Metals

Case Narrative

Stoller-Grand Junction Team

Riverton – RIN# 12054532

Work Order Number: 1205086

1. This report consists of 6 water samples.

2. The samples were received intact at ambient temperature by ALS on 5/4/12.

3. The samples had a pH less than 2 upon receipt.

4. The samples were prepared and analyzed based on SW-846, 3rd Edition procedures.

   For analysis by ICP-MS, the samples were digested following method 3005A and the current revision of SOP 806.

5. Analysis by ICP-MS followed method 6020A and the current revision of SOP 827.

6. All standards and solutions are NIST traceable and were used within their recommended shelf life.

7. The samples were 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 preparation (method) blank and laboratory control sample were digested and analyzed with the samples in this digestion batch.
   - The preparation (method) blank associated with this digestion batch was below the practical quantitation limit for the requested analyte.
   - All laboratory control sample criteria were met.

- All initial and continuing calibration blanks were below the practical quantitation limit for the requested analyte.
- All initial and continuing calibration verifications were within the acceptance criteria for the requested analyte.
- The interference check samples associated with Method 6020A were analyzed.

9. Matrix specific quality control procedures.

   Sample 1205086-1 was designated as the quality control sample for this analysis. Due to limited sample volume, matrix QC consisted of a sample duplicate, serial dilution, and a post spike.

   Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

   - A post spike was digested and analyzed with this batch. All acceptance criteria for accuracy were met.
   - A sample duplicate was digested and analyzed with this batch. All acceptance criteria for precision were met.
   - A serial dilution was analyzed with this ICP-MS batch. All acceptance criteria were met.

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

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.

Jill Latelle — 5-7-12
Jill Latelle — Date
Inorganics Primary Data Reviewer

Inorganics Final Data Reviewer — 5/7/12
Date

Inorganic Data Reporting Qualifiers

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

- Result qualifier -- A “B” is entered if the reported value was obtained from a reading that was less than the Practical Quantitation Limit but greater than or equal to the Instrument Detection Limit (IDL). If the analyte was analyzed for but not detected a “U” is entered. For samples, negative values are reported as non-detects (“U” flagged). For blanks, if the absolute value of the negative value is above the IDL and below the practical quantitation limit, then the result is “B” flagged.

- 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.

Chain of Custody

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1205086
Client Name: Stoller-Grand Junction Team
Client Project Name: Riverton
Client Project Number: RIN# 12054532
Client PO Number: 3862

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
0813	1205086-1	KGT 506	WATER	03-May-12	11:20
0817	1205086-2	KGT 507	WATER	03-May-12	12:20
0815	1205086-3	KGT 508	WATER	03-May-12	11:40
0816	1205086-4	KGT 509	WATER	03-May-12	12:00
2339	1205086-5	KGT 510	WATER	03-May-12	12:10
0837	1205086-6	KGT 526	WATER	03-May-12	11:30

Stoller

Legacy Management Team

Chain of Custody / Sample Submittal Form

RIN: 12054532 **COC:** 12054532.1.1

PO #: 3862 **Cost Number:** 1-501-1-02-117-4-02 **Sampler(s):** 1205086

Project: Riverton **Laboratory:** ALS Laboratory Group

Address: 225 Commerce Dr. **Phone:** 970.490.1511

Matrix: WA - Water **Turnaround (Days):** 2 Ft. Collins, CO 80524 **Fax:** 970.490.1522

	Ship #	Ticket Number	Date / Time Sampled	Site	Location	Container	# Cont.	Preservation	Matrix	Comp.	Grab	Filtered	QC	Analysis
1	1	KGT 506	5/3/12-1120	RVT01	0813	HDPE 125 mL	1	HNO3	WA			N	U	
2	1	KGT 507	5/3/12-1220	RVT01	~~0814~~ 0817	HDPE 125 mL	1	HNO3	WA			N	U	
3	1	KGT 508	5/3/12-1140	RVT01	0815	HDPE 125 mL	1	HNO3	WA			N	U	
4	1	KGT 509	5/3/12-1200	RVT01	0816	HDPE 125 mL	1	HNO3	WA			N	U	
5	1	KGT 510	5/3/12-1210	RVT01	2339	HDPE 125 mL	1	HNO3	WA			N	U	
6	1	KGT526	5/3/12 1130	RVT01	0837	HDPE125mL	1	HNO3	WA			N	U	

Relinquished by (signature)	Date	Time	Relinquished by (signature)	Date	Time	Relinquished by (signature)	Date	Time
[signature]	5/3/12	1240						
Received by (signature)	**Date**	**Time**	**Received by (signature)**	**Date**	**Time**	**Received by (signature)**	**Date**	**Time**
Kandi Bacon	5/4/12	0955						

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Stoller (ST) Workorder No: 1205086

Project Manager: LS Initials: KB Date: 5-4-12

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

Cooler #:	1								
Temperature (°C):	Amb.	19.8							
No. of custody seals on cooler:	2								
DOT Survey/ Acceptance Information — External µR/hr reading:	10								
Background µR/hr reading:	11								

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

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

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: 5/4/12

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r22.xls (6/1/09)

1205086

FedEx® US Airbill Express

FedEx Tracking Number 8735 6490 2834

Form ID No. 0215

Recipient's Copy

1 From This portion can be removed for Recipient's records.

Date

FedEx Tracking Number 873564902834

Sender's Name DAN UNDERWOOD Phone 970 248-6628

Company S M STOLLER CORPORATION GOVT

Address 2597 [redacted] Legacy Way

Dept./Floor/Suite/Room

City GRAND JUNCTION State CO ZIP 81503

2 Your Internal Billing Reference

3 To

Recipient's Name SAMPLE Receipt Phone 970 490-1511

Company ALS LABORATORY Group

Address 225 Commerce Dr

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Address

Use this line for the HOLD location address or for continuation of your shipping address.

City Fort Collins State CO ZIP 80524

HOLD Weekday
FedEx location address REQUIRED. **NOT available for** FedEx First Overnight.

HOLD Saturday
FedEx location address REQUIRED. **Available ONLY for** FedEx Priority Overnight and FedEx 2Day to select locations.

0425838600

8735 6490 2834

4a Express Package Service * To most locations. *Packages up to 150 lbs.*

- [X] FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- [ ] FedEx First Overnight — Earliest next business morning delivery to select locations.*
- [ ] FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Express Saver — Third business day.* Saturday Delivery NOT available.

4b Express Freight Service ** To most locations. *Packages over 150 lbs.*

- [ ] FedEx 1Day Freight — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected. FedEx 1Day Freight Booking No.
- [ ] FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

5 Packaging * Declared value limit $500.

- [ ] FedEx Envelope*
- [ ] FedEx Pak* — Includes FedEx Small Pak and FedEx Large Pak.
- [ ] FedEx Box
- [ ] FedEx Tube
- [ ] Other

10.2

6 Special Handling and Delivery Signature Options

- [ ] SATURDAY Delivery — **NOT available for** FedEx Standard Overnight, FedEx Express Saver, or FedEx 3Day Freight.
- [ ] No Signature Required — Package may be left without obtaining a signature for delivery.
- [ ] Direct Signature — Someone at recipient's address may sign for delivery. ***Fee applies.***
- [ ] Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. ***Fee applies.***

Does this shipment contain dangerous goods? One box must be checked.

- [X] No
- [ ] Yes — As per attached Shipper's Declaration.
- [ ] Yes — Shipper's Declaration not required.
- [ ] Dry Ice — Dry Ice, 9, UN 1845 ____ x ____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box.

- [ ] Cargo Aircraft Only

7 Payment *Bill to:* Enter FedEx Acct. No. or Credit Card No. below. Obtain recip. Acct. No. [ ]

- [X] Sender — Acct. No. in Section 1 will be billed.
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

[redacted]

Total Packages ____ Total Weight ____ lbs. Credit Card Auth. ____

†Our liability is limited to $100 unless you declare a higher value. See the current FedEx Service Guide for details.

605

Rev. Date 2/10 • Part #158279 • ©1994–2010 FedEx • PRINTED IN U.S.A. SRS

fedex.com 1.800.GoFedEx 1.800.463.3339

Sample Results

Total Recoverable URANIUM

Method SW6020A

Sample Results

Lab Name: ALS Environmental -- FC
Client Name: Stoller-Grand Junction Team
Client Project ID: Riverton RIN# 12054532
Work Order Number: 1205086
Reporting Basis: As Received
Analyst: Ross Miller

Final Volume: 50 g
Matrix: WATER
Result Units: UG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	Reporting Limit	IDL	Flag	Sample Aliquot
0813	1205086-1	5/3/2012	5/4/2012	05/07/2012	N/A	10	0.1	0.1	0.029		50 g
0817	1205086-2	5/3/2012	5/4/2012	05/07/2012	N/A	10	0.11	0.1	0.029		50 g
0815	1205086-3	5/3/2012	5/4/2012	05/07/2012	N/A	10	0.1	0.1	0.029		50 g
0816	1205086-4	5/3/2012	5/4/2012	05/07/2012	N/A	10	0.09	0.1	0.029	B	50 g
2339	1205086-5	5/3/2012	5/4/2012	05/07/2012	N/A	10	0.1	0.1	0.029		50 g
0837	1205086-6	5/3/2012	5/4/2012	05/07/2012	N/A	10	0.1	0.1	0.029		50 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *im1205086-1*

Summary Report Forms

ICPMS Metals

Method SW6020A

Method Blank

Lab Name: ALS Environmental -- FC

Work Order Number: 1205086

Client Name: Stoller-Grand Junction Team

ClientProject ID: Riverton RIN# 12054532

Lab ID: IP120504-2MB

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 04-May-12
Date Analyzed: 07-May-12

Prep Batch: IP120504-2
QCBatchID: IP120504-2-3
Run ID: IM120507-10A2
Cleanup: NONE
Basis: N/A
File Name: 013SMPL.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: UG/L
Clean DF: 1

CASNO	Target Analyte	DF	Result	Reporting Limit	IDL	Result Qualifier	EPA Qualifier
7440-61-1	URANIUM	10	0.029	0.1	0.029	U	

Data Package ID: *im1205086-1*

ICPMS Metals

Method SW6020A

Laboratory Control Sample

Lab Name: ALS Environmental -- FC
Work Order Number: 1205086
Client Name: Stoller-Grand Junction Team
ClientProject ID: Riverton RIN# 12054532

Lab ID: IM120504-2LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 05/04/2012
Date Analyzed: 05/07/2012
Prep Method: SW3005A

Prep Batch: IP120504-2
QCBatchID: IP120504-2-3
Run ID: IM120507-10A2
Cleanup: NONE
Basis: N/A
File Name: 014SMPL.

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
7440-61-1	URANIUM	10	10.1	0.1		101	80 - 120%

Data Package ID: *im1205086-1*

ICPMS Metals

Method SW6020

Analytical Spike Sample Recovery

Lab Name: ALS Environmental -- FC

Work Order Number: 1205086

Client Name: Stoller-Grand Junction Team

ClientProject ID: Riverton RIN# 12054532

Field ID: 0813

LabID: 1205086-1A

Run ID: IM120507-10A2

Date Analyzed: 07-May-12

Result Units: ug/l

Target Analyte	Sample Result	Samp Qual	PS Result	PS Qual	Spike Added	PS % Rec.	Control Limits
URANIUM	0.0100		2.04		2	101	75 - 125%

Data Package ID: *im1205086-1*

ICPMS Metals

Method SW6020

Duplicate Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1205086
Client Name: Stoller-Grand Junction Team
ClientProject ID: Riverton RIN# 12054532

Field ID: 0813
Lab ID: 1205086-1D

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 05/03/2012
Date Extracted: 05/04/2012
Date Analyzed: 05/07/2012

Prep Batch: IP120504-2
QCBatchID: IP120504-2-3
Run ID: IM120507-10A2
Cleanup: NONE
Basis: As Received
File Name: 018SMPL.

Sample Aliquot: 50 g
Final Volume: 50 g
Result Units: UG/L
Clean DF: 1

CASNO	Target Analyte	Sample Result	Samp Qual	Duplicate Result	Dup Qual	Reporting Limit	Dilution Factor	RPD	RPD Limit
7440-61-1	URANIUM	0.1		0.1		0.1	10		20

Data Package ID: *im1205086-1*

ICPMS Metals

Method SW6020

Serial Dilution

Lab Name: ALS Environmental -- FC

Work Order Number: 1205086

Client Name: Stoller-Grand Junction Team

ClientProject ID: Riverton RIN# 12054532

Field ID: 0813

Lab ID: 1205086-1L

Run ID: IM120507-10A2

Date Analyzed: 07-May-12

Result Units: ug/l

CASNO	Target Analyte	Sample Result	Samp Qual	SD Result	SD Qual	EPA Qualifier	%D
7440-61-1	URANIUM	0.0100		0.0146	U		

Data Package ID: *im1205086-1*

Prep Batch ID: IP120504-2

Start Date: 05/04/12
Start Time: 13:00
Prep Analyst: Brent A. Stanfield

End Date: 05/04/12
End Time: 17:00

Concentration Method: NONE
Extract Method: SW3005A
Initial Volume Units: g
Final Volume Units: g

Batch Created By: bas
Date Created: 05/04/12
Time Created: 12:59
Validated By: bas
Date Validated: 05/04/12
Time Validated: 13:26

Comments:

QC Batch ID: IP120504-2-3

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
IP120504-2	MB	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1205086
IM120504-2	LCS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1205086
1205086-1	DUP	0813	WATER	5/3/2012	50	50	NONE	1	1205086
1205086-1	SMP	0813	WATER	5/3/2012	50	50	NONE	1	1205086
1205086-2	SMP	0817	WATER	5/3/2012	50	50	NONE	1	1205086
1205086-3	SMP	0815	WATER	5/3/2012	50	50	NONE	1	1205086
1205086-4	SMP	0816	WATER	5/3/2012	50	50	NONE	1	1205086
1205086-5	SMP	2339	WATER	5/3/2012	50	50	NONE	1	1205086
1205086-6	SMP	0837	WATER	5/3/2012	50	50	NONE	1	1205086

QC Types

CAR	Carrier reference sample	DUP	Laboratory Duplicate
LCS	Laboratory Control Sample	LCSD	Laboratory Control Sample Duplicat
MB	Method Blank	MS	Laboratory Matrix Spike
MSD	Laboratory Matrix Spike Duplicate	REP	Sample replicate
RVS	Reporting Level Verification Standar	SMP	Field Sample
SYS	Sample Yield Spike		

URANIUM

Method SW6020

Calibration Verifications

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1205086
Client Name: Stoller-Grand Junction Team
ClientProject ID: Riverton RIN# 12054532

Run ID: IM120507-10A2
Result Units: ug/l

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Spike Added	Result	Reporting Limit	Result Qualifier	% Rec.	Control Limits
ICV	Initial Calibration	5/7/2012	10:09	2	1.90	0.01	N/A	95	90 - 110
CCV1	Continuing Calibration	5/7/2012	10:22	1	1.01	0.01	N/A	101	90 - 110
CCV2	Continuing Calibration	5/7/2012	10:47	1	1.02	0.01	N/A	102	90 - 110

Data Package ID: *im1205086-1*

URANIUM

Method SW6020

Calibration Blanks

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1205086
Client Name: Stoller-Grand Junction Team
ClientProject ID: Riverton RIN# 12054532

Run ID: IM120507-10A2
Result Units: ug/l

Lab ID	Verification Type	Date Analyzed	Time Analyzed	Result	Reporting Limit	Flag
ICB	Initial Calibration	5/7/2012	10:11	0.00292	0.01	U
CCB1	Continuing Calibration	5/7/2012	10:24	0.00292	0.01	U
CCB2	Continuing Calibration	5/7/2012	10:49	0.00292	0.01	U

Data Package ID: *im1205086-1*

ICPMS Metals

Method SW6020

CRDL Standard

Lab Name: **ALS Environmental -- FC**

Work Order Number: 1205086

Client Name: Stoller-Grand Junction Team

ClientProject ID: Riverton RIN# 12054532

Lab ID: CRI1

Run ID: IM120507-10A2

Date Analyzed: 05/07/2012

Result Units: ug/l

CASNO	Target Analyte	Spike Added	Result	Reporting Limit	% Rec.
7440-61-1	URANIUM	0.01	0.009	0.01	90

Data Package ID: *im1205086-1*

ICPMS Metals

Method SW6020

ICP Interference Check Sample

Lab Name: **ALS Environmental -- FC**

Work Order Number: 1205086

Client Name: Stoller-Grand Junction Team

ClientProject ID: Riverton RIN# 12054532

Run ID: IM120507-10A2

Date Analyzed: 05/07/2012

Result Units: ug/l

CASNO	Target Analyte	Spike Added		Results		% Rec.
		ICSA1	ICSAB1	ICSA1	ICSAB1	
7440-61-1	URANIUM		1		1.04	104

Data Package ID: *im1205086-1*

Metals Linear Ranges

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1205086
Client Name: Stoller-Grand Junction Team
ClientProject ID: Riverton RIN# 12054532

Instrument ID: ICPMS2
Active Date: 04/01/2010
Expiration Date: 04/01/2015

CASNO	Target Analyte	Concentration (ppm)
7440-61-1	URANIUM	0.1

ICPMS2 Run Log -- 5/7/2012

Instrument ID: ICPMS2
File Name: 003CALB.
AnalRunID: IM120507-10A1
CalibRefID: IM120507-10A1

Comment	Field ID	Lab ID	DF	Date Analyzed	Time Analyzed
		blank	1	5/7/2012	09:59
		H/1000	1	5/7/2012	10:01
		H/100	1	5/7/2012	10:03
		H/10	1	5/7/2012	10:05
		HIGH	1	5/7/2012	10:07
		ICV	1	5/7/2012	10:09
		ICB	1	5/7/2012	10:11
		CRI1	1	5/7/2012	10:13
		ICSA1	1	5/7/2012	10:15
		ICSAB1	1	5/7/2012	10:17
		IP120504-2MB	10	5/7/2012	10:19
		IM120504-2LCS	10	5/7/2012	10:20
		CCV1	1	5/7/2012	10:22
		CCB1	1	5/7/2012	10:24
	0813	1205086-1	10	5/7/2012	10:30
	0813	1205086-1DUP	10	5/7/2012	10:32
	0813	1205086-1SER	50	5/7/2012	10:33
	0813	1205086-1A	10	5/7/2012	10:35
	0817	1205086-2	10	5/7/2012	10:37
	0815	1205086-3	10	5/7/2012	10:39
	0816	1205086-4	10	5/7/2012	10:41
	2339	1205086-5	10	5/7/2012	10:43
	0837	1205086-6	10	5/7/2012	10:45
		CCV2	1	5/7/2012	10:47
		CCB2	1	5/7/2012	10:49

Data Package ID: IM1205086-1

Raw Data

Header Information for Analytical Sequence 12E07j00

Instrument: Agilent ICPMS Model 7700X; Serial No. JP09400112
Software Revision: B.01.01
Date of Analysis: 05/07/2012
Analyst: Ross Miller

Calibration Standards

High Calibration Standard: ST100324-6 (expires 2/28/2015)
This standard contains the following elements at the listed concentrations (ng/ml).

100000	50000	10000	5000	2000	1000	500	200	100	50	30	10	2
Na	Ca	Mg	Fe	Zn	B	Cr	Mn	V	Pb	Sb	Th	Tl
	K		Al	Ti	Cu	Ni		Co	Be	Cd	U	
					Li	Sn		As		Y	Ag	
								Se		La		
								Mo		Ce		
								Ba		Pr		
								Sr		Nd		

1/10,1/100, and 1/1000 dilutions of the High Calibration Standard are prepared daily to provide additional calibration standards.

ICV

The ICV is prepared by diluting 1ml of the 2nd Source intermediate (ST110707-8, expires 06/20/2012) to 5ml giving the following concentrations (ng/ml).

20000	10000	2000	1000	400	200	100	40	20	10	6	2	0.4
Na	Ca	Mg	Fe	Zn	B	Cr	Mn	V	Pb	Sb	Th	Tl
	K		Al	Ti	Cu	Ni		Co	Be	Cd	U	
					Li	Sn		As		Y	Ag	
								Se		La		
								Mo		Ce		
								Ba		Pr		
								Sr		Nd		

CRI1

The RL1 is prepared by diluting 0.05ml of the Reporting Limit Verification Spike Solution (ST100324-9 expires 2/28/2015) to 50ml giving the following concentrations (ng/ml).

100	50	10	5	2	1	0.5	0.2	0.1	0.05	0.03	0.02	0.01
Na	Ca	Mg	Al	Zn	B	Cr	Mn	V	Pb	Sb	Th	U
	K		Fe	Ti	Cu	Ni		Co	Be	Cd	Tl	Ag
					Li	Sn		As		Y		
								Se		La		
								Mo		Ce		
								Ba		Pr		
								Sr		Nd		

CRI2

The RL2 is prepared by diluting 0.1ml of the Reporting Limit Verification Spike Solution (ST100324-9 expires 2/28/2015) to 50ml giving the following concentrations (ng/ml).

200	100	20	10	4	2	1	0.4	0.2	0.1	0.06	0.04	0.02
Na	Ca	Mg	Al	Zn	B	Cr	Mn	V	Pb	Sb	Th	U
	K		Fe	Ti	Cu	Ni		Co	Be	Cd	Tl	Ag
					Li	Sn		As		Y		
								Se		La		
								Mo		Ce		
								Ba		Pr		
								Sr		Nd		

ICSA

The ICSA is prepared by diluting 0.5ml of ICSA intermediate (ST111103-1, expires 12/01/12) to a final volume of 50ml giving the following concentrations (ng/ml).

42.5×10^6	30000	25000	20000	10000	200
Cl	Ca	Fe	C	Al	Mo
		Na		K	Ti
				Mg	
				P	
				S	

ICSAB

The ICSAB is prepared by diluting 0.5ml of ICSA intermediate (ST111103-1, expires 12/01/12) and 5ml of High Calibration Standard: ST100324-6 (expires 2/28/2015) to a final volume of 50ml. The ICSAB contains the following elements at the listed concentrations (ng/ml).

$42.5X10^6$	35000	25500	20000	15000	11000	10500	10000	400	210
Cl	Ca	Fe	C	K	Mg	Al	P	Ti	Mo
	Na						S		

200	100	50	20	10	5	3	1	0.2
Zn	B	Cr	Mn	V	Pb	Sb	Th	Tl
	Cu	Ni		Co	Be	Cd	U	
	Li	Sn		As		Y	Ag	
				Se		La		
				Ba		Ce		
				Sr		Pr		
						Nd		

CCV

The CCV is prepared by diluting 5ml of the High Calibration Standard: ST100324-6 (expires 2/28/2015) to a final volume of 50ml. The CCV contains the following elements at the listed concentrations (ng/ml).

10000	5000	1000	500	200	100	50	20	10	5	3	1	0.2
Na	Ca	Mg	Fe	Zn	B	Cr	Mn	V	Pb	Sb	Th	Tl
	K		Al	Ti	Cu	Ni		Co	Be	Cd	U	
					Li	Sn		As		Y	Ag	
								Se		La		
								Mo		Ce		
								Ba		Pr		
								Sr		Nd		

Linear Dynamic Range Standards

LDR-Ca,Na,K

The LDR-Ca,Na,K standard is prepared by diluting 1ml of the High Calibration Standard Intermediate Mix (ST100324-5, expires 2/28/2015) to a final volume of 10ml. The LDR-Ca,Na,K standard contains the following elements at the listed concentrations (ng/ml).

100000	50000	20000	10000	5000	2000	1000	500	300	100	20
Mg	Fe	Zn	B	Cr	Mn	V	Pb	Sb	Th	Tl
	Al	Ti	Cu	Ni		Co	Be	Cd	U	
			Li	Sn		As		Y	Ag	
						Se		La		
						Mo		Ce		
						Ba		Pr		
						Sr		Nd		

1000 Na

The 1000 Na standard is prepared by diluting 1ml of the 10000mg/L Na stock solution (ST100301-26, expires 2/28/2015) to a final volume of 10ml. The 1000 Na standard contains Na at 1000000 ng/ml.

500 Ca

The 500 Ca standard is prepared by diluting 0.5ml of the 10000mg/L Ca stock solution (ST100301-9, expires 2/28/2015) to a final volume of 10ml. The 500 Ca standard contains Ca at 500000 ng/ml.

500 K

The 500 K standard is prepared by diluting 0.5ml of the 10000mg/L K stock solution (ST100301-22, expires 2/28/2015) to a final volume of 10ml. The 500 K standard contains K at 500000 ng/ml.

Linear Dynamic Range

The instrument Linear Dynamic Range (LDR) is determined at least every 6 months. The current LDR was determined on 02/13/2012. The instrument LDR is given below (ng/ml).

1000000	500000	100000	50000	20000	10000	5000	2000	1000	500	300	100	20
Na	Ca	Mg	Fe	Zn	B	Cr	Mn	V	Pb	Sb	Th	Tl
	K		Al	Ti	Cu	Ni		Co	Be	Cd	U	
					Li	Sn		As		Y	Ag	
								Se		La		
								Mo		Ce		
								Ba		Pr		
								Sr		Nd		

ICB/CCB and all diluent

1% HNO_3, 1%HCl in double deionized water

HNO_3 Lot No. K23022
HCl Lot No. K33031

Internal Standards

The internal standard intermediate contains 2 PPM each of Ga, Ge and Pt; 1 PPM each of In and Rh and 0.5 PPM of Bi. This intermediate is added to all standards and samples in the same proportion of 1 on top of 100. Most often this is done by adding 0.05ml of internal standard intermediate on top of 5ml of sample or standard. The final concentration of internal standard added to the standards or samples is about 20ppb each of Ga, Ge and Pt; 10ppb each of In and Rh; and 5ppb of Bi.

Pipet ID Numbers

1.0 to 5.0 ml -- M-66
0.1 to 1.0ml -- M-60
0.01 to 0.1ml -- M-56
0.5ml -- M-14

Dilutions

2X dilutions made by diluting 5ml of sample to 10ml final volume
5X dilutions made by diluting 1ml of sample to 5ml final volume
10X dilutions made by diluting 1ml of sample to 10ml final volume
50X dilutions made by diluting 0.1ml of sample to 5ml final volume
100X dilutions made by diluting 0.1ml of sample to 10ml final volume
200X dilutions made by diluting 0.05ml of sample to 10ml final volume
500X dilutions made by diluting 0.02ml of sample to 10ml final volume

Analytical Spikes

1205086-1 post spiked by diluting 0.02ml of ST100407-8 up to a 5ml final volume with the ten fold dilution of the sample digestate.

Daily Maintenance Items

1. Check / change pump tubing
2. Check / clean drain containers
3. Tune instrument per manufacturer's procedures
4. Perform resolution / mass calibration / stability test and print QC tune report

Monthly Maintenance Items

1. Check / clean torch and cones
2. Check / clean nebulizer and spray chamber
3. Check / fill water recirculating reservoir
4. Check / fill vacuum pump oil

Additional Comments

No additional comments.

QC Tune Report

Data File: C:\ICPMH\1\7500\QCTUNE.D
Date Acquired: 7 May 2012 09:35:01 am
Operator:
Misc Info:
Vial Number: 0
Current Method: C:\ICPMH\1\METHODS\2008TUNE.m

Minimum Response(CPS)

Element	Actual	Required	Flag

RSD (%)

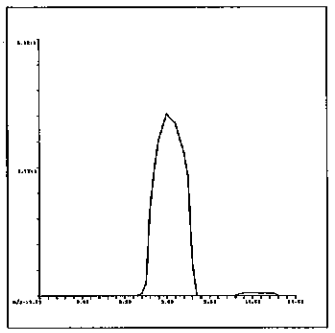
Element	Actual	Required	Flag
9 Be	3.33	5.00	
24 Mg	1.15	5.00	
25 Mg	1.73	5.00	
26 Mg	1.14	5.00	
59 Co	0.86	5.00	
115 In	0.63	5.00	
206 Pb	1.27	5.00	
207 Pb	1.75	5.00	
208 Pb	0.77	5.00	

Ion Ratio

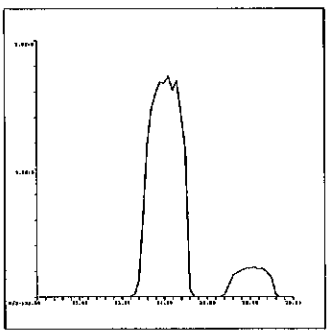
Element	Actual	Required	Flag

Maximum Bkg. Count(CPS)

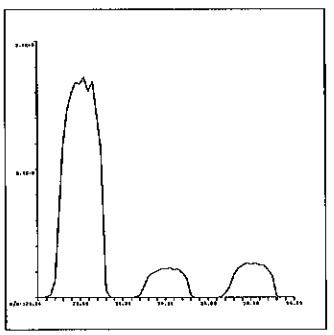
Element	Actual	Required	Flag



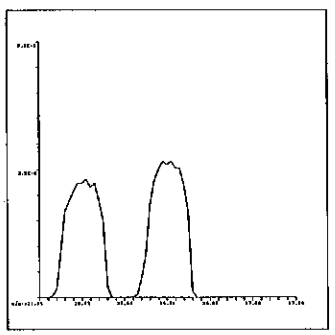
9 Be
Mass Calib.
Actual: 9.05
Required: 8.90-9.10
Flag:
Peak Width
Actual: 0.55
Required: 0.80
Flag:



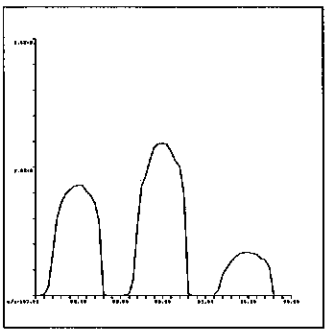
24 Mg
Mass Calib.
Actual: 24.05
Required: 23.90-24.10
Flag:
Peak Width
Actual: 0.55
Required: 0.80
Flag:



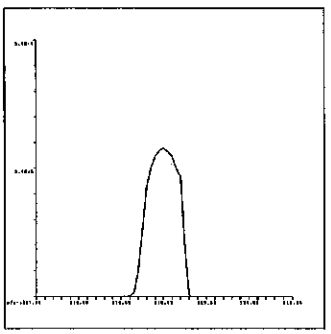
25 Mg
Mass Calib.
Actual: 25.05
Required: 24.90-25.10
Flag:
Peak Width
Actual: 0.60
Required: 0.80
Flag:



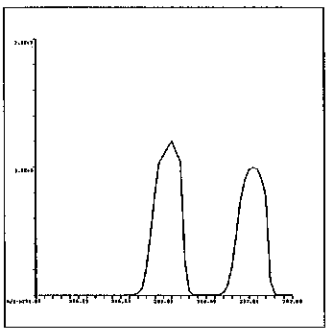
26 Mg
Mass Calib.
Actual: 26.05
Required: 25.90-26.10
Flag:
Peak Width
Actual: 0.55
Required: 0.80
Flag:



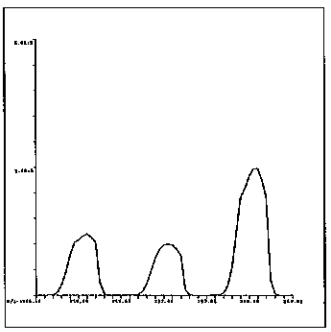
59 Co
Mass Calib.
Actual: 59.00
Required: 58.90-59.10
Flag:
Peak Width
Actual: 0.60
Required: 0.80
Flag:



115 In
Mass Calib.
Actual: 115.00
Required: 114.90-115.10
Flag:
Peak Width
Actual: 0.55
Required: 0.80
Flag:

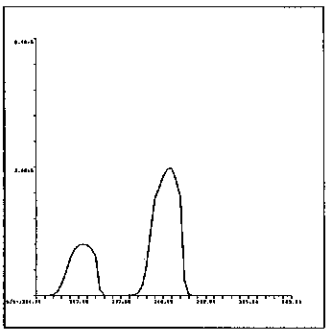


206 Pb
Mass Calib.
Actual: 206.10
Required: 205.90-206.10
Flag:
Peak Width
Actual: 0.45
Required: 0.80
Flag:



207 Pb
Mass Calib.
Actual: 207.05
Required: 206.90-207.10
Flag:
Peak Width
Actual: 0.50
Required: 0.80
Flag:

C:\ICPMH\1\7500\QCTUNE.D



208 Pb
Mass Calib.
Actual: 208.05
Required: 207.90-208.10
Flag:
Peak Width
Actual: 0.50
Required: 0.80
Flag:

QC Tune Result:Pass

Batch Summary Report

Batch Folder: C:¥ICPMH¥1¥DATA¥12E07j00.B¥
Analysis File: 12E07j00.batch.xml
Tune Step: #1 nogas.u

	Rjct	Acq. Date-Time	Data File	Sample Name	Type	Level	Dilution
1		5/7/2012 9:55:59 AM	001SMPL.D	blank	Sample		1.0000
2		5/7/2012 9:57:56 AM	002CALB.D	blank	CalBlk	1	1.0000
3		5/7/2012 9:59:53 AM	003CALB.D	blank	CalBlk	1	1.0000
4		5/7/2012 10:01:49 AM	004CALS.D	H/1000	CalStd	2	1.0000
5		5/7/2012 10:03:43 AM	005CALS.D	H/100	CalStd	3	1.0000
6		5/7/2012 10:05:38 AM	006CALS.D	H/10	CalStd	4	1.0000
7		5/7/2012 10:07:32 AM	007CALS.D	HIGH	CalStd	5	1.0000
8		5/7/2012 10:09:26 AM	008SMPL.D	ICV	Sample		1.0000
9		5/7/2012 10:11:24 AM	009SMPL.D	ICB	Sample		1.0000
10		5/7/2012 10:13:21 AM	010SMPL.D	CRI1	Sample		1.0000
11		5/7/2012 10:15:16 AM	011SMPL.D	ICSA	Sample		1.0000
12		5/7/2012 10:17:10 AM	012SMPL.D	ICSAB	Sample		1.0000
13		5/7/2012 10:19:04 AM	013SMPL.D	IP120504-2MB 10X	Sample		1.0000
14		5/7/2012 10:20:58 AM	014SMPL.D	IM120504-2LCS 10X	Sample		1.0000
15		5/7/2012 10:22:53 AM	015SMPL.D	CCV	Sample		1.0000
16		5/7/2012 10:24:49 AM	016SMPL.D	CCB	Sample		1.0000
17		5/7/2012 10:30:06 AM	017SMPL.D	1205086-1 10X	Sample		1.0000
18		5/7/2012 10:32:01 AM	018SMPL.D	1205086-1D 10X	Sample		1.0000
19		5/7/2012 10:33:56 AM	019SMPL.D	1205086-1L 50X	Sample		1.0000
20		5/7/2012 10:35:52 AM	020SMPL.D	1205086-1A 10X	Sample		1.0000
21		5/7/2012 10:37:46 AM	021SMPL.D	1205086-2 10X	Sample		1.0000
22		5/7/2012 10:39:42 AM	022SMPL.D	1205086-3 10X	Sample		1.0000
23		5/7/2012 10:41:38 AM	023SMPL.D	1205086-4 10X	Sample		1.0000
24		5/7/2012 10:43:34 AM	024SMPL.D	1205086-5 10X	Sample		1.0000
25		5/7/2012 10:45:33 AM	025SMPL.D	1205086-6 10X	Sample		1.0000
26		5/7/2012 10:47:27 AM	026SMPL.D	CCV	Sample		1.0000
27		5/7/2012 10:49:26 AM	027SMPL.D	CCB	Sample		1.0000

Analyte Table

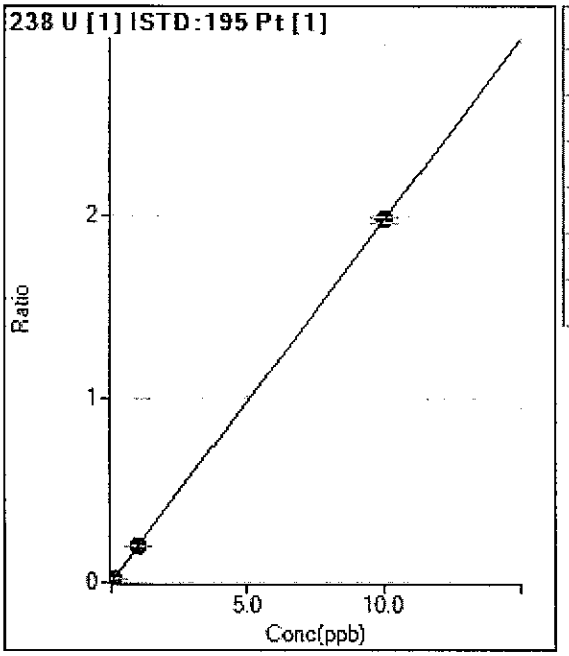
		238 U [1]	
	Sample Name	Conc. [ppb]	CPS
1	blank		64.45
2	blank	0.001	80.00
3	blank	0.000	43.33
4	H/1000	0.010	518.91
5	H/100	0.100	4437.40
6	H/10	1.001	46549.08
7	HIGH	10.000	458269.29
8	ICV	1.905	89068.53
9	ICB	0.000	63.33
10	CRI1	0.009	458.90
11	ICSA	0.000	54.45
12	ICSAB	1.036	47441.97
13	IP120504-2MB ...	0.000	63.33
14	IM120504-2LCS...	1.013	51065.27
15	CCV	1.009	46181.40
16	CCB	0.001	75.55
17	1205086-1 10X	0.010	493.35
18	1205086-1D 10X	0.010	498.90
19	1205086-1L 50X	0.002	140.00
20	1205086-1A 10X	2.035	94492.77
21	1205086-2 10X	0.011	527.79
22	1205086-3 10X	0.010	501.13
23	1205086-4 10X	0.009	455.57
24	1205086-5 10X	0.010	486.68
25	1205086-6 10X	0.010	493.35
26	CCV	1.020	48343.02
27	CCB	0.000	57.78

ISTD Table

		103 Rh (ISTD) [1]		115 In (ISTD) [1]		195 Pt (ISTD) [1]		209 Bi (ISTD) [1]	
	Sample Name	CPS	Recovery%	CPS	Recovery%	CPS	Recovery%	CPS	Recovery%
1	blank	491479.75		544579.30		207235.17		184751.51	
2	blank	493802.78	100.0	542312.12	100.0	208756.72	100.0	181289.77	100.0
3	blank	491626.86	100.0	542041.75	100.0	207604.37	100.0	182091.09	100.0
4	H/1000	562804.42	114.5	624087.76	115.1	237881.26	114.6	208951.52	114.8
5	H/100	529291.33	107.7	588107.21	108.5	222884.15	107.4	198335.37	108.9
6	H/10	550397.92	112.0	617110.99	113.8	235505.94	113.4	203930.83	112.0
7	HIGH	526891.46	107.2	597264.84	110.2	232060.01	111.8	198117.65	108.8
8	ICV	553180.81	112.5	612577.45	113.0	236595.74	114.0	204312.91	112.2
9	ICB	489266.91	99.5	540513.52	99.7	209402.11	100.9	182357.15	100.1
10	CRI1	517733.87	105.3	572378.68	105.6	220715.98	106.3	194288.91	106.7
11	ICSA	539006.72	109.6	613409.01	113.2	234340.78	112.9	207092.91	113.7
12	ICSAB	538597.95	109.6	612126.35	112.9	231598.82	111.6	204133.63	112.1
13	IP120504-2MB ...	487685.77	99.2	538665.94	99.4	209482.85	100.9	184557.53	101.4
14	IM120504-2LCS...	593175.42	120.7	657171.07	121.2	254881.24	122.8	221356.18	121.6
15	CCV	541000.36	110.0	607366.35	112.1	231625.69	111.6	206206.72	113.2
16	CCB	484487.54	98.5	534731.58	98.7	209027.66	100.7	181509.75	99.7
17	1205086-1 10X	542891.42	110.4	604132.33	111.5	233632.26	112.5	208762.00	114.6
18	1205086-1D 10X	541382.33	110.1	606067.74	111.8	235370.41	113.4	205437.54	112.8
19	1205086-1L 50X	525887.78	107.0	585689.16	108.1	224706.83	108.2	200013.51	109.8
20	1205086-1A 10X	548705.81	111.6	615653.65	113.6	235049.55	113.2	206295.93	113.3
21	1205086-2 10X	531198.34	108.0	594267.97	109.6	228109.61	109.9	203005.54	111.5
22	1205086-3 10X	521395.57	106.1	586248.06	108.2	227728.11	109.7	200466.35	110.1
23	1205086-4 10X	521760.71	106.1	585771.27	108.1	225803.20	108.8	196753.30	108.1
24	1205086-5 10X	528260.72	107.5	590048.09	108.9	227959.44	109.8	200890.68	110.3
25	1205086-6 10X	529722.04	107.7	594693.86	109.7	227184.28	109.4	201259.78	110.5
26	CCV	556451.45	113.2	615806.73	113.6	239772.57	115.5	210927.95	115.8
27	CCB	485189.93	98.7	533438.84	98.4	206063.12	99.3	182823.85	100.4

Batch Folder: C:¥ICPMH¥1¥DATA¥12E07j00.B¥
Analysis File: 12E07j00.batch.xml
DA Date-Time: 5/7/2012 10:54:07 AM
Calibration Title:
Calibration Method: External Calibration
VIS Interpolation Fit:
Tune Step: #1 nogas.u

Level	Standard Data File	Sample Name	Acq. Date-Time
1	003CALB.D	blank	5/7/2012 9:59:53 AM
2	004CALS.D	H/1000	5/7/2012 10:01:49 AM
3	005CALS.D	H/100	5/7/2012 10:03:43 AM
4	006CALS.D	H/10	5/7/2012 10:05:38 AM
5	007CALS.D	HIGH	5/7/2012 10:07:32 AM
6			



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	0.000	0.000	43.33	0.0002	P	16.5
2	☐	0.010	0.010	518.91	0.0022	P	11.8
3	☐	0.100	0.100	4437.40	0.0199	P	4.4
4	☐	1.000	1.001	46549.08	0.1979	P	3.6
5	☐	10.000	10.000	458269.29	1.9751	P	1.6
6	☐	2.000					

y = 0.1975 * x + 2.0897E-004

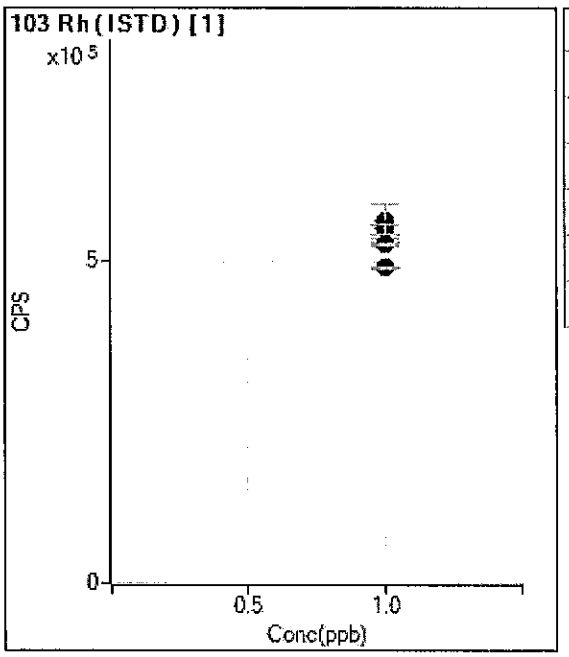
R = 1.0000

DL = 0.0005234

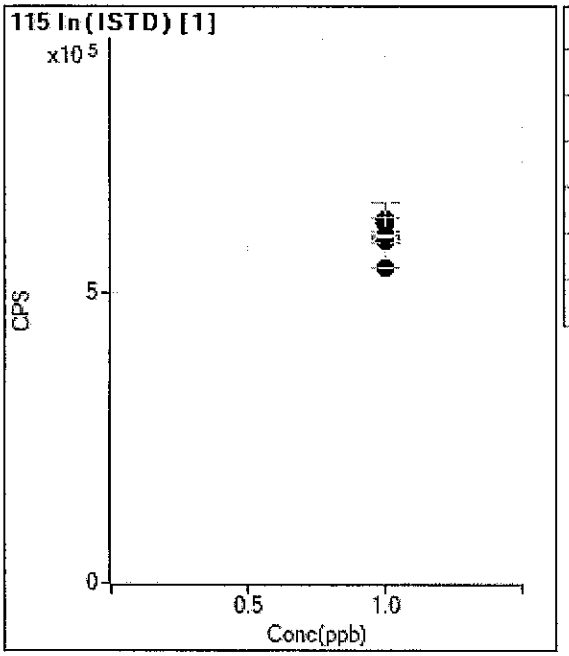
BEC = 0.001058

Weight: None

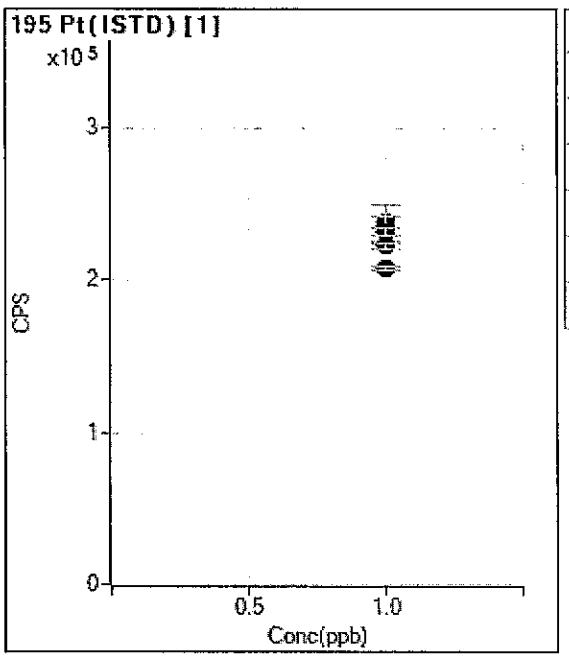
Min Conc: <None>



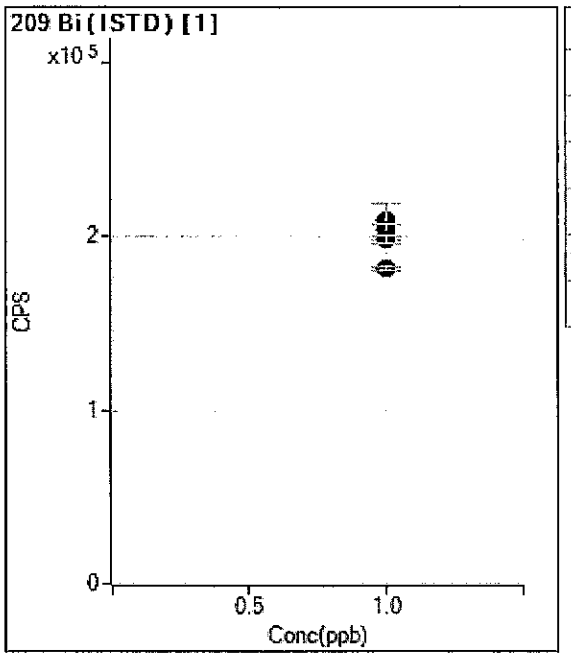
	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	1.000		491626.86		P	0.8
2	☐	1.000		562804.42		P	9.4
3	☐	1.000		529291.33		P	0.7
4	☐	1.000		550397.92		P	2.7
5	☐	1.000		526891.46		P	0.8
6	☐	1.000					



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	1.000		542041.75		P	0.2
2	☐	1.000		624087.76		P	9.7
3	☐	1.000		588107.21		P	1.0
4	☐	1.000		617110.99		P	3.7
5	☐	1.000		597264.84		P	0.7
6	☐	1.000					



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	1.000		207604.37		P	1.4
2	☐	1.000		237881.26		P	10.3
3	☐	1.000		222884.15		P	1.7
4	☐	1.000		235505.94		P	5.1
5	☐	1.000		232060.01		P	2.1
6	☐	1.000					



	Rjct	Conc.	Calc Conc.	CPS	Ratio	Det.	RSD
1	☐	1.000		182091.09		P	1.2
2	☐	1.000		208951.52		P	9.7
3	☐	1.000		198335.37		P	1.9
4	☐	1.000		203930.83		P	3.5
5	☐	1.000		198117.65		P	1.9
6	☐	1.000					

Miscellaneous

METALS DIGESTION WORKSHEET

ALS Laboratory Group

Digestion Date 5.4.12 | HCl Lot No. K52038 | Method: 3005 | Beaker Lot No. 130403-263 | Initial Prep BDS | Final Prep BDS

Digestion Batch IP120504-2 | HNO_3 Lot No. K47023 | SOP/Rev: 8260R15 | Avg. Beaker Wt. (g) 20.2 | Prep Start Time 1000 | Prep End Time 1700

Temp 95 °C | Peroxide Lot No. — | Balance(s): 30 | Pipet(s): M-70 | Digestate Wt. (g) 51.18

Form 805r20.xls (02/10/11)

Note: Each Page is copied as completed and included with the workorder/run documentation; reviewed subsequently

QC Grp	Lab Sample ID	Instrument	Init Vol/Wt (mL / g)	Final Vol. (mL)	Final Wt. (g)	pH	Comments, including metals list
	1205051-1	TR	50.0	52.0	61.4	<2	5051-TR; IC
	1205052-1	↓	↓	↓	↓	↓	5052-TR: Ca, Mg, K, Na,
	1205053-6	↓	↓	↓	↓	↓	5053-TR: RCRA
	-5D	TR/MS	↓	↓	↓	↓	5065-MS; Hg, Li
	-6MS	↓	↓	↓	↓	↓	5086-MS; U
	-6MSD	↓	↓	↓	↓	↓	
	-7	TR	↓	↓	↓	↓	
	1205065-1	MS	↓	↓	↓	↓	
	1205086-1	↓	↓	↓	↓	↓	
	-1D	↓	↓	↓	↓	↓	
	-2	↓	↓	↓	↓	↓	
	-3	↓	↓	↓	↓	↓	
	-4	↓	↓	↓	↓	↓	
	-5	↓	↓	↓	↓	↓	
	-6	↓	↓	↓	↓	↓	
	IP120504-2MB	TR/MS	↓	↓	↓	↓	
	-2LCS	↓	↓	↓	↓	↓	
	IM120504-2LCS	↓	↓	↓	↓	↓	

QC Grp	Lab Sample ID	Init Vol/Wt (mL / g)	Final Vol. (mL)	Final Wt. (g)

Spiking Information	
QC	Amount
ST120412-4	.5mL MS
ST120221-9	.5mL C
ST120221-10	1mL Cat
ST120208-1	1mL Z

5.4.12

5.4.12

419791