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Moab UMTRA Project
Groundwater and Surface Water Monitoring Report
July through December 2021

Revision 0

May 2022

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Moab UMTRA Project
Groundwater and Surface Water Monitoring Report July through December 2021

Revision 0

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5/3/2022

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Revision History

Revision	Date	Reason for Revision
0	May 2022	Initial issue.

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Acronyms and Abbreviations

bgs	below ground surface
CF	configuration
CFR	Code of Federal Regulations
cm	centimeter
COC	chain-of-custody
DOE	U.S. Department of Energy
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ft	feet or foot
IDL	instrument detection limit
MB	method blank
MDL	method detection limit
MESa	Moab Environmental Sampling Database
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
RIN	report identification number
RL	reporting limit
RPD	relative percent difference
SDG	sample data group
UMTRA	Uranium Mill Tailings Remedial Action
yr	year

1.0 Introduction

1.1 Purpose

The purpose of this semi-annual report is to present the results and provide interpretation of the data 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 calendar year 2021. The results of the data validation process are also presented.

The first event included the collection of samples in September 2021 from the Interim Action Well Field (Configuration (CF) 4 monitoring wells, CF5 groundwater extraction wells). These locations are shown on Figure 1.

The second event included samples from Crescent Junction monitoring wells 0202 and 0205 in September 2021. These locations are shows in Figure 2.

1.2 Scope

This report presents a 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). The CF 4 and 5 and Crescent Junction sampling events were validated to Level 2.

Appendix A includes the Water Sampling Field Activities Verification and the trip report associated with the CF4 and CF5 and sampling event. Appendix B provides similar documentation for the Crescent Junction sampling event.

The Minimums and Maximums analyses were generated by the Moab Environmental Sampling (MESa) database to determine if the applicable data were within a normal statistical range. The new data set was 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. Anomalous results are provided in tables in the "Data Assessment" section for each sampling event.

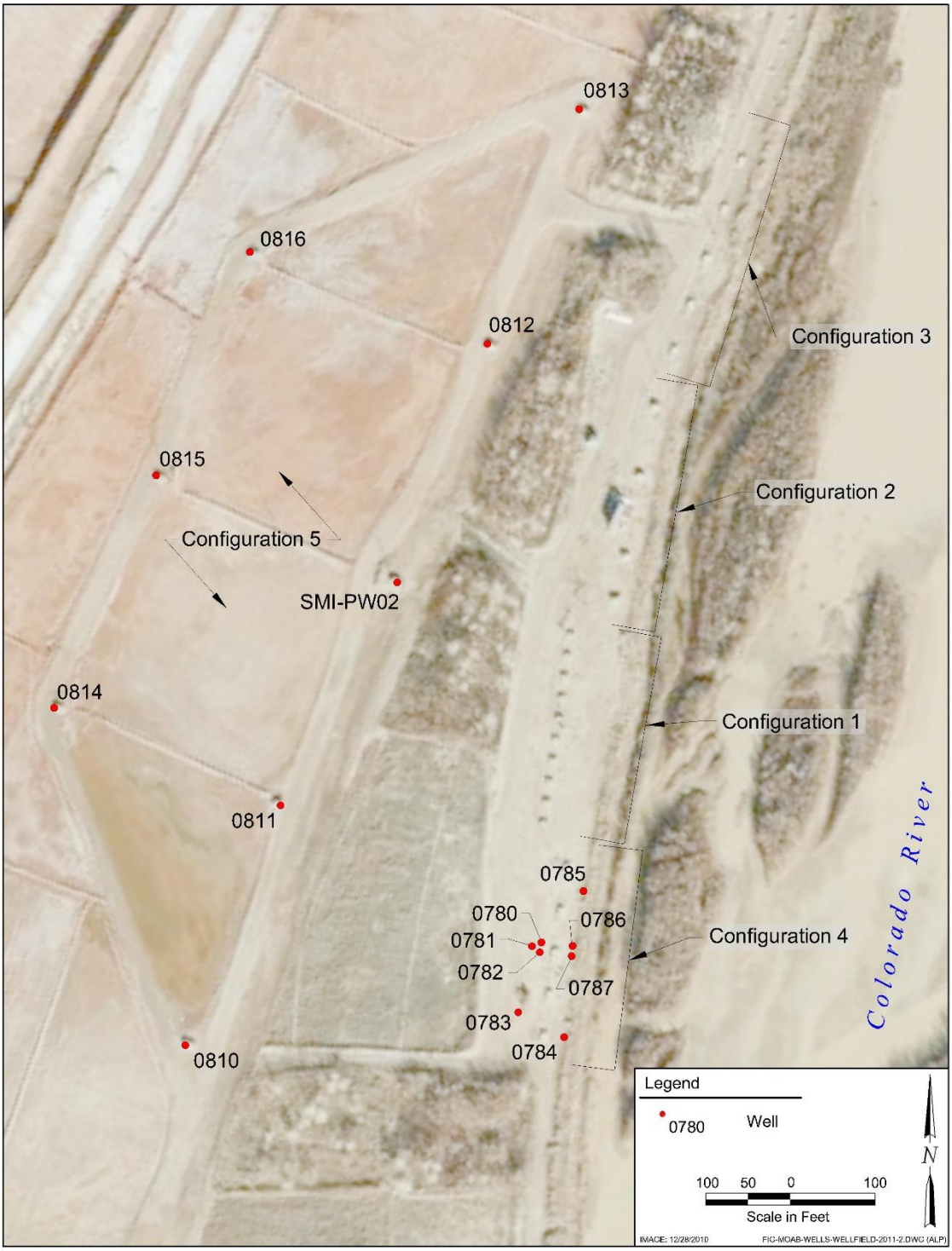

Figure 1. Second Half of 2021 CF4 and CF5 Groundwater Sampling Locations

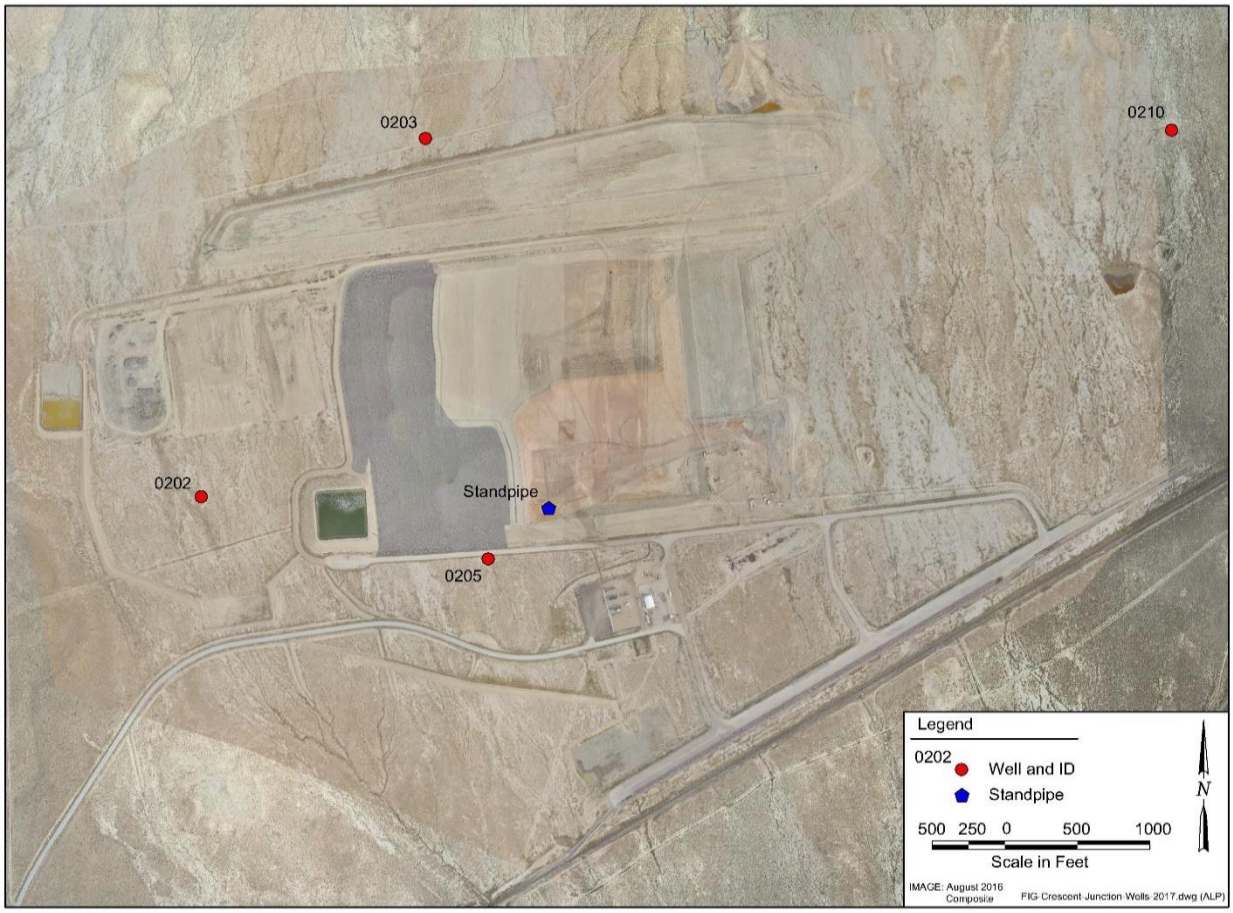

Figure 2. Crescent Junction Sampling Locations

1.3 Data Validation Definitions

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

Method and Calibration Blanks
Method blanks (MBs) are analyzed to assess any contamination that may have occurred during sample preparation. Both initial calibration blanks and continuing calibration blanks 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) are qualified "J" when the detections are less than five times the blank concentration. Non-detects are not qualified.

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

Laboratory Replicate Analysis
The laboratory replicated 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 reporting limit (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 reporting limit (RL).

2.0 September 2021 CF4 and CF5 Sampling Event

2.1 Summary

Groundwater samples were collected from the eight CF5 extraction wells to determine mass removal calculations for ammonia and uranium concentrations and to assess well field performance.

Groundwater samples were also collected from the eight CF4 monitoring wells to determine the impact of the freshwater injection system on the shallow aquifer. These ground water samples were collected to determine how the freshwater injection system impacts shallow zone ammonia concentrations, particularly downgradient of the CF4 injection wells.

2.2 September 2021 CF4 and CF5 Data Assessment

2.2.1 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

RIN	2109129
Laboratory:	ALS Analytics, Fort Collins, Colorado
SDG Number:	2109609
Analysis:	Metals and Inorganics
Validator:	James Ritchey
Review Date:	March 2022

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

Table 1. September 2021 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 2. Refer to Table 3 for an explanation of the data qualifiers applied.

Table 2. September 2021 CF4 and CF5 Sampling Event, Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
SDG 2109609-1 thru 34	All in SDG 2109129	Uranium	J	MS-1, MSD-1

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

Table 3. September 2021 CF4 and CF5 Sampling Event, Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
MS-1	J	UJ	The MS sample chosen was from another client.
MSD-1	J	UJ	No MSD data was included in the narrative.

Notes: "J" indicates results are estimated; it becomes "UJ" for analytical results lower than the detection limit. U indicates the result is below the detection limit.

Sample Shipping/Receiving

ALS Analytics in Fort Collins, Colorado received a total of 34 samples from 16 locations for report identification number (RIN) 2109129 in one shipment; tracking number 1Z5W1Y510191231569 on September 24, 2021.

The sample data group (SDG) was accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed on the form with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt.

Preservation and Holding Times

SDG 2109609 was received intact with a temperature of 3.3°C. All samples were received in the correct container types and 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:

Field Duplicate Analysis

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory replicates, which measure only laboratory performance. A duplicate sample (2109609-33 and -34) was collected from location SMI-PW02. The duplicate results met the EPA recommended laboratory duplicate criteria of less than 20% RPD for results that are greater than 5 times the RL.

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 for SDG 2109609 were received on November 1, 2021. The contents of the EDD 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.

2.2.2 Minimums and Maximums Report and Anomalous Data Review

Based on the results, most concentrations are within the historical range. Table 4 shows the sample results that were greater than 10% off of the historical range.

Table 4. Anomalous Data Associated with the CF4 and CF5 Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Historical Maximum (mg/L)	Disposition
0811	9/15/2021	Ammonia Total as N	270	310	520	These concentrations are less than the historical values. These locations will continue to be monitored to determine the general trend in concentration.
0814	9/15/2021	Ammonia Total as N	71	130	900	

2.3 September 2021 CF4 and CF5 Sampling Event Results

CF4 Sampling

Prior to sampling in September, injection operations had been continuous since early August 2021 when the system was shut down for a week for a minor repair.

The CF4 injection wells are screened and deliver fresh water into the subsurface from 15 to 35 feet (ft) below ground surface (bgs). September 2021 ammonia concentrations are presented in Table 5. Baseline concentrations represent sample results from January 2019, when limited freshwater was injected (less than 750,000 gal) for the six months leading up to the sample collection.

September 2021 ammonia concentrations (Table 5) associated with the downgradient samples collected from a depth less than 20 ft bgs (wells 0784 and 0785) had concentrations that were below 1 milligram per liter (mg/L), indicating the injection system operations impact this shallow subsurface zone (Table 5). The sample from the upgradient shallow zone (from well 0783) was below 50 mg/L. Samples collected from wells 0780 and 0786 (28 ft bgs) and well 0782 (33 ft bgs) had ammonia concentrations ranging from 5.2 to 310 mg/L. From a depth of 36 to 46 ft bgs, the ammonia concentrations ranged from 660 to 900 mg/L (wells 0787 and 0781).

Table 5. CF4 Monitoring Well Ammonia Concentrations, September 2021

Location	Sample Depth (ft bgs)	Upgradient or Downgradient of Injection Wells	Baseline* Concentration (mg/L)	September 2021 Ammonia Concentration (mg/L)
0780	28	Upgradient	330	5.2
0781	46	Upgradient	1,900	900
0782	33	Upgradient	1,100	310
0783	18	Upgradient	20	1.4

Table 5. CF4 Monitoring Well Ammonia Concentrations, September 2021 (continued)

Location	Sample Depth (ft bgs)	Upgradient or Downgradient of Injection Wells	Baseline* Concentration (mg/L)	September 2021 Ammonia Concentration (mg/L)
0784	18	Downgradient	1.1	0.2 (ND)*
0785	18	Downgradient	17	0.2 (ND)*
0786	28	Downgradient	480	19
0787	36	Downgradient	2,100	660

Notes: * = Baseline concentrations taken from samples collected August 2010, prior to when the CF4 wells were used exclusively for injection purposes. (ND)= non-detect or at detection limit of 0.2 mg/L.

Figure 3 displays the ammonia concentrations in samples collected down gradient from a depth of 18 ft bgs (wells 0784 and 0785) since 2016, along with the CF4 weekly injected volume. As the plot displays, consistent injection continues to significantly decrease the shallow groundwater system ammonia concentrations downgradient of the injection wells.

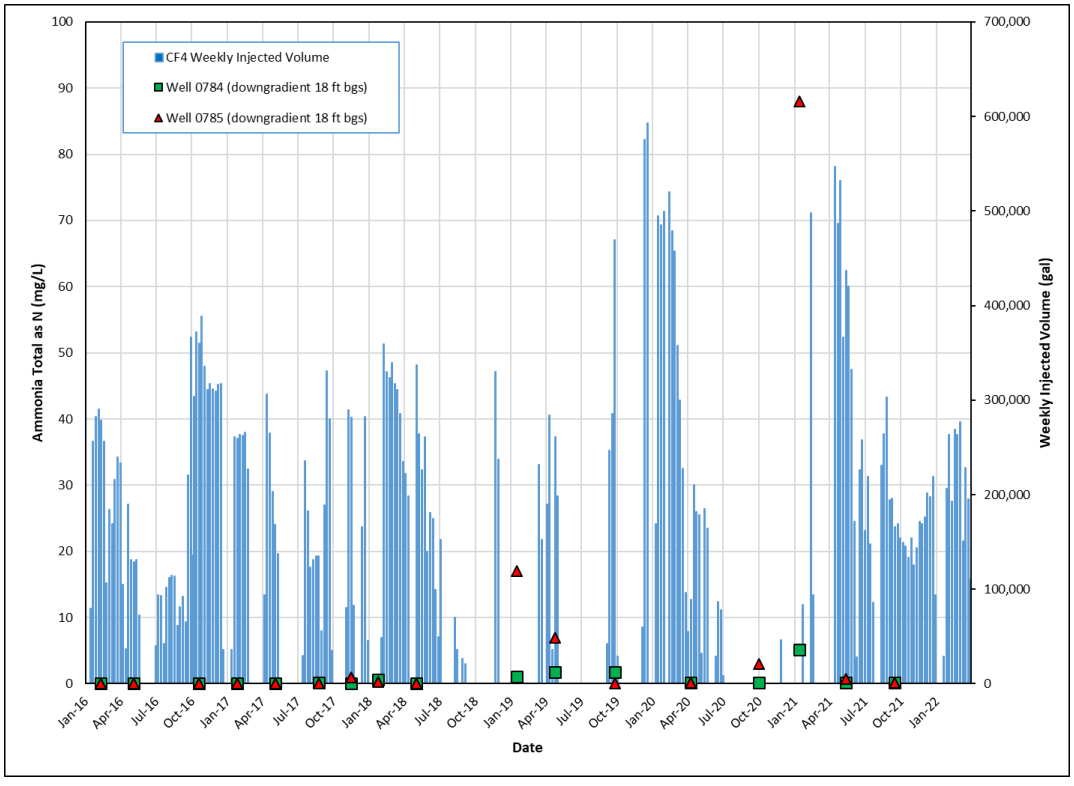

Figure 3. January 2016 through September 2021 CF4 Shallow Zone Ammonia Groundwater Concentrations in Response to Freshwater Injection

CF5 Sampling

Groundwater samples were also collected from the CF5 extraction wells (locations shown on Figure 1) in September 2021. The extraction system had been consistently operational for approximately six months prior to the sample collection, with more than 6.8 mil gal of groundwater removed from the groundwater system during that time. CF5 extraction well ammonia and uranium concentrations associated with this sampling event are displayed in

Table 6. Time versus concentration plots (Figures 4 through 7) were also generated to display the CF5 extraction well ammonia and uranium concentrations measured since July 2010. This nearly covers the timeframe these wells have been utilized to extract groundwater (they were brought online starting in April 2010). Trend lines are also included in these plots.

Table 6. CF5 Extraction Well Analytical Results

Location	Sample Date	Ammonia (mg/L)	Uranium (mg/L)
0810	9/15/21	260	2.6
0811		270	2.0
0812		400	2.0
0813		300	1.8
0814		71	2.5
0815		110	2.7
0816		120	2.4
PW02		400	2.8

Table 7 provides the geometric mean, standard deviation, 95% confidence interval, and the change in ammonia concentration based on the linear trend line for the CF5 extraction wells since 2010. The trend lines applied to data collected since June 2010 from CF5 extraction wells indicate that, with the exception of the samples collected from well 0813, on average the ammonia concentrations are decreasing at a rate ranging from 3.9 to 21.0 mg/L/yr. As of 2021, the CF5 extraction well geometric mean ammonia concentrations range from 179 to 457 mg/L.

Table 7. Statistical Data for CF5 Extraction Well Ammonia Data, 2010 through 2021

Ammonia Concentrations (2010 – 2021)	CF5 Extraction Well							
	0810	0811	0812	0813	0814	0815	0816	PW02
Geometric Mean (mg/L)	316.9	392.8	414.3	326.3	179.4	196.3	162.8	457.8
Standard Deviation (mg/L)	33.6	63.8	64.7	87.3	52.5	76.7	31.5	52.0
95% Confidence Interval (mg/L)	14.4	28.0	27.7	37.4	23.0	33.6	14.2	22.2
Change in Concentration (mg/L/yr)	-3.9	-11.6	-5.9	6.9	-11.4	-21.0	-8.2	-13.5

The trend line associated with data collected from well 0813 indicates concentrations have been increasing over the past 10 years, at a rate of 6.9 mg/L/yr. This increase is a function of the historical low concentrations (measured after the 2011 flooding event) impacting the data set. Only taking into account the ammonia analytical results since 2013, the concentrations decrease on average 11.3 mg/L/yr.

Statistical data for the uranium results since 2010 are presented in Table 8. Trend lines applied to the uranium results over the past 11 years for all CF5 wells indicate four wells on average are decreasing as much as 0.04 mg/L/yr, three wells on average are increasing of up to 0.06 mg/L/yr, and one well has not changed. The well associated with the highest increases is well 0813 that increased on average 0.06 mg/L/yr is located at the northern end of CF5. This minimal increase in uranium is associated with the periodic influx of oxygenated water and its impact on the subsurface geochemical conditions.

Table 8. Statistical Data for CF5 Extraction Well Uranium Data, 2010 through 2021

Uranium Concentrations (2010 – 2021)	CF5 Extraction Well							
	0810	0811	0812	0813	0814	0816	0816	PW02
Geometric Mean (mg/L)	2.99	2.62	2.06	1.53	2.80	3.14	2.50	3.22
Standard Deviation (mg/L)	0.49	0.44	0.29	0.42	0.19	0.25	0.17	0.43
95% Confidence Interval (mg/L)	0.21	0.19	0.12	0.18	0.08	0.11	0.07	0.18
Change in Concentration (mg/L/yr)	-0.04	-0.01	-0.01	+0.06	0.00	+0.02	-0.02	-0.03

Figure 4 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 5 displays a time versus uranium concentration plot for the same set of wells. Figures 6 and 7 are the time versus ammonia and uranium concentration plots, respectively, for CF5 wells 0814 through 0816 (which are located closer to the base of the tailings pile).

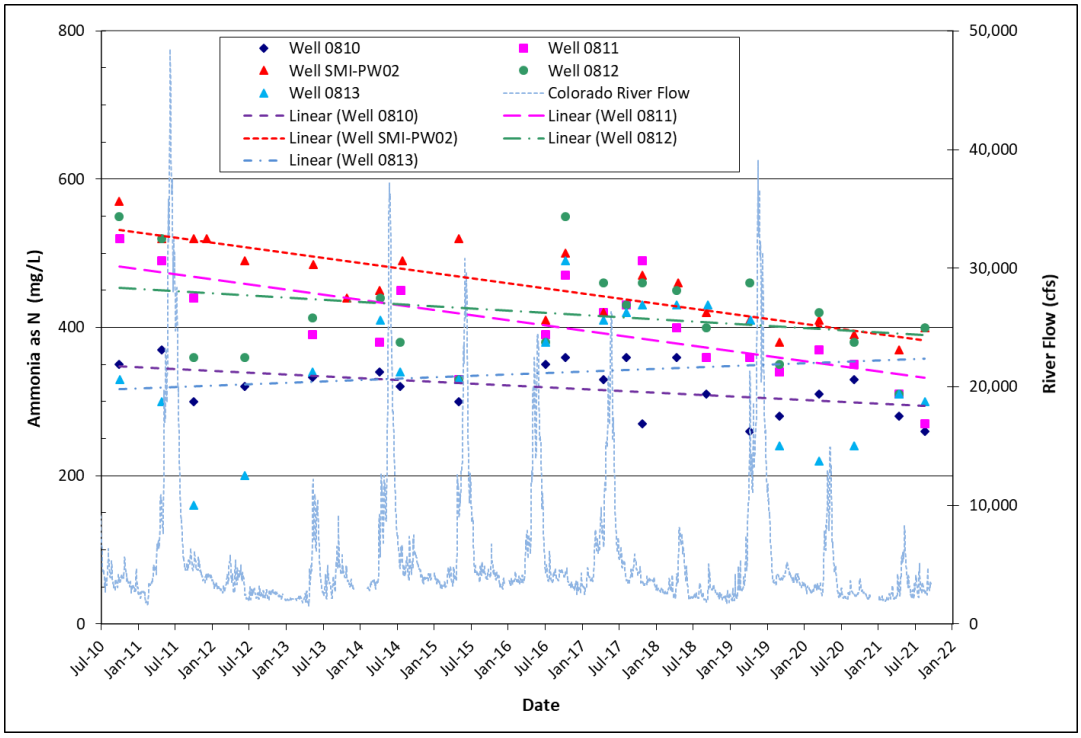

Figure 4. CF5 Extraction Wells 0810, 0811, 0812, 0813, and SMI-PW02 Time versus Ammonia Concentration Plot

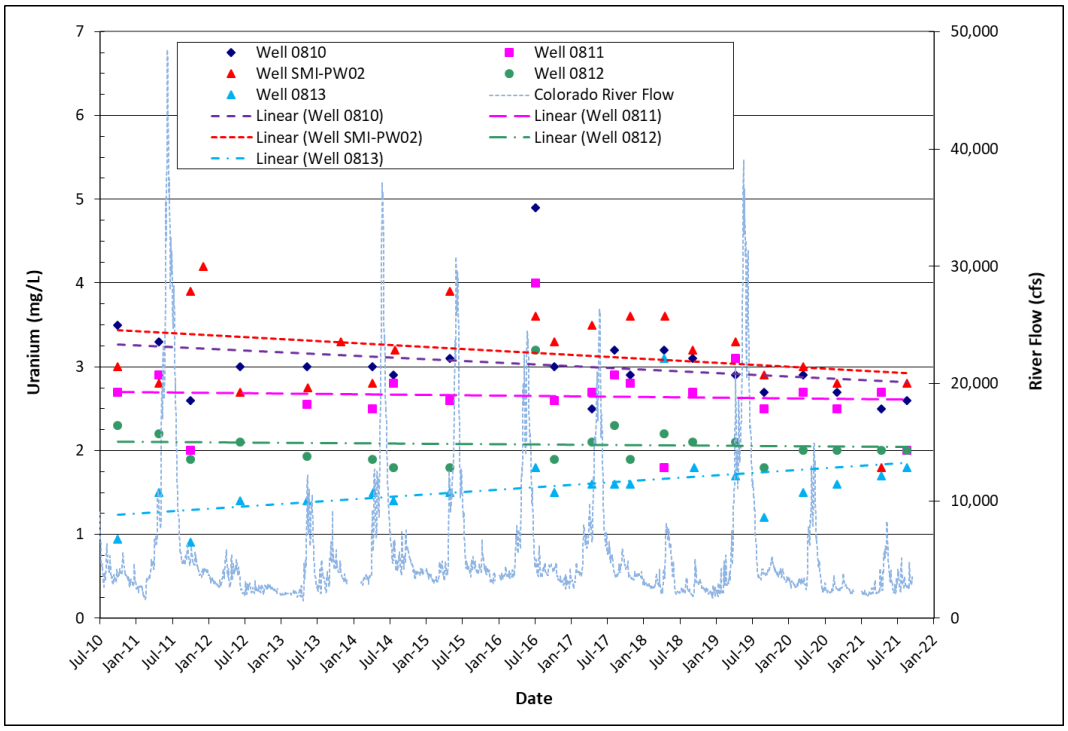

Figure 5. CF5 Extraction Wells 0810, 0811, 0812, 0813, and SMI-PW02 Time versus Uranium Concentration Plot

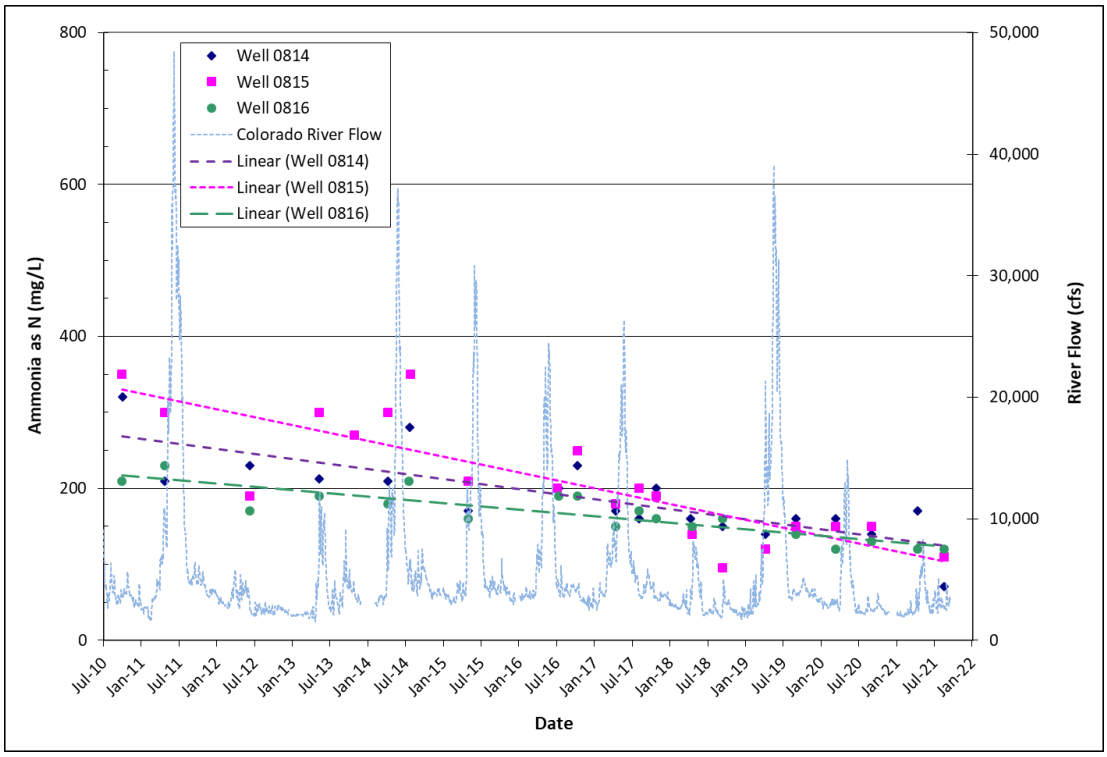

Figure 6. CF5 Extraction Wells 0814, 0815, and 0816 Time versus Ammonia Concentration Plot

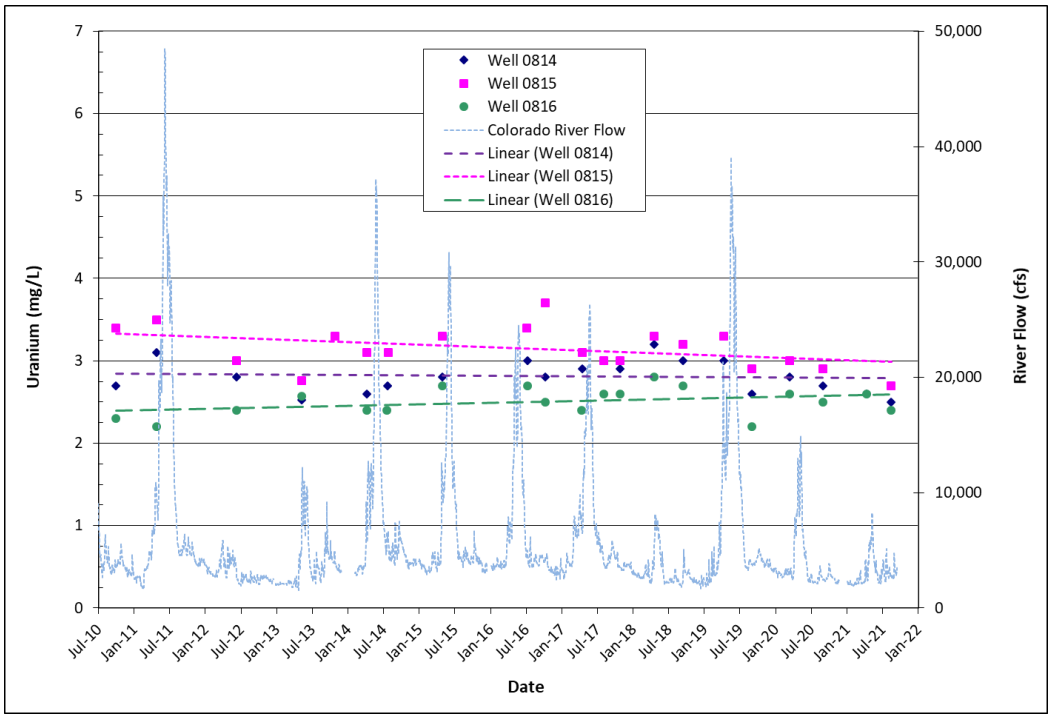

Figure 7. CF5 Extraction Wells 0814, 0815, and 0816
Time versus Uranium Concentration Plot

3.0 September 2021 Crescent Junction Sampling Event

3.1 Summary

Groundwater samples were collected from wells 0202 and 0205 at Crescent Junction as part of the quarterly monitoring at the Crescent Junction Site. If water is present in any of the four monitoring wells during a monitoring event, a sample is typically collected. Samples were analyzed for metals, inorganics, and isotopic uranium.

3.2 September 2021 Crescent Junction Data Assessment

3.2.1 Laboratory Performance Assessment

This validation was performed according to *Standard Practice for Validation of Laboratory Data*. The procedure was applied at Level 2, Data Deliverables Examination. All analyses were successfully completed.

General Information and Validation Results

RIN	2109130
Laboratory:	ALS Analytics, Fort Collins, Colorado
SDG Numbers:	2109606
Analysis:	Inorganics, Metals, Isotopic Uranium
Validator:	Liz Moran
Review Date:	April 2022

The samples were prepared and analyzed using accepted procedures as shown in Table 9.

Table 9. September 2021 Crescent Junction Sampling Event, Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia as N, NH3-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 10. Refer to Table 11 for an explanation of the data qualifiers applied.

Table 10. September 2021 Crescent Junction Sampling Event, Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
SDG 2109606 -1 through -2	0202, 0205	Inorganics	J	MS-1, MSD-1
SDG 2109606-1 through -2	0202, 0205	Nitrate/Nitrite	J	HT-1

Notes: “J” indicates results are estimated; it becomes “UJ” for analytical results lower than the detection limit.

Table 11. September 2021 Crescent Junction Sampling Event, Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-Detects)	Explanation
MS-1	J	UJ	The MS sample chosen was from another client.
MSD-1	J	UJ	The MSD sample chosen from another client.
HT-1	J	UJ	The nitrate/nitrite samples were run one day past the hold-time.

Notes: “J” indicates results are estimated; it becomes “UJ” for analytical results lower than the detection limit. U indicates the result is below the detection limit.

Sample Shipping/Receiving

ALS Analytics in Fort Collins, Colorado, received two samples for RIN 2109130 in a shipment of one cooler. The shipment (SDG 2109606) contained ground water samples from two

observation wells from the Crescent Junction Site. The temperature of the cooler was 3.3°C and it arrived on September 24, 2021 (Tracking number 1Z5W1Y510191231569).

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
The samples were received in the correct container types and had been preserved correctly for the requested analyses. The nitrate/nitrite samples were run one day past the hold-time, so the results were flagged "J" for reason HT-1.

Case Narratives
The case narratives were reviewed, and all detects where found to be within quality-control procedures.

Matrix Spike and Replicate Analysis
The inorganics matrix spike sample and matrix spike sample duplicate were from another client, so all inorganics results were flagged "J" for reason MS-1 and "J" for reason MSD-1.

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

Electronic Data Deliverable File
The EDD files arrived on October 31, 2021. The contents of the EDD were manually examined to ensure all and only the requested data were delivered in compliance with requirements and that the sample results accurately reflected the data contained in the sample data package.

3.2.2 Minimums and Maximums Report and Anomalous Data Review

There were nine anomalous data points that lay outside of the historical result range (Table 12).

Table 12. Anomalous Data Associated with the September 2021 Crescent Junction Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Historical Maximum (mg/L)	Disposition
0202	9/22/21	Ammonia total as N	8.9	11	17	There are a limited number of samples collected from well 0202 and the maximum and minimum range concentrations are still being determined.
		Nitrate/ Nitrite as N	1,000	0.022	520	
		Total Dissolved Solids	40,000	22,000	39,000	
		Chloride	1,200	6,000	28,000	
		Sodium	8,800	8,900	12,000	

Table 12. Anomalous Data Associated with the September 2021 Crescent Junction Sampling Event (continued)

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Historical Maximum (mg/L)	Disposition
0205	9/22/21	Arsenic	0.087	0.0019	0.039	These numbers are reflective of natural variations. Monitoring will continue to determine where the lower-than-average concentrations represents a new trend.
		Ammonia total as N	11	12	22	
		Manganese	0.29	0.3	0.71	
		Sodium	7,400	8,400	14,000	

3.3 September 2021 Crescent Junction Sampling Event Results

The rationale for collecting the groundwater sample from Crescent Junction monitoring well 0202 is to determine if the source of the water that recharges this location is the same as that which recharges well 0205. The sample collected from well 0205 was collected to determine if there were any changes to the source of the groundwater recharging this location. Both samples collected in September were part of the quarterly monitoring for the third quarter of 2021 (Table 13). In addition to the standard analytes, the samples were also analyzed for bicarbonate as CaCO3, carbonate as CaCO3, total alkalinity as CaCO3, uranium-234, uranium-235, and uranium-238. The analyte concentrations in the samples collected from wells 0202 and 0205 are similar, however, the nitrate/nitrate as N and sulfate sample results vary greatly between well 0202 and 0205. Monitoring will continue to determine if the groundwater in the wells is from the same source.

Table 13. Analytical Results from Crescent Junction Wells 0202 and 0205 in September 2021

Analyte	Location	Result (mg/L)
Bicarbonate as CaCO3	0202	980
	0205	910
Carbonate as CaCO3	0202	20
	0205	20
Total Alkalinity as CaCO3	0202	980
	0205	910
Ammonia as N	0202	8.9
	0205	11
Nitrate/Nitrite as N	0202	1,000
	0205	590
Total Dissolved Solids	0202	40,000
	0205	38,000
Fluoride	0202	20
	0205	20
Chloride	0202	1,200
	0205	3,100
Bromide	0202	40
	0205	40
Sulfate	0202	2,400
	0205	24,000
Boron	0202	1
	0205	1.1

Table 13. Analytical Results from Crescent Junction Wells 0202 and 0205 in September 2021 (continued)

Analyte	Location	Result (mg/L)
Calcium	0202	370
	0205	280
Magnesium	0202	690
	0205	730
Manganese	0202	0.5
	0205	0.29
Selenium	0202	0.027
	0205	2.6
Sodium	0202	8,800
	0205	7,400
Uranium	0202	0.022
	0205	0.022

**Only analytes above the detection limit are listed*

4.0 Conclusions

4.1 September 2021 CF4 and CF5 Sampling Event

Ground water samples were collected from the CF4 injection wells, CF4 observation wells, and the CF5 extraction wells in September 2021. Sample results were lower than or consistent with previous results. In general, the ammonia and uranium concentrations are decreasing in most of the extraction wells. Extraction well 0813 has ammonia concentrations that are slighting increasing and extraction wells 0813 and 0816 have uranium concentrations that are slightly increasing.

Analytical results show that the injection system is effective at lowering the ammonia and uranium concentrations, especially in downgradient monitoring wells.

4.2 September Crescent Junction Sampling Event

The groundwater in wells 0202 and 0205 have a similar geochemistry and will continue to be monitored on a quarterly basis for fluctuations in analyte concentrations.

5.0 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), *Characterization of Groundwater Brine Zones at the Moab Project Site (Phase 1)* (GJO-2002-333-TAR, GJO-MOA 19.1.2-3).

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.
September 2021 CF4/CF5 Sampling Event

Appendix A. September 2021 CF4/CF5 Sampling Event

Water Sampling Field Activities Verification

Sampling Event/RIN	CF4/CF5 Sampling Event RIN 2109129	**Date(s) of Water Sampling**	September 14 - 15, 2021
Date(s) of Verification	April 12, 2022	**Name of Verifier**	James Ritchey

	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?	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?	N/A	
10. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 milliliters per minute?	NA	
Was one pump/tubing volume removed before sampling?	NA	
11. Were duplicates taken at a frequency of one per 20 samples?	Yes	A duplicate was collected from location SMI-PW02, given false ID of 2000.

Appendix A. September 2021 CF4/CF5 Sampling Event (*continued*)

Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	CF4/CF5 Sampling Event RIN 2109129	**Date(s) of Water Sampling**	September 14 - 15, 2021
Date(s) of Verification	April 12, 2022	**Name of Verifier**	James Ritchey

	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	All samples 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?	Yes	
Was the true identity of the samples recorded on the quality assurance sample log?	Yes	
15. Were samples collected in the containers specified?	Yes	
16. Were samples filtered and preserved as specified?	Yes	
17. Were the number and types of samples collected as specified?	Yes	
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	

GENERAL WATER QUALITY DATA BY PARAMETER (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 4/13/2022 3:10 PM

PARAMETER	UNITS	LOCATION ID	LOC TYPE, SUBTYPE	SAMPLE: ID DATE	ID	DEPTH (FT BLS) RANGE	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	0780	WL	09/14/2021	0001	28.00	5.2		0.4	-
	mg/L	0781	WL	09/14/2021	0001	46.00	900		40	-
	mg/L	0782	WL	09/14/2021	0001	33.00	310		20	-
	mg/L	0783	WL	09/14/2021	0001	18.00	1.4		0.2	-
	mg/L	0784	WL	09/14/2021	0001	18.00	0.2	U	0.2	-
	mg/L	0785	WL	09/14/2021	0001	18.00	0.2	U	0.2	-
	mg/L	0786	WL	09/14/2021	0001	28.00	19		1	-
	mg/L	0787	WL	09/14/2021	0001	36.00	660		40	-
	mg/L	0810	WL, EXT	09/15/2021	0001	35.00	260		20	-
	mg/L	0811	WL, EXT	09/15/2021	0001	35.00	270		20	-
	mg/L	0812	WL, EXT	09/15/2021	0001	40.00	400	N	40	-
	mg/L	0813	WL, EXT	09/15/2021	0001	40.00	300		20	-
	mg/L	0814	WL, EXT	09/15/2021	0001	40.00	71		10	-
	mg/L	0815	WL, EXT	09/15/2021	0001	45.00	110		10	-
	mg/L	0816	WL, EXT	09/15/2021	0001	45.00	120		5	-
	mg/L	SMI-PW02	WL	09/15/2021	0001	55.00	400		20	-
	mg/L	SMI-PW02	WL			20.04 - 60.04	390		20	-

GENERAL WATER QUALITY DATA BY PARAMETER (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 4/13/2022 3:10 PM

				0002					
				N001					
Oxidation Reduction Potential	mV	0780	WL	09/15/2021 09/14/2021		28.00	80	-	-
	mV	0781	WL	N001	N001	46.00	125	-	-
	mV	0782	WL	09/14/2021 09/14/2021		33.00	-21	-	-
	mV	0783	WL	N001	N001	18.00	-204	-	-
	mV	0784	WL	09/14/2021 09/14/2021		18.00	-65	-	-
	mV	0785	WL	N001	N001	18.00	-33	-	-
	mV	0786	WL	09/14/2021 09/14/2021		28.00	-37	-	-
	mV	0787	WL	09/14/2021	N001	36.00	-4	-	-
	mV	0810	WL, EXT	09/15/2021	N001	35.00	267	-	-
	mV	0811	WL, EXT	09/15/2021	N001	35.00	245	-	-
	mV	0812	WL, EXT	09/15/2021	N001	40.00	206	-	-
	mV	0813	WL, EXT	09/15/2021	N001	40.00	194	-	-
	mV	0814	WL, EXT	09/15/2021	N001	40.00	171	-	-
	mV	0815	WL, EXT	09/15/2021	N001	45.00	191	-	-

PARAMETER	UNITS	LOCATION ID	LOC TYPE, SUBTYPE	SAMPLE: ID DATE	ID	DEPTH (FT BLS) RANGE	RESULT	QUALIFIERS: LAB DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Oxidation Reduction Potential	mV	0816	WL, EXT	09/15/2021	N001	45.00	179			-	-
	mV	SMI-PW02	WL	09/15/2021	N001	55.00	242			-	-

GENERAL WATER QUALITY DATA BY PARAMETER (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 4/13/2022 3:10 PM

pH	s.u.	0780	WL		N001	28.00	7.39	-	-
	s.u.	0781	WL	09/14/2021 09/14/2021	N001	46.00	6.81	-	-
	s.u.	0782	WL		N001	33.00	7.17	-	-
	s.u.	0783	WL	09/14/2021 09/14/2021	N001	18.00	7.22	-	-
	s.u.	0784	WL		N001	18.00	7.52	-	-
	s.u.	0785	WL	09/14/2021 09/14/2021	N001	18.00	7.15	-	-
	s.u.	0786	WL		N001	28.00	7.67	-	-
	s.u.	0787	WL	09/14/2021 09/14/2021	N001	36.00	7.10	-	-
	s.u.	0810	WL, EXT	09/15/2021	N001	35.00	6.57	-	-
	s.u.	0811	WL, EXT	09/15/2021	N001	35.00	6.81	-	-
	s.u.	0812	WL, EXT	09/15/2021	N001	40.00	6.72	-	-
	s.u.	0813	WL, EXT	09/15/2021	N001	40.00	6.90	-	-
	s.u.	0814	WL, EXT	09/15/2021	N001	40.00	6.95	-	-
	s.u.	0815	WL, EXT	09/15/2021	N001	45.00	7.11	-	-
	s.u.	0816	WL, EXT	09/15/2021	N001	45.00	7.39	-	-
	s.u.	SMI-PW02	WL	09/15/2021	N001	55.00	6.73	-	-
Specific Conductance	umhos/cm	0780	WL		N001	28.00	1383	-	-
	umhos/cm	0781	WL	09/14/2021 09/14/2021	N001	46.00	55820	-	-
	umhos/cm	0782	WL			33.00	15475	-	-

GENERAL WATER QUALITY DATA BY PARAMETER (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 4/13/2022 3:10 PM

	umhos/cm	0783	WL	09/14/2021	N001		18.00	1430	-	-
				09/14/2021	N001					
	umhos/cm	0784	WL	09/14/2021	N001		18.00	1232	-	-
				09/14/2021	N001					
	umhos/cm	0785	WL	09/14/2021	N001		18.00	1307	-	-
	umhos/cm	0786	WL	09/14/2021	N001		28.00	1364	-	-
				09/14/2021	N001					
	umhos/cm	0787	WL	09/14/2021	N001		36.00	38070	-	-
	umhos/cm	0810	WL, EXT	09/15/2021	N001		35.00	25757	-	-
	umhos/cm	0811	WL, EXT	09/15/2021	N001		35.00	16897	-	-
	umhos/cm	0812	WL, EXT	09/15/2021	N001		40.00	16519	-	-
	umhos/cm	0813	WL, EXT	09/15/2021	N001		40.00	14395	-	-
	umhos/cm	0814	WL, EXT	09/15/2021	N001		40.00	19660	-	-

PARAMETER	UNITS	LOCATION	LOC TYPE, SUBTYPE	SAMPLE: ID DATE	ID	DEPTH (FT BLS)	RANGE	RESULT	QUALIFIERS: LAB DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Specific Conductance	umhos/cm	0815	WL, EXT	09/15/2021	N001	45.00		18826			-	-
	umhos/cm	0816	WL, EXT	09/15/2021	N001	45.00		20856			-	-
	umhos/cm	SMI-PW02	WL	09/15/2021	N001	55.00		23948			-	-
				09/14/2021	N001							
Temperature	C	0780	WL	09/14/2021	N001	28.00		22.62			-	-
	C	0781	WL	09/14/2021	N001	46.00		19.71			-	-
	C	0782	WL	09/14/2021	N001	33.00		21.17			-	-

GENERAL WATER QUALITY DATA BY PARAMETER (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 4/13/2022 3:10 PM

	C	0783	WL	09/14/2021 09:14:00	N001	18.00	22.13	-	-
	C	0784	WL	09/14/2021 09:14:00	N001	18.00	26.20	-	-
	C	0785	WL	09/14/2021 09:14:00	N001	18.00	26.28	-	-
	C	0786	WL	09/14/2021 09:14:00	N001	28.00	23.83	-	-
	C	0787	WL	09/14/2021	N001	36.00	25.23	-	-
	C	0810	WL, EXT	09/15/2021	N001	35.00	17.49	-	-
	C	0811	WL, EXT	09/15/2021	N001	35.00	17.09	-	-
	C	0812	WL, EXT	09/15/2021	N001	40.00	16.38	-	-
	C	0813	WL, EXT	09/15/2021	N001	40.00	18.98	-	-
	C	0814	WL, EXT	09/15/2021	N001	40.00	17.75	-	-
	C	0815	WL, EXT	09/15/2021	N001	45.00	17.01	-	-
	C	0816	WL, EXT	09/15/2021	N001	45.00	17.24	-	-
	C	SMI-PW02	WL	09/15/2021 09:14:00	N001	55.00	16.72	-	-
Turbidity	NTU	0780	WL	09/14/2021 09:14:00	N001	28.00	3.40	-	-
	NTU	0781	WL	09/14/2021 09:14:00	N001	46.00	2.69	-	-
	NTU	0782	WL	09/14/2021 09:14:00	N001	33.00	2.14	-	-
	NTU	0783	WL	09/14/2021 09:14:00	N001	18.00	4.61	-	-
	NTU	0784	WL	09/14/2021 09:14:00	N001	18.00	4.12	-	-
	NTU	0785	WL			18.00	4.36	-	-

GENERAL WATER QUALITY DATA BY PARAMETER (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 4/13/2022 3:10 PM

	NTU	0786	WL	09/14/2021	N001 N001	28.00	0.95	-	-
	NTU	0787	WL	09/14/2021	N001	36.00	5.31	-	-
	NTU	0810	WL, EXT	09/15/2021	N001	35.00	68.50	-	-
	NTU	0811	WL, EXT	09/15/2021	N001	35.00	21.90	-	-
	NTU	0812	WL, EXT	09/15/2021	N001	40.00	1.02	-	-
	NTU	0813	WL, EXT	09/15/2021	N001	40.00	2.37	-	-

RECORDS: SELECTED FROM USEE205 WHERE RIN = '2109129' 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:

GENERAL WATER QUALITY DATA BY PARAMETER (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 4/13/2022 3:10 PM

PARAMETER	UNITS	LOCATION ID	LOC TYPE, SUBTYPE	SAMPLE: ID	DATE	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Turbidity	NTU	0814	WL, EXT	09/15/2021	N001	40.00	8.81		-	-
	NTU	0815	WL, EXT	09/15/2021	N001	45.00	2.47		-	-
	NTU	0816	WL, EXT	09/15/2021	N001	45.00	4.06		-	-
	NTU	SMI-PW02	WL	09/15/2021	N001	55.00	6.19		-	-
Uranium	mg/L	0780	WL	09/14/2021	0001	28.00	0.037		1.2E-05	-
	mg/L	0781	WL	09/14/2021	0001	46.00	3.200		0.00012	-
	mg/L	0782	WL	09/14/2021	0001	33.00	1.800		1.2E-05	-
	mg/L	0783	WL	09/14/2021	0001	18.00	0.068		1.2E-05	-
	mg/L	0784	WL	09/14/2021	0001	18.00	0.0096		1.2E-05	-
	mg/L	0785	WL	09/14/2021	0001	18.00	0.017		1.2E-05	-
	mg/L	0786	WL	09/14/2021	0001	28.00	0.052		1.2E-05	-
	mg/L	0787	WL	09/14/2021	0001	36.00	2.200		0.00012	-
	mg/L	0810	WL, EXT	09/15/2021	0001	35.00	2.600		0.00012	-
	mg/L	0811	WL, EXT	09/15/2021	0001	35.00	2.000		0.00012	-
	mg/L	0812	WL, EXT	09/15/2021	0001	40.00	2.000		0.00012	-
	mg/L	0813	WL, EXT	09/15/2021	0001	40.00	1.800		1.2E-05	-
	mg/L	0814	WL, EXT	09/15/2021	0001	40.00	2.500		0.00012	-

GENERAL WATER QUALITY DATA BY PARAMETER (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 4/13/2022 3:10 PM

	mg/L	0815	WL, EXT	09/15/2021	0001	45.00	2.700	0.00012	-
	mg/L	0816	WL, EXT	09/15/2021	0001	45.00	2.400	0.00012	-
	mg/L	SMI-PW02	WL	09/15/2021	0001	55.00	2.800	0.00012	-
	mg/L	SMI-PW02	WL	09/15/2021	0002	20.04 - 60.04	2.800	0.00012	-

* 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.

GENERAL WATER QUALITY DATA BY PARAMETER (USEE205) FOR SITE MOA01, Moab Site

REPORT DATE: 4/13/2022 3:10 PM

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 compound (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.

G Possible grout contamination, pH > 9.

L Less than 3 bore volumes purged prior to sampling.

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

R Unusable result.

U Parameter analyzed for but was not detected.

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

J Estimated value. Q Qualitative result due to sampling technique X Location is undefined.

Moab TAC Team

Date: January 12, 2022

To: Elizabeth Moran

From: James Ritchey

Subject: September 2021 Sampling Event

Site: Moab –Sampling Event – September 2021

Date of Sampling Event: September 14 – 15, 2021

Team Members: N. Andrews, J. Ritchey

RIN Number Assigned: All samples were assigned to RIN 2105127.

Sample Shipment: One sample cooler was shipped overnight UPS to ALS Laboratory from Moab, Utah on September 24, 2021 (Tracking number 1Z5W1Y510191231569).

September 2021 Configuration 4 Sampling

Number of Locations Sampled: Eight observation wells (0780, 0781, 0782, 0783, 0784, 0785, 0786, and 0787) were sampled during the September 2021 Sampling Event.

Locations Not Sampled: None.

Field Variance: None.

Quality Control Sample Cross Reference: None.

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

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0780	9/14/2021	9:00	16.42	28
0781	9/14/2021	9:20	16.18	46
0782	9/14/2021	9:35	16.41	32

0783	9/14/2021	13:55	14.47	18
0784	9/14/2021	14:10	16.94	18
0785	9/14/2021	15:00	16.78	18
0786	9/14/2021	14:45	16.13	28
0787	9/14/2021	14:30	16.35	36

September 2021 Configuration 5 Sampling

Number of Locations Sampled: Seven extraction wells (0810, 0811, 0812, 0813, 0814, 0815, 0816, and SMI-PW02) and one duplicate were sampled during the September 2021 Monthly 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	SMI-PW02	Duplicate from 20-60 ft bgs	Ground Water	SEP 012

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	Pump Intake Depth (ft bgs)
0810	9/15/2021	9:35	10.4 – 40.4
0811	9/15/2021	9:45	8.6 – 38.6
0812	9/15/2021	10:10	14.2 – 44.2
0813	9/15/2021	10:25	14.4 – 44.4
0814	9/15/2021	10:55	12.4 – 42.4
0815	9/15/2021	11:05	21.7 – 51.7
0816	9/15/2021	11:25	20.9 – 50.9
SMI-PW02	9/15/2021	9:55	20.0 – 60.0

*Depths to water were not collected for wells.

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)
9/14/2021	2,870
9/15/2021	2,770

Equipment Issues: None.

Corrective Action Required/Taken: None.

Appendix B.
September 2021 Crescent Junction Sampling Event

Appendix B. September 2021 Crescent Junction Sampling Event

Water Sampling Field Activities Verification

Sampling Event/RIN	Crescent Junction Sampling Event RIN 2109130	**Date(s) of Water Sampling**	September 22, 2021
Date(s) of Verification	April 12, 2022	**Name of Verifier**	James Ritchey

	Response (Yes, No, NA)	Comments
12. Is the Sampling Analysis Plan (SAP) the primary document directing field procedures?	Yes	
13. List other documents, standard operating procedures, instructions.	NA	
14. Were the sampling locations specified in the planning documents sampled?	Yes	
15. Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes	
16. Was an operational check of the field equipment conducted in accordance with the SAP?	Yes	
17. Did the operational checks meet criteria?	Yes	
18. 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.
19. Was the category of the well documented?	Yes	
20. 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?	N/A	
21. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 milliliters per minute?	NA	
Was one pump/tubing volume removed before sampling?	NA	
22. Were duplicates taken at a frequency of one per 20 samples?	No	Only two locations were collected, and no duplicates taken.

Appendix B. September 2021 Crescent Junction Sampling Event (*continued*)

Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	Crescent Junction Sampling Event RIN 2109130	**Date(s) of Water Sampling**	September 22, 2021
Date(s) of Verification	April 12, 2022	**Name of Verifier**	James Ritchey

	Response (Yes, No, NA)	Comments
23. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	No	No QA samples were collected during this event.
24. Were trip blanks prepared and included with each shipment of volatile organic compound samples?	NA	
25. Were quality-control samples assigned a fictitious site identification number?	Yes	
Was the true identity of the samples recorded on the quality assurance sample log?	Yes	
26. Were samples collected in the containers specified?	Yes	
27. Were samples filtered and preserved as specified?	Yes	
28. Were the number and types of samples collected as specified?	Yes	
29. Were COC records completed, and was sample custody maintained?	Yes	
30. Are field data sheets signed and dated by both team members?	Yes	
31. Was all other pertinent information documented on the field data sheets?	NA	
32. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
33. Were water levels measured at the locations specified in the planning documents?	Yes	

Appendix B. September 2021 Crescent Junction Sampling Event (*continued*)

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE CRJ01, Crescent Junction Site
LOCATION: 0202 <well>

REPORT DATE: 4/12/2022 2:45 PM

PARAMETER	UNITS	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/22/2021	0001		8.9			2	-
Arsenic	mg/L	09/22/2021	0001		0.039	U		0.039	-
BICARBONATE AS CaCO3	mg/L	09/22/2021	0001		980			20	-
BORON	ug/L	09/22/2021	0001		1300			31	-
Bromide	mg/L	09/22/2021	0001		40	U		40	-
Cadmium	mg/L	09/22/2021	0001		0.0033	U		0.0033	-
Calcium	mg/L	09/22/2021	0001		370			0.12	-
CARBONATE AS CaCO3	mg/L	09/22/2021	0001		20	U		20	-
Chloride	mg/L	09/22/2021	0001		1200			40	-
Chromium	mg/L	09/22/2021	0001		0.0051	U		0.0051	-
Cobalt	mg/L	09/22/2021	0001		0.0045	U		0.0045	-
Copper	mg/L	09/22/2021	0001		0.0097	U		0.0097	-
Fluoride	mg/L	09/22/2021	0001		20	U		20	-
Iron	mg/L	09/22/2021	0001		0.049	U		0.049	-
Lead	mg/L	09/22/2021	0001		0.013	U		0.013	-
Magnesium	mg/L	09/22/2021	0001		690			0.13	-

Manganese	mg/L	09/22/2021 0001	0.5		0.0011	-
MOLYBDENUM	ug/L	09/22/2021 0001	11	U	11	-
Nitrate + Nitrite as Nitrogen	mg/L	09/22/2021 0001	1000		20	-
Selenium	mg/L	09/22/2021 0001	0.027	U	0.027	-
Sodium	mg/L	09/22/2021 0001	8800		0.66	-
Sulfate	mg/L	09/22/2021 0001	2400		200	-
TOTAL ALKALINITY AS CaCO3	mg/L	09/22/2021 0001	980		20	-
Total Dissolved Solids	mg/L	09/22/2021 0001	40000		80	-
Uranium	mg/L	09/22/2021 0001	0.022		1.2E-05	-
Uranium-234	pCi/L	09/22/2021 0001	36.2	M3	0.2	± 6.30
Uranium-235	pCi/L	09/22/2021 0001	0.74	M3	0.12	± 0.38
Uranium-238	pCi/L	09/22/2021 0001	8.6	M3	0.2	± 1.80

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

LOCATION: 0205 <well>

REPORT DATE: 4/12/2022 2:45 PM

PARAMETER	UNITS	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	DATA QA	DETECTION LIMIT	UN-CERTAINTY
Ammonia Total as N	mg/L	09/22/2021	0001		11			2	-
Arsenic	mg/L	09/22/2021	0001		0.087	J		0.039	-
BICARBONATE AS CaCO3	mg/L	09/22/2021	0001		910			20	-
BORON	ug/L	09/22/2021	0001		1100			31	-

Bromide	mg/L	09/22/2021 0001	40	U	40	-
Cadmium	mg/L	09/22/2021 0001	0.0033	U	0.0033	-
Calcium	mg/L	09/22/2021 0001	280		0.12	-
CARBONATE AS CaCO3	mg/L	09/22/2021 0001	20	U	20	-
Chloride	mg/L	09/22/2021 0001	3100		40	-
Chromium	mg/L	09/22/2021 0001	0.0051	U	0.0051	-
Cobalt	mg/L	09/22/2021 0001	0.0045	U	0.0045	-
Copper	mg/L	09/22/2021 0001	0.0097	U	0.0097	-
Fluoride	mg/L	09/22/2021 0001	20	U	20	-
Iron	mg/L	09/22/2021 0001	0.049	U	0.049	-
Lead	mg/L	09/22/2021 0001	0.013	U	0.013	-
Magnesium	mg/L	09/22/2021 0001	730		0.13	-
Manganese	mg/L	09/22/2021 0001	0.29		0.0011	-
MOLYBDENUM	ug/L	09/22/2021 0001	11	U	11	-
Nitrate + Nitrite as Nitrogen	mg/L	09/22/2021 0001	590		10	-
Selenium	mg/L	09/22/2021 0001	2.6		0.027	-
Sodium	mg/L	09/22/2021 0001	7400		0.66	-
Sulfate	mg/L	09/22/2021 0001	24000		500	-
TOTAL ALKALINITY AS CaCO3	mg/L	09/22/2021 0001	910		20	-
Total Dissolved Solids	mg/L	09/22/2021 0001	38000		80	-

Uranium	mg/L	09/22/2021 0001	0.022		1.2E-05	-
Uranium-234	pCi/L	09/22/2021 0001	35.7	M3	0.4	± 6.40
Uranium-235	pCi/L	09/22/2021 0001	0.63	M3	0.14	± 0.38
Uranium-238	pCi/L	09/22/2021 0001	10.7	M3	0.2	± 2.20

RECORDS: SELECTED FROM USEE105 WHERE RIN = '2109130' 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 compound (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.

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

J Estimated value. Q Qualitative result due to sampling technique X Location is undefined.

Moab TAC Team

Date: January 12, 2022

To: Elizabeth Moran

From: James Ritchey

Subject: September 2021 CJ Sampling Event

Site: Crescent Junction – Well 0202 and 0205 Sampling Event – September 2021

Date of Sampling Event: September 22, 2021

Team Members: N. Andrews, J. Ritchey

RIN Number Assigned: All samples were assigned to RIN 2109130.

Sample Shipment: The sample was shipped overnight UPS to ALS Laboratory from Moab, Utah on September 23 of 2021 (Tracking number: 1Z5W1Y510191231569).

Number of Locations Sampled: One sample was collected from each well 0202 and well 0205 during the September 2021 CJ sampling event.

Locations Not Sampled/Reason: None.

Field Variance: None.

Quality Control Sample Cross Reference: None.

Location Specific Information: Wells 0202 and 0205 were sampled using a non-dedicated submersible pump with non-dedicated tubing. The table below provides additional information:

Location	**Date**	***Sample Depth*** **(ft btoc)**	**Depth to Water (ft btoc)**	***Comments***
0202	9/22/2021	60	50.89	
0205	9/22/2021	68	47.74	Yellow water.

Notes: ft btoc = feet below top of casing.

Well Inspection Summary: A well inspection was not conducted.

Equipment: None.

Regulatory: None.

Site Issues: None.

Corrective Action Required/Taken: None.