DOE–EM/GJTAC1930

Office of Environmental Management – Grand Junction

UMTRA Project

Moab UMTRA Project May 2010 Phase 1 Uranium Plume Delineation Investigation Validation Data Package

August 2010

U.S. Department of Energy

Office of Environmental Management

Prepared by the Technical Assistance Contractor under contract number DE-AC30-07CC60012 for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

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Moab UMTRA Project
May 2010 Phase 1 Uranium Plume Delineation Investigation VDP

Revision 0

Review and Approval

8/31/10

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Date

8/31/10

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Revision History

Revision No.	Date	Reason/Basis for Revision
0	August 2010	Initial issue.

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Attachment 1. Sampling Trip Report

Acronyms and Abbreviations

°C	degrees Centigrade
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	Environmental Protection Agency
IA	interim action
ICP	inductively coupled plasma
ICP-MS	inductively coupled plasma-mass spectrometry
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
r^2	correlation coefficient
RIN	report identification number
RL	reporting limit
RPD	relative percent difference
RS	replicate sample
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 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 1.0 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. Various appendices contain the Water Sampling Field Activities Verification, Water Quality Data, Water Level Data and 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 May 2010 sampling event completed from May 17 through June 8, 2010. Grab ground water samples were collected and analyzed from eight locations at various depths surrounding monitoring well 0411 using direct push technology (Geoprobe®). Section 1.0 contains the Summary Criteria and a sample location map (Section 1.1), the Sampling Event Summary (Section 1.2), and the Sampling and Analyses (Section 1.3) for this May 2010 sampling event.

1.1 Summary Criteria

Sampling Period: May 17 through June 8, 2010
The purpose of this sampling was to collect ground water samples from a series of eight borings surrounding monitoring well 0411 as part of the uranium plume delineation investigation. Well 0411 is shown on Figure 1, and the locations of the borings are shown on Figure 2.

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 the Uranium Plume Delineation Work Plan, and the area of the site in which these samples were collected were not impacted by any 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 Phase 1 of the Uranium Plume Delineation Investigation at the former uranium tailings processing site in Moab, Utah. Phase 2 of this investigation will include the collection of soil and ground water from additional locations that will be determined based on the results from Phase 1.

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. In addition, a summary of the results are provided.

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
Phase 1 of this investigation was focused in the vicinity of monitoring well 0411, which has contained ground water concentrations ranging from 5.6 to 19 milligrams per liter (mg/L) uranium since August 2008. A total of eight borings were drilled with a Geoprobe® adjacent to monitoring well 0411, 50 and 100 feet from the center of the well to the north, south, east, and west (Figure 2). Ground water grab samples were collected from various depths at each location and were submitted for uranium analysis only. The results are shown on Figure 2.

Uranium concentration ranged from 0.004 top 8.2 mg/L. The highest concentration was measured in the sample located 100 feet to the north of 0411, at a depth of 14 feet below ground surface. In general, the plume appears to contain the highest concentrations to the north and east of 0411.

Surface Water Sampling Results
There were no surface water locations sampled during this sampling event.

Figure 1. Location of Monitoring Well 0411

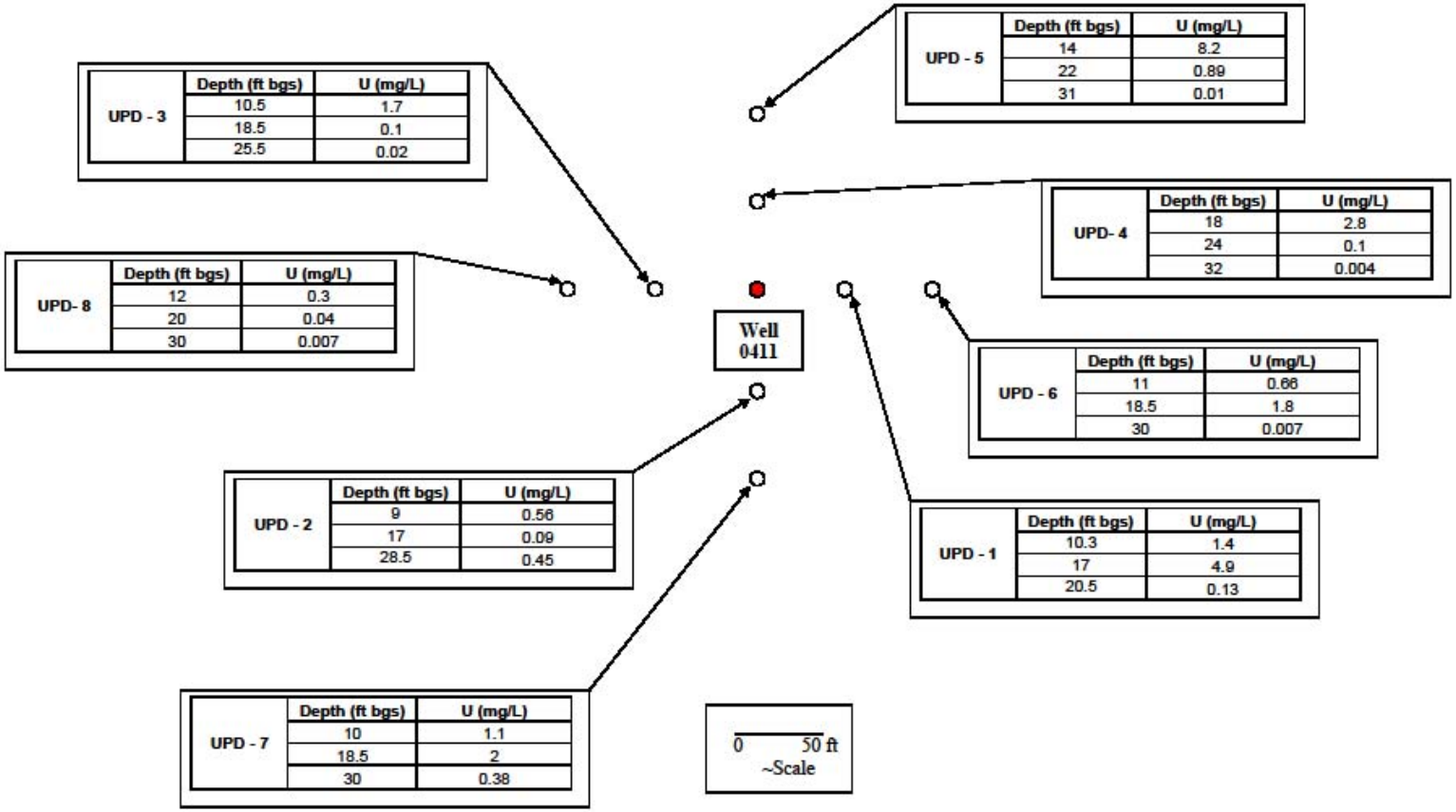

Figure 2. Map of the Phase 1 Uranium Plume Delineation Investigation Sample Locations in the Vicinity Well 0411

1.3 Sampling and Analyses

Sampling and analyses were conducted in accordance with the *Moab UMTRA Project Operations, Maintenance, and Performance Monitoring Plan for the Interim Action Ground Water Treatment System* (DOE-EM/GJ1220), April 2008. Although not listed here, the normal set of locations were sampled. Please refer to the attached trip report (Attachment 1) for specific sampled locations and an explanation of why some locations were not sampled, such as dry conditions at specific surface water locations.

The data validations indicate that the data meet the quality-control criteria specified for this project. An equipment blank (EB) was collected, and an appropriate number of duplicates 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 9480 to 28,700 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. As the checklist exhibits, all sampling was conducted following the applicable procedures. Please see Appendix A for the field activities verification checklist.

2.2 Laboratory Performance Assessment

General Information

Report Identification No. (RIN):	1005046
Sample Event:	May 2010 Uranium Plume Sampling Event
Site(s):	Moab, Utah
Laboratory:	ALS Laboratory Group, Fort Collins, Colorado
Sample Data Group (SDG) Numbers:	1006035 and 1006085
Analysis:	Uranium
Validator:	Rachel Cowan
Review Date:	August 18, 2010

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 3, 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 below for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
All SDG 1006085 samples	UPD-4-S; UPD-4-M; UPD-5-S; UPD-5-M; UPD-5-D; UPD-6-S; UPD-6-M; UPD-6-D; UPD-7-S; UPD-7-M; UPD-7-D; UPD-8-S; UPD-8-M; UPD-8-D;	Uranium	J	P1
1006035-2 through -5	UPD-1-S, UPD-1-M, UPD-1-D, and UPD-2-S	Uranium	J	B1

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.
P1	J	J	Samples are received outside the temperature criteria.
RS1	J	J or R	Results for the affected analyte(s) are regarded as estimated (J) because replicate samples were not analyzed at the frequency stated in the procedure.

Sample Shipping/Receiving

Paragon Analytics in Fort Collins, Colorado, received a total of 27 samples for RIN 1005046 in two shipments. SDG 1006035 of 11 samples arrived on June 4, 2010 (UPS tracking number 1Z5W1Y510190266104), and SDG 1006085 arrived on June 10, 2010 (UPS tracking number 1Z5W1Y510191603729). Each 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 1006035 was received intact in one cooler with the temperature within the cooler at 0.8 degrees Centigrade (°C), which complies with requirements. SDG 1006085 was received in one cooler with the temperature at 5.6°C, which does not comply with requirements. All the SDG 1006085 samples were qualified with a “J” for reason P1. 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 (ICP-MS) analytes (uranium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. And also for ICP-MS, internal standards are analyzed to indicate stability of the instruments.

Method SW-846 6020A, Uranium
The uranium calibrations were performed on June 4 and 11, 2010. The initial calibrations for each SDG were performed using eight calibration standards and one blank, resulting in calibration curves with correlation coefficient (r^2) 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 samples (CCVs) were analyzed at the required frequency, resulting in three CCVs for uranium analyzed on June 4, 2010, and three CCVs for uranium analyzed on June 11, 2010. 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. Nondetects are not to be qualified.

Three uranium CCBs results were greater than the uranium IDLs. However, all associated results were greater than five times the associated blanks' concentrations so no results needed to be qualified.

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.

Laboratory Replicate Analysis
The laboratory replicate (i.e., 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.

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. Duplicate samples were collected from locations UPD-0-M (sample 1006085-1) and UPD-0-D (sample 1006035-1) in the May 2010 Uranium Plume sampling event. The duplicate results met the U.S. Environmental Protection Agency (EPA)-recommended laboratory duplicate criteria of less than 20 RPD for results that are greater than five times the RL, except for the RPD for duplicate UPD-0-M (location UPD-7-D), which was 41. However, since the MSD samples had passed, no results needed to be flagged.

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 provided by the NELAC Institute, 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 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-MS 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-four surface water samples were collected using non-dedicated equipment. Two EBs should have been collected; however, only one EB was collected and analyzed. All analytes for samples UPD-1-S, UPD-1-M, UPD-1-D, and UPD-2-S were "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 June 16, 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 May 2010 Uranium Plume sampling event.

Field Activities
All monitor wells were purged and sampled using the low-flow sampling method; this method was not used at extraction wells. An EB was collected. Two duplicate samples were collected for 27 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, except for uranium in duplicate UPD-0-M (1006085-1), which had an RPD of ±41. However, since the MSD uranium results passed criteria, no uranium results needed to be flagged for RS1.

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

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 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. 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.

3.2 Anomalous Data Review

As previously mentioned, it was not possible to generate a Minimums and Maximums Report for this sampling. As a result, there were no anomalous data.

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

Twenty-four samples were collected using non-dedicated equipment, and as a result, two EBs should have been collected during this sampling event. Only one EB was collected, so four sample results 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 was below its detection limit.

Appendix A.
Water Sampling Field Activities Verification

Appendix A. Water Sampling Field Activities Verification

Sampling Event / RIN	May 2010 Uranium-Plume Event /1005046	**Date(s) of Water Sampling**	May 17-June 8, 2010
Date(s) of Verification	August 22, 2010	**Name of Verifier**	Rachel Cowan

		Response (Yes, No, NA)	**Comments**
1.	Is the Sampling Analysis Plan the primary document directing field procedures?	Yes	
	List other documents, standard operating procedures, instructions.	NA	
2.	Were the sampling locations specified in the planning documents sampled?	NA	
3.	Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes	
4.	Was an operational check of the field equipment conducted twice daily?	Yes	
	Did the operational checks meet criteria?	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	Only temperature, pH, and conductivity measurements were collected.
6.	Was the category of the well documented?	NA	
7.	Were the following conditions met when purging a Category I well:	NA	
	Was one pump/tubing volume purged prior to sampling?	NA	
	Did the water level stabilize prior to sampling?	NA	
	Did pH, specific conductance, and turbidity measurements stabilize prior to sampling?	NA	
	Was the flow rate less than 500 milliliters per minute?	NA	
	If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	NA	
8.	Were the following conditions met when purging a Category II well:		
	Was the flow rate less than 500 milliliters per minute?	NA	
	Was one pump/tubing volume removed prior to sampling?	NA	
9.	Were duplicates taken at a frequency of one per 20 samples?	Yes	Two duplicates were taken for 22 samples.
10.	Were EBs taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	No	Only one EB was collected for 24 samples.

Appendix A. Water Sampling Field Activities Verification (continued)

Sampling Event / RIN	May 2010 Uranium-Plume Event / 1005046	**Date(s) of Water Sampling**	May 17-June 8, 2010
Date(s) of Verification	August 22, 2010	**Name of Verifier**	Rachel Cowan

	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: 8/19/2010

Parameter	Units	Location ID	Location Type	Sample Date	ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Data	QA	Detection Limit	Uncertainty
pH	s.u.	UPD-1	WL	05/17/2010	0001	10.3	-	10.3	6.83			#		
pH	s.u.	UPD-1	WL	05/17/2010	0001	17	-	17	7.4			#		
pH	s.u.	UPD-1	WL	05/18/2010	0001	20.5	-	20.5	7.66			#		
pH	s.u.	UPD-2	WL	05/18/2010	0001	9	-	9	7.69			#		
pH	s.u.	UPD-2	WL	05/19/2010	0001	28.5	-	28.5	7.48			#		
pH	s.u.	UPD-2	WL	05/19/2010	0001	17	-	17	7.69			#		
pH	s.u.	UPD-3	WL	05/19/2010	0001	10.5	-	10.5	8.68			#		
pH	s.u.	UPD-3	WL	05/20/2010	0001	25.5	-	25.5	8.06			#		
pH	s.u.	UPD-3	WL	05/20/2010	0001	18.5	-	18.5	8.2			#		
pH	s.u.	UPD-4	WL	05/24/2010	0001	32	-	32	7.71			#		
pH	s.u.	UPD-4	WL	05/24/2010	0001	18	-	18	7.97			#		
pH	s.u.	UPD-5	WL	05/26/2010	0001	22	-	22	7.5			#		
pH	s.u.	UPD-5	WL	05/26/2010	0001	31	-	31	7.5			#		
pH	s.u.	UPD-6	WL	06/02/2010	0001	11	-	11	7.48			#		
pH	s.u.	UPD-6	WL	06/02/2010	0001	30	-	30	7.77			#		
pH	s.u.	UPD-6	WL	06/02/2010	0001	18.5	-	18.5	8.06			#		
pH	s.u.	UPD-7	WL	06/03/2010	0001	18.5	-	18.5	7.03			#		
pH	s.u.	UPD-7	WL	06/03/2010	0001	10	-	10	7.12			#		
pH	s.u.	UPD-7	WL	06/07/2010	0001	30	-	30	7.03			#		
pH	s.u.	UPD-8	WL	06/07/2010	0001	12	-	12	7.03			#		
pH	s.u.	UPD-8	WL	06/08/2010	0001	20	-	20	7.39			#		
pH	s.u.	UPD-8	WL	06/08/2010	0001	30	-	30	7.41			#		
Specific Conductance	µmhos /cm	UPD-1	WL	05/17/2010	0001	17	-	17	3806			#		
Specific Conductance	µmhos /cm	UPD-1	WL	05/17/2010	0001	10.3	-	10.3	4924			#		
Specific Conductance	µmhos /cm	UPD-1	WL	05/18/2010	0001	20.5	-	20.5	3529			#		

Appendix B. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 8/19/2010

Parameter	Units	Location ID	Location Type	Sample Date	ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Data	QA	Detection Limit	Uncertainty
Specific Conductance	µmhos /cm	UPD-2	WL	05/18/2010	0001	9	-	9	3403			#		
Specific Conductance	µmhos /cm	UPD-2	WL	05/19/2010	0001	17	-	17	3542			#		
Specific Conductance	µmhos /cm	UPD-2	WL	05/19/2010	0001	28.5	-	28.5	7729			#		
Specific Conductance	µmhos /cm	UPD-3	WL	05/19/2010	0001	10.5	-	10.5	3556			#		
Specific Conductance	µmhos /cm	UPD-3	WL	05/20/2010	0001	18.5	-	18.5	3440			#		
Specific Conductance	µmhos /cm	UPD-3	WL	05/20/2010	0001	25.5	-	25.5	4015			#		
Specific Conductance	µmhos /cm	UPD-4	WL	05/24/2010	0001	18	-	18	3084			#		
Specific Conductance	µmhos /cm	UPD-4	WL	05/24/2010	0001	32	-	32	3810			#		
Specific Conductance	µmhos /cm	UPD-5	WL	05/26/2010	0001	22	-	22	4000			#		
Specific Conductance	µmhos /cm	UPD-5	WL	05/26/2010	0001	31	-	31	5189			#		
Specific Conductance	µmhos /cm	UPD-6	WL	06/02/2010	0001	18.5	-	18.5	3233			#		
Specific Conductance	µmhos /cm	UPD-6	WL	06/02/2010	0001	11	-	11	4238			#		
Specific Conductance	µmhos /cm	UPD-6	WL	06/02/2010	0001	30	-	30	5497			#		
Specific Conductance	µmhos /cm	UPD-7	WL	06/03/2010	0001	10	-	10	3785			#		
Specific Conductance	µmhos /cm	UPD-7	WL	06/03/2010	0001	18.5	-	18.5	4663			#		
Specific Conductance	µmhos /cm	UPD-7	WL	06/07/2010	0001	30	-	30	7914			#		
Specific Conductance	µmhos /cm	UPD-8	WL	06/07/2010	0001	12	-	12	3467			#		
Specific Conductance	µmhos /cm	UPD-8	WL	06/08/2010	0001	30	-	30	2553			#		
Specific Conductance	µmhos /cm	UPD-8	WL	06/08/2010	0001	20	-	20	3483			#		
Temperature	C	UPD-1	WL	05/17/2010	0001	10.3	-	10.3	19.68			#		
Temperature	C	UPD-1	WL	05/17/2010	0001	17	-	17	19.77			#		
Temperature	C	UPD-1	WL	05/18/2010	0001	20.5	-	20.5	19.76			#		
Temperature	C	UPD-2	WL	05/18/2010	0001	9	-	9	19.42			#		

Appendix B. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 8/19/2010

Parameter	Units	Location ID	Location Type	Sample Date	ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Data	QA	Detection Limit	Uncertainty
Temperature	C	UPD-2	WL	05/19/2010	0001	17	-	17	19.35			#		
Temperature	C	UPD-2	WL	05/19/2010	0001	28.5	-	28.5	19.55			#		
Temperature	C	UPD-3	WL	05/19/2010	0001	10.5	-	10.5	19.53			#		
Temperature	C	UPD-3	WL	05/20/2010	0001	18.5	-	18.5	19.46			#		
Temperature	C	UPD-3	WL	05/20/2010	0001	25.5	-	25.5	19.59			#		
Temperature	C	UPD-4	WL	05/24/2010	0001	18	-	18	19.67			#		
Temperature	C	UPD-4	WL	05/24/2010	0001	32	-	32	19.67			#		
Temperature	C	UPD-5	WL	05/26/2010	0001	31	-	31	11.58			#		
Temperature	C	UPD-5	WL	05/26/2010	0001	22	-	22	12.75			#		
Temperature	C	UPD-6	WL	06/02/2010	0001	18.5	-	18.5	11.31			#		
Temperature	C	UPD-6	WL	06/02/2010	0001	11	-	11	11.46			#		
Temperature	C	UPD-6	WL	06/02/2010	0001	30	-	30	11.63			#		
Temperature	C	UPD-7	WL	06/03/2010	0001	18.5	-	18.5	12.17			#		
Temperature	C	UPD-7	WL	06/03/2010	0001	10	-	10	12.91			#		
Temperature	C	UPD-7	WL	06/07/2010	0001	30	-	30	11.64			#		
Temperature	C	UPD-8	WL	06/07/2010	0001	12	-	12	12.64			#		
Temperature	C	UPD-8	WL	06/08/2010	0001	20	-	20	14.83			#		
Temperature	C	UPD-8	WL	06/08/2010	0001	30	-	30	15.85			#		
Uranium	mg/L	UPD-1	WL	05/17/2010	0001	10.3	-	10.3	1.4			#	0.00029	
Uranium	mg/L	UPD-1	WL	05/17/2010	0001	17	-	17	4.9			#	0.00029	
Uranium	mg/L	UPD-1	WL	05/18/2010	0001	20.5	-	20.5	0.13			#	0.00029	
Uranium	mg/L	UPD-2	WL	05/18/2010	0001	9	-	9	0.56			#	0.00029	
Uranium	mg/L	UPD-2	WL	05/19/2010	0001	17	-	17	0.097			#	0.00029	
Uranium	mg/L	UPD-2	WL	05/19/2010	0001	28.5	-	28.5	0.45			#	0.00029	
Uranium	mg/L	UPD-3	WL	05/19/2010	0001	10.5	-	10.5	1.7			#	0.00029	
Uranium	mg/L	UPD-3	WL	05/20/2010	0001	25.5	-	25.5	0.025			#	2.9E-005	
Uranium	mg/L	UPD-3	WL	05/20/2010	0001	18.5	-	18.5	0.1			#	0.00029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 8/19/2010

Parameter	Units	Location ID	Location Type	Sample Date	ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Data	QA	Detection Limit	Uncertainty
Uranium	mg/L	UPD-4	WL	05/24/2010	0001	32	-	32	0.0044			#	2.9E-005	
Uranium	mg/L	UPD-4	WL	05/24/2010	0001	24	-	24	0.1			#	2.9E-005	
Uranium	mg/L	UPD-4	WL	05/24/2010	0001	18	-	18	2.8			#	0.00029	
Uranium	mg/L	UPD-4	WL	05/24/2010	0002	32	-	32	0.0061			#	2.9E-005	
Uranium	mg/L	UPD-5	WL	05/25/2010	0001	14	-	14	8.2			#	0.0029	
Uranium	mg/L	UPD-5	WL	05/26/2010	0001	31	-	31	0.012			#	2.9E-005	
Uranium	mg/L	UPD-5	WL	05/26/2010	0001	22	-	22	0.89			#	0.00058	
Uranium	mg/L	UPD-6	WL	06/02/2010	0001	30	-	30	0.0078			#	2.9E-005	
Uranium	mg/L	UPD-6	WL	06/02/2010	0001	11	-	11	0.66			#	0.00058	
Uranium	mg/L	UPD-6	WL	06/02/2010	0001	18.5	-	18.5	1.8			#	0.00058	
Uranium	mg/L	UPD-7	WL	06/03/2010	0001	10	-	10	1.1			#	0.00058	
Uranium	mg/L	UPD-7	WL	06/03/2010	0001	18.5	-	18.5	2			#	0.00058	
Uranium	mg/L	UPD-7	WL	06/07/2010	0001	30	-	30	0.38			#	2.9E-005	
Uranium	mg/L	UPD-7	WL	06/07/2010	0002	30	-	30	0.58			#	0.00029	
Uranium	mg/L	UPD-8	WL	06/07/2010	0001	12	-	12	0.3			#	2.9E-005	
Uranium	mg/L	UPD-8	WL	06/08/2010	0001	30	-	30	0.0073			#	2.9E-005	
Uranium	mg/L	UPD-8	WL	06/08/2010	0001	20	-	20	0.047			#	2.9E-005	

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.

Appendix B. Water Quality Data (continued)

DATA QUALIFIERS:

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

QA QUALIFIER:

#	Validated according to quality assurance guidelines.

Appendix C.
Water Level Data

Appendix C. Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
REPORT DATE: 8/30/2010

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Measurement Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
UPD-1			05/17/2010		8		
UPD-2			05/18/2010		8		
UPD-3			05/19/2010		8.5		
UPD-4			05/24/2010		10		
UPD-5			05/26/2010		12		
UPD-6			06/02/2010		7.5		
UPD-7			06/03/2010		8		
UPD-8			06/07/2010		8		

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: PARAGON (Fort Collins, CO)
RIN: 1005046
Report Date: 8/19/2010

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Uncertainty	Sample Type
Uranium	MOA01	0999	06/08/2010	N001	mg/L	2.9E-005	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.	G	Possible grout contamination, pH > 9.	J	Estimated value.
L	Less than 3 bore volumes purged prior to sampling.	Q	Qualitative result due to sampling technique.	R	Unusable result.
U	Parameter analyzed for but was not detected.	X	Location is undefined.		

SAMPLE TYPES:

E	Equipment Blank.

Attachment 1.
Sampling Trip Report

Attachment 1. Sampling Trip Report

DATE: July 26, 2010

TO: K. Pill

FROM: Jam es Ritchey

SUBJECT: May 2010 Uranium Plume Sampling Trip Report

Site: Moab, Utah

Date of Sampling Event: May 17 to June 08, 2010

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

RIN Number Assigned: All samples were assigned to RIN 1005046.

Sample Shipment: All samples were shipped in two coolers overnight UPS to Paragon Analytics, Inc. from Moab, Utah, on June 03 and June 09, 2010 (Tracking Nos. 0190266104 and 0191603729).

May 2010 Uranium Plume Sampling

Number of Locations Sampled: Eight locations were sampled at three different depths with a Geoprobe® direct-push system. Each location was given a sequential number for location (1 through 8) and a letter to identify the sample depth (S = shallow, M = middle, and D = deep). Including two duplicates and one equipment blank, a total of 27 samples were collected during the May 2010 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-0-D	UPD-4-D	Duplicate Sample from 32 feet	Ground Water	MAY013
UPD-0-M	UPD-7-D	Duplicate Sample from 30 feet	Ground Water	MAY023
UPD-0-S	NA	EB	DI Water	MAY027

DI = deionized; ID = identification

Attachment 1.
Sampling Trip Report (continued)

Location-specific Information – Monitoring wells: All monitoring wells were sampled using micropurge techniques with a peristaltic pump through the sampling port on the Geoprobe®. Sample depths of monitoring wells are listed below.

Name	Date	Time	Sample Depth	Ticket #
UPD-1-S	5/17/2010	11:10	10.3 feet	MAY001
UPD-1-M	5/17/2010	15:45	17 feet	MAY002
UPD-1-D	5/18/2010	10:20	20.5 feet	MAY003
UPD-2-S	5/18/2010	13:55	9 feet	MAY004
UPD-2-M	5/19/2010	10:20	17 feet	MAY005
UPD-2-D	5/19/2010	11:30	28.5 feet	MAY006
UPD-3-S	5/19/2010	15:00	10.5 feet	MAY007
UPD-3-M	5/20/2010	9:30	18.5 feet	MAY008
UPD-3-D	5/20/2010	10:45	25.5 feet	MAY009
UPD-4-S	5/24/2010	10:05	18 feet	MAY010
UPD-4-M	5/24/2010	11:30	24 feet	MAY011
UPD-4-D	5/24/2010	14:00	32 feet	MAY012
UPD-5-S	5/25/2010	9:40	14 feet	MAY014
UPD-5-M	5/26/2010	9:30	22 feet	MAY015
UPD-5-D	5/26/2010	11:30	31 feet	MAY016
UPD-6-S	6/2/2010	10:00	11 feet	MAY017
UPD-6-M	6/2/2010	11:30	18.5 feet	MAY018
UPD-6-D	6/2/2010	13:30	30 feet	MAY019
UPD-7-S	6/3/2010	9:45	10 feet	MAY020
UPD-7-M	6/3/2010	11:30	18.5 feet	MAY021
UPD-7-D	6/7/2010	9:30	30 feet	MAY022
UPD-8-S	6/7/2010	10:50	12 feet	MAY024
UPD-8-M	6/8/2010	9:00	20 feet	MAY025
UPD-8-D	6/8/2010	10:10	30 feet	MAY026

Water Parameters: Parameter readings were collected locations and depths, except UPD-4-M and UPD-5-S, which did not produce enough water. All parameters were collected after sampling and are not fully representative of the ground water.

Name	Temp (C°)	pH	Conductivity
UPD-1-S	19.68	6.83	4924
UPD-1-M	19.77	7.40	3806
UPD-1-D	19.76	7.66	3529
UPD-2-S	19.42	7.69	3403
UPD-2-M	19.35	7.69	3542
UPD-2-D	19.55	7.48	7729
UPD-3-S	19.53	8.68	3556
UPD-3-M	19.46	8.20	3440
UPD-3-D	19.59	8.06	4015
UPD-4-S	19.67	7.97	3084
UPD-4-M	Insufficient volume		
UPD-4-D	19.67	7.71	3810
UPD-5-S	Insufficient volume		
UPD-5-M	12.75	7.50	4000
UPD-5-D	11.58	7.50	5189
UPD-6-S	11.46	7.48	4238
UPD-6-M	11.31	8.06	3233
UPD-6-D	11.63	7.77	5497
UPD-7-S	12.91	7.12	3785
UPD-7-M	12.17	7.03	4663
UPD-7-D	11.64	7.03	7914
UPD-8-S	12.64	7.03	3467
UPD-8-M	14.83	7.39	3483
UPD-8-D	15.85	7.41	2553

Attachment 1.
Sampling Trip Report (continued)

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

Date	Daily Mean Flow (cfs)
05/17/2010	9,480
05/18/2010	10,000
05/19/2010	11,700
05/20/2010	11,900
05/24/2010	14,200
05/25/2010	15,000
05/26/2010	13,100
06/02/2010	20,600
06/03/2010	19,200
06/07/2010	25,600
06/08/2010	28,700

Equipment Issues: None.

Corrective Action Required/Taken: None.