

*Office of Environmental Management – Grand Junction*



Moab UMTRA Project  
May 2009 Validation Data Package for  
the Routine Ground Water and Surface  
Water Sampling Event

August 2009



U.S. Department  
of Energy

**Office of Environmental Management**

**Moab UMTRA Project  
May 2009 Validation Data Package for  
Routine Ground Water and  
Surface Water Sampling Event**

**August 2009**

**Moab UMTRA Project  
May 2009 Routine Ground Water Sampling Event VDP**

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**Revision 0**

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**Review and Approval**

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*8/12/09*

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Date

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## Revision History

<b>Revision No.</b>	<b>Date</b>	<b>Reason/Basis for Revision</b>
0	August 2009	Initial issue.

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### Attachment

Attachment 1. May 2009 Routine Sampling Event Trip Report

## Acronyms and Abbreviations

cfs	cubic feet per second
COC	chain of custody
EB	equipment blank
EDD	electronic data deliverable
EPA	Environment Protection Agency
IDL	instrument detection limit
LCS	laboratory control sample
MB	method blank
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
RIN	report identification number
RS	replicate sample
SDG	sample data group
TDS	total dissolved solids
UMTRA	Uranium Mill Tailings Remedial Action
USGS	U.S. Geological Survey
VDP	validation data package

## 1.0 Introduction

The purpose of this document is to summarize the results of the data validation process associated with ground water and/or surface water samples collected from the Moab Uranium Mill Tailings Remedial Action (UMTRA) site. This data validation follows the criteria according to the *Environmental Procedures Catalog* (STO 6), "Standard Practice for Validation of Laboratory Data," GT-9(P) (2006).

As part of the scope of this document, the complete results of this data validation process are provided. Section 1 presents the Summary Criteria, the Sampling Event Summary, and the Sampling and Analyses. Section 2 provides the Data Assessment Summaries, including the Field Activity Verification, Laboratory Performance Assessment, and Field Analyses/Activities description. All flagged data, and the reasons for the applicable flags, are also presented in Section 2. The Data Presentation is contained in Section 3, which includes a summary of the anomalous data generated by the validation process. Various appendices contain the Water Sampling Field Activities Verification, Minimums and Maximums Report table, Water Quality Data, Water Level Data, and the Blanks Report. Attachment 1 contains the May 2009 routine sampling event trip report. All Colorado River flow discussed in this document are measured from the U.S. Geological Survey (USGS) Cisco gaging station No. 09180500.

This section contains the Summary Criteria with a sample location map (Section 1.1), a Sampling Event Summary (Section 1.2), and the Sampling and Analyses (Section 1.3) for the May 2009 routine sampling event.

### 1.1 Summary Criteria

Sampling Period: May 18 through 20, 2009

The purpose of this sampling was to collect ground water and surface water samples from the standard routine event sampling locations in order to evaluate the overall water quality under Colorado River base flow conditions. Sampling locations are shown on Figure 1.

**1. Did concentrations in water from any domestic well sampled exceed a ground water standard, primary drinking water standard, or health advisory?**

Domestic wells were not sampled during this event.

**2. Were standards exceeded at any point-of-compliance wells?**

Point-of-compliance wells have not been established at the Moab site.

**3. As a result of this sampling round, is there any indication of unexpected contaminated ground water movement?**

There is no indication of unexpected contaminated ground water movement along the bank of the Colorado River. In some instances, the May 2009 contaminant concentrations decreased significantly compared to the concentrations measured during the previous routine sampling event completed in December 2008, especially in areas of the site affected by inflow of river water during the high river stage. Time versus concentration plots for ammonia, total dissolved solids (TDS), and uranium for wells TP-02 (northeast portion of the site), 0492 (just south of the well field), and TP-17 and TP-19 (both of which are located

farther south of the well field) are provided in the Sampling Event Summary. Similar plots are provided for the observation wells located on top of the tailings pile (0437, 0438, and 0439).

Locations 0492 to TP-02 exhibit the most significant seasonal decrease in contaminant concentration of the wells located along the river bank. These wells are not screened within the brine zone (as are TP-17 and TP-19) and are more susceptible to changes in the Colorado River stage. In general, samples collected from 0492 and TP-02 followed the same seasonal pattern exhibited in previous years, in which ammonia concentrations measured in the sample from 0492 decreased in response to the higher river stage. TDS concentrations in samples collected from both locations decreased, and uranium concentrations increased in the sample from TP-02 and decreased in the sample from 0492.

In contrast, samples collected from locations 0437, 0438, and 0439 (all of which are located on top of the tailings pile, but are completed in the underlying alluvial aquifer), contaminant concentrations did not change significantly between December 2008 and May 2009. All analyte concentrations remained within the historical range.

Wells that exceeded selenium and uranium water quality standards are listed in Table 1.

*Table 1. Locations Sampled that Exceeded Selenium and Uranium Ground Water Standards*

Analyte	Standard (mg/L)	Locations Exceeding Standards
Selenium	0.01	0437 (0.12)
Uranium	0.044	0401 (0.34), 0404 (0.44), 0437 (4.0), 0438 (1.7), 0439 (0.82), 0492 (0.38), and TP-02 (2.4)

**4. Is there statistical evidence that contaminants related to the Moab UMTRA Project were detected in a surface body of water in greater concentrations than upstream ambient water quality?**

Since the monitoring of the site began, contaminants have periodically occurred at elevated concentrations in the Colorado River, primarily adjacent to and just downstream from the tailings pile in isolated pools or slow-moving backwater areas. However, the results from the sampling event in May 2009 indicate that areas sampled are not distinguishable from background concentrations in the main channel of the Colorado River, mainly due to the high river stage.

Table 2 presents a summary of the ammonia concentrations associated with the surface water samples collected during this sampling event. For comparison purposes, the applicable state of Utah and federal criteria for both acute and chronic concentrations (along with the temperature and pH data used to calculate these concentrations) are provided.

Table 2. Surface Water Ammonia Concentrations and Comparisons to State of Utah and Federal Criteria

Loc	Date	Temp (°C)	pH	Ammonia as N (mg/L)	State/Federal AWQC-Acute Total as N (mg/L) <sup>1</sup>	State/Federal AWQC-Chronic Total as N (mg/L) <sup>2</sup>
0201	5/18/09	16.3	8.02	0.1	5.62	2.54
0218	5/19/09	15.2	8.12	0.1	4.64	1.91
0226	5/20/09	14.4	8.3	0.1	3.15	1.52
0228	5/20/09	14.0	8.52	0.1	2.14	1.09
CR1	5/18/09	15.8	8.02	0.1	5.62	2.21
CR3	5/20/09	14.7	8.13	0.1	4.64	2.1
CR5	5/20/09	16.8	8.13	0.1	4.64	1.91

AWQC = Ambient Water Quality Criteria; Loc = Location; mg/L = milligrams per liter; Temp = Temperature  
<sup>1</sup>State of Utah, Standards of Quality for Waters of the State (Effective May 1, 2008), Rule R317-2, Table 2.14.2, 1-Hour Average (Acute) Concentration of Total Ammonia as N (mg/L)  
<sup>2</sup>State of Utah, Standards of Quality for Waters of the State (Effective May 1, 2008), Rule R317-2, Table 2.14.2, 30-Day Average (Chronic) Concentration of Total Ammonia as N (mg/L), Fish Early Life Stages Present

As shown in Table 2, none of the samples exceeded the state or federal acute or chronic criteria.

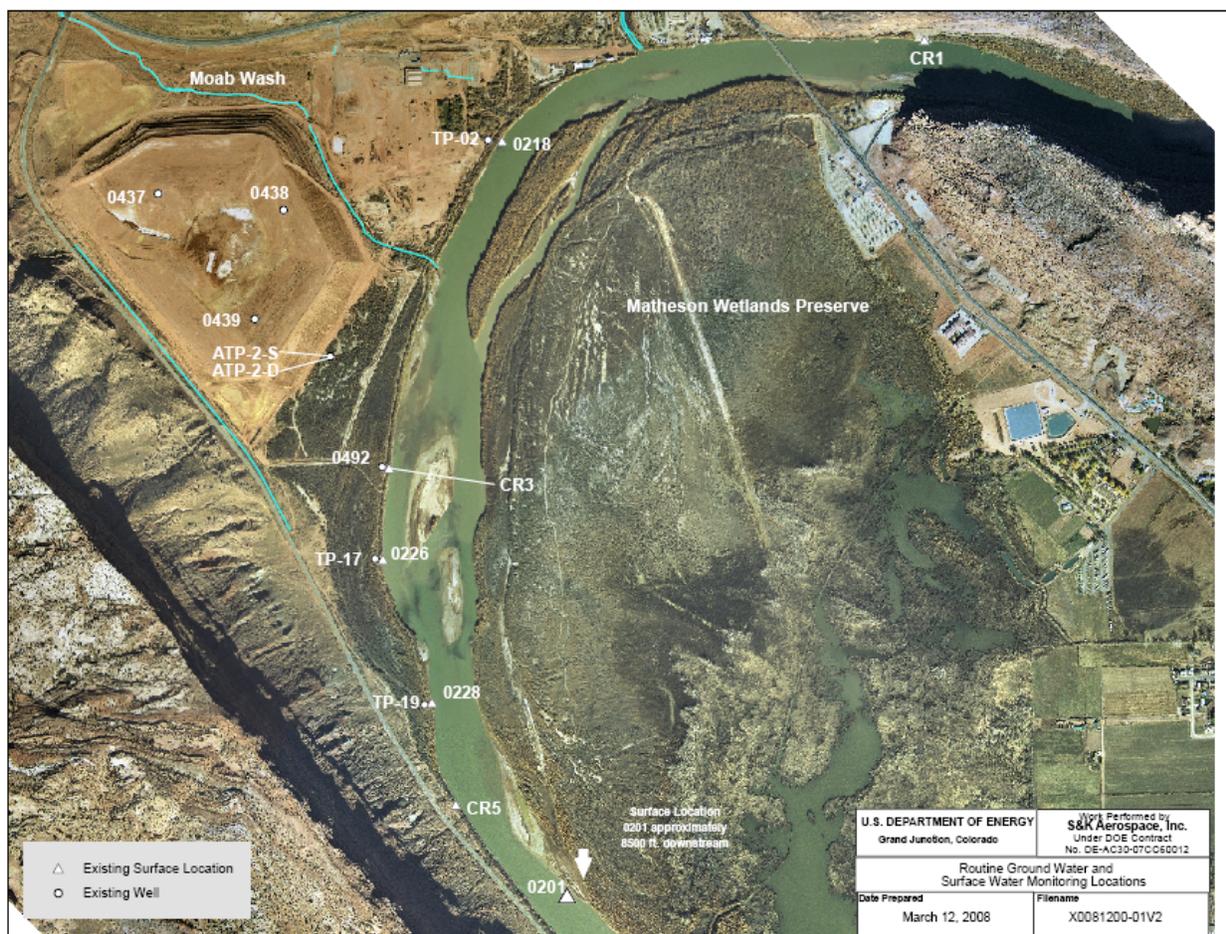


Figure 1. Routine Ground Water and Surface Water Sampling Locations (may include locations not sampled)

## 1.2 Sampling Event Summary

This validation data package (VDP) presents the validated data associated with the ground water and surface water samples collected during the May 2009 routine sampling event at the former uranium tailings processing site in Moab, Utah. This VDP includes a discussion of the data validation process in Section 2.0, with a description of how these data are qualified based on field and laboratory verification assessments (Sections 2.1 and 2.2). Attachment 1 contains the trip report detailing the field events associated with this sampling event.

A list of flagged data is presented in Table 4 in Section 2.2. No data were rejected (flagged as “R”) as a result of this validation process. A Minimums and Maximums Report (presented in Section 3.1) was generated to determine if the data are within a normal statistical range. Any anomalous data, based on the results of the Minimums and Maximums Report, are presented in Section 3.2.

While independent of the data validation process, a brief summary of the most recent concentration trends based on the May 2009 data is provided for the wells located in the floodplain (along the bank of the Colorado River) and in the footprint of the tailings pile. Time versus concentration (ammonia, TDS, and uranium) plots for selected monitoring wells over the past 2 years are presented to display historical trends exhibited by the data. Colorado River flows over the same time frame are also plotted to determine whether the magnitude of river flows influences analyte concentrations. Due to the high river stage (approximately 28,000 cfs), there were no habitat areas present during the sampling event.

### Flood Plain Wells

Time versus concentration plots were generated for wells TP-02, 0492, TP-17, and TP-19 (from north to south). These plots show that samples collected from wells TP-02, TP-17, and TP-19 have historically contained low ammonia concentrations (Figure 2), while the concentration detected from well 0492 has fluctuated between approximately 10 and 120 milligrams per liter (mg/L) over the past 2 years. The historical trend of samples from 0492 having decreased ammonia, TDS, and uranium concentrations during periods of high river flow was apparent again during May 2009.

The TDS plot (Figure 3) graphically shows that locations TP-17 and TP-19 are screened within the brine, while locations TP-02 and 0492 are screened above the brine/freshwater interface. Well TP-02 has consistently contained less than 6,000 mg/L TDS.

Over the past 2 years, uranium concentrations have seasonally fluctuated in samples collected from 0492 and TP-02; samples collected in May 2009 show this trend continues (Figure 4). Typical of wells screened within the brine, uranium concentrations in wells TP-17 and TP-19 are considerably lower compared to TP-02 and 0492. Since July 2006, samples collected from well TP-17 have contained uranium in concentrations near the 0.044 mg/L standard (Figure 5).

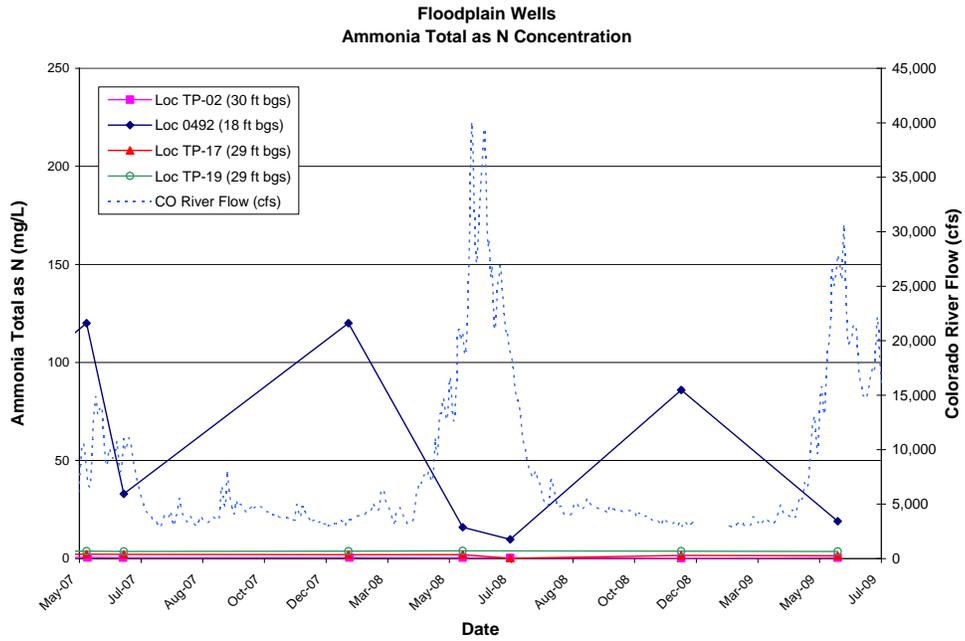


Figure 2. Floodplain Wells Time Versus Ammonia Total (as N) Concentration Plot

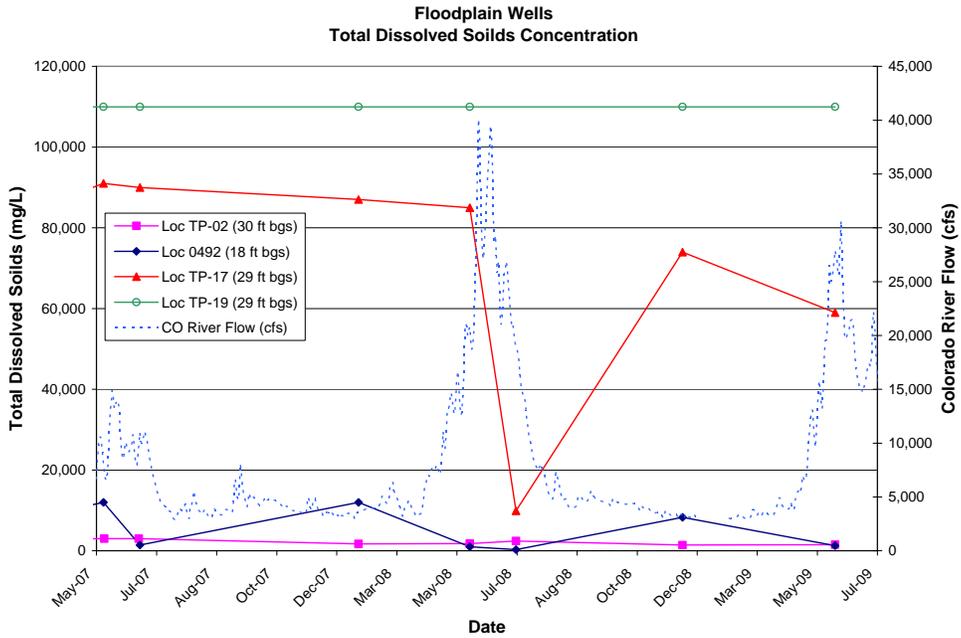


Figure 3. Floodplain Wells Time Versus TDS Concentration Plot

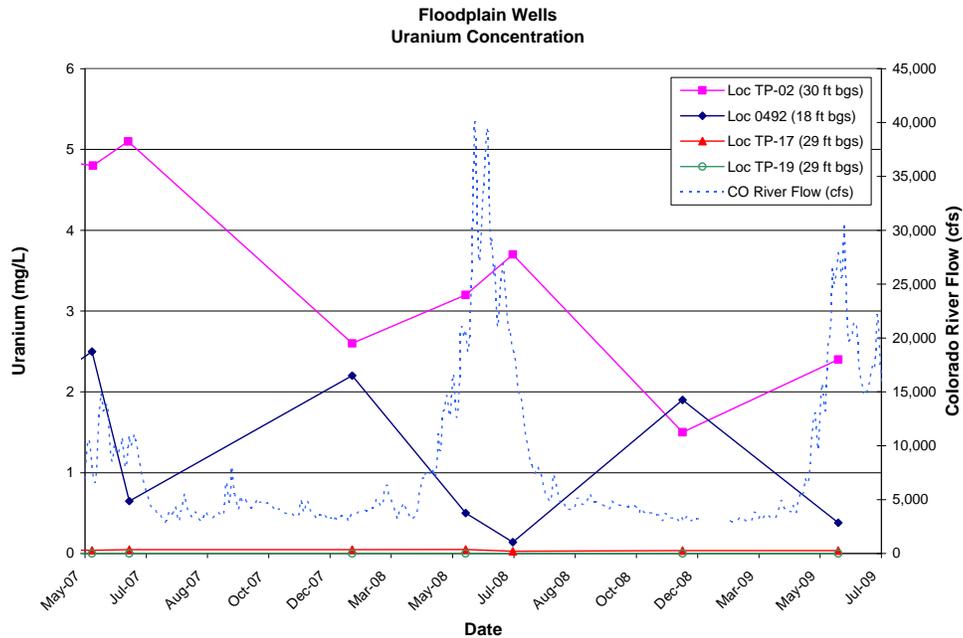


Figure 4. Floodplain Wells Time Versus Uranium Concentration Plot

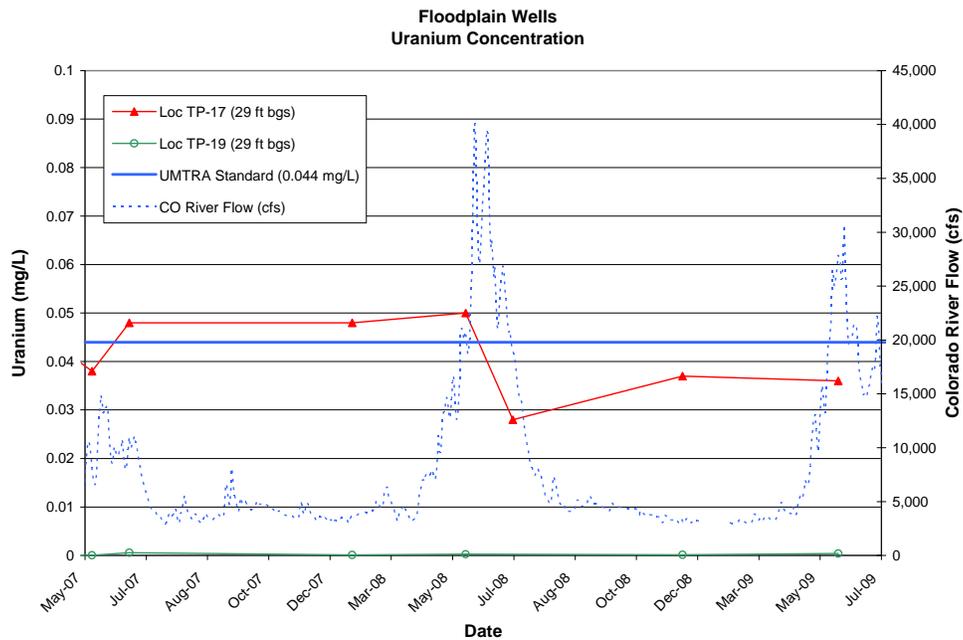


Figure 5. Floodplain Wells TP-17 and TP-19 Uranium Concentration Comparison to UMTRA Standard

### Tailings Pile Wells

The wells located on the tailings pile are all screened within the alluvial material underlying the tailings. In well 0437 (which is located upgradient of 0438 and 0439) ammonia concentrations remain below 1 mg/L, while samples collected from 0438 and 0439 had comparable concentrations (approximately 5 mg/L) as shown in Figure 6. The TDS time versus concentration plot (Figure 7) displays that all three wells are screened within the same freshwater unit in the aquifer (all three had concentrations less than 10,000 mg/L) and have not significantly changed

over the past 2 years. The uranium time versus concentration plots indicate the uranium concentrations measured in May 2009 are consistent with concentrations detected over the past 2 years (Figure 8).

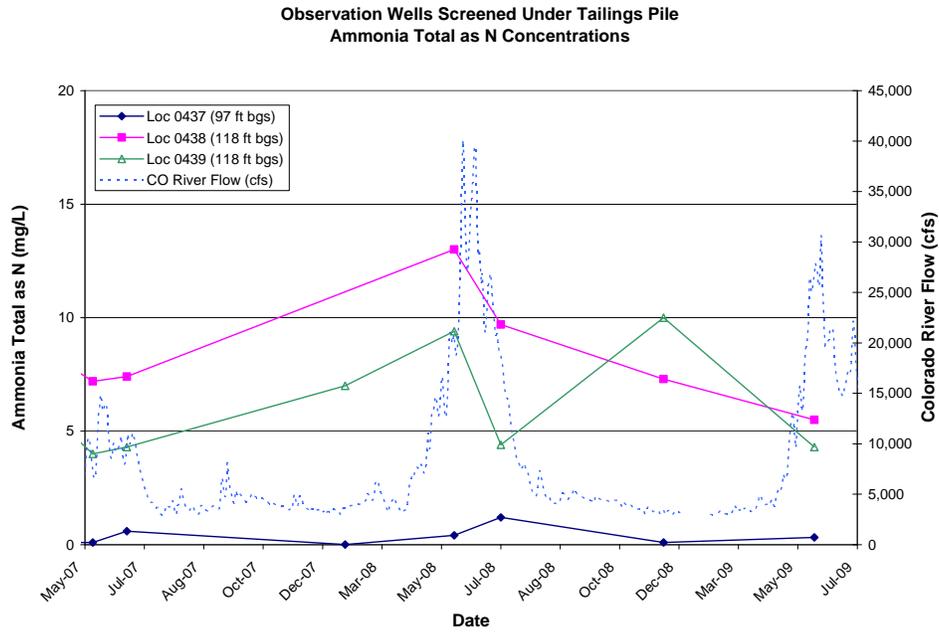


Figure 6. Tailings Pile Wells Time Versus Ammonia Total (as N) Concentration Plot

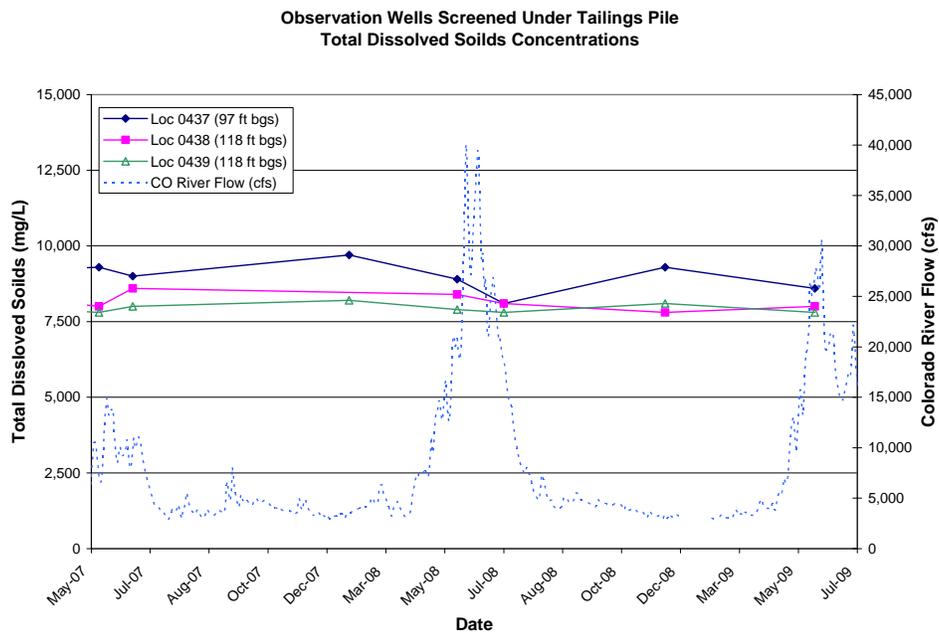


Figure 7. Tailings Pile Wells Time Versus TDS Concentration Plot

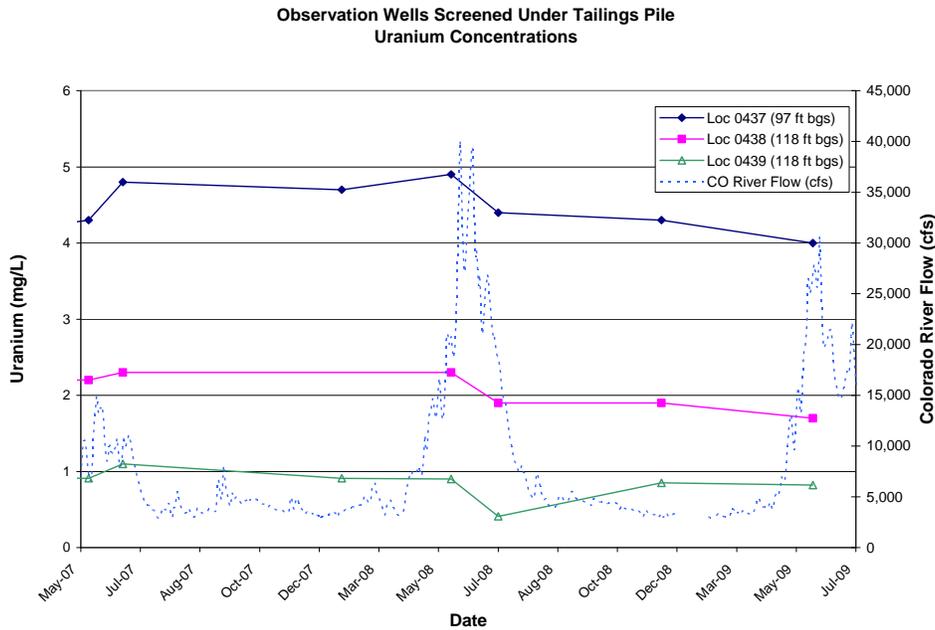


Figure 8. Tailings Pile Wells Time Versus Uranium Concentration Plot

### 1.3 Sampling and Analyses

Sampling and analyses were conducted in accordance with the *Operations, Maintenance, and Performance Monitoring Plan for the Interim Action Ground Water Treatment System, April 2008*. Please refer to the attached trip report (Attachment 1) for specific sampled locations.

The data validations indicate that the data meet the quality-control criteria specified for this project. An adequate number of duplicates were collected, and all holding times were met. One equipment blank (EB) was collected. No significant discrepancies were noted regarding sample shipping and receiving, preservation times, instrument calibration, method blanks (MBs), or matrix spikes (MSs), except as qualified or noted in the Laboratory Performance Assessment (Section 2.2).

There were six anomalous data points associated with two different locations (0401 and 0404), all of which were below the historical minimum concentrations.

According to the USGS Cisco gaging station, the mean daily Colorado River flow rates ranged from 26,200 to 28,000 cubic feet per second (cfs) during this sampling period.

## 2.0 Data Assessment Summary

This section contains the Water Sampling Field Activities Verification (Section 2.1), the Laboratory Performance Assessments (Section 2.2), the Field Analyses/Activities (Section 2.3), and Certification (Section 2.4).

## 2.1 Water Sampling Field Activities Verification

The field activities verification process for this sampling event was documented using the list provided in Appendix A. As the list exhibits, all sampling was conducted following the applicable procedures.

## 2.2 Laboratory Performance Assessment

### General Information

Report Identification No. (RIN): 0905030  
Sample Event: May 2009 Interim Action Well Field Routine Sampling Event  
Site(s): Moab, Utah  
Laboratory: ALS Laboratory Group, Fort Collins, Colorado  
Sample Data Group (SDG) No.: 0905200  
Analysis: Metals and Inorganics  
Validator: Rachel Cowan  
Review Date: June 30, 2009

This validation was performed according to the *Environmental Procedures Catalog* (STO 6), "Standard Practice for Validation of Laboratory Data," GT-9(P) (2006). The procedure was applied at Level 1, Data Deliverables Examination. The Level 1 validation was performed on 100 percent of the samples, which included review of the chain of custody (COC), case narratives, field and sample identifications, holding times, preservation, and cooler receipt. When the case narrative identified items of concern, these items were further investigated in a targeted Level 3 validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 3.

Table 3. Analytes and Methods

Analyte	Line Item Code	Preparation Method	Analytical Method
Ammonia	WCH-A-005	EPA 350.1	EPA 350.1
Chloride	MIS-A-039	SW-846 9056	SW-846 9056
Manganese	G17	SW-846 3005A	SW-846 6010B
Selenium	G14	SW-846 6020A	SW-846 6020A
Sulfate	MIS-A-044	SW-846 9056	SW-846 9056
TDS	WIC-A-033	EPA 160.1	EPA 160.1
Uranium	G1	SW-846 3005A	SW-846 6020A

### Data Qualifier Summary

Analytical results were qualified as listed in Table 4. Refer to Table 5 for an explanation of the data qualifiers applied.

Table 4. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
0905200-2 through -9, -19, -20	0218, 0226, 0228, 0401, 0404, 0437, 0438, 0439, TP-17, TP-19	Ammonia	J	MS1
0905200-2 through -9, -19, -20	0218, 0226, 0228, 0401, 0404, 0437, 0438, 0439, TP-17, TP-19	Chloride	J	RS1

Note: Flags are for detects. See reason codes below for nondetect codes.

Table 5. Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Nondetects)	Explanation
MS1	J	UJ	Results for the affected analyte(s) are regarded as estimated (J) because the MS sample was (a) from another client, (b) of dissimilar matrix, (c) a field blank or EB, or (d) not analyzed at the proper frequency as stated in the appropriate analytical method.
RS1	J	UJ	Results for the affected analyte(s) are regarded as estimated (J) because (a) the replicate sample, matrix spike duplicate, or laboratory control sample duplicate was not analyzed at the appropriate frequency for each matrix or for each data package, or (b) a field blank or EB was used for the replicate analysis.

### Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received a total of 20 samples for RIN 0905030 in one shipment, which arrived on May 22, 2009 (UPS tracking number 1Z5W1Y510192667061). The sample group was accompanied by a COC form. The COC form was checked to confirm that all of the samples were listed on the form with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The sample submittal documents, including the COC forms and the sample tickets, had no errors or omissions except the two described below as noted by ALS.

Sample 0905200-13 (location ATP-2-D) had the wrong field sample number on it for the bottle for ammonia analysis; the COC form, however, was correct.

Sample 0905200-18 had the incorrect field collection date on it; the COC form, however, was correct.

### Preservation and Holding Times

SDG 0905200 was received intact in one cooler with the temperature of 1.2°C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

### Case Narratives

The case narratives were reviewed, and all detects were found to be within quality-control procedures except for the following described below.

### **MS and Replicate Analysis**

MS sample analysis, performed at a frequency of one per 20 samples unless otherwise noted, is a measure of the ability to recover analytes in a particular matrix. Replicate sample (RS) analysis consists of matrix spike duplicate (MSD) samples and field duplicates, analyzed at a frequency of one per 20 samples per method or procedural requirements. These RSs are indicators of laboratory precision for each sample matrix.

### **Method EPA SW-846 9056, Chloride**

The chloride concentration in one of the native samples selected for the MS/MSD was above the analytical range. The method requires that duplicate samples be analyzed for every 10 samples. Although another sample was selected for MS analysis (0905200-5), no MSD was analyzed. The field duplicate passed, thus there was one RS for 20 samples. Samples 0905200-2 through -9, -19, and -20 were “J”-flagged for RS1.

### **Method EPA 350.1, Ammonia**

The ammonia samples did not have the appropriate number of MS/MSD samples as per method requirements, so samples 0905200-2 through -9, -19, and -20 were flagged for MS1. However, the field duplicate sample passed for ammonia results, so no samples had to be “J”-flagged for RS reasons.

### **Laboratory Control Sample**

A laboratory control sample (LCS) must be analyzed at the correct frequency (one LCS per 20 samples) to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. LCSs were prepared and analyzed as appropriate with the following exception.

LCSs were not reported for manganese or uranium. As a standard practice, ALS Group does not prepare LCSs for samples that are field-filtered and acidified and then run directly on the instrument without any additional sample preparation. Per national environmental laboratory accreditation requirements, an MS may be used in place of an LCS provided the acceptance samples are “J”-qualified for LCS failure.

The manganese and uranium MSs passed requirements, so no manganese or uranium samples needed to be qualified for LCS failure.

### **Method and Calibration Blanks**

MBs are analyzed to assess any contamination that may have occurred during sample preparation. Initial calibration blanks and continuing calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. Detected sample results associated with blanks results greater than the method detection limit or instrument detection limit (IDL) (depending on method requirements) were “J”-qualified when the detections were less than five times the associated blank concentration. Nondetects were not qualified. All blanks passed these criteria with the following exceptions.

All calibration blanks for selenium and uranium were greater than each analyte’s associated IDL. Each sample’s uranium and selenium results were checked, and no results were less than five times their associated blank’s concentration, so no results were flagged for this reason.

## **EBs**

An EB is a sample of analyte-free media collected from a rinse of nondedicated sampling equipment used to sample surface water. EBs are collected to document adequate decontamination of nondedicated equipment. One EB should be prepared with each preparation batch.

Seven surface water samples were collected using nondedicated equipment and, following protocol, one EB was collected and analyzed. Chloride, selenium, sulfate, and TDS results from the EB were nondetectable. However, manganese and uranium were above their respective IDLs, and were also greater than five times their respective IDLs. All surface water manganese and uranium results were checked. Since all surface water manganese and uranium results were greater than five times the EB's uranium concentrations, none needed to be qualified.

## **Completeness**

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

## **Electronic Data Deliverable File**

The Electronic Data Deliverable (EDD) files arrived on May 29, 2009. The contents of the EDD files were manually examined to verify that the sample results accurately reflected the data contained in the sample data package and that all and only the requested data were delivered.

## **2.3 Field Analyses/Activities**

The following information summarizes the field analyses and activities for the May 2009 routine sampling event.

### **Field Activities**

All monitor wells were purged and sampled using the low-flow sampling method; this method was not used at extraction wells. One EB was collected for the nondedicated surface water collection equipment, and one ground water duplicate sample was collected for the 20 samples collected during this event. There are no established regulatory criteria for the evaluation of field duplicate samples; therefore, Environmental Protection Agency (EPA) guidance for laboratory duplicates (which is conservative for field duplicates) was used to assess the precision of the field duplicates. All results met the criteria of  $\pm 20$  relative percent difference and are considered acceptable.

## **2.4 Certification**

Results were reported in correct units for all analytes requested. Appropriate contract-required laboratory qualifiers and target analyte lists were used. The reporting limits were met when possible, or an explanation of why they were not met was given in the laboratory case narrative. All analytical quality-control criteria were met except as qualified on the Ground Water Quality Data by Parameter, Surface Water Quality by Parameter, or equipment/trip blank database printouts. The meaning of data qualifiers is defined on the database printouts or defined in the EPA *Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-Media Multi-Concentration* (ILMO2.0) (1991). All data in this package are considered validated and may be treated as final results.

### 3.0 Data Presentation

This section contains the Minimums and Maximums Report (Section 3.1), the Anomalous Data Review (Section 3.2), Water Quality and Water Level Data (Sections 3.3 and 3.4, respectively), and the Blanks Report (Section 3.5).

#### 3.1 Minimums and Maximums Report

The Minimums and Maximums Report (see Appendix B) is generated by the Sample Management System used to query the SEEPro database. The DataVal program compares the new data set with historical data and lists all new data that fall outside the historical data range. Values listed in the report are further screened, and the results are not considered anomalous if: (1) identified low concentrations are the result of low detection limits; (2) the concentration detected is within 50 percent of historical minimum or maximum values; or (3) there were fewer than five historical samples for comparison.

#### 3.2 Anomalous Data Review

Based on the Minimums and Maximums Report, there were six anomalous results from two locations.

<b>Site:</b>	<u>Moab UMTRA Site</u>	<b>Sampling Date:</b>	<u>May 18-20, 2009</u>
<b>Loc. No.</b>	<b>Analyte</b>	<b>Type of Anomaly</b>	<b>Disposition</b>
<u>0401</u>	<u>manganese</u>	<u>low</u>	<u>Concentration diluted from influx of surface water during high river stage.</u>
<u>0404</u>	<u>ammonia</u>	<u>low</u>	<u>Concentration diluted from influx of surface water during high river stage.</u>
<u>0404</u>	<u>chloride</u>	<u>low</u>	<u>Concentration diluted from influx of surface water during high river stage.</u>
<u>0404</u>	<u>sulfate</u>	<u>low</u>	<u>Concentration diluted from influx of surface water during high river stage.</u>
<u>0404</u>	<u>TDS</u>	<u>low</u>	<u>Concentration diluted from influx of surface water during high river stage.</u>
<u>0404</u>	<u>uranium</u>	<u>low</u>	<u>Concentration diluted from influx of surface water during high river stage.</u>

#### 3.3 Water Quality Data

All water quality data are presented in Appendix C.

#### 3.4 Water Level Data

All water level data are presented in Appendix D.

#### 3.5 Blanks Report

Seven samples were collected using nondedicated equipment, and as a result, an EB was collected during this sampling event. The results from the EB collected during this sampling event are presented in Appendix E. As the results show, ammonia, chloride, sulfate, and TDS were below the associated detection limit. The EB manganese results were within five times the

IDL, so the results were due to potential machine error because of the proximity to the detection limit. The EB uranium result is well below the reporting limit, and all associated samples (surface water) were checked. None of the surface water uranium results were within five times the uranium concentration in the equipment blank.

**Appendix A.**  
**Water Sampling Field Activities Verification**

## Appendix A. Water Sampling Field Activities Verification

<b>Sampling Event / RIN</b>	May 2009 Routine Event/0905030	<b>Date(s) of Water Sampling</b>	May 18 to 20, 2009
<b>Date(s) of Verification</b>	July 2, 2009	<b>Name of Verifier</b>	Rachel Cowan

	<b>Response (Yes, No, NA)</b>	<b>Comments</b>
1. Is the Sampling and Analysis Plan the primary document directing field procedures? List other documents, standard operating procedures, instructions.	Yes	
	NA	
2. Were the sampling locations specified in the planning documents sampled?	No	Surface water location CR5 was sampled 40 feet downriver of its usual location because of access issues.
3. Was a pretrip calibration conducted as specified in the aforementioned documents?	Yes	
4. Was an operational check of the field equipment conducted twice daily? Did the operational checks meet criteria?	Yes Yes	
5. Were the number and types (alkalinity, temperature, electrical conductivity, pH, turbidity, dissolved oxygen, oxidation reduction potential) of field measurements taken as specified?	Yes	
6. Was the category of the well documented?	No	Well ATP-2-D did not have its category documented.
7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling? Did the water level stabilize prior to sampling? Did pH, specific conductance, and turbidity measurements stabilize prior to sampling? Was the flow rate less than 500 milliliters per minute ? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes Yes Yes Yes NA	
8. Were the following conditions met when purging a Category II well:  Was the flow rate less than 500 milliliters per minute? Was one pump/tubing volume removed prior to sampling?	Yes Yes	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	One ground water duplicate was taken for 20 samples.

## Appendix A. Water Sampling Field Activities Verification (continued)

10. Were EBs taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	Yes	Surface water samples were collected on nondedicated equipment; one EB was collected for seven surface water samples.
11. Were trip blanks prepared and included with each shipment of volatile organic compound samples?	NA	
12. Were quality-control samples assigned a fictitious site identification number?	Yes	
Was the true identity of the samples recorded on the quality assurance sample log?	Yes	
13. Were samples collected in the containers specified?	Yes	
14. Were samples filtered and preserved as specified?	Yes	
15. Were the number and types of samples collected as specified?	Yes	
16. Were COC records completed, and was sample custody maintained?	Yes	
17. Are field data sheets signed and dated by both team members?	Yes	
18. Was all other pertinent information documented on the field data sheets?	Yes	
19. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
20. Were water levels measured at the locations specified in the planning documents?	No	The water level indicator when wells ATP-2-S and ATP-2-D were being sampled was not working properly, and water levels were not recorded.

**Appendix B.**  
**Minimums and Maximums Report**

## Appendix B. Minimums and Maximums Report

### May 2009 Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: PARAGON (Fort Collins, CO)

RIN: 0905030

Comparison: All Historical Data

Report Date: 7/3/2009

Site Code	Location Code	Sample Date	Analyte	Current			Historical Maximum			Historical Minimum			Count	
				Result	Qualifiers Lab Data		Result	Qualifiers Lab Data		Result	Qualifiers Lab Data		N	N Below Detect
MOA01	0201	05/18/2009	Chloride	16			177			21	J		19	0
MOA01	0201	05/18/2009	Manganese	0.0036	B		0.11	J		0.0042	B	J	11	1
MOA01	0201	05/18/2009	Sulfate	58			433			74	J		19	0
MOA01	0201	05/18/2009	Total Dissolved Solids	210			1070			250			18	0
MOA01	0201	05/18/2009	Uranium	0.0013			0.0088			0.0017			19	0
MOA01	0401	05/20/2009	Manganese	0.62			5.4	J		1.4			11	0
MOA01	0404	05/20/2009	Ammonia Total as N	43	J		490			150	J		29	0
MOA01	0404	05/20/2009	Chloride	190	J		3300	F		790	J		29	0
MOA01	0404	05/20/2009	Manganese	1.1			5.5	F		2			10	0
MOA01	0404	05/20/2009	Selenium	0.008			0.021	F		0.0092	J		8	0
MOA01	0404	05/20/2009	Sulfate	1800			11000	F		3800	J		29	0
MOA01	0404	05/20/2009	Total Dissolved Solids	3300			21000	F		6900			28	0
MOA01	0404	05/20/2009	Uranium	0.44			3.8	F		1.3	J		29	0
MOA01	0438	05/19/2009	Ammonia Total as N	5.5	J		87.7329	QJ		7.2			17	0
MOA01	0492	05/20/2009	Manganese	0.14			6.7			0.15			8	0
MOA01	CR1	05/18/2009	Chloride	15			172			21	J		30	0
MOA01	CR1	05/18/2009	Sulfate	56			439			76	J		30	0

## Appendix B. Minimums and Maximums Report (continued)

### May 2009 Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: PARAGON (Fort Collins, CO)

RIN: 0905030

Comparison: All Historical Data

Report Date: 7/3/2009

Site Code	Location Code	Sample Date	Analyte	Current			Historical Maximum			Historical Minimum			Count	
				Result	Qualifiers Lab	Data	Result	Qualifiers Lab	Data	Result	Qualifiers Lab	Data	N	N Below Detect
MOA01	CR1	05/18/2009	Total Dissolved Solids	210			1060			240			25	0
MOA01	CR1	05/18/2009	Uranium	0.0013			0.008			0.0018			30	1
MOA01	CR3	05/20/2009	Chloride	15			466			20		J	16	0
MOA01	CR3	05/20/2009	Manganese	0.0024	B		0.15			0.0025	B	J	15	2
MOA01	CR3	05/20/2009	Sulfate	60			605			77		J	16	1
MOA01	CR3	05/20/2009	Total Dissolved Solids	200			1780			240			10	0
MOA01	CR3	05/20/2009	Uranium	0.0013			0.0516			0.0017			16	0
MOA01	CR5	05/20/2009	Chloride	15			199			21		J	28	0
MOA01	CR5	05/20/2009	Sulfate	61			443			76		J	28	1
MOA01	CR5	05/20/2009	Total Dissolved Solids	190			1110			230			21	0
MOA01	CR5	05/20/2009	Uranium	0.0013			0.0115			0.0017			28	0
MOA01	TP-17	05/20/2009	Selenium	0.00041	B		0.11			0.00045	B		8	2
MOA01	TP-19	05/20/2009	Chloride	71000		J	66000		F	52000		FQ	19	0
MOA01	TP-19	05/20/2009	Manganese	0.16	B		0.15	B		0.0076	U		8	3

Analyte concentrations presented in blue text represent the historical minimum value exceeded by the concentration presented in red, which is associated with this current sampling event.

## Appendix B. Minimums and Maximums Report (continued)

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

### LAB QUALIFIERS:

- \* Replicate analysis not within control limits.
- > Result above upper detection limit.
- A Tentatively identified compound is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and contract-required detection limit. Organic: Analyte also found in MB.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference; see case narrative.
- H Holding time expired; value suspect.
- I Increased detection limit due to required dilution.
- J Estimated.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound.
- P > 25% difference in detected pesticide or Aroclor concentrations between two columns.
- U Analytical result below detection limit.
- W Postdigestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X,Y,Z Laboratory defined qualifier; see case narrative.

### DATA QUALIFIERS:

- |   |  |   |   |   |                  |
|---|--|---|---|---|------------------|
| F | Low-flow sampling method used.                         | G | Possible grout contamination; pH > 9.         | J | Estimated value. |
| L | Less than three 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.                        |   |                  |

**Appendix C.**  
**Water Quality Data**

## Appendix C. Water Quality Data

**May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site**  
**REPORT DATE: 7/16/2009**

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
Alkalinity, Total (As CaCO3)	mg/L	0201	SL	05/18/2009	0001	0	-	0	132			#		
Alkalinity, Total (As CaCO3)	mg/L	0218	SL	05/19/2009	0001	0	-	0	120			#		
Alkalinity, Total (As CaCO3)	mg/L	0226	SL	05/20/2009	0001	1	-	1	108			#		
Alkalinity, Total (As CaCO3)	mg/L	0228	SL	05/20/2009	0001	0	-	0	80			#		
Alkalinity, Total (As CaCO3)	mg/L	0401	WL	05/20/2009	0001	18	-	18	350			#		
Alkalinity, Total (As CaCO3)	mg/L	0404	WL	05/20/2009	0001	18	-	18	336			#		
Alkalinity, Total (As CaCO3)	mg/L	0437	WL	05/19/2009	0001	97	-	97	586			#		
Alkalinity, Total (As CaCO3)	mg/L	0438	WL	05/19/2009	0001	118	-	118	824			#		
Alkalinity, Total (As CaCO3)	mg/L	0439	WL	05/19/2009	0001	118	-	118	726			#		
Alkalinity, Total (As CaCO3)	mg/L	0492	WL	05/20/2009	0001	18	-	18	372			#		
Alkalinity, Total (As CaCO3)	mg/L	ATP-2-D	WL	05/19/2009	0001	88	-	88	196			#		
Alkalinity, Total (As CaCO3)	mg/L	ATP-2-S	WL	05/19/2009	0001	38	-	38	160			#		
Alkalinity, Total (As CaCO3)	mg/L	CR1	SL	05/18/2009	0001	1	-	1	244			#		
Alkalinity, Total (As CaCO3)	mg/L	CR3	SL	05/20/2009	0001	0	-	0	110			#		
Alkalinity, Total (As CaCO3)	mg/L	CR5	SL	05/20/2009	0001	0	-	0	110			#		
Alkalinity, Total (As CaCO3)	mg/L	TP-02	WL	05/19/2009	0001	30	-	30	430			#		
Alkalinity, Total (As CaCO3)	mg/L	TP-17	WL	05/20/2009	0001	28	-	28	378			#		
Alkalinity, Total (As CaCO3)	mg/L	TP-19	WL	05/20/2009	0001	29	-	29	224			#		
Ammonia Total as N	mg/L	0201	SL	05/18/2009	0001	0	-	0	0.1	U		#	0.1	
Ammonia Total as N	mg/L	0218	SL	05/19/2009	0001	0	-	0	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	0226	SL	05/20/2009	0001	1	-	1	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	0228	SL	05/20/2009	0001	0	-	0	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	0401	WL	05/20/2009	0001	18	-	18	79		J	#	5	
Ammonia Total as N	mg/L	0401	WL	05/20/2009	0002	18	-	18	81			#	5	

## Appendix C. Water Quality Data (continued)

May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site  
 REPORT DATE: 7/16/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
										Lab	Data	QA		
Ammonia Total as N	mg/L	0404	WL	05/20/2009	0001	18	-	18	43	J	#		5	
Ammonia Total as N	mg/L	0437	WL	05/19/2009	0001	97	-	97	0.32	J	#		0.1	
Ammonia Total as N	mg/L	0438	WL	05/19/2009	0001	118	-	118	5.5	J	#		0.2	
Ammonia Total as N	mg/L	0439	WL	05/19/2009	0001	118	-	118	4.3	J	#		0.1	
Ammonia Total as N	mg/L	0492	WL	05/20/2009	0001	18	-	18	19		#		2	
Ammonia Total as N	mg/L	ATP-2-D	WL	05/19/2009	0001	88	-	88	460		#		20	
Ammonia Total as N	mg/L	ATP-2-S	WL	05/19/2009	0001	38	-	38	450		#		20	
Ammonia Total as N	mg/L	CR1	SL	05/18/2009	0001	1	-	1	0.1	U	#		0.1	
Ammonia Total as N	mg/L	CR3	SL	05/20/2009	0001	0	-	0	0.1	U	#		0.1	
Ammonia Total as N	mg/L	CR5	SL	05/20/2009	0001	0	-	0	0.1	U	#		0.1	
Ammonia Total as N	mg/L	TP-02	WL	05/19/2009	0001	30	-	30	0.44		#		0.1	
Ammonia Total as N	mg/L	TP-17	WL	05/20/2009	0001	28	-	28	1.5	J	#		0.1	
Ammonia Total as N	mg/L	TP-19	WL	05/20/2009	0001	29	-	29	3.6	J	#		0.1	
Chloride	mg/L	0201	SL	05/18/2009	0001	0	-	0	16		#		0.2	
Chloride	mg/L	0218	SL	05/19/2009	0001	0	-	0	16	J	#		0.2	
Chloride	mg/L	0226	SL	05/20/2009	0001	1	-	1	15	J	#		0.2	
Chloride	mg/L	0228	SL	05/20/2009	0001	0	-	0	15	J	#		0.2	
Chloride	mg/L	0401	WL	05/20/2009	0001	18	-	18	96	J	#		4	
Chloride	mg/L	0401	WL	05/20/2009	0002	18	-	18	100		#		10	
Chloride	mg/L	0404	WL	05/20/2009	0001	18	-	18	190	J	#		10	
Chloride	mg/L	0437	WL	05/19/2009	0001	97	-	97	1000	J	#		20	
Chloride	mg/L	0438	WL	05/19/2009	0001	118	-	118	930	J	#		20	
Chloride	mg/L	0439	WL	05/19/2009	0001	118	-	118	1300	J	#		20	
Chloride	mg/L	0492	WL	05/20/2009	0001	18	-	18	410		#		10	

## Appendix C. Water Quality Data (continued)

May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site  
 REPORT DATE: 7/16/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Chloride	mg/L	ATP-2-D	WL	05/19/2009	0001	88	-	88	51000			#	1000	
Chloride	mg/L	ATP-2-S	WL	05/19/2009	0001	38	-	38	2300			#	40	
Chloride	mg/L	CR1	SL	05/18/2009	0001	1	-	1	15			#	0.2	
Chloride	mg/L	CR3	SL	05/20/2009	0001	0	-	0	15			#	0.2	
Chloride	mg/L	CR5	SL	05/20/2009	0001	0	-	0	15			#	0.2	
Chloride	mg/L	TP-02	WL	05/19/2009	0001	30	-	30	200			#	4	
Chloride	mg/L	TP-17	WL	05/20/2009	0001	28	-	28	32000	J		#	1000	
Chloride	mg/L	TP-19	WL	05/20/2009	0001	29	-	29	71000	J		#	1000	
Dissolved Oxygen	mg/L	0201	SL	05/18/2009	0001	0	-	0	8.94			#		
Dissolved Oxygen	mg/L	0218	SL	05/19/2009	0001	0	-	0	10.61			#		
Dissolved Oxygen	mg/L	0226	SL	05/20/2009	0001	1	-	1	9.8			#		
Dissolved Oxygen	mg/L	0228	SL	05/20/2009	0001	0	-	0	9.92			#		
Dissolved Oxygen	mg/L	0401	WL	05/20/2009	0001	18	-	18	0.34			#		
Dissolved Oxygen	mg/L	0404	WL	05/20/2009	0001	18	-	18	0.24			#		
Dissolved Oxygen	mg/L	0437	WL	05/19/2009	0001	97	-	97	1.57			#		
Dissolved Oxygen	mg/L	0438	WL	05/19/2009	0001	118	-	118	0.4			#		
Dissolved Oxygen	mg/L	0439	WL	05/19/2009	0001	118	-	118	0.38			#		
Dissolved Oxygen	mg/L	0492	WL	05/20/2009	0001	18	-	18	0.51			#		
Dissolved Oxygen	mg/L	ATP-2-D	WL	05/19/2009	0001	88	-	88	1.88			#		
Dissolved Oxygen	mg/L	ATP-2-S	WL	05/19/2009	0001	38	-	38	0.16			#		
Dissolved Oxygen	mg/L	CR1	SL	05/18/2009	0001	1	-	1	8.83			#		
Dissolved Oxygen	mg/L	CR3	SL	05/20/2009	0001	0	-	0	9.72			#		
Dissolved Oxygen	mg/L	CR5	SL	05/20/2009	0001	0	-	0	9.27			#		
Dissolved Oxygen	mg/L	TP-02	WL	05/19/2009	0001	30	-	30	1.37			#		

## Appendix C. Water Quality Data (continued)

May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site  
 REPORT DATE: 7/16/2009

Parameter	Units	Location ID	Location Type	Sample Date	ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
										Lab	Data	QA		
Dissolved Oxygen	mg/L	TP-17	WL	05/20/2009	0001	28	-	28	0.54			#		
Dissolved Oxygen	mg/L	TP-19	WL	05/20/2009	0001	29	-	29	0.41			#		
Manganese	mg/L	0201	SL	05/18/2009	0001	0	-	0	0.0036	B		#	0.00012	
Manganese	mg/L	0218	SL	05/19/2009	0001	0	-	0	0.0038	B		#	0.00012	
Manganese	mg/L	0226	SL	05/20/2009	0001	1	-	1	0.0032	B		#	0.00012	
Manganese	mg/L	0228	SL	05/20/2009	0001	0	-	0	0.0021	B		#	0.00012	
Manganese	mg/L	0401	WL	05/20/2009	0001	18	-	18	0.62			#	0.00012	
Manganese	mg/L	0401	WL	05/20/2009	0002	18	-	18	0.62			#	0.00012	
Manganese	mg/L	0404	WL	05/20/2009	0001	18	-	18	1.1			#	0.00023	
Manganese	mg/L	0437	WL	05/19/2009	0001	97	-	97	0.71			#	0.00058	
Manganese	mg/L	0438	WL	05/19/2009	0001	118	-	118	2.9			#	0.00058	
Manganese	mg/L	0439	WL	05/19/2009	0001	118	-	118	2			#	0.00058	
Manganese	mg/L	0492	WL	05/20/2009	0001	18	-	18	0.14			#	0.00012	
Manganese	mg/L	ATP-2-D	WL	05/19/2009	0001	88	-	88	1.6			#	0.00058	
Manganese	mg/L	ATP-2-S	WL	05/19/2009	0001	38	-	38	0.18			#	0.0012	
Manganese	mg/L	CR1	SL	05/18/2009	0001	1	-	1	0.0053			#	0.00012	
Manganese	mg/L	CR3	SL	05/20/2009	0001	0	-	0	0.0024	B		#	0.00012	
Manganese	mg/L	CR5	SL	05/20/2009	0001	0	-	0	0.0031	B		#	0.00012	
Manganese	mg/L	TP-02	WL	05/19/2009	0001	30	-	30	0.33			#	0.00012	
Manganese	mg/L	TP-17	WL	05/20/2009	0001	28	-	28	2.4			#	0.0058	
Manganese	mg/L	TP-19	WL	05/20/2009	0001	29	-	29	0.16	B		#	0.0058	
Oxidation Reduction Potential	mV	0201	SL	05/18/2009	0001	0	-	0	119			#		
Oxidation Reduction Potential	mV	0218	SL	05/19/2009	0001	0	-	0	-36			#		
Oxidation Reduction	mV	0226	SL	05/20/2009	0001	1	-	1	-68			#		

## Appendix C. Water Quality Data (continued)

May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site  
 REPORT DATE: 7/16/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
Potential														
Oxidation Reduction Potential	mV	0228	SL	05/20/2009	0001	0	-	0	-119			#		
Oxidation Reduction Potential	mV	0401	WL	05/20/2009	0001	18	-	18	14			#		
Oxidation Reduction Potential	mV	0404	WL	05/20/2009	0001	18	-	18	38			#		
Oxidation Reduction Potential	mV	0437	WL	05/19/2009	0001	97	-	97	199			#		
Oxidation Reduction Potential	mV	0438	WL	05/19/2009	0001	118	-	118	194.7			#		
Oxidation Reduction Potential	mV	0439	WL	05/19/2009	0001	118	-	118	153.3			#		
Oxidation Reduction Potential	mV	0492	WL	05/20/2009	0001	18	-	18	-137			#		
Oxidation Reduction Potential	mV	ATP-2-D	WL	05/19/2009	0001	88	-	88	-202			#		
Oxidation Reduction Potential	mV	ATP-2-S	WL	05/19/2009	0001	38	-	38	-247			#		
Oxidation Reduction Potential	mV	CR1	SL	05/18/2009	0001	1	-	1	143			#		
Oxidation Reduction Potential	mV	CR3	SL	05/20/2009	0001	0	-	0	-9.3			#		
Oxidation Reduction Potential	mV	CR5	SL	05/20/2009	0001	0	-	0	40			#		
Oxidation Reduction Potential	mV	TP-02	WL	05/19/2009	0001	30	-	30	-118			#		
Oxidation Reduction Potential	mV	TP-17	WL	05/20/2009	0001	28	-	28	-145			#		
Oxidation Reduction Potential	mV	TP-19	WL	05/20/2009	0001	29	-	29	-192			#		
pH	s.u.	0201	SL	05/18/2009	0001	0	-	0	8.02			#		
pH	s.u.	0218	SL	05/19/2009	0001	0	-	0	8.12			#		
pH	s.u.	0226	SL	05/20/2009	0001	1	-	1	8.3			#		
pH	s.u.	0228	SL	05/20/2009	0001	0	-	0	8.52			#		
pH	s.u.	0401	WL	05/20/2009	0001	18	-	18	7.58			#		

## Appendix C. Water Quality Data (continued)

May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site  
 REPORT DATE: 7/16/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
pH	s.u.	0404	WL	05/20/2009	0001	18	-	18	7.12			#		
pH	s.u.	0437	WL	05/19/2009	0001	97	-	97	7.34			#		
pH	s.u.	0438	WL	05/19/2009	0001	118	-	118	6.75			#		
pH	s.u.	0439	WL	05/19/2009	0001	118	-	118	6.93			#		
pH	s.u.	0492	WL	05/20/2009	0001	18	-	18	8.11			#		
pH	s.u.	ATP-2-D	WL	05/19/2009	0001	88	-	88	7.49			#		
pH	s.u.	ATP-2-S	WL	05/19/2009	0001	38	-	38	8.58			#		
pH	s.u.	CR1	SL	05/18/2009	0001	1	-	1	8.02			#		
pH	s.u.	CR3	SL	05/20/2009	0001	0	-	0	8.13			#		
pH	s.u.	CR5	SL	05/20/2009	0001	0	-	0	8.13			#		
pH	s.u.	TP-02	WL	05/19/2009	0001	30	-	30	7.34			#		
pH	s.u.	TP-17	WL	05/20/2009	0001	28	-	28	7.42			#		
pH	s.u.	TP-19	WL	05/20/2009	0001	29	-	29	7.14			#		
Selenium	mg/L	0401	WL	05/20/2009	0001	18	-	18	0.0069			#	9.1E-005	
Selenium	mg/L	0404	WL	05/20/2009	0001	18	-	18	0.008			#	9.1E-005	
Selenium	mg/L	0437	WL	05/19/2009	0001	97	-	97	0.12			#	0.00091	
Selenium	mg/L	0439	WL	05/19/2009	0001	118	-	118	0.00089			#	9.1E-005	
Selenium	mg/L	TP-17	WL	05/20/2009	0001	28	-	28	0.00041	B		#	9.1E-005	
Selenium	mg/L	TP-19	WL	05/20/2009	0001	29	-	29	0.00098			#	9.1E-005	
Specific Conductance	µmhos/cm	0201	SL	05/18/2009	0001	0	-	0	358			#		
Specific Conductance	µmhos/cm	0218	SL	05/19/2009	0001	0	-	0	376			#		
Specific Conductance	µmhos/cm	0226	SL	05/20/2009	0001	1	-	1	378			#		
Specific Conductance	µmhos/cm	0228	SL	05/20/2009	0001	0	-	0	382			#		

## Appendix C. Water Quality Data (continued)

May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site  
 REPORT DATE: 7/16/2009

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
Specific Conductance	µmhos/cm	0401	WL	05/20/2009	0001	18	-	18	2485			#		
Specific Conductance	µmhos/cm	0404	WL	05/20/2009	0001	18	-	18	4245			#		
Specific Conductance	µmhos/cm	0437	WL	05/19/2009	0001	97	-	97	11241			#		
Specific Conductance	µmhos/cm	0438	WL	05/19/2009	0001	118	-	118	9336			#		
Specific Conductance	µmhos/cm	0439	WL	05/19/2009	0001	118	-	118	9831			#		
Specific Conductance	µmhos/cm	0492	WL	05/20/2009	0001	18	-	18	2764			#		
Specific Conductance	µmhos/cm	ATP-2-D	WL	05/19/2009	0001	88	-	88	128408			#		
Specific Conductance	µmhos/cm	ATP-2-S	WL	05/19/2009	0001	38	-	38	19357			#		
Specific Conductance	µmhos/cm	CR1	SL	05/18/2009	0001	1	-	1	368			#		
Specific Conductance	µmhos/cm	CR3	SL	05/20/2009	0001	0	-	0	357			#		
Specific Conductance	µmhos/cm	CR5	SL	05/20/2009	0001	0	-	0	368			#		
Specific Conductance	µmhos/cm	TP-02	WL	05/19/2009	0001	30	-	30	2355			#		
Specific Conductance	µmhos/cm	TP-17	WL	05/20/2009	0001	28	-	28	88345			#		
Specific Conductance	µmhos/cm	TP-19	WL	05/20/2009	0001	29	-	29	141968			#		
Sulfate	mg/L	0201	SL	05/18/2009	0001	0	-	0	58			#	0.5	
Sulfate	mg/L	0218	SL	05/19/2009	0001	0	-	0	59			#	0.5	
Sulfate	mg/L	0226	SL	05/20/2009	0001	1	-	1	59			#	0.5	
Sulfate	mg/L	0228	SL	05/20/2009	0001	0	-	0	59			#	0.5	
Sulfate	mg/L	0401	WL	05/20/2009	0001	18	-	18	800			#	10	
Sulfate	mg/L	0401	WL	05/20/2009	0002	18	-	18	800			#	25	
Sulfate	mg/L	0404	WL	05/20/2009	0001	18	-	18	1800			#	25	

## Appendix C. Water Quality Data (continued)

May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site  
 REPORT DATE: 7/16/2009

Parameter	Units	Location ID	Location Type	Sample Date	ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
										Lab	Data	QA		
Sulfate	mg/L	0437	WL	05/19/2009	0001	97	-	97	4000			#	50	
Sulfate	mg/L	0438	WL	05/19/2009	0001	118	-	118	3900			#	50	
Sulfate	mg/L	0439	WL	05/19/2009	0001	118	-	118	3200			#	50	
Sulfate	mg/L	0492	WL	05/20/2009	0001	18	-	18	250			#	25	
Sulfate	mg/L	ATP-2-D	WL	05/19/2009	0001	88	-	88	4400			#	250	
Sulfate	mg/L	ATP-2-S	WL	05/19/2009	0001	38	-	38	7800			#	100	
Sulfate	mg/L	CR1	SL	05/18/2009	0001	1	-	1	56			#	0.5	
Sulfate	mg/L	CR3	SL	05/20/2009	0001	0	-	0	60			#	0.5	
Sulfate	mg/L	CR5	SL	05/20/2009	0001	0	-	0	61			#	0.5	
Sulfate	mg/L	TP-02	WL	05/19/2009	0001	30	-	30	530			#	10	
Sulfate	mg/L	TP-17	WL	05/20/2009	0001	28	-	28	4300			#	250	
Sulfate	mg/L	TP-19	WL	05/20/2009	0001	29	-	29	4200			#	250	
Temperature	C	0201	SL	05/18/2009	0001	0	-	0	16.26			#		
Temperature	C	0218	SL	05/19/2009	0001	0	-	0	15.23			#		
Temperature	C	0226	SL	05/20/2009	0001	1	-	1	14.42			#		
Temperature	C	0228	SL	05/20/2009	0001	0	-	0	14.04			#		
Temperature	C	0401	WL	05/20/2009	0001	18	-	18	15.13			#		
Temperature	C	0404	WL	05/20/2009	0001	18	-	18	14.63			#		
Temperature	C	0437	WL	05/19/2009	0001	97	-	97	17.27			#		
Temperature	C	0438	WL	05/19/2009	0001	118	-	118	17.63			#		
Temperature	C	0439	WL	05/19/2009	0001	118	-	118	17.21			#		
Temperature	C	0492	WL	05/20/2009	0001	18	-	18	14.3			#		
Temperature	C	ATP-2-D	WL	05/19/2009	0001	88	-	88	17.48			#		
Temperature	C	ATP-2-S	WL	05/19/2009	0001	38	-	38	17.46			#		

## Appendix C. Water Quality Data (continued)

May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site  
 REPORT DATE: 7/16/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
										Lab	Data	QA		
Temperature	C	CR1	SL	05/18/2009	0001	1	-	1	15.75			#		
Temperature	C	CR3	SL	05/20/2009	0001	0	-	0	14.73			#		
Temperature	C	CR5	SL	05/20/2009	0001	0	-	0	16.74			#		
Temperature	C	TP-02	WL	05/19/2009	0001	30	-	30	15.76			#		
Temperature	C	TP-17	WL	05/20/2009	0001	28	-	28	12.8			#		
Temperature	C	TP-19	WL	05/20/2009	0001	29	-	29	13.41			#		
Total Dissolved Solids	mg/L	0201	SL	05/18/2009	0001	0	-	0	210			#	20	
Total Dissolved Solids	mg/L	0218	SL	05/19/2009	0001	0	-	0	190			#	20	
Total Dissolved Solids	mg/L	0226	SL	05/20/2009	0001	1	-	1	200			#	20	
Total Dissolved Solids	mg/L	0228	SL	05/20/2009	0001	0	-	0	200			#	20	
Total Dissolved Solids	mg/L	0401	WL	05/20/2009	0001	18	-	18	1400			#	40	
Total Dissolved Solids	mg/L	0401	WL	05/20/2009	0002	18	-	18	1400			#	40	
Total Dissolved Solids	mg/L	0404	WL	05/20/2009	0001	18	-	18	3300			#	80	
Total Dissolved Solids	mg/L	0437	WL	05/19/2009	0001	97	-	97	8600			#	200	
Total Dissolved Solids	mg/L	0438	WL	05/19/2009	0001	118	-	118	8000			#	200	
Total Dissolved Solids	mg/L	0439	WL	05/19/2009	0001	118	-	118	7800			#	200	
Total Dissolved Solids	mg/L	0492	WL	05/20/2009	0001	18	-	18	1300			#	40	
Total Dissolved Solids	mg/L	ATP-2-D	WL	05/19/2009	0001	88	-	88	90000			#	2000	
Total Dissolved Solids	mg/L	ATP-2-S	WL	05/19/2009	0001	38	-	38	14000			#	400	
Total Dissolved Solids	mg/L	CR1	SL	05/18/2009	0001	1	-	1	210			#	20	
Total Dissolved Solids	mg/L	CR3	SL	05/20/2009	0001	0	-	0	200			#	20	
Total Dissolved Solids	mg/L	CR5	SL	05/20/2009	0001	0	-	0	190			#	20	
Total Dissolved Solids	mg/L	TP-02	WL	05/19/2009	0001	30	-	30	1500			#	40	
Total Dissolved Solids	mg/L	TP-17	WL	05/20/2009	0001	28	-	28	59000			#	2000	

## Appendix C. Water Quality Data (continued)

May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site  
 REPORT DATE: 7/16/2009

Parameter	Units	Location ID	Location Type	Sample Date	ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Total Dissolved Solids	mg/L	TP-19	WL	05/20/2009	0001	29	-	29	110000			#	2000	
Turbidity	NTU	0201	SL	05/18/2009	0001	0	-	0	337			#		
Turbidity	NTU	0218	SL	05/19/2009	0001	0	-	0	304			#		
Turbidity	NTU	0226	SL	05/20/2009	0001	1	-	1	253			#		
Turbidity	NTU	0228	SL	05/20/2009	0001	0	-	0	296			#		
Turbidity	NTU	0401	WL	05/20/2009	0001	18	-	18	6.87			#		
Turbidity	NTU	0404	WL	05/20/2009	0001	18	-	18	8.95			#		
Turbidity	NTU	0437	WL	05/19/2009	0001	97	-	97	10.3			#		
Turbidity	NTU	0438	WL	05/19/2009	0001	118	-	118	1.34			#		
Turbidity	NTU	0439	WL	05/19/2009	0001	118	-	118	1.5			#		
Turbidity	NTU	0492	WL	05/20/2009	0001	18	-	18	4.32			#		
Turbidity	NTU	ATP-2-D	WL	05/19/2009	0001	88	-	88	18.7			#		
Turbidity	NTU	ATP-2-S	WL	05/19/2009	0001	38	-	38	9.28			#		
Turbidity	NTU	CR3	SL	05/20/2009	0001	0	-	0	301			#		
Turbidity	NTU	CR5	SL	05/20/2009	0001	0	-	0	336			#		
Turbidity	NTU	TP-02	WL	05/19/2009	0001	30	-	30	22.4			#		
Turbidity	NTU	TP-17	WL	05/20/2009	0001	28	-	28	6.44			#		
Turbidity	NTU	TP-19	WL	05/20/2009	0001	29	-	29	9.62			#		
Uranium	mg/L	0201	SL	05/18/2009	0001	0	-	0	0.0013			#	4.5E-006	
Uranium	mg/L	0218	SL	05/19/2009	0001	0	-	0	0.0012			#	4.5E-006	
Uranium	mg/L	0226	SL	05/20/2009	0001	1	-	1	0.0012			#	4.5E-006	
Uranium	mg/L	0228	SL	05/20/2009	0001	0	-	0	0.0012			#	4.5E-006	
Uranium	mg/L	0401	WL	05/20/2009	0001	18	-	18	0.33			#	9.E-005	
Uranium	mg/L	0401	WL	05/20/2009	0002	18	-	18	0.34			#	9.E-005	

## Appendix C. Water Quality Data (continued)

May 2009 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site  
 REPORT DATE: 7/16/2009

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Uranium	mg/L	0404	WL	05/20/2009	0001	18	-	18	0.44			#	9.E-005	
Uranium	mg/L	0437	WL	05/19/2009	0001	97	-	97	4			#	0.00045	
Uranium	mg/L	0438	WL	05/19/2009	0001	118	-	118	1.7			#	0.00022	
Uranium	mg/L	0439	WL	05/19/2009	0001	118	-	118	0.82			#	9.E-005	
Uranium	mg/L	0492	WL	05/20/2009	0001	18	-	18	0.38			#	9.E-005	
Uranium	mg/L	ATP-2-D	WL	05/19/2009	0001	88	-	88	0.038			#	4.5E-006	
Uranium	mg/L	ATP-2-S	WL	05/19/2009	0001	38	-	38	0.016			#	4.5E-006	
Uranium	mg/L	CR1	SL	05/18/2009	0001	1	-	1	0.0013			#	4.5E-006	
Uranium	mg/L	CR3	SL	05/20/2009	0001	0	-	0	0.0013			#	4.5E-006	
Uranium	mg/L	CR5	SL	05/20/2009	0001	0	-	0	0.0013			#	4.5E-006	
Uranium	mg/L	TP-02	WL	05/19/2009	0001	30	-	30	2.4			#	0.00045	
Uranium	mg/L	TP-17	WL	05/20/2009	0001	28	-	28	0.036			#	4.5E-005	
Uranium	mg/L	TP-19	WL	05/20/2009	0001	29	-	29	0.00038	B		#	4.5E-005	

Note: C = centigrade; Ft BLS = feet below land surface; µmhos/cm = micromhos per centimeter; mV = millivolt; NTU = nephelometric turbidity unit; SL = surface location; S.U. = standard unit; TS = treatment system; WL = well

## Appendix C. Water Quality Data (continued)

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

### LAB QUALIFIERS:

\* Replicate analysis not within control limits.  
> Result above upper detection limit.  
A Tentatively identified compound is a suspected aldol-condensation product.  
B Inorganic: Result is between the instrument detection limit and contract-required detection limit. Organic: Analyte also found in method blank.  
D Analyte determined in diluted sample.  
E Inorganic: Estimate value because of interference; see case narrative.  
H Holding time expired; value suspect.  
I Increased detection limit due to required dilution.  
J Estimated.  
N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound.  
P > 25% difference in detected pesticide or Aroclor concentrations between two columns.  
U Analytical result below detection limit.  
W Postdigestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.  
X,Y,Z Laboratory defined qualifier; see case narrative.

### DATA QUALIFIERS:

F	Low-flow sampling method used.	G	Possible grout contamination; pH > 9.	J	Estimated value.
L	Less than three 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.

**Appendix D.**  
**Water Level Data**

## Appendix D. Water Level Data

**STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site**  
**REPORT DATE: 7/3/2009**

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0401	O	3969.6	05/20/2009		9.69	3959.91	
0404	O	3968.3	05/20/2009		10	3958.3	
0437	O	4048.25	05/19/2009		88.65	3959.6	
0438	O	4054.22	05/19/2009		95.55	3958.67	
0439	O	4055.27	05/19/2009		95.71	3959.56	
0492		3967.64	05/20/2009		7.52	3960.12	
ATP-2-D	O	3967.05	05/19/2009		23.2	3943.85	
ATP-2-S	O	3967.04	05/19/2009		20.16	3946.88	
TP-02	O	3975.55	05/19/2009		15.25	3960.3	
TP-17	D	3963.69	05/20/2009		4.97	3958.72	
TP-19	D	3962.17	05/20/2009		1.97	3960.2	

Flow Codes: B = background; C = cross gradient; D = downgradient; O = on site; U = upgradient  
 Water Level Flags: D = dry  
 Ft = feet

**Appendix E.**  
**Blanks Report**

## Appendix E. Blanks Report

**BLANKS REPORT**  
**LAB: PARAGON (Fort Collins, CO)**  
**RIN: 0905030**  
**Report Date: 7/3/2009**

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab Data	Detection Limit	Uncertainty	Sample Type
Ammonia Total as N	MOA01	0999	05/18/2009	0001	mg/L	0.1	U	0.1		E
Chloride	MOA01	0999	05/18/2009	0001	mg/L	0.2	U	0.2		E
Manganese	MOA01	0999	05/18/2009	0001	mg/L	0.0017	B	0.00012		E
Selenium	MOA01	0999	05/18/2009	0001	mg/L	9.1E-005	U	9.1E-005		E
Sulfate	MOA01	0999	05/18/2009	0001	mg/L	0.5	U	0.5		E
Total Dissolved Solids	MOA01	0999	05/18/2009	0001	mg/L	20	U	20		E
Uranium	MOA01	0999	05/18/2009	0001	mg/L	3.6E-005	B	4.5E-006		E

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

**LAB QUALIFIERS:**

- \* Replicate analysis not within control limits.
- > Result above upper detection limit.
- A Tentatively identified compound is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and contract-required detection limit. Organic: Analyte also found in MB.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference; see case narrative.
- H Holding time expired; value suspect.
- I Increased detection limit due to required dilution.
- J Estimated.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound.
- P > 25% difference in detected pesticide or Aroclor concentrations between two columns.
- U Analytical result below detection limit.
- W Postdigestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X,Y,Z Laboratory defined qualifier; see case narrative.

**DATA QUALIFIERS:**

- F Low-flow sampling method used.
- L Less than three 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.

**SAMPLE TYPES:**

- E Equipment blank.

**Attachment 1.**  
**May 2009 Routine Sampling Event Trip Report**

## Attachment 1. May 2009 Routine Sampling Event Trip Report



Date: May 22, 2009  
To: Ken Pill, Marianne Mullis  
From: Elizabeth Glowiak  
Subject: May 2009 Ground Water and Surface Water Routine Sampling Event Trip Report

**Site:** Moab, Utah

**Date of Sampling Event:** May 18-20, 2009

**Team Members:** K. Pill; E. Glowiak; J. Ritchey

**RIN Number Assigned:** All samples were assigned to RIN 0905030.

**Sample Shipment:** The coolers were shipped overnight UPS to ALS Laboratory Group from Moab, Utah, on May 21, 2009 (Tracking No. 192667061).

**Number of Locations Sampled:** The May 2009 routine sampling event was conducted during the increasing portion of the of the Colorado River Cisco Gage hydrograph. Eleven monitor wells and seven surface water locations were sampled during the sampling event. Including one duplicate and one EB, a total of 20 samples were collected.

**Locations Not Sampled/Reason:** None.

**Field Variance:** Interim action monitoring wells 0401 and 0404 were added to the routine sampling list for the month of May 2009. The location of sample CR5 was collected approximately 40 feet downriver from the actual location due to access issues and high river flow.

**Quality-Control Sample Cross Reference:** The following table shows the false identifications assigned to the quality-control samples.

False ID	True ID	Sample Type	Associated Matrix	Ticket Number
2003	N/A	EB	DI Water	MAY 003
2000	0401	Duplicate from 18 ft bgs	Ground Water	MAY 020

DI = deionized; EB = equipment blank; ft bgs = feet below ground surface; ID = identification

## Attachment 1. May 2009 Routine Sampling Event Trip Report (continued)

**Location-Specific Information:** Wells 0437, 0438, and 0439 were sampled using dedicated bladder pumps. All other remaining monitor wells were sampled using a peristaltic pump and dedicated tubing. Each surface water sample was collected using a peristaltic pump and hose reel. The table below provides additional information.

Sample ID	Location	Date	Sample Depth	Comments
MAY 001	CR1	05/18/2009	Approximately 1 ft	Taken off of the old boat ramp; moderate velocity
MAY 002	0201	05/18/2009	Unknown	Taken off of main river channel
MAY 004	0437	05/19/2009	97 ft bgs	Well was not capped upon arrival
MAY 005	0438	05/19/2009	118 ft bgs	Well was not capped upon arrival
MAY 006	0439	05/19/2009	118 ft bgs	
MAY 007	ATP-2-S	05/19/2009	38 ft bgs	
MAY 008	ATP-2-D	05/19/2009	88 ft bgs	Sulfur odor; preserved samples were clear; nonpreserved samples were yellow; high turbidity
MAY 009	TP-02	05/19/2009	30 ft bgs	High turbidity
MAY 010	0218	05/19/2009	Unknown	Taken approximately 2 ft off bank; moderate velocity
MAY 011	TP-19	05/20/2009	29 ft bgs	Sulfur odor
MAY 012	0228	05/20/2009	Unknown	Taken off of main river channel; in eddy
MAY 013	TP-17	05/20/2009	28 ft bgs	Sulfur odor
MAY 014	0226	05/20/2009	1 ft	Taken off of main river channel
MAY 015	0492	05/20/2009	18 ft bgs	
MAY 016	CR3	05/20/2009	Unknown	Taken off of main river channel
MAY 017	0404	05/20/2009	18 ft bgs	
MAY 018	0401	05/20/2009	18 ft bgs	Duplicate collected
MAY 019	CR5	05/20/2009	Unknown	Taken approximately 40 ft downriver from CR5 due to access issues

ft = feet; ft bgs = feet below ground surface; ID = identification



*Surface Water Location 201*

**Attachment 1. May 2009 Routine Sampling Event Trip Report (continued)**



*Surface Water Location CR1*



*Surface Water Location CR5*

**Attachment 1. May 2009 Routine Sampling Event Trip Report (continued)**



*Surface Water Location CR3*



*Surface Water Location 0226*

**Attachment 1. May 2009 Routine Sampling Event Trip Report (continued)**



*Surface Water Location 0228*



*Surface Water Location 0218*

## Attachment 1. May 2009 Routine Sampling Event Trip Report (continued)

**Water Level Measurements:** Water level data are provided in the table below. These data represent depth to water (feet below top of casing) measurements.

Well No.	Date	Time	Depth to Water (ft btoc)
ATP-2-S	05/19/2009	13:41	20.16
ATP-2-D	05/19/2009	14:09	23.20
0401	05/20/2009	11:21	9.69
0404	05/20/2009	10:53	10.00
0437	05/19/2009	09:07	88.65
0438	05/19/2009	10:00	95.55
0439	05/19/2009	10:33	95.71
0492	05/20/2009	10:02	7.52
TP-02	05/19/2009	15:55	15.25
TP-17	05/20/2009	09:15	4.97
TP-19	05/20/2009	08:24	1.97

ft btoc = feet below top of casing

**Well Inspection Summary:** A well inspection was not conducted.

**Equipment:** The water level indicator was not working properly while sampling wells ATP-2-S and ATP-2-D.

**Regulatory:** None.

**Site Issues:** Mean daily Colorado River flows during this sampling event, according to USGS Cisco gaging station (Station No. 09180500), are provided below:

Date	Daily Mean Flow (cfs)
05/18/2009	26,200
05/19/2009	27,000
05/20/2009	28,000

**Corrective Action Required/Taken:** None