DOE/NV-460 -Rev. 4
UC-700

RULISON SITE
GROUNDWATER MONITORING REPORT
FOURTH QUARTER, 1996

DOE Nevada Operations Office
Las Vegas, Nevada

April 1997

DISCLAIMER

RULISON SITE
GROUNDWATER MONITORING REPORT
FOURTH QUARTER, 1996

Approved by: Janet Appenzeller-Wing Date: 4/3/97
Janet Appenzeller-Wing, Project Manager
Offsites Subproject

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Stephen A. Mellington, Project Manager
Nevada Environmental Restoration Project

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List of Acronyms and Abbreviations

AEC	U.S. Atomic Energy Commission
Austral	Austral Oil Company
BTEX	Benzene, toluene, ethylbenzene, and xylenes
COPC	Constituent(s) of potential concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
EPA ORIA RSL	U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Radiation Sciences Laboratory
ft	Foot (feet)
km	Kilometer(s)
LTGMP	Long-Term Groundwater Monitoring Plan
m	Meter(s)
mi	Mile(s)
MS/MSD	Matrix spike/matrix spike duplicate
QAPP	Quality Assurance Project Plan
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RPD	Relative percent difference
SGZ	Surface Ground Zero
TPH	Total petroleum hydrocarbons
TDS	Total dissolved solids
TSS	Total suspended solids
μg/L	Micrograms per liter
VOC	Volatile organic compound

1.0 Introduction

This report summarizes the results of the fourth quarter 1996 groundwater sampling event for the Rulison Site, which is located approximately 65 kilometers (km) (40 miles [mi]) northeast of Grand Junction, Colorado. The sampling was performed as part of a quarterly groundwater monitoring program implemented by the U.S. Department of Energy (DOE) to monitor the effectiveness of remediation of a drilling effluent pond located at the site. The effluent pond was used for the storage of drilling mud during drilling of the emplacement hole for a 1969 gas stimulation test conducted by the U.S. Atomic Energy Commission (AEC) (the predecessor agency to the DOE), and Austral Oil Company (Austral).

1.1 Site Location

The Rulison Site is located in the North ½ of the Southwest ¼ of Section 25, Township 7 South, Range 95 West of the 6th Principal Meridian, Garfield County, Colorado, approximately 19 km (12 mi) southwest of Rifle, Colorado, and approximately 65 km (40 mi) northeast of Grand Junction, Colorado (Figure 1-1). The site is situated on the north slope of Battlement Mesa on the upper reaches of Battlement Creek, at an elevation of approximately 2,500 meters (m) (8,200 feet [ft]). The valley is open to the north-northwest and is bounded on the other three sides by steep mountain slopes that rise to elevations above 2,927 m (9,600 ft).

1.2 Project Description and Background

Project Rulison, a joint AEC and Austral experiment, was conducted under the AEC's Plowshare Program to evaluate the feasibility of using a nuclear device to stimulate natural gas production in low-permeability, gas-producing geologic formations. The experiment was conducted on September 10, 1969, and consisted of detonating a 40-kiloton nuclear device at a depth of 2,568 m (8,426 ft) below ground surface. Natural gas production testing was conducted in 1970 and 1971.

The site was deactivated by the AEC and Austral in 1972 and abandoned in 1976. Cleanup associated with site abandonment consisted of removing all remaining equipment and materials, plugging the emplacement (R-E) and reentry (R-EX) wells (Figure 1-2), backfilling the mud pits adjacent to the R-EX well, removing the tritium-contaminated soils, and conducting extensive surface soil sampling and analysis to characterize the radiological condition of the site.

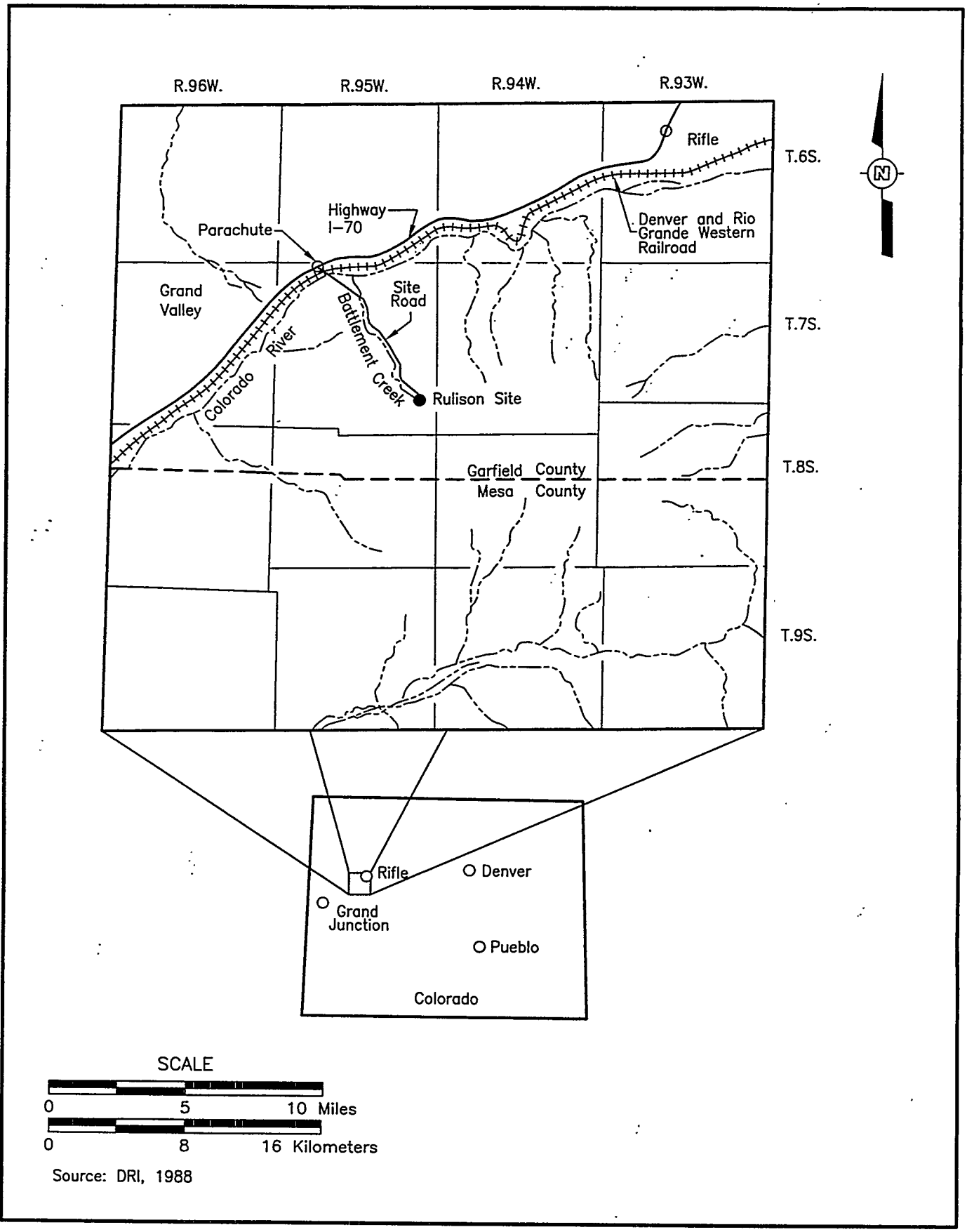

Figure 1-1
Rulison Site Location Map

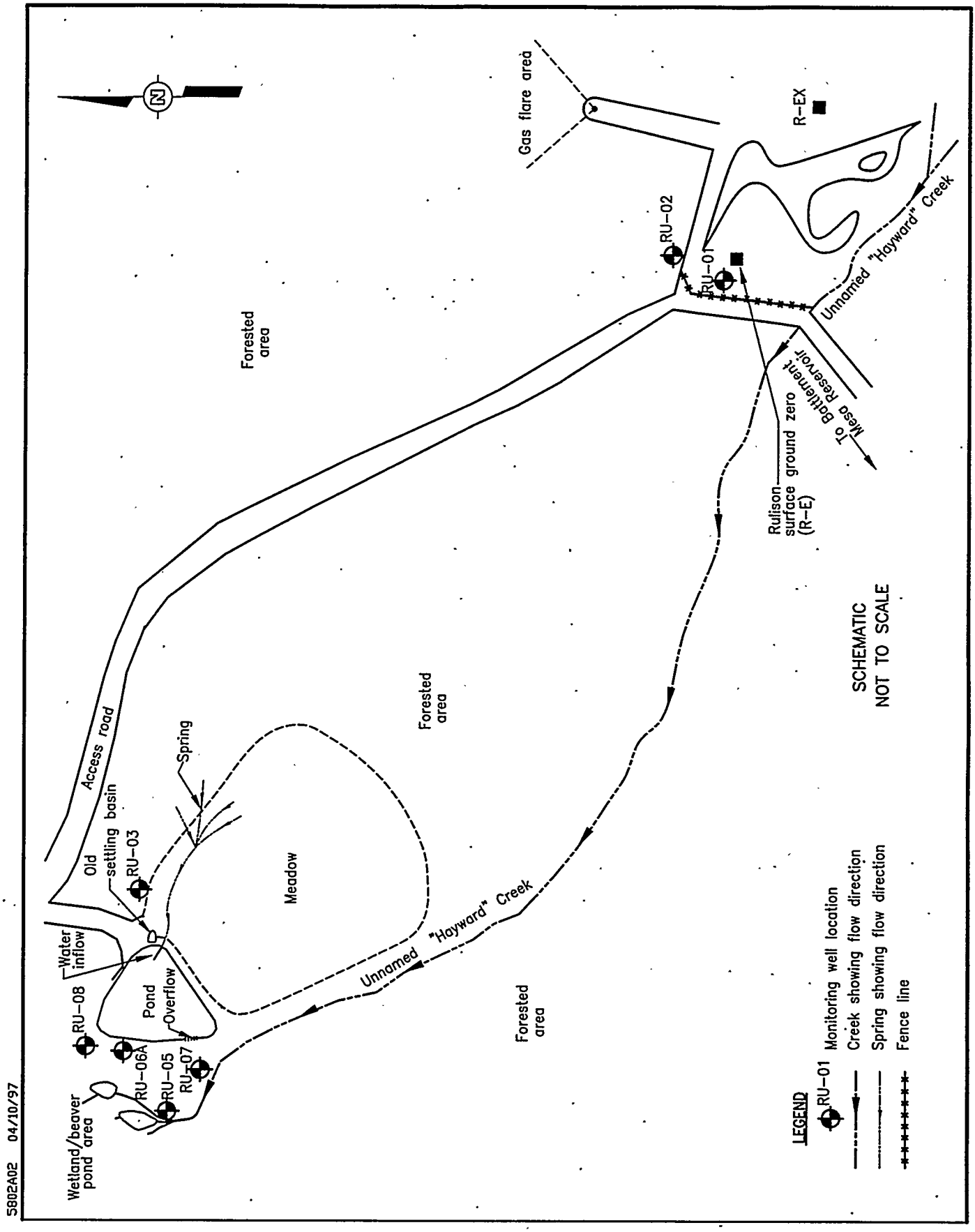

Figure 1-2
Monitoring Well Locations

Detailed descriptions of the site deactivation and abandonment activities and radiological characterizations are presented in the *Rulison Site Cleanup Report* (AEC, 1973), the *Project Rulison Well Plugging and Site Abandonment Final Report* (ERDA, 1977), and the *Rulison Radiation Contamination Clearance Report* (Eberline, 1977).

The drilling effluent pond is an engineered structure located approximately 400 m (1,312 ft) north-northwest of the surface ground zero (SGZ) emplacement well (R-E) (Figure 1-2). The pond covers approximately 0.5 hectare (1.2 acre) as measured at the top of the berm; it is triangular in shape; and it is approximately 6 m (20 ft) deep from the top of the berm to the pond bottom. The drilling effluent pond was used to store nonradioactive drilling fluids generated during drilling of the device emplacement well R-E. The drilling fluids consisted of bentonite drilling mud that contained various additives, such as diesel fuel and chrome lignosulfonate, used to improve drilling characteristics. Most of the drilling wastes were removed from the pond when the site was cleaned up and decommissioned in 1976; however, some drilling fluid was left in the pond. At the request of the property owner, the pond structure was left in place following completion of site decommissioning and was subsequently converted by the property owner to a freshwater holding pond containing aquatic vegetation, amphibians, and stocked rainbow trout.

In 1994 and 1995, four pond sediment sampling events were conducted to evaluate the extent of residual contamination from drilling wastes remaining in the pond. Concentrations of diesel-range total petroleum hydrocarbons (TPH); benzene, toluene, ethylbenzene, and total xylenes (BTEX compounds); barium; chromium; and lead were found in pond sediment samples and soil samples taken from an old settling basin located adjacent to the pond. Based on the results of the 1994 and 1995 sampling events, the DOE decided to conduct a voluntary cleanup action at the pond to reduce the levels of TPH and chromium in pond sediments and soils in and adjacent to the pond. The cleanup was completed in November 1995. One upgradient monitoring well (RU-03 on Figure 1-2) and four downgradient monitoring wells (RU-05, RU-06A, RU-07, and RU-08) were installed around the pond to monitor the effectiveness of the cleanup. A detailed description of pond cleanup and well installation is presented in the *Rulison Site Corrective Action Report* (DOE, 1996a).

1.3 Summary of Site Activities

The fourth quarter 1996 sampling event was conducted on December 3 and 4, 1996, by representatives from the U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Radiation Sciences Laboratory. The weather was cloudy and cold. Wells RU-05, RU-07, and RU-08 were dry, and, therefore, they were not sampled. No other unusual observations were made, and no problems were experienced during the sampling event.

2.0 Sampling and Analysis Procedures

The fourth quarter 1996 groundwater sampling event was conducted in general accordance with the *Rulison Drilling Effluent Pond Site Long-Term Groundwater Monitoring Plan* (LTGMP) (DOE, 1996c) and the *Rulison Site Quality Assurance Project Plan, Rulison Site, Colorado* (QAPP) (DOE, 1996d).

2.1 Groundwater Level Measurement

Before purging and sampling activities at each well began, the depth to groundwater and total depth of the well were measured. This information was used to calculate the appropriate purge volume and to allow evaluation of any potential changes to groundwater flow direction since the previous sampling event.

2.2 Well Purging

Monitoring wells were purged of stagnant groundwater using disposable bailers. The purge water was discharged to the ground under Colorado Wastewater Discharge Permit No. COG-310084 as approved by the Colorado Department of Public Health and Environment, Water Quality Control Division (see Appendix A).

2.3 Sample Collection and Handling

Groundwater samples were collected from Wells RU-03 and RU-06A with disposable bottom-emptying bailers. For quality control (QC) purposes, two duplicate samples and one matrix spike and matrix spike duplicate sample (MS/MSD) were collected during the sampling event. In addition, a trip blank accompanied all volatile organic samples in their shipping container. Samples were containerized and preserved as specified in Table 2-1. All containers were certified clean by the laboratory and remained sealed until ready for use.

2.4 Sample Analysis

The groundwater samples from the fourth quarter sampling event were analyzed for the parameters listed in Table 2-1, as specified in the Rulison LTGMP (DOE, 1996c). These parameters included the constituents of potential concern (COPCs) identified for the drilling effluent pond sediments (TPH, BTEX, barium, chromium, and lead).

Table 2-1
Rulison Site Groundwater Monitoring Program
Sample Container, Preservation, and Analytical Requirements

Parameter	Analytical Method	Sample Container	Minimum Amount of Sample Required	Holding Time	Preservative[a]
BTEX	SW-846[b] 8020	Glass with Teflon™- lined cap	2 x 40 mL	14 days	pH <2 with HCl Cool to 4°C
TPH (diesel fraction)	SW-846 8015M[c]	Glass	1 liter	14 days	pH <2 with H_2SO_4 Cool to 4°C
RCRA[d] Metals	SW-846 6010/ 7470	Glass or Polyethylene	1 liter	180 days	HNO_3 to pH <2 Cool to 4°C
Total Dissolved Solids (TDS)	EPA 160.1[e]	Glass or Polyethylene	100 mL	7 days	Cool to 4°C
Total Suspended Solids (TSS)	EPA 160.2[e]	Glass or Polyethylene	100 mL	7 days	Cool to 4°C
pH	Field	Glass or Polyethylene	25 mL	Analyze Immediately	None

[a]Holding time calculated from verified time of sample collection. Holding time for mercury is 28 days.
[b]U.S. Environmental Protection Agency, SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, 3rd Edition (EPA, 1990)
[c]EPA SW-846, modified according to the California State Water Resources Control Board, *Leaking Underground Fuel Tank Field Manual, Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure*, Appendix B (1989)
[d]Resource Conservation and Recovery Act
[e]U.S. Environmental Protection Agency, *Methods for Chemical Analysis of Water and Wastes*, (EPA, 1983)

mL = Milliliter
HCl = Hydrochloric acid
H_2SO_4 = Sulfuric acid
HNO_3 = Nitric acid
°C = Degrees Celsius

3.0 Analytical Results

The fourth quarter 1996 analytical results for the pond cleanup COPCs (diesel-range TPH, BTEX, barium, chromium, and lead) for the drilling effluent pond monitoring wells are presented in Table 3-1. Appendix B contains the results for all analytes for the fourth quarter sampling event. The analytical data have not been formally validated, although a limited review of the analytical raw data for laboratory method blanks was performed to ensure that the COPC concentrations reported for the groundwater samples were representative of groundwater quality rather than laboratory contamination. The following sections provide a discussion of the fourth quarter 1996 groundwater sampling results.

3.1 BTEX

Benzene, toluene, ethylbenzene, and total xylenes (BTEX compounds) were not detected in any of the groundwater samples from the fourth quarter 1996 sampling event.

3.2 Diesel-Range TPH

Diesel-range TPH was not detected in any of the groundwater samples from the fourth quarter 1996 sampling event.

3.3 Inorganics

The fourth quarter samples from both wells contained barium. In addition, chromium was detected in both samples from Well RU-03, and mercury and arsenic were detected in the sample from Well RU-06A but not in the sample duplicate. Arsenic and mercury were not identified as COPCs for pond cleanup and likely are of local natural origin. The source of chromium in the groundwater is unknown; however, since it was detected in the upgradient well (RU-03) but not the downgradient well (RU-06A), its presence is not likely to represent migration from the pond sediments. Selenium was not detected in the sample from either well.

The laboratory reported positive concentrations for arsenic in both samples from Well RU-03 and lead in one sample from Well RU-03. However, both arsenic and lead were also present in the laboratory blanks associated with the Well RU-03 samples. None of the arsenic or lead results for the RU-03 samples was greater than five times the highest blank concentration, so arsenic and lead are considered to be not detected in the RU-03 samples in accordance with the

Table 3-1
Rulison Site Groundwater Analytical Results:
Fourth Quarter, 1996
(All results in µg/L)
(Page 1 of 2)

Well	First Quarter 1996	Second Quarter 1996	Third Quarter 1996	Fourth Quarter 1996	First Quarter 1997	Second Quarter 1997	Third Quarter 1997	Fourth Quarter 1997
TPH - Diesel								
RU-03	100U	94U	500U	500U				
RU-05	100UJ[1]	94U	NS	NS				
RU-06A	100U	71R	500U	500U				
RU-07	NS	NS	NS	NS				
RU-08	100UJ[1]	94U	NS	NS				
Benzene								
RU-03	0.5U	0.5U	1U	1U				
RU-05	0.5U	0.5U	NS	NS				
RU-06A	0.5U	0.5U	1U	1U				
RU-07	NS	NS	NS	NS				
RU-08	0.5U	0.5U	NS	NS				
Toluene								
RU-03	0.5U	0.5U	1U	1U				
RU-05	0.5U	0.5U	NS	NS				
RU-06A	0.5U	0.5U	1U	1U				
RU-07	NS	NS	NS	NS				
RU-08	0.5U	0.5U	NS	NS				
Ethylbenzene								
RU-03	0.5U	0.5U	1U	1U				
RU-05	0.5U	0.5U	NS	NS				
RU-06A	0.5U	0.5U	1U	1U				
RU-07	NS	NS	NS	NS				
RU-08	0.5U	0.5U	NS	NS				
Xylenes (total)								
RU-03	0.5U	0.5U	1U	1U				
RU-05	0.5U	0.5U	NS	NS				
RU-06A	0.5U	0.5U	1U	1U				
RU-07	NS	NS	NS	NS				
RU-08	0.5U	0.5U	NS	NS				

Table 3-1
Rulison Site Groundwater Analytical Results:
Fourth Quarter, 1996
(All results in µg/L)
(Page 2 of 2)

Well	First Quarter 1996	Second Quarter 1996	Third Quarter 1996	Fourth Quarter 1996	First Quarter 1997	Second Quarter 1997	Third Quarter 1997	Fourth Quarter 1997
Barium								
RU-03	*120*	*110*	105	135				
RU-05	*360*	*120*	NS	NS				
RU-06A	*120*	*120*	119	116				
RU-07	NS	*NS*	NS	NS				
RU-08	*350*	*140*	NS	NS				
Chromium								
RU-03	*10U*	*10U*	1.5U	6.7				
RU-05	*24*	*10U*	NS	NS				
RU-06A	*10U*	*10U*	1.5U	1.5U				
RU-07	NS	NS	NS	NS				
RU-08	*10U*	*10U*	NS	NS				
Lead								
RU-03	*5.6U*	*3U*	1.5	2.3U				
RU-05	*13U*	*3U*	NS	NS				
RU-06A	*3U*	*3U*	0.8U	0.8U				
RU-07	NS	NS	NS	NS				
RU-08	*12U*	*3U*	NS	NS				
Selenium								
RU-03	*16*	*14*	2.8U	2.8U				
RU-05	*7.2*	*6*	NS	NS				
RU-06A	*12*	*20*	2.8U	2.8U				
RU-07	NS	NS	NS	NS				
RU-08	*12*	*22*	NS	NS				

Values in italics are for the dissolved fraction
Values in bold are the fourth quarter 1996 sampling event results
NS = Well dry - no sample collected
U = Analyte not detected above the specified value
R = Quality control indicates that the data are unusable (compound may or may not be present)
J = Reported value is estimated:
[1] Sample analysis exceeded holding time

procedures set forth in the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 1994).

There currently are insufficient data to establish concentration trends or to determine whether total barium concentrations in groundwater downgradient from the pond are significantly elevated above background. Statistical trends will be calculated as data are acquired from additional quarterly groundwater monitoring events.

3.4 Groundwater Flow

Groundwater depth and elevation data for the drilling effluent pond monitoring wells from the fourth quarter sampling event are presented in Table 3-2. Based on the groundwater elevation data, it appears that groundwater flow during the fourth quarter sampling event was generally towards the northwest. Under this flow condition, well RU-03 is upgradient from the pond, and well RU-06A is downgradient from the pond.

Table 3-2
Rulison Site Groundwater Elevations:
Fourth Quarter, 1996

Well	First Quarter 1996	Second Quarter 1996	Third Quarter 1996	**Fourth Quarter 1996**	First Quarter 1997	Second Quarter 1997	Third Quarter 1997	Fourth Quarter 1997
Depth to Water								
RU-03	10.56 m (34.65 ft)	6.81 m (22.33 ft)	12.94 m (42.44 ft)	**12.93 m (42.42 ft)**				
RU-05	2.35 m (7.71 ft)	1.96 m (6.42 ft)	Dry	**Dry**				
RU-06A	4.74 m (15.56 ft)	4.38 m (14.38 ft)	5.55 m (18.20 ft)	**4.72 m (15.5 ft)**				
RU-07	Dry	Dry	Dry	**Dry**				
RU-08	1.78 m (5.85 ft)	1.70 m (5.58 ft)	Dry	**Dry**				
Groundwater Elevation								
RU-03	2444.29 m (8019.33 ft)	2448.05 m (8031.65 ft)	2441.92 m (8011.54 ft)	**2441.92 m (8011.56 ft)**				
RU-05	2433.95 m (7985.41 ft)	2434.35 m (7986.70 ft)	< 2434.09 m (< 7985.87 ft)	**< 2434.09 m (< 7985.87 ft)**				
RU-06A	2430.10 m (7972.78 ft)	2430.46 m (7973.96 ft)	2429.30 m (7970.14 ft)	**2430.12 m (7972.84 ft)**				
RU-07	< 2438.91 m (< 8001.67 ft)	< 2438.91 m (< 8001.67 ft)	< 2438.91 m (< 8001.67 ft)	**< 2438.91 m (< 8001.67 ft)**				
RU-08	2429.05 m (7969.33 ft)	2429.13 m (7969.60 ft)	< 2429.01 m (< 7969.18 ft)	**< 2429.01 m (< 7969.18 ft)**				

Appendix A

Purge Water Discharge Permit

4.0 Quality Control Results

Field and laboratory QC sample requirements and acceptance criteria are specified in the Rulison QAPP (DOE, 1996d). The laboratory narrative for the fourth quarter sampling analytical results is included in Appendix B and provides a summary of the results for laboratory QC samples required under the various analytical methods used for the project. The following sections describe the results for field QC samples that are not covered by the laboratory narratives because they are not explicit requirements under the analytical methods used, but they are required for field sampling under the Rulison QAPP (DOE, 1996d).

4.1 Field Duplicate Samples

Field duplicate samples are used to monitor the variability associated with sample collection procedures and to provide estimates of the total sampling and analytical precision. A duplicate sample was collected from both Well RU-03 and Well RU-06A during the sampling event. The relative percent differences (RPDs) between analytes detected in the original samples and the same analytes detected in the associated field duplicate samples were calculated and compared against the precision acceptance criteria specified in the Rulison QAPP (DOE, 1996d). The sample and sample duplicate results, calculated RPDs, and precision acceptance criteria are presented in Table 4-1.

Barium and chromium were the only analytes detected in the RU-03 sample and/or sample duplicate. The RPD for barium (1 percent) was within the precision acceptance criterion of ± 20 percent specified in the Rulison QAPP (DOE, 1996d). The RPD for chromium (101 percent) was outside of the precision acceptance criterion of ± 20 percent. The reason for the large RPD for chromium is uncertain; however, since chromium was not detected in the downgradient well (RU-06A) the large RPD does not compromise the quality of the downgradient data.

Arsenic, barium, and mercury were the only analytes detected in the RU-06A sample and/or sample duplicate. The RPDs for barium (-8.3 percent) and mercury (≥ 9.5 percent) were within the precision acceptance criterion of ± 20 percent specified in the Rulison QAPP (DOE, 1996d). The RPD for arsenic (≥ 56 percent) was outside of the precision acceptance criterion of ± 20 percent. Since arsenic is likely of local natural origin, its RPD may represent natural variability in groundwater quality.

Table 4-1
Rulison Site Groundwater Monitoring Program
Duplicate Sample Comparison:
Fourth Quarter, 1996
(All results in µg/L)

Analyte	Well RU-03			Well RU-06A			RPD Acceptance Criterion
	Sample	Sample Duplicate	RPD[1]	Sample	Sample Duplicate	RPD[1]	
TPH	500U	500U	ND	500U	500U	ND	± 40
Benzene	1U	1U	ND	1U	1U	ND	± 11 to 24
Toluene	1U	1U	ND	1U	1U	ND	± 11 to 24
Ethylbenzene	1U	1U	ND	1U	1U	ND	± 11 to 24
Xylenes	1U	1U	ND	1U	1U	ND	± 11 to 24
Arsenic	5.6U	3U	ND	3.2	1.8U	≥ 56	± 20
Barium	135	99.3	30.5	116	126	-8.3	± 20
Cadmium	0.6U	0.6U	ND	0.6U	0.6U	ND	± 20
Chromium	6.7	2.2	101	1.5U	1.5U	ND	± 20
Lead	2.3U	0.8U	ND	0.8U	0.8U	ND	± 20
Mercury	0.1U	0.1U	ND	0.11	0.1U	≥ 9.5	± 20
Selenium	2.8U	2.8U	ND	2.8U	2.8U	ND	± 20
Silver	1.5U	1.5U	ND	1.5U	1.5U	ND	± 20

[1] Relative percent difference
U = Analyte not detected above the specified value
ND = Not determined

4.2 Equipment Rinsate Blank Samples

Equipment rinsate blanks are used to monitor potential cross-contamination associated with inadequate equipment decontamination procedures. Sampling equipment decontamination was not required during the fourth quarter sampling event since disposable bailers were used, so an equipment rinsate blank was not prepared.

4.3 Trip Blank Samples

Trip blanks are used to monitor potential volatile organic compound (VOC) cross-contamination introduced into VOC sample containers through diffusion during sample shipment and storage. Trip blank samples were placed in each shipping container used for shipping BTEX samples. BTEX compounds were not detected in the trip blank from the fourth quarter sampling event.

5.0 Summary and Conclusions

The analytical data from the fourth quarter 1996 groundwater sampling event indicate that migration of contaminants from the drilling effluent pond sediments does not appear to be occurring. The following is a summary of the fourth quarter 1996 groundwater sample results:

BTEX Compounds: BTEX compounds were not detected in any of the fourth quarter groundwater samples.

Diesel-Range TPH: Diesel-range TPH was not detected in any of the fourth quarter groundwater samples.

Inorganics: Barium and chromium were the only pond cleanup COPCs detected in the fourth quarter 1996 groundwater samples. Chromium was detected only in the upgradient monitoring well (RU-03), so its presence is not likely to represent migration from the pond sediments. As discussed in Section 3.3, there currently are insufficient data to establish concentration trends or to determine whether barium concentrations in groundwater downgradient from the drilling effluent pond are significantly elevated above background. Statistical trends will be calculated as data are acquired from additional quarterly sampling events.

6.0 References

AEC, see U.S. Atomic Energy Commission.

California State Water Resources Control Board. 1989. *Leaking Underground Fuel Tank Field Manual, Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure.* Sacramento, CA.

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STATE OF COLORADO

Roy Romer, Governor
Patti Shwayder, Acting Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department
of Public Health
and Environment

March 19, 1996

Mr. Kevin D. Leary
DOE

Subject: Reply to request for addition of source to permit COG-310084.

Dear Mr. Leary:

The Division has received and reviewed your fax of 3/19/96. Since the wells described in your fax are in such close proximity to the pond that the permit was designed to provide dewatering conditions for, the Division will allow the wells to be dewatered using the same discharge point as described in the permit. Please follow the same conditions and monitoring schedule as described in the permit. The Division realizes that due to the small amount of water in question, the water might not be of sufficient flow to reach the discharge point. Any future purgings of the water from these wells are covered by this letter and the permit noted above as long as the permit remains active and conditions, monitoring schedule and reporting procedure are followed.

Please feel free to call me at (303)+692-3593 with questions or comments.

Sincerely,

Tom Boyce
Environmental Protection Specialist
Permits and Enforcement
WATER QUALITY CONTROL DIVISION

cc.file

Appendix B

Fourth Quarter 1996 Analytical Results

1D

HBH ANALYSIS DATA SHEET

EPA SAMPLE NO.: RU-3#1

Lab Name: QUANTERRA MO Contract: 317.43

Lab Code: ITMO Case No.: _____ SAS No.: _____ SDG No.: 13038

Matrix : (soil/water) WATER Lab Sample ID: 13038-001

Sample wt/vol: 1000 (g/ml) ML Lab File ID: _____

Level: (low/med) LOW Date Sampled: 12-04-96

% Moisture: not dec._____ dec._____ Date Extracted: 12-11-96

Extraction: (SepF/Cont/Sonc/Shak) SEPF Date Analyzed: 12-17-96

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1.0

CAS NO.	Compound	CONCENTRATION UNITS: (mg/L or mg/Kg) mg/L	Q
	FUEL OIL #2	0.50	U

U: Concentration of analyte is less than the value given.

FORM I HBH

1D
HBH ANALYSIS DATA SHEET

EPA SAMPLE NO.
RU-3#2

Lab Name: QUANTERRA MO Contract: 317.43

Lab Code: ITMO Case No.: _____ SAS No.: _____ SDG No.: 13038

Matrix : (soil/water) WATER Lab Sample ID: 13038-002

Sample wt/vol: 1000 (g/ml) ML Lab File ID: _____

Level: (low/med) LOW Date Sampled: 12-04-96

% Moisture: not dec._____ dec._____ Date Extracted: 12-11-96

Extraction: (SepF/Cont/Sonc/Shak) SEPF Date Analyzed: 12-17-96

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1.0

CAS NO.	Compound	CONCENTRATION UNITS: (mg/L or mg/Kg) mg/L	Q
	FUEL OIL #2	0.50	U

U: Concentration of analyte is less than the value given.

FORM I HBH

1D

HBH ANALYSIS DATA SHEET

EPA SAMPLE NO.: RU-6A

Lab Name: QUANTERRA MO Contract: 317.43

Lab Code: ITMO Case No.: _____ SAS No.: _____ SDG No.: 13038

Matrix : (soil/water) WATER Lab Sample ID: 13038-003

Sample wt/vol: 1000 (g/ml) ML Lab File ID: _____

Level: (low/med) LOW Date Sampled: 12-04-96

% Moisture: not dec._____ dec._____ Date Extracted: 12-11-96

Extraction: (SepF/Cont/Sonc/Shak) SEPF Date Analyzed: 12-17-96

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1.0

CAS NO.	Compound	CONCENTRATION UNITS: (mg/L or mg/Kg) mg/L	Q
	FUEL OIL #2	0.50	U

U: Concentration of analyte is less than the value given.

FORM I HBH

1D
HBH ANALYSIS DATA SHEET

EPA SAMPLE NO.
RU-6A#2

Lab Name: QUANTERRA MO Contract: 317.43

Lab Code: ITMO Case No.: _____ SAS No.: _____ SDG No.: 13038

Matrix : (soil/water) WATER Lab Sample ID: 13038-004

Sample wt/vol: 1000 (g/ml) ML Lab File ID: _____

Level: (low/med) LOW Date Sampled: 12-04-96

% Moisture: not dec._____ dec._____ Date Extracted: 12-11-96

Extraction: (SepF/Cont/Sonc/Shak) SEPF Date Analyzed: 12-17-96

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1.0

CAS NO.	Compound	CONCENTRATION UNITS: (mg/L or mg/Kg) mg/L	Q
	FUEL OIL #2	0.50	U

U: Concentration of analyte is less than the value given.

FORM I HBH

1I

VOLATILE ORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.: RU-3#1

Lab Name: QUANTERRA,MO Contract: 317.43

Lab Code: ITMO Case No.: _____ SAS No.: _____ SDG No.: 13038

Matrix : (soil/water) WATER Lab Sample ID: 13038-001

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: _____

Level: (low/med) LOW Date Sampled: 12-04-96

% Moisture: not dec. _____ Date Analyzed: 12-10-96

Column: (pack/cap) CAP Dilution Factor: 5.0

CAS NO.	Compound	CONCENTRATION UNITS: (UG/L or UG/KG) UG/L	Q
71-43-2	Benzene	1.0	U
108-88-3	Toluene	1.0	U
100-41-4	Ethylbenzene	1.0	U
1330-20-7	Xylenes (total)	1.0	U

U: Concentration of analyte is less than the value given.

FORM I 8020

1I

VOLATILE ORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

RU-3#2

Lab Name: QUANTERRA,MO Contract: 317.43

Lab Code: ITMO Case No.: _____ SAS No.: _____ SDG No.: 13038

Matrix : (soil/water) WATER Lab Sample ID: 13038-002

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: _____

Level: (low/med) LOW Date Sampled: 12-04-96

% Moisture: not dec._____ Date Analyzed: 12-10-96

Column: (pack/cap) CAP Dilution Factor: 5.0

CAS NO.	Compound	CONCENTRATION UNITS: (UG/L or UG/KG) UG/L	Q
71-43-2	Benzene	1.0	U
108-88-3	Toluene	1.0	U
100-41-4	Ethylbenzene	1.0	U
1330-20-7	Xylenes (total)	1.0	U

U: Concentration of analyte is less than the value given.

FORM I 8020

1I

VOLATILE ORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

RU-6A

Lab Name: QUANTERRA,MO Contract: 317.43

Lab Code: ITMO Case No.: _____ SAS No.: _____ SDG No.: 13038

Matrix : (soil/water) WATER Lab Sample ID: 13038-003

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: _____

Level: (low/med) LOW Date Sampled: 12-04-96

% Moisture: not dec._____ Date Analyzed: 12-10-96

Column: (pack/cap) CAP Dilution Factor: 5.0

CAS NO.	Compound	CONCENTRATION UNITS: (UG/L or UG/KG) UG/L	Q
71-43-2	Benzene	1.0	U
108-88-3	Toluene	1.0	U
100-41-4	Ethylbenzene	1.0	U
1330-20-7	Xylenes (total)	1.0	U

U: Concentration of analyte is less than the value given.

FORM I 8020

1I

VOLATILE ORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

RU-6A#2

Lab Name: QUANTERRA,MO Contract: 317.43

Lab Code: ITMO Case No.: _____ SAS No.: _____ SDG No.: 13038

Matrix : (soil/water) WATER Lab Sample ID: 13038-004

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: _____

Level: (low/med) LOW Date Sampled: 12-04-96

% Moisture: not dec._____ Date Analyzed: 12-10-96

Column: (pack/cap) CAP Dilution Factor: 5.0

CAS NO.	Compound	CONCENTRATION UNITS: (UG/L or UG/KG) UG/L	Q
71-43-2	Benzene	1.0	U
108-88-3	Toluene	1.0	U
100-41-4	Ethylbenzene	1.0	U
1330-20-7	Xylenes (total)	1.0	U

U: Concentration of analyte is less than the value given.

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

RU-3#1

Lab Name: QUANTERRA_MO Contract: 317.43

Lab Code: ITMO Case No.: SAS No.: SDG No.: 13038

Matrix (soil/water): WATER Lab Sample ID: 13038-001

Level (low/med): LOW Date Received: 12/05/96

% Solids: 0.0

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

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	5.6	B	U	P
7440-39-3	Barium	135	B		P
7440-43-9	Cadmium	0.60	U		P
7440-47-3	Chromium	6.7	B		P
7439-92-1	Lead	2.3	B	U	P
7439-97-6	Mercury	0.10	U		CV
7782-49-2	Selenium	2.8	U		P
7440-22-4	Silver	1.5	U		P

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

RU-3#2

Lab Name: QUANTERRA_MO_____ Contract: 317.43____
Lab Code: ITMO___ Case No.:_____ SAS No.:_____ SDG No.: 13038_____
Matrix (soil/water): WATER Lab Sample ID: 13038-002
Level (low/med): LOW__ Date Received: 12/05/96
% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	3.0	~~B~~ U		P
7440-39-3	Barium	99.3	~~B~~		P
7440-43-9	Cadmium	0.60	U		P
7440-47-3	Chromium	2.2	~~B~~		P
7439-92-1	Lead	0.80	U		P
7439-97-6	Mercury	0.10	U		CV
7782-49-2	Selenium	2.8	U		P
7440-22-4	Silver	1.5	U		P

Color Before: _____ Clarity Before: _____ Texture: _____
Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

RU-6A

Lab Name: QUANTERRA MO Contract: 317.43

Lab Code: ITMO Case No.: SAS No.: SDG No.: 13038

Matrix (soil/water): WATER Lab Sample ID: 13038-003

Level (low/med): LOW Date Received: 12/05/96

Solids: 0.0

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

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	3.2	B		P
7440-39-3	Barium	116	B		P
7440-43-9	Cadmium	0.60	U		P
7440-47-3	Chromium	1.5	U		P
7439-92-1	Lead	0.80	U		P
7439-97-6	Mercury	0.11	B		CV
7782-49-2	Selenium	2.8	U		P
7440-22-4	Silver	1.5	U		P

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

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1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

RU-6A#2

Lab Name: QUANTERRA_MO_____ Contract: 317.43____
Lab Code: ITMO__ Case No.:_____ SAS No.:_____ SDG No.: 13038_____
Matrix (soil/water): WATER Lab Sample ID: 13038-004
Level (low/med): LOW__ Date Received: 12/05/96
% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic__	1.8	U		P_
7440-39-3	Barium___	126	B		P_
7440-43-9	Cadmium__	0.60	U		P_
7440-47-3	Chromium_	1.5	U		P_
7439-92-1	Lead_____	0.80	U		P_
7439-97-6	Mercury__	0.10	U		CV
7782-49-2	Selenium_	2.8	U		P_
7440-22-4	Silver___	1.5	U		P_

Color Before: _____ Clarity Before: _____ Texture: _____
Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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