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UMTRA Project

Moab UMTRA Project Groundwater and Surface Water Monitoring Report July through December 2019

Revision 0

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DOE-EM/GJTAC3031

Moab UMTRA Project
Groundwater and Surface Water Monitoring Report July through December 2019

Revision 0

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Contents

Section *Page*
Acronyms and Abbreviations vii
1.0 Introduction 1
1.1 Purpose 1
1.2 Scope 1
2.0 Summary of Sampling Events 7
2.1 July 2019 Crescent Junction Sampling Event 7
2.2 September 2019 Side Channel Habitat Sampling 7
2.3 September 2019 CF4 and CF5 Sampling Event 7
2.4 December 2019 Site-wide Sampling Event 8
3.0 Data Assessment 8
3.1 July 2019 Crescent Junction Sampling Event 9
3.1.1 Laboratory Performance Assessment 9
3.1.2 Minimums and Maximums Report and Anomalous Data Review 12
3.2 September 2019 Side Channel Habitat Sampling 12
3.2.1 Laboratory Performance Assessment 12
3.3 September 2019 CF4 and CF5 Sampling Event 12
3.3.1 Laboratory Performance Assessment 12
3.3.2 Minimums and Maximums Report and Anomalous Data Review 15
3.4 December 2019 Site-wide Sampling Event 15
3.4.1 Laboratory Performance Assessment 15
3.4.2 Minimums and Maximums Report and Anomalous Data Review 19
4.0 Results 20
4.1 July 2019 Crescent Junction Sampling Event Results 20
4.2 September 2019 Side Channel Habitat Sampling Results 21
4.3 September 2019 CF4 and CF5 Sampling Event Results 23
4.4 December 2019 Site-wide Sampling Event Results 28
4.4.1 Northeastern Base of Tailings Pile 33
4.4.2 Northeastern Uranium Plume Area 33
4.4.3 Center of Northeastern Uranium Plume Area 33
4.4.4 Atlas Building Vicinity 36
4.4.5 Northeastern Edge of Uranium Plume Area 36
4.4.6 Base of Tailings Pile 39
4.4.7 Southwestern Boundary 39
4.4.8 Riverbank Area 39
4.4.9 Southern and Off-site Areas 43
4.4.10 SMI-PW03 Cluster Sampling Results 45
4.4.11 Surface Water Sampling Results 45
4.5 Groundwater Surface Elevation 47
4.6 Contaminant Distribution 47
5.0 Conclusions 51
5.1 July 2019 Crescent Junction Sampling Event 51
5.2 September 2019 Side Channel Habitat Sampling 51
5.3 September 2019 CF4 and CF5 Sampling Event 52
5.4 December 2019 Site-wide Sampling Event 52
6.0 References 52

Figures

Figure *Page*

Figure 1. Crescent Junction Well 0202 Sampling Location....2
Figure 2. September 2019 Side Channel Habitat Sampling Locations....3
Figure 3. Second Half 2019 CF4 and CF5 Groundwater Sampling Locations....4
Figure 4. December 2019 Site-wide Groundwater Sampling Locations....5
Figure 5. December 2019 Surface Water Sampling Locations....6
Figure 6. September 2019 CF4 Ammonia Groundwater Concentrations....25
Figure 7. September 2019 CF4 Groundwater Elevations....26
Figure 8. September 2019 CF5 Ammonia and Uranium Groundwater Concentrations....27
Figure 9. CF5 Extraction Wells 0810, 0811, 0812, 0813, and SMI-PW02 Time versus Ammonia Concentration Plot....29
Figure 10. CF5 Extraction Wells 0810, 0811, 0812, 0813, and SMI-PW02 Time versus Uranium Concentration Plot....29
Figure 11. CF5 Extraction Wells 0814, 0815, and 0816 Time versus Ammonia Concentration Plot....30
Figure 12. CF5 Extraction Wells 0814, 0815, and 0816 Time versus Uranium Concentration Plot....30
Figure 13. Wells UPD-17 and UPD-18 Time versus Ammonia Concentration Plot....34
Figure 14. Wells UPD-17 and UPD-18 Time versus Uranium Concentration Plot....34
Figure 15. Center of Northeastern Uranium Plume Area Observation Wells 0411, 0413, 0414, and UPD-20 Time versus Ammonia Concentration Plot....35
Figure 16. Center of Northeastern Uranium Plume Area Observation Wells 0411, 0413, 0414, and UPD-20 Time versus Uranium Concentration Plot....35
Figure 17. Vicinity of Atlas Building Observation Wells 0410, UPD-21, UPD-23, and UPD-24 Time versus Ammonia Concentration Plot....37
Figure 18. Vicinity of Atlas Building Observation Wells 0410, UPD-21, UPD-23, and UPD-24 Time versus Uranium Concentration Plot....37
Figure 19. Northeastern Edge of Uranium Plume Area Observation Wells 0412, SMI-MW01, SMI-PZ3S, and UPD-22 Time versus Ammonia Concentration Plot....38
Figure 20. Northeastern Edge of Uranium Plume Area Observation Wells 0412, SMI-MW01, SMI-PZ3S, and UPD-22 Time versus Uranium Concentration Plot....38
Figure 21. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and MW-3 Time versus Ammonia Concentration Plot....40
Figure 22. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and MW-3 Time versus Uranium Concentration Plot....40
Figure 23. Southwestern Boundary Observation Wells 0453, 0454, 0441, and 0440 Time versus Ammonia Concentration Plot....41
Figure 24. Southwestern Boundary Observation Wells 0453, 0454, 0441, and 0440 Time versus Uranium Concentration Plot....41
Figure 25. Riverbank Observation Wells TP-17, 0492, 0407, 0401, 0404, and TP-01 Time versus Ammonia Concentration Plot....42
Figure 26. Riverbank Observation Wells TP-17, 0492, 0407, 0401, 0404, and TP-01 Time versus Uranium Concentration Plot....42
Figure 27. South of Site Observation Wells TP-17 and TP-20 Time versus Ammonia Concentration Plot....44
Figure 28. South of Site Observation Wells TP-17 and TP-20 Time versus Uranium Concentration Plot....44

Figures (*continued*)

Figure *Page*
Figure 29. SMI-PW03 Cluster Time versus Ammonia Concentration Plot....46
Figure 30. SMI-PW03 Cluster Time versus Uranium Concentration Plot....46
Figure 31. Site-wide Groundwater Elevations, October 31 and November 4, 2019....48
Figure 32. Ammonia Plume in Shallow Groundwater, December 2019....49
Figure 33. Uranium Plume in Shallow Groundwater, December 2019 50

Tables

Table *Page*
Table 1. July 2019 Crescent Junction Sampling Event, Analytes and Methods....10
Table 2. July 2019 Crescent Junction Sampling Event, Data Qualifiers 10
Table 3. July 2019 Crescent Junction Sampling Event, Reason Codes for Data Flags 11
Table 4. September 2019 CF4 and CF5 Sampling Event, Analytes and Methods 13
Table 5. September 2019 CF4 and CF5 Sampling Event, Data Qualifiers....13
Table 6. September 2019 CF4 and CF5 Sampling Event, Reason Codes for Data Flags....13
Table 7. December 2019 Site-wide Sampling Event, Analytes and Methods 16
Table 8. December 2019 Site-wide Sampling Event, Data Qualifiers....16
Table 9. December 2019 Site-wide Sampling Event, Reason Codes for Data Flags 16
Table 10. December 2019 Site-wide Sampling Event, Sample Shipping/Receiving....16
Table 11. Anomalous Data Associated with the December 2019 Site-wide Sampling Event....19
Table 12. Crescent Junction Wells 0202 and 0205 Analyte Concentrations, March and July 2019....20
Table 13. September 2019 Side Channel Habitat Surface Water Ammonia Concentrations and Comparisons to EPA Acute and Chronic Criteria 22
Table 14. CF4 Monitoring Well Ammonia Concentrations, January and September 2019 24
Table 15. July through December 2019 Sampling Events, Groundwater Locations Meeting or Exceeding the 0.044 milligrams per liter Uranium Groundwater Standard 31
Table 16. December 2019 Groundwater Locations Exceeding the Arsenic National Primary Drinking Water Standard 32
Table 17. December 2019 Groundwater Locations Exceeding the Selenium National Primary Drinking Water Standard....33
Table 18. December 2019 Site-wide Surface Water Ammonia Concentrations and Comparisons to EPA Acute and Chronic Criteria 45

Appendices

Appendix		*Page*
Appendix A.	July 2019 Crescent Junction Sampling Event	
	Water Sampling Field Activities Verification	A-1
	Water Quality Data	A-3
	Water Level Data	A-6
	Trip Report	A-7
Appendix B.	September 2019 Side Channel Habitat Sampling	
	Water Sampling Field Activities Verification	B-1
	Sampling Location Results	B-3
Appendix C.	September 2019 CF4 and CF5 Sampling Event	
	Water Sampling Field Activities Verification	C-1
	Minimums and Maximums Report	C-3
	Water Quality Data	C-4
	Water Level Data	C-13
	Trip Report	C-14
Appendix D.	December 2019 Site-wide Sampling Event	
	Water Sampling Field Activities Verification	D-1
	Minimums and Maximums Report	D-3
	Blanks Report	D-5
	Water Quality Data	D-6
	Water Level Data	D-34
	Trip Report	D-36

Acronyms and Abbreviations

bgs	below ground surface
CCB	continuing calibration blank
CCV	continuing calibration verification
CF	Configuration
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeter
COC	chain-of-custody
CRI	reporting limit verification
DOE	U.S. Department of Energy
EB	equipment blank
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ft	feet or foot
gpm	gallons per minute
GWP	Groundwater Program
ICB	initial calibration blank
ICP	inductively coupled plasma
ICV	initial calibration verification
IDL	instrument detection limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
µmhos	micro ohms
MB	method blank
MDL	method detection limit
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
QC	quality control
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

1.0 Introduction

1.1 Purpose

The purpose of this semi-annual report is to summarize the results associated with groundwater and surface water samples collected from the U.S. Department of Energy (DOE) Moab Uranium Mill Tailings Remedial Action (UMTRA) Project site during the second half of 2019. The results of the data validation process are also presented.

Three scheduled sampling events and one additional series of samples were collected during this time frame. The first scheduled event included the collection of a sample from the Crescent Junction well 0202 (Figure 1) sampling in July 2019 as part of the quarterly monitoring for the third quarter of 2019.

Starting on September 11 and through September 30, samples were collected weekly (four weeks total) from the side channel off CF4 that contained segments that met the criteria of being a suitable habitat. Samples were collected from the locations shown on Figure 2.

The second scheduled event was completed in September 2019 when samples were collected from CF4 monitoring wells and the CF5 extraction wells (Figure 3), and the third and final scheduled event was completed in December 2019. Samples were collected from a variety of site-wide groundwater and surface water locations, as shown on Figures 4 and 5, respectively.

1.2 Scope

This report 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 Surface Water/Groundwater Sampling and Analysis Plan* (DOE-EM/GJTAC1830). All data validation follows criteria in the *Moab UMTRA Project Standard Practice for Validation of Laboratory Data* (DOE-EM/GJTAC1855).

Appendix A provides the Water Sampling Field Activities Verification, Water Quality Data, Water Level Data, and the trip report associated with the July 2019 Crescent Junction. Appendix B contains the Water Sampling Field Activities Verification, Water Quality Data, and maps containing the habitat sampling results.

Appendices C and D include the Water Sampling Field Activities Verifications, Water Quality Data, Water Level Data, the Minimums and Maximums Reports, and trip reports for the September 2019 CF4/CF5 sampling and December 2019 site-wide sampling events, respectively. Appendix D also contains the data associated with the trip blank collected during the site-wide event.

All Colorado River flows discussed in this document were measured from the U.S. Geological Survey Cisco gaging station number 09180500. River elevation data were collected adjacent to the site.

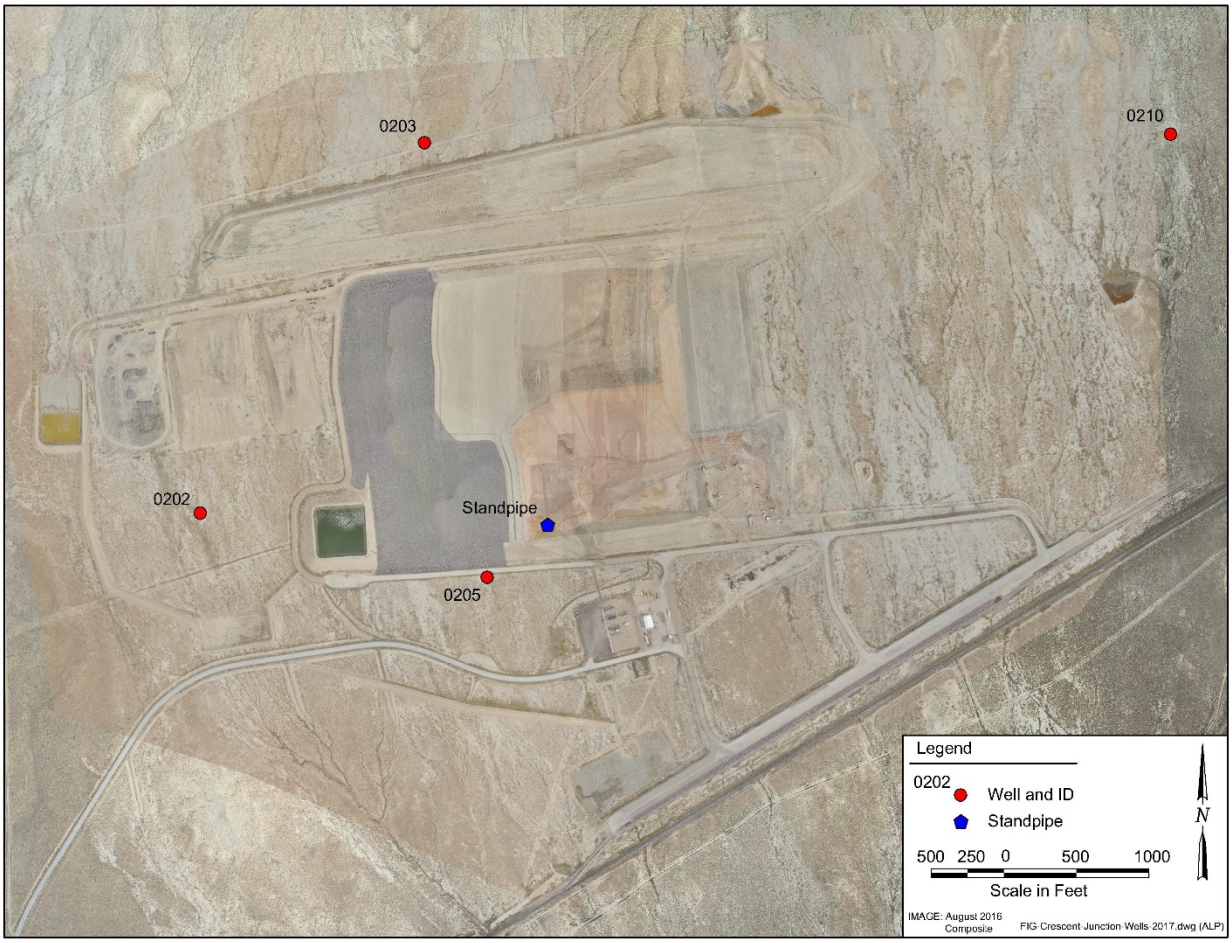

Figure 1. Crescent Junction Well 0202 Sampling Location

The Minimums and Maximums Reports were generated (by the MESa database) to determine if the applicable data were within a normal statistical range. The new data sets were compared to the historical data to determine if the new data fall outside the historical 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.

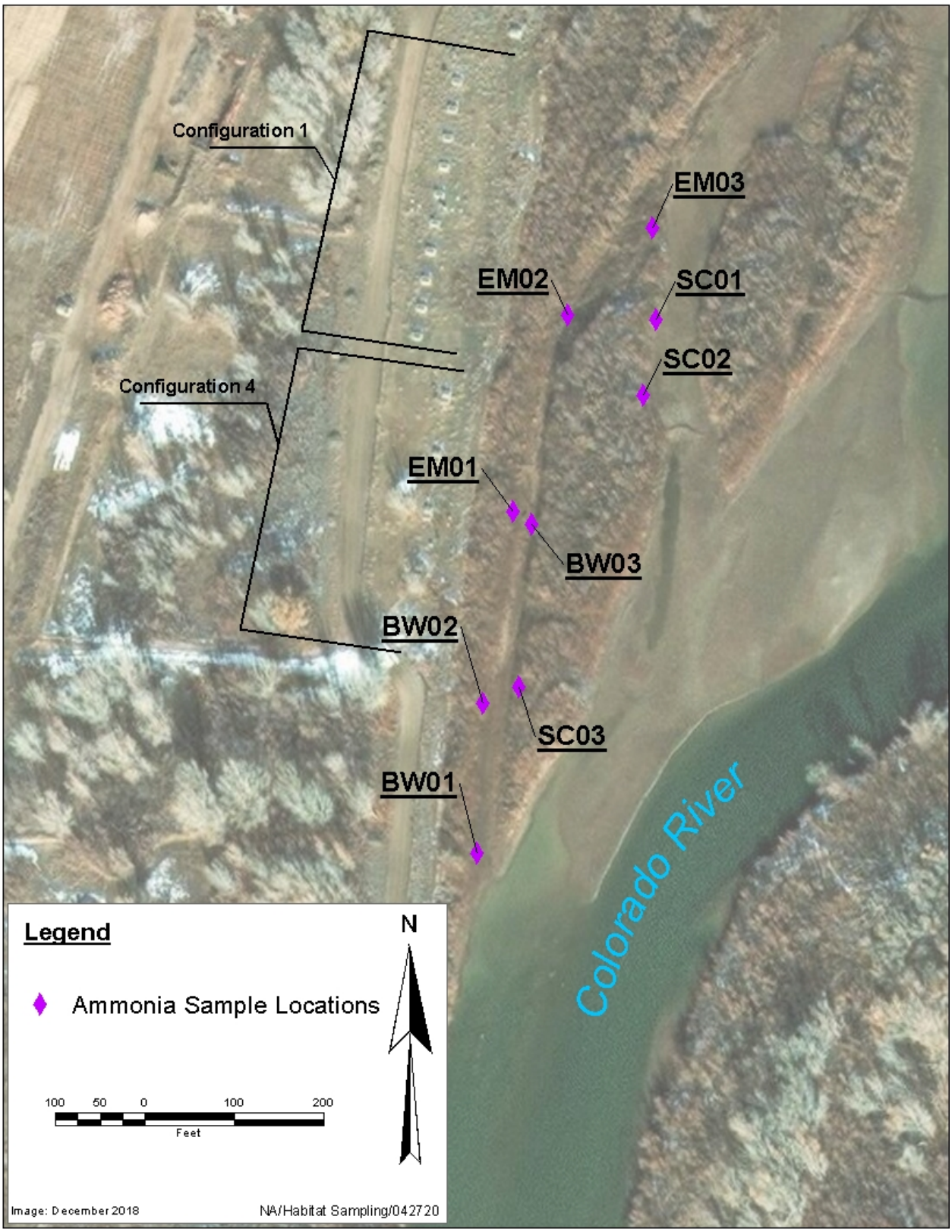

Figure 2. September 2019 Side Channel Habitat Sampling Locations

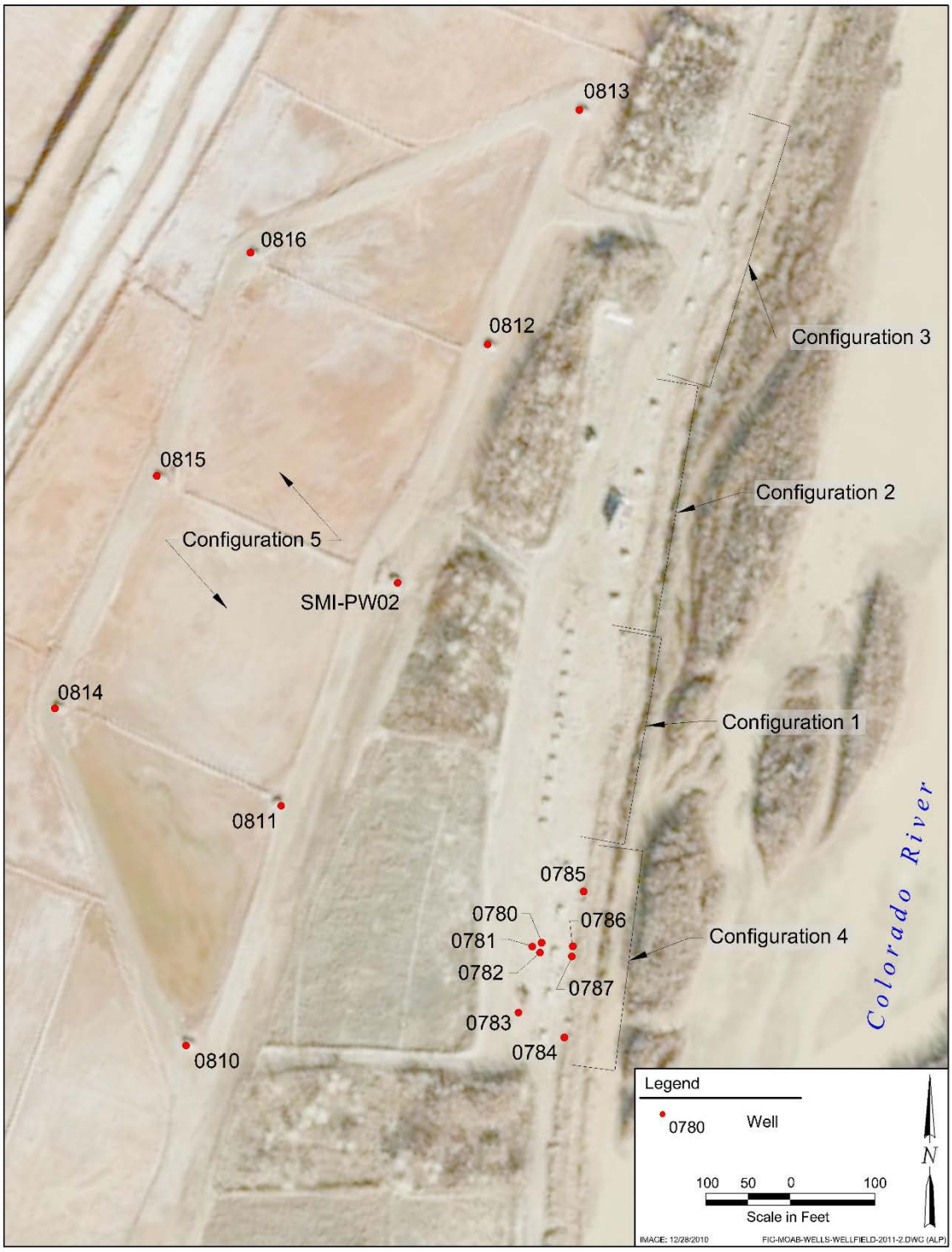

Figure 3. Second Half 2019 CF4 and CF5 Groundwater Sampling Locations

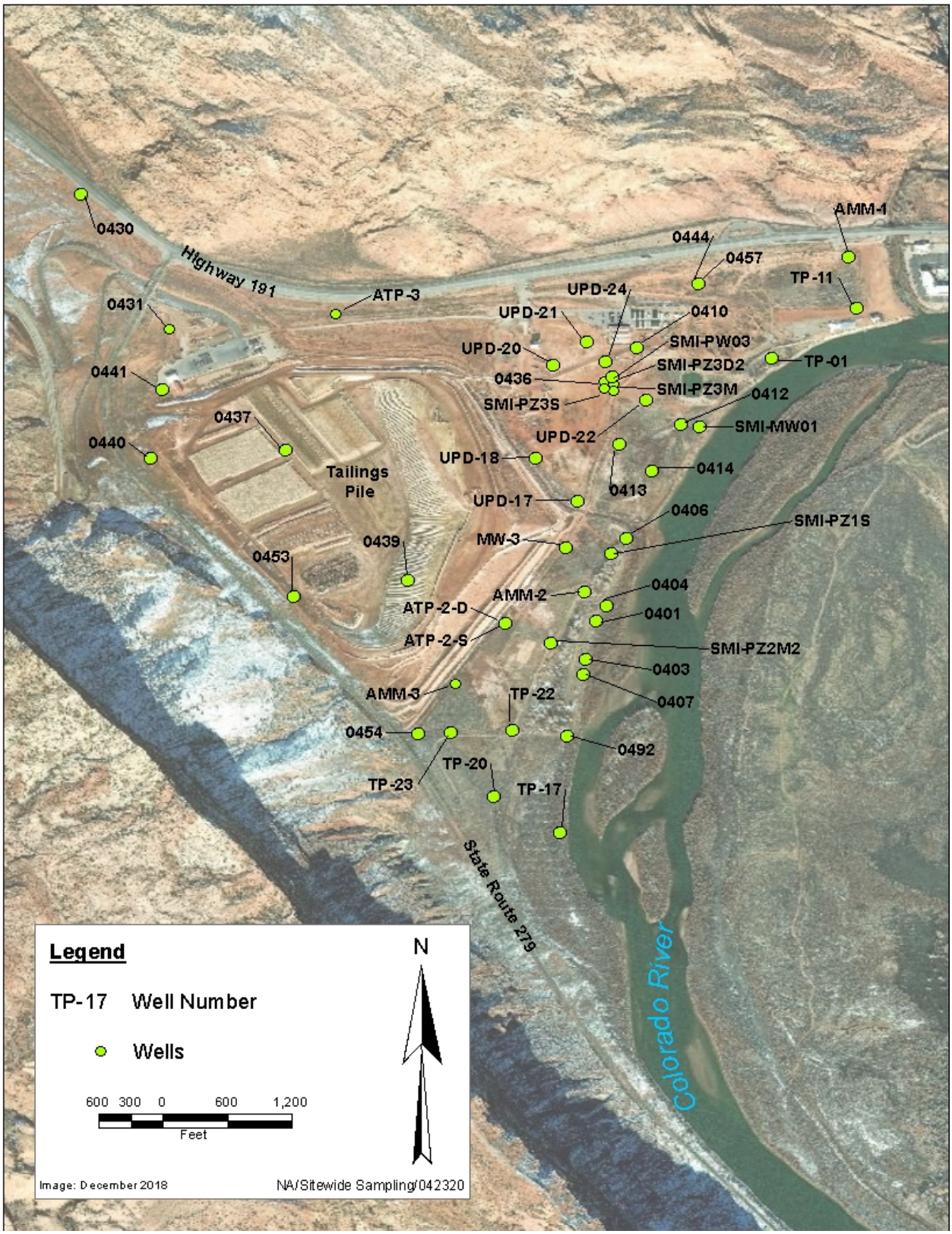

Figure 4. December 2019 Site-wide Groundwater Sampling Locations

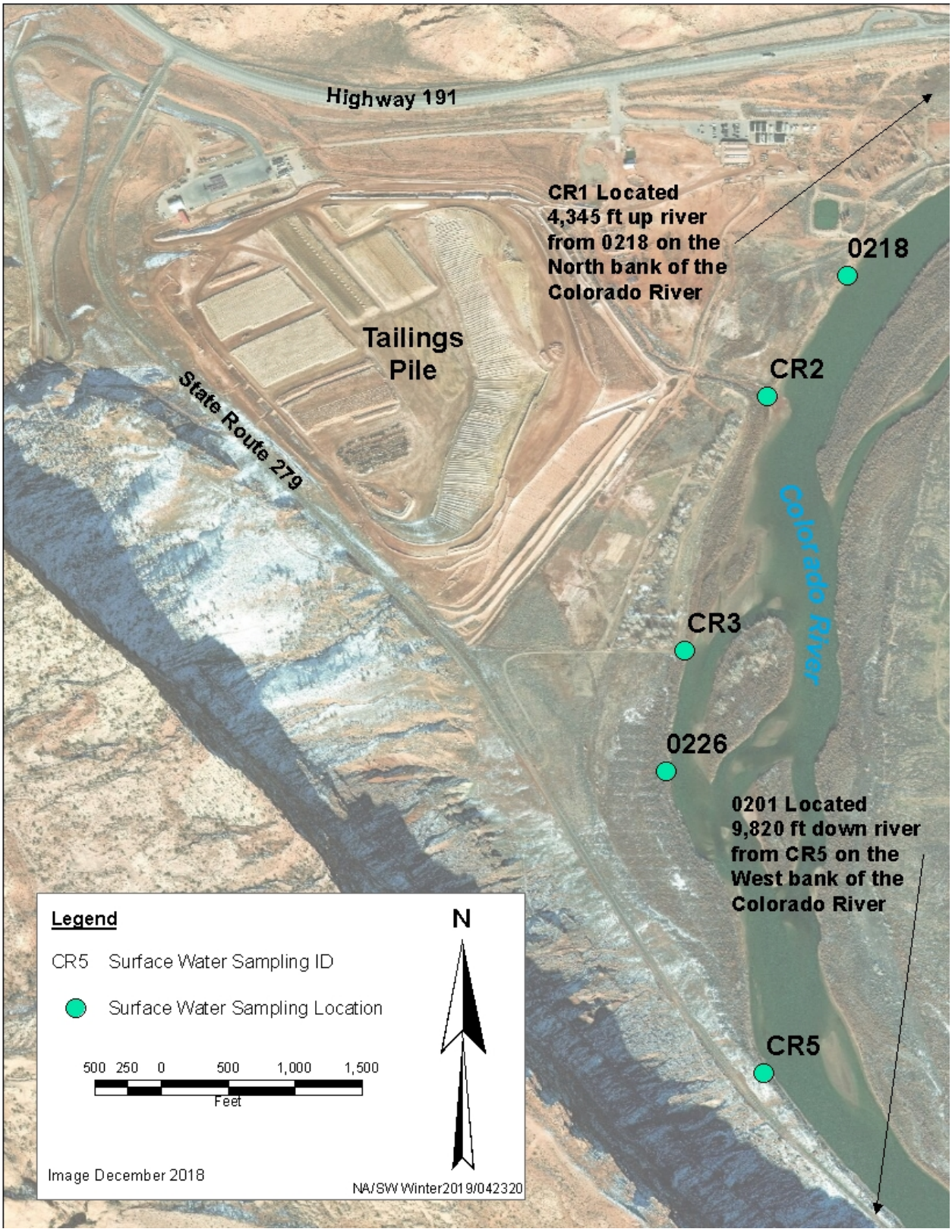

Figure 5. December 2019 Surface Water Sampling Locations

2.0 Summary of Sampling Events

2.1 July 2019 Crescent Junction Sampling Event

A groundwater sample was collected from well 0202 as part of the quarterly monitoring at the Crescent Junction site. If water is present in any of the four monitoring wells during a quarterly monitoring event, a sample is typically collected to determine the water source. Water was first encountered at this location in late June 2019, and the sample collected in July 2019 represents the first time a sample was collected from well 0202 and submitted for analysis.

2.2 September 2019 Side Channel Habitat Sampling

By the second week of September, segments of the side channel located off CF4 were beginning to develop into a suitable habitat. To characterize this side channel and locate the areas of elevated ammonia concentrations, nine surface water samples were collected on September 11.

All samples collected were analyzed using a field ammonia probe, which provided same day results, and assisted with the deployment of the surface water diversion system. Subsequent sampling from six of these locations occurred on September 17, 23, and 30.

2.3 September 2019 CF4 and CF5 Sampling Event

Groundwater samples were collected from the eight CF4 monitoring wells to measure the groundwater contaminant concentrations in September 2019 and determine how effective the freshwater injection system is in diluting the ammonia concentrations (particularly downgradient of the CF4 injection wells). The freshwater injection system was shut down at the beginning of May 2019 due to the high river stage and imminent flooding of the well field.

The system was then restarted in the beginning of September 2019, and because of the re-development of these injection wells between September 11 and 18, more than one million gallons of fresh water were injected into the subsurface over a relatively short period of time prior to this sampling event.

As a result, these ammonia concentrations represent the groundwater system conditions after significant flooding of the site, supplemented by the enhanced (due to the development activities) volume of fresh water injected into the subsurface over less than one month’s time.

Groundwater samples were also collected from the eight CF5 groundwater extraction wells during this event. These data were utilized to measure the most recent contaminant mass removed through the groundwater extraction system and to update the system overall mass removal calculations.

2.4 December 2019 Site-wide Sampling Event

Fifty-four groundwater and surface water samples were collected as part of the site-wide event in December 2019. Site-wide groundwater sampling was conducted to assess any changes and trends in water quality, and the surface water samples associated with this event were collected to assess surface water quality adjacent to the site compared to upstream and downstream water quality. This event corresponds to the time frame when the Colorado River is experiencing base flow conditions.

The 47 groundwater 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 sampled. The seven surface water samples were collected upstream, downstream, and adjacent to the site during this event. All samples were submitted to the ALS Environmental laboratory for ammonia and uranium analysis. Select locations were also analyzed for arsenic and selenium.

3.0 Data Assessment

The following definitions are associated with the data validation process and apply to Section 3.0. Data validation details are provided in the following sections of this report for the individual sampling events.

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 continues to produce acceptable qualitative and quantitative data.

In addition, for inductively coupled plasma (ICP) analytes (uranium), reporting limit verifications (CRIs) verify the linearity of the calibration curve near the reporting limit (RL). For ICP-mass spectrometry analytes (uranium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. For ICP-mass spectrometry analyte uranium, internal standards are also analyzed to indicate stability of the instruments.

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. Depending on method requirements, detected sample results greater than the method detection limit (MDL) or instrument detection limit (IDL) were qualified “J” when the detections were less than five times the blank concentration. Non-detects were not qualified.

Laboratory Control Sample Duplicates
Matrix spike (MS) samples may not be generated due to a limited sample volume. Instead, laboratory control sample (LCS) duplicates **(**LCSDs) are performed. LCSDs that contain known concentrations of the analyte of interest are prepared in the laboratory. The results are used to demonstrate the laboratory is in control of the preparation and analysis of samples.

Matrix Spike and Replicate Analysis
MS sample analysis, performed at a frequency of one per 20 samples unless otherwise noted, is a measure of the ability to recover analytes in a particular matrix. The MS sample results are required to be within the recovery limits.

Laboratory Replicate Analysis
The laboratory replicate results demonstrate acceptable laboratory precision. The relative percent difference (RPD) values for the reported matrix spike duplicate (MSD) results for all other analytes should be less than 20 percent for results greater than five times the RL.

Field Duplicate Analysis
Field duplicate samples are collected and analyzed as an indication of the 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. The duplicate results must meet the U.S. Environmental Protection Agency (EPA)-recommended laboratory duplicate criteria of less than 20 RPD for results that are greater than five times the RL.

Laboratory Control Samples
LCSs provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. Per national environmental laboratory accreditation requirements provided by the NELAC Institute, an MS may be used in place of an LCS provided the acceptance criteria are as stringent.

Metals Serial Dilution
Serial dilution (SD) samples are prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix.

Detection Limits/Dilutions
Dilutions are prepared in a consistent and acceptable manner when they are required. CRIs are re-run at the beginning of each analytical run as a measure of accuracy near the RL. CRIs were made at the required frequency to verify the linearity of the calibration curve near the RL.

3.1 July 2019 Crescent Junction 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 2, Data Deliverables Examination. All analyses were successfully completed.

General Information and Validation Results

Report Identification Number (RIN) : 1907116
Laboratory: ALS Environmental, Fort Collins, Colorado
Sample Data Group (SDG) Number: 1907271
Analysis: Metals, Inorganics, Isotopic Uranium
Validator: James Ritchey
Review Date: 4 April 2020

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

Table 1. July 2019 Crescent Junction Sampling Event, Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia as N, NH_3-N	EPA 350.1	EPA 350.1
Alkalinity	EPA 310.1	EPA 310.1
Bicarbonate	EPA 310.1	EPA 310.1
Carbonate	EPA 310.1	EPA 310.1
Nitrate/Nitrite as N	EPA 353.2	EPA 353.2
Bromide	EPA 300.0 Rev 2.1	300.0 Rev 2.1
Chloride	EPA 300.0 Rev 2.1	300.0 Rev 2.1
Fluoride	EPA 300.0 Rev 2.1	300.0 Rev 2.1
Sulfate	EPA 300.0 Rev 2.1	300.0 Rev 2.1
Arsenic, Barium, Boron, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Potassium, Selenium, Silver, Sodium	SW-6010B	EPA 6010B
Uranium	SW-846- 3005A	SW-846 6020A
Total Dissolved Solids	EPA 160.1	540 C
Isotopic Uranium	SOP 776/778	SOP 714

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. July 2019 Crescent Junction Sampling Event, Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1907271-1	0202	Inorganics	J	MS-1, MSD-1
1907271-1	0202	All Metals	J	MS-1, MSD-1, SD-1
1907271-1	0202	Isotopic Uranium	J	MS-1, MSD-1, SD-1

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

Table 3. July 2019 Crescent Junction Sampling Event, Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
MS-1, MSD-1	J	UJ	Per method requirements, matrix QC was performed for this analysis, however, a sample from this order number was not the selected QC sample. Therefore, the data were not included in the narrative.
SD-1	J	N/A	Serial dilution analysis was not conducted on any samples.

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

Sample Shipping/Receiving

ALS Environmental in Fort Collins, Colorado, received one sample for RIN 1907116 in a shipment of one cooler. The shipment (SDG 190721) contained one groundwater sample (in six bottles) from Crescent Junction well 0202. The temperature of the cooler was 3.2°C, and it arrived on July 12, 2019 (Tracking number 1Z5W1Y510192581288).

The Chain of Custody (COC) forms were checked to confirm that all of the samples were listed on the form with sample collection dates and times, and 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

The samples were received in the correct container types and had been correctly preserved for the requested analyses. The sample was analyzed within the applicable holding time.

Case Narratives

The case narratives were reviewed, and all detects where found to be within quality control procedures except for the following:

Uranium-234 activity is reported in MB AS190730-2MB as above the minimum detectable concentration value, as indicated with a "B3" qualifier on the final reports. The measured blank activity is below the requested MDC. Results are acceptable according to the current revision of SOP 715 and are submitted without further qualification.

Due to limited volume and being prepared at a reduced aliquot, the requested MDC for U-234, U-235 and U-238 was not met for sample 1907271-1. The reported activity for this sample is greater than the achieved MDC. This sample is identified with "M3" flags on the final reports.

Matrix Spike and Replicate Analysis

For all analyses, the selected quality control samples were from another client and not included in the narrative. As a result, there was not a MSD or a SD sample analysis. Therefore, all of the data are flagged "J" for reasons MS-1, MSD-1, and metals and isotopic uranium data were also flagged for reason SD-1.

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 August 14, 2019. 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
Because this event represents the first time this location was sampled, it was not possible to generate a Minimums and Maximums Report for this event.

3.2 September 2019 Side Channel Habitat Sampling

3.2.1 Laboratory Performance Assessment

All samples collected as part of the side channel habitat sampling were analyzed with the field ammonia probe in the on-site groundwater laboratory. Because these samples were not submitted to ALS Environmental for analysis, it was not possible to complete a full laboratory assessment. In addition, these samples were not assigned RIN or SDG numbers.

The actual collection of the samples followed the procedures contained in the *Sampling and Analysis Plan*. All samples were analyzed using a Hach Sension2 portable meter with an ammonia gas-sensing, combination probe (model 51927-00), and the analyses were completed following the manufacturer's instructions. The probe was calibrated before the start of analyzing any group of samples.

The samples were analyzed within 48 hours of collection, so there were no issues associated with exceeding holding times.

3.3 September 2019 CF4 and CF5 Sampling Event

3.3.1 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	1909117
Laboratory:	ALS Environmental, Fort Collins, Colorado
SDG Numbers:	1909586
Analysis:	Metals and Inorganics
Validator:	James Ritchey
Review Date:	26 March 2020

The samples were prepared and analyzed using accepted procedures as shown in Table 4.

Table 4. September 2019 CF4 and CF5 Sampling Event, Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia as N, NH_3-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 5. Refer to Table 6 for an explanation of the data qualifiers applied.

Table 5. September 2019 CF4 and CF5 Sampling Event, Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1909586-1 through -16	All in SDG 1909586	Uranium	J	MS-1, MSD-1, SD-1
1909586-1 through -16	All in SDG 1909586	Ammonia	J	MSD-1

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

Table 6. September 2019 CF4 and CF5 Sampling Event, Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
SD-1	J	U	No serial dilutions were run during the uranium analysis.
MS-1	J	U	The MS sample for the sample group was from another client.
MSD-1	J	U	No MSD data were included in the narrative.

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

Sample Shipping/Receiving

ALS Environmental received a total of 17 samples for RIN 1909117 in one shipment, which arrived on September 27, 2019 (UPS tracking number 1Z5W1Y510194050142). The SDG was accompanied by a chain-of-custody (COC) form.

The COC forms were checked to confirm that all of the samples were listed on the form with sample collection dates and times, and 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 1909586 was received intact with a temperature of 2.1°C, which complies with requirements. All samples were received in the correct container types. All samples were analyzed within the applicable holding times.

Case Narratives

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

Laboratory Instrument Calibration

Method SW-846 6020A, Uranium

The initial calibrations were all performed using four 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 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 the SDG.

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 calibration for ammonia as N was performed using five calibration standards and one blank. The calibration curve had a r^2 value greater than 0.995. ICV and CCV checks were made at the required frequency. All calibration check results were within the acceptance criteria.

Method and Calibration Blanks

None of the CCBs on the ammonia SDG 1909586 were above the MDL and none of the sample results were less than five times the highest CCB; therefore, no locations were flagged.

None of the CCBs on uranium SDG 1909586 were above the MDL and no sample results were less than five times the highest CCB; therefore, no locations had to be flagged.

Matrix Spike Analysis

All of the ammonia matrix spikes met the requirements for frequency and percent recovery, so no data had to be qualified. For the uranium SDG, the MS sample that was selected for QC analysis was from another client and the information was not included in the analysis. Therefore, all of the uranium data were flagged “J” for reason MS-1.

Laboratory Replicate Analysis

The uranium SDGs did not contain an MS or MSD sample; therefore, all of the uranium data are flagged “J” for reason MSD-1.

A matrix spike was performed for the ammonia SDG and was within the recovery range. However, a matrix spike duplicate was not performed and so the data were flagged “J” for reason MSD-1.

Field Duplicate Analysis

A duplicate sample was collected from location 0782 (1909586-16). The duplicate results met the U.S. Environmental Protection Agency (EPA) recommended laboratory duplicate criteria of less than 20 percent relative difference (RPD) for results that are greater than five times the RL.

Laboratory Control Samples
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 Serial Dilution
Since no serial dilution samples were run on the uranium samples in any of the SDGs, the uranium samples were flagged "J" for reason SD-1.

Detection Limits/Dilutions
Dilutions were prepared in a consistent and acceptable manner when they 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.

Electronic Data Deliverable Files
The Electronic Data Deliverable (EDD) files arrived October 31, 2019. 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.

3.3.2 Minimums and Maximums Report and Anomalous Data Review
Appendix C contains the Minimums and Maximums Report for this sampling event. Based on the results, all concentrations were within the acceptable ranges, and there were no anomalous data values associated with this sampling event.

3.4 December 2019 Site-wide Sampling Event

3.4.1 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	1912118
Laboratory:	ALS Environmental, Fort Collins, Colorado
SDG Numbers:	1912361, 1912414, 2001075
Analysis:	Metals and Inorganics
Validator:	Nina Andrews
Review Date:	26 March 2020

The samples were prepared and analyzed using accepted procedures as shown in Table 7. Analytical results were qualified as listed in Table 8. Refer to Table 9 for an explanation of the data qualifiers applied.

Table 7. December 2019 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
Arsenic	SW-846 3005A	ICP-MS 6020B
Selenium	SW-846 3005A	ICP-MS 6020B

Table 8. December 2019 Site-wide Sampling Event, Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1912361-1 through 21 1912414 -1 through 22 2001075 -1 through 15	All in each metals SDG	Uranium and Arsenic	J	MS-1, MSD-1, SD-1
1912361-1 through 21 1912414 -1 through 22	All in SDGs 1912361 and SDG 1912414	Selenium	J	MS-1, MSD-1, SD-1
1912361-1 through 21	All in SDG 1912361	Ammonia	J	MS-2, MSD-1
1912414 -1 through 22	All in SDG 1912414	Ammonia	J	MS-2, MSD-1
2001075 -1 through 15	All in SDG 2001075	Ammonia	J	MS-2, MSD-1
2001075-1 through 3 and 2001075-11 through 14	0201, 0218, 0226, CR1, CR2, CR3, and CR5	Uranium	J	EB-1

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

Table 9. December 2019 Site-wide Sampling Event, Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
SD-1	J	U	No serial dilutions were run during the uranium analysis.
MS-1	J	U	No MS data were included in narrative.
MSD-1	J	U	No MSD data were included in the narrative.
MS-2	J	U	The MS failed due to a low percent recovery.
EB-1	J	U	Equipment blank higher than method detection limit.

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

Sample Shipping/Receiving

ALS Environmental in Fort Collins, Colorado, received a total of 58 samples for RIN 1912118 in three shipments (Table 10).

Table 10. December 2019 Site-wide Sampling Event, Sample Shipping/Receiving

SDG	Number of Samples	Arrival Date	UPS Tracking Number
1912361	21	12/18/2019	1Z5W1Y510195168096
1912414	22	12/20/219	1Z5W1Y510191581404
2001075	15	1/8/2020	1Z5W1Y510195339339

The three SDGs were accompanied by a COC form. The COC form was checked to confirm 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

All of the SDGs were received intact. SDG 1912361 was received with a temperature of 5.3°C, SDG 1912414 was received with a temperature of 1.9°C, and SDG 2001075 was received with a temperature of 0.4°C. The samples associated with SDG 1912361 did arrive at the lab below their 6.0°C threshold, and ice was present in the cooler. All samples were received in the correct container types and were analyzed within the applicable holding times.

Laboratory Instrument Calibration

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, arsenic, and selenium), reporting limit verifications (CRIs) verify the linearity of the calibration curve near the reporting limit (RL). For ICP-Mass Spectrometry (ICP-MS) analytes (uranium, arsenic, and selenium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. Additionally, for ICP-MS analytes uranium, arsenic, and selenium internal standards are analyzed to indicate stability of the instruments.

Method SW-846 6020A, Uranium

The initial calibrations were all performed using four 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.

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 ICP-MS 6020B, Arsenic and Selenium

The initial calibrations were all performed using four 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 arsenic, and selenium were positive and less than three times the 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.

EPA 350.1, Ammonia as N

Initial calibrations for ammonia as N on all SDGs were performed using five calibration standards and one blank. The calibration curve had a r^2 value greater than 0.995.

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

All CCBs for ammonia on all three SDGs reported lower than the IDL so no samples had to be flagged for ammonia, arsenic, and uranium.

All CCBs for selenium on SDG 1912361 and SDG 1912414 reported lower than the IDL so no samples had to be flagged for selenium. Selenium was not analyzed for in SDG 2001075.

Equipment Blanks

One equipment blank (location 2003, 2001075-9) was collected after the surface water tubing was decontaminated. The result had 0.2 milligrams per liter (mg/L) of ammonia (which is the reporting limit) and all the surface water samples also had 0.2 mg/L of ammonia so none were flagged. However, all of the surface water samples had uranium results higher than the 1.2 ug/L of the equipment blank, therefore all uranium results were flagged. With the equipment blank result being higher than the reporting limit for uranium, it is possible that the surface water samples may have been contaminated by the equipment, possibly yielding higher results. All results were higher than the reporting limit for uranium at 0.1 ug/L.

Matrix Spike Analysis

For all of the uranium, arsenic, and selenium SDGs, the MS sample that was selected for QC analysis was from another client and the information was not included in the analysis. Therefore, all of the metals data on were flagged “J” for reason MS-1.

All three ammonia SDGs (1912361, 1912414, and 2001075) had a low recovery on the matrix spike analysis. Therefore, all of the ammonia data in SDGs 1912361, 1912414, and 2001075 have been flagged “J” for reason MS-2.

Laboratory Replicate Analysis

The metals SDGs did not contain an MS or MSD sample; therefore, all of the uranium, arsenic, and selenium data are flagged “J” for reason MSD-1. For Ammonia there were no matrix spike duplicates run for any of the SDGs so all samples were flagged for MSD-1; lack of matrix spike duplicates. All samples in SDGs 1912361, 1912414, and 2001075 were flagged for a matrix spike failing due to low recovery.

Field Duplicate Analysis
Duplicate samples were collected from locations SMI-PZ3S (1912361-19), 0407 (1912414-9), and 0226 (2001075-3), The duplicate results met the U.S. Environmental Protection Agency (EPA) recommended laboratory duplicate criteria of less than 20 percent relative difference (RPD) for results that are greater than five times the RL.

Laboratory Control Samples
LCS results were acceptable for ammonia analyses. Since no MSs were run for uranium, arsenic, or selenium from our samples all SDGs were flagged MS-1 and could also not be used instead of the LCS.

Metals Serial Dilution
Since no serial dilution samples were run on the uranium, arsenic, or selenium samples in any of the SDGs, all the metals samples were flagged "J" for reason SD-1.

Detection Limits/Dilutions
Dilutions were prepared in a consistent and acceptable manner when they 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.

Electronic Data Deliverable Files
The Electronic Data Deliverable (EDD) files arrived January 8, January 2, and January 24, 2020. 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.

3.4.2 Minimums and Maximums Report and Anomalous Data Review

The Minimums and Maximums Report for this sampling event is located in Appendix D. There were three anomalous data points, one based on the arsenic result from the sample collected from ATP-2-D, and two from the selenium results associated with the samples collected from locations 0412 and 0413. All three anomalous data points were below the historical minimum associated with each of these locations, as shown in Table 11.

Table 11. Anomalous Data Associated with the December 2019 Site-wide Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Historical Maximum (mg/L)	Disposition
0412	12/05/2019	Selenium	0.0099	0.029	0.1	First time sample analyzed for this analyte since 2011, and result impacted by different detection limit.
0413	12/05/2019	Selenium	0.047	0.14	0.3	First time sample analyzed for this analyte since 2011, and result impacted by different detection limit.
ATP-2-D	12/09/2019	Arsenic	0.00015	0.00035	0.1	First time sample analyzed for this analyte since 2002, and result impacted by different detection limit.

4.0 Results

4.1 July 2019 Crescent Junction Sampling Event Results

Table 12 displays the analytical results of the July 2019 samples collected from well 0202, along with the results from the most recent sampling of well 0205 in March 2019. These results are presented together for comparison purposes, and to determine if the water present at both locations is from the same source.

Table 12. Crescent Junction Wells 0202 and 0205 Analyte Concentrations, March and July 2019

Analyte	Well 0205 Analyte Concentration on 03/19/2019	Well 0202 Analyte Concentration on 7/11/2019
Ammonia as N	13	14
Arsenic	0.039#	0.0039#
Bicarbonate as $CaCO_3$	1,100	1,200
Boron	1.4	1.5
Bromide	20#	12
Cadmium	0.0033#	0.00033#
Calcium	330	410
Carbonate as $CaCO_3$	20#	50#
Chloride	3,500	7,200
Chromium	0.0051#	0.0051#
Copper	0.0097#	0.0047
Fluoride	10#	1#
Iron	0.049#	0.050#
Lead	0.013#	0.0013#
Magnesium	820	730
Manganese	0.36	0.44
Molybdenum	0.011#	0.011#
Nitrate/ Nitrite as N	960	450
Potassium	47	94
Selenium	3.1	0.027#
Sodium	8,500	8,900
Sulfate	23,000	28,000
Total Alkalinity as $CaCO_3$	1,100	1,200
Total Dissolved Solids	39,000	24,000
Uranium $_{234}$	30.1 +/- 6 pCi/L	37.2 +/- 6.6 pCi/L
Uranium $_{235}$	1.45 +/- 0.75 pCi/L	0.49 +/- 0.32 pCi/L
Uranium $_{238}$	12.2 +/- 2.8 pCi/L	8.2 +/- 1.8 pCi/L
Uranium	0.025	0.025

= Concentration at or below the detection limit
Note: All concentrations in mg/L, except where noted

Results indicate the water type collected from 0202 is similar to the water sampled from 0205, and different from the water type associated with the sample collected from 0202 in 2006 when it was approximately 300 ft deep.

Field observations noted the water from both locations had a distinctive yellow color during the sample purging process.

Compared to the March 2019 well 0205 results, the 0202 water had more than two times the chloride, less than half the nitrate/nitrite as N, the sulfate concentration was 22 percent higher, and the TDS concentration was 38 percent lower. As far as uranium isotopes are concerned, the U-234 concentration was 24 percent higher in the 0202 sample, the U-235 concentration was 66 percent lower, and the U-238 concentration was 33 percent lower. However, these isotope concentrations were all relatively low; that is below 40 picocuries per liter pCi/L for U-234, less than 1.5 pCi/L for U-235, and less than 15 pCi/L for U-238).

One significant difference between these wells is the rate at which the water recharges into the well, with the recharge rate much slower in well 0202, 0.002 gallons per minute (gpm), compared to well 0205 (most recently 0.035 gpm). Based on the available information the source of this water is possibly associated with surface runoff from precipitation events that is migrating through subsurface fractures and into the well. Subsequent samples will be collected from this location as long as water is present in this well, and these results will provide additional information.

4.2 September 2019 Side Channel Habitat Sampling Results

After the Colorado River spring runoff flows peak and through the end of September is the timeframe when a suitable habitat may be utilized by endangered fish species. Once the river flows drop below approximately 5,000 cubic feet per second (cfs), typically a side channel off the CF4 wells may develop into a suitable habitat. The Groundwater Program (GWP) has a procedure in place to monitor the side channels during July through September to determine if a suitable habitat develops. Once a suitable habitat is identified, it is monitored for the presence of any fish, and surface water samples may be collected and analyzed with the ammonia probe to determine if ammonia concentrations exceed EPA chronic or acute criteria.

Starting in August 2019, personnel identified a side channel that had a high potential to develop into a suitable habitat, and by early September, personnel confirmed its presence. This suitable habitat varied from previous habitats that developed off the site as a beaver dam was actively being built across the side channel.

The first series of surface water samples for ammonia probe analysis were collected from nine locations (Figure 2) on September 11, when the river flow was 4,160 cfs. Table 13 presents the ammonia results from the surface water sampling as part of this sampling effort from all four weeks. The ammonia concentrations 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 presented.

The results indicated that one (BW02) of the nine samples collected on September 11 exceeded both the acute and chronic criteria, while three others exceeded only the chronic criteria (from locations BW03, EM01, and EM02). The freshwater injection system was re-started on September 3, and the approach to addressing the slightly elevated ammonia concentrations that were measured at the base of the river bank (up to 5.6 mg/L) was to allow the injection system some time to reduce the concentrations.

Table 13. September 2019 Side Channel Habitat Surface Water Ammonia Concentrations and Comparisons to EPA Acute and Chronic Criteria

September 11, 2019					
Location	**Temp (ºC)**	**pH**	**Ammonia as N (mg/L)**	**EPA - Acute Total as N (mg/L)***	**EPA - Chronic Total as N (mg/L)****
BW01	22.30	NA	0.78	NA	NA
BW02	20.78	8.56	4.16	2.8	0.26
BW03	17.91	8.11	4.33	7.3	0.76
EM01	17.77	8.01	5.6	8.8	0.88
EM02	18.44	8.15	3.33	6.0	0.65
EM03	20.83	8.38	0.38	4.1	0.39
SC01	21.38	NA	0.22	NA	NA
SC02	21.44	8.51	0.22	3.3	0.33
SC03	21.84	8.50	0.23	3.3	0.31
September 17, 2019					
Location	**Temp (ºC)**	**pH**	**Ammonia as N (mg/L)**	**EPA - Acute Total as N (mg/L)***	**EPA - Chronic Total as N (mg/L)****
BW01	21.50	8.99	0.25	1.4	0.14
BW02	20.47	8.27	0.26	4.9	0.49
BW03	19.10	8.23	0.27	6.0	0.61
EM01	18.65	8.23	0.28	6.0	0.61
EM02	19.87	8.32	0.24	4.9	0.49
EM03	20.41	8.47	0.19	3.3	0.35
September 23, 2019					
Location	**Temp (ºC)**	**pH**	**Ammonia as N (mg/L)**	**EPA - Acute Total as N (mg/L)***	**EPA - Chronic Total as N (mg/L)****
BW01	22.47	7.35	0.80	24	1.3
BW02	26.60	8.22	0.45	4.0	0.37
BW03	23.74	8.22	0.04	5.1	0.44
EM01	19.05	8.08	0.09	7.3	0.71
EM02	19.57	7.86	0.62	11	0.89
EM03	20.44	8.34	1.06	4.9	0.49
September 30, 2019					
Location	**Temp (ºC)**	**pH**	**Ammonia as N (mg/L)**	**EPA - Acute Total as N (mg/L)***	**EPA - Chronic Total as N (mg/L)****
BW01	18.50	7.35	0.36	24	1.6
BW02	21.50	7.94	0.03	8.8	0.68
BW03	16.25	8.11	0.05	8.8	1.0
EM01	14.99	7.76	0.12	13	1.4
EM02	13.70	7.89	0.30	11	1.3
EM03	16.54	7.93	0.40	8.8	0.94

NA = pH measured value was suspect, and the criteria could not be applied

*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)

Additional sampling was completed from six of these locations on September 17, 23, and 30 at which time the Colorado River flows were 4,160 cfs, 3,780 cfs, and 3,720 cfs, respectively. Samples collected on September 17 were all below 1.0 mg/L, one of which (from BW01) was 0.11 mg/L above the chronic criteria. Samples collected on September 23 indicated one location that was above 1.0 mg/L (EM03), which along with the sample collected from location BW02 exceeded the chronic criteria.

After analyzing the results from the September 23 sampling, the decision was made on September 25 to shut down the injection system and utilize all fresh water pumped down to the CF4 area through the surface water diversion system. When this area was sampled again on September 30 all six locations were below both the acute and chronic criteria. The surface water diversion system ran through October 3, at which time this area was no longer considered to be a suitable habitat. The Project decided to extend the use of the surface water diversion system into early October as a best management practice. No dead fish were observed during the timeframe when samples were collected.

4.3 September 2019 CF4 and CF5 Sampling Event Results

The eight monitoring wells surrounding the CF4 wells that inject fresh water into the subsurface are sampled to determine the effectiveness of the injection system. This system was shut down at the beginning of May 2019 due to the high river stage and imminent flooding of the well field, and restarted the beginning of September 2019. Re-development of these injection wells between September 11 and 18 allowed for enhanced injection of fresh water into the subsurface, and more than one million gallons of fresh water were injected over a relatively short period of time prior to this sampling event. All locations are provided in Figure 1, and the ammonia concentrations are displayed on Figure 5.

The CF4 wells are screened and deliver fresh water into the subsurface from 15 to 35 feet below ground surface (ft bgs). The ammonia concentrations associated with the downgradient samples collected from a depth less than 20 ft bgs (wells 0784 and 0785) were less than 2 mg/L, clearly indicating the injection system activity impacted this subsurface zone. The sample from the upgradient shallow zone (from well 0783) had an ammonia concentration of 2.2 mg/L, providing evidence of the effectiveness of the system in decreasing contaminant concentrations in the immediate upgradient portion of the groundwater system.

Samples collected from wells 0780 and 0786 (28 ft bgs) and well 0782 (collected from 33 ft bgs) had ammonia concentrations ranging from only 18 to 62 mg/L. These samples represent the conditions near the bottom of the zone where the CF4 injection wells deliver fresh water into the subsurface when the system is active. From a depth of 36 to 46 ft bgs, the ammonia concentrations ranged from 400 to 510 mg/L (wells 0781 and 0787).

While these concentrations are elevated, they are considerably lower than the concentrations measured in January 2019, after only a minimal volume of fresh water was injected during nearly seven months prior to that sampling event. Table 14 presents the ammonia concentrations from the September event and provides a comparison of the January and September 2019 sampling results. The September ammonia results are also are displayed on Figure 6.

Table 14. CF4 Monitoring Well Ammonia Concentrations, January and September 2019

Location	Sample Depth (ft bgs)	Upgradient or Downgradient of Injection Wells	January 2019 Ammonia Concentration (mg/L)	September 2019 Ammonia Concentration (mg/L)
0780	28	Upgradient	330	18
0781	46	Upgradient	1,900	510
0782	33	Upgradient	1,100	62
0783	18	Upgradient	20	2.2
0784	18	Downgradient	1.1	1.7
0785	18	Downgradient	17	<0.1
0786	28	Downgradient	480	41
0787	36	Downgradient	2,100	400

Figure 7 presents the groundwater elevations generated as a result of the mounding developed during freshwater injection system operation in September 2019. The groundwater elevation data indicate there was groundwater mounding of more than 9 ft between the elevation inside the CF4 0770 through 0779 injection wells and the surrounding monitoring wells (0780 through 0787).

Groundwater samples were also collected from the CF5 extraction wells (locations shown on Figure 3) in September 2019, after the well field was flooded from the end of May to the middle of August 2019 due to the high river flows associated with the 2019 Colorado River Spring runoff. The groundwater extraction system had operated on a regular basis for approximately six weeks before when the samples were collected. CF5 ammonia and uranium concentrations associated with this sampling event are displayed on Figure 8.

Time versus concentration plots (Figures 9 through 12) were also generated to display trends of the CF5 extraction wells over a time period of 9 years, which represents the majority of the CF5 well field lifespan (extraction was started in April 2010).

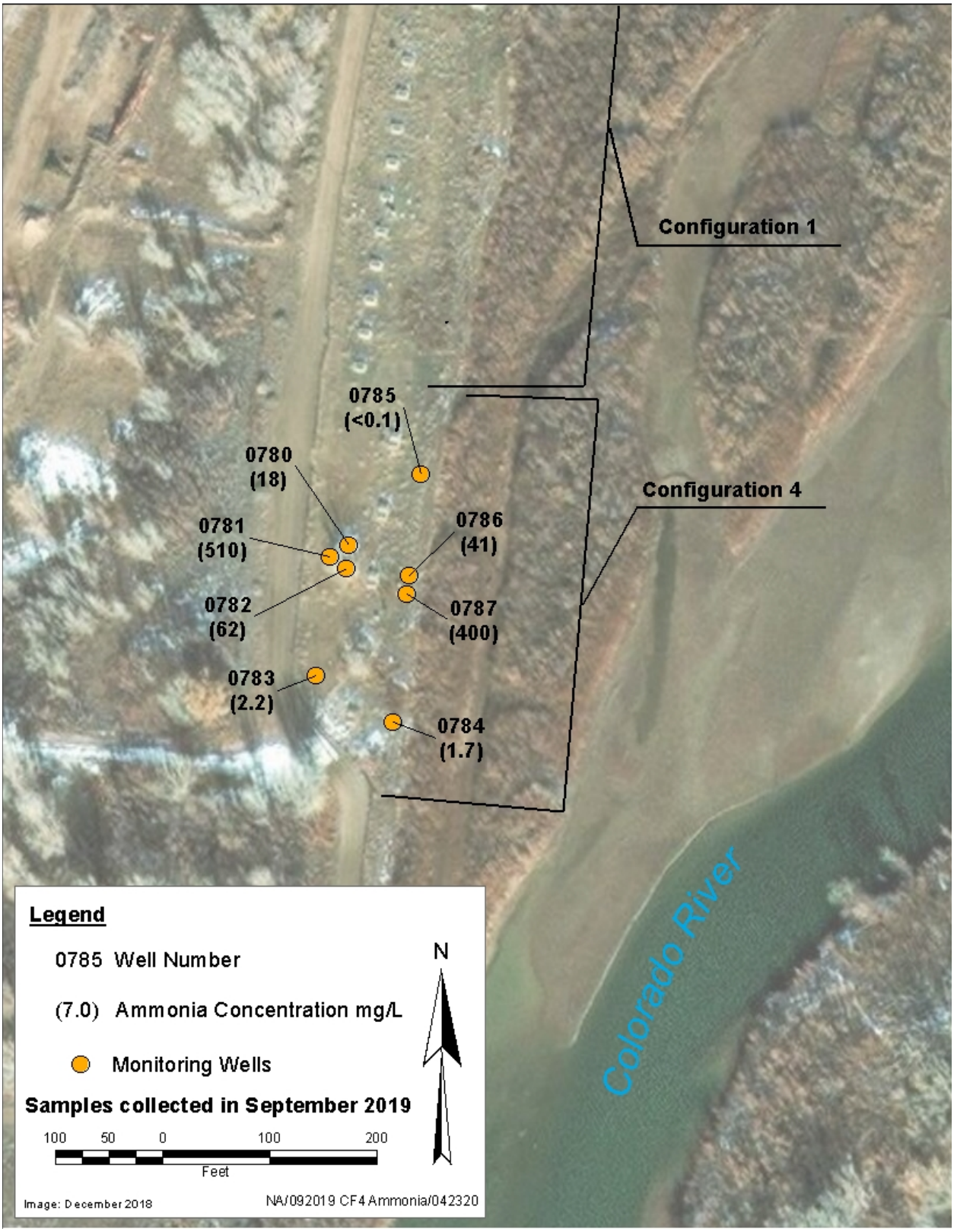

Figure 6. September 2019 CF4 Ammonia Groundwater Concentrations

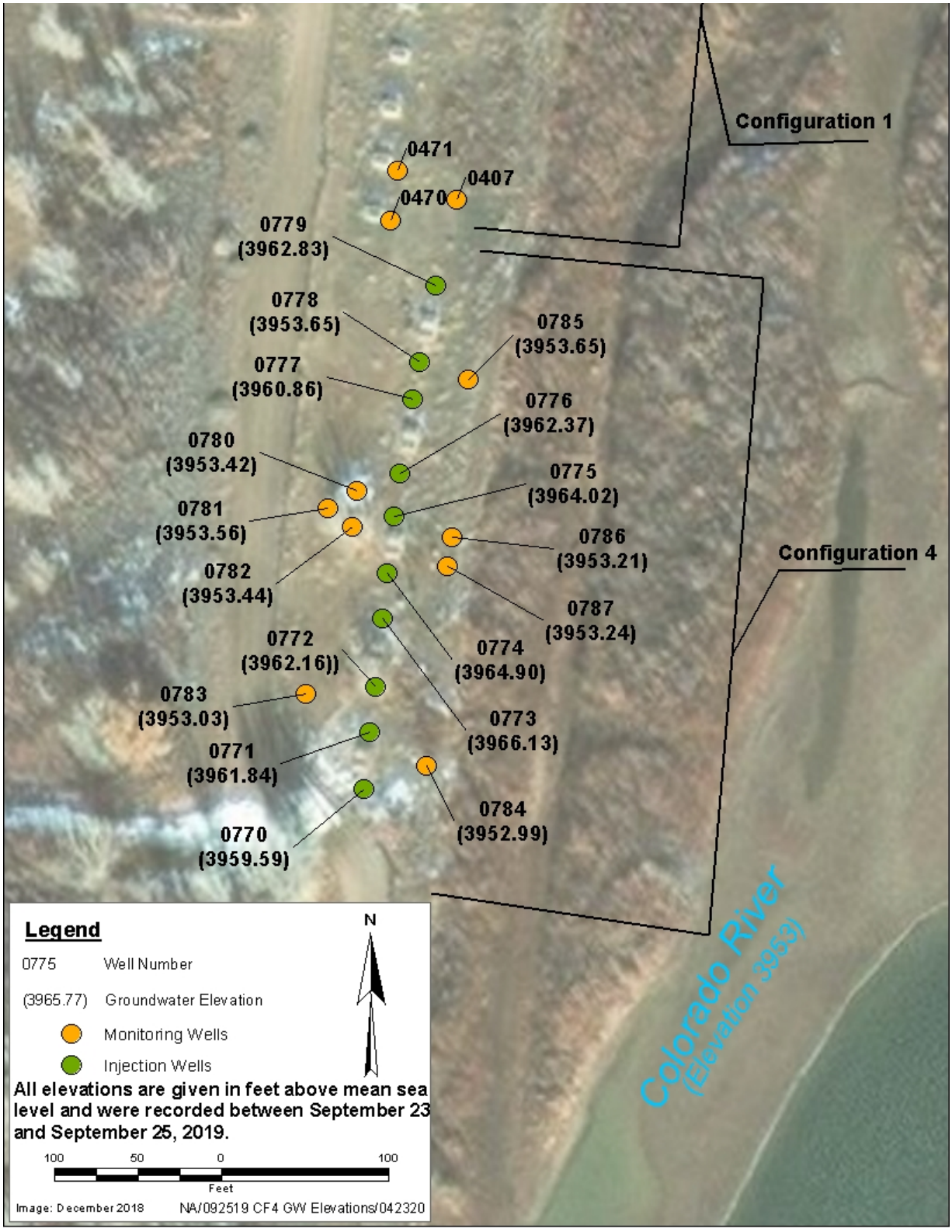

Figure 7. September 2019 CF4 Groundwater Elevations

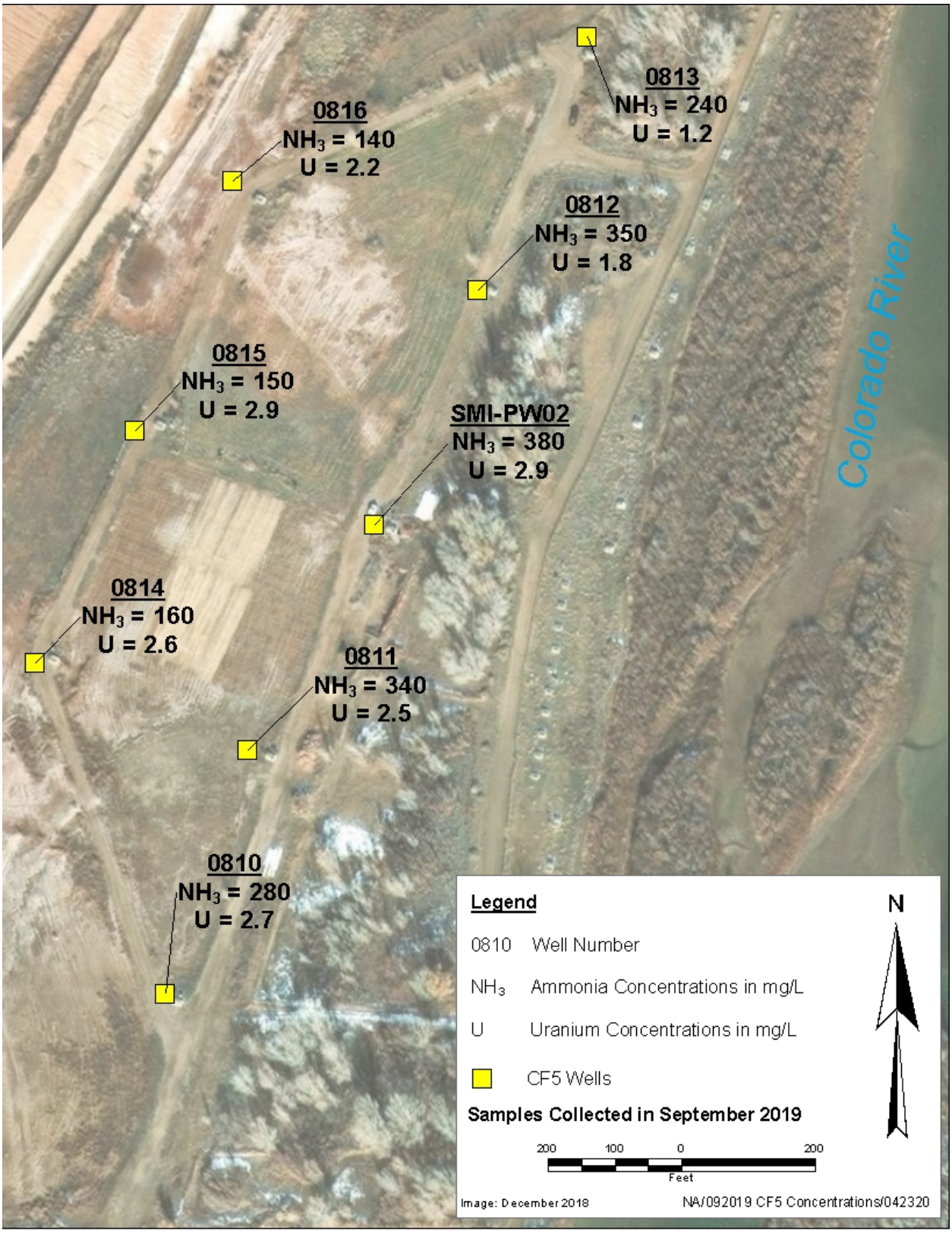

Figure 8. September 2019 CF5 Ammonia and Uranium Groundwater Concentrations

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).

As the plots exhibit, the ammonia concentrations along the CF5 southeastern boundary ranged from 240 to 380 mg/L during the September sampling event (Figure 9), which represents an overall decrease compared to the April 2019 range. The flooding of the well field likely impacted the contaminant concentrations, diluting the groundwater system with fresh water over the six weeks standing water was present in the well field had standing water from the flood.

Ammonia concentrations decreased from each of these five locations with the exception of well 0810, which increased slightly from 260 to 280 mg/L. The ammonia concentration associated with well 0813 had the most significant decrease, from 410 to 240 mg/L between April and September. Well SMI-PW02, which is located at the center of this line of wells (and near the center of the groundwater contaminant plume), has historically had the highest concentration, and this was still the case in this most recent event. In general, concentrations associated with samples collected from these wells have been gradually decreasing since 2018.

Uranium concentrations (Figure 10) in samples from this same set of wells all decreased since the previous sampling event in April due to impacts of the flood. September 2019 uranium concentrations ranged from 1.2 to 2.9 mg/L, while during the previous sampling event in April 2019 the concentrations ranged from 1.7 to 3.3 mg/L. Similar to the ammonia results, well SMI-PW02 continues to have the highest contaminant concentrations.

As shown in Figure 11, ammonia concentrations in the wells located closer to the base of the tailings have been gradually declining since August 2014. Compared to the other extraction wells previously discussed, the ammonia concentrations did not decrease significantly. Also, in the samples collected from wells 0814 and 0815, the concentrations slightly increased (up to 30 mg/L). As a group these three wells ranged from only 140 to 160 mg/L ammonia. Similar to the other five extraction wells, uranium concentrations (Figure 12) decreased from wells 0814 to 0816 since the April 2019 event, on average 0.4 mg/L.

Taking into account all eight extraction wells, the ammonia concentrations continue to be significantly higher (in some cases twice as high) in the samples collected from wells located along the CF5 southeastern boundary compared to the wells located along the toe of the tailings pile. A similar trend is not apparent regarding the uranium concentrations, with both lines of wells having very similar results.

4.4 December 2019 Site-wide Sampling Event Results

All samples collected during this event were analyzed for both ammonia and uranium, and some samples from select locations (based on historical results) were also analyzed for arsenic and selenium. There is no groundwater standard for ammonia; however, Table 15 presents all locations sampled that met or exceeded the UMTRA 0.044 mg/L uranium groundwater standard.

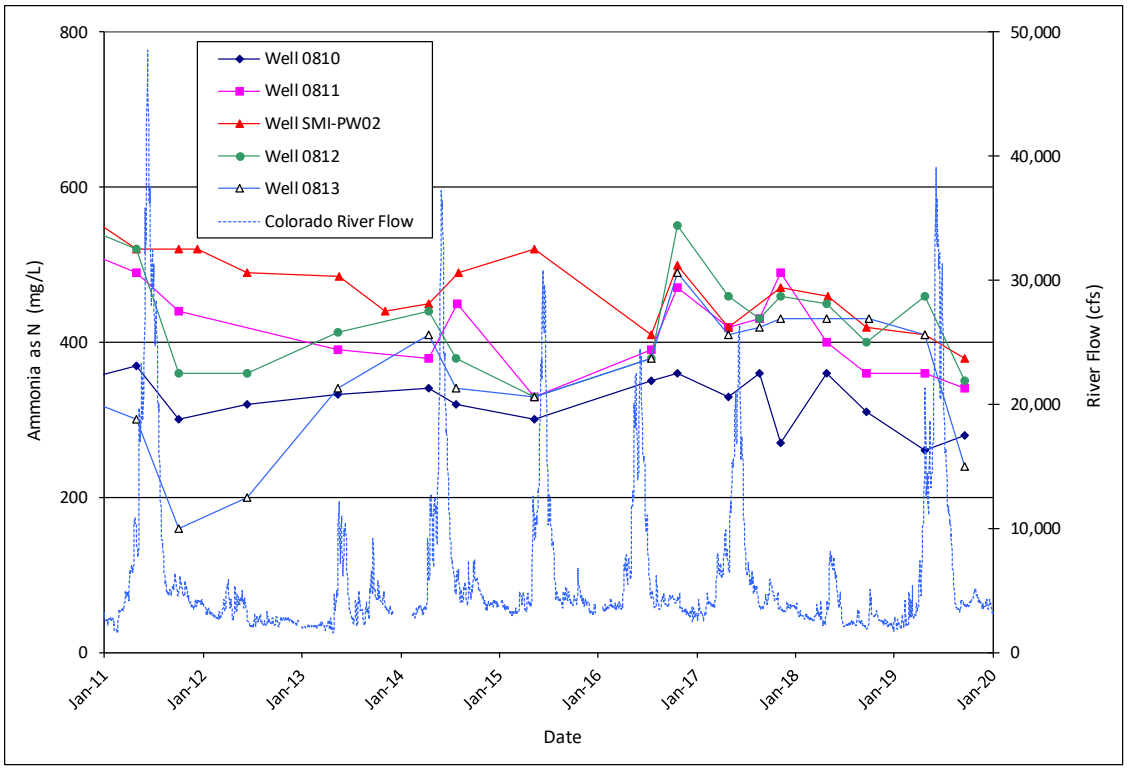

Figure 9. CF5 Extraction Wells 0810, 0811, 0812, 0813, and SMI-PW02 Time versus Ammonia Concentration Plot

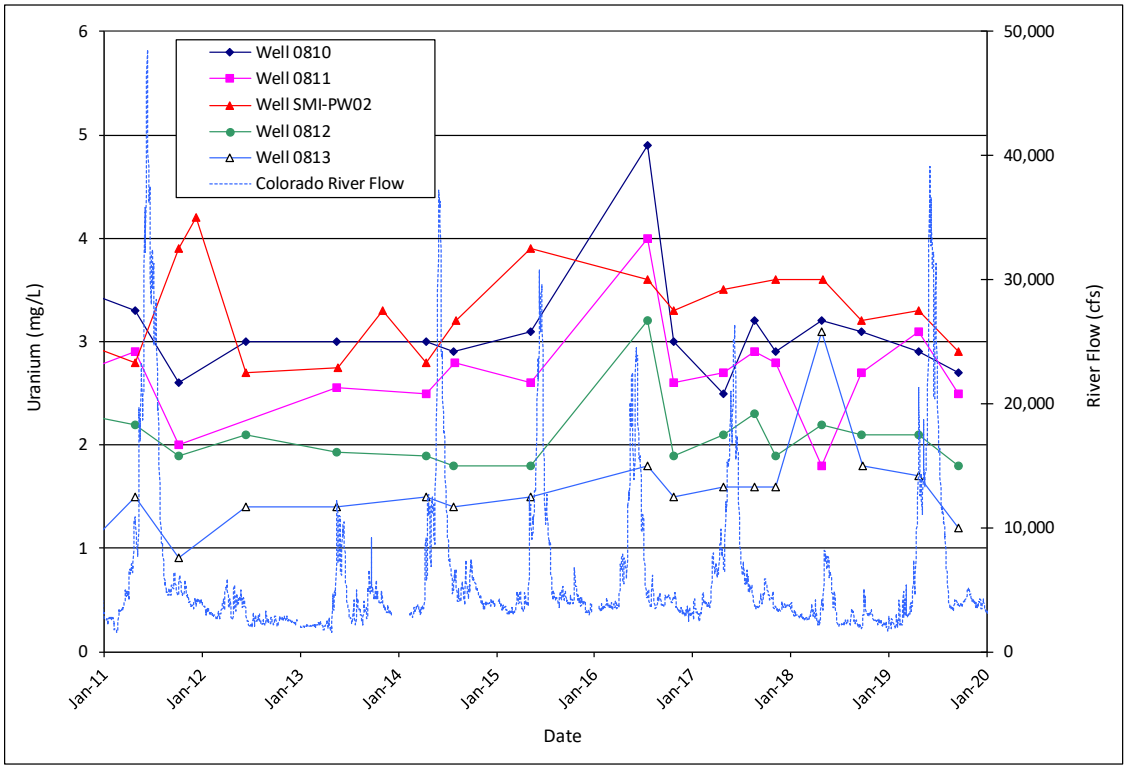

Figure 10. CF5 Extraction Wells 0810, 0811, 0812, 0813, and SMI-PW02 Time versus Uranium Concentration Plot

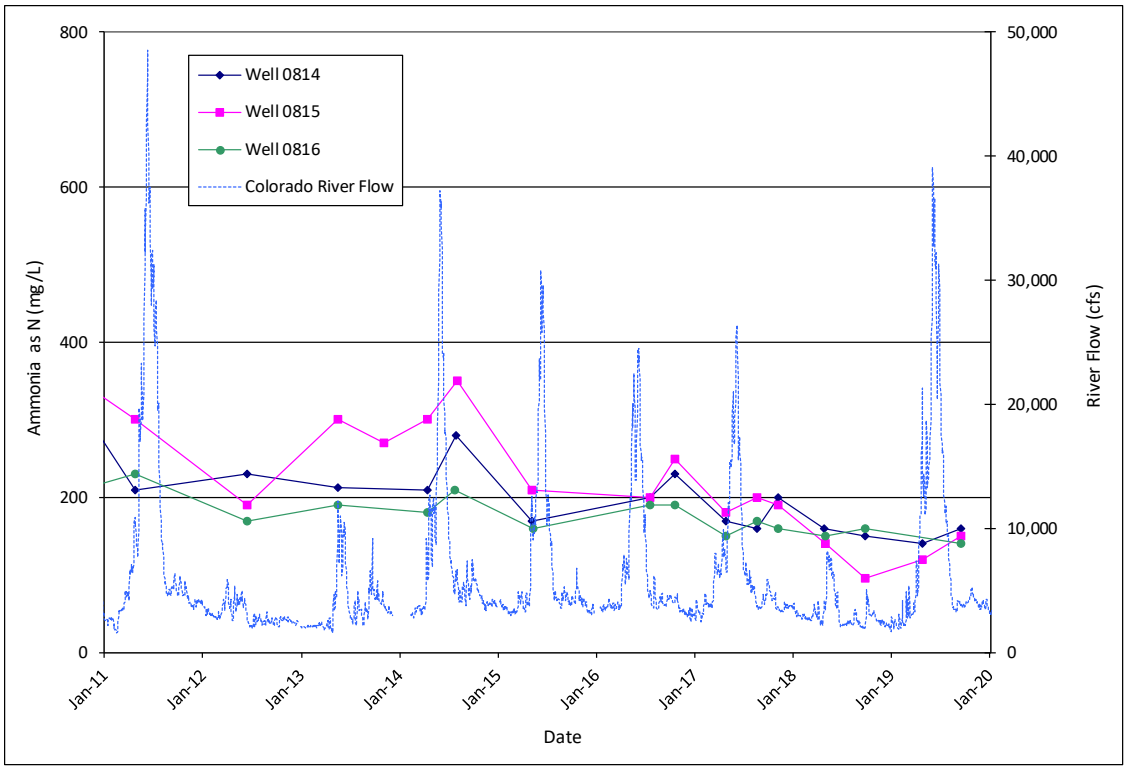

Figure 11. CF5 Extraction Wells 0814, 0815, and 0816 Time versus Ammonia Concentration Plot

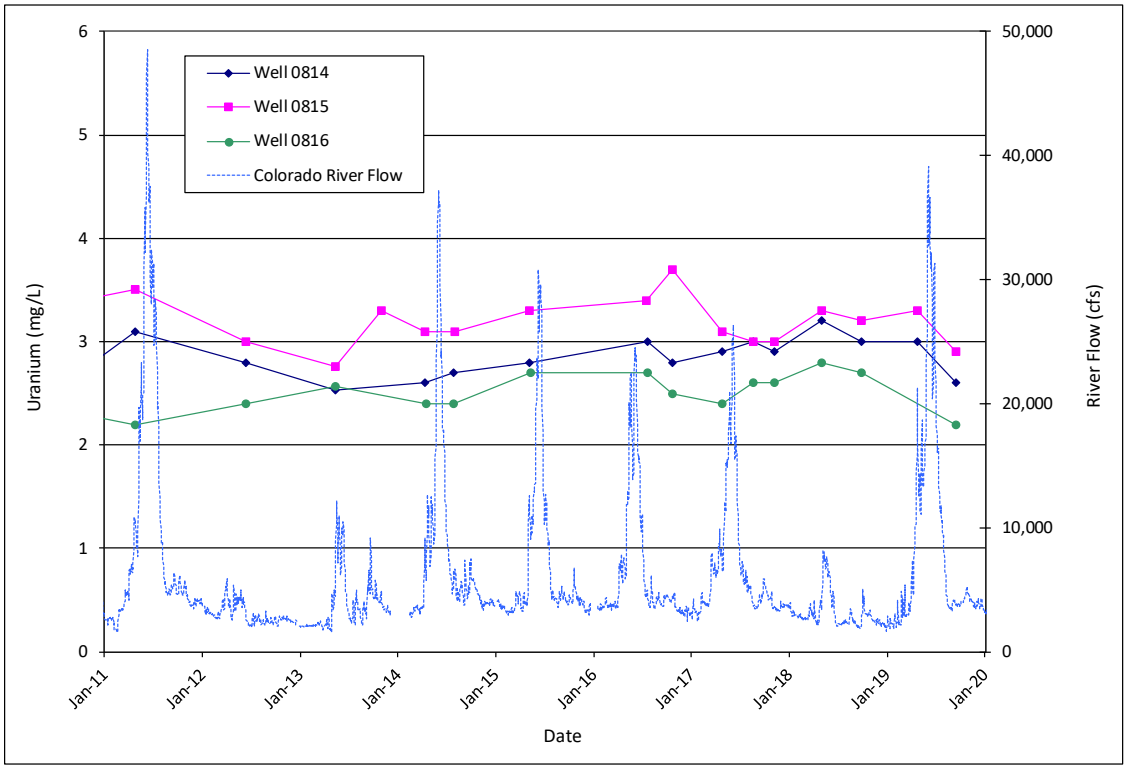

Figure 12. CF5 Extraction Wells 0814, 0815, and 0816 Time versus Uranium Concentration Plot

Table 15. July through December 2019 Sampling Events, Groundwater Locations Meeting or Exceeding the 0.044 mg/L Uranium Groundwater Standard

Well Number	Date	Location	Sample Depth (ft bgs)	Uranium Concentration (mg/L)
0401	12/12/21919	CF2	18	1.7
0403	12/12/2019	CF1	18	0.22
0404	12/12/2019	CF3	18	1.2
0406	12/11/2019	CF1	18	1.6
0407	12/12/2019	CF1	18	1.2
0410	12/10/2019	NE Uranium Plume Area	23.5	0.35
0412	12/5/2019	NE Uranium Plume Area	10	2.2
0413	12/5/2019	NE Uranium Plume Area	10	2.8
0414	12/5/2019	NE Uranium Plume Area	7.5	2.5
0437	12/18/2019	On Tailings Pile	NA	2.5
0439	12/18/2019	On Tailings Pile	NA	1.5
0441	12/31/19	NW Corner of Site	53	0.044
0453	12/18/2019	Along SW Site Boundary	80	1.5
0454	12/9/19	Along SW Site Boundary	13	1.1
0492	12/30/2019	Along S Site Boundary	18	2.1
0780	9/25/2019	CF4	28	0.16
0781	9/25/2019	CF4	46	1.9
0782	9/25/2019	CF4	32	0.37
0783	9/25/2019	CF4	18	0.1
0786	9/26/2019	CF4	28	0.19
0787	9/26/2019	CF4	36	1.8
0810	9/24/2019	CF5 Extraction Well	10 to 40	2.7
0811	9/24/2019	CF5 Extraction Well	9 to 39	2.5
0812	9/24/2019	CF5 Extraction Well	14 to 44	1.8
0813	9/24/2019	CF5 Extraction Well	14 to 44	1.2
0814	9/24/2019	CF5 Extraction Well	12 to 42	2.6
0815	9/24/2019	CF5 Extraction Well	22 to 52	2.9
0816	9/24/2019	CF5 Extraction Well	21 to 51	2.2
AMM-2	12/11/2019	Near CF5	48	1.8
AMM-3	12/11/2019	Near CF5	48	1.5
MW-3	12/11/2019	Near CF5	44	2.1
SMI-MW01	12/5/2019	NE Uranium Plume Area	16	2.7
SMI-PW02	9/24/2019	CF5 Extraction Well	20 to 60	2.9
SMI-PW03	12/10/2019	NE Uranium Plume Area	60	0.39
SMI-PZ1S	12/11/2019	CF5 Vicinity	18	1.1
SMI-PZ2M2	12/9/2019	CF5 Vicinity	56	3
SMI-PZ3D2	12/10/2019	NE Uranium Plume Area	78	0.71
SMI-PZ3M	12/10/2019	NE Uranium Plume Area	59	0.47
SMI-PZ3S	12/10/2019	NE Uranium Plume Area	25	1.4
TP-20	12/9/2019	NE Uranium Plume Area	32	0.044

Table 15. July through December 2019 Sampling Events, Groundwater Locations Meeting or Exceeding the 0.044 mg/L Uranium Groundwater Standard (continued)

Well Number	Date	Location	Sample Depth (ft bgs)	Uranium Concentration (mg/L)
TP-22	12/9/2019	NE Uranium Plume Area	17	0.56
TP-23	12/9/2019	NE Uranium Plume Area	25	1.5
UPD-17	12/10/2019	NE Uranium Plume Area	14	1.3
UPD-18	12/10/2019	NE Uranium Plume Area	13	0.79
UPD-20	12/10/2019	NE Uranium Plume Area	17	0.056
UPD-21	12/10/2019	NE Uranium Plume Area	25	7.3
UPD-22	12/5/2019	NE Uranium Plume Area	9	2.2
UPD-24	12/10/2019	NE Uranium Plume Area	27	6

NE = northeastern; SW = southwestern

This standard is based on Table 1 in Title 40 Code of Federal Regulations Part 192 (40 CFR 192) "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, Subpart A, Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites," assuming uranium-234 and uranium-238 activities are in equilibrium.

Table 15 also includes the locations from the other sampling events from July to December 2019 that exceeded the UMTRA tandard. Tables 16 and 17 provide the locations that exceeded the EPA National Primary Drinking Water Standards for arsenic and selenium, respectively. Of the 17 select locations in which arsenic was analyzed, seven exceeded the 0.01 mg/L standard.

Table 16. December 2019 Groundwater Locations Exceeding the Arsenic 0.01 mg/L EPA National Primary Drinking Water Standard

Well Number	Date	Location	Sample Depth (ft bgs)	Arsenic Concentration (mg/L)
0412	12/5/19	NE Uranium Plume Area	10	0.025
0414	12/5/19	NE Uranium Plume Area	10	0.018
SMI-PZ3S	12/10/19	NE Uranium Plume Area	25	0.013
UPD-17	12/10/19	NE Uranium Plume Area	14	0.018
UPD-18	12/10/19	NE Uranium Plume Area	13	0.019
UPD-22	12/5/19	NE Uranium Plume Area	9	0.011
UPD-24	12/10/19	NE Uranium Plume Area	27	0.26

The groundwater system underlying the site is not a drinking water source, and arsenic was analyzed for informational purposes only. These same locations will be sampled again during the subsequent sampling event as a best management practice to determine if they remain above the standard. These results represent the first arsenic has been analyzed in samples collected from these locations since 2002.

Eight of the 20 select locations had selenium concentrations above the 0.05 mg/L standard. The results presented in Table 17 represent the first time selenium has been analyzed in samples from these locations since 2011. This analysis was also completed as a best management practice as the groundwater is not considered a drinking water source.

Table 17. December 2019 Groundwater Locations Exceeding the Selenium 0.05 mg/L EPA National Primary Drinking Water Standard

Well Number	Date	Location	Sample Depth (ft bgs)	Selenium Concentration (mg/L)
0414	12/5/19	NE Uranium Plume Area	7.5	0.087
0437	12/18/19	On Tailings Pile	NA	0.12
0440	12/18/19	Along NW Site Boundary	117	0.064
0453	12/18/19	Along SW Site Boundary	80	0.21
UPD-17	12/10/19	NE Uranium Plume Area	14	0.081
UPD-18	12/10/19	NE Uranium Plume Area	13	0.098
UPD-21	12/10/19	NE Uranium Plume Area	25	0.098
UPD-24	12/10/19	NE Uranium Plume Area	27	0.071

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, the 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 since 2016 are also plotted against the Colorado River flow to determine if the river stage may impact the concentrations.

4.4.1 Northeastern Base of Tailings Pile

Figures 13 and 14 are time versus ammonia and uranium concentration plots, respectively, for locations UPD-17 and UPD-18 during the past four years. Because of these locations' proximity to the Colorado River and Moab Wash (in which the Colorado River tends to flood during higher flows), ammonia concentrations have displayed a general trend of higher ammonia concentrations during river base flows and, conversely, lower concentrations during the spring runoff or higher flows.

Ammonia concentrations gradually decreased since December 2017 in the samples collected from these two locations, but significantly rebounded to near December 2017 concentrations after the 2019 flooding. Uranium concentrations have also seasonally fluctuated, especially in the samples collected from well UPD-18. Results from the most recent event indicate the uranium concentrations decreased in the sample collected from UPD-18 since the previous event in June 2019, while the UPD-17 concentration has not significantly changed since 2016.

4.4.2 Northeastern Uranium Plume Area

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

4.4.3 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 0413, 0414, and UPD-20. An insufficient volume of water was present in well 0411 to collect a sample from this location during this most recent event.

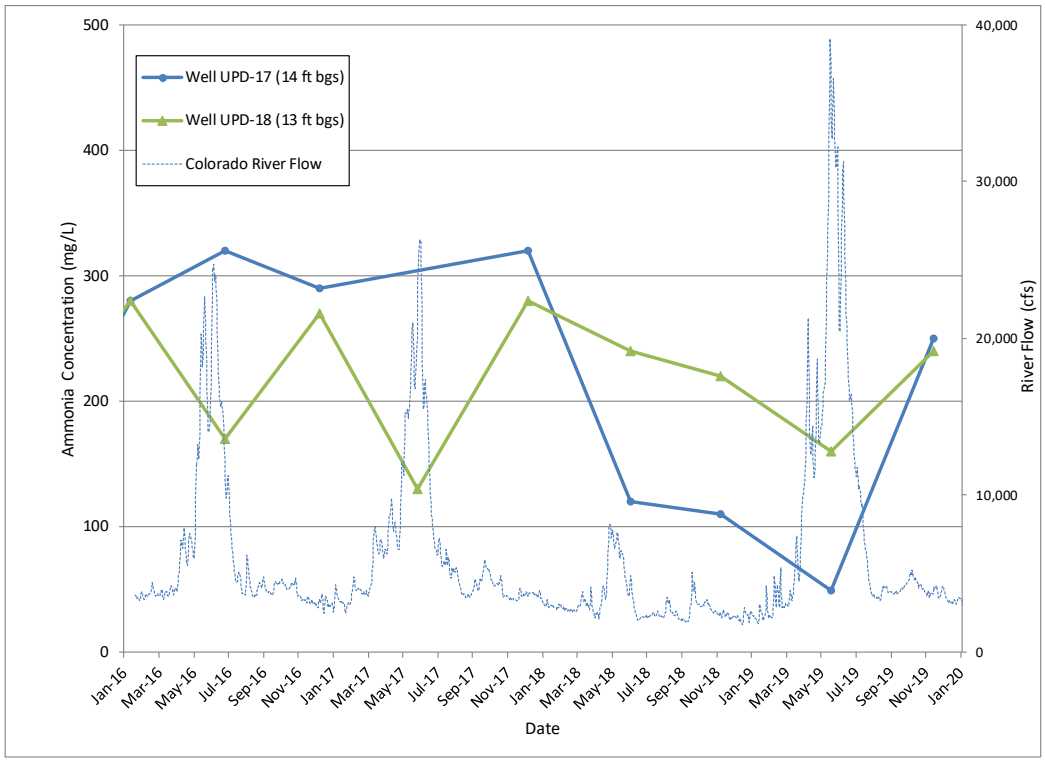

Figure 13. Wells UPD-17 and UPD-18 Time versus Ammonia Concentration Plot

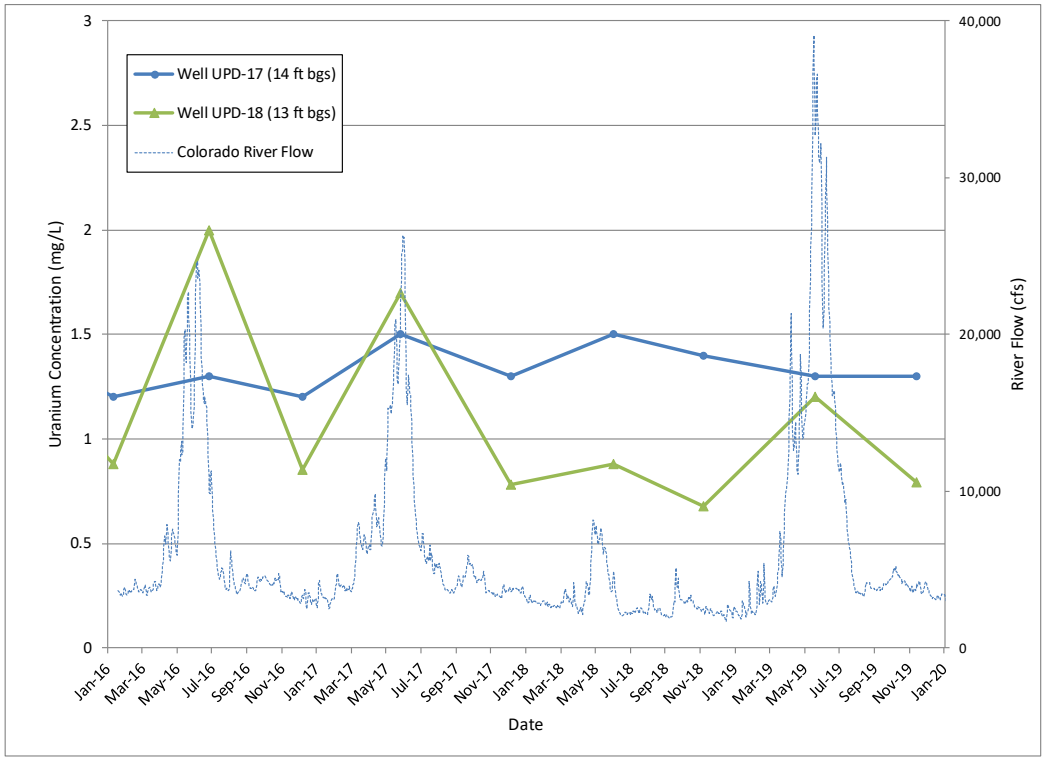

Figure 14. Wells UPD-17 and UPD-18 Time versus Uranium Concentration Plot

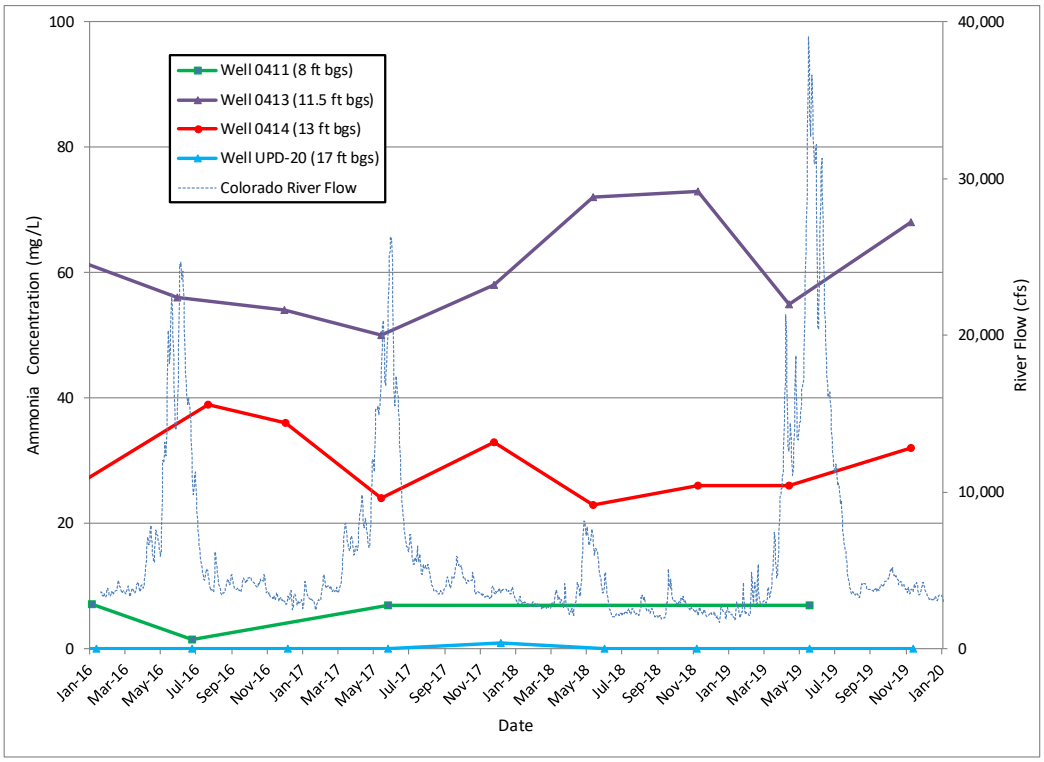

Figure 15. Center of Northeastern Uranium Plume Area Observation Wells 0411, 0413, 0414, and UPD-20 Time versus Ammonia Concentration Plot

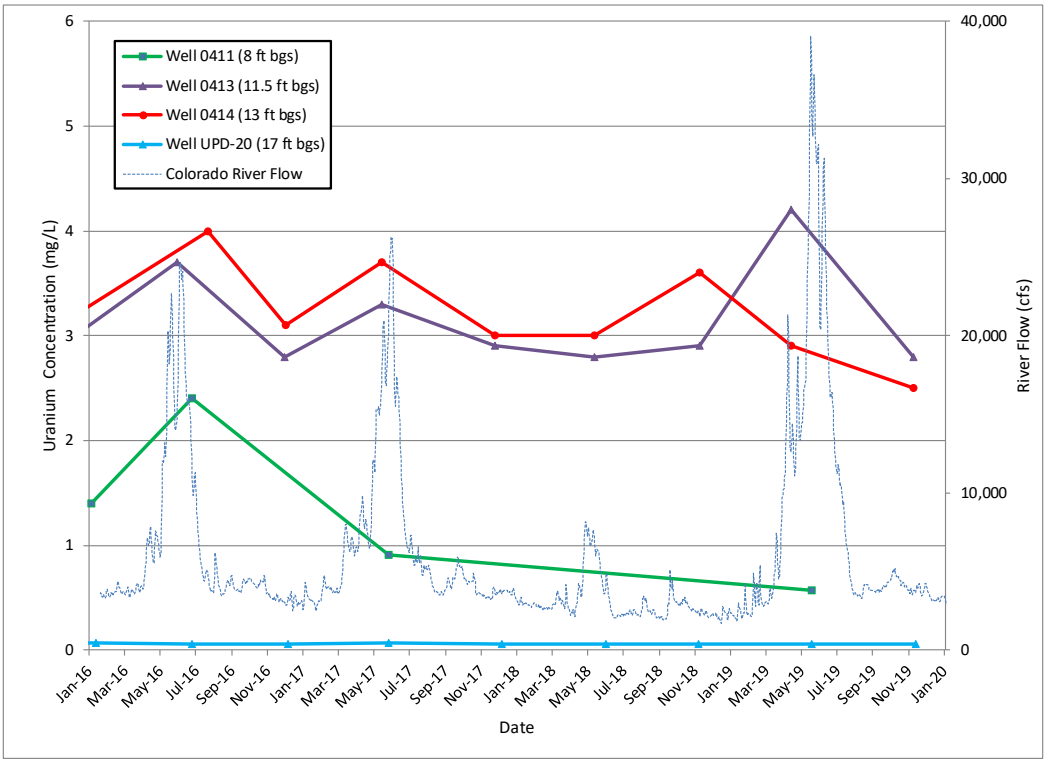

Figure 16. Center of Northeastern Uranium Plume Area Observation Wells 0411, 0413, 0414, and UPD-20 Time versus Uranium Concentration Plot

Ammonia concentrations (Figure 15) continue to remain below the detection limit in the samples collected from well UPD-20. Samples collected from locations 0413 and 0414 indicate ammonia concentrations rebounded during the recent sampling event to nearly 2019 pre-flood levels, and both remain within their respective historical ranges.

The uranium concentration in the sample collected from well UPD-20 was again just above the 0.044 mg/L standard, with a concentration of 0.056 mg/L. Since 2016 the concentration associated with this location has ranged from 0.068 to 0.056 mg/L. The uranium concentrations in samples collected from wells 0413 and 0414 both decreased since the previous event. The uranium concentration measured in well 0413 displayed the largest decrease, from 4.2 to 2.8 mg/L, but still within the historical range. The concentration measured in the sample from 0414 had the historical minimum concentration for this location, 2.5 mg/L (Figure 16).

4.4.4 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, and UPD-24. Due to site conditions, it was not possible to collect a sample from well UPD-23.

As shown in Figure 17, the ammonia concentrations in the samples collected from wells 0410 and UPD-24 did not change since the previous event, and have not significantly changed since 2016. The sample collected from location UPD-21 increased from 1.4 to 20 mg/L. The reason behind such a significant increase is not apparent with the available data. While the 20 mg/L is the highest detected since 2011, this value is still within the historical range.

The uranium concentration (Figure 18) in the sample collected from well 0410 remains lower than 1.0 mg/L and has not significantly changed since 2010. The uranium concentrations in the samples from locations UPD-21 and UPD-24 both increased since the June 2019 event, with the UPD-21 sample having the highest uranium concentration (7.3 mg/L) since 2012. The 6.0 mg/L concentration measured in the sample from UPD-24 was also within the historical range.

4.4.5 Northeastern Edge of Uranium Plume Area

Figures 19 and 20 display ammonia and uranium concentration data for the wells located in the vicinity of the northeastern edge of the uranium plume area (wells 0412, UPD-22, SMI-MW01, and SMI-PZ3S).

As Figure 19 exhibits, the ammonia concentrations associated with sampling wells UPD-22 and SMI-MW01 decreased (still within the historical range), while the concentration in the sample from SMI-PZ3S only increased from 2.3 to 3.9 mg/L. The sample collected from SMI-MW01 (which is located along the riverbank) has exhibited seasonal fluctuation, although the ammonia concentrations in this area of the groundwater system are very low (2 mg/L since 2015). The changes in the ammonia concentration since 2016 in the sample from 0412 is a function of a change in the detection limit (1.0 as opposed to 0.1 mg/L). Similar to the majority of the samples collected in the vicinity of the Atlas Building, all the concentrations in this area of the plume are below 10 mg/L ammonia.

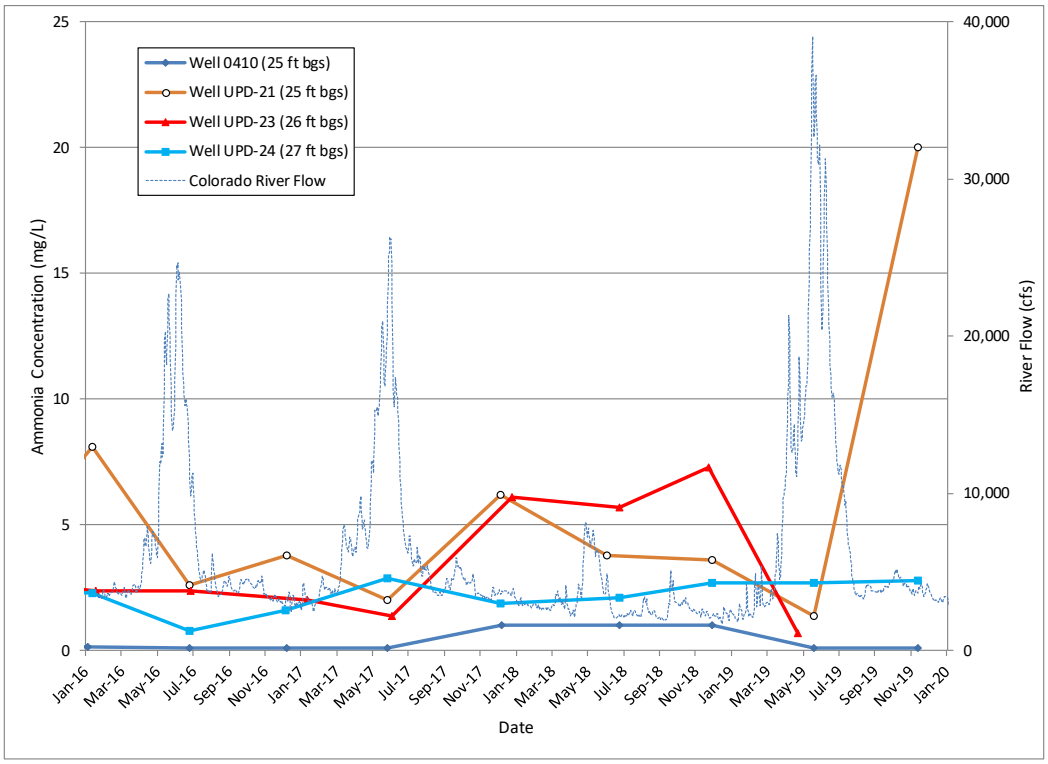

Figure 17. Vicinity of Atlas Building Observation Wells 0410, UPD-21, UPD-23, and UPD-24 Time versus Ammonia Concentration Plot

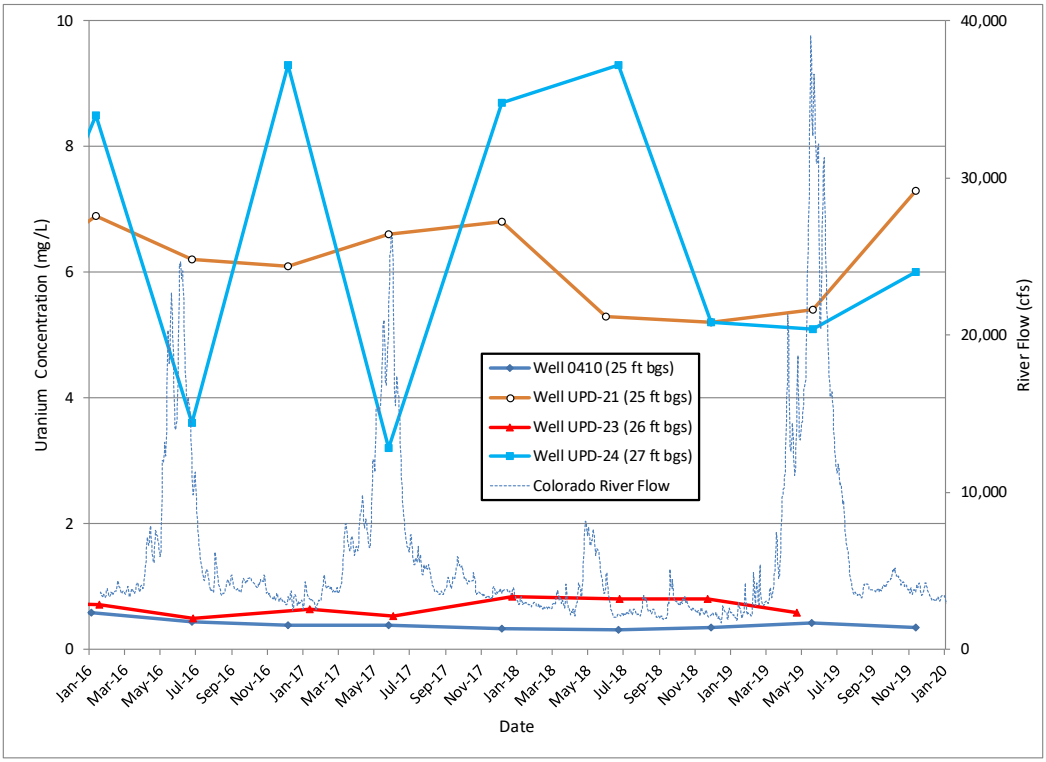

Figure 18. Vicinity of Atlas Building Observation Wells 0410, UPD-21, UPD-23, and UPD-24 Time versus Uranium Concentration Plot

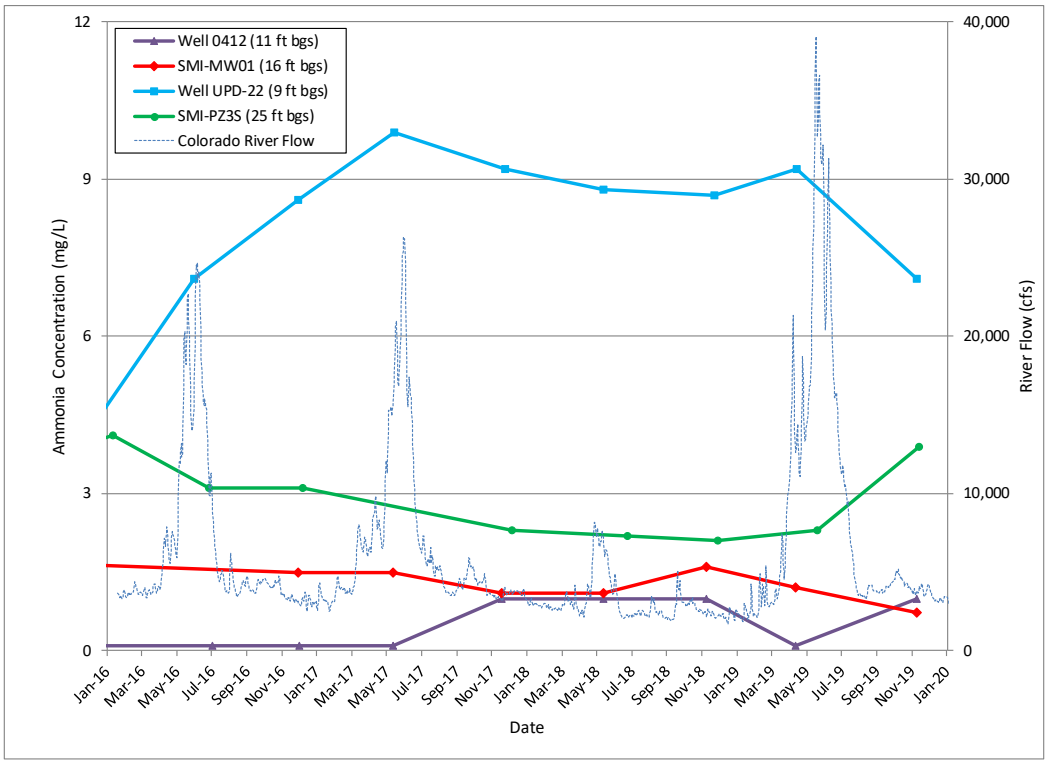

Figure 19. Northeastern Edge of Uranium Plume Area Observation Wells 0412, SMI-MW01, SMI-PZ3S, and UPD-22 Time versus Ammonia Concentration Plot

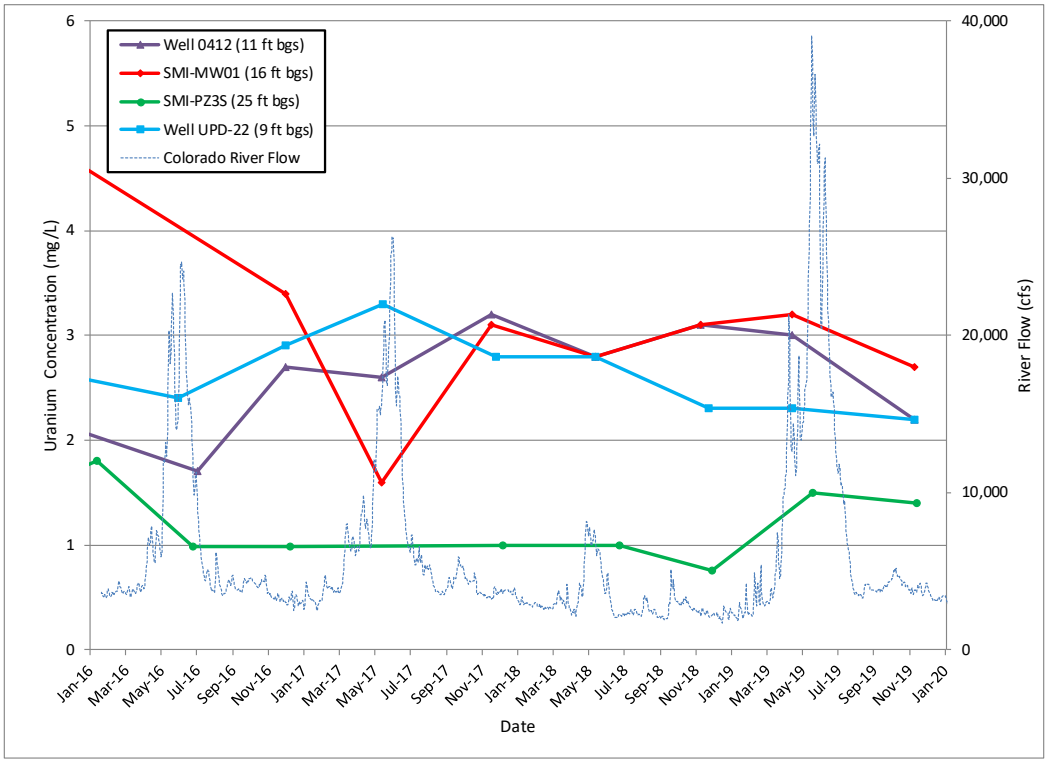

Figure 20. Northeastern Edge of Uranium Plume Area Observation Wells 0412, SMI-MW01, SMI-PZ3S, and UPD-22 Time versus Uranium Concentration Plot

The uranium concentrations (Figure 20) in these samples collected from the same set of wells all decreased (at most 0.8 mg/L). There was essentially no change in the uranium concentrations associated with wells SMI-PZ3S and UPD-22, both of which decreased only 0.1 mg/L compared to the previous event in June 2019. The concentrations in 0412 and UPD-22 have exhibited a gradual downward trend since 2017.

4.4.6 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 for wells AMM-3, ATP-2-S, ATP-2-D, and MW-3 (listed from south to north). As Figure 21 exhibits, the ammonia concentrations measured from these wells all decreased by approximately the same percent, likely in response to the well field flooding. Based on the depth of the samples, the flood water may have impacted down to a depth of at least 88 ft bgs (based on well ATP-2-D).

Uranium concentrations in wells ATP-2-S, with a sample depth 25 ft bgs, and ATP-2-D (sample depth 88 ft bgs) have both been below the 0.044 mg/L uranium UMTRA standard since 2006 and 2005, respectively. Figure 22 suggests the uranium concentrations associated with the samples collected from well MW-3 has been gradually decreasing since December 2018, and the sample collected from AMM-3 only increased 0.1 mg/L over the past year.

4.4.7 Southwestern Boundary

Figures 23 and 24 are time versus concentration plots for ammonia and uranium, respectively, for locations 0441, 0440, 0453, and 0454 (listed from northwest to southeast, or from upgradient to downgradient groundwater flow direction) along the southwestern site boundary.

Both wells 0453 and 0454 ammonia concentrations (Figure 23) have seasonally fluctuated, and the impact from the flooding is apparent. The concentrations of the samples collected from both locations rebounded compared to the previous event in June 2019. Concentrations in these samples more than doubled in well 0453 and increased four times in the sample from well 0454. The ammonia concentration in the samples collected from wells 0440 and 0441 (the upgradient locations) have been at or below the 0.1 mg/L detection limit since 2010.

Wells 0453 and 0454 uranium concentrations (Figure 24) display a similar trend to the ammonia concentrations, with significant increases in the concentrations associated with the samples collected from wells 0453 and 0454 since the previous event. The sample collected from location 0454 rebounded to a lesser degree (from 0.96 to 1.1 mg/L) compared to that of 0453 (increased from 0.66 to 1.5 mg/L). The samples collected from well 0440 (0.032 mg/L) remained below the uranium UMTRA standard, while the concentration in the sample collected from well 0441 was equal to the standard.

4.4.8 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 the south to the north (wells TP-17, 0492, 0407, 0401, 0404, and TP-01). Because these wells are located along the riverbank, their water chemistry has historically been heavily influenced by the seasonal changes of the Colorado River stage.

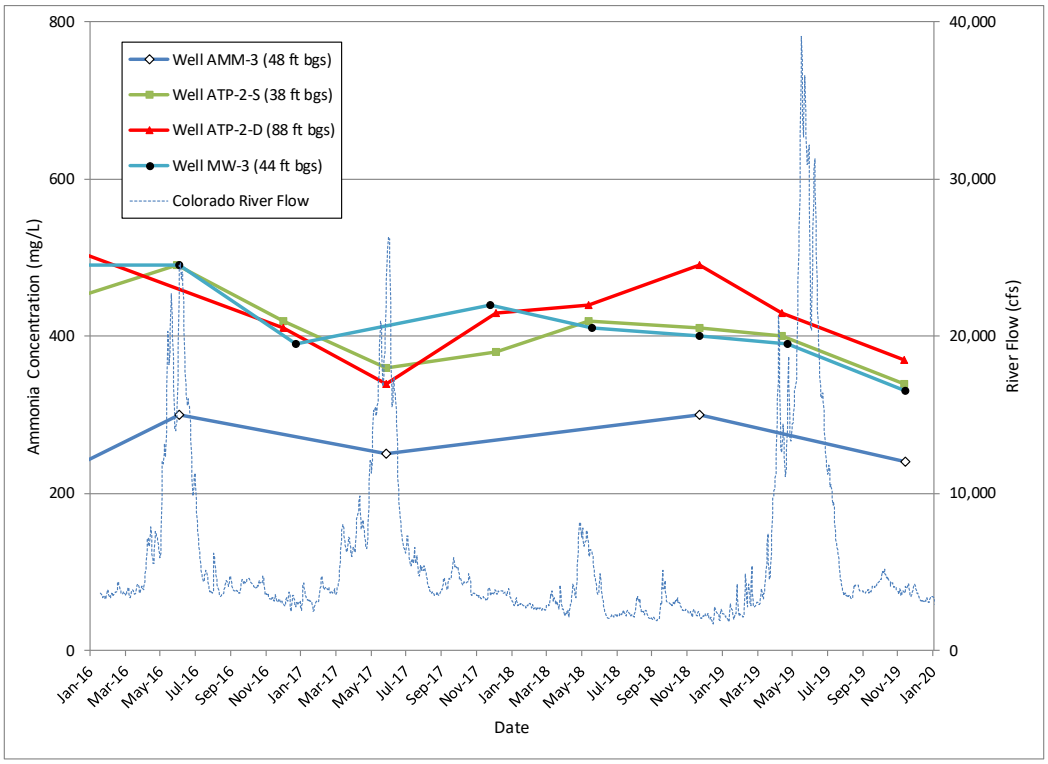

Figure 21. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and MW-3 Time versus Ammonia Concentration Plot

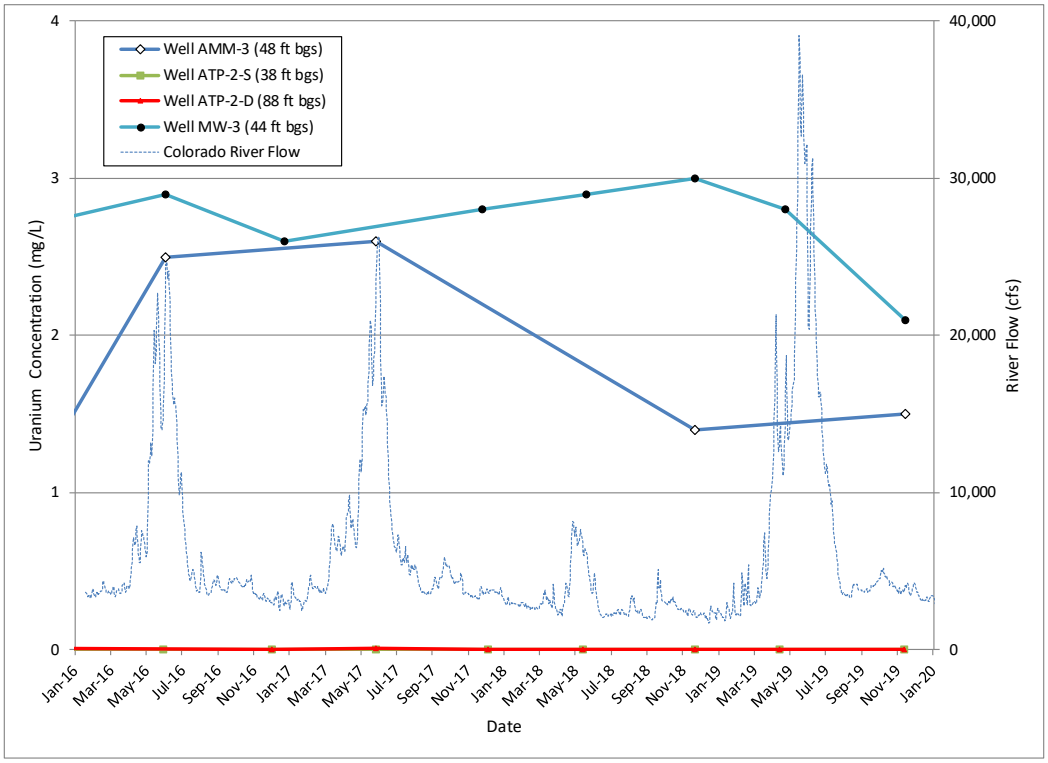

Figure 22. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and MW-3 Time versus Uranium Concentration Plot

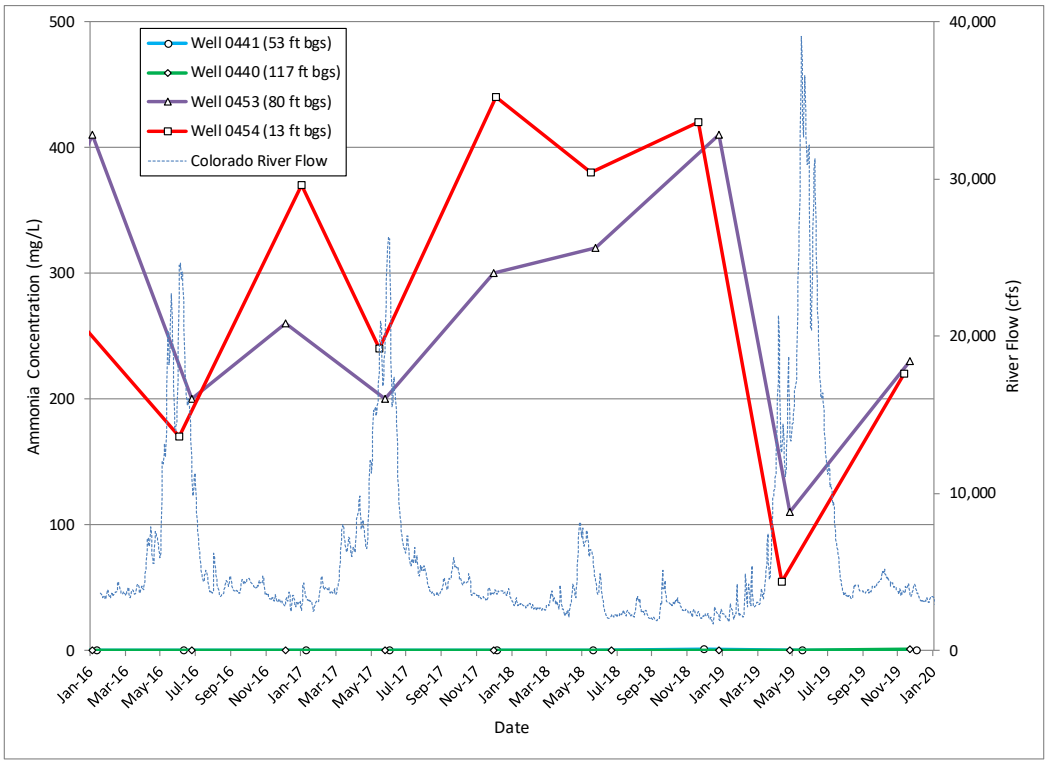

Figure 23. Southwestern Boundary Observation Wells 0453, 0454, 0441, and 0440 Time versus Ammonia Concentration Plot

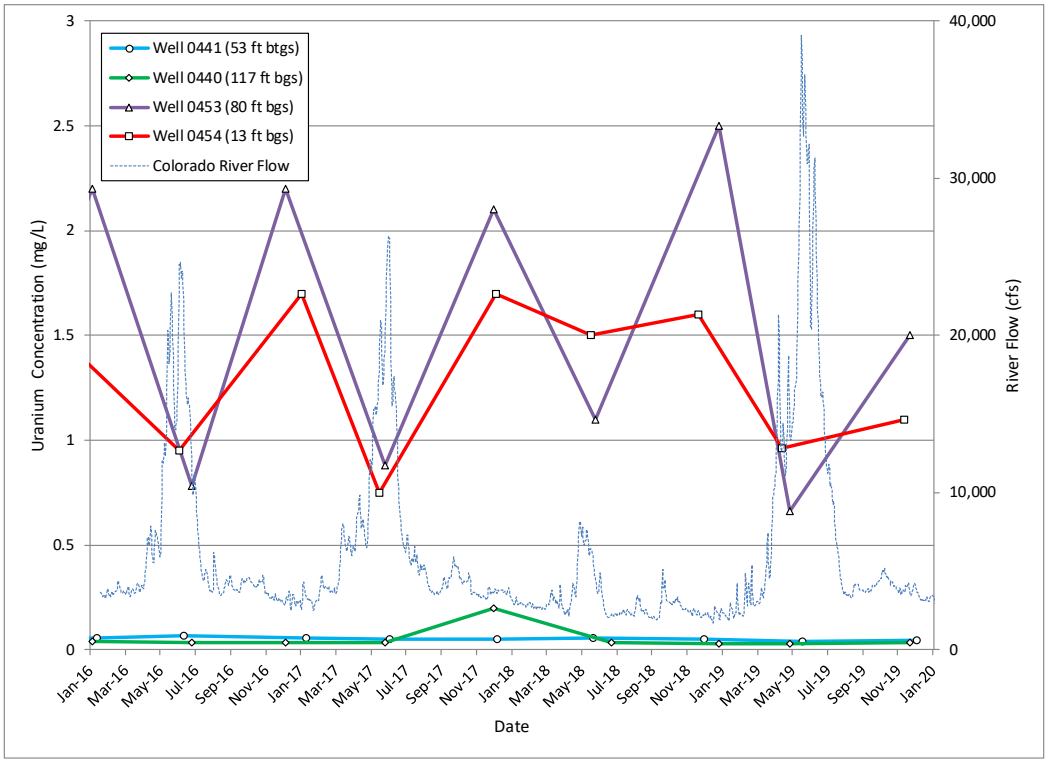

Figure 24. Southwestern Boundary Observation Wells 0453, 0454, 0441, and 0440 Time versus Uranium Concentration Plot

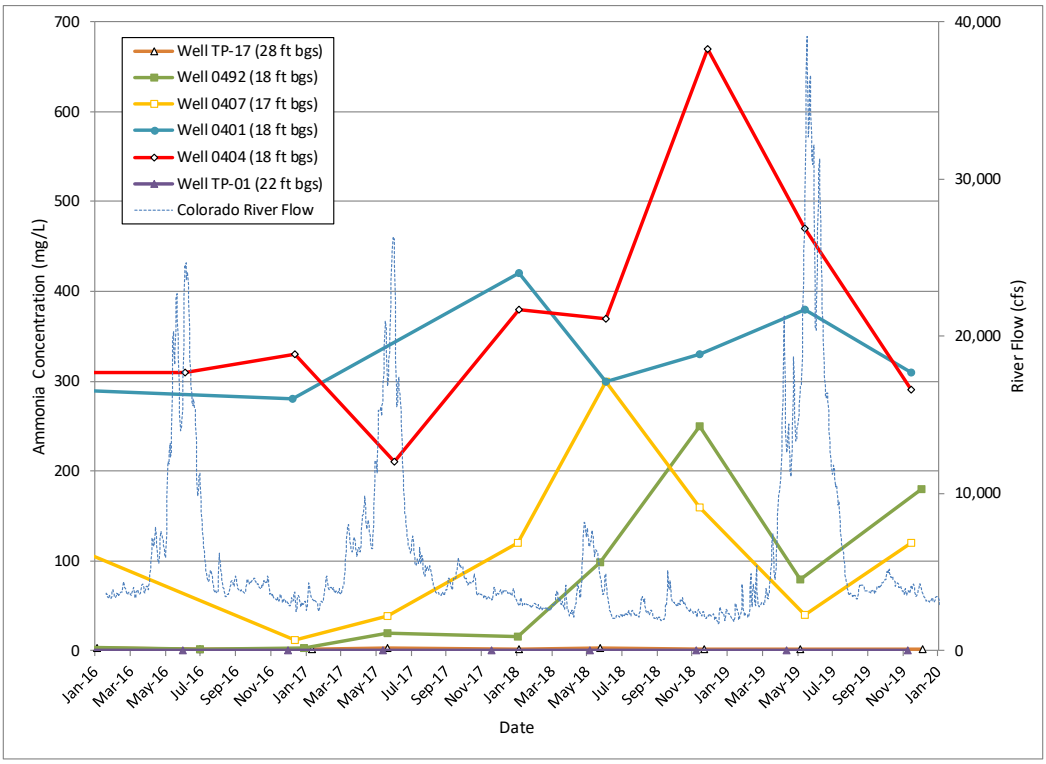

Figure 25. Riverbank Observation Wells TP-17, 0492, 0407, 0401, 0404, and TP-01 Time versus Ammonia Concentration Plot

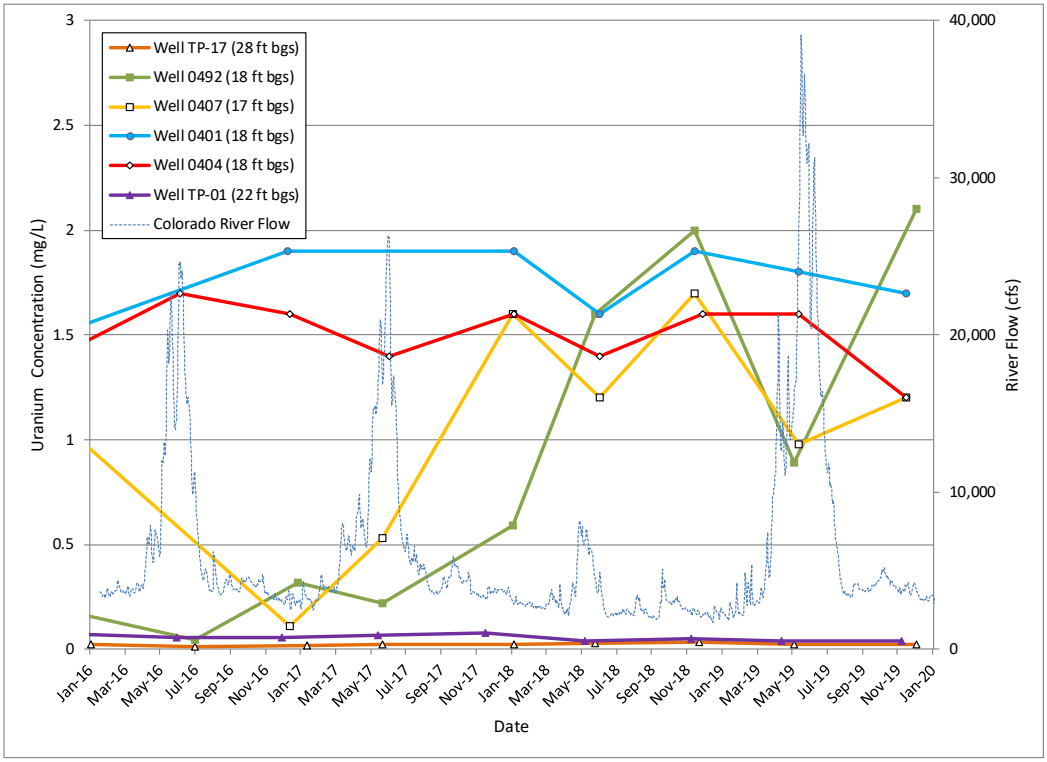

Figure 26. Riverbank Observation Wells TP-17, 0492, 0407, 0401, 0404, and TP-01 Time versus Uranium Concentration Plot

As exhibited in Figure 25, the wells in the middle of the well field (0404 and 0401) both decreased compared to the previous event, while both wells in the southern end (0492 and 0407) increased. This inconsistent response along the riverbank is difficult to explain, and results of future sampling events may provide an explanation.

The ammonia concentration of the sample from 0404 has decreased more than 50 percent within the past year. The lowest ammonia concentrations were associated with the samples collected from the wells farthest to the north (well TP-01, below the 0.1 mg/L detection limit) and to the south along the site (well TP-17, 2.1 mg/L).

As displayed in Figure 26, the same response as detected in the ammonia concentrations applies to the changes in the uranium concentrations, with wells 0492 and 0407 increasing and the concentrations in wells 0404 and 0401 decreasing. The uranium concentration in the sample collected from well 0492 more than doubled within the past six months. As displayed in the ammonia plot, the most southern and northern wells have the lowest uranium concentrations and are below the UMTRA standard.

4.4.9 Southern and Off-site Areas

Figures 27 and 28 are the plots for the two locations sampled south of the site, wells TP-17 and TP-20. Well TP-17 is located along the riverbank, and TP-20 is located approximately 500 ft off the riverbank. Typically, contaminant concentrations are low in samples collected from these wells because they are located along the southern edge of the contaminant plumes.

Both locations have historically displayed seasonal fluctuations (Figure 27), with slight ammonia concentration increases during the peak runoff flows and decreases during base flows. This trend is opposite of that usually observed along the riverbank. Typically, wells located along the riverbank display a well-defined impact of changes in the river stage (lower concentrations during higher runoff flows and higher concentrations during base flows).

However, both wells TP-17 and TP-20 are located in the area of the site where the brine unit is very shallow, as evidenced by a specific conductance above 101,600 micro ohms per centimeter (µmhos/cm) at a depth of just 28 ft bgs and more than 120,600 µmhos/cm at a depth of 32 ft bgs for wells TP-17 and -20, respectively.

The combination of the shallow brine (contaminants in general do not migrate into these areas due to groundwater density differences) and the wells located near the edge of the plume result in very low ammonia concentrations. During the most recent event the concentrations remain below 5 mg/L.

The samples collected from these two locations indicate the uranium concentrations (Figure 28) slightly decreased in TP-17 and significantly increased from 0.0018 to 0.044 mg/L since the previous event in the sample collected from TP-20. The current uranium concentration measured in well TP-20 represents a new historical maximum for samples collected from this location.

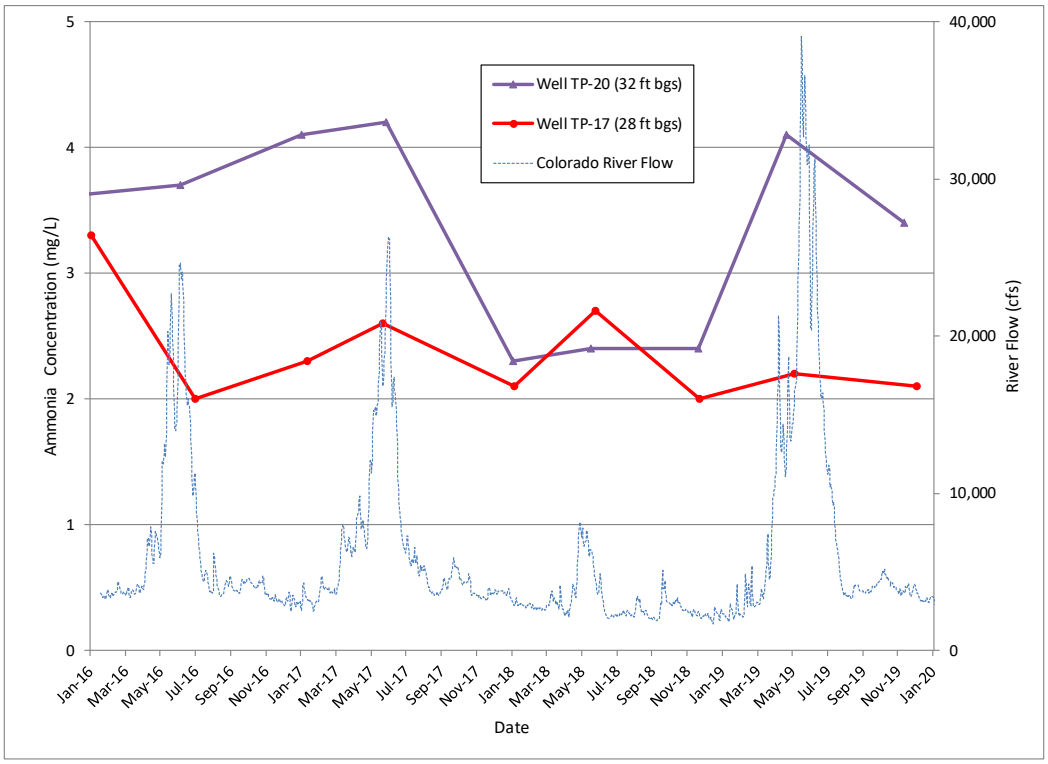

Figure 27. South of Site Observation Wells TP-17 and TP-20
Time versus Ammonia Concentration Plot

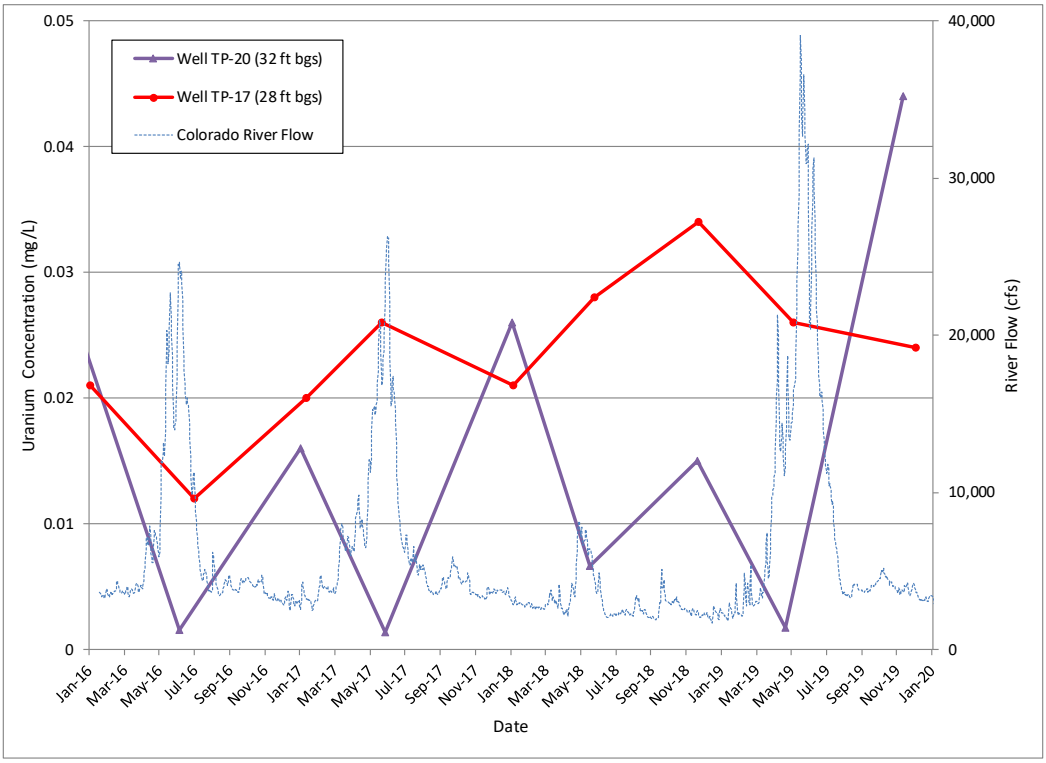

Figure 28. South of Site Observation Wells TP-17 and TP-20
Time versus Uranium Concentration Plot

4.4.10 SMI-PW03 Cluster Sampling Results

During this sampling event samples were also collected from the four wells within the SMI-PW03 cluster at various depths. Wells SMI-PZ3S (25 ft bgs), SMI-PZ3M (59 ft bgs), SMI-PW03 (560 ft bgs), and SMI-PZ3D2 (78 ft bgs) were all sampled in addition to well 0436, which is located adjacent to the cluster, and was sampled from a depth of 197 ft bgs.

Figures 29 and 30 present the time versus ammonia and uranium concentrations, respectively, since 2016. With the samples collected at various depths, these plots provide a vertical profile of the contaminant concentrations in the vicinity of the uranium plume area. As shown in Figure 29 the ammonia concentration has been consistently significantly higher in the sample collected from a depth of 78 ft bgs comparted to the other samples collected. Results indicate the ammonia concentration is less than 5 mg/L near the groundwater surface, increases to approximately 30 mg/L at a depth of 60 ft bgs, and then, moving down to a depth of 78 ft bgs, the concentration increases to over 300 mg/L. At a depth of nearly 200 ft bgs, the concentration is back below 5 mg/L again.

The vertical profile of the uranium concentration varies compared to the ammonia concentration (Figure 30). Consistently since 2016 the uranium concentration has been the highest in the shallowest sample (25 ft bgs). Results suggest the concentration is similar between 59 and 78 ft bgs (all concentrations were between 0.7 and 0.4 mg/L), and, at a depth of nearly 200 ft bgs, the concentration has been consistently below 0.01 mg/L since 2002.

4.4.11 Surface Water Sampling Results

Table 18 presents the ammonia results from the surface water sampling as part of this sampling event, with the samples collected in late December 2019 from locations 0201, 0218, 0226, CR1, CR2, CR3, and CR5 (as shown in Figure 5). The ammonia concentrations 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 18.

Table 18. December 2019 Site-wide 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)**
0201	12/30/2019	0.93	7.47	<0.2	21	3.2
0218	12/30/2019	1.46	7.75	<0.2	13	2.3
0226	12/31/2019	0.26	6.91	<0.2	41	4.5
CR1	12/30/2019	0.93	7.60	<0.2	18	2.9
CR2	12/30/19	1.60	7.57	<0.2	18	2.9
CR3	12/30/2019	1.71	8.60	<0.2	2.8	0.68
CR5	12/30/2019	1.60	7.47	<0.2	21	3.2

*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)

The ammonia concentrations measured during this event were all below the 0.2 mg/L detection limit. All surface water ammonia concentrations are below the applicable EPA criteria (for a suitable habitat) for both acute and chronic concentrations.

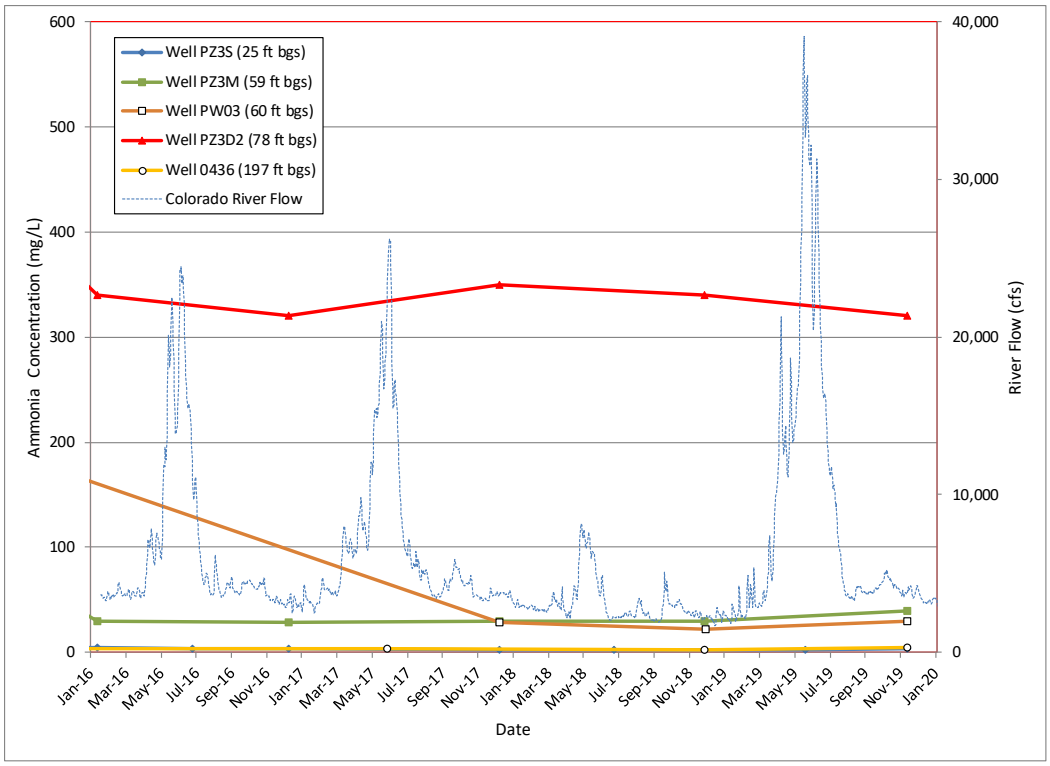

Figure 29. SMI-PW03 Cluster Time versus Ammonia Concentration Plot

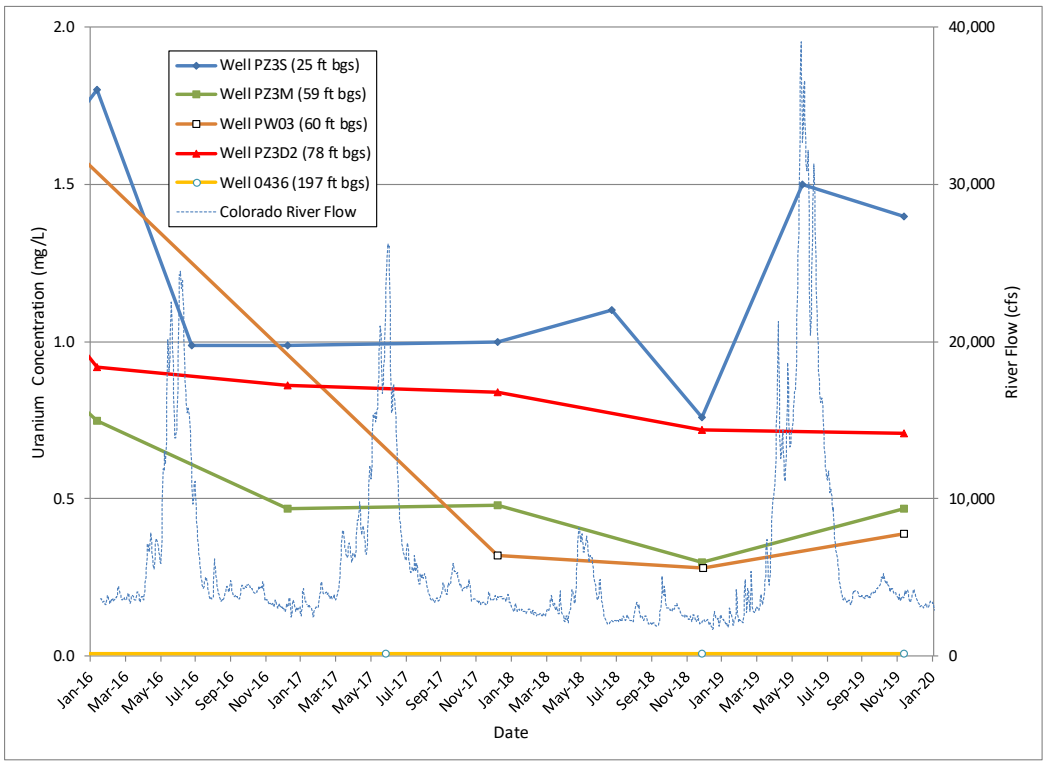

Figure 30. SMI-PW03 Cluster Time versus Uranium Concentration Plot

4.5 Groundwater Surface Elevation

Water level data to generate the groundwater surface contour map were collected October 31 and November 4, 2019, when the Colorado River mean daily flows ranged from 4,960 to 5,210 cfs, and the river stage at the southern end of the site only ranged from 3,954.4 to 3,954.5 feet above mean sea level.

Because river elevations fluctuated only 0.1 ft during this time period, it was possible to use this water level data collected during this time frame to generate the groundwater surface contour map displayed in Figure 31. This contour map displays how the site groundwater system responds to the river during gaining conditions, when groundwater discharges into the Colorado River. Groundwater flow direction and the gradient displayed in this contour map are comparable to historical contour maps generated using groundwater data collected during river base flow conditions.

4.6 Contaminant Distribution

Figures 32 and 33 are maps showing shallow groundwater ammonia and uranium plumes, respectively, using data collected during the December 2019 site-wide event. Contaminant distribution is generally comparable to plume maps generated using data collected during previous site-wide events.

The ammonia and uranium data associated with the sample collected from well 0403 are typically used to generate the contaminant contour maps. As displayed in the plume maps, the data are posted for this location, but were not used for contour generation. During this most recent sampling event, the ammonia and uranium concentrations were significantly lower compared to the samples collected at the same depth and less than 300 ft to both the north and south along the river bank. Typically the concentrations in 0403 are similar to those detected in samples collected from location 0407, less than 200 ft away. This was not the case for this most recent event, and additional sampling of these locations will continue that may provide an explanation.

The ammonia plume map displays how the center of the plume is centered near the tailings pile, with a maximum ammonia concentration of 440 mg/L associated with the sample collected from well SMI-PZ2M2 (located near the middle of the CF5 extraction well field). Similar to previous uranium plume maps, there are two areas of elevated uranium in the shallow groundwater system. Well SMI-PZ2M2 had the highest concentration in the plume in the vicinity of the tailings pile (3.0 mg/L), while the highest uranium concentration associated with the northeastern portion of the site was 7.3 mg/L from location UPD-21.

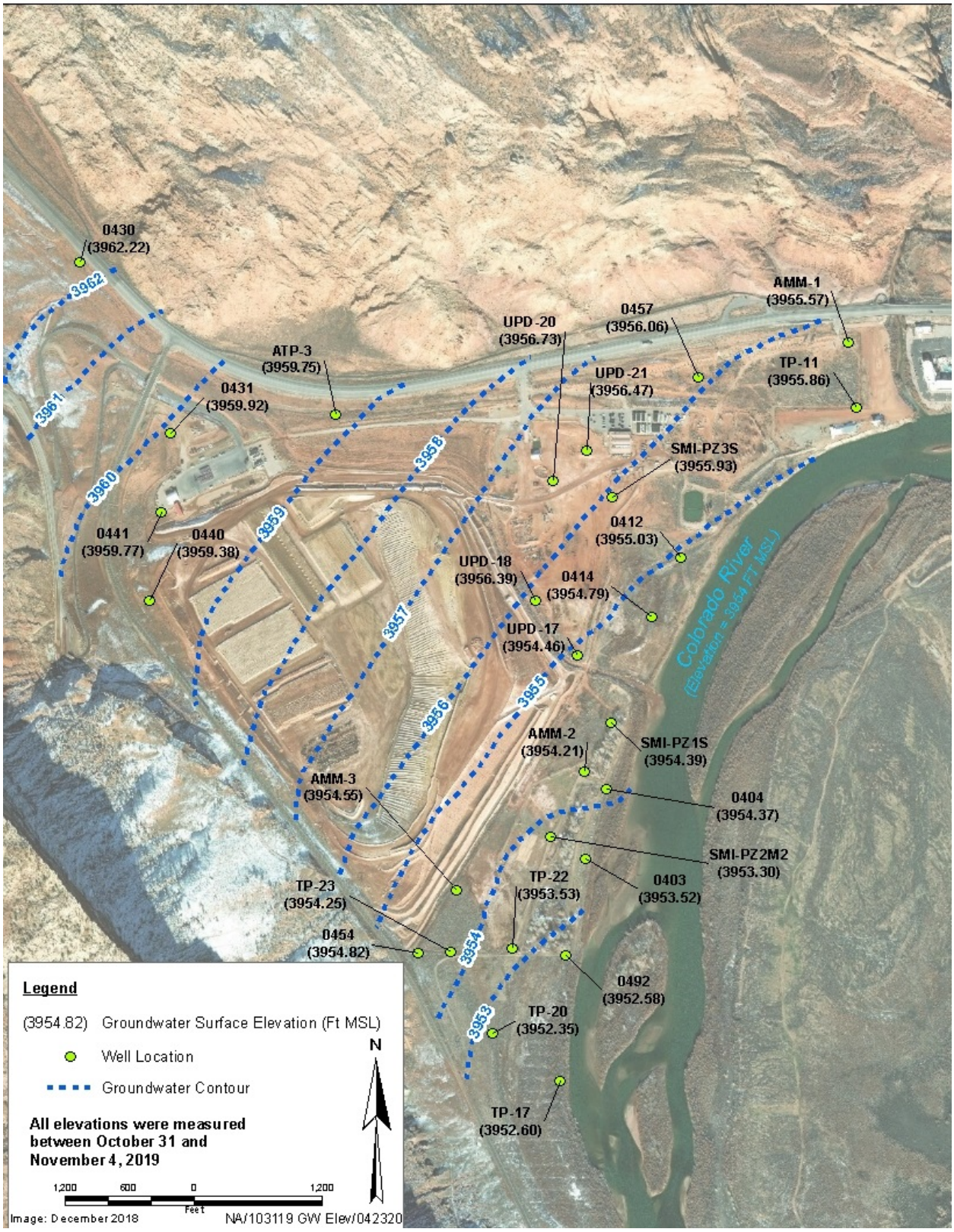

Figure 31. Site-wide Groundwater Elevations, October 31 and November 4, 2019

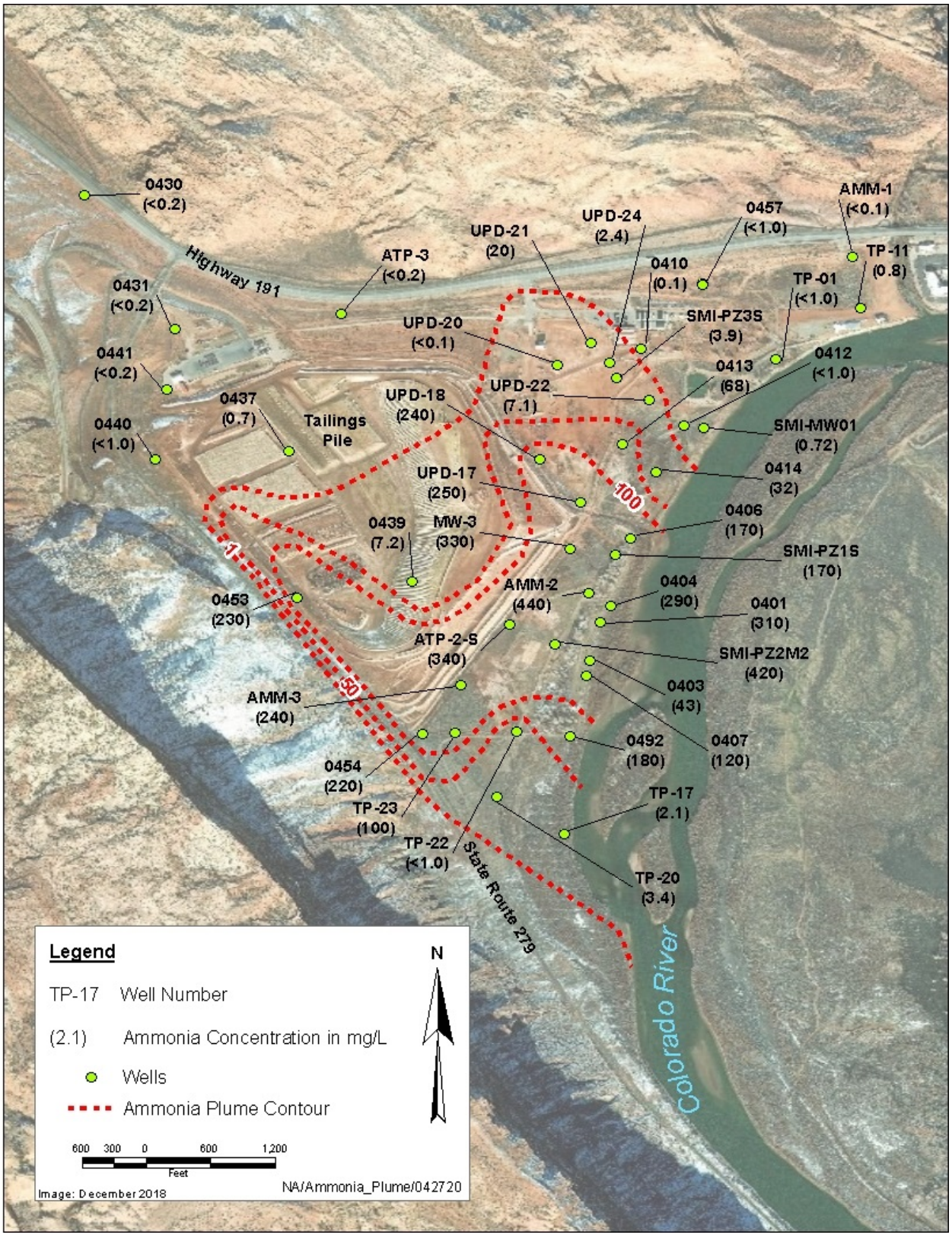

Figure 32. Ammonia Plume in Shallow Groundwater, December 2019

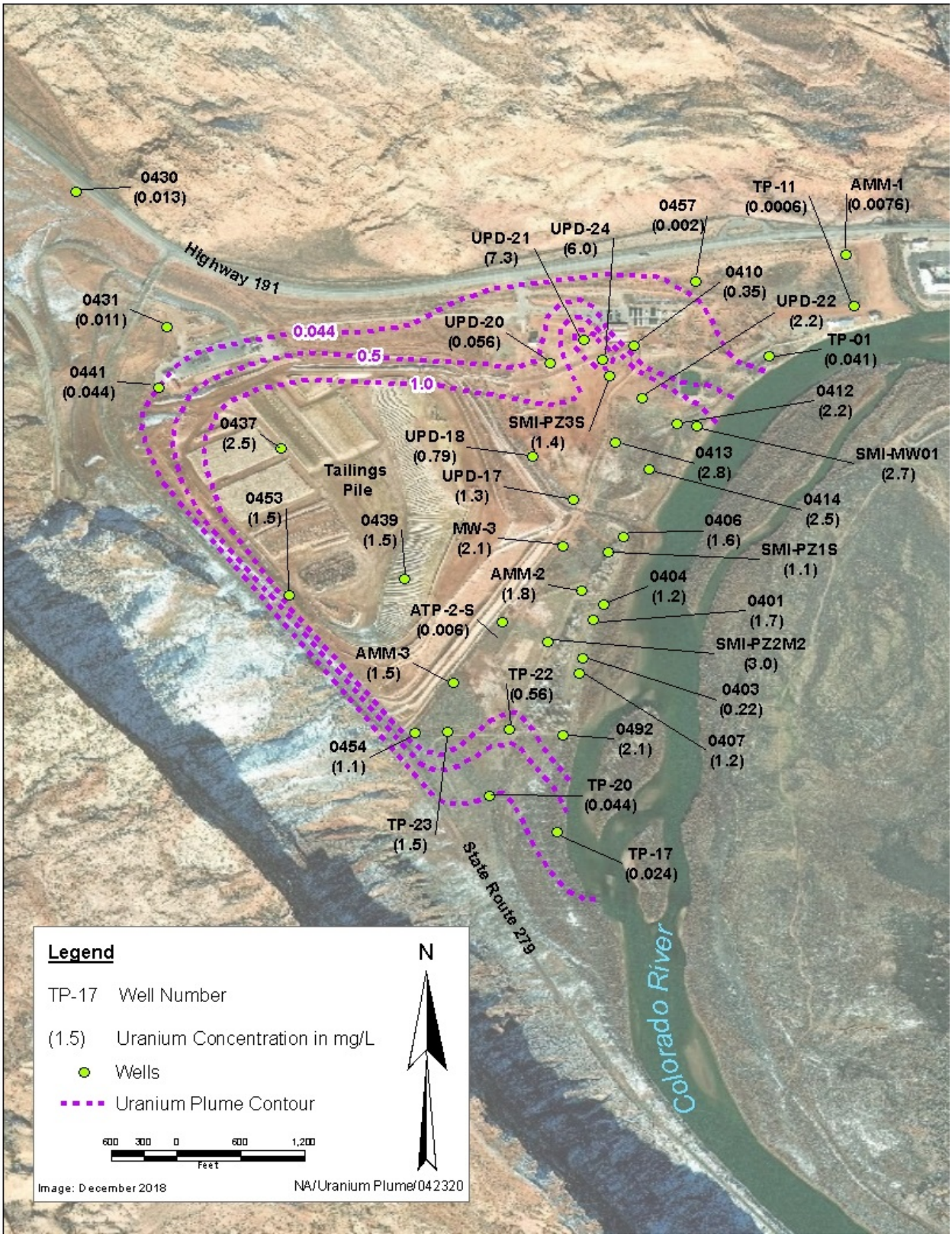

Figure 33. Uranium Plume in Shallow Groundwater, December 2019

5.0 Conclusions

This report presents the results of sampling conducted at the Moab and Crescent Junction sites between July and December 2019. The primary contaminants of interest are ammonia and uranium, and, while there is no EPA drinking water standard maximum concentration level for ammonia, the UMTRA groundwater standard for uranium is 0.044 mg/L. This uranium standard was exceeded in at least one location for each of the Moab site sampling events.

Samples collected from select locations were also analyzed for arsenic and selenium, which have an EPA Drinking Water Standards of 0.01 and 0.05 mg/L, respectively. Refer to Table 15 for a complete list of the Moab site locations and associated uranium concentrations that exceeded the 0.044 mg/L uranium standard. Table 16 provides a list of the locations (and associated concentrations) that exceeded the arsenic standard, and Table 17 presents the locations and concentrations that exceeded the selenium standard.

There were three anomalous data points associated with these July through December 2019 sampling events, all of which were associated with the arsenic and selenium analysis. All three anomalous data points were below the historic minimum concentration, and were the result of inconsistent detection limits being used.

5.1 July 2019 Crescent Junction Sampling Event

This sampling event represented the first time a sample was collected from well 0202 after significant water was first encountered at this location in late June 2019. The sample was part of the third quarter monitoring at the Crescent Junction disposal site, and the results were used to provide information regarding the source of water recharging this well. In addition to the standard analytes, the sample was also analyzed for bicarbonate as $CaCO_3$, carbonate as $CaCO_3$, total alkalinity as $CaCO_3$, uranium-234, uranium-235, and uranium-238. The analyte concentrations measured in this sample indicate that the source water for well 0202 may be similar to the water that recharges well 0205.

5.2 September 2019 Side Channel Habitat Sampling

Starting in August 2019 GWP personnel identified a side channel that had a high potential to develop into a suitable habitat, and personnel confirmed its presence by early September. Surface water samples for ammonia probe analysis were collected over a four week time period, on September 11, 17, 23, and 30.

These results were compared to the EPA acute and chronic criteria for ammonia, and in total, the sample from one location exceeded both the acute and chronic criteria on September 11, and three other samples exceeded the chronic criteria during this same time. After measures were taken to reduce the ammonia concentrations, only one location was above the chronic criteria (by only 0.11 mg/L) based on the September 17 results, and two locations were above the chronic criteria (by only 0.57 mg/L) on September 23. By the September 30 sampling, all results were below both the acute and chronic criteria.

5.3 September 2019 CF4 and CF5 Sampling Event

The collection of groundwater samples from observation wells surrounding the CF4 injection wells in September 2019 was to evaluate the effectiveness of the injection system as it was actively injecting fresh water into the subsurface. The analytical results indicate the injection system reduced the ammonia concentrations in the groundwater system from 15 to 35 ft bgs in the vicinity of CF4 (Table 14), and the water elevation data confirmed more than 9 ft of mounding was generated from the operation of this system.

All eight CF5 wells were sampled to monitor contaminant concentration trends over time and to update the contaminant concentrations used for the mass removal calculations. In general, ammonia and uranium concentrations have not significantly changed over the past five years. The data indicate the samples collected from the extraction wells located along CF5 southeastern boundary have the higher ammonia concentrations compared to the samples collected from the wells near the base of the tailings pile. No trends are apparent based on the uranium concentrations.

5.4 December 2019 Site-wide Sampling Event

The rationale for conducting the December 2019 site-wide sampling event was to collect data from the site during Colorado River base flow and to assess any changes or trends in the groundwater system water chemistry. These results also provide information regarding the impact of the site flooding on the groundwater system. Surface water sampling was also conducted to assess surface water quality adjacent to the site compared to upstream and downstream water quality.

In general, with the exception of the locations in the vicinity of the Colorado River bank, the ammonia and uranium concentrations did not significantly change since the previous site-wide sampling event in May/June 2019. Ammonia concentrations from the seven surface water samples collected during this sampling event were all below the 0.2 mg/L laboratory detection limit and below the applicable EPA criteria (for a suitable habitat) for both acute and chronic concentrations.

6.0 References

40 CFR 192A (Code of Federal Regulations) Subpart A, “Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites.”

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

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

Appendix A.
July 2019 Crescent Junction Sampling Event

Water Sampling Field Activities Verification
Water Quality Data
Water Level Data
Trip Report

Appendix A. July 2019 Crescent Junction Sampling Event

Water Sampling Field Activities Verification

Sampling Event/RIN	July 2019 CJ Sampling Event/RIN 1907116	**Date(s) of Water Sampling**	July 11, 2019
Date(s) of Verification	April 1, 2020	**Name of Verifier**	Ken Pill

		Response (Yes, No, NA)	Comments
1.	Is the Sampling Analysis Plan (SAP) 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?	Yes	
4.	Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes	
5.	Was an operational check of the field equipment conducted in accordance with the SAP?	Yes	
6.	Did the operational checks meet criteria?	Yes	
7.	Were the number and types (alkalinity, temperature, electrical conductivity, pH, turbidity, oxidation reduction potential) of field measurements taken as specified?	Yes	Field measurements for temperature, pH, turbidity, oxidation reduction potential, and conductivity were collected.
8.	Was the category of the well documented?	No	Well 0202 was cat 2
9.	Were the following conditions met when purging a Category I well:		
	Was one pump/tubing volume purged before sampling?	NA	
	Did the water level stabilize before sampling?	NA	
	Did pH, specific conductance, and turbidity measurements stabilize before sampling?	NA	
	Was the flow rate less than 500 milliliters per minute?	NA	
	If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	NA	
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?	NA	Only one sample was collected during this event.

Appendix A. July 2019 Crescent Junction Sampling Event (*continued*)

Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	July 2019 CJ Sampling Event/RIN 1907116	**Date(s) of Water Sampling**	July 11, 2019
Date(s) of Verification	April 1, 2020	**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?	NA	The sample was collected using bladder pump also used for ell 0205, and was thoroughly cleaned prior to sampling.
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?	NA	
Was the true identity of the samples recorded on the quality assurance sample log?	NA	
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?	Yes	

Appendix A. July 2019 Crescent Junction Sampling Event (*continued*)

Water Quality Data

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE CRJ01, Crescent Junction Site

LOCATION: 0202 <well>

REPORT DATE: 4/8/2020 12:47 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	07/11/2019	0001	60.00	14		J	#	1	-
Arsenic	mg/L	07/11/2019	0001	60.00	0.039	U	J	#	0.039	-
BICARBONATE AS CaCO3	mg/L	07/11/2019	0001	60.00	1200		J	#	50	-
BORON	ug/L	07/11/2019	0001	60.00	1500		J	#	31	-
Bromide	mg/L	07/11/2019	0001	60.00	12		J	#	2	-
Cadmium	mg/L	07/11/2019	0001	60.00	0.0033	U	J	#	0.0033	-
Calcium	mg/L	07/11/2019	0001	60.00	410.000		J	#	0.12	-
CARBONATE AS CaCO3	mg/L	07/11/2019	0001	60.00	50	U	J	#	50	-
Chloride	mg/L	07/11/2019	0001	60.00	7200		J	#	100	-
Chromium	mg/L	07/11/2019	0001	60.00	0.0051	U	J	#	0.0051	-
Copper	mg/L	07/11/2019	0001	60.00	0.0097	U	J	#	0.0097	-
Fluoride	mg/L	07/11/2019	0001	60.00	1	U	J	#	1	-
Iron	mg/L	07/11/2019	0001	60.00	0.050	J	J	#	0.049	-
Lead	mg/L	07/11/2019	0001	60.00	0.013	U	J	#	0.013	-
Magnesium	mg/L	07/11/2019	0001	60.00	730.000		J	#	0.13	-
Manganese	mg/L	07/11/2019	0001	60.00	0.440		J	#	0.0011	-
MOLYBDENUM	ug/L	07/11/2019	0001	60.00	11	U	J	#	11	-
Nitrate + Nitrite as Nitrogen	mg/L	07/11/2019	0001	60.00	450		J	#	5	-

Appendix A. July 2019 Crescent Junction Sampling Event (*continued*)

Water Quality Data (*continued*)

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Oxidation Reduction Potential	mV	07/11/2019	N001	60.00	-56			#	-	-
pH	s.u.	07/11/2019	N001	60.00	6.81			#	-	-
Potassium	mg/L	07/11/2019	0001	60.00	94.000		J	#	1.1	-
Selenium	mg/L	07/11/2019	0001	60.00	0.027	U	J	#	0.027	-
Sodium	mg/L	07/11/2019	0001	60.00	8900.000		J	#	0.66	-
Specific Conductance	umhos/cm	07/11/2019	N001	60.00	40980			#	-	-
Sulfate	mg/L	07/11/2019	0001	60.00	28000		J	#	500	-
Temperature	C	07/11/2019	N001	60.00	18.45			#	-	-
TOTAL ALKALINITY AS CaCO3	mg/L	07/11/2019	0001	60.00	1200		J	#	50	-
Total Dissolved Solids	mg/L	07/11/2019	0001	60.00	24000		J	#	1000	-
Turbidity	NTU	07/11/2019	N001	60.00	10.90		J	#	-	-
Uranium	mg/L	07/11/2019	0001	60.00	0.025		J	#	1.2E-05	-
Uranium-234	pCi/L	07/11/2019	0001	60.00	37.2	M3	J	#	0.2	±6.60
Uranium-235	pCi/L	07/11/2019	0001	60.00	0.49	M3	J	#	0.23	±0.32
Uranium-238	pCi/L	07/11/2019	0001	60.00	8.2	M3	J	#	0.3	±1.80

RECORDS: SELECTED FROM USEE105 WHERE RIN = '1907116' AND (DataValidationQualifiers IS NULL OR (DataValidationQualifiers NOT LIKE '%N%' AND DataValidationQualifiers NOT LIKE '%R%' AND DataValidationQualifiers NOT LIKE '%X%'))

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

LAB QUALIFERS:

* Replicate analysis not within control limits.

\+ Correlation coefficient for MSA < 0.995.

\> Result above upper detection limit.

A TIC is a suspected aldol-condensation product.

B Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: 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

M GFAA duplicate injection precision not met.

N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).

P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.

S Result determined by method of standard addition (MSA).

U Analytical result below detection limit.

W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.

X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFERS:

F Low flow sampling method used.

L Less than 3 bore volumes purged prior to sampling.

R Unusable result.

G Possible grout contamination, pH > 9.

N Presumptive evidence that analyte is present. The analyte is "tentatively identified".

U Parameter analyzed for but was not detected.

J Estimated value.

Q Qualitative result due to sampling technique

X Location is undefined.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

Appendix A. July 2019 Crescent Junction Sampling Event (*continued*)

Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE CJ

REPORT DATE: 4/9/2019

Location Code	Flow Code	Ground Surface Elevation (Ft)	Measurement Date Time	Depth From Top of Casing (Ft)	Approximate Water Elevation (MSL)	Water Level Flag
0202	O	4960.0	07/11/2019	53.84	4909.2	

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

Date: October 30, 2019
To: Ken Pill
From: James Ritchey
Subject: July 2019 CJ Sampling Event

Site: Crescent Junction – Well 0202
Date of Sampling Event: July 11, 2019
Team Members: N. Andrews, K. Pill, and J. Ritchey
RIN Number Assigned: All samples were assigned to RIN 1907116
Sample Shipment: The sample was shipped overnight UPS to ALS Environmental from Moab, Utah on July 11 of 2019 (Tracking number: 1Z5W1Y510192581288).

Crescent Junction Well 0205 Sampling

Number of Locations Sampled: One sample was collected from well 0202 during the July 2019 CJ sampling event.

Locations Not Sampled: None.

Field Variance: None.

Quality-control Sample Cross-reference: None.

Location-specific Information: Well 0202 was sampled using a non-dedicated submersible pump with non-dedicated tubing. The table below provides additional information:

Location	Date	Sample Depth (ft bgs)	Depth to Water (ft btoc)	Comments
0202	07/11/2019	60	53.84	Water has yellow color.

Well Inspection Summary: A well inspection was not conducted.

Regulatory: None.

Site Issues: None.

Corrective Action Required/Taken: None.

Appendix B.
September 2019 Side Channel Habitat Sampling

Water Sampling Field Activities Verification
Sampling Location Results

Appendix B. September 2019 Side Channel Habitat Sampling

Water Sampling Field Activities Verification

Sampling Event/RIN	September 2019 Side Channel Habitat Sampling	**Date(s) of Water Sampling**	September 11 through 30, 2019
Date(s) of Verification	April 3, 2020	**Name of Verifier**	Ken Pill

		Response (Yes, No, NA)	Comments
1.	Is the Sampling Analysis Plan (SAP) 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?	Yes	
4.	Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes	
5.	Was an operational check of the field equipment conducted in accordance with the SAP?	Yes	
6.	Did the operational checks meet criteria?	Yes	
7.	Were the number and types (alkalinity, temperature, electrical conductivity, pH, turbidity, oxidation reduction potential) of field measurements taken as specified?	Yes	Field measurements for temperature, pH, turbidity, 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?	NA	
	Did the water level stabilize before sampling?	NA	
	Did pH, specific conductance, and turbidity measurements stabilize before sampling?	NA	
	Was the flow rate less than 500 milliliters per minute?	NA	
	If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	NA	
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?	NA	Only one sample was collected during this event.

Appendix B. September 2019 Side Channel Habitat Sampling (*continued*)

Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	September 2019 Side Channel Habitat Sampling	**Date(s) of Water Sampling**	September 11 through 30, 2019
Date(s) of Verification	April 3, 2020	**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?	NA	The sample was collected using dedicated equipment.
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?	NA	
Was the true identity of the samples recorded on the quality assurance sample log?	NA	
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?	Yes	

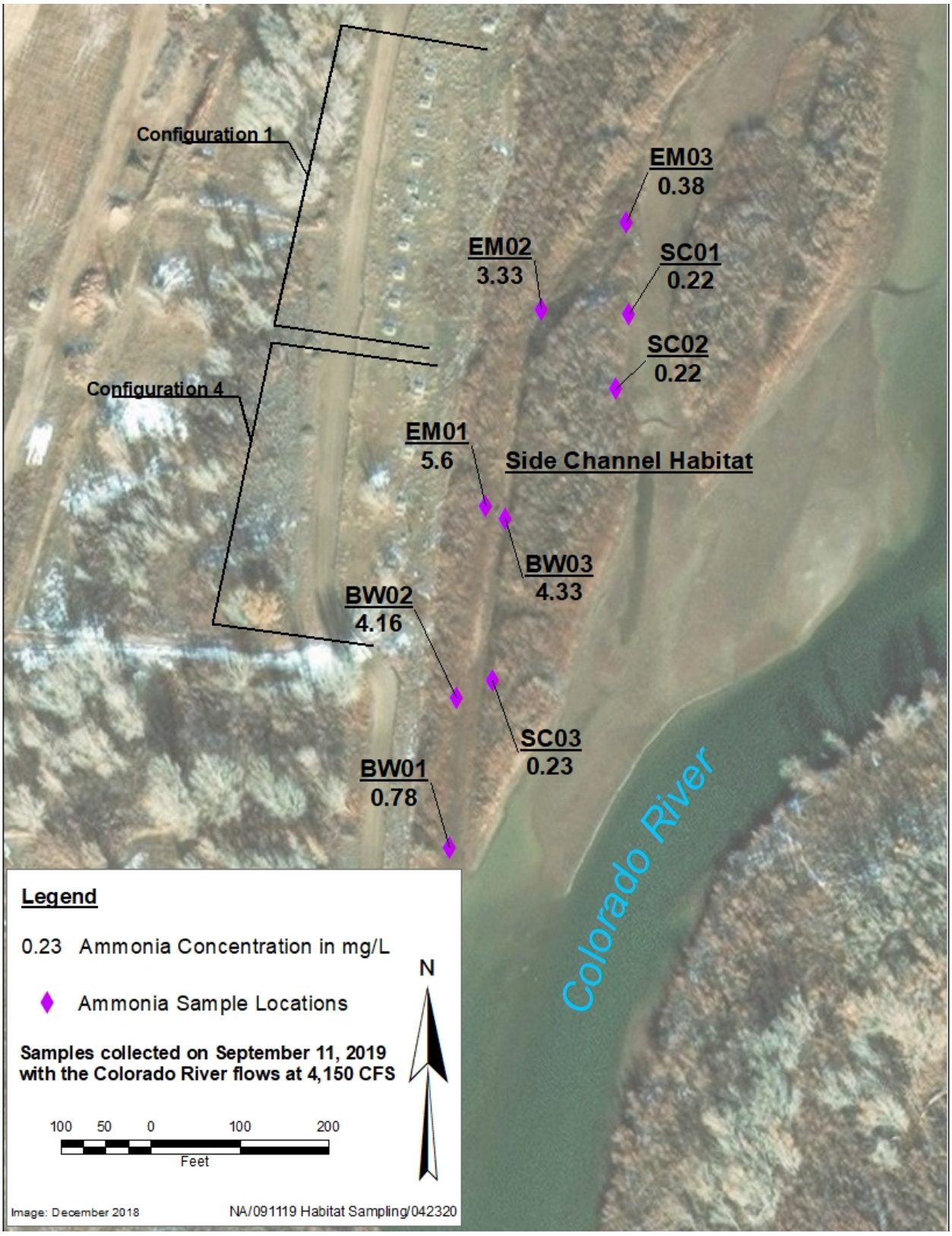

Figure B-1. Habitat Sampling Results, September 11, 2019

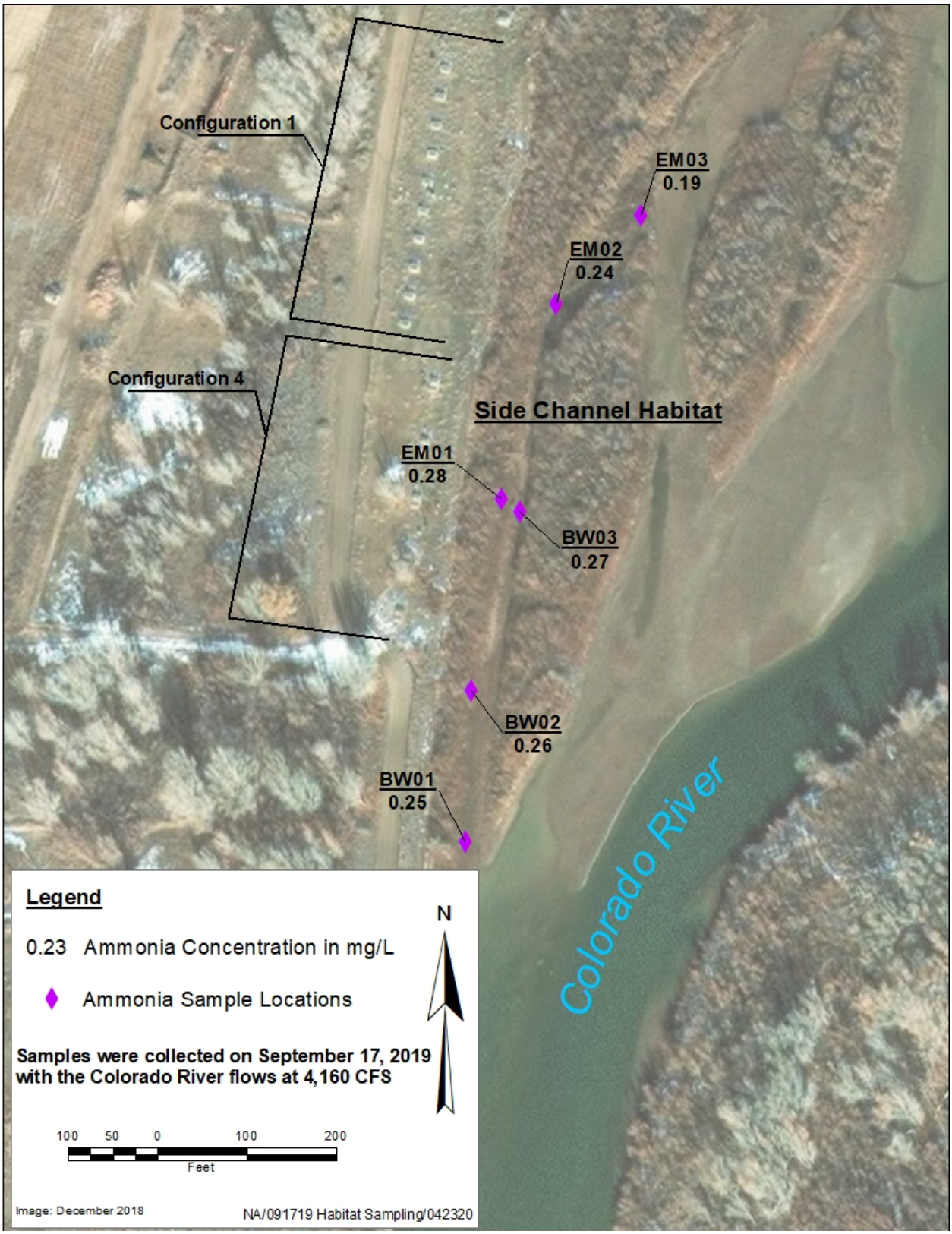

Figure B-2. Habitat Sampling Results, September 17, 2019

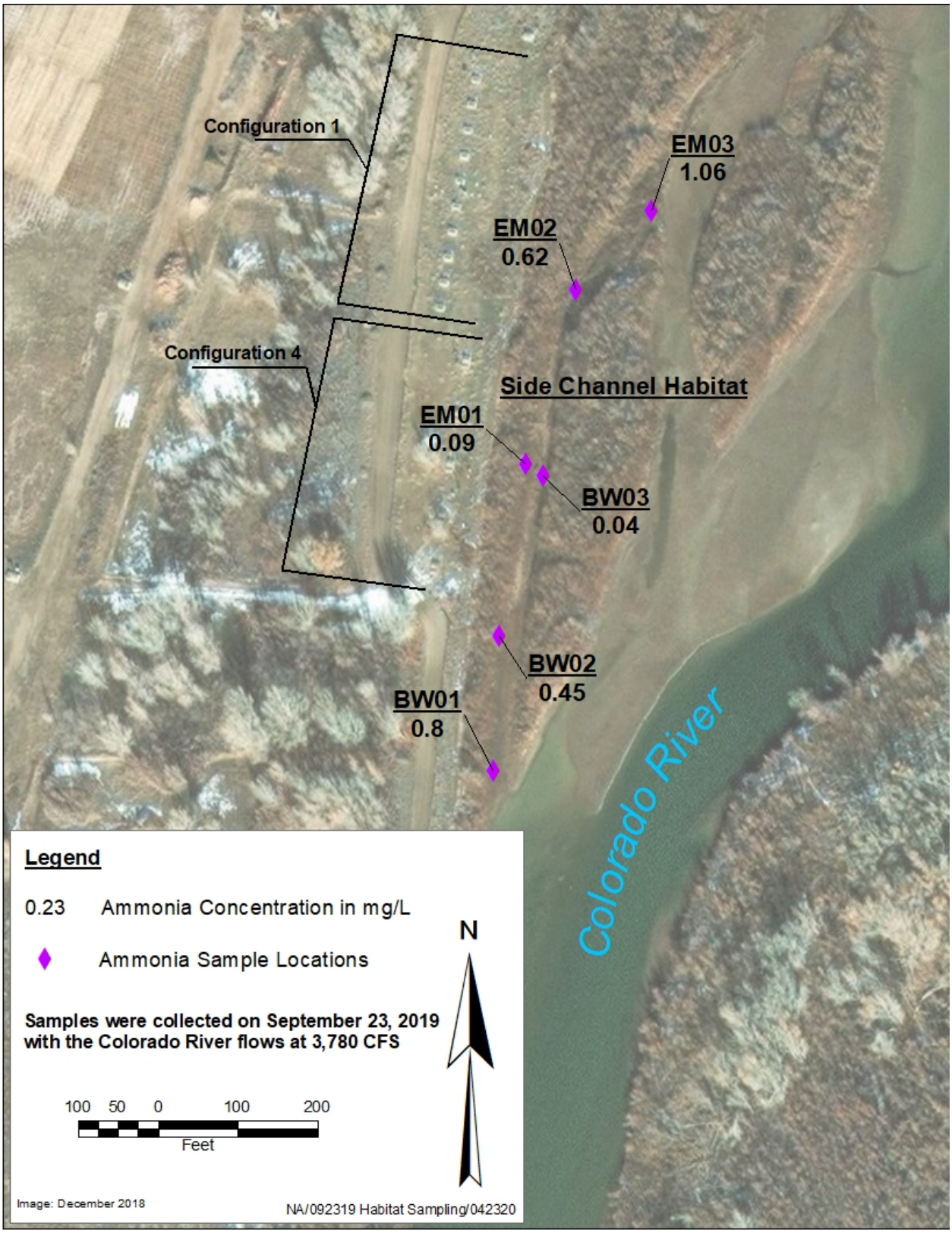

Figure B-3. Habitat Sampling Results, September 23, 2019

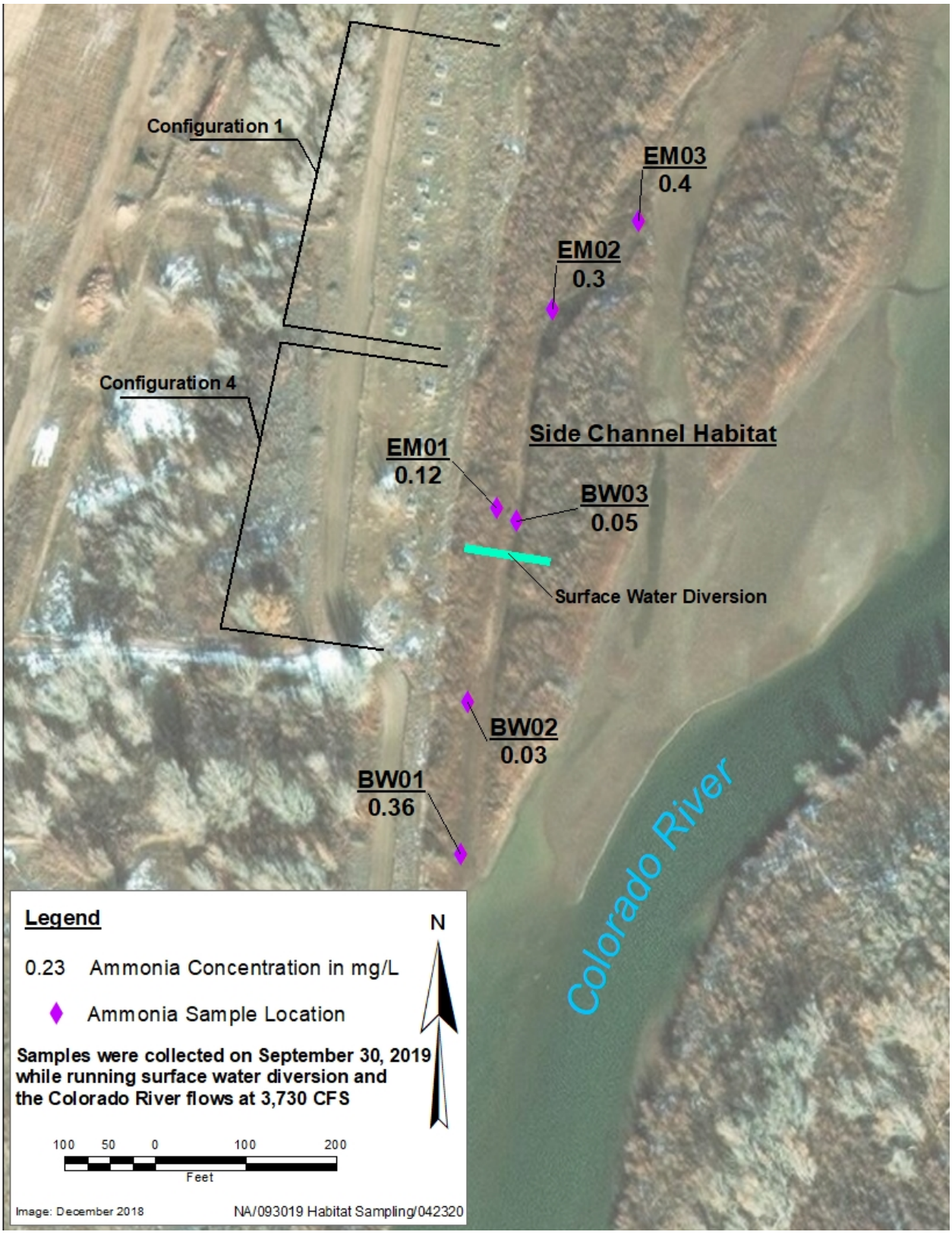

Figure B-4. Habitat Sampling Results, September 30, 2019

Appendix C.
September 2019 CF4 and CF5 Sampling Event

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

Appendix C. September 2019 CF4 and CF5 Sampling Event

Water Sampling Field Activities Verification

Sampling Event/RIN	September 2019 CF4/CF5 Sampling Event /1909117	**Date(s) of Water Sampling**	September 24 – 26, 2019
Date(s) of Verification	March 8, 2020	**Name of Verifier**	Ken Pill

		Response (Yes, No, NA)	Comments
1.	Is the Sampling Analysis Plan (SAP) the primary document directing field procedures?	Yes	
	List other documents, standard operating procedures, instructions.	NA	
2.	Were the sampling locations specified in the planning documents sampled?	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 in accordance with the SAP?	Yes	
	Did the operational checks meet criteria?	Yes	
5.	Were the number and types (alkalinity, temperature, electrical conductivity, pH, turbidity, oxidation reduction potential) of field measurements taken as specified?	Yes	Field measurements for temperature, pH, turbidity, oxidation reduction potential, and conductivity were collected.
6.	Was the category of the well documented?	No	Cat was not documented for well 0783 (Cat 1)
7.	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?	Yes	
8.	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	
9.	Were duplicates taken at a frequency of one per 20 samples?	Yes	One duplicate sample was collected for 15 samples (location 0782)

Appendix C. September 2019 CF4 and CF5 Sampling Event Sampling Event (*continued*)

Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	September 2019 CF4/CF5 Sampling Event /1909117	**Date(s) of Water Sampling**	September 24 – 26, 2019
Date(s) of Verification	March 8, 2020	**Name of Verifier**	Ken Pill

	Response (Yes, No, NA)	Comments
10. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	All samples were collected using dedicated equipment.
11. Were trip blanks prepared and included with each shipment of volatile organic compound samples?	NA	
12. Were quality-control samples assigned a fictitious site identification number?	Yes	Duplicate for 0782 given location 2000
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?	Yes	
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?	Yes	
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?	Yes	

Appendix C. September 2019 CF4 and CF5 Sampling Event (*continued*)
Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters
Laboratory: ALS
RIN: 1909117
Comparison: All Historical Data
Report Date: 4/8/2020 12:56 PM

				Current			Historical Maximum			Historical Minimum			Count	
					Qualifiers			Qualifiers			Qualifiers			
Site Code	Location Code	Sample Date	Analyte	Result	*Lab*	*Data*	Result	*Lab*	*Data*	Result	*Lab*	*Data*	N	N Below Detect
MOA01	SMI-PW02	09/24/2019	Ammonia Total as N	380			4400			410			52	0

Note: All concentrations in mg/L

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

LAB QUALIFERS:
*Replicate analysis not within control limits.
+Correlation coefficient for MSA < 0.995.
>Result above upper detection limit.
A TIC is a suspected aldol-condensation product.
B Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: 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
M GFAA duplicate injection precision not met.
N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
S Result determined by method of standard addition (MSA).
U Analytical result below detection limit.
W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFERS:
--F-Low flow sampling method used.
L-Less than 3 bore volumes purged prior to sampling.
R-Unusable result.
--G-Possible grout contamination, pH > 9.
N-Presumptive evidence that analyte is present. The analyte is "tentatively identified".
U-Parameter analyzed for but was not detected.
--J-Estimated value.
Q-Qualitative result due to sampling technique
X-Location is undefined.

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0780 <well> Configuration 4

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/25/2019	0001	28.00	18		J	#	10	-
Oxidation Reduction Potential	mV	09/25/2019	N001	28.00	-147			#	-	-
pH	s.u.	09/25/2019	N001	28.00	7.37			#	-	-
Specific Conductance	umhos/cm	09/25/2019	N001	28.00	2372			#	-	-
Temperature	C	09/25/2019	N001	28.00	19.79			#	-	-
Turbidity	NTU	09/25/2019	N001	28.00	2.78			#	-	-
Uranium	mg/L	09/25/2019	0001	28.00	0.160		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0781 <well> Configuration 4

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/25/2019	0001	48.00	510		J	#	100	-
Oxidation Reduction Potential	mV	09/25/2019	N001	48.00	-40			#	-	-
pH	s.u.	09/25/2019	N001	48.00	7.01			#	-	-
Specific Conductance	umhos/cm	09/25/2019	N001	48.00	26514			#	-	-
Temperature	C	09/25/2019	N001	48.00	18.27			#	-	-
Turbidity	NTU	09/25/2019	N001	48.00	6.24			#	-	-
Uranium	mg/L	09/25/2019	0001	48.00	1.900		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0782 <well> Configuration 4

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/25/2019	0001	33.00	62		J	#	10	-
Ammonia Total as N	mg/L	09/25/2019	0002	31.01 - 40.78	64		J	#	10	-
Oxidation Reduction Potential	mV	09/25/2019	N001	33.00	-103			#	-	-
pH	s.u.	09/25/2019	N001	33.00	7.61			#	-	-
Specific Conductance	umhos/cm	09/25/2019	N001	33.00	3518			#	-	-
Temperature	C	09/25/2019	N001	33.00	19.04			#	-	-
Turbidity	NTU	09/25/2019	N001	33.00	4.66			#	-	-
Uranium	mg/L	09/25/2019	0001	33.00	0.370		J	#	1.2E-05	-
Uranium	mg/L	09/25/2019	0002	31.01 - 40.78	0.390		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0783 <well> Configuration 4

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/25/2019	0001	18.00	2.2		J	#	1	-
Oxidation Reduction Potential	mV	09/25/2019	N001	18.00	-192			#	-	-
pH	s.u.	09/25/2019	N001	18.00	7.44			#	-	-
Specific Conductance	umhos/cm	09/25/2019	N001	18.00	1765			#	-	-
Temperature	C	09/25/2019	N001	18.00	16.86			#	-	-
Turbidity	NTU	09/25/2019	N001	18.00	5.36			#	-	-
Uranium	mg/L	09/25/2019	0001	18.00	0.100		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0784 <well> Configuration 4

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/25/2019	0001	18.00	1.7		J	#	1	-
Oxidation Reduction Potential	mV	09/25/2019	N001	18.00	-228			#	-	-
pH	s.u.	09/25/2019	N001	18.00	7.42			#	-	-
Specific Conductance	umhos/cm	09/25/2019	N001	18.00	1267			#	-	-
Temperature	C	09/25/2019	N001	18.00	21.43			#	-	-
Turbidity	NTU	09/25/2019	N001	18.00	2.61			#	-	-
Uranium	mg/L	09/25/2019	0001	18.00	0.028		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0785 <well> Configuration 4

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/26/2019	0001	18.00	0.1	U	J	#	0.1	-
Oxidation Reduction Potential	mV	09/26/2019	N001	18.00	-129			#	-	-
pH	s.u.	09/26/2019	N001	18.00	7.10			#	-	-
Specific Conductance	umhos/cm	09/26/2019	N001	18.00	1149			#	-	-
Temperature	C	09/26/2019	N001	18.00	21.23			#	-	-
Turbidity	NTU	09/26/2019	N001	18.00	4.30			#	-	-
Uranium	mg/L	09/26/2019	0001	18.00	0.012		J	#	1.2E-05	-

Appendix C. September 2019 CF4 and CF5 Sampling Event (*continued*)

Water Quality Data (*continued*)

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0786 <well> Configuration 4

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/26/2019	0001	28.00	41		J	#	10	-
Oxidation Reduction Potential	mV	09/26/2019	N001	28.00	-153			#	-	-
pH	s.u.	09/26/2019	N001	28.00	7.59			#	-	-
Specific Conductance	umhos/cm	09/26/2019	N001	28.00	2208			#	-	-
Temperature	C	09/26/2019	N001	28.00	18.76			#	-	-
Turbidity	NTU	09/26/2019	N001	28.00	3.05			#	-	-
Uranium	mg/L	09/26/2019	0001	28.00	0.190		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0787 <well> Configuration 4

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/26/2019	0001	36.00	400		J	#	10	-
Oxidation Reduction Potential	mV	09/26/2019	N001	36.00	-18			#	-	-
pH	s.u.	09/26/2019	N001	36.00	7.04			#	-	-
Specific Conductance	umhos/cm	09/26/2019	N001	36.00	22650			#	-	-
Temperature	C	09/26/2019	N001	36.00	18.11			#	-	-
Turbidity	NTU	09/26/2019	N001	36.00	2.89			#	-	-
Uranium	mg/L	09/26/2019	0001	36.00	1.800		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0810 <well, extraction well> Configuration 5

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/24/2019	0001	10.40 - 40.40	280		J	#	10	-
Oxidation Reduction Potential	mV	09/24/2019	N001	10.40 - 40.40	22			#	-	-
pH	s.u.	09/24/2019	N001	10.40 - 40.40	8.22			#	-	-
Specific Conductance	umhos/cm	09/24/2019	N001	10.40 - 40.40	27754			#	-	-
Temperature	C	09/24/2019	N001	10.40 - 40.40	17.24			#	-	-
Turbidity	NTU	09/24/2019	N001	10.40 - 40.40	10.70			#	-	-
Uranium	mg/L	09/24/2019	0001	10.40 - 40.40	2.700		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0811 <well, extraction well> Configuration 5

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/24/2019	0001	8.60 - 38.60	340		J	#	10	-
Oxidation Reduction Potential	mV	09/24/2019	N001	8.60 - 38.60	-46			#	-	-
pH	s.u.	09/24/2019	N001	8.60 - 38.60	10.38			#	-	-
Specific Conductance	umhos/cm	09/24/2019	N001	8.60 - 38.60	20033			#	-	-
Temperature	C	09/24/2019	N001	8.60 - 38.60	17.43			#	-	-
Turbidity	NTU	09/24/2019	N001	8.60 - 38.60	7.26			#	-	-
Uranium	mg/L	09/24/2019	0001	8.60 - 38.60	2.500		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0812 <well, extraction well> Configuration 5

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/24/2019	0001	14.20 - 44.20	350		J	#	10	-
Oxidation Reduction Potential	mV	09/24/2019	N001	14.20 - 44.20	-25			#	-	-
pH	s.u.	09/24/2019	N001	14.20 - 44.20	11.00			#	-	-
Specific Conductance	umhos/cm	09/24/2019	N001	14.20 - 44.20	14075			#	-	-
Temperature	C	09/24/2019	N001	14.20 - 44.20	17.40			#	-	-
Turbidity	NTU	09/24/2019	N001	14.20 - 44.20	2.43			#	-	-
Uranium	mg/L	09/24/2019	0001	14.20 - 44.20	1.800		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0813 <well, extraction well> Configuration 5

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/24/2019	0001	14.40 - 44.40	240		J	#	10	-
Oxidation Reduction Potential	mV	09/24/2019	N001	14.40 - 44.40	-122			#	-	-
pH	s.u.	09/24/2019	N001	14.40 - 44.40	7.08			#	-	-
Specific Conductance	umhos/cm	09/24/2019	N001	14.40 - 44.40	11334			#	-	-
Temperature	C	09/24/2019	N001	14.40 - 44.40	18.96			#	-	-
Turbidity	NTU	09/24/2019	N001	14.40 - 44.40	10.90			#	-	-
Uranium	mg/L	09/24/2019	0001	14.40 - 44.40	1.200		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0814 <well, extraction well> Configuration 5

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/24/2019	0001	12.40 - 42.40	160		J	#	10	-
Oxidation Reduction Potential	mV	09/24/2019	N001	12.40 - 42.40	-107			#	-	-
pH	s.u.	09/24/2019	N001	12.40 - 42.40	6.96			#	-	-
Specific Conductance	umhos/cm	09/24/2019	N001	12.40 - 42.40	23281			#	-	-
Temperature	C	09/24/2019	N001	12.40 - 42.40	18.15			#	-	-
Turbidity	NTU	09/24/2019	N001	12.40 - 42.40	2.95			#	-	-
Uranium	mg/L	09/24/2019	0001	12.40 - 42.40	2.600		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0815 <well, extraction well> Configuration 5

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/24/2019	0001	21.70 - 51.70	150		J	#	10	-
Oxidation Reduction Potential	mV	09/24/2019	N001	21.70 - 51.70	-83			#	-	-
pH	s.u.	09/24/2019	N001	21.70 - 51.70	6.98			#	-	-
Specific Conductance	umhos/cm	09/24/2019	N001	21.70 - 51.70	20730			#	-	-
Temperature	C	09/24/2019	N001	21.70 - 51.70	17.22			#	-	-
Turbidity	NTU	09/24/2019	N001	21.70 - 51.70	5.23			#	-	-
Uranium	mg/L	09/24/2019	0001	21.70 - 51.70	2.900		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0816 <well, extraction well> Configuration 5

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/24/2019	0001	20.90 - 50.90	140		J	#	10	-
Oxidation Reduction Potential	mV	09/24/2019	N001	20.90 - 50.90	-114			#	-	-
pH	s.u.	09/24/2019	N001	20.90 - 50.90	9.22			#	-	-
Specific Conductance	umhos/cm	09/24/2019	N001	20.90 - 50.90	18596			#	-	-
Temperature	C	09/24/2019	N001	20.90 - 50.90	17.30			#	-	-
Turbidity	NTU	09/24/2019	N001	20.90 - 50.90	3.68			#	-	-
Uranium	mg/L	09/24/2019	0001	20.90 - 50.90	2.200		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: SMI-PW02 <well>

REPORT DATE: 4/8/2020 12:49 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/24/2019	0001	20.04 - 60.04	380		J	#	10	-
Oxidation Reduction Potential	mV	09/24/2019	N001	20.04 - 60.04	-14			#	-	-
pH	s.u.	09/24/2019	N001	20.04 - 60.04	8.86			#	-	-
Specific Conductance	umhos/cm	09/24/2019	N001	20.04 - 60.04	26332			#	-	-
Temperature	C	09/24/2019	N001	20.04 - 60.04	16.46			#	-	-
Turbidity	NTU	09/24/2019	N001	20.04 - 60.04	1.62			#	-	-
Uranium	mg/L	09/24/2019	0001	20.04 - 60.04	2.900		J	#	0.00012	-

RECORDS: SELECTED FROM USEE105 WHERE RIN = '1909117' AND (DataValidationQualifiers IS NULL OR (DataValidationQualifiers NOT LIKE '%N%' AND DataValidationQualifiers NOT LIKE '%R%' AND DataValidationQualifiers NOT LIKE '%X%'))

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

LAB QUALIFERS:

*	Replicate analysis not within control limits.
+	Correlation coefficient for MSA < 0.995.
>	Result above upper detection limit.
A	TIC is a suspected aldol-condensation product.
B	Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: 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
M	GFAA duplicate injection precision not met.
N	Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
P	> 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
S	Result determined by method of standard addition (MSA).
U	Analytical result below detection limit.
W	Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X	Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
Y	Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
Z	Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFERS:

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

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

Appendix C. September 2019 CF4 and CF5 Sampling Event (*continued*)

Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site

REPORT DATE: 4/8/2020 12:53 PM

LOCATION CODE	FLOW CODE	TOP OF CASING ELEVATION (FT)	MEASUREMENT DATE	MEASUREMENT TIME	DEPTH FROM TOP OF CASING (FT)	WATER ELEVATION (FT)	WATER LEVEL FLAG
0780	O	3968.45	09/25/2019		15.03	3953.42	
0781	O	3968.56	09/25/2019		15.00	3953.56	
0782	O	3968.46	09/25/2019		15.02	3953.44	
0783	O	3966.16	09/25/2019		13.13	3953.03	
0784	O	3968.73	09/25/2019		15.74	3952.99	
0785	O	3969.24	09/26/2019		15.59	3953.65	
0786	O	3968.14	09/26/2019		14.93	3953.21	
0787	O	3968.43	09/26/2019		15.19	3953.24	
0810	O	3961.96	09/24/2019		8.80	3953.16	
0811	O	3962.88	09/24/2019		9.42	3953.46	
0812	O	3961.50	09/24/2019		7.26	3954.24	
0813	O	3963.55	09/24/2019		9.20	3954.35	
0814	O	3961.01	09/24/2019		7.02	3953.99	
0815	O	3963.16	09/24/2019		9.79	3953.37	
0816	O	3961.92	09/24/2019		12.36	3949.56	
SMI-PW02	O	3966.73	09/24/2019		21.02	3945.71	

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

Trip Report

Moab TAC Team

Date: October 30, 2019
To: Ken Pill
From: James Ritchey
Subject: September 2019 CF4 and CF5 Sampling Event

Site: Moab
Date of Sampling Event: September 24 – 26, 2019
Team Members: J. Ritchey N. Andrews
RIN Number Assigned: All samples were assigned to RIN 1909117.
Sample Shipment: One sample cooler was shipped overnight UPS to ALS Laboratory from Moab, Utah on September 26, of 2019 (Tracking number 1Z5W1Y510194050142).

September 2019 CF4 Sampling

Number of Locations Sampled: Eight observation wells (0780, 0781, 0782, 0783, 0784, 0785, 0786, and 0787) and one duplicate were sampled during the September 2019 Sampling Event.

Locations Not Sampled: None.

Field Variance: None.

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

False ID	True ID	Sample Type	Associated Matrix	Ticket Number
2000	0782	Duplicate from 32 ft bgs	Groundwater	SEP 012

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 No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0780	9/25/2019	14:00	15.03	28
0781	9/25/2019	14:25	15.00	46
0782	9/25/2019	14:45	15.02	32
0783	9/25/2019	15:40	13.13	18
0784	9/25/2019	16:10	15.74	18
0785	9/26/2019	9:35	15.59	18
0786	9/26/2019	9:50	14.93	28
0787	9/26/2019	10:10	15.19	36

September 2019 CF5 Sampling

Number of Locations Sampled: Seven extraction wells (0810, 0811, 0812, 0813, 0814, 0815, 0816, and SMI-PW02) were sampled during the September 2019 Monthly Sampling Event.

Locations Not Sampled: None.

Field Variance: None.

Quality Control Sample Cross Reference: None.

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

Well No.	Date	Time	Depth to Water (ft btoc)*	Pump Intake Depth (ft bgs)
0810	9/24/2019	11:50	8.80	10.4 – 40.4
0811	9/24/2019	12:05	9.42	8.6 – 38.6
0812	9/24/2019	12:30	7.26	14.2 – 44.2
0813	9/24/2019	15:10	9.20	14.4 – 44.4
0814	9/24/2019	15:45	7.02	12.4 – 42.4
0815	9/24/2019	15:30	9.79	21.7 – 51.7
0816	9/24/2019	15:20	12.36	20.9 – 50.9
SMI-PW02	9/24/2019	12:20	21.02	20.0 – 60.0

*Depths to water were not collected for wells in operation or where a water level could not be attained.

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

Date	Daily Mean Flow (cfs)
9/24/2018	3,830
9/25/2018	3,820
9/26/2018	3,840

Equipment Issues: None.

Corrective Action Required/Taken: None.

Appendix D.
December 2019 Site-wide Sampling Event

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

Appendix D. December 2019 Site-wide Sampling Event

Water Sampling Field Activities Verification

Sampling Event/RIN	December 2019 Site-wide Sampling Event/1912118	**Date(s) of Water Sampling**	December 5 - 31, 2019
Date(s) of Verification	April 15, 2020	**Name of Verifier**	Ken Pill

		Response (Yes, No, NA)	Comments
1.	Is the Sampling Analysis Plan (SAP) the primary document directing field procedures?	Yes	
	List other documents, standard operating procedures, instructions.	NA	
2.	Were the sampling locations specified in the planning documents sampled?	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 in accordance with the SAP?	Yes	
	Did the operational checks meet criteria?	Yes	
5.	Were the number and types (alkalinity, temperature, electrical conductivity, pH, turbidity, oxidation reduction potential) of field measurements taken as specified?	Yes	Field measurements for temperature, pH, turbidity, oxidation reduction potential, and conductivity were collected.
6.	Was the category of the well documented?	No	No category provided for the samples from wells TP-20 (1), UPD-17 (1), SMI-PZ3S (1), 0410 (3), AMM-3 (1), and TP-17 (1)
7.	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?	Yes	
8.	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?	NA	
9.	Were duplicates taken at a frequency of one per 20 samples?	NA	Three duplicates were collected for 60 samples.

Appendix D. December 2019 Site-wide Sampling Event (*continued*)

Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	December 2019 Site-wide Sampling Event/1912118	**Date(s) of Water Sampling**	December 5 - 31, 2019
Date(s) of Verification	April 15, 2020	**Name of Verifier**	Ken Pill

	Response (Yes, No, NA)	Comments
10. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	Yes	One blank was collected for the 7 surface water samples, all other samples were collected using dedicated equipment. (location 2003)
11. Were trip blanks prepared and included with each shipment of volatile organic compound samples?	NA	
12. Were quality-control samples assigned a fictitious site identification number?	Yes	Duplicate samples were collected from locations SMI-PZ3S (2000), 0407 (2001), and 0226 (2002)
Was the true identity of the samples recorded on the quality assurance sample log?	Yes	
13. Were samples collected in the containers specified?	Yes	
14. Were samples filtered and preserved as specified?	Yes	
15. Were the number and types of samples collected as specified?	Yes	
16. Were COC records completed, and was sample custody maintained?	Yes	
17. Are field data sheets signed and dated by both team members?	Yes	
18. Was all other pertinent information documented on the field data sheets?	Yes	
19. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
20. Were water levels measured at the locations specified in the planning documents?	Yes	Water levels were measured between Oct 31 and Nov 6, plus just prior to sample collection

Appendix D. December 2019 Site-wide Sampling Event (*continued*)

Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters
Laboratory: ALS
RIN: 1912118
Comparison: All Historical Data
Report Date: 4/8/2020 12:55 PM

				Current			Historical Maximum			Historical Minimum			Count	
					Qualifiers			Qualifiers			Qualifiers			
Site Code	Location Code	Sample Date	Analyte	Result	Lab	Data	Result	Lab	Data	Result	Lab	Data	N	N Below Detect
MOA01	0412	12/05/2019	Selenium	0.0099	J		0.1		F	0.029			9	0
MOA01	0413	12/05/2019	Selenium	0.047	J		0.3			0.14			10	0
MOA01	0440	12/18/2019	Selenium	0.064			0.0572		QF	0.034		J	7	0
MOA01	ATP-2-D	12/09/2019	Arsenic	0.00015	J		0.1	U		0.00035	B	F	27	17
MOA01	MW-3	12/11/2019	Ammonia Total as N	330			1190			390			21	0
MOA01	SMI-MW01	12/05/2019	Uranium	2.7			17.6			2.8			24	0
MOA01	SMI-PZ2M2	12/09/2019	Uranium	3			2.9			0.5			20	0
MOA01	SMI-PZ3D2	12/10/2019	Uranium	0.71			7			0.72			27	0
MOA01	TP-11	12/05/2019	Uranium	0.00056			0.0035			0.00068			20	0
MOA01	TP-20	12/09/2019	Uranium	0.044			0.034			0.0005	B		29	1
MOA01	TP-22	12/09/2019	Uranium	0.56			0.53			0.21			18	0
MOA01	TP-23	12/09/2019	Ammonia Total as N	100			540		J	140			17	0
MOA01	TP-23	12/09/2019	Uranium	1.5			4.1			2.2			18	0

Note: All concentrations in mg/LSAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

Analyte concentrations presented in blue text represent the historical minimum or maximum value exceeded by the concentration presented in red, which is associated with this current sampling event.

LAB QUALIFIERS:

*	Replicate analysis not within control limits.
>	Result above upper detection limit.
A	TIC is a suspected aldol-condensation product.
B	Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.

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

DATA QUALIFIERS:

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

Appendix D. December 2019 Site-wide Sampling Event (*continued*)

Blanks Report

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Uncertainty	Sample Type
Ammonia Total as N	MOA01	0999	12/31/2019	0001	mg/L	0.2	U		0.2		E
Uranium	MOA01	0999	12/31/2019	0001	mg/L	0.0012	J		1.2E-05		E

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

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

SAMPLE TYPES:

E	Equipment Blank.

Appendix D. December 2019 Site-wide Sampling Event (*continued*)

Water Quality Data

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0201 <surface location, river>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/30/2019	0001	0.00 - 0.00	0.2	U	J	#	0.2	-
Oxidation Reduction Potential	mV	12/30/2019	N001	0.00 - 0.00	187			#	-	-
pH	s.u.	12/30/2019	N001	0.00 - 0.00	7.47			#	-	-
Specific Conductance	umhos/cm	12/30/2019	N001	0.00 - 0.00	1076			#	-	-
Temperature	C	12/30/2019	N001	0.00 - 0.00	0.93			#	-	-
Turbidity	NTU	12/30/2019	N001	0.00 - 0.00	13.80			#	-	-
Uranium	mg/L	12/30/2019	0001	0.00 - 0.00	0.0045		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0218 <surface location, river>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/30/2019	0001	0.00 - 0.00	0.2	U	J	#	0.2	-
Oxidation Reduction Potential	mV	12/30/2019	N001	0.00 - 0.00	179			#	-	-
pH	s.u.	12/30/2019	N001	0.00 - 0.00	7.75			#	-	-
Specific Conductance	umhos/cm	12/30/2019	N001	0.00 - 0.00	1062			#	-	-
Temperature	C	12/30/2019	N001	0.00 - 0.00	1.46			#	-	-
Turbidity	NTU	12/30/2019	N001	0.00 - 0.00	11.70			#	-	-
Uranium	mg/L	12/30/2019	0001	0.00 - 0.00	0.005		J	#	1.2E-05	-

Appendix D. December 2019 Site-wide Sampling Event (*continued*)
Water Quality Data (*continued*)

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0226 <surface location, river>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/31/2019	0001	0.00 - 0.00	0.2	U	J	#	0.2	-
Ammonia Total as N	mg/L	12/31/2019	0002	0.00 - 0.00	0.2	U	J	#	0.2	-
Oxidation Reduction Potential	mV	12/31/2019	N001	0.00 - 0.00	89			#	-	-
pH	s.u.	12/31/2019	N001	0.00 - 0.00	6.91			#	-	-
Specific Conductance	umhos/cm	12/31/2019	N001	0.00 - 0.00	1075			#	-	-
Temperature	C	12/31/2019	N001	0.00 - 0.00	0.26			#	-	-
Turbidity	NTU	12/31/2019	N001	0.00 - 0.00	130.00			#	-	-
Uranium	mg/L	12/31/2019	0001	0.00 - 0.00	0.0057		J	#	1.2E-05	-
Uranium	mg/L	12/31/2019	0002	0.00 - 0.00	0.0057		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0401 <well> Configuration 2

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/12/2019	0001	18.00	310		J	#	10	-
Oxidation Reduction Potential	mV	12/12/2019	N001	18.00	149			#	-	-
pH	s.u.	12/12/2019	N001	18.00	6.78			#	-	-
Specific Conductance	umhos/cm	12/12/2019	N001	18.00	14730			#	-	-
Temperature	C	12/12/2019	N001	18.00	17.99			#	-	-
Turbidity	NTU	12/12/2019	N001	18.00	1.59			#	-	-
Uranium	mg/L	12/12/2019	0001	18.00	1.700		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0403 <well> Configuration 1

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/12/2019	0001	18.00	43		J	#	1	-
Oxidation Reduction Potential	mV	12/12/2019	N001	18.00	63			#	-	-
pH	s.u.	12/12/2019	N001	18.00	7.35			#	-	-
Specific Conductance	umhos/cm	12/12/2019	N001	18.00	1748			#	-	-
Temperature	C	12/12/2019	N001	18.00	16.51			#	-	-
Turbidity	NTU	12/12/2019	N001	18.00	0.78			#	-	-
Uranium	mg/L	12/12/2019	0001	18.00	0.220		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0404 <well> Configuration 3

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/12/2019	0001	18.00	290		J	#	10	-
Oxidation Reduction Potential	mV	12/12/2019	N001	18.00	172			#	-	-
pH	s.u.	12/12/2019	N001	18.00	6.87			#	-	-
Specific Conductance	umhos/cm	12/12/2019	N001	18.00	12290			#	-	-
Temperature	C	12/12/2019	N001	18.00	17.66			#	-	-
Turbidity	NTU	12/12/2019	N001	18.00	0.60			#	-	-
Uranium	mg/L	12/12/2019	0001	18.00	1.200		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0406 <well> Baseline Area

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/11/2019	0001	18.00	170		J	#	10	-
Oxidation Reduction Potential	mV	12/11/2019	N001	18.00	65			#	-	-
pH	s.u.	12/11/2019	N001	18.00	7.02			#	-	-
Specific Conductance	umhos/cm	12/11/2019	N001	18.00	12603			#	-	-
Temperature	C	12/11/2019	N001	18.00	16.63			#	-	-
Turbidity	NTU	12/11/2019	N001	18.00	3.27			#	-	-
Uranium	mg/L	12/11/2019	0001	18.00	1.600		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0407 <well> Configuration 1

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/12/2019	0001	18.00	120	N	J	#	10	-
	mg/L	12/12/2019	0002	13.33 - 18.25	110		J	#	10	-
Oxidation Reduction Potential	mV	12/12/2019	N001	18.00	156			#	-	-
pH	s.u.	12/12/2019	N001	18.00	6.93			#	-	-
Specific Conductance	umhos/cm	12/12/2019	N001	18.00	9998			#	-	-
Temperature	C	12/12/2019	N001	18.00	16.75			#	-	-
Turbidity	NTU	12/12/2019	N001	18.00	1.05			#	-	-
Uranium	mg/L	12/12/2019	0001	18.00	1.200		J	#	0.00012	-
	mg/L	12/12/2019	0002	13.33 - 18.25	1.200		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0410 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	23.50	0.1	U	J	#	0.1	-
Oxidation Reduction Potential	mV	12/10/2019	N001	23.50	-44			#	-	-
pH	s.u.	12/10/2019	N001	23.50	7.17			#	-	-
Specific Conductance	umhos/cm	12/10/2019	N001	23.50	3183			#	-	-
Temperature	C	12/10/2019	N001	23.50	17.19			#	-	-
Turbidity	NTU	12/10/2019	N001	23.50	8.42			#	-	-
Uranium	mg/L	12/10/2019	0001	23.50	0.350		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0412 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/05/2019	0001	9.50	1	U	J	#	1	-
Arsenic	mg/L	12/05/2019	0001	9.50	0.025		J	#	0.0012	-
Oxidation Reduction Potential	mV	12/05/2019	N001	9.50	26			#	-	-
pH	s.u.	12/05/2019	N001	9.50	7.58			#	-	-
Selenium	mg/L	12/05/2019	0001	9.50	0.0099	J	J	#	0.0066	-
Specific Conductance	umhos/cm	12/05/2019	N001	9.50	1395			#	-	-
Temperature	C	12/05/2019	N001	9.50	16.45			#	-	-
Turbidity	NTU	12/05/2019	N001	9.50	108.00			#	-	-
Uranium	mg/L	12/05/2019	0001	9.50	2.200		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0413 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/05/2019	0001	10.50	68		J	#	10	-
Oxidation Reduction Potential	mV	12/05/2019	N001	10.50	-6			#	-	-
pH	s.u.	12/05/2019	N001	10.50	7.42			#	-	-
Selenium	mg/L	12/05/2019	0001	10.50	0.047	J	J	#	0.0066	-
Specific Conductance	umhos/cm	12/05/2019	N001	10.50	7574			#	-	-
Temperature	C	12/05/2019	N001	10.50	14.55			#	-	-
Turbidity	NTU	12/05/2019	N001	10.50	7.72			#	-	-
Uranium	mg/L	12/05/2019	0001	10.50	2.800		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0414 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/05/2019	0001	7.50	32		J	#	1	-
Arsenic	mg/L	12/05/2019	0001	7.50	0.018	J	J	#	0.0012	-
Oxidation Reduction Potential	mV	12/05/2019	N001	7.50	-11			#	-	-
pH	s.u.	12/05/2019	N001	7.50	7.27			#	-	-
Selenium	mg/L	12/05/2019	0001	7.50	0.087	J	J	#	0.0066	-
Specific Conductance	umhos/cm	12/05/2019	N001	7.50	7697			#	-	-
Temperature	C	12/05/2019	N001	7.50	14.91			#	-	-
Turbidity	NTU	12/05/2019	N001	7.50	19.60			#	-	-
Uranium	mg/L	12/05/2019	0001	7.50	2.500		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0430 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/31/2019	0001	101.00	0.2	U	J	#	0.2	-
Oxidation Reduction Potential	mV	12/31/2019	N001	101.00	160			#	-	-
pH	s.u.	12/31/2019	N001	101.00	7.36			#	-	-
Specific Conductance	umhos/cm	12/31/2019	N001	101.00	6388			#	-	-
Temperature	C	12/31/2019	N001	101.00	17.58			#	-	-
Turbidity	NTU	12/31/2019	N001	101.00	0.54			#	-	-
Uranium	mg/L	12/31/2019	0001	101.00	0.013		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0431 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/31/2019	0001	91.00	0.2	U	J	#	0.2	-
Oxidation Reduction Potential	mV	12/31/2019	N001	91.00	189			#	-	-
pH	s.u.	12/31/2019	N001	91.00	6.88			#	-	-
Specific Conductance	umhos/cm	12/31/2019	N001	91.00	36566			#	-	-
Temperature	C	12/31/2019	N001	91.00	17.78			#	-	-
Turbidity	NTU	12/31/2019	N001	91.00	0.73			#	-	-
Uranium	mg/L	12/31/2019	0001	91.00	0.011		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0436 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	197.00	4.1		J	#	1	-
Oxidation Reduction Potential	mV	12/10/2019	N001	197.00	-245			#	-	-
pH	s.u.	12/10/2019	N001	197.00	7.21			#	-	-
Specific Conductance	umhos/cm	12/10/2019	N001	197.00	116237			#	-	-
Temperature	C	12/10/2019	N001	197.00	18.46			#	-	-
Turbidity	NTU	12/10/2019	N001	197.00	7.80			#	-	-
Uranium	mg/L	12/10/2019	0001	197.00	0.0076		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0437 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/18/2019	0001	97.00	0.7		J	#	0.1	-
Oxidation Reduction Potential	mV	12/18/2019	N001	97.00	75			#	-	-
pH	s.u.	12/18/2019	N001	97.00	7.03			#	-	-
Selenium	mg/L	12/18/2019	0001	97.00	0.120		J	#	0.0066	-
Specific Conductance	umhos/cm	12/18/2019	N001	97.00	10182			#	-	-
Temperature	C	12/18/2019	N001	97.00	16.28			#	-	-
Turbidity	NTU	12/18/2019	N001	97.00	2.69			#	-	-
Uranium	mg/L	12/18/2019	0001	97.00	2.500		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0439 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/18/2019	0001	118.00	7.2		J	#	1	-
Arsenic	mg/L	12/18/2019	0001	118.00	0.0012	U	J	#	0.0012	-
Oxidation Reduction Potential	mV	12/18/2019	N001	118.00	172			#	-	-
pH	s.u.	12/18/2019	N001	118.00	6.92			#	-	-
Selenium	mg/L	12/18/2019	0001	118.00	0.0066	U	J	#	0.0066	-
Specific Conductance	umhos/cm	12/18/2019	N001	118.00	10787			#	-	-
Temperature	C	12/18/2019	N001	118.00	12.64			#	-	-
Turbidity	NTU	12/18/2019	N001	118.00	10.60			#	-	-
Uranium	mg/L	12/18/2019	0001	118.00	1.500		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0440 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/18/2019	0001	117.00	1	U	J	#	1	-
Oxidation Reduction Potential	mV	12/18/2019	N001	117.00	164			#	-	-
pH	s.u.	12/18/2019	N001	117.00	6.93			#	-	-
Selenium	mg/L	12/18/2019	0001	117.00	0.064		J	#	0.00066	-
Specific Conductance	umhos/cm	12/18/2019	N001	117.00	8484			#	-	-
Temperature	C	12/18/2019	N001	117.00	15.49			#	-	-
Turbidity	NTU	12/18/2019	N001	117.00	18.50			#	-	-
Uranium	mg/L	12/18/2019	0001	117.00	0.032		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0441 <well> Queue/Support Area

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/31/2019	0001	53.00	0.2	U	J	#	0.2	-
Oxidation Reduction Potential	mV	12/31/2019	N001	53.00	142			#	-	-
pH	s.u.	12/31/2019	N001	53.00	6.84			#	-	-
Specific Conductance	umhos/cm	12/31/2019	N001	53.00	14174			#	-	-
Temperature	C	12/31/2019	N001	53.00	16.38			#	-	-
Turbidity	NTU	12/31/2019	N001	53.00	6.91			#	-	-
Uranium	mg/L	12/31/2019	0001	53.00	0.044		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0444 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/12/2019	0001	116.00	2.2		J	#	1	-
Oxidation Reduction Potential	mV	12/12/2019	N001	116.00	-133			#	-	-
pH	s.u.	12/12/2019	N001	116.00	6.92			#	-	-
Specific Conductance	umhos/cm	12/12/2019	N001	116.00	109610			#	-	-
Temperature	C	12/12/2019	N001	116.00	16.84			#	-	-
Turbidity	NTU	12/12/2019	N001	116.00	2.82			#	-	-
Uranium	mg/L	12/12/2019	0001	116.00	0.014		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0453 <well> Contaminated Area

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/18/2019	0001	80.00	230		J	#	10	-
Oxidation Reduction Potential	mV	12/18/2019	N001	80.00	100			#	-	-
pH	s.u.	12/18/2019	N001	80.00	6.42			#	-	-
Selenium	mg/L	12/18/2019	0001	80.00	0.210		J	#	0.0066	-
Specific Conductance	umhos/cm	12/18/2019	N001	80.00	35084			#	-	-
Temperature	C	12/18/2019	N001	80.00	13.46			#	-	-
Turbidity	NTU	12/18/2019	N001	80.00	2.52			#	-	-
Uranium	mg/L	12/18/2019	0001	80.00	1.500		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0454 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/09/2019	0001	13.00	220		J	#	10	-
Oxidation Reduction Potential	mV	12/09/2019	N001	13.00	-57			#	-	-
pH	s.u.	12/09/2019	N001	13.00	7.04			#	-	-
Specific Conductance	umhos/cm	12/09/2019	N001	13.00	53206			#	-	-
Temperature	C	12/09/2019	N001	13.00	18.35			#	-	-
Turbidity	NTU	12/09/2019	N001	13.00	12.50			#	-	-
Uranium	mg/L	12/09/2019	0001	13.00	1.100		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0457 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/12/2019	0001	29.00	1	U	J	#	1	-
Oxidation Reduction Potential	mV	12/12/2019	N001	29.00	-116			#	-	-
pH	s.u.	12/12/2019	N001	29.00	7.77			#	-	-
Specific Conductance	umhos/cm	12/12/2019	N001	29.00	5617			#	-	-
Temperature	C	12/12/2019	N001	29.00	17.10			#	-	-
Turbidity	NTU	12/12/2019	N001	29.00	2.36			#	-	-
Uranium	mg/L	12/12/2019	0001	29.00	0.0021		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: 0492 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/30/2019	0001	18.00	180		J	#	20	-
Oxidation Reduction Potential	mV	12/30/2019	N001	18.00	175			#	-	-
pH	s.u.	12/30/2019	N001	18.00	8.25			#	-	-
Specific Conductance	umhos/cm	12/30/2019	N001	18.00	17960			#	-	-
Temperature	C	12/30/2019	N001	18.00	15.80			#	-	-
Turbidity	NTU	12/30/2019	N001	18.00	3.02			#	-	-
Uranium	mg/L	12/30/2019	0001	18.00	2.100		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: AMM-1 <well> NE corner of DOE property.

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/05/2019	0001	19.00	0.1	U	J	#	0.1	-
Arsenic	mg/L	12/05/2019	0001	19.00	0.00062	J	J	#	0.00012	-
Oxidation Reduction Potential	mV	12/05/2019	N001	19.00	131			#	-	-
pH	s.u.	12/05/2019	N001	19.00	7.45			#	-	-
Selenium	mg/L	12/05/2019	0001	19.00	0.013		J	#	0.00066	-
Specific Conductance	umhos/cm	12/05/2019	N001	19.00	12025			#	-	-
Temperature	C	12/05/2019	N001	19.00	18.36			#	-	-
Turbidity	NTU	12/05/2019	N001	19.00	6.08			#	-	-
Uranium	mg/L	12/05/2019	0001	19.00	0.0076		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: AMM-2 <well> East of pile along road.

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/11/2019	0001	48.00	440		J	#	10	-
Arsenic	mg/L	12/11/2019	0001	48.00	0.0012	J	J	#	0.0012	-
Oxidation Reduction Potential	mV	12/11/2019	N001	48.00	61			#	-	-
pH	s.u.	12/11/2019	N001	48.00	6.92			#	-	-
Selenium	mg/L	12/11/2019	0001	48.00	0.012	J	J	#	0.0066	-
Specific Conductance	umhos/cm	12/11/2019	N001	48.00	16546			#	-	-
Temperature	C	12/11/2019	N001	48.00	16.46			#	-	-
Turbidity	NTU	12/11/2019	N001	48.00	5.87			#	-	-
Uranium	mg/L	12/11/2019	0001	48.00	1.800		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: AMM-3 <well> Near SE corner of pile.

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/11/2019	0001	48.00	240		J	#	10	-
Arsenic	mg/L	12/11/2019	0001	48.00	0.0031	J	J	#	0.0012	-
Oxidation Reduction Potential	mV	12/11/2019	N001	48.00	-98			#	-	-
pH	s.u.	12/11/2019	N001	48.00	6.97			#	-	-
Selenium	mg/L	12/11/2019	0001	48.00	0.0066	U	J	#	0.0066	-
Specific Conductance	umhos/cm	12/11/2019	N001	48.00	20227			#	-	-
Temperature	C	12/11/2019	N001	48.00	19.10			#	-	-
Turbidity	NTU	12/11/2019	N001	48.00	2.76			#	-	-
Uranium	mg/L	12/11/2019	0001	48.00	1.500		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: ATP-2-D <well, piezometer> Piezometer; see boring ATP-2

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/09/2019	0001	88.00	370		J	#	10	-
Arsenic	mg/L	12/09/2019	0001	88.00	0.00015	J	J	#	0.00012	-
Oxidation Reduction Potential	mV	12/09/2019	N001	88.00	-290			#	-	-
pH	s.u.	12/09/2019	N001	88.00	7.85			#	-	-
Selenium	mg/L	12/09/2019	0001	88.00	0.00076	J	J	#	0.00066	-
Specific Conductance	umhos/cm	12/09/2019	N001	88.00	108879			#	-	-
Temperature	C	12/09/2019	N001	88.00	16.36			#	-	-
Turbidity	NTU	12/09/2019	N001	88.00	25.30			#	-	-
Uranium	mg/L	12/09/2019	0001	88.00	0.0011		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: ATP-2-S <well, piezometer> Piezometer; see boring ATP-2

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/09/2019	0001	25.00	340		J	#	10	-
Arsenic	mg/L	12/09/2019	0001	25.00	0.0034		J	#	0.00012	-
Oxidation Reduction Potential	mV	12/09/2019	N001	25.00	-196			#	-	-
pH	s.u.	12/09/2019	N001	25.00	9.61			#	-	-
Selenium	mg/L	12/09/2019	0001	25.00	0.0016	J	J	#	0.00066	-
Specific Conductance	umhos/cm	12/09/2019	N001	25.00	14057			#	-	-
Temperature	C	12/09/2019	N001	25.00	16.02			#	-	-
Turbidity	NTU	12/09/2019	N001	25.00	82.40			#	-	-
Uranium	mg/L	12/09/2019	0001	25.00	0.0016		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: ATP-3 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/31/2019	0001	51.00	0.2	U	J	#	0.2	-
Arsenic	mg/L	12/31/2019	0001	51.00	0.0014	J	J	#	0.00012	-
Oxidation Reduction Potential	mV	12/31/2019	N001	51.00	127			#	-	-
pH	s.u.	12/31/2019	N001	51.00	7.74			#	-	-
Specific Conductance	umhos/cm	12/31/2019	N001	51.00	2392			#	-	-
Temperature	C	12/31/2019	N001	51.00	17.82			#	-	-
Turbidity	NTU	12/31/2019	N001	51.00	4.67			#	-	-
Uranium	mg/L	12/31/2019	0001	51.00	0.0036		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: CR1 <surface location, river>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/30/2019	0001	3.00	0.2	U	J	#	0.2	-
Oxidation Reduction Potential	mV	12/30/2019	N001	3.00	197			#	-	-
pH	s.u.	12/30/2019	N001	3.00	7.60			#	-	-
Specific Conductance	umhos/cm	12/30/2019	N001	3.00	1065			#	-	-
Temperature	C	12/30/2019	N001	3.00	0.93			#	-	-
Turbidity	NTU	12/30/2019	N001	3.00	9.70			#	-	-
Uranium	mg/L	12/30/2019	0001	3.00	0.0042		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: CR2 <surface location, river>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/30/2019	0001	0.00 - 0.00	0.2	U	J	#	0.2	-
Oxidation Reduction Potential	mV	12/30/2019	N001	0.00 - 0.00	190			#	-	-
pH	s.u.	12/30/2019	N001	0.00 - 0.00	7.57			#	-	-
Specific Conductance	umhos/cm	12/30/2019	N001	0.00 - 0.00	1068			#	-	-
Temperature	C	12/30/2019	N001	0.00 - 0.00	1.60			#	-	-
Turbidity	NTU	12/30/2019	N001	0.00 - 0.00	12.60			#	-	-
Uranium	mg/L	12/30/2019	0001	0.00 - 0.00	0.0084		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: CR3 <surface location, river>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/30/2019	0001	0.00 - 0.00	0.2	U	J	#	0.2	-
Oxidation Reduction Potential	mV	12/30/2019	N001	0.00 - 0.00	156			#	-	-
pH	s.u.	12/30/2019	N001	0.00 - 0.00	8.60			#	-	-
Specific Conductance	umhos/cm	12/30/2019	N001	0.00 - 0.00	1085			#	-	-
Temperature	C	12/30/2019	N001	0.00 - 0.00	1.71			#	-	-
Turbidity	NTU	12/30/2019	N001	0.00 - 0.00	11.00			#	-	-
Uranium	mg/L	12/30/2019	0001	0.00 - 0.00	0.0071		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: CR5 <surface location, river>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/30/2019	0001	0.00 - 0.00	0.2	U	J	#	0.2	-
Oxidation Reduction Potential	mV	12/30/2019	N001	0.00 - 0.00	188			#	-	-
pH	s.u.	12/30/2019	N001	0.00 - 0.00	7.46			#	-	-
Specific Conductance	umhos/cm	12/30/2019	N001	0.00 - 0.00	1091			#	-	-
Temperature	C	12/30/2019	N001	0.00 - 0.00	1.06			#	-	-
Turbidity	NTU	12/30/2019	N001	0.00 - 0.00	93.40			#	-	-
Uranium	mg/L	12/30/2019	0001	0.00 - 0.00	0.0052		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: MW-3 <well> See borehole 8

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/11/2019	0001	44.00	330		J	#	10	-
Oxidation Reduction Potential	mV	12/11/2019	N001	44.00	113			#	-	-
pH	s.u.	12/11/2019	N001	44.00	6.83			#	-	-
Selenium	mg/L	12/11/2019	0001	44.00	0.014	J	J	#	0.0066	-
Specific Conductance	umhos/cm	12/11/2019	N001	44.00	18747			#	-	-
Temperature	C	12/11/2019	N001	44.00	16.74			#	-	-
Turbidity	NTU	12/11/2019	N001	44.00	2.54			#	-	-
Uranium	mg/L	12/11/2019	0001	44.00	2.100		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: SMI-MW01 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/05/2019	0001	16.00	0.72		J	#	0.1	-
Arsenic	mg/L	12/05/2019	0001	16.00	0.0025	J	J	#	0.0012	-
Oxidation Reduction Potential	mV	12/05/2019	N001	16.00	-21			#	-	-
pH	s.u.	12/05/2019	N001	16.00	7.44			#	-	-
Specific Conductance	umhos/cm	12/05/2019	N001	16.00	4927			#	-	-
Temperature	C	12/05/2019	N001	16.00	16.24			#	-	-
Turbidity	NTU	12/05/2019	N001	16.00	20.10			#	-	-
Uranium	mg/L	12/05/2019	0001	16.00	2.700		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: SMI-PW03 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	60.00	30		J	#	1	-
Oxidation Reduction Potential	mV	12/10/2019	N001	60.00	47			#	-	-
pH	s.u.	12/10/2019	N001	60.00	7.67			#	-	-
Specific Conductance	umhos/cm	12/10/2019	N001	60.00	8036			#	-	-
Temperature	C	12/10/2019	N001	60.00	18.15			#	-	-
Turbidity	NTU	12/10/2019	N001	60.00	39.20			#	-	-
Uranium	mg/L	12/10/2019	0001	60.00	0.390		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: SMI-PZ1S <well> Baseline Area

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/11/2019	0001	18.00	170		J	#	10	-
Oxidation Reduction Potential	mV	12/11/2019	N001	18.00	90			#	-	-
pH	s.u.	12/11/2019	N001	18.00	6.92			#	-	-
Specific Conductance	umhos/cm	12/11/2019	N001	18.00	9388			#	-	-
Temperature	C	12/11/2019	N001	18.00	15.61			#	-	-
Turbidity	NTU	12/11/2019	N001	18.00	8.13			#	-	-
Uranium	mg/L	12/11/2019	0001	18.00	1.100		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: SMI-PZ2M2 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/09/2019	0001	56.00	420		J	#	10	-
Oxidation Reduction Potential	mV	12/09/2019	N001	56.00	59			#	-	-
pH	s.u.	12/09/2019	N001	56.00	7.09			#	-	-
Specific Conductance	umhos/cm	12/09/2019	N001	56.00	53712			#	-	-
Temperature	C	12/09/2019	N001	56.00	15.90			#	-	-
Turbidity	NTU	12/09/2019	N001	56.00	5.01			#	-	-
Uranium	mg/L	12/09/2019	0001	56.00	3.000		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: SMI-PZ3D2 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	78.00	320		J	#	10	-
Oxidation Reduction Potential	mV	12/10/2019	N001	78.00	144			#	-	-
pH	s.u.	12/10/2019	N001	78.00	7.23			#	-	-
Specific Conductance	umhos/cm	12/10/2019	N001	78.00	19724			#	-	-
Temperature	C	12/10/2019	N001	78.00	17.89			#	-	-
Turbidity	NTU	12/10/2019	N001	78.00	5.49			#	-	-
Uranium	mg/L	12/10/2019	0001	78.00	0.710		J	#	1.2E-05	-

Appendix D. December 2019 Site-wide Sampling Event (*continued*)
Water Quality Data (*continued*)

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: SMI-PZ3M <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	59.00	39		J	#	1	-
Oxidation Reduction Potential	mV	12/10/2019	N001	59.00	111			#	-	-
pH	s.u.	12/10/2019	N001	59.00	7.61			#	-	-
Specific Conductance	umhos/cm	12/10/2019	N001	59.00	7634			#	-	-
Temperature	C	12/10/2019	N001	59.00	17.58			#	-	-
Turbidity	NTU	12/10/2019	N001	59.00	7.10			#	-	-
Uranium	mg/L	12/10/2019	0001	59.00	0.470		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: SMI-PZ3S <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	25.00	3.9		J	#	1	-
Ammonia Total as N	mg/L	12/10/2019	0002	21.94 - 26.94	3.4			#	1	-
Arsenic	mg/L	12/10/2019	0001	25.00	0.013	J	J	#	0.0012	-
Oxidation Reduction Potential	mV	12/10/2019	N001	25.00	138			#	-	-
pH	s.u.	12/10/2019	N001	25.00	8.12			#	-	-
Selenium	mg/L	12/10/2019	0001	25.00	0.041	J	J	#	0.0066	-
Specific Conductance	umhos/cm	12/10/2019	N001	25.00	4430			#	-	-
Temperature	C	12/10/2019	N001	25.00	18.87			#	-	-
Turbidity	NTU	12/10/2019	N001	25.00	3.75			#	-	-
Uranium	mg/L	12/10/2019	0001	25.00	1.400		J	#	0.00012	-
Uranium	mg/L	12/10/2019	0002	21.94 - 26.94	1.400		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: TP-01 <well> Date, GR_Elev, Boring_Depth frm SMIDoc#2 (ORNL 1/9/98)

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/05/2019	0001	22.00	1	U	J	#	1	-
Arsenic	mg/L	12/05/2019	0001	22.00	0.0023		J	#	0.00012	-
Oxidation Reduction Potential	mV	12/05/2019	N001	22.00	-79			#	-	-
pH	s.u.	12/05/2019	N001	22.00	7.68			#	-	-
Specific Conductance	umhos/cm	12/05/2019	N001	22.00	7353			#	-	-
Temperature	C	12/05/2019	N001	22.00	17.24			#	-	-
Turbidity	NTU	12/05/2019	N001	22.00	2.81			#	-	-
Uranium	mg/L	12/05/2019	0001	22.00	0.041		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: TP-11 <well> Date, GR_Elev, Boring_Depth frm SMIDoc#2 (ORNL 1/9/98);PWC_Moab.mdb chemistry data in both HLA Surface_Water and HLA Groundwater tables

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/05/2019	0001	30.00	0.8		J	#	0.2	-
Oxidation Reduction Potential	mV	12/05/2019	N001	30.00	-119			#	-	-
pH	s.u.	12/05/2019	N001	30.00	7.52			#	-	-
Specific Conductance	umhos/cm	12/05/2019	N001	30.00	16775			#	-	-
Temperature	C	12/05/2019	N001	30.00	16.99			#	-	-
Turbidity	NTU	12/05/2019	N001	30.00	3.40			#	-	-
Uranium	mg/L	12/05/2019	0001	30.00	0.00056		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: TP-17 <well> Date, GR_Elev, Boring_Depth frm SMIDoc#2 (ORNL 1/9/98)

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/31/2019	0001	28.00	2.1	N	J	#	0.2	-
Oxidation Reduction Potential	mV	12/31/2019	N001	28.00	-42			#	-	-
pH	s.u.	12/31/2019	N001	28.00	7.90			#	-	-
Specific Conductance	umhos/cm	12/31/2019	N001	28.00	101640			#	-	-
Temperature	C	12/31/2019	N001	28.00	12.48			#	-	-
Turbidity	NTU	12/31/2019	N001	28.00	13.20			#	-	-
Uranium	mg/L	12/31/2019	0001	28.00	0.024		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: TP-20 <well> Date, GR_Elev, Boring_Depth frm SMIDoc#2 (ORNL 1/9/98)

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/09/2019	0001	32.00	3.4		J	#	1	-
Oxidation Reduction Potential	mV	12/09/2019	N001	32.00	-235			#	-	-
pH	s.u.	12/09/2019	N001	32.00	7.20			#	-	-
Specific Conductance	umhos/cm	12/09/2019	N001	32.00	120637			#	-	-
Temperature	C	12/09/2019	N001	32.00	18.52			#	-	-
Turbidity	NTU	12/09/2019	N001	32.00	9.67			#	-	-
Uranium	mg/L	12/09/2019	0001	32.00	0.044		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: TP-22 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/09/2019	0001	17.00	1	U	J	#	1	-
Oxidation Reduction Potential	mV	12/09/2019	N001	17.00	191			#	-	-
pH	s.u.	12/09/2019	N001	17.00	7.07			#	-	-
Specific Conductance	umhos/cm	12/09/2019	N001	17.00	35960			#	-	-
Temperature	C	12/09/2019	N001	17.00	17.73			#	-	-
Turbidity	NTU	12/09/2019	N001	17.00	14.10			#	-	-
Uranium	mg/L	12/09/2019	0001	17.00	0.560		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: TP-23 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/09/2019	0001	25.00	100		J	#	10	-
Oxidation Reduction Potential	mV	12/09/2019	N001	25.00	155			#	-	-
pH	s.u.	12/09/2019	N001	25.00	7.13			#	-	-
Specific Conductance	umhos/cm	12/09/2019	N001	25.00	28806			#	-	-
Temperature	C	12/09/2019	N001	25.00	17.92			#	-	-
Turbidity	NTU	12/09/2019	N001	25.00	32.50			#	-	-
Uranium	mg/L	12/09/2019	0001	25.00	1.500		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: UPD-17 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	14.50	250	N	J	#	10	-
Arsenic	mg/L	12/10/2019	0001	14.50	0.018	J	J	#	0.0012	-
Oxidation Reduction Potential	mV	12/10/2019	N001	14.50	155			#	-	-
pH	s.u.	12/10/2019	N001	14.50	6.97			#	-	-
Selenium	mg/L	12/10/2019	0001	14.50	0.081	J	J	#	0.0066	-
Specific Conductance	umhos/cm	12/10/2019	N001	14.50	10234			#	-	-
Temperature	C	12/10/2019	N001	14.50	17.47			#	-	-
Turbidity	NTU	12/10/2019	N001	14.50	7.31			#	-	-
Uranium	mg/L	12/10/2019	0001	14.50	1.300		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: UPD-18 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	13.00	240		J	#	10	-
Arsenic	mg/L	12/10/2019	0001	13.00	0.019		J	#	0.00012	-
Oxidation Reduction Potential	mV	12/10/2019	N001	13.00	127			#	-	-
pH	s.u.	12/10/2019	N001	13.00	7.16			#	-	-
Selenium	mg/L	12/10/2019	0001	13.00	0.098		J	#	0.00066	-
Specific Conductance	umhos/cm	12/10/2019	N001	13.00	8454			#	-	-
Temperature	C	12/10/2019	N001	13.00	17.76			#	-	-
Turbidity	NTU	12/10/2019	N001	13.00	5.86			#	-	-
Uranium	mg/L	12/10/2019	0001	13.00	0.790		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: UPD-20 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	17.00	0.1	U	J	#	0.1	-
Arsenic	mg/L	12/10/2019	0001	17.00	0.00045	J	J	#	0.00012	-
Oxidation Reduction Potential	mV	12/10/2019	N001	17.00	93			#	-	-
pH	s.u.	12/10/2019	N001	17.00	7.54			#	-	-
Selenium	mg/L	12/10/2019	0001	17.00	0.0026	J	J	#	0.00066	-
Specific Conductance	umhos/cm	12/10/2019	N001	17.00	3687			#	-	-
Temperature	C	12/10/2019	N001	17.00	18.13			#	-	-
Turbidity	NTU	12/10/2019	N001	17.00	42.70			#	-	-
Uranium	mg/L	12/10/2019	0001	17.00	0.056		J	#	1.2E-05	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: UPD-21 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	25.00	20		J	#	1	-
Arsenic	mg/L	12/10/2019	0001	25.00	0.0012	U	J	#	0.0012	-
Oxidation Reduction Potential	mV	12/10/2019	N001	25.00	130			#	-	-
pH	s.u.	12/10/2019	N001	25.00	7.62			#	-	-
Selenium	mg/L	12/10/2019	0001	25.00	0.098	J	J	#	0.0066	-
Specific Conductance	umhos/cm	12/10/2019	N001	25.00	4195			#	-	-
Temperature	C	12/10/2019	N001	25.00	17.00			#	-	-
Turbidity	NTU	12/10/2019	N001	25.00	10.50			#	-	-
Uranium	mg/L	12/10/2019	0001	25.00	7.300		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: UPD-22 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/05/2019	0001	9.00	7.1		J	#	1	-
Arsenic	mg/L	12/05/2019	0001	9.00	0.011	J	J	#	0.0012	-
Oxidation Reduction Potential	mV	12/05/2019	N001	9.00	-10			#	-	-
pH	s.u.	12/05/2019	N001	9.00	7.68			#	-	-
Selenium	mg/L	12/05/2019	0001	9.00	0.020	J	J	#	0.0066	-
Specific Conductance	umhos/cm	12/05/2019	N001	9.00	4091			#	-	-
Temperature	C	12/05/2019	N001	9.00	19.22			#	-	-
Turbidity	NTU	12/05/2019	N001	9.00	4.62			#	-	-
Uranium	mg/L	12/05/2019	0001	9.00	2.200		J	#	0.00012	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE MOA01, Moab Site

LOCATION: UPD-24 <well>

REPORT DATE: 4/8/2020 12:50 PM

UNITS	PARAMETER	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	12/10/2019	0001	27.00	2.8		J	#	1	-
Arsenic	mg/L	12/10/2019	0001	27.00	0.260		J	#	0.0012	-
Oxidation Reduction Potential	mV	12/10/2019	N001	27.00	-159			#	-	-
pH	s.u.	12/10/2019	N001	27.00	7.80			#	-	-
Selenium	mg/L	12/10/2019	0001	27.00	0.071	J	J	#	0.0066	-
Specific Conductance	umhos/cm	12/10/2019	N001	27.00	4189			#	-	-
Temperature	C	12/10/2019	N001	27.00	18.23			#	-	-
Turbidity	NTU	12/10/2019	N001	27.00	6.08			#	-	-
Uranium	mg/L	12/10/2019	0001	27.00	6.000		J	#	0.00012	-

RECORDS: SELECTED FROM USEE105 WHERE RIN = '1912118' AND (DataValidationQualifiers IS NULL OR (DataValidationQualifiers NOT LIKE '%N%' AND DataValidationQualifiers NOT LIKE '%R%' AND DataValidationQualifiers NOT LIKE '%X%'))

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

LAB QUALIFERS:

*	Replicate analysis not within control limits.
+	Correlation coefficient for MSA < 0.995.
>	Result above upper detection limit.
A	TIC is a suspected aldol-condensation product.
B	Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: 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
M	GFAA duplicate injection precision not met.
N	Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
P	> 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
S	Result determined by method of standard addition (MSA).
U	Analytical result below detection limit.
W	Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X	Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
Y	Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
Z	Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFERS:

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

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

Appendix D. December 2019 Site-wide Sampling Event (*continued*)
Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site

REPORT DATE: 4/8/2020 12:54 PM

LOCATION CODE	FLOW CODE	TOP OF CASING ELEVATION (FT)	MEASUREMENT DATE	MEASUREMENT TIME	DEPTH FROM TOP OF CASING (FT)	WATER ELEVATION (FT)	WATER LEVEL FLAG
0401		3967.36	12/12/2019		13.39	3953.97	
0403	O	3968.95	12/12/2019		15.39	3953.56	
0404	O	3968.30	12/12/2019		14.00	3954.30	
0406	O	3964.59	12/11/2019		10.23	3954.36	
0407	O	3969.09	12/12/2019		15.72	3953.37	
0410	O	3981.12	12/10/2019		24.18	3956.94	
0412	O	3962.48	12/05/2019		7.52	3954.96	
0413	O	3963.19	12/05/2019		7.85	3955.34	
0414	O	3959.20	12/05/2019		4.47	3954.73	
0430	U	4022.10	12/31/2019		60.11	3961.99	
0431	O	4007.21	12/31/2019		47.35	3959.86	
0436	O	3970.80	12/10/2019		10.40	3960.40	
0437	O	4048.25	12/18/2019		48.75	3999.50	
0439	O	4055.27	12/18/2019		36.06	4019.21	
0440	O	4070.63	12/18/2019		111.39	3959.24	
0441		4008.64	12/31/2019		49.03	3959.61	
0444	O	3970.99	12/12/2019		14.83	3956.16	
0453		4031.29	12/18/2019		73.60	3957.69	
0454		3966.53	12/09/2019		11.94	3954.59	
0457	O	3971.30	12/12/2019		15.39	3955.91	
0492		3967.56	12/30/2019		15.50	3952.06	
AMM-1	U	3971.90	12/05/2019		16.42	3955.48	
AMM-2	O	3964.09	12/11/2019		9.70	3954.39	
AMM-3	O	3962.90	12/11/2019		8.30	3954.60	
ATP-2-D	O	3962.17	12/09/2019		6.22	3955.95	
ATP-2-S	O	3962.17	12/09/2019		4.63	3957.54	
ATP-3	O	3998.29	12/31/2019		38.76	3959.53	
MW-3	O	3965.98	12/11/2019		11.25	3954.73	
SMI-MW01	O	3960.29	12/05/2019		5.72	3954.57	
SMI-PW03	O	3975.09	12/10/2019		19.12	3955.97	

Appendix D. December 2019 Site-wide Sampling Event (*continued*)
Water Level Data (*continued*)

LOCATION CODE	FLOW CODE	TOP OF CASING ELEVATION (FT)	MEASUREMENT DATE	MEASUREMENT TIME	DEPTH FROM TOP OF CASING (FT)	WATER ELEVATION (FT)	WATER LEVEL FLAG
SMI-PZ1S	O	3964.13		12/11/2019		9.68	3954.45
SMI-PZ2M2	O	3967.18		12/09/2019		13.61	3953.57
SMI-PZ3D2	O	3975.13		12/10/2019		19.36	3955.77
SMI-PZ3M	O	3975.23		12/10/2019		19.33	3955.90
SMI-PZ3S	O	3975.03		12/10/2019		19.12	3955.91
TP-01	O	3967.71		12/05/2019		13.16	3954.55
TP-11	O	3966.61		12/05/2019		11.72	3954.89
TP-17	D	3963.69		12/31/2019		11.52	3952.17
TP-20	D	3967.55		12/09/2019		15.21	3952.34
TP-22		3966.51		12/09/2019		12.88	3953.63
TP-23		3962.60		12/09/2019		8.63	3953.97
UPD-17		3970.71		12/10/2019		12.95	3957.76
UPD-18		3968.74		12/10/2019		12.70	3956.04
UPD-20		3978.70		12/10/2019		22.10	3956.60
UPD-21		3981.47		12/10/2019		25.14	3956.33
UPD-22		3966.20		12/05/2019		10.56	3955.64
UPD-24		3977.10		12/10/2019		21.06	3956.04

RECORDS: SELECTED FROM USEE700 WHERE LogDate BETWEEN '12/03/2019' AND '12/31/2019'

FLOW CODES:
- D : DOWN GRADIENT
- O : ON-SITE
- U : UPGRADIENT

WATER LEVEL FLAGS:

Date: March 5, 2020
To: Ken Pill
From: James Ritchey
Subject: December 2019 Site Wide Sampling Event

Site: Moab – Site Wide Sampling Event – December 2019
Date of Sampling Event: Dec 5 - 31, 2019
Team Members: N. Andrews and J. Ritchey
RIN Number Assigned: All samples were assigned to RIN 1912118.
Sample Shipment: Three coolers were shipped overnight UPS to ALS Laboratory from Moab, Utah, on December 16 and 19 of 2019 and on January 7 of 2020 (Tracking numbers, 1Z5W1Y510195168096, 1Z5W1Y510191581404, and 1Z5W1Y510195339339).

Number of Locations Sampled: The purpose of the Site Wide Sampling Event is to update contaminant plume maps. A total of 54 locations (seven surface samples and 47 monitoring wells) were sampled during this event. Including three duplicates and an equipment blank, a total of 58 samples were collected during the December 2019 Site Wide Sampling Event. All samples were sent to the laboratory for the regular uranium and ammonia analytes. In addition, several locations were also analyzed for the presence of arsenic and selenium (18 locations for arsenic and 20 locations for selenium). These locations are listed in the table below.

Analyte	Location
As	0412, 0414, 0439, AMM-1, AMM-2, AMM-3, ATP-2-D, ATP-2-S, ATP-3, SMI-MW01, SMI-PZ3S, TP-01, UPD-17, UPD-18, UPD-20, UPD-21, UPD-22, and UPD-24
Se	0412, 0413, 0414, 0437, 0439, 0440, 0453, AMM-1, AMM-2, AMM-3, ATP-2-D, ATP-2-S, MW-3, SMI-PZ3S, UPD-17, UPD-18, UPD-20, UPD-21, UPD-22, and UPD-24

Also, surface water location 0218 was mistakenly sent to the laboratory with a label indicating location “0210”. This was corrected in the when the field and analytical data were uploaded into the MESa database, but was not identified before ALS Laboratory issued the analytical report and data. This will be documented in the associated monitoring report.

Locations Not Sampled/Reason: Wells 0443 and UPD-23 were not sampled this event. Both wells had been sampled earlier in the year.

Field Variance: None.

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

False ID	True ID	Sample Type	Associated Matrix
2000	SMI-PZ3S	Duplicate from 25 ft bgs	Ground Water
2001	0407	Duplicate from 18 bgs	Ground Water
2002	0226	Duplicate	Surface Water
2003	NA	Equipment Blank	Ground Water

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 following table provides additional information.

Location	Date	Sample Depth (ft bgs)	Comments
0201	12/30/2019	NA	Moderate flow, 8ft our, sandy bottom.
0218	12/30/2019	NA	Swift and riffly, 10 ft out. 1ft deep.
0226	12/31/2019	NA	Low flow, 12ft down bank, 3ft out, silty. Duplicate DEC 057 - 2002
0401	12/12/2019	18	
0403	12/12/2019	18	
0404	12/12/2019	18	
0406	12/11/2019	18	
0407	12/12/2019	18	Tubing issue, restart at 10:30. Duplicate DEC 034 – 2001 at 10:15
0410	12/10/2019	23.5	Dewatered at 0.5L. Took sample after one reading.
0412	12/5/2019	9.5	Dropped tubing approximately 1ft. Turbidity increasing. All else stable.
0413	12/5/2019	10.5	
0414	12/5/2019	7.5	
0430	12/31/2019	101	Bladder pump.
0431	12/31/2019	91	
0436	12/10/2019	197	Sulfurous odor. “Deep stinky well”
0437	12/18/2019	(97)	Bladder pump. Sample intake depth and total depth taken from past sampling events. Sample depth correlates with historical sample depth.
0439	12/18/2019	118	Bladder pump. TD=59.68 ft btoc. Pump was pulled up two feet from total depth. It correlates with past sample depths.
0440	12/18/2019	117	Bladder pump.
0441	12/31/2019	53	Bladder pump.
0444	12/12/2019	116	Sulfur odor.
0453	12/18/2019	80	Bladder pump. Water level taken at top of pump and could not be recorded while sampling.
0454	12/9/2019	13	Turbidity stable.
0457	12/12/2019	29	
0492	12/30/2019	18	
AMM-1	12/5/2019	19	
AMM-2	12/11/2019	48	
AMM-3	12/11/2019	48	Black floaties.
ATP-2-D	12/9/2019	88	Gray water.

Location	Date	Sample Depth (ft bgs)	Comments
ATP-2-S	12/9/2019	25	All stable except depth and turbidity.
ATP-3	12/31/2019	51	
CR1	12/30/2019	NA	Moderate flow, 6 ft out.
CR2	12/30/2019	NA	Shallow and riffly flow, 12 ft out, cobble sand.
CR3	12/30/2019	NA	Low flow, 3 ft out, cobbly silt.
CR5	12/30/2019	NA	Slow eddy flow, 10 ft out, silty cobble.
MW-3	12/11/2019	44	
SMI-MW01	12/5/2019	16	
SMI-PW03	12/10/2019	60	
SMI-PZ1S	12/11/2019	18	
SMI-PZ2M2	12/9/2019	56	
SMI-PZ3D2	12/10/2019	78	
SMI-PZ3M	12/10/2019	59	
SMI-PZ3S	12/10/2019	25	Duplicate 2000 - DEC 021 at 1210.
TP-01	12/5/2019	22	Strange stink.
TP-11	12/5/2019	30	
TP-17	12/31/2019	28	Stinky black sulfur water.
TP-20	12/9/2019	32	Sulfur smell.
TP-22	12/9/2019	17	
TP-23	12/9/2019	25	
UPD-17	12/10/2019	14.5	
UPD-18	12/10/2019	13	
UPD-20	12/10/2019	17	Stable but almost no recharge.
UPD-21	12/10/2019	25	
UPD-22	12/5/2019	9	
UPD-24	12/10/2019	27	

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

Location	Date	Depth to Water (ft btoc)
0401	12/12/2019	13.39
0403	12/12/2019	15.39
0404	12/12/2019	14.00
0406	12/11/2019	10.23
0407	12/12/2019	15.72
0410	12/10/2019	24.18
0412	12/5/2019	7.52
0413	12/5/2019	7.85
0414	12/5/2019	4.47
0430	12/31/2019	60.11
0431	12/31/2019	47.35
0436	12/10/2019	10.40
0437	12/18/2019	48.75
0439	12/18/2019	36.06
0440	12/18/2019	111.39
0441	12/31/2019	49.03

Location	Date	Depth to Water (ft btoc)
0444	12/12/2019	14.83
0453	12/18/2019	73.60
0454	12/9/2019	11.94
0457	12/12/2019	15.39
0492	12/30/2019	15.50
AMM-1	12/5/2019	16.42
AMM-2	12/11/2019	9.70
AMM-3	12/11/2019	8.30
ATP-2-D	12/9/2019	6.22
ATP-2-S	12/9/2019	4.63
ATP-3	12/31/2019	38.76
MW-3	12/11/2019	11.25
SMI-MW01	12/5/2019	5.72
SMI-PW03	12/10/2019	19.12
SMI-PZ1S	12/11/2019	9.68
SMI-PZ2M2	12/9/2019	13.61
SMI-PZ3D2	12/10/2019	19.36
SMI-PZ3M	12/10/2019	19.33
SMI-PZ3S	12/10/2019	19.12
TP-01	12/5/2019	13.16
TP-11	12/5/2019	11.72
TP-17	12/31/2019	11.52
TP-20	12/9/2019	15.21
TP-22	12/9/2019	12.88
TP-23	12/9/2019	8.63
UPD-17	12/10/2019	12.95
UPD-18	12/10/2019	12.70
UPD-20	12/10/2019	22.10
UPD-21	12/10/2019	25.14
UPD-22	12/5/2019	10.56
UPD-24	12/10/2019	21.06

*Water level could not be obtained.

Well Inspection Summary: A well inspection was not conducted.

Equipment: None.

Regulatory: None.

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

Date	Daily Mean Flow (cfs)
12/1/2019	3,930
12/2/2019	3,780
12/3/2019	3,520
12/4/2019	3,500
12/5/2019	3,780
12/6/2019	3,770
12/7/2019	3,800
12/8/2019	3,720
12/9/2019	3,690
12/10/2019	3,740
12/11/2019	4,120
12/12/2019	3,970
12/13/2019	3,980
12/15/2019	4,250
12/16/2019	4,210
12/17/2019	4,010
12/18/2019	3,730
12/19/2019	3,510
12/20/2019	3,540
12/21/2019	3,630
12/22/2019	3,680
12/23/2019	3,750
12/24/2019	3,860
12/25/2019	4,020
12/26/2019	4,250
12/27/2019	4,240
12/28/2019	4,070
12/29/2019	3,930
12/30/2019	3,830
12/31/2019	4,000

Corrective Action Required/Taken: None.