

Office of Environmental Management – Grand Junction



Moab UMTRA Project
May 2008 Validation Data Package for
the Routine Ground Water and Surface
Water Sampling

January 2009



U.S. Department
of Energy

Office of Environmental Management

**Moab UMTRA Project
May 2008 Validation Data Package for
Routine Ground Water and
Surface Water Sampling Event**

January 2009

**Moab UMTRA Project
May 2008 Routine Ground Water Sampling Event VDP**

Revision 0

Review and Approval



Kenneth G. Pill
TAC Ground Water Manager

1/12/09

Date



Joseph D. Ritchey
TAC Senior Program Manager

1/14/09

Date

REVISION HISTORY

Revision No.	Date	Reason/Basis for Revision
0	January 2009	Initial issue of Moab UMTRA Project May 2008 Routine Ground Water Sampling Event Validation Data Package.

Table of Contents

Section	Page
Acronyms.....	iv
Introduction.....	1
1.0 Sampling Event Summary	1
1.1 Summary Criteria.....	1
1.2 Executive Summary.....	5
1.3 Sampling and Analyses.....	9
2.0 Data Assessment Summary	10
2.1 Water Sampling Field Activities Verification	10
2.2 Laboratory Performance Assessment	10
2.3 Field Analyses/Activities	14
2.4 Certification	14
3.0 Data Presentation.....	14
3.1 Minimums and Maximums Report	14
3.2 Anomalous Data Review	15
3.3 Water Quality Data	15
3.4 Water Level Data	15
3.5 Blanks Report.....	15

Tables

Table 1. Locations Sampled that Exceed Selenium and Uranium Ground Water Standards	2
Table 2. Surface Water Ammonia Concentrations and Comparisons to State of Utah and Federal Criteria	3
Table 3. Analytes and Methods	11
Table 4. Data Qualifiers.....	11
Table 5. Reason Codes for Data Flags.....	11

Figure

Figure 1. Routine Ground Water and Surface Water Sampling Locations.....	4
--	---

Appendices

Appendix A. Water Sampling Field Activities Verification.....	A-1
Appendix B. Minimums and Maximums Report.....	B-1
Appendix C. Water Quality Data.....	C-1
Appendix D. Water Level Data	D-1

Attachment

Attachment 1. Routine Sampling Trip Report	
--	--

Acronyms

AWQC	ambient water quality criteria
bgs	below ground surface
BL	baseline area
btoc	below top of casing
cfs	cubic feet per second
CCV	continuing calibration verification
COC	chain of custody
CRI	reporting limit verification
DI	deionized
D.O.	dissolved oxygen
EB	equipment blank
EDD	electronic data deliverable
EPA	Environment Protection Agency
ft	feet
ICS	interference check sample
ICP	inductively coupled plasma
ICV	initial calibration verification
IDL	instrument detection limit
LCS	laboratory control samples
MDL	method detection limit
mg/L	milligrams per liter
mL/m	milliliter per minute
MS	matrix spike
MSD	matrix spike duplicate
µmhos/cm	micro mhos per centimeter
µS/cm	micro siemens per centimeter
mV	millivolt
NTU	nephelometric turbidity unit
ORP	oxidation reduction potential
PQL	practical quantitation limit
RDL	required detection limit
RIN	report identification number
RPD	relative percent difference
RS	replicate sample
SDG	sample data group
SL	surface location
Spec Cond	special conditions
SU	standard unit
TDS	total dissolved solids
TS	treatment system
Turb.	turbidity
UMTRA	Uranium Mill Tailings Remedial Action
USGS	U.S. Geological Survey
VDP	validation data package
WL	well

Introduction

This 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 UMTRA site. This data validation follows the criteria according to the *Environmental Procedures Catalog*, "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 Sampling Event Summary, which includes an Executive Summary. 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 Quality Data, Water Level Data, Minimums and Maximums Report tables, and the Trip Report. All Colorado River flow discussed in this document are measured from the USGS Cisco Gaging Station No. 09180500.

1.0 Sampling Event Summary

This section contains the Summary Criteria with a sample location map (Section 1.1), an Executive Summary (Section 1.2), and the Sampling and Analyses (Section 1.3) for the May 2008 Routine Sampling event.

1.1 Summary Criteria

Site: Moab, Utah

Sampling Period: May 14 to 15, 2008

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. This sampling event represents the second routine sampling event for 2008. 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. Contamination in the shallow alluvium beneath the tailings pile and former millsite area flows southeast toward the Colorado River. Contaminant concentrations in May 2008

did not significantly change compared to the concentrations measured in January 2008. 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 (located farther south of the well field) are provided in the Executive Summary. Similar plots are provided for analyses of samples from observation wells completed in the alluvium and located within the footprint of the tailings pile (0437, 0438, and 0439). Low ammonia concentrations in these ground water samples are consistent with previous results. However, the low concentrations are inconsistent with the site conceptual model that describes the tailings as the source of the ammonia. According to the site conceptual model, without a change in the geochemical regimen, the highest ammonia concentrations should be detected below the tailings. Sampling and analysis for the entire suite of nitrogen compounds is recommended as the nitrogen in ground water beneath the tailings may not occur in the form of ammonia.

Locations 0492 and TP-02 exhibit the most significant seasonal variations in contaminant concentration of the wells located along the river bank. These wells are not screened within the brine zone (as TP-17 and TP-19 are) and are more susceptible to changes in the Colorado River stage. The ammonia concentration of the sample collected from 0492 decreased from 120 to 21 milligrams per liter (mg/L) between January and May 2008, while the uranium concentration dropped from 2.2 to 0.5 mg/L during the same time period in response to the changes in the Colorado River flow.

Wells that exceeded water quality standards are listed in Table 1. A new cost-efficient sampling schedule was implemented during 2007. This schedule took into account when some locations, most notably 0401, 0404, and 0405, were sampled as part of monthly sampling events. So while the frequency of the sampling of these locations increased, samples were not always collected at the same time. In order to provide a more complete summary (and provide comparable information as previous routine events), these three locations were added to Table 1 despite the fact that they were not all sampled as part of this routine event. Well 0405 was sampled as part of the April 2008 monthly event, well 0404 was sampled during early February and May 2008, and well 0401 was sampled during February and June 2008. These locations will continue to be sampled in future sampling events.

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

Analyte	Standard (mg/L)	Locations Exceeding Standards
Selenium	0.01	0401 ^a (0.013), 0404 ^a (0.018), 0405 ^b (0.013), 0437 (0.09)
Uranium	0.044	0401 ^c (0.78), 0404 ^d (1.3), 0405 ^b (1.7), 0437 (4.9), 0438 (2.3), 0439 (0.9), 0492 (0.5), TP-02 (3.2)

Notes: a – Location sampled in February 2008
 b – Location sampled in April 2008
 c – Location sampled in June 2008
 d – Location sampled in May 2008 as part of the monthly event

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, site 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 2008 indicate that areas sampled are not distinguishable from background concentrations in the main channel of the Colorado River, despite the fact that some surface water samples were collected from areas of slow-moving water. These low concentrations may be attributable to either the effectiveness of the interim action or dilution from the higher river stage during the sampling time frame.

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) ¹	State/Federal AWQC-Chronic Total as N (mg/L) ²
0201	5/14/08	11.8	7.18	0.1	19.7	5.39
0226	5/14/08	13.2	8.56	0.1	1.77	0.92
0228	5/14/08	12.8	8.63	0.1	1.77	0.92
CR1	5/14/08	12.8	6.29	0.1	32.6	6.67
CR3	5/14/08	13.2	8.25	0.1	3.15	1.52
CR5	5/14/08	12.5	7.85	0.1	8.11	3.18

Notes: Loc = Location, Temp = Temperature, AWQC = Ambient Water Quality Criteria

- (1) 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)
- (2) 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 exceed the state or federal acute or chronic criteria.

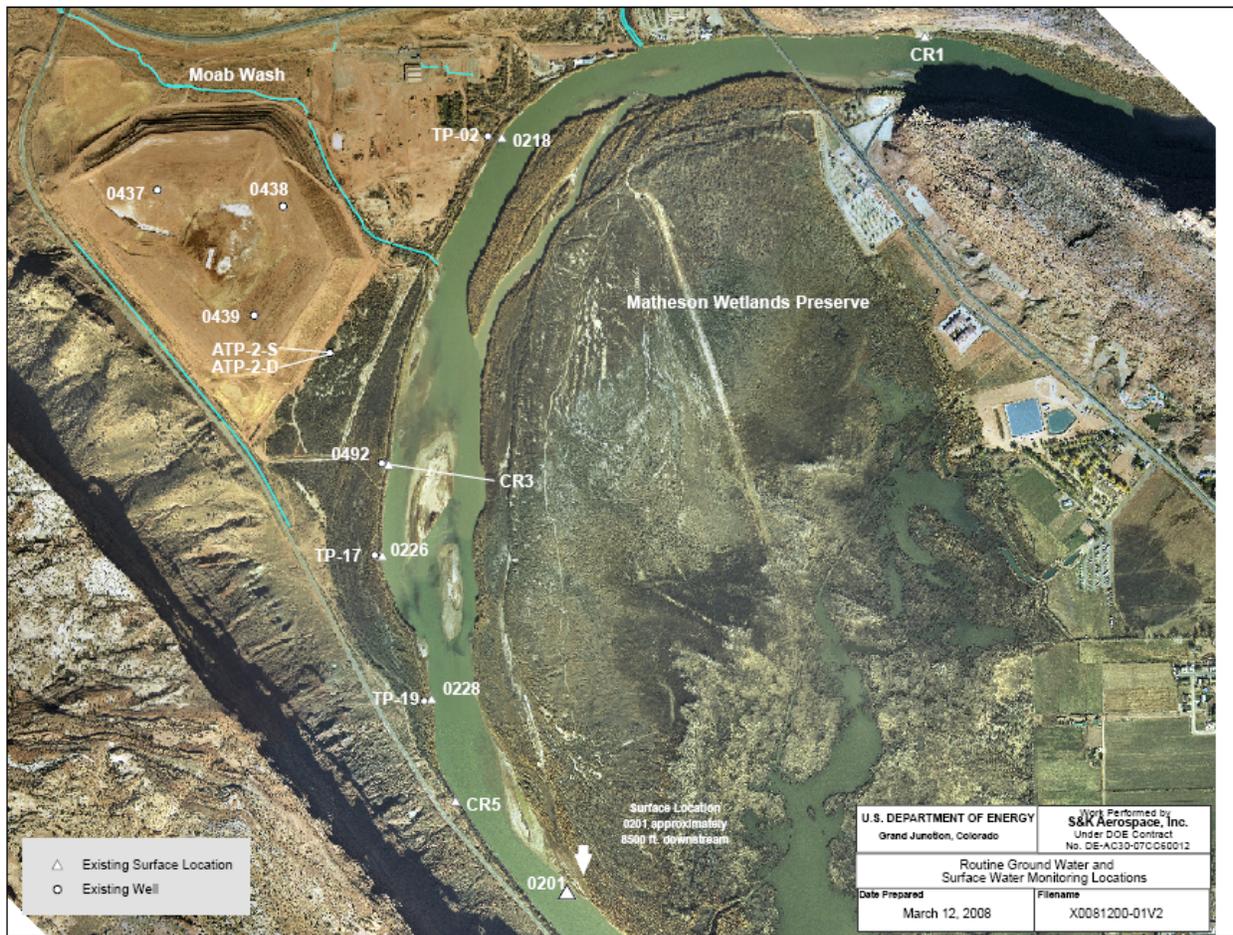


Figure 1. Routine Ground Water and Surface Water Sampling Locations
(may include locations not sampled)

1.2 Executive Summary

This validation data package (VDP) presents the validated data associated with the ground water and surface water samples collected during the May 2008 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.

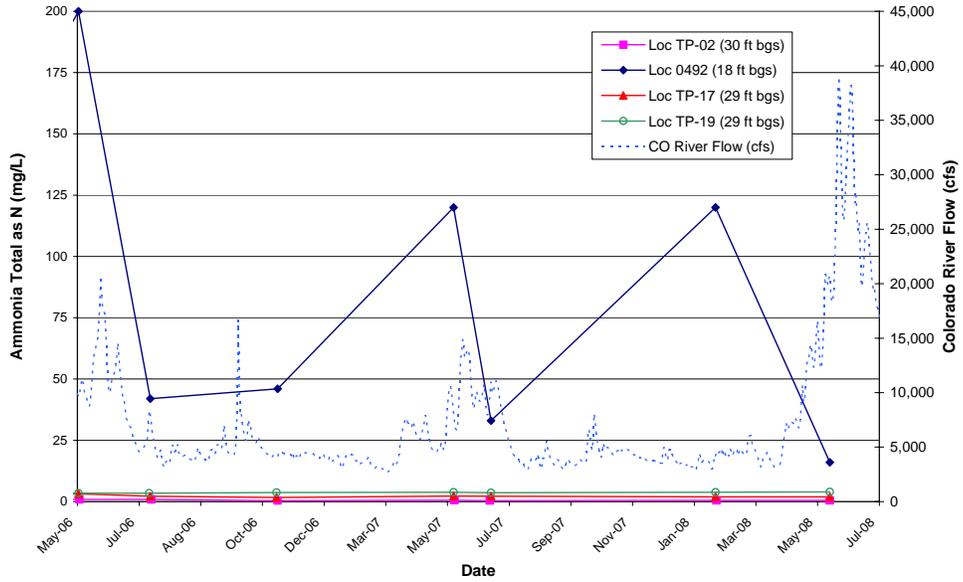
While independent of the data validation process, a brief summary of the most recent concentration trends based on the May 2008 data is provided for the wells located in the floodplain (along the bank of the Colorado River) and in the footprint of the tailings pile. Time versus concentration (ammonia, 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.

Flood Plain Wells

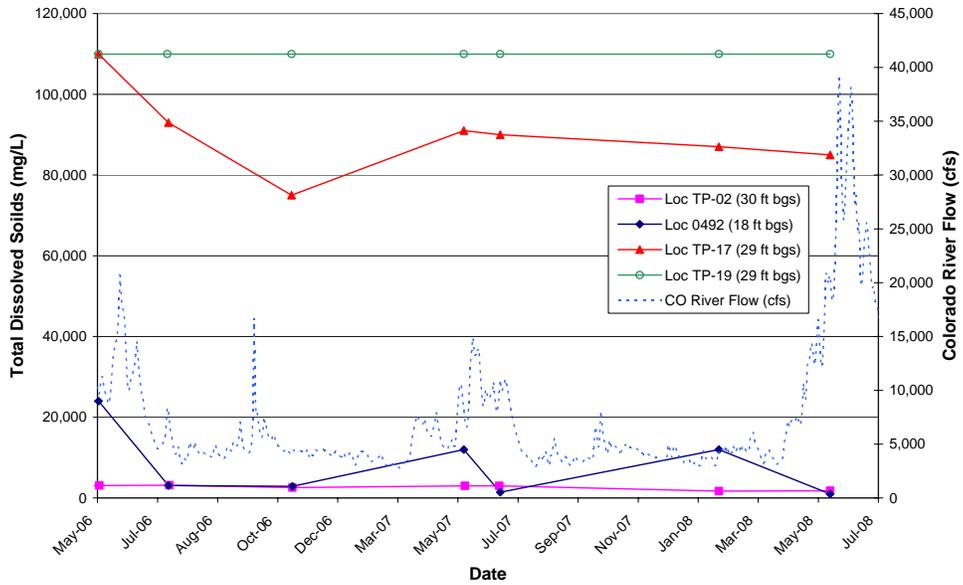
Time concentration plots were generated for wells TP-02, 0492, TP-17, and TP-19 (from north to south). These plots exhibit that samples collected from wells TP-02, TP-17, and TP-19 have historically contained low (below 5 mg/L) ammonia concentrations, while the concentration detected from well 0492 has fluctuated between approximately 20 and 200 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 is apparent again during May 2008.

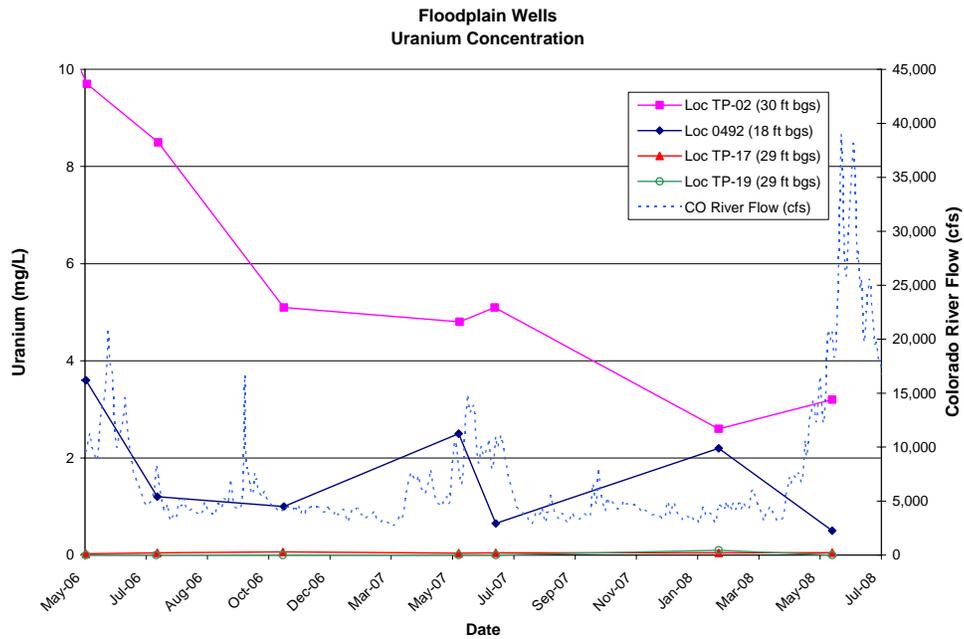
The TDS plot graphically shows that locations TP-17 and TP-19 are screened within the brine, while locations TP-02 and 0492 are above the brine-freshwater interface. Well TP-02 has consistently contained less than 6,000 mg/L TDS. Uranium concentrations have steadily declined in samples collected from wells TP-02 and 0492. 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 concentrations just above the 0.044 mg/L standard. Uranium concentrations in samples collected from well TP-02 have been generally decreasing since late 2005, while the concentrations in samples from 0492 have been fairly consistent.

Floodplain Wells
Ammonia Total as N Concentration



Floodplain Wells
Total Dissolved Solids Concentration

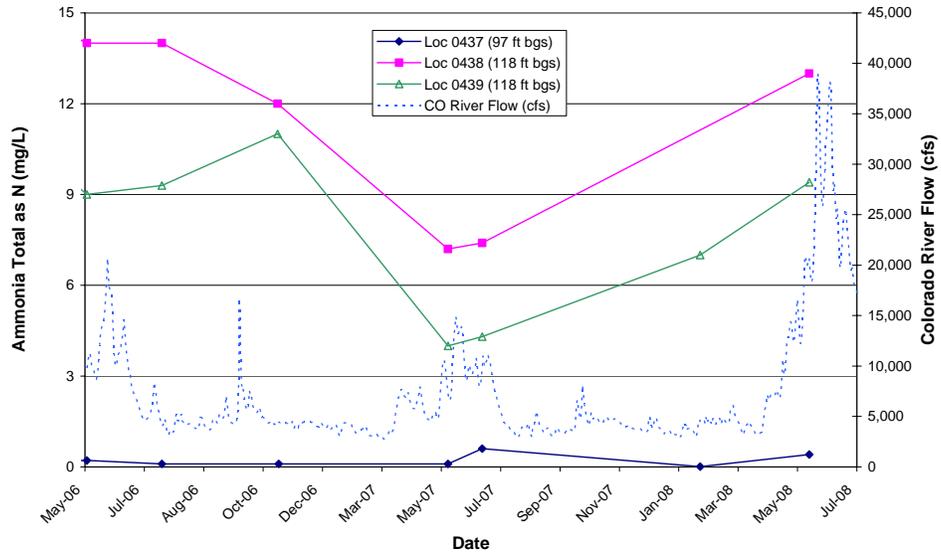




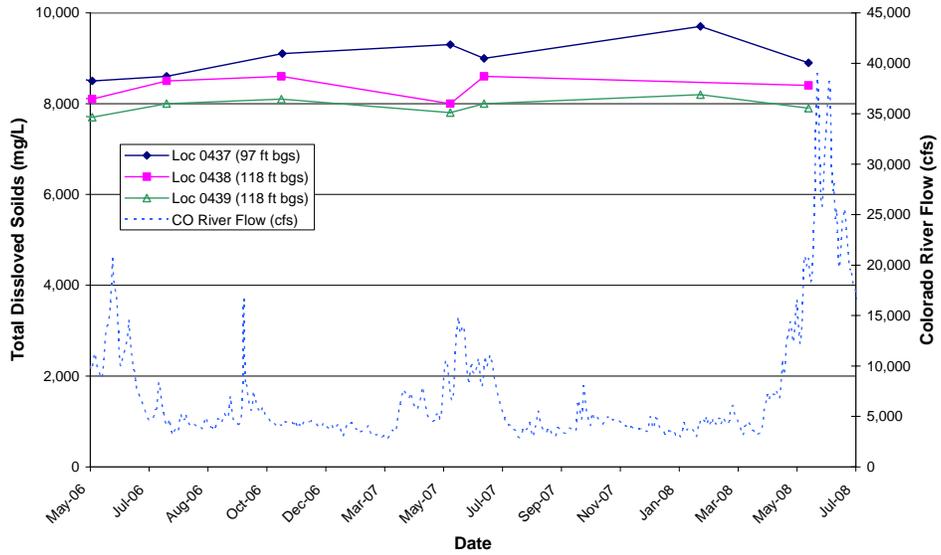
Tailings Pile Wells

The wells located in the footprint of the tailings pile are all screened within the alluvial material underlying the tailings. Ammonia concentrations in samples collected from wells 0438 and 0439 have gradually increased since May 2007. In well 0437, which is located upgradient of 0438 and 0439, ammonia concentrations remain below 1 mg/L. Sampling for the entire suite of nitrogen compounds is recommended as the nitrogen in ground water beneath the tailings may not occur in the form of ammonia. The TDS time concentration plot 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). The uranium time concentration plots indicate the uranium concentrations continue to remain consistent over the past 2 years.

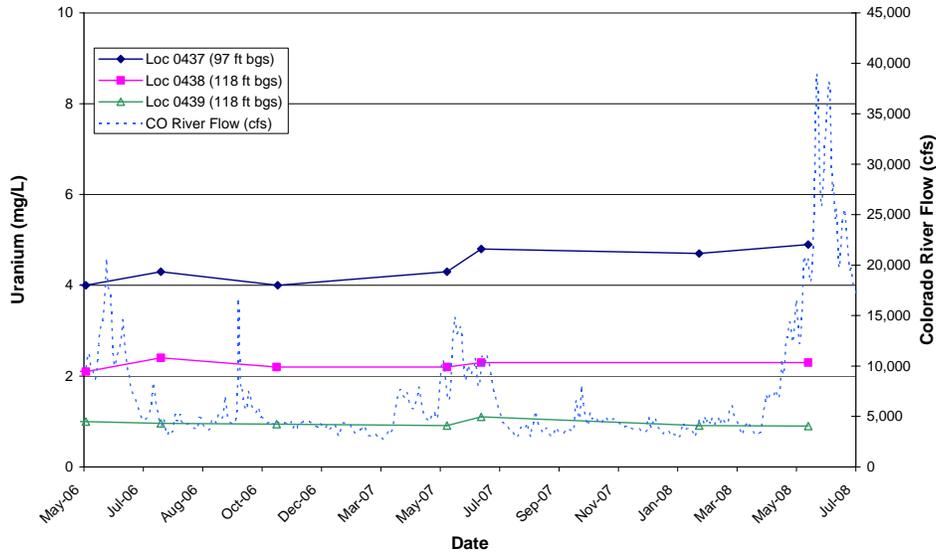
Observation Wells Screened Under Tailings Pile
Ammonia Total as N Concentrations



Observation Wells Screened Under Tailings Pile
Total Dissolved Solids Concentrations



**Observation Wells Screened Under Tailings Pile
Uranium Concentrations**



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, but no blanks were collected (as result of the use of dedicated sampling equipment), and all holding times were met. No significant discrepancies were noted regarding sample shipping and receiving, preservation times, instrument calibration, method blanks, or matrix spikes, except as qualified or noted in the Laboratory Performance Assessment (Section 2.2).

There were three locations with three anomalous data points. The selenium concentration from well location 0438 was a historic low, and the manganese concentration from well TP-19 was a historic high. Both of these locations have been sampled fewer than 10 times for these analytes and appear to be establishing an analyte concentration range. The sample collected from surface water location CR3 had a historic low manganese concentration, which is related to high river flow.

According to the U.S. Geological Survey (USGS) Cisco Gaging Station, the mean daily Colorado River flow rates varied between 19,600 and 20,900 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 following checklist. As the checklist exhibits, all sampling was conducted following the applicable procedures. This verification is provided in Appendix A.

2.2 Laboratory Performance Assessment

General Information

Report Identification Number (RIN):	0805014
Sample Event:	Routine Ground Water and Surface Water Sampling, May 2008
Site(s):	Moab, UT
Laboratory:	Paragon Analytics, Fort Collins, CO
Sample Data Group (SDG) No.:	0805140
Analysis:	Metals and Inorganics
Validator:	Rebecca Hollis
Review Date:	August 25, 2008

This validation was performed according to the *Environmental Procedures Catalog*, “Standard Practice for Validation of Laboratory Data,” GT-9(P) (2006). The procedure was applied at Level 1 on 100 percent of the samples, Data Deliverables Examination. A Level 1 validation includes review of the chain of custody (COC), case narratives, field and sample identifications, holding times, and preservation and cooler receipt. If the case narrative identifies items of concern, these items are further investigated in a targeted Level 3 validation. See attached Data Validation Worksheets for supporting documentation on the data review and 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	Prep Method	Analytical Method
Ammonia as N, NH ₃ -N	WCH-A-005	EPA 350.1	EPA 350.1
Bromide	MIS-A-038	SW-846 9056	SW-846 9056
Chloride	MIS-A-039	SW-846 9056	SW-846 9056
Manganese	GJO-17	SW-846 3005A	SW-846 6010
Selenium	GJO-14	SW-846 3005A	SW-846 6020
Sulfate	MIS-A-044	SW-846 9056	SW-846 9056
Total Dissolved Solids	WIC-A-033	MCAWW 160.1	MCAWW 160.1
Uranium	GJO-01	SW-846 3005A	SW-846 6020

Data Qualifier Summary

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

Table 4. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
0805140-4 through 9	0437, 0438, 0439, 0492, 2501, and ATP-2-D	Ammonia	J	MS1
0805140-4 through 10; -15, and -16	0437, 0438, 0439, 0492, 2501, ATP-2-D, ATP-2-S, TP-17, and TP-19	Ammonia	J	RS2
All 0805140 samples	All 0805140 locations	Chloride	J	RS2
All 0805140 samples	All 0805140 locations	TDS	J	RS2
0805140-1, -2, -3, -11, -12, and -13	0201, 0226, 0228, CR1, CR2, and CR5	All	J	B1

Note: J indicates results are estimated.

Table 5. Reason Codes for Data Flags

Reason Code	Explanation
B1	Results are considered estimated (J) because the blank frequency criteria were not met.
MS1	Results for the affected analyte(s) are regarded as estimated (J) because the matrix spike sample was (a) from another client, (b) of dissimilar matrix, (c) a field blank or equipment blank, or (d) not analyzed at the proper frequency as stated in the appropriate analytical method.
RS2	Results for the affected analyte(s) are regarded as estimated (J) because both the original result and replicate result are greater than or equal to five times the practical quantitation limit, and the relative percent difference exceeds the appropriate control limits.

Sample Shipping/Receiving

Paragon Analytics in Fort Collins, Colorado, received a total of 16 samples for RIN 0800805014 on May 16, 2008, under UPS tracking number 1Z5W1Y510191180755. All samples were accompanied by a COC form. The COC form was checked to confirm that all of the samples were listed on each 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 form and the sample tickets, had no errors or omissions.

Preservation and Holding Times

The sample shipments were received intact with the temperature within the cooler at 1.8 °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 results were found to be within quality-control procedures except for the following.

Matrix Spike and Replicate Analysis

Matrix spike (MS) sample analysis is performed as a measure of the ability to recover analytes in a particular matrix. If the native sample concentration is greater than four times the spike concentration, MS criteria do not apply. Replicate analysis consists of matrix spike duplicate (MSD) samples and field duplicates that are indicators of laboratory precision for each sample matrix.

Method EPA 350.1, Ammonia as N

For ammonia as N analysis, only one MS was performed for the 16 samples in SDG 0805140. Method 350.1 requires MSs to be analyzed for at least 10 percent of the samples. The first 10 samples following the MSD in the preparation batch were not qualified. The remaining eight samples were qualified with a “J” flag.

Method SW-846 9056, Chloride

A chloride MS and MSD check was made for the SDG 0805140 sample preparation batch. However, the native sample for the MS analyses had chloride concentrations that were greater than four times the spike concentration, so MS criteria do not apply to these samples. In addition, the associated field duplicate samples failed validation criteria, so all chloride results were J-flagged for failing the replicate check.

Method SW- 846 6020, Selenium

A selenium MS and MSD check was made for the SDG 0805140 sample preparation batch. However, the native sample for the MS analyses had selenium concentrations that were greater than four times the spike concentration, so MS criteria do not apply to these samples. In addition, the associated field duplicate samples passed validation criteria, so no selenium results were J-flagged for the replicate check.

Field Duplicate

Field duplicates are collected during actual sampling activities. They are labeled with blind IDs and submitted with the regular samples to be analyzed by Paragon Analytics. Sample 0805140-8 (2501) was the duplicate sample taken from location 0492. These samples passed the Environmental Protection Agency (EPA) criteria of ± 20 relative percent difference (RPD) for all analytes, except for ammonia, chloride, and TDS. All associated ammonia, chloride, and TDS results that were also five times the reporting limit were J-flagged.

Laboratory Control Sample

A laboratory control sample (LCS) must be analyzed at the correct frequency (one LCS per SDG) 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, Paragon Analytics does not prepare LCSs for samples that were field-filtered and acidified, and then run directly on the instrument without any additional sample preparation. Per national environmental laboratory accreditation requirements provided by the National Environmental Laboratory Accreditation Conference, an MS may be used in place of an LCS provided the acceptance criteria are as stringent. Manganese and uranium did not have LCSs, but the MS sample passed all criteria so no flags were necessary.

Equipment Blanks

Equipment blanks (EBs) are samples of analyte-free media that have been used to rinse the nondedicated sampling equipment. EBs are collected to document adequate decontamination of nondedicated equipment. EBs are considered to be preparation blanks, and one EB should be prepared with each preparation batch.

Surface Water Samples

The only samples collected on nondedicated equipment were surface water samples from locations 0201, 0226, 0228, CR1, CR3, and CR5. Since no EBs were collected, all analyses from these locations were "J" qualified for this reason.

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 June 2, 2008. The contents of the EDD

were manually examined to verify that the sample results accurately reflect 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 this sampling event period.

Field Activities

All monitor wells were purged and sampled using the low-flow sampling method; this method was not used at extraction wells. No equipment blanks were collected. One duplicate sample was collected. There are no established regulatory criteria for the evaluation of field duplicate samples; therefore, 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 ± 20 RPD and are considered acceptable, except for ammonia (27 percent), chloride (28 percent), and TDS (26 percent).

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 required detection limits (RDLs) 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*, Document Number 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 Check Sheet (Section 3.2), a table containing the 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

There was anomalous data based on the criteria described in Section 3.1 associated with this sampling event.

Site: Moab UMTRA Site Sampling Date: May 14-15, 2008

Loc. No.	Analyte	Type of Anomaly	Disposition
<u>0438</u>	<u>Selenium</u>	<u>Low</u>	<u>Fewer than 10 samples collected from this location for this analyte, still establishing range</u>
<u>CR3</u>	<u>Manganese</u>	<u>Low</u>	<u>High river flow</u>
<u>TP-19</u>	<u>Manganese</u>	<u>High</u>	<u>Fewer than 10 samples collected from this location for this analyte, still establishing range</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

No blanks were collected, so there is no report.

Appendix A. Water Sampling Field Activities Verification

Sampling Event / RIN	May Routine Event / 0805014	Date(s) of Water Sampling	May 14 and 15, 2008
Date(s) of Verification	August 20, 2008	Name of Verifier	Rachel Cowan

	Response (Yes, No, NA)	Comments
1. Is the SAP 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	Two locations were not sampled because of safety reasons and broken equipment. See attached Trip Report.
3. Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes	Two sampling events occurred sequentially, so the pretrip calibration for RIN 0805012 is valid for RIN 0805014.
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?	Yes	
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 (mL/min)? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes	
	Yes	
	Yes	Problems meeting turbidity criteria in various locations as noted in field book.
	Yes	
	NA	
8. Were the following conditions met when purging a Category II well: Was the flow rate less than 500 mL/min? Was one pump/tubing volume removed prior to sampling?	Yes	
	Yes	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	

Appendix A. Water Sampling Field Activities Verification

10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	No	There were no equipment blank samples although there were six samples that were collected using nondedicated equipment.
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 chain-of-custody (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?	Yes	

Appendix B. Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: PARAGON (Fort Collins, CO)

RIN: 0805014

Comparison: All Historical Data

Report Date: 8/19/2008

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	05/14/2008	Chloride	21		177		28			16	0	
MOA01	0201	05/14/2008	Manganese	0.0042	B	0.11	J	0.0044	B U		8	1	
MOA01	0201	05/14/2008	Sulfate	74		433		81			16	0	
MOA01	0438	05/15/2008	Selenium	0.00039	B	0.0116	QJ	0.00083	J		7	0	
MOA01	0492	05/14/2008	Uranium	0.5		6	F	0.65	J		13	0	
MOA01	CR1	05/14/2008	Chloride	21		172		25.1			27	0	
MOA01	CR1	05/14/2008	Sulfate	76		439		84.7			27	0	
MOA01	CR3	05/14/2008	Chloride	20		466		24.2			13	0	
MOA01	CR3	05/14/2008	Manganese	0.0037	B	0.15		0.01	U		12	2	
MOA01	CR3	05/14/2008	Sulfate	77		605		78.4			13	1	
MOA01	CR3	05/14/2008	Total Dissolved Solids	290		1780		570			7	0	
MOA01	CR3	05/14/2008	Uranium	0.0019		0.0516		0.0026			13	0	
MOA01	CR5	05/14/2008	Chloride	21		199		24.9			25	0	
MOA01	CR5	05/14/2008	Sulfate	76		443		81			25	1	
MOA01	CR5	05/14/2008	Uranium	0.0018		0.0115		0.002			25	0	

Appendix B. Minimums and Maximums Report

MOA01	TP-02	05/15/2008	Manganese	0.38	0.75			0.42			14	1	
MOA01	TP-02	05/15/2008	Sulfate	650	2810			680	F		26	0	
MOA01	TP-19	05/14/2008	Bromide	50	40	U	F	20	U	F	7	7	
MOA01	TP-19	05/14/2008	Manganese	0.15	B			0.08		0.0076	U	6	3

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

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- > 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
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
- U Analytical result below detection limit.
- W Post-digestion 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 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 C. Water Quality Data

General Water Quality Data by Parameter (USEE205) for site MOA01, Moab Site
REPORT DATE: 8/19/2008

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BGS)			Result	Qualifiers		Detection Limit	Uncertainty
										Lab	Data QA		
Alkalinity, Total (As CaCO3)	mg/L	0201	SL	05/14/2008	0001	0	-	0	134		0		
Alkalinity, Total (As CaCO3)	mg/L	0226	SL	05/14/2008	0001	0	-	0	120		0		
Alkalinity, Total (As CaCO3)	mg/L	0228	SL	05/14/2008	0001	0	-	0	126		0		
Alkalinity, Total (As CaCO3)	mg/L	0437	WL	05/15/2008	0001	97	-	97	598		0		
Alkalinity, Total (As CaCO3)	mg/L	0438	WL	05/15/2008	0001	118	-	118	766		0		
Alkalinity, Total (As CaCO3)	mg/L	0439	WL	05/15/2008	0001	118	-	118	700		0		
Alkalinity, Total (As CaCO3)	mg/L	0492	WL	05/14/2008	0001	18	-	18	356		0		
Alkalinity, Total (As CaCO3)	mg/L	ATP-2-D	WL	05/15/2008	0001	88	-	88	134		0		
Alkalinity, Total (As CaCO3)	mg/L	ATP-2-S	WL	05/15/2008	0001	36	-	36	206		0		
Alkalinity, Total (As CaCO3)	mg/L	CR1	SL	05/14/2008	0001	0.5	-	0.5	112		0		
Alkalinity, Total (As CaCO3)	mg/L	CR3	SL	05/14/2008	0001	0	-	0	114		0		
Alkalinity, Total (As CaCO3)	mg/L	CR5	SL	05/14/2008	0001	0	-	0	132		0		
Alkalinity, Total (As CaCO3)	mg/L	TP-02	WL	05/15/2008	0001	30	-	30	418		0		
Alkalinity, Total (As CaCO3)	mg/L	TP-17	WL	05/14/2008	0001	28	-	28	302		0		
Alkalinity, Total (As CaCO3)	mg/L	TP-19	WL	05/14/2008	0001	29	-	29	252		0		
Ammonia Total as N	mg/L	0201	SL	05/14/2008	0001	0	-	0	0.1	U	0	0.1	
Ammonia Total as N	mg/L	0226	SL	05/14/2008	0001	0	-	0	0.1	U	0	0.1	
Ammonia Total as N	mg/L	0228	SL	05/14/2008	0001	0	-	0	0.1	U	0	0.1	
Ammonia Total as N	mg/L	0437	WL	05/15/2008	0001	97	-	97	0.41		0	0.1	
Ammonia Total as N	mg/L	0438	WL	05/15/2008	0001	118	-	118	13		0	0.5	
Ammonia Total as N	mg/L	0439	WL	05/15/2008	0001	118	-	118	9.4		0	0.5	
Ammonia Total as N	mg/L	0492	WL	05/14/2008	0001	18	-	18	16		0	1	
Ammonia Total as N	mg/L	0492	WL	05/14/2008	0002	18	-	18	21		0	1	
Ammonia Total as N	mg/L	ATP-2-D	WL	05/15/2008	0001	88	-	88	540		0	20	
Ammonia Total as N	mg/L	ATP-2-S	WL	05/15/2008	0001	36	-	36	540		0	20	

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) for site MOA01, Moab Site
REPORT DATE: 8/19/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID	(Ft BGS)	Lab	Data		QA				
Ammonia Total as N	mg/L	CR1	SL	05/14/2008	0001	0.5	-	0.5	0.1	U		0	0.1	
Ammonia Total as N	mg/L	CR3	SL	05/14/2008	0001	0	-	0	0.1	U		0	0.1	
Ammonia Total as N	mg/L	CR5	SL	05/14/2008	0001	0	-	0	0.1	U		0	0.1	
Ammonia Total as N	mg/L	TP-02	WL	05/15/2008	0001	30	-	30	0.47			0	0.1	
Ammonia Total as N	mg/L	TP-17	WL	05/14/2008	0001	28	-	28	2			0	0.1	
Ammonia Total as N	mg/L	TP-19	WL	05/14/2008	0001	29	-	29	4			0	0.1	
Bromide	mg/L	0201	SL	05/14/2008	0001	0	-	0	0.2	U		0	0.2	
Bromide	mg/L	0226	SL	05/14/2008	0001	0	-	0	0.2	U		0	0.2	
Bromide	mg/L	0228	SL	05/14/2008	0001	0	-	0	0.2	U		0	0.2	
Bromide	mg/L	0437	WL	05/15/2008	0001	97	-	97	1	U		0	1	
Bromide	mg/L	0438	WL	05/15/2008	0001	118	-	118	1	U		0	1	
Bromide	mg/L	0439	WL	05/15/2008	0001	118	-	118	1	U		0	1	
Bromide	mg/L	0492	WL	05/14/2008	0001	18	-	18	0.4	U		0	0.4	
Bromide	mg/L	0492	WL	05/14/2008	0002	18	-	18	0.4	U		0	0.4	
Bromide	mg/L	ATP-2-D	WL	05/15/2008	0001	88	-	88	20	U		0	20	
Bromide	mg/L	ATP-2-S	WL	05/15/2008	0001	36	-	36	4	U		0	4	
Bromide	mg/L	CR1	SL	05/14/2008	0001	0.5	-	0.5	0.2	U		0	0.2	
Bromide	mg/L	CR3	SL	05/14/2008	0001	0	-	0	0.2	U		0	0.2	
Bromide	mg/L	CR5	SL	05/14/2008	0001	0	-	0	0.2	U		0	0.2	
Bromide	mg/L	TP-02	WL	05/15/2008	0001	30	-	30	0.4	U		0	0.4	
Bromide	mg/L	TP-17	WL	05/14/2008	0001	28	-	28	20	U		0	20	
Bromide	mg/L	TP-19	WL	05/14/2008	0001	29	-	29	50			0	20	
Chloride	mg/L	0201	SL	05/14/2008	0001	0	-	0	21			0	1	
Chloride	mg/L	0226	SL	05/14/2008	0001	0	-	0	23			0	1	
Chloride	mg/L	0228	SL	05/14/2008	0001	0	-	0	21			0	1	

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) for site MOA01, Moab Site
REPORT DATE: 8/19/2008

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BGS)			Result	Qualifiers		Detection Limit	Uncertainty
						Lab	Data	QA					
Chloride	mg/L	0437	WL	05/15/2008	0001	97	-	97	1100		0	20	
Chloride	mg/L	0438	WL	05/15/2008	0001	118	-	118	940		0	20	
Chloride	mg/L	0439	WL	05/15/2008	0001	118	-	118	1300		0	20	
Chloride	mg/L	0492	WL	05/14/2008	0001	18	-	18	240		0	4	
Chloride	mg/L	0492	WL	05/14/2008	0002	18	-	18	320		0	4	
Chloride	mg/L	ATP-2-D	WL	05/15/2008	0001	88	-	88	50000		0	1000	
Chloride	mg/L	ATP-2-S	WL	05/15/2008	0001	36	-	36	2400		0	100	
Chloride	mg/L	CR1	SL	05/14/2008	0001	0.5	-	0.5	21		0	1	
Chloride	mg/L	CR3	SL	05/14/2008	0001	0	-	0	20		0	1	
Chloride	mg/L	CR5	SL	05/14/2008	0001	0	-	0	21		0	1	
Chloride	mg/L	TP-02	WL	05/15/2008	0001	30	-	30	250		0	4	
Chloride	mg/L	TP-17	WL	05/14/2008	0001	28	-	28	48000		0	1000	
Chloride	mg/L	TP-19	WL	05/14/2008	0001	29	-	29	62000		0	1000	
Dissolved Oxygen	mg/L	0201	SL	05/14/2008	0001	0	-	0	3.34		0		
Dissolved Oxygen	mg/L	0226	SL	05/14/2008	0001	0	-	0	11.13		0		
Dissolved Oxygen	mg/L	0228	SL	05/14/2008	0001	0	-	0	9.75		0		
Dissolved Oxygen	mg/L	0437	WL	05/15/2008	0001	97	-	97	1.2		0		
Dissolved Oxygen	mg/L	0438	WL	05/15/2008	0001	118	-	118	1.21		0		
Dissolved Oxygen	mg/L	0439	WL	05/15/2008	0001	118	-	118	0.7		0		
Dissolved Oxygen	mg/L	0492	WL	05/14/2008	0001	18	-	18	0.73		0		
Dissolved Oxygen	mg/L	ATP-2-D	WL	05/15/2008	0001	88	-	88	0.27		0		
Dissolved Oxygen	mg/L	ATP-2-S	WL	05/15/2008	0001	36	-	36	0.6		0		
Dissolved Oxygen	mg/L	CR1	SL	05/14/2008	0001	0.5	-	0.5	11.46		0		
Dissolved Oxygen	mg/L	CR3	SL	05/14/2008	0001	0	-	0	9.43		0		
Dissolved Oxygen	mg/L	CR5	SL	05/14/2008	0001	0	-	0	10.34		0		

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) for site MOA01, Moab Site
REPORT DATE: 8/19/2008

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BGS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Dissolved Oxygen	mg/L	TP-02	WL	05/15/2008	0001	30	-	30	0.75			0		
Dissolved Oxygen	mg/L	TP-17	WL	05/14/2008	0001	28	-	28	0.27			0		
Dissolved Oxygen	mg/L	TP-19	WL	05/14/2008	0001	29	-	29	0.16			0		
Manganese	mg/L	0201	SL	05/14/2008	0001	0	-	0	0.0042	B		0	0.00013	
Manganese	mg/L	0226	SL	05/14/2008	0001	0	-	0	0.0038	B		0	0.00013	
Manganese	mg/L	0228	SL	05/14/2008	0001	0	-	0	0.0037	B		0	0.00013	
Manganese	mg/L	0437	WL	05/15/2008	0001	97	-	97	0.8			0	0.00064	
Manganese	mg/L	0438	WL	05/15/2008	0001	118	-	118	3			0	0.00064	
Manganese	mg/L	0439	WL	05/15/2008	0001	118	-	118	1.9			0	0.00064	
Manganese	mg/L	0492	WL	05/14/2008	0001	18	-	18	0.15			0	0.00013	
Manganese	mg/L	0492	WL	05/14/2008	0002	18	-	18	0.16			0	0.00013	
Manganese	mg/L	ATP-2-D	WL	05/15/2008	0001	88	-	88	1.8			0	0.013	
Manganese	mg/L	ATP-2-S	WL	05/15/2008	0001	36	-	36	0.2			0	0.0013	
Manganese	mg/L	CR1	SL	05/14/2008	0001	0.5	-	0.5	0.0038	B		0	0.00013	
Manganese	mg/L	CR3	SL	05/14/2008	0001	0	-	0	0.0037	B		0	0.00013	
Manganese	mg/L	CR5	SL	05/14/2008	0001	0	-	0	0.0039	B		0	0.00013	
Manganese	mg/L	TP-02	WL	05/15/2008	0001	30	-	30	0.38			0	0.00013	
Manganese	mg/L	TP-17	WL	05/14/2008	0001	28	-	28	3.5			0	0.013	
Manganese	mg/L	TP-19	WL	05/14/2008	0001	29	-	29	0.15	B		0	0.013	
Oxidation Reduction Potential	mV	0201	SL	05/14/2008	0001	0	-	0	53			0		
Oxidation Reduction Potential	mV	0226	SL	05/14/2008	0001	0	-	0	-67			0		
Oxidation Reduction Potential	mV	0228	SL	05/14/2008	0001	0	-	0	-103			0		
Oxidation Reduction Potential	mV	0437	WL	05/15/2008	0001	97	-	97	24			0		
Oxidation Reduction Potential	mV	0438	WL	05/15/2008	0001	118	-	118	65			0		

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) for site MOA01, Moab Site
REPORT DATE: 8/19/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BGS)			Result	Qualifiers		Detection Limit	Uncertainty
				Date	ID					Lab	Data QA		
Oxidation Reduction Potential	mV	0439	WL	05/15/2008	0001	118	-	118	24		0		
Oxidation Reduction Potential	mV	0492	WL	05/14/2008	0001	18	-	18	-96		0		
Oxidation Reduction Potential	mV	ATP-2-D	WL	05/15/2008	0001	88	-	88	-212		0		
Oxidation Reduction Potential	mV	ATP-2-S	WL	05/15/2008	0001	36	-	36	-46		0		
Oxidation Reduction Potential	mV	CR1	SL	05/14/2008	0001	0.5	-	0.5	112		0		
Oxidation Reduction Potential	mV	CR3	SL	05/14/2008	0001	0	-	0	-47		0		
Oxidation Reduction Potential	mV	CR5	SL	05/14/2008	0001	0	-	0	16		0		
Oxidation Reduction Potential	mV	TP-02	WL	05/15/2008	0001	30	-	30	-71		0		
Oxidation Reduction Potential	mV	TP-17	WL	05/14/2008	0001	28	-	28	-127		0		
Oxidation Reduction Potential	mV	TP-19	WL	05/14/2008	0001	29	-	29	-177		0		
pH	s.u.	0201	SL	05/14/2008	0001	0	-	0	7.18		0		
pH	s.u.	0226	SL	05/14/2008	0001	0	-	0	8.56		0		
pH	s.u.	0228	SL	05/14/2008	0001	0	-	0	8.63		0		
pH	s.u.	0437	WL	05/15/2008	0001	97	-	97	7.5		0		
pH	s.u.	0438	WL	05/15/2008	0001	118	-	118	6.81		0		
pH	s.u.	0439	WL	05/15/2008	0001	118	-	118	7.05		0		
pH	s.u.	0492	WL	05/14/2008	0001	18	-	18	8.03		0		
pH	s.u.	ATP-2-D	WL	05/15/2008	0001	88	-	88	7.74		0		
pH	s.u.	ATP-2-S	WL	05/15/2008	0001	36	-	36	8.84		0		
pH	s.u.	CR1	SL	05/14/2008	0001	0.5	-	0.5	6.29		0		
pH	s.u.	CR3	SL	05/14/2008	0001	0	-	0	8.25		0		
pH	s.u.	CR5	SL	05/14/2008	0001	0	-	0	7.85		0		
pH	s.u.	TP-02	WL	05/15/2008	0001	30	-	30	7.22		0		

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) for site MOA01, Moab Site
REPORT DATE: 8/19/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BGS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
pH	s.u.	TP-17	WL	05/14/2008	0001	28	-	28	7.23			0		
pH	s.u.	TP-19	WL	05/14/2008	0001	29	-	29	7.06			0		
Selenium	mg/L	0437	WL	05/15/2008	0001	97	-	97	0.09			0	0.0002	
Selenium	mg/L	0438	WL	05/15/2008	0001	118	-	118	0.00039	B		0	0.0002	
Selenium	mg/L	0439	WL	05/15/2008	0001	118	-	118	0.0011			0	0.0002	
Selenium	mg/L	TP-17	WL	05/14/2008	0001	28	-	28	0.00079	B		0	0.0004	
Selenium	mg/L	TP-19	WL	05/14/2008	0001	29	-	29	0.0012			0	0.0004	
Specific Conductance	umhos/cm	0201	SL	05/14/2008	0001	0	-	0	444			0		
Specific Conductance	umhos/cm	0226	SL	05/14/2008	0001	0	-	0	551			0		
Specific Conductance	umhos/cm	0228	SL	05/14/2008	0001	0	-	0	830			0		
Specific Conductance	umhos/cm	0437	WL	05/15/2008	0001	97	-	97	11153			0		
Specific Conductance	umhos/cm	0438	WL	05/15/2008	0001	118	-	118	9435			0		
Specific Conductance	umhos/cm	0439	WL	05/15/2008	0001	118	-	118	9687			0		
Specific Conductance	umhos/cm	0492	WL	05/14/2008	0001	18	-	18	2089			0		
Specific Conductance	umhos/cm	ATP-2-D	WL	05/15/2008	0001	88	-	88	126097			0		
Specific Conductance	umhos/cm	ATP-2-S	WL	05/15/2008	0001	36	-	36	18667			0		
Specific Conductance	umhos/cm	CR1	SL	05/14/2008	0001	0.5	-	0.5	473			0		
Specific Conductance	umhos/cm	CR3	SL	05/14/2008	0001	0	-	0	469			0		
Specific Conductance	umhos/cm	CR5	SL	05/14/2008	0001	0	-	0	447			0		
Specific Conductance	umhos/cm	TP-02	WL	05/15/2008	0001	30	-	30	2344			0		
Specific Conductance	umhos/cm	TP-17	WL	05/14/2008	0001	28	-	28	111729			0		
Specific Conductance	umhos/cm	TP-19	WL	05/14/2008	0001	29	-	29	141207			0		

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) for site MOA01, Moab Site
REPORT DATE: 8/19/2008

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BGS)			Result	Qualifiers		Detection Limit	Uncertainty
						Lab	Data	QA					
Sulfate	mg/L	0201	SL	05/14/2008	0001	0	-	0	74		0	0.5	
Sulfate	mg/L	0226	SL	05/14/2008	0001	0	-	0	77		0	0.5	
Sulfate	mg/L	0228	SL	05/14/2008	0001	0	-	0	75		0	0.5	
Sulfate	mg/L	0437	WL	05/15/2008	0001	97	-	97	4400		0	50	
Sulfate	mg/L	0438	WL	05/15/2008	0001	118	-	118	3800		0	50	
Sulfate	mg/L	0439	WL	05/15/2008	0001	118	-	118	3200		0	50	
Sulfate	mg/L	0492	WL	05/14/2008	0001	18	-	18	230		0	10	
Sulfate	mg/L	0492	WL	05/14/2008	0002	18	-	18	280		0	10	
Sulfate	mg/L	ATP-2-D	WL	05/15/2008	0001	88	-	88	4800		0	50	
Sulfate	mg/L	ATP-2-S	WL	05/15/2008	0001	36	-	36	7700		0	250	
Sulfate	mg/L	CR1	SL	05/14/2008	0001	0.5	-	0.5	76		0	0.5	
Sulfate	mg/L	CR3	SL	05/14/2008	0001	0	-	0	77		0	0.5	
Sulfate	mg/L	CR5	SL	05/14/2008	0001	0	-	0	76		0	0.5	
Sulfate	mg/L	TP-02	WL	05/15/2008	0001	30	-	30	650		0	10	
Sulfate	mg/L	TP-17	WL	05/14/2008	0001	28	-	28	5500		0	50	
Sulfate	mg/L	TP-19	WL	05/14/2008	0001	29	-	29	4700		0	50	
Temperature	C	0201	SL	05/14/2008	0001	0	-	0	11.8		0		
Temperature	C	0226	SL	05/14/2008	0001	0	-	0	13.17		0		
Temperature	C	0228	SL	05/14/2008	0001	0	-	0	12.78		0		
Temperature	C	0437	WL	05/15/2008	0001	97	-	97	16.79		0		
Temperature	C	0438	WL	05/15/2008	0001	118	-	118	16.85		0		
Temperature	C	0439	WL	05/15/2008	0001	118	-	118	16.19		0		
Temperature	C	0492	WL	05/14/2008	0001	18	-	18	14.44		0		
Temperature	C	ATP-2-D	WL	05/15/2008	0001	88	-	88	17.61		0		
Temperature	C	ATP-2-S	WL	05/15/2008	0001	36	-	36	17.04		0		

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) for site MOA01, Moab Site
REPORT DATE: 8/19/2008

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BGS)			Result	Qualifiers		Detection Limit	Uncertainty
						Lab	Data	QA					
Temperature	C	CR1	SL	05/14/2008	0001	0.5	-	0.5	12.84		0		
Temperature	C	CR3	SL	05/14/2008	0001	0	-	0	13.21		0		
Temperature	C	CR5	SL	05/14/2008	0001	0	-	0	12.53		0		
Temperature	C	TP-02	WL	05/15/2008	0001	30	-	30	16.5		0		
Temperature	C	TP-17	WL	05/14/2008	0001	28	-	28	14.3		0		
Temperature	C	TP-19	WL	05/14/2008	0001	29	-	29	15.19		0		
Total Dissolved Solids	mg/L	0201	SL	05/14/2008	0001	0	-	0	270		0	20	
Total Dissolved Solids	mg/L	0226	SL	05/14/2008	0001	0	-	0	270		0	20	
Total Dissolved Solids	mg/L	0228	SL	05/14/2008	0001	0	-	0	280		0	20	
Total Dissolved Solids	mg/L	0437	WL	05/15/2008	0001	97	-	97	8900		0	200	
Total Dissolved Solids	mg/L	0438	WL	05/15/2008	0001	118	-	118	8400		0	200	
Total Dissolved Solids	mg/L	0439	WL	05/15/2008	0001	118	-	118	7900		0	200	
Total Dissolved Solids	mg/L	0492	WL	05/14/2008	0001	18	-	18	1000		0	40	
Total Dissolved Solids	mg/L	0492	WL	05/14/2008	0002	18	-	18	1300		0	40	
Total Dissolved Solids	mg/L	ATP-2-D	WL	05/15/2008	0001	88	-	88	97000		0	2000	
Total Dissolved Solids	mg/L	ATP-2-S	WL	05/15/2008	0001	36	-	36	15000		0	400	
Total Dissolved Solids	mg/L	CR1	SL	05/14/2008	0001	0.5	-	0.5	290		0	20	
Total Dissolved Solids	mg/L	CR3	SL	05/14/2008	0001	0	-	0	290		0	20	
Total Dissolved Solids	mg/L	CR5	SL	05/14/2008	0001	0	-	0	290		0	20	
Total Dissolved Solids	mg/L	TP-02	WL	05/15/2008	0001	30	-	30	1800		0	40	
Total Dissolved Solids	mg/L	TP-17	WL	05/14/2008	0001	28	-	28	85000		0	2000	
Total Dissolved Solids	mg/L	TP-19	WL	05/14/2008	0001	29	-	29	110000		0	2000	
Turbidity	NTU	0201	SL	05/14/2008	0001	0	-	0	458		0		
Turbidity	NTU	0226	SL	05/14/2008	0001	0	-	0	515		0		
Turbidity	NTU	0228	SL	05/14/2008	0001	0	-	0	428		0		

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) for site MOA01, Moab Site
 REPORT DATE: 8/19/2008

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BGS)			Result	Qualifiers			Detection Limit	Uncertainty
										Lab	Data	QA		
Turbidity	NTU	0437	WL	05/15/2008	0001	97	-	97	7.77			0		
Turbidity	NTU	0438	WL	05/15/2008	0001	118	-	118	5.12			0		
Turbidity	NTU	0439	WL	05/15/2008	0001	118	-	118	3.94			0		
Turbidity	NTU	0492	WL	05/14/2008	0001	18	-	18	4.29			0		
Turbidity	NTU	ATP-2-D	WL	05/15/2008	0001	88	-	88	201			0		
Turbidity	NTU	ATP-2-S	WL	05/15/2008	0001	36	-	36	9.82			0		
Turbidity	NTU	CR1	SL	05/14/2008	0001	0.5	-	0.5	354			0		
Turbidity	NTU	CR3	SL	05/14/2008	0001	0	-	0	476			0		
Turbidity	NTU	CR5	SL	05/14/2008	0001	0	-	0	353			0		
Turbidity	NTU	TP-02	WL	05/15/2008	0001	30	-	30	71.7			0		
Turbidity	NTU	TP-17	WL	05/14/2008	0001	28	-	28	8.96			0		
Turbidity	NTU	TP-19	WL	05/14/2008	0001	29	-	29	17.2			0		
Uranium	mg/L	0201	SL	05/14/2008	0001	0	-	0	0.0019			0	3.5E-006	
Uranium	mg/L	0226	SL	05/14/2008	0001	0	-	0	0.0018			0	3.5E-006	
Uranium	mg/L	0228	SL	05/14/2008	0001	0	-	0	0.0018			0	3.5E-006	
Uranium	mg/L	0437	WL	05/15/2008	0001	97	-	97	4.9			0	0.00035	
Uranium	mg/L	0438	WL	05/15/2008	0001	118	-	118	2.3			0	0.00018	
Uranium	mg/L	0439	WL	05/15/2008	0001	118	-	118	0.9			0	7.E-005	
Uranium	mg/L	0492	WL	05/14/2008	0001	18	-	18	0.5			0	7.E-005	
Uranium	mg/L	0492	WL	05/14/2008	0002	18	-	18	0.5			0	7.E-005	
Uranium	mg/L	ATP-2-D	WL	05/15/2008	0001	88	-	88	0.016			0	1.8E-005	
Uranium	mg/L	ATP-2-S	WL	05/15/2008	0001	36	-	36	0.016			0	3.5E-006	
Uranium	mg/L	CR1	SL	05/14/2008	0001	0.5	-	0.5	0.0019			0	3.5E-006	
Uranium	mg/L	CR3	SL	05/14/2008	0001	0	-	0	0.0019			0	3.5E-006	
Uranium	mg/L	CR5	SL	05/14/2008	0001	0	-	0	0.0018			0	3.5E-006	

Appendix C. Water Quality Data

General Water Quality Data by Parameter (USEE205) for site MOA01, Moab Site
REPORT DATE: 8/19/2008

Parameter	Units	Location ID	Location Type	Sample		Depth Range (Ft BGS)			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID					Lab	Data	QA		
Uranium	mg/L	TP-02	WL	05/15/2008	0001	30	-	30	3.2			0	0.00035	
Uranium	mg/L	TP-17	WL	05/14/2008	0001	28	-	28	0.05			0	1.8E-005	
Uranium	mg/L	TP-19	WL	05/14/2008	0001	29	-	29	0.00024	B		0	1.8E-005	

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

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- > 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
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
- U Analytical result below detection limit.
- W Post-digestion 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 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.

Attachment 1. Routine Ground Water Sampling Event



Date: May 27, 2008
To: Ken Pill, M. Mullis
From: E.M. Glowiak
Subject: Routine Sampling Trip Report

Site: Moab – Ground Water and Surface Water Sampling Event – May 2008

Date of Sampling Event: May 14-15, 2008

Team Members: K. Pill, J. Ritchey, E. Glowiak

RIN Number Assigned: All samples were assigned to RIN 0805014

Sample Shipment: The coolers were shipped overnight UPS to Paragon Analytics, Inc. from Moab, Utah, on May 15, 2008 (Tracking No. 191480755).

Number of Locations Sampled: The May Routine Sampling was conducted during the ascending limb of the hydrograph prior to the peak runoff. Nine monitor wells and six surface water locations were sampled during the May Routine Sampling Event. Including one duplicate, a total of 16 samples were collected.

Locations Not Sampled/Reason: Surface water location 0204 was not sampled due to access issues.

Field Variance: None.

Quality-Control Sample Cross Reference: Following are the blind identifications assigned to the quality-control samples:

False ID	True ID	Sample Type	Associated matrix	Ticket Number
2501	0492	Duplicate from 18 ft bgs	Ground Water	NFC 670

Notes: ft bgs = feet below ground surface

Attachment 1. Routine Ground Water Sampling Event

Location Specific Information: Wells 0437 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
NFC 662	CR1	05/14/2008	~ 6"	Taken off of the old boat ramp, approximately 6-in. deep, rapid flow
NFC 669	0492	05/14/2008	18 ft bgs	Duplicate collected
NFC 671	CR3	05/14/2008	Unknown	Taken 5 ft off bank, very turbid, rapid flow
NFC 667	TP-17	05/14/2008	28 ft bgs	Sulfur odor, small black flecks in water
NFC 668	0226	05/14/2008	Unknown	Taken 2 ft off bank, very turbid, wood debris
NFC 665	TP-19	05/14/2008	29 ft bgs	Sulfur odor, water is gray
NFC 666	0228	05/14/2008	Unknown	Taken 1 ft off bank, very high flow, very turbid
NFC 707	TP-02	05/15/2008	30 ft bgs	High turbidity
NFC 704	ATP-2-S	05/15/2008	36 ft bgs	
NFC 705	ATP-2-D	05/15/2008	88 ft bgs	Sulfur odor, preserved samples were clear, nonpreserved samples were yellow, high turbidity
NFC 664	CR5	05/14/2008	Unknown	Taken 2 ft off bank, slow flow through bank debris (tamarisk)
NFC 663	0201	05/14/2008	Unknown	Taken 1.5 ft off bank, slow water flow
NFC 702	0437	05/15/2008	97 ft bgs	
NFC 701	0438	05.15.2008	118 ft bgs	
NFC703	0439	05/15/2008	118 ft bgs	



Location CR1.

Attachment 1. Routine Ground Water Sampling Event



Location 201.



Location CR5.

Attachment 1. Routine Ground Water Sampling Event



Location CR3.



Location 0226.

Attachment 1. Routine Ground Water Sampling Event



Location 0228.

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

Well No.	Date	Time	Depth to Water (ft btoc)
ATP-2-S	05/15/2008	10:50	9.84
ATP-2-D	05/15/2008	11:11	11.90
0437	05/15/2008	09:39	88.94
0438	05/15/2008	09:03	95.64
0439	05/15/2008	10:05	96.47
0492	05/14/2008	16:02	9.88
TP-02	05/15/2008	14:18	16.62
TP-17	05/14/2008	15:13	6.97
TP-19	05/14/2008	13:32	4.79

Well Inspection Summary: A well inspection was not conducted.

Equipment: No issues.

Regulatory: None.

Site Issues: According to the USGS Cisco Gaging Station (Station No. 09180500), the mean daily Colorado River flows during this sampling event are provided below:

<u>Date</u>	Daily Mean Flow (cfs)
05/14/2008	20,900
05/15/2008	19,600

Corrective Action Required/Taken: Develop well TP-02.