LMS/GJO/S01215

Data Validation Package

December 2015
Groundwater and Surface Water Sampling at the Grand Junction, Colorado, Site

March 2016

U.S. DEPARTMENT OF ENERGY | Legacy Management

This page intentionally left blank

Contents

This page intentionally left blank

Sampling Event Summary

Site: Grand Junction, Colorado, Site

Sampling Period: December 8–10, 2015

This event consisted of sampling seven monitoring wells and six surface water locations at the Grand Junction, Colorado, Site (Grand Junction site). Long-term monitoring at the Grand Junction site is prescribed in the 2006 *Long-Term Surveillance and Maintenance Plan for the Grand Junction, Colorado, Site*. Groundwater and surface water samples were analyzed for manganese (groundwater only), molybdenum, selenium, sulfate, and uranium. These constituents were selected on the basis of historical data and consideration of groundwater standards (molybdenum, selenium, and uranium), secondary drinking water standards (sulfate and manganese), human health risk (manganese), and Colorado Department of Public Health and Environment input. Per DOE direction, groundwater and surface water samples were also analyzed for calcium, chloride, iron, magnesium, nitrate + nitrite as N, potassium, and sodium to provide additional water quality data.

Although groundwater quality at the Grand Junction site has improved, analyte concentrations in the alluvial aquifer still exceed U.S. Environmental Protection Agency (EPA) groundwater standards (40 CFR 192), with the uranium standard exceeded in all wells in the monitoring network (Table 1).

Table 1. Locations with Samples that Equaled or Exceeded EPA Groundwater Standards in December 2015

Analyte	Standard[a]	Groundwater		Surface Water	
		Location	Concentration	Location	Concentration
Selenium	0.01	6-2N	0.030	-------	-------
		8-4S	0.030		
		GJ01-01	0.025		
Uranium	0.044	10-19N	0.19	North Pond	0.13
		11-1S	0.13	South Pond	0.27
		14-13NA	0.29	Wetland Area	1.1
		6-2N	0.053		
		8-4S	0.73		
		GJ01-01	0.28		
		GJ84-04	0.33		

[a] Standards are listed in 40 CFR 192.02 Table 1 to Subpart A; concentrations are in milligrams per liter (mg/L).

Surface water features located at the Grand Junction site, which include the North Pond, the South Pond, and the Wetland Area, receive discharge of contaminated alluvial groundwater; therefore, elevated concentrations of groundwater contaminants are expected in the these ponds. Because these locations are recharged by groundwater, results from these locations were

evaluated by comparing them to groundwater standards. Surface water locations with sample concentrations that exceeded groundwater standards are also presented in Table 1.

Surface water results from Gunnison River locations adjacent to and downstream of the site were compared to statistical background threshold values (BTVs) derived using historical data from the Upper Gunnison sampling location, which is located upstream of the site on the Gunnison River. As shown in Table 2, the molybdenum and uranium concentrations at the Lower Gunnison location exceeded the BTV values, which indicates a site-related impact from groundwater discharge to the Gunnison River. However, the molybdenum and uranium concentrations in the sample collected from the Lower Gunnison location are below the State of Colorado surface water standards for the Gunnison River of 0.16 mg/L and 0.03 mg/L, respectively.

Table 2. Comparison of 2015 Gunnison River Concentrations to BTVs

Analyte	Background Threshold Value[a]	Upper Gunnison (Benchmark Location)	Upper Mid Gunnison	Lower Gunnison
Molybdenum	0.0038	0.0032	0.0029	0.0043
Selenium	0.0094	0.0042	0.0049	0.0050
Sulfate	528	340	330	400
Uranium	0.011	0.0077	0.0070	0.0140

[a] BTV values are calculated using ProUCL version 5.0 as provided by EPA. Data from 1996 to present including the December 2015 data were used to calculate the BTVs. The BTVs were calculated using the 95 percent upper simultaneous limit for normally distributed data. Concentrations are in milligrams per liter (mg/L).

Sam Campbell, Site Lead
Navarro Research and Engineering, Inc.

3/11/2016
Date

Data Assessment Summary

This page intentionally left blank

Water Sampling Field Activities Verification Checklist

Project	Grand Junction, Colorado	**Date(s) of Water Sampling**	December 8–10, 2016
Date(s) of Verification	February 19, 2016	**Name of Verifier**	Stephen Donivan

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures?	Yes	
List any Program Directives or other documents, SOPs, instructions.		Work Order letter dated November 17, 2015.
2. Were the sampling locations specified in the planning documents sampled?	Yes	
3. Were field equipment calibrations conducted as specified in the above-named documents?	Yes	Calibrations were performed on December 8, 2015.
4. Was an operational check of the field equipment conducted daily?	Yes	
Did the operational checks meet criteria?	Yes	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	
6. Were wells categorized correctly?	Yes	
7. Were the following conditions met when purging a Category I well:		
Was one pump/tubing volume purged prior to sampling?	Yes	
Did the water level stabilize prior to sampling?	Yes	
Did pH, specific conductance, and turbidity measurements meet criteria prior to sampling?	Yes	
Was the flow rate less than 500 mL/min?	Yes	

Water Sampling Field Activities Verification Checklist (continued)

	Response (Yes, No, NA)	Comments
8. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 mL/min?	NA	All wells were Category I.
Was one pump/tubing volume removed prior to sampling?		
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	A duplicate sample was collected at location 10-19N.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	Yes	One equipment blank was collected.
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	
12. Were the true identities of the QC samples documented?	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 chain of custody records completed and was sample custody maintained?	Yes	
17. Was all pertinent information documented on the field data sheets?	Yes	
18. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
19. Were water levels measured at the locations specified in the planning documents?	Yes	

Laboratory Performance Assessment

General Information

Report Number (RIN):	15117528
Sample Event:	December 8–10, 2015
Site(s):	Grand Junction Office, Colorado
Laboratory:	ALS Laboratory Group, Fort Collins, Colorado
Work Order No.:	1512268
Analysis:	Metals and Wet Chemistry
Validator:	Stephen Donivan
Review Date:	February 19, 2016

Validation was performed according to the Standard Practice for Validation of Environmental Data found in Appendix A of the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, http://sp.lm.doe.gov/Contractor/ControlledDocuments/Controlled%20Documents/S04351_SAP.pdf). The procedure was applied at Level 3, Data Validation.

This validation includes the evaluation of data quality indicators (DQIs) associated with the data. DQIs are the quantitative and qualitative descriptors that are used to interpret the degree of acceptability or utility of data. Indicators of data quality include the analysis of laboratory control samples to assess accuracy; duplicates and replicates to assess precision; and interference check samples to assess bias (see Figures 1, 2, and 3, Data Validation Worksheets). The DQIs comparability, completeness, and sensitivity are also evaluated in the sections to follow.

All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 3.

Table 3. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Chloride	MIS-A-045	SW-846 9056	SW-846 9056
Metals: Ca, Fe, K, Mg, Mn, Na	LMM-01	SW-846 3005A	SW-846 6010B
Metals: Mo, Se, U	LMM-02	SW-846 3005A	SW-846 6020A
Nitrate + Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2
Sulfate	MIS-A-045	SW-846 9056	SW-846 9056

Data Qualifier Summary

Analytical results were qualified as listed in Table 4. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 4. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1512268-1	10-19-N	Selenium	U	Less than 5 times the method blank
1512268-2	11-1S	Selenium	U	Less than 5 times the method blank
1512268-3	14-13NA	Selenium	U	Less than 5 times the method blank
1512268-4	10-19N Duplicate	Selenium	U	Less than 5 times the method blank
1512268-9	GJ84-04	Selenium	U	Less than 5 times the method blank
1512268-10	Lower Gunnison	Uranium	J	Serial dilution result
1512268-11	North Pond	Nitrate/nitrite-N	J	Less than 5 times the equipment blank
1512268-12	South Pond	Nitrate/nitrite-N	J	Less than 5 times the equipment blank
1512268-12	South Pond	Selenium	U	Less than 5 times the method blank
1512268-15	Wetland Area	Selenium	U	Less than 5 times the method blank

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 15 water samples on December 15, 2015, accompanied by a Chain of Custody (COC) form. A copy of the air bill was included in the receiving documentation. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions.

Preservation and Holding Times

The sample shipment was received intact with the temperature in the iced cooler at 1.2 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses and all samples were analyzed within the applicable holding times.

Detection and Quantitation Limits

A method detection limit (MDL) is defined in 40 CFR 136 as the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The MDLs reported by the laboratory were compared to the required MDLs to assess the sensitivity of the analyses and were in compliance with contractual requirements.

The practical quantitation limit (PQL) for an analyte, defined as 5 times the MDL, is the lowest concentration that can be quantitatively measured, and is used when evaluating laboratory method performance in the sections below.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of

interest. Initial calibration verification (ICV) demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification (CCV) demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Method EPA 353.2, Nitrate + Nitrite as N
Calibrations were performed on December 17, 2015, using seven calibration standards. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL as required by the cited method. Initial and continuing calibration verification checks were made at the required frequency with all calibration checks meeting the acceptance criteria.

Method SW-846 6010B, Metals: Ca, Fe, K, Mg, Mn, Na
Calibrations were performed on December 21, 2015, using three calibration standards. The correlation coefficient value was greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL as required by the cited method. Initial and continuing calibration verification checks were made at the required frequency with all calibration checks meeting the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range.

Method SW-846 6020A, Metals: Mo, Se, U
Calibrations were performed on December 22, 2015, using four calibration standards. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL as required by the cited method. Initial and continuing calibration verification checks were made at the required frequency with all calibration checks associated with the samples meeting the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries associated with requested analytes were stable and within acceptable ranges.

Method SW-846 9056, Chloride, Sulfate
Calibrations were performed on November 20, 2015, using five calibration standards. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL as required by the cited method. Initial and continuing calibration verification checks were made at the required frequency with all calibration checks meeting the acceptance criteria.

Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Calibration blanks are analyzed to assess instrument contamination prior to and

during sample analysis. All blank results associated with the samples were below the PQLs for all analytes.

Inductively Coupled Plasma (ICP) Interference Check Sample (ICS) Analysis

Interference check samples are analyzed to verify the instrumental interelement and background correction factors and assess any bias due to interelement interferences. Interference check samples were analyzed at the required frequency with all results meeting the acceptance criteria.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix, and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike concentration. The spike recoveries met the acceptance criteria for all analytes.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision. The relative percent difference for replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. The replicate results met these criteria, demonstrating acceptable laboratory precision.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Metals Serial Dilution

Serial dilutions were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. Serial dilution data are evaluated to assess bias when the concentration of the undiluted sample is greater than 50 times the MDL. All evaluated serial dilution results were acceptable with the following exception. The uranium serial dilution result for the Lower Gunnison sample did not meet the acceptance criteria. The associated sample uranium result is qualified with a “J” flag as an estimated value.

Completeness

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

Chromatography Peak Integration

The integration of analyte peaks was reviewed for all chloride and sulfate data. There were no manual integrations performed and all peak integrations were satisfactory.

Electronic Data Deliverable (EDD) File

The EDD file arrived on December 31, 2015. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

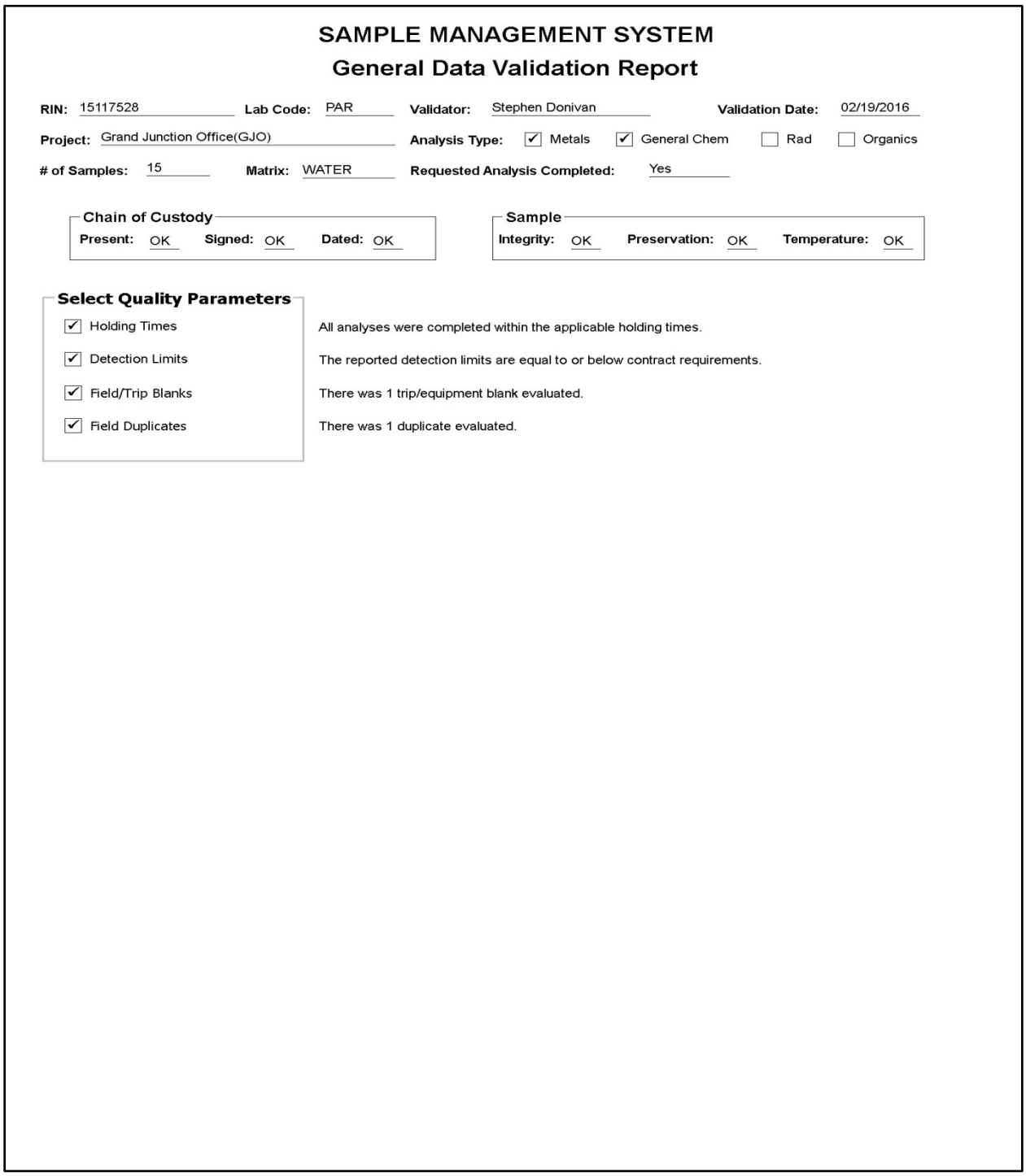
Anion/Cation Balance

The anion/cation balance is used to determine if major ion concentrations have been quantified correctly. The total anions should balance with (be equal to) the total cations when expressed in milliequivalents per liter (meq/L). **Error! Reference source not found.** shows the total anion and cation results in the samples from this event, and the charge balance, which is a relative percent difference calculation. Typically, a charge balance difference less than or equal to 10 percent is considered acceptable.

Table 5. Comparison of Major Anions and Cations

Location	Location Type	Cations (meq/L)	Anions (meq/L)	Charge Balance (%)
10-19N	Groundwater	65.27	73.40	5.86
11-1S	Groundwater	16.26	16.55	0.88
14-13NA	Groundwater	37.22	41.84	5.84
6-2N	Groundwater	28.30	33.51	8.43
8-4S	Groundwater	26.84	28.83	3.57
GJ01-01	Groundwater	17.63	19.03	3.81
GJ84-04	Groundwater	40.48	46.99	7.44
Lower Gunnison	Surface Water	11.26	12.30	4.44
North Pond	Surface Water	38.09	41.19	3.91
South Pond	Surface Water	27.65	29.78	3.71
Upper Gunnison	Surface Water	10.43	10.47	0.16
Upper Middle Gunnison	Surface Water	10.05	10.16	0.55
Wetland Area	Surface Water	119.83	130.62	4.31

The charge balance difference was less than 10 percent for all locations, indicating there are no significant errors associated with the measurement of major ion concentrations.



SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 15117528 Lab Code: PAR Validator: Stephen Donivan Validation Date: 02/19/2016

Project: Grand Junction Office(GJO) Analysis Type: ☑ Metals ☑ General Chem ☐ Rad ☐ Organics

# of Samples: 15 Matrix: WATER Requested Analysis Completed: Yes

Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation: OK Temperature: OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☑ Field/Trip Blanks	There was 1 trip/equipment blank evaluated.
☑ Field Duplicates	There was 1 duplicate evaluated.

Figure 1. General Validation Worksheet

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 15117528 **Lab Code:** PAR **Date Due:** 01/12/2016

Matrix: Water **Site Code:** GJO01 **Date Completed:** 01/04/2016

Analyte	Method Type	Date Analyzed	CALIBRATION				Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
			Int.	R^2	CCV	CCB								
Calcium	ICP/ES	12/21/2015	0.0000	1.0000	OK	OK	OK	104.0	100.0	92.0	2.0	98.0	4.0	100.0
Iron	ICP/ES	12/21/2015	0.0000	1.0000	OK	OK	OK	100.0	99.0	97.0	2.0	98.0		99.0
Magnesium	ICP/ES	12/21/2015	0.0000	0.9999	OK	OK	OK	102.0	103.0	100.0	2.0	101.0	3.0	98.0
Manganese	ICP/ES	12/21/2015	0.0000	0.9999	OK	OK	OK	103.0				106.0		85.0
Molybdenum	ICP/MS	12/22/2015	0.0000	1.0000	OK	OK	OK	105.0	107.0	105.0	2.0	107.0		110.0
Potassium	ICP/ES	12/21/2015	0.0000	0.9999	OK	OK	OK	100.0	107.0	107.0	0.0		3.0	91.0
Selenium	ICP/MS	12/22/2015	0.0000	1.0000	OK	OK	OK	110.0	117.0	106.0	10.0	100.0		128.0
Sodium	ICP/ES	12/21/2015	0.0000	1.0000	OK	OK	OK	102.0	116.0	115.0	0.0		4.0	93.0
Uranium	ICP/MS	12/22/2015	0.0000	1.0000	OK	OK	OK	106.0	108.0	99.0	4.0	104.0	11.0	110.0

Int. Calibration curve intercept
R^2 calibration curve correlation coefficient
CCV Continuing calibration verification
CCB Continuing calibration blank
LCS Laboratory control sample
MS Matrix spike
MSD Matrix spike duplicate
RPD Relative percent difference
ISCAB Interference check solution
CRI Reporting limit verification check

Figure 2. Metals Validation Worksheet

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 15117528 **Lab Code:** PAR **Date Due:** 01/12/2016

Matrix: Water **Site Code:** GJO01 **Date Completed:** 01/04/2016

Analyte	Date Analyzed	CALIBRATION				Method Blank	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	CCV	CCB						
CHLORIDE	12/22/2015	0.000	0.9999	OK	OK	OK	100.00	96	97	1	
Nitrate+Nitrite as N	12/17/2015	0.000	1.0000	OK	OK	OK	100	94	100	6	
SULFATE	12/22/2015	0.000	0.9999	OK	OK	OK	99.00	110	97	3	

Int. Calibration curve intercept
R^2 calibration curve correlation coefficient
CCV Continuing calibration verification
CCB Continuing calibration blank
LCS Laboratory control sample
MS Matrix spike
MSD Matrix spike duplicate
RPD Relative percent difference

Figure 3. Wet Chemistry Validation Worksheet

Sampling Quality Control Assessment

The following information summarizes and assesses quality control for this sampling event.

Sampling Protocol

All monitoring wells met the Category I low-flow sampling criteria. Sample results for these wells were qualified with an "F" flag in the database, indicating the wells were purged and sampled using the low-flow sampling method. Surface water locations were sampled using either a peristaltic pump and tubing reel, or by container immersion.

Equipment Blank

An equipment blank (field ID 2688) was collected after decontamination of the hose reel used to collect the surface water samples. Nitrate/nitrite-N, sodium, and uranium were detected in this blank at concentrations below the PQLs (Figure 4). The associated sample nitrate/nitrite-N results that are greater than the MDL but less than five times the blank concentration are qualified with a "J" flag as estimated values. Sample sodium and uranium results were greater than 10 times the blank concentration, not requiring qualification. The equipment blank results indicate adequate decontamination of the sampling equipment.

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 duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. A duplicate sample was collected from location 10-19N (field duplicate ID 2687). The duplicate results met the criteria, demonstrating acceptable overall precision (see Figure 5).

SAMPLE MANAGEMENT SYSTEM

Validation Report: Equipment/Trip Blanks

RIN: 15117528 **Lab Code:** PAR **Project:** Grand Junction Office(GJO) **Validation Date:** 02/19/2016

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Equipment Blank	1512268-5	SW6010	Sodium	76	J	47	UG/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
1512268-10	NMR 072	Lower Gunnison	72000	1		
1512268-11	NMR 073	North Pond	410000	1		
1512268-12	NMR 074	South Pond	340000	1		
1512268-13	NMR 070	Upper Gunnison	61000	1		
1512268-14	NMR 071	Upper Mid Gunnison	61000	1		

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Equipment Blank	1512268-5	SW6020	Uranium	0.04	J	0.029	UG/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
1512268-10	NMR 072	Lower Gunnison	14	10	E	
1512268-11	NMR 073	North Pond	130	10		
1512268-12	NMR 074	South Pond	270	10		
1512268-13	NMR 070	Upper Gunnison	7.7	10		
1512268-14	NMR 071	Upper Mid Gunnison	7	10		

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Equipment Blank	1512268-5	EPA353.2	Nitrate+Nitrite as N	0.024		0.01	MG/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
1512268-10	NMR 072	Lower Gunnison	0.61	1		
1512268-11	NMR 073	North Pond	0.022	1		J
1512268-12	NMR 074	South Pond	0.01	1		J
1512268-13	NMR 070	Upper Gunnison	0.61	1		
1512268-14	NMR 071	Upper Mid Gunnison	0.61	1		

Figure 4. Equipment Blanks Validation Worksheet

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 15117528 **Lab Code:** PAR **Project:** Grand Junction Office(GJO) **Validation Date:** 02/19/2016

Duplicate: 2687 **Sample:** 10-19N

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Calcium	360000			5	340000			5	5.71		UG/L
CHLORIDE	300			40	300			40	0		MG/L
Iron	220	J		5	180	J		5	20.00		UG/L
Magnesium	210000			5	200000			5	4.88		UG/L
Manganese	3300			5	3300			5	0		UG/L
Molybdenum	53			10	48			10	9.90		UG/L
Nitrate+Nitrite as N	0.02			1	0.017			1			MG/L
Potassium	18000			5	19000			5	5.41		UG/L
Selenium	1.5			10	1.1			10			UG/L
Sodium	680000			5	700000			5	2.90		UG/L
SULFATE	2700			40	2700			40	0		MG/L
Uranium	190			10	180			10	5.41		UG/L

Figure 5. Field Duplicates Validation Worksheet

Certification

All laboratory analytical quality control criteria were met except as qualified in this report. The data qualifiers listed on the SEEPro database reports are defined on the last page of each report. All data in this package are considered validated and available for use.

Laboratory Coordinator: Stephen Donivan — Date: 3-9-2016

Data Validation Lead: Stephen Donivan — Date: 3-9-2016

Attachment 1

Assessment of Anomalous Data

This page intentionally left blank

Potential Outliers Report

This page intentionally left blank

Potential Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers can result from transcription errors, data-coding errors, or measurement system problems. However, outliers can also represent true extreme values of a distribution and can indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not “fit” with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. **Identify extreme values that may be potential outliers.** Do this by generating the Outliers Report using the Sample Management System from data in the environmental database. The application compares the new data set (in standard environmental database units) with historical data and lists the new data that fall outside the historical data range. A determination is also made as to whether the data are normally distributed using the Shapiro-Wilk Test.
2. **Apply the appropriate statistical test.** Dixon's Test for extreme values is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. **Scientifically review statistical outliers and decide on their disposition.** The review should include an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

There were no potential outliers identified, and the data for this event are acceptable as qualified.

Data Validation Outliers Report - No Field Parameters

Comparison: All historical Data Beginning 01/01/2005

Laboratory: ALS Laboratory Group

RIN: 15117528

Report Date: 02/19/2016

Site Code	Location Code	Sample ID	Sample Date	Analyte	Current	Qualifiers		Historical Maximum	Qualifiers		Historical Minimum	Qualifiers		Number of Data Points		Statistical Outlier
					Result	*Lab*	*Data*	Result	*Lab*	*Data*	Result	*Lab*	*Data*	N	N Below Detect	
GJO01	8-4S	N001	12/08/2015	Uranium	0.730		F	0.670		F	0.0970		F	14	0	No

STATISTICAL TESTS:

The distribution of the data is tested for normality or lognormality using the Shapiro-Wilk Test

Outliers are identified using Dixon's Test when there are 25 or fewer data points.

Outliers are identified using Rosner's Test when there are 26 or more data points.

See Data Quality Assessment: Statistical Methods for Practitioners, EPA QC/G-9S, February 2006.

Attachment 2

Data Presentation

This page intentionally left blank

Groundwater Quality Data

This page intentionally left blank

Groundwater Quality Data by Location (USEE100) FOR SITE GJO01, Grand Junction Site
REPORT DATE: 02/19/2016
Location: 10-19N WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/09/2015	N001	-	436		F	#		
Calcium	mg/L	12/09/2015	N001	-	360		F	#	0.12	
Calcium	mg/L	12/09/2015	N002	-	340		F	#	0.12	
Chloride	mg/L	12/09/2015	N001	-	300		F	#	8	
Chloride	mg/L	12/09/2015	N002	-	300		F	#	8	
Dissolved Oxygen	mg/L	12/09/2015	N001	-	1.73		F	#		
Iron	mg/L	12/09/2015	N001	-	0.22	J	F	#	0.033	
Iron	mg/L	12/09/2015	N002	-	0.18	J	F	#	0.033	
Magnesium	mg/L	12/09/2015	N001	-	210		F	#	0.15	
Magnesium	mg/L	12/09/2015	N002	-	200		F	#	0.15	
Manganese	mg/L	12/09/2015	N001	-	3.3		F	#	0.0012	
Manganese	mg/L	12/09/2015	N002	-	3.3		F	#	0.0012	
Molybdenum	mg/L	12/09/2015	N001	-	0.053		F	#	0.00032	
Molybdenum	mg/L	12/09/2015	N002	-	0.048		F	#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/09/2015	N001	-	0.02		F	#	0.01	
Nitrate + Nitrite as Nitrogen	mg/L	12/09/2015	N002	-	0.017		F	#	0.01	
Oxidation Reduction Potential	mV	12/09/2015	N001	-	27.5		F	#		
pH	s.u.	12/09/2015	N001	-	7.15		F	#		
Potassium	mg/L	12/09/2015	N001	-	18		F	#	0.26	
Potassium	mg/L	12/09/2015	N002	-	19		F	#	0.26	

Groundwater Quality Data by Location (USEE100) FOR SITE GJO01, Grand Junction Site
REPORT DATE: 02/19/2016
Location: 10-19N WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Selenium	mg/L	12/09/2015	N001	-	0.0015		UF	#	0.00032	
Selenium	mg/L	12/09/2015	N002	-	0.0011		UF	#	0.00032	
Sodium	mg/L	12/09/2015	N001	-	680		F	#	0.23	
Sodium	mg/L	12/09/2015	N002	-	700		F	#	0.23	
Specific Conductance	umhos /cm	12/09/2015	N001	-	5171		F	#		
Sulfate	mg/L	12/09/2015	N001	-	2700		F	#	20	
Sulfate	mg/L	12/09/2015	N002	-	2700		F	#	20	
Temperature	C	12/09/2015	N001	-	12.7		F	#		
Turbidity	NTU	12/09/2015	N001	-	2.16		F	#		
Uranium	mg/L	12/09/2015	N001	-	0.19		F	#	0.000029	
Uranium	mg/L	12/09/2015	N002	-	0.18		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE GJO01, Grand Junction Site
REPORT DATE: 02/19/2016
Location: 11-1S WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/09/2015	N001	-	247		F	#		
Calcium	mg/L	12/09/2015	N001	-	170		F	#	0.024	
Chloride	mg/L	12/09/2015	N001	-	13		F	#	2	
Dissolved Oxygen	mg/L	12/09/2015	N001	-	1.42		F	#		
Iron	mg/L	12/09/2015	N001	-	0.17		F	#	0.0067	
Magnesium	mg/L	12/09/2015	N001	-	54		F	#	0.03	
Manganese	mg/L	12/09/2015	N001	-	0.81		F	#	0.00024	
Molybdenum	mg/L	12/09/2015	N001	-	0.017		F	#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/09/2015	N001	-	0.01	U	F	#	0.01	
Oxidation Reduction Potential	mV	12/09/2015	N001	-	27.5		F	#		
pH	s.u.	12/09/2015	N001	-	7.29		F	#		
Potassium	mg/L	12/09/2015	N001	-	4.6		F	#	0.052	
Selenium	mg/L	12/09/2015	N001	-	0.00048	J	UF	#	0.00032	
Sodium	mg/L	12/09/2015	N001	-	74		F	#	0.047	
Specific Conductance	umhos /cm	12/09/2015	N001	-	1392		F	#		
Sulfate	mg/L	12/09/2015	N001	-	540		F	#	5	
Temperature	C	12/09/2015	N001	-	11.88		F	#		
Turbidity	NTU	12/09/2015	N001	-	7.29		F	#		
Uranium	mg/L	12/09/2015	N001	-	0.13		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE GJO01, Grand Junction Site
REPORT DATE: 02/19/2016
Location: 14-13NA WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/09/2015	N001	-	361		F	#		
Calcium	mg/L	12/09/2015	N001	-	270		F	#	0.024	
Chloride	mg/L	12/09/2015	N001	-	120		F	#	4	
Dissolved Oxygen	mg/L	12/09/2015	N001	-	1.82		F	#		
Iron	mg/L	12/09/2015	N001	-	0.12		F	#	0.0067	
Magnesium	mg/L	12/09/2015	N001	-	66		F	#	0.03	
Manganese	mg/L	12/09/2015	N001	-	3.7		F	#	0.00024	
Molybdenum	mg/L	12/09/2015	N001	-	0.11		F	#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/09/2015	N001	-	0.036		F	#	0.01	
Oxidation Reduction Potential	mV	12/09/2015	N001	-	42.4		F	#		
pH	s.u.	12/09/2015	N001	-	7.19		F	#		
Potassium	mg/L	12/09/2015	N001	-	19		F	#	0.052	
Selenium	mg/L	12/09/2015	N001	-	0.00097	J	UF	#	0.00032	
Sodium	mg/L	12/09/2015	N001	-	410		F	#	0.047	
Specific Conductance	umhos /cm	12/09/2015	N001	-	3298		F	#		
Sulfate	mg/L	12/09/2015	N001	-	1500		F	#	10	
Temperature	C	12/09/2015	N001	-	14.04		F	#		
Turbidity	NTU	12/09/2015	N001	-	3.42		F	#		
Uranium	mg/L	12/09/2015	N001	-	0.29		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE GJO01, Grand Junction Site
REPORT DATE: 02/19/2016
Location: 6-2N WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/09/2015	N001	-	254		F	#		
Calcium	mg/L	12/09/2015	N001	-	160		F	#	0.024	
Chloride	mg/L	12/09/2015	N001	-	120		F	#	4	
Dissolved Oxygen	mg/L	12/09/2015	N001	-	1.42		F	#		
Iron	mg/L	12/09/2015	N001	-	0.022	J	F	#	0.0067	
Magnesium	mg/L	12/09/2015	N001	-	43		F	#	0.03	
Manganese	mg/L	12/09/2015	N001	-	1		F	#	0.00024	
Molybdenum	mg/L	12/09/2015	N001	-	0.021		F	#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/09/2015	N001	-	0.84		F	#	0.01	
Oxidation Reduction Potential	mV	12/09/2015	N001	-	184.6		F	#		
pH	s.u.	12/09/2015	N001	-	7.68		F	#		
Potassium	mg/L	12/09/2015	N001	-	9.8		F	#	0.052	
Selenium	mg/L	12/09/2015	N001	-	0.03		F	#	0.00032	
Sodium	mg/L	12/09/2015	N001	-	380		F	#	0.047	
Specific Conductance	umhos /cm	12/09/2015	N001	-	2730		F	#		
Sulfate	mg/L	12/09/2015	N001	-	1200		F	#	10	
Temperature	C	12/09/2015	N001	-	15.56		F	#		
Turbidity	NTU	12/09/2015	N001	-	1.14		F	#		
Uranium	mg/L	12/09/2015	N001	-	0.053		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE GJO01, Grand Junction Site
REPORT DATE: 02/19/2016
Location: 8-4S WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/08/2015	N001	-	333		F	#		
Calcium	mg/L	12/08/2015	N001	-	200		F	#	0.024	
Chloride	mg/L	12/08/2015	N001	-	67		F	#	4	
Dissolved Oxygen	mg/L	12/08/2015	N001	-	1.48		F	#		
Iron	mg/L	12/08/2015	N001	-	0.025	J	F	#	0.0067	
Magnesium	mg/L	12/08/2015	N001	-	70		F	#	0.03	
Manganese	mg/L	12/08/2015	N001	-	1.7		F	#	0.00024	
Molybdenum	mg/L	12/08/2015	N001	-	0.12		F	#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/08/2015	N001	-	1.1		F	#	0.05	
Oxidation Reduction Potential	mV	12/08/2015	N001	-	108		F	#		
pH	s.u.	12/08/2015	N001	-	7.28		F	#		
Potassium	mg/L	12/08/2015	N001	-	8.8		F	#	0.052	
Selenium	mg/L	12/08/2015	N001	-	0.03		F	#	0.00032	
Sodium	mg/L	12/08/2015	N001	-	250		F	#	0.047	
Specific Conductance	umhos /cm	12/08/2015	N001	-	2333		F	#		
Sulfate	mg/L	12/08/2015	N001	-	970		F	#	10	
Temperature	C	12/08/2015	N001	-	13.65		F	#		
Turbidity	NTU	12/08/2015	N001	-	1.11		F	#		
Uranium	mg/L	12/08/2015	N001	-	0.73		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE GJO01, Grand Junction Site
REPORT DATE: 02/19/2016
Location: GJ01-01 WELL South of Building 20

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/09/2015	N001	15.5	-	25.5	291		F	#		
Calcium	mg/L	12/09/2015	N001	15.5	-	25.5	110		F	#	0.024	
Chloride	mg/L	12/09/2015	N001	15.5	-	25.5	76		F	#	2	
Dissolved Oxygen	mg/L	12/09/2015	N001	15.5	-	25.5	1.26		F	#		
Iron	mg/L	12/09/2015	N001	15.5	-	25.5	0.0067	U	F	#	0.0067	
Magnesium	mg/L	12/09/2015	N001	15.5	-	25.5	45		F	#	0.03	
Manganese	mg/L	12/09/2015	N001	15.5	-	25.5	0.44		F	#	0.00024	
Molybdenum	mg/L	12/09/2015	N001	15.5	-	25.5	0.071		F	#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/09/2015	N001	15.5	-	25.5	3.3		F	#	0.05	
Oxidation Reduction Potential	mV	12/09/2015	N001	15.5	-	25.5	172.5		F	#		
pH	s.u.	12/09/2015	N001	15.5	-	25.5	7.44		F	#		
Potassium	mg/L	12/09/2015	N001	15.5	-	25.5	6.9		F	#	0.052	
Selenium	mg/L	12/09/2015	N001	15.5	-	25.5	0.025		F	#	0.00032	
Sodium	mg/L	12/09/2015	N001	15.5	-	25.5	190		F	#	0.047	
Specific Conductance	umhos /cm	12/09/2015	N001	15.5	-	25.5	1646		F	#		
Sulfate	mg/L	12/09/2015	N001	15.5	-	25.5	520		F	#	5	
Temperature	C	12/09/2015	N001	15.5	-	25.5	13.46		F	#		
Turbidity	NTU	12/09/2015	N001	15.5	-	25.5	1.3		F	#		
Uranium	mg/L	12/09/2015	N001	15.5	-	25.5	0.28		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE GJO01, Grand Junction Site
REPORT DATE: 02/19/2016
Location: GJ84-04 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/09/2015	N001	-	354		F	#		
Calcium	mg/L	12/09/2015	N001	-	280		F	#	0.024	
Chloride	mg/L	12/09/2015	N001	-	160		F	#	4	
Dissolved Oxygen	mg/L	12/09/2015	N001	-	1.33		F	#		
Iron	mg/L	12/09/2015	N001	-	0.081	J	F	#	0.0067	
Magnesium	mg/L	12/09/2015	N001	-	75		F	#	0.03	
Manganese	mg/L	12/09/2015	N001	-	4.6		F	#	0.00024	
Molybdenum	mg/L	12/09/2015	N001	-	0.069		F	#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/09/2015	N001	-	0.022		F	#	0.01	
Oxidation Reduction Potential	mV	12/09/2015	N001	-	-33.2		F	#		
pH	s.u.	12/09/2015	N001	-	7.2		F	#		
Potassium	mg/L	12/09/2015	N001	-	13		F	#	0.052	
Selenium	mg/L	12/09/2015	N001	-	0.00047	J	UF	#	0.00032	
Sodium	mg/L	12/09/2015	N001	-	460		F	#	0.047	
Specific Conductance	umhos /cm	12/09/2015	N001	-	3565		F	#		
Sulfate	mg/L	12/09/2015	N001	-	1700		F	#	10	
Temperature	C	12/09/2015	N001	-	11.87		F	#		
Turbidity	NTU	12/09/2015	N001	-	1.8		F	#		
Uranium	mg/L	12/09/2015	N001	-	0.33		F	#	0.000029	

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.		

QA QUALIFIER:

#	Validated according to quality assurance guidelines.

This page intentionally left blank

Surface Water Quality Data

This page intentionally left blank

Surface Water Quality Data by Location (USEE102) FOR SITE GJO01, Grand Junction Site

REPORT DATE: 02/19/2016

Location: Lower Gunnison SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/10/2015	N001	174			#		
Calcium	mg/L	12/10/2015	N001	100			#	0.024	
Chloride	mg/L	12/10/2015	N001	16			#	1	
Dissolved Oxygen	mg/L	12/10/2015	N001	12.73			#		
Iron	mg/L	12/10/2015	N001	0.073	J		#	0.0067	
Magnesium	mg/L	12/10/2015	N001	37			#	0.03	
Molybdenum	mg/L	12/10/2015	N001	0.0043			#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/10/2015	N001	0.61			#	0.01	
Oxidation Reduction Potential	mV	12/10/2015	N001	184.1			#		
pH	s.u.	12/10/2015	N001	8.6			#		
Potassium	mg/L	12/10/2015	N001	3.6			#	0.052	
Selenium	mg/L	12/10/2015	N001	0.005			#	0.00032	
Sodium	mg/L	12/10/2015	N001	72			#	0.047	
Specific Conductance	umhos/cm	12/10/2015	N001	1076			#		
Sulfate	mg/L	12/10/2015	N001	400			#	2.5	
Temperature	C	12/10/2015	N001	1.64			#		
Turbidity	NTU	12/10/2015	N001	5.37			#		
Uranium	mg/L	12/10/2015	N001	0.014	E	J	#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE GJO01, Grand Junction Site

REPORT DATE: 02/19/2016

Location: North Pond SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/10/2015	N001	230			#		
Calcium	mg/L	12/10/2015	N001	200			#	0.024	
Chloride	mg/L	12/10/2015	N001	190			#	4	
Dissolved Oxygen	mg/L	12/10/2015	N001	9.31			#		
Iron	mg/L	12/10/2015	N001	0.063	J		#	0.0067	
Magnesium	mg/L	12/10/2015	N001	120			#	0.03	
Molybdenum	mg/L	12/10/2015	N001	0.0065			#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/10/2015	N001	0.022		J	#	0.01	
Oxidation Reduction Potential	mV	12/10/2015	N001	210.6			#		
pH	s.u.	12/10/2015	N001	7.93			#		
Potassium	mg/L	12/10/2015	N001	16			#	0.052	
Selenium	mg/L	12/10/2015	N001	0.0028			#	0.00032	
Sodium	mg/L	12/10/2015	N001	410			#	0.047	
Specific Conductance	umhos/cm	12/10/2015	N001	3404			#		
Sulfate	mg/L	12/10/2015	N001	1500			#	10	
Temperature	C	12/10/2015	N001	2.17			#		
Turbidity	NTU	12/10/2015	N001	2.51			#		
Uranium	mg/L	12/10/2015	N001	0.13			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE GJO01, Grand Junction Site

REPORT DATE: 02/19/2016

Location: South Pond SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/10/2015	0001	124			#		
Calcium	mg/L	12/10/2015	0001	110			#	0.024	
Chloride	mg/L	12/10/2015	0001	82			#	4	
Dissolved Oxygen	mg/L	12/10/2015	N001	14.93			#		
Iron	mg/L	12/10/2015	0001	0.026	J		#	0.0067	
Magnesium	mg/L	12/10/2015	0001	84			#	0.03	
Molybdenum	mg/L	12/10/2015	0001	0.063			#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/10/2015	0001	0.01		J	#	0.01	
Oxidation Reduction Potential	mV	12/10/2015	N001	216.5			#		
pH	s.u.	12/10/2015	N001	8.91			#		
Potassium	mg/L	12/10/2015	0001	18			#	0.052	
Selenium	mg/L	12/10/2015	0001	0.00046	J	U	#	0.00032	
Sodium	mg/L	12/10/2015	0001	340			#	0.047	
Specific Conductance	umhos/cm	12/10/2015	N001	2565			#		
Sulfate	mg/L	12/10/2015	0001	1200			#	10	
Temperature	C	12/10/2015	N001	1.51			#		
Turbidity	NTU	12/10/2015	N001	10.5			#		
Uranium	mg/L	12/10/2015	0001	0.27			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE GJO01, Grand Junction Site

REPORT DATE: 02/19/2016

Location: Upper Gunnison SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/08/2015	N001	154			#		
Calcium	mg/L	12/08/2015	N001	98			#	0.024	
Chloride	mg/L	12/08/2015	N001	9.3			#	1	
Dissolved Oxygen	mg/L	12/08/2015	N001	12.64			#		
Iron	mg/L	12/08/2015	N001	0.14			#	0.0067	
Magnesium	mg/L	12/08/2015	N001	34			#	0.03	
Molybdenum	mg/L	12/08/2015	N001	0.0032			#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/08/2015	N001	0.61			#	0.01	
Oxidation Reduction Potential	mV	12/08/2015	N001	67			#		
pH	s.u.	12/08/2015	N001	8.48			#		
Potassium	mg/L	12/08/2015	N001	3.6			#	0.052	
Selenium	mg/L	12/08/2015	N001	0.0042			#	0.00032	
Sodium	mg/L	12/08/2015	N001	61			#	0.047	
Specific Conductance	umhos/cm	12/08/2015	N001	953			#		
Sulfate	mg/L	12/08/2015	N001	340			#	2.5	
Temperature	C	12/08/2015	N001	2.41			#		
Turbidity	NTU	12/08/2015	N001	4.65			#		
Uranium	mg/L	12/08/2015	N001	0.0077			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE GJO01, Grand Junction Site

REPORT DATE: 02/19/2016

Location: Upper Mid Gunnison SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/10/2015	N001	149			#		
Calcium	mg/L	12/10/2015	N001	92			#	0.024	
Chloride	mg/L	12/10/2015	N001	9.4			#	1	
Dissolved Oxygen	mg/L	12/10/2015	N001	12.59			#		
Iron	mg/L	12/10/2015	N001	0.09	J		#	0.0067	
Magnesium	mg/L	12/10/2015	N001	33			#	0.03	
Molybdenum	mg/L	12/10/2015	N001	0.0029			#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/10/2015	N001	0.61			#	0.01	
Oxidation Reduction Potential	mV	12/10/2015	N001	171.4			#		
pH	s.u.	12/10/2015	N001	8.72			#		
Potassium	mg/L	12/10/2015	N001	3.5			#	0.052	
Selenium	mg/L	12/10/2015	N001	0.0049			#	0.00032	
Sodium	mg/L	12/10/2015	N001	61			#	0.047	
Specific Conductance	umhos/cm	12/10/2015	N001	898			#		
Sulfate	mg/L	12/10/2015	N001	330			#	2.5	
Temperature	C	12/10/2015	N001	1.91			#		
Turbidity	NTU	12/10/2015	N001	5.31			#		
Uranium	mg/L	12/10/2015	N001	0.007			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE GJO01, Grand Junction Site

REPORT DATE: 02/19/2016

Location: Wetland Area SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	12/10/2015	N001	252			#		
Calcium	mg/L	12/10/2015	N001	320			#	0.12	
Chloride	mg/L	12/10/2015	N001	540			#	20	
Dissolved Oxygen	mg/L	12/10/2015	N001	12.34			#		
Iron	mg/L	12/10/2015	N001	0.28	J		#	0.033	
Magnesium	mg/L	12/10/2015	N001	240			#	0.15	
Molybdenum	mg/L	12/10/2015	N001	0.17			#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/10/2015	N001	0.01	U		#	0.01	
Oxidation Reduction Potential	mV	12/10/2015	N001	225.7			#		
pH	s.u.	12/10/2015	N001	8.29			#		
Potassium	mg/L	12/10/2015	N001	58			#	0.26	
Selenium	mg/L	12/10/2015	N001	0.00078	J	U	#	0.00032	
Sodium	mg/L	12/10/2015	N001	1900			#	0.23	
Specific Conductance	umhos/cm	12/10/2015	N001	9530			#		
Sulfate	mg/L	12/10/2015	N001	5300			#	50	
Temperature	C	12/10/2015	N001	1.82			#		
Turbidity	NTU	12/10/2015	N001	4.53			#		
Uranium	mg/L	12/10/2015	N001	1.1			#	0.00029	

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.		

QA QUALIFIER:

#	Validated according to quality assurance guidelines.

This page intentionally left blank

Equipment Blank Data

This page intentionally left blank

BLANKS REPORT

LAB: PARAGON/ALS LABORATORY GROUP (Fort Collins, CO)
RIN: 15117528
Report Date: 02/19/2016

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab	Qualifiers Data	Detection Limit	Uncertainty	Sample Type
Calcium	GJO01	0999	12/10/2015	N001	mg/L	0.024	U		0.024		E
Chloride	GJO01	0999	12/10/2015	N001	mg/L	0.2	U		0.2		E
Iron	GJO01	0999	12/10/2015	N001	mg/L	0.0067	U		0.0067		E
Magnesium	GJO01	0999	12/10/2015	N001	mg/L	0.03	U		0.03		E
Manganese	GJO01	0999	12/10/2015	N001	mg/L	0.00024	U		0.00024		E
Molybdenum	GJO01	0999	12/10/2015	N001	mg/L	0.00032	U		0.00032		E
Nitrate + Nitrite as Nitrogen	GJO01	0999	12/10/2015	N001	mg/L	0.024			0.01		E
Potassium	GJO01	0999	12/10/2015	N001	mg/L	0.052	U		0.052		E
Selenium	GJO01	0999	12/10/2015	N001	mg/L	0.00032	U		0.00032		E
Sodium	GJO01	0999	12/10/2015	N001	mg/L	0.076	J		0.047		E
Sulfate	GJO01	0999	12/10/2015	N001	mg/L	0.5	U		0.5		E
Uranium	GJO01	0999	12/10/2015	N001	mg/L	0.00004	J		0.000029		E

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

F	Low flow sampling method used.	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.

Static Water Level Data

This page intentionally left blank

STATIC WATER LEVELS (USEE700) FOR SITE GJO01, Grand Junction Site
REPORT DATE: 02/19/2016

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
10-19N	O	4566.62	12/09/2015	13:55:50	13.39	4553.23	
11-1S	O	4572.83	12/09/2015	11:30:51	16.41	4556.42	
14-13NA	O	4560.58	12/09/2015	15:35:14	5.98	4554.6	
6-2N	O	4569.89	12/09/2015	09:30:33	13.41	4556.48	
8-4S	O	4568.59	12/08/2015	12:30:45	11.73	4556.86	
GJ01-01		4571.37	12/09/2015	10:35:55	14.82	4556.55	
GJ84-04	D	4563.24	12/09/2015	14:50:21	9.63	4553.61	

FLOW CODES: B BACKGROUND C CROSS GRADIENT D DOWNGRADIENT F OFFSITE
N UNKNOWN O ONSITE U UPGRADIENT

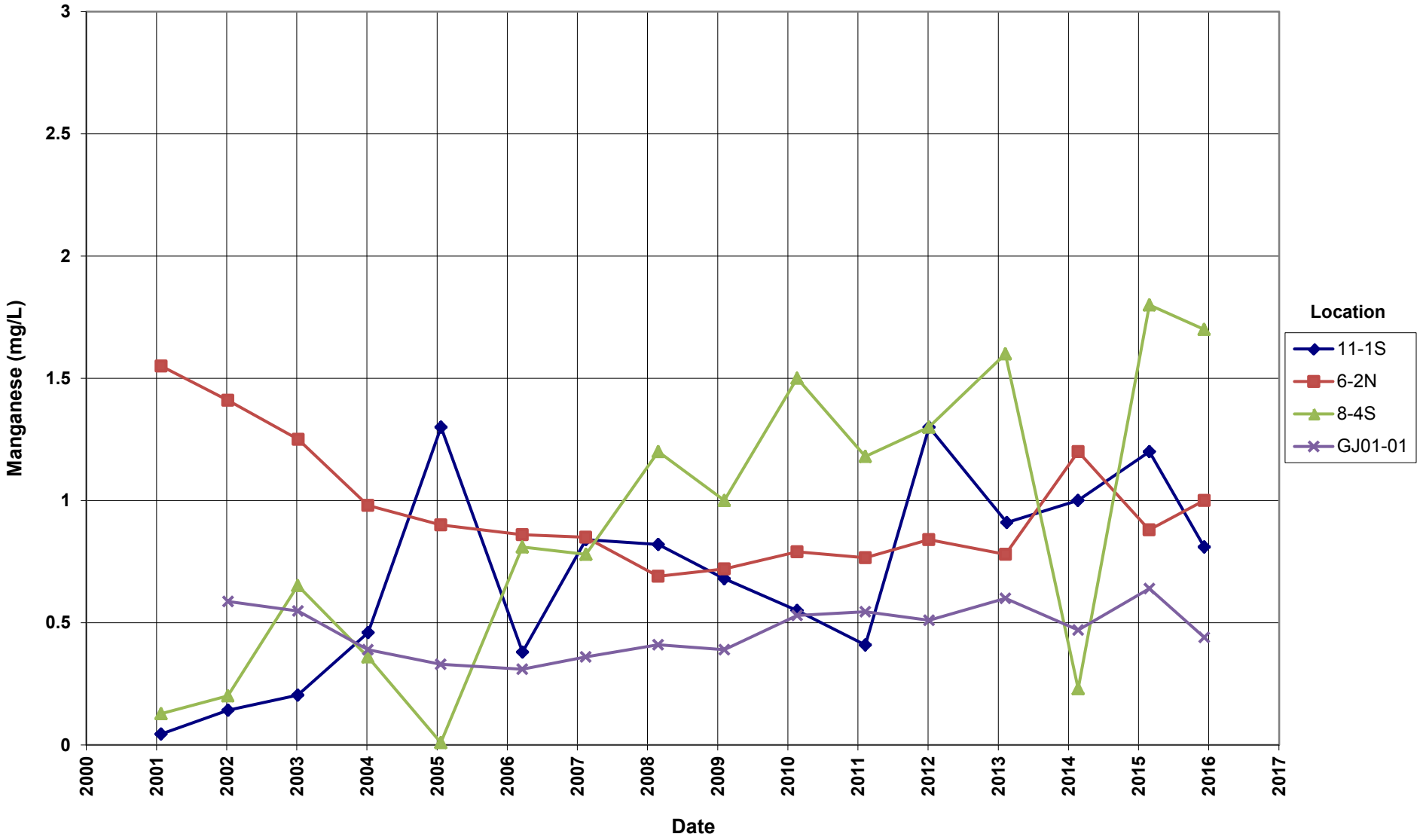
WATER LEVEL FLAGS: D Dry F Flowing B Below top of pump

This page intentionally left blank

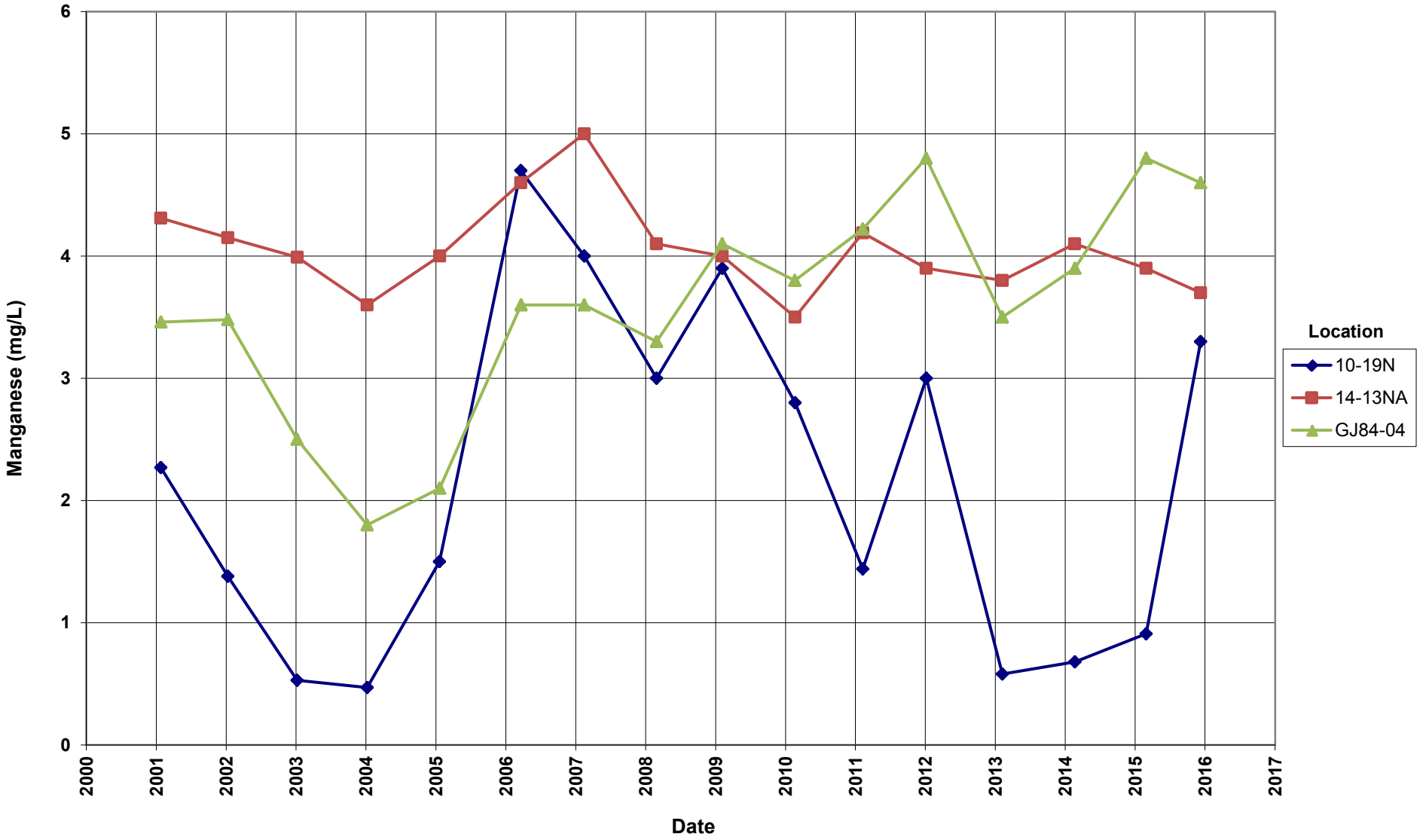
Time-Concentration Graphs
Groundwater Locations

This page intentionally left blank

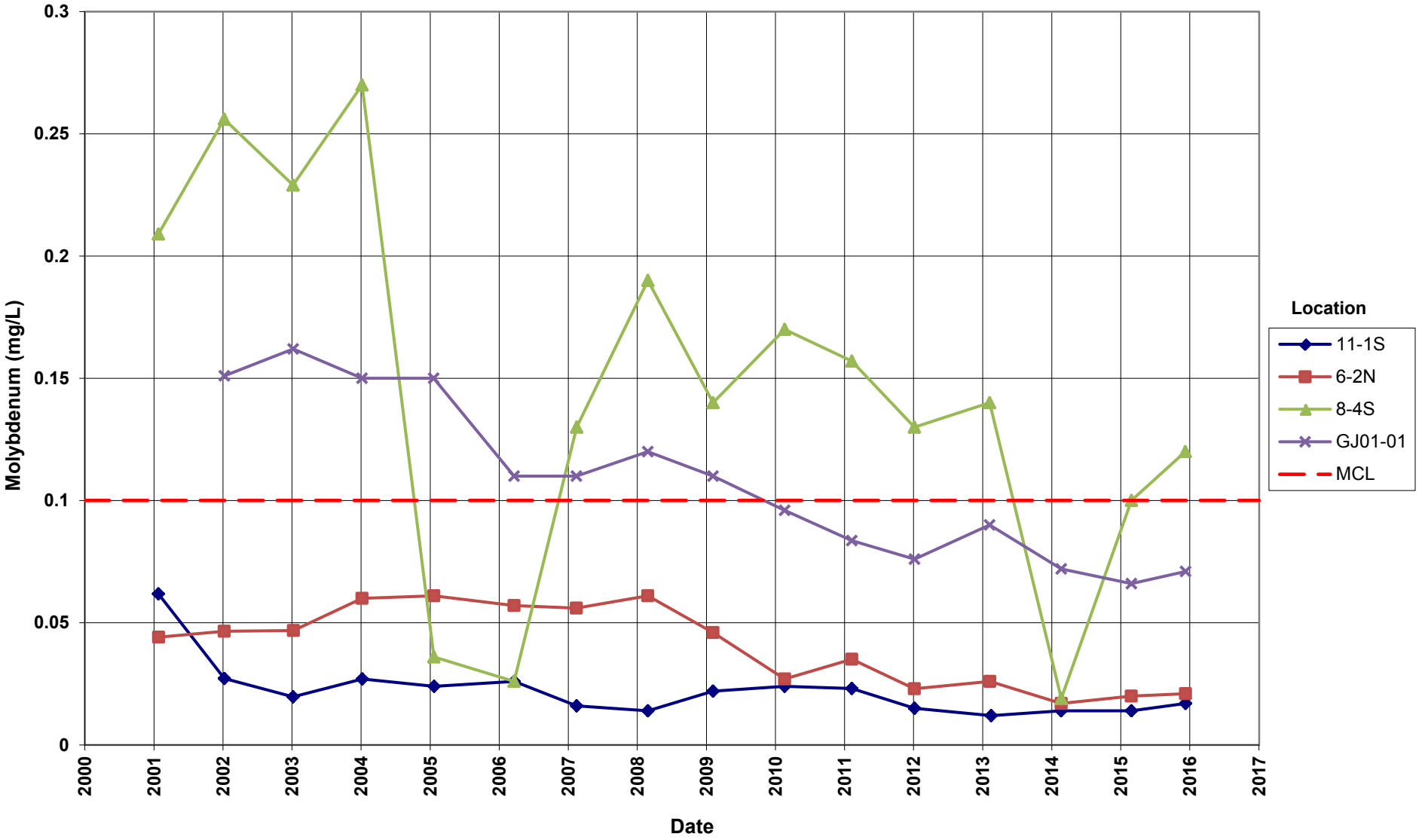
Grand Junction Site
Manganese Concentration



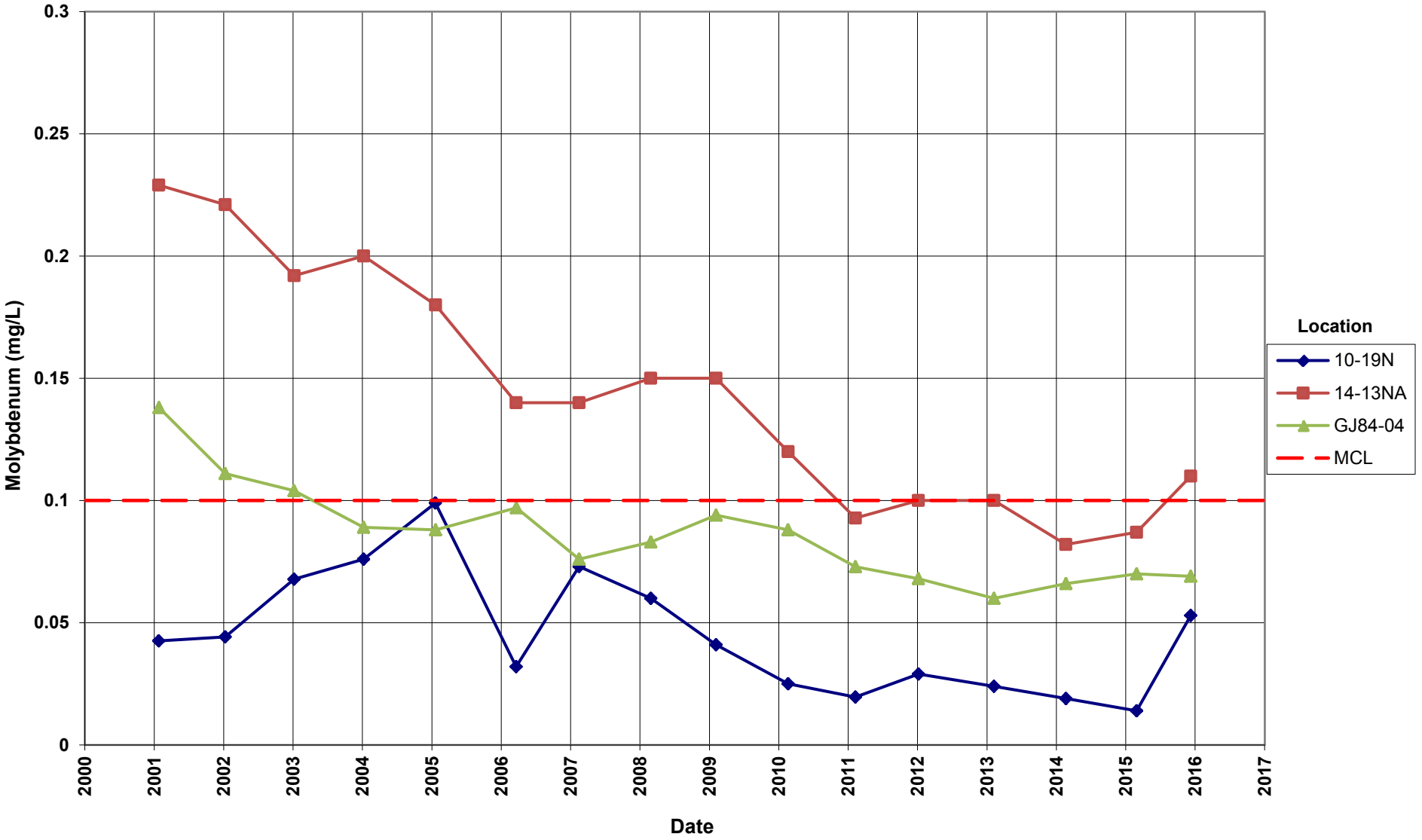
Grand Junction Site
Manganese Concentration



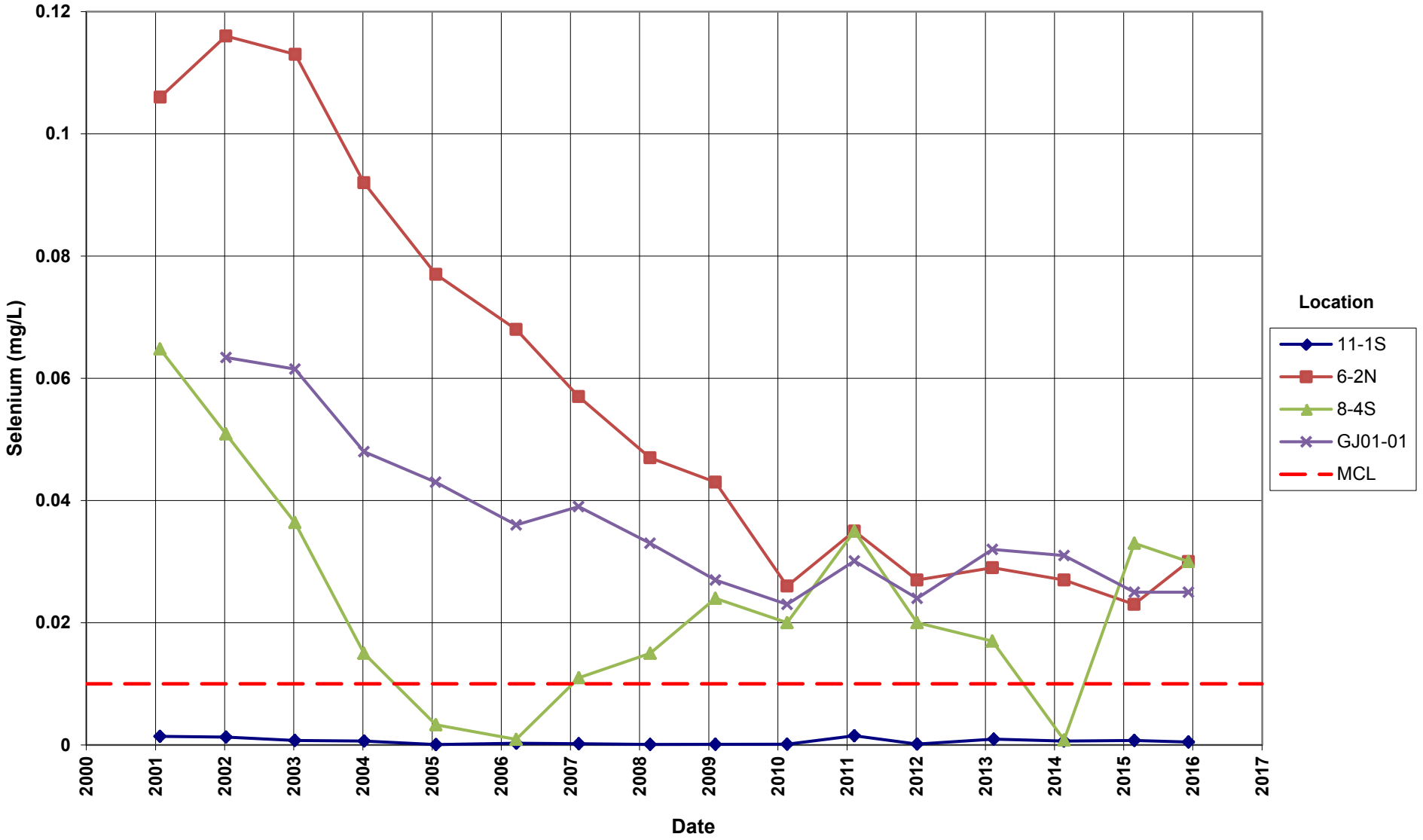
Grand Junction Site
Molybdenum Concentration
Maximum Concentration Limit (MCL) = 0.1 mg/L



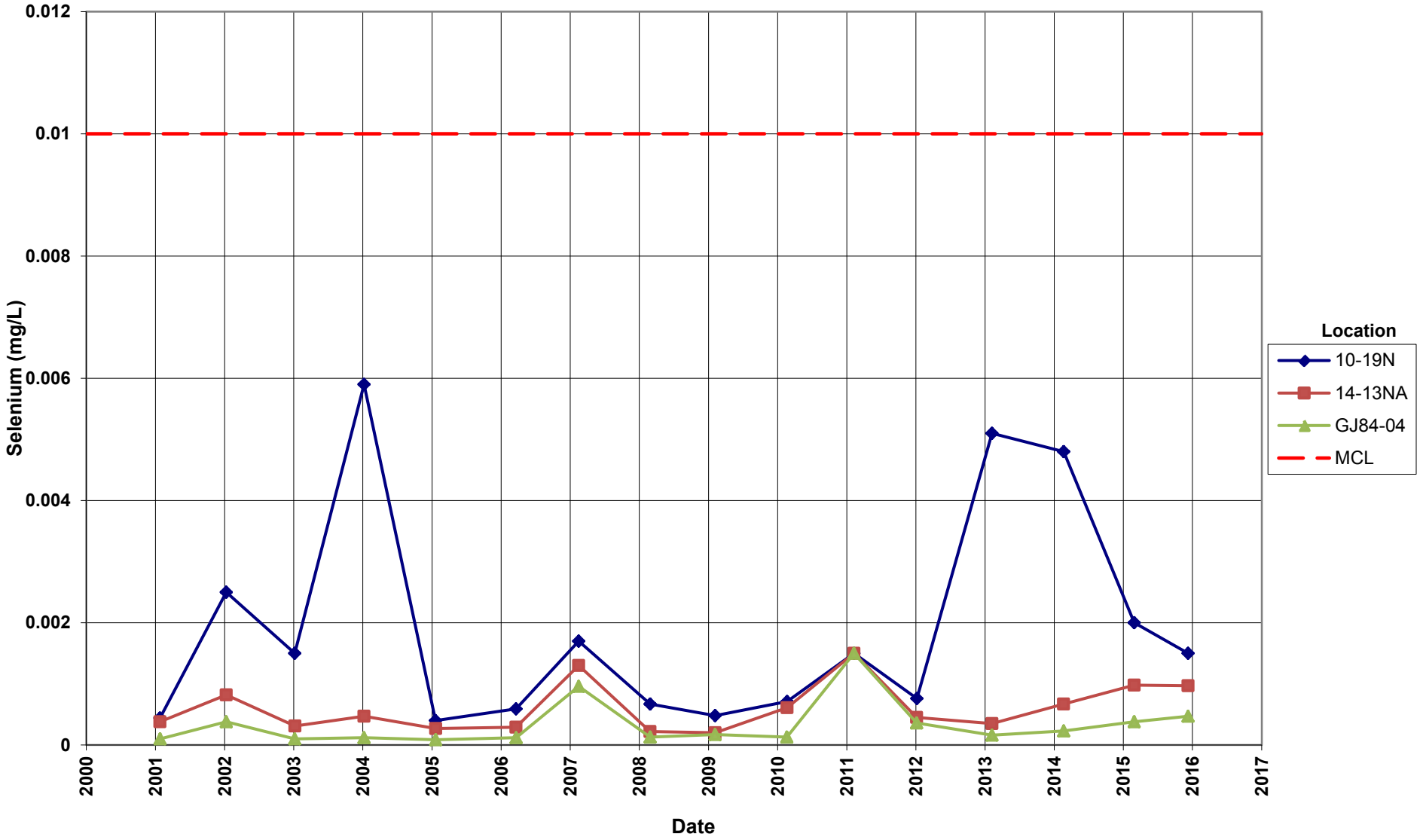
Grand Junction Site
Molybdenum Concentration
Maximum Concentration Limit (MCL) = 0.1 mg/L



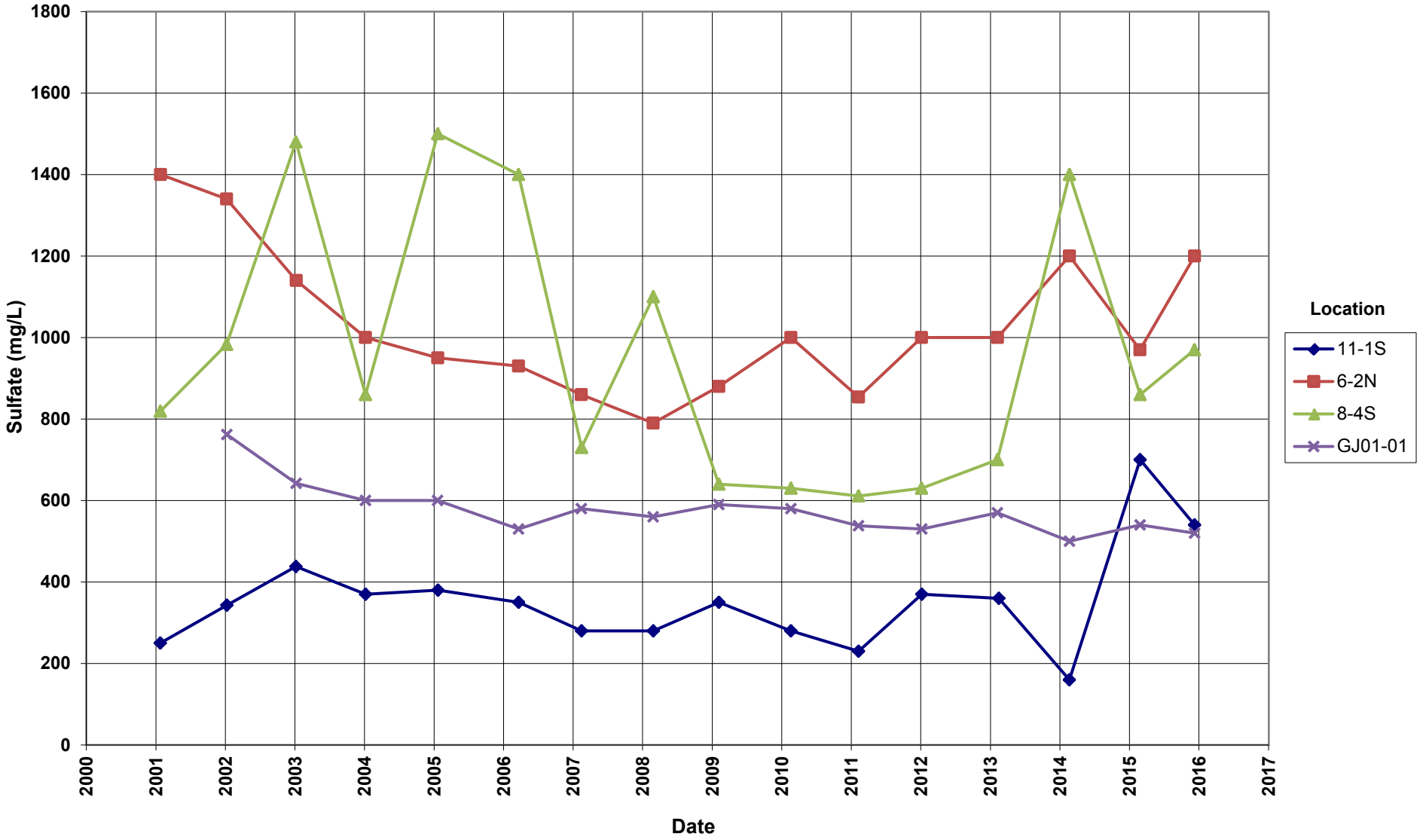
Grand Junction Site
Selenium Concentration
Maximum Concentration Limit (MCL) = 0.01 mg/L



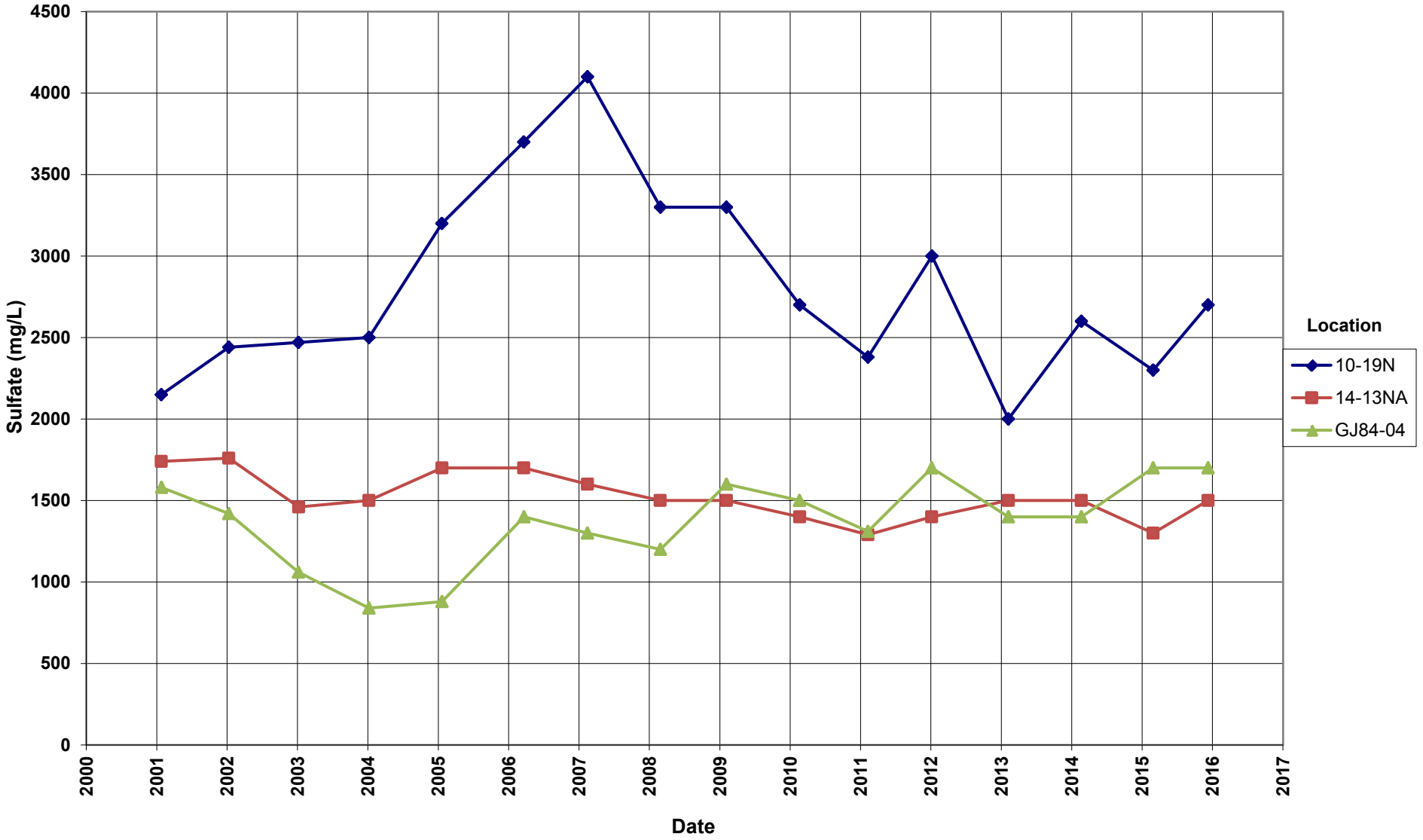
Grand Junction Site
Selenium Concentration
Maximum Concentration Limit (MCL) = 0.01 mg/L



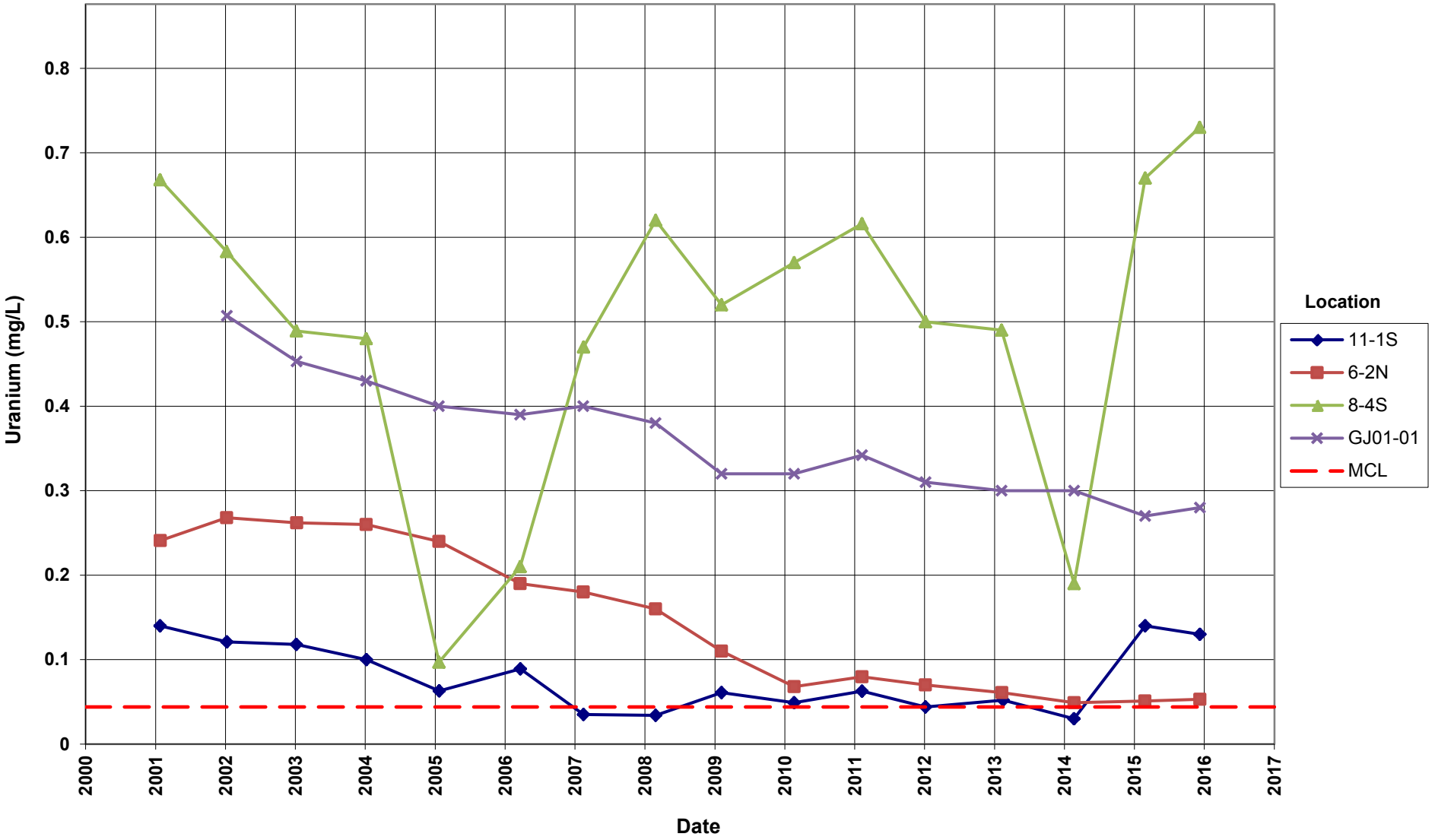
Grand Junction Site
Sulfate Concentration



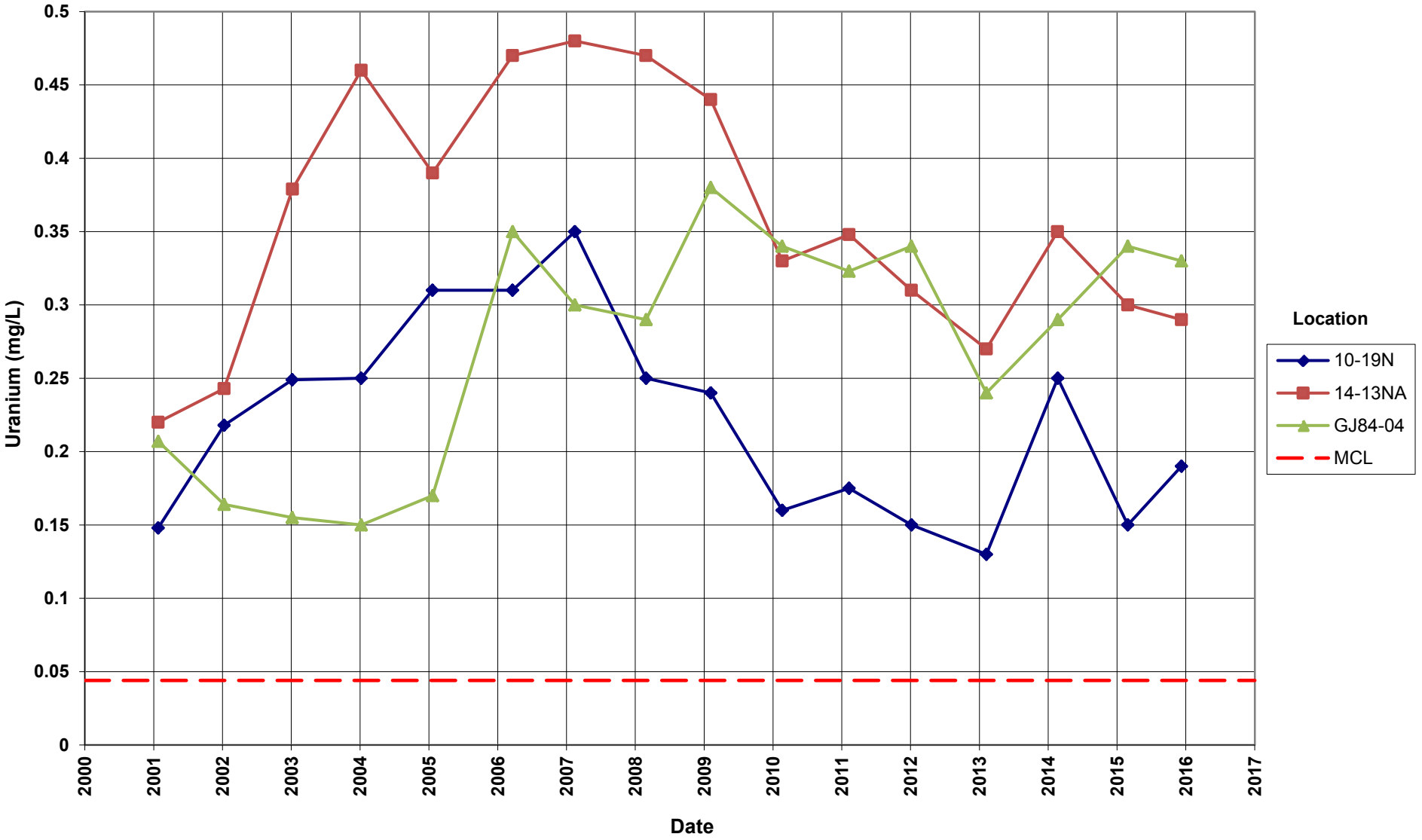
Grand Junction Site
Sulfate Concentration



Grand Junction Site
Uranium Concentration
Maximum Concentration Limit (MCL) = 0.044 mg/L



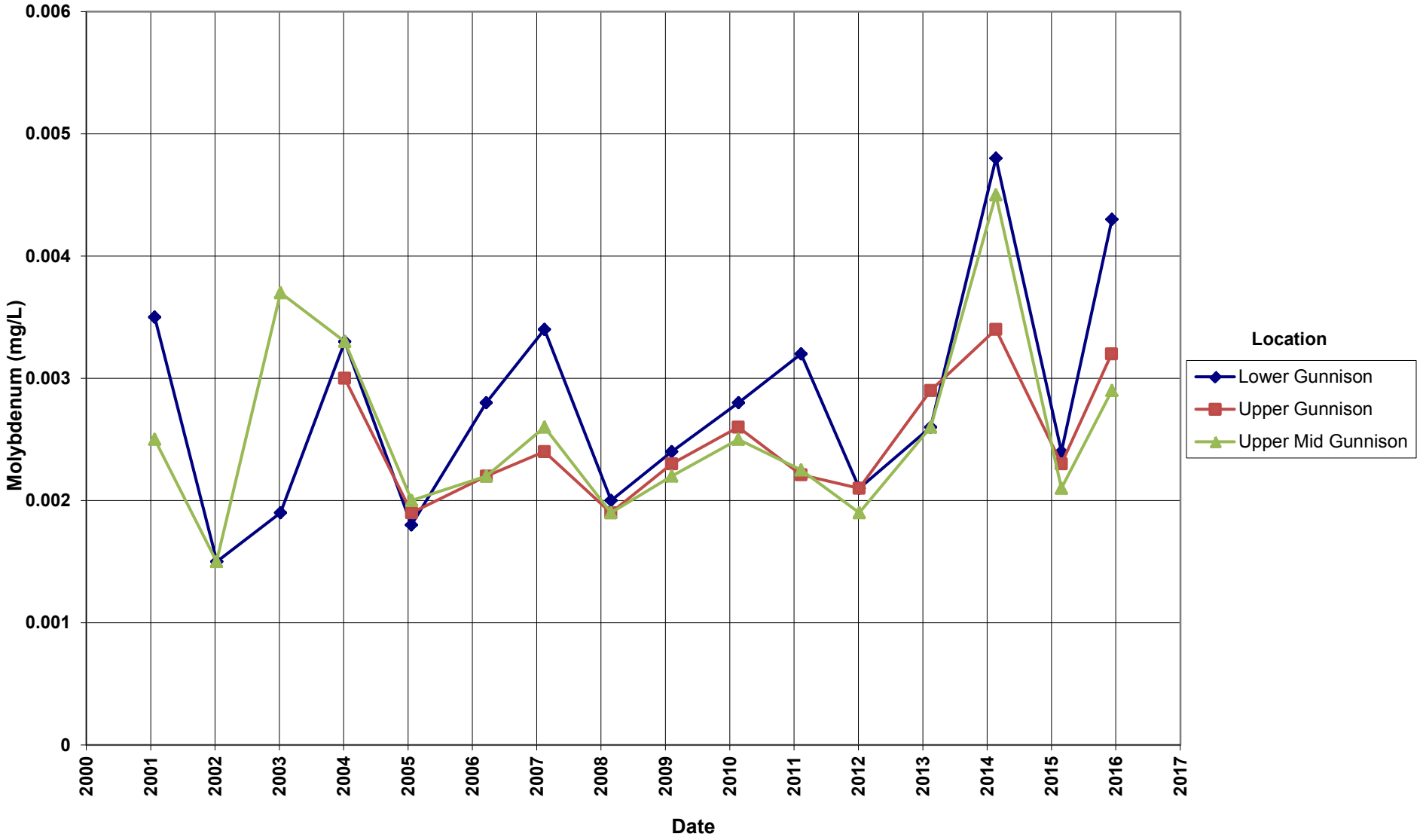
Grand Junction Site
Uranium Concentration
Maximum Concentration Limit (MCL) = 0.044 mg/L



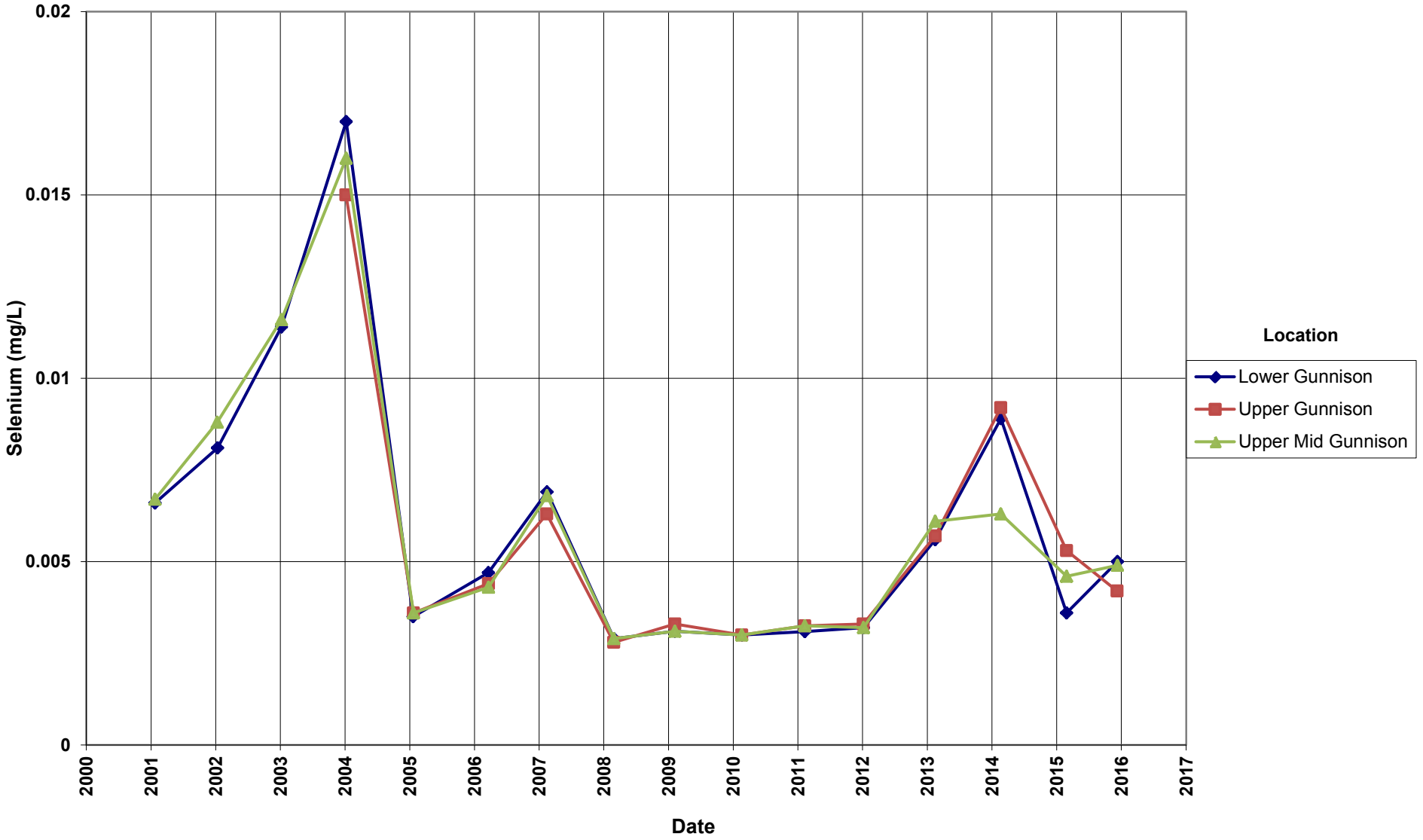
Time-Concentration Graphs
Surface Water Locations

This page intentionally left blank

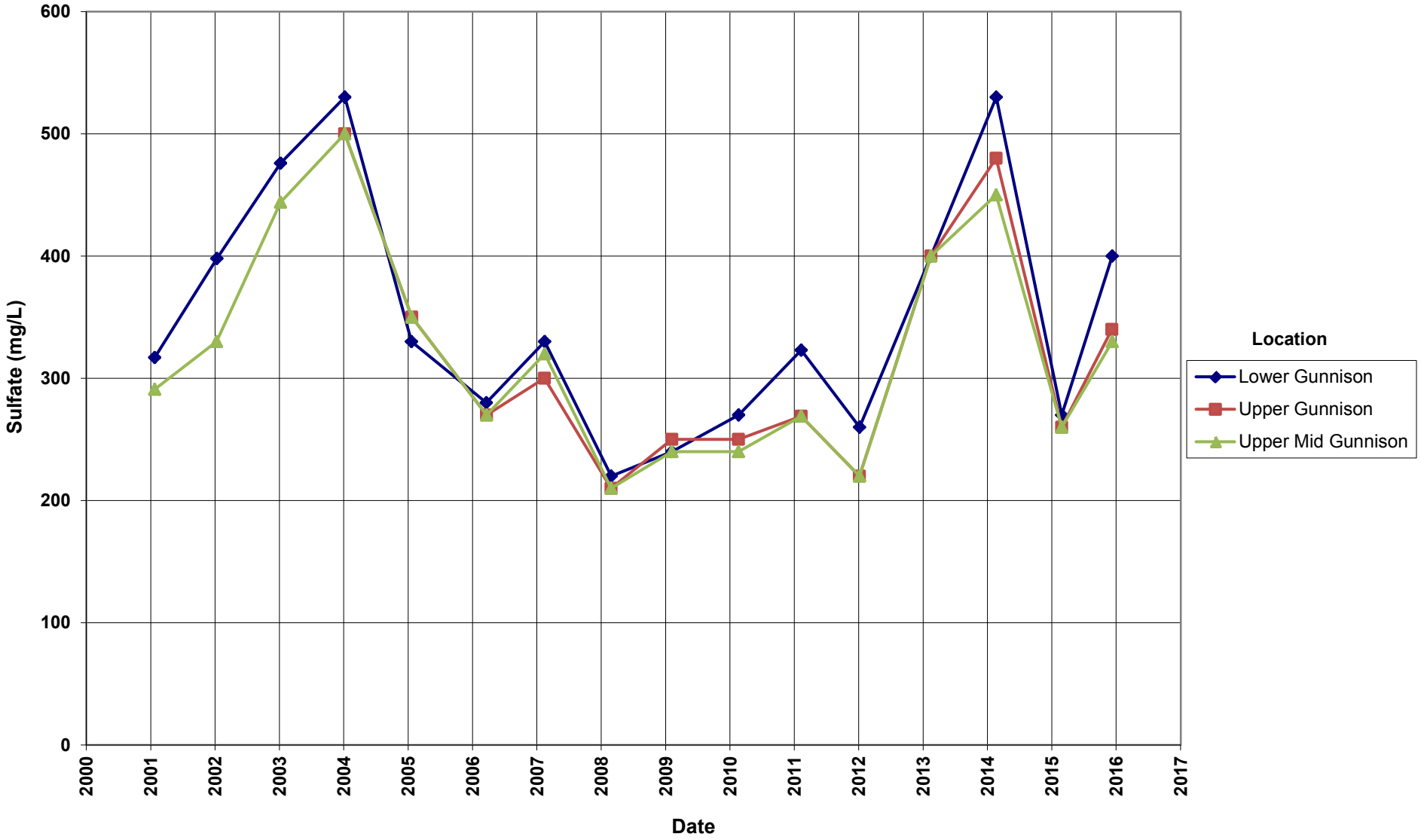
Grand Junction Site
Molybdenum Concentration
River Locations

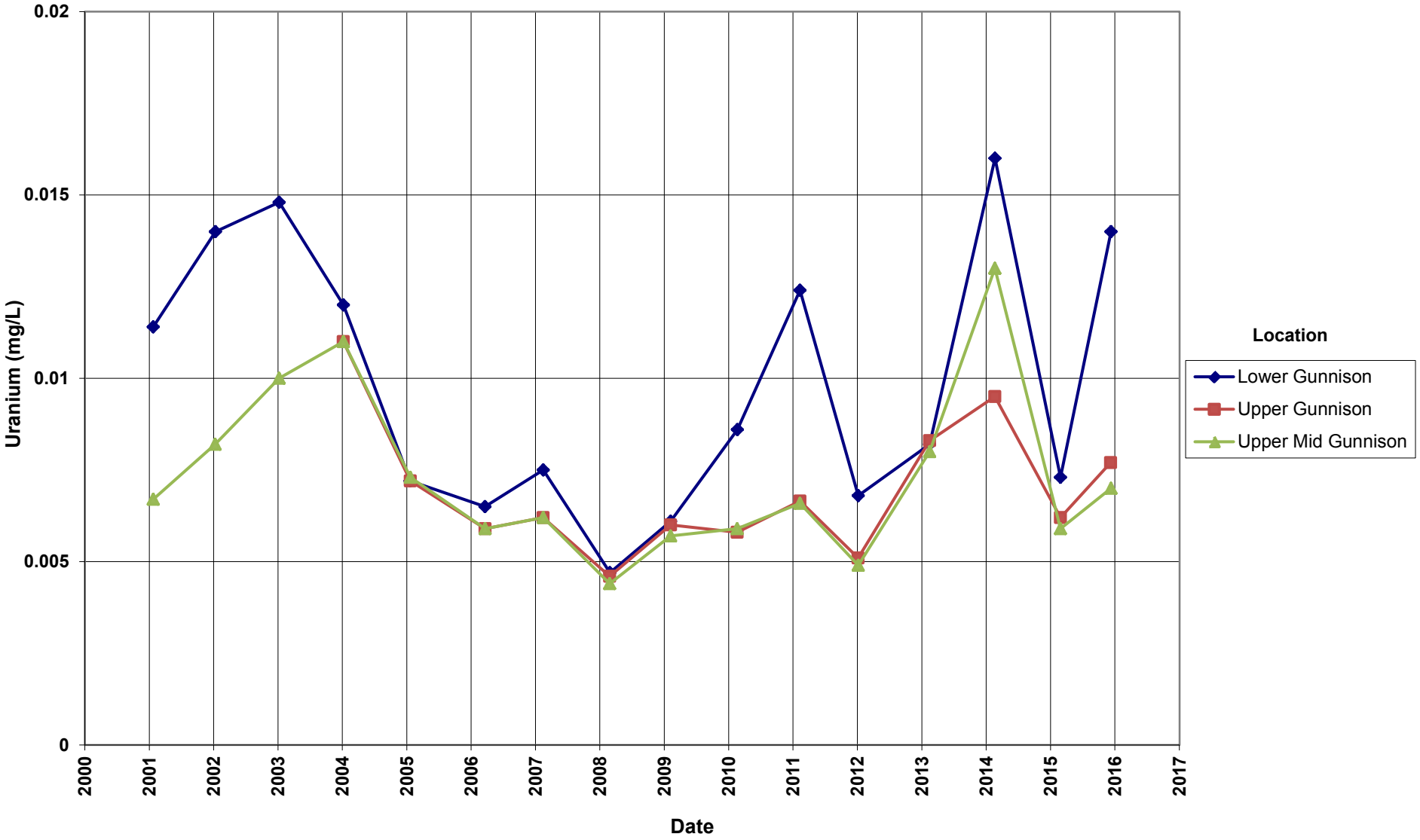


Grand Junction Site
Selenium Concentration
River Locations

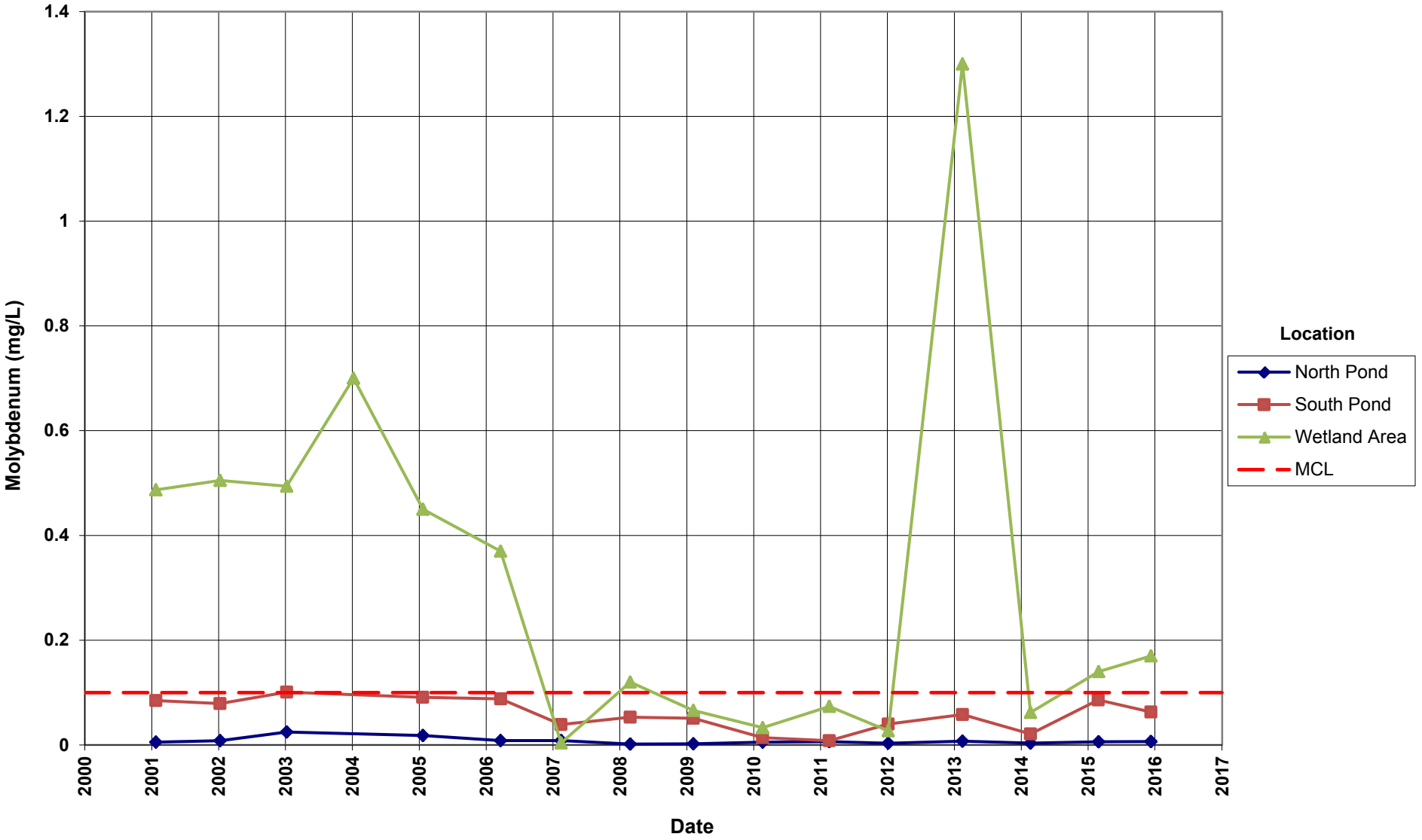


Grand Junction Site
Sulfate Concentration
River Locations

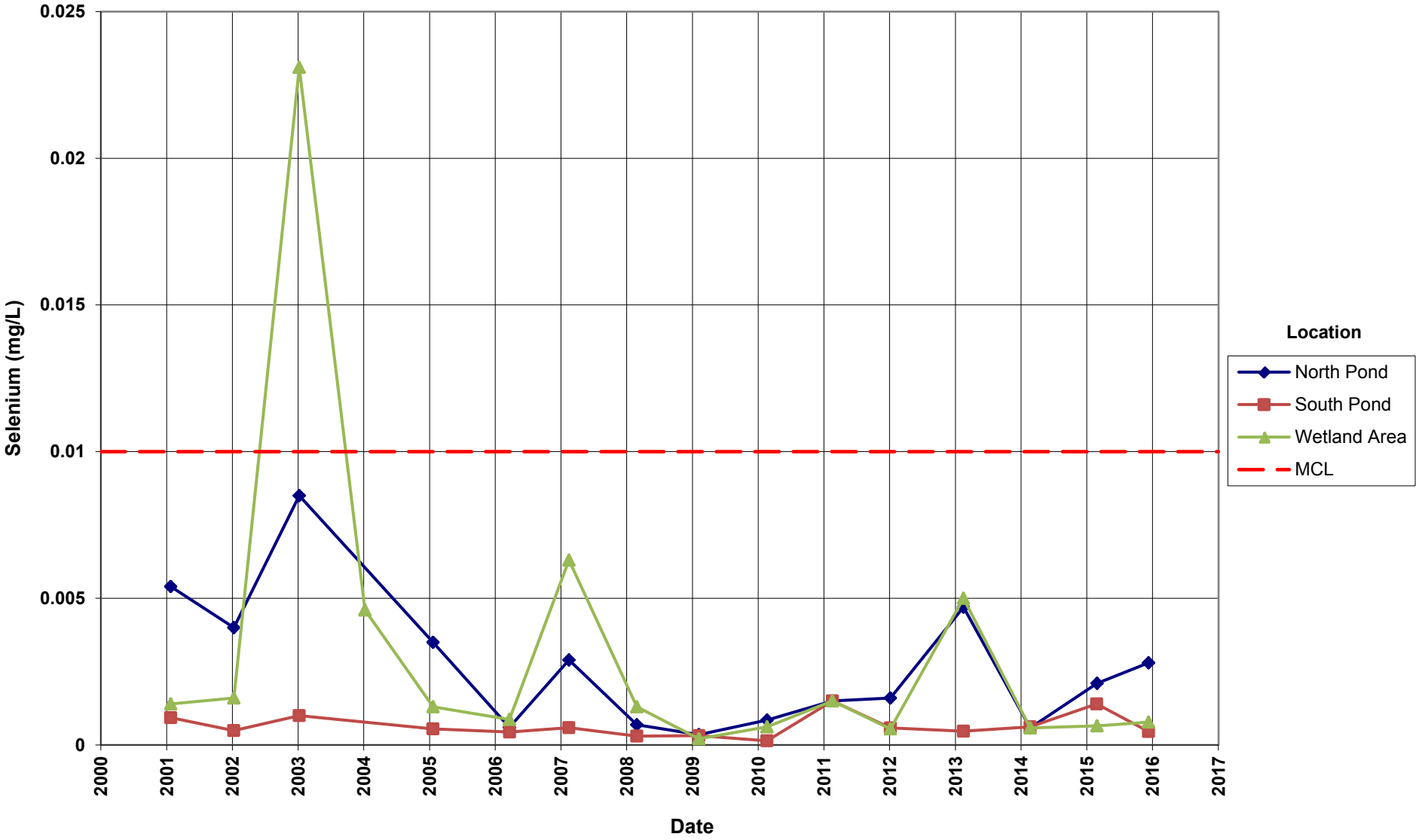



Grand Junction Site
Uranium Concentration
River Locations
Uranium (mg/L)
0.02
0.015
0.01
0.005
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Date
Location
Lower Gunnison
Upper Gunnison
Upper Mid Gunnison

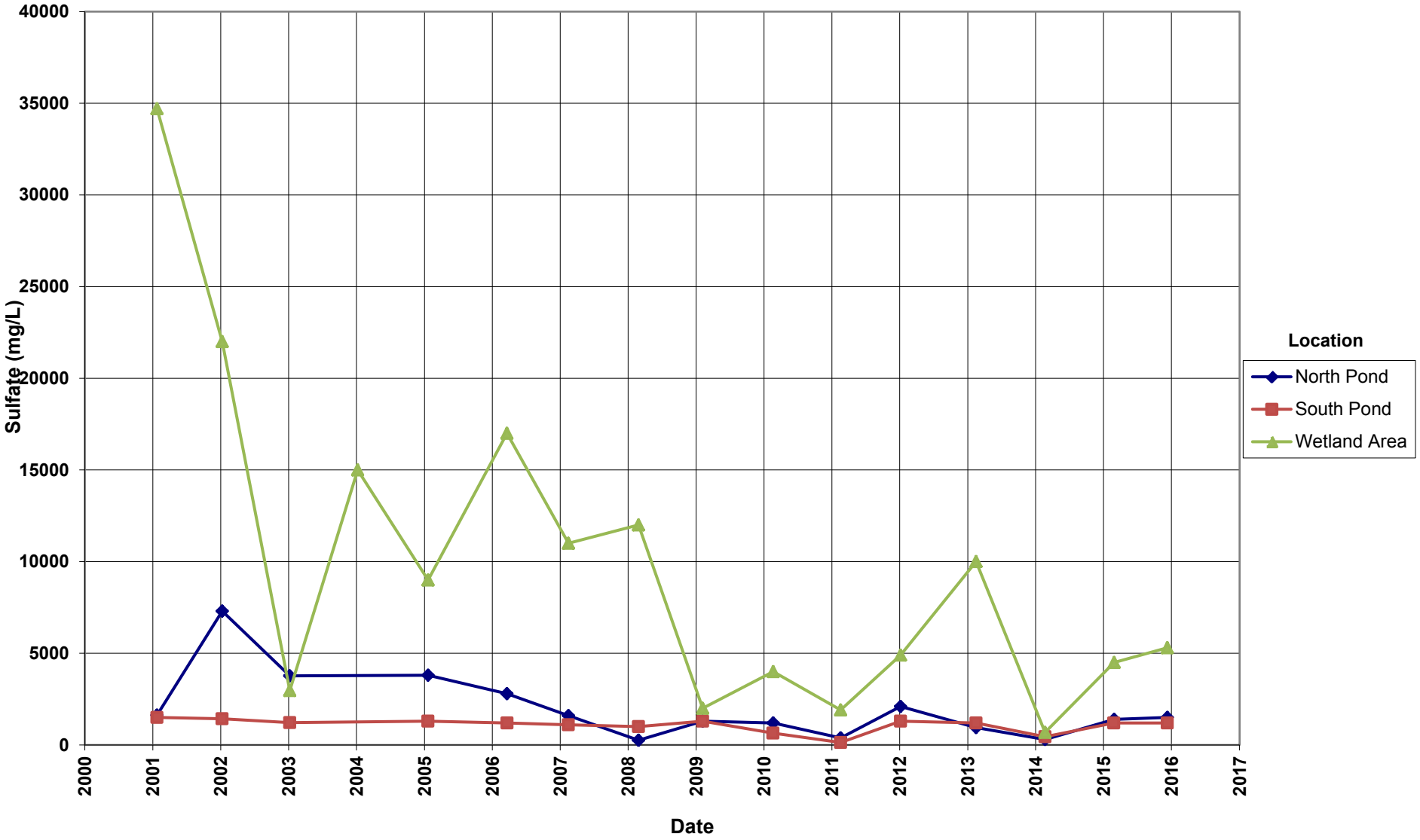
Grand Junction Site
Molybdenum Concentration
Pond and Wetland Locations
Maximum Concentration Limit (MCL) = 0.1 mg/L

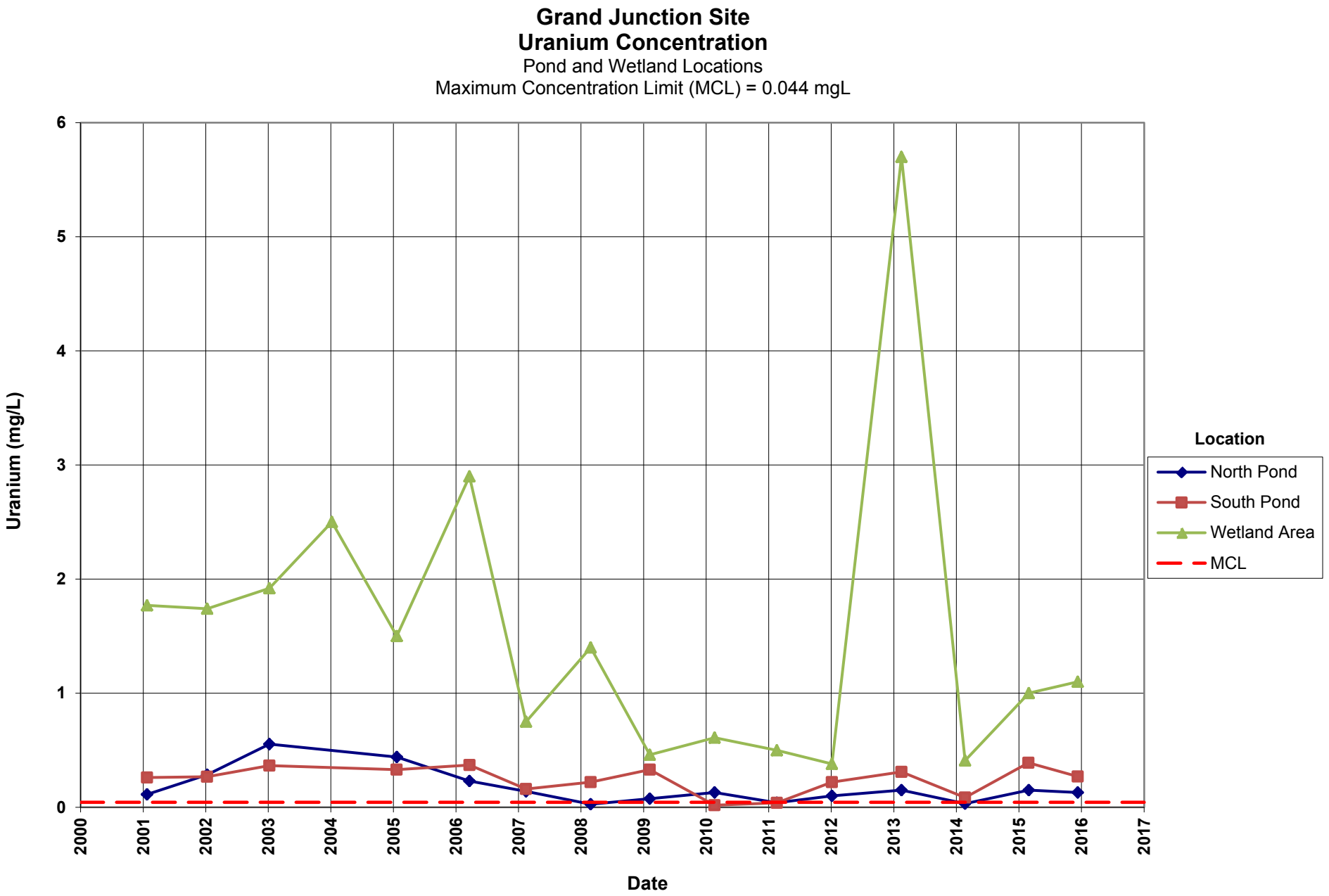


Grand Junction Site
Selenium Concentration
Pond and Wetland Locations
Maximum Concentration Limit (MCL) = 0.01 mg/L



Grand Junction Site
Sulfate Concentration
Pond and Wetland Locations




Grand Junction Site
Uranium Concentration
Pond and Wetland Locations
Maximum Concentration Limit (MCL) = 0.044 mgL
Uranium (mg/L)
0
1
2
3
4
5
6
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Date
Location
North Pond
South Pond
Wetland Area
MCL

Attachment 3

Sampling and Analysis Work Order

This page intentionally left blank

November 17, 2015

Task Assignment 103
Control Number 16-0128

U.S. Department of Energy
Office of Legacy Management
ATTN: William Dam
Site Manager
2597 Legacy Way
Grand Junction, CO 81503

SUBJECT: Contract No. DE-LM0000421, Navarro Research & Engineering, Inc. (Navarro)
Task Assignment 103 LTS&M-UMTRCA TI & TII Sites, D&D Sites, Other Sites, and Other
December 2015 Environmental Sampling at the Grand Junction, Colorado, Site

REFERENCE: Task Assignment 103, 1-103-1-04-302, Grand Junction, Colorado, Site

Dear Mr. Dam:

The purpose of this letter is to inform you of the upcoming sampling event at the Grand Junction, Colorado, site. Enclosed are the map and tables specifying sample locations and analytes for routine monitoring at the Grand Junction site. Water quality data will be collected from this site as part of the environmental sampling currently scheduled to begin the week of December 7, 2015.

The following lists show the monitoring wells (with zone of completion) and surface locations scheduled to be sampled during this event.

Monitoring Wells

8-4S Al	6-2N Al	14-13NA Al	GJ84-04 Al	GJ01-01 Al	10-19N Al
11-1S Al					

*NOTE: Al = Alluvium

Surface Locations

Upper Gunnison	Upper Middle Gunnison	Lower Gunnison
North Pond	South Pond	Wetland Area

All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*. The Access Agreement for the site is in place, which will allow access to all monitoring locations.

Please contact me at (970) 248-6654 if you have any questions.

Sincerely,

Sam Campbell
Site Lead

SC/lcg/bkb

Enclosures (3)

cc: (electronic)
Christina Pennal, DOE
Jeff Carman, Navarro
Sam Campbell, Navarro
Beverly Cook, Navarro
Steve Donivan, Navarro
Lauren Goodknight, Navarro
Diana Osborne, Navarro
EDD Delivery
rc-grand.junction
File: GJO 400.02

Grand Junction, Colorado, Site Sample Location Map

This page intentionally left blank

Sampling Frequencies for Locations at Grand Junction Office Site, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
8-4S			X			
11-1S			X			
6-2N			X			
14-13NA			X			
GJ84-04			X			
GJ01-01			X			
10-19N			X			
Surface Locations						
Upper Gunnison			X			
Upper Middle Gunnison			X			
Lower Gunnison			X			
South Pond			X			
North Pond			X			
Wetland Area			X			

Sampling conducted in February

Constituent Sampling Breakdown

Site	Facility				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	7	6			
Field Measurements					
Alkalinity	X	X			
Dissolved Oxygen	X	X			
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Turbidity	X	X			
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium	X	X	5	SW-846 6010	LMM-01
Chloride	X	X	0.5	SW-846 9056	WCH-A-039
Chromium					
Gross Alpha					
Gross Beta					
Iron	X	X	0.1	SW-846 6020	LMM-01
Lead					
Magnesium	X	X	5	SW-846 6010	LMM-01
Manganese	X		0.005	SW-846 6010	LMM-01
Molybdenum	X	X	0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	0.05	EPA 353.1	WCH-A-022
Potassium	X	X	1	SW-846 6010	LMM-01
Radium-226					
Radium-228					
Selenium	X	X	0.0001	SW-846 6020	LMM-02
Silica					
Sodium	X	X	1	SW-846 6010	LMM-01
Strontium					
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids					
Total Organic Carbon					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	12	11			

Note: All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Attachment 4

Trip Report

This page intentionally left blank

Memorandum

DATE: December 11, 2015

TO: Sam Campbell

FROM: Gretchen Baer

SUBJECT: Sampling Trip Report

Site: Grand Junction Office

Dates of Sampling Event: December 8-10, 2015

Team Members: Sam Campbell and Gretchen Baer

Number of Locations Sampled: Samples were collected from all 7 monitoring well locations and all 6 surface water locations identified on the sampling notification letter. Samples collected will be analyzed for metals (calcium, iron, magnesium, manganese [groundwater only], molybdenum, potassium, selenium, sodium, and uranium), chloride, sulfate, and nitrate + nitrite as nitrogen. Field measurements for alkalinity, dissolved oxygen, oxidation/reduction potential, specific conductance, temperature, and turbidity were also collected.

At all locations, the Earthsoft field application EDGE (version 6.4.2) was field-tested. The EDGE data were collected using a separate Sonde and a separate field computer. The data collected with EDGE were for testing only and the data were not entered into the environmental database. At monitoring well 6-2N, sampling was observed by DOE and Navarro personnel, including visiting Fernald Navarro personnel.

Location Specific Information: At surface water location South Pond the samples were filtered per the SAP because the turbidity measurement was > 10 NTUs.

Quality Control Sample Cross Reference: The following are the false identifications assigned to the quality control samples.

False ID	Ticket Number	True ID	Sample Type	Associated Matrix	Associated Samples
2687	NMR 076	10-19N	Duplicate	Groundwater	N/A
2688	NMR 077	0999	Equipment Blank	Surface Water	Upper Gunnison, Upper Mid Gunnison, Lower Gunnison, South Pond, North Pond

Duplicates were collected by filling all bottles labeled with the location number first, then filling all bottles labeled with the false ID second.

Requisition Index Number (RIN) Assigned: Samples were assigned to RIN 15117528. Field data sheets can be found in \\crow\SMS\15117528\FieldData.

Sample Shipment: Samples were shipped overnight via FedEx to ALS Laboratory Group, Fort Collins, CO, from Grand Junction, CO, on Monday, December 14, 2015.

Water Level Measurements: Water levels were measured in all sampled wells.

Well Inspection Summary: The well location IDs were written on the well caps at 10-19N and 11-1S.

Sampling Method: Samples were collected according to the *Sampling and Analysis Plan (SAP) for the U. S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated).

Field Variance: None. Samples were collected according to the SAP.

Equipment: All equipment functioned properly. At all locations, an additional Sonde was used to collect measurements for entry into the EDGE program. The Sondes were connected in series at all locations with the exception of surface water location Wetland Area. At Wetland Area, the Sondes were placed in the same open container for the measurements.

Stakeholder/Regulatory/DOE: W. Dam and J. Linard (DOE) observed sampling at monitoring well 6-2N. W. Dam also observed sampling at monitoring wells 10-19N and GJ84-04.

Institutional Controls:

Fences, Gates, and Locks: All gates were locked and in good condition. The gate key was checked out from the site guard and was returned at the end of each day.
Signs: No issues were observed.
Trespassing/Site Disturbances: None observed.
Disposal Cell/Drainage Structure Integrity: N/A

Safety Issues: None.

Access Issues: None. Brush and trees have been trimmed back to allow vehicle access along site roads.

General Information: Nothing to note.

Immediate Actions Taken: None.

Future Actions Required or Suggested: None.

GB/lcg

cc: (electronic)
Bill Dam, DOE
Sam Campbell, Navarro
Steve Donivan, Navarro
EDD Delivery