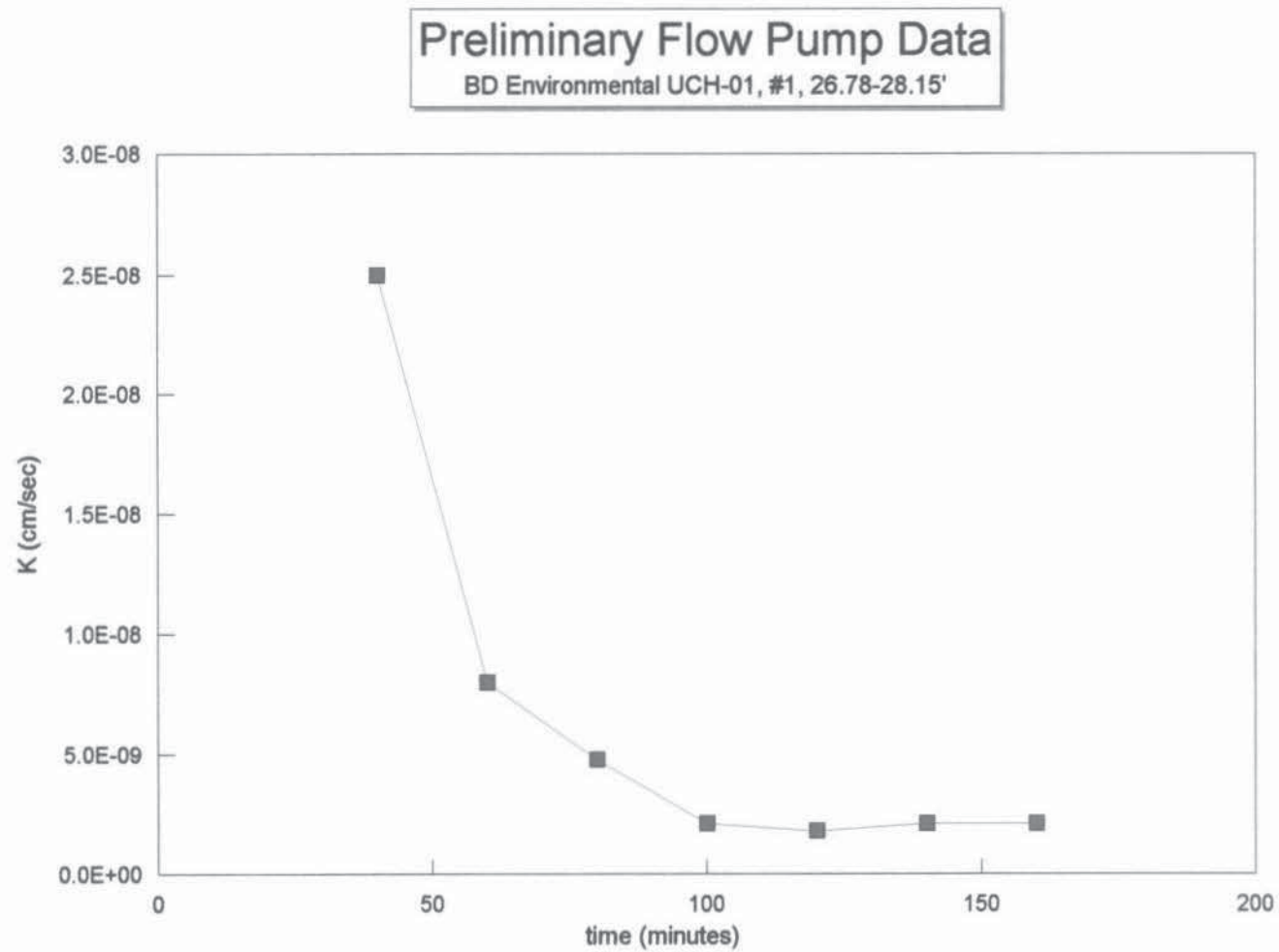
Elapsed Time (Min)	SQRT Time (Min)	Burette Reading (CC)	Volume Defl. (cc)
0.00	0.00	13.50	0.00
0.25	0.50	18.85	-5.35
0.5	0.71	19.20	-5.70
1	1.00	19.50	-6.00
2	1.41	20.20	-6.70
4	2.00	20.40	-6.90
9	3.00	20.80	-7.30
16	4.00	21.10	-7.60
30	5.48	21.30	-7.80
60	7.75	21.60	-8.10
120	10.95	21.80	-8.30
240	15.49	22.00	-8.50
360	18.97	22.10	-8.60

Initial Height (in)	2.365	Init. Vol. (CC)	270.54
Height Change (in)	0.041	Vol. Change (CC)	19.20
Ht. After Cons. (in)	2.324	Cell Exp. (CC)	11.46
Initial Area (sq in)	6.979	Net Change (CC)	7.74
Area After Cons. (sq in)	6.899	Cons. Vol. (CC)	262.80

Data entry by:            DAW Date: 06/14/2012  
 Checked by: can Date: 6/16/2012







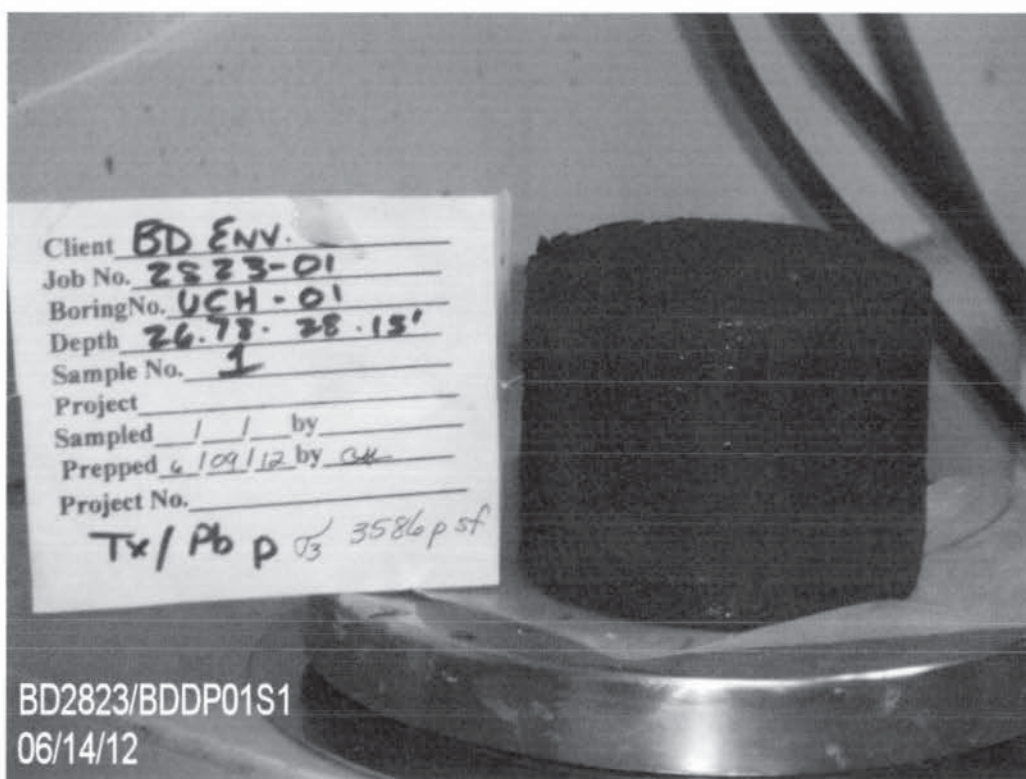
Average last 4 values  
2.0E-09

Data Entered By:  
Data Checked By:  
File Name:

CAL  
DAW  
BDFP01S1

Date: 6-13-2012  
Date Checked 6/14/12







PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD  
ASTM D 5084

CLIENT BD GeoEnvironmental Services

JOB NO. 2823-01

BORING NO.	UCH-1	SAMPLED	
DEPTH	49.5-49.7'	TEST STARTED	06/02/12 CAL
SAMPLE NO.	2	TEST FINISHED	06/18/12 CAL
SOIL DESCR.	Shale	CELL NUMBER	2N
LOCATION	Core Samples UCH-01	SATURATED TEST	Yes
CONF. PRES. PSF	7272	TEST TYPE	TX/Pbp/Tap Water

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST	
Wt. Soil + Moisture (g)	867.5	874.3	
Wt. Wet Soil & Pan (g)	881.6	888.3	
Wt. Dry Soil & Pan (g)	811.7	811.7	
Wt. Lost Moisture (g)	69.9	76.6	
Wt. of Pan Only (g)	14.1	14.1	
Wt. of Dry Soil (g)	797.6	797.6	
Moisture Content %	8.8	9.6	
Wet Density PCF	146.6	148.8	
Dry Density PCF	134.8	135.7	
Init. Diameter (in)	2.863	(cm)	7.272
Init. Area (sq in)	6.438	(sq cm)	41.536
Init. Height (in)	3.502	(cm)	8.895
Vol. Bef. Consol. (cu ft)	0.01305		
Vol. After Consol. (cu ft)	0.01296		
Porosity %	20.88		

FLOW PUMP CALCULATIONS

Pump Setting	5
Velocity CM/Sec	3.29E-05
Q (cc/s)	1.05E-06
Height	3.499
Diameter	2.854
Pressure (psi)	10.000
Area after consol. (cm*cm)	41.283
Gradient	79.109
Permeability k (cm/s)	3.2E-10
Permeability k (m/s)	3.2E-12
Back Pressure (psi)	118.0
Cell Pressure (psi)	168.5
Ave. Effective Stress (psi)	45.500

Average temperature degree C: 23.0

NOTE: Reached transducer maximum of 10 psi. Although the pressures had started to level off the actual permeability value may be slower than reported.

Data entry by: DAW Date: 06/20/2012  
 Checked by: *ppm* Date: *6/20/12*  
 FileName: BDP001S2



# TRIAXIAL COMPRESSION TEST DATA

CLIENT BD GeoEnvironmental Services

JOB NO. 2823-01

BORING NO. UCH-1  
 DEPTH 49.5-49.7'  
 SAMPLE NO. 2  
 SOIL DESCR. Shale  
 LOCATION Core Samples UCH-01  
 CONF. PRES. PSF 7272

SAMPLED  
 TEST STARTED 06/02/12 CAL  
 TEST FINISHED 06/18/12 CAL  
 SETUP NO. 2N  
 SATURATED TEST Yes  
 TEST TYPE TX/Pbp/Tap Water

## SATURATION DATA

Cell Pres. (PSI)	Back Pres. (PSI)	Burette Reading (CC)	Pore Pressure (PSI)	Change	B
		Close Open	Close Open		
40.0	38.0	2.9 14.2			
50.0	48.0	13.1 14.1	38.4 47.2	8.8	0.88
60.0	58.0	13.7 14.8	48.5 57.0	8.5	0.85
70.0	68.0	14.2 14.8	58.4 67.0	8.6	0.86
80.0	78.0	15.1 15.8	68.1 76.8	8.7	0.87
90.0	88.0	15.8 16.5	78.0 87.3	9.3	0.93
100.0	98.0	16.7 17.4	88.0 97.1	9.1	0.91
110.0	108.0	17.5 18.1	98.0 107.3	9.3	0.93
120.0	118.0	18.5 19.0	108.0 117.4	9.4	0.94
130.0		19.3 19.4	118.0 127.5	9.5	0.95

## CONSOLIDATION DATA

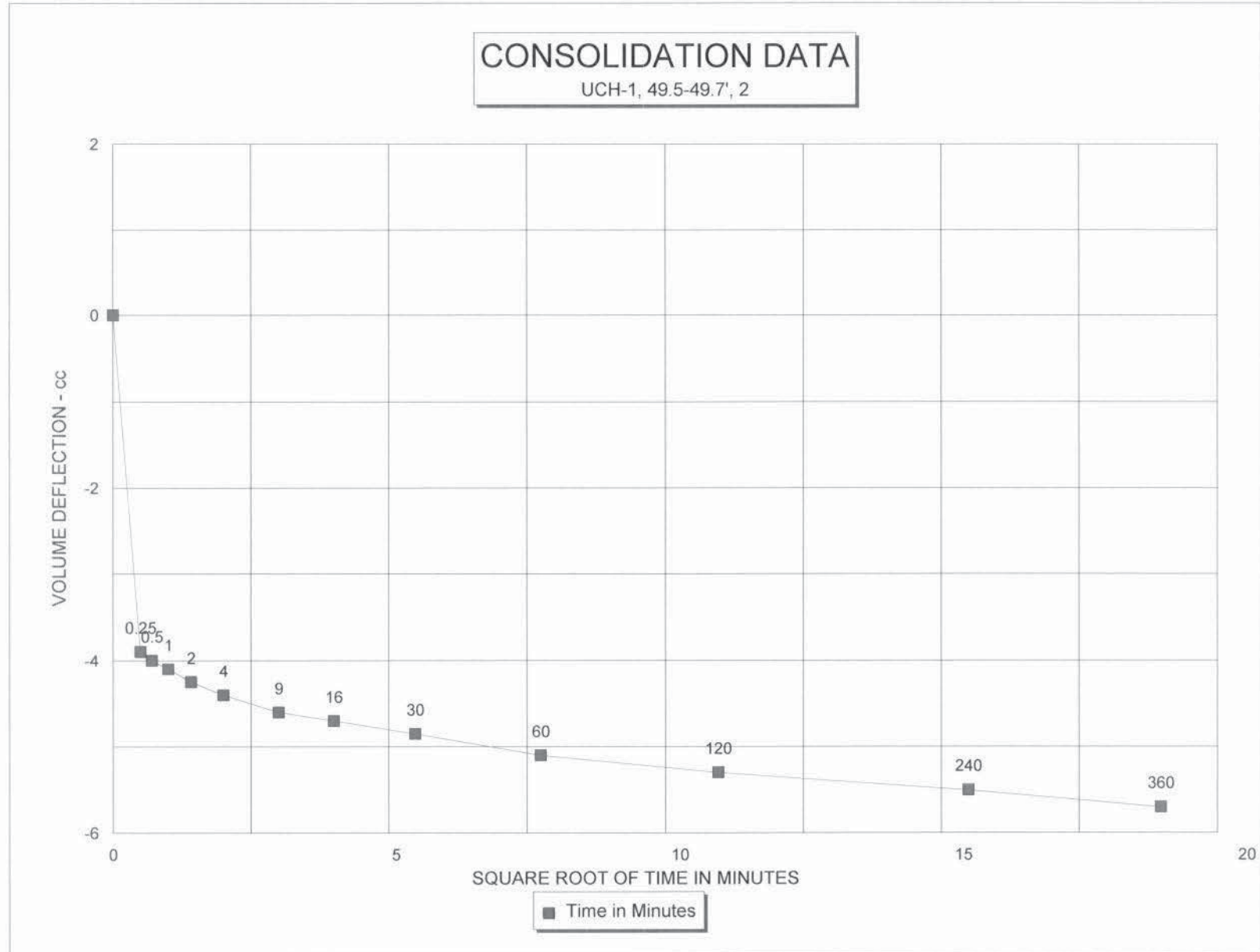
Elapsed Time (Min)	SQRT Time (Min)	Burette Reading (CC)	Volume Defl. (cc)
0.00	0.00	1.00	0.00
0.25	0.50	4.90	-3.90
0.5	0.71	5.00	-4.00
1	1.00	5.10	-4.10
2	1.41	5.25	-4.25
4	2.00	5.40	-4.40
9	3.00	5.60	-4.60
16	4.00	5.70	-4.70
30	5.48	5.85	-4.85
60	7.75	6.10	-5.10
120	10.95	6.30	-5.30
240	15.49	6.50	-5.50
360	18.97	6.70	-5.70

Initial Height (in)	3.502	Init. Vol. (CC)	369.51
Height Change (in)	0.003	Vol. Change (CC)	23.55
Ht. After Cons. (in)	3.499	Cell Exp. (CC)	21.00
Initial Area (sq in)	6.438	Net Change (CC)	2.55
Area After Cons. (sq in)	6.399	Cons. Vol. (CC)	366.96

Data entry by: DAW Date: 06/19/2012  
 Checked by: CAK Date: 6/19/12

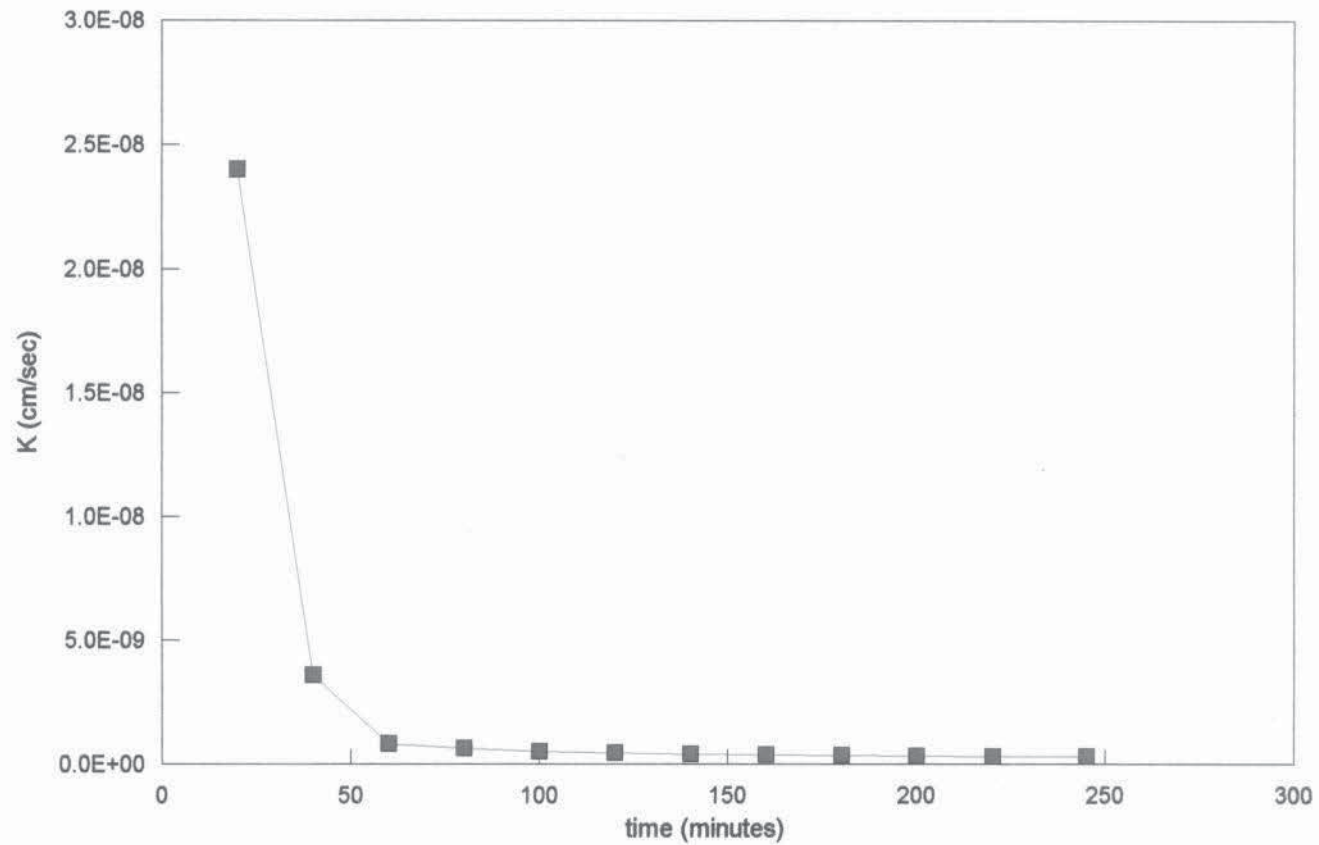






### Preliminary Flow Pump Data

BD GeoEnvironmental, UCH-01 #2 @ 49.5-49.7'



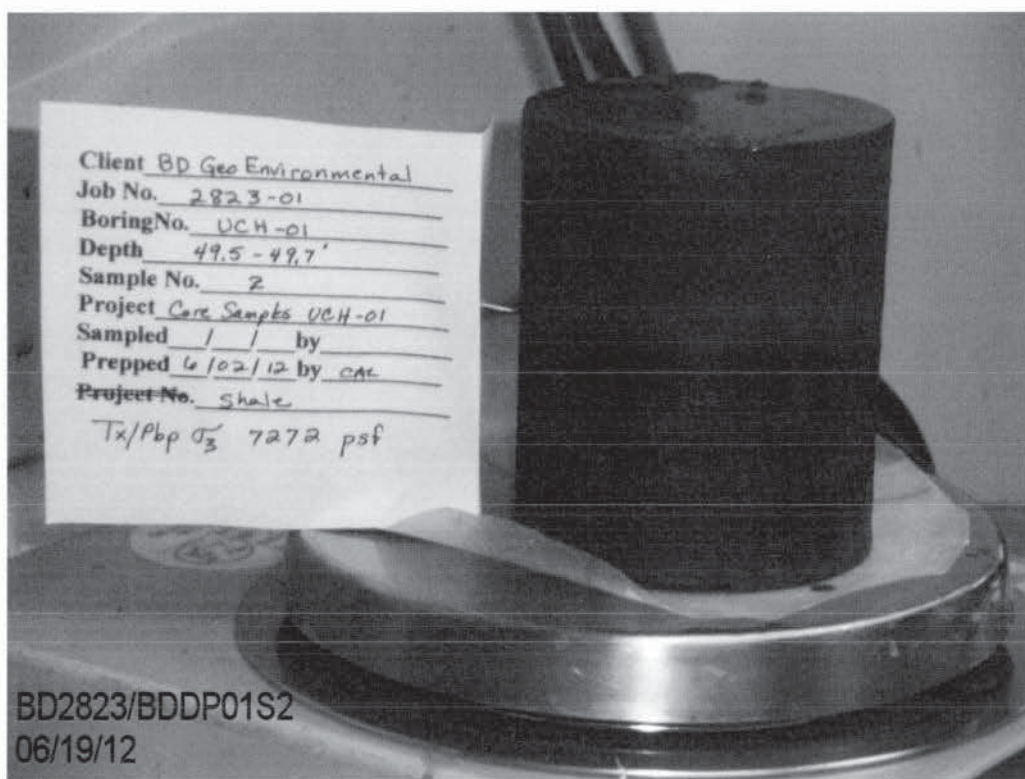
last value  
 $3.2 \times 10^{-10}$

Data Entered By:  
Data Checked By:  
File Name:

CAL  
*dpm*  
BDFP01S2

Date: 6/18/2012  
Date Checked 6/20/12





PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD  
ASTM D 5084

CLIENT BD GeoEnvironmental

JOB NO. 2823-01

BORING NO.	UCH-01	SAMPLED	
DEPTH	96.65-97.6'	TEST STARTED	06/02/12 CAL
SAMPLE NO.	3	TEST FINISHED	06/15/12 CAL
SOIL DESCR.		CELL NUMBER	1N
LOCATION	UCH-01 Core Samples	SATURATED TEST	Yes
CONF. PRES. PSF	14112	TEST TYPE	TX/Pbp/Tap Water

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	957.2	963.3
Wt. Wet Soil & Pan (g)	972.9	978.9
Wt. Dry Soil & Pan (g)	896.2	896.2
Wt. Lost Moisture (g)	76.8	82.8
Wt. of Pan Only (g)	15.7	15.7
Wt. of Dry Soil (g)	880.5	880.5
Moisture Content %	8.7	9.4
Wet Density PCF	145.3	145.9
Dry Density PCF	133.7	133.4

Init. Diameter (in)	2.873	(cm)	7.297
Init. Area (sq in)	6.483	(sq cm)	41.827
Init. Height (in)	3.871	(cm)	9.832
Vol. Bef. Consol. (cu ft)	0.01452		
Vol. After Consol. (cu ft)	0.01455		
Porosity %	20.08		

FLOW PUMP CALCULATIONS

Pump Setting	5
Velocity CM/Sec	3.29E-05
Q (cc/s)	1.05E-06
Height	3.877
Diameter	2.874
Pressure (psi)	10.240
Area after consol. (cm*cm)	41.848
Gradient	73.110
Permeability k (cm/s)	3.4E-10
Permeability k (m/s)	3.4E-12
Back Pressure (psi)	98.0
Cell Pressure (psi)	196.0
Ave. Effective Stress (psi)	92.880

Average temperature degree C: 22.5

NOTE: Flow pump transducer reach maximum 10 psi. Actual permeability is slower than equipment capacity.

Data entry by: DAW Date: 06/18/2012

Checked by: CH Date: 6/19/12

FileName: BDP001S3



## TRIAXIAL COMPRESSION TEST DATA

CLIENT BD GeoEnvironmental

JOB NO. 2823-01

BORING NO. UCH-01  
 DEPTH 96.65-97.6'  
 SAMPLE NO. 3

SOIL DESCR.  
 LOCATION UCH-01 Core Samples  
 CONF. PRES. PSF 14112

SAMPLED  
 TEST STARTED 06/02/12 CAL  
 TEST FINISHED 06/15/12 CAL  
 SETUP NO. 1N  
 SATURATED TEST Yes  
 TEST TYPE TX/Pbp/Tap Water

## SATURATION DATA

Cell Pres. (PSI)	Back Pres. (PSI)	Burette Reading (CC)	Pore Pressure (PSI)	Change	B
		Close Open	Close Open		
40.0	38.0	1.6 8.8			
50.0	48.0	9.3 10.2	38.3 46.0	7.7	0.77
60.0	58.0	10.3 11.0	48.5 56.9	8.4	0.84
70.0	68.0	11.0 11.7	58.3 66.9	8.6	0.86
80.0	78.0	11.9 12.6	68.0 77.3	9.3	0.93
90.0	88.0	12.7 13.4	77.9 87.1	9.2	0.92
100.0	98.0	13.5 14.1	88.1 97.2	9.1	0.91
110.0		14.3 14.3	97.8 107.4	9.6	0.96

## CONSOLIDATION DATA

Elapsed Time (Min)	SQRT Time (Min)	Burette Reading (CC)	Volume Defl. (cc)
0.00	0.00	0.30	0.00
0.25	0.50	6.90	-6.60
0.5	0.71	7.00	-6.70
1	1.00	7.10	-6.80
2	1.41	7.20	-6.90
4	2.00	7.30	-7.00
9	3.00	7.45	-7.15
16	4.00	7.50	-7.20
30	5.48	7.60	-7.30
60	7.75	7.75	-7.45
120	10.95	8.00	-7.70
240	15.49	8.20	-7.90
360	18.97	8.40	-8.10

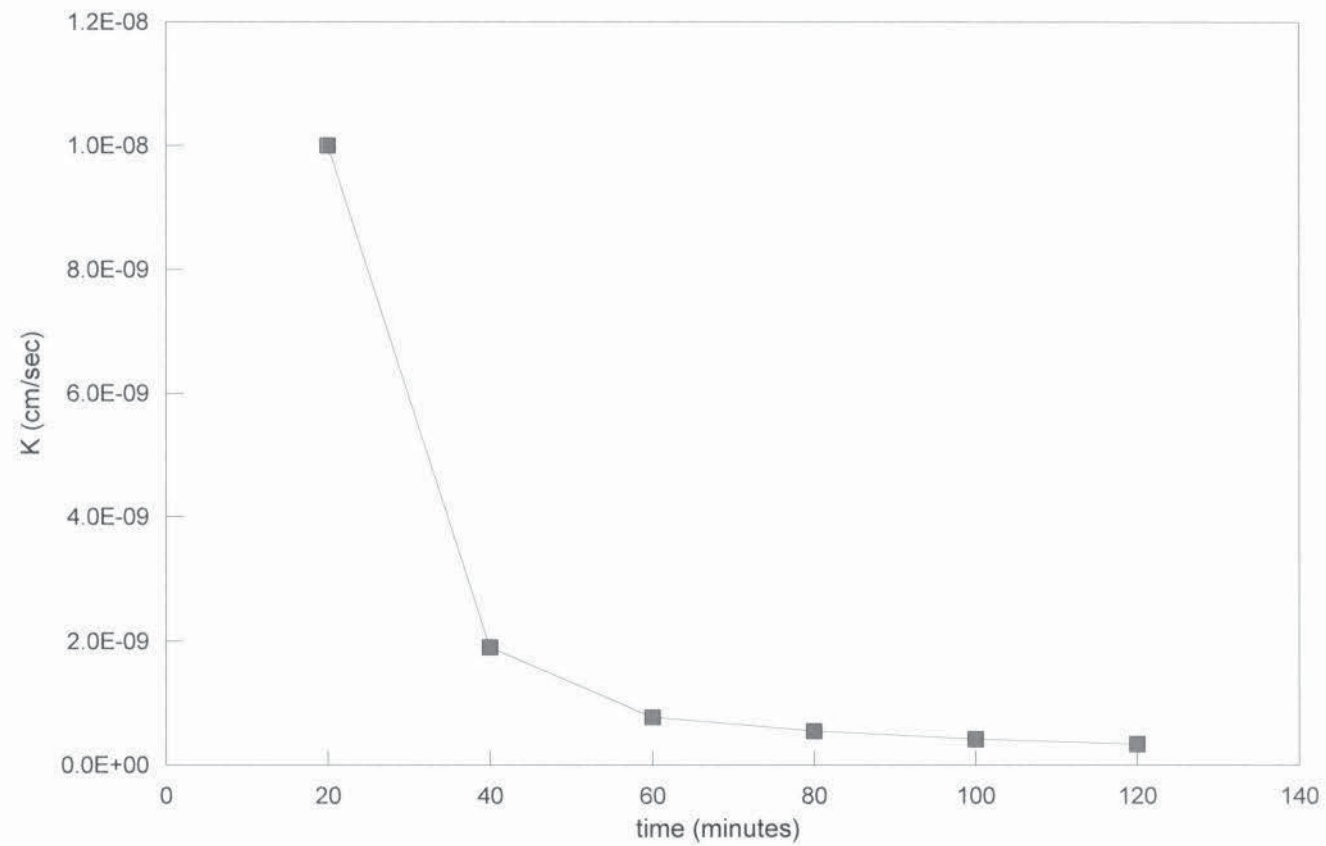
Initial Height (in)	3.871	Init. Vol. (CC)	411.30
Height Change (in)	-0.006	Vol. Change (CC)	21.70
Ht. After Cons. (in)	3.877	Cell Exp. (CC)	22.57
Initial Area (sq in)	6.483	Net Change (CC)	-0.87
Area After Cons. (sq in)	6.486	Cons. Vol. (CC)	412.18

Data entry by: DAW Date: 06/18/2012  
 Checked by: CA Date: 6/19/12



### Preliminary Flow Pump Data

BD GeoEnvironmental, UCH-01 #3 @ 96.65-97.6'



Last value  
3.4E-10

Data Entered By:  
Data Checked By:  
File Name:

CAL  
DAW  
BDFP01S3

Date: 6-15-2012  
Date Checked 6/19/12





