010001

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010002

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 20.06002.01.081

SRR: 26046

TO: 040616-1

Sample ID	Lab System ID	Chloride Results (mg/L)
Prep Blank	----	<0.1
Lab Control	----	202
True Value	----	200
Recovery	----	101%
BL-5A	246046	2048
Duplicate result	246046	2035
RPD	246046	0.64%
Spike result	246046	4040
Spike added	246046	2000
Recovery	246046	99.6%
BL-5B	246047	2907
BL-5C	246048	4038
BL-5D	246049	6280
GS60-A	246050	7484
GS60-B	246051	8053
GS60-C	246052	8329
GS60-D	246053	9077
GS60-E	246054	9931
GS95-A	246055	3151
GS95-B	246056	5143
GS95-C	246057	7602
GS95-D	246058	11716
GS95-E	246059	15287
GS95-F	246060	15583

Reporting Limit: 100 mg/L

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010003

Sample ID
BL-5A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246046

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	<1	1
Calcium	<2.5	2.5
Chromium	0.808	0.25
Iron	15.4	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	0.660	0.25
Nickel	3.63	0.25
Phosphorus	<1.5	1.5
Potassium	1747	10
Silicon	2.04	1.5
Sodium	273	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010004

Sample ID
BL-5B

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246047

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	<1	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	11.4	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	0.674	0.25
Nickel	3.62	0.25
Phosphorus	<1.5	1.5
Potassium	2174	10
Silicon	3.76	1.5
Sodium	590	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010005

Sample ID
BL-5C

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246048

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	1.17	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	8.60	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	0.692	0.25
Nickel	3.74	0.25
Phosphorus	<1.5	1.5
Potassium	2594	10
Silicon	5.52	1.5
Sodium	1049	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010006

Sample ID: BL-5C

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246048

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Aluminum	<1.5	<1.5	0.00%
Boron	1.17	1.13	3.57%
Calcium	<2.5	<2.5	0.00%
Chromium	<0.25	<0.25	0.00%
Iron	8.60	8.10	5.99%
Lithium	<0.25	<0.25	0.00%
Magnesium	<1.5	<1.5	0.00%
Manganese	0.692	0.678	2.05%
Nickel	3.74	3.61	3.57%
Phosphorus	<1.5	<1.5	0.00%
Potassium	2594	2640	1.78%
Silicon	5.52	5.43	1.64%
Sodium	1049	1065	1.49%
Titanium	<0.25	<0.25	0.00%
Uranium	<3.75	<3.75	0.00%
Zirconium	<0.25	<0.25	0.00%

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010007

Sample ID
BL-5D

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246049

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	1.65	1
Calcium	3.22	2.5
Chromium	<0.25	0.25
Iron	5.32	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	0.772	0.25
Nickel	4.09	0.25
Phosphorus	<1.5	1.5
Potassium	3355	10
Silicon	7.66	1.5
Sodium	1917	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY 010008

Sample ID
BL-5D

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246049

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	<1.5	101	100	101.3%
Boron	1.65	206	200	102.0%
Calcium	3.22	1028	1000	102.5%
Chromium	<0.25	9.99	10.0	99.9%
Iron	5.32	60.2	50.0	109.8%
Lithium	<0.25	203	200	101.7%
Magnesium	<1.5	1021	1000	102.1%
Manganese	0.772	26.2	25.0	101.8%
Nickel	4.09	28.7	25.0	98.4%
Phosphorus	<1.5	206	200	102.9%
Potassium	3355	4421	1000	106.6%
Silicon	7.66	211	200	101.7%
Sodium	1917	2939	1000	102.3%
Titanium	<0.25	199	200	99.5%
Uranium	<3.75	209	200	104.4%
Zirconium	<0.25	198	200	99.0%

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010009

Sample ID
GS60-A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246050

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	<1	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	1924	10
Silicon	2.70	1.5
Sodium	3737	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010010

Sample ID
GS60-B

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246051

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	<1	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	2011	10
Silicon	3.09	1.5
Sodium	3923	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010011

Sample ID
GS60-C

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246052

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	<1	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	2243	10
Silicon	3.54	1.5
Sodium	4226	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010012

Sample ID
GS60-D

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246053

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	<1	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	2509	10
Silicon	3.80	1.5
Sodium	4604	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010013

Sample ID
GS60-E

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246054

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	<1	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	0.410	0.25
Phosphorus	<1.5	1.5
Potassium	2586	10
Silicon	4.57	1.5
Sodium	4655	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

Sample ID 010014

GS95-A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246055

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	<1	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	1451	10
Silicon	4.29	1.5
Sodium	1212	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010015

Sample ID
GS95-B

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246056

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	<1	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	1807	10
Silicon	6.74	1.5
Sodium	2250	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010016

Sample ID
GS95-C

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246057

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	1.15	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	2217	10
Silicon	9.70	1.5
Sodium	3485	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010017

Sample ID
GS95-D

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246058

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	1.54	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	2696	10
Silicon	15.3	1.5
Sodium	5557	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010018

Sample ID
GS95-E

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246059

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	1.97	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	0.303	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	3150	10
Silicon	20.6	1.5
Sodium	7514	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010019

Sample ID
GS95-F

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 06/16/04

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: 246060

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	1.88	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	0.309	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	3108	10
Silicon	20.7	1.5
Sodium	7476	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE 010020

Sample ID
LCSW

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: NA

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Aluminum	1.95	2.00	97.5%
Boron	4.01	4.00	100.2%
Calcium	20.5	20.0	102.7%
Chromium	0.195	0.200	97.7%
Iron	1.12	1.00	111.9%
Lithium	3.56	4.00	89.1%
Magnesium	20.4	20.0	101.8%
Manganese	0.507	0.500	101.3%
Nickel	0.492	0.500	98.5%
Phosphorus	4.01	4.00	100.2%
Potassium	20.0	20.0	99.9%
Silicon	4.03	4.00	100.7%
Sodium	20.1	20.0	100.4%
Titanium	3.93	4.00	98.2%
Uranium	4.11	4.00	102.7%
Zirconium	3.88	4.00	97.0%

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010021

Sample ID
PBW

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 06002.01.081

Lab System ID: NA

SRR: 26046

TO: 040616-1

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<1.5	1.5
Boron	<1	1
Calcium	<2.5	2.5
Chromium	<0.25	0.25
Iron	<1.5	1.5
Lithium	<0.25	0.25
Magnesium	<1.5	1.5
Manganese	<0.25	0.25
Nickel	<0.25	0.25
Phosphorus	<1.5	1.5
Potassium	<10	10
Silicon	<1.5	1.5
Sodium	<10	10
Titanium	<0.25	0.25
Uranium	<3.75	3.75
Zirconium	<0.25	0.25

NA- Not Applicable.

010022

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

Task Orders/01-QPP-015

Southwest Research Institute

Laboratory Task Order

TO #: 040616-1 Revision: 1

010023

SDG: 246046
VTSR: 06/16/04
CASE: CNWRA

SRR #'s: 26046
Client(s): DIV 20

Project(s): 06002.01.081
Manager(s): DAMMANN, MIKE
To PM: 06/28/04
To QA: 09/14/04
To Client: 09/15/04

Instructions

DIVISION 20 - CNWRA. 14-day TAT. Using 13-day TAT for report/PM, QAU, 13-day TAT for hardcopy (subject to change). Point of Contact is Yi-Ming Pan (x6640). ICP analysis of test solutions for glass leaching study - Al, B, Ca, Cr, Chlorine, Fe, K, Li, Mg, Mn, Na, Ni, P, Si, Ti, U and Zr. Using IC-SwRI test code for CHLORINE. Solutions are 1000 ppm KCI depleted U238 specimen. Work is 10 CFR 50, Part 21, Appendix B. CONTACT Charlie Butcher (ext. 5928, pager 271-5172) BEFORE STARTING ANY WORK ON THIS TASK ORDER. CONTACT PM WITH ANY QUESTIONS.
revision 1: updated task order. (dr091304)

Documents Related to this task order: 11019[COC 26046]

Test: DIL-DILUTION
Section: METALPREP

Holding: 28 days from CED
Prep, Dilution - NOTE SAMPLE QUANTITY
Cnt: 15

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
246046		1	Liquid	BL-5A	14 May 04	11 Jun 04
246046		2	Liquid	BL-5A	14 May 04	11 Jun 04
246047		1	Liquid	BL-5B	15 May 04	12 Jun 04
246047		2	Liquid	BL-5B	15 May 04	12 Jun 04
246048		1	Liquid	BL-5C	16 May 04	13 Jun 04
246048		2	Liquid	BL-5C	16 May 04	13 Jun 04
246049		1	Liquid	BL-5D	17 May 04	14 Jun 04
246049		2	Liquid	BL-5D	17 May 04	14 Jun 04
246050		1	Liquid	GS60-A	14 May 04	11 Jun 04
246050		2	Liquid	GS60-A	14 May 04	11 Jun 04
246051		1	Liquid	GS60-B	15 May 04	12 Jun 04
246051		2	Liquid	GS60-B	15 May 04	12 Jun 04
246052		1	Liquid	GS60-C	16 May 04	13 Jun 04
246052		2	Liquid	GS60-C	16 May 04	13 Jun 04
246053		1	Liquid	GS60-D	17 May 04	14 Jun 04
246053		2	Liquid	GS60-D	17 May 04	14 Jun 04
246054		1	Liquid	GS60-E	18 May 04	15 Jun 04
246055		1	Liquid	GS95-A	14 May 04	11 Jun 04
246055		2	Liquid	GS95-A	14 May 04	11 Jun 04
246056		1	Liquid	GS95-B	15 May 04	12 Jun 04
246056		2	Liquid	GS95-B	15 May 04	12 Jun 04
246057		1	Liquid	GS95-C	16 May 04	13 Jun 04
246057		2	Liquid	GS95-C	16 May 04	13 Jun 04
246058		1	Liquid	GS95-D	17 May 04	14 Jun 04
246058		2	Liquid	GS95-D	17 May 04	14 Jun 04
246059		1	Liquid	GS95-E	18 May 04	15 Jun 04
246060		1	Liquid	GS95-F	19 May 04	16 Jun 04
246060		2	Liquid	GS95-F	19 May 04	16 Jun 04

Test: IC-SWRI
Section: WETCHEM

Holding: 28 days from CED
Ion Chromatography by SwRI Method (Chlorine) - NOTE SAMPLE QUANTITY
Cnt: 15

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
246046		1	Liquid	BL-5A	14 May 04	11 Jun 04
246046		2	Liquid	BL-5A	14 May 04	11 Jun 04
246047		1	Liquid	BL-5B	15 May 04	12 Jun 04
246047		2	Liquid	BL-5B	15 May 04	12 Jun 04
246048		1	Liquid	BL-5C	16 May 04	13 Jun 04

Southwest Research Institute

Laboratory Task Order

TO #: 040616-1 Revision: 1

010024

SDG: 246046
VTSR: 06/16/04
CASE: CNWRA

SRR #'s: 26046
Client(s): DIV 20

Project(s): 06002.01.081
Manager(s): DAMMANN, MIKE
To PM: 06/28/04
To QA: 09/14/04
To Client: 09/15/04

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
246048		2	Liquid	BL-5C	16 May 04	13 Jun 04
246049		1	Liquid	BL-5D	17 May 04	14 Jun 04
246049		2	Liquid	BL-5D	17 May 04	14 Jun 04
246050		1	Liquid	GS60-A	14 May 04	11 Jun 04
246050		2	Liquid	GS60-A	14 May 04	11 Jun 04
246051		1	Liquid	GS60-B	15 May 04	12 Jun 04
246051		2	Liquid	GS60-B	15 May 04	12 Jun 04
246052		1	Liquid	GS60-C	16 May 04	13 Jun 04
246052		2	Liquid	GS60-C	16 May 04	13 Jun 04
246053		1	Liquid	GS60-D	17 May 04	14 Jun 04
246053		2	Liquid	GS60-D	17 May 04	14 Jun 04
246054		1	Liquid	GS60-E	18 May 04	15 Jun 04
246055		1	Liquid	GS95-A	14 May 04	11 Jun 04
246055		2	Liquid	GS95-A	14 May 04	11 Jun 04
246056		1	Liquid	GS95-B	15 May 04	12 Jun 04
246056		2	Liquid	GS95-B	15 May 04	12 Jun 04
246057		1	Liquid	GS95-C	16 May 04	13 Jun 04
246057		2	Liquid	GS95-C	16 May 04	13 Jun 04
246058		1	Liquid	GS95-D	17 May 04	14 Jun 04
246058		2	Liquid	GS95-D	17 May 04	14 Jun 04
246059		1	Liquid	GS95-E	18 May 04	15 Jun 04
246060		1	Liquid	GS95-F	19 May 04	16 Jun 04
246060		2	Liquid	GS95-F	19 May 04	16 Jun 04

Test: ICP-SWRI
Section: METALS

Holding: 180 days from CED

ICP Analysis by SwRI Method - NOTE SAMPLE QUANTITY

Cnt: 15

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
246046		1	Liquid	BL-5A	14 May 04	10 Nov 04
246046		2	Liquid	BL-5A	14 May 04	10 Nov 04
246047		1	Liquid	BL-5B	15 May 04	11 Nov 04
246047		2	Liquid	BL-5B	15 May 04	11 Nov 04
246048		1	Liquid	BL-5C	16 May 04	12 Nov 04
246048		2	Liquid	BL-5C	16 May 04	12 Nov 04
246049		1	Liquid	BL-5D	17 May 04	13 Nov 04
246049		2	Liquid	BL-5D	17 May 04	13 Nov 04
246050		1	Liquid	GS60-A	14 May 04	10 Nov 04
246050		2	Liquid	GS60-A	14 May 04	10 Nov 04
246051		1	Liquid	GS60-B	15 May 04	11 Nov 04
246051		2	Liquid	GS60-B	15 May 04	11 Nov 04
246052		1	Liquid	GS60-C	16 May 04	12 Nov 04
246052		2	Liquid	GS60-C	16 May 04	12 Nov 04
246053		1	Liquid	GS60-D	17 May 04	13 Nov 04
246053		2	Liquid	GS60-D	17 May 04	13 Nov 04
246054		1	Liquid	GS60-E	18 May 04	14 Nov 04
246055		1	Liquid	GS95-A	14 May 04	10 Nov 04
246055		2	Liquid	GS95-A	14 May 04	10 Nov 04
246056		1	Liquid	GS95-B	15 May 04	11 Nov 04
246056		2	Liquid	GS95-B	15 May 04	11 Nov 04
246057		1	Liquid	GS95-C	16 May 04	12 Nov 04
246057		2	Liquid	GS95-C	16 May 04	12 Nov 04
246058		1	Liquid	GS95-D	17 May 04	13 Nov 04

Southwest Research Institute

Laboratory Task Order

TO #: 040616-1 Revision: 1

010025

SDG: 246046
VTSR: 06/16/04
CASE: CNWRA

SRR #'s: 26046
Client(s): DIV 20

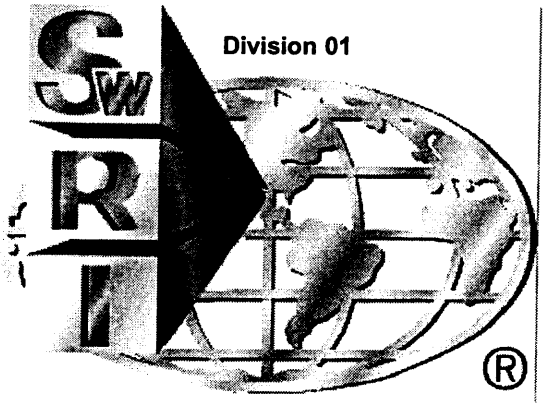
Project(s): 06002.01.081
Manager(s): DAMMANN, MIKE
To PM: 06/28/04
To QA: 09/14/04
To Client: 09/15/04

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
246058		2	Liquid	GS95-D	17 May 04	13 Nov 04
246059		1	Liquid	GS95-E	18 May 04	14 Nov 04
246060		1	Liquid	GS95-F	19 May 04	15 Nov 04
246060		2	Liquid	GS95-F	19 May 04	15 Nov 04

CONTROLLED COPY
IF STAMP IS NOT RED, THIS DOCUMENT IS UNCONTROLLED

01-QPP-015 010026
Division 01
Revision 4
November 2002

Document No. 3



Chemistry and Chemical
Engineering Division

QUALITY PROJECT PLAN FOR

PERFORMANCE OF CHEMICAL ANALYSES FOR COMMERCIAL NUCLEAR POWER PLANTS WITHIN THE DEPARTMENT OF ANALYTICAL AND ENVIRONMENTAL CHEMISTRY

DIV. 20
SRR #26046
PROJECT #06002.01.081
CASE: CNWRA
VTSR: 06/15/04 1430

SOUTHWEST RESEARCH INSTITUTE
Chemistry and Chemical Engineering Division
6220 CULEBRA ROAD, SAN ANTONIO, TEXAS 78238

QUALITY PROJECT PLAN FOR PERFORMANCE OF CHEMICAL ANALYSES FOR COMMERCIAL NUCLEAR POWER PLANTS WITHIN THE DEPARTMENT OF ANALYTICAL AND ENVIONMENTAL CHEMISTRY

SwRI AUTHORIZATION SIGNATORIES

This is to certify that this Quality Project Plan of Southwest Research Institute (SwRI) has been reviewed and approved by the following personnel:

JO ANN BOYD (210) 522-2169 — **DATE** 10/30/02
Quality Assurance Manager

REZA KARIMI (210) 522-2412 — **DATE** 10/30/02
Director, Department of Analytical and Environmental Chemistry

for **MICHAEL G. MACNAUGHTON** (210) 522-5162 — **DATE** 10/30/02
Vice President, Chemistry and Chemical Engineering Division

CHRISTOPHER HOBSON (210) 522-5838 — **DATE** 10/30/02
Quality Assurance Engineer

TABLE OF CONTENTS

PERFORMANCE OF CHEMICAL ANALYSES FOR COMMERCIAL NUCLEAR POWER PLANTS WITHIN THE DEPARTMENT OF ANALYTICAL AND ENVIRONMENTAL CHEMISTRY

1.0 INTRODUCTION

This Quality Project Plan (QPP) defines the Quality Assurance (QA) program requirements for personnel providing the chemical analyses for commercial nuclear power plants. Southwest Research Institute (SwRI) ***Program Quality Plan (PQP-Nuclear)***, *Nuclear Services* shall implement the QA requirements. Project activities controlled by the PQP-Nuclear shall be accomplished as specified by the appropriate sections of **01-QAP-004**, *Quality Assurance Plan for Analytical and Environmental Services* and/or nationally recognized testing methods as specified on individual purchase orders. This QPP shall be applied to all projects initiated for nuclear utilities in the Department of Analytical and Environmental Chemistry. If, as a result of complexity, duration, or other factors, it is determined that a unique, project-specific quality plan is required, the project QAE shall notify the Project Manager and a project-specific quality plan shall be generated in accordance with **SOP-01-4.2.1**, *Preparation and Revision of Documented Procedures*.

2.0 SCOPE

This Quality Project Plan shall be applied to the chemical analyses performed for commercial nuclear power plants by the Department of Analytical and Environmental Chemistry within the Chemistry and Chemical Engineering Division. Although the majority of the work performed for nuclear facilities resides within the Department of Analytical and Environmental Chemistry, other departments within the division may utilize this Quality Project Plan as deemed necessary when nuclear projects are conducted.

3.0 REFERENCES

3.1 *SwRI Quality System Manual – 2000*

3.2 *10 CFR 50, Appendix B, ASME NQA-1*

3.3 *SwRI Program Quality Plan (PQP-Nuclear), Nuclear Services*

3.4 01-QAP-004, *Quality Assurance Plan for Analytical and Environmental Services*

4.0 APPLICABLE SECTIONS OF SwRI PROGRAM QUALITY PLAN (PQP-NUCLEAR)

4.1 Indoctrination and Training

4.1.1 Personnel performing duties affecting quality shall receive quality training to the *SwRI Program Quality Plan (PQP-Nuclear), Nuclear Services* prior to performing any work on projects for nuclear utilities. Institute Quality Systems (IQS) personnel shall perform this training and documentation shall be evident in the personnel training files maintained in Division Quality Assurance.

4.1.2 Indoctrination and training of personnel shall be conducted in accordance with **SOP-01-6.2.1**, *Qualification and Training*.

4.2 Qualification of Personnel

4.2.1 Testing personnel shall be designated as qualified to perform applicable project activities as specified in **SOP-01-6.2.1**, *Qualification and Training*.

4.2.2 During the performance of each testing process, testing personnel shall have access to the necessary documented procedures, i.e., QPP, QAP, Work Order, Division Quality System Standard Operating Procedures (SOPs), and applicable test/analytical procedures (TAPs) available for ready reference.

4.2.3 Any person who has not performed testing activities associated with any particular method being used for nuclear utilities projects for a period of one year shall be reevaluated prior to the conduct of the test.

4.2.4 Quality Assurance personnel witnessing the testing process for nuclear utilities shall have documented evidence of qualifications maintained by Institute Quality Systems.

4.3 Design Control

Not applicable to activities conducted within the Department of Analytical and Environmental Chemistry.

4.4 Right of Access

4.4.1 Procurement documents shall provide for access to the suppliers' facilities and records for surveillance, inspection, or audit by SwRI and clients.

4.4.2 Where appropriate, quality clause **Q32** shall be noted on the procurement documents to indicate that right of access for inspection and surveillance of activities associated with the order shall be afforded to SwRI and clients.

4.5 Control of Supplier-Generated Documents

4.5.1 Client documents shall be controlled in accordance with **SOP-01-4.2.1**, *Preparation and Revision of Documented Procedures*. These procedures provide the requirements for the preparation, review, approval, issue, distribution, and revision of documents controlled by the Chemistry and Chemical Engineering Division.

4.5.2 Documents may be controlled as Plans or Work Instructions and shall be accessible through the Division Intranet link, ***Contract Requirements*** as PDF files.

4.5.3 Nationally recognized test methods shall be of the most current issue or as specified in the purchase order. Work orders shall identify the applicable test methods to be used on the nuclear project.

4.6 Acceptance of Services Only

Not applicable to activities conducted within the Department of Analytical and Environmental Chemistry.

4.7 Commercial Grade Items

4.7.1 Where an item is to be incorporated into a test or deliverable to a client, and that item is not subject to design or specification requirements that are unique to nuclear facilities, used in applications other then nuclear facilities, and procured from the supplier on the specifications set forth in the manufacturers' published product and description, the item shall be considered "commercial grade".

4.7.2 Chemical reagents and standards used for testing purposes shall be ordered to specific chemical grades and certificates of analysis shall be required with each lot.

4.7.3 Controls for procurement planning, supplier selection, supplier performance evaluation, and acceptance of procured items and services other than chemical reagents and standards shall be as identified in **SOP-01-7.4.1**, *Purchasing*, and any referenced document within that procedure.

4.7.4 Receipt inspection of chemical reagents, standards, and test items for use on nuclear safety-related projects shall be performed by department personnel and documented on the *SwRI Receipt Traveler* or **FRM-109**, *Item Receipt Report*, as specified in **SOP-01-8.2.4**, *Monitoring and Measurement*. Any discrepancy such as a damaged container or container label shall be documented on the form and the client shall be contacted for disposition.

4.7.5 Prior or acceptance of a commercial grade item, the receipt inspection shall determine the following:

(a) Damage was not sustained during shipment;

(b) The item has satisfied the specified acceptance criteria; and

(c) Specified documentation, as applicable to the item, was received and is acceptable.

4.7.6 Receipt inspection of chemical reagents and standards shall also consist of verification of chemical type, grade, container integrity, certificate of analysis, and shelf life, where applicable. Upon acceptance of chemical reagents and standards, the containers shall be labeled with the following:

(a) Chemical name;

(b) Chemical grade;

(c) Lot code;

(d) Date received; and

(e) Shelf life, when applicable.

4.7.7 Expired shelf life items shall not be used for testing purposes.

4.7.8 Lot codes of chemical reagents and standards used during equipment standardization and testing shall be recorded on the individual testing data sheets to provide traceability.

4.7.9 Samples supplied to SwRI for testing shall be received by the Sample Custodian and logged into the laboratory logbook. Sample documentation and sample custody shall be maintained in accordance with **TAP-01-0407-001**, *Sample Receipt Inspection*, and **TAP-01-0407-035**, *Organic and Inorganic Sample Security.*

4.7.10 Samples supplied to SwRI for testing shall be labeled with the following:

(a) Sample control number;

(b) Purchase order number;

(c) Purchase order line item number, as applicable;

(d) Work order number;

(e) Nuclear QA label; and

(f) Sample retention date, when applicable.

4.7.11 In the event that samples are damaged upon receipt, a ***Sample Discrepancy Record*** shall be generated from the Division Intranet.

4.7.12 The testing work order shall list the project number, tests required, test methods required, and shall be labeled *Nuclear Quality.*

4.7.13 Identification and traceability shall be maintained in accordance with **SOP-01-7.5.1**, *Item Identification and Traceability.*

4.8 Inspection

4.8.1 Inspection for acceptance shall be performed by qualified persons other than those who conduct or directly supervise the work being inspected.

4.8.2 Institute Quality System (IQS) personnel shall perform surveillance activities as required to ensure compliance with the contract and this Quality Project Plan. Specific areas in which IQS may perform surveillance activities include, but are not limited to, the following:

(a) Receiving inspection and labeling of chemical reagents, standards, and testing samples;

(b) Testing processes;

(c) Calibration and major equipment;

(d) Sample and record retention; and

(e) Test records.

4.9 Inspection and Testing

4.9.1 Required tests for acceptance shall be conducted under appropriate environmental conditions using the tools and equipment necessary to conduct the test in a manner to fulfill test requirements and acceptance criteria.

4.9.2 Tests shall be conducted, controlled, and verified in accordance with **SOP-01-8.2.4**, *Monitoring and Measurement*.

4.9.3 Controls for measuring and test equipment shall be as specified in **SOP-01-7.6.1**, *Control of Measuring and Test Equipment*.

4.9.4 Controls for identification, segregation, reporting, and resolution of nonconforming items and conditions shall be as specified in **SOP-01-8.3.1**, *Nonconformance Reporting*.

4.10 Handling, Storage, Packaging, Preservation, and Delivery

4.10.1 Controls for handling, storage, packaging, preservation, and delivery of items are identified in **SOP-01-7.5.3**, *Handling, Storage, Packaging, Protection, and Delivery of Items*.

4.10.2 Samples specified on the purchase order to be returned to the client shall be prepared and packaged as specified on the purchase order. Each package shall be marked legibly and indelibly with the purchase order/release number and line item number(s) relevant to the package.

4.11 Quality Assurance Records

4.11.1 Quality assurance records shall furnish documentary evidence that items or activities meet specified quality requirements. Documents that ensure this evidence include **TAP-01-0407-014**, *Inventory of Case File Purges*, and **SOP-01-4.2.4**, *Storage and Maintenance of Quality Records*. These documents and this QPP ensure that QA records shall be legible, identifiable, retrievable, and maintained in dual storage.

4.11.2 Records shall be traceable to associated items and activities and shall accurately reflect the work accomplished or information required.

4.11.3 Documents shall be considered valid records only if stamped, initialed or signed and dated by authorized personnel or otherwise authenticated.

4.11.4 Records of test analyses performed by the Department of Analytical and Environmental Chemistry are classified as *nonpermanent* and shall be retained for a minimum of five years. Nonpermanent records are those required to show evidence that an activity was performed in accordance with the applicable requirements, but need not be retained for the life of the item. Based on the use of the final data, the client shall be responsible for determining and implementing permanent storage requirements.

4.11.5 In order to satisfy duplicate storage requirements, one copy of the QA record shall maintained by the Project Manager in Building 70 and a separate copy shall be maintained in the Division Quality Assurance Archives in Building 201. Storage requirements shall be as stated in **SOP-01-4.2.4**, *Storage and Maintenance of Quality Records*, to ensure protection against the risk of damage or destruction.

4.12 10 CFR, Part 21

4.12.1 SwRI procurement documents shall include requirements for reporting and approving disposition of supplier nonconformances and, when required, compliance to 10 CFR, Part 21.

4.12.2 The Manager of Institute Quality Assurance or Director of Institute Quality Systems shall determine if a nonconforming condition is reportable under 10 CFR, Part 21, and initiate reporting and condition in accordance with the SwRI Operating Policies and Procedures (OPP). Safety hazards or defects that could create a substantial safety hazard shall be reported. Substantial safety hazard means a loss of safety function to the extent that there is a major reduction in the degree of protection provided to public health and safety.

4.13 Certified Test Report

The Project Manager and Institute Quality Assurance Manager as complying with all contractual requirements shall certify test reports. The certified test report shall reference the purchase order/release number, the test methods performed, and the purchase order/release line item number.

4.14 Valid Documents List

The Department of Analytical and Environmental Chemistry work order shall specify all applicable documents and appropriate document revision level for each document. The work order shall then serve as the Valid Documents List (VDL) for each individual project.

5.0 HISTORY OF REVISIONS

Revision 4
Title of document changed from the Standard Project Quality Plan *SPQP-CHIAN* to Quality Project Plan, *QPP-015*
Extensive revision to comply with Project Quality Plan PQP-Nuclear, *Nuclear Services*, which replaces SwRI NQAPM, *Nuclear Quality Assurance Program Manual.*

010035

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

Chain of Custody/Login Paperwork

11019

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Shipper Name/ Address:

Client: Div 20 CNWRA
Yi Ming Pan

Client Purchase Order/Other ID: CNWRA

Site/Zone ID:

Requested Turnaround:
- ☑ 2 Weeks
- ☐ 3 Weeks
- ☐ Other: _____

SwRI Contact: Yi Ming Pan x6640

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	TCP Analysis See Additional sheet								
BL-5A	5/14/04	3:30	L		2	✓								
BL-5B	5/15/04	3:30	↓		2	✓								
BL-5C	5/16/04	3:30	↓		2	✓								
BL-5D	5/17/04	3:30	↓		2	✓								
GS 60-A	5/14/04	3:30	L		2	✓								
GS 60-B	5/15/04	↓	↓		2	✓								
GS 60-C	5/16/04	↓	↓		2	✓								
GS 60-D	5/17/04	↓	↓		2	✓								
GS60-E	5/18/04	↓	↓		1	✓								

DIV. 20
SRR #26046
PROJECT #06002.01.081
CASE: CNWRA
VTSR: 06/15/04 1430

REMARKS
Preservation
- **a** = HCl to pH <2
- **b** = HNO_3 to pH <2
- **c** = H_2SO_4 to pH <2
- **d** = NaOH to pH >12
- **e** = Cool (4°C±2°C)
- **f** = Other (specify)

INTACT

Matrix Types:
- **A** – Air
- **B** – Biota
- **D** - Dust
- **E** – Emission/Stack
- **L** - Liquid
- **P** – Product
- **Sd** - Solid
- **S** – Soil
- **SED** – Sediment
- **T** - Tissue
- **W** - Water
- **WP** - Wipe

Sample Types:
- **D** - Duplicate
- **ER** – Equipment Rinsate
- **ES** – Environmental Sample
- **FB** – Field Blank
- **FD** – Field Duplicate
- **MS** – Matrix Spike
- **MSD** – Matrix Spike Dup
- **TB** – Trip Blank

Temp: 22.°C Therm #: 027

Comments:

	Date	Time
Relinquished by (Print/Signature): Brian K Derby	6/10/04	
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 20.06002.01.081

Received by SwRI Lab: (Signature)

Date: 06/15/04 Time: 14:30

Samples Disposed: Date: 010039 Time:

Samples Disposed by:

11019

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Shipper Name/Address:

Client: Div 20 CNWRA Yi Ming Pan

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround:
- ☐ 2 Weeks
- ☐ 3 Weeks
- ☐ Other:

SwRI Contact: Yi Ming Pan X6640

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Top Analysis See Addition Sheet
GS95-A	5/14/04	3:30pm	L		2	✓
GS95-B	5/15/04				2	✓
GS95-C	5/16/04				2	✓
GS95-D	5/17/04				2	✓
GS95-E	5/18/04				1	✓
GS95-P	5/19/04				2	✓

DIV. 20
SRR #26046
PROJECT #06002.01.081
CASE: CNWRA
VTSR: 06/15/04 1430

REMARKS

Preservation
- **a** = HCl to pH <2
- **b** = HNO_3 to pH <2
- **c** = H_2SO_4 to pH <2
- **d** = NaOH to pH >12
- **e** = Cool (4°C±2°C)
- **f** = Other (specify)

INTACT

Matrix Types:
- **A** – Air
- **B** – Biota
- **D** - Dust
- **E** – Emission/Stack
- **L** - Liquid
- **P** – Product
- **Sd** - Solid
- **S** – Soil
- **SED** – Sediment
- **T** - Tissue
- **W** - Water
- **WP** - Wipe

Sample Types:
- **D** - Duplicate
- **ER** – Equipment Rinsate
- **ES** – Environmental Sample
- **FB** – Field Blank
- **FD** – Field Duplicate
- **MS** – Matrix Spike
- **MSD** – Matrix Spike Dup
- **TB** – Trip Blank

Temp: 22.0°C

Therm #: 027

Comments:

	Date	Time
Relinquished by (Print/Signature): Brian K. Daly / [signature]	6/15/04	
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 20-06002.01.081

Received by SwRI Lab: (Signature) [signature]

Date: 06/15/04 Time: 14:30

Samples Disposed: Date / Time

Samples Disposed by:

0100037

Div 01 COC Form 01-01-001, Rev 8/02

SAMPLE LOG-IN SHEET

010038

Lab Name: Southwest Research Institute

Received By (Print Name): DINO ROMAN

Log-in Date: 06/15/2004

Received By (Signature): DR

Case Number: CNWRA

Sample Delivery Group No.

SAS Number: N/A

Remarks: 06002.01.081

1.	Custody Seal(s)	Present/Absent Intact/Broken
2.	Custody Seal Nos.	N/A
3.	Chain-of Custody Records	Present/Absent*
4.	Traffic Reports or Packing Lists	Present/Absent
5.	Airbill	Airbill/Sticker Present/Absent*
6.	Airbill No.	HAND DELIVERED
7.	Sample Tags	Present/Absent
	Sample Tag Numbers	Listed/Not listed on Chain of Custody
8.	Sample Condition	Intact/Broken*/ Leaking
9.	Cooler Temperature	22.0C
10.	Does Information on custody records, traffic reports, and sample tags agree?	Yes/No*
11.	Date Received at Lab	06/15/2004
12.	Time Received	14:30:00

EPA Sample #	Corresponding: Sample Tag #	Corresponding: Assigned Lab #	Remarks: Condition of Sample Shipment, etc
BL-5A	None	246046	Intact
BL-5B	None	246047	Intact
BL-5C	None	246048	Intact
BL-5D	None	246049	Intact
GS60-A	None	246050	Intact
GS60-B	None	246051	Intact
GS60-C	None	246052	Intact
GS60-D	None	246053	Intact
GS60-E	None	246054	Intact
GS95-A	None	246055	Intact
GS95-B	None	246056	Intact
GS95-C	None	246057	Intact
GS95-D	None	246058	Intact
GS95-E	None	246059	Intact
GS95-F	None	246060	Intact

Sample Transfer

Fraction	Fraction
Area # Inorg	Area # Inorg #2
By DINO ROMAN	By
On 06/15/2004	On 06/17/2004

* Contact SMO and attach record of resolution

Reviewed By: CYNTHIA A. SAUCEDA

Date: 06/15/2004 06/17/2004

Logbook No.: Sample Receipt (26046)

Logbook Page No.: 5104 (SECTION 2 OF 3)

010039

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

Copies of Login Book

Sample Login Book

Jun 15, 2004

010040

SwRI Login Area
Division 1

Sample Receipt: 26045	Project: 06002.01.141	Client: DIV 20
VTSR Date: Jun 15, 2004	VTSR Time: 10:05:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
246040	Anion 1C	Water
246041	Anion 2C	Water
246042	Anion 3C	Water
246043	Anion 4C	Water
246044	Anion 5C	Water
246045	Anion 6C	Water

Sample Receipt: 26046	Project: 06002.01.081	Client: DIV 20
VTSR Date: Jun 15, 2004	VTSR Time: 14:30:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
246046	BL-5A	Liquid
246047	BL-5B	Liquid
246048	BL-5C	Liquid
246049	BL-5D	Liquid
246050	GS60-A	Liquid
246051	GS60-B	Liquid
246052	GS60-C	Liquid
246053	GS60-D	Liquid
246054	GS60-E	Liquid
246055	GS95-A	Liquid
246056	GS95-B	Liquid
246057	GS95-C	Liquid
246058	GS95-D	Liquid
246059	GS95-E	Liquid
246060	GS95-F	Liquid

Sample Receipt: 26047	Project: 10192.01.10X	Client: Lynx, LTD.
VTSR Date: Jun 15, 2004	VTSR Time: 16:00:00	Manager: SUN, GANG

System ID	Customer Sample ID	Matrix
246061	0406101350	Aqueous

010041

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

RAW DATA

Div 20
to#040616-1
06002.01.081

system id	elem	result	qual	units	rl	tv	rec	ug/ml	rl	prep	mg/L	date	time
246046	Al3082	1.5	U	mg/L	1.5			0.01066	0.03	50	0.533	07/01/04	11:28
246046	B_2496	1	U	mg/L	1			0.01249	0.02	50	0.6245	07/01/04	11:28
246046	Ca3179	2.5	U	mg/L	2.5			0.03941	0.05	50	1.9705	07/01/04	11:28
246046	Cr2677	0.808		mg/L	0.25			0.01615	0.005	50	0.8075	07/01/04	11:28
246046	Fe2714	15.4		mg/L	1.5			0.30772	0.03	50	15.386	07/01/04	11:28
246046	K_766	1747		mg/L	10			34.9353	0.2	50	1746.765	07/07/04	13:14:29
246046	Li6707	0.25	U	mg/L	0.25			0.00063	0.005	50	0.0315	07/01/04	11:28
246046	Mg2790	1.5	U	mg/L	1.5			0.00380	0.03	50	0.19	07/01/04	11:28
246046	Mn2576	0.660		mg/L	0.25			0.01319	0.005	50	0.6595	07/01/04	11:28
246046	Na589	273		mg/L	10			5.4640	0.2	50	273.2	07/07/04	13:14:29
246046	Ni2316	3.63		mg/L	0.25			0.07266	0.005	50	3.633	07/01/04	11:28
246046	P_1782	1.5	U	mg/L	1.5			-0.01845	0.03	50	-0.9225	07/01/04	11:28
246046	Si2881	2.04		mg/L	1.5			0.04084	0.03	50	2.042	07/01/04	11:28
246046	Ti3349	0.25	U	mg/L	0.25			0.00001	0.005	50	0.0005	07/01/04	11:28
246046	U_4090	3.75	U	mg/L	3.75			0.00112	0.075	50	0.056	07/01/04	11:28
246046	Zr3496	0.25	U	mg/L	0.25			-0.00013	0.005	50	-0.0065	07/01/04	11:28
246047	Al3082	1.5	U	mg/L	1.5			0.01200	0.03	50	0.6	07/01/04	11:33
246047	B_2496	1	U	mg/L	1			0.01618	0.02	50	0.809	07/01/04	11:33
246047	Ca3179	2.5	U	mg/L	2.5			0.04441	0.05	50	2.2205	07/01/04	11:33
246047	Cr2677	0.25	U	mg/L	0.25			0.00392	0.005	50	0.196	07/01/04	11:33
246047	Fe2714	11.4		mg/L	1.5			0.22889	0.03	50	11.4445	07/01/04	11:33
246047	K_766	2174		mg/L	10			43.4863	0.2	50	2174.315	07/07/04	13:18:03
246047	Li6707	0.25	U	mg/L	0.25			0.00070	0.005	50	0.035	07/01/04	11:33
246047	Mg2790	1.5	U	mg/L	1.5			0.00898	0.03	50	0.449	07/01/04	11:33
246047	Mn2576	0.674		mg/L	0.25			0.01347	0.005	50	0.6735	07/01/04	11:33
246047	Na589	590		mg/L	10			11.7923	0.2	50	589.615	07/07/04	13:18:03
246047	Ni2316	3.62		mg/L	0.25			0.07234	0.005	50	3.617	07/01/04	11:33
246047	P_1782	1.5	U	mg/L	1.5			-0.00742	0.03	50	-0.371	07/01/04	11:33
246047	Si2881	3.76		mg/L	1.5			0.07511	0.03	50	3.7555	07/01/04	11:33
246047	Ti3349	0.25	U	mg/L	0.25			0.00000	0.005	50	0	07/01/04	11:33
246047	U_4090	3.75	U	mg/L	3.75			0.01249	0.075	50	0.6245	07/01/04	11:33
246047	Zr3496	0.25	U	mg/L	0.25			-0.00022	0.005	50	-0.011	07/01/04	11:33
246048	Al3082	1.5	U	mg/L	1.5			0.00483	0.03	50	0.2415	07/01/04	11:39
246048	B_2496	1.17		mg/L	1			0.02341	0.02	50	1.1705	07/01/04	11:39
246048	Ca3179	2.5	U	mg/L	2.5			0.04058	0.05	50	2.029	07/01/04	11:39
246048	Cr2677	0.25	U	mg/L	0.25			0.00253	0.005	50	0.1265	07/01/04	11:39
246048	Fe2714	8.60		mg/L	1.5			0.17202	0.03	50	8.601	07/01/04	11:39
246048	K_766	2594		mg/L	10			51.8750	0.2	50	2593.75	07/07/04	13:21:07
246048	Li6707	0.25	U	mg/L	0.25			0.00081	0.005	50	0.0405	07/01/04	11:39

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	rl	prep	mg/L	date	time
246048	Mg2790	1.5	U	mg/L	1.5			0.00158	0.03	50	0.079	07/01/04	11:39
246048	Mn2576	0.692		mg/L	0.25			0.01383	0.005	50	0.6915	07/01/04	11:39
246048	Na589	1049		mg/L	10			20.9823	0.2	50	1049.115	07/07/04	13:21:07
246048	Ni2316	3.74		mg/L	0.25			0.07473	0.005	50	3.7365	07/01/04	11:39
246048	P_1782	1.5	U	mg/L	1.5			-0.00835	0.03	50	-0.4175	07/01/04	11:39
246048	Si2881	5.52		mg/L	1.5			0.11035	0.03	50	5.5175	07/01/04	11:39
246048	Ti3349	0.25	U	mg/L	0.25			-0.00011	0.005	50	-0.0055	07/01/04	11:39
246048	U_4090	3.75	U	mg/L	3.75			-0.01436	0.075	50	-0.718	07/01/04	11:39
246048	Zr3496	0.25	U	mg/L	0.25			-0.00056	0.005	50	-0.028	07/01/04	11:39
246048d	Al3082	1.5	U	mg/L	1.5			0.01070	0.03	50	0.535	07/01/04	11:44
246048d	B_2496	1.13		mg/L	1			0.02259	0.02	50	1.1295	07/01/04	11:44
246048d	Ca3179	2.5	U	mg/L	2.5			0.04320	0.05	50	2.16	07/01/04	11:44
246048d	Cr2677	0.25	U	mg/L	0.25			0.00127	0.005	50	0.0635	07/01/04	11:44
246048d	Fe2714	8.10		mg/L	1.5			0.16201	0.03	50	8.1005	07/01/04	11:44
246048d	K_766	2640		mg/L	10			52.8082	0.2	50	2640.41	07/07/04	13:24:11
246048d	Li6707	0.25	U	mg/L	0.25			0.00079	0.005	50	0.0395	07/01/04	11:44
246048d	Mg2790	1.5	U	mg/L	1.5			0.00574	0.03	50	0.287	07/01/04	11:44
246048d	Mn2576	0.678		mg/L	0.25			0.01355	0.005	50	0.6775	07/01/04	11:44
246048d	Na589	1065		mg/L	10			21.2966	0.2	50	1064.83	07/07/04	13:24:11
246048d	Ni2316	3.61		mg/L	0.25			0.07211	0.005	50	3.6055	07/01/04	11:44
246048d	P_1782	1.5	U	mg/L	1.5			-0.01331	0.03	50	-0.6655	07/01/04	11:44
246048d	Si2881	5.43		mg/L	1.5			0.10855	0.03	50	5.4275	07/01/04	11:44
246048d	Ti3349	0.25	U	mg/L	0.25			-0.00031	0.005	50	-0.0155	07/01/04	11:44
246048d	U_4090	3.75	U	mg/L	3.75			0.05082	0.075	50	2.541	07/01/04	11:44
246048d	Zr3496	0.25	U	mg/L	0.25			-0.00101	0.005	50	-0.0505	07/01/04	11:44
246049	Al3082	1.5	U	mg/L	1.5			0.01728	0.03	50	0.864	07/01/04	11:49
246049	B_2496	1.65		mg/L	1			0.03306	0.02	50	1.653	07/01/04	11:49
246049	Ca3179	3.22		mg/L	2.5			0.06441	0.05	50	3.2205	07/01/04	11:49
246049	Cr2677	0.25	U	mg/L	0.25			0.00329	0.005	50	0.1645	07/01/04	11:49
246049	Fe2714	5.32		mg/L	1.5			0.10643	0.03	50	5.3215	07/01/04	11:49
246049	K_766	3355		mg/L	10			67.0922	0.2	50	3354.61	07/07/04	13:27:16
246049	Li6707	0.25	U	mg/L	0.25			0.00100	0.005	50	0.05	07/01/04	11:49
246049	Mg2790	1.5	U	mg/L	1.5			0.00868	0.03	50	0.434	07/01/04	11:49
246049	Mn2576	0.772		mg/L	0.25			0.01543	0.005	50	0.7715	07/01/04	11:49
246049	Na589	1917		mg/L	10			38.3352	0.2	50	1916.76	07/07/04	13:27:16
246049	Ni2316	4.09		mg/L	0.25			0.08189	0.005	50	4.0945	07/01/04	11:49
246049	P_1782	1.5	U	mg/L	1.5			-0.01236	0.03	50	-0.618	07/01/04	11:49
246049	Si2881	7.66		mg/L	1.5			0.15326	0.03	50	7.663	07/01/04	11:49
246049	Ti3349	0.25	U	mg/L	0.25			-0.00018	0.005	50	-0.009	07/01/04	11:49

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	rl	prep	mg/L	date	time
246049	U 4090	3.75	U	mg/L	3.75			-0.00790	0.075	50	-0.395	07/01/04	11:49
246049	Zr3496	0.25	U	mg/L	0.25			-0.00042	0.005	50	-0.021	07/01/04	11:49
246049s	Al3082	101		mg/L	1.5	100	101.3%	2.02594	0.03	50	101.297	07/01/04	11:55
246049s	B 2496	206		mg/L	1	200	102.0%	4.11336	0.02	50	205.668	07/01/04	11:55
246049s	Ca3179	1028		mg/L	2.5	1000	102.5%	20.55878	0.05	50	1027.939	07/01/04	11:55
246049s	Cr2677	9.99		mg/L	0.25	10	99.9%	0.19985	0.005	50	9.9925	07/01/04	11:55
246049s	Fe2714	60.2		mg/L	1.5	50	109.8%	1.20454	0.03	50	60.227	07/01/04	11:55
246049s	K 766	4421		mg/L	10	1000	106.6%	88.4201	0.2	50	4421.005	07/07/04	13:30:20
246049s	Li6707	203		mg/L	0.25	200	101.7%	4.06603	0.005	50	203.3015	07/01/04	11:55
246049s	Mg2790	1021		mg/L	1.5	1000	102.1%	20.41534	0.03	50	1020.767	07/01/04	11:55
246049s	Mn2576	26.2		mg/L	0.25	25	101.8%	0.52423	0.005	50	26.2115	07/01/04	11:55
246049s	Na589	2939		mg/L	10	1000	102.3%	58.7884	0.2	50	2939.42	07/07/04	13:30:20
246049s	Ni2316	28.7		mg/L	0.25	25	98.4%	0.57405	0.005	50	28.7025	07/01/04	11:55
246049s	P 1782	206		mg/L	1.5	200	102.9%	4.11410	0.03	50	205.705	07/01/04	11:55
246049s	Si2881	211		mg/L	1.5	200	101.7%	4.22026	0.03	50	211.013	07/01/04	11:55
246049s	Ti3349	199		mg/L	0.25	200	99.5%	3.98039	0.005	50	199.0195	07/01/04	11:55
246049s	U 4090	209		mg/L	3.75	200	104.4%	4.17547	0.075	50	208.7735	07/01/04	11:55
246049s	Zr3496	198		mg/L	0.25	200	99.0%	3.95913	0.005	50	197.9565	07/01/04	11:55
246050	Al3082	1.5	U	mg/L	1.5			0.00479	0.03	50	0.2395	07/01/04	12:00
246050	B 2496	1	U	mg/L	1			0.01165	0.02	50	0.5825	07/01/04	12:00
246050	Ca3179	2.5	U	mg/L	2.5			0.03232	0.05	50	1.616	07/01/04	12:00
246050	Cr2677	0.25	U	mg/L	0.25			0.00006	0.005	50	0.003	07/01/04	12:00
246050	Fe2714	1.5	U	mg/L	1.5			-0.00650	0.03	50	-0.325	07/01/04	12:00
246050	K 766	1924		mg/L	10			38.4873	0.2	50	1924.365	07/07/04	13:33:24
246050	Li6707	0.25	U	mg/L	0.25			0.00107	0.005	50	0.0535	07/01/04	12:00
246050	Mg2790	1.5	U	mg/L	1.5			0.00251	0.03	50	0.1255	07/01/04	12:00
246050	Mn2576	0.25	U	mg/L	0.25			0.00092	0.005	50	0.046	07/01/04	12:00
246050	Na589	3737		mg/L	10			74.7392	0.2	50	3736.96	07/07/04	13:33:24
246050	Ni2316	0.25	U	mg/L	0.25			0.00240	0.005	50	0.12	07/01/04	12:00
246050	P 1782	1.5	U	mg/L	1.5			0.00030	0.03	50	0.015	07/01/04	12:00
246050	Si2881	2.70		mg/L	1.5			0.05392	0.03	50	2.696	07/01/04	12:00
246050	Ti3349	0.25	U	mg/L	0.25			0.00000	0.005	50	0	07/01/04	12:00
246050	U 4090	3.75	U	mg/L	3.75			0.00740	0.075	50	0.37	07/01/04	12:00
246050	Zr3496	0.25	U	mg/L	0.25			0.00006	0.005	50	0.003	07/01/04	12:00
246051	Al3082	1.5	U	mg/L	1.5			0.00982	0.03	50	0.491	07/01/04	12:05
246051	B 2496	1	U	mg/L	1			0.00928	0.02	50	0.464	07/01/04	12:05
246051	Ca3179	2.5	U	mg/L	2.5			0.03750	0.05	50	1.875	07/01/04	12:05
246051	Cr2677	0.25	U	mg/L	0.25			-0.00015	0.005	50	-0.0075	07/01/04	12:05
246051	Fe2714	1.5	U	mg/L	1.5			-0.00604	0.03	50	-0.302	07/01/04	12:05

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	rl	prep	mg/L	date	time
246051	K_766	2011		mg/L	10			40.2220	0.2	50	2011.1	07/07/04	13:36:28
246051	Li6707	0.25	U	mg/L	0.25			0.00130	0.005	50	0.065	07/01/04	12:05
246051	Mg2790	1.5	U	mg/L	1.5			0.00776	0.03	50	0.388	07/01/04	12:05
246051	Mn2576	0.25	U	mg/L	0.25			0.00077	0.005	50	0.0385	07/01/04	12:05
246051	Na589	3923		mg/L	10			78.4520	0.2	50	3922.6	07/07/04	13:36:28
246051	Ni2316	0.25	U	mg/L	0.25			0.00186	0.005	50	0.093	07/01/04	12:05
246051	P_1782	1.5	U	mg/L	1.5			-0.00015	0.03	50	-0.0075	07/01/04	12:05
246051	Si2881	3.09		mg/L	1.5			0.06182	0.03	50	3.091	07/01/04	12:05
246051	Ti3349	0.25	U	mg/L	0.25			-0.00012	0.005	50	-0.006	07/01/04	12:05
246051	U_4090	3.75	U	mg/L	3.75			0.01394	0.075	50	0.697	07/01/04	12:05
246051	Zr3496	0.25	U	mg/L	0.25			-0.00055	0.005	50	-0.0275	07/01/04	12:05
246052	Al3082	1.5	U	mg/L	1.5			0.01067	0.03	50	0.5335	07/01/04	12:28
246052	B_2496	1	U	mg/L	1			0.01061	0.02	50	0.5305	07/01/04	12:28
246052	Ca3179	2.5	U	mg/L	2.5			0.03177	0.05	50	1.5885	07/01/04	12:28
246052	Cr2677	0.25	U	mg/L	0.25			-0.00023	0.005	50	-0.0115	07/01/04	12:28
246052	Fe2714	1.5	U	mg/L	1.5			0.00907	0.03	50	0.4535	07/01/04	12:28
246052	K_766	2243		mg/L	10			44.8529	0.2	50	2242.645	07/07/04	13:49:02
246052	Li6707	0.25	U	mg/L	0.25			0.00148	0.005	50	0.074	07/01/04	12:28
246052	Mg2790	1.5	U	mg/L	1.5			0.01238	0.03	50	0.619	07/01/04	12:28
246052	Mn2576	0.25	U	mg/L	0.25			0.00083	0.005	50	0.0415	07/01/04	12:28
246052	Na589	4226		mg/L	10			84.5216	0.2	50	4226.08	07/07/04	13:49:02
246052	Ni2316	0.25	U	mg/L	0.25			0.00206	0.005	50	0.103	07/01/04	12:28
246052	P_1782	1.5	U	mg/L	1.5			-0.01155	0.03	50	-0.5775	07/01/04	12:28
246052	Si2881	3.54		mg/L	1.5			0.07078	0.03	50	3.539	07/01/04	12:28
246052	Ti3349	0.25	U	mg/L	0.25			0.00003	0.005	50	0.0015	07/01/04	12:28
246052	U_4090	3.75	U	mg/L	3.75			0.03547	0.075	50	1.7735	07/01/04	12:28
246052	Zr3496	0.25	U	mg/L	0.25			0.00030	0.005	50	0.015	07/01/04	12:28
246053	Al3082	1.5	U	mg/L	1.5			-0.00042	0.03	50	-0.021	07/01/04	12:34
246053	B_2496	1	U	mg/L	1			0.01255	0.02	50	0.6275	07/01/04	12:34
246053	Ca3179	2.5	U	mg/L	2.5			0.03608	0.05	50	1.804	07/01/04	12:34
246053	Cr2677	0.25	U	mg/L	0.25			-0.00061	0.005	50	-0.0305	07/01/04	12:34
246053	Fe2714	1.5	U	mg/L	1.5			-0.00250	0.03	50	-0.125	07/01/04	12:34
246053	K_766	2509		mg/L	10			50.1729	0.2	50	2508.645	07/07/04	13:52:06
246053	Li6707	0.25	U	mg/L	0.25			0.00177	0.005	50	0.0885	07/01/04	12:34
246053	Mg2790	1.5	U	mg/L	1.5			0.00181	0.03	50	0.0905	07/01/04	12:34
246053	Mn2576	0.25	U	mg/L	0.25			0.00093	0.005	50	0.0465	07/01/04	12:34
246053	Na589	4604		mg/L	10			92.0803	0.2	50	4604.015	07/07/04	13:52:06
246053	Ni2316	0.25	U	mg/L	0.25			0.00264	0.005	50	0.132	07/01/04	12:34
246053	P_1782	1.5	U	mg/L	1.5			-0.00893	0.03	50	-0.4465	07/01/04	12:34

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246053	Si2881	3.80		mg/L	1.5			0.07590	0.03	50	3.795	07/01/04	12:34
246053	Ti3349	0.25	U	mg/L	0.25			-0.00024	0.005	50	-0.012	07/01/04	12:34
246053	U_4090	3.75	U	mg/L	3.75			-0.02106	0.075	50	-1.053	07/01/04	12:34
246053	Zr3496	0.25	U	mg/L	0.25			-0.00108	0.005	50	-0.054	07/01/04	12:34
246054	Al3082	1.5	U	mg/L	1.5			0.01009	0.03	50	0.5045	07/01/04	12:39
246054	B_2496	1	U	mg/L	1			0.01380	0.02	50	0.69	07/01/04	12:39
246054	Ca3179	2.5	U	mg/L	2.5			0.03823	0.05	50	1.9115	07/01/04	12:39
246054	Cr2677	0.25	U	mg/L	0.25			-0.00160	0.005	50	-0.08	07/01/04	12:39
246054	Fe2714	1.5	U	mg/L	1.5			0.01484	0.03	50	0.742	07/01/04	12:39
246054	K_766	2586		mg/L	10			51.7245	0.2	50	2586.225	07/07/04	13:55:11
246054	Li6707	0.25	U	mg/L	0.25			0.00206	0.005	50	0.103	07/01/04	12:39
246054	Mg2790	1.5	U	mg/L	1.5			0.00876	0.03	50	0.438	07/01/04	12:39
246054	Mn2576	0.25	U	mg/L	0.25			0.00233	0.005	50	0.1165	07/01/04	12:39
246054	Na589	4655		mg/L	10			93.1044	0.2	50	4655.22	07/07/04	13:55:11
246054	Ni2316	0.410		mg/L	0.25			0.00820	0.005	50	0.41	07/01/04	12:39
246054	P_1782	1.5	U	mg/L	1.5			-0.00580	0.03	50	-0.29	07/01/04	12:39
246054	Si2881	4.57		mg/L	1.5			0.09147	0.03	50	4.5735	07/01/04	12:39
246054	Ti3349	0.25	U	mg/L	0.25			-0.00032	0.005	50	-0.016	07/01/04	12:39
246054	U_4090	3.75	U	mg/L	3.75			0.02111	0.075	50	1.0555	07/01/04	12:39
246054	Zr3496	0.25	U	mg/L	0.25			-0.00086	0.005	50	-0.043	07/01/04	12:39
246055	Al3082	1.5	U	mg/L	1.5			0.00563	0.03	50	0.2815	07/01/04	12:44
246055	B_2496	1	U	mg/L	1			0.01326	0.02	50	0.663	07/01/04	12:44
246055	Ca3179	2.5	U	mg/L	2.5			0.02191	0.05	50	1.0955	07/01/04	12:44
246055	Cr2677	0.25	U	mg/L	0.25			0.00054	0.005	50	0.027	07/01/04	12:44
246055	Fe2714	1.5	U	mg/L	1.5			0.00240	0.03	50	0.12	07/01/04	12:44
246055	K_766	1451		mg/L	10			29.0122	0.2	50	1450.61	07/07/04	13:58:15
246055	Li6707	0.25	U	mg/L	0.25			0.00154	0.005	50	0.077	07/01/04	12:44
246055	Mg2790	1.5	U	mg/L	1.5			0.00781	0.03	50	0.3905	07/01/04	12:44
246055	Mn2576	0.25	U	mg/L	0.25			0.00012	0.005	50	0.006	07/01/04	12:44
246055	Na589	1212		mg/L	10			24.2300	0.2	50	1211.5	07/07/04	13:58:15
246055	Ni2316	0.25	U	mg/L	0.25			0.00193	0.005	50	0.0965	07/01/04	12:44
246055	P_1782	1.5	U	mg/L	1.5			-0.00978	0.03	50	-0.489	07/01/04	12:44
246055	Si2881	4.29		mg/L	1.5			0.08579	0.03	50	4.2895	07/01/04	12:44
246055	Ti3349	0.25	U	mg/L	0.25			0.00004	0.005	50	0.002	07/01/04	12:44
246055	U_4090	3.75	U	mg/L	3.75			0.01809	0.075	50	0.9045	07/01/04	12:44
246055	Zr3496	0.25	U	mg/L	0.25			0.00006	0.005	50	0.003	07/01/04	12:44
246056	Al3082	1.5	U	mg/L	1.5			0.01287	0.03	50	0.6435	07/01/04	12:50
246056	B_2496	1	U	mg/L	1			0.01519	0.02	50	0.7595	07/01/04	12:50
246056	Ca3179	2.5	U	mg/L	2.5			0.03177	0.05	50	1.5885	07/01/04	12:50

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246056	Cr2677	0.25	U	mg/L	0.25			-0.00030	0.005	50	-0.015	07/01/04	12:50
246056	Fe2714	1.5	U	mg/L	1.5			0.01730	0.03	50	0.865	07/01/04	12:50
246056	K_766	1807		mg/L	10			36.1402	0.2	50	1807.01	07/07/04	14:01:19
246056	Li6707	0.25	U	mg/L	0.25			0.00252	0.005	50	0.126	07/01/04	12:50
246056	Mg2790	1.5	U	mg/L	1.5			0.01225	0.03	50	0.6125	07/01/04	12:50
246056	Mn2576	0.25	U	mg/L	0.25			-0.00003	0.005	50	-0.0015	07/01/04	12:50
246056	Na589	2250		mg/L	10			44.9947	0.2	50	2249.735	07/07/04	14:01:19
246056	Ni2316	0.25	U	mg/L	0.25			0.00160	0.005	50	0.08	07/01/04	12:50
246056	P_1782	1.5	U	mg/L	1.5			-0.01063	0.03	50	-0.5315	07/01/04	12:50
246056	Si2881	6.74		mg/L	1.5			0.13479	0.03	50	6.7395	07/01/04	12:50
246056	Ti3349	0.25	U	mg/L	0.25			-0.00019	0.005	50	-0.0095	07/01/04	12:50
246056	U_4090	3.75	U	mg/L	3.75			0.03465	0.075	50	1.7325	07/01/04	12:50
246056	Zr3496	0.25	U	mg/L	0.25			0.00029	0.005	50	0.0145	07/01/04	12:50
246057	Al3082	1.5	U	mg/L	1.5			0.01593	0.03	50	0.7965	07/01/04	12:55
246057	B_2496	1.15		mg/L	1			0.02290	0.02	50	1.145	07/01/04	12:55
246057	Ca3179	2.5	U	mg/L	2.5			0.03421	0.05	50	1.7105	07/01/04	12:55
246057	Cr2677	0.25	U	mg/L	0.25			0.00001	0.005	50	0.0005	07/01/04	12:55
246057	Fe2714	1.5	U	mg/L	1.5			-0.00077	0.03	50	-0.0385	07/01/04	12:55
246057	K_766	2217		mg/L	10			44.3414	0.2	50	2217.07	07/07/04	14:04:24
246057	Li6707	0.25	U	mg/L	0.25			0.00377	0.005	50	0.1885	07/01/04	12:55
246057	Mg2790	1.5	U	mg/L	1.5			0.00831	0.03	50	0.4155	07/01/04	12:55
246057	Mn2576	0.25	U	mg/L	0.25			0.00009	0.005	50	0.0045	07/01/04	12:55
246057	Na589	3485		mg/L	10			69.7005	0.2	50	3485.025	07/07/04	14:04:24
246057	Ni2316	0.25	U	mg/L	0.25			0.00183	0.005	50	0.0915	07/01/04	12:55
246057	P_1782	1.5	U	mg/L	1.5			-0.00153	0.03	50	-0.0765	07/01/04	12:55
246057	Si2881	9.70		mg/L	1.5			0.19405	0.03	50	9.7025	07/01/04	12:55
246057	Ti3349	0.25	U	mg/L	0.25			0.00001	0.005	50	0.0005	07/01/04	12:55
246057	U_4090	3.75	U	mg/L	3.75			0.00744	0.075	50	0.372	07/01/04	12:55
246057	Zr3496	0.25	U	mg/L	0.25			-0.00035	0.005	50	-0.0175	07/01/04	12:55
246058	Al3082	1.5	U	mg/L	1.5			0.00835	0.03	50	0.4175	07/01/04	13:00
246058	B_2496	1.54		mg/L	1			0.03079	0.02	50	1.5395	07/01/04	13:00
246058	Ca3179	2.5	U	mg/L	2.5			0.03214	0.05	50	1.607	07/01/04	13:00
246058	Cr2677	0.25	U	mg/L	0.25			0.00011	0.005	50	0.0055	07/01/04	13:00
246058	Fe2714	1.5	U	mg/L	1.5			-0.00067	0.03	50	-0.0335	07/01/04	13:00
246058	K_766	2696		mg/L	10			53.9275	0.2	50	2696.375	07/07/04	14:07:27
246058	Li6707	0.25	U	mg/L	0.25			0.00499	0.005	50	0.2495	07/01/04	13:00
246058	Mg2790	1.5	U	mg/L	1.5			0.00774	0.03	50	0.387	07/01/04	13:00
246058	Mn2576	0.25	U	mg/L	0.25			0.00007	0.005	50	0.0035	07/01/04	13:00
246058	Na589	5557		mg/L	10			111.1490	0.2	50	5557.45	07/07/04	14:07:27

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246058	Ni2316	0.25	U	mg/L	0.25			0.00275	0.005	50	0.1375	07/01/04	13:00
246058	P_1782	1.5	U	mg/L	1.5			0.00306	0.03	50	0.153	07/01/04	13:00
246058	Si2881	15.3		mg/L	1.5			0.30664	0.03	50	15.332	07/01/04	13:00
246058	Ti3349	0.25	U	mg/L	0.25			-0.00006	0.005	50	-0.003	07/01/04	13:00
246058	U_4090	3.75	U	mg/L	3.75			0.00714	0.075	50	0.357	07/01/04	13:00
246058	Zr3496	0.25	U	mg/L	0.25			-0.00073	0.005	50	-0.0365	07/01/04	13:00
246059	Al3082	1.5	U	mg/L	1.5			0.00714	0.03	50	0.357	07/01/04	13:05
246059	B_2496	1.97		mg/L	1			0.03945	0.02	50	1.9725	07/01/04	13:05
246059	Ca3179	2.5	U	mg/L	2.5			0.03462	0.05	50	1.731	07/01/04	13:05
246059	Cr2677	0.25	U	mg/L	0.25			-0.00006	0.005	50	-0.003	07/01/04	13:05
246059	Fe2714	1.5	U	mg/L	1.5			0.00377	0.03	50	0.1885	07/01/04	13:05
246059	K_766	3150		mg/L	10			62.9956	0.2	50	3149.78	07/07/04	14:11:02
246059	Li6707	0.303		mg/L	0.25			0.00605	0.005	50	0.3025	07/01/04	13:05
246059	Mg2790	1.5	U	mg/L	1.5			0.01172	0.03	50	0.586	07/01/04	13:05
246059	Mn2576	0.25	U	mg/L	0.25			0.00001	0.005	50	0.0005	07/01/04	13:05
246059	Na589	7514		mg/L	10			150.2723	0.2	50	7513.615	07/07/04	14:11:02
246059	Ni2316	0.25	U	mg/L	0.25			0.00151	0.005	50	0.0755	07/01/04	13:05
246059	P_1782	1.5	U	mg/L	1.5			-0.00210	0.03	50	-0.105	07/01/04	13:05
246059	Si2881	20.6		mg/L	1.5			0.41189	0.03	50	20.5945	07/01/04	13:05
246059	Ti3349	0.25	U	mg/L	0.25			-0.00026	0.005	50	-0.013	07/01/04	13:05
246059	U_4090	3.75	U	mg/L	3.75			0.02591	0.075	50	1.2955	07/01/04	13:05
246059	Zr3496	0.25	U	mg/L	0.25			-0.00054	0.005	50	-0.027	07/01/04	13:05
246060	Al3082	1.5	U	mg/L	1.5			0.00323	0.03	50	0.1615	07/01/04	13:11
246060	B_2496	1.88		mg/L	1			0.03767	0.02	50	1.8835	07/01/04	13:11
246060	Ca3179	2.5	U	mg/L	2.5			0.03242	0.05	50	1.621	07/01/04	13:11
246060	Cr2677	0.25	U	mg/L	0.25			-0.00038	0.005	50	-0.019	07/01/04	13:11
246060	Fe2714	1.5	U	mg/L	1.5			0.00149	0.03	50	0.0745	07/01/04	13:11
246060	K_766	3108		mg/L	10			62.1689	0.2	50	3108.445	07/07/04	14:14:06
246060	Li6707	0.309		mg/L	0.25			0.00618	0.005	50	0.309	07/01/04	13:11
246060	Mg2790	1.5	U	mg/L	1.5			0.00278	0.03	50	0.139	07/01/04	13:11
246060	Mn2576	0.25	U	mg/L	0.25			0.00003	0.005	50	0.0015	07/01/04	13:11
246060	Na589	7476		mg/L	10			149.5173	0.2	50	7475.865	07/07/04	14:14:06
246060	Ni2316	0.25	U	mg/L	0.25			0.00252	0.005	50	0.126	07/01/04	13:11
246060	P_1782	1.5	U	mg/L	1.5			-0.00080	0.03	50	-0.04	07/01/04	13:11
246060	Si2881	20.7		mg/L	1.5			0.41417	0.03	50	20.7085	07/01/04	13:11
246060	Ti3349	0.25	U	mg/L	0.25			-0.00014	0.005	50	-0.007	07/01/04	13:11
246060	U_4090	3.75	U	mg/L	3.75			-0.02431	0.075	50	-1.2155	07/01/04	13:11
246060	Zr3496	0.25	U	mg/L	0.25			-0.00106	0.005	50	-0.053	07/01/04	13:11
lcsw-F30W1	Al3082	1.95		mg/L	1.5	2	97.5%	1.94914	0.03	1	1.94914	07/01/04	11:23

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lcsw-F30W1	B_2496	4.01		mg/L	1	4	100.2%	4.00824	0.02	1	4.00824	07/01/04	11:23
lcsw-F30W1	Ca3179	20.5		mg/L	2.5	20	102.7%	20.54508	0.05	1	20.54508	07/01/04	11:23
lcsw-F30W1	Cr2677	0.195		mg/L	0.25	0.2	97.7%	0.19542	0.005	1	0.19542	07/01/04	11:23
lcsw-F30W1	Fe2714	1.12		mg/L	1.5	1	111.9%	1.11947	0.03	1	1.11947	07/01/04	11:23
lcsww-040707	K_766	20.0		mg/L	10	20	99.9%	19.9783	0.2	1	19.9783	07/07/04	13:11:26
lcsw-F30W1	Li6707	3.56		mg/L	0.25	4	89.1%	3.56360	0.005	1	3.5636	07/01/04	11:23
lcsw-F30W1	Mg2790	20.4		mg/L	1.5	20	101.8%	20.36833	0.03	1	20.36833	07/01/04	11:23
lcsw-F30W1	Mn2576	0.507		mg/L	0.25	0.5	101.3%	0.50650	0.005	1	0.5065	07/01/04	11:23
lcsww-040707	Na589	20.1		mg/L	10	20	100.4%	20.0899	0.2	1	20.0899	07/07/04	13:11:26
lcsw-F30W1	Ni2316	0.492		mg/L	0.25	0.5	98.5%	0.49230	0.005	1	0.4923	07/01/04	11:23
lcsw-F30W1	P_1782	4.01		mg/L	1.5	4	100.2%	4.00746	0.03	1	4.00746	07/01/04	11:23
lcsw-F30W1	Si2881	4.03		mg/L	1.5	4	100.7%	4.02797	0.03	1	4.02797	07/01/04	11:23
lcsw-F30W1	Ti3349	3.93		mg/L	0.25	4	98.2%	3.92784	0.005	1	3.92784	07/01/04	11:23
lcsw-F30W1	U_4090	4.11		mg/L	3.75	4	102.7%	4.10600	0.075	1	4.106	07/01/04	11:23
lcsw-F30W1	Zr3496	3.88		mg/L	0.25	4	97.0%	3.87816	0.005	1	3.87816	07/01/04	11:23
pbw-F30W1 pg57-125	Al3082	1.5	U	mg/L	1.5			0.00824	0.03	50	0.412	07/01/04	11:17
pbw-F30W1 pg57-125	B_2496	1	U	mg/L	1			0.00402	0.02	50	0.201	07/01/04	11:17
pbw-F30W1 pg57-125	Ca3179	2.5	U	mg/L	2.5			0.01390	0.05	50	0.695	07/01/04	11:17
pbw-F30W1 pg57-125	Cr2677	0.25	U	mg/L	0.25			0.00012	0.005	50	0.006	07/01/04	11:17
pbw-F30W1 pg57-125	Fe2714	1.5	U	mg/L	1.5			0.01052	0.03	50	0.526	07/01/04	11:17
pbw-040707	K_766	10	U	mg/L	10			-0.0749	0.2	50	-3.745	07/07/04	13:08:22
pbw-F30W1 pg57-125	Li6707	0.25	U	mg/L	0.25			0.00005	0.005	50	0.0025	07/01/04	11:17
pbw-F30W1 pg57-125	Mg2790	1.5	U	mg/L	1.5			0.00864	0.03	50	0.432	07/01/04	11:17
pbw-F30W1 pg57-125	Mn2576	0.25	U	mg/L	0.25			0.00009	0.005	50	0.0045	07/01/04	11:17
pbw-040707	Na589	10	U	mg/L	10			0.0207	0.2	50	1.035	07/07/04	13:08:22
pbw-F30W1 pg57-125	Ni2316	0.25	U	mg/L	0.25			0.00261	0.005	50	0.1305	07/01/04	11:17
pbw-F30W1 pg57-125	P_1782	1.5	U	mg/L	1.5			-0.00940	0.03	50	-0.47	07/01/04	11:17
pbw-F30W1 pg57-125	Si2881	1.5	U	mg/L	1.5			0.00640	0.03	50	0.32	07/01/04	11:17
pbw-F30W1 pg57-125	Ti3349	0.25	U	mg/L	0.25			0.00003	0.005	50	0.0015	07/01/04	11:17
pbw-F30W1 pg57-125	U_4090	3.75	U	mg/L	3.75			0.00380	0.075	50	0.19	07/01/04	11:17
pbw-F30W1 pg57-125	Zr3496	0.25	U	mg/L	0.25			0.00009	0.005	50	0.0045	07/01/04	11:17

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 57 125

CLIENT(S): DIV 20
TASK ORDER(S): 040616-1 SDG(S): 246046 **010050**
PROJECT NO(S): 06002.01.081
METHOD: 3005A ___ 3050B ___ 3050B-7.5 ___ 3010A ___ 3020A ___ 7760A ___ 7740A ___ $HClO_4$ ___ H_2SO_4 Sb ___
Microwave ___ Fusion ___ Teflon ___ Rock ___ OTHER df 50 dilutions
MATRIX: Water ___ Soil ___ Biota ___ Solid ___ Liquid ✓ TCLP Ext ___ OTHER ___
INSTRUMENT: GFAA ___ ICP ✓ ICP-MS ___ IC ___ FLAA ___ HYDRIDE ___ OTHER ___
ACID INORG #: HNO_3# ** HCl# ** H_2SO_4# ___ $HClO_4$# ___ HF# ___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM ___ SOURCE: IV INORG# 4262 EXP: 7/04 AMT: 50mL
Oven/Hotplate ID: ___ Temperature (°C): Ambient

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PBW-F30W1			5	5	
LCSW-F30L01 *			5		
246046			100mL		
6047					
6048					
6048d					
6049					
6049 MS *					
6050					
6051					
6052					
6053					
6054					
6055					
6056					
6057					
6058					
6059					
6060					
* Spike 50mL Sp.Kit 1		Spex#4306	Exp. 10/04		
20mL I-Cal 1		Spex#4245	Exp. 3/05		
20mL P @ 1000 ppm		IV# 4593	Exp. 6/05		
20mL Zr		IV# 4474	Exp. 3/05		
20mL U		IV# 4473	3/05		
20mL Li		IV# 4149	7/04		
20mL Ti		IV# 4332	12/04		
20mL Si		IV# 4437	2/05		
20mL B		IV# 4301	8/04		
PBW & LCSW are prepared as 5mLs		1% HNO_3	5% HCl	**	LOCATION:
** -RLB-02-041-01	Exp	7-23-04			N/A

PREPARED BY: [signature] DATE: 6-30-04 jed
REVIEWED BY: [signature] DATE: 6-30-04
DISPOSAL INT/DATE/LOC: ___

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
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BOOK / PAGE: 56 244

CLIENT(S): Div 20
TASK ORDER(S): 040616-1 SDG(S): 246046 **010051**
PROJECT NO(S): 06002.01.081
METHOD: 3005A___3050B___3050B-7.5___3010A___3020A___7760A___7740A___$HClO_4$___H_2SO_4 Sb_____
Microwave___Fusion___Teflon___Rock___OTHER dc 50 dilutions
MATRIX: Water___Soil___Biota___Solid___Liquid ✓ TCLP Ext___OTHER_____
INSTRUMENT: GFAA___ICP ✓ ICP-MS___IC___FLAA___HYDRIDE___OTHER_____
ACID INORG #: HNO_3# * HCl# * H_2SO_4#_____ $HClO_4$#_____ HF#_____
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM___SOURCE: IV INORG# 4629 EXP: 8/05 AMT: 500L
Oven/Hotplate ID:_____ Temperature (°C): Ambient

7-7-04

S

Sample Identification	pH	WT(g)	I.V.(ml)	F.V.(ml)
PBW-G07H1			5	5
LCSW-G07H1*			5	5
246046			100uL	5
246047			100uL	5
246048			100uL	5
246048d			100uL	5
246049			100uL	5
246049s			100uL	5
246050			100uL	5
246051			100uL	5
246052			100uL	5
246053			100uL	5
246054			100uL	5
246055			100uL	5
246056			100uL	5
246057			100uL	5
246058			100uL	5
246059			100uL	5
246060			100uL	5

ICAL-1
*spike 50uL ~~spike-1~~ Spex#4514 Exp. 03/05
20uL Li IV#4149 Exp.08/05
PBW&LCSW are prepared as 5mls 1%HNO_3 / 5% HCL-**
** RLB-04-041-01 Exp. 7/23/04
02 CO 8/20/04

LOCATION: N/A

PREPARED BY: _____ DATE: 7-7-04
REVIEWED BY: _____ DATE: 7/7/04
DISPOSAL INT/DATE/LOC: _____

FRM-191 (Rev 2/Mar 03)

Trace Metals Reagent Logbook 010052

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 02 041

Reagent I.D.:	Preparation Description:	Prep Date:	Exp Date:	Initials:
RLB-02-041-01	1% HNO_3 / 5% HCL	4-23-04	7-23-04	JEE
↓	add a 150mLs di water to a 250mL	↓	↓	↓
	Nalgene bottle, add 2.5mLs HNO_3 -			
	reagent 4495, add 12.5mLs HCL -			
↓	reagent 4491, F.V. to 250mLs w/di H_2O	↓	↓	↓
RLB-02-041-02	EFB #2 - E03E1	5-3-04	8-3-04	KE ~~8-3-04~~
↓	5.7ml Acetic Acid dilute	↓	↓	↓
	to 1L Di water. pH 2.85			
RLB-02-041-03	0.1N HNO_3	5-19-04	8-19-04	JEE
↓	add 298mLs di water to a 500mL Nalgene	↓	↓	↓
	bottle, add 1.90mL HNO_3 reagent #4560			
↓	F.V. to 300mLs w/ di water	↓	↓	↓
RLB-02-041-04	5% HNO_3	5-19-04	8-19-04	JEE
↓	add 400mL di to a 500mL Nalgene	↓	↓	↓
	bottle, add 5mLs HNO_3 - reagent #4560			
↓	F.V. to 500mLs w/ di water	↓	↓	↓
RLB02-041-05	5% Potassium Permanganate			
	150G to 3.0L of DI water.	5-20-04	5-20-05	RV
	INORG # 4485	↓	↓	↓
RLB-02-041-06	1N (NaOH) 40g NaOH #4207	5-26-04	5-26-05	KE
	dilute to 1L Di-water	↓		↓

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010053

SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

TJA_2 TRACE ICP DAILY LOG

ANALYST DL DATE 7-1-04

As 189.042 Profile Line As Intensity: 423.919

PEAK POSITION 1009027
VERNIER POSITION 744

QC PREP DATE:	
CCV/ICV	04G01
CRI	
ICSA	DL 7-1-04
ICSAB	

STDs PREP DATE:	
CLP_STD1_SC	04E25
CLP_STD2_SC	04F02
CLP_STD3_SC	04E25
CLP_STD4_SC	04E25
CLP_STD5_SC	04F02
CLP_STD6_SC	04E25
BLK_SC	04F21

COMMENTS	FILE	CLIENT	TO#	PROJECT NO.	METHOD
B406161	Y04JUN	DIL20	040616-1	06002.01.081	SW6 57 125
			DL 7-1-04		

COMMENTS:

MAINTENANCE:

REVIEWED BY: Ordena DATE: 8/10/04

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SOUTHWEST RESEARCH INSTITUTE

6220 Culebra Rd
San Antonio, Texas 78228

SPECTRO ICP DAILY LOG

010054

ANALYST DL DATE 7-7-04

POWER: 1200 FLOWS:

Aux 40
Coolant 60
Mass Flow Controller 1054

CURRENT	PROPOSED	
5030	5033	Na
4785	4777	Fe
4935	4919	Sr

QC PREP DATE:	
CCV/ICV	04G01
CRI	
ICSA	DL 7-7-04
ICSAB	

CLP_STD1_SC	04G01
CLP_STD2_SC	A
CLP_STD3_SC	
CLP_STD4_SC	DL 7-7-04
CLP_STD5_SC	
BLK_SC	04F21

FILE	CLIENT	TO#	PROJECT NO.	METHOD	PREP PAGE
40707	DIV 20	040616-1	06002.01.051	L. KNA	56 e94

DL 7-7-04

COMMENTS: _____

MAINTENANCE:

Cleaned Torch: _____ YES
Changed Pump Tubing: _____ YES
Cleaned Optics: _____ YES
Polished Optics: _____ YES

OTHER: _____

REVIEWED BY: Orduña DATE: 8/7/04

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 04621

Date Prepared: 5-21-04 Prepared By: DL

010055

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4561

Added ✓ 50 ml HCL INORG #: 4554

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-04 INORG #: 4262

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 04621

Date Prepared: 6-21-04 Prepared By: DH

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4582

Added ✓ 50 ml HCL INORG #: 4556

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: ~~4262~~ 10-1-04 6-21-04 INORG #: 4262

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 04609

Date Prepared: 7-9-04 Prepared By: DL

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4583

Added ✓ 50 ml HCL INORG #: 4587

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-04 INORG #: 4262

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 04802

Date Prepared: 8-2-04 Prepared By: DL

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4650

Added ✓ 50 ml HCL INORG #: 4591

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-04 INORG #: 4262

ICP ICV/CCV SOLUTION

CCV- 04C01

010056

Date Prepared: 7-1-04 Prepared By: [signature]

HNO3 INORG #: 4583 HCl INORG #: 4587

Make up as needed in 1000ml volumetric flask in 1% HNO3 AND 5% HCl.

Element	Std Conc (ppm)	Amt added	Check	Source	Inorg #	Stock Conc (ppm)	Exp Date
Sc	10	1ml	✓	INORGVENT	4262	10000	10-1-04
B	5	5ml	✓	SPEX	4564	1000	4-30-05
Li	5	5ml	✓	SPEX	4439	1000	1-30-05
Mo	5	5ml	✓	SPEX	4440	1000	1-30-05
P	5	5ml	✓	SPEX	4307	1000	10-30-04
Si	5	5ml	✓	SPEX	4232	1000	8-30-04
Ti	5	5ml	✓	SPEX	4234	1000	8-30-04
Sr	5	5ml	✓	SPEX	4308	1000	10-30-04
Sn	5	5ml	✓	SPEX	4565	1000	4-30-05
Bi	5	5ml	✓	SPEX	4475	1000	2-28-05
La	5	5ml	✓	SPEX	4438	1000	1-30-05
Y	5	5ml	✓	SPEX	4441	1000	1-30-05
Pd	1	1ml	✓	SPEX	4417	1000	1-15-05
S	1	1ml	✓	SPEX	4617	1000	6-30-05 pm
Th	1	1ml	✓	SPEX	4233	1000	8-30-04
U	1	1ml	✓	SPEX	4619	1000	6-30-05
W	1	1ml	✓	SPEX	4212	1000	8-15-04
Zr	5	5ml	✓	SPEX	4566	1000	4-30-05
Na	10	1ml	✓	SPEX	4443	10000	1-30-05
ICV-2A	vary	10ml	✓	SPEX	4328	mix	11-30-04
ICV-2B	vary	1ml	✓	SPEX	4329	mix	11-30-04
ICV-2C	vary	10ml	✓	SPEX	4330	mix	11-30-04

Expiration Date: 8-15-04

ICP Calibration Standards

Date Prepared: 5-25-04 Prepared By: JL

HNO3 INORG #: 4561 HCl INORG #: 4555

010057

Make up as needed in 500 ml volumetric flasks in 1% HNO3 and 5% HCl.

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
04E25	STD1- 5-24-04 5-25-04	Al	50	2.50	✓	INORVENT	4220	10000	9-1-04
		Ca	50	2.50	✓	INORVENT	4436	10000	2-1-05
		Fe	50	2.50	✓	INORVENT	4470	10000	3-1-05
		K	50	2.50	✓	INORVENT	4320	10000	12-1-04
		Mg	25	1.25	✓	INORVENT	4204	10000	8-1-04
		Na	50	2.50	✓	INORVENT	4205	10000	8-1-04
		Li	10	5.00	✓	INORVENT	4149	1000	7-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25	STD2- 5-24-04 5-25-04	Ba	10	5.00	✓	INORVENT	4465	1000	3-1-05
		Be	5	2.50	✓	INORVENT	4062	1000	6-1-04 5-25-04
		Cr	10	5.00	✓	INORVENT	4318	1000	12-1-04
		Cu	10	5.00	✓	INORVENT	4469	1000	3-1-05
		Ni	10	5.00	✓	INORVENT	4472	1000	3-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25	STD3- 5-24-04 5-25-04	Cd	10	5.00	✓	INORVENT	4467	1000	3-1-05
		Co	10	5.00	✓	INORVENT	4468	1000	3-1-05
		Mn	10	5.00	✓	INORVENT	4434	1000	2-1-05
		V	10	5.00	✓	INORVENT	4321	1000	12-1-04
		Zn	10	5.00	✓	INORVENT	4319	1000	12-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25	STD4- 5-24-04 5-25-04	Ag	2	1.00	✓	INORVENT	4222	1000	9-1-04
		As	10	5.00	✓	INORVENT	4433	1000	2-1-05
		Pb	10	5.00	✓	INORVENT	4313	1000	11-1-04
		Sb	10	5.00	✓	INORVENT	4464	1000	3-1-05
		Se	10	5.00	✓	INORVENT	4152	1000	7-1-04
		TL	10	5.00	✓	INORVENT	4435	1000	2-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	~~10-1-04~~ 10-1-04 5-24-04
04E25	STD5- 5-24-04 5-25-04	B	10	5.00	✓	INORVENT	4201	1000	8-1-04
		Mo	10	5.00	✓	INORVENT	4471	1000	3-1-05
		P	10	5.00	✓	INORVENT	4049	1000	6-1-04 5-25-04
		Si	10	5.00	✓	INORVENT	4437	1000	2-1-05
		Ti	10	5.00	✓	INORVENT	4332	1000	12-1-04
		Sr	10	5.00	✓	INORVENT	4154	1000	7-1-04
		Sn	10	5.00	✓	INORVENT	4512	1000	4-1-05
		Bi	5	2.50	✓	INORVENT	4200	1000	8-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25	STD6- 5-24-04 5-25-04	La	10	5.00	✓	INORVENT	4221	1000	9-1-04
		Na	1	0.05	✓	INORVENT	4205	10000	8-1-04
		Pd	10	5.00	✓	INORVENT	4477	1000	3-1-05
		S	10	5.00	✓	INORVENT	4317	1000	12-1-04
		Th	10	5.00	✓	INORVENT	4283	1000	11-1-04
		U	10	5.00	✓	INORVENT	4473	1000	3-1-05
		W	5	2.50	✓	INORVENT	4203	1000	8-1-04
		Y	10	5.00	✓	INORVENT	4513	1000	4-1-05
		Zr	10	5.00	✓	INORVENT	4442	1000	8-1-05
		SC	10	0.500	✓	INORVENT	4262	10000	10-1-04

Expiration Dates:

STD1: 7-1-04 **STD4:** 7-1-04

STD2: 6-1-04 **STD5:** 6-1-04

STD3: 8-24-04 **STD6:** 8-1-04

ICP Calibration Standards

Date Prepared: 6-2-04 Prepared By: DL

HNO3 INORG #: 4562 HCl INORG #: 4557 **010058**

Make up as needed in 500 ml volumetric flasks in 1% HNO3 and 5% HCl.

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
	STD1-	Al	50	2.50		INORVENT		10000	
		Ca	50	2.50		INORVENT		10000	
		Fe	50	2.50		INORVENT		10000	
		K	50	2.50		INORVENT		10000	
		Mg	25	1.25		INORVENT		10000	
		Na	50	2.50		INORVENT		10000	
		Li	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
6-2-04	STD2-	Ba	10	5.00		INORVENT	4465	1000	3-1-05
		Be	5	2.50	✓	INORVENT	4552	1000	6-1-05
		Cr	10	5.00	✓	INORVENT	4318	1000	12-1-04
		Cu	10	5.00	✓	INORVENT	4469	1000	3-1-05
		Ni	10	5.00	✓	INORVENT	4472	1000	3-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
	STD3-	Cd	10	5.00		INORVENT		1000	
		Co	10	5.00		INORVENT		1000	
		Mn	10	5.00		INORVENT		1000	
		V	10	5.00		INORVENT		1000	
		Zn	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD4-	Ag	10	1.00		INORVENT		1000	
		As	10	5.00		INORVENT		1000	
		Pb	10	5.00		INORVENT		1000	
		Sb	10	5.00		INORVENT		1000	
		Se	10	5.00		INORVENT		1000	
		TL	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
6-2-04	STD5-	B	10	5.00	✓	INORVENT	4201	1000	8-1-04
		Mo	10	5.00	✓	INORVENT	4471	1000	3-1-05
		P	10	5.00	✓	INORVENT	4593	1000	6-1-05
		Si	10	5.00	✓	INORVENT	4437	1000	2-1-05
		Ti	10	5.00	✓	INORVENT	4332	1000	12-1-04
		Sr	10	5.00	✓	INORVENT	4154	1000	7-1-04
		Sn	10	5.00	✓	INORVENT	4512	1000	4-1-05 4-1-05 DH 6-2-
		Bi	5	2.50	✓	INORVENT	4200	1000	8-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
	STD6-	La	10	5.00		INORVENT		1000	
		Na	1	0.05		INORVENT		10000	
		Pd	10	5.00		INORVENT		1000	
		S	10	5.00		INORVENT		1000	
		Th	10	5.00	6-2-04	INORVENT		1000	
		U	10	5.00	DL	INORVENT		1000	
		W	5	2.50		INORVENT		1000	
		Y	10	5.00		INORVENT		1000	
		Zr	10	5.00		INORVENT		1000	
		SC	10	0.500		INORVENT		10000	

Expiration Dates:

STD1: —

STD2: 8-1-04

STD3: —

STD4: —

STD5: 7-1-04

STD6: —

ICP Calibration Standards

010059

Date Prepared: 7-1-04 Prepared By: DL

HNO3 INORG #: 4583 HCl INORG #: 4587

Make up as needed in 500 ml volumetric flasks in 1% HNO3 and 5% HCl.

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
7-1-04	STD1-0AG01	Al	50	2.50	✓	INORVENT	4220	10000	9-1-04
		Ca	50	2.50	✓	INORVENT	4436	10000	2-1-05
		Fe	50	2.50	✓	INORVENT	4470	10000	3-1-05
		K	50	2.50	✓	INORVENT	4320	10000	12-1-04
		Mg	25	1.25	✓	INORVENT	4204	10000	8-1-04
		Na	50	2.50	✓	INORVENT	4205	10000	8-1-04
		Li	10	5.00	✓	INORVENT	4628	1000	8-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
7-8-04	STD2-0AG04	Ba	10	5.00	✓	INORVENT	4465	1000	3-1-05
		Be	5	2.50	✓	INORVENT	4592	1000	6-1-05
		Cr	10	5.00	✓	INORVENT	4318	1000	12-1-04
		Cu	10	5.00	✓	INORVENT	4469	1000	3-1-05
		Ni	10	5.00	✓	INORVENT	4472	1000	3-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
7-8-04	STD3-0AG04	Cd	10	5.00	✓	INORVENT	4467	1000	3-1-05
		Co	10	5.00	✓	INORVENT	4468	1000	3-1-05
		Mn	10	5.00	✓	INORVENT	4434	1000	2-1-05
		V	10	5.00	✓	INORVENT	4321	1000	12-1-04
		Zn	10	5.00	✓	INORVENT	4319	1000	12-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
7-1-04	STD4-0AG01	Ag	2	1.00	✓	INORVENT	4222	1000	9-1-04
		As	10	5.00	✓	INORVENT	4433	1000	2-1-05
		Pb	10	5.00	✓	INORVENT	4313	1000	11-1-04
		Sb	10	5.00	✓	INORVENT	4464	1000	3-1-05
		Se	10	5.00	✓	INORVENT	4630	1000	8-1-05
		TL	10	5.00	✓	INORVENT	4435	1000	2-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
7-8-04	STD5-0AG04	B	10	5.00	✓	INORVENT	4201	1000	8-1-04
		Mo	10	5.00	✓	INORVENT	4471	1000	3-1-05
		P	10	5.00	✓	INORVENT	4593	1000	6-1-05
		Si	10	5.00	✓	INORVENT	4437	1000	2-1-05
		Ti	10	5.00	✓	INORVENT	4332	1000	12-1-04
		Sr	10	5.00	✓	INORVENT	4635	1000	8-1-05
		Sn	10	5.00	✓	INORVENT	4512	1000	4-1-05
		Bi	5	2.50	✓	INORVENT	4200	1000	8-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
7-1-04	STD6-0AG01	La	10	5.00	✓	INORVENT	4221	1000	9-1-04
		Na	1	0.05	✓	INORVENT	4205	10000	8-1-04
		Pd	10	5.00	✓	INORVENT	4447	1000	3-1-05
		S	10	5.00	✓	INORVENT	4317	1000	12-1-04
		Th	10	5.00	✓	INORVENT	4283	1000	11-1-04
		U	10	5.00	✓	INORVENT	4473	1000	3-1-05
		W	5	2.50	✓	INORVENT	4203	1000	8-1-04
		Y	10	5.00	✓	INORVENT	4513	1000	4-1-05
		Zr	10	5.00	✓	INORVENT	4442	1000	8-1-05
		SC	10	0.500	✓	INORVENT	4262	10000	10-1-04

Expiration Dates:

STD1: 8-1-04

STD2: 06/01/05 VDS 08/30/04

STD3: 03/01/05

STD4: 9-1-04

STD5: 08/01/05 VDS 08/30/04

STD6: 8-1-04

010060

ICP ANALYSIS

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.081	Div 20	040616-1	7-1-04	Liquid	57 125

INSTRUMENT: TRACE 2 FILENAME: B406161

INSTRUMENT DL:

Method: DAILY2 Standard: blk
Run Time: 07/01/04 10:33:33

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avge	-.0000	.0004	-.0000	.0001	-.0000	-.0001	.0000
SDev	.0000	.0000	.0001	.0000	.0000	.0000	.0000
%RSD	18.63	1.127	132.4	19.17	123.9	2.158	24.33
#1	-.0000	.0004	-.0000	.0001	-.0000	-.0001	.0000
#2	-.0000	.0004	-.0001	.0001	-.0000	-.0001	.0000

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avge	.0000	.0000	-.0000	.0000	.0004	.0000	.0003
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	.6429	125.6	26.33	44.10	4.199	58.77	12.25
#1	.0000	.0000	-.0000	.0000	.0004	.0000	.0003
#2	.0000	.0000	-.0000	.0000	.0004	.0000	.0003

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Avge	-.0000	.0001	-.0000	.0000	.0000	-.0002	-.0123
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0003
%RSD	141.4	6.617	51.98	89.61	27.67	14.58	2.122
#1	-.0000	.0001	-.0000	.0000	.0000	-.0002	-.0125
#2	.0000	.0000	-.0000	.0000	.0000	-.0002	-.0121

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avge	-.0001	.0000	.0000	-.0000	.0000	.0008	-.0012
SDev	.0000	.0000	.0001	.0000	.0000	.0000	.0000
%RSD	64.79	33.79	284.8	61.71	188.1	2.569	.9189
#1	-.0001	.0000	-.0000	-.0000	.0000	.0008	-.0011
#2	-.0000	.0000	.0001	-.0000	-.0000	.0008	-.0012

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avge	70.59	-.0001	.0001	.0017	.0000	-.0000	.0001
SDev	.46	.0000	.0001	.0000	.0000	.0000	.0000
%RSD	.6462	4.469	114.6	.7313	91.86	141.4	36.62
#1	70.27	-.0001	.0001	.0017	.0000	-.0000	.0000
#2	70.91	-.0001	.0000	.0018	.0001	.0000	.0001

Elem	Ti3349	Tl1908	U_4090	V_2924	W_2079	Y_3710	Zn2062
Avge	-.0001	-.0002	-.0003	-.0000	.0001	.0000	.0000
SDev	.0000	.0000	.0001	.0000	.0001	.0000	.0000
%RSD	40.32	18.51	40.59	39.16	113.4	236.9	12.42
#1	-.0001	-.0002	-.0004	-.0000	.0000	-.0000	.0000
#2	-.0000	-.0002	-.0002	-.0000	.0002	.0000	.0000

Elem	Zr3496
Avge	.0002
SDev	.0001
%RSD	25.68
#1	.0002
#2	.0002

8/6/04

7-1-04 10:54:04

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	705802	10000	--	--	--	--	--
SDev	4537.504	.0000000	--	--	--	--	--
%RSD	.6428858	.0000000	--	--	--	--	--
#1	702594	10000	--	--	--	--	--
#2	709011	10000	--	--	--	--	--

Standardization Rpt. 07/01/04 10:43:36 AM page 1

Method: DAILY2 Standard: clp_std4
Run Time: 07/01/04 10:38:51

Elem	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1	1960/2
Avge	.0815	.1189	.3237	.2778	.1790	.2578	.2646
SDev	.0001	.0000	.0014	.0023	.0005	.0007	.0034
%RSD	.1627	.0240	.4351	.8386	.2584	.2578	1.286
#1	.0816	.1189	.3247	.2761	.1786	.2583	.2622
#2	.0814	.1189	.3227	.2794	.1793	.2574	.2670

Elem	T11908
Avge	.2290
SDev	.0005
%RSD	.2288
#1	.2294
#2	.2286

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	729231	10000	--	--	--	--	--
SDev	4682.461	.0000000	--	--	--	--	--
%RSD	.6421094	.0000000	--	--	--	--	--
#1	725920	10000	--	--	--	--	--
#2	732542	10000	--	--	--	--	--

Standardization Rpt. 07/01/04 10:47:49 AM page 1

Method: DAILY2 Standard: clp_std1
Run Time: 07/01/04 10:43:48

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.1087	.2025	.1036	.1922	3.207	.0885	.0086
SDev	.0001	.0001	.0001	.0002	.001	.0001	.0000
%RSD	.0451	.0452	.1010	.0966	.0164	.1045	.4516
#1	.1088	.2025	.1036	.1924	3.208	.0884	.0086
#2	.1087	.2026	.1037	.1921	3.207	.0886	.0086

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	714789	10000	--	--	--	--	--
SDev	5081.270	.0000000	--	--	--	--	--
%RSD	.7108768	.0000000	--	--	--	--	--
#1	718382	10000	--	--	--	--	--
#2	711196	10000	--	--	--	--	--

Standardization Rpt. 07/01/04 10:52:02 AM page 1

Method: DAILY2 Standard: clp_std5
Run Time: 07/01/04 10:48:01

Elem	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899	Sr4215
Avge	.1690	.0336	.3377	.0172	.1746	.1598	2.544
SDev	.0001	.0001	.0011	.0001	.0005	.0002	.003
%RSD	.0367	.2417	.3133	.6139	.2635	.1173	.1336
#1	.1691	.0337	.3369	.0171	.1749	.1599	2.541
#2	.1690	.0335	.3384	.0173	.1742	.1597	2.546

Elem	Ti3349
Avge	2.641
SDev	.001
%RSD	.0203
#1	2.641
#2	2.641

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	705748	10000	--	--	--	--	--
SDev	2397.799	.0000000	--	--	--	--	--
%RSD	.3397526	.0000000	--	--	--	--	--
#1	707444	10000	--	--	--	--	--
#2	704053	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std2
Run Time: 07/01/04 10:52:14

010066

Elem	Ba4934	Be3130	Cr2677	Cu3247	Ni2316
Avge	1.121	1.370	.4180	.3063	.3574
SDev	.002	.001	.0001	.0001	.0000
%RSD	.2193	.0981	.0304	.0249	.0107
#1	1.119	1.371	.4179	.3063	.3573
#2	1.123	1.369	.4181	.3062	.3574

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	741266	10000	--	--	--	--	--
SDev	7418.257	.0000000	--	--	--	--	--
%RSD	1.000754	.0000000	--	--	--	--	--
#1	736021	10000	--	--	--	--	--
#2	746512	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std3
Run Time: 07/01/04 10:56:05

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	1.007	.2165	.8568	.1936	.3051
SDev	.001	.0001	.0008	.0001	.0004
%RSD	.0809	.0433	.0922	.0375	.1331
#1	1.006	.2164	.8562	.1935	.3048
#2	1.007	.2165	.8573	.1936	.3054

010067

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	711727	10000	--	--	--	--	--
SDev	11555.54	.0000000	--	--	--	--	--
%RSD	1.623592	.0000000	--	--	--	--	--
#1	719898	10000	--	--	--	--	--
#2	703556	10000	--	--	--	--	--

Standardization Rpt. 07/01/04 11:04:42 AM page 1

Method: DAILY2 Standard: clp_std6
Run Time: 07/01/04 11:00:18

Elem	La3988	Na5889	Pd3404	S_1820	Th2837	U_4090	W_2079
Avge	.4716	.0421	.2038	.0343	.1113	.0710	.2073
SDev	.0005	.0001	.0000	.0001	.0001	.0000	.0006
%RSD	.1083	.1763	.0064	.2565	.0737	.0343	.2702
#1	.4720	.0422	.2038	.0343	.1114	.0710	.2069
#2	.4713	.0420	.2039	.0344	.1113	.0710	.2077

Elem	Y_3710	Zr3496
Avge	.7699	1.887
SDev	.0002	.000
%RSD	.0251	.0157
#1	.7701	1.887
#2	.7698	1.887

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	718250	10000	--	--	--	--	--
SDev	7937.273	.0000000	--	--	--	--	--
%RSD	1.105084	.0000000	--	--	--	--	--
#1	723863	10000	--	--	--	--	--
#2	712638	10000	--	--	--	--	--

Standardization Report 07/01/04 11:04:42 AM page 1

Method: DAILY? Slope = Conc(SIR)/IR

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	24.5259	.000956	07/01/04 11:00:18
Al3082	308.215	clp_std1	blk	461.567	-.190964	07/01/04 11:00:18
As1890	189.042	clp_std4	blk	84.0605	.003736	07/01/04 11:00:18
B_2496	249.678	clp_std5	blk	59.1910	-.004191	07/01/04 11:00:18
Ba4934	493.409	clp_std2	blk	8.92120	.000102	07/01/04 11:00:18
Be3130	313.042	clp_std2	blk	3.64824	.000522	07/01/04 11:00:18
Bi2230	223.061	clp_std5	blk	147.588	-.001776	07/01/04 11:00:18
Ca3179	317.933	clp_std1	blk	246.921	-.003848	07/01/04 11:00:18
Cd2265	226.502	clp_std3	blk	9.93115	-.000126	07/01/04 11:00:18
Co2286	228.616	clp_std3	blk	46.1968	.000721	07/01/04 11:00:18
Cr2677	267.716	clp_std2	blk	23.9225	-.000441	07/01/04 11:00:18
Cu3247	324.753	clp_std2	blk	32.6940	-.012853	07/01/04 11:00:18
Fe2714	271.441	clp_std1	blk	482.776	-.011650	07/01/04 11:00:18
K_7664	766.491	clp_std1	blk	260.514	-.076434	07/01/04 11:00:18
La3988	398.853	clp_std6	blk	21.2209	.000408	07/01/04 11:00:18
Li6707	670.784	clp_std1	blk	3.11788	-.000157	07/01/04 11:00:18
Mg2790	279.078	clp_std1	blk	282.309	.004407	07/01/04 11:00:18
Mn2576	257.610	clp_std3	blk	11.6728	-.000091	07/01/04 11:00:18
Mo2020	202.030	clp_std5	blk	29.6213	-.000314	07/01/04 11:00:18
Na3302	330.232	clp_std1	blk	5678.81	1.14305	07/01/04 11:00:18
Na5889	588.991	clp_std6	blk	18.4690	.227671	07/01/04 11:00:18
Ni2316	231.604	clp_std2	blk	27.9790	.001529	07/01/04 11:00:18
P_1782	178.287	clp_std5	blk	583.111	-.015268	07/01/04 11:00:18
2203/1	220.351	clp_std4	blk	30.8956	-.000607	07/01/04 11:00:18
2203/2	220.352	clp_std4	blk	35.9960	.000636	07/01/04 11:00:18
Pd3404	340.458	clp_std6	blk	50.3741	-.001077	07/01/04 11:00:18
S_1820	182.040	clp_std6	blk	297.674	-.232194	07/01/04 11:00:18
Sb2068	206.838	clp_std4	blk	55.5190	.064107	07/01/04 11:00:18
Sc3613	361.384	blk	dark	1.41665	.000000	07/01/04 11:00:18
1960/1	196.021	clp_std4	blk	38.7708	.004559	07/01/04 11:00:18
1960/2	196.022	clp_std4	blk	37.8040	-.002527	07/01/04 11:00:18
Si2881	288.158	clp_std5	blk	57.6484	-.100870	07/01/04 11:00:18
Pb220	220.353	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Se196	196.026	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Sn1899	189.989	clp_std5	blk	62.6304	-.002035	07/01/04 11:00:18
Sr4215	421.552	clp_std5	blk	3.93120	.000003	07/01/04 11:00:18
Th2837	283.730	clp_std6	blk	93.8080	-.005045	07/01/04 11:00:18
Ti3349	334.941	clp_std5	blk	3.78651	.000239	07/01/04 11:00:18
Tl1908	190.864	clp_std4	blk	43.6280	.008216	07/01/04 11:00:18
U_4090	409.014	clp_std6	blk	148.326	.047241	07/01/04 11:00:18
V_2924	292.402	clp_std3	blk	51.6582	.001209	07/01/04 11:00:18
W_2079	207.914	clp_std6	blk	24.1256	-.002776	07/01/04 11:00:18
Y_3710	371.030	clp_std6	blk	12.9858	-.000055	07/01/04 11:00:18
Zn2062	206.200	clp_std3	blk	32.7823	-.001115	07/01/04 11:00:18
Zr3496	349.621	clp_std6	blk	5.79289	-.001169	07/01/04 11:00:18

Analysis Report QC Standard 07/01/04 11:10:03 AM page 1

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 07/01/04 11:04:54
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9911	9.715	4.992	4.766	10.03	.9790	5.008
SDev	.0024	.016	.004	.010	.02	.0003	.007
%RSD	.2424	.1675	.0813	.2111	.2195	.0353	.1405
#1	.9894	9.704	4.995	4.758	10.01	.9793	5.013
#2	.9928	9.727	4.990	4.773	10.05	.9788	5.003
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.04	.9995	4.975	1.950	2.010	10.12	18.21
SDev	.01	.0013	.003	.004	.006	.01	.02
%RSD	.0295	.1252	.0651	.1951	.3171	.0897	.1325
#1	20.04	1.000	4.973	1.953	2.006	10.13	18.19
#2	20.04	.9986	4.977	1.948	2.015	10.12	18.23
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.039	4.555	19.95	1.010	4.970	27.11	Q42.48
SDev	.005	.008	.04	.000	.014	.07	.10
%RSD	.0982	.1691	.2066	.0131	.2788	.2592	.2468
#1	5.035	4.550	19.92	1.010	4.960	27.06	Q42.40
#2	5.042	4.561	19.98	1.010	4.980	27.15	Q42.55
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.887	5.010	4.912	4.976	1.034	1.020	.9656
SDev	.000	.013	.025	.094	.003	.001	.0021
%RSD	.0042	.2514	.5155	1.881	.3196	.1161	.2159
#1	4.887	5.019	4.894	5.042	1.036	1.019	.9641
#2	4.887	5.001	4.930	4.910	1.032	1.021	.9671
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.3	5.139	5.222	5.031	4.954	5.194	4.920
SDev	1.0	.036	.090	.003	.054	.048	.013
%RSD	.9528	.6968	1.732	.0547	1.089	.9308	.2726
#1	101.6	5.114	5.285	5.029	4.993	5.228	4.910
#2	103.0	5.164	5.158	5.033	4.916	5.160	4.929
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.052	.9785	4.827	5.182	.9505	4.957	1.016
SDev	.005	.0029	.000	.016	.0228	.003	.002
%RSD	.1024	.2996	.0013	.3028	2.397	.0569	.1925
#1	5.048	.9764	4.827	5.171	.9666	4.959	1.015
#2	5.056	.9805	4.827	5.193	.9344	4.955	1.017
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	5.086	.9976	4.946
SDev	.001	.0018	.003
%RSD	.0133	.1789	.0554
#1	5.086	.9988	4.944
#2	5.087	.9963	4.948
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	722241	10000	--	--	--	--	--
SDev	6894.291	.0000000	--	--	--	--	--
%RSD	.9545693	.0000000	--	--	--	--	--
#1	717366	10000	--	--	--	--	--
#2	727116	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 07/01/04 11:12:38
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0004	-.0009	.0033	.0001	.0000	-.0020
SDev	.0000	.0010	.0006	.0012	.0002	.0000	.0017
%RSD	7.316	236.6	68.48	36.15	151.9	8.291	88.08
#1	.0004	-.0003	-.0005	.0042	.0003	.0001	-.0007
#2	.0004	.0011	-.0013	.0025	-.0000	.0000	-.0032
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0189	-.0002	.0004	-.0001	-.0003	-.0009	.0108
SDev	.0009	.0003	.0001	.0003	.0003	.0027	.0055
%RSD	4.542	198.8	10.94	375.0	87.57	320.6	51.08
#1	.0195	.0001	.0004	.0001	-.0001	.0011	.0069
#2	.0183	-.0004	.0005	-.0003	-.0005	-.0028	.0147
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0001	.0081	.0000	.0031	-.0446	.0195
SDev	.0003	.0000	.0005	.0001	.0022	.1524	.0054
%RSD	111.0	14.31	5.908	186.6	71.02	341.5	27.80
#1	.0001	.0001	.0078	.0001	.0047	L-.1524	.0157
#2	.0005	.0001	.0085	-.0000	.0016	H.0632	.0233
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	-.0003	.0033	.0012	.0044	L-.0184	-.0002
SDev	.0013	.0018	.0039	.0014	.0012	.0003	.0027
%RSD	143.5	535.8	116.9	120.1	26.65	1.795	1363.
#1	.0018	.0009	.0061	.0022	H.0052	L-.0182	.0017
#2	-.0000	-.0016	.0006	.0002	.0036	L-.0187	-.0021
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.4	.0005	-.0005	.0048	.0019	-.0002	-.0011
SDev	.7	.0020	.0002	.0009	.0023	.0005	.0030
%RSD	.6948	412.5	37.21	18.98	116.9	289.1	263.3
#1	101.9	-.0009	-.0004	.0042	H.0035	-.0006	-.0033
#2	102.9	.0019	-.0007	.0055	.0003	.0002	.0010
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0004	.0001	.0035	.0085	-.0006	.0051
SDev	.0001	.0002	.0002	.0009	.0045	.0003	.0001
%RSD	42.56	54.48	295.2	27.17	52.73	59.62	2.122
#1	.0002	-.0005	.0002	.0042	.0053	-.0008	.0050
#2	.0001	-.0002	-.0001	.0028	.0117	-.0003	.0051
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0017	-.0001
SDev	.0002	.0003	.0007
%RSD	95.22	19.97	687.2
#1	.0004	.0014	.0004
#2	.0001	.0019	-.0006
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	722708	10000	--	--	--	--	--
SDev	5062.177	.0000000	--	--	--	--	--
%RSD	.7004463	.0000000	--	--	--	--	--
#1	719128	10000	--	--	--	--	--
#2	726287	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: pbw-F30W1 pg57-125 Operator:
Run Time: 07/01/04 11:17:56
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0082	.0008	.0040	.0000	.0000	-.0030
SDev	.0007	.0036	.0016	.0001	.0000	.0000	.0030
%RSD	94.53	43.61	196.8	3.037	52.46	49.88	99.80
#1	.0003	.0057	-.0003	.0041	.0000	.0000	-.0052
#2	.0013	.0108	.0019	.0039	.0000	.0000	-.0009
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0139	.0002	.0017	.0001	-.0000	.0105	.0064
SDev	.0003	.0003	.0003	.0002	.0005	.0199	.0026
%RSD	2.218	121.8	19.68	163.1	1447.	189.4	41.12
#1	.0141	.0004	.0014	-.0000	-.0004	-.0036	.0082
#2	.0137	.0000	.0019	.0003	.0003	.0246	.0045
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0001	.0086	.0001	.0007	.0487	.0143
SDev	.0009	.0000	.0005	.0000	.0011	.0953	.0007
%RSD	133.4	49.65	5.575	22.37	153.3	195.5	4.726
#1	.0000	.0000	.0083	.0001	.0015	-.0186	.0138
#2	.0013	.0001	.0090	.0001	-.0001	H.1161	.0148
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0026	-.0094	.0041	-.0020	.0040	-.0098	.0012
SDev	.0003	.0000	.0027	.0019	.0001	.0000	.0003
%RSD	12.89	.2666	66.77	93.30	3.591	.0067	20.93
#1	.0029	-.0094	.0060	-.0034	.0041	-.0098	.0014
#2	.0024	-.0094	.0021	-.0007	.0039	-.0098	.0011
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.51	.0010	-.0005	.0064	.0000	-.0000	-.0029
SDev	.67	.0062	.0005	.0024	.0003	.0017	.0006
%RSD	.6794	611.6	90.04	38.22	1432.	33030.	20.27
#1	98.98	.0054	-.0009	.0047	-.0002	.0012	-.0025
#2	98.03	-.0033	-.0002	.0081	.0003	-.0012	-.0033
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0003	.0000	.0034	.0038	-.0002	.0038
SDev	.0000	.0007	.0001	.0014	.0256	.0007	.0002
%RSD	25.70	223.6	249.6	40.63	674.1	291.9	4.559
#1	.0001	-.0002	-.0000	.0025	-.0143	-.0007	.0037
#2	.0001	.0008	.0001	.0044	.0219	.0002	.0039
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0008	.0001
SDev	.0000	.0001	.0005
%RSD	44.54	15.64	479.2
#1	.0001	.0009	-.0002
#2	.0000	.0007	.0004
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	695320	10000	--	--	--	--	--
SDev	4747.515	.0000000	--	--	--	--	--
%RSD	.6827813	.0000000	--	--	--	--	--
#1	698677	10000	--	--	--	--	--
#2	691963	10000	--	--	--	--	--

010079

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Method: DAILY2 Sample Name: lcsw-F30W1 Operator:
Run Time: 07/01/04 11:23:15
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0514	1.949	2.024	4.008	2.029	.0503	-.0006
SDev	.0008	.002	.007	.006	.000	.0001	.0030
%RSD	1.621	.1151	.3518	.1432	.0051	.1312	527.6
#1	.0508	1.948	2.029	4.012	2.029	.0504	-.0027
#2	.0520	1.951	2.019	4.004	2.029	.0503	.0016

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.55	.0497	.5025	.1954	.2506	1.119	17.40
SDev	.02	.0004	.0003	.0004	.0003	.017	.00
%RSD	.0809	.8712	.0664	.2059	.1038	1.479	.0246
#1	20.53	.0500	.5027	.1957	.2504	1.108	17.39
#2	20.56	.0494	.5022	.1951	.2508	1.131	17.40

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	3.564	20.37	.5065	.0003	17.69	27.84
SDev	.0002	.021	.00	.0000	.0006	.22	.10
%RSD	29.46	.5802	.0073	.0048	176.3	1.244	.3517
#1	.0008	3.578	20.37	.5065	.0007	17.53	27.91
#2	.0005	3.549	20.37	.5065	-.0001	17.84	27.77

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4923	4.007	.4947	.4973	.0029	.0017	.4865
SDev	.0019	.012	.0005	.0028	.0035	.0099	.0043
%RSD	.3749	.2903	.1025	.5599	121.2	569.7	.8783
#1	.4936	3.999	.4944	.4954	.0004	-.0053	.4896
#2	.4910	4.016	.4951	.4993	.0054	.0087	.4835

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.37	2.058	2.067	4.028	.4965	2.064	-.0003
SDev	.97	.001	.011	.003	.0020	.008	.0049
%RSD	1.020	.0410	.5244	.0728	.4088	.3637	1821.
#1	96.06	2.059	2.075	4.030	.4951	2.069	.0032
#2	94.68	2.058	2.059	4.026	.4979	2.059	-.0037

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	-.0159	3.928	2.068	4.106	.5015	.0007
SDev	.0000	.0039	.001	.001	.010	.0005	.0008
%RSD	.8083	24.47	.0220	.0348	.2525	.1070	125.2
#1	.0008	-.0131	3.928	2.067	4.113	.5011	.0001
#2	.0008	-.0186	3.927	2.068	4.099	.5019	.0012

010080

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.5045	3.878
SDev	.0001	.0018	.001
%RSD	846.7	.3530	.0229
#1	-.0001	.5033	3.878
#2	.0000	.5058	3.879

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	673116	10000	--	--	--	--	--
SDev	6859.643	.0000000	--	--	--	--	--
%RSD	1.019089	.0000000	--	--	--	--	--
#1	677966	10000	--	--	--	--	--
#2	668265	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 246046 Operator:
Run Time: 07/01/04 11:28:33
Comment:
Mode: CONC Corr. Factor: 1

010081

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0107	.0007	.0125	.0263	.0001	-.0084
SDev	.0005	.0026	.0028	.0014	.0001	.0000	.0012
%RSD	503.7	23.91	373.0	11.18	.3182	21.26	14.74
#1	-.0002	.0089	-.0012	.0135	.0264	.0001	-.0093
#2	.0004	.0125	.0027	.0115	.0262	.0000	-.0075

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0394	-.0001	.0028	.0162	.0022	.3077	26.47
SDev	.0019	.0001	.0007	.0009	.0002	.0159	.04
%RSD	4.753	200.7	26.82	5.703	8.330	5.164	.1691
#1	.0381	-.0001	.0022	.0168	.0021	.2965	26.44
#2	.0407	.0000	.0033	.0155	.0024	.3190	26.50

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0006	.0038	.0132	-.0000	4.440	6.912
SDev	.0009	.0000	.0023	.0001	.0003	.046	.024
%RSD	130.0	3.605	60.11	.3669	2112.	1.038	.3422
#1	.0001	.0006	.0054	.0132	.0002	4.473	6.929
#2	.0013	.0007	.0022	.0132	-.0002	4.407	6.895

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0727	-.0185	.0002	.0015	.0020	.0140	-.0027
SDev	.0012	.0079	.0029	.0010	.0027	.0117	.0007
%RSD	1.636	42.98	1184.	65.81	136.7	83.75	26.77
#1	.0735	-.0241	.0023	.0008	.0001	.0057	-.0022
#2	.0718	-.0128	-.0018	.0023	.0039	.0222	-.0032

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.7	-.0000	.0022	.0408	.0011	.0015	-.0005
SDev	1.0	.0008	.0002	.0025	.0003	.0001	.0008
%RSD	.9785	3151.	8.830	6.069	26.36	8.046	177.5
#1	103.4	.0005	.0021	.0391	.0013	.0016	.0001
#2	102.0	-.0006	.0024	.0426	.0009	.0014	-.0011

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0002	.0000	.0026	.0011	-.0006	.0032
SDev	.0001	.0012	.0001	.0004	.0084	.0000	.0000
%RSD	11.95	671.3	1116.	16.91	745.3	2.741	1.372
#1	.0006	.0007	-.0001	.0029	-.0048	-.0006	.0032
#2	.0007	-.0010	.0001	.0023	.0070	-.0006	.0032

010082

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0081	-.0001
SDev	.0001	.0007	.0000
%RSD	97.42	8.409	13.88
#1	.0000	.0085	-.0001
#2	.0001	.0076	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	724655	10000	--	--	--	--	--
SDev	7078.139	.0000000	--	--	--	--	--
%RSD	.9767598	.0000000	--	--	--	--	--
#1	729660	10000	--	--	--	--	--
#2	719650	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 246047 Operator:
Run Time: 07/01/04 11:33:52
Comment:
Mode: CONC Corr. Factor: 1

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Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0120	-.0002	.0162	.0249	.0000	-.0034
SDev	.0007	.0029	.0011	.0008	.0000	.0000	.0042
%RSD	576.7	24.48	640.2	4.941	.0306	118.9	120.7
#1	.0007	.0141	.0006	.0168	.0249	.0000	-.0005
#2	-.0004	.0099	-.0009	.0156	.0249	.0000	-.0064

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0444	-.0002	.0026	.0039	.0018	.2289	34.01
SDev	.0002	.0000	.0002	.0003	.0002	.0054	.03
%RSD	.5414	17.64	9.142	6.691	10.96	2.380	.1024
#1	.0442	-.0003	.0027	.0037	.0019	.2327	33.99
#2	.0446	-.0002	.0024	.0041	.0017	.2250	34.04

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0007	.0090	.0135	.0003	9.908	15.61
SDev	.0005	.0000	.0019	.0000	.0005	.082	.01
%RSD	76.87	.0788	20.79	.2413	177.1	.8323	.0625
#1	.0010	.0007	.0077	.0135	.0006	9.849	15.61
#2	.0003	.0007	.0103	.0134	-.0001	9.966	15.62

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0723	-.0074	.0025	.0011	.0010	.0108	-.0028
SDev	.0006	.0006	.0003	.0019	.0009	.0082	.0011
%RSD	.8790	7.568	11.61	174.0	83.90	75.75	38.78
#1	.0728	-.0078	.0023	.0024	.0017	.0166	-.0020
#2	.0719	-.0070	.0027	-.0002	.0004	.0050	-.0035

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.98	.0001	-.0025	.0751	.0016	-.0016	-.0032
SDev	.43	.0007	.0021	.0010	.0011	.0017	.0019
%RSD	.4264	526.8	85.65	1.341	72.43	103.5	59.41
#1	99.68	.0006	-.0010	.0758	.0024	-.0004	-.0045
#2	100.3	-.0004	-.0040	.0744	.0008	-.0028	-.0018

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0029	.0000	.0036	.0125	-.0007	.0018
SDev	.0000	.0019	.0000	.0027	.0169	.0001	.0029
%RSD	4.194	65.80	430.6	73.50	135.6	8.003	157.8
#1	.0006	-.0016	.0000	.0055	.0245	-.0006	.0038
#2	.0006	-.0043	-.0000	.0017	.0005	-.0007	-.0002

010084

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0058	-.0002
SDev	.0001	.0001	.0004
%RSD	71.64	2.193	192.9
#1	.0001	.0059	.0001
#2	.0000	.0057	-.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	705680	10000	--	--	--	--	--
SDev	3007.325	.0000000	--	--	--	--	--
%RSD	.4261602	.0000000	--	--	--	--	--
#1	703553	10000	--	--	--	--	--
#2	707806	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 246048 Operator:
Run Time: 07/01/04 11:39:11
Comment:
Mode: CONC Corr. Factor: 1

010085

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0048	-.0002	.0234	.0292	-.0000	-.0010
SDev	.0006	.0033	.0014	.0004	.0000	.0000	.0006
%RSD	447.9	67.44	651.5	1.701	.0950	57.77	58.05
#1	-.0003	.0025	-.0012	.0231	.0293	-.0000	-.0006
#2	.0006	.0071	.0007	.0237	.0292	-.0000	-.0014

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0406	-.0002	.0023	.0025	.0023	.1720	42.48
SDev	.0018	.0001	.0008	.0000	.0000	.0000	.00
%RSD	4.448	33.85	35.22	.3735	1.259	.0038	.0077
#1	.0393	-.0003	.0017	.0025	.0024	.1720	42.48
#2	.0419	-.0002	.0029	.0025	.0023	.1720	42.48

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0008	.0016	.0138	.0009	17.85	28.54
SDev	.0004	.0000	.0062	.0000	.0005	.13	.00
%RSD	328.4	2.455	390.9	.2565	53.56	.7482	.0161
#1	-.0004	.0008	-.0028	.0139	.0012	17.95	28.54
#2	.0002	.0008	.0060	.0138	.0005	17.76	28.55

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0747	-.0084	-.0008	.0022	.0016	.0064	-.0012
SDev	.0005	.0086	.0010	.0025	.0016	.0005	.0027
%RSD	.6138	103.1	126.4	114.2	105.5	7.465	228.3
#1	.0744	-.0144	-.0015	.0040	.0004	.0067	-.0031
#2	.0751	-.0023	-.0001	.0004	.0027	.0060	.0007

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.8	-.0036	-.0005	.1104	.0012	-.0015	-.0027
SDev	.2	.0006	.0005	.0038	.0014	.0001	.0019
%RSD	.1710	17.60	107.6	3.467	110.1	8.184	71.34
#1	101.9	-.0031	-.0008	.1077	.0022	-.0016	-.0040
#2	101.6	-.0040	-.0001	.1131	.0003	-.0014	-.0013

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0009	-.0001	.0030	-.0144	-.0006	.0012
SDev	.0000	.0007	.0000	.0015	.0123	.0005	.0020
%RSD	4.900	78.63	40.28	51.16	85.64	82.82	166.0
#1	.0006	-.0004	-.0001	.0041	-.0231	-.0002	.0027
#2	.0007	-.0015	-.0002	.0019	-.0057	-.0009	-.0002

010086

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0058	-.0006
SDev	.0000	.0002	.0003
%RSD	393.8	3.027	49.48
#1	.0000	.0056	-.0004
#2	-.0000	.0059	-.0008

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	718234	10000	--	--	--	--	--
SDev	1260.771	.0000000	--	--	--	--	--
%RSD	.1755376	.0000000	--	--	--	--	--
#1	719126	10000	--	--	--	--	--
#2	717343	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 246048d Operator:
Run Time: 07/01/04 11:44:29
Comment:
Mode: CONC Corr. Factor: 1

010087

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0107	.0033	.0226	.0289	.0000	.0001
SDev	.0005	.0019	.0038	.0009	.0000	.0000	.0035
%RSD	699.6	17.68	114.6	4.116	.0145	61.39	4931.
#1	.0004	.0120	.0006	.0219	.0289	.0000	.0025
#2	-.0003	.0094	.0059	.0233	.0289	.0000	-.0024

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0432	-.0000	.0027	.0013	.0019	.1620	42.40
SDev	.0003	.0001	.0003	.0010	.0003	.0061	.16
%RSD	.6523	635.6	12.33	81.28	15.90	3.756	.3886
#1	.0434	.0000	.0029	.0005	.0017	.1663	42.52
#2	.0430	-.0001	.0024	.0020	.0021	.1577	42.28

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0008	.0057	.0136	-.0010	17.96	28.46
SDev	.0004	.0000	.0029	.0002	.0007	.11	.15
%RSD	227.5	1.327	50.34	1.269	68.61	.6217	.5302
#1	.0005	.0008	.0037	.0134	-.0014	18.03	28.56
#2	-.0001	.0008	.0078	.0137	-.0005	17.88	28.35

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0721	-.0133	.0029	-.0014	.0007	.0190	-.0057
SDev	.0005	.0028	.0028	.0019	.0006	.0131	.0016
%RSD	.7338	20.94	96.45	135.5	81.18	68.87	28.31
#1	.0717	-.0113	.0049	-.0027	.0011	.0282	-.0045
#2	.0725	-.0153	.0009	-.0001	.0003	.0097	-.0068

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.2	.0010	-.0005	.1086	.0001	.0000	-.0017
SDev	1.2	.0045	.0016	.0005	.0003	.0005	.0003
%RSD	1.126	471.9	339.8	.4542	486.8	2099.	16.79
#1	104.0	.0042	-.0016	.1082	-.0002	.0003	-.0015
#2	102.4	-.0022	.0007	.1089	.0003	-.0003	-.0019

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0011	-.0003	.0028	.0508	-.0010	.0014
SDev	.0000	.0022	.0000	.0036	.0384	.0003	.0027
%RSD	4.290	204.4	14.95	129.0	75.60	30.86	200.7
#1	.0007	-.0027	-.0003	.0053	.0780	-.0012	.0033
#2	.0007	.0005	-.0004	.0002	.0237	-.0008	-.0006

010088

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0098	-.0010
SDev	.0002	.0003	.0004
%RSD	203.1	2.884	42.89
#1	-.0002	.0096	-.0013
#2	.0000	.0100	-.0007

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	728183	10000	--	--	--	--	--
SDev	8208.096	.0000000	--	--	--	--	--
%RSD	1.127202	.0000000	--	--	--	--	--
#1	733987	10000	--	--	--	--	--
#2	722379	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 246049 Operator:
Run Time: 07/01/04 11:49:47
Comment:
Mode: CONC Corr. Factor: 1

010089

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0173	-.0004	.0331	.0244	.0000	-.0041
SDev	.0001	.0017	.0036	.0009	.0001	.0000	.0095
%RSD	18.66	9.982	929.7	2.793	.3284	50.39	232.5
#1	.0003	.0185	-.0029	.0337	.0243	.0000	-.0108
#2	.0004	.0161	.0022	.0324	.0244	.0000	.0026

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0644	-.0000	.0026	.0033	.0030	.1064	58.07
SDev	.0001	.0000	.0002	.0004	.0001	.0049	.10
%RSD	.1990	71.50	8.537	12.30	4.803	4.637	.1672
#1	.0645	-.0000	.0027	.0036	.0029	.1029	58.00
#2	.0643	-.0001	.0024	.0030	.0031	.1099	58.13

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0010	.0087	.0154	-.0005	34.69	54.30
SDev	.0000	.0000	.0030	.0000	.0009	.12	.01
%RSD	14.30	.9507	34.35	.2619	179.0	.3518	.0113
#1	-.0001	.0010	.0108	.0154	-.0011	34.78	54.31
#2	-.0001	.0010	.0066	.0155	.0001	34.61	54.30

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0819	-.0124	.0042	.0030	.0010	.0389	-.0041
SDev	.0015	.0018	.0027	.0002	.0008	.0018	.0033
%RSD	1.825	14.35	63.92	7.887	78.75	4.588	80.11
#1	.0830	-.0136	.0062	.0028	.0005	.0402	-.0018
#2	.0808	-.0111	.0023	.0032	.0016	.0377	-.0064

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.80	-.0018	.0006	.1533	.0034	-.0002	.0004
SDev	.55	.0010	.0042	.0010	.0008	.0032	.0002
%RSD	.5524	56.69	661.8	.6742	21.78	1927.	62.93
#1	100.2	-.0025	-.0024	.1525	.0040	-.0024	.0005
#2	99.41	-.0011	.0036	.1540	.0029	.0021	.0002

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0007	-.0002	-.0000	-.0079	-.0005	.0017
SDev	.0000	.0022	.0001	.0020	.0051	.0000	.0005
%RSD	.0313	301.1	32.92	6333.	64.14	10.17	31.95
#1	.0007	-.0023	-.0002	-.0014	-.0043	-.0005	.0013
#2	.0007	.0008	-.0001	.0014	-.0115	-.0004	.0020

010090

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0066	-.0004
SDev	.0001	.0002	.0001
%RSD	141.4	2.633	25.84
#1	.0000	.0065	-.0005
#2	.0002	.0067	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	704425	10000	--	--	--	--	--
SDev	3884.845	.0000000	--	--	--	--	--
%RSD	.5514916	.0000000	--	--	--	--	--
#1	707172	10000	--	--	--	--	--
#2	701678	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 246049s Operator:
Run Time: 07/01/04 11:55:06
Comment:
Mode: CONC Corr. Factor: 1

010091

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0522	2.026	2.041	4.113	2.070	.0503	-.0023
SDev	.0011	.000	.003	.017	.009	.0000	.0049
%RSD	2.045	.0077	.1640	.4177	.4152	.0210	217.1
#1	.0530	2.026	2.039	4.101	2.064	.0502	.0012
#2	.0515	2.026	2.044	4.126	2.076	.0503	-.0058

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.56	.0499	.5109	.1999	.2596	1.205	83.01
SDev	.05	.0003	.0008	.0007	.0002	.016	.27
%RSD	.2261	.5438	.1638	.3331	.0850	1.289	.3312
#1	20.59	.0497	.5103	.2003	.2594	1.194	82.82
#2	20.53	.0501	.5115	.1994	.2597	1.216	83.21

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	4.066	20.42	.5242	-.0011	57.40	89.83
SDev	.0009	.015	.03	.0003	.0001	.05	.20
%RSD	114.5	.3649	.1511	.0578	5.959	.0926	.2221
#1	.0014	4.056	20.39	.5240	-.0011	57.44	89.69
#2	.0001	4.077	20.44	.5245	-.0010	57.36	89.98

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.5741	4.114	.4998	.5001	.0042	.0238	.4993
SDev	.0001	.075	.0069	.0110	.0002	.0161	.0044
%RSD	.0260	1.832	1.378	2.191	3.821	67.81	.8799
#1	.5739	4.061	.5047	.5079	.0043	.0124	.4962
#2	.5742	4.167	.4950	.4924	.0041	.0352	.5024

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.40	2.100	2.117	4.220	.5000	2.111	-.0010
SDev	2.50	.017	.055	.003	.0096	.042	.0005
%RSD	2.589	.8002	2.575	.0703	1.920	1.987	47.03
#1	94.64	2.112	2.155	4.218	.5068	2.141	-.0007
#2	98.17	2.088	2.078	4.222	.4933	2.082	-.0013

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0014	-.0152	3.980	2.092	4.175	.5026	.0012
SDev	.0000	.0030	.001	.002	.003	.0001	.0010
%RSD	3.077	19.81	.0318	.0745	.0679	.0241	88.40
#1	.0014	-.0131	3.979	2.091	4.173	.5025	.0019
#2	.0014	-.0173	3.981	2.093	4.177	.5027	.0004

010092

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.5112	3.959
SDev	.0001	.0004	.003
%RSD	115.1	.0709	.0665
#1	-.0000	.5114	3.957
#2	-.0002	.5109	3.961

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	680470	10000	--	--	--	--	--
SDev	17619.69	.0000000	--	--	--	--	--
%RSD	2.589341	.0000000	--	--	--	--	--
#1	668011	10000	--	--	--	--	--
#2	692929	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 246050 Operator:
Run Time: 07/01/04 12:00:24
Comment:
Mode: CONC Corr. Factor: 1

010093

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0048	.0002	.0117	.0204	.0000	-.0001
SDev	.0000	.0012	.0003	.0004	.0002	.0000	.0002
%RSD	6.899	24.96	126.7	3.803	.9927	25.27	210.9
#1	.0003	.0039	.0004	.0120	.0203	.0001	-.0003
#2	.0003	.0056	.0000	.0113	.0206	.0000	.0001

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0323	-.0000	.0019	.0001	.0002	-.0065	34.57
SDev	.0018	.0001	.0002	.0016	.0004	.0340	.18
%RSD	5.452	684.5	11.29	2566.	254.2	522.7	.5089
#1	.0336	.0001	.0020	-.0011	-.0001	.0175	34.45
#2	.0311	-.0001	.0017	.0012	.0004	-.0306	34.70

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0011	.0025	.0009	-.0004	67.40	99.76
SDev	.0002	.0000	.0054	.0002	.0001	.32	.30
%RSD	395.7	.8142	216.3	18.44	15.84	.4674	.3011
#1	.0001	.0011	.0064	.0008	-.0003	67.18	99.55
#2	-.0002	.0011	-.0013	.0010	-.0004	67.62	99.97

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0024	.0003	.0037	.0006	.0027	.0101	-.0009
SDev	.0007	.0039	.0064	.0021	.0022	.0088	.0043
%RSD	27.87	1263.	170.5	328.0	82.93	87.38	450.2
#1	.0019	.0031	.0083	-.0008	.0042	.0163	-.0040
#2	.0029	-.0024	-.0008	.0021	.0011	.0039	.0021

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.1	.0059	-.0007	.0539	.0017	.0015	-.0012
SDev	2.8	.0051	.0015	.0010	.0008	.0007	.0001
%RSD	2.791	87.30	202.7	1.945	45.18	48.61	12.68
#1	99.10	.0095	-.0018	.0547	.0022	.0020	-.0011
#2	103.1	.0022	.0003	.0532	.0011	.0010	-.0013

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0002	-.0000	-.0003	.0074	-.0004	.0016
SDev	.0000	.0028	.0001	.0042	.0129	.0006	.0006
%RSD	6.934	1143.	1879.	1330.	173.6	165.2	35.64
#1	.0006	-.0022	-.0001	-.0033	.0165	-.0009	.0020
#2	.0005	.0017	.0001	.0026	-.0017	.0001	.0012

010094

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0019	.0001
SDev	.0001	.0000	.0010
%RSD	177.2	.7785	1497.
#1	-.0000	.0019	-.0007
#2	.0002	.0019	.0008

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	713580	10000	--	--	--	--	--
SDev	19890.91	.0000000	--	--	--	--	--
%RSD	2.787482	.0000000	--	--	--	--	--
#1	699515	10000	--	--	--	--	--
#2	727645	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 246051 Operator: 010095
Run Time: 07/01/04 12:05:43
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0098	.0008	.0093	.0196	.0000	.0002
SDev	.0001	.0050	.0007	.0000	.0001	.0000	.0031
%RSD	20.80	50.86	86.71	.4015	.4235	179.3	1425.
#1	.0005	.0063	.0013	.0093	.0197	.0000	-.0020
#2	.0007	.0134	.0003	.0093	.0196	-.0000	.0024

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0375	-.0001	.0020	-.0002	-.0000	-.0060	37.14
SDev	.0008	.0001	.0002	.0002	.0002	.0107	.13
%RSD	2.065	101.7	12.05	157.0	643.7	176.6	.3589
#1	.0380	-.0000	.0018	.0000	.0001	-.0136	37.24
#2	.0370	-.0002	.0022	-.0003	-.0002	.0015	37.05

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0013	.0078	.0008	-.0006	73.07	106.9
SDev	.0007	.0001	.0003	.0000	.0002	.32	.3
%RSD	141.8	3.516	3.703	2.156	29.32	.4358	.2350
#1	-.0000	.0013	.0080	.0008	-.0005	73.30	107.1
#2	.0011	.0013	.0076	.0008	-.0007	72.85	106.8

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0019	-.0002	.0035	-.0019	.0029	-.0048	-.0016
SDev	.0009	.0004	.0012	.0001	.0022	.0053	.0001
%RSD	46.14	273.8	35.27	3.279	78.39	109.8	3.975
#1	.0013	.0001	.0026	-.0020	.0013	-.0085	-.0015
#2	.0025	-.0005	.0043	-.0019	.0045	-.0011	-.0016

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.1	.0033	.0021	.0618	-.0001	.0025	-.0009
SDev	1.0	.0043	.0035	.0043	.0005	.0009	.0013
%RSD	1.022	131.0	165.7	6.868	402.2	35.84	137.0
#1	101.8	.0002	.0046	.0588	-.0004	.0031	-.0000
#2	100.4	.0063	-.0004	.0648	.0002	.0019	-.0019

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0022	-.0001	.0007	.0139	-.0004	.0031
SDev	.0000	.0007	.0001	.0000	.0139	.0001	.0010
%RSD	1.533	30.48	87.93	2.265	99.75	23.81	32.56
#1	.0006	-.0018	-.0000	.0007	.0041	-.0004	.0024
#2	.0006	-.0027	-.0002	.0007	.0238	-.0003	.0038

010096

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0020	-.0006
SDev	.0000	.0000	.0002
%RSD	46.64	1.585	38.57
#1	-.0001	.0019	-.0007
#2	-.0001	.0020	-.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	713493	10000	--	--	--	--	--
SDev	7288.857	.0000000	--	--	--	--	--
%RSD	1.021574	.0000000	--	--	--	--	--
#1	718647	10000	--	--	--	--	--
#2	708339	10000	--	--	--	--	--

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 07/01/04 12:15:47
Comment:
Mode: CONC Corr. Factor: 1

010097

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9905	9.696	4.987	4.750	9.999	.9800	4.985
SDev	.0005	.011	.003	.002	.006	.0001	.009
%RSD	.0520	.1168	.0592	.0367	.0576	.0057	.1879
#1	.9902	9.704	4.989	4.749	10.00	.9800	4.978
#2	.9909	9.688	4.985	4.751	9.995	.9800	4.991
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.01	.9956	4.981	1.953	2.009	10.17	18.18
SDev	.01	.0004	.000	.001	.001	.02	.04
%RSD	.0459	.0387	.0089	.0413	.0385	.2001	.1951
#1	20.00	.9958	4.981	1.953	2.009	10.15	18.21
#2	20.01	.9953	4.981	1.952	2.008	10.18	18.16
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.023	4.540	19.95	1.011	4.981	27.03	Q42.22
SDev	.004	.008	.00	.001	.009	.18	.09
%RSD	.0820	.1674	.0063	.0655	.1812	.6571	.2098
#1	5.026	4.545	19.95	1.012	4.975	27.15	Q42.29
#2	5.020	4.535	19.95	1.011	4.988	Q26.90	Q42.16
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.885	4.978	4.932	4.878	1.035	1.008	.9629
SDev	.005	.071	.010	.023	.004	.009	.0102
%RSD	.0985	1.434	.1989	.4782	.3483	.9106	1.064
#1	4.889	5.028	4.925	4.861	1.037	1.015	.9557
#2	4.882	4.927	4.939	4.894	1.032	1.002	.9702
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.2	5.177	5.109	5.040	4.896	5.132	4.926
SDev	.8	.024	.039	.004	.019	.034	.006
%RSD	.8224	.4661	.7671	.0796	.3845	.6659	.1205
#1	101.8	5.160	5.081	5.043	4.883	5.107	4.921
#2	100.6	5.194	5.137	5.037	4.909	5.156	4.930
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.037	.9758	4.827	5.192	.9692	4.951	1.015
SDev	.003	.0015	.000	.028	.0138	.001	.002
%RSD	.0613	.1577	.0074	.5329	1.425	.0170	.1896
#1	5.035	.9769	4.827	5.172	.9789	4.951	1.014
#2	5.039	.9747	4.827	5.211	.9594	4.950	1.017
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	5.084	.9996	4.939
SDev	.002	.0023	.002
%RSD	.0296	.2280	.0423
#1	5.085	.9980	4.941
#2	5.083	1.001	4.938
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	714480	10000	--	--	--	--	--
SDev	5884.542	.0000000	--	--	--	--	--
%RSD	.8236120	.0000000	--	--	--	--	--
#1	718641	10000	--	--	--	--	--
#2	710319	10000	--	--	--	--	--

010100

Analysis Report Blank Sample 07/01/04 12:28:36 PM page 1

Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 07/01/04 12:23:29
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0006	-.0000	.0040	.0001	.0001	-.0026
SDev	.0000	.0018	.0015	.0008	.0000	.0000	.0035
%RSD	8.265	284.3	16380.	21.39	63.53	42.15	136.2
#1	.0004	.0019	.0010	.0034	.0001	.0001	-.0001
#2	.0004	-.0006	-.0011	.0046	.0000	.0000	-.0051
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0177	.0001	.0002	-.0009	-.0003	-.0022	.0064
SDev	.0014	.0001	.0005	.0003	.0001	.0034	.0003
%RSD	8.024	77.27	234.3	34.03	44.36	153.9	4.216
#1	.0187	.0001	.0005	-.0011	-.0004	.0002	.0063
#2	.0167	.0000	-.0001	-.0007	-.0002	-.0046	.0066
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0002	.0030	-.0001	.0017	-.0177	.0188
SDev	.0005	.0000	.0047	.0000	.0013	.0369	.0014
%RSD	95.44	11.15	157.1	3.684	73.98	207.9	7.433
#1	.0009	.0002	.0064	-.0001	.0026	.0083	.0198
#2	.0002	.0002	-.0003	-.0001	.0008	-.0438	.0178
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0015	L-.0140	.0034	.0003	.0031	L-.0189	-.0047
SDev	.0001	.0006	.0005	.0023	.0006	.0043	.0010
%RSD	7.278	4.058	15.94	861.3	20.81	22.55	22.14
#1	.0016	L-.0136	.0030	-.0014	.0036	L-.0219	-.0039
#2	.0014	L-.0144	.0038	.0019	.0027	L-.0159	-.0054
Errors	LC Pass	LC Low	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.6	.0011	.0027	.0052	.0013	.0022	-.0016
SDev	.3	.0008	.0007	.0023	.0017	.0002	.0024
%RSD	.3213	71.23	27.22	45.00	129.2	10.10	148.7
#1	100.9	.0017	.0022	.0035	.0001	.0020	-.0034
#2	100.4	.0006	.0032	.0069	.0025	.0023	.0001
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0023	-.0000	.0019	.0166	-.0005	.0028
SDev	.0000	.0006	.0001	.0038	.0115	.0006	.0005
%RSD	20.26	27.74	990.9	198.8	68.94	126.3	18.56
#1	.0001	-.0028	-.0001	-.0008	.0247	-.0001	.0031
#2	.0001	-.0019	.0001	.0046	.0085	-.0010	.0024
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0010	-.0002
SDev	.0001	.0001	.0002
%RSD	554.3	12.24	68.17
#1	.0001	.0011	-.0003
#2	-.0001	.0009	-.0001
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	710346	10000	--	--	--	--	--
SDev	2328.503	.0000000	--	--	--	--	--
%RSD	.3277986	.0000000	--	--	--	--	--
#1	711992	10000	--	--	--	--	--
#2	708699	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 246052 Operator:
Run Time: 07/01/04 12:28:48
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0107	.0024	.0106	.0166	.0001	.0019
SDev	.0002	.0037	.0006	.0020	.0001	.0000	.0009
%RSD	56.33	34.65	23.13	19.00	.3813	40.94	48.77
#1	.0004	.0133	.0028	.0120	.0166	.0000	.0012
#2	.0002	.0081	.0020	.0092	.0165	.0001	.0025

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0318	.0002	.0014	-.0002	.0003	.0091	39.80
SDev	.0006	.0002	.0007	.0016	.0006	.0166	.21
%RSD	1.837	99.04	47.83	665.5	192.3	183.3	.5203
#1	.0322	.0004	.0018	.0009	.0007	.0208	39.65
#2	.0314	.0001	.0009	-.0014	-.0001	-.0027	39.94

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0010	.0015	.0124	.0008	-.0001	75.96	111.2
SDev	.0001	.0001	.0006	.0001	.0005	.29	.2
%RSD	11.12	4.421	4.949	6.040	493.0	.3864	.1794
#1	.0009	.0014	.0120	.0009	.0003	75.75	111.1
#2	.0011	.0015	.0128	.0008	-.0005	76.17	111.4

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0021	-.0116	-.0019	-.0002	.0041	-.0071	-.0034
SDev	.0009	.0041	.0005	.0003	.0004	.0040	.0016
%RSD	45.02	35.85	28.38	146.1	11.00	56.13	46.21
#1	.0027	-.0086	-.0022	-.0004	.0037	-.0043	-.0023
#2	.0014	-.0145	-.0015	.0000	.0044	-.0100	-.0046

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.3	.0016	.0001	.0708	-.0007	.0006	.0000
SDev	3.0	.0020	.0003	.0035	.0004	.0004	.0009
%RSD	2.955	122.5	262.1	4.890	49.47	70.14	2095.
#1	99.18	.0030	-.0001	.0683	-.0010	.0009	-.0006
#2	103.4	.0002	.0004	.0732	-.0005	.0003	.0007

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0019	.0000	.0011	.0355	.0000	.0029
SDev	.0000	.0020	.0001	.0073	.0046	.0005	.0010
%RSD	2.604	104.6	254.8	683.0	13.07	1295.	35.65
#1	.0006	-.0005	.0001	-.0041	.0388	.0004	.0021
#2	.0006	-.0033	-.0000	.0063	.0322	-.0003	.0036

010104

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0016	.0003
SDev	.0001	.0003	.0008
%RSD	51.63	18.84	246.0
#1	.0001	.0014	.0008
#2	.0001	.0018	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	715041	10000	--	--	--	--	--
SDev	21128.35	.0000000	--	--	--	--	--
%RSD	2.954845	.0000000	--	--	--	--	--
#1	700101	10000	--	--	--	--	--
#2	729981	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 246053 Operator:
Run Time: 07/01/04 12:34:06
Comment:
Mode: CONC Corr. Factor: 1

010105

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	-.0004	.0017	.0126	.0157	.0000	-.0019
SDev	.0009	.0043	.0049	.0002	.0001	.0000	.0004
%RSD	129.5	992.2	282.2	1.931	.5328	21.36	21.05
#1	-.0001	.0026	.0052	.0124	.0156	.0001	-.0022
#2	-.0014	-.0034	-.0017	.0127	.0158	.0000	-.0016

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0361	-.0003	.0010	-.0006	-.0004	-.0025	44.53
SDev	.0001	.0003	.0001	.0001	.0002	.0215	.02
%RSD	.3715	118.5	8.782	11.31	46.28	855.5	.0513
#1	.0362	-.0000	.0010	-.0007	-.0003	.0127	44.54
#2	.0360	-.0005	.0011	-.0006	-.0006	-.0177	44.51

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0009	.0018	.0018	.0009	-.0000	81.93	120.0
SDev	.0004	.0000	.0005	.0000	.0007	.22	.3
%RSD	37.81	.2571	29.80	2.273	1760.	.2698	.2691
#1	-.0007	.0018	.0022	.0010	.0005	82.09	120.2
#2	-.0012	.0018	.0014	.0009	-.0006	81.78	119.8

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0026	-.0089	.0006	.0013	-.0011	-.0084	-.0049
SDev	.0011	.0123	.0006	.0015	.0022	.0043	.0010
%RSD	41.43	137.1	95.01	113.6	207.2	51.58	19.41
#1	.0019	-.0003	.0010	.0003	.0005	-.0115	-.0042
#2	.0034	-.0176	.0002	.0024	-.0026	-.0053	-.0056

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.9	-.0001	-.0001	.0759	.0011	-.0001	.0004
SDev	.2	.0078	.0004	.0017	.0008	.0029	.0037
%RSD	.2318	6484.	713.1	2.275	73.66	4339.	860.3
#1	104.7	.0054	.0002	.0771	.0005	.0020	.0031
#2	105.1	-.0056	-.0003	.0747	.0017	-.0021	-.0022

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	-.0029	-.0002	.0007	-.0211	-.0013	.0012
SDev	.0000	.0006	.0001	.0001	.0205	.0002	.0026
%RSD	3.876	22.55	59.92	19.40	97.48	18.55	217.3
#1	.0005	-.0033	-.0001	.0006	-.0065	-.0014	.0031
#2	.0005	-.0024	-.0004	.0008	-.0356	-.0011	-.0006

010106

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0011	-.0011
SDev	.0001	.0001	.0001
%RSD	136.9	10.64	13.01
#1	-.0002	.0011	-.0010
#2	-.0000	.0012	-.0012

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	740263	10000	--	--	--	--	--
SDev	1684.328	.0000000	--	--	--	--	--
%RSD	.2275311	.0000000	--	--	--	--	--
#1	739072	10000	--	--	--	--	--
#2	741454	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 246054 Operator:
Run Time: 07/01/04 12:39:25
Comment:
Mode: CONC Corr. Factor: 1

010107

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0101	-.0007	.0138	.0058	.0000	-.0026
SDev	.0007	.0015	.0040	.0002	.0000	.0000	.0003
%RSD	118.9	15.26	579.8	1.574	.2791	339.9	10.37
#1	.0001	.0090	-.0036	.0140	.0058	-.0000	-.0024
#2	.0011	.0112	.0022	.0137	.0058	.0000	-.0028

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0382	.0001	.0024	-.0016	-.0001	.0148	49.25
SDev	.0000	.0005	.0012	.0003	.0005	.0107	.15
%RSD	.0909	357.0	51.12	16.05	436.5	72.04	.3059
#1	.0383	.0005	.0015	-.0014	.0002	.0073	49.15
#2	.0382	-.0002	.0032	-.0018	-.0005	.0224	49.36

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0021	.0088	.0023	-.0004	89.96	130.8
SDev	.0005	.0000	.0003	.0000	.0001	.28	.2
%RSD	53.50	.7107	3.071	.4398	38.19	.3086	.1168
#1	.0006	.0021	.0086	.0023	-.0005	89.76	130.6
#2	.0013	.0021	.0090	.0023	-.0003	90.16	130.9

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0082	-.0058	.0078	-.0021	.0017	.0021	-.0027
SDev	.0014	.0016	.0055	.0028	.0008	.0065	.0030
%RSD	16.85	27.01	70.90	134.2	47.96	301.3	109.2
#1	.0092	-.0069	.0039	-.0001	.0022	.0067	-.0006
#2	.0072	-.0047	.0117	-.0041	.0011	-.0024	-.0049

Elem	Sc3613	1960/1	1960/2	Si2881	Sn2920	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.2	.0077	-.0056	.0915	.0012	-.0012	-.0007
SDev	1.9	.0021	.0049	.0029	.0001	.0026	.0019
%RSD	1.863	26.71	87.74	3.130	4.541	223.8	280.9
#1	98.85	.0062	-.0021	.0895	.0012	.0007	-.0020
#2	101.5	.0092	-.0091	.0935	.0012	-.0030	.0007

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	-.0044	-.0003	.0009	.0211	-.0010	-.0001
SDev	.0000	.0031	.0002	.0015	.0126	.0003	.0045
%RSD	2.916	71.37	48.02	156.9	59.88	30.83	4798.
#1	.0004	-.0022	-.0002	-.0001	.0122	-.0012	-.0033
#2	.0004	-.0066	-.0004	.0020	.0301	-.0008	.0031

010108

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0010	-.0009
SDev	.0001	.0001	.0001
%RSD	34.51	9.350	8.907
#1	-.0001	.0009	-.0008
#2	-.0002	.0010	-.0009

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	707065	10000	--	--	--	--	--
SDev	13150.77	.0000000	--	--	--	--	--
%RSD	1.859910	.0000000	--	--	--	--	--
#1	697766	10000	--	--	--	--	--
#2	716364	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 246055 Operator:
Run Time: 07/01/04 12:44:43
Comment:
Mode: CONC Corr. Factor: 1

010109

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0056	.0012	.0133	.0189	.0000	-.0012
SDev	.0004	.0021	.0019	.0002	.0000	.0000	.0065
%RSD	83.34	37.33	159.4	1.624	.0050	69.18	527.8
#1	.0002	.0041	.0026	.0134	.0189	.0000	-.0058
#2	.0008	.0071	-.0002	.0131	.0189	.0000	.0034

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0219	-.0000	.0016	.0005	.0004	.0024	23.83
SDev	.0005	.0002	.0002	.0005	.0001	.0030	.03
%RSD	2.090	644.8	15.03	88.25	27.29	123.9	.1348
#1	.0216	-.0001	.0014	.0002	.0003	.0003	23.81
#2	.0222	.0001	.0017	.0009	.0005	.0045	23.85

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0015	.0078	.0001	.0004	20.95	31.66
SDev	.0002	.0000	.0009	.0000	.0010	.04	.02
%RSD	23.11	2.278	11.10	20.43	284.7	.2069	.0598
#1	.0006	.0015	.0084	.0001	.0011	20.92	31.64
#2	.0008	.0016	.0072	.0001	-.0004	20.98	31.67

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0019	-.0098	.0033	-.0017	.0038	.0021	-.0029
SDev	.0006	.0018	.0012	.0028	.0017	.0041	.0013
%RSD	29.72	18.45	37.24	162.1	43.82	198.3	45.83
#1	.0023	-.0085	.0024	.0003	.0027	.0050	-.0020
#2	.0015	-.0111	.0042	-.0037	.0050	-.0008	-.0039

Elem	Sc3613	1960/1	1960/2	Si2881	Th220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.76	-.0011	.0005	.0858	-.0000	-.0000	-.0021
SDev	.19	.0041	.0021	.0015	.0015	.0000	.0006
%RSD	.1924	360.2	407.6	1.795	3436.	17.51	30.17
#1	97.62	-.0041	.0020	.0847	.0010	-.0000	-.0017
#2	97.89	.0018	-.0010	.0869	-.0011	-.0000	-.0026

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	-.0018	.0000	-.0005	.0181	-.0000	.0016
SDev	.0000	.0021	.0003	.0001	.0054	.0005	.0021
%RSD	4.991	117.1	666.7	22.20	29.68	1086.	134.2
#1	.0004	-.0003	.0002	-.0005	.0143	.0003	.0001
#2	.0005	-.0033	-.0002	-.0006	.0219	-.0004	.0031

010110

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0014	.0001
SDev	.0000	.0003	.0002
%RSD	83.04	21.54	310.3
#1	.0001	.0016	-.0001
#2	.0000	.0012	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	689972	10000	--	--	--	--	--
SDev	1307.440	.0000000	--	--	--	--	--
%RSD	.1894919	.0000000	--	--	--	--	--
#1	689047	10000	--	--	--	--	--
#2	690896	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 246056 Operator:
Run Time: 07/01/04 12:50:01
Comment:
Mode: CONC Corr. Factor: 1

010111

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0129	.0024	.0152	.0190	.0000	.0036
SDev	.0004	.0050	.0024	.0001	.0000	.0000	.0039
%RSD	54.76	39.22	98.08	.5757	.0170	3.497	109.2
#1	.0009	.0164	.0041	.0151	.0190	.0000	.0008
#2	.0004	.0093	.0007	.0153	.0190	.0000	.0064

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0318	.0000	.0012	-.0003	.0002	.0173	30.66
SDev	.0008	.0001	.0001	.0004	.0001	.0248	.09
%RSD	2.528	219.3	8.026	126.8	31.58	143.1	.3034
#1	.0323	.0001	.0013	-.0006	.0002	.0348	30.59
#2	.0312	-.0000	.0011	-.0000	.0001	-.0002	30.72

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0025	.0123	-.0000	.0001	39.41	59.38
SDev	.0003	.0000	.0004	.0000	.0000	.24	.04
%RSD	42.02	.3143	3.217	29.86	40.43	.6141	.0727
#1	.0011	.0025	.0125	-.0000	.0001	39.58	59.35
#2	.0006	.0025	.0120	-.0000	.0001	39.24	59.41

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0016	-.0106	.0025	-.0018	.0025	.0085	-.0024
SDev	.0006	.0030	.0035	.0002	.0015	.0053	.0005
%RSD	35.71	28.18	139.6	10.19	58.97	62.46	22.27
#1	.0012	-.0085	.0000	-.0019	.0015	.0122	-.0027
#2	.0020	-.0128	.0050	-.0017	.0036	.0047	-.0020

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.77	.0016	-.0011	.1348	-.0003	-.0002	.0002
SDev	.17	.0016	.0004	.0004	.0013	.0008	.0014
%RSD	.1762	101.2	37.12	.2809	408.8	369.7	744.1
#1	97.65	.0027	-.0008	.1345	-.0012	.0004	.0011
#2	97.89	.0005	-.0014	.1351	.0006	-.0008	-.0008

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	-.0030	-.0002	.0008	.0347	-.0002	.0031
SDev	.0000	.0005	.0000	.0008	.0032	.0001	.0018
%RSD	5.579	16.30	4.509	93.27	9.294	56.55	60.15
#1	.0005	-.0033	-.0002	.0013	.0324	-.0003	.0044
#2	.0005	-.0027	-.0002	.0003	.0369	-.0001	.0018

010112

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0015	.0003
SDev	.0000	.0002	.0001
%RSD	1911.	13.29	17.79
#1	.0000	.0017	.0003
#2	-.0000	.0014	.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	690086	10000	--	--	--	--	--
SDev	1219.759	.0000000	--	--	--	--	--
%RSD	.1767545	.0000000	--	--	--	--	--
#1	689224	10000	--	--	--	--	--
#2	690949	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 246057 Operator:
Run Time: 07/01/04 12:55:20
Comment:
Mode: CONC Corr. Factor: 1

010113

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0159	.0020	.0229	.0131	.0000	-.0014
SDev	.0002	.0021	.0031	.0013	.0000	.0000	.0030
%RSD	98.12	13.33	155.6	5.663	.1118	10.82	222.4
#1	-.0004	.0144	-.0002	.0220	.0131	.0000	.0008
#2	-.0001	.0174	.0042	.0238	.0131	.0000	-.0035

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0342	-.0001	.0020	.0000	.0004	-.0008	39.79
SDev	.0001	.0002	.0006	.0007	.0003	.0264	.05
%RSD	.4313	148.6	27.45	5628.	66.23	3419.	.1309
#1	.0341	-.0002	.0016	-.0005	.0002	-.0194	39.83
#2	.0343	.0000	.0024	.0005	.0006	.0179	39.75

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0038	.0083	.0001	.0013	63.43	94.57
SDev	.0001	.0000	.0037	.0000	.0003	.31	.36
%RSD	30.69	.9807	44.96	25.05	20.60	.4963	.3831
#1	.0004	.0038	.0057	.0001	.0011	63.65	94.82
#2	.0003	.0038	.0110	.0001	.0015	63.20	94.31

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0018	-.0015	.0044	-.0006	.0022	.0058	.0010
SDev	.0000	.0014	.0008	.0010	.0024	.0027	.0050
%RSD	1.784	92.63	19.01	174.6	107.1	46.56	500.6
#1	.0018	-.0025	.0050	-.0012	.0005	.0077	-.0025
#2	.0019	-.0005	.0038	.0001	.0039	.0039	.0045

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.29	-.0030	.0034	.1941	.0011	.0013	-.0023
SDev	1.53	.0031	.0012	.0031	.0004	.0003	.0018
%RSD	1.592	103.9	34.46	1.593	32.54	19.31	78.98
#1	97.38	-.0008	.0026	.1919	.0009	.0015	-.0036
#2	95.21	-.0052	.0042	.1962	.0014	.0011	-.0010

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	-.0033	.0000	-.0024	.0074	-.0001	.0016
SDev	.0000	.0004	.0000	.0056	.0194	.0008	.0013
%RSD	1.485	11.82	324.1	231.3	260.8	1594.	83.21
#1	.0004	-.0036	-.0000	.0015	-.0063	-.0007	.0025
#2	.0005	-.0031	.0000	-.0064	.0212	.0005	.0007

010114

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0018	-.0004
SDev	.0000	.0002	.0002
%RSD	48.40	10.99	50.05
#1	.0000	.0019	-.0005
#2	.0001	.0016	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	679669	10000	--	--	--	--	--
SDev	10880.96	.0000000	--	--	--	--	--
%RSD	1.600920	.0000000	--	--	--	--	--
#1	687363	10000	--	--	--	--	--
#2	671975	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 246058 Operator: **010115**
Run Time: 07/01/04 13:00:38
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0084	.0013	.0308	.0162	.0001	-.0020
SDev	.0009	.0004	.0019	.0008	.0000	.0000	.0011
%RSD	748.2	4.553	148.6	2.761	.1528	3.276	57.91
#1	.0008	.0086	-.0001	.0302	.0161	.0000	-.0028
#2	-.0005	.0081	.0026	.0314	.0162	.0001	-.0012

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0321	.0001	.0011	.0001	.0000	-.0007	50.20
SDev	.0002	.0001	.0000	.0013	.0000	.0014	.07
%RSD	.6052	66.89	3.717	1106.	108.1	202.8	.1473
#1	.0323	.0001	.0011	-.0008	.0000	.0003	50.26
#2	.0320	.0002	.0011	.0010	.0000	-.0016	50.15

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0050	.0077	.0001	-.0004	104.3	150.2
SDev	.0015	.0000	.0029	.0001	.0002	.3	.5
%RSD	1145.	.2734	36.86	138.9	44.81	.2522	.3011
#1	.0012	.0050	.0098	.0000	-.0003	104.5	150.5
#2	-.0009	.0050	.0057	.0002	-.0005	104.1	149.9

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0028	.0031	.0044	.0004	.0007	.0075	.0002
SDev	.0013	.0155	.0037	.0019	.0002	.0045	.0042
%RSD	47.47	506.2	86.08	519.1	26.27	60.11	2214.
#1	.0018	.0140	.0070	-.0010	.0008	.0043	.0032
#2	.0037	-.0079	.0017	.0017	.0006	.0106	-.0028

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.3	-.0014	.0024	.3066	.0017	.0011	-.0015
SDev	.3	.0026	.0016	.0008	.0000	.0002	.0024
%RSD	.2628	184.9	67.77	.2483	.7692	18.26	156.8
#1	101.4	.0004	.0013	.3072	.0017	.0010	-.0032
#2	101.1	-.0033	.0036	.3061	.0017	.0013	.0002

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0010	-.0001	.0024	.0071	-.0005	.0027
SDev	.0000	.0047	.0001	.0009	.0289	.0008	.0010
%RSD	7.235	477.0	166.7	38.07	404.1	172.7	37.59
#1	.0006	-.0043	-.0001	.0031	.0276	-.0011	.0034
#2	.0005	.0023	.0000	.0018	-.0133	.0001	.0020

010116

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0015	-.0007
SDev	.0002	.0004	.0002
%RSD	367.5	24.71	31.85
#1	-.0002	.0018	-.0009
#2	.0001	.0013	-.0006

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	714710	10000	--	--	--	--	--
SDev	1894.339	.0000000	--	--	--	--	--
%RSD	.2650498	.0000000	--	--	--	--	--
#1	716050	10000	--	--	--	--	--
#2	713371	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 246059 Operator:
Run Time: 07/01/04 13:05:57 010117
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0071	-.0003	.0395	.0044	.0001	.0000
SDev	.0005	.0012	.0045	.0009	.0000	.0000	.0004
%RSD	72.71	16.64	1409.	2.273	1.021	41.00	13380.
#1	.0010	.0063	.0029	.0401	.0044	.0000	.0003
#2	.0003	.0080	-.0035	.0388	.0043	.0001	-.0003

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0346	-.0003	.0016	-.0001	-.0000	.0038	63.30
SDev	.0020	.0000	.0000	.0008	.0001	.0136	.04
%RSD	5.823	14.80	2.373	1255.	111.8	360.8	.0666
#1	.0360	-.0002	.0016	.0005	-.0001	.0134	63.27
#2	.0332	-.0003	.0016	-.0006	-.0000	-.0058	63.33

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0061	.0117	.0000	-.0008	153.9	215.0
SDev	.0002	.0000	.0004	.0000	.0000	.0	.0
%RSD	31.28	.0876	3.475	324.5	3.480	.0087	.0018
#1	.0006	.0061	.0114	.0000	-.0007	153.9	215.0
#2	.0009	.0060	.0120	-.0000	-.0008	153.9	215.0

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0015	-.0021	.0016	-.0016	.0010	.0207	-.0056
SDev	.0001	.0034	.0022	.0019	.0069	.0122	.0032
%RSD	3.628	161.0	136.3	122.3	676.5	58.89	56.23
#1	.0015	-.0045	.0032	-.0002	.0059	.0121	-.0034
#2	.0016	.0003	.0001	-.0029	-.0039	.0293	-.0079

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.2	.0084	-.0024	.4119	-.0005	.0012	-.0021
SDev	.8	.0043	.0026	.0009	.0020	.0003	.0006
%RSD	.8319	51.76	106.1	.2078	433.8	22.36	29.49
#1	99.62	.0053	-.0006	.4113	.0010	.0014	-.0017
#2	100.8	.0114	-.0042	.4125	-.0019	.0010	-.0026

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	-.0038	-.0003	-.0025	.0259	-.0012	.0013
SDev	.0000	.0016	.0000	.0003	.0057	.0005	.0021
%RSD	2.518	42.21	6.373	12.12	21.91	44.67	162.5
#1	.0005	-.0049	-.0003	-.0028	.0219	-.0008	.0028
#2	.0005	-.0027	-.0002	-.0023	.0299	-.0016	-.0002

010118

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0035	-.0005
SDev	.0001	.0000	.0003
%RSD	237.2	.1663	46.71
#1	.0000	.0035	-.0007
#2	-.0001	.0035	-.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	707288	10000	--	--	--	--	--
SDev	5929.797	.0000000	--	--	--	--	--
%RSD	.8383852	.0000000	--	--	--	--	--
#1	703095	10000	--	--	--	--	--
#2	711481	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 246060 Operator: **010119**
Run Time: 07/01/04 13:11:16
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	.0032	-.0014	.0377	.0044	.0001	-.0071
SDev	.0008	.0072	.0002	.0018	.0000	.0000	.0033
%RSD	143.1	221.3	16.66	4.816	.7592	33.27	46.09
#1	-.0012	-.0018	-.0016	.0364	.0044	.0001	-.0094
#2	.0000	.0083	-.0012	.0390	.0044	.0001	-.0048

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0324	.0000	.0007	-.0004	.0003	.0015	64.11
SDev	.0019	.0001	.0000	.0004	.0006	.0344	.07
%RSD	5.690	567.0	5.700	114.2	196.0	2301.	.1051
#1	.0311	-.0000	.0007	-.0007	-.0001	-.0228	64.07
#2	.0337	.0000	.0007	-.0001	.0008	.0258	64.16

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0012	.0062	.0028	.0000	.0006	156.0	218.1
SDev	.0016	.0001	.0054	.0000	.0008	.2	.0
%RSD	133.1	1.299	195.6	78.26	137.0	.1051	.0171
#1	-.0023	.0061	-.0011	.0000	.0012	156.2	218.0
#2	-.0001	.0062	.0066	.0001	.0000	155.9	218.1

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0025	-.0008	-.0003	.0000	-.0012	.0185	-.0038
SDev	.0015	.0157	.0006	.0034	.0055	.0008	.0017
%RSD	60.28	1949.	193.5	7820.	465.2	4.096	43.77
#1	.0014	.0103	-.0008	-.0023	-.0050	.0190	-.0050
#2	.0036	-.0119	.0001	.0024	.0027	.0179	-.0026

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.67	.0022	.0017	.4142	-.0001	.0019	-.0024
SDev	.77	.0022	.0035	.0042	.0025	.0016	.0026
%RSD	.7723	102.0	201.5	1.005	4493.	83.40	106.3
#1	100.2	.0006	.0042	.4112	-.0018	.0030	-.0042
#2	99.12	.0038	-.0007	.4171	.0017	.0008	-.0006

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	-.0022	-.0001	.0006	-.0243	-.0015	-.0004
SDev	.0000	.0033	.0001	.0046	.0370	.0001	.0012
%RSD	6.385	149.0	98.82	753.4	152.2	7.577	268.5
#1	.0005	.0001	-.0000	-.0027	-.0505	-.0014	-.0013
#2	.0005	-.0046	-.0002	.0039	.0019	-.0016	.0004

010120

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0007	-.0011
SDev	.0001	.0001	.0005
%RSD	238.4	11.41	47.71
#1	-.0001	.0006	-.0014
#2	.0000	.0008	-.0007

Int:Std	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	703505	10000	--	--	--	--	--
SDev	5436.237	.0000000	--	--	--	--	--
%RSD	.7727361	.0000000	--	--	--	--	--
#1	707349	10000	--	--	--	--	--
#2	699661	10000	--	--	--	--	--

Analysis Report QC Standard 07/01/04 01:26:27 PM page 1

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 07/01/04 13:21:20 **010121**
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9916	9.674	4.997	4.721	9.936	.9826	4.970
SDev	.0006	.013	.009	.010	.009	.0005	.003
%RSD	.0574	.1351	.1860	.2110	.0895	.0488	.0700
#1	.9920	9.683	5.004	4.728	9.943	.9830	4.973
#2	.9912	9.665	4.990	4.714	9.930	.9823	4.968
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.12	.9997	4.980	1.957	2.001	10.18	Q17.94
SDev	.01	.0018	.002	.002	.004	.04	.04
%RSD	.0532	.1760	.0311	.0932	.2077	.4066	.2147
#1	20.11	1.001	4.979	1.959	2.004	10.15	Q17.97
#2	20.13	.9984	4.981	1.956	1.998	10.21	Q17.91
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.010	4.516	19.97	1.013	4.975	27.10	Q41.90
SDev	.004	.021	.00	.001	.007	.04	.16
%RSD	.0714	.4568	.0065	.0717	.1320	.1455	.3756
#1	5.012	4.531	19.97	1.013	4.970	27.13	Q42.01
#2	5.007	4.502	19.97	1.012	4.979	27.07	Q41.79
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.870	5.066	4.977	4.918	1.028	.9957	.9603
SDev	.015	.056	.047	.007	.001	.0022	.0026
%RSD	.3112	1.110	.9390	.1376	.0630	.2178	.2663
#1	4.881	5.106	4.944	4.914	1.029	.9972	.9621
#2	4.860	5.027	5.010	4.923	1.028	.9942	.9585
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

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Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.70	5.191	5.142	5.045	4.938	5.159	4.920
SDev	.87	.048	.001	.007	.020	.017	.009
%RSD	.9018	.9262	.0151	.1290	.4067	.3207	.1906
#1	97.32	5.157	5.142	5.049	4.924	5.147	4.926
#2	96.09	5.225	5.143	5.040	4.952	5.170	4.913
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.036	.9761	4.821	5.184	.9571	4.951	1.021
SDev	.008	.0044	.002	.004	.0040	.008	.001
%RSD	.1620	.4549	.0411	.0841	.4169	.1708	.0958
#1	5.042	.9792	4.823	5.181	.9599	4.957	1.021
#2	5.031	.9729	4.820	5.188	.9543	4.945	1.022
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	5.071	1.005	4.926
SDev	.012	.001	.009
%RSD	.2364	.0596	.1781
#1	5.080	1.005	4.933
#2	5.063	1.006	4.920
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	682514	10000	--	--	--	--	--
SDev	6158.193	.0000000	--	--	--	--	--
%RSD	.9022801	.0000000	--	--	--	--	--
#1	686869	10000	--	--	--	--	--
#2	678160	10000	--	--	--	--	--

Analysis Report Blank Sample 07/01/04 01:34:09 PM page 1

Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 07/01/04 13:29:02
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0027	-.0009	.0042	.0001	.0001	-.0022
SDev	.0001	.0002	.0005	.0003	.0001	.0000	.0051
%RSD	99.49	5.756	61.42	6.538	209.3	40.69	233.9
#1	.0000	.0026	-.0005	.0044	-.0000	.0000	-.0058
#2	.0001	.0029	-.0012	.0040	.0001	.0001	.0014
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0184	-.0000	.0006	-.0002	-.0001	.0019	.0105
SDev	.0007	.0003	.0003	.0013	.0006	.0095	.0013
%RSD	3.627	1525.	59.53	669.6	819.9	497.2	12.64
#1	.0189	-.0002	.0003	-.0011	-.0005	.0086	.0115
#2	.0180	.0002	.0008	.0007	.0004	-.0048	.0096
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0003	.0029	.0000	.0024	-.0059	.0164
SDev	.0002	.0000	.0010	.0001	.0013	.0893	.0016
%RSD	27.03	10.57	33.74	343.5	54.84	1504.	9.620
#1	.0007	.0002	.0022	-.0000	.0033	L-.0691	.0175
#2	.0011	.0003	.0036	.0001	.0014	H.0572	.0153
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0015	L-.0199	-.0012	.0019	.0036	.0005	-.0013
SDev	.0007	.0042	.0003	.0004	.0008	.0117	.0005
%RSD	47.40	21.03	25.43	19.24	20.84	2178.	36.67
#1	.0020	L-.0169	-.0010	.0022	.0041	-.0077	-.0010
#2	.0010	L-.0229	-.0015	.0017	.0031	.0088	-.0017
Errors	LC Pass	LC Low	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Tl220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.05	.0033	-.0001	.0038	.0009	.0011	.0001
SDev	.31	.0006	.0007	.0012	.0004	.0007	.0010
%RSD	.3113	18.71	1344.	32.81	39.46	61.27	740.5
#1	98.27	.0029	-.0005	.0047	.0012	.0006	-.0006
#2	97.83	.0037	.0004	.0029	.0007	.0015	.0009
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0004	-.0000	.0025	-.0014	-.0003	.0022
SDev	.0000	.0018	.0004	.0046	.0029	.0005	.0039
%RSD	17.46	470.0	1301.	182.0	204.0	153.9	174.0
#1	.0001	-.0017	-.0003	-.0007	-.0034	-.0006	.0050
#2	.0001	.0009	.0002	.0058	.0006	.0000	-.0005
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0007	-.0001
SDev	.0001	.0002	.0006
%RSD	217.4	24.84	567.5
#1	-.0000	.0006	-.0005
#2	.0002	.0008	.0003
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	692082	10000	--	--	--	--	--
SDev	2132.634	.0000000	--	--	--	--	--
%RSD	.3081476	.0000000	--	--	--	--	--
#1	693590	10000	--	--	--	--	--
#2	690574	10000	--	--	--	--	--

010127 4

ICP ANALYSIS

L. K NA
HP
8/6/04

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
060021.01.081	Div 20	040616-1	7-7-04	Liquid	SG 244

INSTRUMENT: Spectro FILENAME: 040707

INSTRUMENT DL:_____

Keep last result visible enabled ...
Starting run ...
Creating high priority queue entries ...

010128

BACKGROUND CORRECTED INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 12:55:04 PM July 7, 2004

	K_766	Li670	Na589	Sc361
# 1	29.5	-11.0	29.0	4692.0
# 2	15.5	-23.0	20.0	4615.0
Mean	22.5	-17.0	24.5	4653.5
SD	9.9	8.5	6.4	54.4
%RSD	44.0	49.9	26.0	1.2

INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 12:55:04 PM July 7, 2004

	K_766	Li670	Na589	Sc361
# 1	0.0	-0.0	0.0	4692.0
# 2	0.0	-0.0	0.0	4615.0
Mean	0.0	-0.0	0.0	4653.5
SD	0.0	0.0	0.0	54.4
%RSD	42.9	50.9	24.8	1.2

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 12:58:12 PM July 7, 2004

	K_766	Li670	Na589
# 1	4119.0	32383.0	22172.5
# 2	4110.0	32167.0	22070.5
Mean	4114.5	32275.0	22121.5
SD	6.4	152.7	72.1
%RSD	0.2	0.5	0.3

INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 12:58:12 PM July 7, 2004

	K_766	Li670	Na589
# 1	0.9	6.8	4.6
# 2	0.9	6.8	4.7
Mean	0.9	6.8	4.7
SD	0.0	0.0	0.0
%RSD	0.7	0.4	0.6

DL 7-7-04

10 sept 04

EVOLUTION by Micro-Active Australia Pty Ltd 1:05:54 PM July 7, 2004

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 1:01:20 PM July 7, 2004

010129

	K_766	Li670	Na589	Sc	Sc361
# 1	1656.0	16337.5	13307.5	4801.0	4801.0
# 2	1629.0	16091.5	13073.5	4716.0	4716.0
Mean	1642.5	16214.5	13190.5	4758.5	4758.5
SD	19.1	173.9	165.5	60.1	60.1
%RSD	1.2	1.1	1.3	1.3	1.3

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 1:01:20 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.7267	5.0072	29.7138	4801.000 H	103.1741
# 2	19.7552	5.0207	29.7175	4716.000 H	101.3450
Mean	19.7409	5.0139	29.7157	4758.500 H	102.2595
SD	0.0202	0.0095	0.0026	60.104	1.2934
%RSD	0.1022	0.1901	0.0087	1.263	1.2648

Checking calibration verification ...
Identity 1 : CLP_CCV_SC Identity 2 :

Report name	Low limit	Value	High limit
K_766	18.000	19.741	22.000
Li670	4.500	5.014	5.500
Na589	27.000	29.716	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 1:05:34 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	26.0	-8.5	57.0	4780.0	4780.0
# 2	25.0	-12.5	34.0	4742.0	4742.0
Mean	25.5	-10.5	45.5	4761.0	4761.0
SD	0.7	2.8	16.3	26.9	26.9
%RSD	2.8	26.9	35.7	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 1:05:34 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.0350	0.0028	0.0715	4780.000 H	102.7222
# 2	0.0253	0.0015	0.0205	4742.000 H	101.9045
Mean	0.0302	0.0021	0.0460	4761.000 H	102.3133
SD	0.0069	0.0009	0.0361	26.870	0.5782
%RSD	22.7221	41.9450	78.5082	0.564	0.5652

Checking calibration blank ...
Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value
K_766	0.100	0.030
Li670	0.010	0.002

Sc361 0.000 102.313
BACKGROUND CORRECTED INTENSITIES
Identity 1 : pbw-040707 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:08:44 PM July 7, 2004

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	K_766	Li670	Na589	Sc	Sc361
# 1	19.5	-8.5	39.5	4675.5	4675.5
# 2	13.5	-14.5	27.5	4626.5	4626.5
Mean	16.5	-11.5	33.5	4651.0	4651.0
SD	4.2	4.2	8.5	34.6	34.6
%RSD	25.7	36.9	25.3	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : pbw-040707 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:08:44 PM July 7, 2004

		K_766	Li670	Na589	Sc	Sc361
		ppm	ppm	ppm		ppm
# 1	L	-0.0385	0.0027	0.0342	4675.500 H	100.4734
# 2	L	-0.1112	0.0008	0.0073	4626.500	99.4190
Mean	L	-0.0749	0.0017	0.0207	4651.000	99.9462
SD		0.0514	0.0014	0.0190	34.648	0.7456
%RSD		68.6267	79.0618	91.6890	0.745	0.7460

BACKGROUND CORRECTED INTENSITIES
Identity 1 : lcsww-040707 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:11:52 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1642.0	12757.0	8849.0	4708.5	4708.5
# 2	1639.0	12756.0	8772.0	4685.5	4685.5
Mean	1640.5	12756.5	8810.5	4697.0	4697.0
SD	2.1	0.7	54.4	16.3	16.3
%RSD	0.1	0.0	0.6	0.3	0.3

APPARENT CONCENTRATIONS
Identity 1 : lcsww-040707 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:11:52 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.9472	3.9877	20.1286	4708.500 H	101.1836
# 2	20.0094	4.0070	20.0512	4685.500 H	100.6886
Mean	19.9783	3.9973	20.0899	4697.000 H	100.9361
SD	0.0439	0.0136	0.0547	16.263	0.3500
%RSD	0.2200	0.3403	0.2725	0.346	0.3467

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246046 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:14:58 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	2865.5	2.5	2432.0	4751.5	4751.5
# 2	2884.5	-2.5	2436.0	4719.5	4719.5
Mean	2875.0	0.0	2434.0	4735.5	4735.5
SD	13.4	3.5	2.8	22.6	22.6
%RSD	0.5	0.0	0.1	0.5	0.5

APPARENT CONCENTRATIONS

EVOLUTION by Micro-Active Australia Pty Ltd 1:24:40 PM July 7, 2004

Identity 1 : 246046 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:14:58 PM July 7, 2004

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	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	34.7000	0.0061	5.4408	4751.500 H	102.1089
# 2	35.1707	0.0046	5.4872	4719.500 H	101.4203
Mean	34.9353	0.0054	5.4640	4735.500 H	101.7646
SD	0.3328	0.0011	0.0328	22.627	0.4869
%RSD	0.9527	20.4473	0.6002	0.478	0.4785

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246047 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:18:06 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	3585.5	-8.0	5235.0	4751.5	4751.5
# 2	3543.5	-6.0	5188.0	4696.5	4696.5
Mean	3564.5	-7.0	5211.5	4724.0	4724.0
SD	29.7	1.4	33.2	38.9	38.9
%RSD	0.8	20.2	0.6	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : 246047 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:18:06 PM July 7, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	43.4894	0.0029	11.7768	4751.500 H	102.1089
# 2	43.4832	0.0035	11.8078	4696.500 H	100.9253
Mean	43.4863	0.0032	11.7923	4724.000 H	101.5171
SD	0.0043	0.0004	0.0220	38.891	0.8369
%RSD	0.0100	13.2185	0.1865	0.823	0.8244

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246048 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:21:14 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	4280.5	0.0	9330.0	4769.0	4769.0
# 2	4262.5	-13.0	9281.0	4732.0	4732.0
Mean	4271.5	-6.5	9305.5	4750.5	4750.5
SD	12.7	9.2	34.6	26.2	26.2
%RSD	0.3	141.4	0.4	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : 246048 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:21:14 PM July 7, 2004

		K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	H	51.7818	0.0054	20.9558	4769.000 H	102.4855
# 2	H	51.9682	0.0013	21.0089	4732.000 H	101.6893
Mean	H	51.8750	0.0034	20.9823	4750.500 H	102.0874
SD		0.1318	0.0029	0.0375	26.163	0.5630
%RSD		0.2541	85.2191	0.1789	0.551	0.5515

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246048d Identity 2 : Type : SAMPLE

EVOLUTION by Micro-Active Australia Pty Ltd 1:30:56 PM July 7, 2004

Weight : 1.0000 Volume : 1.00 Printed : 1:24:22 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	4342.5	-9.0	9449.0	4749.5	4749.5
# 2	4363.5	-26.0	9462.0	4762.5	4762.5
Mean	4353.0	-17.5	9455.5	4756.0	4756.0
SD	14.8	12.0	9.2	9.2	9.2
%RSD	0.3	68.7	0.1	0.2	0.2

010132

APPARENT CONCENTRATIONS
Identity 1 : 246048d Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:24:22 PM July 7, 2004

		K_766		Li670	Na589		Sc		Sc361
		ppm		ppm	ppm				ppm
# 1	H	52.7527		0.0026	21.3112		4749.500	H	102.0658
# 2	H	52.8637	L	-0.0027	21.2821		4762.500	H	102.3456
Mean	H	52.8082	L	-0.0000	21.2966		4756.000	H	102.2057
SD		0.0785		0.0037	0.0205		9.192		0.1978
%RSD		0.1486		10518.0234	0.0963		0.193		0.1935

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246049 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:27:32 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	5512.0	2.0	16974.0	4764.5	4764.5
# 2	5527.0	-12.0	16998.0	4739.5	4739.5
Mean	5519.5	-5.0	16986.0	4752.0	4752.0
SD	10.6	9.9	17.0	17.7	17.7
%RSD	0.2	198.0	0.1	0.4	0.4

APPARENT CONCENTRATIONS
Identity 1 : 246049 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:27:32 PM July 7, 2004

		K_766	Li670	Na589	Sc		Sc361
		ppm	ppm	ppm			ppm
# 1	H	66.8234	0.0060	38.2071	4764.500	H	102.3886
# 2	H	67.3609	0.0016	38.4633	4739.500	H	101.8507
Mean	H	67.0922	0.0038	38.3352	4752.000	H	102.1196
SD		0.3801	0.0031	0.1812	17.678		0.3804
%RSD		0.5665	80.3651	0.4726	0.372		0.3725

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246049s Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:30:38 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	7184.5	12902.0	25712.0	4707.5	4707.5
# 2	7159.5	12862.0	25679.0	4672.5	4672.5
Mean	7172.0	12882.0	25695.5	4690.0	4690.0
SD	17.7	28.3	23.3	24.7	24.7
%RSD	0.2	0.2	0.1	0.5	0.5

APPARENT CONCENTRATIONS
Identity 1 : 246049s Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:30:38 PM July 7, 2004

EVOLUTION by Micro-Active Australia Pty Ltd 1:41:02 PM July 7, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 H	88.2437	4.0338 H	58.6066	4707.500 H	101.1620
# 2 H	88.5965	4.0514 H	58.9702	4672.500 H	100.4089
Mean H	88.4201	4.0426 H	58.7884	4690.000 H	100.7855
SD	0.2494	0.0124	0.2571	24.749	0.5326
%RSD	0.2821	0.3077	0.4373	0.528	0.5284

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BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246050 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:33:48 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	3131.0	6.0	32627.5	4702.5	4702.5
# 2	3104.0	-2.0	32337.5	4626.5	4626.5
Mean	3117.5	2.0	32482.5	4664.5	4664.5
SD	19.1	5.7	205.1	53.7	53.7
%RSD	0.6	282.8	0.6	1.2	1.2

APPARENT CONCENTRATIONS
Identity 1 : 246050 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:33:48 PM July 7, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	38.3393	0.0072 H	74.4638	4702.500 H	101.0544
# 2	38.6352	0.0047 H	75.0147	4626.500	99.4190
Mean	38.4873	0.0060 H	74.7392	4664.500 H	100.2367
SD	0.2092	0.0018	0.3896	53.740	1.1564
%RSD	0.5437	29.6416	0.5212	1.152	1.1537

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246051 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:36:56 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	3320.5	-5.5	34713.5	4762.5	4762.5
# 2	3293.5	0.5	34522.5	4709.5	4709.5
Mean	3307.0	-2.5	34618.0	4736.0	4736.0
SD	19.1	4.2	135.1	37.5	37.5
%RSD	0.6	169.7	0.4	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : 246051 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:36:56 PM July 7, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	40.1608	0.0037 H	78.2293	4762.500 H	102.3456
# 2	40.2833	0.0055 H	78.6747	4709.500 H	101.2051
Mean	40.2220	0.0046 H	78.4520	4736.000 H	101.7753
SD	0.0867	0.0013	0.3150	37.477	0.8065
%RSD	0.2155	28.4989	0.4015	0.791	0.7924

EVOLUTION by Micro-Active Australia Pty Ltd 1:46:26 PM July 7, 2004

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BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 1:41:42 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1661.0	16171.0	13237.0	4818.0	4818.0
# 2	1651.0	16031.0	13097.0	4776.0	4776.0
Mean	1656.0	16101.0	13167.0	4797.0	4797.0
SD	7.1	99.0	99.0	29.7	29.7
%RSD	0.4	0.6	0.8	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 1:41:42 PM July 7, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.7163	4.9387	29.4516	4818.000 H	103.5399
# 2	19.7707	4.9390	29.3963	4776.000 H	102.6361
Mean	19.7435	4.9389	29.4240	4797.000 H	103.0880
SD	0.0385	0.0002	0.0391	29.698	0.6391
%RSD	0.1948	0.0043	0.1330	0.619	0.6199

Checking calibration verification ...
Identity 1 : CLP_CCV_SC Identity 2 :

Report name	Low limit	Value	High limit
K_766	18.000	19.743	22.000
Li670	4.500	4.939	5.500
Na589	27.000	29.424	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 1:45:56 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	18.0	-9.0	31.0	4842.5	4842.5
# 2	27.0	-3.0	17.0	4797.5	4797.5
Mean	22.5	-6.0	24.0	4820.0	4820.0
SD	6.4	4.2	9.9	31.8	31.8
%RSD	28.3	70.7	41.2	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 1:45:56 PM July 7, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 L	-0.0648	0.0026	0.0122	4842.500 H	104.0671
# 2	0.0460	0.0045 L	-0.0185	4797.500 H	103.0988
Mean L	-0.0094	0.0035 L	-0.0031	4820.000 H	103.5830
SD	0.0784	0.0013	0.0217	31.820	0.6847
%RSD	831.1791	36.1648	691.4820	0.660	0.6611

Checking calibration blank ...
Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value
K_766	0.100	-0.009
Li670	0.010	0.004

EVOLUTION by Micro-Active Australia Pty Ltd 1:55:38 PM July 7, 2004

Sc361 0.000 103.583
BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246052 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:49:04 PM July 7, 2004

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	K_766	Li670	Na589	Sc	Sc361
# 1	3575.5	-1.5	36050.5	4586.5	4586.5
# 2	3529.5	-5.5	35853.5	4544.5	4544.5
Mean	3552.5	-3.5	35952.0	4565.5	4565.5
SD	32.5	2.8	139.3	29.7	29.7
%RSD	0.9	80.8	0.4	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : 246052 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:49:04 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	44.9375	0.0049 H	84.3643	4586.500	98.5582
# 2	44.7683	0.0036 H	84.6789	4544.500	97.6544
Mean	44.8529	0.0042 H	84.5216	4565.500	98.1063
SD	0.1197	0.0009	0.2225	29.698	0.6391
%RSD	0.2668	21.6509	0.2632	0.650	0.6514

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246053 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:52:12 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	3874.0	-6.5	38344.5	4463.5	4463.5
# 2	3850.0	-3.5	37833.5	4416.5	4416.5
Mean	3862.0	-5.0	38089.0	4440.0	4440.0
SD	17.0	2.1	361.3	33.2	33.2
%RSD	0.4	42.4	0.9	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : 246053 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:52:12 PM July 7, 2004

		K_766	Li670	Na589	Sc	Sc361
		ppm	ppm	ppm		ppm
# 1	H	50.0626	0.0032 H	92.2107	4463.500	95.9113
# 2	H	50.2832	0.0042 H	91.9499	4416.500	94.8999
Mean	H	50.1729	0.0037 H	92.0803	4440.000	95.4056
SD		0.1559	0.0007	0.1844	33.234	0.7152
%RSD		0.3108	18.5606	0.2003	0.749	0.7496

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246054 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:55:20 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	4290.0	-3.0	41534.0	4800.0	4800.0
# 2	4274.0	-7.0	41318.0	4752.0	4752.0
Mean	4282.0	-5.0	41426.0	4776.0	4776.0
SD	11.3	2.8	152.7	33.9	33.9
%RSD	0.3	56.6	0.4	0.7	0.7

APPARENT CONCENTRATIONS

EVOLUTION by Micro-Active Australia Pty Ltd 2:05:04 PM July 7, 2004

Identity 1 : 246054 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:55:20 PM July 7, 2004

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		K_766 ppm		Li670 ppm		Na589 ppm		Sc		Sc361 ppm
# 1	H	51.5603		0.0045	H	92.8791		4800.000	H	103.1526
# 2	H	51.8887		0.0032	H	93.3296		4752.000	H	102.1196
Mean	H	51.7245		0.0038	H	93.1044		4776.000	H	102.6361
SD		0.2322		0.0009		0.3186		33.941		0.7304
%RSD		0.4489		23.0277		0.3422		0.711		0.7116

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246055 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:58:30 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	2406.0	-22.5	10764.5	4771.5	4771.5
# 2	2383.0	-17.5	10678.5	4711.5	4711.5
Mean	2394.5	-20.0	10721.5	4741.5	4741.5
SD	16.3	3.5	60.8	42.4	42.4
%RSD	0.7	17.7	0.6	0.9	0.9

APPARENT CONCENTRATIONS
Identity 1 : 246055 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 1:58:30 PM July 7, 2004

	K_766 ppm		Li670 ppm	Na589 ppm		Sc		Sc361 ppm
# 1	28.9676	L	-0.0016	24.1738		4771.500	H	102.5393
# 2	29.0569	L	-0.0001	24.2863		4711.500	H	101.2481
Mean	29.0122	L	-0.0008	24.2300		4741.500	H	101.8937
SD	0.0632		0.0010	0.0796		42.426		0.9130
%RSD	0.2177		126.0261	0.3284		0.895		0.8960

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246056 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:01:38 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	3002.0	-16.0	20073.5	4790.5	4790.5
# 2	2985.0	-11.0	19921.5	4744.5	4744.5
Mean	2993.5	-13.5	19997.5	4767.5	4767.5
SD	12.0	3.5	107.5	32.5	32.5
%RSD	0.4	26.2	0.5	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : 246056 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:01:38 PM July 7, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc		Sc361 ppm
# 1	36.0680	0.0005	44.9486	4790.500	H	102.9481
# 2	36.2125	0.0020	45.0408	4744.500	H	101.9583
Mean	36.1402	0.0012	44.9947	4767.500	H	102.4532
SD	0.1022	0.0011	0.0652	32.527		0.7000
%RSD	0.2829	87.6611	0.1450	0.682		0.6832

BACKGROUND CORRECTED INTENSITIES

EVOLUTION by Micro-Active Australia Pty Ltd 2:11:28 PM July 7, 2004

Weight : 1.0000 Volume : 1.00 Printed : 2:04:46 PM July 7, 2004

010137

	K_766	Li670	Na589	Sc	Sc361
# 1	3718.0	-10.0	31334.0	4831.0	4831.0
# 2	3698.0	-6.0	31276.0	4809.0	4809.0
Mean	3708.0	-8.0	31305.0	4820.0	4820.0
SD	14.1	2.8	41.0	15.6	15.6
%RSD	0.4	35.4	0.1	0.3	0.3

APPARENT CONCENTRATIONS
Identity 1 : 246057 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:04:46 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	44.3599	0.0023 H	69.6059	4831.000 H	103.8197
# 2	44.3229	0.0035 H	69.7950	4809.000 H	103.3462
Mean	44.3414	0.0029 H	69.7005	4820.000 H	103.5830
SD	0.0262	0.0009	0.1338	15.556	0.3348
%RSD	0.0590	29.1552	0.1919	0.323	0.3232

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246058 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:07:54 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	4452.5	-3.5	49471.5	4783.0	4783.0
# 2	4487.5	-5.5	49574.5	4783.0	4783.0
Mean	4470.0	-4.5	49523.0	4783.0	4783.0
SD	24.7	1.4	72.8	0.0	0.0
%RSD	0.6	31.4	0.1	0.0	0.0

APPARENT CONCENTRATIONS
Identity 1 : 246058 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:07:54 PM July 7, 2004

		K_766	Li670	Na589	Sc	Sc361
		ppm	ppm	ppm		ppm
# 1	H	53.7152	0.0043 H	111.0333	4783.000 H	102.7867
# 2	H	54.1397	0.0037 H	111.2646	4783.000 H	102.7867
Mean	H	53.9275	0.0040 H	111.1490	4783.000 H	102.7867
SD		0.3001	0.0004	0.1635	0.000	0.0000
%RSD		0.5565	10.9011	0.1471	0.000	0.0000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246059 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:11:02 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	5212.0	10.5	66794.0	4791.0	4791.0
# 2	5148.0	8.5	66127.0	4706.0	4706.0
Mean	5180.0	9.5	66460.5	4748.5	4748.5
SD	45.3	1.4	471.6	60.1	60.1
%RSD	0.9	14.9	0.7	1.3	1.3

APPARENT CONCENTRATIONS
Identity 1 : 246059 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:11:02 PM July 7, 2004

EVOLUTION by Micro-Active Australia Pty Ltd 2:19:06 PM July 7, 2004

010138

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 H	62.8202	0.0086 H	149.6811	4791.000 H	102.9589
# 2 H	63.1711	0.0080 H	150.8634	4706.000 H	101.1298
Mean H	62.9956	0.0083 H	150.2723	4748.500 H	102.0443
SD	0.2481	0.0004	0.8360	60.104	1.2934
%RSD	0.3939	4.8216	0.5563	1.266	1.2675

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 246060 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:14:12 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	5111.0	18.5	65939.5	4753.5	4753.5
# 2	5088.0	4.5	65982.5	4719.5	4719.5
Mean	5099.5	11.5	65961.0	4736.5	4736.5
SD	16.3	9.9	30.4	24.0	24.0
%RSD	0.3	86.1	0.0	0.5	0.5

APPARENT CONCENTRATIONS
Identity 1 : 246060 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:14:12 PM July 7, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 H	62.0856	0.0111 H	148.9317	4753.500 H	102.1519
# 2 H	62.2522	0.0068 H	150.1029	4719.500 H	101.4203
Mean H	62.1689	0.0089 H	149.5173	4736.500 H	101.7861
SD	0.1178	0.0031	0.8282	24.042	0.5174
%RSD	0.1895	34.1968	0.5539	0.508	0.5083

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:18:56 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1662.0	16133.5	13198.0	4853.0	4853.0
# 2	1659.0	16067.5	13141.0	4807.0	4807.0
Mean	1660.5	16100.5	13169.5	4830.0	4830.0
SD	2.1	46.7	40.3	32.5	32.5
%RSD	0.1	0.3	0.3	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:18:56 PM July 7, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.5840	4.8918	29.1525	4853.000 H	104.2931
# 2	19.7379	4.9184	29.3047	4807.000 H	103.3032
Mean	19.6609	4.9051	29.2286	4830.000 H	103.7981
SD	0.1088	0.0188	0.1076	32.527	0.7000
%RSD	0.5535	0.3832	0.3681	0.673	0.6743

Checking calibration verification ...
Identity 1 : CLP_CCV_SC Identity 2 :
Report name Low limit Value High limit

EVOLUTION by Micro-Active Australia Pty Ltd 2:29:30 PM July 7, 2004

Li670	4.500	4.905	5.500
Na589	27.000	29.229	33.000

010139

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:23:10 PM July 7, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	14.5	-12.0	37.0	4845.0	4845.0
# 2	13.5	-8.0	30.0	4798.0	4798.0
Mean	14.0	-10.0	33.5	4821.5	4821.5
SD	0.7	2.8	4.9	33.2	33.2
%RSD	5.1	28.3	14.8	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:23:10 PM July 7, 2004

		K_766	Li670	Na589	Sc	Sc361
		ppm	ppm	ppm		ppm
# 1	L	-0.1069	0.0017	0.0255	4845.000 H	104.1209
# 2	L	-0.1172	0.0029	0.0106	4798.000 H	103.1095
Mean	L	-0.1121	0.0023	0.0180	4821.500 H	103.6152
SD		0.0073	0.0008	0.0105	33.234	0.7152
%RSD		6.5557	36.1993	58.2641	0.689	0.6902

Checking calibration blank ...
Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value	
K_766	0.100	-0.112	Contaminated
Li670	0.010	0.002	
Na589	0.050	0.018	
Sc361	0.000	103.615	

DIV 20
06002.01.081
040616-1

Analyst: RSS
Method: EPA 300

D&pres 6/30/04

010140

	System ID	Analyte	Conc mg/L	RESULT mg/L	Qual	DL	TV	% Rec or RPD
06/25/04	246046	Chloride	2048.425	2048		100		
06/25/04	246046D	Chloride	2035.164	2035		100		0.649%
06/25/04	246046S	Chloride	4040.009	4040		100	2000	99.6%
06/25/04	246047	Chloride	2907.041	2907		100		
06/25/04	246048	Chloride	4038.253	4038		100		
06/25/04	246049	Chloride	6279.889	6280		100		
06/25/04	246050	Chloride	7484.298	7484		100		
06/25/04	246051	Chloride	8053.255	8053		100		
06/25/04	246052	Chloride	8328.546	8329		100		
06/25/04	246053	Chloride	9077.272	9077		100		
06/25/04	246054	Chloride	9930.791	9931		100		
06/25/04	246055	Chloride	3151.163	3151		100		
06/25/04	246056	Chloride	5143.218	5143		100		
06/25/04	246057	Chloride	7601.979	7602		100		
06/25/04	246058	Chloride	11715.756	11716		100		
06/25/04	246059	Chloride	15286.534	15287		100		
06/25/04	246060	Chloride	15583.483	15583		100		

U = UNDETECTED

7/1/04

10 Sept 04

DIV 20
06002.01.081
040616-1

Analyst: RSS
Method: EPA 300

010141

	System ID	Analyte	Conc mg/L	RESULT mg/L	Qual	DL	TV	% Rec or RPD
06/25/04	CCV-1	Chloride	202.030	202		0.1	200	101%
06/25/04	CCV-2	Chloride	203.070	203		0.1	200	102%
06/25/04	CCV-3	Chloride	203.249	203		0.1	200	102%
06/25/04	CCB-1	Chloride	0.010	0.1	U	0.1		
06/25/04	CCB-2	Chloride	0.004	0.1	U	0.1		
06/25/04	CCB-3	Chloride	0.003	0.1	U	0.1		

U = UNDETECTED

Book/Page: 12 007

Southwest Research Institute

Dionex DX500 Ion Chromatography Daily Log

010142

Analyst: RSpurr

Date: 6/24/04

Conductivity: 17.8

Client	Project #	TO #	Analytical Method
DIV 20 ↓	10542.02.002 06002.01.081	040617-9 040616	300 ↓

Loop: 40 ul

Column: AS14 #015-02-087

Comments:

Method: anions 040622

Calibration: 6/22/04

ICV/CCV/MS:

1st Source: SPEX (Inorg # 4518)

Lot #: 25-145AS

CCV Conc: 1:20

MS Conc: 1:100

2nd Source: Nitrite-N

Lot #: 178-01-104

CCV Conc: 1:20

MS Conc: 1:100

✓ ELUENT SOLUTION PREP:

FV = 2.0L DI H20

1.0 mM Sodium Bicarbonate & 3.5 mM Sodium Carbonate

Weight: 0.1688g $NaHCO_3$

Source: Aldrich

Lot: 15308 EI

Weight: 0.7419g Na_2HCO_3

Source: Alfa Aesar

Lot: L06 M34

Balance #34.

Other Eluent:

50 mA-Autoregen (ASRS)

Other Regen:

✓ 7/2/04

Eppendorfs: 5000L 1000J 200J

Work continued from Page

010143 SwRI®

177-01-IC4 Anions - 20ppm Mix + 60ppm SO_4 (STD 1)

Anion	Std. Vol. mL	Conc. mg/L	Inorg #	Spex # Lot	Exp. Date
Fluoride	0.2 mL	1000 mg/L	4388	25-5AS	1/15/05
Chloride	↓	↓	4387	7-147VY	1/15/05
Nitrite-N			4480	7-158VY	3/15/05
Bromide			4603	27-128AS	6/15/05
Nitrate-N			4389	25-65AS	1/15/05
Phosphate-P			4390	7-145VY	1/15/05
* Sulfate		3000 mg/L RSS 6/22/04	4602	27-98AS	6/15/2005

* 1000 mg/L SO_4S.

177-02-IC4 15ppm / 45ppm SO_4 (STD 2)
3ml 177-01-IC4 + 1ml DI H_2O.

177-03-IC4 10ppm Anions + 30ppm SO_4 (STD 3)
2ml 177-01-IC4 + 2ml DI H_2O.

177-04-IC4 5ppm Anions + 15ppm SO_4 (STD 4)
2ml 177-03-IC4 + 2ml DI H_2O.

177-05-IC4 1ppm Anions + 3ppm SO_4 (STD 5)
1ml 177-04-IC4 + 4ml DI H_2O

177-06-IC4 0.5ppm Anions + 1.5ppm SO_4 (STD 6)
2ml 177-05-IC4 + 2ml DI H_2O.

177-07-IC4 0.1ppm Anions RSS 6/22/04 0.3ppm SO_4. (STD 7)
1.8ml RSS 6/22/04 177-06-IC4 + 1.2ml DI H_2O.

177-08-IC4 0ppm (STD 8)
DI H_2O.

177-09-IC4 0ppm - DI H_2O (STD 9)

Work continued to Page

SIGNATURE [signature] DATE 6/22/04

DISCLOSED TO AND UNDERSTOOD BY [signature] DATE 7/1/04

Eppendorf 5000L 1000J 200J WITNESS

Book/Page: 12 009

Southwest Research Institute

Dionex DX500 Ion Chromatography Daily Log

010144

Analyst: RSpier

Date: 6/25/04

Conductivity: 17.8

Client	Project #	TO #	Analytical Method
DIV20 ↓	10542.02.002	040617-9	300
	06002.01.081	040616-1	

Loop: 40ul

Method: anions 040622

Column: AS14 # 015-02-087

Calibration: 6/22/04

Comments:

ICV/CCV/MS:

1st Source: SPEX (Inorg # 4518)

2nd Source: Nitrite N

Lot #: 25-145AS

Lot #: 178-01-1C4

CCV Conc: 1:20

CCV Conc: 1:20

MS Conc: 1:100

MS Conc: 1:100

✓ 1.0 mM Sodium Bicarbonate & 3.5 mM Sodium Carbonate

ELUENT SOLUTION PREP: FV = 2.0L DI H20

Weight: 0.1689g $NaHCO_3$

Weight: 0.7419g Na_2HCO_3

Source: Aldrich

Source: Alfa Aesar

Lot: 15308EJ

Lot: L06M34

Balance # 12

Other Eluent:

50 mA-Autoregen (ASRS)

Other Regen:

✓ 7/2/04

Eppendorfs
5000 L
1000 J
200 J

Book/Page: 12 009

Southwest Research Institute

Dionex DX500 Ion Chromatography Daily Log

010145

Analyst: RSpies

Date: 6/25/04

Conductivity: 17.8

Client	Project #	TO #	Analytical Method
DIV20 ↓	10542.02.002	040617-9	300
	06002.01.081	040616-1	

Loop: 40ul

Method: anions 040622

Column: AS14# 015-02-087

Calibration: 6/22/04

Comments:

ICV/CCV/MS:

1st Source: SPEX (Inorg # 4518)

2nd Source: Nitrite N

Lot #: 25-145AS

Lot #: 178-01-1C4

CCV Conc: 1:20

CCV Conc: 1:20

MS Conc: 1:100

MS Conc: 1:100

✓ 1.0 mM Sodium Bicarbonate & 3.5 mM Sodium Carbonate — ELUENT SOLUTION PREP: FV = 2.0L DI H20

Weight: 0.168g $NaHCO_3$

Weight: 0.7419g Na_2HCO_3

Source: Aldrich

Source: alfa aesar

Lot: 15308EJ

Lot: L06M34

Balance # 12

Other Eluent:

50 mA-Autoregen (ASRS)

Other Regen:

✓ 7/2/04

FRM-226 (Rev 3/Mar 03)

Eppendorfs
5000 L
1000 J
200 J

Schedule File: C:\PeakNet\Schedule\25june ... (cut off)

010146

Line	Sample	Sample Type	Level	Method	Data File	Dilution
1	ICV	Sample		anions040622.met	040625_001.dxd	20
2	ICB	Sample		anions040622.met	040625_002.dxd	1
3	246153	Sample		anions040622.met	040625_003.dxd	20
4	246152	Sample		anions040622.met	040625_004.dxd	20
5	246151	Sample		anions040622.met	040625_005.dxd	20
6	246150	Sample		anions040622.met	040625_006.dxd	20
7	246149	Sample		anions040622.met	040625_007.dxd	20
8	246148	Sample		anions040622.met	040625_008.dxd	20
9	246147	Sample		anions040622.met	040625_009.dxd	20
10	246146	Sample		anions040622.met	040625_010.dxd	20
11	246146D	Sample		anions040622.met	040625_011.dxd	20
12	246146S	Sample		anions040622.met	040625_012.dxd	20
13	CCV	Sample		anions040622.met	040625_013.dxd	20
14	CCB	Sample		anions040622.met	040625_014.dxd	1
15	246046	Sample		anions040622.met	040625_015.dxd	1000
16	246046D	Sample		anions040622.met	040625_016.dxd	1000
17	246046S	Sample		anions040622.met	040625_017.dxd	1000
18	246047	Sample		anions040622.met	040625_018.dxd	1000
19	246048	Sample		anions040622.met	040625_019.dxd	1000
20	246049	Sample		anions040622.met	040625_020.dxd	1000
21	246050	Sample		anions040622.met	040625_021.dxd	1000
22	246051	Sample		anions040622.met	040625_022.dxd	1000
23	246052	Sample		anions040622.met	040625_023.dxd	1000
24	246053	Sample		anions040622.met	040625_024.dxd	1000
25	CCV	Sample		anions040622.met	040625_025.dxd	20
26	CCB	Sample		anions040622.met	040625_026.dxd	1
27	246054	Sample		anions040622.met	040625_027.dxd	1000
28	246055	Sample		anions040622.met	040625_028.dxd	1000
29	246056	Sample		anions040622.met	040625_029.dxd	1000
30	246057	Sample		anions040622.met	040625_030.dxd	1000
31	246058	Sample		anions040622.met	040625_031.dxd	1000
32	246059	Sample		anions040622.met	040625_032.dxd	1000
33	246060	Sample		anions040622.met	040625_033.dxd	1000
34	CCV	Sample		anions040622.met	040625_034.dxd	1000
35	CCB	Sample		anions040622.met	040625_035.dxd	1
36	LCS	Sample		anions040622.met	040625_036.dxd	100
37	245962	Sample		anions040622.met	040625_037.dxd	1
38	245962D	Sample		anions040622.met	040625_038.dxd	1
39	245966	Sample		anions040622.met	040625_039.dxd	1
40	244944	Sample		anions040622.met	040625_040.dxd	1
41	244480	Sample		anions040622.met	040625_041.dxd	1
42	245966D	Sample		anions040622.met	040625_042.dxd	1
43	245969	Sample		anions040622.met	040625_043.dxd	1
44	CCV	Sample		anions040622.met	040625_044.dxd	20
45	CCB	Sample		anions040622.met	040625_045.dxd	1
46	245962	Sample		anions040622.met	040625_046.dxd	20
47	245962D	Sample		anions040622.met	040625_047.dxd	20
48	245966	Sample		anions040622.met	040625_048.dxd	20
49	244944	Sample		anions040622.met	040625_049.dxd	20
50	244480	Sample		anions040622.met	040625_050.dxd	20
51	245966D	Sample		anions040622.met	040625_051.dxd	20
52	245969	Sample		anions040622.met	040625_052.dxd	20
53	CCV	Sample		anions040622.met	040625_053.dxd	20
54	CCB	Sample		anions040622.met	040625_054.dxd	1

Default Method Path: C:\PEAKNET\METHOD
Default Data Path: c:\peaknet\data\040625
Comment:
DIV 20 10542.02.002 TO#040617-9
DIV 20 06002.01.081 TO#040616-1

RSparks 6/30/04

ICV/CCV = Spex 25-145AS (morg #4518)
NO_2N 178-01-IC4 100 mg/L

Spikes: 50ul Spex into 5ml sample/sample dilution.

Sample Name : CCV
Dilution Factor : 20.00
Injection Number : 13
Data File Name : c:\peaknet\data\040625\040625_013.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

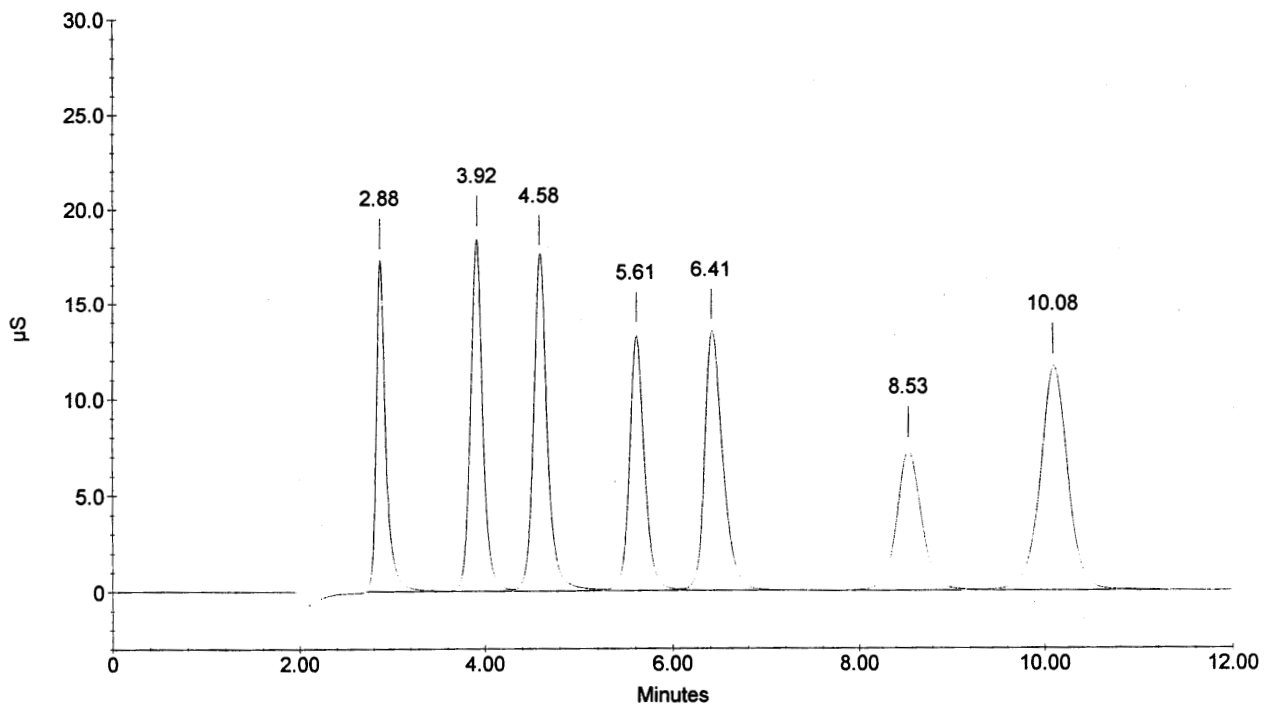
Date Time Collected : 6/25/04 12:53:59 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010147

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.88	FLUORIDE	98.831	171852	1232536	1	-0.46
2	3.92	CHLORIDE	202.030	183565	1674143	2	-3.29
3	4.58	NITRITE-N	95.750	173204	1794608	2	-2.90
4	5.61	BROMIDE	403.388	132457	1485930	2	-3.28
5	6.41	NITRATE-N	83.433	133972	1798147	2	-1.99
6	8.53	PHOSPHATE-P	192.964	72346	1376257	2	0.95
7	10.08	SULFATE	392.073	115827	2403679	2	0.67
	0.00		---total(s)--- 1468.468		11765300		

CCV



Sample Name : CCB
Dilution Factor : 1.00
Injection Number : 14
Data File Name : c:\peaknet\data\040625\040625_014.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

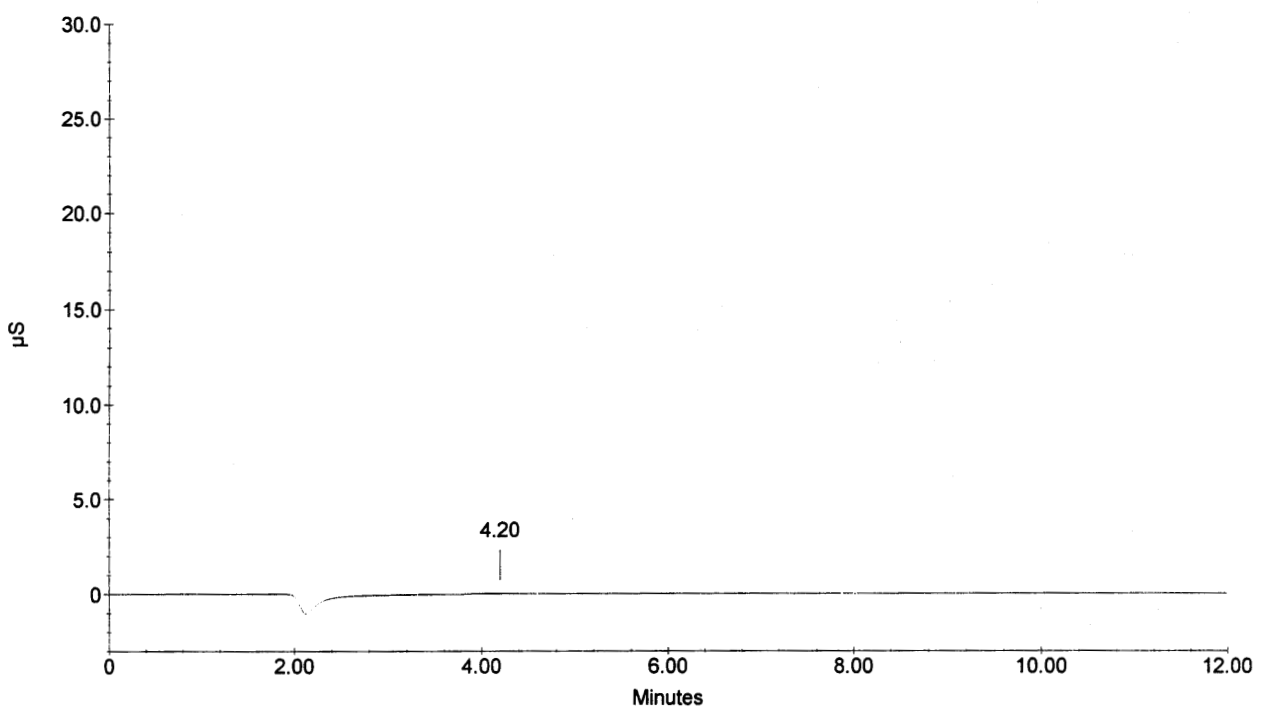
Date Time Collected : 6/25/04 1:08:42 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010148

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.20	CHLORIDE	0.010	77	1508	1	3.62
1	4.20	CHLORIDE	0.010	77	1508	1	3.62
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
		---total(s)---					
	0.00		0.020		3016		

CCB



Sample Name : 246046
Dilution Factor : 1000.00
Injection Number : 15
Data File Name : c:\peaknet\data\040625\040625_015.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

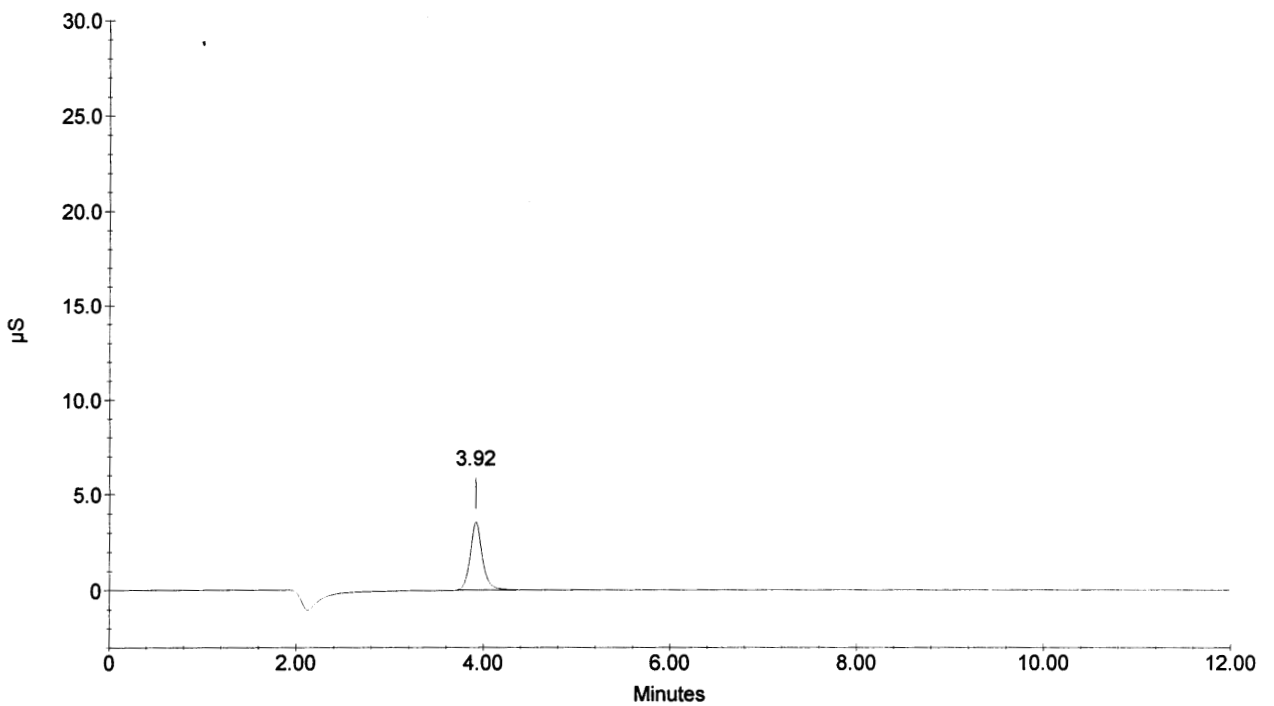
Date Time Collected : 6/25/04 1:23:25 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010149

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.92	CHLORIDE	2048.425	35309	319288	1	-3.29
1	3.92	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P SULFATE	2048.425	35309	319288	1	-3.29
	0.00	---total(s)---	4096.850		638576		

246046



Sample Name : 246046D
Dilution Factor : 1000.00
Injection Number : 16
Data File Name : c:\peaknet\data\040625\040625_016.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

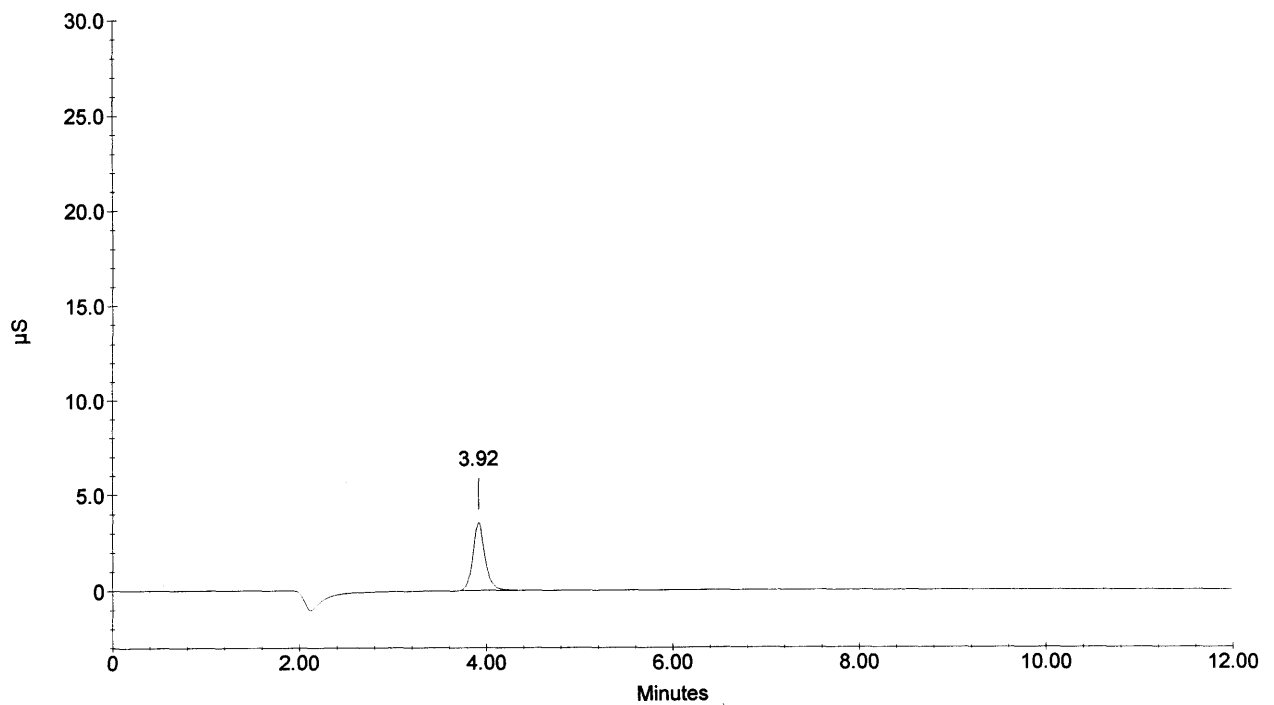
Date Time Collected : 6/25/04 1:38:07 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010150

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.92	CHLORIDE	2035.164	35246	317192	1	-3.29
1	3.92	CHLORIDE	2035.164	35246	317192	1	-3.29
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
			---total(s)---				
	0.00		4070.328		634384		

246046D



Sample Name : 246046S
Dilution Factor : 1000.00
Injection Number : 17
Data File Name : c:\peaknet\data\040625\040625_017.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

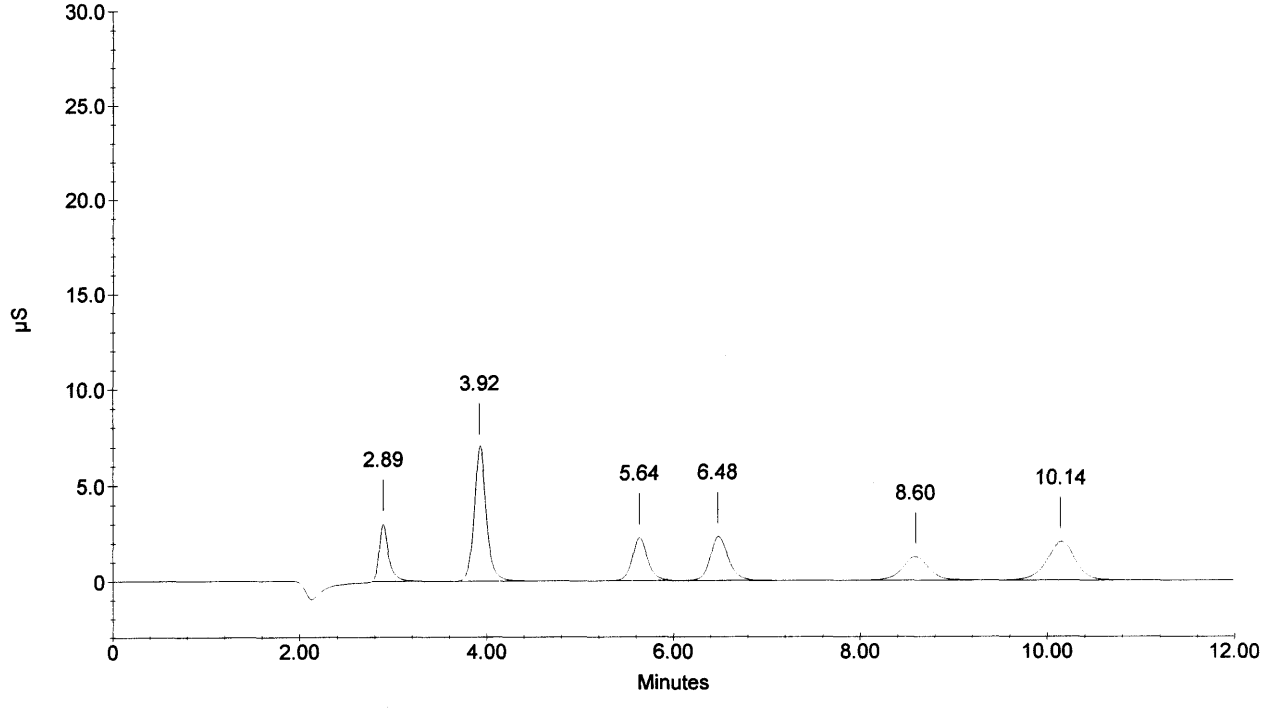
Date Time Collected : 6/25/04 1:52:49 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010151

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.89	FLUORIDE	907.273	30007	213126	1	0.00
2	3.92	CHLORIDE NITRITE-N	4040.009	69302	638676	1	-3.29
3	5.64	BROMIDE	3957.824	22649	262729	2	-2.82
4	6.48	NITRATE-N	753.321	23122	316208	2	-0.97
5	8.60	PHOSPHATE-P	1834.619	12369	246254	2	1.74
6	10.14	SULFATE	3678.386	20264	433453	2	1.33
	0.00		---total(s)--- 15171.431		2110445		

246046S



Sample Name : 246047
Dilution Factor : 1000.00
Injection Number : 18
Data File Name : c:\peaknet\data\040625\040625_018.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

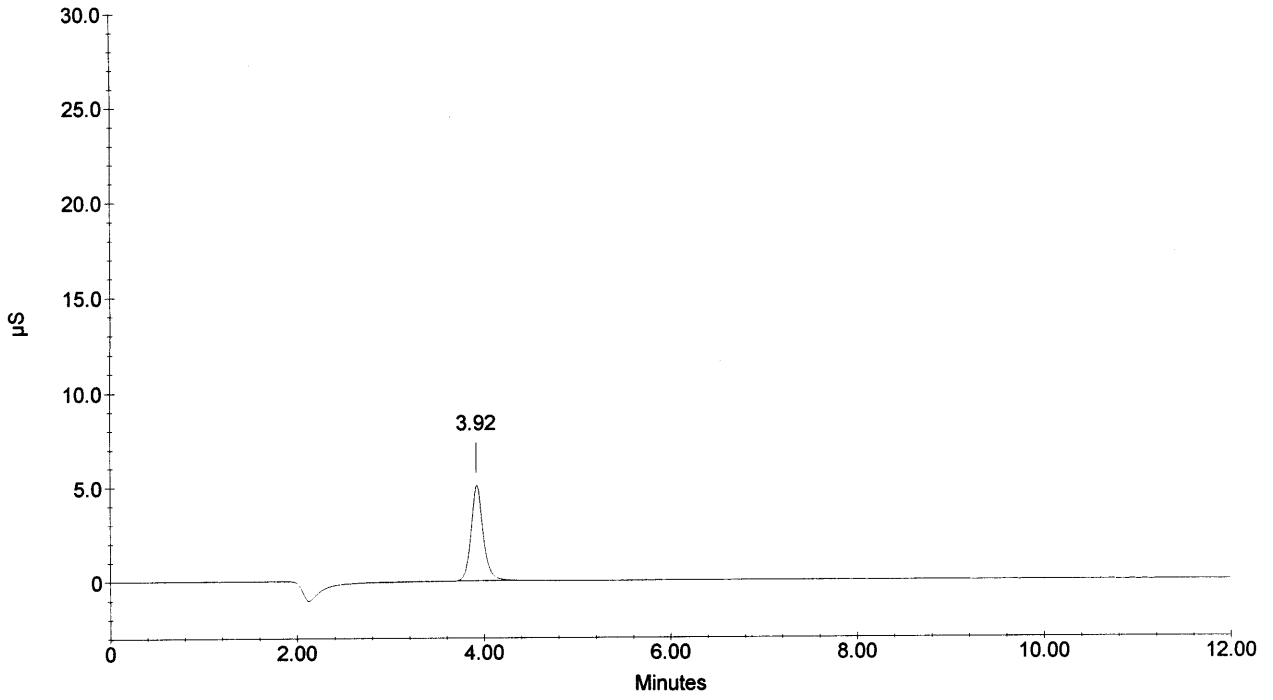
Date Time Collected : 6/25/04 2:07:32 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010152

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.92	CHLORIDE	2907.041	50122	455855	1	-3.29
1	3.92	CHLORIDE	2907.041	50122	455855	1	-3.29
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
			---total(s)---				
	0.00		5814.081		911710		

246047



Sample Name : 246048
Dilution Factor : 1000.00
Injection Number : 19
Data File Name : c:\peaknet\data\040625\040625_019.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

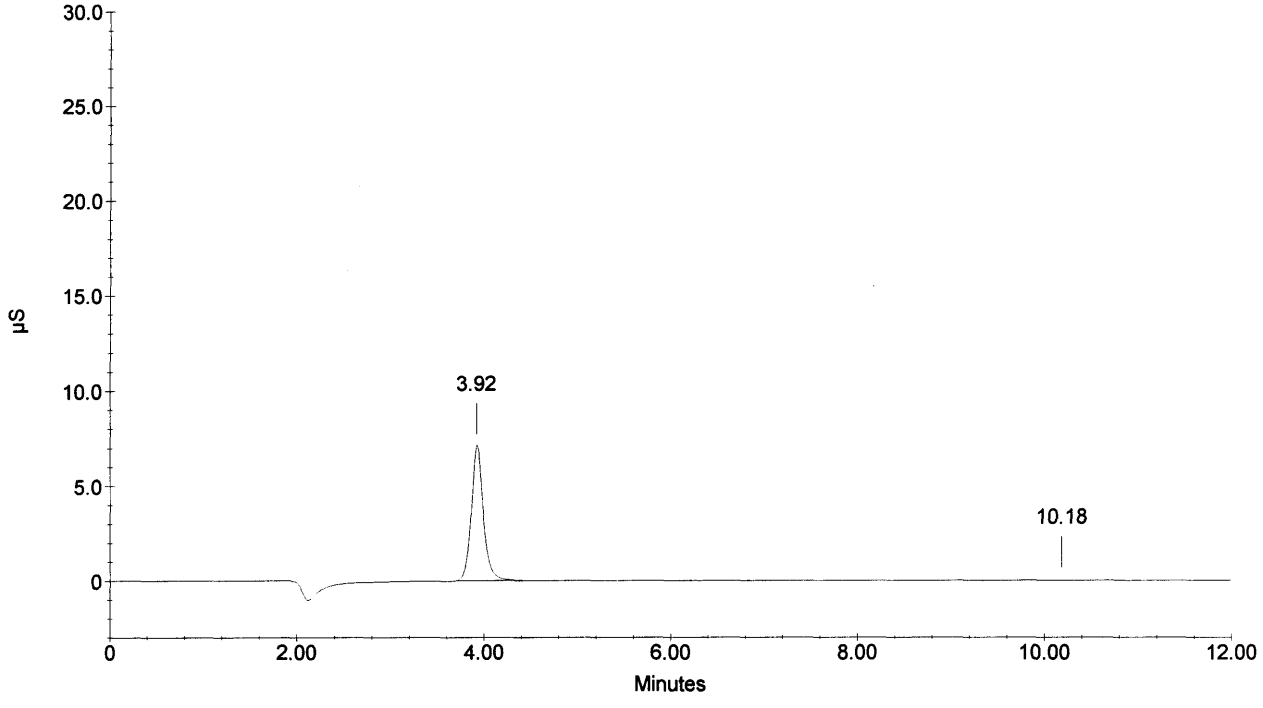
Date Time Collected : 6/25/04 2:22:14 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010153

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.92	CHLORIDE	4038.253	69960	638390	1	-3.29
1	3.92	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	4038.253	69960	638390	1	-3.29
2	10.18	SULFATE	8.192	67	957	1	1.73
	0.00	---total(s)---	8084.698		1277738		

246048



Sample Name : 246049
Dilution Factor : 1000.00
Injection Number : 20
Data File Name : c:\peaknet\data\040625\040625_020.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

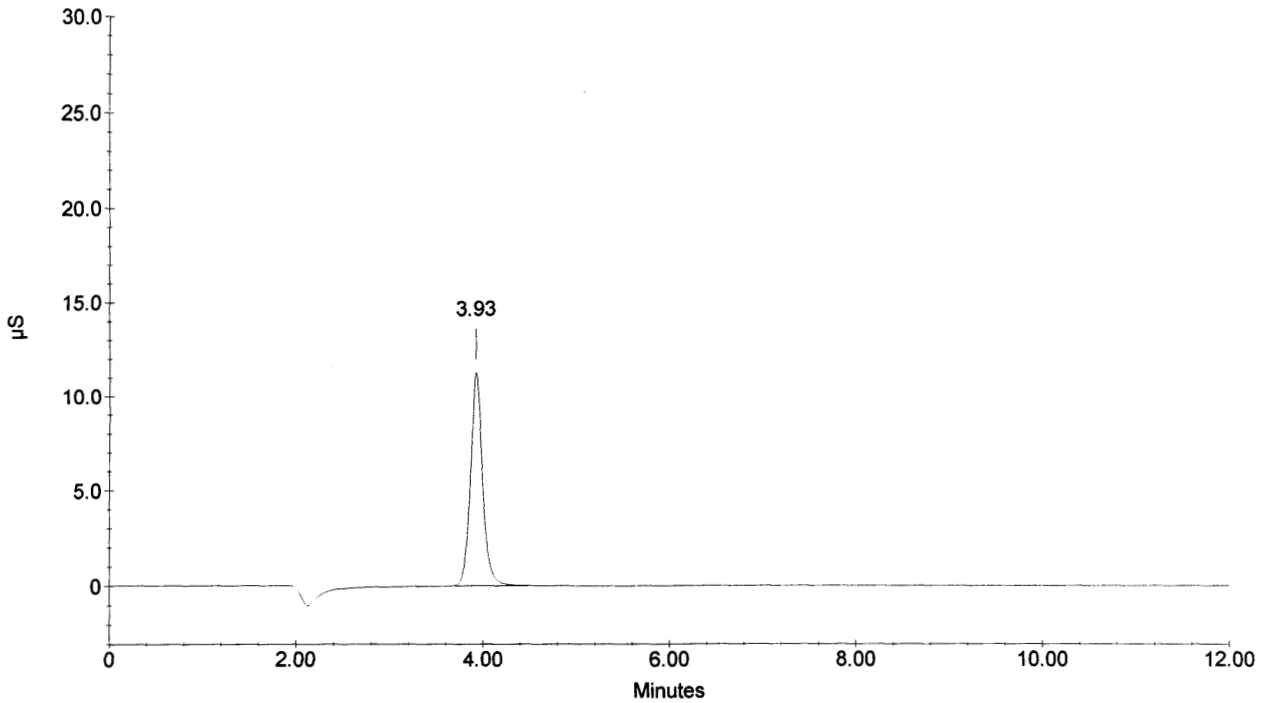
Date Time Collected : 6/25/04 2:36:55 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010154

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.93	CHLORIDE	6279.889	112670	1009446	1	-2.96
1	3.93	CHLORIDE	6279.889	112670	1009446	1	-2.96
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
		---total(s)---					
	0.00		12559.778		2018892		

246049



Sample Name : 246050
Dilution Factor : 1000.00
Injection Number : 21
Data File Name : c:\peaknet\data\040625\040625_021.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

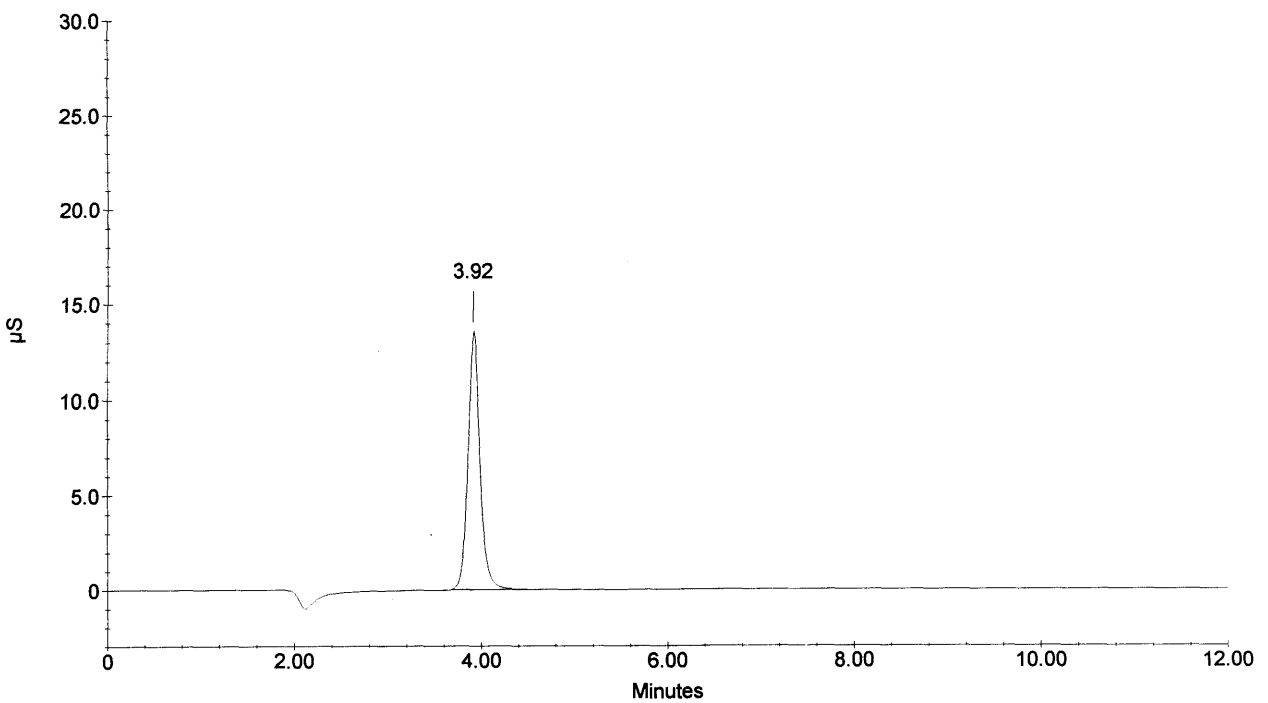
Date Time Collected : 6/25/04 2:51:37 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010155

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.92	CHLORIDE	7484.298	133221	1214314	1	-3.29
1	3.92	CHLORIDE	7484.298	133221	1214314	1	-3.29
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
	0.00	---total(s)---	14968.596		2428629		

246050



Sample Name : 246051
Dilution Factor : 1000.00
Injection Number : 22
Data File Name : c:\peaknet\data\040625\040625_022.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

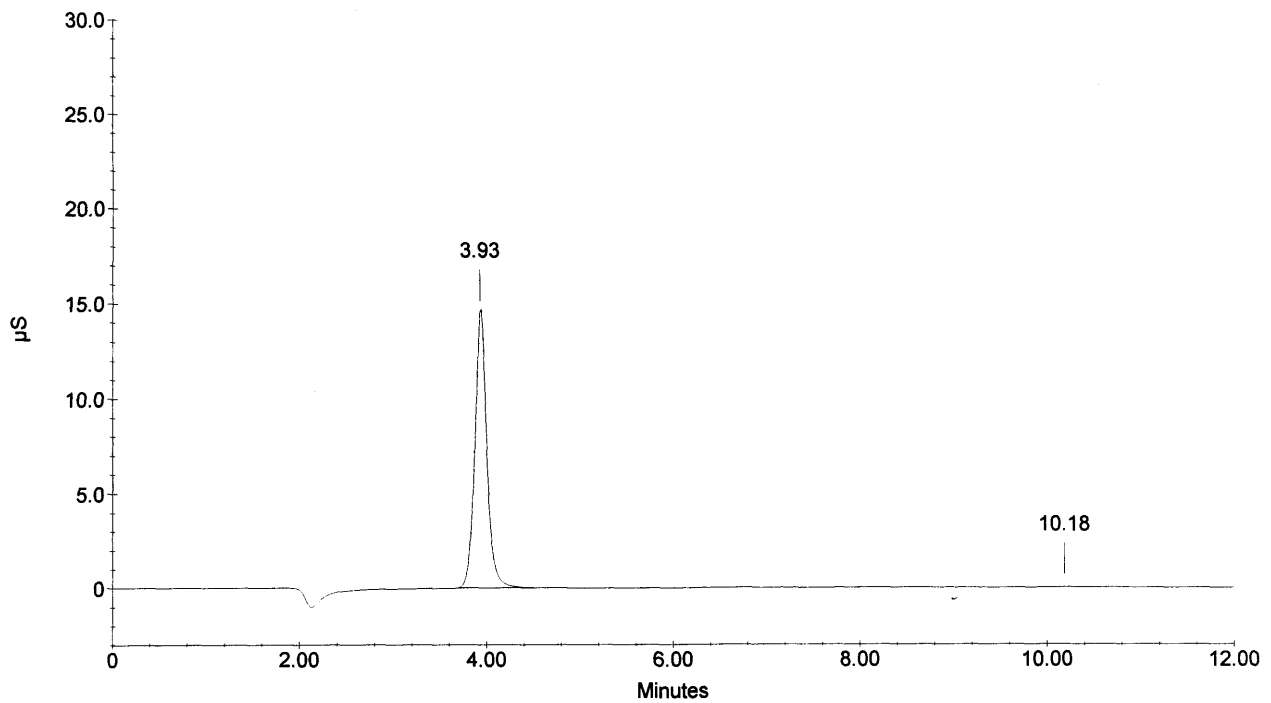
Date Time Collected : 6/25/04 3:06:20 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010156

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.93	CHLORIDE	8053.255	143895	1312520	1	-2.96
1	3.93	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	8053.255	143895	1312520	1	-2.96
2	10.18	SULFATE	7.838	66	916	1	1.73
	0.00	---total(s)---	16114.348		2625955		

246051



Sample Name : 246052
Dilution Factor : 1000.00
Injection Number : 23
Data File Name : c:\peaknet\data\040625\040625_023.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

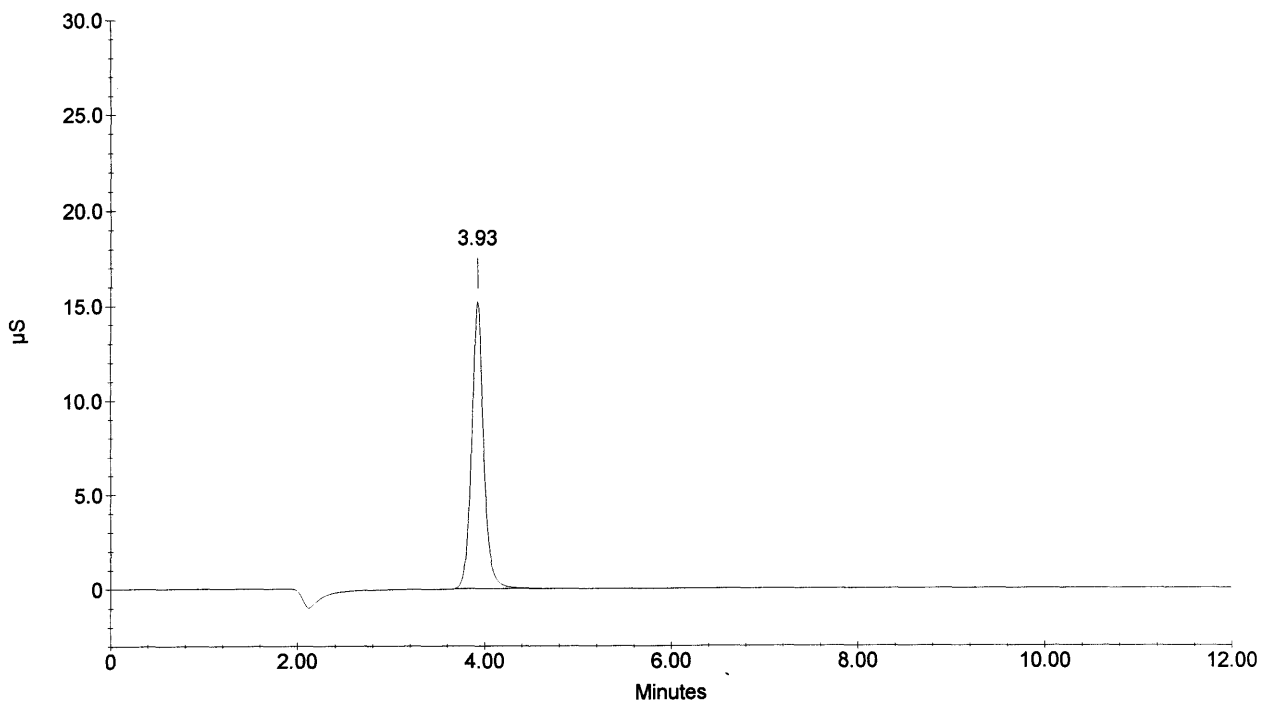
Date Time Collected : 6/25/04 3:21:02 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010157

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.93	CHLORIDE	8328.546	151654	1360377	1	-2.96
1	3.93	CHLORIDE	8328.546	151654	1360377	1	-2.96
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
	0.00		---total(s)--- 16657.092		2720753		

246052



Sample Name : 246053
Dilution Factor : 1000.00
Injection Number : 24
Data File Name : c:\peaknet\data\040625\040625_024.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

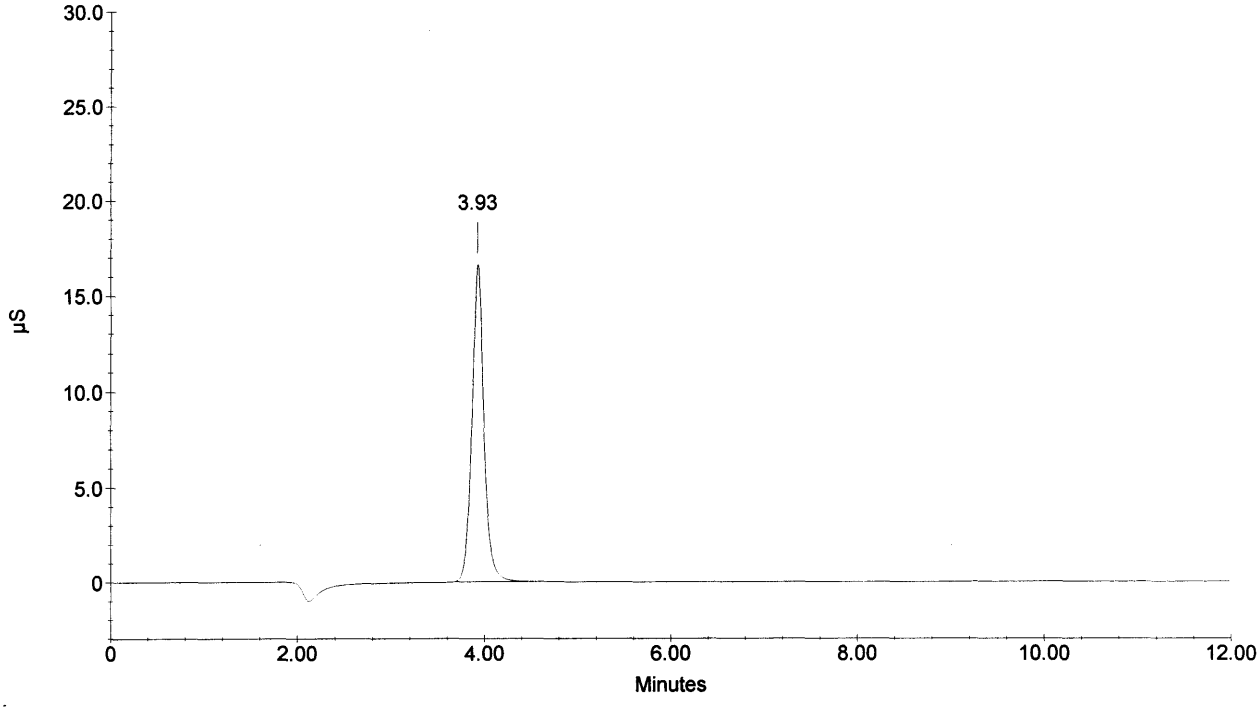
Date Time Collected : 6/25/04 3:35:42 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010158

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.93	CHLORIDE	9077.272	165054	1491688	1	-2.96
1	3.93	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P SULFATE	9077.272	165054	1491688	1	-2.96
	0.00	---total(s)---	18154.543		2983376		

246053



Sample Name : CCV
Dilution Factor : 20.00
Injection Number : 25
Data File Name : c:\peaknet\data\040625\040625_025.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

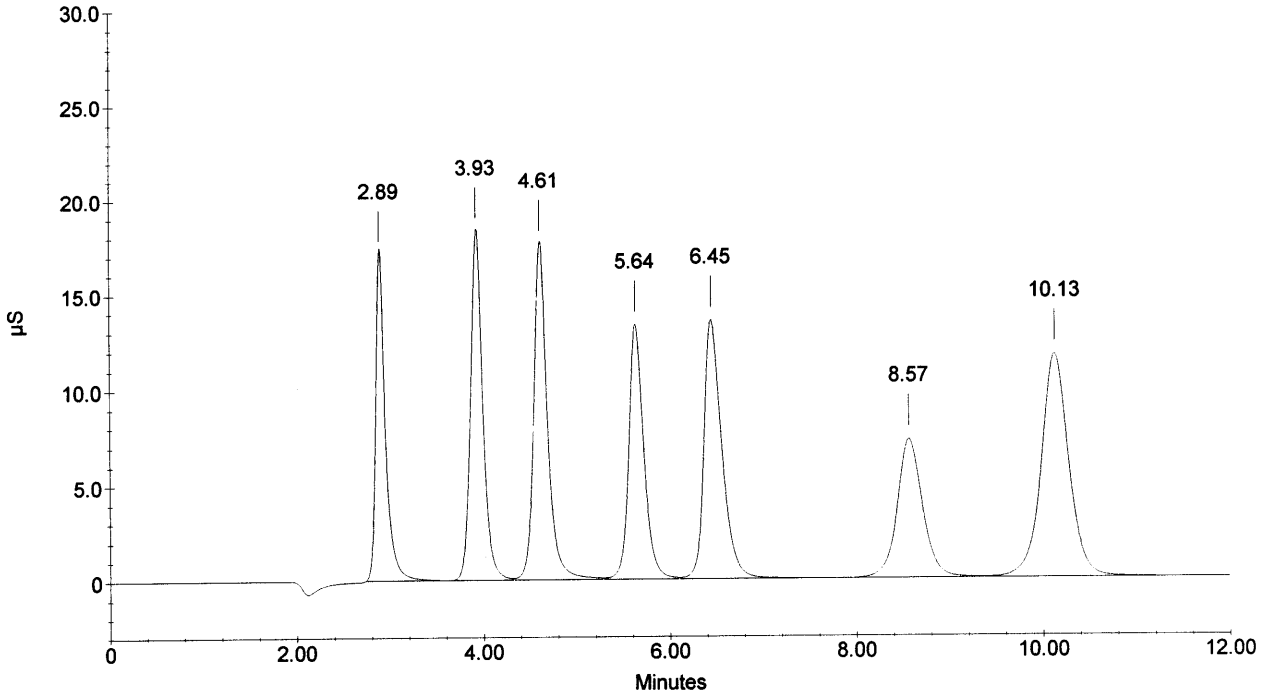
Date Time Collected : 6/25/04 3:50:25 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010159

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.89	FLUORIDE	99.396	170820	1240077	1	0.00
2	3.93	CHLORIDE	203.070	182994	1683498	2	-2.96
3	4.61	NITRITE-N	96.565	176180	1809870	2	-2.33
4	5.64	BROMIDE	405.520	133157	1495003	2	-2.82
5	6.45	NITRATE-N	84.126	135372	1813590	2	-1.38
6	8.57	PHOSPHATE-P	194.065	72885	1384765	2	1.42
7	10.13	SULFATE	394.111	116972	2416832	2	1.20
	0.00		---total(s)--- 1476.853		11843634		

CCV



Sample Name : CCB
Dilution Factor : 1.00
Injection Number : 26
Data File Name : c:\peaknet\data\040625\040625_026.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

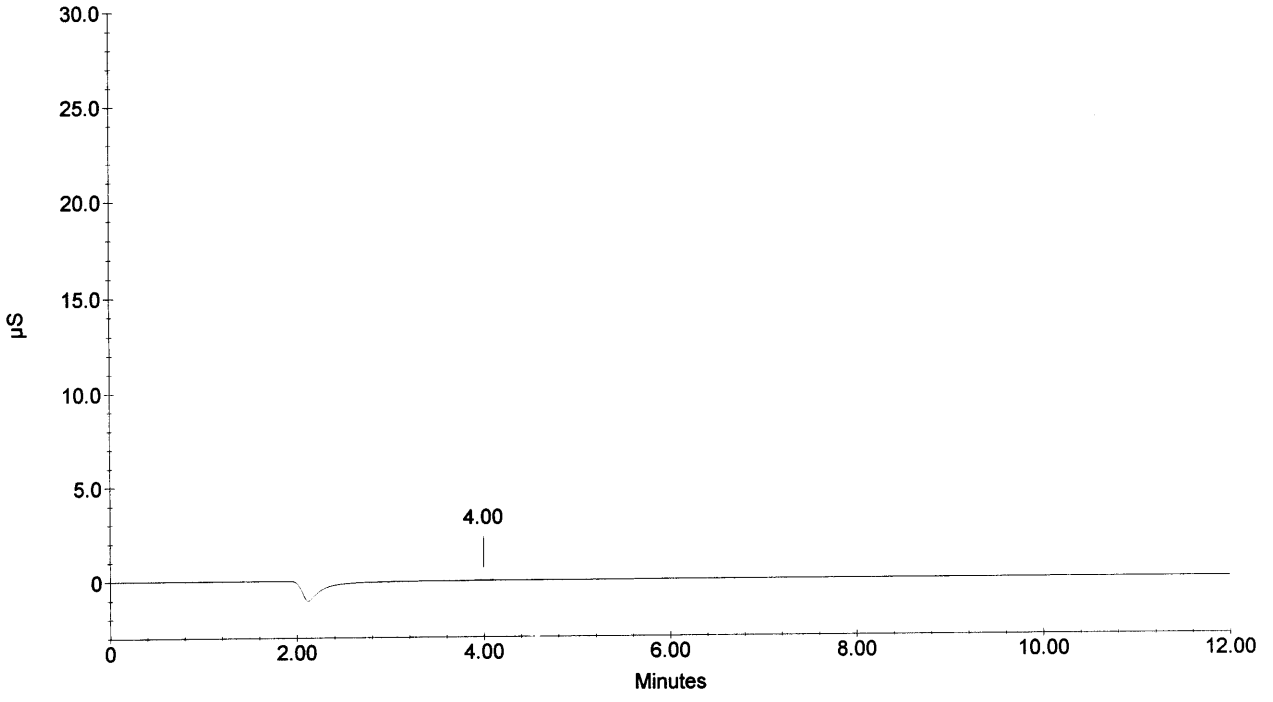
Date Time Collected : 6/25/04 4:05:08 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010160

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.00	CHLORIDE	0.004	65	549	1	-1.32
1	4.00	CHLORIDE	0.004	65	549	1	-1.32
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
		---total(s)---					
	0.00		0.007		1099		

CCB



Sample Name : 246054
Dilution Factor : 1000.00
Injection Number : 27
Data File Name : c:\peaknet\data\040625\040625_027.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

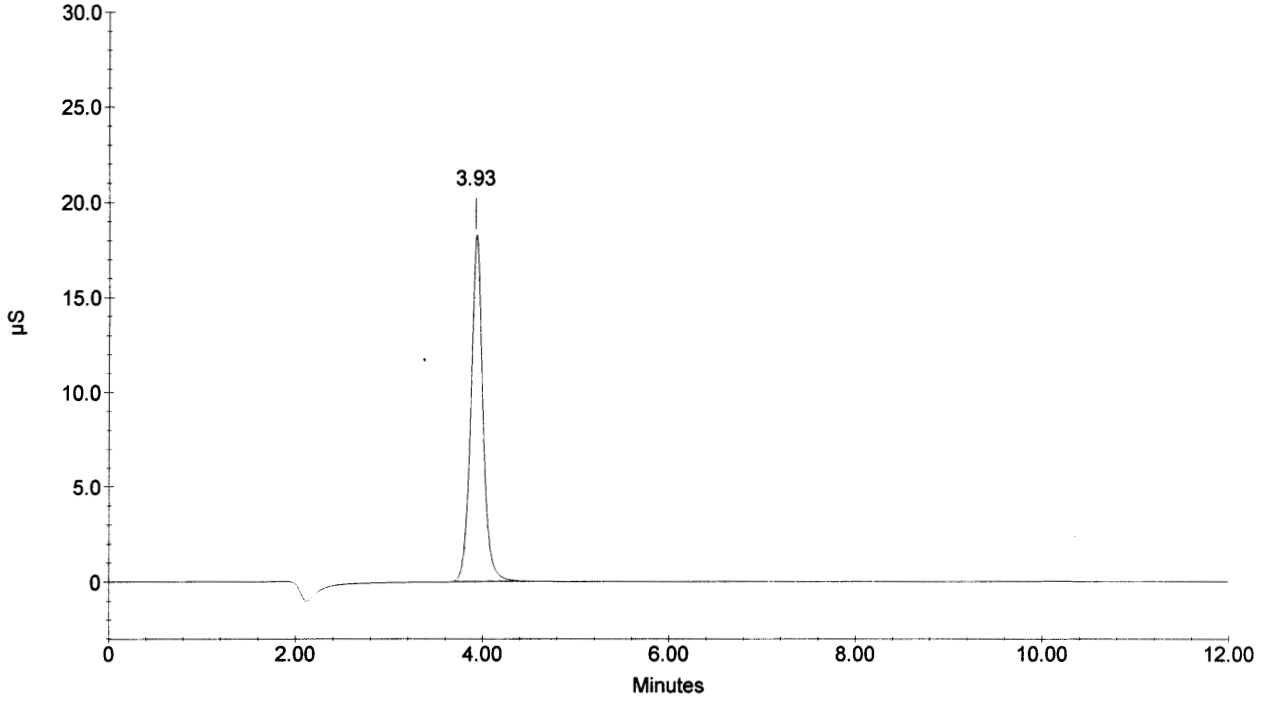
Date Time Collected : 6/25/04 4:19:49 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010161

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.93	CHLORIDE	9930.791	178593	1643503	1	-2.96
1	3.93	CHLORIDE	9930.791	178593	1643503	1	-2.96
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
		---total(s)---					
	0.00		19861.583		3287006		

246054



Sample Name : 246055
Dilution Factor : 1000.00
Injection Number : 28
Data File Name : c:\peaknet\data\040625\040625_028.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

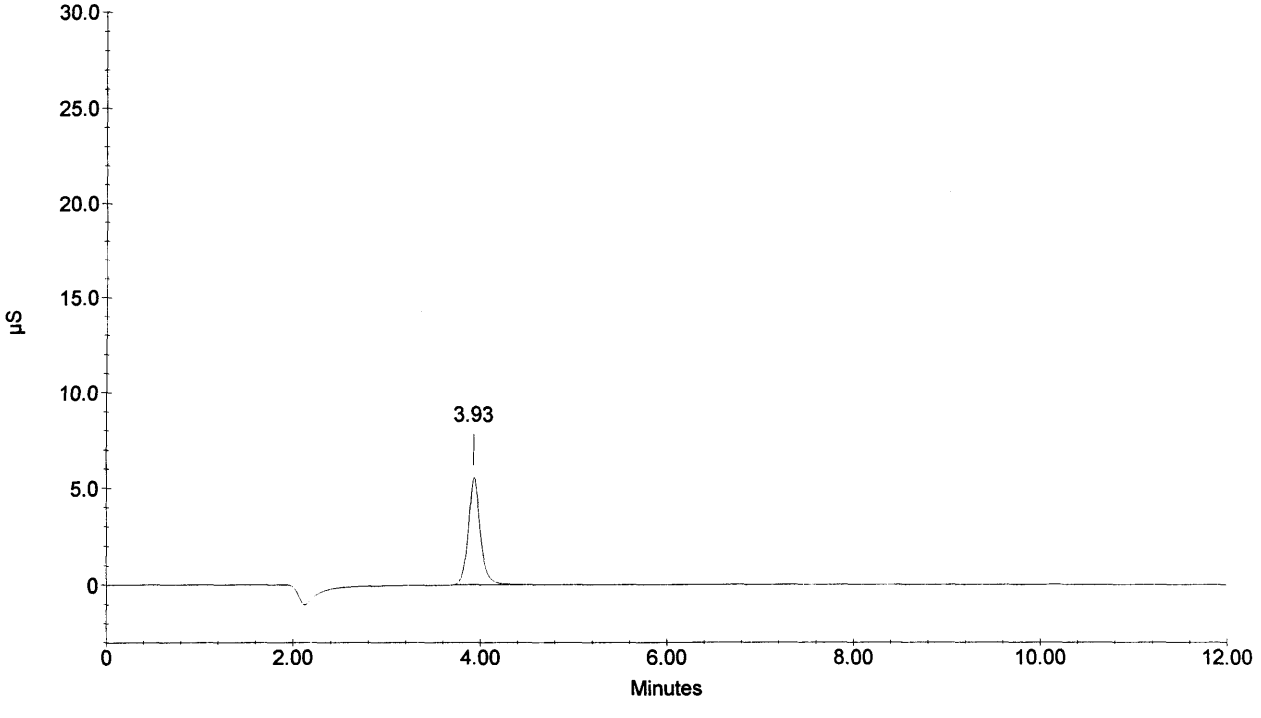
Date Time Collected : 6/25/04 4:34:30 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010162

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.93	CHLORIDE	3151.163	54773	494992	1	-2.96
1	3.93	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P SULFATE	3151.163	54773	494992	1	-2.96
	0.00	---total(s)---	6302.326		989984		

246055



Sample Name : 246056
Dilution Factor : 1000.00
Injection Number : 29
Data File Name : c:\peaknet\data\040625\040625_029.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

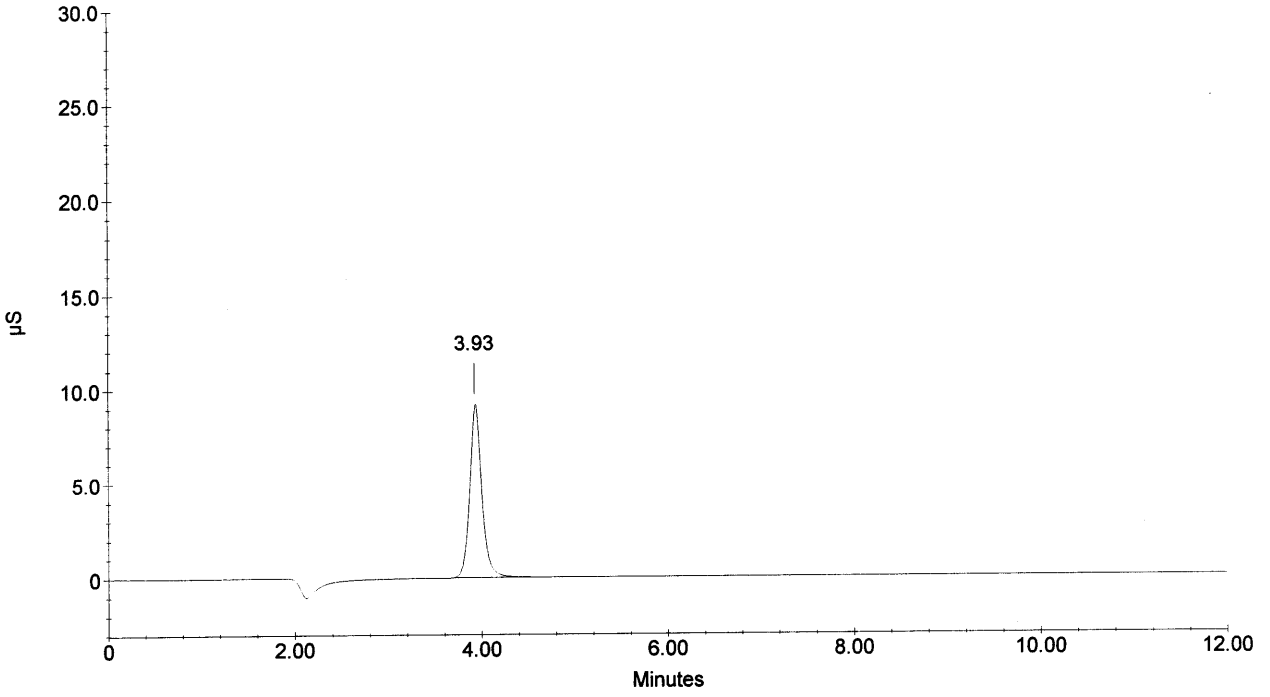
Date Time Collected : 6/25/04 4:49:11 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010163

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.93	CHLORIDE	5143.218	90146	819689	1	-2.96
1	3.93	CHLORIDE	5143.218	90146	819689	1	-2.96
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
	0.00		---total(s)--- 10286.436		1639379		

246056



Sample Name : 246057
Dilution Factor : 1000.00
Injection Number : 30
Data File Name : c:\peaknet\data\040625\040625_030.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

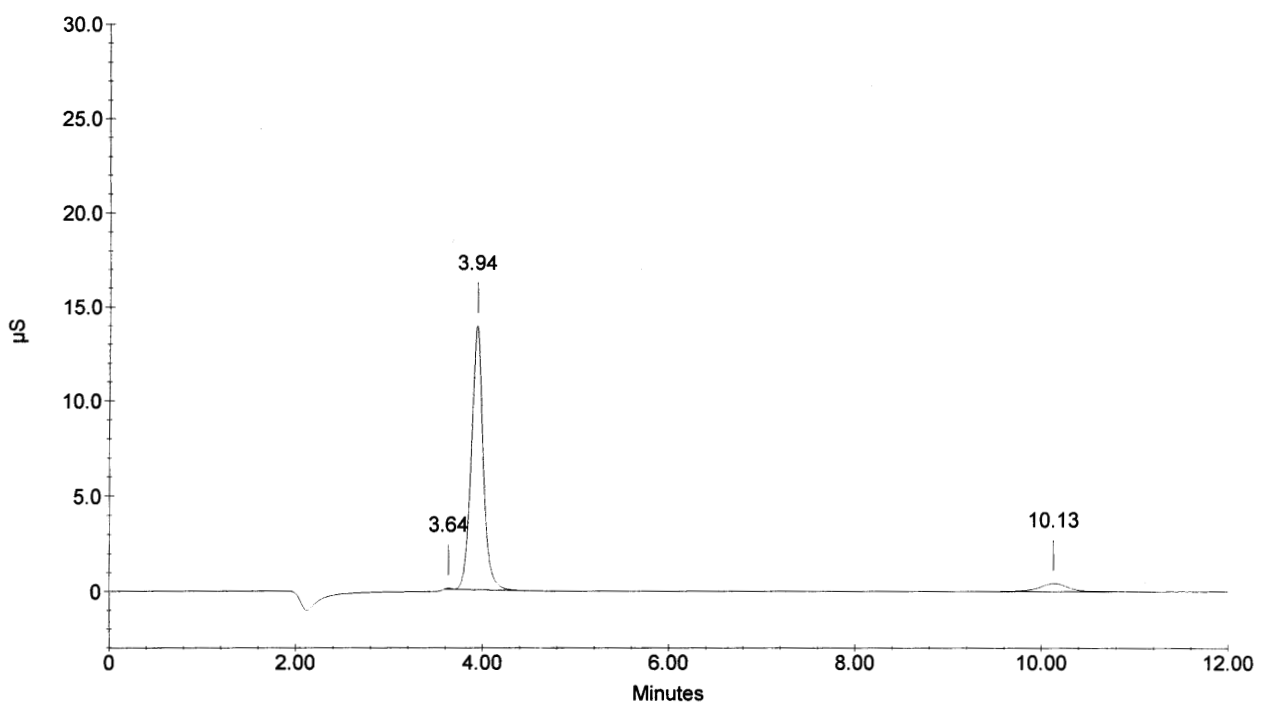
Date Time Collected : 6/25/04 5:03:52 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010164

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.64		0.000	612	2347	2	
2	3.94	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	7601.979	138898	1234550	2	-2.63
3	10.13	SULFATE	795.117	4272	93068	1	1.20
	0.00		---total(s)--- 8397.096		1329965		

246057



Sample Name : 246058
Dilution Factor : 1000.00
Injection Number : 31
Data File Name : c:\peaknet\data\040625\040625_031.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

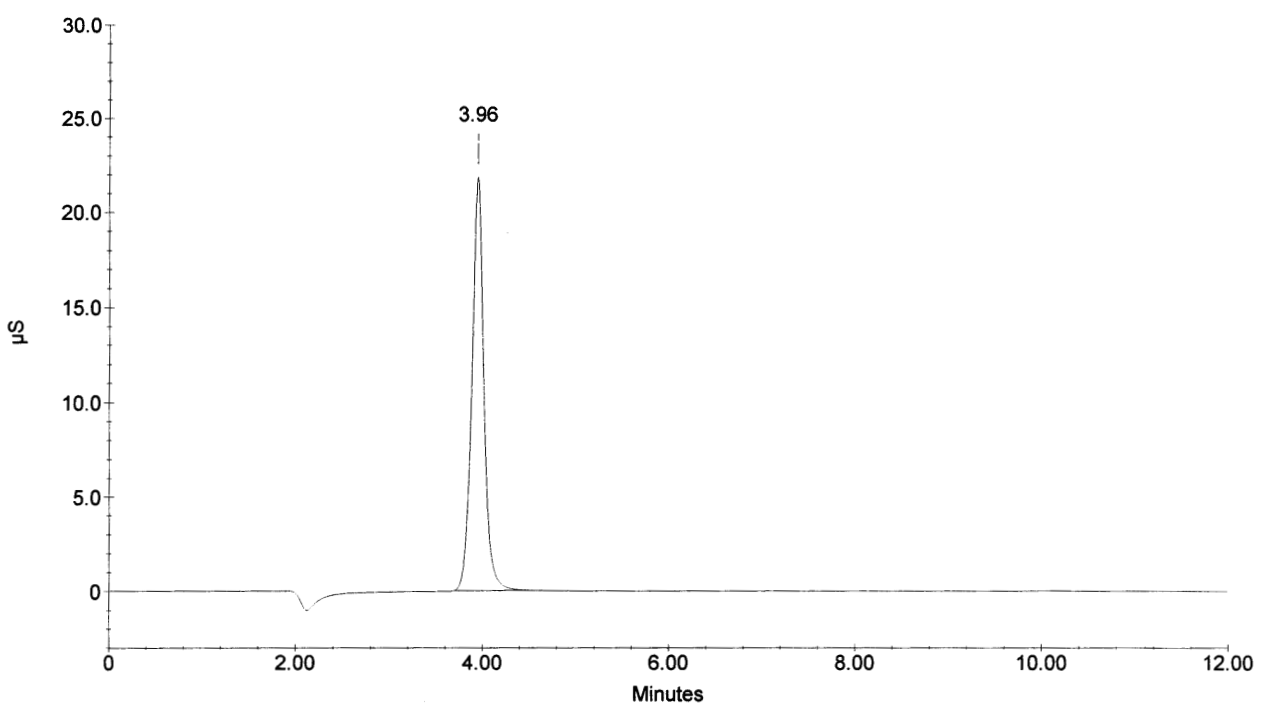
Date Time Collected : 6/25/04 5:18:33 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010165

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.96	CHLORIDE	11715.756	218015	1968770	1	-2.30
1	3.96	CHLORIDE	11715.756	218015	1968770	1	-2.30
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
		---total(s)---					
	0.00		23431.512		3937540		

246058



Sample Name : 246059
Dilution Factor : 1000.00
Injection Number : 32
Data File Name : c:\peaknet\data\040625\040625_032.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

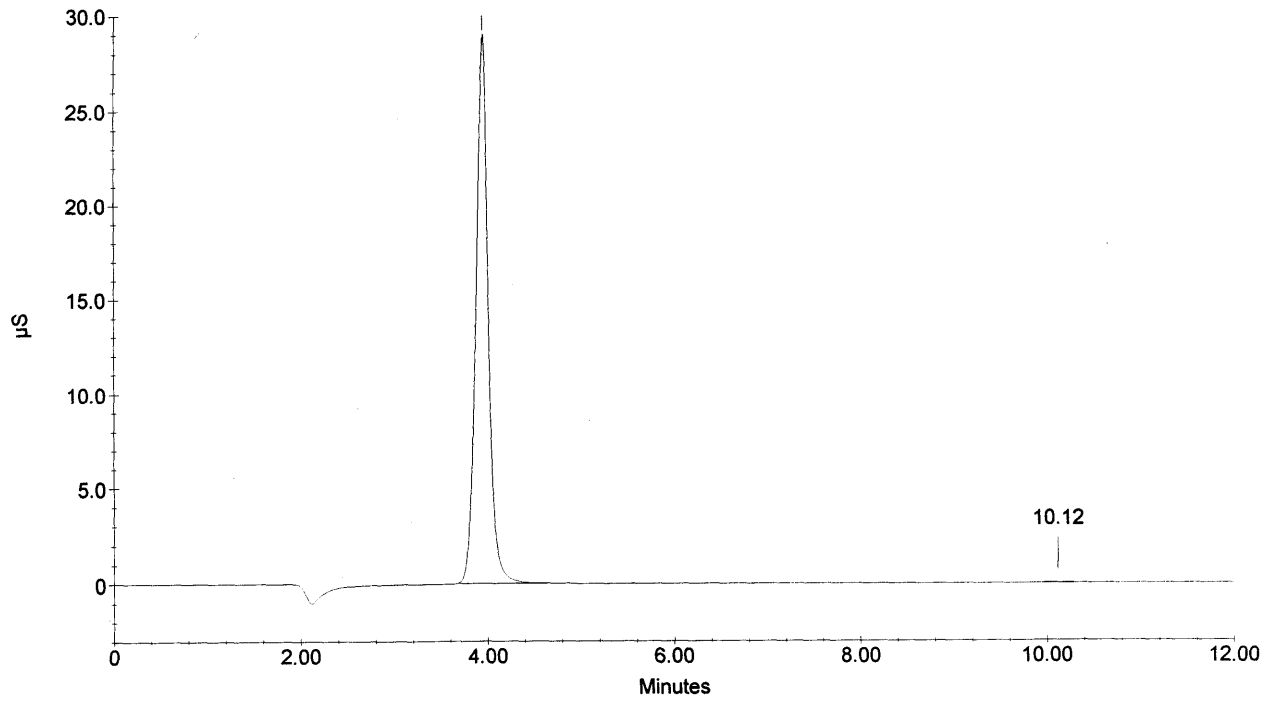
Date Time Collected : 6/25/04 5:33:14 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010166

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.94	CHLORIDE	15286.534	285189	2655112	1	-2.63
1	3.94	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	15286.534	285189	2655112	1	-2.63
2	10.12	SULFATE	11.835	84	1383	1	1.07
	0.00	---total(s)---	30584.903		5311606		

246059



Sample Name : 246060
Dilution Factor : 1000.00
Injection Number : 33
Data File Name : c:\peaknet\data\040625\040625_033.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

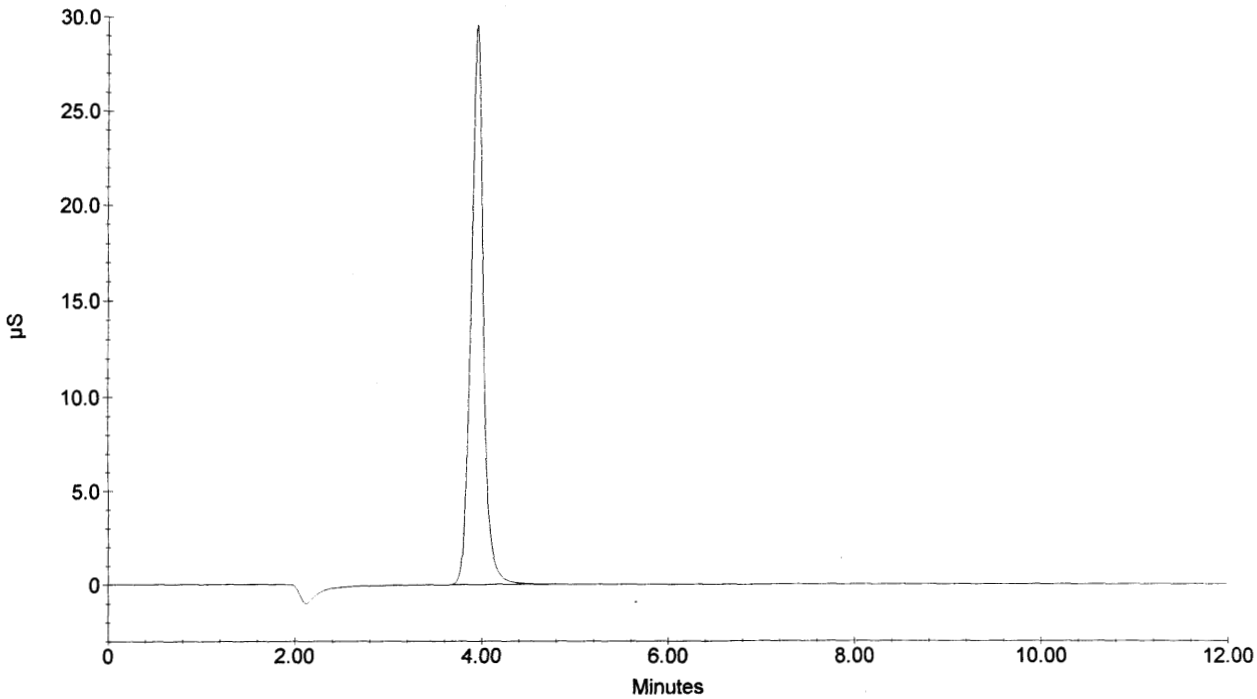
Date Time Collected : 6/25/04 5:47:54 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010167

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.96	CHLORIDE	15583.483	293130	2714591	1	-2.30
1	3.96	CHLORIDE	15583.483	293130	2714591	1	-2.30
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
	0.00		---total(s)--- 31166.966		5429182		

246060



Sample Name : CCV
Dilution Factor : 20.00
Injection Number : 34
Data File Name : ...\040625_034.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

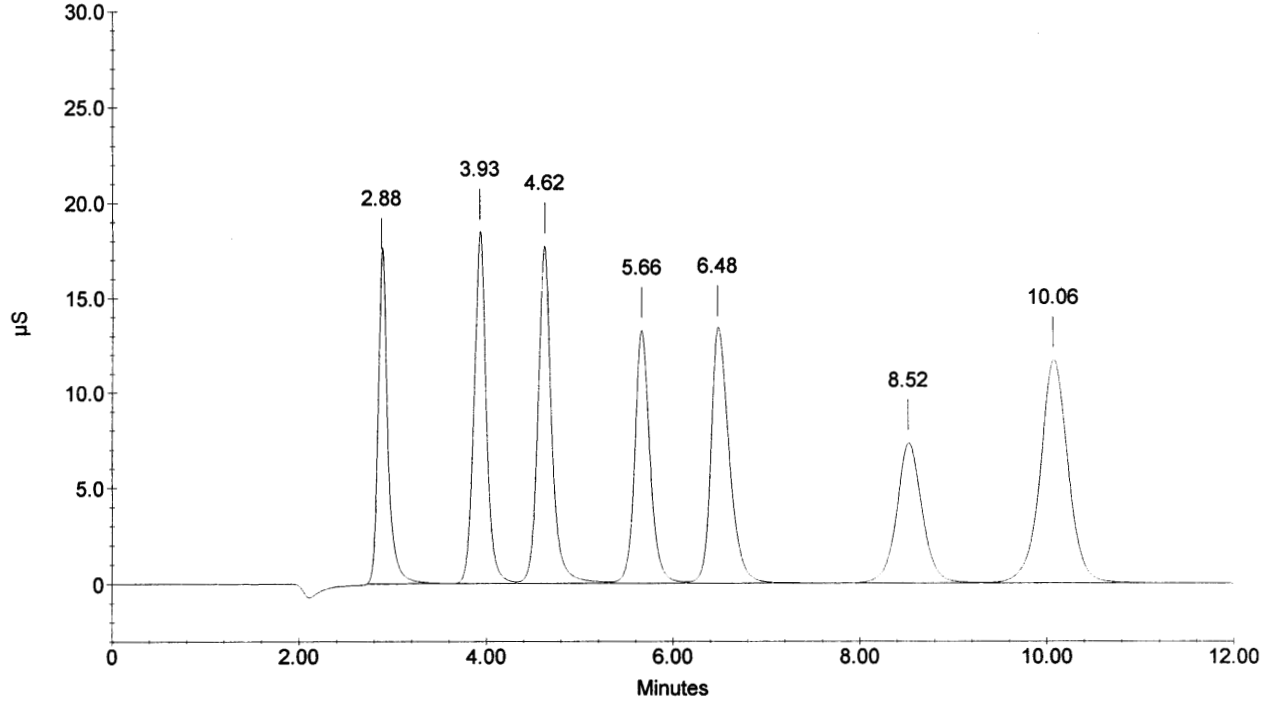
Date Time Collected : 6/25/04 6:02:35 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010168

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.88	FLUORIDE	100.058	168676	1248920	2	-0.46
2	3.93	CHLORIDE	203.249	183925	1685113	2	-2.96
3	4.62	NITRITE-N	96.450	176674	1807722	2	-2.05
4	5.66	BROMIDE	405.238	132125	1493800	2	-2.36
5	6.48	NITRATE-N	83.916	132982	1808911	2	-0.97
6	8.52	PHOSPHATE-P	194.135	72684	1385303	2	0.79
7	10.06	SULFATE	393.846	116395	2415118	2	0.53
	0.00		---total(s)--- 1476.892		11844887		

CCV



Sample Name : CCB
Dilution Factor : 1.00
Injection Number : 35
Data File Name : c:\peaknet\data\040625\040625_035.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\25jun04.sch

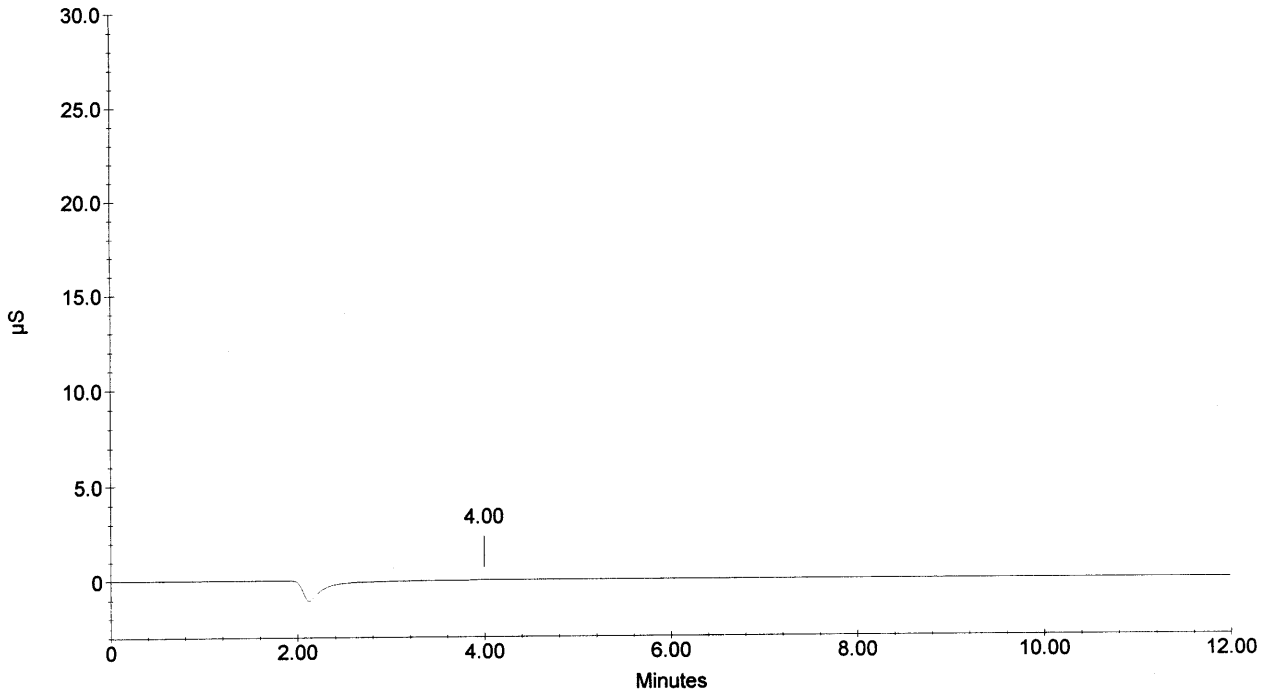
Date Time Collected : 6/25/04 6:17:16 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010169

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.00	CHLORIDE	0.003	47	499	1	-1.32
1	4.00	CHLORIDE	0.003	47	499	1	-1.32
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
			---total(s)---				
	0.00		0.006		999		

CCB



Schedule File: C:\PeakNet\schedule\040622.sch

Line	Sample	Sample Type	Level	Method	Data File	Dilution
1	STD 8 177-08-IC4	Calibration St	1	anions040622.met	040622_001.dxd	1
2	STD 7 177-07-IC4	Calibration St	2	anions040622.met	040622_002.dxd	1
3	STD 6 177-06-IC4	Calibration St	3	anions040622.met	040622_003.dxd	1
4	STD 5 177-05-IC4	Calibration St	4	anions040622.met	040622_004.dxd	1
5	STD 4 177-04-IC4	Calibration St	5	anions040622.met	040622_005.dxd	1
6	STD 3 177-03-IC4	Calibration St	6	anions040622.met	040622_006.dxd	1
7	STD 2 177-02-IC4	Calibration St	7	anions040622.met	040622_007.dxd	1
8	STD 1 177-01-IC4	Calibration St	8	anions040622.met	040622_008.dxd	1
9	STD 9 177-09-IC4	Calibration St	1	anions040622.met	040622_009.dxd	1
10	ICV	Sample		anions040622.met	040622_010.dxd	20
11	ICB	Sample		anions040622.met	040622_011.dxd	1

010170

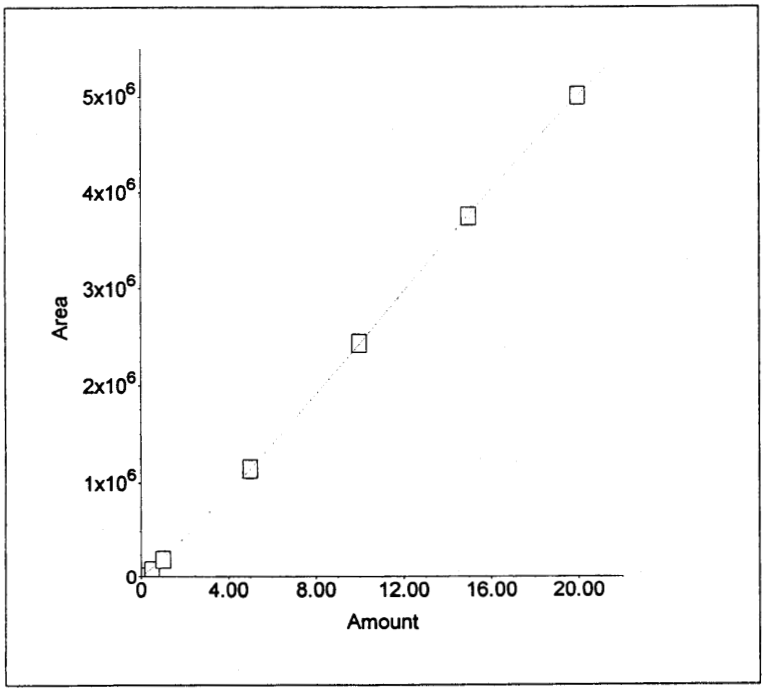
Default Method Path: C:\PEAKNET\METHOD
Default Data Path: C:\PEAKNET\DATA\040622
Comment:
EPA300 & SW 846 9056

ICV = Spex 25-145AS (Inorg # 4578)
NO_2N 178-01-IC4

R Spies
6/30/04

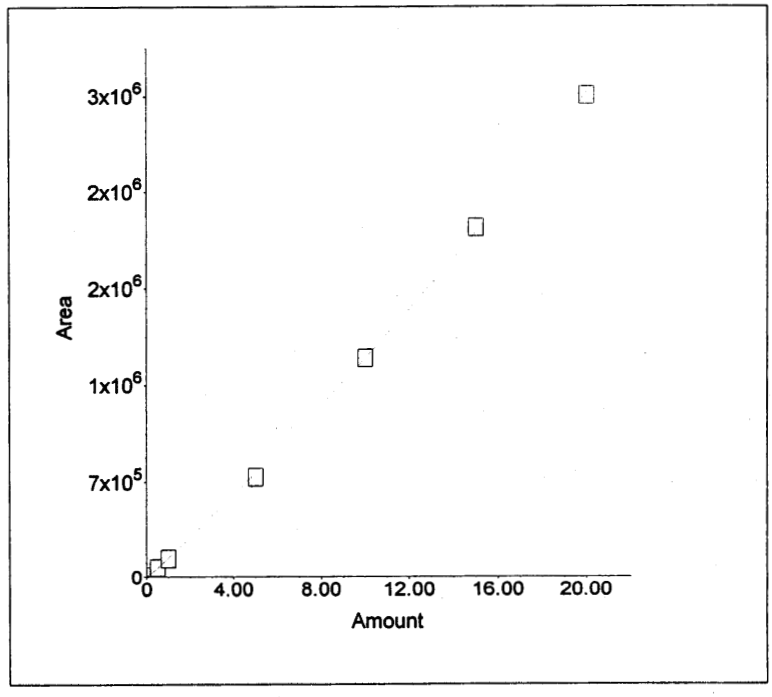
Method:C:\PEAKNET\METHOD\ANIONS040622.MET Updated:6/22/04 3:53:38 PM Total:7

1. Component:FLUORIDE
Standard:External Fit Type:Cubic
Origin:Force Calibration:Area
r^2=0.999953
Amt=3.044799e-020*Resp^3+
-2.870275e-013*Resp^2+
4.316773e-006*Resp+0

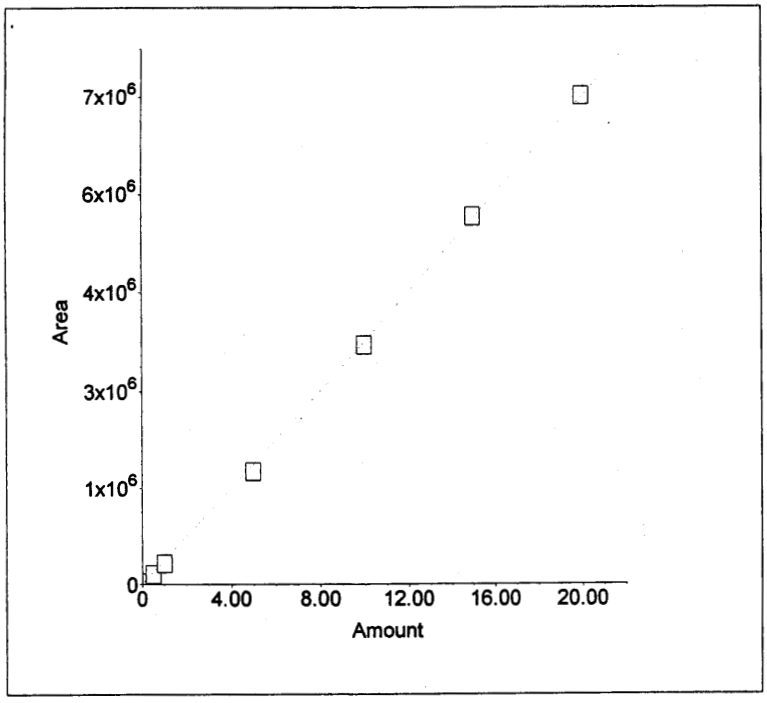


2. Component:CHLORIDE
Standard:External Fit Type:Quadratic
Origin:Force Calibration:Area
r^2=0.999821
Amt=-2.817856e-013*Resp^2+
6.505570e-006*Resp+0

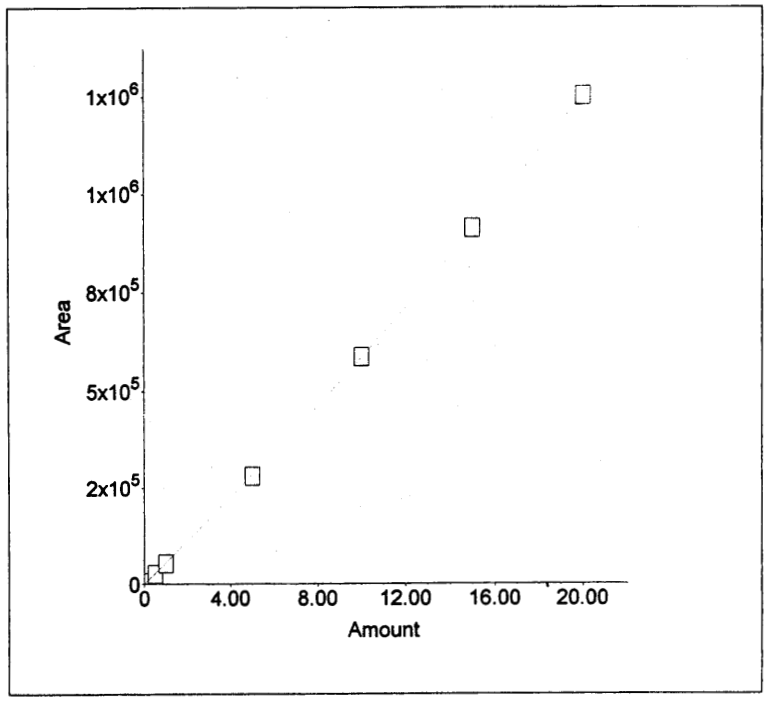
010171



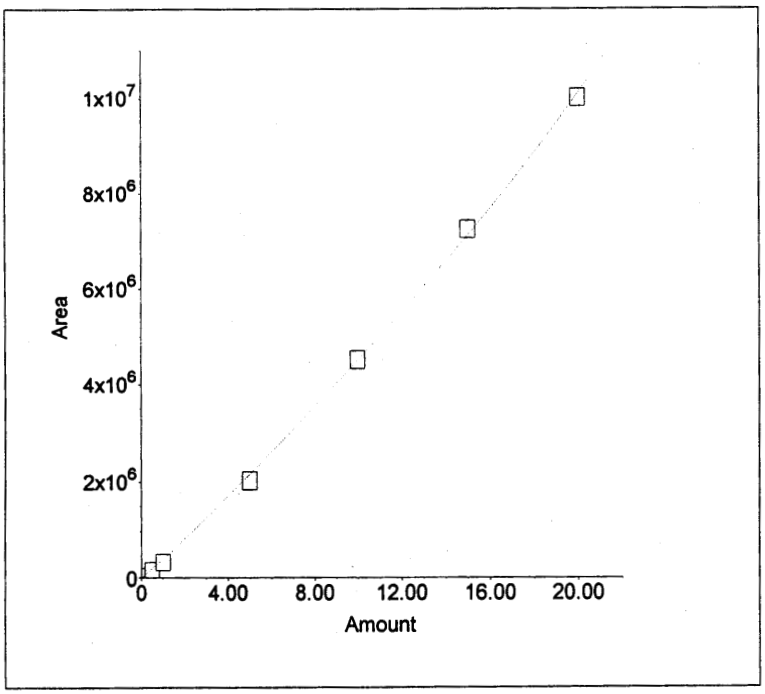
3. Component:NITRITE-N
Standard:External Fit Type:Linear
Origin:Force Calibration:Area
r^2=0.999621
Amt=2.668e-006*Resp+0



4. Component:BROMIDE
Standard:External Fit Type:Quadratic
Origin:Force Calibration:Area
r^2=0.999954
Amt=-1.218708e-012*Resp^2+
1.538449e-005*Resp+0

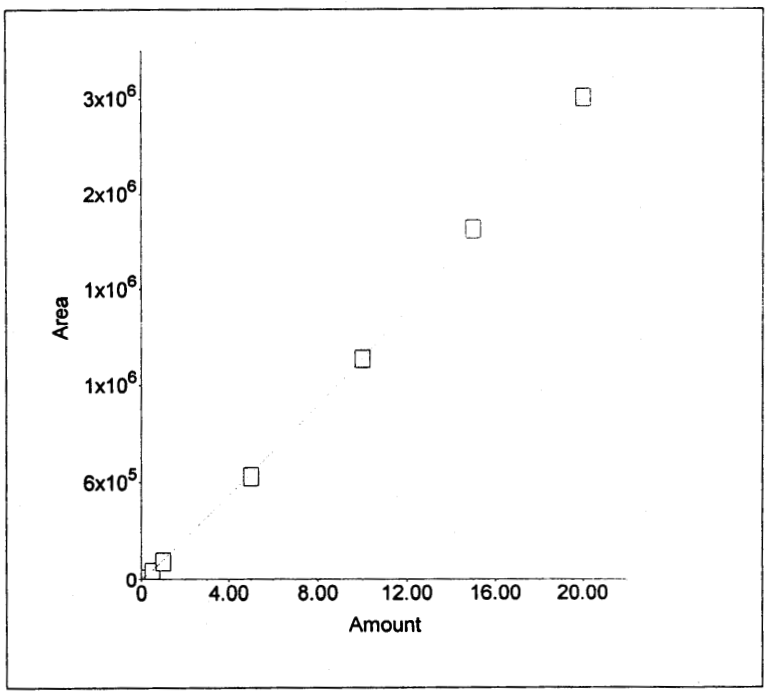


5. Component:NITRATE-N
Standard:External Fit Type:Quadratic
Origin:Force Calibration:Area
r^2=0.999492
Amt=-4.209966e-014*Resp^2+
2.395673e-006*Resp+0

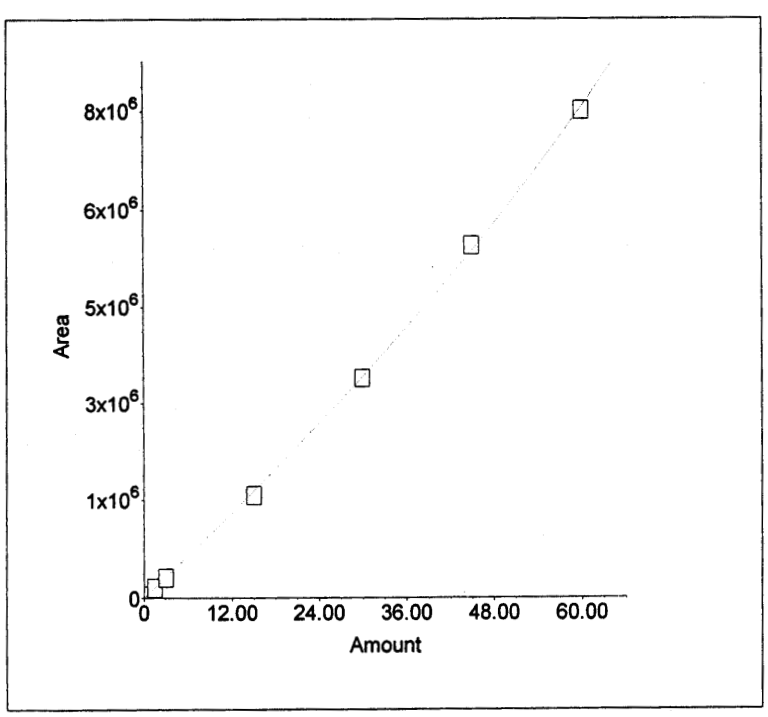


6. Component:PHOSPHATE-P
Standard:External Fit Type:Quadratic
Origin:Force Calibration:Area
r^2=0.999784
Amt=-3.890673e-013*Resp^2+
7.545921e-006*Resp+0

010172



7. Component:SULFATE
Standard:External Fit Type:Quadratic
Origin:Force Calibration:Area
r^2=0.999728
Amt=-1.677817e-013*Resp^2+
8.558970e-006*Resp+0



Sample Name : STD 8 177-08-IC4
Dilution Factor : 1.00
Injection Number : 1
Data File Name : c:\peaknet\data\040622\040622_001.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

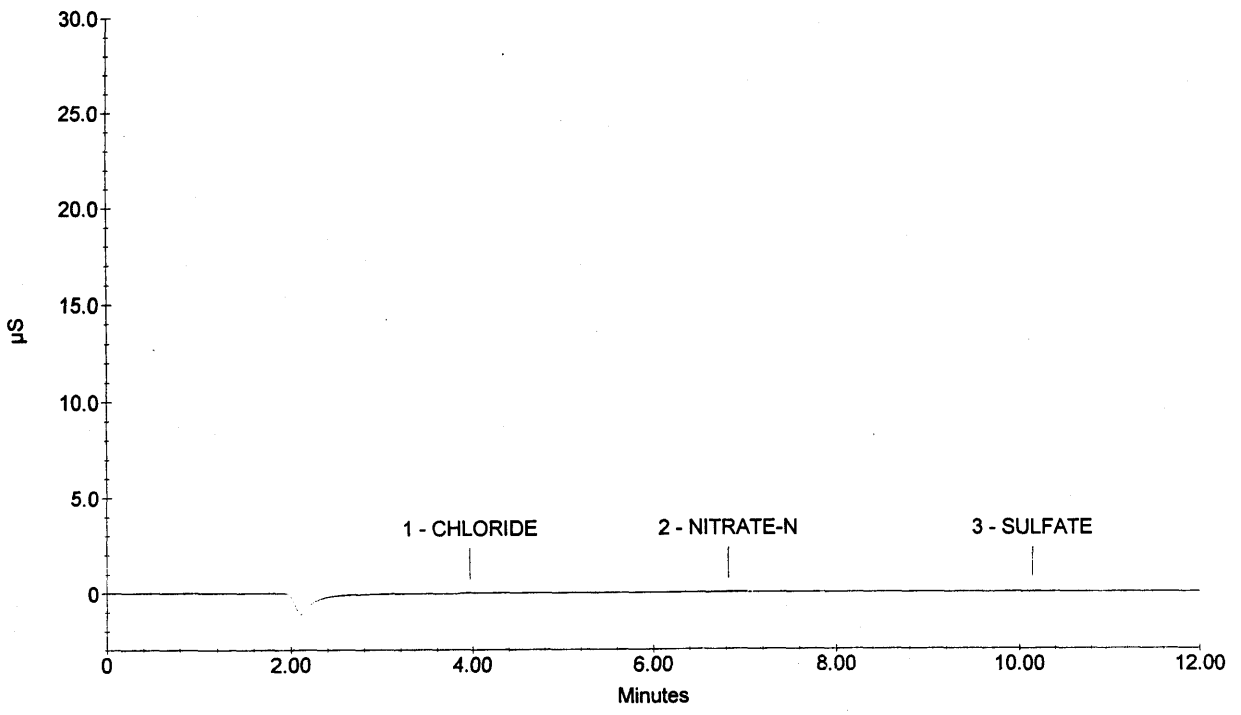
Date Time Collected : 6/22/04 11:40:54 AM
Date Time Updated : 6/22/04 3:48:55 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018090
System Operator : RSS

010173

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	3.97	CHLORIDE	0.00	1106	133
1	3.97	CHLORIDE NITRITE-N BROMIDE	0.00	1106	133
2	6.82	NITRATE-N PHOSPHATE-P	0.00	2572	205
3	10.14	SULFATE	0.00	4850	220

STD 8 177-08-IC4



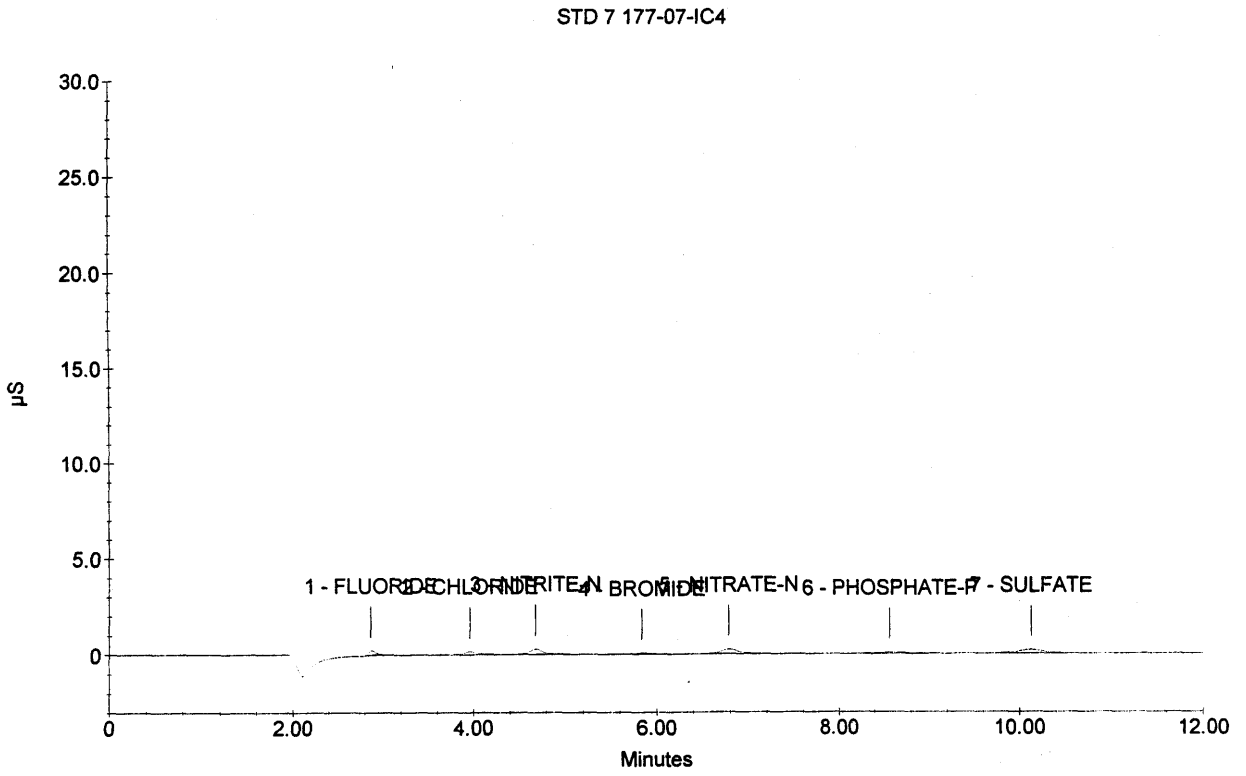
Sample Name : STD 7 177-07-IC4
Dilution Factor : 1.00
Injection Number : 2
Data File Name : c:\peaknet\data\040622\040622_002.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

Date Time Collected : 6/22/04 11:55:33 AM
Date Time Updated : 6/22/04 3:48:59 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010174

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.86	FLUORIDE	0.10	15684	2442
2	3.96	CHLORIDE	0.10	16211	1759
3	4.68	NITRITE-N	0.10	28066	2890
4	5.84	BROMIDE	0.10	5624	498
5	6.78	NITRATE-N	0.10	31824	2358
6	8.56	PHOSPHATE-P	0.10	11247	601
7	10.12	SULFATE	0.30	38142	1876



Sample Name : STD 6 177-06-IC4
Dilution Factor : 1.00
Injection Number : 3
Data File Name : c:\peaknet\data\040622\040622_003.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

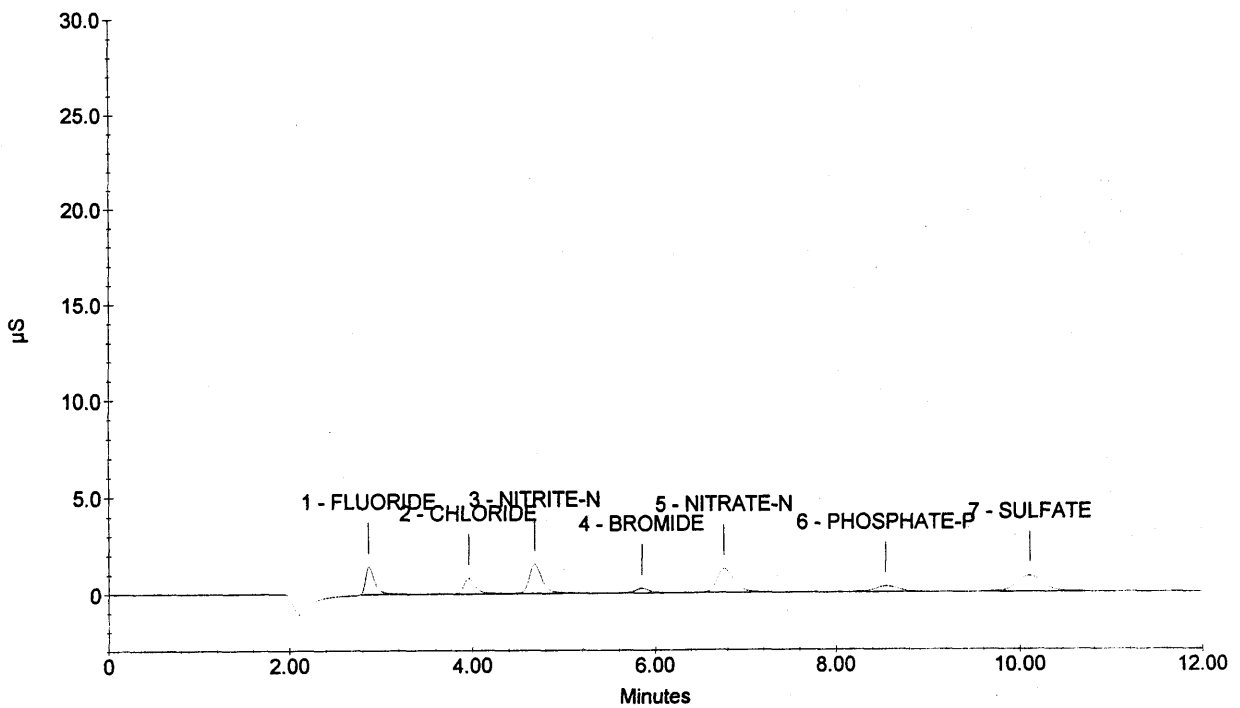
Date Time Collected : 6/22/04 12:10:15 PM
Date Time Updated : 6/22/04 3:49:04 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010175

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.86	FLUORIDE	0.50	99663	14259
2	3.96	CHLORIDE	0.50	75370	8219
3	4.68	NITRITE-N	0.50	153456	15191
4	5.85	BROMIDE	0.50	29766	2560
5	6.76	NITRATE-N	0.50	170413	12313
6	8.54	PHOSPHATE-P	0.50	56740	2997
7	10.10	SULFATE	1.50	173676	8397

STD 6 177-06-IC4



Sample Name : STD 5 177-05-IC4
Dilution Factor : 1.00
Injection Number : 4
Data File Name : c:\peaknet\data\040622\040622_004.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

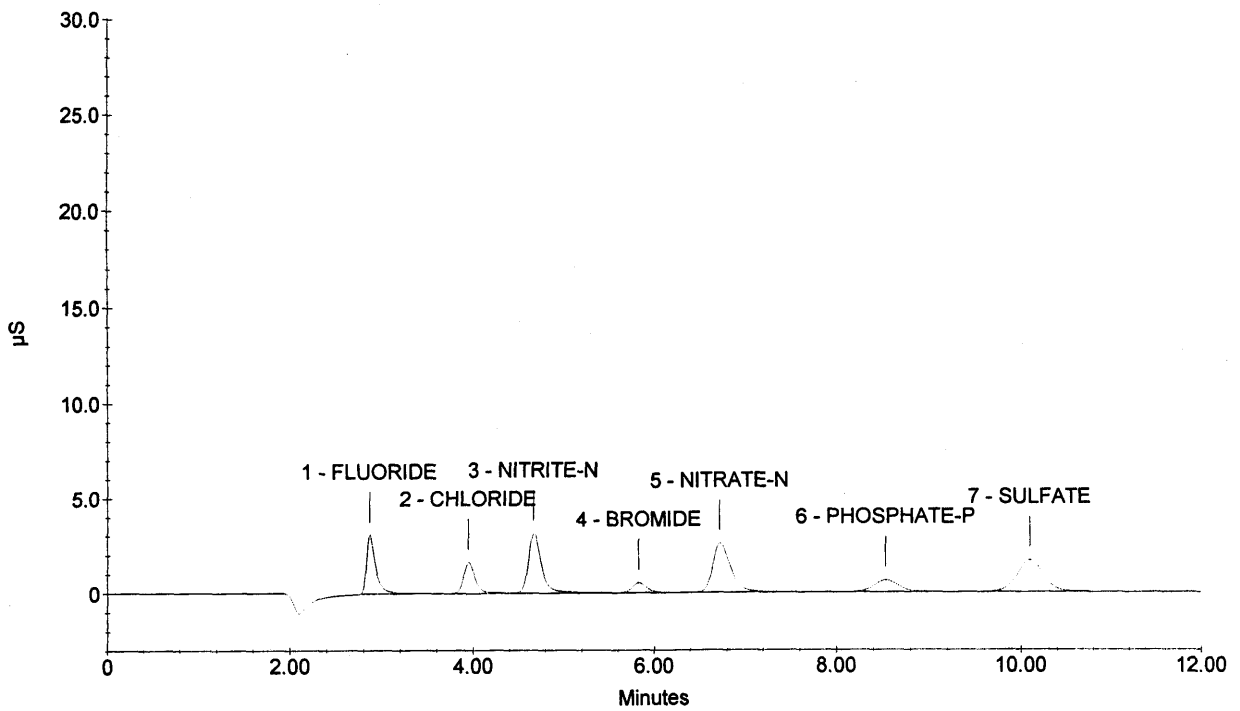
Date Time Collected : 6/22/04 12:24:55 PM
Date Time Updated : 6/22/04 3:49:08 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010176

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.86	FLUORIDE	1.00	214673	30598
2	3.94	CHLORIDE	1.00	147584	16282
3	4.66	NITRITE-N	1.00	324429	31240
4	5.82	BROMIDE	1.00	61824	5247
5	6.72	NITRATE-N	1.00	351545	25507
6	8.53	PHOSPHATE-P	1.00	120558	6282
7	10.09	SULFATE	3.00	343827	16699

STD 5 177-05-IC4



Sample Name : STD 4 177-04-IC4
Dilution Factor : 1.00
Injection Number : 5
Data File Name : c:\peaknet\data\040622\040622_005.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

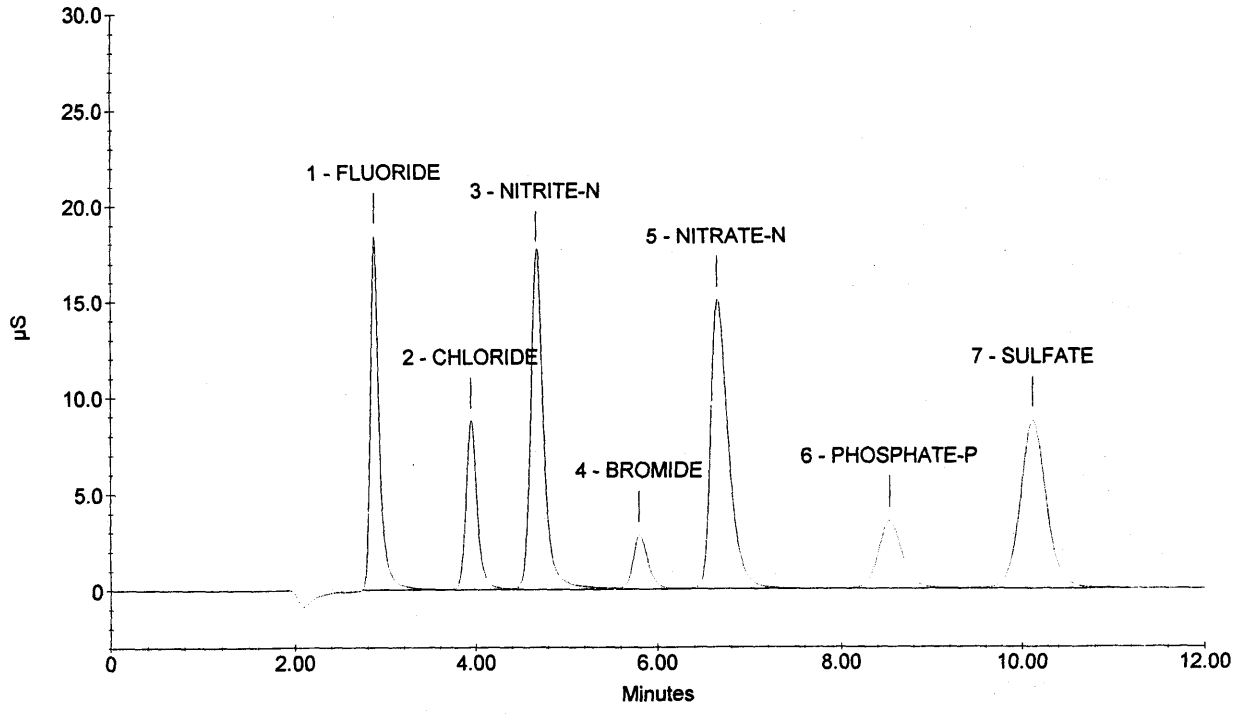
Date Time Collected : 6/22/04 12:39:36 PM
Date Time Updated : 6/22/04 3:49:11 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010177

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.88	FLUORIDE	5.00	1249311	183737
2	3.94	CHLORIDE	5.00	764286	86778
3	4.66	NITRITE-N	5.00	1763018	173760
4	5.80	BROMIDE	5.00	328544	28053
5	6.64	NITRATE-N	5.00	2040797	149957
6	8.53	PHOSPHATE-P	5.00	663949	35154
7	10.10	SULFATE	15.00	1739219	86511

STD 4 177-04-IC4



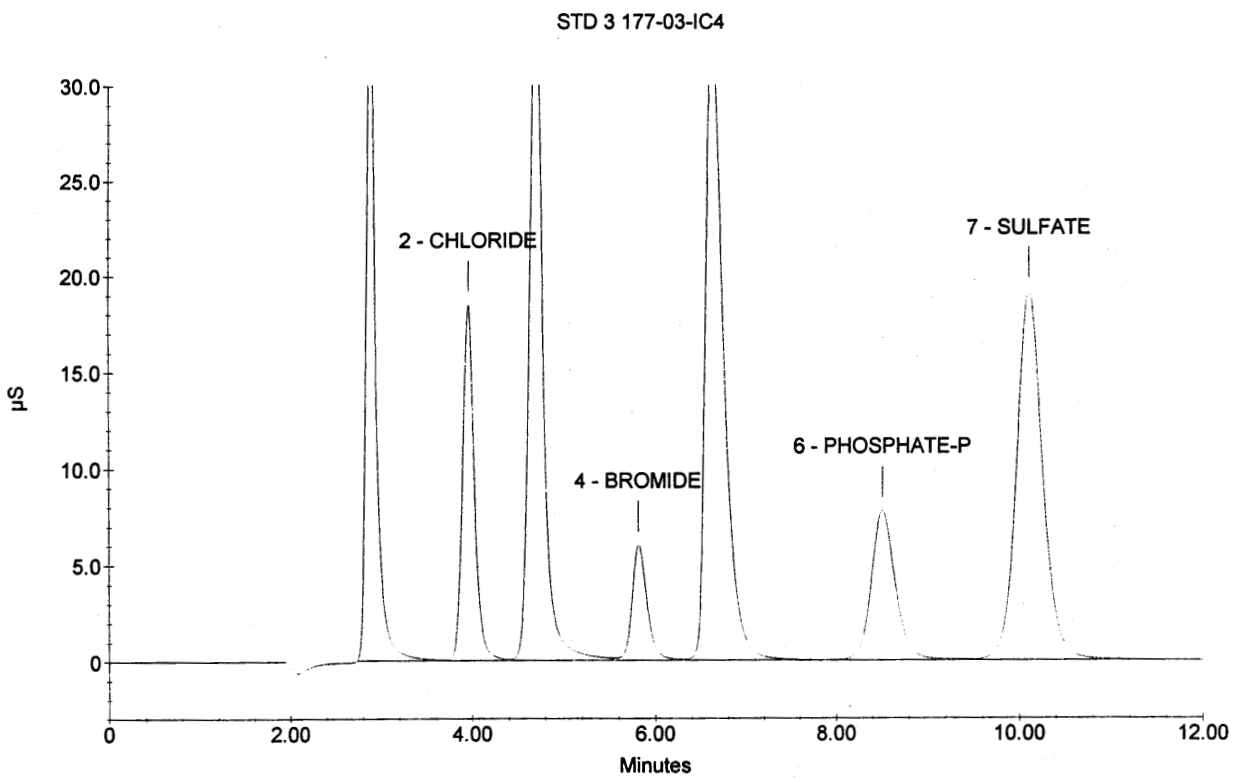
Sample Name : STD 3 177-03-IC4
Dilution Factor : 1.00
Injection Number : 6
Data File Name : c:\peaknet\data\040622\040622_006.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

Date Time Collected : 6/22/04 12:54:16 PM
Date Time Updated : 6/22/04 3:49:15 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010178

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.88	FLUORIDE	10.00	2665804	366427
2	3.96	CHLORIDE	10.00	1655893	184330
3	4.69	NITRITE-N	10.00	3707012	357947
4	5.81	BROMIDE	10.00	688272	59797
5	6.61	NITRATE-N	10.00	4547116	328131
6	8.50	PHOSPHATE-P	10.00	1428173	77538
7	10.09	SULFATE	30.00	3773275	191012



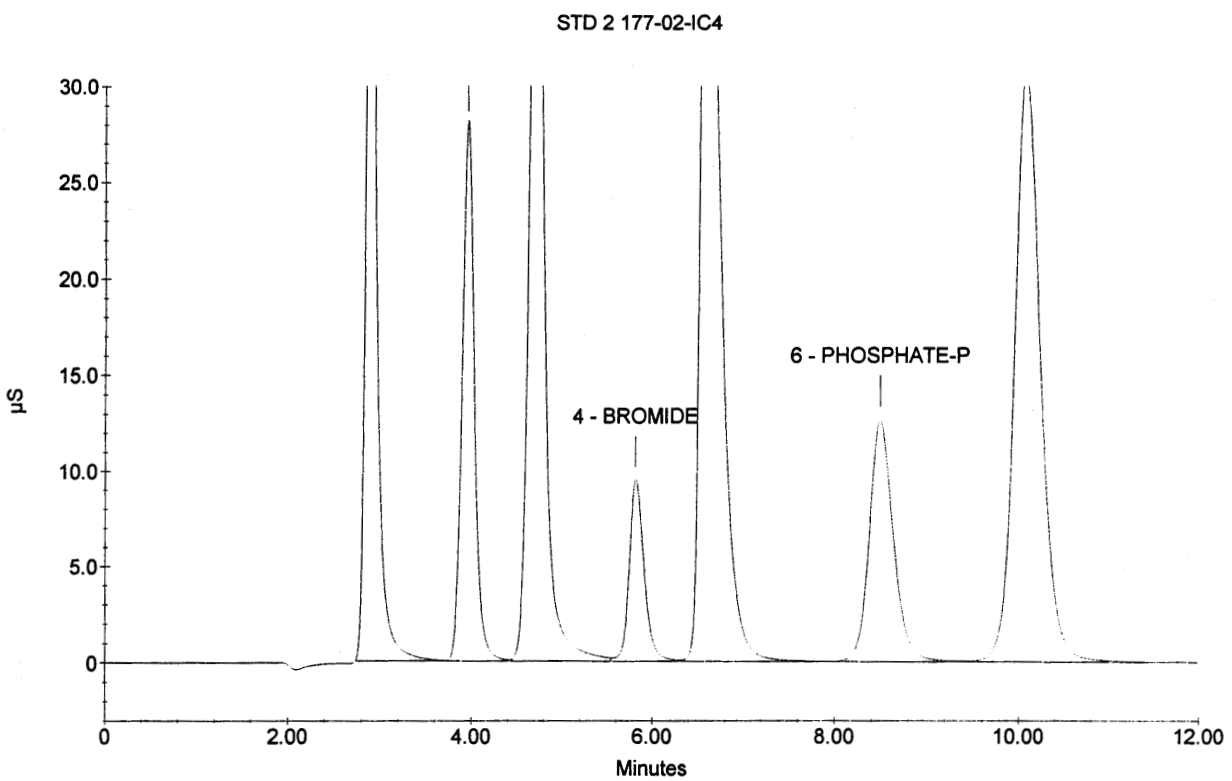
Sample Name : STD 2 177-02-IC4
Dilution Factor : 1.00
Injection Number : 7
Data File Name : c:\peaknet\data\040622\040622_007.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

Date Time Collected : 6/22/04 1:08:57 PM
Date Time Updated : 6/22/04 3:49:18 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010179

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.89	FLUORIDE	15.00	4096803	546794
2	3.96	CHLORIDE	15.00	2631927	278791
3	4.72	NITRITE-N	15.00	5660428	528607
4	5.81	BROMIDE	15.00	1070216	94254
5	6.58	NITRATE-N	15.00	7296057	514667
6	8.49	PHOSPHATE-P	15.00	2279473	125893
7	10.06	SULFATE	45.00	6051191	306767



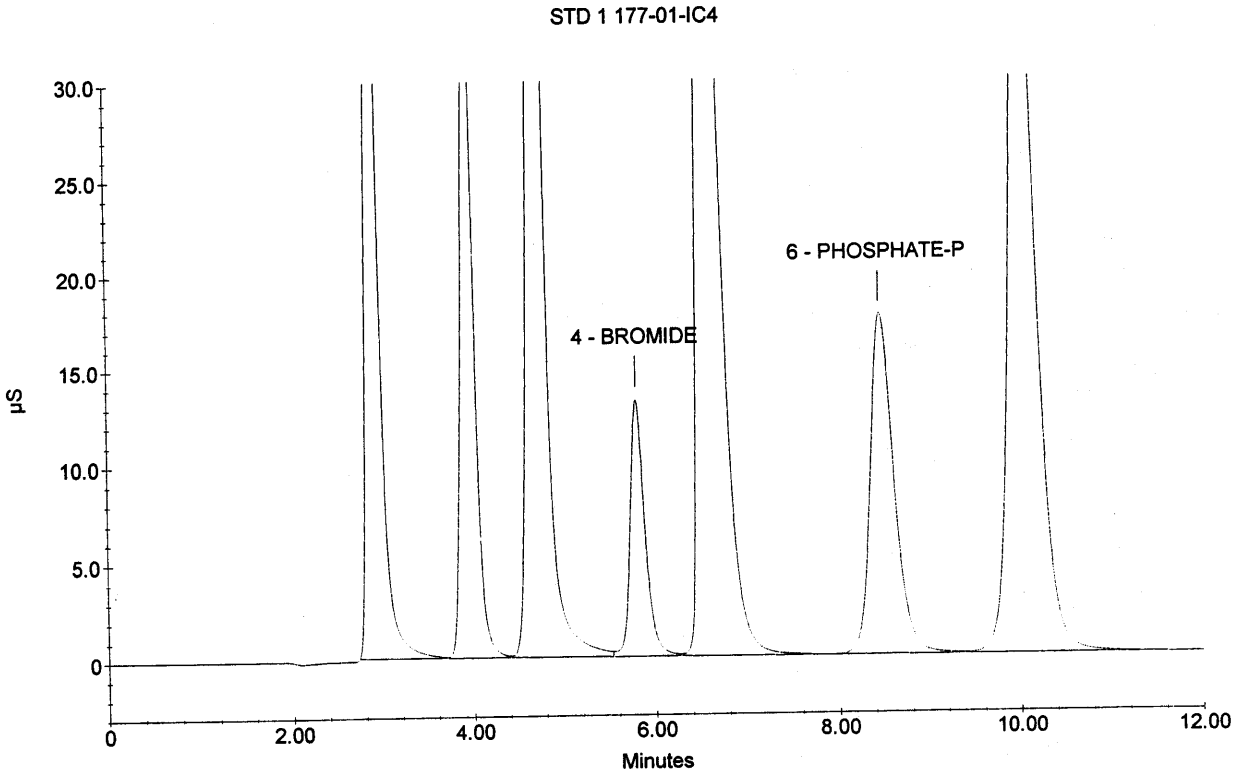
Sample Name : STD 1 177-01-IC4
Dilution Factor : 1.00
Injection Number : 8
Data File Name : c:\peaknet\data\040622\040622_008.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

Date Time Collected : 6/22/04 1:23:39 PM
Date Time Updated : 6/22/04 3:49:22 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010180

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.89	FLUORIDE	20.00	5470798	682986
2	3.96	CHLORIDE	20.00	3633847	373479
3	4.72	NITRITE-N	20.00	7518140	667759
4	5.80	BROMIDE	20.00	1468576	131327
5	6.54	NITRATE-N	20.00	10087786	701908
6	8.45	PHOSPHATE-P	20.00	3151553	175123
7	10.01	SULFATE	60.00	8338830	422992



Sample Name : STD 9 177-09-IC4
Dilution Factor : 1.00
Injection Number : 9
Data File Name : c:\peaknet\data\040622\040622_009.DXD
Method File Name : ...\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

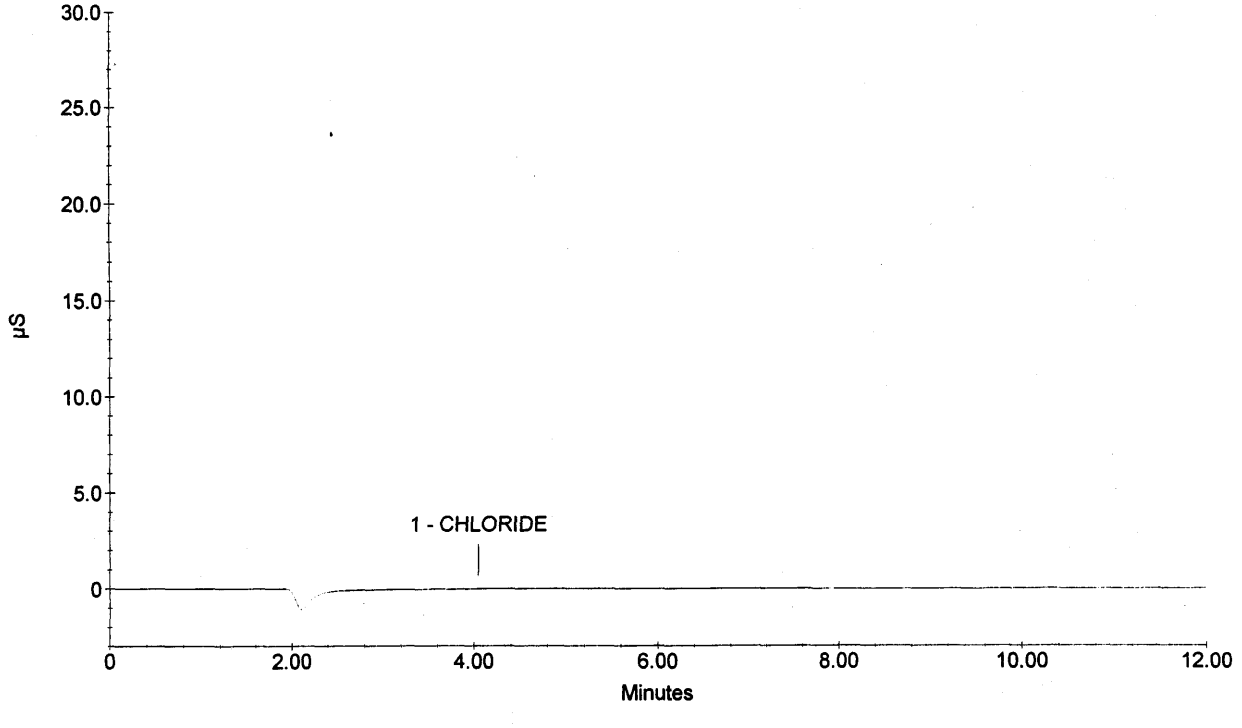
Date Time Collected : 6/22/04 1:46:11 PM
Date Time Updated : 6/22/04 3:49:26 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010181

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	4.05	CHLORIDE	0.00	763	67
1	4.05	CHLORIDE	0.00	763	67
		NITRITE-N			
		BROMIDE			
		NITRATE-N			
		PHOSPHATE-P			
		SULFATE			

STD 9 177-09-IC4



Sample Name : ICV
Dilution Factor : 20.00
Injection Number : 10
Data File Name : ...\040622_010.DXD
Method File Name : C:\PeakNet\method\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

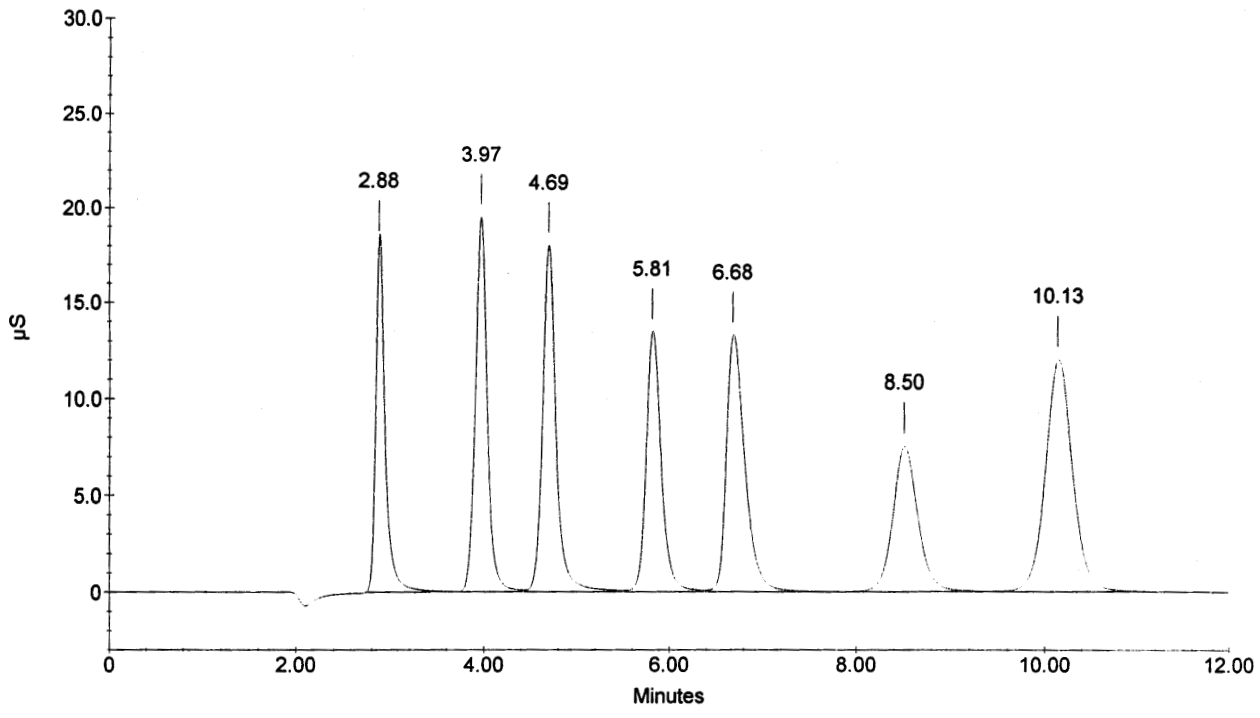
Date Time Collected : 6/22/04 3:20:43 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010182

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.88	FLUORIDE	102.318	180581	1279152	2	-0.46
2	3.97	CHLORIDE	206.674	194415	1715979	2	-1.98
3	4.69	NITRITE-N	97.137	179452	1820599	2	-0.64
4	5.81	BROMIDE	411.331	133818	1519813	2	0.17
5	6.68	NITRATE-N	85.162	131899	1836684	2	2.09
6	8.50	PHOSPHATE-P	195.509	74697	1395936	2	0.63
7	10.13	SULFATE	397.367	119590	2437852	2	1.20
	0.00		---total(s)--- 1495.497		12006014		

ICV



Sample Name : ICB
Dilution Factor : 1.00
Injection Number : 11
Data File Name : ...\040622_011.DXD
Method File Name : C:\PeakNet\method\ANIONS040622.met
Schedule File Name : c:\peaknet\schedule\040622.sch

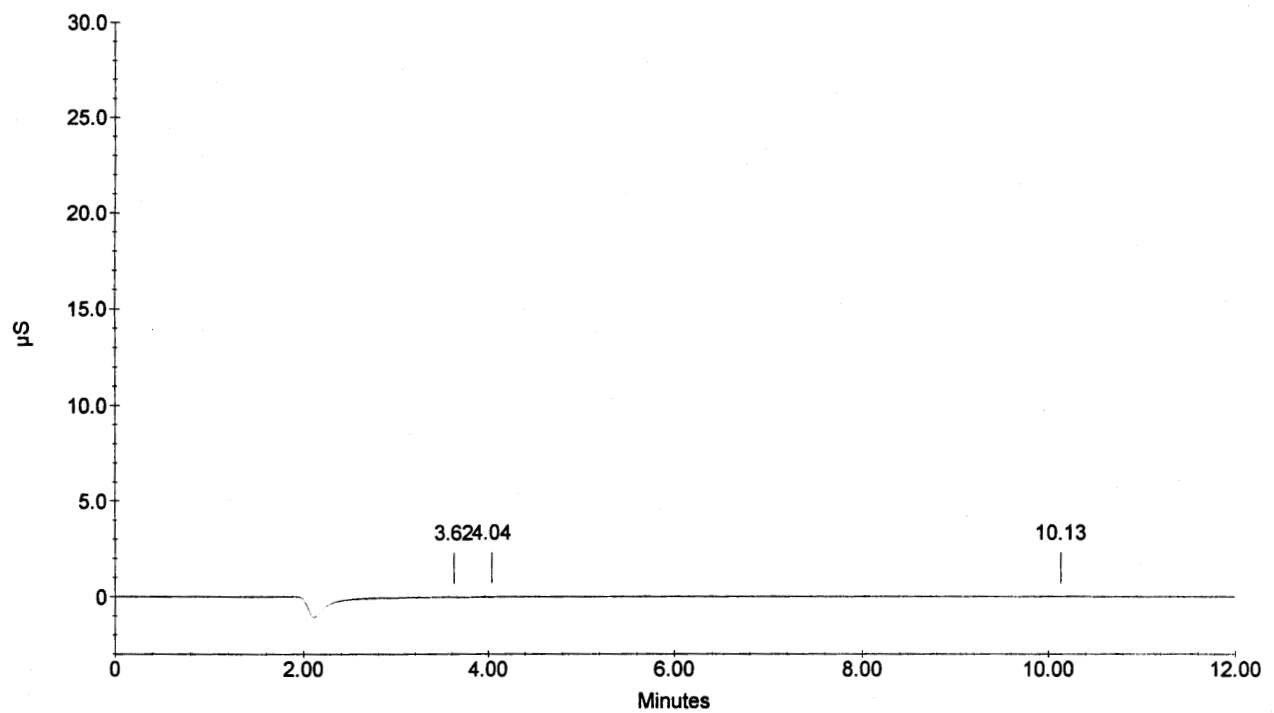
Date Time Collected : 6/22/04 3:35:42 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010183

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.62		0.000	58	679	1	
2	4.04	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	0.016	181	2433	1	-0.33
3	10.13	SULFATE	0.006	56	671	1	1.20
			---total(s)---				
	0.00		0.022		3783		

ICB



SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

Certificates of Analysis

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A509

Lot No: 1104020
Release Date: February, 2004
Expiry Date: February, 2007

Tests	Units	Value
Assay	%	70%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<1
Chromium	ppb	<0.2
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<1
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.2
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.2
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.2
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.2
Zirconium	ppb	<0.1

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Si, K, Na, B, Al, Mg & Mn will increase due to storage in glass bottles.

B McKelvey

Dr. B. McKelvey
QA/QC Manager

Fisher Scientific Chemical Division
Pittsburgh, PA., 15275 Phone (412) 490-8300

Fisher Chemical
A Fisher Scientific Company

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/05/04
DATE EXPIRED: 09/09/2007
DATE OPENED: 05/05/04
INORG: 4558-4563 PO: F53373

010186

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A509

Lot No: 1104010
Release Date: January, 2004
Expiry Date: January, 2007

Tests	Units	Value
Assay	%	70%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<1
Chromium	ppb	<0.2
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<1
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.2
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.2
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.2
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.2
Zirconium	ppb	<0.1

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Si, K, Na, B, Al, Mg & Mn will increase due to storage in glass bottles.

B McKelvey

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QA/QC Manager
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Fisher Chemical
A Fisher Scientific Company

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/01/04
DATE EXPIRED: 01/01/2007 MDL
DATE OPENED: 06/01/04
INORG: 4580-4585 PO: F53383

010187

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A509

Lot No: 1104010
Release Date: January, 2004
Expiry Date: January, 2007

Tests	Units	Value
Assay	%	70%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<1
Chromium	ppb	<0.2
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<1
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.2
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.2
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.2
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.2
Zirconium	ppb	<0.1

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Si, K, Na, B, Al, Mg & Mn will increase due to storage in glass bottles.

B McKelvey

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Fisher Chemical
A Fisher Scientific Company

INORGANIC LABS/RADIOCHEM LABS
DATE RECEIVED: 03/15/04
DATE EXPIRED: 03/15/2004
DATE OPENED: 03/16/04
INORG: 4495-45000 PO: E53351

010188

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508 Lot No: 4103101
Release Date: January, 2004
Expiry Date: January, 2007

Tests	Units	Value
Assay	%	35%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<0.5
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.5
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.1
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.5
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.5
Zirconium	ppb	<0.1

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Si, K, Na, B, Al, Mg & Mn will increase due to storage in glass bottles.

B McKelvey

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Fisher Chemical
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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/05/04
DATE EXPIRED: 01/01/2007
DATE OPENED: 05/05/04
INORG: 4552-4551 PO: F53373

010189

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508 Lot No: 4103101
Release Date: January, 2004
Expiry Date: January, 2007

Tests	Units	Value
Assay	%	35%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<0.5
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.5
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.1
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.5
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.5
Zirconium	ppb	<0.1

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Si, K, Na, B, Al, Mg & Mn will increase due to storage in glass bottles.

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/01/04
DATE EXPIRED: 01/01/2007
DATE OPENED: 06/01/04
INDEX: 4586-4591 PO: E53393

010190

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508 Lot No: 4103100
Release Date: October, 2003
Expiry Date: October, 2006

Tests	Units	Value
Assay	%	37%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.5
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.1
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.5
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.5
Zirconium	ppb	<0.1

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Si, K, Na, B, Al, Mg & Mn will increase due to storage in glass bottles.

B McKelvey

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 03/15/04
DATE EXPIRED: 03/15/2014
DATE OPENED: 03/15/04
INORG: 4489-4496 PO: F53351

010191

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/3/03
DATE EXPIRED: 12/3/2004 OK
DATE OPENED: 12/3/03
INORG: 4306 PO: PS2961

SPEXertificate™

Certificate of Reference Material

Catalog Number: SPIKE-1 **Lot No.:** 25-23AS
Description: **Spike Sample Standard 1**
Matrix: 5% Nitric Acid/tr Tartaric Acid - HF

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM	Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Al	200	199.51	3101a	Pb	50	49.98	3128
As	200	199.89	3103a	Sb	50	50.02	3102a
Ba	200	199.68	3104a	V	50	49.95	3165
Se	200	200.10	3149	Zn	50	50.02	3168a
TL	200	200.07	3158	Cu	25	25.34	3114
Fe	100	99.91	3126a	Cr	20	20.04	3112a
Co	50	50.25	3113	Ag	5	5.00	3151
Mn	50	49.98	3132	Be	5	5.00	3105a
Ni	50	50.11	3136	Cd	5	4.99	3108

Spex Reference Multi: Lot #2-61BD, 17-55AS, 19-85ASREF

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single component exceeding +/- 2%. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: OCT - - 2003 Certifying Officer: N. Kocherlakota

Report of Certification 010192

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
$X = x+/-U$ where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

010193

SPEXertificate™

Certificate of Reference Material

INORGANIC LABS/RADIOCHEM LABS
DATE RECEIVED: 09/5/03
DATE EXPIRED: 09/15/2004 V02
DATE OPENED: 09/16/03
INORS: 4345 PO: E5338

Catalog Number: ICAL-1 **Lot No.:** 25-176AS
Description: **Instrument Calibration Standard 1**
Matrix: 5% Nitric Acid

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	5,000	4,984.92	3109a
K	5,000	4,990.26	3141a
Mg	5,000	4,991.82	3131a
Na	5,000	4,998.07	3152a

Spex Reference Multi: Lot #10-100AS, 12-113AS, 5-198VY, 6-28VY-REF

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single element exceeding +/-2%. This includes uncertainty of measurements and other effects, such as transpiration losses. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: SEP -- 2003 Certifying Officer: N. Kocherlakota

Report of Certification 010194

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

010195

SPEXertificate™

Certificate of Reference Material

Catalog Number: ICAL-1 **Lot No.:** 25-178AS
Description: **Instrument Calibration Standard 1**
Matrix: 5% Nitric Acid

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	5,000	4,984.92	3109a
K	5,000	4,990.26	3141a
Mg	5,000	4,991.82	3131a
Na	5,000	4,998.07	3152a

Spex Reference Multi: Lot #10-100AS, 12-113AS, 5-198VY, 6-28VY-REF

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single element exceeding +/-2%. This includes uncertainty of measurements and other effects, such as transpiration losses. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: MAR - - 2001 Certifying Officer: N. Kocherlakota

Report of Certification 010196

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

010197

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Zirconium in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGZR1-1 and CGZR1-5
Lot Number:	**W-ZR01056**
Starting Material:	ZrO2
Starting Material Purity (%):	99.994542
Starting Material Lot No	22855
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS PG 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VB
DATE OPENED: 02/25/04
INORG: 4474 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1004 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3169 Lot Number: 990109

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.01416	M	Dy	< 0.01188	O	Li	< 0.00012	M	Pr	< 0.00059	M	Te	< 0.05942
M	Sb	< 0.00099	M	Er	< 0.00990	M	Lu	< 0.00079	M	Re	< 0.00198	M	Tb	< 0.00059
M	As	< 0.01981	M	Eu	< 0.00594	O	Mg	< 0.00012	M	Rh	< 0.00198	M	Tl	< 0.00198
M	Ba	< 0.01981	M	Gd	< 0.00198	O	Mn	< 0.00401	M	Rb	< 0.00198	M	Th	< 0.00198
O	Be	< 0.40048	M	Ga	< 0.00198	O	Hg	< 0.04405	M	Ru	< 0.00396	M	Tm	< 0.00079
M	Bi	< 0.00079	M	Ge	< 0.01188	O	Mo	< 0.40048	M	Sm	< 0.00198	M	Sn	< 0.00990
M	B	< 0.13864	M	Au	< 0.00594	M	Nd	< 0.00396	O	Sc	< 0.00064	O	Ti	< 0.16019
O	Cd	< 0.02123	M	Hf	0.04403	O	Ni	0.01214	M	Se	< 0.01585	M	W	< 0.01981
O	Ca	0.00809	M	Ho	< 0.00099	O	Nb	< 0.08010	O	Si	< 0.80096	M	U	< 0.00396
M	Ce	< 0.00990	M	In	< 0.01981	n	Os		O	Ag	< 0.40048	M	V	< 0.00396
M	Cs	< 0.00059	M	Ir	< 0.00990	M	Pd	< 0.00990	O	Na	< 0.02803	M	Yb	< 0.00198
O	Cr	< 0.00881	O	Fe	0.00344	O	P	< 0.01922	M	Sr	< 0.00099	O	Y	< 0.00401
M	Co	< 0.00594	M	La	< 0.00099	M	Pt	< 0.00396	O	S	< 0.28033	O	Zn	< 0.04005
M	Cu	< 0.01188	M	Pb	< 0.00594	O	K	< 0.00681	M	Ta	< 0.01386	s	Zr	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010199

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 91.224; +4; 6,7,8; $Zr(F)_x^{y-}$

Chemical Compatibility - Soluble in concentrated HCl, HF, H_2SO_4 (very hot) and HNO_3. Avoid H_3PO_4 and neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions but precipitation with phosphate, oxalate, and tartrate with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF .

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $Zr(F)_x^{y-}$ + $Zr(OH)_xF_y^{z-}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Zr(F)_x^{y-}$ chemically stable for years in 2-5% HNO_3 / trace HF in an LDPE container.

Zr Containing Samples (Preparation and Solution) - Metal (Soluble in H_2O / HF / HNO_3); Oxide - unlike TiO_2 the ZrO_2 is best fused in one of the following ways (Na_2O_2 in Ni*, Na_2CO_3 in Pt* or Borax in Pt*); Organic Matrices (Dry ash at 450 °C in Pt* and dissolve by fusing with Na_2CO_3 and dissolving in HF / HNO_3 / H_2O).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈Boncs.)
ICP-OES	343.823 nm	0.007 / 0.0004 µg/mL	1	ion	Hf, Nb
ICP-OES	339.198 nm	0.008 / 0.0007 µg/mL	1	ion	Th, Mo
ICP-OES	272.261 nm	0.018 / 0.001 µg/mL	1	ion	Cr, V, Th, W
ICP-MS	90 amu	2 ppt	n/a	M+	$^{74}Ge^{16}O$, $^{74}Se^{16}O$, [$^{180}X^{2+}$ (where X = Hf, Ta, W)]

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VDS
DATE OPENED: 02/25/04
INORG: 4474 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010200

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 19, 2003

Expiration Date:

EXPIRES
1 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010201

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Scandium IN 5% HNO_3 (abs)

Catalog Number: CGSC1-1and CGSC1-5

Lot Number: **W-SC02058**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 V03
DATE OPENED: 07/01/04
INORG: 46289 PO: F53406

Starting Material:	Sc_2O_3
Starting Material Purity:	99.99%
Starting Material Lot No:	632-5721

CERTIFIED CONCENTRATION: 1005 ± 2 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value $(\bar{x}) = \frac{\sum x_i}{n}$ Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1007 ± 3 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1005 ± 2 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3148a.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm .

O	Al	<0.070	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	0.0028
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	i	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	0.0043	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.020	M	Au	<0.00030	M	Nd	<0.00020	s	Sc		M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	0.0030	O	Ni	<0.084	O	Se	<0.67	M	W	<0.0010
O	Ca	0.016	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.034	M	U	<0.00020
M	Ce	<0.00050	M	In	<0.00010	n	Os		M	Ag	0.0050	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.16	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.16	O	P	i	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0075
M	Cu	<0.00060	M	Pb	0.00050	O	K	<5.01	M	Ta	<0.00070	M	Zr	0.032

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.038 g/mL

QA:KL Rev.01080404N

Paul R. Haines

Quality Assurance Manager Expires:

EXPIRES
01 AUG 2005

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010203

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

CUSTOM-GRADE SOLUTION 10,000 µg/mL Scandium IN 5% HNO_3 (abs)

Catalog Number: CGSC10-1and CGSC10-5

Lot Number: **T-SC02053**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/24/03
DATE EXPIRED: 10/01/2004 V05
DATE OPENED: 09/24/03
INORG: 4260 PO: F50030

Starting Material:	Sc_2O_3
Starting Material Purity:	99.999%
Starting Material Lot No:	632-5721

CERTIFIED CONCENTRATION: 10,047 ± 29 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

($\bar{x}$) = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 10,047 ± 29 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 9994 ± 41 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3148a.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm .

O	Al	<0.070	M	Dy	<0.0060	M	Li	<0.010	M	Pr	<0.00030	M	Te	<0.030
M	Sb	<0.00050	M	Er	<0.0050	M	Lu	<0.00040	M	Re	<0.0010	M	Tb	<0.00030
M	As	<0.010	M	Eu	<0.0030	M	Mg	<0.030	M	Rh	<0.0010	M	Tl	<0.0010
M	Ba	<0.010	M	Gd	<0.0010	M	Mn	<0.0040	M	Rb	<0.0010	M	Th	0.028
M	Be	<0.00050	M	Ga	<0.0010	i	Hg		M	Ru	<0.0020	M	Tm	<0.00040
M	Bi	0.043	M	Ge	<0.0060	M	Mo	<0.0020	M	Sm	<0.0010	M	Sn	<0.0050
O	B	<0.034	M	Au	<0.0030	M	Nd	<0.0020	s	Sc		n	Ti	
M	Cd	<0.0030	M	Hf	0.030	O	Ni	<0.084	O	Se	<0.67	M	W	<0.010
O	Ca	0.17	M	Ho	<0.00050	M	Nb	<0.00050	O	Si	<0.034	M	U	<0.0020
M	Ce	<0.0050	M	In	<0.0010	n	Os		M	Ag	0.0050	M	V	<0.0020
M	Cs	<0.00030	M	Ir	<0.0050	M	Pd	<0.0050	O	Na	<0.16	M	Yb	<0.0010
M	Cr	<0.0050	O	Fe	<0.16	i	P		M	Sr	<0.00050	M	Y	<0.040
M	Co	<0.0030	M	La	<0.00050	M	Pt	<0.0020	n	S		M	Zn	0.075
M	Cu	<0.0060	M	Pb	0.0050	O	K	<5.01	M	Ta	<0.0070	M	Zr	0.32

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.073 g/mL

(over)

QA:KL Rev.021203DN

Paul R. Haines
Quality Assurance Manager

Expires:

EXPIRES
01/2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

Members of IQ Net : Argentina (**IRAM**), Australia (**QAS**), Austria (**ÖQS**), Belgium (**Avinter**) , Brazil (**FCAV**), Canada (**QMI**), Hong Kong (**HKQAA**), Columbia (**ICONTEC**), Czech Republic (**CQS**), Denmark (**DS**), Finland (**SFS**), France (**AFAQ**), Germany (**DQS**), Greece (**ELOT**), Hungary (**MSZT**), Ireland (**NSAI**), Israel (**SII**), Italy (**CISQ**), Japan (**JQA**), Korea (**KSA-QA**), Netherlands (**KEMA**), Norway (**NCS**), Poland(**PCBC**), Portugal (**APCER**), Singapore (**PSB**), Slovenia (**SIQ**), Spain (**AENOR**), Switzerland (**SQS**)

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLB9-2X/2Y/2T **Lot No.** 10-119B

Description: 1000 mg/L Boron

Matrix: H2O

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1001 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM 3107

The CRM is prepared gravimetrically using high purity (NH4)2B4O7-4H2O Lot# 08001E. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

Method: Titration with Sodium Hydroxide using Phenolphthalein as indicator. Sodium Hydroxide standardized against Potassium Biphthalate NIST SRM #84k

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.001 @ 22.3 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.06	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.001	Re	<0.001
Ag	0.002	Ga	<0.001	Rb	<0.001
Ba	<0.001	In	<0.001	Sr	<0.001
Be	<0.001	K	<0.06	Sb	<0.001
Bi	0.03	Li	<0.001	Si	0.01
Cd	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.001	Mg	<0.001	V	0.003
Cr	<0.001	Na	0.01	Zr	<0.001
		Ni	0.001	Zn	0.004

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: APR '04 Certifying Officer: N. Kocherlakota

Report of Certification 010206

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

010207

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLLI2-2X/2Y **Lot No.** 10-12LI

Description: 1000 mg/L Lithium

Matrix: 2% HNO3

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 997.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3129a

The CRM is prepared gravimetrically using high purity Lithium Carconate Lot# 03021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Evaporate to dryness. Fume with Sulfuric Acid. Ignite and weigh as Li2SO4.

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.014 @ 22.2 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.001	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.007	Re	<0.001
Ag	<0.003	Ga	<0.001	Rb	<0.001
B	<0.008	In	<0.001	Sr	<0.001
Ba	0.001	K	0.20	Sb	<0.001
Be	<0.001	Mn	<0.001	Si	0.007
Bi	<0.001	Mo	<0.001	Ti	<0.001
Ca	0.017	Mg	<0.001	Tl	<0.001
Cr	<0.001	Na	0.01	V	<0.001
Cd	0.008	Ni	<0.001	Zr	<0.001
Co	<0.001			Zn	0.035

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN '04 Certifying Officer: N. Kocherlakota

DATE RECEIVED: 01/23/04
DATE EXPIRED: 01/30/2005 WO3
DATE OPENED: 01/23/04
INORG: 4439 PO: F52396

Report of Certification 010208

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

010209

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLMO9-2X/2Y/2T **Lot No.** 10-74MO

Description: 1000 mg/L Molybdenum

Matrix: H2O

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 998 mg/ L

Uncertainty Associated with Measurement: +/-3.0mg/L

Certified Value is Traceable to: NIST SRM #3134

The CRM is prepared gravimetrically using high purity (NH4)6Mo7(O)24 Lot# 03011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L

Method: Precipitation using 8 Hydroxy Quinoline,filter,dry and weigh as MoO2 (C9H6NO)2.

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 0.9989 @ 23.7 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	0.003	Pb	0.002
As	0.04	Fe	<0.10	Re	0.03
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.006	In	<0.001	Sr	<0.001
Ba	0.001	K	0.01	Sb	0.005
Be	<0.01	Li	<0.001	Si	<0.50
Bi	<0.001	Mg	0.10	Ti	0.004
Ca	0.01	Mn	0.001	Tl	<0.001
Cr	<0.002	Na	0.007	V	0.003
Cd	<0.10	Ni	<0.001	Zr	<0.001
Co	0.002			Zn	0.009

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN 04 Certifying Officer: N. Kocherlakota

DATE RECEIVED: 01/23/04
DATE EXPIRED: 01/31/2005 VO3
DATE OPENED: 01/23/04
INORG: HHO PO: F52396

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
$X = x+/-U$ where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

010211

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/31/03
DATE EXPIRED: 12/31/2004 DK
DATE OPENED: 1/13/04
INDEX: 4307 PO: F52061

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLP9-2X/2Y/2T **Lot No.** 9-150P
Description: 1000 mg/L Phosphorus
Matrix: H2O

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 1002.5 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3139a

The CRM is prepared gravimetrically using high purity (NH4)H2(PO4) Lot# W1002B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

Method: Precipitation using Magnesia Mixture. Filter, ignite, and weigh as Mg2P2O7.

Instrumentation Analysis By ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 0.9996 @ 24.0 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	<0.001	Pb	<0.001
As	0.001	Fe	<0.001	Rb	<0.001
Ag	<0.002	Ga	<0.001	Re	<0.001
B	<0.002	In	<0.001	Sn	<0.001
Ba	<0.001	K	0.006	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.004
Bi	<0.001	Mg	<0.001	Ti	0.004
Ca	0.004	Mn	<0.001	Tl	<0.001
Cr	<0.008	Mo	<0.001	V	<0.006
Cd	<0.001	Na	0.003	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	0.07

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: OCT -- 2003 Certifying Officer: N. Kocherlakota

010212

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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010213

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLSI9-2X/2Y/2T **Lot No.** 10-07SI

Description: 1000 mg/L Silicon

Matrix: H2O / 0.4% F-

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 998.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM #3150

The CRM is prepared gravimetrically using high purity (NH4)2SiF6 Lot# 02021D. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Precipitation using Ammonium Molybdate and 8-Hydroxy Quinoline. Filter, dry, and weigh as (C9H7ON)4(H4)[Si(Mo12O40)]

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 26.5 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.020	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.003	In	<0.001	Sr	<0.001
Ba	<0.001	K	<0.010	Sb	0.03
Be	<0.001	Li	<0.001	Ti	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.018	Mn	<0.001	V	<0.001
Cr	<0.002	Mo	<0.001	Zr	0.05
Cd	<0.001	Na	0.02	Zn	0.06
Co	<0.001	Ni	0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: AUG '03 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/05/03
DATE EXPIRED: 08/30/2004 VCS
DATE OPENED: 09/05/03
INORG: 42832 PO: E52225

Report of Certification

010214

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
$X = x+/-U$ where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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010215

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Certificate of Reference Material

Catalog Number: PLTI9-2X/2Y/2T **Lot No.** 10-38TI

Description: 1000 mg/L Titanium

Matrix: H2O/ 0.24% F-

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 1001 mg/L

Uncertainty Associated with Measurement: 3.0mg/L

Certified Value is Traceable to: NIST SRM #3162a

The CRM is prepared gravimetrically using high purity (NH4)2TiF6 Lot# 02021E. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

Method: Precipitation using Ammonium Hydroxide. Filter, ignite, and weigh as TiO2.

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.001 @ 22.5 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.006	Cu	<0.10	Pb	<0.001
As	<0.001	Fe	<0.01	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	0.003	In	<0.001	Si	0.52
Ba	<0.001	K	<0.01	Sr	0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.013	Mn	<0.001	V	<0.001
Cr	<0.003	Mo	<0.001	Zr	0.01
Cd	<0.001	Na	0.02	Zn	0.03
Co	0.002	Ni	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: AUG '03 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/05/03
DATE EXPIRED: 08/30/2004 MS
DATE OPENED: 09/05/03
INORG: 4234 PO: 450905

Report of Certification

010216

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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DATE RECEIVED: 10/31/03
DATE EXPIRED: 10/31/2004
DATE OPENED: 11/3/03
INORS: 4308 PO: ES201

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Certificate of Reference Material

Catalog Number: PLSR2-2X/2Y/2T **Lot No.** 9-166SR

Description: 1000 mg/L Strontium in 2% HNO3

Matrix: 2% HNO3

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 1002.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3153a

The CRM is prepared gravimetrically using high purity Strontium Carbonate Lot# 02001B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.010 @ 22.7 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.001	Rb	<0.001
Ag	<0.002	Ga	<0.001	Re	<0.001
B	<0.003	In	<0.001	Si	0.043
Ba	0.008	K	0.10	Sb	<0.001
Be	<0.001	Li	0.007	Ti	<0.002
Bi	<0.001	Mg	<0.003	Tl	<0.001
Ca	0.014	Mn	<0.001	V	<0.001
Cr	0.001	Mo	<0.001	Zr	<0.001
Cd	<0.001	Na	0.01	Zn	0.04
Co	<0.001	Ni	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: OCT -- 2003 Certifying Officer: N. Kocherlakota

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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Certificate of Reference Material

Catalog Number: PLSN5-2X/2Y/2T **Lot No.** 10-87SN

Description: 1000 mg/L Tin

Matrix: 20% HCL

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1003 mg/ L

Uncertainty Associated with Measurement: +/-3.0mg/L

Certified Value is Traceable to: NIST SRM 3161a

The CRM is prepared gravimetrically using high purity Tin Metal Lot# 05021C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

Method: Precipitation using Ammonium Hydroxide. Filter, ignite, and weigh as SnO2.

Instrumental Analysis by ICP spectrometer: 1001 mg/ L

Uncertified Properties:

Density: 1.034 @24.8C Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.003	Cu	0.001	Pb	0.004
As	<0.20	Fe	0.18	Rb	<0.001
Ag	0.006	Ga	<0.001	Re	<0.001
B	<0.002	In	0.05	Si	0.20
Ba	0.004	K	<0.20	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.003
Bi	<0.001	Mg	0.004	Ti	0.009
Ca	0.02	Mn	0.003	Tl	<0.001
Cr	0.02	Mo	<0.001	V	<0.40
Cd	0.002	Na	0.02	Zr	<0.001
Co	0.007	Ni	0.06	Zn	0.05

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: APR '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 5/7/04
DATE EXPIRED: 4/30/05
DATE OPENED: 5/11/04 DK
INORG: 4565 PO: F53371

010220

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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010221

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Certificate of Reference Material

Catalog Number: PLBI4-2X/2Y **Lot No.** 10-68BI

Description: 1000 mg/L Bismuth

Matrix: 10% HNO3

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below

Certified Value: 1001 mg/L

Uncertainty Associated with Measurement: +/-3.0mg/L

Certified Value is Traceable to: NIST SRM 3106

The CRM is prepared gravimetrically using high purity Bismuth Metal Lot# 04941B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: EDTA titration using Xylenol Orange as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumental Analysis by ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 1.052@23.1 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.006	Cu	0.002	Pb	0.009
As	<0.001	Fe	0.001	Re	<0.001
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.003	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.002	Sb	0.002
Be	<0.001	Li	<0.001	Si	<0.01
Cd	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.006	Mg	0.002	V	<0.001
Cr	<0.001	Na	0.009	Zr	<0.001
		Ni	0.001	Zn	0.01

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: FEB '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RAUCHEM LABS
DATE RECEIVED: 02/25/04
DATE EXPIRED: 02/28/2005 VOS
DATE OPENED: 02/25/04
INORG: 4475 PO: F52382

Report of Certification 010222

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
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010223

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLLA2-2X/2Y **Lot No.** 10-27LA
Description: 1000 mg/L Lanthanum
Matrix: 2% HNO3

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 1000 mg/L
Uncertainty Associated with Measurement: +/-3.0mg/L
Certified Value is Traceable to: NIST SRM #3127a

The CRM is prepared gravimetrically using high purity La(NO3)3-6H2O Lot# 03951B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.010 @ 22.3 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.02	Lu	<0.001	Th	<0.001
Ca	0.029	Mn	<0.001	Tm	<0.001
Dy	<0.001	Mo	<0.001	Ti	<0.001
Er	<0.001	Nd	<0.001	Tb	<0.001
Eu	<0.001	Ni	<0.001	Ta	<0.001
Fe	0.005	Na	0.01	Tl	<0.001
Gd	<0.001	Pr	<0.001	V	<0.001
Ga	<0.001	Rb	<0.001	W	<0.001
Hf	<0.001	Sc	0.002	Y	<0.001
Ho	<0.001	Sm	<0.001	Yb	<0.001
In	<0.001			Zr	<0.001

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others
This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN '04 Certifying Officer: N. Kocherlakota

Report of Certification

010224

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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010225

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLY2-2X/2Y/2T **Lot No.** 9-152Y

Description: 1,000 mg/L Yttrium

Matrix: 2% HNO3

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 1001.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3167a.

The CRM is prepared gravimetrically using high purity Yttrium Oxide Lot# 08001A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.010 @ 24.8 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ce	<0.001	La	<0.001	Tb	<0.001
Ca	0.007	Lu	<0.001	Tm	<0.001
Dy	<0.001	Mn	<0.001	Tl	<0.001
Er	<0.001	Mo	<0.001	Th	<0.001
Eu	<0.001	Nd	<0.001	Ta	<0.001
Fe	0.003	Ni	<0.001	Ti	<0.001
Gd	<0.001	Na	0.005	V	<0.001
Ga	<0.001	Pr	<0.001	W	<0.001
Hf	<0.001	Rb	<0.001	Yb	<0.001
Ho	<0.001	Sc	<0.001	Zr	0.003
In	<0.001	Sm	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN '04 Certifying Officer: N. Kocherlakota

DATE RECEIVED: 01/23/04
DATE EXPIRED: 01/30/2005 YDO
DATE OPENED: 01/23/04
INORG: 4444 PO: F50306

Report of Certification

010226

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 35: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact the certifying organization.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 35, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The uncertainty of the certified value listed on the reverse of this document is the total uncertainty U.
$U = 2U_c + B$ mg/L
Where U_c = combined uncertainty components associated with volumetric and gravimetric factors, B is the uncertainty component of two independent methods of analysis (including the systematic and random uncertainties)
95% confidence limits = $X \pm t_{0.05} \sqrt{\Sigma U_c^2}$
where X = grand mean
$t_{0.05}$ = the percentile of the student's t distribution for (k-1) degrees of freedom.

Certification Traveler Report:

All certified values reported were derived from the Traveler Report identified by the lot number of this CRM. For further information contact the certifying organization.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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010227

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Certificate of Reference Material

Catalog Number: PLPD3-2X/2Y **Lot No.** 10-108PD

Description: 1000 mg/L Palladium

Matrix: 10% HCl

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1002.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3138

The CRM is prepared gravimetrically using high purity Palladium Powder Lot# 01021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

Method: Precipitation using Glyoxime. Filter, dry, and weigh as Pd(C4H7O2N2)2

Instrumental Analysis by ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.017 @ 23.6 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.01	Fe	0.024	Re	<0.001
Au	0.003	Ga	<0.001	Rh	0.001
Ag	0.005	Ir	<0.001	Rb	<0.001
B	<0.002	In	<0.001	Ru	<0.001
Be	<0.003	Mg	0.008	Sn	0.007
Bi	<0.001	Mn	<0.001	Te	<0.002
Ca	0.014	Na	0.02	Ti	<0.001
Cd	<0.001	Ni	<0.001	W	<0.001
Co	0.004	Pb	0.002	Zr	<0.001
Cr	<0.003	Pt	<0.001	Zn	1.0
Cu	0.001				

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN '04 Certifying Officer: N. Kocherlakota

Report of Certification

010228

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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010229

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Certificate of Reference Material

Catalog Number: PLS9-2X/2Y/2T **Lot No.** 10-122S

Description: 1000 mg/L Sulfur

Matrix: H2O

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1001 mg/L

Uncertainty Associated with Measurement: +/-3.0mg/L

Certified Value is Traceable to: NIST SRM #3154

The CRM is prepared gravimetrically using high purity Ammonium Sulfate Lot# 05891M. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

Method: Precipitation using Barium Chloride. Filter, ignite and weigh as BaSO4.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.001 @ 22.7 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	<0.001	Cu	<0.001	Pb	<0.001
As	0.003	Fe	0.014	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.001	In	<0.001	Si	0.003
Ba	<0.001	K	<0.10	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	0.005	Ti	<0.001
Ca	0.012	Mn	<0.002	Tl	<0.001
Cr	<0.001	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.01	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	<0.002

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JUN -- 2004 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/25/04
DATE EXPIRED: 06/30/2005 NO
DATE OPENED: 06/29/04
INORG: 4617 PO: F53398

Report of Certification 010230

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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Certificate of Reference Material

Catalog Number: PLTH2-2X/2Y **Lot No.** 10-24TH

Description: 1000 mg/L Thorium

Matrix: 2% HNO3

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 999 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3159

The CRM is prepared gravimetrically using high purity Th(NO3)4-4H2O Lot# 01851R. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: EDTA titration using Xylenol Orange as indicator. EDTA syandardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.010 @ 22.0 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.01	La	0.003	Tb	<0.001
Ca	0.27	Lu	<0.001	Tm	<0.001
Dy	<0.001	Mn	<0.001	Ti	<0.002
Er	<0.001	Mo	<0.001	Ta	<0.001
Eu	<0.001	Nd	0.003	Tl	<0.001
Fe	<0.01	Ni	<0.001	V	<0.001
Gd	<0.001	Na	0.04	W	<0.001
Ga	<0.001	Pr	<0.001	Y	0.002
Hf	<0.001	Rb	<0.001	Yb	<0.001
Ho	<0.001	Sc	<0.03	Zr	<0.001
In	<0.001	Sm	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: AUG '03 Certifying Officer: N. Kocherlakota

INORGANIC LABS/KAUFMAN LABS
DATE RECEIVED: 09/05/03
DATE EXPIRED: 08/30/2004 VQS
DATE OPENED: 09/05/03
INORG: 4233 PO: F52005

Report of Certification

010232

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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010233

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLU2-2X/2Y **Lot No.** 10-127U

Description: 1000 mg/L Uranium

Matrix: 2% HNO3

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1004 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3164

The CRM is prepared gravimetrically using high purity Uranium(V,VI) Oxide Lot# 04001D. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

Method: Evaporate to dryness. Ignite and weigh as U3O8.

Instrumental Analysis by ICP spectrometer: 1005 mg/L

Uncertified Properties:

Density: 1.010 @ 21.6 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.005	Cu	0.01	Pb	0.008
As	0.04	Fe	0.41	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.003	In	<0.001	Si	0.03
Ba	<0.001	K	0.022	Sr	0.003
Be	<0.001	Li	<0.001	Sb	0.003
Bi	<0.001	Mg	0.002	Ti	<0.001
Ca	0.09	Mn	0.003	Tl	<0.001
Cr	<0.002	Mo	0.004	V	0.004
Cd	<0.001	Na	0.08	Zr	0.002
Co	<0.001	Ni	<0.001	Zn	0.06

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JUN - - 2004 Certifying Officer: N. Kocherlakota

Report of Certification 010234

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
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010235

INORGANIC LABS/RADLHEM LABS
DATE RECEIVED: 08/11/03
DATE EXPIRED: 08/15/2004 +05
DATE OPENED: 08/13/03
INORG: 4212 PO: E52218

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLW9-2X/2Y **Lot No.** 9-177W
Description: 1000 mg/L Tungsten
Matrix: H2O

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 1,000 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3163

The CRM is prepared gravimetrically using high purity Ammonium Tungstate Lot# 02001H. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: Fume with Sulfuric Acid to dryness. Ignite and weigh as WO3.

Instrumentation Analysis By ICP spectrometer: 1000 mg/L
Uncertified Properties:

Density: 0.9979 @ 23.7 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	<0.001	Pb	<0.001
As	0.01	Fe	<0.01	Rb	<0.001
Ag	<0.003	Ga	<0.001	Re	0.004
B	<0.005	In	<0.001	Si	.56
Ba	<0.001	K	0.05	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.001
Bi	<0.001	Mg	<0.001	Ti	<0.001
Ca	0.009	Mn	<0.001	Tl	<0.001
Cr	<0.001	Mo	0.005	V	0.001
Cd	<0.001	Na	0.03	Zr	<0.001
Co	0.001	Ni	<0.001	Zn	0.01

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: AUG '03 Certifying Officer: N. Kocherlakota

010236

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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SPEX CertiPrep
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732-549-7144 • **1-800-LAB-SPEX** • Fax: 732-603-9647
CRMSales@spexcsp.com • www.spexcsp.com
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010237

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLZR2-2X/2Y/2T **Lot No.** 10-05ZR
Description: 1000 mg/L Zirconium
Matrix: 2% HNO3

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 997 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM 3169

The CRM is prepared gravimetrically using high purity Zirconyl Nitrate Lot# 11011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Evaporate to dryness. Fume with Sulfuric Acid. Ignite and weigh as ZrO2.

Instrumentation Analysis By ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.010 @ 23.6 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.03	Cu	0.002	Pb	0.002
As	<0.001	Fe	0.017	Rb	<0.001
Ag	<0.05	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Si	0.10
Ba	<0.001	K	0.10	Sr	<0.001
Be	<0.001	Li	0.002	Sb	<0.001
Bi	<0.001	Mg	0.003	Ti	<0.001
Ca	0.11	Mn	<0.001	Tl	<0.001
Cr	<0.009	Mo	<0.001	V	<0.001
Cd	0.004	Na	0.04	Zn	0.02
Co	<0.001	Ni	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others
This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: APR '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 5/7/04
DATE EXPIRED: 4/30/05
DATE OPENED: 5/11/04
INORG: 4506 PO: F55324

Report of Certification 010238

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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SPEXertificate™

Certificate of Reference Material

Catalog Number: PLNA2-3X/3Y **Lot No.** U8-128NA

Description: 10,000 mg/L Sodium

Matrix: 5% HNO3

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 9998 mg/L

Uncertainty Associated with Measurement: +/- 30 mg/L

Certified Value is Traceable to: NIST SRM 3152a.

The CRM is prepared gravimetrically using high purity Sodium Carbonate Lot# 02021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 9998 mg/L

Method: Evaporate to dryness. Fume with Sulfuric Acid. Ignite and weigh as Na2SO4.

Instrumentation Analysis By ICP spectrometer: 9998 mg/L

Uncertified Properties:

Density: 1.049 @ 23.9 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	0.003	Pb	<0.001
As	<0.003	Fe	0.03	Re	<0.001
Ag	<0.03	Ga	<0.001	Rb	<0.001
B	<0.03	In	<0.001	Sr	<0.002
Ba	0.03	K	0.14	Sb	<0.001
Be	<0.02	Li	<0.002	Sn	<0.001
Bi	<0.001	Mg	0.30	Ti	<0.004
Ca	0.52	Mn	0.008	Tl	<0.001
Cr	<0.004	Mo	<0.001	V	<0.001
Cd	<0.001	Ni	<0.002	Zr	<0.001
Co	<0.001			Zn	<0.03

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN '04 Certifying Officer: N. Kocherlakota

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • **1-800-LAB-SPEX** • Fax: 732-603-9647
CRMSales@spexcsp.com • www.spexcsp.com
Always Providing Superior Quality . . . Unparalleled Service™

010241

SPEXertificate™

Certificate of Reference Material

INORGANIC LABS/BADCHEM LABS
DATE RECEIVED: 11/26/03
DATE EXPIRED: 11/30/2004 YRS
DATE OPENED: 11/21/03
PROJ: 4328 PO: F52878

Catalog Number: ICV-2A **Lot No.:** 24-84AS
Description: **Initial Calibration Verification Standard II**
Matrix: 5% Nitric Acid

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM	Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	2,000	2,005.40	3109a	Ni	500	500.58	3136
K	2,000	1,997.89	3141a	V	500	504.23	3165
Mg	2,000	1,992.26	3131a	Cr	200	203.21	3112a
Na	2,000	1,992.99	3152a	Cu	200	199.75	3114
Al	1,000	1,005.90	3101a	Ag	100	100.46	3151
Ba	1,000	1,001.51	3104a	Be	100	100.04	3105a
Fe	1,000	1,003.17	3126a	Mn	100	100.64	3132
Co	500	505.10	3113	Zn	100	100.52	3168a

Spex Reference Multi: Lot #4-63BD, 14-125AS

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single component exceeding +/- 2%. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: NOV -- 2003 Certifying Officer: N. Kocherlakota

010242

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
$X = x+/-U$ where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i, and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647
CRMSales@spexcsp.com • www.spexcsp.com
Always Providing Superior Quality . . . Unparalleled Service™

010243

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLSB7-2X/2Y/2T **Lot No.** 10-43SB
Description: 1000 mg/L Antimony
Matrix: H2O/0.6Tart.Acid/tr.HNO3

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1004 mg/ L
Uncertainty Associated with Measurement: +/-3.0mg/L
Certified Value is Traceable to: NIST SRM 3102a

The CRM is prepared gravimetrically using high purity Antimony Metal Lot# 04021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1005 mg/L

Method: Evaporate to dryness. Fume with Nitric Acid. Ignite and weigh as Sb2O4.

Instrumental Analysis by ICP spectrometer: 1002 mg/ L

Uncertified Properties:

Density: 1.046 @ 25.5 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.03	Cu	0.002	Pb	0.009
As	<0.001	Fe	0.03	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.01	Si	<0.01
Be	<0.001	Li	<0.001	Ti	<0.003
Bi	0.002	Mg	0.005	Tl	<0.001
Ca	0.14	Mn	<0.001	V	<0.001
Cr	<0.002	Mo	<0.001	Zr	<0.001
Cd	<0.001	Na	0.005	Zn	0.02
Co	<0.001	Ni	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: NOV -- 2003 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/20/03
DATE EXPIRED: 11/30/2004 WS
DATE OPENED: 11/21/03
INORG: 4329 PO: F58278

Report of Certification 010244

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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ISO 9001
CERTIFIED

010245

SPEXertificate™

Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/20/03
DATE EXPIRED: 11/30/2004 YQS
DATE OPENED: 11/21/03
INORG: 4339 PO: F52078

Catalog Number: ICV-2C **Lot No.:** 24-85AS
Description: **Initial Calibration Verification Standard II**
Matrix: 5% Nitric Acid

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
As	500	497.85	3103a
Pb	500	495.41	3128
Se	500	501.98	3149
TL	500	501.89	3158
Cd	100	99.77	3108

Spex Reference Multi: Lot #4-51BDREF, 15-39AS, 11-173AS

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single element exceeding +/- 2%. This includes uncertainty of measurements and other effects, such as transpiration losses. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: NOV -- 2003 Certifying Officer: N. Kocherlakota

010246

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

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Instructions for Use:

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Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

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ISO 9001 CERTIFIED

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010247

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Aluminum in 5% (abs) HNO_3**

Catalog Number:	CGAL10-1 and CGAL10-5
Lot Number:	**W-AL04008**
Starting Material:	Al metal
Starting Material Purity (%):	99.998460
Starting Material Lot No	607116
Matrix:	5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004 V03
DATE OPENED: 08/26/03
INORG: 4220 PO: F52224

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10070 ± 31 µg/mL

Certified Density: 1.059 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10006 ± 55 µg/mL**
ICP Assay NIST SRM 3101a Lot Number: 992003

Assay Method #2 **10070 ± 31 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

S	Al		M	Dy	< 0.02695	O	Li	0.00011	M	Pr	< 0.00135	M	Te	< 0.13473
M	Sb	< 0.00225	M	Er	< 0.02245	M	Lu	< 0.00180	M	Re	< 0.00449	M	Tb	< 0.00135
M	As	< 0.04491	M	Eu	< 0.01347	O	Mg	0.00470	M	Rh	< 0.00449	M	Tl	< 0.00449
M	Ba	< 0.04491	M	Gd	< 0.00449	M	Mn	< 0.01796	M	Rb	< 0.00449	M	Th	< 0.00449
O	Be	< 0.00017	M	Ga	< 0.00449	O	Hg	< 0.00700	M	Ru	< 0.00898	M	Tm	< 0.00180
M	Bi	< 0.00180	M	Ge	< 0.02695	M	Mo	< 0.00898	M	Sm	< 0.00449	M	Sn	< 0.02245
O	B	0.01164	M	Au	< 0.01347	M	Nd	< 0.00898	M	Sc	< 0.04491	M	Ti	< 0.22454
M	Cd	< 0.01347	M	Hf	< 0.00898	O	Ni	< 0.00600	M	Se	< 0.03593	M	W	< 0.04491
O	Ca	0.01903	M	Ho	< 0.00225	M	Nb	< 0.00225	O	Si	0.07389	M	U	< 0.00898
M	Ce	< 0.02245	O	In	< 0.03000	n	Os		M	Ag	< 0.00898	M	V	< 0.00898
M	Cs	< 0.00135	M	Ir	< 0.02245	M	Pd	< 0.02245	O	Na	0.03359	M	Yb	< 0.00449
O	Cr	0.00336	O	Fe	0.00493	O	P	< 0.03000	M	Sr	< 0.00225	M	Y	< 0.17963
M	Co	< 0.01347	M	La	< 0.00225	M	Pt	< 0.00898	O	S	< 0.10000	M	Zn	< 0.08982
M	Cu	< 0.02695	M	Pb	< 0.01347	O	K	0.02911	M	Ta	< 0.03144	M	Zr	< 0.02245

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 26.98154; +3; 6; $Al(H_2O)_6^{3+}$
Chemical Compatibility - Soluble in HCl, HNO_3, HF and H_2SO_4. Avoid neutral media. Soluble in strongly basic NaOH forming the $Al(OH)_4(H_2O)_2^-$ species. Stable with most metals and inorganic anions. The phosphate is insoluble in water and only slightly soluble in acid.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.
Al Containing Samples (Preparation and Solution) - Metal (Best dissolved in HCl / HNO_3); α- Al_2O_3 (Na_2CO_3 fusion in Pt*); γ- Al_2O_3 (Soluble in acids such as HCl); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (sulfuric/peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl.
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppm conc.)
ICP-OES 394.401 nm	0.05 / 0.006 µg/mL	1	atom	U, Ce
ICP-OES 396.152 nm	0.03 / 0.006 µg/mL	1	atom	Mo, Zr, Ce
ICP-OES 167.078 nm	0.1 / 0.009 µg/mL	1	ion	Fe
ICP-MS 27 amu	30 ppt	n/a	M+	$^{12}C^{15}N$, $^{13}C^{14}N$, $^{1}H^{13}C^{14}N$, $^{11}B^{16}O$, $^{54}Cr^{2+}$, $^{54}Fe^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004 VOS
DATE OPENED: 08/26/03
INORG: 4220 PO: E52224

010250

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 13, 2003

Expiration Date:

EXPIRES
1 SEP 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	
Certificate Approved By:	Katalin Le, QC Supervisor	
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	

010251

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Calcium in 1.4% (abs) HNO_3**

Catalog Number:	CGCA10-1, CGCA10-2, and CGCA10-5
Lot Number:	**W-CA03022**
Starting Material:	CaO
Starting Material Purity (%):	99.999389
Starting Material Lot No	C27L01
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 01/30/04
DATE EXPIRED: 02/01/2005 V03
DATE OPENED: 01/30/04
INORG: 4436 PO: F52303

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9968 ± 18 µg/mL

Certified Density: 1.038 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **9968 ± 18 µg/mL**
ICP Assay NIST SRM 3109a Lot Number: 000622

Assay Method #2 **9973 ± 25 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00013	M	Dy	< 0.03067	O	Li	0.00011	M	Pr	< 0.00153	M	Te	< 0.15333
M	Sb	< 0.00256	M	Er	< 0.02556	M	Lu	< 0.00204	M	Re	< 0.00511	M	Tb	< 0.00153
M	As	< 0.05111	M	Eu	< 0.01533	O	Mg	0.03453	M	Rh	< 0.00511	M	Tl	< 0.00511
O	Ba	0.00063	M	Gd	< 0.00511	O	Mn	< 0.00030	M	Rb	< 0.00511	M	Th	< 0.00511
O	Be	< 0.00009	M	Ga	< 0.00511	O	Hg	< 0.01100	M	Ru	< 0.01022	M	Tm	< 0.00204
M	Bi	< 0.00204	M	Ge	< 0.03067	M	Mo	< 0.01022	M	Sm	< 0.00511	M	Sn	< 0.02556
O	B	< 0.00054	M	Au	< 0.01533	M	Nd	< 0.01022	O	Sc	< 0.00002	M	Ti	< 0.25555
O	Cd	< 0.00450	M	Hf	< 0.01022	O	Ni	< 0.00230	O	Se	< 0.00620	M	W	< 0.05111
S	Ca		M	Ho	< 0.00256	M	Nb	< 0.00256	O	Si	0.00253	M	U	< 0.01022
M	Ce	< 0.02556	O	In	< 0.00200	n	Os		M	Ag	< 0.01022	O	V	< 0.00090
M	Cs	< 0.00153	M	Ir	< 0.02556	M	Pd	< 0.02556	O	Na	< 0.00010	M	Yb	< 0.00511
O	Cr	0.00183	O	Fe	< 0.00110	O	P	< 0.00480	O	Sr	0.02021	M	Y	< 0.20444
O	Co	< 0.00120	M	La	< 0.00256	M	Pt	< 0.01022	O	S	0.01053	O	Zn	0.02232
O	Cu	< 0.00400	M	Pb	< 0.01533	O	K	< 0.00170	M	Ta	< 0.03578	M	Zr	< 0.02556

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 40.078; +2; 6; $Ca(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl and HNO_3. Avoid H_2SO_4, HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

Ca Containing Samples (Preparation and Solution) - Metal (best dissolved in diluted HNO_3) Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (dry ash and dissolution in dilute HCl. Do not heat when dissolving to avoid precipitation of SiO_2) .The oxide, hydroxide, carbonate, phosphate, and fluoride of calcium are soluble in % levels of HCl or HNO_3. The sulfates (gypsum, anhydrite, etc.), certain silicates and complex compounds require fusion with Na_2CO_3 followed by HCl / water dissolution. Contamination is a very real problem when analyzing for trace levels.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe interferences.)
ICP-OES	393.366 nm	0.0002 / 0.00004 µg/mL	1	ion	U, Ce
ICP-OES	396.847 nm	0.0005 / 0.00006 µg/mL	1	ion	Th
ICP-OES	422.673 nm	0.01 / 0.001 µg/mL	1	atom	Ge
ICP-MS	44 amu	1200 ppt	n/a	M+	$^{12}C^{16}O_2$, $^{28}Si^{16}O$, $^{88}Sr^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 09/01/2005 VD3
DATE OPENED: 01/20/04
INORG: 4436 PO: E52303

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010254

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 23, 2003

Expiration Date: EXPIRES 1 FEB 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010255

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Iron in 3.5% (abs) HNO_3**

Catalog Number:	CGFE10-1, CGFE10-2, and CGFE10-5
Lot Number:	**W-FE03030**
Starting Material:	Fe metal
Starting Material Purity (%):	99.999569
Starting Material Lot No	23166
Matrix:	3.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 v03
DATE OPENED: 02/25/04
INORG: 4470 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,016 ± 25 µg/mL

Certified Density: 1.050 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10,031 ± 33 µg/mL**
ICP Assay NIST SRM 3126a Lot Number: 000606

Assay Method #2 **10,016 ± 25 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00270	M Dy < 0.02413	O Li < 0.00003	M Pr < 0.00121	M Te < 0.12066
M Sb < 0.00201	M Er < 0.02011	M Lu < 0.00161	M Re < 0.00402	M Tb < 0.00121
M As < 0.04022	M Eu < 0.01207	O Mg < 0.00006	M Rh < 0.00402	M Tl < 0.00402
M Ba < 0.04022	M Gd < 0.00402	O Mn < 0.02000	M Rb < 0.00402	M Th < 0.00402
O Be < 0.00005	M Ga < 0.00402	O Hg < 0.01100	M Ru < 0.00804	M Tm < 0.00161
M Bi < 0.00161	i Ge	M Mo < 0.00804	M Sm < 0.00402	M Sn < 0.02011
O B < 0.00090	M Au < 0.01207	M Nd < 0.00804	M Sc < 0.04022	M Ti < 0.20109
M Cd < 0.01207	M Hf < 0.00804	O Ni < 0.05000	M Se < 0.03218	M W < 0.04022
O Ca 0.00291	M Ho < 0.00201	M Nb < 0.00201	O Si < 0.01000	M U < 0.00804
M Ce < 0.02011	M In < 0.04022	n Os	M Ag < 0.00804	M V < 0.00804
M Cs < 0.00121	M Ir < 0.02011	M Pd < 0.02011	O Na 0.00776	M Yb < 0.00402
M Cr < 0.02011	s Fe	i P	M Sr < 0.00201	M Y < 0.16087
O Co < 0.00110	M La < 0.00201	M Pt < 0.00804	O S < 0.07200	M Zn 0.04876
M Cu < 0.02413	M Pb < 0.01207	O K < 0.00170	M Ta < 0.02815	M Zr < 0.02011

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 55.847; +3; 6; $Fe(H_2O)_6^{3+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF and H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Fe Containing Samples (Preparation and Solution) - Metal (Soluble in HCl); Oxides (If the oxide has been at a high temperature then Na_2CO_3 fusion in Pt* followed by HCl dissolution otherwise dissolve in dilute HCl); Ores (See Oxides above using only the fusion approach).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppmcs.)
ICP-OES	238.204 nm	0.005 / 0.001 µg/mL	1	ion	Ru, Co
ICP-OES	239.562 nm	0.005 / 0.001 µg/mL	1	ion	Co, W, Cr
ICP-OES	259.940 nm	0.006 / 0.001 µg/mL	1	ion	Hf, Nb
ICP-MS	56 amu	970 ppt	n/a	M+	$^{40}Ar^{16}N^{1}H$, $^{40}Ar^{16}O$, $^{38}Ar^{18}O^{1}H$, $^{38}Ar^{18}O$, $^{37}Cl^{18}O^{1}H$, $^{40}Ca^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

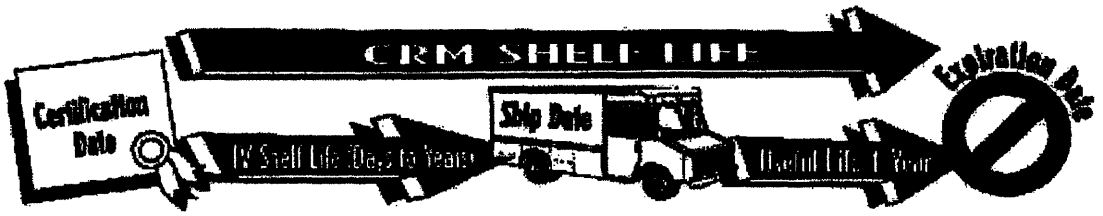
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 V05
DATE OPENED: 02/25/04
INORG: 4470 PO: F52393

010258

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 20, 2003

Expiration Date:

EXPIRES
1 MAR 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010259

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Potassium in 1.4% (abs) HNO_3**

Catalog Number:	CGK10-1, CGK10-2, and CGK10-5
Lot Number:	**W-K02111**
Starting Material:	KNO3
Starting Material Purity (%):	99.997230
Starting Material Lot No	K18J19
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 1 of 2
DATE EXPIRED: 12/1/2004 OK
DATE OPENED: 11/5/03
INORG: 4320 PO: F52256

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9930 ± 9 µg/mL

Certified Density: 1.024 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma e_r s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **9926 ± 62 µg/mL**
ICP Assay NIST SRM 3141a Lot Number: 891312

Assay Method #2 **9930 ± 9 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION -** All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION -** The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION -** In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN μg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	< 0.00090	M	Dy	< 0.02400	O	Li	< 0.00003	M	Pr	< 0.00120	M	Te	< 0.11998
M	Sb	< 0.00200	M	Er	< 0.02000	M	Lu	< 0.00160	M	Re	< 0.00400	M	Tb	< 0.00120
M	As	< 0.03999	M	Eu	< 0.01200	O	Mg	0.00100	M	Rh	< 0.00400	M	Tl	< 0.00400
M	Ba	< 0.03999	M	Gd	< 0.00400	O	Mn	< 0.00003	M	Rb	0.49948	M	Th	< 0.00400
O	Be	< 0.00020	M	Ga	< 0.00400	O	Hg	< 0.01500	M	Ru	< 0.00800	M	Tm	< 0.00160
M	Bi	< 0.00160	O	Ge	< 0.00150	M	Mo	< 0.00800	M	Sm	< 0.00400	M	Sn	< 0.02000
O	B	< 0.00060	O	Au	< 0.00300	M	Nd	< 0.00800	O	Sc	< 0.00002	O	Ti	< 0.00070
M	Cd	< 0.01200	M	Hf	< 0.00800	O	Ni	< 0.00230	O	Se	< 0.05000	M	W	< 0.03999
O	Ca	0.00075	M	Ho	< 0.00200	M	Nb	< 0.00200	O	Si	< 0.00340	M	U	< 0.00800
M	Ce	< 0.02000	M	In	< 0.03999	n	Os		M	Ag	< 0.00800	O	V	< 0.00090
M	Cs	< 0.00120	M	Ir	< 0.02000	M	Pd	< 0.02000	O	Na	0.21730	M	Yb	< 0.00400
M	Cr	< 0.02000	O	Fe	0.00212	O	P	< 0.00250	M	Sr	< 0.00200	M	Y	< 0.15998
M	Co	< 0.01200	M	La	< 0.00200	M	Pt	< 0.00800	O	S	< 0.07200	O	Zn	0.00050
M	Cu	< 0.02400	M	Pb	< 0.01200	S	K		M	Ta	< 0.02800	M	Zr	< 0.02000

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4 °C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 29.0983; +1; (6); K^+(aq)
(Coordination Number in parentheses is assumed, not certain.)
Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Avoid use of $HClO_4$ due to insolubility of the perchlorate. Stable with all metals and inorganic anions except ClO_4^-.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
K Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt° followed by HCl dissolution-blank levels of K in sodium carbonate critical); Organic Matrices (Sulfuric/peroxide digestion)
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤concs.)
ICP-OES	766.490 nm	0.4 / 0.001 μg/mL	1	atom	2^{nd} order radiation from R.E.s on some optical designs
ICP-OES	771.531 nm	1.0 / 0.03 μg/mL	1	atom	2^{nd} order radiation from R.E.s on some optical designs
ICP-OES	404.721 nm	1.1 / 0.05 μg/mL	1	atom	U, Ce,
ICP-MS	39 amu	10 ppt	n/a	M^+	^{38}ArH, $^{23}Na^{16}O$, $^{78}Se^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 30, 2003

Expiration Date:

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 3 of 2
DATE EXPIRED: 12/1/2004 DP
DATE OPENED: 11/5/03
INORG: 4336 PO: ES2258

EXPIRES
1 Dec 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant
Certificate Approved By:	Katalin Le, QC Supervisor
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director

010263

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade 10000 µg/mL Magnesium in 1.4% (abs) HNO_3

Catalog Number:	CGMG10-1 and CGMG10-5
Lot Number:	**T-MG03006**
Starting Material:	Mg metal
Starting Material Purity (%):	99.9968
Starting Material Lot No	RML91191
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 V03
DATE OPENED: 08/01/03
INORG: 4204 PO: F52391

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9921 ± 20 µg/mL

Certified Density: 1.050 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value $(\bar{x}) = \frac{\sum x_i}{n}$

Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

"Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **9998 ± 20 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **9921 ± 20 µg/mL**
ICP Assay NIST SRM 3131a Lot Number: 991107

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.02454	M	Dy	< 0.02455	O	Li	0.00797	M	Pr	< 0.00123	M	Te	< 0.12275
M	Sb	0.00306	M	Er	< 0.02046	M	Lu	< 0.00164	M	Re	< 0.00409	M	Tb	< 0.00123
M	As	< 0.04092	M	Eu	< 0.01228	S	Mg		M	Rh	< 0.00409	M	Tl	< 0.00409
M	Ba	< 0.04092	M	Gd	< 0.00409	M	Mn	< 0.01637	M	Rb	< 0.00409	M	Th	< 0.00409
O	Be	< 0.00017	M	Ga	< 0.00409	O	Hg	< 0.00900	M	Ru	< 0.00818	M	Tm	< 0.00164
M	Bi	< 0.00164	M	Ge	< 0.02455	M	Mo	< 0.00818	M	Sm	< 0.00409	M	Sn	< 0.02046
O	B	0.00871	M	Au	< 0.01228	M	Nd	< 0.00818	M	Sc	< 0.04092	O	Ti	0.10206
M	Cd	< 0.01228	M	Hf	< 0.00818	O	Ni	0.01404	M	Se	< 0.03273	M	W	< 0.04092
O	Ca	0.01070	M	Ho	< 0.00205	M	Nb	< 0.00205	O	Si	0.03186	M	U	< 0.00818
M	Ce	< 0.02046	M	In	< 0.04092	n	Os		M	Ag	< 0.00818	M	V	< 0.00818
M	Cs	< 0.00123	M	Ir	< 0.02046	M	Pd	< 0.02046	O	Na	0.01817	M	Yb	< 0.00409
O	Cr	0.02315	O	Fe	0.02467	O	P	< 0.01600	M	Sr	< 0.00205	M	Y	< 0.16367
M	Co	< 0.01228	M	La	< 0.00205	M	Pt	< 0.00818	n	S		O	Zn	0.01892
O	Cu	0.00672	O	Pb	0.03236	O	K	< 0.05000	M	Ta	< 0.02864	M	Zr	< 0.02046

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 24.305; +2; 6; $Mg(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, HNO_3, and H_2SO_4 avoid HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicates, carbonates, hydroxides, oxides, and tungstates in neutral and slightly acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

Mg Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO_3); Oxide (Readily soluble in above compatible aqueous acidic solutions); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	279.553 nm	0.0002 /0.00003 µg/mL	1	ion	Th
ICP-OES	280.270 nm	0.0003 /0.00005 µg/mL	1	ion	U, V
ICP-OES	285.213 nm	0.002 / 0.00003 µg/mL	1	atom	U, Hf, Cr, Zr
ICP-MS	24 amu	42 ppt	n/a	M+	$^{7}Li^{16}O$, $^{48}Ti^{+2}$, $^{48}Ca^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

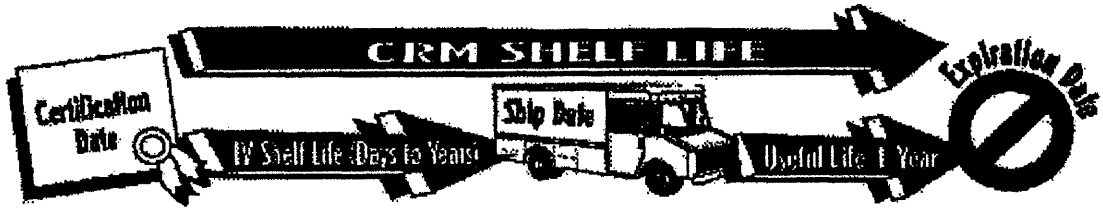
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 VOID
DATE OPENED: 08/01/03
INORG: 4204 PO: E52391

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 28, 2002

Expiration Date: EXPIRES 01 Oct 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, QA Administrator

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010267

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Sodium in 1.4% (abs) HNO_3**

Catalog Number:	CGNA10-1, CGNA10-2, and CGNA10-5
Lot Number:	**T-NA03006**
Starting Material:	Na_2CO_3
Starting Material Purity (%):	99.999936
Starting Material Lot No	42095
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 VOS
DATE OPENED: 08/01/03
INORG: 4205 PO: F52391

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,005 ± 7 µg/mL

Certified Density: 1.032 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\sum x_i}{n}$

Uncertainty (±) = $\frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$\bar{x}$ = mean
x_i = individual results
n = number of measurements
$\sum s_i$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10,067 ± 75 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 990907

Assay Method #2 **10,005 ± 7 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.02499	O	Li	< 0.00003	M	Pr	< 0.00125	M	Te	< 0.12494
M	Sb	< 0.00208	M	Er	< 0.02082	M	Lu	< 0.00167	M	Re	< 0.00417	M	Tb	< 0.00125
M	As	< 0.04165	M	Eu	< 0.01249	O	Mg	0.00015	M	Rh	< 0.00417	M	Tl	< 0.00417
M	Ba	< 0.04165	M	Gd	< 0.00417	O	Mn	< 0.00003	M	Rb	< 0.00417	M	Th	< 0.00417
O	Be	< 0.00020	M	Ga	< 0.00417	O	Hg	< 0.01500	M	Ru	< 0.00833	M	Tm	< 0.00167
M	Bi	< 0.00167	O	Ge	< 0.00150	M	Mo	< 0.00833	M	Sm	< 0.00417	M	Sn	< 0.02082
O	B	< 0.00060	O	Au	< 0.00300	M	Nd	< 0.00833	O	Sc	< 0.00002	O	Ti	< 0.00070
M	Cd	< 0.01249	M	Hf	< 0.00833	O	Ni	< 0.00230	O	Se	< 0.05000	M	W	< 0.04165
O	Ca	0.00160	M	Ho	< 0.00208	M	Nb	< 0.00208	O	Si	< 0.00340	M	U	< 0.00833
M	Ce	< 0.02082	M	In	< 0.04165	n	Os		M	Ag	< 0.00833	O	V	< 0.00090
M	Cs	0.00104	M	Ir	< 0.02082	M	Pd	< 0.02082	S	Na		M	Yb	< 0.00417
M	Cr	< 0.02082	O	Fe	< 0.00110	O	P	< 0.04000	M	Sr	< 0.00208	M	Y	< 0.16658
M	Co	< 0.01249	M	La	< 0.00208	M	Pt	< 0.00833	O	S	< 0.07200	O	Zn	0.00130
O	Cu	< 0.00140	M	Pb	< 0.01249	O	K	0.00873	M	Ta	< 0.02915	M	Zr	< 0.02082

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.98977; +1; (6); $Na^{+}(aq)$ largely ionic in nature (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppm conc.)
ICP-OES	589.595 nm	0.07 / 0.00009 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	588.995 nm	0.03 / 0.006 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	330.237 nm	2.0 / 0.09 µg/mL	1	atom	Pd, Zn
ICP-MS	23 amu	310 ppt	n/a	M+	$^{46}Ti^{+2}$, $^{46}Ca^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 24, 2003
Expiration Date: EXPIRES 01 2004

INORGANIC LABS/RADCHEM LABS 3 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 WB
DATE OPENED: 08/01/03
INORG: 4205 PO: F52391

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010270

Certificate Prepared By:	Debbie Newman, LIMS Administrator
Certificate Approved By:	Katalin Le, QC Supervisor
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director

Debbie Newman
Katalin Le
Paul R Gaines

010271

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Lithium in 0.1% HNO_3 (abs)

Catalog Number: CGLI1-1, CGLI1-2 and CGLI1-5

Lot Number: **W-LI02066**

Starting Material:	Li_2CO_3
Starting Material Purity:	99.999%
Starting Material Lot No:	1053

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004 VO
DATE OPENED: 06/23/03
INORG: 4149 PO: E52370

CERTIFIED CONCENTRATION: 998 ± 2 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value $(\bar{x}) = \frac{\sum x_i}{n}$ Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 998 ± 2 µg/mL
Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 1000 ± 4 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3129a.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.**
An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	<0.010	M	Dy	<0.00060	s	Li		M	Pr	<0.000030	O	Te	<0.0090
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.044	M	Eu	<0.00030	O	Mg	<0.00010	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00020	M	Rb	<0.00010	M	Th	<0.00010
O	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.0070	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.0060	M	Au	<0.010	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00030
O	Cd	<0.0018	M	Hf	<0.00020	O	Ni	<0.0040	O	Se	<0.020	M	W	<0.0010
O	Ca	0.051	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	0.023	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		O	Ag	<0.0040	O	V	<0.0010
M	Cs	0.0018	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.10	M	Yb	<0.00010
O	Cr	<0.0020	O	Fe	<0.0020	O	P	<0.030	O	Sr	<0.0010	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.050	O	Zn	<0.030
M	Cu	<0.00060	M	Pb	<0.00030	O	K	0.0070	M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.004 g/mL

(over)

QA:KL Rev.022403DN

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 01 12004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(COS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010273

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Cadmium in 2% (abs) HNO_3**

Catalog Number:	CGCD1-1, CGCD1-2, and CGCD1-5
Lot Number:	**W-CD01127**
Starting Material:	Cd shot
Starting Material Purity (%):	99.998904
Starting Material Lot No	C14M30
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4467 PO: F523323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1007 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The Independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1007 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1005 ± 5 µg/mL**
ICP Assay NIST SRM 3108 Lot Number: 890312

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.01191	O Li < 0.00002	M Pr < 0.00060	O Te < 0.00700
M Sb 0.00039	M Er < 0.00993	M Lu < 0.00079	M Re < 0.00199	M Tb < 0.00060
M As < 0.01985	M Eu < 0.00596	O Mg 0.00002	M Rh < 0.00199	M Tl < 0.00199
M Ba < 0.01985	M Gd < 0.00199	M Mn < 0.00794	M Rb < 0.00199	M Th < 0.00199
M Be < 0.00099	M Ga < 0.00199	O Hg < 0.01200	M Ru < 0.00397	M Tm < 0.00079
M Bi < 0.00079	M Ge < 0.01191	M Mo < 0.00397	M Sm < 0.00199	M Sn < 0.00993
O B < 0.00900	M Au < 0.00596	M Nd < 0.00397	M Sc < 0.01985	M Ti < 0.09925
s Cd	M Hf < 0.00397	O Ni < 0.00300	M Se < 0.01588	M W < 0.01985
O Ca 0.00378	M Ho < 0.00099	M Nb < 0.00099	O Si < 0.00340	M U < 0.00397
M Ce < 0.00993	O In < 0.00200	n Os	M Ag < 0.00397	M V < 0.00397
M Cs < 0.00060	M Ir < 0.00993	M Pd 0.00691	M Na < 0.19849	M Yb < 0.00199
M Cr < 0.00993	O Fe < 0.00110	O P < 0.00300	M Sr < 0.00099	M Y < 0.07940
M Co < 0.00596	M La < 0.00099	M Pt < 0.00397	O S < 0.03000	O Zn 0.00040
M Cu < 0.01191	M Pb < 0.00596	O K 0.00015	M Ta < 0.01389	M Zr < 0.00993

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 112.41; +2; 4; $Cd_2(OH)$ (aq)$^{+}$ and $Cd(OH)_2(aq)$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, and HF. Avoid basic media forming insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media. The sulfide, carbonate, oxalate, phosphate, and cyanide are insoluble in water and soluble in HCl, HNO_3 and NH_4OH. The chloride, bromide and iodide are soluble in water. CdI_2 us one of the few iodides soluble in ethanol. All compounds of Cd are soluble in excess NaI, due to the formation of the complex ion, CdI_4^{2-}.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO_3/LDPE container.

Cd Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl or HNO_3); Ores (Dissolve in HCl / HNO_3, then take to fumes with H_2SO_4. The silica and lead sulfate are filtered off after addition of water.); Organic based (dry ash at 450°C and dissolve ash in HCl) (sulfuric/peroxide acid digestion).

***Atomic* Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):**

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppms.)
ICP-OES	214.438 nm	0.003 / 0.0003 µg/mL	1	ion	Pt, Ir
ICP-OES	228.802 nm	0.003 / 0.0003 µg/mL	1	atom	Co, Ir, As, Pt
ICP-OES	226.502 nm	0.003 / 0.0003 µg/mL	1	ion	Ir
ICP-MS	111 amu	11 ppt	n/a	M^{+}	$^{95}Mo^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 V03
DATE OPENED: 02/25/04
INORG: 4467 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 24, 2003

Expiration Date: EXPIRES 12 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Cobalt in 2% (abs) HNO_3**

Catalog Number:	CGCO1-1, CGCO1-2, and CGCO1-5
Lot Number:	**W-QCO01114**
Starting Material:	Co powder
Starting Material Purity (%):	99.995670
Starting Material Lot No	22897
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOID
DATE OPENED: 02/25/04
INORG: 4468 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 1.016 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum s$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 4 µg/mL**
ICP Assay NIST SRM 3181 Lot Number: 000630

Assay Method #2 **1002 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00025	M Dy < 0.02419	O Li 0.00001	M Pr < 0.00121	M Te < 0.12097
M Sb < 0.00202	M Er < 0.02016	M Lu < 0.00161	M Re < 0.00403	M Tb < 0.00121
O As < 0.10000	M Eu < 0.01210	O Mg 0.00045	M Rh < 0.00403	M Tl < 0.00403
M Ba < 0.04032	M Gd < 0.00403	O Mn 0.00003	M Rb < 0.00403	M Th < 0.00403
M Be < 0.00202	M Ga < 0.00403	O Hg < 0.05000	M Ru < 0.00807	M Tm < 0.00161
M Bi < 0.00161	M Ge < 0.02419	M Mo < 0.00807	M Sm < 0.00403	M Sn < 0.02016
O B < 0.04000	M Au < 0.01210	M Nd < 0.00807	M Sc < 0.04032	M Ti < 0.20162
M Cd < 0.01210	M Hf < 0.00807	O Ni < 0.02000	M Se < 0.03226	M W < 0.04032
O Ca 0.00325	M Ho < 0.00202	M Nb < 0.00202	O Si < 0.00400	M U < 0.00807
M Ce < 0.02016	M In < 0.04032	n Os	M Ag < 0.00807	M V < 0.00807
M Cs < 0.00121	M Ir < 0.02016	M Pd < 0.02016	O Na 0.00138	M Yb < 0.00403
M Cr < 0.02016	O Fe 0.00875	n P	M Sr < 0.00202	M Y < 0.16129
s Co	M La < 0.00202	M Pt < 0.00807	n S	M Zn < 0.08065
M Cu < 0.02419	M Pb < 0.01210	O K 0.03000	M Ta < 0.02823	M Zr < 0.02016

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.9332; +2; 6; $Co(H_2O)_6^{+2}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppm conc.)
ICP-OES	238.892 nm	0.01/.002 µg/mL	1	ion	Fe, W, Ta
ICP-OES	228.616 nm	0.01/.001 µg/mL	1	ion	
ICP-OES	237.862 nm	0.01/.002 µg/mL	1	ion	W, Re, Al, Ta
ICP-MS	59 amu	2 ppt	n/a	M+	$^{43}Ca^{16}O^{1}H$, $^{40}Ar^{19}O^{1}H$, $^{40}Ar^{23}Na$, $^{43}Ca^{16}O$, $^{25}Mg^{34}Cl$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 28, 2003

Expiration Date:

EXPIRES
1 MAR 2005

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 V03
DATE OPENED: 02/25/04
INORG: 4468 PO: F52303

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Manganese in 2% (abs) HNO_3**

Catalog Number:	CGMN1-1, CGMN1-2, and CGMN1-5
Lot Number:	**W-MN02036**
Starting Material:	Mn pieces
Starting Material Purity (%):	99.995300
Starting Material Lot No	21563
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 VOS
DATE OPENED: 01/20/04
INORG: 4434 PO: F52301

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1000 ± 2 µg/mL**
ICP Assay NIST SRM 3132 Lot Number: 890903

Assay Method #2 **1003 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00221	M	Dy	< 0.02471	O	Li	0.00020	M	Pr	< 0.00124	M	Te	< 0.12355
M	Sb	< 0.00206	M	Er	< 0.02059	M	Lu	< 0.00165	M	Re	< 0.00412	M	Tb	< 0.00124
M	As	< 0.04118	M	Eu	< 0.01236	O	Mg	0.03350	M	Rh	< 0.00412	M	Tl	< 0.00412
M	Ba	< 0.04118	M	Gd	< 0.00412	s	Mn		M	Rb	< 0.00412	M	Th	< 0.00412
M	Be	< 0.00206	O	Ga	< 0.05000	i	Hg		M	Ru	< 0.00824	M	Tm	< 0.00165
M	Bi	< 0.00165	O	Ge	< 0.00300	M	Mo	< 0.00824	M	Sm	< 0.00412	M	Sn	< 0.02059
O	B	0.00295	M	Au	< 0.01236	M	Nd	< 0.00824	M	Sc	< 0.04118	M	Ti	< 0.20592
M	Cd	< 0.01236	M	Hf	< 0.00824	M	Ni	< 0.03295	M	Se	< 0.03295	M	W	< 0.04118
O	Ca	0.00340	M	Ho	< 0.00206	M	Nb	< 0.00206	O	Si	0.00275	M	U	< 0.00824
M	Ce	< 0.02059	M	In	< 0.04118	n	Os		M	Ag	< 0.00824	M	V	< 0.00824
M	Cs	< 0.00124	M	Ir	< 0.02059	M	Pd	< 0.02059	O	Na	0.00225	M	Yb	< 0.00412
M	Cr	< 0.02059	O	Fe	< 0.01000	i	P		M	Sr	< 0.00206	M	Y	< 0.16474
M	Co	< 0.01236	M	La	< 0.00206	M	Pt	< 0.00824	i	S		O	Zn	0.00250
M	Cu	< 0.02471	M	Pb	< 0.01236	O	K	0.00105	M	Ta	< 0.02883	M	Zr	< 0.02059

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.9380; +2; 6; $Mn(H_2O)_6^{2+}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO_3/LDPE container.

Mn Containing Samples (Preparation and Solution) - Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H_2SO_4 and heat to SO_3 fumes - dense white fumes).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at conc.)
ICP-OES	257.610nm	0.0014 / 0.00002 µg/mL	1	ion	Ce, W, Re
ICP-OES	259.373 nm	0.0016 / 0.00002 µg/mL	1	ion	U, Ta, Mo, Fe, Nb
ICP-OES	260.569 nm	0.0021 / 0.00002 µg/mL	1	ion	Co
ICP-MS	55 amu	10 ppt	n/a	M+	$^{40}Ar^{14}N^1H$, $^{39}K^{16}O$, $^{37}Cl^{18}O$, $^{40}Ar^{14}N$, $^{38}Ar^{17}O$, $^{38}Ar^{16}O^1H$, $^{38}Ar^{16}O^1H$, $^{37}Cl^{17}O^1H$, $^{23}Na^{32}S$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 09/01/2005 VDS
DATE OPENED: 01/20/04
INORG: 4434 PO: F52301

010284

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 **IV Shelf Life** - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 **Expiration Date** - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 04, 2003

Expiration Date: EXPIRES 1 FEB 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010285

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Vanadium in 1.4% HNO_3 (abs)

Catalog Number: CGV1-1, CGV1-2 and CGV1-5

Lot Number: **T-V02032**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03
DATE EXPIRED: 12/1/2004 OR
DATE OPENED: 11/5/03
INORG: 4321 PO: F52258

Starting Material:	Vanadium Pentoxide
Starting Material Purity:	99.999%
Starting Material Lot No:	46

CERTIFIED CONCENTRATION: 990 ± 2 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 993 ± 4 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 990 ± 2 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3165.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Al	0.0095	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.042	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	0.0089	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	i	Mn		M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	0.016	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	0.00055
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	0.00024	O	Si	<0.030	M	U	0.0011
M	Ce	<0.00050	O	In	<0.070	n	Os		M	Ag	0.00044	s	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
O	Cr	<0.020	O	Fe	<0.050	I	P		M	Sr	<0.000050	M	Y	<0.0040
O	Co	<0.050	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0041
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.015 g/mL

(over)

QA:KL Rev.082202DN

Paul R. Haines
Quality Assurance Manager

EXPIRES
Expires: 12/2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO Guide 25 A2LA .Accredited (Certificate Number 0883-01)
3. MIL-STD-45662A
4. 10CFR50 Appendix B
5. 10CFR21

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

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inorganic ventures / iv labs

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certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade **1000 µg/mL Zinc in 1.4% (abs) HNO_3**

Catalog Number:	CGZN1-1, CGZN1-2, and CGZN1-5
Lot Number:	**W-ZN02018**
Starting Material:	Zn shot
Starting Material Purity (%):	99.999889
Starting Material Lot No	J17L26
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 1002
DATE EXPIRED: 12/1/2004
DATE OPENED: 11/5/03
INORG: 4319 PO: F55258

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1006 ± 3 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma e_i s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
ΣS = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1002 ± 6 µg/mL**
ICP Assay NIST SRM 3168a Lot Number: 001402

Assay Method #2 **1006 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00200	M Dy < 0.02440	O Li 0.00001	M Pr < 0.00122	M Te < 0.12198
M Sb < 0.00203	M Er < 0.02033	M Lu < 0.00163	M Re < 0.00407	M Tb < 0.00122
M As < 0.04066	M Eu < 0.01220	O Mg 0.00011	M Rh < 0.00407	M Tl < 0.00407
M Ba < 0.04066	M Gd < 0.00407	M Mn < 0.01626	M Rb < 0.00407	M Th < 0.00407
M Be < 0.00203	M Ga < 0.00407	O Hg < 0.01000	M Ru < 0.00813	M Tm < 0.00163
M Bi < 0.00163	M Ge < 0.02440	M Mo < 0.00813	M Sm < 0.00407	M Sn < 0.02033
O B 0.00015	M Au < 0.01220	M Nd < 0.00813	M Sc < 0.04066	M Ti < 0.20331
M Cd < 0.01220	M Hf < 0.00813	O Ni 0.00009	M Se < 0.03253	M W < 0.04066
O Ca 0.00022	M Ho < 0.00203	M Nb < 0.00203	O Si < 0.00400	M U < 0.00813
M Ce < 0.02033	M In < 0.04066	n Os	M Ag < 0.00813	M V < 0.00813
M Cs < 0.00122	M Ir < 0.02033	M Pd < 0.02033	O Na 0.00055	M Yb < 0.00407
O Cr < 0.00100	O Fe 0.00005	O P < 0.00300	M Sr < 0.00203	M Y < 0.16264
M Co < 0.01220	M La < 0.00203	M Pt < 0.00813	O S < 0.02000	s Zn
O Cu < 0.00050	M Pb < 0.01220	O K 0.00018	M Ta < 0.02846	M Zr < 0.02033

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39; +2; 4; $Zn(OH)_4^{2-}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media that promotes the formation of insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Zn Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3); Organic based (Dry ash at 450°C and dissolve ash in HCl) (Sulfuric/peroxide acid digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.		Order	Type	Interferences (underlined indicates severe interferences.)
ICP-OES	213.856 nm	0.002 / 0.0004 µg/mL	1	atom		Ni, Cu, V
ICP-OES	202.548 nm	0.004 / 0.0002 µg/mL	1	ion		Nb, Cu, Co, Hf
ICP-OES	206.200 nm	0.006 / 0.0006 µg/mL	1	ion		Sb, Ta, Bi, Os
ICP-MS	66 amu	7 ppt		n/a	M+	$^{50}Ti^{16}O$, $^{50}Cr^{16}O$, $^{50}V^{16}O$, $^{34}S^{16}O_2$, $^{32}S^{16}O^{16}O$, $^{32}S^{16}O_2$, $^{32}S^{16}O^{16}O$, $^{32}S^{32}S$, $^{32}S_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010290

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 02, 2003

Expiration Date:

EXPIRES
1 Dec 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 2 of 2
DATE EXPIRED: 12/1/2004 PR
DATE OPENED: 11/5/03
INORG: 4319 PO: F52258

010291

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
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certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Silver in 3.5% HNO_3 (abs)

Catalog Number: CGAG1-1, CGAG1-2 and CGAG1-5

Lot Number: **T-AG02015**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004 VOID
DATE OPENED: 08/26/03
INORG: 4222 PO: E52224

Starting Material:	Silver Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	F15102

CERTIFIED CONCENTRATION: 1001 ± 2 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1004 ± 3 µg/mL
Method: Volhard Titration vs NIST SRM 999a Potassium Chloride

Instrument Analysis: 1001 ± 2 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3151.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	<0.00010	M	Dy	<0.00060	O	Li	<0.000030	M	Pr	<0.000030	O	Te	<0.030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.0050	M	Eu	<0.00030	O	Mg	<0.000040	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00030	M	Rb	<0.00010	M	Th	<0.00010
O	Be	<0.00050	M	Ga	<0.00010	O	Hg	0.00090	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.0020	O	Au	<0.012	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00070
O	Cd	<0.0020	M	Hf	<0.00020	O	Ni	<0.0070	O	Se	<0.036	M	W	<0.0010
O	Ca	<0.000050	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.0030	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.020	n	Os		s	Ag		M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
O	Cr	<0.0020	O	Fe	<0.00070	O	P	<0.030	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.020	O	Zn	<0.0010
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0060	M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.024 g/mL

QA:KL Rev.08210200

Paul R. Haines

Quality Assurance Manager

Expires:

EXPIRES
1 SEP 2004

010292

QUALITY STANDARD DOCUMENTATION

1.ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)
Members of IQ Net : Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (COS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

2.ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3.ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4.MIL-STD-45662A
5.10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6.10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance
Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life -The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date -The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010293

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Arsenic in 1.4% (abs) HNO_3**

Catalog Number:	CGAS1-1, CGAS1-2, and CGAS1-5
Lot Number:	**W-AS02022**
Starting Material:	POLYCRYSTALINE LUMP
Starting Material Purity (%):	99.998994
Starting Material Lot No	23115
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 VD
DATE OPENED: 01/20/04
INORG: 4433 PO: F52301

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1014 ± 3 µg/mL

Certified Density: 1.012 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1014 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3103a Lot Number: 891003

Assay Method #2 **1008 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00038	M	Dy	< 0.01596	O	Li	0.00009	M	Pr	< 0.00080	M	Te	< 0.07978
O	Sb	< 0.01000	M	Er	< 0.01330	M	Lu	< 0.00106	O	Re	< 0.01000	M	Tb	< 0.00080
s	As		M	Eu	< 0.00798	O	Mg	0.00009	M	Rh	< 0.00266	M	Tl	< 0.00266
M	Ba	< 0.02660	M	Gd	< 0.00266	O	Mn	< 0.00003	M	Rb	< 0.00266	M	Th	< 0.00266
M	Be	< 0.00133	M	Ga	< 0.00266	O	Hg	< 0.01200	M	Ru	< 0.00532	M	Tm	< 0.00106
M	Bi	< 0.00106	M	Ge	< 0.01596	M	Mo	< 0.00532	M	Sm	< 0.00266	O	Sn	0.00049
O	B	< 0.01200	M	Au	< 0.00798	M	Nd	< 0.00532	M	Sc	< 0.02660	M	Ti	< 0.13297
M	Cd	< 0.00798	M	Hf	< 0.00532	M	Ni	< 0.02128	M	Se	< 0.02128	M	W	< 0.02660
O	Ca	0.00189	M	Ho	< 0.00133	O	Nb	< 0.00200	O	Si	0.00415	M	U	< 0.00532
M	Ce	< 0.01330	M	In	< 0.02660	n	Os		M	Ag	< 0.00532	M	V	< 0.00532
M	Cs	< 0.00080	M	Ir	< 0.01330	M	Pd	< 0.01330	O	Na	0.00159	M	Yb	< 0.00266
M	Cr	< 0.01330	O	Fe	< 0.00110	O	P	< 0.00260	M	Sr	< 0.00133	M	Y	< 0.10638
M	Co	< 0.00798	M	La	< 0.00133	M	Pt	< 0.00532	O	S	< 0.02500	O	Zn	0.00057
M	Cu	< 0.01596	M	Pb	< 0.00798	O	K	0.00132	M	Ta	< 0.01862	M	Zr	< 0.01330

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.9216; mix of +3 and +5; 6; H_3AsO_4 and $HAsO_2$

Chemical Compatibility - Arsenic has no cationic chemistry. It is soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices water and NH_4OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

As Containing Samples (Preparation and Solution) - As° (soluble in 1:1 H_2O / HNO_3). Oxides (the oxide exists in crystalline and amorphous forms where the amorphoric form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled). Minerals (One gram of powered sample is fused in a Ni° crucible with 10 grams of a 1:1 mix of K_2CO_3 and KNO_3 and the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of the sample are fused with 15 grams of a 1:1 Na_2CO_3 / Na_2O_2 mix in a Ni° crucible. The fuseate is extracted with water and acidified with HNO_3)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at <1ppm conc.)
ICP-OES	189.042 nm	0.05 / 0.005 µg/mL	1	atom	Cr
ICP-OES	193.696 nm	0.1 / 0.01 µg/mL	1	atom	V, Ge
ICP-OES	228.812 nm	0.1 / 0.01 µg/mL	1	atom	Cd, Pt, Ir, Co
ICP-MS	75 amu	20 ppt	n/a	M+	$^{40}Ar^{35}Cl$, $^{59}Co^{16}O$, $^{38}Ar^{37}Ar^{1}H$, $^{38}Ar^{37}Cl$, $^{39}Ar^{36}K$, $^{150}Nd^{2+}$, $^{150}Sm^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 V03
DATE OPENED: 01/20/04
INORG: 4433 PO: F52301

010296

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 01, 2003

Expiration Date: EXPIRES 1 E 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010297

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/3/03
DATE EXPIRED: 11/1/04
DATE OPENED: 11/3/03 DL
INORG: 4313 PO: 252258

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Lead in 0.35% (abs) HNO_3**

Catalog Number:	CGPB1-1, CGPB1-2, and CGPB1-5
Lot Number:	**W-PB02114**
Starting Material:	Pb(NO3)2
Starting Material Purity (%):	99.999974
Starting Material Lot No	22150
Matrix:	0.35% (abs) HNO_3

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1006 ± 2 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

The Certified Value is the wet assay value. The following equations are used in the calculations of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

$\bar{x}$ = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1005 ± 2 µg/mL**
ICP Assay NIST SRM 3128 Lot Number: 991504

Assay Method #2 **1006 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00270	M Dy < 0.01193	O Li < 0.00002	M Pr < 0.00060	M Te < 0.05965
M Sb < 0.00099	M Er < 0.00994	M Lu < 0.00080	M Re < 0.00199	M Tb < 0.00060
M As < 0.01989	M Eu < 0.00597	O Mg 0.00008	O Rh < 0.00900	O Tl 0.00130
M Ba < 0.01989	M Gd < 0.00199	M Mn < 0.00795	M Rb < 0.00199	M Th < 0.00199
M Be < 0.00099	M Ga < 0.00199	O Hg < 0.01500	M Ru < 0.00398	M Tm < 0.00080
O Bi < 0.02000	M Ge < 0.01193	M Mo < 0.00398	M Sm < 0.00199	M Sn < 0.00994
O B < 0.04000	M Au < 0.00597	M Nd < 0.00398	M Sc < 0.01989	M Ti < 0.09942
M Cd < 0.00597	M Hf < 0.00398	M Ni < 0.01591	M Se < 0.01591	M W < 0.01989
O Ca 0.00009	M Ho < 0.00099	M Nb < 0.00099	O Si < 0.00340	M U < 0.00398
M Ce < 0.00994	M In < 0.01989	n Os	M Ag < 0.00398	M V < 0.00398
M Cs < 0.00060	M Ir < 0.00994	M Pd < 0.00994	O Na < 0.00600	M Yb < 0.00199
M Cr < 0.00994	O Fe 0.00011	O P < 0.00500	M Sr < 0.00099	M Y < 0.07954
M Co < 0.00597	M La < 0.00099	M Pt < 0.00398	O S < 0.10000	M Zn < 0.03977
M Cu < 0.01193	s Pb	O K < 0.00180	M Ta < 0.01392	M Zr < 0.00994

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 207.2; +2; 6; $Pb(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, HF and HNO_3. Avoid H_2SO_4. Stable with most metals and inorganic anions forming insoluble carbonate, borate, sulfate, sulfite, sulfide, phosphate, oxalate, chromate, tannate, iodate, and cyanide in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Pb Containing Samples (Preparation and Solution) - Metal (Best dissolved in 1:1 H_2O / HNO_3); Oxides (The many different Pb oxides are soluble in HNO_3 with the exception of PbO_2 which is soluble in HCl or HF); Ores and Alloys (Best attacked using 1:1 H_2O / HNO_3); Organic Matrices (Dry ash and dissolve in dilute HCl.).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤5ppcs.)
ICP-OES 168.215 nm	0.03 / 0.003 µg/mL	1	ion	Co
ICP-OES 220.353 nm	0.04 / 0.006 µg/mL	1	ion	Bi, Nb
ICP-OES 217.000 nm	0.09 / 0.03 µg/mL	1	atom	W, Ir, Hf, Sb, Th
ICP-MS 208 amu	5 ppt	n/a	M+	$^{192}Pt^{16}O$, $^{192}Os^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

010300

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/3/03
DATE EXPIRED: 11/1/04 DM
DATE OPENED: 11/3/03
INORG: 4313 PO: F52058

Certification Date: January 23, 2003

Expiration Date: EXPIRES NOV 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Antimony in 0.7% (abs) HNO_3 / 3% Tartaric Acid**

Catalog Number:	CGSB1-1, CGSB1-2 and CGSB1-5
Lot Number:	**W-SB02078**
Starting Material:	Sb shot
Starting Material Purity (%):	99.989188
Starting Material Lot No	D17L24
Matrix:	0.7% (abs) HNO_3 / 3% Tartaric Acid

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 1.019 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1005 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3102a Lot Number: 990707

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VIS
DATE OPENED: 02/25/04
INORG: 4404 PO: E52323

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.04519	M	Dy	< 0.00597	O	Li	0.00004	M	Pr	< 0.00030	M	Te	< 0.02983
S	Sb		M	Er	< 0.00497	M	Lu	< 0.00040	M	Re	< 0.00099	M	Tb	< 0.00030
M	As	< 0.00994	M	Eu	< 0.00298	O	Mg	0.00171	M	Rh	< 0.00099	M	Tl	0.00040
O	Ba	0.00003	M	Gd	< 0.00099	O	Mn	0.00321	M	Rb	< 0.00099	M	Th	< 0.00099
O	Be	< 0.00001	M	Ga	< 0.00099	O	Hg	< 0.01500	M	Ru	< 0.00199	M	Tm	< 0.00040
M	Bi	0.00170	M	Ge	< 0.00597	M	Mo	< 0.00199	M	Sm	< 0.00099	M	Sn	0.00050
O	B	0.00100	M	Au	< 0.00298	M	Nd	< 0.00199	O	Sc	< 0.00016	O	Ti	0.00131
M	Cd	< 0.00298	M	Hf	< 0.00199	O	Ni	0.00100	M	Se	< 0.49711	M	W	< 0.00994
O	Ca	0.00884	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	0.00502	M	U	< 0.00199
O	Ce	< 0.00300	M	In	< 0.00994	n	Os		M	Ag	< 0.00199	M	V	< 0.00199
M	Cs	< 0.00030	M	Ir	< 0.00497	M	Pd	< 0.00497	O	Na	0.00362	M	Yb	< 0.00099
O	Cr	0.00954	O	Fe	0.01306	O	P	< 0.04000	M	Sr	< 0.00050	M	Y	< 0.03977
M	Co	< 0.00298	O	La	< 0.00120	M	Pt	< 0.00199	I	S		O	Zn	0.00141
O	Cu	0.00321	M	Pb	0.00060	O	K	0.01004	M	Ta	< 0.00696	M	Zr	< 0.00497

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 121.75; +3 ; 6; $Sb(O)C_4H_4O_6^-$
Chemical Compatibility - Stable in concentrated HCl, dilute or concentrated HF. Stable in dilute HNO_3 as the fluoride or tartrate complex. Avoid basic media. Stable with most metals and inorganic anions in acidic media as the tartrate provided the acidity is not too high or the acid is oxidizing causing loss of the stabilizing tartrate ion. The fluoride complex of antimony is stable in strong acid but you should only mix with other metals that are fluorinated.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-2% HNO_3 / LDPE container.
Sb Containing Samples (Preparation and Solution) - Metal and alloys (Soluble in H_2O / HF / HNO_3 mixture); Oxides (Soluble in HCl and tartaric acid or H_2O / HF / HNO_3 mixtures); Ores (Fusion with Na_2CO_3 in Pt[a] followed by dissolving the fuseate in a H_2O / HF / HNO_3 mixture); Organic based (Sulfuric acid / hydrogen peroxide digestion)
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe et «Borcs.)
ICP-OES 206.833 nm	0.03 / 0.003 µg/mL	1	atom	Ta, Cr, Ge, Hf
ICP-OES 217.581 nm	0.05 / 0.005 µg/mL	1	atom	Nb, W, Re, Fe,
ICP-OES 231.147 nm	0.06 / 0.006 µg/mL	1	atom	Ni, Co ,Pt
ICP-MS 121 amu	5 ppt	n/a	M+	$^{105}Pd^{16}O$, $^{89}Y^{16}O_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

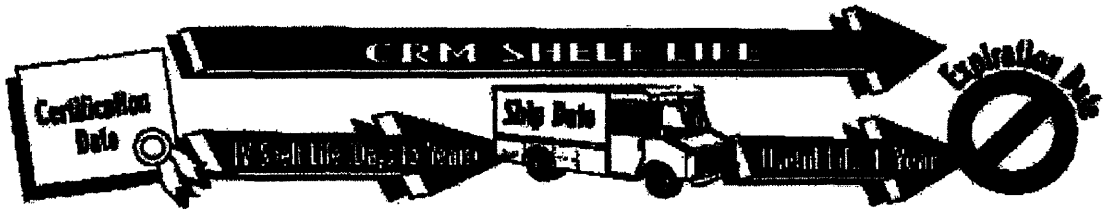
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 44604 PO: F52393

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 23, 2003

Expiration Date: EXPIRES 1M2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010305

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Selenium in 1.4% (abs) HNO_3**

Catalog Number:	CGSE1-1, CGSE1-2, and CGSE1-5
Lot Number:	**T-SE01102**
Starting Material:	Se shot
Starting Material Purity (%):	99.9971
Starting Material Lot No	C09L08
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004 VOS
DATE OPENED: 06/23/03
INORG: 4152 PO: 152370

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 995 ± 3 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

"Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **995 ± 3 µg/mL (Avg. 2 runs)**
ICP Assay NIST SRM 3149 Lot Number: 992106

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00017	M	Dy	< 0.01196	O	Li	< 0.00003	M	Pr	< 0.00060	M	Te	< 0.05981
M	Sb	0.00160	M	Er	< 0.00997	M	Lu	< 0.00080	O	Re	< 0.00900	M	Tb	< 0.00060
O	As	< 0.00500	M	Eu	< 0.00598	O	Mg	< 0.00003	M	Rh	< 0.00199	M	Tl	< 0.00199
M	Ba	< 0.01994	M	Gd	< 0.00199	M	Mn	< 0.00798	M	Rb	< 0.00199	M	Th	< 0.00199
O	Be	< 0.00009	M	Ga	< 0.00199	O	Hg	0.01950	O	Ru	0.00220	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01196	O	Mo	< 0.00400	M	Sm	< 0.00199	M	Sn	< 0.00997
O	B	< 0.00006	M	Au	< 0.00598	M	Nd	< 0.00399	M	Sc	< 0.01994	M	Ti	< 0.09969
M	Cd	< 0.00598	M	Hf	< 0.00399	O	Ni	< 0.00090	S	Se		M	W	< 0.01994
O	Ca	0.00200	M	Ho	< 0.00100	O	Nb	< 0.00400	O	Si	0.00055	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01994	n	Os		M	Ag	0.00070	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	0.00355	M	Yb	< 0.00199
M	Cr	< 0.00997	O	Fe	0.00060	O	P	< 0.00300	M	Sr	< 0.00100	M	Y	< 0.07975
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	O	S	0.00500	M	Zn	< 0.03988
M	Cu	< 0.01196	M	Pb	< 0.00598	O	K	0.00070	M	Ta	< 0.01396	O	Zr	< 0.00040

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4 °C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96; +4; 6; H_2SeO_3

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels - stable for months alone or mixed with other elements at equivalent levels - in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Se Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Readily soluble in water); Minerals and alloys (Acid digestion with HNO_3 or HNO_3 / HF); Organic Matrices (Acid digestion with hot concentrated H_2SO_4 accompanied by the careful dropwise addition of H_2O_2 until clear)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at [illegible])
ICP-OES	196.026 nm	0.08 / 0.006 µg/mL	1	atom	Fe
ICP-OES	203.985 nm	0.2 / 0.05 µg/mL	1	atom	Sb, Ir, Cr, Ta
ICP-OES	206.279 nm	0.3 / 0.16 µg/mL	1	atom	Cr, Pt
ICP-MS	82 amu	200 ppt	n/a	M⁺	$^{12}C^{35}Cl_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS pg. 2 of 3
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4152 PO: F52370

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010308

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: November 27, 2002

Expiration Date: EXPIRES 01 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, QA Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010309

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Thallium in 0.5% (abs) HNO_3**

Catalog Number:	CGTL1-1, CGTL1-2, and CGTL1-5
Lot Number:	**W-QTL01094**
Starting Material:	TLNO3
Starting Material Purity (%):	99.996539
Starting Material Lot No	22928
Matrix:	0.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS P3-2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 V03
DATE OPENED: 01/20/04
INORG: 4435 PO: F52301

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1001 ± 4 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1001 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3158 Lot Number: 993012

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Al < 0.01000	M Dy < 0.00600	O Li < 0.00002	M Pr < 0.00030	M Te < 0.03000
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.01000	M Eu < 0.00300	O Mg 0.00012	M Rh < 0.00100	s Tl
M Ba < 0.01000	M Gd < 0.00100	M Mn < 0.00400	M Rb < 0.00100	M Th < 0.00100
M Be < 0.00050	M Ga < 0.00100	O Hg < 0.01200	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00600	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
O B < 0.00140	M Au < 0.00300	M Nd < 0.00200	M Sc < 0.01000	M Ti < 0.05000
O Cd 0.00150	M Hf < 0.00200	M Ni < 0.00800	M Se < 0.00800	M W < 0.01000
O Ca 0.00085	M Ho < 0.00050	M Nb < 0.00050	O Si < 0.00340	M U < 0.00200
M Ce < 0.00500	M In < 0.01000	n Os	M Ag 0.04000	M V < 0.00200
M Cs < 0.00030	M Ir < 0.00500	M Pd < 0.00500	O Na 0.00050	M Yb < 0.00100
M Cr < 0.00500	O Fe 0.00030	O P < 0.00260	M Sr < 0.00050	M Y < 0.04000
M Co < 0.00300	M La < 0.00050	M Pt < 0.00200	O S < 0.03000	O Zn 0.00110
M Cu < 0.00600	M Pb 0.00210	O K < 0.00180	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

010311

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do nd return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 204.383; +1; 6; $Tl(H_2O)_6^{+}$

Chemical Compatibility - Soluble in HCl, HNO_3, and H_2SO_4. Stable with most metals and inorganic anions. The sulfite, thiocyanate and oxalate are moderately soluble; the phosphate and arsenite are slightly soluble and the sulfide is insoluble.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Tl Containing Samples (Preparation and Solution) - Metal (Best dissolved in HNO_3 which forms chiefly the Tl^{+} ion.); Oxide (The thallous oxide is readily soluble in water. The thallic oxide requires high levels of acid); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppms.)
ICP-OES	190.864 nm	0.04 / 0.004 µg/mL	1	ion	V, Ti
ICP-OES	276.787 nm	0.1 / 0.01 µg/mL	1	atom	Te, V, Fe, Cr
ICP-OES	351.924 nm	0.2 / 0.02 µg/mL	1	atom	Th, Ce, Zr
ICP-MS	205 amu	2 ppt	n/a	M+	$^{189}Os^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 V05
DATE OPENED: 01/20/04
INORG: 4435 PO: F52301

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010312

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: December 09, 2003

Expiration Date: EXPIRES 1 FEB 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, Production Manager	Debbie Newman
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010313

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Lanthanum in 1.4% HNO_3 (abs)

Catalog Number: CGLA1-1 and CGLA1-5

Lot Number: **T-QLA01057**

Starting Material:	Lanthanum Oxide
Starting Material Purity:	99.999%
Starting Material Lot No:	LA-0-5-017

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004 003
DATE OPENED: 08/26/03
INORG: 4221 PO: E53224

CERTIFIED CONCENTRATION: 1002 ± 3 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value $(\bar{x}) = \frac{\sum x_i}{n}$ Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1002 ± 3 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1007 ± 3 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3127a.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	<0.040	M	Dy	<0.00060	M	Li	<0.0010	O	Pr	<0.020	M	Te	<0.0030
M	Sb	<0.000050	M	Er	0.0010	M	Lu	0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
O	Ba	<0.020	M	Gd	0.039	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.030	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	0.00040	M	Sn	<0.00050
O	B	<0.020	M	Au	<0.00030	M	Nd	0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	0.00010	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
i	Ce		O	In	<0.030	n	Os		M	Ag	<0.00020	M	V	<0.00020
n	Cs		M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	O	P	<0.050	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	s	La		M	Pt	<0.00020	n	S		M	Zn	<0.0020
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.009 g/mL (over)

QA:KSL Rev.121702DN

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 1 SEP 2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010315

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Palladium in 3.3% (abs) HCL**

Catalog Number:	CGPD1-1 and CGPD1-5
Lot Number:	**W-PD02019**
Starting Material:	Pd(NO3)2
Starting Material Purity (%):	99.999248
Starting Material Lot No	11974A-00
Matrix:	3.3% (abs) HCL

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 03/01/04
DATE EXPIRED: 03/01/2005 YDS
DATE OPENED: 03/01/04
INORG: 4377 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 994 ± 3 µg/mL

Certified Density: 1.022 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **994 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3138 Lot Number: 990207

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00400	M	Dy	< 0.00060	O	Li	< 0.04000	M	Pr	< 0.00003	O	Te	< 0.01300
O	Sb	< 0.00500	M	Er	< 0.00050	M	Lu	< 0.00004	M	Re	< 0.00010	M	Tb	< 0.00003
O	As	< 0.01400	M	Eu	< 0.00030	O	Mg	< 0.01100	O	Rh	< 0.00600	M	Tl	< 0.00010
M	Ba	< 0.00100	M	Gd	< 0.00010	O	Mn	< 0.00650	M	Rb	< 0.00010	M	Th	< 0.00010
O	Be	< 0.00009	M	Ga	< 0.00010	O	Hg	< 0.01100	O	Ru	< 0.00200	M	Tm	< 0.00004
M	Bi	< 0.00004	M	Ge	< 0.00060	M	Mo	< 0.00020	M	Sm	< 0.00010	O	Sn	< 0.00700
O	B	< 0.00090	O	Au	< 0.00300	M	Nd	< 0.00020	O	Sc	< 0.00009	O	Ti	< 0.00100
O	Cd	< 0.00600	M	Hf	< 0.00020	O	Ni	0.01800	M	Se	< 0.00080	M	W	< 0.00100
O	Ca	0.00700	M	Ho	< 0.00005	M	Nb	< 0.00005	O	Si	0.00600	M	U	< 0.00020
M	Ce	< 0.00050	O	In	< 0.03300	n	Os		O	Ag	< 0.00670	M	V	< 0.00020
M	Cs	< 0.00003	M	Ir	< 0.00050	S	Pd		O	Na	0.01500	M	Yb	< 0.00010
O	Cr	0.00450	O	Fe	0.04600	O	P	0.00600	M	Sr	< 0.00005	M	Y	< 0.00400
M	Co	< 0.00030	M	La	< 0.00005	O	Pt	< 0.00600	O	S	< 0.02500	O	Zn	< 0.00060
O	Cu	0.00360	M	Pb	< 0.00030	O	K	< 0.02000	M	Ta	< 0.00070	M	Zr	< 0.00050

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 106.42; +2; 6; $Pd(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media. Avoid contact with water soluble organics such as aldehydes since Pd^{2+} is easily reduced.
Stability - 2-100 ppb levels. 2ppb Pd is stable for 1 day in 1% HNO_3 / LDPE container. 10 ppb is stable for 3 days in 1% HNO_3 / LDPE container. 100 ppb is stable for 6 months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Pd Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3 or Aqua Regia); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤5ppm.)
ICP-OES	340.458 nm	0.04 / 0.003 µg/mL	1	atom	Ce, Th, Zr
ICP-OES	363.470 nm	0.05 / 0.007 µg/mL	1	atom	
ICP-OES	229.651 nm	0.07 / 0.004 µg/mL	1	ion	Co
ICP-MS	105 amu	2 ppt	n/a	M+	$^{89}Y^{16}O$, $^{40}Ar^{65}Cu$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 14, 2003

Expiration Date:

EXPIRES
01/2005

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 03/01/04
DATE EXPIRED: 03/01/2005 VD
DATE OPENED: 03/01/04
INORG: 4477 PO: F52323

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul Gaines

010319

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Sulfur in H_2O**

Catalog Number:	CGS1-1 and CGS1-5
Lot Number:	**W-QS01098**
Starting Material:	H_2SO_4
Starting Material Purity (%):	99.999965
Starting Material Lot No	N38818
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 1 of 2
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4317 PO: F52258

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1010 ± 2 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value $(\bar{x}) = \frac{\Sigma x_i}{n}$

Uncertainty $(\pm) = \frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 8 µg/mL**
ICP Assay NIST SRM 3154 Lot Number: 892205

Assay Method #2 **1010 ± 2 µg/mL**
Acidimetric NIST SRM 84k Lot Number: 84k

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00025	M Dy < 0.01197	O Li < 0.00016	M Pr < 0.00060	M Te < 0.05984
M Sb < 0.00100	M Er < 0.00997	M Lu < 0.00080	M Re < 0.00200	M Tb < 0.00060
M As < 0.01995	M Eu < 0.00598	O Mg < 0.00004	M Rh < 0.00200	M Tl < 0.00200
M Ba < 0.01995	M Gd < 0.00200	M Mn < 0.00798	M Rb < 0.00200	M Th < 0.00200
O Be < 0.00200	M Ga < 0.00200	O Hg < 0.01100	M Ru < 0.00399	M Tm < 0.00080
M Bi < 0.00080	M Ge < 0.01197	M Mo < 0.00399	M Sm < 0.00200	M Sn < 0.00997
O B < 0.00990	M Au < 0.00598	M Nd < 0.00399	M Sc < 0.01995	M Ti < 0.09974
M Cd < 0.00598	M Hf < 0.00399	O Ni < 0.00230	O Se < 0.00620	M W < 0.01995
O Ca 0.00020	M Ho < 0.00100	M Nb < 0.00100	O Si < 0.00410	M U < 0.00399
M Ce < 0.00997	M In < 0.01995	n Os	M Ag < 0.00399	M V < 0.00399
M Cs < 0.00060	M Ir < 0.00997	M Pd < 0.00997	O Na < 0.00010	M Yb < 0.00200
M Cr < 0.00997	O Fe 0.00015	O P < 0.00480	M Sr < 0.00100	M Y < 0.07979
M Co < 0.00598	M La < 0.00100	M Pt < 0.00399	s S	O Zn 0.00125
M Cu < 0.01197	M Pb < 0.00598	O K < 0.00170	M Ta < 0.01396	M Zr < 0.00997

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 32.066; +6; 6; $(O=)_2S(OH)_2$

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4 and HF aqueous matrices water and NH_4OH. Stable with all metals and inorganic anions at low to moderate ppm levels under acidic conditions except Ba and Pb and to a lesser extent Sr, and Ca.

Stability - 2-100 ppb levels - stability unknown - in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in LDPE container.

S Containing Samples (Preparation and Solution) - We most often get questions about the determination of S in Rocks, Silicates and insoluble sulfates (the finely powered sample is fused in a Pt* crucible with 6* times its weight of Na_2CO_3 + 0.5 grams KNO_3. The fuseate is extracted with water. Any $BaSO_4$ present in the sample is transposed by the carbonate fusion to the $BaCO_3$ which is left behind in the water-insoluble residue. If $PbSO_4$ is present the fuseate should be boiled with a sodium carbonate saturated with CO_2 solution for 1 hour or more where the $PbSO_4$ will be transposed to the water insoluble carbonate which can be filtered off. Boiling the fuseate with a saturated carbonate solution is good insurance for samples containing Ba, Sr, and Ca. The Ba, Pb, Sr, Ca, free filtrate can be acidified and measured by ICP.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≥ppm cs.)
ICP-OES	166.669nm	0.2 / 0.19 µg/mL	1	atom	Si, B
ICP-OES	182.034 nm	0.3 / 0.024 µg/mL	1	atom	
ICP-OES	143.328 nm	0.4 / 0.035 µg/mL	1	atom	
ICP-MS	32 amu	30,000 ppt	n/a	M$^+$	$^{16}O_2$, $^{14}N^{16}O$, $^{15}N^{17}O$, $^{14}N^{17}O^1H$, $^{15}N^{16}O^1H$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

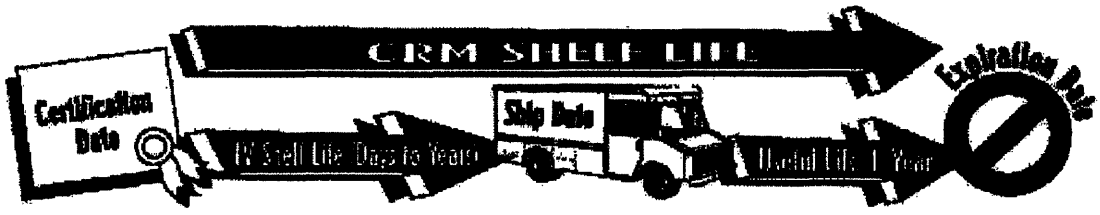
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

010322

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 282
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4317 PO: F52358

Certification Date: August 27, 2003

Expiration Date: EXPIRES 12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010323

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Thorium in 3% HNO_3 (abs)

Catalog Number: CGTH1-1 and CGTH1-5

Lot Number: **T-TH01059**

Starting Material:	Thorium Nitrate
Starting Material Purity:	99.999%
Starting Material Lot No:	C01L32

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/08/03
DATE EXPIRED: 11/01/2004 V05
DATE OPENED: 10/08/03
INORG: 4383 PO: F50340

CERTIFIED CONCENTRATION: 1001 ± 3 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value $(\bar{x}) = \frac{\sum x_i}{n}$ Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1001 ± 3 µg/mL
Method: EDTA Titration vs NIST SRM Lead Nitrate.

Instrument Analysis: 1002 ± 4 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3159.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	<0.00090	M	Dy	0.0062	O	Li	<0.000030	M	Pr	0.00037	O	Te	<0.031
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.014	M	Eu	<0.00030	O	Mg	<0.000060	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	0.0050	M	Gd	0.0054	O	Mn	<0.0000030	M	Rb	<0.00010	s	Th	
O	Be	<0.00020	M	Ga	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	0.0095	M	Sn	<0.00050
O	B	<0.00060	M	Au	<0.00030	M	Nd	0.0026	M	Sc	<0.0010	O	Ti	<0.00092
O	Cd	<0.0045	M	Hf	<0.00020	O	Ni	<0.0023	M	Se	<0.010	M	W	<0.0010
O	Ca	<0.030	M	Ho	0.00022	M	Nb	<0.000050	O	Si	<0.0034	M	U	0.074
M	Ce	<0.00050	O	In	<0.0020	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.00010	M	Yb	<0.00010
O	Cr	<0.00080	O	Fe	<0.0011	i	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.072	O	Zn	<0.00058
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0017	M	Ta	<0.00070	M	Zr	0.0085

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.022 g/mL

QA:KL Rev.050802DN

(over)

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Paul R. Haines
Quality Assurance Manager

EXPIRES
01 NOV 2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010325

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Uranium in 1% (abs) HNO_3**

Catalog Number:	CGU1-1 and CGU1-5
Lot Number:	**W-U01059**
Starting Material:	UO2(NO3)2.6H2O
Starting Material Purity (%):	99.994419
Starting Material Lot No	RB0018
Matrix:	1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4473 PO: F52393

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 997 ± 2 µg/mL

Certified Density: 1.021 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **997 ± 2 µg/mL**
ICP Assay NIST SRM 3164 Lot Number: 891509

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Al	0.05166	M	Dy	< 0.01494	M	Li	< 0.02490	M	Pr	< 0.00075	M	Te	< 0.07470
M	Sb	< 0.00125	M	Er	< 0.01245	M	Lu	< 0.00100	M	Re	< 0.00249	M	Tb	0.00003
M	As	< 0.02490	M	Eu	< 0.00747	M	Mg	< 0.07470	M	Rh	< 0.00249	M	Tl	< 0.00249
M	Ba	< 0.02490	M	Gd	0.00310	M	Mn	0.00083	M	Rb	< 0.00249	M	Th	< 0.00249
M	Be	< 0.00125	M	Ga	< 0.00249	i	Hg		M	Ru	< 0.00498	M	Tm	< 0.00100
M	Bi	< 0.00100	M	Ge	< 0.01494	M	Mo	0.00093	M	Sm	0.00010	O	Sn	< 0.10000
M	B	< 0.17429	M	Au	< 0.00747	M	Nd	< 0.00498	M	Sc	< 0.02490	M	Ti	0.00258
M	Cd	0.00103	M	Hf	< 0.00498	M	Ni	< 0.01992	M	Se	< 0.01992	M	W	< 0.02490
O	Ca	0.05395	M	Ho	0.00052	M	Nb	< 0.00125	i	Si		s	U	
M	Ce	0.00010	M	In	< 0.02490	n	Os		M	Ag	< 0.00498	M	V	< 0.00498
M	Cs	< 0.00075	M	Ir	< 0.01245	M	Pd	< 0.01245	O	Na	0.00664	M	Yb	< 0.00249
M	Cr	< 0.01245	M	Fe	< 0.49798	i	P		M	Sr	< 0.00125	M	Y	0.00062
M	Co	< 0.00747	M	La	0.00145	M	Pt	< 0.00498	i	S		M	Zn	0.00114
M	Cu	0.00072	M	Pb	0.00217	i	K		M	Ta	< 0.01743	M	Zr	< 0.01245

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

010327

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do nd return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 238.0289; +6; 8; UO_2^{2+} (uranyl)

Chemical Compatibility - Soluble in HCl and HNO_3. Avoid H_3PO_4. H_2SO_4 and HF matrices should not be a problem depending upon [U]. Although the UO_2^{2+} ion is distinctly basic, any U^{4+} will precipitate in basic media. UO_2^{2+} salts are generally soluble in water and UO_2^{2+} is stable with most metals and inorganic anions. The uranyl phosphate is insoluble in water. UF_4 and UF_6 are water soluble.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

U Containing Samples (Preperation and Solution) - Metal (Dissolves rapidly in HCl and HNO_3); Oxide (Soluble in HNO_3); Ores (Digest for 1-2 hours with 1 gram of ore to 30 mL 1:1 HNO_3. Silica insolubles are removed by filtration after bringing the sample to fumes with conc. H_2SO_4.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ conc.)
ICP-OES	385.958 nm	0.3 / 0.01 µg/mL	1	ion	Th, Fe
ICP-OES	367.007 nm	0.3 / 0.02 µg/mL	1	ion	Th, Ce
ICP-OES	263.553 nm	0.3 / 0.01 µg/mL	1	ion	Ce, Ir, Th, Rh, W, Zr, Ta, Ti, V, Hf, Fe, Re, Ru
ICP-MS	238 amu	2 ppt	n/a	M+	$^{206}Pb^{16}O_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4473 PO: F52393

*NOTICE TO ICP-MS USERS: The ^{235}U in this standard is depleted. The certified abundances in Atom % are as follows:

		Natural Abundance	IV's Certified Abundance
	Isotope	Atom %	Atom %
Uranium	^{238}U	99.3	99.8 ± 0.1
	^{235}U	0.70	0.204 ± 0.002

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: June 10, 2003

Expiration Date:

EXPIRES
1 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010329

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Tungsten In 1% (abs) HNO_3/1% (abs) HF**

Catalog Number:	CGW1-1 and CGW1-5
Lot Number:	**W-W01080**
Starting Material:	W Powder
Starting Material Purity (%):	99.990703
Starting Material Lot No	21418,C31H46,D02J21,E03K06,D11F29
Matrix:	1% (abs) HNO_3/1% (abs) HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 VOS
DATE OPENED: 08/01/03
INORG: 4203 PO: E52383

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1001 ± 2 µg/mL

Certified Density: 1.006 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

$\bar{x}$ = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1001 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3163 Lot Number: 990209

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.01792	M	Dy	< 0.00595	O	Li	< 0.00008	M	Pr	< 0.00030	M	Te	< 0.02974
M	Sb	< 0.00050	M	Er	< 0.00496	M	Lu	< 0.00040	i	Re		M	Tb	< 0.00030
M	As	< 0.00991	M	Eu	< 0.00297	O	Mg	0.00120	M	Rh	< 0.00099	M	Tl	< 0.00099
M	Ba	< 0.00991	M	Gd	< 0.00099	M	Mn	< 0.00397	M	Rb	< 0.00099	M	Th	< 0.00099
M	Be	< 0.00050	M	Ga	< 0.00099	O	Hg	< 0.04778	M	Ru	< 0.00198	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00595	M	Mo	0.00050	M	Sm	< 0.00099	M	Sn	< 0.00496
O	B	< 1.19460	M	Au	< 0.00297	M	Nd	< 0.00198	O	Sc	< 0.00036	M	Ti	0.00198
M	Cd	< 0.00297	M	Hf	< 0.00198	M	Ni	< 0.00793	M	Se	< 0.00793	S	W	
O	Ca	0.00080	M	Ho	< 0.00050	O	Nb	< 0.06371	O	Si	< 0.01354	M	U	< 0.00198
M	Ce	< 0.00496	M	In	< 0.00991	n	Os		M	Ag	< 0.00198	M	V	< 0.00198
M	Cs	< 0.00030	M	Ir	< 0.00496	M	Pd	< 0.00496	O	Na	0.04778	M	Yb	< 0.00099
M	Cr	< 0.00496	O	Fe	< 0.03982	n	P		M	Sr	< 0.00050	M	Y	< 0.03965
M	Co	< 0.00297	M	La	< 0.00050	M	Pt	< 0.00198	n	S		M	Zn	< 0.01983
M	Cu	< 0.00595	M	Pb	0.00060	O	K	0.03146	O	Ta	< 0.39820	M	Zr	0.00079

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 183.85; +6; 6,7,8,9 WOF_4^{+2}(chemical form as received)

Chemical Compatibility - W is very readily hydrolyzed requiring 0.1 to 1% HF solutions for stable acidic solutions. The WOF_4^{+2} is soluble in % levels of HCl and HNO_3 provided it is in the WOF_4^{+2} form. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths. Is best to be mixed only with other fluorinated metals (Ti, Zr, Hf, Nb, Ta, Mo, Si, Sn, Ge). Look for yellow WO_3 precipitate if mixed with other transition elements at higher levels indicating instability. The yellow WO_3 will form over a period of weeks even in trace HF, therefore, HF levels of W multi- element blends should be ~ 1 %.

Stability - 2-100 ppb levels stable (Alone or mixed with all other metals that are at comparable levels) as the WOF_4^{+2} for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the WOF_4^{+2} chemically stable for years in 1% HF in an LDPE container.

W Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3); Oxide (Soluble in HF or NH.OH) ; Organic Matrices (Dry ash at 450 °C in Pt* and dissolve oxide with HF).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppm)
ICP-OES 207.911 nm	0.03 / 0.001 µg/mL	1	ion	Ru, In
ICP-OES 224.875 nm	0.05 / 0.005 µg/mL	1	ion	Co, Rh, Ag
ICP-OES 209.475 nm	0.05 / 0.005 µg/mL	1	ion	Mo
ICP-MS 182 amu	5 ppt	n/a	M+	$^{166}Er^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 v05
DATE OPENED: 08/01/03
INORG: 4203 PO: E52383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 10, 2003

Expiration Date: EXPIRES 1 2 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010333

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Yttrium in 1.4% (abs) HNO_3**

Catalog Number:	CGY1-1, CGY1-2, and CGY1-5
Lot Number:	**X-QY01101**
Starting Material:	Y_2O_3
Starting Material Purity (%):	99.999727
Starting Material Lot No	9918901OYL
Matrix:	1.4% (abs) HNO_3

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1006 ± 2 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1004 ± 4 µg/mL**
ICP Assay NIST SRM 3167a Lot Number: 790412

Assay Method #2 **1006 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

INORGANIC LABS/RADCHEM LABS P3-1ofa
DATE RECEIVED: 03/30/04
DATE EXPIRED: 04/01/2005 VOID
DATE OPENED: 03/30/04
INORG: 4513 PO: F53361

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00024	M Dy < 0.00595	O Li < 0.00002	M Pr < 0.00030	M Te < 0.02976
O Sb < 0.01000	M Er < 0.00496	M Lu < 0.00040	M Re < 0.00099	M Tb < 0.00030
M As < 0.00992	M Eu < 0.00298	O Mg 0.00015	M Rh < 0.00099	M Tl < 0.00099
M Ba < 0.00992	M Gd < 0.00099	O Mn < 0.00002	M Rb < 0.00099	M Th < 0.00099
M Be < 0.00050	M Ga < 0.00099	O Hg < 0.02000	M Ru < 0.00198	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00595	M Mo < 0.00198	M Sm < 0.00099	M Sn < 0.00496
O B 0.00013	M Au < 0.00298	M Nd < 0.00198	O Sc < 0.00003	M Ti < 0.04959
M Cd < 0.00298	M Hf < 0.00198	M Ni < 0.00794	M Se < 0.00794	M W < 0.00992
O Ca 0.00100	M Ho < 0.00050	M Nb < 0.00050	O Si 0.00170	M U < 0.00198
M Ce < 0.00496	M In < 0.00992	n Os	O Ag < 0.02000	O V < 0.00080
M Cs < 0.00030	M Ir < 0.00496	O Pd < 0.10000	O Na < 0.05000	M Yb < 0.00099
M Cr < 0.00496	O Fe 0.00070	O P < 0.07000	O Sr < 0.00004	s Y
M Co < 0.00298	M La < 0.00050	M Pt < 0.00198	O S < 0.04300	O Zn 0.00025
M Cu < 0.00595	M Pb < 0.00298	O K < 0.10000	M Ta < 0.00694	O Zr < 0.00070

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 88.9059; +3; 6; $Y(OH)(H_2O)_5^{2+}$
Chemical Compatibility - Soluble in HCl, H_2SO_4 and HNO_3. Avoid HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.
Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H_2O/HNO_3); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H_2O /HCl or HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤5ppm)
ICP-OES	360.073 nm	0.005 / 0.000036 µg/mL	1	ion	Ce, Th
ICP-OES	371.030 nm	0.004 / 0.00007 µg/mL	1	ion	Ce
ICP-OES	377.433 nm	0.005 / 0.0009 µg/mL	1	ion	Ta, Th
ICP-MS	89 amu	0.8 ppt	n/a	M⁺	$^{73}Ge^{16}O$, $^{178}Hf^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 03/30/04
DATE EXPIRED: 04/01/2005 v03
DATE OPENED: 03/30/04
INORG: 4513 PO: P533661

010336

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 24, 2004

Expiration Date:

EXPIRES
1A2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010337

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Zirconium in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGZR1-1 and CGZR1-5
Lot Number:	**W-ZR01056**
Starting Material:	ZrO2
Starting Material Purity (%):	99.994542
Starting Material Lot No	22855
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 01/23/04
DATE EXPIRED: 08/01/2005 V03
DATE OPENED: 01/23/04
INORG: 4442 PO: F52306

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1004 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3169 Lot Number: 990109

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.01416	M Dy < 0.01188	O Li < 0.00012	M Pr < 0.00059	M Te < 0.05942
M Sb < 0.00099	M Er < 0.00990	M Lu < 0.00079	M Re < 0.00198	M Tb < 0.00059
M As < 0.01981	M Eu < 0.00594	O Mg < 0.00012	M Rh < 0.00198	M Tl < 0.00198
M Ba < 0.01981	M Gd < 0.00198	O Mn < 0.00401	M Rb < 0.00198	M Th < 0.00198
O Be < 0.40048	M Ga < 0.00198	O Hg < 0.04405	M Ru < 0.00396	M Tm < 0.00079
M Bi < 0.00079	M Ge < 0.01188	O Mo < 0.40048	M Sm < 0.00198	M Sn < 0.00990
M B < 0.13864	M Au < 0.00594	M Nd < 0.00396	O Sc < 0.00064	O Ti < 0.16019
O Cd < 0.02123	M Hf 0.04403	O Ni 0.01214	M Se < 0.01585	M W < 0.01981
O Ca 0.00809	M Ho < 0.00099	O Nb < 0.08010	O Si < 0.80096	M U < 0.00396
M Ce < 0.00990	M In < 0.01981	n Os	O Ag < 0.40048	M V < 0.00396
M Cs < 0.00059	M Ir < 0.00990	M Pd < 0.00990	O Na < 0.02803	M Yb < 0.00198
O Cr < 0.00881	O Fe 0.00344	O P < 0.01922	M Sr < 0.00099	O Y < 0.00401
M Co < 0.00594	M La < 0.00099	M Pt < 0.00396	O S < 0.28033	O Zn < 0.04005
M Cu < 0.01188	M Pb < 0.00594	O K < 0.00681	M Ta < 0.01386	s Zr

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 91.224; +4; 6, 7, 8; $Zr(F)_6^{-2}$
Chemical Compatibility - Soluble in concentrated HCl, HF, H_2SO_4 (very hot) and HNO_3. Avoid H_3PO_4 and neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions but precipitation with phosphate, oxalate, and tartrate with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF .
Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $Zr(F)_6^{-2}$ + $Zr(OH)_2F_2^{-2}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Zr(F)_6^{-2}$ chemically stable for years in 2-5% HNO_3 / trace HF in an LDPE container.
Zr Containing Samples (Preparation and Solution) - Metal (Soluble in H_2O / HF / HNO_3); Oxide - unlike TiO_2 the ZrO_2 is best fused in one of the following ways (Na_2O_2 in Ni*, Na_2CO_3 in Pt* or Borax in Pt*); Organic Matrices (Dry ash at 450 °C in Pt* and dissolve by fusing with Na_2CO_3 and dissolving in HF / HNO_3 / H_2O).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe et al bonds.)
ICP-OES	343.823 nm	0.007 / 0.0004 µg/mL	1	ion	Hf, Nb
ICP-OES	339.198 nm	0.008 / 0.0007 µg/mL	1	ion	Th, Mo
ICP-OES	272.261 nm	0.018 / 0.001 µg/mL	1	ion	Cr, V, Th, W
ICP-MS	90 amu	2 ppt	n/a	M+	$^{74}Ge^{16}O_2$, $^{78}Se^{16}O_2$, [$^{180}X^{16}O_2$ (where X = Hf, Ta, W)]

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 3 of 3
DATE RECEIVED: 01/23/04
DATE EXPIRED: 08/01/2005 VD5
DATE OPENED: 01/23/04
INORG: 4442 PO: F52306

010340

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 19, 2003

Expiration Date: EXPIRES 01 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010341

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Barium in 0.1% (abs) HNO_3**

Catalog Number:	CGBA1-1, CGBA1-2, and CGBA1-5
Lot Number:	**W-BA02023**
Starting Material:	Ba(NO3)2
Starting Material Purity (%):	99.999730
Starting Material Lot No	21879
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4465 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1001 ± 1 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = *mean*
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM *certificate of analysis.*)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 4 µg/mL**
ICP Assay NIST SRM 3104a Lot Number: 992907

Assay Method #2 **1001 ± 1 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00011	M	Dy	< 0.01269	O	Li	< 0.00400	M	Pr	< 0.00063	M	Te	< 0.06343
M	Sb	< 0.00106	M	Er	< 0.01057	M	Lu	< 0.00085	M	Re	< 0.00211	O	Tb	< 0.00390
M	As	< 0.02114	O	Eu	< 0.00040	O	Mg	0.00009	M	Rh	< 0.00211	M	Tl	< 0.00211
s	Ba		O	Gd	< 0.00052	M	Mn	< 0.00846	M	Rb	< 0.00211	M	Th	< 0.00211
M	Be	< 0.00106	M	Ga	< 0.00211	O	Hg	< 0.01200	M	Ru	< 0.00423	M	Tm	< 0.00085
M	Bi	< 0.00085	M	Ge	< 0.01269	M	Mo	< 0.00423	O	Sm	< 0.00071	M	Sn	< 0.01057
M	B	< 0.14800	M	Au	< 0.00634	O	Nd	< 0.00330	M	Sc	< 0.02114	M	Ti	< 0.10571
M	Cd	< 0.00634	M	Hf	< 0.00423	M	Ni	< 0.01691	M	Se	< 0.01691	M	W	< 0.02114
O	Ca	0.00072	M	Ho	< 0.00106	M	Nb	< 0.00106	O	Si	< 0.00340	M	U	< 0.00423
M	Ce	< 0.01057	M	In	< 0.02114	n	Os		M	Ag	< 0.00423	M	V	< 0.00423
M	Cs	< 0.00063	M	Ir	< 0.01057	M	Pd	< 0.01057	M	Na	< 0.21142	M	Yb	< 0.00211
M	Cr	< 0.01057	O	Fe	0.00062	O	P	< 0.00260	O	Sr	0.00379	O	Y	0.00040
M	Co	< 0.00634	M	La	< 0.00106	M	Pt	< 0.00423	O	S	< 0.02500	O	Zn	< 0.00039
M	Cu	< 0.01269	M	Pb	0.00020	O	K	< 0.00180	O	Ta	< 0.00690	M	Zr	< 0.01057

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 137.33; +2; 6; $Ba(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_2SO_4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, iodate, molybdate, sulfite and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1 -10,000 ppm solutions chemically stable for years in 1-3.5% HNO_3 / LDPE container.

Ba Containing Samples (Preparation and Solution) - Metal(is best dissolved in diluted HNO_3); Ores(Carbonate fusion in Pt° followed by HCl dissolution. If sulfate is present dissolve the fuseate using HCl /tartaric acid to prevent $BaSO_4$ precipitate); Organic Matrices (dry ash and dissolve in dilute HCl.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ultConcs.)
ICP-OES	455.403 nm	0.002 / 0.0001 µg/mL	1	ion	Zr, U
ICP-OES	233.527 nm	0.004 / 0.0003 µg/mL	1	ion	
ICP-OES	230.424 nm	0.004 / 0.0005 µg/mL	1	ion	Mo, Ir, Co
ICP-MS	138 amu	1 ppt	n/a	M^+	$^{122}Sn^{16}O$, $^{122}Te^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VO3
DATE OPENED: 02/25/04
INORG: 4465 PO: F52323

010344

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 28, 2003

Expiration Date:

EXPIRES
1 JAN 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Beryllium in 2% (abs) HNO_3**

Catalog Number:	CGBE1-1, CGBE1-2, and CGBE1-5
Lot Number:	**W-BE01104**
Starting Material:	Be(OOCCH3)2
Starting Material Purity (%):	99.999897
Starting Material Lot No	01-10-01
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS P3-1 of 2
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VOS
DATE OPENED: 06/01/04
INORG: 4592 PO: F53393

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1007 ± 4 µg/mL

Certified Density: 1.023 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1007 ± 4 µg/mL**
ICP Assay NIST SRM 3105a Lot Number: 892707

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00800	M	Dy	< 0.01305	O	Li	< 0.00002	M	Pr	< 0.00065	M	Te	< 0.06525
M	Sb	< 0.00109	M	Er	< 0.01087	M	Lu	< 0.00087	M	Re	< 0.00218	M	Tb	< 0.00065
M	As	< 0.02175	M	Eu	< 0.00652	O	Mg	< 0.00003	M	Rh	< 0.00218	M	Tl	< 0.00218
M	Ba	< 0.02175	M	Gd	< 0.00218	O	Mn	< 0.00002	M	Rb	< 0.00218	M	Th	< 0.00218
s	Be		M	Ga	< 0.00218	O	Hg	< 0.01500	M	Ru	< 0.00435	M	Tm	< 0.00087
M	Bi	< 0.00087	M	Ge	< 0.01305	M	Mo	< 0.00435	M	Sm	< 0.00218	M	Sn	< 0.01087
O	B	< 0.01200	M	Au	< 0.00652	M	Nd	< 0.00435	O	Sc	< 0.00009	M	Ti	< 0.10874
M	Cd	< 0.00652	M	Hf	< 0.00435	M	Ni	< 0.65245	M	Se	< 0.01740	M	W	< 0.02175
O	Ca	0.00164	M	Ho	< 0.00109	M	Nb	< 0.00109	O	Si	0.00649	M	U	< 0.00435
M	Ce	< 0.01087	M	In	< 0.02175	n	Os		M	Ag	< 0.00435	M	V	< 0.00435
M	Cs	< 0.00065	M	Ir	< 0.01087	M	Pd	< 0.01087	O	Na	0.00368	M	Yb	< 0.00218
O	Cr	< 0.00900	O	Fe	0.00268	n	P		M	Sr	< 0.00109	M	Y	< 0.08699
M	Co	< 0.00652	M	La	< 0.00109	M	Pt	< 0.00435	i	S		M	Zn	< 0.04350
M	Cu	< 0.01305	M	Pb	< 0.00652	O	K	< 0.10000	M	Ta	< 0.01522	M	Zr	< 0.01087

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 9.01218; +2; 4; $Be'(H_2O)_4'^{+2}$
Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.
Stability - 2-100 ppb levels stable for months in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10 % HNO_3 / LDPE container.
Be Containing Samples (Preparation and Solution) - Metal (is best dissolved in diluted H_2SO_4.); BeO (boiling nitric, hydrochloric, or sulfuric acids or $KHSO_4$ fusion); Ores (H_2SO_4/HF digestion or carbonate fusion in Pt*); Organic Matrices (sulfuric/peroxide digestion or nitric/sulfuric/perchloric acid decomposition, or dry ash and dissolution according to the BeO procedure above).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at 100ppm)
ICP-OES 313.042 nm	0.0003 / 0.00009 µg/mL	1	ion	Y, Ce, U
ICP-OES 234.861 nm	0.0003 / 0.00016 µg/mL	1	atom	Fe, Ta, Mo
ICP-OES 313.107 nm	0.0007 / 0.0005 µg/mL	1	ion	Ce, Th, Tm
ICP-MS 9 amu	4 ppt	n/a	M'	

010347

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 08, 2004

Expiration Date: EXPIRES 1 2005

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VOS
DATE OPENED: 06/01/04
INORG: 4592 PO: F53393

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, Production Manager
Certificate Approved By:	Katalin Le, QC Manager
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director

010349

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Chromium^{+3} in 1.4% HNO_3 (abs)

Catalog Number: CGCR(3)1-1, CGCR(3)1-2 and CGCR(3)1-5

Lot Number: **W-QCR02033**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03
DATE EXPIRED: 12/1/2004 DK
DATE OPENED: 11/5/03
INORG: 4318 PO: FS2258

Starting Material:	Chromium Metal
Starting Material Purity:	99.995%
Starting Material Lot No:	F16I22

CERTIFIED CONCENTRATION: 995 ± 3 µg/mL

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Instrument Analysis: 995 ± 3 µg/mL (Avg of 3 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3112a.

Calculated Value: 1002 µg/mL
Method: Calculated, based on starting material.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.0028	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	O	Mg	<0.010	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.050	M	Rb	0.0066	M	Th	<0.00010
M	Be	<0.000050	M	Ga	0.00070	O	Hg	<0.10	M	Ru	0.017	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.10	i	Se		M	W	<0.0010
O	Ca	0.0011	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.10	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.10	n	Os		M	Ag	0.00070	i	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	0.016	M	Yb	<0.00010
s	Cr		O	Fe	<0.10	i	P		M	Sr	<0.000050	M	Y	<0.0040
O	Co	<0.10	M	La	<0.000050	M	Pt	<0.00020	n	S		O	Zn	<0.10
M	Cu	<0.00060	M	Pb	0.00039	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.010 g/mL

(over)

QA:KSL Rev.080403JTS

Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 12/2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina (**IRAM**), Australia (**QAS**), Austria (**ÖQS**), Belgium (**Avinter**) , Brazil (**FCAV**), Canada (**QMI**), Hong Kong (**HKQAA**), Columbia (**ICONTEC**), Czech Republic (**CQS**), Denmark (**DS**), Finland (**SFS**), France (**AFAQ**), Germany (**DQS**), Greece (**ELOT**), Hungary (**MSZT**), Ireland (**NSAI**), Israel (**SII**), Italy (**CISQ**), Japan (**JQA**), Korea (**KSA-QA**), Netherlands (**KEMA**), Norway (**NCS**), Poland(**PCBC**), Portugal (**APCER**), Singapore (**PSB**), Slovenia (**SIQ**), Spain (**AENOR**), Switzerland (**SQS**)

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010351

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
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certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Copper in 2% (abs) HNO_3**

Catalog Number:	CGCU1-1, CGCU1-2, and CGCU1-5
Lot Number:	**W-CU02064**
Starting Material:	Cu shot
Starting Material Purity (%):	99.999437
Starting Material Lot No	K09C13
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 V03
DATE OPENED: 02/25/04
INORG: 4469 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The Independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1005 ± 2 µg/mL**
ICP Assay NIST SRM 3114 Lot Number: 891811

Assay Method #2 **1005 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.03027	O Li < 0.00002	M Pr < 0.00151	M Te < 0.15134
M Sb < 0.00252	M Er < 0.02522	M Lu < 0.00202	M Re < 0.00504	M Tb < 0.00151
M As < 0.05045	M Eu < 0.01513	O Mg 0.00001	M Rh < 0.00504	M Tl < 0.00504
M Ba < 0.05045	M Gd < 0.00504	M Mn < 0.02018	M Rb < 0.00504	M Th < 0.00504
M Be < 0.00252	M Ga < 0.00504	O Hg < 0.01500	M Ru < 0.01009	M Tm < 0.00202
M Bi < 0.00202	M Ge < 0.03027	M Mo < 0.01009	M Sm < 0.00504	O Sn 0.00439
M B < 0.35312	M Au < 0.01513	M Nd < 0.01009	M Sc < 0.05045	M Ti < 0.25223
M Cd < 0.01513	M Hf < 0.01009	M Ni < 0.04036	M Se < 0.04036	M W < 0.05045
O Ca 0.00011	M Ho < 0.00252	M Nb < 0.00252	O Si < 0.00340	M U < 0.01009
M Ce < 0.02522	M In < 0.05045	n Os	M Ag < 0.01009	O V < 0.00300
M Cs < 0.00151	M Ir < 0.02522	M Pd < 0.02522	O Na 0.00044	M Yb < 0.00504
M Cr < 0.02522	O Fe 0.00054	O P < 0.00260	M Sr < 0.00252	M Y < 0.20178
M Co < 0.01513	M La < 0.00252	M Pt < 0.01009	n S	M Zn < 0.10089
s Cu	M Pb 0.00050	O K < 0.00180	M Ta < 0.03531	M Zr < 0.02522

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010353

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4 °C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.546; +2; 6; $Cu(H_2O)_6^{2+}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Cu Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at elbencs.)
ICP-OES	324.754 nm	0.06/.001 µg/mL	1	atom	Nb, U, Th, Mo, Hf
ICP-OES	224.700 nm	0.01/.001 µg/mL	1	ion	Pb, Ir, Ni, W
ICP-OES	219.958 nm	0.01/.002 µg/mL	1	atom	Th, Ta, Nb, U, Hf
ICP-MS	63 amu	10 ppt	n/a	M+	$^{40}Ar^{23}Na$ $^{47}Ti^{16}O$, $^{14}N^{12}C^{37}Cl$, $^{16}O^{12}C^{35}Cl$, $^{46}Ca^{17}O$, $^{23}Na^{40}Ca$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 vo3
DATE OPENED: 02/25/04
INORG: 4469 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010354

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 02, 2003

Expiration Date:

EXPIRES
12-2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

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certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Nickel in 1.4% (abs) HNO_3**

Catalog Number:	CGNI1-1, CGNI1-2, and CGNI1-5
Lot Number:	**W-NI02030**
Starting Material:	Ni pieces
Starting Material Purity (%):	99.999371
Starting Material Lot No	L06L02
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VDS
DATE OPENED: 02/25/04
INORG: 4472 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 2 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **999 ± 5 µg/mL**
ICP Assay NIST SRM 3136 Lot Number: 000612

Assay Method #2 **1002 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00938	M	Dy	< 0.06577	O	Li	< 0.00006	M	Pr	< 0.00329	M	Te	< 0.32886
M	Sb	< 0.00548	M	Er	< 0.05481	M	Lu	< 0.00439	M	Re	< 0.01096	M	Tb	< 0.00329
O	As	< 0.01689	M	Eu	< 0.03289	O	Mg	0.00002	M	Rh	< 0.01096	M	Tl	< 0.01096
M	Ba	< 0.10962	M	Gd	< 0.01096	M	Mn	< 0.04385	M	Rb	< 0.01096	M	Th	< 0.01096
O	Be	< 0.00626	M	Ga	< 0.01096	O	Hg	< 0.03441	M	Ru	< 0.02192	M	Tm	< 0.00439
M	Bi	< 0.00439	M	Ge	< 0.06577	M	Mo	< 0.02192	M	Sm	< 0.01096	M	Sn	< 0.05481
O	B	< 0.03097	M	Au	< 0.03289	M	Nd	< 0.02192	M	Sc	< 0.10962	M	Ti	< 0.54811
M	Cd	< 0.03289	M	Hf	< 0.02192	S	Ni		O	Se	< 0.01877	M	W	< 0.10962
O	Ca	< 0.01157	M	Ho	< 0.00548	M	Nb	< 0.00548	O	Si	0.00188	M	U	< 0.02192
M	Ce	< 0.05481	M	In	< 0.10962	n	Os		M	Ag	< 0.02192	M	V	< 0.02192
M	Cs	< 0.00329	M	Ir	< 0.05481	M	Pd	< 0.05481	O	Na	0.00102	M	Yb	< 0.01096
M	Cr	< 0.05481	O	Fe	0.00156	O	P	< 0.31280	M	Sr	< 0.00548	M	Y	< 0.43849
O	Co	0.00182	M	La	< 0.00548	M	Pt	< 0.02192	O	S	< 0.07820	M	Zn	0.00189
M	Cu	< 0.06577	M	Pb	< 0.03289	O	K	0.00043	M	Ta	< 0.07674	M	Zr	< 0.05481

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69; +2; 6; $Ni(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Ni Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤5ppm cs.)
ICP-OES	221.647 nm	0.01 / 0.0009 µg/mL	1	ion	Si
ICP-OES	232.003 nm	0.02 / 0.006 µg/mL	1	atom	Cr, Re, Os, Nb, Ag, Pt, Fe
ICP-OES	231.604 nm	0.02 / 0.002 µg/mL	1	ion	Sb, Ta, Co
ICP-MS	60 amu	100 ppt	n/a	M+	$^{44}Ca^{16}O^{1}H$, $^{44}Ca^{16}O$, $^{23}Na^{37}Cl$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 23, 2003

Expiration Date:

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4472 PO: F52323

EXPIRES 1 MAR 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010359

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Boron In H_2O**

Catalog Number:	CGB1-1, CGB1-2, and CGB1-5
Lot Number:	**W-B02042**
Starting Material:	H_3BO_3
Starting Material Purity (%):	99.999998
Starting Material Lot No	OV0133
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 V03
DATE OPENED: 08/01/03
INORG: 4201 PO: E53383

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 999 ± 2 µg/mL

Certified Density: 1.001 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

$\bar{x}$ = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **999 ± 2 µg/mL (Avg 2 runs)**

ICP Assay NIST SRM 3107 Lot Number: 991907

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.00600	O Li < 0.00002	M Pr < 0.00030	M Te < 0.03000
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.01000	M Eu < 0.00300	O Mg < 0.00006	M Rh < 0.00100	M Tl < 0.00100
O Ba < 0.00010	M Gd < 0.00100	O Mn < 0.00002	M Rb < 0.00100	M Th < 0.00100
O Be < 0.00017	O Ga < 0.00160	O Hg < 0.01500	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00600	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
s B	M Au < 0.00300	M Nd < 0.00200	O Sc < 0.00002	M Ti < 0.05000
M Cd < 0.00300	M Hf < 0.00200	O Ni < 0.00230	O Se < 0.00620	M W < 0.01000
O Ca < 0.00007	M Ho < 0.00050	M Nb < 0.00050	O Si 0.00067	M U < 0.00200
O Ce < 0.00300	M In < 0.01000	n Os	M Ag < 0.00200	O V < 0.00083
M Cs < 0.00030	M Ir < 0.00500	M Pd < 0.00500	O Na < 0.00010	M Yb < 0.00100
M Cr < 0.00500	O Fe < 0.00110	O P < 0.00250	M Sr < 0.00050	M Y < 0.04000
O Co < 0.00110	M La < 0.00050	M Pt < 0.00200	O S < 0.10000	O Zn < 0.00019
M Cu < 0.00600	M Pb < 0.00300	O K < 0.00300	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 10.811; +3; 4; $B(OH)_3$ and $B(OH)_4^-$

Chemical Compatibility - Moderately soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices and very soluble in NH_4OH . Stable with all metals and inorganic anions at low to moderate ppm levels.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-1,000 ppm solutions chemically stable for years in 1% HNO_3 / LDPE container. 1000 -10,000 ppm stable for years in dilute NH_4OH / LDPE container.

***B* Containing Samples (Preparation and Solution)** - Metal (Crystalline form is scarcely attacked by acids or alkaline solutions; amorphous form is soluble in conc. HNO_3 or H_2SO_4); $B(OH)_3$ (water soluble); Ores (avoid acid digestions and use caustic fusions in Pt-ware); Organic Matrices (dry ash mixed with Na_2CO_3 in Pt-ware at 450°C then increase heat to 1000°C to fuse; or perform a Na_2O_2 fusion in a Ni-crucible / Parr bomb).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤5ppms.)
ICP-OES 249.773 nm	0.003 / 0.001 µg/mL	1	atom	W, Ce, Co, Th, Ta, Mn, Mo, Fe
ICP-OES 249.678 nm	0.004 / 0.003 µg/mL	1	atom	Os, W, Co, Cr, Hf
ICP-OES 208.959 nm	0.007 / 0.0005 µg/mL	1	atom	Mo
ICP-MS 11 amu	700 ppt	n/a	M+	

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

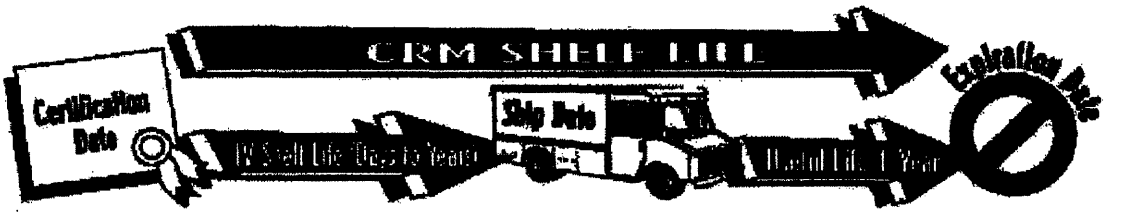
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 VOS
DATE OPENED: 08/01/03
INORG: 4201 PO: F50383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 21, 2003

Expiration Date: EXPIRES 1-2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010363

inorganic ventures / iv labs

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certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Molybdenum In H_2O tr. NH_4OH**

Catalog Number:	CGMO1-1, CGMO1-2, and CGMO1-5
Lot Number:	**W-MO01132**
Starting Material:	(NH4)6Mo7O24xH2O
Starting Material Purity (%):	99.995947
Starting Material Lot No	21410
Matrix:	H_2O tr. NH_4OH

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4471 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 0.998 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1004 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3134 Lot Number: 891307

Assay Method #2 **1008 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.05000	M Dy < 0.01198	O Li < 0.01000	O Pr < 0.10000	i Te
M Sb 0.00939	M Er < 0.00998	M Lu < 0.00080	M Re < 0.00200	M Tb < 0.00060
M As < 0.01997	M Eu < 0.00599	O Mg < 0.05000	M Rh < 0.00200	M Tl < 0.00200
M Ba < 0.01997	M Gd < 0.00200	M Mn < 0.00799	M Rb 0.02445	M Th < 0.00200
M Be < 0.00100	M Ga < 0.00200	i Hg	M Ru < 0.00399	M Tm < 0.00080
M Bi < 0.00080	M Ge < 0.01198	s Mo	M Sm < 0.00200	M Sn < 0.00998
O B < 0.50000	M Au < 0.00599	O Nd < 0.05000	O Sc < 0.05000	O Ti < 0.00500
O Cd < 0.50000	M Hf < 0.00399	M Ni < 0.01597	M Se < 0.01597	M W 0.05576
O Ca 0.00026	M Ho < 0.00100	O Nb < 0.10000	O Si < 0.10000	M U < 0.00399
O Ce < 0.05000	M In 0.00235	n Os	M Ag < 0.00399	M V < 0.00399
M Cs < 0.00060	M Ir < 0.00998	M Pd < 0.00998	O Na < 0.10000	M Yb < 0.00200
M Cr < 0.00998	O Fe < 0.50000	i P	M Sr < 0.00100	M Y < 0.07987
M Co < 0.00599	M La < 0.00100	M Pt < 0.00399	i S	M Zn < 0.03993
M Cu < 0.01198	M Pb < 0.00599	O K 0.00980	M Ta < 0.01398	M Zr < 0.00998

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do nd return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 95.94; +6; 6,7,8,9; $[MoO_4]^{-2}$(chemical form as received)

Chemical Compatibility - Mo is received in a NH_4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The $[MoO_4]^{-2}$ is soluble in concentrated HCl $[MoOCl_4]^{-}$, dilute HF / HNO_3 $[MoOF_4]^{-2}$ and basic media $[MoO_4]^{-2}$. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the $[MoO_4]^{-2}$ chemical form.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $[MoOF_4]^{-2}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $[MoO_4]^{-2}$ chemically stable for years in 1% NH_4OH in a LDPE container.

Mo Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3 or hot dilute HCl); Oxide (soluble in HF or NH_4OH) ; Organic Matrices (Dry ash at 450°C in Pt* and dissolve oxide with HF or HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppmcs.)
ICP-OES	202.030 nm	0.008 / 0.0002 µg/mL	1	ion	Os, Hf
ICP-OES	203.844 nm	0.012 / 0.002 µg/mL	1	ion	
ICP-OES	204.598 nm	0.012 / 0.001 µg/mL	1	ion	Ir, Ta
ICP-MS	95 amu	3 ppt	n/a	M+	$^{79}Ar^{16}K^{16}O$, $^{79}Br^{16}O$, $^{190}Os^{2+}$, $^{190}Pt^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 VOS
DATE OPENED: 02/25/04
INORG: 4471 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 23, 2003

Expiration Date:

EXPIRES
1 MAR 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010367

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Phosphorus in H_2O

Catalog Number: CGP1-1, CGP1-2 and CGP1-5

Lot Number: **W-P01123**

Starting Material:	Phosphoric Acid
Starting Material Purity:	99.999%
Starting Material Lot No:	J18804

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VOS
DATE OPENED: 06/01/04
INORG: 4593 PO: E53393

CERTIFIED CONCENTRATION: 1006 ± 4 µg/mL

The Certified Value is the wet assay value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1006 ± 4 µg/mL
Method: Acidimetric Titration vs NIST SRM 84k KHP.

Instrument Analysis: 1002 ± 4 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3139a.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	<0.040	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.012	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	0.00070	O	Hg	<0.020	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	n	Sc		n	Ti	
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
M	Ce	<0.00050	M	In	<0.030	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	s	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0035
M	Cu	0.080	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.001 g/mL

(over)

QA:KL Rev.01080402N

Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 1 JUN 2005

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceabl to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Silicon in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGSI1-1, CGSI1-2, and CGSI1-5
Lot Number:	**W-SI02082**
Starting Material:	SiO_2
Starting Material Purity (%):	99.996367
Starting Material Lot No	C05310C
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 V03
DATE OPENED: 01/20/04
INORG: 4437 PO: F52303

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 5 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1000 ± 5 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3150 Lot Number: 991108

Assay Method #2 **1001 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION -** All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION -** The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION -** In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.02730	M Dy < 0.01358	O Li < 0.00009	M Pr < 0.00068	M Te < 0.06791
M Sb < 0.00113	M Er < 0.01132	M Lu < 0.00091	M Re < 0.00226	M Tb < 0.00068
M As < 0.02264	M Eu < 0.00679	O Mg < 0.04991	M Rh < 0.00226	M Tl < 0.00226
M Ba < 0.02264	M Gd < 0.00226	M Mn < 0.00906	M Rb < 0.00226	M Th < 0.00226
O Be < 0.00091	M Ga < 0.00226	O Hg < 0.04991	M Ru < 0.00453	M Tm < 0.00091
M Bi < 0.00091	M Ge < 0.01358	M Mo < 0.00453	M Sm < 0.00226	M Sn < 0.01132
O B 0.02409	M Au < 0.00679	M Nd < 0.00453	O Sc < 0.00091	O Ti 0.01325
M Cd < 0.00679	M Hf < 0.00453	O Ni < 0.01044	M Se < 0.01811	M W < 0.02264
O Ca 0.00135	M Ho < 0.00113	M Nb < 0.00113	s Si	M U < 0.00453
M Ce < 0.01132	M In < 0.02264	n Os	M Ag < 0.00453	O V < 0.00408
M Cs < 0.00068	M Ir < 0.01132	M Pd < 0.01132	O Na 0.02008	M Yb < 0.00226
O Cr < 0.00681	O Fe < 0.00499	O P < 0.02269	O Sr < 0.00032	M Y < 0.09055
M Co < 0.00679	M La < 0.00113	M Pt < 0.00453	O S < 0.11342	M Zn < 0.04528
O Cu < 0.00454	M Pb < 0.00679	O K < 0.00771	M Ta 0.00200	M Zr < 0.01132

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 28.0855; +4; 6; $Si(OH)_x(F)_y^{z-}$

Chemical Compatibility - Soluble in HCl, HF, H_3PO_4, H_2SO_4 and HNO_3 as the $Si(OH)_x(F)_y^{z-}$. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths, or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming silicic acid (silicic acid is soluble up to ~100 ppm in water) in all dilute acids except HF.

Stability - 2-100 ppb levels - stability unknown - (alone or mixed with all other metals) as the $Si(OH)_x(F)_y^{z-}$. 1-10,000 ppm single element solutions as the $Si(OH)_x(F)_y^{z-}$ chemically stable for years in 2-5 % HNO_3 / trace HF in a LDPE container.

Si Containing Samples (Preparation and Solution) - Metal (Soluble in 1:1:1 H_2O / HF / HNO_3); Oxide - SiO_2, amorphic (Dissolve by heating in 1:1:1 H_2O / HF / HNO_3); Oxide - quartz (Fuse in Pt° with Na_2CO_3); Geological Samples (Fuse in Pt° with Na_2CO_3 followed by HCl solution of the fuseate); Organic Matrices containing silicates and non volatile silicon compounds (Dry ash at 450°C in Pt° and dissolve by gently warming with 1:1:1 H_2O / HF / H_2SO_4 or fuse / ash with Na_2CO_3 and dissolve fuseate with HCl / H_2O); Silicone Oils - dimethyl silicones depolymerize to form volatile monomer units when heated (Measure directly in alcoholic KOH / xylene mixture where sample is treated first with the KOH at 60-100 °C to "unzip" the Si-O-Si polymeric structure or digest with concentrated H_2SO_4/H_2O_2 followed by cooling and dissolution of the dehydrated silica with HF.) Note that the direct analysis of silicone oils in an organic solvent will result in false high results due to high vapor pressure of volatile monomer units like hexamethylcyclotrisiloxane. The KOH forms the $K_2{}^+Si(CH_3)_2O^-$ salt which is not volatile at room temperature.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe interferences.)
ICP-OES	251.611 nm	0.012 / 0.003 µg/mL	1	Ion	Ta, U, Zn, Th
ICP-OES	212.412 nm	0.02 / 0.01 µg/mL	1	Ion	Hf, Os, Mo, Ta
ICP-OES	288.158 nm	0.03 / 0.004 µg/mL	1	Ion	Ta, Ce, Cr, Cd, Th
ICP-MS	28 amu	4000 - 8000 ppt	n/a	M+	$^{14}N_2$, $^{12}C^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for Information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

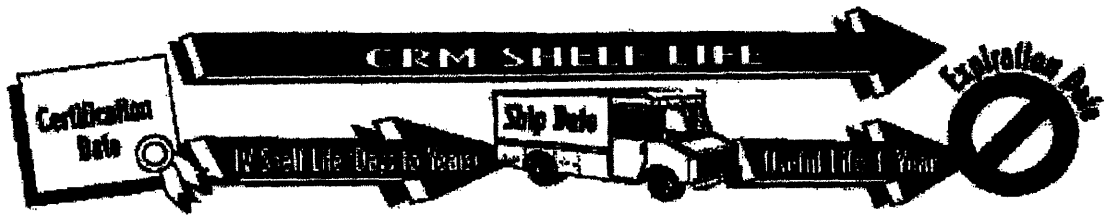
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005 VOS
DATE OPENED: 01/20/04
INORG: 4437 PO: F52303

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 24, 2003

Expiration Date: EXPIRES 1 FEB 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010373

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Titanium in 1.4% HNO_3 (abs) tr. HF

Catalog Number: CGTI1-1, CGTI1-2 and CGTI1-5

This standard should **not** be prepared or stored in glass.

Lot Number: **T-TI02039**

Starting Material:	Titanium Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	F29I14

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/24/03
DATE EXPIRED: 12/01/2004 v05
DATE OPENED: 11/25/03
INORG: 4338 PO: F52279

CERTIFIED CONCENTRATION: 1010 ± 3 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

($\bar{x}$) = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Calculated Value: 1002 µg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1010 ± 3 µg/mL (Average of 3 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3162a.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.**
An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	<0.010	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Ta	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	O	Mg	< 0.020	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	M	Mn	0.0020	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.050	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.050	M	Au	<0.00030	M	Nd	<0.00020	O	Sc	<0.0020	s	Ti	
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.010	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.020	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	0.12	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.010	i	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	i	S		M	Zn	0.19
O	Cu	<0.040	M	Pb	<0.00030	n	K	0.23	M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.011 g/mL

QA:KL Rev.080502GN

(over)

Paul R. Haines
Quality Assurance Manager

Expires:

EXPIRES 12/2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010375

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Strontium in 0.1% (abs) HNO_3**

Catalog Number:	CGSR1-1, CGSR1-2, and CGSR1-5
Lot Number:	**T-SR01123**
Starting Material:	$SrCO_3$
Starting Material Purity (%):	99.9951
Starting Material Lot No	22593
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS pg. 1 of 3
DATE RECEIVED: 06/30/03
DATE EXPIRED: 07/01/2004 VOS
DATE OPENED: 06/23/03
INORG: 4154 PO: F52370

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 998 ± 2 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1002 ± 8 µg/mL**
ICP Assay NIST SRM 3153a Lot Number: 990906

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.00600	O	Li	< 0.00003	M	Pr	< 0.00030	O	Te	< 0.10000
M	Sb	< 0.00050	M	Er	< 0.00500	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	< 0.00030
O	As	< 0.00500	M	Eu	< 0.00300	O	Mg	0.00037	O	Rh	< 0.00600	M	Tl	< 0.00100
M	Ba	0.04001	M	Gd	< 0.00100	O	Mn	0.00018	i	Rb		M	Th	< 0.00100
O	Be	< 0.00009	M	Ga	< 0.00100	O	Hg	< 0.01500	O	Ru	< 0.00300	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00600	M	Mo	< 0.00200	M	Sm	< 0.00100	M	Sn	< 0.00500
O	B	< 0.00060	M	Au	< 0.00300	M	Nd	< 0.00200	M	Sc	< 0.01000	M	Ti	< 0.05001
M	Cd	< 0.00300	M	Hf	< 0.00200	O	Ni	< 0.00300	O	Se	< 0.05000	M	W	< 0.01000
O	Ca	0.03600	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	0.00056	M	U	< 0.00200
M	Ce	< 0.00500	O	In	< 0.00200	n	Os		M	Ag	< 0.00200	M	V	< 0.00200
M	Cs	< 0.00030	M	Ir	< 0.00500	O	Pd	< 0.00400	O	Na	0.00520	M	Yb	< 0.00100
O	Cr	< 0.00080	O	Fe	0.00080	O	P	< 0.00480	s	Sr		O	Y	< 0.00004
M	Co	< 0.00300	M	La	< 0.00050	M	Pt	< 0.00200	n	S		M	Zn	< 0.02000
O	Cu	< 0.00140	M	Pb	< 0.00300	O	K	< 0.00170	M	Ta	< 0.00700	M	Zr	< 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 87.62; +2; 6; $Sr(H_2O)_6^{+2}$
Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_2SO_4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1 - 3.5% HNO_3 / LDPE container.
Sr Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO_3); Ores (Carbonate fusion in Pt° followed by HCl dissolution); Organic Matrices (Dry ash and dissolution in dilute HCl).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at = concs.)
ICP-OES	407.771 nm	0.0004 / 0.00006 µg/mL	1	ion	U, Ce
ICP-OES	421.552 nm	0.0008 / 0.00004 µg/mL	1	ion	Rb
ICP-OES	460.733 nm	0.07 / 0.003 µg/mL	1	atom	Ce
ICP-MS	88 amu	1200 ppt	n/a	M$^+$	$^{72}Ge^{16}O$, $^{176}Yb^{+2}$, $^{176}Lu^{+2}$, $^{176}Hf^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

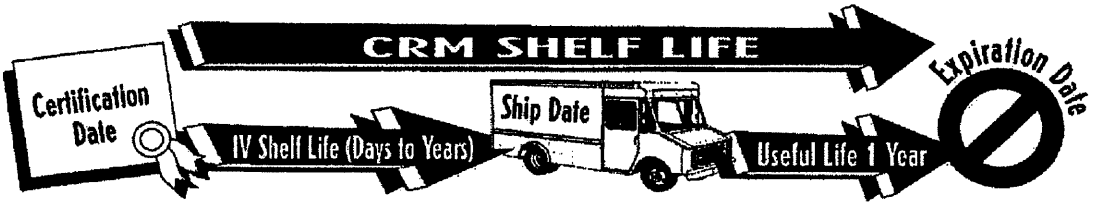
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 31, 2002

Expiration Date: EXPIRES 01 2004

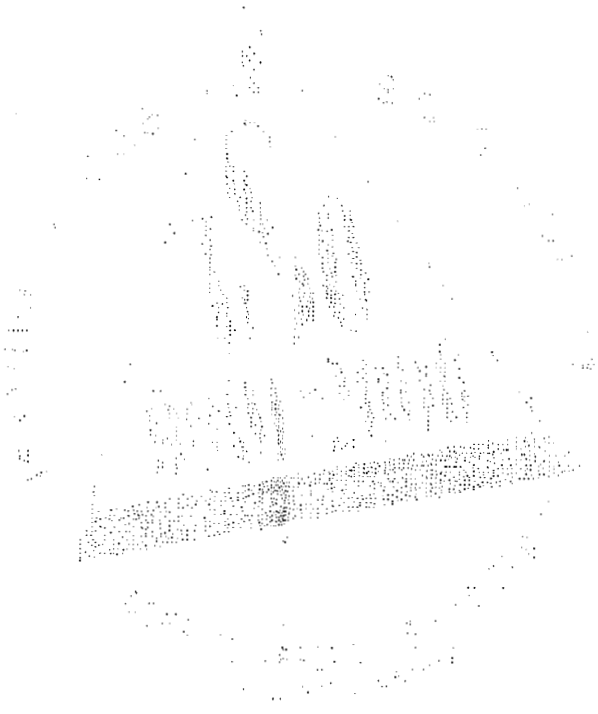
INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004 VOS
DATE OPENED: 06/23/03
INORG: 4154 PO: F52370

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, QA Administrator

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director



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inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Tin in H_20 tr. HNO_3 tr. HF**

Catalog Number:	CGSN1-1, CGSN1-2, and CGSN1-5
Lot Number:	**X-SN01115**
Starting Material:	Sn Shot
Starting Material Purity (%):	99.999438
Starting Material Lot No	G12M23
Matrix:	H_20 tr. HNO_3 tr. HF

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 995 ± 2 µg/mL

Certified Density: 0.998 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **995 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3161a Lot Number: 993107

Assay Method #2 **998 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 03/30/04
DATE EXPIRED: 04/01/2005 VOS
DATE OPENED: 03/30/04
INORG: 4512 PO: E53361

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00050	M Dy < 0.01205	O Li < 0.00002	M Pr < 0.00060	M Te < 0.06026
O Sb < 0.01000	M Er < 0.01004	M Lu < 0.00080	M Re < 0.00201	M Tb < 0.00060
M As < 0.02009	M Eu < 0.00603	O Mg < 0.00003	M Rh < 0.00201	M Tl < 0.00201
O Ba < 0.00070	M Gd < 0.00201	M Mn < 0.00804	M Rb < 0.00201	M Th < 0.00201
M Be < 0.00100	M Ga < 0.00201	O Hg < 0.01500	M Ru < 0.00402	M Tm < 0.00080
M Bi < 0.00080	M Ge < 0.01205	M Mo < 0.00402	M Sm < 0.00201	s Sn
O B < 0.01200	M Au < 0.00603	M Nd < 0.00402	M Sc < 0.02009	M Ti < 0.10043
O Cd 0.00009	M Hf < 0.00402	O Ni < 0.01000	M Se < 0.01607	M W < 0.02009
O Ca < 0.00150	M Ho < 0.00100	M Nb < 0.00100	O Si < 0.00340	M U < 0.00402
M Ce < 0.01004	M In < 0.02009	n Os	M Ag < 0.00402	M V < 0.00402
M Cs < 0.00060	M Ir < 0.01004	M Pd < 0.01004	O Na < 0.00010	M Yb < 0.00201
M Cr < 0.01004	O Fe < 0.00110	O P < 0.00500	M Sr < 0.00100	M Y < 0.08035
O Co < 0.00200	M La < 0.00100	M Pt < 0.00402	n S	M Zn < 0.04017
M Cu < 0.01205	M Pb 0.00593	O K < 0.00200	M Ta < 0.01406	M Zr < 0.01004

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do nd return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 118.710; +4; 4,5, 6, 7,8 $Sn(OH)_xF_y^{z-}$

Chemical Compatibility - Soluble in HCl and dilute HF / HNO_3. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F^- away. (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated.) Stable with most inorganic anions provided it is in the chemical form shown above.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $Sn(OH)_xF_y^{z-}$ for 1 year in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Sn(OH)_xF_y^{z-}$ chemically stable for years in 2-5% HNO_3 / trace HF in a LDPE container.

Sn Containing Samples (Preparation and Solution) - Metal (Soluble in HF /HNO_3 or HCl); Oxides - SnO (soluble in HCl), SnO_2 -very resistant to all acids including HF (Fusion with equal parts of Na_2CO_3 and S. It is then soluble in water or dilute acids as the thiostannate.); Alloys (Treat first 0.1 g with 10 mL conc. H_2SO_4 to boiling until the alloy disintegrates and nearly all of the sulfuric acid is expelled. Then add 100 mL O_2 free water and 50 mL of conc HCl or transfer to a plastic container and add 1 mL HF in either case warming gently to bring about solution.) Organic Matrices (Volatility and precipitation of the insoluble stannic oxide are problems. Consultation of the literature should be made for individual matrices / Sn compounds.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≥ 100 ppm conc.)
ICP-OES 189.989 nm	0.03 / 0.003 µg/mL	1	ion	
ICP-OES 242.949 nm	0.1 / 0.01 µg/mL	1	atom	W, Mo, Rh, Ta, Co
ICP-MS 120 amu	5 ppt	n/a	M^+	^{240}Te, $^{104}Ru^{16}O$, $^{104}Pd^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 03/30/04
DATE EXPIRED: 04/01/2005 VOS
DATE OPENED: 03/30/04
INORG: 4512 PO: E53361

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010382

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 11, 2004

Expiration Date: EXPIRES 1 FEB 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010383

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Bismuth In 3.5% (abs) HNO_3**

Catalog Number:	CGBI1-1 and CGBI1-5
Lot Number:	**W-BI01089**
Starting Material:	Bi needles
Starting Material Purity (%):	99.999090
Starting Material Lot No	G25L16
Matrix:	3.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 VOS
DATE OPENED: 08/01/03
INORG: 4300 PO: F52383

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 4 µg/mL

Certified Density: 1.026 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

$\bar{x}$ = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1002 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3106 Lot Number: 991212

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00012	M	Dy	< 0.01202	O	Li	< 0.00002	M	Pr	< 0.00060	M	Te	< 0.06008
M	Sb	< 0.00100	M	Er	< 0.01001	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.02003	M	Eu	< 0.00601	O	Mg	0.00070	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.02003	M	Gd	< 0.00200	O	Mn	< 0.00020	M	Rb	< 0.00200	M	Th	< 0.00200
M	Be	< 0.00100	M	Ga	< 0.00200	O	Hg	< 0.01500	M	Ru	< 0.00401	M	Tm	< 0.00080
s	Bi		M	Ge	< 0.01202	M	Mo	< 0.00401	M	Sm	< 0.00200	M	Sn	< 0.01001
M	B	< 0.14018	M	Au	< 0.00601	M	Nd	< 0.00401	M	Sc	< 0.02003	M	Ti	< 0.10013
O	Cd	0.00017	M	Hf	< 0.00401	M	Ni	< 0.01602	M	Se	< 0.01602	M	W	< 0.02003
O	Ca	0.00245	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	0.00105	M	U	< 0.00401
M	Ce	< 0.01001	O	In	0.00105	n	Os		M	Ag	< 0.00401	M	V	< 0.00401
M	Cs	< 0.00060	M	Ir	< 0.01001	O	Pd	< 0.00400	O	Na	0.00240	M	Yb	< 0.00200
O	Cr	0.00020	O	Fe	0.00014	O	P	< 0.01000	M	Sr	< 0.00100	M	Y	< 0.08011
M	Co	< 0.00601	M	La	< 0.00100	M	Pt	< 0.00401	O	S	< 0.03000	O	Zn	0.00008
O	Cu	0.00014	O	Pb	0.00135	O	K	0.00039	M	Ta	< 0.01402	M	Zr	< 0.01001

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 208.9804; +3; 6 ;$Bi(O)(H_2O)_5^{3+}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4 and HF. **Avoid** basic media forming insoluble hydroxide. Stable with most metals and inorganic anions in acidic media. Many salts that are insoluble in water are soluble in HCl, HNO_3 and HF. The major problem with Bi^{3+} is its tendency to hydrolyze at higher concentrations or in dilute acid. Nitric acid solutions should be 5% to hold the Bi in solution in the 100 to 10000 µg/mL concentration range

Stability - 2-100 ppb levels stable for months in 1 % HNO_3 /LDPE container. 1-10,000 ppm solutions chemically stable for years in 5 - 7% HNO_3 / LDPE container.

Bi Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HNO_3); Alloys (Dissolve in conc. 4:1 HCl /HNO_3. Heating may be required.); Organic based (dry ash at 450°C and dissolve ash in HNO_3 or acid digestion with conc. hot sulfuric acid adding hydrogen peroxide dropwise and carefully until clear.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ Concs.)
ICP-OES	223.061 nm	0.04 / 0.005 µg/mL	1	atom	Th, Ir, Tl Cu
ICP-OES	306.772 nm	0.08 / 0.01 µg/mL	1	atom	Th, U, Zr, Hf, Fe
ICP-OES	222.825 nm	0.1 / 0.02 µg/mL	1	atom	Cr, Hf, Ce, Os
ICP-MS	209 amu	2 ppt	n/a	M+	$^{193}Ir^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004 VOS
DATE OPENED: 08/01/03
INORG: 4200 PO: F52383

010386

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 28, 2003

Expiration Date: EXPIRES 1-2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Lithium in 0.1% (abs) HNO_3**

Catalog Number:	CGLI1-1 and CGLI1-5
Lot Number:	**W-LI02073**
Starting Material:	Li_2CO_3
Starting Material Purity (%):	99.997165
Starting Material Lot No	1123
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 VOS
DATE OPENED: 07/01/04
INORG: 4628 PO: F53406

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 995 ± 2 µg/mL

Certified Density: 1.004 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **995 ± 2 µg/mL**
ICP Assay NIST SRM 3129a Lot Number: 000505

Assay Method #2 **995 ± 6 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00120	M	Dy	< 0.01199	S	Li		M	Pr	< 0.00060	M	Te	< 0.05994
M	Sb	< 0.00100	M	Er	< 0.00999	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.01998	M	Eu	< 0.00599	O	Mg	0.00650	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.01998	M	Gd	< 0.00200	O	Mn	0.00006	M	Rb	< 0.00200	M	Th	< 0.00200
O	Be	< 0.00020	M	Ga	< 0.00200	O	Hg	< 0.01500	M	Ru	< 0.00400	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01199	M	Mo	< 0.00400	M	Sm	< 0.00200	O	Sn	< 0.00600
O	B	0.00020	M	Au	< 0.00599	M	Nd	< 0.00400	M	Sc	< 0.01998	O	Ti	< 0.00070
M	Cd	< 0.00599	M	Hf	< 0.00400	O	Ni	< 0.00230	M	Se	< 0.01598	O	W	< 0.00400
O	Ca	0.04050	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	0.04650	M	U	< 0.00400
M	Ce	< 0.00999	O	In	< 0.00400	n	Os		M	Ag	< 0.00400	O	V	0.00009
M	Cs	< 0.00060	M	Ir	< 0.00999	M	Pd	< 0.00999	O	Na	0.03200	M	Yb	< 0.00200
M	Cr	< 0.00999	O	Fe	0.00200	O	P	< 0.00250	O	Sr	0.00026	M	Y	< 0.07992
M	Co	< 0.00599	M	La	< 0.00100	M	Pt	< 0.00400	O	S	0.01250	O	Zn	0.00145
O	Cu	0.00100	M	Pb	< 0.00599	O	K	0.00950	M	Ta	< 0.01399	M	Zr	< 0.00999

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 6.941; +1; (6); $Li^{+}(aq)$ large effective radius due to hydration sphere (Coordination Number in parentheses is assumed, not certain.)
Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Li Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt° followed by HCl dissolution-blank levels of Li in sodium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤5ppm cs.)
ICP-OES 670.784 nm	0.002 / 0.00002 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES 460.286 nm	0.9 / 0.04 µg/mL	1	atom	Zr, Th
ICP-OES 323.261 nm	1.1 / 0.05 µg/mL	1	atom	Sb, Th, Ni
ICP-MS 7 amu	10 ppt		n/a	M+

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 +03
DATE OPENED: 07/01/04
INORG: 4628 PO: F53406

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010390

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 12, 2003

Expiration Date: EXPIRES 01 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

178 PROJECT NO.
BOOK NO.

TITLE Nitrite-N

Work continued from Page

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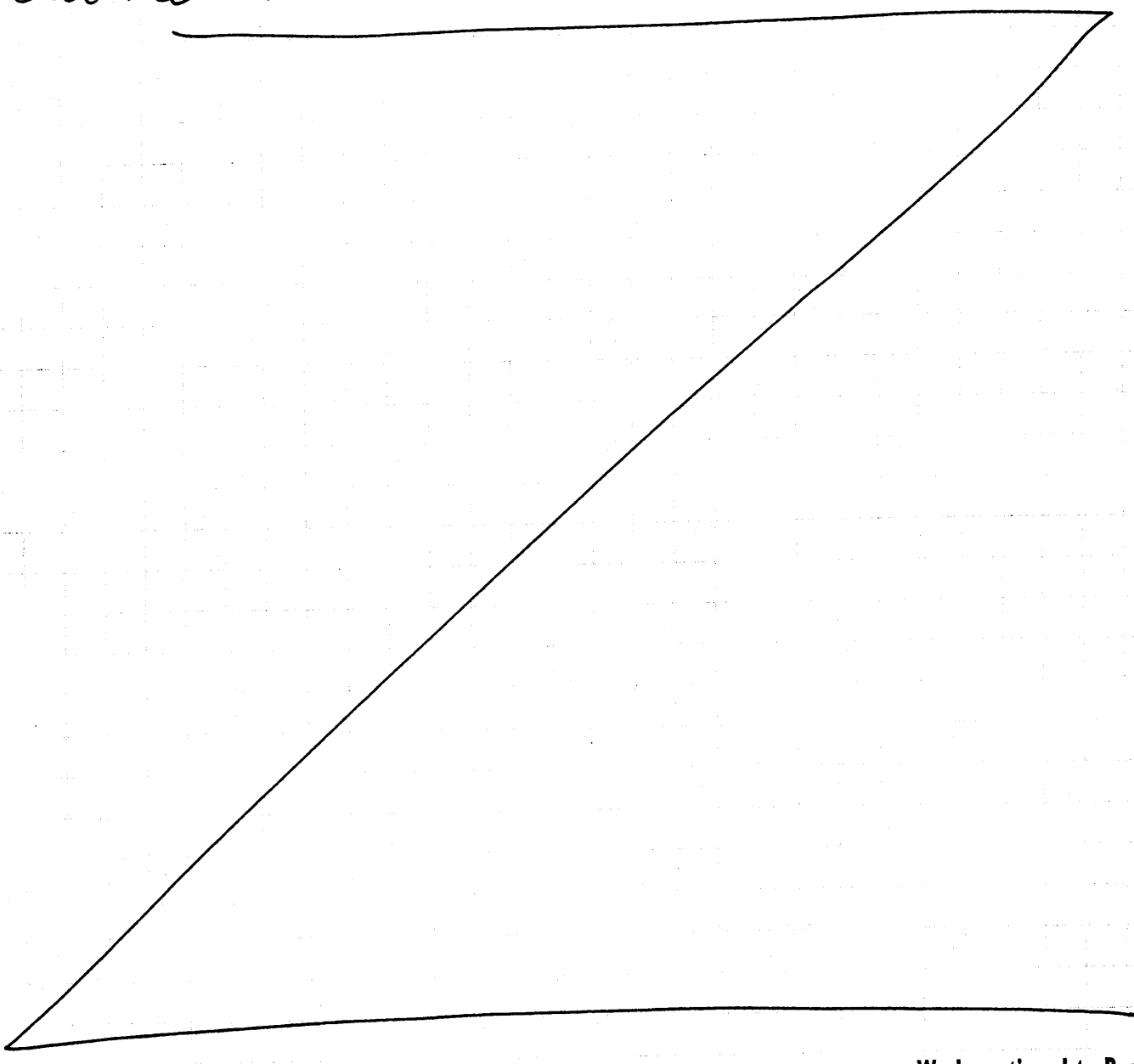
SwRI®

178-01-IC4 Nitrite N, 100 mg/L

0.0493g Sodium nitrite (Fisher, Lot # 944033 Inorg # 0277) diluted to 100 mL DI H_2O.

Balance #12.



Work continued to Page

SIGNATURE [signature] DATE 6/22/04

DISCLOSED TO AND UNDERSTOOD BY [signature] DATE 7/1/04 WITNESS DATE

010392

SPEXertificate™

Certificate of Reference Material

Catalog Number: AS-F9-2X/2Y **Lot No.** 25-5AS
Description: 1000 mg/L Fluoride
Matrix: H2O

This **ASSURANCE**® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 998 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/
Certified Value is Traceable to: NIST SRM 3183

The CRM is prepared gravimetrically using high purity Sodium Fluoride Lot# M44142 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L
Method: Potentiometric using Fluoride combination electrode

Instrumentation Analysis By Ion Chromatography: 999 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<0.2	NO3	<0.2
Cl	<10	PO4	<1
NO2	<0.2	SO4	<0.5

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others
This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN -- 2004 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/06/05
DATE EXPIRED: 01/15/2005 VD3
DATE OPENED: 01/06/05
INORG: 4388 PO: E5299

010393

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
$X = x +/- U$ where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
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SPEXertificate ™

Certificate of Reference Material

Catalog Number: AS-CL9-2X/2Y **Lot No.** 7-147VY
Description: 1000 mg/L Chloride
Matrix: H2O

PARAGON LABS/RADCHEM LABS
DATE RECEIVED: 01/06/04
DATE EXPIRED: 01/15/2005 vos
DATE OPENED: 01/06/04
INORG: 4387 PO: F5292

This ASSURANCE ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 997 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3182

The CRM is prepared gravimetrically using high puritySodium Chloride Lot# 004723 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Gravimetry: Precipitation using AgNO3, filtering, drying and weighing as AgCl.

Instrumentation Analysis By Ion Chromatography: 997 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Element	mg/L	Element	mg/L
F	<0.05	Br	<0.1
PO4	<0.05	NO3	<0.1
SO4	<0.05	NO2	<0.2

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN - - 2004 Certifying Officer: N. Kocherlakota

Report of Certification

010395

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
$X = x+/-U$ where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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010396

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Certificate of Reference Material

Catalog Number: AS-NO2N9-2X/2Y **Lot No.** 7-158VY

Description: 1000 mg/L Nitrite-N

Matrix: H2O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1001.5 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: SPEX CRM 0902

The CRM is prepared gravimetrically using high purity Sodium Nitrite Lot# 0791R . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000mg/L

Method: Titration with KMNO4 that was standardized against Sodium Oxalate NIST SRM 40h.

Instrumentation Analysis By Ion Chromatography: 1003 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<20	NO3	<40
Cl	<20	PO4	<0.8
F	<0.4	SO4	<0.4

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: MAR -- 2004 Certifying Officer: N. Kocheviakota

Report of Certification

010397

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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Certificate of Reference Material

Catalog Number: AS-BR9-2X/2Y **Lot No.** 27-128AS

Description: 1000 mg/L Bromide

Matrix: H2O

This ASSURANCE ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1003.5 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM 3184

The CRM is prepared gravimetrically using high purity Sodium Bromide Lot# 017400 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L:

Method: Precipitation using Silver Nitrate, filter, dry and weigh as AgBr.

Instrumentation Analysis By Ion Chromatography: 1004 mg/L:

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Cl	<1.50	NO3	<0.05
F	<0.02	PO4	<0.20
NO2	<0.05	SO4	<0.05

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JUN - - 2004 Certifying Officer: N. Kocherlakota

INORGANIC LABS/EQUIPMENT LABS
DATE RECEIVED: 06/15/04
DATE EXPIRED: 06/15/2005 03
DATE OPENED: 06/15/04
INORG: 4603 PO: F53392

Report of Certification 010399

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647 • CRMSales@spexcsp.com • www.spexcsp.com

010400

SPEXertificate™

Certificate of Reference Material

Catalog Number: AS-NO3N9-2X/2Y **Lot No.** 25-65AS

Description: 1000 mg/L Nitrate Nitrogen

Matrix: H2O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 1003.5 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM 3185

The CRM is prepared gravimetrically using high purity Sodium Nitrate Lot# M14156 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

Method: Precipitate using Nitron Acetate, filter, dry and weigh as C20H16N4HNO3

Instrumentation Analysis By Ion Chromatography: 1003 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<0.5	NO2	<0.2
Cl	<0.2	PO4	<2.0
F	<0.05	SO4	<0.5

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN -- 2004 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/06/04
DATE EXPIRED: 01/15/2005 VS
DATE OPENED: 01/06/04
INORS: 4389 PO: F52292

Report of Certification

010401

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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010402

SPEXertificate™

Certificate of Reference Material

Catalog Number: AS-PO4P9-2X/2Y **Lot No.** 7-145VY
Description: 1000 mg/L Phosphate-P
Matrix: H2O

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 998 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM #318b

The CRM is prepared gravimetrically using high purityKH2PO4 Lot# V35142 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L
Method: Precipitation using Magnesia Mixture. Filter, ignite, and weigh as Mg2P2O7

Instrumentation Analysis By Ion Chromatography:998 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Element	mg/L	Element	mg/L
Cl	<3.0	Br	<0.3
F	<0.2	NO3	<0.5
NO2	<0.3	SO4	<0.5

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN - - 2004 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/06/04
DATE EXPIRED: 01/05/2005 VD5
DATE OPENED: 01/06/04
INITIAL: 4390 PO: F5292

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
$X = x+/-U$ where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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010404

SPEXertificate™

Certificate of Reference Material

Catalog Number: AS-SO4S9-2X/2Y **Lot No.** 27-98AS

Description: 1000 mg/L Sulfate-S

Matrix: H2O

This ASSURANCE ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1000.5 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM 3181

The CRM is prepared gravimetrically using high purity Potassium Sulfate Lot# X34146 . The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L:

Method: Precipitated using Barium Chloride, filtered, ignited and weighed as BaSO4.

Instrumentation Analysis By Ion Chromatography: 1003 mg/L:

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<0.03	NO3	<0.03
Cl	<0.03	PO4	<0.30
F	<0.02		
NO2	<0.03		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JUN - - 2004 Certifying Officer: N. Kochekakota

INORGANIC LABS/RADLICHEM LABS
DATE RECEIVED: 06/14/04
DATE EXPIRED: 06/15/2005
DATE OPENED: 06/14/04
INORG: 4602 PO: E53392

Report of Certification

010405

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647 • CRMSales@spexcsp.com • www.spexcsp.com

010406

SPEXertificate™

Certificate of Reference Material

Catalog Number: ICMIX2-100 **Lot No.:** 25-145AS
Description: **IC Instrument Check Standard 2**
Matrix: H_2O

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single ion concentrates of individual elements using Class A laboratory ware to give precise concentration.
Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ION Chromatography:

Analyte	Labeled (mg/L)	Measured (mg/L)	NIST SRM
F^-	100	100	3183
Cl^-	200	200	3182
Br^-	400	399	3184
NO_3^-	400	402	3185
HPO_4^{-2}	600	600	3186
SO_4^{-2}	400	399	3181

Spex Reference Multi: Lot #IC6-77VY

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single component exceeding +/- 2%. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: APR - - 2004 Certifying Officer: N. Kocherlakota

Report of Certification

010407

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

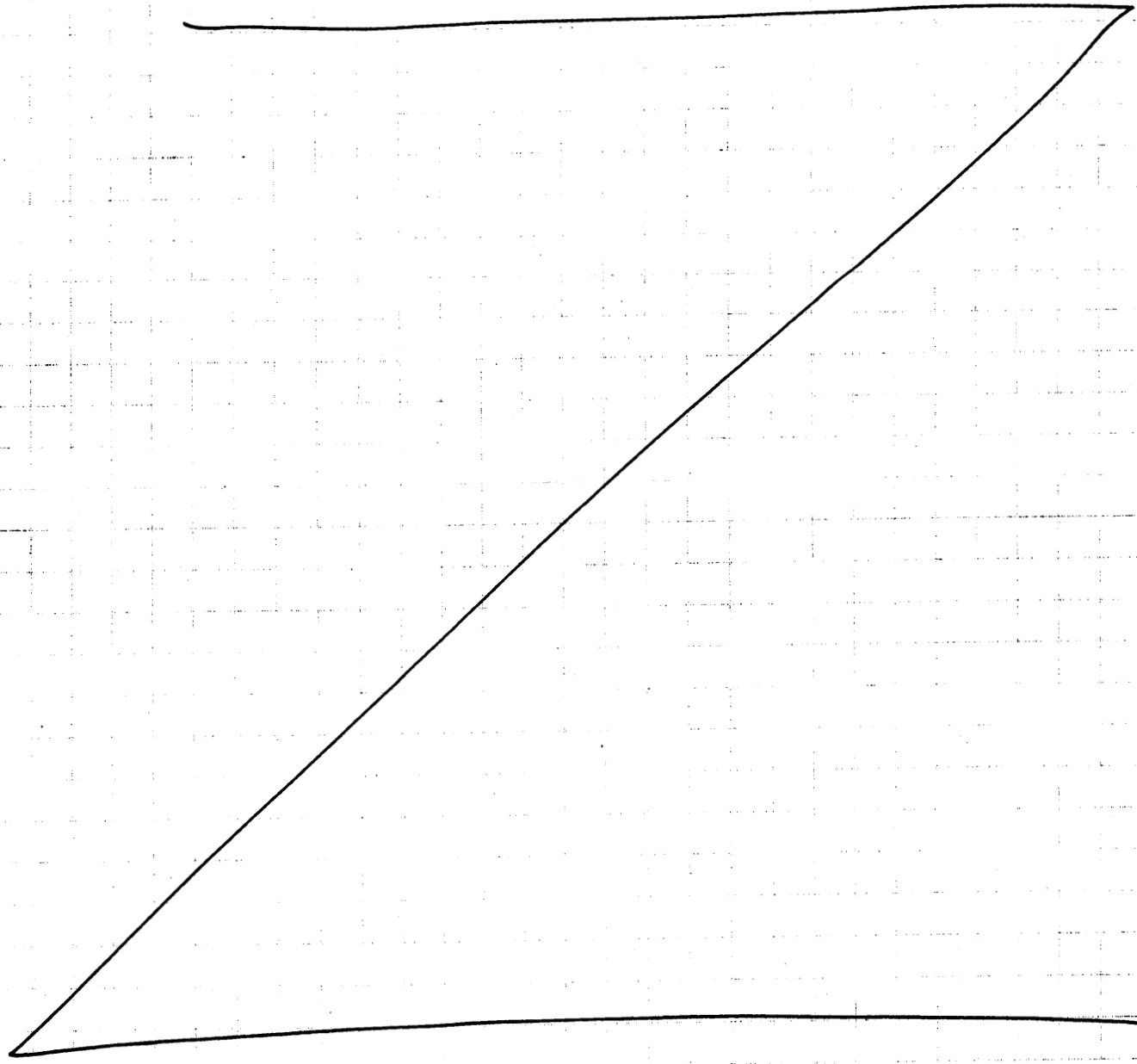
ISO 9001
CERTIFIED

SwRI®

178-01-IC4 Nitrite N, 100 mg/L

0.0493g Sodium nitrite (Fisher, Lot # 944033 Inorg # 0277) diluted to 100 ml DI H_2O.

Balance #12.



SIGNATURE [signature] DATE 6/22/04

DISCLOSED TO AND UNDERSTOOD BY [signature] DATE 7/1/04 WITNESS DATE

FROM: Fisher Scientific TO: Extension PAGES: 2

FISHER SCIENTIFIC CHEMICAL DIVISION
One Reagent Lane, Fair Lawn, NJ 07410

010409

ANALYTICAL CONTROL LABORATORY ANALYSIS

Name & Grade:
SODIUM NITRITE, A.C.S.
Catalog Number: S347
Lot Number: 944033 Date of Testing/Mfg: 07/14/94
P.O./ Other Customer ID:

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. The following are the actual analytical results obtained:

Test	Unit	Result
APPEARANCE	PASS/FAIL	PASS-WHITE CRYSTS W/YEL TINT
ASSAY	%	99.5000
CALCIUM IN %	%	0.0030
CHLORIDE	%	0.0020
FLUORIDE (F)	PPM	0.400
HEAVY METALS	%	0.0003
IDENTIFICATION		PASS
INSOLUBLE MATTER	%	0.0020
IRON	%	0.00030
POTASSIUM	%	0.00100
SULFATE (SO4)	%	0.0020

Approved by: Frederick H. Turk, FL Analytical QA Supv. or Edgar E. Hess, BPF Analytical QA Supv.

Date: 07/18/94 (Signed and dated original is on file)

NOTE: The data listed is valid for all package sizes of this lot of product, expressed as a extension of the catalog number listed above. If there are any questions with this certificate, please call Steven P. Davis, Analytical QA Manager, at (201) 703-3149.

Ref. No. S347..944033.B1. Location: FL

010410

1001 West Saint Paul Avenue
Milwaukee, WI 53233 USA
Tel.: 800-558-9160 • (414) 273-3850
Fax: 800-962-9591 • (414) 273-4979
e-mail: aldrich@sial.com

ALDRICH®

Certificate of Analysis

SOUTHWEST RESEARCH INST
DANNY RAMIREZ
6220 CULEBRA RD
SAN ANTONIO TX 78238

PO NBR: 130686E

INORGANICS LAB 27/28/29/30/34
DATE RECEIVED: 1/9/2001
DATE EXPIRED: 1/9/2012 OR
DATE OPENED: 1/9/2001
INORG: 2626 PO: 130686E

PRODUCT NUMBER: 236527-500G

LOT NUMBER: 15308EI

PRODUCT NAME: SODIUM HYDROGENCARBONATE, 99.7+%, A.C.S. REAGENT

FORMULA: NAHCO3

FORMULA WEIGHT: 84.01

APPEARANCE	WHITE POWDER
TITRATION	100.3 % (WITH HCL)
ICP ASSAY	CONFIRMS SODIUM COMPONENT
INSOLUBLE MATTER	0.001% *
CALCIUM	0.0050%
CHLORIDE	0.0014% *
IRON	< 0.0001% *
HEAVY METALS	<5PPM (AS PB) *
POTASSIUM	<0.0020 % *
MAGNESIUM	0.00025%
AMMONIUM	<5PPM *
PHOSPHATE	<0.001% *
CALCIUM, MAGNESIUM & R2O3 PRECIPITATE	0.016% *

CONTINUED ON NEXT PAGE

ALDRICH CHEMICAL COMPANY
DAVID SWESSEL
JANUARY 5, 2001

Certificate of Analysis

THE RIGHT CHEMICALS
THE RIGHT CHEMISTRY

INORGANIC LABS/RADCHEM LABS 010411
DATE RECEIVED: 02/27/03
DATE EXPIRED: 02/27/2013 VOS
DATE OPENED: 04/10/03
INORG: 4033 PO: 330176E

Sodium carbonate, ACS primary standard, 99.95-100.05% (dried basis)

Stock Number: 33377
Lot Number: L06M34

Analysis

Test	Limits	Results
Assay (dried basis)	99.95 – 100.05 %	100.0 %
Insoluble	0.01 % max	< 0.01 %
Loss on heating (285°C)	1.0 % max	< 0.05 %
Chloride	0.001 % max	< 0.001 %
Nitrogen compounds	0.001 % max	< 0.001 %
Phosphate	0.001 % max	< 0.001 %
Silica	0.005 % max	< 0.005 %
Sulfur compounds	0.003 % max	< 0.003 %
NH_4OH precipitate	0.01 % max	< 0.01 %
Potassium	0.005 % max	< 0.001 %
Calcium	0.02 % max	< 0.01 %
Magnesium	0.004 % max	< 0.004 %
Heavy metals (as Pb)	0.0005 % max	< 0.0005 %
Iron	0.0005 % max	< 0.0005 %

Traceable to NIST? Yes

Certified by:

Quality Control:

Alfa Aesar®
A Johnson Matthey Company

TUV CERT ISO 9002

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www.alfa.com • email: info@alfa.com

010412

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

Pipette Calibrations

Book/Page: 03 033

SwRI – Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

(Space provide for Inorganic Laboratories' Fixed Volume Pipette Verification Spreadsheet)

7-1-04

010413

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Spreadsheet

Eppendorf #	True Value (uL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
Lab30	1000	1.0072	1.0068	1.0054	1.01	100.65
TMA1	1000	1.0059	1.0072	1.0094	1.01	100.75
TMA2	1000	1.0040	1.0039	1.0021	1.00	100.33
TMA3	1000	OUT	OF	SERVICE		
TMA6	1000	1.0093	1.0086	1.0098	1.01	100.92
TMB1	900	0.9033	0.9018	0.9013	0.90	100.24
TMC1	800	0.8002	0.8011	0.8007	0.80	100.08
TMDD1	750	0.7568	0.7521	0.7501	0.75	100.40
TMD1	700	0.7054	0.7018	0.7021	0.70	100.44
TMD2	700	0.7099	0.7058	0.7031	0.71	100.90
TME1	600	0.6027	0.6018	0.6007	0.60	100.29
TMF2	500	0.5011	0.5037	0.5019	0.50	100.45
TMF5	500	0.5058	0.5084	0.5060	0.51	101.35
ICF1	500	0.5054	0.5032	0.5030	0.50	100.77
L30-500	500	0.5013	0.4998	0.4999	0.50	100.07
TMG3	400	0.3946	0.3948	0.3944	0.39	98.65
TMH1	300	OUT	OF	SERVICE		
TMH2	300	0.3031	0.3001	0.3000	0.30	100.36
TMJ1	250	0.2524	0.2504	0.2500	0.25	100.37
TMJ2	250	0.2501	0.2507	0.2502	0.25	100.13
TMJ3	250	0.2525	0.2530	0.2522	0.25	101.03
TMK2	200	0.2015	0.2001	0.2012	0.20	100.47
TML1	150	0.1513	0.1516	0.1504	0.15	100.73
TMM1	120	0.1210	0.1209	0.1203	0.12	100.61
TMN3	100	0.1026	0.1004	0.1004	0.10	101.13
ICN1	100	0.0990	0.1002	0.1001	0.10	99.77
TMQ1	80	0.0806	0.0804	0.0804	0.08	100.58
TMR1	70	OUT	OF	SERVICE		
TMS1	60	OUT	OF	SERVICE		
LAB-30A	50	NOT	FOUND			
TMU1	40	0.0404	0.0402	0.0400	0.04	100.50
TMU2	40	0.0399	0.0400	0.0399	0.04	99.83
TMV1	30	0.0300	0.0300	0.0299	0.03	99.89
L30-20	20	0.0201	0.0202	0.0201	0.02	100.67
TMW1	25	0.0251	0.0250	0.0251	0.03	100.27
TMY1	15	OUT	OF	SERVICE		

010414 Book/Page 03 034

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (°C): 21

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	
Lab30	1000	1.0072	1.0068	1.0054	
TMA1	1000	1.0059	1.0072	1.0094	
TMA2	1000	1.0040	1.0039	1.0021	
TMA3	1000	OUT	OF	SERVICE	
TMA6	1000	~~NOT~~ 1.0093	1.0086 ~~FOUND~~	1.0098	found on 7.2.04 gw
TMB1	900	.9033	.9018	.9013	
TMC1	800	.8002	.8011	.8007	
TMDD1	750	.7568	.7521	.7501	
TMD1	700	.7054	.7018	.7021	
TMD2	700	.7099	.7058	.7031	
TME1	600	.6027	.6018	.6007	
TMF2	500	.5011	.5037	.5019	
TMF5	500	.5058	.5084	.5060	
ICF1	500	.5054	.5032	.5030	
L30-500	500	.5013	.4998	.4999	
TMG3	400	.3946	.3948	.3944	
TMH1	300	OUT	OF	SERVICE	
TMH2	300	.3031	.3001	.3000	
TMJ1	250	.2524	.2504	.2500	
TMJ2	250	.2501	.2507	.2502	
TMJ3	250	.2525	.2530	.2522	
TMK2	200	.2015	.2001	.2012	
TML1	150	.1513	.1516	.1504	
TMM1	120	.1210	.1209	.1203	
TMN3	100	.1026	.1004	.1004	
ICN1	100	.0990	.1002	.1001	
TMQ1	80	.0806	.0804	.0804	
TMR1	70	OUT	OF	SERVICE	
TMS1	60	OUT	OF	SERVICE	
LAB-30A	50	NOT	FOUND	—	
TMU1	40	.0404	.0402	.0400	
TMU2	40	.0399	.0400	.0399	
TMV1	30	.0300	.0300	.0299	
L30-20	20	.0201	.0202	.0201	
TMW1	25	.0251	.0250	.0251	
TMY1	15	OUT	OF	SERVICE	

Analyst: John Wills Date: 7-1-04

Reviewed by: Wade Wilson Date: 07/12/04

Book/page: 06 | 037

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

6/21/04

010415

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20				0.000	0.00
ADJ200-A	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-C	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-D	100				0.000	0.00
	200				0.000	0.00
	20	0.0205	0.0203	0.0204	0.020	102.00
ADJ200-G	100	0.0996	0.1011	0.1021	0.101	100.93
	200	0.1986	0.1974	0.2003	0.199	99.38
	20				0.000	0.00
ADJ200-H	100				0.000	0.00
	200				0.000	0.00
	20	0.0202	0.0203	0.0202	0.020	101.17
ADJ200-J	100	0.0991	0.1005	0.0989	0.100	99.50
	200	0.2013	0.2041	0.2027	0.203	101.35
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00

FRM-247a (Rev 3/Oct 03)

010416 Book/page: 06 038

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 21

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
20 µL – 200 µL		20			
	ADJ200-A	100			
		200			
		20			
	ADJ200-C	100			
		200			
		20			
	ADJ200-D	100			
		200			
		20	0.0205	0.0203	0.0204
	ADJ200-G	100	0.0996	0.1011	0.1021
		200	0.1986	0.1974	0.2003
		20			
	ADJ200-H	100	COULD NOT FIND		
		200			
		20	0.0202	0.0203	0.0202
	ADJ200-J	100	0.0991	0.1005	0.0989
		200	0.2013	0.2041	0.2027
		20			
	ADJ200-K	100			
		200			
		20			
	ADJ200	100			
		200			

6/21/04

6/21/04

Analyst: _____ Date: 6/21/04

Reviewed by: _____ Date: 7/7/04

Book/page: 06 039

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

6-25-04

010417

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20	0.0201	0.0201	0.0201	0.020	100.50
ADJ200-A	100	0.0997	0.0991	0.0994	0.099	99.40
	200	0.1997	0.1998	0.1992	0.200	99.78
	20	0.0203	0.0202	0.0203	0.020	101.33
ADJ200-C	100	0.1004	0.0998	0.1011	0.100	100.43
	200	0.1994	0.1995	0.1994	0.199	99.72
	20	0.0204	0.0202	0.0202	0.020	101.33
ADJ200-D	100	0.0991	0.0996	0.0998	0.100	99.50
	200	0.1994	0.1992	0.1989	0.199	99.58
	20					
ADJ200-G	100					
	200					
	20					
ADJ200-H	100					
	200					
	20					
ADJ200-J	100					
	200					
	20	0.0200	0.0201	0.0200	0.020	100.17
ADJ200-K	100	0.0998	0.1001	0.0993	0.100	99.73
	200	0.2001	0.1996	0.1996	0.200	99.88
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					

FRM-247a (Rev 4/Apr 04)

010418 Book/page: 06 040

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G-011 diH20 Temperature (° C) 21

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20	.0201	.0201	.0201
ADJ200-A	100	.0997	.0991	.0994
	200	.1997	.1998	.1992
	20	.0203	.0202	.0203
ADJ200-C	100	.1004	.0998	.1011
	200	.1994	.1995	.1994
	20	.0204	.0202	.0202
ADJ200-D	100	.0991	.0996	.0998
	200	.1994	.1992	.1989
	20			
ADJ200-G	100			
	200			
	20			
ADJ200-H	100			
	200		6-25-04	
	20			
ADJ200-J	100			
	200			
	20	.0200	.0201	.0200
ADJ200-K	100	.0998	.1001	.0993
	200	.2001	.1996	.1996
	20			
ADJ200	100		6-25-04	
	200			

Analyst: John Wilks Date: 6-25-04

Reviewed by: Walter Cl Jr Date: 06/30/04

Book/page: 06 041

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

7-2-04

010419

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20	0.0204	0.0203	0.0203	0.020	101.67
ADJ200-A	100	0.1003	0.1001	0.0996	0.100	100.00
	200	0.2009	0.2017	0.2014	0.201	100.67
	20	0.0202	0.0203	0.0201	0.020	101.00
ADJ200-C	100	0.0998	0.0986	0.0991	0.099	99.17
	200	0.1990	0.1996	0.1989	0.199	99.58
	20	0.0200	0.0200	0.0200	0.020	100.00
ADJ200-D	100	0.0995	0.0999	0.0998	0.100	99.73
	200	0.1989	0.2003	0.1994	0.200	99.77
	20					
ADJ200-G	100					
	200					
	20					
ADJ200-H	100					
	200					
	20					
ADJ200-J	100					
	200					
	20	0.0201	0.0202	0.0204	0.020	101.17
ADJ200-K	100	0.0996	0.1002	0.1008	0.100	100.20
	200	0.2000	0.1998	0.1998	0.200	99.93
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					

FRM-247a (Rev 4/Apr 04)

010420 Book/page: 06 042

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20	.0204	.0203	.0203
ADJ200-A	100	.1003	.1001	.0996
	200	.2009	.2017	.2014
	20	.0202	.0203	.0201
ADJ200-C	100	.0998	.0986	.0991
	200	.1990	.1996	.1989
	20	.0200	.0200	.0200
ADJ200-D	100	.0995	.0999	.0998
	200	.1989	.2003	.1994
	20			
ADJ200-G	100			
	200			
	20			
ADJ200-H	100			
	200			7-2-04
	20			
ADJ200-J	100			
	200			
	20	.0201	.0202	.0204
ADJ200-K	100	.0996	.1002 ~~.1000~~ JEO 7-2-04	.1008
	200	.2000	.1998	.1998
	20			
ADJ200	100		7-2-04	
	200			

Analyst: [signature] Date: 7-2-04

Reviewed by: [signature] Date: 7/7/04

Book/page: 06 043

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

Initial 7/6/04 010421

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20				0.000	0.00
ADJ200-A	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-C	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-D	100				0.000	0.00
	200				0.000	0.00
	20	0.0204	0.0204	0.0203	0.020	101.83
ADJ200-G	100	0.0985	0.0982	0.0996	0.099	98.77
	200	0.1980	0.1978	0.1990	0.198	99.13
	20	0.0201	0.0200	0.0201	0.020	100.33
ADJ200-H	100	0.0988	0.0992	0.0987	0.099	98.90
	200	0.1988	0.1993	0.1984	0.199	99.42
	20	0.0202	0.0204	0.0204	0.020	101.67
ADJ200-J	100	0.0991	0.0994	0.0980	0.099	98.83
	200	0.1991	0.1979	0.1987	0.199	99.28
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00

FRM-247a (Rev 3/Oct 03)

010422 Book/page: 06 044

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
20 µL – 200 µL		20			
	ADJ200-A	100			
		200			
		20			
	ADJ200-C	100			
		200			
		20			
	ADJ200-D	100			
		200			
		20	0.0204	0.0204	0.0203
	ADJ200-G	100	0.0985	0.0982	0.0996
		200	0.1980	0.1978	0.1990
		20	0.0201	0.0200	0.0201
	ADJ200-H	100	0.0988	0.0992	0.0987
		200	0.1988	0.1993	0.1984
		20	0.0202	0.0204	0.0204
	ADJ200-J	100	0.0991	0.0994	0.0980
		200	0.1991	0.1979	0.1987
		20			
	ADJ200-K	100			
		200			
		20			
	ADJ200	100			
		200			

Analyst: [signature] Date: 7/6/04

Reviewed by: [signature] Date: 7/7/04

Book/page: 06 097

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010423

6/21/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100				0.000	0.00
ADJ1000-C	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-D	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-E	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-F	500				0.000	0.00
	1000				0.000	0.00
	100	0.0987	0.0989	0.0984	0.099	98.67
ADJ1000-G	500	0.5034	0.5047	0.5009	0.503	100.60
	1000	0.9925	0.9884	0.9907	0.991	99.05
	100	0.0990	0.0985	0.0983	0.099	98.60
ADJ1000-H	500	0.4938	0.4960	0.4941	0.495	98.93
	1000	1.0006	1.0019	0.9991	1.001	100.05
	100	0.0986	0.0997	0.0994	0.099	99.23
ADJ1000-J	500	0.5005	0.5021	0.5013	0.501	100.26
	1000	1.0041	1.0031	1.0026	1.003	100.33
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00

FRM-247b (Rev 2/Oct 03)

010424 Book/page: 06 098

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: Gold diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100			
ADJ1000-C	500			
	1000			
	100			
ADJ1000-D	500			
	1000			
	100			
ADJ1000-E	500			
	1000			
	100			
ADJ1000-F	500			
	1000			
	100	0.0987	0.0989	0.0984
ADJ1000-G	500	0.5034	0.5041	0.5009
	1000	0.9925	0.9884	0.9907
	100	0.0990	0.0985	0.0983
ADJ1000-H	500	0.4938	0.4960	0.4941
	1000	1.0006	1.0019	0.9991
	100	0.0986	0.0991	0.0994
ADJ1000-J	500	0.5005	0.5021	0.5013
	1000	1.0041	1.0031	1.0026
	100			
ADJ1000-K	500			
	1000			
	100			
ADJ1000	500			
	1000			

6/21/04

6/21/04

Analyst: _____ Date: 6/21/04

Reviewed by: _____ Date: 7/7/04

Book/page: 06 099

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010425

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100	0.1017	0.1019	0.1016	0.102	101.73
ADJ1000-C	500	0.4986	0.4988	0.4991	0.499	99.77
	1000	0.9946	0.9961	0.9938	0.995	99.48
	100	0.0999	0.1014	0.1013	0.101	100.87
ADJ1000-D	500	0.4945	0.4962	0.4974	0.496	99.21
	1000	0.9936	0.9942	0.9938	0.994	99.39
	100	0.1004	0.1004	0.1016	0.101	100.80
ADJ1000-E	500	0.4968	0.4974	0.4963	0.497	99.37
	1000	0.9992	1.0040	1.0018	1.002	100.17
	100	0.1003	0.1010	0.1009	0.101	100.73
ADJ1000-F	500	0.4988	0.4991	0.4974	0.498	99.69
	1000	0.9951	0.9956	0.9954	0.995	99.54
	100					
ADJ1000-G	500					
	1000					
	100					
ADJ1000-H	500					
	1000					
	100					
ADJ1000-J	500					
	1000					
	100	0.1011	0.1010	0.0998	0.101	100.63
ADJ1000-K	500	0.4958	0.4964	0.4987	0.497	99.39
	1000	1.0001	0.9999	1.0002	1.000	100.01
	100					
ADJ1000	500					
	1000					

FRM-247b (Rev 3/Apr 04)

010426 Book/page: 06 100

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	.1017	.1019	.1016
ADJ1000-C	500	.4986	.4988	.4991
	1000	.9946	.9961	.9938
	100	.0999	.1014	.1013
ADJ1000-D	500	.4945	.4962	.4974
	1000	.9936	.9942	.9938
	100	.1004	.1004	.1016
ADJ1000-E	500	.4968	.4974	.4963
	1000	.9992	1.0040	1.0018
	100	.1003	.1010	.1009
ADJ1000-F	500	.4988	.4991	.4974
	1000	.9951	.9956	.9954
	100			
ADJ1000-G	500			
	1000			
	100			
ADJ1000-H	500			
	1000			
	100			
ADJ1000-J	500			
	1000			
	100	.1011	.1010	.0998
ADJ1000-K	500	.4958	.4964	.4987
	1000	1.0001	.9999	1.0002
	100			
ADJ1000	500			
	1000			

JW 6-25-04

JW 6-25-04

Analyst: John Wilbur Date: 6-25-04

Reviewed by: Valerie Alger Date: 06/30/04

Book/page: 06 101

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010427

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100	0.1019	0.1018	0.1020	0.102	101.90
ADJ1000-C	500	0.4980	0.5004	0.4997	0.499	99.87
	1000	1.0011	1.0018	0.9979	1.000	100.03
	100	0.1020	0.1008	0.1018	0.102	101.53
ADJ1000-D	500	0.4934	0.4966	0.4971	0.496	99.14
	1000	1.0012	1.0011	1.0020	1.001	100.14
	100	0.1012	0.1007	0.1004	0.101	100.77
ADJ1000-E	500	0.4946	0.4968	0.4952	0.496	99.11
	1000	0.9938	0.9960	0.9968	0.996	99.55
	100	0.1010	0.1005	0.1001	0.101	100.53
ADJ1000-F	500	0.4994	0.5008	0.4978	0.499	99.87
	1000	0.9966	0.9999	1.0005	0.999	99.90
	100					
ADJ1000-G	500					
	1000					
	100					
ADJ1000-H	500					
	1000					
	100					
ADJ1000-J	500					
	1000					
	100	0.1007	0.1004	0.1001	0.100	100.40
ADJ1000-K	500	0.5022	0.5036	0.5040	0.503	100.65
	1000	1.0001	0.9998	1.0029	1.001	100.09
	100					
ADJ1000	500					
	1000					

FRM-247b (Rev 3/Apr 04)

010428

Book/page: 06 102

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	.1019	.1018	.1020
ADJ1000-C	500	.4980	.5004	.4997
	1000	1.0011	1.0018	.9979
	100	.1020	.1008	.1018
ADJ1000-D	500	.4934	.4966	.4971
	1000	1.0012	1.0011	1.0030
	100	.1012	.1007 .0953 7-2-04	.1004
ADJ1000-E	500	.4946	.4968	.4952
	1000	.9938	.9960	.9968
	100	.1010	.1005	.1001
ADJ1000-F	500	.4994	.5008	.4978
	1000	.9946	.9999	1.0005
	100			
ADJ1000-G	500			
	1000			
	100		7-2-04	
ADJ1000-H	500			
	1000			
	100			
ADJ1000-J	500			
	1000			
	100	.1007	.1004	.1001
ADJ1000-K	500	.5022	.5036	.5040
	1000	1.0001	.9998	1.0029
	100			
ADJ1000	500		7-2-04	
	1000			

Analyst: John Wills Date: 7-2-04

Reviewed by: R Spies Date: 7/7/04

Book/page: 06 103

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

7/6/04

010429

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100				0.000	0.00
ADJ1000-C	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-D	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-E	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-F	500				0.000	0.00
	1000				0.000	0.00
	100	0.1013	0.1019	0.1010	0.101	101.40
ADJ1000-G	500	0.4939	0.4941	0.4968	0.495	98.99
	1000	0.9823	0.9811	0.9832	0.982	98.22
	100	0.0990	0.0996	0.0992	0.099	99.27
ADJ1000-H	500	0.4925	0.4942	0.4911	0.493	98.52
	1000	0.9827	0.9836	0.9856	0.984	98.40
	100	0.0991	0.1002	0.1005	0.100	99.93
ADJ1000-J	500	0.4962	0.4943	0.4980	0.496	99.23
	1000	0.9871	0.9913	0.9889	0.989	98.91
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00

Book/page: 06 104

010430

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100			
ADJ1000-C	500			
	1000			
	100			
ADJ1000-D	500			
	1000			
	100			
ADJ1000-E	500			
	1000			
	100			
ADJ1000-F	500			
	1000			
	100	0.1013	0.1019	0.1010
ADJ1000-G	500	0.4939	0.4941	0.4968
	1000	0.9823	0.9811	0.9832
	100	0.0990	0.0996	0.0992
ADJ1000-H	500	0.4925	0.4942	0.4911
	1000	0.9827	0.9836	0.9856
	100	0.0991	0.1002	0.1005
ADJ1000-J	500	0.4962	0.4943	0.4980
	1000	0.9871	0.9913	0.9889
	100			
ADJ1000-K	500			
	1000			
	100			
ADJ1000	500			
	1000			

7/6/04

7/6/04

Analyst: _____ Date: 7/6/04

Reviewed by: _____ Date: 7/7/04

Book/page: 06 157

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010431

6/21/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500				0.000	0.00
ADJ5000-C	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-G	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-H	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-I	2500				0.000	0.00
	5000				0.000	0.00
	500	0.5044	0.5020	0.5036	0.503	100.67
ADJ5000-J	2500	2.5087	2.5021	2.5104	2.507	100.28
	5000	5.0216	5.0183	5.0227	5.021	100.42
	500	0.4917	0.4959	0.4967	0.495	98.95
ADJ5000-K	2500	2.5066	2.5013	2.5039	2.504	100.16
	5000	5.0327	5.0391	5.0283	5.033	100.67
	500	0.5047	0.5011	0.5032	0.503	100.60
ADJ5000-L	2500	2.4905	2.4889	2.4922	2.491	99.62
	5000	5.0511	5.0481	5.0496	5.050	100.99
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00

FRM-247c (Rev 2/Mar 03)

010432 Book/page: 06 158

4-19-04

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500			
ADJ5000-C	2500			
	5000			
	500			
ADJ5000-G	2500			
	5000			
	500			
ADJ5000-H	2500			
	5000			
	500			
ADJ5000-I	2500			
	5000			
	500	0.5044	0.5020	0.5036
ADJ5000-J	2500	2.5087	2.5021	2.5104
	5000	5.0216	5.0183	5.0227
	500	0.4917	0.4959	0.4967
ADJ5000-K	2500	2.5066	2.5013	2.5039
	5000	5.0327	5.0391	5.0283
	500	0.5047	0.5011	0.5032
ADJ5000-L	2500	2.4905	2.4889	2.4922
	5000	5.0511	5.0481	5.0496
	500			
ADJ5000-M	2500			
	5000			
	500			
ADJ5000-N	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

6/21/04

6/21/04

Analyst: [signature] Date: 6/21/04

Reviewed by: [signature] Date: 7/7/04

Book/page: 06 159

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

6-25-04

010433

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500	0.4987	0.4998	0.4993	0.499	99.85
ADJ5000-C	2500	2.5038	2.5040	2.5031	2.504	100.15
	5000	5.0338	5.0186	5.0341	5.029	100.58
	500					
ADJ5000-G	2500	OUT	OF	SERVICE		
	5000					
	500					
ADJ5000-H	2500	OUT	OF	SERVICE		
	5000					
	500	0.5012	0.5008	0.5004	0.501	100.16
ADJ5000-I	2500	2.4992	2.4989	2.4988	2.499	99.96
	5000	5.0338	5.0066	5.0061	5.016	100.31
	500					
ADJ5000-J	2500					
	5000					
	500					
ADJ5000-K	2500					
	5000					
	500					
ADJ5000-L	2500					
	5000					
	500	0.5028	0.5016	0.5010	0.502	100.36
ADJ5000-M	2500	2.5009	2.4986	2.4984	2.499	99.97
	5000	5.0093	5.0084	5.0006	5.006	100.12
	500	0.5074	0.5003	0.5001	0.503	100.52
ADJ5000-N	2500	2.5171	2.5001	2.5004	2.506	100.23
	5000	5.0298	5.0096	5.0110	5.017	100.34
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					

010434 Book/page: 06 160

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500	.4987	.4998	.4993
ADJ5000-C	2500	2.5038	2.5040	2.5031
	5000	5.0338	5.0186	5.0341
	500			
ADJ5000-G	2500	Out	OF	SERVICE
	5000			
	500			
ADJ5000-H	2500	out	OF	SERVICE
	5000			
	500	.5012	.5008	.5004
ADJ5000-I	2500	2.4992	2.4989	2.4988
	5000	5.0338	5.0066	5.0061
	500			
ADJ5000-J	2500			
	5000			
	500			
ADJ5000-K	2500			
	5000		6-25-04	
	500			
ADJ5000-L	2500			
	5000			
	500	.5028	.5016	.5010
ADJ5000-M	2500	2.5009	2.4986	2.4984
	5000	5.0093	5.0084	5.0006
	500	.5074	.5003	.5001
ADJ5000-N	2500	2.5171	2.5001	2.5004
	5000	5.0298	5.0096	5.0110
	500			
ADJ5000	2500			
	5000		6-25-04	
	500			
ADJ5000	2500			
	5000			

Analyst: John Wills Date: 6-25-04

Reviewed by: [signature] Date: 06/30/04

Book/page: 06 161

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

7-2-04

010435

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500	0.5056	0.5030	0.5031	0.504	100.78
ADJ5000-C	2500	2.4956	2.4948	2.4948	2.495	99.80
	5000	5.0400	5.0398	5.0421	5.041	100.81
	500					
ADJ5000-G	2500	OUT	OF	SERVICE		
	5000					
	500					
ADJ5000-H	2500	OUT	OF	SERVICE		
	5000					
	500	0.5025	0.4973	0.5040	0.501	100.25
ADJ5000-I	2500	2.5202	2.5176	2.5050	2.514	100.57
	5000	5.0111	5.0140	4.9979	5.008	100.15
	500					
ADJ5000-J	2500					
	5000					
	500					
ADJ5000-K	2500					
	5000					
	500					
ADJ5000-L	2500					
	5000					
	500	0.5061	0.5024	0.5006	0.503	100.61
ADJ5000-M	2500	2.4991	2.4996	2.4980	2.499	99.96
	5000	5.0074	5.0048	5.0011	5.004	100.09
	500	0.5094	0.5046	0.5074	0.507	101.43
ADJ5000-N	2500	2.4984	2.5067	2.5001	2.502	100.07
	5000	5.0254	4.9996	4.9999	5.008	100.17
	500					
ADJ5000	2500					
	5000					
	500					
. ADJ5000	2500					
	5000					

FRM-247c (Rev 3/Apr 04)

010436

Book/page: 06 162

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500	.5056	.5030	.5031
ADJ5000-C	2500	2.4956	2.4948	2.4948
	5000	5.0400	5.0398	5.0421
	500			
ADJ5000-G	2500	OUT	OF	SERVICE
	5000			
	500			
ADJ5000-H	2500	OUT	OF	SERVICE
	5000			
	500	.5025	.4973	.5040
ADJ5000-I	2500	2.5202	2.5176	2.5050
	5000	5.0111	5.0140	4.9979
	500			
ADJ5000-J	2500			
	5000			
	500			
ADJ5000-K	2500			
	5000			
	500			
ADJ5000-L	2500			
	5000			
	500	.5061	.5024	.5006
ADJ5000-M	2500	2.4991	2.4996	2.4980
	5000	5.0074	5.0048	5.0011
	500	.5094	.5046	.5074
ADJ5000-N	2500	2.4984	2.5067	2.5001
	5000	5.0254	4.9996	4.9999
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

7-2-04

7-2-04

Analyst: John Wilder Date: 7-2-04

Reviewed by: R Spires Date: 7/7/04

Book/page: 06 163

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

[signature] 7/6/04

010437

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500				0.000	0.00
ADJ5000-C	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-G	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-H	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-I	2500				0.000	0.00
	5000				0.000	0.00
	500	0.5068	0.5093	0.5049	0.507	101.40
ADJ5000-J	2500	2.4984	2.4924	2.4972	2.496	99.84
	5000	5.0151	5.0265	5.0194	5.020	100.41
	500	0.5066	0.5026	0.5031	0.504	100.82
ADJ5000-K	2500	2.4946	2.4927	2.4910	2.493	99.71
	5000	4.9937	4.9891	4.9953	4.993	99.85
	500	0.4958	0.4990	0.4981	0.498	99.53
ADJ5000-L	2500	2.4796	2.4792	2.4775	2.479	99.15
	5000	4.9738	4.9633	4.9662	4.968	99.36
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00

FRM-247c (Rev 2/Mar 03)

010438 Book/page: 06 164

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500			
ADJ5000-C	2500			
	5000			
	500			
ADJ5000-G	2500			
	5000			
	500			
ADJ5000-H	2500			
	5000			
	500			
ADJ5000-I	2500			
	5000			
	500	0.5068	0.5093	0.5049
ADJ5000-J	2500	2.4984	2.4924	2.4972
	5000	5.0151	5.0265	5.0194
	500	0.5066	0.5026	0.5031
ADJ5000-K	2500	2.4946	2.4927	2.4910
	5000	4.9937	4.9891	4.9953
	500	0.4958	0.4990	0.4981
ADJ5000-L	2500	2.4796	2.4792	2.4775
	5000	4.9738	4.9633	4.9662
	500			
ADJ5000-M	2500			
	5000			
	500			
ADJ5000-N	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

7/6/04

7/6/04

Analyst: _____ Date: 7/6/04

Reviewed by: _____ Date: 7/7/04

010439

Book/page: 06 158

SW 4-19-04

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500			
ADJ5000-C	2500			
	5000			
	500			
ADJ5000-G	2500			
	5000			
	500			
ADJ5000-H	2500			
	5000			
	500			
ADJ5000-I	2500			
	5000			
	500	0.5044	0.5020	0.5036
ADJ5000-J	2500	2.5087	2.5021	2.5104
	5000	5.0216	5.0183	5.0227
	500	0.4917	0.4959	0.4967
ADJ5000-K	2500	2.5066	2.5013	2.5039
	5000	5.0327	5.0391	5.0283
	500	0.5047	0.5011	0.5032
ADJ5000-L	2500	2.4905	2.4889	2.4922
	5000	5.0511	5.0481	5.0496
	500			
ADJ5000-M	2500			
	5000			
	500			
ADJ5000-N	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

6/21/04

6/21/04

Analyst: [signature] Date: 6/21/04

Reviewed by: [signature] Date: 7/7/04

Book/page: 06 157

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

6/21/04

010440

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500				0.000	0.00
ADJ5000-C	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-G	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-H	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-I	2500				0.000	0.00
	5000				0.000	0.00
	500	0.5044	0.5020	0.5036	0.503	100.67
ADJ5000-J	2500	2.5087	2.5021	2.5104	2.507	100.28
	5000	5.0216	5.0183	5.0227	5.021	100.42
	500	0.4917	0.4959	0.4967	0.495	98.95
ADJ5000-K	2500	2.5066	2.5013	2.5039	2.504	100.16
	5000	5.0327	5.0391	5.0283	5.033	100.67
	500	0.5047	0.5011	0.5032	0.503	100.60
ADJ5000-L	2500	2.4905	2.4889	2.4922	2.491	99.62
	5000	5.0511	5.0481	5.0496	5.050	100.99
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00

FRM-247c (Rev 2/Mar 03)

010442 Book/page: 06 098

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: Gold diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100			
ADJ1000-C	500			
	1000			
	100			
ADJ1000-D	500			
	1000			
	100			
ADJ1000-E	500			
	1000			
	100			
ADJ1000-F	500			
	1000			
	100	0.0987	0.0989	0.0984
ADJ1000-G	500	0.5034	0.5041	0.5009
	1000	0.9925	0.9884	0.9907
	100	0.0990	0.0995	0.0983
ADJ1000-H	500	0.4938	0.4960	0.4941
	1000	1.0006	1.0019	0.9991
	100	0.0986	0.0997	0.0994
ADJ1000-J	500	0.5005	0.5021	0.5013
	1000	1.0041	1.0031	1.0026
	100			
ADJ1000-K	500			
	1000			
	100			
ADJ1000	500			
	1000			

Analyst: [signature] Date: 6/21/04

Reviewed by: [signature] Date: 7/7/04

Book/page: 06 097

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

6/21/04

010444

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100				0.000	0.00
ADJ1000-C	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-D	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-E	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-F	500				0.000	0.00
	1000				0.000	0.00
	100	0.0987	0.0989	0.0984	0.099	98.67
ADJ1000-G	500	0.5034	0.5047	0.5009	0.503	100.60
	1000	0.9925	0.9884	0.9907	0.991	99.05
	100	0.0990	0.0985	0.0983	0.099	98.60
ADJ1000-H	500	0.4938	0.4960	0.4941	0.495	98.93
	1000	1.0006	1.0019	0.9991	1.001	100.05
	100	0.0986	0.0997	0.0994	0.099	99.23
ADJ1000-J	500	0.5005	0.5021	0.5013	0.501	100.26
	1000	1.0041	1.0031	1.0026	1.003	100.33
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00

010446 Book/page: 06 038

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 21

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
20 µL – 200 µL		20			
	ADJ200-A	100			
		200			
		20			
	ADJ200-C	100			
		200			
		20			
	ADJ200-D	100			
		200			
		20	0.0205	0.0203	0.0204
	ADJ200-G	100	0.0996	0.1011	0.1021
		200	0.1986	0.1974	0.2003
		20			
	ADJ200-H	100	COULD NOT FIND		
		200			
		20	0.0202	0.0203	0.0202
	ADJ200-J	100	0.0991	0.1005	0.0989
		200	0.2013	0.2041	0.2027
		20			
	ADJ200-K	100			
		200			
		20			
	ADJ200	100			
		200			

6/21/04

6/21/04

Analyst: _____ Date: 6/21/04

Reviewed by: _____ Date: 7/7/04

Book/page: 06 | 037

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010447

6/21/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20				0.000	0.00
ADJ200-A	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-C	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-D	100				0.000	0.00
	200				0.000	0.00
	20	0.0205	0.0203	0.0204	0.020	102.00
ADJ200-G	100	0.0996	0.1011	0.1021	0.101	100.93
	200	0.1986	0.1974	0.2003	0.199	99.38
	20				0.000	0.00
ADJ200-H	100				0.000	0.00
	200				0.000	0.00
	20	0.0202	0.0203	0.0202	0.020	101.17
ADJ200-J	100	0.0991	0.1005	0.0989	0.100	99.50
	200	0.2013	0.2041	0.2027	0.203	101.35
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00

FRM-247a (Rev 3/Oct 03)

010448

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

Balance Calibrations

Southwest Research Institute®
Division 01

BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
12	Bldg. 70 Lab 27	1122510787	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
6-30-04	2.0000	2.0000	KE	SN: 99-TS0526-15
7-1-04	2.0000	2.0000	KE	"
7-2-04	2.0000	2.0000	KE	"
7-6-04	2.0000	2.0000	[illegible]	"
7-7-04	2.0000	1.9999	[illegible]	"
7-8-04	2.0000	2.0000	[illegible]	"
7-9-04	2.0000	2.0001	[illegible]	"
7-12-04	2.0000	2.0000	[illegible]	"
7-13-04	2.0000	2.0000	KE	"
7-14-04	2.0000	2.0001	[illegible]	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
19	27	0068597	±0.05	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
6-25-04	Lab 101 / 10.00g	10.02g	JCB	S/N: 99-J50624-5
6-26-04	10.00	10.00	[signature]	"
6-28-04	10.00	10.00	[signature]	"
6-29-04	10.00	10.01	KE	"
6-30-04	10.00	10.00	KE	"
6-30-04	10.00	10.01	KE	" Lab 28
6-30-04	10.00	10.00	KE	" Lab 27
7-1-04	10.00	10.00	KE	"
7-2-04	10.00	10.00	[signature]	"
7-6-04	10.00	10.00	[signature]	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
19	27	0068597	±0.05	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
7-6-04	10.00	10.00	JW	SN: 99-J5064-5
7-8-04	10.00	10.01	JW	"
7-9-04	10.00	10.00	JW	"
7-12-04	10.00	10.01	JW	"
7/13/04	10.000	10.00	KE	"
7-14-04	10.00	10.00	JW	"
7-15-04	10.00	10.00	KE	"
7-16-04	10.00	10.01	KE	"
7-19-04	10.00	10.02	KE	"
7-20-04	10.00	10.01	KE	"

JW x4

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

Southwest Research Institute®
Division 01

BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
34	Bldg. 70 Lab 27	1116031935	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
6-24-04	2.0000	2.0001	KE	SN:99-J50526-1
6-25-04	2.0000	2.0000	KE	"
6-28-04	2.0000	2.0000	[illegible]	"
6-29-04	2.0000	2.0000	KE	"
6-30-04	2.0000	1.9999	KE	"
7-1-04	2.0000	2.0000	KE	"
7-2-04	2.0000	2.0000	KE	"
7-6-04	2.0000	2.0000	[illegible]	"
7-7-04	2.0000	2.0000	[illegible]	"
7-8-04	2.0000	2.0000	[illegible]	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
12	Bldg. 70 Lab 27	1122510787	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
6-17-04	2.00000	2.0000	KE	SN: 99-J50526 75
6-18-04	2.0000	2.0000	KE	"
6-21-04	2.0000	2.0000	KE	"
6-22-04	2.0000	2.0001	KE	"
6-23-04	2.0000	2.0000	KE	"
6-24-04	2.0000	2.0000	KE	"
6-25-04	2.0000	1.9999	[signature]	"
6-26-04	2.0000	2.0000	KE	"
6.28.04	2.0000	2.0000	[signature]	"
6.29.04	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
34	Bldg. 70 Lab 27	1116031935	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	SN: 99-J50526-15
6-10-04	2.0000	2.0000	KE	"
6-11-04	2.0000	2.0000	KE	"
6-14-04	2.0000	1.9999	[signature]	"
6-15-04	2.0000	2.0001	[signature]	"
6-16-04	2.0000	2.0000	KE	"
6-17-04	2.0000	2.0000	KE	"
6-18-04	2.0000	2.0000	KE	"
6-21-04	2.0000	2.0000	KE	"
6-22-04	2.0000	2.0000	KE	"
6-23-04	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

Southwest Research Institute®
Division 01

BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
34	Bldg. 70 Lab 27	1116031935	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
6-24-04	2.0000	2.0001	KE	SN:99-JS0526-19
6-25-04	2.0000	2.0000	KE	"
6-28-04	2.0000	2.0000	KE	"
6-29-04	2.0000	2.0000	KE	"
6-30-04	2.0000	1.9999	KE	"
7-1-04	2.0000	2.0000	KE	"
7-2-04	2.0000	2.0000	KE	"
7-6-04	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

4400677 5/11/04

HIGH PURITY SYSTEM (HP) 010457

DATE / TIME	INITIALS	RESISTIVITY MONITOR (M OHMS)	RESISTIVITY MONITOR QC LT.	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
6/17/04 5:38pm	DR	18.04	✓	✓	✓	2190.5	✓
6/18/04 6:30pm	DR	18.06	✓	✓	✓	2199.8	✓
6/21/04 5:21pm	DR	18.05	✓	✓	✓	2239.7	✓
6/22/04 5:31pm	DR	18.05	✓	✓	✓	2263.3	✓
6/23/04 5:56pm	DR	18.05	✓	✓	✓	2307.8	✓
6/24/04 2:45pm	JW	18.04	✓	✓	✓	2320.8	✓
6/25/04 4:39pm	JW	18.07	✓	✓	✓	2380.5	✓
6/28/04 3pm	DR	18.05	✓	✓	✓	2522.7	✓
6/29/04 6:12pm	DR	18.04	✓	✓	✓	2607.8	✓
6/30/04 8pm	DR	18.03	✓	✓	✓	2666.7	✓
7/1/04 4:52pm	DR	18.03	✓	✓	✓	2696.6	✓
7/2/04 7:22pm	DR	18.04	✓	✓	✓	2745.6	✓
		RSS					

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
6/17/04 5:38pm	DR	✓	(15) ✓	923.3	✓
6/18/04 6:30pm	DR	✓	(15.5) ✓	923.4	✓
6/21/04 5:21pm	DR	✓	(16) ✓	923.6	✓
6/22/04 5:31pm	DR	✓	(16.5) ✓	923.8	✓
6/23/04 5:56pm	DR	X	(17) ✓	929.5	need P.O. call USFilter
6/24/04 2:47pm	JW	X	(17.5) ✓	930.2	✓ US Filter called (Ric'd PO)
6/25/04 4:41pm	JW	X	(18) ✓	930.4	waiting on U.S. Filter
6/28/04 3pm	DR	✓	(15.5) ✓	935.6	tank exchanged. All OK. ✓
6/29/04 6:13pm	DR	✓	(15.5) ✓	935.8	✓
6/30/04 8pm	DR	✓	(16) ✓	936.1	✓
7/1/04 4:50pm	DR	✓	(16) ✓	936.3	✓
7/2/04 7:22pm	DR	✓	(16.5) ✓	955.4	✓
		RSS			

Legend: Check = Green (OK); X = Red (call for service)

R Spurls 7/6/04

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

C40008

010458

HIGH PURITY SYSTEM (HP)

DATE / TIME	INITIALS	RESISTIVITY MONITOR (M OHMS)	RESISTIVITY MONITOR QC LT.	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
7/6/04 5:20pm	DR	18.04	✓	✓	✓	2785.8	✓
7/7/04 6:01pm	DR	18.03	✓	✓	✓	2798.6	✓
7/8/04 4:30pm	DR	18.04	✓	✓	✓	2803.7	✓
7/9/04 5:05pm	DR	18.03	✓	✓	✓	2819.2	✓
7/12/04 5:08pm	DR	18.04	✓	✓	✓	2845.2	✓
7/13/04 4:08pm	DR	18.04	✓	✓	✓	2879.8	✓
7/14/04 11:10pm	DR	18.04	✓	✓	✓	2900.3	✓
7/15/04 8:40pm	DR	18.04	✓	X	✓	2932.7	need P.O.
7/16/04 7pm	DR	18.04	✓	X	✓	2950.6	USFilter called
7/19/04 9:30pm	DR	18.03	✓	✓	✓	2960.5	tank xchange. online
7/20/04 6:50pm	DR	18.04	✓	✓	✓	2972.1	✓
7/21/04 6pm	DR	18.04	✓	✓	✓	2999.2	✓
7/22/04 5:25pm	DR	18.03	✓	✓	✓	3011.5	✓
7/23/04 5:20pm	DR	18.03	✓	✓	✓	3018.7	✓
7/26/04 6:30pm	DR	18.04	✓	✓	✓	3042.5	✓
7/27/04 11:40pm	DR	18.04	✓	✓	✓	3081.3	✓

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
7/6/04 5:20pm	DR	✓	(17) ✓	955.9	✓
7/7/04 6:01pm	DR	✓	(17) X	956.1	✓; need P.O. call USFilter
7/8/04 4:30pm	DR	✓	(17.5) X	957.0	P.O. received; USFilter called.
7/9/04 5:05pm	DR	✓	(18.5) ✓	957.6	Tank exchange. Back online. ✓
7/12/04 5:08pm	DR	✓	(16) ✓	958.1	✓
7/13/04 4:08pm	DR	✓	(16) ✓	958.2	✓
7/14/04 11:10pm	DR	✓	(17) ✓	958.9	✓
7/15/04 8:40pm	DR	✓	(17) ✓	959.5	✓
7/16/04 7pm	DR	✓	(17) X	963.1	USFILTER called.
7/19/04 9:30pm	DR	✓	(15.5) ✓	965.4	tank exchange. back online.
7/20/04 6:50pm	DR	✓	(15.5) ✓	965.5	✓
7/21/04 6pm	DR	✓	(15.5) ✓	965.7	✓
7/22/04 5:25pm	DR	✓	(16) ✓	965.7	✓
7/23/04 5:20pm	DR	✓	(16) ✓	965.7	✓
7/26/04 6:30pm	DR	✓	(16) ✓	967.5	✓
7/27/04 11:40pm	DR	✓	(16.5) ✓	967.6	✓

Legend: Check = Green (OK); X = Red (call for service)

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

010459

HIGH PURITY SYSTEM (HP)

DATE / TIME	INITIALS	RESISTIVITY MONITOR (M OHMS)	QC LT.	QC LIGHTS QC 1	QC 2	USAGE (GALS)	COMMENTS
6/17/04 5:38pm	DR	18.04	✓	✓	✓	2190.5	✓
6/18/04 6:30pm	DR	18.06	✓	✓	✓	2199.8	✓
6/21/04 5:21pm	DR	18.05	✓	✓	✓	2239.7	✓
6/22/04 5:31pm	DR	18.05	✓	✓	✓	2263.3	✓
6/23/04 5:56pm	DR	18.05	✓	✓	✓	2307.8	✓
6/24/04 2:45pm	JW	18.04	✓	✓	✓	2320.8	✓
6/25/04 4:39pm	JW	18.07	✓	✓	✓	2380.5	✓
6/28/04 3pm	DR	18.05	✓	✓	✓	2522.7	✓
6/29/04 6:12pm	DR	18.04	✓	✓	✓	2607.8	✓
6/30/04 8pm	DR	18.03	✓	✓	✓	2666.7	✓
7/1/04 4:52pm	DR	18.03	✓	✓	✓	2694.6	✓
7/2/04 7:22pm	DR	18.04	✓	✓	✓	2745.6	✓
		RSS					

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS QC 1	QC 2	USAGE (GALS)	COMMENTS
6/17/04 5:38pm	DR	✓	(15) ✓	923.3	✓
6/18/04 6:30pm	DR	✓	(15.5) ✓	923.4	✓
6/21/04 5:21pm	DR	✓	(16) ✓	923.6	✓
6/22/04 5:31pm	DR	✓	(16.5) ✓	923.8	✓
6/23/04 5:56pm	DR	X	(17) ✓	929.5	need P.O. call USFilter
6/24/04 2:47pm	JW	X	(17.5) ✓	930.2	✓ US Filter called (Rec'd PO)
6/25/04 4:41pm	JW	X	(18) ✓	930.4	waiting on U.S. Filter
6/28/04 3pm	DR	✓	(15.5) ✓	935.6	tank exchanged. ALL OK. ✓
6/29/04 6:13pm	DR	✓	(15.5) ✓	935.8	✓
6/30/04 8pm	DR	✓	(16) ✓	936.1	✓
7/1/04 4:50pm	DR	✓	(16) ✓	936.3	✓
7/2/04 7:22pm	DR	✓	(16.5) ✓	955.4	✓
		RSS			

Legend: Check = Green (OK); X = Red (call for service)

RSpns 7/6/04

FRM-019 (Rev 0/Jan 04)

010460

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

SURVEILLANCE REPORTS
From Division 30

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040616-1
SRR: 26046
SDG: 246046
CASE: CNWRA
VTSR: June 15, 2004
PROJECT#: 06002.01.081

DATA FOR ARCHIVE

Schedule File: C:\PeakNet\schedule\24jun04a.SCH

Line	Sample	Sample Type	Level	Method	Data File	Dilution
1	ICV	Sample		anions040622.met	040624_001.dxd	20
2	ICB	Sample		anions040622.met	040624_002.dxd	1
3	246046	Sample		anions040622.met	040624_003.dxd	200
4	246046D	Sample		anions040622.met	040624_004.dxd	200
5	246046S	Sample		anions040622.met	040624_005.dxd	200
6	246047	Sample		anions040622.met	040624_006.dxd	200
7	246048	Sample		anions040622.met	040624_007.dxd	200
8	246049	Sample		anions040622.met	040624_008.dxd	200
9	246050	Sample		anions040622.met	040624_009.dxd	200
10	246051	Sample		anions040622.met	040624_010.dxd	200
11	246052	Sample		anions040622.met	040624_011.dxd	200
12	246053	Sample		anions040622.met	040624_012.dxd	200
13	CCV	Sample		anions040622.met	040624_013.dxd	20
14	CCB	Sample		anions040622.met	040624_014.dxd	1
15	246054	Sample		anions040622.met	040624_015.dxd	200
16	246055	Sample		anions040622.met	040624_016.dxd	200
17	246056	Sample		anions040622.met	040624_017.dxd	200
18	246057	Sample		anions040622.met	040624_018.dxd	200
19	246058	Sample		anions040622.met	040624_019.dxd	200
20	246059	Sample		anions040622.met	040624_020.dxd	200
21	246060	Sample		anions040622.met	040624_021.dxd	200
22	CCV	Sample		anions040622.met	040624_022.dxd	20
23	CCB	Sample		anions040622.met	040624_023.dxd	1
24	246146	Sample		anions040622.met	040623_024.dxd	20
25	246146D	Sample		anions040622.met	040623_025.dxd	20
26	246146S	Sample		anions040622.met	040623_026.dxd	20
27	246147	Sample		anions040622.met	040623_027.dxd	20
28	246148	Sample		anions040622.met	040623_028.dxd	20
29	246149	Sample		anions040622.met	040623_029.dxd	20
30	246150	Sample		anions040622.met	040623_030.dxd	20
31	246151	Sample		anions040622.met	040623_031.dxd	20
32	246152	Sample		anions040622.met	040623_032.dxd	20
33	246153	Sample		anions040622.met	040623_033.dxd	20
34	CCV	Sample		anions040622.met	040623_034.dxd	20
35	CCB	Sample		anions040622.met	040623_035.dxd	1
36	PB	Sample		anions040622.met	040623_036.dxd	1
37	CCV	Sample		anions040622.met	040623_037.dxd	20
38	CCB	Sample		anions040622.met	040623_038.dxd	1

Default Method Path: C:\PEAKNET\METHOD
Default Data Path: C:\PEAKNET\DATA\040624A
Comment:
DIV 20 10542.02.002 TO#040617-9
DIV 20 06002.01.081 TO#040616-1

DSpus 6/25/04

ICV/CCV = Spex 25-145AS (Inorg # 4518)
NO_2N 178-01-1C4
Spiked 50ul of spex + NO_2N into 5ml sample/sample deletion.

& Archive Only. Rerun More Dilute!
Reran Samples on 6/25/04.

Book/Page: 12 007

Southwest Research Institute

Dionex DX500 Ion Chromatography Daily Log

Analyst: RSpurr

Date: 6/24/04

Conductivity: 17.8

Client	Project #	TO #	Analytical Method
DIV 20	10 542.02.002	040617-9	300
↓	06002.01.081	040616	↓

Loop: 40 ul

Method: anions 040622

Column: AS14 #015-02-087

Calibration: 6/22/04

Comments:

ICV/CCV/MS:

1st Source: SPEX (Inorg# 4518)

2nd Source: Nitrite-N

Lot #: 25-145AS

Lot #: 178-01-1C4

CCV Conc: 1:20

CCV Conc: 1:20

MS Conc: 1:100

MS Conc: 1:100

✓

1.0 mM Sodium Bicarbonate & 3.5 mM Sodium Carbonate

ELUENT SOLUTION PREP: FV = 2.0L DI H20

Weight: 0.1688g $NaHCO_3$

Weight: 0.7419g Na_2HCO_3

Source: Aldrich

Source: Alfa Aesar

Lot: 15308 EI

Lot: L06M34

Balance #34.

Other Eluent:

50 mA-Autoregen (ASRS)

Other Regen:

✓ 7/2/04

Eppendorfs: 5000L
1000J
200J

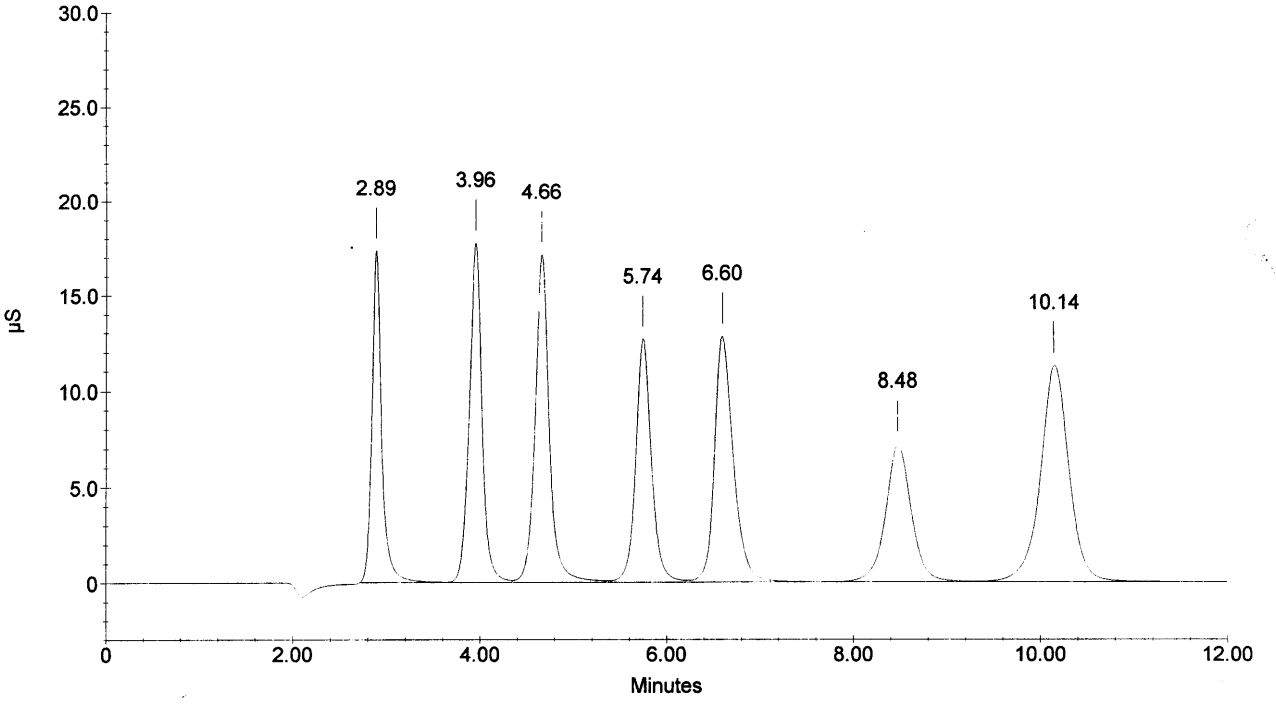
Sample Name : ICV
Dilution Factor : 20.00
Injection Number : 1
Data File Name : c:\peaknet\data\040624a\040624_001.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 6:45:51 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.89	FLUORIDE	100.009	173045	1248264	2	0.00
2	3.96	CHLORIDE	202.232	177246	1675963	2	-2.30
3	4.66	NITRITE-N	96.938	170818	1816870	2	-1.20
4	5.74	BROMIDE	404.449	126182	1490444	2	-0.98
5	6.60	NITRATE-N	84.076	127760	1812469	2	0.87
6	8.48	PHOSPHATE-P	193.943	71405	1383822	2	0.32
7	10.14	SULFATE	392.885	112352	2408918	2	1.33
	0.00		---total(s)--- 1474.532		11836752		

ICV



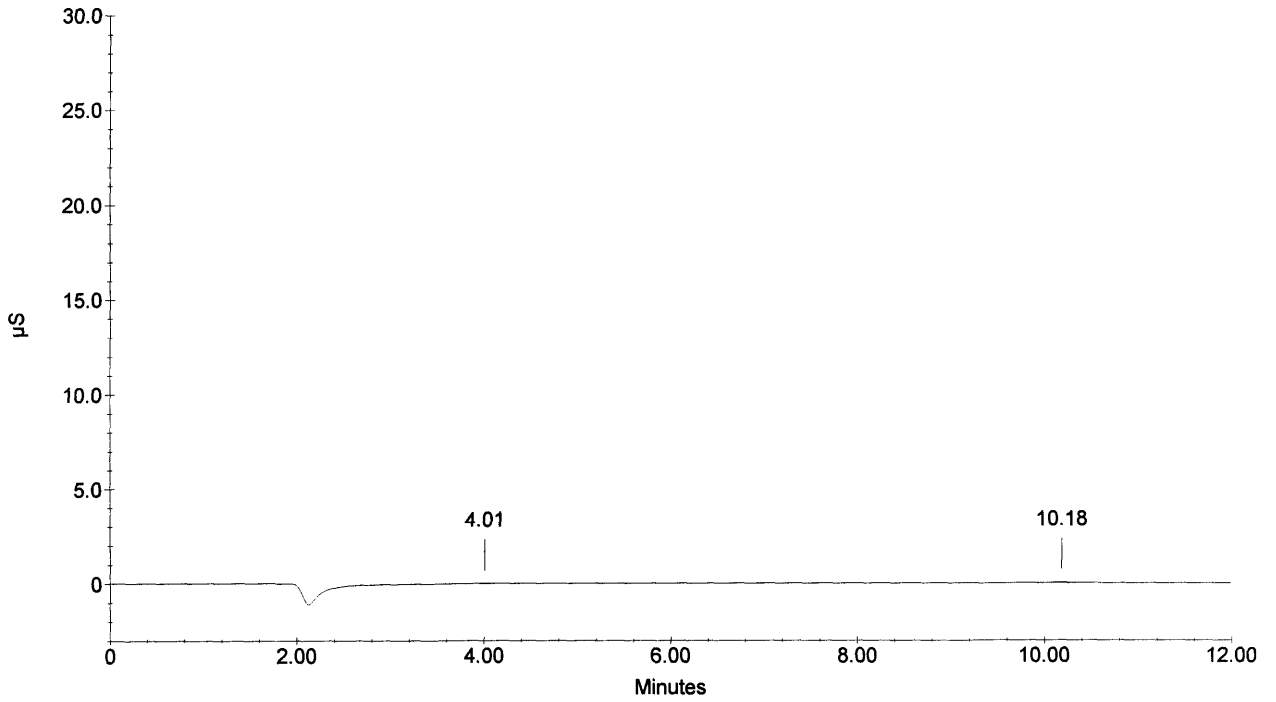
Sample Name : ICB
Dilution Factor : 1.00
Injection Number : 2
Data File Name : c:\peaknet\data\040624a\040624_002.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 7:00:35 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.01	CHLORIDE	0.007	107	1033	1	-0.99
1	4.01	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	0.007	107	1033	1	-0.99
2	10.18	SULFATE	0.036	252	4248	1	1.73
	0.00	---total(s)---	0.050		6313		

ICB



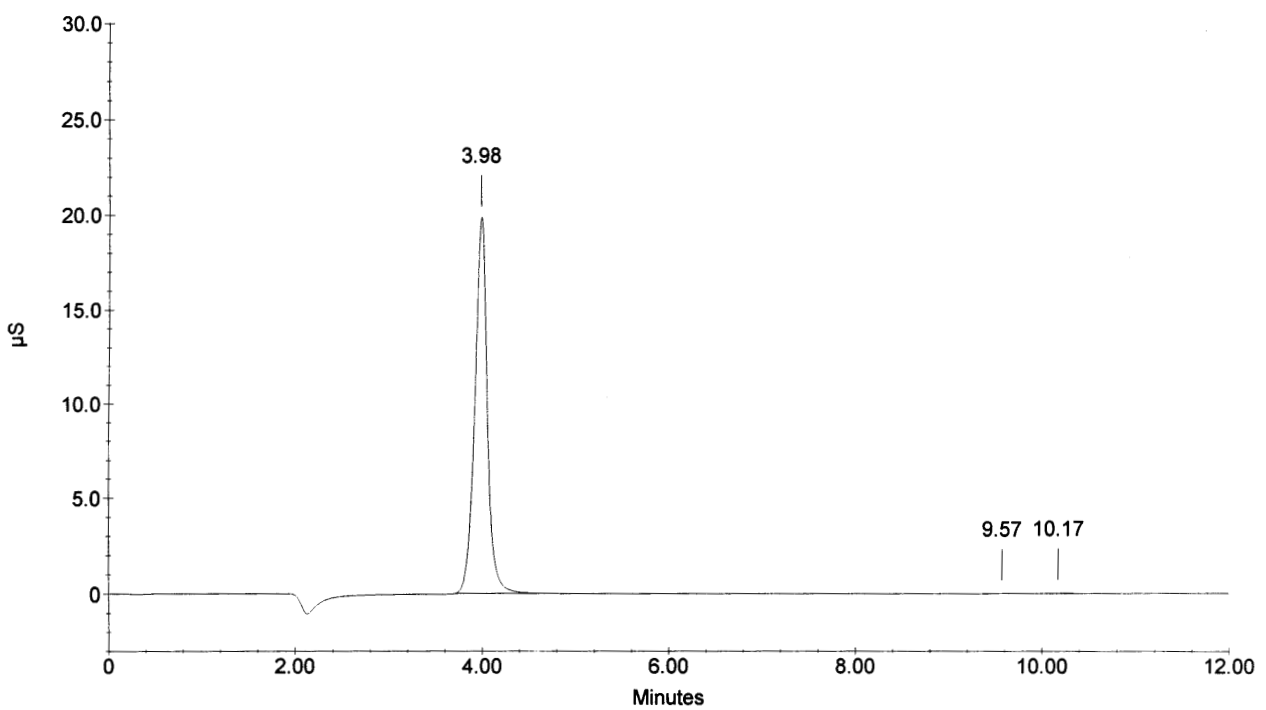
Sample Name : 246046
Dilution Factor : 200.00
Injection Number : 3
Data File Name : c:\peaknet\data\040624a\040624_003.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 7:15:17 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.98	CHLORIDE	2218.242	197229	1853719	1	-1.65
1	3.98	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	2218.242	197229	1853719	1	-1.65
3	10.17	SULFATE	3.279	132	1916	1	1.60
	0.00	---total(s)---	4439.762		3709354		

246046



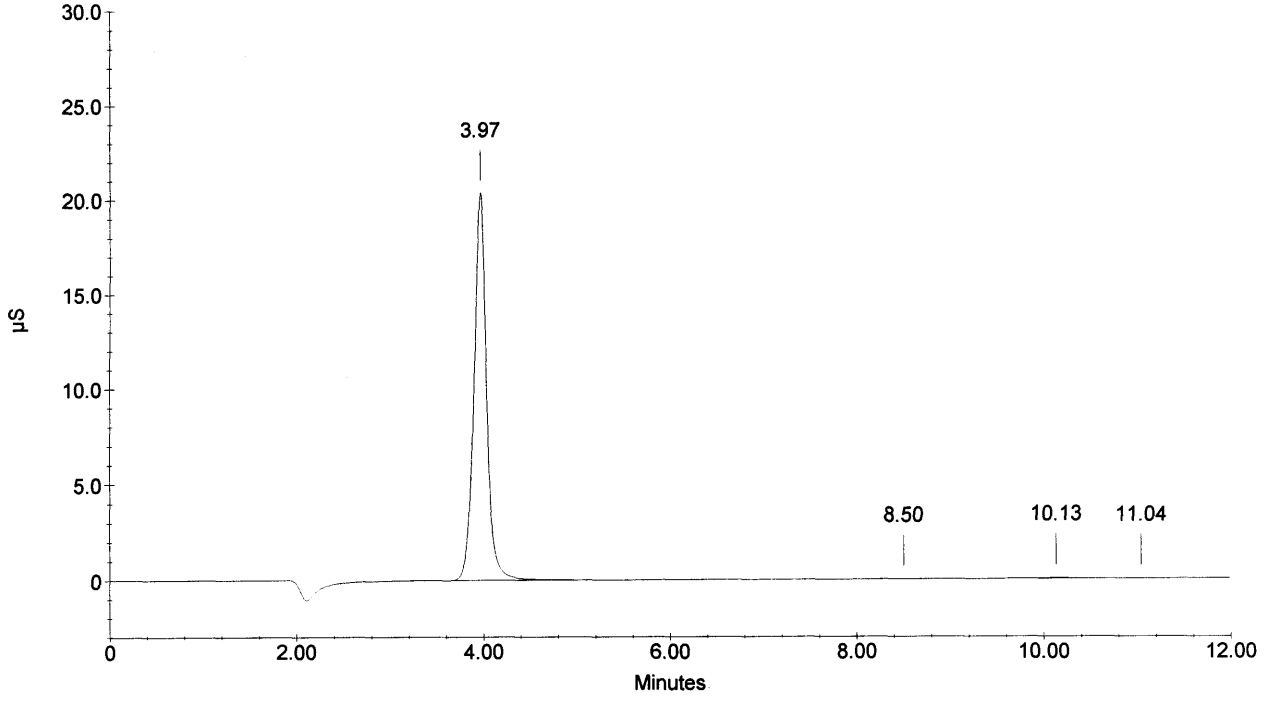
Sample Name : 246046D
Dilution Factor : 200.00
Injection Number : 4
Data File Name : c:\peaknet\data\040624a\040624_004.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 7:29:58 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.97	CHLORIDE	2273.333	203029	1904294	1	-1.98
1	3.97	CHLORIDE NITRITE-N BROMIDE NITRATE-N	2273.333	203029	1904294	1	-1.98
2	8.50	PHOSPHATE-P	1.191	49	789	1	0.63
3	10.13	SULFATE	13.010	369	7601	1	1.20
	0.00		---total(s)--- 4560.868		3816978		

246046D



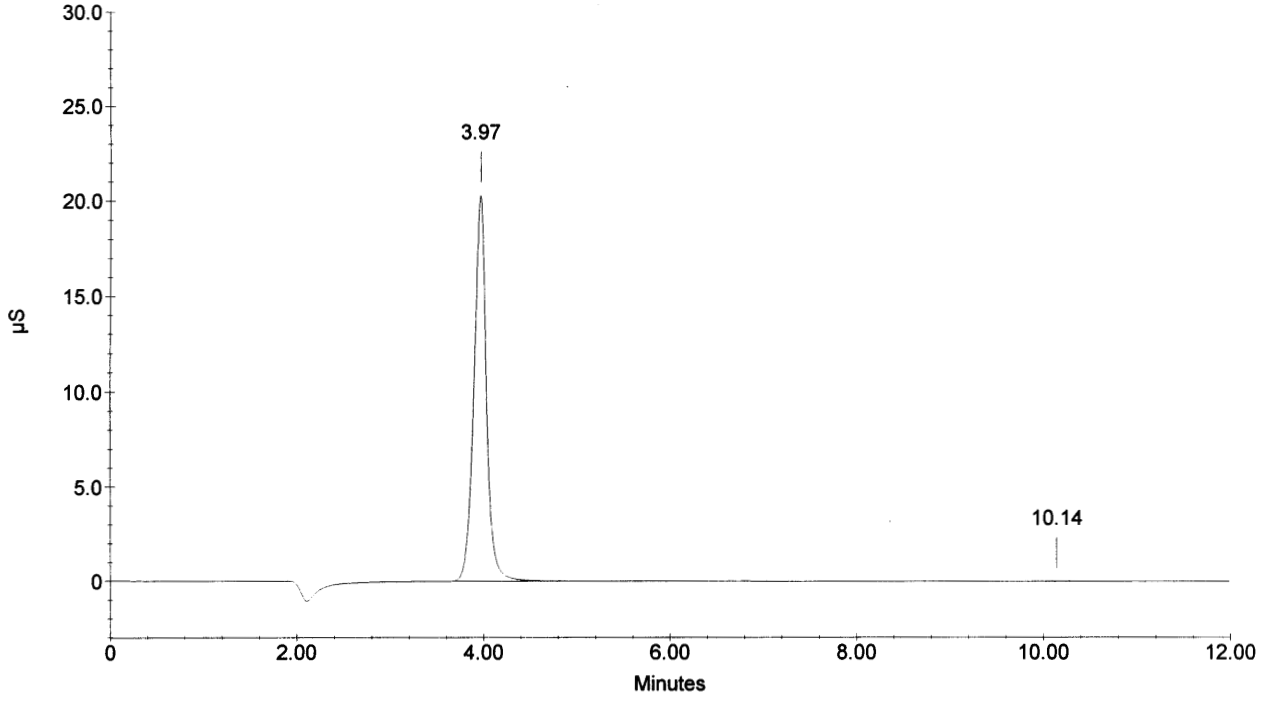
Sample Name : 246046S
Dilution Factor : 200.00
Injection Number : 5
Data File Name : c:\peaknet\data\040624a\040624_005.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 7:44:41 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.97	CHLORIDE	2271.176	202574	1902308	1	-1.98
1	3.97	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	2271.176	202574	1902308	1	-1.98
2	10.14	SULFATE	4.793	169	2800	1	1.33
	0.00	---total(s)---	4547.145		3807416		

246046S



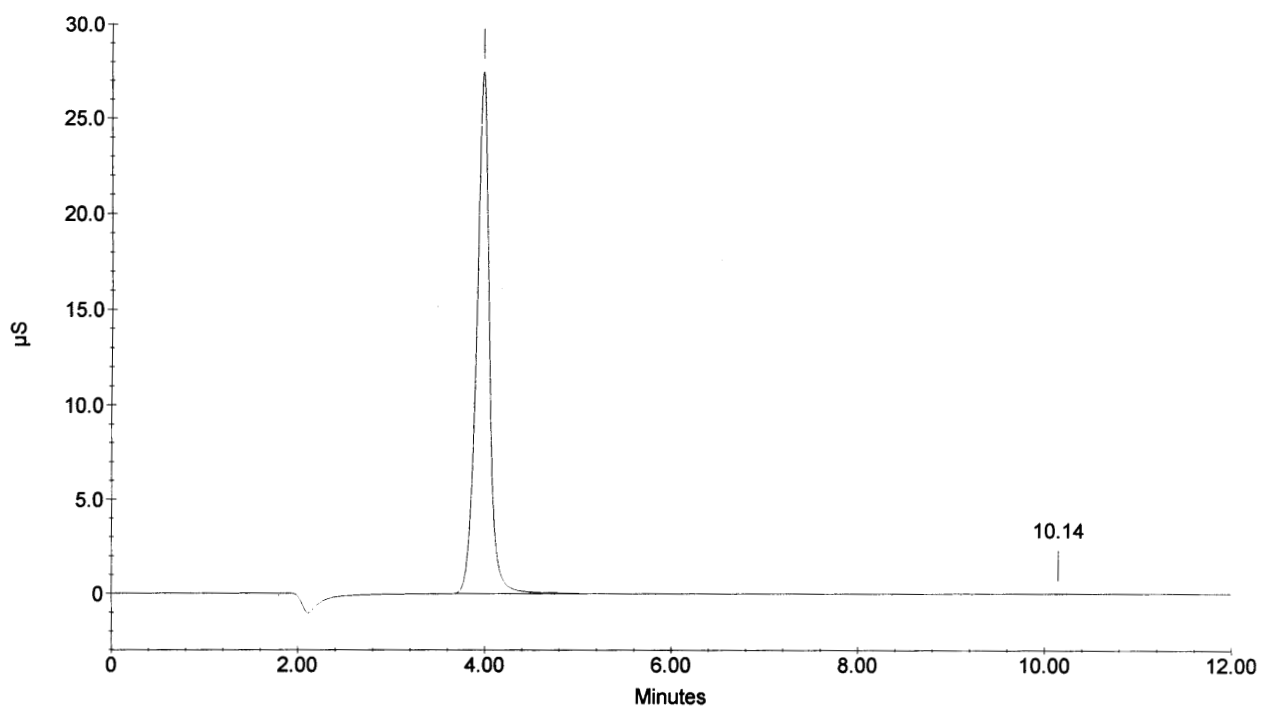
Sample Name : 246047
Dilution Factor : 200.00
Injection Number : 6
Data File Name : c:\peaknet\data\040624a\040624_006.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 7:59:22 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.98	CHLORIDE	3032.554	274394	2630439	1	-1.65
1	3.98	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	3032.554	274394	2630439	1	-1.65
2	10.14	SULFATE	4.236	129	2475	1	1.33
	0.00	---total(s)---	6069.344		5263352		

246047



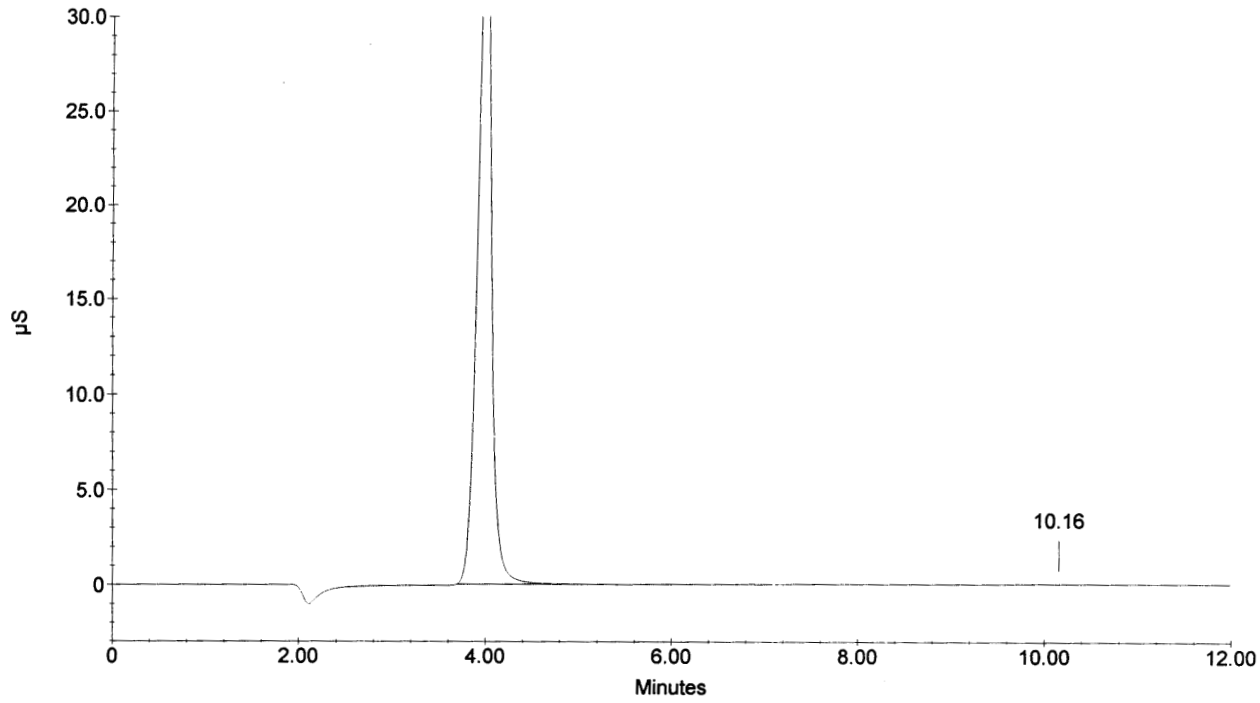
Sample Name : 246048
Dilution Factor : 200.00
Injection Number : 7
Data File Name : c:\peaknet\data\040624a\040624_007.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 8:14:04 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.00	CHLORIDE	4089.493	377598	3753230	1	-1.32
1	4.00	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	4089.493	377598	3753230	1	-1.32
2	10.16	SULFATE	4.359	133	2547	1	1.47
	0.00	---total(s)---	8183.345		7509007		

246048



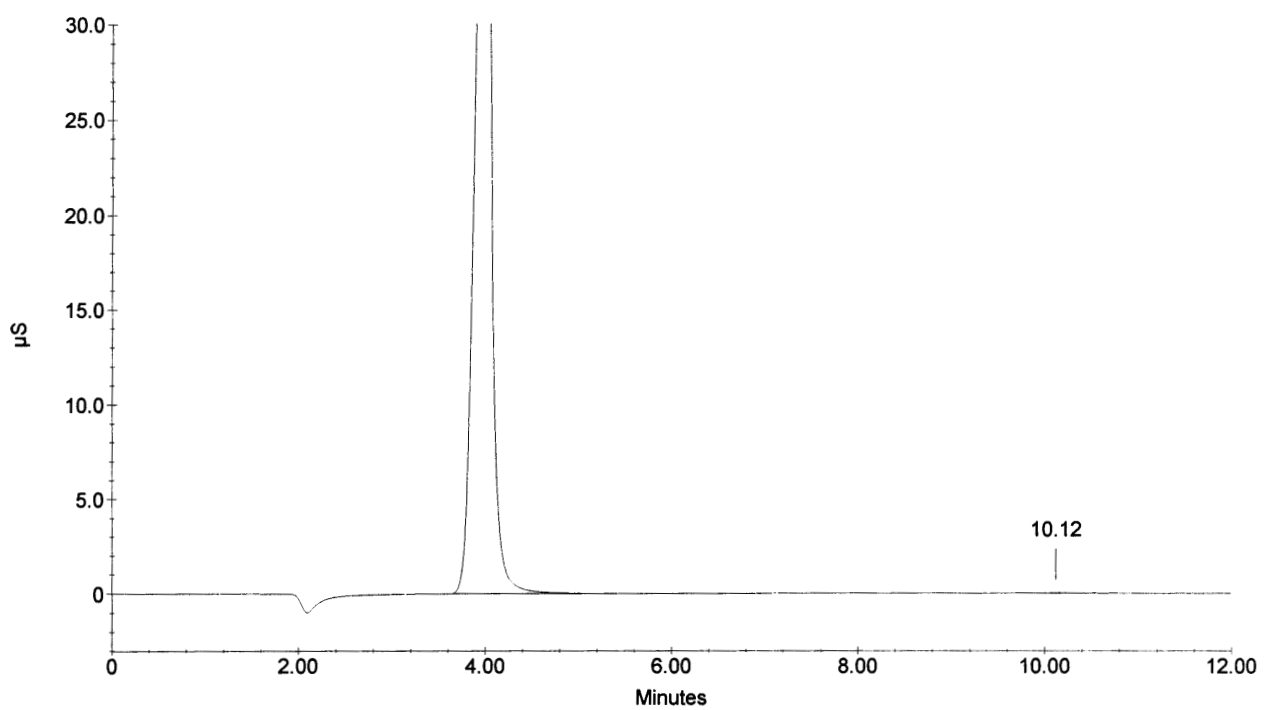
Sample Name : 246049
Dilution Factor : 200.00
Injection Number : 8
Data File Name : c:\peaknet\data\040624a\040624_008.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 8:28:47 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.00	CHLORIDE	5925.734	571940	6241996	1	-1.32
1	4.00	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	5925.734	571940	6241996	1	-1.32
2	10.12	SULFATE	5.876	189	3433	1	1.07
	0.00	---total(s)---	11857.343		12487425		

246049



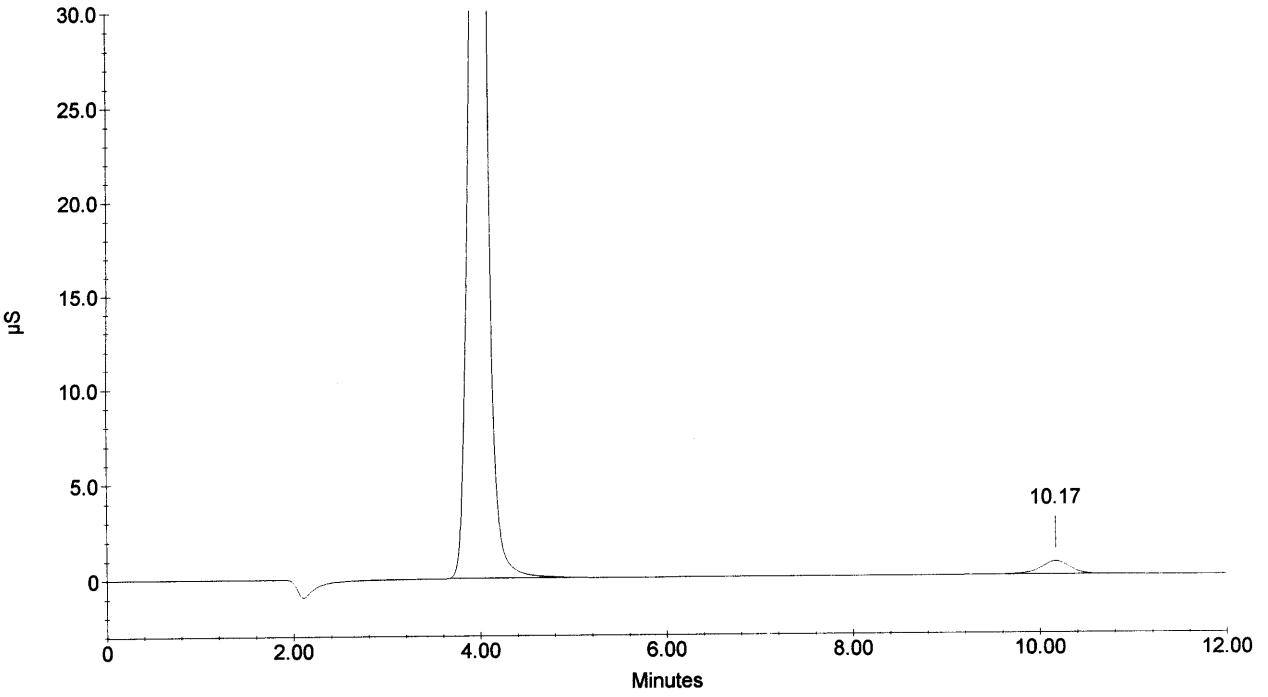
Sample Name : 246050
Dilution Factor : 200.00
Injection Number : 9
Data File Name : c:\peaknet\data\040624a\040624_009.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 8:43:28 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.04	CHLORIDE	6707.212	671940	7769998	1	-0.33
1	4.04	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	6707.212	671940	7769998	1	-0.33
2	10.17	SULFATE	261.423	6992	153178	1	1.60
	0.00		---total(s)--- 13675.847		15693174		

246050



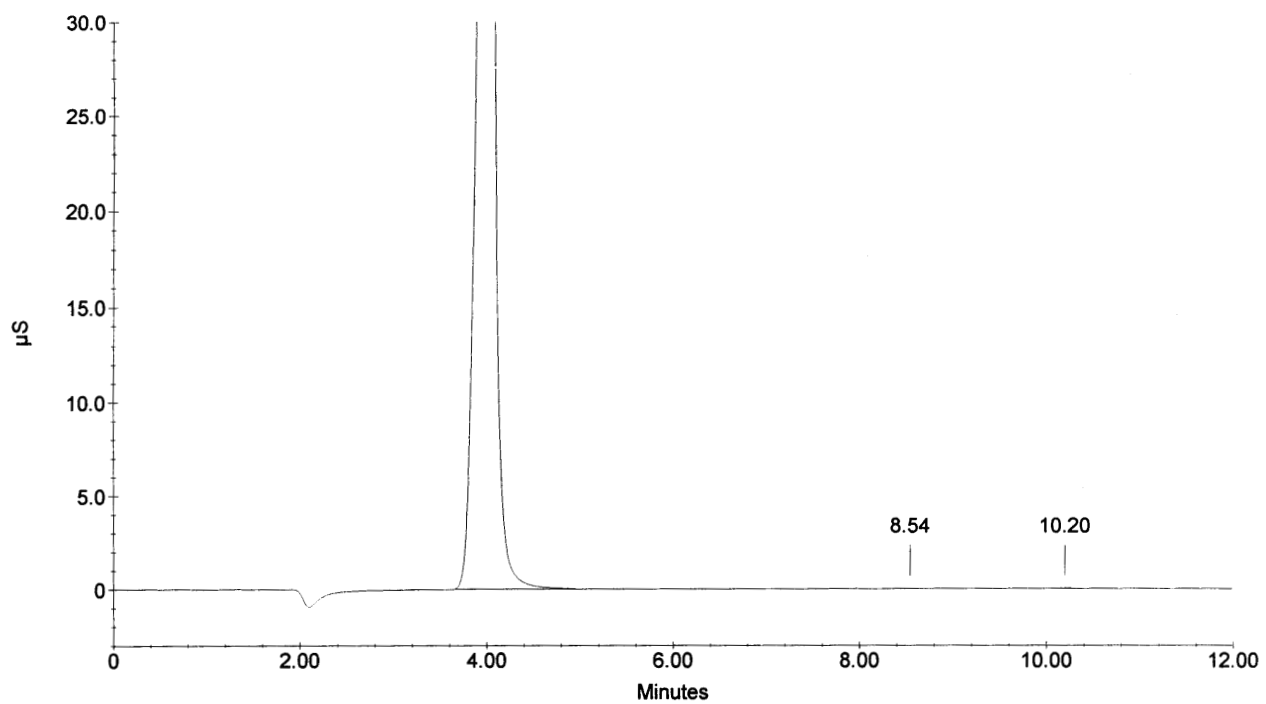
Sample Name : 246051
Dilution Factor : 200.00
Injection Number : 10
Data File Name : c:\peaknet\data\040624a\040624_010.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 8:58:09 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.02	CHLORIDE	6883.258	699511	8209501	1	-0.66
1	4.02	CHLORIDE NITRITE-N BROMIDE NITRATE-N	6883.258	699511	8209501	1	-0.66
2	8.54	PHOSPHATE-P	1.459	55	967	1	1.10
3	10.20	SULFATE	5.090	174	2974	1	1.86
	0.00		---total(s)--- 13773.064		16422942		

246051



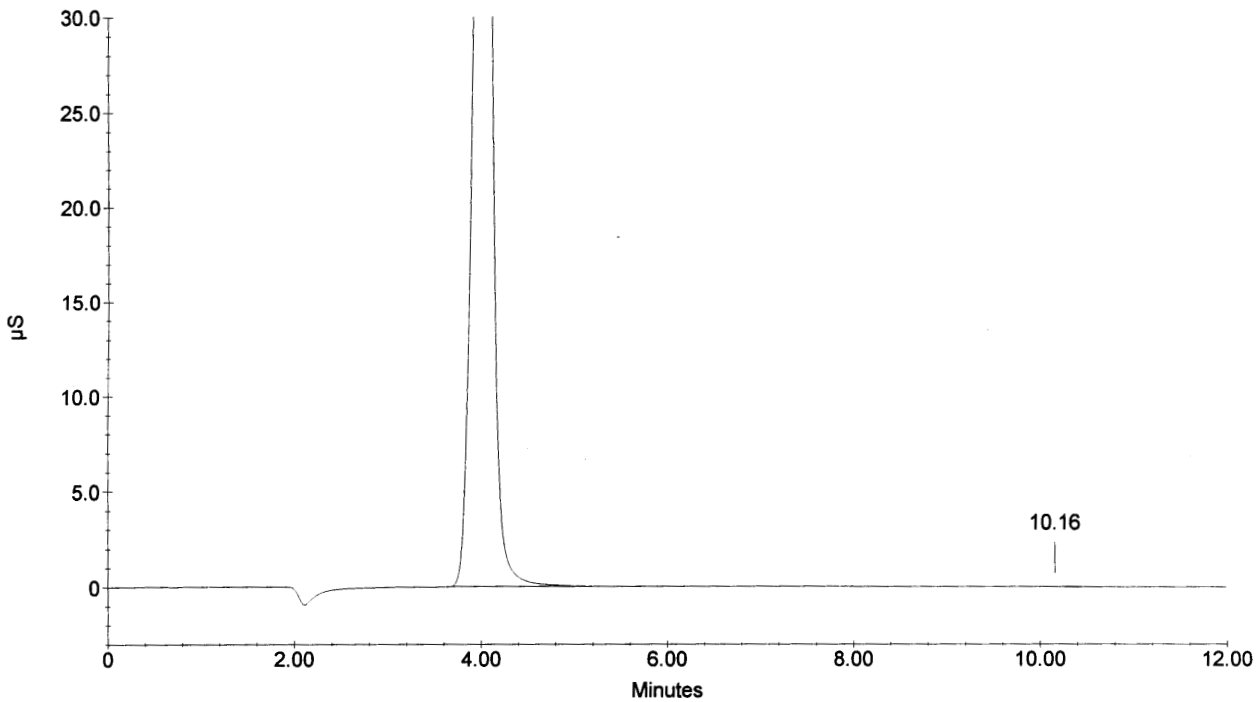
Sample Name : 246052
Dilution Factor : 200.00
Injection Number : 11
Data File Name : c:\peaknet\data\040624a\040624_011.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 9:12:50 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.05	CHLORIDE	7040.786	716922	8658999	1	0.00
1	4.05	CHLORIDE	7040.786	716922	8658999	1	0.00
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
2	10.16	SULFATE	3.994	138	2333	1	1.47
	0.00	---total(s)---	14085.566		17320332		

246052



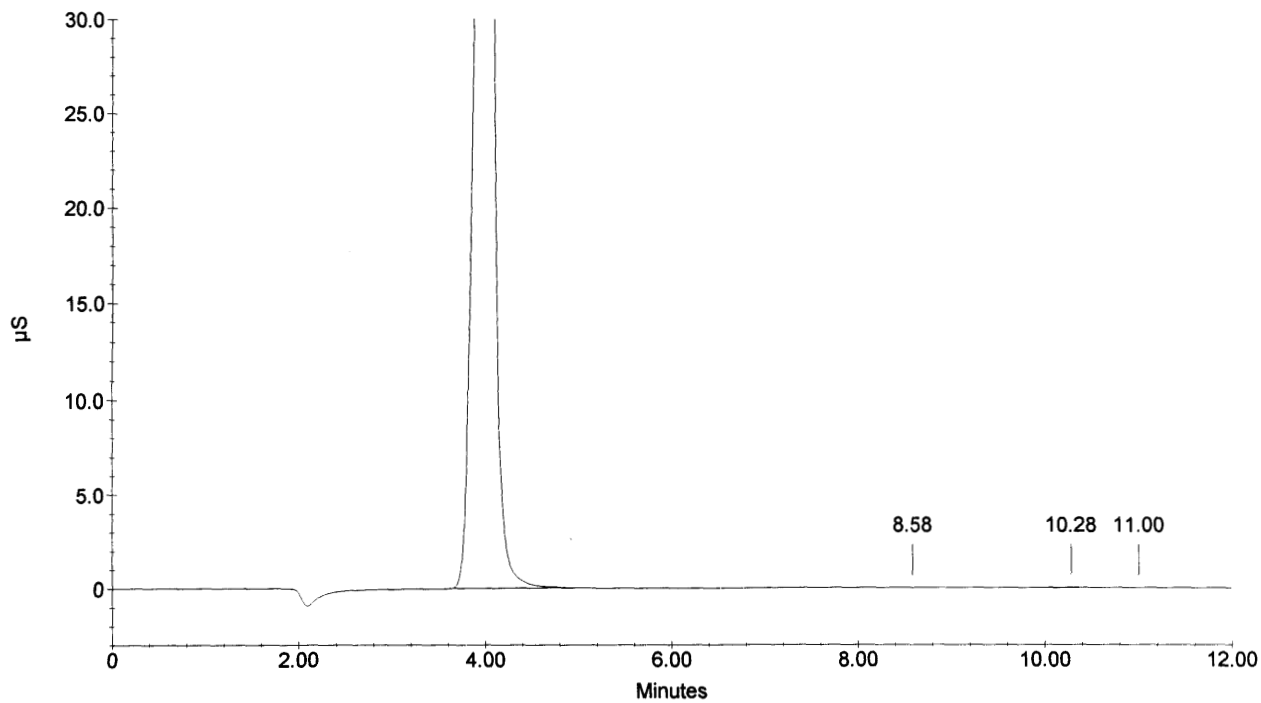
Sample Name : 246053
Dilution Factor : 200.00
Injection Number : 12
Data File Name : c:\peaknet\data\040624a\040624_012.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 9:27:32 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.02	CHLORIDE	7220.855	745091	9279615	1	-0.66
1	4.02	CHLORIDE NITRITE-N BROMIDE NITRATE-N	7220.855	745091	9279615	1	-0.66
2	8.58	PHOSPHATE-P	0.629	52	417	1	1.58
3	10.28	SULFATE	10.618	206	6204	1	2.66
	0.00	---total(s)---	14452.957		18565850		

246053



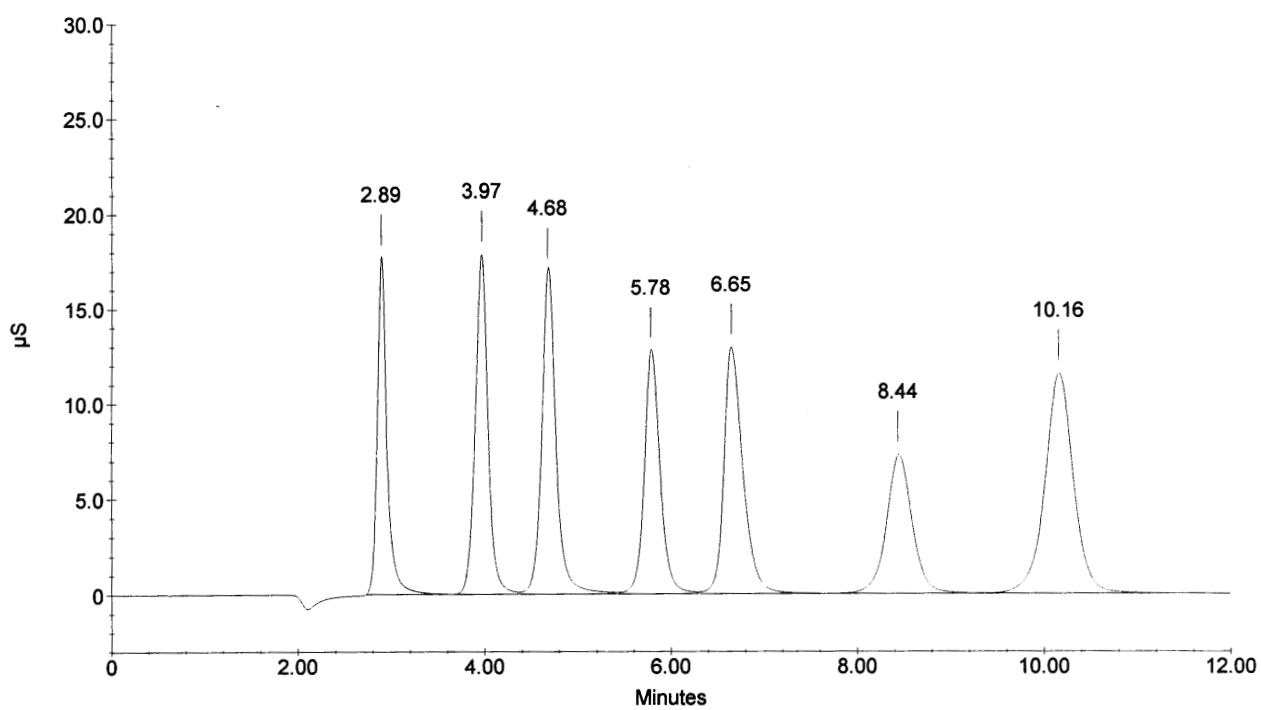
Sample Name : CCV
Dilution Factor : 20.00
Injection Number : 13
Data File Name : c:\peaknet\data\040624a\040624_013.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 9:42:13 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.89	FLUORIDE	101.918	176420	1273800	2	0.00
2	3.97	CHLORIDE	204.834	178218	1699386	2	-1.98
3	4.68	NITRITE-N	97.501	169232	1827419	2	-0.92
4	5.78	BROMIDE	409.926	127286	1513804	2	-0.29
5	6.65	NITRATE-N	85.426	128995	1842593	2	1.68
6	8.44	PHOSPHATE-P	195.510	72273	1395941	2	-0.16
7	10.16	SULFATE	399.586	115236	2452190	2	1.47
	0.00		---total(s)--- 1494.702		12005134		

CCV



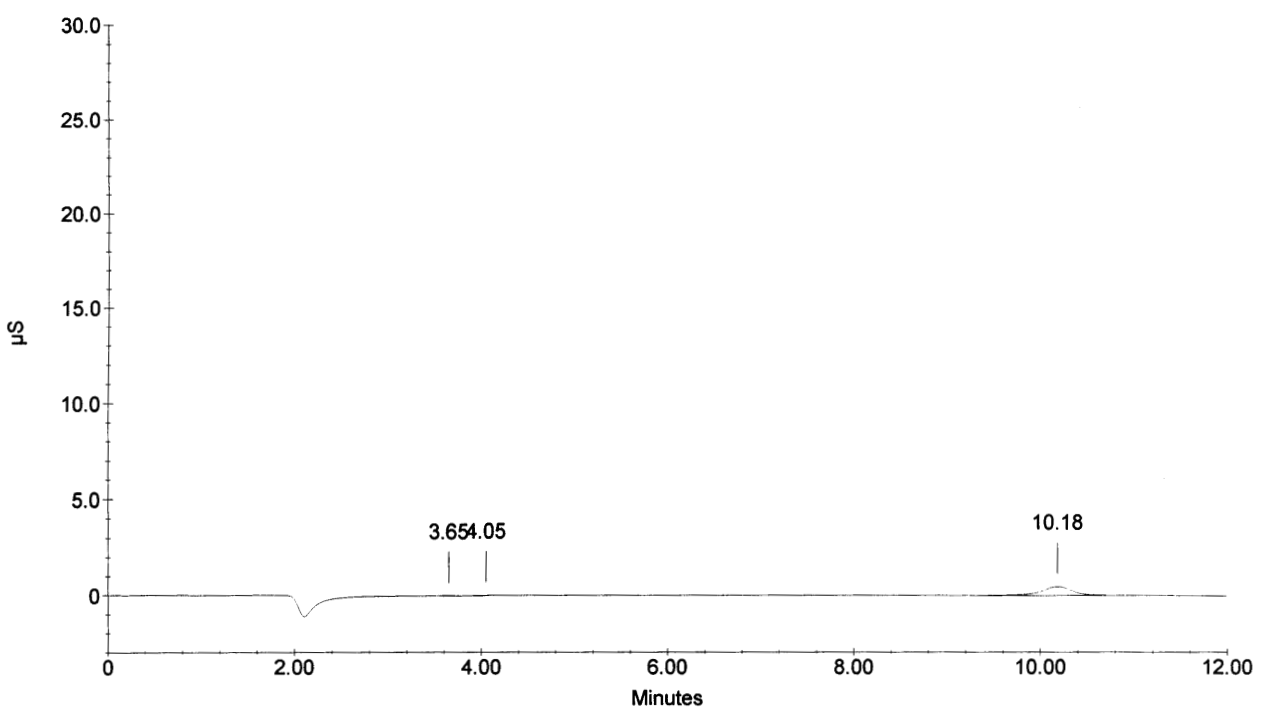
Sample Name : CCB
Dilution Factor : 1.00
Injection Number : 14
Data File Name : c:\peaknet\data\040624a\040624_014.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 9:56:55 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.65		0.000	62	540	1	
2	4.05	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	0.014	167	2211	1	0.00
3	10.18	SULFATE	0.955	4644	111822	1	1.73
	0.00		---total(s)--- 0.969		114574		

CCB



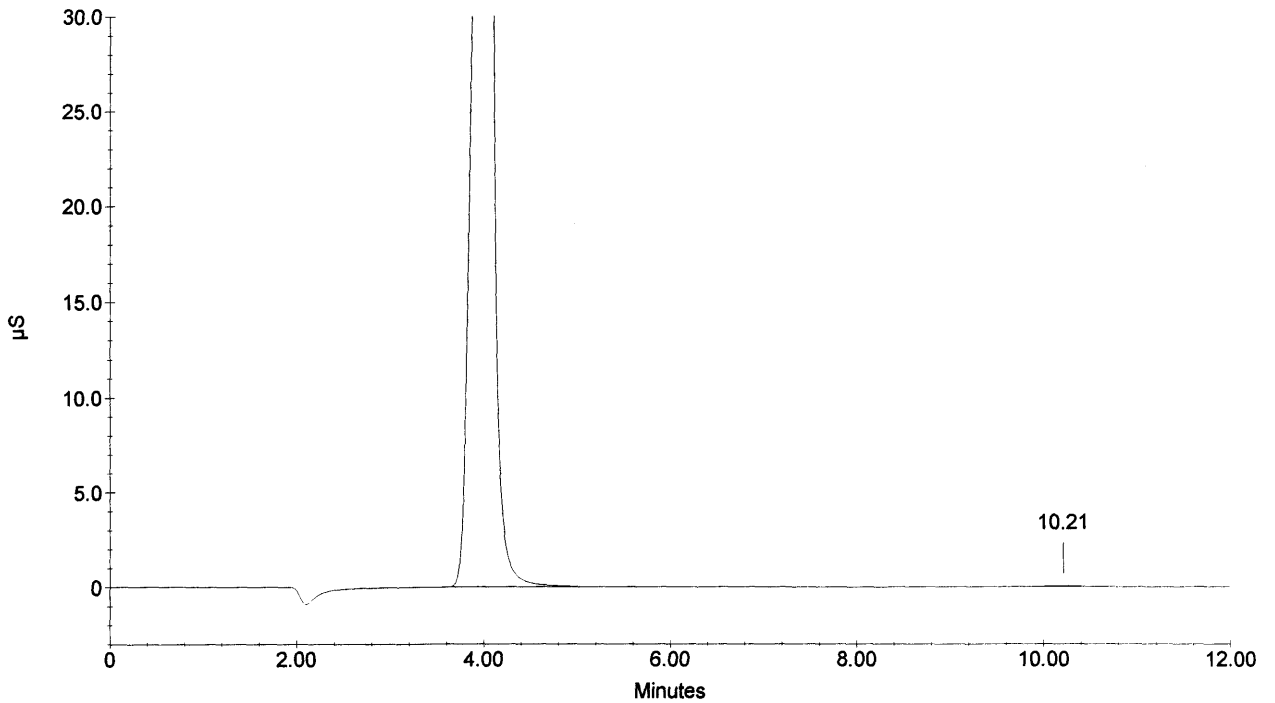
Sample Name : 246054
Dilution Factor : 200.00
Injection Number : 15
Data File Name : c:\peaknet\data\040624a\040624_015.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 10:11:36 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.04	CHLORIDE	7401.666	785098	10159002	1	-0.33
1	4.04	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	7401.666	785098	10159002	1	-0.33
2	10.21	SULFATE	13.247	404	7740	1	2.00
	0.00		---total(s)--- 14816.578		20325744		

246054



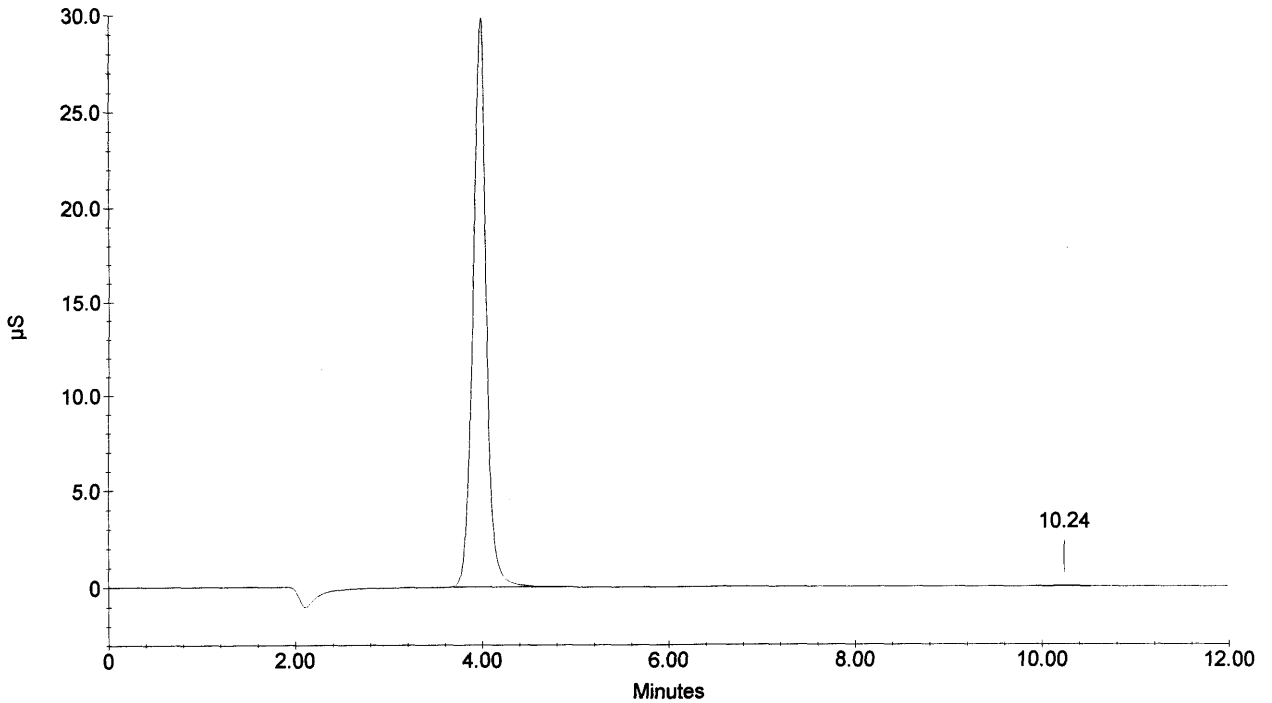
Sample Name : 246055
Dilution Factor : 200.00
Injection Number : 16
Data File Name : c:\peaknet\data\040624a\040624_016.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 10:26:17 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.98	CHLORIDE	3337.120	296064	2938941	1	-1.65
1	3.98	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	3337.120	296064	2938941	1	-1.65
2	10.24	SULFATE	8.097	235	4731	1	2.26
	0.00	---total(s)---	6682.337		5882612		

246055



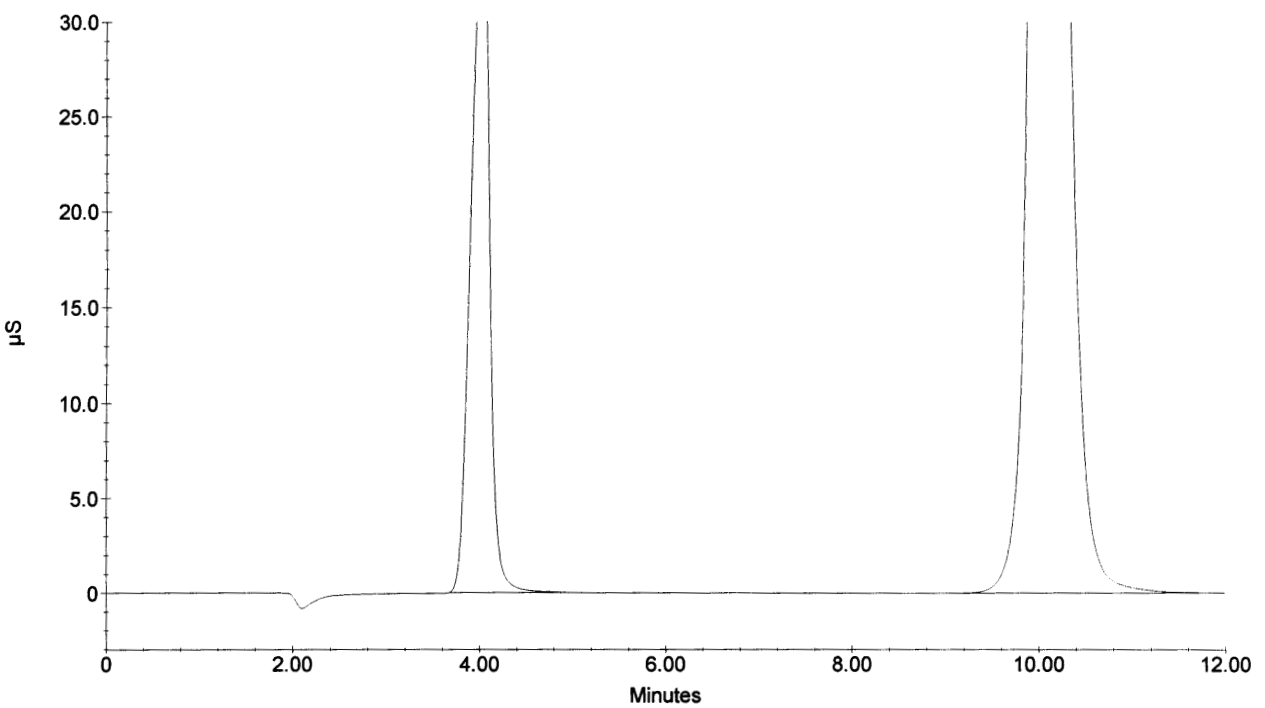
Sample Name : 246056
Dilution Factor : 200.00
Injection Number : 17
Data File Name : c:\peaknet\data\040624a\040624_017.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 10:40:59 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.04	CHLORIDE	5062.697	356210	4954135	1	-0.33
1	4.04	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	5062.697	356210	4954135	1	-0.33
2	10.02	SULFATE	21826.864	1134805	25166232	1	0.13
	0.00	---total(s)---	31952.257		35074502		

246056



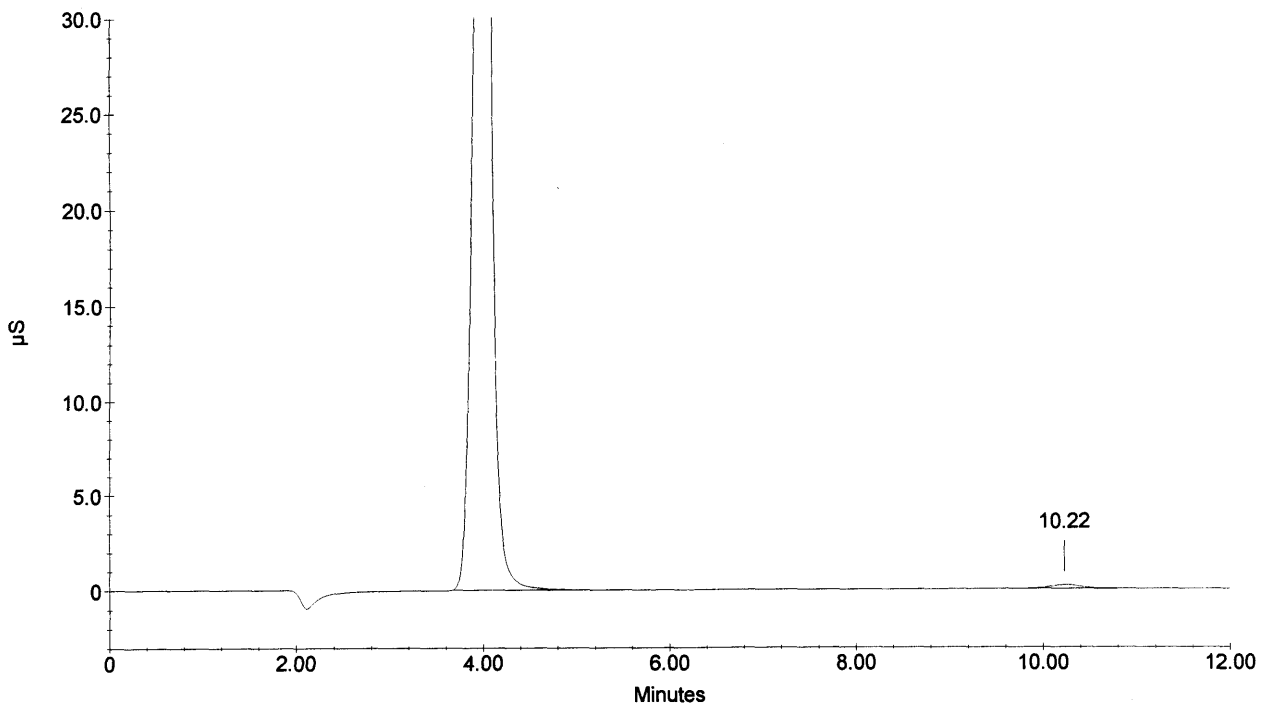
Sample Name : 246057
Dilution Factor : 200.00
Injection Number : 18
Data File Name : c:\peaknet\data\040624a\040624_018.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 10:55:39 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.04	CHLORIDE	6657.905	646915	7655796	1	-0.33
1	4.04	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	6657.905	646915	7655796	1	-0.33
2	10.22	SULFATE	74.445	1992	43526	1	2.13
	0.00	---total(s)---	13390.254		15355118		

246057



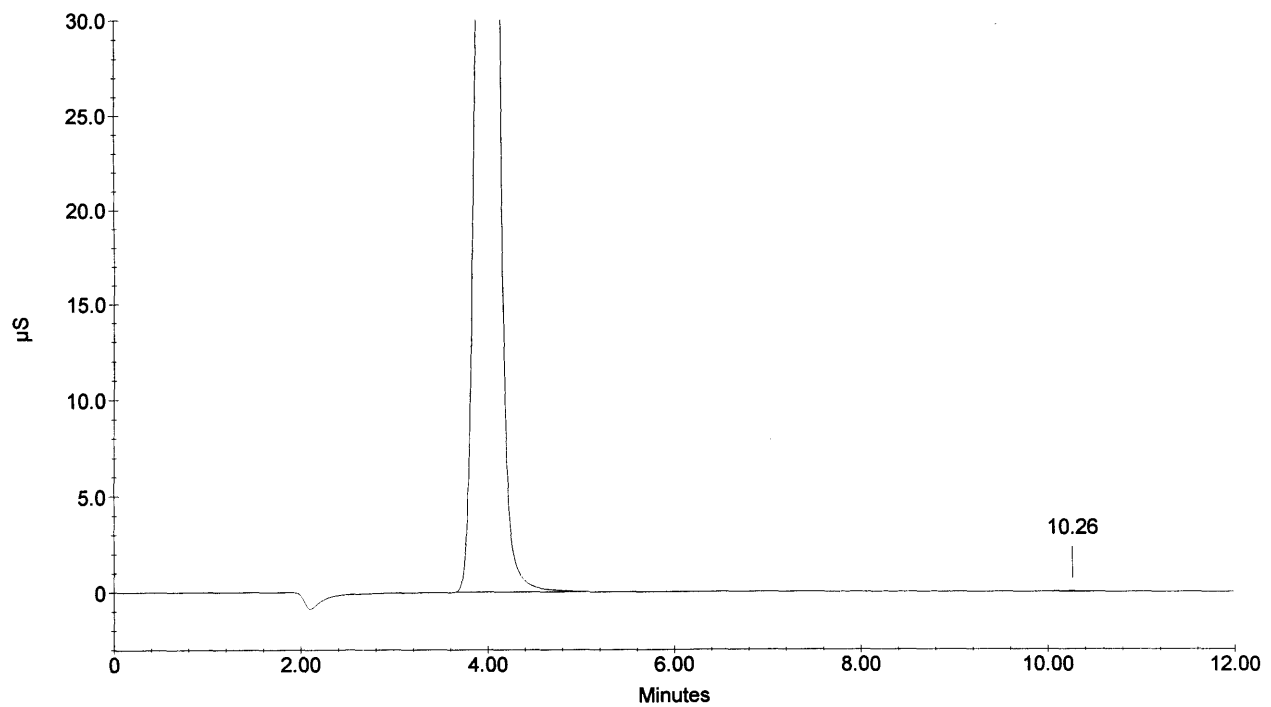
Sample Name : 246058
Dilution Factor : 200.00
Injection Number : 19
Data File Name : c:\peaknet\data\040624a\040624_019.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 11:10:22 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.06	CHLORIDE	7500.386	860183	11949758	1	0.33
1	4.06	CHLORIDE	7500.386	860183	11949758	1	0.33
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
2	10.26	SULFATE	9.195	254	5372	1	2.53
	0.00		---total(s)--- 15009.968		23904887		

246058



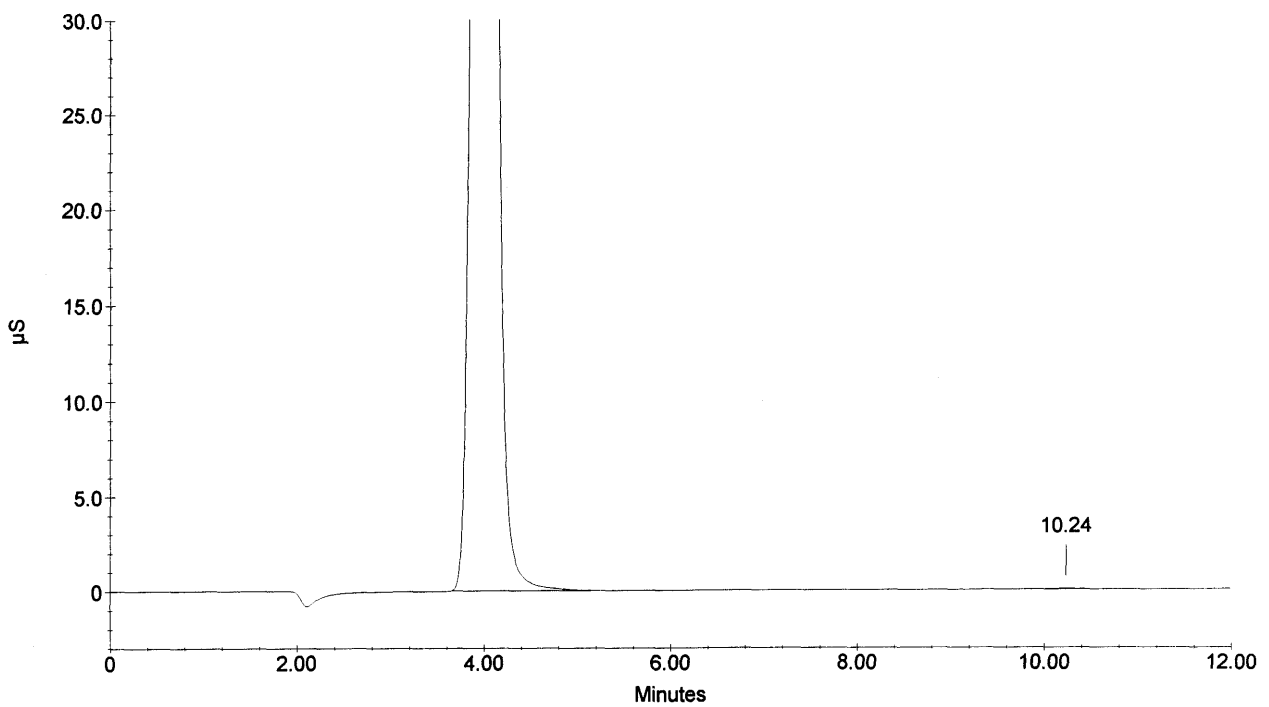
Sample Name : 246059
Dilution Factor : 200.00
Injection Number : 20
Data File Name : c:\peaknet\data\040624a\040624_020.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 11:25:03 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.09	CHLORIDE	6361.145	1037658	16057869	1	0.99
1	4.09	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	6361.145	1037658	16057869	1	0.99
2	10.24	SULFATE	9.451	288	5522	1	2.26
	0.00		---total(s)--- 12731.741		32121259		

246059



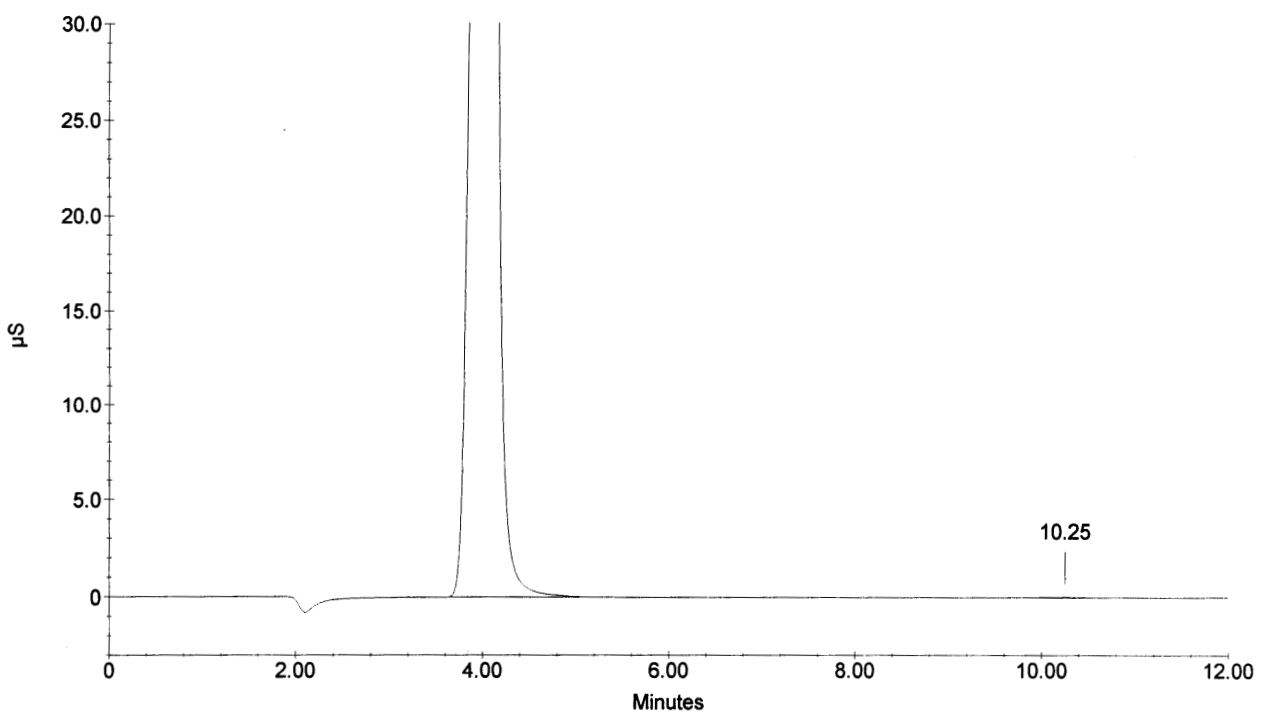
Sample Name : 246060
Dilution Factor : 200.00
Injection Number : 21
Data File Name : c:\peaknet\data\040624a\040624_021.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 11:39:45 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.09	CHLORIDE	6313.518	1030812	16150519	1	0.99
1	4.09	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P	6313.518	1030812	16150519	1	0.99
2	10.25	SULFATE	6.622	222	3869	1	2.40
	0.00		---total(s)--- 12633.657		32304906		

246060



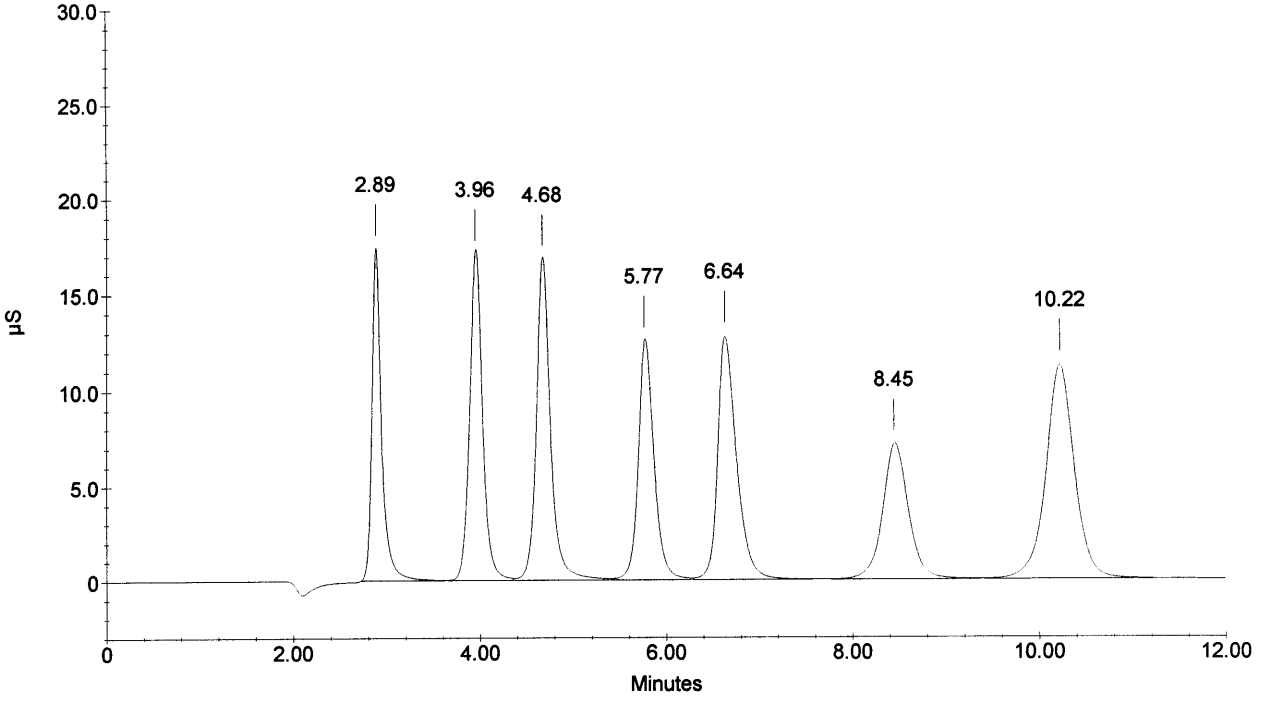
Sample Name : CCV
Dilution Factor : 20.00
Injection Number : 22
Data File Name : c:\peaknet\data\040624a\040624_022.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/24/04 11:54:27 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.89	FLUORIDE	100.094	173745	1249395	2	0.00
2	3.96	CHLORIDE	202.076	170822	1674564	2	-2.30
3	4.68	NITRITE-N	95.754	168022	1794669	2	-0.92
4	5.77	BROMIDE	404.553	125322	1490887	2	-0.52
5	6.64	NITRATE-N	83.942	127860	1809496	2	1.48
6	8.45	PHOSPHATE-P	194.278	71778	1386411	2	0.00
7	10.22	SULFATE	393.854	112621	2415171	2	2.13
	0.00		---total(s)--- 1474.552		11820593		

CCV



Sample Name : CCB
Dilution Factor : 1.00
Injection Number : 23
Data File Name : c:\peaknet\data\040624a\040624_023.DXD
Method File Name : c:\peaknet\method\anions040622.met
Schedule File Name : c:\peaknet\schedule\24jun04a.sch

Date Time Collected : 6/25/04 12:09:09 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.05	CHLORIDE	0.002	38	277	1	0.00
1	4.05	CHLORIDE	0.002	38	277	1	0.00
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
		---total(s)---					
	0.00		0.004		554		

CCB