

**Additional Groundwater Sampling and Analysis
At
Bluewater Uranium Mill Site
Grants, New Mexico**

License No. SUA 1470, Docket No. 40-8902

Prepared for:

**Atlantic Richfield Company
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Prepared by:

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November 1996

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1

Additional Groundwater Sampling and Analysis Report

1.0 Introduction

In October 1996, Atlantic Richfield Company (ARCO) conducted additional groundwater sampling and analysis at the Point of Compliance (POC) and Background wells at the Bluewater Uranium Mill Site in accordance with the U. S. Nuclear Regulatory Commission's (NRC) August 28, 1996 request to assure that all constituents found in the tailings pile are within acceptable limits. In April 1987, the NRC conducted sampling and analysis of tailings liquid at the Site to verify the potential existence of hazardous constituents as defined in 40 CFR Part 261, and to determine future groundwater monitoring programs at the Site. In its August 28, 1996 correspondence, the NRC indicated that several contaminants detected in the tailings liquid were not identified in the groundwater, and the laboratory detection limits for some constituents were higher than the compliance limit during its 1987 sampling. The NRC stated that it must be assured that all constituents found in the tailings are within acceptable limits in groundwater prior to license termination.

Upon receipt of the NRC's August 28, 1996 request for additional groundwater analyses, ARCO developed a monitoring plan containing constituents to be sampled, analytical methods, and detection limits. All constituents that were detected, and for which the detection limits were elevated were included for analysis. The NRC's April 1987 tailings liquid sampling results and ARCO's June 1988 groundwater detection monitoring results were reviewed. The plan, including the constituents to be monitored, analytical methods, and the detection limits, was discussed and agreed upon by Mr. Ken Hooks and Mr. Mike Latin of the NRC, and Mr. Natver Patel of AVM Environmental Services, Inc. during the September 24, 1996, October 4, 1996, and October 9, 1996 telephone conference meetings. All constituents detected by the NRC's 1987 tailings liquid sampling, and listed in 10 CFR 40, Appendix A, Criterion 13 were selected for analysis.

2.0 Sampling and Analysis

Groundwater samples were collected in October 1996 at POC and Background wells in both the Alluvial and San Andres aquifers by AVM Environmental Services, Inc. of Grants, New Mexico. Figure 2-1 shows the groundwater sampling well locations. The sampling and preservation was conducted in accordance with the approved Site groundwater monitoring procedures, and in conformance with the specified requirements of the U.S. Environmental Protection Agency (EPA) approved analytical methods.

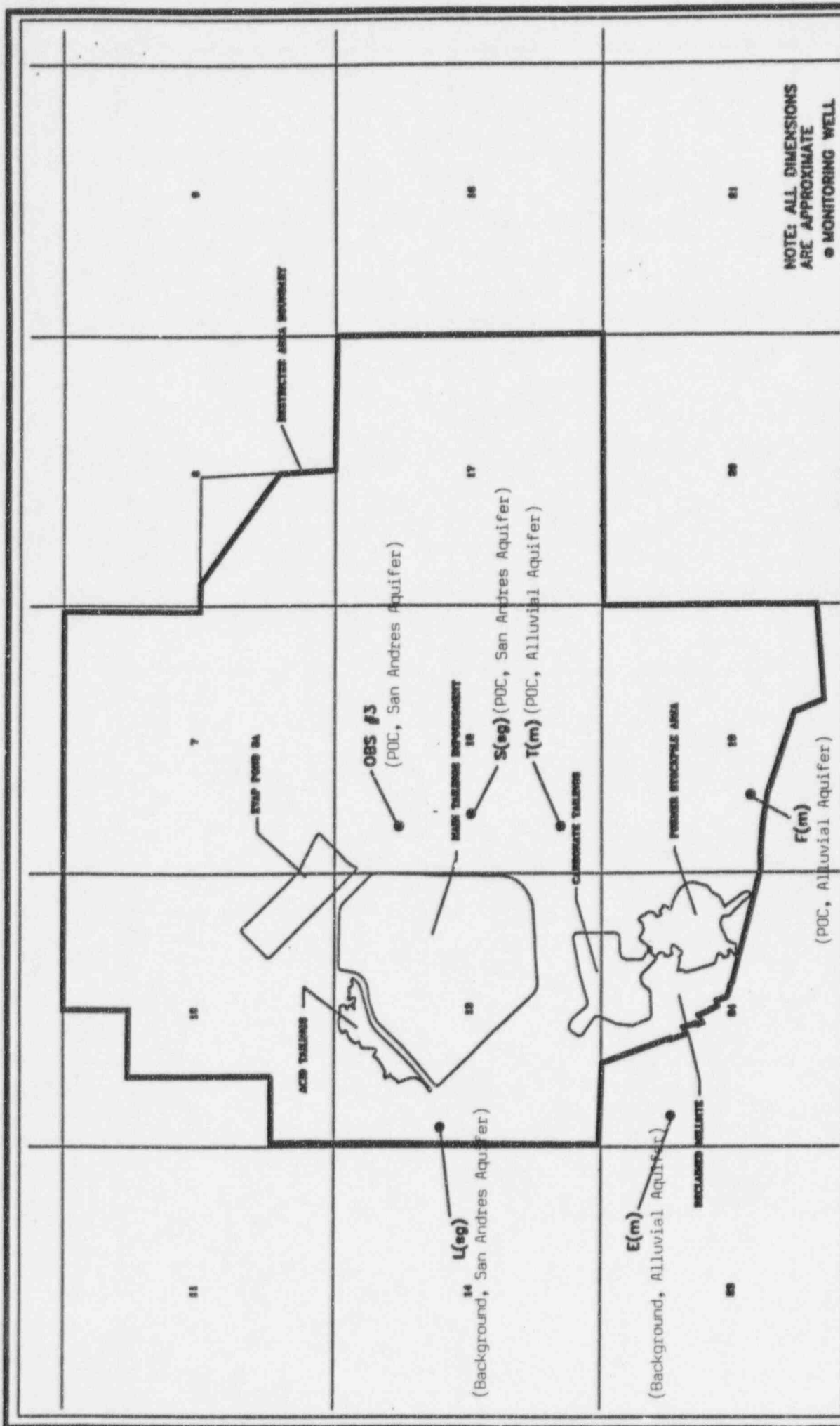


FIGURE 2-1
LOCATIONS OF GROUND WATER
MONITORING SITES

ANDERSON ENGINEERING CO., INC.
1000 N. 10th St.
Tulsa, Oklahoma 74103
Tel: (918) 438-1111
Fax: (918) 438-1112
E-mail: anderson@anderson-engineering.com



DATE: 10/10/00
DRAWN BY: JES
CHECKED BY: JES
DATE: 10/10/00
REVISION: 001
PROJECT: 1000000000

The samples were analyzed by Energy Laboratories, Inc. of Casper, Wyoming, a commercial vendor laboratory. The samples were analyzed for the following constituents using EPA methods.

Inorganic

Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium

Chromium
Cyanide
Fluoride
Lead
Mercury
Nickel

Nitrate
Phosphorous
Silver
Thallium

Organics

Acetone
Carbon Disulfide

Radionuclides

Radium 226
Radium 228
Thorium 230

3.0 Sampling Results

The field sampling data, chain of custody, and the results are included in attachment to this report. The results are summarized in Table 1. Table 1 also shows analytical method used and detection limit for each constituent. The results show that only As, Ba, F, NO₃, Ra-226, and Ra-228 were detected in groundwater. Following is the interpretation and explanation of the results for the detected constituents:

Arsenic (As) Arsenic was not detected at POC wells in the San Andres aquifer. The arsenic levels at Background and POC wells in the Alluvial aquifer are below the 0.05 mg/l primary drinking water MCL (SDWA, 40 CFR 141.11) and NRC's Groundwater Protection Standard (10 CFR 40, Appendix A, Criterion 5C).

Barium (Ba) Barium was not detected at POC wells in the San Andres aquifer. The barium levels at Background and POC wells in the Alluvial aquifer are below the 1.0 mg/l primary drinking water MCL (SDWA, 40 CFR 144.11) and NRC's Groundwater Protection Standard (10 CFR 40, Appendix A, Criterion 5C).

TABLE 1

ADDITIONAL GROUNDWATER SAMPLE ANALYSIS
BLUEWATER MILL

Constituents	Analytical Method	MDL	Units	Alluvial Aquifer			San Andres Aquifer		
				Background Well	POC Well		Background Well	POC Well	
				E(M)	F(M)	T(M)	L(SG)	S(SG)	OBS 3
Sample Date				10/9/96	10/8/96	10/8/96	10/9/96	10/9/96	10/9/96
Antimony (Sb)	EPA-200.9	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic (As)	EPA-206.3	0.001	mg/L	0.002	0.004	0.010	0.003	<0.001	<0.001
Barium (Ba)	EPA-200.7	0.010	mg/L	0.020	0.020	0.030	0.010	<0.010	0.010
Beryllium (Be)	EPA-200.7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Boron (B)	EPA-200.7	0.004	mg/L	0.190	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium (Cd)	EPA-200.9	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium (Cr)	EPA-200.9	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cyanide (CN)	EPA-335.3	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoride (F)	EPA-340.2	0.10	mg/L	0.24	0.27	0.27	0.49	0.33	0.31
Lead (Pb)	EPA-200.9	0.005	mg/L	<0.005	<.005	<0.005	<0.005	<0.005	<0.005
Mercury (Hg)	EPA-245.1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni)	EPA-200.9	0.005	mg/L	0.009	<.005	<0.005	<0.005	<0.005	<0.005
Nitrate (NO ₃)	EPA-353.2	0.10	mg/L	1.83	2.19	3.92	<0.10	2.74	4.52
Phosphorous (P)	EPA-200.7	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver (Ag)	EPA-200.9	0.003	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Thallium (Tl)	EPA-200.9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thorium(230)	alpha spec.	0.20	pCi/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Radium(226)	EPA-903.1	0.20	pCi/L	<0.20	<0.20	<0.20	4.4+/-0.4	<0.20	0.9+/-0.2
Radium(228)	EPA-904.0	1.0	pCi/L	<1.0	<1.0	<1.0	7.4+/-0.4	<0.10	<1.0
Acetone	EPA-8260	20.0	mg/L	ND	ND	ND	ND	ND	ND
Carbon Disulfide (CS ₂)	EPA-8260	1.0	mg/L	ND	ND	ND	ND	ND	ND

Fluoride (F) The fluoride level of 0.30 mg/l detected at POC wells in San Andres aquifer are below the 0.50 mg/l level measured at the Background well. Considering the precision of the method, the fluoride level of 0.27 mg/l detected at POC wells in the Alluvial aquifer is essentially the same as the 0.24 mg/l level measured at the Background well. Nevertheless, the detected levels are far below the 2.0 mg/l secondary drinking water MCL (SDWA, 40 CFR 143.3).

Nitrate (NO_3 nitrogen) The nitrate levels detected at POC and Background wells in both the Alluvial and San Andres aquifer are below the 10.0 mg/l primary drinking water MCL (SDWA, 40 CFR 141.11).

Radium 226 (Ra-226) The Ra-226 0.9 ± 0.2 pCi/l level detected at one of the San Andres POC well, Well OBS#3, is below the 4.4 ± 0.4 pCi/l measured at the Background well L(SG), and the NRC's 5.0 pCi/l Groundwater Protection Standard for Ra-226/Ra-228 specified in 10 CFR 40, Appendix A, Criterion 5C.

This October 1996 groundwater monitoring results are essentially the similar to the 1988 detection monitoring results, and assures that no additional contaminants from tailings have entered the groundwater at the Site, and that all detected constituents are within acceptable limits.

LABORATORY ANALYSIS REPORT - AVM Environmental

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Sample I.D.:
Laboratory I.D. #:
Sample Matrix:
Sample Date:
Report Date:

E (M)
96-58729
Water
10-09-96
November 21, 1996 (r)

Major Ions	Units	Results	Detection Limit
Nitrite + Nitrate (NO ₂ + NO ₃)	mg/L	1.83	0.10
Fluoride (F)	mg/L	0.24	0.10

Non-Metals	Units	Results	Detection Limit
Cyanide (CN)	mg/L	< 0.005	0.005
Phosphorus (P)	mg/L	< 0.05	0.05

Trace Metals	Units	Results	Detection Limit
Antimony (Sb)	mg/L	< 0.005	0.005
Arsenic (As)	mg/L	0.002	0.001
Barium (Ba)	mg/L	0.020	0.010
Beryllium (Be)	mg/L	< 0.005	0.005
Boron (B)	mg/L	0.190	0.004
Cadmium (Cd)	mg/L	< 0.005	0.005
Chromium (Cr)	mg/L	< 0.005	0.005
Lead (Pb)	mg/L	< 0.005	0.005
Mercury (Hg)	mg/L	< 0.001	0.001
Nickel (Ni)	mg/L	0.009	0.005
Silver (Ag)	mg/L	< 0.003	0.003
Thallium (Tl)	mg/L	< 0.001	0.001

Radiometric	Units	Results	Detection Limit
Radium 226 (Ra ₂₂₆)	pCi/L	< 0.2	0.2
Radium Precision ±			
Radium 228 (Ra ₂₂₈)	pCi/L	< 1.0	1.0
Radium Precision ±			
Thorium 230 (Th ₂₃₀)	pCi/L	< 0.2	0.2
Thorium Precision ±			

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Sample I.D.:
Laboratory I.D. #:
Sample Matrix:
Sample Date:
Report Date:

F (M)
96-58730
Water
10-08-96
November 21, 1996 (r)

Major Ions	Units	Results	Detection Limit
Nitrite + Nitrate (NO ₂ + NO ₃)	mg/L	2.19	0.10
Fluoride (F)	mg/L	0.27	0.10

Non-Metals	Units	Results	Detection Limit
Cyanide (CN)	mg/L	< 0.005	0.005
Phosphorus (P)	mg/L	< 0.05	0.05

Trace Metals	Units	Results	Detection Limit
Antimony (Sb)	mg/L	< 0.005	0.005
Arsenic (As)	mg/L	0.004	0.001
Barium (Ba)	mg/L	0.020	0.010
Beryllium (Be)	mg/L	< 0.005	0.005
Boron (B)	mg/L	< 0.004	0.004
Cadmium (Cd)	mg/L	< 0.005	0.005
Chromium (Cr)	mg/L	< 0.005	0.005
Lead (Pb)	mg/L	< 0.005	0.005
Mercury (Hg)	mg/L	< 0.001	0.001
Nickel (Ni)	mg/L	< 0.005	0.005
Silver (Ag)	mg/L	< 0.003	0.003
Thallium (Tl)	mg/L	< 0.001	0.001

Radiometric	Units	Results	Detection Limit
Radium 226 (Ra ₂₂₆)	pCi/L	< 0.2	0.2
Radium Precision ±			
Radium 228 (Ra ₂₂₈)	pCi/L	< 1.0	1.0
Radium Precision ±			
Thorium 230 (Th ₂₃₀)	pCi/L	< 0.2	0.2
Thorium Precision ±			

LABORATORY ANALYSIS REPORT - AVM Environmental

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Sample I.D.:
Laboratory I.D. #:
Sample Matrix:
Sample Date:
Report Date:

T (M)
96-58731
Water
10-08-96
November 21, 1996 (r)

Major Ions	Units	Results	Detection Limit
Nitrite + Nitrate (NO ₂ + NO ₃)	mg/L	3.92	0.10
Fluoride (F)	mg/L	0.27	0.10

Non-Metals	Units	Results	Detection Limit
Cyanide (CN)	mg/L	< 0.005	0.005
Phosphorus (P)	mg/L	< 0.05	0.05

Trace Metals	Units	Results	Detection Limit
Antimony (Sb)	mg/L	< 0.005	0.005
Arsenic (As)	mg/L	0.010	0.001
Barium (Ba)	mg/L	0.030	0.010
Beryllium (Be)	mg/L	< 0.005	0.005
Boron (B)	mg/L	< 0.004	0.004
Cadmium (Cd)	mg/L	< 0.005	0.005
Chromium (Cr)	mg/L	< 0.005	0.005
Lead (Pb)	mg/L	< 0.005	0.005
Mercury (Hg)	mg/L	< 0.001	0.001
Nickel (Ni)	mg/L	< 0.005	0.005
Silver (Ag)	mg/L	< 0.003	0.003
Thallium (Tl)	mg/L	< 0.001	0.001

Radiometric	Units	Results	Detection Limit
Radium 226 (Ra ₂₂₆)	pCi/L	< 0.2	0.2
Radium Precision ±			
Radium 228 (Ra ₂₂₈)	pCi/L	< 1.0	1.0
Radium Precision ±			
Thorium 230 (Th ₂₃₀)	pCi/L	< 0.2	0.2
Thorium Precision ±			

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2393 SALT CREEK HIGHWAY • CASPER, WY 82601 • FAX (307) 234-1639

LABORATORY ANALYSIS REPORT - AVM Environmental

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Sample I.D.:
Laboratory I.D. #:
Sample Matrix:
Sample Date:
Report Date:

L (SG)
96-58732
Water
10-09-96
November 21, 1996 (r)

Major Ions	Units	Results	Detection Limit
Nitrite + Nitrate (NO ₂ + NO ₃)	mg/L	< 0.10	0.10
Fluoride (F)	mg/L	0.49	0.10

Non-Metals	Units	Results	Detection Limit
Cyanide (CN)	mg/L	< 0.005	0.005
Phosphorus (P)	mg/L	< 0.05	0.05

Trace Metals	Units	Results	Detection Limit
Antimony (Sb)	mg/L	< 0.005	0.005
Arsenic (As)	mg/L	0.003	0.001
Barium (Ba)	mg/L	0.010	0.010
Beryllium (Be)	mg/L	< 0.005	0.005
Boron (B)	mg/L	< 0.004	0.004
Cadmium (Cd)	mg/L	< 0.005	0.005
Chromium (Cr)	mg/L	< 0.005	0.005
Lead (Pb)	mg/L	< 0.005	0.005
Mercury (Hg)	mg/L	< 0.001	0.001
Nickel (Ni)	mg/L	< 0.005	0.005
Silver (Ag)	mg/L	< 0.003	0.003
Thallium (Tl)	mg/L	< 0.001	0.001

Radiometric	Units	Results	Detection Limit
Radium 226 (Ra ₂₂₆)	pCi/L	4.4	0.2
Radium Precision ±		0.4	
Radium 228 (Ra ₂₂₈)	pCi/L	7.4	1.0
Radium Precision ±		0.4	
Thorium 230 (Th ₂₃₀)	pCi/L	< 0.2	0.2
Thorium Precision ±			

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Sample I.D.:
Laboratory I.D. #:
Sample Matrix:
Sample Date:
Report Date:

OBS #3
96-58733
Water
10-09-96
November 21, 1996 (r)

Major Ions	Units	Results	Detection Limit
Nitrite + Nitrate (NO ₂ + NO ₃)	mg/L	4.52	0.10
Fluoride (F)	mg/L	0.33	0.10

Non-Metals	Units	Results	Detection Limit
Cyanide (CN)	mg/L	< 0.005	0.005
Phosphorus (P)	mg/L	< 0.05	0.05

Trace Metals	Units	Results	Detection Limit
Antimony (Sb)	mg/L	< 0.005	0.005
Arsenic (As)	mg/L	< 0.001	0.001
Barium (Ba)	mg/L	0.010	0.010
Beryllium (Be)	mg/L	< 0.005	0.005
Boron (B)	mg/L	< 0.004	0.004
Cadmium (Cd)	mg/L	< 0.005	0.005
Chromium (Cr)	mg/L	< 0.005	0.005
Lead (Pb)	mg/L	< 0.005	0.005
Mercury (Hg)	mg/L	< 0.001	0.001
Nickel (Ni)	mg/L	< 0.005	0.005
Silver (Ag)	mg/L	< 0.003	0.003
Thallium (Tl)	mg/L	< 0.001	0.001

Radiometric	Units	Results	Detection Limit
Radium 226 (Ra ₂₂₆)	pCi/L	0.9	0.2
Radium Precision ±		0.2	
Radium 228 (Ra ₂₂₈)	pCi/L	< 1.0	1.0
Radium Precision ±			
Thorium 230 (Th ₂₃₀)	pCi/L	< 0.2	0.2
Thorium Precision ±			

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LABORATORY ANALYSIS REPORT - AVM Environmental

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Sample I.D.:
Laboratory I.D. #:
Sample Matrix:
Sample Date:
Report Date:

S (SG)
96-58734
Water
10-09-96
November 21, 1996 (r)

Major Ions	Units	Results	Detection Limit
Nitrite + Nitrate (NO ₂ + NO ₃)	mg/L	2.74	0.10
Fluoride (F)	mg/L	0.31	0.10

Non-Metals	Units	Results	Detection Limit
Cyanide (CN)	mg/L	< 0.005	0.005
Phosphorus (P)	mg/L	< 0.05	0.05

Trace Metals	Units	Results	Detection Limit
Antimony (Sb)	mg/L	< 0.005	0.005
Arsenic (As)	mg/L	< 0.001	0.001
Barium (Ba)	mg/L	< 0.010	0.010
Beryllium (Be)	mg/L	< 0.005	0.005
Boron (B)	mg/L	< 0.004	0.004
Cadmium (Cd)	mg/L	< 0.005	0.005
Chromium (Cr)	mg/L	< 0.005	0.005
Lead (Pb)	mg/L	< 0.005	0.005
Mercury (Hg)	mg/L	< 0.001	0.001
Nickel (Ni)	mg/L	< 0.005	0.005
Silver (Ag)	mg/L	< 0.003	0.003
Thallium (Tl)	mg/L	< 0.001	0.001

Radiometric	Units	Results	Detection Limit
Radium 226 (Ra ₂₂₆)	pCi/L	< 0.2	0.2
Radium Precision ±			
Radium 228 (Ra ₂₂₈)	pCi/L	< 1.0	1.0
Radium Precision ±			
Thorium 230 (Th ₂₃₀)	pCi/L	< 0.2	0.2
Thorium Precision ±			

QUALITY ASSURANCE REPORT - AVM Environmental

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Laboratory I.D. #(s): 96-59829 to 96-58734
Report Date: November 11, 1996

Major Ions	Method	Dup ₁ #1 %	Dup #2 %	Spk ₂ #1 %	Spk #2 %	Analyst	Date Analyzed
Nitrite + Nitrate	EPA-353.2	95	-	100	-	RK	11-11-96
Fluoride	EPA-340.2	100	-	90	-	DJ	10-15-96

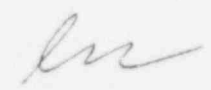
Non-Metals							
Cyanide	EPA-335.3	100	-	110	-	ELI-B	10-17-96
Phosphorus	EPA-200.7	100	-	103	-	TS	11-11-96

Trace Metals							
Antimony	EPA-200.9	100	-	85	-	SD	11-11-96
Arsenic	EPA-206.3	110	-	110	-	MM	10-15-96
Barium	EPA-200.7	100	-	105	-	TS	11-11-96
Beryllium	EPA-200.7	100	-	102	-	SD	10-29-96
Boron	EPA-200.7	100	-	106	-	TS	11-11-96
Cadmium	EPA-200.7	100	-	102	-	SD	10-29-96
Chromium	EPA-200.7	100	-	102	-	SD	10-29-96
Lead	EPA-200.9	100	-	88	-	CP	10-15-96
Mercury	EPA-245.1	100	-	95	-	MM	10-16-96
Nickel	EPA-200.7	100	-	101	-	SD	10-29-96
Silver	EPA-200.7	100	-	95	-	TS	11-11-96
Thallium	EPA-200.9	100	-	106	-	CP	10-15-96

Radiometrics							
Radium 226	EPA-903.0	100	-	112	-	RS	10-23-96
Radium 228	EPA-904.0	100	-	99	-	DB	11-06-96
Thorium 230	EPA-907.0	100	-	90	-	PH	10-28-96

NOTES:

- (1) These values are an assessment of analytical precision. They are a percent recovery of the original result. ELI duplicates 10 percent of all samples for each analytical method.
- (2) These values are an assessment of analytical accuracy. They are a percent recovery of the spike addition. ELI performs a matrix spike on 10 percent of all samples for each analytical method.

Report Approved By: 

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EPA METHOD 8260

Client: **AVM Environmental**
Sample ID: **E (M)**
Laboratory ID: **C96-58729**
Matrix: **Water**
Dilution Factor: **1**

Date Sampled: **10/09/96**
Date Received: **10/14/96**
Date Analyzed: **10/15/96**
Date Reported: **10/19/96**

C.A.S. #	TARGET COMPOUNDS	CONCENTRATION (µg/L)	LIMIT OF DETECTION (µg/L)
67-64-1	Acetone (2-Propanone)	ND	20.0
75-15-0	Carbon disulfide	ND	1.0

ND - Analyte not detected at stated limit of detection

RUNTIME QUALITY ASSURANCE REPORT

INTERNAL STANDARDS	AREA	ICAL / CCAL AREA	PERCENT RECOVERY	ACCEPTANCE RANGE
Pentafluorobenzene	781038	896279	87.1%	50 - 200 %
Fluorobenzene	1372468	1558290	88.1%	50 - 200 %
1,4 - Difluorobenzene	1221766	1353910	90.2%	50 - 200 %
Chlorobenzene - d5	906455	965888	93.8%	50 - 200 %
1,4 - Dichlorobenzene - d4	471173	517777	91.0%	50 - 200 %

SYSTEM MONITORING COMPOUNDS	CONCENTRATION	PERCENT RECOVERY	ACCEPTANCE RANGE
Dibromofluoromethane	9.71	97.1%	86 - 118 %
Toluene - d8	10.3	103%	88 - 110 %
4 - Bromofluorobenzene	9.35	93.5%	86 - 115 %
1,2 - Dichlorobenzene - d4	9.96	99.6%	80 - 120 %

REFERENCES

Method 8260: Volatile Organics by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Technique
Test Methods for Evaluating Solid Waste, SW-846, Third Edition, USEPA, November 1990

Report File: F:\REPORTS\CLIENTS\96\ORGANICS\AVM_ENVIR\96_58729.XLS

Analyst: yw
Reviewed: sec

**ENERGY LABORATORIES, INC.**

P.O. BOX 3258 • CASPER, WY 82602 • PHONE (307) 235-0515
2393 SALT CREEK HIGHWAY • CASPER, WY 82601 • FAX (307) 234-1639

EPA METHOD 8260

Client: **AVM Environmental**
Sample ID: **F (M)**
Laboratory ID: **C96-58730**
Matrix: **Water**
Dilution Factor: **1**

Date Sampled: **10/09/96**
Date Received: **10/14/96**
Date Analyzed: **10/15/96**
Date Reported: **10/19/96**

C.A.S. #	TARGET COMPOUNDS	CONCENTRATION (µg/L)	LIMIT OF DETECTION (µg/L)
67-64-1	Acetone (2-Propanone)	ND	20.0
75-15-0	Carbon disulfide	ND	1.0

ND - Analyte not detected at stated limit of detection

RUNTIME QUALITY ASSURANCE REPORT

INTERNAL STANDARDS	AREA	ICAL / CCAL AREA	PERCENT RECOVERY	ACCEPTANCE RANGE
Pentafluorobenzene	797660	896279	89.0%	50 - 200 %
Fluorobenzene	1363729	1558290	87.5%	50 - 200 %
1,4 - Difluorobenzene	1242408	1353910	91.8%	50 - 200 %
Chlorobenzene - d5	894665	965888	92.6%	50 - 200 %
1,4 - Dichlorobenzene - d4	472291	517777	91.2%	50 - 200 %

SYSTEM MONITORING COMPOUNDS	CONCENTRATION	PERCENT RECOVERY	ACCEPTANCE RANGE
Dibromofluoromethane	9.35	93.5%	86 - 118 %
Toluene - d8	9.96	99.6%	88 - 110 %
4 - Bromofluorobenzene	9.42	94.2%	86 - 115 %
1,2 - Dichlorobenzene - d4	9.57	95.7%	80 - 120 %

REFERENCES

Method 8260: Volatile Organics by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Technique
Test Methods for Evaluating Solid Waste, SW-846, Third Edition, USEPA, November 1990

Report File: F:\REPORTS\CLIENTS\96\ORGANICS\AVM_ENVIR96_58729.XLS

Analyst: yw
Reviewed: sec

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EPA METHOD 8260

Client: **AVM Environmental**
Sample ID: **T (M)**
Laboratory ID: **C96-58731**
Matrix: **Water**
Dilution Factor: **1**

Date Sampled: **10/09/96**
Date Received: **10/14/96**
Date Analyzed: **10/15/96**
Date Reported: **10/19/96**

C.A.S. #	TARGET COMPOUNDS	CONCENTRATION (µg/L)	LIMIT OF DETECTION (µg/L)
67-64-1	Acetone (2-Propanone)	ND	20.0
75-15-0	Carbon disulfide	ND	1.0

ND - Analyte not detected at stated limit of detection

RUNTIME QUALITY ASSURANCE REPORT

INTERNAL STANDARDS	AREA	ICAL / CCAL AREA	PERCENT RECOVERY	ACCEPTANCE RANGE
Pentafluorobenzene	741907	896279	82.8%	50 - 200 %
Fluorobenzene	1304061	1558290	83.7%	50 - 200 %
1,4 - Difluorobenzene	1165776	1353910	86.1%	50 - 200 %
Chlorobenzene - d5	861210	965888	89.2%	50 - 200 %
1,4 - Dichlorobenzene - d4	458068	517777	88.5%	50 - 200 %

SYSTEM MONITORING COMPOUNDS	CONCENTRATION	PERCENT RECOVERY	ACCEPTANCE RANGE
Dibromofluoromethane	9.79	97.9%	86 - 118 %
Toluene - d8	10.2	102%	88 - 110 %
4 - Bromofluorobenzene	9.44	94.4%	86 - 115 %
1,2 - Dichlorobenzene - d4	9.88	98.8%	80 - 120 %

REFERENCES

Method 8260: Volatile Organics by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Technique
Test Methods for Evaluating Solid Waste, SW-846, Third Edition, USEPA, November 1990

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EPA METHOD 8260

Client: **AVM Environmental**
Sample ID: **L (SG)**
Laboratory ID: **C96-58732**
Matrix: **Water**
Dilution Factor: **1**

Date Sampled: **10/09/96**
Date Received: **10/14/96**
Date Analyzed: **10/15/96**
Date Reported: **10/19/96**

C.A.S. #	TARGET COMPOUNDS	CONCENTRATION (µg/L)	LIMIT OF DETECTION (µg/L)
67-64-1	Acetone (2-Propanone)	ND	20.0
75-15-0	Carbon disulfide	ND	1.0

ND - Analyte not detected at stated limit of detection

RUNTIME QUALITY ASSURANCE REPORT

INTERNAL STANDARDS	AREA	ICAL / CCAL AREA	PERCENT RECOVERY	ACCEPTANCE RANGE
Pentafluorobenzene	760775	896279	84.9%	50 - 200 %
Fluorobenzene	1362345	1558290	87.4%	50 - 200 %
1,4 - Difluorobenzene	1199720	1353910	88.6%	50 - 200 %
Chlorobenzene - d5	894768	965888	92.6%	50 - 200 %
1,4 - Dichlorobenzene - d4	477545	517777	92.2%	50 - 200 %

SYSTEM MONITORING COMPOUNDS	CONCENTRATION	PERCENT RECOVERY	ACCEPTANCE RANGE
Dibromofluoromethane	9.71	97.1%	86 - 118 %
Toluene - d8	10.3	103%	88 - 110 %
4 - Bromofluorobenzene	9.50	95.0%	86 - 115 %
1,2 - Dichlorobenzene - d4	9.78	97.8%	80 - 120 %

REFERENCES

Method 8260: Volatile Organics by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Technique
Test Methods for Evaluating Solid Waste, SW-846, Third Edition, USEPA, November 1990

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EPA METHOD 8260

Client: **AVM Environmental**
Sample ID: **OBS #3**
Laboratory ID: **C96-58733**
Matrix: **Water**
Dilution Factor: **1**

Date Sampled: **10/09/96**
Date Received: **10/14/96**
Date Analyzed: **10/15/96**
Date Reported: **10/19/96**

C.A.S. #	TARGET COMPOUNDS	CONCENTRATION (µg/L)	LIMIT OF DETECTION (µg/L)
67-64-1	Acetone (2-Propanone)	ND	20.0
75-15-0	Carbon disulfide	ND	1.0

ND - Analyte not detected at stated limit of detection

RUNTIME QUALITY ASSURANCE REPORT

INTERNAL STANDARDS	AREA	ICAL / CCAL AREA	PERCENT RECOVERY	ACCEPTANCE RANGE
Pentafluorobenzene	787064	896279	87.8%	50 - 200 %
Fluorobenzene	1385861	1558290	88.9%	50 - 200 %
1,4 - Difluorobenzene	1225565	1353910	90.5%	50 - 200 %
Chlorobenzene - d5	918075	965888	95.0%	50 - 200 %
1,4 - Dichlorobenzene - d4	488487	517777	94.3%	50 - 200 %

SYSTEM MONITORING COMPOUNDS	CONCENTRATION	PERCENT RECOVERY	ACCEPTANCE RANGE
Dibromofluoromethane	9.60	96.0%	86 - 118 %
Toluene - d8	10.2	102%	88 - 110 %
4 - Bromofluorobenzene	9.45	94.5%	86 - 115 %
1,2 - Dichlorobenzene - d4	9.75	97.5%	80 - 120 %

REFERENCES

Method 8260: Volatile Organics by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Technique
Test Methods for Evaluating Solid Waste, SW-846, Third Edition, USEPA, November 1990

Report File: FIREPORTS\CLIENTS\96\ORGANICS\AVM_ENVIR96_58729.XLS

Analyst: yw
Reviewed: sec

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EPA METHOD 8260

Client: **AVM Environmental**
Sample ID: S (SG)
Laboratory ID: C96-58734
Matrix: Water
Dilution Factor: 1

Date Sampled: 10/09/96
Date Received: 10/14/96
Date Analyzed: 10/15/96
Date Reported: 10/19/96

<u>C.A.S. #</u>	<u>TARGET COMPOUNDS</u>	<u>CONCENTRATION</u> <u>(µg/L)</u>	<u>LIMIT OF</u> <u>DETECTION (µg/L)</u>
67-64-1	Acetone (2-Propanone)	ND	20.0
75-15-0	Carbon disulfide	ND	1.0

ND - Analyte not detected at stated limit of detection

RUNTIME QUALITY ASSURANCE REPORT

<u>INTERNAL STANDARDS</u>	<u>AREA</u>	<u>ICAL / CCAL</u> <u>AREA</u>	<u>PERCENT</u> <u>RECOVERY</u>	<u>ACCEPTANCE</u> <u>RANGE</u>
Pentafluorobenzene	767061	896279	85.6%	50 - 200 %
Fluorobenzene	1377251	1558290	88.4%	50 - 200 %
1,4 - Difluorobenzene	1221531	1353910	90.2%	50 - 200 %
Chlorobenzene - d5	880788	965888	91.2%	50 - 200 %
1,4 - Dichlorobenzene - d4	469576	517777	90.7%	50 - 200 %

<u>SYSTEM MONITORING COMPOUNDS</u>	<u>CONCENTRATION</u>	<u>PERCENT</u> <u>RECOVERY</u>	<u>ACCEPTANCE</u> <u>RANGE</u>
Dibromofluoromethane	9.81	98.1%	86 - 118 %
Toluene - d8	10.1	101%	88 - 110 %
4 - Bromofluorobenzene	9.65	96.5%	86 - 115 %
1,2 - Dichlorobenzene - d4	9.78	97.8%	80 - 120 %

REFERENCES

Method 8260: Volatile Organics by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Technique
Test Methods for Evaluating Solid Waste, SW-846, Third Edition, USEPA, November 1990

Report File: F:\REPORTS\CLIENTS\96\ORGANICS\AVM_ENVIR96_58729.XLS

Analyst: yw
Reviewed: sec

**ENERGY LABORATORIES, INC.**

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EPA METHOD 8260

Client: **AVM Environmental**
Sample ID: **TRIP BLANK**
Laboratory ID: **TB58734**
Matrix: **Water**
Dilution Factor: **1**

Date Sampled: **10/09/96**
Date Received: **10/14/96**
Date Analyzed: **10/15/96**
Date Reported: **10/19/96**

C.A.S. #	TARGET COMPOUNDS	CONCENTRATION (µg/L)	LIMIT OF DETECTION (µg/L)
67-64-1	Acetone (2-Propanone)	ND	20.0
75-15-0	Carbon disulfide	ND	1.0

ND - Analyte not detected at stated limit of detection

RUNTIME QUALITY ASSURANCE REPORT

INTERNAL STANDARDS	AREA	ICAL / CCAL AREA	PERCENT RECOVERY	ACCEPTANCE RANGE
Pentafluorobenzene	759795	896279	84.8%	50 - 200 %
Fluorobenzene	1349596	1558290	86.6%	50 - 200 %
1,4 - Difluorobenzene	1194048	1353910	88.2%	50 - 200 %
Chlorobenzene - d5	883594	965888	91.5%	50 - 200 %
1,4 - Dichlorobenzene - d4	458272	517777	88.5%	50 - 200 %

SYSTEM MONITORING COMPOUNDS	CONCENTRATION	PERCENT RECOVERY	ACCEPTANCE RANGE
Dibromofluoromethane	9.66	96.6%	86 - 118 %
Toluene - d8	10.1	101%	88 - 110 %
4 - Bromofluorobenzene	9.38	93.8%	86 - 115 %
1,2 - Dichlorobenzene - d4	9.85	98.5%	80 - 120 %

REFERENCES

Method 8260: Volatile Organics by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Technique
Test Methods for Evaluating Solid Waste, SW-846, Third Edition, USEPA, November 1990

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Analyst: yw
Reviewed: sec

**ENERGY LABORATORIES, INC.**P.O. BOX 3258 • CASPER, WY 82602 • PHONE (307) 235-0515
2393 SALT CREEK HIGHWAY • CASPER, WY 82601 • FAX (307) 234-1639**EPA METHOD 8260
QC RESULTS - MATRIX SPIKE**

Client: AVM Environmental
Sample Set: C96-58729 through C96-58734
Laboratory ID: C96-58729 S
Matrix: Water

Date Sampled: 10/09/96
Date Received: 10/14/96
Date Analyzed: 10/15/96
Date Reported: 10/19/96

INTERNAL STANDARDS

	ICAL / CCAL	SPIKED SAMPLE		SPIKE DUPLICATE		ACCEPTANCE
	AREA	AREA	%	AREA	%	RANGE
Pentafluorobenzene	896279	708730	79.1%	724586	80.8%	50 - 200 %
Fluorobenzene	1558290	1265324	81.2%	1289922	82.8%	50 - 200 %
1,4 - Difluorobenzene	1353910	1124692	83.1%	1154779	85.3%	50 - 200 %
Chlorobenzene - d5	965888	835933	86.5%	854541	88.5%	50 - 200 %
1,4 - Dichlorobenzene-d4	517777	433094	83.6%	448744	86.7%	50 - 200 %

SYSTEM MONITORING COMPOUNDS

	SPIKED SAMPLE	PERCENT	SPIKE DUPLICATE	PERCENT	ACCEPTANCE
	CONCENTRATION	RECOVERY	CONCENTRATION	RECOVERY	RANGE
Dibromofluoromethane	9.71	97.1%	9.65	96.5%	86 - 118 %
Toluene - d8	10.2	102%	10.1	101%	88 - 110 %
4 - Bromofluorobenzene	9.23	92.3%	9.36	93.6%	86 - 115 %
1,2 - Dichlorobenzene-d4	9.64	96.4%	9.94	99.4%	80 - 120 %

SPIKED SAMPLE RESULTS

	SPIKED SAMPLE	ORIG. CONC.	SPIKE AMOUNT	PERCENT	ACCEPTANCE
	CONCENTRATION	(µg/L) *	(µg/L)	RECOVERY	RANGE
Acetone (2-Propanone)	99.4	ND	100	99.4%	80 - 120 %
Carbon disulfide	11.1	ND	11.5	96.1%	80 - 120 %

SPIKE DUPLICATE SAMPLE RESULTS

* Concentration does not include dilution correction

	SPIKE DUP	ORIG. CONC.	SPIKE	PERCENT	RPD	RPD
	CONCENTRATION	(µg/L) *	(µg/L)	RECOVERY	RPD	LIMITS
Acetone (2-Propanone)	97.5	ND	100	97.5%	1.9%	10 %
Carbon disulfide	11.0	ND	11.5	95.3%	0.8%	10 %

MATRIX SPIKE: 0 of 4 Matrix Spike results are outside of established QC Limits
MATRIX SPIKE DUPLICATE: 0 of 2 Matrix Spike Duplicate results are outside of established QC Limits

Report Approved By:

Report File: F:\REPORTS\CLIENTS\96\ORGANICS\AVM_ENVIR\96_58729.XLS

Analyst: yw
Reviewed: sec

ENERGY LABORATORIES, INC.'S CHAIN OF CUSTODY RECORD

Mail Only: PO Box 3258 • Casper, WY • 82602-3258
 UPS/FedEx Deliveries: 2393 Salt Creek Highway • Casper, WY • 82602

voice 307-235-0515
 fax 307-234-1639

For Sample Tracking Purposes, Please Provide Contact Name and Telephone #'S As Indicated (SEE BACK OF FORM FOR EXAMPLES AND INSTRUCTIONS)

Project Name / Location / Purchase Order #				Number of containers Sample Type: A W S V U O Air Water Soils/solids Vegetation Urine Other	Type of Analyses Requested					Special Requests
Name / Phone # / Fax #										Comments, Special Instructions, etc.
Date	Time	composite	grab sample							
APM Environmental - 2116 W. High St. Suite B Grants NM 87020 Name / Phone # / Fax # NAT Patel - 505-287-4593 / 505-287-2595										
Send Invoice to: SAME Send Report to: SAME Sample I.D.										
10/19/96	0850	X		E(M)	6- W	X				
10/8/96	1236			F(M)						
10/8/96	1145			T(M)						
10/8/96	0947			L(SG)						
10/19/96	1125			OBS #3						
10/19/96	1302			S(SG)						

1. Sampler: (signature) B. M. Garcia	Date 10/10/96	Time	Received by: (signature) UPS	2. Relinquished by: (signature)	Date	Time	Received by: (signature)
3. Relinquished by: (signature) NAT Patel	Date 10/10/96	Time	Received by: (signature) UPS	4. Relinquished by: (signature)	Date 10/11/96	Time 1000	Received at Laboratory by: (signature) [Signature]

Groundwater Field Sampling Data

Groundwater Field Sampling Data

Sample/Well Name	Date	Time	Water Level, feet		Temp deg.C	E.C.		pH		Total # Containers	Samplers	
			Depth	Elevation		ntr check	Rdg uMhos/cm	ntr Check	Rdg pH			
6600.31 Y2(M)	10-8-96	1236	108.22	6492.09	16.11	✓	747	✓	7.77	X	10	AP/RG
6623.45 Y2(M)	10-8-96	1353	108.37		15	✓	800	✓	7.60	X	4	
6613.08 Y2(M)	10-9-96	0850	76.74	6536.34	13	✓	1061	✓	7.68	X	10	
6609.40 L54	10-8-96	1645	118.60	6490.80	16	✓	1080	✓	7.87	X	10	
6602.60 K(M)	10-9-96	0947	111.90	6440.70	18	✓	2450	✓	7.08	X	9	
6612.60 S54	10-9-96	1012	NO H ₂ O IN WELL	-	-	-	-	-	-	-	-	
6621.14 Y2(M)	10-9-96	1125	136.91	6475.69	16	✓	4200	✓	6.98	X	9	
6590.76 Y2(M)	10-9-96	1302	145.11	6476.03	17	✓	3730	✓	7.12	X	9	
6601.40 SIMPSON RESIDENCE	10-9-96	1420	112.89	6477.87	17	✓	1790	✓	7.39	X	3	
6575.76 AUG #4	10-9-96	1505	116.57	6484.83	17	✓	1530	✓	7.60	X	3	
6589.19	10-9-96	1512	-	-	17	✓	1050	✓	7.53	X	3	
	10-10-96	1025	113.58	6475.61	18	✓	2520	✓	7.21	X	3	

1 Litter, filtered
HNO₃ preserved

1 Litter, filtered
unpreserved, cooled

0.5 Litter, filtered
H₂SO₄ preserved