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**Groundwater Quality Assessment Plan
for the Metallurgical Laboratory
Hazardous Waste Management Facility (U)**

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**Groundwater Quality Assessment Plan
for the Metallurgical Laboratory
Hazardous Waste Management Facility**

October 1990

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Approved by: D. B. Moore

Date: 10/11/90

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Keywords: Resource Conservation and Recovery Act, Assessments, Metallurgical Laboratory, Ground Water, Seepage Basins

WESTINGHOUSE SAVANNAH RIVER COMPANY
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INTRODUCTION

The Metallurgical Laboratory Hazardous Waste Management Facility (MLHWMF) will be closed under interim status regulation (SCDHEC Regulations R.61-79.265) and permitted as a hazardous waste management facility by a Post Closure Part B Permit under 40 CFR 264. Both the closure and post closure of the MLHWMF under 40 CFR regulations were prescribed in the NRDC Consent Decree settlement which resulted from Docket #CV AC 1:85-2583-6 in the UNITED STATES DISTRICT COURT, DISTRICT OF SOUTH CAROLINA, AIKEN DIVISION. A groundwater monitoring program for the MLHWMF is required under both interim status (Part A Facility) and permitted status (approved Part B Facility). The boundaries of the MLHWMF were determined by estimating the historical high water mark in the overflow area using historical areal photographs, existing site topographic maps, and existing vegetation changes.

HISTORY OF THE FACILITY

The Metallurgical Laboratory Hazardous Waste Management Facility consists of the process sewer line leading to the Metallurgical Laboratory basin from the fence, the Metallurgical Laboratory basin, the drainage outfall to the Carolina bay, and the Carolina bay itself. The Metallurgical Laboratory basin was constructed in 1956. It received effluent consisting primarily of the noncontact cooling water and small quantities of laboratory rinsewater from the Metallurgical Laboratory. The effluent was discharged continuously at approximately 1,000 gallons per day (gpd) throughout the operating period of the basin. The release of hazardous wastes to the Metallurgical Laboratory HWMF was discontinued in 1983. All flow to the Metallurgical Laboratory HWMF was terminated on November 8, 1985.

The Metallurgical Laboratory HWMF received F001, F003, F007, and D011 waste. F001 waste includes spent halogenated solvents used in degreasing (trichloroethylene, 1,1,1-trichloroethane, and carbon tetrachloride). F003 waste includes spent nonhalogenated solvents (acetone), and F007 waste is spent cyanide plating bath solution. Extract from D001 waste obtained using the extraction procedure (EP) toxicity test contains silver in concentrations greater than 5 mg/l.

At present forty-three constituents are analyzed per sample. Trichloroethylene, tetrachloroethylene, and total radium are the only constituents that were reported above Primary Drinking Water Standards (PDWS) during 2Q90 (Table 1). Table 2 lists the constituents that are being analyzed at present. Appendix A presents the trends for the analyzed constituents from 4Q88 to 2Q90.

Well: AMB	4	5	6	7	8D	9D	10D	10DD	11D	12D
-----------	---	---	---	---	----	----	-----	------	-----	-----

Volume of water (gallons)

in well	3.23	3.53	2.97	6.54	5.16	6.59	7.47	11.21	7.18	7.19
purged	5.00	27.00	25.00	29.00	35.00	35.00	43.00	52.00	65.00	42.00

Groundwater Contamination Indicator Parameter Results (ug/L unless otherwise noted)

pH (pH units) (1)	6.2	4.9	5.2	6.1	5.4	5.5	6.0	6.5	9.2	5.7
Specific Conductivity (umhos/cm) (1)	88.0	43.0	42.0	77.0	38.0	48.0	73.0	129.0	134.0	62.0
Total Organic Carbon	2000.0	2000.0	LT 1000	LT 1000	1000.0	2000.0	LT 1000	2000.0	LT 1000	1000.0
Total Organic Halogens	52.0	121.0	LT 5	LT 5	LT 5	LT 5	LT 5	LT 5	LT 5	LT 5

Constituents Above the Primary Drinking Water Standards

Trichloroethylene (ug/L)	74.0	175.0	6.9	LT 2	LT 1	LT 1	LT 1	LT 1	LT 1	LT 1
Tetrachloroethylene (ug/L)	3.0	15.0	LT 2	LT 2	LT 1	LT 1	LT 1	LT 1	LT 1	LT 2
Total Radium (pCi/L)	1.7+-2.4	6.6+-4.5	2.6+-3.5	LT 1	LT 1	LT 1	2.7+-2.4	1.4+-2.1	1.4+-2.1	LT 1

(1) Field measurement

Table 1: Summary of 2Q90 Metallurgical Laboratory Hazardous Waste Management Facility Detection Monitoring

Table 2: Constituents analyzed for at the MLHWMF

Specific Conductance	Selenium
pH	Silica
Silver	Silvex
Arsenic	Sulfate
Barium	Tetrachloroethylene
Calcium	Total Dissolved Solids
Carbon Tetrachloride	Total Organic Carbon
Cadmium	Total Organic Halogens
Chloroform	Total Phosphates
Chloride	Trichloroethylene
Chromium	Toxaphene
Cyanide	Trans-1,2-dichloroethene
Endrin	1,1-Dichloroethene
Fluoride	1,1,1-Trichloroethane
Iron	2,4-Dichlorophenoxyacetic Acid
Mercury	Gross Alpha
Potassium	Nonvolatile Beta
Lindane	Total Radium
Methoxychlor	Tritium
Magnesium	
Manganese	
Sodium	
Nickel	
Nitrate as Nitrogen	
Lead	
Phenols	

DEFINITION OF THE UPPERMOST AQUIFER

The uppermost aquifer in the vicinity of MLHWMF is considered to extend from the surface of the water table to the top of the Ellenton clay and is approximately 115 feet thick as depicted in Figure 1.

LOCATION OF WELLS

Existing

Currently there are 9 water table monitoring wells and 1 perched water table monitoring well (AMB 10DD) installed at the MLHWMF as shown on Figure 2. Table 3 lists the well identification number, location, and screen elevations for each of the existing wells. All of the existing monitoring wells were installed under DPSOP 254 specifications. Additional construction information for the existing wells is presented in Appendix B. Monitoring wells AMB 4D-6D, 8D, and 10D are downgradient wells; wells AMB 7D, 10D, and 12D are sidegradient wells; and 11D are upgradient wells. Water table elevations from the existing wells indicate that there is a very small horizontal gradient to the northwest at the facility. Figure 3 shows the water table surface in the vicinity of the MLHWMF for 1Q90.

Proposed

Installation of monitoring wells around the MLHWMF area consists of 3 upper Congaree (B) wells and 3 lower Congaree (A) wells. No additional water table wells will be installed. Table 1 lists the well identification number, location, and approximate depth for each of the proposed wells. These wells will be located downgradient to flow in the respective unit. Monitoring wells AMB 10B and 13B are proposed downgradient wells and AMB 6B is the proposed upgradient well for the upper Congaree. Monitoring wells AMB 10A and 13A are the proposed downgradient wells and AMB 6A is the proposed upgradient well for the lower Congaree.

The decision to not install additional water table wells was made based on the fact that there exist sufficient water table monitoring wells downgradient to provide sufficient data on plume movement in the water table zone. These wells were installed and are maintained as part of the SRS M-Area HWMF Corrective Action Plan (CAP). The purpose of these wells is to define the extent, concentration distribution, and migration rate of the solvent plume. As part of an on-going groundwater quality program, these wells were used to provide a large hydrologic, geologic, and water-quality information data base in and around the A- and M-Area.

Following delineation of the contamination plume a comprehensive remedial action effort prepared by the SRS, submitted and approved by SCDHEC, was put into operation. As part of the remedial action program a continuing investigation of groundwater

Figure 1: Well log depicting location of Uppermost Aquifer

Figure 2: Site Map

Figure 3: Water Table Potentiometric Map 1Q90

Table 3: Information on existing and proposed well installations

				Screen Elevation (msl, ft)		SRP Coordinates			
Well ID	Type	Drilling Method	Approximate Depth (ft)	Top	Bottom	North	East	Latitude	Longitude
Existing Wells									
AMB 4D	DG	2	165	242	222	104125	51480	33.3400434	81.7335490
AMB 5D	DG	2	165	242	222	104083	51467	33.3399293	81.7335016
AMB 6D	DG	2	165	245	225	104034	51466	33.3398193	81.7334089
AMB 7D	SG	2.3	156	240	220	103919	51624	33.3398231	81.7327690
AMB 8D	DG	1.2	157	245	225	103875	51400	33.3393601	81.7332733
AMB 9D	DG	1.2	155	242	222	103585	51263	33.3384953	81.7330699
AMB 10D	SG	1.2	155	241.5	221.5	103293	51456	33.3381649	81.7319936
AMB 11D	UG	1.2	150	242.5	222.5	103132	51933	33.3395990	81.7304242
AMB 12D	SG	1.2	159	242	222	103102	51902	33.3395763	81.7314202
Proposed Wells									
AMB 6B	UG	2	250	172	167	104083	51467	33.3398193	81.7334089
AMB 6A	UG	2.3	300	132	127	104083	51467	33.3398193	81.7334089
AMB 10B	DG	2	250	172	167	103293	51456	33.3381649	81.7319936
AMB 10A	DG	2.3	300	132	127	103293	51456	33.3381649	81.7319936
AMB 13B	DG	2	250	172	167	103000	51400	33.3374258	81.7315711
AMB 13A	DG	2.3	300	132	127	103000	51400	33.3374258	81.7315711

Type: DG = downgradient
 UG = upgradient
 SG = sidegradient

Method: 1 = Auger
 2 = Mud rotary
 3 = Core

contamination in the A- and M-Area is underway as provided for in Section J of Volume III to the SRS RCRA Part B (M-Area HWMF Post Closure Permit) as follows:

"... the specific corrective action program for the M-Area HWMF is a specific subset of the comprehensive remedial action effort currently in progress in the A/M Area. The remedial action program addresses other known and suspected sources of groundwater contamination (potential SWMUs), as well as the regulated unit. All of the area will be remediated under the auspices of this permit."

Groundwater contamination in the vicinity of the Metallurgical Laboratory HWMF is part of a contamination plume that underlies the A- and M-Areas. Groundwater movement in the water table, lower Congaree, and upper Congaree, is effected by the groundwater recovery system that is in operation in M-Area.

The placement of the wells in the Congaree, both upper and lower, was based on potentiometric data from existing wells which indicate the direction of groundwater flow in these two zones as shown by Figures 4 and 5. The available data indicate that the gradient in the upper Congaree is to the south southeast (SRS Coordinates) and the gradient in the lower Congaree is to the south southwest (SRS Coordinates).

By placing clusters at AMB 6 and 10 vertical gradient movement of the plume may be examined.

INSTALLATION OF WELLS

The lower Congaree well in each cluster will be wire-line cored continuously, sampled every 2 feet, and geophysically logged to the total drilled depth. The samples will be analyzed for VOCs. Each well will be completed using mud rotary methods. Drilling and completion methods used for the well installation will follow Section V of DPSOP 254. Five (5) foot screens will be used for all wells. The wells will be screened in the same lithologic interval as the other upper and lower Congaree wells in the M-Area HWMF. This will enable the data to be incorporated into the SRS M-Area HWMF program.

DEVELOPMENT OF WELLS

The drilling contractor will have 1 drilling crew and 1 developing crew available for this project. Development of all wells will begin within 4 days of installation of each well. Prompt development of the wells is necessary to ensure that they are thoroughly developed. After the wells have been developed, slug tests will be performed to determine the hydraulic conductivity (K) after which pumps will be installed.

Figure 4: Upper Congaree Potentiometric Map 1Q90

Figure 5: Lower Congaree Potentiometric Map 1Q90

SAMPLING AND ANALYSIS

All MLHWMF monitoring wells will be sampled and analyzed for the constituents listed in Table 4. Sampling and analysis of the six new wells will be done on a quarterly basis for the first year. Results from the first year of groundwater analyses will be used to determine the sampling schedule for following years. The additional parameters indicating groundwater contamination listed in Table 4 were selected based on knowledge of the waste stream discharged to the basin. Samples will be collected and shipped according to procedures outlined in Section XI DPSOP 254. Groundwater monitoring samples will be analyzed using EPA approved methods.

DATA EVALUATION

The analytical results will be used to construct contaminant maps and cross-sections. Monitoring data summary tables and graphs of indicator parameters will be constructed.

SCHEDULE

Installation of the proposed MLHWMF Assessment monitoring wells is scheduled to begin as soon as all of the appropriate approvals have been obtained. Table 5 depicts the schedule of activities for the Metallurgical Laboratory HWMF Part B Permit Revision. The results obtained from these additional wells will be presented in the revised part B permit application and in the quarterly groundwater reports for the MLHWMF.

SAFETY

Standard SRS safety procedures for well installation, as described in DPSOP 254, will be followed.

QUALITY ASSURANCE / QUALITY CONTROL

The QA/QC methods for drilling presented in DPSOP 254 will be followed.

Table 4: Indicator parameters for detection monitoring at the Metallurgical Laboratory Hazardous Waste Management Facility with their approved EPA Analytical Methods

Parameters for establishing drinking water suitability

Arsenic	EPA 206.3
Barium	EPA 200.7
Cadmium	EPA 200.7
Chromium	EPA 200.7
Fluoride	EPA 300.0
Lead	EPA 239.2
Mercury	EPA 245.1
Nitrate as N	EPA 300.0
Selenium	EPA 206.3
Silver	EPA 200.7
Endrin	EPA 608/8080
Lindane	EPA 608/8080
Methoxychlor	EPA 608/8080
Toxaphene	EPA 608/8080
2,4-D	EPA 608/8080
2,4,5-TP Silvex	EPA 608/8080
Radium	EPA 900.1
Gross Alpha	Standard Methods 703
Gross Beta	Standard Methods 703
Depth to water surface	

Parameters for establishing groundwater quality

Chloride	EPA 300.0
Iron	EPA 200.7
Manganese	EPA 200.7
Phenols	EPA 420.2
Sodium	EPA 200.7
Sulfate	EPA 300.0

Parameters for indicating groundwater contamination

pH (field)	
Specific Conductance (field)	
Total Organic Carbon	EPA 415.1
Total Organic Halogens	EPA 450.1

Additional parameters indicating groundwater contamination

Trichloroethylene	EPA 624
Tetrachloroethylene	EPA 624
Carbon Tetrachloride	EPA 624
Vinyl Chloride	EPA 624
1,1 Dichloroethylene	EPA 624
Methyl Methacrylate	EPA 624

Table 5: Schedule of Activities for the Metallurgical Laboratory HWMF Part B Permit Revision

Schedule Name : Metallurgical Laboratory HWMF Part B Permit Revision
 As-of Date : 12-Jun-90 9:00am Schedule File : C:\TL3\DATA\PARTBREV

Task Name	Duration (Wks)	Notes	8/3/90	5/24/90
Revise Part B Groundwater Section	42			
Characterize Hydrologic Prop.	37			
Collect existing data	4	5		
Evaluate existing data	5	5,6		
Conduct aquifer perf. tests	10	4,6,8		
Document conclusions	6			
Characterize aquifer flow	25	9,19,13		
Collect existing data	3			
Correlate geophysical logs	8			
Prepare hydrogeologic sections	9	3,4,7		
Prepare potentiometric maps	3	8,13		
Prepare head difference maps	2	3,4		
Collect site specific data	12			
Construct monitoring wells	9			
Write report	4	10,12		
Groundwater quality assessment	16			
Monitoring data summary tables	3	2,18		
Graph indicator parameters	3	2,18		
Contaminant maps	4	2		
Contaminant cross-section (?)	6			
Review and revision	5			
Submit to SCDHEC	0			M

Notes: This column indicates which NODs are addressed by each task.

APPENDIX A
TRENDS OF CONTAMINANTS FROM 4Q88 TO 2Q90

Time Series Plot of Total Organic Carbon

Time Series Plot of Field Specific Conductivity

Time Series Plot of Field pH

Time Series Plot of Trichloroethylene

Time Series Plot of Total Organic Halogens

AMB 4			AMB 5			AMB 6			AMB 7		
Date	Result	Mod. Lab	Date	Result	Mod. Lab	Date	Result	Mod. Lab	Date	Result	Mod. Lab

Total Organic Halogens (ug/l)

12/88	57	EE	12/88	17	EE	12/88	8	EE	12/88	25	EE
3/89	40	EE	3/89	50	EE	3/89	5	LT	3/89	8.9	EE
6/89	55	GE	6/89	110	GE	6/89	14	GE	6/89	8	GE
8/89	30	GE	8/89	113	GE	8/89	5	GE	8/89	72	GE
5/90	52	GE	11/89	133	GE	11/89	8	GE	11/89	7	GE
			3/90	167	GE	3/90	5	LT	3/90	16	GE
			5/90	121	GE	4/90	5	LT	5/90	5	LT

Trichloroethylene (ug/L)

12/88	43	EE	12/88	39	EE	12/88	4	EE	12/88	1	EE
3/89	21.5	MA	3/89	42.5	MA	3/89	2.11	MA	3/89	1.06	MA
6/89	34	GE	6/89	161	GE	6/89	6	GE	6/89	2	GE
8/89	28.5	MA	8/89	160	GE	8/89	8.81	MA	8/89	2.63	MA
5/90	74.00	GE	11/89	300	GE	11/89	63	GE	11/89	2.2	GE
			3/90	180	GE	3/90	5	GE	3/90	1	LT
			5/90	176.00	GE	4/90	6.00	GE	5/90	2.00	LT

Water Level Elevation (feet above msl)

12/88	234.82	12/88	234.78	12/88	234.91	12/88	235.14
3/89	233.73	3/89	233.73	3/89	233.70	3/89	234.02
6/89	234.01	6/89	231.28	6/89	231.71	6/89	233.46
8/89	233.02	8/89	233.85	8/89	233.95	8/89	234.35
11/89	232.75	11/89	233.46	11/89	233.95	11/89	232.91
3/90	232.57	3/90	232.46	3/90	232.55	3/90	232.63
5/90	232.14	5/90	232.08	4/90	231.79	5/90	232.55

AMB 4			AMB 5			AMB 6			AMB 7		
Date	Result	Mod. Lab	Date	Result	Mod. Lab	Date	Result	Mod. Lab	Date	Result	Mod. Lab
pH (pH units)											
12/88	6.70	FD	12/3/88	5.80	FD	12/4/88	8.50	FD	12/4/88	7.40	FD
3/89	6.40	FD	3/20/89	5.50	FD	3/20/89	5.70	FD	3/21/89	7.50	FD
6/89	5.80	FD	6/3/89	4.70	FD	6/3/89	5.10	FD	6/4/89	7.50	FD
8/89	6.50	FD	8/6/89	5.10	FD	8/6/89	5.40	FD	8/6/89	8.10	FD
5/90	6.20	FD	11/26/89	4.60	FD	11/26/89	5.20	FD	11/26/89	6.60	FD
			3/3/90	4.70	FD	3/3/90	5.40	FD	3/4/90	7.00	FD
			5/18/90	4.90	FD	4/20/90	5.20	FD	5/17/90	6.10	FD

Specific Conductance (umhos/cm)

12/88	142.00	FD	12/88	64.00	FD	12/88	310.00	FD	12/88	232.00	FD
3/89	131.00	FD	3/89	57.00	FD	3/89	55.00	FD	3/89	278.00	FD
6/89	121.00	FD	6/89	49.00	FD	6/89	50.00	FD	6/89	268.00	FD
8/89	109.00	FD	8/89	43.00	FD	8/89	43.00	FD	8/89	215.00	FD
5/90	88.00	FD	11/89	47.00	FD	11/89	47.00	FD	11/89	195.00	FD
			3/90	42.00	FD	3/90	55.00	FD	3/90	202.00	FD
			5/90	43.00	FD	4/90	42.00	FD	5/90	77.00	FD

Total Organic Carbon (ug/L)

12/88	1100	EE	12/88	1000	LT	EE	3000	EE	12/88	6800	EE
3/89	6300	EE	3/89	1100	EE	EE	1000	EE	3/89	2200	EE
6/89	6000	GE	6/89	2000	GE	6/89	2000	GE	6/89	5000	GE
8/89	4000	GE	8/89	1000	GE	8/89	1000	GE	8/89	2000	GE
5/90	2000	GE	11/89	1000	LT	11/89	1000	GE	11/89	5000	GE
			3/90	1000	GE	3/90	1000	GE	3/90	2000	GE
			5/90	2000	GE	4/90	1000	LT	5/90	1000	LT

APPENDIX B

WELL CONSTRUCTION INFORMATION

SRP MONITORING WELL CONSTRUCTION DETAILS

DRILLING SUBCONTRACTOR DDTC

WELL NUMBER A 1113-4

DRILLER W. J. Anderson 5/26

SRP COORDINATES $\sim 104125.45^\circ - 148^\circ$

DATE OF INSTALLATION 10/20/72

SANITARY SEAL ELEVATION 380.35

TECH. O.S./CO. NAME K. Craig / Welding House

**NOTE: ALL MEASUREMENTS
ARE FROM GROUND
SURFACE AT START
OF BORING - MEASUREMENTS
TO NEAREST 0.1 FOOT.**

1) Total drilled depth/hole diameter 1165' / 9 7/8"

2) Casing/Screen Tally (Measured to Nearest 0.01 Foot) _____

(a) Sump & Plug 5.49'

(b) Screen Length 20.01

(c) Screen Type/Slot Size PVC 51.40 / 0.015"

(d) Casing Joint Lengths (Measured in up-hole Sequence From Top of Screen) 11/0.04 12/0.02

(3) $10.01'$, $10.02'$, $10.02'$, $10.03'$, $10.02'$

(8) 10.02', 9/0.03', 10.02', 10.04', 9/0.01'

(12) $10.02' \rightarrow 10.02$

(e) Total Length of Casing 135.8

(f) Type of Casing PLC. SCH 40 4" Ø

3) Depths to Centralizers 14' 54' 74' 134'

156

4) Total Depth of Installed Well 161.3'

5) Casing Stick Up (Standard 2.5' A.G.S.) 25'

6) Depth to Top of Filter Pack 111'

Quantity (Bags) 3 Size 0.45" - 0.55 mm

Brand/Trade Name Exeter - Durapac

7) Depth to Top of Fine Sand Seal 10.5'

Quantity (Sacks) 2

8) Depth to Top of Bentonite Seal 101'

Quantity (Buckets) 2

9) Thickness of Grout 10

Total Grout Quantity (Bags)

SRP MONITORING WELL CONSTRUCTION DETAILS

DRILLING SUBCONTRACTOR INTC

WELL NUMBER A11B-5

DRILLER Joe

SRP COORDINATES N104004 E 51462

DATE OF INSTALLATION 09/12/82

SANITARY SEAL ELEVATION 577.1' msl

TECH. O.S./CO. NAME Craig / Worthington

1) Total drilled depth/hole diameter 165' / 9 1/2" ID

2) Casing/Screen Tally (Measured to Nearest 0.01 Foot)

(a) Sump & Plug 5.35'

(b) Screen Length 20.34'

(c) Screen Type/Slot Size PVC 2.140 / 0.015"

(d) Casing Joint Lengths (Measured in up-hole Sequence From Top of Screen)

(1) 10.015' (2) 10.12' (3) 10.02' (4) 10.02'

(5) 10.02' (6) 10.02' (7) 10.02' (8) 10.02' (9) 10.02'

(10) 10.02' (11) 10.02' (12) 10.02' (13) 10.02' (14) 10.02'

(e) Total Length of Casing 135.5'

(f) Type of Casing PVC 2.140

3) Depths to Centralizers 145' 54.5' 94.5'

135.5' 156.5'

4) Total Depth of Installed Well 160.9'

5) Casing Stick Up (Standard 2.5' A.G.S.) 2.5'

6) Depth to Top of Filter Pack 126'

Quantity (Bags) 15 Size 0.45 - 0.55 mm

Brand/Trade Name Foster-Durham

7) Depth to Top of Fine Sand Seal 121'

Quantity (Sacks) 2

8) Depth to Top of Bentonite Seal 115'

Quantity (Buckets) 2

9) Thickness of Grout 115'

Total Grout Quantity (Bags) 2

NOTE: ALL MEASUREMENTS ARE FROM GROUND SURFACE AT START OF BORING - MEASUREMENTS TO NEAREST 0.1 FOOT.

SRP MONITORING WELL CONSTRUCTION DETAILS

DRILLING SUBCONTRACTOR MTC

WELL NUMBER A1113-6

DRILLER W. A. "426"

SRP COORDINATES N 104027 E 51466

DATE OF INSTALLATION 09/14/85

SANITARY SEAL ELEVATION 37' 1" MSL

TECH. O.S./CO. NAME K. Craig / Westinghouse

NOTE: ALL MEASUREMENTS ARE FROM GROUND SURFACE AT START OF BORING - MEASUREMENTS TO NEAREST 0.1 FOOT.

1) Total drilled depth/hole diameter 165' / 9 3/4"

2) Casing/Screen Tally (Measured to Nearest 0.01 Foot)

(a) Sump & Plug 5.37'

(b) Screen Length 10.06'

(c) Screen Type/Slot Size PVC 2.440 / 0.015"

(d) Casing Joint Lengths (Measured in up-hole Sequence From Top of Screen) (1) 10.0' (2) 10.0' (3) 10.005' (4) 9.99' (5) 10.016' (6) 10.0' (7) 10.015' (8) 9.99' (9) 10.0' (10) 10.0' (11) 10.005' (12) 10.02' (13) 10.0' (14) 5.01'

(e) Total Length of Casing 132.5'

(f) Type of Casing PVC SCH 4, 4" Ø

3) Depths to Centralizers 11.6', 51.6', 91.6'
131.6', 153.6'

4) Total Depth of Installed Well 158.03'

5) Casing Stick Up (Standard 2.5' A.G.S.) 2.5'

6) Depth to Top of Filter Pack 125.5'

Quantity (Bags) 15 Size 0.45 - 0.55 mm

Brand/Trade Name Foster - Duramix

7) Depth to Top of Fine Sand Seal 123.5'

Quantity (Sacks) 1.5

8) Depth to Top of Bentonite Seal 118.5'

Quantity (Buckets) 2

9) Thickness of Grout 118.5'

Total Grout Quantity (Bags)

SRP MONITORING WELL CONSTRUCTION DETAILS

DRILLING SUBCONTRACTOR MTC

WELL NUMBER AMB-7

DRILLER S. Reese / William Aaron

SRP COORDINATES N 103919.96
E 51624.91

DATE OF INSTALLATION 08/31/88

SANITARY SEAL ELEVATION 369.87'

TECH. O.S./CO. NAME M Craig / Westinghouse

NOTE: ALL MEASUREMENTS ARE FROM GROUND SURFACE AT START OF BORING - MEASUREMENTS TO NEAREST 0.1 FOOT.

1) Total drilled depth/hole diameter 156' / 9 7/8"

2) Casing/Screen Tally (Measured to Nearest 0.01 Foot)

(a) Sump & Plug 5.41'

(b) Screen Length 20.04'

(c) Screen Type/Slot Size PVC Sh 40, Slotted / 0.015"

(d) Casing Joint Lengths (Measured in up-hole Sequence From Top of Screen) (1) 10.02' (2) 10.02'

(3) 10.02' (4) 10.02' (5) 10.02' (6) 10.01'

(7) 10.03' (8) 10.02' (9) 10.07' (10) 10.03'

(11) 10.02' (12) 10.02' (13) 10.02'

(e) Total Length of Casing 130.31'

(f) Type of Casing PVC, Sh 40, 4"

3) Depths to Centralizers 5', 45', 85'

125', 147'

4) Total Depth of Installed Well 151.3'

5) Casing Stick Up (Standard 2.5' A.G.S.) 2.5'

6) Depth to Top of Filter Pack 121.0'

Quantity (Bags) 17 Size 0.45 - 0.55 mm

Brand/Trade Name Foster - Dixiana

7) Depth to Top of Fine Sand Seal 118.5'

Quantity (Sacks) 2

8) Depth to Top of Bentonite Seal 114.0'

Quantity (Buckets) 2

9) Thickness of Grout 1.4'

Total Grout Quantity (Bags) 56

SRS MONITORING WELL CONSTRUCTION DETAILS

DRILLING SUBCONTRACTOR Graves

WELL NUMBER AMB-8D

DRILLER Steve Rogers/#701 (SC)

SRP COORDINATES N 103874.74
E 51400.46

DATE OF INSTALLATION 10-27-89

SANITARY SEAL ELEVATION 369.61

TECH. O.S./CO. NAME R. J. Hunt/Sirrine

NOTE: ALL MEASUREMENTS ARE FROM GROUND SURFACE AT START OF BORING - MEASUREMENTS TO NEAREST 0.1 FOOT.

1) Total drilled depth/hole diameter 157 ft./11 7/8 in.

2) Casing/Screen Tally (Measured to Nearest 0.01 Foot) 153.52 ft.

(a) Sump & Plug 5.36 ft.

(b) Screen Length 20.01 ft.

(c) Screen Type/Slot Size Sch. 40 PVC/0.015 in.

(d) Casing Joint Lengths (Measured in up-hole Sequence From Top of Screen) 10.00/10.01/10.01/10.01/10.02/10.01/10.02/10.02/10.01/10.00/8.01

(e) Total Length of Casing 128.15 ft.

(f) Type of Casing Sch. 40 PVC, 4 in. diameter

3) Depths to Centralizers 18/45/85/125/149

4) Total Depth of Installed Well 151.02 ft.

5) Casing Stick Up (Standard 2.5' A.G.S.) 2.5 ft.

6) Depth to Top of Filter Pack 122.2 ft.

Quantity (Bags) 16 Size FX-50

Brand/Trade Name Foster-Dixiana

7) Depth to Top of Fine Sand Seal 120.5 ft.

Quantity (Sacks) 2

8) Depth to Top of Bentonite Seal 111.2 ft.

Quantity (Buckets) 2

• Fine sand to 108.4 ft.

9) Thickness of Grout 108.4 ft.

Total Grout Quantity (Bags) 10/12/8/19

SRS MONITORING WELL CONSTRUCTION DETAILS

DRILLING SUBCONTRACTOR Graves

WELL NUMBER AMB-9D

ILLER Steve Rogers/#701 (SC)

SRP COORDINATES N 103585.24
E 51262.99

DATE OF INSTALLATION 10-18-89

SANITARY SEAL ELEVATION 367.88

TECH. O.S./CO. NAME R. J. Hunt/Sirrine

**NOTE: ALL MEASUREMENTS
ARE FROM GROUND
SURFACE AT START
OF BORING - MEASUREMENTS
TO NEAREST 0.1 FOOT.**

1) Total drilled depth/hole diameter 155.0 ft./11 7/8 in.

2) Casing/Screen Tally (Measured to Nearest 0.01 Foot) 153.87 ft.

(a) Sump & Plug 5.37 ft.

(b) Screen Length 20.00 ft.

(c) Screen Type/Slot Size Sch. 40 PVC/0.015 in.

(d) Casing Joint Lengths (Measured in up-
hole Sequence From Top of Screen) 10.00/10.02/10.01/
10.00/10.00/10.01/10.00/10.00/10.00/10.00/10.01/
8.45

(e) Total Length of Casing 128.5 ft.

(f) Type of Casing Sch. 40 PVC, 4 in. diameter

3) Depths to Centralizers 18/44/84/124/148

4) Total Depth of Installed Well 151.37 ft.

5) Casing Stick Up (Standard 2.5' A.G.S.) 2.5 ft.

6) Depth to Top of Filter Pack 120.4 ft.

Quantity (Bags) 18 Size FX-50

Brand/Trade Name Foster-Dixiana

7) Depth to Top of Fine Sand Seal 118.0 ft.

Quantity (Sacks) 2

8) Depth to Top of Bentonite Seal 109.5 ft.

Quantity (Buckets) 3

* Fine sand to 107.5 ft.

9) Thickness of Grout 107.5 ft.

Total Grout Quantity (Bags) 11/48

SRS MONITORING WELL CONSTRUCTION DETAILS

DRILLING SUBCONTRACTOR Graves

WELL NUMBER AMB-10D

DRILLER Steve Rogers/#701 (SC)

SRP COORDINATES N 103293.40
E 51455.96

DATE OF INSTALLATION 11-1-89

SANITARY SEAL ELEVATION 365.51

TECH. O.S./CO. NAME R. J. Hunt/Sirrine

NOTE: ALL MEASUREMENTS ARE FROM GROUND SURFACE AT START OF BORING - MEASUREMENTS TO NEAREST 0.1 FOOT.

1) Total drilled depth/hole diameter 155.0 ft./11 7/8 in.

2) Casing/Screen Tally (Measured to Nearest 0.01 Foot) 151.91 ft.

(a) Sump & Plug 5.38 ft.

(b) Screen Length 20.02 ft.

(c) Screen Type/Slot Size Sch. 40 PVC/0.015 in.

(d) Casing Joint Lengths (Measured in up-hole Sequence From Top of Screen) 10.00/10.01/10.01/10.01/10.00/10.02/10.01/10.02/10.01/10.01/10.00/10.01
6.40

(e) Total Length of Casing 126.51 ft.

(f) Type of Casing Sch. 40 PVC, 4 in. diameter

3) Depths to Centralizers 13/43/83/123/147

4) Total Depth of Installed Well 149.41 ft.

5) Casing Stick Up (Standard 2.5' A.G.S.) 2.5 ft.

6) Depth to Top of Filter Pack 122.2 ft.

Quantity (Bags) 14 Size FX-50

Brand/Trade Name Foster-Dixiana

7) Depth to Top of Fine Sand Seal 119.5 ft.

Quantity (Sacks) 2

8) Depth to Top of Bentonite Seal 111.2 ft.

Quantity (Buckets) 3

* Fine sand to 109.0 ft.

9) Thickness of Grout 109.0 ft.

Total Grout Quantity (Bags) 10/12/9/4/9

SRS MONITORING WELL CONSTRUCTION DETAILS

DRILLING SUBCONTRACTOR Graves

WELL NUMBER AMB-11D

DRILLER Jim Hall/#653 (SC)

SRP COORDINATES N 103132.29
E 51932.57

DATE OF INSTALLATION 6/12/89

SANITARY SEAL ELEVATION 364.03

TECH. O.S./CO. NAME A.M. Pelletier/Sirrine

NOTE: ALL MEASUREMENTS ARE FROM GROUND SURFACE AT START OF BORING - MEASUREMENTS TO NEAREST 0.1 FOOT.

- 1) Total drilled depth/hole diameter 150.0 ft./11 7/8 In.
- 2) Casing/Screen Tally (Measured to Nearest 0.01 Foot) 149.36 ft.
 - (a) Sump & Plug 5.38 ft.
 - (b) Screen Length 19.98 ft.
 - (c) Screen Type/Slot Size Sch. 40 PVC/0.015 In.
 - (d) Casing Joint Lengths (Measured in up-hole Sequence From Top of Screen) 10.03/10.02/10.03/10.02/10.02/10.02/10.03/10.02/10.01/10.01/10.01/10.00/3.78
 - (e) Total Length of Casing 124.0 ft.
 - (f) Type of Casing Sch. 40 PVC, 4 In. diameter
- 3) Depths to Centralizers 20/40/80/120/142
- 4) Total Depth of Installed Well 146.86 ft.
- 5) Casing Stick Up (Standard 2.5' A.G.S.) 2.50 ft.
- 6) Depth to Top of Filter Pack 115.4 ft.
 - Quantity (Bags) 23 Size FX-50
 - Brand/Trade Name Foster-Dixiana
- 7) Depth to Top of Fine Sand Seal 112.8 ft.
 - Quantity (Sacks) 2
- 8) Depth to Top of Bentonite Seal 108.0 ft.
 - Quantity (Buckets) 3
- 9) Thickness of Grout 108.0 ft.
 - Total Grout Quantity (Bags) 8/54

SRS MONITORING WELL CONSTRUCTION DETAILS

DRILLING SUBCONTRACTOR Graves

WELL NUMBER AMB-12D

RILLER Jim Hall/#653 (SC)

SRP COORDINATES N 103602.43
E 51901.58

DATE OF INSTALLATION 6/15/89

SANITARY SEAL ELEVATION 369.82

TECH. O.S./CO. NAME R.J. Hunt/Sirrine

**NOTE: ALL MEASUREMENTS
ARE FROM GROUND
SURFACE AT START
OF BORING - MEASUREMENTS
TO NEAREST 0.1 FOOT.**

1) Total drilled depth/hole diameter 159.1 ft./11 7/8 in.

2) Casing/Screen Tally (Measured to Nearest 0.01 Foot) 156.31 ft.

(a) Sump & Plug 5.38 ft.

(b) Screen Length 20.04 ft.

(c) Screen Type/Slot Size Sch. 40 PVC/0.015 in.

(d) Casing Joint Lengths (Measured in up-hole Sequence From Top of Screen) 10.01/10.01/10.01/
10.01/10.01/10.01/10.02/10.01/10.01/10.02/10.02/10.01/
10.02/0.72

(e) Total Length of Casing 130.89 ft.

(f) Type of Casing Sch. 40 PVC, 4 in. diameter

3) Depths to Centralizers 47/87/127/149

4) Total Depth of Installed Well 153.81 ft.

5) Casing Stick Up (Standard 2.5' A.G.S.) 2.50 ft.

6) Depth to Top of Filter Pack 122.54 ft.

Quantity (Bags) 19 Size FX-50

Brand/Trade Name Foster-Dixiana

7) Depth to Top of Fine Sand Seal 118.56 ft.

Quantity (Sacks) 2

8) Depth to Top of Bentonite Seal 115.65 ft.

Quantity (Buckets) 3

* Fine sand to 113.41 ft.

9) Thickness of Grout 113.41 ft.

Total Grout Quantity (Bags) 6/48

END

DATE FILMED

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