



# Metals

## Case Narrative

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### **Colorado Oil & Gas Conservation Commission**

Complaint 200221032

Work Order Number: 0910289

1. This report consists of 1 water sample.
2. The sample was received cool and intact by ALS on 10/28/09.
3. The sample was to be analyzed for dissolved metals. The sample was filtered through a 0.45 micron filter and preserved with nitric acid to a pH less than two prior to analysis.
4. The sample was prepared for analysis based on Methods for the Determination of Metals in Environmental Samples – Supplement 1 procedures.

Prior to analysis by Trace ICP, an ionization buffer was added to the sample and associated QC to improve the sodium and potassium quantitation.

For analysis by Trace ICP and ICP-MS, the sample was digested following method 200.2 and SOP 806 Rev. 13.

The sample was prepared for ICP-MS analysis of arsenic and selenium by passing the digested sample and associated QC through a cation exchange column. The cation exchange column removes cations from the matrix and eliminates the  $\text{CaCl}^+$  (mass 75) interferences on arsenic.

5. The sample was analyzed following Methods for the Determination of Metals in Environmental Samples – Supplement 1 procedures.

Analysis by Trace ICP followed method 200.7 and SOP 807 Rev. 12.

The relationship between intensity and concentration for each element is established using at least four standards, one of which is a blank solution.



During sample analysis concentrations are computed by the software and the results are printed in mg/L. The instrument software does not provide a printout which gives both intensity and concentration. The validity of the calibration equation is tested by analyzing the following solutions: a blank, a low level check solution with concentrations near the reporting limit, an Initial Calibration Verification (ICV) standard from a 2<sup>nd</sup> source standard solution with concentrations near the middle of the analytical range, a Continuing Calibration Verification (CCV) standard with concentrations at two times those in the ICV, and a readback of the highest calibration standard.

These solutions provide verification that the calibration equations are functioning properly throughout the analytical range of the instrument. During sample analysis dilutions are made for analytes found at concentrations above the highest calibration standard. No results are taken from extrapolations beyond the highest standard.

Analysis by ICP-MS followed method 200.8 and SOP 827 Rev. 7.

The relationship between intensity and concentration for each element is established using at least four standards, one of which is a blank solution. A calibration equation relating instrument response to concentration is developed by the instrument software. The equation is a higher order polynomial. This type of equation is used to improve quantitation accuracy at lower concentrations where the relationship between concentration and instrument response is non-linear.

During sample analysis concentrations are computed by the software and the results are printed in ug/L. The validity of the calibration equation is tested by analyzing the following solutions: a blank, a low level check solution with concentrations near the reporting limit, an Initial Calibration Verification (ICV) standard from a 2<sup>nd</sup> source standard solution with concentrations near the middle of the analytical range, a Continuing Calibration Verification (CCV) standard with concentrations near the middle of the analytical range but different than those in the ICV, and a readback of the highest calibration standard.

These solutions provide verification that the calibration equations are functioning properly throughout the analytical range of the instrument. During sample analysis dilutions are made for analytes found at concentrations above the highest calibration standard. No results are taken from extrapolations beyond the highest standard.

6. All standards and solutions are NIST traceable and were used within their recommended shelf life.
7. The sample was prepared and analyzed within the established hold times.

All in house quality control procedures were followed, as described below.

8. General quality control procedures.



- A filter (method) blank and laboratory control sample were filtered, preserved, and digested at the same time as the samples. There were not more than 20 samples associated with each filtered blank and laboratory control sample.
- The preparation (method) blank associated with this digestion batch was below the reporting limit for the requested analytes.
- The laboratory control samples associated with this digestion batch were within the acceptance limits. This indicates complete digestions according to the method.
- All initial and continuing calibration blanks associated with each analytical batch were below the practical quantitation limits for the requested analytes with the exception of CCB7 for molybdenum and thallium. The analytes that exceeded acceptance criteria were not reported from the samples bracketed by this CCB.
- All initial and continuing calibration verifications associated with each analytical batch were within the acceptance criteria for the requested analytes with the exceptions of CCV6 for selenium and CCV7 for molybdenum and thallium. The analytes that exceeded acceptance criteria were not reported from the samples bracketed by these CCVs.
- The interference check samples associated with Method 200.7 were within acceptance criteria.
- The interference check samples associated with Method 200.8 were analyzed, and the high standard readbacks were within acceptance criteria.

9. Matrix specific quality control procedures.

Per method requirements, matrix QC was performed for each analysis. Since a sample from this order number was not the selected quality control (QC) sample, matrix specific QC results are not included in this report.

10. It is a standard practice that samples for ICP-MS are analyzed at a dilution.

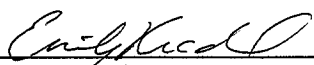
11. Sodium Adsorption Ration (SAR) was determined by calculation based on a reference from the client. Calcium, magnesium, and sodium concentrations were determined by ICP, Method 200.7.

$$SAR = Na / (((Ca + Mg) / 2)^{1/2})$$

The analyte results are the me/L concentrations based on conversions from their mg/L concentrations. Please note that the SAR value is unitless.



The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

  
Emily Knodel  
Inorganics Primary Data Reviewer

11-10-09  
Date

  
Inorganics Final Data Reviewer

11/10/09  
Date



### **Inorganic Data Reporting Qualifiers**

The following qualifiers are used by the laboratory when reporting results of inorganic analyses.

- Result qualifier -- If the analyte was analyzed for but not detected a "U" is entered.
- QC qualifier -- Specified entries and their meanings are as follows:
  - E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
  - M - Duplicate injection precision was not met.
  - N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
  - Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
  - \* - Duplicate analysis (relative percent difference) not within control limits.

# ALS Laboratory Group -- FC

## Sample Number(s) Cross-Reference Table

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**Paragon OrderNum:** 0910289

**Client Name:** Colorado Oil & Gas Conservation Commission

**Client Project Name:** Complaint 200221032

**Client Project Number:**

**Client PO Number:** OE PHA 090000000004

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Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
Meadows WW	0910289-1		WATER	27-Oct-09	11:14
Trip Blank	0910289-2		WATER	27-Oct-09	



# ALS Laboratory Group

225 Commerce Drive, Fort Collins, CO 80524

TF: 800-443-1511 PH: 970-490-1511 FX: 970-490-1522

## Chain-of-Custody

0910289

Project Name/No.		Sampler(s)		Date	Page	of	Lab ID
REPORT TO: Peter Gintautas		Gintautas		27 Oct 2009	1	1	
PHONE: 719-846-3091				Turnaround	Standard	or Due	Disposal
FAX: 719-846-3384							By Lab or Retu
E-MAIL: peter.gintautas@state.co							
COMPANY: Colo. Oil & Gas Comm.							
ADDRESS: PO Box 108 Trinidad CO 81082							
Provide additional information as needed in Comments below.		Circle Analytical Method Above		Circle Analytical Method At			
Sample ID	Date	Time	Lab ID	Matrix	Preservative (Type HCl, etc.)	No. of Containers	
Stevens WW	27 Oct	09:30	W	W		1	
Complaint 200221028						6	
Liceno WW	27 Oct	10:30	W	W		3	
Complaint 200221032	27 Oct					5	
Meadows WW	27 Oct	11:14	W	W		3	
Complaint 200221031						5	
Bieber WW	27 Oct	12:00	W	W		3	
Zone (Circle): EST CST MST PST		Matrix: O = oil S = soil NS = Non-soil solid W = water L = liquid E = extract F = filter					
For metals or anions, please detail analyte list below.							
Comments: (Trip blanks + Complaint 200221032) = 8260-25 + tertbutanol/TICs							
Anions = Br, Cl, F, NO <sub>2</sub> , NO <sub>3</sub> , SO <sub>4</sub>							
Filter + Preserve metals upon receipt							
200.7 = B, Ba, Be, Ca, Cr, Co, Cu, Fe, Li, Mg, Mn, Ni, K, Na, Sr, Zn, Si							
200.8 = Sb, As, Cd, Pb, Mo, Se, Ag, Te, U							
Originator: Retain pink page or a photocopy!							
Relinquished By: (1)		Signature: [Signature]		Printed Name: Peter Gintautas		Date: 27 Oct 09 Time: 16:20	
Received By: (1)		Signature: [Signature]		Printed Name: Laurenschmitt		Date: 10/28/09 Time: 10:15	



## CONDITION OF SAMPLE UPON RECEIPT FORM

Client: COGCCWorkorder No: 0910288 ~~10/28/09~~ <sup>0910289</sup>Project Manager: AWInitials: LAS Date: 10/28/09

1. Does this project require any <b>special handling</b> in addition to standard Paragon procedures?		YES	<u>NO</u>
2. Are custody <b>seals</b> on <b>shipping containers</b> intact?	NONE	<u>YES</u>	NO
3. Are Custody seals on <b>sample containers</b> intact?	<u>NONE</u>	YES	NO
4. Is there a <b>COC (Chain-of-Custody)</b> present or other representative documents?		<u>YES</u>	NO
5. Are the <b>COC and bottle labels complete and legible</b> ?		<u>YES</u>	NO
6. Is the <b>COC in agreement</b> with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	<u>NO</u> *
7. Were <b>airbills / shipping documents</b> present and/or removable?	DROP OFF	<u>YES</u>	NO <sup>10/29/09</sup>
8. Are all aqueous <b>samples requiring preservation preserved correctly?</b> (excluding volatiles)	N/A	<u>YES</u>	<u>NO</u> *
9. Are all aqueous <b>non-preserved samples pH 4-9?</b>	N/A	<u>YES</u>	NO
10. Is there <b>sufficient sample</b> for the requested analyses?		<u>YES</u>	NO
11. Were all samples placed in the <b>proper containers</b> for the requested analyses?		<u>YES</u>	NO
12. Are all samples within <b>holding times</b> for the requested analyses?		<u>YES</u>	NO
13. Were all sample containers received <b>intact?</b> (not broken or leaking, etc.)		<u>YES</u>	NO
14. Are all samples requiring <b>no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon)</b> headspace free? <b>Size of bubble:</b> _____ < green pea _____ > green pea	N/A	<u>YES</u>	NO
15. Do perchlorate LCMS-MS samples <b>have</b> headspace? (at least 1/3 of container required)	<u>N/A</u>	YES	NO
16. Were samples checked for and free from the presence of <b>residual chlorine?</b> (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	<u>N/A</u>	YES	NO
17. Were the samples <b>shipped on ice?</b>		<u>YES</u>	NO
18. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: <u>#2</u> #4		<u>YES</u>	NO
Cooler #: <u>1</u> <u>2</u>			
Temperature (°C): <u>2.7°</u> <u>3.8°</u>			
No. of custody seals on cooler: <u>1</u> <u>1</u>			
External µR/hr reading: <u>15</u> <u>15</u>			
Background µR/hr reading: <u>13</u>			
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? <u>YES</u> NO / NA (If no, see Form 008.)			

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

\* 2 trip blanks not accounted for on COC - supplemental letter states they are to go with this workorder (sample #2 = 2 trip blanks)

\* metals will be filtered and preserved by the lab (prior to analysis)

If applicable, was the client contacted? YES / NO NA Contact: \_\_\_\_\_ Date/Time: \_\_\_\_\_Project Manager Signature / Date: [Signature] 11/2/09

\*IR Gun #2: Oakton, SN 29922500201-0066

\*IR Gun #4: Oakton, SN 2372220101-0002



# Dissolved Metals by 200.7

Method EPA200.7 Revision 4.4

## Sample Results

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 0910289

Client Name: Colorado Oil & Gas Conservation Commission

ClientProject ID: Complaint 200221032

Field ID: Meadows WW

Lab ID: 0910289-1

Sample Matrix: WATER

% Moisture: N/A

Date Collected: 27-Oct-09

Date Extracted: 05-Nov-09

Date Analyzed: 05-Nov-09

Prep Method: EPA200.2 Rev 2.8

Prep Batch: IP091105-3

QCBatchID: IP091105-3-1

Run ID: IT091105-2A5

Cleanup: NONE

Basis: As Received

File Name: 091105A.

Sample Aliquot: 50 g

Final Volume: 50 g

Result Units: mg/l

Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7440-39-3	BARIUM	1	0.25	0.1		
7440-41-7	BERYLLIUM	1	0.002	0.002	U	
7440-42-8	BORON	1	0.1	0.1	U	
7440-70-2	CALCIUM	1	16	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.1	0.1	U	
7439-93-2	LITHIUM	1	0.01	0.01	U	
7439-95-4	MAGNESIUM	1	2.2	1		
7439-96-5	MANGANESE	1	0.01	0.01	U	
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	1	1	U	
7440-21-3	SILICON	1	3.3	0.05		
7440-23-5	SODIUM	1	73	1		
	SODIUM ADSORPTION RATIO	1	4.5	0.17		
7440-24-6	STRONTIUM	1	0.55	0.01		
7440-66-6	ZINC	1	0.02	0.02	U	

Data Package ID: IT0910289-1

Date Printed: Monday, November 09, 2009

ALS Laboratory Group -- FC

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# Dissolved Metals by 200.8

Method EPA200.8 Revision 5.4

## Sample Results

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 0910289

Client Name: Colorado Oil & Gas Conservation Commission

ClientProject ID: Complaint 200221032

Field ID:	Meadows WW
Lab ID:	0910289-1

Sample Matrix: WATER

% Moisture: N/A

Date Collected: 27-Oct-09

Date Extracted: 05-Nov-09

Date Analyzed: 06-Nov-09

Prep Method: EPA200.2 Rev 2.8

Prep Batch: IP091105-3

QCBatchID: IP091105-3-2

Run ID: IM091106-1A2

Cleanup: NONE

Basis: As Received

File Name: 06NOV09A

Sample Aliquot: 50 g

Final Volume: 50 g

Result Units: UG/L

Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7440-36-0	ANTIMONY	10	0.94	0.3		
7440-38-2	ARSENIC	10	2	2	U	
7440-43-9	CADMIUM	10	0.3	0.3	U	
7439-92-1	LEAD	10	0.5	0.5	U	
7439-98-7	MOLYBDENUM	10	2.5	1		
7782-49-2	SELENIUM	10	1	1	U	
7440-22-4	SILVER	10	0.1	0.1	U	
7440-28-0	THALLIUM	10	0.2	0.2	U	
7440-61-1	URANIUM	10	0.1	0.1	U	

Data Package ID: IM0910289-1

Date Printed: Monday, November 09, 2009

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# Metals by 200.7

## Method EPA200.7 Revision 4.4

### Method Blank

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 0910289

Client Name: Colorado Oil & Gas Conservation Commission

ClientProject ID: Complaint 200221032

Lab ID: F091104-1MB

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 05-Nov-09

Date Analyzed: 05-Nov-09

Prep Method: EPA200.2 Rev 2.8

Prep Batch: IP091105-3

QCBatchID: IP091105-3-1

Run ID: IT091105-2A5

Cleanup: NONE

Basis: N/A

File Name: 091105A.

Sample Aliquot: 50 g

Final Volume: 50 g

Result Units: mg/l

Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7440-39-3	BARIUM	1	0.1	0.1	U	
7440-41-7	BERYLLIUM	1	0.002	0.002	U	
7440-42-8	BORON	1	0.1	0.1	U	
7440-70-2	CALCIUM	1	1	1	U	
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.1	0.1	U	
7439-93-2	LITHIUM	1	0.01	0.01	U	
7439-95-4	MAGNESIUM	1	1	1	U	
7439-96-5	MANGANESE	1	0.01	0.01	U	
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	1	1	U	
7440-21-3	SILICON	1	0.05	0.05	U	
7440-23-5	SODIUM	1	1	1	U	
7440-24-6	STRONTIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

Data Package ID: IT0910289-1

Date Printed: Monday, November 09, 2009

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# Metals by 200.7

## Method EPA200.7 Revision 4.4

### Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 0910289

Client Name: Colorado Oil & Gas Conservation Commission

ClientProject ID: Complaint 200221032

Lab ID: F091104-1LCS

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 11/05/2009

Date Analyzed: 11/05/2009

Prep Method: EPA200.22.8

Prep Batch: IP091105-3

QCBatchID: IP091105-3-1

Run ID: IT091105-2A5

Cleanup: NONE

Basis: N/A

File Name: 091105A.

Sample Aliquot: 50 g

Final Volume: 50 g

Result Units: mg/l

Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7440-39-3	BARIUM	2	1.96	0.1		98	85 - 115%
7440-41-7	BERYLLIUM	0.05	0.0494	0.002		99	85 - 115%
7440-42-8	BORON	1	0.983	0.1		98	85 - 115%
7440-70-2	CALCIUM	40	40.2	1		101	85 - 115%
7440-47-3	CHROMIUM	0.2	0.195	0.01		98	85 - 115%
7440-48-4	COBALT	0.5	0.513	0.01		103	85 - 115%
7440-50-8	COPPER	0.25	0.253	0.01		101	85 - 115%
7439-89-6	IRON	1	1.03	0.1		103	85 - 115%
7439-93-2	LITHIUM	0.5	0.467	0.01		93	85 - 115%
7439-95-4	MAGNESIUM	40	40.6	1		102	85 - 115%
7439-96-5	MANGANESE	0.5	0.488	0.01		98	85 - 115%
7440-02-0	NICKEL	0.5	0.51	0.02		102	85 - 115%
7440-09-7	POTASSIUM	40	36.8	1		92	85 - 115%
7440-21-3	SILICON	2	1.99	0.05		99	85 - 115%
7440-23-5	SODIUM	40	36.8	1		92	85 - 115%
7440-24-6	STRONTIUM	0.5	0.486	0.01		97	85 - 115%
7440-66-6	ZINC	0.5	0.493	0.02		99	85 - 115%

Data Package ID: IT0910289-1

Date Printed: Monday, November 09, 2009

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# Metals by 200.8

## Method EPA200.8 Revision 5.4

### Method Blank

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 0910289

Client Name: Colorado Oil & Gas Conservation Commission

ClientProject ID: Complaint 200221032

Lab ID: F091104-1MB

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 05-Nov-09

Date Analyzed: 06-Nov-09

Prep Method: EPA200.2 Rev 2.8

Prep Batch: IP091105-3

QCBatchID: IP091105-3-2

Run ID: IM091106-1A2

Cleanup: NONE

Basis: N/A

File Name: 06NOV09A

Sample Aliquot: 50 g

Final Volume: 50 g

Result Units: UG/L

Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	Result Qualifier	EPA Qualifier
7440-36-0	ANTIMONY	10	0.3	0.3	U	
7440-38-2	ARSENIC	10	2	2	U	
7440-43-9	CADMIUM	10	0.3	0.3	U	
7439-92-1	LEAD	10	0.5	0.5	U	
7439-98-7	MOLYBDENUM	10	1	1	U	
7782-49-2	SELENIUM	10	1	1	U	
7440-22-4	SILVER	10	0.1	0.1	U	
7440-28-0	THALLIUM	10	0.2	0.2	U	
7440-61-1	URANIUM	10	0.1	0.1	U	

Data Package ID: IM0910289-1

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# Metals by 200.8

Method EPA200.8 Revision 5.4

## Laboratory Control Sample

Lab Name: ALS Laboratory Group -- FC

Work Order Number: 0910289

Client Name: Colorado Oil & Gas Conservation Commission

ClientProject ID: Complaint 200221032

Lab ID: FM91104-1LCS

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 11/05/2009

Date Analyzed: 11/06/2009

Prep Method: EPA200.22.8

Prep Batch: IP091105-3

QCBatchID: IP091105-3-2

Run ID: IM091106-1A2

Cleanup: NONE

Basis: N/A

File Name: 06NOV09A

Sample Aliquot: 50 g

Final Volume: 50 g

Result Units: UG/L

Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7440-36-0	ANTIMONY	20	20	0.3		100	85 - 115%
7440-38-2	ARSENIC	40	38.1	2		95	85 - 115%
7440-43-9	CADMIUM	20	19.9	0.3		100	85 - 115%
7439-92-1	LEAD	100	99.2	0.5		99	85 - 115%
7439-98-7	MOLYBDENUM	20	19.7	1		98	85 - 115%
7782-49-2	SELENIUM	40	35.8	1		89	85 - 115%
7440-22-4	SILVER	20	20	0.1		100	85 - 115%
7440-28-0	THALLIUM	1	0.849	0.2		85	85 - 115%
7440-61-1	URANIUM	20	19.6	0.1		98	85 - 115%

Data Package ID: IM0910289-1

Date Printed: Monday, November 09, 2009

ALS Laboratory Group -- FC

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