

Office of Environmental Management – Grand Junction



Moab UMTRA Project
August 2010 Phase 2 Uranium Plume
Delineation Investigation
Validation Data Package

November 2010



U.S. Department
of Energy

Office of Environmental Management

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August 2010 Phase 2 Uranium Plume Delineation Investigation VDP**

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Review and Approval

 11/22/10

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 11/22/10

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Acronyms and Abbreviations

bgs	below ground surface
CCB	continuing calibration blank
CCV	continuing calibration verification
cfs	cubic feet per second
COC	chain of custody
CRI	reporting limit verification
EB	equipment blank
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ft	feet
IA	interim action
ICP	inductively coupled plasma
ISCA	interference check sample
ICSAB	interference check sample
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
RL	reporting limit
RPD	relative percent difference
SD	serial dilution
SDG	sample data group
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 “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 1.0 presents the Summary Criteria, the Sampling Event Summary, and the Sampling and Analysis. Section 2.0 provides the Data Assessment Summaries, including the Field Activity Verification, Laboratory Performance Assessment, Field Analyses/Activities description, and the Certification. All flagged data, and the reasons for the applicable flags, are also presented in Section 2.0. The Data Presentation is contained in Section 3.0, which includes a summary of the anomalous data generated by the validation process. The appendices contain the Water Sampling Field Activities Verification, Water Quality Data, Water Level Data and the Blanks Report. Attachment 1 contains the trip report. All Colorado River flow discussed in this document is measured from the U.S. Geological Survey (USGS) Cisco gauging station number 09180500.

This validation data package (VDP) presents the results of the August 2010 sampling event completed from July 15 through August 24, 2010, in which grab ground water samples were collected at various depths from eight locations in the vicinity of the uranium plume. Section 1.0 contains the Summary Criteria with a sample location map (Section 1.1), the Sampling Event Summary (Section 1.2), and the Sampling and Analyses (Section 1.3) for this August 2010 uranium plume sampling event.

1.1 Summary Criteria

Sampling Period: July 15 through August 24, 2010

The purpose of this sampling was to collect ground water samples from a series of eight borings as part of Phase 2 of the uranium plume delineation investigation (Figure 1).

1. As a result of this sampling event, is there any indication of anomalous data that may be related to well field pump rate changes, river flow, or other known causes?

No. These samples were collected following procedures in the Uranium Plume Delineation Work Plan. The area of the site where these samples were collected was not impacted by well field activities or changes in the Colorado River stage.

There are no anomalous data associated with this event due to the fact that these samples represent the first samples collected at these locations. Due to the nature of this sampling event, it was not possible to generate a Minimums and Maximums Report.

2. Were all interim action (IA) well field pumps operating within the planned parameters?

Not applicable to this sampling event.

3. Was the evaporation pond functioning properly?

Not applicable to this sampling event.

4. Were all proposed well (ground water) and surface water locations sampled during this event?

Yes.

5. Were there any site activities that have impacted or may impact the IA system?

Not applicable to this sampling event.

1.2 Sampling Event Summary

This VDP presents the validated data associated with the ground water samples collected during the August 2010 Phase 2 of the Uranium Plume Delineation Investigation 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 3 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 not generated due to the fact that this event represents the first time these locations were sampled.

Uranium Plume Sampling Results

During Phase 2, a total of eight borings were drilled with a Geoprobe to further delineate the uranium plume to supplement borings drilled during Phase 1. Ground water grab samples were collected from various depths at each location, and were submitted for uranium analysis only. The results from both Phases 1 and 2 are shown on Figure 1.

Uranium concentrations from the Phase 2 locations ranged from 0.0006 to 8.8 milligrams per liter (mg/L). The highest concentration was measured in the sample from location UPD-12, which is located 430 feet (ft) to the east of monitoring well 0411, at a depth of 15 ft below ground surface (bgs). In general, taking into consideration the Phase 1 and 2 results, there appears to be discrete areas of elevated uranium as opposed to one large plume.

Surface Water Sampling Results

There were no surface water locations sampled during this sampling event.



Figure 1. Map of the Phase 2 Uranium Plume Investigation Sample Locations (also includes Phase I locations not sampled)

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*, (DOE-EM/GJ1220), April 2008. Please refer to the attached trip report (Attachment 1) for specific information regarding the sampled locations.

The data validations indicate that the data meet the quality-control criteria specified for this project. Both an equipment blank (EB) and a duplicate were collected. All samples were analyzed within their prescribed holding times. 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).

According to the USGS Cisco gauging station number 09180500, the mean daily Colorado River flow during the sampling period ranged from 2,700 to 5,530 cubic feet per second (cfs).

2.0 Data Assessment Summaries

This section contains the Water Sampling Field Activities Verification (Section 2.1), the Laboratory Performance Assessment (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 checklist in Appendix A.

2.2 Laboratory Performance Assessment

General Information

Report Identification Number (RIN):	1008051
Sample Event:	August 2010 Phase 2 Uranium Plume Sampling
Site(s):	Moab, Utah
Laboratory:	ALS Laboratory Group, Fort Collins, Colorado
Sample Data Group (SDG) Number:	1008339
Analysis:	Uranium
Validator:	Rachel Cowan
Review Date:	November 3, 2010

This validation was performed according to “Standard Practice for Validation of Laboratory Data,” GT-9(P) (2006). The procedure was applied at Level 3 on 100 percent of the samples, Data Deliverables Examination. 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 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Preparation Method	Analytical Method
Uranium	G1	SW-846 3005A	SW-846 6020A

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to Table 3 for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1008339-21	UPD-9-M	Uranium	J	B1, MS1

J indicates results are estimated and becomes a UJ for analytical results below the detection limit.

Table 3. Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-Detects)	Explanation
B1	J	J	Blank frequency criteria were not met.
MS1	J	UJ	MS frequency criteria were not met.

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received a total of 21 samples for RIN 1008051 in one shipment. SDG 1008339 of 21 samples arrived on August 26, 2010 (tracking number 0191586338). The SDG was accompanied by a chain of custody (COC) form. The COC forms were checked to confirm that all of the samples were listed on the forms 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.

Preservation and Holding Times

SDG 1008339 was received intact in one cooler with the temperature within the cooler being at ambient temperature, 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.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear curve. Compliance requirements for continuing calibration checks are established to ensure the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. Calibration standards were prepared from independent sources. In addition, for inductively coupled plasma (ICP) analytes (uranium), reporting limit verifications (CRIs) verify the linearity of the calibration curve near

the reporting limit (RL). For ICP-mass spectrometry analytes (uranium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. And also for ICP- mass spectrometry, internal standards are analyzed to indicate stability of the instruments.

Method SW-846 6020A, Uranium

The uranium calibrations were performed on August 30, 2010. The initial calibrations for each SDG were performed using eight calibration standards and one blank, resulting in calibration curves with correlation coefficient values greater than 0.995. The calibration curve intercepts for uranium were positive, and were less than the instrument detection level (IDL).

Initial calibration verification samples and continuing calibration verification (CCV) samples were analyzed at the required frequency, resulting in three CCV samples. All calibration checks met the acceptance criteria. CRIs were made at the required frequency to verify the linearity of the calibration curve near the RL.

The CRI verifications were within the acceptance criteria range. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries were stable and within acceptable ranges.

Method and Calibration Blanks

MBs are analyzed to assess any contamination that may have occurred during sample preparation. Both initial calibration and continuing calibration blanks (CCBs) are analyzed to assess instrument contamination prior to and during sample analysis. Detected sample results associated with blanks results greater than the IDL are to be “U”-qualified when the detections were less than five times the blank concentration. Non-detects are not to be qualified.

All the CCBs results were less than the uranium IDL.

ICP Interference Check Sample Analysis

ICP interference check samples (ICSA and ICSAB) are analyzed to verify the instrument inter-element and background correction factors. For the uranium analyses, the ICSA values for calcium, magnesium, aluminum, and iron were not provided for verification of the instrument’s inter-element and background correction factors. The percent recoveries of the ICSAB samples were provided and were acceptable for all uranium analyses. All other check sample results met the acceptance criteria, so no qualification of the sample results was deemed necessary.

MS Analysis

MS samples were prepared and analyzed for all analytes as a measure of method performance in the sample matrix. Laboratory spike standards are prepared from independent sources. The MS recoveries met the recovery and precision criteria for all uranium analyses. An MS sample must be prepared for every 20 samples. Since only one MS was prepared for 21 samples, sample 1008339-21 was “J”-flagged for this reason.

Laboratory Replicate Analysis

The laboratory replicate (matrix spike duplicate [MSD]) results demonstrate acceptable laboratory precision. The relative percent difference (RPD) values for MSDs in both SDGs were less than 20 percent for results greater than five times the RL. An MSD sample must be prepared for every 20 samples. Although only one MS was prepared for 21 laboratory samples, there was

one field duplicate sample collected for 19 field samples, which passed criteria, so no results were flagged for replicate reasons.

Field Duplicate Analysis

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory replicates, which measure only laboratory performance. A duplicate sample was collected from location UPD-14-D (sample 1008339-11) in the August 2010 Uranium Plume sampling event. The duplicate results met the U.S. Environmental Protection Agency (EPA) recommended laboratory duplicate criteria of less than 20 percent relative difference (RPD) for results that are greater than five times the RL.

Laboratory Control Sample

Laboratory control samples (LCS) provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. LCS results were acceptable for all analyses with the following exceptions.

LCSs were not reported for uranium. As a standard practice, ALS Laboratory Group does not prepare LCSs for samples that were field-filtered and acidified and 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 criteria are as stringent. Therefore, no qualification was required due to of lack of LCS results because all of the MS results for uranium were acceptable. See the MS Analysis section for required qualification.

Metals Serial Dilution

Serial dilution (SD) samples were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. ICP-mass spectrometry SD data are evaluated when the concentration of the undiluted sample is greater than 100 times the RL. ICP-atomic emission spectroscopy SD data are evaluated when the concentration of the undiluted sample is greater than 50 times the RL. All evaluated SD data were acceptable.

Detection Limits/Dilutions

Dilutions were prepared in a consistent and acceptable manner when dilutions were required. The required detection limits were achieved for all analytes.

EBs

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

Twenty-one surface water samples were collected using non-dedicated equipment, and these samples were prepared in two preparation batches. Since only one EB was collected and analyzed in one of the preparation batches, sample 1008339-21 in the second preparation batch was “J”-flagged 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 September 1, 2010. The contents of the EDD files were manually examined to ensure all and only the requested data are delivered in compliance with requirements and that the sample results accurately reflect the data contained in the sample data package

2.3 Field Analyses/Activities

The following information summarizes the field analyses and activities for the August 2010 uranium plume sampling event.

Field Activities

All borings were purged and sampled using the low-flow sampling method. An EB and a duplicate sample were collected for 21 total samples. 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.

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 RLs were met. 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 discusses the Minimums and Maximums Report (Section 3.1), the Anomalous Data Review Check Sheet (Section 3.2), tables 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

A Minimums and Maximums Report 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 reports 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 less or more than 50 percent of historical minimum or maximum values; or (3) there were fewer than

five historical samples for comparison. As the locations in this sampling event were not previously sampled, no Minimums and Maximums Report could be generated.

3.2 Anomalous Data Review

As previously mentioned, it was not possible to generate a Minimums and Maximums Report for this sampling event due to the fact that these locations were not previously sampled. As a result, there were no anomalous data.

3.3 Water Quality Data

All water quality data are presented in Appendix B.

3.4 Water Level Data

All water level data are presented in Appendix C.

3.5 Blanks Report

Nineteen ground water grab samples were collected using non-dedicated equipment and, as a result, one EB was collected during this sampling event. However, each preparation batch of field samples needed an EB, and one sample was prepared in a different batch with no EB. Results of this one sample from the different batch were “J”-flagged as described in the Laboratory Performance Assessment Report (Section 2.2). The results from the EB collected during this sampling event are presented in Appendix D. As the results show, uranium in the EB was below its detection limit.

3.6 Conclusion

As part of Phase 2 of the Uranium Plume Delineation Investigation, 19 ground water grab samples were collected at various depths from eight borings drilled using the Geoprobe. The boring locations were to supplement the results from Phase 1. In addition to measuring pH, specific conductance, and temperature in the field, these samples were submitted to ALS Laboratory Group for uranium analysis exclusively.

Uranium concentrations from these Phase 2 locations ranged from 0.0006 to 8.8 mg/L. The highest concentration was measured in the sample from location UPD-12, which is located 430 ft to the east of monitoring well 0411, at a depth of 15 ft bgs. Taking into consideration the Phase 1 and 2 results, there are discrete areas of elevated uranium as opposed to one large plume in ground water.

Appendix A.
Water Sampling Field Activities Verification

Sampling Event / RIN	<u>August 2010 Uranium Plume Event/1008051</u>	Date(s) of Water Sampling	<u>July 15 – August 24, 2010</u>
Date(s) of Verification	<u>November 4, 2010</u>	Name of Verifier	<u>Rachel Cowan</u>

	Response (Yes, No, NA)	Comments
1. Is the Sampling Analysis Plan the primary document directing field procedures? List other documents, standard operating procedures, instructions.	<u>Yes</u>	
	<u>NA</u>	
2. Were the sampling locations specified in the planning documents sampled?	<u>NA</u>	
3. Was a pre-trip calibration conducted as specified in the aforementioned documents?	<u>Yes</u>	
4. Was an operational check of the field equipment conducted twice daily? Did the operational checks meet criteria?	<u>Yes</u> <u>Yes</u>	
5. Were the number and types (alkalinity, temperature, electrical conductivity, pH, turbidity, dissolved oxygen, oxidation reduction potential) of field measurements taken as specified?	<u>Yes</u>	<u>Only temperature, pH, and conductivity measurements were collected.</u>
6. Was the category of the well documented?	<u>NA</u>	
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?	<u>NA</u> <u>NA</u> <u>NA</u> <u>NA</u> <u>NA</u> <u>NA</u>	
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?	<u>NA</u> <u>NA</u>	
9. Were duplicates taken at a frequency of one per 20 samples?	<u>Yes</u>	<u>One duplicate was taken for 19 field samples.</u>
10. Were EBs taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	<u>No</u>	<u>One EB was collected for 19 field samples, but there was one sample that was in a separate preparation batch.</u>

Sampling Event / RIN	<u>August 2010 Uranium-Plume Event/1008051</u>	Date(s) of Water Sampling	<u>July 15 – August 24, 2010</u>
Date(s) of Verification	<u>November 4, 2010</u>	Name of Verifier	<u>Rachel Cowan</u>

	Response (Yes, No, NA)	Comments
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?	NA	
16. Were COC records completed, and was sample custody maintained?	Yes	
17. Are field data sheets signed and dated by both team members?	NA	
18. Was all other pertinent information documented on the field data sheets?	NA	
19. Was the presence or absence of ice in the cooler documented at every sample location?	NA	
20. Were water levels measured at the locations specified in the planning documents?	NA	

Appendix B.
Water Quality Data

Appendix B. Water Quality Data

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 11/12/2010

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.	UPD-10-S	WL	07/20/2010	0001	16	-	16	7.2		#		
pH	s.u.	UPD-11-M	WL	07/22/2010	0001	26	-	26	7.13		#		
pH	s.u.	UPD-11-S	WL	07/22/2010	0001	16	-	16	7.17		#		
pH	s.u.	UPD-12-D	WL	07/28/2010	0001	33	-	33	8.24		#		
pH	s.u.	UPD-12-M	WL	07/28/2010	0001	25	-	25	8.32		#		
pH	s.u.	UPD-13-D	WL	08/02/2010	0001	31	-	31	7.84		#		
pH	s.u.	UPD-13-S	WL	08/02/2010	0001	16	-	16	8.22		#		
pH	s.u.	UPD-14-D	WL	08/04/2010	0001	32.5	-	32.5	7.84		#		
pH	s.u.	UPD-14-M	WL	08/04/2010	0001	25	-	25	7.55		#		
pH	s.u.	UPD-14-S	WL	08/04/2010	0001	15	-	15	7.51		#		
pH	s.u.	UPD-15-D	WL	08/10/2010	0001	29.5	-	29.5	7.19		#		
pH	s.u.	UPD-15-M	WL	08/10/2010	0001	22	-	22	7.19		#		
pH	s.u.	UPD-15-S	WL	08/10/2010	N001	14	-	14	8.42		#		
pH	s.u.	UPD-9-D	WL	07/15/2010	0001	31	-	31	7.45		#		
pH	s.u.	UPD-9-M	WL	07/15/2010	0001	23	-	23	7.45		#		
Specific Conductance	umhos/cm	UPD-10-S	WL	07/20/2010	0001	16	-	16	7783		#		
Specific Conductance	umhos/cm	UPD-11-M	WL	07/22/2010	0001	26	-	26	9287		#		
Specific Conductance	umhos/cm	UPD-11-S	WL	07/22/2010	0001	16	-	16	9913		#		
Specific Conductance	umhos/cm	UPD-12-D	WL	07/28/2010	0001	33	-	33	6882		#		
Specific Conductance	umhos/cm	UPD-12-M	WL	07/28/2010	0001	25	-	25	224		#		
Specific Conductance	umhos/cm	UPD-13-D	WL	08/02/2010	0001	31	-	31	14521		#		
Specific Conductance	umhos/cm	UPD-13-S	WL	08/02/2010	0001	16	-	16	6925		#		
Specific Conductance	umhos/cm	UPD-14-D	WL	08/04/2010	0001	32.5	-	32.5	3849		#		
Specific Conductance	umhos/cm	UPD-14-M	WL	08/04/2010	0001	25	-	25	2542		#		

Appendix B. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 11/12/2010

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Specific Conductance	umhos/cm	UPD-14-S	WL	08/04/2010	0001	15	-	15	2297			#		
Specific Conductance	umhos/cm	UPD-15-D	WL	08/10/2010	0001	29.5	-	29.5	6766			#		
Specific Conductance	umhos/cm	UPD-15-M	WL	08/10/2010	0001	22	-	22	5703			#		
Specific Conductance	umhos/cm	UPD-15-S	WL	08/10/2010	0001	14	-	14	4157			#		
Specific Conductance	umhos/cm	UPD-9-D	WL	07/15/2010	0001	31	-	31	3246			#		
Specific Conductance	umhos/cm	UPD-9-M	WL	07/15/2010	N001	23	-	23	3246			#		
Temperature	C	UPD-11-M	WL	07/22/2010	0001	26	-	26	8.45			#		
Temperature	C	UPD-11-S	WL	07/22/2010	0001	16	-	16	11.16			#		
Temperature	C	UPD-12-D	WL	07/28/2010	0001	33	-	33	11.21			#		
Temperature	C	UPD-12-M	WL	07/28/2010	0001	25	-	25	9.7			#		
Temperature	C	UPD-13-D	WL	08/02/2010	0001	31	-	31	10.5			#		
Temperature	C	UPD-13-S	WL	08/02/2010	0001	16	-	16	11.75			#		
Temperature	C	UPD-14-D	WL	08/04/2010	0001	32.5	-	32.5	12.72			#		
Temperature	C	UPD-14-M	WL	08/04/2010	0001	25	-	25	11.11			#		
Temperature	C	UPD-14-S	WL	08/04/2010	0001	15	-	15	11.4			#		
Temperature	C	UPD-15-D	WL	08/10/2010	0001	29.5	-	29.5	8.14			#		
Temperature	C	UPD-15-M	WL	08/10/2010	0001	22	-	22	6.51			#		
Temperature	C	UPD-15-S	WL	08/10/2010	0001	14	-	14	8.42			#		
Uranium	mg/L	UPD-10-D	WL	07/20/2010	0001	18	-	18	0.39			#	0.00029	
Uranium	mg/L	UPD-10-S	WL	07/20/2010	0001	16	-	16	0.82			#	0.00058	
Uranium	mg/L	UPD-11-M	WL	07/22/2010	0001	26	-	26	0.35			#	0.00015	
Uranium	mg/L	UPD-11-S	WL	07/22/2010	0001	16	-	16	1.3			#	0.0015	
Uranium	mg/L	UPD-12-D	WL	07/28/2010	0001	33	-	33	0.36			#	0.00058	
Uranium	mg/L	UPD-12-M	WL	07/28/2010	0001	25	-	25	0.42			#	0.00058	
Uranium	mg/L	UPD-12-S	WL	07/27/2010	0001	15	-	15	8.8			#	0.0058	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 11/12/2010

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	UPD-13-D	WL	08/02/2010	0001	31	-	31	0.3		#	0.00029	
Uranium	mg/L	UPD-13-S	WL	08/02/2010	0001	16	-	16	0.087		#	2.9E-005	
Uranium	mg/L	UPD-14-D	WL	08/04/2010	0001	32.5	-	32.5	2.1		#	0.0015	
Uranium	mg/L	UPD-14-D	WL	08/04/2010	0002	32.5	-	32.5	2.2		#	0.0015	
Uranium	mg/L	UPD-14-M	WL	08/04/2010	0001	25	-	25	0.79		#	0.00058	
Uranium	mg/L	UPD-14-S	WL	08/04/2010	0001	15	-	15	1		#	0.00058	
Uranium	mg/L	UPD-15-D	WL	08/10/2010	0001	29.5	-	29.5	0.88		#	0.00058	
Uranium	mg/L	UPD-15-M	WL	08/10/2010	0001	22	-	22	1.1		#	0.00058	
Uranium	mg/L	UPD-15-S	WL	08/10/2010	0001	14	-	14	0.74		#	0.00058	
Uranium	mg/L	UPD-16-M	WL	08/24/2010	0001	25.5	-	25.5	1.3		#	0.00058	
Uranium	mg/L	UPD-16-S	WL	08/24/2010	0001	15.5	-	15.5	2.2		#	0.00058	
Uranium	mg/L	UPD-9-D	WL	07/15/2010	0001	31	-	31	0.011		#	2.9E-005	
Uranium	mg/L	UPD-9-M	WL	07/15/2010	0001	23	-	23	0.61	J	#	0.00058	

BLS = below land surface; C = centigrade; µmhos/cm = micromhos per centimeter; S.U. = standard unit; WL = well

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 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.
- 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.

QA QUALIFIER:

- # Validated according to quality assurance guidelines.

Appendix C.
Water Level Data

Appendix C. Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
REPORT DATE: 11/1/2010

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
UPD-9			07/15/2010		17		
UPD-10			07/20/2010		10		
UPD-11			07/22/2010		15		
UPD-12			07/27/2010		12		
UPD-13			08/02/2010		13		
UPD-14			08/04/2010		13		
UPD-15			08/10/2010		10		
UPD-16			08/24/2010		9		

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

Appendix D.
Blanks Report

Appendix D. Blanks Report

BLANKS REPORT

LAB: ALS Laboratory Group (Fort Collins, CO)

RIN: 1008051

Report Date:

11/12/2010

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab Data	Detection Limit	Uncertainty	Sample Type
Uranium	MOA01	UPD-0-E	8/10/2010	N001	mg/L	0.00062	U	2.9E-005		E

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.

SAMPLE TYPES:

- E Equipment Blank.

Attachment 1.
Sampling Trip Report

**Attachment 1.
Sampling Trip Report (continued)**



DATE: October 25, 2010
TO: K. Pill
FROM: James Ritchey
SUBJECT: August 2010 Phase 2 Uranium Plume Sampling Trip Report

Site: Moab, Utah

Date of Sampling Event: July 15 – August 24, 2010

Team Members: T. Meadows, R. Hopping, E. Colunga, E. Glowiak, James Ritchey

RIN Number Assigned: All samples were assigned to RIN 1008051.

Sample Shipment: All samples were shipped in one cooler UPS overnight to ALS Laboratory Group from Moab, Utah, on August 25, 2010 (Tracking Nos. 0191586338).

May 2010 Uranium Plume Sampling

Number of Locations Sampled: Eight Geoprobe® borings were drilled as part of Phase 2 of the uranium plume delineation investigation (Phase 1 samples were submitted under RIN# 1005046). Ground water grab samples were collected at various depths from these eight locations. Each boring was given a sequential number for location (UPD-9 through UPD-16) and a letter to identify the sample depth (S = shallow, M = middle, and D = deep). Including one duplicate and one EB, a total of 21 samples were collected during the August 2010 Phase 2 Uranium Plume Sampling Event.

Locations Not Sampled: None.

Field Variance: None

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

False ID	True ID	Sample Type	Associated Matrix	Ticket Number
UPD-51-G	UPD-14-D	Duplicate Sample from 32.5 ft.	Ground Water	AUG 115
UPD-0-E	NA	EB	DI Water	AUG 119

DI = deionized water; ID = identification

Attachment 1.
Sampling Trip Report (continued)

Location-specific Information – Borings: All borings were sampled using a peristaltic pump for low-flow sampling through the sampling port on the Geoprobe®. Sample depths of are listed below.

Name	Date	Time	Sample Depth	Ticket Number
UPD-9-M	7/15/2010	10:30	23	AUG 101
UPD-9-D	7/15/2010	11:00	31	AUG 102
UPD-10-S	7/20/2010	10:00	16	AUG 103
UPD-10-D	7/20/2010	11:30	18	AUG 104
UPD-11-S	7/22/2010	8:30	16	AUG 105
UPD-11-M	7/22/2010	9:15	26	AUG 106
UPD-12-S	7/27/2010	8:00	15	AUG 107
UPD-12-M	7/28/2010	8:15	25	AUG 108
UPD-12-D	7/28/2010	9:30	33	AUG 109
UPD-13-S	8/2/2010	9:00	16	AUG 110
UPD-13-D	8/2/2010	10:30	31	AUG 111
UPD-14-S	8/4/2010	8:15	15	AUG 112
UPD-14-M	8/4/2010	8:45	25	AUG 113
UPD-14-D	8/4/2010	10:30	32.5	AUG 114
UPD-15-S	8/10/2010	9:30	14	AUG 116
UPD-15-M	8/10/2010	10:30	22	AUG 117
UPD-15-D	8/10/2010	11:10	29.5	AUG 118
UPD-16-S	8/24/2010	10:00	15.5	AUG 120
UPD-16-M	8/24/2010	10:30	25.5	AUG 121

Water Parameters: Parameter readings were collected at all locations and depths except UPD-12-S, UPD-16-S, and UPD-16-M, which did not produce enough water. Parameters collected at locations UPD-9 and UPD-10 were combined for a collective reading due to a limited volume of water.

Name	Temp (C°)	pH	Conductivity
UPD-9-M	-	7.45	3246
UPD-9-D			
UPD-10-S	-	7.2	7783
UPD-10-D			
UPD-11-S	11.16	7.17	9913
UPD-11-M	8.45	7.13	9287
UPD-12-S	Insufficient volume		
UPD-12-M	9.7	8.32	224
UPD-12-D	11.21	8.24	6882
UPD-13-S	11.75	8.22	6925
UPD-13-D	10.5	7.84	14521
UPD-14-S	11.4	7.51	2297
UPD-14-M	11.11	7.55	2542
UPD-14-D	12.72	7.84	3849
UPD-15-S	8.42	6.99	4157
UPD-15-M	6.51	7.19	5703
UPD-15-D	8.14	7.19	6766
UPD-16-S	Insufficient volume		
UPD-16-M	Insufficient volume		

Attachment 1.
Sampling Trip Report (continued)

Site Issues: The mean daily Colorado River flows during this sampling event according to the USGS Cisco gauging station number 09180500 are provided below.

Date	Daily Mean Flow (cfs)
7/15/2010	4,260
7/20/2010	2,940
7/22/2010	2,700
7/27/2010	3,280
7/28/2010	3,260
8/2/2010	4,710
8/4/2010	5,530
8/10/2010	5,040
8/24/2010	4,430

Equipment Issues: None.

Corrective Action Required/Taken: None.