PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-43

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION _____ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS Dry 1/16/96 START 0915, 1/14/96 FINISH 1810, 1/14/96 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	0				1-inch TOPSOIL SILTY CLAY (CL), light brown, moist, stiff, trace organics	Start Drilling: 0915 Modified loess
			5			
5.0	5					5 ft. to 10 ft. HNU = 2 ppm Off core sample
			3			
10.0	10					
			4			
15.0	15					0930
			10		With black and orange mottling below 23 ft.	
25.0	25					24 ft. to 25 ft. HNU = 1 ppm Off core sample
					CLAYEY SAND (SC), brick red, moist, dense, medium, quartz, with trace fine to coarse, subrounded to rounded, chert gravel	0952 Fluvial Deposits
			8		29 ft. to 31 ft.: with brown and gray sand seams/laminations	29 ft. to 30 ft. HNU = 7 ppm, off core sample

PROJECT NUMBER	BORING NUMBER	
113630.01.ZZ	MW-43	SHEET 2 OF 4

SOIL BORING LOG

PROJECT ODMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION _____ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS Dry 1/16/96 START 0915, 1/14/96 FINISH 1810, 1/14/96 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE DRILLING FLUID LOSS TESTS AND INSTRUMENTATION
	33				Orange below 32 feet	
	35		2		POORLY-GRADED SAND (SP), orange, moist, loose, medium, quartz, with trace fine, subrounded, chert gravel	1007
35.0						
	40		5		WELL-GRADED GRAVELLY SAND (SW), orange, moist, loose, fine to coarse, quartz and fine to coarse, subangular to rounded, chert gravel	1015
40.0						
	45		5		POORLY-GRADED SAND (SP), orange, moist, loose, medium, quartz, with trace fine subrounded, chert gravel	1023
45.0						44 ft. to 45 ft. HNU = 7 to 12 ppm Off core sample
	50		5			1031
50.0						1058
	55		5		Trace coarse, subrounded, chert gravel 54 ft. to 54.5 ft.	
55.0						1110
			10		SILTY FINE SAND (SM), orange, loose, moist, quartz	55 ft. to 65 ft. HNU = 4 ppm, off core

CH2M HILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-43 SHEET 3 OF 4

SOIL BORING LOG

PROJECT DDMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION _____ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS Dry 1/16/96 START 0915, 1/14/96 FINISH 1810, 1/14/96 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					Yellowish-orange below 62 ft.	Free water present on gravels below 62 ft.
65.0	65					
			3		Moist to wet below 65 ft.	1133, 65 ft. to 68 ft. HNU = 6 to 12 ppm Off core sample
	68					
						1156, 68 ft. to 71 ft. HNU = 5 ppm Off core sample
70.0			7		Moist below 72 ft.	
	75					
75.0					WELL-GRADED SAND (SW), yellowish-orange, wet, loose, fine to coarse, quartz, trace fine, subrounded, chert gravel	1218 75 ft. to 80 ft. HNU = 12 ppm Off core sample
			5			
	80					
80.0						1255
			5			
	85					
85.0						1315 1320, lunch break 1340, drilling again 85 ft. to 87 ft. HNU = 2 to 6 ppm Off core sample
			7			

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-43 SHEET 4 OF 4

SOIL BORING LOG

PROJECT ODMT Groundwater Investigation LOCATION Memphis, TN

ELEVATION _____ DRILLING CONTRACTOR Boart Longyear

DRILLING METHOD AND EQUIPMENT Rotasonic

WATER LEVELS Dry 1/16/96 START 0915, 1/14/96 FINISH 1810, 1/14/96 LOGGER S. Bruer

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION	COMMENTS
	92					
	95		3			1418, 92 ft. to 95 ft. HNU = 7 ppm Off core sample
95.0					POORLY-GRADED SAND (SP), yellowish-orange, moist, quartz, trace fine, subrounded, chert gravel	95 ft. to 100 ft. HNU = 1 to 4 ppm Off core sample
	100		3.5			
100.0					Olive green and brown below 101 ft.	1537, 100 ft. to 104 ft. HNU = 2 to 7 ppm Off core sample Geotech sample 100' to 102'
	104		4			
	104.5		0.5		SANDSTONE, dark red to dark brown, hard, well-cemented, medium, quartz, ferruginous	1610, Installing MW-43
105.0					Auger refusal at 104.5 ft.	1810, MW-43 Installed (see attached construction log)
110.0						
115.0						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-43

SOIL BORING LOG

PROJECT : DDMT October 1998 Well Installation — LOCATION : Memphis, TN

ELEVATION : BTOC (flush) = 284.99 ft — DRILLING CONTRACTOR : Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED : Rotasonic 4" x 6" Method

WATER LEVELS : 128.38 ft (11/12/98) — START :10/20/98 — END: 10/21/98 — LOGGER : T. Proper/ATL

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. PID (ppm): *(Soil headspace)*
						T=1130 Begin overdrill to TD=99 ft. and removal of previous well casing.
5						
10						
15						
20						
25						
30						

LEGEND

FID Flame Ionization Detector

SPT Split Spoon Sample

CH2MHILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-43

SOIL BORING LOG

PROJECT : DDMT October 1998 Well Installation — LOCATION : Memphis, TN

ELEVATION : BTOC (flush) = 284.99 ft — DRILLING CONTRACTOR : Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED : Rotasonic 4" x 6" Method

WATER LEVELS : 128.38 ft (11/12/98) START :10/20/98 END: 10/21/98 LOGGER : T. Proper/ATL

35
40
45
50
55
60
65
70

LEGEND

FID Flame Ionization Detector
SPT Split Spoon Sample

CH2MHILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-43

SOIL BORING LOG

PROJECT : DDMT October 1998 Well Installation — LOCATION : Memphis, TN

ELEVATION : BTOC (flush) = 284.99 ft — DRILLING CONTRACTOR : Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED : Rotasonic 4" x 6" Method

WATER LEVELS : 128.38 ft (11/12/98) — START :10/20/98 — END: 10/21/98 — LOGGER : T. Proper/ATL

75							
80							
85							
90							
95							
100							T=1320 Break for lunch. T=1350 Begin drilling again. T=1540 Driller says 99'-104.5' core washed away because of water used to retrieve drill bit that had broken off due to very hard subsurface material.
105							Previous auger refusal (1/14/96) at 104.5 ft.
					WELL GRADED SAND (GW)- black (some brown), moisture uncertain due to water from drill rig, very dense (can't penetrate at all with puddy knife), medium to coarse grained, well cemented quartz.		T=1600
110		2			Hard layer ends WELL GRADED SAND WITH GRAVEL (GW)- orangish brown,		0

LEGEND

FID Flame Ionization Detector

SPT Split Spoon Sample

CH2MHILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-43

SOIL BORING LOG

PROJECT : DDMT October 1998 Well Installation — LOCATION : Memphis, TN

ELEVATION : BTOC (flush) = 284.99 ft — DRILLING CONTRACTOR : Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED : Rotasonic 4" x 6" Method

WATER LEVELS : 128.38 ft (11/12/98) — START :10/20/98 — END: 10/21/98 — LOGGER : T. Proper/ATL

115					moisture uncertain due to water from drill rig, loose, medium to coarse grained, quartz, chert gravel (<0.5" to 2").	
120		10			POORLY GRADED SAND (SP)- light gray, moist to wet, loose, fine grained, quartz. Same but wet	T=1630
125						
130		20			Same but tan, also clay layer- gray, firm, 2" thick, moist to wet. Same clay layer as 125' except soft, 4" thick. Same as 129'. Same as 129'. Same as 129'.	T=1730
135						
140					Same as 129' but only 1" thick. Same as 125' except tan to buff, fine to medium grained, wet (no clay).	
145						T=1740 Stopped drilling for the day (145')
					Same as 140' but has rust stain mottling. Same except light gray.	T=0847 (10/21/98) Begin drilling again. T=0905 Drilling stops b/c water pump on rig not working properly. T=1340 Begin drilling again - water pump fixed. T=1400 Core removed (145'-165')

LEGEND

FID Flame Ionization Detector

SPT Split Spoon Sample

CH2MHILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-43

SOIL BORING LOG

PROJECT : DDMT October 1998 Well Installation — LOCATION : Memphis, TN

ELEVATION : BTOC (flush) = 284.99 ft — DRILLING CONTRACTOR : Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED : Rotasonic 4" x 6" Method

WATER LEVELS : 128.38 ft (11/12/98) — START :10/20/98 — END: 10/21/98 — LOGGER : T. Proper/ATL

150						
155		20			Same but color change to tan.	0
160					3" band of rust staining.	
165						T=1445 T=1450 Stop drilling to call Greg Underberg. T=1640 Begin drilling again.
170					3" clay layer-gray and soft	T=0815 (10/22/98) Collect sample for grain-size analysis at 169'-170'.
175		20			CLAY (CL)- top 1.5 ft. gray and tan mottled, moist, soft, moderate plasticity. Same but only gray and firm.	0
180					POORLY GRADED SAND WITH CLAY (SP-SC)- gray, moist to wet, loose, quartz, fine to medium grained, contains 3-4" sections of clay (gray and soft).	
185					POORLY GRADED SAND (SP)- gray, moist to wet, loose, fine to medium grained, quartz. 2" black layer at 182' (organic?), sand changes to black and tan mottled and medium grained. Color change to orangish tan.	
					6" band of orange to rust color.	T=1807

LEGEND

FID Flame Ionization Detector

SPT Split Spoon Sample

CH2MHILL

PROJECT NUMBER	BORING NUMBER
113630.01.ZZ	MW-43

SOIL BORING LOG

PROJECT : DDMT October 1998 Well Installation
LOCATION : Memphis, TN
ELEVATION : BTOC (flush) = 284.99 ft
DRILLING CONTRACTOR : Boart-Longyear, Little Falls, MN
DRILLING METHOD AND EQUIPMENT USED : Rotasonic 4" x 6" Method
WATER LEVELS : 128.38 ft (11/12/98) START :10/20/98 END: 10/21/98 LOGGER : T. Proper/ATL

190					Changes to buff color and wet. Changes to gray color.	
195					Changes back to buff color. Changes to light gray to white.	0
200					2" layer of material of medium density. 1" band of light orange color.	
205						T=1810 Stop drilling for the day.
210						T=0800 (10/22/98) Begin running casing for TW T=0925 **Set Temporary Well (TW-43)** Screen: 193.8'-203.8' TD: 204.3 Plug: 203.8'-204.3' Sand: ~192'-202' (Filter Sil™, remaining is Memphis Sand) Pellets: 190'-192' T=1000 (10/26/98) Remove temporary well **Set Monitoring Well (MW43)** Bentonite Pellets: 173'-189' TD: 172' Plug: 171.5'-172' Screen: 161.5'-171.5' Sand: 157'-173' Grout: GS-157'

LEGEND
FID Flame Ionization Detector
SPT Split Spoon Sample