

*Office of Environmental Management – Grand Junction*



Moab UMTRA Project  
Ground Water and Surface  
Water Monitoring Report  
January through June 2014

Revision 0

September 2014



U.S. Department  
of Energy

**Office of Environmental Management**

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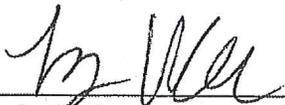
**Moab UMTRA Project  
Ground Water and Surface Water Monitoring Report  
January through June 2014**

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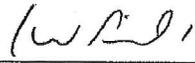
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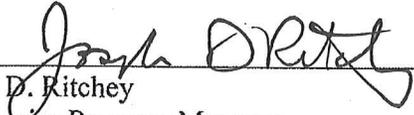
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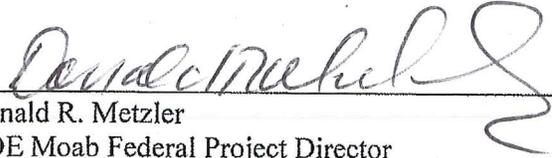
  
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## Revision History

<b>Revision No.</b>	<b>Date</b>	<b>Reason/Basis for Revision</b>
0	September 2014	Initial issue.

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## Acronyms and Abbreviations

ALS	ALS Environmental, Inc.
CCB	continuing calibration blank
CCV	continuing calibration verification
CF	Configuration
CFR	Code of Federal Regulations
cfs	cubic feet per second
COC	chain-of-custody
CRI	reporting limit verification
DOE	U.S. Department of Energy
EB	equipment blank
EDD	electronic data deliverables
EPA	U.S. Environmental Protection Agency
ft	feet or foot
ft bgs	feet below ground surface
ft btoc	feet below top of casing
ICB	initial calibration blank
ICP	inductively coupled plasma
ICV	initial calibration verification
IDL	instrument detection limit
LCS	laboratory control sample
MB	method blanks
MDL	method detection limit
mg/L	milligrams per liter
MS	matrix spike or mass spectroscopy
MSD	matrix spike duplicate
$r^2$	correlation coefficient
RIN	report identification number
RL	reporting limit
RPD	relative percent difference
SD	serial dilution
SDG	sample data group
UMTRA	Uranium Mill Tailings Remedial Action
USGS	U.S. Geological Survey

## 1.0 Introduction

### 1.1 Purpose

The purpose of this semi-annual report is to summarize the results associated with ground water and surface water samples collected from the U.S. Department of Energy (DOE) Moab Uranium Mill Tailings Remedial Action (UMTRA) Project site during the first half of 2014. The results of the data validation process are also presented. Two sampling events were completed during this time frame. The sampling event in April included the collection of surface water samples from the Colorado River side channel off Configuration (CF) 4 and the collection of ground water samples from CF4 monitoring wells and CF5 extraction wells. The other event was completed during May/June 2014, with samples collected from a variety of site-wide ground water and surface water locations.

All surface water locations are shown on Figure 1. The April surface water sampling was conducted to assess the surface water quality along the side channel adjacent to and downgradient of CF4. The April CF4 and CF5 ground water sample locations are shown on Figure 2, with the CF4 samples collected to monitor the effectiveness of the freshwater injection system, and the CF5 samples collected to update the ammonia and uranium concentrations for mass removal calculations and contaminant concentration trends.

The site-wide event ground water sampling locations are shown on Figure 3. The surface water samples associated with this event were collected 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.

### 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 these events. Sampling and analyses were conducted in accordance with the *Moab UMTRA Project Operations and Maintenance Manual* (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). Appendix A includes Water Sampling Field Activities Verification, Minimums and Maximums Report, Water Quality Data, Blanks Report, Water Level Data, and the trip report associated with the April sampling event. Appendix B contains Water Sampling Field Activities Verification, Minimums and Maximums Report, Water Quality Data, Blanks Report, Water Level Data, and the trip report associated with the May/June site-wide sampling event. 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.

The Minimums and Maximums Reports were 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.

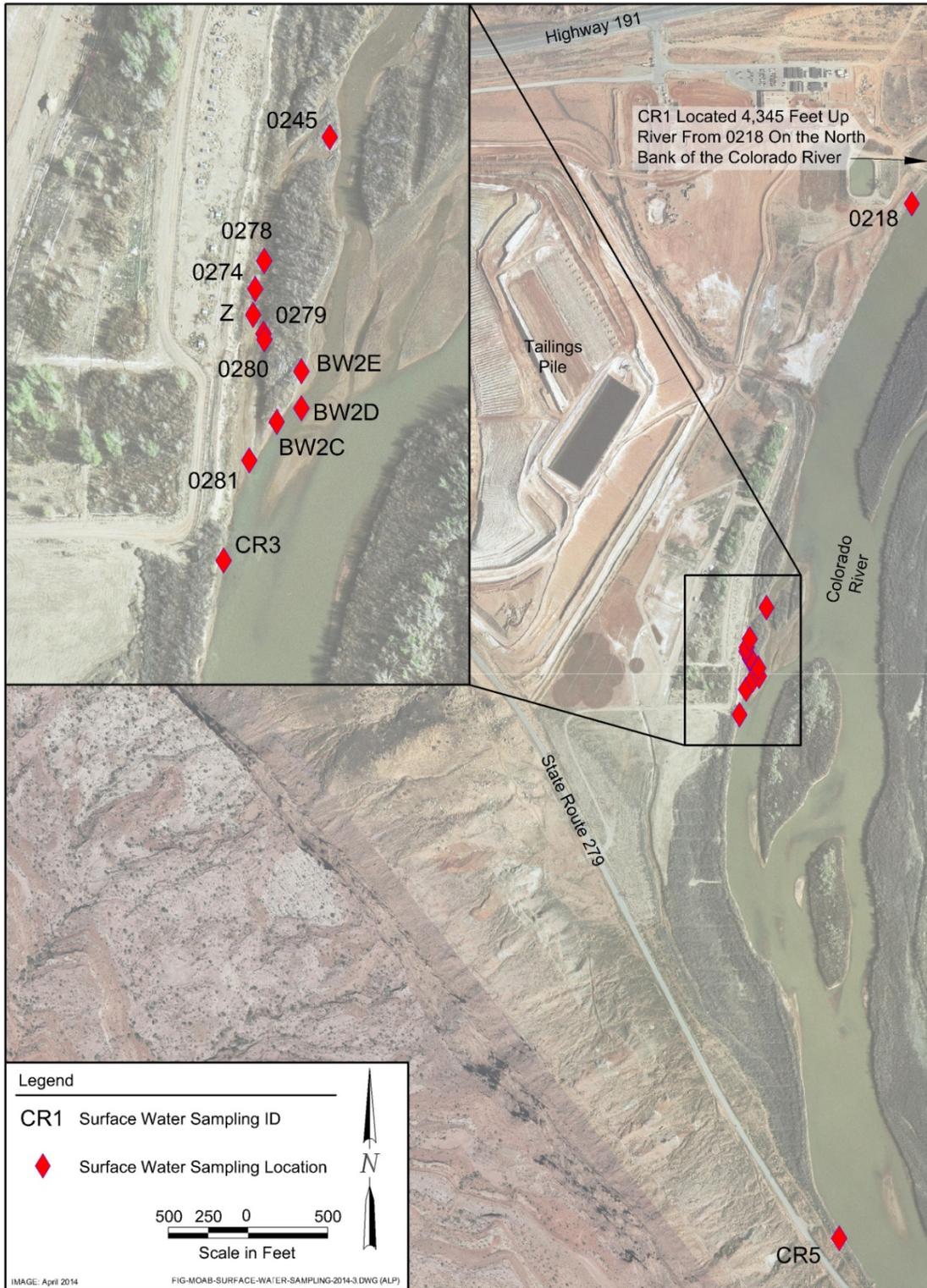


Figure 1. April and May/June 2014 Surface Water Sampling Locations



Figure 2. April 2014 CF4 and CF5 Ground Water Sampling Locations

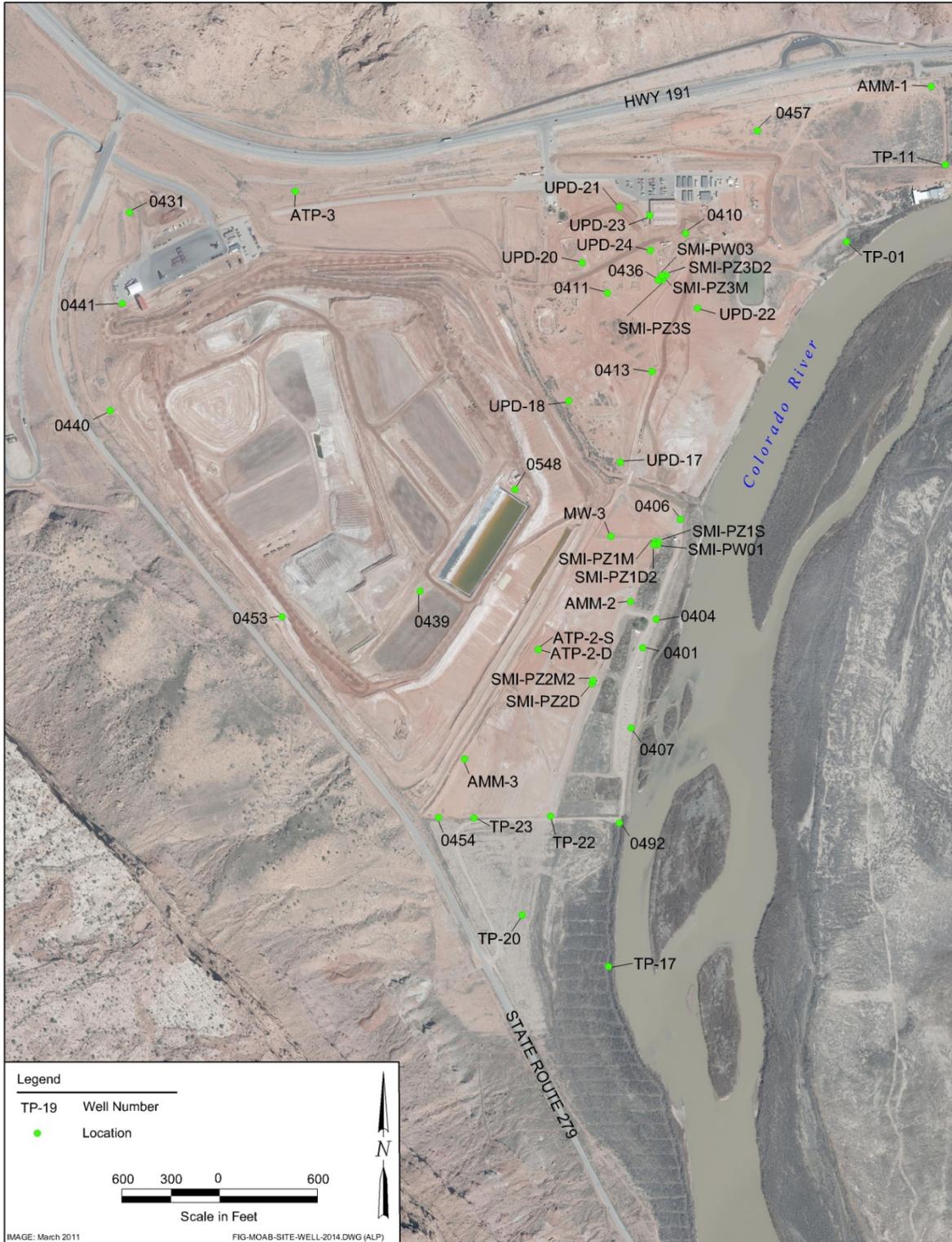


Figure 3. May/June 2014 Site-wide Ground Water Sampling Locations

## **2.0 Summary of Sampling Events**

### **2.1 April 2014 Sampling Event**

Eleven surface water samples (Figure 1) were collected in the vicinity of the Colorado River side channel off CF4 on April 10. Following the U.S. Fish and Wildlife Service definition, this side channel was not a suitable habitat when the samples were collected. The samples were collected to determine where higher concentrations of ammonia were present in preparation for when this side channel may develop into a suitable habitat after the peak spring runoff flows that typically occur in late May or early June.

Ground water samples (Figure 2) were collected from CF4 monitoring wells to determine how effectively the freshwater injection system was diluting the ammonia concentrations, particularly downgradient of the CF4 injection wells. The analytical results associated with the samples of extracted ground water from the CF5 extraction wells were used to update the mass removal calculations.

### **2.2 May/June 2014 Site-wide Sampling Event**

Fifty ground water and surface water samples were collected between May 19 and June 19 as part of the site-wide event. This event corresponds to the time frame when the Colorado River is generally experiencing base flow conditions.

The 46 ground water samples were collected from a variety of downgradient and cross-gradient locations at various depths. The locations in the vicinity of the northeastern uranium plume were also included. All samples were analyzed for ammonia using a HACH sension 2 portable pH/ISE probe and meter. All samples were also submitted to ALS Environmental, Inc. (ALS), laboratory for ammonia analysis. All samples were analyzed by ALS for uranium. All ground water sample locations are shown on Figure 3.

The four surface water samples were collected upstream, downstream, and adjacent to the site during this event. These surface water locations are presented on Figure 1.

## **3.0 Data Assessment**

### **3.1 April 2014 Sampling Event**

#### **3.1.1 Laboratory Performance Assessment**

This validation was performed according to *Standard Practice for Validation of Laboratory Data*. The procedure was applied at Level 3, Data Deliverables Examination. All analyses were successfully completed.

## General Information and Validation Results

Report Identification Number (RIN) 1404069  
 Laboratory: ALS, Fort Collins, Colorado  
 Sample Date Group (SDG) Number: 1404367  
 Analysis: Metals and Inorganics  
 Validator: Elizabeth Moran  
 Review Date: September 2, 2014

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

*Table 1. April 2014 Sampling Event Analytes and Methods*

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

## Data Qualifier Summary

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

*Table 2. April 2014 Sampling Event Data Qualifiers*

Sample Number	Location	Analyte	Flag	Reason
1404367-1 through -30	All in SDG 1305470	Ammonia	J	MS-1
1404367-1 through -30	All in SDG 1305470	Uranium	J	MS-1

"J" indicates results are estimated; it becomes "UJ" for analytical results below the detection limit.

*Table 3. April 2014 Sampling Event Reason Codes for Data Flags*

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
MS-1	J	U	Results for the affected analytes are regarded as estimated because the concentration of the native sample was much greater than the spike added, so the spike recovery may not be accurate.

"J" indicates results are estimated; it becomes "UJ" for analytical results below the detection limit.

## Sample Shipping/Receiving

ALS received a total of 30 samples for RIN 1404069 in one shipment of two coolers. SDG 1404367 consisted of 30 uranium and 30 ammonia samples and arrived on April 22, 2014 (UPS tracking numbers 1Z5W1Y510190587857 and 1Z5W1Y510193448644). 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 1404367, packed in two coolers, was received intact with temperatures of 2.2°C and 2.4°C, which complies with all requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

### **Case Narratives**

The case narratives were reviewed, and all results were found to be within quality-control procedures.

### **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 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 maintains its ability to produce 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. With ICP-MS analyte uranium, internal standards are also analyzed to indicate stability of the instruments.

### **Method SW-846 6020A, Uranium**

The calibration for the uranium analyses for SDG 1404367 was performed on April 23, 2014. The initial calibrations were both performed using five calibration standards and one blank, resulting in calibration curves with correlation coefficient ( $r^2$ ) values greater than 0.995. The values of the calibration curve intercepts for uranium were positive and less than three times the instrument detection limit (IDL).

Initial calibration verification (ICV) and continuing calibration verification (CCV) checks were made at the required frequency. 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 for all SDGs.

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 EPA 350.1, Ammonia as N**

Initial calibrations for ammonia as N for SDG 1404367 was performed using four calibration standards and a blank on April 24, 2014. The calibration curve had an  $r^2$  value greater than 0.995 and an intercept less than three times the method detection limit (MDL).

ICV and CCV checks were made at the required frequency. All calibration check results for all SDGs were within the acceptance criteria.

### **Method and Calibration Blanks**

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

All of the uranium CCBs were less than the IDL on both of the SDGs. No results had to be qualified.

Four ammonia CCBs had a result that was greater than the ammonia MDL (CCB1, CCB3, CCB9, and CCB13). None of the associated ammonia results were less than five times the highest blank value, so none of the data had 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.

One EB was collected, and the uranium and ammonia concentrations of the sample were at the IDL, indicating the equipment was thoroughly decontaminated between sample locations.

### **Matrix Spike Analysis**

Matrix spike (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 spike recoveries met the recovery and precision criteria for all analytes.

An MS recovery was met with sample 1404367-1 MS and matrix spike duplicate (MSD); however, an MS recovery could not be evaluated for uranium in SDG 1404367 (1404367-21 MS and MSD). The concentration of the analyte in the native sample was greater than four times the concentration of MS added; therefore this data was flagged “J” for reason MS-1.

For ammonia as N analysis in SDG 1404367, two MSs were analyzed for the 33 total ammonia samples. An MS recovery was met with sample 1404367-1 MS and MSD; however, a recovery was not met with sample 1404367-21 MS and MSD.

The concentration of the analyte in the native sample was greater than four times the concentration of the spike added. Two MSs were required for the number of samples; therefore this data was flagged “J” for reason MS-1.

### **Laboratory Replicate Analysis**

The laboratory replicate results demonstrate acceptable laboratory precision. The relative percent difference (RPD) values for the reported MSD results for all other analytes should be less than 20 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 0813 (1404367-18) and 0816 (1404367-21). The duplicate results met the U.S. Environmental Protection Agency (EPA)-recommended laboratory duplicate criteria of less than 20 RPD for results greater than five times the RL.

### **Laboratory Control Sample**

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

LCSs were not reported for uranium. In accordance with 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.

### **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. All evaluated SD data were acceptable.

### **Detection Limits/Dilutions**

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

### **Completeness**

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

### **Electronic Data Deliverable Files**

The Electronic Data Deliverable (EDD) files arrived on April 30, 2014. The contents of the EDD files were manually examined to ensure all and only the requested data were delivered in compliance with requirements and that the sample results accurately reflected the data contained in the sample data package.

### 3.1.2 Minimums and Maximums Report and Anomalous Data Review

The Minimums and Maximums Report for this sampling event is located in Appendix A. Based on the results, there were seven anomalous data points associated with this event, all of which were below the historical minimum because the freshwater injection system was operational when the samples were collected and had been running consistently since mid-January 2014. Table 4 presents the sampling locations, sampling dates, contaminant concentration, and the historical concentrations.

Table 4. Anomalous Data Associated With the April 2014 Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Historical Maximum (mg/L)	Disposition
0782	04/14/2014	Ammonia Total as N	9.5	21	NA	Concentration lower due to impact of freshwater injection system.
0783	04/15/2014	Ammonia Total as N	0.4	22	NA	Concentration lower due to impact of freshwater injection system.
0783	04/15/2014	Uranium	0.063	0.17	NA	Concentration lower due to impact of freshwater injection system.
0784	04/15/2014	Ammonia Total as N	0.1	1.4	NA	Concentration lower due to impact of freshwater injection system.
0784	04/15/2014	Uranium	0.0089	0.048	NA	Concentration lower due to impact of freshwater injection system.
0785	04/14/2014	Ammonia Total as N	0.1	0.28	NA	Concentration lower due to impact of freshwater injection system.
0786	04/14/2014	Ammonia Total as N	0.5	4.3	NA	Concentration lower due to impact of freshwater injection system.

mg/L = milligrams per liter

## 3.2 May/June 2014 Site-wide Sampling Event

### 3.2.1 Laboratory Performance Assessment

This validation was performed according to *Standard Practice for Validation of Laboratory Data*. The procedure was applied at Level 3, Data Deliverables Examination. All analyses were successfully completed.

#### General Information and Validation Results

RIN 1405070  
 Laboratory: ALS  
 SDG Numbers: 1406036, 1406294, 1406432  
 Analysis: Inorganics and Metals  
 Validator: Elizabeth Moran  
 Review Date: September 4, 2014

The samples were prepared and analyzed using accepted procedures as shown in Table 5.

Table 5. May/June 2014 Site-wide Sampling Event Analytes and Methods

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

Analytical results were qualified as listed in Table 6. Refer to Table 7 for an explanation of the data qualifiers applied.

Table 6. May/June 2014 Site-wide Sampling Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1406294-1 through -22	All in SDG 1406294	Uranium	J	MS-1
1406294-1 through -22	All in SDG 1406294	Ammonia	J	MS-2

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

Table 7. May/June 2014 Site-wide Sampling Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
MS-1	J	U	Results for the affected analyte(s) are regarded as estimated (J) because the MS sample was not analyzed at the proper frequency, as stated in the appropriate analytical method.
MS-2	J	U	Results for the affected analytes are regarded as estimated because the concentration of the native sample was much greater than the spike added, so the spike recovery may not be accurate.

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

### Sample Shipping/Receiving

ALS received a total of 54 samples for RIN 1405070 in three shipments as shown in Table 8. All of the SDGs were accompanied by a COC form.

Table 8. May/June 2014 Site-wide Sampling Shipment and Receipt Summary

SDG	Date Arrived	Number of Uranium Samples	Number of Ammonia Samples	Tracking Number
1406036	6/3/2014	15	15	1Z5W1Y510198913935
1406294	6/13/2014	22	22	1Z5W1Y510199416748
1406432	6/20/2014	17	17	1Z5W1Y510190219905

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 1406036 was received intact with a temperature of 0.4°C, SDG 1406294 was received intact with a temperature of 5°C, and SDG 1406432 was received with a temperature of 3.8°C, which complies with requirements.

All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

### **Case Narratives**

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

### **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 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 maintains its ability to produce 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 ICP analytes (uranium), CRIs verify the linearity of the calibration curve near the RL. For ICP-MS analytes (uranium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. With ICP-MS analyte uranium, internal standards are also analyzed to indicate stability of the instruments.

#### ***Method SW-846 6020A, Uranium***

The calibration for the uranium analyses were performed on June 5, June 16, and June 23, 2014. The initial calibrations were both performed using five calibration standards and one blank, resulting in calibration curves with  $r^2$  values greater than 0.995. The values of the calibration curve intercepts for uranium were positive and less than three times the IDL.

ICV and CCV checks were made at the required frequency. 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 for all SDGs.

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 EPA 350.1, Ammonia as N***

Initial calibrations for ammonia as N (for all SDGs) were performed using four calibration standards and a blank on June 5, June 18, and June 23, 2014. The calibration curve had an  $r^2$  value greater than 0.995 and an intercept less than three times the MDL.

ICV and CCV checks were made at the required frequency. All calibration check results for all SDGs were within the acceptance criteria.

### **Method and Calibration Blanks**

MBs are analyzed to assess any contamination that may have occurred during sample preparation. Both ICBs and CCBs are analyzed to assess instrument contamination before and during sample analysis. Detected sample results associated with blank results greater than the MDL or IDL (depending on method requirements) were qualified “U” when the detections were less than five times the blank concentration. Non-detects were not qualified.

All of the uranium and ammonia CCBs were less than the IDL on both of the SDGs. No results had to be qualified.

### **Equipment Blanks**

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.

One EB was collected after the surface water tubing was decontaminated. The ammonia and uranium sample results confirm that the equipment was sufficiently cleaned between sample locations.

### **Matrix Spike 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 spike recoveries met the recovery and precision criteria for uranium. However, on SDG 1406294, only one MS was analyzed for 22 samples, and there must be one MS sample per 20 samples analyzed. Therefore, the uranium data in SDG 1406294 was flagged “J” for reason MS-1.

The appropriate number of MS samples were analyzed for ammonia, but the two MSs for SDG 1406294 (1406294-1MS and 1406594-21MS) failed because the native concentration was greater than the analytical range. As a result, the ammonia data in SDG 1406294 was flagged “J” for reason MS-2.

### **Laboratory Replicate Analysis**

The laboratory replicate results demonstrate acceptable laboratory precision. The RPD values for the reported results (MSD) for all other analytes should be less than 20 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 only measure laboratory performance. Duplicate samples were collected from locations TP-20 (1406036-13), AMM-3 (1406294-13), and SMI-PW01 (1406294-16). The duplicate results met the EPA-recommended laboratory duplicate criteria of less than 20 RPD for results that are greater than five times the RL.

### Laboratory Control Sample

LCSs provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. LCS results were acceptable for ammonia analyses.

LCSs were not reported for uranium. 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.

### Metals SD

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. 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.

### Completeness

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

### EDD Files

The EDD files arrived on June 10, June 23, and June 27. The contents of the EDD files were manually examined to ensure all and only the requested data were delivered in compliance with requirements and that the sample results accurately reflected the data contained in the sample data package.

### 3.2.2 Minimums and Maximums Report and Anomalous Data Review

The Minimums and Maximums Report for this sampling event is located in Appendix B. Based on the results, there was only one anomalous data point associated with this event, with the uranium concentration measured from the sample collected from well ATP-2-D below the historical minimum concentration. Table 9 presents a summary of the results of the Minimums and Maximums Report for this event.

Table 9. Anomalous Data Associated With the May/June 2014 Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Historical Maximum (mg/L)	Disposition
ATP-2-D	05/20/2014	Uranium	0.00094	0.0028	NA	Concentration below 0.044 mg/L UMTRA standard

mg/L = milligrams per liter

## 4.0 Results

### 4.1 April 2014 Sampling Event

#### 4.1.1 Surface Water Sampling Results

The surface water sampling event conducted in April 2014 included the collection of samples from locations listed below in Table 10. All locations shown on Figure 1. These locations were sampled in preparation for the post-spring runoff peak flows, when the side channel could potentially develop into a suitable habitat. It is important to note that at the time the samples were collected, the side channel was not considered to be a suitable habitat for endangered fish species. The data collected from this sampling event would determine where the highest ammonia concentrations were present in the side channel before the peak spring runoff flows. Information obtained would provide insight into where to position the diversion points to be most effective should it be necessary to operate the diversion system.

The results and comparisons to the applicable EPA criteria for both acute and chronic concentrations (along with the temperature and pH data used to calculate these concentrations) are also included in Table 10.

*Table 10. April 2014 Surface Water Ammonia Concentrations and Comparisons to EPA Acute and Chronic Criteria*

Location	Date	Temp (°C)	pH	Ammonia as N (mg/L)	EPA - Acute Total as N (mg/L) <sup>1</sup>	EPA - Chronic Total as N (mg/L) <sup>2</sup>
0245	04/10/2014	20.87	9.23	1.8	1.4	0.15
0274	04/10/2014	22.88	8.43	24	3.8	0.34
0278	04/10/2014	21.71	8.00	33	8.8	0.68
0279	04/10/2014	23.60	8.31	24	4.2	0.38
0280	04/10/2014	27.88	8.64	0.21	1.7	0.18
0281	04/10/2014	24.76	8.71	13	1.8	0.18
BW2C	04/10/2014	21.49	9.05	1.7	1.4	0.15
BW2D	04/10/2014	23.19	9.19	3.7	1.3	0.13
BW2E	04/10/2014	22.10	9.20	2.3	1.4	0.14
CR3	04/10/2014	21.39	9.28	0.93	1.4	0.15
Z	04/10/2014	16.12	8.47	1.4	3.3	0.53

mg/L = milligrams per liter

- (1) EPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater State (Effective April 2013), Table N.4., Temperature and pH-Dependent Values, Acute Concentration of Total Ammonia as N (mg/L)
- (2) EPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater State (Effective April 2013), Table 6., Temperature and pH-Dependent Values, Chronic Concentration of Total Ammonia as N (mg/L)

The ammonia concentrations from locations 0280, CR3, and Z were below the acute criteria, and all the measured concentrations were above the chronic criteria. There were no fish observed when the samples were collected.

Figure 4 presents the ammonia concentrations along the side channel off CF4.

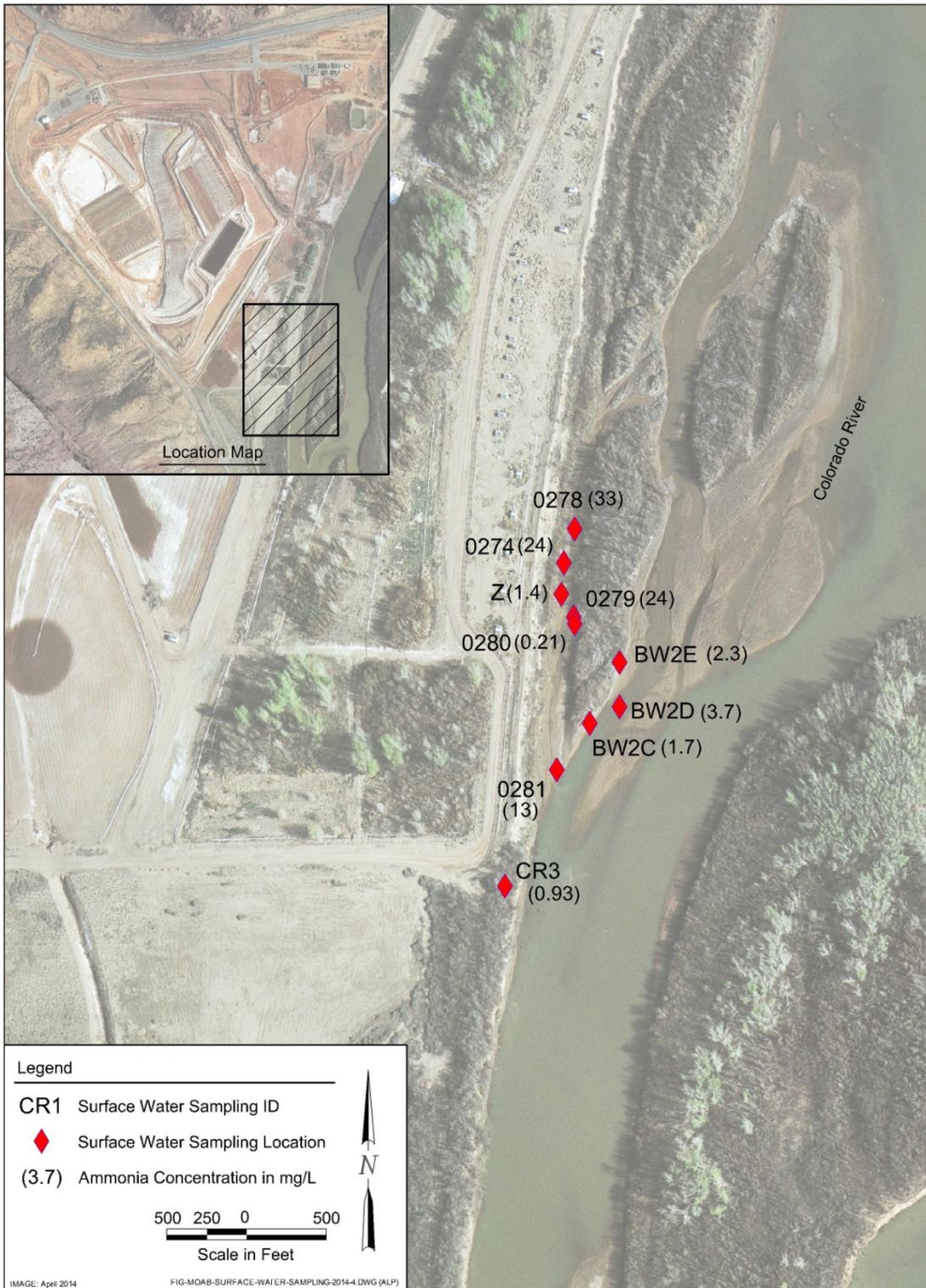


Figure 4. April 2014 Surface Water Ammonia Concentrations

#### **4.1.2 CF4 Ground Water Sampling Results**

The observation wells surrounding the CF4 injection wells (Figure 2) were sampled on April 14 and 15, 2014, to evaluate the effectiveness of the freshwater injection system. The ammonia concentrations are displayed on Figure 5. In general, the injection wells are screened and, therefore, deliver freshwater into the subsurface, from 15 to 35 feet (ft) below ground surface (bgs). The results show a significant reduction in concentrations in the downgradient (east) direction, particularly in the zone above 35 ft bgs. In the upgradient direction, concentrations are also impacted by freshwater injection above 35 ft bgs. The highest ammonia concentration was associated with the sample collected from well 0781 from a depth of 48 ft bgs upgradient of the CF4 injection wells.

Figure 6 presents the ground water mound developed as a result of the freshwater injection system, as measured on April 15, the same time the samples were collected. The ground water elevation data indicate there was a difference of more than 10 ft between the elevation inside the injection wells and upgradient observation wells.

#### **4.1.3 CF5 Ground Water Sampling Results**

All eight of the CF5 extraction wells were sampled between April 15 and 17, 2014, to monitor contaminant concentration trends and update the contaminant concentrations used for the mass removal calculations. Figure 7 presents the extraction rates and associated drawdowns measured when the samples were collected. The ammonia and uranium concentrations are displayed on Figure 8.

Time versus concentration plots were generated to display the trends displayed by the CF5 extraction wells during the past 2 years. Figure 9 is the time versus ammonia concentration plot for extraction wells 0810 through 0813 and SMI-PW02, all of which are located along the CF5 southeastern boundary. Figure 10 displays a time versus uranium concentration plot for the same set of wells. Figures 11 and 12 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 2).

As the four plots exhibit, with a few exceptions, the ammonia and uranium concentrations did not significantly change over the past 2 years. As of April 2014, all ammonia concentrations ranged from 340 to 440 milligrams per liter (mg/L) along the southeastern CF5 boundary and from 180 to 300 mg/L along the base of the tailings pile. The uranium concentrations for all eight extraction wells ranged from 1.5 to 3.1 mg/L.

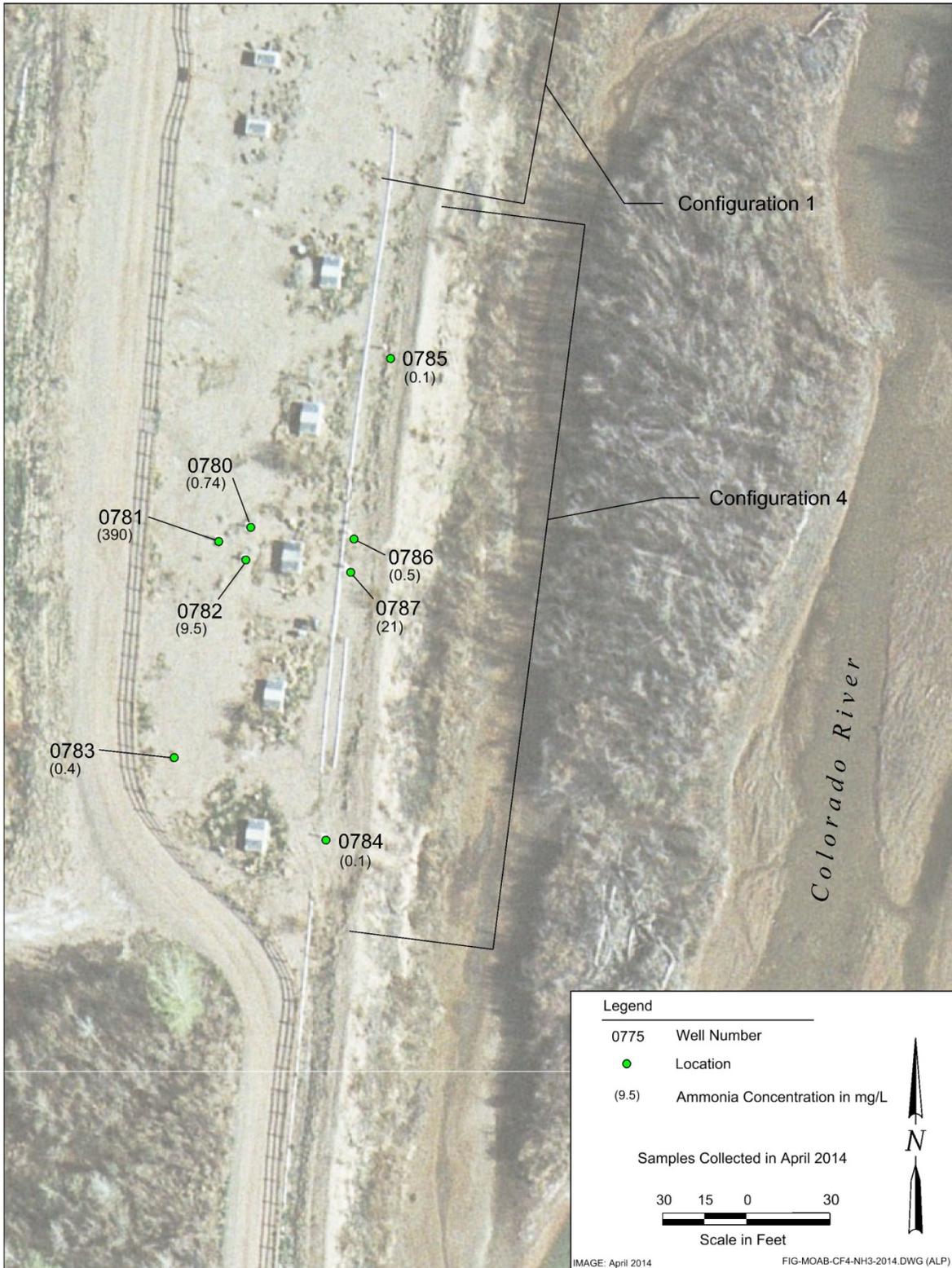


Figure 5. April 2014 CF4 Ground Water Ammonia Concentrations

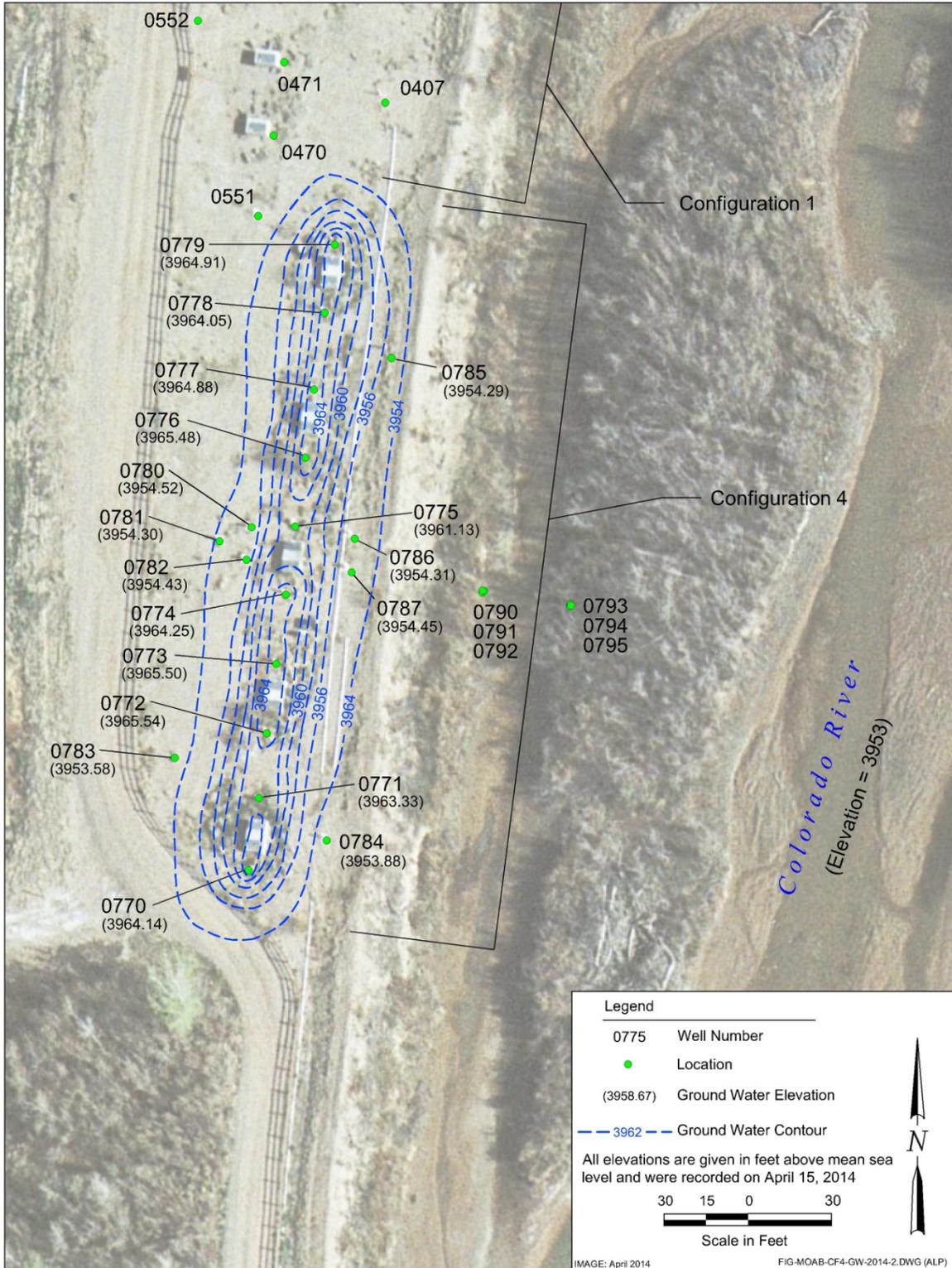


Figure 6. April 2014 CF4 Ground Water Elevation Contour Map, During Injection

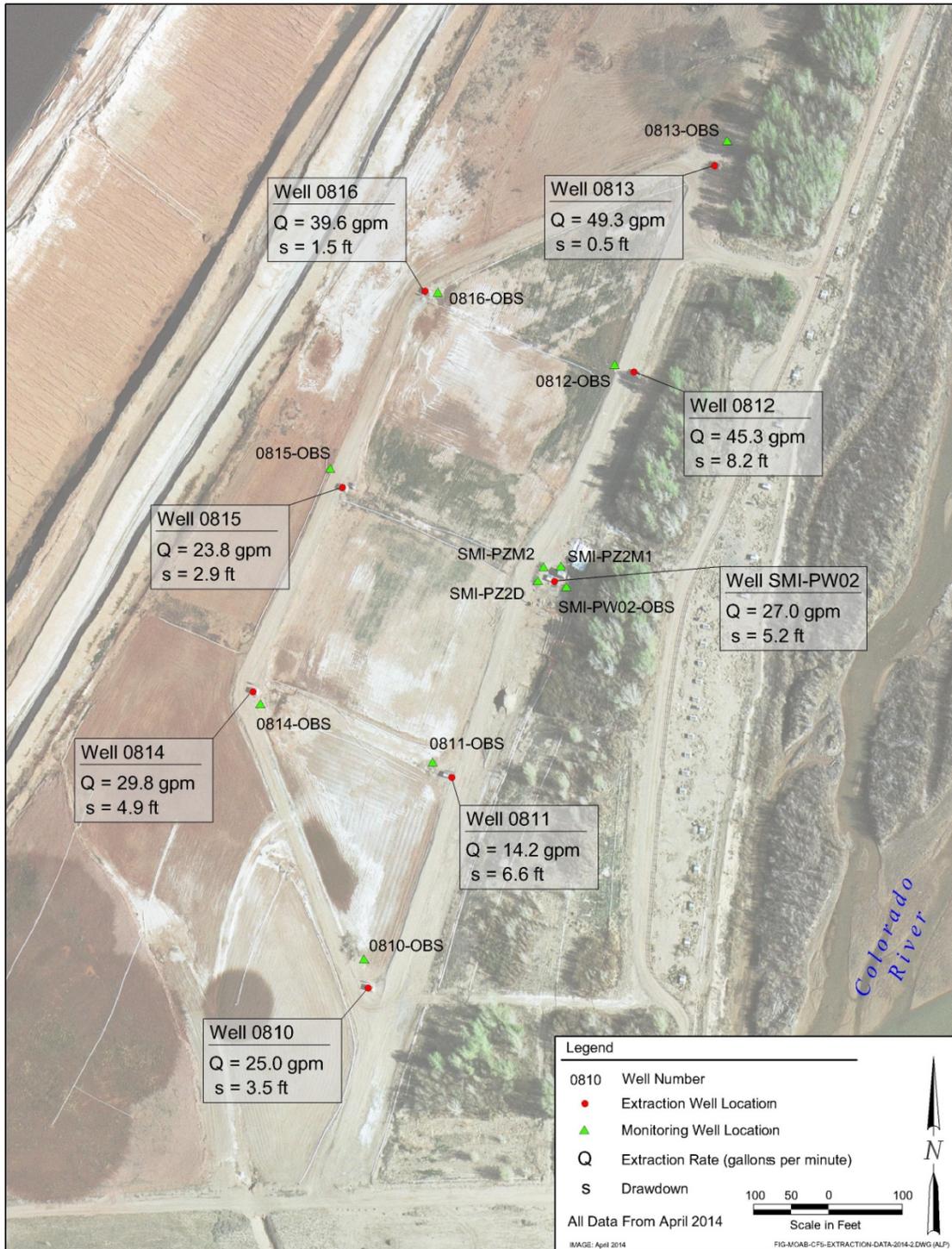


Figure 7. April 2014 CF5 Pumping Rates and Drawdowns

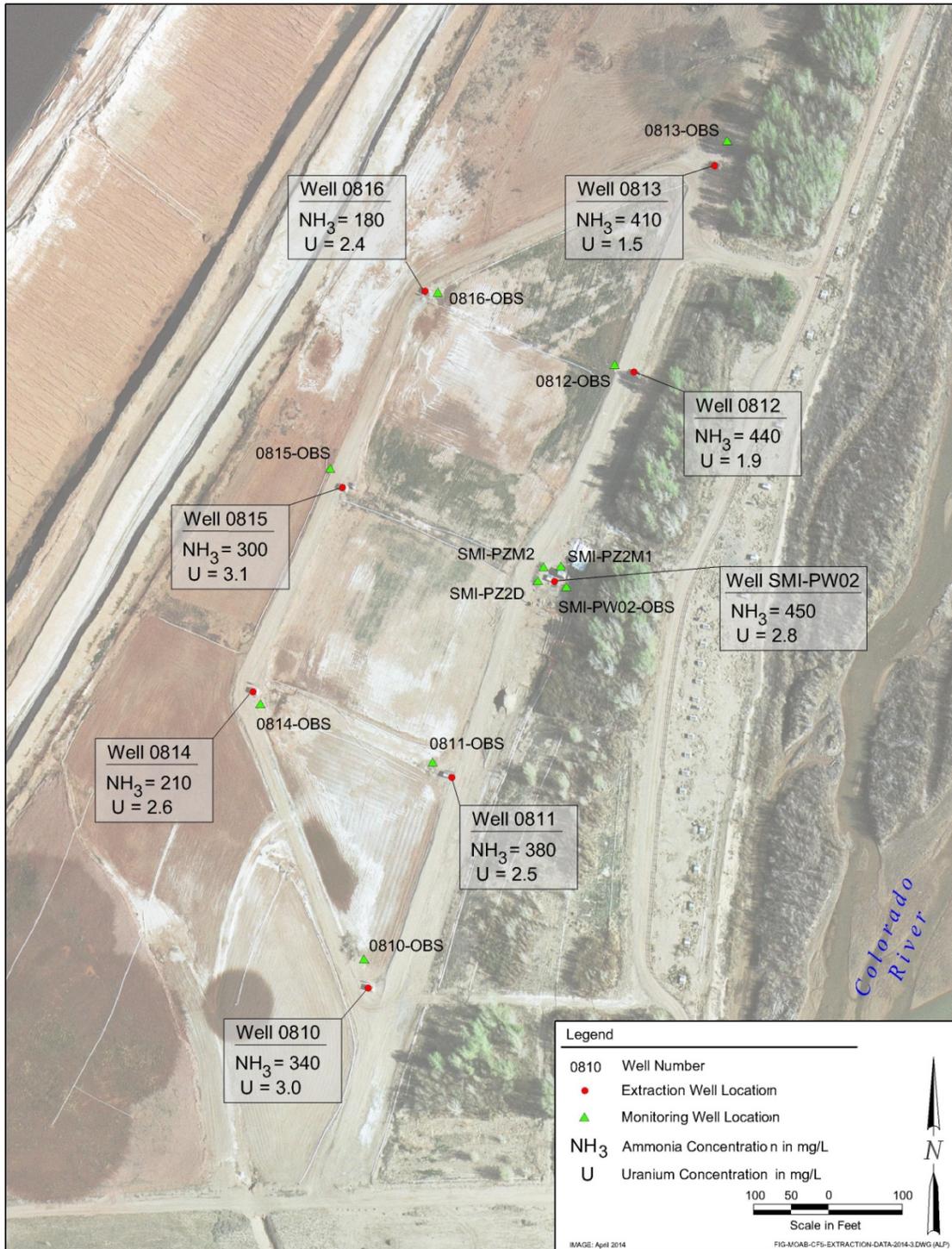


Figure 8. April 2014 CF5 Ammonia and Uranium Concentrations

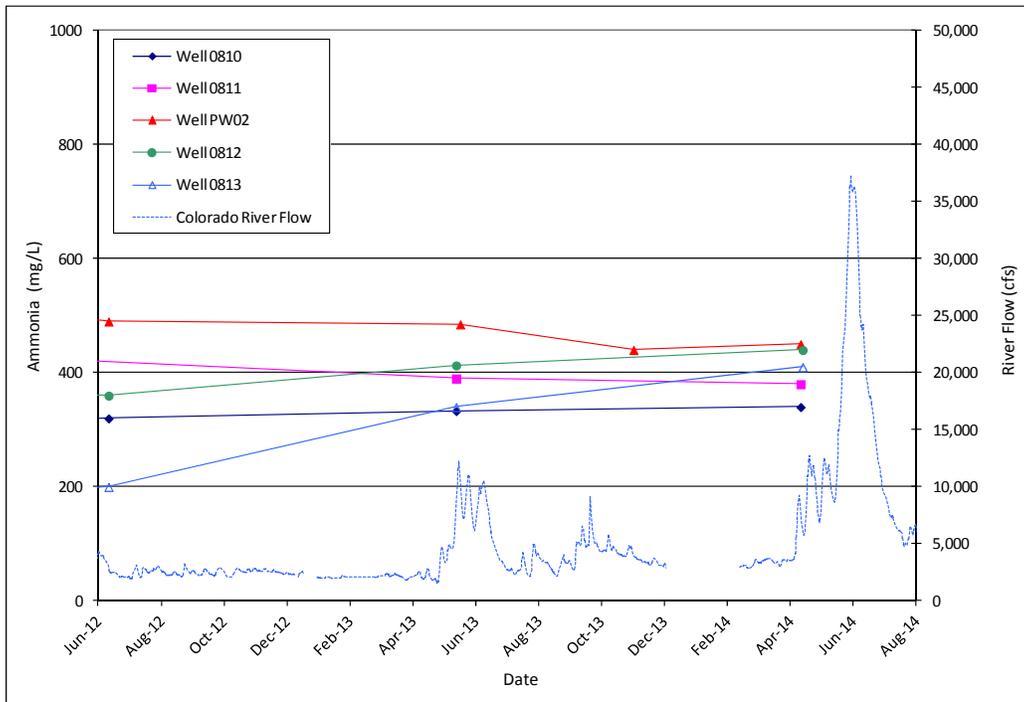


Figure 9. CF5 Extraction Wells 0810, 0811, 0812, 0813, and PW02 Time versus Ammonia Concentration Plot

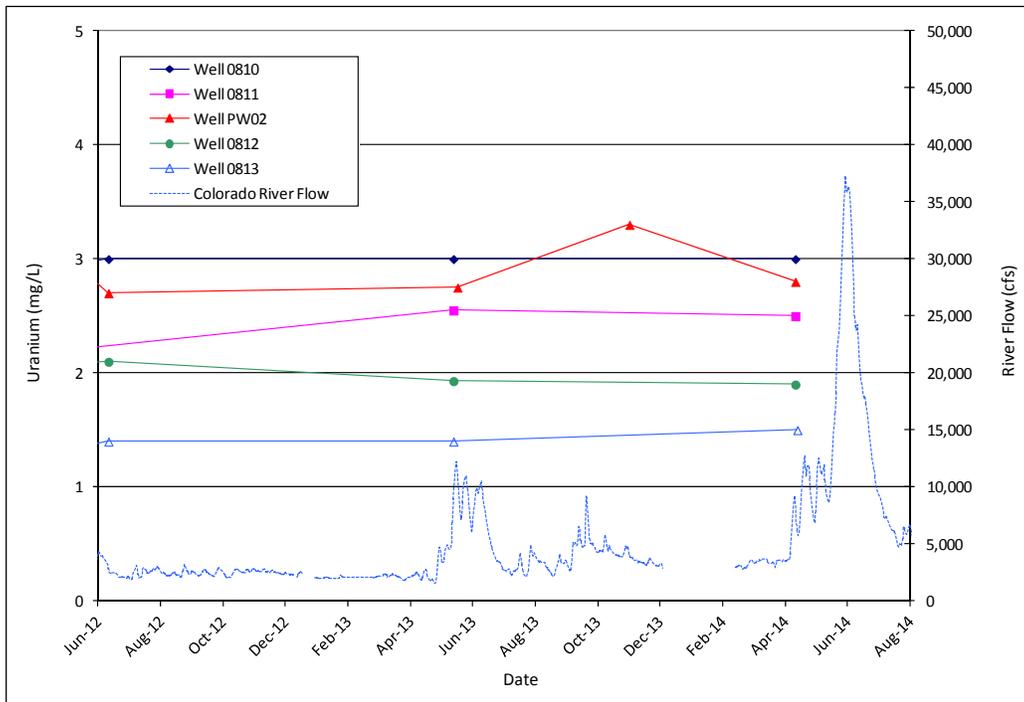


Figure 10. CF5 Extraction Wells 0810, 0811, 0812, 0813, and PW02 Time versus Uranium Concentration Plot

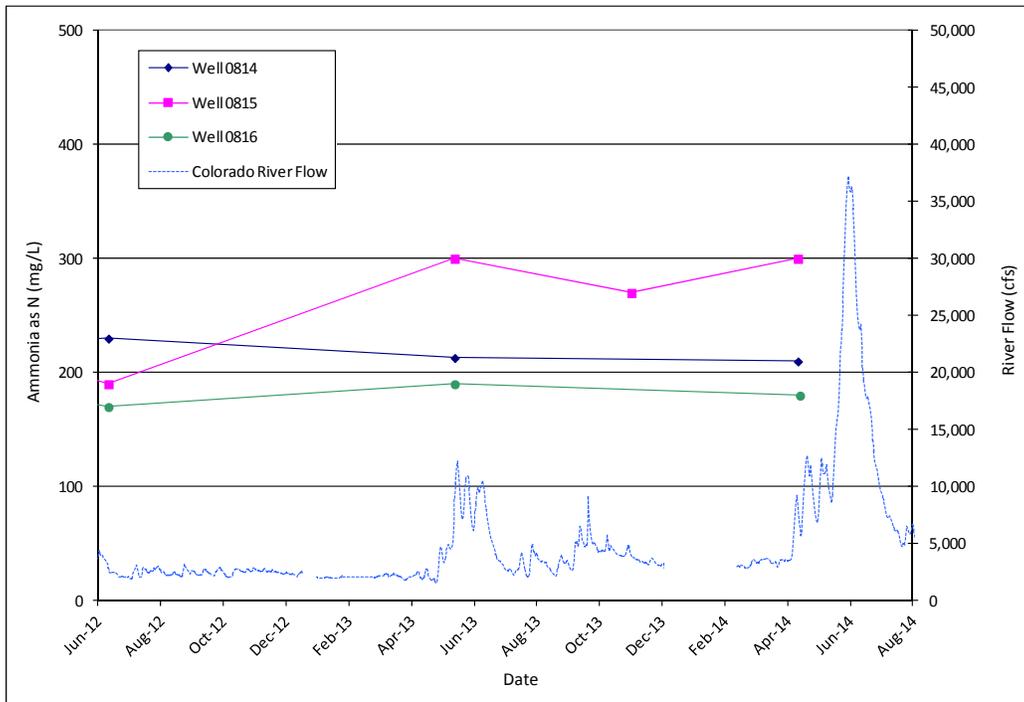


Figure 11. CF5 Extraction Wells 0814, 0815, and 0816  
Time versus Ammonia Concentration Plot

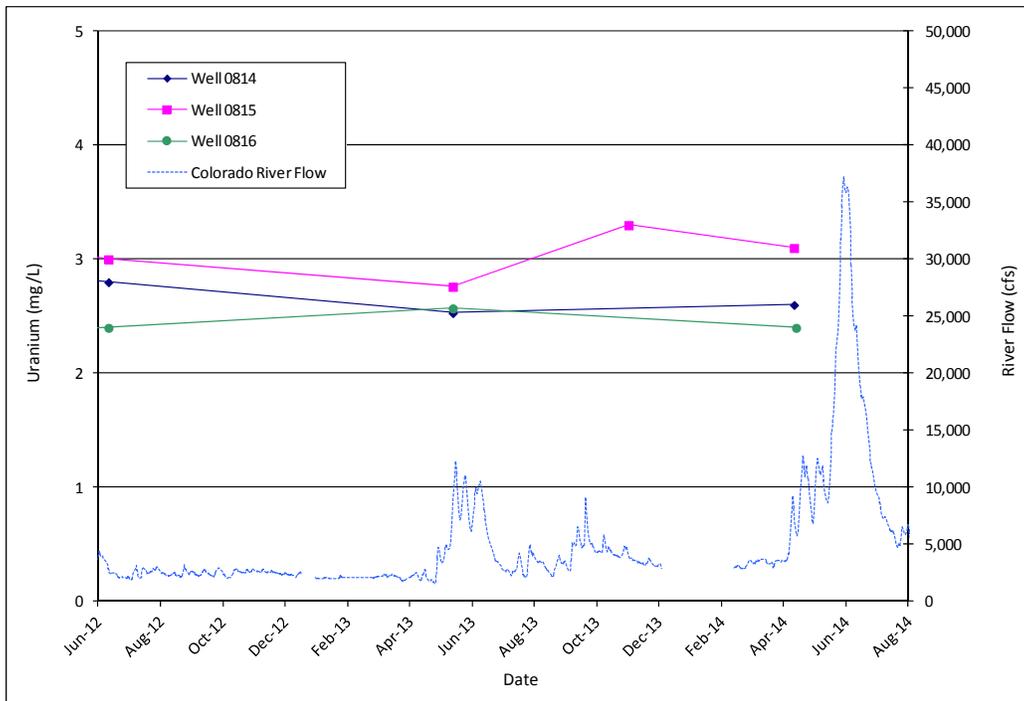


Figure 12. CF5 Extraction Wells 0814, 0815, and 0816  
Time versus Uranium Concentration Plot

## **4.2 May/June 2014 Site-wide Sampling Event**

All samples collected during this event were analyzed for ammonia and uranium. Table 11 presents the site-wide locations and associated concentrations that exceeded the 0.044 mg/L uranium ground water standard, which is based on Table 1 in Title 40 Code of Federal Regulations Part 192, Subpart A (40 CFR 192A), “Standard for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites,” assuming uranium-234 and uranium-238 activities are in equilibrium.

## **4.3 Ground Water Quality Trends**

To present the trends observed in the water chemistry for the site-wide locations, the site was divided into six areas. These include the northeastern base of the tailings pile, northeastern uranium plume (which includes the PW03 cluster), the southeastern 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. Results based on analysis using the ammonia probe are also displayed.

### **4.3.1 Northeastern Base of Tailings Pile**

Figures 13 and 14 are time versus ammonia and uranium concentration plots, respectively, for these locations. The ammonia concentration in the sample collected from UPD-17 decreased since June 2013, while the sample from UPD-18 has remained unchanged over the past 2 years (Figure 13). The uranium concentrations have not significantly changed over the past 2 years as shown in Figure 14.

### **4.3.2 Northeastern Uranium Plume Area**

Due to the number of wells associated with the northeastern uranium plume, this area of the site was further divided into three subareas: the center of the plume, the vicinity of the Atlas building, and the northeastern edge of the plume area.

### **4.3.3 Center of Northeastern Uranium Plume Area**

Figures 15 and 16 are the time versus ammonia and uranium concentration plots, respectively, for the center of the northeastern uranium plume area, which includes locations 0411, 0413, 0414, and UPD-20. As displayed in Figure 15, the ammonia concentrations have remained consistently below 5 mg/L in the samples collected from wells UPD-20 and 0411 and have slightly increased in the sample collected from 0413 since the June 2012 event.

The uranium concentrations have not significantly changed in the samples collected from wells 0413 and UPD-20 since June 2012 (Figure 16), while the sample collected from well 0411 showed a significant increase (from 1.7 to 4.9 mg/L) since June 2013.

### **4.3.4 Atlas Building Vicinity**

The ammonia and uranium concentrations associated with samples collected from locations in the vicinity of the Atlas building are displayed in Figures 17 and 18, respectively. These wells include 0410, UPD-21, UPD-23, and UPD-24. Wells UPD-23 and UPD-24 were installed in the winter of 2012 to better define the extent of the elevated uranium concentrations detected in the samples collected from well UPD-21. This sampling event represents the fourth time these new wells were sampled.

Table 11. May/June 2014 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	6/3/2014	CF2 Vicinity	18	1.0
0404	6/3/2014	CF3 Vicinity	18	0.96
0406	6/5/2014	Baseline Area	11	1.40
0407	6/3/2014	CF1 Vicinity	17	0.21
0410	6/17/2014	NE Uranium Plume Area	27	0.43
0411	6/10/2014	NE Uranium Plume Area	8	4.90
0413	5/22/2014	NE Uranium Plume Area	10.5	3.70
0439	6/11/2014	On Tailings Pile	120	1.20
0441	6/12/2014	Along SW Site Boundary	53	0.05
0453	6/17/2014	Along SW Site Boundary	80	0.89
0454	5/21/2014	Along SW Site Boundary	13	1.60
0492	6/3/2014	Along S Site Boundary	18	0.073
AMM-2	5/20/2014	Near Base of Tailings Pile	48	2.30
AMM-3	6/9/2014	Near Base of Tailings Pile	48	2.80
MW-3	6/3/2014	CF5 Vicinity	44	3.10
SMI-PW01	6/5/2014	CF5 Vicinity	40	3.00
SMI-PW03	6/17/2014	NE Uranium Plume Area	40	2.50
SMI-PZ1D2	6/9/2014	CF5 Vicinity	73	2.00
SMI-PZ1M	6/9/2014	CF5 Vicinity	57	2.90
SMI-PZ1S	6/5/2014	CF5 Vicinity	18	0.74
SMI-PZ2D	5/21/2014	CF5 Vicinity	75	0.35
SMI-PZ2M2	5/21/2014	CF5 Vicinity	56	0.85
SMI-PZ3D2	6/17/2014	NE Uranium Plume Area	78	1.20
SMI-PZ3M	6/17/2014	NE Uranium Plume Area	59	1.20
SMI-PZ3S	6/17/2014	NE Uranium Plume Area	25	2.00
TP-01	5/19/2014	NE Uranium Plume Area	22	0.08
TP-22	6/2/2014	NE Uranium Plume Area	17	0.23
TP-23	5/21/2014	NE Uranium Plume Area	25	4.10
UPD-17	6/10/2014	NE Uranium Plume Area	14	1.20
UPD-18	6/10/2014	NE Uranium Plume Area	13	1.00
UPD-20	6/16/2014	NE Uranium Plume Area	17	0.07
UPD-21	6/16/2014	NE Uranium Plume Area	25	5.80
UPD-22	6/18/2014	NE Uranium Plume Area	9	2.90
UPD-23	6/4/2014	NE Uranium Plume Area	26	0.63
UPD-24	6/16/2014	NE Uranium Plume Area	27	7.00

NE = northeastern; SW = southwestern

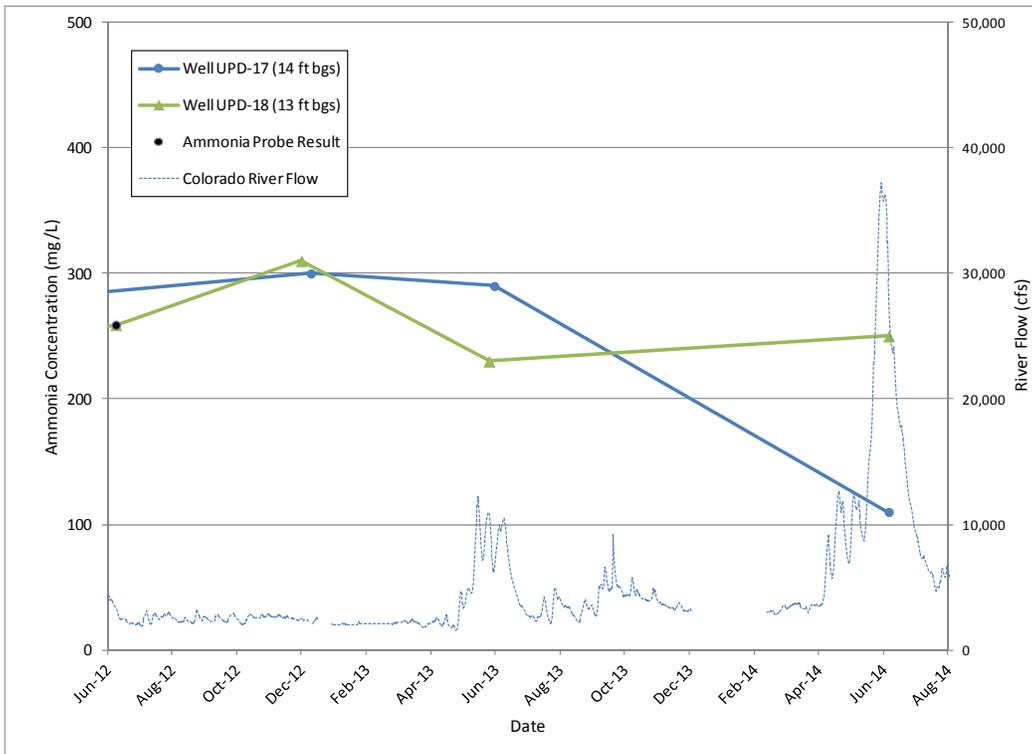


Figure 13. Wells UPD-17 and UPD-18  
Time versus Ammonia Concentration Plot

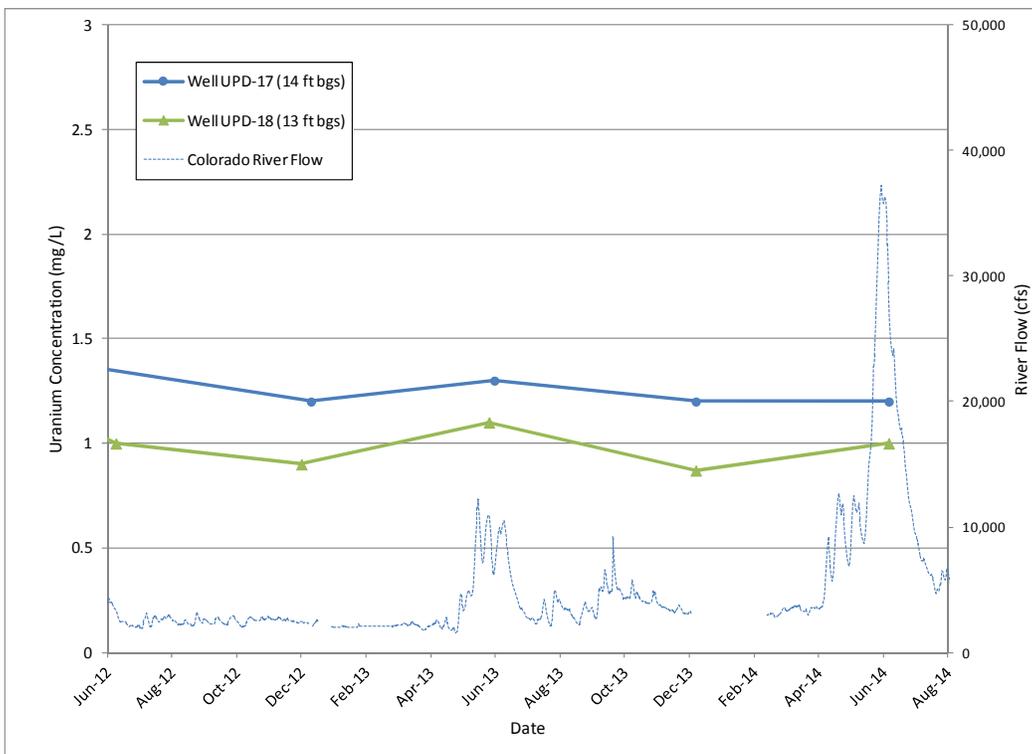


Figure 14. Wells UPD-17 and UPD-18  
Time versus Uranium Concentration Plot

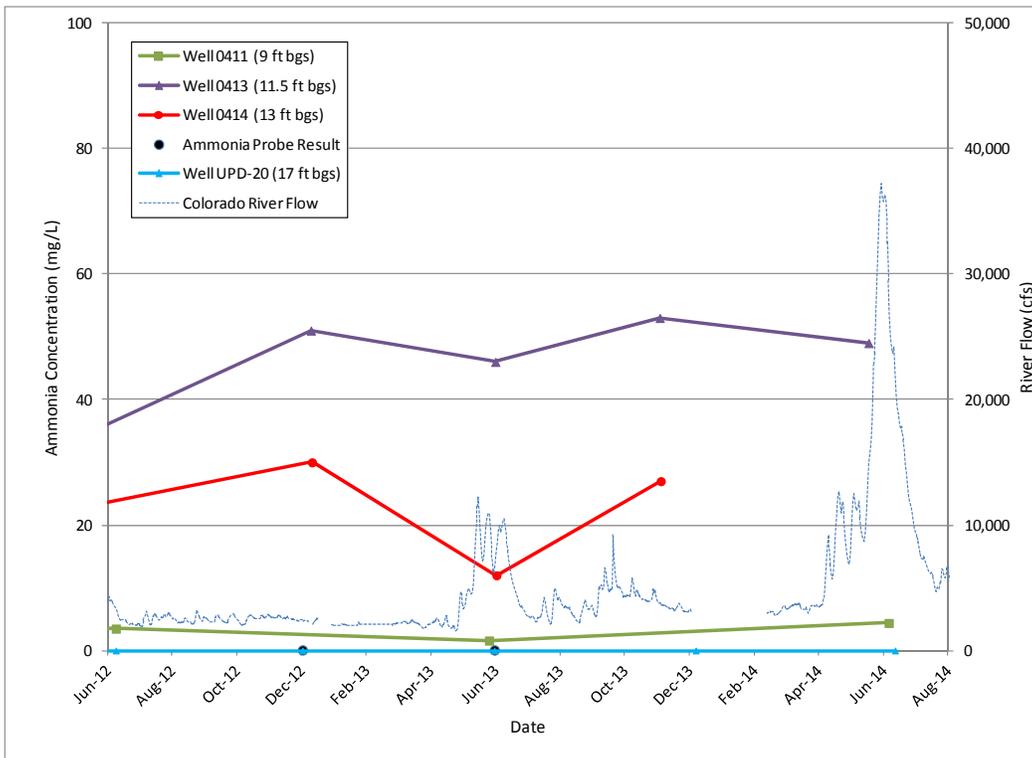


Figure 15. Center of Northeastern Uranium Plume Area Observation Wells 0411, 0413, 0414, and UPD-20 Time versus Ammonia Concentration Plot

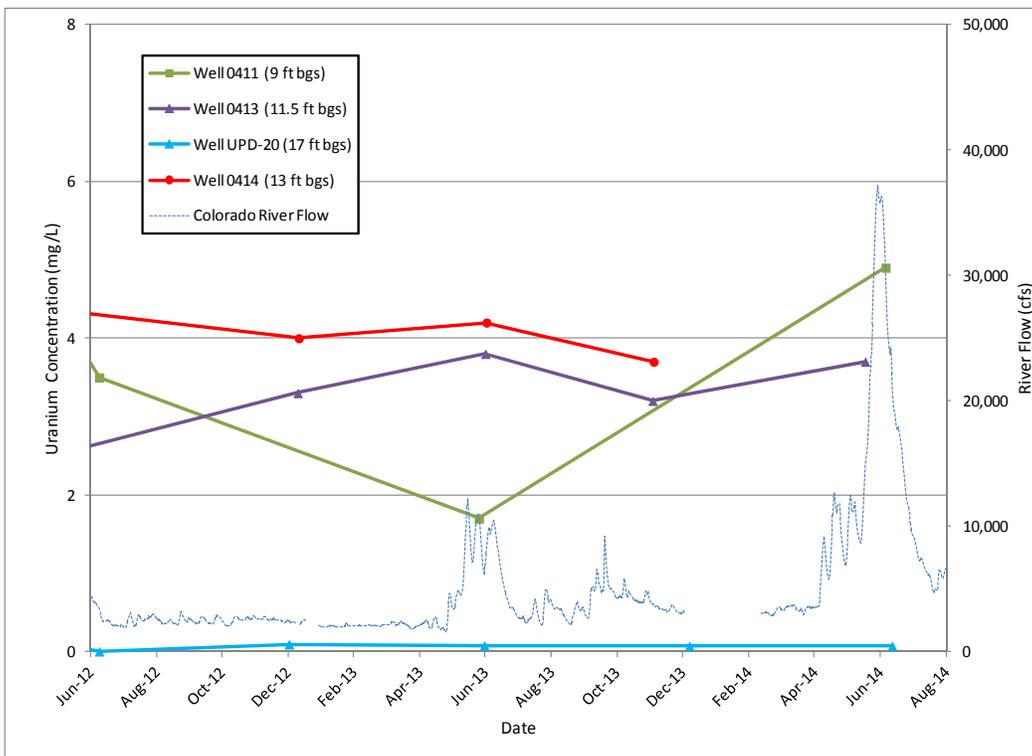


Figure 16. Center of Northeastern Uranium Plume Area Observation Wells 0411, 0413, 0414, and UPD-20 Time versus Uranium Concentration Plot

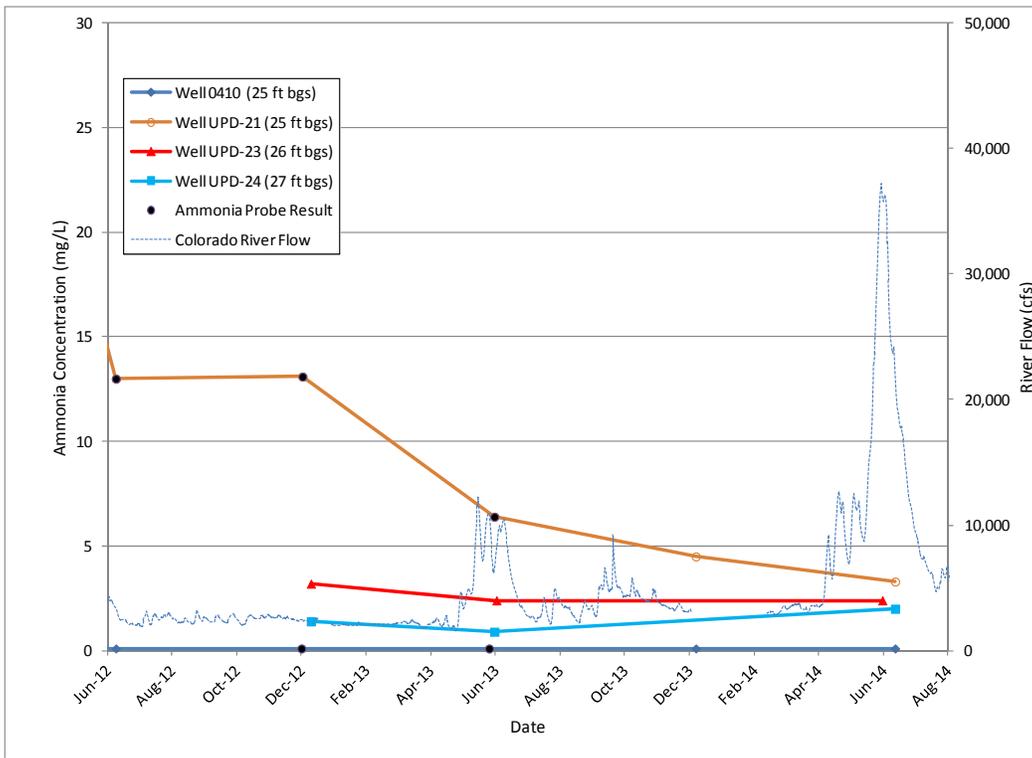


Figure 17. Vicinity of Atlas Building Observation Wells 0410, UPD-21, UPD-23, and UPD-24 Time versus Ammonia Concentration Plot

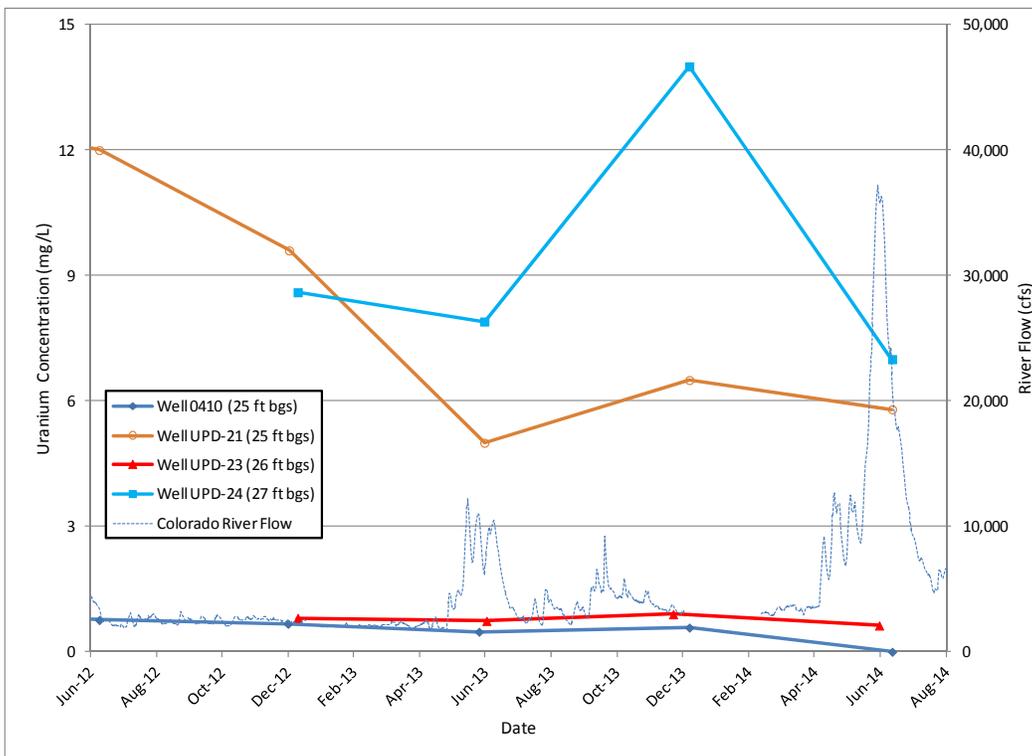


Figure 18. Vicinity of Atlas Building Observation Wells 0410, UPD-21, UPD-23, and UPD-24 Time versus Uranium Concentration Plot

As shown in Figure 17, the ammonia concentrations in the samples collected from each of the wells were all less than 5 mg/L. Figure 18 displays that the uranium concentrations in samples collected from wells 0410 and UPD-23 remain below 1 mg/L. The sample collected from well UPD-21 has also not significantly changed since June 2013. The sample collected from well UPD-24 indicates the concentration has rebounded to near June 2013 levels, decreasing from 14 to 7 mg/L.

#### 4.3.5 Northeastern Edge of Uranium Plume Area

Figures 19 and 20 display comparable data for the wells located in the vicinity of the northeastern edge of the plume area (wells 0412, UPD-22, SMI-MW01, and SMI-PZ3S). It was not possible to collect samples from wells SMI-MW01 or 0412 during this event due to flood waters in this area of the site. As Figure 19 exhibits, the ammonia concentrations in the samples collected from each of the remaining locations have not changed significantly over the past 2 years, and are below 5 mg/L.

In general, the uranium concentrations (Figure 20) have followed a similar trend, with no significant changes within the past 2 years. The uranium concentrations in the samples collected from each location are all near or below 3 mg/L.

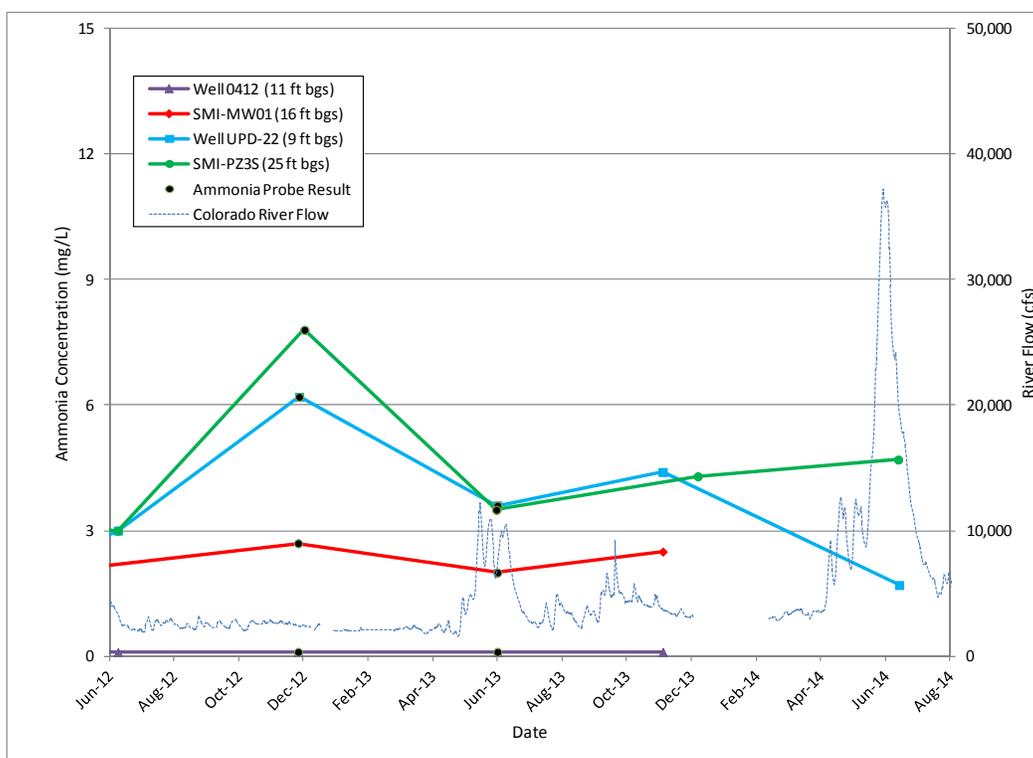


Figure 19. Northeastern Edge of Uranium Area Observation Wells 0412, SMI-MW01, SMI-PZ3S, and UPD-22 Time versus Ammonia Concentration Plot

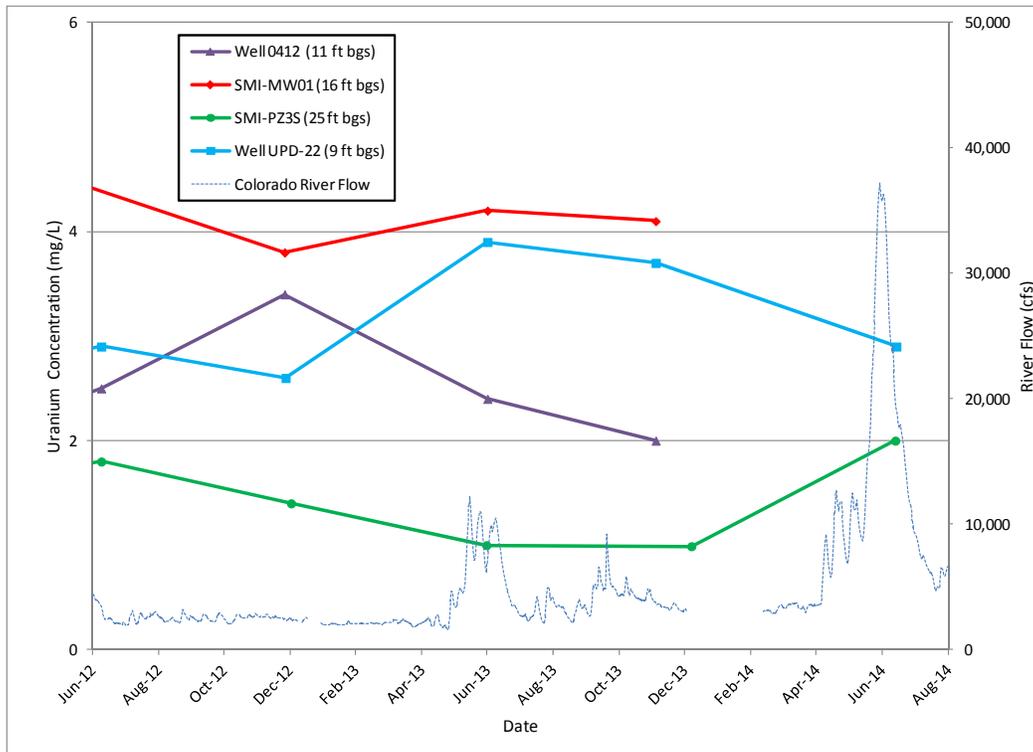


Figure 20. Northeastern Edge of Uranium Area Observation Wells 0412, SMI-MW01, SMI-PZ3S, and UPD-22 Time versus Uranium Concentration Plot

#### 4.3.6 Base of Tailings Pile

The time versus ammonia and uranium concentration plots for the area near the base of the tailings pile are presented in Figures 21 and 22. As Figure 21 exhibits, the ammonia concentrations have generally fluctuated independently 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 not significantly changed in this area of the site since June 2012. Uranium concentrations (Figure 22) have increased in the samples collected from wells AMM-2 and -3, but are still below 3 mg/L.

#### 4.3.7 Southwestern Boundary

Figures 23 and 24 display the time versus concentration plots for the locations along the southwestern boundary presented in the upgradient to downgradient direction. Ammonia concentrations in the sample collected from well 0453 (Figure 23) continue to decrease, from 423 to 240 mg/L since June 2013, while the concentration measured in the sample from well 0454 gradually increased during this same time period from 220 to 360 mg/L. Uranium concentrations in samples collected from both 0453 and 0454 have gradually decreased since December 2012, both dropping below 2 mg/L (Figure 24). The sample collected from well 0440 continued having ammonia concentrations below the detection limit and uranium concentrations below the 0.044 mg/L UMTRA standard.

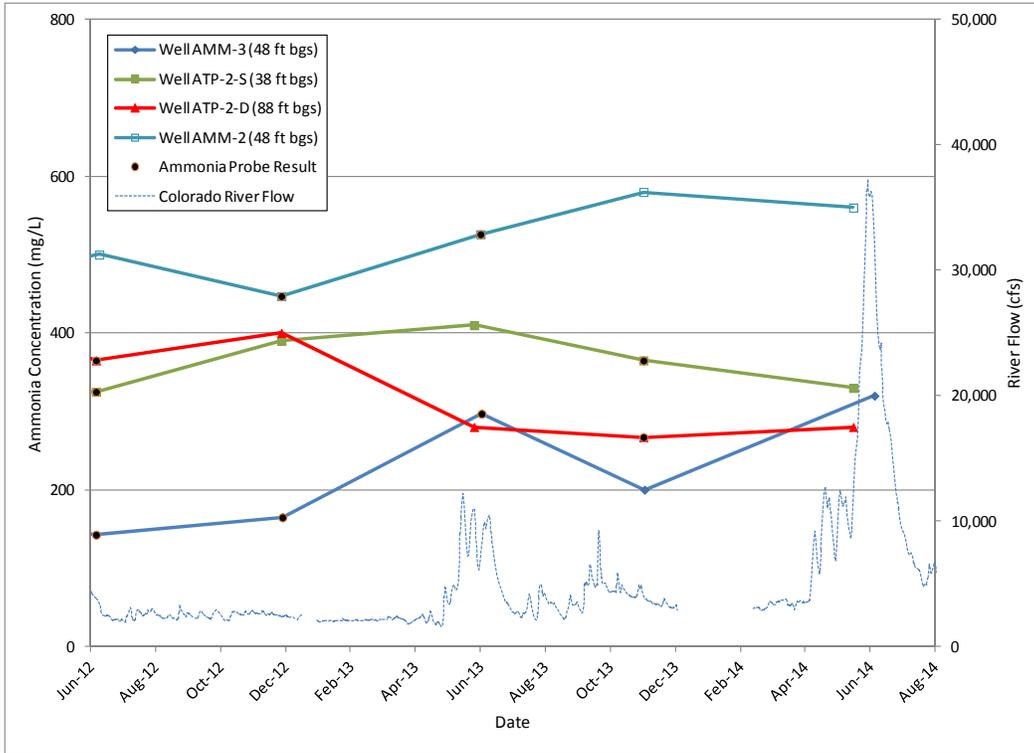


Figure 21. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 Time versus Ammonia Concentration Plot

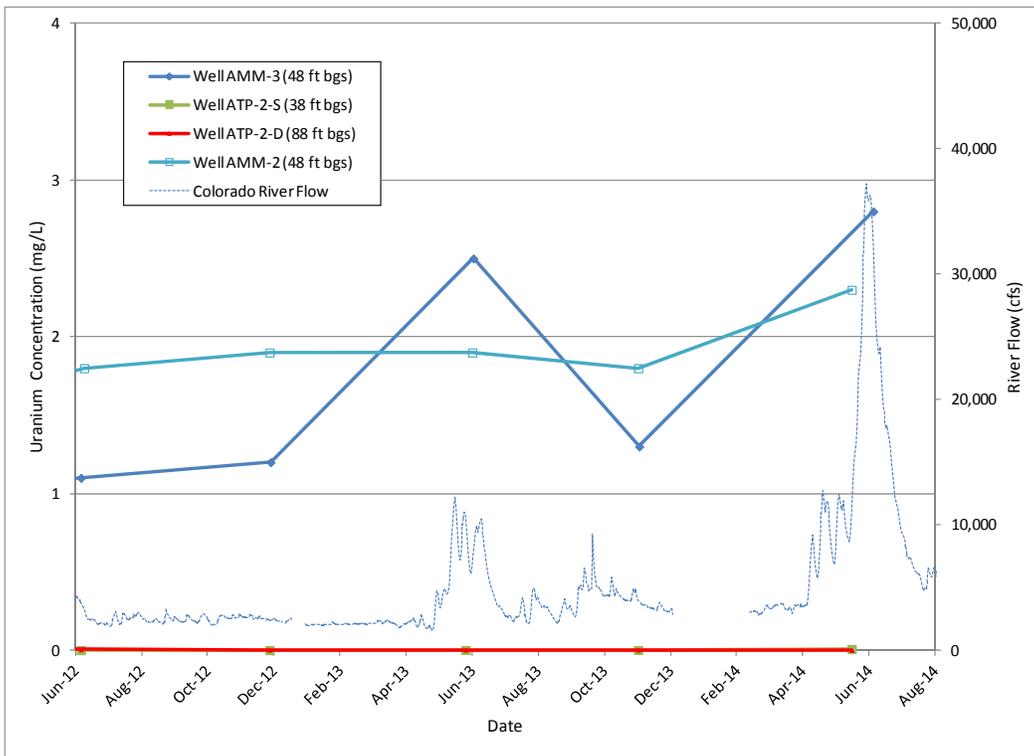


Figure 22. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 Time versus Uranium Concentration Plot

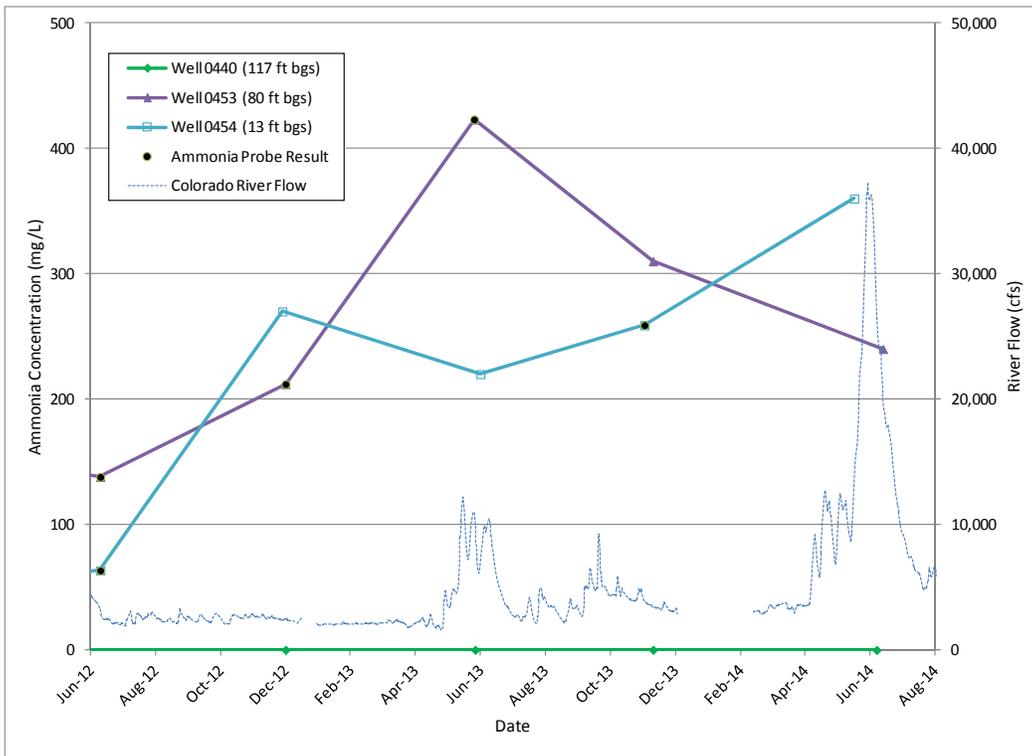


Figure 23. Southwestern Boundary Observation Wells 0453, 0454, and 0440 Time versus Ammonia Concentration Plot

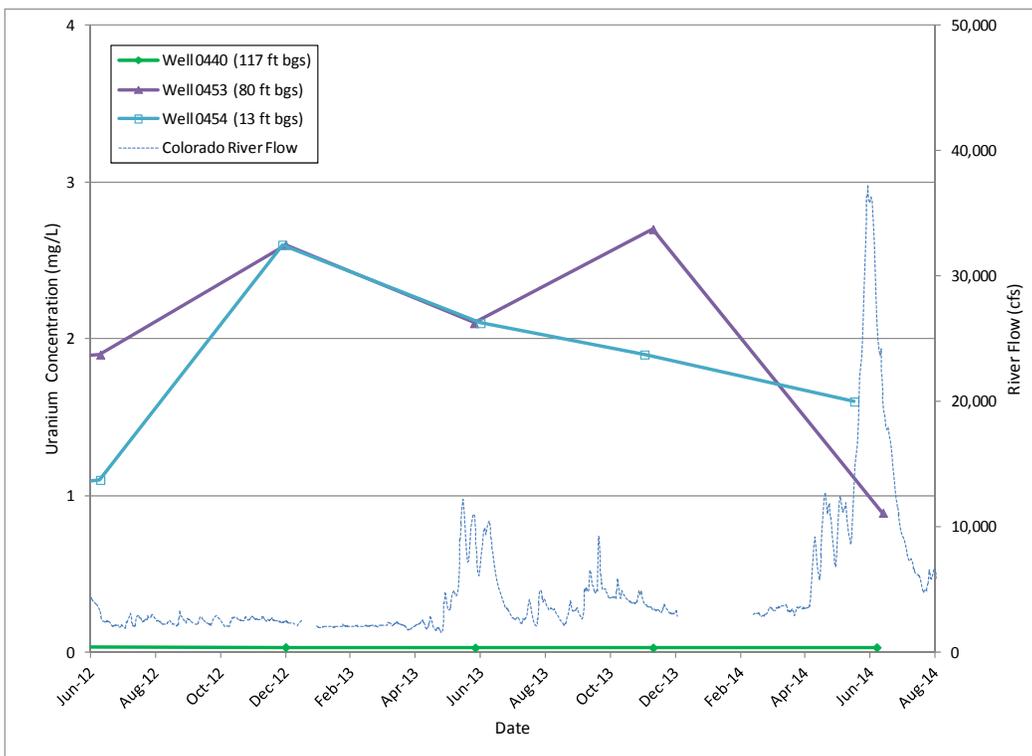


Figure 24. Southwestern Boundary Observation Wells 0453, 0454, and 0440 Time versus Uranium Concentration Plot

### 4.3.8 Riverbank Area

Figures 25 and 26 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. As of May/June 2014, ammonia concentrations have not significantly changed in each well of the wells sampled along the riverbank during this event with the exception of well 0401, which increased from 143 to 250 mg/L since December 2013. This was not expected because an increase in the river stage usually results in a decrease in the contaminant concentrations.

Uranium concentrations (Figure 26) in all the sampled wells decreased to less than 1 mg/L. The concentration in the sample collected from well 0401 decreased from 3 to 1 mg/L in response to the increased river stage.

### 4.3.9 Southern and Off-site Areas

Figures 27 and 28 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 ft off the bank. It was not possible to access well TP-19 due to the high river flows, and a sample was not collected. Ammonia concentrations (Figure 27) in samples collected from TP-17 and TP-20 remain below 4 mg/L after increasing in November/December 2012. The uranium concentrations (Figure 28) have consistently been below the 0.044 mg/L UMTRA standard over the past 2 years.

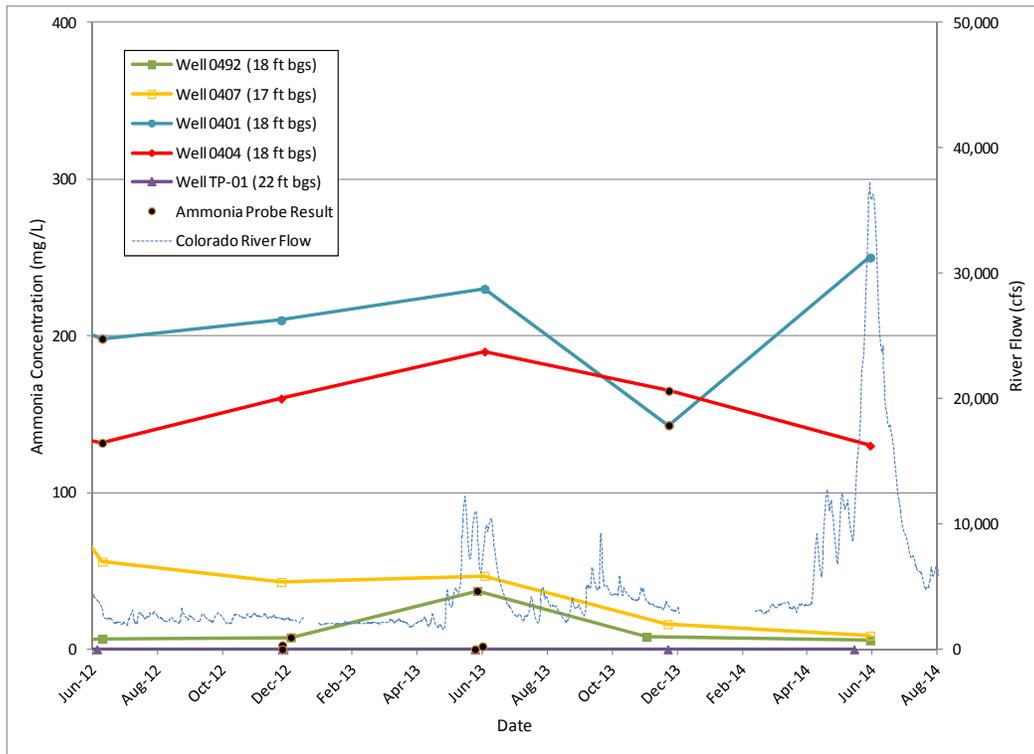


Figure 25. Riverbank Observation Wells 0492, 0401, 0404, and TP-01 Time versus Ammonia Concentration Plot

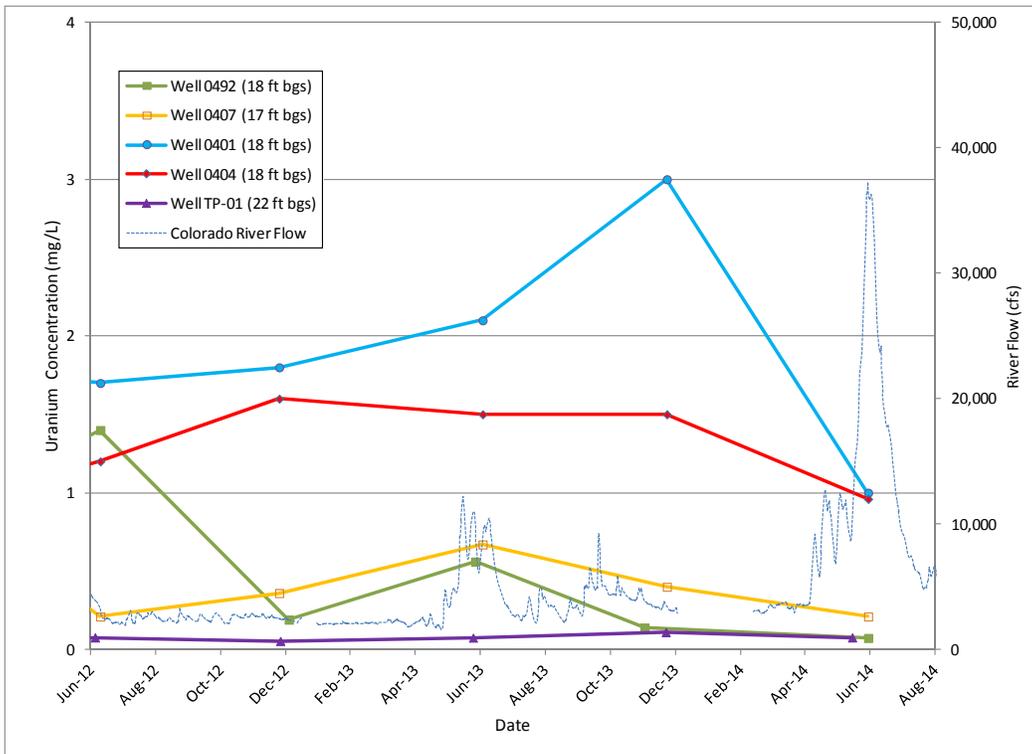


Figure 26. Riverbank Observation Wells 0492, 0401, 0404, and TP-01 Time versus Uranium Concentration Plot

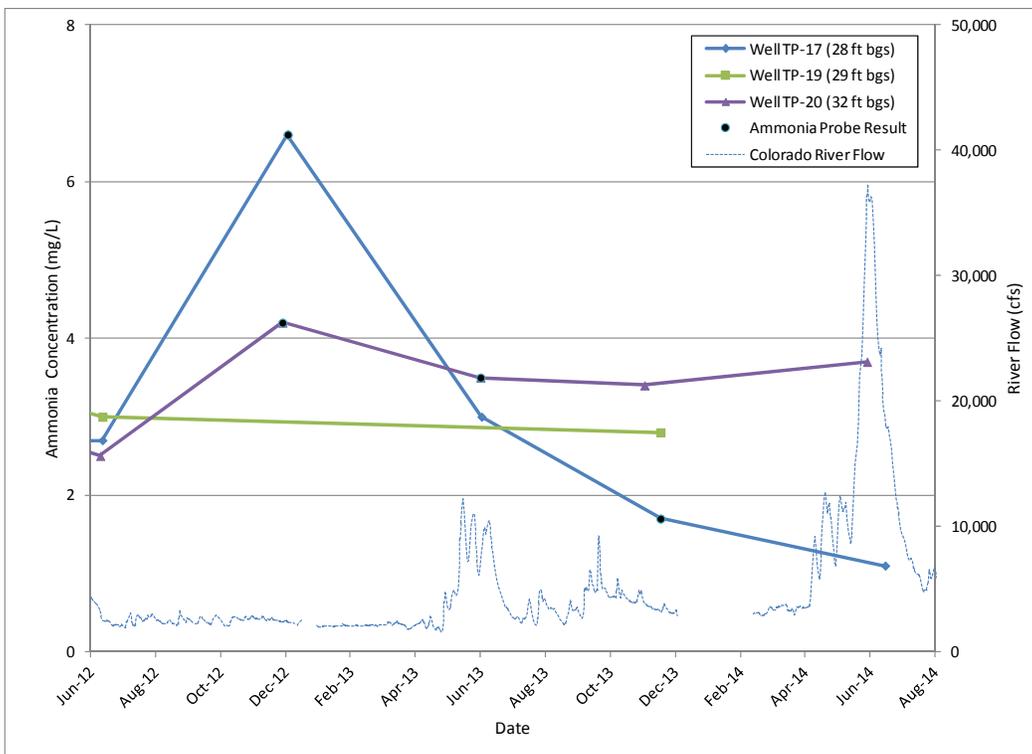


Figure 27. South of Site Observation Wells TP-17, TP-19, and TP-20 Time versus Ammonia Concentration Plot

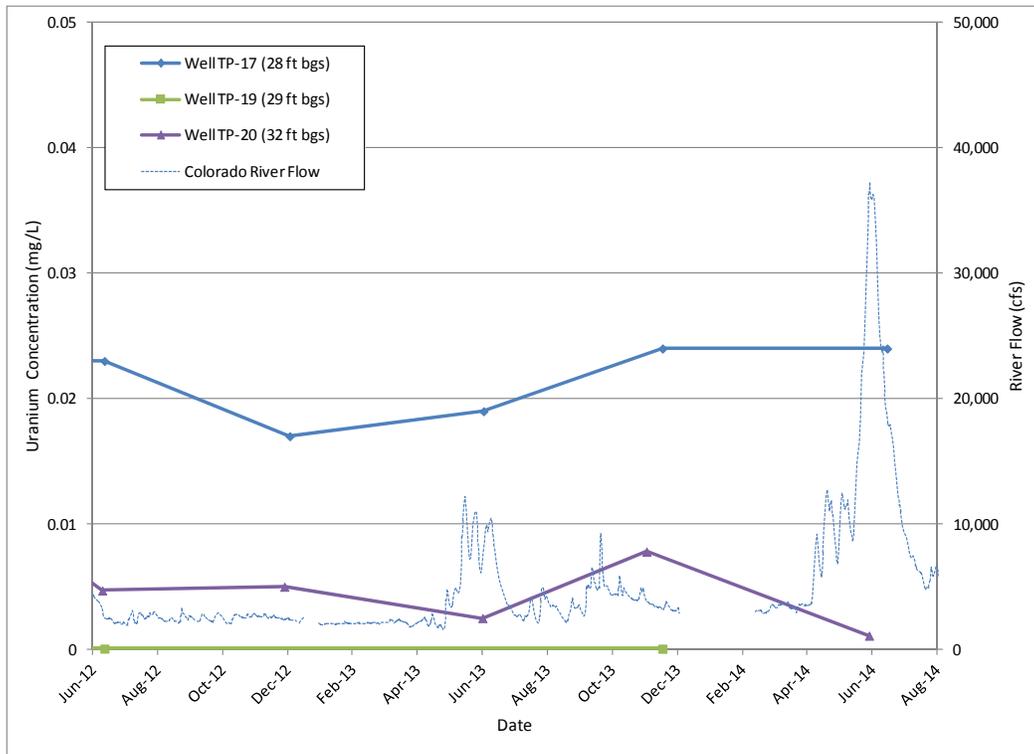


Figure 28. South of Site Observation Wells TP-17, TP-19, and TP-20 Time versus Uranium Concentration Plot

#### 4.4 Surface Water Sampling Results

Table 12 presents the ammonia results from the surface water sampling conducted in May/June 2014 from locations 0218, 0274, CR1, and CR5 (as shown on Figure 1). The ammonia concentrations, all of which were below the 0.1 mg/L detection limit, and comparisons to the applicable EPA criteria for both acute and chronic concentrations (along with the temperature and pH data used to calculate these concentrations) are shown in Table 12.

Table 12. May/June 2014 Surface Water Ammonia Concentrations and Comparisons to EPA Acute and Chronic Criteria

Location	Date	Temp (°C)	pH	Ammonia as N (mg/L)	EPA - Acute Total as N (mg/L)*	EPA - Chronic Total as N (mg/L)**
0218	6/16/14	15.97	8.41	<0.1	4.1	0.53
0274	6/16/14	17.05	8.40	<0.1	4.1	0.50
CR1	6/16/14	15.96	8.40	<0.1	4.1	0.53
CR5	6/16/14	17.53	8.36	<0.1	4.1	0.47

\*U.S. EPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater State (Effective April 2013), Table N.4., Temperature and pH-Dependent Values, Acute Concentration of Total Ammonia as N (mg/L)

\*\*U.S. EPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater State (Effective April 2013), Table 6., Temperature and pH-Dependent Values, Chronic Concentration of Total Ammonia as N (mg/L)

#### 4.5 Ammonia Probe Analysis Results

All site-wide samples collected were analyzed for ammonia using a Sension2 portable meter with an ammonia gas-sensing, combination probe (model 51927-00). For approximately one-half of the samples, sample splits were collected and submitted to ALS for ammonia analysis to determine how the measured concentrations compared to each other. Table 13 provides the results measured by both ALS and the field method.

Table 13. Site-wide Ammonia Field Analysis Results Compared to Analytical Laboratory Results

Well Number	Date	Ammonia Concentration (mg/L)	
		Analytical Laboratory Results	Field Results
0401	6/3/2014	250	243
0404	6/3/2014	130	132.7
0406	6/5/2014	150	67.3
0407	6/3/2014	8.8	7.46
0410	6/17/2014	0.1	0.1
0411	6/10/2014	4.4	2.21
0413	5/22/2014	49	51.8
0431	6/12/2014	0.1	0.1
0436	6/17/2014	3.9	2.32
0439	6/11/2014	6.2	3.14
0440	6/11/2014	0.1	0.1
0441	6/12/2014	0.1	0.1
0453	6/17/2014	240	156
0454	5/21/2014	360	201
0457	5/19/2014	0.1	0.1
0492	6/3/2014	5.8	5.6
AMM-1	5/19/2014	0.1	1.9
AMM-2	5/20/2014	560	284
AMM-3	6/9/2014	320	344
ATP-2-D	5/20/2014	280	192
ATP-2-S	5/20/2014	330	210
ATP-3	6/12/2014	0.25	0.1
MW-3	6/3/2014	460	267
SMI-PW01	6/5/2014	940	392
SMI-PW03	6/17/2014	21	13.61
SMI-PZ1D2	6/9/2014	1600	889
SMI-PZ1M	6/9/2014	820	774
SMI-PZ1S	6/5/2014	100	93.1
SMI-PZ2D	5/21/2014	380	211
SMI-PZ2M2	5/21/2014	620	350
SMI-PZ3D2	6/17/2014	370	245
SMI-PZ3M	6/17/2014	44	28.2
SMI-PZ3S	6/17/2014	4.7	3.14

Table 13. Site-wide Ammonia Field Analysis Results Compared to Analytical Laboratory Results (continued)

Well Number	Date	Ammonia Concentration (mg/L)	
		Analytical Laboratory Results	Field Results
TP-01	5/19/2014	0.1	0.1
TP-11	5/19/2014	0.84	0.1
TP-17	6/19/2014	1.1	0.1
TP-20	6/2/2014	3.7	4.75
TP-22	6/2/2014	0.1	0.1
TP-23	5/21/2014	170	150.7
UPD-17	6/10/2014	110	65.9
UPD-18	6/10/2014	250	215
UPD-20	6/16/2014	0.12	0.1
UPD-21	6/16/2014	3.3	3.35
UPD-22	6/18/2014	1.7	1.12
UPD-23	6/4/2014	2.4	3.91
UPD-24	6/16/2014	2	4.53

Field results measured using HACH sension 2 portable pH/ISE probe and meter.  
Analytical laboratory results provided by ALS.

Figure 29 is a graphical representation displaying the comparison between the ammonia results generated from the analytical laboratory and the ammonia probe. The analytical laboratory and the ammonia probe comparison result with the trendline having an  $r^2$  value of 0.902. This suggests the ammonia field probe provides comparable results, especially when the ammonia concentration is below 400 mg/L.

In some cases, the ammonia probe sample results differed more than 50 percent compared to the laboratory ammonia results. The discrepancy may be attributed to the high total dissolved solids concentration of the sample, since high concentrations of dissolved ions affect the instrument accuracy. The ammonia probe was calibrated before the samples were analyzed; however, the high specific conductance of some of the samples may have affected the results.

#### 4.6 Ground Water Surface

Water level data were collected between May 19 and June 19, when the Colorado River mean daily flows ranged from 9,390 to 37,200 cubic feet per second (cfs), and the river stage at the site ranged from 3,963 to 3,966 cfs. Ground water elevations quickly respond to changes in river flows, and it was not possible to generate a representative ground water contour map using these data. Figure 30 displays the elevations measured between June 3 and 12, when the mean daily flows ranged between 25,000 and 37,200 cfs.

With the limited number of locations measured during this time frame, the map does not include contour lines, but the data are posted. The Colorado River was under losing conditions at this time; this is evident based on the elevations posted along the riverbank compared to the interior of the site.

## 4.7 Contaminant Distribution

Figures 31 and 32 are maps showing shallow ground water ammonia and uranium plumes, respectively, using data collected during the May/June 2014 site-wide event. Contaminant distribution is generally comparable to previous plume maps generated using data collected during the past 2 years.

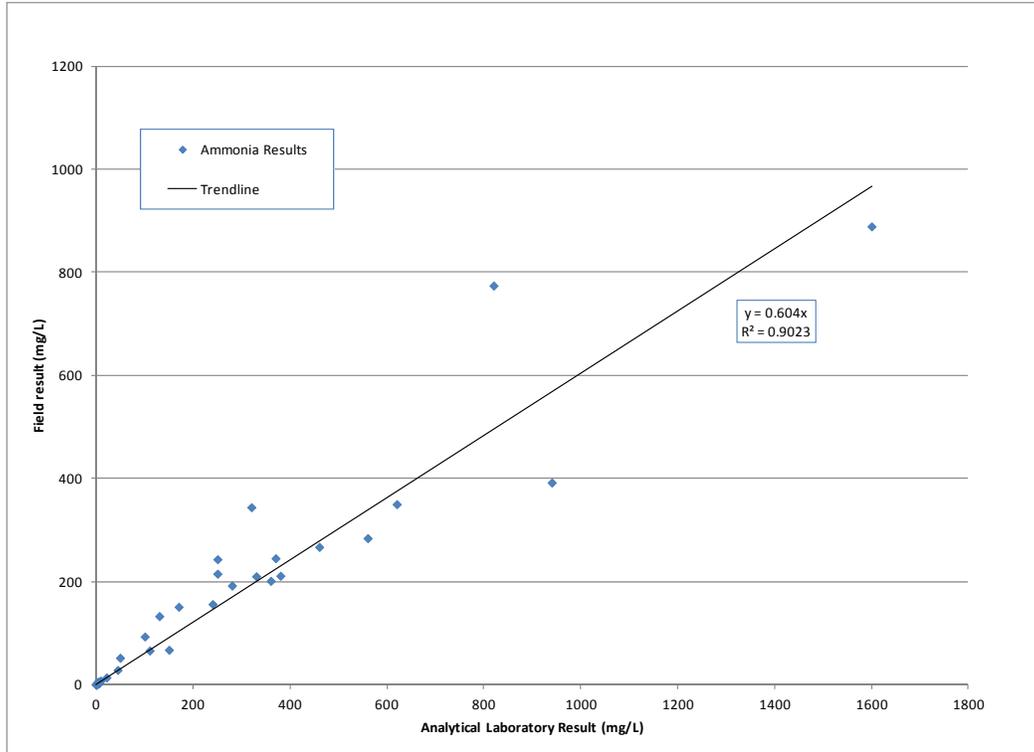


Figure 29. Graphical Comparison of Ammonia Results Generated from the Analytical Laboratory and Field Analyses

While Figure 31 displays the result associated with well ATP-2-S, this concentration was not taken into consideration for the contour line location. This well is screened over a deeper interval in this shallow zone and is not representative of the uranium concentration in the shallowest ground water. The contour lines were based on the concentration measured in extraction well 0815, located within 50 ft southeast of ATP-2-S.

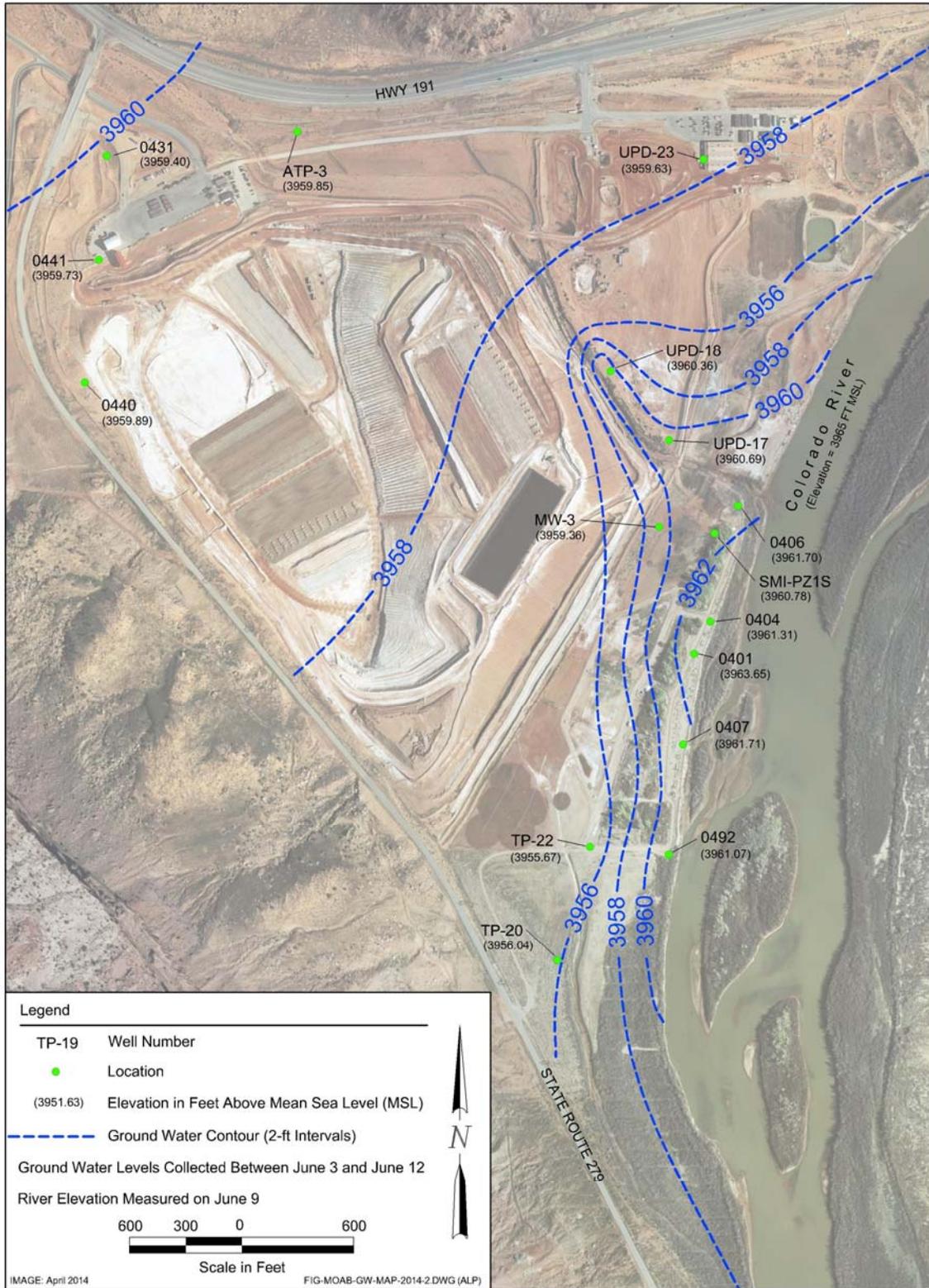


Figure 30. Site-wide Ground Water Elevations, June 3 through 12, 2014

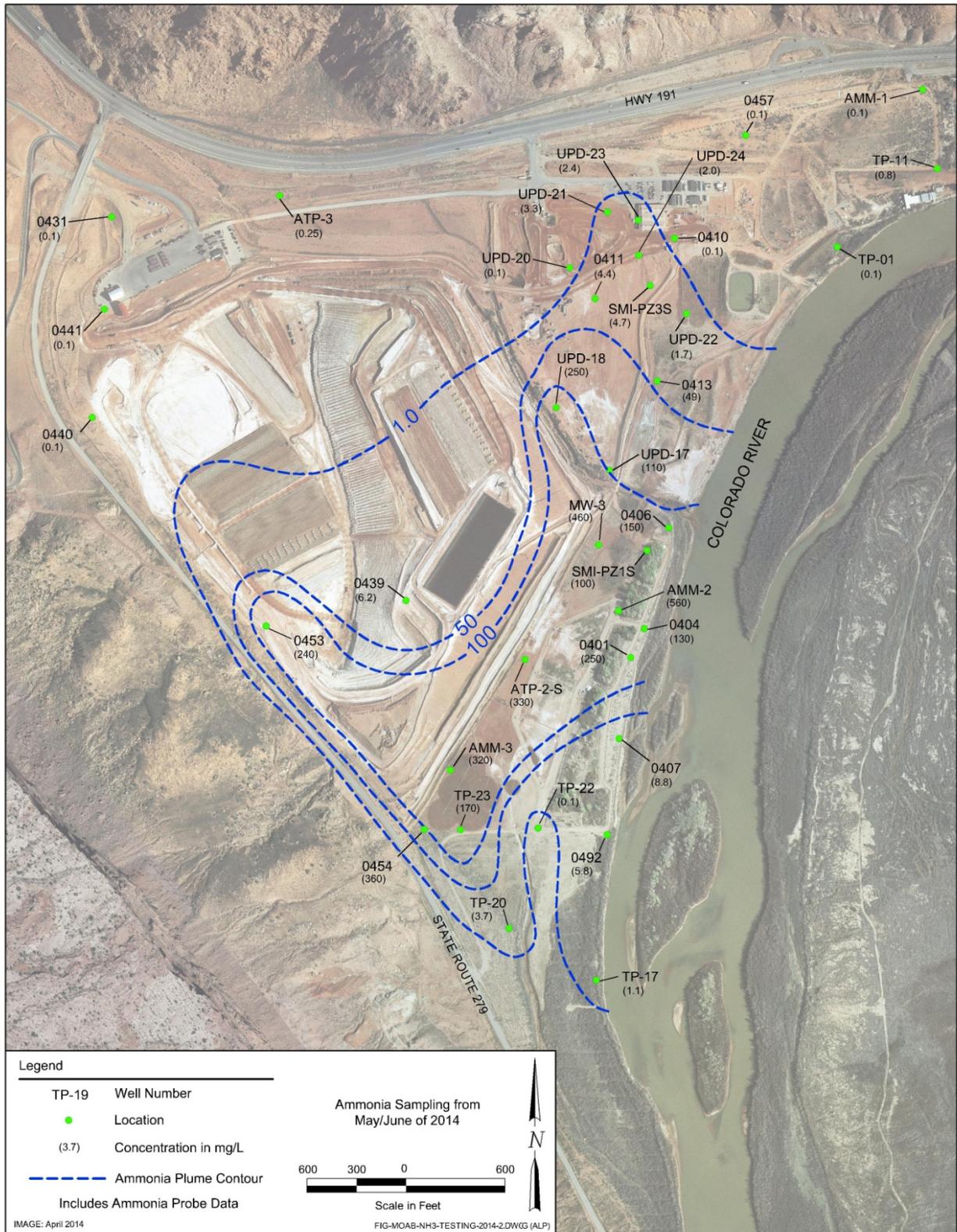


Figure 31. Ammonia Plume in Shallow Ground Water, May/June 2014



Figure 32. Uranium Plume in Shallow Ground Water, May/June 2014

## **5.0 Conclusions**

### **5.1 April 2014 Sampling Event**

The rationale for completing the April 2014 sampling event was to prepare for the post-spring runoff flows in the side channel off CF4. At the time these samples were collected, the side channel by definition was not considered to be a suitable habitat, and young of year endangered fish species would not utilize this portion of the river. The surface water data collected from 11 locations would be useful for placement of the diversion system discharge points should this area become a suitable habitat. Concentrations of the samples ranged from 0.21 to 33 mg/L, with the majority of the samples above the acute and chronic EPA criteria.

The CF4 ground water samples were collected to assess the performance of the freshwater injection system. The samples collected from these monitoring wells indicated the injection system was effective at reducing the ammonia concentrations with the subsurface shallow zone (15 to 35 ft bgs). Water elevation data confirmed up to 10 ft of mounding was generated from this system.

Analytical results associated with the samples of extracted ground water from the CF5 extraction wells were used to update the mass removal calculations and monitor any concentration trends. Ammonia and uranium concentrations in general have not significantly changed over the past 2 years.

### **5.2 May/June 2014 Site-wide Sampling Event**

The rationale for conducting the May/June 2014 site-wide sampling event was to collect data from the site when the Colorado River typically experiences peak spring runoff flows and to assess any changes and trends in the ground water system water chemistry. 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 May/June 2014 site-wide sampling event.

- In general, the ammonia and uranium concentrations did not significantly change since the previous site-wide sampling event in November/December 2013. As expected, concentrations associated with locations impacted by the river stage in particular decreased as historically observed during seasonal high river flows.
- With the exception of one sample analyzed for uranium (which was more than 50 percent below the historical minimum), all ammonia and uranium concentrations in the site-wide wells were within 50 percent of historical ranges during this sampling event.
- All surface water samples collected during this sampling event had ammonia concentrations below the applicable state of EPA criteria for both acute and chronic concentrations.

## 6.0 References

40 CFR 192A (Code of Federal Regulations), “Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites.”

DOE (U.S. Department of Energy), *Moab UMTRA Project Operations and Maintenance Manual* (DOE-EM/GJTAC1973).

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

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

**Appendix A.**  
**April 2014 Surface Water Sampling Event**

**Water Sampling Field Activities Verification**  
**Minimums and Maximums Report**  
**Water Quality Data**  
**Blanks Report**  
**Water Level Data**  
**Trip Report**

## Appendix A. Water Sampling Field Activities Verification

Sampling Event/RIN	April 2014 Sampling Event/1404069	Date(s) of Water Sampling	April 10-17, 2014
Date(s) of Verification	August 13, 2014	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?	Yes	
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	
		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	Two duplicates were collected for 27 samples.
10.	Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	Yes	One equipment blank was collected for 11 surface water samples
11.	Were trip blanks prepared and included with each shipment of volatile organic compound samples?	NA	

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

<b>Sampling Event/RIN</b>	April 2014 Sampling Event/1404069	<b>Date(s) of Water Sampling</b>	April 10-17, 2014
<b>Date(s) of Verification</b>	August 13, 2014	<b>Name of Verifier</b>	Ken Pill
		<b>Response (Yes, No, NA)</b>	<b>Comments</b>
12. Were quality-control samples assigned a fictitious site identification number?	Yes		
13. Was the true identity of the samples recorded on the quality assurance sample log?	Yes		
14. Were samples collected in the containers specified?	Yes		
15. Were samples filtered and preserved as specified?	Yes		
16. Were the number and types of samples collected as specified?	NA		
17. Were COC records completed, and was sample custody maintained?	Yes		
18. Are field data sheets signed and dated by both team members?	Yes		
19. Was all other pertinent information documented on the field data sheets?	NA		
20. Was the presence or absence of ice in the cooler documented at every sample location?	Yes		
21. Were water levels measured at the locations specified in the planning documents?	NA		

## Appendix A. Minimums and Maximums Report

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

Laboratory: ALS

RIN: 1404069

Comparison: All Historical Data

Report Date: 9/5/2014

Site Code	Location Code	Sample Date	Analyte	Current		Historical Maximum			Historical Minimum			Count	
				Result	Qualifiers Lab Data	Result	Lab	Data	Result	Lab	Data	N	N Below Detect
MOA01	0782	04/14/2014	Ammonia Total as N	9.5		2300			21			37	0
MOA01	0782	04/14/2014	Uranium	0.014		2.9		F	0.021			38	0
MOA01	0783	04/15/2014	Ammonia Total as N	0.4		380		F	22			13	0
MOA01	0783	04/15/2014	Uranium	0.063		3.7		F	0.17			14	0
MOA01	0784	04/15/2014	Ammonia Total as N	0.1	U	410		J	1.4			15	0
MOA01	0784	04/15/2014	Uranium	0.0089		3.7		F	0.048			16	0
MOA01	0785	04/14/2014	Ammonia Total as N	0.1	U	680		J	0.28			18	0
MOA01	0785	04/14/2014	Uranium	0.017		3.2		F	0.034			19	0
MOA01	0786	04/14/2014	Ammonia Total as N	0.5		820		J	4.3			35	0
MOA01	0786	04/14/2014	Uranium	0.0097		3.2		F	0.017			36	0
MOA01	0787	04/14/2014	Ammonia Total as N	21		910			32		F	37	0
MOA01	0816	04/17/2014	Uranium	1.1		4.1			1.9			15	0

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.

## Appendix A. Minimums and Maximums Report (*continued*)

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.		

## Appendix A. Water Quality Data

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0245 SURFACE LOCATION Configuration 1

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0 - 0	1.8		J	#	0.1	
Oxidation Reduction Potential	mV	04/10/2014	0001	0 - 0	-60			#		
pH	s.u.	04/10/2014	0001	0 - 0	9.23			#		
Specific Conductance	umhos /cm	04/10/2014	0001	0 - 0	1135			#		
Temperature	C	04/10/2014	0001	0 - 0	20.87			#		
Turbidity	NTU	04/10/2014	0001	0 - 0	17.7			#		
Uranium	mg/L	04/10/2014	0001	0 - 0	0.024		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0274 SURFACE LOCATION Configuration 4

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0 - 0	24		J	#	2.5	
Oxidation Reduction Potential	mV	04/10/2014	0001	0 - 0	-6			#		
pH	s.u.	04/10/2014	0001	0 - 0	8.43			#		
Specific Conductance	umhos /cm	04/10/2014	0001	0 - 0	2992			#		
Temperature	C	04/10/2014	0001	0 - 0	22.88			#		
Turbidity	NTU	04/10/2014	0001	0 - 0	5.24			#		
Uranium	mg/L	04/10/2014	0001	0 - 0	0.28		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0278 SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0 - 0	33		J	#	2.5	
Oxidation Reduction Potential	mV	04/10/2014	0001	0 - 0	-11			#		
pH	s.u.	04/10/2014	0001	0 - 0	8			#		
Specific Conductance	umhos/cm	04/10/2014	0001	0 - 0	3500			#		
Temperature	C	04/10/2014	0001	0 - 0	21.71			#		
Turbidity	NTU	04/10/2014	0001	0 - 0	86.6			#		
Uranium	mg/L	04/10/2014	0001	0 - 0	0.36		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0279 SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0 - 0	24		J	#	2.5	
Oxidation Reduction Potential	mV	04/10/2014	0001	0 - 0	-22			#		
pH	s.u.	04/10/2014	0001	0 - 0	8.31			#		
Specific Conductance	umhos/cm	04/10/2014	0001	0 - 0	2890			#		
Temperature	C	04/10/2014	0001	0 - 0	23.6			#		
Turbidity	NTU	04/10/2014	0001	0 - 0	62.5			#		
Uranium	mg/L	04/10/2014	0001	0 - 0	0.28		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

**General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site**

**REPORT DATE: 9/5/2014**

**Location: 0280 SURFACE LOCATION**

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0 - 0	0.21		J	#	0.1	
Oxidation Reduction Potential	mV	04/10/2014	0001	0 - 0	-19			#		
pH	s.u.	04/10/2014	0001	0 - 0	8.64			#		
Specific Conductance	umhos/cm	04/10/2014	0001	0 - 0	1440			#		
Temperature	C	04/10/2014	0001	0 - 0	27.88			#		
Turbidity	NTU	04/10/2014	0001	0 - 0	116			#		
Uranium	mg/L	04/10/2014	0001	0 - 0	0.042		J	#	0.000029	

**General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site**

**REPORT DATE: 9/5/2014**

**Location: 0281 SURFACE LOCATION**

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0 - 0	13		J	#	2.5	
Oxidation Reduction Potential	mV	04/10/2014	0001	0 - 0	-40			#		
pH	s.u.	04/10/2014	0001	0 - 0	8.71			#		
Specific Conductance	umhos/cm	04/10/2014	0001	0 - 0	2214			#		
Temperature	C	04/10/2014	0001	0 - 0	24.76			#		
Turbidity	NTU	04/10/2014	0001	0 - 0	63.3			#		
Uranium	mg/L	04/10/2014	0001	0 - 0	0.17		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0780 WELL Configuration 4

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/14/2014	0001	28 -	0.74		J	#	0.1	
Oxidation Reduction Potential	mV	04/14/2014	0001	28 -	125			#		
pH	s.u.	04/14/2014	0001	28 -	7.98			#		
Specific Conductance	umhos/cm	04/14/2014	0001	28 -	1068			#		
Temperature	C	04/14/2014	0001	28 -	13.32			#		
Turbidity	NTU	04/14/2014	0001	28 -	5.73			#		
Uranium	mg/L	04/14/2014	0001	28 -	0.011		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0781 WELL Configuration 4

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/14/2014	0001	48 -	390		J	#	50	
Oxidation Reduction Potential	mV	04/14/2014	0001	48 -	122			#		
pH	s.u.	04/14/2014	0001	48 -	7.37			#		
Specific Conductance	umhos/cm	04/14/2014	0001	48 -	17970			#		
Temperature	C	04/14/2014	0001	48 -	12.89			#		
Turbidity	NTU	04/14/2014	0001	48 -	2.49			#		
Uranium	mg/L	04/14/2014	0001	48 -	0.46		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0782 WELL Configuration 4

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)		Result	Qualifiers			Detection Limit	Uncertainty
							Lab	Data	QA		
Ammonia Total as N	mg/L	04/14/2014	0001	33	-	9.5	J	#		2.5	
Oxidation Reduction Potential	mV	04/14/2014	0001	33	-	133		#			
pH	s.u.	04/14/2014	0001	33	-	7.81		#			
Specific Conductance	umhos/cm	04/14/2014	0001	33	-	1228		#			
Temperature	C	04/14/2014	0001	33	-	13.09		#			
Turbidity	NTU	04/14/2014	0001	33	-	2.15		#			
Uranium	mg/L	04/14/2014	0001	33	-	0.014	J	#		0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0783 WELL Configuration 4

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)		Result	Qualifiers			Detection Limit	Uncertainty
							Lab	Data	QA		
Ammonia Total as N	mg/L	04/15/2014	0001	18	-	0.4	J	#		0.1	
Oxidation Reduction Potential	mV	04/15/2014	0001	18	-	107		#			
pH	s.u.	04/15/2014	0001	18	-	7.6		#			
Specific Conductance	umhos/cm	04/15/2014	0001	18	-	1412		#			
Temperature	C	04/15/2014	0001	18	-	9.2		#			
Turbidity	NTU	04/15/2014	0001	18	-	6.67		#			
Uranium	mg/L	04/15/2014	0001	18	-	0.063	J	#		0.000029	

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0784 WELL Configuration 4

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/15/2014	0001	18 -	0.1	U	J	#	0.1	
Oxidation Reduction Potential	mV	04/15/2014	0001	18 -	106			#		
pH	s.u.	04/15/2014	0001	18 -	7.83			#		
Specific Conductance	umhos/cm	04/15/2014	0001	18 -	1103			#		
Temperature	C	04/15/2014	0001	18 -	10.79			#		
Turbidity	NTU	04/15/2014	0001	18 -	2.16			#		
Uranium	mg/L	04/15/2014	0001	18 -	0.0089		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0785 WELL Configuration 4

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/14/2014	0001	18 -	0.1	U	J	#	0.1	
Oxidation Reduction Potential	mV	04/14/2014	0001	18 -	123			#		
pH	s.u.	04/14/2014	0001	18 -	7.56			#		
Specific Conductance	umhos/cm	04/14/2014	0001	18 -	1146			#		
Temperature	C	04/14/2014	0001	18 -	9.96			#		
Turbidity	NTU	04/14/2014	0001	18 -	2.19			#		
Uranium	mg/L	04/14/2014	0001	18 -	0.017		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0786 WELL Configuration 4

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/14/2014	0001	28 -	0.5		J	#	0.1	
Oxidation Reduction Potential	mV	04/14/2014	0001	28 -	125			#		
pH	s.u.	04/14/2014	0001	28 -	7.83			#		
Specific Conductance	umhos/cm	04/14/2014	0001	28 -	1097			#		
Temperature	C	04/14/2014	0001	28 -	13.22			#		
Turbidity	NTU	04/14/2014	0001	28 -	2.81			#		
Uranium	mg/L	04/14/2014	0001	28 -	0.0097		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0787 WELL Configuration 4

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/14/2014	0001	36 -	21		J	#	2.5	
Oxidation Reduction Potential	mV	04/14/2014	0001	36 -	129			#		
pH	s.u.	04/14/2014	0001	36 -	8.08			#		
Specific Conductance	umhos/cm	04/14/2014	0001	36 -	1400			#		
Temperature	C	04/14/2014	0001	36 -	11.95			#		
Turbidity	NTU	04/14/2014	0001	36 -	1.88			#		
Uranium	mg/L	04/14/2014	0001	36 -	0.035		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0810 WELL Configuration 5

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/15/2014	0001	10.4 - 40.4	340		J	#	50	
Oxidation Reduction Potential	mV	04/15/2014	0001	10.4 - 40.4	109			#		
pH	s.u.	04/15/2014	0001	10.4 - 40.4	7.01			#		
Specific Conductance	umhos/cm	04/15/2014	0001	10.4 - 40.4	31635			#		
Temperature	C	04/15/2014	0001	10.4 - 40.4	17.72			#		
Turbidity	NTU	04/15/2014	0001	10.4 - 40.4	9.16			#		
Uranium	mg/L	04/15/2014	0001	10.4 - 40.4	3		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0811 WELL Configuration 5

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/15/2014	0001	8.6 - 38.6	380		J	#	50	
Oxidation Reduction Potential	mV	04/15/2014	0001	8.6 - 38.6	115			#		
pH	s.u.	04/15/2014	0001	8.6 - 38.6	6.95			#		
Specific Conductance	umhos/cm	04/15/2014	0001	8.6 - 38.6	22176			#		
Temperature	C	04/15/2014	0001	8.6 - 38.6	17.04			#		
Turbidity	NTU	04/15/2014	0001	8.6 - 38.6	6.04			#		
Uranium	mg/L	04/15/2014	0001	8.6 - 38.6	2.5		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0812 WELL Configuration 5

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/17/2014	0001	14.2 - 44.2	440		J	#	50	
Oxidation Reduction Potential	mV	04/17/2014	0001	14.2 - 44.2	-91			#		
pH	s.u.	04/17/2014	0001	14.2 - 44.2	6.75			#		
Specific Conductance	umhos/cm	04/17/2014	0001	14.2 - 44.2	19533			#		
Temperature	C	04/17/2014	0001	14.2 - 44.2	15.29			#		
Turbidity	NTU	04/17/2014	0001	14.2 - 44.2	2.63			#		
Uranium	mg/L	04/17/2014	0001	14.2 - 44.2	1.9		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0813 WELL Configuration 5

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/17/2014	0001	14.4 - 44.4	410		J	#	50	
Ammonia Total as N	mg/L	04/17/2014	0002	14.4 - 44.4	400		J	#	50	
Oxidation Reduction Potential	mV	04/17/2014	0001	14.4 - 44.4	-68			#		
pH	s.u.	04/17/2014	0001	14.4 - 44.4	6.66			#		
Specific Conductance	umhos/cm	04/17/2014	0001	14.4 - 44.4	15616			#		
Temperature	C	04/17/2014	0001	14.4 - 44.4	14.07			#		
Turbidity	NTU	04/17/2014	0001	14.4 - 44.4	2.46			#		
Uranium	mg/L	04/17/2014	0001	14.4 - 44.4	1.5		J	#	0.000029	
Uranium	mg/L	04/17/2014	0002	14.4 - 44.4	1.5		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0814 WELL Configuration 5

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/15/2014	0001	12.4 - 42.4	210		J	#	20	
Oxidation Reduction Potential	mV	04/15/2014	0001	12.4 - 42.4	118			#		
pH	s.u.	04/15/2014	0001	12.4 - 42.4	6.79			#		
Specific Conductance	umhos/cm	04/15/2014	0001	12.4 - 42.4	24571			#		
Temperature	C	04/15/2014	0001	12.4 - 42.4	17.73			#		
Turbidity	NTU	04/15/2014	0001	12.4 - 42.4	4.6			#		
Uranium	mg/L	04/15/2014	0001	12.4 - 42.4	2.6		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0815 WELL Configuration 5

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/15/2014	0001	21.7 - 51.7	300		J	#	50	
Oxidation Reduction Potential	mV	04/15/2014	0001	21.7 - 51.7	117			#		
pH	s.u.	04/15/2014	0001	21.7 - 51.7	6.91			#		
Specific Conductance	umhos/cm	04/15/2014	0001	21.7 - 51.7	28623			#		
Temperature	C	04/15/2014	0001	21.7 - 51.7	17.48			#		
Turbidity	NTU	04/15/2014	0001	21.7 - 51.7	6.08			#		
Uranium	mg/L	04/15/2014	0001	21.7 - 51.7	3.1		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

**General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site**  
**REPORT DATE: 9/5/2014**  
**Location: 0816 WELL Configuration 5**

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
								Lab	Data	QA		
Ammonia Total as N	mg/L	04/17/2014	0001	20.9	-	50.9	180	J	#	50		
Ammonia Total as N	mg/L	04/17/2014	0002	20.9	-	50.9	180	J	#	20		
Oxidation Reduction Potential	mV	04/17/2014	0001	20.9	-	50.9	-122		#			
pH	s.u.	04/17/2014	0001	20.9	-	50.9	6.83		#			
Specific Conductance	umhos/cm	04/17/2014	0001	20.9	-	50.9	22617		#			
Temperature	C	04/17/2014	0001	20.9	-	50.9	17.41		#			
Turbidity	NTU	04/17/2014	0001	20.9	-	50.9	3.78		#			
Uranium	mg/L	04/17/2014	0001	20.9	-	50.9	2.4	J	#	0.000029		
Uranium	mg/L	04/17/2014	0002	20.9	-	50.9	1.1	J	#	0.000029		

**General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site**  
**REPORT DATE: 9/5/2014**  
**Location: BW2C SURFACE LOCATION**

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
								Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0	-	0	1.7	J	#	0.1		
Oxidation Reduction Potential	mV	04/10/2014	0001	0	-	0	-52		#			
pH	s.u.	04/10/2014	0001	0	-	0	9.05		#			
Specific Conductance	umhos/cm	04/10/2014	0001	0	-	0	1236		#			
Temperature	C	04/10/2014	0001	0	-	0	21.49		#			
Turbidity	NTU	04/10/2014	0001	0	-	0	26.9		#			
Uranium	mg/L	04/10/2014	0001	0	-	0	0.02	J	#	0.000029		

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: BW2D SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0 - 0	3.7		J	#	0.1	
Oxidation Reduction Potential	mV	04/10/2014	0001	0 - 0	-58			#		
pH	s.u.	04/10/2014	0001	0 - 0	9.19			#		
Specific Conductance	umhos/cm	04/10/2014	0001	0 - 0	1245			#		
Temperature	C	04/10/2014	0001	0 - 0	23.19			#		
Turbidity	NTU	04/10/2014	0001	0 - 0	24.1			#		
Uranium	mg/L	04/10/2014	0001	0 - 0	0.028		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: BW2E SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0 - 0	2.3		J	#	0.1	
Oxidation Reduction Potential	mV	04/10/2014	0001	0 - 0	-31			#		
pH	s.u.	04/10/2014	0001	0 - 0	9.2			#		
Specific Conductance	umhos/cm	04/10/2014	0001	0 - 0	1212			#		
Temperature	C	04/10/2014	0001	0 - 0	22.1			#		
Turbidity	NTU	04/10/2014	0001	0 - 0	39.8			#		
Uranium	mg/L	04/10/2014	0001	0 - 0	0.026		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: CR3 SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0 - 0	0.93		J	#	0.1	
Oxidation Reduction Potential	mV	04/10/2014	0001	0 - 0	-66			#		
pH	s.u.	04/10/2014	0001	0 - 0	9.28			#		
Specific Conductance	umhos/cm	04/10/2014	0001	0 - 0	1116			#		
Temperature	C	04/10/2014	0001	0 - 0	21.39			#		
Turbidity	NTU	04/10/2014	0001	0 - 0	100			#		
Uranium	mg/L	04/10/2014	0001	0 - 0	0.015		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: SMI-PW02 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	04/15/2014	0001	20.04 - 60.04	450		J	#	50	
Oxidation Reduction Potential	mV	04/15/2014	0001	20.04 - 60.04	117			#		
pH	s.u.	04/15/2014	0001	20.04 - 60.04	6.82			#		
Specific Conductance	umhos/cm	04/15/2014	0001	20.04 - 60.04	35268			#		
Temperature	C	04/15/2014	0001	20.04 - 60.04	16.21			#		
Turbidity	NTU	04/15/2014	0001	20.04 - 60.04	1.11			#		
Uranium	mg/L	04/15/2014	0001	20.04 - 60.04	2.8		J	#	0.000029	

## Appendix A. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: Z SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
								Lab	Data	QA		
Ammonia Total as N	mg/L	04/10/2014	0001	0	-	0	1.4	J	#	0.1		
Oxidation Reduction Potential	mV	04/10/2014	0001	0	-	0	-21		#			
pH	s.u.	04/10/2014	0001	0	-	0	8.47		#			
Specific Conductance	umhos/cm	04/10/2014	0001	0	-	0	1624		#			
Temperature	C	04/10/2014	0001	0	-	0	16.12		#			
Turbidity	NTU	04/10/2014	0001	0	-	0	159		#			
Uranium	mg/L	04/10/2014	0001	0	-	0	0.078	J	#	0.000029		

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 TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X,Y,Z Laboratory defined qualifier, see case narrative.

#### DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9. J Estimated value.
- Q Qualitative result due to sampling technique. R Unusable result.
- X Location is undefined.

QA QUALIFIER:# Validated according to quality assurance guidelines.

## Appendix A. Blanks Report

**BLANKS REPORT**  
**LAB: ALS**  
**RIN: 1404069**  
**Report Date: 9/5/2014**

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab Data	Detection Limit	Uncertainty	Sample Type
Ammonia Total as N	MOA01	0999	04/17/2014	0001	mg/L	.14		.1		E
Uranium	MOA01	0999	04/17/2014	0001	mg/L	.000029	U	.000029		E

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

**LAB QUALIFIERS:**

- \* Replicate analysis not within control limits.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X,Y,Z Laboratory defined qualifier, see case narrative.

**DATA QUALIFIERS:**

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- Q Qualitative result due to sampling technique.
- X Location is undefined.
- J Estimated value.
- R Unusable result.

**SAMPLE TYPES:**

- E Equipment Blank.

## Appendix A. Water Level Data

<b>STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site</b>							
<b>REPORT DATE: 9/9/2014</b>							
<b>Location Code</b>	<b>Flow Code</b>	<b>Top of Casing Elevation (Ft)</b>	<b>Measurement Time</b>	<b>Date</b>	<b>Depth From Top of Casing (Ft)</b>	<b>Water Elevation (MSL)</b>	<b>Water Level Flag</b>
0780	O	3968.45	4/14/2014		13.93	3954.52	
0781	O	3968.56	4/14/2014		14.26	3954.3	
0782	O	3968.46	4/14/2014		14.03	3954.43	
0783	O	3966.16	4/15/2014		12.58	3953.58	
0784	O	3968.73	4/15/2014		14.85	3953.88	
0785	O	3969.24	4/14/2014		14.95	3954.29	
0786	O	3968.14	4/14/2014		13.83	3954.31	
0787	O	3968.43	4/14/2014		13.98	3954.45	
0810	O	3961.88	4/15/2014		11.44	3950.44	P
0811	O	3962.82	4/15/2014		15.2	3947.62	P
0812	O	3963.12	4/17/2014		17.2	3945.92	P
0813	O	3964.45	4/17/2014		10.06	3954.39	P
0814	O	3960.98	4/15/2014		11.81	3949.17	P
0815	O	3963.14	4/15/2014		11.52	3951.62	P
0816	O	3961.87	4/17/2014		9.28	3952.59	P
SMI-PW02	O	3966.73	4/15/2014		16.81	3949.92	P

Flow Codes: B = background; C = cross gradient; D = downgradient; MSL = mean sea level O = on site;  
 U = upgradient, Water Level Flags: D = dry, P = Water level measured while well was actively extracting ground water

## Appendix A. April 2014 Surface Water Sampling Event Trip Report



DATE: July 16, 2014  
TO: K. Pill  
FROM: James Ritchey  
SUBJECT: April 2014 Surface Water Sampling Event

**Dates of Sampling Event:** April 10 to 17, 2014

**Team Members:** Elizabeth Moran, Ken Pill, James Ritchey

**RIN Number Assigned:** All samples were assigned to RIN 1404069.

**Sample Shipment:** All samples were shipped in one cooler overnight via UPS to ALS from Moab, Utah, on April 21, 2014 (Tracking Number 1Z5W1Y510193448644).

### April 2014 Surface Water Sampling

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**Number of Locations Sampled:** Eleven surface water samples (0245, 0274, 0278, 0279, 0280, 0281, BW2C, BW2D, BW2E, CR3, and Z) and one EB were collected during the April 2014 sampling event.

**Locations Not Sampled:** None.

**Field Variance:** None.

**Quality-control Sample Cross-reference:** The false identifications assigned to the quality control samples are shown below.

False ID	True ID	Sample Type	Associated Matrix
2002	NA	EB	De-ionized Water

## Appendix A. April 2014 Surface Water Sampling Event Trip Report (continued)

**Location-specific Information:** Each surface water sample was collected in a dedicated open container and then filtered using a peristaltic pump and tubing. The tubing was cleaned with soap and de-ionized water between samples. The table below provides additional information.

Sample ID	Location	Date
APR 010	0245	04/10/2014
APR 002	0274	04/10/2014
APR 001	0278	04/10/2014
APR 004	0279	04/10/2014
APR 005	0280	04/10/2014
APR 006	0281	04/10/2014
APR 007	BW2C	04/10/2014
APR 008	BW2D	04/10/2014
APR 009	BW2E	04/10/2014
APR 011	CR3	04/10/2014
APR 003	Z	04/10/2014



*Surface Water Location 0245*

**Appendix A. April 2014 Surface Water Sampling Event Trip Report**  
*(continued)*



*Surface Water Location 0278*



*Surface Water Locations 0274, Z, and 0279*

**Appendix A. April 2014 Surface Water Sampling Event Trip Report**  
*(continued)*



*Surface Water Location 0280*



*Surface Water Locations BW2C, BW2D, and BW2E*

## Appendix A. April 2014 Surface Water Sampling Event Trip Report (continued)

### April 2014 Configuration 4 Sampling

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**Number of Locations Sampled:** Eight observation wells (0780, 0781, 0782, 0783, 0784, 0785, 0786, and 0787) were sampled during the April 2014 sampling event.

**Locations Not Sampled:** None.

**Field Variance:** None.

**Location-specific Information – Observation Wells:** All observation wells were sampled using micro-purge techniques with a peristaltic pump and dedicated pump-head and downhole tubing. Sample depths and water levels for each observation well are listed below.

Well Number	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0780	04/14/2014	14:37	13.93	28
0781	04/14/2014	14:07	14.26	48
0782	04/14/2014	14:23	14.03	33
0783	04/15/2014	10:47	12.58	18
0784	04/15/2014	10:33	14.85	18
0785	04/14/2014	14:56	14.95	18
0786	04/14/2014	15:11	13.83	28
0787	04/14/2014	15:25	13.98	36

ft btoc = feet below top of casing

### April 2014 Configuration 5 Sampling

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**Number of Locations Sampled:** Eight extraction wells (0810, 0811, 0812, 0813, 0814, 0815, 0816, and SMI-PW02), and two duplicates were sampled during the April 2014 sampling event.

**Locations Not Sampled:** None.

**Field Variance:** None.

**Quality-control Sample Cross-reference:** The false identifications assigned to the quality-control samples are shown below.

False ID	True ID	Sample Type	Associated Matrix	Ticket Number
2000	0813	Duplicate from 40 ft bgs.	Ground Water	APR 026
2001	0816	Duplicate from 45 ft bgs.	Ground Water	APR 028

## Appendix A. April 2014 Surface Water Sampling Event Trip Report (continued)

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

Well Number	Date	Time	Depth to Water (ft btoc)	Pump Intake Depth (ft bgs)
0810	04/15/2014	13:22	11.44	35
0811	04/15/2014	14:00	15.20	35
0812	04/17/2014	13:50	17.20	40
0813	04/17/2014	10:06	10.06	40
0814	04/15/2014	14:46	11.81	40
0815	04/15/2014	14:15	11.52	45
0816	04/17/2014	13:38	9.28	45
SMI-PW01	04/15/2014	14:04	16.81	55

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

Date	Daily Mean Flow (cfs)
04/10/2014	4,190
04/11/2014	5,630
04/12/2014	7,160
04/13/2014	8,510
04/14/2014	9,220
04/15/2014	8,110
04/16/2014	6,840
04/17/2014	6,250

**Equipment Issues:** None.

**Corrective Action Required/Taken:** None.

**Appendix B.**  
**May/June 2014 Site-wide Sampling Event**

**Water Sampling Field Activities Verification**  
**Minimums and Maximums Report**  
**Water Quality Data**  
**Blanks Report**  
**Water Level Data**  
**Trip Report**

## Appendix B. Water Sampling Field Activities Verification

<b>Sampling Event/RIN</b>	May/June 2014 Site-wide Sampling Event/1405070	<b>Date(s) of Water Sampling</b>	May 19 through June 19, 2014
<b>Date(s) of Verification</b>	August 14, 2014	<b>Name of Verifier</b>	Ken Pill
		<b>Response (Yes, No, NA)</b>	<b>Comments</b>
1.	Is the Sampling Analysis Plan the primary document directing field procedures?	Yes	
2.	List other documents, standard operating procedures, instructions.	NA	
3.	Were the sampling locations specified in the planning documents sampled?	No	Wells TP-19, 0412, 0414, MW-R-2, and SMI-MW01 were not sampled as they could not be safely accessed due to flood waters.
4.	Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes	
5.	Was an operational check of the field equipment conducted twice daily?	Yes	
6.	Did the operational checks meet criteria?	Yes	
7.	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.
8.	Was the category of the well documented?	Yes	
9.	Were the following conditions met when purging a Category I well:		
	Was one pump/tubing volume purged before sampling?	Yes	
	Did the water level stabilize before sampling?	Yes	
	Did pH, specific conductance, and turbidity measurements stabilize before sampling?	Yes	
	Was the flow rate less than 500 milliliters per minute?	Yes	
	If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	NA	
10.	Were the following conditions met when purging a Category II well:		
	Was the flow rate less than 500 milliliters per minute?	Yes	
	Was one pump/tubing volume removed before sampling?	Yes	
11.	Were duplicates taken at a frequency of one per 20 samples?	Yes	Three duplicates were collected for 50 samples.

## Appendix B. Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	May/June 2014 Site-wide Sampling Event/1405070	Date(s) of Water Sampling	May 19 through June 19, 2014
Date(s) of Verification	August 14, 2014	Name of Verifier	Ken Pill
	Response (Yes, No, NA)	Comments	
12. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	Yes	One EB was collected for the four surface water samples.	
13. Were trip blanks prepared and included with each shipment of volatile organic compound samples?	NA		
14. 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		
15. Were samples collected in the containers specified?	Yes		
16. Were samples filtered and preserved as specified?	Yes		
17. Were the number and types of samples collected as specified?	NA		
18. Were COC records completed, and was sample custody maintained?	Yes		
19. Are field data sheets signed and dated by both team members?	Yes		
20. Was all other pertinent information documented on the field data sheets?	NA		
21. Was the presence or absence of ice in the cooler documented at every sample location?	Yes		
22. Were water levels measured at the locations specified in the planning documents?	NA		

## Appendix B. Minimums and Maximums Report

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

Laboratory: ALS  
 RIN: 1405070  
 Comparison: All Historical Data  
 Report Date: 9/5/2014

Site Code	Location Code	Sample Date	Analyte	Current			Historical Maximum			Historical Minimum			Count	
				Result	Qualifiers Lab Data		Result	Qualifiers Lab Data		Result	Qualifiers Lab Data		N	N Below Detect
MOA01	0406	06/05/2014	Ammonia Total as N	150			510			200			17	0
MOA01	0431	06/12/2014	Uranium	0.013			0.011	FQ		0.009	FQ		11	0
MOA01	0441	06/12/2014	Uranium	0.047			0.046			0.025			5	0
MOA01	0457	05/19/2014	Uranium	0.0024			0.0022			0.0014			11	0
MOA01	0492	06/03/2014	Uranium	0.073			6	F		0.14			31	0
MOA01	AMM-3	06/09/2014	Ammonia Total as N	330			320			41			22	0
MOA01	ATP-2-D	05/20/2014	Uranium	0.00094			8.64			0.0028			62	0
MOA01	ATP-3	06/12/2014	Ammonia Total as N	0.25			0.2			0.026	B	F	12	7
MOA01	MW-3	06/03/2014	Ammonia Total as N	460			1190			470			9	0
MOA01	SMI-PW03	06/17/2014	Ammonia Total as N	21			150	J		25			18	0
MOA01	SMI-PZ1S	06/05/2014	Ammonia Total as N	100			565			120			27	0
MOA01	TP-23	05/21/2014	Uranium	4.1			3.7			3			7	0

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.

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

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.		

## Appendix B. Water Quality Data

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0218 SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/16/2014	0001	0 - 0	0.1	U		#	0.1	
Dissolved Oxygen	mg/L	06/16/2014	0001	0 - 0	2.67			#		
Oxidation Reduction Potential	mV	06/16/2014	0001	0 - 0	-260			#		
pH	s.u.	06/16/2014	0001	0 - 0	8.41			#		
Specific Conductance	umhos /cm	06/16/2014	0001	0 - 0	427			#		
Temperature	C	06/16/2014	0001	0 - 0	15.97			#		
Turbidity	NTU	06/16/2014	0001	0 - 0	131			#		
Uranium	mg/L	06/16/2014	0001	0 - 0	0.0016			#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0274 SURFACE LOCATION Configuration 4

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/16/2014	0001	0 - 0	0.1	U		#	0.1	
Dissolved Oxygen	mg/L	06/16/2014	0001	0 - 0	2.22			#		
Oxidation Reduction Potential	mV	06/16/2014	0001	0 - 0	-270			#		
pH	s.u.	06/16/2014	0001	0 - 0	8.4			#		
Specific Conductance	umhos /cm	06/16/2014	0001	0 - 0	419			#		
Temperature	C	06/16/2014	0001	0 - 0	17.05			#		
Turbidity	NTU	06/16/2014	0001	0 - 0	124			#		
Uranium	mg/L	06/16/2014	0001	0 - 0	0.0016			#	0.000029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0401 WELL Configuration 2

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/03/2014	0001	18 -	250		J	#	50	
Dissolved Oxygen	mg/L	06/03/2014	0001	18 -	0.77			#		
Oxidation Reduction Potential	mV	06/03/2014	0001	18 -	-226			#		
pH	s.u.	06/03/2014	0001	18 -	6.86			#		
Specific Conductance	umhos /cm	06/03/2014	0001	18 -	11744			#		
Temperature	C	06/03/2014	0001	18 -	15.87			#		
Turbidity	NTU	06/03/2014	0001	18 -	2.14			#		
Uranium	mg/L	06/03/2014	0001	18 -	1		J	#	0.00015	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0404 WELL Configuration 3

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/03/2014	0001	18 -	130		J	#	10	
Dissolved Oxygen	mg/L	06/03/2014	0001	18 -	1.86			#		
Oxidation Reduction Potential	mV	06/03/2014	0001	18 -	-234			#		
pH	s.u.	06/03/2014	0001	18 -	6.81			#		
Specific Conductance	umhos /cm	06/03/2014	0001	18 -	9429			#		
Temperature	C	06/03/2014	0001	18 -	15.81			#		
Turbidity	NTU	06/03/2014	0001	18 -	4.12			#		
Uranium	mg/L	06/03/2014	0001	18 -	0.96		J	#	0.000029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0406 WELL Baseline Area

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/05/2014	0001	11 -	150		J	#	20	
Dissolved Oxygen	mg/L	06/05/2014	0001	11 -	0.74			#		
Oxidation Reduction Potential	mV	06/05/2014	0001	11 -	-260			#		
pH	s.u.	06/05/2014	0001	11 -	6.94			#		
Specific Conductance	umhos /cm	06/05/2014	0001	11 -	10930			#		
Temperature	C	06/05/2014	0001	11 -	15.06			#		
Turbidity	NTU	06/05/2014	0001	11 -	189			#		
Uranium	mg/L	06/05/2014	0001	11 -	1.4		J	#	0.00015	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0407 WELL Configuration 1

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/03/2014	0001	17 -	8.8		J	#	2.5	
Dissolved Oxygen	mg/L	06/03/2014	0001	17 -	2.97			#		
Oxidation Reduction Potential	mV	06/03/2014	0001	17 -	-229			#		
pH	s.u.	06/03/2014	0001	17 -	7.19			#		
Specific Conductance	umhos /cm	06/03/2014	0001	17 -	4688			#		
Temperature	C	06/03/2014	0001	17 -	16.4			#		
Turbidity	NTU	06/03/2014	0001	17 -	3.93			#		
Uranium	mg/L	06/03/2014	0001	17 -	0.21		J	#	0.000029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0410 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/17/2014	0001	23.5 -	0.1	U		#	0.1	
Dissolved Oxygen	mg/L	06/17/2014	0001	23.5 -	4.28			#		
Oxidation Reduction Potential	mV	06/17/2014	0001	23.5 -	-266			#		
pH	s.u.	06/17/2014	0001	23.5 -	7.25			#		
Specific Conductance	umhos /cm	06/17/2014	0001	23.5 -	3406			#		
Temperature	C	06/17/2014	0001	23.5 -	19.5			#		
Turbidity	NTU	06/17/2014	0001	23.5 -	10			#		
Uranium	mg/L	06/17/2014	0001	23.5 -	0.43			#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0411 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/10/2014	0001	8 -	4.4		J	#	0.1	
Dissolved Oxygen	mg/L	06/10/2014	0001	8 -	3			#		
Oxidation Reduction Potential	mV	06/10/2014	0001	8 -	-206.6			#		
pH	s.u.	06/10/2014	0001	8 -	7.65			#		
Specific Conductance	umhos /cm	06/10/2014	0001	8 -	5709			#		
Temperature	C	06/10/2014	0001	8 -	20.6			#		
Turbidity	NTU	06/10/2014	0001	8 -	147			#		
Uranium	mg/L	06/10/2014	0001	8 -	4.9		J	#	0.00029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0413 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/22/2014	0001	10.5 -	49			#	2.5	
Dissolved Oxygen	mg/L	05/22/2014	0001	10.5 -	1.44			#		
Oxidation Reduction Potential	mV	05/22/2014	0001	10.5 -	-218.1			#		
pH	s.u.	05/22/2014	0001	10.5 -	7.39			#		
Specific Conductance	umhos /cm	05/22/2014	0001	10.5 -	5481			#		
Temperature	C	05/22/2014	0001	10.5 -	14.45			#		
Turbidity	NTU	05/22/2014	0001	10.5 -	3.05			#		
Uranium	mg/L	05/22/2014	0001	10.5 -	3.7			#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0431 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/12/2014	0001	91 -	0.1	U	J	#	0.1	
Dissolved Oxygen	mg/L	06/12/2014	0001	91 -	0.76			#		
Oxidation Reduction Potential	mV	06/12/2014	0001	91 -	-246			#		
pH	s.u.	06/12/2014	0001	91 -	7.12			#		
Specific Conductance	umhos /cm	06/12/2014	0001	91 -	35513			#		
Temperature	C	06/12/2014	0001	91 -	20.31			#		
Turbidity	NTU	06/12/2014	0001	91 -	0.74			#		
Uranium	mg/L	06/12/2014	0001	91 -	0.013		J	#	0.000029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0436 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/17/2014	0001	197 -	3.9			#	0.1	
Dissolved Oxygen	mg/L	06/17/2014	0001	197 -	0.4			#		
Oxidation Reduction Potential	mV	06/17/2014	0001	197 -	-281.5			#		
pH	s.u.	06/17/2014	0001	197 -	7.25			#		
Specific Conductance	umhos /cm	06/17/2014	0001	197 -	135034			#		
Temperature	C	06/17/2014	0001	197 -	20.15			#		
Turbidity	NTU	06/17/2014	0001	197 -	5.12			#		
Uranium	mg/L	06/17/2014	0001	197 -	0.0095			#	0.00029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0439 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/11/2014	0001	120 -	6.2		J	#	2.5	
Dissolved Oxygen	mg/L	06/11/2014	0001	120 -	1.12			#		
Oxidation Reduction Potential	mV	06/11/2014	0001	120 -	-250			#		
pH	s.u.	06/11/2014	0001	120 -	7.03			#		
Specific Conductance	umhos /cm	06/11/2014	0001	120 -	10241			#		
Temperature	C	06/11/2014	0001	120 -	17.94			#		
Turbidity	NTU	06/11/2014	0001	120 -	76.4			#		
Uranium	mg/L	06/11/2014	0001	120 -	1.2		J	#	0.00015	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0440 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/11/2014	0001	119 -	0.1	U	J	#	0.1	
Dissolved Oxygen	mg/L	06/11/2014	0001	119 -	3.57			#		
Oxidation Reduction Potential	mV	06/11/2014	0001	119 -	-207			#		
pH	s.u.	06/11/2014	0001	119 -	7.09			#		
Specific Conductance	umhos /cm	06/11/2014	0001	119 -	8691			#		
Temperature	C	06/11/2014	0001	119 -	21.16			#		
Turbidity	NTU	06/11/2014	0001	119 -	18.2			#		
Uranium	mg/L	06/11/2014	0001	119 -	0.032		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0441 WELL Queue/Support Area

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/12/2014	0001	53 -	0.1	U	J	#	0.1	
Dissolved Oxygen	mg/L	06/12/2014	0001	53 -	0.32			#		
Oxidation Reduction Potential	mV	06/12/2014	0001	53 -	-246			#		
pH	s.u.	06/12/2014	0001	53 -	7.26			#		
Specific Conductance	umhos /cm	06/12/2014	0001	53 -	9522			#		
Temperature	C	06/12/2014	0001	53 -	19.58			#		
Turbidity	NTU	06/12/2014	0001	53 -	9.85			#		
Uranium	mg/L	06/12/2014	0001	53 -	0.047		J	#	0.000029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0453 WELL Contaminated Area

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/17/2014	0001	80 -	240			#	10	
Dissolved Oxygen	mg/L	06/17/2014	0001	80 -	1.07			#		
Oxidation Reduction Potential	mV	06/17/2014	0001	80 -	-261			#		
pH	s.u.	06/17/2014	0001	80 -	7.3			#		
Specific Conductance	umhos /cm	06/17/2014	0001	80 -	33918			#		
Temperature	C	06/17/2014	0001	80 -	20.75			#		
Turbidity	NTU	06/17/2014	0001	80 -	3.36			#		
Uranium	mg/L	06/17/2014	0001	80 -	0.89			#	0.00029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0454 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/21/2014	0001	13 -	360			#	50	
Dissolved Oxygen	mg/L	05/21/2014	0001	13 -	0.44			#		
Oxidation Reduction Potential	mV	05/21/2014	0001	13 -	-237			#		
pH	s.u.	05/21/2014	0001	13 -	6.55			#		
Specific Conductance	umhos /cm	05/21/2014	0001	13 -	61559			#		
Temperature	C	05/21/2014	0001	13 -	17.07			#		
Turbidity	NTU	05/21/2014	0001	13 -	7.89			#		
Uranium	mg/L	05/21/2014	0001	13 -	1.6			#	0.00015	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0457 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/19/2014	0001	29 -	0.1	U		#	0.1	
Dissolved Oxygen	mg/L	05/19/2014	0001	29 -	1.82			#		
Oxidation Reduction Potential	mV	05/19/2014	0001	29 -	-241			#		
pH	s.u.	05/19/2014	0001	29 -	7.59			#		
Specific Conductance	umhos /cm	05/19/2014	0001	29 -	5644			#		
Temperature	C	05/19/2014	0001	29 -	17.7			#		
Turbidity	NTU	05/19/2014	0001	29 -	4.41			#		
Uranium	mg/L	05/19/2014	0001	29 -	0.0024			#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: 0492 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/03/2014	0001	18 -	5.8		J	#	2.5	
Dissolved Oxygen	mg/L	06/03/2014	0001	18 -	2.35			#		
Oxidation Reduction Potential	mV	06/03/2014	0001	18 -	-235			#		
pH	s.u.	06/03/2014	0001	18 -	7.51			#		
Specific Conductance	umhos /cm	06/03/2014	0001	18 -	897			#		
Temperature	C	06/03/2014	0001	18 -	16.42			#		
Turbidity	NTU	06/03/2014	0001	18 -	3.14			#		
Uranium	mg/L	06/03/2014	0001	18 -	0.073		J	#	0.000029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: AMM-1 WELL NE corner of DOE property.

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/19/2014	0001	19 -	0.1	U		#	0.1	
Dissolved Oxygen	mg/L	05/19/2014	0001	19 -	2.28			#		
Oxidation Reduction Potential	mV	05/19/2014	0001	19 -	-229			#		
pH	s.u.	05/19/2014	0001	19 -	7.04			#		
Specific Conductance	umhos /cm	05/19/2014	0001	19 -	22724			#		
Temperature	C	05/19/2014	0001	19 -	18.62			#		
Turbidity	NTU	05/19/2014	0001	19 -	1.85			#		
Uranium	mg/L	05/19/2014	0001	19 -	0.0076			#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: AMM-2 WELL East of pile along road.

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/20/2014	0001	48 -	560			#	50	
Dissolved Oxygen	mg/L	05/20/2014	0001	48 -	0.68			#		
Oxidation Reduction Potential	mV	05/20/2014	0001	48 -	-243			#		
pH	s.u.	05/20/2014	0001	48 -	6.43			#		
Specific Conductance	umhos /cm	05/20/2014	0001	48 -	20874			#		
Temperature	C	05/20/2014	0001	48 -	16.84			#		
Turbidity	NTU	05/20/2014	0001	48 -	9.6			#		
Uranium	mg/L	05/20/2014	0001	48 -	2.3			#	0.00015	

## Appendix B. Water Quality Data (continued)

**General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site**

**REPORT DATE: 9/5/2014**

**Location: AMM-3 WELL Near SE corner of pile.**

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)		Result	Qualifiers			Detection Limit	Uncertainty
							Lab	Data	QA		
Ammonia Total as N	mg/L	06/09/2014	0001	48	-	320	J	#		50	
Ammonia Total as N	mg/L	06/09/2014	0002	48	-	330	J	#		50	
Dissolved Oxygen	mg/L	06/09/2014	0001	48	-	0.42			#		
Oxidation Reduction Potential	mV	06/09/2014	0001	48	-	-221			#		
pH	s.u.	06/09/2014	0001	48	-	6.96			#		
Specific Conductance	umhos/cm	06/09/2014	0001	48	-	20653			#		
Temperature	C	06/09/2014	0001	48	-	20.76			#		
Turbidity	NTU	06/09/2014	0001	48	-	4.57			#		
Uranium	mg/L	06/09/2014	0001	48	-	2.8	J	#		0.00029	
Uranium	mg/L	06/09/2014	0002	48	-	2.8	J	#		0.00029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: ATP-2-D WELL Piezometer; see boring ATP-2

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/20/2014	0001	88 -	280			#	20	
Dissolved Oxygen	mg/L	05/20/2014	0001	88 -	0.74			#		
Oxidation Reduction Potential	mV	05/20/2014	0001	88 -	-243			#		
pH	s.u.	05/20/2014	0001	88 -	7.19			#		
Specific Conductance	umhos /cm	05/20/2014	0001	88 -	128841			#		
Temperature	C	05/20/2014	0001	88 -	18.36			#		
Turbidity	NTU	05/20/2014	0001	88 -	42.2			#		
Uranium	mg/L	05/20/2014	0001	88 -	0.00094			#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: ATP-2-S WELL Piezometer; see boring ATP-2

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/20/2014	0001	25 -	330			#	20	
Dissolved Oxygen	mg/L	05/20/2014	0001	25 -	2.4			#		
Oxidation Reduction Potential	mV	05/20/2014	0001	25 -	-241			#		
pH	s.u.	05/20/2014	0001	25 -	8.7			#		
Specific Conductance	umhos /cm	05/20/2014	0001	25 -	14049			#		
Temperature	C	05/20/2014	0001	25 -	19.51			#		
Turbidity	NTU	05/20/2014	0001	25 -	9.48			#		
Uranium	mg/L	05/20/2014	0001	25 -	0.0086			#	0.000029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: ATP-3 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)		Result	Qualifiers			Detection Limit	Uncertainty
				Lab	Data		QA				
Ammonia Total as N	mg/L	06/12/2014	0001	51	-	0.25		J	#	0.1	
Dissolved Oxygen	mg/L	06/12/2014	0001	51	-	2.27			#		
Oxidation Reduction Potential	mV	06/12/2014	0001	51	-	-250			#		
pH	s.u.	06/12/2014	0001	51	-	7.62			#		
Specific Conductance	umhos /cm	06/12/2014	0001	51	-	2684			#		
Temperature	C	06/12/2014	0001	51	-	19.55			#		
Turbidity	NTU	06/12/2014	0001	51	-	2.13			#		
Uranium	mg/L	06/12/2014	0001	51	-	0.0028		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: CR1 SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
				Lab	Data	QA						
Ammonia Total as N	mg/L	06/16/2014	0001	0	-	0	0.1	U	#	0.1		
Dissolved Oxygen	mg/L	06/16/2014	0001	0	-	0	3.01		#			
Oxidation Reduction Potential	mV	06/16/2014	0001	0	-	0	-268		#			
pH	s.u.	06/16/2014	0001	0	-	0	8.4		#			
Specific Conductance	umhos /cm	06/16/2014	0001	0	-	0	487		#			
Temperature	C	06/16/2014	0001	0	-	0	15.96		#			
Turbidity	NTU	06/16/2014	0001	0	-	0	171		#			
Uranium	mg/L	06/16/2014	0001	0	-	0	0.0018		#	0.000029		

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: CR5 SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)		Result	Qualifiers			Detection Limit	Uncertainty
							Lab	Data	QA		
Ammonia Total as N	mg/L	06/16/2014	0001	0	-	0	0.1	U	#	0.1	
Dissolved Oxygen	mg/L	06/16/2014	0001	0	-	0	1.86		#		
Oxidation Reduction Potential	mV	06/16/2014	0001	0	-	0	-278		#		
pH	s.u.	06/16/2014	0001	0	-	0	8.36		#		
Specific Conductance	umhos/cm	06/16/2014	0001	0	-	0	419		#		
Temperature	C	06/16/2014	0001	0	-	0	17.53		#		
Turbidity	NTU	06/16/2014	0001	0	-	0	288		#		
Uranium	mg/L	06/16/2014	0001	0	-	0	0.0016		#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: MW-3 WELL See borehole 8

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)		Result	Qualifiers			Detection Limit	Uncertainty
							Lab	Data	QA		
Ammonia Total as N	mg/L	06/03/2014	0001	44	-		460		J	#	50
Dissolved Oxygen	mg/L	06/03/2014	0001	44	-		0.51			#	
Oxidation Reduction Potential	mV	06/03/2014	0001	44	-		-287			#	
pH	s.u.	06/03/2014	0001	44	-		6.82			#	
Specific Conductance	umhos/cm	06/03/2014	0001	44	-		29243			#	
Temperature	C	06/03/2014	0001	44	-		18.57			#	
Turbidity	NTU	06/03/2014	0001	44	-		7.17			#	
Uranium	mg/L	06/03/2014	0001	44	-		3.1		J	#	0.00029

## Appendix B. Water Quality Data (continued)

**General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site**

**REPORT DATE: 9/5/2014**

**Location: SMI-PW01 WELL Baseline Area**

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)		Result	Qualifiers			Detection Limit	Uncertainty
							Lab	Data	QA		
Ammonia Total as N	mg/L	06/05/2014	0001	40	-	940	J	#		2.5	
Ammonia Total as N	mg/L	06/05/2014	0002	40	-	880	J	#		50	
Dissolved Oxygen	mg/L	06/05/2014	0001	40	-	0.5		#			
Oxidation Reduction Potential	mV	06/05/2014	0001	40	-	-240		#			
pH	s.u.	06/05/2014	0001	40	-	6.86		#			
Specific Conductance	umhos/cm	06/05/2014	0001	40	-	33538		#			
Temperature	C	06/05/2014	0001	40	-	17.6		#			
Turbidity	NTU	06/05/2014	0001	40	-	8.02		#			
Uranium	mg/L	06/05/2014	0001	40	-	3	J	#		0.00029	
Uranium	mg/L	06/05/2014	0002	40	-	3	J	#		0.00029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: SMI-PW03 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/17/2014	0001	40 -	21			#	2	
Dissolved Oxygen	mg/L	06/17/2014	0001	40 -	1.28			#		
Oxidation Reduction Potential	mV	06/17/2014	0001	40 -	-266			#		
pH	s.u.	06/17/2014	0001	40 -	7.81			#		
Specific Conductance	umhos /cm	06/17/2014	0001	40 -	6410			#		
Temperature	C	06/17/2014	0001	40 -	21.34			#		
Turbidity	NTU	06/17/2014	0001	40 -	2.65			#		
Uranium	mg/L	06/17/2014	0001	40 -	2.5			#	0.00029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: SMI-PZ1D2 WELL Baseline Area

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/09/2014	0001	23 -	1600		J	#	50	
Dissolved Oxygen	mg/L	06/09/2014	0001	23 -	0.26			#		
Oxidation Reduction Potential	mV	06/09/2014	0001	23 -	-205			#		
pH	s.u.	06/09/2014	0001	23 -	6.71			#		
Specific Conductance	umhos /cm	06/09/2014	0001	23 -	89761			#		
Temperature	C	06/09/2014	0001	23 -	16.71			#		
Turbidity	NTU	06/09/2014	0001	23 -	24.3			#		
Uranium	mg/L	06/09/2014	0001	23 -	2		J	#	0.00058	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: SMI-PZ1M WELL Baseline Area

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/09/2014	0001	57 -	820		J	#	50	
Dissolved Oxygen	mg/L	06/09/2014	0001	57 -	0.4			#		
Oxidation Reduction Potential	mV	06/09/2014	0001	57 -	-213			#		
pH	s.u.	06/09/2014	0001	57 -	6.88			#		
Specific Conductance	umhos /cm	06/09/2014	0001	57 -	32130			#		
Temperature	C	06/09/2014	0001	57 -	16.51			#		
Turbidity	NTU	06/09/2014	0001	57 -	31.5			#		
Uranium	mg/L	06/09/2014	0001	57 -	2.9		J	#	0.00029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: SMI-PZ1S WELL Baseline Area

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/05/2014	0001	18 -	100		J	#	2.5	
Dissolved Oxygen	mg/L	06/05/2014	0001	18 -	1.14			#		
Oxidation Reduction Potential	mV	06/05/2014	0001	18 -	-251			#		
pH	s.u.	06/05/2014	0001	18 -	7.07			#		
Specific Conductance	umhos /cm	06/05/2014	0001	18 -	5803			#		
Temperature	C	06/05/2014	0001	18 -	13.49			#		
Turbidity	NTU	06/05/2014	0001	18 -	8.62			#		
Uranium	mg/L	06/05/2014	0001	18 -	0.74		J	#	0.00015	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: SMI-PZ2D WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/21/2014	0001	75 -	380			#	50	
Dissolved Oxygen	mg/L	05/21/2014	0001	75 -	0.27			#		
Oxidation Reduction Potential	mV	05/21/2014	0001	75 -	-224			#		
pH	s.u.	05/21/2014	0001	75 -	6.7			#		
Specific Conductance	umhos /cm	05/21/2014	0001	75 -	123372			#		
Temperature	C	05/21/2014	0001	75 -	16.97			#		
Turbidity	NTU	05/21/2014	0001	75 -	3.73			#		
Uranium	mg/L	05/21/2014	0001	75 -	0.35			#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: SMI-PZ2M2 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/21/2014	0001	56 -	620			#	50	
Dissolved Oxygen	mg/L	05/21/2014	0001	56 -	0.55			#		
Oxidation Reduction Potential	mV	05/21/2014	0001	56 -	-222			#		
pH	s.u.	05/21/2014	0001	56 -	6.71			#		
Specific Conductance	umhos /cm	05/21/2014	0001	56 -	109761			#		
Temperature	C	05/21/2014	0001	56 -	16.47			#		
Turbidity	NTU	05/21/2014	0001	56 -	6			#		
Uranium	mg/L	05/21/2014	0001	56 -	0.85			#	0.00015	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: SMI-PZ3D2 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/17/2014	0001	78 -	370			#	10	
Dissolved Oxygen	mg/L	06/17/2014	0001	78 -	1.01			#		
Oxidation Reduction Potential	mV	06/17/2014	0001	78 -	-252.8			#		
pH	s.u.	06/17/2014	0001	78 -	7.2			#		
Specific Conductance	umhos /cm	06/17/2014	0001	78 -	21119			#		
Temperature	C	06/17/2014	0001	78 -	19.27			#		
Turbidity	NTU	06/17/2014	0001	78 -	2.11			#		
Uranium	mg/L	06/17/2014	0001	78 -	1.2			#	0.00029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: SMI-PZ3M WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/17/2014	0001	59 -	44			#	2	
Dissolved Oxygen	mg/L	06/17/2014	0001	59 -	1.44			#		
Oxidation Reduction Potential	mV	06/17/2014	0001	59 -	-262.9			#		
pH	s.u.	06/17/2014	0001	59 -	7.56			#		
Specific Conductance	umhos /cm	06/17/2014	0001	59 -	9052			#		
Temperature	C	06/17/2014	0001	59 -	18.96			#		
Turbidity	NTU	06/17/2014	0001	59 -	3.07			#		
Uranium	mg/L	06/17/2014	0001	59 -	1.2			#	0.000029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: SMI-PZ3S WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/17/2014	0001	25 -	4.7			#	0.1	
Dissolved Oxygen	mg/L	06/17/2014	0001	25 -	5.32			#		
Oxidation Reduction Potential	mV	06/17/2014	0001	25 -	-265			#		
pH	s.u.	06/17/2014	0001	25 -	8.1			#		
Specific Conductance	umhos /cm	06/17/2014	0001	25 -	4907			#		
Temperature	C	06/17/2014	0001	25 -	18.42			#		
Turbidity	NTU	06/17/2014	0001	25 -	9.25			#		
Uranium	mg/L	06/17/2014	0001	25 -	2			#	0.00029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: TP-01 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/19/2014	0001	22 -	0.1	U		#	0.1	
Dissolved Oxygen	mg/L	05/19/2014	0001	22 -	1.38			#		
Oxidation Reduction Potential	mV	05/19/2014	0001	22 -	-253			#		
pH	s.u.	05/19/2014	0001	22 -	6.32			#		
Specific Conductance	umhos /cm	05/19/2014	0001	22 -	6706			#		
Temperature	C	05/19/2014	0001	22 -	19.42			#		
Turbidity	NTU	05/19/2014	0001	22 -	7.39			#		
Uranium	mg/L	05/19/2014	0001	22 -	0.077			#	0.000029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: TP-11 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/19/2014	0001	30 -	0.84			#	0.1	
Dissolved Oxygen	mg/L	05/19/2014	0001	30 -	1.95			#		
Oxidation Reduction Potential	mV	05/19/2014	0001	30 -	-241			#		
pH	s.u.	05/19/2014	0001	30 -	7.26			#		
Specific Conductance	umhos /cm	05/19/2014	0001	30 -	19558			#		
Temperature	C	05/19/2014	0001	30 -	16.94			#		
Turbidity	NTU	05/19/2014	0001	30 -	6.37			#		
Uranium	mg/L	05/19/2014	0001	30 -	0.00085			#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: TP-17 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/19/2014	0001	28 -	1.1			#	0.1	
Dissolved Oxygen	mg/L	06/19/2014	0001	28 -	-4.58			#		
Oxidation Reduction Potential	mV	06/19/2014	0001	28 -	-263			#		
pH	s.u.	06/19/2014	0001	28 -	7.57			#		
Specific Conductance	umhos /cm	06/19/2014	0001	28 -	49957			#		
Temperature	C	06/19/2014	0001	28 -	14.74			#		
Turbidity	NTU	06/19/2014	0001	28 -	14.1			#		
Uranium	mg/L	06/19/2014	0001	28 -	0.024			#	0.000029	

## Appendix B. Water Quality Data *(continued)*

**General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site**

**REPORT DATE: 9/5/2014**

**Location: TP-20 WELL**

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)		Result	Qualifiers			Detection Limit	Uncertainty
							Lab	Data	QA		
Ammonia Total as N	mg/L	06/02/2014	0001	32	-	3.7			#	0.1	
Ammonia Total as N	mg/L	06/02/2014	0002	32	-	3.7			#	0.1	
Dissolved Oxygen	mg/L	06/02/2014	0001	32	-	0.29			#		
Oxidation Reduction Potential	mV	06/02/2014	0001	32	-	-218			#		
pH	s.u.	06/02/2014	0001	32	-	7.2			#		
Specific Conductance	umhos /cm	06/02/2014	0001	32	-	137242			#		
Temperature	C	06/02/2014	0001	32	-	19.02			#		
Turbidity	NTU	06/02/2014	0001	32	-	9.09			#		
Uranium	mg/L	06/02/2014	0001	32	-	0.0011			#	0.000029	
Uranium	mg/L	06/02/2014	0002	32	-	0.00095			#	0.000029	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: TP-22 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/02/2014	0001	17 -	0.1	U		#	0.1	
Dissolved Oxygen	mg/L	06/02/2014	0001	17 -	2.36			#		
Oxidation Reduction Potential	mV	06/02/2014	0001	17 -	-209			#		
pH	s.u.	06/02/2014	0001	17 -	6.7			#v		
Specific Conductance	umhos /cm	06/02/2014	0001	17 -	30633			#		
Temperature	C	06/02/2014	0001	17 -	16.27			#		
Turbidity	NTU	06/02/2014	0001	17 -	114			#		
Uranium	mg/L	06/02/2014	0001	17 -	0.23			#	0.00015	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: TP-23 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	05/21/2014	0001	25 -	170			#	10	
Dissolved Oxygen	mg/L	05/21/2014	0001	25 -	4.74			#		
Oxidation Reduction Potential	mV	05/21/2014	0001	25 -	-231			#		
pH	s.u.	05/21/2014	0001	25 -	6.79			#		
Specific Conductance	umhos /cm	05/21/2014	0001	25 -	49933			#		
Temperature	C	05/21/2014	0001	25 -	19.3			#		
Turbidity	NTU	05/21/2014	0001	25 -	77.8			#		
Uranium	mg/L	05/21/2014	0001	25 -	4.1			#	0.00015	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: UPD-17 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/10/2014	0001	14.5 -	110		J	#	2.5	
Dissolved Oxygen	mg/L	06/10/2014	0001	14.5 -	0.26			#		
Oxidation Reduction Potential	mV	06/10/2014	0001	14.5 -	-263.6			#		
pH	s.u.	06/10/2014	0001	14.5 -	6.79			#		
Specific Conductance	umhos /cm	06/10/2014	0001	14.5 -	9029			#		
Temperature	C	06/10/2014	0001	14.5 -	17.43			#		
Turbidity	NTU	06/10/2014	0001	14.5 -	4.47			#		
Uranium	mg/L	06/10/2014	0001	14.5 -	1.2		J	#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: UPD-18 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/10/2014	0001	13 -	250		J	#	50	
Dissolved Oxygen	mg/L	06/10/2014	0001	13 -	0.4			#		
Oxidation Reduction Potential	mV	06/10/2014	0001	13 -	-239.4			#		
pH	s.u.	06/10/2014	0001	13 -	6.97			#		
Specific Conductance	umhos /cm	06/10/2014	0001	13 -	9104			#		
Temperature	C	06/10/2014	0001	13 -	17.76			#		
Turbidity	NTU	06/10/2014	0001	13 -	102			#		
Uranium	mg/L	06/10/2014	0001	13 -	1		J	#	0.00015	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: UPD-20 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/16/2014	0001	17 -	0.12			#	0.1	
Dissolved Oxygen	mg/L	06/16/2014	0001	17 -	0.55			#		
Oxidation Reduction Potential	mV	06/16/2014	0001	17 -	-277			#		
pH	s.u.	06/16/2014	0001	17 -	7.55			#		
Specific Conductance	umhos /cm	06/16/2014	0001	17 -	3770			#		
Temperature	C	06/16/2014	0001	17 -	19.12			#		
Turbidity	NTU	06/16/2014	0001	17 -	101			#		
Uranium	mg/L	06/16/2014	0001	17 -	0.073			#	0.000029	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: UPD-21 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/16/2014	0001	25 -	3.3			#	0.1	
Dissolved Oxygen	mg/L	06/16/2014	0001	25 -	1.21			#		
Oxidation Reduction Potential	mV	06/16/2014	0001	25 -	-273.9			#		
pH	s.u.	06/16/2014	0001	25 -	7.46			#		
Specific Conductance	umhos /cm	06/16/2014	0001	25 -	3413			#		
Temperature	C	06/16/2014	0001	25 -	19.42			#		
Turbidity	NTU	06/16/2014	0001	25 -	3.12			#		
Uranium	mg/L	06/16/2014	0001	25 -	5.8			#	0.00058	

## Appendix B. Water Quality Data (continued)

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: UPD-22 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/18/2014	0001	9 -	1.7			#	0.2	
Dissolved Oxygen	mg/L	06/18/2014	0001	9 -	3.13			#		
Oxidation Reduction Potential	mV	06/18/2014	0001	9 -	-289			#		
pH	s.u.	06/18/2014	0001	9 -	7.61			#		
Specific Conductance	umhos /cm	06/18/2014	0001	9 -	2662			#		
Temperature	C	06/18/2014	0001	9 -	17.57			#		
Turbidity	NTU	06/18/2014	0001	9 -	8.6			#		
Uranium	mg/L	06/18/2014	0001	9 -	2.9			#	0.00058	

### General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: UPD-23 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	06/04/2014	0001	26 -	2.4		J	#	0.1	
Dissolved Oxygen	mg/L	06/04/2014	0001	26 -	0.98			#		
Oxidation Reduction Potential	mV	06/04/2014	0001	26 -	-265			#		
pH	s.u.	06/04/2014	0001	26 -	7.44			#		
Specific Conductance	umhos /cm	06/04/2014	0001	26 -	3506			#		
Temperature	C	06/04/2014	0001	26 -	19.12			#		
Turbidity	NTU	06/04/2014	0001	26 -	32.5			#		
Uranium	mg/L	06/04/2014	0001	26 -	0.63		J	#	0.00015	

## Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 9/5/2014

Location: UPD-24 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Ammonia Total as N	mg/L	06/16/2014	0001	27 -	2			#	0.1	
Dissolved Oxygen	mg/L	06/16/2014	0001	27 -	0.71			#		
Oxidation Reduction Potential	mV	06/16/2014	0001	27 -	-266			#		
pH	s.u.	06/16/2014	0001	27 -	7.55			#		
Specific Conductance	umhos /cm	06/16/2014	0001	27 -	4750			#		
Temperature	C	06/16/2014	0001	27 -	18.21			#		
Turbidity	NTU	06/16/2014	0001	27 -	1.22			#		
Uranium	mg/L	06/16/2014	0001	27 -	7			#	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 TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X,Y,Z Laboratory defined qualifier, see case narrative.

### DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9. J Estimated value.
- Q Qualitative result due to sampling technique. R Unusable result.
- X Location is undefined.

### QA QUALIFIER:

- # Validated according to quality assurance guidelines.

## Appendix B. Blanks Report

**BLANKS REPORT**  
**LAB: ALS**  
**RIN: 1405070**  
**Report Date: 9/5/2014**

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab Data	Detection Limit	Uncertainty	Sample Type
Ammonia Total as N	MOA01	0999	06/19/2014	0001	mg/L	.1	U	.1		E
Uranium	MOA01	0999	06/19/2014	0001	mg/L	.0013		.000029		E

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

**LAB QUALIFIERS:**

- \* Replicate analysis not within control limits.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X,Y,Z Laboratory defined qualifier, see case narrative.

**DATA QUALIFIERS:**

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- Q Qualitative result due to sampling technique.
- X Location is undefined.
- J Estimated value.
- R Unusable result.

**SAMPLE TYPES:**

- E Equipment Blank.

## Appendix B. Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site							
REPORT DATE: 9/5/2014							
Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Time	Date	Depth From Top of Casing (Ft)	Water Elevation (MSL)	Water Level Flag
401		3969.6	6/3/14		5.95	3963.65	
404	O	3968.3	6/3/14		6.99	3961.31	
406	O	3964.59	6/5/14		2.89	3961.7	
407	O	3969.09	6/3/14		7.38	3961.71	
410	O	3981.05	6/17/14		21.1	3959.95	
411	O	3962.43	6/10/14		5.61	3956.82	
413	O	3963.19	5/22/14		7.08	3956.11	
431	O	4007.04	6/12/14		47.64	3959.4	
436	U	3970.8	6/17/14		6.7	3964.1	
439	O	4055.27	6/11/14		89.56	3965.71	
440	U	4070.71	6/1/14		110.82	3959.89	
441	O	4008.77	6/12/14		49.04	3959.73	
453	U	4031.29	6/17/14		73.44	3957.85	
454	O	3966.53	5/21/14		11.3	3955.23	
457	O	3971.3	5/19/14		14.52	3956.78	
492		3967.56	6/3/14		6.49	3961.07	
AMM-1	O	3972.02	5/19/14		15.73	3956.29	
AMM-2		3964.09	5/20/14		8.83	3955.26	
AMM-3	O	3962.9	6/9/14		2.35	3960.55	
ATP-2-D	O	3962.17	5/20/14		5.51	3956.66	
ATP-2-S		3962.17	5/20/14		13.48	3948.69	
ATP-3	O	3998.29	6/12/14		38.44	3959.85	
MW-3	U	3965.98	6/3/14		6.62	3959.36	
SMI-PW01	O	3963.96	6/5/14		3.21	3960.75	
SMI-PW03		3975.04	6/17/14		14.94	3960.1	
SMI-PZ1D2		3963.77	6/9/14		3.37	3960.4	
SMI-PZ1M	O	3963.16	6/9/14		1.76	3961.4	
SMI-PZ1S	O	3962.90	11/5/2013		9.01	3953.89	

## Appendix B. Water Level Data *(continued)*

**STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site**  
**REPORT DATE: 9/5/2014**

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Time	Date	Depth From Top of Casing (Ft)	Water Elevation (MSL)	Water Level Flag
SMI-PZ2D	O	3967.38	5/21/14		14.16	3953.22	
SMI-PZ2M2	O	3967.18	5/21/14		12.84	3954.34	
SMI-PZ3D2	O	3975.13	6/17/14		15.48	3959.65	
SMI-PZ3M		3975.23	6/17/14		15.19	3960.04	
SMI-PZ3S	O	3975.03	6/17/14		14.9	3960.13	
TP-11	O	3967.51	5/19/14		10.67	3956.84	
TP-17	O	3963.69	6/19/14		5.52	3958.17	
TP-20	O	3967.55	6/2/14		11.51	3956.04	
TP-22	O	3966.51	6/2/14		10.84	3955.67	
TP-23	O	3962.6	5/21/14		7.55	3955.05	
UPD-17	O	3967.44	6/10/14		6.75	3960.69	
UPD-18	O	3969	6/10/14		8.64	3960.36	
UPD-20	D	3978.73	6/16/14		19.03	3959.7	
UPD-21	D	3981.45	6/16/14		21.58	3959.87	
UPD-22	D	3966.2	6/18/14		6.11	3960.09	
UPD-23		3982.38	6/4/14		22.75	3959.63	
UPD-24		3977.1	6/16/14		16.99	3960.11	

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

## Appendix B. May/June 2014 Site-wide Sampling Event Trip Report



Date: July 16, 2014  
To: Ken Pill  
From: James Ritchey  
Subject: May/June 2014 Site-wide Sampling Event

**Date of Sampling Event:** May 19 to June 19, 2014

**Team Members:** E. Moran, K. Pill, and J. Ritchey

**RIN Number Assigned:** All samples were assigned to RIN 1405070.

**Sample Shipment:** The coolers were shipped overnight via UPS to ALS from Moab, Utah, on June 02, 12, and 19 of 2014 (Tracking numbers 1Z5W1Y510198913935, 1Z5W1Y510199416748, and 1Z5W1Y510190219905).

**Number of Locations Sampled:** The purpose of the site-wide sampling event is to update contaminant plume maps. A total of 50 locations (four surface samples and 46 monitoring wells) were sampled during this event. Including three duplicates and one EB, a total of 54 samples were collected during the May/June 2014 sampling event.

**Locations Not Sampled/Reason:** Wells 0412, 0414, MW-R-2, SMI-MW01, and TP-19 could not be safely accessed due to flood waters and were not sampled.

**Field Variance:** Samples collected for observation well SMI-PZ1D2 were sent for analysis as SMI-PZ1D. The results will be entered into SeePro under the correct well name.

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

False ID	True ID	Sample Type	Associated matrix
2000	TP-20	Duplicate from 32 ft bgs	Ground Water
2001	SMI-PW01	Duplicate from 40 ft bgs	Ground Water
2002	AMM-3	Duplicate from 48 ft bgs	Ground Water
2004	NA	Equipment Blank	De-ionized Water

## Appendix B. May/June 2014 Site-wide Sampling Event Trip Report *(continued)*

**Location-specific Information:** All of the observation wells were sampled using a peristaltic pump and dedicated tubing, unless otherwise noted. The surface water samples were collected with dedicated surface water tubing that was decontaminated with Alconox® and de-ionized water between locations. The table below provides additional information.

Location	Date	Sample Depth (ft bgs)	Ammonia Probe Results (mg/L)	Ammonia Lab Analysis	Comments
0218	06/16/2014	–	–	Yes	Surface water
0274	06/16/2014	–	–	Yes	Surface water
0401	06/03/2014	18	243	Yes	
0404	06/03/2014	18	132.7	Yes	
0406	06/05/2014	11	67.3	Yes	
0407	06/03/2014	17	7.46	Yes	
0410	06/17/2014	23.5	<1	Yes	
0411	06/10/2014	8	2.21	Yes	Dewatered at 1 L, recharging a little.
0413	05/22/2014	10.5	51.8	Yes	
0431	06/12/2014	91	<1	Yes	
0436	06/17/2014	197	2.32	Yes	Sulfur odor.
0439	06/11/2014	120	3.14	Yes	Top of pump at 115.75 ft btoc. Pulled the pump of 2 ft. Casing cud down since sampled last. Sampled with bladder pump.
0440	06/01/2014	119	<1	Yes	Sampled with bladder pump.
0441	06/12/2014	53	<1	Yes	Sampled with bladder pump. Water level at top of pump.
0453	06/17/2014	80	156	Yes	Sampled with bladder pump.
0454	05/21/2014	13	201	Yes	
0457	05/19/2014	29	<1	Yes	
0492	06/03/2014	18	5.60	Yes	Conductivity keeps dropping. We sampled at 2.5 L because the river is ~3 ft from the well, and freshwater is likely infiltrating into the well.
AMM-1	05/19/2014	19	1.90	Yes	
AMM-2	05/20/2014	48	284	Yes	
AMM-3	06/09/2014	48	344	Yes	Base of well is submerged in ~5 in of flood water.
ATP-2-D	05/20/2014	88	192	Yes	
ATP-2-S	05/20/2014	25	210	Yes	
ATP-3	06/12/2014	51	<1	Yes	Sampled with bladder pump.
CR1	06/16/2014	–	–	Yes	Surface water
CR5	06/16/2014	–	–	Yes	Surface water
MW-3	06/03/2014	44	267	Yes	
SMI-PW01	06/05/2014	40	392	Yes	Duplicate.
SMI-PW03	06/17/2014	40	13.61	Yes	

## Appendix B. May/June 2014 Site-wide Sampling Event Trip Report *(continued)*

Location	Date	Sample Depth (ft bgs)	Ammonia Probe Results (mg/L)	Ammonia Lab Analysis	Comments
SMI-PZ1D2	06/09/14	73	899	Yes	
SMI-PZ1M	06/09/2014	57	774	Yes	2 ft off bottom.
SMI-PZ1S	06/05/2014	18	93.1	Yes	
SMI-PZ2D	05/21/2014	75	211	Yes	
SMI-PZ2M2	05/21/2014	56	350	Yes	
SMI-PZ3D2	06/17/2014	78	245	Yes	
SMI-PZ3M	06/17/2014	59	28.2	Yes	Duplicate.
SMI-PZ3S	06/17/2014	25	3.14	Yes	
TP-01	05/19/2014	22	<1	Yes	Water level not obtainable – casing blocked.
TP-11	05/19/2014	30	<1	Yes	
TP-17	06/19/2014	28	<1	Yes	
TP-20	06/02/2014	32	4.75	Yes	Sulfur odor
TP-22	06/02/2014	17	<1	Yes	Well dewatered at 2.5 L.
TP-23	05/21/2014	25	150.7	Yes	Small tubing.
UPD-17	06/10/2014	14.5	65.9	Yes	
UPD-18	06/10/2014	13	215	Yes	
UPD-20	06/16/2014	17	<1	Yes	
UPD-21	06/16/2014	25	3.35	Yes	
UPD-22	06/18/2014	9	1.12	Yes	
UPD-23	06/04/2014	26	3.91	Yes	
UPD-24	06/16/2014	27	4.53	Yes	

ft btoc = feet below top of casing; L = liter

**Water Level Measurements:** Water level data are provided in the table below. These data represent depth to water (ft btoc) measurements.

Well No.	Date	Depth to Water (ft btoc)
0401	06/03/2014	5.95
0404	06/03/2014	6.99
0406	06/05/2014	2.89
0407	06/03/2014	7.38
0410	06/17/2014	21.10
0411	06/10/2014	5.61
0413	05/22/2014	7.08
0431	06/12/2014	47.64
0436	06/17/2014	6.70
0439	06/11/2014	89.56
0440	06/01/2014	110.82
0441	06/12/2014	49.04

## Appendix B. May/June 2014 Site-wide Sampling Event Trip Report *(continued)*

Well No.	Date	Depth to Water (ft btoc)
0453	06/17/2014	73.44
0454	05/21/2014	11.30
0457	05/19/2014	14.52
0492	06/03/2014	6.49
AMM-1	05/19/2014	15.73
AMM-2	05/20/2014	8.83
AMM-3	06/09/2014	2.35
ATP-2-D	05/20/2014	5.51
ATP-2-S	05/20/2014	13.48
ATP-3	06/12/2014	38.44
MW-3	06/03/2014	6.62
SMI-PW01	06/05/2014	3.21
SMI-PW03	06/17/2014	14.94
SMI-PZ1D2	06/09/2014	3.37
SMI-PZ1M	06/09/2014	1.76
SMI-PZ1S	06/05/2014	3.35
SMI-PZ2D	05/21/2014	14.16
SMI-PZ2M2	05/21/2014	12.84
SMI-PZ3D2	06/17/2014	15.48
SMI-PZ3M	06/17/2014	15.19
SMI-PZ3S	06/17/2014	14.90
TP-01	05/19/2014	Casing blocked.
TP-11	05/19/2014	10.67
TP-17	06/19/2014	5.52
TP-20	06/02/2014	11.51
TP-22	06/02/2014	10.84
TP-23	05/21/2014	7.55
UPD-17	06/10/2014	6.75
UPD-18	06/10/2014	8.64
UPD-20	06/16/2014	19.03
UPD-21	06/16/2014	21.58
UPD-22	06/18/2014	6.11
UPD-23	06/04/2014	22.75
UPD-24	06/16/2014	16.99

**Appendix B. May/June 2014 Site-wide Sampling Event Trip Report (*continued*)**



*Surface Water Location 0218*



*Surface Water Location 0274*

**Appendix B. May/June 2014 Site-wide Sampling Event Trip Report (*continued*)**



*Surface Water Location CR1*



*Surface Water Location CR5*

## Appendix B. May/June 2014 Site-wide Sampling Event Trip Report *(continued)*

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

**Equipment:** None.

**Regulatory:** None.

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

Date	Daily Mean Flow (cfs)
5/19/2014	9,390
5/20/2014	10,900
5/21/2014	13,000
5/22/2014	14,900
5/23/2014	15,700
5/24/2014	16,500
5/25/2014	18,300
5/26/2014	21,900
5/27/2014	22,800
5/28/2014	23,700
5/29/2014	26,100
5/30/2014	29,100
5/31/2014	31,700
6/1/2014	34,600
6/2/2014	36,300
6/3/2014	37,200
6/4/2014	36,000
6/5/2014	35,800
6/6/2014	36,300
6/7/2014	36,000
6/8/2014	34,400
6/9/2014	32,500
6/10/2014	29,500
6/11/2014	26,700
6/12/2014	25,000
6/13/2014	24,100
6/14/2014	23,700
6/15/2014	24,200
6/16/2014	22,200
6/17/2014	20,400
6/18/2014	19,300
6/19/2014	18,900

**Corrective Action Required/Taken:** None.