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Sampling And Analysis Of Soil From the Old F-Area Effluent Ditch and its Surrounding Wetlands (U)

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EXECUTIVE SUMMARY

Four surface soil samples were collected from the wetlands at the old F-Area effluent ditch. All samples were collected near shallow well point locations (Dixon et al., 1994) except FHB012, which was collected from the effluent ditch stream sediment. Samples were analyzed for metals, Target Compound List (TCL) volatile organic compounds (VOCs), and gross radiological indicators.

Barium, beryllium, and zinc were detected in all four samples and antimony was detected in three of four samples. These metals occur naturally in the wetland soils at the SRS. Comparisons of metals concentrations were made to concentration ranges taken from background wetland soil samples (Dixon et al., in prep). These comparisons showed that barium and beryllium concentrations were within expected ranges while zinc and antimony concentrations were elevated above expected concentration ranges.

Volatile organic compounds were detected in all four samples. Detected compounds included acetone, 2-butanone (Methyl ethyl ketone), chloromethane, cis-1,2-dichloroethene, and toluene. The only radionuclide detected in significant quantities was tritium which was detected in all four samples.

INTRODUCTION

The Radioactive Waste Burial Grounds are central waste storage sites that are used for the disposal of both radioactive and nonradioactive wastes originating from both onsite and offsite (Jaegge et al., 1985). The burial grounds are divided into three areas: (1) Building 643-E (old burial ground), which received wastes from 1952 through 1972; (2) Building 643-7E, which has been receiving wastes since 1969; and (3) Building 643-28E which is a closure area within 643-7E that is termed the Mixed Waste Management Facility (MWMF) (Jaegge et al., 1985). The sampling zone along the old F-Area effluent ditch receives discharge from shallow groundwater flowing under the southwest corner of 643-E.

Recent analytical results from shallow well point and near-surface water sampling in the wetlands that comprise the old F-Area effluent ditch have shown that tritium and small quantities of VOCs are outcropping in the area (Dixon 1993a and b; Dixon et al., 1994). Volatile organic compounds detected in shallow well point and near-surface water samples include 1,2-dichloroethylene, acetone, methyl ethyl ketone, toluene, tetrachloroethylene, trichloroethylene, and vinyl chloride.

In March 1994, soil samples were collected from several locations along the effluent ditch from which shallow well point and near-surface water samples are routinely collected (Figure 1). Table 1 lists the sampling locations. All samples were collected near shallow well point locations except FHB012 which was collected from the effluent ditch stream sediment. At each location, soil was scooped from the ground surface and placed directly into the sample containers. Sample containers were stored in coolers containing blue ice for transport to the processing area where they were maintained at 4°C until they were delivered to the lab for analysis.

The information in this report was developed during the course of work under Contract No. DE-AC09-89SR18035 with the U. S. Department of Energy.

Analytical services were provided by the Savannah River Technology Center (SRTC) Analytical Development Section (ADS) for the analytes listed in Table 2. All samples were analyzed for the metals appearing in Table 2 using an Inductively Coupled Plasma (ICP) procedure (WSRC-L16.1, 1993a) except mercury which was quantified using a cold vapor Atomic Absorption (AA) procedure (WSRC-L16.1, 1993b). All samples were also analyzed for the volatile organic compounds appearing on the Target Compound List (TCL; Table 2) using Contract Laboratory Protocol (CLP) following a Gas Chromatography - Mass Spectrometry (GC-MS) procedure (WSRC-L16.1, 1993c). The practical quantitation limit (PQL) for all volatile organic analyses was 9 µg/kg. All VOC samples were submitted in replicate.

All samples were analyzed for gross alpha, nonvolatile beta activity (rad screen), gamma PHA, and tritium. Gross alpha and nonvolatile beta activities were determined using a microwave digestion procedure (WSRC-L16.1, 1993d). Lower limits of detection for the gross alpha and nonvolatile beta were 3 pCi/g and 7 pCi/g, respectively. This method used by ADS for the rad screen is a qualitative procedure which is a good indicator of the presence of radioactivity in samples. However, due to subsampling and counting limitations, absolute quantities are subject to large uncertainties. Uncertainty estimates for gross alpha and nonvolatile beta have been estimated to be ± 100 pCi/g. All gross alpha results are rounded up to the nearest 1 pCi/g and nonvolatile beta results are rounded up to the nearest 5 pCi/g.

Samples for gamma PHA analysis were prepared using the microwave digestion procedure mentioned earlier (WSRC-L16.1, 1993d) and activities were determined using germanium detectors (WSRC-L16.1, 1993e). Minimum detectable amounts (MDA) are radionuclide specific and are identified upon determination of particular radionuclides.

Samples for tritium analysis were prepared by leaching 2.5 g soil samples with nitric acid. Two milliliter aliquots of the leachate solution were added to liquid scintillation cocktails and counted in a liquid scintillation counter. The MDA for tritium analyses is moisture content dependent and is estimated on a wet weight basis to be about 1 pCi/ml.

Figure 1. Soil Sampling Locations Along the Old F-Area Effluent Ditch. (All locations are prefixed by "FHB0").

Table 1. Soil Sampling Locations.

Sampling Locations	SRS Coordinates	
	North	East
FHB012 ¹	73424	53878
FHB013	73514	53840
FHB014	73571	53729
FHB018	73567	54024

¹FHB012 is a stream sediment sample.

Table 2. List of Analytes

Metals	Volatile Organic Compounds ¹		Radiological Screens
Antimony	Chloromethane	Trichloroethene	Gross alpha
Arsenic	Vinyl Chloride	1,2-Dichloropropane	Nonvolatile beta
Barium	Bromomethane	Bromodichloromethane	Gamma PHA
Beryllium	Chloroethane	4-Methyl-2-Pentanone	
Cadmium	Acetone	cis-1,3-Dichloropropene	
Chromium	1,1-Dichloroethene	Toluene	
Cobalt	Carbon Disulfide	trans-1,3-Dichloropropene	
Copper	Methylene Chloride	1,1,2-Trichloroethane	
Lead	trans-1,2-Dichloroethene	Tetrachloroethene	
Mercury	1,1-Dichloroethane	2-Hexanone	
Nickel	Vinyl Acetate	Dibromochloromethane	
Selenium	2-Butanone	Chlorobenzene	
Silver	cis-1,2-Dichloroethene	Ethylbenzene	
Thallium	Chloroform	Xylenes (Total)	
Tin	1,1,1-Trichloroethane	Styrene	
Vanadium	Carbon Tetrachloride	Bromoform	
Zinc	Benzene	1,1,2,2-Tetrachloroethane	
	1,2-Dichloroethane		

¹Target Compound List

DISCUSSION

Analytical results for the soil samples collected from the wetlands along the old F-Area effluent ditch south of 643-E (old burial ground) and its surrounding wetlands are presented in Appendix A. Radiochemistry and metals results are presented on a dry weight basis. Results of the metals analyses were provided by the laboratory on a wet weight basis and converted to dry weight based on moisture contents determined from the radiological samples. Results of the volatile organic analyses are presented on a wet weight basis. Included in the laboratory analyses tables for each location and analyte is the lab that performed the analyses, any result or analytical modifiers, and the analytical results. A legend is given at the beginning of Appendix A that provides explanations for the abbreviations and modifiers used to present the data. Data presented in Appendix A are considered scoping level data.

Samples for volatile organic analysis were submitted in replicate. The results from the replicate samples are presented in the data tables along with the reference samples and are noted with an "R" in the replicate field. Replicate samples for FHB014 and FHB018 were rejected due to instrument interferences and were not reported by the lab and are not listed in the data tables.

Metals

A total of four different metals were detected in the soil samples representing 24 percent of the metals analyzed. Barium, beryllium, and zinc were detected in all four soil samples and antimony was detected in all samples except FHB014. All four of these metals occur naturally in the soils of the SRS at various concentrations. To determine if the reported concentrations were elevated above expected ranges, comparisons were made to ranges determined from background wetland soil samples (Dixon et al., in prep). Dixon et al. (in prep) collected soil cores from 50 wetland locations onsite and from 25 wetland locations offsite in an effort to establish the naturally occurring geochemical and physical properties of the wetland soils occurring on the SRS. Sampling locations were selected from areas unimpacted by SRS or other commercial operations. Soil cores were collected from five different soil groupings. Each soil group consisted of similar soil series and the five groups together represented almost all of the wetland soils occurring on the SRS. Cores were divided into depth increments and samples were analyzed for a wide range of geochemical and physical parameters. A portion of the samples underwent complete RCRA Appendix IX analysis and all of the samples were analyzed for metals and general physical properties.

Concentrations of antimony, barium, beryllium, and zinc were compared to ranges determined from Dixon et al. (in prep) for soil grouping three (Fluvaquents) for the onsite locations (surface horizon). Soil grouping three was chosen because soils in the wetlands along the old F-Area effluent ditch have been delineated by Rogers (1990) as belonging to the Seventh Approximation (USDA, 1987) great group "Fluvaquents". Barium and beryllium concentrations for the four soil samples were within the range determined from Dixon et al. (in prep) for the Fluvaquents soil grouping (grouping three). Antimony and zinc concentrations were found to be elevated above the ranges reported by Dixon et al. (in prep). Table 3 shows a comparison of the results with the ranges reported by Dixon et al. (in prep).

Volatile Organic and Radiological Analyses

A total of five different volatile organic compounds were detected above the PQL (9 µg/kg). Acetone was detected at all locations. 2-Butanone (methyl ethyl ketone) was detected above the PQL at locations FHB014 and FHB018. Chloromethane and toluene were detected at location FHB018 and cis-1,2-dichloroethene were detected at location FHB012. Although below the PQL, toluene was observed at locations FHB012, FHB013, and FHB014 and cis-1,2-dichloroethene was observed slightly below the PQL at location FHB014.

Acetone is a common laboratory contaminant and is routinely detected in method blanks. Toluene and 2-butanone are also laboratory contaminants but are not detected in method blanks as commonly as acetone. The positive acetone, 2-butanone, and toluene results were reviewed with ADS and determined to be true positive values. These compounds were not detected in any of the method blanks analyzed with the samples and detected quantities were determined to be too large to be attributable to lab contamination. Each of these compounds have been observed in water samples collected from the shallow well points and near-surface water samplers installed in the wetlands along the old F-Area effluent ditch. This area is being influenced by a VOC plume migrating from 643-E which is likely the source of the organics observed in the soil samples.

Gross alpha, nonvolatile beta, and gamma PHA scans were performed on all four soil samples. Results of the gross alpha and nonvolatile beta scans were reviewed with ADS and determined to be within the range commonly observed for background soil samples at SRS. Results for gross alpha and nonvolatile beta from Dixon et al. (in prep) were not available for comparisons. Gamma PHA scans on all samples did not produce any positive results.

Table 3. Comparison of metals concentrations with ranges taken from Dixon et al. (in prep).

Location	Analyte	Result ¹	Background Range ²	Units
FHB012	Antimony	44	<1.83 - <26.3	µg/g
FHB012	Barium	0.6	4.7 - 90.3	µg/g
FHB012	Beryllium	0.1	<0.09 - <0.95	µg/g
FHB012	Zinc	73	1.63 - 9.6	µg/g
FHB013	Antimony	70	<1.83 - <26.3	µg/g
FHB013	Barium	5.6	4.7 - 90.3	µg/g
FHB013	Beryllium	0.3	<0.09 - <0.95	µg/g
FHB013	Zinc	212	1.63 - 9.6	µg/g
FHB014	Barium	1.4	4.7 - 90.3	µg/g
FHB014	Beryllium	0.84	<0.09 - <0.95	µg/g
FHB014	Zinc	191	1.63 - 9.6	µg/g
FHB018	Antimony	77	<1.83 - <26.3	µg/g
FHB018	Barium	32	4.7 - 90.3	µg/g
FHB018	Beryllium	0.37	<0.09 - <0.95	µg/g
FHB018	Zinc	160	1.63 - 9.6	µg/g

¹Reported as dry weight.²Ranges presented were determined from Dixon et al. (in prep).

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APPENDIX A
Analytical Results

ANALYTICAL RESULTS

Analytical results for each soil sampling location are presented in this section. Included in the laboratory analyses tables for each location and analyte is the lab that performed the analyses, any result or analytical qualifiers, the analytical results and the units of measurement.

The following is a list of abbreviations used in the tables:

Lab	Laboratory performing analysis
Rep	Replication or Lab Duplication Sample (denoted by either a "R" or a "D")
Qualifier	Result or analysis qualifier
ADS	Analytical Development Section

Result and Analysis Qualifiers

Result Qualifiers	
CODE	DESCRIPTION
(BLANK)	Data not remarked. Number should be interpreted exactly as reported.
J	The analytical result is an estimated quantity.
R	Rejected because of performance requirements in the sample or associated quality control analyses were not met. The analyte may or may not be present.
U	Material analyzed for but not detected. Value reported is the sample quantification limit.

Analysis Qualifiers	
CODE	DESCRIPTION
L	Analytical result is greater than the upper calibration value (20 X PQL). For most VOC analytes, linearity has been observed up to 100 X PQL.

FHB012

Sample Date: 03/07/94

Matrix: Soil

Moisture Content: 30.2%

Metals Analyses:

Analyte	Lab	Qualifier	Results	Units ¹
Antimony	ADS		44	µg/g
Arsenic	ADS	U	29	µg/g
Barium	ADS		0.6	µg/g
Beryllium	ADS		0.1	µg/g
Cadmium	ADS	U	1	µg/g
Chromium	ADS	U	6	µg/g
Cobalt	ADS	U	6	µg/g
Copper	ADS	U	1	µg/g
Lead	ADS	U	29	µg/g
Mercury	ADS	U	1	µg/g
Nickel	ADS	U	7	µg/g
Selenium	ADS	U	43	µg/g
Silver	ADS	U	3	µg/g
Thallium	ADS	U	29	µg/g
Tin	ADS	U	10	µg/g
Vanadium	ADS	U	1	µg/g
Zinc	ADS		73	µg/g

¹Reported as dry weight after moisture content corrections.

Volatile Organic Analyses:

Analyte	Lab	Rep	Qualifier	Results	Units ¹
1,1,1-Trichloroethane	ADS		U	9	µg/kg
1,1,1-Trichloroethane	ADS	R	U	9	µg/kg
1,1,1-Trichloroethane	ADS	D	U	9	µg/kg
1,1,2,2-Tetrachloroethane	ADS		U	9	µg/kg
1,1,2,2-Tetrachloroethane	ADS	R	U	9	µg/kg
1,1,2,2-Tetrachloroethane	ADS	D	U	9	µg/kg
1,1,2-Trichloroethane	ADS		U	9	µg/kg
1,1,2-Trichloroethane	ADS	R	U	9	µg/kg
1,1,2-Trichloroethane	ADS	D	U	9	µg/kg
1,1-Dichloroethane	ADS		U	9	µg/kg
1,1-Dichloroethane	ADS	R	U	9	µg/kg
1,1-Dichloroethane	ADS	D	U	9	µg/kg
1,1-Dichloroethene	ADS		U	9	µg/kg
1,1-Dichloroethene	ADS	R	U	9	µg/kg
1,1-Dichloroethene	ADS	D	U	9	µg/kg
1,2-Dichloroethane	ADS		U	9	µg/kg
1,2-Dichloroethane	ADS	R	U	9	µg/kg
1,2-Dichloroethane	ADS	D	U	9	µg/kg

FHB012

Volatile Organic Analyses Continued:

Analyte	Lab	Rep	Qualifier	Results	Units ¹
1,2-Dichloropropane	ADS		U	9	µg/kg
1,2-Dichloropropane	ADS	R	U	9	µg/kg
1,2-Dichloropropane	ADS	D	J	0	µg/kg
2-Butanone	ADS		U	9	µg/kg
2-Butanone	ADS	R	U	9	µg/kg
2-Butanone	ADS	D	J	1	µg/kg
2-Hexanone	ADS		U	9	µg/kg
2-Hexanone	ADS	R	U	9	µg/kg
2-Hexanone	ADS	D	U	9	µg/kg
4-Methyl-2-Pentanone	ADS		J	1	µg/kg
4-Methyl-2-Pentanone	ADS	R	J	1	µg/kg
4-Methyl-2-Pentanone	ADS	D	U	9	µg/kg
Acetone	ADS		U	9	µg/kg
Acetone	ADS	R	J	9	µg/kg
Acetone	ADS	D		14	µg/kg
Benzene	ADS		J	0	µg/kg
Benzene	ADS	R	J	0	µg/kg
Benzene	ADS	D	J	0	µg/kg
Bromodichloromethane	ADS		U	9	µg/kg
Bromodichloromethane	ADS	R	U	9	µg/kg
Bromodichloromethane	ADS	D	U	9	µg/kg
Bromoform	ADS		U	9	µg/kg
Bromoform	ADS	R	U	9	µg/kg
Bromoform	ADS	D	U	9	µg/kg
Bromomethane	ADS		U	9	µg/kg
Bromomethane	ADS	R	U	9	µg/kg
Bromomethane	ADS	D	U	9	µg/kg
Carbon Disulfide	ADS		J	1	µg/kg
Carbon Disulfide	ADS	R	J	1	µg/kg
Carbon Disulfide	ADS	D	J	1	µg/kg
Carbon Tetrachloride	ADS		U	9	µg/kg
Carbon Tetrachloride	ADS	R	U	9	µg/kg
Carbon Tetrachloride	ADS	D	U	9	µg/kg
Chlorobenzene	ADS		U	9	µg/kg
Chlorobenzene	ADS	R	U	9	µg/kg
Chlorobenzene	ADS	D	U	9	µg/kg
Chloroethane	ADS		U	9	µg/kg
Chloroethane	ADS	R	J	3	µg/kg
Chloroethane	ADS	D	U	9	µg/kg
Chloroform	ADS		J	0	µg/kg
Chloroform	ADS	R	J	0	µg/kg
Chloroform	ADS	D	U	9	µg/kg
Chloromethane	ADS		U	9	µg/kg
Chloromethane	ADS	R	U	9	µg/kg
Chloromethane	ADS	D	U	9	µg/kg

FHB012

Volatile Organic Analyses Continued:

Analyte	Lab	Rep	Qualifier	Results	Units ¹
cis-1,2-Dichloroethene	ADS			9	µg/kg
cis-1,2-Dichloroethene	ADS	R	J	8	µg/kg
cis-1,2-Dichloroethene	ADS	D		20	µg/kg
cis-1,3-Dichloropropene	ADS		U	9	µg/kg
cis-1,3-Dichloropropene	ADS	R	U	9	µg/kg
cis-1,3-Dichloropropene	ADS	D	U	9	µg/kg
Dibromochloromethane	ADS		U	9	µg/kg
Dibromochloromethane	ADS	R	U	9	µg/kg
Dibromochloromethane	ADS	D	U	9	µg/kg
Ethylbenzene	ADS		U	9	µg/kg
Ethylbenzene	ADS	R	U	9	µg/kg
Ethylbenzene	ADS	D	U	9	µg/kg
Methylene Chloride	ADS		J	0	µg/kg
Methylene Chloride	ADS	R	J	0	µg/kg
Methylene Chloride	ADS	D	J	0	µg/kg
Styrene	ADS		U	9	µg/kg
Styrene	ADS	R	U	9	µg/kg
Styrene	ADS	D	U	9	µg/kg
Tetrachloroethene	ADS		J	3	µg/kg
Tetrachloroethene	ADS	R	J	5	µg/kg
Tetrachloroethene	ADS	D	J	4	µg/kg
Toluene	ADS		J	1	µg/kg
Toluene	ADS	R	J	2	µg/kg
Toluene	ADS	D	J	1	µg/kg
trans-1,2-Dichloroethene	ADS		J	0	µg/kg
trans-1,2-Dichloroethene	ADS	R	J	0	µg/kg
trans-1,2-Dichloroethene	ADS	D	J	1	µg/kg
trans-1,3-Dichloropropene	ADS		U	9	µg/kg
trans-1,3-Dichloropropene	ADS	R	U	9	µg/kg
trans-1,3-Dichloropropene	ADS	D	U	9	µg/kg
Trichloroethene	ADS		J	3	µg/kg
Trichloroethene	ADS	R	J	4	µg/kg
Trichloroethene	ADS	D	J	5	µg/kg
Vinyl Acetate	ADS		U	9	µg/kg
Vinyl Acetate	ADS	R	U	9	µg/kg
Vinyl Acetate	ADS	D	U	9	µg/kg
Vinyl Chloride	ADS		U	9	µg/kg
Vinyl Chloride	ADS	R	U	9	µg/kg
Vinyl Chloride	ADS	D	U	9	µg/kg
Xylenes (Total)	ADS		U	9	µg/kg
Xylenes (Total)	ADS	R	U	9	µg/kg
Xylenes (Total)	ADS	D	U	9	µg/kg

¹Reported as wet weight.

FHB012

Radiological Analyses:

Analyte	Lab	Qualifier	Result	Units
Gross Alpha	ADS	J	1	pCi/g ¹
Nonvolatile Beta	ADS		30	pCi/g ¹
Tritium	ADS		18000	pCi/g ²

¹Reported as dry weight after moisture content corrections.

²Reported as wet weight.

FHB013

Sample Date: 03/07/94

Matrix: Soil

Moisture Content: 21.8%

Metals Analyses:

Analyte	Lab	Qualifier	Results	Units ¹
Antimony	ADS		70	µg/g
Arsenic	ADS	U	30	µg/g
Barium	ADS		5.6	µg/g
Beryllium	ADS		0.3	µg/g
Cadmium	ADS	U	2	µg/g
Chromium	ADS	U	6	µg/g
Cobalt	ADS	U	6	µg/g
Copper	ADS	U	2	µg/g
Lead	ADS	U	30	µg/g
Mercury	ADS	U	2	µg/g
Nickel	ADS	U	8	µg/g
Selenium	ADS	U	46	µg/g
Silver	ADS	U	3	µg/g
Thallium	ADS	U	30	µg/g
Tin	ADS	U	11	µg/g
Vanadium	ADS	U	2	µg/g
Zinc	ADS		212	µg/g

¹Reported as dry weight after moisture content corrections.

Volatile Organic Analyses:

Analyte	Lab	Rep	Qualifier	Results	Units ¹
1,1,1-Trichloroethane	ADS		U	9	µg/kg
1,1,1-Trichloroethane	ADS	R	U	9	µg/kg
1,1,2,2-Tetrachloroethane	ADS		U	9	µg/kg
1,1,2,2-Tetrachloroethane	ADS	R	U	9	µg/kg
1,1,2-Trichloroethane	ADS		U	9	µg/kg
1,1,2-Trichloroethane	ADS	R	U	9	µg/kg
1,1-Dichloroethane	ADS		J	0	µg/kg
1,1-Dichloroethane	ADS	R	U	9	µg/kg
1,1-Dichloroethene	ADS		U	9	µg/kg
1,1-Dichloroethene	ADS	R	U	9	µg/kg
1,2-Dichloroethane	ADS		U	9	µg/kg
1,2-Dichloroethane	ADS	R	U	9	µg/kg
1,2-Dichloropropane	ADS		U	9	µg/kg
1,2-Dichloropropane	ADS	R	U	9	µg/kg
2-Butanone	ADS		U	9	µg/kg
2-Butanone	ADS	R	U	9	µg/kg
2-Hexanone	ADS		U	9	µg/kg
2-Hexanone	ADS	R	U	9	µg/kg
4-Methyl-2-Pentanone	ADS		U	9	µg/kg
4-Methyl-2-Pentanone	ADS	R	U	9	µg/kg

FHB013

Volatile Organic Analyses Continued:

Analyte	Lab	Rep	Qualifier	Results	Units ¹
Acetone	ADS		U	9	µg/kg
Acetone	ADS	R		21	µg/kg
Benzene	ADS		J	0	µg/kg
Benzene	ADS	R	J	0	µg/kg
Bromodichloromethane	ADS		U	9	µg/kg
Bromodichloromethane	ADS	R	U	9	µg/kg
Bromoform	ADS		U	9	µg/kg
Bromoform	ADS	R	U	9	µg/kg
Bromomethane	ADS		U	9	µg/kg
Bromomethane	ADS	R	U	9	µg/kg
Carbon Disulfide	ADS		J	1	µg/kg
Carbon Disulfide	ADS	R	J	1	µg/kg
Carbon Tetrachloride	ADS		U	9	µg/kg
Carbon Tetrachloride	ADS	R	U	9	µg/kg
Chlorobenzene	ADS		U	9	µg/kg
Chlorobenzene	ADS	R	U	9	µg/kg
Chloroethane	ADS		U	9	µg/kg
Chloroethane	ADS	R	J	1	µg/kg
Chloroform	ADS		J	0	µg/kg
Chloroform	ADS	R	U	9	µg/kg
Chloromethane	ADS		U	9	µg/kg
Chloromethane	ADS	R	U	9	µg/kg
cis-1,2-Dichloroethene	ADS		U	9	µg/kg
cis-1,2-Dichloroethene	ADS	R	U	9	µg/kg
cis-1,3-Dichloropropene	ADS		U	9	µg/kg
cis-1,3-Dichloropropene	ADS	R	U	9	µg/kg
Dibromochloromethane	ADS		U	9	µg/kg
Dibromochloromethane	ADS	R	U	9	µg/kg
Ethylbenzene	ADS		U	9	µg/kg
Ethylbenzene	ADS	R	J	1	µg/kg
Methylene Chloride	ADS		J	0	µg/kg
Methylene Chloride	ADS	R	U	9	µg/kg
Styrene	ADS		J	0	µg/kg
Styrene	ADS	R	U	9	µg/kg
Tetrachloroethene	ADS		J	1	µg/kg
Tetrachloroethene	ADS	R	J	1	µg/kg
Toluene	ADS		J	3	µg/kg
Toluene	ADS	R	J	6	µg/kg
trans-1,2-Dichloroethene	ADS		U	9	µg/kg
trans-1,2-Dichloroethene	ADS	R	U	9	µg/kg
trans-1,3-Dichloropropene	ADS		U	9	µg/kg
trans-1,3-Dichloropropene	ADS	R	U	9	µg/kg
Trichloroethene	ADS		U	9	µg/kg
Trichloroethene	ADS	R	U	9	µg/kg
Vinyl Acetate	ADS		U	9	µg/kg
Vinyl Acetate	ADS	R	U	9	µg/kg

FHB013

Volatile Organic Analyses Continued:

Analyte	Lab	Rep	Qualifier	Results	Units ¹
Vinyl Chloride	ADS		U	9	µg/kg
Vinyl Chloride	ADS	R	U	9	µg/kg
Xylenes (Total)	ADS		U	9	µg/kg
Xylenes (Total)	ADS	R	U	9	µg/kg

¹Reported as wet weight.

Radiological Analyses:

Analyte	Lab	Qualifier	Result	Units
Gross Alpha	ADS	J	2	pCi/g ¹
Nonvolatile Beta	ADS		25	pCi/g ²
Tritium	ADS		580	pCi/g ²

¹Reported as dry weight after moisture content corrections.²Reported as wet weight.

FHB014

Sample Date: 03/07/94

Matrix: Soil

Moisture Content: 55.6%

Metals Analyses:

Analyte	Lab	Qualifier	Results	Units ¹
Antimony	ADS	U	56	µg/g
Arsenic	ADS	U	56	µg/g
Barium	ADS		1.4	µg/g
Beryllium	ADS		0.84	µg/g
Cadmium	ADS	U	3	µg/g
Chromium	ADS	U	11	µg/g
Cobalt	ADS	U	11	µg/g
Copper	ADS	U	3	µg/g
Lead	ADS	U	56	µg/g
Mercury	ADS	U	3	µg/g
Nickel	ADS	U	14	µg/g
Selenium	ADS	U	84	µg/g
Silver	ADS	U	6	µg/g
Thallium	ADS	U	56	µg/g
Tin	ADS	U	20	µg/g
Vanadium	ADS	U	3	µg/g
Zinc	ADS		191	µg/g

¹Reported as dry weight after moisture content corrections.

Volatile Organic Analyses:

Analyte	Lab	Rep	Qualifier	Results	Units ¹
1,1-Dichloroethene	ADS		U	9	µg/kg
1,1-Dichloroethane	ADS		U	9	µg/kg
1,1,1-Trichloroethane	ADS		U	9	µg/kg
1,2-Dichloroethane	ADS		U	9	µg/kg
1,2-Dichloropropane	ADS		U	9	µg/kg
1,1,2-Trichloroethane	ADS		U	9	µg/kg
1,1,2,2-Tetrachloroethane	ADS		U	9	µg/kg
2-Butanone	ADS			127	µg/kg
2-Hexanone	ADS		U	9	µg/kg
4-Methyl-2-Pentanone	ADS		U	9	µg/kg
Acetone	ADS			137	µg/kg
Benzene	ADS		J	0	µg/kg
Bromodichloromethane	ADS		U	9	µg/kg
Bromoform	ADS		U	9	µg/kg
Bromomethane	ADS		J	1	µg/kg
Carbon Disulfide	ADS		J	2	µg/kg
Carbon Tetrachloride	ADS		U	9	µg/kg
Chlorobenzene	ADS		U	9	µg/kg
Chloroethane	ADS		U	9	µg/kg
Chloroform	ADS		U	9	µg/kg

FHB014

Volatile Organic Analyses Continued:

Analyte	Lab	Rep	Qualifier	Results	Units ¹
Chloromethane	ADS		J	8	µg/kg
cis-1,2-Dichloroethene	ADS		J	8	µg/kg
cis-1,3-Dichloropropene	ADS		U	9	µg/kg
Dibromochloromethane	ADS		U	9	µg/kg
Ethylbenzene	ADS		U	9	µg/kg
Methylene Chloride	ADS		U	9	µg/kg
Styrene	ADS		U	9	µg/kg
Tetrachloroethene	ADS		J	2	µg/kg
Toluene	ADS		LJ	267	µg/kg
trans-1,2-Dichloroethene	ADS		U	9	µg/kg
trans-1,3-Dichloropropene	ADS		U	9	µg/kg
Trichloroethene	ADS		J	2	µg/kg
Vinyl Acetate	ADS		U	9	µg/kg
Vinyl Chloride	ADS		U	9	µg/kg
Xylenes (Total)	ADS		U	9	µg/kg

¹Reported as wet weight.

Radiological Analyses:

Analyte	Lab	Qualifier	Result	Units
Gross Alpha	ADS	J	3	pCi/g ¹
Nonvolatile Beta	ADS		55	pCi/g ¹
Tritium	ADS		730	pCi/g ²

¹Reported as dry weight after moisture content corrections.²Reported as wet weight.

FHB018

Sample Date: 03/07/94

Matrix: Soil

Moisture Content: 41.1%

Metals Analyses:

Analyte	Lab	Qualifier	Results	Units ¹
Antimony	ADS		77	µg/g
Arsenic	ADS	U	37	µg/g
Barium	ADS		32	µg/g
Beryllium	ADS		0.37	µg/g
Cadmium	ADS	U	2	µg/g
Chromium	ADS	U	7	µg/g
Cobalt	ADS	U	7	µg/g
Copper	ADS	U	2	µg/g
Lead	ADS	U	37	µg/g
Mercury	ADS	U	2	µg/g
Nickel	ADS	U	9	µg/g
Selenium	ADS	U	55	µg/g
Silver	ADS	U	4	µg/g
Thallium	ADS	U	37	µg/g
Tin	ADS	U	13	µg/g
Vanadium	ADS	U	2	µg/g
Zinc	ADS		160	µg/g

¹Reported as dry weight after moisture content corrections.

Volatile Organic Analyses:

Analyte	Lab	Rep	Qualifier	Results	Units ¹
1,1-Dichloroethene	ADS		U	9	µg/g
1,1-Dichloroethane	ADS		U	9	µg/g
1,1,1-Trichloroethane	ADS		U	9	µg/g
1,2-Dichloroethane	ADS		U	9	µg/g
1,2-Dichloropropane	ADS		U	9	µg/g
1,1,2-Trichloroethane	ADS		U	9	µg/g
1,1,2,2-Tetrachloroethane	ADS		U	9	µg/g
2-Butanone	ADS			20	µg/g
2-Hexanone	ADS		U	9	µg/g
4-Methyl-2-Pentanone	ADS		U	9	µg/g
Acetone	ADS			70	µg/g
Benzene	ADS		J	1	µg/g
Bromodichloromethane	ADS		U	9	µg/g
Bromoform	ADS		U	9	µg/g
Bromomethane	ADS		J	2	µg/g
Carbon Disulfide	ADS		J	2	µg/g
Carbon Tetrachloride	ADS		U	9	µg/g
Chlorobenzene	ADS		U	9	µg/g
Chloroethane	ADS		U	9	µg/g
Chloroform	ADS		U	9	µg/g

FHB018

Volatile Organic Analyses Continued:

Analyte	Lab	Rep	Qualifier	Results	Units ¹
Chloromethane	ADS			16	µg/g
cis-1,2-Dichloroethene	ADS		U	9	µg/g
cis-1,3-Dichloropropene	ADS		U	9	µg/g
Dibromochloromethane	ADS		U	9	µg/g
Ethylbenzene	ADS		U	9	µg/g
Methylene Chloride	ADS		U	9	µg/g
Styrene	ADS		U	9	µg/g
Tetrachloroethene	ADS		J	1	µg/g
Toluene	ADS			37	µg/g
trans-1,2-Dichloroethene	ADS		J	0	µg/g
trans-1,3-Dichloropropene	ADS		U	9	µg/g
Trichloroethene	ADS		U	9	µg/g
Vinyl Acetate	ADS		U	9	µg/g
Vinyl Chloride	ADS		U	9	µg/g
Xylenes (Total)	ADS		U	9	µg/g

¹Reported as wet weight.

Radiological Analyses:

Analyte	Lab	Qualifier	Result	Units
Gross Alpha	ADS		8	pCi/g ¹
Nonvolatile Beta	ADS		40	pCi/g ¹
Tritium	ADS		19900	pCi/g ²

¹Reported as dry weight after moisture content corrections.²Reported as wet weight.