

APPENDIX B.
Boring Logs



SCFmw-001

(Page 1 of 5)

Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 12" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/17/09; 0946
 End Date : 03/24/09; 1150
 Northing Coord. : 554768.62
 Easting Coord. : 2353178.98
 Total Depth of Boring : 230 ft

05-19-2010 Z:\PUBLIC\IRVAAP\IRVAAP_PBA_2008\Task 3.0 Sharon Conglomerate Wells\3.2 Implementation of WPIFieldBoring_Logs\SCFmw-001.bor

Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 1118.53	Well: SCFmw-001 TOC Elev.: 1120.71	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
0		(0.0' - 20.8') Silty CLAY (CL); some Gravel throughout; dry to damp; stiff; 2.5Y6/3 light brown with 10YR5/6 yellowish brown and 10YR4/1 gray mottling.	1118		Above Grade Completion	5/4/3/4	1.1/2.0		Elevation: NGVD 1929 NAVD 1988: TOC: 1120.17 Surface: 1117.99
5			1113		6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete	2/3/3/2	0.9/2.0		
10			1108		Concrete 0 - 1.0 ft bgs	4/6/11/9	1.2/2.0		
15			1103		Below Grade Completion 8" Outer Casing set from 0 ft - 35 ft bgs	9/15/13/15	1.2/2.0		
20			1098		Cement Bentonite Grout 1.0' - 188 ft bgs	7/5/6/8	0.0/2.0		
25		(20.8' - 32.5') Poorly sorted medium to coarse grained SAND (SP); some pockets of Silt and Clay; wet; loose to very loose; 10YR4/2 dark grayish brown and 10YR5/1 gray.	1093		Holeplug 3/8 Coarse Grade Bentonite Chips 188.0' - 198.0 ft bgs & 212' - 230 ft bgs	4/4/7/9	0.9/2.0		
30			1088		Riser 2" ID PVC Sch 40 2.5' ags - 201.0 ft bgs	7/7/9/6	1.25/2.0		
35		(32.5') SANDSTONE (SS); 10YR5/3 brown; competent. Auger to 35 ft bgs to set 8" outer casing; no recovery Drill using tricone bit to 37 ft bgs; no recovery.	1083		Centralizers: 6" expansion; placed at 2', 51', 99', 148', & 197 ft bgs	6/6/5/11	1.0/2.0		
40		(37.0' - 54.0') Connoquenessing Sandstone Member. Medium grained quartzose SANDSTONE (SS); dry; medium cementation; some laminations throughout; 5Y6/1 brownish gray.	1078		Sand Pack 198.0 ft -212.0 ft Sidley #5 Sand	8/12/7/10	2.0/2.0		
45		40' - 54' Trace mudstone clasts; some laminations	1073		Screen 2" ID PVC Sch 80 201.0 - 211.0 ft bgs 0.010 slot	2/2/3/3	1.8/2.0		
50		50' - 54' Very fractured		Borehole Dia 6"	4/3/2/4	1.2/2.0			
					1/1/1/1	0.8/2.0			
					2/1/2/1	0.5/2.0			
					2/1/2/1	0.5/2.0			
					2/50/1	0.5/0.5			
							NA		
							2.6/3.0		
							10.1/10		

Boring was hand cleared for MEC on 02/09/09
 8" protective casing set using 12.25" ID HSAs from 0 - 35 ft bgs
 22.6 gallons of water injected during drilling; 11,000 gallons of water removed.

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SCFmw-001

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 1118.53	Well: SCFmw-001 TOC Elev.: 1120.71	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
50			1068		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete Concrete 0 - 1.0 ft bgs Below Grade Completion 8" Outer Casing set from 0 ft - 35 ft bgs Cement Bentonite Grout 1.0' - 188 ft bgs Holeplug 3/8 Coarse Grade Bentonite Chips 188.0' - 198.0 ft bgs & 212' - 230 ft bgs Riser 2" ID PVC Sch 40 2.5' ags - 201.0 ft bgs Centralizers: 6" expansion; placed at 2', 51', 99', 148', & 197 ft bgs Sand Pack 198.0 ft -212.0 ft Sidley #5 Sand Screen 2" ID PVC Sch 80 201.0 - 211.0 ft bgs 0.010 slot Borehole Dia 6"		3.9/10		
55		(54.0' - 157') Sharon SHALE (SH). 54.0' - 61.0' Shale with Sandstone layers and laminations throughout, more cohesive; light gray; Sandstone content decreases with depth.	1063						
60		61.0' - 157' SHALE (SH); micaceous; trace Sandstone; wet; planar, brittle structure; very dark gray to black.	1058						
65			1053						
70			1048						
75			1043						
80			1038						
85			1033						
90		88.0 ft. Increase in fine light gray Sandstone seams; less brittle.	1028						
95		94' - 107' Alternating Shale and Sandstone; brittleness decreases with depth.	1023						

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 1118.53	Well: SCFmw-001 TOC Elev.: 1120.71	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
100			1018		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete		9.2/10		
105			1013		Concrete 0 - 1.0 ft bgs				
110		(107' - 157') Alternating SANDSTONE and SHALE (SH/SS); 107' - 110' Light gray Sandstone w/ Shale Seams	1008		Below Grade Completion 8" Outer Casing set from 0 ft - 35 ft bgs		9.8/10		
115			1003		Cement Bentonite Grout 1.0' - 188 ft bgs				
120		120.8' Evaporate concretion in voids	998		Holeplug 3/8 Coarse Grade Bentonite Chips 188.0' - 198.0 ft bgs & 212' - 230 ft bgs		9.7/10		
125			993		Riser 2" ID PVC Sch 40 2.5' ags - 201.0 ft bgs				
130			988		Centralizers: 6" expansion; placed at 2', 51', 99', 148', & 197 ft bgs		10.3/10		
135			983		Sand Pack 198.0 ft -212.0 ft Sidley #5 Sand				
140			978		Screen 2" ID PVC Sch 80 201.0 - 211.0 ft bgs 0.010 slot		9.7/10		
145			973		Borehole Dia 6"				
150		150'-157' Increasing Sandstone content with depth; color lightens with depth.							

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 1118.53	Well: SCFmw-001 TOC Elev.: 1120.71	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments	
150			968		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete		9.8/10			
155			963		Concrete 0 - 1.0 ft bgs					
160		(157' - 212.2') Sharon Conglomerate. Fine to medium grained quartzose SANDSTONE (SS); wet; loosely cemented; laminations throughout; 2.5Y6/1 gray.	958		Below Grade Completion 8" Outer Casing set from 0 ft - 35 ft bgs			9.3/10		
165		Alternating SH/SS to 167 ft bgs	953		Cement Bentonite Grout 1.0' - 188 ft bgs					
170		(167' - 170') Medium to coarse grained Sandstone with rounded fine throughout; some mineralization in voids; trace shale laminations.	948		Holeplug 3/8 Coarse Grade Bentonite Chips 188.0' - 198.0 ft bgs & 212' - 230 ft bgs			5.9/10		
175		(170' - 190') Fining and coarsening sequences throughout; decreasing Gravel content with depth.	943		Riser 2" ID PVC Sch 40 2.5' ags - 201.0 ft bgs					
180			938		Centralizers: 6" expansion; placed at 2', 51', 99', 148', & 197 ft bgs			9.8/10		
185			933		Sand Pack 198.0 ft -212.0 ft Sidley #5 Sand					
190		(190') Medium grained Sandstone; fractured to 199 ft bgs.	928		Screen 2" ID PVC Sch 80 201.0 - 211.0 ft bgs 0.010 slot					
195			923		Borehole Dia 6"			10.1/10		
200			198							

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 1118.53	Well: SCFmw-001 TOC Elev.: 1120.71	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
200		(200' - 210') Trace pyrite accumulations; Gravel content increases with depth; very fractured from 202' - 203'. 203' - 204.8' Shale layer	918		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete Concrete 0 - 1.0 ft bgs Below Grade Completion 8" Outer Casing set from 0 ft - 35 ft bgs Cement Bentonite Grout 1.0' - 188 ft bgs Holeplug 3/8 Coarse Grade Bentonite Chips 188.0' - 198.0 ft bgs & 212' - 230 ft bgs Riser 2" ID PVC Sch 40 2.5' ags - 201.0 ft bgs Centralizers: 6" expansion; placed at 2', 51', 99', 148', & 197 ft bgs Sand Pack 198.0 ft - 212.0 ft Sidley #5 Sand Screen 2" ID PVC Sch 80 201.0 - 211.0 ft bgs 0.010 slot Borehole Dia 6"		8.5/10		Soil Color Chart Munsell 2000 Rev Ed. Rock Color Chart Munsell 1995, 8th Ed.
205		913							
210		908							
215		903							
220		(212.2' - 222.5') Alternating SHALE with Sandstone laminations; Mudstone at 216.7 ft bgs (222.5' - 230.0') Cuyahoga Formation. SHALE (SH); dry; brittle; very dark gray.	898				8.7/10		
225			893				9.5/10		
230		Boring terminated at 230 ft bgs.	888						
235			883						
240			878						
245			873						
250									

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 22.6 gallons of water injected during drilling; 11,000 gallons of water removed.

SCFmw-001



SCFmw-002

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Drilling Company : Frontz Drilling
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 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
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 Portage County

Start Date : 02/10/09; 1430
 End Date : 03/17/09; 1531
 Northing Coord. : 555152.38
 Easting Coord. : 2368927.36
 Total Depth of Boring : 153 ft

05-19-2010 Z:\PUBLIC\IRVAAP\IRVAAP_PBA_2008\Task 3.0 Sharon Conglomerate Wells\3.2 Implementation of WPIFieldBoring_Logs\SCFmw-002.bo

Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 982.28	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
0		(0.0' - 8.0') Silty CLAY (CL); dry; soft; stiffness increases with depth; medium plasticity; from 0.0' - 6.0' color is mottled 10YR4/3 brown, 10YR5/1 gray, and 10YR5/6 yellowish brown. From 6.0' - 8.0' Clay is 10YR4/1 dark gray and 10YR3/6 dark yellowish brown.	982	<p>Well: SCFmw-002 TOC Elev.: 984.56</p>	2/3/4/3	0.9/2.0	<p>Elevation: NGVD 1929 NAVD 1988: TOC: 984.02 Surface: 981.74</p>	
5		(8.0' - 9.5') Fine SAND (SW); dense; wet; 10YR5/3 brown.	977		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete	4/3/5/3		1.2/2.0
10		(9.5' - 10.1') Sandy CLAY (SC); dense; moist; 10YR5/3 brown.	972		Concrete 0 - 1.0 ft bgs	3/4/2/7		1.5/2.0
15		(10.1' - 20.0') Silty CLAY (CL); Silt content increases with depth; little subangular, 1/2" Gravel; shale/gravel content increases with depth; medium stiff; damp to dry; 5/5B bluish gray.	967		Below Grade Completion 8" Outer casing set from 0 ft - 30 ft bgs	11/7/5/9		2.0/2.0
20		(20.0' - 24.0') SILT (ML); stiff; dry; brittle; shale fragments throughout; 10YR3/1 very dark gray.	962		Cement Bentonite Grout 1.0' - 118.5 ft bgs	7/11/13/9		2.0/2.0
25		(24.0' - 24.75') Weathered SHALE (SH); dry; brittle; 10YR3/1 very dark gray. Competent bedrock by 24.75 ft bgs.	957		Holeplug 3/8 Coarse Grade Bentonite Chips 118.5 - 134.0 ft bgs & 148' - 153 ft bgs	4/3/7/7		0.0/2.0
30		Augered to 30 ft bgs for installation of 8" outer casing. No rock core recovery 24.75' - 30.0'	952		Riser 2" ID PVC Sch 40 2.5' ags - 137.0 ft bgs	4/2/3/5		1.1/2.0
35		Air rotary drilling using tricone bit to 32 ft bgs to commence rock coring. No recovery 30 - 32 ft bgs.	947		Centralizers: 6" expansion; placed at 2', 42', 83' and 126 ft bgs	5/5/3/8		2.0/2.0
40		No recovery 32' - 40' bgs.	942		Sand Pack 134.0 - 148.0 ft bgs Sidley #5 Sand	6/5/7/9		0.8/2.0
45		(40.0' - 53.5') SHALE (SH); micaceous with trace pyrite accumulations throughout; increasing thickness and frequency of interbedded Sandstone with depth; brittle; dry; wet by 45 ft bgs; dark gray.	937		Screen 2" ID PVC Sch 40 137.0 - 147.0 ft bgs 0.010 slot	7/9/11/7		0.6/2.0
50			50	Borehole Dia 6"	9/13/11/13	0.8/2.0		
					17/ 50/3	0.75/0.75		

Boring was hand cleared for MEC on 02/09/09
 8" outer casing set using 8.25" ID HSAs from 0 ft - 30 ft bgs
 165.7 gallons of water injected during drilling; 3,500 gallons of water removed.

SCFmw-002



SCFmw-002

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50			932		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete		9.2/10		
55		(53.5' - 148.5') Sharon Conglomerate. Medium grained quartzose SANDSTONE (SS); rounded to subrounded fine Gravel throughout; wet; loosely cemented; laminations throughout; mineral accumulations in voids and fractures; 2.5Y6/1 gray with little 2.5Y 7/1 light gray.	927		Concrete 0 - 1.0 ft bgs				
60		Interbedded Shale seams from 53.5' - 58.5' bgs.	922		Below Grade Completion 8" Outer casing set from 0 ft - 30 ft bgs			9.8/10	
65		60.0' - 64.9' Coarser sequences with increased Gravel content.	917		Cement Bentonite Grout 1.0' - 118.5 ft bgs				
70		70.0' - 75.0' Highly fractured.	912		Holeplug 3/8 Coarse Grade Bentonite Chips 118.5 - 134.0 ft bgs & 148' - 153 ft bgs			8.3/10	
75		74.7' - 77.0' Coarse grained SANDSTONE with increased rounded, 1/4" - 1.5" Gravel content.	907		Riser 2" ID PVC Sch 40 2.5' ags - 137.0 ft bgs				
80		76.9' - 77.0' Fine coal seam. 80.0' - 90.0' Highly fractured.	902		Centralizers: 6" expansion; placed at 2', 42', 83' and 126 ft bgs			3.4/10	
85			897		Sand Pack 134.0 - 148.0 ft bgs Sidley #5 Sand				
90		90.0' Coarser SANDSTONE.	892		Screen 2" ID PVC Sch 40 137.0 - 147.0 ft bgs 0.010 slot			9.2/10	
95		92.2' - 95.0' CONGLOMERATE; significant subrounded to rounded Gravel with medium to coarse Sand matrix; loosely cemented.	887		Borehole Dia 6"				
100		97.0' - 98.0' Fining downward with depth.							

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100		100.7' Rounded Gravel.	882		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete Concrete 0 - 1.0 ft bgs Below Grade Completion 8" Outer casing set from 0 ft - 30 ft bgs Cement Bentonite Grout 1.0' - 118.5 ft bgs Holeplug 3/8 Coarse Grade Bentonite Chips 118.5 - 134.0 ft bgs & 148' - 153 ft bgs Riser 2" ID PVC Sch 40 2.5' ags - 137.0 ft bgs Centralizers: 6" expansion; placed at 2', 42', 83' and 126 ft bgs Sand Pack 134.0 - 148.0 ft bgs Sidley #5 Sand Screen 2" ID PVC Sch 40 137.0 - 147.0 ft bgs 0.010 slot Borehole Dia 6"		8.2/10		
105		111.5' - 114.5' Few Shale seams throughout.	877						
110		118.9' - 119.8' Coarse grained SANDSTONE.	872						
115		120.0' - 121.0' Rounded Gravel; coral fossil with pyrite replacement; Shale seam at 120.9' bgs.	867						
120		127.5' - 128.15' Shale seam.	862						
125		130.0' - 131.0' Shale seams throughout.	857						
130		141.9' Mudstone seam; increased Gravel and Shale content with depth.	852						
135		(148.5' - 153.0') Cuyahoga Formation. SHALE (SH); dry; brittle; dark gray.	847						
140			842						
145			837						
150			147 148 150						

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05-19-2010 Z:\PUBLIC\IR\VAAP PBA 2008\Task 3.0 Sharon Conglomerate Wells\3.2 Implementation of WPIFieldBoring_Logs\SCFmw-002.bo

Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 982.28	Well: SCFmw-002 TOC Elev.: 984.56	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
150		Boring terminated at 153.0 ft bgs.	832	 153	Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete Concrete 0 - 1.0 ft bgs Below Grade Completion 8" Outer casing set from 0 ft - 30 ft bgs Cement Bentonite Grout 1.0' - 118.5 ft bgs Holeplug 3/8 Coarse Grade Bentonite Chips 118.5 - 134.0 ft bgs & 148' - 153 ft bgs Riser 2" ID PVC Sch 40 2.5' ags - 137.0 ft bgs Centralizers: 6" expansion; placed at 2', 42', 83' and 126 ft bgs Sand Pack 134.0 - 148.0 ft bgs Sidley #5 Sand Screen 2" ID PVC Sch 40 137.0 - 147.0 ft bgs 0.010 slot Borehole Dia 6"		3.0/3.0		Soil Color Chart Munsell 2000 Rev Ed. Rock Color Chart Munsell 1995, 8th Ed.
155	827								
160	822								
165	817								
170	812								
175	807								
180	802								
185	797								
190	792								
195	787								
200									

Boring was hand cleared for MEC on 02/09/09
 8" outer casing set using 8.25" ID HSAs from 0 ft - 30 ft bgs
 165.7 gallons of water injected during drilling; 3,500 gallons of water removed.

SCFmw-002
(Page 4 of 4)



SCFmw-003

(Page 1 of 3)

Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

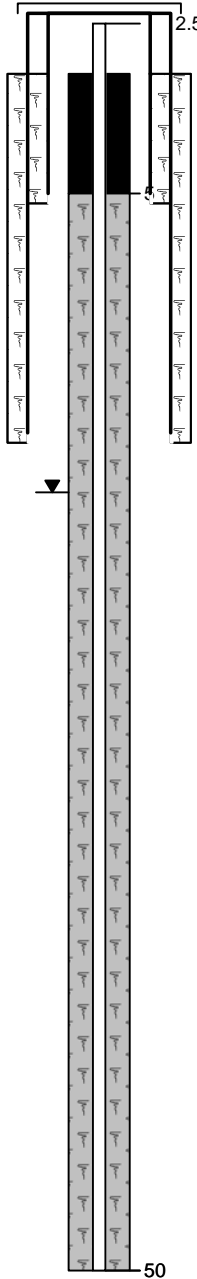
Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/16/09; 1000
 End Date : 03/13/09
 Northing Coord. : 557957.67
 Easting Coord. : 2375843.20
 Total Depth of Boring : 140 ft

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 956.14	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
0		(0.0' - 7.8') Silty CLAY (CL); dry; medium stiff; trace subangular Gravel; 10YR5/6 yellowish brown and 10YR4/3 brown; fine Sand seams throughout.	956	Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete	3/7/5/6 3/3/4/7 13/15/11/9	1.2/2.0 1.9/2.0 1.0/2.0		Elevation: NGVD 1929 NAVD 1988: TOC: 957.92 Surface: 955.59
5		(7.8' - 10.0') Silty fine SAND (SM); Sandstone fragments throughout; wet; medium dense; 10YR5/3 brown.	951	Concrete 0 - 1.0 ft bgs	9/7/10/9 13/11/11/13 50/3	1.0/2.0 0.6/2.0 0.25/0.25		
10		(10.0' - 10.25') SANDSTONE (SS); dry; light brown 2.5Y6/3. Augered to 15 ft to install 8" Outer Casing; drill using tricone bit to 16 ft bgs for rock coring.	946	Below Grade Completion 8" Outer Casing set from 0 ft - 15 ft bgs		NA		
15		(15.0' - 138.5') Sharon Conglomerate. Medium grained quartzose SANDSTONE (SS); wet by 20 ft; loosely cemented; light gray 2.5Y7/1 light gray with some gray 2.5Y6/1 laminations; mineral accumulations within parting layers and voids.	941	Cement Bentonite Grout 1.0' - 115.5'				
20			936	Holeplug 3/8 Coarse Grade Bentonite Chips 115.5' - 123.0 ft bgs & 138.5' - 140'		8.0/9.0		
25			931	Riser 2" ID PVC Sch 40 2.5' ags - 125.5 ft bgs		5.0/5.0		
30			926	Centralizers: 6" expansion; placed at 2', 38', 76', and 114 ft bgs.		8.2/10.0		
35			921	Sand Pack 123.0 ft - 136 ft bgs Sidley #5 Sand				
40		Lost core between 37'-40 ft bgs	916	Screen 2" ID PVC Sch 40 125.5 - 135.5 ft bgs 0.010 slot		10.0/10.0		
45		Coal seam at 44.3 ft bgs	911					
50			50	Borehole Dia 6"				

Well: SCFmw-003
 TOC Elev.: 958.47



Boring was hand cleared for MEC on 02/16/09
 8" outer casing set using 12.25" ID HSAs from 0 - 15 ft bgs
 33.3 gallons of water injected during drilling; 4,000 gallons of water removed.

SCFmw-003



SCFmw-003

(Page 2 of 3)

Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/16/09; 1000
 End Date : 03/13/09
 Northing Coord. : 557957.67
 Easting Coord. : 2375843.20
 Total Depth of Boring : 140 ft

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 956.14	Well: SCFmw-003 TOC Elev.: 958.47	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
50		Quartz rounded gravel at 51.2 ft bgs	906		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete		10.0/10.0		
55		57.9' - 59.3' Coarser Sandstone sequence; increased amount of subrounded Gravel.	901		Concrete 0 - 1.0 ft bgs				
60			896		Below Grade Completion 8" Outer Casing set from 0 ft - 15 ft bgs			10.0/10.0	
65		Mudstone clasts at 65.7 ft bgs	891		Cement Bentonite Grout 1.0' - 115.5'				
70			886		Holeplug 3/8 Coarse Grade Bentonite Chips 115.5' - 123.0 ft bgs & 138.5' - 140'			10.1/10.0	
75		3/4" Subrounded Gravel 73 ft bgs	881		Riser 2" ID PVC Sch 40 2.5' ags - 125.5 ft bgs				
80			876		Centralizers: 6" expansion; placed at 2', 38', 76', and 114 ft bgs.			9.3/10.0	
85		83.0' - 84.3' & 86.4' - 91' Coarser grained SANDSTONE; increased amounts of subrounded Gravel; increased fracturing from 80' - 91'; mineral concretions along parting fractures.	871		Sand Pack 123.0 ft - 136 ft bgs Sidley #5 Sand				
90			866		Screen 2" ID PVC Sch 40 125.5 - 135.5 ft bgs 0.010 slot			9.2/10.0	
95		Shale stringers from 96'-100 ft bgs	861						
100					Borehole Dia 6"				

Boring was hand cleared for MEC on 02/16/09
 8" outer casing set using 12.25" ID HSAs from 0 - 15 ft bgs
 33.3 gallons of water injected during drilling; 4,000 gallons of water removed.



SCFmw-003

(Page 3 of 3)

Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/16/09; 1000
 End Date : 03/13/09
 Northing Coord. : 557957.67
 Easting Coord. : 2375843.20
 Total Depth of Boring : 140 ft

05-19-2010 Z:\PUBLIC\IRVAAP\IRVAAP_PBA_2008\Task 3.0 Sharon Conglomerate Wells\3.2 Implementation of WPIFieldBoring_Logs\SCFmw-003.bor

Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 956.14	Well: SCFmw-003 TOC Elev.: 958.47	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments	
100		Increased fractures from 100'-106'	856		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete		10.2/10.0			
105		109.3' - 109.45' Mudstone seam	851		Concrete 0 - 1.0 ft bgs					
110			846		Below Grade Completion 8" Outer Casing set from 0 ft - 15 ft bgs			10.0/10.0		
115			841		Cement Bentonite Grout 1.0' - 115.5'					
120		Fractured from 120' - 123 ft bgs Increased gravel content 124' - 130'	836		Holeplug 3/8 Coarse Grade Bentonite Chips 115.5' - 123.0 ft bgs & 138.5' - 140'			10.0/10.0		
125		135' - 138.5' Very fractured Sandstone with abundant 1/4" - 1.5" rounded and subrounded quartzose Gravel throughout; some mudstone clasts.	831		Riser 2" ID PVC Sch 40 2.5' ags - 125.5 ft bgs					
130			826		Centralizers: 6" expansion; placed at 2', 38', 76', and 114 ft bgs.					
135			821		Sand Pack 123.0 ft - 136 ft bgs Sidley #5 Sand			8.4/10.0		
140		(138.5' - 140') Cuyahoga Formation. SHALE; brittle; some Sandstone laminations and seams throughout, very dark gray. Boring terminated at 140 ft bgs.	816		Screen 2" ID PVC Sch 40 125.5 - 135.5 ft bgs 0.010 slot					Soil Color Chart Munsell 2000 Rev Ed. Rock Color Chart Munsell 1995, 8th Ed.
145			811							
150					Borehole Dia 6"					

Boring was hand cleared for MEC on 02/16/09
 8" outer casing set using 12.25" ID HSAs from 0 - 15 ft bgs
 33.3 gallons of water injected during drilling; 4,000 gallons of water removed.



SCFmw-004

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Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/25/09; 1458
 End Date : 03/10/09; 0948
 Northing Coord. : 560361.03
 Easting Coord. : 2378730.23
 Total Depth of Boring : 120 ft

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 941.87	Well: SCFmw-004 TOC Elev.: 944.17	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
0		(0.0' - 10.0') Silty Clay (CL); Sand lenses throughout; dry; medium stiff; plastic; wet by 7.8 ft bgs; 10YR5/3 brown and 10YR4/1 dark gray.	941		Above Grade Completion	3/4/5/7	1.3/2.0	Elevation: NGVD 1929 NAVD 1988: TOC: 943.62 Surface: 941.32	
5			936		6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete	5/4/3/5	1.9/2.0		
10		(10.0' - 24.0') SILT (ML); little pockets of Clay; saturated; medium plasticity; 10YR4/1 dark gray.	931		Concrete 0 ft - 1.0 ft bgs	2/5/4/3	1.25/2.0		
15			926		Below Grade Completion 8" Outer Casing set from 0 ft- 55 ft bgs	2/2/3/2	1.6/2.0		
20			921		Cement Bentonite Grout 1.0' - 77.0 ft bgs	4/5/3/4	1.9/2.0		
25		(24.0' - 26.5') Silty CLAY (CL); some subangular 1/4" Gravel; little Sand lenses; dry; plastic; 10YR4/1 dark gray.	916		Holeplug 3/8 Coarse Grade Bentonite Chips 77.0' - 95.0' bgs & 111' - 120 ft bgs	3/5/4/4	1.5/2.0		
30		(24.6' - 28.0') SILT (ML); little pockets of Clay; damp; medium plasticity; soft; 10YR4/1 dark gray.	911		Riser 2" ID PVC Sch 40 2.5' ags - 100.0' bgs	2/2/3/3	2.0/2.0		
35		(28.0' - 32.5') Silty fine SAND (SM); little subangular Gravel; Silt content increases with depth; moist; medium dense; 10YR4/1 dark gray.	906		Centralizers: 6" expansion at 3', 59', and 86 ft bgs 8" expansion at 29 ft bgs	2/2/3/4	1.3/2.0		
40		(32.5' - 34') SILT (ML); wet; trace Sand; wet; medium dense; 10YR4/1 dark gray.	901		Sand Pack 95.0 ft - 111.0 ft bgs Sidley #5 Sand	1/1/1/1	2.0/2.0		
45		(34.0' - 42.25') Sandy SILT (ML); some pockets of increased Clay content from 34.0' - 36.6'; little 1/8" to 3/4" subangular Gravel; moist to dry with depth; stiff; Sand and Gravel content increases with depth; 10YR4/1 dark gray.	896		Screen 2" ID PVC Sch 40 100.0 - 110.0 ft bgs 0.010 slot	1/2/1/4	0.9/2.0		
50		(42.25' - 50') Fine SAND (SW); coarsening downward to coarse Sand and fine Gravel; some subrounded Gravel (1/4"-1/2"); some Sandstone fragments; little Silty matrix; moist; stiff to hard; 10YR4/1 dark gray.			Borehole Dia 6"	2/2/4/3	1.4/2.0		
						8/5/5/5	1.2/2.0		
					6/8/11/8	1.25/2.0			
					13/9/11/11	1.35/2.0			
					11/50/3	0.75/0.75			

Boring was hand cleared for MEC on 02/25/09
 8" outer casing set using 12.25" ID HSAs from 0.0' - 55 ft bgs
 37 gallons of water injected during drilling; 2,000 gallons of water removed.

SCFmw-004

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SCFmw-004

(Page 2 of 3)

Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/25/09; 1458
 End Date : 03/10/09; 0948
 Northing Coord. : 560361.03
 Easting Coord. : 2378730.23
 Total Depth of Boring : 120 ft

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 941.87	Well: SCFmw-004 TOC Elev.: 944.17	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
50		(50.0' - 111.5') Sharon Conglomerate. Medium grained quartzose SANDSTONE (SS); trace subrounded fine quartzose Gravel throughout; wet; loosely cemented; laminations throughout; mineral accumulations in voids and fractures including pyrite and siderite; trace coals seams (<1/8" thick); 5Y6/1 Gray.	891		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete		NA		
55			886		Concrete 0 ft - 1.0 ft bgs		4.3/4.5		
60		58.3' Shale Seam	881	59	Below Grade Completion 8" Outer Casing set from 0 ft- 55 ft bgs		8.8/10.0		
65			876		Cement Bentonite Grout 1.0' - 77.0 ft bgs				
70		68.6'-68.7' Shale Seam			Holeplug 3/8 Coarse Grade Bentonite Chips 77.0' - 95.0' bgs & 111' - 120 ft bgs				
75		71.6' & 74.6' Rounded 1/2" Gravel seam	871		Riser 2" ID PVC Sch 40 2.5' ags - 100.0' bgs		10.0/10.0		
80		76.8' - 77.5' Coarser grained SANDSTONE with increased Gravel content	866	77	Centralizers: 6" expansion at 3', 59', and 86 ft bgs 8" expansion at 29 ft bgs		9.75/10.0		
85		78.3' - 78.5 Rounded 1/4"-1/2" Gravel seam 81.5' Subrounded 1.5" Gravel Increased laminations from 82' - 90' 88.8' Subrounded 1.5" Gravel	861		Sand Pack 95.0 ft - 111.0 ft bgs Sidley #5 Sand				
90			856	86	Screen 2" ID PVC Sch 40 100.0 - 110.0 ft bgs 0.010 slot		5.5/10.0		
95		90'-100' Very fractured; poor recovery	851		Borehole Dia 6"				
100			846	95					

Boring was hand cleared for MEC on 02/25/09
 8" outer casing set using 12.25" ID HSAs from 0.0' - 55 ft bgs
 37 gallons of water injected during drilling; 2,000 gallons of water removed.

SCFmw-004

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SCFmw-004

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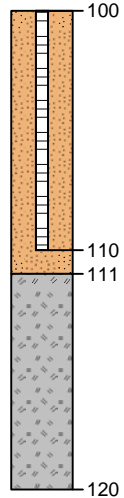
Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/25/09; 1458
 End Date : 03/10/09; 0948
 Northing Coord. : 560361.03
 Easting Coord. : 2378730.23
 Total Depth of Boring : 120 ft

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 941.87	Well: SCFmw-004 TOC Elev.: 944.17	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
100			841		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete		10.2/10.0		
105			836		Concrete 0 ft - 1.0 ft bgs				
110		(111.5' - 120') Cuyahoga Formation. SHALE (SH); planar; brittle; some fine Sandstone laminations throughout; very dark gray.	831		Below Grade Completion 8" Outer Casing set from 0 ft- 55 ft bgs		9.5/10.0		
115			826		Cement Bentonite Grout 1.0' - 77.0 ft bgs				
120		Boring terminated at 120 ft bgs.	821		Holeplug 3/8 Coarse Grade Bentonite Chips 77.0' - 95.0' bgs & 111' - 120 ft bgs				
125			816		Riser 2" ID PVC Sch 40 2.5' ags - 100.0' bgs				
130			811		Centralizers: 6" expansion at 3', 59', and 86 ft bgs 8" expansion at 29 ft bgs				
135			806		Sand Pack 95.0 ft - 111.0 ft bgs Sidley #5 Sand				
140			801		Screen 2" ID PVC Sch 40 100.0 - 110.0 ft bgs 0.010 slot				Soil Color Chart Munsell 2000 Rev Ed.
145			796		Borehole Dia 6"				Rock Color Chart Munsell 1995, 8th Ed.
150									



Boring was hand cleared for MEC on 02/25/09
 8" outer casing set using 12.25" ID HSAs from 0.0' - 55 ft bgs
 37 gallons of water injected during drilling; 2,000 gallons of water removed.

SCFmw-004



SCFmw-005

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Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/13/09; 0818
 End Date : 03/24/09; 1500
 Northing Coord. : 567302.35
 Easting Coord. : 2377014.05
 Total Depth of Boring : 160 ft

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 958.43	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
0		(0.0' - 1.5') SILT (ML); some Gravel; dry; soft; organics throughout; 10YR4/3 brown.	958	Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete	3/5/5/4	0.8/2.0		Elevation: NGVD 1929
5		(1.5' - 4.75') Silty CLAY (CL); dry; medium stiff; low plasticity ; 10YR4/3 brown mottled 10YR5/6 yellowish brown and 10YR5/1 gray.	953	Concrete 0 - 1.0 ft bgs	7/5/9/7	1.5/2.0		NAVD 1988: TOC: 960.26 Surface: 957.89
10		(4.75' - 11.0) Augered to 10 ft bgs for installation of outer casing; no recovery.	948	Below Grade Completion 8" Outer Casing set 0 ft - 10 ft bgs	11/50/2	0.75/0.75		
15		10.0' - 11.0' Drilled using tricone bit to 11.0 ft bgs for rock coring.		Cement Bentonite Grout 1.0' - 126.0 ft bgs				
20		(11.0' - 156') Sharon Conglomerate. SANDSTONE (SS); medium grained; some subrounded Gravel; wet by 12 ft bgs; loosely cemented; mineral accumulations in voids; yellowish brown 10YR6/6 iron staining; increase in 5Y6/1 gray with depth; laminations throughout.	943	Holeplug 3/8 Coarse Grade Bentonite Chips 126.0' - 136' bgs & 155' - 160.1 ft bgs				
25		Fractured from 11-24 ft bgs; small seams of coarser Sand and Gravel.	938	Riser 2" ID PVC Sch 40 2.5 ft ags - 139.0 ft bgs				
30			933	Centralizers: 6" expansion; placed at 2 ft bgs 8" expansion; placed at 43', 84', & 125' bgs				
35			928	Sand Pack 136.0 ft - 155 ft bgs Sidley #5 Sand				
40			923	Screen 2" ID PVC Sch 40 139.0 - 154.0 ft bgs 0.010 slot				
45			918	Borehole Dia 8"				
50		47' - 53.8' Coarse Sandstone and 1/4" - 1/2" Gravel.	913					

Boring was hand cleared for MEC on 02/09/09
 8" outer casing set using 12.25" ID HSAs from 0 ft - 10 ft bgs
 156.5 gallons of water injected during drilling; 19,000 gallons of water removed.

SCFmw-005



SCFmw-005

(Page 2 of 4)

Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/13/09; 0818
 End Date : 03/24/09; 1500
 Northing Coord. : 567302.35
 Easting Coord. : 2377014.05
 Total Depth of Boring : 160 ft

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 958.43	Well: SCFmw-005 TOC Elev.: 960.80	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
50			908		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete		10.0/10.0		
55		57.7' Fine rounded Gravel seam	903		Concrete 0 - 1.0 ft bgs				
60		60.6 5Y6/1 Gray; no staining.	898		Below Grade Completion 8" Outer Casing set 0 ft - 10 ft bgs		9.6/10.0		
65		62.5-63.9 Medium to coarse Sandstone	893		Cement Bentonite Grout 1.0' - 126.0 ft bgs				
70			888		Holeplug 3/8 Coarse Grade Bentonite Chips 126.0' - 136' bgs & 155' - 160.1 ft bgs		10.0/10.0		
75			883		Riser 2" ID PVC Sch 40 2.5 ft ags - 139.0 ft bgs				
80		82' - 83' Increased mineralization in voids/fractures	878		Centralizers: 6" expansion; placed at 2 ft bgs 8" expansion; placed at 43', 84', & 125' bgs		10.0/10.0		
85			873		Sand Pack 136.0 ft - 155 ft bgs Sidley #5 Sand				
90			868		Screen 2" ID PVC Sch 40 139.0 - 154.0 ft bgs 0.010 slot		9.9/10.0		
95			863		Borehole Dia 8"				
100									

Boring was hand cleared for MEC on 02/09/09
 8" outer casing set using 12.25" ID HSAs from 0 ft - 10 ft bgs
 156.5 gallons of water injected during drilling; 19,000 gallons of water removed.

SCFmw-005

(Page 2 of 4)



SCFmw-005

(Page 3 of 4)

Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/13/09; 0818
 End Date : 03/24/09; 1500
 Northing Coord. : 567302.35
 Easting Coord. : 2377014.05
 Total Depth of Boring : 160 ft

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 958.43	Well: SCFmw-005 TOC Elev.: 960.80	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
100		100.5' Subrounded 1/2" Gravel seam	858		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete Concrete 0 - 1.0 ft bgs Below Grade Completion 8" Outer Casing set 0 ft - 10 ft bgs Cement Bentonite Grout 1.0' - 126.0 ft bgs Holeplug 3/8 Coarse Grade Bentonite Chips 126.0' - 136' bgs & 155' - 160.1 ft bgs Riser 2" ID PVC Sch 40 2.5 ft ags - 139.0 ft bgs Centralizers: 6" expansion; placed at 2 ft bgs 8" expansion; placed at 43', 84', & 125' bgs Sand Pack 136.0 ft - 155 ft bgs Sidley #5 Sand Screen 2" ID PVC Sch 40 139.0 - 154.0 ft bgs 0.010 slot Borehole Dia 8"		7.1/10.0		
105		100.6' - 115' Interbedded Shale seams (<1/8" - 0.5' thick).	853						
110			848						
115		115' - 117' Increase in rounded Gravel content.	843						
120		116' - 126' Fractured	838						
125			833						
130		127' - 141' Trace to no Gravel	828						
135			823						
140		141'-150' Increase in Gravel with depth.	818						
145			813						
150			150						

Boring was hand cleared for MEC on 02/09/09
 8" outer casing set using 12.25" ID HSAs from 0 ft - 10 ft bgs
 156.5 gallons of water injected during drilling; 19,000 gallons of water removed.

SCFmw-005



SCFmw-005

(Page 4 of 4)

Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
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 8451 State Route 5
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 Portage County

Start Date : 02/13/09; 0818
 End Date : 03/24/09; 1500
 Northing Coord. : 567302.35
 Easting Coord. : 2377014.05
 Total Depth of Boring : 160 ft

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 958.43	Well: SCFmw-005 TOC Elev.: 960.80	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
150		150' - 155' Coarse grained Sandstone with little Gravel	808		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete Concrete 0 - 1.0 ft bgs Below Grade Completion 8" Outer Casing set 0 ft - 10 ft bgs Cement Bentonite Grout 1.0' - 126.0 ft bgs Holeplug 3/8 Coarse Grade Bentonite Chips 126.0' - 136' bgs & 155' - 160.1 ft bgs Riser 2" ID PVC Sch 40 2.5 ft ags - 139.0 ft bgs Centralizers: 6" expansion; placed at 2 ft bgs 8" expansion; placed at 43', 84', & 125' bgs Sand Pack 136.0 ft - 155 ft bgs Sidley #5 Sand Screen 2" ID PVC Sch 40 139.0 - 154.0 ft bgs 0.010 slot Borehole Dia 8"		9.1/10.0		Soil Color Chart Munsell 2000 Rev Ed. Rock Color Chart Munsell 1995, 8th Ed.
155		(155' - 160.1') Cuyahoga Formation. SHALE (SH); planar; brittle; few Sandstone laminations and layers throughout; very dark gray to black.	803						
160		Boring terminated at 160.1 ft bgs.	798						
165			793						
170			788						
175			783						
180			778						
185			773						
190			768						
195			763						
200									

Boring was hand cleared for MEC on 02/09/09
 8" outer casing set using 12.25" ID HSAs from 0 ft - 10 ft bgs
 156.5 gallons of water injected during drilling; 19,000 gallons of water removed.

SCFmw-005

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SCFmw-006

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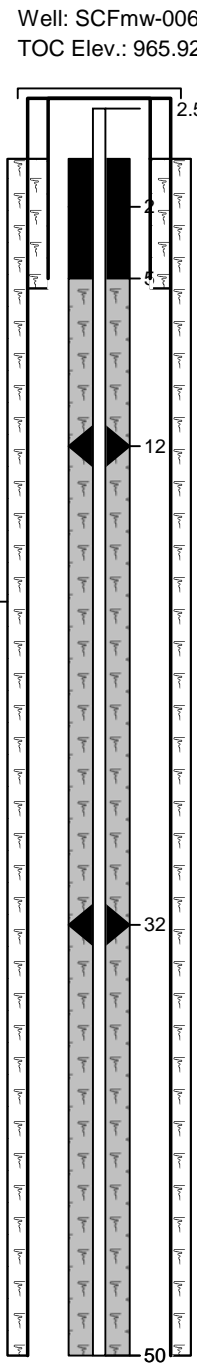
Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
 : 2" 2' Long Split Spoon
 : 6" 10' Long Core Barrel

Ravenna Army Ammunition Plant
 8451 State Route 5
 Ravenna, Ohio 44266
 Portage County

Start Date : 02/19/09; 1032
 End Date : 03/03/09; 1630
 Northing Coord. : 569583.41
 Easting Coord. : 2369394.54
 Total Depth of Boring : 90 ft

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Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 963.69	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
0		(0.0' - 6.25') Silty CLAY (CL); dry; soft to stiff; medium plasticity; 10YR5/4 yellow brown, some 10YR5/6 yellow brown and 10YR5/1 gray (1.0' - 2.25'); sand lenses from 3.0' - 6.25'.	963	Above Grade Completion	4/3/2/3	1.7/2.0		Elevation: NGVD 1929
5		(6.25' - 8.25') Clayey SAND (SC); medium to fine grained; moist; medium dense; 10YR5/3 brown.	958	6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete	5/6/7/11	2.0/2.0		NAVD 1988: TOC: 965.38 Surface: 963.15
10		(8.25' - 20.3') SAND (SP); coarsening and fining sequences; pockets of Clay and Silt throughout; little fine 1/4" Gravel; dry; medium dense; 10YR4/3 brown.	953	Concrete 0 - 1.0 ft bgs	7/7/9/11	2.0/2.0		
15		(20.3' - 33.6') Medium to coarse grained SAND (SW); trace fine Gravel; damp; loose; 10YR4/1 dark gray and 10YR4/2 dark grayish brown.	948	Below Grade Completion	9/9/8/7	1.5/2.0		
20	943		8" Outer Casing set from 0 ft - 60 ft bgs	3/7/7/6	2.0/2.0			
25	938		Cement Bentonite Grout 1.0' - 70' bgs	3/2/4/3	1.3/2.0			
30	933		Holeplug 3/8 Coarse Grade Bentonite Chips 70 ft - 73 ft bgs & 87 ft - 90 ft bgs	4/3/2/2	2.0/2.0			
35		(33.6' - 46.4') Clayey SILT (ML); little Gravel and Shale fragments; Sand lenses from 44-46.4 ft; dry; stiff; 10YR4/1 dark gray.	928	Riser 2" ID PVC Sch 40 2.5' ags - 76.0 ft bgs	2/2/1/7	2.0/2.0		
40	923		Centralizers: 6" expansion; placed at 2' and 72 ft bgs 8" expansion; placed at 12', 32', & 52' bgs	1/1/1/3/	2.0/2.0			
45		(46.4' - 47.6') 1/2" subangular GRAVEL and Clayey SILT (GM); wet to moist; medium dense; 10YR4/1 dark gray.	918	Sand Pack 73.0 ft - 87 ft bgs Sidley #5 Sand	1/1/1/1	2.0/2.0		
50			Screen 2" ID PVC Sch 40 76.0 - 86.0 ft bgs 0.010 slot	3/7/2/2	2.0/2.0			
				Borehole Dia 6"	8/6/6/10	0.8/2.0		
					6/5/3/5	1.5/2.0		
					6/6/9/7	1.5/2.0		
					6/5/9/9	1.3/2.0		
					11/13/9/9	1.5/2.0		
					4/7/7/11	1.0/2.0		
					6/5/4/9	2.0/2.0		
					7/9/9/10	0.9/2.0		



Boring was hand cleared for MEC on 02/09/09
 8" outer casing set using 12.25" ID HSAs from 0 ft - 60 ft bgs
 3.1 gallons of water injected during drilling; 1,200 gallons of water removed.

SCFmw-006



SCFmw-006

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Drilling Company : Frontz Drilling
 Driller : Rob Hamilton
 Designation of Drill : CME 75/ TH-60
 Type of Drill Rig : Auger Rig/Air Rotary
 Geologist : Amanda Trenton
 Oversight Company : SAIC
 Borehole Diameter : 14" Overburden/6" Rock
 Sampling Equipment : 12.25" Hollow Stem Augers
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Start Date : 02/19/09; 1032
 End Date : 03/03/09; 1630
 Northing Coord. : 569583.41
 Easting Coord. : 2369394.54
 Total Depth of Boring : 90 ft

05-19-2010 Z:\PUBLIC\IRVAAP\IRVAAP_PBA_2008\Task 3.0 Sharon Conglomerate Wells\3.2 Implementation of WPIFieldBoring_Logs\SCFmw-006.bo

Depth in feet	USCS Symbol	DESCRIPTION	Surf. Elev. 963.69	Well: SCFmw-006 TOC Elev.: 965.92	Well Constr. Information	Blow Count	Recovery	Collection Interval	Comments
50		(47.6' - 51.75') Clayey SILT (ML); trace 1/4" subangular Gravel; some fine Sand lenses throughout, increased Sand content with depth; dry to damp; 10YR4/1 dark gray.	913		Above Grade Completion 6" Protective Casing 3 ft ags - 5 ft bgs Set In Concrete	7/13/11/19	1.3/2.0		
55		(51.75' - 52.6') SAND and SILT (SM); dry; dense; 10YR4/1 dark gray.	908		Concrete 0 - 1.0 ft bgs	11/13/19/50/3	1.0/2.0		
60		(52.6' - 53.7') Fine SAND; trace Silt, Silt content decreases with depth; dry; dense; 10YR4/1 dark gray and 10YR5/3 brown.	903		Below Grade Completion 8" Outer Casing set from 0 ft - 60 ft bgs		NA		
65		(53.7' - 54.0') SANDSTONE (SS); weathered; competent bedrock by 55.0 ft bgs. Augered to 60 ft bgs to set 8" outer casing, no recovery. Drilled using tricone bit to 61' for rock coring, no recovery.	898		Cement Bentonite Grout 1.0' - 70' bgs		7.4/9.0		
70		(61' - 70') Sharon Conglomerate. Medium grained quartzose SANDSTONE (SS); wet; loosely cemented; little fine subrounded quartzose Gravel throughout Sandstone matrix; laminations throughout with trace coal seams (<1/8" thick); some mineral accumulations in voids and fractures; some coarser sequences; 5Y6/1 Gray	893		Holeplug 3/8 Coarse Grade Bentonite Chips 70 ft - 73 ft bgs & 87 ft - 90 ft bgs		9.3/10.0		
75		Thin coal seam at 70.0' surrounded by subrounded Gravel	888		Riser 2" ID PVC Sch 40 2.5' ags - 76.0 ft bgs		9.4/10.0		
80		(74.2') 1/4"-1" Subrounded Gravel	883		Centralizers: 6" expansion; placed at 2' and 72 ft bgs 8" expansion; placed at 12', 32', & 52' bgs				
85		(81.6' - 87.3') Coarsening downward sandstone; coarser Gravels at 81.6', 82.7', and 83.7'.	878		Sand Pack 73.0 ft - 87 ft bgs Sidley #5 Sand				
90		Coarse 1/2" - 1.5" subrounded Gravel at 87.3' bgs.	873		Screen 2" ID PVC Sch 40 76.0 - 86.0 ft bgs 0.010 slot				
95		(87.3' - 90.0') Cuyahoga Formation. SHALE; interbedded very fine Sandstone laminations; dry; brittle; very dark gray.	868		Borehole Dia 6"				Soil Color Chart Munsell 2000 Rev Ed. Rock Color Chart Munsell 1995, 8th Ed.
100		Boring terminated at 90 ft bgs.							

Boring was hand cleared for MEC on 02/09/09
 8" outer casing set using 12.25" ID HSAs from 0 ft - 60 ft bgs
 3.1 gallons of water injected during drilling; 1,200 gallons of water removed.

SCFmw-006