









## GEOTECHNICAL BORING LOG

Prepared By: MBL Date: 3/5/14Checked By: JCM Date: 3/5/14

SHEET 1 OF 1

BECHTEL NO.: 25847				AMEC PROJECT NO.: 6468-13-1072				COUNTY: Roane, TN				GEOLOGIST: J. Terry						
SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee								DRILLER: G. Akins/K. Amburn				Boring Orientation						
BORING NO.: MP-423				DRILL METHOD: Mud Rotary/Core				DRILL MACHINE: D-120 (MW-2)				Inclination: Vertical						
GROUND ELEV.: 799.0 ft (NAVD88)				NORTHING: 571,470 US ft (NAD83)				EASTING: 2,448,276 US ft (NAD83)				Azimuth: NA						
TOTAL DEPTH: 319.3 ft		SAMPLE METHODS: ASTM D 1586-11; 2488-09a; 2113-08; 6032-08						ROD TYPE: AWJ		HAMMER (ID): 140-lb Auto (R308)								
DATE STARTED: 7/8/13		COMPLETED: 7/22/13		HOLE DIA.: 4"		CASING DEPTH: 45.4 ft		CORE SIZE: HQ3		BITS USED: 4" Roller Cone								
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL DESCRIPTION AND REMARKS						
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100								
799.0					Ground Surface							799.0	0.0					
799.0	0.0	4	8	19						SS-1		797.0	2.0					
796.7	2.3	11	7	3						SS-2		797.0	2.0					
794.0	5.0	3	6	10						SS-3		790.6	8.4					
791.4	7.6	3	4	11						SS-4A SS-4B		789.5	9.5					
789.0	10.0	8	8	10						SS-5		787.0	12.0					
786.6	12.4	6	8	11						SS-6		787.0	12.0					
784.0	15.0	4	5	10						SS-7		776.0	23.0					
779.0	20.0	6	8	11						SS-8		776.0	23.0					
773.9	25.1	5	7	8						SS-9		772.0	27.0					
768.9	30.1	10	22	35						SS-10		772.0	27.0					
763.9	35.1	50/0.4								SS-11		765.0	34.0					
										SS-11		761.7	37.3					
												Observed water levels: 19.6 ft bgs, AM 7/9/13 35.2 ft bgs, AM 7/10/13 36.1 ft bgs, AM 7/11/13 40.3 ft bgs, AM 7/16/13 40.5 ft bgs, AM 7/17/13 41.8 ft bgs, AM 7/18/13 42.0 ft bgs, AM 7/19/13 41.9 ft bgs, AM 7/20/13 40.0 ft bgs, AM 7/21/13 44.0 ft bgs, AM 7/22/13						

CLINCH RIVER SMR BORE FINAL CLINCH FINAL LOGS.GPJ CLINCH BORING DATA TEMPLATE.GDT 3/5/14



## GEOTECHNICAL CORING LOG

Prepared By: MBL Date: 3/5/14Checked By: JCM Date: 3/5/14

SHEET 1 OF 6

BECHTEL PROJECT NO.: 25847				AMEC PROJECT NO.: 6468-13-1072				COUNTY: Roane, TN		GEOLOGIST: J. Terry	
SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee								DRILLER: G. Akins/K. Amburn		Boring Orientation Inclination: Vertical Azimuth: NA	
BORING NO.: MP-423				DRILL METHOD: Mud Rotary/Core				DRILL MACHINE: D-120 (MW-2)			
GROUND ELEV.: 799.0 ft (NAVD88)				NORTHING: 571,470 US ft (NAD83)				EASTING: 2,448,276 US ft (NAD83)			
TOTAL DEPTH: 319.3 ft				SAMPLE METHODS: ASTM D 1586-11; 2488-09a; 2113-08; 6032-08						HAMMER (ID): 140-lb Auto (R308)	
DATE STARTED: 7/8/13				COMPLETED: 7/22/13		CASING DEPTH: 45.4 ft		CORE BARREL TYPE: HQ3/Diamond Impregnated core bits			
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %		RQD (ft) %	SAMP. NO.	LOG	ROCK DESCRIPTION AND REMARKS		
									Begin Coring @ 37.3 ft		
761.7	37.3	2.0	7:11	(0.5)	(0.0)	Run 1		761.7	LIMESTONE (MICRITE), grayish brown (10YR 5/2) to dark gray (7.5YR 4/1, 10YR 4/1), weak, laminated to very thinly bedded, moderately to slightly weathered, interbedded with little to some, laminated to very thin Calcareous SILTSTONE, wavy/irregular bedding, trace calcite-filled pits; strong HCl reaction ( <b>Lincolnshire Formation-Eidson Member-Unit A</b> )		
759.7	39.3	2.0	5:13	25%	0%						
		2.0	4:05	(1.4)	(0.0)	Run 2			39.3-39.4, 39.9-40.0, 43.0-44.3ft: Rod drops		
757.7	41.3		6:22	70%	0%				40.6, 40.7, 40.8, 41.0, 41.2, 41.3ft: BJ, 35°, PS, PO-O, D, III		
		3.0	8:25	(1.8)	(0.9)	Run 3			41.3, 41.4, 41.6, 41.8, 41.9, 42.1, 42.2ft: BJ, 35°, PR, PO-O, D, III		
			5:12	60%	30%			756.0	41.7, 42.0ft: J, 45°, SR, PO-O, D, III		
754.7	44.3		0:23								
			N=50/0.4			SS-12		754.2	VOID/SOIL FILLED CAVITY: No core recovery-rod drop to 44.3'; sampled as LEAN CLAY with Sand (CL), dark yellowish brown (10YR 4/6), very soft, wet, low plasticity fines, little coarse sand, weak HCl reaction (SS-12: 44.3-45.2'=WOR-50/0.4' (N=50/0.4'))		
								753.6			
753.6	45.4	4.0	5:42	(4.0)	(2.8)	Run 4			WEATHERED ROCK: LIMESTONE-Casing advanced to 45.4', resume rock coring		
			3:40	100%	70%				LIMESTONE (MICRITE) with trace (WACKESTONE), gray (10YR 5/1, 2.5Y 5/1) to dark gray (10YR 4/1), weak to medium strong and strong, laminated to thinly bedded, slightly weathered to fresh, interbedded with little to some, laminated to thin Calcareous SILTSTONE, dark gray (2.5Y 4/1) to very dark gray (10YR 3/1, 7.5YR 3/1) and greenish black (10Y 2.5/1), planar to wavy/wispy and irregular to diffuse bedding, and trace to few, very thin to thin chert beds, lenses, and nodules (gray to dark gray and black, with calcite filled tensional fractures orthogonal to bedding); slight bioturbation, locally to moderately weathered and discolored-brown (7.5YR 4/4), trace calcite filled pits and sparry calcite "bird eyes", trace pyrite, trace fossils, locally argillaceous, strong HCl reaction		
			3:29						46.3, 46.4, 46.6, 46.9, 47.4, 47.5, 47.6, 47.7, 48.1, 48.9, 49.4ft: BJ, 30°, PS-PR, PO-O, D, II-III		
749.6	49.4		3:37						49.6, 52.2, 52.3, 53.4, 53.7, 54.0ft: BJ, 30-35°, PS, D, III		
		5.0	3:22	(4.9)	(4.1)	Run 5			49.8ft: J, 55°, SR, C, III		
			2:25	98%	82%				50.4, 51.8ft: BJ, 30°, PS-US, T-PO, B, II		
			2:02						52.6ft: BJ, 20-25°, UR, D, III		
			2:57						52.8-53.8ft: SH, 50°, A, I, with calcite and spaced at about 0.1'		
744.6	54.4		3:09						54.3, 54.6, 54.7, 55.3, 55.5, 55.8, 57.3ft: BJ, 30-35°, SR, PO-O, D, III		
		5.0	3:22	(5.0)	(1.7)	Run 6			57.6, 58.0, 58.1, 58.3, 58.5, 58.7, 59.0ft: BJ, 30-35°, SR, PO-O, D, III		
			2:55	100%	34%				56.1, 56.4, 56.8ft: BJ, 30°, PS, T-PO, B, II		
			2:35						57.1, 57.7ft: J, 40-50°, SR, PO-O, B, II		
739.6	59.4		2:29						59.8, 60.8, 62.2, 63.5ft: BJ, 30-35°, SS, PO, B, II		
		5.0	2:02	(5.0)	(5.0)	Run 7					
			2:09	100%	100%						
			2:39								
			2:28								
734.6	64.4										
		5.0	2:04	(5.0)	(3.0)	Run 8			65.1, 66.7, 68.0ft: BJ, 30°, PS, T-PO, B, II		
			1:45	100%	60%	L7-29			66.1, 66.4, 67.3, 67.6, 67.9, 68.1, 68.3ft: BJ, 40°, US, T-PO, B, II		
			1:45						68.6, 68.9, 69.1ft: BJ, 30°, UR, PO-O, F, II		
			1:51						69.2-70.5ft: SZ/FZ, 40-55°, VT, A, I, with calcite		
729.6	69.4		2:37								
		5.0	2:55	(4.7)	(3.5)	Run 9			71.1, 71.5, 72.0, 72.7, 73.6, 73.8ft: BJ, 35°, PS, PO-O, B, II		
			3:36	94%	70%						
			2:11								
			2:14								
			2:12			L7-30					
724.6	74.4										
724.4	74.6	0.2	0:58/0.2	(0.2)	(0.0)	Run 10			74.4, 74.5ft: BJ, 30°, PS, T-PO, B, III		
		4.8	4:20/0.8	100%	0%	Run 11			74.6ft: BJ, 30°, PS, T-PO, B, III		
			3:55	(4.8)	(3.7)				74.7, 74.9, 75.0, 75.1, 75.3, 75.4ft: BJ, 30-35°, PS, PO, D, III		
			2:13	100%	77%				76.3, 77.6, 78.9, 79.3ft: BJ, 30°, PR, T-PO, B, II		
			2:56						75.8-78.9ft: As above with strong bioturbation, irregular coarse horizontal and vertical burrows filled with sparry calcite and carbonate, fossiliferous		
			2:29								
719.6	79.4										
719.1	79.9	0.5	1:47/0.5	(0.4)	(0.0)	Run 12			79.4, 79.5ft: BJ, 20-25°, UR/UL/SL, T-PO, D, II		
		4.5	2:00/0.5	80%	0%	Run 13			79.6ft: BJ, 25-30°, PR, T-PO, B, II		
			3:04	(4.4)	(4.0)				79.8, 80.7ft: BJ, 40°, UR-UL-SL, T-PO, B-E, II-III		
			2:26	98%	89%	L7-31			79.7ft: SH, 45°, PS, VT, A, I, with calcite		
			1:27						79.9ft: BJ, 25-30°, UR, T-PO, B, III		
			2:35					715.6	80.1-81.8ft: FZ/SZ, 40-75°, PR, VT-T, A, I, with calcite and spaced at about 0.2'		
714.6	84.4								81.5, 82.5, 83.1ft: BJ, 25°, UL-PR-SR, T-PO, B, II		
		5.0	3:53	(5.0)	(3.7)	Run 14					
				100%	74%						

CLINCH RIVER SMR CORE FINAL CLINCH FINAL LOGS.GPJ CLINCH BORING DATA TEMPLATE.GDT 3/5/14





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BORING NO.: MP-423				DRILL METHOD: Mud Rotary/Core				DRILL MACHINE: D-120 (MW-2)				Inclination: Vertical	
GROUND ELEV.: 799.0 ft (NAVD88)				NORTHING: 571,470 US ft (NAD83)				EASTING: 2,448,276 US ft (NAD83)				Azimuth: NA	
TOTAL DEPTH: 319.3 ft				SAMPLE METHODS: ASTM D 1586-11; 2488-09a; 2113-08; 6032-08						HAMMER (ID): 140-lb Auto (R308)			
DATE STARTED: 7/8/13				COMPLETED: 7/22/13		CASING DEPTH: 45.4 ft		CORE BARREL TYPE: HQ3/Diamond Impregnated core bits					
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %		RQD (ft) %	SAMP. NO.	L O G	ROCK DESCRIPTION AND REMARKS				
									Continued from previous page				
709.6	89.4		4:33 4:55 6:05 6:09						LIMESTONE (MICRITE), gray (10YR 5/1) to dark gray (10YR 4/1), strong, very thin to moderately bedded, locally laminated, slightly weathered to fresh, stylolitic, interbedded with trace to little, laminated to very thin, Calcareous SILTSTONE, planar to wispy/irregular and diffuse, and few to little, very thin to moderate chert beds, lenses, and nodules (gray to dark gray and black, with calcite filled tensional fractures orthogonal to bedding); calcite healed fractures and shear zones through-out, trace calcite filled pits and vugs (separate/non-touching), trace to slight bioturbation, strong HCl reaction (continued) 83.5ft: BJ, 25°, SR, B, II 83.9,84.1,84.8,85.1,85.2,85.6ft: BJ, 40°, PR/PS/PL, T-PO, B-C-D, II-III 86.6-90.1ft: FZ/SZ, 50-80°, calcite-healed fractures 87.2,88.0ft: BJ, 30°, PR, PO, C, II 87.3ft: J, 30°, PR, PO, C, II 89.7,89.8ft: BJ, 40°, PR-US, O, D, III, mostly mechanically reduced to rubble 90.1,90.2ft: BJ, 40°, PR-PL, T-PO, B-D, III 90.1ft: J, 35°, SR, PO-O, E, III 90.7,93.2ft: BJ, 40°, PS/PL, O, B, II-III 90.8-94.0ft: SZ/FZ, 50-90°, VT-PO, A-B, I 90.9,91.3ft: BJ, 45°, PR/PL, PO-O, B, II-III 93.7ft: BJ, 30°, UR-UL, O-MO, B, III 94.1ft: BJ, 40°, UL, T-PO, B, III 94.1ft: J, 35°, SS-US, T-PO, B, III 94.7,95.3,95.6,95.9,96.2,96.9,97.1,97.7,97.9,98.2,98.6ft: SH/BJ, 30°, PL-SL, T, C, II 98.5ft: J, 40°, PR, T-PO, B, II 98.6-99.2ft: FZ/SZ, 35-85° 100.1,100.4,101.0,101.5,101.8,102.3,103.2,103.9,104.0,104.1ft: SH, 35-40°, SL/PL, T-PO, B, II 101.0ft: J, 20-25°, SR, PO-O, B, III 101.0-101.9ft: SZ, 30-85°, with calcite-healed limestone breccia 103.6ft: J, 0°, SR, T-PO, B, II 104.4,105.0,105.2,105.5,105.9,106.0,106.2,106.7ft: BJ, 30°, PL-SL, T-PO, B-C, II 107.5,107.8,107.9,108.0,108.1,108.5,109.2ft: BJ/SH, 30°, PL-SL, T-PO, B-C, II 104.9,106.5,106.6,107.2,107.6ft: BJ, 30°, PS-SS, T-PO, B, II 104.9,107.2ft: J, 50°, PR, PO, B, II				
708.4	90.6	1.2	4:10	(1.2)	(0.4)	Run 15							
		2.8	4:53/0.2 4:56/0.8 6:08 5:39	100% (2.8) 100%	33% (0.0) 0%	Run 16							
705.6	93.4		8:08	(1.0)	(0.7)	Run 17							
704.6	94.4	1.0	4:00	100% (4.8)	70% (3.0)	Run 18							
		5.0	3:11 2:54 2:30 3:30	96% (5.0)	60% (4.2)								
699.6	99.4		4:13 3:03 2:20 2:15 4:05	100% (5.0)	84% (1.9)	Run 19							
694.6	104.4	5.0	4:28 3:52 5:35 3:57 3:22	100% (5.0)	38% (4.1)	Run 20							
689.6	109.4		2:26 2:29 2:20 2:36 3:20	100% (5.0)	80% (4.0)	Run 21							
684.6	114.4	4.8	3:37 3:08 3:28 6:58 5:51/0.8	96% (4.6)	85% (4.1)	Run 22							
679.8	119.2		2:34 2:13 2:08 3:06 5:45	(5.0) 100%	(3.9) 78%	Run 23							
674.8	124.2	5.0	5:46 3:10 2:23 2:03 2:26	100% (5.0)	92% (4.6)	Run 24							
669.8	129.2		1:51 1:57 3:05 2:10 2:00	(5.0) 100%	(4.8) 96%	Run 25							
664.8	134.2	5.0											

CLINCH RIVER SMR CORE FINAL CLINCH FINAL LOGS.GPJ CLINCH BORING DATA TEMPLATE.GDT 3/5/14



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SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee								DRILLER: G. Akins/K. Amburn		Boring Orientation	
BORING NO.: MP-423				DRILL METHOD: Mud Rotary/Core				DRILL MACHINE: D-120 (MW-2)		Inclination: Vertical	
GROUND ELEV.: 799.0 ft		(NAVD88)		NORTHING: 571,470		US ft (NAD83)		EASTING: 2,448,276		US ft (NAD83)	
TOTAL DEPTH: 319.3 ft		SAMPLE METHODS: ASTM D 1586-11; 2488-09a; 2113-08; 6032-08						HAMMER (ID): 140-lb Auto (R308)			
DATE STARTED: 7/8/13		COMPLETED: 7/22/13		CASING DEPTH: 45.4 ft		CORE BARREL TYPE: HQ3/Diamond Impregnated core bits					
ROCK DESCRIPTION AND REMARKS											
Continued from previous page											
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	ROD (ft) %	SAMP. NO.	L O G				
659.8	139.2	5.0	2:10 1:53 1:56 1:43 2:04	(5.0) 100%	(5.0) 100%	Run 26 L7-34		CALCAREOUS SILTSTONE, black (N 2.5/) to very dark greenish gray (10GY 3/1) and very dark gray (2.5Y 3/1), weak, laminated to thickly bedded, fresh, interbedded with some laminated to thin LIMESTONE (MICRITE), gray (10YR 5/1), planar to amorphous and diffuse bedding, and trace irregular chert nodules (black); slight to moderate bioturbation, trace calcite filled pits, strong HCl reaction ( <b>Upper Blackford Formation-Unit A</b> ) (continued)			
654.9	144.1	4.9	2:00 1:52 2:11 2:07 2:30/0.9	(4.9) 100%	(4.2) 86%	Run 27		LIMESTONE (GRAINSTONE/MICRITE), gray (2.5Y 5/1), medium strong, very thinly to thinly bedded, slightly weathered to fresh, interbedded with little to some, laminated to very thin Calcareous SILTSTONE, black (5Y 2.5/1), wavy/wispy to planar bedding, and trace to few, very thin to thin chert beds, lenses, and nodules (dark gray to black and dark yellowish brown, with calcite filled tensional fractures orthogonal to bedding); strong HCl reaction 139.7ft: J, 0-50°, SR, T-PO, B, II 140.3,140.8ft: BJ, 30°, PR-US, T-O, C, II 141.5,141.8,142.6ft: J, 60°, VT, A, I, with calcite 141.7,142.0,142.1,142.4,142.8,143.5ft: BJ, 25°, PL, T-PO, B-D, II 143.6ft: J, 50-90°, US, B, II 144.2,144.5,145.8,146.0ft: BJ, 20-40°, PS/PR/SR/PL, T-O, B-D, II 146.1ft: J, 0°, PR-PL, T-PO, C, II			
649.9	149.1	5.0	2:40 2:29 2:27 2:42 2:55	(4.9) 98%	(4.8) 96%	Run 28		CALCAREOUS SILTSTONE, black (5Y 2.5/1) to dusky red (10R 3/3) and dark reddish gray (10R 4/1) with trace dark greenish gray (10GY 4/1), weak, laminated to thickly bedded, slightly weathered to fresh, interbedded with few to little, laminated to very thin LIMESTONE (MICRITE), irregular to amorphous and diffuse bedding; strong bioturbation, strong HCl reaction 147.2ft: J, 25°, SR-SL, T-PO, C, II 148.0ft: BJ, 30°, PR, T-PO, B, II			
644.9	154.1	5.1	2:03 1:44 1:55 2:00 1:47	(4.9) 98%	(4.9) 98%	Run 29		LIMESTONE (MICRITE/WACKESTONE) with few (PACKSTONE/GRAINSTONE), gray (10YR 5/1), medium strong, laminated to thinly bedded, locally to moderately bedded and nodular, fresh, interbedded with some, laminated to thin, locally to moderately bedded Calcareous SILTSTONE, very dark gray (2.5Y 3/1) to black (2.5Y 2.5/1, 10YR 2/1), and dusky red (10R 3/2) to dark reddish gray (2.5YR 3/1) and dark reddish brown (2.5YR 2.5/3), locally with trace dark greenish gray (10Y 4/1), planar to locally wavy/wispy and irregular to diffuse bedding, and trace to few, very thin to thin chert beds, lenses, and nodules (gray to dark gray, black, dusky red, and strong brown, with calcite filled tensional fractures orthogonal to bedding); slight to moderate bioturbation, trace calcite filled pits and burrows, strong HCl reaction 152.8,153.9ft: BJ, 40°, SS, T-PO, B, II 153.7,153.8ft: BJ, 30°, PS-PL, T-PO, B, II 154.1,154.2,154.4,154.5,155.2,156.0,158.4ft: BJ, 40°, PL, T-PO, B-C, II 157.3ft: J, 0-60°, SR, T, B, II 160.3,161.6ft: BJ, 30°, PS-PL, T-PO, B, II 162.2ft: J, 0-30°, UR, T-PO, D, II 163.4ft: BJ, 30°, PL-SL, PO-O, C, II 165.8ft: BJ, 30°, US, T-PO, B, II 166.7ft: BJ, 30°, PR-PL, T-PO, B, II 167.9,168.0,168.1ft: BJ, 30°, SR, T-PO, C, II 168.3ft: BJ, 30°, SR, PO-O, C-D, II			
639.8	159.2	5.0	2:25 1:49 1:37 1:36 2:05/1.1	(5.1) 100%	(4.6) 90%	Run 30		170.0,172.2,173.3ft: BJ, 30°, PL, T-PO, C-B, II			
634.8	164.2	5.0	1:52 1:35 1:50 2:12 2:18	(5.0) 100%	(5.0) 100%	Run 31		175.9,176.5ft: BJ, 30°, SR, T-PO, B, II 177.2ft: J, 40°, SR, T, B, II 177.3,177.8,178.5ft: BJ, 40°, PL, T-PO, C, II 178.4-178.5ft: SZ, 10-40°, calcite-healed fractures 178.9ft: BJ, 40°, UR, T, B, II			
629.8	169.2	5.0	2:11 1:47 1:45 2:02 2:15	(5.0) 100%	(4.7) 94%	Run 32					
624.8	174.2	5.0	1:56 1:49 1:51 1:50 1:57	(5.0) 100%	(5.0) 100%	Run 33					
619.8	179.2	5.0	2:36 2:32 2:07 2:34 2:51	(5.0) 100%	(5.0) 100%	Run 34					
		5.0	2:18 2:05 2:05 2:00	(5.0) 100%	(4.2) 84%	Run 35 L7-35					

CLINCH RIVER SMR CORE FINAL CLINCH FINAL LOGS.GPJ CLINCH BORING DATA TEMPLATE.GDT 3/5/14





BECHTEL PROJECT NO.: 25847			AMEC PROJECT NO.: 6468-13-1072			COUNTY: Roane, TN		GEOLOGIST: J. Terry	
SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee						DRILLER: G. Akins/K. Amburn		Boring Orientation	
BORING NO.: MP-423			DRILL METHOD: Mud Rotary/Core			DRILL MACHINE: D-120 (MW-2)		Inclination: Vertical	
GROUND ELEV.: 799.0 ft (NAVD88)			NORTHING: 571,470 US ft (NAD83)			EASTING: 2,448,276 US ft (NAD83)		Azimuth: NA	
TOTAL DEPTH: 319.3 ft			SAMPLE METHODS: ASTM D 1586-11; 2488-09a; 2113-08; 6032-08				HAMMER (ID): 140-lb Auto (R308)		
DATE STARTED: 7/8/13			COMPLETED: 7/22/13		CASING DEPTH: 45.4 ft		CORE BARREL TYPE: HQ3/Diamond Impregnated core bits		
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN ROD (ft) %	SAMP. NO.	L O G	ROCK DESCRIPTION AND REMARKS	
								Continued from previous page	
614.8	184.2	5.0	2:10 2:05 2:00 2:09 2:45 3:46	(5.0) 100%	(4.9) 98%	Run 36		CALCAREOUS SILTSTONE, variably dark reddish gray (10R 3/1), dusky red (7.5R 3/4-3/3, 10R 3/2), dark reddish brown (2.5YR 2.5/3), weak red (2.5YR 5/2), very dusky red (2.5YR 2.5/2), grading to very dark gray (10YR 3/1, 5Y 3/1) to black (5YR 2.5/1, 10YR 2/1), with trace greenish gray (10Y 4/1), weak to strong, laminated to moderately bedded, fresh, interbedded with few to some, laminated to thin LIMESTONE (MICRITE/WACKESTONE) and few (PACKSTONE/GRAINSTONE), greenish gray (10Y 5/1) and gray (10YR 5/1) to dark gray (N 4/), mostly planar to irregular/amorphous and diffuse bedding, and few to little, very thin to moderate chert beds, lenses, and nodules (dusky red and reddish brown to dark gray and black, with calcite filled tensional fractures orthogonal to bedding); moderate to strong bioturbation, trace to few calcite filled pits and burrows, strong HCl reaction (continued)	
609.8	189.2	5.0	2:50 3:06 2:51 3:02 3:08	(4.9) 98%	(4.5) 90%	Run 37		179.1ft: J, 45°, VT, A, I, with calcite 179.8,179.9,180.2,180.9,181.1,182.6,183.8, 30-40°, SL-PS-SS-UR-PR-PL, T-PO, B-C, II 180.8ft: SH, 10°, SL, T, C, II 181.3ft: SH, 35°, UL, PO-O, C, II 182.2ft: BJ, 25°, SS, T-PO, B, II 183.2,183.4ft: BJ, 30-35°, SR-SL, T-PO, B, II	
604.8	194.2	5.0	2:50 2:19 2:11 2:16 2:23	(5.0) 100%	(5.0) 100%	Run 38		184.3,184.5,185.0,186.1,186.7,187.0,187.8,187.9ft: BJ, 35°, SR-PS-PL, T-PO, B-C, II 191.6,191.7,191.9,192.1,192.8,192.9ft: BJ, 30°, SL-PL, T-PO, B-C, II 195.9ft: BJ, 20°, US, T-PO, B, II 196.7,197.5,197.7,197.9,198.1,198.4,198.8ft: BJ, 35°, PL-SL, T-PO, B-C, II	
599.8	199.2								
599.1	199.9	0.7	3:50/0.7	(0.6)	(0.0)	Run 39		199.2ft: BJ, 40°, UR, T-PO, B, II	
		4.3	0:57/0.3 3:55 3:09 3:32 4:01	86% (4.3) 100%	0% (3.5) 81%	Run 40		199.4-199.6ft: BJ, 25°, PR-PL, T-PO, E, II 200.3ft: J, 70°, SR, T, B, II 200.3,200.5,200.9ft: BJ, 30-40°, UR-SR, T, B, II 201.4,201.6,202.3,202.8,203.2ft: BJ, 35°, PR, T-PO, B, C, II 203.5,203.7,203.9-204.0,204.1ft: BJ, 25-40°, UR, T-PO, B-C, II	
594.8	204.2	5.0	3:03 2:00 2:47 2:54 3:02	(5.0) 100%	(4.5) 90%	Run 41		205.0,205.1,205.5,205.9,206.4,207.2,207.3,207.4,207.7,208.2,208.9ft: BJ, 25°, PR, T-PO, B-C, II	
589.8	209.2	5.0	2:38 2:24 2:32 3:12 3:09	(5.0) 100%	(4.5) 90%	Run 42		209.8,210.1,211.3,211.4,211.5ft: BJ, 25-30°, PR-SL, T-PO, E, II 210.8ft: BJ, 40°, PS, T-PO, B, II 212.1ft: BJ, 20°, UR-UL, T-PO, C, II 213.2ft: J, 10-20°, UR, T-PO, B, II 212.2-213.2ft: As above, with LIMESTONE (WACKESTONE), grayish brown (10YR 5/2), with few carbonate clasts and chert nodules	
584.8	214.2	5.0	2:49 2:43 2:11 2:35 2:21	(5.0) 100%	(5.0) 100%	Run 43		215.4,217.5ft: BJ, 32°, PS-SS, T, B-C, II	
579.8	219.2	5.0	2:09 2:13 2:44 2:48 2:33	(5.0) 100%	(4.5) 90%	Run 44		220.0,220.6,223.4,223.7ft: BJ, 20-25°, UR-SR, T-PO, B-C, II 221.1ft: BJ, 30°, PS-SL, T, C, II 221.5,221.9,222.5,222.8,222.9ft: BJ, 35°, SR-UR-UL, T-PO, B-C, II 223.0,223.3ft: BJ, 70°, SL, T-PO, C, II	
574.8	224.2	5.0	3:41 3:09 2:58 3:47 3:45	(5.0) 100%	(4.9) 98%	Run 45		LIMESTONE (MICRITE/WACKESTONE), gray (2.5Y 6/1, 10YR 6/1-5/1), weak to strong, laminated to moderately bedded, fresh, interbedded with few to some, laminated to moderately bedded Calcareous SILTSTONE, dusky red (10R 3/3), black (10YR 2/1), dark reddish gray (10R 3/1), very dusky red (10R 2.5/2), and greenish gray (10Y 5/1), planar to wavy/wispy, irregular and diffuse bedding, few to little, very thin to moderate chert beds, lenses, and nodules (reddish black, dark brown, reddish brown, to gray and black, with calcite filled tensional fractures orthogonal to bedding); slight to moderate bioturbation, trace calcite filled pits and burrows, strong HCl reaction	
569.8	229.2	5.0	3:49 3:31 2:17	(5.0) 100%	(5.0) 100%	Run 46		224.2,226.7ft: J, 0-20°, SR, PO, B-C, II 224.2,224.6,225.0,228.0ft: BJ, 30°, US-UR-SR, T-PO, C, II 227.4,227.5ft: J, 60°, PR-SR, T, B-C, II	



BECHTEL PROJECT NO.: 25847				AMEC PROJECT NO.: 6468-13-1072				COUNTY: Roane, TN		GEOLOGIST: J. Terry	
SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee								DRILLER: G. Akins/K. Amburn		Boring Orientation	
BORING NO.: MP-423				DRILL METHOD: Mud Rotary/Core				DRILL MACHINE: D-120 (MW-2)		Inclination: Vertical	
GROUND ELEV.: 799.0 ft (NAVD88)				NORTHING: 571,470 US ft (NAD83)				EASTING: 2,448,276 US ft (NAD83)		Azimuth: NA	
TOTAL DEPTH: 319.3 ft				SAMPLE METHODS: ASTM D 1586-11; 2488-09a; 2113-08; 6032-08				HAMMER (ID): 140-lb Auto (R308)			
DATE STARTED: 7/8/13				COMPLETED: 7/22/13		CASING DEPTH: 45.4 ft		CORE BARREL TYPE: HQ3/Diamond Impregnated core bits			
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %		ROD (ft) %	SAMP. NO.	L O G	ROCK DESCRIPTION AND REMARKS		
Continued from previous page											
564.8	234.2	5.0	1:56 3:01 3:24 5:08 3:30 2:53 3:09	(5.0) 100%	(5.0) 100%	Run 47			LIMESTONE (MICRITE/WACKESTONE), gray (2.5Y 6/1, 10YR 6/1-5/1), weak to strong, laminated to moderately bedded, fresh, interbedded with few to some, laminated to moderately bedded Calcareous SILTSTONE, dusky red (10R 3/3), black (10YR 2/1), dark reddish gray (10R 3/1), very dusky red (10R 2.5/2), and greenish gray (10Y 5/1), planar to wavy/wispy, irregular and diffuse bedding, few to little, very thin to moderate chert beds, lenses, and nodules (reddish black, dark brown, reddish brown, to gray and black, with calcite filled tensional fractures orthogonal to bedding); slight to moderate bioturbation, trace calcite filled pits and burrows, strong HCl reaction (continued) 227.6ft: BJ, 25°, SL, O-MO, C, II 228.6,229.0,229.6,229.8ft: BJ, 20-30°, PR-PL, T-PO, B-C, II 229.7ft: J, 45°, PR, T, B, II 230.4,230.7ft: BJ, 35-40°, PR, T, C, II 233.5ft: J, 5-30°, SR, T, B, II 235.6,236.0,236.4,237.2,238.1,238.9ft: BJ, 30°, SL-PR, T-PO, B-C, II 237.3ft: J, 60°, SR, T, C, II 236.8-237.4,237.9-238.9ft: FZ/SZ, 30-90°, VT, A, I, with calcite and spaced at 0.1-0.5'		
559.8	239.2	5.0	3:29 4:18 3:51 3:40 3:46	(5.0) 100%	(4.9) 98%	Run 48			CALCAREOUS SILTSTONE, very dusky red (10R 2.5/2) to dusky red (10R 3/2, 2.5YR 3/2) and dark reddish gray (2.5YR 4/1-3/1), weak to strong, laminated to thinly bedded, slightly weathered to fresh, interbedded with little to some, laminated to very thin LIMESTONE (MICRITE/WACKESTONE), gray (10YR 5/1) to light gray (N 7/), diffuse and wavy to mostly planar bedding, and few to little, very thin to thin chert beds, lenses, and nodules (reddish brown, to black, with calcite filled tensional fractures orthogonal to bedding); moderate to strong bioturbation, trace calcite filled pits and burrows, strong HCl reaction 240.0,241.8,242.0,242.4,242.7,242.8ft: BJ, 20-28°, PL-PR, T-PO, B-C, II 240.5ft: J, 0-10°, SR, PO, B, II 240.7,240.9,241.2,241.4,243.2,243.7,244.0,244.1ft: BJ, 30°, PR-PL, T-PO, B-C-D, II 244.3,244.7,245.0,245.5,246.3,248.1ft: BJ, 20-30, PR-SL, T-PO, C, II 248.2,248.5,248.8ft: BJ, 35°, PR, PO, C, II 249.3,249.4,249.5,249.6,249.8,250.0,250.1ft: BJ, 20-40°, PR, T-PO, B-C, II 250.3,250.7,251.0,252.0,252.3,252.6,252.9,253.0ft: BJ, 20-40°, PR, T-PO, B-C, II		
554.8	244.2	5.0	3:09 3:31 2:53 2:34 2:57	(5.0) 100%	(4.7) 94%	Run 49			LIMESTONE (MICRITE), gray (10YR 6/1-5/1, 2.5Y 6/1) to dark gray (10YR 4/1), weak to medium strong and strong, laminated to thinly bedded, trace nodular, slightly weathered to fresh, interbedded with few to little, laminated to thin Calcareous SILTSTONE, black (5YR 2.5/1, 10YR 2/1) to dark gray (10YR 4/1) and very dark gray (10YR 3/1), with dusky red (10R 3/3) and trace greenish gray (10Y 4/1), mostly planar to wavy/wispy and irregular bedding, and little to some, thin to moderate chert beds, lenses, and nodules (jasperoidal, dark reddish gray, dark reddish brown, to dark gray and black, few with red specks, with calcite filled tensional fractures orthogonal to bedding); slight bioturbation, trace calcite filled pits and burrows, strong HCl reaction 253.3,253.7,253.8,254.1ft: BJ, 20-40°, PR, T-PO, B-C, II 254.9,255.1,255.3,255.6,255.9ft: BJ, 30°, UR-US-PS-PL,T, B-C, II 255.5ft: BJ, 20°, PS, T, B, II 256.3,256.4,256.6,256.8,257.5ft: BJ, 35°, PR-PL, T, C, II 257.0ft: BJ, 20°, UR, T-PO, E, II 257.7-257.8ft: SZ, 30°, SL, T, C, II 258.1ft: J, 40°, SR, T-PO, C, II 258.2ft: BJ, 10-45°, SR, T-PO, C, II 258.4ft: BJ, 35°, SR, VT, A, I 259.9,260.0,260.1ft: SH, 15-25°, UL, T-PO, C, II 261.5,261.8,262.9,263.1,263.8ft: BJ, 25°, PR, T-PO, B-C, II 262.4ft: BJ, 15-20°, US, T, C, II 265.0,265.3,265.6,267.7,268.1ft: BJ, 30°, UR-PR, T-PO, C, II 267.2ft: J, 5°, SS, T-PO, B, II 270.4,271.3ft: J, 40-55°, SS/SR, T-PO, B, II 271.3ft: BJ, 15°, SR, T-PO, B, II 271.8,272.2,272.7ft: BJ, 30°, PR-SR, PO, B-D, II		
549.8	249.2	5.0	3:29 3:20 2:39 2:22 3:39	(5.0) 100%	(4.8) 96%	Run 50			272.9-274.2ft: As above, with little to some angular to subrounded, medium sand to coarse gravel sized chert and dolomite clasts, gray and black to brownish gray; few chert clasts contain fragments of dolomite		
544.8	254.2	2.0	4:18 6:17	(2.0) 100%	(1.7) 85%	Run 51			CHERT, dark gray (7.5YR 4/1), very strong, thinly to moderately bedded, fresh, with angular clasts of CRYSTALLINE DOLOMITE		
542.8	256.2	1.9	5:10 6:05/0.9	(1.9) 100%	(1.8) 95%	Run 52			CRYSTALLINE DOLOMITE, gray (10YR 5/1) to reddish gray (2.5YR 5/1) with trace weak red (5R 4/3) and greenish gray (10GY 5/1), strong to very strong, thinly to moderately bedded, fresh; dolomite and calcite healed fractures through-out, trace calcite and dolomite filled pits and vugs (separate/non-touching), trace stylolites, weak(delayed) to no HCl reaction (Knox Group-Newala Formation)		
540.9	258.1	1.1	6:42/1.1	(1.1) 100%	(1.1) 100%	Run 53					
539.8	259.2	0.5	3:08/0.5	(0.2) 40%	(0.0) 0%	Run 54					
539.3	259.7	4.5	3:51/0.5 4:03 3:05 4:21 3:41	(0.2) 40% (4.5) 100%	(0.0) 0% (3.5) 78%	Run 55					
534.8	264.2	4.5	2:58 6:20 4:08 4:50	(4.5) 100%	(4.5) 100%	Run 56					
530.3	268.7	0.1	10:24/0.5	(0.0) 0%	(0.0) 0%	Run 57					
530.2	268.8	0.6	19:37/0.1	(0.0) 0%	(0.0) 0%	Run 58/59					
529.6	269.4	4.0	16:25/0.6 3:32 3:37 2:45 3:42	(0.6) 100% (4.0) 100%	(0.6) 100% (3.7) 93%	Run 60					
525.6	273.4	0.9	5:47/0.9	(0.9) 100%	(0.9) 100%	Run 61					
524.7	274.3	5.0	3:32 4:18 5:31 3:03 3:25	(5.0) 100%	(4.5) 90%	Run 62					
519.7	279.3	5.0	3:14	(5.0)	(5.0)	Run 63					

CLINCH RIVER SMR CORE FINAL CLINCH FINAL LOGS.GPJ CLINCH BORING DATA TEMPLATE.GDT 3/5/14





BECHTEL PROJECT NO.: 25847			AMEC PROJECT NO.: 6468-13-1072			COUNTY: Roane, TN		GEOLOGIST: J. Terry	
SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee						DRILLER: G. Akins/K. Amburn		Boring Orientation	
BORING NO.: MP-423			DRILL METHOD: Mud Rotary/Core			DRILL MACHINE: D-120 (MW-2)		Inclination: Vertical	
GROUND ELEV.: 799.0 ft (NAVD88)			NORTHING: 571,470 US ft (NAD83)			EASTING: 2,448,276 US ft (NAD83)		Azimuth: NA	
TOTAL DEPTH: 319.3 ft		SAMPLE METHODS: ASTM D 1586-11; 2488-09a; 2113-08; 6032-08					HAMMER (ID): 140-lb Auto (R308)		
DATE STARTED: 7/8/13		COMPLETED: 7/22/13		CASING DEPTH: 45.4 ft		CORE BARREL TYPE: HQ3/Diamond Impregnated core bits			
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	ROD (ft) %	SAMP. NO.	L O G	ROCK DESCRIPTION AND REMARKS	
								Continued from previous page	
514.7	284.3		4:16 3:01 2:44 2:49	100%	100%			CRYSTALLINE DOLOMITE, gray (10YR 5/1) to reddish gray (2.5YR 5/1) with trace weak red (5R 4/3) and greenish gray (10GY 5/1), strong to very strong, thinly to moderately bedded, fresh; dolomite and calcite healed fractures through-out, trace calcite and dolomite filled pits and vugs (separate/non-touching), trace stylolites, weak(delayed) to no HCl reaction ( <b>Knox Group-Newala Formation</b> ) (continued)	
		5.0	2:54 2:27 3:11 3:03 2:42	(5.0) 100%	(5.0) 100%	Run 64		510.2	276.7ft: BJ, 20°, SR, PO, C, II 276.8,277.2,277.4,277.7,278.4,278.8ft: J, 5-30°, SR, T-PO, B-C, II 278.2,278.6ft: J, 50°, VT, A, I, with dolomite 279.4-280.8,280.5ft: J, 90° and 60°, VT, A, I, with calcite 279.7,280.1ft: J, 10-20°, PR, T-PO, B, II 280.8-281.9ft: FZ/SZ, 30-90°, SR, VT, PO, B-E, I 281.9,282.5,283.6ft: BJ, 30-35°, SR, PO, B-D, II, stylolites 282.7,283.9ft: J, 80-85°, VT, A, I, with calcite 284.1-287.8ft: J, 20-90°, VT, A, I, spaced at about 0.1-0.2' 285.3,285.6,286.5,287.1,287.5ft: BJ, 20-25°, UR-SR-PR, T-PO-O, C-D, II; stylolites 287.0,287.6ft: J, 55° and 90°, SR, T-PO, C-D, II 287.9,288.5ft: J, 35-40°, UR-SR, T-PO, D, II
509.7	289.3		3:16 2:33 3:23 2:45 3:02	(5.0) 100%	(4.9) 98%	Run 65			DOLOMITIC LIMESTONE (CRYSTALLINE), gray (10YR 5/1) and very dark gray (10YR 3/1) to greenish gray (5GY 5/1) with weak red (7.5YR 4/3), strong to very strong, very thinly to moderately bedded, locally laminated, fresh; dolomite and calcite healed fractures through-out, trace calcite and dolomite filled pits and vugs (separate/non-touching), trace stylolites, weak HCl reaction
		5.0	3:05 2:34 2:47 2:36 3:03	(5.0) 100%	(4.7) 94%	Run 66		499.2	291.1,292.1,292.5,292.8,293.4ft: BJ, 30-35°, UR-SL-PR, T-PO, C, II 291.6,291.9ft: SH, 35-45°, VT, A, I, with dolomite 293.1-293.3ft: SZ, 35-50°, VT, a, I, with dolomite 293.4ft: J, 30°, SR, T-PO, C, II 294.2ft: J, 35°, SR, T-PO, C, II 296.0ft: J, 60°, SR, T, C, II 297.3ft: J, 20°, PR, O-MO, L, II 297.6ft: BJ, 30°, UR, T-PO, D, II 298.4,298.7ft: J, 15°, PR, T-PO, C, II
504.7	294.3		2:26 2:25 2:33 2:20 2:49	(5.0) 100%	(4.7) 94%	Run 67 LT-37			CRYSTALLINE DOLOMITE, weak red (10R 5/3) to gray (10YR 5/1), greenish gray (10Y 5/1), dusky red (7.5YR 3/2), greenish gray (10Y 6/1), gray (7.5YR 6/1), with trace brown (7.5YR 5/2), locally mottled, strong, very thinly to thinly bedded, fresh; dolomite and calcite healed fractures through-out, trace calcite and dolomite filled pits and vugs (separate/non-touching), trace stylolites, weak(delayed) to no HCl reaction
		5.0	2:36 2:20 2:33 2:57 2:53	(5.0) 100%	(4.7) 94%	Run 68		491.1	300.8,301.5ft: BJ, 20°, PR-SR, T-PO, C, II 302.1,302.8ft: J, 15-20°, SR, T-PO, C, II 302.3ft: BJ, 45°, SR, PO, D, II 305.5,307.3,307.4ft: BJ, 30-40°, SR-PR-SL, T, B, II 306.0ft: J, 60°, VT, a, I
489.7	309.3		2:54 2:00 2:02 2:13 1:55	(5.0) 100%	(5.0) 100%	Run 69			CRYSTALLINE DOLOMITE, weak red (10R 4/2) with gray (7.5 YR 6/1), dusky red (10R 3/3) with greenish gray (10GY 5/1) and dark greenish gray (10GY 4/1) to gray (10YR 5/1), mottled, strong, very thinly to moderately bedded, fresh, trace laminated SILSTONE interbeds; mottling appears to mimic pre-dolomitization fractures and bedding, dolomite and calcite healed fractures through-out, trace calcite and dolomite filled pits and vugs (separate/non-touching), trace stylolites, weak(delayed) to no HCl reaction
		5.0	2:15 2:30 2:44 3:14 3:02	(5.0) 100%	(5.0) 100%	Run 70			307.9ft: J, 50°, PR-SL, T, B, II 308.5,308.9ft: BJ, 15-25°, SR/SL/PR, T-O, B-D, II 311.5ft: BJ, 40°, SR, T, B, II 318.9ft: J, 40-45°, PR, T, B, II
479.7	319.3							479.7	Boring and coring terminated at 319.3 feet.

CLINCH RIVER SMR CORE FINAL CLINCH FINAL LOGS.GPJ CLINCH BORING DATA TEMPLATE.GDT 3/5/14



# MP-423 – Boxes 1 and 2



# MP-423 – Boxes 3 and 4





## MP-423 – Boxes 5 and 6



## MP-423 – Boxes 7 and 8

