010001

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 060330-39
SRR: 28901
SDG: 276580
CASE: B. Werling
VTSR: March 30, 2006
PROJECT#: 06002.01.222

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010002

Sample ID
C-CS-1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/30/06

Matrix: Water

Project No.: 06002.01.222

Lab System ID: 276580

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	0.870	0.200
Cadmium	<0.0500	0.0500
Calcium	1.01	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	<1.00	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	0.936	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	33.2	4.00
Selenium	<0.0500	0.0500
Silicon	2.63	0.200
Silver	<0.0500	0.0500
Sodium	152	2.50
Strontium	<0.0500	0.0500
Sulfur	12.0	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

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SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010003

Sample ID
C-CS-1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/30/06

Matrix: Water

Project No.: 06002.01.222

Lab System ID: 276580

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Aluminum	<0.500	<0.500	0.00%
Antimony	<0.100	<0.100	0.00%
Arsenic	<0.0500	<0.0500	0.00%
Barium	<0.0500	<0.0500	0.00%
Beryllium	<0.0500	<0.0500	0.00%
Bismuth	<0.150	<0.150	0.00%
Boron	0.870	0.870	0.00%
Cadmium	<0.0500	<0.0500	0.00%
Calcium	1.01	0.997	1.30%
Chromium	<0.0500	<0.0500	0.00%
Cobalt	<0.0750	<0.0750	0.00%
Copper	<0.0500	<0.0500	0.00%
Iron	<1.00	<1.00	0.00%
Lanthanum	<0.0750	<0.0750	0.00%
Lead	<0.0500	<0.0500	0.00%
Lithium	<0.0500	<0.0500	0.00%
Magnesium	0.936	0.998	6.41%
Manganese	<0.0500	<0.0500	0.00%
Molybdenum	<0.0500	<0.0500	0.00%
Nickel	<0.0500	<0.0500	0.00%
Palladium	<0.200	<0.200	0.00%
Phosphorus	<0.200	<0.200	0.00%
Potassium	33.2	34.8	4.71%
Selenium	<0.0500	<0.0500	0.00%
Silicon	2.63	2.63	0.00%
Silver	<0.0500	<0.0500	0.00%
Sodium	152	149	1.99%
Strontium	<0.0500	<0.0500	0.00%
Sulfur	12.0	12.0	0.00%
Thallium	<0.150	<0.150	0.00%
Thorium	<0.250	<0.250	0.00%
Tin	<0.0500	<0.0500	0.00%
Titanium	<0.0500	<0.0500	0.00%
Tungsten	<0.100	<0.100	0.00%
Uranium	<2.00	<2.00	0.00%
Vanadium	<0.0500	<0.0500	0.00%
Yttrium	<0.0500	<0.0500	0.00%
Zinc	<0.0500	<0.0500	0.00%
Zirconium	<0.0500	<0.0500	0.00%

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SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010004

Sample ID
C-CS-1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/30/06

Matrix: Water

Project No.: 06002.01.222

Lab System ID: 276580

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	<0.500	19.8	20.000	99.0%
Antimony	<0.100	4.98	5.000	99.6%
Arsenic	<0.0500	20.2	20.000	101.0%
Barium	<0.0500	20.1	20.000	100.5%
Beryllium	<0.0500	0.497	0.500	99.4%
Bismuth	NA	NA	NA	NA
Boron	NA	NA	NA	NA
Cadmium	<0.0500	0.498	0.500	99.6%
Calcium	1.01	211	200.000	105.0%
Chromium	<0.0500	1.97	2.000	98.5%
Cobalt	<0.0750	5.07	5.000	101.4%
Copper	<0.0500	2.52	2.500	100.8%
Iron	<1.00	11.4	10.000	114.0%
Lanthanum	NA	NA	NA	NA
Lead	<0.0500	4.89	5.000	97.8%
Lithium	NA	NA	NA	NA
Magnesium	0.936	208	200.000	103.5%
Manganese	<0.0500	5.08	5.000	101.6%
Molybdenum	NA	NA	NA	NA
Nickel	<0.0500	4.93	5.000	98.6%
Palladium	NA	NA	NA	NA
Phosphorus	<0.200	42.3	40.000	105.8%
Potassium	33.2	239	200.000	102.9%
Selenium	<0.0500	20.5	20.000	102.5%
Silicon	2.63	44.2	40.000	103.9%
Silver	<0.0500	0.502	0.500	100.4%
Sodium	152	350	200.000	99.0%
Strontium	NA	NA	NA	NA
Sulfur	NA	NA	NA	NA
Thallium	<0.150	20.7	20.000	103.5%
Thorium	NA	NA	NA	NA
Tin	NA	NA	NA	NA
Titanium	NA	NA	NA	NA
Tungsten	NA	NA	NA	NA
Uranium	NA	NA	NA	NA
Vanadium	<0.0500	4.90	5.000	98.0%
Yttrium	NA	NA	NA	NA
Zinc	<0.0500	5.04	5.000	100.8%
Zirconium	NA	NA	NA	NA

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010005

Sample ID
C-CS-10

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/30/06

Matrix: Water

Project No.: 06002.01.222

Lab System ID: 276581

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	<0.200	0.200
Cadmium	<0.0500	0.0500
Calcium	20.5	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	20.4	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	19.7	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	18.3	4.00
Selenium	<0.0500	0.0500
Silicon	<0.200	0.200
Silver	<0.0500	0.0500
Sodium	21.5	2.50
Strontium	<0.0500	0.0500
Sulfur	0.334	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010006

Sample ID
C-CS-2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/30/06

Matrix: Water

Project No.: 06002.01.222

Lab System ID: 276582

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	0.435	0.200
Cadmium	<0.0500	0.0500
Calcium	1.04	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	<1.00	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	0.628	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	17.8	4.00
Selenium	<0.0500	0.0500
Silicon	1.27	0.200
Silver	<0.0500	0.0500
Sodium	76.5	2.50
Strontium	<0.0500	0.0500
Sulfur	6.16	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010007

Sample ID
C-CS-3

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 276583

Method: ICP SW846 6010B

Client: Division 20

Date Received: 03/30/06

Project No.: 06002.01.222

SRR: 28901

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	0.428	0.200
Cadmium	<0.0500	0.0500
Calcium	1.08	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	<1.00	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	0.677	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	17.1	4.00
Selenium	<0.0500	0.0500
Silicon	1.16	0.200
Silver	<0.0500	0.0500
Sodium	74.2	2.50
Strontium	<0.0500	0.0500
Sulfur	6.01	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010008

Sample ID
C-CS-4

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/30/06

Matrix: Water

Project No.: 06002.01.222

Lab System ID: 276584

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	0.420	0.200
Cadmium	<0.0500	0.0500
Calcium	0.986	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	<1.00	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	0.584	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	16.6	4.00
Selenium	<0.0500	0.0500
Silicon	1.21	0.200
Silver	<0.0500	0.0500
Sodium	74.5	2.50
Strontium	<0.0500	0.0500
Sulfur	6.10	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010009

Sample ID
C-CS-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/30/06

Matrix: Water

Project No.: 06002.01.222

Lab System ID: 276585

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	0.426	0.200
Cadmium	<0.0500	0.0500
Calcium	0.929	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	<1.00	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	0.581	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	15.0	4.00
Selenium	<0.0500	0.0500
Silicon	1.18	0.200
Silver	<0.0500	0.0500
Sodium	73.2	2.50
Strontium	<0.0500	0.0500
Sulfur	5.95	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010010

Sample ID
C-CS-6

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/30/06

Matrix: Water

Project No.: 06002.01.222

Lab System ID: 276586

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	0.469	0.200
Cadmium	<0.0500	0.0500
Calcium	0.808	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	<1.00	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	0.653	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	16.9	4.00
Selenium	<0.0500	0.0500
Silicon	1.21	0.200
Silver	<0.0500	0.0500
Sodium	80.3	2.50
Strontium	<0.0500	0.0500
Sulfur	6.21	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010011

Sample ID
C-CS-7

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 276587

Method: ICP SW846 6010B

Client: Division 20

Date Received: 03/30/06

Project No.: 06002.01.222

SRR: 28901

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	0.424	0.200
Cadmium	<0.0500	0.0500
Calcium	0.689	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	<1.00	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	<0.500	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	16.2	4.00
Selenium	<0.0500	0.0500
Silicon	1.12	0.200
Silver	<0.0500	0.0500
Sodium	73.3	2.50
Strontium	<0.0500	0.0500
Sulfur	5.76	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010012

Sample ID
C-CS-8

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/30/06

Matrix: Water

Project No.: 06002.01.222

Lab System ID: 276588

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	0.450	0.200
Cadmium	<0.0500	0.0500
Calcium	0.756	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	<1.00	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	<0.500	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	17.9	4.00
Selenium	<0.0500	0.0500
Silicon	1.18	0.200
Silver	<0.0500	0.0500
Sodium	79.1	2.50
Strontium	<0.0500	0.0500
Sulfur	6.28	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010013

Sample ID
C-CS-9

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/30/06

Matrix: Water

Project No.: 06002.01.222

Lab System ID: 276589

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	0.436	0.200
Cadmium	<0.0500	0.0500
Calcium	0.750	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	<1.00	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	<0.500	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	17.2	4.00
Selenium	<0.0500	0.0500
Silicon	1.12	0.200
Silver	<0.0500	0.0500
Sodium	77.7	2.50
Strontium	<0.0500	0.0500
Sulfur	6.17	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

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SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE

010014

Sample ID
LCSW - D12H2 / D13H2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 06002.01.222

Lab System ID: NA

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Aluminum	1.95	2.00	97.5%
Antimony	0.489	0.500	97.8%
Arsenic	2.00	2.00	100.0%
Barium	2.01	2.00	100.5%
Beryllium	0.0495	0.0500	99.0%
Bismuth	NA	NA	NA
Boron	NA	NA	NA
Cadmium	0.0492	0.0500	98.4%
Calcium	20.7	20.0	103.5%
Chromium	0.194	0.200	97.0%
Cobalt	0.501	0.500	100.2%
Copper	0.248	0.250	99.2%
Iron	1.14	1.00	114.0%
Lanthanum	NA	NA	NA
Lead	0.481	0.500	96.2%
Lithium	NA	NA	NA
Magnesium	20.6	20.0	103.0%
Manganese	0.503	0.500	100.6%
Molybdenum	NA	NA	NA
Nickel	0.489	0.500	97.8%
Palladium	NA	NA	NA
Phosphorus	4.21	4.00	105.3%
Potassium	20.6	20.0	103.0%
Selenium	2.01	2.00	100.5%
Silicon	4.11	4.00	102.8%
Silver	0.0495	0.0500	99.0%
Sodium	20.4	20.0	102.0%
Strontium	NA	NA	NA
Sulfur	NA	NA	NA
Thallium	2.06	2.00	103.0%
Thorium	NA	NA	NA
Tin	NA	NA	NA
Titanium	NA	NA	NA
Tungsten	NA	NA	NA
Uranium	NA	NA	NA
Vanadium	0.488	0.500	97.6%
Yttrium	NA	NA	NA
Zinc	0.497	0.500	99.4%
Zirconium	NA	NA	NA

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010015

Sample ID
PBW - D12H2 / D13H2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 06002.01.222

Lab System ID: NA

SRR: 28901

Method: ICP SW846 6010B

Task Order: 060330-39

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.500	0.500
Antimony	<0.100	0.100
Arsenic	<0.0500	0.0500
Barium	<0.0500	0.0500
Beryllium	<0.0500	0.0500
Bismuth	<0.150	0.150
Boron	<0.200	0.200
Cadmium	<0.0500	0.0500
Calcium	<0.500	0.500
Chromium	<0.0500	0.0500
Cobalt	<0.0750	0.0750
Copper	<0.0500	0.0500
Iron	<1.00	1.00
Lanthanum	<0.0750	0.0750
Lead	<0.0500	0.0500
Lithium	<0.0500	0.0500
Magnesium	<0.500	0.500
Manganese	<0.0500	0.0500
Molybdenum	<0.0500	0.0500
Nickel	<0.0500	0.0500
Palladium	<0.200	0.200
Phosphorus	<0.200	0.200
Potassium	<4.00	4.00
Selenium	<0.0500	0.0500
Silicon	<0.200	0.200
Silver	<0.0500	0.0500
Sodium	<2.50	2.50
Strontium	<0.0500	0.0500
Sulfur	<0.200	0.200
Thallium	<0.150	0.150
Thorium	<0.250	0.250
Tin	<0.0500	0.0500
Titanium	<0.0500	0.0500
Tungsten	<0.100	0.100
Uranium	<2.00	2.00
Vanadium	<0.0500	0.0500
Yttrium	<0.0500	0.0500
Zinc	<0.0500	0.0500
Zirconium	<0.0500	0.0500

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 060330-39
SRR: 28901
SDG: 276580
CASE: B. Werling
VTSR: March 30, 2006
PROJECT#: 06002.01.222

010016

Task Orders/01-QPP-015

Southwest Research Institute

Laboratory Task Order

TO #: 060330-39 Revision: 1

SDG: 276580
VTSR: 03/30/06
CASE: CNWRA

SRR #'s: 28901
Client(s): Div. 20

Project(s): 06002.01.222
Manager(s): DAMMANN, MIKE
To PM: 04/24/06
To QA: 05/01/06
To Client: 05/08/06

010017

Instructions

DIVISION 20 - CNWRA. 4-WEEK TAT. Using 25-day TAT for PM/preliminary, DRG/QAU; 27-day TAT hardcopy; subject to change.

Work is 10 CFR 50 Appendix B, 10 CFR Part 21, contact MARK EHNSTROM (ext. 3530) or CHARLIE BUTCHER (ext. 5928, pager 271-5172) or JO ANN BOYD (ext. 2169) BEFORE STARTING ANY WORK ON THIS TASK ORDER.

** NOTE ** Somewhere on your data, please make a notation indicating WHO and WHEN Mark Ehnstrom or Charlie Butcher or Jo Ann Boyd were contacted. This will help facilitate the final package to QA.

TWENTY samples received on 03/30/06 for ANIONS by IC and MAJOR & MINOR elements by ICP. Out of the 20, 10 samples are for ICP, which are listed in this task order. Point of Contact is BRADLEY WERLING (x6565).

CONTACT PM WITH ANY ADDITIONAL QUESTIONS.

Revision 1, 5/2/06: prelims emailed on 4/21/06, revised due dates to allow time for copies to be made. (jr)

Documents Related to this task order: 22327[COC 28901]

Test: DIL-DILUTION
Section: METALPREP

Holding: 28 days from CED
Prep, Dilution
Cnt: 10

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
276580		1	Water	C-CS-1	22 Mar 06	19 Apr 06
276581		1	Water	C-CS-10	30 Mar 06	27 Apr 06
276582		1	Water	C-CS-2	29 Mar 06	26 Apr 06
276583		1	Water	C-CS-3	29 Mar 06	26 Apr 06
276584		1	Water	C-CS-4	29 Mar 06	26 Apr 06
276585		1	Water	C-CS-5	29 Mar 06	26 Apr 06
276586		1	Water	C-CS-6	29 Mar 06	26 Apr 06
276587		1	Water	C-CS-7	29 Mar 06	26 Apr 06
276588		1	Water	C-CS-8	29 Mar 06	26 Apr 06
276589		1	Water	C-CS-9	29 Mar 06	26 Apr 06

Test: ICP-SWRI
Section: METALS

Holding: 180 days from CED
ICP Analysis by SwRI Method - MAJOR & MINOR ELEMENTS
Cnt: 10

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
276580		1	Water	C-CS-1	22 Mar 06	18 Sep 06
276581		1	Water	C-CS-10	30 Mar 06	26 Sep 06
276582		1	Water	C-CS-2	29 Mar 06	25 Sep 06
276583		1	Water	C-CS-3	29 Mar 06	25 Sep 06
276584		1	Water	C-CS-4	29 Mar 06	25 Sep 06
276585		1	Water	C-CS-5	29 Mar 06	25 Sep 06
276586		1	Water	C-CS-6	29 Mar 06	25 Sep 06
276587		1	Water	C-CS-7	29 Mar 06	25 Sep 06
276588		1	Water	C-CS-8	29 Mar 06	25 Sep 06
276589		1	Water	C-CS-9	29 Mar 06	25 Sep 06

UNCONTROLLED COPY

01-QPP-015
Division 01
Revision 5
June 2004

010018

Document No._____

Division 01

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

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

010019

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 Quality Assurance Manager	(210) 522-2169	6/4/04 **DATE**
REZA KARIMI Director, Department of Analytical and Environmental Chemistry	(210) 522-2412	6/4/04 **DATE**
MICHAEL G. MACNAUGHTON Vice President, Chemistry and Chemical Engineering Division	(210) 522-5162	6/4/04 **DATE**
CHRISTOPHER HOBSON Quality Assurance Engineer	(210) 522-5838	6/4/2004 **DATE**

010020

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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. This training will be conducted either by Institute Quality Systems (IQS) or Division 01 Quality Assurance personnel and documentation shall be evident in the personnel training files maintained in Division

010022

01 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 [illegible] activities as specified in **SOP-01-6.2.1**, *Qualification and Training*.

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

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

4.2.4 Quality Assurance personnel witnessing the testing process for nuclear [illegible] shall have documented evidence of qualifications maintained by Institute [illegible] Systems or Division 01 Quality Assurance.

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. Task 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) Task 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 task 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 task order shall specify all applicable documents and appropriate document revision level for each document. The task order shall then serve as the Valid Documents List (VDL) for each individual project.

5.0 HISTORY OF REVISIONS

Versions 0 through 3 of this plan are maintained on record in Division 01 Quality Assurance.

Revision 4
Title of document changed from the Standard Project Quality Plan *SPQP-CH/AN* 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.*

Revision 5
Revised 4.1.1 to include designated Division 01 QA staff to conduct pertinent nuclear training sessions to the SwRI Program Quality Plan (PQP-Nuclear), *Nuclear Services*
Revised step 4.2.4 to include Division QA as an entity along with IQS, to maintain documented evidence of qualifications

010028

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 060330-39
SRR: 28901
SDG: 276580
CASE: B. Werling
VTSR: March 30, 2006
PROJECT#: 06002.01.222

Chain of Custody/Login Paperwork

22321

SAMPLE LIST/CHAIN OF CUSTODY

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

Shipper Name/Address: BRADLEY WERLING DIV20 Bld 57

Client: Div. 20

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround:
- ☐ 2 Weeks
- ☐ 3 Weeks
- ☒ Other: 4 weeks

SwRI Contact: Mike Dammann

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analyses of major/minor elements RP
C-CS-1	3/22/06		W		1	✓
C-CS-2	3/29/06					✓
C-CS-3	3/29/06					✓
C-CS-4	3/29/06					✓
C-CS-5	3/29/06					✓
C-CS-6	3/29/06					✓
C-CS-7	3/29/06					✓
C-CS-8	3/29/06					✓
C-CS-9	3/29/06					✓
C-CS-10	3/30/06					✓

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)

Nuclear Safety related - use appropriate QA procedures

POC - Brad Werling
phone - 6565
fax - 5184

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: RADIOACTIVE - Np237 at 8.5×10^{-7} M or 1.14×10^{-4} µCi/mL
SN 783/26

	Date	Time
Relinquished by (Print/Signature): x Bradley Werling / Bradley Werling	3-30-06 x	1600 x
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 20.06002.222

Received by SwRI Lab: (Signature)

Date: 3/30/06 Time: 1600

Samples Disposed: Date: Time:

Samples Disposed by:

SWA# 29901

010029

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

Page 1 of 1

SAMPLE LOG-IN SHEET

010030

Lab Name
Southwest Research Institute

Received By (Print Name)
DINO ROMAN

Received By (Signature)

Log-in Date
03/30/2006

Case Number
B. Werling

Remarks: 06002.01.222

Sample Delivery Group No.

SAS Number
N/A

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	03/30/2006
12	Time Received	16:00:00

EPA Sample #	Sample Tag #	Assigned Lab #	Remarks: Condition of Sample Shipment, etc
A-CS-1	None	276570	Intact
A-CS-10	None	276571	Intact
A-CS-2	None	276572	Intact
A-CS-3	None	276573	Intact
A-CS-4	None	276574	Intact
A-CS-5	None	276575	Intact
A-CS-6	None	276576	Intact
A-CS-7	None	276577	Intact
A-CS-8	None	276578	Intact
A-CS-9	None	276579	Intact
C-CS-1	None	276580	Intact
C-CS-10	None	276581	Intact
C-CS-2	None	276582	Intact
C-CS-3	None	276583	Intact
C-CS-4	None	276584	Intact
C-CS-5	None	276585	Intact
C-CS-6	None	276586	Intact
C-CS-7	None	276587	Intact
C-CS-8	None	276588	Intact
C-CS-9	None	276589	Intact

Sample Transfer

Fraction RAD	Fraction
Area # R12	Area #
By DINO ROMAN	By
On 03/30/2006	On

* Contact SMO and attach record of resolution

Reviewed By

Date 04.03.06

Logbook No Sample Receipt (28901)

Logbook Page No. 5757 Section 1,2 of 4

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 060330-39
SRR: 28901
SDG: 276580
CASE: B. Werling
VTSR: March 30, 2006
PROJECT#: 06002.01.222

Copies of Login Book

Sample Login Book

010032

Mar 30, 2006

SwRI Login Area
Division 1

Sample Receipt: 28899 | Project: 11543.13.00X | Client: CH2M-WG Idaho (C
VTSR Date: Mar 30, 2006 | VTSR Time: 08:00:00 | Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
276530	BEA000819	Water
276531	BEA000820	Water
276532	BEA000821	Water
276533	BEA000822	Water
276534	BEA000823	Water
276535	BEA000824	Water
276536	BEA000831	Water
276537	BEA000832	Water
276538	BEA000833	Water
276539	BEA000834	Water
276540	BEA000835	Water
276541	BEA000836	Water

Sample Receipt: 28900 | Project: 06685.61.00X | Client: US EPA REGION II
VTSR Date: Mar 30, 2006 | VTSR Time: 08:00:00 | Manager: TAN, CK

System ID	Customer Sample ID	Matrix
276547	VVI-DUP-02- 20060329	Air
276548	VVI-R22-01- 20060329	Air
276549	VVI-R22-02- 20060329	Air
276550	VVI-R22-03- 20060329	Air
276551	VVI-R29-01- 20060329	Air
276552	VVI-R29-02- 20060329	Air
276553	VVI-R29-03- 20060329	Air
276554	VVI-R36-01- 20060329	Air
276555	VVI-R36-02- 20060329	Air

Sample Receipt: 28901 | Project: 06002.01.222 | Client: Div. 20
VTSR Date: Mar 30, 2006 | VTSR Time: 16:00:00 | Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
276570	A-CS-1	Water

Sample Login Book

Mar 30, 2006

SwRI Login Area
Division 1

Sample Receipt: 28901 | Project: 06002.01.222 | Client: Div. 20
VTSR Date: Mar 30, 2006 | VTSR Time: 16:00:00 | Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
276571	A-CS-10	Water
276572	A-CS-2	Water
276573	A-CS-3	Water
276574	A-CS-4	Water
276575	A-CS-5	Water
276576	A-CS-6	Water
276577	A-CS-7	Water
276578	A-CS-8	Water
276579	A-CS-9	Water
276580	C-CS-1	Water
276581	C-CS-10	Water
276582	C-CS-2	Water
276583	C-CS-3	Water
276584	C-CS-4	Water
276585	C-CS-5	Water
276586	C-CS-6	Water
276587	C-CS-7	Water
276588	C-CS-8	Water
276589	C-CS-9	Water

Sample Receipt: 28902 | Project: 01.00751d.007 | Client: Div.01
VTSR Date: Mar 30, 2006 | VTSR Time: 17:30:00 | Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
276590	2006Q1-01	Wipe
276591	2006Q1-02	Wipe
276592	2006Q1-03	Wipe
276593	2006Q1-04	Wipe
276594	2006Q1-05	Wipe
276595	2006Q1-06	Wipe
276596	2006Q1-07	Wipe
276597	2006Q1-08	Wipe

010034

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 060330-39
SRR: 28901
SDG: 276580
CASE: B. Werling
VTSR: March 30, 2006
PROJECT#: 06002.01.222

RAW DATA

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 64 049

CLIENT(S): Div. 20 4-13-06 010035
TASK ORDER(S): ~~06330~~ 060330-39 SDG(S): 28901
PROJECT NO(S): 06002.01.222
METHOD: 3005A___ 3050B___ 3050B-7.5___ 3010A___ 3020A___ 7760A___ 7740A___ $HClO_4$___ $HClO_4/H_2SO_4$___
Microwave___ Fusion___ Teflon___ Rock___ OTHER dilutions
MATRIX: Water ✓ Soil___ Biota___ Solid___ Liquid___ TCLP Ext___ OTHER___
INSTRUMENT: GFAA___ ICP ✓ ICP-MS___ IC___ FLAA___ HYDRIDE___ OTHER___
ACID INORG #: HNO_3# 5714 HCl# 5687 H_2SO_4#___ $HClO_4$#___ HF#___ H_2O_2#___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM___ SOURCE: IV INORG# 5709 EXP: 5-1-07 AMT: 100uL
Oven/Hotplate/ Block ID: N/A Temperature (°C): N/A

Sample Identification		df	WT(g)	I.V.(ml)	F.V.(ml)
PBW-D13H2		1		10	10
LCSW-D13H2		1		10	10
276580		10		1	10
276580d		10		1	10
276580s*		10		1	10
276581		10		1	10
276582		10		1	10
276583		10		1	10
276584		10		1	10
276585		10		1	10
276586		10		1	10
276587		10		1	10
276588		10		1	10
276589		10		1	10

*40uL P IV#5254 Exp.6/06
*40uL Si IV#5665 Exp.3/1/07
*40uL ICAL-1 Spex#5529 exp. 12/30/06
*100uL Spike-1 #5528 Exp.12/30/06
PBW&LCSW are prepared as 10mls 1%HNO_3 / 5% HCL

4-13-06

Contacted:
Charlie Butler
Mark Ebnstrom
4-13-06 2:43 pm
4-13-06

LOCATION: N/A

PREPARED BY: ___ DATE: 4-13-06
REVIEWED BY: ___ DATE: 4-14-06
DISPOSAL INT/DATE/LOC: ___

FRM-191 (Rev 4/Jan 05)

BOOK/ PAGE 11 082

SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

010036

TJA_2 TRACE ICP DAILY LOG

ANALYST [signature]

DATE 4-13-06

As 189.042 Profile Line

As Intensity: 546.562

PEAK POSITION -.016853

VERNIER POSITION 711

STDs PREP DATE:	
CLP_STD1_SC	06003
CLP_STD2_SC	
CLP_STD3_SC	
CLP_STD4_SC	
CLP_STD5_SC	
CLP_STD6_SC	
BLK_SC	06003

QC PREP DATE:	
CCV/ICV	06003
CRI	
ICSA	
ICSAB	06003

COMMENTS	FILE	CLIENT	TO#	PROJECT NO.	METHOD
B060413	Y06APR	Hersuth	060308-9	11817.06.023	SW1 64-04C
B060330-39	A06A8K	DIV 20	060330-39	06602.01.222	600 64-049
B060316	A06A8K	DIV 20	060331-6 060412-10	06602.01.322	600 6 3070
		4-13-06			

COMMENTS:

MAINTENANCE: Changed pump tub

REVIEWED BY: Oaena

DATE: 4/25/04

BOOK/ PAGE 19 302

SOUTHWEST RESEARCH INSTITUTE®
6220 Culebra Rd
San Antonio, Texas 78228

010037

SPECTRO ICP DAILY LOG

ANALYST [illegible]

DATE 4-14-06

POWER: 1200

FLOWS:
Aux 40
Coolant 60
Mass Flow Controller 887

CURRENT	PROPOSED	
5120	5116	Na
4776	4774	Fe
4953	4946	Sr

QC PREP DATE:	
CCV/ICV	06003
CRI	
ICSA	
ICSAB	06003

CLP_STD1_SC	06003
CLP_STD2_SC	
CLP_STD3_SC	
CLP_STD4_SC	
CLP_STD5_SC	
BLK_SC	06003

FILE	CLIENT	TO#	PROJECT NO.	METHOD	PREP PAGE
060414	Hergith	060508-9	11817.06.023	SW-1	64-046
060414A	DIV.20	060380-39	06002.01.222	6010B	64-049
060414B	DIV.20	060331-6 060412-10	06002.02.322	6010B	63-070

4-14-06

COMMENTS:

MAINTENANCE:

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

OTHER:

REVIEWED BY: Oduña

DATE: 4/25/06

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 06C01

Date Prepared: 3-1-06 Prepared By: [signature] 010038

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 5649

Added ✓ 50 ml HCL INORG #: 5615

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 5-1-06 INORG #: 5175

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 06D03

Date Prepared: 4-3-06 Prepared By: [signature]

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 5710

Added ✓ 50 ml HCL INORG #: 5686

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 5-1-06 INORG #: 5175

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-

Date Prepared:_____ Prepared By:_____

Make up as needed in 1000ml volumetric flask.

Added_____ 10 ml HNO3 INORG #:_____

Added_____ 50 ml HCL INORG #:_____

Added_____ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: _____INORG #:_____

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-

Date Prepared:_____ Prepared By:_____

Make up as needed in 1000ml volumetric flask.

Added_____ 10 ml HNO3 INORG #:_____

Added_____ 50 ml HCL INORG #:_____

Added_____ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: _____INORG #:_____

ICP ICV/CCV SOLUTION

010039

CCV- 06D03

Date Prepared: 4-3-06 Prepared By: [illegible]

HNO3 INORG #: 5710 HCl INORG #: 5686

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	5175	10000	5-1-06
B	5	5ml	✓	SPEX	5585	1000	1-15-07
Li	5	5ml	✓	SPEX	5327	1000	8-15-06
Mo	5	5ml	✓	SPEX	5326	1000	8-15-06
P	5	5ml	✓	SPEX	5280	1000	6-30-06
Si	5	5ml	✓	SPEX	5669	1000	2-28-07
Ti	5	5ml	✓	SPEX	5681	1000	2-28-07
Sr	5	5ml	✓	SPEX	5246	1000	5-30-06
Sn	5	5ml	✓	SPEX	5680	1000	10-30-06
Bi	5	5ml	✓	SPEX	5432	1000	10-1~~5~~ 30-06
La	5	5ml	✓	SPEX	5325	1000	8-15-06
Y	5	5ml	✓	SPEX	5431	1000	10-15-06
Pd	1	1ml	✓	SPEX	5586	1000	1-15-07
S	1	1ml	✓	SPEX	5296	1000	7-15-06
Th	1	1ml	✓	SPEX	5358	1000	8-30-06
U	1	1ml	✓	SPEX	5279	1000	6-30-06
W	1	1ml	✓	SPEX	5314	1000	7-30-06
Zr	5	5ml	✓	SPEX	~~5567~~ 5670	1000	1-28-07
Na	10	1ml	✓	SPEX	5587	10000	1-15-07
ICV-2A	vary	10ml	✓	SPEX	5429	mix	10-15-06
ICV-2B	vary	1ml	✓	SPEX	5430	mix	10-15-06
ICV-2C	vary	10ml	✓	SPEX	5428	mix	10-15-06

Expiration Date: 5-1-06

ICP Calibration Standards

010040

Date Prepared: 4-3-06 Prepared By: [illegible]

HNO3 INORG #: 5710 HCl INORG #: 5686

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
4-3-06	STD1- 06003	Al	50	2.50	✓	INORVENT	5405	10000	10-1-06
		Ca	50	2.50	✓	INORVENT	5636	10000	3-1-07
		Fe	50	2.50	✓	INORVENT	5661	10000	3-1-07
		K	50	2.50	✓	INORVENT	5471	10000	12-1-06
		Mg	25	1.25	✓	INORVENT	5312	10000	8-1-06
		Na	50	2.50	✓	INORVENT	5310	10000	8-1-06
		Li	10	5.00	✓	INORVENT	5244	1000	6-1-06
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD2- 06003	Ba	10	5.00	✓	INORVENT	5657	1000	3-1-07
		Be	5	2.50	✓	INORVENT	5253	1000	6-1-06
		Cr	10	5.00	✓	INORVENT	5470	1000	12-1-06
		Cu	10	5.00	✓	INORVENT	5659	1000	3-1-07
		Ni	10	5.00	✓	INORVENT	5663	1000	3-1-07
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD3- 06003	Cd	10	5.00	✓	INORVENT	5660	1000	3-1-07
		Co	10	5.00	✓	INORVENT	5658	1000	3-1-07
		Mn	10	5.00	✓	INORVENT	5634	1000	3-1-07
		V	10	5.00	✓	INORVENT	5472	1000	12-1-06
		Zn	10	5.00	✓	INORVENT	5538	1000	2-1-07
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD4- 06003	Ag	2	1.00	✓	INORVENT	5406	1000	10-1-06
		As	10	5.00	✓	INORVENT	5633	1000	3-1-07
		Pb	10	5.00	✓	INORVENT	5255	1000	6-1-06
		Sb	10	5.00	✓	INORVENT	5655	1000	3-1-07
		Se	10	5.00	✓	INORVENT	5313	1000	8-1-06
		TL	10	5.00	✓	INORVENT	5635	1000	3-1-07
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD5- 06003	B	10	5.00	✓	INORVENT	5656	1000	3-1-07
		Mo	10	5.00	✓	INORVENT	5662	1000	3-1-07
		P	10	5.00	✓	INORVENT	5254	1000	6-1-06
		Si	10	5.00	✓	INORVENT	5665	1000	3-1-07
		Ti	10	5.00	✓	INORVENT	5474	1000	12-1-06
		Sr	10	5.00	✓	INORVENT	5243	1000	6-1-06
		Sn	10	5.00	✓	INORVENT	5174	1000	5-1-06
		Bi	5	2.50	✓	INORVENT	5309	1000	8-1-06
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
4-3-06	STD6- 06003	La	10	5.00	✓	INORVENT	5407	1000	10-1-06
		Na	1	0.05	✓	INORVENT	5310	10000	8-1-06
		Pd	10	5.00	✓	INORVENT	5664	1000	3-1-07 04
		S	10	5.00	✓	INORVENT	5535	1000	2-1-07
		Th	10	5.00	✓	INORVENT	5469	1000	12-1-06
		U	10	5.00	✓	INORVENT	5408	1000	10-1-06
		W	5	2.50	✓	INORVENT	5308	1000	8-1-06
		Y	10	5.00	✓	INORVENT	5588	1000	2-1-07
		Zr	10	5.00	5311	INORVENT	5311	1000	8-1-06
		SC	10	0.500	✓	INORVENT	5175	10000	5-1-06

Expiration Dates:

STD1: 5-1-06 **STD4:** 5-1-06

STD2: 5-1-06 **STD5:** 5-1-06

STD3: 5-1-06 **STD6:** 5-1-06

DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

276580 for B

0.08698 ug/ml X 10ml / 1ml = 0.870 mg/L

4-20-06

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
pbw-D12H2	Ag3280	0.0500	U		mg/L	0.05				0.005	0.0409	0.0409	1	0.05	0.00409	04/13/06	16:51
pbw-D12H2	Al3082	0.500	U		mg/L	0.5				0.05	0.277	0.277	1	0.5	0.0277	04/13/06	16:51
pbw-D12H2	As1890	0.0500	U		mg/L	0.05				0.005	0.0001	0.0001	1	0.05	0.00001	04/13/06	16:51
pbw-D12H2	B_2496	0.200	U		mg/L	0.2				0.02	0.045	0.045	1	0.2	0.0045	04/13/06	16:51
pbw-D12H2	Ba4934	0.0500	U		mg/L	0.05				0.005	0.0027	0.0027	1	0.05	0.00027	04/13/06	16:51
pbw-D12H2	Be3130	0.0500	U		mg/L	0.05				0.005	0.0013	0.0013	1	0.05	0.00013	04/13/06	16:51
pbw-D12H2	Bi2230	0.150	U		mg/L	0.15				0.015	0.1374	0.137	1	0.15	0.01374	04/13/06	16:51
pbw-D12H2	Ca3179	0.500	U		mg/L	0.5				0.05	0.0836	0.0836	1	0.5	0.00836	04/13/06	16:51
pbw-D12H2	Cd2265	0.0500	U		mg/L	0.05				0.005	0.0056	0.0056	1	0.05	0.00056	04/13/06	16:51
pbw-D12H2	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0501	0.0501	1	0.075	0.00501	04/13/06	16:51
pbw-D12H2	Cr2677	0.0500	U		mg/L	0.05				0.005	0.0165	0.0165	1	0.05	0.00165	04/13/06	16:51
pbw-D12H2	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0122	0.0122	1	0.05	0.00122	04/13/06	16:51
pbw-D12H2	Fe2714	1.00	U		mg/L	1				0.1	0.7024	0.702	1	1	0.07024	04/13/06	16:51
pbw-D12H2	La3988	0.0750	U		mg/L	0.075				0.0075	0.055	0.055	1	0.075	0.0055	04/13/06	16:51
pbw-D12H2	Li6707	0.0500	U		mg/L	0.05				0.005	0.0035	0.0035	1	0.05	0.00035	04/13/06	16:51
pbw-D12H2	Mg2790	0.500	U		mg/L	0.5				0.05	0.3109	0.311	1	0.5	0.03109	04/13/06	16:51
pbw-D12H2	Mn2576	0.0500	U		mg/L	0.05				0.005	0.0008	0.0008	1	0.05	0.00008	04/13/06	16:51
pbw-D12H2	Mo2020	0.0500	U		mg/L	0.05				0.005	0.0087	0.0087	1	0.05	0.00087	04/13/06	16:51
pbw-D12H2	Ni2316	0.0500	U		mg/L	0.05				0.005	0.0189	0.0189	1	0.05	0.00189	04/13/06	16:51
pbw-D12H2	P_1782	0.200	U		mg/L	0.2				0.02	0.0947	0.0947	1	0.2	0.00947	04/13/06	16:51
pbw-D12H2	Pd3404	0.200	U		mg/L	0.2				0.02	0.1683	0.168	1	0.2	0.01683	04/13/06	16:51
pbw-D12H2	S_1820	0.200	U		mg/L	0.2				0.02	0.0228	0.0228	1	0.2	0.00228	04/13/06	16:51
pbw-D12H2	Sb2068	0.100	U		mg/L	0.1				0.01	0.0386	0.0386	1	0.1	0.00386	04/13/06	16:51
pbw-D12H2	Si2881	0.200	U		mg/L	0.2				0.02	0.1808	0.181	1	0.2	0.01808	04/13/06	16:51
pbw-D12H2	Pb220	0.0500	U		mg/L	0.05				0.005	0.0038	0.0038	1	0.05	0.00038	04/13/06	16:51
pbw-D12H2	Se196	0.0500	U		mg/L	0.05				0.005	0.0312	0.0312	1	0.05	0.00312	04/13/06	16:51
pbw-D12H2	Sn1899	0.0500	U		mg/L	0.05				0.005	0.0126	0.0126	1	0.05	0.00126	04/13/06	16:51
pbw-D12H2	Sr4215	0.0500	U		mg/L	0.05				0.005	0.0022	0.0022	1	0.05	0.00022	04/13/06	16:51
pbw-D12H2	Th2837	0.250	U		mg/L	0.25				0.025	0.0089	0.0089	1	0.25	0.00089	04/13/06	16:51
pbw-D12H2	Ti3349	0.0500	U		mg/L	0.05				0.005	0.002	0.002	1	0.05	0.0002	04/13/06	16:51
pbw-D12H2	Tl1908	0.150	U		mg/L	0.15				0.015	0.0344	0.0344	1	0.15	0.00344	04/13/06	16:51
pbw-D12H2	U_4090	2.00	U		mg/L	2				0.2	1.8398	1.84	1	2	0.18398	04/13/06	16:51
pbw-D12H2	V_2924	0.0500	U		mg/L	0.05				0.005	0.0076	0.0076	1	0.05	0.00076	04/13/06	16:51
pbw-D12H2	W_2079	0.100	U		mg/L	0.1				0.01	0.075	0.075	1	0.1	0.0075	04/13/06	16:51
pbw-D12H2	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0032	0.0032	1	0.05	0.00032	04/13/06	16:51
pbw-D12H2	Zn2062	0.0500	U		mg/L	0.05				0.005	0.0051	0.0051	1	0.05	0.00051	04/13/06	16:51
pbw-D12H2	Zr3496	0.0500	U		mg/L	0.05				0.005	0.024	0.024	1	0.05	0.0024	04/13/06	16:51
lcsw-D12H2	Ag3280	0.0495			mg/L	0.005		99.0%	0.05	0.005	0.04946	0.0495	1	0.005	0.04946	04/13/06	16:56
lcsw-D12H2	Al3082	1.95			mg/L	0.05		97.5%	2	0.05	1.95355	1.95	1	0.05	1.95355	04/13/06	16:56
lcsw-D12H2	As1890	2.00			mg/L	0.005		100.0%	2	0.005	2.00279	2	1	0.005	2.00279	04/13/06	16:56

010041

DIV20_060330_39Trace

4/20/06

DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
lcsw-D12H2	B_2496	0.0200	U		mg/L	0.02			0	0.02	0.00087	0.00087	1	0.02	0.00087	04/13/06	16:56
lcsw-D12H2	Ba4934	2.01			mg/L	0.005		100.5%	2	0.005	2.01222	2.01	1	0.005	2.01222	04/13/06	16:56
lcsw-D12H2	Be3130	0.0495			mg/L	0.005		99.0%	0.05	0.005	0.04954	0.0495	1	0.005	0.04954	04/13/06	16:56
lcsw-D12H2	Bi2230	0.0150	U		mg/L	0.015			0	0.015	0.00389	0.00389	1	0.015	0.00389	04/13/06	16:56
lcsw-D12H2	Ca3179	20.7			mg/L	0.05		103.5%	20	0.05	20.73214	20.7	1	0.05	20.73214	04/13/06	16:56
lcsw-D12H2	Cd2265	0.0492			mg/L	0.005		98.4%	0.05	0.005	0.04923	0.0492	1	0.005	0.04923	04/13/06	16:56
lcsw-D12H2	Co2286	0.501			mg/L	0.0075		100.2%	0.5	0.0075	0.50079	0.501	1	0.0075	0.50079	04/13/06	16:56
lcsw-D12H2	Cr2677	0.194			mg/L	0.005		97.0%	0.2	0.005	0.19352	0.194	1	0.005	0.19352	04/13/06	16:56
lcsw-D12H2	Cu3247	0.248			mg/L	0.005		99.2%	0.25	0.005	0.24774	0.248	1	0.005	0.24774	04/13/06	16:56
lcsw-D12H2	Fe2714	1.14			mg/L	0.1		114.0%	1	0.1	1.14167	1.14	1	0.1	1.14167	04/13/06	16:56
lcsw-D12H2	La3988	0.00750	U		mg/L	0.0075			0	0.0075	0.00025	0.00025	1	0.0075	0.00025	04/13/06	16:56
lcsw-D12H2	Li6707	0.00500	U		mg/L	0.005			0	0.005	0.00027	0.00027	1	0.005	0.00027	04/13/06	16:56
lcsw-D12H2	Mg2790	20.6			mg/L	0.05		103.0%	20	0.05	20.55078	20.6	1	0.05	20.55078	04/13/06	16:56
lcsw-D12H2	Mn2576	0.503			mg/L	0.005		100.6%	0.5	0.005	0.50262	0.503	1	0.005	0.50262	04/13/06	16:56
lcsw-D12H2	Mo2020	0.00500	U		mg/L	0.005			0	0.005	-0.00098	-0.00098	1	0.005	-0.00098	04/13/06	16:56
lcsw-D12H2	Ni2316	0.489			mg/L	0.005		97.8%	0.5	0.005	0.48914	0.489	1	0.005	0.48914	04/13/06	16:56
lcsw-D12H2	P_1782	4.21			mg/L	0.02		105.3%	4	0.02	4.21489	4.21	1	0.02	4.21489	04/13/06	16:56
lcsw-D12H2	Pd3404	0.0200	U		mg/L	0.02			0	0.02	0.0031	0.0031	1	0.02	0.0031	04/13/06	16:56
lcsw-D12H2	S_1820	0.0200	U		mg/L	0.02			0	0.02	-0.0045	-0.0045	1	0.02	-0.0045	04/13/06	16:56
lcsw-D12H2	Sb2068	0.489			mg/L	0.01		97.8%	0.5	0.01	0.489	0.489	1	0.01	0.489	04/13/06	16:56
lcsw-D12H2	Si2881	4.11			mg/L	0.02		102.8%	4	0.02	4.11377	4.11	1	0.02	4.11377	04/13/06	16:56
lcsw-D12H2	Pb220	0.481			mg/L	0.005		96.2%	0.5	0.005	0.48052	0.481	1	0.005	0.48052	04/13/06	16:56
lcsw-D12H2	Se196	2.01			mg/L	0.005		100.5%	2	0.005	2.00946	2.01	1	0.005	2.00946	04/13/06	16:56
lcsw-D12H2	Sn1899	0.00500	U		mg/L	0.005			0	0.005	-0.00173	-0.00173	1	0.005	-0.00173	04/13/06	16:56
lcsw-D12H2	Sr4215	0.00500	U		mg/L	0.005			0	0.005	0.00068	0.00068	1	0.005	0.00068	04/13/06	16:56
lcsw-D12H2	Th2837	0.0250	U		mg/L	0.025			0	0.025	-0.02304	-0.023	1	0.025	-0.02304	04/13/06	16:56
lcsw-D12H2	Ti3349	0.00500	U		mg/L	0.005			0	0.005	-0.00026	-0.00026	1	0.005	-0.00026	04/13/06	16:56
lcsw-D12H2	Tl1908	2.06			mg/L	0.015		103.0%	2	0.015	2.06172	2.06	1	0.015	2.06172	04/13/06	16:56
lcsw-D12H2	U_4090	0.200	U		mg/L	0.2			0	0.2	0.00105	0.00105	1	0.2	0.00105	04/13/06	16:56
lcsw-D12H2	V_2924	0.488			mg/L	0.005		97.6%	0.5	0.005	0.48769	0.488	1	0.005	0.48769	04/13/06	16:56
lcsw-D12H2	W_2079	0.0100	U		mg/L	0.01			0	0.01	-0.00035	-0.00035	1	0.01	-0.00035	04/13/06	16:56
lcsw-D12H2	Y_3710	0.00500	U		mg/L	0.005			0	0.005	-0.00037	-0.00037	1	0.005	-0.00037	04/13/06	16:56
lcsw-D12H2	Zn2062	0.497			mg/L	0.005		99.4%	0.5	0.005	0.49716	0.497	1	0.005	0.49716	04/13/06	16:56
lcsw-D12H2	Zr3496	0.00500	U		mg/L	0.005			0	0.005	-0.00076	-0.00076	1	0.005	-0.00076	04/13/06	16:56
276580	Ag3280	0.0500	U		mg/L	0.05				0.005	0.0173	0.0173	1	0.05	0.00173	04/13/06	17:00
276580	Al3082	0.500	U		mg/L	0.5				0.05	0.2241	0.224	1	0.5	0.02241	04/13/06	17:00
276580	As1890	0.0500	U		mg/L	0.05				0.005	0.0088	0.0088	1	0.05	0.00088	04/13/06	17:00
276580	B_2496	0.870			mg/L	0.2				0.02	0.8698	0.87	1	0.2	0.08698	04/13/06	17:00
276580	Ba4934	0.0500	U		mg/L	0.05				0.005	0.0032	0.0032	1	0.05	0.00032	04/13/06	17:00
276580	Be3130	0.0500	U		mg/L	0.05				0.005	0.0009	0.0009	1	0.05	0.00009	04/13/06	17:00

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276580	Bi2230	0.150	U		mg/L	0.15				0.015	-0.0014	-0.0014	1	0.15	-0.00014	04/13/06	17:00
276580	Ca3179	1.01			mg/L	0.5				0.05	1.0074	1.01	1	0.5	0.10074	04/13/06	17:00
276580	Cd2265	0.0500	U		mg/L	0.05				0.005	0.0025	0.0025	1	0.05	0.00025	04/13/06	17:00
276580	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0267	0.0267	1	0.075	0.00267	04/13/06	17:00
276580	Cr2677	0.0500	U		mg/L	0.05				0.005	0.017	0.017	1	0.05	0.0017	04/13/06	17:00
276580	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0172	0.0172	1	0.05	0.00172	04/13/06	17:00
276580	Fe2714	1.00	U		mg/L	1				0.1	0.2588	0.259	1	1	0.02588	04/13/06	17:00
276580	La3988	0.0750	U		mg/L	0.075				0.0075	0.0191	0.0191	1	0.075	0.00191	04/13/06	17:00
276580	Li6707	0.0500	U		mg/L	0.05				0.005	0.0022	0.0022	1	0.05	0.00022	04/13/06	17:00
276580	Mg2790	0.936			mg/L	0.5				0.05	0.9356	0.936	1	0.5	0.09356	04/13/06	17:00
276580	Mn2576	0.0500	U		mg/L	0.05				0.005	0.019	0.019	1	0.05	0.0019	04/13/06	17:00
276580	Mo2020	0.0500	U		mg/L	0.05				0.005	0.0054	0.0054	1	0.05	0.00054	04/13/06	17:00
276580	Ni2316	0.0500	U		mg/L	0.05				0.005	0.0288	0.0288	1	0.05	0.00288	04/13/06	17:00
276580	P_1782	0.200	U		mg/L	0.2				0.02	0.0471	0.0471	1	0.2	0.00471	04/13/06	17:00
276580	Pd3404	0.200	U		mg/L	0.2				0.02	0.0359	0.0359	1	0.2	0.00359	04/13/06	17:00
276580	S_1820	12.0			mg/L	0.2				0.02	11.9772	12	1	0.2	1.19772	04/13/06	17:00
276580	Sb2068	0.100	U		mg/L	0.1				0.01	0.036	0.036	1	0.1	0.0036	04/13/06	17:00
276580	Si2881	2.63			mg/L	0.2				0.02	2.6266	2.63	1	0.2	0.26266	04/13/06	17:00
276580	Pb220	0.0500	U		mg/L	0.05				0.005	0.0034	0.0034	1	0.05	0.00034	04/13/06	17:00
276580	Se196	0.0500	U		mg/L	0.05				0.005	0.0401	0.0401	1	0.05	0.00401	04/13/06	17:00
276580	Sn1899	0.0500	U		mg/L	0.05				0.005	0.0062	0.0062	1	0.05	0.00062	04/13/06	17:00
276580	Sr4215	0.0500	U		mg/L	0.05				0.005	0.001	0.001	1	0.05	0.0001	04/13/06	17:00
276580	Th2837	0.250	U		mg/L	0.25				0.025	0.051	0.051	1	0.25	0.0051	04/13/06	17:00
276580	Ti3349	0.0500	U		mg/L	0.05				0.005	0.0038	0.0038	1	0.05	0.00038	04/13/06	17:00
276580	Tl1908	0.150	U		mg/L	0.15				0.015	0.0335	0.0335	1	0.15	0.00335	04/13/06	17:00
276580	U_4090	2.00	U		mg/L	2				0.2	0.5814	0.581	1	2	0.05814	04/13/06	17:00
276580	V_2924	0.0500	U		mg/L	0.05				0.005	0.0119	0.0119	1	0.05	0.00119	04/13/06	17:00
276580	W_2079	0.100	U		mg/L	0.1				0.01	0.032	0.032	1	0.1	0.0032	04/13/06	17:00
276580	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0031	0.0031	1	0.05	0.00031	04/13/06	17:00
276580	Zn2062	0.0500	U		mg/L	0.05				0.005	0.0012	0.0012	1	0.05	0.00012	04/13/06	17:00
276580	Zr3496	0.0500	U		mg/L	0.05				0.005	0.0156	0.0156	1	0.05	0.00156	04/13/06	17:00
276580d	Ag3280	0.0500	U		mg/L	0.05	0.0%			0.005	0.0252	0.0252	1	0.05	0.00252	04/13/06	17:05
276580d	Al3082	0.500	U		mg/L	0.5	0.0%			0.05	0.4979	0.498	1	0.5	0.04979	04/13/06	17:05
276580d	As1890	0.0500	U		mg/L	0.05	0.0%			0.005	0.002	0.002	1	0.05	0.0002	04/13/06	17:05
276580d	B_2496	0.870			mg/L	0.2	0.0%			0.02	0.8704	0.87	1	0.2	0.08704	04/13/06	17:05
276580d	Ba4934	0.0500	U		mg/L	0.05	0.0%			0.005	0.0031	0.0031	1	0.05	0.00031	04/13/06	17:05
276580d	Be3130	0.0500	U		mg/L	0.05	0.0%			0.005	0.0009	0.0009	1	0.05	0.00009	04/13/06	17:05
276580d	Bi2230	0.150	U		mg/L	0.15	0.0%			0.015	0.0595	0.0595	1	0.15	0.00595	04/13/06	17:05
276580d	Ca3179	0.997			mg/L	0.5	1.3%			0.05	0.997	0.997	1	0.5	0.0997	04/13/06	17:05
276580d	Cd2265	0.0500	U		mg/L	0.05	0.0%			0.005	0.0033	0.0033	1	0.05	0.00033	04/13/06	17:05

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276580d	Co2286	0.0750	U		mg/L	0.075	0.0%			0.0075	0.0261	0.0261	1	0.075	0.00261	04/13/06	17:05
276580d	Cr2677	0.0500	U		mg/L	0.05	0.0%			0.005	0.0172	0.0172	1	0.05	0.00172	04/13/06	17:05
276580d	Cu3247	0.0500	U		mg/L	0.05	0.0%			0.005	0.018	0.018	1	0.05	0.0018	04/13/06	17:05
276580d	Fe2714	1.00	U		mg/L	1	0.0%			0.1	0.4925	0.493	1	1	0.04925	04/13/06	17:05
276580d	La3988	0.0750	U		mg/L	0.075	0.0%			0.0075	0.0313	0.0313	1	0.075	0.00313	04/13/06	17:05
276580d	Li6707	0.0500	U		mg/L	0.05	0.0%			0.005	0.0033	0.0033	1	0.05	0.00033	04/13/06	17:05
276580d	Mg2790	0.998			mg/L	0.5	6.4%			0.05	0.9975	0.998	1	0.5	0.09975	04/13/06	17:05
276580d	Mn2576	0.0500	U		mg/L	0.05	0.0%			0.005	0.0184	0.0184	1	0.05	0.00184	04/13/06	17:05
276580d	Mo2020	0.0500	U		mg/L	0.05	0.0%			0.005	0.0014	0.0014	1	0.05	0.00014	04/13/06	17:05
276580d	Ni2316	0.0500	U		mg/L	0.05	0.0%			0.005	0.0377	0.0377	1	0.05	0.00377	04/13/06	17:05
276580d	P_1782	0.200	U		mg/L	0.2	0.0%			0.02	0.0229	0.0229	1	0.2	0.00229	04/13/06	17:05
276580d	Pd3404	0.200	U		mg/L	0.2	0.0%			0.02	0.0755	0.0755	1	0.2	0.00755	04/13/06	17:05
276580d	S_1820	12.0			mg/L	0.2	0.0%			0.02	12.0223	12	1	0.2	1.20223	04/13/06	17:05
276580d	Sb2068	0.100	U		mg/L	0.1	0.0%			0.01	0.0238	0.0238	1	0.1	0.00238	04/13/06	17:05
276580d	Si2881	2.63			mg/L	0.2	0.0%			0.02	2.6259	2.63	1	0.2	0.26259	04/13/06	17:05
276580d	Pb220	0.0500	U		mg/L	0.05	0.0%			0.005	0.0026	0.0026	1	0.05	0.00026	04/13/06	17:05
276580d	Se196	0.0500	U		mg/L	0.05	0.0%			0.005	0.0169	0.0169	1	0.05	0.00169	04/13/06	17:05
276580d	Sn1899	0.0500	U		mg/L	0.05	0.0%			0.005	-0.0027	-0.0027	1	0.05	-0.00027	04/13/06	17:05
276580d	Sr4215	0.0500	U		mg/L	0.05	0.0%			0.005	0.0015	0.0015	1	0.05	0.00015	04/13/06	17:05
276580d	Th2837	0.250	U		mg/L	0.25	0.0%			0.025	0.0512	0.0512	1	0.25	0.00512	04/13/06	17:05
276580d	Ti3349	0.0500	U		mg/L	0.05	0.0%			0.005	0.0037	0.0037	1	0.05	0.00037	04/13/06	17:05
276580d	Tl1908	0.150	U		mg/L	0.15	0.0%			0.015	0.0146	0.0146	1	0.15	0.00146	04/13/06	17:05
276580d	U_4090	2.00	U		mg/L	2	0.0%			0.2	0.9617	0.962	1	2	0.09617	04/13/06	17:05
276580d	V_2924	0.0500	U		mg/L	0.05	0.0%			0.005	0.0119	0.0119	1	0.05	0.00119	04/13/06	17:05
276580d	W_2079	0.100	U		mg/L	0.1	0.0%			0.01	0.0521	0.0521	1	0.1	0.00521	04/13/06	17:05
276580d	Y_3710	0.0500	U		mg/L	0.05	0.0%			0.005	0.0032	0.0032	1	0.05	0.00032	04/13/06	17:05
276580d	Zn2062	0.0500	U		mg/L	0.05	0.0%			0.005	0.0042	0.0042	1	0.05	0.00042	04/13/06	17:05
276580d	Zr3496	0.0500	U		mg/L	0.05	0.0%			0.005	0.015	0.015	1	0.05	0.0015	04/13/06	17:05
276580s	Ag3280	0.502			mg/L	0.05		100.4%	0.5	0.005	0.5016	0.502	1	0.05	0.05016	04/13/06	17:10
276580s	Al3082	19.8			mg/L	0.5		99.0%	20	0.05	19.807	19.8	1	0.5	1.9807	04/13/06	17:10
276580s	As1890	20.2			mg/L	0.05		101.0%	20	0.005	20.1993	20.2	1	0.05	2.01993	04/13/06	17:10
276580s	B_2496	0.875		#DIV/0!	mg/L	0.2		#DIV/0!	0	0.02	0.8749	0.875	1	0.2	0.08749	04/13/06	17:10
276580s	Ba4934	20.1			mg/L	0.05		100.5%	20	0.005	20.1341	20.1	1	0.05	2.01341	04/13/06	17:10
276580s	Be3130	0.497			mg/L	0.05		99.4%	0.5	0.005	0.4971	0.497	1	0.05	0.04971	04/13/06	17:10
276580s	Bi2230	0.150	U	#DIV/0!	mg/L	0.15		#DIV/0!	0	0.015	0.0112	0.0112	1	0.15	0.00112	04/13/06	17:10
276580s	Ca3179	211			mg/L	0.5		105.0%	200	0.05	210.733	211	1	0.5	21.0733	04/13/06	17:10
276580s	Cd2265	0.498			mg/L	0.05		99.6%	0.5	0.005	0.4975	0.498	1	0.05	0.04975	04/13/06	17:10
276580s	Co2286	5.07			mg/L	0.075		101.4%	5	0.0075	5.0673	5.07	1	0.075	0.50673	04/13/06	17:10
276580s	Cr2677	1.97			mg/L	0.05		98.5%	2	0.005	1.9668	1.97	1	0.05	0.19668	04/13/06	17:10
276580s	Cu3247	2.52			mg/L	0.05		100.8%	2.5	0.005	2.5203	2.52	1	0.05	0.25203	04/13/06	17:10

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276580s	Fe2714	11.4			mg/L	1		114.0%	10	0.1	11.4396	11.4	1	1	1.14396	04/13/06	17:10
276580s	La3988	0.0750	U	#DIV/0!	mg/L	0.075		#DIV/0!	0	0.0075	0.0055	0.0055	1	0.075	0.00055	04/13/06	17:10
276580s	Li6707	0.0500	U	#DIV/0!	mg/L	0.05		#DIV/0!	0	0.005	0.0034	0.0034	1	0.05	0.00034	04/13/06	17:10
276580s	Mg2790	208			mg/L	0.5		103.5%	200	0.05	208.4498	208	1	0.5	20.84498	04/13/06	17:10
276580s	Mn2576	5.08			mg/L	0.05		101.6%	5	0.005	5.0752	5.08	1	0.05	0.50752	04/13/06	17:10
276580s	Mo2020	0.0500	U	#DIV/0!	mg/L	0.05		#DIV/0!	0	0.005	-0.0025	-0.0025	1	0.05	-0.00025	04/13/06	17:10
276580s	Ni2316	4.93			mg/L	0.05		98.6%	5	0.005	4.9296	4.93	1	0.05	0.49296	04/13/06	17:10
276580s	P_1782	42.3			mg/L	0.2		105.8%	40	0.02	42.3435	42.3	1	0.2	4.23435	04/13/06	17:10
276580s	Pd3404	0.200	U	#DIV/0!	mg/L	0.2		#DIV/0!	0	0.02	0.0219	0.0219	1	0.2	0.00219	04/13/06	17:10
276580s	S_1820	12.3		#DIV/0!	mg/L	0.2		#DIV/0!	0	0.02	12.3295	12.3	1	0.2	1.23295	04/13/06	17:10
276580s	Sb2068	4.98			mg/L	0.1		99.6%	5	0.01	4.9835	4.98	1	0.1	0.49835	04/13/06	17:10
276580s	Si2881	44.2			mg/L	0.2		103.9%	40	0.02	44.1577	44.2	1	0.2	4.41577	04/13/06	17:10
276580s	Pb220	4.89			mg/L	0.05		97.8%	5	0.005	4.8862	4.89	1	0.05	0.48862	04/13/06	17:10
276580s	Se196	20.5			mg/L	0.05		102.5%	20	0.005	20.5226	20.5	1	0.05	2.05226	04/13/06	17:10
276580s	Sn1899	0.0500	U	#DIV/0!	mg/L	0.05		#DIV/0!	0	0.005	0.0026	0.0026	1	0.05	0.00026	04/13/06	17:10
276580s	Sr4215	0.0500	U	#DIV/0!	mg/L	0.05		#DIV/0!	0	0.005	0.0072	0.0072	1	0.05	0.00072	04/13/06	17:10
276580s	Th2837	0.250	U	#DIV/0!	mg/L	0.25		#DIV/0!	0	0.025	-0.1923	-0.192	1	0.25	-0.01923	04/13/06	17:10
276580s	Ti3349	0.0500	U	#DIV/0!	mg/L	0.05		#DIV/0!	0	0.005	0.0027	0.0027	1	0.05	0.00027	04/13/06	17:10
276580s	Tl1908	20.7			mg/L	0.15		103.5%	20	0.015	20.7154	20.7	1	0.15	2.07154	04/13/06	17:10
276580s	U_4090	2.00	U	#DIV/0!	mg/L	2		#DIV/0!	0	0.2	0.4802	0.48	1	2	0.04802	04/13/06	17:10
276580s	V_2924	4.90			mg/L	0.05		98.0%	5	0.005	4.9034	4.9	1	0.05	0.49034	04/13/06	17:10
276580s	W_2079	0.100	U	#DIV/0!	mg/L	0.1		#DIV/0!	0	0.01	0.029	0.029	1	0.1	0.0029	04/13/06	17:10
276580s	Y_3710	0.0500	U	#DIV/0!	mg/L	0.05		#DIV/0!	0	0.005	-0.0004	-0.0004	1	0.05	-0.00004	04/13/06	17:10
276580s	Zn2062	5.04			mg/L	0.05		100.8%	5	0.005	5.0358	5.04	1	0.05	0.50358	04/13/06	17:10
276580s	Zr3496	0.0500	U	#DIV/0!	mg/L	0.05		#DIV/0!	0	0.005	0.0103	0.0103	1	0.05	0.00103	04/13/06	17:10
276581	Ag3280	0.0500	U		mg/L	0.05				0.005	0.0045	0.0045	1	0.05	0.00045	04/13/06	17:15
276581	Al3082	0.500	U		mg/L	0.5				0.05	0.1573	0.157	1	0.5	0.01573	04/13/06	17:15
276581	As1890	0.0500	U		mg/L	0.05				0.005	0.0171	0.0171	1	0.05	0.00171	04/13/06	17:15
276581	B_2496	0.200	U		mg/L	0.2				0.02	0.0137	0.0137	1	0.2	0.00137	04/13/06	17:15
276581	Ba4934	0.0500	U		mg/L	0.05				0.005	0.0019	0.0019	1	0.05	0.00019	04/13/06	17:15
276581	Be3130	0.0500	U		mg/L	0.05				0.005	0.0005	0.0005	1	0.05	0.00005	04/13/06	17:15
276581	Bi2230	0.150	U		mg/L	0.15				0.015	-0.0137	-0.0137	1	0.15	-0.00137	04/13/06	17:15
276581	Ca3179	20.5			mg/L	0.5				0.05	20.5169	20.5	1	0.5	2.05169	04/13/06	17:15
276581	Cd2265	0.0500	U		mg/L	0.05				0.005	0.0006	0.0006	1	0.05	0.00006	04/13/06	17:15
276581	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0315	0.0315	1	0.075	0.00315	04/13/06	17:15
276581	Cr2677	0.0500	U		mg/L	0.05				0.005	0.01	0.01	1	0.05	0.001	04/13/06	17:15
276581	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0144	0.0144	1	0.05	0.00144	04/13/06	17:15
276581	Fe2714	20.4			mg/L	1				0.1	20.3543	20.4	1	1	2.03543	04/13/06	17:15
276581	La3988	0.0750	U		mg/L	0.075				0.0075	0.0027	0.0027	1	0.075	0.00027	04/13/06	17:15
276581	Li6707	0.0500	U		mg/L	0.05				0.005	0.0009	0.0009	1	0.05	0.00009	04/13/06	17:15

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276581	Mg2790	19.7			mg/L	0.5				0.05	19.6674	19.7	1	0.5	1.96674	04/13/06	17:15
276581	Mn2576	0.0500	U		mg/L	0.05				0.005	0.0007	0.0007	1	0.05	0.00007	04/13/06	17:15
276581	Mo2020	0.0500	U		mg/L	0.05				0.005	-0.0021	-0.0021	1	0.05	-0.00021	04/13/06	17:15
276581	Ni2316	0.0500	U		mg/L	0.05				0.005	0.0257	0.0257	1	0.05	0.00257	04/13/06	17:15
276581	P_1782	0.200	U		mg/L	0.2				0.02	0.0514	0.0514	1	0.2	0.00514	04/13/06	17:15
276581	Pd3404	0.200	U		mg/L	0.2				0.02	0.0115	0.0115	1	0.2	0.00115	04/13/06	17:15
276581	S_1820	0.334			mg/L	0.2				0.02	0.3342	0.334	1	0.2	0.03342	04/13/06	17:15
276581	Sb2068	0.100	U		mg/L	0.1				0.01	0.0397	0.0397	1	0.1	0.00397	04/13/06	17:15
276581	Si2881	0.200	U		mg/L	0.2				0.02	0.0487	0.0487	1	0.2	0.00487	04/13/06	17:15
276581	Pb220	0.0500	U		mg/L	0.05				0.005	0.0048	0.0048	1	0.05	0.00048	04/13/06	17:15
276581	Se196	0.0500	U		mg/L	0.05				0.005	0.0264	0.0264	1	0.05	0.00264	04/13/06	17:15
276581	Sn1899	0.0500	U		mg/L	0.05				0.005	0.0006	0.0006	1	0.05	0.00006	04/13/06	17:15
276581	Sr4215	0.0500	U		mg/L	0.05				0.005	0.002	0.002	1	0.05	0.0002	04/13/06	17:15
276581	Th2837	0.250	U		mg/L	0.25				0.025	0.0287	0.0287	1	0.25	0.00287	04/13/06	17:15
276581	Ti3349	0.0500	U		mg/L	0.05				0.005	0.0023	0.0023	1	0.05	0.00023	04/13/06	17:15
276581	Tl1908	0.150	U		mg/L	0.15				0.015	0.018	0.018	1	0.15	0.0018	04/13/06	17:15
276581	U_4090	2.00	U		mg/L	2				0.2	-0.0034	-0.0034	1	2	-0.00034	04/13/06	17:15
276581	V_2924	0.0500	U		mg/L	0.05				0.005	0.0012	0.0012	1	0.05	0.00012	04/13/06	17:15
276581	W_2079	0.100	U		mg/L	0.1				0.01	0.0316	0.0316	1	0.1	0.00316	04/13/06	17:15
276581	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0012	0.0012	1	0.05	0.00012	04/13/06	17:15
276581	Zn2062	0.0500	U		mg/L	0.05				0.005	-0.0009	-0.0009	1	0.05	-0.00009	04/13/06	17:15
276581	Zr3496	0.0500	U		mg/L	0.05				0.005	0.0063	0.0063	1	0.05	0.00063	04/13/06	17:15
276582	Ag3280	0.0500	U		mg/L	0.05				0.005	0.0094	0.0094	1	0.05	0.00094	04/13/06	17:19
276582	Al3082	0.500	U		mg/L	0.5				0.05	0.1318	0.132	1	0.5	0.01318	04/13/06	17:19
276582	As1890	0.0500	U		mg/L	0.05				0.005	-0.0147	-0.0147	1	0.05	-0.00147	04/13/06	17:19
276582	B_2496	0.435			mg/L	0.2				0.02	0.435	0.435	1	0.2	0.0435	04/13/06	17:19
276582	Ba4934	0.0500	U		mg/L	0.05				0.005	0.0013	0.0013	1	0.05	0.00013	04/13/06	17:19
276582	Be3130	0.0500	U		mg/L	0.05				0.005	0.0007	0.0007	1	0.05	0.00007	04/13/06	17:19
276582	Bi2230	0.150	U		mg/L	0.15				0.015	0.0417	0.0417	1	0.15	0.00417	04/13/06	17:19
276582	Ca3179	1.04			mg/L	0.5				0.05	1.0366	1.04	1	0.5	0.10366	04/13/06	17:19
276582	Cd2265	0.0500	U		mg/L	0.05				0.005	-0.001	-0.001	1	0.05	-0.0001	04/13/06	17:19
276582	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0021	0.0021	1	0.075	0.00021	04/13/06	17:19
276582	Cr2677	0.0500	U		mg/L	0.05				0.005	0.0035	0.0035	1	0.05	0.00035	04/13/06	17:19
276582	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0151	0.0151	1	0.05	0.00151	04/13/06	17:19
276582	Fe2714	1.00	U		mg/L	1				0.1	0.402	0.402	1	1	0.0402	04/13/06	17:19
276582	La3988	0.0750	U		mg/L	0.075				0.0075	0.0189	0.0189	1	0.075	0.00189	04/13/06	17:19
276582	Li6707	0.0500	U		mg/L	0.05				0.005	0.0021	0.0021	1	0.05	0.00021	04/13/06	17:19
276582	Mg2790	0.628			mg/L	0.5				0.05	0.6275	0.628	1	0.5	0.06275	04/13/06	17:19
276582	Mn2576	0.0500	U		mg/L	0.05				0.005	0.016	0.016	1	0.05	0.0016	04/13/06	17:19
276582	Mo2020	0.0500	U		mg/L	0.05				0.005	0.0033	0.0033	1	0.05	0.00033	04/13/06	17:19

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276582	Ni2316	0.0500	U		mg/L	0.05				0.005	0.0152	0.0152	1	0.05	0.00152	04/13/06	17:19
276582	P_1782	0.200	U		mg/L	0.2				0.02	0.0889	0.0889	1	0.2	0.00889	04/13/06	17:19
276582	Pd3404	0.200	U		mg/L	0.2				0.02	0.0682	0.0682	1	0.2	0.00682	04/13/06	17:19
276582	S_1820	6.16			mg/L	0.2				0.02	6.155	6.16	1	0.2	0.6155	04/13/06	17:19
276582	Sb2068	0.100	U		mg/L	0.1				0.01	-0.0062	-0.0062	1	0.1	-0.00062	04/13/06	17:19
276582	Si2881	1.27			mg/L	0.2				0.02	1.2707	1.27	1	0.2	0.12707	04/13/06	17:19
276582	Pb220	0.0500	U		mg/L	0.05				0.005	0.0106	0.0106	1	0.05	0.00106	04/13/06	17:19
276582	Se196	0.0500	U		mg/L	0.05				0.005	0.0158	0.0158	1	0.05	0.00158	04/13/06	17:19
276582	Sn1899	0.0500	U		mg/L	0.05				0.005	-0.0021	-0.0021	1	0.05	-0.00021	04/13/06	17:19
276582	Sr4215	0.0500	U		mg/L	0.05				0.005	0.0011	0.0011	1	0.05	0.00011	04/13/06	17:19
276582	Th2837	0.250	U		mg/L	0.25				0.025	0.0111	0.0111	1	0.25	0.00111	04/13/06	17:19
276582	Ti3349	0.0500	U		mg/L	0.05				0.005	-0.0007	-0.0007	1	0.05	-0.00007	04/13/06	17:19
276582	Tl1908	0.150	U		mg/L	0.15				0.015	0.0348	0.0348	1	0.15	0.00348	04/13/06	17:19
276582	U_4090	2.00	U		mg/L	2				0.2	0.3378	0.338	1	2	0.03378	04/13/06	17:19
276582	V_2924	0.0500	U		mg/L	0.05				0.005	0.002	0.002	1	0.05	0.0002	04/13/06	17:19
276582	W_2079	0.100	U		mg/L	0.1				0.01	0.0143	0.0143	1	0.1	0.00143	04/13/06	17:19
276582	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0002	0.0002	1	0.05	0.00002	04/13/06	17:19
276582	Zn2062	0.0500	U		mg/L	0.05				0.005	0.0002	0.0002	1	0.05	0.00002	04/13/06	17:19
276582	Zr3496	0.0500	U		mg/L	0.05				0.005	0.0044	0.0044	1	0.05	0.00044	04/13/06	17:19
276583	Ag3280	0.0500	U		mg/L	0.05				0.005	0.0028	0.0028	1	0.05	0.00028	04/13/06	17:24
276583	Al3082	0.500	U		mg/L	0.5				0.05	0.1592	0.159	1	0.5	0.01592	04/13/06	17:24
276583	As1890	0.0500	U		mg/L	0.05				0.005	-0.0167	-0.0167	1	0.05	-0.00167	04/13/06	17:24
276583	B_2496	0.428			mg/L	0.2				0.02	0.4277	0.428	1	0.2	0.04277	04/13/06	17:24
276583	Ba4934	0.0500	U		mg/L	0.05				0.005	0.0013	0.0013	1	0.05	0.00013	04/13/06	17:24
276583	Be3130	0.0500	U		mg/L	0.05				0.005	0.0008	0.0008	1	0.05	0.00008	04/13/06	17:24
276583	Bi2230	0.150	U		mg/L	0.15				0.015	-0.0188	-0.0188	1	0.15	-0.00188	04/13/06	17:24
276583	Ca3179	1.08			mg/L	0.5				0.05	1.0778	1.08	1	0.5	0.10778	04/13/06	17:24
276583	Cd2265	0.0500	U		mg/L	0.05				0.005	0.0008	0.0008	1	0.05	0.00008	04/13/06	17:24
276583	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0256	0.0256	1	0.075	0.00256	04/13/06	17:24
276583	Cr2677	0.0500	U		mg/L	0.05				0.005	0.0133	0.0133	1	0.05	0.00133	04/13/06	17:24
276583	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0088	0.0088	1	0.05	0.00088	04/13/06	17:24
276583	Fe2714	1.00	U		mg/L	1				0.1	0.1785	0.179	1	1	0.01785	04/13/06	17:24
276583	La3988	0.0750	U		mg/L	0.075				0.0075	0.0022	0.0022	1	0.075	0.00022	04/13/06	17:24
276583	Li6707	0.0500	U		mg/L	0.05				0.005	0.0015	0.0015	1	0.05	0.00015	04/13/06	17:24
276583	Mg2790	0.677			mg/L	0.5				0.05	0.6767	0.677	1	0.5	0.06767	04/13/06	17:24
276583	Mn2576	0.0500	U		mg/L	0.05				0.005	0.0119	0.0119	1	0.05	0.00119	04/13/06	17:24
276583	Mo2020	0.0500	U		mg/L	0.05				0.005	0.0018	0.0018	1	0.05	0.00018	04/13/06	17:24
276583	Ni2316	0.0500	U		mg/L	0.05				0.005	0.0205	0.0205	1	0.05	0.00205	04/13/06	17:24
276583	P_1782	0.200	U		mg/L	0.2				0.02	0.0305	0.0305	1	0.2	0.00305	04/13/06	17:24
276583	Pd3404	0.200	U		mg/L	0.2				0.02	0.0365	0.0365	1	0.2	0.00365	04/13/06	17:24

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276583	S_1820	6.01			mg/L	0.2				0.02	6.0053	6.01	1	0.2	0.60053	04/13/06	17:24
276583	Sb2068	0.100	U		mg/L	0.1				0.01	0.0048	0.0048	1	0.1	0.00048	04/13/06	17:24
276583	Si2881	1.16			mg/L	0.2				0.02	1.1558	1.16	1	0.2	0.11558	04/13/06	17:24
276583	Pb220	0.0500	U		mg/L	0.05				0.005	0.0142	0.0142	1	0.05	0.00142	04/13/06	17:24
276583	Se196	0.0500	U		mg/L	0.05				0.005	-0.0087	-0.0087	1	0.05	-0.00087	04/13/06	17:24
276583	Sn1899	0.0500	U		mg/L	0.05				0.005	-0.0127	-0.0127	1	0.05	-0.00127	04/13/06	17:24
276583	Sr4215	0.0500	U		mg/L	0.05				0.005	0.0007	0.0007	1	0.05	0.00007	04/13/06	17:24
276583	Th2837	0.250	U		mg/L	0.25				0.025	0.0467	0.0467	1	0.25	0.00467	04/13/06	17:24
276583	Ti3349	0.0500	U		mg/L	0.05				0.005	-0.0009	-0.0009	1	0.05	-0.00009	04/13/06	17:24
276583	Tl1908	0.150	U		mg/L	0.15				0.015	0.0018	0.0018	1	0.15	0.00018	04/13/06	17:24
276583	U_4090	2.00	U		mg/L	2				0.2	0.1649	0.165	1	2	0.01649	04/13/06	17:24
276583	V_2924	0.0500	U		mg/L	0.05				0.005	-0.0001	-0.0001	1	0.05	-0.00001	04/13/06	17:24
276583	W_2079	0.100	U		mg/L	0.1				0.01	0.0175	0.0175	1	0.1	0.00175	04/13/06	17:24
276583	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0003	0.0003	1	0.05	0.00003	04/13/06	17:24
276583	Zn2062	0.0500	U		mg/L	0.05				0.005	0.0008	0.0008	1	0.05	0.00008	04/13/06	17:24
276583	Zr3496	0.0500	U		mg/L	0.05				0.005	0.0005	0.0005	1	0.05	0.00005	04/13/06	17:24
276584	Ag3280	0.0500	U		mg/L	0.05				0.005	0.0035	0.0035	1	0.05	0.00035	04/13/06	17:29
276584	Al3082	0.500	U		mg/L	0.5				0.05	0.1451	0.145	1	0.5	0.01451	04/13/06	17:29
276584	As1890	0.0500	U		mg/L	0.05				0.005	-0.0082	-0.0082	1	0.05	-0.00082	04/13/06	17:29
276584	B_2496	0.420			mg/L	0.2				0.02	0.4201	0.42	1	0.2	0.04201	04/13/06	17:29
276584	Ba4934	0.0500	U		mg/L	0.05				0.005	0.001	0.001	1	0.05	0.0001	04/13/06	17:29
276584	Be3130	0.0500	U		mg/L	0.05				0.005	0.001	0.001	1	0.05	0.0001	04/13/06	17:29
276584	Bi2230	0.150	U		mg/L	0.15				0.015	-0.0229	-0.0229	1	0.15	-0.00229	04/13/06	17:29
276584	Ca3179	0.986			mg/L	0.5				0.05	0.986	0.986	1	0.5	0.0986	04/13/06	17:29
276584	Cd2265	0.0500	U		mg/L	0.05				0.005	0	0	1	0.05	0	04/13/06	17:29
276584	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0226	0.0226	1	0.075	0.00226	04/13/06	17:29
276584	Cr2677	0.0500	U		mg/L	0.05				0.005	0.0027	0.0027	1	0.05	0.00027	04/13/06	17:29
276584	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0146	0.0146	1	0.05	0.00146	04/13/06	17:29
276584	Fe2714	1.00	U		mg/L	1				0.1	0.3695	0.37	1	1	0.03695	04/13/06	17:29
276584	La3988	0.0750	U		mg/L	0.075				0.0075	0.0056	0.0056	1	0.075	0.00056	04/13/06	17:29
276584	Li6707	0.0500	U		mg/L	0.05				0.005	0.0025	0.0025	1	0.05	0.00025	04/13/06	17:29
276584	Mg2790	0.584			mg/L	0.5				0.05	0.5843	0.584	1	0.5	0.05843	04/13/06	17:29
276584	Mn2576	0.0500	U		mg/L	0.05				0.005	0.0204	0.0204	1	0.05	0.00204	04/13/06	17:29
276584	Mo2020	0.0500	U		mg/L	0.05				0.005	-0.0078	-0.0078	1	0.05	-0.00078	04/13/06	17:29
276584	Ni2316	0.0500	U		mg/L	0.05				0.005	0.0201	0.0201	1	0.05	0.00201	04/13/06	17:29
276584	P_1782	0.200	U		mg/L	0.2				0.02	0.0186	0.0186	1	0.2	0.00186	04/13/06	17:29
276584	Pd3404	0.200	U		mg/L	0.2				0.02	0.0762	0.0762	1	0.2	0.00762	04/13/06	17:29
276584	S_1820	6.10			mg/L	0.2				0.02	6.0976	6.1	1	0.2	0.60976	04/13/06	17:29
276584	Sb2068	0.100	U		mg/L	0.1				0.01	0.0136	0.0136	1	0.1	0.00136	04/13/06	17:29
276584	Si2881	1.21			mg/L	0.2				0.02	1.2087	1.21	1	0.2	0.12087	04/13/06	17:29

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276584	Pb220	0.0500	U		mg/L	0.05				0.005	0.0163	0.0163	1	0.05	0.00163	04/13/06	17:29
276584	Se196	0.0500	U		mg/L	0.05				0.005	0.0289	0.0289	1	0.05	0.00289	04/13/06	17:29
276584	Sn1899	0.0500	U		mg/L	0.05				0.005	-0.0084	-0.0084	1	0.05	-0.00084	04/13/06	17:29
276584	Sr4215	0.0500	U		mg/L	0.05				0.005	0.0007	0.0007	1	0.05	0.00007	04/13/06	17:29
276584	Th2837	0.250	U		mg/L	0.25				0.025	0.0343	0.0343	1	0.25	0.00343	04/13/06	17:29
276584	Ti3349	0.0500	U		mg/L	0.05				0.005	0.0001	0.0001	1	0.05	0.00001	04/13/06	17:29
276584	Tl1908	0.150	U		mg/L	0.15				0.015	0.0001	0.0001	1	0.15	0.00001	04/13/06	17:29
276584	U_4090	2.00	U		mg/L	2				0.2	0.1112	0.111	1	2	0.01112	04/13/06	17:29
276584	V_2924	0.0500	U		mg/L	0.05				0.005	-0.0037	-0.0037	1	0.05	-0.00037	04/13/06	17:29
276584	W_2079	0.100	U		mg/L	0.1				0.01	0.0426	0.0426	1	0.1	0.00426	04/13/06	17:29
276584	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0005	0.0005	1	0.05	0.00005	04/13/06	17:29
276584	Zn2062	0.0500	U		mg/L	0.05				0.005	-0.0002	-0.0002	1	0.05	-0.00002	04/13/06	17:29
276584	Zr3496	0.0500	U		mg/L	0.05				0.005	0.0035	0.0035	1	0.05	0.00035	04/13/06	17:29
276585	Ag3280	0.0500	U		mg/L	0.05				0.005	0.0074	0.0074	1	0.05	0.00074	04/13/06	17:34
276585	Al3082	0.500	U		mg/L	0.5				0.05	0.0942	0.0942	1	0.5	0.00942	04/13/06	17:34
276585	As1890	0.0500	U		mg/L	0.05				0.005	-0.0103	-0.0103	1	0.05	-0.00103	04/13/06	17:34
276585	B_2496	0.426			mg/L	0.2				0.02	0.426	0.426	1	0.2	0.0426	04/13/06	17:34
276585	Ba4934	0.0500	U		mg/L	0.05				0.005	0.0028	0.0028	1	0.05	0.00028	04/13/06	17:34
276585	Be3130	0.0500	U		mg/L	0.05				0.005	0.001	0.001	1	0.05	0.0001	04/13/06	17:34
276585	Bi2230	0.150	U		mg/L	0.15				0.015	-0.0179	-0.0179	1	0.15	-0.00179	04/13/06	17:34
276585	Ca3179	0.929			mg/L	0.5				0.05	0.9287	0.929	1	0.5	0.09287	04/13/06	17:34
276585	Cd2265	0.0500	U		mg/L	0.05				0.005	0.0017	0.0017	1	0.05	0.00017	04/13/06	17:34
276585	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0205	0.0205	1	0.075	0.00205	04/13/06	17:34
276585	Cr2677	0.0500	U		mg/L	0.05				0.005	0.0159	0.0159	1	0.05	0.00159	04/13/06	17:34
276585	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0173	0.0173	1	0.05	0.00173	04/13/06	17:34
276585	Fe2714	1.00	U		mg/L	1				0.1	0.7045	0.705	1	1	0.07045	04/13/06	17:34
276585	La3988	0.0750	U		mg/L	0.075				0.0075	0.0075	0.0075	1	0.075	0.00075	04/13/06	17:34
276585	Li6707	0.0500	U		mg/L	0.05				0.005	0.0029	0.0029	1	0.05	0.00029	04/13/06	17:34
276585	Mg2790	0.581			mg/L	0.5				0.05	0.5812	0.581	1	0.5	0.05812	04/13/06	17:34
276585	Mn2576	0.0500	U		mg/L	0.05				0.005	0.0291	0.0291	1	0.05	0.00291	04/13/06	17:34
276585	Mo2020	0.0500	U		mg/L	0.05				0.005	-0.0083	-0.0083	1	0.05	-0.00083	04/13/06	17:34
276585	Ni2316	0.0500	U		mg/L	0.05				0.005	0.0059	0.0059	1	0.05	0.00059	04/13/06	17:34
276585	P_1782	0.200	U		mg/L	0.2				0.02	0.0746	0.0746	1	0.2	0.00746	04/13/06	17:34
276585	Pd3404	0.200	U		mg/L	0.2				0.02	0.1094	0.109	1	0.2	0.01094	04/13/06	17:34
276585	S_1820	5.95			mg/L	0.2				0.02	5.9497	5.95	1	0.2	0.59497	04/13/06	17:34
276585	Sb2068	0.100	U		mg/L	0.1				0.01	0.0435	0.0435	1	0.1	0.00435	04/13/06	17:34
276585	Si2881	1.18			mg/L	0.2				0.02	1.1795	1.18	1	0.2	0.11795	04/13/06	17:34
276585	Pb220	0.0500	U		mg/L	0.05				0.005	0.0197	0.0197	1	0.05	0.00197	04/13/06	17:34
276585	Se196	0.0500	U		mg/L	0.05				0.005	-0.0124	-0.0124	1	0.05	-0.00124	04/13/06	17:34
276585	Sn1899	0.0500	U		mg/L	0.05				0.005	0.0051	0.0051	1	0.05	0.00051	04/13/06	17:34

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276585	Sr4215	0.0500	U		mg/L	0.05				0.005	0.0008	0.0008	1	0.05	0.00008	04/13/06	17:34
276585	Th2837	0.250	U		mg/L	0.25				0.025	0.0573	0.0573	1	0.25	0.00573	04/13/06	17:34
276585	Ti3349	0.0500	U		mg/L	0.05				0.005	0.0039	0.0039	1	0.05	0.00039	04/13/06	17:34
276585	Tl1908	0.150	U		mg/L	0.15				0.015	0.0389	0.0389	1	0.15	0.00389	04/13/06	17:34
276585	U_4090	2.00	U		mg/L	2				0.2	0.3201	0.32	1	2	0.03201	04/13/06	17:34
276585	V_2924	0.0500	U		mg/L	0.05				0.005	0.0112	0.0112	1	0.05	0.00112	04/13/06	17:34
276585	W_2079	0.100	U		mg/L	0.1				0.01	0.0256	0.0256	1	0.1	0.00256	04/13/06	17:34
276585	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0022	0.0022	1	0.05	0.00022	04/13/06	17:34
276585	Zn2062	0.0500	U		mg/L	0.05				0.005	0.0029	0.0029	1	0.05	0.00029	04/13/06	17:34
276585	Zr3496	0.0500	U		mg/L	0.05				0.005	0.0119	0.0119	1	0.05	0.00119	04/13/06	17:34
276586	Ag3280	0.0500	U		mg/L	0.05				0.005	0.011	0.011	1	0.05	0.0011	04/13/06	17:50
276586	Al3082	0.500	U		mg/L	0.5				0.05	0.136	0.136	1	0.5	0.0136	04/13/06	17:50
276586	As1890	0.0500	U		mg/L	0.05				0.005	-0.0108	-0.0108	1	0.05	-0.00108	04/13/06	17:50
276586	B_2496	0.469			mg/L	0.2				0.02	0.4691	0.469	1	0.2	0.04691	04/13/06	17:50
276586	Ba4934	0.0500	U		mg/L	0.05				0.005	0.0031	0.0031	1	0.05	0.00031	04/13/06	17:50
276586	Be3130	0.0500	U		mg/L	0.05				0.005	0.0008	0.0008	1	0.05	0.00008	04/13/06	17:50
276586	Bi2230	0.150	U		mg/L	0.15				0.015	-0.0111	-0.0111	1	0.15	-0.00111	04/13/06	17:50
276586	Ca3179	0.808			mg/L	0.5				0.05	0.8078	0.808	1	0.5	0.08078	04/13/06	17:50
276586	Cd2265	0.0500	U		mg/L	0.05				0.005	0.0027	0.0027	1	0.05	0.00027	04/13/06	17:50
276586	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0217	0.0217	1	0.075	0.00217	04/13/06	17:50
276586	Cr2677	0.0500	U		mg/L	0.05				0.005	0.0158	0.0158	1	0.05	0.00158	04/13/06	17:50
276586	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0201	0.0201	1	0.05	0.00201	04/13/06	17:50
276586	Fe2714	1.00	U		mg/L	1				0.1	0.0971	0.0971	1	1	0.00971	04/13/06	17:50
276586	La3988	0.0750	U		mg/L	0.075				0.0075	0.0131	0.0131	1	0.075	0.00131	04/13/06	17:50
276586	Li6707	0.0500	U		mg/L	0.05				0.005	0.0024	0.0024	1	0.05	0.00024	04/13/06	17:50
276586	Mg2790	0.653			mg/L	0.5				0.05	0.6528	0.653	1	0.5	0.06528	04/13/06	17:50
276586	Mn2576	0.0500	U		mg/L	0.05				0.005	0.0051	0.0051	1	0.05	0.00051	04/13/06	17:50
276586	Mo2020	0.0500	U		mg/L	0.05				0.005	0.0005	0.0005	1	0.05	0.00005	04/13/06	17:50
276586	Ni2316	0.0500	U		mg/L	0.05				0.005	0.0269	0.0269	1	0.05	0.00269	04/13/06	17:50
276586	P_1782	0.200	U		mg/L	0.2				0.02	0.0438	0.0438	1	0.2	0.00438	04/13/06	17:50
276586	Pd3404	0.200	U		mg/L	0.2				0.02	0.0526	0.0526	1	0.2	0.00526	04/13/06	17:50
276586	S_1820	6.21			mg/L	0.2				0.02	6.2056	6.21	1	0.2	0.62056	04/13/06	17:50
276586	Sb2068	0.100	U		mg/L	0.1				0.01	0.0533	0.0533	1	0.1	0.00533	04/13/06	17:50
276586	Si2881	1.21			mg/L	0.2				0.02	1.2133	1.21	1	0.2	0.12133	04/13/06	17:50
276586	Pb220	0.0500	U		mg/L	0.05				0.005	0.0305	0.0305	1	0.05	0.00305	04/13/06	17:50
276586	Se196	0.0500	U		mg/L	0.05				0.005	-0.0144	-0.0144	1	0.05	-0.00144	04/13/06	17:50
276586	Sn1899	0.0500	U		mg/L	0.05				0.005	0.0127	0.0127	1	0.05	0.00127	04/13/06	17:50
276586	Sr4215	0.0500	U		mg/L	0.05				0.005	0.0008	0.0008	1	0.05	0.00008	04/13/06	17:50
276586	Th2837	0.250	U		mg/L	0.25				0.025	0.0751	0.0751	1	0.25	0.00751	04/13/06	17:50
276586	Ti3349	0.0500	U		mg/L	0.05				0.005	0.0038	0.0038	1	0.05	0.00038	04/13/06	17:50

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276586	Tl1908	0.150	U		mg/L	0.15				0.015	0.0072	0.0072	1	0.15	0.00072	04/13/06	17:50
276586	U_4090	2.00	U		mg/L	2				0.2	0.3222	0.322	1	2	0.03222	04/13/06	17:50
276586	V_2924	0.0500	U		mg/L	0.05				0.005	0.0131	0.0131	1	0.05	0.00131	04/13/06	17:50
276586	W_2079	0.100	U		mg/L	0.1				0.01	0.0232	0.0232	1	0.1	0.00232	04/13/06	17:50
276586	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0034	0.0034	1	0.05	0.00034	04/13/06	17:50
276586	Zn2062	0.0500	U		mg/L	0.05				0.005	-0.0011	-0.0011	1	0.05	-0.00011	04/13/06	17:50
276586	Zr3496	0.0500	U		mg/L	0.05				0.005	0.0164	0.0164	1	0.05	0.00164	04/13/06	17:50
276587	Ag3280	0.0500	U		mg/L	0.05				0.005	-0.0117	-0.0117	1	0.05	-0.00117	04/13/06	17:55
276587	Al3082	0.500	U		mg/L	0.5				0.05	0.1033	0.103	1	0.5	0.01033	04/13/06	17:55
276587	As1890	0.0500	U		mg/L	0.05				0.005	-0.0122	-0.0122	1	0.05	-0.00122	04/13/06	17:55
276587	B_2496	0.424			mg/L	0.2				0.02	0.4236	0.424	1	0.2	0.04236	04/13/06	17:55
276587	Ba4934	0.0500	U		mg/L	0.05				0.005	0.0016	0.0016	1	0.05	0.00016	04/13/06	17:55
276587	Be3130	0.0500	U		mg/L	0.05				0.005	0.0004	0.0004	1	0.05	0.00004	04/13/06	17:55
276587	Bi2230	0.150	U		mg/L	0.15				0.015	-0.0194	-0.0194	1	0.15	-0.00194	04/13/06	17:55
276587	Ca3179	0.689			mg/L	0.5				0.05	0.6891	0.689	1	0.5	0.06891	04/13/06	17:55
276587	Cd2265	0.0500	U		mg/L	0.05				0.005	-0.0053	-0.0053	1	0.05	-0.00053	04/13/06	17:55
276587	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0038	0.0038	1	0.075	0.00038	04/13/06	17:55
276587	Cr2677	0.0500	U		mg/L	0.05				0.005	0.012	0.012	1	0.05	0.0012	04/13/06	17:55
276587	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0106	0.0106	1	0.05	0.00106	04/13/06	17:55
276587	Fe2714	1.00	U		mg/L	1				0.1	0.0214	0.0214	1	1	0.00214	04/13/06	17:55
276587	La3988	0.0750	U		mg/L	0.075				0.0075	-0.0156	-0.0156	1	0.075	-0.00156	04/13/06	17:55
276587	Li6707	0.0500	U		mg/L	0.05				0.005	0.0009	0.0009	1	0.05	0.00009	04/13/06	17:55
276587	Mg2790	0.500	U		mg/L	0.5				0.05	0.4246	0.425	1	0.5	0.04246	04/13/06	17:55
276587	Mn2576	0.0500	U		mg/L	0.05				0.005	0.0143	0.0143	1	0.05	0.00143	04/13/06	17:55
276587	Mo2020	0.0500	U		mg/L	0.05				0.005	-0.0024	-0.0024	1	0.05	-0.00024	04/13/06	17:55
276587	Ni2316	0.0500	U		mg/L	0.05				0.005	0.0184	0.0184	1	0.05	0.00184	04/13/06	17:55
276587	P_1782	0.200	U		mg/L	0.2				0.02	0.0797	0.0797	1	0.2	0.00797	04/13/06	17:55
276587	Pd3404	0.200	U		mg/L	0.2				0.02	-0.0195	-0.0195	1	0.2	-0.00195	04/13/06	17:55
276587	S_1820	5.76			mg/L	0.2				0.02	5.7588	5.76	1	0.2	0.57588	04/13/06	17:55
276587	Sb2068	0.100	U		mg/L	0.1				0.01	-0.0175	-0.0175	1	0.1	-0.00175	04/13/06	17:55
276587	Si2881	1.12			mg/L	0.2				0.02	1.1198	1.12	1	0.2	0.11198	04/13/06	17:55
276587	Pb220	0.0500	U		mg/L	0.05				0.005	0.0029	0.0029	1	0.05	0.00029	04/13/06	17:55
276587	Se196	0.0500	U		mg/L	0.05				0.005	-0.0029	-0.0029	1	0.05	-0.00029	04/13/06	17:55
276587	Sn1899	0.0500	U		mg/L	0.05				0.005	-0.0277	-0.0277	1	0.05	-0.00277	04/13/06	17:55
276587	Sr4215	0.0500	U		mg/L	0.05				0.005	-0.0002	-0.0002	1	0.05	-0.00002	04/13/06	17:55
276587	Th2837	0.250	U		mg/L	0.25				0.025	0.0612	0.0612	1	0.25	0.00612	04/13/06	17:55
276587	Ti3349	0.0500	U		mg/L	0.05				0.005	0.0025	0.0025	1	0.05	0.00025	04/13/06	17:55
276587	Tl1908	0.150	U		mg/L	0.15				0.015	0.0231	0.0231	1	0.15	0.00231	04/13/06	17:55
276587	U_4090	2.00	U		mg/L	2				0.2	-0.63	-0.63	1	2	-0.063	04/13/06	17:55
276587	V_2924	0.0500	U		mg/L	0.05				0.005	0.0002	0.0002	1	0.05	0.00002	04/13/06	17:55

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276587	W_2079	0.100	U		mg/L	0.1				0.01	0.0051	0.0051	1	0.1	0.00051	04/13/06	17:55
276587	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0025	0.0025	1	0.05	0.00025	04/13/06	17:55
276587	Zn2062	0.0500	U		mg/L	0.05				0.005	-0.0029	-0.0029	1	0.05	-0.00029	04/13/06	17:55
276587	Zr3496	0.0500	U		mg/L	0.05				0.005	0.0016	0.0016	1	0.05	0.00016	04/13/06	17:55
276588	Ag3280	0.0500	U		mg/L	0.05				0.005	-0.0112	-0.0112	1	0.05	-0.00112	04/13/06	17:59
276588	Al3082	0.500	U		mg/L	0.5				0.05	-0.0098	-0.0098	1	0.5	-0.00098	04/13/06	17:59
276588	As1890	0.0500	U		mg/L	0.05				0.005	-0.01	-0.01	1	0.05	-0.001	04/13/06	17:59
276588	B_2496	0.450			mg/L	0.2				0.02	0.4504	0.45	1	0.2	0.04504	04/13/06	17:59
276588	Ba4934	0.0500	U		mg/L	0.05				0.005	0.0014	0.0014	1	0.05	0.00014	04/13/06	17:59
276588	Be3130	0.0500	U		mg/L	0.05				0.005	0.0003	0.0003	1	0.05	0.00003	04/13/06	17:59
276588	Bi2230	0.150	U		mg/L	0.15				0.015	-0.0515	-0.0515	1	0.15	-0.00515	04/13/06	17:59
276588	Ca3179	0.756			mg/L	0.5				0.05	0.7559	0.756	1	0.5	0.07559	04/13/06	17:59
276588	Cd2265	0.0500	U		mg/L	0.05				0.005	-0.0024	-0.0024	1	0.05	-0.00024	04/13/06	17:59
276588	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0005	0.0005	1	0.075	0.00005	04/13/06	17:59
276588	Cr2677	0.0500	U		mg/L	0.05				0.005	0.0112	0.0112	1	0.05	0.00112	04/13/06	17:59
276588	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0131	0.0131	1	0.05	0.00131	04/13/06	17:59
276588	Fe2714	1.00	U		mg/L	1				0.1	0.0845	0.0845	1	1	0.00845	04/13/06	17:59
276588	La3988	0.0750	U		mg/L	0.075				0.0075	-0.0204	-0.0204	1	0.075	-0.00204	04/13/06	17:59
276588	Li6707	0.0500	U		mg/L	0.05				0.005	0.001	0.001	1	0.05	0.0001	04/13/06	17:59
276588	Mg2790	0.500	U		mg/L	0.5				0.05	0.4568	0.457	1	0.5	0.04568	04/13/06	17:59
276588	Mn2576	0.0500	U		mg/L	0.05				0.005	0.0201	0.0201	1	0.05	0.00201	04/13/06	17:59
276588	Mo2020	0.0500	U		mg/L	0.05				0.005	0.0043	0.0043	1	0.05	0.00043	04/13/06	17:59
276588	Ni2316	0.0500	U		mg/L	0.05				0.005	0.0188	0.0188	1	0.05	0.00188	04/13/06	17:59
276588	P_1782	0.200	U		mg/L	0.2				0.02	0.0772	0.0772	1	0.2	0.00772	04/13/06	17:59
276588	Pd3404	0.200	U		mg/L	0.2				0.02	-0.0064	-0.0064	1	0.2	-0.00064	04/13/06	17:59
276588	S_1820	6.28			mg/L	0.2				0.02	6.278	6.28	1	0.2	0.6278	04/13/06	17:59
276588	Sb2068	0.100	U		mg/L	0.1				0.01	0.0345	0.0345	1	0.1	0.00345	04/13/06	17:59
276588	Si2881	1.18			mg/L	0.2				0.02	1.1798	1.18	1	0.2	0.11798	04/13/06	17:59
276588	Pb220	0.0500	U		mg/L	0.05				0.005	0.0241	0.0241	1	0.05	0.00241	04/13/06	17:59
276588	Se196	0.0500	U		mg/L	0.05				0.005	0.0024	0.0024	1	0.05	0.00024	04/13/06	17:59
276588	Sn1899	0.0500	U		mg/L	0.05				0.005	-0.0159	-0.0159	1	0.05	-0.00159	04/13/06	17:59
276588	Sr4215	0.0500	U		mg/L	0.05				0.005	-0.0003	-0.0003	1	0.05	-0.00003	04/13/06	17:59
276588	Th2837	0.250	U		mg/L	0.25				0.025	0.0732	0.0732	1	0.25	0.00732	04/13/06	17:59
276588	Ti3349	0.0500	U		mg/L	0.05				0.005	0.0002	0.0002	1	0.05	0.00002	04/13/06	17:59
276588	Tl1908	0.150	U		mg/L	0.15				0.015	0.0015	0.0015	1	0.15	0.00015	04/13/06	17:59
276588	U_4090	2.00	U		mg/L	2				0.2	-0.6061	-0.606	1	2	-0.06061	04/13/06	17:59
276588	V_2924	0.0500	U		mg/L	0.05				0.005	-0.0028	-0.0028	1	0.05	-0.00028	04/13/06	17:59
276588	W_2079	0.100	U		mg/L	0.1				0.01	0.0007	0.0007	1	0.1	0.00007	04/13/06	17:59
276588	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0004	0.0004	1	0.05	0.00004	04/13/06	17:59
276588	Zn2062	0.0500	U		mg/L	0.05				0.005	-0.0041	-0.0041	1	0.05	-0.00041	04/13/06	17:59

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
276588	Zr3496	0.0500	U		mg/L	0.05				0.005	-0.0051	-0.0051	1	0.05	-0.00051	04/13/06	17:59
276589	Ag3280	0.0500	U		mg/L	0.05				0.005	-0.0093	-0.0093	1	0.05	-0.00093	04/13/06	18:04
276589	Al3082	0.500	U		mg/L	0.5				0.05	-0.0287	-0.0287	1	0.5	-0.00287	04/13/06	18:04
276589	As1890	0.0500	U		mg/L	0.05				0.005	-0.0258	-0.0258	1	0.05	-0.00258	04/13/06	18:04
276589	B_2496	0.436			mg/L	0.2				0.02	0.4361	0.436	1	0.2	0.04361	04/13/06	18:04
276589	Ba4934	0.0500	U		mg/L	0.05				0.005	0.0013	0.0013	1	0.05	0.00013	04/13/06	18:04
276589	Be3130	0.0500	U		mg/L	0.05				0.005	0.0005	0.0005	1	0.05	0.00005	04/13/06	18:04
276589	Bi2230	0.150	U		mg/L	0.15				0.015	-0.0366	-0.0366	1	0.15	-0.00366	04/13/06	18:04
276589	Ca3179	0.750			mg/L	0.5				0.05	0.7503	0.75	1	0.5	0.07503	04/13/06	18:04
276589	Cd2265	0.0500	U		mg/L	0.05				0.005	-0.0032	-0.0032	1	0.05	-0.00032	04/13/06	18:04
276589	Co2286	0.0750	U		mg/L	0.075				0.0075	0.0132	0.0132	1	0.075	0.00132	04/13/06	18:04
276589	Cr2677	0.0500	U		mg/L	0.05				0.005	0.0056	0.0056	1	0.05	0.00056	04/13/06	18:04
276589	Cu3247	0.0500	U		mg/L	0.05				0.005	0.0125	0.0125	1	0.05	0.00125	04/13/06	18:04
276589	Fe2714	1.00	U		mg/L	1				0.1	0.3286	0.329	1	1	0.03286	04/13/06	18:04
276589	La3988	0.0750	U		mg/L	0.075				0.0075	-0.017	-0.017	1	0.075	-0.0017	04/13/06	18:04
276589	Li6707	0.0500	U		mg/L	0.05				0.005	0.0011	0.0011	1	0.05	0.00011	04/13/06	18:04
276589	Mg2790	0.500	U		mg/L	0.5				0.05	0.4745	0.475	1	0.5	0.04745	04/13/06	18:04
276589	Mn2576	0.0500	U		mg/L	0.05				0.005	0.0477	0.0477	1	0.05	0.00477	04/13/06	18:04
276589	Mo2020	0.0500	U		mg/L	0.05				0.005	0	0	1	0.05	0	04/13/06	18:04
276589	Ni2316	0.0500	U		mg/L	0.05				0.005	0.017	0.017	1	0.05	0.0017	04/13/06	18:04
276589	P_1782	0.200	U		mg/L	0.2				0.02	0.0553	0.0553	1	0.2	0.00553	04/13/06	18:04
276589	Pd3404	0.200	U		mg/L	0.2				0.02	-0.013	-0.013	1	0.2	-0.0013	04/13/06	18:04
276589	S_1820	6.17			mg/L	0.2				0.02	6.1717	6.17	1	0.2	0.61717	04/13/06	18:04
276589	Sb2068	0.100	U		mg/L	0.1				0.01	-0.0252	-0.0252	1	0.1	-0.00252	04/13/06	18:04
276589	Si2881	1.12			mg/L	0.2				0.02	1.124	1.12	1	0.2	0.1124	04/13/06	18:04
276589	Pb220	0.0500	U		mg/L	0.05				0.005	0.0077	0.0077	1	0.05	0.00077	04/13/06	18:04
276589	Se196	0.0500	U		mg/L	0.05				0.005	0.0187	0.0187	1	0.05	0.00187	04/13/06	18:04
276589	Sn1899	0.0500	U		mg/L	0.05				0.005	-0.0106	-0.0106	1	0.05	-0.00106	04/13/06	18:04
276589	Sr4215	0.0500	U		mg/L	0.05				0.005	0	0	1	0.05	0	04/13/06	18:04
276589	Th2837	0.250	U		mg/L	0.25				0.025	0.0866	0.0866	1	0.25	0.00866	04/13/06	18:04
276589	Ti3349	0.0500	U		mg/L	0.05				0.005	0.001	0.001	1	0.05	0.0001	04/13/06	18:04
276589	Tl1908	0.150	U		mg/L	0.15				0.015	0.016	0.016	1	0.15	0.0016	04/13/06	18:04
276589	U_4090	2.00	U		mg/L	2				0.2	-0.5944	-0.594	1	2	-0.05944	04/13/06	18:04
276589	V_2924	0.0500	U		mg/L	0.05				0.005	0.0026	0.0026	1	0.05	0.00026	04/13/06	18:04
276589	W_2079	0.100	U		mg/L	0.1				0.01	0.0118	0.0118	1	0.1	0.00118	04/13/06	18:04
276589	Y_3710	0.0500	U		mg/L	0.05				0.005	0.0009	0.0009	1	0.05	0.00009	04/13/06	18:04
276589	Zn2062	0.0500	U		mg/L	0.05				0.005	-0.0027	-0.0027	1	0.05	-0.00027	04/13/06	18:04
276589	Zr3496	0.0500	U		mg/L	0.05				0.005	0.0005	0.0005	1	0.05	0.00005	04/13/06	18:04

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DIV. 20
TO#060330-39
Project No 06002.01.222
Prep. Page 64-049

4-20-06

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
pbw-D13H2	K_766	4.00	U		mg/L	4				0.4	-1.485491842	-1.49	1	4	-0.148549184	04/14/06	11:21 AM
pbw-D13H2	Na589	2.50	U		mg/L	2.5				0.3	1.347291984	1.35	1	2.5	0.134729198	04/14/06	11:21 AM
lcsw-D13H2	K_766	20.6			mg/L	0.4		103.0%	20	0.4	20.57335777	20.6	1	0.4	20.57335777	04/14/06	11:24 AM
lcsw-D13H2	Na589	20.4			mg/L	0.25		102.0%	20	0.3	20.44129421	20.4	1	0.25	20.44129421	04/14/06	11:24 AM
276580	K_766	33.2			mg/L	4				0.4	33.21719156	33.2	1	4	3.321719156	04/14/06	11:27 AM
276580	Na589	152			mg/L	2.5				0.3	152.340371	152	1	2.5	15.2340371	04/14/06	11:27 AM
276580d	K_766	34.8			mg/L	4	4.7%			0.4	34.79698695	34.8	1	4	3.479698695	04/14/06	11:30 AM
276580d	Na589	149			mg/L	2.5	2.0%			0.3	149.0437261	149	1	2.5	14.90437261	04/14/06	11:30 AM
276580s	K_766	239			mg/L	4		102.9%	200	0.4	239.020258	239	1	4	23.9020258	04/14/06	11:33 AM
276580s	Na589	350			mg/L	2.5		99.0%	200	0.3	349.9621232	350	1	2.5	34.99621232	04/14/06	11:33 AM
276581	K_766	18.3			mg/L	4				0.4	18.3385784	18.3	1	4	1.83385784	04/14/06	11:37 AM
276581	Na589	21.5			mg/L	2.5				0.3	21.54159468	21.5	1	2.5	2.154159468	04/14/06	11:37 AM
276582	K_766	17.8			mg/L	4				0.4	17.80052714	17.8	1	4	1.780052714	04/14/06	11:40 AM
276582	Na589	76.5			mg/L	2.5				0.3	76.48338685	76.5	1	2.5	7.648338685	04/14/06	11:40 AM
276583	K_766	17.1			mg/L	4				0.4	17.13989739	17.1	1	4	1.713989739	04/14/06	11:43 AM
276583	Na589	74.2			mg/L	2.5				0.3	74.15915652	74.2	1	2.5	7.415915652	04/14/06	11:43 AM
276584	K_766	16.6			mg/L	4				0.4	16.61610248	16.6	1	4	1.661610248	04/14/06	11:46 AM
276584	Na589	74.5			mg/L	2.5				0.3	74.54158185	74.5	1	2.5	7.454158185	04/14/06	11:46 AM
276585	K_766	15.0			mg/L	4				0.4	15.04639172	15	1	4	1.504639172	04/14/06	11:49 AM
276585	Na589	73.2			mg/L	2.5				0.3	73.22062631	73.2	1	2.5	7.322062631	04/14/06	11:49 AM
276586	K_766	16.9			mg/L	4				0.4	16.93415661	16.9	1	4	1.693415661	04/14/06	12:00 PM
276586	Na589	80.3			mg/L	2.5				0.3	80.34414586	80.3	1	2.5	8.034414586	04/14/06	12:00 PM
276587	K_766	16.2			mg/L	4				0.4	16.21049157	16.2	1	4	1.621049157	04/14/06	12:03 PM
276587	Na589	73.3			mg/L	2.5				0.3	73.32542426	73.3	1	2.5	7.332542426	04/14/06	12:03 PM
276588	K_766	17.9			mg/L	4				0.4	17.94259772	17.9	1	4	1.794259772	04/14/06	12:06 PM
276588	Na589	79.1			mg/L	2.5				0.3	79.08876572	79.1	1	2.5	7.908876572	04/14/06	12:06 PM
276589	K_766	17.2			mg/L	4				0.4	17.17414823	17.2	1	4	1.717414823	04/14/06	12:09 PM
276589	Na589	77.7	✓		mg/L	2.5				0.3	77.74664849	77.7	1	2.5	7.774664849	04/14/06	12:09 PM

276589 for Na

$$\frac{7.7747\ \text{ug/ml} \times 10\text{ml}}{1\text{ml}} = 77.7\ \text{mg/L}$$

4/20/06

010054

DIV20_060330_39Spectro

☐ 200.7 TAP No. 01-0406-028 Rev3/Jan06

☑ 6010B TAP No. 01-0406-130 Rev5/Jan06

☐ Other_____

QC STD. ID's	
CCV	06B03
CRI	
ICSA	
ICSAB	06D03

ICP CAL.STD. ID's	
Std0	06D03
Std1	
Std2	
Std3	
Std4	
Std5	
Std6	06D03

010055

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.222	Div. 20	060330-39	4-13-06	Water	64-049

INSTRUMENT: Trace 2 FILENAME: B6033039

4-13-06

File converted to wsl? ☐

Method: DAILY2 Standard: blk
Run Time: 04/13/06 15:48:10

010056

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avge	-.0000	.0006	-.0000	.0000	-.0000	.0005	.0000
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	126.8	1.671	20.47	17.24	28.02	1.218	141.4
#1	-.0000	.0006	-.0000	.0000	-.0000	.0005	.0000
#2	-.0001	.0006	-.0001	.0000	-.0000	.0005	.0000

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avge	.0000	.0000	-.0000	-.0000	.0004	.0000	.0002
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0001
%RSD	51.87	188.8	214.8	51.39	9.580	207.0	26.53
#1	.0000	.0000	.0000	-.0000	.0003	.0000	.0003
#2	.0000	-.0000	-.0000	-.0000	.0004	-.0000	.0002

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Avge	-.0000	-.0000	-.0000	.0000	-.0000	-.0002	-.0133
SDev	.0001	.0000	.0000	.0000	.0000	.0000	.0003
%RSD	470.7	62.71	577.1	1251.	173.0	11.46	2.036
#1	.0000	-.0000	.0000	-.0000	-.0000	-.0002	-.0131
#2	-.0001	-.0000	-.0000	.0000	.0000	-.0003	-.0135

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avge	-.0000	.0000	.0001	-.0001	.0000	.0006	-.0011
SDev	.0000	.0000	.0001	.0001	.0001	.0000	.0001
%RSD	30.04	8.130	87.46	240.7	231.6	4.944	4.482
#1	-.0001	.0000	.0000	.0000	.0001	.0006	-.0012
#2	-.0000	.0000	.0002	-.0002	-.0000	.0006	-.0011

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avge	86.46	-.0001	.0000	.0018	.0000	-.0000	-.0000
SDev	.23	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	.2688	10.80	100.9	.7687	177.8	141.4	258.5
#1	86.62	-.0001	.0000	.0018	.0001	.0000	-.0000
#2	86.29	-.0001	.0000	.0018	-.0000	-.0000	.0000

Elem	Ti3349	Tl1908	U_4090	V_2924	W_2079	Y_3710	Zn2062
Avge	-.0002	-.0002	-.0005	-.0000	.0001	-.0000	.0000
SDev	.0000	.0000	.0003	.0000	.0001	.0000	.0000
%RSD	22.51	10.98	60.68	34.68	106.7	283.7	141.4
#1	-.0002	-.0003	-.0003	-.0001	.0000	-.0000	.0000
#2	-.0001	-.0002	-.0007	-.0000	.0002	.0000	.0000

Elem	Zr3496
Avge	-.0000
SDev	.0001
%RSD	412.4
#1	-.0001
#2	.0001

9-13-06

4/20/06

010057

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	864510	10000	--	--	--	--	--
SDev	2370.222	.0000000	--	--	--	--	--
%RSD	.2741694	.0000000	--	--	--	--	--
#1	866186	10000	--	--	--	--	--
#2	862834	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std4
Run Time: 04/13/06 15:52:55

010058

Elem	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1	1960/2
Avge	.0847	.1132	.2863	.2519	.1593	.2204	.2343
SDev	.0001	.0000	.0013	.0016	.0002	.0007	.0017
%RSD	.1314	.0328	.4388	.6507	.1029	.3215	.7159
#1	.0847	.1133	.2872	.2507	.1592	.2210	.2331
#2	.0848	.1132	.2854	.2530	.1594	.2199	.2355

Elem	Tl1908
Avge	.1914
SDev	.0002
%RSD	.1063
#1	.1916
#2	.1913

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	847012	10000	--	--	--	--	--
SDev	246.7803	.0000000	--	--	--	--	--
%RSD	.0291354	.0000000	--	--	--	--	--
#1	846838	10000	--	--	--	--	--
#2	847187	10000	--	--	--	--	--

010059

Method: DAILY2 Standard: clp_std1
Run Time: 04/13/06 15:57:19

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.1038	.2267	.0886	.1823	2.832	.0944	.0079
SDev	.0003	.0008	.0001	.0008	.009	.0002	.0000
%RSD	.2441	.3542	.0765	.4403	.3065	.1927	.4844
#1	.1040	.2261	.0885	.1829	2.838	.0943	.0079
#2	.1036	.2272	.0886	.1817	2.826	.0946	.0079

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	840988	10000	--	--	--	--	--
SDev	6607.206	.0000000	--	--	--	--	--
%RSD	.7856481	.0000000	--	--	--	--	--
#1	845660	10000	--	--	--	--	--
#2	836316	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std5
Run Time: 04/13/06 16:01:02

010060

Elem	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899	Sr4215
Avge	.1804	.0296	.2922	.0294	.1705	.1435	2.470
SDev	.0006	.0001	.0010	.0001	.0006	.0004	.000
%RSD	.3327	.2416	.3584	.1872	.3681	.2857	.0090
#1	.1809	.0297	.2915	.0295	.1710	.1432	2.470
#2	.1800	.0296	.2929	.0294	.1701	.1438	2.470

Elem	Ti3349
Avge	2.886
SDev	.005
%RSD	.1818
#1	2.890
#2	2.883

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	853858	10000	--	--	--	--	--
SDev	3425.225	.0000000	--	--	--	--	--
%RSD	.4011470	.0000000	--	--	--	--	--
#1	856280	10000	--	--	--	--	--
#2	851436	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std2
Run Time: 04/13/06 16:04:42

010061

Elem	Ba4934	Be3130	Cr2677	Cu3247	Ni2316
Avge	.9230	1.512	.4173	.3285	.3074
SDev	.0018	.002	.0012	.0027	.0004
%RSD	.1980	.1593	.2878	.8382	.1190
#1	.9243	1.510	.4165	.3305	.3077
#2	.9217	1.513	.4182	.3266	.3072

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	862276	10000	--	--	--	--	--
SDev	7182.083	.0000000	--	--	--	--	--
%RSD	.8329212	.0000000	--	--	--	--	--
#1	867355	10000	--	--	--	--	--
#2	857198	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std3
Run Time: 04/13/06 16:08:23

010062

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	.9307	.1968	.9564	.2021	.2643
SDev	.0011	.0003	.0004	.0001	.0004
%RSD	.1148	.1289	.0451	.0459	.1446
#1	.9315	.1970	.9561	.2020	.2645
#2	.9300	.1966	.9567	.2021	.2640

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	865612	10000	--	--	--	--	--
SDev	5359.162	.0000000	--	--	--	--	--
%RSD	.6191179	.0000000	--	--	--	--	--
#1	861823	10000	--	--	--	--	--
#2	869402	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std6
Run Time: 04/13/06 16:12:03

010063

Elem	La3988	Na5889	Pd3404	S_1820	Th2837	U_4090	W_2079
Avge	.4590	.0321	.2067	.0337	.0991	.0638	.1718
SDev	.0007	.0003	.0006	.0000	.0001	.0004	.0000
%RSD	.1492	.9599	.2654	.0640	.1091	.6892	.0150
#1	.4585	.0319	.2063	.0337	.0991	.0635	.1718
#2	.4595	.0323	.2070	.0337	.0992	.0641	.1719

Elem	Y_3710	Zr3496
Avge	.7275	2.014
SDev	.0000	.006
%RSD	.0047	.2880
#1	.7274	2.010
#2	.7275	2.018

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	848676	10000	--	--	--	--	--
SDev	5963.031	.0000000	--	--	--	--	--
%RSD	.7026271	.0000000	--	--	--	--	--
#1	844460	10000	--	--	--	--	--
#2	852893	10000	--	--	--	--	--

Standardization Report 04/13/06 04:15:56 PM page 1

Method: DAILY2 Slope = Conc(SIR)/IR

010064

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	23.5904	.000793	04/13/06 04:12:03
Al3082	308.215	clp_std1	blk	484.549	-.285283	04/13/06 04:12:03
As1890	189.042	clp_std4	blk	88.2807	.003933	04/13/06 04:12:03
B_2496	249.678	clp_std5	blk	55.4307	-.001603	04/13/06 04:12:03
Ba4934	493.409	clp_std2	blk	10.8343	.000282	04/13/06 04:12:03
Be3130	313.042	clp_std2	blk	3.30883	-.001632	04/13/06 04:12:03
Bi2230	223.061	clp_std5	blk	167.317	-.000193	04/13/06 04:12:03
Ca3179	317.933	clp_std1	blk	220.632	-.002423	04/13/06 04:12:03
Cd2265	226.502	clp_std3	blk	10.7415	-.000037	04/13/06 04:12:03
Co2286	228.616	clp_std3	blk	50.8154	.000678	04/13/06 04:12:03
Cr2677	267.716	clp_std2	blk	23.9592	.000872	04/13/06 04:12:03
Cu3247	324.753	clp_std2	blk	30.4704	-.010981	04/13/06 04:12:03
Fe2714	271.441	clp_std1	blk	564.965	-.008472	04/13/06 04:12:03
K_7664	766.491	clp_std1	blk	274.616	-.060333	04/13/06 04:12:03
La3988	398.853	clp_std6	blk	21.8030	.000292	04/13/06 04:12:03
Li6707	670.784	clp_std1	blk	3.53062	.000088	04/13/06 04:12:03
Mg2790	279.078	clp_std1	blk	264.630	.001388	04/13/06 04:12:03
Mn2576	257.610	clp_std3	blk	10.4554	-.000006	04/13/06 04:12:03
Mo2020	202.030	clp_std5	blk	34.2280	.000178	04/13/06 04:12:03
Na3302	330.232	clp_std1	blk	6146.41	1.48261	04/13/06 04:12:03
Na5889	588.991	clp_std6	blk	22.1682	.295448	04/13/06 04:12:03
Ni2316	231.604	clp_std2	blk	32.5208	.001579	04/13/06 04:12:03
P_1782	178.287	clp_std5	blk	340.174	-.007084	04/13/06 04:12:03
2203/1	220.351	clp_std4	blk	34.9386	-.004228	04/13/06 04:12:03
2203/2	220.352	clp_std4	blk	39.6940	.002349	04/13/06 04:12:03
Pd3404	340.458	clp_std6	blk	49.6516	-.001174	04/13/06 04:12:03
S_1820	182.040	clp_std6	blk	301.803	-.184489	04/13/06 04:12:03
Sb2068	206.838	clp_std4	blk	62.3349	.069685	04/13/06 04:12:03
Sc3613	361.384	blk	dark	1.15664	.000000	04/13/06 04:12:03
1960/1	196.021	clp_std4	blk	45.3435	.004931	04/13/06 04:12:03
1960/2	196.022	clp_std4	blk	42.6833	-.000690	04/13/06 04:12:03
Si2881	288.158	clp_std5	blk	59.0339	-.106491	04/13/06 04:12:03
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	69.7628	-.001570	04/13/06 04:12:03
Sr4215	421.552	clp_std5	blk	4.04809	.000019	04/13/06 04:12:03
Th2837	283.730	clp_std6	blk	105.402	.001033	04/13/06 04:12:03
Ti3349	334.941	clp_std5	blk	3.46453	.000597	04/13/06 04:12:03
Tl1908	190.864	clp_std4	blk	52.1742	.012129	04/13/06 04:12:03
U_4090	409.014	clp_std6	blk	154.736	.072281	04/13/06 04:12:03
V_2924	292.402	clp_std3	blk	49.4797	.002431	04/13/06 04:12:03
W_2079	207.914	clp_std6	blk	29.1071	-.003288	04/13/06 04:12:03
Y_3710	371.030	clp_std6	blk	13.7433	.000048	04/13/06 04:12:03
Zn2062	206.200	clp_std3	blk	37.8601	-.000088	04/13/06 04:12:03
Zr3496	349.621	clp_std6	blk	5.42336	.000190	04/13/06 04:12:03

Analysis Report QC Standard 04/13/06 04:20:43 PM

Method: DAILY2 Sample Name: icv/ccv Operator: 010065
Run Time: 04/13/06 16:16:09
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9952	9.946	5.078	4.981	10.15	.9850	5.049
SDev	.0032	.021	.016	.014	.02	.0012	.002
%RSD	.3185	.2134	.3197	.2864	.2215	.1262	.0466
#1	.9974	9.961	5.089	4.991	10.16	.9841	5.051
#2	.9930	9.931	5.066	4.971	10.13	.9859	5.048
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	20.13	1.001	5.114	1.991	2.054	10.14	18.41
SDev	.10	.004	.005	.007	.010	.02	.08
%RSD	.5108	.3944	.0952	.3542	.5101	.2184	.4109
#1	20.05	.9983	5.111	1.986	2.061	10.13	18.47
#2	20.20	1.004	5.118	1.996	2.046	10.16	18.36
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	4.995	4.728	20.00	1.021	5.003	28.12	Q43.43
SDev	.009	.001	.03	.002	.016	.15	.10
%RSD	.1794	.0113	.1613	.2379	.3266	.5489	.2356
#1	5.002	4.728	19.98	1.020	4.992	28.01	Q43.50
#2	4.989	4.727	20.03	1.023	5.015	28.23	Q43.36
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	5.000	5.055	5.019	4.917	1.032	1.009	1.012
SDev	.014	.000	.039	.007	.003	.012	.005
%RSD	.2720	.0025	.7807	.1409	.2676	1.226	.4543
#1	4.991	5.055	5.046	4.922	1.030	1.017	1.009
#2	5.010	5.055	4.991	4.912	1.034	.9999	1.015
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

010066

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.73	5.214	5.102	5.058	4.951	5.140	4.984
SDev	.59	.051	.013	.009	.018	.026	.026
%RSD	.6087	.9727	.2623	.1707	.3570	.5026	.5238
#1	98.16	5.250	5.112	5.064	4.963	5.158	4.966
#2	97.31	5.178	5.093	5.052	4.938	5.121	5.003
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	5.059	.9877	4.829	5.247	1.034	4.969	1.045
SDev	.010	.0093	.002	.012	.027	.004	.001
%RSD	.1932	.9405	.0392	.2230	2.652	.0762	.0578
#1	5.066	.9811	4.830	5.255	1.053	4.967	1.046
#2	5.052	.9942	4.828	5.238	1.014	4.972	1.045
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	5.066	1.023	4.824
SDev	.004	.006	.005
%RSD	.0736	.6108	.0944
#1	5.069	1.019	4.821
#2	5.064	1.028	4.827
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

010067

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	844864	10000	--	--	--	--	--
SDev	5148.444	.0000000	--	--	--	--	--
%RSD	.6093811	.0000000	--	--	--	--	--
#1	848505	10000	--	--	--	--	--
#2	841224	10000	--	--	--	--	--

Analysis Report Blank Sample 04/13/06 04:27:11 PM page 1

Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 04/13/06 16:22:37 010068
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	.0021	.0026	.0053	.0001	.0000	-.0047
SDev	.0005	.0022	.0006	.0014	.0001	.0000	.0001
%RSD	929.3	106.9	22.20	25.48	59.78	46.95	2.176
#1	-.0003	.0005	.0022	.0062	.0000	.0000	-.0046
#2	.0004	.0036	.0030	.0043	.0001	.0001	-.0048
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	.0026	.0000	-.0004	-.0004	.0002	.0281	.0459
SDev	.0038	.0002	.0002	.0001	.0002	.0394	.0441
%RSD	145.7	1226.	60.17	13.25	88.28	140.1	96.06
#1	-.0001	.0002	-.0005	-.0004	.0001	.0003	.0147
#2	.0052	-.0001	-.0002	-.0005	.0003	H.0560	.0771
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0500	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0500	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0003	.0007	-.0000	.0008	H.4136	.0157
SDev	.0001	.0001	.0052	.0001	.0009	.4119	.0212
%RSD	57.88	59.49	733.3	152.2	116.9	99.60	135.0
#1	.0001	.0001	-.0029	-.0001	.0014	H.1223	.0007
#2	.0004	.0004	.0044	.0000	.0001	H.7049	.0307
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High	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	.0010	.0088	-.0003	.0058	H.0067	-.0086	.0025
SDev	.0002	.0107	.0033	.0003	.0112	.0019	.0011
%RSD	17.80	122.4	1242.	4.438	168.9	21.56	42.48
#1	.0012	.0012	-.0026	.0060	-.0013	-.0073	.0018
#2	.0009	H.0164	.0021	.0056	H.0146	-.0099	.0033
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC High	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

010069

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.2	-.0005	.0023	.0014	.0038	.0014	.0001
SDev	.5	.0010	.0009	.0030	.0009	.0009	.0009
%RSD	.4874	184.1	38.89	211.3	24.39	66.71	1140.
#1	99.89	-.0012	.0017	-.0007	.0031	.0007	.0007
#2	100.6	.0002	.0030	.0036	.0044	.0020	-.0005
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0050	.0050	.0050
Low				-.0100	-.0050	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0008	-.0000	.0085	.0213	-.0001	-.0002
SDev	.0000	.0011	.0000	.0013	.0077	.0006	.0002
%RSD	56.82	135.1	915.0	14.71	36.19	836.8	90.47
#1	.0000	.0000	.0000	.0094	.0158	-.0005	-.0003
#2	.0000	.0016	-.0000	.0076	.0267	.0003	-.0001
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	-.0002	.0001
SDev	.0001	.0002	.0003
%RSD	115.9	84.35	198.3
#1	.0000	-.0004	-.0001
#2	.0002	-.0001	.0003
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010070

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	866501	10000	--	--	--	--	--
SDev	4217.185	.0000000	--	--	--	--	--
%RSD	.4866913	.0000000	--	--	--	--	--
#1	863519	10000	--	--	--	--	--
#2	869483	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: cri Operator: 010071
Run Time: 04/13/06 16:27:23
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0195	.0909	.0190	.0953	.0187	.0100	.0070
SDev	.0002	.0024	.0008	.0024	.0003	.0001	.0007
%RSD	1.206	2.585	4.389	2.548	1.729	1.263	10.14
#1	.0193	.0892	.0184	.0970	.0189	.0099	.0065
#2	.0196	.0926	.0196	.0936	.0185	.0101	.0075
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	.0200	.1000	.0200	.1000	.0200	.0100	
Range	50.00	50.00	50.00	50.00	50.00	50.00	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0029	.0099	.1012	.0222	.0510	.1220	.0415
SDev	.0065	.0003	.0001	.0018	.0019	.0793	.0973
%RSD	222.8	2.656	.1289	7.887	3.833	64.99	234.1
#1	-.0017	.0100	.1011	.0234	.0523	.0659	-.0272
#2	.0075	.0097	.1013	.0209	.0496	Q.1781	.1103
Errors	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value		.0100	.1000	.0200	.0500	.1000	
Range		50.00	50.00	50.00	50.00	50.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0611	-.0061	.0307	.0184	.5654	.0039
SDev	.0013	.0003	.0000	.0001	.0002	1.112	.0261
%RSD	201.6	.5562	.6483	.4162	.9017	196.6	666.6
#1	-.0016	.0609	-.0060	.0308	.0185	-.2207	-.0145
#2	.0003	.0614	-.0061	.0306	.0183	1.352	.0224
Errors	NOCHECK	QC Pass	NOCHECK	QC Pass	QC Pass	NOCHECK	NOCHECK
Value		.1000		.0300	.0200		
Range		50.00		50.00	50.00		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0830	.1032	-.0039	.0130	.0072	.0066	.1258
SDev	.0005	.0111	.0053	.0074	.0209	.0015	.0041
%RSD	.5853	10.77	138.5	57.41	291.7	22.22	3.225
#1	.0833	.0953	-.0076	.0182	-.0076	.0055	.1287
#2	.0827	.1110	-.0001	.0077	.0219	.0076	.1229
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass
Value	.0800	.1000					.1200
Range	50.00	50.00					50.00

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

010072

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.51	.0087	.0171	.0955	.0074	.0143	.0891
SDev	.50	.0040	.0024	.0037	.0032	.0003	.0022
%RSD	.5079	45.76	14.22	3.823	43.14	2.083	2.489
#1	97.86	.0059	.0188	.0929	Q.0096	.0145	.0875
#2	97.16	.0115	.0154	.0981	.0051	.0141	.0907
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				.1000	.0060	.0100	.1000
Range				50.00	50.00	50.00	50.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0184	.0088	.0178	.0210	.1404	.1006	-.0009
SDev	.0000	.0062	.0006	.0050	.0211	.0019	.0003
%RSD	.0129	71.01	3.396	23.75	15.01	1.880	27.88
#1	.0184	.0132	.0183	.0175	.1255	.1019	-.0011
#2	.0184	.0044	.0174	.0245	.1552	.0992	-.0007
Errors	QC Pass	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	.0200		.0200	.0200	.2000	.1000	
Range	50.00		50.00	50.00	50.00	50.00	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0003	.0404	.0950
SDev	.0004	.0005	.0013
%RSD	102.1	1.220	1.370
#1	.0006	.0400	.0959
#2	.0001	.0407	.0941
Errors	NOCHECK	QC Pass	QC Pass
Value		.0400	.1000
Range		50.00	50.00

010073

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	843023	10000	--	--	--	--	--
SDev	4327.494	.0000000	--	--	--	--	--
%RSD	.5133304	.0000000	--	--	--	--	--
#1	846083	10000	--	--	--	--	--
#2	839963	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: icsa Operator:
Run Time: 04/13/06 16:32:10
Comment:
Mode: CONC Corr. Factor: 1

010074

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	508.5	-.0004	-.0154	.0025	.0002	.0036
SDev	.0003	.5	.0007	.0002	.0001	.0000	.0030
%RSD	110.0	.1074	167.3	1.334	2.828	23.01	83.06
#1	-.0001	508.9	-.0009	-.0152	.0025	.0002	.0057
#2	-.0004	508.1	.0001	-.0155	.0026	.0002	.0015
Errors	NOCHECK	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value		500.0					
Range		20.00					

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	467.1	.0053	.0011	-.0005	.0030	189.5	.0250
SDev	.1	.0002	.0003	.0011	.0001	.3	.0191
%RSD	.0278	4.166	31.57	201.2	2.631	.1790	76.63
#1	467.0	.0052	.0013	-.0013	.0031	189.7	.0385
#2	467.2	.0055	.0008	.0002	.0030	189.2	.0114
Errors	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass	NOCHECK
Value	500.0					200.0	
Range	20.00					20.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0053	.0004	534.2	.0067	-.0025	.7628	-.0006
SDev	.0008	.0001	.3	.0001	.0005	.1599	.0051
%RSD	15.70	20.73	.0520	1.575	19.75	20.96	886.4
#1	.0047	.0004	534.4	.0068	-.0022	.8759	.0030
#2	.0058	.0003	534.0	.0066	-.0029	.6498	-.0041
Errors	NOCHECK	NOCHECK	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value			500.0				
Range			20.00				

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0032	-.0069	.0434	-.0216	.0028	.0111	.0047
SDev	.0001	.0212	.0007	.0042	.0048	.0015	.0066
%RSD	2.126	306.2	1.531	19.28	171.8	13.81	141.4
#1	.0032	.0081	.0429	-.0245	.0062	.0100	.0094
#2	.0031	-.0219	.0439	-.0186	-.0006	.0122	.0000
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

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

010075

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	88.29	-.0023	-.0004	.0645	.0001	-.0010	-.0040
SDev	.32	.0050	.0053	.0015	.0030	.0052	.0004
%RSD	.3574	216.3	1318.	2.387	3160.	507.3	9.813
#1	88.07	.0012	.0034	.0656	-.0020	.0027	-.0043
#2	88.51	-.0058	-.0042	.0635	.0022	-.0047	-.0037
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0162	-.0465	-.0010	.0013	.0221	-.0020	-.0004
SDev	.0000	.0080	.0000	.0036	.0103	.0000	.0025
%RSD	.0839	17.12	2.972	273.5	46.53	1.022	643.7
#1	.0162	-.0409	-.0010	.0038	.0148	-.0019	-.0022
#2	.0162	-.0521	-.0009	-.0012	.0293	-.0020	.0014
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0005	.0075	-.0003
SDev	.0000	.0006	.0006
%RSD	6.820	7.558	223.1
#1	-.0005	.0071	-.0007
#2	-.0006	.0079	.0002
Errors	NOCHECK	NOCHECK	NOCHECK
Value			
Range			

010076

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	763298	10000	--	--	--	--	--
SDev	2748.524	.0000000	--	--	--	--	--
%RSD	.3600855	.0000000	--	--	--	--	--
#1	761354	10000	--	--	--	--	--
#2	765241	10000	--	--	--	--	--

Analysis Report QC Standard 04/13/06 04:41:30 PM page 1

Method: DAILY2 Sample Name: icsab Operator:
Run Time: 04/13/06 16:36:56
Comment:
Mode: CONC Corr. Factor: 1

010077

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.107	514.2	1.051	1.034	.5434	.4927	.0048
SDev	.002	2.4	.016	.008	.0038	.0012	.0062
%RSD	.2111	.4663	1.492	.7675	.6987	.2464	128.9
#1	1.108	515.9	1.062	1.040	.5461	.4936	.0004
#2	1.105	512.5	1.040	1.029	.5407	.4919	.0092
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	1.000	500.0	1.000	1.000	.5000	.5000	
Range	20.00	20.00	20.00	20.00	20.00	20.00	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	469.3	.9785	.4950	.4973	.5651	190.7	.0137
SDev	1.1	.0015	.0002	.0004	.0062	.1	.0929
%RSD	.2417	.1529	.0327	.0857	1.102	.0765	679.5
#1	468.5	.9795	.4948	.4970	.5695	190.8	-.0520
#2	470.1	.9774	.4951	.4976	.5607	190.6	.0794
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	500.0	1.000	.5000	.5000	.5000	200.0	
Range	20.00	20.00	20.00	20.00	20.00	20.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0049	1.218	540.6	.5104	1.019	.9329	-.0059
SDev	.0053	.004	.2	.0004	.008	.6332	.0282
%RSD	109.0	.3618	.0449	.0796	.7821	67.87	481.8
#1	.0011	1.221	540.8	.5107	1.014	.4852	-.0258
#2	.0086	1.214	540.4	.5102	1.025	1.381	.0141
Errors	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	NOCHECK	NOCHECK
Value			500.0	.5000	1.000		
Range			20.00	20.00	20.00		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9580	1.017	1.046	.9600	.0023	.0024	1.038
SDev	.0009	.010	.007	.0098	.0163	.0077	.014
%RSD	.0939	.9415	.6982	1.025	707.7	318.5	1.337
#1	.9573	1.010	1.041	.9670	-.0092	.0078	1.028
#2	.9586	1.024	1.052	.9530	.0138	-.0030	1.048
Errors	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass
Value	1.000						1.000
Range	20.00						20.00

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

010078

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	88.85	1.048	.9918	1.116	.9888	1.011	1.018
SDev	.72	.007	.0080	.012	.0041	.003	.003
%RSD	.8129	.6806	.8040	1.118	.4181	.2906	.3220
#1	88.34	1.053	.9861	1.107	.9918	1.009	1.015
#2	89.36	1.043	.9974	1.125	.9859	1.013	1.020
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				1.000	1.000	1.000	1.000
Range				20.00	20.00	20.00	20.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.063	-.0322	.9731	1.010	.9662	.4995	.0030
SDev	.005	.0038	.0026	.001	.1569	.0023	.0038
%RSD	.4608	11.66	.2651	.0910	16.24	.4636	128.6
#1	1.066	-.0295	.9749	1.009	.8552	.5012	.0003
#2	1.059	-.0349	.9712	1.010	1.077	.4979	.0057
Errors	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	NOCHECK
Value	1.000			1.000	1.000	.5000	
Range	20.00			20.00	20.00	20.00	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0005	.9630	.9407
SDev	.0001	.0027	.0002
%RSD	17.66	.2827	.0231
#1	-.0005	.9611	.9408
#2	-.0006	.9649	.9405
Errors	NOCHECK	QC Pass	QC Pass
Value		1.000	1.000
Range		20.00	20.00

010079

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	768068	10000	--	--	--	--	--
SDev	6240.217	.0000000	--	--	--	--	--
%RSD	.8124569	.0000000	--	--	--	--	--
#1	763655	10000	--	--	--	--	--
#2	772480	10000	--	--	--	--	--

Analysis Report QC Standard 04/13/06 04:46:18 PM page 1

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 04/13/06 16:41:42
Comment:
Mode: CONC Corr. Factor: 1

010080

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9942	9.885	5.072	4.952	10.10	.9859	5.050
SDev	.0020	.001	.005	.016	.00	.0024	.001
%RSD	.2045	.0144	.1037	.3154	.0357	.2397	.0233
#1	.9956	9.884	5.069	4.941	10.10	.9875	5.051
#2	.9927	9.886	5.076	4.963	10.11	.9842	5.049
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	20.20	1.004	5.126	1.997	2.041	10.16	18.30
SDev	.09	.003	.019	.008	.005	.08	.08
%RSD	.4295	.3341	.3656	.3915	.2214	.7389	.4312
#1	20.26	1.007	5.139	2.003	2.037	10.21	18.24
#2	20.14	1.002	5.113	1.992	2.044	10.10	18.36
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	4.989	4.715	20.03	1.025	5.026	28.31	Q43.21
SDev	.002	.011	.07	.003	.001	.21	.13
%RSD	.0328	.2392	.3264	.3343	.0257	.7471	.3099
#1	4.988	4.707	20.07	1.028	5.027	28.46	Q43.11
#2	4.990	4.723	19.98	1.023	5.025	28.16	Q43.30
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	5.005	5.082	5.065	4.965	1.034	.9966	1.018
SDev	.007	.066	.082	.093	.004	.0046	.003
%RSD	.1449	1.307	1.616	1.882	.4064	.4630	.2773
#1	5.010	5.129	5.122	5.031	1.037	.9933	1.016
#2	5.000	5.035	5.007	4.899	1.031	.9999	1.020
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

010081

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.83	5.273	5.123	5.047	4.998	5.173	4.996
SDev	1.47	.073	.093	.003	.090	.086	.024
%RSD	1.519	1.385	1.811	.0572	1.792	1.666	.4825
#1	95.79	5.325	5.189	5.045	5.061	5.234	5.013
#2	97.87	5.221	5.058	5.049	4.935	5.112	4.979
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	5.046	.9885	4.828	5.250	1.047	4.979	1.057
SDev	.001	.0017	.006	.003	.072	.010	.011
%RSD	.0208	.1711	.1318	.0515	6.855	.1958	1.026
#1	5.047	.9897	4.833	5.252	1.098	4.986	1.065
#2	5.046	.9873	4.824	5.248	.9962	4.972	1.050
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	5.064	1.031	4.830
SDev	.003	.006	.004
%RSD	.0593	.5611	.0847
#1	5.066	1.035	4.833
#2	5.062	1.027	4.827
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

010082

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	837118	10000	--	--	--	--	--
SDev	12720.14	.0000000	--	--	--	--	--
%RSD	1.519515	.0000000	--	--	--	--	--
#1	828124	10000	--	--	--	--	--
#2	846113	10000	--	--	--	--	--

Analysis Report Blank Sample 04/13/06 04:51:06 PM page 1

Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 04/13/06 16:46:32 010083
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	-.0002	-.0013	.0063	.0001	.0000	.0021
SDev	.0003	.0034	.0009	.0000	.0000	.0000	.0032
%RSD	42.01	1651.	65.88	.5234	1.175	47.55	148.1
#1	.0006	.0022	-.0007	.0063	.0001	.0000	.0044
#2	.0011	-.0026	-.0019	.0063	.0001	.0000	-.0001
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	.0014	-.0000	.0009	-.0005	.0007	.0128	.0298
SDev	.0001	.0001	.0010	.0002	.0002	.0194	.0122
%RSD	7.194	1495.	111.4	41.20	23.89	151.0	41.00
#1	.0015	.0001	.0002	-.0007	.0008	.0266	.0385
#2	.0013	-.0001	.0017	-.0004	.0005	-.0009	.0212
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0500	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0500	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0010	.0002	.0034	.0000	.0014	H.2790	.0022
SDev	.0005	.0001	.0051	.0000	.0001	.1437	.0000
%RSD	46.11	21.90	147.3	1524.	9.956	51.53	1.372
#1	.0007	.0002	-.0001	.0000	.0013	H.3806	.0022
#2	.0014	.0002	.0070	-.0000	.0015	H.1773	.0023
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High	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	.0062	.0027	.0002	H.0054	-.0083	-.0014
SDev	.0001	.0092	.0071	.0013	.0043	.0096	.0036
%RSD	15.56	148.7	258.5	653.5	78.29	116.3	252.3
#1	.0008	-.0003	.0077	-.0007	H.0084	L-.0151	.0011
#2	.0010	H.0127	-.0023	.0011	.0024	-.0015	-.0040
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC High	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

010084

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.03	.0024	-.0003	.0048	.0011	.0006	-.0017
SDev	.48	.0046	.0005	.0006	.0015	.0019	.0008
%RSD	.4880	190.5	169.3	12.92	145.2	292.7	49.08
#1	98.69	.0057	.0001	.0044	.0021	.0019	-.0011
#2	99.38	-.0008	-.0006	.0053	-.0000	-.0007	-.0022
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0050	.0050	.0050
Low				-.0100	-.0050	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0017	.0000	.0097	.0405	.0004	.0028
SDev	.0000	.0006	.0000	.0043	.0363	.0001	.0004
%RSD	2.105	37.67	14.15	44.34	89.71	12.30	13.63
#1	.0001	.0021	.0000	H.0127	.0148	.0005	.0025
#2	.0001	.0012	.0000	.0066	.0662	.0004	.0031
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	.0001	.0003
SDev	.0001	.0000	.0001
%RSD	94.70	.9280	41.09
#1	.0002	.0001	.0004
#2	.0000	.0001	.0002
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010085

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	856160	10000	--	--	--	--	--
SDev	4125.968	.0000000	--	--	--	--	--
%RSD	.4819158	.0000000	--	--	--	--	--
#1	853242	10000	--	--	--	--	--
#2	859077	10000	--	--	--	--	--

Method: DAILY2 Sample Name: pbw-D12H2 Operator: 010086
Run Time: 04/13/06 16:51:17
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	.0277	.0000	.0045	.0003	.0001	H.0137
SDev	.0032	.0148	.0018	.0005	.0002	.0001	.0087
%RSD	77.84	53.44	11590.	10.81	64.09	38.45	63.15
#1	.0018	.0172	-.0012	.0049	.0004	.0001	.0076
#2	H.0064	.0382	.0013	.0042	.0002	.0002	H.0199
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
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	.0084	.0006	H.0050	.0017	.0012	H.0702	.0824
SDev	.0029	.0004	.0015	.0009	.0009	.0360	.0431
%RSD	34.45	74.60	30.10	52.06	72.35	51.20	52.31
#1	.0063	.0003	.0040	.0023	.0019	.0448	.0519
#2	.0104	.0009	H.0061	.0010	.0006	H.0957	H.1129
Errors	LC Pass	LC Pass	LC High	LC Pass	LC Pass	LC High	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0500	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0500	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H.0055	.0004	.0311	.0001	.0009	H.7419	.0094
SDev	.0034	.0002	.0196	.0002	.0009	.4794	.0027
%RSD	62.34	48.66	62.89	255.5	100.0	64.61	28.24
#1	.0031	.0002	.0173	.0002	.0015	H.4030	.0075
#2	H.0079	.0005	.0449	-.0001	.0003	H1.081	.0113
Errors	LC High	LC Pass	LC Pass	LC Pass	LC Pass	LC High	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	.0019	.0095	-.0019	.0015	H.0168	.0023	.0039
SDev	.0007	.0059	.0096	.0049	.0068	.0003	.0047
%RSD	36.98	61.98	494.4	322.2	40.36	13.92	120.7
#1	.0024	H.0136	-.0087	.0050	H.0120	.0025	.0072
#2	.0014	.0053	.0048	-.0020	H.0216	.0021	.0006
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC High	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

010087

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.21	-.0006	.0050	H.0181	.0004	.0031	.0013
SDev	1.84	.0026	.0055	.0097	.0001	.0028	.0008
%RSD	1.929	460.0	110.2	53.40	24.52	89.10	59.36
#1	96.51	-.0024	.0088	H.0113	.0005	H.0051	.0007
#2	93.91	.0012	.0011	H.0249	.0003	.0012	.0018
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC Pass	LC Pass	LC Pass
High				.0100	.0050	.0050	.0050
Low				-.0100	-.0050	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0009	.0002	.0034	H.1840	.0008	.0075
SDev	.0001	.0081	.0003	.0022	.0989	.0005	.0059
%RSD	63.32	914.8	146.6	65.07	53.76	65.72	78.85
#1	.0001	.0067	.0004	.0019	H.1140	.0011	.0033
#2	.0003	-.0049	-.0000	.0050	H.2539	.0004	H.0117
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC High	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	.0003	.0005	.0024
SDev	.0002	.0005	.0004
%RSD	75.79	103.4	15.63
#1	.0005	.0001	.0027
#2	.0001	.0009	.0021
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010088

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	823061	10000	--	--	--	--	--
SDev	15887.27	.0000000	--	--	--	--	--
%RSD	1.930267	.0000000	--	--	--	--	--
#1	834295	10000	--	--	--	--	--
#2	811827	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: lcsw-D12H2 Operator: 010089
Run Time: 04/13/06 16:56:03
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0495	1.954	2.003	.0009	2.012	.0495	.0039
SDev	.0018	.006	.000	.0014	.004	.0001	.0065
%RSD	3.709	.3058	.0038	160.9	.1850	.2959	166.5
#1	.0508	1.958	2.003	-.0001	2.015	.0497	.0085
#2	.0482	1.949	2.003	.0019	2.010	.0494	-.0007

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.73	.0492	.5008	.1935	.2477	1.142	16.92
SDev	.07	.0002	.0000	.0033	.0000	.025	.06
%RSD	.3357	.3800	.0006	1.685	.0115	2.225	.3474
#1	20.68	.0494	.5008	.1912	.2478	1.160	16.96
#2	20.78	.0491	.5008	.1958	.2477	1.124	16.88

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0003	20.55	.5026	-.0010	18.42	27.25
SDev	.0018	.0000	.01	.0008	.0014	.33	.05
%RSD	684.0	15.40	.0249	.1613	139.8	1.818	.1661
#1	.0015	.0003	20.55	.5021	-.0020	18.66	27.21
#2	-.0010	.0002	20.55	.5032	-.0000	18.18	27.28

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4891	4.215	.4890	.4763	.0031	-.0045	.4890
SDev	.0035	.001	.0104	.0041	.0078	.0040	.0059
%RSD	.7233	.0141	2.133	.8681	252.5	89.67	1.201
#1	.4866	4.214	.4963	.4792	.0087	-.0016	.4849
#2	.4917	4.215	.4816	.4734	-.0024	-.0074	.4932

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.55	2.045	1.992	4.114	.4805	2.009	-.0017
SDev	.10	.016	.048	.019	.0062	.037	.0016
%RSD	.1034	.7668	2.389	.4588	1.297	1.839	92.16
#1	95.48	2.056	2.025	4.127	.4849	2.036	-.0006
#2	95.62	2.034	1.958	4.100	.4761	1.983	-.0029

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0230	-.0003	2.062	.0011	.4877	-.0004
SDev	.0001	.0061	.0005	.008	.0498	.0013	.0024
%RSD	9.559	26.66	180.2	.3855	4726.	.2758	679.5
#1	.0007	-.0274	-.0006	2.067	.0363	.4867	.0013
#2	.0006	-.0187	.0001	2.056	-.0342	.4886	-.0021

010090

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0004	.4972	-.0008
SDev	.0003	.0020	.0011
%RSD	77.72	.3986	141.6
#1	-.0006	.4958	-.0015
#2	-.0002	.4986	.0000

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	826004	10000	--	--	--	--	--
SDev	857.7205	.0000000	--	--	--	--	--
%RSD	.1038397	.0000000	--	--	--	--	--
#1	825398	10000	--	--	--	--	--
#2	826611	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 276580 Operator:
Run Time: 04/13/06 17:00:52
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	.0017	.0224	.0009	.0870	.0003	.0001	-.0001
SDev	.0010	.0016	.0026	.0013	.0001	.0000	.0054
%RSD	59.04	7.046	287.9	1.498	23.42	37.52	3788.
#1	.0010	.0213	.0027	.0861	.0003	.0001	.0037
#2	.0025	.0235	-.0009	.0879	.0004	.0001	-.0040

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1007	.0003	.0027	.0017	.0017	.0259	2.550
SDev	.0025	.0002	.0016	.0010	.0013	.0294	.012
%RSD	2.524	62.45	60.25	58.31	74.57	113.7	.4627
#1	.0989	.0001	.0015	.0010	.0008	.0051	2.542
#2	.1025	.0004	.0038	.0024	.0026	.0467	2.559

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0019	.0002	.0936	.0019	.0005	12.33	17.16
SDev	.0007	.0001	.0077	.0003	.0000	.07	.08
%RSD	37.03	53.12	8.188	16.02	6.615	.6023	.4785
#1	.0014	.0001	.0881	.0017	.0005	12.28	17.22
#2	.0024	.0003	.0990	.0021	.0006	12.39	17.10

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0029	.0047	.0005	.0002	.0036	1.198	.0036
SDev	.0007	.0023	.0026	.0056	.0026	.016	.0003
%RSD	24.15	47.87	504.9	2458.	71.96	1.351	7.354
#1	.0024	.0031	-.0013	.0042	.0018	1.186	.0034
#2	.0034	.0063	.0024	-.0037	.0054	1.209	.0038

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.88	.0034	.0043	.2627	.0003	.0040	.0006
SDev	1.75	.0057	.0019	.0047	.0028	.0006	.0045
%RSD	1.849	166.7	45.36	1.800	833.7	15.17	729.9
#1	96.12	-.0006	.0057	.2593	.0023	.0036	-.0026
#2	93.64	.0075	.0029	.2660	-.0017	.0045	.0038

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0051	.0004	.0034	.0581	.0012	.0032
SDev	.0000	.0049	.0004	.0048	.0190	.0011	.0023
%RSD	17.90	96.31	104.5	142.9	32.64	90.79	70.51
#1	.0001	.0016	.0001	-.0000	.0447	.0004	.0048
#2	.0001	.0086	.0007	.0067	.0716	.0020	.0016

010092

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0003	.0001	.0016
SDev	.0002	.0002	.0013
%RSD	53.95	157.1	79.50
#1	.0002	-.0000	.0007
#2	.0004	.0003	.0024

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	820191	10000	--	--	--	--	--
SDev	15161.78	.0000000	--	--	--	--	--
%RSD	1.848567	.0000000	--	--	--	--	--
#1	830912	10000	--	--	--	--	--
#2	809470	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 276580d Operator: 010093
Run Time: 04/13/06 17:05:38
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0025	.0498	.0002	.0870	.0003	.0001	.0060
SDev	.0028	.0173	.0031	.0014	.0003	.0000	.0109
%RSD	110.0	34.72	1549.	1.562	85.31	41.96	183.8
#1	.0006	.0376	.0024	.0861	.0001	.0001	-.0018
#2	.0045	.0620	-.0020	.0880	.0005	.0001	.0137

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0997	.0003	.0026	.0017	.0018	.0493	2.556
SDev	.0041	.0005	.0030	.0018	.0016	.0121	.035
%RSD	4.145	153.0	114.2	104.6	90.23	24.65	1.366
#1	.0968	-.0000	.0005	.0004	.0007	.0407	2.532
#2	.1026	.0007	.0047	.0030	.0030	.0578	2.581

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0031	.0003	.0998	.0018	.0001	12.59	17.00
SDev	.0041	.0001	.0227	.0003	.0001	.73	.08
%RSD	129.9	42.75	22.74	15.28	84.31	5.778	.4791
#1	.0003	.0002	.0837	.0016	.0002	12.08	17.06
#2	.0060	.0004	.1158	.0020	.0001	13.10	16.95

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0038	.0023	-.0016	.0012	.0076	1.202	.0024
SDev	.0014	.0040	.0022	.0016	.0065	.009	.0069
%RSD	35.72	173.0	135.8	135.5	86.42	.7788	290.7
#1	.0028	.0051	-.0032	.0000	.0029	1.196	-.0025
#2	.0047	-.0005	-.0001	.0023	.0122	1.209	.0073

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.32	-.0032	.0041	.2626	.0003	.0017	-.0003
SDev	2.10	.0044	.0029	.0127	.0018	.0004	.0009
%RSD	2.205	140.1	70.03	4.831	688.6	26.23	319.9
#1	96.81	-.0000	.0021	.2536	-.0010	.0014	-.0009
#2	93.83	-.0063	.0061	.2716	.0015	.0020	.0003

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0051	.0004	.0015	.0962	.0012	.0052
SDev	.0001	.0003	.0003	.0051	.1473	.0024	.0011
%RSD	100.9	5.558	86.13	349.1	153.1	197.8	22.13
#1	.0000	.0049	.0001	-.0022	-.0080	-.0005	.0044
#2	.0003	.0053	.0006	.0051	.2003	.0029	.0060

010094

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0003	.0004	.0015
SDev	.0004	.0003	.0024
%RSD	113.6	71.16	163.5
#1	.0001	.0002	-.0002
#2	.0006	.0006	.0032

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	824026	10000	--	--	--	--	--
SDev	18197.39	.0000000	--	--	--	--	--
%RSD	2.208350	.0000000	--	--	--	--	--
#1	836894	10000	--	--	--	--	--
#2	811159	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 276580s Operator:
Run Time: 04/13/06 17:10:24
Comment:
Mode: CONC Corr. Factor: 1

010095

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0502	1.981	2.020	.0875	2.013	.0497	.0011
SDev	.0016	.005	.004	.0013	.003	.0001	.0086
%RSD	3.262	.2453	.2057	1.447	.1562	.1017	765.1
#1	.0513	1.984	2.023	.0866	2.011	.0497	.0072
#2	.0490	1.977	2.017	.0884	2.016	.0498	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	21.07	.0498	.5067	.1967	.2520	1.144	21.27
SDev	.02	.0003	.0004	.0020	.0008	.008	.07
%RSD	.0870	.6030	.0869	1.015	.3057	.6919	.3172
#1	21.09	.0500	.5064	.1953	.2515	1.138	21.22
#2	21.06	.0495	.5070	.1981	.2526	1.150	21.31

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0003	20.84	.5075	-.0003	32.55	48.53
SDev	.0014	.0000	.03	.0001	.0010	.01	.09
%RSD	244.9	3.674	.1494	.0236	398.7	.0202	.1788
#1	.0015	.0003	20.82	.5074	-.0010	32.54	48.46
#2	-.0004	.0003	20.87	.5076	.0005	32.55	48.59

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4930	4.234	.4894	.4882	.0022	1.233	.4984
SDev	.0010	.005	.0018	.0010	.0012	.023	.0049
%RSD	.1992	.1259	.3654	.2027	54.07	1.839	.9730
#1	.4937	4.231	.4907	.4889	.0014	1.217	.4949
#2	.4923	4.238	.4882	.4875	.0030	1.249	.5018

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	93.82	2.079	2.039	4.416	.4886	2.052	.0003
SDev	.07	.008	.028	.001	.0013	.016	.0011
%RSD	.0758	.3874	1.349	.0151	.2570	.7625	420.2
#1	93.87	2.074	2.058	4.415	.4895	2.063	-.0005
#2	93.77	2.085	2.019	4.416	.4877	2.041	.0010

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0192	.0003	2.072	.0480	.4903	.0029
SDev	.0001	.0038	.0004	.004	.0491	.0014	.0013
%RSD	8.562	19.99	129.5	.2043	102.2	.2923	44.95
#1	.0008	-.0220	.0000	2.069	.0827	.4893	.0038
#2	.0007	-.0165	.0005	2.075	.0133	.4914	.0020

010096

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.5036	.0010
SDev	.0002	.0010	.0009
%RSD	474.7	.1991	85.45
#1	-.0002	.5043	.0004
#2	.0001	.5029	.0017

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	811060	10000	--	--	--	--	--
SDev	616.5971	.0000000	--	--	--	--	--
%RSD	.0760236	.0000000	--	--	--	--	--
#1	811496	10000	--	--	--	--	--
#2	810624	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 276581 Operator:
Run Time: 04/13/06 17:15:09
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	.0005	.0157	.0017	.0014	.0002	.0001	-.0014
SDev	.0005	.0073	.0060	.0021	.0001	.0000	.0091
%RSD	120.0	46.71	351.5	155.3	66.09	26.30	661.2
#1	.0008	.0209	.0060	.0029	.0003	.0000	.0051
#2	.0001	.0105	-.0025	-.0001	.0001	.0001	-.0078

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	2.052	.0001	.0032	.0010	.0014	2.035	1.219
SDev	.008	.0000	.0000	.0009	.0003	.007	.002
%RSD	.4063	27.87	.5912	86.46	17.16	.3412	.1599
#1	2.058	.0000	.0032	.0016	.0016	2.040	1.218
#2	2.046	.0001	.0031	.0004	.0013	2.031	1.221

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0001	1.967	.0001	-.0002	1.599	2.078
SDev	.0009	.0000	.004	.0001	.0009	.202	.011
%RSD	320.6	39.60	.1934	169.9	395.2	12.61	.5069
#1	.0009	.0001	1.969	.0002	.0004	1.456	2.071
#2	-.0004	.0001	1.964	-.0000	-.0008	1.742	2.086

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0026	.0051	-.0039	.0026	.0012	.0334	.0040
SDev	.0001	.0002	.0007	.0005	.0014	.0091	.0028
%RSD	1.947	4.018	18.59	18.34	124.3	27.32	70.42
#1	.0025	.0050	-.0034	.0030	.0022	.0399	.0059
#2	.0026	.0053	-.0044	.0023	.0001	.0270	.0020

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.86	-.0004	.0042	.0049	.0005	.0026	.0001
SDev	.79	.0074	.0001	.0010	.0006	.0024	.0010
%RSD	.8381	1659.	1.102	19.89	117.4	91.93	1661.
#1	94.30	-.0057	.0042	.0042	.0009	.0009	-.0007
#2	95.42	.0048	.0041	.0056	.0001	.0044	.0008

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0029	.0002	.0018	-.0003	.0001	.0032
SDev	.0000	.0014	.0001	.0030	.0231	.0008	.0017
%RSD	15.53	47.16	47.16	165.7	6797.	682.7	53.81
#1	.0002	.0038	.0003	-.0003	.0160	.0007	.0020
#2	.0002	.0019	.0002	.0039	-.0167	-.0005	.0044

010098

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	-.0001	.0006
SDev	.0001	.0005	.0010
%RSD	86.89	481.7	156.4
#1	.0002	.0002	.0013
#2	.0000	-.0004	-.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	820048	10000	--	--	--	--	--
SDev	6945.910	.0000000	--	--	--	--	--
%RSD	.8470131	.0000000	--	--	--	--	--
#1	815136	10000	--	--	--	--	--
#2	824959	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 275582 Operator:
Run Time: 04/13/06 17:19:56
Comment:
Mode: CONC Corr. Factor: 1

010099

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0132	-.0015	.0435	.0001	.0001	.0042
SDev	.0015	.0091	.0005	.0006	.0001	.0001	.0039
%RSD	163.7	68.89	36.80	1.323	108.1	62.08	93.73
#1	.0020	.0196	-.0019	.0439	.0002	.0001	.0069
#2	-.0001	.0068	-.0011	.0431	.0000	.0000	.0014

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1037	-.0001	.0002	.0004	.0015	.0402	1.269
SDev	.0029	.0002	.0010	.0015	.0009	.0466	.036
%RSD	2.752	208.7	455.5	413.2	58.02	115.8	2.811
#1	.1057	.0000	.0009	.0014	.0021	.0731	1.294
#2	.1016	-.0003	-.0005	-.0007	.0009	.0073	1.244

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0019	.0002	.0628	.0016	.0003	6.207	8.119
SDev	.0024	.0001	.0111	.0001	.0009	.407	.045
%RSD	128.0	59.83	17.68	4.674	264.9	6.555	.5577
#1	.0036	.0003	.0706	.0017	.0010	6.495	8.087
#2	.0002	.0001	.0549	.0016	-.0003	5.919	8.151

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0015	.0089	-.0003	.0018	.0068	.6155	-.0006
SDev	.0017	.0007	.0011	.0028	.0101	.0030	.0008
%RSD	112.0	8.205	315.1	161.2	147.8	.4876	121.2
#1	.0027	.0084	-.0011	-.0002	.0140	.6176	-.0012
#2	.0003	.0094	.0004	.0038	-.0003	.6134	-.0001

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.68	.0012	.0018	.1271	.0011	.0016	-.0002
SDev	1.19	.0028	.0034	.0021	.0023	.0032	.0004
%RSD	1.255	235.2	192.9	1.674	211.0	202.3	167.9
#1	93.84	.0032	.0042	.1286	-.0005	.0039	-.0005
#2	95.52	-.0008	-.0006	.1256	.0027	-.0007	.0000

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0011	-.0001	.0035	.0338	.0002	.0014
SDev	.0001	.0027	.0001	.0071	.0720	.0002	.0042
%RSD	80.28	246.1	126.9	203.3	213.0	83.47	294.8
#1	.0002	.0031	-.0000	.0085	.0847	.0003	.0044
#2	.0000	-.0008	-.0001	-.0015	-.0171	.0001	-.0016

010100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0000	.0004
SDev	.0001	.0005	.0015
%RSD	460.1	2186.	340.3
#1	.0001	.0004	.0015
#2	-.0001	-.0003	-.0006

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	818466	10000	--	--	--	--	--
SDev	10274.97	.0000000	--	--	--	--	--
%RSD	1.255393	.0000000	--	--	--	--	--
#1	811201	10000	--	--	--	--	--
#2	825732	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 275583 Operator:
Run Time: 04/13/06 17:24:42
Comment:
Mode: CONC Corr. Factor: 1

010101

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0159	-.0017	.0428	.0001	.0001	-.0019
SDev	.0003	.0051	.0015	.0008	.0000	.0000	.0004
%RSD	90.15	31.76	90.60	1.832	27.06	27.85	23.35
#1	.0005	.0195	-.0006	.0433	.0002	.0001	-.0022
#2	.0001	.0123	-.0028	.0422	.0001	.0001	-.0016

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1078	.0001	.0026	.0013	.0009	.0179	1.254
SDev	.0003	.0002	.0009	.0004	.0000	.0043	.007
%RSD	.2547	267.8	35.68	29.68	4.488	23.92	.5636
#1	.1080	.0003	.0019	.0011	.0009	.0148	1.249
#2	.1076	-.0001	.0032	.0016	.0009	.0209	1.259

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0002	.0677	.0012	.0002	6.000	7.992
SDev	.0005	.0000	.0015	.0000	.0003	.064	.001
%RSD	225.3	3.885	2.214	3.616	176.0	1.059	.0144
#1	.0006	.0001	.0666	.0012	-.0000	5.955	7.991
#2	-.0001	.0002	.0687	.0012	.0004	6.045	7.993

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0021	.0031	-.0025	.0034	.0037	.6005	.0005
SDev	.0006	.0038	.0032	.0014	.0027	.0080	.0006
%RSD	27.33	124.0	126.3	42.28	72.94	1.327	123.5
#1	.0017	.0004	-.0003	.0024	.0055	.6062	.0009
#2	.0025	.0057	-.0048	.0044	.0018	.5949	.0001

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.92	-.0021	-.0003	.1156	.0014	-.0009	-.0013
SDev	.25	.0003	.0012	.0011	.0001	.0007	.0003
%RSD	.2621	13.32	400.5	.9896	7.994	78.51	23.52
#1	94.75	-.0023	.0005	.1164	.0015	-.0004	-.0011
#2	95.10	-.0019	-.0011	.1148	.0013	-.0014	-.0015

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0047	-.0001	.0002	.0165	-.0000	.0018
SDev	.0000	.0024	.0001	.0016	.0046	.0003	.0014
%RSD	8.965	51.60	137.0	882.5	28.14	2773.	80.92
#1	.0001	.0030	-.0000	.0013	.0198	-.0002	.0028
#2	.0001	.0064	-.0002	-.0009	.0132	.0002	.0007

010102

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0001	.0001
SDev	.0000	.0000	.0004
%RSD	.9937	.2871	668.5
#1	.0000	.0001	.0003
#2	.0000	.0001	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	820626	10000	--	--	--	--	--
SDev	2085.258	.0000000	--	--	--	--	--
%RSD	.2541059	.0000000	--	--	--	--	--
#1	819151	10000	--	--	--	--	--
#2	822100	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 275584 Operator:
Run Time: 04/13/06 17:29:27
Comment:
Mode: CONC Corr. Factor: 1

010103

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0145	-.0008	.0420	.0001	.0001	-.0023
SDev	.0009	.0011	.0010	.0003	.0000	.0000	.0009
%RSD	262.3	7.600	122.1	.6025	29.43	14.75	41.09
#1	-.0003	.0153	-.0015	.0418	.0001	.0001	-.0016
#2	.0010	.0137	-.0001	.0422	.0001	.0001	-.0030

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0986	-.0000	.0023	.0003	.0015	.0370	1.233
SDev	.0004	.0003	.0005	.0003	.0000	.0010	.017
%RSD	.3810	3401.	20.44	105.7	.9167	2.722	1.338
#1	.0989	-.0002	.0019	.0001	.0015	.0377	1.245
#2	.0983	.0002	.0026	.0005	.0015	.0362	1.222

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0003	.0584	.0020	-.0008	6.279	7.854
SDev	.0016	.0000	.0043	.0001	.0009	.071	.040
%RSD	288.5	11.56	7.281	3.154	118.1	1.130	.5113
#1	-.0006	.0002	.0554	.0020	-.0014	6.229	7.882
#2	.0017	.0003	.0614	.0021	-.0001	6.329	7.826

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0020	.0019	.0024	.0013	.0076	.6098	.0014
SDev	.0001	.0008	.0008	.0015	.0005	.0048	.0011
%RSD	5.131	41.57	34.53	122.1	7.022	.7925	83.85
#1	.0019	.0013	.0018	.0023	.0080	.6063	.0022
#2	.0021	.0024	.0029	.0002	.0072	.6132	.0006

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.43	.0001	.0043	.1209	.0016	.0029	-.0008
SDev	.82	.0035	.0012	.0027	.0008	.0003	.0002
%RSD	.8687	2696.	29.15	2.263	45.96	11.84	23.70
#1	93.85	-.0023	.0051	.1189	.0022	.0026	-.0007
#2	95.01	.0026	.0034	.1228	.0011	.0031	-.0010

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0034	.0000	.0000	.0111	-.0004	.0043
SDev	.0001	.0037	.0000	.0007	.0543	.0007	.0015
%RSD	84.24	107.2	178.9	3709.	487.9	178.6	36.42
#1	.0000	.0060	-.0000	.0005	-.0272	-.0008	.0032
#2	.0001	.0008	.0000	-.0005	.0495	.0001	.0054

010104

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	-.0000	.0004
SDev	.0000	.0001	.0003
%RSD	21.83	349.1	68.84
#1	.0001	-.0001	.0002
#2	.0000	.0000	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	816368	10000	--	--	--	--	--
SDev	7109.958	.0000000	--	--	--	--	--
%RSD	.8709252	.0000000	--	--	--	--	--
#1	811341	10000	--	--	--	--	--
#2	821396	10000	--	--	--	--	--

Analysis Report 04/13/06 05:38:51 PM

Method: DAILY2 Sample Name: 275585 Operator:
Run Time: 04/13/06 17:34:17
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	.0094	-.0010	.0426	.0003	.0001	-.0018
SDev	.0010	.0045	.0011	.0010	.0000	.0001	.0060
%RSD	130.1	47.92	101.2	2.321	3.338	80.32	337.7
#1	.0001	.0062	-.0003	.0433	.0003	.0000	.0025
#2	.0014	.0126	-.0018	.0419	.0003	.0002	-.0061

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0929	.0002	.0021	.0016	.0017	.0705	1.213
SDev	.0033	.0006	.0013	.0003	.0001	.0514	.065
%RSD	3.589	308.1	64.76	16.15	6.207	72.95	5.369
#1	.0905	-.0002	.0011	.0018	.0017	.0341	1.167
#2	.0952	.0006	.0030	.0014	.0018	.1068	1.259

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0003	.0581	.0029	-.0008	6.189	7.673
SDev	.0007	.0002	.0053	.0000	.0002	.884	.018
%RSD	98.28	76.07	9.101	.7134	26.65	14.28	.2321
#1	.0002	.0001	.0544	.0029	-.0010	5.564	7.685
#2	.0013	.0004	.0619	.0029	-.0007	6.814	7.660

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0075	.0033	.0013	.0109	.5950	.0044
SDev	.0013	.0043	.0001	.0032	.0115	.0106	.0003
%RSD	214.7	57.19	2.477	250.1	105.1	1.773	7.244
#1	.0015	.0044	.0032	.0036	.0028	.5875	.0041
#2	-.0003	.0105	.0034	-.0010	.0191	.6024	.0046

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.69	-.0001	-.0018	.1180	.0020	-.0012	.0005
SDev	1.15	.0015	.0003	.0020	.0021	.0003	.0019
%RSD	1.215	1234.	17.17	1.699	108.1	22.84	364.2
#1	95.50	.0009	-.0020	.1165	.0035	-.0010	-.0008
#2	93.87	-.0012	-.0016	.1194	.0005	-.0014	.0018

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0057	.0004	.0039	.0320	.0011	.0026
SDev	.0001	.0027	.0001	.0038	.0397	.0001	.0034
%RSD	69.64	47.14	24.96	97.02	124.1	4.282	132.2
#1	.0000	.0076	.0005	.0066	.0039	.0011	.0002
#2	.0001	.0038	.0003	.0012	.0601	.0012	.0050

010106

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0003	.0012
SDev	.0001	.0002	.0003
%RSD	36.25	77.58	25.01
#1	.0003	.0001	.0010
#2	.0002	.0005	.0014

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	818582	10000	--	--	--	--	--
SDev	9997.783	.0000000	--	--	--	--	--
%RSD	1.221353	.0000000	--	--	--	--	--
#1	825652	10000	--	--	--	--	--
#2	811513	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ccv4 Operator:
Run Time: 04/13/06 17:40:52
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	.9915	9.911	5.059	4.946	10.08	.9840	5.032
SDev	.0006	.002	.014	.010	.02	.0007	.019
%RSD	.0580	.0155	.2750	.2058	.1916	.0704	.3703
#1	.9910	9.910	5.049	4.939	10.06	.9835	5.019
#2	.9919	9.912	5.069	4.953	10.09	.9845	5.046
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1.100	11.00	5.500	5.500	11.00	1.100	5.500
Low	.9000	9.000	4.500	4.500	9.000	.9000	4.500

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.17	1.001	5.110	1.994	2.042	10.14	18.28
SDev	.02	.002	.003	.001	.001	.01	.01
%RSD	.1150	.1682	.0605	.0384	.0573	.0623	.0573
#1	20.15	1.000	5.112	1.993	2.042	10.14	18.27
#2	20.19	1.003	5.108	1.994	2.043	10.14	18.29
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.985	4.721	20.02	1.022	5.002	28.22	H43.26
SDev	.006	.002	.04	.001	.007	.01	.02
%RSD	.1241	.0337	.2166	.0965	.1366	.0316	.0552
#1	4.980	4.719	19.99	1.022	4.998	28.21	H43.28
#2	4.989	4.722	20.05	1.023	5.007	28.23	H43.24
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	5.500	5.500	22.00	1.100	5.500	33.00	33.00
Low	4.500	4.500	18.00	.9000	4.500	27.00	27.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.978	5.131	5.022	4.918	1.027	1.008	1.018
SDev	.016	.013	.007	.001	.006	.023	.005
%RSD	.3166	.2505	.1337	.0219	.6294	2.323	.5273
#1	4.990	5.141	5.017	4.919	1.023	1.025	1.014
#2	4.967	5.122	5.026	4.918	1.032	.9918	1.021
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

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

010108

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.18	5.233	5.067	5.048	4.953	5.123	4.971
SDev	.60	.002	.009	.003	.002	.007	.012
%RSD	.6130	.0336	.1817	.0554	.0308	.1313	.2325
#1	97.60	5.235	5.074	5.050	4.952	5.127	4.963
#2	96.76	5.232	5.061	5.046	4.954	5.118	4.979
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.043	.9822	4.816	5.215	1.031	4.968	1.044
SDev	.001	.0008	.003	.035	.030	.006	.002
%RSD	.0130	.0860	.0669	.6665	2.933	.1231	.2033
#1	5.043	.9828	4.814	5.190	1.052	4.963	1.042
#2	5.042	.9816	4.818	5.240	1.009	4.972	1.045
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	5.065	1.026	4.832
SDev	.001	.002	.002
%RSD	.0135	.1824	.0502
#1	5.065	1.025	4.830
#2	5.064	1.027	4.834
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

010109

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	840054	10000	--	--	--	--	--
SDev	5148.444	.0000000	--	--	--	--	--
%RSD	.6128710	.0000000	--	--	--	--	--
#1	843694	10000	--	--	--	--	--
#2	836413	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccb4 Operator:
Run Time: 04/13/06 17:45:38
Comment:
Mode: CONC Corr. Factor: 1

010110

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0037	-.0016	.0060	.0002	-.0000	-.0022
SDev	.0016	.0047	.0021	.0024	.0002	.0000	.0016
%RSD	1386.	127.9	126.6	39.97	83.75	61.38	72.56
#1	.0012	-.0003	-.0002	.0077	.0004	-.0000	-.0011
#2	-.0010	-.0070	-.0031	.0043	.0001	-.0000	-.0033
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	.0016	-.0000	.0013	.0001	.0005	-.0107	.0024
SDev	.0026	.0002	.0012	.0013	.0003	.0030	.0033
%RSD	162.5	3815.	92.95	1320.	75.29	28.20	139.7
#1	-.0002	.0001	.0021	.0010	.0007	-.0129	.0047
#2	.0034	-.0001	.0004	-.0008	.0002	-.0086	.0000
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0500	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0500	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0002	.0030	.0000	.0009	.0158	-.0005
SDev	.0023	.0000	.0138	.0001	.0009	.0462	.0040
%RSD	674.7	15.33	461.4	1786.	106.0	292.4	818.1
#1	.0020	.0002	.0127	.0001	.0015	-.0169	.0023
#2	-.0013	.0002	-.0068	-.0001	.0002	.0485	-.0033
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	.0014	H.0111	-.0022	.0044	-.0002	.0054	.0022
SDev	.0004	.0043	.0006	.0014	.0032	.0025	.0068
%RSD	32.10	39.13	28.30	32.76	1400.	45.84	308.5
#1	.0017	H.0142	-.0018	.0054	-.0025	.0036	.0070
#2	.0011	.0080	-.0027	.0034	.0020	.0071	-.0026
Errors	LC Pass	LC High	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

010111

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.30	-.0033	.0032	-.0004	.0022	.0010	-.0023
SDev	.50	.0021	.0021	.0043	.0012	.0007	.0021
%RSD	.5046	64.02	65.21	1065.	53.51	65.84	91.37
#1	99.65	-.0018	.0017	.0026	.0030	.0005	-.0039
#2	98.94	-.0048	.0046	-.0034	.0014	.0015	-.0008
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0050	.0050	.0050
Low				-.0100	-.0050	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0049	.0002	H.0108	.0076	.0006	.0022
SDev	.0001	.0022	.0003	.0020	.0526	.0009	.0015
%RSD	230.4	44.58	142.4	18.63	688.0	159.5	70.30
#1	.0001	.0064	.0004	H.0122	.0448	.0012	.0033
#2	-.0000	.0033	-.0000	.0094	-.0296	-.0001	.0011
Errors	LC Pass	LC Pass	LC Pass	LC High	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	.0002	.0007
SDev	.0001	.0002	.0019
%RSD	141.9	141.1	282.3
#1	.0002	.0003	.0020
#2	-.0000	.0000	-.0007
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010112

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	858380	10000	--	--	--	--	--
SDev	4344.464	.0000000	--	--	--	--	--
%RSD	.5061237	.0000000	--	--	--	--	--
#1	861452	10000	--	--	--	--	--
#2	855308	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 275586 Operator: 010113
Run Time: 04/13/06 17:50:26
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	.0136	-.0011	.0469	.0003	.0001	-.0011
SDev	.0001	.0042	.0004	.0021	.0002	.0000	.0133
%RSD	6.224	30.79	33.31	4.424	50.82	48.55	1188.
#1	.0011	.0106	-.0008	.0454	.0002	.0001	-.0105
#2	.0012	.0166	-.0013	.0484	.0004	.0001	.0083

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0808	.0003	.0022	.0016	.0020	.0097	1.261
SDev	.0020	.0001	.0006	.0022	.0011	.0042	.015
%RSD	2.475	35.27	25.19	135.4	52.41	43.19	1.169
#1	.0794	.0002	.0018	.0001	.0013	.0067	1.251
#2	.0822	.0003	.0026	.0031	.0028	.0127	1.272

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0013	.0002	.0653	.0005	.0001	6.302	8.363
SDev	.0004	.0001	.0026	.0001	.0001	.298	.050
%RSD	31.86	37.15	3.904	23.50	245.8	4.724	.5963
#1	.0010	.0002	.0635	.0004	-.0000	6.091	8.399
#2	.0016	.0003	.0671	.0006	.0002	6.512	8.328

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0027	.0044	.0009	.0041	.0053	.6206	.0053
SDev	.0004	.0005	.0050	.0003	.0058	.0282	.0009
%RSD	15.19	10.61	557.1	7.599	110.4	4.550	16.72
#1	.0024	.0041	.0044	.0043	.0012	.6006	.0047
#2	.0030	.0047	-.0026	.0039	.0094	.6405	.0060

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.19	-.0037	-.0003	.1213	.0031	-.0014	.0013
SDev	1.69	.0004	.0004	.0017	.0019	.0001	.0029
%RSD	1.789	11.73	122.5	1.392	61.30	8.426	231.5
#1	95.39	-.0040	-.0000	.1201	.0044	-.0014	-.0008
#2	93.00	-.0034	-.0006	.1225	.0017	-.0015	.0034

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0075	.0004	.0007	.0322	.0013	.0023
SDev	.0000	.0011	.0006	.0011	.0532	.0010	.0007
%RSD	39.92	15.37	150.6	158.0	165.0	75.19	30.31
#1	.0001	.0067	-.0000	-.0001	-.0054	.0006	.0028
#2	.0001	.0083	.0008	.0015	.0698	.0020	.0018

010114

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0003	-.0001	.0016
SDev	.0001	.0002	.0014
%RSD	39.62	197.1	86.00
#1	.0002	-.0003	.0006
#2	.0004	.0000	.0027

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	814316	10000	--	--	--	--	--
SDev	14517.61	.0000000	--	--	--	--	--
%RSD	1.782797	.0000000	--	--	--	--	--
#1	824582	10000	--	--	--	--	--
#2	804051	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 275587 Operator:
Run Time: 04/13/06 17:55:11
Comment:
Mode: CONC Corr. Factor: 1

010115

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0012	.0103	-.0012	.0424	.0002	.0000	-.0019
SDev	.0018	.0092	.0007	.0005	.0001	.0000	.0062
%RSD	151.0	89.26	54.43	1.255	56.77	89.98	321.2
#1	-.0024	.0038	-.0008	.0420	.0002	.0000	-.0064
#2	.0001	.0169	-.0017	.0427	.0001	.0001	.0025

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0689	-.0005	.0004	.0012	.0011	.0021	1.120
SDev	.0020	.0002	.0010	.0002	.0001	.0369	.028
%RSD	2.957	37.18	268.5	18.18	10.02	1722.	2.485
#1	.0675	-.0007	-.0003	.0014	.0011	-.0239	1.100
#2	.0704	-.0004	.0011	.0011	.0010	.0282	1.139

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0016	.0001	.0425	.0014	-.0002	5.721	7.754
SDev	.0021	.0001	.0143	.0001	.0002	.161	.017
%RSD	135.7	113.2	33.75	6.570	92.83	2.814	.2192
#1	-.0031	.0000	.0323	.0015	-.0004	5.608	7.742
#2	-.0001	.0002	.0526	.0014	-.0001	5.835	7.766

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0018	.0080	-.0018	.0013	-.0020	.5759	-.0018
SDev	.0008	.0038	.0070	.0037	.0074	.0180	.0005
%RSD	43.44	47.33	390.6	281.1	378.4	3.117	30.67
#1	.0013	.0106	-.0068	.0039	-.0072	.5632	-.0014
#2	.0024	.0053	.0032	-.0013	.0033	.5886	-.0021

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.57	-.0051	.0021	.1120	.0003	-.0003	-.0028
SDev	.41	.0014	.0011	.0082	.0001	.0002	.0019
%RSD	.4259	28.19	51.76	7.304	44.92	79.76	69.99
#1	95.86	-.0040	.0013	.1062	.0004	-.0005	-.0041
#2	95.29	-.0061	.0028	.1178	.0002	-.0001	-.0014

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0061	.0003	.0023	-.0630	.0000	.0005
SDev	.0001	.0001	.0001	.0007	.0819	.0002	.0012
%RSD	210.7	1.040	44.95	30.53	130.0	717.7	227.8
#1	-.0001	.0061	.0003	.0018	-.1209	.0002	-.0003
#2	.0000	.0062	.0002	.0028	-.0051	-.0001	.0013

010116

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0003	-.0003	.0002
SDev	.0002	.0002	.0003
%RSD	77.79	53.30	157.0
#1	.0004	-.0004	-.0000
#2	.0001	-.0002	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	826228	10000	--	--	--	--	--
SDev	3520.685	.0000000	--	--	--	--	--
%RSD	.4261157	.0000000	--	--	--	--	--
#1	828717	10000	--	--	--	--	--
#2	823738	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 275588 Operator:
Run Time: 04/13/06 17:59:56
Comment:
Mode: CONC Corr. Factor: 1

010117

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0011	-.0010	-.0010	.0450	.0001	.0000	-.0052
SDev	.0009	.0045	.0011	.0014	.0003	.0000	.0039
%RSD	83.79	459.1	112.2	3.173	171.7	29.34	75.34
#1	-.0005	.0022	-.0002	.0461	.0003	.0000	-.0024
#2	-.0018	-.0042	-.0018	.0440	-.0000	.0000	-.0079

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0756	-.0002	.0001	.0011	.0013	.0085	1.250
SDev	.0014	.0002	.0014	.0022	.0006	.0127	.010
%RSD	1.803	81.50	2799.	195.7	42.18	150.3	.8059
#1	.0766	-.0001	.0011	.0027	.0017	.0174	1.243
#2	.0746	-.0004	-.0010	-.0004	.0009	-.0005	1.257

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0020	.0001	.0457	.0020	.0004	6.336	8.448
SDev	.0018	.0000	.0073	.0001	.0014	.128	.046
%RSD	86.28	22.17	15.88	2.681	326.8	2.019	.5501
#1	-.0008	.0001	.0508	.0021	.0014	6.245	8.415
#2	-.0033	.0001	.0406	.0020	-.0006	6.426	8.481

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0019	.0077	.0001	.0035	-.0006	.6278	.0035
SDev	.0023	.0018	.0020	.0002	.0000	.0124	.0046
%RSD	122.1	23.36	2241.	5.898	7.219	1.978	134.4
#1	.0035	.0090	-.0013	.0034	-.0007	.6190	.0067
#2	.0003	.0064	.0015	.0037	-.0006	.6366	.0002

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.92	.0010	-.0002	.1180	.0024	.0002	-.0016
SDev	.61	.0025	.0049	.0058	.0008	.0024	.0017
%RSD	.6318	243.5	2901.	4.887	33.85	980.6	107.5
#1	95.50	-.0008	.0033	.1221	.0018	.0020	-.0004
#2	96.35	.0028	-.0036	.1139	.0030	-.0015	-.0028

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0073	.0000	.0002	-.0606	-.0003	.0001
SDev	.0000	.0057	.0004	.0017	.0364	.0011	.0015
%RSD	120.7	77.24	1984.	1127.	60.09	388.5	1997.
#1	-.0000	.0113	.0003	.0014	-.0349	.0005	-.0010
#2	-.0001	.0033	-.0003	-.0011	-.0864	-.0011	.0011

010118

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	-.0004	-.0005
SDev	.0001	.0006	.0017
%RSD	378.4	156.2	329.1
#1	.0001	.0000	.0007
#2	-.0001	-.0009	-.0017

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	829260	10000	--	--	--	--	--
SDev	5183.800	.0000000	--	--	--	--	--
%RSD	.6251112	.0000000	--	--	--	--	--
#1	825595	10000	--	--	--	--	--
#2	832926	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 275589 Operator:
Run Time: 04/13/06 18:04:45
Comment:
Mode: CONC Corr. Factor: 1

010119

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0009	-.0029	-.0026	.0436	.0001	.0001	-.0037
SDev	.0006	.0011	.0014	.0006	.0001	.0000	.0003
%RSD	61.16	39.62	52.83	1.340	36.86	48.03	9.372
#1	-.0005	-.0037	-.0016	.0440	.0002	.0000	-.0034
#2	-.0013	-.0021	-.0035	.0432	.0001	.0001	-.0039

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0750	-.0003	.0013	.0006	.0013	.0329	1.226
SDev	.0005	.0002	.0019	.0005	.0001	.0029	.008
%RSD	.6375	55.60	140.4	88.55	7.997	8.860	.6684
#1	.0747	-.0002	.0026	.0009	.0012	.0308	1.220
#2	.0754	-.0004	.0000	.0002	.0013	.0349	1.231

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0017	.0001	.0475	.0048	.0000	5.916	8.290
SDev	.0002	.0000	.0106	.0001	.0001	.101	.004
%RSD	12.51	2.765	22.40	2.609	41530.	1.705	.0529
#1	-.0016	.0001	.0550	.0049	-.0001	5.987	8.287
#2	-.0019	.0001	.0399	.0047	.0001	5.845	8.293

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0017	.0055	-.0037	.0030	-.0013	.6172	-.0025
SDev	.0001	.0022	.0068	.0034	.0010	.0125	.0031
%RSD	3.332	39.16	182.1	111.2	74.88	2.022	120.8
#1	.0017	.0040	-.0085	.0054	-.0020	.6084	-.0004
#2	.0017	.0071	.0011	.0006	-.0006	.6260	-.0047

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.46	-.0006	.0031	.1124	.0008	.0019	-.0011
SDev	.87	.0009	.0017	.0003	.0000	.0008	.0024
%RSD	.9074	147.6	54.35	.2829	3.226	43.44	224.6
#1	96.08	-.0013	.0043	.1126	.0008	.0025	.0006
#2	94.85	.0000	.0019	.1122	.0008	.0013	-.0027

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0087	.0001	.0016	-.0594	.0003	.0012
SDev	.0000	.0004	.0000	.0056	.0170	.0002	.0042
%RSD	296.0	4.852	28.56	348.5	28.55	90.96	356.5
#1	.0000	.0084	.0001	-.0023	-.0474	.0004	.0042
#2	-.0000	.0090	.0001	.0055	-.0714	.0001	-.0018

010120

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	-.0003	.0001
SDev	.0000	.0002	.0003
%RSD	.5006	69.66	635.6
#1	.0001	-.0001	.0003
#2	.0001	-.0004	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	825307	10000	--	--	--	--	--
SDev	7522.202	.0000000	--	--	--	--	--
%RSD	.9114429	.0000000	--	--	--	--	--
#1	830626	10000	--	--	--	--	--
#2	819988	10000	--	--	--	--	--

Method: DAILY2 Sample Name: zzzzzz Operator:
Run Time: 04/13/06 18:09:31 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	-.0003	-.0081	.0008	-.0006	.0001	-.0000	-.0019
SDev	.0009	.0054	.0012	.0015	.0002	.0000	.0021
%RSD	256.7	66.43	152.6	247.3	123.8	40.35	110.2
#1	.0003	-.0043	-.0001	-.0017	.0000	-.0000	-.0004
#2	-.0009	-.0118	.0016	.0005	.0002	-.0000	-.0033

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0001	-.0007	.0005	.0001	-.0132	-.0073
SDev	.0011	.0003	.0006	.0012	.0010	.0181	.0171
%RSD	165.7	412.9	85.43	217.2	1114.	136.9	232.8
#1	.0001	.0003	-.0003	-.0003	-.0006	-.0004	.0047
#2	-.0015	-.0001	-.0011	.0014	.0008	-.0260	-.0194

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0009	.0000	-.0046	.0001	-.0008	.0276	-.0066
SDev	.0008	.0001	.0011	.0001	.0012	.2628	.0079
%RSD	84.35	177.0	23.66	113.7	144.8	952.1	118.9
#1	-.0004	.0001	-.0038	.0000	-.0017	.2134	-.0011
#2	-.0015	-.0000	-.0054	.0002	.0000	-.1582	-.0122

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0013	.0029	-.0020	.0015	-.0027	.0072	.0015
SDev	.0007	.0101	.0073	.0028	.0027	.0074	.0057
%RSD	53.41	353.8	373.2	189.9	101.8	101.7	384.5
#1	.0008	.0100	.0032	-.0005	-.0008	.0124	-.0025
#2	.0017	-.0043	-.0071	.0035	-.0046	.0020	.0055

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.24	.0015	.0038	-.0025	.0003	.0030	-.0034
SDev	.22	.0041	.0001	.0007	.0006	.0014	.0015
%RSD	.2172	280.0	1.276	29.41	160.2	46.77	45.57
#1	99.09	.0044	.0038	-.0019	.0007	.0040	-.0023
#2	99.40	-.0014	.0037	-.0030	-.0000	.0020	-.0045

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0027	-.0000	.0016	-.0280	-.0004	.0009
SDev	.0000	.0044	.0003	.0005	.0202	.0007	.0000
%RSD	113.6	160.4	2175.	33.07	72.09	178.2	4.316
#1	-.0000	-.0004	-.0002	.0020	-.0137	-.0009	.0008
#2	-.0000	.0058	.0002	.0012	-.0422	.0001	.0009

010122

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	-.0004	-.0001
SDev	.0002	.0001	.0007
%RSD	1465.	15.49	1337.
#1	-.0001	-.0004	-.0006
#2	.0002	-.0004	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	857972	10000	--	--	--	--	--
SDev	1885.147	.0000000	--	--	--	--	--
%RSD	.2197212	.0000000	--	--	--	--	--
#1	856639	10000	--	--	--	--	--
#2	859305	10000	--	--	--	--	--

Method: DAILY2 Sample Name: cri Operator:
Run Time: 04/13/06 18:14:16
Comment:
Mode: CONC Corr. Factor: 1

010123

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0189	.0886	.0205	.0919	.0184	.0099	.0035
SDev	.0001	.0007	.0031	.0008	.0000	.0000	.0047
%RSD	.6421	.8054	15.03	.8611	.2289	.1604	136.3
#1	.0190	.0881	.0184	.0913	.0183	.0099	.0068
#2	.0188	.0891	.0227	.0924	.0184	.0100	.0001
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	.0300		.0300	.1500	.0300	.0150	
Low	.0100		.0100	.0500	.0100	.0050	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0025	.0098	.1010	.0208	.0503	.0925	.0136
SDev	.0022	.0003	.0006	.0006	.0001	.0223	.0218
%RSD	89.36	3.433	.6162	2.953	.0940	24.08	160.5
#1	.0009	.0095	.1006	.0204	.0503	.0767	-.0018
#2	.0040	.0100	.1015	.0213	.0504	.1082	.0290
Errors	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High		.0150	.1500	.0300	.0750	.1500	
Low		.0050	.0500	.0100	.0250	.0500	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0008	.0614	-.0009	.0304	.0180	.3359	-.0078
SDev	.0009	.0003	.0054	.0000	.0009	.2903	.0008
%RSD	111.3	.4195	611.8	.0369	4.794	86.42	9.594
#1	-.0015	.0612	-.0047	.0304	.0187	.1307	-.0073
#2	-.0002	.0616	.0029	.0304	.0174	.5412	-.0084
Errors	NOCHECK	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	NOCHECK
High		.1500		.0450	.0300		
Low		.0500		.0150	.0100		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0815	.0993	.0068	.0095	.0042	.0129	.1248
SDev	.0025	.0029	.0007	.0014	.0050	.0017	.0043
%RSD	3.046	2.904	10.45	14.40	117.4	13.05	3.423
#1	.0798	.0973	.0073	.0105	.0007	.0140	.1217
#2	.0833	.1013	.0063	.0085	.0078	.0117	.1278
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	.1200	.1500					.1800
Low	.0400	.0500					.0600

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

010124

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.61	.0100	.0120	.0947	.0086	.0114	.0914
SDev	.81	.0003	.0008	.0019	.0011	.0006	.0028
%RSD	.8360	2.799	6.493	2.038	13.33	5.402	3.103
#1	97.18	.0102	.0126	.0933	H.0094	.0118	.0894
#2	96.03	.0098	.0115	.0960	.0078	.0109	.0934
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.1500	.0090	.0150	.1500
Low				.0500	.0030	.0050	.0500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0185	.0035	.0174	.0236	.1503	.0991	-.0001
SDev	.0000	.0002	.0001	.0005	.0384	.0006	.0022
%RSD	.0006	6.996	.4751	2.143	25.53	.5735	1851.
#1	.0185	.0033	.0174	.0233	.1232	.0995	.0014
#2	.0185	.0037	.0175	.0240	.1775	.0987	-.0017
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	LC Pass	NOCHECK
High	.0300		.0300	.0300		.1500	
Low	.0100		.0100	.0100		.0500	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0405	.0954
SDev	.0001	.0002	.0010
%RSD	72.10	.5268	1.006
#1	.0000	.0404	.0948
#2	.0001	.0407	.0961
Errors	NOCHECK	LC Pass	NOCHECK
High		.0600	
Low		.0200	

010125

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	835193	10000	--	--	--	--	--
SDev	7008.842	.0000000	--	--	--	--	--
%RSD	.8391883	.0000000	--	--	--	--	--
#1	840149	10000	--	--	--	--	--
#2	830237	10000	--	--	--	--	--

Analysis Report 04/13/06 06:23:36 PM

Method: DAILY2 Sample Name: icsa Operator:
Run Time: 04/13/06 18:19:02
Comment:
Mode: CONC Corr. Factor: 1

010126

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0016	509.8	-.0014	-.0182	.0026	.0002	-.0049
SDev	.0007	1.4	.0011	.0003	.0002	.0000	.0014
%RSD	42.60	.2652	79.46	1.542	8.918	3.199	27.51
#1	-.0021	510.8	-.0006	-.0184	.0027	.0002	-.0059
#2	-.0011	508.9	-.0021	-.0180	.0024	.0002	-.0040
Errors	NOCHECK	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High		600.0					
Low		400.0					

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	465.1	.0056	-.0002	-.0002	.0030	188.6	.0236
SDev	.3	.0003	.0005	.0016	.0010	.4	.0075
%RSD	.0627	5.034	248.5	1066.	32.02	.2013	31.90
#1	465.3	.0054	-.0006	.0010	.0037	188.9	.0182
#2	464.9	.0058	.0002	-.0013	.0023	188.4	.0289
Errors	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass	NOCHECK
High	600.0					240.0	
Low	400.0					160.0	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	.0003	532.3	.0068	-.0011	.6347	.0073
SDev	.0007	.0000	.5	.0000	.0026	.1323	.0083
%RSD	17.16	4.882	.0934	.0367	236.0	20.84	113.1
#1	.0036	.0003	532.7	.0068	-.0030	.7282	.0015
#2	.0046	.0004	532.0	.0068	.0007	.5412	.0132
Errors	NOCHECK	NOCHECK	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High			600.0				
Low			400.0				

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0035	-.0126	.0361	-.0167	.0010	.0189	-.0031
SDev	.0000	.0035	.0004	.0035	.0050	.0083	.0106
%RSD	.6550	27.33	1.152	21.18	527.9	43.68	341.0
#1	.0036	-.0102	.0364	-.0192	-.0026	.0248	-.0106
#2	.0035	-.0151	.0358	-.0142	.0045	.0131	.0044
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

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

010127

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	88.37	.0065	-.0023	.0622	.0009	.0006	-.0050
SDev	.92	.0032	.0035	.0027	.0022	.0034	.0035
%RSD	1.045	49.58	152.0	4.413	237.2	561.4	69.92
#1	87.72	.0087	.0002	.0602	-.0006	.0030	-.0025
#2	89.02	.0042	-.0048	.0641	.0025	-.0018	-.0074
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0162	-.0397	-.0010	.0008	-.0256	-.0021	.0072
SDev	.0000	.0013	.0001	.0027	.0306	.0013	.0016
%RSD	.0454	3.375	15.00	354.3	119.4	61.08	22.63
#1	.0162	-.0388	-.0009	-.0012	-.0472	-.0012	.0060
#2	.0162	-.0407	-.0011	.0027	-.0040	-.0030	.0083
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0006	.0081	.0000
SDev	.0002	.0004	.0008
%RSD	36.40	4.604	1972.
#1	-.0004	.0084	.0006
#2	-.0007	.0079	-.0005
Errors	NOCHECK	NOCHECK	NOCHECK
High			
Low			

010128

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	763998	10000	--	--	--	--	--
SDev	7937.273	.0000000	--	--	--	--	--
%RSD	1.038914	.0000000	--	--	--	--	--
#1	758385	10000	--	--	--	--	--
#2	769610	10000	--	--	--	--	--

Analysis Report 04/13/06 06:28:22 PM

Method: DAILY2 Sample Name: icsab Operator: 010129
Run Time: 04/13/06 18:23:48
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.103	514.0	1.045	1.025	.5410	.4910	-.0004
SDev	.001	.6	.001	.005	.0013	.0003	.0035
%RSD	.1352	.1118	.1309	.4756	.2447	.0681	852.8
#1	1.102	513.6	1.046	1.022	.5401	.4913	.0021
#2	1.104	514.4	1.044	1.029	.5420	.4908	-.0029
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	1.200	600.0	1.200	1.200	.6000	.6000	
Low	.8000	400.0	.8000	.8000	.4000	.4000	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	469.4	.9712	.4943	.4974	.5638	190.5	.0361
SDev	2.4	.0019	.0003	.0002	.0037	.3	.0519
%RSD	.5028	.2003	.0512	.0425	.6478	.1554	143.5
#1	471.1	.9699	.4945	.4973	.5613	190.7	.0728
#2	467.8	.9726	.4941	.4976	.5664	190.2	-.0005
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	600.0	1.200	.6000	.6000	.6000	240.0	
Low	400.0	.8000	.4000	.4000	.4000	160.0	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0048	H1.220	540.2	.5088	1.018	.9753	.0049
SDev	.0011	.006	.9	.0002	.002	.5082	.0049
%RSD	23.48	.5257	.1696	.0445	.1482	52.11	101.2
#1	.0056	H1.215	539.6	.5086	1.017	1.335	.0084
#2	.0040	H1.224	540.9	.5090	1.019	.6159	.0014
Errors	NOCHECK	LC High	LC Pass	LC Pass	LC Pass	NOCHECK	NOCHECK
High		1.200	600.0	.6000	1.200		
Low		.8000	400.0	.4000	.8000		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9537	1.027	1.037	.9685	.0063	.0068	1.040
SDev	.0002	.021	.018	.0073	.0086	.0091	.023
%RSD	.0202	2.045	1.718	.7589	136.7	133.8	2.214
#1	.9538	1.013	1.049	.9633	.0124	.0004	1.024
#2	.9536	1.042	1.024	.9737	.0002	.0132	1.056
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	1.200	1.200					1.200
Low	.8000	.8000					.8000

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

010130

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	89.06	1.039	1.003	1.106	.9913	1.015	1.009
SDev	1.07	.015	.016	.002	.0010	.006	.000
%RSD	1.197	1.442	1.574	.1675	.1047	.5445	.0094
#1	88.30	1.050	.9916	1.107	.9920	1.011	1.009
#2	89.81	1.029	1.014	1.105	.9905	1.019	1.010
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High					1.200	1.200	1.200
Low					.8000	.8000	.8000

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.062	-.0273	.9701	.9997	1.018	.4985	.0050
SDev	.003	.0044	.0015	.0127	.043	.0003	.0064
%RSD	.2945	15.94	.1518	1.276	4.209	.0513	128.7
#1	1.059	-.0304	.9691	.9906	1.048	.4983	.0004
#2	1.064	-.0243	.9711	1.009	.9875	.4987	.0095
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	LC Pass	NOCHECK
High	1.200		1.200	1.200		.6000	
Low	.8000		.8000	.8000		.4000	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0003	.9584	.9487
SDev	.0001	.0050	.0017
%RSD	30.83	.5171	.1751
#1	-.0002	.9619	.9475
#2	-.0004	.9549	.9499
Errors	NOCHECK	LC Pass	NOCHECK
High		1.200	
Low		.8000	

010131

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	769898	10000	--	--	--	--	--
SDev	9270.877	.0000000	--	--	--	--	--
%RSD	1.204170	.0000000	--	--	--	--	--
#1	763342	10000	--	--	--	--	--
#2	776453	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccv3 Operator:
Run Time: 04/13/06 18:28:34
Comment:
Mode: CONC Corr. Factor: 1

010132

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9942	9.946	5.051	4.956	10.09	.9837	5.041
SDev	.0001	.006	.009	.013	.02	.0029	.001
%RSD	.0082	.0562	.1720	.2711	.2298	.3002	.0206
#1	.9941	9.942	5.045	4.947	10.08	.9858	5.042
#2	.9942	9.950	5.057	4.966	10.11	.9816	5.040
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1.100	11.00	5.500	5.500	11.00	1.100	5.500
Low	.9000	9.000	4.500	4.500	9.000	.9000	4.500

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.16	.9995	5.103	1.993	2.051	10.13	18.58
SDev	.05	.0043	.019	.003	.003	.02	.08
%RSD	.2599	.4343	.3734	.1511	.1366	.1518	.4387
#1	20.19	1.003	5.116	1.996	2.050	10.14	18.53
#2	20.12	.9964	5.089	1.991	2.053	10.12	18.64
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.997	4.764	20.04	1.021	4.986	28.37	H43.59
SDev	.001	.006	.01	.002	.012	.42	.06
%RSD	.0200	.1216	.0565	.2333	.2484	1.476	.1433
#1	4.996	4.760	20.05	1.023	4.995	28.07	H43.54
#2	4.998	4.768	20.04	1.019	4.978	28.66	H43.63
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	5.500	5.500	22.00	1.100	5.500	33.00	33.00
Low	4.500	4.500	18.00	.9000	4.500	27.00	27.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.968	5.121	5.006	4.932	1.039	1.009	1.015
SDev	.016	.002	.034	.047	.001	.007	.001
%RSD	.3137	.0410	.6857	.9586	.1424	.6846	.0697
#1	4.979	5.120	5.030	4.966	1.040	1.014	1.014
#2	4.957	5.123	4.982	4.899	1.038	1.004	1.015
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

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

010133

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.95	5.218	5.098	5.060	4.957	5.138	4.963
SDev	.88	.046	.024	.003	.043	.031	.004
%RSD	.9029	.8793	.4625	.0609	.8668	.6036	.0760
#1	96.33	5.251	5.115	5.063	4.987	5.160	4.966
#2	97.57	5.186	5.081	5.058	4.927	5.116	4.960
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.062	.9861	4.818	5.195	1.059	4.962	1.043
SDev	.001	.0051	.005	.005	.013	.006	.003
%RSD	.0154	.5201	.1035	.1037	1.193	.1211	.2811
#1	5.063	.9897	4.822	5.199	1.050	4.966	1.045
#2	5.061	.9825	4.815	5.191	1.068	4.958	1.041
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	5.065	1.021	4.851
SDev	.000	.005	.004
%RSD	.0087	.5250	.0873
#1	5.065	1.025	4.854
#2	5.065	1.017	4.848
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

010134

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	838122	10000	--	--	--	--	--
SDev	7531.395	.0000000	--	--	--	--	--
%RSD	.8986041	.0000000	--	--	--	--	--
#1	832796	10000	--	--	--	--	--
#2	843447	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccb3 Operator:
Run Time: 04/13/06 18:33:23
Comment:
Mode: CONC Corr. Factor: 1

010135

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0011	-.0119	.0029	.0063	.0003	-.0000	-.0044
SDev	.0004	.0083	.0011	.0011	.0002	.0000	.0026
%RSD	40.71	69.93	38.74	17.58	86.21	32.20	59.58
#1	-.0014	-.0178	.0037	.0071	.0004	-.0000	-.0062
#2	-.0008	-.0060	.0021	.0055	.0001	-.0000	-.0025
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	-.0002	-.0002	-.0013	.0001	.0007	-.0228	-.0075
SDev	.0012	.0001	.0004	.0001	.0000	.0117	.0097
%RSD	558.9	68.03	33.87	98.20	4.351	51.27	128.7
#1	-.0011	-.0003	-.0016	.0001	.0007	-.0310	-.0144
#2	.0006	-.0001	-.0010	.0000	.0006	-.0145	-.0007
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0500	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0500	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0009	.0001	-.0077	.0000	.0020	L-.1468	.0012
SDev	.0011	.0000	.0043	.0000	.0023	.1757	.0023
%RSD	121.1	12.38	56.32	447.0	114.9	119.7	193.0
#1	-.0017	.0001	-.0107	.0000	.0037	L-.2710	-.0004
#2	-.0001	.0001	-.0046	-.0000	.0004	-.0226	.0029
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	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	.0003	H.0127	-.0055	.0059	-.0036	-.0072	-.0001
SDev	.0001	.0001	.0002	.0029	.0035	.0029	.0040
%RSD	46.87	1.184	3.178	49.31	98.51	40.06	4397.
#1	.0003	H.0126	-.0054	.0079	L-.0061	-.0052	-.0029
#2	.0002	H.0128	-.0057	.0038	-.0011	-.0093	.0028
Errors	LC Pass	LC High	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

010136

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.66	-.0071	.0023	-.0012	.0021	-.0008	-.0026
SDev	.88	.0053	.0017	.0046	.0020	.0007	.0014
%RSD	.8868	75.05	73.41	389.1	96.07	78.96	53.34
#1	100.3	-.0109	.0035	-.0045	.0035	-.0013	-.0036
#2	99.04	-.0033	.0011	.0021	.0007	-.0004	-.0016
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0050	.0050	.0050
Low				-.0100	-.0050	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0037	.0001	.0036	-.0415	.0001	.0026
SDev	.0000	.0014	.0001	.0002	.0337	.0003	.0024
%RSD	207.5	36.14	84.54	5.197	81.15	215.7	93.42
#1	.0000	.0028	.0002	.0037	-.0653	-.0001	.0044
#2	-.0000	.0047	.0001	.0035	-.0177	.0003	.0009
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	-.0000	-.0002
SDev	.0001	.0001	.0001
%RSD	103.4	283.4	56.44
#1	.0002	-.0001	-.0002
#2	.0000	.0000	-.0001
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010137

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	861600	10000	--	--	--	--	--
SDev	7615.540	.0000000	--	--	--	--	--
%RSD	.8838835	.0000000	--	--	--	--	--
#1	866985	10000	--	--	--	--	--
#2	856215	10000	--	--	--	--	--

☐ 200.7 TAP No. 01-0406-028 Rev3/Jan06

☑ 6010B TAP No. 01-0406-130 Rev5/Jan06

☐ Other_____

QC STD. ID's	
CCV	06003
CRI	
ICSA	
ICSAB	06003

ICP CAL.STD. ID's	
Std0	06003
Std1	06003
Std2	
Std3	
Std4	
Std5	
Std6	

010138

K Na

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.222	Div 20	06033039	4-14-06	Water	64 049

INSTRUMENT: Spectro FILENAME: 060414A

4-14-06

File converted to wsl? ☐

EVOLUTION by Micro-Active Australia Pty Ltd 11:00:26 AM April 14, 2006

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BACKGROUND CORRECTED INTENSITIES
Identity 1 : BLK SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 10:54:04 AM April 14, 2006

	K 766	Li670	Na589	Sc361
# 1	36.5	-7.0	124.0	3398.5
# 2	30.5	-23.0	126.0	3395.5
Mean	33.5	-15.0	125.0	3397.0
SD	4.2	11.3	1.4	2.1
%RSD	12.7	75.4	1.1	0.1

INTENSITIES
Identity 1 : BLK SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 10:54:04 AM April 14, 2006

	K 766	Li670	Na589	Sc361
# 1	0.0	-0.0	0.0	3398.5
# 2	0.0	-0.0	0.0	3395.5
Mean	0.0	-0.0	0.0	3397.0
SD	0.0	0.0	0.0	2.1
%RSD	12.6	75.5	1.2	0.1

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP STD1 SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 10:57:06 AM April 14, 2006

	K 766	Li670	Na589
# 1	3396.5	20902.0	18997.5
# 2	3353.5	20606.0	18678.5
Mean	3375.0	20754.0	18838.0
SD	30.4	209.3	225.6
%RSD	0.9	1.0	1.2

INTENSITIES
Identity 1 : CLP STD1 SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 10:57:06 AM April 14, 2006

	K 766	Li670	Na589
# 1	1.0	5.9	5.4
# 2	1.0	5.9	5.3
Mean	1.0	5.9	5.4
SD	0.0	0.0	0.0
%RSD	0.0	0.1	0.3

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP CCV SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 11:00:14 AM April 14, 2006

	K 766	Li670	Na589	Sc	Sc361
# 1	1377.0	10459.5	11511.0	3523.0	3523.0
# 2	1388.0	10401.5	11451.0	3497.0	3497.0
Mean	1382.5	10430.5	11481.0	3510.0	3510.0
SD	7.8	41.0	42.4	18.4	18.4
%RSD	0.6	0.4	0.4	0.5	0.5

4/20/06

4-14-06

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 11:00:14 AM April 14, 2006

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EVOLUTION by Micro-Active Australia Pty Ltd 11:06:32 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	20.0489	5.0327	30.3526	3523.000 H	103.7163
# 2	20.3674	5.0420	30.4197	3497.000 H	102.9494
Mean	20.2081	5.0374	30.3862	3510.000 H	103.3328
SD	0.2252	0.0066	0.0474	18.385	0.5422
%RSD	1.1143	0.1304	0.1560	0.524	0.5248

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

Report name	Low limit	Value	High limit
K_766	18.000	20.208	22.000
Li670	4.500	5.037	5.500
Na589	27.000	30.386	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 11:03:18 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	37.0	-15.5	157.0	3645.0	3645.0
# 2	32.0	-2.5	154.0	3570.0	3570.0
Mean	34.5	-9.0	155.5	3607.5	3607.5
SD	3.5	9.2	2.1	53.0	53.0
%RSD	10.2	102.1	1.4	1.5	1.5

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 11:03:18 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.0152	0.0003	0.0590	3645.000 H	107.3146
# 2 L	-0.0473	0.0063	0.0596	3570.000 H	105.1025
Mean L	-0.0160	0.0033	0.0593	3607.500 H	106.2085
SD	0.0442	0.0043	0.0004	53.033	1.5642
%RSD	275.8019	129.5159	0.7236	1.470	1.4727

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

Report name	CRDL	Value	
K_766	0.100	-0.016	
Li670	0.010	0.003	
Na589	0.050	0.059	Contaminated
Sc361	0.000	106.209	

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CRI Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 11:06:20 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	22.0	172.5	105.5	3610.5	3610.5
# 2	27.0	180.5	116.5	3556.5	3556.5
Mean	24.5	176.5	111.0	3583.5	3583.5
SD	3.5	5.7	7.8	38.2	38.2

RSD	14.4	3.2	7.6	1.1	1.1

APPARENT CONCENTRATIONS
Identity 1 : CRI Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 11:06:20 AM April 14, 2006 **010141**
EVOLUTION by Micro-Active Australia Pty Ltd 11:12:56 AM April 14, 2006

		K_766 ppm		Li670 ppm		Na589 ppm		Sc		Sc361 ppm
# 1	L	-0.1983		0.0883	L	-0.0712		3610.500	H	106.2970
# 2	L	-0.1194		0.0934	L	-0.0380		3556.500	H	104.7043
Mean	L	-0.1589		0.0909	L	-0.0546		3583.500	H	105.5007
SD		0.0558		0.0036		0.0235		38.184		1.1262
%RSD		35.0940		3.9186		43.0529		1.066		1.0675

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

Report name	Low limit	Value	High limit
Li670	0.090	0.091	0.110

BACKGROUND CORRECTED INTENSITIES
Identity 1 : ICSA Identity 2 : Type : INTRF
Weight : 1.0000 Volume : 1.00 Printed : 11:09:24 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	26.0	-9.0	199.0	3530.5	3530.5
# 2	35.0	-6.0	192.0	3436.5	3436.5
Mean	30.5	-7.5	195.5	3483.5	3483.5
SD	6.4	2.1	4.9	66.5	66.5
%RSD	20.9	28.3	2.5	1.9	1.9

APPARENT CONCENTRATIONS
Identity 1 : ICSA Identity 2 : Type : INTRF
Weight : 1.0000 Volume : 1.00 Printed : 11:09:24 AM April 14, 2006

		K_766 ppm		Li670 ppm		Na589 ppm		Sc		Sc361 ppm
# 1	L	-0.1314		0.0032		0.1839		3530.500	H	103.9375
# 2		0.0170		0.0045		0.1792		3436.500	H	101.1650
Mean	L	-0.0572		0.0038		0.1815		3483.500	H	102.5512
SD		0.1049		0.0010		0.0033		66.468		1.9604
%RSD		183.4604		25.0426		1.8121		1.908		1.9116

BACKGROUND CORRECTED INTENSITIES
Identity 1 : ICSAB Identity 2 : Type : ICSAB
Weight : 1.0000 Volume : 1.00 Printed : 11:12:28 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	20.5	2171.0	214.0	3485.5	3485.5
# 2	21.5	2137.0	186.0	3415.5	3415.5
Mean	21.0	2154.0	200.0	3450.5	3450.5
SD	0.7	24.0	19.8	49.5	49.5
%RSD	3.4	1.1	9.9	1.4	1.4

APPARENT CONCENTRATIONS
Identity 1 : ICSAB Identity 2 : Type : ICSAB
Weight : 1.0000 Volume : 1.00 Printed : 11:12:28 AM April 14, 2006

		K_766 ppm		Li670 ppm		Na589 ppm		Sc		Sc361 ppm
# 1	L	-0.2094		1.0618		0.2311		3495.500	H	102.6102

# 2	L	-0.1977	1.0653	0.1959	3415.500 H	100.5456
lean	L	-0.1986	1.0641	0.1985	3450.500 H	101.5779
SD		0.0154	0.0034	0.0461	49.497	1.4599
RSD		7.7452	0.3162	23.2228	1.435	1.4372

EVOLUTION by Micro-Active Australia Pty Ltd 11:18:56 AM April 14, 2006

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Checking interference check standard ...
Identity 1 : ICSAB Identity 2 :

Report name	Low limit	Value	High limit
Li670	0.800	1.064	1.200

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 11:15:34 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	1429.0	10624.5	11742.0	3633.5	3633.5
# 2	1391.0	10525.5	11600.0	3582.5	3582.5
lean	1410.0	10575.0	11671.0	3608.0	3608.0
SD	26.9	70.0	100.4	36.1	36.1
RSD	1.9	0.7	0.9	1.0	1.0

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 11:15:34 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	20.1765	4.9568	30.0164	3633.500 H	106.9754
# 2	19.9129	4.9805	30.0762	3582.500 H	105.4712
lean	20.0447	4.9686	30.0463	3608.000 H	106.2233
SD	0.1864	0.0167	0.0423	36.062	1.0636
RSD	0.9297	0.3370	0.1408	1.000	1.0013

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

Report name	Low limit	Value	High limit
K_766	18.000	20.045	22.000
Li670	4.500	4.969	5.500
Na589	27.000	30.046	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 11:18:38 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	6.5	-23.0	141.0	3686.0	3686.0
# 2	15.5	-15.0	155.0	3640.0	3640.0
lean	11.0	-19.0	148.0	3663.0	3663.0
SD	6.4	5.7	9.9	32.5	32.5
RSD	57.9	29.8	6.7	0.9	0.9

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 11:18:38 AM April 14, 2006

		K_766	Li670	Na589	Sc	Sc361
		ppm	ppm	ppm		ppm
# 1	L	-0.4261 L	-0.0031	0.0137	3686.000 H	108.5238
# 2	L	-0.2949	0.0005	0.0544	3640.000 H	107.1671

ean	L	-0.3605 L	-0.0013	0.0340	3663.000 H	107.8455
D		0.0928	0.0025	0.0288	32.527	0.9594
RSD		25.7502	195.9380	84.5602	0.888	0.8896

VOLUTION by Micro-Active Australia Pty Ltd 11:28:00 AM April 14, 2006

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hecking calibration blank ...
dentity 1 : Calibration blank Identity 2 :

eport name	CRDL	Value	
_766	0.100	-0.361	Contaminated
i670	0.010	-0.001	
a589	0.050	0.034	
c361	0.000	107.845	

ACKGROUND CORRECTED INTENSITIES
dentity 1 : pbw-D13H2 Identity 2 : 64-049 Type : SAMPLE
eight : 1.0000 Volume : 1.00 Printed : 11:21:42 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	25.0	-10.0	182.5	3497.0	3497.0
# 2	24.0	-7.0	173.5	3464.0	3464.0
ean	24.5	-8.5	178.0	3480.5	3480.5
D	0.7	2.1	6.4	23.3	23.3
RSD	2.9	25.0	3.6	0.7	0.7

PPARENT CONCENTRATIONS
dentity 1 : pbw-D13H2 Identity 2 : 64-049 Type : SAMPLE
eight : 1.0000 Volume : 1.00 Printed : 11:21:42 AM April 14, 2006

		K_766	Li670	Na589	Sc	Sc361
		ppm	ppm	ppm		ppm
# 1	L	-0.1427	0.0026	0.1446	3497.000 H	102.9494
# 2	L	-0.1544	0.0041	0.1249	3464.000 H	101.9761
ean	L	-0.1485	0.0033	0.1347	3480.500 H	102.4628
D		0.0082	0.0010	0.0140	23.335	0.6882
RSD		5.5252	30.0246	10.3600	0.670	0.6717

ACKGROUND CORRECTED INTENSITIES
dentity 1 : lcsw-D13H2 Identity 2 : 64-049 Type : SAMPLE
eight : 1.0000 Volume : 1.00 Printed : 11:24:46 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	1419.5	-10.0	7826.5	3542.0	3542.0
# 2	1395.5	-10.0	7711.5	3481.0	3481.0
ean	1407.5	-10.0	7769.0	3511.5	3511.5
D	17.0	0.0	81.3	43.1	43.1
RSD	1.2	0.0	1.0	1.2	1.2

PPARENT CONCENTRATIONS
dentity 1 : lcsw-D13H2 Identity 2 : 64-049 Type : SAMPLE
eight : 1.0000 Volume : 1.00 Printed : 11:24:46 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	20.5700	0.0027	20.4146	3542.000 H	104.2767
# 2	20.5767	0.0026	20.4680	3481.000 H	102.4775
ean	20.5734	0.0027	20.4413	3511.500 H	103.3771
D	0.0048	0.0001	0.0378	43.134	1.2722
RSD	0.0232	2.2316	0.1847	1.228	1.2306

ACKGROUND CORRECTED INTENSITIES
dentity 1 : 276580 Identity 2 : 64-049 Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 11:27:48 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	258.5	-5.5	5923.5	3569.5	3569.5
# 2	258.5	-25.5	5823.5	3514.5	3514.5

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Mean	258.5	-15.5	5873.5	3542.0	3542.0
SD	0.0	14.1	70.7	38.9	38.9
%RSD	0.0	91.2	1.2	1.1	1.1

APPARENT CONCENTRATIONS
Identity 1 : 276580 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:27:48 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.2919	0.0049	15.2457	3569.500 H	105.0877
# 2	3.3515 L	-0.0048	15.2224	3514.500 H	103.4656
Mean	3.3217	0.0000	15.2340	3542.000 H	104.2767
SD	0.0422	0.0068	0.0165	38.891	1.1471
%RSD	1.2695	23201.0375	0.1083	1.098	1.1000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276580d Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:30:54 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	263.0	-22.0	5823.0	3598.0	3598.0
# 2	276.0	-16.0	5696.0	3499.0	3499.0
Mean	269.5	-19.0	5759.5	3548.5	3548.5
SD	9.2	4.2	89.8	70.0	70.0
%RSD	3.4	22.3	1.6	2.0	2.0

APPARENT CONCENTRATIONS
Identity 1 : 276580d Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:30:54 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.3275 L	-0.0029	14.8598	3598.000 H	105.9283
# 2	3.6319 L	-0.0003	14.9490	3499.000 H	103.0084
Mean	3.4797 L	-0.0016	14.9044	3548.500 H	104.4684
SD	0.2152	0.0018	0.0631	70.004	2.0647
%RSD	6.1845	117.4832	0.4232	1.973	1.9764

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276580s Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:33:58 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	1673.5	-20.5	13535.5	3602.0	3602.0
# 2	1647.5	-33.5	13382.5	3554.0	3554.0
Mean	1660.5	-27.0	13459.0	3578.0	3578.0
SD	18.4	9.2	108.2	33.9	33.9
%RSD	1.1	34.0	0.8	0.9	0.9

APPARENT CONCENTRATIONS
Identity 1 : 276580s Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:33:58 AM April 14, 2006

	K 766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	23.9294 L	-0.0022	34.9600	3602.000 H	106.0463
# 2	23.8746 L	-0.0085	35.0324	3554.000 H	104.6306

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Mean	23.9020 L	-0.0053	34.9962	3578.000 H	105.3384
SD	0.0387	0.0045	0.0512	33.941	1.0011
%RSD	0.1620	84.0235	0.1462	0.949	0.9503

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276581 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:37:02 AM April 14, 2006

	K 766	Li670	Na589	Sc	Sc361
# 1	167.0	-21.0	925.0	3526.0	3526.0
# 2	147.0	-33.0	943.0	3495.0	3495.0
Mean	157.0	-27.0	934.0	3510.5	3510.5
SD	14.1	8.5	12.7	21.9	21.9
%RSD	9.0	31.4	1.4	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : 276581 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:37:02 AM April 14, 2006

	K 766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	1.9734 L	-0.0026	2.1190	3526.000 H	103.8047
# 2	1.6943 L	-0.0085	2.1893	3495.000 H	102.8904
Mean	1.8339 L	-0.0056	2.1542	3510.500 H	103.3476
SD	0.1973	0.0042	0.0497	21.920	0.6465
%RSD	10.7586	75.0838	2.3060	0.624	0.6256

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276582 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:40:06 AM April 14, 2006

	K 766	Li670	Na589	Sc	Sc361
# 1	151.5	-21.0	2996.0	3550.0	3550.0
# 2	156.5	-17.0	3003.0	3501.0	3501.0
Mean	154.0	-19.0	2999.5	3525.5	3525.5
SD	3.5	2.8	4.9	34.6	34.6
%RSD	2.3	14.9	0.2	1.0	1.0

APPARENT CONCENTRATIONS
Identity 1 : 276582 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:40:06 AM April 14, 2006

	K 766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	1.7268 L	-0.0025	7.5835	3550.000 H	104.5126
# 2	1.8333 L	-0.0007	7.7132	3501.000 H	103.0674
Mean	1.7801 L	-0.0016	7.6483	3525.500 H	103.7900
SD	0.0754	0.0013	0.0918	34.648	1.0219
%RSD	4.2339	77.2552	1.1997	0.983	0.9846

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276583 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:43:10 AM April 14, 2006

	K 766	Li670	Na589	Sc	Sc361

# 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
# 2	144.0	-26.0	2883.5	3498.0	3498.0
Mean	149.0	-24.5	2900.5	3511.0	3511.0
SD	7.1	2.1	24.0	18.4	18.4

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%RSD	4.7	8.7	0.8	0.5	0.5

APPARENT CONCENTRATIONS
Identity 1 : 276583 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:43:10 AM April 14, 2006

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	1.7807 L	-0.0036	7.4327	3524.000 H	103.7458
# 2	1.6473 L	-0.0051	7.3992	3498.000 H	102.9789
Mean	1.7140 L	-0.0043	7.4159	3511.000 H	103.3623
SD	0.0943	0.0011	0.0237	18.385	0.5422
%RSD	5.5010	24.9891	0.3195	0.524	0.5246

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276584 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:46:16 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	142.0	-24.5	2931.5	3544.0	3544.0
# 2	150.0	-26.5	2919.5	3504.0	3504.0
Mean	146.0	-25.5	2925.5	3524.0	3524.0
SD	5.7	1.4	8.5	28.3	28.3
%RSD	3.9	5.5	0.3	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : 276584 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:46:16 AM April 14, 2006

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	1.5895 L	-0.0042	7.4259	3544.000 H	104.3356
# 2	1.7337 L	-0.0053	7.4824	3504.000 H	103.1559
Mean	1.6616 L	-0.0048	7.4542	3524.000 H	103.7458
SD	0.1020	0.0008	0.0400	28.284	0.8342
%RSD	6.1370	16.2777	0.5364	0.803	0.8041

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276585 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:49:18 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	133.5	-34.0	2913.5	3560.5	3560.5
# 2	137.5	-28.0	2839.5	3488.5	3488.5
Mean	135.5	-31.0	2876.5	3524.5	3524.5
SD	2.8	4.2	52.3	50.9	50.9
%RSD	2.1	13.7	1.8	1.4	1.4

APPARENT CONCENTRATIONS
Identity 1 : 276585 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 11:49:18 AM April 14, 2006

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	1.4541 L	-0.0087	7.3424	3560.500 H	104.8223

# 2	1.5352 L	-0.0061	7.2815	3485.500 H	102.6937
Mean	1.5046 L	-0.0074	7.3221	3524.500 H	103.7605
SD	0.0715	0.0018	0.0287	50.912	1.5016
%RSD	4.7493	24.6291	0.3923	1.445	1.4472

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BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 11:52:22 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	1416.0	10613.5	11758.0	3646.5	3646.5
# 2	1385.0	10354.5	11519.0	3553.5	3553.5
Mean	1400.5	10484.0	11638.5	3600.0	3600.0
SD	21.9	183.1	169.0	65.8	65.8
%RSD	1.6	1.7	1.5	1.8	1.8

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 11:52:22 AM April 14, 2006

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.9151	4.9340	29.9494	3646.500 H	107.3588
# 2	19.9908	4.9396	30.1103	3553.500 H	104.6158
Mean	19.9530	4.9368	30.0298	3600.000 H	105.9873
SD	0.0535	0.0039	0.1138	65.761	1.9396
%RSD	0.2684	0.0797	0.3790	1.827	1.8300

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

Report name	Low limit	Value	High limit
K_766	18.000	19.953	22.000
Li670	4.500	4.937	5.500
Na589	27.000	30.030	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 11:56:26 AM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	22.5	-19.5	149.5	3664.5	3664.5
# 2	33.5	-18.5	155.5	3605.5	3605.5
Mean	28.0	-19.0	152.5	3635.0	3635.0
SD	7.8	0.7	4.2	41.7	41.7
%RSD	27.8	3.7	2.8	1.1	1.1

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 11:56:26 AM April 14, 2006

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 L	-0.1958 L	-0.0015	0.0376	3664.500 H	107.8897
# 2 L	-0.0300 L	-0.0012	0.0595	3605.500 H	106.1495
Mean L	-0.1129 L	-0.0014	0.0485	3635.000 H	107.0196

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SD	0.1173	0.0002	0.0155	41.719	1.2305
%RSD	103.8392	16.5998	31.9188	1.148	1.1438

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

Report name	CRDL	Value	
K 766	0.100	-0.113	Contaminated
Li670	0.010	-0.001	

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Na589	0.050	0.049
Sc361	0.000	107.020

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276586 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 12:00:30 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	139.5	-15.5	3197.0	3544.0	3544.0
# 2	155.5	-7.5	3066.0	3477.0	3477.0
Mean	147.5	-11.5	3131.5	3510.5	3510.5
SD	11.3	5.7	92.6	47.4	47.4
%RSD	7.7	49.2	3.0	1.3	1.3

APPARENT CONCENTRATIONS
Identity 1 : 276586 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 12:00:30 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	1.5524	0.0001	8.1297	3544.000 H	104.3356
# 2	1.8344	0.0038	7.9391	3477.000 H	102.3595
Mean	1.6934	0.0019	8.0344	3510.500 H	103.3476
SD	0.1994	0.0027	0.1348	47.376	1.3973
%RSD	11.7779	136.2492	1.6780	1.350	1.3521

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276587 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 12:03:36 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	138.0	-24.5	2895.0	3572.0	3572.0
# 2	148.0	-27.5	2856.0	3466.0	3466.0
Mean	143.0	-26.0	2875.5	3519.0	3519.0
SD	7.1	2.1	27.6	75.0	75.0
%RSD	4.9	8.2	1.0	2.1	2.1

APPARENT CONCENTRATIONS
Identity 1 : 276587 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 12:03:36 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	1.5141 L	-0.0041	7.2690	3572.000 H	105.1615
# 2	1.7280 L	-0.0060	7.3961	3466.000 H	102.0351
Mean	1.6210 L	-0.0050	7.3325	3519.000 H	103.5983
SD	0.1513	0.0013	0.0899	74.953	3.2167

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276588 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 12:06:44 PM April 14, 2006

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	K_766	Li670	Na589	Sc	Sc361
# 1	148.0	-19.5	3101.5	3543.0	3543.0
# 2	161.0	-29.5	3076.5	3489.0	3489.0
Mean	154.5	-24.5	3089.0	3516.0	3516.0
SD	9.2	7.1	17.7	38.2	38.2
%RSD	5.9	28.9	0.6	1.1	1.1

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APPARENT CONCENTRATIONS
Identity 1 : 276588 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 12:06:44 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	1.6792 L	-0.0018	7.8789	3543.000 H	104.3061
# 2	1.9093 L	-0.0068	7.9389	3489.000 H	102.7135
Mean	1.7943 L	-0.0043	7.9089	3516.000 H	103.5098
SD	0.1627	0.0035	0.0424	38.184	1.1262
%RSD	9.0677	81.3985	0.5362	1.086	1.0880

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 276589 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 12:09:48 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	158.0	-30.5	3068.5	3558.5	3558.5
# 2	143.0	-26.5	3051.5	3522.5	3522.5
Mean	150.5	-28.5	3060.0	3540.5	3540.5
SD	10.6	2.8	12.0	25.5	25.5
%RSD	7.0	9.9	0.4	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : 276589 Identity 2 : 64-049 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 12:09:48 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	1.8175 L	-0.0070	7.7559	3558.500 H	104.7633
# 2	1.6173 L	-0.0053	7.7934	3522.500 H	103.7015
Mean	1.7174 L	-0.0061	7.7747	3540.500 H	104.2324
SD	0.1416	0.0013	0.0265	25.456	0.7508
%RSD	8.2429	20.4060	0.3407	0.719	0.7203

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CRI Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 12:12:50 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	17.0	170.5	181.5	3681.5	3681.5
# 2	23.0	174.5	168.5	3605.5	3605.5
Mean	20.0	172.5	175.0	3643.5	3643.5
SD	4.2	2.8	9.2	53.7	53.7
%RSD	21.2	1.6	5.3	1.5	1.5

APPARENT CONCENTRATIONS
Identity 1 : CRI Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 12:12:50 PM April 14, 2006

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		K_766 ppm	Li670 ppm	Na589 ppm	Sc		Sc361 ppm
# 1	L	-0.2759	0.0859	0.1175	3681.500	H	108.3911
# 2	L	-0.1833	0.0894	0.0934	3605.500	H	106.1495
Mean	L	-0.2296	0.0876	0.1054	3643.500	H	107.2703
SD		0.0655	0.0025	0.0170	53.740		1.5850
%RSD		28.5463	2.8486	16.1737	1.475		1.4776

EVOLUTION by Micro-Active Australia Pty Ltd 12:22:26 PM April 14, 2006

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

Report name	Low limit	Value	High limit	
Li670	0.090	0.088	0.110	Failed

BACKGROUND CORRECTED INTENSITIES
Identity 1 : ICSA Identity 2 : Type : INTRF
Weight : 1.0000 Volume : 1.00 Printed : 12:15:54 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	33.0	-11.0	207.5	3495.0	3495.0
# 2	36.0	-8.0	183.5	3451.0	3451.0
Mean	34.5	-9.5	195.5	3473.0	3473.0
SD	2.1	2.1	17.0	31.1	31.1
%RSD	6.1	22.3	8.7	0.9	0.9

APPARENT CONCENTRATIONS
Identity 1 : ICSA Identity 2 : Type : INTRF
Weight : 1.0000 Volume : 1.00 Printed : 12:15:54 PM April 14, 2006

		K_766 ppm	Li670 ppm	Na589 ppm	Sc		Sc361 ppm
# 1	L	-0.0221	0.0021	0.2121	3495.000	H	102.8904
# 2		0.0300	0.0036	0.1539	3451.000	H	101.5927
Mean		0.0040	0.0028	0.1830	3473.000	H	102.2416
SD		0.0368	0.0010	0.0412	31.113		0.9176
%RSD		929.7885	34.8400	22.5028	0.896		0.8975

BACKGROUND CORRECTED INTENSITIES
Identity 1 : ICSAB Identity 2 : Type : ICSAB
Weight : 1.0000 Volume : 1.00 Printed : 12:19:00 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	28.0	2135.0	226.5	3486.0	3486.0
# 2	29.0	2097.0	193.5	3442.0	3442.0
Mean	28.5	2116.0	210.0	3464.0	3464.0
SD	0.7	26.9	23.3	31.1	31.1
%RSD	2.5	1.3	11.1	0.9	0.9

APPARENT CONCENTRATIONS
Identity 1 : ICSAB Identity 2 : Type : ICSAB
Weight : 1.0000 Volume : 1.00 Printed : 12:19:00 PM April 14, 2006

		K_766 ppm	Li670 ppm	Na589 ppm	Sc		Sc361 ppm
# 1	L	-0.0963	1.0441	0.2647	3486.000	H	102.3250
# 2	L	-0.0756	1.0387	0.1925	3442.000	H	101.3272

ean L	[illegible]	[illegible]	[illegible]	[illegible] H	[illegible]
D	0.0146	0.0038	0.0582	31.113	0.9176
RSD	17.0272	0.3690	26.0185	0.898	0.8999

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Checking interference check standard ...
Identity 1 : ICSAB Identity 2 :

Report name	Low limit	Value	High limit
Li670	0.800	1.041	1.200

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 12:22:04 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
EVOLUTION by Micro-Active Australia Pty Ltd 12:27:54 PM April 14, 2006					
# 1	1395.0	10528.0	11775.0	3625.0	3625.0
# 2	1398.0	10413.0	11663.0	3595.0	3595.0
Mean	1396.5	10470.5	11719.0	3610.0	3610.0
SD	2.1	81.3	79.2	21.2	21.2
%RSD	0.2	0.8	0.7	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 12:22:04 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.7315	4.9233	30.1731	3625.000 H	106.7247
# 2	19.9444	4.9102	30.1351	3595.000 H	105.8398
Mean	19.8379	4.9168	30.1541	3610.000 H	106.2823
SD	0.1505	0.0093	0.0269	21.213	0.6257
%RSD	0.7589	0.1887	0.0892	0.588	0.5887

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

Report name	Low limit	Value	High limit
K_766	18.000	19.838	22.000
Li670	4.500	4.917	5.500
Na589	27.000	30.154	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 12:25:06 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
# 1	30.5	-10.5	179.5	3712.0	3712.0
# 2	30.5	-15.5	176.5	3626.0	3626.0
Mean	30.5	-13.0	178.0	3669.0	3669.0
SD	0.0	3.5	2.1	60.8	60.8
%RSD	0.0	27.2	1.2	1.7	1.7

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 12:25:06 PM April 14, 2006

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1 L	-0.0866	0.0027	0.1086	3712.000 H	109.2907
# 2 L	-0.0763	0.0002	0.1116	3626.000 H	106.7542
Mean L	-0.0814	0.0015	0.1101	3669.000 H	108.0224
SD	0.0073	0.0017	0.0021	60.811	1.7936

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

Report name	CRDL	Value	
K 766	0.100	-0.081	
Li670	0.010	0.001	
Na589	0.050	0.110	Contaminated
Sc361	0.000	108.022	

010153

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 060330-39
SRR: 28901
SDG: 276580
CASE: B. Werling
VTSR: March 30, 2006
PROJECT#: 06002.01.222

Certificates of Analysis

010154

Fisher Scientific

TRACEMETAL GRADE NITRIC ACID
CERTIFICATE OF ANALYSIS

B McKelvey

Dr. B. McKelvey
QA/QC Manager

CATALOG NUMBER: A509
LOT NUMBER: 1105100
RELEASE DATE: October, 2005
EXPIRY DATE: October, 2008

Tests	Maximum Specification	Actual Value	Units
ASSAY (HNO_3, w/w):	67 - 70%	70%	% by w/w
Color:	10	<10	APHA

Analyte	Maximum Specification	Actual Value (in ppb)	Analyte	Maximum Specification	Actual Value (in ppb)
Aluminum (Al)	1 ppb	<0.5	Neodymium (Nd)	0.5 ppb	<0.1
Antimony (Sb)	1 ppb	<0.1	Nickel (Ni)	1 ppb	<0.1
Arsenic (As)	1 ppb	<0.1	Niobium (Nb)	0.5 ppb	<0.1
Barium (Ba)	1 ppb	<0.1	Palladium (Pd)	0.5 ppb	<0.1
Beryllium (Be)	1 ppb	<0.1	Platinum (Pt)	0.5 ppb	<0.1
Bismuth (Bi)	1 ppb	<0.1	Potassium (K)	1 ppb	<0.2
Boron (B)	1 ppb	<0.5	Praseodymium (Pr)	0.5 ppb	<0.1
Cadmium (Cd)	1 ppb	<0.1	Rhenium (Re)	0.5 ppb	<0.1
Calcium (Ca)	1 ppb	<0.5	Rhodium (Rh)	0.5 ppb	<0.1
Cerium (Ce)	0.5 ppb	<0.1	Rubidium (Rb)	0.5 ppb	<0.1
Cesium (Cs)	0.5 ppb	<0.1	Ruthenium (Ru)	0.5 ppb	<0.1
Chromium (Cr)	1 ppb	<0.5	Samarium (Sm)	0.5 ppb	<0.1
Cobalt (Co)	1 ppb	<0.1	Scandium (Sc)	0.5 ppb	<0.1
Copper (Cu)	1 ppb	<0.1	Selenium (Se)	1 ppb	<0.1
Dysprosium (Dy)	0.5 ppb	<0.1	Silver (Ag)	1 ppb	<0.1
Erbium (Er)	0.5 ppb	<0.1	Sodium (Na)	1 ppb	<0.2
Europium (Eu)	0.5 ppb	<0.1	Strontium (Sr)	1 ppb	<0.1
Gadolinium (Gd)	0.5 ppb	<0.1	Tantalum (Ta)	Information Only	<0.1
Gallium (Ga)	0.5 ppb	<0.1	Tellurium (Te)	0.5 ppb	<0.1
Germanium (Ge)	0.5 ppb	<0.1	Terbium (Tb)	0.5 ppb	<0.1
Gold (Au)	0.5 ppb	<0.1	Thallium (Tl)	0.5 ppb	<0.1
Hafnium (Hf)	0.5 ppb	<0.1	Thorium (Th)	1 ppb	<0.1
Holmium (Ho)	0.5 ppb	<0.1	Thulium (Tm)	0.5 ppb	<0.1
Indium (In)	0.5 ppb	<0.1	Tin (Sn)	1 ppb	<0.1
Iron (Fe)	1 ppb	<0.5	Titanium (Ti)	1 ppb	<0.1
Lanthanum (La)	0.5 ppb	<0.1	Tungsten (W)	0.5 ppb	<0.1
Lead (Pb)	1 ppb	<0.1	Uranium (U)	1 ppb	<0.1
Lithium (Li)	1 ppb	<0.1	Vanadium (V)	1 ppb	<0.1
Lutetium (Lu)	0.5 ppb	<0.1	Ytterbium (Yb)	0.5 ppb	<0.1
Magnesium (Mg)	1 ppb	<0.2	Yttrium (Y)	0.5 ppb	<0.1
Manganese (Mn)	1 ppb	<0.1	Zinc (Zn)	1 ppb	<0.2
Mercury (Hg)	1 ppb	<0.2	Zirconium (Zr)	1 ppb	<0.1
Molybdenum (Mo)	1 ppb	<0.1			

Analyte	Maximum Specification	Actual Value (in p pm)	Analyte	Maximum Specification	Actual Value (in p pm)
Chloride (Cl)	0.2 ppm	<0.2	Total Sulfur (S)	0.3 ppm	<0.3
Total Phosphorus (P)	0.01 ppm	<0.01			

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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TRACEMETAL GRADE HYDROCHLORIC ACID
CERTIFICATE OF ANALYSIS

B McKelvey

Dr. B. McKelvey
QA/QC Manager

CATALOG NUMBER: A508
LOT NUMBER: 4105090
RELEASE DATE: October, 2005
EXPIRY DATE: October, 2008

Tests	Maximum Specification	Actual Value	Units
ASSAY (HCl, w/w):	34 - 37%	36%	% by w/w
Color:	10	<10	APHA

Analyte	Maximum Specification	Actual Value (in ppb)	Analyte	Maximum Specification	Actual Value (in ppb)
Aluminum (Al)	1 ppb	<0.5	Neodymium (Nd)	0.5 ppb	<0.1
Antimony (Sb)	1 ppb	<0.1	Nickel (Ni)	1 ppb	<0.1
Arsenic (As)	1 ppb	<0.1	Niobium (Nb)	0.5 ppb	<0.1
Barium (Ba)	1 ppb	<0.1	Palladium (Pd)	Information Only	<0.5
Beryllium (Be)	1 ppb	<0.1	Platinum (Pt)	Information Only	<0.5
Bismuth (Bi)	1 ppb	<0.1	Potassium (K)	1 ppb	<0.1
Boron (B)	1 ppb	<0.5	Praseodymium (Pr)	0.5 ppb	<0.1
Cadmium (Cd)	1 ppb	<0.1	Rhenium (Re)	0.5 ppb	<0.1
Calcium (Ca)	1 ppb	<0.5	Rhodium (Rh)	0.5 ppb	<0.1
Cerium (Ce)	0.5 ppb	<0.1	Rubidium (Rb)	0.5 ppb	<0.1
Cesium (Cs)	0.5 ppb	<0.1	Ruthenium (Ru)	0.5 ppb	<0.1
Chromium (Cr)	1 ppb	<0.1	Samarium (Sm)	0.5 ppb	<0.1
Cobalt (Co)	1 ppb	<0.1	Scandium (Sc)	0.5 ppb	<0.1
Copper (Cu)	1 ppb	<0.1	Selenium (Se)	1 ppb	<0.1
Dysprosium (Dy)	0.5 ppb	<0.1	Silver (Ag)	1 ppb	<0.1
Erbium (Er)	0.5 ppb	<0.1	Sodium (Na)	1 ppb	<0.5
Europium (Eu)	0.5 ppb	<0.1	Strontium (Sr)	1 ppb	<0.1
Gadolinium (Gd)	0.5 ppb	<0.1	Tantalum (Ta)	Information Only	<1
Gallium (Ga)	0.5 ppb	<0.1	Tellurium (Te)	0.5 ppb	<0.1
Gold (Au)	0.5 ppb	<0.1	Terbium (Tb)	0.5 ppb	<0.1
Hafnium (Hf)	0.5 ppb	<0.1	Thallium (Tl)	0.5 ppb	<0.1
Holmium (Ho)	0.5 ppb	<0.1	Thorium (Th)	1 ppb	<0.1
Indium (In)	0.5 ppb	<0.1	Thulium (Tm)	0.5 ppb	<0.1
Iron (Fe)	1 ppb	<0.5	Tin (Sn)	1 ppb	<0.1
Lanthanum (La)	0.5 ppb	<0.1	Titanium (Ti)	1 ppb	<0.1
Lead (Pb)	1 ppb	<0.1	Tungsten (W)	0.5 ppb	<0.1
Lithium (Li)	1 ppb	<0.1	Uranium (U)	1 ppb	<0.1
Lutetium (Lu)	0.5 ppb	<0.1	Vanadium (V)	1 ppb	<0.1
Magnesium (Mg)	1 ppb	<0.5	Ytterbium (Yb)	0.5 ppb	<0.1
Manganese (Mn)	1 ppb	<0.1	Yttrium (Y)	0.5 ppb	<0.1
Mercury (Hg)	1 ppb	<0.2	Zinc (Zn)	1 ppb	<0.5
Molybdenum (Mo)	1 ppb	<0.1	Zirconium (Zr)	1 ppb	<0.1

Analyte	Maximum Specification	Actual Value (in ppm)	Analyte	Maximum Specification	Actual Value (in ppm)
Bromide (Br)	10 ppm	<10	Total Sulphur (S)	0.3 ppm	<0.3
Total Phosphorus (P)	0.01 ppm	<0.01	Free Chlorine (Cl2)	0.5 ppm	<0.5

Element concentrations are at the point of bottling. Concentrations of some elements will increase due to the storage container.
Glass bottles: Al, B, Ca, K, Mg, Mn, Na & Si. Polyethylene bottles: Al, Ca, Fe, Na & Zn.

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SPEXertificate™

Certificate of Reference Material

Catalog Number: ICAL-1 **Lot No.:** 31-66AS
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	5011.87	3109a
K	5,000	5011.80	3141a
Mg	5,000	5020.86	3131a
Na	5,000	4995.13	3152a

Spex Reference Multi: Lot #6-28VY, 6-104VY, 25-178AS-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: DEC. - - 2005 Certifying Officer: N. Kocherlakota

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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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DATE OPENED: 12/28/05
INORG: 5528 PO: F56668

SPECertificate™

Certificate of Reference Material

Catalog Number: SPIKE-1 **Lot No.:** 8-108VY
Description: Spike Sample Standard 1
Matrix: 5% Nitric Acid/Tr-Tart- 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	3101a	Pb	50	49.8	3128
As	200	199	3103a	Sb	50	49.5	3102a
Ba	200	199	3104a	V	50	49.7	3165
Se	200	197	3149	Zn	50	49.4	3168a
TL	200	199	3158	Cu	25	25.4	3114
Fe	100	98.8	3126a	Cr	20	19.8	3112a
Co	50	50.0	3113	Ag	5	4.96	3151
Mn	50	50.0	3132	Be	5	5.00	3105a
Ni	50	49.8	3136	Cd	5	5.00	3108

Spex Reference Multi: Lot # 17-55AS, 19-85AS, 22-93AS.

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: DEC. - - 2005 Certifying Officer: N. Kocherlakota

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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.
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ISO/REMCO N280

Material Source:

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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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CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 DESCRIPTION OF CRM — 1000 µg/mL Scandium in 5% (abs) HNO3

Catalog Number:	CGSC1-1, CGSC1-2, and CGSC1-5
Lot Number:	**Z-SC02067**
Starting Material:	Sc2O3
Starting Material Purity (%):	99.997123
Starting Material Lot No:	BSC-632-1-5736
Matrix:	5% (abs) HNO3

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3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1008 ± 3 µg/mL

Certified Density: 1.039 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 $(\bar{x}) = \frac{\sum x1}{n}$ — $(\bar{x})$ = mean; x1 = individual results; n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s1)2]^{1/2}}{(n)^{1/2}}$ — $\sum s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** — **1005 ± 6 µg/mL**
ICP Assay NIST SRM 3148a Lot Number: 792111

Assay Method #2 — **1008 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

#5709
Page 1 of 4

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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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	< 0.00100	M	Dy	< 0.00595	M	Li	< 0.00992	M	Pr	< 0.00030	M	Te	< 0.02975
M	Sb	< 0.00050	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	0.00072	M	Rh	< 0.00099	M	Tl	< 0.00099
M	Ba	0.00031	M	Gd	< 0.00099	M	Mn	< 0.00397	M	Rb	< 0.00099	M	Th	0.00901
M	Be	< 0.00050	M	Ga	< 0.00099	O	Hg	< 0.01000	M	Ru	< 0.00198	M	Tm	0.00031
M	Bi	< 0.00040	M	Ge	< 0.00595	M	Mo	< 0.00198	M	Sm	< 0.00099	M	Sn	< 0.00496
M	B	< 0.06942	M	Au	< 0.00298	M	Nd	< 0.00198	s	Sc		O	Ti	< 0.00100
M	Cd	< 0.00298	M	Hf	< 0.00198	O	Ni	< 0.00090	M	Se	< 0.00793	M	W	< 0.00992
O	Ca	0.01412	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	< 0.00340	M	U	< 0.00198
M	Ce	< 0.00496	M	In	< 0.00992	n	Os		M	Ag	< 0.00198	M	V	< 0.00198
M	Cs	< 0.00030	M	Ir	< 0.00496	M	Pd	< 0.00496	O	Na	< 0.09000	M	Yb	< 0.00099
O	Cr	< 0.00080	O	Fe	0.00049	n	P		M	Sr	< 0.00050	O	Y	< 0.00100
M	Co	< 0.00298	M	La	< 0.00050	M	Pt	< 0.00198	O	S	< 0.02500	M	Zn	0.00031
O	Cu	< 0.00140	M	Pb	< 0.00298	O	K	< 0.10000	M	Ta	< 0.00694	O	Zr	0.02119

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 - 44.95591; +3; 6; Sc(H2O)6+2

Chemical Compatibility - Soluble in HCl, H2SO4 and HNO3. Avoid HF, H3PO4 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. The fluoride is soluble in excess HF forming ScF63- (not recommended for standard preparations).

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10% HNO3 / LDPE container. Small atomic radius increases hydrolysis requiring higher acid levels than other Rare Earths.

Sc Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H2O / HNO3); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H2O / HCl or HNO3), (Aqua Regia or nitric / perchloric / sulfuric acid digestions can be used. **Exercise caution when using perchloric acid.)**

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)
ICP-OES 335.373 nm	0.004 / 0.00002 µg/mL	1	ion	
ICP-OES 337.215 nm	0.004 / 0.00002 µg/mL	1	ion	Ti, U, Ni, Rh
ICP-OES 424.683 nm	0.003 / 0.00002 µg/mL	1	ion	Ce
ICP-MS 45 amu	2.3 ppt	n/a	M+	16O212CH, 29Si16O, 90Zr+2

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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)

010163

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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 20, 2006

Expiration Date: EXPIRES 1 M 2 D 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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Page 4 of 4

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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 **10000 µg/mL Scandium in 5% (abs) HNO_3**

Catalog Number:	CGSC10-1, CGSC10-2, and CGSC10-5
Lot Number:	**X-SC02061**
Starting Material:	Sc2O3
Starting Material Purity (%):	99.996918
Starting Material Lot No	BSC-632-1-5736
Matrix:	5% (abs) HNO_3

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,007 ± 21 µg/mL

Certified Density: 1.071 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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$\sum S$ = 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** **10,005 ± 26 µg/mL**
ICP Assay NIST SRM 3148a Lot Number: 792111

Assay Method #2 **10,007 ± 21 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/31/05
DATE EXPIRED: 5/1/2006
DATE OPENED: 3/31/05 by
INORG: 5175 PO: 5/1/2006

1 of 4
5175

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	< 0.00100	M	Dy	< 0.00598	M	Li	< 0.00997	M	Pr	< 0.00030	M	Te	< 0.02990
M	Sb	< 0.00050	M	Er	< 0.00498	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	< 0.00030
M	As	< 0.00997	M	Eu	< 0.00299	O	Mg	0.00100	M	Rh	< 0.00100	M	Tl	< 0.00100
M	Ba	< 0.00997	M	Gd	< 0.00100	M	Mn	< 0.00399	M	Rb	< 0.00100	M	Th	0.11759
M	Be	< 0.00050	M	Ga	< 0.00100	O	Hg	< 0.01000	M	Ru	< 0.00199	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00598	M	Mo	< 0.00199	M	Sm	< 0.00100	M	Sn	< 0.00498
M	B	< 0.06976	M	Au	< 0.00299	M	Nd	< 0.00199	s	Sc		O	Ti	< 0.00100
M	Cd	< 0.00299	M	Hf	< 0.00199	O	Ni	< 0.00090	M	Se	< 0.00797	M	W	< 0.00997
O	Ca	0.11500	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	0.02000	M	U	< 0.00199
M	Ce	< 0.00498	M	In	< 0.00997	n	Os		M	Ag	< 0.00199	M	V	< 0.00199
M	Cs	< 0.00030	M	Ir	< 0.00498	M	Pd	< 0.00498	O	Na	< 0.09000	M	Yb	< 0.00100
O	Cr	0.00470	O	Fe	0.00370	n	P		M	Sr	< 0.00050	O	Y	< 0.00100
M	Co	< 0.00299	M	La	< 0.00050	M	Pt	< 0.00199	O	S	< 0.02500	O	Zn	0.00600
O	Cu	< 0.00140	M	Pb	< 0.00299	O	K	< 0.10000	M	Ta	< 0.00698	O	Zr	0.23000

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 - 44.95591; +3; 6; $Sc(H_2O)_6^{+3}$

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. The fluoride is soluble in excess HF forming ScF_6^{3-} (not recommended for standard preparations)

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. Small atomic radius increases hydrolysis requiring higher acid levels than other Rare Earths.

Sc Containing Sample 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), (Aqua Regia or nitric / perchloric / sulfuric acid digestions can be used. **Exercise caution when using perchloric acid.**)

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	335.373 nm	0.004 / 0.00002 µg/mL	1	ion	
ICP-OES	337.215 nm	0.004 / 0.00002 µg/mL	1	ion	Ti, U, Ni, Rh
ICP-OES	424.683 nm	0.003 / 0.00002 µg/mL	1	ion	Ce
ICP-MS	45 amu	2.3 ppt	n/a	M'	$^{16}O_2$, ^{12}CH, $^{29}Si^{16}O$, $^{90}Zr^{+2}$

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)

010167

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 01, 2004

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

4 of 4
5175

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/11/06
DATE EXPIRED: 1/15/07 DR
DATE OPENED: 1/12/06
INORG: 5585 PO: E56675

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLB9-2X/2Y/2T **Lot No.** 11-166B

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: 1004 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 Ammonium Tetraborate, Lot #: 07031A. 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: Titration with Sodium Hydroxide using Phenolphthalein as indicator. Sodium Hydroxide standardized against Potassium Biphthalate NIST SRM #84k

Instrumental Analysis by ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.00 @ 23.7 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

As	0.004	Cu	<0.001	Pb	<0.001
Al	0.10	Fe	0.002	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
Ba	<0.001	In	<0.001	Sr	<0.001
Bi	<0.001	K	<0.01	Sb	<0.001
Be	<0.001	Li	<0.001	Si	0.04
Cr	<0.001	Mn	<0.001	Ti	<0.003
Co	0.002	Mg	v	Tl	<0.001
Cd	<0.001	Mo	<0.001	V	0.003
Ca	<0.001	Ni	<0.001	Zn	<0.01
		Na	0.03	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. [illegible] 2006 Certifying Officer: N. Kocherlakota

© 2004 SPEX CertiPrep, Inc.

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

010170

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLLI2-2X/2Y **Lot No.** 11-120LI

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 relevant to the certified properties listed below.

Certified Value: 1002 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3129a

The CRM is prepared gravimetrically using high purity Lithium Carbonate 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: 1003 mg/L

Method: Evaporate to dryness Fume with Sulfuric Acid. Ignite and weigh as Li2SO4

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.013 @ 24.6 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	<0.001	Cu	0.02	Pb	0.008
Ag	<0.001	Fe	0.04	Rb	<0.001
As	0.06	Ga	<0.001	Re	<0.001
Bi	<0.001	In	<0.001	Sr	0.004
Be	<0.001	K	<0.20	Sb	0.004
B	<0.001	Li	<0.001	Si	<0.100
Ba	0.004	Mg	0.004	Tl	<0.001
Cr	<0.001	Mo	0.007	Ti	<0.001
Co	<0.001	Mn	0.004	V	0.006
Ca	0.012	Ni	<0.001	Zn	0.03
Cd	<0.001	Na	0.100	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.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 8/4/05
DATE EXPIRED: 8/15/06
DATE OPENED: 8/6/05
INORG: S327 PO: 15483

Date of Certification: AUG - 2005 Certifying Officer: N. Kocherlakota

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010171

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.

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SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLMO9-2X/2Y/2T **Lot No.** 11-51MO

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: 1000 mg/L

Uncertainty Associated with Measurement: +/-3.0 mg/L

Certified Value is Traceable to: NIST SRM #3134

The CRM is prepared gravimetrically using high purity (NH4)6(Mo)7(O)24-4H2OLot# 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: 1000 mg/L

Method: Precipitation using 8-Hydroxy Quinoline. Filter, dry, and weigh as MoO2(C9H6NO)2.

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 09989 @23.7 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
As	0.03	Cu	0.003	Pb	<0.001
Ag	<0.002	Fe	0.110	Rb	<0.001
Al	<0.002	Ga	<0.001	Re	0.030
Ba	<0.001	In	<0.001	Sr	<0.001
Be	<0.002	K	0.060	Sb	<0.001
B	<0.007	Li	<0.003	Si	<0.200
Bi	<0.001	Mn	0.002	Ti	0.003
Cd	<0.100	Mg	<0.001	Tl	<0.001
Ca	0.010	Ni	<0.001	V	0.004
Cr	<0.003	Na	<0.002	Zr	<0.001
Co	<0.001			Zn	0.006

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.

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DATE RECEIVED: 8/4/05
DATE EXPIRED: 8/15/06
DATE OPENED: 8/15/05
INORG: 3326 PO: 152083

Date of Certification: AUG - 2005 Certifying Officer: N. Kocherlakota

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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: PLP9-2X/2Y/2T **Lot No.** 11-90P
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 relevant to the certified properties listed below.

Certified Value: 1000 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM #3139a

The CRM is prepared gravimetrically using high purity (NH4)H2(PO4) Lot# 04941I. 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: 999 mg/L

Method: Precipitation using Magnesia Mixture. Filter, ignite and weigh as Mg2P2O7.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.000 @ 24.3 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.001	Cu	<0.001	Pb	<0.001
Ag	<0.009	Fe	0.02	Re	<0.001
Al	0.02	Ga	<0.001	Rb	<0.001
B	<0.002	In	<0.001	Si	0.01
Be	<0.001	K	<0.20	Sb	0.02
Ba	<0.001	Li	<0.001	Sr	<0.001
Bi	<0.001	Mo	0.002	Ti	0.006
Cr	<0.001	Mn	<0.001	Tl	0.003
Ca	0.025	Mg	0.002	V	<0.001
Cd	<0.001	Ni	<0.001	Zn	0.60
Co	<0.001	Na	0.009	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: _____ Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 4/30/05
DATE EXPIRED: 4/30/06
DATE OPENED: 4/30/05
INORG: 5280 PO: 55208

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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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DATE EXPIRED: 2/28/07 DR
DATE OPENED: 2/24/06
INORG: 5669 PO: F56687

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Certificate of Reference Material

Catalog Number: PLSI9-2X/2Y/2T **Lot No.** 11-167SI
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 relevant to the certified properties listed below.

Certified Value: 1003 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM #3150

The CRM is prepared gravimetrically using high purity (NH4)2SiF6 Lot# 08041C. 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 Molybdate and 8-Hydroxy Quinoline. Filter, dry, and weigh as (C9H7ON)4[Si(Mo12O40)]

Instrumental Analysis by ICP spectrometer: 1003 mg/L
Uncertified Properties:

Density: 1.001 @ 23.0 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
As	0.002	Cu	0.002	Pb	<0.001
Al	0.01	Fe	0.01	Rb	<0.001
Ag	<0.002	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Sb	<0.001
Bi	<0.001	K	0.01	Sr	<0.001
Be	<0.002	Li	0.005	Tl	<0.001
Ba	<0.001	Mo	<0.001	Ti	<0.002
Cd	<0.001	Mn	<0.001	V	<0.001
Co	<0.001	Mg	<0.001	Zn	0.90
Cr	<0.001	Ni	0.008	Zr	<0.001
Ca	0.03	Na	0.007		

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. --2006 Certifying Officer: N. Kocherlakota

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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.

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DATE RECEIVED: 2/28/06
DATE EXPIRED: 2/28/2007 DK
DATE OPENED: 2/28/06
INORG: 5681 PO: F56687

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Certificate of Reference Material

Catalog Number: PLTI9-2X/2Y/2T **Lot No.** 11-127TI

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 relevant to the certified properties listed below.

Certified Value: 1002 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3162a

The CRM is prepared gravimetrically using high purity (NH4)2TiF6 Lot# 09971D. 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 Ammonium Hydroxide. Filter, ignite, and weigh as TiO2.

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 0.9980 @ 24.7 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
As	0.002	Cu	0.14	Pb	0.003
Al	0.01	Fe	<0.01	Rb	<0.001
Ag	<0.008	Ga	<0.001	Re	<0.001
Be	<0.001	In	<0.001	Sr	<0.001
Ba	0.003	K	<0.04	Sb	<0.001
Bi	<0.001	Li	<0.001	Si	0.75
B	0.02	Mo	<0.001	Tl	<0.001
Cr	<0.001	Mn	<0.001	V	<0.001
Co	<0.001	Mg	0.008	Zr	0.001
Cd	0.002	Na	0.02	Zn	0.002
Ca	0.02	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: FEB - 2006 Certifying Officer: N. Kocherlakota

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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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Certificate of Reference Material

Catalog Number: PLSR2-2X/2Y/2T **Lot No.** 10-130SR

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 relevant to the certified properties listed below.

Certified Value: 1000 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3153a

The CRM is prepared gravimetrically using high purity Strontium Carbonate Lot# 09031B. 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.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 23.5 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	0.006	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.001	In	<0.001	Si	0.012
Ba	0.02	K	0.20	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	<0.001	Ti	<0.001
Ca	0.016	Mn	<0.001	Tl	<0.001
Cr	0.003	Mo	<0.001	V	0.003
Cd	<0.001	Na	0.004	Zr	
Co	<0.001	Ni	<0.001	Zn	<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.

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DATE EXPIRED: 5/30/06
DATE OPENED: 5/24/05
INORG: 5246 PO: 145158

5246
1 of 2

Date of Certification: MAY - 2005 Certifying Officer: N. Kocherlakota

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010181

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.

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DATE EXPIRED: 10/30/2006 DR
DATE OPENED: 2/28/06
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Certificate of Reference Material

010182

Catalog Number: PLSN5-2X/2Y/2T **Lot No.** 11-155SN

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: 1001 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3161

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: 1002 mg/L

Method: Precipitation using Ammonium Hydroxide. Filter, ignite, and weigh as SnO2.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.041 @ 23.1 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.10	Cu	0.02	Pb	0.02
Ag	0.08	Fe	0.55	Re	<0.001
Al	0.09	Ga	0.002	Rb	<0.001
Bi	0.02	In	<0.01	Si	0.15
Ba	0.01	K	0.30	Sr	0.004
B	0.01	Li	0.007	Sb	0.05
Be	<0.001	Mn	0.01	Ti	0.01
Cr	0.04	Mo	0.01	Tl	0.01
Co	0.04	Mg	0.07	V	<0.10
Cd	0.009	Ni	0.14	Zr	0.01
Ca	0.15	Na	0.09	Zn	2.0

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: _____ Certifying Officer: N. Kocherlakota

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Certificate of Reference Material

Catalog Number: PLBI4-2X/2Y **Lot No.** 11-136BI

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: 1003 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3106

The CRM is prepared gravimetrically using high purity Bismuth Metal Lot# 07931E. 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: 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 @ 25.1 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.001	Cu	<0.001	Pb	0.002
Al	0.002	Fe	0.01	Rb	<0.001
Ag	<0.04	Ga	<0.001	Re	<0.001
B	<0.03	In	<0.001	Sb	<0.001
Ba	<0.001	K	0.01	Si	0.027
Be	<0.002	Li	<0.001	Sr	<0.001
Cr	<0.001	Mo	<0.001	Tl	<0.001
Co	<0.001	Mn	<0.001	Ti	<0.001
Cd	<0.001	Mg	<0.001	V	<0.001
Ca	0.04	Ni	0.002	Zr	<0.001
		Na	0.003	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.

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DATE OPENED: 10/17/05
INORG: 9437 PO: D20050530

Date of Certification: OCT - 2005 Certifying Officer: N. Kocherlakota

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Report of Certification

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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:

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.

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SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLLA2-2X/2Y **Lot No.** 11-32LA

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 relevant to the certified properties listed below.

Certified Value: 1000 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3127a

The CRM is prepared gravimetrically using high purity Lanthanum Oxide Lot# 11901J. 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: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.011 @ 21.8 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.007	Lu	<0.001	Tm	<0.001
Ca	12.00	Mn	<0.003	Ti	0.01
Dy	<0.001	Mo	<0.001	Tl	0.02
Er	<0.001	Nd	<0.001	Ta	<0.001
Eu	<0.001	Ni	<0.003	Tb	<0.001
Fe	0.02	Na	0.08	Th	<0.001
Ga	<0.001	Pr	<0.001	V	<0.001
Gd	<0.10	Rb	<0.001	W	<0.001
Hf	<0.001	Sc	0.003	Yb	<0.001
Ho	<0.001	Sm	<0.001	Y	0.003
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.

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DATE RECEIVED: 8/4/05
DATE EXPIRED: 8/15/06
DATE OPENED: 8/5/05
INORG: S325 PO: F32033

Date of Certification: AUG - 2005 Certifying Officer: N. Kocherlakota

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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.

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Certificate of Reference Material

Catalog Number: PLY2-2X/2Y/2T **Lot No.** 11-84Y

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 relevant 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 #3167

The CRM is prepared gravimetrically using high purity Yttrium Oxide Lot# 04041A. 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.

Instrumental Analysis by ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.011 @ 24.0 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ca	0.02	Lu	<0.001	Tm	<0.001
Ce	<0.001	La	<0.001	Ti	<0.001
Dy	<0.001	Mn	<0.001	Tl	<0.001
Er	<0.001	Mo	<0.001	Tb	<0.001
Eu	<0.001	Nd	<0.001	Th	<0.001
Fe	0.005	Na	0.001	Ta	<0.001
Ga	<0.001	Ni	<0.001	V	<0.001
Gd	<0.001	Pr	<0.001	W	<0.001
Ho	<0.001	Rb	<0.001	Yb	<0.001
Hf	<0.001	Sm	<0.001	Zr	<0.001
In	<0.001	Sc	<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.

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DATE RECEIVED: 10/17/05
DATE EXPIRED: 10/15/06
DATE OPENED: 10/17/05
INORG: 5/3 PO: 207030

Date of Certification: OCT - 2005 Certifying Officer: N. Kocherlakota

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Report of Certification

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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:

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.

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DATE RECEIVED: 1/11/06
DATE EXPIRED: 1/15/2007 DR
DATE OPENED: 1/12/06
INORG: 5586 PO: F56675

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Certificate of Reference Material

Catalog Number: PLPD3-2X/2Y **Lot No.** 12-18PD
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: 1003 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM #3138
The CRM is prepared gravimetrically using high purity Palladium Metal, Lot #: 02041D. 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: Precipitation using Glyoxime. Filter, dry, and weigh as Pd(C4H7O2N2)2

Instrumental Analysis by ICP spectrometer: 1001 mg/L
Uncertified Properties:

Density: 1.020 @ 24.0 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Au	0.003	Fe	0.027	Ru	<0.001
Ag	0.01	Ga	<0.001	Rh	0.002
Al	0.005	Ir	<0.001	Rb	<0.001
Be	<0.005	In	<0.001	Re	<0.001
Bi	<0.001	Mg	0.003	Sn	0.03
B	<0.09	Mn	0.008	Te	<0.001
Co	<0.001	Ni	0.02	Ti	<0.002
Cu	0.002	Na	0.02	W	<0.001
Cr	0.006	Pt	<0.001	Zn	0.05
Cd	0.003	Pb	0.10	Zr	<0.001
Ca	0.014				

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. -- 2000 Certifying Officer: N. Kocherlakota

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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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DATE EXPIRED: 7/31/2006 DK
DATE OPENED: 7/7/05
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Certificate of Reference Material

Catalog Number: PLS9-2X/2Y/2T **Lot No.** 11-63S
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: 1001.5 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/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: 1003 mg/L

Method: Precipitation using Barium Chloride. Filter, ignite and weigh as BaSO4.

Instrumental Analysis by ICP spectrometer: 1000 mg/L
Uncertified Properties:

Density: 1000 @ 23.2 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ag	<0.001	Cu	<0.001	Pb	<0.001
Al	<0.001	Fe	0.01	Re	<0.001
As	<0.001	Ga	<0.001	Rb	<0.001
Be	<0.002	In	<0.001	Si	0.033
Ba	<0.001	K	0.009	Sb	<0.001
B	<0.001	Li	<0.001	Sr	<0.001
Bi	<0.001	Mg	0.004	Ti	<0.001
Cd	<0.001	Mn	<0.001	Tl	0.02
Co	<0.001	Mo	<0.001	V	<0.002
Ca	0.015	Na	0.01	Zn	0.03
Cr	<0.005	Ni	<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: JUL - 2005 Certifying Officer: N. Kocherlakota

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Certificate of Reference Material

Catalog Number: PLTH2-2X/2Y **Lot No.** 11-82TH

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 relevant to the certified properties listed below.

Certified Value: 1000 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: 1001 mg/L

Method: EDTA titration using Xylenol Orange as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.010 @ 24.1 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ca	<0.02	Lu	<0.001	Th	<0.001
Ce	0.01	La	0.003	Tb	<0.001
Dy	<0.001	Mo	<0.001	Tm	<0.001
Er	<0.001	Mn	<0.001	Ta	<0.001
Eu	<0.001	Na	0.04	Tl	<0.001
Fe	<0.01	Nd	0.003	Ti	<0.001
Gd	<0.001	Ni	<0.001	V	<0.001
Ga	<0.001	Pr	<0.001	W	<0.001
Hf	<0.001	Rb	<0.001	Y	0.002
Ho	<0.0001	Sm	<0.001	Yb	<0.001
In	<0.001	Sc	<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.

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DATE OPENED: 8/31/05
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Date of Certification: AUG - 2005 Certifying Officer: N. Kocherlakota

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Report of Certification

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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.

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Certificate of Reference Material

Catalog Number: PLU2-2X/2Y **Lot No.** 11-124U

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: 1000 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 Triuranium Octaoxide 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: 1001 mg/L

Method: Evaporate to dryness. Ignite and weigh as U3O8.

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.009 @ 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	0.01	Cu	0.01	Pb	0.04
Ag	<0.005	Fe	0.20	Re	<0.001
As	0.05	Ga	<0.001	Rb	<0.001
Bi	<0.001	In	<0.001	Si	<0.01
Ba	0.005	K	0.03	Sb	0.004
Be	<0.001	Li	<0.001	Sr	0.003
B	<0.001	Mg	0.003	Tl	0.001
Ca	0.05	Mn	0.004	Ti	0.006
Cd	<0.001	Mo	0.006	V	0.005
Co	0.001	Ni	<0.001	Zr	<0.003
Cr	<0.002	Na	0.10	Zn	0.007

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DATE EXPIRED: 4/30/09
DATE OPENED: 4/30/05
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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: _____ Certifying Officer: N. Kocherlakota

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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: PLW9-2X/2Y **Lot No.** 11-83W

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 relevant to the certified properties listed below.

Certified Value: 1003 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3163

The CRM is prepared gravimetrically using high purity Ammonium Tungstate Lot# M0600W. 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: Fume with Sulfuric Acid to dryness. Ignite and weigh as WO3.

Instrumental Analysis by ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.000 @ 19.6 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ag	<0.005	Cu	<0.001	Pb	<0.001
Al	0.006	Fe	0.001	Rb	<0.001
As	0.003	Ga	<0.001	Re	0.006
B	<0.003	In	<0.001	Sr	<0.001
Be	<0.001	K	<0.10	Sb	<0.001
Bi	<0.001	Li	<0.001	Si	0.52
Ba	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.005	Mn	<0.001	Ti	<0.001
Cr	<0.001	Mg	<0.001	V	<0.001
Cd	<0.001	Ni	<0.001	Zr	<0.001
Co	<0.001	Na	0.09	Zn	0.005

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.

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DATE OPENED: 7/26/05
INORG: 5341 PO: 165213

Date of Certification: JUL - 2005 Certifying Officer: N. Kocherlakota

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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:

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.

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DATE OPENED: 2/24/06 DF
INORG: 5670 PO: F56687

SPEXertificate

Certificate of Reference Material

Catalog Number: PLZR2-2X/2Y/2T **Lot No.** 12-07ZR

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 relevant 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 #3169

The CRM is prepared gravimetrically using high purity Zirconyl Nitrate, Lot #: 02041A. 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: Fume with Sulfuric Acid to dryness. Ignite and weigh as ZrO2.

Instrumental Analysis by ICP spectrometer: 996 mg/L

Uncertified Properties:

Density: 1.0099g/cc @ 24.4 Degrees Celsiu

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.001	Cu	<0.001	Pb	0.003
Al	0.03	Fe	0.03	Re	<0.001
Ag	<0.01	Ga	<0.001	Rb	<0.001
Be	<0.01	In	<0.001	Sb	<0.001
Bi	<0.001	K	<0.30	Si	0.01
B	<0.01	Li	<0.005	Sr	<0.001
Ba	<0.001	Mn	<0.001	Tl	<0.001
Cd	0.006	Mg	<0.001	Ti	<0.03
Ca	0.012	Mo	<0.001	V	<0.001
Co	0.001	Na	0.03	Zn	0.02
Cr	<0.008	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: FEB. --2006 Certifying Officer: N. Kocherlakota

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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:

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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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/11/06
DATE EXPIRED: 1/15/07
DATE OPENED: 1/13/06 DR
INORG: 5587 PO: F56675

SPEXertificate™

Certificate of Reference Material

010200

Catalog Number: PLNA2-3X/3Y **Lot No.** X9-161NA

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 relevant to the certified properties listed below.

Certified Value: 9982 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# 05031C. 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: 9979 mg/L

Method: Evaporate to dryness. Fume with Sulfuric Acid. Ignite and weigh as Na2SO4.

Instrumental Analysis by ICP spectrometer: 9985 mg/L

Uncertified Properties:

Density: 1.051 @ 20.5 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.06	Cu	0.02	Pb	0.009
As	<0.006	Fe	0.02	Re	<0.001
Ag	<0.001	Ga	<0.001	Rb	<0.001
Bi	<0.001	In	<0.001	Si	0.01
Be	<0.02	K	0.50	Sb	<0.001
Ba	0.01	Li	0.003	Sr	<0.002
B	<0.30	Mg	0.50	Tl	<0.003
Cr	<0.02	Mn	0.007	Ti	<0.008
Cd	<0.001	Mo	<0.001	V	<0.005
Ca	0.42	Ni	<0.002	Zn	<0.03
Co	<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. -- 2006 Certifying Officer: N. Kocherlakota

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Report of Certification

010201

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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010202

SPEXertificate™

Certificate of Reference Material

Catalog Number: ICV-2A **Lot No.:** 29-175AS
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.

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	1,995.81	3109a	Ni	500	499.54	3136
K	2,000	1,995.56	3141a	V	500	499.79	3165
Mg	2,000	1,995.61	3131a	Cr	200	199.97	3112a
Na	2,000	1,995.63	3152a	Cu	200	199.98	3114
Al	1,000	989.06	3101a	Ag	100	99.44	3151
Ba	1,000	999.68	3104a	Be	100	99.16	3105a
Fe	1,000	995.89	3126a	Mn	100	100.03	3132
Co	500	500.41	3113	Zn	100	100.06	3168a

Spex Reference Multi: Lot # 1-58GM, 15-37AS, 11-171AS REF

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/14/05
DATE EXPIRED: 10/15/06
DATE OPENED: 10/14/05
INORG: 5429 PO: 0000203

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. -- 2005 Certifying Officer: N. Kocherlakota

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010203

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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010204

SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLSB7-2X/2Y/2T **Lot No.** 11-02SB

Description: 1000 mg/L Antimony

Matrix: H2O / 0.6% Tart.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: 997 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3102a

The CRM is prepared gravimetrically using high purity Antimony Metal Lot# 01041A. 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 nitric acid. Ignite and weigh as Sb2O4.

Instrumental Analysis by ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.003 @ 31.6 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	0.002	Pb	0.002
Ag	<0.001	Fe	35.00	Rb	<0.001
As	0.03	Ga	<0.001	Re	<0.001
Ba	0.005	In	<0.001	Sr	0.001
B	<0.50	K	0.90	Si	0.08
Bi	0.003	Li	<0.004	Ti	0.004
Be	<0.001	Mo	<0.001	Tl	0.01
Cr	<0.01	Mg	0.07	V	<0.004
Ca	4.00	Mn	<0.003	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	2.00
Cd	<0.001	Na	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.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/4/05
DATE EXPIRED: 10/15/06
DATE OPENED: 10/4/05
INORG: 5430 PO: D00010601

Date of Certification: OCT. -- 2005 Certifying Officer: N. Kocherlakota

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010205

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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010206

SPECertificate™

Certificate of Reference Material

Catalog Number: ICV-2C **Lot No.:** 29-176AS
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	499.69	3103a
Pb	500	499.61	3128
Se	500	499.91	3149
TL	500	499.92	3158
Cd	100	99.90	3108

Spex Reference Multi: Lot #11-34AS, 1-57MG, 15-39AS Reff

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/14/05
DATE EXPIRED: 10/15/06
DATE OPENED: 10/14/05
INORG: 5428 PO: 20070223

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: OCT. -- 2005 Certifying Officer: N. Kocherlakota

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010207

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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inorganic ventures / IV Labs 010208

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, CGAL10-2, and CGAL10-5
Lot Number:	**X-AL04021**
Starting Material:	Al metal
Starting Material Purity (%):	99.997990
Starting Material Lot No	607116
Matrix:	5% (abs) HNO_3

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,030 ± 19 µg/mL

Certified Density: 1.071 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 $(\pm) = \frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

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** **10,030 ± 19 µg/mL**
ICP Assay NIST SRM 3101a Lot Number: 010808

Assay Method #2 **10,022 ± 21 µg/mL**
EDTA NIST SRM 928 Lot Number: 392110

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 9/23/05
DATE EXPIRED: 10/1/06
DATE OPENED: 9/27/05
INORG: 5405 PO: D20060435

pg. 1 of 1
5405

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	< 0.03378	O	Li	< 0.00020	M	Pr	< 0.00169	M	Te	< 0.16892
M	Sb	< 0.00282	M	Er	< 0.02815	M	Lu	< 0.00225	M	Re	< 0.00563	M	Tb	< 0.00169
M	As	< 0.05631	M	Eu	< 0.01689	O	Mg	0.00498	M	Rh	< 0.00563	M	Tl	< 0.00563
M	Ba	< 0.05631	M	Gd	< 0.00563	M	Mn	< 0.02252	M	Rb	< 0.00563	M	Th	< 0.00563
O	Be	< 0.00017	M	Ga	< 0.00563	O	Hg	< 0.00700	M	Ru	< 0.01126	M	Tm	< 0.00225
M	Bi	< 0.00225	M	Ge	< 0.03378	M	Mo	< 0.01126	M	Sm	< 0.00563	M	Sn	< 0.02815
O	B	0.01173	M	Au	< 0.01689	M	Nd	< 0.01126	M	Sc	< 0.05631	O	Ti	0.00213
M	Cd	< 0.01689	M	Hf	< 0.01126	O	Ni	< 0.00600	M	Se	< 0.04505	M	W	< 0.05631
O	Ca	0.01013	M	Ho	< 0.00282	M	Nb	< 0.00282	O	Si	0.07462	M	U	< 0.01126
M	Ce	< 0.02815	M	In	< 0.05631	n	Os		M	Ag	< 0.01126	M	V	< 0.01126
M	Cs	< 0.00169	M	Ir	< 0.02815	M	Pd	< 0.02815	O	Na	0.06396	M	Yb	< 0.00563
O	Cr	0.00533	O	Fe	0.00586	O	P	< 0.03000	M	Sr	< 0.00282	M	Y	< 0.22523
M	Co	< 0.01689	M	La	< 0.00282	M	Pt	< 0.01126	O	S	< 0.10000	M	Zn	0.00450
M	Cu	< 0.03378	M	Pb	< 0.01689	O	K	0.01208	M	Ta	< 0.03942	M	Zr	< 0.02815

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 $Al(OH)_4(H_2O)_2^{1-}$ 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^0);
γ- Al_2O_3 (Soluble in acids such as HCl) ; Ores (Carbonate fusion in Pt^0 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)
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^+	$^{12}C^{15}N$, $^{13}C^{14}N$, $^{1}H^{12}C^{14}N$, $^{11}B^{16}O$, $^{54}Cr^{2+}$, $^{54}Fe^{2+}$

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)

010211

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: December 28, 2004

Expiration Date: EXPIRES 1?2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010212

CERTIFICATE OF ANALYSIS

INORGANIC VENTURES
195 Lehigh Avenue, Suite 4
Lakewood, New Jersey 08701 · USA
inorganicventures.com

tel: 800.669.6799 · 732.901.1900
fax: 732.901.1903
info@inorganicventures.com

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is deigned and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 **DESCRIPTION OF CRM** **10000 µg/mL Calcium in 1.4% (abs) HNO3**

Catalog Number:	CGCA10-1, CGCA10-2, and CGCA10-5
Lot Number:	**Y-CA03038**
Starting Material:	CaO
Starting Material Purity (%):	99.999046
Starting Material Lot No:	C27L01
Matrix:	1.4% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/30/06
DATE EXPIRED: 31/2007 DR
DATE OPENED: 1/31/06
INORG: 5636 PO: F56681

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,010 ± 23 µg/mL 9653 ± 22 µg/g

Certified Density: 1.037 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 $(\bar{x}) = \frac{\Sigma x1}{n}$ $(\bar{x})$ = mean
x1 = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\Sigma s1)2]^{1/2}}{(n)^{1/2}}$ $\Sigma s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **10,046 ± 35 µg/mL** **9688 ± 34 µg/g**
ICP Assay NIST SRM 3109a Lot Number: 000622

Assay Method #2 **10,010 ± 23 µg/mL** **9653 ± 22 µg/g**
EDTA NIST SRM 928 Lot Number: 928

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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	< 0.04250	O	Li	< 0.00002	M	Pr	< 0.00213	M	Te	< 0.21248
M	Sb	< 0.00354	M	Er	< 0.03541	M	Lu	< 0.00283	M	Re	< 0.00708	M	Tb	< 0.00213
M	As	< 0.07082	M	Eu	< 0.02125	O	Mg	0.05319	M	Rh	< 0.00708	M	Tl	< 0.00708
O	Ba	0.00038	M	Gd	< 0.00708	O	Mn	0.00029	M	Rb	< 0.00708	M	Th	< 0.00708
O	Be	< 0.00009	M	Ga	< 0.00708	O	Hg	< 0.01100	M	Ru	< 0.01417	M	Tm	< 0.00283
M	Bi	< 0.00283	M	Ge	< 0.04250	M	Mo	< 0.01417	M	Sm	< 0.00708	M	Sn	< 0.03541
O	B	< 0.00054	M	Au	< 0.02125	M	Nd	< 0.01417	O	Sc	< 0.00002	M	Ti	< 0.35413
O	Cd	< 0.00450	M	Hf	< 0.01417	O	Ni	< 0.00230	O	Se	< 0.00620	M	W	< 0.07082
s	Ca		M	Ho	< 0.00354	M	Nb	< 0.00354	O	Si	0.00228	M	U	< 0.01417
M	Ce	< 0.03541	O	In	< 0.00200	n	Os		M	Ag	< 0.01417	O	V	< 0.00090
M	Cs	< 0.00213	M	Ir	< 0.03541	M	Pd	< 0.03541	O	Na	0.00950	M	Yb	< 0.00708
O	Cr	< 0.00080	O	Fe	< 0.00110	O	P	< 0.00480	O	Sr	0.02849	M	Y	< 0.28330
O	Co	< 0.00120	M	La	< 0.00354	M	Pt	< 0.01417	O	S	< 0.02500	O	Zn	0.00874
O	Cu	< 0.00400	M	Pb	< 0.02125	O	K	< 0.00170	M	Ta	< 0.04958	M	Zr	< 0.03541

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 - 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 Pt0 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)
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+	16O212C, 28Si16O, 88Sr

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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)

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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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 09, 2005

Expiration Date: EXPIRES 01MAR2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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4 of 4

010216

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 Iron in 3.5% (abs) HNO3**

Catalog Number:	CGFE10-1, CGFE10-2, and CGFE10-5
Lot Number:	**Y-FE03052**
Starting Material:	Fe powder
Starting Material Purity (%):	99.999864
Starting Material Lot No:	23503
Matrix:	3.5% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 2/24/06
INORG: 5661 PO: F56688

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,007 ± 20 µg/mL 9576 ± 19 µg/g

Certified Density: 1.045 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 $(\bar{x}) = \frac{\Sigma x_1}{n}$

Uncertainty $(\pm) = \frac{2[(\Sigma s_1)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean
x_1 = individual results
n = number of measurements
Σs_1 = 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **9981 ± 34 µg/mL 9551 ± 33 µg/g**
ICP Assay NIST SRM 3126a Lot Number: 000606

Assay Method #2 **10,007 ± 20 µg/mL 9576 ± 19 µg/g**
EDTA NIST SRM 928 Lot Number: 928

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1 of 4

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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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	< 0.03263	O	Li	< 0.00003	M	Pr	< 0.00163	M	Te	< 0.16312
M	Sb	< 0.00272	M	Er	< 0.02719	M	Lu	< 0.00218	M	Re	< 0.00544	M	Tb	< 0.00163
M	As	< 0.05437	M	Eu	< 0.01631	O	Mg	0.00185	M	Rh	< 0.00544	M	Tl	< 0.00544
M	Ba	< 0.05437	M	Gd	< 0.00544	O	Mn	< 0.05000	M	Rb	< 0.00544	M	Th	< 0.00544
O	Be	< 0.00005	M	Ga	< 0.00544	O	Hg	< 0.01100	M	Ru	< 0.01087	M	Tm	< 0.00218
M	Bi	< 0.00218	i	Ge		M	Mo	< 0.01087	M	Sm	< 0.00544	M	Sn	< 0.02719
O	B	< 0.00090	M	Au	< 0.01631	M	Nd	< 0.01087	M	Sc	< 0.05437	M	Ti	< 0.27187
M	Cd	< 0.01631	M	Hf	< 0.01087	O	Ni	< 0.00230	M	Se	< 0.04350	M	W	< 0.05437
O	Ca	0.00572	M	Ho	< 0.00272	M	Nb	< 0.00272	O	Si	< 0.01000	M	U	< 0.01087
M	Ce	< 0.02719	M	In	< 0.05437	n	Os		M	Ag	< 0.01087	M	V	< 0.01087
M	Cs	< 0.00163	M	Ir	< 0.02719	M	Pd	< 0.02719	O	Na	0.00831	M	Yb	< 0.00544
M	Cr	< 0.02719	s	Fe		i	P		M	Sr	< 0.00272	M	Y	< 0.21750
O	Co	< 0.00110	M	La	< 0.00272	M	Pt	< 0.01087	O	S	< 0.07200	M	Zn	< 0.10875
M	Cu	< 0.03263	M	Pb	< 0.01631	O	K	< 0.00170	M	Ta	< 0.03806	M	Zr	< 0.02719

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 - 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^0 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)
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^+	$^{40}Ar^{15}N^1H$, $^{40}Ar^{16}O$, $^{36}Ar^{17}O^1H$, $^{38}Ar^{18}O$, $^{37}Cl^{16}O^1H$, $^{40}Ca^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 05, 2005

Expiration Date: EXPIRES 01 MAR 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager Katalin Le

Certifying Officer: Paul Gaines, PhD., Technical Director Paul R Gaines

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010220

inorganic ventures / iv labs

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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 **10000 µg/mL Potassium in 1.4% (abs) HNO3**

Catalog Number:	CGK10-1, CGK10-2, and CGK10-5
Lot Number:	**Y-K02129**
Starting Material:	KNO3
Starting Material Purity (%):	99.998112
Starting Material Lot No	B19P01
Matrix:	1.4% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/28/05
DATE EXPIRED: 12/01/06 (2)
DATE OPENED: 11/29/05
INORG: 5471 PO: D20024720

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9983 ± 5 µg/mL 9759 ± 5 µg/g

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 $(\bar{x}) = \frac{\Sigma x_1}{n}$

Uncertainty $(\pm) = \frac{2[(\Sigma s_1)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean
x_1 = individual results
n = number of measurements
Σs_1 = 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **9926 ± 36 µg/mL 9703 ± 35 µg/g**
ICP Assay NIST SRM 3141a Lot Number: 891312

Assay Method #2 **9983 ± 5 µg/mL 9759 ± 5 µg/g**
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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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	0.00072	M	Dy	< 0.00597	O	Li	< 0.00001	M	Pr	< 0.00030	M	Te	< 0.02986
M	Sb	< 0.00050	M	Er	< 0.00498	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	< 0.00030
M	As	< 0.00995	M	Eu	< 0.00299	O	Mg	0.00068	M	Rh	< 0.00100	M	Tl	< 0.00100
M	Ba	< 0.00995	M	Gd	< 0.00100	O	Mn	0.00020	M	Rb	0.55238	M	Th	< 0.00100
O	Be	< 0.00003	M	Ga	< 0.00100	O	Hg	< 0.00255	M	Ru	< 0.00199	M	Tm	< 0.00040
M	Bi	< 0.00040	O	Ge	< 0.00026	M	Mo	< 0.00199	M	Sm	< 0.00100	M	Sn	< 0.00498
O	B	< 0.00010	O	Au	< 0.00051	M	Nd	< 0.00199	O	Sc	< 0.00002	O	Ti	< 0.00012
M	Cd	< 0.00299	M	Hf	< 0.00199	O	Ni	< 0.00039	O	Se	< 0.00851	M	W	< 0.00995
O	Ca	0.00357	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	< 0.00058	M	U	< 0.00199
M	Ce	< 0.00498	M	In	< 0.00995	n	Os		M	Ag	< 0.00199	O	V	< 0.00015
M	Cs	< 0.00030	M	Ir	< 0.00498	M	Pd	< 0.00498	O	Na	0.15315	M	Yb	< 0.00100
M	Cr	< 0.00498	O	Fe	0.00048	O	P	< 0.00043	M	Sr	< 0.00050	M	Y	< 0.03981
M	Co	< 0.00299	M	La	< 0.00050	M	Pt	< 0.00199	O	S	< 0.01225	O	Zn	0.00068
M	Cu	< 0.00597	M	Pb	0.08559	s	K		M	Ta	< 0.00697	M	Zr	< 0.00498

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^0 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)
ICP-OES	766.490 nm	0.4 / 0.001 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	771.531 nm	1.0 / 0.03 µg/mL	1	atom	2nd 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

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 17, 2005

Expiration Date:

EXPIRES
01 DEC 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
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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, CGMG10-2, and CGMG10-5
Lot Number:	**X-MG03018**
Starting Material:	Mg metal
Starting Material Purity (%):	99.994984
Starting Material Lot No	91191
Matrix:	1.4% (abs) HNO_3

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,039 ± 31 µg/mL

Certified Density: 1.051 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.)

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** **10,039 ± 31 µg/mL**
ICP Assay NIST SRM 3131a Lot Number: 991107

Assay Method #2 **10,079 ± 21 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 7/22/05
DATE EXPIRED: 8/1/06
DATE OPENED: 7/22/05
INORG: 5312 PO: F55213

Pg. 1 of 4
5312

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		0.04714	M	Dy	<	0.03601	O	Li		0.00623	M	Pr	<	0.00180	M	Te	<	0.18002
M	Sb	<	0.00300	M	Er	<	0.03000	M	Lu	<	0.00240	M	Re	<	0.00600	M	Tb	<	0.00180
M	As	<	0.06001	M	Eu	<	0.01800	s	Mg			M	Rh	<	0.00600	M	Tl	<	0.00600
M	Ba	<	0.06001	M	Gd	<	0.00600	O	Mn		0.07408	M	Rb	<	0.00600	M	Th	<	0.00600
O	Be	<	0.00017	M	Ga	<	0.00600	O	Hg	<	0.00900	M	Ru	<	0.01200	M	Tm	<	0.00240
M	Bi	<	0.00240	M	Ge	<	0.03601	M	Mo	<	0.01200	M	Sm	<	0.00600	M	Sn	<	0.03000
O	B		0.00303	M	Au	<	0.01800	M	Nd	<	0.01200	M	Sc	<	0.06001	O	Ti		0.09765
M	Cd	<	0.01800	M	Hf	<	0.01200	O	Ni		0.01229	M	Se	<	0.04801	M	W	<	0.06001
O	Ca		0.14984	M	Ho	<	0.00300	M	Nb	<	0.00300	O	Si		0.02357	M	U	<	0.01200
M	Ce	<	0.03000	M	In	<	0.06001	n	Os			M	Ag	<	0.01200	M	V	<	0.01200
M	Cs	<	0.00180	M	Ir	<	0.03000	M	Pd	<	0.03000	O	Na		0.02189	M	Yb	<	0.00600
O	Cr		0.02189	O	Fe		0.03704	O	P	<	0.01600	M	Sr	<	0.00300	M	Y		0.02021
M	Co	<	0.01800	M	La	<	0.00300	M	Pt	<	0.01200	n	S			O	Zn		0.00572
O	Cu		0.00674	O	Pb		0.02694	O	K	<	0.05000	M	Ta	<	0.04201	M	Zr	<	0.03000

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)

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 15, 2004

Expiration Date:

EXPIRES
1/02006

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

010228

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 Sodium in 1.4% (abs) HNO3**

Catalog Number:	CGNA10-1, CGNA10-2, and CGNA10-5
Lot Number:	**X-QNA02148**
Starting Material:	Na2CO3
Starting Material Purity (%):	99.999819
Starting Material Lot No:	42063
Matrix:	1.4% (abs) HNO3

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,006 ± 6 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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_i$ = 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **10,019 ± 33 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 990907

Assay Method #2 **10,006 ± 6 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 7/22/05
DATE EXPIRED: 8/1/06
DATE OPENED: 7/22/05 (8)
INORG: 5310 PO: F55213

1 of 4
5310

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	M	Te	< 0.02998
M	Sb	< 0.00050	M	Er	< 0.00500	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	< 0.00030
M	As	< 0.00999	M	Eu	< 0.00300	O	Mg	0.00010	M	Rh	< 0.00100	M	Tl	< 0.00100
M	Ba	< 0.00999	M	Gd	< 0.00100	O	Mn	< 0.00003	M	Rb	< 0.00100	M	Th	< 0.00100
O	Be	< 0.00020	M	Ga	< 0.00100	O	Hg	< 0.01500	M	Ru	< 0.00200	M	Tm	< 0.00040
M	Bi	< 0.00040	O	Ge	< 0.00150	M	Mo	< 0.00200	M	Sm	< 0.00100	M	Sn	< 0.00500
O	B	< 0.00060	O	Au	< 0.00300	M	Nd	< 0.00200	O	Sc	< 0.00002	O	Ti	< 0.00070
M	Cd	< 0.00300	M	Hf	< 0.00200	O	Ni	< 0.00230	O	Se	< 0.05000	M	W	< 0.00999
O	Ca	0.00050	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	< 0.00340	M	U	< 0.00200
M	Ce	< 0.00500	M	In	< 0.00999	n	Os		M	Ag	< 0.00200	O	V	< 0.00090
M	Cs	< 0.00030	M	Ir	< 0.00500	M	Pd	< 0.00500	S	Na		M	Yb	< 0.00100
M	Cr	< 0.00500	O	Fe	< 0.00110	O	P	< 0.04000	M	Sr	< 0.00050	M	Y	< 0.03997
M	Co	< 0.00300	M	La	< 0.00050	M	Pt	< 0.00200	O	S	< 0.07200	O	Zn	0.00250
O	Cu	< 0.00140	M	Pb	< 0.00300	O	K	0.04000	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 - 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)
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: October 11, 2004

Expiration Date: EXPIRES 10/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010232

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 0.07% (abs) HNO_3**

Catalog Number:	CGLI1-1, CGLI1-2. and CGLI1-5
Lot Number:	**X-LI02079**
Starting Material:	Li_2CO_3
Starting Material Purity (%):	99.997165
Starting Material Lot No	1123
Matrix:	0.07% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 5/19/05
DATE EXPIRED: 6/1/06
DATE OPENED: 5/19/05
INORG: 5244 PO: 55180

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 999 ± 3 µg/mL

Certified Density: 1.004 g/mL (measured at 22° C)

The Certified Value is the ICP 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 $(\pm) = 2[(\Sigma s_i)^2]^{1/2} / (n)^{1/2}$

$(\bar{x})$ = 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 ± 1 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **999 ± 3 µg/mL**
ICP Assay NIST SRM 3129a Lot Number: 000505

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1 of 4

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

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^0 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)
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)

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: December 10, 2004

Expiration Date: EXPIRES 01 JAN 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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INORGANIC VENTURES
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Lakewood, New Jersey 08701 · USA
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CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 DESCRIPTION OF CRM — 1000 µg/mL Barium in 0.1% (abs) HNO3

Catalog Number:	CGBA1-1, CGBA1-2, and CGBA1-5
Lot Number:	**Y-BA02033**
Starting Material:	Ba(NO3)2
Starting Material Purity (%):	99.985748
Starting Material Lot No:	22898
Matrix:	0.1% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 2/24/06
INORG: 5657 PO: F56688

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:

Certified Value $(\bar{x}) = \frac{\Sigma x1}{n}$ — $(\bar{x})$ = mean; x1 = individual results; n = number of measurements

Uncertainty $(\pm) = \frac{2[(\Sigma s1)2]^{1/2}}{(n)^{1/2}}$ — $\Sigma s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** — **995 ± 3 µg/mL**
ICP Assay NIST SRM 3104a Lot Number: 992907

Assay Method #2 — **998 ± 2 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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		0.00427	M	Dy	<	0.01190	O	Li	<	0.00400	M	Pr	<	0.00060	M	Te	<	0.05952
M	Sb	<	0.00099	M	Er	<	0.00992	M	Lu	<	0.00079	M	Re	<	0.00198	O	Tb	<	0.00390
M	As	<	0.01984	O	Eu	<	0.00040	O	Mg		0.00114	M	Rh	<	0.00198	M	Tl	<	0.00198
s	Ba			O	Gd	<	0.00052	M	Mn	<	0.00794	M	Rb	<	0.00198	M	Th	<	0.00198
M	Be	<	0.00099	M	Ga	<	0.00198	O	Hg	<	0.01200	M	Ru	<	0.00397	M	Tm	<	0.00079
M	Bi	<	0.00079	M	Ge	<	0.01190	M	Mo	<	0.00397	O	Sm	<	0.00071	M	Sn	<	0.00992
M	B	<	0.13889	M	Au	<	0.00595	O	Nd	<	0.00140	M	Sc	<	0.01984	M	Ti	<	0.09921
M	Cd	<	0.00595	M	Hf	<	0.00397	M	Ni	<	0.01587	M	Se	<	0.01587	M	W	<	0.01984
O	Ca		0.00695	M	Ho	<	0.00099	M	Nb	<	0.00099	O	Si	<	0.00340	M	U	<	0.00397
M	Ce	<	0.00992	M	In	<	0.01984	n	Os			M	Ag	<	0.00397	M	V	<	0.00397
M	Cs	<	0.00060	M	Ir	<	0.00992	M	Pd	<	0.00992	M	Na	<	0.19841	M	Yb	<	0.00198
M	Cr	<	0.00992	O	Fe		0.00417	O	P	<	0.00260	O	Sr		2.18330	O	Y		0.32749
M	Co	<	0.00595	O	La	<	0.00020	M	Pt	<	0.00397	O	S	<	0.02500	O	Zn		0.17863
M	Cu	<	0.01190	M	Pb	<	0.00595	O	K	<	0.00180	O	Ta	<	0.00690	M	Zr	<	0.00992

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 - 137.33; +2; 6; Ba(H2O)6+2

Chemical Compatibility - Soluble in HCl, and HNO3. Avoid H2SO4, 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% HNO3 / LDPE container. 1 -10,000 ppm solutions chemically stable for years in 1-3.5% HNO3 / LDPE container.

Ba Containing Samples (Preparation and Solution) - Metal(is best dissolved in diluted HNO3); Ores(Carbonate fusion in Pt0 followed by HCl dissolution. If sulfate is present dissolve the fuseate using HCl / tartaric acid to prevent BaSO4 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)
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+	122Sn16O, 122Te16O

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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)

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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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 27, 2005

Expiration Date:

EXPIRES
01 MAR 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
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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 Beryllium in 2% (abs) HNO_3**

Catalog Number:	CGBE1-1, CGBE1-2, and CGBE1-5
Lot Number:	**Y-BE01107**
Starting Material:	Be(OOCCH3)2
Starting Material Purity (%):	99.999897
Starting Material Lot No	01-10-01
Matrix:	2% (abs) HNO_3

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1008 ± 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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty (±) $= \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_i$ = 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.)

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** **1008 ± 3 µg/mL**
ICP Assay NIST SRM 3105a Lot Number: 892707

Assay Method #2 **1001 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 5/27/05
DATE EXPIRED: 6/1/06 (by)
DATE OPENED: 5/27/05
INORG: 5253 PO: 55195

1 of 4
5253

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^0); 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)
ICP-OES 313.042 nm	0.0003 / 0.00009 µg/mL	1	ion	V, 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^+	

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)

010243

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 21, 2005

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator — Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager — Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director — Paul R Gaines

010244

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 Chromium (+3) in 1.4% (abs) HNO3**

Catalog Number:	CGCR(3)1-1, CGCR(3)1-2, and CGCR(3)1-5
Lot Number:	**Y-CR02145**
Starting Material:	(NH4)2Cr2O7
Starting Material Purity (%):	99.997402
Starting Material Lot No:	D25M04
Matrix:	1.4% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/28/05
DATE EXPIRED: 12/01/06
DATE OPENED: 11/29/05
INORG: 5470 PO: DR0924720

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1006 ± 4 µg/mL 995 ± 4 µg/g

Certified Density: 1.011 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 $(\bar{x}) = \frac{\Sigma x_1}{n}$

Uncertainty $(\pm) = \frac{2[(\Sigma s_1)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean
x_1 = individual results
n = number of measurements
Σs_1 = 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1006 ± 4 µg/mL 995 ± 4 µg/g (Avg 2 runs)**
ICP Assay NIST SRM 3112a Lot Number: 990607

Assay Method #2 **1004 ± 5 µg/mL 984 ± 5 µg/g (Avg. 2 runs)**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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 < 0.00598	O Li < 0.00002	M Pr < 0.00030	M Te < 0.02989
M Sb < 0.00050	M Er < 0.00498	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.00996	M Eu < 0.00299	O Mg < 0.00030	M Rh < 0.00100	M Tl < 0.00100
M Ba < 0.00996	M Gd < 0.00100	M Mn < 0.00399	M Rb < 0.00100	M Th < 0.00100
M Be < 0.00050	M Ga 0.00080	O Hg < 0.01500	M Ru < 0.00199	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00598	M Mo < 0.00199	M Sm < 0.00100	M Sn < 0.00498
O B < 0.01000	M Au < 0.00299	M Nd < 0.00199	M Sc < 0.00996	O Ti < 0.00100
M Cd < 0.00299	M Hf < 0.00199	M Ni < 0.00797	M Se < 0.00797	M W < 0.00996
O Ca 0.00120	M Ho < 0.00050	M Nb < 0.00050	O Si 0.00600	M U < 0.00199
M Ce < 0.00498	M In < 0.00996	n Os	M Ag < 0.00199	O V < 0.02000
M Cs < 0.00030	M Ir < 0.00498	M Pd < 0.00498	O Na 0.01700	M Yb < 0.00100
S Cr	O Fe < 0.01000	O P < 0.04000	M Sr < 0.00050	M Y < 0.03985
M Co < 0.00299	M La < 0.00050	M Pt < 0.00199	i S	O Zn < 0.00400
M Cu < 0.00598	M Pb 0.05579	O K 0.12000	M Ta < 0.00697	M Zr < 0.00498

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 cont return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 51.9961; +3; 6; $Cr(H_2O)_6^{3+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most me anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically 1-5% HNO_3 / LDPE container.
Cr Containing Samples (Preparation and Solution) - Metal (soluble in HCl); Oxides/Ores (Chrome ore/oxides dissolve. The following procedures [A-D] are commonly used:

A. Fusion with $KHSO_4$ and extraction with hot KCl. The residue fused with Na_2CO_3 and $KClO_3$, 3:1.
B. Fusion with $NaKSO_4$ and NaF, 2:1.
C. Fusion with magnesia or lime and sodium or potassium carbonates, 4:1.
D. Fusion with Na_2O_2 or NaOH and KNO_3 or NaOH and Na_2O_2.

Nickel, iron, copper, or silver crucibles should be used for **D**. Platinum may be used for **A, B and C**); Organic Matrices (Ash at 450? C followed by one of the fusion methods above or sulfuric/hydrogen peroxide acid applicable to **non oxide** containing samples) .

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)
ICP-OES	205.552 nm	0.006 / 0.0008 µg/mL	1	ion	Os
ICP-OES	284.325 nm	0.008 / 0.0007 µg/mL	1	ion	
ICP-OES	276.654 nm	0.01 / 0.001 µg/mL	1	ion	Cu, Ta, V
ICP-MS	52 amu	40 ppt	n/a	M^+	$^{36}S^{16}O$, $^{36}Ar^{16}O$ - The ^{50}Cr, ^{53}Cr, ^{54}Cr lines suffer fro potential interferences from sulfur, chlorine and ar oxygen, nitrogen and carbon.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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)

010247

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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: September 21, 2005

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager Katalin Le

Certifying Officer: Paul Gaines, PhD., Technical Director Paul R Gaines

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CERTIFICATE OF ANALYSIS

INORGANIC VENTURES
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1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 **DESCRIPTION OF CRM** **1000 µg/mL Copper in 2% (abs) HNO3**

Catalog Number:	CGCU1-1, CGCU1-2, and CGCU1-5
Lot Number:	**Y-CU02077**
Starting Material:	Cu shot
Starting Material Purity (%):	99.999437
Starting Material Lot No:	K09C13
Matrix:	2% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 2/24/06
INORG: 5659 PO: F56688

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 2 µg/mL

Certified Density: 1.015 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 $(\bar{x}) = \frac{\Sigma x1}{n}$ ($\bar{x}$) = mean
x1 = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\Sigma s1)2]^{1/2}}{(n)^{1/2}}$ $\Sigma s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1003 ± 3 µg/mL**
ICP Assay NIST SRM 3114 Lot Number: 891811

Assay Method #2 **1000 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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	< 0.15133
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

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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 - 63.546; +2; 6; Cu(H2O)62+

Chemical Compatibility - Stable in HCl, HNO3, H2SO4, HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Cu Containing Samples (Preparation and Solution) - Metal (soluble in HNO3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO3).

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)
ICP-OES 324.754 nm	0.06/.001 µg/mL		atom	Nb, U, Th, Mo, Hf
ICP-OES 224.700 nm	0.01/.001µg/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+	40Ar23Na 47Ti16O, 14N12C37Cl, 16O12C35Cl, 44Ca16O, 23Na40Ca

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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)

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010251

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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 11, 2006

Expiration Date:

EXPIRES
01MAR2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager Katalin Le

Certifying Officer: Paul Gaines, PhD., Technical Director Paul R Gaines

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4 of 4

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INORGANIC™ VENTURES
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Lakewood, New Jersey 08701 · USA
inorganicventures.com
tel: 800.669.6799 · 732.901.1900
fax: 732.901.1903
info@inorganicventures.com

CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 DESCRIPTION OF CRM — 1000 µg/mL Nickel in 1.4% (abs) HNO3

Catalog Number:	CGNI1-1, CGNI1-2, and CGNI1-5
Lot Number:	**Y-NI02038**
Starting Material:	Ni metal bars
Starting Material Purity (%):	99.999675
Starting Material Lot No:	B20G26
Matrix:	1.4% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 2/24/06
INORG: 56663 PO: F56688

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1005 ± 2 µg/mL 996 ± 2 µg/g

Certified Density: 1.009 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 $(\bar{x}) = \frac{\sum x1}{n}$ ($\bar{x}$) = mean; x1 = individual results; n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s1)2]^{1/2}}{(n)^{1/2}}$ $\sum s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1000 ± 4 µg/mL 991 ± 4 µg/g**
ICP Assay NIST SRM 3136 Lot Number: 000612

Assay Method #2 **1005 ± 2 µg/mL 996 ± 2 µg/g**
EDTA NIST SRM 928 Lot Number: 928

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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 < 0.00300	M Dy < 0.04849	O Li < 0.00002	M Pr < 0.00243	M Te < 0.24247
M Sb < 0.00404	M Er < 0.04041	M Lu < 0.00323	M Re < 0.00808	M Tb < 0.00243
O As < 0.00540	M Eu < 0.02425	O Mg 0.00049	M Rh < 0.00808	M Tl < 0.00808
M Ba < 0.08082	M Gd < 0.00808	M Mn < 0.03233	M Rb < 0.00808	M Th < 0.00808
O Be < 0.00200	M Ga < 0.00808	O Hg < 0.01100	M Ru < 0.01616	M Tm < 0.00323
M Bi < 0.00323	M Ge < 0.04849	M Mo < 0.01616	M Sm < 0.00808	M Sn < 0.04041
O B < 0.00990	M Au < 0.02425	M Nd < 0.01616	M Sc < 0.08082	M Ti < 0.40411
M Cd < 0.02425	M Hf < 0.01616	S Ni	O Se < 0.00600	M W < 0.08082
O Ca 0.00025	M Ho < 0.00404	M Nb < 0.00404	O Si 0.00132	M U < 0.01616
M Ce < 0.04041	M In < 0.08082	n Os	M Ag < 0.01616	M V < 0.01616
M Cs < 0.00243	M Ir < 0.04041	M Pd < 0.04041	O Na 0.00037	M Yb < 0.00808
M Cr < 0.04041	O Fe 0.00055	O P < 0.10000	M Sr < 0.00404	M Y < 0.32329
O Co < 0.00200	M La < 0.00404	M Pt < 0.01616	O S < 0.02500	M Zn 0.00231
M Cu < 0.04849	M Pb < 0.02425	O K < 0.00170	M Ta < 0.05657	M Zr < 0.04041

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 - 58.69; +2; 6; Ni(H2O)62+

Chemical Compatibility - Stable in HCl, HNO3, H2SO4 ,HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Ni Containing Samples (Preparation and Solution) - Metal (Soluble in HNO3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO3).

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)
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+	43Ca16O1H , 44Ca16O, 23Na37Cl

8.0 HAZARDOUS INFORMATION

- Please refer to the enclosed Material Safety 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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 05, 2005

Expiration Date:

EXPIRES
01 MAR 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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INORGANIC VENTURES
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Lakewood, New Jersey 08701 - USA
inorganicventures.com
tel: 800.669.6799 · 732.901.1900
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info@inorganicventures.com

CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 DESCRIPTION OF CRM — 1000 µg/mL Cadmium in 2% (abs) HNO3

Catalog Number:	CGCD1-1, CGCD1-2, and CGCD1-5
Lot Number:	**Y-CD01136**
Starting Material:	Cd shot
Starting Material Purity (%):	99.998904
Starting Material Lot No:	C14M30
Matrix:	2% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 2/24/06
INORG: 5660 PO: F56688

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1007 ± 2 µg/mL 993 ± 2 µg/g

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 $(\bar{x}) = \frac{\sum x1}{n}$ — $(\bar{x})$ = mean; x1 = individual results; n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s1)2]^{1/2}}{(n)^{1/2}}$ — $\sum s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1003 ± 6 µg/mL 989 ± 6 µg/g**
ICP Assay NIST SRM 3108 Lot Number: 890312

Assay Method #2 **1007 ± 2 µg/mL 993 ± 2 µg/g**
EDTA NIST SRM 928 Lot Number: 928

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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 ;Cd2(OH) (aq)3+ and Cd(OH)(aq) 1+

Chemical Compatibility - Stable in HCl, HNO3, H2SO4 , 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 ir water and soluble

in HCl, HNO3 and NH4OH. The chloride, bromide and iodide are soluble in water. CdI2 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, CdI42-.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO3/LDPE container.

Cd Containing Samples (Preparation and Solution) - Metal (soluble in HNO3); Oxides (Soluble in HCl or HNO3); Ores (Dissolve in HCl / HNO3 then take to fumes with H2SO4. The silica and lead sulfate are filtered off after addition of water.); Organic based (dry ash at 450EC 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)
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+	95Mo16O

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: September 19, 2005

Expiration Date: EXPIRES 01 MAR 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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4 of 4

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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) HNO3**

Catalog Number:	CGCO1-1, CGCO1-2, and CGCO1-5
Lot Number:	**Y-CO01128**
Starting Material:	Co powder
Starting Material Purity (%):	99.999016
Starting Material Lot No:	23171
Matrix:	2% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 2/24/06
INORG: 5658 PO: F56688

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1004 ± 3 µg/mL 988 ± 3 µg/g

Certified Density: 1.016 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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_i$ = 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1004 ± 3 µg/mL 988 ± 3 µg/g**
ICP Assay NIST SRM 3113 Lot Number: 00630

Assay Method #2 **1004 ± 3 µg/mL 988 ± 3 µg/g**
EDTA NIST SRM 928 Lot Number: 928

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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	< 0.02425	O	Li	0.00004	M	Pr	< 0.00121	M	Te	< 0.12126
M	Sb	< 0.00202	M	Er	< 0.02021	M	Lu	< 0.00162	M	Re	< 0.00404	M	Tb	< 0.00121
O	As	< 0.10000	M	Eu	< 0.01213	O	Mg	0.00120	M	Rh	< 0.00404	M	Tl	< 0.00404
M	Ba	< 0.04042	M	Gd	< 0.00404	O	Mn	< 0.00400	M	Rb	< 0.00404	M	Th	< 0.00404
M	Be	< 0.00202	M	Ga	< 0.00404	O	Hg	< 0.05000	M	Ru	< 0.00808	M	Tm	< 0.00162
M	Bi	< 0.00162	M	Ge	0.00320	M	Mo	< 0.00808	M	Sm	< 0.00404	M	Sn	< 0.02021
O	B	0.00046	M	Au	< 0.01213	M	Nd	< 0.00808	M	Sc	< 0.04042	M	Ti	< 0.20210
M	Cd	< 0.01213	M	Hf	< 0.00808	O	Ni	< 0.02000	M	Se	< 0.03234	M	W	< 0.04042
O	Ca	0.00385	M	Ho	< 0.00202	M	Nb	< 0.00202	O	Si	< 0.00400	M	U	< 0.00808
M	Ce	< 0.02021	M	In	< 0.04042	n	Os		M	Ag	< 0.00808	M	V	< 0.00808
M	Cs	< 0.00121	M	Ir	< 0.02021	M	Pd	< 0.02021	O	Na	0.00077	M	Yb	< 0.00404
M	Cr	< 0.02021	O	Fe	< 0.00400	n	P		M	Sr	< 0.00202	M	Y	< 0.16168
s	Co		M	La	< 0.00202	M	Pt	< 0.00808	n	S		O	Zn	0.00027
M	Cu	< 0.02425	M	Pb	0.00116	O	K	0.00068	M	Ta	< 0.02829	M	Zr	< 0.02021

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 cont 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 met anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically 1-5% HNO_3 / LDPE container.
Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl); Ore / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

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2894

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
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^+	$^{43}Ca^{16}O^1H$, $^{40}Ar^{18}O^1H$, $^{36}Ar^{23}Na$, $^{43}Ca^{16}O$, $^{24}Mg^{35}Cl$

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: June 01, 2005

Expiration Date: EXPIRES 01 MAR 2007

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384

010263

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

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010264

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 Manganese in 2% (abs) HNO3**

Catalog Number:	CGMN1-1, CGMN1-2, and CGMN1-5
Lot Number:	**Y-MN02046**
Starting Material:	Mn pieces
Starting Material Purity (%):	99.949553
Starting Material Lot No:	G26P13
Matrix:	2% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/27/06
DATE EXPIRED: 3/1/2007
DATE OPENED: 1/27/06
INORG: 5634 PO: E56650

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1009 ± 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 $(\bar{x}) = \frac{\sum x1}{n}$

$(\bar{x})$ = mean
x1 = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s1)2]^{1/2}}{(n)^{1/2}}$

$\sum s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1003 ± 7 µg/mL**
ICP Assay NIST SRM 3132 Lot Number: 890903

Assay Method #2 **1009 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

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1 of 4

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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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	0.00075	M	Dy	< 0.02397	O	Li	< 0.00002	M	Pr	< 0.00120	M	Te	< 0.11985
M	Sb	0.00140	M	Er	< 0.01998	M	Lu	< 0.00160	M	Re	< 0.00400	M	Tb	< 0.00120
M	As	< 0.03995	M	Eu	< 0.01198	O	Mg	0.13054	M	Rh	< 0.00400	M	Tl	< 0.00400
M	Ba	< 0.03995	M	Gd	< 0.00400	s	Mn		M	Rb	< 0.00400	M	Th	< 0.00400
M	Be	< 0.00200	O	Ga	< 0.05000	i	Hg		M	Ru	< 0.00799	M	Tm	< 0.00160
M	Bi	< 0.00160	O	Ge	< 0.00300	M	Mo	0.00361	M	Sm	< 0.00400	M	Sn	< 0.01998
O	B	< 0.03700	M	Au	< 0.01198	M	Nd	< 0.00799	M	Sc	< 0.03995	O	Ti	< 0.00200
M	Cd	0.00120	M	Hf	< 0.00799	M	Ni	< 0.03196	M	Se	0.14041	M	W	< 0.03995
O	Ca	0.00603	M	Ho	< 0.00200	M	Nb	< 0.00200	O	Si	< 0.05000	M	U	< 0.00799
M	Ce	< 0.01998	M	In	< 0.03995	n	Os		M	Ag	< 0.00799	M	V	< 0.00799
M	Cs	< 0.00120	M	Ir	< 0.01998	M	Pd	< 0.01998	O	Na	0.00402	M	Yb	< 0.00400
M	Cr	0.10030	O	Fe	< 0.01000	i	P		M	Sr	0.00331	M	Y	< 0.15980
M	Co	0.01003	M	La	< 0.00200	M	Pt	< 0.00799	i	S		O	Zn	0.02510
M	Cu	0.00451	M	Pb	0.06018	O	K	0.02510	M	Ta	< 0.02797	M	Zr	< 0.01998

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(H2O)62+

Chemical Compatibility - Stable in HCl, HNO3, H2SO4 ,HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO3/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 H2SO4 and heat to SO3 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)
ICP-OES 257.610 nm	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+	40Ar14N1H, 39K16O, 37Cl18O, 40Ar15N, 38Ar17O, 6Ar18O1H , 38Ar16O1H, 37Cl17O1H, 23Na32S

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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)

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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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: December 09, 2005

Expiration Date:

EXPIRES
01/2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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4 of 4

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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 Vanadium in 1.4% (abs) HNO3**

Catalog Number:	CGV1-1, CGV1-2, and CGV1-5
Lot Number:	**Y-QV01119**
Starting Material:	V2O5
Starting Material Purity (%):	99.986532
Starting Material Lot No:	Stractor 46
Matrix:	1.4% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/28/05
DATE EXPIRED: 12/01/06 (2)
DATE OPENED: 11/29/05
INORG: 5472 PO: DR0024720

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1006 ± 3 µg/mL 992 ± 3 µg/g

Certified Density: 1.014 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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = 2\left[\frac{(\sum s_i)^2}{(n)}\right]^{1/2}$

$\sum s_i$ = 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1007 ± 3 µg/mL 993 ± 3 µg/g**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1006 ± 3 µg/mL 992 ± 3 µg/g**
ICP Assay NIST SRM 3165 Lot Number: 992706

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 < 0.00600	M Dy < 0.00597	O Li < 0.00002	M Pr < 0.00030	M Te < 0.02984
M Sb 0.04543	M Er < 0.00497	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.00995	M Eu < 0.00298	O Mg < 0.10000	M Rh < 0.00100	M Tl < 0.00100
M Ba < 0.00995	M Gd < 0.00100	M Mn 0.00069	M Rb < 0.00100	M Th < 0.00100
M Be < 0.00050	M Ga < 0.00100	O Hg < 0.01200	M Ru < 0.00199	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00597	M Mo 0.01481	M Sm < 0.00100	M Sn < 0.00497
O B < 0.04000	M Au < 0.00298	M Nd < 0.00199	M Sc < 0.00995	M Ti < 0.04973
M Cd < 0.00298	M Hf < 0.00199	M Ni < 0.07957	M Se < 0.00796	M W < 0.00995
O Ca 0.00596	M Ho < 0.00050	M Nb < 0.00050	O Si 0.04964	M U < 0.00199
M Ce < 0.00497	M In < 0.00995	n Os	M Ag < 0.00199	s V
M Cs < 0.00030	M Ir < 0.00497	M Pd < 0.00497	O Na < 0.01000	M Yb < 0.00100
O Cr < 0.10000	O Fe 0.08936	O P < 0.10000	M Sr < 0.00050	M Y < 0.03978
O Co < 0.00200	M La < 0.00050	M Pt < 0.00199	n S	M Zn < 0.01989
M Cu < 0.00597	M Pb < 0.00298	O K 0.03276	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 - 50.9415; +5; 6; $H_2V_{10}O_{28}^{4-}$

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4, HF, H_3PO_4 and strong 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.

V Containing Samples (Preparation and Solution) - Metal (Fusion with NaOH or KOH in Ni^0 or Na_2CO_3 / KNO_3); Oxides (V_2O_3 - use HCl, V_2O_4 - use HCl or HNO_3, V_2O_5 - use concentrated acids); Ores (Na_2CO_3 / KNO_3 in Pt^0 ***caution - nitrates attack Pt***° followed by water extraction of fuseate); Organic Matrices (Ash at 450 ?C followed by dissolving according to V_2O_5 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.)
ICP-OES	309.311 nm	0.005 / 0.001 µg/mL	1	ion	Mg, U, Th
ICP-OES	292.402 nm	0.006 / 0.001 µg/mL	1	ion	Th
ICP-OES	290.882 nm	0.008 / 0.0008 µg/mL	1	atom	Hf, Nb
ICP-MS	51 amu	4 ppt	n/a	M^+	$^{34}S^{16}O^1H$, $^{35}Cl^{16}O$, $^{38}Ar^{13}C$, $^{35}Ar^{15}N$, $^{35}Ar^{14}N^1H$, $^{37}Cl^{14}N$, $^{35}S^{15}N$, $^{33}S^{18}O$, $^{34}S^{17}O$, $^{102}Ru^{+2}$, $^{102}Pd^{+2}$

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: August 11, 2005

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager

Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul R Gaines

010272

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 Zinc in 1.4% (abs) HNO3**

Catalog Number:	CGZN1-1, CGZN1-2, and CGZN1-5
Lot Number:	**Y-ZN02028**
Starting Material:	Zn shot
Starting Material Purity (%):	99.999689
Starting Material Lot No:	D15M12
Matrix:	1.4% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/4/06
DATE EXPIRED: 3/1/2007
DATE OPENED: 11/4/06
INORG: 5538 PO: F56669

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1003 ± 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 $(\bar{x}) = \frac{\Sigma x1}{n}$

$(\bar{x})$ = mean
x1 = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\Sigma s1)2]^{1/2}}{(n)^{1/2}}$

$\Sigma s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1006 ± 5 µg/mL**
ICP Assay NIST SRM 3168a Lot Number: 001402

Assay Method #2 **1003 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

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1004

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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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	< 0.02420	O	Li	< 0.00003	M	Pr	< 0.00121	M	Te	< 0.12098
M	Sb	< 0.00202	M	Er	< 0.02016	M	Lu	< 0.00161	M	Re	< 0.00403	M	Tb	< 0.00121
M	As	< 0.04033	M	Eu	< 0.01210	O	Mg	< 0.00006	M	Rh	< 0.00403	M	Tl	< 0.00403
M	Ba	< 0.04033	M	Gd	< 0.00403	M	Mn	< 0.01613	M	Rb	< 0.00403	M	Th	< 0.00403
M	Be	< 0.00202	M	Ga	< 0.00403	O	Hg	< 0.01000	M	Ru	< 0.00807	M	Tm	< 0.00161
M	Bi	< 0.00161	M	Ge	< 0.02420	M	Mo	< 0.00807	M	Sm	< 0.00403	M	Sn	< 0.02016
O	B	0.00025	M	Au	< 0.01210	M	Nd	< 0.00807	M	Sc	< 0.04033	M	Ti	< 0.20164
M	Cd	< 0.01210	M	Hf	< 0.00807	O	Ni	0.00013	M	Se	< 0.03226	M	W	< 0.04033
O	Ca	0.00018	M	Ho	< 0.00202	M	Nb	< 0.00202	O	Si	0.00050	M	U	< 0.00807
M	Ce	< 0.02016	M	In	< 0.04033	n	Os		M	Ag	< 0.00807	M	V	< 0.00807
M	Cs	< 0.00121	M	Ir	< 0.02016	M	Pd	< 0.02016	O	Na	0.00200	M	Yb	< 0.00403
O	Cr	< 0.00100	O	Fe	0.00008	O	P	< 0.00300	M	Sr	< 0.00202	M	Y	< 0.16131
M	Co	< 0.01210	M	La	< 0.00202	M	Pt	< 0.00807	O	S	< 0.02000	s	Zn	
O	Cu	< 0.00050	M	Pb	< 0.01210	O	K	0.00025	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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010274

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± °4C. 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)(aq)1+

Chemical Compatibility - Stable in HCl, HNO3, H2SO4 ,HF, H3PO4 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% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Zn Containing Samples (Preparation and Solution) - Metal (Soluble in HNO3); Oxides (Soluble in HCl); Ores (Dissolve in HCl /HNO3); Organic based (Dry ash at 450EC 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)
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+	50Ti16O,50Cr16O, 50V16O, 34S16O2, 32S16O18O, 32S17O2, 33S16O17O, 32S34S, 33S2

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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)

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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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: November 10, 2005

Expiration Date: EXPIRES 1 FEB 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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010276

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 Silver in 3.5% (abs) HNO_3**

Catalog Number:	CGAG1-1, CGAG1-2, and CGAG1-5
Lot Number:	**Y-QAG01132**
Starting Material:	Ag shot
Starting Material Purity (%):	99.998444
Starting Material Lot No	J18M38
Matrix:	3.5% (abs) HNO_3

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1003 ± 3 µg/mL

Certified Density: 1.025 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 $(\bar{x}) = \frac{\sum x_1}{n}$

$(\bar{x})$ = mean
x_1 = individual results
n = number of measurements

Uncertainty (±) $= \frac{2[(\sum s_1)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_1$ = 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 ± 3 µg/mL (Avg of 2 full assays)**
Volhard NIST SRM 999a Lot Number: 999a

Assay Method #2 **1003 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3151 Lot Number: 992212

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 9/23/05
DATE EXPIRED: 10/1/06 (5)
DATE OPENED: 9/27/05
INORG: 5406 PO: D120616435

pg 1 of 4
5406

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	0.00165	M	Dy	< 0.01198	O	Li	0.00001	M	Pr	< 0.00060	M	Te	< 0.05991
M	Sb	< 0.00100	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	0.00012	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.01997	M	Gd	< 0.00200	M	Mn	< 0.00799	M	Rb	< 0.00200	M	Th	< 0.00200
M	Be	< 0.00100	M	Ga	< 0.00200	O	Hg	< 0.01500	M	Ru	< 0.00399	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01198	M	Mo	< 0.00399	M	Sm	< 0.00200	M	Sn	< 0.00998
M	B	< 0.13978	O	Au	< 0.00300	M	Nd	< 0.00399	M	Sc	< 0.01997	M	Ti	< 0.09984
O	Cd	0.00042	M	Hf	< 0.00399	O	Ni	< 0.00300	M	Se	< 0.01598	M	W	< 0.01997
O	Ca	0.00250	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	0.00399	M	U	< 0.00399
M	Ce	< 0.00998	M	In	< 0.01997	n	Os		s	Ag		M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00998	O	Pd	< 0.00400	O	Na	0.00319	M	Yb	< 0.00200
M	Cr	< 0.00998	O	Fe	0.00100	O	P	< 0.00300	M	Sr	< 0.00100	M	Y	< 0.07987
M	Co	< 0.00599	M	La	< 0.00100	O	Pt	< 0.01700	O	S	< 0.02500	O	Zn	< 0.00040
O	Cu	0.00150	M	Pb	0.00199	O	K	0.00035	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 010278

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 - 107.8682; +1; 6; $Ag(H_2O)_6^+$
Chemical Compatibility - Stable in HNO_3, and HF. **Avoid** basic media. Ag forms more insoluble salts than any other metal. It also is subject to photochemical reduction to the metal in HCl media although 10 µg/mL solutions in 10% HCl [$AgCl_x^{1-x}$] are commonly used in the analytical laboratory. The most common solubility problems exist with arsenate, arsenite , bromide, chloride, iodide, carbonate , chromate, cyanide, iodate, oxalate, oxide, sulfate, sulfide, tartrate, and thiocyanate in aqueous media. The addition of nitric acid renders many of these salts soluble.
Stability - 2-100 ppb levels stable for 75+ days when mixed with equivalent levels of all other elements including the precious metals (where chloride is present) when in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Ag Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HNO_3); Ores (Digestion with conc. 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)
ICP-OES 328.068 nm	0.007 / 0.0007 µg/mL	1	atom	Ce, Rh, V
ICP-OES 338.289 nm	0.013 / 0.001µg/mL	1	atom	Ce, Cr, Th
ICP-OES 243.779 nm	0.12 / 0.01 µg/mL	1	ion	Mn, Th, Ni, Rh
ICP-MS 107 amu	1 ppt	n/a	M^+	$^{91}Zr^{16}O$

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)

010279

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, 2005

Expiration Date: EXPIRES 1/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator — Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager — Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director — Paul R Gaines

010280

INORGANIC VENTURES
195 Lehigh Avenue, Suite 4
Lakewood, New Jersey 08701 · USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 732.901.1900
fax: 732.901.1903
info@inorganicventures.com

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/27/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 1/27/06
INORG: 5633 PO: FS6680

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 DESCRIPTION OF CRM — 1000 µg/mL Arsenic in 1.4% (abs) HNO3

Catalog Number:	CGAS1-1, CGAS1-2, and CGAS1-5
Lot Number:	**Y -AS02029**
Starting Material:	As Polycrystaline lump
Starting Material Purity (%):	99.999055
Starting Material Lot No:	23115
Matrix:	1.4% (abs) HNO3

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1004 ± 2 µg/mL 995 ± 2 µg/g

Certified Density: 1.009 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 $(\bar{x}) = \frac{\Sigma x1}{n}$

$(\bar{x})$ = mean
x1 = individual results
n = number of measurements

Uncertainty (±) $= \frac{2[(\Sigma s1)2]^{1/2}}{(n)^{1/2}}$

$\Sigma s1$ = The summation of all significant estimated errors
(Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1004 ± 2 µg/mL 995 ± 2 µg/g (Avg 2 runs)**
ICP Assay NIST SRM 3103a Lot Number: 010713

Assay Method #2 **1003 ± 5 µg/mL 994 ± 5 µg/g**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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	< 0.01884	O	Li	< 0.00002	M	Pr	< 0.00094	M	Te	< 0.09418
O	Sb	< 0.01000	M	Er	< 0.01570	M	Lu	< 0.00126	O	Re	< 0.01000	M	Tb	< 0.00094
s	As		M	Eu	< 0.00942	O	Mg	0.00017	M	Rh	< 0.00314	M	Tl	< 0.00314
M	Ba	< 0.03139	M	Gd	< 0.00314	O	Mn	0.00005	M	Rb	< 0.00314	M	Th	< 0.00314
M	Be	< 0.00157	M	Ga	< 0.00314	O	Hg	< 0.01200	M	Ru	< 0.00628	M	Tm	< 0.00126
M	Bi	< 0.00126	M	Ge	< 0.01884	M	Mo	< 0.00628	M	Sm	< 0.00314	O	Sn	0.00073
O	B	< 0.01200	M	Au	< 0.00942	M	Nd	< 0.00628	M	Sc	< 0.03139	M	Ti	< 0.15697
M	Cd	< 0.00942	M	Hf	< 0.00628	O	Ni	< 0.00200	M	Se	< 0.02511	M	W	< 0.03139
O	Ca	0.00206	M	Ho	< 0.00157	O	Nb	< 0.00200	O	Si	0.00476	M	U	< 0.00628
M	Ce	< 0.01570	M	In	< 0.03139	n	Os		M	Ag	< 0.00628	M	V	< 0.00628
M	Cs	< 0.00094	M	Ir	< 0.01570	M	Pd	< 0.01570	O	Na	0.00159	M	Yb	< 0.00314
M	Cr	< 0.01570	O	Fe	< 0.00110	O	P	< 0.00260	M	Sr	< 0.00157	M	Y	< 0.12558
M	Co	< 0.00942	M	La	< 0.00157	M	Pt	< 0.00628	O	S	< 0.02500	O	Zn	0.00044
M	Cu	< 0.01884	M	Pb	< 0.00942	O	K	0.00048	M	Ta	< 0.02198	M	Zr	< 0.01570

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 - 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) - As0 (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 Ni0 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 Ni0 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)
ICP-OES189.042 nm	0.05 / 0.005 µg/mL	1	atom	Cr
ICP-OES193.696 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+	40Ar35Cl, 59Co16O, 36Ar38Ar1H, 38Ar37Cl, 6Ar39K, 150Nd2+,150Sm2+

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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)

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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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: September 15, 2005

Expiration Date:

EXPIRES
01 MAR 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Malda, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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010284

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
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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 Lead in 0.35% (abs) HNO_3**

Catalog Number:	CGPB1-1, CGPB1-2, and CGPB1-5
Lot Number:	**X-PB02118**
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: 1005 ± 2 µg/mL

Certified Density: 1.001 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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$\sum S$ = 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** **1005 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1001 ± 4 µg/mL**
ICP Assay NIST SRM 3128 Lot Number: 991504

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 5/27/05
DATE EXPIRED: 6/1/06
DATE OPENED: 5/27/05
INORG: 5255 PO: 55195

1 of 4
5255

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 ≈ concs.)
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)

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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 17, 2004

Expiration Date: EXPIRES 01 JAN 2006

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

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INORGANIC VENTURES
195 Lehigh Avenue, Suite 4
Lakewood, New Jersey 08701 · USA
inorganicventures.com
tel: 800.669.6799 · 732.901.1900
fax: 732.901.1903
ganicventures.com

CERTIFICATE OF ANALYSIS

INORGANIC LABS/RADCHEM LABS
[redacted] DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 2/24/06
INORG: 5655 PO: F56688 [redacted]

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 **DESCRIPTION OF CRM** **1000 µg/mL Antimony in 0.7% (abs) HNO3 / 3% Tartaric Acid**

Catalog Number:	CGSB1-1, CGSB1-2 and CGSB1-5
Lot Number:	**Y-SB02091**
Starting Material:	Sb shot
Starting Material Purity (%):	99.992045
Starting Material Lot No:	D29N32
Matrix:	0.7% (abs) HNO3 / 3% Tartaric Acid

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 998 ± 3 µg/mL

Certified Density: 1.020 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 $(\bar{x}) = \frac{\Sigma x1}{n}$ ($\bar{x}$) = mean
x1 = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\Sigma s1)2]^{1/2}}{(n)^{1/2}}$ $\Sigma s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **998 ± 3 µg/mL** **(Avg 2 Runs)**
ICP Assay NIST SRM 3102a Lot Number: 990707

Assay Method #2 **1001 ± 5 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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		0.02900	M	Dy	<	0.00591	O	Li		0.00002	M	Pr	<	0.00030	M	Te	<	0.02956
s	Sb			M	Er	<	0.00493	M	Lu	<	0.00039	M	Re	<	0.00099	M	Tb	<	0.00030
M	As	<	0.00985	M	Eu	<	0.00296	O	Mg		0.00140	M	Rh	<	0.00099	M	Tl	<	0.00099
O	Ba		0.00014	M	Gd	<	0.00099	O	Mn		0.00200	M	Rb	<	0.00099	M	Th	<	0.00099
O	Be	<	0.00001	M	Ga	<	0.00099	O	Hg	<	0.01500	M	Ru	<	0.00197	M	Tm	<	0.00039
M	Bi	<	0.00039	M	Ge	<	0.00591	M	Mo	<	0.00197	M	Sm	<	0.00099	M	Sn		0.00059
O	B		0.00099	M	Au	<	0.00296	M	Nd	<	0.00197	O	Sc	<	0.00016	O	Ti		0.00085
M	Cd	<	0.00296	M	Hf	<	0.00197	O	Ni		0.00310	M	Se	<	0.00788	M	W	<	0.00985
O	Ca		0.00680	M	Ho	<	0.00049	M	Nb	<	0.00049	O	Si		0.00530	M	U	<	0.00197
O	Ce	<	0.00300	M	In	<	0.00985	n	Os			M	Ag	<	0.00197	M	V	<	0.00197
M	Cs	<	0.00030	M	Ir	<	0.00493	M	Pd	<	0.00493	O	Na		0.00430	M	Yb	<	0.00099
O	Cr		0.00830	O	Fe		0.00900	O	P	<	0.04000	M	Sr	<	0.00049	M	Y	<	0.03941
M	Co	<	0.00296	O	La	<	0.00120	M	Pt	<	0.00197	n	S			O	Zn		0.00026
O	Cu		0.00260	M	Pb	<	0.00296	O	K		0.00700	M	Ta	<	0.00690	M	Zr	<	0.00493

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 - 121.75; +3 ; 6; Sb(O)C4H4O6-1

Chemical Compatibility - Stable in concentrated HCl, dilute or concentrated HF. Stable in dilute HNO3 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% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-2% HNO3 / LDPE container.

Sb Containing Samples (Preparation and Solution) - Metal and alloys (Soluble in H2O / HF / HNO3 mixture); Oxides (Soluble in HCl and tartaric acid or H2O / HF / HNO3 mixtures); Ores (Fusion with Na2CO3 in Pt0 followed by dissolving the fuseate in a H2O / HF / HNO3 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)
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+	105Pd16O, 89Y16O2

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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)

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010291

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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 31, 2005

Expiration Date: EXPIRES 01 MAR 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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4064

010292

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 Selenium in 1.4% (abs) HNO_3**

Catalog Number:	CGSE1-1, CGSE1-2, and CGSE1-5
Lot Number:	**X-SE01106**
Starting Material:	Se shot
Starting Material Purity (%):	99.997834
Starting Material Lot No	I20L45
Matrix:	1.4% (abs) HNO_3

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1006 ± 2 µg/mL 997 ± 2 µg/g

Certified Density: 1.009 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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_i$ = 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.)

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 µg/mL 993 µg/g**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **1006 ± 2 µg/mL 997 ± 2 µg/g (Avg 2 runs)**
ICP Assay NIST SRM 3149 Lot Number: 992106

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 7/22/05
DATE EXPIRED: 8/1/06
DATE OPENED: 7/22/05
INORG: 5313 PO: F55213

p. 1 of 4
5313

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	0.00030	M	Dy	< 0.01196	O	Li	< 0.00003	M	Pr	< 0.00060	M	Te	< 0.05982
M	Sb	< 0.00100	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	0.00021	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	0.01054	O	Ru	< 0.00700	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	0.00060	M	Hf	< 0.00399	O	Ni	0.00028	S	Se		M	W	< 0.01994
O	Ca	0.00100	M	Ho	< 0.00100	O	Nb	< 0.00400	O	Si	< 0.00300	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01994	n	Os		M	Ag	< 0.00399	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	0.00402	M	Yb	< 0.00199
M	Cr	0.00080	O	Fe	0.00271	O	P	< 0.00300	M	Sr	< 0.00100	M	Y	< 0.07976
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	O	S	< 0.04000	M	Zn	0.00400
M	Cu	0.00130	M	Pb	< 0.00598	O	K	0.00060	M	Ta	< 0.01396	O	Zr	0.00005

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

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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_3or 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)
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)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010295

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 30, 2004

Expiration Date: EXPIRES 1 02006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator — Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager — Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director — Paul R Gaines

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010296

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 Thallium in 0.5% (abs) HNO3**

Catalog Number:	CGTL1-1, CGTL1-2, and CGTL1-5
Lot Number:	**Y-TL01093**
Starting Material:	TlNO3
Starting Material Purity (%):	99.999824
Starting Material Lot No:	G09P28
Matrix:	0.5% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/27/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 1/27/06
INORG: 5635 PO: E56680

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 2 µg/mL 1000 ± 2 µg/g

Certified Density: 1.002 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
$\sum s_i$ = 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1002 ± 2 µg/mL 1000 ± 2 µg/g (Avg. 2 runs)**
ICP Assay NIST SRM 3158 Lot Number: 993012

Assay Method #2 **1000 ± 5 µg/mL 998 ± 5 µg/g**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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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 < 0.02018	M Dy < 0.01211	O Li < 0.00002	M Pr < 0.00061	M Te < 0.06055
M Sb < 0.00101	M Er < 0.01009	M Lu < 0.00081	M Re < 0.00202	M Tb < 0.00061
M As < 0.02018	M Eu < 0.00606	O Mg 0.00030	M Rh < 0.00202	s Tl
M Ba < 0.02018	M Gd < 0.00202	M Mn < 0.00807	M Rb < 0.00202	M Th < 0.00202
M Be < 0.00101	M Ga < 0.00202	O Hg < 0.01200	M Ru < 0.00404	M Tm < 0.00081
M Bi < 0.00081	M Ge < 0.01211	M Mo < 0.00404	M Sm < 0.00202	M Sn < 0.01009
O B < 0.00140	M Au < 0.00606	M Nd < 0.00404	M Sc < 0.02018	M Ti < 0.10091
O Cd < 0.00540	M Hf < 0.00404	O Ni < 0.00090	M Se < 0.01615	M W < 0.02018
O Ca 0.00015	M Ho < 0.00101	M Nb < 0.00101	O Si < 0.00340	M U < 0.00404
M Ce < 0.01009	M In < 0.02018	n Os	M Ag < 0.00404	M V < 0.00404
M Cs < 0.00061	M Ir < 0.01009	M Pd < 0.01009	O Na 0.00124	M Yb < 0.00202
M Cr < 0.01009	O Fe < 0.00100	O P < 0.00260	M Sr < 0.00101	M Y < 0.08073
M Co < 0.00606	M La < 0.00101	M Pt < 0.00404	O S < 0.03000	O Zn 0.00154
M Cu < 0.01211	M Pb < 0.00606	O K < 0.00180	M Ta < 0.01413	M Zr < 0.01009

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 - 204.383; +1; 6; $Tl(H_2O)_6^{1+}$

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^{0} 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 indicate severe)
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	Ta, 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^{+}	$^{186}Os^{16}O$

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)

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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 23, 2005

Expiration Date: EXPIRES 01 MAR 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

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CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 DESCRIPTION OF CRM 1000 µg/mL Boron in H20

Catalog Number:	CGB1-1, CGB1-2, and CGB1-5
Lot Number:	**Y-B02054**
Starting Material:	H3BO3
Starting Material Purity (%):	99.999998
Starting Material Lot No:	OV0133
Matrix:	H20

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 2/24/06
INORG: 5656 PO: F56688

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1004 ± 2 µg/mL 1005 ± 2 µg/g

Certified Density: 0.999 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 $(\bar{x}) = \frac{\Sigma x1}{n}$ $(\bar{x})$ = mean
x1 = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\Sigma s1)2]^{1/2}}{(n)^{1/2}}$ $\Sigma s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **1004 ± 2 µg/mL 1005 ± 2 µg/g (Avg 2 runs)**
ICP Assay NIST SRM 3107 Lot Number: 991907

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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

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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 - 10.811; +3; 4; B(OH)3 and B(OH)4-1

Chemical Compatibility - Moderately soluble in HCl, HNO3, H2SO4 and HF aqueous matrices and very soluble in NH4OH . Stable with all metals and inorganic anions at low to moderate ppm levels.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-1,000 ppm solutions chemically stable for years in 1% HNO3 / LDPE container. 1000 -10,000 ppm stable for years in dilute NH4OH / 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. HNO3 or H2SO4); B(OH)3 (water soluble); Ores(avoid acid digestions and use caustic fusions in PtE); Organic Matrices (dry ash mixed with Na2CO3 in PtE at 450EC then increase heat to 1000EC to fuse; or perform a Na2O2 fusion in a NiE 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)
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 11amu	700 ppt	n/a	M+	

8.0 HAZARDOUS INFORMATION

- Please refer to the enclosed Material Safety 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)

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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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 06, 2005

Expiration Date: EXPIRES 01 MAR 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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INORGANIC VENTURES
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CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 DESCRIPTION OF CRM — 1000 µg/mL Molybdenum in H20 tr NH4OH

Catalog Number:	CGMO1-1, CGMO1-2, and CGMO1-5
Lot Number:	**Y-MO02010**
Starting Material:	(NH4)6Mo7O24xH2O
Starting Material Purity (%):	99.994915
Starting Material Lot No:	23398
Matrix:	H20 tr NH4OH

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 2/24/06
INORG: 56607 PO: F56688

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1007 ± 3 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 $(\bar{x}) = \frac{\Sigma x1}{n}$ — $(\bar{x})$ = mean; x1 = individual results; n = number of measurements

Uncertainty $(\pm) = \frac{2[(\Sigma s1)2]^{1/2}}{(n)^{1/2}}$ — $\Sigma s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** — **1007 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3134 Lot Number: 891307

Assay Method #2 — **1000 ± 5 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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	<	0.01240	O	Li	<	0.01000	O	Pr	<	0.10000	i	Te		
M	Sb	<	0.00103	M	Er	<	0.01034	M	Lu	<	0.00083	M	Re		0.00687	M	Tb	<	0.00062
M	As	<	0.02067	M	Eu	<	0.00620	O	Mg	<	0.05000	M	Rh	<	0.00207	M	Tl	<	0.00207
M	Ba	<	0.02067	M	Gd	<	0.00207	M	Mn	<	0.00827	M	Rb	<	0.00207	M	Th	<	0.00207
M	Be	<	0.00103	M	Ga	<	0.00207	i	Hg			M	Ru	<	0.00413	M	Tm	<	0.00083
M	Bi	<	0.00083	M	Ge	<	0.01240	s	Mo			M	Sm	<	0.00207	M	Sn	<	0.01034
O	B	<	0.50000	M	Au	<	0.00620	O	Nd	<	0.05000	O	Sc	<	0.05000	O	Ti	<	0.00500
O	Cd	<	0.50000	M	Hf	<	0.00413	M	Ni	<	0.01654	M	Se	<	0.01654	M	W		0.07838
O	Ca		0.00098	M	Ho	<	0.00103	M	Nb	<	0.00103	O	Si	<	0.10000	M	U	<	0.00413
O	Ce	<	0.05000	M	In		0.00503	n	Os			M	Ag	<	0.00413	M	V	<	0.00413
M	Cs	<	0.00062	M	Ir	<	0.01034	M	Pd	<	0.01034	O	Na	<	0.10000	M	Yb	<	0.00207
M	Cr	<	0.01034	O	Fe	<	0.50000	i	P			M	Sr		0.00042	M	Y	<	0.08269
M	Co	<	0.00620	M	La	<	0.00103	M	Pt	<	0.00413	i	S			M	Zn		0.00051
M	Cu	<	0.01240	M	Pb	<	0.00620	O	K	<	0.03000	M	Ta	<	0.01447	M	Zr	<	0.01034

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 010306

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 - 95.94; +6; 6,7,8,9; [MoO4]-2(chemical form as received)

Chemical Compatibility - Mo is received in a NH4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The [MoO4]-2 is soluble in concentrated HCl [MoOCl5]-2, dilute HF / HNO3 [MoOF5]-2 and basic media [MoO4]-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 [MoO4]-2 chemical form.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the [MoOF5]-2 for months in 1% HNO3 / LDPE container. 1-10,000 ppm single element solutions as the [MoO4]-2 chemically stable for years in 1% NH4OH in a LDPE container.

Mo Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO3 or hot dilute HCl); Oxide (soluble in HF or NH4OH) ; Organic Matrices (Dry ash at 450EC in Pt0 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)
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+	40Ar39K16O, 79Br16O, 190Os2+, 190Pt2+

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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)

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010307

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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 31, 2005

Expiration Date: EXPIRES 01 MAR 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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010308

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 Phosphorus in H_2O

Catalog Number: CGP1-1, CGP1-2 and CGP1-5

Lot Number: **Y-P01127**

Starting Material:	Phosphoric Acid
Starting Material Purity:	99.999%
Starting Material Lot No:	J18804

CERTIFIED CONCENTRATION: 1000 ± 5 µg/mL

The Certified Value is the ICP 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: 1004 ± 2 µg/mL
Method: Acidimetric Titration vs NIST SRM 84k KHP.

Instrument Analysis: 1000 ± 5 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3139a Lot number 890607.

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): 0.999 g/mL

QA:KL Rev.020806CG

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 5/27/05
DATE EXPIRED: 6/1/06
DATE OPENED: 5/27/05
INORG: 5254 PO: 55193

Paul R. Haines
Quality Assurance Manager

1 of 2
5254

Expires: EXPIRES 01/2006

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/IEC 17025-1999 - Chemical Testing - Accredited A2LA (Certificate Number 883.01)
3. ISO/IEC Guide 34-2000 - Reference Materials Production - Accredited A2LA (Certificate Number 883.02)
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

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 H20 / tr. HF / tr. HNO3**

Catalog Number:	CGSI1-1, CGSI1-2, and CGSI1-5
Lot Number:	**Y- SI02092**
Starting Material:	SiO2
Starting Material Purity (%):	99.995055
Starting Material Lot No:	C05310C
Matrix:	H20 / tr. HF / tr. HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 2/24/06
INORG: 5665 PO: F56658

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL 1002 ± 2 µg/g

Certified Density: 1.002 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
$\sum s_i$ = 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'In-house std.' is specified.

4.1 **Assay Method #1** **1004 ± 2 µg/mL 1002 ± 2 µg/g (Avg 2 runs)**
ICP Assay NIST SRM 3150 Lot Number: 991108

Assay Method #2 **999 µg/mL 997 µg/g**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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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	0.03189	M	Dy	< 0.01211	O	Li	0.00011	M	Pr	< 0.00061	M	Te	< 0.06054
M	Sb	< 0.00101	M	Er	< 0.01009	M	Lu	< 0.00081	M	Re	< 0.00202	M	Tb	< 0.00061
M	As	< 0.02018	M	Eu	< 0.00605	O	Mg	0.00203	M	Rh	< 0.00202	M	Tl	< 0.00202
M	Ba	< 0.02018	M	Gd	< 0.00202	M	Mn	< 0.00807	M	Rb	< 0.00202	M	Th	< 0.00202
O	Be	< 0.00100	M	Ga	< 0.00202	O	Hg	< 0.05514	M	Ru	< 0.00404	M	Tm	< 0.00081
M	Bi	< 0.00081	M	Ge	< 0.01211	M	Mo	< 0.00404	M	Sm	< 0.00202	M	Sn	< 0.01009
O	B	0.03417	M	Au	< 0.00605	M	Nd	< 0.00404	O	Sc	< 0.00100	O	Ti	0.01822
M	Cd	< 0.00605	M	Hf	< 0.00404	O	Ni	< 0.01153	M	Se	< 0.01614	O	W	< 0.02005
O	Ca	0.00103	M	Ho	< 0.00101	M	Nb	< 0.00101	s	Si		M	U	< 0.00404
M	Ce	< 0.01009	M	In	< 0.02018	n	Os		M	Ag	< 0.00404	O	V	< 0.00451
M	Cs	< 0.00061	M	Ir	< 0.01009	M	Pd	< 0.01009	O	Na	0.01595	M	Yb	< 0.00202
O	Cr	< 0.00752	O	Fe	0.00396	O	P	< 0.02506	O	Sr	< 0.00035	M	Y	< 0.08072
M	Co	< 0.00605	M	La	< 0.00101	M	Pt	< 0.00404	O	S	< 0.12531	O	Zn	0.00273
O	Cu	< 0.00501	M	Pb	< 0.00605	O	K	0.00105	O	Ta	< 0.03007	M	Zr	< 0.01009

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 - 28.0855; +4; 6; $Si(OH)_x(F)_y^{2-}$

Chemical Compatibility - Soluble in HCl, HF, H_3PO_4, H_2SO_4 and HNO_3 as the $Si(OH)_x(F)_y^{2-}$. 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 $Si(OH)_x(F)_y^{2-}$. 1-10,000 ppm single element solutions as the $Si(OH)_x(F)_y^{2-}$ 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^0 with Na_2CO_3); Geological Samples (Fuse in Pt^0 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^0 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)
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)

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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 09, 2005

Expiration Date: EXPIRES 01 MAY 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

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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 Titanium in 1.4% (abs) HNO_3 tr.HF**

Catalog Number:	CGTI1-1, CGTI1-2, and CGTI1-5
Lot Number:	**X-TI02047**
Starting Material:	Ti granules
Starting Material Purity (%):	99.960814
Starting Material Lot No	K27M07
Matrix:	1.4% (abs) HNO_3 tr.HF

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1000 ± 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 $(\bar{x}) = \frac{\Sigma x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = 2[(\Sigma s_i)^2]^{1/2} / (n)^{1/2}$

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.)

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 ± 3 µg/mL (Avg of 2 runs)**
ICP Assay NIST SRM 3162a Lot Number: 992801

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/28/05
DATE EXPIRED: 12/1/06
DATE OPENED: 11/29/05
INORG: 5474 PO: DR0024720

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5474

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 < 0.01201	M Dy < 0.01190	O Li < 0.00080	M Pr < 0.00060	M Te < 0.05951
M Sb < 0.00099	M Er < 0.00992	M Lu < 0.00079	M Re < 0.00198	M Tb < 0.00060
M As < 0.01984	M Eu < 0.00595	O Mg < 0.00040	M Rh < 0.00198	M Tl < 0.00198
M Ba < 0.01984	M Gd < 0.00198	O Mn 0.00161	M Rb < 0.00198	M Th < 0.00198
M Be < 0.00099	M Ga < 0.00198	O Hg < 0.06004	M Ru < 0.00397	M Tm < 0.00079
M Bi < 0.00079	M Ge < 0.01190	M Mo < 0.00397	M Sm < 0.00198	M Sn < 0.00992
O B < 0.00801	M Au < 0.00595	M Nd < 0.00397	O Sc < 0.00008	s Ti
M Cd < 0.00595	M Hf < 0.00397	M Ni < 0.01587	M Se < 0.01587	M W < 0.01984
O Ca < 0.00024	M Ho < 0.00099	M Nb < 0.00099	O Si < 0.01601	M U < 0.00397
M Ce < 0.00992	M In < 0.01984	n Os	M Ag < 0.00397	O V < 0.00801
M Cs < 0.00060	M Ir < 0.00992	M Pd < 0.00992	O Na 0.14051	M Yb < 0.00198
M Cr < 0.00992	O Fe < 0.00400	O P < 0.02001	M Sr. < 0.00099	M Y < 0.07935
M Co < 0.00595	M La < 0.00099	M Pt < 0.00397	i S	O Zn < 0.00080
O Cu < 0.01201	M Pb < 0.00595	O K 0.26095	M Ta < 0.01389	M Zr < 0.00992

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 010316

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 Formin Solution - 47.867; +4; 6; $Ti(F)_6^{-2}$

Chemical Compatibility - Soluble in concentrated HCl, HF, H_3PO_4, H_2SO_4 and 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 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) as the $Ti(F)_6^{-2}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Ti(F)_6^{-2}$ chemically stable for years in 2-5% HNO_3 / trace HF in an LDPE container.

Ti Containing Samples (Preparation and Solution) - Metal (Soluble in H_2O / HF ***caution -powder reacts violently***); Oxide - lowtemperature history *anatase or rutile* (Dissolved by heating in 1:1:1 H_2O / HF / H_2SO_4); Oxide - high temperature history (~800? C) *brookite* (fuse in Pt^0 with $K_2S_2O_7$); Ores (fuse in Pt^0 with KF + $K_2S_2O_7$ - no KF if silica not present); Organic Matrices (Dry ash at 450? C in Pt^0 and dissolve by heating with 1:1:1 H_2O / HF / H_2SO_4 or fuse ash with pyrosulfate if oxide is as plastic pigment and likely in brookite crystalline form).

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)
ICP-OES	334.941 nm	0.0038 / 0.000028 µg/mL	1	ion	Nb, Ta, Cr, U
ICP-OES	336.121 nm	0.0053 / 0.000034 µg/mL	1	ion	W, Mo, Co
ICP-OES	323.452 nm	0.0054 / 0.00092 µg/mL	1	ion	Ce, Ar, Ni
ICP-MS	48 amu	14 ppt	n/a	M^+	[$^{32}S^{16}O$, $^{32}S^{14}N$, $^{14}N^{16}O^{18}O$, $^{14}N^{17}N_2$, $^{36}Ar^{12}C$, ^{48}Ca, $^{96}X^{+2}$ (where X = Zr, Mo, Ru)]

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)

010317

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: December 14, 2004

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	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 Strontium in 0.1% (abs) HNO3

Catalog Number:	CGSR1-1, CGSR1-2, and CGSR1-5
Lot Number:	**Y-SR01128**
Starting Material:	SrCO3
Starting Material Purity (%):	99.999250
Starting Material Lot No:	22878
Matrix:	0.1% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 5/9/05
DATE EXPIRED: 6/1/06
DATE OPENED: 5/19/05
INORG: 5243 PO: 55189

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1005 ± 2 µg/mL 1005 ± 2 µg/g

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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_i$ = 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** **1005 ± 2 µg/mL** **1005 ± 2 µg/g**
EDTA NIST SRM 928 Lot Number: 392110

Assay Method #2 **1006 ± 4 µg/mL** **1006 ± 4 µg/g**
ICP Assay NIST SRM 3153a Lot Number: 990906

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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	<	0.00595	O	Li		0.00013	M	Pr	<	0.00030	O	Te	<	0.10000
M	Sb	<	0.00050	M	Er	<	0.00496	M	Lu	<	0.00040	M	Re	<	0.00099	M	Tb	<	0.00030
O	As	<	0.00500	M	Eu	<	0.00297	O	Mg		0.00008	O	Rh	<	0.00600	M	Tl	<	0.00099
M	Ba		0.00197	M	Gd		0.00512	O	Mn		0.00003	i	Rb			M	Th	<	0.00099
O	Be	<	0.00009	M	Ga	<	0.00099	O	Hg	<	0.01500	O	Ru	<	0.00300	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	<	0.00060	M	Au	<	0.00297	M	Nd	<	0.00198	M	Sc	<	0.00991	M	Ti	<	0.04956
M	Cd	<	0.00297	M	Hf	<	0.00198	O	Ni	<	0.00300	O	Se	<	0.05000	M	W	<	0.00991
O	Ca		0.00447	M	Ho	<	0.00050	M	Nb	<	0.00050	O	Si	<	0.00340	M	U	<	0.00198
M	Ce	<	0.00496	O	In	<	0.00200	n	Os			M	Ag	<	0.00198	M	V	<	0.00198
M	Cs	<	0.00030	M	Ir	<	0.00496	O	Pd	<	0.00400	O	Na		0.00149	M	Yb		0.00059
O	Cr	<	0.00080	O	Fe		0.00044	O	P	<	0.00480	s	Sr			O	Y	<	0.00004
M	Co	<	0.00297	M	La	<	0.00050	M	Pt	<	0.00198	n	S			M	Zn	<	0.01982
O	Cu	<	0.00140	M	Pb		0.00016	O	K	<	0.00170	M	Ta	<	0.00694	M	Zr	<	0.00496

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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2 of 4

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 ± °4C. 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^0 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)
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)

010321

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 15, 2005

Expiration Date: EXPIRES 01 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

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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 Tin in H_2O tr HNO_3 tr HF**

Catalog Number:	CGSN1-1, CGSN1-2, and CGSN1-5
Lot Number:	**Y-QSN01140**
Starting Material:	Sn Shot
Starting Material Purity (%):	99.999438
Starting Material Lot No	G12M23
Matrix:	H_2O tr HNO_3 tr HF

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 994 ± 4 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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = 2\left[\left(\sum s_i\right)^2 / (n)\right]^{1/2}$

$\sum s_i$ = 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.)

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 ± 4 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
DATE RECEIVED: 3/31/05
DATE EXPIRED: 5/1/05
DATE OPENED: 3/31/05
INORG: 5174 PO: 5216

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	< [illegible]
O	Cd	0.00009	M	Hf	< 0.00402	O	Ni	< 0.01000	M	Se	< 0.01607	M	W	[illegible]
O	Ca	< 0.00150	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	< 0.00340	M	U	[illegible]
M	Ce	< 0.01004	M	In	< 0.02009	n	Os		M	Ag	< 0.00402	M	V	[illegible]
M	Cs	< 0.00060	M	Ir	< 0.01004	M	Pd	< 0.01004	O	Na	< 0.00010	M	Yb	[illegible]
M	Cr	< 0.01004	O	Fe	< 0.00110	O	P	< 0.00500	M	Sr	< 0.00100	M	Y	[illegible]
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

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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 - 118.710; +4; 4,5, 6, 7,8; $Sn(OH)_xF_y^{2-}$

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 $Sn(OH)_xF_y^{2-}$ for 1 year in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Sn(OH)_xF_y^{2-}$ 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)
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^+	^{120}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)

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 01, 2005

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	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 Bismuth in 3.5% (abs) HNO_3**

Catalog Number:	CGBI1-1, CGBI1-2, and CGBI1-5
Lot Number:	**X-BI01093**
Starting Material:	Bi needles
Starting Material Purity (%):	99.999090
Starting Material Lot No	G25L16
Matrix:	3.5% (abs) HNO_3

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 2 µg/mL 976 ± 2 µg/g

Certified Density: 1.025 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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_i$ = 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.)

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 976 ± 2 µg/g (Avg 2 runs)**
ICP Assay NIST SRM 3106 Lot Number: 991212

Assay Method #2 **1001 µg/mL 977 µg/g**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 7/22/05
DATE EXPIRED: 8/1/06
DATE OPENED: 7/22/05
INORG: 5309 PO: F55213

1 of 1
5309

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

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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 - 208.9804; +3; **6** ;$Bi(O)(H_2O)_x^{1+}$
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)
ICP-OES	223.061 nm	0.04 / 0.005 µg/mL	1	atom	Th, Ir, Ti 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)

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5309

010329

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 18, 2004

Expiration Date: EXPIRES 1 12 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator — Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager — Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director — Paul R Gaines

010330

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 Lanthanum in 1.4% (abs) HNO_3**

Catalog Number:	CGLA1-1, CGLA1-2, and CGLA1-5
Lot Number:	**X-QLA01072**
Starting Material:	La2O3
Starting Material Purity (%):	99.991832
Starting Material Lot No	RP-LA-0-5-017
Matrix:	1.4% (abs) HNO_3

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1003 ± 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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$\sum S$ = 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** **1003 ± 4 µg/mL**
ICP Assay NIST SRM 3127a Lot Number: 890402

Assay Method #2 **1003 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 392110

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 9/23/05
DATE EXPIRED: 10/1/06 (B)
DATE OPENED: 9/27/05
INORG: 5407 PO: D20[illegible]35

pg. 1 of 4
5407

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 < 0.00992	M Dy < 0.00595	O Li < 0.00002	M Pr < 0.00030	M Te < 0.02975
M Sb < 0.00050	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 0.00281	M Rh < 0.00099	M Tl < 0.00099
M Ba < 0.00992	O Gd < 0.00080	O Mn < 0.00002	M Rb < 0.00099	M Th < 0.00099
M Be < 0.00050	M Ga < 0.00099	i Hg	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 < 0.03600	M Au < 0.00298	M Nd 0.00020	O Sc < 0.00003	M Ti < 0.04958
M Cd < 0.00298	M Hf < 0.00198	M Ni < 0.00793	M Se < 0.00793	M W < 0.00992
O Ca 0.00903	M Ho < 0.00050	M Nb < 0.00050	O Si < 0.01000	M U < 0.00198
O Ce < 0.00300	M In < 0.00992	n Os	M Ag < 0.00198	O V < 0.00080
M Cs < 0.00030	M Ir < 0.00496	M Pd < 0.00496	O Na < 0.05000	M Yb < 0.00099
M Cr < 0.00496	O Fe < 0.00150	n P	O Sr < 0.00004	M Y < 0.03966
M Co < 0.00298	s La	M Pt < 0.00198	O S < 0.04300	O Zn 0.10539
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 - 138.9055; +3; 6 to 8, 9,10 for some compounds; $La(OH)_x(H_2O)_x^{3+}$
Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid HF, H_3PO_4, H_2SO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride and sparingly soluble sulfates (La - Eu exhibit low sulfate solubility). 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.
La Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolved by heating in H_2O / HNO_3); Ores (Carbonate fusion in Pt^0 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 ≈ concs.)
ICP-OES	333.749 nm	0.01 / 0.001 µg/mL	1	ion	
ICP-OES	408.672 nm	0.01 / 0.001 µg/mL	1	ion	Th
ICP-OES	412.323 nm	0.01 / 0.001 µg/mL	1	ion	Ce, Th
ICP-MS	139 amu	1 ppt	n/a	M^+	$^{121}Sb^{16}O$, $^{123}Te^{16}O$

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

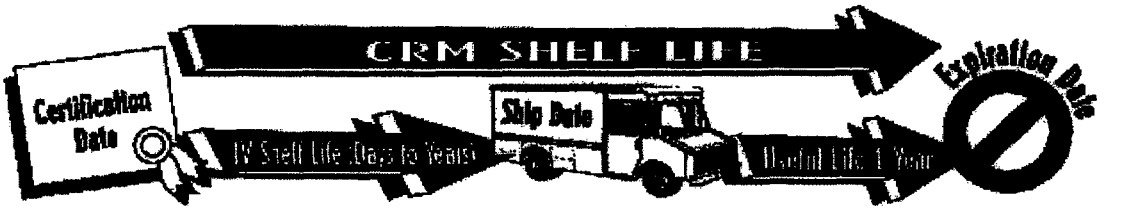
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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)

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 05, 2004

Expiration Date: EXPIRES 1 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010334

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 Palladium in 3.3% (abs) HCl**

Catalog Number:	CGPD1-1, CGPD1-2, and CGPD1-5
Lot Number:	**Y-PD02034**
Starting Material:	Pd(NO3)2
Starting Material Purity (%):	99.998752
Starting Material Lot No:	12636-A-00
Matrix:	3.3% (abs) HCl

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/24/06
DATE EXPIRED: 3/1/2007
DATE OPENED: 2/24/06
INORG: 5664 PO: F56688

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 999 ± 3 µg/mL

Certified Density: 1.022 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 ($\bar{x}$) = $\frac{\Sigma x1}{n}$

($\bar{x}$) = mean
x1 = individual results
n = number of measurements

Uncertainty (±) = $\frac{2[(\Sigma s1)2]^{1/2}}{(n)^{1/2}}$

$\Sigma s1$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **999 ± 3 µg/mL (Avg. of 2 Runs)**
ICP Assay NIST SRM 3138 Lot Number: 990207

Assay Method #2 **999 ± 5 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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		0.00795	M	Dy	<	0.00602	O	Li	<	0.04000	M	Pr	<	0.00030	O	Te	<	0.01300
O	Sb	<	0.00500	M	Er	<	0.00502	M	Lu	<	0.00040	M	Re	<	0.00100	M	Tb	<	0.00030
O	As	<	0.01400	M	Eu	<	0.00301	O	Mg	<	0.01100	O	Rh		0.01509	M	Tl	<	0.00100
M	Ba	<	0.01003	M	Gd	<	0.00100	O	Mn	<	0.00650	M	Rb	<	0.00100	M	Th	<	0.00100
O	Be	<	0.00009	M	Ga	<	0.00100	O	Hg	<	0.01100	O	Ru	<	0.00200	M	Tm	<	0.00040
M	Bi	<	0.00040	M	Ge	<	0.00602	M	Mo	<	0.00201	M	Sm	<	0.00100	O	Sn	<	0.00700
O	B	<	0.00090	O	Au	<	0.00300	M	Nd	<	0.00201	O	Sc	<	0.00009	O	Ti		0.00067
O	Cd	<	0.00600	M	Hf	<	0.00201	O	Ni		0.00211	M	Se	<	0.00803	M	W	<	0.01003
O	Ca		0.00443	M	Ho	<	0.00050	M	Nb	<	0.00050	O	Si		0.00392	M	U	<	0.00201
M	Ce	<	0.00502	O	In	<	0.03300	n	Os			O	Ag		0.01408	O	V	<	0.00100
M	Cs	<	0.00030	M	Ir	<	0.00502	s	Pd			O	Na		0.00704	M	Yb	<	0.00100
O	Cr		0.00503	O	Fe		0.02313	O	P	<	0.00300	M	Sr	<	0.00050	M	Y	<	0.04013
M	Co	<	0.00301	M	La	<	0.00050	O	Pt		0.04426	O	S	<	0.02500	O	Zn		0.00151
O	Cu		0.00905	M	Pb		0.00807	O	K	<	0.02000	M	Ta	<	0.00702	M	Zr	<	0.00502

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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2 of 4

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(H2O)62+

Chemical Compatibility - Stable in HCl, HNO3, H2SO4 ,HF, H3PO4 Avoid basic media. Stable with most metals and inorganic anions in acidic media. Avoid contact with water soluble organics such as aldehydes since Pd2+ is easily reduced.

Stability - 2-100 ppb levels. 2ppb Pd is stable for 1 day in 1% HNO3 / LDPE container. 10 ppb is stable for 3 days in 1% HNO3 / LDPE container. 100 ppb is stable for $5 months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Pd Containing Samples (Preparation and Solution) - Metal (Soluble in HNO3 or Aqua Regia); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO3).

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)
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+	40Ar65Cu, 89Y16O

8.0 HAZARDOUS INFORMATION

- Please refer to the enclosed Material Safety 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)

5664
3d4

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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: December 16, 2005

Expiration Date: EXPIRES 01 MAR 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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010338

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 Sulfur in H_2O**

Catalog Number:	CGS1-1, CGS1-2, and CGS1-5
Lot Number:	**Y-S01074**
Starting Material:	H_2SO_4
Starting Material Purity (%):	99.999991
Starting Material Lot No	X48058
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/4/2006
DATE EXPIRED: 3/1/2007 DR
DATE OPENED: 1/4/2006
INORG: 5539 PO: F56669

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1000 ± 2 µg/mL 1000 ± 2 µg/g

Certified Density: 1.000 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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_i$ = 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** **1001 ± 2 µg/mL 1001 ± 2 µg/g**
Acidimetric NIST SRM 84k Lot Number: 84k

Assay Method #2 **1000 ± 2 µg/mL 1000 ± 2 µg/g**
ICP Assay NIST SRM 3154 Lot Number: 892205

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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 < 0.00300	M Dy < 0.01201	O Li < 0.00016	M Pr < 0.00060	M Te < 0.06005
M Sb < 0.00100	M Er < 0.01001	M Lu < 0.00080	M Re < 0.00200	M Tb < 0.00060
M As < 0.02002	M Eu < 0.00601	O Mg < 0.00004	M Rh < 0.00200	M Tl < 0.00200
M Ba < 0.02002	M Gd < 0.00200	M Mn < 0.00801	M Rb < 0.00200	M Th < 0.00200
O Be < 0.00200	M Ga < 0.00200	O Hg < 0.01100	M Ru < 0.00400	M Tm < 0.00080
M Bi < 0.00080	M Ge < 0.01201	M Mo < 0.00400	M Sm < 0.00200	M Sn < 0.01001
O B < 0.00990	M Au < 0.00601	M Nd < 0.00400	M Sc < 0.02002	M Ti < 0.10008
M Cd < 0.00601	M Hf < 0.00400	O Ni < 0.00230	O Se < 0.00620	M W < 0.02002
O Ca < 0.00370	M Ho < 0.00100	M Nb < 0.00100	O Si < 0.00410	M U < 0.00400
M Ce < 0.01001	M In < 0.02002	n Os	M Ag < 0.00400	M V < 0.00400
M Cs < 0.00060	M Ir < 0.01001	M Pd < 0.01001	O Na 0.00007	M Yb < 0.00200
M Cr < 0.01001	O Fe < 0.00110	O P < 0.00480	M Sr < 0.00100	M Y < 0.08006
M Co < 0.00601	M La < 0.00100	M Pt < 0.00400	s S	O Zn < 0.00040
M Cu < 0.01201	M Pb < 0.00601	O K < 0.00170	M Ta < 0.01401	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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

010340

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^0 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)
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^+	$^{16}O_2$, $^{14}N^{18}O$, $^{15}N^{17}O$, $^{14}N^{17}O^1H$, $^{15}N^{16}O^1H$

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)

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010341

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 01, 2005

Expiration Date: EXPIRES 1 FEB 2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator — Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager — Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director — Paul R Gaines

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010342

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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 Thorium in 3% (abs) HNO3

Catalog Number:	CGTH1-1, CGTH1-2, and CGTH1-5
Lot Number:	**Y-TH01065**
Starting Material:	Th(NO3)4x4H2O
Starting Material Purity (%):	99.998809
Starting Material Lot No:	X-25828-7
Matrix:	3% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/28/05
DATE EXPIRED: 12/1/06 (2)
DATE OPENED: 11/29/05
INORG: 5469 PO: D0092471720

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1001 ± 3 µg/mL 980 ± 3 µg/g

Certified Density: 1.021 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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_i$ = 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** **1002 ± 3 µg/mL** **981 ± 3 µg/g**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #2 **1001 ± 3 µg/mL** **980 ± 3 µg/g**
ICP Assay NIST SRM 3159 Lot Number: 992912

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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	< 0.00998	M	Dy	< 0.00599	O	Li	< 0.05000	M	Pr	< 0.00030	M	Te	< 0.02995
M	Sb	< 0.00050	M	Er	< 0.00499	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	< 0.00030
M	As	< 0.00998	M	Eu	< 0.00300	O	Mg	< 0.02000	M	Rh	< 0.00100	M	Tl	< 0.00100
M	Ba	< 0.00998	M	Gd	< 0.00100	M	Mn	0.00049	M	Rb	< 0.00100	s	Th	
M	Be	< 0.00050	M	Ga	< 0.00100	i	Hg		M	Ru	< 0.00200	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00599	M	Mo	< 0.00200	M	Sm	< 0.00100	M	Sn	< 0.00499
M	B	< 0.06987	M	Au	< 0.00300	M	Nd	0.00044	M	Sc	< 0.00998	M	Ti	< 0.04991
M	Cd	< 0.00300	M	Hf	< 0.00200	M	Ni	< 0.00799	M	Se	< 0.00799	M	W	< 0.00998
O	Ca	< 0.10000	M	Ho	< 0.00050	M	Nb	< 0.00050	i	Si		M	U	0.00406
M	Ce	0.00267	M	In	< 0.00998	n	Os		M	Ag	< 0.00200	M	V	< 0.00200
M	Cs	< 0.00030	M	Ir	< 0.00499	M	Pd	< 0.00499	O	Na	< 0.05000	M	Yb	< 0.00100
M	Cr	< 0.00499	O	Fe	< 0.05000	i	P		M	Sr	< 0.00050	M	Y	< 0.03993
M	Co	< 0.00300	M	La	0.00076	M	Pt	< 0.00200	i	S		M	Zn	0.00425
M	Cu	< 0.00599	M	Pb	< 0.00300	O	K	< 0.03000	M	Ta	< 0.00699	M	Zr	0.01978

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 - 232.0381; +4 ; 8; $Th(OH)^{3+}$ and $Th(OH)_2^{2+}$

Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_3PO_4, H_2SO_4 and HF although solubilities may not be a problem depending upon pH and matrix (For example: ThF_4 is soluble in acids). Avoid neutral to basic media. Th^{4+} is stable with most metals and inorganic anions forming an insoluble carbonate, oxide, fluoride, oxalate, sulfate and phosphate in neutral to 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 2-5% HNO_3 / LDPE container.

Th Containing Samples (Preparation and Solution) - Metal (Soluble in Aqua Regia); Oxide (The heated oxide is not soluble in acids except hot conc. H_2SO_4); Ores (Na_2O_2 fusion at 480 ± 20?C for 7 minutes, cool and treat sintered mass with 50 mL cold water and stand until disintegrated. The mass is transferred to a beaker and acidified with HCl with 25 mL excess HCl added. Any residue is collected on a Whatman No. 42 filter, dried and ignited to 1000 ?C in Pt crucible and the ash treated with H_2SO_4 / HF and fumed. If residue remains, then treat it by peroxide fusion as 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)
ICP-OES	283.730 nm	0.07 / 0.007 µg/mL	1	ion	U, Zr
ICP-OES	283.231 nm	0.07 / 0.007 µg/mL	1	ion	U, Mo, Ti, Fe, Cr
ICP-OES	274.716 nm	0.08 / 0.008 µg/mL	1	ion	Ti, Ta, Fe, V
ICP-MS	232 amu	1 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)

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 15, 2005

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

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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 Tungsten in 0.1% (abs) HNO_3 1% (abs) HF**

Catalog Number:	CGW1-1, CGW1-2, and CGW1-5
Lot Number:	**Y-W01085**
Starting Material:	W Powder
Starting Material Purity (%):	99.993920
Starting Material Lot No	B23P45
Matrix:	0.1% (abs) HNO_3 1% (abs) HF

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 998 ± 2 µg/mL 991 ± 2 µg/g

Certified Density: 1.007 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 $(\bar{x}) = \frac{\sum x_1}{n}$

$(\bar{x})$ = mean
x_1 = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s_1)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_1$ = 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** **998 ± 2 µg/mL 991 ± 2 µg/g (Avg 2 runs)**
ICP Assay NIST SRM 3163 Lot Number: 990209

Assay Method #2 **1002 µg/mL 995 µg/g**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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DATE RECEIVED: 7/22/05
DATE EXPIRED: 8/1/06
DATE OPENED: 7/22/05
INORG: 5308 PO: F55213

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5308

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	0.01998	M	Dy	< 0.00599	O	Li	< 0.00008	M	Pr	< 0.00030	M	Te	< 0.02995
M	Sb	< 0.00050	M	Er	< 0.00499	M	Lu	< 0.00040	i	Re		M	Tb	< 0.00030
M	As	< 0.00999	M	Eu	< 0.00300	O	Mg	0.00256	M	Rh	< 0.00100	M	Tl	< 0.00100
M	Ba	< 0.00999	M	Gd	< 0.00100	M	Mn	< 0.00399	M	Rb	< 0.00100	M	Th	< 0.00100
M	Be	< 0.00050	M	Ga	< 0.00100	O	Hg	< 0.04794	M	Ru	< 0.00200	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00599	M	Mo	< 0.00200	M	Sm	< 0.00100	M	Sn	< 0.00499
O	B	0.07191	M	Au	< 0.00300	M	Nd	< 0.00200	O	Sc	< 0.00036	O	Ti	< 0.00360
M	Cd	< 0.00300	M	Hf	0.00100	O	Ni	< 0.03995	M	Se	< 0.00799	s	W	
O	Ca	0.00240	M	Ho	< 0.00050	O	Nb	< 0.06392	i	Si		M	U	< 0.00200
M	Ce	< 0.00499	M	In	< 0.00999	n	Os		M	Ag	< 0.00200	M	V	< 0.00200
M	Cs	< 0.00030	M	Ir	< 0.00499	M	Pd	< 0.00499	O	Na	0.05194	M	Yb	< 0.00100
M	Cr	< 0.00499	O	Fe	< 0.03995	n	P		M	Sr	< 0.00050	M	Y	< 0.03994
M	Co	< 0.00300	M	La	< 0.00050	M	Pt	< 0.00200	n	S		M	Zn	0.00120
M	Cu	< 0.00599	M	Pb	< 0.00300	O	K	0.03436	O	Ta	< 0.39951	M	Zr	< 0.00499

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_5^{-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_5^{-2} is soluble in % levels of HCl and HNO_3 provided it is in the WOF_5^{-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_5^{-2} for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the WOF_5^{-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_4OH) ; Organic Matrices (Dry ash at 450 ? C in Pt^0 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)
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)

010349

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 29, 2005

Expiration Date: EXPIRES 1\2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator — Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager — 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
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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 Yttrium in 1.4% (abs) HNO3**

Catalog Number:	CGY1-1, CGY1-2, and CGY1-5
Lot Number:	**Y- Y01097**
Starting Material:	Y2O3
Starting Material Purity (%):	99.998662
Starting Material Lot No:	9918901OYL
Matrix:	1.4% (abs) HNO3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/11/06
DATE EXPIRED: 2/1/2007 OR
DATE OPENED: 1/12/06
INORG: 5588 PO: F56675

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1001 ± 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 $(\bar{x}) = \frac{\Sigma x1}{n}$ $(\bar{x})$ = mean
x1 = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\Sigma s1)2]^{1/2}}{(n)^{1/2}}$ $\Sigma s1$ = The summation of all significant estimated errors
(Most common are the errors from instrumental measurement weighting, 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 an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 **Assay Method #1** **999 ± 4 µg/mL**
ICP Assay NIST SRM 3167a Lot Number: 790412

Assay Method #2 **1001 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

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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 CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's 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	0.00198	M	Dy	0.00030	O	Li	< 0.00002	M	Pr	< 0.00030	M	Te	< 0.02988
M	Sb	< 0.00050	M	Er	< 0.00498	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	0.00099
M	As	< 0.00996	M	Eu	0.00027	O	Mg	0.00020	M	Rh	< 0.00100	M	Tl	< 0.00100
M	Ba	< 0.00996	M	Gd	< 0.00100	O	Mn	< 0.00002	M	Rb	< 0.00100	M	Th	< 0.00100
M	Be	< 0.00050	M	Ga	< 0.00100	O	Hg	< 0.02000	M	Ru	< 0.00199	M	Tm	0.00007
M	Bi	< 0.00040	M	Ge	< 0.00598	M	Mo	< 0.00199	M	Sm	0.00014	M	Sn	< 0.00498
O	B	< 0.00100	M	Au	< 0.00299	M	Nd	0.00008	O	Sc	< 0.00003	M	Ti	< 0.04980
M	Cd	< 0.00299	M	Hf	< 0.00199	M	Ni	< 0.00797	M	Se	< 0.00797	M	W	< 0.00996
O	Ca	0.00183	M	Ho	0.00006	M	Nb	< 0.00050	O	Si	< 0.00400	M	U	< 0.00199
M	Ce	0.00010	M	In	< 0.00996	n	Os		O	Ag	< 0.02000	O	V	< 0.00080
M	Cs	< 0.00030	M	Ir	< 0.00498	O	Pd	< 0.10000	O	Na	< 0.05000	M	Yb	0.00028
M	Cr	< 0.00498	O	Fe	0.00076	O	P	< 0.07000	O	Sr	< 0.00004	s	Y	
M	Co	< 0.00299	M	La	0.00025	M	Pt	< 0.00199	O	S	< 0.04300	O	Zn	0.01189
M	Cu	< 0.00598	M	Pb	< 0.00299	O	K	< 0.10000	M	Ta	< 0.00697	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

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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 - 88.9059; +3; 6; Y(OH)(H2O)x+2

Chemical Compatibility - Soluble in HCl, H2SO4 and HNO3. Avoid HF, H3PO4 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% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H2O/ HNO3); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H2O / HCl or HNO3).

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)
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+	73Ge16O, 178Hf+2

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety 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 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 Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 19, 2005
Expiration Date: EXPIRES 01/6/2007

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Technical Director

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010354

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, CGZR1-2, and CGZR1-5
Lot Number:	**Y-ZR01062**
Starting Material:	ZrO_2
Starting Material Purity (%):	99.994542
Starting Material Lot No	22855
Matrix:	H_2O tr. HNO_3 tr. HF

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 995 ± 3 µg/mL 996 ± 3 µg/g

Certified Density: 0.999 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 $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$\sum s_i$ = 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.)

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 996 ± 3 µg/g**
ICP Assay NIST SRM 3169 Lot Number: 990109

Assay Method #2 **1001 µg/mL 1002 µg/g**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 7/22/05
DATE EXPIRED: 8/1/06
DATE OPENED: 7/22/05
INORG: 5311 PO: F55213

1 of 4
5311

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 $Zr(F)_6^{-2}$ + $Zr(OH)_4F_2^{-2}$ 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^0, Na_2CO_3 in Pt^0 or Borax in Pt^0); Organic Matrices (Dry ash at 450 °C in Pt^0 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)
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)

010357

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 16, 2005

Expiration Date:

EXPIRES
1 2 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010358

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 060330-39
SRR: 28901
SDG: 276580
CASE: B. Werling
VTSR: March 30, 2006
PROJECT#: 06002.01.222

Pipette Calibrations

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SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

Balance #: 3-1 Thermometer #: G011 diH20 Temperature (°C): 21

010359

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
Lab30	1000	1.0067	1.0058	1.0153
TMA1	1000	1.0187	1.0097	1.0060
TMA2	1000	1.0189	1.0105	1.0067
TMA3	1000	NOT	FOUND	
TMA6	1000	1.0171	1.0149	1.0100
TMB1	900	.9056	.8996	.9023
TMC1	800	.8066	.7999	.8011
TMDD1	750	.7518	.7519	.7521
TMD1	700	.7050	.7063	.7046
TMD2	700	.7069	.6999	.7018
TME1	600	.6042	.6028	.6040
TMF2	500	.4999	.5028	.5033
TMF5	500	.5054	.5038	.5037
ICF1	500	.5036	.4987	.4996
L30-500	500	3.2 ×6 ÷3 ~~.0499~~ .4999	.4995 ~~.0495~~ (.0495)	.4999
TMG3	400	.4080	.3978	.4021
TMH1	300	OUT	OF	SERVICE
TMH2	300	.3030	.3041	.3018
TMJ1	250	.2519	.2502	.2501
TMJ2	250	.2512	.2507	.2513
TMJ3	250	.2514	.2518	.2526
TMK2	200	.2032	.2028	.2042
TML1	150	.1504	.1501	.1503
TMM1	120	.1206	.1218	.1204
TMN3	100	OUT	OF	SERVICE
ICN1	100	.0995	.0997	.1001
TMQ1	80	.0799	.0801	.0798
TMR1	70	OUT	OF	SERVICE
TMS1	60	OUT	OF	SERVICE
LAB-30A	50	OUT	OF	SERVICE
TMU1	40	.0398	.0399	.0400
TMU2	40	.0398	.0401	.0399
TMV1	30	.0301	.0299	.0303
L30-20	20	.0198	.0199	.0200
TMW1	25	.0248	.0249	.0250
TMY1	15	OUT	OF	SERVICE

Analyst: John Willis Date: 3-24-06

Reviewed by: [illegible] Date: 4-2-06

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SwRI – Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

(Space provide for Inorganic Laboratories' Fixed Volume Pipette Verification Spreadsheet)

3-24-06

010360

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	1.0067	1.0058	1.0153	1.01	100.93
TMA1	1000	1.0187	1.0097	1.0060	1.01	101.15
TMA2	1000	1.0189	1.0105	1.0067	1.01	101.20
TMA3	1000	NOT	FOUND			
TMA6	1000	1.0171	1.0149	1.0100	1.01	101.40
TMB1	900	0.9056	0.8996	0.9023	0.90	100.28
TMC1	800	0.8066	0.7999	0.8011	0.80	100.32
TMDD1	750	0.7518	0.7519	0.7521	0.75	100.26
TMD1	700	0.7050	0.7063	0.7046	0.71	100.76
TMD2	700	0.7069	0.6999	0.7018	0.70	100.41
TME1	600	0.6042	0.6028	0.6040	0.60	100.61
TMF2	500	0.4999	0.5028	0.5033	0.50	100.40
TMF5	500	0.5054	0.5038	0.5037	0.50	100.86
ICF1	500	0.5036	0.4987	0.4996	0.50	100.13
L30-500	500	0.4999	0.4995	0.4999	0.50	99.95
TMG3	400	0.4080	0.3978	0.4021	0.40	100.66
TMH1	300	OUT	OF	SERVICE		
TMH2	300	0.3030	0.3041	0.3018	0.30	~~0.00~~ 100.99
TMJ1	250	0.2519	0.2502	0.2501	0.25	100.29
TMJ2	250	0.2512	0.2507	0.2513	0.25	100.43
TMJ3	250	0.2514	0.2518	0.2526	0.25	100.77
TMK2	200	0.2032	0.2028	0.2042	0.20	101.70
TML1	150	0.1504	0.1501	0.1503	0.15	100.18
TMM1	120	0.1206	0.1218	0.1204	0.12	100.78
TMN3	100	OUT	OF	SERVICE		
ICN1	100	0.0955	0.0997	0.1001	0.10	98.43
TMQ1	80	0.0799	0.0801	0.0798	0.08	99.92
TMR1	70	OUT	OF	SERVICE		
TMS1	60	OUT	OF	SERVICE		
LAB-30A	50	OUT	OF	SERVICE		
TMU1	40	0.0398	0.0399	0.0400	0.04	99.75
TMU2	40	0.0398	0.0401	0.0399	0.04	99.83
TMV1	30	0.0301	0.0299	0.0303	0.03	100.33
L30-20	20	0.0198	0.0199	0.0200	0.02	99.50
TMW1	25	0.0248	0.0249	0.0250	0.02	99.60
TMY1	15	OUT	OF	SERVICE		

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SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

3-21-06

010361

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	0.0200	0.0201	0.020	100.33
ADJ200-A	100	0.0991	0.0990	0.0989	0.099	99.00
	200	0.1996	0.1998	0.1996	0.200	99.83
	20					
ADJ200-C	100	OUT	OF	SERVICE		
	200					
	20					
ADJ200-D	100	OUT	OF	SERVICE		
	200					
	20	0.0204	0.0200	0.0200	0.020	100.67
ADJ200-G	100	0.0989	0.0984	0.0981	0.098	98.47
	200	0.1999	0.1992	0.1995	0.200	99.77
	20					
ADJ200-H	100					
	200					
	20					
ADJ200-J	100					
	200					
	20					
ADJ200-K	100	NOT	IN USE-	GLOVEBOX		
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					

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SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010362

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	.0201	.0200	.0201
	ADJ200-A	100	.0991	.0990	.0989
		200	.1996	.1998	.1996
		20			
	ADJ200-C	100	out	of	service
		200			
		20	.0204	.0200	.0200
	ADJ200-~~D~~ G	100	.0989	.0984	.0981
	JW 3-18-06 x2	200	.1999	.1992	.1995
		20			
	ADJ200-~~G~~ D	100	D - out of Service		
		200			
		20			
	ADJ200-H	100		JW 3-21-06	
		200			
		20			
	ADJ200-J	100			
		200			
		20			
	ADJ200-K	100	not in	use —	glovebox
		200			
		20			
	ADJ200	100		3-21-06	
		200			

Analyst: John Wilk Date: 3-21-06

Reviewed by: Noble Gun Date: 04/28/06

Book/page: 08 055

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

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SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (	% of True V
	20					
ADJ200-A	100					
	200					
	20					
ADJ200-C	100					
	200					
	20					
ADJ200-D	100					
	200					
	20				0.0000	0.00
ADJ200-G	100				0.0000	0.00
	200				0.0000	0.00
	20	0.0201	0.0202	0.0203	0.0202	101.00
ADJ200-H	100	0.1013	0.1013	0.1019	0.1015	101.50
	200	0.1999	0.2009	0.2015	0.2008	100.38
	20	0.0203	0.0203	0.0204	0.0203	101.67
ADJ200-J	100	0.1017	0.1013	0.1011	0.1014	101.37
	200	0.2013	0.2009	0.2007	0.2010	100.48

JV 04/03/06

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SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: 6011 diH20 Temperature (° C) 010364

	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			
	ADJ200-G	100			
		200			
		20	0.0201	0.0202	0.0203
	ADJ200-H	100	0.1013	0.1013	0.1019
		200	0.1999	0.2009	0.2015
		20	0.0203	0.0203	0.0204
	ADJ200-J	100	0.1017	0.1013	0.1011
		200	0.2013	0.2009	0.2007
		20			
	ADJ200-K	100			
		200			
		20			
	ADJ200	100			
		200			

Analyst: [signature] Date: 04/03/06

Reviewed by: [signature] Date: 04/27/06

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SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

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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	0.1012	0.1018	0.1018	0.102	101.60
ADJ1000-C	500	0.4903	0.4933	0.4950	0.493	98.57
	1000	1.0014	0.9941	0.9943	0.997	99.66
	100	0.1007	0.1001	0.1003	0.100	100.37
ADJ1000-D	500	0.4920	0.4945	0.4942	0.494	98.71
	1000	0.9940	0.9945	0.9913	0.993	99.33
	100	0.1010	0.1018	0.1012	0.101	101.33
ADJ1000-E	500	0.4970	0.4985	0.4987	0.498	99.61
	1000	0.9949	0.9955	0.9977	0.996	99.60
	100	0.1015	0.1009	0.1018	0.101	101.40
ADJ1000-F	500	0.5010	0.4985	0.4992	0.500	99.91
	1000	0.9984	1.0012	1.0000	1.000	99.99
	100					
ADJ1000-G	500					
	1000					
	100					
ADJ1000-H	500					
	1000					
	100					
ADJ1000-J	500					
	1000					
	100					
ADJ1000-K	500	NOT	IN USE-	GLOVEBOX		
	1000					
	100					
ADJ1000	500					
	1000					

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SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010366

Balance #: 34 Thermometer #: G-011 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	.1012	.1018	.1018
ADJ1000-C	500	.4903	.4933	.4950
	1000	1.0014	.9941	.9943
	100	.1007	.1001	.1003
ADJ1000-D	500	.4920	.4945	.4942
	1000	.9940	.9945	.9913
	100	.1010	.1018	.1012
ADJ1000-E	500	.4970	.4985	.4987
	1000	.9949	.9955	.9977
	100	.1015	.1009	.1018
ADJ1000-F	500	.5010	.4985	.4992
	1000	.9984	1.0012	1.0000
	100			
ADJ1000-G	500			
	1000			
	100			
ADJ1000-H	500			
	1000			
	100			
ADJ1000-J	500			
	1000			
	100			
ADJ1000-K	500	NOT	IN USE –	glovebox
	1000			
	100			
ADJ1000	500			
	1000			

3-21-06

3-21-06

Analyst: John Willis Date: 3-21-06

Reviewed by: Neil Gu Date: 04/27/06

Book/page: 08 113

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

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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	0.0995	0.0979	0.0981	0.0985	98.50
ADJ1000-G	500	0.4927	0.4947	0.4924	0.4933	98.65
	1000	0.9934	0.9933	0.9931	0.9933	99.33
	100	0.1001	0.1003	0.1009	0.1004	100.43
ADJ1000-H	500	0.5075	0.5010	0.5011	0.5032	100.64
	1000	1.0017	1.0029	1.0031	1.0026	100.26
	100	0.1003	0.1010	0.1023	0.1012	101.20
ADJ1000-J	500	0.5005	0.5025	0.5017	0.5016	100.31
	1000	1.0033	1.0049	1.0053	1.0045	100.45

JV 04/03/06

Book/page: 08 114

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: 6011 diH20 Temperature (° C) 010368

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	0.0995	0.0979	0.0991
ADJ1000-G	500	0.4927 JV 04/03/06	0.4947 JV 04/03/06	0.4924 JV 04/03/06
	1000	0.9934	0.9933	0.9931
	100	0.1001	0.1003	0.1009
ADJ1000-H	500	0.5075	0.5010 JV 04/03/06	0.5011
	1000	1.0017	1.0029	1.0031
	100	0.1003	0.1010	0.1023
ADJ1000-J	500	0.5005	0.5025	0.5017
	1000	1.0033	1.0049	1.0053
	100			
ADJ1000-K	500			
	1000			
	100			
ADJ1000	500			
	1000			

J.V. 04/03/06

JV 04/03/06

Analyst: [signature] Date: 04/03/06

Reviewed by: [signature] Date: 04/27/06

Book/page: 08 171

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010369

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	0.5026	0.5079	0.5020	0.504	100.83
ADJ5000-C	2500	2.4907	2.4916	2.4884	2.490	99.61
	5000	5.0248	5.0069	4.9957	5.009	100.18
	500					
ADJ5000-G	2500	OUT	OF	SERVICE		
	5000					
	500					
ADJ5000-H	2500	OUT	OF	SERVICE		
	5000					
	500	0.5086	0.5025	0.5086	0.507	101.31
ADJ5000-I	2500	2.4856	2.4812	2.5064	2.491	99.64
	5000	4.9976	4.9938	5.0305	5.007	100.15
	500					
ADJ5000-J	2500					
	5000					
	500					
ADJ5000-K	2500					
	5000					
	500					
ADJ5000-L	2500					
	5000					
	500					
ADJ5000-M	2500	NOT	IN USE-	GLOVEBOX		
	5000					
	500	0.4974	0.4970	0.4979	0.497	99.49
ADJ5000-N	2500	2.4955	2.5005	2.4998	2.499	99.94
	5000	5.0109	5.0020	5.0071	5.007	100.13
	500	0.5005	0.5038	0.5013	0.502	100.37
ADJ5000-O	2500	2.5085	2.4938	2.4990	2.500	100.02
	5000	4.9955	4.9932	5.0069	4.999	99.97
	500					
ADJ5000	2500					
	5000					

FRM-247c (Rev 3/Apr 04)

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SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010370

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	.5026	.5079	.5020
ADJ5000-C	2500	2.4907	2.4916	2.4884
	5000	5.0248	5.0069	4.9957
	500			
ADJ5000-G	2500	out	of	service
	5000			
	500			
ADJ5000-H	2500	out	of	service
	5000			
	500	.5086	.5025	.5086
ADJ5000-I	2500	2.4856	2.4812	2.5064
	5000	4.9976	4.~~9738~~ JW .9938 3-21-06	5.0305
	500			
ADJ5000-J	2500			
	5000			
	500			
ADJ5000-K	2500		JW 3-21-06	
	5000			
	500			
ADJ5000-L	2500			
	5000			
	500			
ADJ5000-M	2500	Not	in use-	glovebox
	5000			
	500	.4974	.4970	.4979
ADJ5000-N	2500	2.4955	2.5005	2.4998
	5000	5.0109	5.0050	5.0071
	500	.5005	.5038	.5013
ADJ5000-O	2500	2.5085	2.4938	2.4990
	5000	4.9955	4.9932	5.0069
	500			
ADJ5000	2500	JW 3-21-06		
	5000			

Analyst: John Weber Date: 3-21-06

Reviewed by: Nale [illegible] Date: 04/28/06

Book/page: 08 173

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010371

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	0.5011	0.5023	0.5013	0.5016	100.31
ADJ5000-J	2500	2.4993	2.4991	2.4990	2.4991	99.97
	5000	5.0000	4.9998	4.9993	4.9997	99.99
	500				0.0000	0.00
ADJ5000-K	2500				0.0000	0.00
	5000				0.0000	0.00
	500	0.5024	0.5029	0.5031	0.5028	100.56
ADJ5000-L	2500	2.5078	2.5064	2.5053	2.5065	100.26
	5000	4.9913	4.9919	4.9933	4.9922	99.84

TV 04/03/16

Book/page: 08 174

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010372

Balance #: 16 Thermometer #: G 011 diH20 Temperature (° C) 21

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
500 µL – 5000 µL		500			
	ADJ5000-C	2500			
		5000			
		500			
	ADJ5000-G	2500			
		5000			
		500			
	ADJ5000-H	2500			
		5000			
		500			
	ADJ5000-I	2500			
		5000			
		500	0.5011	0.5023	0.5013
	ADJ5000-J	2500	2.4993	2.4991	2.4990
		5000	5.0000	4.9998	4.9993
		500			
	ADJ5000-K	2500			
		5000			
		500	0.5024	0.5029	0.5031
	ADJ5000-L	2500	2.5018	2.5064	2.5053
		5000	4.9913	4.9919	4.9933
		500			
	ADJ5000-M	2500			
		5000			
		500			
	ADJ5000-N	2500			
		5000			
		500			
	ADJ5000	2500			
		5000			
		500			
	ADJ5000	2500			
		5000			

JV 04/03/06

JV 04/03/06

Analyst: [signature] Date: 04/03/06

Reviewed by: [signature] Date: 04/28/06

FRM-244 (c) (Rev 3/Apr 04)

SOUTHWEST RESEARCH INSTITUTE 010373
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 060330-39
SRR: 28901
SDG: 276580
CASE: B. Werling
VTSR: March 30, 2006
PROJECT#: 06002.01.222

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

r40034

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

010374

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
3/24/06 730pm	DR	18.06	✓	✓	✓	14572.0	✓
3/27/06 8pm	DR	18.06	✓	✓	✓	14594.9	✓
3/28/06 1026pm	DR	18.06	✓	✓	✓	14603.7	✓
3/29/06 740pm	DR	18.05	✓	✓	✓	14620.5	✓
3/30/06 730pm	DR	18.06	✓	✓	✓	14648.2	✓
3/31/06 711pm	DR	18.05	✓	✓	✓	14665.7	✓
4/3/06 6pm	DR	18.05	✓	✓	✓	14700.1	✓
4/4/06 805pm	DR	18.05	✓	✓	✓	14730.9	✓
4/5/06 8pm	DR	18.05	✓	✓	✓	14767.3	✓
4/6/06 855pm	DR	18.05	✓	✓	✓	14796.1	✓
4/7/06 625pm	DR	18.05	✓	✓	✓	14813.7	✓
4/10/06 710pm	DR	18.05	✓	✓	✓	14860.2	✓
4/11/06 825pm	DR	18.05	✓	✓	✓	14889.3	✓
4/12/06 815pm	DR	18.05	✓	✓	✓	14920.4	✓
4/13/06 730pm	DR	18.05	✓	✓	✓	14941.9	✓
4/14/06 8pm	DR	18.05	✓	✓	✓	14958.6	✓

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
3/24/06 731pm	DR	✓	✓ 8	31140.6	✓
3/27/06 801pm	DR	X	✓ 8	31140.6	no usage
3/28/06 1027pm	DR	✓	✓ 8	31142.2	✓
3/29/06 734pm	DR	✓	✓ 8	31145.0	✓
3/30/06 731pm	DR	✓	✓ 8	31146.1	✓
3/31/06 712pm	DR	✓	✓ 8.5	31147.9	✓
4/3/06 601pm	DR	✓	✓ 8	31149.0	✓
4/4/06 806pm	DR	✓	✓ 8.5	31150.7	✓
4/5/06 801pm	DR	X	✓ 8	31150.7	no usage.
4/6/06 856pm	DR	✓	✓ 8	31152.5	✓
4/7/06 636pm	DR	X	✓ 8	31152.5	no usage
4/10/06 711pm	DR	✓	✓ 8	31155.2	✓
4/11/06 826pm	DR	✓	✓ 8.5	31156.1	✓
4/12/06 816pm	DR	✓	✓ 13	31210.8	✓
4/13/06 731pm	DR	✓	✓ 11.5	31214.0	✓
4/14/06 801pm	DR	✓	✓ 11	31216.9	✓

Legend: Check = Green (OK); X = Red (call for service)

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 060330-39
SRR: 28901
SDG: 276580
CASE: B. Werling
VTSR: March 30, 2006
PROJECT#: 06002.01.222

010375

Balance Calibrations

Southwest Research Institute®
Division 01, Building 70
Inorganic's Balance Verification Log

010376

Balance Number	Asset Number	Manufacturer	Model Number	Location	Number of Places	Maximum Weight
12	010892	Mettler	XS 205	Lab 47	4th 5th	220 g 81 g

Date	Operator	Asset# 011988 Std Wt. 200 g Tolerance: 199.9800-200.0200 g Recorded Wt. (g)	Asset# 011997 Std Wt. 2 g Tolerance: 1.99980-2.00020 g Recorded Wt. (g)	Asset# 012002 Std Wt. 0.02 g Tolerance: 0.01995-0.02005 g Recorded Wt. (g)
4-10-06	KE	199.9997	2.00006	0.02002
4-11-06	KE	199.9995	1.99996	0.02000
4-12-06	JW	199.9998	1.99995	0.02003
4-13-06	JW	199.9999	1.99992	0.01996
4-14-06	KE	200.0000	2.00006	0.01998
4-15-06	KE	199.9998	2.00009	0.02001
4-17-06	JW	199.9998	2.00008	0.02000
4-18-06	KE	199.9996	2.00000	0.020000
4-19-06	KE	199.9996	1.99998	0.02002
4-20-06	KE	199.9990	1.99996	0.02001
4-21-06	KE	199.9996	KE X 2.00004	0.02001
4-22-06	RSS	199.9996	2.00002	0.02002
4-24-06	JW	199.9998	2.00004	0.02003
4-25-06	KE	199.9995	2.00005	0.02002
4-26-06	KE	199.9997	2.00001	0.01999
4-27-06	JW	199.9997	2.00001	0.01998

Comments:

Southwest Research Institute®
Division 01, Building 70
Inorganic's Balance Verification Log

010377

Balance Number	Asset Number	Manufacturer	Model Number	Location	Number of Places	Maximum Weight
19	003493	Denver	400	Lab 47	2	400 g

Date	Operator	Asset# 011990 Std Wt. 400 g Tolerance: 399.80-400.20 g Recorded Wt. (g)	Asset# 011997 Std Wt. 2 g Tolerance: 1.96-2.04 g Recorded Wt. (g)
4-10-06	KE	400.01	2.00
4-10-06	KE	400.02	2.01 **
4-10-06	KE	400.02	2.00 *
4-11-06	JW	400.02	2.01
4-12-06	JW	400.02	2.01
4-13-06	JW	400.00	2.00
4-14-06	KE	400.02	2.00
4-17-06	JW	400.01	2.00
4-18-06	KE	400.03	2.00
4-19-06	KE	400.04	2.00
4-20-06	KE	400.03	2.00
4-20-06	KE	400.00	2.00 ***
4-20-06	KE	400.03	2.00 KE ****
4-21-06	KE	400.05	2.00
4-24-06	JW	400.02	2.01
4-25-06	KE	400.04	2.00
4-26-06	KE	400.02	2.00
4-27-06	JW	400.03	2.00

Comments: ** Lab ~~46~~ 43, hood 70-45 4-10-06 KE
* returned to lab KE 47 4-10-06 KE; *** Lab 46 hood 70-41 KE
**** returned to lab 47 KE,

Southwest Research Institute®
Division 01, Building 70
Inorganic's Balance Verification Log

010378

Balance Number	Asset Number	Manufacturer	Model Number	Location	Number of Places	Maximum Weight
34	005420	Mettler	AG 245	Lab 47	4th 5th	210 g 41 g

Date	Operator	Asset# 011988 Std Wt. 200 g Tolerance: 199.9800-200.02000 g Recorded Wt. (g)	Asset# 011997 Std Wt. 2 g Tolerance: 1.99980-2.00020 g Recorded Wt. (g)	Asset# 012002 Std Wt. 0.02 g Tolerance: 0.01995-0.02005 g Recorded Wt. (g)
4-10-06	KE	199.9995	2.00002	0.02002
4-11-06	JW	199.9997	1.99998	0.01998
4-12-06	JW	199.9994	1.99996	0.01999
4-13-06	JW	200.0000	2.00001	0.02000
4-14-06	KE	200.0001	2.00007	0.02000
4-17-06	JW	199.9999	2.00001	0.02003
4-18-06	KE	199.9997	1.99997	0.02000
4-19-06	KE	199.9997	1.99997	0.01996
4-20-06	KE	199.9997	2.00006	0.02000
4-21-06	KE	199.9995	2.00001	0.01997
4-22-06	TCM	200.0000	2.00001	0.02000
4-23-06	TCM	200.0000	2.00001	0.02000
4-24-06	JW	200.0001	2.00003	0.02003
4-25-06	KE	199.9997	2.00000	0.02001
4-26-06	KE	199.9999	2.00000	0.01997
4-27-06	JW	200.0002	2.00003	0.02001

Comments: