



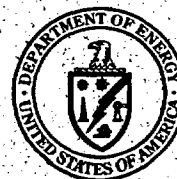
GJO-2003-461-TAC  
GJO-GWRIV 2.0-3

# **Verification Monitoring Report for the Riverton, Wyoming, UMTRA Project Site**

## **Update for 2003**

**July 2003**

Prepared by the  
**U.S. Department of Energy**  
Grand Junction Office



**UMTRA Ground Water Project**

**Verification Monitoring Report for the  
Riverton, Wyoming, UMTRA Project Site**

**Update for 2003**

**July 2003**

**Prepared by  
U.S. Department of Energy  
Grand Junction Office  
Grand Junction, Colorado**

**Work Performed Under DOE Contract No. DE-AC13-02GJ79491**

## Contents

1.0	Purpose of Report.....	1
2.0	Results of 2003 Monitoring.....	1
2.1	Ground Water .....	1
2.2	Surface Water .....	2
2.3	Fish from the Oxbow Lake .....	2
3.0	Conclusions .....	3
4.0	References .....	4

## Figures

Figure 1.	Monitoring Locations at the Riverton Site .....	5
Figure 2.	Ground Water Elevations and Streamflow at the Riverton Site.....	6
Figure 3.	Uranium Concentrations in Ground Water at the Riverton Site.....	7
Figure 4.	Molybdenum Concentrations in Ground Water at the Riverton Site .....	8
Figure 5.	Uranium Concentrations in Surface Water Near the Riverton Site.....	9
Figure 6.	Molybdenum Concentrations in Surface Water Near the Riverton Site .....	9
Figure 7.	Predicted versus Actual Uranium Concentrations in Ground Water at the Riverton Site .....	10
Figure 8.	Predicted versus Actual Molybdenum Concentrations in Ground Water at the Riverton Site .....	10

## Tables

Table 1.	Monitor Wells and Surface Water Sampling Locations at the Riverton Site .....	1
Table 2.	Summary of Fish Tissue Sampling Data from the Oxbow Lake Compared with Applicable Benchmarks .....	3

## Appendices

Appendix A – Ground Water Quality Data by Parameter
Appendix B – Surface Water Quality Data by Parameter

## 1.0 Purpose of Report

The purpose of this report is to provide an annual update to the *Verification Monitoring Report, Riverton, Wyoming, UMTRA Project Site* issued in September 2001 (DOE 2001). A summary of site conditions and the monitoring program at the Riverton site is provided in the above referenced report. This update is based on results of the annual ground water and surface water sampling event performed at the Riverton site during May 2003. In addition, fish were caught in the oxbow lake for tissue analysis for uranium and molybdenum. More surface water sampling locations were added along the west side of the oxbow lake in conjunction with the fish collection effort.

Ground water and surface water sampling locations at the Riverton site are identified on Figure 1 and in Table 1.

Table 1. Monitor Wells and Surface Water Sampling Locations at the Riverton Site

Location ID	Aquifer Zone	Total Depth	Location	Rationale
<b>Ground Water</b>				
RVT-705	Semiconfined	50	Offsite	Track plume centroid migration
RVT-707	Unconfined	17	Offsite	" "
RVT-710	Unconfined	20	Upgradient	Background
RVT-716	Unconfined	13	Onsite	Track upper plume
RVT-717	Semiconfined	50	Onsite	" "
RVT-718	Unconfined	18	Offsite	Track crossgradient plume
RVT-719	Semiconfined	40	Offsite	" "
RVT-722	Unconfined	18	Offsite	Track mid-plume area
RVT-723	Semiconfined	49	Offsite	" "
RVT-731	Unconfined	12	Onsite	Upper crossgradient
RVT-735	Semiconfined	44	Across River	
<b>Surface Water</b>				
RVT-747			Oxbow Lake	Surface water recharged by plume
RVT-749			Koch Ditch	Near existing sulfur plant
RVT-794			Little Wind River	Upstream
RVT-796			Little Wind River	Downstream

## 2.0 Results of 2003 Monitoring

### 2.1 Ground Water

Uranium and molybdenum are the indicator constituents for compliance monitoring at the Riverton site (DOE 1998). Uranium concentrations in ground water in the surficial unconfined and the underlying semiconfined aquifers, based on the 2003 sampling results, are shown on Figure 1. Uranium concentrations in the surficial unconfined aquifer are contoured to show the current configuration of the contaminant plume. Ground water elevations from dataloggers in monitor wells in the unconfined aquifer (RVT-707 and RVT-716) and the semiconfined aquifer (RVT-709), and streamflow plots from the U.S. Geological Survey gaging stations along the Little Wind River and Wind River adjacent to the Riverton site are shown on Figure 2. Time



versus concentration plots for uranium and molybdenum in ground water in the unconfined and semiconfined aquifers at the Riverton site are shown on Figures 3 and 4. Ground water quality data by parameter for locations sampled during May 2003 are provided in Appendix A.

Results of the monitoring program to date show that concentrations of uranium and molybdenum in ground water in the surficial unconfined aquifer are still above the respective maximum concentration limits (MCL) in the contaminant plume, which is migrating southeastward from the former processing site toward the Little Wind River (Figures 1, 3, and 4). Concentrations of molybdenum are decreasing as predicted, but concentrations of uranium have increased slightly in monitor wells RVT-707 and RVT-722, in the centroid of the plume. This variation is expected as the contaminant plume migrates downgradient toward the river because of the complexity of the alluvial system. The overall indication is that natural flushing is still occurring in the surficial aquifer. Concentrations of uranium and molybdenum in ground water in the semiconfined aquifer are still significantly below the respective MCLs, indicating no impact of site-related contamination to this unit (Figures 3 and 4).

## 2.2 Surface Water

Contaminated ground water discharges to the Little Wind River southeast of the site, but there is no evidence of impact to surface water quality in the river based on one downstream sample taken from the northern bank (RVT-796) (Figures 5 and 6). Concentrations of uranium are still elevated in surface water in the oxbow lake, which was formed by a shift in the river path in 1994 (Figures 1 and 5). Data indicate that the oxbow lake is recharged by contaminated ground water. Concentrations in the oxbow lake vary depending on the stage of the river and whether the oxbow lake is periodically reconnected and flushed by the river at high water stage. Water from the oxbow lake was collected on May 13, 2003, when the mean daily stream flow was 240 cubic feet per second (CFS). Flow in the Little Wind River peaked at 2,380 CFS on June 1, 2003 (Figure 2). Additional surface water locations were sampled during 2003 in conjunction with the fish sampling to confirm the consistency of water quality in the oxbow lake (Figure 1). These results are consistent with results from the initial location (RVT-747) (Figure 1 and Appendix B).

Time versus concentration plots for uranium and molybdenum in surface water at the Riverton site are shown on Figures 5 and 6. Surface water quality data by parameter for locations sampled during May 2003 are provided in Appendix B.

## 2.3 Fish from the Oxbow Lake

Based on recent concern that fish in the oxbow lake near the Riverton site may be impacted by elevated levels of uranium and molybdenum in the surface water, carp were caught during the May sampling round for tissue analysis. The objective of the investigation was to evaluate risks to human health and the environment based on the potential bioaccumulation of uranium and molybdenum found in the carp. The goal of the sampling was to capture several smaller carp for whole body analysis to evaluate ecological risks and several larger fish for muscle tissue analysis to evaluate risks to human health from fish consumption. Only two larger carp were captured, and the muscle tissue from these specimens was evaluated consistent with the work plan. The results of the muscle tissue analysis are presented in Table 2.

**Table 2. Summary of Fish Tissue Sampling Data from the Oxbow Lake Compared with Applicable Benchmarks**

<b>Constituent</b>	<b>Sample 1 (mg/kg)</b>	<b>Sample 2 (mg/kg)</b>	<b>Average (mg/kg)</b>	<b>Risk Based Benchmark (mg/kg)</b>
Molybdenum	0.01	0.01	0.01	6.8
Uranium	0.009	0.021	0.015	4.1

**Notes:**

- The risk-based benchmarks are screening levels for fish consumption.
- Concentrations above the level listed may be of concern using standard exposure factors for fish consumption.
- The value listed for uranium is derived from the toxicological data from the Integrated Risk Information System (IRIS); there is also a provisional toxicological risk value that yields a benchmark of 0.27mg/kg.
- The benchmarks were obtained from Hubbard (2003).

Results from all samples were considerably below the human health risk benchmarks. Molybdenum was not detected (0.01 mg/kg is the detection limit for molybdenum), and the results for uranium were much lower than predicted using the highest surface water concentration and bioaccumulation factors found in the literature. Although the smaller fish that were to be used in evaluating potential ecological risks could not be collected, it is likely, based on the above results, that limited negative impacts are occurring to the carp or predators that may eat the carp.

### 3.0 Conclusions

While concentrations of both uranium and molybdenum in ground water in the shallow unconfined aquifer are still above their respective MCLs, levels are generally decreasing, indicating that natural flushing is occurring in the aquifer. Levels of uranium in ground water in the shallow unconfined aquifer increased slightly for 2003, but still show an overall decrease with time. Some fluctuation is expected, and longer-term trends show the overall success of the natural flushing strategy. Concentrations of uranium and molybdenum in ground water in the underlying semiconfined aquifer remain at or below detection limits. Surface water in the oxbow lake has been impacted by the site as it is recharged by shallow contaminated ground water. Concentrations of uranium and molybdenum in the surface water of the Little Wind River remain at or below detection limits.

Comparison of concentrations of uranium and molybdenum in ground water in the unconfined aquifer predicted by probabilistic hydrogeologic modeling, versus actual concentrations determined by analysis of samples from monitor well RVT-707, are shown in Figures 7 and 8, respectively.

Verification monitoring of ground water and surface water from designated locations will continue on an annual basis for another year (through May 2004) as specified in the Ground Water Compliance Action Plan (DOE 1998). At the end of this 5-year verification monitoring period, sampling will be conducted once every 5 years until analytical data demonstrate that ground water in the uppermost aquifer has been cleaned up.

## 4.0 References

Hubbard, J., 2003. Risk-Based Concentration Tables. U.S. Environmental Protection Agency, Region III. April 17. <http://www.epa.gov/reg3hwmd/risk/index.htm>.

U.S. Department of Energy (DOE), 1998. *Final Ground Water Compliance Action Plan for the Riverton, Wyoming, Title I UMTRA Project Site*, attached to letter from DOE to NRC of September 22, 1998.

\_\_\_\_\_, 2001. *Verification Monitoring Report, Riverton, Wyoming, UMTRA Project Site*, GJO-2001-255-TAR, September.

\_\_\_\_\_, 2002. *Verification Monitoring Report for the Riverton, Wyoming, UMTRA Project Site, Update for 2002*. GJO-2002-352-TAC, August.

\_\_\_\_\_, 2003. *Data Validation for the Riverton, Wyoming UMTRA Site*, July.

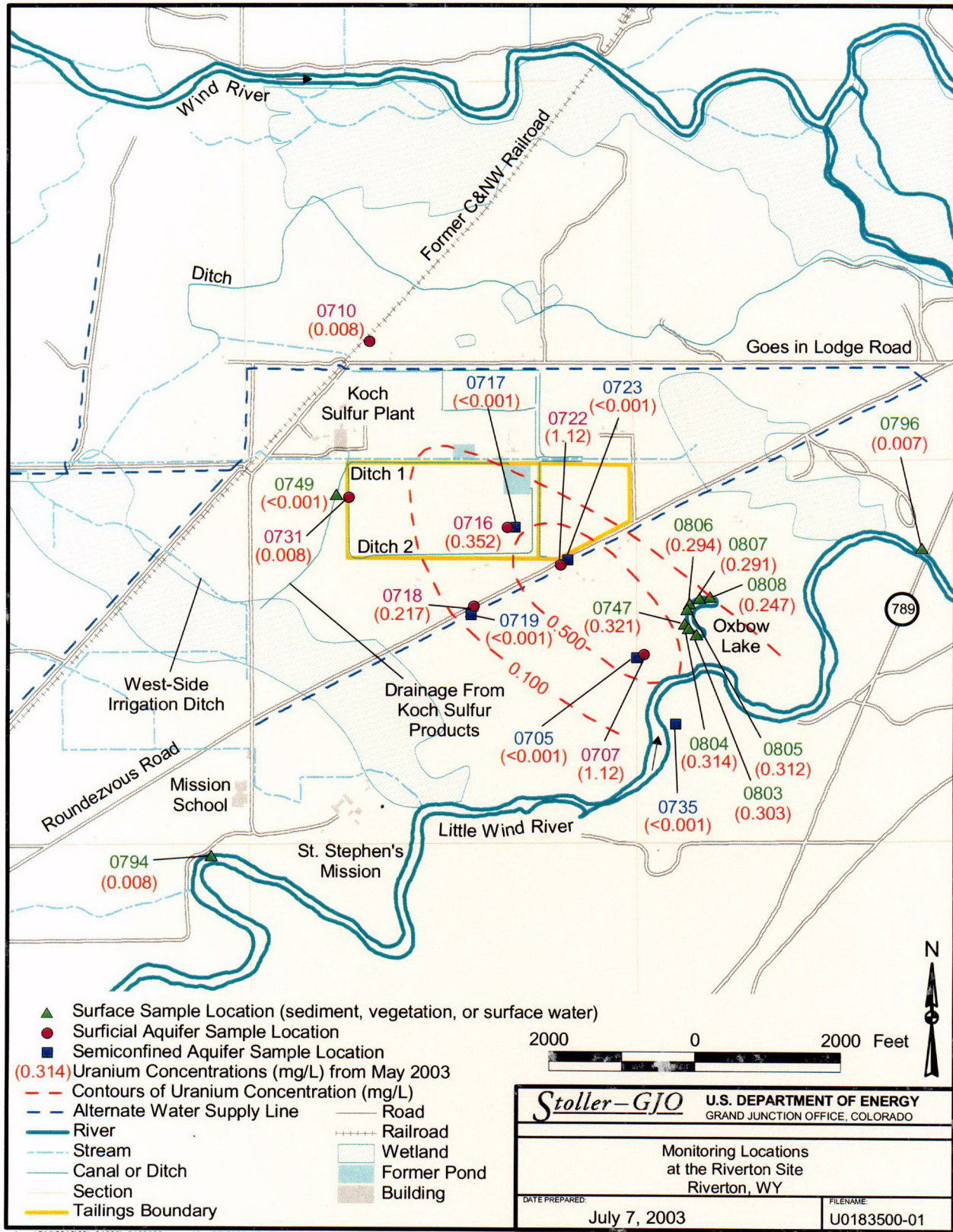


Figure 1. Monitoring Locations at the Riverton Site

C01



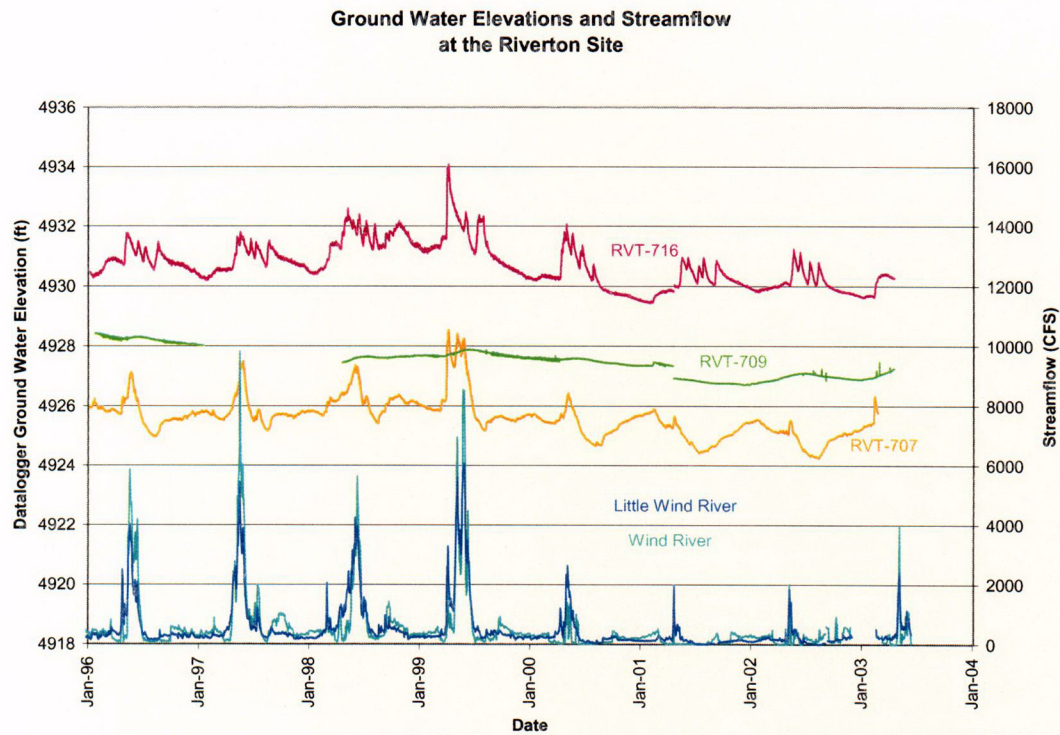


Figure 2. Ground Water Elevations and Streamflow at the Riverton Site

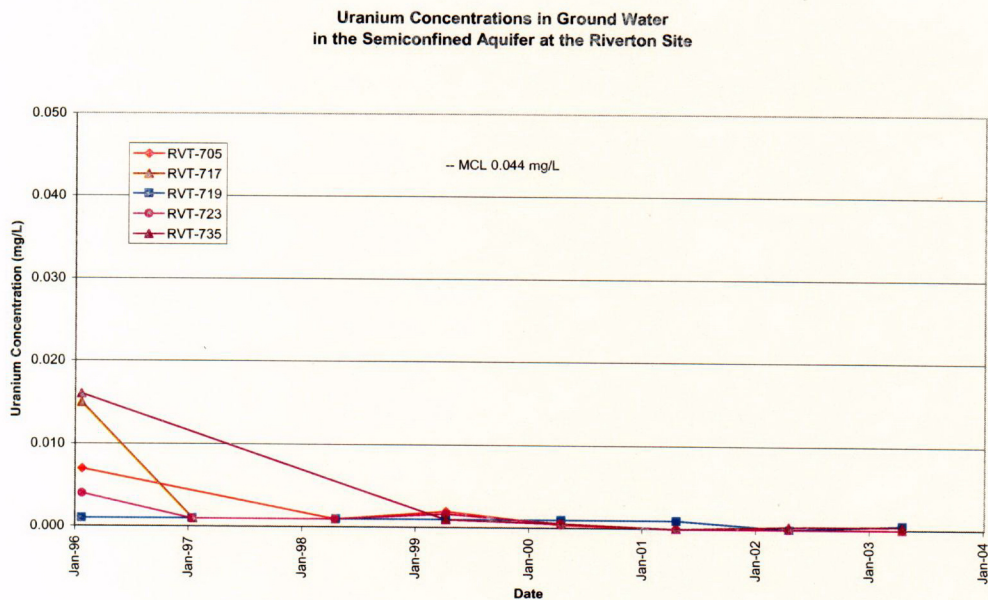
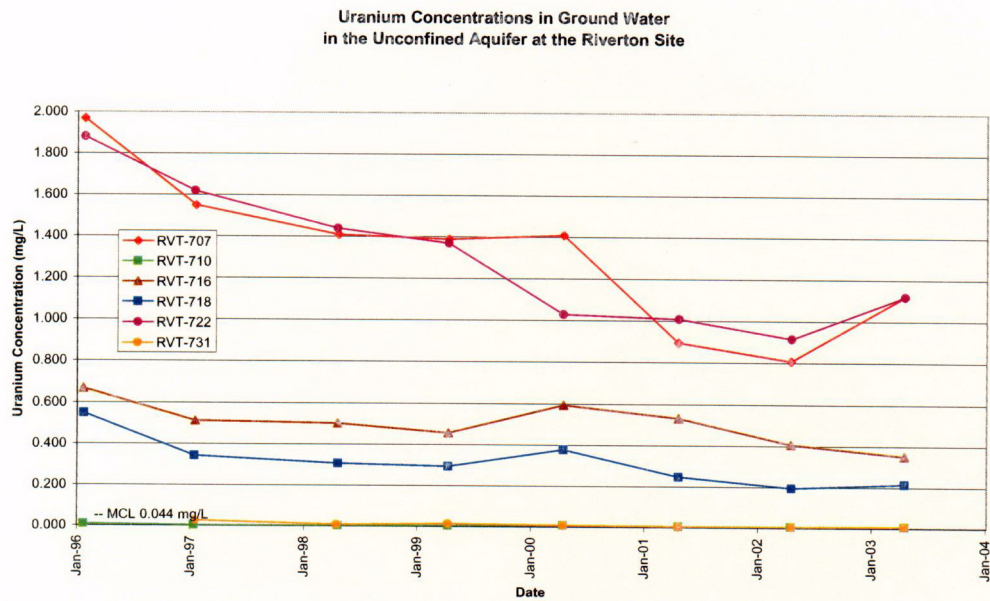
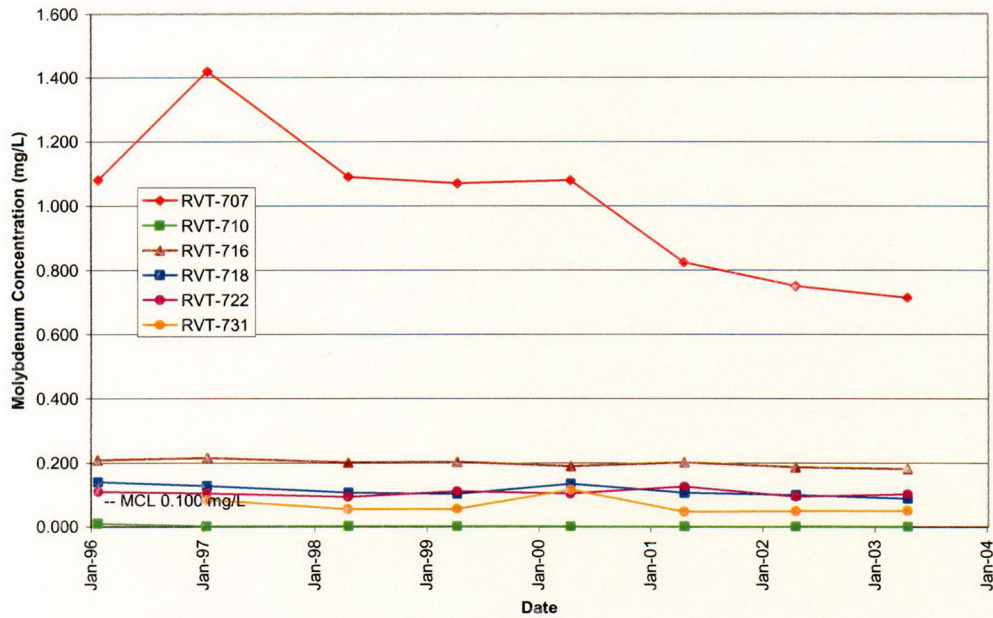


Figure 3. Uranium Concentrations in Ground Water at the Riverton Site



**Molybdenum Concentrations in Ground Water  
in the Unconfined Aquifer at the Riverton Site**



**Molybdenum Concentrations in Ground Water  
in the Semiconfined Aquifer at the Riverton Site**

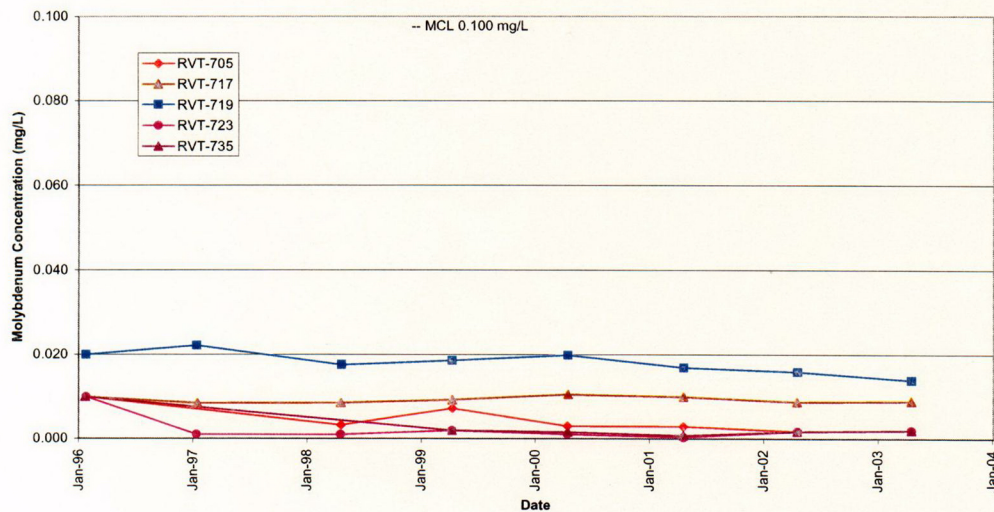


Figure 4. Molybdenum Concentrations in Ground Water at the Riverton Site

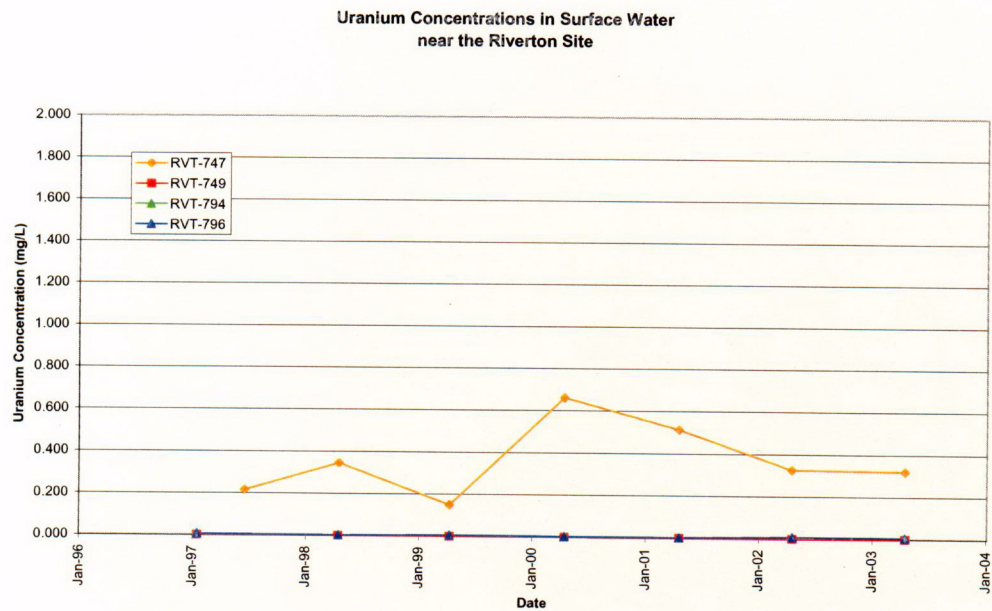


Figure 5. Uranium Concentrations in Surface Water Near the Riverton Site

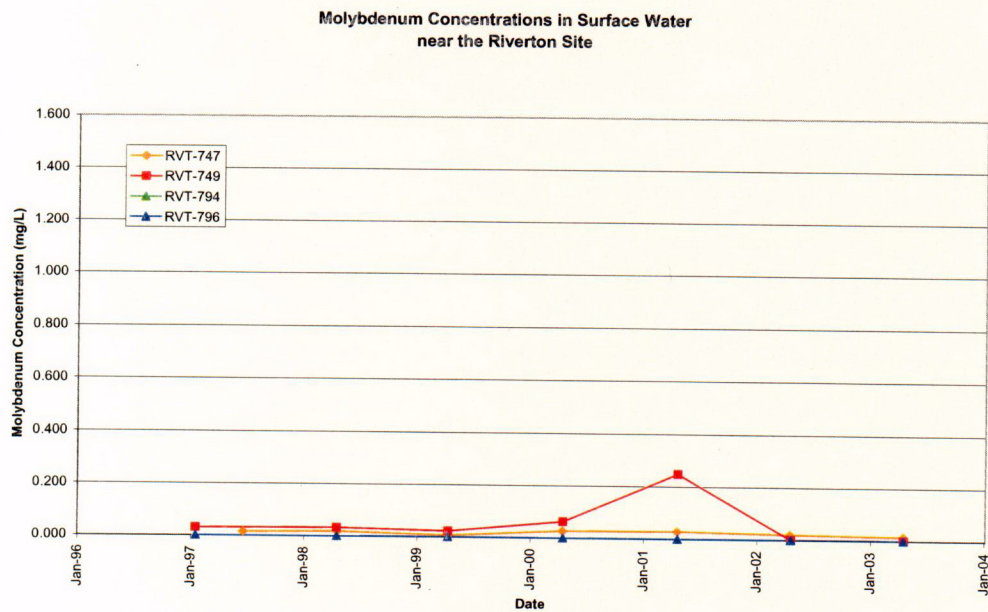


Figure 6. Molybdenum Concentrations in Surface Water Near the Riverton Site



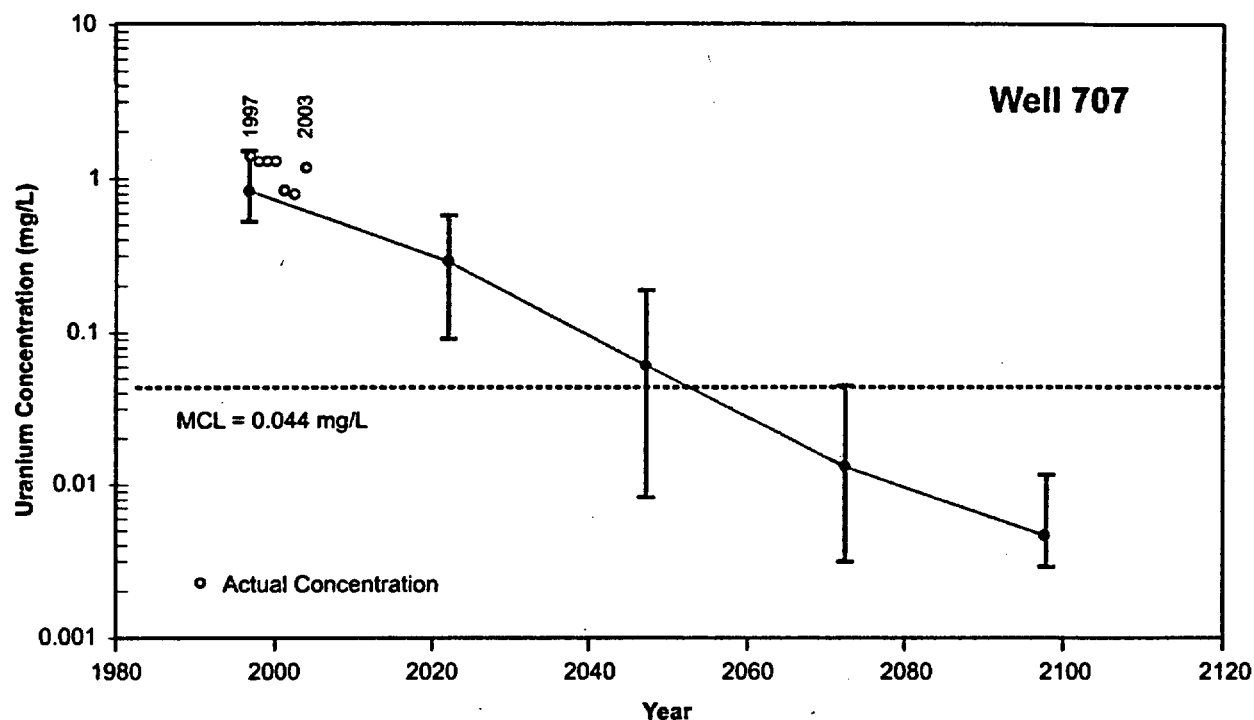


Figure 7. Predicted versus Actual Uranium Concentrations in Ground Water at the Riverton Site

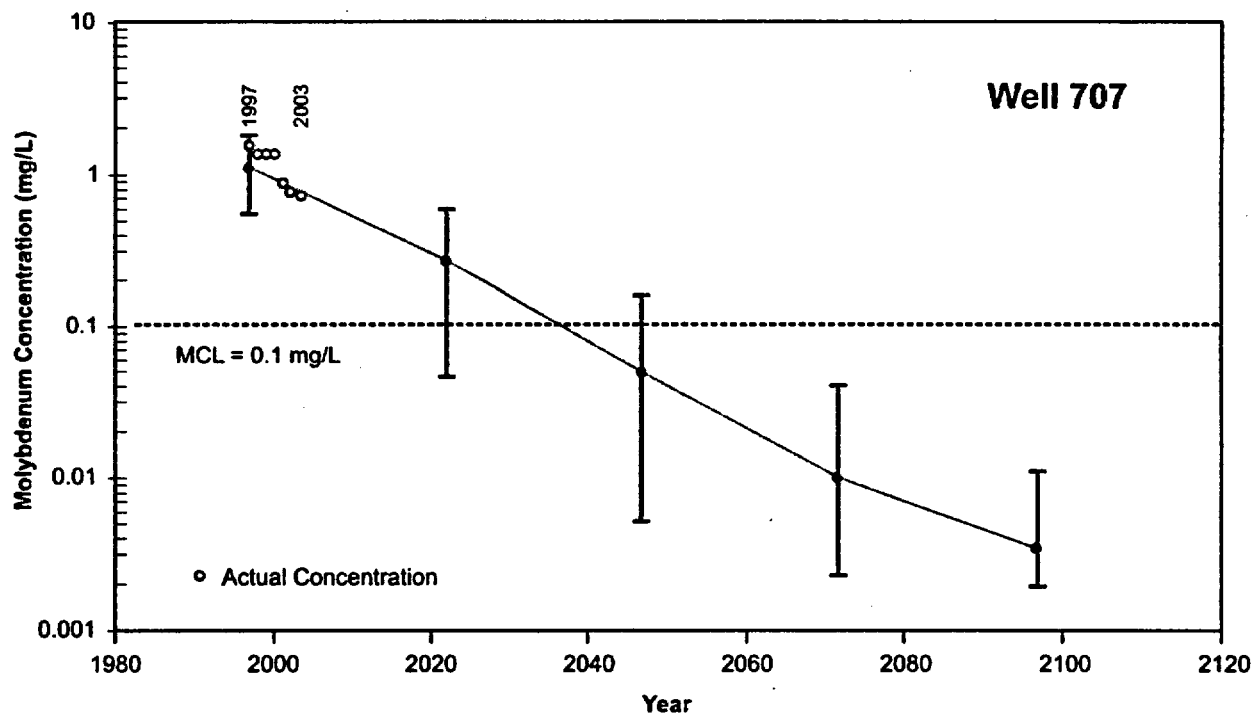


Figure 8. Predicted versus Actual Molybdenum Concentrations in Ground Water at the Riverton Site

## **Appendix A**

### **Ground Water Quality Data by Parameter**

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE RVT01, RIVERTON  
 REPORT DATE: 7/2/2003 9:37 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Arsenic	mg/L	0705	WL	05/13/2003	0001	37.30 - 61.80	0.00010	U FQ #	0.0001	-
	mg/L	0707	WL	05/13/2003	0001	9.10 - 23.30	0.00130	B F #	0.0001	-
	mg/L	0710	WL	05/14/2003	0001	9.80 - 26.80	0.00210	B F #	0.0001	-
	mg/L	0716	WL	05/14/2003	0001	9.78 - 14.78	0.00035	B F #	0.0001	-
	mg/L	0717	WL	05/14/2003	0001	45.10 - 55.10	0.001	B F #	0.0001	-
	mg/L	0718	WL	05/14/2003	0001	17.70 - 22.70	0.00076	B F #	0.0001	-
	mg/L	0719	WL	05/14/2003	0001	37.86 - 47.86	0.00220	B FQ #	0.0001	-
	mg/L	0722	WL	05/14/2003	0001	15.85 - 25.85	0.00010	U F #	0.0001	-
	mg/L	0723	WL	05/14/2003	0001	45.24 - 55.24	0.00055	B F #	0.0001	-
	mg/L	0731	WL	05/14/2003	0001	2.00 - 11.40	0.0194	F #	0.0001	-
	mg/L	0735	WL	05/14/2003	0001	-4906.66 - -4891.66	0.00046	B F #	0.0001	-
	mg/L	0735	WL	05/14/2003	0002	-4906.66 - -4891.66	0.00040	B F #	0.0001	-
Manganese	mg/L	0705	WL	05/13/2003	0001	37.30 - 61.80	0.00066	B FQ #	0.0001	-
	mg/L	0707	WL	05/13/2003	0001	9.10 - 23.30	1.800	F #	0.0001	-
	mg/L	0710	WL	05/14/2003	0001	9.80 - 26.80	0.00037	B UF #	0.0001	-
	mg/L	0716	WL	05/14/2003	0001	9.78 - 14.78	0.419	F #	0.0001	-
	mg/L	0717	WL	05/14/2003	0001	45.10 - 55.10	0.227	F #	0.0001	-
	mg/L	0718	WL	05/14/2003	0001	17.70 - 22.70	1.290	F #	0.0001	-
	mg/L	0719	WL	05/14/2003	0001	37.86 - 47.86	0.107	FQ #	0.0001	-
	mg/L	0722	WL	05/14/2003	0001	15.85 - 25.85	0.735	F #	0.0001	-
	mg/L	0723	WL	05/14/2003	0001	45.24 - 55.24	0.721	F #	0.0001	-
	mg/L	0731	WL	05/14/2003	0001	2.00 - 11.40	0.00300	B F #	0.0001	-
	mg/L	0735	WL	05/14/2003	0001	-4906.66 - -4891.66	0.00630	B F #	0.0001	-
	mg/L	0735	WL	05/14/2003	0002	-4906.66 - -4891.66	0.00910	B F #	0.0001	-
Molybdenum	mg/L	0705	WL	05/13/2003	0001	37.30 - 61.80	0.00210	B FQ #	0.002	-
	mg/L	0707	WL	05/13/2003	0001	9.10 - 23.30	0.715	F #	0.002	-

## GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE RVT01, RIVERTON

REPORT DATE: 7/2/2003 9:37 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Molybdenum	mg/L	0710	WL	05/14/2003	0001	9.80 - 26.80	0.00200	U F #	0.002	-
	mg/L	0716	WL	05/14/2003	0001	9.78 - 14.78	0.182	F #	0.002	-
	mg/L	0717	WL	05/14/2003	0001	45.10 - 55.10	0.00850	B F #	0.002	-
	mg/L	0718	WL	05/14/2003	0001	17.70 - 22.70	0.0885	F #	0.002	-
	mg/L	0719	WL	05/14/2003	0001	37.86 - 47.86	0.0140	FQ #	0.002	-
	mg/L	0722	WL	05/14/2003	0001	15.85 - 25.85	0.103	F #	0.002	-
	mg/L	0723	WL	05/14/2003	0001	45.24 - 55.24	0.00200	U F #	0.002	-
	mg/L	0731	WL	05/14/2003	0001	2.00 - 11.40	0.0510	F #	0.002	-
	mg/L	0735	WL	05/14/2003	0001	-4906.66 - -4891.66	0.00200	U F #	0.002	-
	mg/L	0735	WL	05/14/2003	0002	-4906.66 - -4891.66	0.00270	B F #	0.002	-
Nickel	mg/L	0705	WL	05/13/2003	0001	37.30 - 61.80	0.00140	B FQ #	0.0009	-
	mg/L	0707	WL	05/13/2003	0001	9.10 - 23.30	0.0527	F #	0.0009	-
	mg/L	0710	WL	05/14/2003	0001	9.80 - 26.80	0.00090	U F #	0.0009	-
	mg/L	0716	WL	05/14/2003	0001	9.78 - 14.78	0.00620	B F #	0.0009	-
	mg/L	0717	WL	05/14/2003	0001	45.10 - 55.10	0.00090	U F #	0.0009	-
	mg/L	0718	WL	05/14/2003	0001	17.70 - 22.70	0.0252	B F #	0.0009	-
	mg/L	0719	WL	05/14/2003	0001	37.86 - 47.86	0.00090	U FQ #	0.0009	-
	mg/L	0722	WL	05/14/2003	0001	15.85 - 25.85	0.0106	B F #	0.0009	-
	mg/L	0723	WL	05/14/2003	0001	45.24 - 55.24	0.00090	U F #	0.0009	-
	mg/L	0731	WL	05/14/2003	0001	2.00 - 11.40	0.01000	B F #	0.0009	-
	mg/L	0735	WL	05/14/2003	0001	-4906.66 - -4891.66	0.00090	U F #	0.0009	-
	mg/L	0735	WL	05/14/2003	0002	-4906.66 - -4891.66	0.00090	U F #	0.0009	-
Sulfate	mg/L	0705	WL	05/13/2003	0001	37.30 - 61.80	456.000	FQ #	0.175	-
	mg/L	0707	WL	05/13/2003	0001	9.10 - 23.30	2800.000	F #	0.875	-
	mg/L	0710	WL	05/14/2003	0001	9.80 - 26.80	198.000	F #	0.0675	-
	mg/L	0716	WL	05/14/2003	0001	9.78 - 14.78	613.000	F #	0.35	-

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE RVT01, RIVERTON  
 REPORT DATE: 7/2/2003 9:37 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN- CERTAINTY
Sulfate	mg/L	0717	WL	05/14/2003	0001	45.10 - 55.10	773.000	F #	0.35	-
	mg/L	0718	WL	05/14/2003	0001	17.70 - 22.70	1940.000	F #	0.875	-
	mg/L	0719	WL	05/14/2003	0001	37.86 - 47.86	428.000	FQ #	0.175	-
	mg/L	0722	WL	05/14/2003	0001	15.85 - 25.85	1520.000	F #	0.875	-
	mg/L	0723	WL	05/14/2003	0001	45.24 - 55.24	2010.000	F #	0.875	-
	mg/L	0731	WL	05/14/2003	0001	2.00 - 11.40	1390.000	F #	0.35	-
	mg/L	0735	WL	05/14/2003	0001	-4906.66 - -4891.66	645.000	F #	0.175	-
	mg/L	0735	WL	05/14/2003	0002	-4906.66 - -4891.66	612.000	F #	0.175	-
Uranium	mg/L	0705	WL	05/13/2003	0001	37.30 - 61.80	0.00041	B FQ #	0.0001	-
	mg/L	0707	WL	05/13/2003	0001	9.10 - 23.30	1.120	F #	0.0005	-
	mg/L	0710	WL	05/14/2003	0001	9.80 - 26.80	0.00750	B F #	0.0001	-
	mg/L	0716	WL	05/14/2003	0001	9.78 - 14.78	0.352	F #	0.0001	-
	mg/L	0717	WL	05/14/2003	0001	45.10 - 55.10	0.00010	U F #	0.0001	-
	mg/L	0718	WL	05/14/2003	0001	17.70 - 22.70	0.217	F #	0.0001	-
	mg/L	0719	WL	05/14/2003	0001	37.86 - 47.86	0.00056	B FQ #	0.0001	-
	mg/L	0722	WL	05/14/2003	0001	15.85 - 25.85	1.120	F #	0.0005	-
	mg/L	0723	WL	05/14/2003	0001	45.24 - 55.24	0.00010	U F #	0.0001	-
	mg/L	0731	WL	05/14/2003	0001	2.00 - 11.40	0.00750	B F #	0.0001	-
	mg/L	0735	WL	05/14/2003	0001	-4906.66 - -4891.66	0.00046	B F #	0.0001	-
	mg/L	0735	WL	05/14/2003	0002	-4906.66 - -4891.66	0.00046	B F #	0.0001	-

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE RVT01, RIVERTON  
REPORT DATE: 7/2/2003 9:37 am

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
-----------	-------	-------------	---------------	-----------------	----------------------	--------	-------------------------	-----------------	--------------

RECORDS: SELECTED FROM USEE200 WHERE site\_code='RVT01' AND location\_code in('0705','0707','0710','0716','0717','0718','0719','0722','0723','0731','0735') AND (data\_validation\_qualifiers IS NULL OR data\_validation\_qualifiers NOT LIKE '%R%' AND data\_validation\_qualifiers NOT LIKE '%X%') AND cas in('07440-38-2','07439-98-5','07439-98-7','07440-02-0','SULFATE','07440-61-1') AND DATE\_SAMPLED between #1/1/2003# and #1/1/2004#

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LOCATION TYPES: WL WELL

LAB QUALIFIERS:

- \* Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- Q Qualitative result due to sampling technique
- X Location is undefined.
- J Estimated value.
- R Unusable result.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

## **Appendix B**

### **Surface Water Quality Data by Parameter**

**SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE RVT01, RIVERTON**  
**REPORT DATE: 7/14/2003 8:52 am**

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN- CERTAINTY
Arsenic	mg/L	0747	05/13/2003	0001	0.0009 B	#	0.0001	-
	mg/L	0747	05/13/2003	0002	0.001 B	#	0.0001	-
	mg/L	0749	05/14/2003	0001	0.0005 B	#	0.0001	-
	mg/L	0794	05/12/2003	0001	0.0008 B	#	0.0001	-
	mg/L	0796	05/12/2003	0001	0.0007 B	#	0.0001	-
	mg/L	0803	05/13/2003	0001	0.0007 B	#	0.0001	-
	mg/L	0804	05/13/2003	0001	0.0009 B	#	0.0001	-
	mg/L	0805	05/13/2003	0001	0.0009 B	#	0.0001	-
	mg/L	0806	05/13/2003	0001	0.0011 B	#	0.0001	-
	mg/L	0807	05/13/2003	0001	0.0009 B	#	0.0001	-
	mg/L	0808	05/13/2003	0001	0.0017 B	#	0.0001	-
Manganese	mg/L	0747	05/13/2003	0001	0.539	#	0.0001	-
	mg/L	0747	05/13/2003	0002	0.528	#	0.0001	-
	mg/L	0749	05/14/2003	0001	0.0273	#	0.0001	-
	mg/L	0794	05/12/2003	0001	0.0257	#	0.0001	-
	mg/L	0796	05/12/2003	0001	0.0211	#	0.0001	-
	mg/L	0803	05/13/2003	0001	0.399	#	0.0001	-
	mg/L	0804	05/13/2003	0001	0.427	#	0.0001	-
	mg/L	0805	05/13/2003	0001	0.432	#	0.0001	-
	mg/L	0806	05/13/2003	0001	0.414	#	0.0001	-
	mg/L	0807	05/13/2003	0001	0.403	#	0.0001	-
	mg/L	0808	05/13/2003	0001	0.681	#	0.0001	-
Molybdenum	mg/L	0747	05/13/2003	0001	0.0154	#	0.002	-
	mg/L	0747	05/13/2003	0002	0.0195	#	0.002	-
	mg/L	0749	05/14/2003	0001	0.0022 B	#	0.002	-
	mg/L	0794	05/12/2003	0001	0.0020 U	#	0.002	-
	mg/L	0796	05/12/2003	0001	0.0020 U	#	0.002	-
	mg/L	0803	05/13/2003	0001	0.0142	#	0.002	-
	mg/L	0804	05/13/2003	0001	0.0177	#	0.002	-
	mg/L	0805	05/13/2003	0001	0.0176	#	0.002	-
	mg/L	0806	05/13/2003	0001	0.0169	#	0.002	-
	mg/L	0807	05/13/2003	0001	0.0162	#	0.002	-
	mg/L	0808	05/13/2003	0001	0.0136	#	0.002	-
Nickel	mg/L	0747	05/13/2003	0001	0.0037 B	#	0.0009	-
	mg/L	0747	05/13/2003	0002	0.0031 B	#	0.0009	-
	mg/L	0749	05/14/2003	0001	0.0222 B	#	0.0009	-
	mg/L	0794	05/12/2003	0001	0.0009 U	#	0.0009	-
	mg/L	0796	05/12/2003	0001	0.0009 U	#	0.0009	-



SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE RVT01, RIVERTON  
REPORT DATE: 7/14/2003 8:52 am

PARAMETER	UNITS	LOCATION ID	SAMPLE:		RESULT	QUALIFIERS:			DETECTION LIMIT	UN- CERTAINTY
			DATE	ID		LAB	DATA	QA		
Nickel	mg/L	0803	05/13/2003	0001	0.0031	B		#	0.0009	-
	mg/L	0804	05/13/2003	0001	0.0030	B		#	0.0009	-
	mg/L	0805	05/13/2003	0001	0.0025	B		#	0.0009	-
	mg/L	0806	05/13/2003	0001	0.0021	B		#	0.0009	-
	mg/L	0807	05/13/2003	0001	0.0026	B		#	0.0009	-
	mg/L	0808	05/13/2003	0001	0.0035	B		#	0.0009	-
Sulfate	mg/L	0747	05/13/2003	0001	615.000			#	0.175	-
	mg/L	0747	05/13/2003	0002	668.000			#	0.175	-
	mg/L	0749	05/14/2003	0001	226.000			#	0.0875	-
	mg/L	0794	05/12/2003	0001	363.000			#	0.175	-
	mg/L	0796	05/12/2003	0001	375.000			#	0.175	-
	mg/L	0803	05/13/2003	0001	602.000			#	0.175	-
	mg/L	0804	05/13/2003	0001	596.000			#	0.175	-
	mg/L	0805	05/13/2003	0001	603.000			#	0.175	-
	mg/L	0806	05/13/2003	0001	583.000			#	0.175	-
	mg/L	0807	05/13/2003	0001	574.000			#	0.175	-
	mg/L	0808	05/13/2003	0001	573.000		J	#	0.0175	-
Uranium	mg/L	0747	05/13/2003	0001	0.321			#	0.0001	-
	mg/L	0747	05/13/2003	0002	0.320			#	0.0001	-
	mg/L	0749	05/14/2003	0001	0.0002	B		#	0.0001	-
	mg/L	0794	05/12/2003	0001	0.0077	B		#	0.0001	-
	mg/L	0796	05/12/2003	0001	0.0072	B		#	0.0001	-
	mg/L	0803	05/13/2003	0001	0.303			#	0.0001	-
	mg/L	0804	05/13/2003	0001	0.314			#	0.0001	-
	mg/L	0805	05/13/2003	0001	0.312			#	0.0001	-
	mg/L	0806	05/13/2003	0001	0.294			#	0.0001	-
	mg/L	0807	05/13/2003	0001	0.291			#	0.0001	-
	mg/L	0808	05/13/2003	0001	0.247			#	0.0001	-

**SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE RVT01, RIVERTON**  
**REPORT DATE: 7/14/2003 8:52 am**

PARAMETER	UNITS	LOCATION		SAMPLE:		RESULT	QUALIFIERS:		DETECTION	UN-
		ID		DATE	ID		LAB	DATA QA	LIMIT	CERTAINTY

RECORDS: SELECTED FROM USEE800 WHERE site\_code='RVT01' AND location\_code  
in('0747','0749','0794','0796','0803','0804','0805','0806','0807','0808') AND (data\_validation\_qualifiers IS NULL OR  
data\_validation\_qualifiers NOT LIKE '%R%' AND data\_validation\_qualifiers NOT LIKE '%X%' ) AND cas in('07440-38-2','07439-96-  
5','07439-98-7','07440-02-0','SULFATE','07440-61-1') AND DATE\_SAMPLED between #1/1/2003# and #1/1/2004#

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

**LAB QUALIFIERS:**

- Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

**DATA QUALIFIERS:**

- |  |  |
|--|--|
| F Low flow sampling method used.               | G Possible grout contamination, pH > 9.              |
| J Estimated value.                             | L Less than 3 bore volumes purged prior to sampling. |
| Q Qualitative result due to sampling technique | R Unusable result.                                   |
| U Parameter analyzed for but was not detected. | X Location is undefined.                             |

QA QUALIFIER: # = validated according to Quality Assurance guidelines.