DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7-20-13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7 *

Casing Height above ground, Ft: 1.75 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z3 Test length: 7.5 Test Section Depth (from Datum): From 78.75 To 86.25 (Tol ± 0.5)

(A) Depth to Water Table From Datum, Ft: 9.51 Test Water Temp: — Baro Pressure, psi: 14.36

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 82.50

(C) Distance Water Table to Center of Test Interval Ft. 72.99 Static water pressure at center = (C*62.4/144) + Baro = 46

MAXIMUM TEST PRESSURE, Po = ((A+B*1) + C*0.57) [Po = 53] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 18 ; 2/3 Po= 35 ; 1/2 Po= 27 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z3 Sequence No. B Planned Center Pressure: 81

Transducer Readings Before Packers Inflated: Top 19.74 ; Middle 45.31 ; Bottom: 49.11

Transducer Readings After Packers Inflated: Top 19.80 ; Middle 48.59 ; Bottom: 44.48

MP-401 Z3 SEQUENCE B

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
08:28:30	18764	----	----	----	65.63	15	BEGIN INCREASE FLOW
08:29:00	18764	18764	0	0	72.42	25	
08:29:30	18764	18764	0	0	73.78	25	INCREASE FLOW
08:30:00	18764	18764	0	0	74.49	25	
08:30:30	18764	18764	0	0	78.68	30	
08:31:00	18764	18765	1	2	78.52	30	INCREASE FLOW
08:31:30	18765	18765	0	0	78.80	30	
08:32:00	18765	18765	0	0	84.03	35	
08:32:30	18765	18765	0	0	84.06	35	DECREASE FLOW
08:33:00	18765	18765	0	0	84.04	35	
08:33:30	18765	18765	0	0	81.14	32	
08:34:00	18765	18765	0	0	80.96	32	
08:34:30	18765	18765	0	0	81.11	32	
08:35:00	18765	18766	1	2	80.80	32	
08:35:30	18766	18766	0	0	80.62	31	
08:36:00	18766	18766	0	0	80.77	31	
08:36:30	18766	18766	0	0	80.62	31	
08:37:00	18766	18766	0	0	80.55	31	END

*From Preliminary Boring Layout Survey

08:37:55 BOTTOM TRANS = 43.93
08:38:23 TOP TRANS = ~~33.~~ 19.80

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

7-20-13

Form Rev 0 - Reviewed by SJZ 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7-20-13

Boring No MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7 *

Casing Height above ground, Ft: 1.75 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z3 Test length: 7.5 Test Section Depth (from Datum): From 78.75 To 86.25 (TOL ± 0.5)

(A) Depth to Water Table From Datum, Ft: 9.51 Test Water Temp: — Baro Pressure, psi: 14.36

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 82.50

(C) Distance Water Table to Center of Test Interval Ft. 72.99 Static water pressure at center = (C*62.4/144) + Baro = 46

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 53] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 18 ; 2/3 Po= 35 ; 1/2 Po= 27 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z3 Sequence No. C Planned Center Pressure: 99

Transducer Readings Before Packers Inflated: Top 19.74 ; Middle 45.31 ; Bottom: 49.11

Transducer Readings After Packers Inflated: Top 19.80 ; Middle 48.59 ; Bottom: 44.48

MP-401 Z3 SEQUENCE C

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
08:41:30	18766	----	----	---	80.42	31	BEGIN INCREASE FLOW
08:42:00	18766	18 766	0	0	83.33	40	
08:42:30	18766	18 766	0	0	89.44	40	
08:43:00	18766	18 766	0	0	89.15	40	INCREASE FLOW
08:43:30	18766	18 766	0	0	89.11	40	
08:44:00	18766	18 766	0	0	95.26	47	
08:44:30	18766	18 766	0	0	96.41	46	INCREASE FLOW
08:45:00	18766	18 766	0	0	96.68	46	
08:45:30	18766	18 766	0	0	98.97	49	
08:46:00	18766	18 766	0	0	98.64	49	
08:46:30	18766	18 766	0	0	98.64	49	
08:47:00	18766	18 766	0	0	98.34	49	
08:47:30	18766	18 766	0	0	98.71	49	
08:48:00	18766	18 766	0	0	98.54	49	
08:48:30	18766	18 766	0	0	98.64	49	END
				08:49:30	BOTTOM	TRANS	43.79
				08:50:00	TOP	TRANS	19.81

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SJL 12/12/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7-20-13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7*

Casing Height above ground, Ft: 1.75 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z3 Test length: 7.5 Test Section Depth (from Datum): From 78.75 To 86.25 (Tol ± 0.5)

(A) Depth to Water Table From Datum, Ft: 9.51 Test Water Temp: — Baro Pressure, psi: 14.36

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 82.50

(C) Distance Water Table to Center of Test Interval Ft. 72.99 Static water pressure at center = (C*62.4/144) + Baro = 46

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 53] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 18 ; 2/3 Po= 35 ; 1/2 Po= 27 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z3 Sequence No. D Planned Center Pressure: 73

Transducer Readings Before Packers Inflated: Top 19.74 ; Middle 45.31 ; Bottom: 49.11

Transducer Readings After Packers Inflated: Top 19.80 ; Middle 48.59 ; Bottom: 44.48

MP-401 Z3 SEQUENCE D

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
08:51:30	18765	----	----	----	97.91	49	BEGIN DECREASE FLOW
08:52:00	18765	18765	0	0	87.03	34	
08:52:30	18765	18765	0	0	84.19	34	
08:53:00	18765	X	No READING			Ok. 7-20-13	
08:53:30	18765	18765	0	0	84.27	34	
08:54:00	18765	18765	0	0	83.99	34	
08:54:30	18765	18765	0	0	78.42	27	
08:55:00	18765	18765	0	0	78.42	27	DECREASE FLOW.
08:55:30	18765	18765	0	0	78.23	27	
08:56:00	18765	18765	0	0	74.85	25	
08:56:30	18765	18765	0	0	75.08	25	
08:57:00	18765	18765	0	0	75.05	25	
08:57:30	18765	18765	0	0	74.87	25	
08:58:00	18765	18765	0	0	74.86	25	
08:58:30	18765	18765	0	0	75.01	25	
08:59:00	18765	18765	0	0	74.77	25	
08:59:30	18765	18765	0	0	74.60	25	
09:00:00	18765	18765	0	0	75.06	25	END

*From Preliminary Boring Layout Survey

09:01:00 BOTTOM TRANS = 43.66
09:01:30 TOP = 19.81

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7-20-13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7*

Casing Height above ground, Ft: 1.75 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z3 Test length: 7.5 Test Section Depth (from Datum): From 78.75 To 86.25 (Tol ± 0.5)

(A) Depth to Water Table From Datum, Ft: 9.51 Test Water Temp: ~ Baro Pressure, psi: 14.36

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 82.50

(C) Distance Water Table to Center of Test Interval Ft. 72.99 Static water pressure at center = (C*62.4/144) + Baro = 46

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 53] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 18 ; 2/3 Po= 35 ; 1/2 Po= 27 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z3 Sequence No. E Planned Center Pressure: 99

Transducer Readings Before Packers Inflated: Top 19.74 ; Middle 45.31 ; Bottom: 49.11

Transducer Readings After Packers Inflated: Top 19.80 ; Middle 48.59 ; Bottom: 44.48

MP-401 Z3 SEQUENCE E

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
09:03:00	18765	----	----		74.39	25	BEGIN INCREASE FLOW
09:03:30	18765	18765	0	0	83.68	35	
09:04:00	18765	18765	0	0	84.56	35	
09:04:30	18765	18765	0	0	84.98	35	INCREASE FLOW
09:05:00	18765	18765	0	0	93.28	44	
09:05:30	18765	18765	0	0	93.77	44	INCREASE FLOW
09:06:00	18765	18765	0	0	94.02	44	
09:06:30	18765	18764	0-1	0-2	97.10	47	SS 7-20-13
09:07:00	18764	18764	0	0	97.04	47	INCREASE FLOW
09:07:30	18764	18764	0	0	95.42	47	
09:08:00	18764	18764	0	0	98.67	49	
09:08:30	18764	18764	0	0	99.09	49	
09:09:00	18764	18764	0	0	99.15	49	
09:09:30	18764	18764	0	0	99.24	49	
09:10:00	18764	18764	0	0	99.00	49	
09:10:30	18764	18764	0	0	98.61	49	
09:11:00	18764	18764	0	0	98.65	49	
09:11:30	18764	18764	0	0	98.66	49	

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SSR 12/17/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7-20-13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7 *

Casing Height above ground, Ft: 1.75 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z3 Test length: 7.5 Test Section Depth (from Datum): From 78.75 To 86.25 (TOL ± 0.5)

(A) Depth to Water Table From Datum, Ft: 9.51 Test Water Temp: — Baro Pressure, psi: 14.36

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 82.50

(C) Distance Water Table to Center of Test Interval Ft. 72.99 Static water pressure at center = (C*62.4/144) + Baro = 46

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 53] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 18 ; 2/3 Po= 35 ; 1/2 Po= 27 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z3 Sequence No. E Planned Center Pressure: 99

Transducer Readings Before Packers Inflated: Top 19.74 ; Middle 45.31 ; Bottom: 49.11

Transducer Readings After Packers Inflated: Top 19.80 ; Middle 48.59 ; Bottom: 44.48

MP-401 Z3 SEQUENCE E (CONT'D)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
09:12:00	18764	18 764	0	0	98.64	49	
09:12:30	18 764	18 764	0	0	98.90	49	
09:13:00	18 764	18 764	0	0	98.91	49	END
				09:13:45	Bottom	TRANS =	43.55
				09:14:30	Top	TRANS =	19.82

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

This Sheet applies to all zone 3 tests

SJL 12/13/13

BORING: MP-401

DATE: 7-~~19~~ 28-13 GJG. 7-20-13

DATA COLLECTED BY: TOM McGILL / JIM GODDARD

SHUT-IN TEST PRESSURE: N/A psi

SJL 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi
	NOT USED	
	GJG. 7-19-13	

GJG. 7-20-13

EQUIPMENT USED

Transducers: Mini Trol Serial Numbers: 335896 (6-12-13) 142142 (6-20-13)
315381 (6-20-13) 1414

Surface Pressure Gage: MW-3, MW-4, MW-5 (6-11-13)
NITROGEN MW-1, MW-2 (6-11-13)

Barometric Probe: 121315 (6-12-13)

THERMOMETER LT28 (5-1-13)

Flow Meter: 8824788 (FIELD 7-8-13)

Stop Watch: L286 (6-10-13)

Date of Calibration: IN PARENTHESIS

Calibration due: POST TESTING

FILES:

MP-401	Z3	(B)	2013-07-20	09,20,44	WSL
MP-401	Z3	(B)	2013-07-20	09,20,44	EXCEL
MP-401	Z3	(T)	2013-07-20	09,16,12	WSL
MP-401	Z3	(T)	2013-07-20	09,16,12	EXCEL
MP-401	Z3	(M)	2013-07-20	09,17,38	WSL
MP-401	Z3	(M)	2013-07-20	09,17,38	EXCEL
MP-401	Z3	(L)	2013-07-20	09,19,09	WSL
MP-401	Z3	(L)	2013-07-20	09,19,09	EXCEL

Packer Test Worksheet

Clinch River SMR Project
AMEC Project No. 6468 13 1072

Test Date	7/19/2013
Prepared By	J. Goddard
Checked By	TJA

Boring Number	MP 401
Zone No.	4
Assigned Interval Top (ft-bgs)	237.00
Assigned Interval Bottom (ft-bgs)	244.50
Center of test interval (ft-bgs)	240.75
Height of Casing (ft ags)	1.75
Depth to water (ft below TOC)	9.05
Depth to Water (Ft- bgs)	7.30
Baro Pressure (psi)	14.37
A= Depth to Water Table (ft)	9.05
B=Surface Gage Height (ft)	1.50
C= Height of water above center of test interval (ft)	233.45
Static Water Pressure @ center of Interval (psi)	116
Max Test Pressure (Po) (psi)	144
1/3 Po (psi)	48
2/3 Po (psi)	96
1/2 Po (psi)	72

	Center Test Pressures (psi)	Inflation Pressure (psi)
Sequence A 1/3	164	214
Sequence B 2/3	212	262
Sequence C 1.0	260	310
Sequence D 1/2	188	238
Sequence E 1.0	260	310

Pipe Check (Estimate Only for Field Guidance))

Length of Packer Assembly	13.29
Average Length of Pipe Section	21.12
Length of pipe to TOC	232.96
Number of Pipe Sections	11.03
length of stickup above TOC (ft)	20.48

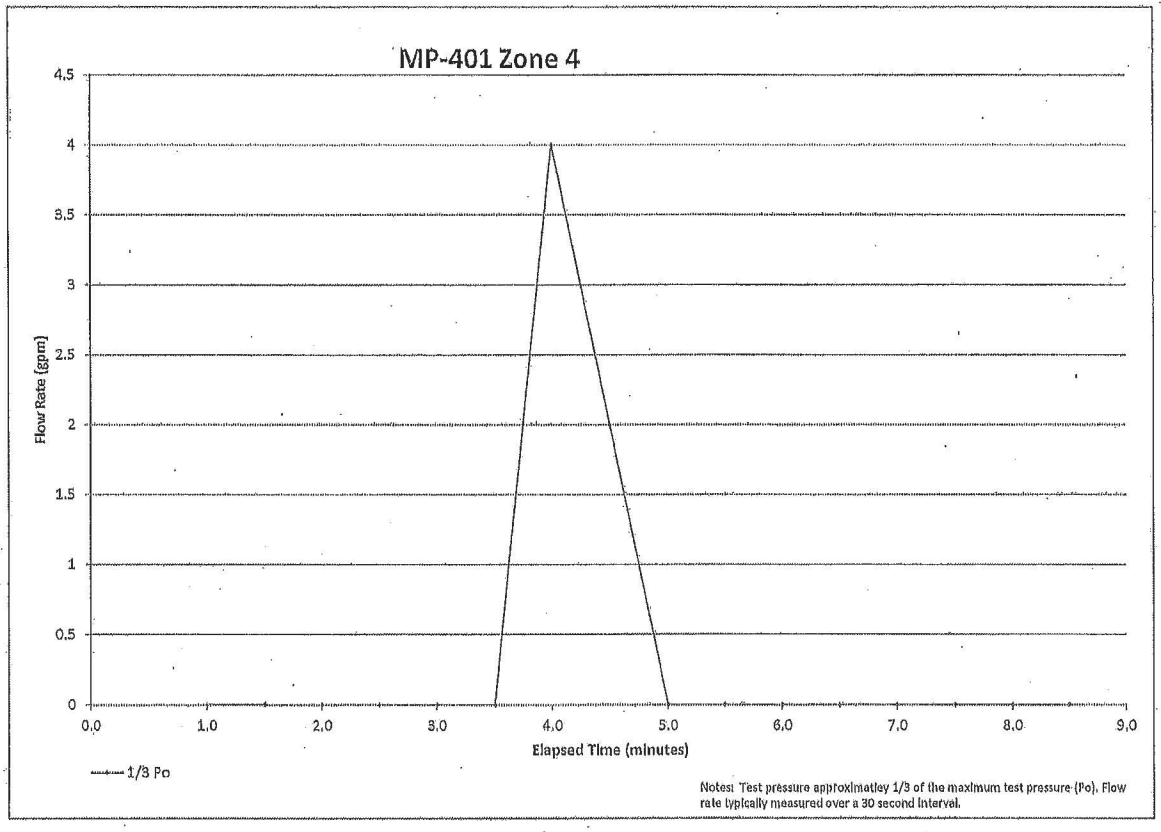
Clinch River SMR Project
Double Packer Borehole Permeability Test Data Sheet
AMEC Environment & Infrastructure, Inc.
AMEC Project # 6468-13-1072

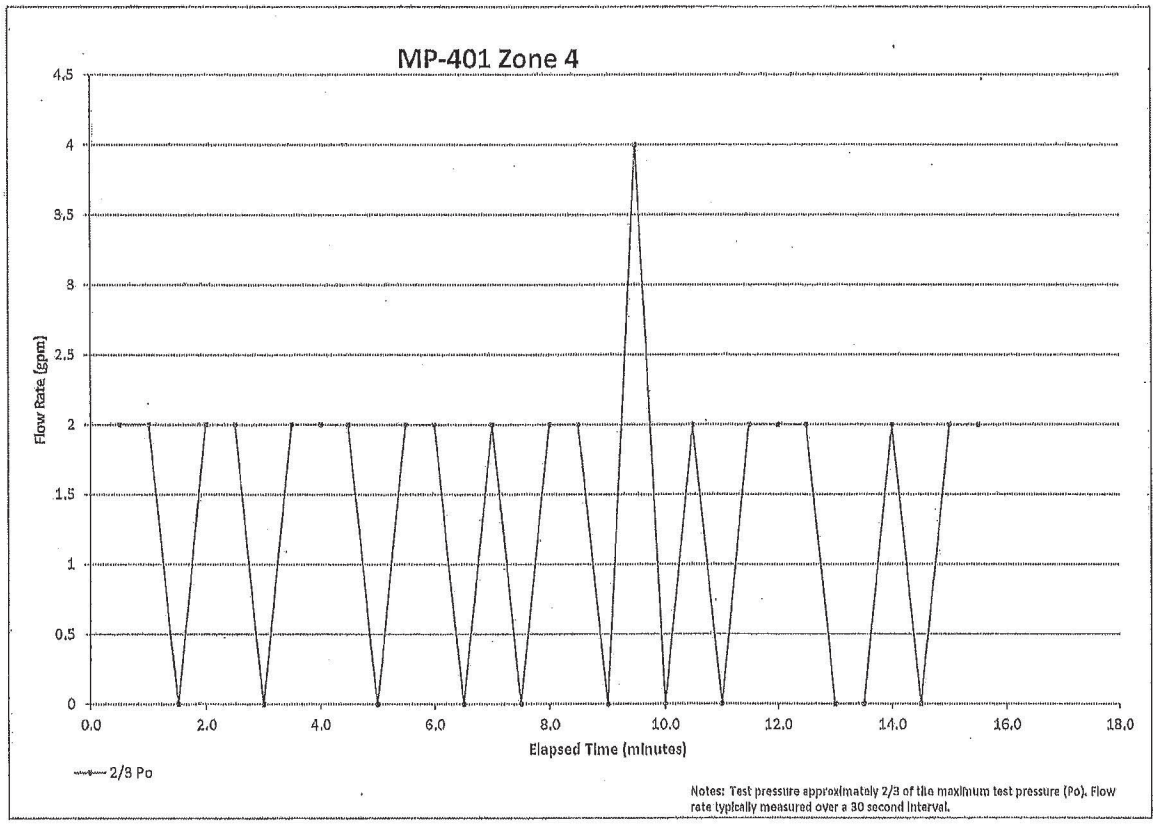
Prepared by: CDT Date: 4-8-14
Checked by: JCL Date: 4-8-14

Boring: MP-401
Zone: Z4 ***237.0 feet to 244.5 feet below ground surface***
Transducer Location: Middle

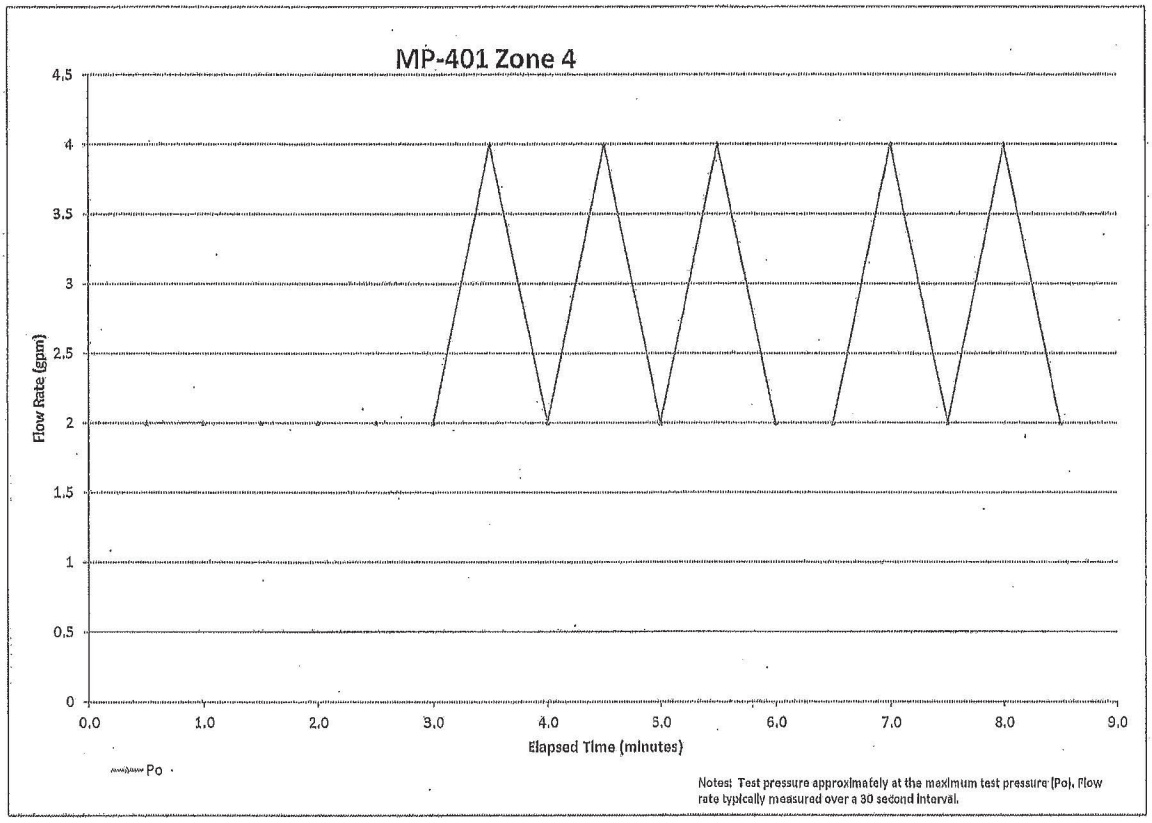
Sequence A (1/3 Po)				Sequence B (2/3 Po)				Sequence C (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
15:18:00	0.0	no reading		15:29:30	0.0	165.83		15:47:30	0.0	***214.07***	
15:18:30	0.5	no reading		15:30:00	0.5	175.33	2	15:48:00	0.5	214.11	2
15:19:00	1.0	113.69	0	15:30:30	1.0	181.52	2	15:48:30	1.0	235.95	2
15:19:30	1.5	113.62	0	15:31:00	1.5	189.92	0	15:49:00	1.5	***236.60***	2
15:20:00	2.0	113.49	0	15:31:30	2.0	190.74	2	15:49:30	2.0	235.88	2
15:20:30	2.5	123.38	0	15:32:00	2.5	196.04	2	15:50:00	2.5	252.39	2
15:21:00	3.0	124.18	0	15:32:30	3.0	201.33	0	15:50:30	3.0	251.18	2
15:21:30	3.5	135.08	0	15:33:00	3.5	201.47	2	15:51:00	3.5	254.99	4
15:22:00	4.0	141.14	4	15:33:30	4.0	212.27	2	15:51:30	4.0	256.63	2
15:22:30	4.5	157.25	2	15:34:00	4.5	212.79	2	15:52:00	4.5	262.95	4
15:23:00	5.0	162.10	0	15:34:30	5.0	213.01	0	15:52:30	5.0	265.78	2
15:23:30	5.5	165.15	0	15:35:00	5.5	214.14	2	15:53:00	5.5	262.84	4
15:24:00	6.0	165.10	0	15:35:30	6.0	208.50	2	15:53:30	6.0	262.45	2
15:24:30	6.5	165.25	0	15:36:00	6.5	207.98	0	15:54:00	6.5	262.80	2
15:25:00	7.0	165.33	0	15:36:30	7.0	206.74	2	15:54:30	7.0	262.04	4
15:25:30	7.5	165.69	0	15:37:00	7.5	209.74	0	15:55:00	7.5	***261.03***	2
15:26:00	8.0	165.28	0	15:37:30	8.0	209.50	2	15:55:30	8.0	261.46	4
15:26:30	8.5	165.35	0	15:38:00	8.5	211.21	2	15:56:00	8.5	261.76	2
				15:38:30	9.0	211.12	0				
				15:39:00	9.5	210.95	4				
				15:39:30	10.0	211.52	0				
				15:40:00	10.5	211.18	2				
				15:40:30	11.0	211.10	0				
				15:41:00	11.5	210.02	2				
				15:41:30	12.0	211.22	2				
				15:42:00	12.5	214.78	2				
				15:42:30	13.0	215.02	0				
				15:43:00	13.5	214.95	0				
				15:43:30	14.0	214.54	2				
				15:44:00	14.5	214.73	0				
				15:44:30	15.0	214.97	2				
				15:45:00	15.5	214.98	2				

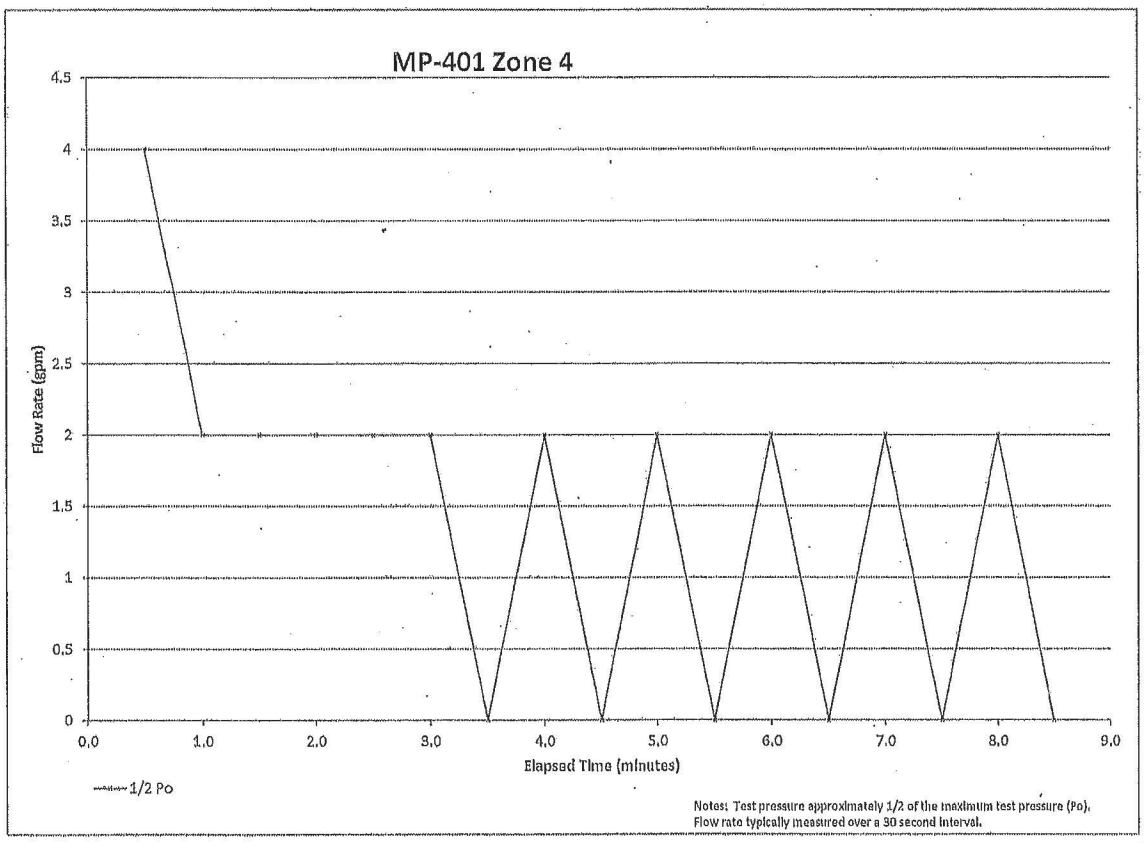
Sequence D (1/2 Po)				Sequence E (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
15:59:00	0.0	260.35		16:10:30	0.0	190.26	
15:59:30	0.5	245.77	4	16:11:00	0.5	190.20	0
16:00:00	1.0	248.40	2	16:11:30	1.0	200.20	2
16:00:30	1.5	249.17	2	16:12:00	1.5	200.74	0
16:01:00	2.0	242.61	2	16:12:30	2.0	209.20	2
16:01:30	2.5	244.22	2	16:13:00	2.5	212.05	2
16:02:00	3.0	212.94	2	16:13:30	3.0	213.82	2
16:02:30	3.5	213.16	0	16:14:00	3.5	222.85	0
16:03:00	4.0	203.01	2	16:14:30	4.0	232.39	4
16:03:30	4.5	201.38	0	16:15:00	4.5	231.41	2
16:04:00	5.0	201.89	2	16:15:30	5.0	232.43	4
16:04:30	5.5	190.86	0	16:16:00	5.5	***241.16***	2
16:05:00	6.0	190.60	2	16:16:30	6.0	248.87	2
16:05:30	6.5	190.42	0	16:17:00	6.5	258.93	4
16:06:00	7.0	190.90	2	16:17:30	7.0	251.60	2
16:06:30	7.5	190.77	0	16:18:00	7.5	251.13	2
16:07:00	8.0	190.45	2	16:18:30	8.0	253.88	4
16:07:30	8.5	190.73	0	16:19:00	8.5	253.22	2
				16:19:30	9.0	252.88	2
				16:20:00	9.5	257.43	2
				16:20:30	10.0	256.30	4
				16:21:00	10.5	255.07	4
				16:21:30	11.0	255.75	6
				16:22:00	11.5	254.95	4
				16:22:30	12.0	262.45	2
				16:23:00	12.5	261.09	0
				16:23:30	13.0	260.30	4
				16:24:00	13.5	259.91	4
				16:24:30	14.0	259.39	4
				16:25:00	14.5	258.55	4
				16:25:30	15.0	258.41	6
				16:26:00	15.5	257.46	4
				16:26:30	16.0	257.27	2



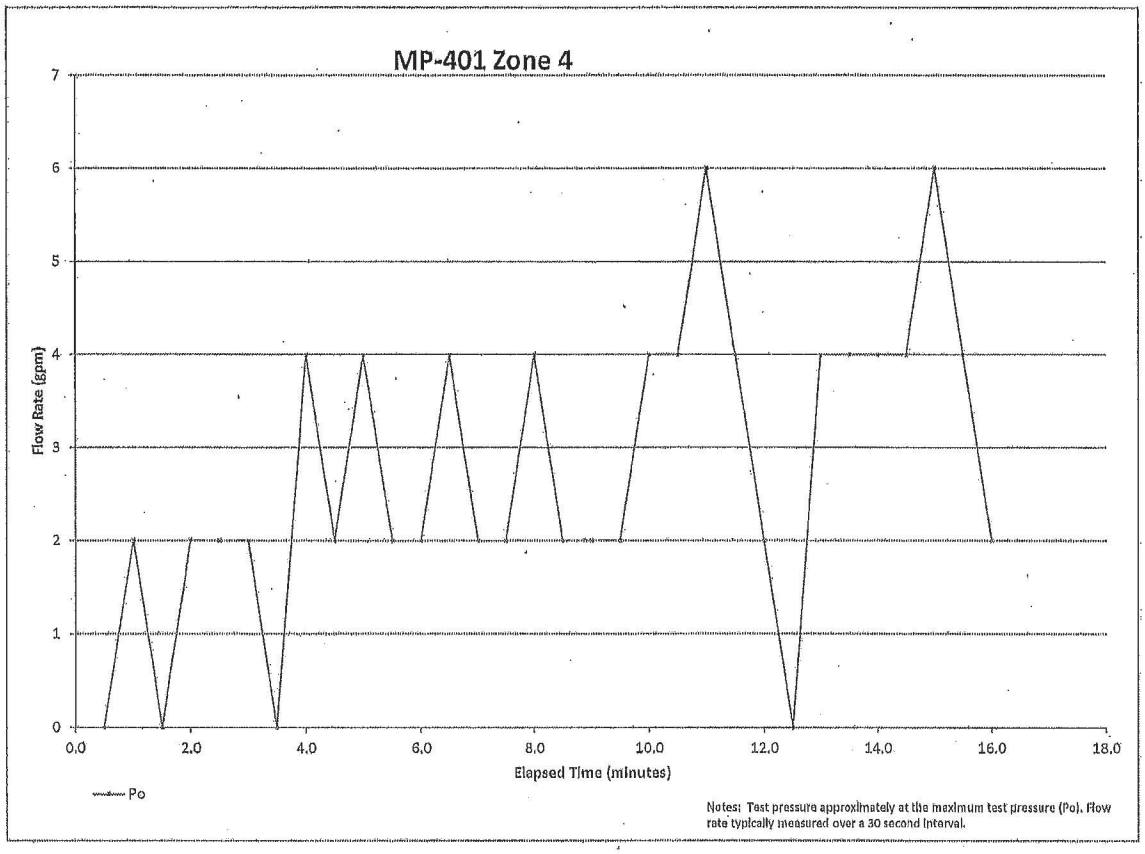


Prepared by/Date: KHL 1/4/14
Checked by/Date: JDJ 1/4/14





Prepared by/Date: KHL 1/4/14
Checked by/Date: JRJ 1/12/14



Prepared by/Date: KAL 1/4/14
Checked by/Date: JCJ 1/12/14

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7- -13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7 *

Casing Height above ground, Ft: 1.75 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z4 Test length: 7.5 Test Section Depth (from Datum): From 238.75 To 246.25

(A) Depth to Water Table From Datum, Ft: 9.05 Test Water Temp: 78°F WELL 59°F Baro Pressure, psi: 14.37

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 242.50

(C) Distance Water Table to Center of Test Interval Ft. 233.45 Static water pressure at center = (C*62.4/144) + Baro = 11.6

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 144] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Sequence ID: A B C D E

Po Values: 1/3 Po = 48 ; 2/3 Po= 96 ; 1/2 Po= 72 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z4 Sequence No. A Planned Center Pressure: 164

Transducer Readings Before Packers Inflated: Top 27.69 ; Middle 112.55 ; Bottom: 116.36

Transducer Readings After Packers Inflated: Top 27.70 ; Middle 114.76 ; Bottom: 113.57

MP-401 Z4 SEQUENCE A

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
15:18:00	18637	----	----	----		0	BEGIN
15:18:30	18637						
15:19:00	18637	18637	0	0	113.69	0	BEGIN INCREASE FLOW
15:19:30	18637	18637	0	0	113.62	0	
15:20:00	18637	18637	0	0	113.49	7	
15:20:30	18637	18637	0	0	123.38	7	INCREASE FLOW
15:21:00	18637	18637	0	0	124.18	7	
15:21:30	18637	18637	0	0	135.08	20	INCREASE FLOW
15:22:00	18637	18639	2	4	141.14	40	
15:22:30	18639	18640	1	2	157.25	40	INCREASE FLOW
15:23:00	18640	18640	0	0	162.10	48	
15:23:30	18640	18640	0	0	165.15	48	
15:24:00	18640	18640	0	0	165.10	48	
15:24:30	18640	18640	0	0	165.25	48	
15:25:00	18640	18640	0	0	165.33	48	
15:25:30	18640	18640	0	0	165.69	48	
15:26:00	18640	18640	0	0	165.28	48	
15:26:30	18640	18640	0	0	165.35	48	END

No Readings

*From Preliminary Boring Layout Survey

15:27:20 Bottom Trans = 111.78
15:28:00 Top Trans = 27.73

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by _____

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7- -13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7 *

Casing Height above ground, Ft: 1.75 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z4 Test length: 7.5 Test Section Depth (from Datum): From 238.75 To 246.25

(A) Depth to Water Table From Datum, Ft: 9.05 Test Water Temp: 78°F WELL 59°F Baro Pressure, psi: 14.37

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 242.50

(C) Distance Water Table to Center of Test Interval Ft. 233.45 Static water pressure at center = (C*62.4/144) + Baro = 116

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 144] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 48 ; 2/3 Po= 96 ; 1/2 Po= 72 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z4 Sequence No. B Planned Center Pressure: 212

Transducer Readings Before Packers Inflated: Top 27.69 ; Middle 112.55 ; Bottom: 116.36

Transducer Readings After Packers Inflated: Top 27.70 ; Middle 114.76 ; Bottom: 113.57

MP-401 Z4 SEQUENCE B

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
15:29:30	18640	----	----	---	165.83	48	BEGIN INCREASE FLOW
15:30:00	18640	18641	1	2	175.33	65	
15:30:30	18641	18642	1	2	181.52	65	INCREASE FLOW
15:31:00	18642	18642	0	0	189.92	75	
15:31:30	18642	18643	1	2	190.74	75	INCREASE FLOW
15:32:00	18643	18644	1	2	196.04	85	
15:32:30	18644	18644	0	0	201.33	85	INCREASE FLOW
15:33:00	18644	18645	1	2	201.47	85	
15:33:30	18645	18646	1	2	212.27	95	
15:34:00	18646	18647	1	2	212.79	95	
15:34:30	18647	18647	0	0	213.01	95	
15:35:00	18647	18648	1	2	214.14	95	DECREASE FLOW
15:35:30	18648	18649	1	2	208.50	93	INCREASE FLOW
15:36:00	18649	18649	0	0	207.98	93	
15:36:30	18649 ~~649~~	18650	1	2	206.74	94	
15:37:00	18650	18650	0	0	209.74	94	INCREASE FLOW
15:37:30	18650	18651	1	2	209.50	94	
15:38:00	18651	18652	1	2	211.21	95	

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by _____

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7- -13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7*

Casing Height above ground, Ft: 1.75 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z4 SJR 12/13/13 Test length: 7.5 Test Section Depth (from Datum): From 238.75 To 246.25

(A) Depth to Water Table From Datum, Ft: 9.05 Test Water Temp: 78°F Well 59°F Baro Pressure, psi: 14.37

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 242.50

(C) Distance Water Table to Center of Test Interval Ft. 233.45 Static water pressure at center = (C*62.4/144) + Baro = 116

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 144] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Sequence ID: A B C D E

Po Values: 1/3 Po = 48 ; 2/3 Po= 96 ; 1/2 Po= 72 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z4 SJR 12/13/13 Sequence No. B Planned Center Pressure: 212

Transducer Readings Before Packers Inflated: Top 27.69 ; Middle 112.55 ; Bottom: 116.36

Transducer Readings After Packers Inflated: Top 27.70 ; Middle 114.76 ; Bottom: 113.57

MP-401 Z4 SJR 12/13/13 SEQUENCE B (CONT'D)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
15:38:30	18652	18652	0	0	211.12	95	
15:39:00	18652	18654	2	4	210.95	95	
15:39:30	18654	18654	0	0	211.52	95	
15:40:00	18654	18655	1	2	211.18	95	
15:40:30	18655	18655	0	0	211.10	95	
15:41:00	18655	18656	1	2	210.02	95	INCREASE FLOW
15:41:30	18656	18657	1	2	211.22 ~~211.22~~	98	
15:42:00	18657	18658	1	2	214.78	98	
15:42:30	18658	18658	0	0	215.02	98	
15:43:00	18658	18658	0	0	214.95	98	SJR 7-19-13 ~~INCREASE FLOW~~
15:43:30	18658	18659	1	2	214.54	99	
15:44:00	18659	18659	0	0	214.73	99	
15:44:30	18659	18660	1	2	214.97	99	
15:45:00	18660	18661	1	2	214.98	99	END
				15:45:45	BOTTOM	TRANS =	111.80
				15:46:20	TOP	TRANS =	27.76

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SJR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7- -13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7*

Casing Height above ground, Ft: 1.75 SJC 12/13/13 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z4 Test length: 7.5 Test Section Depth (from Datum): From 238.75 To 246.25

(A) Depth to Water Table From Datum, Ft: 9.05 Test Water Temp: 78°F WELL 59°F Baro Pressure, psi: 14.37

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 242.50

(C) Distance Water Table to Center of Test Interval Ft. 233.45 Static water pressure at center = (C*62.4/144) + Baro = 116

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 144] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 48 ; 2/3 Po = 96 ; 1/2 Po = 72 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z4 12/13/13 Sequence No. C Planned Center Pressure: 260

Transducer Readings Before Packers Inflated: Top 27.69 ; Middle 112.55 ; Bottom: 116.36

Transducer Readings After Packers Inflated: Top 27.70 ; Middle 114.76 ; Bottom: 113.57

MP-401 Z4 SJC 12/13/13 SEQUENCE C

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
15:47:30	18664	----	----	----	214.07	99	BEGIN INCREASE FLOW
15:48:00	18664	18665	1	2	214.11	99	
15:48:30	18665	18666	1	2	235.95	120	
15:49:00	18666	18667	1	2	236.60	120	INCREASE FLOW
15:49:30	18667	18668	1	2	236.88	120	INCREASE FLOW
15:50:00	18668	18669	1	2	252.39	135	
15:50:30	18669	18670	1	2	251.18	135	INCREASE FLOW
15:51:00	18670	18672	2	4	254.99	140	
15:51:30	18672	18673	1	2	256.63	140	INCREASE FLOW
15:52:00	181673	18675	2	4	262.95	145	
15:52:30	181675	18676	1	2	265.78	145	
15:53:00	18676	18678	2	4	262.84	145	
15:53:30	18678	18679	1	2	262.45	145	
15:54:00	18679	18680	1	2	262.80	145	
15:54:30	18680	18682	2	4	262.04	145	
15:55:00	18682	18683	1	2	261.03	145	
15:55:30	18683	18685	2	4	261.46	145	
15:56:00	18685	18686	1	2	261.76	145	END

*From Preliminary Boring Layout Survey

15:56:50 BOTTOM TRANS = 113.95
15:57:30 TOP TRANS = 27.79

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SJC 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7- -13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7*

Casing Height above ground, Ft: 1.75 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z4 SR 12/13/13 Test length: 7.5 Test Section Depth (from Datum): From 238.75 To 246.25

(A) Depth to Water Table From Datum, Ft: 9.05 Test Water Temp: 78°F WELL 59°F Baro Pressure, psi: 14.37

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 242.50

(C) Distance Water Table to Center of Test Interval Ft. 233.45 Static water pressure at center = (C*62.4/144) + Baro = 116

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 144] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 48 ; 2/3 Po= 96 ; 1/2 Po= 72 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z4 12/13/13 Sequence No. D Planned Center Pressure: 188

Transducer Readings Before Packers Inflated: Top 27.69 ; Middle 112.55 ; Bottom: 116.36

Transducer Readings After Packers Inflated: Top 27.70 ; Middle 114.76 ; Bottom: 113.57

MP-401 Z4 12/13/13 SEQUENCE D

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
15:59:00	18695	----	----	----	260.35	142	BEGIN DECREASE FLOW
15:59:30	18695	18697	2	4	245.77	129	
16:00:00	18697	18698	1	2	248.40	130	DECREASE FLOW
16:00:30	18698	18699	1	2	249.17	130	
16:01:00	18699	18700	1	2	242.61	125	DECREASE FLOW
16:01:30	18700	18701	1	2	244.22	125	
16:02:00	18701	18702	1	2	212.94	95	
16:02:30	18702	18702	0	0	213.16	95	DECREASE FLOW.
16:03:00	18702	18703	1	2	203.01	83	
16:03:30	18703	18703	0	0	201.38	83	DECREASE FLOW
16:04:00	18703	18704	1	2	201.89	72	
16:04:30	18704	18704	0	0	190.86	72	
16:05:00	18704	18705	1	2	190.60	72	
16:05:30	18705	18705	0	0	190.42	72	
16:06:00	18705	18706	1	2	190.90	72	
16:06:30	18706	18706	0	0	190.77	72	
16:07:00	18706	18707	1	2	190.45	72	
16:07:30	18707	18707	0	0	190.73	72	END

Qbs. 7-19-13

*From Preliminary Boring Layout Survey

16:08:15 BOTTOM TRANS = 112.22
16:08:50 TOP TRANS 27.77

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7- -13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7*

Casing Height above ground, Ft: 1.75 SJC 12/13/13 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z4 Test length: 7.5 Test Section Depth (from Datum): From 238.75 To 246.25

(A) Depth to Water Table From Datum, Ft: 9.05 Test Water Temp: 78°F WELL 59°F Baro Pressure, psi: 14.37

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 242.50

(C) Distance Water Table to Center of Test Interval Ft. 233.45 Static water pressure at center = (C*62.4/144) + Baro = 116

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 144] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 48 ; 2/3 Po = 96 ; 1/2 Po = 72 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z4 SJC 12/13/13 Sequence No. E Planned Center Pressure: 260

Transducer Readings Before Packers Inflated: Top 27.69 ; Middle 112.55 ; Bottom: 116.36

Transducer Readings After Packers Inflated: Top 27.74 ; Middle 114.76 ; Bottom: 113.57

MP-401 Z4 SJC 12/13/13 SEQUENCE E

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
16\10\30	18711	----	----	----	190.26	72	BEGIN INCREASE FLOW
16\11\00	18711	18711	0	0	190.20	72	
16\11\30	18711	18712	1	2	200.20	82	
16\12\00	18712	18712	0	0	200.74	82	INCREASE FLOW
16\12\30	18712	18713	1	2	209.20	93	
16\13\00	18713	18714	1	2	212.05	95	INCREASE FLOW
16\13\30	18714	18715	1	2	213.82	105	
16\14\00	18715	18715	0	0	222.85	105	INCREASE FLOW.
16\14\30	18715	18717	2	4	232.39	114	
16\15\00	18717	18718	1	2	231.41	114	INCREASE FLOW
16\15\30	18718	18720	2	4	232.43	125	
16\16\00	18720	18721	1	2	241.16	130	INCREASE FLOW
16\16\30	18721	18722	1	2	248.87	141	
16\17\00	18722	18724	2	4	258.93	141	
16\17\30	18724	18725	1	2	251.60	135	INCREASE FLOW
16\18\00	18725	18726	1	2	251.13	136	
16\18\30	18726	18728	2	4	253.88	136	
16\19\00	18728	18729	1	2	253.22	136	INCREASE FLOW

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SJC 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7- -13

Boring No. MP-401 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 420 Gnd Elev, Ft: 825.7*

Casing Height above ground, Ft: 1.75 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 827.45 = Datum

TEST ID: MP-401 Z4 SJR 12/13/13 Test length: 7.5 Test Section Depth (from Datum): From 238.75 To 246.25

(A) Depth to Water Table From Datum, Ft: 9.05 Test Water Temp: 78°F WELL 59°F Baro Pressure, psi: 14.37

(B) Surface Gage Height Above Datum, Ft. 1.50 Depth to Center of Test Interval From Datum, Ft: 242.50

(C) Distance Water Table to Center of Test Interval Ft. 233.45 Static water pressure at center = (C*62.4/144) + Baro = 116

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 144] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po.
Sequence ID: A B C D E

Po Values: 1/3 Po = 48 ; 2/3 Po= 96 ; 1/2 Po= 72 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-401 Z4 SJR 12/13/13 Sequence No. E Planned Center Pressure: 260

Transducer Readings Before Packers Inflated: Top 27.69 ; Middle 112.55 ; Bottom: 116.36

Transducer Readings After Packers Inflated: Top 27.70 ; Middle 114.76 ; Bottom: 113.57

MP-401 Z4 SJR 12/13/13 SEQUENCE E (CONT'D)

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
16:19:30	18729	18730	1	2	252.88	140	
16:20:00	18730	18731	1	2	257.43	140	
16:20:30	18731	18733	2	4	256.30	139	
16:21:00	18733	18735	2	4	255.07	139	
16:21:30	18735	18738	3	6	255.75	139	INCREASE FLOW
16:22:00	18738	18740	2	4	254.95	146	
16:22:30	18740	18741	1	2	262.45	144	
16:23:00	18741	18741	0	0	261.09	144	
16:23:30	18741	18743	2	4	260.30	144	
16:24:00	18743	18745	2	4	259.91	142	
16:24:30	18745	18747	2	4	259.39	142	
16:25:00	18747	18749	2	4	258.55	141	
16:25:30	18749	18752	3	6	258.41	141	
16:26:00	18752	18754	2	4	257.46	140	
16:26:30	18754	18755	1	2	257.27	140	END
				16:27:15	BOTTOM	TRANS	* 117.09
				16:27:50	TOP	TRANS	* 27.74

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SJR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

This Sheet applies to all Zone 4 Tests

BORING: MP-401

DATE: 7-19-13

DATA COLLECTED BY: TOM McGILL / JIM GODDARD

SHUT-IN TEST PRESSURE: N/A psi

SJR 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi
	NOT USED	
	GJG 7-19-13	

EQUIPMENT USED

Transducers: Mini Trol Serial Numbers: 335896 (6-12-13) 315381 (6-20-13) 142142 (6-20-13)

Surface Pressure Gage: MW-4 & MW-5; BACKFLOW MW-3 (6-11-13) NITROGEN MW-1 & MW-2 (6-11-13).

Barometric Probe: 121315 (6-12-13)

Flow Meter: 8824788 (FIELD CAL. 7-18-13)

Stop Watch: L286 (6-10-13)

THERMOMETER LT28 (5-1-13)

Date of Calibration: IN PARENTHESIS

Calibration due: POST TESTING

FILES:

MP-401	Z4	(B)	2013-07-19	16.35.55	WSL
MP-401	Z4	(B)	2013-07-19	16.35.55	EXCEL
MP-401	Z4	(T)	2013-07-19	16.29.32	WSL
MP-401	Z4	(T)	2013-07-19	16.29.32	EXCEL
MP-401	Z4	(M)	2013-07-19	16.31.17	WSL
MP-401	Z4	(M)	2013-07-19	16.31.17	EXCEL
MP-401	Z4	(L)	2013-07-19	16.33.39	WSL
MP-401	Z4	(L)	2013-07-19	16.33.39	EXCEL

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SJR 12/13/13

PACKER TEST FLOW RATE GRAPHS

Boring MP-415

Packer Test Intervals:

- MP-415 Zone 1: 27.5 feet to 35 feet
- MP-415 Zone 2: 162.5 feet to 170 feet
- MP-415 Zone 3: 252.5 feet to 260.0 feet

Graphs of flow rate (gpm) vs time (minutes) have been created from Excel sheets containing data from field data sheets. For clarity, individual plots for each sequence within a tested interval are presented. Generally, plots are not provided if the field data sheets indicate no flow during a test sequence. ***Bechtel Field Instruction forms are provided. AMEC f***ield data sheets are provided following the graphs for each zone. Transducer data file names are listed on the last field data sheet of each test interval. Transducer data files are furnished as electronic files ***in a data supplement submittal***.

BECHTEL POWER CORPORATION
Project No. 25847
Clinch River CPA Project- Site Subsurface Investigation
FIELD INSTRUCTION FORM

Specification Section: 5.3.7.2

Packer Testing in MP 415

Field Instruction: The following are the three (3) depth zones in which packer testing will be conducted in borehole MP 415:

Zone 1: 27.5 to 35 feet below land surface (± 0.25 ft) GAD 7/4/13
Zone 2: 162.5 to 170 feet below land surface (± 0.5 ft) GAD 7/4/13
Zone 3: 252.5 to 260 feet below land surface (± 0.5 ft)

The desired pressure ranges that will be tested in each of the three zones are based on the calculation of the test pressures as provided in AMEC Project Procedures CRP-3 – Packer Pressure Testing in Boreholes, Attachment B (Bechtel Power InfoWorks 25847-601-V14-CY00-00018-006) or latest revision at time of testing. The test pressures will be determined just before the commencement of the tests by measuring the water level at the start of test.

Basis/Justification for Instruction:

The depth of the above zones was selected based on fracture zones identified from DRAFT geologic core logs, RQD analysis and from the acoustic televiewer logs. The bottom depth limitation is due to the maximum cable length of 285 feet. The justification of the pressure ranges that will be tested will be based on procedure AMEC Project Procedures CRP-3 – Packer Pressure Testing in Boreholes, Attachment B (Bechtel Power InfoWorks 25847-601-V14-CY00-00018-006) or latest revision at time of testing.

Specification requires Contractor to provide test depths and pressures.

Note: This FIF **supersedes 25847-601-K0I-CY00-00005.**

Prepared By: Garrett Day — Name; Signature; 7/4/13 — Date
Reviewed By: GERALD MELANE — Name; Signature; 7/4/13 — Date
Approved By: John Brown for Mark Reinwitz — Name; see attached; Signature; 7/4/13 — Date
(see Section 1.2 for further instructions)
Received By AMEC
Site Mgr or Proj Mgr: S. Criscenzo — Name; Signature; 7/4/13 — Date

©2013 Bechtel Power Corporation. Contains Contractor Confidential Information.

Zone 3 field test completed (GAD) 7/5/13
Zone 2 field test completed (GAD) 7/5/13
Zone 1 field test completed (GAD) 7/6/13

Clinch River SMR Project
Double Packer Borehole Permeability Test Data Sheet
AMEC Environment & Infrastructure, Inc.
AMEC Project # 6468-13-1072

Prepared by: CDT Date: 4-8-14
Checked by: JAJ Date: 4-9-14

Boring: MP-415
Zone: Z1 ***27.5 feet to 35.0 feet below ground surface***
Transducer Location: Middle

Sequence A (1/3 Po)				Sequence B (2/3 Po)				Sequence C (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
16:37:00	0.0	no reading		0:00:00	0.0	Not Tested		0:00:00	0.0	Not Tested	
16:37:30	0.5	no reading		0:00:30	0.5			0:00:30	0.5		
16:38:00	1.0	21.75	8	0:01:00	1.0			0:01:00	1.0		
16:38:30	1.5	22.53	28	0:01:30	1.5			0:01:30	1.5		
16:39:00	2.0	22.71	40	0:02:00	2.0			0:02:00	2.0		
16:39:30	2.5	23.36	42	0:02:30	2.5			0:02:30	2.5		
16:40:00	3.0	23.50	48	0:03:00	3.0			0:03:00	3.0		
16:40:30	3.5	23.60	48	0:03:30	3.5			0:03:30	3.5		
16:41:00	4.0	23.76	32	0:04:00	4.0			0:04:00	4.0		
16:41:30	4.5	24.58	62	0:04:30	4.5			0:04:30	4.5		
16:42:00	5.0	25.56	68	0:05:00	5.0			0:05:00	5.0		
16:42:30	5.5	25.62	80	0:05:30	5.5			0:05:30	5.5		
16:43:00	6.0	25.59	110	0:06:00	6.0			0:06:00	6.0		
16:43:30	6.5	25.60	70	0:06:30	6.5						
16:44:00	7.0	25.60	60	0:07:00	7.0						
16:44:30	7.5	25.54	50								
16:45:00	8.0	25.66	60								
16:45:30	8.5	25.72	80								
16:46:00	9.0	26.06	90								
16:46:30	9.5	24.00	60								
16:47:00	10.0	no reading	no reading	changed tanks							
16:47:30	10.5	no reading	no reading								
16:48:00	11.0	no reading	no reading								
16:48:30	11.5	no reading	no reading								
16:49:00	12.0	27.02	72								
16:49:30	12.5	27.07	70								
16:50:00	13.0	27.21	40								
16:50:30	13.5	27.33	80								
16:51:00	14.0	27.48	60								

Sequence D (1/2 Po)				Sequence E (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
0:00:00	0.0	Not Tested		0:00:00	0.0	Not Tested	
0:00:30	0.5			0:00:30	0.5		
0:01:00	1.0			0:01:00	1.0		
0:01:30	1.5			0:01:30	1.5		
0:02:00	2.0			0:02:00	2.0		
0:02:30	2.5			0:02:30	2.5		
0:03:00	3.0			0:03:00	3.0		
0:03:30	3.5			0:03:30	3.5		
0:04:00	4.0			0:04:00	4.0		
0:04:30	4.5			0:04:30	4.5		
0:05:00	5.0			0:05:00	5.0		
0:05:30	5.5			0:05:30	5.5		
0:06:00	6.0			0:06:00	6.0		
0:06:30	6.5			0:06:30	6.5		
0:07:00	7.0						
0:07:30	7.5						
0:08:00	8.0						
0:08:30	8.5						
0:09:00	9.0						
0:09:30	9.5						
0:10:00	10.0						
0:10:30	10.5						
0:11:00	11.0						
0:11:30	11.5						
0:12:00	12.0						
0:12:30	12.5						
0:13:00	13.0						
0:13:30	13.5						
0:14:00	14.0						
0:14:30	14.5						
0:15:00	15.0						
0:15:30	15.5						

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7-18-13

Boring No. MP-202 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 460 Gnd Elev, Ft: 811.7 *

Casing Height above ground, Ft: 1.23 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 812.93 = Datum

TEST ID: MP-202 Z2 Test length: 7.5 Test Section Depth (from Datum): From 154.23 To 161.73

(A) Depth to Water Table From Datum, Ft: 39.28 Test Water Temp: 85°F Baro Pressure, psi: 14.44

(B) Surface Gage Height Above Datum, Ft. 1.63 Depth to Center of Test Interval From Datum, Ft: ~~186.98~~ 157.98 [illegible] 7-18-13

(C) Distance Water Table to Center of Test Interval Ft. 118.70 Static water pressure at center = (C*62.4/144) + Baro = 66

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 109] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 36 ; 2/3 Po= 73 ; 1/2 Po= 55 Add Appropriate Po value to static pressure at center of test interval

TEST NO. MP-202Z2 Sequence No. B Planned Center Pressure: 139

Transducer Readings Before Packers Inflated: Top 19.12 ; Middle 65.07 ; Bottom: 68.89

Transducer Readings After Packers Inflated: Top 19.77 ; Middle 66.21 ; Bottom: 68.28

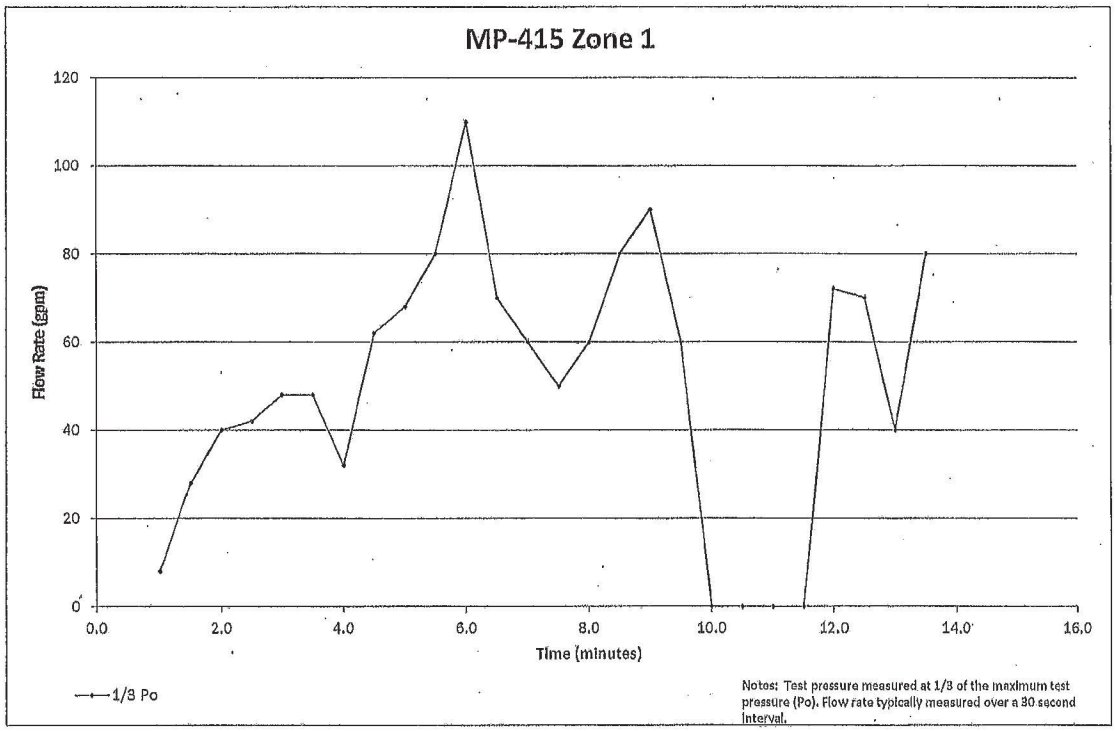
MP-202 Z2 SEQUENCE B

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
14:59:00	18515	----	----	----	103.39	26	BEGIN INCREASE FLOW
14:59:30	18515	18 515	0	0	110.49	36	
15:00:00	18515	18 516	1	2	113.96	35	INCREASE FLOW
15:00:30	18516	18 517	1	2	114.40	51	
15:01:00	18517	18 517	0	0	131.25	51	
15:01:30	18517	18 518	1	2	131.31	51	INCREASE FLOW
15:02:00	18518	18 519	1	2	134.77	57	
15:02:30	18519	18 520	1	2	136.01	57	
15:03:00	18520	18 521	1	2	135.95	57	
15:03:30	18521	18 522	1	2	136.08	57	
15:04:00	18522	18 523	1	2	136.61	57	
15:04:30	18523	18 523	0	0	136.62	57	
15:05:00	18523	18 524	1	2	136.21	57	INCREASE FLOW
15:05:30	18524	18 525	1	2	136.36	57	
15:06:00	18525	18 525	0	0	139.35	59	
15:06:30	18525	18 526	1	2	137.52	59	
15:07:00	18526	18 527	1	2	137.33	59	INCREASE FLOW
15:07:30	18527	18 528	1	2	137.10	59	

*From Preliminary Boring Layout Survey

Form Approved for Use on Clinch River SMR Project - J. A. Tice, Technical Lead

Form Rev 0 - Reviewed by SJZ 12/13/13



Prepared by/Date: KAL 1/4/14
Checked by/Date: JAJ 1/12/14

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7-5-13

Boring No. MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 *DATUM

Casing Height above ground, Ft: 0.3 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 = ~~Datum~~ QJS. 7-5-13

TEST ID: MP-415 Zone 1 (27.5-35) Test length: 7.5 Test Section Depth (from Datum): From 27.5 To 35

(A) Depth to Water Table From Datum, Ft: 13.12 Test Water Temp: 75°F Baro Pressure, psi: 14.44

(B) Surface Gage Height Above Datum, Ft. -0.3 Depth to Center of Test Interval From Datum, Ft: 31.83

(C) Distance Water Table to Center of Test Interval Ft. 21.88 Static water pressure at center = (C*62.4/144) + Baro = 23.92

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 25.3] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 8.43; 2/3 Po = 16.87; 1/2 Po = 12.65 Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 1 Sequence No. A A QJS. 7-5-13 Planned Center Pressure: ~~32.35~~ 32.35 QJS. 7-5-13

Transducer Readings Before Packers Inflated: Top 16.79; Middle 21.74; Bottom: 25.56

Transducer Readings After Packers Inflated: Top 16.71; Middle 21.75; Bottom: 25.58

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
16:37:00	8392	----	----				BEGIN
16:38:00	8392	8396	4	8	21.75	0	
16:38:30	8396	8410	14	28	22.53	0	
16:39:00	8410	8430	20	40	22.71	0	
16:39:30	8430 QJS. 7-5-13	8451	21	42	23.36	0	
16:40:00	8451	8475	24	48	23.50	0	
QJS. 7-5-13 16:~~41:00~~ 40:30	8475	8499	24	48	23.60	0	
16:~~41:30~~ 41:00	8499	8515	16	32	23.76	0	
16:41:30	8515	8546	31	62	24.58	0	
16:42:00	8546	8580	34	68	25.56	0	
16:42:30	8580	8620	40	80	25.62	30	
16:43:00	8620	8675 QJS. 7-5-13	55	110	25.59	35	
16:43:30	8675	8710	35	70	25.60	35	
16:44:00	8710	8740	30	60	25.60	35	
16:44:30	8740	8765	25	50	25.54	35	
16:45:00	8765	8795	30	60	25.66	35	
16:45:30	8795	8835	40	80	25.72	35	
16:46:00	8835	8880	45	90	26.06	0	SWAPPED TANKS
16:46:30	8880	8910	30	60	24.00	35	

*From Preliminary Boring Layout Survey

16:48:00 Bottom 25.62
16:48:30 Top 17.68

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SJC 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7-5-13

Boring No. MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 *DATUM

Casing Height above ground, Ft: 0.3 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 = ~~Datum~~ 7-5-13

TEST ID: MP-415 Zone 1 Test length: 7.5 Test Section Depth (from Datum): From 27.5 To 35

(A) Depth to Water Table From Datum, Ft: 13.12 Test Water Temp: 75°F Baro Pressure, psi: 14.44

(B) Surface Gage Height Above Datum, Ft. -0.3 Depth to Center of Test Interval From Datum, Ft: 31.83

(C) Distance Water Table to Center of Test Interval Ft. 21.88 Static water pressure at center = (C*62.4/144) + Baro = 23.92

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = 25.3] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 8.43; 2/3 Po = 16.87; 1/2 Po = 12.65 Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 1 Sequence No. ~~A~~ 7-5-13 Planned Center Pressure: ~~32.35~~ 7-5-13

Transducer Readings Before Packers Inflated: Top 16.79; Middle 21.74; Bottom: 25.56

Transducer Readings After Packers Inflated: Top 16.71; Middle 21.75; Bottom: 25.58

Sequence A Continued SDL 12/13/13

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
16:49:00	8910	9090	180	72	27.07	35	
16:49:30	9090	9125	35	70	27.07	35	
16:50:00	9125	9145	20	40	27.21	35	
16:50:30	9145	9185	40	80	27.33	35	
16:51:00	9185	9215	30	60	27.48	35	END ZONE 1
7-5-13 16:52:30							

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

BORING: MP-415, Zone 1

DATE: ~~7-2~~ 7-5-13

7-5-13 DATA COLLECTED BY: Tom McGill / Jim Goddard

SHUT-IN TEST PRESSURE: N/A psi

SDZ 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi

NOT USED

7-5-13

EQUIPMENT USED

DOWN HOLE 7-5-13

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; 315381/R24039 (intermediate) *6/20/13*; 141142/R20367 (deep) *6/20/13*; 315380/R24038 (spare) *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

CHECKED 7-5-13

FILES FOR ZONE 1:

MP-415 Zone 1 (M) 2013-07-05 16.53.06 Excel
MP-415 Zone 1 (M) 2013-07-05 16.53.06 WSL
MP-415 Zone 1 (B) 2013-07-05 16.57.14 Excel
MP-415 Zone 1 (B) 2013-07-05 16.57.14 WSL
MP-415 Zone 1 (T) 2013-07-05 16.56.09 Excel
MP-415 Zone 1 (T) 2013-07-05 16.56.09 WSL
MP-415 Zone 1 (L) 2013-07-05 16.54.47 Excel
MP-415 Zone 1 (L) 2013-07-05 16.54.47 WSL

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SJZ 12/13/13

Clinch River SMR Project
Double Packer Borehole Permeability Test Data Sheet
AMEC Environment & Infrastructure, Inc.
AMEC Project # 6468-13-1072

Prepared by: CDT Date: 4-8-14
Checked by: JAS Date: 4-8-14

Boring: MP-415
Zone: 2 ***162.5 feet to 170.0 feet below ground surface***
Transducer Location: Middle

Sequence A (1/3 Po)				Sequence B (2/3 Po)				Sequence C (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
13:56:00	0.0	84.56		14:07:30	0.0	141.05		14:16:30	0.0	188.88	
13:56:30	0.5	no reading		14:08:00	0.5	141.33	0	14:17:00	0.5	no reading	
13:57:00	1.0	no reading		14:08:30	1.0	141.20	0	14:17:30	1.0	184.34	0
13:57:30	1.5	no reading		14:09:00	1.5	141.66	0	14:18:00	1.5	183.79	0
13:58:00	2.0	94.03	0	14:09:30	2.0	141.11	0	14:18:30	2.0	182.64	0
13:58:30	2.5	no reading		14:10:00	2.5	141.03	0	14:19:00	2.5	184.39	0
13:59:00	3.0	94.40	0	14:10:30	3.0	148.47	0	14:19:30	3.0	187.76	0
13:59:30	3.5	101.88	0	14:11:00	3.5	149.23	0	14:20:00	3.5	190.00	0
14:00:00	4.0	102.01	0	14:11:30	4.0	149.33	0	14:20:30	4.0	190.26	0
14:00:30	4.5	107.71	0	14:12:00	4.5	149.29	0	14:21:00	4.5	190.41	0
14:01:00	5.0	no reading		14:12:30	5.0	149.01	0	14:21:30	5.0	187.50	0
14:01:30	5.5	115.32	0					14:22:00	5.5	190.45	0
14:02:00	6.0	117.62	0					14:22:30	6.0	no reading	
14:02:30	6.5	117.45	0					14:23:00	6.5	no reading	
14:03:00	7.0	117.47	0								
14:03:30	7.5	117.45	0								
14:04:00	8.0	117.42	0								
14:04:30	8.5	117.39	0								
14:05:00	9.0	117.29	0								
14:05:30	9.5	no reading									
14:06:00	10.0	123.67	0								

Sequence D (1/2 Po)				Sequence E (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
14:27:30	0.0	137.82		14:39:30	0.0	187.92	
14:28:00	0.5	138.21	0	14:40:00	0.5	190.90	0
14:28:30	1.0	138.25	0	14:40:30	1.0	187.16	0
14:29:00	1.5	135.36	0	14:41:00	1.5	187.99	0
14:29:30	2.0	132.33	0	14:41:30	2.0	186.43	0
14:30:00	2.5	132.17	0	14:42:00	2.5	188.46	0
14:30:30	3.0	131.83	0	14:42:30	3.0	190.38	0
14:31:00	3.5	131.79	0	14:43:00	3.5	191.73	0
14:31:30	4.0	131.82	0	14:43:30	4.0	190.02	0
14:32:00	4.5	132.16	0	14:44:00	4.5	188.55	0
14:32:30	5.0	132.00	0	14:44:30	5.0	185.35	0
14:33:00	5.5	131.95	0	14:45:00	5.5	188.66	0
14:33:30	6.0	131.93	0				
14:34:00	6.5	131.84	0				

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7/5/13

Boring No. MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 DATUM

Casing Height above ground, Ft: 0.3 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 = Datum QD 7-10-13

TEST ID: MP-415 Zone 2 Test length: 7.5 Test Section Depth (from Datum): From 162.5 To 170.0

(A) Depth to Water Table From Datum, Ft: 12.99 Test Water Temp: 75°F Baro Pressure, psi: 14.46

(B) Surface Gage Height Above Datum, Ft. ~0.3 Depth to Center of Test Interval From Datum, Ft: 166.25

(C) Distance Water Table to Center of Test Interval Ft. ~~149.26~~ 153.26 TM 7/5/13 Static water pressure at center = (C*62.4/144) + Baro = 80.9

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = ~~100.5~~ 100.0 TM 7/5/13] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Po Values: 1/3 Po = ~~35.8~~ 33.3 TM 7/5/13; 2/3 Po = ~~71.7~~ 66.7 TM 7/5/13; 1/2 Po = ~~53.8~~ 50.0 TM 7/5/13 Sequence ID: A B C D E

Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 2 Sequence No. A Planned Center Pressure: 114.2 TM 7/5/15

Transducer Readings Before Packers Inflated: Top 22.04; Middle ~~80.78~~ 80.78; Bottom: 84.57

Transducer Readings After Packers Inflated: Top 22.04; Middle 83.68; Bottom: 89.56

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
1356 00	8391	----	----	----	84.54	5	BEGIN
1356 30							
1357 00							
1357 30							
1359 00	8391	8391	0		94.03	5	
1359 00	8391	8391	0		94.4	10	
1359 30	8391	8391	0		101.88	10	
14 00 00	8391	8391	0		102.01	20	
14 00 30	8391	8391	0	83 7-5-13	107.74	20	
14 01 30	83	8391	0		115.32	30	
14 02 00		8391	0		117.62	30	
14 02 30		8391	0		117.45	30	
14 03 00		8391	0		117.47	30	
14 03 30		8391	0		117.45	30	
14 04 00		8391	0		117.42	30	
14 04 30		8391	0		117.39	30	
14 05 00		8391	0		117.29	30	
14 06		8391	0		123.67	30	

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

BORING: MP-415 ZONE 2 SEQ A

DATE: 7-5-2013

DATA COLLECTED BY: TOM McGILL / JIM GODDARD

SHUT-IN TEST PRESSURE: N/A psi

SEE PG 1 SJL 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi

NOT USED

JG. 7-5-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; 315381/R24039 (intermediate) *6/20/13*; 141142/R20367 (deep) *6/20/13*; 315380/R24038 (spare) *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

FILES (SEQUENCES A THROUGH E):

MP-415 ZONE 2 (B) 2013-07-05 14,50,08 WSL
MP-415 ZONE 2 (B) 2013-07-05 14,50,08 EXCEL
MP-415 ZONE 2 (T) 2013-07-05 14,48,26 WSL
MP-415 ZONE 2 (T) 2013-07-05 14,48,26 EXCEL
MP-415 ZONE 2 (M) 2013-07-05 14,~~52,52~~ 51.34 WSL JG. 7-5-13
MP-415 ZONE 2 (M) 2013-07-05 14,~~52,52~~ 51.34 EXCEL
MP-415 ZONE 2 (L) 2013-07-05 14,52,52 WSL
MP-415 ZONE 2 (L) 2013-07-05 14,52,52 EXCEL

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SJL 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7/5/13

Boring No. MP-415 Borehole Diameter, in.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 DATUM

Casing Height above ground, Ft: 0.3 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 = ~~Datum~~ 7-10-13

TEST ID: MP-415 Zone 2 Test length: 7.5 Test Section Depth (from Datum): From 162.5 To 170.0

(A) Depth to Water Table From Datum, Ft: 12.99 Test Water Temp: 75°F Baro Pressure, psi: 14.46

(B) Surface Gage Height Above Datum, Ft. -0.3 Depth to Center of Test Interval From Datum, Ft: 166.25

(C) Distance Water Table to Center of Test Interval Ft. 153.26 ~~149.26~~ Static water pressure at center = (C*62.4/144) + Baro = 80.9

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = 100.0 ~~100.5~~] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Po Values: 1/3 Po = 33.3 ~~35.8~~; 2/3 Po = 66.7 ~~71.7~~; 1/2 Po = 50.0 ~~53.8~~ Sequence ID: A B C D E Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 2 Sequence No. 13 Planned Center Pressure: 147.6

Transducer Readings Before Packers Inflated: Top 22.04; Middle 80.78 ~~80.78~~; Bottom: 84.57

Transducer Readings After Packers Inflated: Top 22.04; Middle 83.68; Bottom: 89.56

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
140730	8391	----	----	---	141.05	55	BEGIN
140800	8391	8391	0		141.33	55	
140830	8391	8391	0		141.20	55	
140900	8391	8391	0		141.66	55	
140930	8391	8391	0		141.11	55	
141000	8391	8391	0		141.03	55	
141030	8391	8391	0		148.47	65	
141100	8391	8391	0		149.23	65	
141130	8391	8391	0		149.33	65	
141200	8391	8391	0		149.29	65	
141230	8391	8391	0		149.01	65	END SEQ.
			141330	BOTTOM	TRANSDUCER	=	87.45
			141400	TOP	TRANS	=	22.02

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SJZ 12/17/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

BORING: MP-415 ZONE 2, SEQ. B

DATE: 7-5-2013

DATA COLLECTED BY: TOM McGILL/JIM GODDARD

SHUT-IN TEST PRESSURE: N/A psi

SEE PG 1 SR 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi
	NOT USED	

JL 7-5-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; 315381/R24039 (intermediate) *6/20/13*; 141142/R20367 (deep) *6/20/13*; 315380/R24038 (spare) *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7/5/13

Boring No. MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 DATUM

Casing Height above ground, Ft: 0.3 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 ~~=Datum~~ 7-10-13

TEST ID: MP-415 Zone 2 TM 7/5/13 (162.5 TO 170) Test length: 7.5 Test Section Depth (from Datum): From 162.5 To 170.0

(A) Depth to Water Table From Datum, Ft: 12.99 Test Water Temp: 75°F Baro Pressure, psi: 14.46

(B) Surface Gage Height Above Datum, Ft. ~0.3 Depth to Center of Test Interval From Datum, Ft: 166.25

(C) Distance Water Table to Center of Test Interval Ft. ~~149.26~~ 153.26 TM 7/5/13 Static water pressure at center = (C*62.4/144) + Baro = 80.9

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = ~~100.5~~ 100.0 TM 7/5/13] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Po Values: 1/3 Po = ~~35.8~~ 33.3 TM 7/5/13; 2/3 Po = ~~71.7~~ 66.7 TM 7/5/13; 1/2 Po = ~~53.8~~ 50.0 TM 7/5/13 Sequence ID: A B C D E Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 2 Sequence No. C Planned Center Pressure: 180.9 TM 7/5/13

Transducer Readings Before Packers Inflated: Top 22.04; Middle ~~80.78~~ 80.78; Bottom: 84.57

Transducer Readings After Packers Inflated: Top 22.04; Middle 83.68; Bottom: 89.56

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
141630	8391	----	----	----	188.88	95	BEGIN
141730	8391	8391			184.34	95	
141800	8391	8391			183.79	95	
141830	8391	8391			182.64	95	
141900	8391	8391			184.39	100	BUMPED PRESSURE
141930	8391	8391			187.76	100	
142000	8391	8391			190.00	100	
142030	8391	8391			190.26	100	
142100	8391	8391			190.41	100	
142130	8391	8391			187.50	100	
142200	8391	8391			190.45	100	END SEQ
142330							
142300							

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SJL 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

BORING: MP-415, Zone 2, Seq C

DATE: 7-5-2013

DATA COLLECTED BY: Tom McGill / Jim Goddard

SHUT-IN TEST PRESSURE: N/A psi

See Pg 1 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi
	Not Used	

7-5-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; 315381/R24039 (intermediate) *6/20/13*; 141142/R20367 (deep) *6/20/13*; 315380/R24038 (spare) *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7/5/13

Boring No. MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 DATUM

Casing Height above ground, Ft: 0.3 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 = ~~Datum~~ QA 7-10-13

TEST ID: MP-415 Zone 2 (415 TM 7/5/13) Test length: 7.5 Test Section Depth (from Datum): From 162.5 (162.5 TM 170) To 170.0

(A) Depth to Water Table From Datum, Ft: 12.99 Test Water Temp: 75°F Baro Pressure, psi: 14.46

(B) Surface Gage Height Above Datum, Ft. ~0.3 Depth to Center of Test Interval From Datum, Ft: 166.25

(C) Distance Water Table to Center of Test Interval Ft. ~~149.26~~ 153.26 TM 7/5/13 Static water pressure at center = (C*62.4/144) + Baro = 80.9

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = ~~100.5~~ 100.0 TM 7/5/13] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Po Values: 1/3 Po = ~~35.8~~ 33.3 TM 7/5/13; 2/3 Po = ~~71.7~~ 66.7 TM 7/5/13; 1/2 Po = ~~53.8~~ 50.0 TM 7/5/13 Sequence ID: A B C D E Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 2 Sequence No. D Planned Center Pressure: 130.9 ~~80.78~~ 80.78 TM 7/5/13

Transducer Readings Before Packers Inflated: Top 22.04; Middle ~~80.78~~ 80.78; Bottom: 84.57

Transducer Readings After Packers Inflated: Top 22.04; Middle 83.68; Bottom: 89.56

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
14 27 30	8391	----	----	----	137.82	50	BEGIN
28 00	8391	8391	0	0	138.21	50	
28 30	8391	8391	0	0	138.25	50	
29 00	8391	8391	0	0	135.36	45	DROPPED PRES
29 30	8391	8391	0	0	132.33	45	
14 30 00	8391	8391	0	0	132.17	45	
30 30	8391	8391	0	0	131.83	45	
31 00	8391	8391	0	0	131.79	45	
31 30	8391	8391	0	0	131.82	45	
32 00	8391	8391	0	0	132.06	45	
32 30	8391	8391	0	0	132.00	45	
33 00	8391	8391	0	0	131.95	45	
33 30	8391	8391	0	0	131.93	45	
14 34 00	8391	8391	0	0	131.80	45	END SEQ.
			14 36 00	BOTTOM	TRANS	=	87.24
			14 36 30	TOP	TRANS	=	22.01

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SJR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

BORING: MP-415, ZONE 2, SEQ D

DATE: 7-5-2013

DATA COLLECTED BY: TOM McGILL / JIM GODDARD

SHUT-IN TEST PRESSURE: N/A psi

SEE PG 1 SR 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi

NOT USED

7-5-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; 315381/R24039 (intermediate) *6/20/13*; 141142/R20367 (deep) *6/20/13*; 315380/R24038 (spare) *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7/5/13

Boring No: MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 DATUM

Casing Height above ground, Ft: 0.3 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 ~~Datum~~ 7-10-13.

TEST ID: MP-415 Zone 2 (415 TM 7/5/13) Test length: 7.5 Test Section Depth (from Datum): From 162.5 (162.5 to 170) To 170.0

(A) Depth to Water Table From Datum, Ft: 12.99 Test Water Temp: 75°F Baro Pressure, psi: 14.46

(B) Surface Gage Height Above Datum, Ft. ~0.3 Depth to Center of Test Interval From Datum, Ft: 166.25

(C) Distance Water Table to Center of Test Interval Ft. ~~149.26~~ 153.26 TM 7/5/13 Static water pressure at center = (C*62.4/144) + Baro = 80.9

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = ~~100.5~~ 100.0 TM 7/5/13] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Po Values: 1/3 Po = ~~35.8~~ 33.3 TM 7/5/13; 2/3 Po = ~~71.7~~ 66.7 TM 7/5/13; 1/2 Po = ~~33.8~~ 50.0 TM 7/5/13 Sequence ID: A B C D E

Add Appropriate Po value to static pressure at center of test interval

TEST NO Zone 2 Sequence No. E Planned Center Pressure: 180.9 TM 7/5/13

Transducer Readings Before Packers Inflated: Top 22.04; Middle ~~80.78~~ 80.78; Bottom: 84.57

Transducer Readings After Packers Inflated: Top 22.04; Middle 83.68; Bottom: 87.56

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
1439 30	8391	----	----	----	187.92	100	BEGIN
1440 00	8391	8391			190.90	100	
1440 30	8391	8391			187.16	100	
1441 00	8391	8391			187.99	100	
1441 30	8391	8391			186.43	100	
1442 00	8391	8391			188.46	100	
1442 30	8391	8391			190.38	100	
1443 00	8391	8391			191.73	100	
1443 ~~00~~ 30	8391	8391			190.02	100	
1443 ~~30~~ 00	8391	8391			188.55	100	
1444 30	8391	8391			185.35	100	
1445 00	8391	8391			188.66	100	END SEQ.
			14:46	BOTTOM TRANS		=	87.22
			144630	TOP	TRANS	=	22.01

QJS. 7-5-13

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SRL 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

BORING: MP-415, ZONE 2, SEQ E

DATE: 7-5-2013

DATA COLLECTED BY: TOM McGILL / JIM GODDARD

SHUT-IN TEST PRESSURE: N/A psi

SEE PG 1 SR 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi

NOT USED

7-5-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; 315381/R24039 (intermediate) *6/20/13*; 141142/R20367 (deep) *6/20/13*; 315380/R24038 (spare) *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

Clinch River SMR Project
Double Packer Borehole Permeability Test Data Sheet
AMEC Environment & Infrastructure, Inc.
AMEC Project # 6468-13-1072

Prepared by: CDT Date: 4-8-14
Checked by: JOL Date: 4-8-14

Boring: MP-415
Zone: Z3 ***252.5 feet to 260.0 feet below ground surface***
Transducer Location: Middle

Sequence A (1/3 Po)				Sequence B (2/3 Po)				Sequence C (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm) (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
11:23:00	0.0	122.92		11:39:00	0.0	219.74		11:52:00	0.0	270.30	
11:23:30	0.5	No Reading		11:39:30	0.5	220.43	0	11:52:30	0.5	269.61	0
11:24:00	1.0	No Reading		11:40:00	1.0	218.58	0	11:53:00	1.0	270.59	0
11:24:30	1.5	No Reading		11:40:30	1.5	217.44	0	11:53:30	1.5	268.93	0
11:25:00	2.0	No Reading		11:41:00	2.0	220.36	0	11:54:00	2.0	268.00	0
11:25:30	2.5	122.92	0	11:41:30	2.5	219.07	0	11:54:30	2.5	268.02	0
11:26:00	3.0	127.00	0	11:42:00	3.0	219.34	0				
11:26:30	3.5	132.95	0	11:42:30	3.5	210.93	0				
11:27:00	4.0	137.62	0	11:43:00	4.0	220.19	0				
11:27:30	4.5	163.69	0	11:43:30	4.5	218.80	0				
11:28:01	5.0	164.21	0								
11:28:31	5.5	183.00	0								
11:29:01	6.0	183.29	0								
11:29:31	6.5	No Reading									
11:30:02	7.0	195.87	0								
11:30:32	7.5	175.70	0								
11:31:02	8.0	168.12	0								
11:31:32	8.5	168.26	0								
11:32:03	9.0	169.23	0								
11:32:33	9.5	168.35	0								
11:33:03	10.0	168.66	0								

Sequence D (1/2 Po)				Sequence E (Po)			
Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)	Time	Elapsed Time (minutes)	Pressure (psi)	Flow Rate (gpm)
11:58:00	0.0	190.67		12:02:30	0.0	268.42	
11:58:30	0.5	189.30	0	12:03:00	0.5	264.81	0
11:59:00	1.0	189.82	0	12:03:30	1.0	264.35	0
11:59:30	1.5	189.70	0	12:04:00	1.5	266.03	0
12:00:00	2.0	189.15	0	12:04:30	2.0	265.18	0
12:00:30	2.5	189.23	0	12:05:00	2.5	264.70	0
12:01:00	3.0	189.30	0	12:05:30	3.0	266.63	0

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7/5/13

Boring No MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 DATUM

Casing Height above ground, Ft: 0.58 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 = Datum- QD 7-10-13

TEST ID: MP-415 Zone 3 Test length: 7.5 (252.5 to 260) Test Section Depth (from Datum): From 252.5 To 260.0

(A) Depth to Water Table From Datum, Ft: 13.4 Test Water Temp: 75° Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. -0.3 Depth to Center of Test Interval From Datum, Ft: 256.25

(C) Distance Water Table to Center of Test Interval Ft. 242.85 Static water pressure at center = (C*62.4/144) + Baro = 119.7

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 157.5] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 50.5; 2/3 Po= 101.0; 1/2 Po= 75.75 Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 3 Sequence No. A Planned Center Pressure: 170.2

Transducer Readings Before Packers Inflated: Top 20.10; Middle 119.91; Bottom: 123.72

Transducer Readings After Packers Inflated: Top 20.09; Middle 124.26; Bottom: 130.85

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:23	8390	----	----	---	122.92	Ø	Begin
11:25:30	8390	8390	Ø	Ø	122.92	Ø	
11:26:00	8390	8390	Ø	Ø	127.0	Ø	
11:26:30	8390	8390	Ø	Ø	132.95	Ø	
11:27:00	8390	8390	Ø	Ø	137.62	Ø	
11:27:30	8390	8390	Ø	Ø	163.69	Ø	
11:28:00	8390	8390	Ø	Ø	164.21	Ø	
11:28:30	8390	8390	Ø	Ø	183.0	63	
11:29:00	8390	8390	Ø	Ø	183.29	100	
11:30:00	8390	8390	Ø	Ø	195.87 ~~175~~	75	QD. 7-5-13
11:30:30	8390	8390	Ø	Ø	175.70	55	
11:31:00	8390	8390	Ø	Ø	168.12	45	
11:31:30	8390	8390	Ø	Ø	168.26	45	
11:32:00	8390	8390	Ø	Ø	169.23	45	
11:32:30	8390	8390	Ø	Ø	168.35	45	
11:33:00	8390	8390	Ø	Ø	168.66	45	

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SJ 12/17/13

ZONE 3

BORING: MP-415 DEEP SEQ A

DATE: 7-5-2013

DATA COLLECTED BY: TOM McGILL / JIM GODDARD

SHUT-IN TEST PRESSURE: N/A psi

SEE PAGE 1 SJR 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi

NOT USED

JJG. 7-5-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; 315381/R24039 (intermediate) *6/20/13*; 141142/R20367 (deep) *6/20/13*; 315380/R24038 (spare) *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

FILES (SEQUENCES A THROUGH E):

MP-415 ZONE 3 (B) 2013-07-05 12.15.17 WSL

MP-415 ZONE 3 (B) 2013-07-05 12.15.17 EXCEL

MP-415 ZONE 3 (T) 2013-07-05 12.13.45 WSL

MP-415 ZONE 3 (T) 2013-07-05 12.13.45 EXCEL

MP-415 ZONE 3 (L) 2013-07-05 12.10.56 WSL

MP-415 ZONE 3 (L) 2013-07-05 12.10.56 EXCEL

MP-415 ZONE 3 (M) 2013-07-05 12.09.22 WSL

MP-415 ZONE 3 (M) 2013-07-05 12.09.22 EXCEL

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7/5/13

Boring No. MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 DATUM

Casing Height above ground, Ft: 0.58 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 = Datum. 7-10-13

TEST ID: MP-415 Zone 3 Test length: 7.5 (252.5 to 260) Test Section Depth (from Datum): From 252.5 To 260.0

(A) Depth to Water Table From Datum, Ft: 13.4 Test Water Temp: 75° Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. -0.3 Depth to Center of Test Interval From Datum, Ft: 256.25

(C) Distance Water Table to Center of Test Interval Ft. 242.85 Static water pressure at center = (C*62.4/144) + Baro = 119.7

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 151.5] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 50.5; 2/3 Po = 101.0; 1/2 Po = 75.75 Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 3 Sequence No. B Planned Center Pressure: 220.7

Transducer Readings Before Packers Inflated: Top 20.10; Middle 119.91; Bottom: 123.72

Transducer Readings After Packers Inflated: Top 20.09; Middle 124.26; Bottom: 130.85

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:39	8390	----	----	----	219.74	95	BEGIN
11:39:30	8390	8390	Ø	Ø	220.43	95	
11:40	8390	8390	Ø	Ø	218.58	95	
11:40:30	8390	8390	Ø	Ø	217.44	95	
11:41:00	8390	8390	Ø	Ø	220.36	95	
41:30	8390	8390	Ø	Ø	219.07	95	
42:00	8390	8390	Ø	Ø	219.34	95	
42:30	8390	8390	Ø	Ø	216.93	95	
43:00	8390	8390	Ø	Ø	220.19	95	
43:30		8390	Ø	Ø	218.80	95 ~~98~~	7-5-13
				11:46	BOTTOM TRANS =		130.42
					NOT LEAKING		
				11:47	TOP TRANS =		20.6
					NOT LEAKING		
					MIDDLE =		

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SJR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

BORING: MP-415 DEEP SEQ B

DATE: 7-15-2013 MCGILL

DATA COLLECTED BY: TOM MACN / JIM GODDARD

SHUT-IN TEST PRESSURE: 7-3-13 N/A psi

SEE PG 1 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi

NOT USED

7-5-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; 315381/R24039 (intermediate) *6/20/13*; 141142/R20367 (deep) *6/20/13*; 315380/R24038 (spare) *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 8468-13-1072 DATE: 7/5/13

Boring No MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 DATUM

Casing Height above ground, Ft: 0.58 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 ~~Datum~~ 7-10-13

TEST ID: MP-415 Zone 3 Test length: 7.5 (252.5 to 260) Test Section Depth (from Datum): From 252.5 To 260.0

(A) Depth to Water Table From Datum, Ft: 13.4 Test Water Temp: 75° Baro. Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. -0.3 Depth to Center of Test Interval From Datum, Ft: 256.25

(C) Distance Water Table to Center of Test Interval Ft. 242.85 Static water pressure at center = (C*62.4/144) + Baro = 119.7

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = 151.5] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Sequence ID: A B C D E

Po Values: 1/3 Po = 50.5; 2/3 Po = 101.0; 1/2 Po = 75.75 Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 3 Sequence No. C Planned Center Pressure: 271.2

Transducer Readings Before Packers Inflated: Top 20.10; Middle 119.91; Bottom: 123.72

Transducer Readings After Packers Inflated: Top 20.09; Middle 124.26; Bottom: 130.85

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:52	8390	----	----	----	270.30	145	BEGIN
11:52:30	8390	8390	Ø	Ø	269.61	145	
11:53:00	8390	8390	Ø	Ø	270.59	145	
11:53:30	8390	8390	Ø	Ø	268.93	145	
11:54:00	8390	8390	Ø	Ø	268.00	145	
11:54:30	8390	8390	Ø	Ø	268.02	145	

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Techncial Lead Form Rev 0 - Reviewed by GR 12/13/13

BORING: MP-415 DEEP SEQ C

DATE: 7-5-2013

DATA COLLECTED BY: TOM McGILL / JIM GODDARD

SHUT-IN TEST PRESSURE: N/A psi

SEE PG 1 SR 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi

NOT USED

8D. 7-5-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; 315381/R24039 (intermediate) *6/20/13*; 141142/R20367 (deep) *6/20/13*; 315380/R24038 (spare) *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 8468-13-1072 DATE: 7/5/13

Boring No MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft. 320.1 Gnd Elev, Ft: 784.1 DATUM

Casing Height above ground, Ft: 0.58 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 = ~~Datum~~ 7-10-13

TEST ID: MP-415 Zone 3 Test length: 7.5 (252.5 to 260.0) Test Section Depth (from Datum): From 252.5 To 260.0

(A) Depth to Water Table From Datum, Ft: 13.4 Test Water Temp: 75° Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. -0.3 Depth to Center of Test Interval From Datum, Ft: 256.25

(C) Distance Water Table to Center of Test Interval Ft 242.85 Static water pressure at center = (C*62.4/144) + Baro = 119.7

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.67) [Po = 151.5] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po

Sequence ID: A B C D E

Po Values: 1/3 Po = 50.5; 2/3 Po = 101.0; 1/2 Po = 75.75 Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 3 Sequence No. D Planned Center Pressure: 195.45

Transducer Readings Before Packers Inflated: Top 20.10; Middle 119.91; Bottom: 123.72

Transducer Readings After Packers Inflated: Top 20.09; Middle 124.26; Bottom: 130.85

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
11:58:00	8390	----	----	---	190.67	65	BEGIN
11:58:30	8390	8390	0	0	189.30	65	
11:59:00	8390	8390	0	0	189.82	65	
11:59:30	8390	8390	0	0	189.70	65	
12:00:00	8390	8390	0	0	189.15	65	
12:00:30	8390	8390	0	0	189.23	65	
12:01:00	8390	8390	0	0	189.30	65	

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SSR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

BORING: MP-415 DEEP SEQ D

DATE: 7-5-2013

DATA COLLECTED BY: TOM McGILL / JIM GODDARD

SHUT-IN TEST PRESSURE: N/A psi

SEE PG 1 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi
	NOT USED	

QD. 7-5-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; 315381/R24039 (intermediate) *6/20/13*; 141142/R20367 (deep) *6/20/13*; 315380/R24038 (spare) *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET
AMEC ENVIRONMENTAL & INFRASTRUCTURE, INC.

PROJECT NAME: Clinch River SMR Project JOB NO. 6468-13-1072 DATE: 7/5/13

Boring No MP-415 Borehole Diameter, In.: 3.8 Total Boring Depth, Ft: 320.1 Gnd Elev, Ft: 784.1 DATUM

Casing Height above ground, Ft: 0.58 Elev. Top of Casing, Ft. (Gnd Elev + Casing Height): 784.68 = Datum 7-10-13

TEST ID: MP-415 Zone 3 Test length: 7.5 (252.5 to 260) Test Section Depth (from Datum): From 252.5 To 260.0

(A) Depth to Water Table From Datum, Ft: 13.4 Test Water Temp: 75° Baro Pressure, psi: 14.45

(B) Surface Gage Height Above Datum, Ft. -0.3 Depth to Center of Test Interval From Datum, Ft: 256.25

(C) Distance Water Table to Center of Test Interval Ft. 242.85 Static water pressure at center = (C*62.4/144) + Baro = 119.7

MAXIMUM TEST PRESSURE, Po = ([A+B*1] + C*0.57) [Po = 157.5] Test Pressure sequence = 1/3 Po, 2/3 Po, Po, 1/2 Po, Po
Sequence ID: A B C D E

Po Values: 1/3 Po = 50.5; 2/3 Po = 101.0; 1/2 Po = 75.75 Add Appropriate Po value to static pressure at center of test interval

TEST NO. Zone 3 Sequence No. E Planned Center Pressure: 271.2

Transducer Readings Before Packers Inflated: Top 20.10; Middle 119.91; Bottom: 123.72

Transducer Readings After Packers Inflated: Top 20.09; Middle 124.26; Bottom: 130.85

Time, Minutes	FLOW METER READING, Gallons			FLOW, gpm	Middle Transducer Reading, psi	Surface Gage Pressure, psi	REMARKS
	Initial	Final	Difference				
12:02:30	8390	---	---		268.42	140	BEGIN
12:03:00	8390	8390			264.81	140	
12:03:30	8390	8390			264.35	140	
12:04:00	8390	8390			266.03	140	
12:04:30	8390	8390			265.18	140	
12:05:00 ~~12:05:00~~	8390	8390			268.70	140	7-5-13
12:05:30	8390	8390			266.63	140	
7-5-13							

*From Preliminary Boring Layout Survey

Form Approved for Use on the Clinch River SMR Project - J.A. Tice Technical Lead Form Rev 0 - Reviewed by SR 12/13/13

DOUBLE PACKER BOREHOLE PERMEABILITY TEST DATA SHEET

BORING: MP-415 Deep Seq E

DATE: 7-5-2013

DATA COLLECTED BY: Tom McGill/Jim Goddard

SHUT-IN TEST PRESSURE: N/A psi

See Pg 1 SR 12/13/13

TIME, minute	SURFACE GAGE PRESSURE, psi	CENTER TRANSDUCER PRESSURE, psi

Not Used

GJ 7-5-13

EQUIPMENT USED

Transducers: Level Troll 700 Serial Numbers: 335896/R24844 (shallow) *6/12/13*; **315381/R24039 (intermediate)** *6/20/13*; **141142/R20367 (deep)** *6/20/13*; **315380/R24038 (spare)** *6/20/13*

Surface Pressure Gage: (Both Wika 213.53) - MW-3 (at pump); MW-4 (at totalizer) *6/11/13*

Barometric Probe: (Baro Troll) 121315/R22669 *6/12/13*

Flow Meter: (Master Meter 1344) – 8824788 field checked *6/25/13*

Stop Watch: (Sportline 220) – L286/2786 *6/10/13*

Date of Calibration: Dates in italics after equipment serial number

Calibration due: Post Testing

PACKER TEST FLOW RATE GRAPHS

Boring MP-416

Packer Test Intervals: ***(below ground surface)*** ***(below top of casing)***

MP-416 Zone 1:	***75.0*** feet to ***82.5*** feet	**Not Tested**
MP-416 Zone 2:	***89.0*** feet to ***96.5*** feet:	***89.79*** feet to ***97.29*** feet
MP-416 Zone 3:	***109.0*** feet to ***116.5*** feet:	***109.79*** feet to ***117.29*** feet
MP-416 Zone 4:	***205.0*** feet to ***212.5*** feet:	***205.79*** feet to ***213.29*** feet

Graphs of flow rate (gpm) vs time (minutes) have been created from Excel sheets containing data from field data sheets. For clarity, individual plots for each sequence within a tested interval are presented. Generally, plots are not provided if the field data sheets indicate no flow during a test sequence. ***Bechtel Field Instruction forms are provided. AMEC field data sheets are provided following the graphs for each zone. The AMEC field data sheets use top of casing as a field measurement reference. Assigned test interval depths below ground surface were converted to depths below top of casing by adding the casing height to the assigned test interval depths.*** Transducer data file names are listed on the last field data sheet of each test interval. Transducer data files are furnished as electronic files ***in a data supplement submittal***.