

Office of Environmental Management – Grand Junction



Moab UMTRA Project
Ground Water and Surface Water
Monitoring January through June 2012

Revision 0

October 2012



U.S. Department
of Energy

Office of Environmental Management

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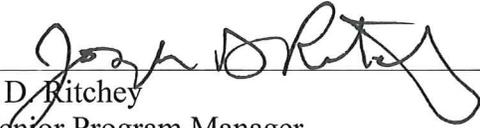
Review and Approval



10/15/12

Kenneth G. Pill
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Date



10/15/12
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In concurrence:



10-16-12

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Date

Revision History

Revision No.	Date	Reason/Basis for Revision
0	October 2012	Initial issue.

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Acronyms and Abbreviations

ALS	ALS Environmental
°C	degrees Centigrade
bgs	below ground surface
CCB	continuing calibration blank
CCV	continuing calibration verification
CF	Configuration
CFR	Code of Federal Regulations
cfs	cubic feet per second
COC	chain of custody
DOE	U.S. Department of Energy
EB	equipment blank
EDD	electronic data deliverable
ft	feet or foot
ft bgs	feet below ground surface
ft btoc	feet below top of casing
ICB	initial calibration blank
ICP-MS	inductively coupled plasma-mass spectroscopy
ICV	initial calibration verification
IDL	instrument detection limit
LCS	laboratory control sample
MB	method blank
MDL	method detection limit or minimum detection limit
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
NTU	nephelometric turbidity unit
RIN	report identification number
RS	replicate sample
SD	serial dilution
SDG	sample data group
UMTRA	Uranium Mill Tailings Remedial Action
USGS	U.S. Geological Survey

1.0 Introduction

1.1 Purpose

The purpose of this semi-annual report is to summarize the results associated with surface water and ground water samples collected from the U.S. Department of Energy (DOE) Moab Uranium Mill Tailings Remedial Action (UMTRA) site during the first half of 2012. The results of the data validation process are also presented. One site-wide sampling event was completed during June 2012, with samples collected from Configuration (CF) 5 and a variety of site-wide surface water and ground water locations. All ground water sample locations are shown on Figures 1 and 2, with the surface water locations shown on Figure 3.

The rationale for the sampling was to measure ammonia and uranium concentrations in the CF5 extraction wells for accurately determining contaminant mass removal rates from the ground water system. Surface water sampling was conducted to assess surface water quality adjacent to the site compared to the upstream and downstream water quality. Site-wide ground water sampling was conducted to assess any changes and trends in water quality. A number of the upgradient wells typically sampled during the site-wide events were not sampled as they have consistently contained below applicable detection limits since installation.

1.2 Scope

This document presents the Summary of Sampling Events and Data Assessments, including a summary of the anomalous data generated by the validation process, and results for this event. 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/GJTAC1973) and the *Moab UMTRA Project Surface Water/Ground Water Sampling and Analysis Plan* (DOE-EM/GJTAC1830), and all data validation follows the criteria according to the *Moab UMTRA Project Standard Practice for Validation of Laboratory Data* (DOE-EM/GJTAC1855). The trip report is also provided in Appendix A. All Colorado River flow discussed in this document is measured from the U.S. Geological Survey (USGS) Cisco gaging station number 09180500. River elevation data were collected on site.

A Minimums and Maximums Report was generated (by the Sample Management System and the SEEPro database) to determine if the applicable data are within a normal statistical range. The new data set was compared to the historical data to determine if these data fall outside the historical data range. 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.



Figure 1. Map of CF5 Ground Water Sample Locations for the June 2012 Site-wide Sampling Event

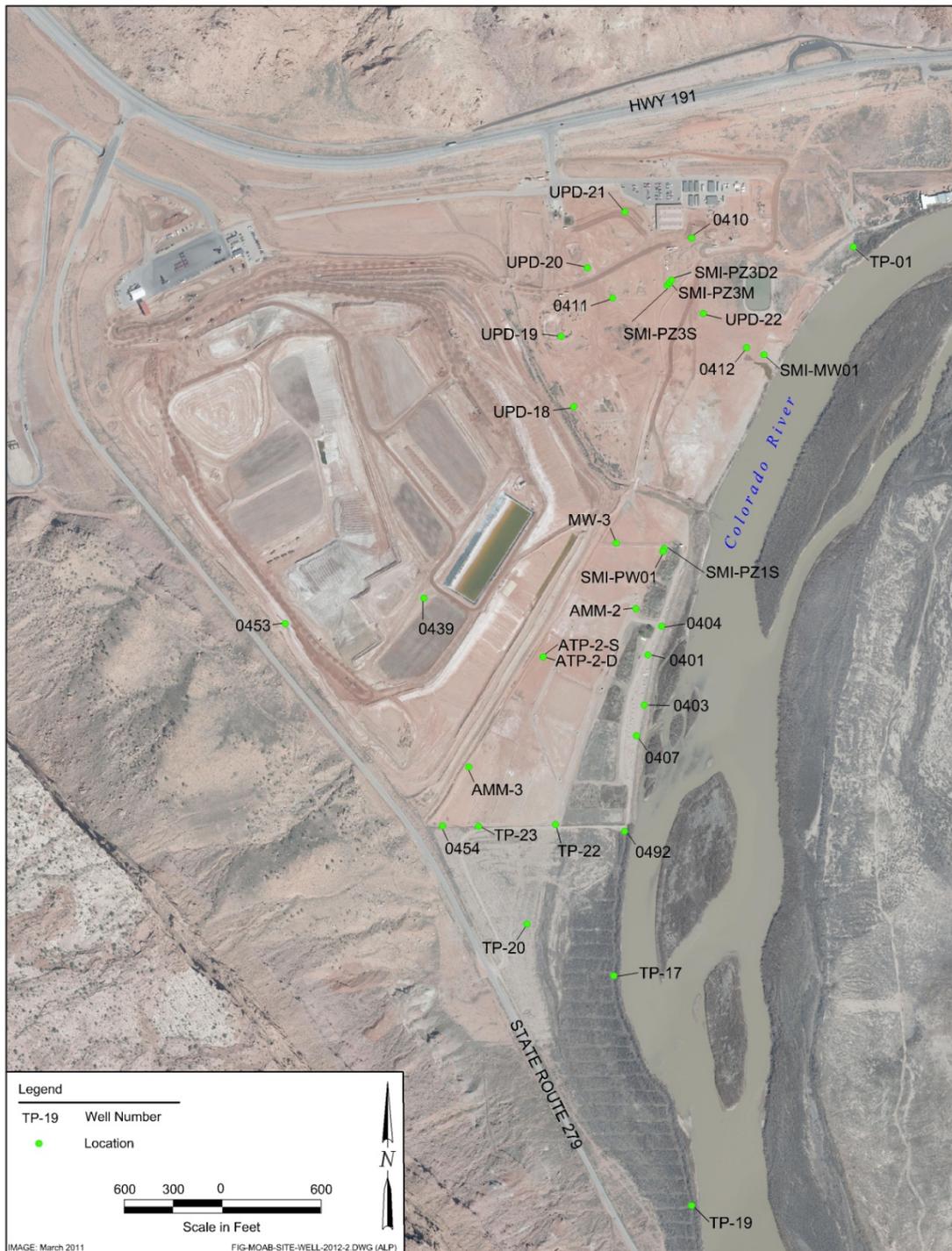


Figure 2. June 2012 Site-wide Ground Water Sampling Locations

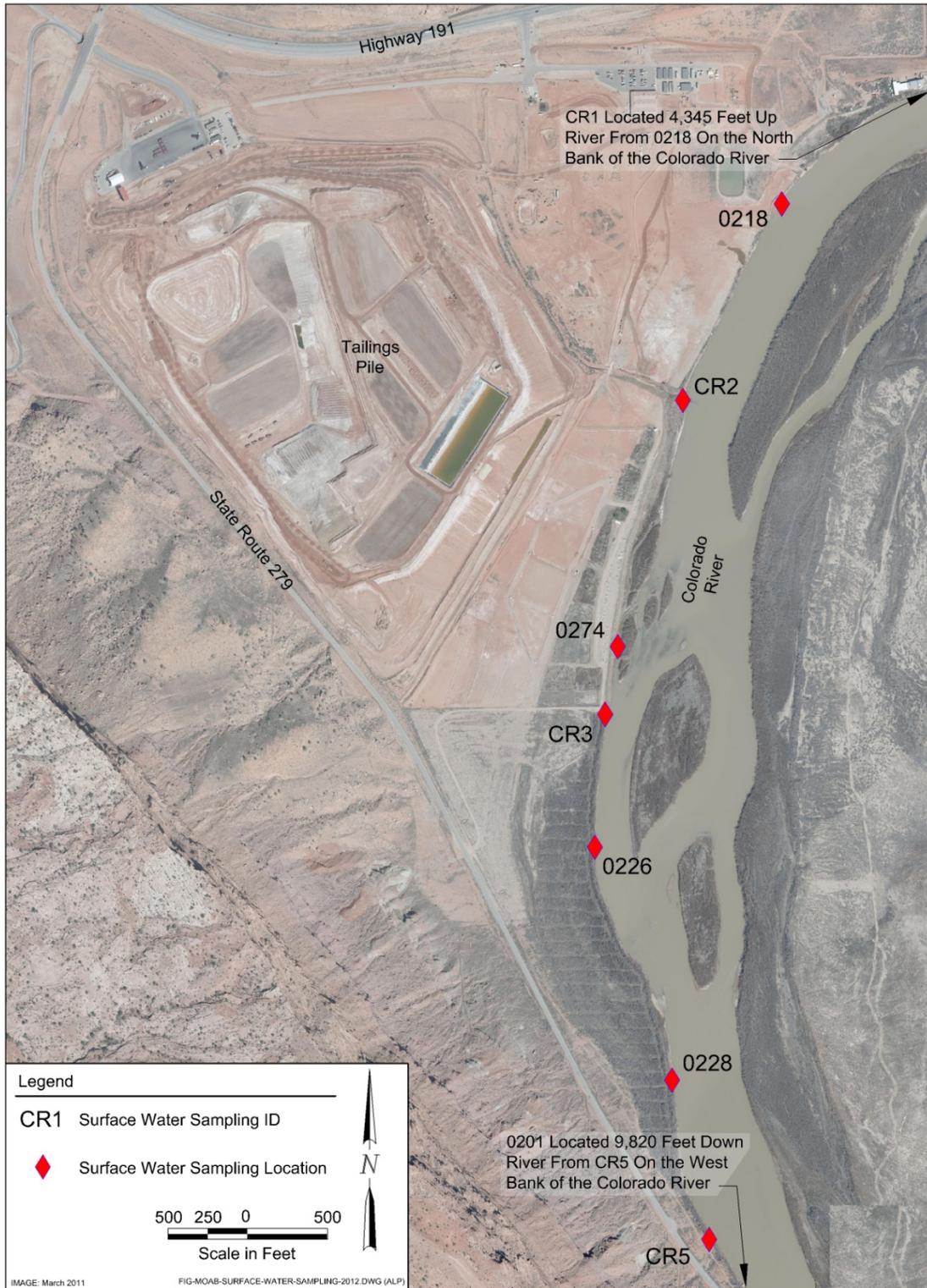


Figure 3. June 2012 Site-wide Surface Water Sampling Locations

2.0 Summary of Sampling Event

A total of 48 ground water and seven surface water samples were collected between June 7 and 14 as part of the site-wide event. This event corresponds to the time frame when the Colorado River flows are generally peaking in response to the spring runoff. However, the 2011/2012 snow pack was 60 percent of average for the upper Colorado River basin, and the peak flow during the runoff was 5,860 cfs as opposed to an average peak of 23,300 cfs. All ground water sample locations are shown on Figures 1 and 2.

These ground water samples were collected from a variety of downgradient and cross-gradient locations at various depths. Also included were the locations in the vicinity of the northeastern uranium plume, including wells UPD-18 through 22. All samples were analyzed for ammonia using a HACH sension 2 portable pH/ISE probe and meter. Approximately one-half of these samples were also submitted to ALS Environmental (ALS) laboratory for ammonia analysis. All samples were analyzed by ALS for uranium. Of the 48 ground water samples, seven were collected from CF5 extraction wells (no sample was collected from well 0811 due to equipment issues) to determine the ammonia and uranium mass removal rates for the ground water extraction system. All seven samples were submitted to ALS for both ammonia and uranium analysis.

The seven surface water samples were collected upstream, downstream, and adjacent to the site during this event. These surface water locations are presented on Figure 3.

3.0 Data Assessment

3.1 June 2012 Site-wide Sampling Event

3.1.1 Laboratory Performance Assessment

This validation was performed according to the *Standard Practice for Validation of Laboratory Data*. The procedure was applied at Level 1, Data Deliverables Examination. All analyses were successfully completed.

General Information and Validation Results

Report Identification Number (RIN): 1206064

Laboratory: ALS, Fort Collins, Colorado

Sample Date Group (SDG) Number: 1206250

Analysis: Inorganics and Metals

Validator: Elizabeth Moran

Review Date: September 27, 2012

The samples were prepared and analyzed using accepted procedures as shown in Table 1.

Table 1. June 2012 Site-wide Sampling Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia	EPA 350.1	EPA 350.1
Uranium	SW-846 3005A	SW-846 6020A

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

Table 2. June 2012 Site-wide Sampling Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1206064	All locations	Ammonia as N	J	MS-2

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

Table 3. June 2012 Site-wide Sampling Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-Detects)	Explanation
MS-2	J	U	The matrix spike result was less than 80 percent recovery and the matrix spike was not analyzed at the proper frequency as stated in the appropriate analytical method.

Sample Shipping/Receiving

ALS received a total of 48 samples (a total of 48 samples were for uranium analysis, and 35 of those locations also required ammonia as N analysis) for RIN 1206064 in one shipment of two coolers. SDG 1206250 of 48 samples arrived on June 19, 2012 (UPS tracking numbers 1Z5W1Y510192003438 and 1Z5W1Y510192741024). The SDG was accompanied by a chain of custody (COC) form. The COC form was checked to confirm that all of the samples were listed on the form with sample collection dates and times and that signatures and dates were present indicating sample relinquishment and receipt. The sample submittal documents, including the COC forms and the sample tickets, had no errors or omissions.

Preservation and Holding Times

SDG 1206250 was received intact in two coolers with the temperatures inside the coolers at 0.4 degrees Centigrade (°C) and 3.2°C. 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.

Laboratory Instrument Calibration and Quantification

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.

Besides instrument calibration, initial calibration verification samples (ICVs) and continuing calibration verification samples (CCVs) are analyzed at a required frequency of one per 10 samples. Quantification evaluations allow assessment of very low-level results as to their validity.

All instrument calibration requirements were met.

Matrix Spike and Replicate Analysis

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

Method 350.1, Ammonia as N

The MS sample selected for testing matrix specific quality control had a 71 percent recovery for ammonia as N for sample location 1206250-1 (surface water location 0218). Following procedure, the ammonia data was flagged because the percentage was less than 75 percent. In addition, an inadequate number of MS samples were tested per the Method 350.1 requirement of 10 percent. The ammonia data was flagged "J" for reason MS-2.

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 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 lack of LCS results, because all of the MSs results for uranium were acceptable.

Method and Calibration Blanks

Method blanks (MBs) are analyzed to assess any contamination that may have occurred during sample preparation. Initial calibration blanks (ICB) and continuing calibration blanks (CCB) are analyzed to assess instrument contamination before and during sample analysis. Detected sample results associated with blanks results greater than the method detection limit (MDL) or instrument detection limit (IDL) (depending on method requirements) were "J"-qualified when the detections were less than five times the associated blank concentration. Non-detects were not qualified.

According to the case narratives, all ICBs and CCBs for all analytes passed requirements.

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. Inductively-coupled plasma mass spectrometry (ICP-MS) SD data are evaluated when the concentration of the undiluted sample is greater than 100 times the reporting limit.

Method 6020A, Uranium

The uranium SD sample result was greater than a 10 percent difference. The sample chosen for the serial dilution was location 0218; this surface water location has a relatively low uranium concentration. Since the undiluted sample result for the serial dilution analysis is less than 100 times the practical quantitation limit, the uranium data does not have to be qualified.

Equipment Blanks

An equipment blank (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.

All samples were collected using dedicated equipment. As a result, it was not necessary to collect any EBs.

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 29, 2012. The contents of the EDDs were manually examined to verify that the sample results accurately reflected the data contained and that all and only the requested data were delivered.

3.1.2 Minimums and Maximums Report and Anomalous Data Review

Based on the results, there were no anomalous data points associated with this sampling event.

4.0 Results

As previously mentioned, all samples collected during this event were analyzed for uranium, and approximately one-half were analyzed for ammonia by ALS.

Table 4 presents the locations (and associated concentrations) that exceeded the 0.044 milligram per liter (mg/L) uranium ground water standard. The uranium standard is based on Table 1 in Title 40 Code of Federal Regulations Part 192, Subpart A (40 CFR 192A), "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings and Uranium In Situ Leaching Processing Facilities," assuming uranium-234 and uranium-238 activities are in equilibrium.

Table 4. June 2012 Site-wide Locations Exceeding the 0.044 mg/L Uranium Ground Water Standard

Well Number	Date	Location	Sample Depth (ft bgs)	Uranium Concentration (mg/L)
0401	6/12/2012	CF2 Vicinity	18	1.7
0403	6/12/2012	CF1 Vicinity	18	0.92
0404	6/12/2012	CF3 Vicinity	18	1.2
0407	6/12/2012	CF1 Vicinity	17	0.21
0410	6/11/2012	NE Uranium Plume Area	25	0.76
0411	6/11/2012	NE Uranium Plume Area	9	3.5
0412	6/7/2012	NE Uranium Plume Area	10.5	2.5
0439	6/12/2012	NE Uranium Plume Area	118	0.90
0453	6/12/2012	Along SW Site Boundary	80	1.9
0454	6/8/2012	Along S Site Boundary	13	1.1
0492	6/12/2012	Along S Site Boundary	18	1.4
0810	6/13/2012	CF5 Extraction Well	10.4 – 40.4	3.0
0812	6/13/2012	CF5 Extraction Well	8.6 – 38.6	2.1
0813	6/13/2012	CF5 Extraction Well	14.4 – 44.4	1.4
0814	6/14/2012	CF5 Extraction Well	12.4 – 42.4	2.6
0815	6/14/2012	CF5 Extraction Well	21.7 – 51.7	3.0
0816	6/14/2012	CF5 Extraction Well	20.9 – 50.9	2.4
AMM-2	6/11/2012	Near Base of Tailings Pile	48	1.8
AMM-3	6/8/2012	Near Base of Tailings Pile	48	1.1
SMI-MW01	6/7/2012	NE Uranium Plume Area	16	4.7
SMI-PW02	6/13/2012	CF5 Extraction Well	20.0 – 60.0	2.7
SMI-PZ1S	6/11/2012	CF5 Vicinity	18	1.4
SMI-PZ3D2	6/11/2012	NE Uranium Plume Area	78	1.2
SMI-PZ3M	6/11/2012	NE Uranium Plume Area	59	1.3
SMI-PZ3S	6/11/2012	NE Uranium Plume Area	25	1.8
TP-01	6/7/2012	NE Uranium Plume Area	22	0.077
TP-22	6/8/2012	NE Uranium Plume Area	17	0.33
TP-23	6/8/2012	NE Uranium Plume Area	25	3.0
UPD-18	6/11/2012	NE Uranium Plume Area	14	1.0
UPD-19	6/11/2012	NE Uranium Plume Area	14	0.65
UPD-20	6/11/2012	NE Uranium Plume Area	25	0.14
UPD-21	6/11/2012	NE Uranium Plume Area	25	12.0
UPD-22	6/7/2012	NE Uranium Plume Area	15	2.9

ft bgs = feet below ground surface, S = southern; SW = southwestern; NE = northeastern

CF5 Extraction Wells

Time versus concentration plots were generated to display the trends displayed by the CF5 extraction wells during the past 2 years. Figure 4 is the time versus ammonia concentration plot for extraction wells 0810 through 0813 and PW02, all of which are located along the CF5 southeastern boundary. Figure 5 displays a time versus uranium concentration plot for the same set of wells. Figures 6 and 7 are the time versus ammonia and uranium concentration plots, respectively, for CF5 wells 0814 through 0816, which are located closer to the base of the tailings pile (Figure 1).

As the four plots exhibit, with a few exceptions, the ammonia and uranium concentrations did not significantly change since April 2011. One exception would be the PW02 uranium concentration, which increased to 4.2 mg/L in December 2011, and decreased to 2.7 mg/L in June 2012 (which is just below the concentration measured in April 2011). The ammonia concentration measured in the sample collected from well 0815 has gradually decreased since October 2010 from 350 mg/L to 190 mg/L in June 2011.

Figure 8 presents the various pumping rates and associated drawdowns for all CF5 wells measured between June and August 2012.

To present the trends observed in the water chemistry for the site-wide locations, the site was divided into seven areas. These include the northeastern base of the tailings pile (wells UPD-17 through -19), northeastern uranium plume (which includes the PW03 cluster), the south east base of the tailings pile, along the southwestern boundary, along the Colorado River bank, and south of the site. All results are also plotted against the Colorado River flow to determine if the river stage may impact the concentrations.

Northeastern Base of the Tailings Pile

Wells UPD-17, -18, and -19 were installed along the northeastern base of the tailings in Spring 2011 and were first sampled in October 2011. Figures 9 and 10 are time versus ammonia and uranium concentration plots, respectively, for these locations. It was not possible to collect a sample from Well UPD-17 in June 2012.

The first three samples collected from these locations suggest ammonia concentrations in samples collected from UPD-17 and -18 are between 200 and 300 mg/L, while the concentration in the sample collected from UPD-19 is between 50 and 100 mg/L (Figure 9). With only three samples collected from these locations, no clear trend is evident.

For the first two samples collected from UPD-17 and -18, the uranium concentrations were similar (Figure 10). In June 2012 the uranium concentrations for wells UPD-18 and -19 were below 1 mg/L.

Northeastern Uranium Plume Area

Figures 11 and 12 are the time versus ammonia and uranium concentration plots, respectively, for the northeastern uranium plume area. Figures 13 and 14 display comparable data for the PW03 cluster, which is located within this area.

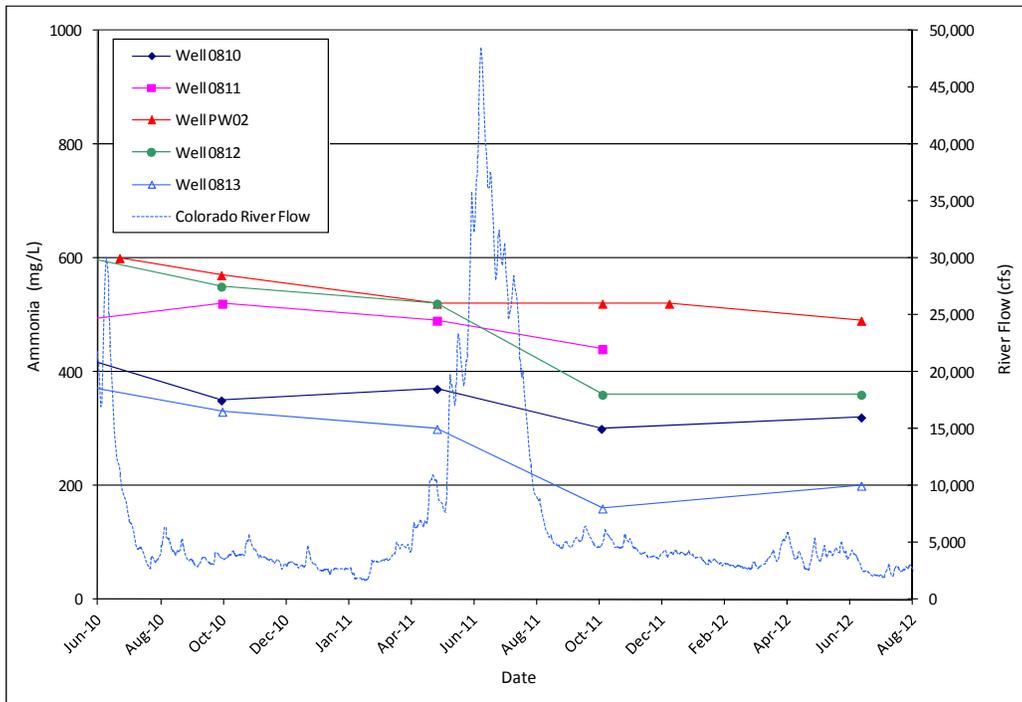


Figure 4. CF5 Extraction Wells 0810, 0811, 0812, 0813, and PW02 Time Versus Ammonia Concentration Plot

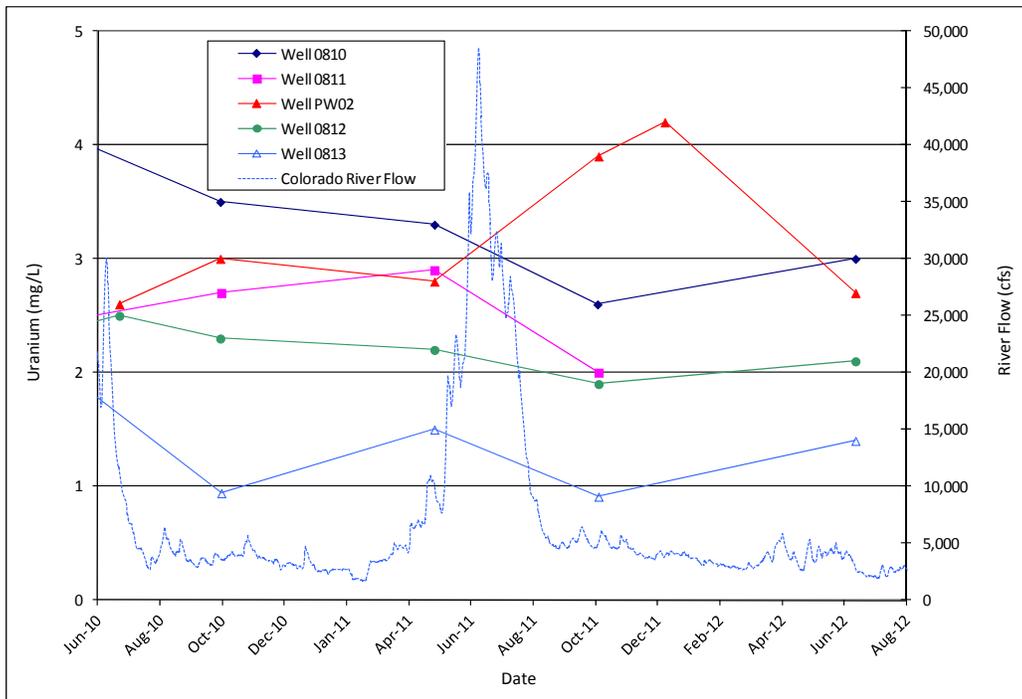


Figure 5. CF5 Extraction Wells 0810, 0811, 0812, 0813, and PW02 Time Versus Uranium Concentration Plot

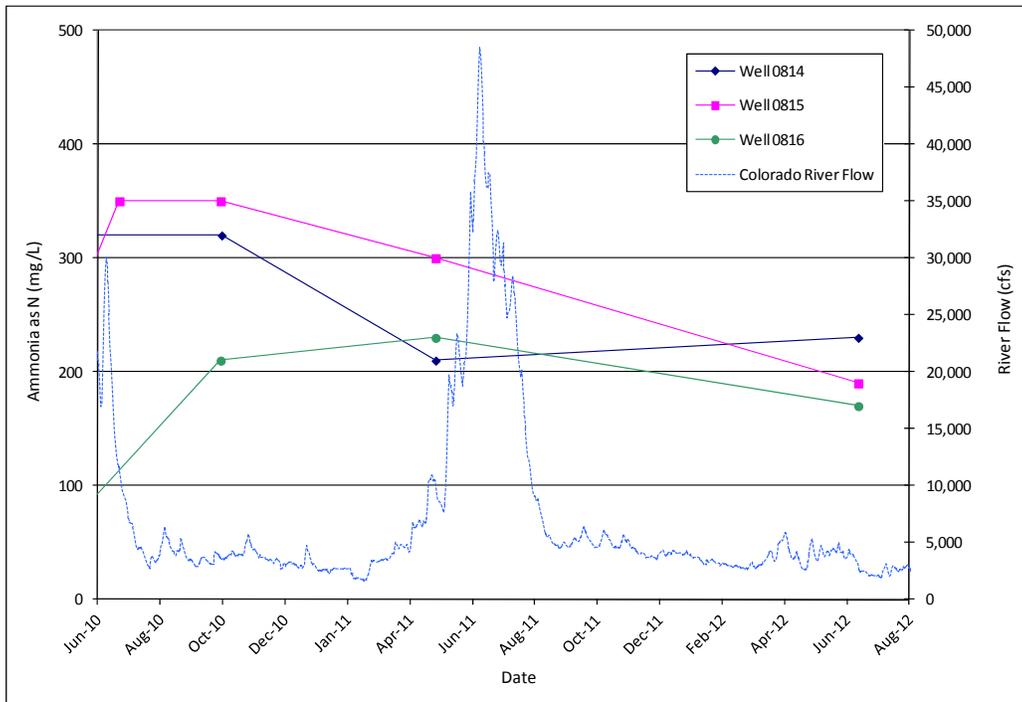


Figure 6. CF5 Extraction Wells 0814, 0815, and 0816
Time Versus Ammonia Concentration Plot

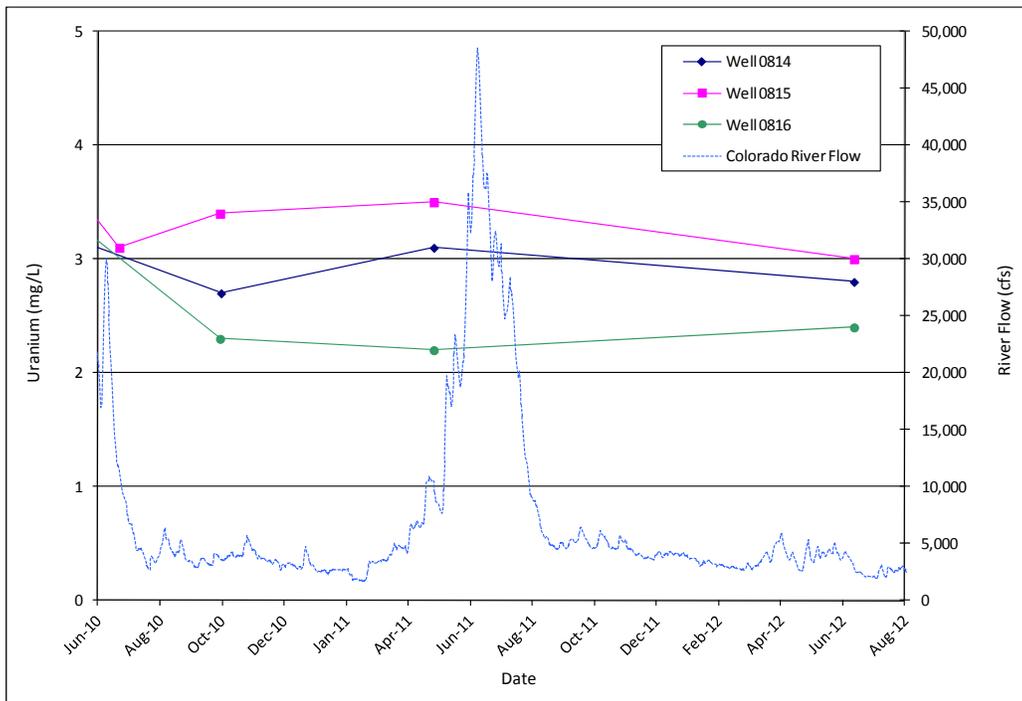


Figure 7. CF5 Extraction Wells 0814, 0815, and 0816
Time Versus Uranium Concentration Plot

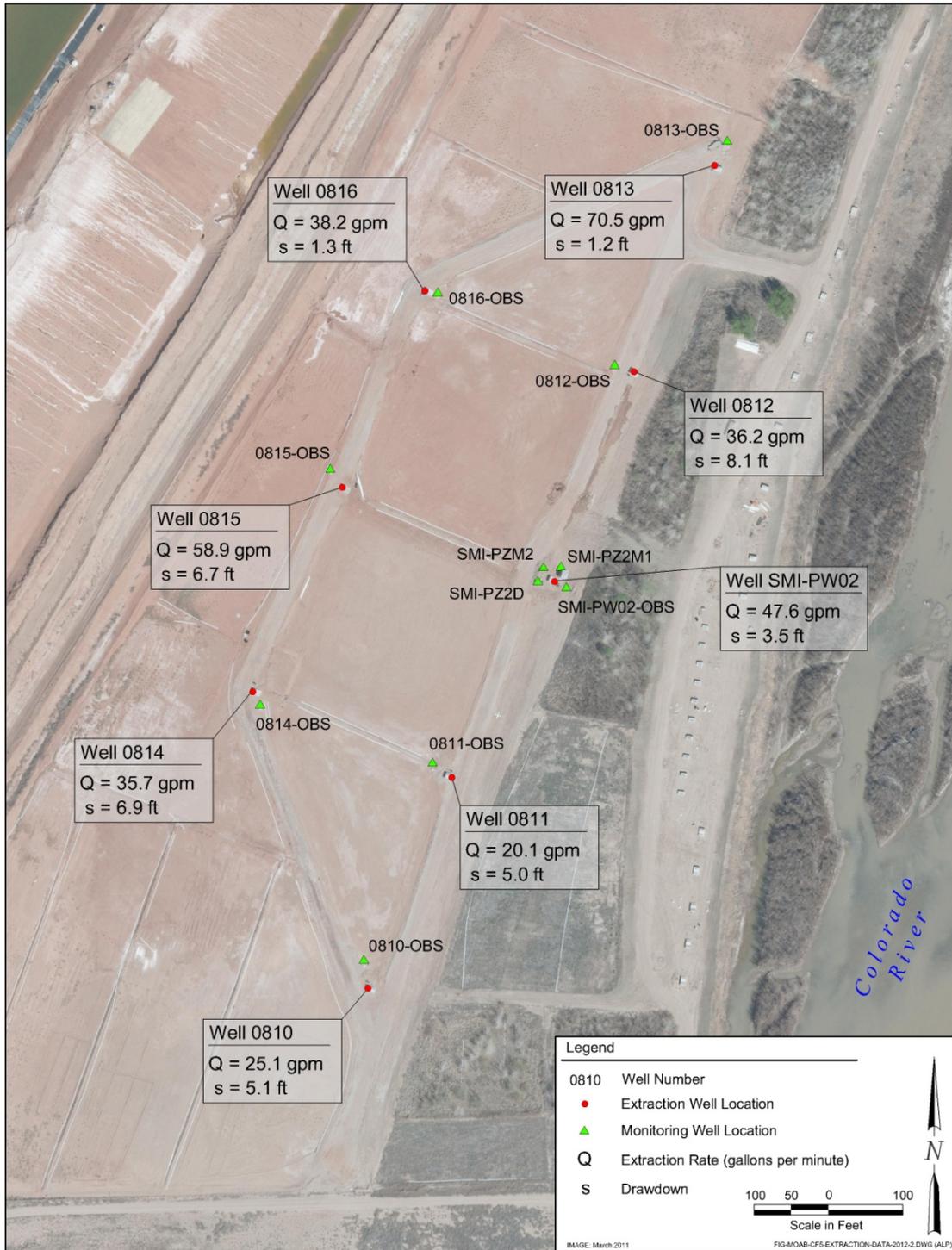


Figure 8. CF5 Pumping Rates and Drawdowns, June through August 2012

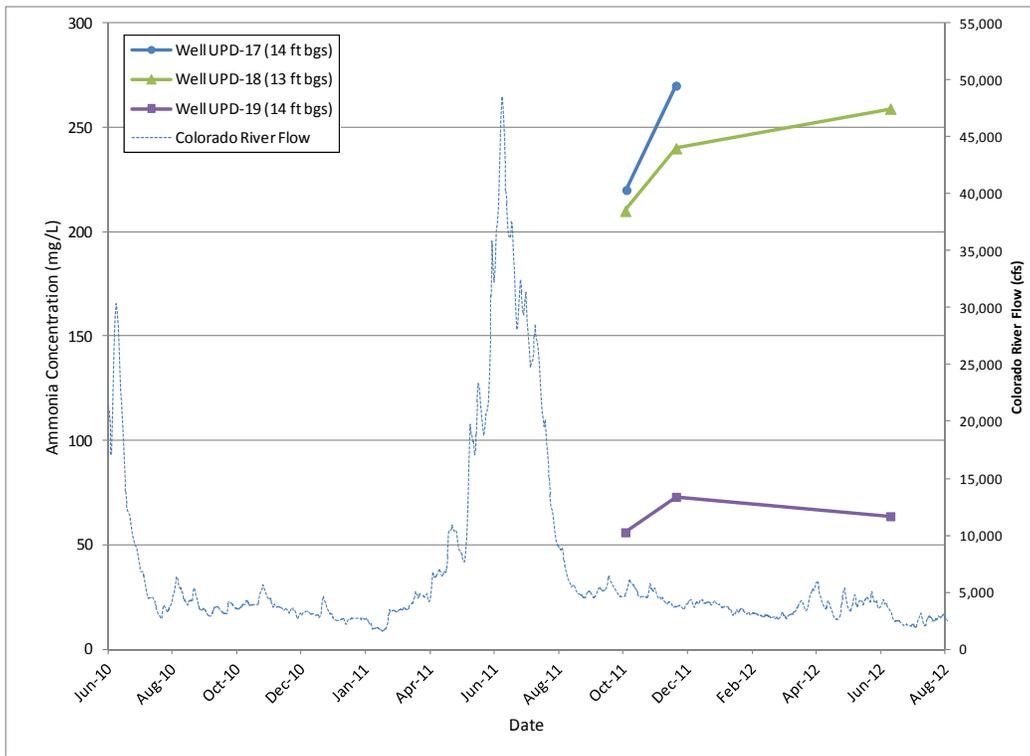


Figure 9. Wells UPD-17, UPD-18, and UPD-19 Time Versus Ammonia Concentration Plot

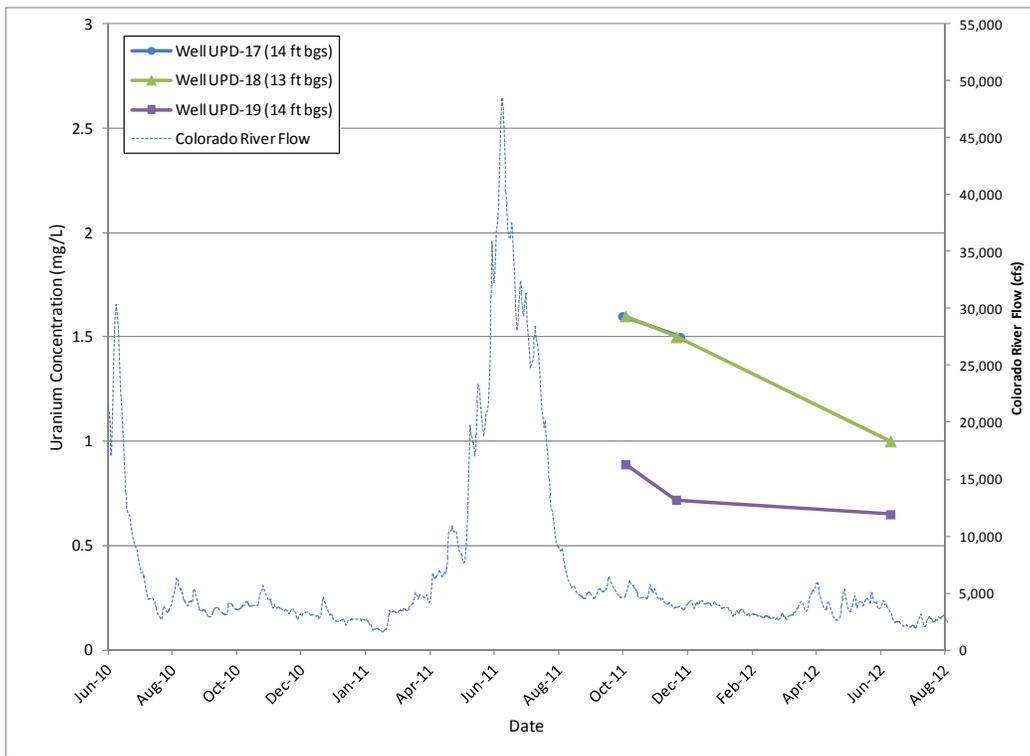


Figure 10. Wells UPD-17, UPD-18, and UPD-19 Time Versus Uranium Concentration Plot

As Figure 11 exhibits, the ammonia concentrations have generally remained consistent with the exception of the concentration measured from UPD-21. The ammonia concentration in well UPD-21 has decreased from 74 to 13 mg/L since October 2011. The concentrations in wells 0410 and 0412 are below the detection limit of 0.1 mg/L, and the sample collected from UPD-22 has been below 5 mg/L. Uranium concentrations (Figure 12) in well 0411 decreased since November 2011, while the uranium concentrations measured in the samples collected from well UPD-21 has consistently been above 10 mg/L since October 2011.

Figures 13 and 14 are the time versus ammonia and uranium concentration plots, respectively, for the PW03 cluster, which is located near the center of the northeastern uranium plume area. These wells provide a vertical profile of the concentrations in this area as samples are collected from 25 (PZ3S), 59 (PZ3M), and 78 (PZ3D2) feet below ground surface (ft bgs).

Elevated ammonia has been measured in the sample collected from PZ3D2 and, to a lesser degree, from PZ3M during the past 2 years. Uranium concentrations range between 1 and 2 mg/L from these same wells in addition to well PZ3S.

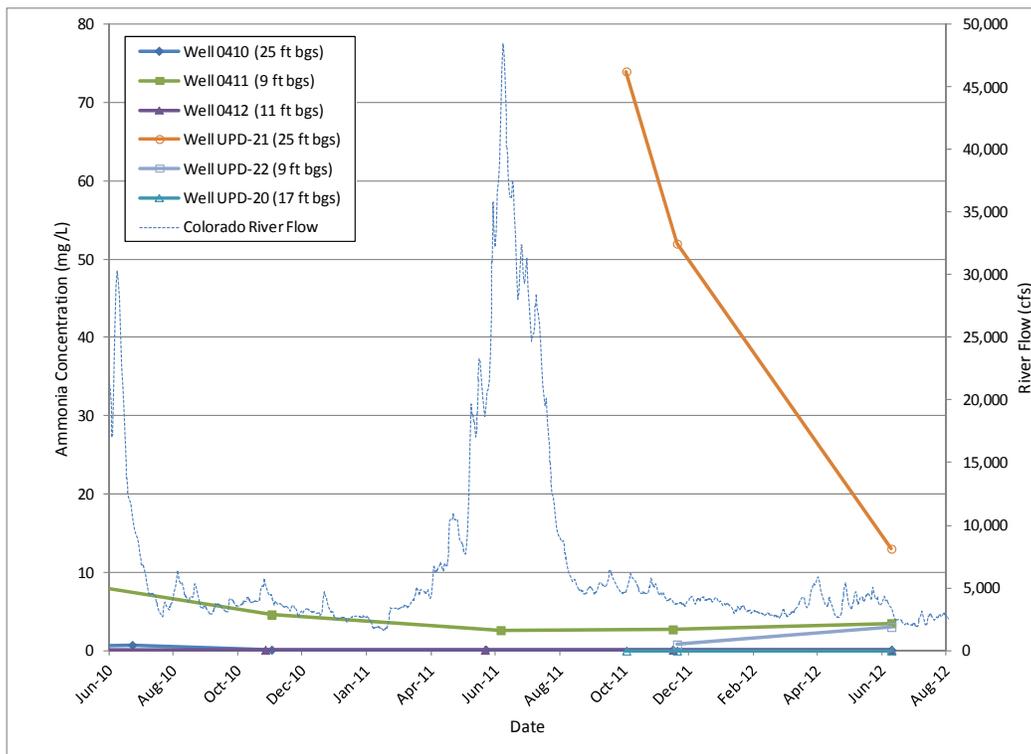


Figure 11. Northeastern Uranium Plume Observation Wells 0410 through 0412 and UPD-20 through UPD-22 Time Versus Ammonia Concentration Plot

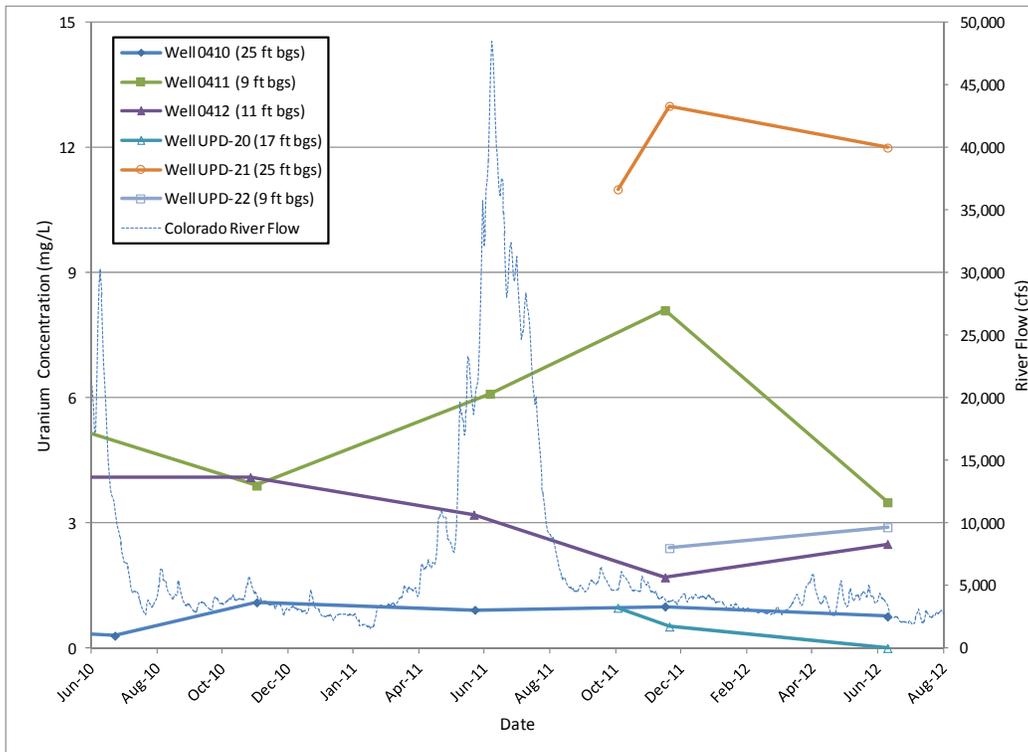


Figure 12. Northeastern Uranium Plume Observation Wells 0410 through 0412 and UPD-20 through UPD-22 Time Versus Uranium Concentration Plot

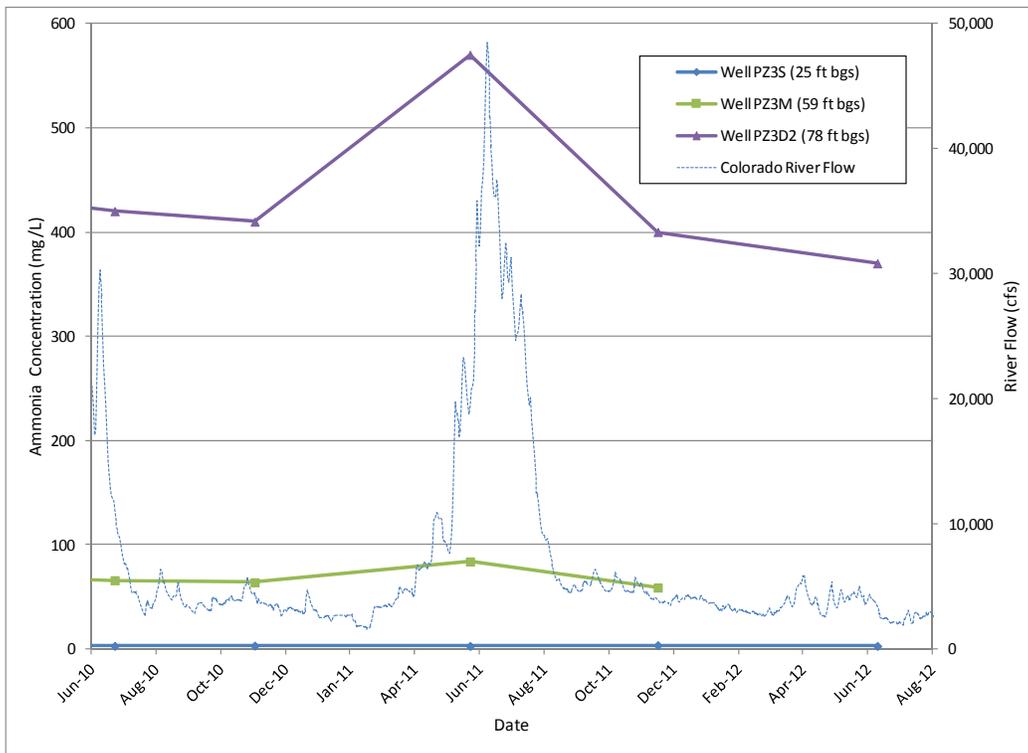


Figure 13. PW03 Cluster Observation Wells PZ3S, PZ3M, and PZ3D2 Time Versus Ammonia Concentration Plot

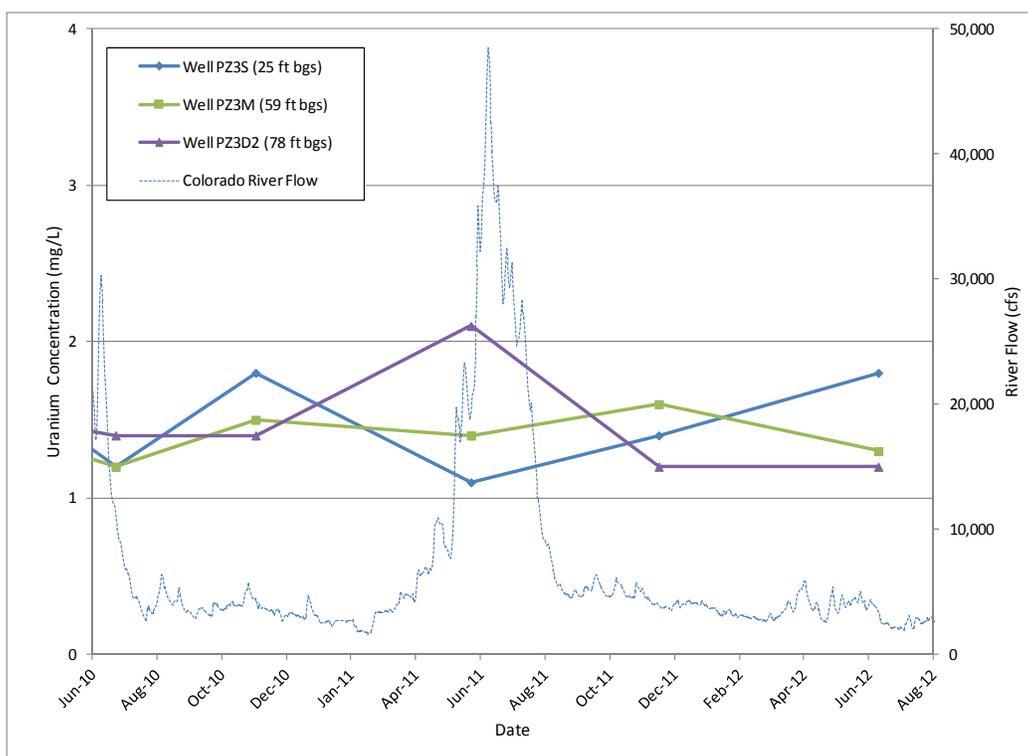


Figure 14. PW03 Cluster Plume Observation Wells PZ3S, PZ3M, and PZ3D2 Time Versus Uranium Concentration Plot

Base of the Tailings Pile

The time versus ammonia and uranium concentration plots for the area near the base of the tailings pile are presented in Figures 15 and 16. As Figure 15 exhibits, the ammonia concentrations have generally fluctuated independent of the river flow in the samples collected from wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 (listed from south to north). The data suggest the ammonia concentrations have level off since the area was flooded, starting in May 2011. Uranium concentrations (Figure 16) have been consistent since November 2011, and the ATP wells have consistently been below 0.1 mg/L during the past 2 years.

Southwestern Boundary

Figures 17 and 18 display the time versus concentration plots for the locations along the southwestern boundary (Figure 2), presented in the upgradient to downgradient direction. Both ammonia and uranium concentrations in the samples collected from wells 0453 and 0454 have not changed significantly since November 2011.

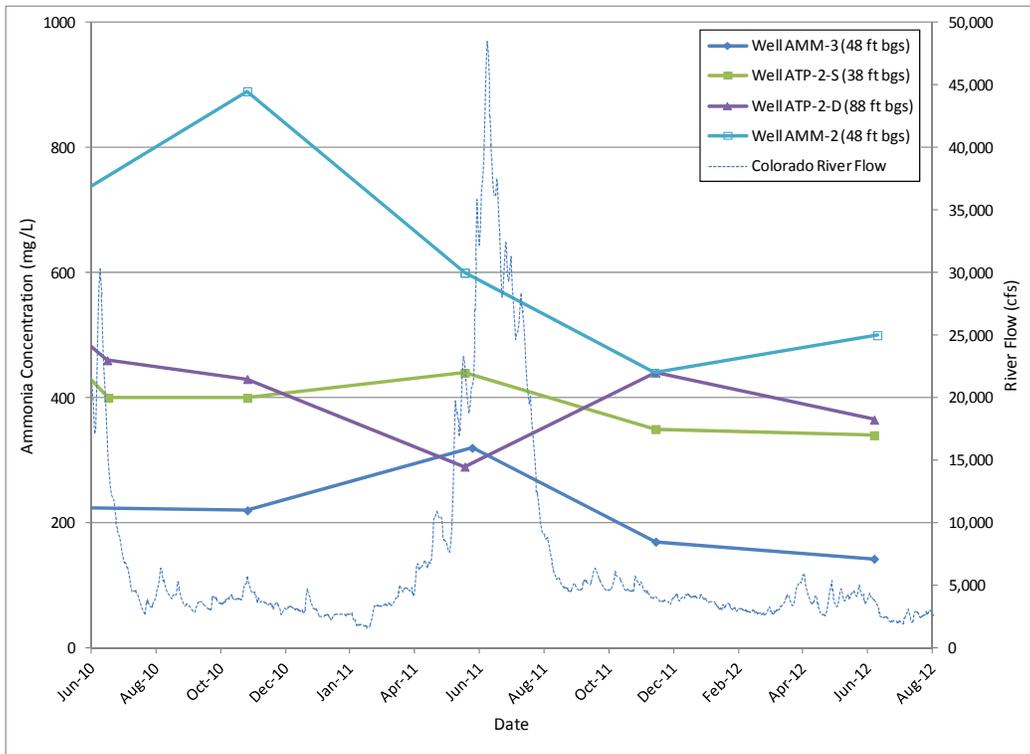


Figure 15. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 Time Versus Ammonia Concentration Plot

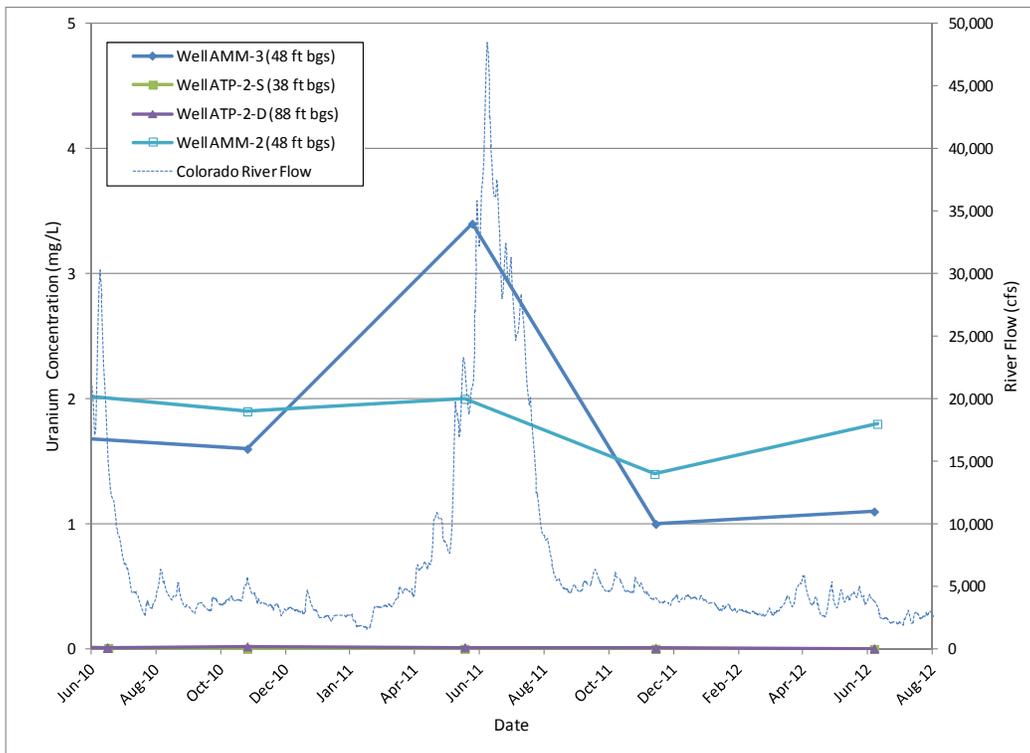


Figure 16. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 Time Versus Uranium Concentration Plot

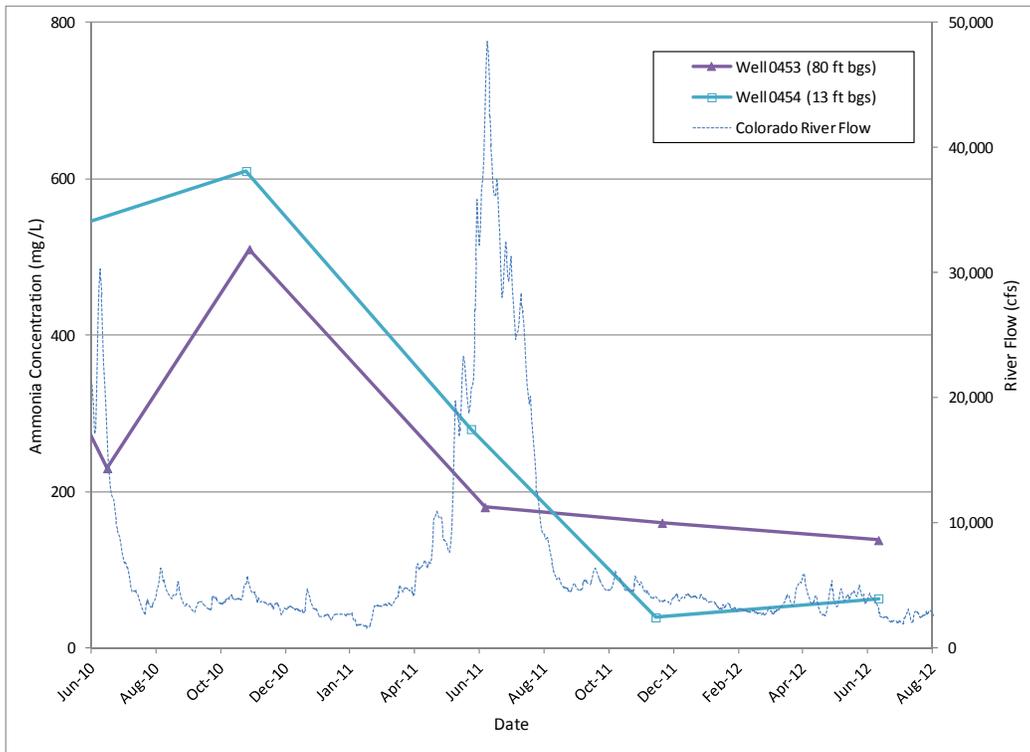


Figure 17. Southwest Boundary Observation Wells 0453 and 0454 Time Versus Ammonia Concentration Plot

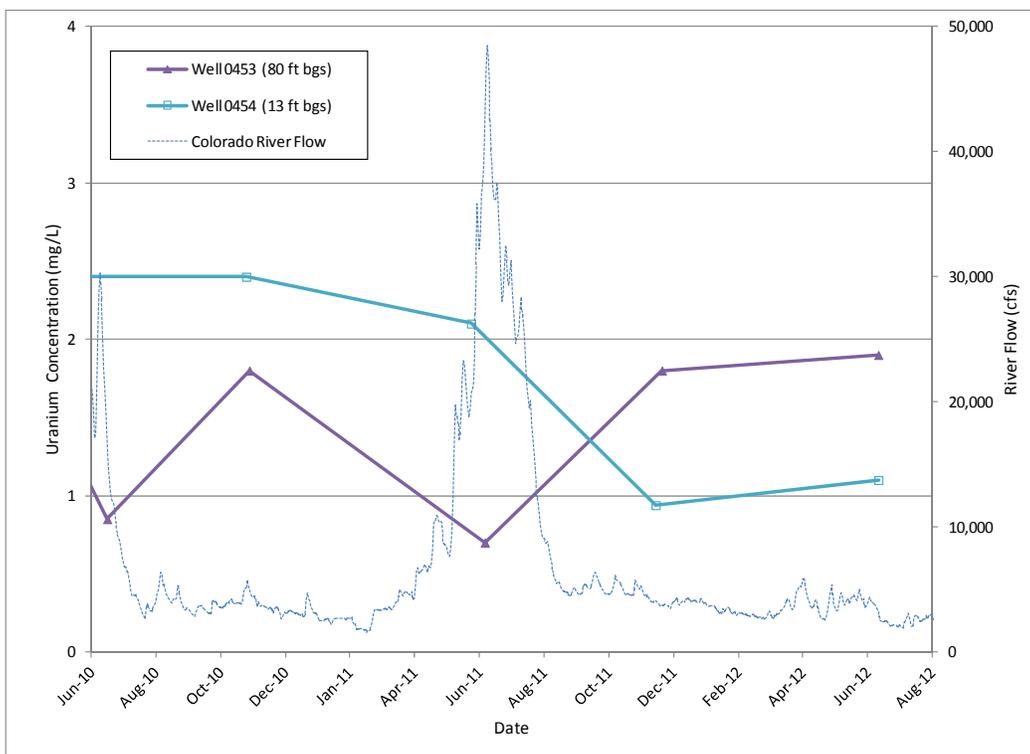


Figure 18. Southwest Boundary Observation Wells 0453 and 0454 Time Versus Uranium Concentration Plot

Riverbank Area

Figures 19 and 20 are the time versus ammonia and uranium concentration plots, respectively, for the locations sampled along the riverbank, presented from south to north. Ammonia concentrations are low at the southern and northern ends of the site, and increase near the middle. This plot also demonstrates how significant of an impact the higher river flows result in lower ground water concentrations, as expected. As of June 2012, ammonia concentrations have not rebounded to pre-2011 flood levels in wells 0401 and 0404. Uranium concentrations (Figure 20) have remained consistent in wells 0401 and TP-01 and have gradually increased since May 2011 in wells 0404 and 0492.

Southern and Off-site Areas

Figures 21 and 22 are the plots for the three locations sampled to the south of the site. Wells TP-17 and TP-19 are located along the riverbank, and TP-20 is located approximately 600 feet (ft) off the bank. Ammonia concentrations (Figure 21) have remained below 4 mg/L during the past 2 years, and the uranium concentrations (Figure 22) have consistently been below 0.044 mg/L during the same time frame.

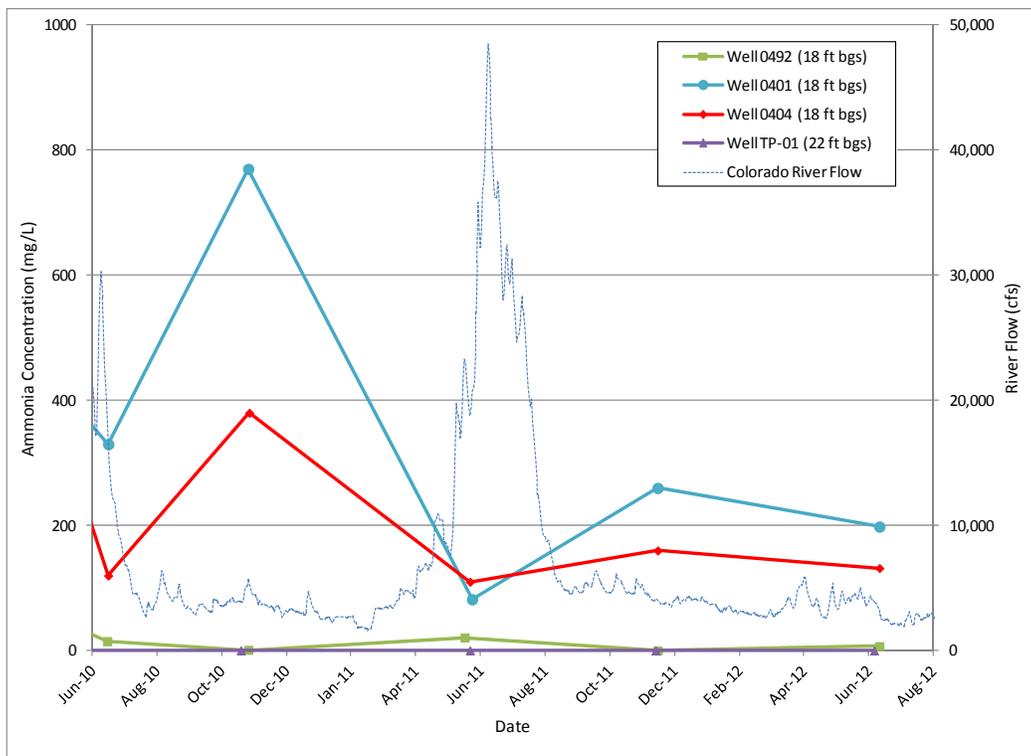


Figure 19. Riverbank Observation Wells 0492, 0401, 0404, and TP-01 Time Versus Ammonia Concentration Plot

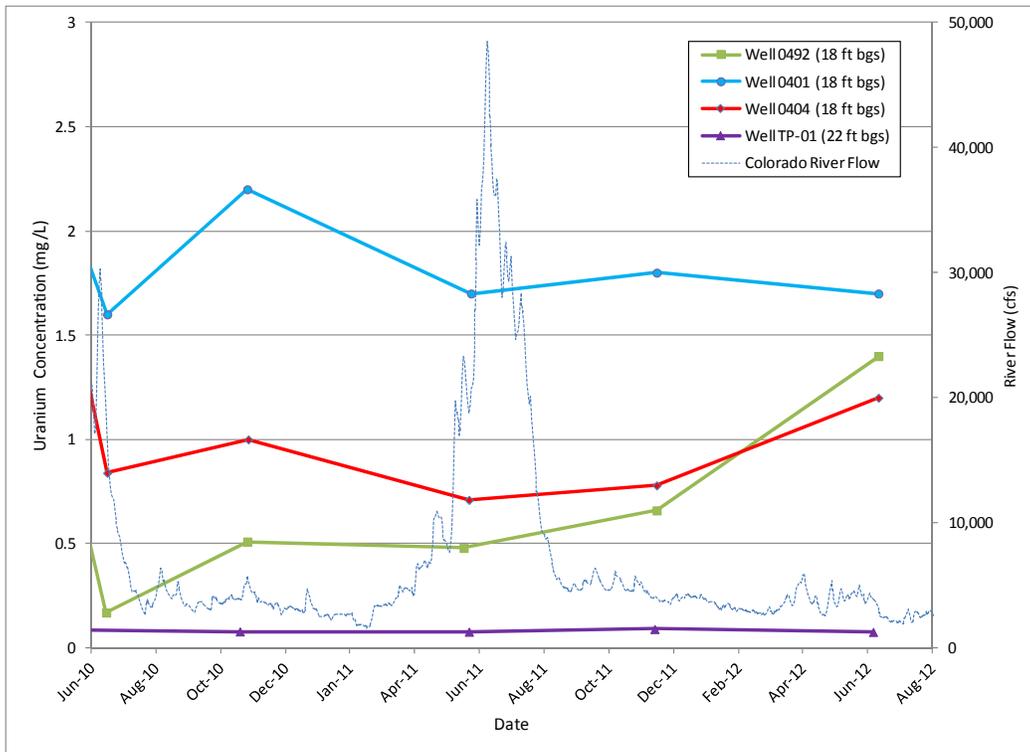


Figure 20. Riverbank Observation Wells 0492, 0401, 0404, and TP-01 Time Versus Uranium Concentration Plot

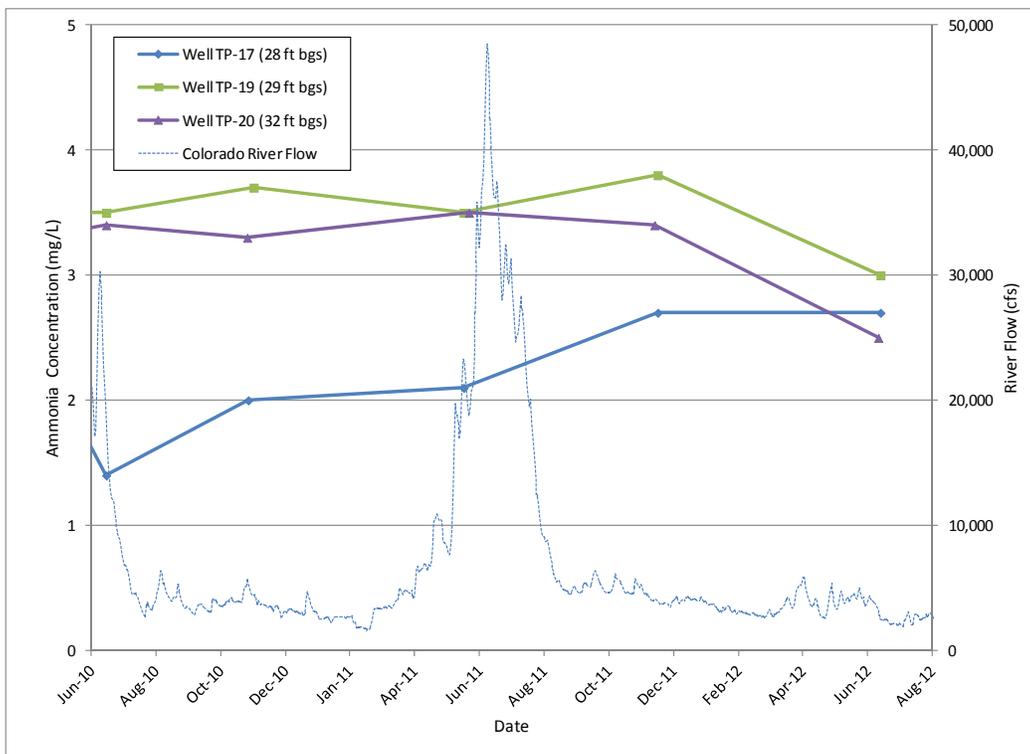


Figure 21. South of the Site Observation Wells TP-17, TP-19, and TP-20 Time Versus Ammonia Concentration Plot

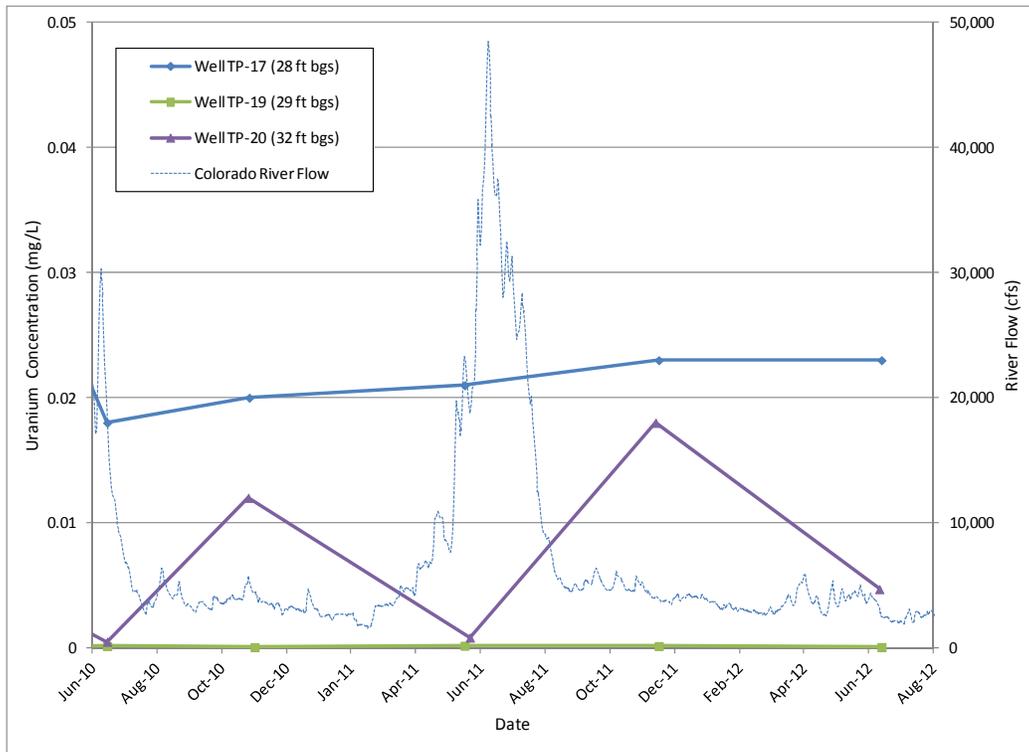


Figure 22. South of the Site Observation Wells TP-17, TP-19, and TP-20 Time Versus Uranium Concentration Plot

Surface Water Sampling

Table 5 presents the ammonia results from the surface water sampling conducted in December 2011 from locations 0218, 0226, 0228, CR1, CR2, CR3, and CR5 (as shown on Figure 3). The ammonia concentrations and comparisons to 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 also shown in Table 5.

Table 5. Surface Water Ammonia Concentrations and Comparisons to State of Utah and Federal Criteria

Location	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
0218	6/7/12	21.7	8.45	0.1	2.14	0.672
0226	6/14/12	23.0	8.77	0.15	1.23	0.359
0228	6/14/12	24.1	8.88	0.1	1.04	0.306
CR1	6/7/12	20.4	8.39	0.1	2.59	0.906
CR2	6/7/12	24.4	8.59	0.1	1.77	0.499
CR3	6/12/12	24.6	8.54	0.68	2.14	0.591
CR5	6/7/12	21.0	8.46	0.1	2.14	0.672

Loc = location, Temp = temperature, AWQC = ambient water quality criteria

Notes:

- (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

With the exception of the samples collected from 0226 and CR3, the ammonia concentrations were below the detection limit of 0.1 mg/L. However, the concentration detected in the sample from location 0226 was below both the acute and chronic criteria, and the sample collected from location CR3 was below the acute, and just above the chronic criteria. It is important to note that in the vicinity of location CR3, a habitat was not established at the time of this sampling.

Ammonia Probe Analysis Results

All samples collected were analyzed for ammonia using a portable HACH ammonia meter. For approximately one-half of the samples, sample splits were collected and submitted to ALS for ammonia analysis to determine how the measured concentrations compare to each other. Table 6 provides the results measured by both ALS and the ammonia probe. As the table displays, the results are comparable.

Table 6. Ammonia Probe Analysis Results Compared to Analytical Results

Well Number	Date	Ammonia Concentration (mg/L)	
		Analytical Results	Ammonia Probe Results
0401	6/12/2012	NA	198
0403	6/12/2012	41	35.6
0404	6/12/2012	NA	132
0407	6/12/2012	56	70
0410	6/11/2012	0.1	5.81
0411	6/11/2012	3.5	5.31
0412	6/7/2012	0.1	NA
0439	6/12/2012	7.9	8.95
0453	6/12/2012	NA	175
0454	6/8/2012	NA	86.9
0492	6/12/2012	7.0	10.5
0810	6/13/2012	320	277
0812	6/13/2012	360	319
0813	6/13/2012	200	184
0814	6/14/2012	230	201
0815	6/14/2012	190	174
0816	6/14/2012	170	152
AMM-2	6/11/2012	500	491
AMM-3	6/8/2012	NA	143
ATP-2-D	6/8/2012	NA	365
ATP-2-S	6/8/2012	NA	325
SMI-MW01	6/7/2012	0.43	2.37
SMI-PW02	6/13/2012	490	458
SMI-PZ1S	6/11/2012	NA	178
SMI-PZ3D2	6/11/2012	370	384
SMI-PZ3M	6/11/2012	NA	34.0
SMI-PZ3S	6/11/2012	3.0	4.78
TP-01	6/7/2012	0.1	0.27

Table 6. Ammonia Probe Analysis Results Compared to Analytical Results (continued)

Well Number	Date	Ammonia Concentration (mg/L)	
		Analytical Results	Ammonia Probe Results
TP-17	6/14/2012	2.7	3.72
TP-19	6/14/2012	3.0	3.44
TP-20	6/12/2012	2.5	4.86
TP-22	6/8/2012	0.1	<0.3
TP-23	6/8/2012	NA	106
UPD-18	6/11/2012	NA	259
UPD-19	6/11/2012	NA	63.7
UPD-20	6/11/2012	0.1	<0.6
UPD-21	6/11/2012	NA	13.0
UPD-22	6/7/2012	3.0	4.08

NA = Not Applicable (sample not analyzed)
 Ammonia probe results measured using HACH sension 2 portable pH/ISE probe and meter
 Analytical results provided by ALS

Contour Maps

Figure 23 is a ground water contour map generated for the site in June 2012. All water level data were collected from the shallow aquifer zone and exhibit a ground water flow direction towards the Colorado River. Figures 24 and 25 are the shallow ground water ammonia and uranium plume maps generated using the data collected during the June 2012 site-wide event. These maps are generally comparable to previous plume maps during river base flow conditions.

5.0 Conclusions

The rationale for conducting the June site-wide sampling event was to collect data during river base-flow conditions and assess any changes and trends in the ground water system water chemistry. As part of this event CF5 extraction well samples were collected to accurately measure ammonia and uranium mass removal rates for the ground water system by the ground water extraction system. Surface water sampling was also conducted to assess surface water quality adjacent to the site compared to the upstream and downstream water quality.

The following conclusions can be made from the June 2012 site-wide sampling event:

- In general, the ammonia and uranium concentrations did not significantly change since the previous site-wide sampling event that occurred in October 2011. All contaminant concentrations were comparable to historical river base-flow conditions. Despite the fact that this event occurred when the Colorado River flows are typically high due to the spring runoff, a below average snow pack resulted in flows that were well below average.
- With the exception of the uranium concentration detected in well PW02, ammonia and uranium concentrations in the CF5 wells were within historical ranges during this sampling event. The uranium concentration decreased from 4.2 mg/L in December 2011 to 2.7 mg/L in June 2012.

- With the exception of one surface water sample collected from CR3, the ammonia concentrations were below the applicable state of Utah and federal criteria for both acute and chronic concentrations. The sample collected from location CR3 was below the acute criteria, and just above the chronic criteria. However, no habitat was present when this sample was collected.

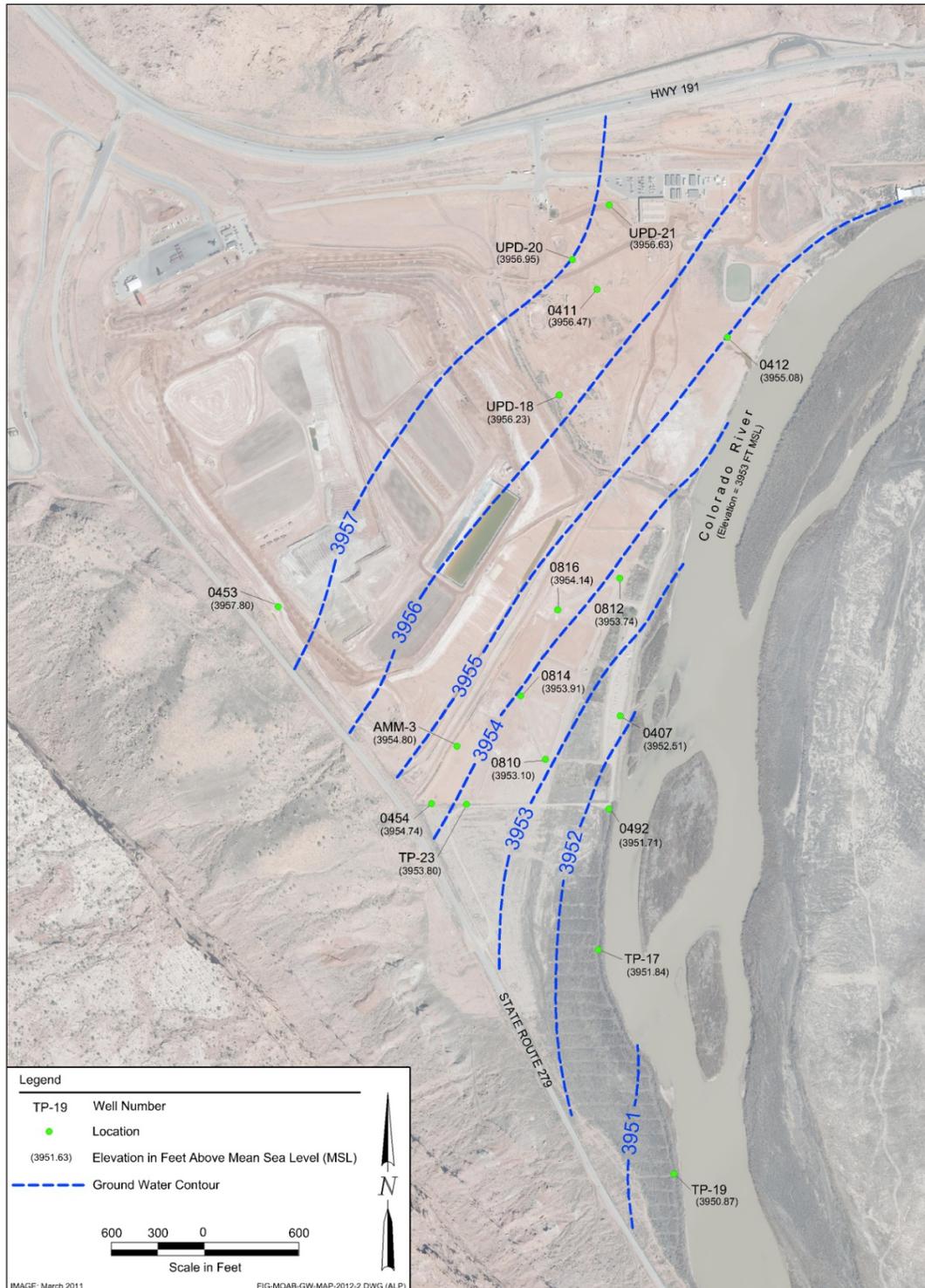


Figure 23. Site-wide Ground Water Contour Map, June 2012

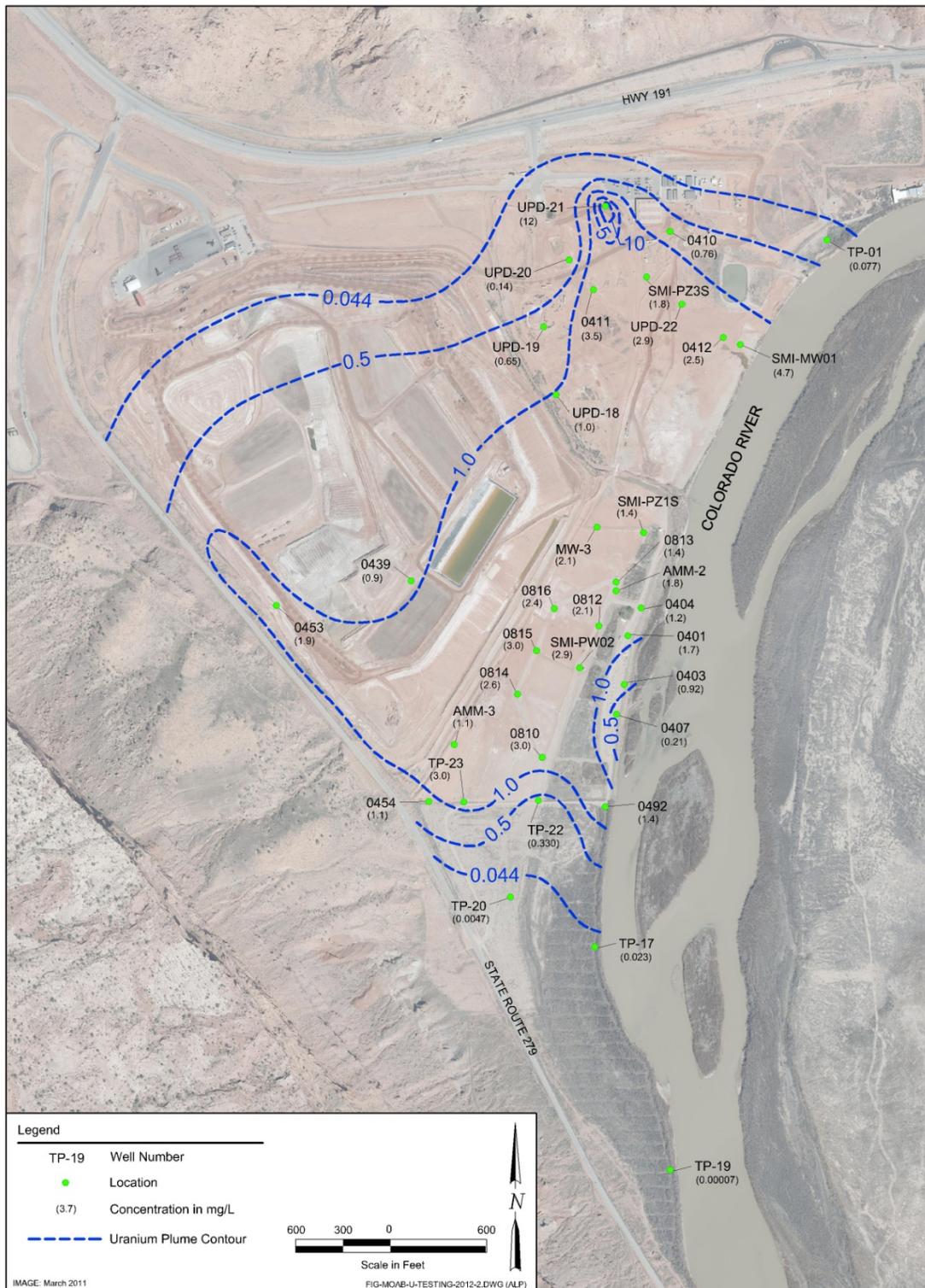


Figure 25. Location of Uranium Plume in Shallow Ground Water, June 2012

6.0 References

40 CFR 192A (Code of Federal Regulations), “Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings and Uranium In Situ Leaching Processing Facilities.”

DOE (U.S. Department of Energy), *Moab UMTRA Project Operations, Maintenance, and Performance Monitoring Plan for the Interim Action Ground Water Treatment System* (DOE-EM/GJTAC1973), October 2012.

DOE (U.S. Department of Energy), *Moab UMTRA Project Surface Water/Ground Water Sampling and Analysis Plan* (DOE-EM/GJTAC1830), July 2012.

DOE (U.S. Department of Energy), *Moab UMTRA Project Standard Practice for Validation of Laboratory Data* (DOE-EM/GJTAC1855), September 2011.

Appendix A.
June 2012 Site-wide Sampling Event
Water Sampling Field Activities Verification
Water Quality Data
Water Level Data
Trip Report

Appendix A. Water Sampling Field Activities Verification

Sampling Event/RIN	June 2012 Site-wide Sampling Event/1206064	Date(s) of Water Sampling	June 7-14, 2012
Date(s) of Verification	August 14, 2012	Name of Verifier	Ken Pill
		Response (Yes, No, NA)	Comments
1.	Is the Sampling Analysis Plan the primary document directing field procedures? List other documents, standard operating procedures, instructions.	Yes	
		NA	
2.	Were the sampling locations specified in the planning documents sampled?	No	The following wells were not sampled: UPD-17 (surface casing damaged) and 0811 (equipment malfunction).
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? 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	Field measurements for temperature, pH, turbidity, dissolved oxygen, oxidation reduction potential, and conductivity were collected.
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 before sampling? Did the water level stabilize before sampling? Did pH, specific conductance, and turbidity measurements stabilize before sampling? Was the flow rate less than 500 milliliters per minute? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes	
		Yes	
		Yes	
		NA	
		NA	
8.	Were the following conditions met when purging a Category II well: Was the flow rate less than 500 milliliters per minute? Was one pump/tubing volume removed before sampling?	NA	
		NA	
9.	Were duplicates taken at a frequency of one per 20 samples?	Yes	Three duplicates were collected for 48 samples.
10.	Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	All samples were collected on dedicated equipment.

Appendix A. Water Sampling Field Activities Verification (continued)

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 Samples with turbidity over 10 nephelometric turbidity units (NTUs) were filtered.
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?	Yes
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?	Yes
20. Were water levels measured at the locations specified in the planning documents?	NA

NA = not applicable

Appendix A. Water Quality Data

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 9/27/2012

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
										Lab	Data	QA		
Ammonia Total as N	mg/L	0218	SL	06/07/2012	0001	0	-	0	0.1	UN	J	#	0.1	
Ammonia Total as N	mg/L	0226	SL	06/14/2012	0001	0	-	0	0.15		J	#	0.1	
Ammonia Total as N	mg/L	0228	SL	06/14/2012	0001	0	-	0	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	0403	WL	06/12/2012	0001	18	-	18	41		J	#	1	
Ammonia Total as N	mg/L	0407	WL	06/12/2012	0001	17	-	17	56		J	#	2	
Ammonia Total as N	mg/L	0410	WL	06/11/2012	0001	25	-	25	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	0411	WL	06/11/2012	0001	9	-	9	3.5		J	#	0.1	
Ammonia Total as N	mg/L	0412	WL	06/07/2012	0001	10.5	-	10.5	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	0439	WL	06/12/2012	0001	118	-	118	7.9		J	#	0.2	
Ammonia Total as N	mg/L	0492	WL	06/12/2012	0001	18	-	18	7		J	#	0.2	
Ammonia Total as N	mg/L	0492	WL	06/12/2012	0002	18	-	18	6.8		J	#	0.2	
Ammonia Total as N	mg/L	0810	WL	06/13/2012	0001	10	-	40	320		J	#	10	
Ammonia Total as N	mg/L	0812	WL	06/13/2012	0001	14	-	44	350		J	#	10	
Ammonia Total as N	mg/L	0812	WL	06/13/2012	0002	14	-	44	360		J	#	10	
Ammonia Total as N	mg/L	0813	WL	06/13/2012	0001	14	-	44	200		J	#	5	
Ammonia Total as N	mg/L	0814	WL	06/14/2012	0001	12	-	42	230		J	#	5	
Ammonia Total as N	mg/L	0814	WL	06/14/2012	0002	12	-	42	230		J	#	5	
Ammonia Total as N	mg/L	0815	WL	06/14/2012	0001	22	-	52	190		J	#	5	
Ammonia Total as N	mg/L	0816	WL	06/14/2012	0001	21	-	51	170		J	#	5	
Ammonia Total as N	mg/L	AMM-2	WL	06/11/2012	0001	48	-	48	500		J	#	20	
Ammonia Total as N	mg/L	CR1	SL	06/07/2012	0001	0	-	0	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	CR2	SL	06/07/2012	0001	0	-	0	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	CR3	SL	06/12/2012	0001	0	-	0	0.68		J	#	0.1	
Ammonia Total as N	mg/L	CR5	SL	06/07/2012	0001	0	-	0	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	SMI-MW01	WL	06/07/2012	0001	16	-	16	0.43		J	#	0.1	

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 9/27/2012

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
								Lab	Data	QA		
Ammonia Total as N	mg/L	SMI-PW02	WL	06/13/2012	0001	20 - 60	490	J	#		10	
Ammonia Total as N	mg/L	SMI-PZ3D2	WL	06/11/2012	0001	78 - 78	370	J	#		10	
Ammonia Total as N	mg/L	SMI-PZ3S	WL	06/11/2012	0001	25 - 25	3	J	#		0.1	
Ammonia Total as N	mg/L	TP-01	WL	06/07/2012	0001	22 - 22	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	TP-17	WL	06/14/2012	0001	28 - 28	2.7	J	#		0.1	
Ammonia Total as N	mg/L	TP-19	WL	06/14/2012	0001	29 - 29	3	J	#		0.1	
Ammonia Total as N	mg/L	TP-20	WL	06/12/2012	0001	32 - 32	2.5	J	#		0.1	
Ammonia Total as N	mg/L	TP-22	WL	06/08/2012	0001	17 - 17	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	UPD-20	WL	06/11/2012	0001	17 - 17	0.1	U	J	#	0.1	
Ammonia Total as N	mg/L	UPD-22	WL	06/07/2012	0001	9 - 9	3	J	#		0.1	
Dissolved Oxygen	mg/L	0218	SL	06/07/2012	0001	0 - 0	6.7			#		
Dissolved Oxygen	mg/L	0226	SL	06/14/2012	0001	0 - 0	7.14			#		
Dissolved Oxygen	mg/L	0228	SL	06/14/2012	0001	0 - 0	3.33			#		
Dissolved Oxygen	mg/L	0401	WL	06/12/2012	N001	18 - 18	0.45			#		
Dissolved Oxygen	mg/L	0403	WL	06/12/2012	N001	18 - 18	0.99			#		
Dissolved Oxygen	mg/L	0404	WL	06/12/2012	N001	18 - 18	1.79			#		
Dissolved Oxygen	mg/L	0407	WL	06/12/2012	N001	17 - 17	1.16			#		
Dissolved Oxygen	mg/L	0410	WL	06/11/2012	0001	25 - 25	6.4			#		
Dissolved Oxygen	mg/L	0411	WL	06/11/2012	0001	9 - 9	6.97			#		
Dissolved Oxygen	mg/L	0412	WL	06/07/2012	0001	10.5 - 10.5	5.23			#		
Dissolved Oxygen	mg/L	0439	WL	06/12/2012	0001	118 - 118	1.51			#		
Dissolved Oxygen	mg/L	0453	WL	06/12/2012	0001	80 - 80	1.21			#		
Dissolved Oxygen	mg/L	0454	WL	06/08/2012	N001	13 - 13	4.53			#		
Dissolved Oxygen	mg/L	0492	WL	06/12/2012	N001	18 - 18	0.26			#		
Dissolved Oxygen	mg/L	0810	WL	06/13/2012	N001	10 - 40	1.74			#		
Dissolved Oxygen	mg/L	0812	WL	06/13/2012	N001	14 - 44	1.81			#		
Dissolved Oxygen	mg/L	0813	WL	06/13/2012	N001	14 - 44	2.22			#		
Dissolved Oxygen	mg/L	0814	WL	06/14/2012	N001	12 - 42	1.41			#		

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 9/27/2012

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
								Lab	Data	QA		
Dissolved Oxygen	mg/L	0815	WL	06/14/2012	N001	22 - 52	0.54				#	
Dissolved Oxygen	mg/L	0816	WL	06/14/2012	N001	21 - 51	0.73				#	
Dissolved Oxygen	mg/L	AMM-2	WL	06/11/2012	0001	48 - 48	0.44				#	
Dissolved Oxygen	mg/L	AMM-3	WL	06/08/2012	N001	48 - 48	5.52				#	
Dissolved Oxygen	mg/L	ATP-2-D	WL	06/08/2012	N001	88 - 88	0.84				#	
Dissolved Oxygen	mg/L	ATP-2-S	WL	06/08/2012	0001	25 - 25	3.19				#	
Dissolved Oxygen	mg/L	CR1	SL	06/07/2012	N001	0 - 0	6.67				#	
Dissolved Oxygen	mg/L	CR2	SL	06/07/2012	0001	0 - 0	10.65				#	
Dissolved Oxygen	mg/L	CR3	SL	06/12/2012	0001	0 - 0	8.34				#	
Dissolved Oxygen	mg/L	CR5	SL	06/07/2012	N001	0 - 0	6.81				#	
Dissolved Oxygen	mg/L	SMI-MW01	WL	06/07/2012	0001	16 - 16	3.39				#	
Dissolved Oxygen	mg/L	SMI-PW02	WL	06/13/2012	N001	20 - 60	1.88				#	
Dissolved Oxygen	mg/L	SMI-PZ1S	WL	06/11/2012	0001	18 - 18	0.54				#	
Dissolved Oxygen	mg/L	SMI-PZ3D2	WL	06/11/2012	N001	78 - 78	0.4				#	
Dissolved Oxygen	mg/L	SMI-PZ3M	WL	06/11/2012	N001	59 - 59	0.49				#	
Dissolved Oxygen	mg/L	SMI-PZ3S	WL	06/11/2012	N001	25 - 25	0.56				#	
Dissolved Oxygen	mg/L	TP-01	WL	06/07/2012	N001	22 - 22	5.33				#	
Dissolved Oxygen	mg/L	TP-17	WL	06/14/2012	N001	28 - 28	-0.02				#	
Dissolved Oxygen	mg/L	TP-19	WL	06/14/2012	N001	29 - 29	-0.11				#	
Dissolved Oxygen	mg/L	TP-20	WL	06/12/2012	N001	32 - 32	0.23				#	
Dissolved Oxygen	mg/L	TP-22	WL	06/08/2012	N001	17 - 17	10.82				#	
Dissolved Oxygen	mg/L	TP-23	WL	06/08/2012	0001	25 - 25	8.93				#	
Dissolved Oxygen	mg/L	UPD-18	WL	06/11/2012	N001	13 - 13	4.59				#	
Dissolved Oxygen	mg/L	UPD-19	WL	06/11/2012	0001	14 - 14	2.32				#	
Dissolved Oxygen	mg/L	UPD-20	WL	06/11/2012	N001	17 - 17	2.3				#	
Dissolved Oxygen	mg/L	UPD-21	WL	06/11/2012	N001	25 - 25	2.79				#	
Dissolved Oxygen	mg/L	UPD-22	WL	06/07/2012	0001	9 - 9	3.09				#	

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Oxidation Reduction Potential	mV	0218	SL	06/07/2012	0001	0	-	0	222			#		
Oxidation Reduction Potential	mV	0226	SL	06/14/2012	0001	0	-	0	-84			#		
Oxidation Reduction Potential	mV	0228	SL	06/14/2012	0001	0	-	0	-183			#		
Oxidation Reduction Potential	mV	0401	WL	06/12/2012	N001	18	-	18	143			#		
Oxidation Reduction Potential	mV	0403	WL	06/12/2012	N001	18	-	18	123			#		
Oxidation Reduction Potential	mV	0404	WL	06/12/2012	N001	18	-	18	170			#		
Oxidation Reduction Potential	mV	0407	WL	06/12/2012	N001	17	-	17	84			#		
Oxidation Reduction Potential	mV	0410	WL	06/11/2012	0001	25	-	25	159			#		
Oxidation Reduction Potential	mV	0411	WL	06/11/2012	0001	9	-	9	50			#		
Oxidation Reduction Potential	mV	0412	WL	06/07/2012	0001	10.5	-	10.5	221			#		
Oxidation Reduction Potential	mV	0439	WL	06/12/2012	0001	118	-	118	81			#		
Oxidation Reduction Potential	mV	0453	WL	06/12/2012	0001	80	-	80	103			#		
Oxidation Reduction Potential	mV	0454	WL	06/08/2012	N001	13	-	13	221			#		
Oxidation Reduction Potential	mV	0492	WL	06/12/2012	N001	18	-	18	-115			#		
Oxidation Reduction Potential	mV	0810	WL	06/13/2012	N001	10	-	40	172			#		
Oxidation Reduction Potential	mV	0812	WL	06/13/2012	N001	14	-	44	103			#		
Oxidation Reduction Potential	mV	0813	WL	06/13/2012	N001	14	-	44	93			#		
Oxidation Reduction Potential	mV	0814	WL	06/14/2012	N001	12	-	42	60.6			#		
Oxidation Reduction Potential	mV	0815	WL	06/14/2012	N001	22	-	52	82.7			#		
Oxidation Reduction Potential	mV	0816	WL	06/14/2012	N001	21	-	51	96.5			#		
Oxidation Reduction Potential	mV	AMM-2	WL	06/11/2012	0001	48	-	48	31			#		
Oxidation Reduction Potential	mV	AMM-3	WL	06/08/2012	N001	48	-	48	101			#		
Oxidation Reduction Potential	mV	ATP-2-D	WL	06/08/2012	N001	88	-	88	-181			#		

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

Parameter	Units	Location ID	Location Type	Sample		Depth Range			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID	(Ft	BLS)				Lab	Data		
Oxidation Reduction Potential	mV	ATP-2-S	WL	06/08/2012	0001	25	-	25	211				#	
Oxidation Reduction Potential	mV	CR1	SL	06/07/2012	N001	0	-	0	199				#	
Oxidation Reduction Potential	mV	CR2	SL	06/07/2012	0001	0	-	0	274				#	
Oxidation Reduction Potential	mV	CR3	SL	06/12/2012	0001	0	-	0	-68				#	
Oxidation Reduction Potential	mV	CR5	SL	06/07/2012	N001	0	-	0	193				#	
Oxidation Reduction Potential	mV	SMI-MW01	WL	06/07/2012	0001	16	-	16	184				#	
Oxidation Reduction Potential	mV	SMI-PW02	WL	06/13/2012	N001	20	-	60	144				#	
Oxidation Reduction Potential	mV	SMI-PZ1S	WL	06/11/2012	0001	18	-	18	47				#	
Oxidation Reduction Potential	mV	SMI-PZ3D2	WL	06/11/2012	N001	78	-	78	-39				#	
Oxidation Reduction Potential	mV	SMI-PZ3M	WL	06/11/2012	N001	59	-	59	-102				#	
Oxidation Reduction Potential	mV	SMI-PZ3S	WL	06/11/2012	N001	25	-	25	-19				#	
Oxidation Reduction Potential	mV	TP-01	WL	06/07/2012	N001	22	-	22	140				#	
Oxidation Reduction Potential	mV	TP-17	WL	06/14/2012	N001	28	-	28	-141				#	
Oxidation Reduction Potential	mV	TP-19	WL	06/14/2012	N001	29	-	29	-325				#	
Oxidation Reduction Potential	mV	TP-20	WL	06/12/2012	N001	32	-	32	-230				#	
Oxidation Reduction Potential	mV	TP-22	WL	06/08/2012	N001	17	-	17	242				#	
Oxidation Reduction Potential	mV	TP-23	WL	06/08/2012	0001	25	-	25	241				#	
Oxidation Reduction Potential	mV	UPD-18	WL	06/11/2012	N001	13	-	13	86				#	
Oxidation Reduction Potential	mV	UPD-19	WL	06/11/2012	0001	14	-	14	-95				#	
Oxidation Reduction Potential	mV	UPD-20	WL	06/11/2012	N001	17	-	17	-76				#	
Oxidation Reduction Potential	mV	UPD-21	WL	06/11/2012	N001	25	-	25	136				#	
Oxidation Reduction Potential	mV	UPD-22	WL	06/07/2012	0001	9	-	9	240				#	

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

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.	0218	SL	06/07/2012	0001	0	-	0	8.45			#		
pH	s.u.	0226	SL	06/14/2012	0001	0	-	0	8.77			#		
pH	s.u.	0228	SL	06/14/2012	0001	0	-	0	8.88			#		
pH	s.u.	0401	WL	06/12/2012	N001	18	-	18	6.81			#		
pH	s.u.	0403	WL	06/12/2012	N001	18	-	18	6.62			#		
pH	s.u.	0404	WL	06/12/2012	N001	18	-	18	6.87			#		
pH	s.u.	0407	WL	06/12/2012	N001	17	-	17	7.78			#		
pH	s.u.	0410	WL	06/11/2012	0001	25	-	25	7.1			#		
pH	s.u.	0411	WL	06/11/2012	0001	9	-	9	8.18			#		
pH	s.u.	0412	WL	06/07/2012	0001	10.5	-	10.5	7.59			#		
pH	s.u.	0439	WL	06/12/2012	0001	118	-	118	6.89			#		
pH	s.u.	0453	WL	06/12/2012	0001	80	-	80	6.95			#		
pH	s.u.	0454	WL	06/08/2012	N001	13	-	13	7.46			#		
pH	s.u.	0492	WL	06/12/2012	N001	18	-	18	6.85			#		
pH	s.u.	0810	WL	06/13/2012	N001	10	-	40	6.92			#		
pH	s.u.	0812	WL	06/13/2012	N001	14	-	44	6.98			#		
pH	s.u.	0813	WL	06/13/2012	N001	14	-	44	7.05			#		
pH	s.u.	0814	WL	06/14/2012	N001	12	-	42	6.72			#		
pH	s.u.	0815	WL	06/14/2012	N001	22	-	52	6.77			#		
pH	s.u.	0816	WL	06/14/2012	N001	21	-	51	6.73			#		
pH	s.u.	AMM-2	WL	06/11/2012	0001	48	-	48	6.83			#		
pH	s.u.	AMM-3	WL	06/08/2012	N001	48	-	48	7.06			#		
pH	s.u.	ATP-2-D	WL	06/08/2012	N001	88	-	88	7.76			#		
pH	s.u.	ATP-2-S	WL	06/08/2012	0001	25	-	25	9.07			#		
pH	s.u.	CR1	SL	06/07/2012	N001	0	-	0	8.39			#		
pH	s.u.	CR2	SL	06/07/2012	0001	0	-	0	8.59			#		
pH	s.u.	CR3	SL	06/12/2012	0001	0	-	0	8.54			#		
pH	s.u.	CR5	SL	06/07/2012	N001	0	-	0	8.46			#		

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

Parameter	Units	Location ID	Location Type	Sample		Depth Range			Result	Qualifiers			Detection Limit	Uncertainty
				Date	ID	(Ft	BLS)					Lab		
pH	s.u.	SMI-MW01	WL	06/07/2012	0001	16	-	16	7.31				#	
pH	s.u.	SMI-PW02	WL	06/13/2012	N001	20	-	60	6.84				#	
pH	s.u.	SMI-PZ1S	WL	06/11/2012	0001	18	-	18	6.78				#	
pH	s.u.	SMI-PZ3D2	WL	06/11/2012	N001	78	-	78	6.96				#	
pH	s.u.	SMI-PZ3M	WL	06/11/2012	N001	59	-	59	7.34				#	
pH	s.u.	SMI-PZ3S	WL	06/11/2012	N001	25	-	25	7.93				#	
pH	s.u.	TP-01	WL	06/07/2012	N001	22	-	22	7.61				#	
pH	s.u.	TP-17	WL	06/14/2012	N001	28	-	28	7.19				#	
pH	s.u.	TP-19	WL	06/14/2012	N001	29	-	29	6.76				#	
pH	s.u.	TP-20	WL	06/12/2012	N001	32	-	32	7.19				#	
pH	s.u.	TP-22	WL	06/08/2012	N001	17	-	17	6.96				#	
pH	s.u.	TP-23	WL	06/08/2012	0001	25	-	25	6.95				#	
pH	s.u.	UPD-18	WL	06/11/2012	N001	13	-	13	6.82				#	
pH	s.u.	UPD-19	WL	06/11/2012	0001	14	-	14	7				#	
pH	s.u.	UPD-20	WL	06/11/2012	N001	17	-	17	7.34				#	
pH	s.u.	UPD-21	WL	06/11/2012	N001	25	-	25	7.26				#	
pH	s.u.	UPD-22	WL	06/07/2012	0001	9	-	9	7.75				#	
Specific Conductance	umhos/cm	0218	SL	06/07/2012	0001	0	-	0	1195				#	
Specific Conductance	umhos/cm	0226	SL	06/14/2012	0001	0	-	0	1863				#	
Specific Conductance	umhos/cm	0228	SL	06/14/2012	0001	0	-	0	1567				#	
Specific Conductance	umhos/cm	0401	WL	06/12/2012	N001	18	-	18	13076				#	
Specific Conductance	umhos/cm	0403	WL	06/12/2012	N001	18	-	18	10466				#	
Specific Conductance	umhos/cm	0404	WL	06/12/2012	N001	18	-	18	9686				#	
Specific Conductance	umhos/cm	0407	WL	06/12/2012	N001	17	-	17	2042				#	
Specific Conductance	umhos/cm	0410	WL	06/11/2012	0001	25	-	25	3545				#	

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

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	0411	WL	06/11/2012	0001	9	-	9	5044			#		
Specific Conductance	umhos /cm	0412	WL	06/07/2012	0001	10.5	-	10.5	3793			#		
Specific Conductance	umhos /cm	0439	WL	06/12/2012	0001	118	-	118	10059			#		
Specific Conductance	umhos /cm	0453	WL	06/12/2012	0001	80	-	80	28326			#		
Specific Conductance	umhos /cm	0454	WL	06/08/2012	N001	13	-	13	9843			#		
Specific Conductance	umhos /cm	0492	WL	06/12/2012	N001	18	-	18	21395			#		
Specific Conductance	umhos /cm	0810	WL	06/13/2012	N001	10	-	40	32365			#		
Specific Conductance	umhos /cm	0812	WL	06/13/2012	N001	14	-	44	20367			#		
Specific Conductance	umhos /cm	0813	WL	06/13/2012	N001	14	-	44	12182			#		
Specific Conductance	umhos /cm	0814	WL	06/14/2012	N001	12	-	42	26232			#		
Specific Conductance	umhos /cm	0815	WL	06/14/2012	N001	22	-	52	28007			#		
Specific Conductance	umhos /cm	0816	WL	06/14/2012	N001	21	-	51	24188			#		
Specific Conductance	umhos /cm	AMM-2	WL	06/11/2012	0001	48	-	48	18471			#		
Specific Conductance	umhos /cm	AMM-3	WL	06/08/2012	N001	48	-	48	17964			#		
Specific Conductance	umhos /cm	ATP-2-D	WL	06/08/2012	N001	88	-	88	124324			#		
Specific Conductance	umhos /cm	ATP-2-S	WL	06/08/2012	0001	25	-	25	16371			#		
Specific Conductance	umhos /cm	CR1	SL	06/07/2012	N001	0	-	0	1023			#		
Specific Conductance	umhos /cm	CR2	SL	06/07/2012	0001	0	-	0	1116			#		
Specific Conductance	umhos /cm	CR3	SL	06/12/2012	0001	0	-	0	2016			#		
Specific Conductance	umhos /cm	CR5	SL	06/07/2012	N001	0	-	0	1052			#		
Specific Conductance	umhos /cm	SMI-MW01	WL	06/07/2012	0001	16	-	16	4791			#		
Specific Conductance	umhos /cm	SMI-PW02	WL	06/13/2012	N001	20	-	60	53458			#		
Specific Conductance	umhos /cm	SMI-PZ1S	WL	06/11/2012	0001	18	-	18	12540			#		

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

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	SMI-PZ3D2	WL	06/11/2012	N001	78	-	78	22506				#	
Specific Conductance	umhos /cm	SMI-PZ3M	WL	06/11/2012	N001	59	-	59	9064				#	
Specific Conductance	umhos /cm	SMI-PZ3S	WL	06/11/2012	N001	25	-	25	4832				#	
Specific Conductance	umhos /cm	TP-01	WL	06/07/2012	N001	22	-	22	7552				#	
Specific Conductance	umhos /cm	TP-17	WL	06/14/2012	N001	28	-	28	123465				#	
Specific Conductance	umhos /cm	TP-19	WL	06/14/2012	N001	29	-	29	142946				#	
Specific Conductance	umhos /cm	TP-20	WL	06/12/2012	N001	32	-	32	138105				#	
Specific Conductance	umhos /cm	TP-22	WL	06/08/2012	N001	17	-	17	27570				#	
Specific Conductance	umhos /cm	TP-23	WL	06/08/2012	0001	25	-	25	52178				#	
Specific Conductance	umhos /cm	UPD-18	WL	06/11/2012	N001	13	-	13	11200				#	
Specific Conductance	umhos /cm	UPD-19	WL	06/11/2012	0001	14	-	14	4178				#	
Specific Conductance	umhos /cm	UPD-20	WL	06/11/2012	N001	17	-	17	3188				#	
Specific Conductance	umhos /cm	UPD-21	WL	06/11/2012	N001	25	-	25	3705				#	
Specific Conductance	umhos /cm	UPD-22	WL	06/07/2012	0001	9	-	9	3869				#	
Temperature	C	0218	SL	06/07/2012	0001	0	-	0	21.76				#	
Temperature	C	0226	SL	06/14/2012	0001	0	-	0	22.97				#	
Temperature	C	0228	SL	06/14/2012	0001	0	-	0	24.07				#	
Temperature	C	0401	WL	06/12/2012	N001	18	-	18	15.85				#	
Temperature	C	0403	WL	06/12/2012	N001	18	-	18	15.82				#	
Temperature	C	0404	WL	06/12/2012	N001	18	-	18	15.66				#	
Temperature	C	0407	WL	06/12/2012	N001	17	-	17	17.47				#	
Temperature	C	0410	WL	06/11/2012	0001	25	-	25	18.98				#	
Temperature	C	0411	WL	06/11/2012	0001	9	-	9	26.44				#	
Temperature	C	0412	WL	06/07/2012	0001	10.5	-	10.5	18.04				#	
Temperature	C	0439	WL	06/12/2012	0001	118	-	118	18.44				#	

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Temperature	C	0453	WL	06/12/2012	0001	80	-	80	26.64			#		
Temperature	C	0454	WL	06/08/2012	N001	13	-	13	17.38			#		
Temperature	C	0492	WL	06/12/2012	N001	18	-	18	16.97			#		
Temperature	C	0810	WL	06/13/2012	N001	10	-	40	17.1			#		
Temperature	C	0812	WL	06/13/2012	N001	14	-	44	16.89			#		
Temperature	C	0813	WL	06/13/2012	N001	14	-	44	16.02			#		
Temperature	C	0814	WL	06/14/2012	N001	12	-	42	18.43			#		
Temperature	C	0815	WL	06/14/2012	N001	22	-	52	17.97			#		
Temperature	C	0816	WL	06/14/2012	N001	21	-	51	16.71			#		
Temperature	C	AMM-2	WL	06/11/2012	0001	48	-	48	17.49			#		
Temperature	C	AMM-3	WL	06/08/2012	N001	48	-	48	19.45			#		
Temperature	C	ATP-2-D	WL	06/08/2012	N001	88	-	88	17.92			#		
Temperature	C	ATP-2-S	WL	06/08/2012	0001	25	-	25	17.02			#		
Temperature	C	CR1	SL	06/07/2012	N001	0	-	0	20.36			#		
Temperature	C	CR2	SL	06/07/2012	0001	0	-	0	24.44			#		
Temperature	C	CR3	SL	06/12/2012	0001	0	-	0	24.57			#		
Temperature	C	CR5	SL	06/07/2012	N001	0	-	0	21.02			#		
Temperature	C	SMI-MW01	WL	06/07/2012	0001	16	-	16	19.3			#		
Temperature	C	SMI-PW02	WL	06/13/2012	N001	20	-	60	17.21			#		
Temperature	C	SMI-PZ1S	WL	06/11/2012	0001	18	-	18	16.65			#		
Temperature	C	SMI-PZ3D2	WL	06/11/2012	N001	78	-	78	20.22			#		
Temperature	C	SMI-PZ3M	WL	06/11/2012	N001	59	-	59	19.6			#		
Temperature	C	SMI-PZ3S	WL	06/11/2012	N001	25	-	25	18.9			#		
Temperature	C	TP-01	WL	06/07/2012	N001	22	-	22	16.73			#		
Temperature	C	TP-17	WL	06/14/2012	N001	28	-	28	14.73			#		
Temperature	C	TP-19	WL	06/14/2012	N001	29	-	29	15.34			#		
Temperature	C	TP-20	WL	06/12/2012	N001	32	-	32	20.17			#		

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Temperature	C	TP-22	WL	06/08/2012	N001	17	-	17	18.46			#		
Temperature	C	TP-23	WL	06/08/2012	0001	25	-	25	19.02			#		
Temperature	C	UPD-18	WL	06/11/2012	N001	13	-	13	18.49			#		
Temperature	C	UPD-19	WL	06/11/2012	0001	14	-	14	18.35			#		
Temperature	C	UPD-20	WL	06/11/2012	N001	17	-	17	18.7			#		
Temperature	C	UPD-21	WL	06/11/2012	N001	25	-	25	18.34			#		
Temperature	C	UPD-22	WL	06/07/2012	0001	9	-	9	19.1			#		
Turbidity	NTU	0218	SL	06/07/2012	0001	0	-	0	21.9			#		
Turbidity	NTU	0226	SL	06/14/2012	0001	0	-	0	153			#		
Turbidity	NTU	0228	SL	06/14/2012	0001	0	-	0	31.3			#		
Turbidity	NTU	0401	WL	06/12/2012	N001	18	-	18	1.25			#		
Turbidity	NTU	0403	WL	06/12/2012	N001	18	-	18	1.08			#		
Turbidity	NTU	0404	WL	06/12/2012	N001	18	-	18	1.37			#		
Turbidity	NTU	0407	WL	06/12/2012	N001	17	-	17	0.94			#		
Turbidity	NTU	0410	WL	06/11/2012	0001	25	-	25	268			#		
Turbidity	NTU	0411	WL	06/11/2012	0001	9	-	9	68.8			#		
Turbidity	NTU	0412	WL	06/07/2012	0001	10.5	-	10.5	122			#		
Turbidity	NTU	0439	WL	06/12/2012	0001	118	-	118	70.5			#		
Turbidity	NTU	0453	WL	06/12/2012	0001	80	-	80	24.4			#		
Turbidity	NTU	0454	WL	06/08/2012	N001	13	-	13	2.23			#		
Turbidity	NTU	0492	WL	06/12/2012	N001	18	-	18	1.15			#		
Turbidity	NTU	0810	WL	06/13/2012	N001	10	-	40	2.58			#		
Turbidity	NTU	0812	WL	06/13/2012	N001	14	-	44	4.77			#		
Turbidity	NTU	0813	WL	06/13/2012	N001	14	-	44	1.08			#		
Turbidity	NTU	0814	WL	06/14/2012	N001	12	-	42	1.83			#		
Turbidity	NTU	0815	WL	06/14/2012	N001	22	-	52	4.17			#		
Turbidity	NTU	0816	WL	06/14/2012	N001	21	-	51	7.22			#		
Turbidity	NTU	AMM-2	WL	06/11/2012	0001	48	-	48	38.5			#		

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Turbidity	NTU	AMM-3	WL	06/08/2012	N001	48	-	48	4.51			#		
Turbidity	NTU	ATP-2-D	WL	06/08/2012	N001	88	-	88	10			#		
Turbidity	NTU	ATP-2-S	WL	06/08/2012	0001	25	-	25	24.8			#		
Turbidity	NTU	CR1	SL	06/07/2012	N001	0	-	0	293			#		
Turbidity	NTU	CR2	SL	06/07/2012	0001	0	-	0	68.7			#		
Turbidity	NTU	CR3	SL	06/12/2012	0001	0	-	0	371			#		
Turbidity	NTU	CR5	SL	06/07/2012	N001	0	-	0	29.8			#		
Turbidity	NTU	SMI-MW01	WL	06/07/2012	0001	16	-	16	303			#		
Turbidity	NTU	SMI-PW02	WL	06/13/2012	N001	20	-	60	1.85			#		
Turbidity	NTU	SMI-PZ1S	WL	06/11/2012	0001	18	-	18	113			#		
Turbidity	NTU	SMI-PZ3D2	WL	06/11/2012	N001	78	-	78	3.13			#		
Turbidity	NTU	SMI-PZ3M	WL	06/11/2012	N001	59	-	59	5.73			#		
Turbidity	NTU	SMI-PZ3S	WL	06/11/2012	N001	25	-	25	5.91			#		
Turbidity	NTU	TP-01	WL	06/07/2012	N001	22	-	22	3.91			#		
Turbidity	NTU	TP-17	WL	06/14/2012	N001	28	-	28	9.98			#		
Turbidity	NTU	TP-19	WL	06/14/2012	N001	29	-	29	9.19			#		
Turbidity	NTU	TP-20	WL	06/12/2012	N001	32	-	32	6.31			#		
Turbidity	NTU	TP-22	WL	06/08/2012	N001	17	-	17	98.5			#		
Turbidity	NTU	TP-23	WL	06/08/2012	0001	25	-	25	106			#		
Turbidity	NTU	UPD-18	WL	06/11/2012	N001	13	-	13	9.26			#		
Turbidity	NTU	UPD-19	WL	06/11/2012	0001	14	-	14	21.4			#		
Turbidity	NTU	UPD-20	WL	06/11/2012	N001	17	-	17	23.8			#		
Turbidity	NTU	UPD-21	WL	06/11/2012	N001	25	-	25	4.21			#		
Turbidity	NTU	UPD-22	WL	06/07/2012	0001	9	-	9	41.3			#		
Uranium	mg/L	0218	SL	06/07/2012	0001	0	-	0	0.0044	E		#	2.9E-005	
Uranium	mg/L	0226	SL	06/14/2012	0001	0	-	0	0.0068			#	2.9E-005	
Uranium	mg/L	0228	SL	06/14/2012	0001	0	-	0	0.0054			#	2.9E-005	

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

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	0401	WL	06/12/2012	0001	18	-	18	1.7		#	0.00029		
Uranium	mg/L	0403	WL	06/12/2012	0001	18	-	18	0.92		#	0.00015		
Uranium	mg/L	0404	WL	06/12/2012	0001	18	-	18	1.2		#	0.00015		
Uranium	mg/L	0407	WL	06/12/2012	0001	17	-	17	0.21		#	0.00015		
Uranium	mg/L	0410	WL	06/11/2012	0001	25	-	25	0.76		#	0.00029		
Uranium	mg/L	0411	WL	06/11/2012	0001	9	-	9	3.5		#	0.00058		
Uranium	mg/L	0412	WL	06/07/2012	0001	10.5	-	10.5	2.5		#	0.00058		
Uranium	mg/L	0439	WL	06/12/2012	0001	118	-	118	0.9		#	0.00015		
Uranium	mg/L	0453	WL	06/12/2012	0001	80	-	80	1.9		#	0.00029		
Uranium	mg/L	0454	WL	06/08/2012	0001	13	-	13	1.1		#	0.00029		
Uranium	mg/L	0492	WL	06/12/2012	0001	18	-	18	1.4		#	0.00015		
Uranium	mg/L	0492	WL	06/12/2012	0002	18	-	18	1.3		#	0.00015		
Uranium	mg/L	0810	WL	06/13/2012	0001	10	-	40	3		#	0.00058		
Uranium	mg/L	0812	WL	06/13/2012	0001	14	-	44	2.1		#	0.00029		
Uranium	mg/L	0812	WL	06/13/2012	0002	14	-	44	2.1		#	0.00015		
Uranium	mg/L	0813	WL	06/13/2012	0001	14	-	44	1.4		#	0.00015		
Uranium	mg/L	0814	WL	06/14/2012	0001	12	-	42	2.6		#	0.00058		
Uranium	mg/L	0814	WL	06/14/2012	0002	12	-	42	2.8		#	0.00015		
Uranium	mg/L	0815	WL	06/14/2012	0001	22	-	52	3		#	0.00058		
Uranium	mg/L	0816	WL	06/14/2012	0001	21	-	51	2.4		#	0.00058		
Uranium	mg/L	AMM-2	WL	06/11/2012	0001	48	-	48	1.8		#	0.00015		
Uranium	mg/L	AMM-3	WL	06/08/2012	0001	48	-	48	1.1		#	0.00015		
Uranium	mg/L	ATP-2-D	WL	06/08/2012	0001	88	-	88	0.0046		#	2.9E-005		
Uranium	mg/L	ATP-2-S	WL	06/08/2012	0001	25	-	25	0.0011		#	2.9E-005		
Uranium	mg/L	CR1	SL	06/07/2012	0001	0	-	0	0.0035		#	2.9E-005		
Uranium	mg/L	CR2	SL	06/07/2012	0001	0	-	0	0.0098		#	2.9E-005		
Uranium	mg/L	CR3	SL	06/12/2012	0001	0	-	0	0.014		#	2.9E-005		
Uranium	mg/L	CR5	SL	06/07/2012	0001	0	-	0	0.0043		#	2.9E-005		

Appendix A. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 9/27/2012

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	SMI-MW01	WL	06/07/2012	0001	16	-	16	4.7			#	0.00058	
Uranium	mg/L	SMI-PW02	WL	06/13/2012	0001	20	-	60	2.7			#	0.00029	
Uranium	mg/L	SMI-PZ1S	WL	06/11/2012	0001	18	-	18	1.4			#	0.00015	
Uranium	mg/L	SMI-PZ3D2	WL	06/11/2012	0001	78	-	78	1.2			#	0.00015	
Uranium	mg/L	SMI-PZ3M	WL	06/11/2012	0001	59	-	59	1.3			#	0.00015	
Uranium	mg/L	SMI-PZ3S	WL	06/11/2012	0001	25	-	25	1.8			#	0.00015	
Uranium	mg/L	TP-01	WL	06/07/2012	0001	22	-	22	0.077			#	2.9E-005	
Uranium	mg/L	TP-17	WL	06/14/2012	0001	28	-	28	0.023			#	2.9E-005	
Uranium	mg/L	TP-19	WL	06/14/2012	0001	29	-	29	7.E-005	B		#	2.9E-005	
Uranium	mg/L	TP-20	WL	06/12/2012	0001	32	-	32	0.0047			#	2.9E-005	
Uranium	mg/L	TP-22	WL	06/08/2012	0001	17	-	17	0.33			#	2.9E-005	
Uranium	mg/L	TP-23	WL	06/08/2012	0001	25	-	25	3			#	0.00029	
Uranium	mg/L	UPD-18	WL	06/11/2012	0001	13	-	13	1			#	0.00015	
Uranium	mg/L	UPD-19	WL	06/11/2012	0001	14	-	14	0.65			#	0.00015	
Uranium	mg/L	UPD-20	WL	06/11/2012	0001	17	-	17	0.14			#	0.00015	
Uranium	mg/L	UPD-21	WL	06/11/2012	0001	25	-	25	12			#	0.00058	
Uranium	mg/L	UPD-22	WL	06/07/2012	0001	9	-	9	2.9			#	0.00058	

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

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.

Appendix A. Water Quality Data (continued)

LAB QUALIFIERS (continued):

W Postdigestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X,Y,Z Laboratory defined qualifier; see case narrative.

DATA QUALIFIERS:

F	Low-flow sampling method used.	G	Possible grout contamination; pH > 9.	J	Estimated value.
L	Less than three bore volumes purged before 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 A. Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
REPORT DATE: 9/27/2012

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0401	O	3968.95	6/12/2012		13.65	3955.95	
0403	O	3968.95	6/12/2012		15.90	3953.05	
0404	O	3968.3	6/12/2012		14.19	3954.11	
0407	O	3969.09	6/12/2012		16.58	3952.51	
0410	O	3981.05	6/11/2012		24.86	3956.19	
0411	O	3962.43	6/11/2012		8.41	3956.47	
0412	O	3964.88	6/07/2012		7.35	3955.08	
0439	O	4055.27	6/12/2012		98.18	3957.09	
0453		4031.29	6/12/2012		73.49	3957.80	
0454		3966.53	6/8/2012		11.79	3954.74	
0492		3967.56	6/12/2012		15.85	3951.71	
0810		3961.96	6/13/2012		8.86	3953.10	
0812		3961.50	6/13/2012		7.76	3953.74	
0813		3963.55	6/13/2012		9.45	3954.10	
0814		3961.01	6/14/2012		7.10	3953.91	
0815		3963.16	6/14/2012		9.14	3954.02	
0816		3961.92	6/14/2012		7.78	3954.14	
AMM-2	O	3964.09	6/11/2012		9.99	3954.10	
AMM-3	O	3962.9	6/8/2012		8.10	3954.80	
ATP-2-D	O	3962.17	6/8/2012		6.72	3955.45	
ATP-2-S	O	3962.17	6/8/2012		8.65	3953.52	
SMI-MW01	O	3960.22	6/7/2012		5.50	3954.72	
SMI-PW01	O	3963.96	6/13/2012		19.98	3943.98	
SMI-PZ1S	O	3964.13	6/11/2012		9.81	3954.32	
SMI-PZ3D2	O	3975.13	6/11/2012		19.16	3955.97	
SMI-PZ3M	O	3975.23	6/11/2012		19.05	3956.18	

Appendix A. Water Level Data (continued)

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
REPORT DATE: 9/27/2012

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
SMI-PZ3S	O	3975.03	6/11/2012		18.94	3956.09	
TP-17	D	3963.69	6/14/2012		11.85	3951.84	
TP-19	D	3962.17	6/14/2012		11.30	3950.87	
TP-20	D	3967.55	6/12/2012		13.38	3954.17	
TP-22		3966.51	6/8/2012		13.12	3953.39	
TP-23		3962.6	6/8/2012		8.80	3953.80	
UPD-18		3969.00	6/11/2012		12.77	3956.23	
UPD-20		3978.73	6/11/2012		21.78	3956.95	
UPD-21		3981.45	6/11/2012		24.82	3956.63	
UPD-22		3966.20	6/7/2012		10.35	3955.85	

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



Moab TAC Team

Date: July 16, 2012

To: Ken Pill

From: James Ritchey

Subject: June 2012 Site-wide and CF5 Sampling Event

Event: Moab – Site-wide Sampling and Routine Sampling Event – June 2012

Date of Sampling Event: June 7 to 14, 2012

Team Members: E. Moran and J. Ritchey

RIN Number Assigned: All samples were assigned to RIN 1206064.

Sample Shipment: Two coolers were shipped overnight via UPS to ALS from Moab, Utah, on June 18, 2012 (Tracking number 0192741024).

Number of Locations Sampled: The purpose of the Site-wide Sampling Event was to update contaminant plume maps. A total of 31 well locations and seven surface water locations were sampled during this event. Including one duplicate, a total of 39 samples were collected during the June 2012 ground water sampling event.

Locations Not Sampled/Reason: The casing at well UPD-17 was damaged, and it could not be sampled.

Field Variance: To minimize costs, samples were generally not filtered if the turbidity was below 10 NTUs, and some samples were not submitted to the laboratory for ammonia analysis. All samples were analyzed on site with the ammonia probe. See the Location-specific Information section for details concerning filtering and lab analysis.

Quality-control Sample Cross Reference: The following false identifications (IDs) were assigned to the quality control samples:

False ID	True ID	Sample Type	Associated matrix
2000	0492	Duplicate from 18 ft bgs	Ground Water

Location-specific Information: All of the observation wells were sampled using a peristaltic pump and dedicated tubing unless otherwise noted. The table below provides additional information:

Location	Date	Sample Depth (ft bgs)	Filtered	Ammonia Lab Analysis	Comments
0218	06/07/2012	NA	Yes	Yes	Collected 3 ft off bank in 5 in. of water. Slight eddy, muddy substrate.
0226	06/14/2012	NA	Yes	Yes	Approx. 6 in. deep. Moderate flow. 1 ft off bank.
0228	06/14/2012	NA	Yes	Yes	Approx. 2 in. deep. 2 ft off bank.
0401	06/12/2012	18	No	No	
0403	06/12/2012	18	No	Yes	
0404	06/12/2012	18	No	No	
0407	06/12/2012	17	No	Yes	
0410	06/11/2012	25	Yes	Yes	Dewatered at 1.5L.
0411	06/11/2012	9	Yes	Yes	Dewatered at 0.2L.
0412	06/07/2012	10.5	Yes	Yes	
0439	06/12/2012	118	Yes	Yes	Turbidity meter not working properly. Sampled with dedicated bladder pump.
0453	06/12/2012	80	Yes	No	Turbidity meter not working. Water level near top of pump and may not be accurate. Pumping is slow. Parameters are stable. Sampled with dedicated bladder pump.
0454	06/08/2012	13	No	No	
0492	06/12/2012	18	No	Yes	Duplicate
AMM-2	06/11/2012	48	Yes	Yes	
AMM-3	06/08/2012	48	No	No	
ATP-2-D	06/08/2012	88	No	No	
ATP-2-S	06/08/2012	25	Yes	No	
CR1	06/07/2012	NA	Yes	Yes	Sampled collected in 4 in. of water, moderate flow.
CR2	06/07/2012	NA	Yes	Yes	Taken in Approx. 3 in. of water, moderate flow.
CR3	06/12/2012	NA	Yes	Yes	Taken Approx. 1 ft from bank in fairly stagnant water. Approx. 6 in. deep. Foamy.
CR5	06/07/2012	NA	Yes	Yes	Water Approx. 3-4 in. deep, rocky substrate.
SMI-MW01	06/07/2012	16	Yes	Yes	
SMI-PZ1S	06/11/2012	18	Yes	No	
SMI-PZ3D2	06/11/2012	78	No	Yes	
SMI-PZ3M	06/11/2012	59	No	No	
SMI-PZ3S	6/11/2012	25	No	Yes	
TP-01	06/07/2012	22	No	Yes	Cannot obtain water level due to broken casing. Sulfur odor.
TP-17	06/14/2012	28	No	Yes	Can't obtain water levels with tubing in casing.
TP-19	06/14/2012	29	No	Yes	Can't obtain water levels with tubing in casing. Water is gray.
TP-20	06/12/2012	32	No	Yes	
TP-22	06/08/2012	17	Yes	Yes	Well dewatered at 2.5 L. Turbidity increased.
TP-23	06/08/2012	25	Yes	No	
UPD-18	06/11/2012	13	No	No	Dewatered at 0.3L. Conductivity keeps dropping, but well is recharging, so it was sampled.
UPD-19	06/11/2012	14	Yes	No	Tubing is blocked at 7.75 ft, and a water level was not obtainable.
UPD-20	06/11/2012	17*	Yes	Yes	Tubing had to be lowered to reach GW. Turbidity increased at 3.0L.
UPD-21	06/11/2012	25	No	No	
UPD-22	06/07/2012	9	Yes	Yes	Sample turbidity stayed Approx. 20 NTU and increased to 40 NTU.

Approx. = approximately; GW = ground water; L = liter

Water Level Measurements: Water level data are provided in the table below. These data represent depth to water (ft btoc) measurements. Water levels were not obtainable at locations TP-01 and UPD-19 due to broken and blocked casings.

Well No.	Depth to Water (ft btoc)
0401	13.65
0403	15.90
0404	14.19
0407	16.58
0410	24.86
0411	8.41
0412	7.35
0439	98.18
0453	73.49
0454	11.79
0492	15.85
AMM-2	9.99
AMM-3	8.10
ATP-2-D	6.72
ATP-2-S	8.65
SMI-MW01	5.50
SMI-PZ1S	9.81
SMI-PZ3D2	19.16
SMI-PZ3M	19.05
SMI-PZ3S	18.94
TP-01	Not Obtainable
TP-17	11.85
TP-19	11.30
TP-20	13.38
TP-22	13.12
TP-23	8.80
UPD-18	12.77
UPD-19	Not Obtainable
UPD-20	21.78
UPD-21	24.82
UPD-22	10.35



Surface Water Location CR1



Surface Water Location CR2



Surface Water Location CR3



Surface Water Location CR5



Surface Water Location 0218



Surface Water Location 0226



Surface Water Location 0228

June 2012 CF5 Sampling

Number of Locations Sampled: Seven extraction wells (0810, 0812, 0813, 0814, 0815, 0816, and SMI-PW02) and two duplicates were collected. A total of nine samples were collected during the June 2012 Sampling Event.

Locations Not Sampled: Well 0811 was not sampled due to formation sands breaching the well screen.

Field Variance: None.

Quality-control Sample Cross Reference: The following false IDs were assigned to the quality-control samples:

False ID	True ID	Sample Type	Associated matrix
2001	0812	Duplicate from 40 ft	Ground Water
2002	0814	Duplicate from 40 ft	Ground Water

Location-specific Information – Extraction Wells: Extraction wells were sampled using dedicated submersible pumps. Samples were collected into open containers and filtered using dedicated flexible tubing. Sample depths and water levels for each extraction well are listed below.

Well No.	Date	Time	Depth to Water (ft btoc)	Pump Intake Depth (ft bgs)
0810	06/13/2012	13:30	14.12	35
0812	06/13/2012	14:15	16.34	40
0813	06/13/2012	14:40	10.79	40
0814	06/14/2012	16:35	19.32	40
0815	06/14/2012	16:05	13.67	45
0816	06/14/2012	16:00	9.46	45
SMI-PW02	06/13/2012	13:55	19.98	55

Well Inspection Summary: A well inspection was not conducted.

Equipment: The batteries in the turbidity meter expired while sampling in the contamination area, impacting two sample locations (0439 and 0453). Lab samples were filtered and the turbidity was later analyzed from an additional non-filtered sample.

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.

Date	Daily Mean Flow (cfs)
06/07/2012	3,970
06/08/2012	3,860
06/09/2012	3,700
06/10/2012	3,540
06/11/2012	3,380
06/12/2012	3,210
06/13/2012	2,860
06/14/2012	2,580

Corrective Action Required/Taken: None.