

# Data Validation Package

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**August 2008  
Groundwater Sampling  
at the Grand Junction, Colorado  
Disposal Site**

**January 2009**



**U.S. DEPARTMENT OF  
ENERGY**

Office of  
Legacy Management

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# Sampling Event Summary

**Site:** Grand Junction, Colorado, Disposal Site

**Sampling Period:** August 4, 2008

The *Interim Long-Term Surveillance Plan for the Cheney Disposal Site Near Grand Junction, Colorado* requires annual monitoring to assess the performance of the disposal cell. Monitor wells 0731, 0732, and 0733 were sampled as specified in the plan. Sampling and analysis were conducted in accordance with *Sampling and Analyses Plan for the U.S. Department of Energy Office of Legacy Management Sites* and the *Environmental Procedures Catalog*.

The water level was measured at each sampled well. The water level in well 0733, located in the disposal cell, is lower than water levels in adjacent wells 0731 and 0732, indicating a hydraulic gradient toward the disposal cell. The attached hydrograph shows stable water levels in well 0733 over the past several years.

Results from this sampling event were generally consistent with results from the past several years as shown in the attached concentration versus time graphs. The following are observed from these groundwater data.

- Molybdenum concentrations continue to be significantly below the maximum contaminant level (MCL) of 0.1 milligrams per liter (mg/L).
- Nitrate + nitrite as nitrogen concentrations exceed the standard in both wells adjacent to the cell (0731 and 0732). This contaminant is below the MCL and continues to trend downward in well 0733, which is located in the cell.
- Selenium concentrations continue to exceed the MCL in wells 0731 and 0732, but remain below the standard in well 0733. This is to be expected as selenium levels are typically elevated in sediments of the Mancos Shale in the area.
- No large variations in sulfate concentrations have been observed since 2002 with the exception of the reduced concentrations observed in 2006. The 2007 and 2008 concentrations are more typical of the values previously observed and it is suspected that a laboratory error may have occurred in 2006.
- Uranium concentrations remain below the MCL in wells 0731 and 0732, but exceed the MCL in well 0733 after trending upward since 2003. Higher uranium concentrations are expected in this well, located in the disposal cell.
- The concentrations of total dissolved solids and vanadium remain relatively consistent with past results and the vanadium concentrations observed are just above the method detection limit (MDL). No polychlorinated biphenyls (PCBs) were detected in any of the wells.

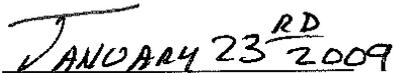
Wells with sample concentrations that exceeded U.S. Environmental Protection Agency (EPA) groundwater standards (40 CFR 192) are listed in Table 1.

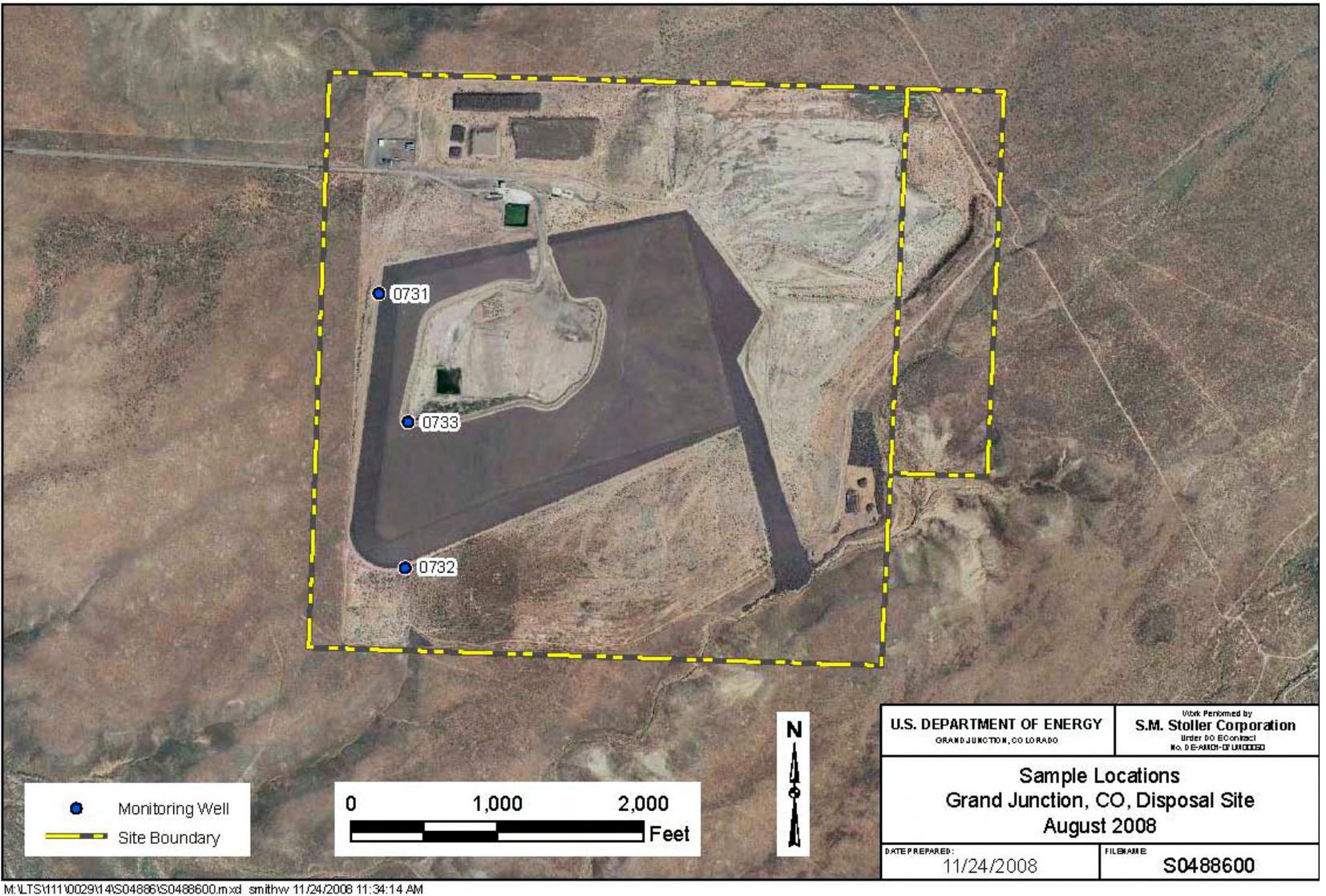
Table 1. Grand Junction Disposal Site Wells Where EPA Standards Were Exceeded in August 2008

Analyte	Standard <sup>a</sup>	Location	Concentration
Nitrate + Nitrite as Nitrogen	10	0731	35
		0732	30
		0732 Duplicate	36
Selenium	0.01	0731	0.59
		0732	0.27
		0732 Duplicate	0.26
Uranium	0.044	0733	0.065

<sup>a</sup>Standards are listed in 40 CFR 192.02 Table 1 to subpart A; units are in mg/L.

  
 Gary Baur  
 Site Lead, S.M. Stoller

  
 Date



Grand Junction, Colorado, Disposal Site Sample Location Map

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# **Data Assessment Summary**

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## Water Sampling Field Activities Verification Checklist

<b>Project</b>	Grand Junction, CO	<b>Date(s) of Water Sampling</b>	August 4, 2008
<b>Date(s) of Verification</b>	October 2, 2008	<b>Name of Verifier</b>	Gretchen Baer

	<b>Response (Yes, No, NA)</b>	<b>Comments</b>
1. Is the SAP the primary document directing field procedures? List other documents, SOPs, instructions.	Yes	Work Order Letter dated July 23, 2008.
2. Were the sampling locations specified in the planning documents sampled?	Yes	
3. Was a pre-trip calibration conducted as specified in the above-named documents?	Yes	Pre-trip calibration was performed on August 1, 2008.
4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria?	Yes	
	Yes	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	
6. Was the category of the well documented?	Yes	
7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling?	Yes	
Did the water level stabilize prior to sampling?	Yes	
Did pH, specific conductance, and turbidity measurements stabilize prior to sampling?	Yes	
Was the flow rate less than 500 mL/min?	Yes	
If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	NA	

## 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	
Was one pump/tubing volume removed prior to sampling?	NA	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	NA	Dedicated sampling equipment and tubing was used.
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	
12. Were QC samples assigned a fictitious site identification number?	Yes	The duplicate sample was assigned a location ID of 2978.
Was the true identity of the samples recorded on the Quality Assurance Sample Log or in the Field Data Collection System (FDACS) report?	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. Are field data sheets signed and dated by both team members (hardcopies) or are dates present for the "Date Completed" fields (FDACS)?	Yes	
18. Was all other pertinent information documented on the field data sheets?	Yes	
19. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
20. Were water levels measured at the locations specified in the planning documents?	Yes	

## Laboratory Performance Assessment

### General Information

Report Number (RIN): 08071743  
Sample Event: August 4, 2008  
Site(s): Grand Junction, Colorado, Disposal Site  
Laboratory: Paragon Analytics  
Work Order No.: 0808019  
Analysis: Metals, Organics, and Wet Chemistry  
Validator: Gretchen Baer  
Review Date: October 2, 2008

This validation was performed according to the *Environmental Procedures Catalog*, “Standard Practice for Validation of Laboratory Data,” GT-9(P). The procedure was applied at Level 3, Data Validation. See attached Data Validation Worksheets for supporting documentation on the data review and validation. 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 2.

Table 2. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Metals: Molybdenum, Selenium, Uranium, and Vanadium	LMM-02	SW-846 3005A	SW-846 6020A
Nitrate + Nitrite as N	WCH-A-022	MCAWW 353.2	MCAWW 353.2
Polychlorinated Biphenyls (PCBs)	PEP-A-006	SW-846 3520C, 3665A	SW-846 8082
Sulfate	MIS-A-044	SW-846 9056	SW-846 9056
Total Dissolved Solids	WCH-A-033	MCAWW 160.1	MCAWW 160.1

### Data Qualifier Summary

None of the sample results required additional qualification.

### Sample Shipping/Receiving

Paragon Analytics in Fort Collins, Colorado, received four water samples on August 5, 2008, under air bill number 7927 3583 3865 accompanied by a Chain of Custody (COC) form. 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 inside the iced cooler at 4.0 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

## Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear curve. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods.

### *Method MCAWW 160.1*

There are no calibration requirements associated with the determination of total dissolved solids.

### *Method MCAWW 353.2*

Calibrations for nitrate + nitrite as N were performed using seven calibration standards on August 8, 2008. 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. Initial and continuing calibration verification checks were made at the required frequency resulting in three verification checks. All calibration check results were within the acceptance criteria.

### *Method SW-846 6020A*

Calibrations for molybdenum and uranium were performed on August 21, 2008, and for selenium and vanadium on August 22, 2008, using two 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. Calibration and laboratory spike standards were prepared from independent sources. Initial and continuing calibration verification checks were made at the required frequency resulting in 14 verification checks. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the practical quantitation limit 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 8082*

The initial calibrations for PCBs were performed using five calibration standards on July 25, 2008. Calibration curves were established using linear regression. Linear regression calibrations had correlation coefficient values greater than 0.99 and intercepts less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency resulting in two verification checks. All calibration checks met the acceptance criteria for all analytes on both gas chromatography columns, with eight exceptions on the confirmation column (column 2). PCBs were not detected on column 1 in any field sample; therefore, acceptable performance of column 2 was not required.

### *Method SW-846 9056*

Calibrations for sulfate were performed using six calibration standards on July 18, 2008. 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. Initial and continuing calibration verification checks were made at the required frequency resulting in three verification checks. All calibration check results were within 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.

### *Metals and Wet Chemistry*

All method blank and calibration blank results associated with the samples were below the practical quantitation limits for all analytes with the exception of one selenium calibration blank. There were no reported results associated with this blank. All method blank and calibration blank results associated with the samples were below the practical quantitation limits for all analytes. Some metals blanks exceeded the MDL but all associated sample results were greater than 5 times the blank concentrations.

### *Organics*

The method blank results were below the practical quantitation limits and MDL for all target compounds.

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

ICP interference check samples ICSA and ICSAB were analyzed at the required frequency to verify the instrumental interelement and background correction factors. All check sample results met the acceptance criteria.

### Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike concentration. The spikes met the recovery and precision criteria for all analytes evaluated.

### Laboratory Replicate Analysis

Laboratory replicate sample results demonstrate acceptable laboratory precision. The relative percent difference (RPD) values for the sample replicates, laboratory control sample replicates, and matrix spike replicates were less than 20 percent for results that are greater than 5 times the practical quantitation limit, indicating acceptable precision. The RPD for the nitrate + nitrite as N matrix spike replicate was hand-calculated from the raw data.

### 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. ICP-MS serial dilution data are evaluated when the concentration of the undiluted sample is greater than 100 times the practical quantitation limit. All evaluated serial dilution data were acceptable.

### PCB Surrogate Recoveries

Laboratory performance for individual samples is established by monitoring the recovery of surrogate spikes. The PCB surrogate recoveries were within the acceptance ranges for all samples.

### Detection Limits/Dilutions

Samples were diluted in a consistent and acceptable manner when required. The samples were diluted prior to analysis of molybdenum, uranium, and vanadium to reduce interferences. The required detection limits were met for all analytes.

### 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 PCB data. All manual integrations that were performed were acceptable and all peak integrations were satisfactory.

### Electronic Data Deliverable (EDD) File

The EDD file arrived on August 27, 2008. 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.

**SAMPLE MANAGEMENT SYSTEM**  
**General Data Validation Report**

RIN: 08071743      Lab Code: PAR      Validator: Gretchen Baer      Validation Date: 9/30/2008  
Project: Grand Junction Disp/Proc Sites      Analysis Type:  Metals     General Chem     Rad     Organics  
# of Samples: 4      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
- Detection Limits
- Field/Trip Blanks
- Field Duplicates

All analyses were completed within the applicable holding times.

The reported detection limits are equal to or below contract requirements.

There was 1 duplicate evaluated.

## SAMPLE MANAGEMENT SYSTEM Metals Data Validation Worksheet

**RIN:** 08071743      **Lab Code:** PAR      **Date Due:** 9/2/2008  
**Matrix:** Water      **Site Code:** GRJ03      **Date Completed:** 8/28/2008

Analyte	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
		Int.	R^2	ICV	CCV	ICB	CCB								
MOLYBDENUM	08/21/2008	-0.0040	1.0000	OK	OK	OK	OK	OK	97.0	112.0	117.0	4.0	112.0		106.0
SELENIUM	08/22/2008	-0.0290	1.0000	OK	OK	OK	OK	OK	89.0			9.0	99.0	7.0	110.0
SELENIUM	08/22/2008											2.0			
URANIUM	08/21/2008	-0.0010	1.0000	OK	OK	OK	OK	OK	98.0	100.0	109.0	4.0	105.0	2.0	124.0
URANIUM	08/21/2008											0.0			
VANADIUM	08/22/2008	-0.0150	1.0000	OK	OK	OK	OK	OK	98.0	122.0	124.0	1.0	101.0		96.0

**SAMPLE MANAGEMENT SYSTEM**  
**Organics Data Validation Summary**

**RIN:** 08071743      **Project:** Grand Junction Disp/Proc Site **Lab Code:** PAR      **Validation Date:** 10/2/2008

**LCS Recovery:** All LCS recoveries were within the laboratory acceptance limits.

**Method Blank(s):** All method blanks results were below the method detection limit.

**MS/MSD Recovery:** All MS/MSD recoveries were within the laboratory acceptance limits.

**Surrogate Recovery:** All surrogate recoveries were within the laboratory acceptance limits.

## SAMPLE MANAGEMENT SYSTEM

### Wet Chemistry Data Validation Worksheet

**RIN:** 08071743      **Lab Code:** PAR      **Date Due:** 9/2/2008  
**Matrix:** Water      **Site Code:** GRJ03      **Date Completed:** 8/28/2008

Analyte	Date Analyzed	CALIBRATION						Method	LCS	MS	MSD	DUP	Serial Dil.
		Int.	R^2	ICV	CCV	ICB	CCB	Blank	%R	%R	%R	RPD	%R
NITRATE/NITRITE AS N	08/08/2008	-0.009	0.9999	OK	OK	OK	OK	OK	97.0			0.60	
SULFATE	08/06/2008	0.451	0.9999	OK	OK	OK	OK	OK	90.0	90.0	93.0	1.00	
TOTAL DISSOLVED SOLIDS	08/11/2008							OK	102.0			1.00	

## **Sampling Quality Control Assessment**

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

### Sampling Protocol

Sample results for all monitor wells were qualified with an “F” flag in the database, indicating the wells were purged and sampled using the low-flow sampling method. All wells met the Category I criteria.

### Equipment Blank Assessment

An equipment blank was not required because samples were collected using dedicated equipment.

### Field Duplicate Assessment

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. Duplicate samples were collected from location 0732 (field duplicate ID 2978). The duplicate results met the EPA recommended laboratory duplicate criteria of less than 20 percent relative difference for results that are greater than 5 times the practical quantitation limit, indicating acceptable overall precision.

**SAMPLE MANAGEMENT SYSTEM**  
**Validation Report: Field Duplicates**

Page 1 of 1

RIN: 08071743    Lab Code: PAR    Project: Grand Junction Disp/Proc Sites    Validation Date: 9/30/2008

Duplicate: 2978

Sample: 0732

Analyte	Sample			Duplicate			RPD	RER	Units
	Result	Flag	Error	Result	Flag	Error			
AROCLOR-1016	0.12	U		0.13	U				UG/L
AROCLOR-1016	0.12	U		0.13	U				UG/L
AROCLOR-1221	0.14	U		0.15	U				UG/L
AROCLOR-1221	0.14	U		0.15	U				UG/L
AROCLOR-1232	0.13	U		0.13	U				UG/L
AROCLOR-1232	0.13	U		0.13	U				UG/L
AROCLOR-1242	0.085	U		0.09	U				UG/L
AROCLOR-1242	0.085	U		0.09	U				UG/L
AROCLOR-1248	0.1	U		0.11	U				UG/L
AROCLOR-1248	0.1	U		0.11	U				UG/L
AROCLOR-1254	0.14	U		0.14	U				UG/L
AROCLOR-1254	0.14	U		0.14	U				UG/L
AROCLOR-1260	0.095	U		0.1	U				UG/L
AROCLOR-1260	0.095	U		0.1	U				UG/L
MOLYBDENUM	2.5			2.9			14.81		UG/L
NITRATE/NITRITE AS N	36			30			18.18		MG/L
SELENIUM	270			260			3.77		UG/L
SULFATE	4200			4100			2.41		MG/L
TOTAL DISSOLVED SOLIDS	7800			7900			1.27		MG/L
URANIUM	22			21			4.65		UG/L
VANADIUM	0.63			0.45					UG/L

## 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: Steve Donivan 1-27-2009  
Steve Donivan Date

Data Validation Lead: Gretchen Baer 1/22/09  
Gretchen Baer Date

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**Attachment 1**  
**Assessment of Anomalous Data**

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# Potential Outliers Report

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## 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 may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and 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 by generating the Outliers Report using the Sample Management System from data in the SEEPro database. The application compares the new data set with historical data and lists the new data that fall outside the historical data range. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test 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.

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

### Data Validation Outliers Report - No Field Parameters

Laboratory: PARAGON (Fort Collins, CO)

RIN: 08071743

Comparison: All Historical Data

Report Date: 1/7/2009

Site Code	Location Code	Sample Date	Analyte	Current		Historical Maximum		Historical Minimum		Number of Data Points		Normally Distributed	Statistical Outlier
				Result	Qualifiers Lab Data	Result	Qualifiers Lab Data	Result	Qualifiers Lab Data	N	N Below Detect		
GRJ03	0731	08/04/2008	Nitrate + Nitrite as Nitrogen	35	F	26	F	7.9	FQ	6	0	Yes	No
GRJ03	0732	08/04/2008	Nitrate + Nitrite as Nitrogen	36	F	35	F	28	F	6	0	Yes	No
GRJ03	0733	08/04/2008	Uranium	0.065	F	0.051	F	0.0175	F	17	0	No	Yes

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

#### LAB QUALIFIERS:

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

#### DATA QUALIFIERS:

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

#### 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**

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## **Groundwater Quality Data**

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**Groundwater Quality Data by Location (USEE100) FOR SITE GRJ03, Grand Junction Disposal Site**

REPORT DATE: 1/7/2009

Location: 0731 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)		Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (As CaCO3)	mg/L	08/04/2008	N001	17	- 32	189		F	#		
Aroclor - 1016	ug/L	08/04/2008	N001	17	- 32	0.12	U	F	#	0.12	
Aroclor - 1221	ug/L	08/04/2008	N001	17	- 32	0.14	U	F	#	0.14	
Aroclor - 1232	ug/L	08/04/2008	N001	17	- 32	0.13	U	F	#	0.13	
Aroclor - 1242	ug/L	08/04/2008	N001	17	- 32	0.085	U	F	#	0.085	
Aroclor - 1248	ug/L	08/04/2008	N001	17	- 32	0.1	U	F	#	0.1	
Aroclor - 1254	ug/L	08/04/2008	N001	17	- 32	0.14	U	F	#	0.14	
Aroclor - 1260	ug/L	08/04/2008	N001	17	- 32	0.095	U	F	#	0.095	
Molybdenum	mg/L	08/04/2008	N001	17	- 32	0.0037		F	#	0.0001	
Nitrate + Nitrite as Nitrogen	mg/L	08/04/2008	N001	17	- 32	35		F	#	0.5	
Oxidation Reduction Potential	mV	08/04/2008	N001	17	- 32	168		F	#		
pH	s.u.	08/04/2008	N001	17	- 32	7.44		F	#		
Selenium	mg/L	08/04/2008	N001	17	- 32	0.59		F	#	0.0024	
Specific Conductance	umhos/cm	08/04/2008	N001	17	- 32	8442		F	#		
Sulfate	mg/L	08/04/2008	N001	17	- 32	4000		F	#	50	
Temperature	C	08/04/2008	N001	17	- 32	19.48		F	#		
Total Dissolved Solids	mg/L	08/04/2008	N001	17	- 32	7600		F	#	200	

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**Groundwater Quality Data by Location (USEE100) FOR SITE GRJ03, Grand Junction Disposal Site**

REPORT DATE: 1/7/2009

Location: 0731 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Turbidity	NTU	08/04/2008	N001	17 - 32	1.14		F	#		
Uranium	mg/L	08/04/2008	N001	17 - 32	0.034		F	#	0.0000045	
Vanadium	mg/L	08/04/2008	N001	17 - 32	0.00092		F	#	0.0001	

**Groundwater Quality Data by Location (USEE100) FOR SITE GRJ03, Grand Junction Disposal Site**

REPORT DATE: 1/7/2009

Location: 0732 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)		Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (As CaCO3)	mg/L	08/04/2008	N001	17.52	- 33	161		F	#		
Aroclor - 1016	ug/L	08/04/2008	N001	17.52	- 33	0.12	U	F	#	0.12	
Aroclor - 1016	ug/L	08/04/2008	N002	17.52	- 33	0.13	U	F	#	0.13	
Aroclor - 1221	ug/L	08/04/2008	N001	17.52	- 33	0.14	U	F	#	0.14	
Aroclor - 1221	ug/L	08/04/2008	N002	17.52	- 33	0.15	U	F	#	0.15	
Aroclor - 1232	ug/L	08/04/2008	N001	17.52	- 33	0.13	U	F	#	0.13	
Aroclor - 1232	ug/L	08/04/2008	N002	17.52	- 33	0.13	U	F	#	0.13	
Aroclor - 1242	ug/L	08/04/2008	N001	17.52	- 33	0.085	U	F	#	0.085	
Aroclor - 1242	ug/L	08/04/2008	N002	17.52	- 33	0.09	U	F	#	0.09	
Aroclor - 1248	ug/L	08/04/2008	N001	17.52	- 33	0.1	U	F	#	0.1	
Aroclor - 1248	ug/L	08/04/2008	N002	17.52	- 33	0.11	U	F	#	0.11	
Aroclor - 1254	ug/L	08/04/2008	N001	17.52	- 33	0.14	U	F	#	0.14	
Aroclor - 1254	ug/L	08/04/2008	N002	17.52	- 33	0.14	U	F	#	0.14	
Aroclor - 1260	ug/L	08/04/2008	N001	17.52	- 33	0.095	U	F	#	0.095	
Aroclor - 1260	ug/L	08/04/2008	N002	17.52	- 33	0.1	U	F	#	0.1	
Molybdenum	mg/L	08/04/2008	N001	17.52	- 33	0.0025		F	#	0.0001	
Molybdenum	mg/L	08/04/2008	N002	17.52	- 33	0.0029		F	#	0.0001	

**Groundwater Quality Data by Location (USEE100) FOR SITE GRJ03, Grand Junction Disposal Site**

REPORT DATE: 1/7/2009

Location: 0732 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)		Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Nitrate + Nitrite as Nitrogen	mg/L	08/04/2008	N001	17.52	- 33	36		F	#	0.5	
Nitrate + Nitrite as Nitrogen	mg/L	08/04/2008	N002	17.52	- 33	30		F	#	0.5	
Oxidation Reduction Potential	mV	08/04/2008	N001	17.52	- 33	170		F	#		
pH	s.u.	08/04/2008	N001	17.52	- 33	7.46		F	#		
Selenium	mg/L	08/04/2008	N001	17.52	- 33	0.27		F	#	0.0012	
Selenium	mg/L	08/04/2008	N002	17.52	- 33	0.26		F	#	0.0012	
Specific Conductance	umhos/cm	08/04/2008	N001	17.52	- 33	8834		F	#		
Sulfate	mg/L	08/04/2008	N001	17.52	- 33	4200		F	#	50	
Sulfate	mg/L	08/04/2008	N002	17.52	- 33	4100		F	#	50	
Temperature	C	08/04/2008	N001	17.52	- 33	14.64		F	#		
Total Dissolved Solids	mg/L	08/04/2008	N001	17.52	- 33	7800		F	#	200	
Total Dissolved Solids	mg/L	08/04/2008	N002	17.52	- 33	7900		F	#	200	
Turbidity	NTU	08/04/2008	N001	17.52	- 33	1.28		F	#		
Uranium	mg/L	08/04/2008	N001	17.52	- 33	0.022		F	#	0.000045	
Uranium	mg/L	08/04/2008	N002	17.52	- 33	0.021		F	#	0.000045	
Vanadium	mg/L	08/04/2008	N001	17.52	- 33	0.00063		F	#	0.0001	
Vanadium	mg/L	08/04/2008	N002	17.52	- 33	0.00045		F	#	0.0001	

**Groundwater Quality Data by Location (USEE100) FOR SITE GRJ03, Grand Junction Disposal Site**

REPORT DATE: 1/7/2009

Location: 0733 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)		Result	Qualifiers		Detection Limit	Uncertainty
							Lab	Data QA		
Alkalinity, Total (As CaCO3)	mg/L	08/04/2008	N001	63.8	- 73.8	414		F #		
Aroclor - 1016	ug/L	08/04/2008	N001	63.8	- 73.8	0.12	U	F #	0.12	
Aroclor - 1221	ug/L	08/04/2008	N001	63.8	- 73.8	0.14	U	F #	0.14	
Aroclor - 1232	ug/L	08/04/2008	N001	63.8	- 73.8	0.13	U	F #	0.13	
Aroclor - 1242	ug/L	08/04/2008	N001	63.8	- 73.8	0.086	U	F #	0.086	
Aroclor - 1248	ug/L	08/04/2008	N001	63.8	- 73.8	0.1	U	F #	0.1	
Aroclor - 1254	ug/L	08/04/2008	N001	63.8	- 73.8	0.14	U	F #	0.14	
Aroclor - 1260	ug/L	08/04/2008	N001	63.8	- 73.8	0.096	U	F #	0.096	
Molybdenum	mg/L	08/04/2008	N001	63.8	- 73.8	0.0021		F #	0.0001	
Nitrate + Nitrite as Nitrogen	mg/L	08/04/2008	N001	63.8	- 73.8	7.8		F #	0.2	
Oxidation Reduction Potential	mV	08/04/2008	N001	63.8	- 73.8	190		F #		
pH	s.u.	08/04/2008	N001	63.8	- 73.8	6.97		F #		
Selenium	mg/L	08/04/2008	N001	63.8	- 73.8	0.0025		F #	0.000024	
Specific Conductance	umhos/cm	08/04/2008	N001	63.8	- 73.8	13260		F #		
Sulfate	mg/L	08/04/2008	N001	63.8	- 73.8	6100		F #	50	
Temperature	C	08/04/2008	N001	63.8	- 73.8	17.72		F #		
Total Dissolved Solids	mg/L	08/04/2008	N001	63.8	- 73.8	13000		F #	200	
Turbidity	NTU	08/04/2008	N001	63.8	- 73.8	0.79		F #		
Uranium	mg/L	08/04/2008	N001	63.8	- 73.8	0.065		F #	0.0000045	

**Groundwater Quality Data by Location (USEE100) FOR SITE GRJ03, Grand Junction Disposal Site**

REPORT DATE: 1/7/2009

Location: 0733 WELL

Parameter	Units	Sample		Depth Range			Result	Qualifiers		Detection Limit	Uncertainty
		Date	ID	(Ft BLS)				Lab	Data QA		
Vanadium	mg/L	08/04/2008	N001	63.8	-	73.8	0.0018	F	#	0.0001	

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

**LAB QUALIFIERS:**

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

**DATA QUALIFIERS:**

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

**QA QUALIFIER:**

- # Validated according to quality assurance guidelines.

## **Static Water Level Data**

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**STATIC WATER LEVELS (USEE700) FOR SITE GRJ03, Grand Junction Disposal Site**  
**REPORT DATE: 1/7/2009**

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
0731	D	5218.52	08/04/2008	11:24:48	23.13	5195.39	
0732	C	5202.5	08/04/2008	12:15:08	25.49	5177.01	
0733	N	5232.84	08/04/2008	10:01:16	68.9	5163.94	

FLOW CODES: B BACKGROUND      C CROSS GRADIENT      D DOWN GRADIENT      F OFF SITE  
                   N UNKNOWN            O ON SITE            U UPGRADIENT

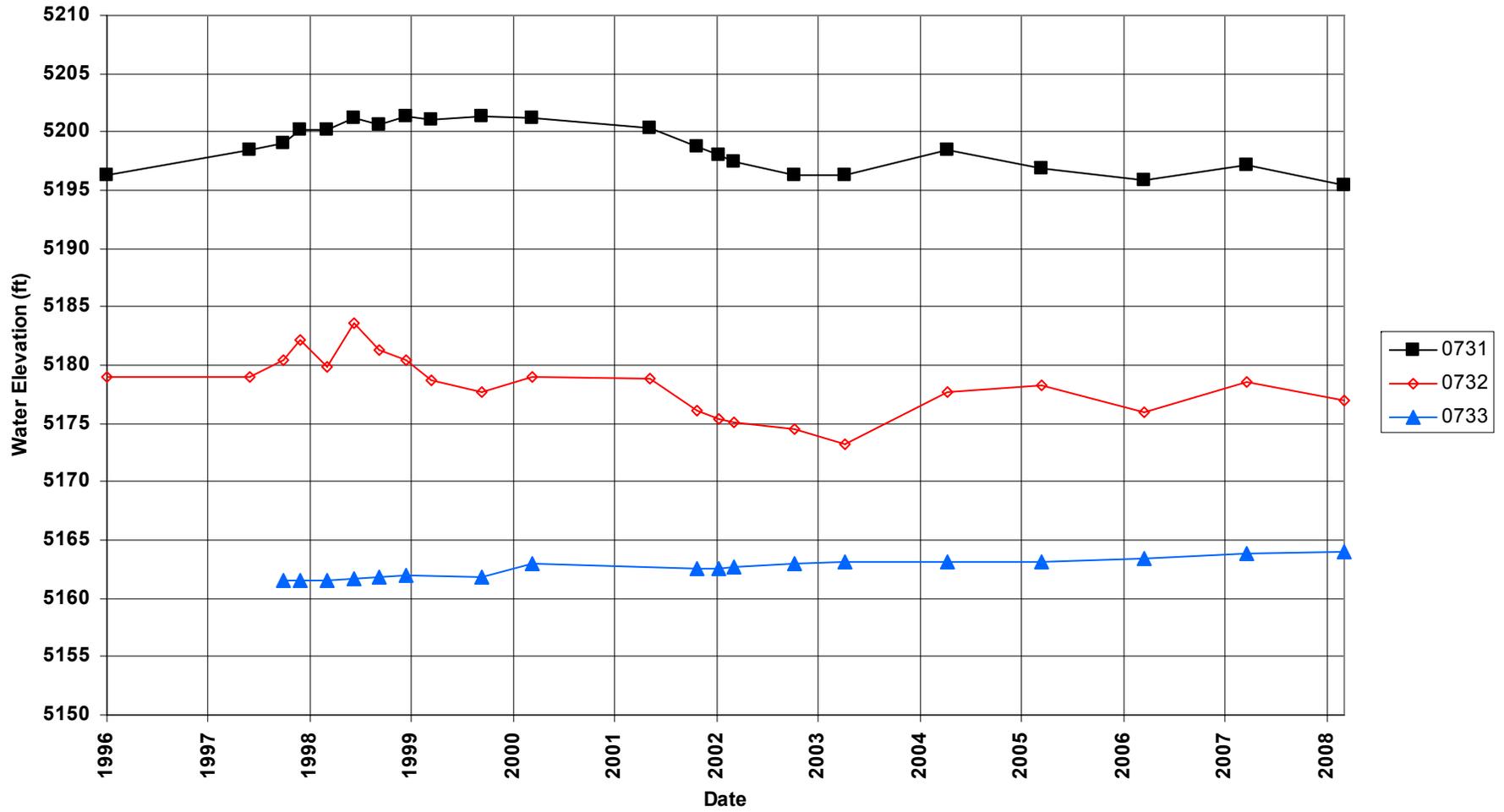
WATER LEVEL FLAGS: D Dry      F FLOWING

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# Hydrograph

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### Grand Junction Disposal Site Hydrograph



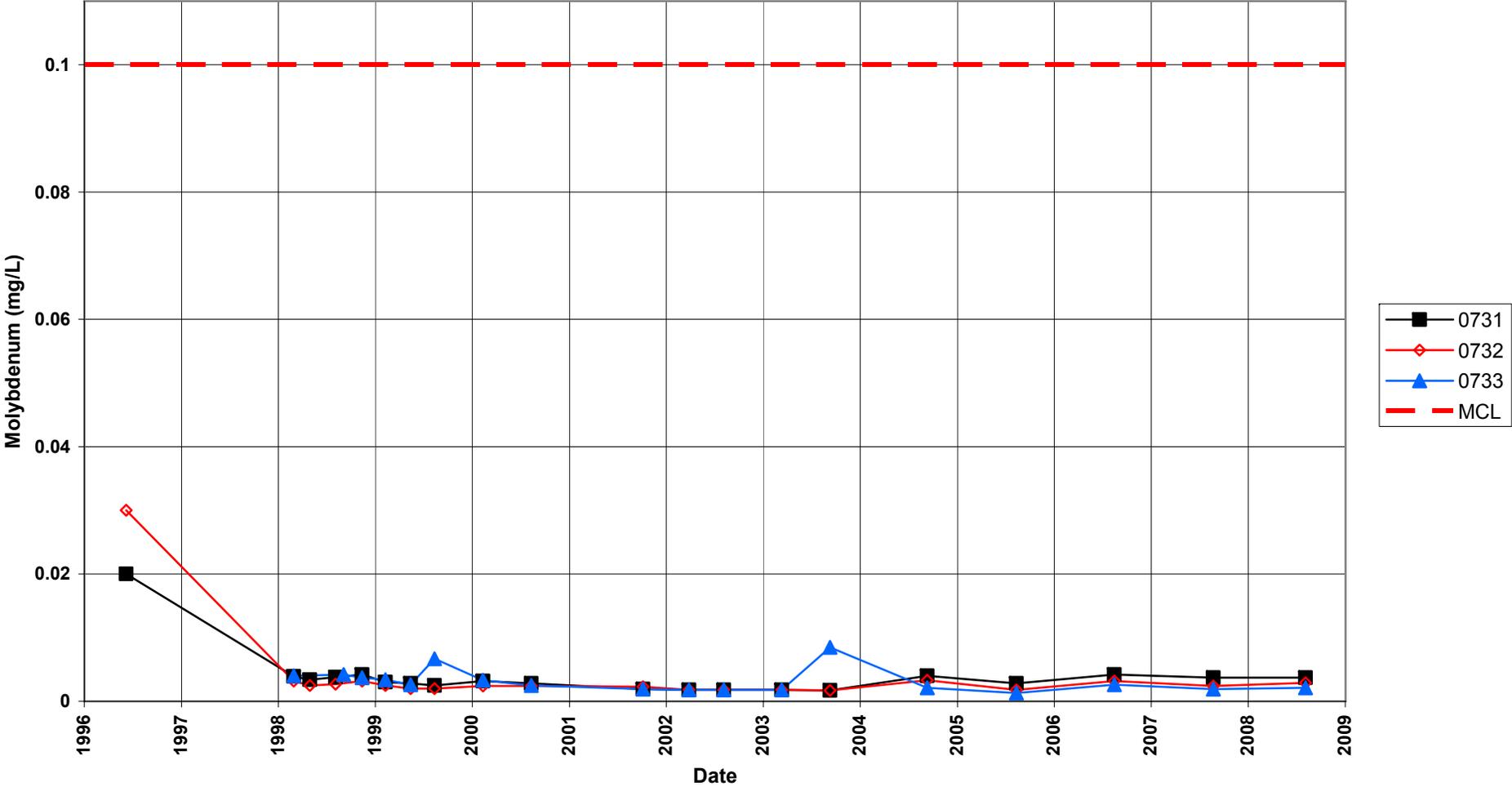
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## **Time-Concentration Graphs**

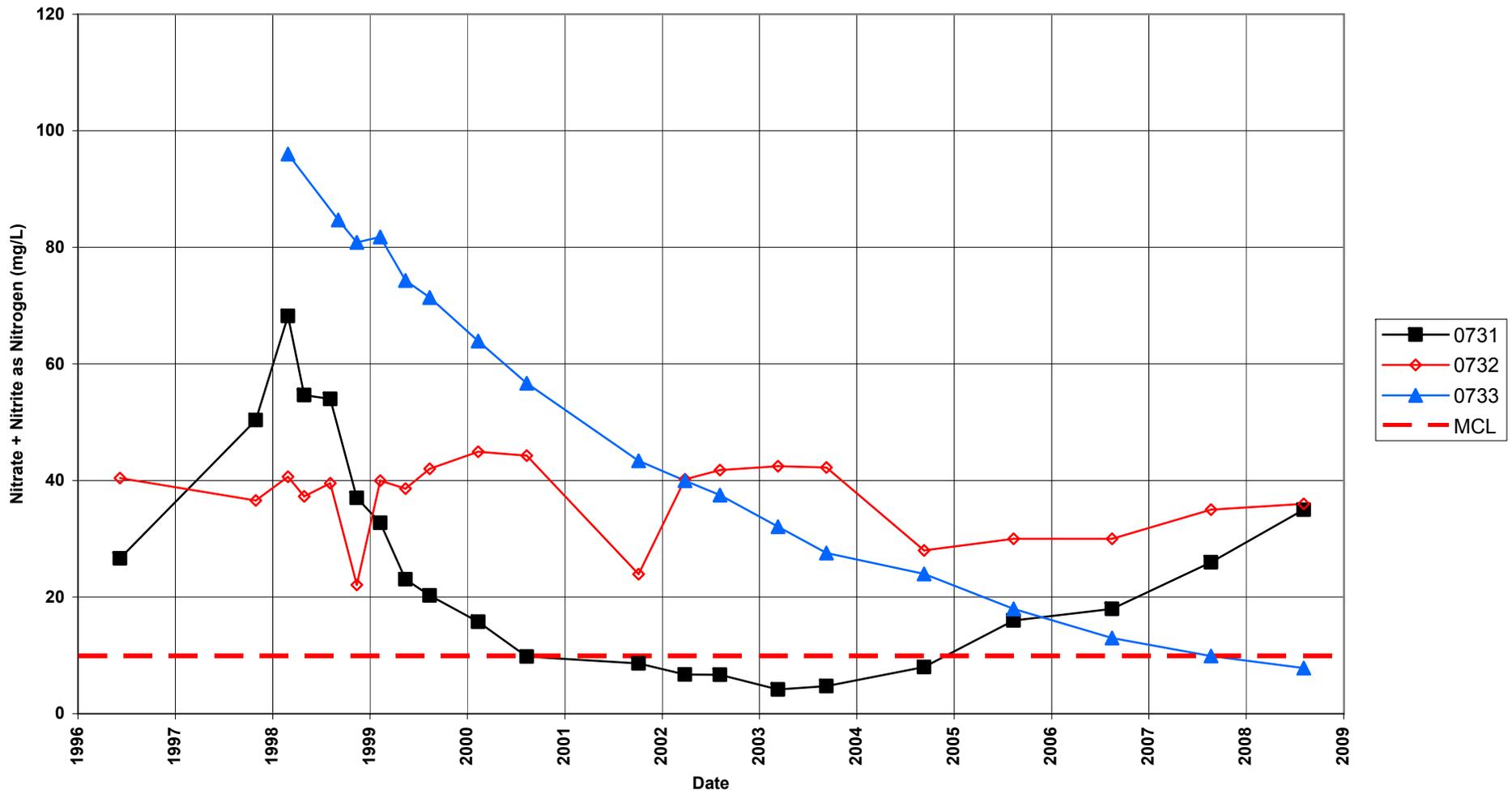
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# Grand Junction Disposal Site Molybdenum Concentration

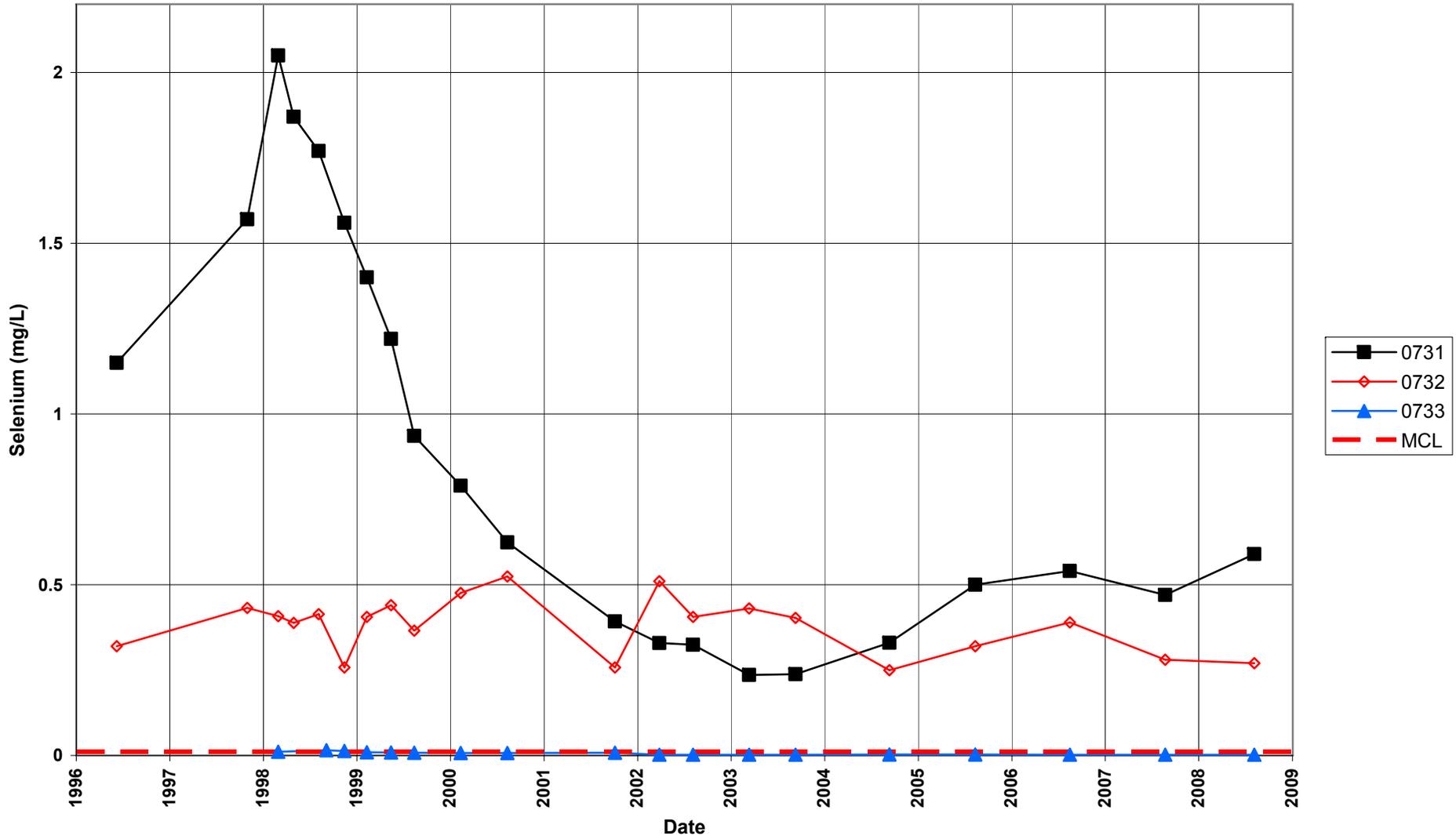
Maximum Contaminant Level = 0.1 mg/L



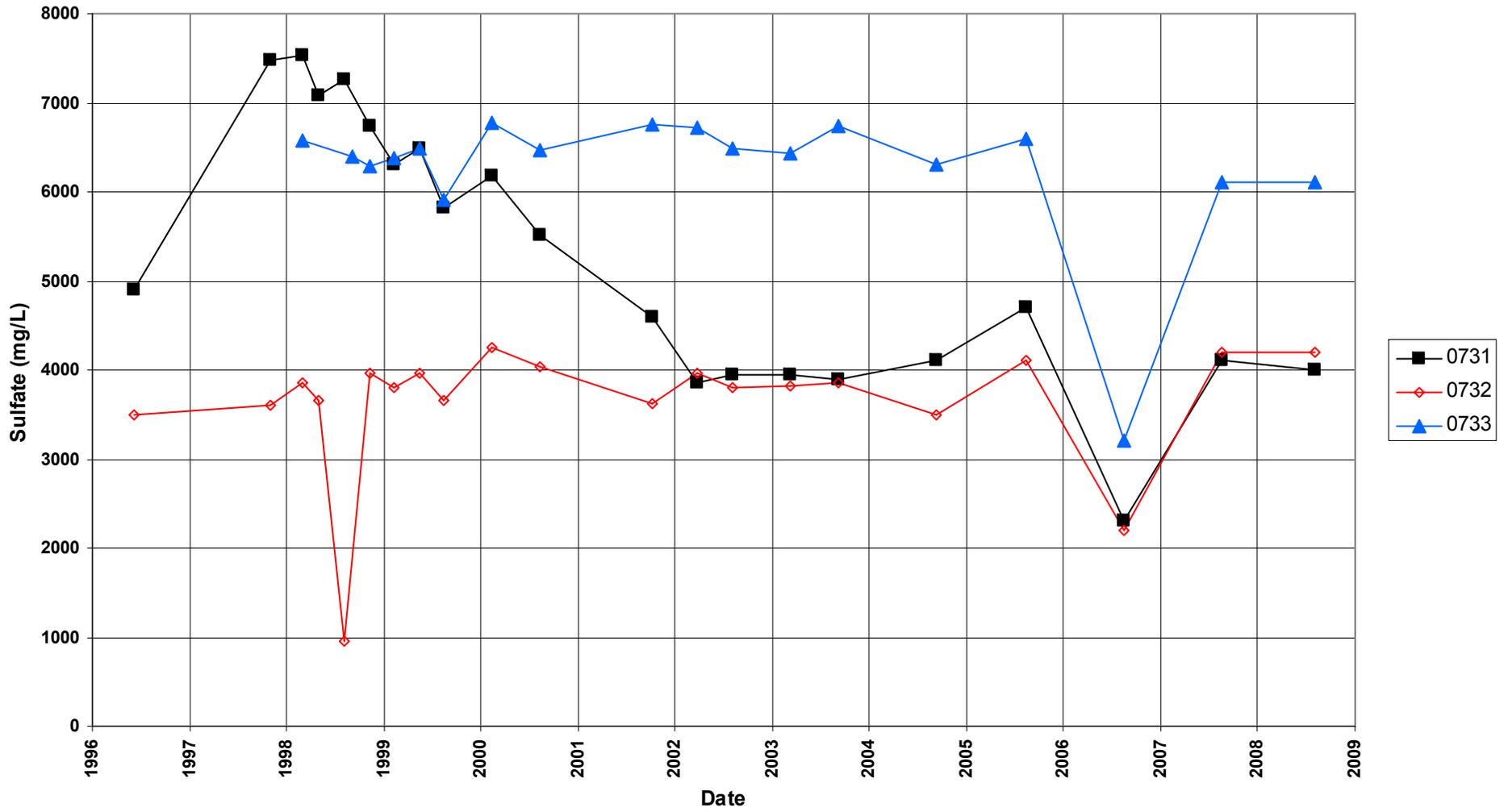
**Grand Junction Disposal Site**  
**Nitrate + Nitrite as Nitrogen Concentration**  
 Maximum Contaminant Level = 10 mg/L



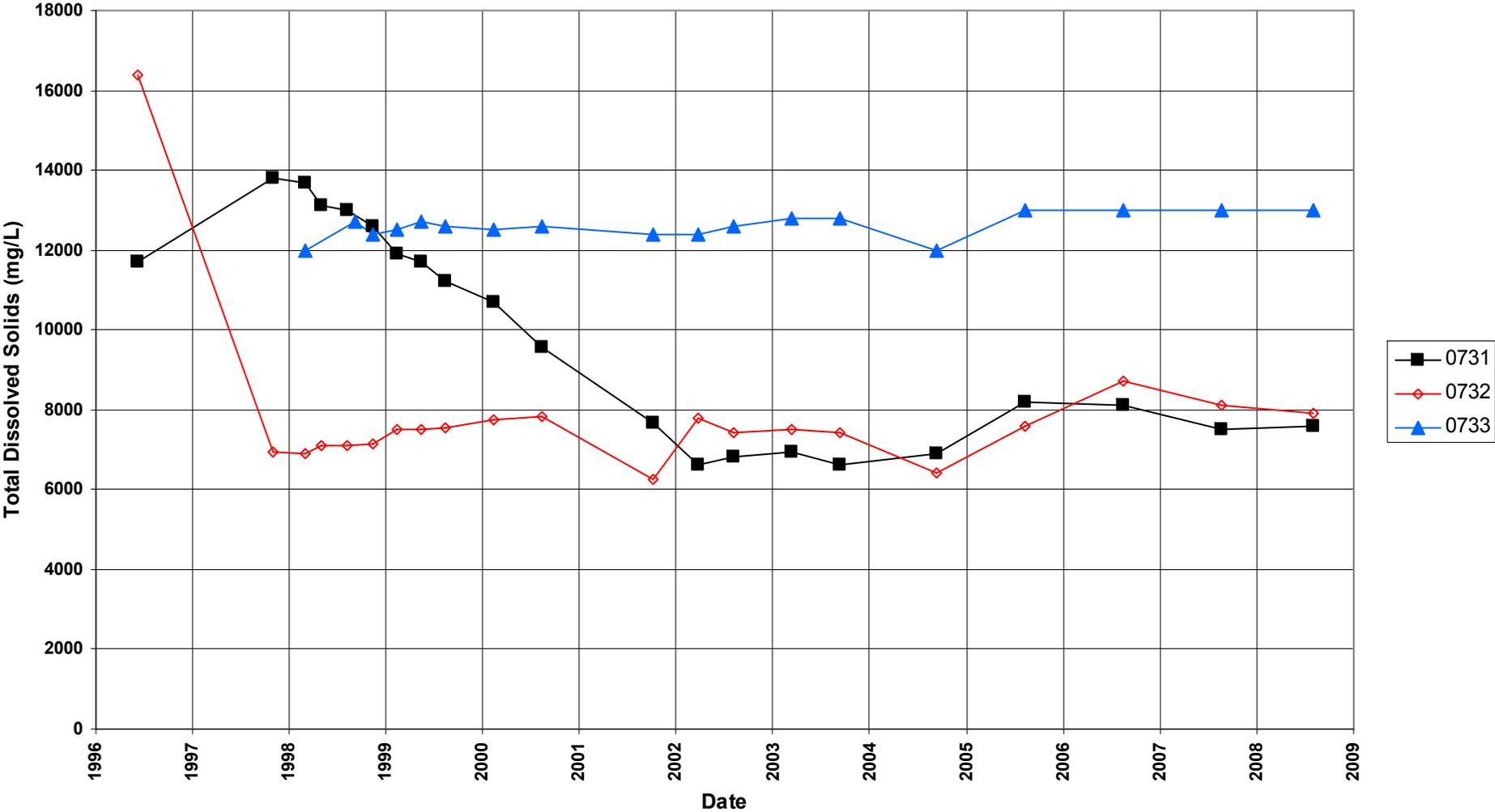
**Grand Junction Disposal Site  
Selenium Concentration**  
Maximum Contaminant Level = 0.1 mg/L



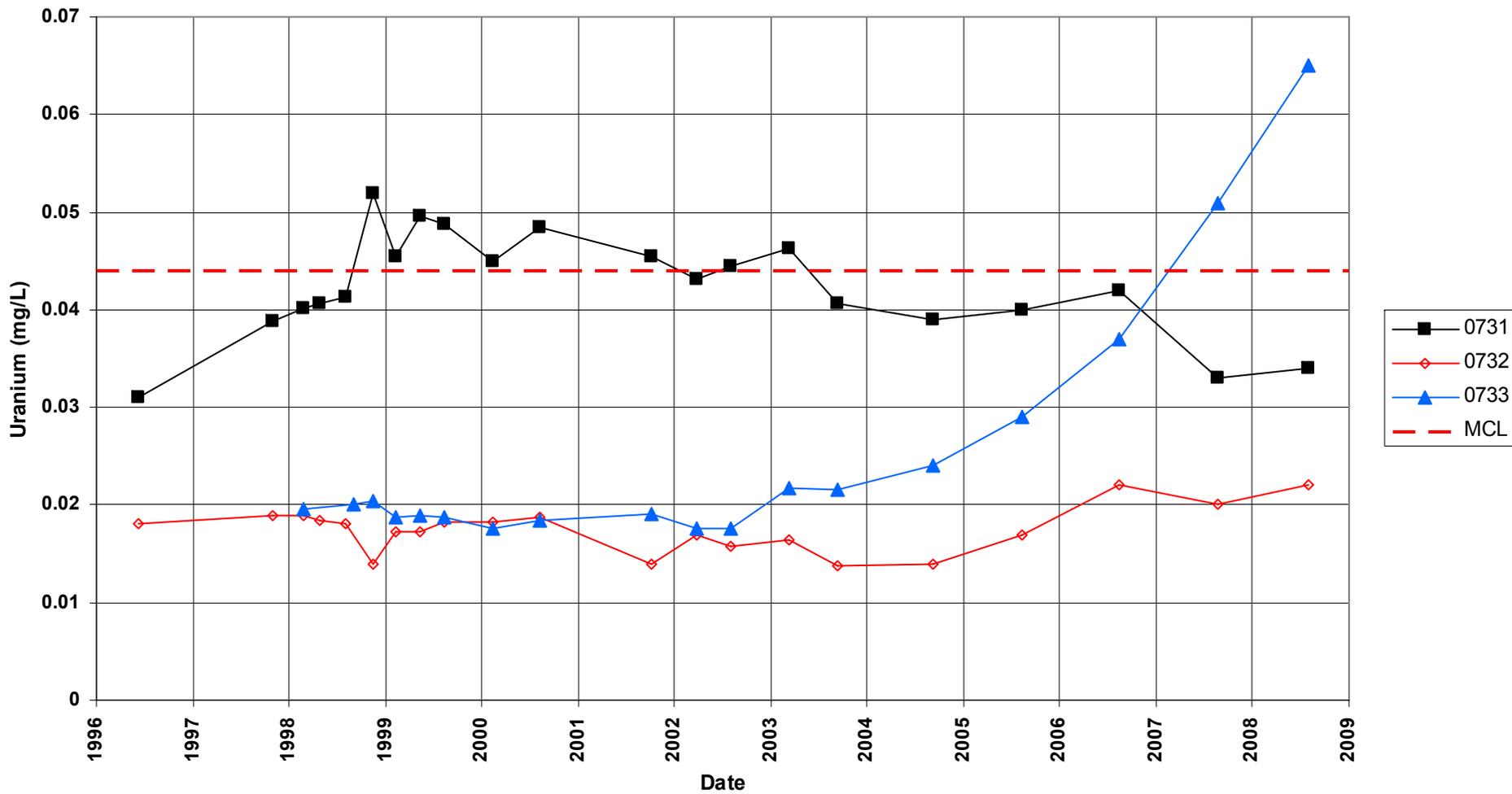
### Grand Junction Disposal Site Sulfate Concentration



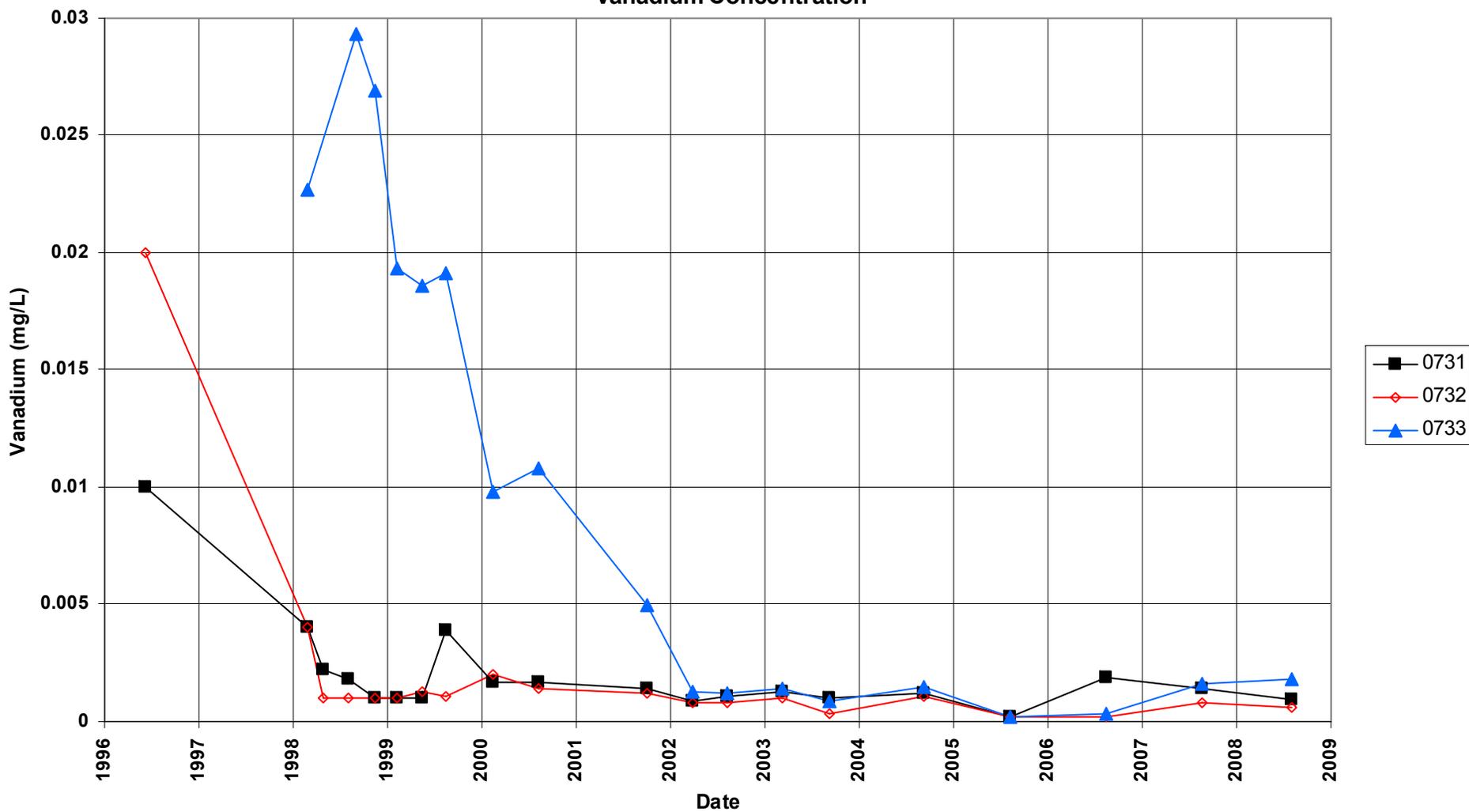
### Grand Junction Disposal Site Total Dissolved Solids Concentration



**Grand Junction Disposal Site**  
**Uranium Concentration**  
Maximum Contaminant Level = 0.044 mg/L



### Grand Junction Disposal Site Vanadium Concentration



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**Attachment 3**  
**Sampling and Analysis Work Order**

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# Stoller

established 1959

Task Order LM00-501  
Control Number 08-0549

July 23, 2008

U.S. Department of Energy  
Office of Legacy Management  
ATTN: Joe Desormeau  
Site Manager  
2597 B ¼ Road  
Grand Junction, CO 81503

SUBJECT: Contract No. DE-AM01-07LM00060, Stoller  
August 2008 Environmental Sampling at Grand Junction, Colorado, Disposal Site

Reference: Task Order LM00-501-02-106-402, Grand Junction, CO, Disposal Site

Dear Mr. Desormeau:

The purpose of this letter is to inform you of the upcoming sampling event at the Grand Junction, Disposal Site. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the site. Water quality data will be collected at this site as part of the routine environmental sampling currently scheduled to begin the week of August 4, 2008.

The following list shows the monitor wells (with zone of completion) scheduled to be sampled during this event.

**Monitor Wells\***

0731 AI      0732 AI      0733 TI

\*NOTE: AI = Alluvium; TI = Tailings

All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*. Access agreements are being reviewed and are expected to be complete by the beginning of fieldwork.

If you have any questions, please call me at extension 6391.

Sincerely,



Gary Baur  
Site Lead

GB/lcg/hc

The S.M. Stoller Corporation    2597 B ¼ Road    Grand Junction, CO 81503    (970) 248-6000    Fax: (970) 248-6040

Joe Desormeau  
Control Number 08-0549  
Page 2

Enclosures (3)

cc: (electronic)  
Cheri Bahrke, Stoller  
Gary Baur, Stoller  
Steve Donovan, Stoller  
Bev Gallagher, Stoller  
Lauren Goodknight, Stoller  
EDD Delivery

cc w/o enclosures:  
(rc-grand.junction) Records GJT 410.02

\\Condor\home\140048\My Documents\Ground Water\GRJ\Disposal Site-GRJ\0808GRJ-ltr.doc

## Constituent Sampling Breakdown

Site	Grand Junction Disposal Site		Required Detection Limit (mg/L)	Analytical Method	Line Item Code
	Ground Water	Surface Water			
Analyte					
Approx. No. Samples/yr	3	0			
<i>Field Measurements</i>					
Alkalinity	X				
Dissolved Oxygen					
Redox Potential	X				
pH	X				
Specific Conductance	X				
Turbidity	X				
Temperature	X				
<i>Laboratory Measurements</i>					
Aluminum					
Ammonia as N (NH3-N)					
Antimony					
Arsenic					
Cadmium					
Calcium					
Chloride					
Chromium					
Cobalt					
Copper					
Magnesium					
Manganese					
Molybdenum	X		0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
PCBs	X		0.0005	SW-846 8082	PEP-A-006
Potassium					
Selenium	X		0.0001	SW-846 6020	LMM-02
Silica					
Sodium					
Strontium					
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Sulfide					
Thallium					
Thorium-230					
Tin					
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium	X		0.0003	SW-846 6020	LMM-02
Zinc					
<b>Total No. of Analytes</b>	<b>8</b>	<b>0</b>			

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

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# **Attachment 4**

## **Trip Report**

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*Memorandum*

DATE: August 6, 2008

TO: Gary Baur

FROM: Gretchen Baer

SUBJECT: Trip Report

**Site:** Grand Junction Disposal Site, Colorado

**Date of Sampling Event:** August 4, 2008

**Team Members:** Gretchen Baer and Sam Campbell. Sampling at one well was monitored by Tom Maveal, radiation control technician (RCT).

**Number of Locations Sampled:** 3 monitor wells.

**Locations Not Sampled/Reason:** None.

**Location Specific Information:** Well 0733 is in a contamination area. All equipment, bottles, and supplies were checked by the RCT. All were clean except the water level indicator, which was left on site for any radon activity to dissipate. It will be checked again in the near future and brought back to office if clean.

Ticket Number	Location	Sample Date	Description	Notes
GIS 001	0731	8/4/08	Category I	Data logger could not be downloaded—the correct connection cable was not available
GIS 002	0732	8/4/08	Category I	PCBs collected in triplicate for lab QC Data logger was downloaded
GIS 003	0733	8/4/08	Category I	RCT Monitored sampling Data logger was downloaded

**Field Variance:** None.

**Quality Control Sample Cross Reference:** The following is the false identification assigned to the quality control sample:

False ID	True ID	Sample Type	Associated Matrix	Ticket Number
2978	0732	Duplicate	Groundwater	GIS 004

**Requisition Numbers Assigned:** All samples were assigned to report identification number (RIN) 08071743.

**Sample Shipment:** Samples were shipped overnight by FedEx to Paragon Analytics, Inc., Fort Collins, CO, from Grand Junction, CO, on August 4, 2008.

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

Well	Date	Depth to water (ft btoc)	Notes
0731	8/4/08	23.13	
0732	8/4/08	25.49	Roots may have interfered with the measurement. The manual WL differed from the data logger WL by approximately 1 ft.
0733	8/4/08	68.90	WL Indicator checked by RCT and left on site for future testing.

**Well Inspection Summary:** Well inspections were conducted at all sampled wells. All wells were in good condition. Roots were observed in well 0732. These roots may have interfered with the water level measurement. This well needs to be cleaned out.

**Equipment:** All wells were equipped with dedicated bladder pumps.

**Institutional Controls:**

**Fences, Gates, Locks:** No gates or locks were opened. Fences appeared to be adequate.

**Signs:** No missing/damaged signs were noted.

**Trespassing/Site Disturbances:** None

**Site Issues**

**Disposal Cell/Drainage Structure Integrity:** No issues identified.

**Vegetation/Noxious Weed Concerns:** No issues identified.

**Maintenance Requirements:** None observed.

**Corrective Action Taken/Required:** Roots should be cleaned out of well 0732. The data logger in well 0732 may need recalibration, and the data logger in well 0731 needs to be downloaded. This work is scheduled for 8/14/2008.

cc: (electronic)  
Joseph Desormeau, DOE  
Steve Donovan, Stoller  
EDD Delivery