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Columbia Environmental Research Center

Los Alamos National Laboratory Use Study Phase II: Toxicity Testing of Surface Waters and Sediment Pore Waters

Appendix A

U.S. Department of the Interior
U.S. Geological Survey

Los Alamos National Laboratory Use Assessment
Phase II

Toxicity Testing of
Surface Waters and Sediment Pore Waters at
Los Alamos National Laboratory

Appendix A: Chemical Analysis Reports

A report by:

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Prepared for:

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New Mexico Ecological Services Field Office
Albuquerque, New Mexico

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Environmental and Contaminants Research Center
Biological Resource Division, US Geological Survey
4200 New Haven Rd., Columbia, Missouri 65201

Final Laboratory Report FY-98-31-18

TITLE: POLYCHLORINATED BIPHENYLS IN FISH AND SEDIMENT FROM LOS ALAMOS NATIONAL LABORATORY

Date: July 24, 1998

Submitted By:

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Sample History: Sediments and caged fish, collected from several streams located in and around Los Alamos National Laboratory, NM, were submitted for total PCB analysis by a congener PCB methodology. Although not requested, we provided the congener data as well.

Analytical Preparation Methods Summary:

Sample Preparation:

After the sample mass (10g analyzed) was determined, the samples were dehydrated by addition of anhydrous sodium sulfate (sediment was previously air dried) and method recovery standards, PCBs 030, 204 were spiked. Samples were extracted with methylene chloride, and for the fish, a small portion of the extract (1 %) was used to determine percent lipid. Sediment extracts for PCB analysis were taken through a multi-step cleanup (ECRC SOP C5.144): single column reactive cleanup, and high performance gel permeation chromatography (HP-GPC) (1). Fish tissue extracts were taken through a similar multi-step

cleanup: two columns of reactive cleanup, and HP-GPC (ECRC SOP C5.143). The final extracts were analyzed by capillary GC/ECD for PCBs.

Capillary Gas Chromatography/ Electron Capture Detection (CGC/ECD):

Purified sample extracts were analyzed by CGC/ECD to measure total PCBs (Tables 1& 4). The CGC/ECD analyses were performed as described in ECRC SOP C5.154 (2). All CGC/ECD analyses were performed using Hewlett-Packard 5890 Series II GCs with cool on-column capillary injection systems and Hewlett-Packard model 7673 autosamplers. For all analyses, a 5-m section of 0.53 mm id uncoated and deactivated (Restek Corp, Inc.) capillary retention gap was attached to the front of each analytical column by a "Press-Tight" (Restek Corp, Inc.) union and the temperature of the ECD was held at 330°C.

PCB congener analysis:

Two sets of extracts (sediments and tissue) were chromatographed on a 60-m x 0.25-mm DB-5 (0.25μm 5% phenyl-, 95% methylsilicone, J&W Scientific). The H_2-carrier was pressure regulated at 25 psi for set 1 (sediment) and 24 psi for set 2 (fish tissue). The temperature program was as follows: initial temperature 60 °C, immediately ramped to 150 °C at 15 °C/min, then ramped to 250 °C at 1.0 °C/min and held for 5 min, and finally ramped to 320 °C at 10 °C/min, and held for 1 min.

Capillary GC/ECD data were collected, archived in digital form, and processed using a PE-Nelson chromatography data system which includes the model 970 interface and version 4.1 of Turbochrom™ chromatography software running on a Pentium or 486 based microcomputer. Six levels of PCB standards--a combination of Aroclors 1242, 1248, 1254, 1260 in 1:1:1:1 w/w/w/w ratio (designated A1111)--were used for PCB calibration, ranging from total PCB concentrations of 200 to 8000 ng/mL. An instrumental internal standard (IIS) method with octachloronaphthalene (OCN) was used to calculate the concentrations of the targeted compounds. Results of the analysis for total PCBs are presented in Tables 1 & 4 with final concentrations expressed as nanograms per gram (ng/g) dry weight for sediments and ng/g wet weight for the fish. Quality control data--spikes, blanks, replicates, controls--are presented in Tables 2 & 5. Recovery data for spiked PCBs 030 and 204 are in Tables 3 & 6..

Results:

Quality Control Procedures:

The experimentally determined method detection limits (MDLs) are presented in Tables 2 & 5 and were determined according to the method outlined by Keith *et al.* (3,4), based on procedure blank results.

PCBs were spiked into control matrices--sediment or bluegill fish tissue at 2 μg total PCBs (ECRC numbers:

MS 033098 and MS 041798). Recovery for total PCBs was 83% in the sediment and 97% in the tissue spike. GC reproducibility was assessed by analyses of triplicates of the matrix spike (MS), positive control (PC) sediment (ECRC # 235C-1, Saginaw River, MI sediment), procedural blank (PB), and one of the samples (Tables 2 & 5). Method precision was assessed by processing three equal aliquots of one sample and averaged 6% relative standard deviation (%RSD) for the fish triplicates (sediment sample triplicate concentrations were below the detection limit) (Tables 2 & 5).

The recovery of spiked compounds, PCBs 030 and 204, are presented in Tables 3 & 6. PCB 030, a trichlorobiphenyl, is representative of more volatile early eluting PCBs (Cl_1 - Cl_3). PCB 204, an octachlorobiphenyl, is less volatile and more representative of later eluting PCBs (Cl_4 - Cl_{10}). Recoveries for sediment averaged 71 ± 8% for PCB 030 and 75 ± 10% for PCB 204. Fish recoveries averaged 84 ± 5% for PCB 030 and 89 ± 5% for PCB 204.

Results:

The results for congener specific and total PCBs are in Tables 1 & 4 as concentrations (ng/g) in dry weight sediment or wet weight tissue. Samples in Tables 1 & 4 are designated by their ECRC database number and are cross-referenced to their field identification number and site description. Chromatograms showing the differences in the PCB congener patterns are presented in Figures 1- 3.

REFERENCES

(1) Meadows, J.; 1991. ECRC SOP: C5.143. "Extraction of PCBs, PCDDs, and PCDFs from tissue samples, and cleanup of the extracts in preparation for GC/ECD analysis for PCBs, then fractionation of the extracts on dispersed carbon."

(2) Echols, K.R.; 1995. ECRC SOP: C5.154. "Capillary Gas Chromatography with Electron Capture Detection Procedure for Congener Specific Polychlorinated Biphenyl Analysis."

(3) Keith, L.H.; Crummet, W; Deegan, J., Jr; Libby, R.A.; Taylor, J.K.; and Wentler, G. 1983. "Principles of environmental analysis." Anal. Chem. 55: 2210-2218.

(4) Keith, L.H. 1991. Environmental Sampling and Analysis. Lewis Publishers.

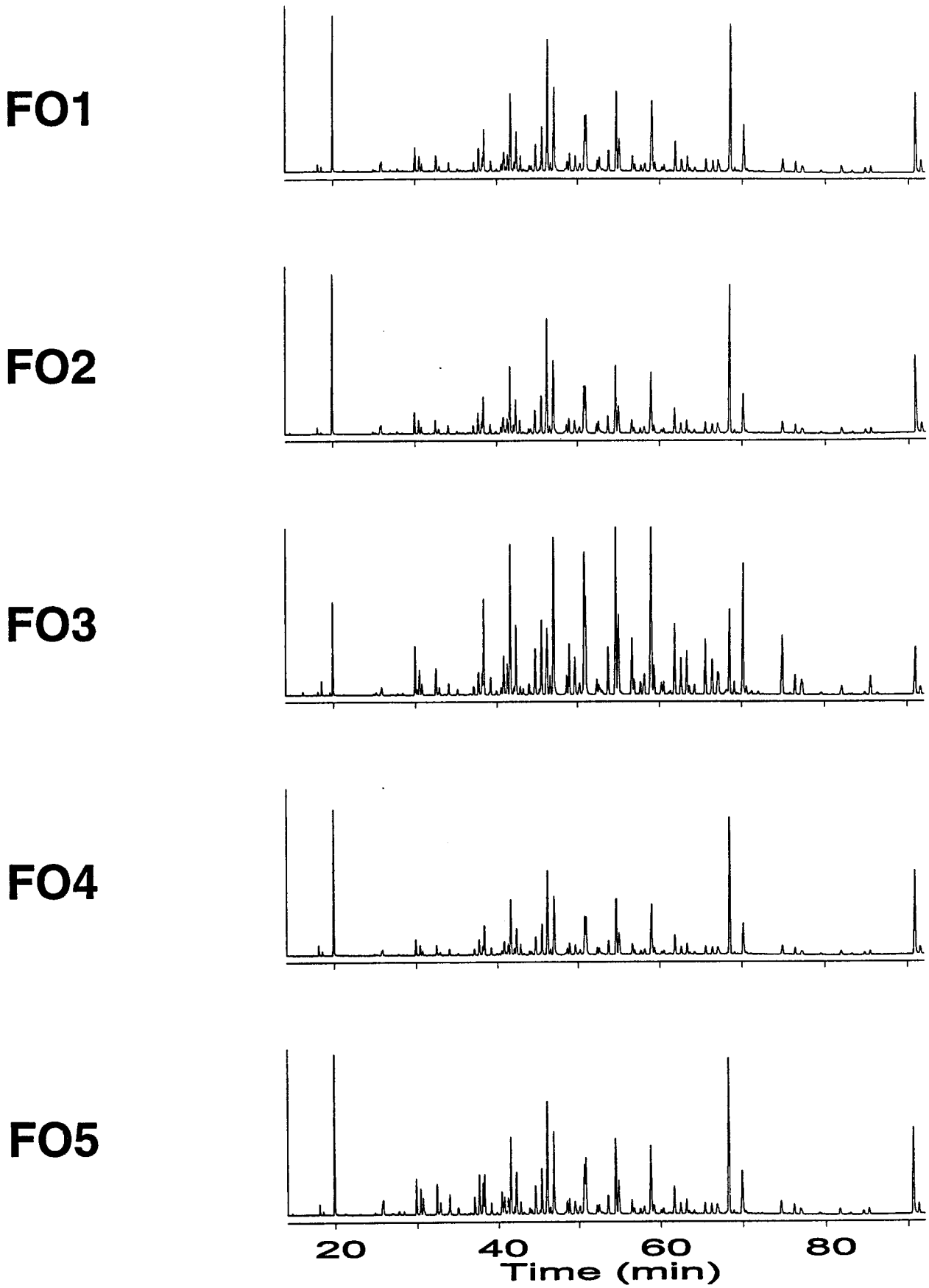
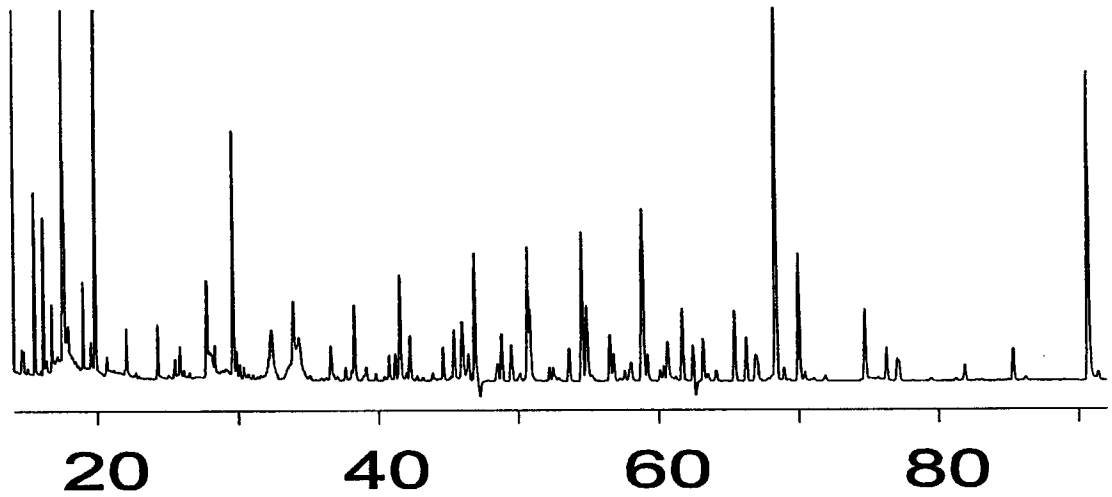


Figure 1. GC/ECD chromatograms of PCBs in fish.

Sandia, Upper



Sandia, Lower

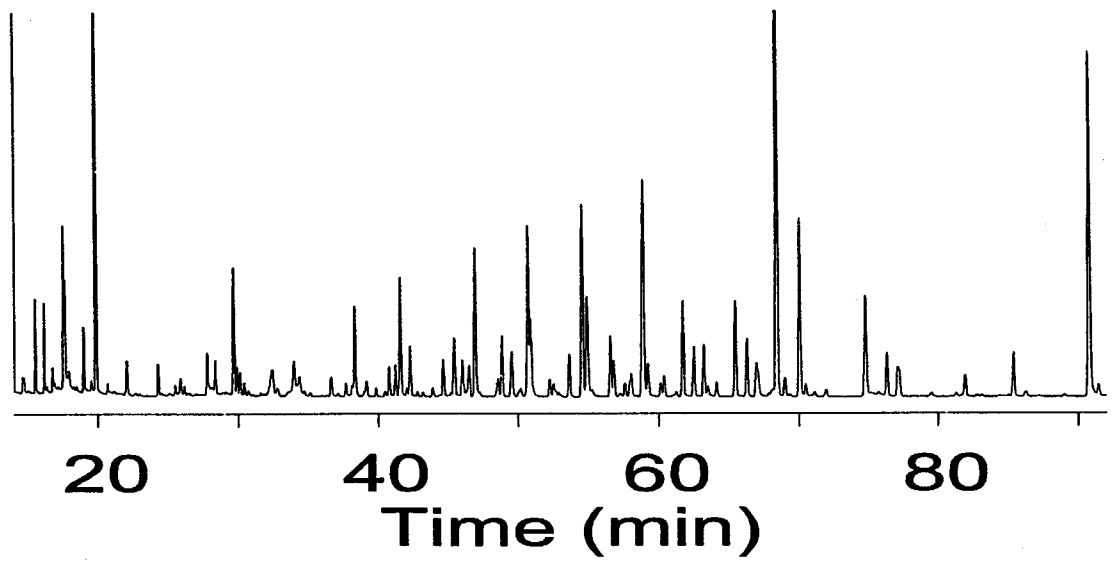


Figure 2. GC/ECD chromatograms of PCBs in sediment from upper and lower Sandia.

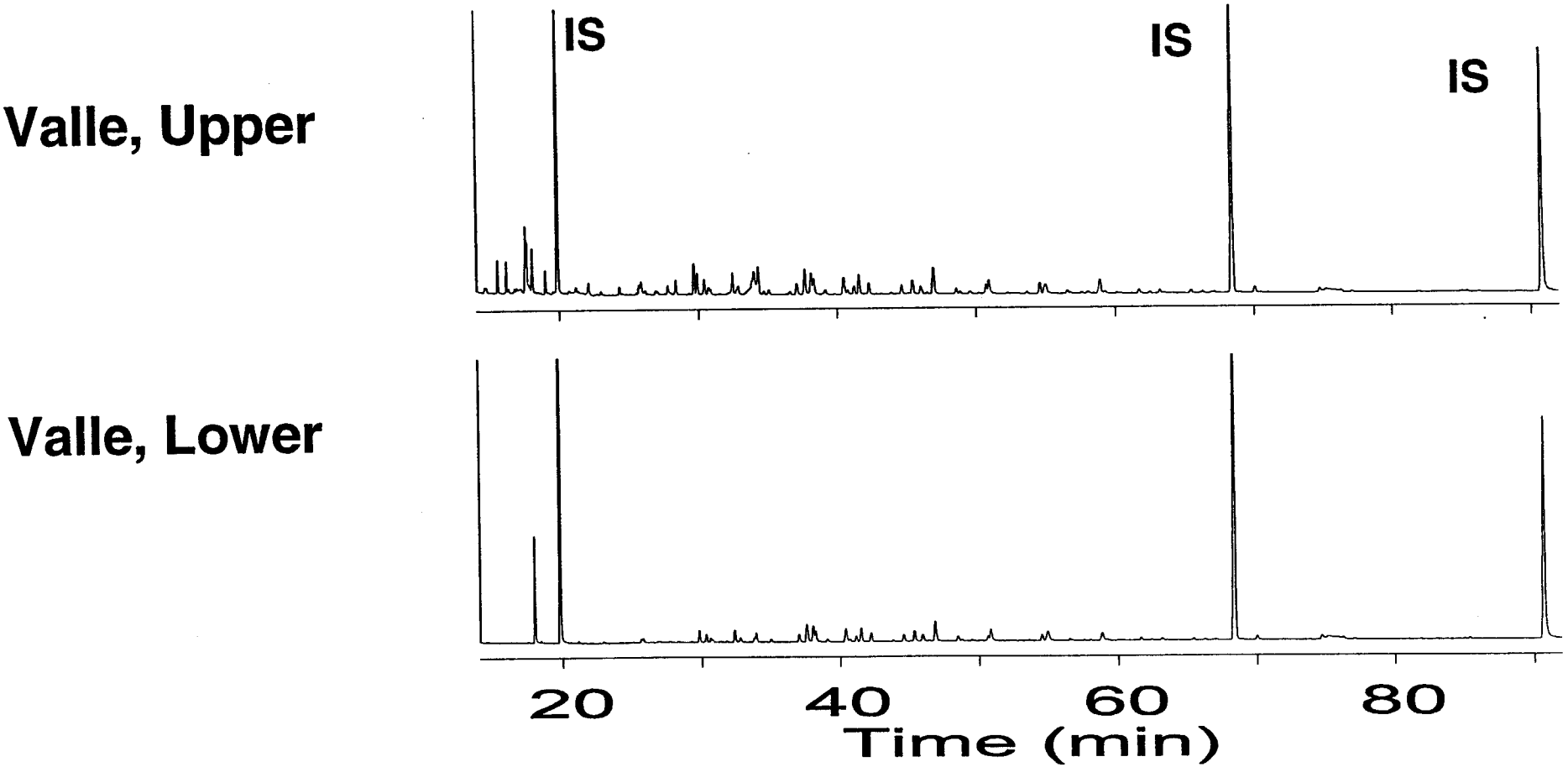


Figure 3. C/ECD chromatograms of PCBs from sediment, upper and lower Valle. Scale = 100mV. IS = internal standard.

Table 1. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	Sample Matrix	Grams Extracted	004,010	007,009	006	005,008	019	018	017,015	024,027
VUS1-P (a)	Valle, upper site	Sediment	10.00	<0.1	0.3	<0.2	6.8	<0.1	0.6	0.2	<0.1
VLS1-P	Valle, lower site	Sediment	10.00	<0.1	<0.1	<0.2	<0.1	<0.1	0.2	<0.1	<0.1
PUS1-P A (b)	Pajarito, upper site	Sediment	10.00	<0.1	<0.1	<0.2	0.3	<0.1	0.1	<0.1	<0.1
PUS1-P B (b)	Pajarito, upper site	Sediment	10.00	<0.1	<0.1	<0.2	0.4	<0.1	0.1	<0.1	<0.1
PUS1-P C (b)	Pajarito, upper site	Sediment	10.00	<0.1	<0.1	<0.2	0.3	<0.1	0.1	<0.1	<0.1
PLS1-P	Pajarito, lower site	Sediment	10.00	<0.1	<0.1	<0.2	0.2	<0.1	0.1	<0.1	<0.1
SUSM1-P	Sandia, upper site	Sediment	10.00	<0.1	<0.1	<0.2	33.0	<0.1	0.3	<0.1	<0.1
SLSM1-P	Sandia, lower site	Sediment	10.00	<0.1	0.3	<0.2	12.4	<0.1	0.3	<0.1	<0.1
LUSM1-P	Los Alamos, upper site	Sediment	10.00	<0.1	<0.1	<0.2	0.1	<0.1	0.2	<0.1	<0.1
LLSM1-P	Los Alamos, lower site	Sediment	10.00	<0.1	<0.1	<0.2	0.1	<0.1	0.1	<0.1	<0.1

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 1. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	016,032	029	026	025	031	028	020,033	053	051	022	045	046	052	043
VUS1-P (a)	Valle, upper site	0.3	1.5	<0.1	<0.1	0.6	1.1	0.4	0.1	<0.1	0.7	<0.1	<0.1	1.7	<0.1
VLS1-P	Valle, lower site	0.1	<0.1	<0.1	<0.1	0.2	0.3	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.0	<0.1
PUS1-P A (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
PUS1-P B (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
PUS1-P C (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PLS1-P	Pajarito, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
SUSM1-P	Sandia, upper site	0.1	7.3	<0.1	0.3	0.2	<0.1	<0.1	<0.1	<0.1	5.8	<0.1	<0.1	1.7	<0.1
SLSM1-P	Sandia, lower site	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.0	<0.1	<0.1	1.6	<0.1
LUSM1-P	Los Alamos, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1
LLSM1-P	Los Alamos, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 1. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	049	047	048	044	042	041	064	040	067	063	074	070,076	066	095
VUS1-P (a)	Valle, upper site	1.3	0.7	0.5	1.5	1.0	1.2	1.1	0.3	<0.1	0.3	0.9	2.0	0.1	0.8
VLS1-P	Valle, lower site	0.8	0.4	0.3	0.8	0.6	0.4	0.4	0.2	<0.1	<0.1	0.7	1.5	<0.1	0.6
PUS1-P A (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
PUS1-P B (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
PUS1-P C (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
PLS1-P	Pajarito, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
SUSM1-P	Sandia, upper site	0.9	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	2.6	0.3	0.8	<0.1	3.4
SLSM1-P	Sandia, lower site	<0.1	0.3	<0.1	1.2	0.3	<0.1	<0.1	0.2	<0.1	1.4	0.2	0.8	<0.1	3.5
LUSM1-P	Los Alamos, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2
LLSM1-P	Los Alamos, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 1. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	091	056,060	092	084	101	099	119	083	097	081	087	136	110	082
VUS1-P (a)	Valle, upper site	0.3	0.8	0.2	0.4	1.4	0.9	<0.1	0.1	0.6	<0.1	0.9	0.1	1.4	0.3
VLS1-P	Valle, lower site	0.2	0.7	0.2	0.3	1.0	0.7	<0.1	<0.1	0.5	<0.1	0.7	<0.1	1.1	0.3
PUS1-P A (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1
PUS1-P B (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1
PUS1-P C (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
PLS1-P	Pajarito, lower site	<0.1	<0.1	<0.1	<0.1	0.4	0.1	<0.1	<0.1	0.1	<0.1	0.3	<0.1	0.3	<0.1
SUSM1-P	Sandia, upper site	0.9	0.2	1.1	1.2	7.4	3.1	0.2	0.4	2.0	0.2	2.9	1.6	5.2	0.8
SLSM1-P	Sandia, lower site	0.9	0.2	1.1	1.2	6.4	2.9	0.2	0.4	1.9	0.2	2.7	1.8	5.5	0.8
LUSM1-P	Los Alamos, upper site	<0.1	<0.1	<0.1	<0.1	0.3	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1
LLSM1-P	Los Alamos, lower site	<0.1	<0.1	<0.1	<0.1	0.3	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 1. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	151	135,144,124	147	107	123,149	118	134	114	131,122	146	153	132	105
VUS1-P (a)	Valle, upper site	0.2	0.2	<0.1	0.1	0.6	1.0	<0.1	<0.1	<0.1	0.1	<0.5	0.6	0.8
VLS1-P	Valle, lower site	<0.1	<0.1	<0.1	<0.1	0.3	0.9	<0.1	<0.1	<0.1	<0.1	<0.5	0.4	0.7
PUS1-P A (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	0.1	<0.1
PUS1-P B (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.5	0.1	<0.1
PUS1-P C (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1
PLS1-P	Pajarito, lower site	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.5	0.1	<0.1
SUSM1-P	Sandia, upper site	2.6	1.9	0.2	0.4	7.3	3.7	0.8	0.3	0.3	1.6	4.8	6.0	1.6
SLSM1-P	Sandia, lower site	2.8	2.1	0.2	0.4	8.2	3.5	0.8	0.7	0.3	1.8	5.3	6.8	1.6
LUSM1-P	Los Alamos, upper site	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.1	<0.1	<0.1	<0.5	<0.1	<0.1
LLSM1-P	Los Alamos, lower site	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.2	<0.1	<0.1	<0.5	0.1	<0.1

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 1. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	141	179	137	176	130	138	158	129	178	182,187	183	128	167	185
VUS1-P (a)	Valle, upper site	0.2	<0.1	<0.1	<0.1	0.1	0.8	0.1	<0.1	<0.1	0.2	<0.1	0.2	<0.1	<0.1
VLS1-P	Valle, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1	<0.1
PUS1-P A (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PUS1-P B (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PUS1-P C (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PLS1-P	Pajarito, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2	<0.1
SUSM1-P	Sandia, upper site	2.0	1.5	0.5	0.5	0.9	5.6	0.9	0.6	0.6	2.9	1.2	2.3	0.4	0.3
SLSM1-P	Sandia, lower site	2.2	1.8	0.6	0.6	1.0	9.8	1.0	0.6	0.7	3.4	1.9	2.6	0.4	0.3
LUSM1-P	Los Alamos, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
LLSM1-P	Los Alamos, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 1. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	174	177	171,202	156	173	201	157	172	197	180	193	191	200	170,190
VUS1-P (a)	Valle, upper site	0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<1.1
VLS1-P	Valle, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<1.1
PUS1-P A (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1.1
PUS1-P B (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1.1
PUS1-P C (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1.1
PLS1-P	Pajarito, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1.1
SUSM1-P	Sandia, upper site	2.6	1.7	0.9	0.8	<0.1	0.3	0.4	0.4	<0.1	4.7	0.3	0.2	0.2	1.5
SLSM1-P	Sandia, lower site	3.1	2.0	0.9	1.0	0.1	0.3	0.5	0.4	<0.1	5.6	0.3	0.3	0.2	1.7
LUSM1-P	Los Alamos, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<1.1
LLSM1-P	Los Alamos, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<1.1

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 1. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	198	199	196,203	189	208,195	207	194	205	206	209	Total cPCBs
VUS1-P (a)	Valle, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.9	41.6
VLS1-P	Valle, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	17.5
PUS1-P A (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	<2.6
PUS1-P B (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	<2.6
PUS1-P C (b)	Pajarito, upper site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	<2.6
PLS1-P	Pajarito, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	3.0
SUSM1-P	Sandia, upper site	<0.1	0.8	1.1	0.1	0.5	<0.1	1.0	<0.1	0.3	<0.9	154.0
SLSM1-P	Sandia, lower site	<0.1	0.9	1.3	0.1	0.5	<0.1	1.2	<0.1	0.4	<0.9	133.6
LUSM1-P	Los Alamos, upper site	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	<2.6
LLSM1-P	Los Alamos, lower site	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	<2.6

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 2. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	Sample Matrix	Grams Extracted	004,010	007,009	006	005,008	019	018	017,015	024,027
VUS1-P GCR1	Valle, upper site; GC QC triplicate	Sediment	10.00	<0.1	0.4	<0.2	6.6	<0.1	0.5	0.2	<0.1
VUS1-P GCR2	Valle, upper site; GC QC triplicate	Sediment	10.00	<0.1	0.3	<0.2	7.0	<0.1	0.6	0.2	<0.1
VUS1-P GCR3	Valle, upper site; GC QC triplicate	Sediment	10.00	<0.1	0.3	<0.2	7.0	<0.1	0.6	0.2	<0.1
AVG:	(Average)				0.3		6.8		0.6	0.2	
SD(N-1):	(Sample Standard Deviation)				0.1		0.2		0.0	0.0	
% RSD:	(% Relative Standard Deviation)				15		3		5	6	
PUS1-P A	Pajarito, upper site; QC triplicate	Sediment	10.00	<0.1	<0.1	<0.2	0.3	<0.1	0.1	<0.1	<0.1
PUS1-P B	Pajarito, upper site; QC triplicate	Sediment	10.00	<0.1	<0.1	<0.2	0.4	<0.1	0.1	<0.1	<0.1
PUS1-P C	Pajarito, upper site; QC triplicate	Sediment	10.00	<0.1	<0.1	<0.2	0.3	<0.1	0.1	<0.1	<0.1
AVG:							0.3		0.1		
SD(N-1):							0.1		0.0		
% RSD:							18		7		
PC 033098 GCR1	Positive control, GC QC triplicate	Saginaw Bay, MI sediment	10.00	11.7	1.1	17.8	15.1	5.2	43.0	29.5	1.9
PC 033098 GCR2	Positive control, GC QC triplicate	Saginaw Bay, MI sediment	10.00	11.3	1.1	17.2	14.8	5.0	40.8	28.4	1.8
PC 033098 GCR3	Positive control, GC QC triplicate	Saginaw Bay, MI sediment	10.00	12.4	1.1	17.8	15.1	5.1	42.3	29.6	1.9
AVG:				11.8	1.1	17.6	15.0	5.1	42.0	29.2	1.9
SD(N-1):				0.5	0.0	0.4	0.2	0.1	1.1	0.7	0.0
% RSD:				4	2	2	1	2	3	2	2
MS 033098 GCR1	Matrix Spike, GC QC triplicate	ECRC Pond Sediment	10.00	0.9	0.2	0.3	1.5	0.3	2.6	1.0	0.2
MS 033098 GCR2	Matrix Spike, GC QC triplicate	ECRC Pond Sediment	10.00	0.9	0.2	0.3	1.6	0.4	2.8	1.1	0.2
MS 033098 GCR3	Matrix Spike, GC QC triplicate	ECRC Pond Sediment	10.00	1.0	0.3	0.3	1.6	0.3	2.9	1.2	0.2
AVG:				0.9	0.2	0.3	1.5	0.3	2.8	1.1	0.2
SD(N-1):				0.1	0.0	0.0	0.1	0.0	0.2	0.1	0.0
% RSD:				7	7	10	5	5	6	7	10
MB 033098	Matrix Blank	ECRC Pond Sediment	10.00	<0.1	<0.1	<0.2	<0.1	<0.1	0.1	<0.1	<0.1
PB 033098 GCR1	Procedural Blank		-	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00
PB 033098 GCR2	Procedural Blank		-	0.00	0.01	0.22	0.00	0.00	0.00	0.00	0.00
PB 033098 GCR3	Procedural Blank		-	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00
AVG:				0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00
SD(N-1):				0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
% RSD:				0	14	3	13	10	4	16	14
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*			0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1

*Note: MDL set to <0.1 if lower (IDL). Otherwise as shown.

Table 2. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	016,032	029	026	025	031	028	020,033	053	051	022	045	046	052	043
VUS1-P GCR1	Valle, upper site; GC QC triplicate	0.3	1.5	<0.1	<0.1	0.6	1.1	0.3	0.1	<0.1	0.7	<0.1	<0.1	1.8	<0.1
VUS1-P GCR2	Valle, upper site; GC QC triplicate	0.4	1.6	<0.1	<0.1	0.6	1.1	0.4	0.1	<0.1	0.8	<0.1	<0.1	1.7	<0.1
VUS1-P GCR3	Valle, upper site; GC QC triplicate	0.3	1.3	<0.1	<0.1	0.6	1.1	0.4	0.1	<0.1	0.7	<0.1	<0.1	1.7	<0.1
AVG:	(Average)	0.3	1.5			0.6	1.1	0.4	0.1		0.7			1.7	0.0
SD(N-1):	(Sample Standard Deviation)	0.0	0.2			0.0	0.0	0.0	0.0		0.0			0.1	0.0
% RSD:	(% Relative Standard Deviation)	8	12			1	1	4	4		6			3	0
PUS1-P A	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
PUS1-P B	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
PUS1-P C	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
AVG:															
SD(N-1):															
% RSD:															
PC 033098 GCR1	Positive control, GC QC triplicate	25.1	0.2	36.5	19.3	28.7	17.7	4.5	7.1	4.0	4.2	4.7	4.4	43.3	1.2
PC 033098 GCR2	Positive control, GC QC triplicate	24.0	0.2	35.1	18.3	27.6	17.1	4.5	6.7	3.9	4.0	4.5	4.2	40.8	1.0
PC 033098 GCR3	Positive control, GC QC triplicate	24.9	0.2	36.2	18.8	28.6	17.3	4.6	6.7	4.0	4.2	4.6	4.3	41.6	1.2
AVG:		24.7	0.2	35.9	18.8	28.3	17.3	4.5	6.8	4.0	4.1	4.6	4.3	41.9	1.1
SD(N-1):		0.6	0.0	0.8	0.5	0.6	0.3	0.1	0.2	0.1	0.1	0.1	0.1	1.3	0.1
% RSD:		2	6	2	3	2	2	2	3	2	2	2	2	3	12
MS 033098 GCR1	Matrix Spike, GC QC triplicate	1.6	<0.1	0.4	0.2	1.3	1.7	1.5	0.4	0.1	0.8	0.4	0.2	2.9	<0.1
MS 033098 GCR2	Matrix Spike, GC QC triplicate	1.7	0.1	0.4	0.2	1.5	1.9	1.7	0.4	0.2	0.8	0.5	0.2	3.2	0.1
MS 033098 GCR3	Matrix Spike, GC QC triplicate	2.0	<0.1	0.4	0.2	1.5	1.9	1.7	0.4	0.2	0.9	0.5	0.2	3.2	0.1
AVG:		1.8	0.0	0.4	0.2	1.4	1.9	1.6	0.4	0.2	0.8	0.5	0.2	3.1	0.1
SD(N-1):		0.2	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.1
% RSD:		14	0	8	9	8	6	8	6	8	7	7	6	6	0
MB 033098	Matrix Blank	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PB 033098 GCR1	Procedural Blank	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PB 033098 GCR2	Procedural Blank	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PB 033098 GCR3	Procedural Blank	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG:		0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SD(N-1):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% RSD:		8	11	7	16	12	8	16	18	12	11	14	11	6	16
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

*Note: MDL set to <0.1 if lower (IDL). Otherwise as shown.

Table 2. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	049	047	048	044	042	041	064	040	067	063	074	070,076	066	095	091
VUS1-P GCR1	Valle, upper site; GC QC triplicate	1.4	0.7	0.5	1.5	1.0	1.3	1.1	0.3	<0.1	0.3	0.9	2.1	0.1	0.8	0.4
VUS1-P GCR2	Valle, upper site; GC QC triplicate	1.3	0.7	0.5	1.5	1.0	1.3	1.2	0.3	<0.1	0.3	0.9	2.0	0.1	0.8	0.3
VUS1-P GCR3	Valle, upper site; GC QC triplicate	1.3	0.7	0.5	1.5	1.1	1.0	0.9	0.3	<0.1	0.4	0.9	2.0	0.1	0.8	0.3
AVG:	(Average)	1.3	0.7	0.5	1.5	1.0	1.2	1.1	0.3		0.3	0.9	2.0	0.1	0.8	0.3
SD(N-1):	(Sample Standard Deviation)	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0		0.1	0.0	0.0	0.0	0.0	0.0
% RSD:	(% Relative Standard Deviation)	2	0	4	2	6	16	11	4		17	1	2	1	2	3
PUS1-P A	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
PUS1-P B	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
PUS1-P C	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
AVG:															0.1	
SD(N-1):															0.0	
% RSD:															17	
PC 033098 GCR1	Positive control, GC QC triplicate	41.3	24.2	1.4	18.5	20.3	24.3	5.8	5.5	1.1	1.7	6.3	10.1	0.5	7.9	4.4
PC 033098 GCR2	Positive control, GC QC triplicate	39.4	23.1	1.4	17.4	18.5	23.1	5.5	5.2	1.1	1.6	6.1	9.6	0.5	7.3	4.4
PC 033098 GCR3	Positive control, GC QC triplicate	40.2	23.8	1.2	18.0	19.1	23.6	5.7	5.4	1.1	1.6	6.3	10.1	0.5	7.9	4.5
AVG:		40.3	23.7	1.4	18.0	19.3	23.7	5.7	5.3	1.1	1.6	6.2	9.9	0.5	7.7	4.4
SD(N-1):		0.9	0.5	0.1	0.5	0.9	0.6	0.1	0.1	0.0	0.0	0.1	0.3	0.0	0.4	0.0
% RSD:		2	2	8	3	5	2	2	3	2	1	2	3	2	5	1
MS 033098 GCR1	Matrix Spike, GC QC triplicate	1.7	0.7	0.8	1.9	1.4	0.8	0.8	0.4	<0.1	<0.1	0.9	2.0	<0.1	1.9	0.4
MS 033098 GCR2	Matrix Spike, GC QC triplicate	1.9	0.8	0.9	2.1	1.6	0.9	0.8	0.5	<0.1	<0.1	1.1	2.3	<0.1	2.2	0.5
MS 033098 GCR3	Matrix Spike, GC QC triplicate	2.0	0.8	0.9	2.1	1.6	0.9	0.9	0.5	<0.1	0.1	1.1	2.3	<0.1	2.1	0.5
AVG:		1.9	0.8	0.9	2.0	1.5	0.9	0.8	0.4	0.0	0.0	1.0	2.2	0.0	2.1	0.5
SD(N-1):		0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.2	0.0
% RSD:		6	9	5	6	10	5	6	8	0	0	8	7	0	8	7
MB 033098	Matrix Blank	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PB 033098 GCR1	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PB 033098 GCR2	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PB 033098 GCR3	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG:		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SD(N-1):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% RSD:		17	13	11	0	6	18	12	0	9	9	11	6	13	19	9
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

*Note: MDL set to <0.1 if lower (IDL). Otherwise as shown.

Table 2. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	056,060	092	084	101	099	119	083	097	081	087	136	110	082	151
VUS1-P GCR1	Valle, upper site; GC QC triplicate	0.8	0.2	0.4	1.4	0.9	<0.1	0.1	0.6	<0.1	0.9	0.1	1.4	0.3	0.2
VUS1-P GCR2	Valle, upper site; GC QC triplicate	0.8	0.2	0.4	1.4	0.9	<0.1	0.1	0.6	<0.1	0.8	0.1	1.3	0.3	0.2
VUS1-P GCR3	Valle, upper site; GC QC triplicate	0.8	0.2	0.4	1.4	0.9	<0.1	0.1	0.7	<0.1	0.9	0.1	1.3	0.3	0.2
AVG:	(Average)	0.8	0.2	0.4	1.4	0.9		0.1	0.6	0.0	0.9	0.1	1.4	0.3	0.2
SD(N-1):	(Sample Standard Deviation)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% RSD:	(% Relative Standard Deviation)	1	2	3	1	1		1	2	0	3	9	2	6	3
PUS1-P A	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1
PUS1-P B	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1	<0.1
PUS1-P C	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
AVG:					0.2	0.0							0.2		
SD(N-1):					0.0	0.1							0.0		
% RSD:					9	0							20		
PC 033098 GCR1	Positive control, GC QC triplicate	3.7	2.4	4.2	7.1	5.0	0.7	1.4	3.1	0.7	3.0	0.8	9.5	1.3	1.0
PC 033098 GCR2	Positive control, GC QC triplicate	3.6	2.3	4.0	6.7	4.8	0.7	1.3	3.0	0.7	2.9	0.8	9.0	1.2	0.9
PC 033098 GCR3	Positive control, GC QC triplicate	3.7	2.4	4.1	7.0	4.9	0.7	1.5	3.2	0.8	3.0	0.8	9.3	1.3	1.0
AVG:		3.7	2.4	4.1	6.9	4.9	0.7	1.4	3.1	0.8	3.0	0.8	9.3	1.3	0.9
SD(N-1):		0.1	0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.2	0.0	0.0
% RSD:		2	4	3	3	2	2	6	2	7	2	2	2	2	2
MS 033098 GCR1	Matrix Spike, GC QC triplicate	0.7	0.5	0.7	2.9	1.1	<0.1	0.2	0.9	<0.1	1.3	0.6	2.1	0.3	1.0
MS 033098 GCR2	Matrix Spike, GC QC triplicate	0.8	0.5	0.8	3.2	1.2	<0.1	0.2	1.0	<0.1	1.5	0.7	2.3	0.3	1.1
MS 033098 GCR3	Matrix Spike, GC QC triplicate	0.8	0.5	0.8	3.2	1.3	<0.1	0.2	1.0	<0.1	1.5	0.7	2.3	0.4	1.2
AVG:		0.8	0.5	0.8	3.1	1.2	0.0	0.2	0.9	0.0	1.4	0.7	2.2	0.3	1.1
SD(N-1):		0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1
% RSD:		7	5	6	6	6	0	8	6	0	6	6	6	7	6
MB 033098	Matrix Blank	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PB 033098 GCR1	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PB 033098 GCR2	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PB 033098 GCR3	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG:		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SD(N-1):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% RSD:		16	13	0	17	0	7	11	12	8	17	17	10	11	0
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

*Note: MDL set to <0.1 if lower (IDL). Otherwise as shown.

Table 2. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	135,144,124	147	107	123,149	118	134	114	131,122	146	153	132	105	141	179
VUS1-P GCR1	Valle, upper site; GC QC triplicate	0.1	<0.1	0.1	0.6	1.0	<0.1	<0.1	<0.1	0.1	<0.5	0.6	0.8	0.2	<0.1
VUS1-P GCR2	Valle, upper site; GC QC triplicate	0.2	<0.1	0.1	0.6	1.0	<0.1	<0.1	<0.1	0.1	<0.5	0.6	0.8	0.2	<0.1
VUS1-P GCR3	Valle, upper site; GC QC triplicate	0.2	<0.1	0.1	0.6	1.0	<0.1	<0.1	<0.1	0.1	<0.5	0.5	0.8	0.2	<0.1
AVG:	(Average)	0.2		0.1	0.6	1.0				0.1		0.6	0.8	0.2	
SD(N-1):	(Sample Standard Deviation)	0.0		0.0	0.0	0.0				0.0		0.0	0.0	0.0	
% RSD:	(% Relative Standard Deviation)	13		1	4	1				1		2	3	2	
PUS1-P A	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	0.1	<0.1	<0.1	<0.1
PUS1-P B	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.5	0.1	<0.1	<0.1	<0.1
PUS1-P C	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
AVG:					0.1										
SD(N-1):					0.0										
% RSD:					14										
PC 033098 GCR1	Positive control, GC QC triplicate	0.9	0.2	0.7	2.6	5.2	0.4	1.0	0.1	0.7	1.3	4.0	1.5	0.5	0.5
PC 033098 GCR2	Positive control, GC QC triplicate	0.9	0.3	0.7	2.5	4.8	0.4	0.9	0.1	0.7	1.3	4.2	1.3	0.5	0.4
PC 033098 GCR3	Positive control, GC QC triplicate	0.9	0.3	0.7	2.6	5.1	0.4	1.0	0.1	0.7	1.3	3.8	1.6	0.5	0.5
AVG:		0.9	0.3	0.7	2.6	5.1	0.4	1.0	0.1	0.7	1.3	4.0	1.5	0.5	0.5
SD(N-1):		0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0
% RSD:		2	5	2	4	4	1	1	8	4	3	5	11	3	3
MS 033098 GCR1	Matrix Spike, GC QC triplicate	0.8	<0.1	0.2	2.6	1.6	0.2	<0.1	0.1	0.4	1.6	2.3	0.6	0.8	0.6
MS 033098 GCR2	Matrix Spike, GC QC triplicate	0.8	<0.1	0.2	2.9	1.7	0.3	<0.1	0.1	0.5	1.7	2.5	0.6	0.9	0.6
MS 033098 GCR3	Matrix Spike, GC QC triplicate	0.8	<0.1	0.2	2.9	1.8	0.3	<0.1	0.1	0.5	1.7	2.1	0.6	0.9	0.6
AVG:		0.8	0.0	0.2	2.8	1.7	0.3	0.0	0.1	0.5	1.7	2.3	0.6	0.9	0.6
SD(N-1):		0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.0
% RSD:		6	0	6	6	7	7	0	5	6	5	9	3	6	5
MB 033098	Matrix Blank	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
PB 033098 GCR1	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00
PB 033098 GCR2	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00
PB 033098 GCR3	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00
AVG:		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00
SD(N-1):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00
% RSD:		18	13	9	0	16	0	9	16	11	12	13	10	12	0
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.1

*Note: MDL set to <0.1 if lower (IDL). Otherwise as shown.

Table 2. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	137	176	130	138	158	129	178	182,187	183	128	167	185	174	177	171,202
VUS1-P GCR1	Valle, upper site; GC QC triplicate	<0.1	<0.1	0.1	0.8	0.1	<0.1	<0.1	0.2	<0.1	0.2	<0.1	<0.1	0.1	<0.1	<0.1
VUS1-P GCR2	Valle, upper site; GC QC triplicate	<0.1	<0.1	0.1	0.8	0.1	<0.1	<0.1	0.2	<0.1	0.2	<0.1	<0.1	0.1	<0.1	<0.1
VUS1-P GCR3	Valle, upper site; GC QC triplicate	<0.1	<0.1	0.1	0.8	0.1	<0.1	<0.1	0.2	<0.1	0.2	<0.1	<0.1	0.1	<0.1	<0.1
AVG:	(Average)			0.1	0.8	0.1			0.2		0.2			0.1		
SD(N-1):	(Sample Standard Deviation)			0.0	0.0	0.0			0.0		0.0			0.0		
% RSD:	(% Relative Standard Deviation)			1	2	5			7		2			3		
PUS1-P A	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PUS1-P B	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PUS1-P C	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
AVG:					0.1											
SD(N-1):					0.0											
% RSD:					14											
PC 033098 GCR1	Positive control, GC QC triplicate	0.3	0.1	0.4	2.5	0.4	0.2	0.2	0.8	0.4	0.6	0.2	<0.1	0.6	0.5	0.3
PC 033098 GCR2	Positive control, GC QC triplicate	0.2	0.1	0.3	2.4	0.4	0.2	0.2	0.8	0.4	0.6	0.2	<0.1	0.6	0.4	0.3
PC 033098 GCR3	Positive control, GC QC triplicate	0.3	0.1	0.4	2.4	0.4	0.3	0.2	0.9	0.5	0.6	0.2	<0.1	0.6	0.5	0.3
AVG:		0.3	0.1	0.3	2.4	0.4	0.2	0.2	0.8	0.4	0.6	0.2	0.0	0.6	0.5	0.3
SD(N-1):		0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% RSD:		18	8	9	2	3	15	19	5	7	8	18	0	3	3	2
MS 033098 GCR1	Matrix Spike, GC QC triplicate	0.2	0.2	0.2	2.6	0.4	0.2	0.2	0.9	0.6	0.5	0.1	0.1	1.0	0.6	0.3
MS 033098 GCR2	Matrix Spike, GC QC triplicate	0.2	0.2	0.2	2.9	0.4	0.2	0.2	1.1	0.7	0.5	0.1	0.1	1.0	0.6	0.3
MS 033098 GCR3	Matrix Spike, GC QC triplicate	0.2	0.2	0.2	2.9	0.4	0.2	0.2	1.2	0.7	0.5	0.2	0.1	1.1	0.6	0.3
AVG:		0.2	0.2	0.2	2.8	0.4	0.2	0.2	1.1	0.7	0.5	0.1	0.1	1.0	0.6	0.3
SD(N-1):		0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0
% RSD:		6	3	9	5	4	8	6	12	7	5	9	5	5	6	7
MB 033098	Matrix Blank	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PB 033098 GCR1	Procedural Blank	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PB 033098 GCR2	Procedural Blank	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PB 033098 GCR3	Procedural Blank	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG:		0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SD(N-1):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% RSD:		14	11	9	5	7	13	17	2	0	13	7	0	13	19	9
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

*Note: MDL set to <0.1 if lower (IDL). Otherwise as shown.

Table 2. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	156	173	201	157	172	197	180	193	191	200	170,190	198	199	196,203	189
VUS1-P GCR1	Valle, upper site; GC QC triplicate	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<1.1	<0.1	<0.1	<0.1	<0.1
VUS1-P GCR2	Valle, upper site; GC QC triplicate	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<1.1	<0.1	<0.1	<0.1	<0.1
VUS1-P GCR3	Valle, upper site; GC QC triplicate	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<1.1	<0.1	<0.1	<0.1	<0.1
AVG:	(Average)	0.1						0.3								
SD(N-1):	(Sample Standard Deviation)	0.0						0.0								
% RSD:	(% Relative Standard Deviation)	4						1								
PUS1-P A	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1.1	<0.1	<0.1	<0.1	<0.1
PUS1-P B	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1.1	<0.1	<0.1	<0.1	<0.1
PUS1-P C	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1.1	<0.1	<0.1	<0.1	<0.1
AVG:																
SD(N-1):																
% RSD:																
PC 033098 GCR1	Positive control, GC QC triplicate	0.4	<0.1	<0.1	0.1	0.2	<0.1	1.3	<0.1	0.1	<0.1	<1.1	<0.1	0.3	0.5	<0.1
PC 033098 GCR2	Positive control, GC QC triplicate	0.4	<0.1	<0.1	0.1	0.2	<0.1	1.3	<0.1	0.1	<0.1	<1.1	<0.1	0.3	0.5	<0.1
PC 033098 GCR3	Positive control, GC QC triplicate	0.4	<0.1	<0.1	0.1	0.3	<0.1	1.3	<0.1	0.1	<0.1	<1.1	<0.1	0.3	0.5	<0.1
AVG:		0.4	0.0	0.0	0.1	0.2	0.0	1.3	0.0	0.1	0.0	0.0	0.0	0.3	0.5	0.0
SD(N-1):		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% RSD:		4	0	0	7	1	0	2	0	7	0	0	0	5	2	0
MS 033098 GCR1	Matrix Spike, GC QC triplicate	0.3	<0.1	<0.1	0.1	0.1	<0.1	1.7	<0.1	<0.1	<0.1	<1.1	<0.1	0.2	0.4	<0.1
MS 033098 GCR2	Matrix Spike, GC QC triplicate	0.3	<0.1	<0.1	0.1	0.2	<0.1	1.8	0.1	<0.1	<0.1	<1.1	<0.1	0.2	0.4	<0.1
MS 033098 GCR3	Matrix Spike, GC QC triplicate	0.4	<0.1	<0.1	0.1	0.2	<0.1	1.8	0.1	0.1	<0.1	<1.1	<0.1	0.2	0.4	<0.1
AVG:		0.4	0.0	0.0	0.1	0.2	0.0	1.8	0.1	0.0	0.0	0.0	0.0	0.2	0.4	0.0
SD(N-1):		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
% RSD:		4	0	0	12	4	0	6	0	0	0	0	0	5	7	0
MB 033098	Matrix Blank	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1.1	<0.1	<0.1	<0.1	<0.1
PB 033098 GCR1	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	0.00	0.00
PB 033098 GCR2	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	0.00
PB 033098 GCR3	Procedural Blank	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.00
AVG:		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.00	0.00	0.00	0.00
SD(N-1):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00
% RSD:		16	11	8	13	20	0	12	0	17	17	10	16	6	0	0
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.1	0.1	0.1	0.1	0.1

*Note: MDL set to <0.1 if lower (IDL). Otherwise as shown.

Table 2. Congener Specific Data (ng/g) for Los Alamos Sediment Samples

Sample Name	Field ID	208,195	207	194	205	206	209	Total cPCBs
VUS1-P GCR1	Valle, upper site; GC QC triplicate	<0.1	<0.1	<0.1	<0.1	0.2	<0.9	39.7
VUS1-P GCR2	Valle, upper site; GC QC triplicate	<0.1	<0.1	<0.1	<0.1	0.1	<0.9	39.7
VUS1-P GCR3	Valle, upper site; GC QC triplicate	<0.1	<0.1	<0.1	<0.1	0.1	<0.9	39.1
AVG:	(Average)					0.1		39.5
SD(N-1):	(Sample Standard Deviation)					0.0		0.4
% RSD:	(% Relative Standard Deviation)					10		1
PUS1-P A	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	<2.6
PUS1-P B	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	<2.6
PUS1-P C	Pajarito, upper site; QC triplicate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	<2.6
AVG:								
SD(N-1):								
% RSD:								
PC 033098 GCR1	Positive control, GC QC triplicate	0.2	<0.1	0.3	<0.1	0.4	<0.9	574.5
PC 033098 GCR2	Positive control, GC QC triplicate	0.2	<0.1	0.5	<0.1	0.4	<0.9	548.5
PC 033098 GCR3	Positive control, GC QC triplicate	0.2	<0.1	0.4	<0.1	0.4	<0.9	566.3
AVG:		0.2	0.0	0.4	0.0	0.4	0.0	563.1
SD(N-1):		0.0	0.0	0.1	0.0	0.0	0.0	13.3
% RSD:		2	0	14	0	3	0	2
MS 033098 GCR1	Matrix Spike, GC QC triplicate	0.2	<0.1	0.3	<0.1	0.2	<0.9	67.9
MS 033098 GCR2	Matrix Spike, GC QC triplicate	0.2	<0.1	0.4	<0.1	0.2	<0.9	75.0
MS 033098 GCR3	Matrix Spike, GC QC triplicate	0.2	<0.1	0.4	<0.1	0.2	<0.9	76.7
AVG:		0.2	0.0	0.3	0.0	0.2	0.0	73.2
SD(N-1):		0.0	0.0	0.0	0.0	0.0	0.0	4.7
% RSD:		8	0	6	0	18	0	6
MB 033098	Matrix Blank	<0.1	<0.1	<0.1	<0.1	<0.1	<0.9	0.1
PB 033098 GCR1	Procedural Blank	0.00	0.00	0.00	0.00	0.02	0.70	2.28
PB 033098 GCR2	Procedural Blank	0.00	0.00	0.00	0.00	0.02	0.76	2.45
PB 033098 GCR3	Procedural Blank	0.00	0.00	0.00	0.00	0.02	0.77	2.30
AVG:		0.00	0.00	0.00	0.00	0.02	0.74	2.34
SD(N-1):		0.00	0.00	0.00	0.00	0.00	0.04	0.10
% RSD:		10	0	0	12	3	5	4
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.1	0.1	0.1	0.9	2.6

*Note: MDL set to <0.1 if lower (IDL). Otherwise as shown.

Total PCBs % Recovery
77
85
87
AVG = 83
Std = 5.3

Table 3. Procedural Internal Standard Recovery (%) for Los Alamos Sediment Samples

Sample Name	Field ID	Sample Matrix	Grams Spiked	Congener-030 Amount (ng)	Congener-030 % Recovery	Congener-204 Amount (ng)	Congener-204 % Recovery
VUS1-P (a)	Valle, upper site	Sediment	10.00	211	65	183	64
VLS1-P	Valle, lower site	Sediment	10.00	248	76	216	76
PUS1-P A (b)	Pajarito, upper site	Sediment	10.00	232	71	209	73
PUS1-P B (b)	Pajarito, upper site	Sediment	10.00	298	91	249	87
PUS1-P C (b)	Pajarito, upper site	Sediment	10.00	216	66	182	64
PLS1-P	Pajarito, lower site	Sediment	10.00	228	70	198	69
SUSM1-P	Sandia, upper site	Sediment	10.00	228	70	226	79
SLSM1-P	Sandia, lower site	Sediment	10.00	207	63	200	70
LUSM1-P	Los Alamos, upper site	Sediment	10.00	227	69	203	71
LLSM1-P	Los Alamos, lower site	Sediment	10.00	204	63	176	62
PC 033098 (a)	Positive control	Saginaw Bay, MI sediment	10.00	217	66	209	73
MS 033098 (a)	Matrix Spike	ECRC Pond Sediment	10.00	205	63	212	74
MB 033098	Matrix Blank	ECRC Pond Sediment	10.00	278	85	279	98
PB 033098 (a)	Procedural Blank		-	224	69	246	86
MOCK 100% I-030	ECRC #186W(b)	PCB congener 030		326			
MOCK 100% I-204	ECRC #397R-1	PCB congener 204				285	
				Average Recovery:	71		75
				Standard Deviation:	8		10

(a) GC Replicate Average
(b) QC Triplicate

Table 4. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Site Description	Sample Matrix	Grams Extracted	% Lipid	004,010	007,009	006	005,008	019	018	017,015
FO1 (a)	Background	Fish	10.00	6.5	<0.1	<0.2	<0.1	0.6	<0.1	0.7	0.4
FO2	Los Alamos Canyon	Fish	10.00	6.2	<0.1	<0.2	<0.1	0.2	<0.1	0.2	0.1
FO3	Sandia	Fish	10.00	5.6	<0.1	<0.2	<0.1	<0.1	<0.1	0.5	0.2
FO4	Pajarito	Fish	10.00	5.4	<0.1	<0.2	<0.1	0.1	<0.1	<0.1	<0.1
FO5 A (b)	Canön de Valle	Fish	10.00	5.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.6	0.2
FO5 B (b)	Canön de Valle	Fish	10.00	5.2	<0.1	<0.2	<0.1	<0.1	<0.1	0.7	0.2
FO5 C (b)	Canön de Valle	Fish	9.97	5.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.7	0.2

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 4. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Site Description	024,027	016,032	029	026	025	031	028	020,033	053	051	022	045	046
FO1 (a)	Background	0.2	0.3	0.1	1.1	0.2	1.9	3.2	0.6	0.1	<0.1	1.0	0.3	<0.1
FO2	Los Alamos Canyon	0.1	0.1	<0.1	0.9	0.2	1.6	2.9	0.4	0.1	<0.1	0.8	0.3	<0.1
FO3	Sandia	0.2	0.3	0.1	0.9	0.2	1.5	4.2	0.3	0.5	0.1	0.9	1.1	<0.1
FO4	Pajarito	<0.1	<0.1	<0.1	0.6	0.4	1.0	1.9	0.2	<0.1	<0.1	0.5	0.2	<0.1
FO5 A (b)	Canön de Valle	<0.1	0.3	<0.1	0.7	0.1	2.1	4.3	0.4	0.3	<0.1	1.0	0.8	<0.1
FO5 B (b)	Canön de Valle	<0.1	0.3	<0.1	0.8	0.1	2.4	4.6	0.5	0.5	<0.1	1.1	0.9	<0.1
FO5 C (b)	Canön de Valle	<0.1	0.3	<0.1	0.8	0.1	2.4	4.5	0.5	0.5	<0.1	1.1	0.9	0.1

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 4. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Site Description	052	043	049	047	048	044	042	041	064	040	067	063	074	070,076
FO1 (a)	Background	9.3	<0.1	6.0	3.2	0.3	4.5	3.1	0.2	1.6	1.0	0.6	0.4	3.3	8.6
FO2	Los Alamos Canyon	8.5	0.2	5.5	3.0	0.3	4.2	2.8	<0.1	1.5	0.9	0.1	0.3	2.9	7.7
FO3	Sandia	40.7	0.6	19.8	9.1	1.1	14.7	8.1	0.6	3.6	3.8	0.1	0.7	5.5	14.4
FO4	Pajarito	5.9	<0.1	3.8	2.1	<0.1	2.8	1.9	<0.1	0.9	0.6	<0.1	0.2	2.1	5.4
FO5 A (b)	Canön de Valle	13.1	0.2	9.7	6.8	1.2	8.0	6.5	0.6	3.3	1.9	0.5	0.6	5.7	12.5
FO5 B (b)	Canön de Valle	14.2	0.2	10.6	7.3	1.4	8.7	7.1	0.7	3.6	2.1	0.6	0.6	6.2	13.4
FO5 C (b)	Canön de Valle	14.5	0.2	10.8	7.4	1.5	9.0	7.1	0.7	3.7	2.1	0.5	0.6	6.4	13.6

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 4. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Site Description	066	095	091	056,060	092	084	101	099	119	083	097	081	087	136
FO1 (a)	Background	0.2	12.1	3.8	1.3	5.6	5.1	30.7	16.6	0.7	1.9	9.2	1.0	12.8	2.8
FO2	Los Alamos Canyon	0.2	11.0	3.4	1.3	4.8	4.9	27.0	14.2	0.3	1.6	8.1	0.9	11.3	2.4
FO3	Sandia	0.7	58.2	12.9	2.5	20.6	18.2	124.5	58.4	4.0	6.6	31.9	2.4	41.0	13.2
FO4	Pajarito	0.2	7.9	2.5	0.8	3.6	3.3	19.9	10.4	0.2	1.2	6.0	0.7	8.4	1.8
FO5 A (b)	Canön de Valle	0.5	9.7	3.6	3.8	4.6	4.4	25.8	14.8	0.6	1.7	8.5	0.9	11.2	1.9
FO5 B (b)	Canön de Valle	0.6	10.7	4.1	4.2	5.2	4.9	28.5	17.0	0.7	1.8	9.3	0.9	12.4	2.2
FO5 C (b)	Canön de Valle	0.6	10.9	4.1	4.3	5.2	4.9	29.1	17.1	0.7	1.9	9.6	1.0	12.5	2.3

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 4. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Site Description	110	082	151	135,144,124	147	107	123,149	118	134	114	131,122	146	153
FO1 (a)	Background	20.4	2.6	5.4	4.9	1.1	2.3	17.1	18.4	3.4	4.5	0.8	5.7	15.5
FO2	Los Alamos Canyon	18.3	2.3	4.6	4.4	1.0	1.8	15.2	15.6	3.0	3.9	0.8	4.9	13.3
FO3	Sandia	78.1	8.7	33.0	23.5	3.0	6.4	103.6	60.9	9.8	5.4	2.7	27.2	78.1
FO4	Pajarito	13.3	1.7	3.4	3.2	0.7	1.4	11.1	11.9	2.0	2.1	0.6	3.6	9.9
FO5 A (b)	Canön de Valle	17.1	2.9	3.9	3.7	0.7	2.0	13.0	15.6	2.3	2.8	0.7	4.5	12.0
FO5 B (b)	Canön de Valle	18.9	3.2	4.3	4.1	0.9	2.2	14.3	17.3	2.5	2.9	0.8	4.9	13.4
FO5 C (b)	Canön de Valle	19.4	3.2	4.4	4.1	0.8	2.4	14.0	18.1	2.4	2.2	0.8	4.9	13.6

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 4. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Site Description	132	105	141	179	137	176	130	138	158	129	178	182,187	183	128
FO1 (a)	Background	6.8	9.4	3.5	2.0	1.5	0.6	1.9	20.6	1.8	1.1	1.4	8.1	2.9	4.9
FO2	Los Alamos Canyon	5.7	8.6	3.1	1.8	1.4	0.5	1.7	17.9	1.6	1.0	1.2	6.8	2.6	4.4
FO3	Sandia	41.2	39.9	25.2	9.5	6.2	4.1	10.5	113.7	11.1	6.2	5.5	40.1	18.5	27.4
FO4	Pajarito	4.6	6.6	2.3	1.2	1.1	<0.4	1.3	13.6	1.2	0.7	0.8	4.8	1.8	3.5
FO5 A (b)	Canön de Valle	6.8	8.0	2.8	1.4	1.2	<0.4	1.7	16.3	1.5	0.9	1.0	6.0	2.3	4.1
FO5 B (b)	Canön de Valle	6.7	8.9	3.1	1.7	1.4	0.4	1.9	18.3	1.6	1.0	1.1	6.8	2.6	4.6
FO5 C (b)	Canön de Valle	6.7	8.9	3.1	1.6	1.4	0.4	1.9	18.4	1.6	1.0	1.1	6.7	2.2	4.6

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 4. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Site Description	167	185	174	177	171,202	156	173	201	157	172	197	180	193	191
FO1 (a)	Background	0.9	0.7	<2.5	2.3	2.2	1.4	0.1	0.6	1.3	<0.8	0.2	11.0	0.7	0.3
FO2	Los Alamos Canyon	0.8	0.6	<2.5	2.0	1.8	1.4	0.1	0.6	1.0	<0.8	0.1	9.7	0.6	0.2
FO3	Sandia	4.6	3.0	23.3	16.1	7.3	9.9	0.7	4.8	2.6	3.2	0.3	56.0	3.3	2.1
FO4	Pajarito	0.6	0.4	<2.5	<1.6	1.3	1.1	<0.1	0.4	0.7	<0.8	<0.1	7.1	0.4	<0.1
FO5 A (b)	Canön de Valle	0.6	0.5	<2.5	1.8	1.6	1.1	<0.1	0.6	0.8	<0.8	0.1	8.4	0.5	0.2
FO5 B (b)	Canön de Valle	0.7	0.5	<2.5	2.1	1.8	1.4	0.1	0.5	1.0	<0.8	0.1	9.5	0.6	0.3
FO5 C (b)	Canön de Valle	0.7	0.5	<2.5	2.0	1.9	1.1	<0.1	0.6	0.9	<0.8	0.1	9.3	0.6	0.3

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 4. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Site Description	200	170,190	198	199	196,203	189	208,195	207	194	205	206	209	Total cPCBs
FO1 (a)	Background	0.2	<3.2	0.1	1.9	1.6	0.1	<0.3	0.5	1.0	0.1	2.5	2.4	362.8
FO2	Los Alamos Canyon	0.2	<3.2	<0.1	1.6	1.3	0.1	<0.3	0.4	0.9	0.1	2.1	2.0	311.8
FO3	Sandia	1.0	21.9	0.4	7.0	7.5	0.8	3.0	0.5	5.9	0.8	2.7	1.9	1519.4
FO4	Pajarito	<0.1	<3.2	<0.1	1.1	1.0	<0.1	<0.3	0.3	0.6	<0.1	1.5	1.5	224.1
FO5 A (b)	Canön de Valle	<0.1	<3.2	<0.1	1.4	1.2	0.1	<0.3	0.4	0.8	<0.1	1.9	1.8	332.7
FO5 B (b)	Canön de Valle	0.1	<3.2	<0.1	1.5	1.4	0.1	<0.3	0.4	0.9	0.1	2.0	1.9	368.4
FO5 C (b)	Canön de Valle	<0.1	<3.2	<0.1	1.5	1.3	0.1	<0.3	0.4	0.9	0.1	2.1	2.0	370.8

(a) GC Replicate Average
(b) QC Triplicate
Samples Are Not Recovery Corrected

Table 5. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Field ID	Sample Matrix	Grams Extracted	% Lipid	004,010	007,009	006	005,008	019	018
FO1 GCR1	Background; GC QC triplicate	Fish	9.90	6.5	<0.1	<0.2	<0.1	0.6	<0.1	0.7
FO1 GCR2	Background; GC QC triplicate	Fish	9.90	6.5	<0.1	<0.2	<0.1	0.6	<0.1	0.7
FO1 GCR3	Background; GC QC triplicate	Fish	9.90	6.5	<0.1	<0.2	<0.1	0.6	<0.1	0.7
AVG:	(Average)							0.6		0.7
SD(N-1):	(Sample Standard Deviation)							0.0		0.0
% RSD:	(% Relative Standard Deviation)							3		1
FO5 A	Canõn de Valle; QC triplicate	Fish	9.90	5.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.6
FO5 B	Canõn de Valle; QC triplicate	Fish	9.90	5.2	<0.1	<0.2	<0.1	<0.1	<0.1	0.7
FO5 C	Canõn de Valle; QC triplicate	Fish	9.87	5.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.7
AVG:										0.6
SD(N-1):										0.1
% RSD:										8
MS 041798 GCR1	Matrix Spike, GC QC triplicate	ECRC Control Bluegill 654C	9.92	3.5	15.9	3.4	1.0	28.2	5.2	49.0
MS 041798 GCR2	Matrix Spike, GC QC triplicate	ECRC Control Bluegill 654C	9.92	3.5	15.4	3.3	5.4	27.8	5.0	47.7
MS 041798 GCR3	Matrix Spike, GC QC triplicate	ECRC Control Bluegill 654C	9.92	3.5	15.2	3.3	5.4	26.9	5.0	47.4
AVG:					15.5	3.3	3.9	27.6	5.0	48.0
SD(N-1):					0.3	0.0	2.6	0.7	0.1	0.8
% RSD:					2	1	65	3	3	2
MB 041798	Matrix Blank	ECRC Control Bluegill 654C	9.92	3.5	<0.1	<0.2	0.1	1.0	<0.1	<0.1
PB 041798 GCR1	Procedural Blank GC QC Triplicate		-	-	0.02	0.19	0.09	0.02	0.00	0.12
PB 041798 GCR2	Procedural Blank GC QC Triplicate		-	-	0.02	0.16	0.09	0.02	0.00	0.13
PB 041798 GCR3	Procedural Blank GC QC Triplicate		-	-	0.02	0.18	0.08	0.02	0.00	0.11
AVG:					0.02	0.18	0.09	0.02	0.00	0.12
SD(N-1):					0.00	0.01	0.00	0.00	0.00	0.01
% RSD:					12	7	5	7	0	7
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*				0.1	0.2	0.1	0.1	0.1	0.1

*Note: MDL set to <0.1 if lower than IDL. Otherwise as shown.
IDL = instrumental detection limit.

Table 5. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Field ID	017,015	024,027	016,032	029	026	025	031	028	020,033	053	051	022
FO1 GCR1	Background; GC QC triplicate	0.4	0.2	0.3	0.1	1.1	0.2	1.9	3.3	0.6	0.1	<0.1	1.0
FO1 GCR2	Background; GC QC triplicate	0.4	0.2	0.3	0.1	1.1	0.2	1.9	3.2	0.6	0.1	<0.1	1.0
FO1 GCR3	Background; GC QC triplicate	0.4	0.2	0.3	0.1	1.0	0.2	1.9	3.2	0.6	0.2	<0.1	1.0
AVG:	(Average)	0.4	0.2	0.3	0.1	1.1	0.2	1.9	3.2	0.6	0.1		1.0
SD(N-1):	(Sample Standard Deviation)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0		0.0
% RSD:	(% Relative Standard Deviation)	5	0	2	6	6	2	1	1	4	19		1
FO5 A	Canön de Valle; QC triplicate	0.2	<0.1	0.3	<0.1	0.7	0.1	2.1	4.3	0.4	0.3	<0.1	1.0
FO5 B	Canön de Valle; QC triplicate	0.2	<0.1	0.3	<0.1	0.8	0.1	2.4	4.6	0.5	0.5	<0.1	1.1
FO5 C	Canön de Valle; QC triplicate	0.2	<0.1	0.3	<0.1	0.8	0.1	2.4	4.5	0.5	0.5	<0.1	1.1
AVG:		0.2		0.3		0.8	0.1	2.3	4.4	0.5	0.4		1.1
SD(N-1):		0.0		0.0		0.0	0.0	0.2	0.2	0.1	0.1		0.1
% RSD:		14		2		0	8	7	4	10	16		6
MS 041798 GCR1	Matrix Spike, GC QC triplicate	22.7	1.5	30.1	0.9	6.6	3.1	22.3	34.4	26.5	7.0	2.4	13.5
MS 041798 GCR2	Matrix Spike, GC QC triplicate	21.9	1.4	29.1	0.8	6.5	3.0	22.2	33.4	26.1	6.3	2.3	13.2
MS 041798 GCR3	Matrix Spike, GC QC triplicate	22.0	1.4	29.1	0.8	6.4	3.0	21.7	34.3	26.0	7.1	2.3	13.3
AVG:		22.2	1.4	29.4	0.8	6.5	3.0	22.1	34.0	26.2	6.8	2.4	13.3
SD(N-1):		0.4	0.0	0.6	0.0	0.1	0.1	0.3	0.5	0.3	0.4	0.0	0.1
% RSD:		2	2	2	4	2	2	2	2	1	6	2	1
MB 041798	Matrix Blank	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1	<0.1
PB 041798 GCR1	Procedural Blank GC QC Triplicate	0.07	0.01	0.06	0.01	0.01	0.00	0.03	0.06	0.05	0.00	0.01	0.03
PB 041798 GCR2	Procedural Blank GC QC Triplicate	0.06	0.01	0.05	0.01	0.01	0.00	0.03	0.06	0.05	0.00	0.01	0.03
PB 041798 GCR3	Procedural Blank GC QC Triplicate	0.06	0.01	0.06	0.01	0.01	0.00	0.03	0.06	0.06	0.00	0.01	0.03
AVG:		0.06	0.01	0.06	0.01	0.01	0.00	0.03	0.06	0.05	0.00	0.01	0.03
SD(N-1):		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% RSD:		4	9	4	3	13	11	4	1	4	11	5	1
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

*Note: MDL set to <0.1 if lower than IDL. Otherwise as shown.
IDL = instrumental detection limit.

Table 5. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Field ID	045	046	052	043	049	047	048	044	042	041	064	040	067
FO1 GCR1	Background; GC QC triplicate	0.3	<0.1	9.5	<0.1	6.0	3.2	0.3	4.6	3.2	0.2	1.7	1.1	0.6
FO1 GCR2	Background; GC QC triplicate	0.3	<0.1	9.4	<0.1	6.1	3.4	0.3	4.5	3.1	0.2	1.6	1.0	0.6
FO1 GCR3	Background; GC QC triplicate	0.3	<0.1	9.1	<0.1	5.8	3.1	0.3	4.4	2.9	0.2	1.6	1.0	0.5
AVG:	(Average)	0.3		9.3		6.0	3.2	0.3	4.5	3.1	0.2	1.6	1.0	0.6
SD(N-1):	(Sample Standard Deviation)	0.0		0.2		0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
% RSD:	(% Relative Standard Deviation)	0		2		3	4	7	2	5	3	1	5	4
FO5 A	Canõn de Valle; QC triplicate	0.8	<0.1	13.1	0.2	9.7	6.8	1.2	8.0	6.5	0.6	3.3	1.9	0.5
FO5 B	Canõn de Valle; QC triplicate	0.9	<0.1	14.2	0.2	10.6	7.3	1.4	8.7	7.1	0.7	3.6	2.1	0.6
FO5 C	Canõn de Valle; QC triplicate	0.9	0.1	14.5	0.2	10.8	7.4	1.5	9.0	7.1	0.7	3.7	2.1	0.5
AVG:		0.9	0.0	14.0	0.2	10.4	7.2	1.4	8.6	6.9	0.7	3.5	2.0	0.6
SD(N-1):		0.1	0.1	0.7	0.0	0.6	0.3	0.1	0.5	0.3	0.0	0.2	0.1	0.1
% RSD:		0	0	5	7	6	5	10	6	5	6	7	0	0
MS 041798 GCR1	Matrix Spike, GC QC triplicate	7.8	3.7	53.8	1.6	31.5	12.5	15.4	33.9	24.8	13.4	15.5	7.6	1.4
MS 041798 GCR2	Matrix Spike, GC QC triplicate	7.5	3.5	52.1	1.4	30.8	12.1	14.8	32.7	24.4	13.3	14.8	7.3	1.4
MS 041798 GCR3	Matrix Spike, GC QC triplicate	7.4	3.5	51.9	2.0	30.1	11.8	15.1	32.6	23.9	13.9	14.4	7.1	1.4
AVG:		7.6	3.5	52.6	1.7	30.8	12.1	15.1	33.1	24.3	13.5	14.9	7.3	1.4
SD(N-1):		0.2	0.1	1.1	0.3	0.7	0.3	0.3	0.7	0.5	0.3	0.5	0.2	0.0
% RSD:		3	3	2	15	2	3	2	2	2	2	4	3	3
MB 041798	Matrix Blank	<0.1	<0.1	<0.7	<0.1	0.2	<0.1	<0.1	<0.3	<0.1	<0.1	0.1	<0.1	<0.1
PB 041798 GCR1	Procedural Blank GC QC Triplicate	0.00	0.00	0.59	0.01	0.13	0.09	0.05	0.21	0.07	0.02	0.05	0.01	0.01
PB 041798 GCR2	Procedural Blank GC QC Triplicate	0.00	0.00	0.53	0.01	0.10	0.11	0.05	0.18	0.07	0.02	0.05	0.01	0.01
PB 041798 GCR3	Procedural Blank GC QC Triplicate	0.00	0.00	0.54	0.01	0.10	0.09	0.05	0.17	0.07	0.02	0.05	0.01	0.01
AVG:		0.00	0.00	0.56	0.01	0.11	0.10	0.05	0.19	0.07	0.02	0.05	0.01	0.01
SD(N-1):		0.00	0.00	0.04	0.00	0.01	0.01	0.00	0.02	0.01	0.00	0.00	0.00	0.00
% RSD:		8	11	6	6	13	13	2	12	7	9	1	5	11
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.7	0.1	0.2	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1

*Note: MDL set to <0.1 if lower than IDL. Otherwise as shown.
IDL = instrumental detection limit.

Table 5. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Field ID	063	074	070,076	066	095	091	056,060	092	084	101	099	119
FO1 GCR1	Background; GC QC triplicate	0.4	3.3	8.6	0.2	12.3	3.9	1.3	5.2	4.8	30.7	16.5	0.7
FO1 GCR2	Background; GC QC triplicate	0.4	3.3	8.6	0.2	12.1	3.8	1.4	5.8	5.3	31.0	16.8	0.7
FO1 GCR3	Background; GC QC triplicate	0.4	3.3	8.5	0.2	11.9	3.8	1.4	5.7	5.2	30.5	16.5	0.7
AVG:	(Average)	0.4	3.3	8.6	0.2	12.1	3.8	1.3	5.6	5.1	30.7	16.6	0.7
SD(N-1):	(Sample Standard Deviation)	0.0	0.0	0.1	0.0	0.2	0.1	0.1	0.4	0.3	0.3	0.2	0.0
% RSD:	(% Relative Standard Deviation)	1	1	1	2	2	2	6	6	5	1	1	3
FO5 A	Canön de Valle; QC triplicate	0.6	5.7	12.5	0.5	9.7	3.6	3.8	4.6	4.4	25.8	14.8	0.6
FO5 B	Canön de Valle; QC triplicate	0.6	6.2	13.4	0.6	10.7	4.1	4.2	5.2	4.9	28.5	17.0	0.7
FO5 C	Canön de Valle; QC triplicate	0.6	6.4	13.6	0.6	10.9	4.1	4.3	5.2	4.9	29.1	17.1	0.7
AVG:		0.6	6.1	13.2	0.5	10.5	4.0	4.1	5.0	4.7	27.8	16.3	0.7
SD(N-1):		0.0	0.4	0.6	0.0	0.6	0.3	0.3	0.3	0.3	1.8	1.3	0.0
% RSD:		0	6	4	5	6	7	6	7	7	6	8	0
MS 041798 GCR1	Matrix Spike, GC QC triplicate	1.5	17.2	36.7	1.3	37.8	7.7	12.5	9.4	12.6	54.2	20.8	0.9
MS 041798 GCR2	Matrix Spike, GC QC triplicate	1.5	16.8	36.0	1.3	36.2	7.5	12.3	9.2	12.2	52.7	20.3	0.9
MS 041798 GCR3	Matrix Spike, GC QC triplicate	1.5	16.8	35.8	1.3	35.6	7.3	12.2	9.2	12.1	52.5	20.3	0.9
AVG:		1.5	16.9	36.1	1.3	36.5	7.5	12.3	9.3	12.3	53.1	20.5	0.9
SD(N-1):		0.0	0.2	0.5	0.0	1.1	0.2	0.1	0.2	0.3	0.9	0.3	0.0
% RSD:		2	1	1	1	3	3	1	2	2	2	2	2
MB 041798	Matrix Blank	<0.1	0.3	0.6	<0.1	<0.5	0.2	0.1	0.4	<0.2	2.0	1.6	<0.1
PB 041798 GCR1	Procedural Blank GC QC Triplicate	0.00	0.09	0.29	0.01	0.52	0.07	0.06	0.10	0.18	1.05	0.38	0.00
PB 041798 GCR2	Procedural Blank GC QC Triplicate	0.00	0.09	0.25	0.01	0.53	0.08	0.07	0.09	0.19	0.99	0.40	0.00
PB 041798 GCR3	Procedural Blank GC QC Triplicate	0.00	0.09	0.25	0.01	0.52	0.07	0.07	0.10	0.18	0.99	0.39	0.00
AVG:		0.00	0.09	0.26	0.01	0.52	0.07	0.07	0.10	0.18	1.01	0.39	0.00
SD(N-1):		0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.01	0.00
% RSD:		4	1	10	6	1	5	2	8	2	3	3	4
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.3	0.1	0.5	0.1	0.1	0.1	0.2	1.1	0.4	0.1

*Note: MDL set to <0.1 if lower than IDL. Otherwise as shown.
IDL = Instrumental detection limit.

Table 5. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Field ID	083	097	081	087	136	110	082	151	135,144,124	147	107	123,149
FO1 GCR1	Background; GC QC triplicate	1.9	9.4	1.0	12.9	2.8	20.9	2.5	5.5	5.1	1.2	2.2	17.5
FO1 GCR2	Background; GC QC triplicate	1.9	9.2	1.0	12.8	2.7	20.3	2.6	5.3	5.0	0.9	2.4	17.1
FO1 GCR3	Background; GC QC triplicate	1.9	8.9	0.9	12.6	2.7	19.9	2.5	5.2	4.7	1.1	2.1	16.8
AVG:	(Average)	1.9	9.2	1.0	12.8	2.8	20.4	2.6	5.4	4.9	1.1	2.3	17.1
SD(N-1):	(Sample Standard Deviation)	0.0	0.2	0.1	0.2	0.1	0.5	0.0	0.2	0.2	0.1	0.1	0.3
% RSD:	(% Relative Standard Deviation)	2	2	6	1	2	2	1	3	4	11	6	2
FO5 A	Canõn de Valle; QC triplicate	1.7	8.5	0.9	11.2	1.9	17.1	2.9	3.9	3.7	0.7	2.0	13.0
FO5 B	Canõn de Valle; QC triplicate	1.8	9.3	0.9	12.4	2.2	18.9	3.2	4.3	4.1	0.9	2.2	14.3
FO5 C	Canõn de Valle; QC triplicate	1.9	9.6	1.0	12.5	2.3	19.4	3.2	4.4	4.1	0.8	2.4	14.0
AVG:		1.8	9.1	0.9	12.0	2.1	18.5	3.1	4.2	4.0	0.8	2.2	13.8
SD(N-1):		0.1	0.5	0.1	0.7	0.2	1.2	0.2	0.3	0.3	0.1	0.2	0.7
% RSD:		0	6	0	6	8	7	6	6	7	0	0	5
MS 041798 GCR1	Matrix Spike, GC QC triplicate	2.8	15.4	1.3	23.7	11.3	36.4	5.2	19.1	13.6	1.0	2.5	48.5
MS 041798 GCR2	Matrix Spike, GC QC triplicate	2.7	15.0	1.2	23.1	10.8	35.5	5.1	18.4	13.1	1.2	2.3	47.5
MS 041798 GCR3	Matrix Spike, GC QC triplicate	2.7	14.9	1.2	23.1	10.7	35.8	5.1	18.4	13.1	1.1	2.4	47.2
AVG:		2.8	15.1	1.2	23.3	10.9	35.9	5.1	18.6	13.3	1.1	2.4	47.7
SD(N-1):		0.1	0.3	0.0	0.4	0.3	0.5	0.1	0.4	0.3	0.1	0.1	0.7
% RSD:		2	2	3	2	3	1	2	2	2	8	4	1
MB 041798	Matrix Blank	<0.1	0.4	<0.1	0.7	<0.3	<1.4	<0.2	<1.0	<0.7	0.1	0.2	<3.7
PB 041798 GCR1	Procedural Blank GC QC Triplicate	0.03	0.33	0.00	0.60	0.27	1.32	0.18	0.86	0.61	0.04	0.07	3.48
PB 041798 GCR2	Procedural Blank GC QC Triplicate	0.03	0.33	0.00	0.57	0.22	1.19	0.14	0.77	0.51	0.03	0.07	3.28
PB 041798 GCR3	Procedural Blank GC QC Triplicate	0.03	0.34	0.00	0.54	0.24	1.24	0.14	0.77	0.50	0.03	0.07	3.32
AVG:		0.03	0.33	0.00	0.57	0.24	1.25	0.15	0.80	0.54	0.03	0.07	3.36
SD(N-1):		0.00	0.01	0.00	0.03	0.03	0.06	0.03	0.05	0.06	0.00	0.00	0.11
% RSD:		3	2	17	5	12	5	17	7	11	10	5	3
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.4	0.1	0.7	0.3	1.4	0.2	1.0	0.7	0.1	0.1	3.7

*Note: MDL set to <0.1 if lower than IDL. Otherwise as shown.
IDL = instrumental detection limit.

Table 5. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Field ID	118	134	114	131,122	146	153	132	105	141	179	137	176	130
FO1 GCR1	Background; GC QC triplicate	18.6	3.5	4.5	0.8	5.8	15.7	6.7	9.7	3.6	2.1	1.6	0.6	1.9
FO1 GCR2	Background; GC QC triplicate	18.5	3.4	4.5	0.8	5.7	15.5	6.7	9.5	3.5	2.0	1.5	0.6	1.9
FO1 GCR3	Background; GC QC triplicate	18.0	3.4	4.5	0.8	5.6	15.2	6.9	9.1	3.4	2.0	1.5	0.5	1.9
AVG:	(Average)	18.4	3.4	4.5	0.8	5.7	15.5	6.8	9.4	3.5	2.0	1.5	0.6	1.9
SD(N-1):	(Sample Standard Deviation)	0.3	0.1	0.0	0.0	0.1	0.3	0.1	0.3	0.1	0.1	0.0	0.1	0.0
% RSD:	(% Relative Standard Deviation)	2	2	0	3	2	2	1	3	2	3	2	9	2
FO5 A	Canön de Valle; QC triplicate	15.6	2.3	2.8	0.7	4.5	12.0	6.8	8.0	2.8	1.4	1.2	<0.4	1.7
FO5 B	Canön de Valle; QC triplicate	17.3	2.5	2.9	0.8	4.9	13.4	6.7	8.9	3.1	1.7	1.4	0.4	1.9
FO5 C	Canön de Valle; QC triplicate	18.1	2.4	2.2	0.8	4.9	13.6	6.7	8.9	3.1	1.6	1.4	0.4	1.9
AVG:		17.0	2.4	2.6	0.8	4.8	13.0	6.7	8.6	3.0	1.6	1.3	0.3	1.8
SD(N-1):		1.3	0.1	0.4	0.0	0.2	0.8	0.0	0.5	0.2	0.1	0.1	0.2	0.1
% RSD:		7	5	16	5	5	6	0	6	6	8	6	0	0
MS 041798 GCR1	Matrix Spike, GC QC triplicate	26.9	4.5	1.0	1.5	8.2	29.5	43.4	11.7	14.2	10.9	2.8	3.9	3.5
MS 041798 GCR2	Matrix Spike, GC QC triplicate	26.0	4.7	1.2	1.7	7.9	28.6	42.3	11.1	13.7	10.2	2.7	3.3	3.7
MS 041798 GCR3	Matrix Spike, GC QC triplicate	26.1	4.7	1.2	1.7	7.9	28.6	43.5	10.2	13.7	10.4	2.7	3.5	3.6
AVG:		26.3	4.6	1.1	1.7	8.0	28.9	43.1	11.0	13.9	10.5	2.8	3.5	3.6
SD(N-1):		0.5	0.1	0.2	0.1	0.1	0.5	0.6	0.8	0.3	0.4	0.1	0.3	0.1
% RSD:		2	3	13	7	2	2	1	7	2	4	2	8	3
MB 041798	Matrix Blank	1.8	0.9	0.1	0.1	<0.8	<4.0	<4.4	<1.1	<1.6	<1.1	<0.2	<0.4	<0.4
PB 041798 GCR1	Procedural Blank GC QC Triplicate	1.53	0.25	0.04	0.08	0.71	3.80	4.02	0.85	1.57	1.09	0.23	0.39	0.37
PB 041798 GCR2	Procedural Blank GC QC Triplicate	1.54	0.25	0.03	0.07	0.66	3.59	3.72	0.96	1.54	1.09	0.22	0.36	0.35
PB 041798 GCR3	Procedural Blank GC QC Triplicate	1.47	0.27	0.03	0.07	0.66	3.56	3.60	0.93	1.54	1.06	0.22	0.34	0.32
AVG:		1.51	0.26	0.03	0.07	0.68	3.65	3.78	0.91	1.55	1.08	0.22	0.36	0.35
SD(N-1):		0.04	0.01	0.00	0.00	0.03	0.13	0.22	0.06	0.01	0.02	0.01	0.02	0.03
% RSD:		2	4	7	2	4	4	6	6	1	1	2	6	7
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	1.6	0.3	0.1	0.1	0.8	4.0	4.4	1.1	1.6	1.1	0.2	0.4	0.4

*Note: MDL set to <0.1 if lower than IDL. Otherwise as shown.
IDL = instrumental detection limit.

Table 5. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Field ID	138	158	129	178	182,187	183	128	167	185	174	177	171,202	156
FO1 GCR1	Background; GC QC triplicate	20.9	1.8	1.1	1.4	8.3	3.0	5.0	0.9	0.7	<2.5	2.4	2.2	1.5
FO1 GCR2	Background; GC QC triplicate	20.6	1.8	1.1	1.3	8.0	2.9	4.9	0.9	0.7	<2.5	2.3	2.2	1.5
FO1 GCR3	Background; GC QC triplicate	20.2	1.7	1.1	1.3	7.9	2.9	4.8	0.9	0.7	<2.5	2.3	2.2	1.3
AVG:	(Average)	20.6	1.8	1.1	1.4	8.1	2.9	4.9	0.9	0.7		2.3	2.2	1.4
SD(N-1):	(Sample Standard Deviation)	0.3	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0		0.1	0.0	0.1
% RSD:	(% Relative Standard Deviation)	2	2	2	2	3	2	2	4	2		3	2	6
FO5 A	Canõn de Valle; QC triplicate	16.3	1.5	0.9	1.0	6.0	2.3	4.1	0.6	0.5	<2.5	1.8	1.6	1.1
FO5 B	Canõn de Valle; QC triplicate	18.3	1.6	1.0	1.1	6.8	2.6	4.6	0.7	0.5	<2.5	2.1	1.8	1.4
FO5 C	Canõn de Valle; QC triplicate	18.4	1.6	1.0	1.1	6.7	2.2	4.6	0.7	0.5	<2.5	2.0	1.9	1.1
AVG:		17.6	1.6	1.0	1.1	6.5	2.4	4.4	0.7	0.5		1.9	1.8	1.2
SD(N-1):		1.2	0.1	0.1	0.1	0.4	0.2	0.3	0.1	0.0		0.1	0.1	0.2
% RSD:		7	5	0	0	7	9	6	0	0		7	8	16
MS 041798 GCR1	Matrix Spike, GC QC triplicate	49.8	5.8	3.0	3.8	21.9	11.3	11.3	2.0	2.0	17.2	10.3	5.0	5.6
MS 041798 GCR2	Matrix Spike, GC QC triplicate	48.4	5.4	2.9	3.6	21.0	10.9	10.9	1.9	1.9	16.5	9.9	4.8	5.5
MS 041798 GCR3	Matrix Spike, GC QC triplicate	48.4	5.6	2.9	3.6	21.1	10.9	11.0	2.0	1.9	16.5	9.9	4.8	5.3
AVG:		48.9	5.6	3.0	3.7	21.3	11.1	11.1	2.0	2.0	16.7	10.1	4.9	5.5
SD(N-1):		0.8	0.2	0.1	0.1	0.5	0.2	0.2	0.0	0.0	0.4	0.2	0.1	0.2
% RSD:		2	3	2	2	2	2	2	1	2	2	2	3	3
MB 041798	Matrix Blank	<7.5	<1.0	<0.4	<0.5	<3.8	<1.6	<1.3	<0.2	<0.2	<2.5	<1.6	<0.8	<0.9
PB 041798 GCR1	Procedural Blank GC QC Triplicate	7.07	0.91	0.38	0.47	3.49	1.59	1.26	0.16	0.23	2.43	1.48	0.73	0.87
PB 041798 GCR2	Procedural Blank GC QC Triplicate	6.65	0.95	0.33	0.43	3.31	1.56	1.27	0.19	0.23	2.39	1.45	0.69	0.88
PB 041798 GCR3	Procedural Blank GC QC Triplicate	6.67	0.95	0.34	0.45	3.14	1.53	1.24	0.17	0.22	2.33	1.41	0.67	0.84
AVG:		6.80	0.94	0.35	0.45	3.31	1.56	1.26	0.17	0.23	2.38	1.45	0.69	0.86
SD(N-1):		0.24	0.02	0.03	0.02	0.17	0.03	0.01	0.01	0.00	0.05	0.03	0.03	0.02
% RSD:		4	2	8	4	5	2	1	8	1	2	2	4	2
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	7.5	1.0	0.4	0.5	3.8	1.6	1.3	0.2	0.2	2.5	1.6	0.8	0.9

*Note: MDL set to <0.1 if lower than IDL. Otherwise as shown.
IDL = instrumental detection limit.

Table 5. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Field ID	173	201	157	172	197	180	193	191	200	170,190	198	199	196,203
FO1 GCR1	Background; GC QC triplicate	0.1	0.6	1.3	<0.8	0.2	11.1	0.7	0.3	0.2	<3.2	0.1	2.0	1.6
FO1 GCR2	Background; GC QC triplicate	0.1	0.6	1.3	<0.8	0.1	10.9	0.6	0.3	0.2	<3.2	0.1	1.9	1.6
FO1 GCR3	Background; GC QC triplicate	0.1	0.6	1.2	<0.8	0.1	10.9	0.7	0.2	0.2	<3.2	0.1	1.9	1.6
AVG:	(Average)	0.1	0.6	1.3		0.2	11.0	0.7	0.3	0.2		0.1	1.9	1.6
SD(N-1):	(Sample Standard Deviation)	0.0	0.0	0.1		0.0	0.1	0.0	0.0	0.0		0.0	0.1	0.0
% RSD:	(% Relative Standard Deviation)	9	3	4		0	1	2	1	4		0	3	3
FO5 A	Canön de Valle; QC triplicate	<0.1	0.6	0.8	<0.8	0.1	8.4	0.5	0.2	<0.1	<3.2	<0.1	1.4	1.2
FO5 B	Canön de Valle; QC triplicate	0.1	0.5	1.0	<0.8	0.1	9.5	0.6	0.3	0.1	<3.2	<0.1	1.5	1.4
FO5 C	Canön de Valle; QC triplicate	<0.1	0.6	0.9	<0.8	0.1	9.3	0.6	0.3	<0.1	<3.2	<0.1	1.5	1.3
AVG:			0.6	0.9		0.1	9.1	0.6	0.2				1.5	1.3
SD(N-1):			0.0	0.1		0.0	0.6	0.0	0.0				0.1	0.1
% RSD:			0	0		0	6	0	0				0	0
MS 041798 GCR1	Matrix Spike, GC QC triplicate	0.5	1.5	2.6	2.0	0.2	30.7	1.7	1.3	1.2	15.0	0.4	6.3	6.7
MS 041798 GCR2	Matrix Spike, GC QC triplicate	0.5	1.4	2.6	2.0	0.2	29.7	1.7	1.2	1.2	14.5	0.4	6.1	6.5
MS 041798 GCR3	Matrix Spike, GC QC triplicate	0.5	1.5	2.5	2.0	0.2	29.8	1.7	1.2	1.2	14.7	0.4	6.1	6.5
AVG:		0.5	1.5	2.6	2.0	0.2	30.1	1.7	1.3	1.2	14.7	0.4	6.2	6.6
SD(N-1):		0.0	0.0	0.1	0.0	0.0	0.5	0.0	0.0	0.0	0.2	0.0	0.2	0.1
% RSD:		1	3	2	1	1	2	2	2	3	2	5	2	2
MB 041798	Matrix Blank	<0.1	<0.1	<0.2	<0.8	<0.1	<4.7	0.2	<0.1	<0.1	<3.2	<0.1	<0.7	<0.8
PB 041798 GCR1	Procedural Blank GC QC Triplicate	0.05	0.07	0.17	0.69	0.00	4.63	0.14	0.10	0.11	2.71	0.00	0.66	0.72
PB 041798 GCR2	Procedural Blank GC QC Triplicate	0.04	0.07	0.14	0.60	0.00	4.59	0.13	0.12	0.10	2.27	0.00	0.65	0.67
PB 041798 GCR3	Procedural Blank GC QC Triplicate	0.04	0.08	0.16	0.58	0.00	4.61	0.13	0.12	0.12	2.51	0.00	0.63	0.67
AVG:		0.04	0.07	0.16	0.63	0.00	4.61	0.13	0.11	0.11	2.50	0.00	0.65	0.69
SD(N-1):		0.00	0.00	0.01	0.06	0.00	0.02	0.01	0.01	0.01	0.22	0.00	0.01	0.03
% RSD:		10	5	7	9	5	0	4	9	7	9	9	2	4
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.1	0.2	0.8	0.1	4.7	0.2	0.1	0.1	3.2	0.1	0.7	0.8

*Note: MDL set to <0.1 if lower than IDL. Otherwise as shown.
IDL = instrumental detection limit.

Table 5. Congener Specific Data (ng/g) for Los Alamos Fish Samples

Sample Name	Field ID	189	208,195	207	194	205	206	209	Total cPCBs
FO1 GCR1	Background; GC QC triplicate	0.1	<0.3	0.5	1.1	0.1	2.6	2.5	361.4
FO1 GCR2	Background; GC QC triplicate	0.1	<0.3	0.5	1.0	0.1	2.5	2.4	358.6
FO1 GCR3	Background; GC QC triplicate	0.1	<0.3	0.5	1.0	0.1	2.5	2.4	351.4
AVG:	(Average)	0.1		0.5	1.0	0.1	2.5	2.4	357.2
SD(N-1):	(Sample Standard Deviation)	0.0		0.0	0.0	0.0	0.1	0.1	5.1
% RSD:	(% Relative Standard Deviation)	0		0	3	0	3	3	1
FO5 A	Canõn de Valle; QC triplicate	0.1	<0.3	0.4	0.8	<0.1	1.9	1.8	332.7
FO5 B	Canõn de Valle; QC triplicate	0.1	<0.3	0.4	0.9	0.1	2.0	1.9	368.4
FO5 C	Canõn de Valle; QC triplicate	0.1	<0.3	0.4	0.9	0.1	2.1	2.0	370.8
AVG:		0.1		0.4	0.9	0.1	2.0	1.9	357.3
SD(N-1):		0.0		0.0	0.1	0.1	0.1	0.1	21.3
% RSD:		0		0	0	0	0	6	6
MS 041798 GCR1	Matrix Spike, GC QC triplicate	0.5	2.6	0.3	5.6	0.4	1.7	0.2	1282.3
MS 041798 GCR2	Matrix Spike, GC QC triplicate	0.5	2.5	0.3	5.3	0.4	1.7	0.2	1249.5
MS 041798 GCR3	Matrix Spike, GC QC triplicate	0.4	2.5	0.3	5.4	0.4	1.7	0.2	1247.6
AVG:		0.5	2.5	0.3	5.4	0.4	1.7	0.2	1259.8
SD(N-1):		0.0	0.1	0.0	0.1	0.0	0.0	0.0	19.5
% RSD:		6	2	2	2	2	1	3	2
MB 041798	Matrix Blank	<0.1	<0.3	<0.1	<0.5	<0.1	<0.7	<1.1	<64.4
PB 041798 GCR1	Procedural Blank GC QC Triplicate	0.05	0.26	0.01	0.49	0.02	0.66	1.06	61.17
PB 041798 GCR2	Procedural Blank GC QC Triplicate	0.05	0.25	0.01	0.47	0.02	0.70	1.07	58.38
PB 041798 GCR3	Procedural Blank GC QC Triplicate	0.05	0.25	0.01	0.47	0.02	0.65	1.05	57.96
AVG:		0.05	0.25	0.01	0.48	0.02	0.67	1.06	59.17
SD(N-1):		0.00	0.00	0.00	0.01	0.00	0.02	0.01	1.74
% RSD:		3	2	8	2	1	4	1	3
MDL = PB Avg + 3(PB Std)	(Method Detection Limit)*	0.1	0.3	0.1	0.5	0.1	0.7	1.1	64.4

Total PCBs % Recovery
98
96
96
AVG = 97
Std = 1.7

*Note: MDL set to <0.1 if lower than IDL. Otherwise as shown.
IDL = instrumental detection limit.

Table 6. Procedural Internal Standard Recovery (%) for Los Alamos Fish Samples

Sample Name	Field ID	Sample Matrix	Grams Spiked	% Lipid	Congener-030 Amount (ng)	Congener-030 % Recovery	Congener-204 Amount (ng)	Congener-204 % Recovery
FO1 (a)	Background	Fish	9.90	5.1	336	85	378	89
FO2	Los Alamos Canyon	Fish	9.90	6.2	356	91	400	95
FO3	Sandia	Fish	9.90	5.6	343	87	386	91
FO4	Pajarito	Fish	9.90	5.4	300	76	339	80
FO5 A (b)	Canön de Valle	Fish	9.90	5.1	302	77	340	80
FO5 B (b)	Canön de Valle	Fish	9.90	5.2	323	82	380	90
FO5 C (b)	Canön de Valle	Fish	9.87	5.1	338	86	380	90
MS 041798 (a)	Matrix Spike	ECRC Control Bluegill 654C	9.92	3.5	335	85	379	90
MB 041798	Matrix Blank	ECRC Control Bluegill 654C	9.92	3.5	351	89	404	95
PB 041798 (a)	Procedural Blank		-	-	328	83	382	90
MOCK 100% I-030	ECRC #207W-2	PCB congener 030			394			
MOCK 100% I-204	ECRC #397R-1	PCB congener 204					423	
					Average Recovery:	84		89
					Standard Deviation:	5		5

(a) GC Replicate Average
(b) QC Triplicate

STATE OF MISSOURI
Mel Carnahan, Governor • David A. Shorr, Director
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102-0176

ENVIRONMENTAL SERVICES PROGRAM

PAUL HEINE
4200 NEW HAVEN RD.
COLUMBIA, MO 65201

Lab Number: 97-A6062

Sample Number: 97-G415

RESULTS OF SAMPLE ANALYSES FOR PUBLIC WATER SUPPLIES

Report Date: July 30, 1997
Date Collected: June 25, 1997
Sample Location: WELL #2
PWS Name: MIDWEST SCIENCE CENTER

PWS County: BOONE
PWS ID: MO3100572

Analysis Performed	Results	MCL	SS	Units
Total Dissolved Solids	363	--	500	mg/L
Alkalinity as CaCO3	250	--	--	mg/L
Hardness as CaCO3	310	--	--	mg/L
Fluoride	0.35	4.00	2.00	mg/L
Sulfate	44.1	--	250	mg/L
Chloride	21.5	--	250	mg/L
Cyanide	< 0.100	0.200	--	mg/L
Silver, Dissolved	< 5.00	--	100	ug/L
Aluminum, Dissolved	< 10.0	--	200	ug/L
Arsenic, Dissolved	< 1.0	50.0	--	ug/L
Barium, Dissolved	77.6	2000	--	ug/L
Beryllium, Dissolved	< 1.00	4.00	--	ug/L
Calcium, Dissolved	81.8	--	--	mg/L
Cadmium, Dissolved	< 1.00	5.00	--	ug/L
Chromium, Dissolved	2.56	100	--	ug/L
Copper, Dissolved	4.21	1300	1000	ug/L
Iron, Dissolved	159	--	300	ug/L
Mercury, Dissolved	< 0.20	2.00	--	ug/L
Potassium, Dissolved	2.6	--	--	mg/L
Magnesium, Dissolved	25.9	--	--	mg/L
Manganese, Dissolved	10.6	--	50.0	ug/L
Sodium, Dissolved	22.2	--	--	mg/L
Nickel, Dissolved	6.65	100	--	ug/L
Lead, Dissolved	< 4.0	15.0	--	ug/L
Antimony, Dissolved	< 3.0	6.0	--	ug/L
Selenium, Dissolved	< 2.0	50.0	--	ug/L
Thallium, Dissolved	< 1.00	2.00	--	ug/L
Zinc, Dissolved	< 5.00	--	5000	ug/L

Report Date: July 30, 1997

Lab Number: 97-A6062
Sample Number: 97-G415

MCL=Maximum Contaminant Level SS=Secondary Standard --=Not Applicable

The analysis of this sample was performed in accordance with procedures approved or recognized by the U.S. Environmental Protection Agency. If you have any questions, please contact Mr. Terry Timmons at 573/751-1188.

James H. Long, Director
Environmental Services Program
Division of Environmental Quality

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF ENVIRONMENTAL QUALITY

P.O. Box 176 Jefferson City, MO 65102-0176

ENVIRONMENTAL SERVICES PROGRAM

PAUL HEINE
4200 NEW HAVEN RD.
COLUMBIA, MO 65201

Lab Number: 97-A6071

Sample Number: 97-G518

RESULTS OF SAMPLE ANALYSES FOR PUBLIC WATER SUPPLIES

Report Date: July 14, 1997
Date Collected: June 25, 1997
Sample Location: WELL #2
PWS Name: MIDWEST SCIENCE CENTER

PWS County: BOONE
PWS ID: MO3100572

Analysis Performed	Results	MCL	Units
VOC Results:			
Dichlorodifluoromethane	< 20.0	--	ug/L
Chloromethane	< 2.5	--	ug/L
Vinyl Chloride	< 0.5	2.0	ug/L
Bromomethane	< 9.0	--	ug/L
Chloroethane	< 2.5	--	ug/L
Trichlorofluoromethane	< 2.5	--	ug/L
1,1-Dichloroethene	< 0.5	7.0	ug/L
Methylene Chloride	< 0.5	5.0	ug/L
Methyl-tert-butyl ether	< 5.0	--	ug/L
trans-1,2-Dichloroethene	< 0.5	100	ug/L
1,1-Dichloroethane	< 1.0	--	ug/L
2,2-Dichloropropane	< 1.0	--	ug/L
cis-1,2-Dichloroethene	< 0.5	70.0	ug/L
Chloroform	< 0.5	--	ug/L
Bromochloromethane	< 1.0	--	ug/L
1,1,1-Trichloroethane	< 0.5	200	ug/L
1,1-Dichloropropene	< 1.0	--	ug/L
Carbon Tetrachloride	< 0.5	5.0	ug/L
Benzene	< 0.5	5.0	ug/L
1,2-Dichloroethane	< 0.5	5.0	ug/L
Trichloroethene	< 0.5	5.0	ug/L
1,2-Dichloropropane	< 0.5	5.0	ug/L
Bromodichloromethane	< 0.5	--	ug/L
Dibromomethane	< 1.0	--	ug/L
cis-1,3-Dichloropropane	< 2.0	--	ug/L
Toluene	< 0.5	1000	ug/L
trans-1,3-Dichloropropane	< 1.0	--	ug/L
1,1,2-Trichloroethane	< 0.5	5.0	ug/L

Report Date: July 14, 1997

Lab Number: 97-A6071
Sample Number: 97-G518

Analysis Performed	Results	MCL	Units
Tetrachloroethene	< 0.5	5.0	ug/L
1,3-Dichloropropane	< 2.0	--	ug/L
Dibromochloromethane	< 0.5	--	ug/L
1,2-Dibromoethane	< 2.0	--	ug/L
Chlorobenzene	< 0.5	100	ug/L
Ethylbenzene	< 0.5	700	ug/L
1,1,1,2-Tetrachloroethane	< 1.0	--	ug/L
Total Xylenes	< 0.5	10000	ug/L
Styrene	< 0.5	100	ug/L
Isopropylbenzene	< 2.0	--	ug/L
Bromoform	< 0.5	--	ug/L
1,1,2,2-Tetrachloroethane	< 1.0	--	ug/L
1,2,3-Trichloropropane	< 1.0	--	ug/l
n-Propylbenzene	< 2.0	--	ug/L
Bromobenzene	< 1.0	--	ug/L
2-Chlorotoluene	< 2.0	--	ug/L
4-Chlorotoluene	< 2.0	--	ug/L
1,3,5-Trimethylbenzene	< 2.0	--	ug/L
tert-Butylbenzene	< 2.0	--	ug/L
1,2,4-Trimethylbenzene	< 1.0	--	ug/L
sec-Butylbenzene	< 2.0	--	ug/L
p-isopropyltoluene	< 2.0	--	ug/L
1,3-Dichlorobenzene	< 1.0	--	ug/L
1,4-Dichlorobenzene	< 0.5	75.0	ug/L
n-Butylbenzene	< 2.0	--	ug/L
1,2-Dichlorobenzene	< 0.5	600	ug/L
1,2-Dibromo-3-Chlorobenz	< 5.0	--	ug/L
1,2,4-Trichlorobenzene	< 0.5	70.0	ug/L
Hexachlorobutadiene	< 1.0	--	ug/L
Naphthalene	< 2.0	--	ug/L
1,2,3-Trichlorobenzene	< 2.0	--	ug/L

MCL = Maximum Contaminant Level -- = Not Applicable

The analysis of this sample was performed in accordance with procedures approved or recognized by the U.S. Environmental Protection Agency. If you have any questions, please contact Mr. Terry Timmons at 573/751-1188.

James H. Long, Director
Environmental Services Program
Division of Environmental Quality

Environmental and Contaminants Research Center
BRD, US Geological Survey
4200 New Haven Rd., Columbia, Missouri 65201

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Final Laboratory Report FY-98-30-08

ANALYSIS OF EXPLOSIVES RESIDUES IN SEDIMENT AND WATER FROM FOUR STREAMS IN NEW MEXICO - 2nd AND 3rd SAMPLINGS

January 21, 1998

Submitted By:

J.C. Meadows
Analytical Chemistry

Approved By:

C.E. Orazio
Analytical Chemistry, Group Leader

To: Joel Lusk
US Fish and Wildlife Service
2105 Osuna NE
Albuquerque, NM 87113

Subject: Results of the High Performance Liquid Chromatography/ UV Absorbance Detection (HPLC/UV) analysis of sediments and waters using EPA Method 8330[1].

Analytical Methods Summary:

Sample Preparation: Samples were received in the Analytical Chemistry laboratory in two shipments. ECRC #'s 17160 - 17163 were received on August 20, 1997. ECRC #'s 17035 - 17045 were received October 7, 1997. The samples were shipped in coolers with ice as part of a larger shipment of samples for other analytes. Samples for explosives residue analysis were segregated into a separate cooler and held under refrigeration at 4° C until the initiation of analytical protocols. Samples of water for high level residues were removed immediatetly upon receipt and held under refrigeration until processed.

Procedures for analysis are listed in detail in EPA Method 8330. In summary, sediments were air-dried in clean glass pans covered with aluminum foil away from direct light. Aliquants of two grams each were weighed from the dried sediment and extracted with acetonitrile in an ultrasonic ice bath for 18 hours. The extracts for analysis were filtered through Whatman 13mm X 0.45μm PTFE syringe filters and mixed with equal volumes of 5% (w/v) aqueous $CaCl_2$ solution. These solutions were analyzed by HPLC/UV.

Water samples for high-level residue analysis were mixed with equal volumes of acetonitrile. These solutions were filtered through Whatman 13mm X 0.45μm PTFE syringe filters and analyzed by HPLC/UV. Waters for low-level analysis were processed as indicated in Method 8330, with the exception that the primary extractions were performed in separatory funnels with shaking rather than in volumetric flasks with stirring. Portions of the recovered acetonitrile extracts were mixed with equal volumes of organic-free water, filtered through Whatman 13mm X 0.45μm PTFE syringe filters, and analyzed directly by HPLC/UV.

HPLC/UV analysis: Analysis was performed with a Perkin Elmer Series 410 LC pump coupled with a PE ISS 200 autosampler and an Isco V^4 variable wavelength absorbance detector operating at 254 nm. Primary separations were accomplished with a 4.6 mm x 25 cm (5 μm) C-18 reverse phase column (Restek Pinnacle™ ODS) with a Brownlee New Guard™ RP-18 guard cartridge. Confirmatory chromatography was done with a 4.6 mm x 25 cm (5 μm) CN reverse phase column (Restek Pinnacle™ CN) with a 4.6 mm x 30 mm (5 μm) CN (Restek) guard column. Data was collected and analyzed using PE-Nelson 3600 Chromatography software. The mobile phase was 50:50 methanol:organic-free water, pumped at 1.5 mL/minute.

Quality Control Procedures: Initial calibrations of equipment and standards and evaluation of reagents and control matrices were performed as recommended in EPA Method 8330. Standards for calibration were prepared fresh daily as outlined in Method 8330, except that certified stock standard solutions were purchased from Ultra Scientific. The analytical system was monitored by the addition of an internal reference compound (1,2-dinitrobenzene; Ultra Scientific) to each field and QC sample. Four matrix spikes of organic-free water were performed with the low-level water analysis. The water samples were spiked with 500 ng of each analyte in methanol solution. Insufficient sample was available to perform any replicate analyses of field samples. For the sediment, 3 matrix blanks and 3 matrix spikes were processed. The matrix used was ECRC's control pond sediment, which was verified free of analytes. Analytes were added to the spikes at a rate of 1 μg/2 g dry sediment. One of the field samples was extracted and analyzed in triplicate. All QC samples were processed identically to the field samples.

Results:

Samples were analyzed for:

- HMX
- RDX
- 1,3,5-trinitrobenzene (1,3,5-TNB)
- 1,3-dinitrobenzene (1,3-DNB)
- tetryl
- nitrobenzene (NB)
- 2,4,6-trinitrotoluene (2,4,6-TNT)
- 2-amino-4,6-dinitrotoluene (2-Am-4,6-DNT)
- 4-amino-2,6-dinitrotoluene (4-Am-2,6-DNT)
- 2,4-dinitrotoluene (2,4-DNT)
- 2,6-dinitrotoluene (2,6-DNT)
- 2-nitrotoluene (2-NT)
- 4-nitrotoluene (4-NT)
- 3-nitrotoluene (3-NT)

Analytical results are summarized in Table 1. The results in Table 1 have been corrected for recoveries using the following equation:

Corrected sample amount =

$$(Uncorrected\,sample\,amount)\frac{(\bar{x}MS_{IS})}{(\bar{x}MS_{ANALYTE\,Rec})(Sample_{IS})}$$

Where $\bar{x}MS_{IS}$ is the average recovery (fractional) of the internal standard (1,2-Dinitrobenzene) in the matrix spikes, $\bar{x}MS_{ANALYTE\ Rec}$ is the average recovery of the analyte in the matrix spikes, and $Sample_{IS}$ is the recovery of the internal standard in the sample.

The two amino-DNT's and the two DNT's co-eluted on the primary (C-18) column, but were separated by the cyano column. Therefore, peaks matching the elution window for these compounds on the C-18 column were quantified on the cyano column. All other values reported are derived from the C-18 calibration data, with identity confirmation by cyano chromatography. Method detection limit (MDL) was considered to be the mass of analyte which produced a chromatographic peak with a height approximately three times the average matrix blank baseline deflection. In terms of absolute amounts, the lowest discernable standard

was 5 pg/μL of each analyte. The sample concentration which would produce a 5 pg/μL peak was back-calculated using the sample size, dilution factors, and final extract volume specified in EPA Method 8330 and was designated MDL. For the low-level water analysis, the MDL was 0.06μg/L; for sediment, MDL was 50ng/g. Method quantitation limit (MQL) was considered to be six times the average matrix blank baseline deflection, or the deflection elicited by a 10 pg/μL standard, and similar calculations yielded an MQL of 0.13μg/L for the low-level water analysis and 100ng/g for the sediment. Values which are less than the stated MQL but greater than the stated MDL are reported in brackets. Where concentration values for peaks quantified by C-18 chromatography are unconfirmed by CN chromatography to within ± 25 %, the lower values are reported values.

Matrix spike recoveries are summarized in Tables 2B - 5B. Analytical results for the triplicate sediment analysis are listed as averages in Table 1 and individually in Tables 2A and 4A. The relative standard deviations (standard deviation divided by the mean) for the concentrations of detectable compounds in the sample range from 8.8 to 37 percent and average 25.1%.

References:

(1) Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC), Revision 0, September 1994, by the US EPA.

Environmental and Contaminants Research Center
BRD, US Geological Survey
4200 New Haven Rd., Columbia, Missouri 65201

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Final Laboratory Report FY-97-30-42

ANALYSIS OF EXPLOSIVES RESIDUES IN SEDIMENT AND WATER FROM FOUR STREAMS IN NEW MEXICO

September 15, 1997

Submitted By:

J.C. Meadows
Analytical Chemistry

Approved By:

C.E. Orazio
Analytical Chemistry, Group Leader

To: Joel Lusk
US Fish and Wildlife Service
2105 Osuna NE
Albuquerque, NM 87113

Subject: Results of the High Performance Liquid Chromatography/ UV Absorbance Detection (HPLC/UV) analysis of sediments and waters using EPA Method 8330[1].

Analytical Methods Summary:

Sample Preparation: Samples were received in the Analytical Chemistry laboratory on August 4, 1997. The samples were shipped in coolers with ice as part of a larger shipment of samples for other analytes. Samples for explosives residue analysis were segregated into a separate cooler and held under refrigeration at 4° C until the initiation of analytical protocols. Samples of water for high level residues were removed immediatetly upon receipt and held under refrigeration until processed.

Procedures for analysis are listed in detail in EPA Method 8330. In summary, sediments were air-dried in clean glass pans covered with aluminum foil away from direct light. At the time of aliquanting the sediments for extraction, separate portions were also removed for percent moisture analysis. This information was used to more exactly quantify the actual weight of the sediment subsamples which were extracted and analyzed. Aliquants for analysis were extracted with acetonitrile in an ultrasonic ice bath for 18 hours. The extracts for analysis were filtered through Whatman 13mm X 0.45μm PTFE syringe filters and mixed with equal volumes of 5% (w/v) aqueous $CaCl_2$ solution. These solutions were analyzed by HPLC/UV.

Water samples for high-level residue analysis were mixed with equal volumes of acetonitrile. These solutions were filtered through Whatman 13mm X 0.45μm PTFE syringe filters and analyzed by HPLC/UV. Waters for low-level analysis were processed as indicated in Method 8330, with the exception that the primary extractions were performed in separatory funnels with shaking rather than in volumetric flasks with stirring. Portions of the recovered acetonitrile extracts were mixed with equal volumes of organic-free water, filtered through Whatman 13mm X 0.45μm PTFE syringe filters, and analyzed directly by HPLC/UV.

HPLC/UV analysis: Analysis was performed with a Perkin Elmer Series 410 LC pump coupled with a PE ISS 200 autosampler and an Isco V^4 variable wavelength absorbance detector operating at 254 nm. Primary separations were accomplished with a 4.6 mm x 25 cm (5 μm) C-18 reverse phase column (Restek Pinnacle™ ODS) with a Brownlee New Guard™ RP-18 guard cartridge. Confirmatory chromatography was done with a 4.6 mm x 25 cm (5 μm) CN reverse phase column (Restek Pinnacle™ CN) with a 4.6 mm x 30 mm (5 μm) CN (Restek) guard column. Data was collected and analyzed using PE-Nelson 3600 Chromatography software. The mobile phase was 50:50 methanol:organic-free water, pumped at 1.5 mL/minute.

Quality Control Procedures: Initial calibrations of equipment and standards and evaluation of reagents and control matrices were performed as recommended in EPA Method 8330. Standards for calibration were prepared fresh daily as outlined in Method 8330, except that certified stock standard solutions were purchased from Ultra Scientific. The analytical system was monitored by the addition of an internal reference compound (1,2-dinitrobenzene; Ultra Scientific) to each field and QC sample. Two matrix spikes of organic-free water were performed with the low-level water analysis. One was performed using the standard EPA stir method and the other was performed with the separatory funnel shake method. The water samples were spiked with 500 ng of each analyte in methanol solution. Insufficient sample was available to perform any replicate analyses of field samples. For the sediment, 3 matrix blanks and 3 matrix spikes were processed. The matrix used was ECRC's control pond sediment, which was verified free of analytes. Analytes were added to the spikes at a rate of 1 μg/2 g dry sediment. One of the field samples was extracted and analyzed in triplicate. All QC samples were processed identically to the field samples with the exception of the one water spike extracted with the EPA stirring method.

Results:

Samples were analyzed for:

HMX
RDX
1,3,5-trinitrobenzene (1,3,5-TNB)
1,3-dinitrobenzene (1,3-DNB)
tetryl
nitrobenzene (NB)
2,4,6-trinitrotoluene (2,4,6-TNT)
2-amino-4,6-dinitrotoluene (2-Am-4,6-DNT)
4-amino-2,6-dinitrotoluene (4-Am-2,6-DNT)
2,4-dinitrotoluene (2,4-DNT)
2,6-dinitrotoluene (2,6-DNT)
2-nitrotoluene (2-NT)
4-nitrotoluene (4-NT)
3-nitrotoluene (3-NT)

Analytical results are summarized in Table 1. The results in Table 1 have been corrected for recoveries using the following equation:

Corrected sample amount =

$$(Uncorrected\,sample\,amount)\frac{(\bar{x}MS_{IS})}{(\bar{x}MS_{ANALYTE\,Rec})(Sample_{IS})}$$

Where $\bar{x}MS_{IS}$ is the average recovery (fractional) of the internal standard (1,2-Dinitrobenzene) in the matrix spikes, $\bar{x}MS_{ANALYTE\ Rec}$ is the average recovery of the analyte in the matrix spikes, and $Sample_{IS}$ is the recovery of the internal standard in the sample.

The two amino-DNT's and the two DNT's co-eluted on the primary (C-18) column, but were separated by the cyano column. Therefore, peaks matching the elution window for these compounds on the C-18 column were quantified on the cyano column. All other values reported are derived from the C-18 calibration data, with identity confirmation by cyano chromatography. Method detection limit (MDL) was considered to be the mass of analyte which produced a chromatographic peak with a height approximately three times the average matrix blank baseline deflection. In terms of absolute amounts, the lowest discernable standard was 5 pg/μL of each analyte. The sample concentration which would produce a 5 pg/μL peak was back-calculated using the sample size, dilution factors, and final extract volume specified in EPA Method 8330

and was designated MDL. For the low-level water analysis, the MDL was 0.06μg/L; for sediment, MDL was 50ng/g. Method quantitation limit (MQL) was considered to be six times the average matrix blank baseline deflection, or the deflection elicited by a 10 pg/μL standard,and similar calculations yielded an MQL of 0.13μg/L for the low-level water analysis and 100ng/g for the sediment. Values which are less than the stated MQL but greater than the stated MDL are reported in brackets. Where concentration values for peaks quantified by C-18 chromatography are unconfirmed by CN chromatography to within ± 25 %, the lower values are reported values. Matrix spike recoveries are summarized in Tables 2a and 2b.

References:

(1) Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC), Revision 0, September 1994, by the US EPA.

Table 1: Summary report of explosives residues in water and sediment samples from LANL Use Study.

Sample description	Sample I.D. ECRC # / LANL #	Analytes (Water - μg/L; Sediment - ng/g dry weight)													
		HMX	RDX	1,3,5-TNB	1,3-DNB	Tetryl	NB	2,4,6-TNT	4-Am-2,6-DNT	2-Am-4,6-DNT	DNT's	DNT's	2-NT	4-NT	3-NT
Blank	17036 /BLKWR02	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Los Alamos, Upper - Water	17160 /ULWE02	< MQL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Los Alamos, Upper - Sediment	17038 / LUSE3	< MQL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Los Alamos, Lower - Sediment	17039 / LLSE3	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Pajarito, Upper - Water	17162 / PUWE02	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Pajarito, Upper - Water	17035 / PUWE03	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Pajarito, Upper - Sediment	17042 / PUSE3	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Pajarito, Lower -Sediment	17043 / PLSE3	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Sandia, Upper - Water	17161 / SUWE02	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Sandia, Upper - Sediment	17040 / SUSE3	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Sandia, Lower - Sediment	17041 / SLSE3	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Cañon de Valle, Upper - Water	17163 / VUWE02	172	542	< MDL	< MDL	< MDL	< MDL	< MDL	48.6 [a]	22.5 [a]	< MDL	< MDL	< MDL	< MDL	< MDL
Cañon de Valle, Upper - Water	17037 / VUWE03	56.5	105	< MDL	< MDL	< MDL	< MDL	< MDL	19.6 [a]	15.7 [a]	< MDL	< MDL	< MDL	< MDL	< MDL
Cañon de Valle, Upper - Sediment	17044 / VUSE3	1130	1804	< MDL	< MDL	< MDL	< MDL	127	415 [a]	530 [a]	< MDL	< MDL	< MDL	< MDL	< MDL
Cañon de Valle, Lower - Sediment	17045 / VLSE3	[91.2]	104	< MDL	< MDL	< MDL	< MDL	26.2	352 [a]	345 [a]	< MDL	< MDL	< MDL	< MDL	< MDL

MQL_{Water} = 0.13 μg/L; $MQL_{Sediment}$ = 100 ng/g; MDL_{Water} = 0.06 μg/L; $MDL_{Sediment}$ = 50 ng/g
Sample 17044 / VUSE3 is the average of triplicate analyses.
[a] Separation and quantitation by cyano chromatography

Table 1: Summary report of explosives residues In water and sediment samples from LANL Use Study.

Sample description	Sample I.D. ECRC # / LANL #	Analytes (Water - μg/L; Sediment - ng/g dry weight)													
		HMX	RDX	1,3,5-TNB	1,3-DNB	Tetryl	NB	2,4,6-TNT	4-Am-2,6-DNT	2-Am-4,6-DNT	DNT's	DNT's	2-NT	4-NT	3-NT
Los Alamos, Upper - Water	16390 /LUWE01	< MQL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Los Alamos, Upper - Sediment	16380 / LUSE2	< MQL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Los Alamos, Lower - Sediment	16381 / LLSE2	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Pajarito, Upper - Water	16392 / PUWE01	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Pajarito, Upper - Sediment	16376 / PUS2	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Pajarito, Lower -Sediment	16377 / PLS2	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Sandia, Upper - Water	16391 / SUWE01	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Sandia, Upper - Sediment	16378 / SUSE2	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Sandia, Lower - Sediment	16379 / SLSE2	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Cañon de Valle, Upper - Water	16393 / VUWE01	5.6	13.2	< MDL	< MDL	< MDL	< MDL	< MDL	0.5 [a]	1.1 [a,c]	< MDL	< MDL	< MDL	< MDL	< MDL
Cañon de Valle, Upper - Sediment	16374 / VUS2	799	308 [b]	< MDL	< MDL	< MDL	< MDL	144	[74.1] [a]	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL
Cañon de Valle, Lower - Sediment	16375 / VLS2	366	< MDL [b]	< MDL	< MDL	< MDL	< MDL	[89.3]	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL	< MDL

MQL_{Water} = 0.13 μg/L; $MQL_{Sediment}$ = 100 ng/g; MDL_{Water} = 0.06 μg/L; $MDL_{Sediment}$ = 50 ng/g

Sample 16377 / PLS2 is the average of triplicate analyses.

[a] Separation and quantitation by cyano chromatography

[b] Large chromatographic peak detected by C-18 but identity not confirmed by CN; CN value is reported.

[c] An unknown compound eluted close to 2-amino-4,6-DNT with cyano chromatography of water samples, making assessment of spike recovery difficult. Recovery of amino-DNTs is used in correction of concentration for recovery.

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DETERMINATION OF METALS IN WATER AND ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTABLE METALS IN SEDIMENTS COLLECTED FROM LOS ALAMOS, NEW MEXICO

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SAMPLE HISTORY:

A total of four sediments and 30 water samples collected from sites near the Los Alamos National Laboratory in New Mexico were received by the Inorganic Chemistry section of the Midwest Science Center (MSC) on 8/27/96. Four of the water samples were pore water which correlated with the four sediments. The remaining 26 water samples were surface water samples. The sediments were to be analyzed for percent moisture, loss on ignition, acid-volatile

sulfide (AVS) and simultaneously extractable metals (SEM; cadmium, copper, nickel, lead, and zinc). In addition, a metals semi-quantitative scan was requested for the sediments, but selenium was to be determined by hydride generation atomic absorption. A semi-quantitative metals scan was also requested for the water samples, with selenium also determined by atomic absorption spectroscopy. The objective of the analyses was to evaluate the potential toxicity by chemical measures. The purpose of this report is to provide analytical data for the samples which will provide evidence as to the presence and bioavailability of certain elemental contaminants.

METHODS:

Sediments:

Sediment samples were processed through the preparative and flow scheme in one block with an associated BID (block initiation date) which included the following quality control for the preparation and determination of AVS and SEM: procedural blank, duplicate sample, two reference sediments, and two pre-extraction spikes (one blank and one sample). During AVS determination, quality control also included an analysis spike (post-extraction) and a calibration solution. Quality control parameters for SEM determinations by ICP-MS included a continuing calibration blank, independent calibration verification standard, laboratory control sample, duplicate analysis, analysis spike, interference check solution, and dilution percent difference. Additional aliquants of sediment forming a second BID set were processed for the semi-quantitative metals scan, and quality control included procedural blanks, procedural blank spikes, sample replicates, reference materials, and sample spikes. Precision was determined by repeated runs of a laboratory control solution. Another aliquant of each sediment sample constituted a third BID set which was processed for the determination of selenium by hydride generation atomic absorption. Quality control for this set included procedural blanks and blank spikes, sample replicates and spikes, analysis spikes, and reference solutions. All quality control results were tabulated to provide an overview of quality assurance and to facilitate interpretation.

For AVS/SEM determination, each sediment sample was briefly homogenized in its collection container with a plastic scoop, following which a ~5 mL aliquant was taken for AVS determination. During the AVS determination on each sediment sample, a simultaneously extractable metals fraction was generated as described in standard operating procedure (SOP) C5.156. This method was adapted from the EPA draft method 376.3 (4/91) written by Allen, Gongmin, Boothman, DiToro, and Mahony, and utilized a silver/sulfide electrode for determining AVS. Fifty mL of each extract was vacuum filtered through a 0.4 µm polycarbonate

membrane. A portion of each filtered SEM extract (10 mL) was subjected to a microwave oven nitric acid/hydrogen peroxide digestion utilizing 50 mL Zymark tubes as described in SOP C5.217. Final dilution volume for the digestates was 50 mL in a matrix of 1% nitric acid. A preliminary scan of these digestates indicated that they could be analyzed at full strength with the software adjusting for the 5X dilution which occurred during digestion. All SEM digestates were analyzed by inductively-coupled plasma-mass spectrometry (ICP-MS, SOP C5.212). A second aliquant of wet sediment was taken for the determination of percent moisture (SOP C5.168) and loss on ignition (LOI, SOP C5.197) at 500°C (percent of dry weight). A portion of each sample was lyophilized (SOP C5.36) and then homogenized (SOP C5.208d), following which a dried aliquant was digested (SOPC 5.94) in a sealed Teflon vessel in a microwave oven to prepare a digestate suitable for semi-quantitative scan by ICP-MS (SOP C5.212). A second dried aliquant was subjected to a magnesium nitrate/nitric acid dry ashing procedure (SOP C5.26) prior to the determination of selenium by flow injection hydride generation atomic absorption (SOP C5.171).

Water:

Water samples were also processed through the preparative and flow scheme in three blocks or groups, each with an associated BID (block initiation date), which included the following quality control for the preparation and determination of selenium by hydride generation and other metals by ICP-MS: procedural blanks, replicate samples, reference solutions, pre-digestion spikes, analysis spikes (post-digestion spikes), and calibration checks. Additional quality control parameters for metal determinations (semi-quantitative scan) by ICP-MS included a calibration verification standard and a laboratory control sample. All quality control results were tabulated to provide an overview of quality assurance and to facilitate interpretation.

To prepare digestates for the determination of selenium, an aliquot (20 mL) of each sample was subjected to a nitric acid - magnesium nitrate dry ashing procedure in a muffle furnace, as described in SOP C5.25. This procedure includes a hot HCl reduction of the ashed residue to reduce selenium to the +4 valence state required for instrumental analysis. Final digestate matrix was 10% HCl. Selenium was determined by flow injection hydride generation atomic absorption spectroscopy, as described in SOP C5.171.

For determination of other elements by ICP-MS, a separate aliquot (10 mL) of each pore water sample was subjected to an evaporative digestion using HNO_3 and H_2O_2 in a microwave oven (SOP C5.217). After evaporating to ~1 mL, samples were cooled and diluted to 50 mL with deionized water. Final acid matrix was 2% HNO_3. Digestates were analyzed without further dilution by a PE/SCIEX

Elan 6000 ICP-MS, which was set up and optimized according to the manufacturer's specifications and described in SOP C5.212, with the exception that the semi-quantitative scan method was used in software method setup (TotalQuant®). The accuracy of this instrumental approach is reported to be ± 30-50% by the manufacturer. Surface water samples were also analyzed by semi-quantitative scan as described for the pore water samples.

RESULTS AND DISCUSSION:

Sediment AVS and SEM, Selenium, and Semiquantitative Scan:

Percent moisture, LOI, AVS, and SEM results for sediment samples are indicated in Table 1. These results ranged as follows: moisture,29.3 to 41.5%; LOI, 0.6 to 1.8%; ; AVS, 0.0014 to 0.0031 µmole/g; simultaneously extractable metals in µg/g dry weight: Cd, 0.017 to 0.099; Cu, 0.33 to 8.43; Ni, 0.32 to 0.66; Pb, 2.34 to 6.21; and Zn, 2.96 to 14.6.

SEM/AVS ratios and SEM-AVS differences were calculated for elements which are known to form sulfides less soluble than iron or manganese and are indicated in Table 2. Sediments having an SEM/AVS ratio > 1 and positive SEM-AVS differences are considered potentially toxic to organisms in the aquatic ecosystem. The SEM-AVS difference is generally more meaningful for samples with low AVS, as is the case here, because it better reflects the magnitude of SEM "metal excess." Because these samples contained very low AVS concentrations (0.0014 - 0.0031 µmole/g), and low SEM concentrations, SEM/AVS ratios were all > 1, but the SEM-AVS differences indicated little metal excess (0.064 - 0.242 µmole/g).

Results of a semi-quantitative scan of the sediments by ICP-MS are indicated in Table 3. Generally, element concentrations were seen to increase from Site 1 to Site 5. Selenium concentrations showed little differences between the sites.

Water: Semi-Quantitative Scan and Selenium:

Concentrations of elements determined by semi-quantitative scan are indicated in Table 4 for pore waters and in Table 5 for surface waters. Concentrations of selenium determined by hydride generation atomic spectroscopy were less than the detection limit (< 0.53) for all of these samples. In general, concentrations of vanadium, chromium, manganese, cobalt, zinc, and cadmium were higher in the pore water samples than in surface waters. The ASTM soft water collected 8/15/96 (#13049) had elevated levels of aluminum, calcium, rubidium, cadmium, barium, and lead when compared to ``ASTM H_2O 8/16/96'' (#13056) and may indicate contamination by these elements.

QUALITY CONTROL:

Calibration:

Instrument calibration during quantitative analysis of sediment SEM extracts by ICP-MS was verified by analyzing a continuing calibration blank and independent calibration verification standards, as indicated in Table 6. Periodic runs of a laboratory control solution served to monitor calibration throughout the TotalQuant® scan for sediments (Table 7) and for water (Table 9). A standardized Na_2S solution confirmed calibration of the sulfide-specific electrode during AVS determination (Table 8), and NIST certified solutions were used to verify instrumental calibration during the determination of selenium by hydride generation (Table 8).

Control Materials:

Results from the analysis of control materials are indicated in Tables 10-13. For SEM analyses, reference solutions (NIST 1643d and TMDW) were analyzed as ICP-MS laboratory control samples, and recoveries ranged from 88 - 110 percent (Table 10). A NIST 2704 river sediment was extracted with 1 N HCL, which resulted in fair recoveries for cadmium, copper, lead, and zinc, but poorer recoveries for and nickel (Table 10). Similar results were seen with another sediment reference material, NIST 1645, except that copper along with nickel exhibited poorer recoveries in an extract of this material. Low recoveries for a partial digestion such as the 1N HCl treatment are not unexpected because NIST certified ranges for sediment are based on recovery of metals from a "total" digestion procedure. These recoveries are consistent with previous 1N HCl digestions performed by MSC on sediments. Recoveries of elements from reference sediments acid digested by microwave and analyzed by a semi-quantitative scan are indicated in Table 11. Low recoveries exhibited from various elements in the three materials may reflect the ``acid extractable'' digestion used, which yields incomplete solubilization of the sediment. Lead and iron exhibited high recoveries, but fair to good recoveries were observed for most of the remaining elements. Recoveries of sulfide from a 1N HCl extract of NIST 1645 River Sediment and selenium in two reference waters and two reference sediments analyzed by hydride atomic absorption were excellent (Table 12). Recoveries of elements in two reference solutions subjected to an evaporative digestion with pore water samples and analyzed by ICP-MS TotalQuant® scan are indicated in Table 13. Recoveries were fair to good for most elements, with the exception of cadmium and vanadium in NIST 1643d and iron in QCP-TMS.

Analytical and Method Precision:

Analytical precision for the SEM quantitative analysis was measured by analyzing a sediment sample twice at the instrument and determining the relative percent difference (RPD), which ranged from - 1.1 to 0.43 (#12551 ICPMS DUP), as indicated in Table 14. Method precision was estimated in two ways: from the duplicate extraction and microwave evaporative digestion of a sample, and from the duplicate microwave evaporative digestion alone. Precision was poorest for a duplicate extraction and microwave evaporative digestion performed on sample #13387, with RPD values ranging from 68 - 95%. Precision for just a microwave digestion alone on samples #13021 and #13387 was also poor, with RPDs ranging from 36 to 104%. A duplicate microwave digestion on extract #13385 indicated good precision, with RPDs ranging from - 1.5 to 26%. Four other samples from another sample set that were duplicated and ran with these Los Alamos samples exhibited RPD values generally < 30%. Method precision from the duplicate preparation and analysis of sediment sulfide exhibited RPD values ranging from 21 to 58% (Table 15). Analytical precision for the TotalQuant® scan on sediments was determined by repeated runs of a reference solution, which exhibited percent relative standard deviation values of < 19% (Table 16). The %RSD for the triplicate preparation and analysis of sediment samples for selenium by hydride generation ranged from 5.9 to 13.5% (Table 17). The duplicate digestion and analysis of a pore water sample by TotalQuant® indicated RPD values < 33% for most elements, but poorer results for Fe, Cu, Zn, As, and Ag(Table 18). Analytical precision for the TotalQuant® scan on surface water samples was determined by repeated runs of a reference solution, which exhibited percent relative standard deviation values of < 19% (Table 19). The %RSD for the triplicate preparation and analysis of water samples for selenium by hydride generation ranged from 0.0 to 58% (Table 17). However, concentrations for all samples were < the method limit of detection (0.53), so the precision of replicates for selenium is not indicative of the overall method.

Analytical precision within an instrumental run for Se by hydride generation indicated a %RSD of 1.9% for water and 3.0 - 4.3% for sediments (Table 20).

Spikes:

SEM sample spikes were of three types: analytical (performed on digested extract during instrumental analysis), MW Digest. (extract spiked at level of microwave evaporative digestion, and SEM (sample or reagent blank spiked before extraction with HCl). The recoveries for these spike types are indicated in Table 21, and ranged from 76 - 116%, regardless of spike type. The recoveries of spiked sulfide from a reagent blank and sediment samples ranged from 89% to 93%, respectively (Table 22). Two post

extraction sulfide spikes indicated no significant matrix suppression or enhancement, as recovery ranged from 98% to 102% (Table 23). Recoveries of elements from spiked sediment samples and blanks digested and analyzed by a TotalQuant® scan are indicated in Tables 24 and 25. For samples having spike/background ratios > 1, recoveries ranged from 80% to 129%, but poorer recoveries were observed for W and Ag (low) and Tl and Pb (high). Similarly, digested blank spike recoveries ranged from 79% to 138% (Table 25), but Tl and Pb again exhibited high recoveries (198% and 241%). Sediment samples spiked with selenium and digested exhibited recoveries of 90% to 98% (Table 22). A post-digestion (analysis) spike on a sediment digestate analyzed during the semi-quantitative scan exhibited recoveries ranging from 80% to 133% (Table 26), but high recoveries for Tl and Pb (206% and 259%). This continuing pattern of high recoveries for Tl and Pb in sediment digestates indicated a significant matrix enhancement problem for these elements. An analysis spike on a pore water sample analyzed by ICP-MS TotalQuant® scan exhibited recoveries ranging from 74 to 124% (Table 27). Blank spikes analyzed by the same technique exhibited recoveries ranging from 65% to 137% for those elements having spike/background ratios > 10 (Table 28). Recoveries of selenium from spiked pore water and surface water ranged from 103% to 110% (Table 22), and analysis spike recoveries ranged from 110% to 117% (Table 23).

ICP-MS Interference Checks:

Quantitative analysis by ICP-MS requires the analysis of two interference checks. A five fold dilution of a sediment extract indicated agreement 11 percent or better for all elements (Table 29). A synthetic interference check solution was analyzed with percent recoveries of analytes of interest indicated in Table 30. The high Cd recovery is due to the interference of MoO on Cd in this synthetic solution which contains 2 ppm Mo. This does not reflect sample matrix behavior, since Mo in pore water was not in appreciable quantities. Overall, these results indicate that the ICP-MS is adequately correcting for interferences.

Blank Equivalent Concentrations:

Blank equivalent concentrations (BEC) were computed for sulfide and selenium in SEM procedural blanks. The results in Table 31 indicate BEC values that are less than the method limit of detection for each analyte and matrix.

Instrument Detection Limits, Method Detection Limits, and Limits of Quantitation:

Instrument detection limits, method detection limits, and limits of quantitation are indicated in Table 32 for each SEM analyte determined by ICP-MS quantitative analysis, and in Tables 33 and 34 for sulfide and selenium.

Overall, the quality control results were considered to be acceptable based on specifications established by MSC.

Table 1. Percent moisture, loss on ignition, acid volatile sulfide (μmol/g), and concentrations of elements (μg/g) in sediments from Los Alamos.

MSC #	Field ID	Matrix	% Moisture	% LOI	AVS	Cd	Cu	Ni	Pb	Zn
13018	Site 1 (Los Alamos Ref)	Sediment Extract	41.5	1.8	0.0031	0.017	0.33	0.32	2.39	2.96
13019	Site 3 (Sandia Canyon)	Sediment Extract	34.3	1.3	0.0022	0.075	1.51	0.63	2.34	12.9
13020	Site 4 (Pajarito Canyon	Sediment Extract	29.3	0.6	0.0014	0.052	0.81	0.40	4.66	3.35
13021	Site 5 (Cononde Valle)	Sediment Extract	34.0	1.0	0.0026	0.099	8.43	0.66	6.21	14.6

Table 2. Ratio of SEM/AVS (a) and SEM-AVS difference (b) for cadmium, copper, nickel, lead, and zinc.

a. SEM/AVS

MSC #	Field Label	Cd	Cu	Ni	Pb	Zn	Σ^a
13018	Site 1 (Los Alamos Ref)	0.048	1.69	1.74	3.72	14.59	21.8
13019	Site 3 (Sandia Canyon)	0.302	10.80	4.87	5.13	89.73	111.
13020	Site 4 (Pajarito Canyon	0.331	9.13	4.91	16.08	36.64	67.1
13021	Site 5 (Cononde Valle)	0.337	51.00	4.35	11.52	86.00	153.

[a]Σ = Σ[Cd,Cu,Ni,Pb,Zn] µMol/g ÷AVS µMol/g.

b. SEM - AVS

MSC #	Field Label	Cd	Cu	Ni	Pb	Zn	Σ^a
13018	Site 1 (Los Alamos Ref)	-0.0030	0.0021	0.0023	0.0084	0.0421	0.064
13019	Site 3 (Sandia Canyon)	-0.0015	0.0216	0.0085	0.0091	0.1952	0.242
13020	Site 4 (Pajarito Canyon	-0.0009	0.0114	0.0055	0.0211	0.0499	0.093
13021	Site 5 (Cononde Valle)	-0.0017	0.1300	0.0087	0.0274	0.2210	0.396

[a]Σ = Σ[Cd,Cu,Ni,Pb,Zn] µMol/g - AVS µMol/g.

Table 3. Semi-quantitative scan of elements in Los Alamos sediments by ICP-MS. Units are µg/g dry weight. Selenium (Se) determined by hydride generation atomic spectroscopy.

Element	Site 1 LA Ref 13018	Site 3 Sandia 13019	Site 4 Pajarito 13020	Site 5 Can. Valle 13021
Li	6.1	6.2	3.8	9.8
Na	175.	151.	209.	416.
Mg	169.	277.	283.	776.
Al	1369.	1989.	2362.	4612.
K	427.	500.	609.	1054.
Ca	194.	336.	405.	912.
Sc	0.6	1.1	1.3	3.1
Ti	94.1	115.	157.	217.
V	ND[a]	ND	11.4	7.6
Cr	ND	16.0	ND	ND
Mn	56.1	81.0	348.	406.
Fe	1841.	3158.	5600.	6932.
Co	0.4	1.0	4.4	2.5
Ni	0.9	1.3	2.2	3.3
Cu	0.8	2.4	3.3	12.4
Zn	10.6	30.1	15.0	46.5
Ga	1.0	1.4	1.7	3.4
Ge	0.04	0.03	0.04	0.09
As	1.0	1.5	2.9	2.8
Se[b]	0.04	0.02	0.04	0.06
Rb	3.1	4.4	3.9	6.5
Sr	2.1	3.7	5.6	9.0
Y	4.1	3.9	4.2	7.1
Zr	2.3	1.9	3.7	6.0
Nb	0.8	0.7	0.6	1.2
Mo	0.1	0.6	0.5	0.3
Ru	ND	ND	ND	ND
Pd	0.01	0.02	0.04	0.04
Ag	ND	0.3	0.7	0.6
Cd	ND	0.06	0.01	0.05
In	0.03	0.02	0.02	0.06
Sn	0.6	0.6	0.6	2.1
Sb	ND	ND	ND	ND
Te	ND	0.006	0.01	0.03
Cs	0.3	0.4	0.4	0.6
Ba	13.8	23.0	72.9	1906.
La	7.2	8.4	12.1	21.9
Ce	12.3	16.5	23.7	43.0
Pr	2.0	2.2	2.6	5.2
Nd	5.8	6.9	8.7	17.5
Sm	1.3	1.3	1.7	3.9
Eu	0.03	0.08	0.2	0.4
Gd	1.5	1.6	2.0	3.6
Tb	0.2	0.2	0.3	0.5
Dy	1.3	1.3	1.5	2.7
Ho	0.2	0.2	0.2	0.4
Er	0.6	0.6	0.7	1.0
Tm	0.08	0.08	0.09	0.2
Yb	0.7	0.7	0.7	1.2
Lu	0.1	0.09	0.1	0.2
Hf	0.2	0.2	0.4	0.5
Ta	0.03	0.04	0.03	0.04
W	0.4	0.3	0.3	1.7
Re	ND	ND	ND	ND
Os	ND	ND	ND	ND
Ir	ND	ND	ND	ND
Pt	ND	ND	ND	ND
Au	0.03	0.04	0.02	0.02
Tl	ND	0.008	0.02	0.2
Pb	8.4	10.2	24.5	25.9
Th	2.4	3.1	4.6	5.5
U	0.4	0.3	0.4	0.7

[a]ND = not detected.

[b]Se method detection limit = 0.007 µg/g dry weight.

Table 4. Semi-quantitative scan of elements (ppb) in Los Alamos Pore Water by ICP-MS. Selenium (Se) determined by hydride generation atomic spectroscopy.

Element	Est. Det. Limit	Site 1 8/20/96 13061	Site 3 8/20/96 13062	Site 4 8/20/96 13063	Site 5 8/20/96 13064
Li	0.010	4.40	18.4	1.65	3.10
Na	0.010	5143.	55992.	8927.	12887.
Mg	0.010	2021.	3963.	2721.	3098.
Al	0.010	53.5	66.8	57.1	72.7
K	0.100	2258.	8280.	2165.	2090.
Ca	0.100	6224.	15957.	8711.	11233.
Sc	0.010	9.15	12.3	5.60	5.45
Ti	0.010	7.70	11.7	3.60	4.25
V	0.010	342.	332.	372.	340.
Cr	0.010	10.8	17.4	44.3	11.9
Mn	0.010	118.	352.	125.	217.
Fe	0.010	ND	55.2	137.	ND
Co	0.010	0.40	0.50	0.85	0.35
Ni	0.010	1.55	3.35	17.70	2.05
Cu	0.010	2.15	7.10	3.40	2.95
Zn	0.010	179.	50.6	71.6	61.4
Ga	0.010	0.85	1.05	1.10	1.00
Ge	0.010	0.50	0.70	0.75	0.50
As	0.010	0.35	2.40	0.30	ND
Se	0.530	< 0.53	< 0.53	< 0.53	< 0.53
Rb	0.010	5.70	5.45	1.50	2.05
Sr	0.010	45.6	77.8	69.9	100.
Y	0.001	0.20	0.15	0.25	0.35
Zr	0.001	0.20	0.25	0.15	0.15
Nb	0.001	0.05	0.05	ND	ND
Mo	0.001	0.25	48.4	1.10	0.80
Ru	0.001	ND	ND	ND	ND
Pd	0.010	ND	ND	ND	ND
Ag	0.001	0.20	0.90	0.25	0.10
Cd	0.010	7.25	6.15	4.90	3.30
In	0.001	ND	ND	ND	ND
Sn	0.010	10.4	10.9	11.4	9.75

Element	Est. Det. Limit	Site 1 8/20/96 13061	Site 3 8/20/96 13062	Site 4 8/20/96 13063	Site 5 8/20/96 13064
Sb	0.001	0.25	0.30	0.25	0.25
Te	0.010	0.05	0.05	0.05	0.05
Cs	0.001	0.05	0.05	ND	ND
Ba	0.001	76.9	118.	55.7	3782.
La	0.001	0.15	0.15	0.20	0.20
Ce	0.001	0.30	0.40	0.35	0.35
Pr	0.001	0.05	0.05	0.10	0.05
Nd	0.001	0.15	0.15	0.20	0.20
Sm	0.001	0.05	ND	0.05	0.10
Eu	0.001	ND	ND	ND	0.50
Gd	0.001	0.05	0.05	0.05	0.05
Tb	0.001	ND	ND	0.05	ND
Dy	0.001	0.05	0.05	0.05	0.05
Ho	0.001	ND	ND	ND	ND
Er	0.001	ND	ND	0.05	0.05
Tm	0.001	ND	ND	0.05	ND
Yb	0.001	0.05	ND	0.05	0.20
Lu	0.001	ND	ND	ND	0.05
Hf	0.001	ND	ND	ND	ND
Ta	0.001	ND	ND	ND	ND
W	0.001	0.10	2.65	0.10	0.45
Re	0.001	ND	ND	ND	ND
Os	0.001	ND	ND	ND	ND
Ir	0.001	ND	ND	ND	ND
Pt	0.001	ND	ND	ND	ND
Au	0.001	0.05	0.35	1.10	0.40
Tl	0.001	0.10	0.05	0.10	0.10
Pb	0.001	1.05	1.40	1.30	1.20
Th	0.001	ND	ND	ND	ND
U	0.001	ND	0.35	0.10	0.10

[a]ND = not detected; value of "0.00" resulting from TotalQuant determination (semi-quantitative analysis).

Table 5. Concentrations (ppb) of elements in Los Alamos water samples determined by semi-quantitative scan.

Element	Est. Det. Limit	Site 1 8/13/96 13036	Site 2 8/13/96 13037	Site 3 8/13/96 13038	Site 4 8/13/96 13039	Site 5 8/13/96 13040	Site 1 8/14/96 13043	Site 2 8/14/96 13044	Site 3 8/14/96 13045	Site 4 8/14/96 13046	Site 5 8/14/96 13047	Site 1 8/16/96 13050
Li	0.010	6.11	3.50	25.4	2.32	4.50	5.58	3.83	22.7	3.35	3.89	6.26
Na	0.010	6375.	5969.	58275.	10680.	17161.	6483.	6409.	52241.	13549.	17310.	6557.
Mg	0.010	3066.	2964.	4570.	3121.	4191.	2852.	3045.	4553.	3458.	3861.	2969.
Al	0.010	54.7	64.5	29.5	89.3	35.9	39.4	43.9	24.3	97.8	46.4	40.8
K	0.100	2377.	2257.	9336.	2948.	2379.	2436.	2555.	9077.	3618.	3144.	2882.
Ca	0.100	7190.	8021.	18685.	10634.	15523.	7498.	8036.	17979.	10955.	14965.	7233.
Sc	0.010	9.14	7.09	19.6	6.11	9.31	7.46	6.25	19.4	5.93	8.86	8.22
Ti	0.010	6.82	5.93	18.6	6.10	6.28	6.05	5.18	16.5	6.15	6.49	6.53
V	0.010	2.26	1.10	8.30	1.55	1.15	2.23	1.19	8.53	1.93	1.03	2.45
Cr	0.010	1.31	0.17	4.47	0.96	0.86	1.00	0.54	4.11	1.31	1.29	1.54
Mn	0.010	2.51	15.4	57.1	17.4	22.2	2.2	21.7	51.7	16.2	19.5	3.16
Fe	0.010	80.1	ND[a]	321	70.8	88.0	3.5	76.2	207	83.9	42.6	70.6
Co	0.010	0.07	0.07	0.14	0.16	0.17	0.06	0.12	0.17	0.14	0.23	0.07
Ni	0.010	1.94	1.86	1.96	3.51	2.33	1.26	1.53	2.37	2.92	4.94	2.07
Cu	0.010	0.36	0.83	5.11	6.35	2.32	2.40	3.43	5.69	24.6	12.9	4.97
Zn	0.010	7.89	10.9	23.9	36.3	14.4	30.3	30.0	24.8	42.9	88.9	37.3
Ga	0.010	0.05	0.06	0.05	0.08	0.01	0.01	0.02	0.04	0.05	0.01	0.02
Ge	0.010	0.01	ND	0.22	ND	0.01	0.01	ND	0.18	ND	ND	ND
As	0.010	0.89	0.63	5.03	0.23	0.96	0.56	0.63	5.56	1.00	0.60	0.31
Se[b]	0.53	< 0.53	<0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53
Rb	0.010	6.62	5.81	7.74	2.39	2.96	6.92	5.61	8.18	3.01	3.80	7.16
Sr	0.010	55.7	65.8	88.0	75.7	125.	54.2	65.0	84.9	79.8	120.	56.3
Y	0.001	0.14	0.19	0.17	0.32	0.41	0.12	0.16	0.12	0.31	0.37	0.12
Zr	0.001	0.11	0.15	0.17	0.26	0.11	0.12	0.14	0.15	0.29	0.13	0.15
Nb	0.001	0.03	0.04	0.04	0.02	0.02	0.02	0.03	0.04	0.02	0.01	0.03
Mo	0.001	0.39	0.43	63.7	0.36	0.94	0.45	0.51	56.6	2.44	0.77	0.36
Ru	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pd	0.010	ND	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ag	0.001	0.10	ND	0.12	0.10	ND	ND	ND	0.08	ND	ND	ND
Cd	0.010	0.40	0.23	0.39	3.05	1.61	3.37	3.87	1.65	3.84	5.92	2.05
In	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sn	0.010	0.18	0.17	0.24	0.22	0.14	0.15	0.11	0.26	0.29	0.74	0.29

[a]ND = not detected; value of "0.00" resulting from TotalQuant determination (semi-quantitative analysis).

[b]Se concentrations determined by flow injection hydride generation atomic absorption spectroscopy.

Table 5. Concentrations (ppb) of elements in Los Alamos water samples determined by semi-quantitative scan..... .....(continued).....

Element	Est. Det. Limit	Site 1 8/13/96 13036	Site 2 8/13/96 13037	Site 3 8/13/96 13038	Site 4 8/13/96 13039	Site 5 8/13/96 13040	Site 1 8/14/96 13043	Site 2 8/14/96 13044	Site 3 8/14/96 13045	Site 4 8/14/96 13046	Site 5 8/14/96 13047	Site 1 8/16/96 13050
Sb	0.001	0.02	ND[a]	0.19	0.03	0.03	0.01	ND	0.14	0.02	0.08	ND
Te	0.010	ND	ND	ND	ND	ND	ND	ND	ND	0.01	ND	0.03
Cs	0.001	ND	0.02	0.09	0.02	0.01	0.07	0.02	0.09	0.02	0.01	0.08
Ba	0.001	59.3	26.5	25.1	42.7	6890.	21.9	26.4	21.7	48.7	6374.	21.2
La	0.001	ND	0.15	0.17	0.31	0.11	0.08	0.10	0.13	0.24	0.11	0.11
Ce	0.001	ND	0.34	0.42	0.43	0.13	0.12	0.28	0.33	0.34	0.13	0.18
Pr	0.001	0.02	0.04	0.05	0.08	0.03	0.02	0.03	0.04	0.07	0.02	0.03
Nd	0.001	0.08	0.13	0.12	0.28	0.09	0.07	0.10	0.10	0.21	0.07	0.08
Sm	0.001	0.01	0.02	0.02	0.05	0.02	ND	0.01	0.01	0.04	0.01	0.01
Eu	0.001	ND	ND	ND	ND	0.28	ND	ND	ND	ND	0.26	ND
Gd	0.001	0.02	0.02	0.02	0.04	0.02	0.01	0.02	0.02	0.03	0.02	0.02
Tb	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dy	0.001	0.01	0.01	0.02	0.04	0.03	0.01	0.02	0.01	0.03	0.03	0.01
Ho	0.001	ND	ND	ND	ND	0.01	ND	ND	ND	ND	0.01	ND
Er	0.001	0.01	0.01	0.01	0.02	0.06	0.01	0.01	0.02	0.02	0.05	ND
Tm	0.001	ND	ND	ND	0.01	0.01	ND	ND	ND	0.01	0.01	ND
Yb	0.001	ND	ND	ND	0.03	0.14	ND	ND	ND	0.03	0.11	ND
Lu	0.001	ND	ND	ND	0.01	0.03	ND	ND	ND	0.01	0.02	ND
Hf	0.001	ND	ND	ND	0.01	ND	0.01	0.01	ND	0.01	0.01	ND
Ta	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
W	0.001	0.15	0.04	1.44	0.03	0.08	0.10	0.04	1.44	0.08	0.08	0.06
Re	0.001	ND	ND	0.01	ND	ND	ND	ND	0.01	0.01	ND	ND
Os	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ir	0.001	0.48	0.42	0.39	0.54	0.67	1.13	0.71	0.43	0.50	0.44	1.02
Pt	0.001	1.10	1.52	0.62	1.39	0.89	1.83	1.38	0.70	0.96	0.63	1.61
Au	0.001	ND	ND	ND	0.01	ND	ND	ND	ND	ND	ND	ND
Tl	0.001	ND	0.02	ND	ND	ND	ND	0.01	ND	ND	ND	ND
Pb	0.001	0.25	0.25	0.69	0.53	0.26	0.29	0.58	0.92	2.58	3.21	1.12
Th	0.001	0.19	0.16	0.17	0.06	0.05	ND	ND	ND	ND	ND	ND
U	0.001	0.05	0.02	0.28	0.07	0.14	0.04	0.01	0.31	0.10	0.12	0.03

[a]ND = not detected; value of "0.00" resulting from TotalQuant determination (semi-quantitative analysis).

Table 5. Concentrations (ppb) of elements in Los Alamos water samples determined by semi-quantitative scan .....(continued).....

Element	Est. Det. Limit	Site 2 8/16/96 13051	Site 3 8/16/96 13052	Site 4 8/16/96 13053	Site 5 8/16/96 13054	Site 1 8/20/96 13057	Site 3 8/20/96 13058	Site 4 8/20/96 13059	Site 5 8/20/96 13060	RO BLK 8/13/96 13041	STM H2O 8/13/96 13042	RO BLK 8/15/96 13048
Li	0.010	3.84	22.3	2.30	4.53	6.28	21.66	2.03	4.50	0.02	0.16	0.04
Na	0.010	6142.	60115.	10998.	18318.	6580.	51468.	10756.	18554.	62.4	11554.	1121.
Mg	0.010	2900.	4240.	3523.	4589.	3102.	4414.	3338.	4639.	11.1	5699.	160.
Al	0.010	51.9	43.6	76.1	25.1	39.2	25.8	68.3	28.4	1.28	4.10	7.88
K	0.100	2323.	9172.	2492.	2410.	2668.	9581.	2520.	2500.	79.2	1134.	657.
Ca	0.100	8157.	17333.	10902.	15991.	7219.	17776.	10375.	16867.	70.3	13387.	488.
Sc	0.010	6.50	18.1	5.3	7.98	8.59	17.38	5.79	8.22	ND	0.19	ND
Ti	0.010	6.20	18.0	5.7	6.69	6.90	16.57	6.90	6.65	0.05	0.12	0.12
V	0.010	1.16	8.01	1.70	1.14	2.51	7.78	1.75	0.96	0.01	0.04	0.04
Cr	0.010	0.38	5.61	0.91	1.04	1.41	3.41	1.00	0.62	0.15	0.21	0.52
Mn	0.010	24.5	52.2	14.9	23.7	2.28	50.24	12.1	24.6	0.17	0.53	1.19
Fe	0.010	49.0	303.	100.	228.	7.81	264.	132.	112.	7.19	22.6	8.89
Co	0.010	0.08	0.19	0.12	0.17	0.05	0.23	0.12	0.17	0.01	0.02	0.04
Ni	0.010	0.90	3.95	1.73	2.13	1.22	2.06	1.64	1.86	0.19	1.04	2.11
Cu	0.010	0.87	10.5	2.23	1.85	5.02	6.07	3.92	1.78	0.72	1.30	11.4
Zn	0.010	7.80	46.6	18.5	7.36	25.6	27.8	35.8	6.89	7.57	2.36	38.3
Ga	0.010	0.04	0.04	0.03	0.01	0.01	0.06	0.04	0.01	ND	ND	ND
Ge	0.010	ND	0.19	ND	ND	ND	0.16	ND	ND	ND	ND	ND
As	0.010	0.44	5.45	0.94	0.73	0.62	4.53	0.62	0.37	0.05	0.11	0.07
Se[b]	0.53	< 0.53	<0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53
Sr	0.010	65.9	80.2	78.8	132.	56.8	85.6	79.5	131.	0.24	32.5	1.75
Rb	0.010	5.73	7.34	2.09	2.88	7.01	6.69	2.20	2.86	0.05	0.45	0.60
Y	0.001	0.17	0.19	0.32	0.42	0.12	0.14	0.29	0.42	ND	ND	ND
Zr	0.001	0.13	0.18	0.24	0.08	0.13	0.13	0.21	0.07	ND	0.03	0.01
Nb	0.001	0.03	0.04	0.02	0.01	0.02	0.03	0.02	0.01	ND	ND	ND
Mo	0.001	0.45	47.0	0.34	0.99	0.39	51.00	0.38	0.87	ND	0.05	ND
Ru	0.001	ND	ND	ND	ND	ND	0.00	ND	ND	ND	ND	ND
Pd	0.010	ND	ND	ND	ND	ND	0.02	ND	ND	ND	ND	ND
Ag	0.001	ND	ND	0.11	ND	ND	1.88	0.53	0.05	0.05	0.19	ND
Cd	0.010	0.38	4.35	1.97	0.69	1.00	3.04	4.73	1.16	0.15	0.52	2.69
In	0.001	ND	ND	ND	ND	ND	0.00	ND	ND	ND	ND	ND
Sn	0.010	0.07	0.36	0.13	0.15	0.49	0.46	0.29	0.16	0.45	0.16	0.39

[a]ND = not detected; value of "0.00" resulting from TotalQuant determination (semi-quantitative analysis).

Table 5. Concentrations (ppb) of elements in Los Alamos water samples determined by semi-quantitative scan .....(continued).....

Element	Est. Det. Limit	Site 2 8/16/96 13051	Site 3 8/16/96 13052	Site 4 8/16/96 13053	Site 5 8/16/96 13054	Site 1 8/20/96 13057	Site 3 8/20/96 13058	Site 4 8/20/96 13059	Site 5 8/20/96 13060	RO BLK 8/13/96 13041	STM H2O 8/13/96 13042	RO BLK 8/15/96 13048
Sb	0.001	ND[a]	0.15	0.04	0.02	ND	0.48	0.09	0.03	0.01	0.05	0.05
Te	0.010	ND	ND	ND	ND	ND	0.00	0.01	ND	ND	ND	ND
Cs	0.001	0.02	0.08	0.01	0.01	0.07	0.04	0.01	0.01	ND	0.01	ND
Ba	0.001	25.2	30.7	50.2	2764.	22.4	26.8	56.7	7728.	3.39	28.6	7.56
La	0.001	0.12	0.24	0.23	0.09	0.07	0.16	0.20	0.11	ND	0.01	ND
Ce	0.001	0.30	0.42	0.31	0.09	0.14	0.28	0.24	0.08	ND	ND	ND
Pr	0.001	0.04	0.05	0.07	0.02	0.02	0.04	0.06	0.02	ND	ND	ND
Nd	0.001	0.10	0.17	0.21	0.07	0.08	0.11	0.20	0.08	ND	ND	ND
Sm	0.001	0.01	0.02	0.04	0.02	0.01	0.03	0.03	0.01	ND	ND	ND
Eu	0.001	ND	ND	ND	0.28	ND	0.00	ND	0.24	ND	ND	ND
Gd	0.001	0.02	0.03	0.04	0.01	0.01	0.03	0.03	0.01	ND	ND	ND
Tb	0.001	ND	ND	ND	ND	ND	0.00	ND	ND	ND	ND	ND
Dy	0.001	0.01	0.02	0.04	0.04	0.01	0.01	0.03	0.04	ND	ND	ND
Ho	0.001	ND	ND	ND	0.01	ND	0.00	ND	0.01	ND	ND	ND
Er	0.001	0.01	0.02	0.02	0.07	0.01	0.01	0.02	0.06	ND	ND	ND
Tm	0.001	ND	ND	ND	0.02	ND	0.00	ND	0.01	ND	ND	ND
Yb	0.001	0.01	0.00	0.03	0.13	ND	0.00	0.02	0.16	ND	ND	ND
Lu	0.001	ND	ND	0.01	0.03	ND	0.00	0.01	0.03	ND	ND	ND
Hf	0.001	ND	ND	ND	ND	ND	0.00	ND	0.01	ND	ND	ND
Ta	0.001	ND	ND	ND	ND	ND	0.00	ND	ND	ND	ND	ND
W	0.001	0.05	1.39	0.04	0.10	0.07	1.33	0.03	0.09	ND	ND	ND
Re	0.001	ND	0.01	ND	0.01	ND	0.01	ND	ND	ND	ND	ND
Os	0.001	ND	0.00	ND	ND	ND	0.00	ND	ND	ND	ND	ND
Ir	0.001	0.43	0.42	0.51	0.73	1.20	0.60	0.88	0.59	ND	ND	ND
Pt	0.001	0.83	0.53	0.80	1.23	2.24	1.03	1.20	0.98	ND	ND	ND
Au	0.001	ND	ND	ND	ND	ND	0.00	ND	ND	ND	ND	ND
Tl	0.001	0.02	0.00	ND	ND	ND	0.02	ND	0.01	ND	ND	ND
Pb	0.001	0.40	4.69	1.19	0.84	0.59	1.67	0.79	0.49	0.10	0.11	3.58
Th	0.001	ND	ND	ND	ND	ND	0.00	ND	ND	0.02	0.16	ND
U	0.001	0.02	0.26	0.09	0.13	0.03	0.33	0.08	0.14	ND	0.03	ND

[a]ND = not detected; value of "0.00" resulting from TotalQuant

Table 5. Concentrations (ppb) of elements in Los Alamos water samples determined by semi-quantitative scan .....(continued).....

Element	Est. Det. Limit	ASTM H2O 8/15/96 13049	RO BLK 8/16/96 13055	ASTM H2O 8/16/96 13056	Filtration Blk 8/21/96 13065
Li	0.010	0.20	ND[a]	0.06	ND
Na	0.010	11561	81.2	11523	140
Mg	0.010	4826	19.5	4892	20
Al	0.010	12.8	1.66	2.30	2.75
K	0.100	1792	86.9	923	84
Ca	0.100	12118	52.9	7665	89
Sc	0.010	0.20	ND	ND	ND
Ti	0.010	0.34	0.01	0.08	0.01
V	0.010	0.15	0.02	0.03	0.05
Cr	0.010	0.66	0.58	0.71	1.43
Mn	0.010	3.00	0.35	0.62	1.66
Fe	0.010	19.5	3.03	7.47	15.49
Co	0.010	0.08	0.01	0.02	0.01
Ni	0.010	4.76	0.71	4.12	0.39
Cu	0.010	10.7	1.27	0.86	0.68
Zn	0.010	61.3	10.4	5.86	7.94
Ga	0.010	ND	ND	ND	ND
Ge	0.010	ND	ND	ND	ND
As	0.010	0.25	0.04	ND	0.03
Se[b]	0.53	< 0.53	<0.53	< 0.53	< 0.53
Sr	0.010	41.8	0.38	40.4	0.34
Rb	0.010	1.25	0.07	0.15	0.05
Y	0.001	0.01	ND	ND	ND
Zr	0.001	0.04	0.01	ND	0.01
Nb	0.001	ND	ND	ND	ND
Mo	0.001	0.07	0.01	0.01	ND
Ru	0.001	ND	ND	ND	ND
Pd	0.010	ND	ND	ND	ND
Ag	0.001	ND	ND	ND	ND
Cd	0.010	5.03	0.29	0.72	0.09
In	0.001	ND	ND	ND	ND
Sn	0.010	3.10	0.39	0.11	0.77

[a]ND = not detected; value of "0.00" resulting from TotalQuant determination (semi-quantitative analysis).

[b]Se concentrations determined by flow injection hydride generation atomic absorption spectroscopy.

Table 5. Concentrations (ppb) of elements in Los Alamos water samples determined by semi-quantitative scan .....(continued).....

Element	Est. Det. Limit	ASTM H2O 8/15/96 13049	RO BLK 8/16/96 13055	ASTM H2O 8/16/96 13056	Filtration Blk 8/21/96 13065
Sb	0.001	0.07	0.01	ND[a]	0.04
Te	0.010	ND	0.01	ND	ND
Cs	0.001	0.01	ND	ND	ND
Ba	0.001	338	8.07	37.3	1.4
La	0.001	0.01	ND	ND	ND
Ce	0.001	0.01	ND	ND	ND
Pr	0.001	ND	ND	ND	ND
Nd	0.001	0.01	ND	ND	ND
Sm	0.001	ND	ND	ND	ND
Eu	0.001	0.01	ND	ND	ND
Gd	0.001	ND	ND	ND	ND
Tb	0.001	ND	ND	ND	ND
Dy	0.001	ND	ND	ND	ND
Ho	0.001	ND	ND	ND	ND
Er	0.001	ND	ND	ND	ND
Tm	0.001	ND	ND	ND	ND
Yb	0.001	ND	ND	ND	ND
Lu	0.001	ND	ND	ND	ND
Hf	0.001	ND	ND	ND	ND
Ta	0.001	ND	ND	ND	ND
W	0.001	ND	ND	ND	ND
Re	0.001	ND	ND	ND	ND
Os	0.001	ND	ND	ND	ND
Ir	0.001	ND	ND	ND	ND
Pt	0.001	ND	ND	ND	ND
Au	0.001	ND	ND	ND	ND
Tl	0.001	ND	ND	ND	ND
Pb	0.001	3.22	0.29	0.51	0.14
Th	0.001	ND	ND	ND	ND
U	0.001	0.04	ND	0.01	ND

[a]ND = not detected; value of "0.00" resulting from TotalQuant

Table 6. Concentrations of elements in a continuing calibration blank (CCB) and independent calibration verification standard (ICVS) ran every 10 samples. Results expressed as ug/L.

BID[a] & Run #	Element	CCB[b]	ICVS	% Rec (ICVS)[c]
10/9/96 Run #1	Ni	-0.0073	9.20	102.
	Cu	0.0016	45.6	101.
	Zn	-0.0011	44.0	98.
	Cd	0.0006	2.88	96.
	Pb	0.0008	40.9	91.
10/9/96 Run #2	Ni	-0.0326	9.42	105.
	Cu	0.0012	46.2	103.
	Zn	-0.0119	45.0	100.
	Cd	-0.0004	2.83	94.
	Pb	0.0012	40.5	90.
10/9/96 Run #3	Ni	-0.0268	9.50	106.
	Cu	0.0125	45.5	101.
	Zn	0.1936	44.0	98.
	Cd	0.0021	2.80	93.
	Pb	0.0429	41.1	91.
10/9/96 Run #4	Ni	-0.0325	9.31	103.
	Cu	0.0111	46.5	103.
	Zn	0.2040	45.2	101.
	Cd	0.0019	2.84	95.
	Pb	0.0386	41.1	91.
10/9/96 Run #5	Ni	-0.0220	9.45	105.
	Cu	0.0111	45.9	102.
	Zn	0.2311	43.2	96.
	Cd	0.0015	2.79	93.
	Pb	0.0395	40.0	89.
10/9/96 Run #6	Ni	-0.0197	9.32	104.
	Cu	0.0282	44.9	100.
	Zn	-0.1395	42.5	94.
	Cd	0.0005	2.86	95.
	Pb	0.0346	40.0	89.
10/9/96 Run #7	Ni	-0.0233	9.41	105.
	Cu	0.0277	44.8	100.
	Zn	-0.0829	42.3	94.
	Cd	0.0027	2.84	95.
	Pb	0.0368	40.1	89.
10/9/96 Run #8	Ni	-0.0042	9.34	104.
	Cu	0.0325	45.5	101.
	Zn	-0.0565	42.0	93.
	Cd	0.0027	2.97	99.
	Pb	0.0366	40.2	89.
10/9/96 Run #9	Ni	0.0453	9.52	106.
	Cu	0.0440	46.3	103.
	Zn	0.0132	42.1	94.
	Cd	0.0053	2.95	98.
	Pb	0.0397	39.8	89.
10/9/96 Run #10	Ni	0.0626	9.73	108.
	Cu	0.0495	47.6	106.
	Zn	-0.0056	42.9	95.
	Cd	0.0042	2.95	98.
	Pb	0.0399	40.0	89.
10/9/96 Run #11	Ni	0.0723	9.70	108.
	Cu	0.0446	46.9	104.
	Zn	0.0514	42.8	95.
	Cd	0.0062	3.03	101.
	Pb	0.0362	40.1	89.
10/9/96 Run #12	Ni	0.0805	9.80	109.
	Cu	0.0532	47.8	106.
	Zn	0.0387	43.3	96.
	Cd	0.0048	3.07	102.
	Pb	0.0364	39.7	88.

[a]BID & Run # = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block"; run # refers to # of times CCB or ICVS analyzed in analytical run.

[b]acceptance criteria for CCB is +/- 3 X IDL for each element.

[c]acceptance criteria for ICVS = +/- 10% (90% - 110%).

ICVS = 45ppb for all elements except Ni and Cd, which were 9 ppb and 3ppb respectively.

Table 7. Recovery of elements from a calibration standard[a].

Element	Measured Conc(ppb)	Theoretical Conc(ppb)	Recovery
Li	86.	100.	86.
Be	103.	100.	103.
Na	128.	100.	128.
Mg	86.	100.	86.
Al	92.	100.	92.
Ca	149.	100.	149.
Sc	94.	100.	94.
V	101.	100.	101.
Cr	109.	100.	109.
Mn	87.	100.	87.
Co	94.	100.	94.
Ni	95.	100.	95.
Cu	92.	100.	92.
Zn	123.	100.	123.
As	96.	100.	96.
Se	118.	100.	118.
Sr	92.	100.	92.
Mo	85.	100.	85.
Ag	64.	100.	64.
Cd	102.	100.	102.
Sb	118.	100.	118.
Ba	105.	100.	105.
La	92.	100.	92.
Eu	130.	100.	130.
Ho	132.	100.	132.
Yb	143.	100.	143.
Tl	210.	100.	210.
Pb	169.	100.	169.
Th	218.	100.	218.
U	210.	100.	210.

[a]High Purity Standards ICP-MS Calibration Standard; Cat.# ICP-MSCS.

Table 8. Performance of calibration solutions used for instrument calibration during AVS and selenium determinations.

BID[a]	Ele.	Run Date	Ref. Material	Actual Conc	Meas Conc 1	Meas Conc 2	% Error 1	% Error 2	ISOP[b]	Oper Init.
8/28/96	S	8/30/97	Na_2S Soln	18.6	-1.6	17.8	-1.6	-4.3	C5.156	WGB
1/22/97	Se	2/6/97	NIST 3149	5.0	4.99	5.19	0.2	3.8	C5.171	MJW
3/3/97	Se	3/6/97	NIST 3150	5.0	5.08	4.90	1.6	-2.0	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]ISOP = instrumental standard operating procedure.

Table 9. Recovery of elements from a calibration standard[a].

Element	Actual Conc	Measured Conc	% Recovery
Al	80.	63.7	80.
V	80.	71.0	89.
Cr	80.	68.1	85.
Mn	80.	69.4	87.
Co	80.	72.5	91.
Ni	80.	72.3	90.
Cu	80.	82.0	103.
Zn	80.	95.9	120.
As	80.	88.3	110.
Ag	80.	83.6	104.
Cd	80.	87.3	109.
Sb	80.	84.3	105.
Ba	80.	72.6	91.
Tl	80.	68.3	85.
Pb	80.	73.9	92.

[a]High Purity Standard ICP-MS Calibration Standard; Cat# ICP-MSCS.

Table 10. Recoveries of elements from reference solutions and HCl extracted reference sediment materials.

Reference Material	Element	Actual Conc.(µg/g)	Meas. Conc.(µg/g)	% Rec
NIST 1643d[a]	Ni	58.1 +/- 2.7	60.3	104.
	Cu	20.5 +/- 3.8	20.9	102.
	Zn	72.48 +/- 0.65	73.1	101.
	Cd	6.47 +/- 0.37	7.1	110.

Reference Material	Element	Actual Conc.(µg/g)	Meas. Conc.(µg/g)	SD n=7	% Rec
TMDW[b]	Ni	60 +/- 6	62.3	1.52	104.
	Cu	20 +/- 2	19.6	0.42	98.0
	Zn	70 +/- 7	61.6	0.49	88.0
	Cd	10 +/- 1	10.7	0.45	107.
	Pb	40 +/- 4	37.7	0.17	94.2

Reference Material	Element	Actual Conc.(µg/g)	Meas. Conc.(µg/g)	% Rec
NIST 2704 Buffalo River Sediment[c]	Ni	44.1 +/- 3	8.66	19.6
	Cu	98.6 +/- 5	61.0	61.9
	Zn	438 +/- 12	275.	62.8
	Cd	3.45 +/- 0.22	3.35	97.4
	Pb	161 +/- 17	124.	76.9

Reference Material	Element	Actual Conc.(µg/g)	Meas. Conc.(µg/g)	SD n=3	% Rec
NIST 1645 River Sediment[d]	Ni	45.8 +/- 2.9	23.2	7.65	50.7
	Cu	109 +/- 19	52.0	1.45	47.7
	Zn	1720 +/- 170	1270.	19.5	73.8
	Cd	10.2 +/- 1.5	6.8	0.20	66.7
	Pb	714 +/- 28	508.	77.5	71.2

[a]NIST 1643d = National Institute of Standards and Technology Standard Reference Material Trace Elements in Water 1643d. Concentration results in mg/L. Solution used as instrumental laboratory control sample.

[b]TMDW = Trace Metals in Drinking Water laboratory control solution, Cat # CRM-TMDW; concentration results in µg/L. Solution used as instrumental laboratory control sample.

[c]NIST Buffalo River Sediment = National Institute of Standards and Technology SRM 2704 extracted with 1N HCl; concentration results in µg/g dry weight.

[d]NIST 1645 River Sediment = National Institute of Standards and Technology SRM 1645 River Sediment extracted with 1 N HCl; concentration results in mg/g dry weight.

Table 11. Recovery of elements from reference sediment materials prepared by a total recoverable digestion and analyzed by ICP-MS semi-quantitative scan.

BID[a]	MSC QC #	Description	Matrix	Element	Units	Conc.	Certified Mean	Upper Limit	Lower Limit	% Rec.	ISOP	Oper. Init.
3/21/97	61	NIST 1645	Sediment	Na	µg/g dry	1049.	5400.	5500.	5300.	20.	C5.212	RHW/TWM
				Mg	µg/g dry	6895.	7400.	7600.	7200.	96.	C5.212	RHW/TWM
				Al	µg/g dry	5248.	22600.	23000.	22200.	24.	C5.212	RHW/TWM
				K	µg/g dry	593.	12600.	13100.	12100.	4.9	C5.212	RHW/TWM
				Ca	µg/g dry	26400.	(29000.)	---	---	91.	C5.212	RHW/TWM
				V	µg/g dry	16.	24.	30.	17.	95.	C5.212	RHW/TWM
				Cr	µg/g dry	31752.	29600.	32400.	26800.	100.	C5.212	RHW/TWM
				Mn	µg/g dry	795.	785.	882.	688.	100.	C5.212	RHW/TWM
				Fe	µg/g dry	66616.	113000.	125000.	101000.	66.	C5.212	RHW/TWM
				Co	µg/g dry	7.7	10.	11.	9.5	81.	C5.212	RHW/TWM
				Ni	µg/g dry	40.	46.	49.	43.	94.	C5.212	RHW/TWM
				Cu	µg/g dry	123.	109.	128.	90.	100.	C5.212	RHW/TWM
				Zn	µg/g dry	2304.	1720.	1890.	1550.	122.	C5.212	RHW/TWM
				As	µg/g dry	71.	(66.)	---	---	108.	C5.212	RHW/TWM
				Cd	µg/g dry	9.8	10.	12.	8.7	100.	C5.212	RHW/TWM
				Sb	µg/g dry	24.	(51.)	---	---	47.	C5.212	RHW/TWM
				Tl	µg/g dry	1.7	1.1	1.5	1.4	114.	C5.212	RHW/TWM
				Pb	µg/g dry	1487.	714.	742.	686.	200.	C5.212	RHW/TWM
				Th	µg/g dry	1.2	1.6	1.8	1.4	89.	C5.212	RHW/TWM
				U	µg/g dry	1.4	1.1	1.2	1.1	119.	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

Table 11. Recovery of elements from reference sediment materials prepared by a total recoverable digestion and analyzed by ICP-MS semi-quantitative scan .....(continued).....

BID[a]	MSC QC #	Description	Matrix	Element	Units	Conc.	Certified Mean	Upper Limit	Lower Limit	% Rec.	ISOP	Oper. Init.
3/21/97	71	NIST 2704	Sediment	Li	µg/g dry	27.	48.	52.	43.	62.	C5.212	RHW/TWM
				Mg	µg/g dry	8282.	12000.	12200.	11800.	70.	C5.212	RHW/TWM
				Al	µg/g dry	11152.	61100.	62700.	59500.	19.	C5.212	RHW/TWM
				K	µg/g dry	1285.	20000.	20400.	19600.	6.6	C5.212	RHW/TWM
				Ca	µg/g dry	20957.	26000.	26300.	25700.	82.	C5.212	RHW/TWM
				Ti	µg/g dry	52.	4570.	4750.	4390.	1.2	C5.212	RHW/TWM
				V	µg/g dry	21.	95.	99.	91.	23.	C5.212	RHW/TWM
				Cr	µg/g dry	83.	135.	140.	130.	64.	C5.212	RHW/TWM
				Mn	µg/g dry	516.	555.	574.	536.	96.	C5.212	RHW/TWM
				Fe	µg/g dry	64140.	41100.	42100.	40100.	152.	C5.212	RHW/TWM
				Co	µg/g dry	13.	14.	15.	13.	97.	C5.212	RHW/TWM
				Ni	µg/g dry	37.	44.	47.	41.	90.	C5.212	RHW/TWM
				Cu	µg/g dry	97.	99.	104.	94.	100.	C5.212	RHW/TWM
				Zn	µg/g dry	572.	438.	450.	426.	127.	C5.212	RHW/TWM
				As	µg/g dry	22.	23.	24.	23.	96.	C5.212	RHW/TWM
				Rb	µg/g dry	12.6	(100.)	---	---	13.	C5.212	RHW/TWM
				Sr	µg/g dry	31.3	(130.)	---	---	24.	C5.212	RHW/TWM
				Cd	µg/g dry	3.6	3.5	3.7	3.2	100.	C5.212	RHW/TWM
				Sn	µg/g dry	4.2	(9.5)	---	---	45.	C5.212	RHW/TWM
				Sb	µg/g dry	1.0	3.8	3.9	3.6	28.	C5.212	RHW/TWM
				Ba	µg/g dry	138.	414.	426.	402.	34.	C5.212	RHW/TWM
				Tl	µg/g dry	1.1	1.1	1.1	1.0	100.	C5.212	RHW/TWM
				Pb	µg/g dry	357.	161.	178.	144.	200.	C5.212	RHW/TWM
				Th	µg/g dry	5.1	(9.2)	---	---	55.	C5.212	RHW/TWM
				U	µg/g dry	1.5	3.1	3.3	3.0	48.	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

Table 11. Recovery of elements from reference sediment materials prepared by a total recoverable digestion and analyzed by ICP-MS semi-quantitative scan. .....(continued).....

BID[a]	MSC QC #	Description	Matrix	Element	Units	Conc.	Certified Mean	Upper Limit	Lower Limit	% Rec.	ISOP	Oper. Init.
3/21/97	68	PACS-1	Sediment	Na	µg/g dry	16865.	32600.	33400.	31800.	53.	C5.212	RHW/TWM
				Mg	µg/g dry	9561.	14500.	15000.	14000.	68.	C5.212	RHW/TWM
				Al	µg/g dry	16880.	64700.	65900.	63500.	27.	C5.212	RHW/TWM
				K	µg/g dry	3256.	12500.	13300.	11700.	27.8	C5.212	RHW/TWM
				Ca	µg/g dry	9081.	20900.	21800.	20000.	45.	C5.212	RHW/TWM
				Ti	µg/g dry	838.	4220	4290.	4150.	20.2	C5.212	RHW/TWM
				V	µg/g dry	80.	127	132.	122.	66.	C5.212	RHW/TWM
				Cr	µg/g dry	58.	113.	121.	105.	55.	C5.212	RHW/TWM
				Mn	µg/g dry	303.	470.	482.	458.	66.	C5.212	RHW/TWM
				Fe	µg/g dry	64903.	48700.	49500.	47900.	131.	C5.212	RHW/TWM
				Co	µg/g dry	17.	18.	19.	16.	100.	C5.212	RHW/TWM
				Ni	µg/g dry	38.	44.	46.	42.	89.	C5.212	RHW/TWM
				Cu	µg/g dry	542.	452.	468.	436.	116.	C5.212	RHW/TWM
				Zn	µg/g dry	1115.	824.	846.	802.	132.	C5.212	RHW/TWM
				As	µg/g dry	208.	211.	222.	200.	100.	C5.212	RHW/TWM
				Sr	µg/g dry	73.6	277.	288.	266.	28.	C5.212	RHW/TWM
				Mo	µg/g dry	11.	12.	13.	11.	95.	C5.212	RHW/TWM
				Cd	µg/g dry	2.8	2.4	2.6	2.2	110.	C5.212	RHW/TWM
				Sn	µg/g dry	33.	41.	44.	38.	88.	C5.212	RHW/TWM
				Sb	µg/g dry	57.	171.	185.	157.	36.	C5.212	RHW/TWM
				Pb	µg/g dry	1076.	404.	424.	384.	254.	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

Table 12. Concentration of AVS and selenium in various reference and/or research materials. Measured concentrations (Meas. Conc.) expressed as µg/g unless otherwise specified.

BID[a]	Ele.	QC #	Meas. Conc.	Reference Material	Matrix	Upper Limit	Lower Limit	Pass/ Fail	Prep SOP	Prep Init.	ISOP[b]	Oper. Init.
8/28/96	S	61	212.7	NIST 1645[c]	Sediment	248.3	142.9	+	C5.156	JWA	C5.156	WGB
1/22/97	Se	74	12.60	NIST 1643d[d]	Water	12.74	10.12	+	C5.25	MJW	C5.171	MJW
1/22/97	Se	77	91.70	QCP-TMS[e]	Water	94.40	75.60	+	C5.25	MJW	C5.171	MJW
3/3/97	Se	71	1.078	NIST 2704	Sediment	1.28	0.960	+	C5.26	MJW	C5.171	MJW
3/3/97	Se	68	1.042	NRCC PACS-1	Sediment	1.31	0.871	+	C5.26	MJW	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]ISOP = instrumental standard operating procedure.

[c]NIST 1645 = National Institute of Standards and Technology Standard Reference Material 1645: River Sediment.

Table 13. Recoveries of elements from acid-digested reference solutions.

NIST 1643d[a]

Element	Actual Conc.	Meas. Conc.	% Rec
Ag	1.27 +/- 0.057	1.17	96.
Al	127.6 +/- 3.5	90.1	73.
As	56.02 +/- 0.73	64.1	113.
Ca	31.04 +/- 0.5	22.4	73.
Cd	6.47 +/- 0.37	9.35	137.
Co	25 +/- 0.59	21.8	89.
Cr	18.53 +/- 0.20	16.6	91.
Cu	20.5 +/- 3.8	20.4	100.
K	2.356 +/- 0.035	2.10	90.
Li	16.6 +/- 0.55	11.7	73.
Mg	7.989 +/- 0.035	6.18	78.
Mn	37.66 +/- 0.83	31.8	86.
Mo	112.9 +/- 1.7	102.	92.
Na	22.07 +/- 0.64	17.8	83.
Ni	58.1 +/- 2.7	74.6	123.
Pb	18.15 +/- 0.64	13.0	74.
Rb	13	10.6	82.
Sb	54.1 +/- 1.1	52.6	99.
Sr	294.8 +/- 3.4	257.	88.
Te	1	1.13	113.
Tl	7.28 +/- 0.25	4.65	66.
V	35.1 +/- 1.4	70.2	192.
Zn	72.48 +/- 0.65	80.0	109.

QCP-TMS[b]

Element	Actual Conc.	Meas. Conc.	% Rec
Ag	155 +/- 2	156.	100.
Al	563 +/- 6	357.	64.
As	188 +/- 2	207.	109.
Ba	775 +/- 8	852.	109.
Cd	110 +/- 1	129.	116.
Co	600 +/- 6	517.	79.
Cr	375 +/- 4	281.	76.
Cu	763 +/- 8	671.	89.
Fe	763 +/- 8	377.	50.
Mn	325 +/- 3	257.	80.
Mo	240 +/- 3	206.	87.
Ni	450 +/- 5	365.	82.
Pb	713 +/- 7	626.	89.
Sb	238 +/- 3	250.	104.
Sr	413 +/- 4	410.	100.
Tl	190 +/- 2	171.	91.
V	750 +/- 8	800.	106.
Zn	788 +/- 8	954.	120.

[a]NIST 1643d = National Institute of Standards and Technology Standard Reference Material Trace Elements in Water 1643d; concentration units in µg/L

[b]QC+TMS = QC Plus Trace Metals Stability standard, Cat # QCP-TMS; concentration results in µg/L.

Table 14. Method precision from the duplicate digestion and analysis of sediment samples.

BID[a]	Sample ID	Matrix	Element	Rep 1	Rep 2	Diff[b]	Mean	RPD[c]	ISOP[d]	Oper. Init.
10/9/96	12551 SEM[e]	Sediment extract	Ni	0.05864	0.06752	-0.00888	0.06308	14.	C5.212	RHW/TWM
			Cu	0.11222	0.13085	-0.01863	0.12153	15.	C5.212	RHW/TWM
			Zn	0.45109	0.52147	-0.07039	0.48628	14.	C5.212	RHW/TWM
			Cd	0.00313	0.00356	-0.00043	0.00334	13.	C5.212	RHW/TWM
			Pb	0.17168	0.19584	-0.02416	0.18376	13.	C5.212	RHW/TWM
10/9/96	12547 MWB[f]	Sediment extract	Ni	0.00896	0.01838	-0.00941	0.01367	69.	C5.212	RHW/TWM
			Cu	0.01462	0.01574	-0.00112	0.01518	7.4	C5.212	RHW/TWM
			Zn	0.18569	0.17398	0.01171	0.17984	6.5	C5.212	RHW/TWM
			Cd	0.00055	0.00062	-0.00007	0.00059	13.	C5.212	RHW/TWM
			Pb	0.05093	0.05329	-0.00236	0.05211	4.5	C5.212	RHW/TWM
10/9/96	12973 MWB[f]	Sediment extract	Ni	0.05668	0.05646	0.00022	0.05657	0.40	C5.212	RHW/TWM
			Cu	0.14706	0.13929	0.00777	0.14317	5.4	C5.212	RHW/TWM
			Zn	0.13889	0.13594	0.00296	0.13741	2.2	C5.212	RHW/TWM
			Cd	0.00212	0.00219	-0.00007	0.00216	3.3	C5.212	RHW/TWM
			Pb	0.13317	0.13390	-0.00074	0.13354	0.55	C5.212	RHW/TWM
10/9/96	12976 MWB[f]	Sediment extract	Ni	0.05327	0.07190	-0.01863	0.06259	30.	C5.212	RHW/TWM
			Cu	0.17542	0.21121	-0.03580	0.19331	19.	C5.212	RHW/TWM
			Zn	0.45803	0.48953	-0.03150	0.47378	6.6	C5.212	RHW/TWM
			Cd	0.00270	0.00328	-0.00057	0.00299	19.	C5.212	RHW/TWM
			Pb	0.20514	0.22582	-0.02068	0.21548	9.6	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]Diff = Dup 1 - Dup 2.

[c]RPD = relative percent difference, calculated as Diff/Mean X 100; acceptance criteria +/- 10%.

[d]ISOP = standard operating procedure used for instrumental analysis of sample, here MSC SOP C5.212.

[e]two aliquants of sample 12551 extracted with 1N HCl followed by microwave evaporative digestion; units µg/mL.

[g]two aliquots each of HCl extracts of samples 12547, 12973, and 12976 subjected to microwave evaporative digestion; units µg/mL.

Table 14. Method precision from the duplicate digestion and analysis of sediment samples....(continued).....

BID[a]	Sample ID	Matrix	Element	Rep 1	Rep 2	Diff[b]	Mean	RPD[c]	ISOP[d]	Oper. Init.
10/9/96	13385 MWB DUP[e]	Sediment Extract	Ni	0.01915	0.02010	-0.0009479	0.01962	- 4.8	C5.212	RHW/TWM
			Cu	0.00554	0.00428	0.0012560	0.00491	26.	C5.212	RHW/TWM
			Zn	0.22147	0.22190	-0.0004370	0.22168	- 0.20	C5.212	RHW/TWM
			Cd	0.00190	0.00186	0.0000417	0.00188	2.2	C5.212	RHW/TWM
			Pb	0.07398	0.07512	-0.0011468	0.07455	- 1.5	C5.212	RHW/TWM
10/9/96	13387 MWB DUP[e]	Sediment Extract	Ni	0.15728	0.09178	0.0654970	0.12453	53.	C5.212	RHW/TWM
			Cu	0.14482	0.09317	0.0516483	0.11900	43.	C5.212	RHW/TWM
			Zn	1.23919	0.77761	0.4615806	1.00840	46.	C5.212	RHW/TWM
			Cd	0.01261	0.00876	0.0038522	0.01068	36.	C5.212	RHW/TWM
			Pb	0.60248	0.37246	0.2300157	0.48747	47.	C5.212	RHW/TWM
10/9/96	13387 SEM DUP[f]	Sediment Extract	Ni	0.15728	0.07678	0.0804971	0.11703	69.	C5.212	RHW/TWM
			Cu	0.14482	0.06492	0.0799054	0.10487	76.	C5.212	RHW/TWM
			Zn	1.23919	0.60316	0.6360285	0.92118	69.	C5.212	RHW/TWM
			Cd	0.01261	0.00619	0.0064203	0.00940	68.	C5.212	RHW/TWM
			Pb	0.60248	0.21434	0.3881400	0.40841	95.	C5.212	RHW/TWM
10/9/96	12551 ICPMS DUP[g]	Sediment Extract	Ni	0.01345	0.01360	-0.0001543	0.01353	- 1.1	C5.212	RHW/TWM
			Cu	0.02635	0.02660	-0.0002557	0.02648	- 0.97	C5.212	RHW/TWM
			Zn	0.10392	0.10348	0.0004432	0.10370	0.43	C5.212	RHW/TWM
			Cd	0.00073	0.00074	-0.0000083	0.00074	- 1.1	C5.212	RHW/TWM
			Pb	0.03897	0.03935	-0.0003733	0.03916	- 0.95	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or

[b]Diff = Dup 1 - Dup 2.

[c]RPD = relative percent difference, calculated as Diff/Mean X 100; acceptance criteria +/- 10%.

[d]ISOP = standard operating procedure used for instrumental analysis of sample, here MSC SOP C5.212.

[e]two aliquots each of HCl extracts of samples 13385 and 13387 subjected to microwave evaporative digestion; units µg/mL.

[f]two aliquants of sample 13387 extracted with 1N HCl followed by microwave evaporative digestion; units µg/mL.

[g]two aliquots of sample extract 12551 analyzed twice at the instrument.

Table 14. Method precision from the duplicate digestion and analysis of sediment samples.....(continued).....

BID[a]	Sample ID	Matrix	Element	Rep 1	Rep 2	Diff[b]	Mean	RPD[c]	ISOP[d]	Oper. Init.
10/9/96	13021 MWB DUP[e]	Sediment Extract	Ni	0.02778	0.01887	0.0089113	0.02333	38.	C5.212	RHW/TWM
			Cu	0.35252	0.11060	0.2419188	0.23156	104.	C5.212	RHW/TWM
			Zn	0.61160	0.35568	0.2559218	0.48364	53.	C5.212	RHW/TWM
			Cd	0.00412	0.00224	0.0018808	0.00318	59.	C5.212	RHW/TWM
			Pb	0.25970	0.17052	0.0891760	0.21511	41.	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or

[b]Diff = Dup 1 - Dup 2.

[c]RPD = relative percent difference, calculated as Diff/Mean X 100; acceptance criteria +/- 10%.

[d]ISOP = standard operating procedure used for instrumental analysis of sample, here MSC SOP C5.212.

[e]two aliquots each of HCl extract of sample 13021 subjected to microwave evaporative digestion; units µg/mL.

Table 15. Relative percent difference from the duplicate analysis of samples.

Analysis Date	Ele.	Matrix	Dup 1	Dup 2	Mean	Units	Diff[a]	RPD[b]	PSOP	Prep. Init.	ISOP[c]	Oper. Init.
8/28/96	S	SED EXT	1.633	1.322	1.480	µM/g	0.311	21.	C5.156	JWA	C5.156	WGB
8/28/96	S	SED EXT	0.0026	0.0047	0.0037	µM/g	0.0021	58.	C5.156	JWA	C5.156	WGB

[a]Diff = Dup 1 - Dup 2.

[b]RPD = relative percent difference, calculated as Diff/Mean X 100; acceptance criteria +/- 10%

[c]ISOP = standard operating procedure used for instrumental analysis of sample.

Table 16. Precision from repetitive analyses of a laboratory control solution[a].

Element	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Theoretical Values	Mean Conc	STD DEV	%RSD
Li	18.2	21.5	21.1	22.1	19.8	20.1	20.0	20.5	1.4	6.9
Na	6529.	6883.	6437.	6103.	5847.	5285.	6000.	6180.6	565.9	9.2
Mg	8921.	9640.	10011.	9748.	9363.	8191.	9000.	9312.2	663.1	7.1
Al	139.	143.	130.	105.	98.	97.	120.	118.7	21.2	17.9
K	2742.	2666.	2746.	2866.	2747.	2457.	2500.	2703.9	136.6	5.1
Ca	33663.	37340.	36762.	30996.	36216.	29185.	35000.	34027.0	3347.0	9.8
V	24.6	30.4	28.1	33.2	28.8	28.2	30.0	28.9	2.8	9.8
Cr	20.4	21.4	22.4	22.4	20.4	22.1	20.0	21.5	0.9	4.3
Mn	36.0	44.5	39.1	48.9	41.4	32.0	40.0	40.3	6.0	15.0
Fe	116.	150.	138.	158.	104.	101.	100.	127.7	23.9	18.7
Co	22.1	27.9	26.7	27.1	25.6	26.0	25.0	25.9	2.0	7.9
Ni	51.5	64.1	59.7	61.3	61.1	56.9	60.0	59.1	4.4	7.4
Cu	18.4	21.0	19.6	21.8	21.7	19.4	20.0	20.3	1.4	6.9
Zn	72.3	78.1	73.9	79.1	75.8	70.8	70.0	75.0	3.3	4.4
As	75.7	85.0	79.4	82.1	79.3	72.2	80.0	78.9	4.5	5.7
Rb	9.1	10.3	11.2	10.7	10.2	9.7	10.0	10.2	0.7	7.2
Mo	100.	98.	99.	105.	106.	109.	100.	103.2	4.5	4.3
Ag	1.99	2.01	2.07	2.14	1.98	1.92	2.00	2.0	0.1	3.8
Cd	9.74	10.4	10.2	10.7	10.0	9.7	10.0	10.1	0.4	3.7
Sb	9.56	10.2	10.3	10.5	10.7	9.7	10.0	10.2	0.5	4.5
Te	3.07	3.00	3.09	3.21	3.00	2.74	3.00	3.0	0.2	5.2
Ba	50.7	71.6	61.2	72.8	69.0	69.8	50.0	65.8	8.5	12.9
Tl	10.83	11.16	10.94	10.39	10.21	10.90	10.00	10.7	0.4	3.4
Pb	43.8	49.1	40.2	43.3	40.3	43.6	40.0	43.4	3.3	7.5
U	11.1	11.1	10.3	10.9	11.0	11.5	10.0	11.0	0.4	3.4

[a]High Purity Trace Metals in Drinking Water, Cat. # CRM-TMDW; High Purity Standards, Charleston, S.C.

Table 17. Percent relative standard deviation from triplicate preparation and analysis of samples for selenium.

BID[a]	Ele.	Matrix	Rep 1	Rep 2	Rep 3	Mean	Units	SD[b]	%RSD[c]	PSOP[d]	Prep. Init.	ISOP[e]	Oper. Init.
1/22/97	Se	Water	0.200	0.500	0.200	0.300	ng/mL	0.173	58.	C5.25	MJW	C5.171	MJW
1/22/97	Se	Water	0.300	0.300	0.300	0.300	ng/mL	0.000	0.0	C5.25	MJW	C5.171	MJW
1/22/97	Se	Water	0.450	0.450	0.450	0.450	ng/mL	0.000	0.0	C5.25	MJW	C5.171	MJW
3/3/97	Se	Sediment	0.206	0.184	0.191	0.193	ug/g	0.011	5.9	C5.26	MJW	C5.171	MJW
3/3/97	Se	Sediment	0.040	0.032	0.032	0.034	ug/g	0.005	13.5	C5.26	MJW	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]SD = standard deviation.

[c]%RSD = percent relative standard deviation.

[d]PSOP = standard operating procedure used for chemical preparation of sample.

[e]ISOP = standard operating procedure used for instrumental analysis of sample.

BID[a]	Matrix	Element	Dup 1	Dup 2	Diff[b]	Mean	RPD[c]	ISOP[d]	Oper. Init.
1/10/97	Pore Water	Li	4.4	5.00	- 0.600	4.70	13.	C5.212	RHW/TWM
		Na	5.14	5.61	- 0.471	5.38	8.8	C5.212	RHW/TWM
		Mg	2.02	2.13	- 0.105	2.07	5.1	C5.212	RHW/TWM
		Al	53.5	55.1	- 1.60	54.3	2.9	C5.212	RHW/TWM
		K	2258.	2404.	-145.45	2331.	6.2	C5.212	RHW/TWM
		Ca	6.22	6.74	- 0.514	6.48	7.9	C5.212	RHW/TWM
		Sc	9.15	8.00	1.15	8.58	13.	C5.212	RHW/TWM
		Ti	7.70	6.30	1.40	7.00	20.	C5.212	RHW/TWM
		V	342.	338.	3.75	340.	1.1	C5.212	RHW/TWM
		Cr	10.8	11.6	- 0.800	11.2	7.2	C5.212	RHW/TWM
		Mn	118.	130.	-11.60	124.	9.3	C5.212	RHW/TWM
		Fe	- 0.700	44.6	-45.30	22.0	206.	C5.212	RHW/TWM
		Co	0.400	0.450	- 0.050	0.43	12.	C5.212	RHW/TWM
		Ni	1.55	1.70	- 0.150	1.63	9.2	C5.212	RHW/TWM
		Cu	2.15	3.35	- 1.20	2.75	44.	C5.212	RHW/TWM
		Zn	179.	87.9	91.1	133.	68.	C5.212	RHW/TWM
		Ga	0.850	1.00	- 0.15	0.925	16.	C5.212	RHW/TWM
		Ge	0.500	0.700	- 0.200	0.600	33.	C5.212	RHW/TWM
		As	0.350	- 3.05	3.40	- 1.350	252.	C5.212	RHW/TWM
		Rb	5.70	5.65	0.050	5.68	0.88	C5.212	RHW/TWM
		Sr	45.6	47.2	- 1.60	46.4	3.5	C5.212	RHW/TWM
		Y	0.200	0.200	0.000	0.200	0.00	C5.212	RHW/TWM
		Zr	0.200	0.150	0.050	0.175	29.	C5.212	RHW/TWM
		Nb	0.050	0.050	0.000	0.050	0.00	C5.212	RHW/TWM
		Mo	0.250	0.300	- 0.050	0.275	18.	C5.212	RHW/TWM
		Ru	ND	ND	ND	---	---	C5.212	RHW/TWM
		Pd	ND	ND	ND	---	---	C5.212	RHW/TWM
		Ag	0.200	0.100	0.100	0.150	67.	C5.212	RHW/TWM
		Cd	7.25	8.10	- 0.850	7.68	11.	C5.212	RHW/TWM
		In	ND	ND	ND	---	---	C5.212	RHW/TWM
		Sn	10.4	9.70	0.700	10.1	7.0	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]Diff = Dup 1 - Dup 2; sample 13061 used for duplicate digestion and analysis.

[c]RPD = relative percent difference, calculated as Diff/Mean X 100; acceptance criteria +/- 10%.

[d]ISOP = standard operating procedure used for instrumental analysis of sample, here MSC SOP C5.212.

Table 18. Method precision from the duplicate digestion and analysis of a pore water sample....(continued)

BID[a]	Matrix	Element	Dup 1	Dup 2	Diff[b]	Mean	RPD[c]		Oper. Init.
1/10/97	Pore Water	Sb	0.25	0.25	0.00	0.3	0.00	C5.212	RHW/TWM
		Te	0.050	0.050	0.00	0.1	0.00	C5.212	RHW/TWM
		Cs	0.050	0.050	0.00	0.1	0.00	C5.212	RHW/TWM
		Ba	76.9	80.0	- 3.15	78.4	4.02	C5.212	RHW/TWM
		La	0.15	0.15	0.00	0.2	0.00	C5.212	RHW/TWM
		Ce	0.30	0.30	0.00	0.3	0.00	C5.212	RHW/TWM
		Pr	0.050	0.050	0.00	0.1	0.00	C5.212	RHW/TWM
		Nd	0.15	0.15	0.00	0.2	0.00	C5.212	RHW/TWM
		Sm	0.050	0.050	0.00	0.1	0.00	C5.212	RHW/TWM
		Eu	ND	ND	---	---	---	C5.212	RHW/TWM
		Gd	0.050	0.050	0.00	0.1	0.00	C5.212	RHW/TWM
		Tb	ND	ND	---	---	---	C5.212	RHW/TWM
		Dy	0.050	0.050	0.00	0.1	0.00	C5.212	RHW/TWM
		Ho	ND	ND	---	---	---	C5.212	RHW/TWM
		Er	ND	ND	---	---	---	C5.212	RHW/TWM
		Tm	ND	ND	---	---	---	C5.212	RHW/TWM
		Yb	0.050	0.050	0.00	0.1	0.00	C5.212	RHW/TWM
		Lu	ND	ND	---	---	---	C5.212	RHW/TWM
		Hf	ND	ND	---	---	---	C5.212	RHW/TWM
		Ta	ND	ND	---	---	---	C5.212	RHW/TWM
		W	0.10	0.10	0.00	0.1	0.00	C5.212	RHW/TWM
		Re	ND	ND	---	---	---	C5.212	RHW/TWM
		Os	ND	ND	---	---	---	C5.212	RHW/TWM
		Ir	ND	ND	---	---	---	C5.212	RHW/TWM
		Pt	ND	ND	---	---	---	C5.212	RHW/TWM
		Au	0.050	0.050	0.00	0.05	0.0	C5.212	RHW/TWM
		Tl	0.10	0.10	0.00	0.10	0.0	C5.212	RHW/TWM
		Pb	1.05	1.20	- 0.15	1.13	13.3	C5.212	RHW/TWM
		Th	ND	ND	---	---	---	C5.212	RHW/TWM
		U	ND	ND	---	---	---	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample a a member of the group or "block."

[b]Diff = Dup 1 - Dup 2; sample 13061 used for duplicate digestion and analysis.

[c]RPD = relative percent difference, calculated as Diff/Mean X 100; acceptance criteria +/- 10%.

[d]ISOP = standard operating procedure used for instrumental analysis of sample, here MSC SOP C5.212

Table 19. Precision from repetitive analyses of a laboratory control solution[a]

Element	Run #1	Run #2	Run #3	Run #4	Actual Conc	Mean Conc	SD	% RSD
Li	19.4	19.1	19.6	20.2	20.0	19.6	0.5	2.4
Na	6656.	6703.	6656.	6854.	6000.	6717.	93.7	1.4
Mg	9667.	9767.	9579.	10345.	9000.	9839.	345.4	3.5
Al	125.	123.	125.	122.	120.	124.	1.6	1.3
K	2629.	2811.	2882.	2785.	2500.	2777.	106.5	3.8
Ca	36222.	35432.	36731.	36760.	35000.	36286.	621.1	1.7
V	31.9	31.8	30.5	32.3	30.0	31.6	0.8	2.5
Cr	20.3	20.3	20.4	19.9	20.0	20.2	0.2	1.2
Mn	42.5	40.3	39.0	40.1	40.0	40.5	1.5	3.6
Fe	144.	138.	126.	158.	100.	141.7	13.4	9.4
Co	24.9	25.9	25.6	26.1	25.0	25.6	0.5	2.0
Ni	61.6	58.6	60.5	62.6	60.0	60.8	1.7	2.8
Cu	20.7	20.4	20.2	20.5	20.0	20.5	0.2	1.0
Zn	69.3	70.7	68.5	69.0	70.0	69.4	0.9	1.3
As	82.2	81.6	77.8	82.7	80.0	81.1	2.2	2.7
Rb	12.4	8.25	12.0	12.7	10.0	11.3	2.1	18.3
Mo	101.	103.	101.	104.	100.	102.4	1.8	1.7
Ag	2.17	2.12	2.01	2.18	2.00	2.12	0.1	3.7
Cd	9.93	9.71	9.28	10.1	10.0	9.75	0.4	3.6
Sb	10.3	10.4	9.98	10.9	10.0	10.4	0.4	3.5
Te	3.31	3.15	2.98	3.20	3.00	3.16	0.1	4.3
Ba	51.5	51.5	49.4	53.4	50.0	51.4	1.6	3.1
Tl	10.1	10.3	10.0	9.96	10.0	10.1	0.2	1.5
Pb	40.5	41.4	41.2	39.1	40.0	40.6	1.0	2.5
U	10.2	10.1	10.5	10.2	10.0	10.2	0.2	1.7

[a]High Purity Trace Metals in Drinking Water, Cat # CRM-TMDW; High Purity Standards, Charleston, S.C.

Table 20. Instrumental precision and sensitivity within an analytical "run" for selenium.

BID[a]	Ele.	Run Date	Std. Conc.[b]	Volc (µL)	Initial Abs/Read	Mean Read[d]	# of checks	SD[e]	%RSD[f]	Char. Mass[g]	ISOP	Oper. Init.
1/22/97	Se	2/6/97	5	500	0.116	0.11989	9	0.00226	1.9%	N/A	C5.25	MJW
3/3/97	Se	3/6/97	5	500	0.142	0.14643	7	0.00443	3.0%	N/A	C5.26	MJW
3/3/97	Se	3/7/97	5	500	0.143	0.13217	6	0.00564	4.3%	N/A	C5.25	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]Std. Conc. = units in ppb unless otherwise noted.

[c]Vol (µL) = microliters of standard injected into graphite furnace.

[d]Mean Read = units are absorbance, concentration, or intensity depending upon instrumentation used.

[e]SD = standard deviation.

[f]%RSD = percent relative standard deviation.

[g]Char. Mass = picograms of the analyte that will give 1% absorption (applicable for graphite furnace techniques only).

Table 21. Percent recovery of elements from spiked blanks, sediment samples, and sediment extracts.

BID[a]	Ele.	Spk Type	Matrix	Analysis Units	Spk Amt.[b] µg	Vol. (mL)	Effective[c] Conc.	Bkgd.[d] Conc.	Total[e] Conc.	% Rec.[f]	Spk/Bkgd	ISOP	Oper. Init.
7/29/96	Cd	12548 - Analytical	Sed. Ext.	µg/L	0.018	10.	1.8	0.12	1.95	101.	15.	C5.212	RHW/TWM
7/29/96	Cu	12548 - Analytical	Sed. Ext.	µg/L	0.24	10.	24.	2.96	25.4	93.5	8.1	C5.212	RHW/TWM
7/29/96	Ni	12548 - Analytical	Sed. Ext.	µg/L	0.090	10.	9.	4.37	13.0	96.2	2.1	C5.212	RHW/TWM
7/29/96	Pb	12548 - Analytical	Sed. Ext.	µg/L	0.60	10.	60.	8.26	62.0	89.6	7.3	C5.212	RHW/TWM
7/29/96	Zn	12548 - Analytical	Sed. Ext.	µg/L	0.60	10.	60.	15.0	76.1	102.	4.0	C5.212	RHW/TWM
7/29/96	Cd	12547 - MW Digest.	Sed. Ext.	µg/L	0.20	50.	40.	0.59	45.0	111.	68.	C5.212	RHW/TWM
7/29/96	Cu	12547 - MW Digest.	Sed. Ext.	µg/L	2.0	50.	400.	15.2	429.	103.	26.	C5.212	RHW/TWM
7/29/96	Ni	12547 - MW Digest.	Sed. Ext.	µg/L	2.0	50.	400.	13.7	431.	104.	29.	C5.212	RHW/TWM
7/29/96	Pb	12547 - MW Digest.	Sed. Ext.	µg/L	2.0	50.	400.	52.1	373.	80.3	7.7	C5.212	RHW/TWM
7/29/96	Zn	12547 - MW Digest.	Sed. Ext.	µg/L	20.	50.	4000.	180.	4017.	96.	22.	C5.212	RHW/TWM
8/28/96	Cd	12973 - MW Digest.	Sed. Ext.	µg/L	2.0	50.	40.	0.44	44.7	111.	92.	C5.212	RHW/TWM
8/28/96	Cu	12973 - MW Digest.	Sed. Ext.	µg/L	20.	50.	400.	27.9	468.	110.	14.	C5.212	RHW/TWM
8/28/96	Ni	12973 - MW Digest.	Sed. Ext.	µg/L	20.	50.	400.	11.3	444.	108.	35.	C5.212	RHW/TWM
8/28/96	Pb	12973 - MW Digest.	Sed. Ext.	µg/L	20.	50.	400.	26.7	398.	93.	15.	C5.212	RHW/TWM
8/28/96	Zn	12973 - MW Digest.	Sed. Ext.	µg/L	200.	50.	4000.	27.5	4125.	102.	145.	C5.212	RHW/TWM
10/9/96	Cd	13385 - MW Digest.	Sed. Ext.	µg/L	2.0	50.	40.	1.894	43.9	105.	21.	C5.212	RHW/TWM
10/9/96	Cu	13385 - MW Digest.	Sed. Ext.	µg/L	20.	50.	400.	5.13	422.	104.	78.	C5.212	RHW/TWM
10/9/96	Ni	13385 - MW Digest.	Sed. Ext.	µg/L	20.	50.	400.	19.7	428.	102.	20.	C5.212	RHW/TWM
10/9/96	Pb	13385 - MW Digest.	Sed. Ext.	µg/L	20.	50.	400.	74.7	379.	76.	5.	C5.212	RHW/TWM
10/9/96	Zn	13385 - MW Digest.	Sed. Ext.	µg/L	200.	50.	4000.	222.	4025.	95.1	18.	C5.212	RHW/TWM
10/9/96	Cd	13387 - MW Digest.	Sed. Ext.	µg/L	2.0	50.	40.	2.04	43.4	103.	20.	C5.212	RHW/TWM
10/9/96	Cu	13387 - MW Digest.	Sed. Ext.	µg/L	20.	50.	400.	22.8	408.	96.	18.	C5.212	RHW/TWM
10/9/96	Ni	13387 - MW Digest.	Sed. Ext.	µg/L	20.	50.	400.	23.7	426.	101.	17.	C5.212	RHW/TWM
10/9/96	Pb	13387 - MW Digest.	Sed. Ext.	µg/L	20.	50.	400.	93.1	444.	88.	4.	C5.212	RHW/TWM
10/9/96	Zn	13387 - MW Digest.	Sed. Ext.	µg/L	200.	50.	4000.	193.	3987.	94.9	21.	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."
as a member of the group or "block."

[b]Spike Amt. µg = the absolute microgram (µg) amount of the spike which was added to a sample.

[c]Effective Conc. = the Spike Amt (µg) divided by the total solution volume, units µg/L.

[d]Bkgd Conc. = the measured concentration of the sample prior to spiking, units µg/L.

[e]Total Conc. = the measured concentration of the spiked sample (spike + background, units µg/L.

[f]% Rec. = percent recovery: [(Total Conc. - Bkgd Conc.)/Effective Conc. * 100]

Table 21 . Percent recovery of elements from spiked blanks, sediments, and sediment extracts....(continued)

BID[a]	Ele.	Spike Type	Matrix	Analysis Units	Spk Amt.[b] µg	Vol. (mL)	Effective[c] Conc.	Bkgd.[d] Conc.	Total[e] Conc.	% Rec[f]	Spk/Bkgd	ISOP	Oper. Init.
7/29/96	Cd	12551 SEM	Sed. Ext.	ug/L	10.	103.1	97.	3.34	116.	116.	29.	C5.212	RHW/TWM
7/29/96	Cu	12551 SEM	Sed. Ext.	ug/L	100.	103.1	970.	122.	1192.	110.	8.0	C5.212	RHW/TWM
7/28/96	Ni	12551 SEM	Sed. Ext.	ug/L	100.	103.1	970.	63.1	1125.	110.	15.	C5.212	RHW/TWM
7/29/96	Pb	12551 SEM	Sed. Ext.	ug/L	100.	103.1	970.	184.	1117.	96.3	5.3	C5.212	RHW/TWM
7/29/96	Zn	12551 SEM	Sed. Ext.	ug/L	1000.	103.1	9699.	486.	10973.	108.	20.	C5.212	RHW/TWM
8/28/96	Cd	13021 SEM	Sed. Ext.	ug/L	10.	103.3	97.	3.19	110.	111.	30.	C5.212	RHW/TWM
8/28/96	Cu	13021 SEM	Sed. Ext.	ug/L	100.	103.3	968.	232.	1178.	97.8	4.2	C5.212	RHW/TWM
8/28/96	Ni	13021 SEM	Sed. Ext.	ug/L	100.	103.3	968.	23.4	1076.	109.	41.	C5.212	RHW/TWM
8/28/96	Pb	13021 SEM	Sed. Ext.	ug/L	100.	103.3	968.	215.	1169.	98.5	4.5	C5.212	RHW/TWM
8/28/96	Zn	13021 SEM	Sed. Ext.	ug/L	1000.	103.3	9681.	484.	10945.	108.	20.	C5.212	RHW/TWM
10/9/96	Cd	13387 SEM	Sed. Ext.	ug/L	10.	103.5	97.	6.20	108.	106.	16.	C5.212	RHW/TWM
10/9/96	Cu	13387 SEM	Sed. Ext.	ug/L	100.	103.5	966.	65.1	1020.	98.8	15.	C5.212	RHW/TWM
10/9/96	Ni	13387 SEM	Sed. Ext.	ug/L	100.	103.5	966.	76.9	1065.	102.	13.	C5.212	RHW/TWM
10/9/96	Pb	13387 SEM	Sed. Ext.	ug/L	100.	103.5	966.	214.	1110.	92.6	4.5	C5.212	RHW/TWM
10/9/96	Zn	13387 SEM	Sed. Ext.	ug/L	1000.	103.5	9662.	603.	9967.	96.9	16.	C5.212	RHW/TWM
7/29/96	Cd	Blank SEM	Blk. Ext.	ug/L	10.	101.	99.	0.088	106.	107.	1121.	C5.212	RHW/TWM
7/29/96	Cu	Blank SEM	Blk. Ext.	ug/L	100.	101.	990.	1.27	1035.	104.	779.	C5.212	RHW/TWM
7/29/96	Ni	Blank SEM	Blk. Ext.	ug/L	100.	101.	990.	0.553	1031.	104.	1789.	C5.212	RHW/TWM
7/29/96	Pb	Blank SEM	Blk. Ext.	ug/L	100.	101.	990.	0.831	896.	90.4	1192.	C5.212	RHW/TWM
7/29/96	Zn	Blank SEM	Blk. Ext.	ug/L	1000.	101.	9901.	21.7	9856.	99.3	457.	C5.212	RHW/TWM
8/28/96	Cd	Blank SEM	Blk. Ext.	ug/L	2.	100.4	20.	0.125	21.6	108.	159.	C5.212	RHW/TWM
8/28/96	Cu	Blank SEM	Blk. Ext.	ug/L	20.	100.4	199.	3.35	220.	109.	59.	C5.212	RHW/TWM
8/28/96	Ni	Blank SEM	Blk. Ext.	ug/L	20.	100.4	199.	2.23	220.	109.	89.	C5.212	RHW/TWM
8/28/96	Pb	Blank SEM	Blk. Ext.	ug/L	20.	100.4	199.	1.09	187.	93.2	182.	C5.212	RHW/TWM
8/28/96	Zn	Blank SEM	Blk. Ext.	ug/L	200.	100.4	1992.	45.1	2053.	101.	44.	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."
as a member of the group or "block."

[b]Spike Amt. µg = the absolute microgram (µg) amount of the spike which was added to the blank.

[c]Effective Conc. = the Spike Amt (µg) divided by the the sample volume (L).

[d]Bkgd Conc. = the measured concentration of the sample prior to spiking, units µg/L.

[e]Total Conc. = the measured concentration of the spiked sample (spike + background, units µg/L).

[f]% Rec. = percent recovery: [(Total Conc. - Bkgd Conc.)/Effective Conc. * 100]

Table 21 . Percent recovery of elements from spiked blanks, sediments, and sediment extracts....(continued)

BID[a]	Ele.	Spike Type	Matrix	Analysis Units	Spk Amt.[b] µg	Vol. (mL)	Effective[c] Conc.	Bkgd.[d] Conc.	Total[e] Conc.	% Rec[f]	Spk/Bkgd	ISOP	Oper. Init.
10/9/96	Cd	Blk. SEM	Blk. Ext.	ug/L	2.	100.4	20.	0.11	22.	110.	179.	C5.212	RHW/TWM
10/9/96	Cu	Blk. SEM	Blk. Ext.	ug/L	20.	100.4	199.	2.	222.	110.	117.3	C5.212	RHW/TWM
10/9/96	Ni	Blk. SEM	Blk. Ext.	ug/L	20.	100.4	199.	0.4	229.	115.	534.	C5.212	RHW/TWM
10/9/96	Pb	Blk. SEM	Blk. Ext.	ug/L	20.	100.4	199.	1.	183.	91.4	197.9	C5.212	RHW/TWM
10/9/96	Zn	Blk. SEM	Blk. Ext.	ug/L	200.	100.4	1992.	40.	1994.	98.	49.	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."
as a member of the group or "block."

[b]Spike Amt. µg = the absolute microgram (µg) amount of the spike which was added to the blank.

[c]Effective Conc. = the Spike Amt (µg) divided by the the average sample volume (0.1004 L).

[d]Bkgd Conc. = the measured concentration of the sample prior to spiking, units µg/L.

[e]Total Conc. = the measured concentration of the spiked sample (spike + background, units µg/L).

[f]% Rec. = percent recovery: [(Total Conc. - Bkgd Conc.)/Effective Conc. * 100]

Table 22. Percent recoveries of sulfide and selenium in digested spikes.

1 BID[a]	2 Ele.	3 Spike Form	4 Amt.[b] µg	5 Matrix	6 Total µg[c] Meas.	7 Bkgd.[d] µg	8 Spk/Bkdg[e]	9 Spk/Bkg[d] SD	10 % REC[f]	PSOP	Prep. Init.	ISOP	Oper. Init.
8/28/96	S	Na_2S	596.	BLK EXT	532.	0.0	∞	∞	89.	C5.156	JWA	C5.156	WGB
8/28/96	S	Na^2S	1193.	SED EXT	1292.	179.	6.6	45.	93.	C5.156	JWA	C5.156	WGB
8/28/96	S	Na^2S	1193.	SED EXT	1087.	0.4	2860.	7060.	91.	C5.156	JWA	C5.156	WGB
1/22/97	Se	Se^{+4}	1.0	WATER	1.08	0.006	167.	289.	107.	C5.25	MJW	C5.171	MJW
1/22/97	Se	SeMETH	2.0	WATER	2.06	0.006	333.	578.	103.	C5.25	MJW	C5.171	MJW
1/22/97	Se	Se^{+4}	1.0	WATER	1.10	0.006	167.	∞	110.	C5.25	MJW	C5.171	MJW
1/22/97	Se	Se^{+6}	2.0	WATER	2.16	0.006	333.	∞	108.	C5.25	MJW	C5.171	MJW
1/22/97	Se	SeMETH	2.0	WATER	2.13	0.009	222.	∞	106.	C5.25	MJW	C5.171	MJW
1/22/97	Se	Se^{+6}	10.0	WATER	10.70	0.009	1111.	∞	107.	C5.25	MJW	C5.171	MJW
3/3/97	Se	SeMETH	2.0	SEDIMENT	1.90	0.097	21.	350.	90.	C5.26	MJW	C5.171	MJW
3/3/97	Se	Se+6	10.0	SEDIMENT	9.52	0.097	103.	1757.	94.	C5.26	MJW	C5.171	MJW
3/3/97	Se	SeMETH	2.0	SEDIMENT	1.97	0.017	118.	862.	98.	C5.26	MJW	C5.171	MJW
3/3/97	Se	Se+6	10.0	SEDIMENT	9.76	0.017	588.	4255.	97.	C5.26	MJW	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]Amt µg = the absolute microgram (µg) amount of the spike in the form listed in column 3 which was added to a sample.

[c]Total µg Meas. = the microgram (µg) of the analyte in the sample spike measured by the instrument (spike + background).

[d]Bkgd (µg) = Mean background amount in µg; the mean amount in µg from three aliquots of sample taken through the preparation and analysis methodology.

[e]Spk/Bkgd = the ratio of the spike amount added (column 4) divided by the mean sample background concentration (column 7).

[f]%REC = Total µg Meas. (column 6) - Bkgd. µg (column 7) divided by the Amt. µg (column 4) X 100.

Table 23. Percent recoveries of sulfide and selenium in analysis spikes analyzed as matrix suppression or enhancement checks.

BID[a]	Ele.	Matrix	Analysis Units	Spk. Amt. µg[b]	Vol.	Effec. Conc.[c]	Bkgd. Conc.[d]	Total Conc.[e]	%REC[f]	SOP	Prep. Init.	ISOP	Oper. Init.
10/9/96	S	SED EXT	µM	9.3	1.0	10.0	2.06	11.3	98.	C5.156	JWA	C5.156	WGB
10/9/96	S	SED EXT	µM	9.3	1.0	9.9	0.011	9.45	102.	C5.156	JWA	C5.156	WGB
1/22/97	Se	WATER	ng/mL	0.05	10.	5.0	0.08	5.56	110.	C5.25	MJW	C5.171	MJW
1/22/97	Se	WATER	ng/mL	0.05	10.	5.0	0.03	5.86	117.	C5.25	MJW	C5.171	MJW
1/22/97	Se	WATER	ng/mL	0.05	10.	5.0	0.06	5.91	117.	C5.25	MJW	C5.171	MJW
1/22/97	Se	WATER	ng/mL	0.05	10.	5.0	0.18	6.00	116.	C5.25	MJW	C5.171	MJW
3/3/97	Se	SEDIMENT	ng/mL	0.05	10.	5.0	0.13	5.57	109.	C5.26	MJW	C5.171	MJW
3/3/97	Se	SEDIMENT	ng/mL	0.05	10.	5.0	2.46	7.72	105.	C5.26	MJW	C5.171	MJW
3/3/97	Se	SEDIMENT	ng/mL	0.05	10.	5.0	0.12	5.53	108.	C5.26	MJW	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b] Spk Amt. µg = the absolute microgram (µg) amount of the spike in the form listed in column 3 which was added to a sample.

[c]Effec. Conc. = the Spike Amt divided by the total solution volume.

[d]Bkgd. Conc. = the measured concentration of the sample prior to spiking.

[e]Total Conc. = the measured concentration of the spiked sample (spike + background).

[f]%REC = percent recovery.

Table 24. Recoveries of elements from spiked sediment samples.

Element	12972 Bkgd	12972 Spk 1 Total Conc	12972 Spk 1 Bkgd Corr.	12972 Spk 2 Total Conc	12972 Spk 2 Bkdg Corr	Spike 1 Conc (ppb)	Spike 2 Conc (ppb)	% Rec 12972 Spk 1	% Rec 12972 Spk 2	Spk 1 Spk/Bkgd Ratio	Spk 2 Spk/Bkgd Ratio
Na	2406.	3121.	715.	20641.	18235.	1000.	20000.	72.	91.	0.4	8.3
Mg	11154.	11043.	- 111.	17962.	6808.	1000.	5000.	0.	136.	0.1	0.4
Al	35010.	36085.	1075.	54608.	19598.	1000.	20000.	108.	98.	0.0	0.6
K	8165.	13093.	4928.	13678.	5514.	5000.	5000.	99.	110.	0.6	0.6
Ca	26331.	25233.	- 1098.	32117.	5785.	100.	5000.	0.	116.	< 0.1	0.2
Cr	27.3	1319.	1292.	0.00		1000.		129.	---	37.	
Mn	1477.	2515.	1039.	1437.		1000.		104.	---	0.7	
Fe	51000.	55203.	4203.	75470.	24471.	1000.	20000.	420.	122.	< 0.1	0.4
Co	34.8	1157.	1122.	33.7		1000.		112.	---	29.	
Ni	45.5	971.	925.	41.4		1000.		93.	---	22.	
Cu	74.1	1166.	1092.	72.7		1000.		109.	---	14.	
Zn	165.	1355.	1190.	175.		1000.		119.	---	6.1	
As	14.7	2347.	2332.	16.5		2000.		117.	---	136.	
Sr	306.	392.	86.1	324.		100.		86.	---	0.3	
Mo	1.04	1.42	0.38	43.7	42.6	---	50.	---	85.	---	47.9
Ag	0.00	260.	260.	0.04		1000.		26.	---	∞	
Cd	0.15	1166.	1166.	0.52		1000.		117.	---	6522.	
Sb	0.00	0.00	0.00	1875.	1875.	---	4000.	---	47.	---	∞
Ba	1618.	1352.	- 266.	1378.		100.		0.	---	0.1	
W	0.09	0.92	0.83	0.14		50.		2.	---	577.	
Tl	1.35	98.4	97.0	1.54		50.		194.	---	37.	
Pb	85.3	2630.	2544.	94.4		1000.		254.	---	12.	

Table 24. Recoveries of elements from spiked sediment samples.....(continued)....

Element	13021 Bkgd	13021 Spk 1 Total Conc	13021 Spk 1 Bkgd Corr.	13021 Spk 2 Total Conc	13021 Spk 2 Bkdg Corr	Spike 1 Conc (ppb)	Spike 2 Conc (ppb)	% Rec 13021 Spk 1	% Rec 13021 Spk 2	Spk 1 Spk/Bkgd Ratio	Spk 2 Spk/Bkgd Ratio
Na	1989.	2566.	577.	20641.	20063.	1000.	20000.	58.	100.	0.5	10.1
Mg	3618.	4748.	1130.	17962.	9064.	1000.	5000.	0.	181.	0.3	1.4
Al	23354.	23284.	- 70.	54608.	40563.	1000.	20000.	- 7.	203.	< 0.1	0.9
K	4943.	9422.	4479.	13678.	11749.	5000.	5000.	90.	235.	1.0	1.0
Ca	4248.	5140.	892.	32117.	8907.	100.	5000.	0.	178.	< 0.1	1.2
Cr	0.	1218.	1218.	0.00		1000.		122.	---	(*)	
Mn	1822.	2894.	1072.	1437.		1000.		107.	---	0.5	
Fe	33076.	35824.	2748.	75470.	49934.	1000.	20000.	275.	250.	< 0.1	0.6
Co	10.	1204.	1194.	33.7		1000.		119.	---	99.	
Ni	17.	1003.	986.	41.4		1000.		99.	---	59.	
Cu	53.	1128.	1075.	72.7		1000.		108.	---	19.	
Zn	230.	1395.	1165.	175.		1000.		116.	---	4.3	
As	11.	2176.	2165.	16.5		2000.		108.	---	178.	
Sr	44.	124.	79.9	324.	42.6	100.		80.	---	2.3	
Mo	1.58	1.78	0.20	43.7	57.9	---	50.	---	116.	---	31.6
Ag	4.	260.	257.	0.04		1000.		26.	---	284.	
Cd	0.	1034.	1034.	0.52		1000.		103.	---	3125.	
Sb	0.00	0.00	0.00	1875.	5083.	---	4000.	---	127.	---	(*)
Ba	10203.	9186.	- 1017.	1378.		100.		0.	---	< 0.1	
W	7.52	19.15	11.63	0.14		50.		23.	---	6.6	
Tl	0.8	96.9	96.1	1.54		50.		192.	---	59.	
Pb	142.	2862.	2720.	94.4		1000.		272.	---	7.0	

Table 24. Recoveries of elements from spiked sediment samples.....(continued).....

Element	NIST 2704 Bkgd	NIST 2704 Spk 1 Total Conc	NIST 2704 Spk 1 Bkgd Corr.	NIST 2704 Spk 2 Total Conc	NIST 12972 Spk 2 Bkdg Corr	Spike 1 Conc (ppb)	Spike 2 Conc (ppb)	% Rec NIST 2704 Spk 1	% Rec NIST 2704 Spk 2	Spk 1 Spk/Bkgd Ratio	Spk 2 Spk/Bkgd Ratio
Na	665.	1594.	928.	47422.	46756.	1000.	50000.	93.	94.	1.5	75.
Mg	42887.	41223.	- 1664.	48957.	6070.	1000.	4000.	0.	152.	< 0.1	0.1
Al	53320.	52713.	- 607.	102125.	48805.	1000.	50000.	- 61.	98.	< 0.1	0.9
K	6676.	10953.	4277.	11482.	4806.	5000.	4000.	86.	120.	0.7	0.6
Ca	104254.	92342.	-11912.	109416.	5162.	100.	4000.	0.	129.	< 0.1	0.0
Cr	412.	1789.	1378.	450.13		1000.		138.	---	2.4	
Mn	2644.	3244.	600.	2543.		1000.		60.	---	0.4	
Fe	327753.	327754.	1.	327753.	- 1.	1000.	50000.	0.	0.	< 0.1	0.2
Co	62.	1202.	1140.	73.9		1000.		114.	---	16.	
Ni	185.	1209.	1025.	213.2		1000.		102.	---	5.4	
Cu	492.	1566.	1074.	538.2		1000.		107.	---	2.0	
Zn	2790.	4026.	1235.	2982.		1000.		124.	---	0.4	
As	105.	2164.	2059.	133.7		2000.		103.	---	19.	
Sr	156.	289.	132.3	146.		100.		132.	---	0.6	
Mo	17.90	15.92	- 1.98	37.0	19.1		20.	---	95.	---	1.1
Ag	2.	255.	253.	4.06		1000.		25.	---	595.	
Cd	18.	1084.	1066.	28.64		1000.		107.	---	56.	
Sb	5.02	5.87	0.86	467.	461.		1000.	---	46.	---	∞
Ba	697.	807.	110.	712.		100.		0.	---	0.1	
W	2.13	8.74	6.61	2.07		50.		13.	---	23.	
Tl	5.3	96.0	90.7	6.14		50.		181.	---	9.4	
Pb	1621.	4617.	2996.	1598.4		1000.		300.	---	0.6	

Table 25. Digestion Blank Concentrations and Blank Spike Recoveries[a].

Element	Blk #1 Bkgd	Blk #2 Bkgd	Blk #3 Bkgd	Mean Blk Bkgd	Blk Spk 1 Total Conc	Blk Spk 1 Actual Conc	Blk Spk 2 Total Conc	Blk Spk 2 Actual Conc	Spike 1 Conc (ppb)	Spike 2 Conc (ppb)	% Rec Blk Spk 1	% Rec Blk Spk 2	Spk/Bkgd Ratio
Na	5.99	2.90	2.19	3.69	990.	987.	Sb	S	1000.	20000.	99.	---	---
Mg	2.00	1.30	0.17	1.16	944.	943.	4796.	4794.	1000.	5000.	94.	96.	---
Al	1.73	0.25	1.21	1.06	1163.	1162.	22536.	22535.	1000.	20000.	116.	113.	---
K	0.00	0.00	0.00	0.00	5757.	5757.	6906.	6906.	5000.	5000.	115.	138.	[b]
Cr	1.08	0.93	1.13	1.05	1100.	1099.	---	---	1000.		110.	---	955.
Mn	0.06	0.05	0.07	0.06	985.	985.	---	---	1000.		99.	---	16667.
Fe	7.65	16.28	23.62	15.85	807.	791.	S	S	1000.	20000.	79.	---	---
Ni	0.29	0.18	0.06	0.18	1144.	1144.	---	---	1000.		114.	---	5660.
Cd	0.00	0.00	0.00	0.00	1189.	1189.	---	---	1000.		119.	---	[b]
Sb	0.15	0.08	0.07	0.10	---	---	5077.	5077.		4000.	---	127.	40000.
Ca	31.30	51.83	58.03	47.05	223.	176.	4912.	4865.	100.	5000.	176.	97.	---
Co	0.03	0.20	0.01	0.08	1034.	1034.	---	---	1000.		103.	---	12500.
Cu	0.39	0.01	0.08	0.16	1083.	1083.	---	---	1000.		108.	---	6250.
Zn	1.57	0.00	- 0.08	0.50	1099.	1098.	---	---	1000.		110.	---	2013.
As	- 0.19	0.02	- 0.14	- 0.10	2253.	2253.	---	---	2000.		113.	---	19355.
Mo	0.05	0.01	0.01	0.02	---	---	49.6	49.5		50.	---	99.	2143.
Sr	0.01	0.02	0.01	0.01	103.	103.	---	---	100.		103.	---	7500.
Ag	0.09	0.01	0.01	0.04	282.	282.	---	---	1000.		28.	---	27273.
Ba	0.00	0.00	0.00	0.00	131.	131.	---	---	100.		131.	---	[b]
W	0.04	0.00	0.01	0.02	13.	13.	---	---	50.		26.	---	3000.
Tl	0.00	0.00	0.00	0.00	99.	99.	---	---	50.		198.	---	[b]
Pb	1.41	0.03	0.20	0.55	2415.	2414.	---	---	1000.		241.	---	1829.

[a]Spiked reagent blanks taken through microwave evaporative digestion; all concentrations units ng/mL (ppb).

[b]concentration level too high (detector saturation).

Table 26. Recovery of elements from a spiked sample[a].

Element	Bkgd	Total Conc	Actual Conc	Theoretical Conc(ppb)	% Recovery
Al	541.	6306.	5765.1	5000.	115.
V	5.0	111.	106.5	100.	106.
Cr	0.32	114.	113.2	100.	113.
Mn	56.9	166.	109.3	100.	109.
Fe	605.	4617.	4012.2	5000.	80.
Co	0.51	110.	109.1	100.	109.
Ni	0.45	94.	93.9	100.	94.
Cu	0.44	105.	104.8	100.	105.
Zn	0.00	117.	116.7	100.	117.
As	0.63	115.	114.0	100.	114.
Ag	0.00	93.	93.3	100.	93.
Cd	0.00	109.	108.5	100.	109.
Sb	0.09	133.	132.6	100.	133.
Ba	16.2	140.	123.5	100.	124.
Tl	0.04	206.	205.7	100.	206.
Pb	1.7	261.	258.8	100.	259.

[a]High Purity Standards ICP-MS Calibration Standard; Cat.# ICP-MSCS; High Purity Standards, Chartleston, SC. Sample 12548 used for spiking. Spike was instrumental or analysis spike.

Table 27. Recovery of elements from a spiked pore water sample[a].

Element	Bkgd	Total Conc	Actual Conc	Theoretical Conc(ppb)	% Recovery
Al	10.0	69.08	59.1	80	74.
V	81.8	168.69	86.9	80	109.
Cr	2.8	69.41	66.6	80	83.
Mn	34.4	121.6	87.2	80	109.
Co	0.1	69.06	68.9	80	86.
Ni	0.5	72.54	72.0	80	90.
Cu	0.7	75.38	74.7	80	93.
Zn	2.8	101.77	99.0	80	124.
As	2.8	93.23	90.5	80	113.
Ag	0.0	81.48	81.5	80	102.
Cd	0.2	90.97	90.7	80	113.
Sb	0.1	85.78	85.7	80	107.
Ba	14.5	103.86	89.3	80	112.
Tl	0.0	74.08	74.1	80	93.
Pb	0.1	77.42	77.3	80	97.

[a]High Purity Standards ICP-MS Calibration Standard; Cat.# ICP-MSCS; High Purity Standards, Chartleston, SC. Sample 13391 used for spiking.

Table 28. Digestion Blank Concentrations and Blank Spike Recoveries[a].

Element	Blk #1 Bkgd	Blk #2 Bkgd	Blk #3 Bkgd	Mean Blk Bkgd	Blk Spk 1 Total Conc	Blk Spk 2 Actual Conc	Blk Spk 2 Total Conc	Blk Spk 2 Actual Conc	Spike Conc (ppb)	% Rec Blk Spk 1	% Rec Blk Spk 2	Spk/Bkgd Ratio
Na	25.8	31.8	27.0	28.2	678.	650.	---	---	1000.	65.	---	36.
Mg	0.0	3.950	2.000	1.983	690.	688.	---	---	1000.	69.	---	504.
Al	1.65	0.00	0.00	0.55	658.	658.	---	---	1000.	66.	---	1818.
K	58.9	55.3	51.7	55.3	3929.	3874.	---	---	5000.	77.	---	90.
Cr	8.80	10.8	12.2	10.60	847.	837.	---	---	1000.	84.	---	94.
Fe	0.20	0.40	0.30	0.30	870.	870.	---	---	1000.	87.	---	3333.
Mn	108.	98.	90.	99.	619.	520.	---	---	1000.	52.	---	10.
Ni	0.050	0.100	0.050	0.067	869.	869.	---	---	1000.	87.	---	15000.
Cd	5.30	0.25	0.30	1.95	1202.	1200.	---	---	1000.	120.	---	513.
Ca	900.	1106.	1044.	1017.	---	---	1058.	40.7	100.	---	41.	< 1.
Co	0.050	0.0	0.0	0.017	---	---	963.	963.	1000.	---	96.	60000.
Cu	2.50	0.25	0.15	0.97	---	---	1030.	1029.	1000.	---	103.	1034.
Zn	7.95	28.2	12.0	16.03	---	---	1381.	1365.	1000.	---	137.	62.
As	- 2.70	- 0.25	- 1.85	- 1.60	---	---	2601.	2603.	2000.	---	130.	1250.
Sr	0.050	0.	0.	0.	---	---	95.6	95.5	100.	---	95.	750.
Ag	0.20	0.05	0.00	0.08	---	---	1024.	1024.	1000.	---	102.	12000.
Ba	0.10	0.25	0.10	0.15	---	---	101.	100.	100.	---	100.	667.
Pb	0.30	0.20	0.20	0.23	---	---	1079.	1079.	1000.	---	108.	4286.

[a]Spiked reagent blanks taken through microwave evaporative digestion; all concentrations units ng/mL (ppb).

Table 29. Interference check using dilution percent difference.

BID[a]	Run Date	Matrix Type	Element	Undiluted Sample	Diluted Sample[b]	% Diff[c]
10/9/96	1/22/97	Sed. Ext.[d]	Cd	2.62	2.61	0.2
10/9/96	1/22/97	Sed. Ext.	Cu	29.	30.	5.1
10/9/96	1/22/97	Sed. Ext.	Ni	31.	33.	6.6
10/9/96	1/22/97	Sed. Ext.	Pb	115.	111.	3.9
10/9/96	1/22/97	Sed. Ext.	Zn	245.	272.	11.

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]dilution factor = 5 (1+4).

[c]dilution % difference acceptance criteria = +/- 10%; concentrations exceeding +/- 10%. indicative of suspect interferent.

[d]sediment extract used for dilution check was from sample 13387.

Table 30. Recovery of elements from an interference check solution[a].

BID	Run Date	Element	Conc (ppb) measured	Conc (ppb) actual	Dilution Factor	% Rec.[b]
10/9/96	1/22/97	Ni	200.	186.6	5	93.
		Cu	100.	94.2	5	94.
		Zn	100.	127.0	5	127.
		Cd	50.	71.6	5	143.
		Pb	100.	94.9	5	95.

[a]High Purity ICP-MS Solution AB in 2% nitric acid, Charleston, SC.; CAT # ICP-MS-ICS.

[b]suggested acceptance tolerance 80% - 120%.

Table 31. Blank equivalent concentrations (BEC) of sulfide and selenium for procedural blank solutions analyzed as part of a sample group or "block."

BID[a]	Ele.	Matrix	Soln. Units	Soln 1 Conc.	Soln 2 Conc.	Soln 3 Conc.	Dil. Vol.	Mean Conc.[b]	Sample Wgt.[c]	Mean BEC µg/g	BEC SD µg/g	PSOP	Prep. Init.	ISOP	Oper. Init.
8/28/96	S	SED EXT	µM	0.0	0.00	0.00	1.0	0.0	2.5	0.0	0.0	C5.156	JWA	C5.156	WGB
1/22/97	Se	WATER	ng/mL	0.05	0.01	-0.01	100.	0.017	20.	0.083	0.153	C5.25	MJW	C5.171	MJW
3/3/97	Se	SEDIMENT	ng/mL	0.02	0.00	0.02	100.	0.013	0.5	0.003	0.002	C5.26	MJW	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]Mean Conc. = the mean solution concentration of the procedural blanks for a block, n = 3.

[c]Sample Wgt. = weight (g) used for BEC calculation.

Table 32. Instrument detection limits, method detection limits, and limits of quantitation for the analytes of interest.

BID	Run Date[a]	Element	Std Conc.[b]	Blk SD 1[c]	Blk SD 2	Blk SD 3	IDL[d]	MDL[e]	LOQ[f]	ISOP	Oper. Init.
10/9/96	1/22/96	Cd	0.0	0.001398	0.0016482	0.00129	0.0043	0.0024	0.01	C5.212	RHW/TWM
10/9/96	1/22/96	Cu	0.0	0.421985	0.0170804	0.01629	0.4554	0.029	0.09	C5.212	RHW/TWM
10/9/96	1/22/96	Ni	0.0	0.090821	0.0109416	0.00431	0.1061	0.018	0.06	C5.212	RHW/TWM
10/9/96	1/22/96	Pb	0.0	0.034244	0.0089588	0.00729	0.0505	0.0096	0.03	C5.212	RHW/TWM
10/9/96	1/22/96	Zn	0.0	0.126422	0.8741180	0.13436	1.1349	0.38	1.26	C5.212	RHW/TWM

[a]date of 3rd non-consecutive day analysis, following which IDL was computed.

[b]concentration of low level standard used in analysis in ppb, which was reagent blank or 0 conc standard.

[c]standard deviation from analysis of 0 standard (reagent blank) 7 consecutive times in one day.

[d]IDL = instrument detection limit (ng/mL), computed as 3 X mean of standard deviations.

[e]MDL = method detection limit (ng/mL), computed as $3 \times (SD_b^2 + SD_s^2)^{1/2}$ where SD_b = standard deviation of a blank (n = 3) and

SD_s = standard deviation of a low level sample or spiked sample (n = 3); units are μg/g dry weight.

[f]LOQ = limit of quantitation (μg/g dry weight), computed as 3.3 X the MDL.

Table 33. Instrument detection limit for AVS and selenium.

BID	Run Date[a]	Ele.	Std. Conc.[b]	Std SD 1[c]	Std SD 2	Std SD 3	IDL[d]	Units	SOP	Oper. Init.
8/28/96	5/20/96	S	0.1	0.00126	0.00158	0.00312	0.00597	µMol	C4.103	WGB
1/22/97	12/24/96	Se	0.4	0.01512	0.01813	0.0269	0.060	ng/mL	C4.95	MJW
3/3/97	12/24/96	Se	0.4	0.01512	0.01813	0.0269	0.060	ng/mL	C4.95	MJW

[a]date of 3rd consecutive day analysis, following which IDL was computed.

[b]concentration of low level standard used in analysis, in ppb.

[c]standard deviation from analysis of standard 7 consecutive times in one day.

[d]IDL = instrument detection limit, computed as 3 times the mean of standard deviations.

Table 34. Limit of detection (LOD) and limit of quantitation (LOQ) values for AVS and selenium.

BID[a]	Ele.	Matrix	W/D/L[b]	Sample SD[c]	Blank SD[d]	LOD[e]	LOQ[f]	PSOP	Prep. Init.	ISOP	Oper. Init.	Units
8/28/96	S	SED EXT	D	0.00047	0.0	0.0014	0.0047	C5.156	JWA	C5.156	WGB	µM/g
1/22/97	Se	WATER	L	0.08660	0.15280	0.527	1.74	C5.25	MJW	C5.171	MJW	ng/mL
3/3/97	Se	SEDIMENT	D	0.00643	0.00231	0.020	0.07	C5.26	MJW	C5.171	MJW	µg/g

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]W/D/L = wet, dry, or liquid (starting sample state).

[c]Sample SD = the standard deviation of low level sample concentrations.

[d]Blank SD = the standard deviation of procedural blank concentrations.

[e]LOD = limit of detection calculated as:

$$3\,[SD_b^2 + SD_s^2]^{1/2}$$

where SD_b = standard deviation of the blank and SD_s = standard deviation of a low level sample.

[f]LOQ = limit of quantitation calculated as 3.3 X LOD. Values between LOD and LOQ have poorer accuracy and thus poorer reliability.

U.S. Department of the Interior
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Final Laboratory Report FY98-32-13

DETERMINATION OF ACID VOLATILE SULFIDE, SIMULTANEOUSLY EXTRACTABLE METALS, AND SEMI-QUANTITATIVE METALS IN SEDIMENTS COLLECTED FROM CANYONS AT THE LOS ALAMOS NATIONAL LABORATORY

Work Unit: 40049, LANL-PW-97

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Date: May 8, 1998

SAMPLE HISTORY:

A total of four sediment samples collected from canyon sites around the Los Alamos National Laboratory were received by the Inorganic Chemistry section of the Environmental and Contaminants Research Center (ECRC) on 8/22/97. The samples were collected 8/11/97 - 8/14/97 in I-Chem glass jars and stored by refrigeration for one week before transmission to the Inorganic Section. The

sediments were to be analyzed for percent moisture, loss on ignition, acid-volatile sulfide (AVS) and simultaneously extractable metals (SEM; cadmium, copper, nickel, lead, and zinc). In addition, a metals semi-quantitative scan was requested for the sediments. The objective of the analyses was to evaluate the potential toxicity by chemical measures. The purpose of this report is to provide analytical data for the samples which will provide evidence as to the presence and bioavailability of certain elemental contaminants.

METHODS:

Sediments:

Sediment samples were processed through the preparative and analytical flow scheme in one block with an associated BID (block initiation date) which included the following quality control for the preparation and determination of AVS and SEM: procedural blank, duplicate sample, one reference sediment, and one pre-extraction spike (blank). During AVS determination, quality control also included an analysis spike (post-extraction) and a calibration check solution. Quality control parameters for SEM determinations by ICP-MS included a continuing calibration blank, independent calibration verification standard, laboratory control samples, duplicate analysis, analysis spike, interference check solution, and dilution percent difference. Additional aliquants of sediment forming a second BID set were processed for the semi-quantitative metals scan, and quality control included procedural blanks, procedural blank spikes, sample replicates, reference materials, and sample spikes. Precision was determined by repeated runs of a laboratory control solution. All quality control results were tabulated to provide an overview of quality assurance and to facilitate interpretation.

For AVS/SEM determination, each sediment sample was briefly homogenized in its collection container with a plastic scoop, following which a ~5 mL aliquant was taken for AVS determination. During the AVS determination on each sediment sample, a simultaneously extractable metals fraction was generated as described in standard operating procedure (SOP) C5.156. This method was adapted from the EPA draft method 376.3 (4/91) written by Allen, Gongmin, Boothman, DiToro, and Mahony, and utilized a silver/sulfide electrode for determining AVS. Fifty mL of each extract was vacuum filtered through a 0.4 µm polycarbonate membrane. A portion of each filtered SEM extract (10 mL) was subjected to a microwave oven nitric acid/hydrogen peroxide digestion utilizing 50 mL Zymark tubes as described in SOP C5.217. Final dilution volume for the digestates was 50 mL in a matrix of

1% nitric acid. A preliminary scan of these digestates indicated that they could be analyzed at full strength with no additional dilution. All SEM digestates were analyzed by inductively-coupled plasma-mass spectrometry (ICP-MS, SOP C5.212). A second aliquant of wet sediment was taken for the determination of percent moisture (SOP C5.168) and loss on ignition (LOI, SOP C5.197) at 500°C (percent of dry weight). A portion of each sample was lyophilized (SOP C5.36) and then homogenized (SOP C5.208d), following which a dried aliquant was digested (SOPC 5.94) in a sealed Teflon vessel in a microwave oven to prepare a digestate suitable for semi-quantitative scan by ICP-MS (SOP C5.212). The accuracy of the semi-quantitative approach (TotalQuant®) is reported to be ± 30-50% by the manufacturer.

RESULTS AND DISCUSSION:

AVS and SEM:

Percent moisture, LOI, AVS, and SEM results for sediment samples are indicated in Table 1. These results ranged as follows: moisture, 25.1 to 31%; LOI, 0.8 to 2.6%; ; AVS, 0.012 to 0.769 µmole/g; simultaneously extractable metals in µg/g dry weight: Cd, 0.033 to 0.275; Cu, 0.632 to 7.87; Ni, 0.432 to 2.94; Pb, 4.16 to 14.2; and Zn, 4.31 to 26.6.

SEM/AVS ratios and SEM-AVS differences were calculated for elements which are known to form sulfides less soluble than iron or manganese and are indicated in Table 2. Sediments having an SEM/AVS ratio > 1 and positive SEM-AVS differences are considered potentially toxic to organisms in the aquatic ecosystem. The SEM-AVS difference is generally more meaningful for samples with low AVS, as is the case here, because it better reflects the magnitude of SEM "metal excess." Because these samples contained low AVS concentrations (0.012 - 0.769 µmole/g) and low SEM concentrations, SEM/AVS ratios for some samples were > 1, but the SEM-AVS differences indicated the magnitude of the metal excess was small(maximum of 0.2 µmole/g).

SEMI-QUANTITATIVE SCAN

Results of a semi-quantitative scan of the sediments by ICP-MS are indicated in Table 3. Concentrations of metals in sediments were generally consistent and comparable from canyon to canyon. In a couple of instances, an element at one site stood out compared to the other canyon sites. For example, concentrations of Cr at Sandia (ECRC# 16231) and Ba at Caron deValle (ECRC# 16233) were

markedly higher than the concentrations of these elements exhibited at the other canyon locations. However, the remainder of the semi-quantitative scan results were generally unremarkable.

QUALITY CONTROL:

Calibration:

Instrument calibration during quantitative analysis of sediment SEM extracts by ICP-MS was verified by analyzing a continuing calibration blank and independent calibration verification standards, as indicated in Table 4. Periodic runs of a laboratory control solution served to monitor calibration throughout the TotalQuant® scan for sediments (Table 5). In addition, a separate calibration solution was ran at the beginning of the run, which exibited recoveries ranging from 55% to 129% (Table 6). A standardized Na_2S solution confirmed calibration of the sulfide-specific electrode during AVS determination (Table 7).

Control Materials:

Results from the analysis of control materials are indicated in Tables 8-10. For SEM analyses, reference solutions (NIST 1643d and TMDW) were analyzed as ICP-MS laboratory control samples, and recoveries ranged from 95 - 100 percent (Table 8). A NIST 1645 river sediment was extracted with 1 N HCL, which resulted in fair recoveries for Zn, Cd, and Pb, but poorer recoveries for Ni and Cu (Table 8). Low recoveries for a partial digestion such as the 1N HCl treatment are not unexpected because NIST certified ranges for sediment are based on recovery of metals from a "total" digestion procedure. These recoveries are consistent with previous 1N HCl extractions performed by ECRC on sediments. Recoveries of elements from reference sediments acid digested by microwave and analyzed by a semi-quantitative scan are indicated in Table 9. Low recoveries exhibited from various elements in the two materials (e.g. Na, K, Sb, Al, Ti, V, Cr, Rb, Sr, Th, U) may reflect the acid extractable digestion used, which yields incomplete solubilization of the sediment. Recoveries of sulfide (based on ECRC historical data) from a 1N HCl extract of NIST 1645 River Sediment are indicated in Table 10.

Analytical and Method Precision:

Analytical precision for the SEM quantitative analysis was measured by analyzing a sediment extract twice at the instrument and determining the relative percent difference (RPD), which

ranged from 1.4 to 3.8 (#16232 Analysis), as indicated in Table 11. Analytical precision for the TotalQuant® scan on sediments was determined by repeated runs of a reference solution, which exhibited percent relative standard deviation (%RSD) values of < 17% (Table 5). Method precision for SEM extracts was estimated in two ways: from the duplicate extraction and microwave evaporative digestion of a sample, and from the duplicate microwave evaporative digestion alone (Table 11). Precision for a duplicate extraction and microwave evaporative digestion performed on sample #16230 exhibited RPD values ranging from 2.7 to 32% (#16230 SEM). Precision for a duplicate microwave digestion alone on extract #16231 (16231 SEM MW) indicated RPDs ranging from 1.1 to 38%. Method precision from the duplicate preparation and analysis of sediment sulfide exhibited an atypically high RPD value of 45%, presumably due to the low level of AVS (Table 12). The triplicate digestion and analysis of a sediment sample by TotalQuant® indicated RSD values < 31% for most elements, but poorer results for Sb, and Pb (Table 13).

Spikes:

SEM sample spikes were of three types: analytical (performed on digested extract during instrumental analysis), MW Digest. (extract spiked at level of microwave evaporative digestion, and SEM (sample or reagent blank spiked before extraction with HCl). The recoveries for these spike types are indicated in Table 14, and ranged from 93 to 117% for all spike types. The recovery of spiked sulfide from a reagent blank was 92% (Table 15). Recoveries of elements from a sediment sample spiked prior to acid digestion and analyzed by a TotalQuant® scan are indicated in Table 16. For samples having spike/background ratios > 1, recoveries ranged from 77% to 137%, but a poorer recovery was observed for Sb (57%).

ICP-MS Interference Checks:

Quantitative analysis by ICP-MS requires the analysis of two interference checks. A five fold dilution of a sediment extract indicated agreement 10% or better for all elements except Zn, which was 15.6 (Table 17). A synthetic interference check solution was analyzed with percent recoveries of analytes of interest indicated in Table 18. The high Cd recovery (150%) is due to the interference of MoO on Cd in this synthetic solution which contains 2 ppm Mo. This does not reflect sample matrix behavior, since Mo in the sediment was not in appreciable quantities. Overall, these results indicate that the ICP-MS is adequately

correcting for interferences with the exception of Zn, which could have a small positive interference.

Blank Equivalent Concentrations:

Blank equivalent concentrations (BEC) were computed for SEM procedural blanks for sediment (Table 19). The results indicate SEM BEC values that are less than the method limit of detection (MLOD) for Cd and Pb, but just above the MLOD for Ni, Cu, and Zn. MW BECs were less than the MLOD for each analyte. BECs for procedural blanks in the semi-quantitative run are indicated in Table 20.

Instrument Detection Limits, Method Detection Limits, and Limits of Quantitation:

Instrument detection limits, method detection limits, and limits of quantitation are indicated in Table 21 for each SEM analyte determined by ICP-MS quantitative analysis. The method detection limit for sulfide was 0.001 umol/g dry weight.

Overall, the quality control results were considered to be acceptable based on specifications established by ECRC.

Table 1. Percent moisture, loss on ignition, acid volatile sulfide (µmol/g), and concentrations of simultaneously extracted metals (µg/g) in sediments from the Los Alamos National Lab.

ECRC #	Field ID	Matrix	% Moisture	% LOI	AVS	Cd	Cu	Ni	Pb	Zn
16230	1-Los Alamos Canyon	Sediment Extract	31.0	2.6	0.131	0.033	0.632	0.432	4.34	4.63
16231	2-Sandia Canyon	Sediment Extract	25.1	1.2	0.769	0.180	3.31	0.627	4.16	26.6
16232	3-Pajarito Canyon	Sediment Extract	28.6	1.7	0.012	0.275	2.88	2.94	14.2	4.31
16233	4-Caron deValle	Sediment Extract	26.8	0.8	0.062	0.073	7.87	0.941	6.55	7.95

Table 2. Ratio of SEM/AVS (a) and SEM-AVS difference (b) for cadmium, copper, nickel, lead, and zinc.

a. SEM/AVS

ECRC#	Field ID	Cd	Cu	Ni	Pb	Zn	Σ^a
16230	1-Los Alamos Canyon	0.0022	0.076	0.056	0.160	0.54	0.83
16231	2-Sandia Canyon	0.0021	0.068	0.014	0.026	0.53	0.64
16232	3-Pajarito Canyon	0.2036	3.77	4.17	5.71	5.50	19.3
16233	4-Caron deValle	0.0104	2.00	0.259	0.510	1.96	4.74

[a]$\Sigma = \Sigma$[Cd,Cu,Ni,Pb,Zn] μMol/g ÷ AVS μMol/g.

b. SEM - AVS

ECRC#	Field ID	Cd	Cu	Ni	Pb	Zn	Σ^a
16230	1-Los Alamos Canyon	- 0.1	- 0.1	- 0.1	- 0.1	- 0.1	- 0.02
16231	2-Sandia Canyon	- 0.8	- 0.7	- 0.8	- 0.7	- 0.4	- 0.3
16232	3-Pajarito Canyon	- 0.01	0.03	0.04	0.1	0.1	0.2
16233	4-Caron deValle	- 0.1	0.1	- 0.05	- 0.03	0.1	0.2

[a]$\Sigma = \Sigma$[Cd,Cu,Ni,Pb,Zn] μMol/g - AVS μMol/g.

Table 3. Concentrations[a] of elements in Los Alamos sediments determined by semi-quantitative scan.

Element	1-Los Alamos ECRC# 16230	2-Sandia ECRC# 16231	3-Pajarito ECRC# 16232	4-Caron deValle ECRC# 16233
Li	4	2	2	5
Na	70	80	100	60
Mg	100	200	300	500
Al	1000	2000	2000	2000
K	200	200	200	500
Ca	500	400	500	500
Sc	0.4	0.4	0.6	0.7
Ti	50	70	100	90
V	2	3	10	6
Cr	2	50	3	3
Mn	100	100	400	200
Fe	2000	2000	4000	3000
Co	0.6	0.6	10	1
Ni	1	1	5	2
Cu	1	4	4	8
Zn	< 1	< 1	< 1	< 1
Ga	2	2	3	3
Ge	< 0.1	< 0.1	< 0.1	< 0.1
As	0.5	0.8	3	1
Se	< 1	< 1	< 1	< 1
Rb	3	3	3	4
Sr	5	4	7	6
Y	8	4	7	7
Zr	4	2	6	5
Nb	1	< 1	< 1	< 1
Mo	0.4	0.8	0.8	0.5
Ru	< 1	< 1	< 1	< 1
Pd	< 0.1	< 0.1	< 0.1	< 0.1
Ag	< 0.1	0.9	0.8	0.4
Cd	< 0.1	< 0.1	< 0.1	0.1
In	< 1	< 1	< 1	< 1
Sn	2	2	0.9	2
Sb	< 0.1	< 0.1	0.1	0.2
Te	< 0.1	< 0.1	< 0.1	< 0.1
Cs	< 1	< 1	< 1	< 1
Ba	20	30	80	500
La	8	8	10	10
Ce	20	20	30	20
Pr	2	2	4	4
Nd	7	6	10	10
Sm	1	1	2	2
Eu	< 0.1	< 0.1	0.2	0.2
Gd	2	1	2	2
Tb	0.3	0.2	0.3	0.3
Dy	2	0.9	2	2
Ho	30	30	40	30
Er	0.8	0.4	0.7	0.7
Tm	0.1	< 0.1	0.1	0.1
Yb	0.8	0.4	0.7	0.8
Lu	0.1	< 0.1	0.1	0.1
Hf	0.2	0.1	0.3	0.2
Ta	0.2	0.2	0.2	0.2
W	0.2	0.2	0.1	0.6
Re	< 0.1	< 0.1	< 0.1	< 0.1
Os	< 0.1	< 0.1	< 0.1	< 0.1
Ir	< 0.1	< 0.1	< 0.1	< 0.1
Pt	< 0.1	< 0.1	< 0.1	< 0.1
Au	< 0.1	0.2	< 0.1	< 0.1
Tl	< 0.1	0.2	< 0.1	< 0.1
Pb	5	4	10	9
Th	2	1	3	2
U	< 1	< 1	< 1	< 1

[a]Concentration units ug/g dry weight.

Table 4. Concentrations of elements in a continuing calibration blank (CCB) and independent calibration verification standard (ICVS) ran every 10 samples. Results expressed as µg/mL.

BID[a] & Run #	Element	CCB[b]	ICVS	% Rec (ICVS)[c]
12/02/97 Run #1	Ni	-0.0211	24.0	96.
	Cu	-0.0015	25.1	100.
	Zn	-0.0464	24.8	99.
	Cd	0.0005	26.4	106.
	Pb	-0.0004	25.7	103.
12/02/97 Run #2	Ni	-0.0246	24.8	99.
	Cu	0.0049	25.5	102.
	Zn	-0.0936	24.7	99.
	Cd	-0.0008	25.9	103.
	Pb	-0.0007	25.0	100.
12/02/97 Run #3	Ni	-0.0250	23.9	96.
	Cu	-0.0017	24.5	98.
	Zn	-0.1189	24.5	98.
	Cd	-0.0011	25.7	103.
	Pb	0.0001	25.0	100.
12/02/97 Run #4	Ni	-0.0252	24.0	96.
	Cu	0.0004	24.4	98.
	Zn	-0.0680	24.2	97.
	Cd	-0.0001	26.1	104.
	Pb	-0.0005	24.6	99.
12/02/97 Run #5	Ni	-0.0260	24.8	99.
	Cu	-0.0020	24.8	99.
	Zn	-0.1205	24.8	99.
	Cd	-0.0008	25.7	103.
	Pb	0.0004	24.6	99.
12/02/97 Run #6	Ni	-0.0304	23.9	95.
	Cu	-0.0031	24.3	97.
	Zn	-0.1034	24.4	97.
	Cd	-0.0008	26.2	105.
	Pb	-0.0013	24.3	97.
12/02/97 Run #7	Ni	-0.0189	23.0	92.
	Cu	0.0428	23.9	95.
	Zn	-0.0497	24.2	97.
	Cd	-0.0007	25.3	101.
	Pb	0.0001	25.4	101.

[a]BID & Run # = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block"; run # refers to # of times CCB or ICVS analyzed in analytical run.

[b]acceptance criteria for CCB is +/- 3 X IDL for each element.

[c]acceptance criteria for ICVS = +/- 10% (90% - 110%).
ICVS = 25ppb for all elements.

Table 5. Percent relative standard deviation from repeated analysis of Trace Metals in Drinking Water Standard[a] during sediment run. Results expressed in ng/mL.

Element	Run #1	Run #2	Actual Conc	Mean Conc	SD	% RSD
Li	19.1	20.8	20.0	19.9	1.2	5.9
Na	5760.	5919.	6000.	5840.	112.2	1.9
Mg	8774.	9376.	9000.	9075.	425.4	4.7
Al	126.	122.	120.	124.	3.1	2.5
K	2461.	2410.	2500.	2435.	36.5	1.5
Ca	31628.	33182.	35000.	32405.	1098.7	3.4
V	30.4	31.3	30.0	30.9	0.6	2.1
Cr	20.8	20.1	20.0	20.5	0.5	2.2
Mn	35.8	38.9	40.0	37.3	2.2	5.9
Fe	117.	143.	100.	130.	18.3	14.
Co	24.3	23.9	25.0	24.1	0.3	1.2
Ni	53.8	56.1	60.0	55.0	1.6	2.9
Cu	20.7	20.1	20.0	20.4	0.4	2.0
Zn	69.7	68.2	70.0	69.0	1.1	1.5
As	81.9	81.2	80.0	81.5	0.5	0.6
Se	8.8	9.8	10.0	9.3	0.7	7.6
Rb	9.8	10.3	10.0	10.0	0.4	4.0
Sr	245.	243.	250.	244.	1.5	0.6
Mo	101.	101.	100.	101.	0.5	0.5
Ag	1.9	1.9	2.0	1.9	0.0	0.7
Cd	10.3	10.3	10.0	10.3	0.0	0.2
Sb	10.0	9.9	10.0	10.0	0.1	0.6
Te	3.1	2.9	3.0	3.0	0.1	4.2
Ba	49.7	50.8	50.0	50.2	0.8	1.5
Pr	9.8	9.5	10.0	9.6	0.2	2.6
Tb	9.7	9.5	10.0	9.6	0.2	1.6
Tm	10.0	9.9	10.0	10.0	0.1	1.1
Ta	11.0	8.6	10.0	9.8	1.7	17.
Au	10.4	10.3	10.0	10.3	0.1	0.8
Tl	9.9	9.7	10.0	9.8	0.1	0.9
Pb	37.4	40.2	40.0	38.8	2.0	5.1
U	9.9	10.1	10.0	10.0	0.2	1.7

[a]High Purity Trace Metals in Drinking Water, Cat # CRM-TMDW, Charleston, SC.; Pr, Tb, Tm, Ta, and Au manually added to represent rare earth area of mass spectral range.

Table 6. Recovery of elements from a laboratory control sample[a].

Element	Actual Conc	Meas Conc	% Rec
Li	80.	58.2	73.
Na	80.	59.5	74.
Mg	80.	44.0	55.
Al	80.	66.8	84.
Ca	80.	101.	127.
V	80.	63.4	79.
Cr	80.	63.9	80.
Mn	80.	59.0	74.
Co	80.	59.1	74.
Ni	80.	66.5	83.
Cu	80.	71.0	89.
Zn	80.	103.	129.
As	80.	89.9	112.
Se	80.	87.3	109.
Sr	80.	74.2	93.
Mo	80.	70.3	88.
Ag	80.	70.1	88.
Cd	80.	97.4	122.
Sb	80.	87.7	110.
Ba	80.	77.7	97.
La	80.	62.0	78.
Eu	80.	72.1	90.
Yb	80.	83.3	104.
Tl	80.	67.3	84.
Pb	80.	67.3	84.
Th	80.	64.4	81.
U	80.	65.0	81.

[a]ICP-MS Calibration Standard; Cat# ICP-MSCS; High Purity Standards, Charleston, SC.

Table 7. Performance of a standardized Na_2S solution used for instrument calibration during AVS determination.

BID[a]	Ele.	Run Date	Ref. Material	Actual Conc	Meas Conc 1	Meas Conc 2	% Error 1	% Error 2	ISOP[b]	Oper Init.
08/27/97	S	08/28/97	Na_2S	19.8	19.2	18.4	3.03	7.07	C5.156	JWA/WGB

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]ISOP = instrumental standard operating procedure.

Table 8. Recoveries of elements from reference solutions and an HCl extracted reference sediment material.

Reference Material	Element	Actual Conc.(µg/g)	Meas. Conc.(µg/g)	% Rec
NIST 1643d[a]	Ni	58.1 +/- 2.7	52.9	95.
	Cu	20.5 +/- 3.8	19.7	100.
	Zn	72.48 +/- 0.65	69.3	96.
	Cd	6.47 +/- 0.37	6.9	100.

Reference Material	Element	Actual Conc.(µg/g)	Meas. Conc.(µg/g) n=3	SD n=3	% Rec
TMDW[b]	Ni	60 +/- 6	54.6	0.12	100.
	Cu	20 +/- 2	20.2	1.17	100.
	Zn	70 +/- 7	76.1	7.56	100.
	Cd	10 +/- 1	10.3	0.48	100.

Reference Material	Element	Actual Conc.(µg/g)	Meas. Conc.(µg/g)	% Rec
NIST 1645 River Sediment[c]	Ni	45.8 +/- 2.9	13.6	32.
	Cu	109 +/- 19	47.7	53.
	Zn	1720 +/- 170	1300.	84.
	Cd	10.2 +/- 1.5	6.8	78.
	Pb	714 +/- 28	563.	82.

[a]NIST 1643d = National Institute of Standards and Technology Standard Reference Material Trace Elements in Water 1643d. Concentration results in mg/L. Solution used as instrumental laboratory control sample.

[b]TMDW = Trace Metals in Drinking Water laboratory control solution, Cat # CRM-TMDW; concentration results in ug/L. Solution used as instrumental laboratory control sample.

[c]NIST 1645 River Sediment = National Institute of Standards and Technology SRM 1645 River Sediment extracted with 1 N HCl; concentration results in ug/g dry weight.

Table 9. Recovery of elements from sediment reference materials.

a. NIST SRM 1645 River Sediment

Element	Units	Meas. Conc.	Cert. Mean	Upper Limit	Lower Limit	% Rec
Na	ug/g dry	984.	5400.	5500.	5300.	19.
Mg	ug/g dry	5332.	7400.	7600.	7200.	74.
Al	ug/g dry	4360.	22600	23000.	22200.	20.
K	ug/g dry	411.	12600.	13100.	12100.	3.
Ca	ug/g dry	21534.	(29000)	31900.	26100.	83.
V	ug/g dry	15.2	23.5	30.4	16.6	92.
Cr	ug/g dry	22331.	29600.	32400.	26800.	83.
Mn	ug/g dry	567.	785.	882.	688.	82.
Co	ug/g dry	6.04	10.1	10.7	9.50	64.
Ni	ug/g dry	32.5	45.8	48.7	42.9	76.
Cu	ug/g dry	107.	109.	128.	90.0	100.
Zn	ug/g dry	2052.	1720.	1890.	1550.	109.
As	ug/g dry	75.0	(66)	72.6	59.4	103.
Sb	ug/g dry	23.8	(51)	56.1	45.9	52.
Hg	ug/g dry	0.68	1.10	1.60	0.6	100.
Tl	ug/g dry	0.99	1.44	1.51	1.37	73.
Pb	ug/g dry	540.	714.	742.	686.	79.
Th	ug/g dry	0.84	1.62	1.84	1.40	60.
U	ug/g dry	0.68	1.11	1.16	1.06	64.

b. NIST SRM 2704 Buffalo River Sediment

Element	Units	Meas. Conc.	Cert. Mean	Upper Limit	Lower Limit	% Rec
Li	ug/g dry	19.4	47.5	51.6	43.4	45.
Mg	ug/g dry	6854.	12000.	12200.	11800.	58.
Al	ug/g dry	8156.	61100.	62700.	59500.	14.
K	ug/g dry	678.	20000.	20400.	19600.	3.
Ca	ug/g dry	17476.	26000.	26300.	25700.	68.
Ti	ug/g dry	24.7	4570.	4750.	4390.	1.
V	ug/g dry	16.1	95.0	99.0	91.0	18.
Cr	ug/g dry	64.2	135.	140.	130.	49.
Mn	ug/g dry	366.	555.	574.	536.	68.
Fe	ug/g dry	19252.	41100.	42100.	40100.	48.
Co	ug/g dry	8.70	14.0	14.6	13.4	65.
Ni	ug/g dry	29.4	44.1	47.1	41.1	72.
Cu	ug/g dry	93.9	98.6	104.	93.6	100.
Zn	ug/g dry	555.	438.	450.	426.	123.
As	ug/g dry	21.8	23.4	24.2	22.6	96.
Rb	ug/g dry	8.59	(100)	100.	100.	9.
Sr	ug/g dry	31.4	(130)	130.	130.	24.
Cd	ug/g dry	4.05	3.45	3.67	3.23	110.
Sn	ug/g dry	5.15	(9.5)	9.50	9.50	54.
Sb	ug/g dry	1.03	3.79	3.94	3.64	28.
Hg	ug/g dry	1.30	1.47	1.54	1.40	93.
Tl	ug/g dry	0.50	1.06	1.13	0.99	50.
Pb	ug/g dry	159.	161.	178.	144.	100.
Th	ug/g dry	2.63	(9.2)	9.20	9.20	29.
U	ug/g dry	0.65	3.13	3.26	3.00	22.

Table 10. Concentration of sulfide in a reference sediment. Measured concentrations (Meas. Conc.) expressed as ug/g unless otherwise specified.

BID[a]	Ele.	QC #	Meas. Conc.	Reference Material	Matrix	Upper Limit	Lower Limit	Pass/ Fail	Prep SOP	Prep Init.	ISOP[b]	Oper. Init.
08/27/97	S	61	208.	NIST 1645[c]	sediment	240.	140.	+	C5.156	JWA	C5.156	WGB

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]ISOP = instrumental standard operating procedure.

[c]NIST 1645 River Sediment = National Institute of Standards and Technology SRM 1645 River Sediment extracted with 1 N HCl; concentration results in ug/g dry weight.

Table 11. Method precision from the duplicate extraction, digestion, and analysis of sediments.

BID[a]	Sample ID	Matrix	Element	Rep 1	Rep 2	Diff[b]	Mean	RPD[c]	ISOP[d]	Oper. Init.
12/02/97	16230 SEM[e]	Sediment extract	Ni	0.432	0.412	0.020	0.422	4.7	C5.212	RHW/TWM
			Cu	0.632	0.616	0.017	0.624	2.7	C5.212	RHW/TWM
			Zn	4.63	4.23	0.402	4.43	9.1	C5.212	RHW/TWM
			Cd	0.033	0.039	0.0057	0.036	16.	C5.212	RHW/TWM
			Pb	4.34	6.02	1.68	5.18	32.	C5.212	RHW/TWM
12/02/97	16231 SEM MW[f]	Sediment extract	Ni	0.627	0.689	0.062	0.658	9.4	C5.212	RHW/TWM
			Cu	3.31	3.27	0.037	3.29	1.1	C5.212	RHW/TWM
			Zn	26.6	39.0	12.4	32.8	38.	C5.212	RHW/TWM
			Cd	0.180	0.175	0.0054	0.177	3.0	C5.212	RHW/TWM
			Pb	4.16	4.15	0.015	4.15	0.4	C5.212	RHW/TWM
12/02/97	16232 Analysis[g]	Sediment extract	Ni	0.023	0.024	0.0009	0.023	3.8	C5.212	RHW/TWM
			Cu	0.022	0.023	0.0009	0.023	3.8	C5.212	RHW/TWM
			Zn	0.036	0.037	0.0012	0.036	3.2	C5.212	RHW/TWM
			Cd	0.002	0.002	0.0000	0.002	1.4	C5.212	RHW/TWM
			Pb	0.019	0.018	0.0004	0.018	2.3	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]Diff = Dup 1 - Dup 2.

[c]RPD = relative percent difference, calculated as Diff/Mean X 100; acceptance criteria +/- 10%.

[d]ISOP = standard operating procedure used for instrumental analysis of sample, here MSC SOP C5.212.

[e]two aliquants of sample 16230 extracted with 1N HCl followed by microwave evaporative digestion; units µg/mL.

[f]two aliquots each of HCl extracts of sample 16231 subjected to microwave evaporative digestion; units µg/mL.

[g]duplicate instrumental analysis of extract 16232.

Table 12. Relative percent difference from the duplicate analysis of samples.

Analysis Date	Ele.	Matrix	Dup 1	Dup 2	Mean	Units	Diff[a]	RPD[b]	PSOP	Prep. Init.	ISOP[c]	Oper. Init.
08/28/97	S	sediment	0.131	0.083	0.107	uMol/g	0.048	45.	C5.156	JWA	C5.156	WGB

[a]Diff = Dup 1 - Dup 2.

[b]RPD = relative percent difference, calculated as Diff/Mean X 100; acceptance criteria +/- 10%

[c]ISOP = standard operating procedure used for instrumental analysis of sample.

Table 13. Percent relative standard deviation from the triplicate preparation and analysis of a sediment sample.

Element	1-LA 16230 Rep1	1-LA 16230 Rep2	1-LA 16230 Rep3	Mean	SD	%RSD
Li	4.4	4.3	5.8	4.8	0.88	18.
Na	73.4	42.1	80.7	65.4	20.5	31.
Mg	134.	157.	168.	153.	17.4	11.
Al	1310.	1475.	1782.	1523	240.	16.
K	152.	159.	176.	162.	12.0	7.4
Ca	462.	501.	481.	482.	19.3	4.0
Ti	49.4	59.5	57.6	55.5	5.3	9.6
V	2.4	3.6	3.3	3.1	0.62	20.
Cr	1.6	1.8	1.9	1.8	0.19	11.
Mn	111.	112.	117.	113.	3.0	2.7
Fe	1828.	1964.	1813.	1868.	83.0	4.4
Co	0.57	0.64	0.62	0.61	0.034	5.5
Ni	1.1	1.9	1.8	1.6	0.39	24.
Cu	1.2	1.8	1.3	1.4	0.32	23.
Zn	ND	ND	ND	---	---	---
Ga	1.6	2.1	2.1	2.0	0.30	15.
Ge	0.038	0.053	0.035	0.042	0.010	24.
As	0.46	0.37	0.38	0.40	0.048	12.
Se	ND	ND	ND	---	---	---
Rb	3.1	2.8	3.0	3.0	0.17	5.7
Sr	5.3	6.2	6.7	6.1	0.72	12.
Y	8.0	10.0	10.9	9.6	1.5	15.
Zr	4.2	4.9	6.6	5.2	1.2	23.
Nb	1.3	1.3	1.6	1.4	0.13	9.0
Mo	0.42	0.40	0.35	0.39	0.039	10.
Ru	ND[a]	ND	ND	---	---	---
Pd	ND	ND	ND	---	---	---
Ag	0.038	0.027	0.035	0.033	0.006	18.
Cd	ND	ND	ND	---	---	---
In	0.038	0.027	0.035	0.033	0.006	18.
Sn	2.0	1.1	1.8	1.6	0.44	27.

[a]ND = not detected

Element	1-LA 16230 Rep1	1-LA 16230 Rep2	1-LA 16230 Rep3	Mean	SD	%RSD
Sb	0.077	0.053	0.035	0.055	0.021	38.
Te	ND	ND	ND	---	---	---
Cs	0.50	0.51	0.55	0.5	0.030	5.8
Ba	23.9	26.6	30.7	27.0	3.4	13.
La	8.4	10.1	11.3	9.9	1.5	15.
Ce	15.4	23.4	21.0	19.9	4.1	21.
Pr	2.3	2.9	3.1	2.8	0.45	16.
Nd	7.3	8.9	9.8	8.7	1.3	15.
Sm	1.5	1.9	2.1	1.8	0.35	19.
Eu	0.077	0.080	0.069	0.075	0.006	7.3
Gd	1.6	2.1	2.2	2.0	0.29	15.
Tb	0.27	0.32	0.35	0.31	0.040	13.
Dy	1.6	1.9	2.2	1.9	0.29	15.
Er	0.77	0.88	1.0	0.9	0.12	13.
Tm	0.11	0.13	0.14	0.13	0.012	10.
Yb	0.84	0.99	1.1	1.0	0.13	14.
Lu	0.11	0.13	0.17	0.14	0.030	21.
Hf	0.19	0.24	0.31	0.25	0.060	24.
Ta	0.19	0.13	0.17	0.17	0.030	18.
W	0.19	0.21	0.21	0.20	0.011	5.5
Re	ND	ND	ND	---	---	---
Os	ND	ND	ND	---	---	---
Ir	ND	ND	ND	---	---	---
Pt	0.038	0.027	0.035	0.033	0.006	18.
Au	ND	ND	ND	---	---	---
Tl	0.038	0.053	0.069	0.054	0.015	29.
Pb	4.8	5.3	14.3	8.1	5.3	66.
Th	1.7	2.1	2.4	2.0	0.33	16.
U	0.38	0.45	0.55	0.46	0.09	19.

Table 14 . Percent recovery of elements from spiked blanks and sediment extracts.

BID[a]	Ele.	Spk Type	Matrix	Analysis Units	Spk Amt.[b] ug	Vol. (L)	Effective[c] Conc.	Bkgd.[d] Conc.	Total[e] Conc.	% Rec.[f]	Spk/Bkgd	ISOP	Oper. Init.
12/02/97	Ni	16230 - Analytical	Sed. Ext.	ug/L	0.300	0.010	30.0	3.81	34.8	103.	8.	C5.212	RHW/TWM
12/02/97	Cu	16230 - Analytical	Sed. Ext.	ug/L	0.300	0.010	30.0	4.93	34.3	98.	6.	C5.212	RHW/TWM
12/02/97	Zn	16230 - Analytical	Sed. Ext.	ug/L	0.300	0.010	30.0	5.00	34.3	98.	6.	C5.212	RHW/TWM
12/02/97	Cd	16230 - Analytical	Sed. Ext.	ug/L	0.300	0.010	30.0	0.24	33.1	110.	123.	C5.212	RHW/TWM
12/02/97	Pb	16230 - Analytical	Sed. Ext.	ug/L	0.300	0.010	30.0	3.42	32.2	96.	9.	C5.212	RHW/TWM
12/02/97	Ni	16231 - MW Digest.	Sed. Ext.	ug/L	50.	0.050	1000.	5.38	1150.8	115.	186.	C5.212	RHW/TWM
12/02/97	Cu	16231 - MW Digest.	Sed. Ext.	ug/L	50.	0.050	1000.	26.9	1000.	97.	37.	C5.212	RHW/TWM
12/02/97	Zn	16231 - MW Digest.	Sed. Ext.	ug/L	500.	0.050	10000.	268.0	9737.	95.	37.	C5.212	RHW/TWM
12/02/97	Cd	16231 - MW Digest.	Sed. Ext.	ug/L	5.0	0.050	100.	1.5	104.	103.	69.	C5.212	RHW/TWM
12/02/97	Pb	16231 - MW Digest.	Sed. Ext.	ug/L	50.	0.050	1000.	34.	1027.	99.	29.	C5.212	RHW/TWM
12/02/97	Ni	Blank - SEM	Sed. Ext.	ug/L	100.	0.5	200.	1.02	194.	97.	196.	C5.212	RHW/TWM
12/02/97	Cu	Blank - SEM	Sed. Ext.	ug/L	100.	0.5	200.	0.70	210.	105.	287.	C5.212	RHW/TWM
12/02/97	Zn	Blank - SEM	Sed. Ext.	ug/L	1000.	0.5	2000.	5.26	1861.	93.	381.	C5.212	RHW/TWM
12/02/97	Cd	Blank - SEM	Sed. Ext.	ug/L	10.	0.5	20.	0.02	21.	104.	815.	C5.212	RHW/TWM
12/02/97	Pb	Blank - SEM	Sed. Ext.	ug/L	100.	0.5	200.	0.30	209.	105.	676.	C5.212	RHW/TWM
12/02/97	Ni	Blank - MW Digest.	Sed. Ext.	ug/L	50.	0.050	1000.	0.020	1090.	109.	49640.	C5.212	RHW/TWM
12/02/97	Cu	Blank - MW Digest.	Sed. Ext.	ug/L	50.	0.050	1000.	0.126	1164.	116.	7945.	C5.212	RHW/TWM
12/02/97	Zn	Blank - MW Digest.	Sed. Ext.	ug/L	500.	0.050	10000.	0.802	10577.	106.	12464.	C5.212	RHW/TWM
12/02/97	Cd	Blank - MW Digest.	Sed. Ext.	ug/L	5.0	0.050	100.	0.004	106.	106.	25142.	C5.212	RHW/TWM
12/02/97	Pb	Blank - MW Digest.	Sed. Ext.	ug/L	50.	0.050	1000.	0.039	1175.	117.	25472.	C5.212	RHW/TWM

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block." as a member of the group or "block."

[b]Spike Amt. ug = the absolute microgram (ug) amount of the spike which was added to a sample.

[c]Effective Conc. = the Spike Amt (µg) divided by the total solution volume, units ug/L.

[d]Bkgd Conc. = the measured concentration of the sample prior to spiking, units ug/L.

[e]Total Conc. = the measured concentration of the spiked sample (spike + background, units ug/L.

[f]% Rec. = percent recovery: [(Total Conc. - Bkgd Conc.)/Effective Conc. * 100]

Table 15. Percent recoveries of sulfide in a digested spike.

BID[a]	Ele.	Spike Form	Amt.[b] uMol	Matrix	Total uMol[c] Meas.	Bkgd.[d] uMol	Spk/Bkdg[e]	Spk/Bkgd[d] SD	% REC[f]	PSOP	Prep. Init.	ISOP	Oper. Init.
12/02/97	S	Na_2S	19.8	Blank	18.2	0.0	∞	N/A[g]	92.	C5.156	JWA	C5.156	WGB

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]Amt uMol = the absolute uMol amount of the spike in the form listed in column 3 which was added to a sample.

[c]Total uMol Meas. = the micromoles (uMol) of the analyte in the sample spike measured by the instrument (spike + background).

[d]Bkgd (uMol) = background amount of the blank in μMol.

[e]Spk/Bkgd = the ratio of the spike amount added (column 4) divided by the mean sample background concentration (column 7).

[f]%REC = Total uMol Meas. (column 6) - Bkgd. uMol (column 7) divided by the Amt. uMol (column 4) X 100.

[g]N/A = not applicable; standard deviation of background was 0.0.

Table 16. Recovery of elements spiked into a sediment sample prior to acid digestion.

Element	Spike Conc (ug/g)	Bkgd Conc (ug/g)	Spk/Bkgd Ratio	Total Conc (ug/g)	% Recovery
Mg	3649.	153.	24.	3098.	81.
Cr	36.5	1.8	21.	32.6	84.
Ni	36.5	1.6	23.	29.5	77.
Cu	36.5	1.4	26.	36.5	96.
Zn	365.	0.0	∞	500.	137.
As	36.5	0.40	90.	31.1	84.
Cd	3.65	0.0	∞	4.53	124.
Sb	3.65	0.05	67.	2.15	57.
Pb	36.5	8.1	4.	41.2	91.

Table 17. Interference check using dilution percent difference.

BID[a]	Run Date	Matrix Type	Element	Undiluted Sample	Diluted Sample[b]	% Diff[c]
12/02/97	12/05/97	Sed. Ext.[d]	Ni	29.0	6.71	15.6
12/02/97	12/05/97	Sed. Ext.	Cu	30.9	6.80	10.0
12/02/97	12/05/97	Sed. Ext.	Zn	39.1	8.33	6.6
12/02/97	12/05/97	Sed. Ext.	Cd	29.8	6.26	5.0
12/02/97	12/05/97	Sed. Ext.	Pb	31.1	6.69	7.5

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]dilution factor = 5 (1+4).

[c]dilution % difference acceptance criteria = +/- 10%; concentrations exceeding +/- 10%. indicative of suspect interferent.

[d]sediment extract used for dilution check was from sample 16230.

Table 18. Recovery of elements from an interference check solution[a].

BID	Run Date	Element	Conc (ppb) measured	Conc (ppb) actual	Dilution Factor	% Rec.[b]
12/02/97	12/05/97	Ni	200.	128.	5	64.
12/02/97	12/05/97	Cu	100.	74.	5	74.
12/02/97	12/05/97	Zn	100.	110.	5	110.
12/02/97	12/05/97	Cd	50.	75.	5	150.
12/02/97	12/05/97	Pb	100.	100.	5	100.

[a]High Purity ICP-MS Solution AB in 2% nitric acid, Charleston, SC.; CAT # ICP-MS-ICS.

[b]suggested acceptance tolerance 80% - 120%.

Table 19. Blank equivalent concentrations for SEM procedure.

BID	Blank Type	Element	Solution Concentration (ng/mL) Rep 1	Rep 2	Rep 3	Dry Weight Equivalent Concentration (ug/g) Rep 1	Rep 2	Rep 3	Mean	Std Dev
12/02/97	SEM	Ni	5.11	---	---	0.1363	---	---	0.1363	---
		Cu	3.49	---	---	0.0930	---	---	0.0930	---
		Zn	26.3	---	---	0.7008	---	---	0.7008	---
		Cd	0.123	---	---	0.0033	---	---	0.0033	---
		Pb	1.48	---	---	0.0395	---	---	0.0395	---
12/02/97	MW	Ni	0.019	0.228	0.055	0.0005	0.0061	0.0015	0.0027	0.0030
		Cu	1.18	0.446	0.263	0.0314	0.0119	0.0070	0.0168	0.0129
		Zn	4.48	4.61	2.95	0.1195	0.1229	0.0786	0.1070	0.0247
		Cd	0.013	0.029	0.018	0.0004	0.0008	0.0005	0.0005	0.0002
		Pb	0.194	0.208	0.187	0.0052	0.0055	0.0050	0.0052	0.0003

Table 20. Blank equivalent concentrations (ug/g dry weight) of elements in digestion blanks analyzed with sediment.

Element	BEC Blk 1	BEC Blk 2	BEC Blk 3	Mean BEC
Li	0.04	0.04	0.04	0.04
Na	1.2	11.	52.	21.47
Mg	0.00	0.00	0.00	0.00
Al	1.2	4.5	6.6	4.12
K	0.00	0.00	0.00	0.00
Ca	0.00	0.00	0.00	0.00
Ti	0.00	0.08	0.12	0.07
V	0.04	0.04	0.04	0.04
Cr	0.88	0.72	0.40	0.67
Mn	0.00	0.00	0.08	0.03
Fe	20.	0.00	41.	20.19
Co	0.00	0.00	0.00	0.00
Ni	0.24	0.20	0.00	0.15
Cu	0.68	0.00	0.08	0.25
Zn	- 0.76	- 0.60	- 0.64	- 0.67
Ga	0.00	0.00	0.00	0.00
Ge	0.00	0.00	0.00	0.00
As	0.12	0.00	0.04	0.05
Rb	0.00	0.00	0.00	0.00
Sr	0.00	0.00	0.04	0.01
Y	0.00	0.00	0.00	0.00
Zr	0.16	0.00	0.24	0.13
Nb	0.00	0.00	0.00	0.00
Mo	0.08	0.04	0.04	0.05
Ru	0.00	0.00	0.00	0.00
Pd	0.00	0.00	0.00	0.00
Ag	0.00	0.00	0.00	0.00
Cd	0.00	0.00	0.00	0.00
In	0.00	0.00	0.00	0.00
Sn	0.32	0.20	0.08	0.20

Element	BEC Blk 1	BEC Blk 2	BEC Blk 3	Mean BEC
Sb	0.16	0.08	0.08	0.11
Te	0.00	0.00	0.00	0.00
Cs	0.00	0.00	0.00	0.00
Ba	0.00	0.00	0.00	0.00
La	0.00	0.00	0.00	0.00
Ce	0.00	0.00	0.00	0.00
Pr	0.00	0.00	0.00	0.00
Nd	0.00	0.00	0.00	0.00
Sm	0.00	0.00	0.00	0.00
Eu	0.00	0.00	0.00	0.00
Gd	0.00	0.00	0.00	0.00
Tb	0.00	0.00	0.00	0.00
Dy	0.00	0.00	0.00	0.00
Er	0.00	0.00	0.00	0.00
Tm	0.00	0.00	0.00	0.00
Yb	0.00	0.00	0.00	0.00
Lu	0.00	0.00	0.00	0.00
Hf	0.00	0.00	0.00	0.00
Ta	0.24	0.24	0.20	0.23
W	0.00	0.00	0.00	0.00
Re	0.00	0.00	0.00	0.00
Os	0.00	0.00	0.00	0.00
Ir	0.00	0.00	0.00	0.00
Pt	0.04	0.04	0.04	0.04
Au	0.08	0.04	0.04	0.05
Tl	0.00	0.00	0.00	0.00
Pb	0.00	0.00	0.00	0.00
Th	0.12	0.12	0.08	0.11
U	0.00	0.00	0.00	0.00

Table 21. Instrument detection limits, method detection limits, and limits of quantitation for SEM.

BID	Run Date[a]	Element	Std Conc.[b]	Blk SD 1[c]	Blk SD 2	Blk SD 3	IDL[d]	MDL[e]	LOQ[f]	ISOP	Oper. Init.
12/02/97	09/29/97	Cd	0.0	0.000708	0.0005648	0.00081	0.0021	0.082	0.27	C5.212	RHW/TWM
12/02/97	09/29/97	Cu	0.0	0.004319	0.0028864	0.00251	0.0097	0.077	0.25	C5.212	RHW/TWM
12/02/97	09/29/97	Ni	0.0	0.053507	0.0081289	0.02520	0.0868	0.211	0.70	C5.212	RHW/TWM
12/02/97	09/29/97	Pb	0.0	0.001218	0.0010637	0.01677	0.0191	0.097	0.32	C5.212	RHW/TWM
12/02/97	09/29/97	Zn	0.0	0.030232	0.2936031	0.05749	0.3813	0.046	0.15	C5.212	RHW/TWM

[a]date of 3rd non-consecutive day analysis, following which IDL was computed.

[b]concentration of low level standard used in analysis in ppb, which was reagent blank or 0 conc standard.

[c]standard deviation from analysis of 0 standard (reagent blank) 7 consecutive times in one day.

[d]IDL = instrument detection limit (ng/mL), computed as 3 X mean of standard deviations.

[e]MDL = method detection limit (ng/mL), computed as $3 \times (SD_b^2 + SD_s^2)^{1/2}$ where SD_b = standard deviation of a blank (n = 3) and SD_s = standard deviation of a low level sample or spiked sample (n = 3); units are µg/g dry weight.

[f]LOQ = limit of quantitation (µg/g dry weight), computed as 3.3 X the MDL.

MRI REPORT

Narrative Report for Catalog No. 8990081

For U.S. Fish and Wildlife Service
Patuxent Analytical Control Facility
10211 Beech Forest Road
Laurel, Maryland 20708-4041

Purchase Order No.
MRI Project No. 4661-A

May 4, 1998

MIDWEST RESEARCH INSTITUTE 425 Volker Boulevard, Kansas City, MO 64110-2299 • (816) 753-7600

US Fish and Wildlife Service
Patuxent Analytical Control Facility
10211 Beech Forest Road
Laurel, MD 20708-4041

COVER PAGE - METALS ANALYSES DATA PACKAGE

Lab Name: MRI
Catalog No.: 8990081

Purchase Order No.: 8PXSA-7-0066

FWS Sample No.	Lab Sample ID
VUWM01	5343
VLWM02	5344
PUWM01	5345
PLWM02	5346
SUWM01	5347
SUWM01D	5348
SLWM02	5349
LUWM01	5350
LLWM02	5351
BlankWM01	5352
VUWM02	5353
VLWM03	5354
PUWM02	5355
PUWM02D	5356
PLWM03	5357
SUWM02	5358
SLWM03	5359
LUWM02	5342
LLWM03	5360
BLKWM02	5361
VUWM04	5362
VUWM04D	5363
VLWM05	5364
PUWM04	5365
PLWM05	5366
SUWM04	5367
SLWM05	5368
LUWMO4	5369
LLWM05	5370
BLKWM04	5371
VUWM06	5372
VLWM07	5373
PUWM06	5374
PLWM07	5375

Patuxent Analytical Control Facility
10211 Beech Forest Road
Laurel, MD 20708-4041

COVER PAGE - METALS ANALYSES DATA PACKAGE (Cont.)

Lab Name: MRI
Catalog No.: 8990081

Purchase Order No.: 8PXSA-7-0066

FWS Sample No.	Lab Sample ID
SUWM06	5376
SLWM07	5377
LUWM06	5378
LUWM06D	5379
LLWM07	5380
BLKWM04-2	5381
VUWM08	5382
VLWM09	5383
PUWM08	5384
PLWM09	5385
SUWM08	5386
SUWM08D	5387
SLWM09	5388
LUWM08	5389
LLWM09	5390
BlankWM08	5391
PW1	5392
PW2	5393
PW3	5394
PW4	5395
PW5	5396
PW6	5397
PW7	5398

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10211 Beech Forest Road
Laurel, MD 20708-4041

COVER PAGE - METALS ANALYSES DATA PACKAGE (Cont.)

Lab Name: MRI
Catalog No.: 8990081

Purchase Order No.: 8PXSA-7-0066

FWS Sample No.	Lab Sample ID
VUS1-M	5326
VLS1-M	5327
PUS1-M	5328
PLS1-M	5329
SUSM1-M	5330
SLSM1-M	5331
LUSM1-M	5332
LLSM1-M	5333
VUSM2-M	5334
VLSM2-M	5335
PUSM2-M	5336
PLSM2-M	5337
SUSM2-M	5338
SLSM2-M	5339
LUSM2-M	5340
LLSM2-M	5341
Sandia Canyon	5402
Pajarito Canyon	5403
Canon de Valle	5404
Los Alamos Canyon	5405

Were ICP interelement corrections applied? YES/NO YES

Were ICP background corrections applied? YES/NO YES
If yes, were raw data generated before application of background corrections? YES/NO AFTER

Comments: Narrative Report is attached. Yes (Yes)

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for all conditions other than those conditions detailed in the Narrative Report. Release of data contained in this hardcopy data package and in the data submitted on magnetic media, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: John L. Stanley

Date: 5/4/98

Name: John Stanley, Ph.D.

Title: Director, Chemical Sciences Department

Section 1.
Introduction

This narrative report lists the deliverables submitted for Catalog 8990081 and addresses the modifications and deviations for digestion and analytical methods. The methods were followed to the extent possible, with the exceptions discussed below. The following deliverables are included with this shipment:

1. Cover page
2. Narrative report
3. Sample analysis data reports, Form 1A (Appendices A and B)
4. QA/QC data reports (Appendices C and D)

This narrative report is presented in five sections: (1) introduction; (2) sample receipt and handling; (3) sample preparation; (4) sample analysis and quality control; and (5) organization of the data. The sample analysis section is divided into subsections that address the analysis, the sample analysis quality control (QC) results, and the instrument analysis QC results. Difficulties encountered with the sample matrices and the methods also are addressed in this report.

Catalog 8990081 consisted of the 20 solid and 57 aqueous field samples listed on the cover page. Soil samples were submitted for mercury by cold vapor atomic absorption spectrometry (CVAA), selenium by hydride generation atomic absorption spectrometry (HYAA) and an inductively coupled plasma atomic emission spectrometry (ICP) scan. Aqueous samples were submitted for selenium by HYAA and an ICP scan.

The requested analyses were summarized in purchase order 8PXSA-7-0066. The preparation of a matrix spike (S) and a duplicate (D) sample were required for each group of 20 samples. The sample results shown on Form 1A and the QC results shown on Forms 5 and 6 are presented on a single report page combining the ICP, CVAA, and HYAA data.

Section 2.
Sample Receipt and Handling

The samples for Catalog 8990081 were received cold on January 7, 1998. All samples were received intact, with the exception of three samples (VLSM2-M, PUSM2-M, and PLSM2-M) that were received in broken containers. Upon receipt, the contents of the damaged samples were transferred to new clean containers. Four soil/sediment samples (Sandia Canyon, Canon de Valle, Pajarito Canyon, and Los Alamos Canyon) were received without a chain-of-custody record. Sample VLWM02 was mislabeled as VLWM01. All sample receipt discrepancies were discussed with Duane Chapman and resolved prior to initiating work on the samples. The sample receipt form was returned to the Patuxent Analytical Control Facility (PACF) within five days of the validated time of sample receipt for the catalog.

The pH of each aqueous sample was measured during sample receipt. The pH value was < 2 for all aqueous samples received in this Catalog. The samples were stored at 4°C upon receipt as per the method, and all analyses were performed within the specified holding times.

Section 3.
Sample Preparation

The samples from Catalog 8990081 were digested using three digestion procedures before analysis, one each for the ICP, HYAA, and CVAA analysis types. Preparation blanks, laboratory control samples and an SRM for soil was processed through each digestion procedure, as per the method requirements. Matrix spikes and duplicate samples were also prepared at a frequency of one set per 20 field samples.

Sediment homogenization and moisture determination: A suitable vessel was preweighed (vessel weight) and an aliquot of sediment sample was added to the tared vessel (aliquot wet weight). The sample was dried for 24 hours in an oven at 105°C. After drying, the sample was placed in a dessicator to cool. The vessel + dry sample weight was recorded. The dried sample was then homogenized using a mortar and pestle for grinding. The ground sample was passed through a No. 10 sieve (2.0 mm mesh size).

Percent Moisture = [1 – (vessel + dry weight – vessel weight/aliquot wet weight)] x 100

Preparation of soil/sediment for ICP scan: A one-gram aliquot of the previously dried coarsely ground soil was transferred to a beaker and the metals were extracted using a nitric acid and hydrogen peroxide digestion procedure. The digestate was transferred to a 100-mL volumetric flask and diluted to volume using reagent grade water. The samples were prepared in two separate batches.

Preparation of water samples for ICP scan using microwave digestion: A 45-mL aliquot of each well-mixed, acid preserved water sample was combined with 5-mL of concentrated nitric acid in a heavy duty microwave vessel. The vessel was capped and digested for 10 minutes at 165°C using a CEM MDS 2100 microwave system. Each digestate was transferred to a 50-mL centrifuge tube for analysis. The aqueous samples were prepared for analysis in three batches.

Preparation of soil/sediment and water samples for selenium hydride atomic absorption spectrometry: A 50-mL aliquot of each well-mixed, acid-preserved water sample was transferred to a beaker. For the soil/sediment matrix a 50-mL aliquot of the previously digested sample was used. The aliquots were further digested for selenium using nitric and sulfuric acids. The volume was reduced until the evolution of SO_3 fumes. Water was added and the volume again reduced until the evolution of SO_3 fumes. The sample was diluted to 50 mL with water. The samples were prepared for analysis in four batches.

Preparation of soil/sediment samples for mercury analysis: A 0.2-gram aliquot of the undried soil/sediment was digested in sulfuric and nitric acids at 95°C for two minutes then cooled. Potassium permanganate and potassium persulfate was added to the digestate and the sample was returned to the water bath for an additional 30-minute digestion at 95°C. The excess permanganate was reduced with a sodium chloride-

hydroxylamine sulfate solution and the sample was diluted to 200-mL. One batch of 20 soil/sediment field samples was prepared for mercury analysis.

Preparation of water samples for mercury analysis: A 100-mL aliquot of water was digested using sulfuric acid, nitric acid, potassium permanganate, and potassium persulfate for two hour in a 95°C water bath. Excess permanganate was reduced with sodium chloride-hydroxylamine sulfate solution and the sample was diluted to 200 mL. The aqueous samples were prepared for analysis in three batches.

Section 4.
Sample Analysis and Quality Control

The sample analysis results are presented on Form 1A in Appendices A and B for the soil/sediment and water matrices, respectively. The analysis, the sample QC, and the instrument QC are discussed in this section. Difficulties noted for selected samples, problems and resolutions from the analysis, and method difficulties encountered are also discussed.

4.1 Sample Analysis

4.1.1 Quantitative ICP Analysis

The quantitative ICP analysis was performed using a Thermo Jarrell Ash ICAP 61E atomic emission spectrometer. Dilution of the digests was required for the analysis in some cases, to lower selected analytes to within the calibration range of the instrument. The ICP analysis for soil/sediment samples was completed in three runs, two for Batch 23S and one run for 25S. The first run for 23S was on 1-15-98 and a second analytical was required for five analytes (Cd, Cu, Fe, Mn, and Zn) on 3-18-98. Preparation Batch 25S was analyzed on 2-13-98. One run was required for the water analysis and was performed on 4-22-98.

4.1.2 CVAA Analysis

The CVAA analysis was performed using a PSA Merlin Plus Mercury Analyzer set-up in CVAA mode. This instrument provides a direct readout of absorbance and solution concentration (µg/L) in the digested sample matrix. The mercury analysis was completed in one run on 1-9-98 for the soil/sediment samples. The water samples did not require mercury analysis.

4.1.3 HYAA Analysis

Selenium absorption was measured using a GBC 902 atomic emission/absorption spectrometer. A 10-mL aliquot of the digestate was combined with 5 mL of water and 5 mL of hydrochloric acid. The selenium was then converted to a volatile hydride with hydrogen produced from a sodium borohydride reaction. In some cases, dilutions were required to lower the analyte concentration to within the calibration range of the instrument. Selenium was analyzed in one analytical run on 3-4-98 combining both the water and soil/sediment sample matrices. Only one set of quality control samples were required for Se analysis for the soil samples. All soil/sediment samples were combined into one batch.

4.2 Sample Analysis Quality Control

4.2.1 Preparation Blank Results

The preparation blank results reported in Appendices C and D were within the method specifications. The absolute value of the concentration of the blank was less than or equal to the minimum acceptable detection limits for each respective analyte.

4.2.2 Matrix Spike Results

4.2.2.1 Soil

Samples PUSM2-M and Pajarito Canyon were selected for laboratory matrix spike and duplicate analysis. All spike recoveries were within the method criterion of 80% to 120% except for the elements as noted below.

PUSM2-M and Pajarito Canyon: Al, Fe, Mn, and Mg in both samples were spiked too low relative to the native sample. All other analytes were recovered within the data quality objectives.

4.2.2.2 Water

Samples PUWM01, PUWM04, and PLWM09 were selected for laboratory matrix spike and duplicate analysis. All spike recoveries meet the method criterion of 80% to 120% recovery with the exception of elements as noted below.

In sample PUWM04S the matrix spike sample was above the upper limit of 120% for As, B, Cd, Cr, Cu, Pb, Mg, Mn, Mo, Ni, V, and Zn. This appears to be a systematic error in the spiking for this sample. A review of the data for this microwave digested sample does not indicate an appreciable loss of sample during prep. All other spike recoveries for the water samples met the acceptance criteria.

4.2.3 Duplicate Results

Duplicate samples were prepared and analyzed with each sample preparation batch and for each analysis type (ICP, GFAA, and CVAA). The results of these analyses reported on Form 5B were all within the method specifications of ≤20% relative percent difference, with the exceptions as noted below.

4.2.3.1 Soil/Sediment

All of the analytes passed the duplicate precision test with the exception of Cu, and Zn in PUSM2-M and B and Ni in Pajarito Canyon. During sample preparation, both of these samples were noted as being coarse mainly composed of sand. It is suspected that the composition of the soil/sediment is a possible source of the high RPD values obtained for these analytes.

4.2.3.2 Water

All of the analytes met the acceptance criteria for the duplicate precision test with the exception of Cr and Zn (PUWM01), Cd and Ni (PUWM04), and Cr and V (PLWM09). Both results (native and duplicate) for the analytes listed were within 5 times the instrument detection limit (IDL). More variability is expected for measurements made at less than 5 times the IDL.

4.2.4 Laboratory Control Samples and Standard Reference Material

4.2.4.1 Soil/Sediment

A NIST Standard Reference Material (SRM) 2704 was prepared with the soil samples. The results for the SRM are within the historical limits for a SW-846 Method 3050 prep.

4.2.4.2 Water

A NIST traceable standard solution supplied by Inorganic Ventures was used as the reference material for water batches. All of the recoveries with the exception of the Mg results (122.4%, 122.7%, and 122.4%) and one Se recovery (123.5%) were within 10% of the true concentration.

4.3 Instrumental Analysis Quality Control

4.3.1 Initial and Continuing Calibration Verifications

All initial calibration verification (ICV) and continuing calibration verifications (CCVs) met the analytical method specifications for ICP, CVAA, and HYAA.

4.3.2 Initial and Continuing Calibration Blank Verifications

The absolute value of the results of the analysis of the ICB and the continuing calibration blanks (CCBs) were all either less than the IDL or between the IDL and the minimum level (ML) as listed in the contract.

4.3.3 ICP Interference Check Sample

The analysis results of the interference check sample containing the interferents plus analytes (ICSAB) were within 20% of the true values.

Section 5.
Organization of the Data

Appendices A and B of this narrative report contain the sample analysis data reports (Form 1A). Results are presented in mg/kg (dry weight) for the soil/sediment samples and µg/L for the water samples. Results below the IDL have been corrected for sample size, percent solids (if applicable), and dilution volume and are identified with a "U" flag in the "C" column of the form. Results between the instrument detection limit and the minimum acceptable method detection limits are identified with a "B" flag in the "C" column of the form. The Q-column is not used. The "M" column denotes the type of analysis performed (P = inductively coupled plasma, CV= cold vapor atomic absorption, and HY= hydride generated atomic absorption). The preparation (digestion) batch is noted as the Episode No. All quality control for an individual preparation batch can be traced by the batch number.

Appendices C and D of this report contain the QA/QC data reports for the following:

1. Preparation Blanks (Form 3A)
2. Matrix Spike and Duplicate (Forms 5A and 5B, respectively)
3. Laboratory control samples (Form 6)

MRI REPORT

Narrative Report for Catalog No. 8990081

Data

For U.S. Fish and Wildlife Service
Patuxent Analytical Control Facility
10211 Beech Forest Road
Laurel, Maryland 20708-4041

Purchase Order No.
MRI Project No. 4661-A

May 4, 1998

MIDWEST RESEARCH INSTITUTE 425 Volker Boulevard, Kansas City, MO 64110-2299 • (816) 753-7600

Appendix A

Soil/Sediment Sample Analysis Data Forms
Catalog 8990081

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VLS1-M

Matrix (aqueous/solid/leachate): solid % solids: 74.7

Lab ID 5327

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3823.70			P
7440-38-2	Arsenic	1.64	U		P
7440-39-3	Barium	573.26			P
7440-41-7	Beryllium	0.56			P
7440-42-8	Boron	2.65	B		P
7440-43-9	Cadmium	0.29			P
7440-47-3	Chromium	4.11			P
7440-50-8	Copper	78.75			P
7439-89-6	Iron	9507.80			P
7439-92-1	Lead	18.40			P
7439-95-4	Magnesium	648.48			P
7439-96-5	Manganese	287.17			P
7439-97-6	Mercury	0.10	U		CV
7439-98-7	Molybdenum	0.70	B		P
7440-02-0	Nickel	5.22			P
7782-49-2	Selenium	0.25	U		HY
7440-24-6	Strontium	5.91			P
7440-62-2	Vanadium	9.14			P
7440-66-6	Zinc	47.25			P

Color before: BROWN Clarity before: NA Texture: COARSE

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VUS1-M

Matrix (aqueous/solid/leachate): solid % solids: 65.1

Lab ID 5324

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4949.80			P
7440-38-2	Arsenic	1.56	U		P
7440-39-3	Barium	842.11			P
7440-41-7	Beryllium	0.76			P
7440-42-8	Boron	3.42	B		P
7440-43-9	Cadmium	0.35			P
7440-47-3	Chromium	6.36			P
7440-50-8	Copper	11.09			P
7439-89-6	Iron	12640.00			P
7439-92-1	Lead	38.74			P
7439-95-4	Magnesium	1099.10			P
7439-96-5	Manganese	802.88			P
7439-97-6	Mercury	0.10	U		CV
7439-98-7	Molybdenum	1.13	B		P
7440-02-0	Nickel	7.76			P
7782-49-2	Selenium	0.36			HY
7440-24-6	Strontium	7.61			P
7440-62-2	Vanadium	16.17			P
7440-66-6	Zinc	57.56			P

Color before: BROWN Clarity before: NA Texture: COARSE

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUS1-M

Matrix (aqueous/solid/leachate): solid % solids: 74.9

Lab ID 5328

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4538.00			P
7440-38-2	Arsenic	1.66	U		P
7440-39-3	Barium	72.90			P
7440-41-7	Beryllium	0.58			P
7440-42-8	Boron	2.12	B		P
7440-43-9	Cadmium	0.19	U		P
7440-47-3	Chromium	4.80			P
7440-50-8	Copper	3.46			P
7439-89-6	Iron	8043.40			P
7439-92-1	Lead	10.28			P
7439-95-4	Magnesium	720.84			P
7439-96-5	Manganese	458.39			P
7439-97-6	Mercury	0.07	U		CV
7439-98-7	Molybdenum	0.56	B		P
7440-02-0	Nickel	5.15			P
7782-49-2	Selenium	0.25	U		HY
7440-24-6	Strontium	9.05			P
7440-62-2	Vanadium	12.51			P
7440-66-6	Zinc	20.81			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PLS1-M

Matrix (aqueous/solid/leachate): solid % solids: 70.2

Receipt date: 01/07/98 Analysis Date: 01/14/98 Lab ID 5329

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3493.30			P
7440-38-2	Arsenic	3.46			P
7440-39-3	Barium	44.30			P
7440-41-7	Beryllium	0.55			P
7440-42-8	Boron	1.81	B		P
7440-43-9	Cadmium	0.42			P
7440-47-3	Chromium	3.74			P
7440-50-8	Copper	9.63			P
7439-89-6	Iron	5858.50			P
7439-92-1	Lead	52.59			P
7439-95-4	Magnesium	582.44			P
7439-96-5	Manganese	210.62			P
7439-97-6	Mercury	0.12	U		CV
7439-98-7	Molybdenum	0.65	B		P
7440-02-0	Nickel	9.91			P
7782-49-2	Selenium	0.26	U		HY
7440-24-6	Strontium	8.00			P
7440-62-2	Vanadium	8.88			P
7440-66-6	Zinc	18.70			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SUSM1-M

Matrix (aqueous/solid/leachate): solid % solids: 73.0

Lab ID 5330

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6675.00			P
7440-38-2	Arsenic	1.60	U		P
7440-39-3	Barium	67.16			P
7440-41-7	Beryllium	0.74			P
7440-42-8	Boron	3.60	B		P
7440-43-9	Cadmium	0.41			P
7440-47-3	Chromium	99.02			P
7440-50-8	Copper	11.09			P
7439-89-6	Iron	11473.00			P
7439-92-1	Lead	12.82			P
7439-95-4	Magnesium	1080.30			P
7439-96-5	Manganese	318.58			P
7439-97-6	Mercury	0.11	B		CV
7439-98-7	Molybdenum	6.80			P
7440-02-0	Nickel	5.98			P
7782-49-2	Selenium	0.30			HY
7440-24-6	Strontium	13.31			P
7440-62-2	Vanadium	13.55			P
7440-66-6	Zinc	74.11			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SLSM1-M

Matrix (aqueous/solid/leachate): solid % solids: 74.5

Lab ID 5331

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6971.60			P
7440-38-2	Arsenic	1.69	U		P
7440-39-3	Barium	93.42			P
7440-41-7	Beryllium	0.77			P
7440-42-8	Boron	4.62	B		P
7440-43-9	Cadmium	0.54			P
7440-47-3	Chromium	198.91			P
7440-50-8	Copper	19.21			P
7439-89-6	Iron	13762.00			P
7439-92-1	Lead	20.24			P
7439-95-4	Magnesium	1736.30			P
7439-96-5	Manganese	456.98			P
7439-97-6	Mercury	0.21	B		CV
7439-98-7	Molybdenum	3.75	B		P
7440-02-0	Nickel	8.12			P
7782-49-2	Selenium	0.26	U		HY
7440-24-6	Strontium	15.10			P
7440-62-2	Vanadium	16.47			P
7440-66-6	Zinc	144.63			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LUSM1-M

Matrix (aqueous/solid/leachate): solid % solids: 62.3

Lab ID 5332

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5574.10			P
7440-38-2	Arsenic	1.71	U		P
7440-39-3	Barium	45.24			P
7440-41-7	Beryllium	0.85			P
7440-42-8	Boron	3.04	B		P
7440-43-9	Cadmium	0.19	U		P
7440-47-3	Chromium	5.80			P
7440-50-8	Copper	4.44			P
7439-89-6	Iron	7284.10			P
7439-92-1	Lead	8.33			P
7439-95-4	Magnesium	720.55			P
7439-96-5	Manganese	211.14			P
7439-97-6	Mercury	0.14	U		CV
7439-98-7	Molybdenum	0.77	B		P
7440-02-0	Nickel	5.92			P
7782-49-2	Selenium	0.52			HY
7440-24-6	Strontium	12.22			P
7440-62-2	Vanadium	8.31			P
7440-66-6	Zinc	31.27			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LLSM1-M

Matrix (aqueous/solid/leachate): solid % solids: 51.6

Receipt date: 01/07/98 Analysis Date: 01/14/98

Lab ID 5333

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6811.10			P
7440-38-2	Arsenic	1.59	U		P
7440-39-3	Barium	68.55			P
7440-41-7	Beryllium	1.13			P
7440-42-8	Boron	3.28	B		P
7440-43-9	Cadmium	0.18	B		P
7440-47-3	Chromium	6.08			P
7440-50-8	Copper	4.93			P
7439-89-6	Iron	6200.70			P
7439-92-1	Lead	12.54			P
7439-95-4	Magnesium	821.69			P
7439-96-5	Manganese	197.57			P
7439-97-6	Mercury	0.15	U		CV
7439-98-7	Molybdenum	0.84	B		P
7440-02-0	Nickel	6.21			P
7782-49-2	Selenium	0.49			HY
7440-24-6	Strontium	19.60			P
7440-62-2	Vanadium	9.50			P
7440-66-6	Zinc	33.48			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VUSM2-M

Matrix (aqueous/solid/leachate): solid % solids: 62.1

Lab ID 5334

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5760.20			P
7440-38-2	Arsenic	1.60	U		P
7440-39-3	Barium	2009.40			P
7440-41-7	Beryllium	0.74			P
7440-42-8	Boron	4.43	B		P
7440-43-9	Cadmium	0.43			P
7440-47-3	Chromium	8.08			P
7440-50-8	Copper	31.44			P
7439-89-6	Iron	9839.00			P
7439-92-1	Lead	25.91			P
7439-95-4	Magnesium	1120.50			P
7439-96-5	Manganese	585.31			P
7439-97-6	Mercury	0.11	U		CV
7439-98-7	Molybdenum	0.92	B		P
7440-02-0	Nickel	10.16			P
7782-49-2	Selenium	0.65			HY
7440-24-6	Strontium	15.61			P
7440-62-2	Vanadium	10.58			P
7440-66-6	Zinc	77.02			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

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USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VLSM2-M

Matrix (aqueous/solid/leachate): solid % solids: 83.3

Lab ID 5335

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4342.50			P
7440-38-2	Arsenic	1.61	U		P
7440-39-3	Barium	518.23			P
7440-41-7	Beryllium	0.53			P
7440-42-8	Boron	2.63	B		P
7440-43-9	Cadmium	0.22			P
7440-47-3	Chromium	3.64			P
7440-50-8	Copper	12.09			P
7439-89-6	Iron	7632.20			P
7439-92-1	Lead	8.08			P
7439-95-4	Magnesium	522.91			P
7439-96-5	Manganese	203.65			P
7439-97-6	Mercury	0.07	U		CV
7439-98-7	Molybdenum	0.71	B		P
7440-02-0	Nickel	6.09			P
7782-49-2	Selenium	0.24	U		HY
7440-24-6	Strontium	5.64			P
7440-62-2	Vanadium	7.25			P
7440-66-6	Zinc	38.93			P

Color before: BROWN Clarity before: NA Texture: COARSE

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUSM2-M

Matrix (aqueous/solid/leachate): solid % solids: 81.5

Lab ID 5336

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5512.50			P
7440-38-2	Arsenic	1.65	U		P
7440-39-3	Barium	51.12			P
7440-41-7	Beryllium	0.80			P
7440-42-8	Boron	2.16	B		P
7440-43-9	Cadmium	0.20			P
7440-47-3	Chromium	4.86			P
7440-50-8	Copper	3.95			P
7439-89-6	Iron	9827.70			P
7439-92-1	Lead	12.52			P
7439-95-4	Magnesium	725.28			P
7439-96-5	Manganese	384.63 ~~386~~ 4-17-98			P
7439-97-6	Mercury	0.08	U		CV
7439-98-7	Molybdenum	1.01	B		P
7440-02-0	Nickel	5.34			P
7782-49-2	Selenium	0.25	U		HY
7440-24-6	Strontium	7.29			P
7440-62-2	Vanadium	14.36			P
7440-66-6	Zinc	27.13			P

Color before: BROWN Clarity before: NA Texture: COARSE

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

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USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PLSM2-M

Matrix (aqueous/solid/leachate): solid % solids: 81.5

Lab ID 5337

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3734.20			P
7440-38-2	Arsenic	1.69	U		P
7440-39-3	Barium	47.18			P
7440-41-7	Beryllium	0.51			P
7440-42-8	Boron	3.91	B		P
7440-43-9	Cadmium	0.50			P
7440-47-3	Chromium	5.32			P
7440-50-8	Copper	6.66			P
7439-89-6	Iron	6843.00			P
7439-92-1	Lead	9.02			P
7439-95-4	Magnesium	608.55			P
7439-96-5	Manganese	299.99			P
7439-97-6	Mercury	0.09	U		CV
7439-98-7	Molybdenum	0.84	B		P
7440-02-0	Nickel	11.31			P
7782-49-2	Selenium	0.26	U		HY
7440-24-6	Strontium	5.68			P
7440-62-2	Vanadium	11.09			P
7440-66-6	Zinc	19.68			P

Color before: BROWN Clarity before: NA Texture: COARSE

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.:

SUSM2-M

Matrix (aqueous/solid/leachate): solid % solids: 77.7

Lab Id 5338

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3540.30			P
7440-38-2	Arsenic	1.55	U		P
7440-39-3	Barium	46.38			P
7440-41-7	Beryllium	0.57			P
7440-42-8	Boron	2.43	B		P
7440-43-9	Cadmium	0.37			P
7440-47-3	Chromium	107.20			P
7440-50-8	Copper	8.20			P
7439-89-6	Iron	8748.80			P
7439-92-1	Lead	10.80			P
7439-95-4	Magnesium	586.09			P
7439-96-5	Manganese	220.99			P
7439-97-6	Mercury	0.10	B		CV
7439-98-7	Molybdenum	1.93	B		P
7440-02-0	Nickel	4.28	B		P
7782-49-2	Selenium	0.22			HY
7440-24-6	Strontium	9.29			P
7440-62-2	Vanadium	7.38			P
7440-66-6	Zinc	74.02			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SLSM2-M

Matrix (aqueous/solid/leachate): solid % solids: 76.8

Lab ID 5339

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3683.90			P
7440-38-2	Arsenic	1.59	U		P
7440-39-3	Barium	59.76			P
7440-41-7	Beryllium	0.51			P
7440-42-8	Boron	2.55	B		P
7440-43-9	Cadmium	0.36			P
7440-47-3	Chromium	143.58			P
7440-50-8	Copper	10.39			P
7439-89-6	Iron	7195.90			P
7439-92-1	Lead	11.02			P
7439-95-4	Magnesium	617.11			P
7439-96-5	Manganese	354.51			P
7439-97-6	Mercury	0.12	U		CV
7439-98-7	Molybdenum	2.28	B		P
7440-02-0	Nickel	4.11	B		P
7782-49-2	Selenium	0.25			HY
7440-24-6	Strontium	9.23			P
7440-62-2	Vanadium	7.09			P
7440-66-6	Zinc	77.02			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LUSM2-M

Matrix (aqueous/solid/leachate): solid % solids: 72.7

Lab ID 5340

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2395.60			P
7440-38-2	Arsenic	1.69	U		P
7440-39-3	Barium	19.27			P
7440-41-7	Beryllium	0.52			P
7440-42-8	Boron	4.19	B		P
7440-43-9	Cadmium	0.19	U		P
7440-47-3	Chromium	3.50			P
7440-50-8	Copper	1.74			P
7439-89-6	Iron	3621.80			P
7439-92-1	Lead	6.81			P
7439-95-4	Magnesium	408.85			P
7439-96-5	Manganese	102.72			P
7439-97-6	Mercury	0.11	U		CV
7439-98-7	Molybdenum	0.49	B		P
7440-02-0	Nickel	4.28	B		P
7782-49-2	Selenium	0.36			HY
7440-24-6	Strontium	4.71	B		P
7440-62-2	Vanadium	4.65			P
7440-66-6	Zinc	21.47			P

Color before: BROWN Clarity before: NA Texture: COARSE

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LLSM2-M

Matrix (aqueous/solid/leachate): solid % solids: 74.2

Lab ID 5341

Receipt date: 01/07/98 Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4197.70			P
7440-38-2	Arsenic	1.63	U		P
7440-39-3	Barium	38.33			P
7440-41-7	Beryllium	0.78			P
7440-42-8	Boron	2.37	B		P
7440-43-9	Cadmium	0.18	U		P
7440-47-3	Chromium	3.62			P
7440-50-8	Copper	2.98			P
7439-89-6	Iron	4737.60 ~~473~~ equiv 4.74			P
7439-92-1	Lead	11.66			P
7439-95-4	Magnesium	498.43			P
7439-96-5	Manganese	170.79			P
7439-97-6	Mercury	0.11	U		CV
7439-98-7	Molybdenum	0.49	B		P
7440-02-0	Nickel	4.22	B		P
7782-49-2	Selenium	0.30			HY
7440-24-6	Strontium	9.99			P
7440-62-2	Vanadium	5.69			P
7440-66-6	Zinc	25.34			P

Color before: BROWN Clarity before: NA Texture: COARSE

Color after: YELLOW Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 25S EPA SAMPLE NO.

Contract No.: 5040042 SAS No.: SANDIA CANYON

Matrix (aqueous/solid/leachate): solid % solids: 82.4

Receipt date: 01/07/98 Analysis Date: 02/13/98

LAB ID 5402

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6668.70			P
7440-38-2	Arsenic	1.70	U		P
7440-39-3	Barium	69.68			P
7440-41-7	Beryllium	0.56			P
7440-42-8	Boron	3.05	B		P
7440-43-9	Cadmium	0.35			P
7440-47-3	Chromium	183.43			P
7440-50-8	Copper	13.36			P
7439-89-6	Iron	9358.60			P
7439-92-1	Lead	15.71			P
7439-95-4	Magnesium	945.27			P
7439-96-5	Manganese	397.59			P
7439-97-6	Mercury	0.11	U		CV
7439-98-7	Molybdenum	2.15	B		P
7440-02-0	Nickel	5.03			P
7782-49-2	Selenium	0.26	U		HY
7440-24-6	Strontium	10.32			P
7440-62-2	Vanadium	10.65			P
7440-66-6	Zinc	99.32			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

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USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 25S EPA SAMPLE NO.

Contract No.: 5040042 SAS No.:

Matrix (aqueous/solid/leachate): solid % solids: 69.0

PAJARITO CANYON

Receipt date: 01/07/98 Analysis Date: 02/13/98

LAB ID 5403

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8034.40			P
7440-38-2	Arsenic	1.70	U		P
7440-39-3	Barium	81.22			P
7440-41-7	Beryllium	0.70			P
7440-42-8	Boron	2.02	B		P
7440-43-9	Cadmium	0.44			F
7440-47-3	Chromium	7.58			P
7440-50-8	Copper	9.56			P
7439-89-6	Iron	9804.50			P
7439-92-1	Lead	14.64			P
7439-95-4	Magnesium	1158.80			P
7439-96-5	Manganese	558.05			P
7439-97-6	Mercury	0.12	U		CV
7439-98-7	Molybdenum	0.74	B		P
7440-02-0	Nickel	12.83			P
7782-49-2	Selenium	0.35			HY
7440-24-6	Strontium	13.48			P
7440-62-2	Vanadium	15.54			P
7440-66-6	Zinc	34.44			P

Color before: BROWN Clarity before: NA Texture: COARSE

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:
PAJARITO CANYON

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 25S EPA SAMPLE NO.

Contract No.: 5040042 SAS No.: CAÑON DE VALLE

Matrix (aqueous/solid/leachate): solid % solids: 69.8

Receipt date: 01/07/98 Analysis Date: 02/13/98

LAB ID 5404

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5068.60			P
7440-38-2	Arsenic	1.74	U		P
7440-39-3	Barium	40.67			P
7440-41-7	Beryllium	0.65			P
7440-42-8	Boron	1.91	B		P
7440-43-9	Cadmium	0.16			F
7440-47-3	Chromium	4.16			P
7440-50-8	Copper	3.03			P
7439-89-6	Iron	4803.20			P
7439-92-1	Lead	21.39			P
7439-95-4	Magnesium	556.20			P
7439-96-5	Manganese	231.65			P
7439-97-6	Mercury	0.10	U		CV
7439-98-7	Molybdenum	0.73	B		P
7440-02-0	Nickel	4.25	B		P
7782-49-2	Selenium	0.26	U		HY
7440-24-6	Strontium	8.72			P
7440-62-2	Vanadium	6.34			P
7440-66-6	Zinc	26.83			P

Color before: BROWN Clarity before: NA Texture: COARSE

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:
CAÑON DE VALLE

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USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 25S EPA SAMPLE NO.

Contract No.: 5040042 SAS No.:

Matrix (aqueous/solid/leachate): solid % solids: 79.6

LOS ALAMOS CANYON

Receipt date: 01/07/98 Analysis Date: 02/13/98

LAB ID 5405

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6330.80			P
7440-38-2	Arsenic	1.70	U		P
7440-39-3	Barium	803.55			P
7440-41-7	Beryllium	0.54			P
7440-42-8	Boron	3.01	B		P
7440-43-9	Cadmium	0.16			F
7440-47-3	Chromium	5.85			P
7440-50-8	Copper	11.66			P
7439-89-6	Iron	8199.30			P
7439-92-1	Lead	19.58			P
7439-95-4	Magnesium	991.45			P
7439-96-5	Manganese	308.99			P
7439-97-6	Mercury	0.08	U		CV
7439-98-7	Molybdenum	0.65	B		P
7440-02-0	Nickel	5.72			P
7782-49-2	Selenium	0.25	U		HY
7440-24-6	Strontium	9.14			P
7440-62-2	Vanadium	10.03			P
7440-66-6	Zinc	47.15			P

Color before: BROWN Clarity before: NA Texture: MEDIUM

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:
LOS ALAMOS CANYON

Appendix B

Water Sample Analysis Forms Catalog 8990081

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FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LUWM02

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1869.80			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	28.89			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.58			P
7440-47-3	Chromium	3.65			P
7440-50-8	Copper	2.52	B		P
7439-89-6	Iron	559.50			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3106.30			P
7439-96-5	Manganese	10.65			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	65.05			P
7440-62-2	Vanadium	2.83			P
7440-66-6	Zinc	8.25	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VUWM01

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	283.34			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	2229.00			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.98			P
7440-47-3	Chromium	4.16			P
7440-50-8	Copper	2.22	B		P
7439-89-6	Iron	227.44			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5359.00			P
7439-96-5	Manganese	54.39			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	5.93			P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	121.89			P
7440-62-2	Vanadium	3.48			P
7440-66-6	Zinc	4.53	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VLWM02

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	201.77			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	3025.00			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	4.16			P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	140.54			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5396.90			P
7439-96-5	Manganese	4.32	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.82	B		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	128.79			P
7440-62-2	Vanadium	3.67			P
7440-66-6	Zinc	4.73	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUWM01

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1556.60			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	35.18			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	4.42			P
7440-50-8	Copper	2.71	B		P
7439-89-6	Iron	600.39			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	2929.20			P
7439-96-5	Manganese	11.93			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	3.2			HY
7440-24-6	Strontium	57.77			P
7440-62-2	Vanadium	4.62			P
7440-66-6	Zinc	8.09	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.:

PLWM02

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	675.85			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	32.85			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.78			P
7440-47-3	Chromium	4.33			P
7440-50-8	Copper	2.88	B		P
7439-89-6	Iron	252.65			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3134.00			P
7439-96-5	Manganese	3.09	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	5.22	B		P
7782-49-2	Selenium	3.2			HY
7440-24-6	Strontium	62.90			P
7440-62-2	Vanadium	4.31			P
7440-66-6	Zinc	10.20	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SUWM01

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	250.31			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	20.64			P
7440-41-7	Beryllium	0.34	B		P
7440-42-8	Boron	51.43	B		P
7440-43-9	Cadmium	2.12			P
7440-47-3	Chromium	11.76			P
7440-50-8	Copper	9.52			P
7439-89-6	Iron	391.85			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	4935.00			P
7439-96-5	Manganese	42.17			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	27.31	B		P
7440-02-0	Nickel	9.77			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	68.95			P
7440-62-2	Vanadium	14.01			P
7440-66-6	Zinc	26.40			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SUWM01D

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	127.82			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	19.70			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	50.28	B		P
7440-43-9	Cadmium	2.54			P
7440-47-3	Chromium	9.34			P
7440-50-8	Copper	6.99			P
7439-89-6	Iron	289.07			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5065.10			P
7439-96-5	Manganese	41.29			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	29.10	B		P
7440-02-0	Nickel	6.45			P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	71.15			P
7440-62-2	Vanadium	12.77			P
7440-66-6	Zinc	26.44			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SLWM02

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	89.49			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	19.82			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	60.77	B		P
7440-43-9	Cadmium	1.69			P
7440-47-3	Chromium	6.03			P
7440-50-8	Copper	6.06			P
7439-89-6	Iron	248.74			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5527.00			P
7439-96-5	Manganese	35.70			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	43.43	B		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	76.14			P
7440-62-2	Vanadium	10.38			P
7440-66-6	Zinc	28.21			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.:

LUWM01

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	324.81			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	19.58			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	110.44	B		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3124.50			P
7439-96-5	Manganese	1.59	U		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	56.50			P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	5.59	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LLWM02

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	371.65			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	19.92			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	126.23			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3151.80			P
7439-96-5	Manganese	1.62	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	56.33			P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	3.66	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: BlankWM01

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	21.53	U		P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	1.61	B		P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	9.18			P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	76.26	B		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	36.27	U		P
7439-96-5	Manganese	2.37	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	15.12			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	0.23	U		P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	3.94	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VUWM02

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	625.26			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	2396.70			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	5.04			P
7440-50-8	Copper	3.14	B		P
7439-89-6	Iron	359.10			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	4993.80			P
7439-96-5	Manganese	60.99			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	6.90			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	118.13			P
7440-62-2	Vanadium	4.23			P
7440-66-6	Zinc	5.51	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VLWM03

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	289.84			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	3371.50			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	37.15	B		P
7440-43-9	Cadmium	1.68			P
7440-47-3	Chromium	4.62			P
7440-50-8	Copper	2.62	B		P
7439-89-6	Iron	178.96			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	4927.60			P
7439-96-5	Manganese	5.60	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	5.88			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	125.41			P
7440-62-2	Vanadium	3.58			P
7440-66-6	Zinc	4.23	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUWM02

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4167.10			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	48.50			P
7440-41-7	Beryllium	0.36	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.89			P
7440-47-3	Chromium	4.50			P
7440-50-8	Copper	2.78	B		P
7439-89-6	Iron	1701.90			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3409.80			P
7439-96-5	Manganese	15.13			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	7.90			P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	65.75			P
7440-62-2	Vanadium	5.81			P
7440-66-6	Zinc	9.30	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUWM02D

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	404.48			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	36.78			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	2.94	B		P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	176.14			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3119.60			P
7439-96-5	Manganese	4.41	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	5.15	B		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	63.86			P
7440-62-2	Vanadium	3.43			P
7440-66-6	Zinc	4.05	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PLWM03

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	271.94			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	32.88			P
7440-41-7	Beryllium	0.35	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.55			P
7440-47-3	Chromium	2.91	B		P
7440-50-8	Copper	2.38	B		P
7439-89-6	Iron	129.15			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	2774.70			P
7439-96-5	Manganese	4.25	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	57.60			P
7440-62-2	Vanadium	2.46			P
7440-66-6	Zinc	4.00	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SUWM02

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	389.30			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	20.88			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	47.88	B		P
7440-43-9	Cadmium	2.30			P
7440-47-3	Chromium	8.16			P
7440-50-8	Copper	6.73			P
7439-89-6	Iron	332.76			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	4009.90			P
7439-96-5	Manganese	33.07			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	27.46	B		P
7440-02-0	Nickel	5.75			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	58.16			P
7440-62-2	Vanadium	10.50			P
7440-66-6	Zinc	21.86			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SLWM03

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	215.56			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	17.00			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	39.84	B		P
7440-43-9	Cadmium	3.15			P
7440-47-3	Chromium	7.92			P
7440-50-8	Copper	5.71			P
7439-89-6	Iron	181.49			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3489.20			P
7439-96-5	Manganese	23.79			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	25.36	B		P
7440-02-0	Nickel	5.41	B		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	53.27			P
7440-62-2	Vanadium	9.06			P
7440-66-6	Zinc	16.82			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LLWM03

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	426.58			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	23.89			P
7440-41-7	Beryllium	0.34	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	5.89			P
7440-50-8	Copper	3.26	B		P
7439-89-6	Iron	134.52			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3044.80			P
7439-96-5	Manganese	2.37	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	8.67			P
7782-49-2	Selenium	2.6	4		HY
7440-24-6	Strontium	60.91			P
7440-62-2	Vanadium	5.61			P
7440-66-6	Zinc	4.61	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: BLKWM02

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	34.56	B		P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	0.79	U		P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	3.43			P
7440-50-8	Copper	2.32	B		P
7439-89-6	Iron	5.62	B		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	47.08	B		P
7439-96-5	Manganese	1.59	U		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	0.23	U		P
7440-62-2	Vanadium	2.28			P
7440-66-6	Zinc	3.97	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VUWM04

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1003.80			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	2688.90			P
7440-41-7	Beryllium	0.44	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	3.75			P
7440-47-3	Chromium	10.65			P
7440-50-8	Copper	6.48			P
7439-89-6	Iron	472.75			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5503.90			P
7439-96-5	Manganese	30.60			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	13.31			P
7782-49-2	Selenium	2.6	4		HY
7440-24-6	Strontium	126.14			P
7440-62-2	Vanadium	9.53			P
7440-66-6	Zinc	11.99			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VUWM04D

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1167.30			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	2735.00			P
7440-41-7	Beryllium	0.39	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	4.07			P
7440-47-3	Chromium	8.91			P
7440-50-8	Copper	5.04	B		P
7439-89-6	Iron	551.34			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5539.00			P
7439-96-5	Manganese	30.96			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	9.50			P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	127.43			P
7440-62-2	Vanadium	8.10			P
7440-66-6	Zinc	10.74	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VLWM05

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	755.66			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	3194.70			P
7440-41-7	Beryllium	0.42	B		P
7440-42-8	Boron	27.48	B		P
7440-43-9	Cadmium	3.50			P
7440-47-3	Chromium	9.70			P
7440-50-8	Copper	6.65			P
7439-89-6	Iron	353.94			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5602.60			P
7439-96-5	Manganese	3.84	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	10.25			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	132.35			P
7440-62-2	Vanadium	8.48			P
7440-66-6	Zinc	8.94	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUWM04

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3921.30			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	52.38			P
7440-41-7	Beryllium	0.48	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	2.71			P
7440-47-3	Chromium	8.62			P
7440-50-8	Copper	5.42	B		P
7439-89-6	Iron	1587.50			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	4017.10			P
7439-96-5	Manganese	12.52			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	6.70			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	76.43			P
7440-62-2	Vanadium	8.70			P
7440-66-6	Zinc	12.06			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PLWM05

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3275.70			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	49.83			P
7440-41-7	Beryllium	0.43	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	2.90			P
7440-47-3	Chromium	5.89			P
7440-50-8	Copper	2.91	B		P
7439-89-6	Iron	1342.80			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3986.90			P
7439-96-5	Manganese	9.01			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	8.33			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	77.07			P
7440-62-2	Vanadium	6.31			P
7440-66-6	Zinc	9.15	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SUWM04

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	133.14			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	31.16			P
7440-41-7	Beryllium	0.37	B		P
7440-42-8	Boron	69.59	B		P
7440-43-9	Cadmium	2.78			P
7440-47-3	Chromium	10.74			P
7440-50-8	Copper	6.27			P
7439-89-6	Iron	540.27			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	6128.30			P
7439-96-5	Manganese	67.88			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	47.01	B		P
7440-02-0	Nickel	7.54			P
7782-49-2	Selenium	2.6			HY
7440-24-6	Strontium	75.65			P
7440-62-2	Vanadium	12.67			P
7440-66-6	Zinc	24.68			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SLWM05

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	92.89			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	32.11			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	65.92	B		P
7440-43-9	Cadmium	1.52			P
7440-47-3	Chromium	8.22			P
7440-50-8	Copper	4.53	B		P
7439-89-6	Iron	425.49			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	6973.40			P
7439-96-5	Manganese	49.22			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	42.83	B		P
7440-02-0	Nickel	6.26			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	85.88			P
7440-62-2	Vanadium	10.51			P
7440-66-6	Zinc	22.85			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.:

Matrix (aqueous/solid/leachate): aqueous % solids:

LUWM04

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1140.70			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	29.37			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	362.59			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3437.70			P
7439-96-5	Manganese	3.15	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	77.09			P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	4.92	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LLWM05

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	933.20			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	28.92			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	298.80			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3446.80			P
7439-96-5	Manganese	2.74	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	75.97			P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	3.94	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: BLKWM04

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	21.53	U		P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	0.79	U		P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	2.61	U		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	36.27	U		P
7439-96-5	Manganese	1.59	U		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	0.23	U		P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	1.70	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VUWM06

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1720.10			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	4239.60			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	20.97	B		P
7440-43-9	Cadmium	1.52			P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	803.52			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5318.10			P
7439-96-5	Manganese	88.28			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	144.41			P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	6.38	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VLWM07

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	645.88			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	4990.50			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	103.68	B		P
7440-43-9	Cadmium	2.15			P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	2.19	B		P
7439-89-6	Iron	304.71			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5313.60			P
7439-96-5	Manganese	9.98			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	5.94			P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	155.03			P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	6.86	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUWM06

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	14893.00			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	87.71			P
7440-41-7	Beryllium	0.65			P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	2.62			P
7440-47-3	Chromium	6.11			P
7440-50-8	Copper	3.13	B		P
7439-89-6	Iron	6244.50			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5069.80			P
7439-96-5	Manganese	29.93			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	8.02			P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	88.08			P
7440-62-2	Vanadium	11.03			P
7440-66-6	Zinc	21.78			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PLWM07

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	539.10			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	46.94			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.96			P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	3.16	B		P
7439-89-6	Iron	298.91			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3717.90			P
7439-96-5	Manganese	4.54	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	5.95			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	78.98			P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	4.75	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SUWM06

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	224.35			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	36.46			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	60.20	B		P
7440-43-9	Cadmium	2.45			P
7440-47-3	Chromium	6.71			P
7440-50-8	Copper	4.74	B		P
7439-89-6	Iron	361.09			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5196.10			P
7439-96-5	Manganese	60.80			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	77.60			P
7440-02-0	Nickel	7.49			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	72.28			P
7440-62-2	Vanadium	9.37			P
7440-66-6	Zinc	32.45			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.:

Matrix (aqueous/solid/leachate): aqueous % solids:

LUWM06D

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	781.44			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	28.44			P
7440-41-7	Beryllium	0.34	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.63			P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	244.75			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3226.60			P
7439-96-5	Manganese	2.71	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	71.61			P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	13.06			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LLWM07

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	829.03			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	27.65			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	2.43			P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	258.93			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3170.30			P
7439-96-5	Manganese	2.86	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	69.24			P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	4.61	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: BLKWM04-2

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	21.53	U		P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	0.79	U		P
7440-41-7	Beryllium	0.36	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	1.47	U		P
7440-47-3	Chromium	2.49	U		P
7440-50-8	Copper	2.15	U		P
7439-89-6	Iron	2.61	U		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	36.27	U		P
7439-96-5	Manganese	1.59	U		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	4.42	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	0.23	U		P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	4.16	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VUWM08

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1441.90			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	3403.00			P
7440-41-7	Beryllium	0.39	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	2.44			P
7440-47-3	Chromium	4.14			P
7440-50-8	Copper	2.35	B		P
7439-89-6	Iron	658.59			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5530.00			P
7439-96-5	Manganese	25.44			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	5.35	B		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	135.30			P
7440-62-2	Vanadium	3.67			P
7440-66-6	Zinc	6.48	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: VLWM09

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1008.80			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	3779.00			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	34.37	B		P
7440-43-9	Cadmium	2.38			P
7440-47-3	Chromium	50.29			P
7440-50-8	Copper	5.02	B		P
7439-89-6	Iron	798.61			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	5696.40			P
7439-96-5	Manganese	17.96			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	103.34			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	143.65			P
7440-62-2	Vanadium	2.04	U		P
7440-66-6	Zinc	10.80	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUWM08

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3991.10			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	52.43			P
7440-41-7	Beryllium	0.52	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	2.52			P
7440-47-3	Chromium	4.40			P
7440-50-8	Copper	9.37			P
7439-89-6	Iron	1640.50			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	4032.90			P
7439-96-5	Manganese	14.96			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	6.97			P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	77.84			P
7440-62-2	Vanadium	4.99			P
7440-66-6	Zinc	13.05			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.:

Matrix (aqueous/solid/leachate): aqueous % solids:

PLWM09

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3606.20			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	51.94			P
7440-41-7	Beryllium	0.43	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	2.35			P
7440-47-3	Chromium	3.90			P
7440-50-8	Copper	6.15			P
7439-89-6	Iron	1522.00			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3959.20			P
7439-96-5	Manganese	10.17			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	6.89			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	77.20			P
7440-62-2	Vanadium	4.32			P
7440-66-6	Zinc	12.85			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI_____ Episode No.: 8W____ EPA SAMPLE NO.

Contract No.: 8990081____ SAS No.: _____

SUWM08

Matrix (aqueous/solid/leachate): aqueous_ % solids: _____

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	142.19			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	32.41			P
7440-41-7	Beryllium	0.34	U		P
7440-42-8	Boron	73.44	B		P
7440-43-9	Cadmium	3.92			P
7440-47-3	Chromium	11.62			P
7440-50-8	Copper	9.57			P
7439-89-6	Iron	692.66			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	6868.30			P
7439-96-5	Manganese	72.99			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	260.87			P
7440-02-0	Nickel	9.35			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	143.00			P
7440-62-2	Vanadium	14.71			P
7440-66-6	Zinc	42.00			P

Color before: COLORLESS_ Clarity before: CLEAR_____ Texture: NA_____

Color after: COLORLESS_ Clarity after: CLEAR_____ Artifacts: No_____

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI_____ Episode No.: 8W____ EPA SAMPLE NO.

Contract No.: 8990081____ SAS No.: _____

SUWM08D

Matrix (aqueous/solid/leachate): aqueous_ % solids: _____

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	113.46			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	32.41			P
7440-41-7	Beryllium	0.39	B		P
7440-42-8	Boron	78.77	B		P
7440-43-9	Cadmium	3.37			P
7440-47-3	Chromium	11.55			P
7440-50-8	Copper	14.61			P
7439-89-6	Iron	584.99			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	6846.80			P
7439-96-5	Manganese	71.17			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	260.87			P
7440-02-0	Nickel	11.89			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	142.03			P
7440-62-2	Vanadium	15.10			P
7440-66-6	Zinc	33.71			P

Color before: COLORLESS_ Clarity before: CLEAR_____ Texture: NA_____

Color after: COLORLESS_ Clarity after: CLEAR_____ Artifacts: No_____

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: SLWM09

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	129.69			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	24.64			P
7440-41-7	Beryllium	0.42	B		P
7440-42-8	Boron	73.16	B		P
7440-43-9	Cadmium	4.35			P
7440-47-3	Chromium	13.58			P
7440-50-8	Copper	9.34			P
7439-89-6	Iron	351.71			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	6098.10			P
7439-96-5	Manganese	36.92			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	257.58			P
7440-02-0	Nickel	9.95			P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	119.15			P
7440-62-2	Vanadium	17.00			P
7440-66-6	Zinc	31.87			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LUWM08

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	936.68			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	28.92			P
7440-41-7	Beryllium	0.48	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	3.64			P
7440-47-3	Chromium	8.35			P
7440-50-8	Copper	5.55	B		P
7439-89-6	Iron	287.95			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3384.20			P
7439-96-5	Manganese	3.62	B		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	8.16			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	72.48			P
7440-62-2	Vanadium	6.72			P
7440-66-6	Zinc	10.97	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: LLWM09

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	787.22			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	28.78			P
7440-41-7	Beryllium	0.48	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	3.45			P
7440-47-3	Chromium	7.04			P
7440-50-8	Copper	3.75	B		P
7439-89-6	Iron	245.21			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3422.00			P
7439-96-5	Manganese	13.53			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	6.24			P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	72.16			P
7440-62-2	Vanadium	5.66			P
7440-66-6	Zinc	6.90	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: BlankWM08

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	42.40	B		P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	0.79	U		P
7440-41-7	Beryllium	0.44	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	2.74			P
7440-47-3	Chromium	5.58			P
7440-50-8	Copper	3.22	B		P
7439-89-6	Iron	9.91	B		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	77.60	B		P
7439-96-5	Manganese	1.59	U		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	7.57			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	0.23	U		P
7440-62-2	Vanadium	4.22			P
7440-66-6	Zinc	4.61	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PW1

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	115.20			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	28.96			P
7440-41-7	Beryllium	0.41	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	4.36			P
7440-47-3	Chromium	7.17			P
7440-50-8	Copper	4.91	B		P
7439-89-6	Iron	39.30	B		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	2889.40			P
7439-96-5	Manganese	127.25			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	11.44			P
7782-49-2	Selenium	2.6	u		HY
7440-24-6	Strontium	56.81			P
7440-62-2	Vanadium	5.32			P
7440-66-6	Zinc	14.99			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.:

Matrix (aqueous/solid/leachate): aqueous % solids:

PW2

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	251.54			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	76.94			P
7440-41-7	Beryllium	0.37	B		P
7440-42-8	Boron	68.26	B		P
7440-43-9	Cadmium	4.91			P
7440-47-3	Chromium	16.42			P
7440-50-8	Copper	9.45			P
7439-89-6	Iron	173.30			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	6204.10			P
7439-96-5	Manganese	1181.40			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	53.28	B		P
7440-02-0	Nickel	16.38			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	107.22			P
7440-62-2	Vanadium	10.71			P
7440-66-6	Zinc	24.83			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PW3

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	200.72			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	130.25			P
7440-41-7	Beryllium	0.51	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	5.36			P
7440-47-3	Chromium	10.48			P
7440-50-8	Copper	11.52			P
7439-89-6	Iron	58.12	B		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	3056.00			P
7439-96-5	Manganese	613.31			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	19.13			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	63.83			P
7440-62-2	Vanadium	9.59			P
7440-66-6	Zinc	24.91			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PW4

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	98.79			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	3579.50			P
7440-41-7	Beryllium	0.37	B		P
7440-42-8	Boron	37.12	B		P
7440-43-9	Cadmium	3.81			P
7440-47-3	Chromium	8.04			P
7440-50-8	Copper	7.85			P
7439-89-6	Iron	43.83	B		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	4894.20			P
7439-96-5	Manganese	811.17			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	14.48			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	121.22			P
7440-62-2	Vanadium	5.84			P
7440-66-6	Zinc	17.02			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.:

Matrix (aqueous/solid/leachate): aqueous % solids: PW5

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	52.20	B		P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	1.61	B		P
7440-41-7	Beryllium	0.41	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	3.06			P
7440-47-3	Chromium	5.26			P
7440-50-8	Copper	4.66	B		P
7439-89-6	Iron	8.96	B		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	95.91	B		P
7439-96-5	Manganese	7.46			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	7.07			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	0.61	B		P
7440-62-2	Vanadium	4.39			P
7440-66-6	Zinc	12.64			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PW6

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	372.70			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	29.40			P
7440-41-7	Beryllium	0.42	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	4.14			P
7440-47-3	Chromium	6.51			P
7440-50-8	Copper	5.45	B		P
7439-89-6	Iron	120.73			P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	2841.80			P
7439-96-5	Manganese	68.62			P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	10.14			P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	60.59			P
7440-62-2	Vanadium	3.89			P
7440-66-6	Zinc	16.48			P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PW7

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	72.96			P
7440-38-2	Arsenic	21.53	U		P
7440-39-3	Barium	0.79	U		P
7440-41-7	Beryllium	0.40	B		P
7440-42-8	Boron	19.27	U		P
7440-43-9	Cadmium	2.81			P
7440-47-3	Chromium	4.35			P
7440-50-8	Copper	4.48	B		P
7439-89-6	Iron	33.89	B		P
7439-92-1	Lead	15.87	U		P
7439-95-4	Magnesium	57.97	B		P
7439-96-5	Manganese	1.59	U		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.97	U		P
7440-02-0	Nickel	6.06			P
7782-49-2	Selenium	2.6	a		HY
7440-24-6	Strontium	0.23	B		P
7440-62-2	Vanadium	2.62			P
7440-66-6	Zinc	5.87	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

Appendix C

Soil/Sediment QC Analysis Forms
Catalog 8990081

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PBS

Matrix (aqueous/solid/leachate): solid % solids: 100.0

Lab ID 5399

Receipt date: / / Analysis Date: 01/14/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4.39	B		P
7440-38-2	Arsenic	1.70	U		P
7440-39-3	Barium	0.10	B		P
7440-41-7	Beryllium	0.15	B		P
7440-42-8	Boron	2.00	B		P
7440-43-9	Cadmium	0.19	U		P
7440-47-3	Chromium	0.44	U		P
7440-50-8	Copper	0.26	U		P
7439-89-6	Iron	8.06	B		P
7439-92-1	Lead	1.40	U		P
7439-95-4	Magnesium	3.50	U		P
7439-96-5	Manganese	0.06	U		P
7439-97-6	Mercury	0.10	U		CV
7439-98-7	Molybdenum	0.31	U		P
7440-02-0	Nickel	0.61	U		P
7782-49-2	Selenium	0.26	U		HY
7440-24-6	Strontium	0.01	B		P
7440-62-2	Vanadium	0.42	U		P
7440-66-6	Zinc	0.39	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 25S EPA SAMPLE NO.

Contract No.: 5040042 SAS No.: PBS

Matrix (aqueous/solid/leachate): solid % solids: 100.0

Receipt date: / / Analysis Date: 02/13/98

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2.99	B		P
7440-38-2	Arsenic	1.70	U		P
7440-39-3	Barium	0.07	U		P
7440-41-7	Beryllium	0.17	B		P
7440-42-8	Boron	1.86	B		P
7440-43-9	Cadmium	0.008			F
7440-47-3	Chromium	0.53	B		P
7440-50-8	Copper	0.30	B		P
7439-89-6	Iron	6.89	B		P
7439-92-1	Lead	2.44	B		P
7439-95-4	Magnesium	4.26	B		P
7439-96-5	Manganese	0.08	B		P
7439-97-6	Mercury	0.10	U		CV
7439-98-7	Molybdenum	0.31	U		P
7440-02-0	Nickel	0.61	U		P
7782-49-2	Selenium	0.26	U		HY
7440-24-6	Strontium	0.03	B		P
7440-62-2	Vanadium	0.42	U		P
7440-66-6	Zinc	0.66	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:
AQUEOUS PREP. BLANK

USEPA - ITD

FORM 5A
MATRIX SPIKE RECOVERY

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUSM2-MS

Matrix (aqueous/solid/leachate): solid

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Sample Concentration (SR)	Spike Added (SA1)	MS Concentration (MSSR)	MS %R(1) (S)	Q	M
7429-90-5	Aluminum	5512.5000	197.14	6591.9000	547.5		P
7440-38-2	Arsenic	1.6524	78.86	75.4960	95.7		P
7440-39-3	Barium	51.1210	216.86	236.0300	85.3		P
7440-41-7	Beryllium	0.7971	19.71	20.9720	102.4		P
7440-42-8	Boron	2.1559	98.57	89.7390	88.9		P
7440-43-9	Cadmium	0.2022	19.71	18.7580	94.1		P
7440-47-3	Chromium	4.8581	88.71	94.0350	100.5		P
7440-50-8	Copper	3.9522	49.29	50.4940	98.5		P
7439-89-6	Iron	9827.7000	295.71	11410.0000	577.9		P
7439-92-1	Lead	12.5190	98.57	119.7500	108.8		P
7439-95-4	Magnesium	725.2800	197.14	1464.2000	374.8		P
7439-96-5	Manganese	384.6300	216.86	1123.8000	340.9		P
7439-97-6	Mercury	0.08	4.00	4.19	104.9		CV
7439-98-7	Molybdenum	1.0060	19.71	20.1490	97.1		P
7440-02-0	Nickel	5.3383	49.29	57.9820	106.8		P
7782-49-2	Selenium	0.251	197.14	225.42	114.3		HY
7440-24-6	Strontium	7.2900	118.28	129.4200	103.3		P
7440-62-2	Vanadium	14.3560	29.57	47.4250	111.8		P
7440-66-6	Zinc	27.1330	216.86	241.8500	95.0		P

(1) Contract-recommended control limits: 75-125%.

Comments:

USEPA - ITD

FORM 5A
MATRIX SPIKE RECOVERY

Lab Name: MRI Episode No.: 25S EPA SAMPLE NO.

Contract No.: 5040042 SAS No.: 5403S

Matrix (aqueous/solid/leachate): solid

PAJARITO CANYON

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Sample Concentration (SR)	Spike Added (SA1)	MS Concentration (MSSR)	MS %R(1) (S)	Q	M
7429-90-5	Aluminum	8034.4000	199.80	7574.6000	-230		P
7440-38-2	Arsenic	1.7007	79.92	74.5400	93.3		P
7440-39-3	Barium	81.2230	119.88	193.9300	94.0		P
7440-41-7	Beryllium	0.6963	19.98	19.2140	92.7		P
7440-42-8	Boron	2.0188	99.90	95.6360	93.7		P
7440-43-9	Cadmium	0.442	19.98	20.380	99.8		F
7440-47-3	Chromium	7.5780	89.91	99.5070	102.2		P
7440-50-8	Copper	9.5608	49.95	57.6900	96.4		P
7439-89-6	Iron	9804.5000	299.70	9211.7000	-198		P
7439-92-1	Lead	14.6420	99.90	118.3300	103.8		P
7439-95-4	Magnesium	1158.8000	199.80	1249.5000	45.4		P
7439-96-5	Manganese	558.0500	219.78	713.1900	70.6		P
7439-97-6	Mercury						CV
7439-98-7	Molybdenum	0.7433	19.98	19.3580	93.2		P
7440-02-0	Nickel	12.8330	49.95	64.1890	102.8		P
7782-49-2	Selenium						HY
7440-24-6	Strontium	13.4750	119.88	134.7300	101.1		P
7440-62-2	Vanadium	15.5440	29.97	44.9220	98.0		P
440-66-6	Zinc	34.4370	219.78	262.1000	103.6		P

.) Contract-recommended control limits: 75-125%.

Comments:

USEPA - ITD

FORM 5B

~~MATRIX SPIKE~~ SAMPLE DUPLICATE ~~RECOVERY~~ PRECISION AW 4/17/98

Lab Name: MRI Episode No.: 23S EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUSM2-MD

Matrix (aqueous/solid/leachate): solid

LAB ID 5336D

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	~~Spike Added (SA2)~~	~~MSD Concentration (MSDSR)~~ Duplicate Conc. AW 4/17/98	~~MSD~~ %R (D)	RPD (1)	Q	M
429-90-5	Aluminum	0.00	5525.1000		0.2		P
7440-38-2	Arsenic	0.00	1.5977		3.4		P
440-39-3	Barium	0.00	57.0970		11.0		P
440-41-7	Beryllium	0.00	0.7453		6.7		P
7440-42-8	Boron	0.00	1.7820		19.0		P
7440-43-9	Cadmium		0.2096		3.6		P
440-47-3	Chromium	0.00	4.3675		10.6		P
440-50-8	Copper		7.5470		62.5		P
7439-89-6	Iron		11312.00		14.0		P
439-92-1	Lead	0.00	12.1700		2.8		P
439-95-4	Magnesium	0.00	730.0100		0.7		P
7439-96-5	Manganese		368.5600		4.3		P
439-97-6	Mercury		0.08		0.0		CV
439-98-7	Molybdenum	0.00	1.0451		3.8		P
7440-02-0	Nickel	0.00	5.3694		0.6		P
7782-49-2	Selenium		0.231		0.0		HY
440-24-6	Strontium	0.00	8.8985		19.9		P
440-62-2	Vanadium	0.00	13.4670		6.4		P
7440-66-6	Zinc		33.4470		20.8		P

.) Contract-recommended control limit: ≤20%.

Comments:

USEPA - ITD

FORM 5B

~~MATRIX SPIKE~~ SAMPLE DUPLICATE ~~RECOVERY~~ PRECISION

Lab Name: MRI Episode No.: 25S EPA SAMPLE NO.

Contract No.: 5040042 SAS No.: 5403D

Matrix (aqueous/solid/leachate): solid

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	~~Spike Added (SA2)~~	~~MSD Concentration (MSDSR)~~	MSD %R (D)	RPD (1)	Q	M
7429-90-5	Aluminum	0.00	7205.0000		10.9		P
7440-38-2	Arsenic	0.00	1.6995		0.1		P
7440-39-3	Barium	0.00	80.5470		0.8		P
7440-41-7	Beryllium	0.00	0.6718		3.6		P
7440-42-8	Boron	0.00	1.5315		27.5		P
7440-43-9	Cadmium	0.00	0.379		15.3		F
7440-47-3	Chromium	0.00	6.7710		11.2		P
7440-50-8	Copper	0.00	8.6384		10.1		P
7439-89-6	Iron	0.00	9580.8000		2.3		P
7439-92-1	Lead	0.00	12.7890		13.5		P
7439-95-4	Magnesium	0.00	1031.6000		11.6		P
7439-96-5	Manganese	0.00	555.8900		0.4		P
7439-97-6	Mercury						CV
7439-98-7	Molybdenum	0.00	0.8527		13.7		P
7440-02-0	Nickel	0.00	10.4560		20.4		P
7782-49-2	Selenium						HY
7440-24-6	Strontium	0.00	12.4870		7.6		P
7440-62-2	Vanadium	0.00	15.5220		0.1		P
7440-66-6	Zinc	0.00	30.9540		10.7		P

) Contract-recommended control limit: ≤20%.

Comments:

USEPA - ITD

FORM 6
LABORATORY CONTROL SAMPLE

Lab Name: MRI Episode No.: 23S

Contract No.: 8990081 SAS No.: Analysis Date: 01/14/98

Solid LCS Source: NIST 2704 Aqueous LCS Source:

CAS No.	Analyte	Aqueous LCS (ug/L)			Solid LCS (mg/Kg)		
		True	Found	%R(1)	True	Found	%R(1)
7429-90-5	Aluminum				61100.0	12009.00	19.7
7440-38-2	Arsenic				23.4	16.31	69.7
7440-39-3	Barium				414.0	80.55	19.5
7440-41-7	Beryllium				0.0	0.80	
7440-42-8	Boron				0.0	9.36	
7440-43-9	Cadmium				3.5	3.72	107.9
7440-47-3	Chromium				135.0	78.56	58.2
7440-50-8	Copper				98.6	90.00	91.3
7439-89-6	Iron				41100.0	33269.00	80.9
7439-92-1	Lead				161.0	147.12	91.4
7439-95-4	Magnesium				12000.0	8932.80	74.4
7439-96-5	Manganese				555.0	451.83	81.4
7439-97-6	Mercury				1.5	1.42	96.9
7439-98-7	Molybdenum				0.0	3.79	
7440-02-0	Nickel				44.1	39.46	89.5
7782-49-2	Selenium				1.124	1.156	102.9
7440-24-6	Strontium				0.0	30.75	
7440-62-2	Vanadium				95.0	19.82	20.9
7440-66-6	Zinc				438.0	386.45	88.7

(1) Contract-required control limits: 80-120% (with the exception of Ag and Sb).

Comments:

USEPA - ITD

FORM 6
LABORATORY CONTROL SAMPLE

Lab Name: MRI Episode No.: 25S

Contract No.: 8990081 SAS No.: Analysis Date: 02/13/98

Solid LCS Source: NIST 2704 Aqueous LCS Source:

CAS No.	Analyte	Aqueous LCS (ug/L)			Solid LCS (mg/Kg)		
		True	Found	%R(1)	True	Found	%R(1)
7429-90-5	Aluminum				61100.0	15263.00	25.0
7440-38-2	Arsenic				23.4	2.63	11.2
7440-39-3	Barium				414.0	96.29	23.3
7440-41-7	Beryllium				0.0	0.80	
7440-42-8	Boron				0.0	7.27	
7440-43-9	Cadmium				3.5	3.67	106.4
7440-47-3	Chromium				135.0	88.81	65.8
7440-50-8	Copper				98.6	100.52	101.9
7439-89-6	Iron				41100.0	36 046.00	87.7
7439-92-1	Lead				161.0	170.14	105.7
7439-95-4	Magnesium				12000.0	9887.20	82.4
7439-96-5	Manganese				196.1	496.24	253.1
7439-97-6	Mercury				1.47	1.42	96.6
7439-98-7	Molybdenum				0.0	3.65	
7440-02-0	Nickel				44.1	43.11	97.7
7782-49-2	Selenium						
7440-24-6	Strontium				0.0	34.86	
7440-62-2	Vanadium				95.0	26.50	27.9
7440-66-6	Zinc				438.0	446.64	102.0

(1) Contract-required control limits: 80-120% (with the exception of Ag and Sb).

Comments:

Appendix D

Water Sample QC Forms Catalog 8990081

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.:

Matrix (aqueous/solid/leachate): aqueous % solids:

MBLANK

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	19.00	U		P
7440-38-2	Arsenic	19.00	U		P
7440-39-3	Barium	0.70	U		P
7440-41-7	Beryllium	0.30	U		P
7440-42-8	Boron	17.00	U		P
7440-43-9	Cadmium	1.30	U		P
7440-47-3	Chromium	2.20	U		P
7440-50-8	Copper	1.90	U		P
7439-89-6	Iron	2.91	B		P
7439-92-1	Lead	14.00	U		P
7439-95-4	Magnesium	32.00	U		P
7439-96-5	Manganese	1.40	U		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.50	U		P
7440-02-0	Nickel	3.90	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	0.20	U		P
7440-62-2	Vanadium	1.80	U		P
7440-66-6	Zinc	3.88	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: MBLANK

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	50.79			P
7440-38-2	Arsenic	19.00	U		P
7440-39-3	Barium	0.70	U		P
7440-41-7	Beryllium	0.40	B		P
7440-42-8	Boron	17.00	U		P
7440-43-9	Cadmium	2.76			P
7440-47-3	Chromium	6.98			P
7440-50-8	Copper	4.27	B		P
7439-89-6	Iron	4.18	B		P
7439-92-1	Lead	14.00	U		P
7439-95-4	Magnesium	98.16	B		P
7439-96-5	Manganese	1.40	U		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.50	U		P
7440-02-0	Nickel	4.76	B		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	0.34	B		P
7440-62-2	Vanadium	5.59			P
7440-66-6	Zinc	3.91	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 1A
METALS ANALYSIS DATA SHEET

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: MBLANK

Matrix (aqueous/solid/leachate): aqueous % solids:

Receipt date: 01/07/98 Analysis Date: 04/22/98

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	21.56	B		P
7440-38-2	Arsenic	19.00	U		P
7440-39-3	Barium	0.70	U		P
7440-41-7	Beryllium	0.38	B		P
7440-42-8	Boron	17.00	U		P
7440-43-9	Cadmium	1.79			P
7440-47-3	Chromium	2.43	B		P
7440-50-8	Copper	1.90	B		P
7439-89-6	Iron	3.06	B		P
7439-92-1	Lead	14.00	U		P
7439-95-4	Magnesium	32.00	U		P
7439-96-5	Manganese	1.40	U		P
7439-97-6	Mercury				CV
7439-98-7	Molybdenum	3.50	U		P
7440-02-0	Nickel	3.90	U		P
7782-49-2	Selenium	2.6	U		HY
7440-24-6	Strontium	0.20	U		P
7440-62-2	Vanadium	1.80	U		P
7440-66-6	Zinc	4.25	B		P

Color before: COLORLESS Clarity before: CLEAR Texture: NA

Color after: COLORLESS Clarity after: CLEAR Artifacts: No

Comments:

USEPA - ITD

FORM 5A
MATRIX SPIKE RECOVERY

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUWM01S

Matrix (aqueous/solid/leachate): aqueous

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Sample Concentration (SR)	Spike Added (SA1)	MS Concentration (MSSR)	MS %R(1) (S)	Q	M
7429-90-5	Aluminum	1556.6000	2222.22	4036.3000	111.6		
7440-38-2	Arsenic	21.5330	888.88	1013.2000	114.0		P
7440-39-3	Barium	35.1790	222.22	275.1400	108.0		P
7440-41-7	Beryllium	0.3400	222.22	238.2400	107.2		P
7440-42-8	Boron	19.2670	333.33	372.8800	111.9		P
7440-43-9	Cadmium	1.4733	222.22	256.7500	115.5		P
7440-47-3	Chromium	4.4200	444.44	513.4800	114.5		P
7440-50-8	Copper	2.7087	333.33	371.5200	110.6		P
7439-89-6	Iron	600.3900	3333.33	4265.6000	110.0		P
7439-92-1	Lead	15.8670	1111.11	1271.2000	114.4		P
7439-95-4	Magnesium	2929.2000	2222.22	5483.1000	114.9		P
7439-96-5	Manganese	11.9340	222.22	258.8500	111.1		P
7439-97-6	Mercury						CV
7439-98-7	Molybdenum	3.9667	444.44	501.0100	112.7		P
7440-02-0	Nickel	4.4200	555.55	662.6900	119.3		P
7782-49-2	Selenium	3.2	100.06	118.1	114.9		HY
7440-24-6	Strontium	57.7660	222.22	293.0800	105.9		P
7440-62-2	Vanadium	4.6240	333.33	385.8000	114.4		P
7440-66-6	Zinc	8.0920	222.22	273.5200	119.4		P

(1) Contract-recommended control limits: 75-125%.

Comments:

USEPA - ITD

FORM 5A
MATRIX SPIKE RECOVERY

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUWM04S

Matrix (aqueous/solid/leachate): aqueous

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Sample Concentration (SR)	Spike Added (SA1)	MS Concentration (MSSR)	MS %R(1) (S)	Q	M
429-90-5	Aluminum	3921.3000	2222.22	6357.5000	109.6		P
440-38-2	Arsenic	21.5330	888.89	1139.6000	128.2		P
440-39-3	Barium	52.3830	222.22	314.6200	118.0		P
440-41-7	Beryllium	0.4760	222.22	264.9200	119.0		P
440-42-8	Boron	19.2670	333.33	416.9300	125.1		P
440-43-9	Cadmium	2.7087	222.22	285.6600	127.3		P
440-47-3	Chromium	8.6247	444.44	573.7800	127.2		P
440-50-8	Copper	5.4173	333.33	408.9000	121.0		P
439-89-6	Iron	1587.5000	3333.33	5484.2000	116.9		P
439-92-1	Lead	15.8670	1111.11	1416.7000	127.5		P
439-95-4	Magnesium	4017.1000	2222.22	6750.9000	123.0		P
439-96-5	Manganese	12.5230	222.22	284.4600	122.4		P
439-97-6	Mercury						CV
439-98-7	Molybdenum	3.9667	444.44	594.7500	133.8		P
440-02-0	Nickel	6.6980	555.55	743.9400	132.7		P
782-49-2	Selenium	2.6	100.00	106.7	106.7		HY
440-24-6	Strontium	76.4320	222.22	333.7900	115.8		P
440-62-2	Vanadium	8.7040	333.33	429.7800	126.3		P
440-66-6	Zinc	12.0590	222.22	298.3800	128.8		P

) Contract-recommended control limits: 75-125%.

Comments:

USEPA - ITD

FORM 5A
MATRIX SPIKE RECOVERY

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PLWM09S

Matrix (aqueous/solid/leachate): aqueous

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Sample Concentration (SR)	Spike Added (SA1)	MS Concentration (MSSR)	MS %R(1) (S)	Q	M
7429-90-5	Aluminum	3606.2000	2222.22	5536.4000	86.9		P
7440-38-2	Arsenic	21.5330	888.89	929.6500	104.6		P
7440-39-3	Barium	51.9410	222.22	269.3900	97.9		P
7440-41-7	Beryllium	0.4307	222.22	217.0400	97.5		P
7440-42-8	Boron	19.2670	333.33	342.7000	102.8		P
7440-43-9	Cadmium	2.3460	222.22	230.8300	102.8		P
7440-47-3	Chromium	3.8987	444.44	460.1600	102.7		P
7440-50-8	Copper	6.1540	333.33	337.2600	99.3		P
7439-89-6	Iron	1522.0000	3333.33	4601.2000	92.4		P
7439-92-1	Lead	15.8670	1111.11	1124.5000	101.2		P
7439-95-4	Magnesium	3959.2000	2222.22	6116.3000	97.1		P
7439-96-5	Manganese	10.1660	222.22	229.9600	98.9		P
7439-97-6	Mercury						CV
7439-98-7	Molybdenum	3.9667	444.44	476.0700	107.1		P
7440-02-0	Nickel	6.8907	555.56	603.7500	107.4		P
7782-49-2	Selenium	2.6	100.00	101.4	101.4		HY
7440-24-6	Strontium	77.2030	222.22	287.1600	94.5		P
7440-62-2	Vanadium	4.3180	333.33	346.7800	102.7		P
7440-66-6	Zinc	12.8520	222.22	241.5900	102.9		P

.) Contract-recommended control limits: 75-125%.

Comments:

USEPA - ITD

FORM 5B
MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: MRI Episode No.: 8W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PLWM09D

Matrix (aqueous/solid/leachate): aqueous

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Spike Added (SA2)	MSD Concentration (MSDSR)	MSD %R (D)	RPD (1)	Q	M
29-90-5	Aluminum	0.00	3600.9000		0.1		P
440-38-2	Arsenic	0.00	21.5330		0.0		P
440-39-3	Barium	0.00	52.0430		0.2		P
440-41-7	Beryllium	0.00	0.4760		10.0		P
440-42-8	Boron	0.00	19.2670		0.0		P
440-43-9	Cadmium	0.00	2.3460		0.0		P
440-47-3	Chromium	0.00	5.6553		36.8		P
440-50-8	Copper	0.00	6.3240		2.7		P
439-89-6	Iron	0.00	1494.2000		1.8		P
39-92-1	Lead	0.00	15.8670		0.0		P
39-95-4	Magnesium	0.00	3969.9000		0.3		P
439-96-5	Manganese	0.00	9.7920		3.7		P
439-97-6	Mercury						CV
39-98-7	Molybdenum	0.00	3.9667		0.0		P
440-02-0	Nickel	0.00	7.4120		7.3		P
782-49-2	Selenium		2.6		0.0		HY
440-24-6	Strontium	0.00	76.7610		0.6		P
440-62-2	Vanadium	0.00	5.5647		25.2		P
440-66-6	Zinc	0.00	12.7610		0.7		P

) Contract-recommended control limit: ≤20%.

Comments:

USEPA - ITD

FORM 6
LABORATORY CONTROL SAMPLE

Lab Name: MRI Episode No.: 6W

Contract No.: 8990081 SAS No.: Analysis Date: 04/22/98

Solid LCS Source: Aqueous LCS Source: INORGANIC VENTURES NIST TRACEABLE STANDARD SOLUTION.

CAS No.	Analyte	Aqueous LCS (ug/L)			Solid LCS (mg/Kg)		
		True	Found	%R(1)	True	Found	%R(1)
7429-90-5	Aluminum	1960.8	2168.00	110.6			
7440-38-2	Arsenic	784.3	823.92	105.1			
7440-39-3	Barium	196.1	200.19	102.1			
7440-41-7	Beryllium	196.1	194.97	99.4			
7440-42-8	Boron	294.1	303.75	103.3			
7440-43-9	Cadmium	196.1	208.62	106.4			
7440-47-3	Chromium	392.2	421.19	107.4			
7440-50-8	Copper	294.4	305.57	103.8			
7439-89-6	Iron	2941.2	3084.50	104.9			
7439-92-1	Lead	980.4	1050.50	107.2			
7439-95-4	Magnesium	1960.8	2399.80	122.4			
7439-96-5	Manganese	196.1	205.07	104.6			
7439-97-6	Mercury						
7439-98-7	Molybdenum	392.2	415.46	105.9			
7440-02-0	Nickel	490.2	538.35	109.8			
7782-49-2	Selenium	100.0	107.2	107.2			
7440-24-6	Strontium	196.1	198.49	101.2			
7440-62-2	Vanadium	294.1	314.51	106.9			
7440-66-6	Zinc	196.1	215.71	110.0			

(1) Contract-required control limits: 80-120% (with the exception of Ag and Sb).

Comments:

USEPA - ITD

FORM 5B
MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: MRI Episode No.: 6W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUWM01D

Matrix (aqueous/solid/leachate): aqueous

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Spike Added (SA2)	MSD Concentration (MSDSR)	MSD %R (D)	RPD (1)	Q	M
429-90-5	Aluminum	0.00	1570.0000		0.9		P
440-38-2	Arsenic	0.00	21.5330		0.0		P
440-39-3	Barium	0.00	35.4730		0.8		P
440-41-7	Beryllium	0.00	0.3400		0.0		P
440-42-8	Boron	0.00	19.2670		0.0		P
440-43-9	Cadmium	0.00	1.4733		0.0		P
440-47-3	Chromium	0.00	3.1507		33.5		P
440-50-8	Copper	0.00	2.7087		0.0		P
439-89-6	Iron	0.00	613.1700		2.1		P
439-92-1	Lead	0.00	15.8670		0.0		P
439-95-4	Magnesium	0.00	2944.4000		0.5		P
439-96-5	Manganese	0.00	12.2170		2.3		P
439-97-6	Mercury						CV
439-98-7	Molybdenum	0.00	3.9667		0.0		P
440-02-0	Nickel	0.00	4.4200		0.0		P
782-49-2	Selenium		3.2		2.2		HY
440-24-6	Strontium	0.00	58.2080		0.8		P
440-62-2	Vanadium	0.00	4.4427		4.0		P
440-66-6	Zinc	0.00	11.9340		38.4		P

Contract-recommended control limit: ≤20%.

Comments:

USEPA - ITD

FORM 5B
MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: MRI Episode No.: 7W EPA SAMPLE NO.

Contract No.: 8990081 SAS No.: PUWM04D

Matrix (aqueous/solid/leachate): aqueous

Concentration Units (ug/L or mg/Kg dry weight): ug/L

CAS No.	Analyte	Spike Added (SA2)	MSD Concentration (MSDSR)	MSD %R (D)	RPD (1)	Q	M
7429-90-5	Aluminum	0.00	3928.9000		0.2		P
7440-38-2	Arsenic	0.00	21.5330		0.0		P
7440-39-3	Barium	0.00	52.3830		0.0		P
7440-41-7	Beryllium	0.00	0.4760		0.0		P
7440-42-8	Boron	0.00	19.2670		0.0		P
7440-43-9	Cadmium	0.00	3.5020		25.5		P
7440-47-3	Chromium	0.00	9.5313		10.0		P
7440-50-8	Copper	0.00	5.2360		3.4		P
7439-89-6	Iron	0.00	1593.7000		0.4		P
7439-92-1	Lead	0.00	15.8670		0.0		P
7439-95-4	Magnesium	0.00	4047.6000		0.8		P
7439-96-5	Manganese	0.00	12.5230		0.0		P
7439-97-6	Mercury						CV
7439-98-7	Molybdenum	0.00	3.9667		0.0		P
7440-02-0	Nickel	0.00	8.7267		26.3		P
7782-49-2	Selenium		2.6		0.0		HY
7440-24-6	Strontium	0.00	76.6810		0.3		P
7440-62-2	Vanadium	0.00	9.5880		9.7		P
7440-66-6	Zinc	0.00	11.8770		1.5		P

.) Contract-recommended control limit: ≤20%.

Comments:

USEPA - ITD

FORM 6
LABORATORY CONTROL SAMPLE

Lab Name: MRI Episode No.: 7W

Contract No.: 8990081 SAS No.: Analysis Date: 04/22/98

Solid LCS Source: Aqueous LCS Source: INORGANIC VENTURES STANDARD SOLUTION

CAS No.	Analyte	Aqueous LCS (ug/L)			Solid LCS (mg/Kg)		
		True	Found	%R(1)	True	Found	%R(1)
7429-90-5	Aluminum	1960.8	2154.70	109.9			
7440-38-2	Arsenic	784.3	813.03	103.7			
7440-39-3	Barium	196.1	193.35	98.6			
7440-41-7	Beryllium	196.1	190.90	97.3			
7440-42-8	Boron	294.1	297.24	101.1			
7440-43-9	Cadmium	196.1	213.43	108.8			
7440-47-3	Chromium	392.2	421.66	107.5			
7440-50-8	Copper	294.4	296.68	100.8			
7439-89-6	Iron	2941.2	3024.20	102.8			
7439-92-1	Lead	980.4	1042.00	106.3			
7439-95-4	Magnesium	1960.8	2405.70	122.7			
7439-96-5	Manganese	196.1	202.89	103.5			
7439-97-6	Mercury						
7439-98-7	Molybdenum	392.2	408.35	104.1			
7440-02-0	Nickel	490.2	549.68	112.1			
7782-49-2	Selenium	100.0	123.5	123.5			
7440-24-6	Strontium	196.1	191.69	97.8			
7440-62-2	Vanadium	294.1	313.07	106.5			
7440-66-6	Zinc	196.1	216.73	110.5			

(1) Contract-required control limits: 80-120% (with the exception of Ag and Sb).

Comments:

USEPA - ITD

FORM 6
LABORATORY CONTROL SAMPLE

Lab Name: MRI Episode No.: 8W

Contract No.: 8990081 SAS No.: Analysis Date: 04/22/98

Solid LCS Source: Aqueous LCS Source: INORGANIC VENTURES STANDARD SOLUTION

CAS No.	Analyte	Aqueous LCS (ug/L)			Solid LCS (mg/Kg)		
		True	Found	%R(1)	True	Found	%R(1)
7429-90-5	Aluminum	1960.8	2173.40	110.8			
7440-38-2	Arsenic	784.3	831.11	106.0			
7440-39-3	Barium	196.1	206.17	105.1			
7440-41-7	Beryllium	196.1	198.06	101.0			
7440-42-8	Boron	294.1	301.95	102.7			
7440-43-9	Cadmium	196.1	208.97	106.6			
7440-47-3	Chromium	392.2	420.18	107.1			
7440-50-8	Copper	294.4	309.06	105.0			
7439-89-6	Iron	2941.2	3084.00	104.9			
7439-92-1	Lead	980.4	1039.20	106.0			
7439-95-4	Magnesium	1960.8	2400.00	122.4			
7439-96-5	Manganese	196.1	204.71	104.4			
7439-97-6	Mercury						
7439-98-7	Molybdenum	392.2	413.22	105.4			
7440-02-0	Nickel	490.2	549.66	112.1			
7782-49-2	Selenium	100.0	116.2	116.2			
7440-24-6	Strontium	196.1	201.61	102.8			
7440-62-2	Vanadium	294.1	313.58	106.6			
7440-66-6	Zinc	196.1	217.44	110.9			

(1) Contract-required control limits: 80-120% (with the exception of Ag and Sb).

Comments:

Appendix A, Table A. Results of MRI metals analysis of water, on two dates. The first analysis was within the Clean Water Acts mandated holding time, but may have been confounded by a instrument problem. The second analysis was performed on the same extracts (extracts were performed within time limits) using the repaired instrument. However, the second analysis was not performed within the specified holding time. Mercury and selenium were measured by different procedures, and these analyses were therefore not affected by the instrument problem.

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
BLKWMO2	Al	20.40	34.56
	As	19.27	21.53
	B	17.00	19.27
	Ba	0.79	0.79
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	3.43
	Cu	2.95	2.32
	Fe	62.33	5.62
	Hg	0.00	.
	Mg	39.67	47.08
	Mn	0.68	1.59
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	0.11	0.23
	V	4.76	2.28
	Zn	3.08	3.97
BLKWMO4	Al	20.40	21.53
	As	19.27	21.53
	B	17.00	19.27
	Ba	0.79	0.79
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	2.49
	Cu	2.95	2.15
	Fe	62.33	2.61
	Hg	0.00	.
	Mg	39.67	36.27
	Mn	0.68	1.59
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	0.11	0.23
	V	4.76	2.04
	Zn	1.70	1.70

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
Blank WMO8	Al	20.40	42.40
	As	19.27	21.53
	B	17.00	19.27
	Ba	0.79	0.79
	Be	0.34	0.44
	Cd	2.15	2.74
	Cr	4.99	5.58
	Cu	2.95	3.22
	Fe	62.33	9.91
	Hg	0.00	
	Mg	39.67	77.60
	Mn	0.68	1.59
	Mo	3.51	3.97
	Ni	6.91	7.57
	Pb	15.87	15.87
	Se	2.60	
	Sr	0.11	0.23
	V	4.76	4.22
	Zn	2.02	4.61
LLWMO2	Al	323.99	371.65
	As	19.27	21.53
	B	17.00	19.27
	Ba	18.57	19.92
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	2.49
	Cu	2.95	2.15
	Fe	62.33	126.23
	Hg	0.00	.
	Mg	3032.50	3151.80
	Mn	0.83	1.62
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	56.33	56.33
	V	4.76	2.04
	Zn	2.32	3.66

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
LLWMO3	Al	373.89	426.58
	As	19.27	21.53
	B	17.00	19.27
	Ba	22.38	23.89
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	5.89
	Cu	2.95	3.26
	Fe	169.27	134.52
	Hg	0.00	.
	Mg	2903.20	3044.80
	Mn	1.70	2.37
	Mo	3.51	3.97
	Ni	6.91	8.67
	Pb	15.87	15.87
	Se	2.60	.
	Sr	59.55	60.91
	V	4.76	5.61
	Zn	3.24	4.61
LLWMO5	Al	879.24	933.20
	As	19.27	21.53
	B	17.00	19.27
	Ba	27.09	28.92
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	2.49
	Cu	2.95	2.15
	Fe	258.68	298.80
	Hg	0.00	.
	Mg	3298.60	3446.80
	Mn	2.40	2.74
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	72.41	75.97
	V	4.76	2.04
	Zn	3.31	3.94

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
LLWMO7	Al	784.73	829.03
	As	19.27	21.53
	B	17.00	19.27
	Ba	25.74	27.65
	Be	0.34	0.34
	Cd	2.15	2.43
	Cr	4.99	2.49
	Cu	2.95	2.15
	Fe	218.89	258.93
	Hg	0.00	.
	Mg	3096.70	3170.30
	Mn	2.23	2.86
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	68.22	69.24
	V	4.76	2.00
	Zn	3.43	4.61
LLWMO9	Al	723.02	787.22
	As	19.27	21.53
	B	17.00	19.27
	Ba	27.02	28.78
	Be	0.34	0.48
	Cd	2.15	3.45
	Cr	4.99	7.04
	Cu	2.95	3.75
	Fe	226.04	245.21
	Hg	0.00	.
	Mg	3290.40	3422.00
	Mn	11.03	13.53
	Mo	3.51	3.97
	Ni	6.91	6.24
	Pb	15.87	15.87
	Se	2.60	.
	Sr	71.86	72.16
	V	4.76	5.66
	Zn	4.31	6.90

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
LUWM02	Al	1808.60	1869.80
	As	19.27	21.53
	B	17.00	19.27
	Ba	27.19	28.89
	Be	0.34	0.34
	Cd	2.15	1.58
	Cr	4.99	3.65
	Cu	2.95	2.52
	Fe	607.00	559.50
	Hg	0.00	.
	Mg	3008.40	3106.30
	Mn	9.96	10.65
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	63.68	65.05
	V	4.76	2.83
	Zn	6.17	8.25
LUWM06	Al	1116.40	1156.40
	As	19.27	21.53
	B	17.00	19.27
	Ba	28.32	28.92
	Be	0.34	0.39
	Cd	2.15	2.78
	Cr	4.99	2.49
	Cu	2.95	3.15
	Fe	292.70	362.75
	Hg	0.00	.
	Mg	3173.10	3254.00
	Mn	2.72	3.30
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	72.68	72.57
	V	4.76	2.04
	Zn	3.96	5.41

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
LUWM08	Al	877.21	936.68
	As	19.27	21.53
	B	17.00	19.27
	Ba	28.31	28.92
	Be	0.34	0.34
	Cd	2.15	3.64
	Cr	4.99	8.35
	Cu	2.95	5.55
	Fe	286.09	287.95
	Hg	0.00	.
	Mg	3310.10	3384.20
	Mn	2.33	3.62
	Mo	3.51	3.97
	Ni	6.91	8.16
	Pb	15.87	15.87
	Se	2.60	.
	Sr	73.91	72.48
	V	4.76	6.72
	Zn	5.93	10.97
LUWMO1	Al	275.51	324.81
	As	19.27	21.53
	B	17.00	19.27
	Ba	18.15	19.58
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	2.49
	Cu	2.95	2.10
	Fe	62.33	110.44
	Hg	0.00	.
	Mg	2980.90	3124.50
	Mn	0.95	1.59
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	55.38	56.50
	V	4.76	5.04
	Zn	4.41	5.59

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
LUWMO4	Al	1085.30	1140.70
	As	19.27	21.53
	B	17.00	19.27
	Ba	28.31	29.37
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	2.49
	Cu	2.95	2.15
	Fe	344.52	362.59
	Hg	0.00	.
	Mg	3304.80	3437.70
	Mn	2.67	3.15
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	74.02	77.09
	V	4.76	2.04
	Zn	4.05	4.92
LUWMO6D	Al	738.50	781.44
	As	19.27	21.53
	B	17.00	19.27
	Ba	26.53	28.44
	Be	0.34	0.34
	Cd	2.15	1.63
	Cr	4.99	2.49
	Cu	2.95	2.16
	Fe	168.71	244.75
	Hg	0.00	.
	Mg	3130.40	3226.60
	Mn	1.93	2.71
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	71.05	71.61
	V	4.76	2.04
	Zn	10.84	13.06

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PLWM03	Al	204.26	271.94
	As	19.27	21.53
	B	17.00	19.27
	Ba	31.53	32.88
	Be	0.34	0.35
	Cd	2.15	1.55
	Cr	4.99	2.91
	Cu	2.95	2.38
	Fe	62.33	129.15
	Hg	0.00	.
	Mg	2630.90	2774.70
	Mn	3.04	4.25
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	.
	Sr	57.91	57.60
	V	4.76	2.46
	Zn	1.70	4.00
PLWM05	Al	3134.00	3275.70
	As	19.27	21.53
	B	17.00	19.27
	Ba	47.42	49.83
	Be	0.34	0.43
	Cd	2.21	2.90
	Cr	4.99	5.89
	Cu	2.95	2.91
	Fe	1530.10	1342.80
	Hg	0.00	.
	Mg	3827.00	3986.90
	Mn	8.40	9.01
	Mo	3.51	3.97
	Ni	6.91	8.33
	Pb	15.83	15.87
	Se	2.60	.
	Sr	74.67	77.07
	V	4.76	6.31
	Zn	8.22	9.15

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PLWM07	Al	507.50	539.10
	As	19.27	21.53
	B	17.00	19.27
	Ba	44.17	46.94
	Be	0.34	0.36
	Cd	2.15	1.96
	Cr	4.99	2.49
	Cu	2.95	3.16
	Fe	254.12	298.91
	Hg	0.00	.
	Mg	3609.10	3717.90
	Mn	4.00	4.54
	Mo	3.51	3.97
	Ni	6.91	5.95
	Pb	15.87	15.87
	Se	2.60	.
	Sr	77.66	78.98
	V	4.76	2.04
	Zn	3.51	4.75
PLWM09	Al	3576.50	3606.20
	As	19.27	21.53
	B	17.00	19.27
	Ba	50.00	51.94
	Be	0.34	0.43
	Cd	2.15	2.35
	Cr	4.99	3.90
	Cu	2.95	6.15
	Fe	1666.20	1522.00
	Hg	0.00	.
	Mg	3883.40	3959.10
	Mn	9.32	10.17
	Mo	3.51	3.97
	Ni	6.91	6.89
	Pb	15.87	15.87
	Se	2.60	.
	Sr	77.63	77.20
	V	4.76	4.32
	Zn	10.95	12.85

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PLWM09D	Al	3554.80	3576.50
	As	19.27	19.27
	B	17.00	19.27
	Ba	49.30	51.94
	Be	0.34	0.43
	Cd	2.15	2.15
	Cr	4.99	4.99
	Cu	2.95	2.95
	Fe	1605.70	1666.20
	Hg	0.00	.
	Mg	3871.90	3883.40
	Mn	7.89	9.32
	Mo	3.51	3.51
	Ni	6.91	6.91
	Pb	15.87	15.87
	Se	2.60	.
	Sr	76.53	77.63
	V	4.76	4.76
	Zn	8.53	10.85
PLWMO2	Al	625.75	675.85
	As	19.27	21.53
	B	17.00	19.27
	Ba	32.94	32.85
	Be	0.34	0.34
	Cd	2.15	1.78
	Cr	4.99	4.33
	Cu	2.95	2.88
	Fe	258.24	252.65
	Hg	0.00	.
	Mg	3037.80	3134.00
	Mn	2.36	3.09
	Mo	3.51	3.97
	Ni	6.91	5.22
	Pb	15.87	15.87
	Se	3.20	.
	Sr	62.57	62.90
	V	4.76	4.31
	Zn	8.28	10.20

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PUWM01	Al	1505.40	1556.60
	As	19.27	21.53
	B	17.00	19.27
	Ba	33.62	35.18
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	4.42
	Cu	2.95	2.71
	Fe	623.91	600.39
	Hg	0.00	.
	Mg	2859.50	2929.20
	Mn	11.04	11.93
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	3.20	.
	Sr	57.86	57.77
	V	4.76	4.62
	Zn	6.43	8.09
PUWM02	Al	4000.00	4167.10
	As	19.27	21.53
	B	17.00	19.27
	Ba	46.17	48.50
	Be	0.34	0.36
	Cd	2.15	1.89
	Cr	4.99	4.50
	Cu	2.95	2.78
	Fe	1826.40	1701.90
	Hg	0.00	.
	Mg	3263.50	3409.80
	Mn	14.01	15.13
	Mo	3.51	3.97
	Ni	6.91	7.90
	Pb	15.87	15.87
	Se	2.60	.
	Sr	64.58	65.75
	V	4.76	5.81
	Zn	7.97	9.30

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PUWM04D	Al	3802.80	3749.70
	As	19.27	19.27
	B	17.00	17.00
	Ba	50.65	50.01
	Be	0.34	0.34
	Cd	2.15	2.26
	Cr	5.44	4.99
	Cu	2.95	2.95
	Fe	1856.40	1802.50
	Hg	0.00	.
	Mg	3939.20	3862.70
	Mn	11.74	11.63
	Mo	3.51	3.51
	Ni	7.41	6.91
	Pb	15.87	15.83
	Se	2.60	.
	Sr	76.25	75.02
	V	5.34	4.76
	Zn	10.32	10.79
PUWM04	Al	3749.70	3921.30
	As	19.27	21.53
	B	17.00	19.27
	Ba	50.01	52.38
	Be	0.34	0.48
	Cd	2.26	2.71
	Cr	4.99	8.62
	Cu	2.95	5.42
	Fe	1802.50	1587.50
	Hg	0.00	.
	Mg	3862.70	4017.10
	Mn	11.63	12.52
	Mo	3.51	3.97
	Ni	6.91	6.70
	Pb	15.83	15.87
	Se	2.60	.
	Sr	75.02	76.43
	V	4.76	8.70
	Zn	10.79	12.06

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PUWM06	Al	14711.00	14893.00
	As	19.27	21.53
	B	17.00	19.27
	Ba	84.58	87.71
	Be	0.51	0.65
	Cd	2.15	2.60
	Cr	4.99	6.11
	Cu	2.95	3.13
	Fe	7069.10	6244.50
	Hg	0.00	0.00
	Mg	4982.30	5069.80
	Mn	29.52	29.93
	Mo	3.51	3.97
	Ni	7.08	8.02
	Pb	15.87	15.87
	Se	0.00	2.60
	Sr	87.19	88.08
	V	7.99	11.03
	Zn	21.68	21.78
PUWM08	Al	3937.50	3991.10
	As	19.27	21.53
	B	17.00	19.27
	Ba	50.37	52.43
	Be	0.34	0.52
	Cd	2.15	2.52
	Cr	4.99	4.40
	Cu	3.43	9.37
	Fe	1782.60	1640.50
	Hg	0.00	.
	Mg	3907.10	4032.90
	Mn	14.25	14.96
	Mo	3.51	3.97
	Ni	6.91	6.97
	Pb	15.87	15.87
	Se	2.60	.
	Sr	77.31	77.84
	V	4.76	4.99
	Zn	10.22	13.05

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PUWMO2D	Al	340.52	404.48
	As	19.27	21.53
	B	17.00	19.27
	Ba	35.46	36.78
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	2.94
	Cu	2.95	2.15
	Fe	62.33	176.14
	Hg	0.00	.
	Mg	2969.90	3119.60
	Mn	3.20	4.41
	Mo	3.51	3.97
	Ni	6.91	5.15
	Pb	15.87	15.87
	Se	2.60	.
	Sr	63.60	63.86
	V	4.76	3.43
	Zn	1.75	4.05
SLWM07	Al	128.16	172.47
	As	19.27	21.53
	B	66.33	58.87
	Ba	26.57	27.89
	Be	0.34	0.40
	Cd	2.15	1.68
	Cr	4.99	6.31
	Cu	2.95	4.06
	Fe	129.28	221.79
	Hg	0.00	
	Mg	4780.20	4921.90
	Mn	36.31	37.48
	Mo	75.12	75.96
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	
	Sr	69.85	70.00
	V	4.76	8.95
	Zn	22.91	25.23

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
SLWM09	Al	42.97	129.69
	As	19.27	21.53
	B	73.18	73.16
	Ba	24.89	24.64
	Be	0.34	0.42
	Cd	2.15	4.35
	Cr	4.99	13.58
	Cu	2.95	9.34
	Fe	366.24	351.71
	Hg	0.00	
	Mg	6048.80	6098.10
	Mn	35.72	36.92
	Mo	258.09	257.58
	Ni	6.91	9.95
	Pb	15.87	15.87
	Se	2.60	
	Sr	123.14	119.15
	V	8.70	17.00
	Zn	28.21	31.87
SLWMO2	Al	45.91	89.49
	As	23.64	21.53
	B	58.75	60.77
	Ba	19.11	19.82
	Be	0.34	0.34
	Cd	2.15	1.69
	Cr	4.99	6.03
	Cu	2.95	6.06
	Fe	204.35	248.74
	Hg	0.00	
	Mg	5418.90	5527.00
	Mn	34.99	35.70
	Mo	43.26	43.43
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	
	Sr	76.49	76.14
	V	5.95	10.38
	Zn	25.97	28.21

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
SLWMO3	Al	168.23	215.56
	As	19.27	21.53
	B	40.62	39.84
	Ba	16.29	17.00
	Be	0.34	0.34
	Cd	2.15	3.15
	Cr	4.99	7.92
	Cu	2.95	5.71
	Fe	175.52	181.49
	Hg	0.00	
	Mg	3322.40	3489.20
	Mn	22.52	23.79
	Mo	22.17	25.36
	Ni	6.91	5.41
	Pb	15.87	15.87
	Se	2.60	
	Sr	52.17	53.27
	V	4.91	9.06
	Zn	13.60	16.82
SLWMO5	Al	58.77	92.89
	As	19.27	21.53
	B	72.93	65.92
	Ba	30.66	32.11
	Be	0.34	0.34
	Cd	2.15	1.52
	Cr	4.99	8.22
	Cu	2.95	4.53
	Fe	384.97	425.49
	Hg	0.00	
	Mg	6777.30	6973.40
	Mn	47.70	49.22
	Mo	41.32	42.83
	Ni	6.91	6.26
	Pb	15.87	15.87
	Se	2.60	
	Sr	85.32	85.88
	V	6.24	10.51
	Zn	20.23	22.85

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
SUWM02	Al	324.50	389.30
	As	19.27	21.53
	B	44.10	47.88
	Ba	20.33	20.88
	Be	0.34	0.34
	Cd	2.15	2.30
	Cr	4.99	8.16
	Cu	2.95	6.73
	Fe	254.74	332.76
	Hg	0.00	
	Mg	3836.20	4009.90
	Mn	31.41	33.70
	Mo	26.69	27.46
	Ni	6.91	5.75
	Pb	15.87	15.87
	Se	2.60	
	Sr	58.24	58.16
	V	4.76	10.50
	Zn	18.63	21.86
SUWM08	Al	94.91	142.19
	As	19.27	21.53
	B	78.28	73.44
	Ba	32.19	32.41
	Be	0.34	0.34
	Cd	2.15	3.92
	Cr	6.04	11.62
	Cu	4.27	9.57
	Fe	807.86	692.66
	Hg	0.00	
	Mg	6692.70	6868.30
	Mn	71.25	72.99
	Mo	258.31	260.87
	Ni	8.27	9.35
	Pb	15.87	15.87
	Se	2.60	
	Sr	141.88	143.00
	V	10.76	14.71
	Zn	38.78	42.00

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
SUWM08D	Al	61.04	113.46
	As	19.27	21.53
	B	81.07	78.77
	Ba	32.26	32.41
	Be	0.34	0.39
	Cd	2.15	3.37
	Cr	4.99	11.55
	Cu	9.67	14.61
	Fe	663.44	584.99
	Hg	0.00	
	Mg	6779.50	6846.80
	Mn	70.45	71.17
	Mo	257.02	260.87
	Ni	7.76	11.89
	Pb	15.87	15.87
	Se	2.60	
	Sr	144.27	142.03
	V	9.24	15.10
	Zn	34.03	33.71
SUWMO1	Al	206.03	250.31
	As	19.27	21.53
	B	56.12	51.43
	Ba	19.32	20.64
	Be	0.34	0.34
	Cd	2.15	2.12
	Cr	4.99	11.73
	Cu	5.63	9.52
	Fe	374.12	391.85
	Hg	0.00	
	Mg	4806.60	4935.00
	Mn	40.90	42.17
	Mo	20.45	27.31
	Ni	6.91	9.77
	Pb	15.87	15.87
	Se	2.60	
	Sr	69.26	68.95
	V	7.80	14.01
	Zn	22.50	26.40

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
SUWMO1D	Al	76.61	127.82
	As	19.27	21.53
	B	52.01	50.28
	Ba	18.16	19.70
	Be	0.34	0.34
	Cd	2.15	2.54
	Cr	4.99	9.34
	Cu	3.25	6.99
	Fe	254.68	289.07
	Hg	0.00	
	Mg	4921.60	5056.10
	Mn	39.89	41.29
	Mo	21.74	29.10
	Ni	6.91	6.45
	Pb	15.87	15.87
	Se	2.60	
	Sr	70.75	71.15
	V	7.14	12.77
	Zn	23.64	26.44
SUWMO4	Al	93.23	133.14
	As	19.27	21.53
	B	71.26	69.59
	Ba	29.77	31.16
	Be	0.34	0.37
	Cd	2.15	2.78
	Cr	5.77	10.74
	Cu	3.29	6.27
	Fe	578.35	540.27
	Hg	0.00	
	Mg	5948.50	6128.30
	Mn	66.02	67.88
	Mo	47.57	47.01
	Ni	9.70	7.54
	Pb	15.87	15.87
	Se	2.60	
	Sr	75.09	75.65
	V	8.64	12.67
	Zn	22.19	24.68

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
SUWMO6	Al	160.31	224.35
	As	19.27	21.53
	B	62.49	60.20
	Ba	35.31	36.46
	Be	0.34	0.34
	Cd	2.15	2.45
	Cr	4.99	6.71
	Cu	2.95	4.74
	Fe	297.30	361.09
	Hg	0.00	
	Mg	5079.50	5196.10
	Mn	59.22	60.80
	Mo	76.68	77.60
	Ni	6.91	7.49
	Pb	15.87	15.87
	Se	2.60	
	Sr	72.53	72.28
	V	4.76	9.37
	Zn	29.59	32.45
VLWM02	Al	164.11	201.77
	As	19.27	21.53
	B	21.23	19.27
	Ba	2950.70	3025.00
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	4.16
	Cu	2.95	2.15
	Fe	102.16	140.54
	Hg	0.00	
	Mg	5272.80	5396.90
	Mn	3.55	4.32
	Mo	3.51	3.97
	Ni	6.91	4.82
	Pb	15.87	15.87
	Se	2.60	
	Sr	127.85	128.79
	V	4.76	3.67
	Zn	2.29	4.73

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
VLWM03	Al	218.60	289.84
	As	19.27	21.63
	B	38.85	37.12
	Ba	3331.10	3371.33
	Be	0.34	0.34
	Cd	2.15	1.68
	Cr	4.99	4.62
	Cu	2.95	2.62
	Fe	62.33	178.96
	Hg	0.00	
	Mg	4766.70	4927.60
	Mn	4.09	5.60
	Mo	3.51	3.97
	Ni	6.91	5.88
	Pb	15.87	15.87
	Se	2.60	
	Sr	125.98	125.41
	V	4.76	3.58
	Zn	1.89	4.23
VLWM07	Al	603.21	645.88
	As	19.27	21.53
	B	106.54	103.68
	Ba	4665.20	4990.50
	Be	0.34	0.34
	Cd	2.15	2.15
	Cr	4.99	2.49
	Cu	2.95	2.19
	Fe	301.58	304.79
	Hg	0.00	
	Mg	5139.80	5313.60
	Mn	9.28	9.98
	Mo	3.51	3.97
	Ni	6.90	5.94
	Pb	15.87	15.87
	Se	2.60	
	Sr	150.08	155.03
	V	4.76	2.04
	Zn	5.32	6.86

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
VLWM09	Al	961.85	1008.80
	As	19.27	21.53
	B	37.05	34.37
	Ba	3546.30	3779.00
	Be	0.34	0.34
	Cd	2.15	2.38
	Cr	4.99	50.29
	Cu	2.95	5.02
	Fe	493.42	798.61
	Hg	0.00	
	Mg	5532.90	5696.40
	Mn	3.63	17.96
	Mo	3.51	3.97
	Ni	6.91	103.34
	Pb	15.87	15.87
	Se	2.60	
	Sr	139.76	143.65
	V	4.76	2.04
	Zn	5.45	10.80
VLWMO5	Al	703.62	755.66
	As	19.27	21.53
	B	34.79	27.48
	Ba	3083.00	3194.70
	Be	0.34	0.42
	Cd	2.39	3.50
	Cr	6.03	9.70
	Cu	2.95	6.65
	Fe	498.02	353.94
	Hg	0.00	
	Mg	5396.80	5602.60
	Mn	3.26	3.84
	Mo	3.51	3.97
	Ni	10.15	10.50
	Pb	15.87	15.87
	Se	2.60	
	Sr	129.87	132.53
	V	5.60	8.48
	Zn	8.09	8.94

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
VUWM01	Al	244.85	283.34
	As	19.27	21.53
	B	17.00	19.27
	Ba	2180.20	2229.00
	Be	0.34	0.34
	Cd	2.15	1.98
	Cr	4.99	4.16
	Cu	2.95	2.22
	Fe	203.92	227.44
	Hg	0.00	
	Mg	5248.60	5359.00
	Mn	53.23	54.39
	Mo	3.51	3.97
	Ni	6.91	5.93
	Pb	15.87	15.87
	Se	2.60	
	Sr	121.26	121.89
	V	4.76	3.48
	Zn	2.47	4.53
VUWM02	Al	560.20	625.26
	As	19.27	21.53
	B	17.00	19.27
	Ba	2374.00	2396.70
	Be	0.34	0.34
	Cd	2.15	1.47
	Cr	4.99	5.04
	Cu	2.95	3.14
	Fe	316.74	359.10
	Hg	0.00	
	Mg	4856.40	4993.80
	Mn	59.25	60.99
	Mo	3.51	3.97
	Ni	6.90	6.90
	Pb	15.87	15.87
	Se	2.60	
	Sr	119.44	118.13
	V	4.76	4.23
	Zn	3.24	5.51

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
VUWMO4	Al	936.86	1003.80
	As	19.27	21.53
	B	19.62	19.27
	Ba	2650.00	2688.90
	Be	0.34	0.44
	Cd	2.15	3.75
	Cr	4.99	10.65
	Cu	2.95	6.48
	Fe	575.91	472.75
	Hg	0.00	
	Mg	5328.80	5503.90
	Mn	28.88	30.60
	Mo	3.51	4.00
	Ni	7.79	13.31
	Pb	15.87	15.87
	Se	2.60	
	Sr	125.82	126.14
	V	4.76	9.53
	Zn	10.06	11.99
VUWMO4D	Al	1118.20	1167.30
	As	19.27	21.53
	B	23.21	19.27
	Ba	2656.00	2735.00
	Be	0.34	0.39
	Cd	2.15	4.07
	Cr	5.46	8.91
	Cu	2.95	5.04
	Fe	703.65	551.34
	Hg	0.00	
	Mg	5406.10	5539.00
	Mn	30.11	30.96
	Mo	3.51	3.97
	Ni	8.92	9.50
	Pb	15.87	15.87
	Se	2.60	
	Sr	126.11	127.43
	V	4.90	8.10
	Zn	10.90	10.74

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
VUWMO6	Al	1642.70	1720.10
	As	19.27	21.53
	B	23.68	20.97
	Ba	3934.70	4239.60
	Be	0.34	0.34
	Cd	2.15	1.52
	Cr	4.99	2.49
	Cu	2.95	2.15
	Fe	853.76	803.52
	Hg	0.00	
	Mg	5123.70	5318.10
	Mn	85.24	88.28
	Mo	3.51	3.97
	Ni	6.91	4.42
	Pb	15.87	15.87
	Se	2.60	
	Sr	138.64	144.41
	V	4.76	2.04
	Zn	5.94	6.38
VUWMO8	Al	1386.90	1441.90
	As	19.27	21.53
	B	22.76	19.27
	Ba	3223.00	3403.00
	Be	0.34	0.39
	Cd	2.15	2.44
	Cr	4.99	4.14
	Cu	2.95	2.35
	Fe	721.74	658.59
	Hg	0.00	
	Mg	5379.50	5330.00
	Mn	24.49	25.44
	Mo	3.51	3.97
	Ni	6.91	5.35
	Pb	15.87	15.87
	Se	2.60	
	Sr	132.32	135.30
	V	4.76	3.69
	Zn	5.08	6.48

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PW1	Al	47.28	115.20
	As	19.27	21.53
	B	17.00	19.27
	Ba	29.75	28.96
	Be	0.34	0.41
	Cd	2.15	4.36
	Cr	4.99	7.17
	Cu	2.95	4.91
	Fe	62.33	39.30
	Hg	0.00	.
	Mg	2784.80	2889.40
	Mn	125.52	127.25
	Mo	3.51	3.97
	Ni	6.99	11.44
	Pb	15.87	15.87
	Se	2.60	.
	Sr	57.18	56.81
	V	4.76	5.32
	Zn	11.87	14.99
PW2	Al	181.93	251.54
	As	19.27	21.53
	B	67.66	68.26
	Ba	77.59	76.94
	Be	0.34	0.34
	Cd	2.15	4.91
	Cr	4.99	16.42
	Cu	2.95	9.45
	Fe	155.16	173.30
	Hg	0.00	.
	Mg	6167.10	6204.10
	Mn	1187.60	1181.40
	Mo	60.06	53.28
	Ni	9.84	16.38
	Pb	15.87	15.87
	Se	2.60	.
	Sr	111.27	107.22
	V	4.76	10.71
	Zn	21.20	24.81

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PW3	Al	58.08	200.72
	As	19.27	21.53
	B	17.00	19.27
	Ba	129.35	130.63
	Be	0.34	0.51
	Cd	2.15	5.36
	Cr	4.99	10.48
	Cu	2.95	11.52
	Fe	63.33	58.12
	Hg	0.00	
	Mg	2932.80	3056.00
	Mn	609.81	613.31
	Mo	3.51	3.97
	Ni	8.42	19.13
	Pb	15.87	15.87
	Se	2.60	
	Sr	65.44	63.83
	V	4.76	9.59
	Zn	20.74	24.91
PW4	Al	24.98	98.79
	As	19.27	21.53
	B	38.05	37.12
	Ba	3563.90	3579.50
	Be	0.34	0.37
	Cd	2.15	3.81
	Cr	4.99	8.04
	Cu	2.95	7.85
	Fe	62.33	43.83
	Hg	0.00	
	Mg	4799.80	4894.20
	Mn	808.75	811.17
	Mo	3.51	3.97
	Ni	6.91	14.48
	Pb	15.87	15.87
	Se	2.60	
	Sr	123.85	121.22
	V	4.76	5.84
	Zn	13.07	17.02

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PW5	Al	20.40	52.20
	As	19.27	21.53
	B	17.00	19.27
	Ba	0.79	1.61
	Be	0.34	0.34
	Cd	2.15	3.06
	Cr	4.99	5.26
	Cu	2.95	4.66
	Fe	62.33	8.96
	Hg	0.00	
	Mg	39.67	95.91
	Mn	5.94	7.46
	Mo	3.51	3.97
	Ni	6.91	7.07
	Pb	15.87	15.87
	Se	2.60	
	Sr	0.20	0.61
	V	4.76	4.39
	Zn	9.76	12.64
PW6	Al	250.08	372.70
	As	19.27	21.53
	B	17.00	19.27
	Ba	23.86	29.40
	Be	0.34	0.42
	Cd	2.15	4.14
	Cr	4.99	6.51
	Cu	2.95	5.45
	Fe	62.33	120.73
	Hg	0.00	
	Mg	2671.80	2841.80
	Mn	65.53	68.62
	Mo	3.51	3.97
	Ni	6.91	10.14
	Pb	15.87	15.87
	Se	2.60	
	Sr	57.44	60.59
	V	4.76	3.89
	Zn	12.33	16.48

Sample Designation	Analyte	Concentration (µg/L) 1/15/98	Concentration (µg/L) 4/22/98
PW7	Al	20.40	72.96
	As	19.27	21.53
	B	17.00	19.27
	Ba	0.79	0.79
	Be	0.34	0.40
	Cd	2.15	2.81
	Cr	4.99	4.35
	Cu	2.95	4.48
	Fe	62.33	33.89
	Hg	0.00	
	Mg	39.67	57.97
	Mn	0.68	1.59
	Mo	3.51	3.97
	Ni	6.91	6.06
	Pb	15.87	15.87
	Se	2.60	
	Sr	0.11	0.23
	V	4.76	2.62
	Zn	2.70	5.87

Appendix A, Table B. Relative percent difference between MRI's two analyses of the same sample extracts. The first analysis was within the Clean Water Acts mandated holding time, but may have been confounded by a instrument problem. The second analysis was performed on the same extracts (extracts were performed within time limits) using the repaired instrument. However, the second analysis was not performed within the specified holding time. Mercury and selenium were measured by different procedures, and these analyses were therefore not affected by the instrument problem.

Analyte	AVERAGE Relative Percent Difference
Aluminum	26.1
Arsenic	10.4
Boron	5.0
Barium	4.8
Beryllium	8.6
Cadmium	6.5
Chromium	5.9
Copper	23.1
Iron	-6.5
Magnesium	5.8
Manganese	20.5
Molybdenum	10.3
Nickel	-4.3
Strontium	8.4
Vanadium	-3.6
Zinc	27.9
Lead	0

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