SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Div. 20
TASK ORDER: 031106-12
SRR: 25200
SDG: 237578
CASE: CNWRA
VTSR: November 06, 2003
PROJECT#: 06002.01.141

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010001

Sample ID
16P-1003-FA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237578

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.620	0.05
Antimony	<0.01	0.01
Arsenic	0.014	0.005
Barium	0.022	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.204	0.025
Cadmium	<0.005	0.005
Calcium	2.17	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	1.14	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.081	0.005
Magnesium	0.388	0.05
Manganese	0.024	0.005
Molybdenum	0.063	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	0.043	0.04
Potassium	1.92	0.2
Selenium	<0.015	0.015
Silicon	21.1	0.05
Silver	<0.005	0.005
Sodium	110	0.2
Strontium	0.028	0.005
Sulfur	20.2	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.015	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010002

Sample ID
16P-1003-FA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237578

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Aluminum	0.620	0.659	6.19%
Antimony	<0.01	<0.01	0.00%
Arsenic	0.014	0.008	54.9%
Barium	0.022	0.020	10.3%
Beryllium	<0.005	<0.005	0.00%
Bismuth	<0.015	<0.015	0.00%
Boron	0.204	0.206	0.95%
Cadmium	<0.005	<0.005	0.00%
Calcium	2.17	2.18	0.63%
Chromium	<0.005	<0.005	0.00%
Cobalt	<0.005	<0.005	0.00%
Copper	<0.005	<0.005	0.00%
Iron	1.14	1.23	7.02%
Lanthanum	<0.005	0.005	200%
Lead	<0.005	<0.005	0.00%
Lithium	0.081	0.081	0.43%
Magnesium	0.388	0.373	3.89%
Manganese	0.024	0.025	0.12%
Molybdenum	0.063	0.064	2.48%
Nickel	<0.005	<0.005	0.00%
Palladium	<0.01	<0.01	0.00%
Phosphorus	0.043	0.040	6.90%
Potassium	-----	-----	-----
Selenium	<0.015	<0.015	0.00%
Silicon	21.1	21.4	1.55%
Silver	<0.005	<0.005	0.00%
Sodium	-----	-----	-----
Strontium	0.028	0.028	0.40%
Sulfur	20.2	19.6	2.61%
Thallium	<0.025	<0.025	0.00%
Thorium	<0.01	<0.01	0.00%
Tin	<0.01	<0.01	0.00%
Titanium	<0.005	<0.005	0.00%
Tungsten	<0.015	<0.015	0.00%
Uranium	<0.1	<0.1	0.00%
Vanadium	<0.005	<0.005	0.00%
Yttrium	<0.005	<0.005	0.00%
Zinc	0.015	0.015	0.34%
Zirconium	<0.005	<0.005	0.00%

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010003

Sample ID
16P-1003-FUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237579

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.340	0.05
Antimony	<0.01	0.01
Arsenic	0.011	0.005
Barium	0.008	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.210	0.025
Cadmium	<0.005	0.005
Calcium	1.85	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.262	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.082	0.005
Magnesium	0.269	0.05
Manganese	0.014	0.005
Molybdenum	0.066	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	1.79	0.2
Selenium	<0.015	0.015
Silicon	20.7	0.05
Silver	<0.005	0.005
Sodium	105	0.2
Strontium	0.022	0.005
Sulfur	19.8	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.007	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010004

Sample ID
16P-1003-FUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237579

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	0.340	2.30	2.00	98.2%
Antimony	<0.01	0.370	0.500	74.0%
Arsenic	0.011	2.12	2.00	105.4%
Barium	0.008	2.05	2.00	102.0%
Beryllium	<0.005	0.053	0.050	105.9%
Bismuth	NA	NA	NA	NA
Boron	NA	NA	NA	NA
Cadmium	<0.005	0.052	0.050	103.5%
Calcium	1.85	22.6	20.0	103.9%
Chromium	<0.005	0.184	0.200	91.8%
Cobalt	<0.005	0.520	0.500	103.9%
Copper	<0.005	0.259	0.250	103.6%
Iron	0.262	1.23	1.00	97.2%
Lanthanum	NA	NA	NA	NA
Lead	<0.005	0.523	0.500	104.5%
Lithium	NA	NA	NA	NA
Magnesium	0.269	21.2	20.0	104.6%
Manganese	0.014	0.523	0.500	102.0%
Molybdenum	NA	NA	NA	NA
Nickel	<0.005	0.509	0.500	101.9%
Palladium	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA
Potassium	-----	-----	-----	-----
Selenium	<0.015	2.32	2.00	116.0%
Silicon	NA	NA	NA	NA
Silver	<0.005	0.042	0.050	84.5%
Sodium	-----	-----	-----	-----
Strontium	NA	NA	NA	NA
Sulfur	NA	NA	NA	NA
Thallium	<0.025	2.28	2.00	114.2%
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	<0.005	0.514	0.500	102.9%
Yttrium	NA	NA	NA	NA
Zinc	0.007	0.536	0.500	105.8%
Zirconium	NA	NA	NA	NA

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010005

Sample ID
16P-1003-UFUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237580

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.354	0.05
Antimony	<0.01	0.01
Arsenic	0.019	0.005
Barium	0.038	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.273	0.025
Cadmium	<0.005	0.005
Calcium	6.53	0.05
Chromium	<0.005	0.005
Cobalt	0.010	0.005
Copper	0.009	0.005
Iron	1.07	0.05
Lanthanum	<0.005	0.005
Lead	0.005	0.005
Lithium	0.112	0.005
Magnesium	0.901	0.05
Manganese	0.054	0.005
Molybdenum	0.063	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	0.061	0.04
Potassium	1.98	0.2
Selenium	<0.015	0.015
Silicon	27.1	0.05
Silver	<0.005	0.005
Sodium	117	0.2
Strontium	0.078	0.005
Sulfur	27.7	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	0.011	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.045	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010006

Sample ID
16P-1003-UFUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237580

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Aluminum	-----	-----	-----
Antimony	-----	-----	-----
Arsenic	-----	-----	-----
Barium	-----	-----	-----
Beryllium	-----	-----	-----
Bismuth	-----	-----	-----
Boron	-----	-----	-----
Cadmium	-----	-----	-----
Calcium	-----	-----	-----
Chromium	-----	-----	-----
Cobalt	-----	-----	-----
Copper	-----	-----	-----
Iron	-----	-----	-----
Lanthanum	-----	-----	-----
Lead	-----	-----	-----
Lithium	-----	-----	-----
Magnesium	-----	-----	-----
Manganese	-----	-----	-----
Molybdenum	-----	-----	-----
Nickel	-----	-----	-----
Palladium	-----	-----	-----
Phosphorus	-----	-----	-----
Potassium	1.98	1.89	4.72%
Selenium	-----	-----	-----
Silicon	-----	-----	-----
Silver	-----	-----	-----
Sodium	117	117	0.31%
Strontium	-----	-----	-----
Sulfur	-----	-----	-----
Thallium	-----	-----	-----
Thorium	-----	-----	-----
Tin	-----	-----	-----
Titanium	-----	-----	-----
Tungsten	-----	-----	-----
Uranium	-----	-----	-----
Vanadium	-----	-----	-----
Yttrium	-----	-----	-----
Zinc	-----	-----	-----
Zirconium	-----	-----	-----

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010007

Sample ID
19D-1003-FA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237581

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.01	0.01
Arsenic	0.007	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.232	0.025
Cadmium	<0.005	0.005
Calcium	2.23	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.275	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.249	0.005
Magnesium	0.103	0.05
Manganese	0.040	0.005
Molybdenum	0.039	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	2.99	0.2
Selenium	<0.015	0.015
Silicon	7.10	0.05
Silver	<0.005	0.005
Sodium	173	0.2
Strontium	0.006	0.005
Sulfur	9.97	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	0.010	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010008

Sample ID
19D-1003-FA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237581

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	-----	-----	-----	-----
Antimony	-----	-----	-----	-----
Arsenic	-----	-----	-----	-----
Barium	-----	-----	-----	-----
Beryllium	-----	-----	-----	-----
Bismuth	-----	-----	-----	-----
Boron	-----	-----	-----	-----
Cadmium	-----	-----	-----	-----
Calcium	-----	-----	-----	-----
Chromium	-----	-----	-----	-----
Cobalt	-----	-----	-----	-----
Copper	-----	-----	-----	-----
Iron	-----	-----	-----	-----
Lanthanum	-----	-----	-----	-----
Lead	-----	-----	-----	-----
Lithium	-----	-----	-----	-----
Magnesium	-----	-----	-----	-----
Manganese	-----	-----	-----	-----
Molybdenum	-----	-----	-----	-----
Nickel	-----	-----	-----	-----
Palladium	-----	-----	-----	-----
Phosphorus	-----	-----	-----	-----
Potassium	2.99	23.0	20.0	100.1%
Selenium	-----	-----	-----	-----
Silicon	-----	-----	-----	-----
Silver	-----	-----	-----	-----
Sodium	173	189	20.0	84.5%
Strontium	-----	-----	-----	-----
Sulfur	-----	-----	-----	-----
Thallium	-----	-----	-----	-----
Thorium	-----	-----	-----	-----
Tin	-----	-----	-----	-----
Titanium	-----	-----	-----	-----
Tungsten	-----	-----	-----	-----
Uranium	-----	-----	-----	-----
Vanadium	-----	-----	-----	-----
Yttrium	-----	-----	-----	-----
Zinc	-----	-----	-----	-----
Zirconium	-----	-----	-----	-----

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010009

Sample ID
19D-1003-FUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237582

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.01	0.01
Arsenic	0.008	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.233	0.025
Cadmium	<0.005	0.005
Calcium	2.24	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.202	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.247	0.005
Magnesium	0.106	0.05
Manganese	0.039	0.005
Molybdenum	0.038	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	3.08	0.2
Selenium	<0.015	0.015
Silicon	7.13	0.05
Silver	<0.005	0.005
Sodium	173	0.2
Strontium	0.006	0.005
Sulfur	9.89	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	0.025	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010010

Sample ID
19D-1003-UFUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237583

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.096	0.05
Antimony	<0.01	0.01
Arsenic	0.007	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.234	0.025
Cadmium	<0.005	0.005
Calcium	2.18	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	1.33	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.256	0.005
Magnesium	0.111	0.05
Manganese	0.049	0.005
Molybdenum	0.035	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	0.046	0.04
Potassium	2.93	0.2
Selenium	<0.015	0.015
Silicon	7.80	0.05
Silver	<0.005	0.005
Sodium	173	0.2
Strontium	0.007	0.005
Sulfur	9.85	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	0.024	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.014	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010011

Sample ID
19IM1-25-1003-FA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237584

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.167	0.05
Antimony	<0.01	0.01
Arsenic	0.035	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.179	0.025
Cadmium	<0.005	0.005
Calcium	0.543	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.074	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.125	0.005
Magnesium	0.071	0.05
Manganese	0.015	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	3.04	0.2
Selenium	<0.015	0.015
Silicon	27.9	0.05
Silver	<0.005	0.005
Sodium	94.7	0.2
Strontium	<0.005	0.005
Sulfur	5.56	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010012

Sample ID
19IM1-25-1003-FUA-5

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 237585

Client: Division 20

Date Received: 11/06/03

Project No.: 20.06002.01.141

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.132	0.05
Antimony	<0.01	0.01
Arsenic	0.034	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.162	0.025
Cadmium	<0.005	0.005
Calcium	0.538	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.125	0.005
Magnesium	0.068	0.05
Manganese	0.014	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	0.040	0.04
Potassium	2.92	0.2
Selenium	<0.015	0.015
Silicon	28.2	0.05
Silver	<0.005	0.005
Sodium	94.4	0.2
Strontium	<0.005	0.005
Sulfur	5.48	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010013

Sample ID
19IM1-25-1003-UFUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237586

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.204	0.05
Antimony	<0.01	0.01
Arsenic	0.033	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.163	0.025
Cadmium	<0.005	0.005
Calcium	0.761	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.195	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.128	0.005
Magnesium	0.094	0.05
Manganese	0.025	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	0.045	0.04
Potassium	3.04	0.2
Selenium	<0.015	0.015
Silicon	28.7	0.05
Silver	<0.005	0.005
Sodium	94.8	0.2
Strontium	<0.005	0.005
Sulfur	5.63	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.019	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET **010014**

Sample ID
19IM2-25-1003-FA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237587

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.158	0.05
Antimony	<0.01	0.01
Arsenic	0.037	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.157	0.025
Cadmium	<0.005	0.005
Calcium	0.360	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.074	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.126	0.005
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	0.040	0.04
Potassium	2.96	0.2
Selenium	<0.015	0.015
Silicon	28.5	0.05
Silver	<0.005	0.005
Sodium	95.6	0.2
Strontium	<0.005	0.005
Sulfur	5.69	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

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SAMPLE ANALYSIS DATA SHEET

010015

Sample ID
19IM2-25-1003-FUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237588

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.120	0.05
Antimony	<0.01	0.01
Arsenic	0.035	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.157	0.025
Cadmium	<0.005	0.005
Calcium	0.359	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.127	0.005
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	3.09	0.2
Selenium	<0.015	0.015
Silicon	28.5	0.05
Silver	<0.005	0.005
Sodium	97.1	0.2
Strontium	<0.005	0.005
Sulfur	5.81	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010016

Sample ID
19IM2-25-1003-UFUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237589

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.174	0.05
Antimony	<0.01	0.01
Arsenic	0.032	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.157	0.025
Cadmium	<0.005	0.005
Calcium	0.409	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.190	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.127	0.005
Magnesium	<0.05	0.05
Manganese	0.034	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	3.11	0.2
Selenium	<0.015	0.015
Silicon	28.7	0.05
Silver	<0.005	0.005
Sodium	97.3	0.2
Strontium	<0.005	0.005
Sulfur	5.69	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.006	0.005
Zirconium	<0.005	0.005

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SAMPLE ANALYSIS DATA SHEET

010017

Sample ID
7SC-24-1003-FA-5

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 237590

Client: Division 20

Date Received: 11/06/03

Project No.: 20.06002.01.141

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.01	0.01
Arsenic	<0.005	0.005
Barium	0.056	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.259	0.025
Cadmium	<0.005	0.005
Calcium	28.1	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.105	0.005
Magnesium	28.9	0.05
Manganese	0.075	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	8.08	0.2
Selenium	<0.015	0.015
Silicon	13.7	0.05
Silver	<0.005	0.005
Sodium	82.2	0.2
Strontium	0.413	0.005
Sulfur	45.0	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010018

Sample ID
7SC-24-1003-FUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237591

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.01	0.01
Arsenic	0.005	0.005
Barium	0.056	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.260	0.025
Cadmium	<0.005	0.005
Calcium	28.3	0.05
Chromium	<0.005	0.005
Cobalt	0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.104	0.005
Magnesium	28.9	0.05
Manganese	0.071	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	0.042	0.04
Potassium	8.16	0.2
Selenium	<0.015	0.015
Silicon	13.7	0.05
Silver	<0.005	0.005
Sodium	82.0	0.2
Strontium	0.413	0.005
Sulfur	43.7	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	0.016	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010019

Sample ID
7SC-24-1003-UFUA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237592

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.01	0.01
Arsenic	<0.005	0.005
Barium	0.057	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	0.260	0.025
Cadmium	<0.005	0.005
Calcium	28.2	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.081	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.105	0.005
Magnesium	28.9	0.05
Manganese	0.071	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	8.12	0.2
Selenium	<0.015	0.015
Silicon	13.7	0.05
Silver	<0.005	0.005
Sodium	81.6	0.2
Strontium	0.416	0.005
Sulfur	44.3	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.016	0.005
Zirconium	<0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010020

Sample ID
98Q-1003-FA-5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237593

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.01	0.01
Arsenic	<0.005	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	<0.025	0.025
Cadmium	<0.005	0.005
Calcium	10.1	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.005	0.005
Magnesium	0.065	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	5.25	0.2
Selenium	<0.015	0.015
Silicon	19.4	0.05
Silver	<0.005	0.005
Sodium	27.0	0.2
Strontium	<0.005	0.005
Sulfur	0.114	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	0.008	0.005

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010021

Sample ID
98Q-1003-FA-6

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 11/06/03

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 237594

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.01	0.01
Arsenic	<0.005	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	<0.025	0.025
Cadmium	<0.005	0.005
Calcium	9.91	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.005	0.005
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	5.32	0.2
Selenium	<0.015	0.015
Silicon	19.4	0.05
Silver	<0.005	0.005
Sodium	26.6	0.2
Strontium	<0.005	0.005
Sulfur	<0.025	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	0.005	0.005

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SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE

010022

Sample ID
LCSW - L11W1 / L24W1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 20.06002.01.141

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Aluminum	1.92	2.00	95.9%
Antimony	0.515	0.500	102.9%
Arsenic	2.08	2.00	104.1%
Barium	2.02	2.00	101.2%
Beryllium	0.054	0.050	108.4%
Bismuth	NA	NA	NA
Boron	NA	NA	NA
Cadmium	0.052	0.050	104.9%
Calcium	20.8	20.0	104.0%
Chromium	0.203	0.200	101.7%
Cobalt	0.515	0.500	103.0%
Copper	0.251	0.250	100.4%
Iron	1.03	1.00	103.1%
Lanthanum	NA	NA	NA
Lead	0.527	0.500	105.4%
Lithium	NA	NA	NA
Magnesium	20.4	20.0	101.9%
Manganese	0.516	0.500	103.1%
Molybdenum	NA	NA	NA
Nickel	0.511	0.500	102.2%
Palladium	NA	NA	NA
Phosphorus	NA	NA	NA
Potassium	18.3	20.0	91.4%
Selenium	2.15	2.00	107.3%
Silicon	NA	NA	NA
Silver	0.052	0.050	104.4%
Sodium	18.6	20.0	93.2%
Strontium	NA	NA	NA
Sulfur	NA	NA	NA
Thallium	2.22	2.00	110.9%
Thorium	NA	NA	NA
Tin	NA	NA	NA
Titanium	NA	NA	NA
Tungsten	NA	NA	NA
Uranium	NA	NA	NA
Vanadium	0.510	0.500	102.0%
Yttrium	NA	NA	NA
Zinc	0.531	0.500	106.2%
Zirconium	NA	NA	NA

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010023

Sample ID
PBW - L11W1 / L24W2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: NA

SRR: 25200

TO: 031106-12

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.01	0.01
Arsenic	<0.005	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.015	0.015
Boron	<0.025	0.025
Cadmium	<0.005	0.005
Calcium	<0.05	0.05
Chromium	<0.005	0.005
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.05	0.05
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.005	0.005
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.005	0.005
Palladium	<0.01	0.01
Phosphorus	<0.04	0.04
Potassium	<0.2	0.2
Selenium	<0.015	0.015
Silicon	<0.05	0.05
Silver	<0.005	0.005
Sodium	<0.2	0.2
Strontium	<0.005	0.005
Sulfur	<0.025	0.025
Thallium	<0.025	0.025
Thorium	<0.01	0.01
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.015	0.015
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Div. 20
TASK ORDER: 031106-12
SRR: 25200
SDG: 237578
CASE: CNWRA
VTSR: November 06, 2003
PROJECT#: 06002.01.141

Task Orders/01-QPP-015

Southwest Research Institute

Laboratory Task Order

TO #: 031106-12 Revision: 1

610024

Project(s): 06002.01.141
Manager(s): DAMMANN, MIKE
To PM: 12/02/03
To QA: 12/31/03
To Client: 01/02/04

SDG: 237578
VTSR: 11/06/03
CASE: DIV 20 - CNWRA

SRR #'s: 25200
Client(s): DIV 20

Instructions

DIVISION 20 - CNWRA. 28-day TAT listed on COC (subject to change). Point of Contact is Bradley Werling (ext. 6565). Work is 10 CFR 50, Part 21, Appendix B. Contact Charlie Butcher (ext. 5928, pager 271-5172) before starting ANY WORK on this task order. ICP analysis is for MAJOR and MINOR elements. CONTACT PM WITH ANY QUESTIONS.
revision 1: updating task order. (dr123003)

Documents Related to this task order: 7451

Test: DIL-DILUTION
Section: METALPREP

Holding: 28 days from CED

Prep, Dilution Cnt: 17

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
237578		1	Water	16P-1003-FA-5	05 Nov 03	03 Dec 03
237579		1	Water	16P-1003-FUA-5	05 Nov 03	03 Dec 03
237580		1	Water	16P-1003-UFUA-5	05 Nov 03	03 Dec 03
237581		1	Water	19D-1003-FA-5	05 Nov 03	03 Dec 03
237582		1	Water	19D-1003-FUA-5	05 Nov 03	03 Dec 03
237583		1	Water	19D-1003-UFUA-5	05 Nov 03	03 Dec 03
237584		1	Water	19IM1-25-1003-FA-5	05 Nov 03	03 Dec 03
237585		1	Water	19IM1-25-1003-FUA-5	05 Nov 03	03 Dec 03
237586		1	Water	19IM1-25-1003-UFUA-5	05 Nov 03	03 Dec 03
237587		1	Water	19IM2-25-1003-FA-5	05 Nov 03	03 Dec 03
237588		1	Water	19IM2-25-1003-FUA-5	05 Nov 03	03 Dec 03
237589		1	Water	19IM2-25-1003-UFUA-5	05 Nov 03	03 Dec 03
237590		1	Water	7SC-24-1003-FA-5	05 Nov 03	03 Dec 03
237591		1	Water	7SC-24-1003-FUA-5	05 Nov 03	03 Dec 03
237592		1	Water	7SC-24-1003-UFUA-5	05 Nov 03	03 Dec 03
237593		1	Water	98Q-1003-FA-5	05 Nov 03	03 Dec 03
237594		1	Water	98Q-1003-FA-6	05 Nov 03	03 Dec 03

Test: ICP-SWRI
Section: METALS

Holding: 180 days from CED

ICP Analysis by SwRI Method Cnt: 17

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
237578		1	Water	16P-1003-FA-5	05 Nov 03	03 May 04
237579		1	Water	16P-1003-FUA-5	05 Nov 03	03 May 04
237580		1	Water	16P-1003-UFUA-5	05 Nov 03	03 May 04
237581		1	Water	19D-1003-FA-5	05 Nov 03	03 May 04
237582		1	Water	19D-1003-FUA-5	05 Nov 03	03 May 04
237583		1	Water	19D-1003-UFUA-5	05 Nov 03	03 May 04
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237586		1	Water	19IM1-25-1003-UFUA-5	05 Nov 03	03 May 04
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237591		1	Water	7SC-24-1003-FUA-5	05 Nov 03	03 May 04
237592		1	Water	7SC-24-1003-UFUA-5	05 Nov 03	03 May 04
237593		1	Water	98Q-1003-FA-5	05 Nov 03	03 May 04
237594		1	Water	98Q-1003-FA-6	05 Nov 03	03 May 04

Southwest Research Institute

Laboratory Task Order

TO #: 031106-12 Revision: 1

010026

Project(s): 06002.01.141
Manager(s): DAMMANN, MIKE
To PM: 12/02/03
To QA: 12/31/03
To Client: 01/02/04

SDG: 237578
VTSR: 11/06/03
CASE: DIV 20 - CNWRA

SRR #'s: 25200
Client(s): DIV 20

010026

01-QPP-015
Division 01
Revision 4
November 2002

Document No. 3

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IF STAMP IS NOT RED, THIS DOCUMENT IS UNCONTROLLED

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

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:

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

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

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

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

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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-01-5.2**, *Preparation and Revision of Plans*.

2.0 SCOPE

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

3.0 REFERENCES

3.1 *SwRI Quality System Manual – 2000*

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

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

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

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

4.1 Indoctrination and Training

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

4.1.2 Indoctrination and training of personnel shall be conducted in accordance with **SOP-01-18.1**, *Qualification and Training*.

4.2 Qualification of Personnel

4.2.1 Testing personnel shall be designated as qualified to perform applicable project activities as specified in **SOP-01-18.1**, *Qualification and Training*.

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

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

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

4.3 Design Control

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

4.4 Right of Access

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

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

4.5 Control of Supplier-Generated Documents

4.5.1 Client documents shall be controlled in accordance with procedures under **SOP-01-5.0**, *Document and Data Control*, depending on the type of document supplied. These procedures provide the requirements for the preparation, review, approval, issue, distribution, and revision of documents controlled by the Chemistry and Chemical Engineering Division.

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

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

4.6 Acceptance of Services Only

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

4.7 Commercial Grade Items

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

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

4.7.3 Controls for procurement planning, supplier selection, supplier performance evaluation, and acceptance of procured items and services other than chemical reagents and standards shall be as identified in **SOP-01-6.1**, *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-01-10.1**, *Inspection and Test Conduct*. 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 and Login*, and **TAP-01-0407-035**, *Sample/Extract Storage and Custody*.

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

(a) Sample control number;

(b) Purchase order number;

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

(d) Work order number;

(e) Nuclear QA label; and

(f) Sample retention date, when applicable.

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

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

4.7.13 Identification and traceability shall be maintained in accordance with **SOP-01-8.1**, *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-01-10.1**, *Inspection and Test Conduct.*

4.9.3 Controls for measuring and test equipment shall be as specified in **SOP-01-11.1**, *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-01-13.1**, *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-01-15.1**, *Handling, Storage, Packaging, Preservation, 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-01-16.1**, *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-01-16.1**, *Storage and Maintenance of Quality Records*, to ensure protection against the risk of damage or destruction.

4.12 10 CFR, Part 21

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

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

4.13 Certified Test Report

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

4.14 Valid Documents List

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

5.0 HISTORY OF REVISIONS

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

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Div. 20
TASK ORDER: 031106-12
SRR: 25200
SDG: 237578
CASE: CNWRA
VTSR: November 06, 2003
PROJECT#: 06002.01.141

Chain of Custody/Login Paperwork

7451

SAMPLE LIST/CHAIN OF CUSTODY

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

Shipper Name/Address: BRAD WERLING X6565
CNWRA - DIV 20
BLD - 57

Client:

Client Purchase Order/Other ID:

Site/Zone ID:

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

SwRI Contact: Mike Dammann

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analysis of major + minor elements by ICP								intact	
19IM1-Z5-1003-	11-5-03		W		1	X								✓	
UFUA-5															
19IM2-Z5-1003-	11-5-03		W		1	X								✓	
UFUA-5															
7SC-Z4-1003-	11-5-03		W		1	X								✓	
UFUA-5															
16P-1003-	11-5-03		W		1	X								✓	
UFUA-5															
19D-1003-	11-5-03		W		1	X								✓	
UFUA-5															

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: ~~4~~ 22°C

Therm #: 024

Comments:

610/81-85 EWDP 27-Oct

Relinquished by (Print/Signature)	Date	Time
Brad Werling / Brad Werling	11-6-03	0916
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

SwRI Project#: 20.06002.01.141

Received by SwRI Lab: (Signature)

Date: 11/6/03 Time: 0916

Samples Disposed: Date / Time

Samples Disposed by:

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

7451

Shipper Name/Address: BRAD WERLING
CNWRA - DIV 20
BLD - 57

Client:

SAMPLE LIST/CHAIN OF CUSTODY

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

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

Client Purchase Order/Other ID:

Site/Zone ID:

SwRI Contact: Mike Dammann

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analysis of major + minor elements by ICP								intact	
98Q-1003-FA-6	11-5-03		W		1	X								✓	
98Q-1003-FA-5	11-5-03		W		1	X								✓	
19IM1-Z5-1003-FUA-5	11-5-03		W		1	X								✓	
19IM2-Z5-1003-FUA-5	11-5-03		W		1	X								✓	
19D-1003-FUA-5	11-5-03		W		1	X								✓	

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 Safty 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°C

Therm #: 026

Comments:
610/81-85 EWDP 27-30-Oct

Relinquished by (Print/Signature)	Date	Time
Brad Werling / Brad Werling	11-6-03	0916
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

SwRI Project#: 20.06002.01.141

Received by SwRI Lab: (Signature)

Date: 11/6/03 Time: 0916

Samples Disposed: Date / Time

Samples Disposed by:

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

7451

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CNWRA-Div 20
BLD-57

Client:

Client Purchase Order/Other ID:

Site/Zone ID:

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

SwRI Contact: Mike Dunmann

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analysis of major + minor elements by ICP									
														intact	
16P-1003-FUA-5	11-5-03		W		1	X								✓	
7SC-Z4-1003-FUA-5	11-5-03		W		1	X								✓	
19IM1-Z5-1003-FA-5	11-5-03		W		1	X								✓	
19IM2-Z5-1003-FA-5	11-5-03		W		1	X								✓	
16P-1003-FA-5	11-5-03		W		1	X								✓	

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- d = NaOH to pH >12
- e = Cool (4°C±2°C)
- f = Other (specify)

Nuclear Safty Related - use appropriate QA procedures

POC - Brad Werling
Phone - 6565
Fax - 5184

20.06002.01.141

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: 22C
Therm #: 026

Comments:
610/81-85 EWDP 27-30-00

Relinquished by (Print/Signature)	Date	Time
Brad Werling / Brad Werling	11-6-03	0916
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

SwRI Project#: —

Received by SwRI Lab: (Signature)

Date 11/6/03 Time 0916

Samples Disposed: Date Time

Samples Disposed by:

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

7451

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CNWRA - DIV 20
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Client:

Client Purchase Order/Other ID:

Site/Zone ID:

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

SwRI Contact: Mike Dunmam

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analysis of major + minor elements by ICP								intact	
19D-1003-FA-5	11-5-03		W		1	X								✓	
7SC-24-1003-FA-5	11-5-03		W		1	X								✓	

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)
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Nuclear Safty Related - use appropriate QA procedures

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phone - 6565
Fax - 5184

20.06002.01.141

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:

Therm #:

Comments:

610/81-85 EWDP 27-30-Oct

Relinquished by (Print/Signature)	Date	Time
Brad Werling / Brad Werling	11-6-03	0916
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

SwRI Project#: 1

Received by SwRI Lab: (Signature)

Date: 11/6/03 Time: 0916

Samples Disposed: Date: Time:

Samples Disposed by:

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

Southwest Research Institute

LOG-IN CHECKLIST

Sample Receipt Report No.: **25200**

C10039

Project Information All product information shall be derived from a contract, statement of work (SOW), or project manager (PM).				
Previous PM information	Yes	☐	No	☒
Current PM information	Yes	☒	No	☐
Sponsor's Documentation All original documentation must be attached to the work order and sent to Div 01 Quality Assurance (DQA).				
Delivery documentation (*) = (Tape on 8 ½ x 11 white paper)	Yes	☐	No	☒
Hand carried	Yes	☒	No	☐
Correspondence	Yes	☐	No	☒
Custody seals*	Yes	☐	No	☒
Chain-of-custody/Traffic report	Yes	☒	No	☐
Sample tags* (Confirm with container information before removal)	Yes	☐	No	☒
Hazard notifications	Yes	☐	No	☒
Product Condition Sample(s) shall not be left unattended once an ice chest has been opened.				
Sample(s) received intact	Yes	☒	No	☐
Container(s) received leaking	Yes	☐	No	☒
Container(s) received damaged	Yes	☐	No	☒
Lid(s) received damaged	Yes	☐	No	☒
Product Preparation				
FRM-115 (pH) Preservation Report / Metals & Wetchem H2O	Yes	☒	No	☐
Product Storage Sample(s) shall be stored in a designated location with their corresponding sample control records (SCR).				
Sample(s) in designated location	Yes	☒	No	☐
Sample Receipt Report All copies must be legible.				
Computerized sample receipt report with original documents	Yes	☒	No	☐
Sample custodian signature and date on all original documents.	Yes	☒	No	☐
Copy of sample receipt report to PM	Yes	☒	No	☐
PM sample receipt report approval with initial and date	Yes	☒	No	☐
Case file documents to DQA	Yes	☒	No	☐
Print sample log-in page and place in log-in notebook	Yes	☒	No	☐
Chain-of-Custody/Traffic Report				
Sample Custodian's signature, date, and time	Yes	☒	No	☐
Document thermometer no. / temperature (Confirm calibration is current)	Yes	☒	No	☐
Document condition of sample(s)	Yes	☒	No	☐
FRM-109				
Discrepancies	Yes	☒	No	☐
FRM-109 to PM	Yes	☒	No	☐
FRM-109 to Client (Only for required contracts)	Yes	☐	No	☒
FRM-109 to Inorganics for discrepancies of FRM-115	Yes	☒	No	☐
Ice Chest Shipment				
Clean ice chest/Discard used bags and ice/Return Sponsor's packing material	Yes	☐	No	☒
SwRI shipping ticket with project identification	Yes	☐	No	☒
Log-In Closure				
Sample Custodian's Signature:	Date: 11/06/03		Time: 11:57 AM	

SAMPLE LOG-IN SHEET

010040

Lab Name: Southwest Research Institute

Received By (Print Name): KHALED EDRISI

Log-in Date: 11/06/2003

Received By (Signature): [signature]

Case Number: CNWRA

Sample Delivery Group No.:

SAS Number: N/A

Remarks: 06002.01.141

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	11/06/2003
12.	Time Received	09:16:00

EPA Sample #	Corresponding Sample Tag #	Corresponding Assigned Lab #	Remarks: Condition of Sample Shipment, etc
16P-1003-FA-5	None	237578	Intact
16P-1003-FUA-5	None	237579	Intact
16P-1003-UFUA-5	None	237580	Intact
19D-1003-FA-5	None	237581	Intact
19D-1003-FUA-5	None	237582	Intact
19D-1003-UFUA-5	None	237583	Intact
19IM1-25-1003-FA-5	None	237584	Intact
19IM1-25-1003-FUA-5	None	237585	Intact
19IM1-25-1003-UFUA-5	None	237586	Intact
19IM2-25-1003-FA-5	None	237587	Intact
19IM2-25-1003-FUA-5	None	237588	Intact
19IM2-25-1003-UFUA-5	None	237589	Intact
7SC-24-1003-FA-5	None	237590	Intact
7SC-24-1003-FUA-5	None	237591	Intact
7SC-24-1003-UFUA-5	None	237592	Intact
98Q-1003-FA-5	None	237593	Intact
98Q-1003-FA-6	None	237594	Intact

Sample Transfer

Fraction: Inorganics	Fraction:
Area #: RF 13	Area #:
By: KHALED EDRISI	By:
On: 11/06/2003	On:

* Contact SMO and attach record of resolution

Reviewed By: CYNTHIA A. SALCEDA

Date: 11/07/2003

Logbook No.: Sample Receipt (25200)

Logbook Page No.: 4882 (SECTION 2 OF 4)

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Div. 20
TASK ORDER: 031106-12
SRR: 25200
SDG: 237578
CASE: CNWRA
VTSR: November 06, 2003
PROJECT#: 06002.01.141

Copies of Login Book

Sample Login Book

Nov 06, 2003

SwRI Login Area
Division 1

Sample Receipt: 25199	Project: 06002.01.141	Client: DIV 20
VTSR Date: Nov 06, 2003	VTSR Time: 09:16:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
237571	19IM1-25-1003-UFUA-1	Water
237572	19IM2-25-1003-FUA-1	Water
237573	19IM2-25-1003-UFUA-1	Water
237574	7SC-24-1003-FUA-1	Water
237575	7SC-24-1003-UFUA-1	Water
237576	7SC-24-1003-FUA-2	Water
237577	99Q-1003-FUA-1	Water

Sample Receipt: 25200	Project: 06002.01.141	Client: DIV 20
VTSR Date: Nov 06, 2003	VTSR Time: 09:16:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
237578	16P-1003-FA-5	Water
237579	16P-1003-FUA-5	Water
237580	16P-1003-UFUA-5	Water
237581	19D-1003-FA-5	Water
237582	19D-1003-FUA-5	Water
237583	19D-1003-UFUA-5	Water
237584	19IM1-25-1003-FA-5	Water
237585	19IM1-25-1003-FUA-5	Water
237586	19IM1-25-1003-UFUA-5	Water
237587	19IM2-25-1003-FA-5	Water
237588	19IM2-25-1003-FUA-5	Water
237589	19IM2-25-1003-UFUA-5	Water
237590	7SC-24-1003-FA-5	Water
237591	7SC-24-1003-FUA-5	Water
237592	7SC-24-1003-UFUA-5	Water
237593	98Q-1003-FA-5	Water
237594	98Q-1003-FA-6	Water

Sample Receipt: 25201	Project: 05748.01.002	Client: EGLIN A.F.B.
VTSR Date: Nov 06, 2003	VTSR Time: 09:35:00	Manager: SCOTT, JIM

System ID	Customer Sample ID	Matrix
237596	1008 A	Water

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Div. 20
TASK ORDER: 031106-12
SRR: 25200
SDG: 237578
CASE: CNWRA
VTSR: November 06, 2003
PROJECT#: 06002.01.141

RAW DATA

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 54 294

010042

CLIENT(S): DW 11-11-03 ~~TRC~~ DIV 20
TASK ORDER(S): 031106-12 SDG(S): 237578
PROJECT NO(S): 06002.01.141
METHOD: 3005A___ 3050B___ 3050B-7.5___ 3010A___ 3020A___ 7760A___ 7740A___ $HClO_4$___ H_2SO_4 Sb___
Microwave___ Fusion___ Teflon___ Rock___ OTHER Aliquots
MATRIX: Water ✓ Soil___ Biota___ Solid___ Liquid___ TCLP Ext___ OTHER
INSTRUMENT: GFAA___ ICP ✓ ICP-MS___ IC___ FLAA___ HYDRIDE___ OTHER
ACID INORG #: HNO_3# ** HCl# ** H_2SO_4#___ $HClO_4$#___ HF#___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM___ SOURCE: JV INORG# 4261 EXP: 10/04 AMT: 50nL
Oven/Hotplate ID: — Temperature (°C): —

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PBW-L11W1			5	5	
LCSW-L11W1 *			↓	↓	
237578					
7578d					
7579					
7579D *					
7580					
7581					
7582					
7583					
7584					
7585					
7586					
7587					
7588					
7589					
7590					
7591					
7592					
7593					
↓ 7594			↓	↓	
* Spike 50nL Spike	Spex#	4306	Exp. 10/04		
↓ 20nL Z-LAL1	Spex#	4245	Exp. 9/04		
** - RLB-02-032-04	1%	HNO_3 / 5%	HCL	Exp. 1/04	
PBW and LCSW are prepared as 5mLs - **					
					LOCATION: N/A

PREPARED BY: John Wilkes DATE: 11-11-03
REVIEWED BY: [illegible] DATE: 11-11-03
DISPOSAL INT/DATE/LOC:

FRM-191 (Rev 2/Mar 03)

A311061L

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 55 124

010043

CLIENT(S): DIV 20
TASK ORDER(S): 031106-12 SDG(S): 237578
PROJECT NO(S): 06002.01.141
METHOD: 3005A ___ 3050B ___ 3050B-7.5 ___ 3010A ___ 3020A ___ 7760A ___ 7740A ___ $HClO_4$ ___ H_2SO_4 Sb ___
Microwave ___ Fusion ___ Teflon ___ Rock ___ OTHER Aliquots
MATRIX: Water ✓ Soil ___ Biota ___ Solid ___ Liquid ___ TCLP Ext ___ OTHER ___
INSTRUMENT: GFAA ___ ICP ✓ ICP-MS ___ IC ___ FLAA ___ HYDRIDE ___ OTHER ___
ACID INORG #: HNO_3# ** HCl# ** H_2SO_4# ___ $HClO_4$# ___ HF# ___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM ___ SOURCE: IV INORG# 4261 EXP: 10/04 AMT: 50NL
Oven/Hotplate ID: — Temperature (°C): —

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PBW-L24W2			5	50	11-24-03
LCSW-L24W1 *					
237578					
7579					
7580					
7580d					
7581					
7581(S)					
~~7582~~ 7582					
7583					
7584					
7585					
7586					
7587					
7588					
7589					
7590					
7591					
7592					
7593					
7594					
* Spike 50NL Spike1	Spex#	4306	Exp 10/04		
20NL I-CAL 1	Spex#	4245	Exp 9/04		
** - RLB-02-032-04	1%	HNO_3 / 5%	HCL		
PBW and LCSW are prepared as 5mLs-**					LOCATION: N/A

PREPARED BY: John Willis DATE: 11-24-03
REVIEWED BY: [illegible] DATE: 11-24-03
DISPOSAL INT/DATE/LOC: ___

FRM-191 (Rev 2/Mar 03)

Trace Metals Reagent Logbook

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 02 032

[redacted]

Reagent I.D.:	Preparation Description:	Prep Date:	Exp Date:	Initials:
RLB-02-032-01	10% HCL	10-28-03	1-28-04	JW
	add 180 mls di water to a 200 mL Nalgene			
	bottle, add 20 mls HCL inorg # 4291			
	F.V. is 200 mls			
RLB02-032-02	10 x Sol. As			
	9.5 g L Ascorbic #4272 + 18.75 G KI	10-28-03	10-29-03	BL
	# 5758 + 18.75 ml HCL # 4292 to			
	100 ml with Reg. water			
RLB-02-032-03	1% HNO_3 / 5% HCL	10-29-03	1-29-04	JW
	add 100 mls di water to a 250 mL Nalgene			
	bottle, add 2.5 mls HNO_3 inorg # 4295,			
	add 12.5 mls HCL inorg # 4292,			
	F.V. to 250 mls with di water			
RLB-02-032-04	1% HNO_3 / 5% HCL	11-4-03	1-4-04	JW
	add 100 mls di water to 250 mL Nalgene			
	bottle, add 2.5 mls HNO_3 inorg # 4296,			
	add 12.5 mls HCL inorg # 4292, F.V. to			
	250 mls with di water			
RLB2-032-05	5% $KMNO_3$			
	150 G to 3 L reag. water			
	# 3663	11-4-03	11-4-04	BL

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SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

010045

TJA TRACE ICP DAILY LOG

ANALYST [illegible] DATE 11-12-03

As 189.042 Profile Line As Intensity: 234.869

PEAK POSITION -.026293
VERNIER POSITION 283
AUTOSAMPLER Yes X No

QC PREP DATE:	
CCV/ICV	03K12
CRI	03K04
ICSA	03K11
ICSAB	03K04

STDs PREP DATE:	
CLP_STD1_SC	03K05
CLP_STD2_SC	03K05
CLP_STD3_SC	03K05
CLP_STD4_SC	03K05
CLP_STD5_SC	03301
CLP_STD6_SC	03K05
BLK_SC	03329

COMMENTS	FILE	CLIENT	TO#	PROJECT NO.	METHOD
A3110612	DAily32	Div 20	031106-12	06002.01.141	DAily1 54254
A3101104	DAily32	INEEL	031010-4 031013-11	06355.04.006	54256 54256
↓	↓	↓	031024-5	↓	
		[illegible] 11-12-03			

COMMENTS:

MAINTENANCE:

REVIEWED BY: T. Ohmi DATE: 12/3/03

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SOUTHWEST RESEARCH INSTITUTE

6220 Culebra Rd
San Antonio, Texas 78228

SPECTRO ICP DAILY LOG

ANALYST: Del

DATE: 11-24-03

POWER: 1700

FLOWS:
Aux 39
Coolant 60
Mass Flow Controller 1054

CURRENT	PROPOSED	
5006/5073	5073 / X 5063	Na
4761 4800	4800 / 4795	Fe
4913/4991	4991 / 4975	Sr

QC PREP DATE:	
CCV/ICV	03L12
CRI	11-24-03
ICSA	
ICSAB	

CLP_STD1_SC	03L05
CLP_STD2_SC	11-24-03
CLP_STD3_SC	
CLP_STD4_SC	
CLP_STD5_SC	
BLK_SC	03L21

FILE	CLIENT	TO#	PROJECT NO.	METHOD	PREP PAGE
031124	Div20	031106-12	06002.01.141	LiKNA	SS 124
031124	Div18	031113-5	18023.01.078	LiKNA	NA
		11-24-03			

COMMENTS:

MAINTENANCE:

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

OTHER:

REVIEWED BY: COrduña

DATE: 11/24/03

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-03J02

Date Prepared: 9-2-03 Prepared By: D

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4197

Added ✓ 50 ml HCL INORG #: 4190

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-03 INORG #: 3683

020647

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-03J25

Date Prepared: 9-25-03 Prepared By: D

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4237

Added ✓ 50 ml HCL INORG #: 4247

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- ~~03J31~~ 03J01 DH 10-1-03

Date Prepared: ~~9-31-03~~ 10-1-03 DH Prepared By: D

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4237

Added ✓ 50 ml HCL INORG #: 4249

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-03J29

Date Prepared: 10-29-03 Prepared By: D

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4295

Added ✓ 50 ml HCL INORG #: 4292

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 03L21

Date Prepared: 11-21-03 Prepared By: DL

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4299

Added ✓ 50 ml HCL INORG #: 4289

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-03M04

Date Prepared: 12/4/03 Prepared By: TOD

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4299

Added ✓ 50 ml HCL INORG #: 4335

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

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

CCV- 03212

010049

Date Prepared: 11-12-03 Prepared By: DL

HNO3 INORG #: 4297 HCl INORG #: 4294

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
						at 11-12-03	
Sc	10	1ml	✓	INORGVENT	~~4306~~ 4262	10000	~~10-30-04~~ 11-12-03 10-1-04
B	5	5ml	✓	SPEX	4139	1000	6·30·04
Li	5	5ml	✓	SPEX	4065	1000	5·15·04
Mo	5	5ml	✓	SPEX	4066	1000	5·15·04
P	5	5ml	✓	SPEX	4307	1000	10·30·04
Si	5	5ml	✓	SPEX	4232	1000	8·30·04
Ti	5	5ml	✓	SPEX	4234	1000	8·30·04
Sr	5	5ml	✓	SPEX	4308	1000	10·30·04
Sn	5	5ml	✓	SPEX	4141	1000	6·30·04
Bi	5	5ml	✓	SPEX	4138	1000	6·30·04
La	5	5ml	✓	SPEX	4064	1000	5·15·04
Y	5	5ml	✓	SPEX	4067	1000	5·15·04
Pd	1	1ml	✓	SPEX	3928	1000	1·15·04
S	1	1ml	✓	SPEX	4140	1000	6·30·04
Th	1	1ml	✓	SPEX	4233	1000	8·30·04
U	1	1ml	✓	SPEX	4142	1000	6·30·04
W	1	1ml	✓	SPEX	4212	1000	8·15·04
Zr	5	5ml	✓	SPEX	4213	1000	8·15·04
Na	10	1ml	✓	SPEX	3951	10000	2·15·04
ICV-2A	vary	10ml	✓	SPEX	3773	mix	11·30·03
ICV-2B	vary	1ml	✓	SPEX	3774	mix	11·30·03
ICV-2C	vary	10ml	✓	SPEX	3775	mix	11·30·03

Expiration Date: 11-30-03

ICP Calibration Standards

Date Prepared: 11-5-03 Prepared By: [illegible]

HNO3 INORG #: 4296 HCl INORG #: 4293

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
11-5-03	STD1- 03LC5 DK	Al	50	2.50	✓	INORVENT	4220	10000	9-1-04
		Ca	50	2.50	✓	INORVENT	3900	10000	2-1-04
		Fe	50	2.50	✓	INORVENT	3963	10000	3-1-04
		K	50	2.50	✓	INORVENT	4320	10000	12-1-04
		Mg	25	1.25	✓	INORVENT	4204	10000	8-1-04
		Na	50	2.50	✓	INORVENT	4205	10000	8-1-04
		Li	10	5.00	✓	INORVENT	4149	1000	7-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
11-5-03	STD2- 03LC5	Ba	10	5.00	✓	INORVENT	3971	1000	3-1-04
		Be	5	2.50	✓	INORVENT	4062	1000	6-1-04
		Cr	10	5.00	✓	INORVENT	4318	1000	12-1-04
		Cu	10	5.00	✓	INORVENT	3955	1000	3-1-04
		Ni	10	5.00	✓	INORVENT	3957	1000	3-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
11-5-03	STD3- 03LC5	Cd	10	5.00	✓	INORVENT	3972	1000	3-1-04
		Co	10	5.00	✓	INORVENT	3973	1000	3-1-04
		Mn	10	5.00	✓	INORVENT	3921	1000	2-1-04
		V	10	5.00	✓	INORVENT	4321	1000	12-1-04
		Zn	10	5.00	✓	INORVENT	4319	1000	12-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
11-5-03	STD4- 03LC5	Ag	2	1.00	✓	INORVENT	4222	1000	9-1-04
		As	10	5.00	✓	INORVENT	3999	1000	2-1-04
		Pb	10	5.00	✓	INORVENT	4313	1000	11-1-04
		Sb	10	5.00	✓	INORVENT	3953	1000	3-1-04
		Se	10	5.00	✓	INORVENT	4152	1000	7-1-04
		TL	10	5.00	✓	INORVENT	3922	1000	2-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
	STD5-	B	10	5.00		INORVENT		1000	
		Mo	10	5.00		INORVENT		1000	
		P	10	5.00		INORVENT		1000	
		Si	10	5.00		INORVENT		1000	
		Ti	10	5.00		INORVENT		1000	
		Sr	10	5.00		INORVENT		1000	
		Sn	10	5.00		INORVENT		1000	
		Bi	5	2.50		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
11-5-03	STD6- 03LC5	La	10	5.00	✓	INORVENT	4221	1000	9-1-04
		Na	1	0.05	✓	INORVENT	4205	10000	8-1-04
		Pd	10	5.00	✓	INORVENT	3964	1000	3-1-04
		S	10	5.00	✓	INORVENT	4317	1000	12-1-04
		Th	10	5.00	✓	INORVENT	4283	1000	11-1-04
		U	10	5.00	✓	INORVENT	3974	1000	3-1-04
		W	5	2.50	✓	INORVENT	4203	1000	8-1-04
		Y	10	5.00	✓	INORVENT	4063	1000	6-1-04
		Zr	10	5.00	✓	INORVENT	3954	1000	3-1-04
		SC	10	0.500	✓	INORVENT	4262	10000	10-1-04

Expiration Dates:

STD1: 2-1-04 STD4: 2-1-04

STD2: 3-1-04 STD5:

STD3: 2-1-04 STD6: 3-1-04

ICP Calibration Standards

Date Prepared: ~~9-31-03~~ 10-1-03 Prepared By: [illegible]

HNO3 INORG #: 4237 HCl INORG #: 4249

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
~~9-31-03~~ 10-1-03	STD1- ~~03-31-04~~ 03501	Al	50	2.50	✓	INORVENT	4220	10000	9-1-04
		Ca	50	2.50	✓	INORVENT	3900	10000	2-1-04
		Fe	50	2.50	✓	INORVENT	3963	10000	3-1-04
		K	50	2.50	✓	INORVENT	3734	10000	11-1-03
		Mg	25	1.25	✓	INORVENT	4204	10000	8-1-04
		Na	50	2.50	✓	INORVENT	4205	10000	8-1-04
		Li	10	5.00	✓	INORVENT	4149	1000	7-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
~~9-31-03~~ 10-1-03	STD2- ~~03-31-04~~ 03501	Ba	10	5.00	✓	INORVENT	3931	1000	3-1-04
		Be	5	2.50	✓	INORVENT	4062	1000	6-1-04
		Cr	10	5.00	✓	INORVENT	3732	1000	11-1-03
		Cu	10	5.00	✓	INORVENT	3955	1000	3-1-04
		Ni	10	5.00	✓	INORVENT	3957	1000	3-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
~~9-31-03~~ 10-1-03	STD3- ~~03-31-04~~ 03501	Cd	10	5.00	✓	INORVENT	3972	1000	3-1-04
		Co	10	5.00	✓	INORVENT	3973	1000	3-1-04
		Mn	10	5.00	✓	INORVENT	3921	1000	2-1-04
		V	10	5.00	✓	INORVENT	3740	1000	11-1-03
		Zn	10	5.00	✓	INORVENT	3741	1000	11-1-03
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
~~9-31-03~~ 10-1-03	STD4- ~~03-31-04~~ 03501	Ag	2	1.00	✓	INORVENT	4222	1000	9-1-04
		As	10	5.00	✓	INORVENT	3999	1000	2-1-04
		Pb	10	5.00	✓	INORVENT	3735	1000	11-1-03
		Sb	10	5.00	✓	INORVENT	3953	1000	3-1-04
		Se	10	5.00	✓	INORVENT	4152	1000	7-1-04
		TL	10	5.00	✓	INORVENT	3922	1000	2-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
~~9-31-03~~ 10-1-03	STD5- ~~03-31-04~~ 03501	B	10	5.00	✓	INORVENT	3954	1000	3-1-04
		Mo	10	5.00	✓	INORVENT	3956	1000	3-1-04
		P	10	5.00	✓	INORVENT	4049	1000	6-1-04
		Si	10	5.00	✓	INORVENT	4153	1000	7-1-04
		Ti	10	5.00	✓	INORVENT	3762	1000	12-1-03
		Sr	10	5.00	✓	INORVENT	4154	1000	7-1-04
		Sn	10	5.00	✓	INORVENT	4026	1000	4-1-04
		Bi	5	2.50		INORVENT	4200	1000	8-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
10-1-03	STD6- 03501	La	10	5.00	✓	INORVENT	4221	1000	9-1-04
		Na	1	0.05	42 ✓	INORVENT	4205	10000	8-1-04
		Pd	10	5.00	✓	INORVENT	3964	1000	3-1-04
		S	10	5.00	✓	INORVENT	3739	1000	11-1-03
		Th	10	5.00	✓	INORVENT	3641	1000	10-1-03
		U	10	5.00	✓	INORVENT	3974	1000	3-1-04
		W	5	2.50	✓	INORVENT	4203	1000	8-1-04
		Y	10	5.00	✓	INORVENT	4063	1000	6-1-04
		Zr	10	5.00	✓	INORVENT	3958	1000	3-1-04
		SC	10	0.500	✓	INORVENT	4262	10000	10-1-04

OH Exp. order

Expiration Dates:

STD1: 11-1-03 STD4: 11-1-03

STD2: 11-1-03 STD5: 12-1-03

STD3: 11-1-03 STD6: ~~11-1-03~~ 10-1-03

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J Rawyk 12/18/03 R Jones 12/22/03

system id	elem	result	qual	units	rl	tv	rec		ug/ml	date	time
237578	Ag3280	0.005	U	mg/L	0.005				0.00051	11/12/03	11:51
237578	Al3082	0.620		mg/L	0.05				0.61976	11/12/03	11:51
237578	As1890	0.014		mg/L	0.005				0.01445	11/12/03	11:51
237578	B_2496	0.204		mg/L	0.025				0.20366	11/12/03	11:51
237578	Ba4934	0.022		mg/L	0.005				0.02162	11/12/03	11:51
237578	Be3130	0.005	U	mg/L	0.005				0.00037	11/12/03	11:51
237578	Bi2230	0.015	U	mg/L	0.015				0.00519	11/12/03	11:51
237578	Ca3179	2.17		mg/L	0.05				2.16732	11/12/03	11:51
237578	Cd2265	0.005	U	mg/L	0.005				0.00024	11/12/03	11:51
237578	Co2286	0.005	U	mg/L	0.005				0.00499	11/12/03	11:51
237578	Cr2677	0.005	U	mg/L	0.005				0.00416	11/12/03	11:51
237578	Cu3247	0.005	U	mg/L	0.005				0.00272	11/12/03	11:51
237578	Fe2714	1.14		mg/L	0.05				1.14329	11/12/03	11:51
237578	K_7664	1.92		mg/L	0.2				1.9201	11/24/03	
237578	La4086	0.005	U	mg/L	0.005				0.00486	11/12/03	11:51
237578	Li6707	0.081		mg/L	0.005				0.08147	11/12/03	11:51
237578	Mg2790	0.388		mg/L	0.05				0.38805	11/12/03	11:51
237578	Mn2576	0.024		mg/L	0.005				0.02448	11/12/03	11:51
237578	Mo2020	0.063		mg/L	0.01				0.06260	11/12/03	11:51
237578	Na3302	110		mg/L	0.2				110.1565	11/24/03	
237578	Ni2316	0.005	U	mg/L	0.005				0.00148	11/12/03	11:51
237578	P_1782	0.043		mg/L	0.04				0.04318	11/12/03	11:51
237578	Pb220	0.005	U	mg/L	0.005				0.00177	11/12/03	11:51
237578	Pd3404	0.01	U	mg/L	0.01				0.00411	11/12/03	11:51
237578	S_1820	20.2		mg/L	0.025				20.16623	11/12/03	11:51
237578	Sb2068	0.01	U	mg/L	0.01				0.00324	11/12/03	11:51
237578	Se196	0.015	U	mg/L	0.015				0.00737	11/12/03	11:51
237578	Si2881	21.1		mg/L	0.05				21.06237	11/12/03	11:51
237578	Sn1899	0.01	U	mg/L	0.01				0.00231	11/12/03	11:51
237578	Sr4215	0.028		mg/L	0.005				0.02773	11/12/03	11:51
237578	Th2837	0.01	U	mg/L	0.01				0.00066	11/12/03	11:51
237578	Ti3372	0.005	U	mg/L	0.005				0.00405	11/12/03	11:51
237578	Tl1908	0.025	U	mg/L	0.025				0.00128	11/12/03	11:51
237578	U_3859	0.1	U	mg/L	0.1				0.07833	11/12/03	11:51
237578	V_2924	0.005	U	mg/L	0.005				0.00275	11/12/03	11:51
237578	W_2079	0.015	U	mg/L	0.015				-0.00026	11/12/03	11:51
237578	Y_3710	0.005	U	mg/L	0.005				0.00069	11/12/03	11:51
237578	Zn2062	0.015		mg/L	0.005				0.01472	11/12/03	11:51
237578	Zr3496	0.005	U	mg/L	0.005				0.00073	11/12/03	11:51
237578d	Ag3280	0.005	U	mg/L	0.005				-0.00017	11/12/03	11:56
237578d	Al3082	0.659		mg/L	0.05				0.65934	11/12/03	11:56
237578d	As1890	0.008		mg/L	0.005				0.00823	11/12/03	11:56
237578d	B_2496	0.206		mg/L	0.025				0.20561	11/12/03	11:56
237578d	Ba4934	0.020		mg/L	0.005				0.01951	11/12/03	11:56
237578d	Be3130	0.005	U	mg/L	0.005				0.00021	11/12/03	11:56
237578d	Bi2230	0.015	U	mg/L	0.015				0.00382	11/12/03	11:56
237578d	Ca3179	2.18		mg/L	0.05				2.18110	11/12/03	11:56
237578d	Cd2265	0.005	U	mg/L	0.005				0.00000	11/12/03	11:56
237578d	Co2286	0.005	U	mg/L	0.005				0.00450	11/12/03	11:56
237578d	Cr2677	0.005	U	mg/L	0.005				0.00455	11/12/03	11:56
237578d	Cu3247	0.005	U	mg/L	0.005				0.00274	11/12/03	11:56
237578d	Fe2714	1.23		mg/L	0.05				1.22652	11/12/03	11:56
237578d	La4086	0.005		mg/L	0.005				0.00506	11/12/03	11:56
237578d	Li6707	0.081		mg/L	0.005				0.08112	11/12/03	11:56

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system id	elem	result	qual	units	rl	tv	rec		ug/ml	date	time
237578d	Mg2790	0.373		mg/L	0.05				0.37323	11/12/03	11:56
237578d	Mn2576	0.025		mg/L	0.005				0.02451	11/12/03	11:56
237578d	Mo2020	0.064		mg/L	0.01				0.06417	11/12/03	11:56
237578d	Ni2316	0.005	U	mg/L	0.005				0.00246	11/12/03	11:56
237578d	P_1782	0.040		mg/L	0.04				0.04030	11/12/03	11:56
237578d	Pb220	0.005	U	mg/L	0.005				0.00336	11/12/03	11:56
237578d	Pd3404	0.01	U	mg/L	0.01				0.00365	11/12/03	11:56
237578d	S_1820	19.6		mg/L	0.025				19.64684	11/12/03	11:56
237578d	Sb2068	0.01	U	mg/L	0.01				0.00094	11/12/03	11:56
237578d	Se196	0.015	U	mg/L	0.015				0.00428	11/12/03	11:56
237578d	Si2881	21.4		mg/L	0.05				21.39072	11/12/03	11:56
237578d	Sn1899	0.01	U	mg/L	0.01				0.00362	11/12/03	11:56
237578d	Sr4215	0.028		mg/L	0.005				0.02784	11/12/03	11:56
237578d	Th2837	0.01	U	mg/L	0.01				-0.00157	11/12/03	11:56
237578d	Ti3372	0.005	U	mg/L	0.005				0.00438	11/12/03	11:56
237578d	Tl1908	0.025	U	mg/L	0.025				0.00641	11/12/03	11:56
237578d	U_3859	0.1	U	mg/L	0.1				0.08619	11/12/03	11:56
237578d	V_2924	0.005	U	mg/L	0.005				0.00285	11/12/03	11:56
237578d	W_2079	0.015	U	mg/L	0.015				0.00089	11/12/03	11:56
237578d	Y_3710	0.005	U	mg/L	0.005				0.00096	11/12/03	11:56
237578d	Zn2062	0.015		mg/L	0.005				0.01467	11/12/03	11:56
237578d	Zr3496	0.005	U	mg/L	0.005				0.00161	11/12/03	11:56
237579	Ag3280	0.005	U	mg/L	0.005				0.00058	11/12/03	12:01
237579	Al3082	0.340		mg/L	0.05				0.34002	11/12/03	12:01
237579	As1890	0.011		mg/L	0.005				0.01112	11/12/03	12:01
237579	B_2496	0.210		mg/L	0.025				0.20976	11/12/03	12:01
237579	Ba4934	0.008		mg/L	0.005				0.00804	11/12/03	12:01
237579	Be3130	0.005	U	mg/L	0.005				0.00011	11/12/03	12:01
237579	Bi2230	0.015	U	mg/L	0.015				0.00672	11/12/03	12:01
237579	Ca3179	1.85		mg/L	0.05				1.84598	11/12/03	12:01
237579	Cd2265	0.005	U	mg/L	0.005				0.00014	11/12/03	12:01
237579	Co2286	0.005	U	mg/L	0.005				0.00390	11/12/03	12:01
237579	Cr2677	0.005	U	mg/L	0.005				-0.00067	11/12/03	12:01
237579	Cu3247	0.005	U	mg/L	0.005				0.00132	11/12/03	12:01
237579	Fe2714	0.262		mg/L	0.05				0.26168	11/12/03	12:01
237579	K_7664	1.79		mg/L	0.2				1.7867	11/24/03	
237579	La4086	0.005	U	mg/L	0.005				0.00225	11/12/03	12:01
237579	Li6707	0.082		mg/L	0.005				0.08247	11/12/03	12:01
237579	Mg2790	0.269		mg/L	0.05				0.26938	11/12/03	12:01
237579	Mn2576	0.014		mg/L	0.005				0.01352	11/12/03	12:01
237579	Mo2020	0.066		mg/L	0.01				0.06640	11/12/03	12:01
237579	Na3302	105		mg/L	0.2				105.1779	11/24/03	
237579	Ni2316	0.005	U	mg/L	0.005				0.00021	11/12/03	12:01
237579	P_1782	0.04	U	mg/L	0.04				0.03875	11/12/03	12:01
237579	Pb220	0.005	U	mg/L	0.005				-0.00006	11/12/03	12:01
237579	Pd3404	0.01	U	mg/L	0.01				0.00430	11/12/03	12:01
237579	S_1820	19.8		mg/L	0.025				19.77896	11/12/03	12:01
237579	Sb2068	0.01	U	mg/L	0.01				0.00279	11/12/03	12:01
237579	Se196	0.015	U	mg/L	0.015				0.00559	11/12/03	12:01
237579	Si2881	20.7		mg/L	0.05				20.72975	11/12/03	12:01
237579	Sn1899	0.01	U	mg/L	0.01				0.00986	11/12/03	12:01
237579	Sr4215	0.022		mg/L	0.005				0.02184	11/12/03	12:01
237579	Th2837	0.01	U	mg/L	0.01				-0.00301	11/12/03	12:01
237579	Ti3372	0.005	U	mg/L	0.005				0.00251	11/12/03	12:01

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system id	elem	result	qual	units	rl	tv	rec		ug/ml	date	time
237579	Tl1908	0.025	U	mg/L	0.025				0.00126	11/12/03	12:01
237579	U_3859	0.1	U	mg/L	0.1				0.08519	11/12/03	12:01
237579	V_2924	0.005	U	mg/L	0.005				0.00186	11/12/03	12:01
237579	W_2079	0.015	U	mg/L	0.015				0.00260	11/12/03	12:01
237579	Y_3710	0.005	U	mg/L	0.005				0.00009	11/12/03	12:01
237579	Zn2062	0.007		mg/L	0.005				0.00739	11/12/03	12:01
237579	Zr3496	0.005	U	mg/L	0.005				0.00059	11/12/03	12:01
237579s	Ag3280	0.042		mg/L	0.005	0.05	84.5%		0.04223	11/12/03	12:06
237579s	Al3082	2.30		mg/L	0.05	2	98.2%		2.30374	11/12/03	12:06
237579s	As1890	2.12		mg/L	0.005	2	105.4%		2.11930	11/12/03	12:06
237579s	B_2496	0.197		mg/L	0.025				0.19743	11/12/03	12:06
237579s	Ba4934	2.05		mg/L	0.005	2	102.0%		2.04871	11/12/03	12:06
237579s	Be3130	0.053		mg/L	0.005	0.05	105.9%		0.05294	11/12/03	12:06
237579s	Bi2230	0.015	U	mg/L	0.015				0.00713	11/12/03	12:06
237579s	Ca3179	22.6		mg/L	0.05	20	103.9%		22.63233	11/12/03	12:06
237579s	Cd2265	0.052		mg/L	0.005	0.05	103.5%		0.05174	11/12/03	12:06
237579s	Co2286	0.520		mg/L	0.005	0.5	103.9%		0.51951	11/12/03	12:06
237579s	Cr2677	0.184		mg/L	0.005	0.2	91.8%		0.18356	11/12/03	12:06
237579s	Cu3247	0.259		mg/L	0.005	0.25	103.6%		0.25908	11/12/03	12:06
237579s	Fe2714	1.23		mg/L	0.05	1	97.2%		1.23375	11/12/03	12:06
237579s	La4086	0.005	U	mg/L	0.005				0.00204	11/12/03	12:06
237579s	Li6707	0.083		mg/L	0.005				0.08274	11/12/03	12:06
237579s	Mg2790	21.2		mg/L	0.05	20	104.6%		21.18984	11/12/03	12:06
237579s	Mn2576	0.523		mg/L	0.005	0.5	101.9%		0.52340	11/12/03	12:06
237579s	Mo2020	0.068		mg/L	0.01				0.06783	11/12/03	12:06
237579s	Ni2316	0.509		mg/L	0.005	0.5	101.9%		0.50942	11/12/03	12:06
237579s	P_1782	0.053		mg/L	0.04				0.05273	11/12/03	12:06
237579s	Pb220	0.523		mg/L	0.005	0.5	104.5%		0.52253	11/12/03	12:06
237579s	Pd3404	0.01	U	mg/L	0.01				0.00482	11/12/03	12:06
237579s	S_1820	18.8		mg/L	0.025				18.80460	11/12/03	12:06
237579s	Sb2068	0.370		mg/L	0.01	0.5	74.0%		0.36982	11/12/03	12:06
237579s	Se196	2.32		mg/L	0.015	2	116.0%		2.31989	11/12/03	12:06
237579s	Si2881	19.7		mg/L	0.05				19.72542	11/12/03	12:06
237579s	Sn1899	0.01	U	mg/L	0.01				0.00353	11/12/03	12:06
237579s	Sr4215	0.021		mg/L	0.005				0.02092	11/12/03	12:06
237579s	Th2837	0.01	U	mg/L	0.01				-0.00588	11/12/03	12:06
237579s	Ti3372	0.005	U	mg/L	0.005				0.00201	11/12/03	12:06
237579s	Tl1908	2.28		mg/L	0.025	2	114.2%		2.28312	11/12/03	12:06
237579s	U_3859	0.1	U	mg/L	0.1				0.05602	11/12/03	12:06
237579s	V_2924	0.514		mg/L	0.005	0.5	102.9%		0.51431	11/12/03	12:06
237579s	W_2079	0.015	U	mg/L	0.015				-0.00183	11/12/03	12:06
237579s	Y_3710	0.005	U	mg/L	0.005				0.00015	11/12/03	12:06
237579s	Zn2062	0.536		mg/L	0.005	0.5	105.9%		0.53649	11/12/03	12:06
237579s	Zr3496	0.005	U	mg/L	0.005				0.00114	11/12/03	12:06
237580	Ag3280	0.005	U	mg/L	0.005				0.00031	11/12/03	12:10
237580	Al3082	0.354		mg/L	0.05				0.35365	11/12/03	12:10
237580	As1890	0.019		mg/L	0.005				0.01909	11/12/03	12:10
237580	B_2496	0.273		mg/L	0.025				0.27345	11/12/03	12:10
237580	Ba4934	0.038		mg/L	0.005				0.03849	11/12/03	12:10
237580	Be3130	0.005	U	mg/L	0.005				0.00001	11/12/03	12:10
237580	Bi2230	0.015	U	mg/L	0.015				0.00637	11/12/03	12:10
237580	Ca3179	6.53		mg/L	0.05				6.52550	11/12/03	12:10
237580	Cd2265	0.005	U	mg/L	0.005				0.00017	11/12/03	12:10
237580	Co2286	0.010		mg/L	0.005				0.00978	11/12/03	12:10

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237580	Cr2677	0.005	U	mg/L	0.005				0.00148	11/12/03	12:10
237580	Cu3247	0.009		mg/L	0.005				0.00943	11/12/03	12:10
237580	Fe2714	1.07		mg/L	0.05				1.06622	11/12/03	12:10
237580	K_7664	1.98		mg/L	0.2				1.9776	11/24/03	
237580	La4086	0.005	U	mg/L	0.005				0.00225	11/12/03	12:10
237580	Li6707	0.112		mg/L	0.005				0.11168	11/12/03	12:10
237580	Mg2790	0.901		mg/L	0.05				0.90135	11/12/03	12:10
237580	Mn2576	0.054		mg/L	0.005				0.05414	11/12/03	12:10
237580	Mo2020	0.063		mg/L	0.01				0.06266	11/12/03	12:10
237580	Na3302	117		mg/L	0.2				117.4242	11/24/03	
237580	Ni2316	0.005	U	mg/L	0.005				0.00457	11/12/03	12:10
237580	P_1782	0.061		mg/L	0.04				0.06107	11/12/03	12:10
237580	Pb220	0.005		mg/L	0.005				0.00545	11/12/03	12:10
237580	Pd3404	0.01	U	mg/L	0.01				0.00517	11/12/03	12:10
237580	S_1820	27.7		mg/L	0.025				27.65908	11/12/03	12:10
237580	Sb2068	0.01	U	mg/L	0.01				0.00376	11/12/03	12:10
237580	Se196	0.015	U	mg/L	0.015				0.01308	11/12/03	12:10
237580	Si2881	27.1		mg/L	0.05				27.09569	11/12/03	12:10
237580	Sn1899	0.011		mg/L	0.01				0.01054	11/12/03	12:10
237580	Sr4215	0.078		mg/L	0.005				0.07765	11/12/03	12:10
237580	Th2837	0.01	U	mg/L	0.01				-0.00404	11/12/03	12:10
237580	Ti3372	0.005	U	mg/L	0.005				0.00114	11/12/03	12:10
237580	Tl1908	0.025	U	mg/L	0.025				-0.00774	11/12/03	12:10
237580	U_3859	0.1	U	mg/L	0.1				0.07550	11/12/03	12:10
237580	V_2924	0.005	U	mg/L	0.005				0.00391	11/12/03	12:10
237580	W_2079	0.015	U	mg/L	0.015				0.00130	11/12/03	12:10
237580	Y_3710	0.005	U	mg/L	0.005				0.00013	11/12/03	12:10
237580	Zn2062	0.045		mg/L	0.005				0.04497	11/12/03	12:10
237580	Zr3496	0.005	U	mg/L	0.005				0.00064	11/12/03	12:10
237580d	K_7664	1.89		mg/L	0.2				1.8865	11/24/03	
237580d	Na3302	117		mg/L	0.2				117.0635	11/24/03	
237581	Ag3280	0.005	U	mg/L	0.005				-0.00060	11/12/03	12:15
237581	Al3082	0.05	U	mg/L	0.05				0.03098	11/12/03	12:15
237581	As1890	0.007		mg/L	0.005				0.00684	11/12/03	12:15
237581	B_2496	0.232		mg/L	0.025				0.23215	11/12/03	12:15
237581	Ba4934	0.005	U	mg/L	0.005				0.00350	11/12/03	12:15
237581	Be3130	0.005	U	mg/L	0.005				-0.00002	11/12/03	12:15
237581	Bi2230	0.015	U	mg/L	0.015				0.00396	11/12/03	12:15
237581	Ca3179	2.23		mg/L	0.05				2.22925	11/12/03	12:15
237581	Cd2265	0.005	U	mg/L	0.005				0.00005	11/12/03	12:15
237581	Co2286	0.005	U	mg/L	0.005				0.00348	11/12/03	12:15
237581	Cr2677	0.005	U	mg/L	0.005				-0.00101	11/12/03	12:15
237581	Cu3247	0.005	U	mg/L	0.005				0.00086	11/12/03	12:15
237581	Fe2714	0.275		mg/L	0.05				0.27546	11/12/03	12:15
237581	K_7664	2.99		mg/L	0.2				2.9881	11/24/03	
237581	La4086	0.005	U	mg/L	0.005				0.00140	11/12/03	12:15
237581	Li6707	0.249		mg/L	0.005				0.24912	11/12/03	12:15
237581	Mg2790	0.103		mg/L	0.05				0.10256	11/12/03	12:15
237581	Mn2576	0.040		mg/L	0.005				0.04014	11/12/03	12:15
237581	Mo2020	0.039		mg/L	0.01				0.03947	11/12/03	12:15
237581	Na3302	173		mg/L	0.2				172.5599	11/24/03	
237581	Ni2316	0.005	U	mg/L	0.005				-0.00007	11/12/03	12:15
237581	P_1782	0.04	U	mg/L	0.04				0.02545	11/12/03	12:15
237581	Pb220	0.005	U	mg/L	0.005				0.00000	11/12/03	12:15

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237581	Pd3404	0.01	U	mg/L	0.01				0.00002	11/12/03	12:15
237581	S_1820	9.97		mg/L	0.025				9.96728	11/12/03	12:15
237581	Sb2068	0.01	U	mg/L	0.01				-0.00130	11/12/03	12:15
237581	Se196	0.015	U	mg/L	0.015				0.00785	11/12/03	12:15
237581	Si2881	7.10		mg/L	0.05				7.09798	11/12/03	12:15
237581	Sn1899	0.010		mg/L	0.01				0.01041	11/12/03	12:15
237581	Sr4215	0.006		mg/L	0.005				0.00643	11/12/03	12:15
237581	Th2837	0.01	U	mg/L	0.01				-0.00192	11/12/03	12:15
237581	Ti3372	0.005	U	mg/L	0.005				-0.00029	11/12/03	12:15
237581	Tl1908	0.025	U	mg/L	0.025				-0.02088	11/12/03	12:15
237581	U_3859	0.1	U	mg/L	0.1				0.04897	11/12/03	12:15
237581	V_2924	0.005	U	mg/L	0.005				0.00011	11/12/03	12:15
237581	W_2079	0.015	U	mg/L	0.015				-0.00309	11/12/03	12:15
237581	Y_3710	0.005	U	mg/L	0.005				0.00006	11/12/03	12:15
237581	Zn2062	0.005	U	mg/L	0.005				0.00229	11/12/03	12:15
237581	Zr3496	0.005	U	mg/L	0.005				0.00092	11/12/03	12:15
237581s	K_7664	23.0		mg/L	0.2	20	100.1%		23.0114	11/24/03	
237581s	Na3302	189		mg/L	0.2	20	82.3%		189.4536	11/24/03	
237582	Ag3280	0.005	U	mg/L	0.005				-0.00001	11/12/03	12:20
237582	Al3082	0.05	U	mg/L	0.05				0.02816	11/12/03	12:20
237582	As1890	0.008		mg/L	0.005				0.00770	11/12/03	12:20
237582	B_2496	0.233		mg/L	0.025				0.23320	11/12/03	12:20
237582	Ba4934	0.005	U	mg/L	0.005				0.00312	11/12/03	12:20
237582	Be3130	0.005	U	mg/L	0.005				-0.00001	11/12/03	12:20
237582	Bi2230	0.015	U	mg/L	0.015				0.00610	11/12/03	12:20
237582	Ca3179	2.24		mg/L	0.05				2.24230	11/12/03	12:20
237582	Cd2265	0.005	U	mg/L	0.005				0.00023	11/12/03	12:20
237582	Co2286	0.005	U	mg/L	0.005				0.00370	11/12/03	12:20
237582	Cr2677	0.005	U	mg/L	0.005				-0.00123	11/12/03	12:20
237582	Cu3247	0.005	U	mg/L	0.005				-0.00065	11/12/03	12:20
237582	Fe2714	0.202		mg/L	0.05				0.20248	11/12/03	12:20
237582	K_7664	3.08		mg/L	0.2				3.0764	11/24/03	
237582	La4086	0.005	U	mg/L	0.005				0.00219	11/12/03	12:20
237582	Li6707	0.247		mg/L	0.005				0.24661	11/12/03	12:20
237582	Mg2790	0.106		mg/L	0.05				0.10601	11/12/03	12:20
237582	Mn2576	0.039		mg/L	0.005				0.03876	11/12/03	12:20
237582	Mo2020	0.038		mg/L	0.01				0.03837	11/12/03	12:20
237582	Na3302	173		mg/L	0.2				172.8243	11/24/03	
237582	Ni2316	0.005	U	mg/L	0.005				-0.00012	11/12/03	12:20
237582	P_1782	0.04	U	mg/L	0.04				0.03902	11/12/03	12:20
237582	Pb220	0.005	U	mg/L	0.005				-0.00150	11/12/03	12:20
237582	Pd3404	0.01	U	mg/L	0.01				0.00464	11/12/03	12:20
237582	S_1820	9.89		mg/L	0.025				9.88691	11/12/03	12:20
237582	Sb2068	0.01	U	mg/L	0.01				-0.00021	11/12/03	12:20
237582	Se196	0.015	U	mg/L	0.015				0.00788	11/12/03	12:20
237582	Si2881	7.13		mg/L	0.05				7.13240	11/12/03	12:20
237582	Sn1899	0.025		mg/L	0.01				0.02542	11/12/03	12:20
237582	Sr4215	0.006		mg/L	0.005				0.00641	11/12/03	12:20
237582	Th2837	0.01	U	mg/L	0.01				-0.00171	11/12/03	12:20
237582	Ti3372	0.005	U	mg/L	0.005				0.00021	11/12/03	12:20
237582	Tl1908	0.025	U	mg/L	0.025				-0.02226	11/12/03	12:20
237582	U_3859	0.1	U	mg/L	0.1				0.06348	11/12/03	12:20
237582	V_2924	0.005	U	mg/L	0.005				0.00000	11/12/03	12:20
237582	W_2079	0.015	U	mg/L	0.015				-0.00088	11/12/03	12:20

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237582	Y_3710	0.005	U	mg/L	0.005				0.00005	11/12/03	12:20
237582	Zn2062	0.005	U	mg/L	0.005				0.00118	11/12/03	12:20
237582	Zr3496	0.005	U	mg/L	0.005				0.00074	11/12/03	12:20
237583	Ag3280	0.005	U	mg/L	0.005				0.00005	11/12/03	12:25
237583	Al3082	0.096		mg/L	0.05				0.09599	11/12/03	12:25
237583	As1890	0.007		mg/L	0.005				0.00715	11/12/03	12:25
237583	B_2496	0.234		mg/L	0.025				0.23412	11/12/03	12:25
237583	Ba4934	0.005	U	mg/L	0.005				0.00423	11/12/03	12:25
237583	Be3130	0.005	U	mg/L	0.005				-0.00001	11/12/03	12:25
237583	Bi2230	0.015	U	mg/L	0.015				0.00111	11/12/03	12:25
237583	Ca3179	2.18		mg/L	0.05				2.17952	11/12/03	12:25
237583	Cd2265	0.005	U	mg/L	0.005				-0.00004	11/12/03	12:25
237583	Co2286	0.005	U	mg/L	0.005				0.00363	11/12/03	12:25
237583	Cr2677	0.005	U	mg/L	0.005				-0.00174	11/12/03	12:25
237583	Cu3247	0.005	U	mg/L	0.005				0.00005	11/12/03	12:25
237583	Fe2714	1.33		mg/L	0.05				1.32630	11/12/03	12:25
237583	K_7664	2.93		mg/L	0.2				2.9317	11/24/03	
237583	La4086	0.005	U	mg/L	0.005				0.00198	11/12/03	12:25
237583	Li6707	0.256		mg/L	0.005				0.25611	11/12/03	12:25
237583	Mg2790	0.111		mg/L	0.05				0.11050	11/12/03	12:25
237583	Mn2576	0.049		mg/L	0.005				0.04894	11/12/03	12:25
237583	Mo2020	0.035		mg/L	0.01				0.03477	11/12/03	12:25
237583	Na3302	173		mg/L	0.2				173.4907	11/24/03	
237583	Ni2316	0.005	U	mg/L	0.005				-0.00058	11/12/03	12:25
237583	P_1782	0.046		mg/L	0.04				0.04621	11/12/03	12:25
237583	Pb220	0.005	U	mg/L	0.005				-0.00124	11/12/03	12:25
237583	Pd3404	0.01	U	mg/L	0.01				0.00293	11/12/03	12:25
237583	S_1820	9.85		mg/L	0.025				9.85413	11/12/03	12:25
237583	Sb2068	0.01	U	mg/L	0.01				0.00353	11/12/03	12:25
237583	Se196	0.015	U	mg/L	0.015				0.01123	11/12/03	12:25
237583	Si2881	7.80		mg/L	0.05				7.80068	11/12/03	12:25
237583	Sn1899	0.024		mg/L	0.01				0.02423	11/12/03	12:25
237583	Sr4215	0.007		mg/L	0.005				0.00653	11/12/03	12:25
237583	Th2837	0.01	U	mg/L	0.01				-0.00086	11/12/03	12:25
237583	Ti3372	0.005	U	mg/L	0.005				0.00095	11/12/03	12:25
237583	Tl1908	0.025	U	mg/L	0.025				-0.02756	11/12/03	12:25
237583	U_3859	0.1	U	mg/L	0.1				0.02347	11/12/03	12:25
237583	V_2924	0.005	U	mg/L	0.005				0.00003	11/12/03	12:25
237583	W_2079	0.015	U	mg/L	0.015				-0.00304	11/12/03	12:25
237583	Y_3710	0.005	U	mg/L	0.005				-0.00005	11/12/03	12:25
237583	Zn2062	0.014		mg/L	0.005				0.01397	11/12/03	12:25
237583	Zr3496	0.005	U	mg/L	0.005				0.00010	11/12/03	12:25
237584	Ag3280	0.005	U	mg/L	0.005				0.00040	11/12/03	12:46
237584	Al3082	0.167		mg/L	0.05				0.16689	11/12/03	12:46
237584	As1890	0.035		mg/L	0.005				0.03486	11/12/03	12:46
237584	B_2496	0.179		mg/L	0.025				0.17861	11/12/03	12:46
237584	Ba4934	0.005	U	mg/L	0.005				0.00264	11/12/03	12:46
237584	Be3130	0.005	U	mg/L	0.005				-0.00016	11/12/03	12:46
237584	Bi2230	0.015	U	mg/L	0.015				0.00826	11/12/03	12:46
237584	Ca3179	0.543		mg/L	0.05				0.54330	11/12/03	12:46
237584	Cd2265	0.005	U	mg/L	0.005				0.00013	11/12/03	12:46
237584	Co2286	0.005	U	mg/L	0.005				0.00395	11/12/03	12:46
237584	Cr2677	0.005	U	mg/L	0.005				-0.00070	11/12/03	12:46
237584	Cu3247	0.005	U	mg/L	0.005				0.00018	11/12/03	12:46

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237584	Fe2714	0.074		mg/L	0.05				0.07445	11/12/03	12:46
237584	K_7664	3.04		mg/L	0.2				3.0363	11/24/03	
237584	La4086	0.005	U	mg/L	0.005				0.00259	11/12/03	12:46
237584	Li6707	0.125		mg/L	0.005				0.12491	11/12/03	12:46
237584	Mg2790	0.071		mg/L	0.05				0.07063	11/12/03	12:46
237584	Mn2576	0.015		mg/L	0.005				0.01529	11/12/03	12:46
237584	Mo2020	0.01	U	mg/L	0.01				0.00422	11/12/03	12:46
237584	Na3302	94.7		mg/L	0.2				94.7452	11/24/03	
237584	Ni2316	0.005	U	mg/L	0.005				0.00015	11/12/03	12:46
237584	P_1782	0.04	U	mg/L	0.04				0.02897	11/12/03	12:46
237584	Pb220	0.005	U	mg/L	0.005				-0.00260	11/12/03	12:46
237584	Pd3404	0.01	U	mg/L	0.01				0.00373	11/12/03	12:46
237584	S_1820	5.56		mg/L	0.025				5.56027	11/12/03	12:46
237584	Sb2068	0.01	U	mg/L	0.01				0.00289	11/12/03	12:46
237584	Se196	0.015	U	mg/L	0.015				0.00640	11/12/03	12:46
237584	Si2881	27.9		mg/L	0.05				27.90196	11/12/03	12:46
237584	Sn1899	0.01	U	mg/L	0.01				0.00219	11/12/03	12:46
237584	Sr4215	0.005	U	mg/L	0.005				0.00192	11/12/03	12:46
237584	Th2837	0.01	U	mg/L	0.01				-0.00133	11/12/03	12:46
237584	Ti3372	0.005	U	mg/L	0.005				0.00116	11/12/03	12:46
237584	Tl1908	0.025	U	mg/L	0.025				0.01142	11/12/03	12:46
237584	U_3859	0.1	U	mg/L	0.1				0.07460	11/12/03	12:46
237584	V_2924	0.005		mg/L	0.005				0.00506	11/12/03	12:46
237584	W_2079	0.015	U	mg/L	0.015				0.00119	11/12/03	12:46
237584	Y_3710	0.005	U	mg/L	0.005				0.00013	11/12/03	12:46
237584	Zn2062	0.005	U	mg/L	0.005				0.00344	11/12/03	12:46
237584	Zr3496	0.005	U	mg/L	0.005				0.00123	11/12/03	12:46
237585	Ag3280	0.005	U	mg/L	0.005				0.00045	11/12/03	12:51
237585	Al3082	0.132		mg/L	0.05				0.13187	11/12/03	12:51
237585	As1890	0.034		mg/L	0.005				0.03385	11/12/03	12:51
237585	B_2496	0.162		mg/L	0.025				0.16160	11/12/03	12:51
237585	Ba4934	0.005	U	mg/L	0.005				0.00044	11/12/03	12:51
237585	Be3130	0.005	U	mg/L	0.005				-0.00018	11/12/03	12:51
237585	Bi2230	0.015	U	mg/L	0.015				0.00592	11/12/03	12:51
237585	Ca3179	0.538		mg/L	0.05				0.53801	11/12/03	12:51
237585	Cd2265	0.005	U	mg/L	0.005				0.00026	11/12/03	12:51
237585	Co2286	0.005	U	mg/L	0.005				0.00433	11/12/03	12:51
237585	Cr2677	0.005	U	mg/L	0.005				-0.00125	11/12/03	12:51
237585	Cu3247	0.005	U	mg/L	0.005				-0.00095	11/12/03	12:51
237585	Fe2714	0.05	U	mg/L	0.05				0.04260	11/12/03	12:51
237585	K_7664	2.92		mg/L	0.2				2.9233	11/24/03	
237585	La4086	0.005	U	mg/L	0.005				0.00239	11/12/03	12:51
237585	Li6707	0.125		mg/L	0.005				0.12451	11/12/03	12:51
237585	Mg2790	0.068		mg/L	0.05				0.06789	11/12/03	12:51
237585	Mn2576	0.014		mg/L	0.005				0.01392	11/12/03	12:51
237585	Mo2020	0.01	U	mg/L	0.01				0.00292	11/12/03	12:51
237585	Na3302	94.4		mg/L	0.2				94.418	11/24/03	
237585	Ni2316	0.005	U	mg/L	0.005				-0.00037	11/12/03	12:51
237585	P_1782	0.040		mg/L	0.04				0.04036	11/12/03	12:51
237585	Pb220	0.005	U	mg/L	0.005				-0.00285	11/12/03	12:51
237585	Pd3404	0.01	U	mg/L	0.01				0.00433	11/12/03	12:51
237585	S_1820	5.48		mg/L	0.025				5.48117	11/12/03	12:51
237585	Sb2068	0.01	U	mg/L	0.01				0.00226	11/12/03	12:51
237585	Se196	0.015	U	mg/L	0.015				0.00556	11/12/03	12:51

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237585	Si2881	28.2		mg/L	0.05				28.16215	11/12/03	12:51
237585	Sn1899	0.01	U	mg/L	0.01				0.00780	11/12/03	12:51
237585	Sr4215	0.005	U	mg/L	0.005				0.00182	11/12/03	12:51
237585	Th2837	0.01	U	mg/L	0.01				-0.00327	11/12/03	12:51
237585	Ti3372	0.005	U	mg/L	0.005				0.00130	11/12/03	12:51
237585	Tl1908	0.025	U	mg/L	0.025				0.00850	11/12/03	12:51
237585	U_3859	0.1	U	mg/L	0.1				0.09038	11/12/03	12:51
237585	V_2924	0.005	U	mg/L	0.005				0.00410	11/12/03	12:51
237585	W_2079	0.015	U	mg/L	0.015				0.00274	11/12/03	12:51
237585	Y_3710	0.005	U	mg/L	0.005				-0.00007	11/12/03	12:51
237585	Zn2062	0.005	U	mg/L	0.005				0.00220	11/12/03	12:51
237585	Zr3496	0.005	U	mg/L	0.005				0.00040	11/12/03	12:51
237586	Ag3280	0.005	U	mg/L	0.005				0.00014	11/12/03	12:56
237586	Al3082	0.204		mg/L	0.05				0.20392	11/12/03	12:56
237586	As1890	0.033		mg/L	0.005				0.03324	11/12/03	12:56
237586	B_2496	0.163		mg/L	0.025				0.16308	11/12/03	12:56
237586	Ba4934	0.005	U	mg/L	0.005				0.00108	11/12/03	12:56
237586	Be3130	0.005	U	mg/L	0.005				-0.00013	11/12/03	12:56
237586	Bi2230	0.015	U	mg/L	0.015				0.00608	11/12/03	12:56
237586	Ca3179	0.761		mg/L	0.05				0.76082	11/12/03	12:56
237586	Cd2265	0.005	U	mg/L	0.005				-0.00003	11/12/03	12:56
237586	Co2286	0.005	U	mg/L	0.005				0.00328	11/12/03	12:56
237586	Cr2677	0.005	U	mg/L	0.005				-0.00093	11/12/03	12:56
237586	Cu3247	0.005	U	mg/L	0.005				-0.00027	11/12/03	12:56
237586	Fe2714	0.195		mg/L	0.05				0.19455	11/12/03	12:56
237586	K_7664	3.04		mg/L	0.2				3.0399	11/24/03	
237586	La4086	0.005	U	mg/L	0.005				0.00217	11/12/03	12:56
237586	Li6707	0.128		mg/L	0.005				0.12799	11/12/03	12:56
237586	Mg2790	0.094		mg/L	0.05				0.09406	11/12/03	12:56
237586	Mn2576	0.025		mg/L	0.005				0.02485	11/12/03	12:56
237586	Mo2020	0.01	U	mg/L	0.01				0.00261	11/12/03	12:56
237586	Na3302	94.8		mg/L	0.2				94.7542	11/24/03	
237586	Ni2316	0.005	U	mg/L	0.005				0.00009	11/12/03	12:56
237586	P_1782	0.045		mg/L	0.04				0.04487	11/12/03	12:56
237586	Pb220	0.005	U	mg/L	0.005				-0.00102	11/12/03	12:56
237586	Pd3404	0.01	U	mg/L	0.01				0.00333	11/12/03	12:56
237586	S_1820	5.63		mg/L	0.025				5.63160	11/12/03	12:56
237586	Sb2068	0.01	U	mg/L	0.01				-0.00049	11/12/03	12:56
237586	Se196	0.015	U	mg/L	0.015				0.00396	11/12/03	12:56
237586	Si2881	28.7		mg/L	0.05				28.74402	11/12/03	12:56
237586	Sn1899	0.01	U	mg/L	0.01				0.00617	11/12/03	12:56
237586	Sr4215	0.005	U	mg/L	0.005				0.00294	11/12/03	12:56
237586	Th2837	0.01	U	mg/L	0.01				-0.00192	11/12/03	12:56
237586	Ti3372	0.005	U	mg/L	0.005				0.00131	11/12/03	12:56
237586	Tl1908	0.025	U	mg/L	0.025				0.01264	11/12/03	12:56
237586	U_3859	0.1	U	mg/L	0.1				0.07838	11/12/03	12:56
237586	V_2924	0.005	U	mg/L	0.005				0.00491	11/12/03	12:56
237586	W_2079	0.015	U	mg/L	0.015				0.00053	11/12/03	12:56
237586	Y_3710	0.005	U	mg/L	0.005				0.00011	11/12/03	12:56
237586	Zn2062	0.019		mg/L	0.005				0.01937	11/12/03	12:56
237586	Zr3496	0.005	U	mg/L	0.005				0.00112	11/12/03	12:56
237587	Ag3280	0.005	U	mg/L	0.005				-0.00031	11/12/03	13:00
237587	Al3082	0.158		mg/L	0.05				0.15800	11/12/03	13:00
237587	As1890	0.037		mg/L	0.005				0.03730	11/12/03	13:00

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237587	B_2496	0.157		mg/L	0.025				0.15683	11/12/03	13:00
237587	Ba4934	0.005	U	mg/L	0.005				0.00025	11/12/03	13:00
237587	Be3130	0.005	U	mg/L	0.005				-0.00017	11/12/03	13:00
237587	Bi2230	0.015	U	mg/L	0.015				0.00726	11/12/03	13:00
237587	Ca3179	0.360		mg/L	0.05				0.35965	11/12/03	13:00
237587	Cd2265	0.005	U	mg/L	0.005				0.00000	11/12/03	13:00
237587	Co2286	0.005	U	mg/L	0.005				0.00387	11/12/03	13:00
237587	Cr2677	0.005	U	mg/L	0.005				-0.00129	11/12/03	13:00
237587	Cu3247	0.005	U	mg/L	0.005				-0.00073	11/12/03	13:00
237587	Fe2714	0.074		mg/L	0.05				0.07428	11/12/03	13:00
237587	K_7664	2.96		mg/L	0.2				2.9562	11/24/03	
237587	La4086	0.005	U	mg/L	0.005				0.00145	11/12/03	13:00
237587	Li6707	0.126		mg/L	0.005				0.12569	11/12/03	13:00
237587	Mg2790	0.05	U	mg/L	0.05				0.04042	11/12/03	13:00
237587	Mn2576	0.005	U	mg/L	0.005				0.00383	11/12/03	13:00
237587	Mo2020	0.01	U	mg/L	0.01				0.00303	11/12/03	13:00
237587	Na3302	95.6		mg/L	0.2				95.6233	11/24/03	
237587	Ni2316	0.005	U	mg/L	0.005				-0.00029	11/12/03	13:00
237587	P_1782	0.040		mg/L	0.04				0.04010	11/12/03	13:00
237587	Pb220	0.005	U	mg/L	0.005				-0.00119	11/12/03	13:00
237587	Pd3404	0.01	U	mg/L	0.01				0.00419	11/12/03	13:00
237587	S_1820	5.69		mg/L	0.025				5.69496	11/12/03	13:00
237587	Sb2068	0.01	U	mg/L	0.01				-0.00043	11/12/03	13:00
237587	Se196	0.015	U	mg/L	0.015				0.00007	11/12/03	13:00
237587	Si2881	28.5		mg/L	0.05				28.50282	11/12/03	13:00
237587	Sn1899	0.01	U	mg/L	0.01				0.00083	11/12/03	13:00
237587	Sr4215	0.005	U	mg/L	0.005				0.00085	11/12/03	13:00
237587	Th2837	0.01	U	mg/L	0.01				-0.00099	11/12/03	13:00
237587	Ti3372	0.005	U	mg/L	0.005				0.00110	11/12/03	13:00
237587	Tl1908	0.025	U	mg/L	0.025				0.00640	11/12/03	13:00
237587	U_3859	0.1	U	mg/L	0.1				0.07039	11/12/03	13:00
237587	V_2924	0.005	U	mg/L	0.005				0.00486	11/12/03	13:00
237587	W_2079	0.015	U	mg/L	0.015				0.00234	11/12/03	13:00
237587	Y_3710	0.005	U	mg/L	0.005				-0.00002	11/12/03	13:00
237587	Zn2062	0.005	U	mg/L	0.005				0.00339	11/12/03	13:00
237587	Zr3496	0.005	U	mg/L	0.005				0.00138	11/12/03	13:00
237588	Ag3280	0.005	U	mg/L	0.005				0.00001	11/12/03	13:05
237588	Al3082	0.120		mg/L	0.05				0.12017	11/12/03	13:05
237588	As1890	0.035		mg/L	0.005				0.03467	11/12/03	13:05
237588	B_2496	0.157		mg/L	0.025				0.15656	11/12/03	13:05
237588	Ba4934	0.005	U	mg/L	0.005				0.00029	11/12/03	13:05
237588	Be3130	0.005	U	mg/L	0.005				-0.00004	11/12/03	13:05
237588	Bi2230	0.015	U	mg/L	0.015				0.00851	11/12/03	13:05
237588	Ca3179	0.359		mg/L	0.05				0.35877	11/12/03	13:05
237588	Cd2265	0.005	U	mg/L	0.005				0.00012	11/12/03	13:05
237588	Co2286	0.005	U	mg/L	0.005				0.00382	11/12/03	13:05
237588	Cr2677	0.005	U	mg/L	0.005				-0.00112	11/12/03	13:05
237588	Cu3247	0.005	U	mg/L	0.005				-0.00096	11/12/03	13:05
237588	Fe2714	0.05	U	mg/L	0.05				0.04585	11/12/03	13:05
237588	K_7664	3.09		mg/L	0.2				3.0895	11/24/03	
237588	La4086	0.005	U	mg/L	0.005				0.00193	11/12/03	13:05
237588	Li6707	0.127		mg/L	0.005				0.12680	11/12/03	13:05
237588	Mg2790	0.05	U	mg/L	0.05				0.03637	11/12/03	13:05
237588	Mn2576	0.005	U	mg/L	0.005				0.00406	11/12/03	13:05

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237588	Mo2020	0.01	U	mg/L	0.01				0.00272	11/12/03	13:05
237588	Na3302	97.1		mg/L	0.2				97.0979	11/24/03	
237588	Ni2316	0.005	U	mg/L	0.005				-0.00051	11/12/03	13:05
237588	P_1782	0.04	U	mg/L	0.04				0.03274	11/12/03	13:05
237588	Pb220	0.005	U	mg/L	0.005				-0.00244	11/12/03	13:05
237588	Pd3404	0.01	U	mg/L	0.01				0.00332	11/12/03	13:05
237588	S_1820	5.81		mg/L	0.025				5.80537	11/12/03	13:05
237588	Sb2068	0.01	U	mg/L	0.01				0.00023	11/12/03	13:05
237588	Se196	0.015	U	mg/L	0.015				0.00136	11/12/03	13:05
237588	Si2881	28.5		mg/L	0.05				28.50225	11/12/03	13:05
237588	Sn1899	0.01	U	mg/L	0.01				0.00611	11/12/03	13:05
237588	Sr4215	0.005	U	mg/L	0.005				0.00087	11/12/03	13:05
237588	Th2837	0.01	U	mg/L	0.01				-0.00190	11/12/03	13:05
237588	Ti3372	0.005	U	mg/L	0.005				0.00090	11/12/03	13:05
237588	Tl1908	0.025	U	mg/L	0.025				0.01041	11/12/03	13:05
237588	U_3859	0.1	U	mg/L	0.1				0.07138	11/12/03	13:05
237588	V_2924	0.005		mg/L	0.005				0.00528	11/12/03	13:05
237588	W_2079	0.015	U	mg/L	0.015				0.00175	11/12/03	13:05
237588	Y_3710	0.005	U	mg/L	0.005				0.00001	11/12/03	13:05
237588	Zn2062	0.005	U	mg/L	0.005				0.00262	11/12/03	13:05
237588	Zr3496	0.005	U	mg/L	0.005				0.00204	11/12/03	13:05
237589	Ag3280	0.005	U	mg/L	0.005				0.00029	11/12/03	13:10
237589	Al3082	0.174		mg/L	0.05				0.17385	11/12/03	13:10
237589	As1890	0.032		mg/L	0.005				0.03159	11/12/03	13:10
237589	B_2496	0.157		mg/L	0.025				0.15731	11/12/03	13:10
237589	Ba4934	0.005	U	mg/L	0.005				0.00049	11/12/03	13:10
237589	Be3130	0.005	U	mg/L	0.005				-0.00008	11/12/03	13:10
237589	Bi2230	0.015	U	mg/L	0.015				0.00836	11/12/03	13:10
237589	Ca3179	0.409		mg/L	0.05				0.40912	11/12/03	13:10
237589	Cd2265	0.005	U	mg/L	0.005				0.00004	11/12/03	13:10
237589	Co2286	0.005	U	mg/L	0.005				0.00418	11/12/03	13:10
237589	Cr2677	0.005	U	mg/L	0.005				-0.00053	11/12/03	13:10
237589	Cu3247	0.005	U	mg/L	0.005				-0.00038	11/12/03	13:10
237589	Fe2714	0.190		mg/L	0.05				0.18990	11/12/03	13:10
237589	K_7664	3.11		mg/L	0.2				3.1053	11/24/03	
237589	La4086	0.005	U	mg/L	0.005				0.00193	11/12/03	13:10
237589	Li6707	0.127		mg/L	0.005				0.12693	11/12/03	13:10
237589	Mg2790	0.05	U	mg/L	0.05				0.04487	11/12/03	13:10
237589	Mn2576	0.034		mg/L	0.005				0.03400	11/12/03	13:10
237589	Mo2020	0.01	U	mg/L	0.01				0.00247	11/12/03	13:10
237589	Na3302	97.3		mg/L	0.2				97.3213	11/24/03	
237589	Ni2316	0.005	U	mg/L	0.005				0.00003	11/12/03	13:10
237589	P_1782	0.04	U	mg/L	0.04				0.02992	11/12/03	13:10
237589	Pb220	0.005	U	mg/L	0.005				-0.00105	11/12/03	13:10
237589	Pd3404	0.01	U	mg/L	0.01				0.00234	11/12/03	13:10
237589	S_1820	5.69		mg/L	0.025				5.68979	11/12/03	13:10
237589	Sb2068	0.01	U	mg/L	0.01				0.00081	11/12/03	13:10
237589	Se196	0.015	U	mg/L	0.015				0.00498	11/12/03	13:10
237589	Si2881	28.7		mg/L	0.05				28.72847	11/12/03	13:10
237589	Sn1899	0.01	U	mg/L	0.01				0.00963	11/12/03	13:10
237589	Sr4215	0.005	U	mg/L	0.005				0.00107	11/12/03	13:10
237589	Th2837	0.01	U	mg/L	0.01				-0.00255	11/12/03	13:10
237589	Ti3372	0.005	U	mg/L	0.005				0.00105	11/12/03	13:10
237589	Tl1908	0.025	U	mg/L	0.025				-0.01542	11/12/03	13:10

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237589	U_3859	0.1	U	mg/L	0.1				0.08163	11/12/03	13:10
237589	V_2924	0.005		mg/L	0.005				0.00545	11/12/03	13:10
237589	W_2079	0.015	U	mg/L	0.015				-0.00159	11/12/03	13:10
237589	Y_3710	0.005	U	mg/L	0.005				0.00011	11/12/03	13:10
237589	Zn2062	0.006		mg/L	0.005				0.00616	11/12/03	13:10
237589	Zr3496	0.005	U	mg/L	0.005				0.00137	11/12/03	13:10
237590	Ag3280	0.005	U	mg/L	0.005				0.00012	11/12/03	13:15
237590	Al3082	0.05	U	mg/L	0.05				0.04353	11/12/03	13:15
237590	As1890	0.005	U	mg/L	0.005				0.00035	11/12/03	13:15
237590	B_2496	0.259		mg/L	0.025				0.25874	11/12/03	13:15
237590	Ba4934	0.056		mg/L	0.005				0.05606	11/12/03	13:15
237590	Be3130	0.005	U	mg/L	0.005				-0.00035	11/12/03	13:15
237590	Bi2230	0.015	U	mg/L	0.015				0.00460	11/12/03	13:15
237590	Ca3179	28.1		mg/L	0.05				28.14830	11/12/03	13:15
237590	Cd2265	0.005	U	mg/L	0.005				0.00018	11/12/03	13:15
237590	Co2286	0.005	U	mg/L	0.005				0.00462	11/12/03	13:15
237590	Cr2677	0.005	U	mg/L	0.005				-0.00132	11/12/03	13:15
237590	Cu3247	0.005	U	mg/L	0.005				-0.00044	11/12/03	13:15
237590	Fe2714	0.05	U	mg/L	0.05				0.02468	11/12/03	13:15
237590	K_7664	8.08		mg/L	0.2				8.079	11/24/03	
237590	La4086	0.005	U	mg/L	0.005				0.00227	11/12/03	13:15
237590	Li6707	0.105		mg/L	0.005				0.10455	11/12/03	13:15
237590	Mg2790	28.9		mg/L	0.05				28.89275	11/12/03	13:15
237590	Mn2576	0.075		mg/L	0.005				0.07487	11/12/03	13:15
237590	Mo2020	0.01	U	mg/L	0.01				0.00552	11/12/03	13:15
237590	Na3302	82.2		mg/L	0.2				82.1895	11/24/03	
237590	Ni2316	0.005	U	mg/L	0.005				0.00118	11/12/03	13:15
237590	P_1782	0.04	U	mg/L	0.04				0.02175	11/12/03	13:15
237590	Pb220	0.005	U	mg/L	0.005				-0.00189	11/12/03	13:15
237590	Pd3404	0.01	U	mg/L	0.01				0.00464	11/12/03	13:15
237590	S_1820	45.0		mg/L	0.025				45.01411	11/12/03	13:15
237590	Sb2068	0.01	U	mg/L	0.01				0.00131	11/12/03	13:15
237590	Se196	0.015	U	mg/L	0.015				0.00631	11/12/03	13:15
237590	Si2881	13.7		mg/L	0.05				13.68723	11/12/03	13:15
237590	Sn1899	0.01	U	mg/L	0.01				0.00742	11/12/03	13:15
237590	Sr4215	0.413		mg/L	0.005				0.41273	11/12/03	13:15
237590	Th2837	0.01	U	mg/L	0.01				-0.00739	11/12/03	13:15
237590	Ti3372	0.005	U	mg/L	0.005				0.00064	11/12/03	13:15
237590	Tl1908	0.025	U	mg/L	0.025				0.00545	11/12/03	13:15
237590	U_3859	0.1	U	mg/L	0.1				0.05746	11/12/03	13:15
237590	V_2924	0.005	U	mg/L	0.005				-0.00103	11/12/03	13:15
237590	W_2079	0.015	U	mg/L	0.015				0.00481	11/12/03	13:15
237590	Y_3710	0.005	U	mg/L	0.005				0.00003	11/12/03	13:15
237590	Zn2062	0.005	U	mg/L	0.005				0.00189	11/12/03	13:15
237590	Zr3496	0.005	U	mg/L	0.005				0.00188	11/12/03	13:15
237591	Ag3280	0.005	U	mg/L	0.005				0.00202	11/12/03	13:20
237591	Al3082	0.05	U	mg/L	0.05				0.04931	11/12/03	13:20
237591	As1890	0.005		mg/L	0.005				0.00506	11/12/03	13:20
237591	B_2496	0.260		mg/L	0.025				0.26003	11/12/03	13:20
237591	Ba4934	0.056		mg/L	0.005				0.05610	11/12/03	13:20
237591	Be3130	0.005	U	mg/L	0.005				-0.00024	11/12/03	13:20
237591	Bi2230	0.015	U	mg/L	0.015				0.01187	11/12/03	13:20
237591	Ca3179	28.3		mg/L	0.05				28.28334	11/12/03	13:20
237591	Cd2265	0.005	U	mg/L	0.005				0.00059	11/12/03	13:20

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237591	Co2286	0.005		mg/L	0.005				0.00509	11/12/03	13:20
237591	Cr2677	0.005	U	mg/L	0.005				-0.00203	11/12/03	13:20
237591	Cu3247	0.005	U	mg/L	0.005				0.00192	11/12/03	13:20
237591	Fe2714	0.05	U	mg/L	0.05				0.01057	11/12/03	13:20
237591	K_7664	8.16		mg/L	0.2				8.1617	11/24/03	
237591	La4086	0.005	U	mg/L	0.005				0.00375	11/12/03	13:20
237591	Li6707	0.104		mg/L	0.005				0.10407	11/12/03	13:20
237591	Mg2790	28.9		mg/L	0.05				28.90833	11/12/03	13:20
237591	Mn2576	0.071		mg/L	0.005				0.07132	11/12/03	13:20
237591	Mo2020	0.01	U	mg/L	0.01				0.00484	11/12/03	13:20
237591	Na3302	82.0		mg/L	0.2				82.0032	11/24/03	
237591	Ni2316	0.005	U	mg/L	0.005				-0.00047	11/12/03	13:20
237591	P_1782	0.042		mg/L	0.04				0.04198	11/12/03	13:20
237591	Pb220	0.005	U	mg/L	0.005				-0.00234	11/12/03	13:20
237591	Pd3404	0.01	U	mg/L	0.01				0.00656	11/12/03	13:20
237591	S_1820	43.7		mg/L	0.025				43.74258	11/12/03	13:20
237591	Sb2068	0.01	U	mg/L	0.01				0.00859	11/12/03	13:20
237591	Se196	0.015	U	mg/L	0.015				0.00491	11/12/03	13:20
237591	Si2881	13.7		mg/L	0.05				13.65035	11/12/03	13:20
237591	Sn1899	0.016		mg/L	0.01				0.01634	11/12/03	13:20
237591	Sr4215	0.413		mg/L	0.005				0.41301	11/12/03	13:20
237591	Th2837	0.01	U	mg/L	0.01				-0.00822	11/12/03	13:20
237591	Ti3372	0.005	U	mg/L	0.005				0.00147	11/12/03	13:20
237591	Tl1908	0.025	U	mg/L	0.025				0.00383	11/12/03	13:20
237591	U_3859	0.1	U	mg/L	0.1				0.09174	11/12/03	13:20
237591	V_2924	0.005	U	mg/L	0.005				-0.00123	11/12/03	13:20
237591	W_2079	0.015	U	mg/L	0.015				0.01042	11/12/03	13:20
237591	Y_3710	0.005	U	mg/L	0.005				-0.00005	11/12/03	13:20
237591	Zn2062	0.005	U	mg/L	0.005				0.00132	11/12/03	13:20
237591	Zr3496	0.005	U	mg/L	0.005				0.00091	11/12/03	13:20
237592	Ag3280	0.005	U	mg/L	0.005				-0.00164	11/12/03	13:25
237592	Al3082	0.05	U	mg/L	0.05				0.03167	11/12/03	13:25
237592	As1890	0.005	U	mg/L	0.005				0.00053	11/12/03	13:25
237592	B_2496	0.260		mg/L	0.025				0.25969	11/12/03	13:25
237592	Ba4934	0.057		mg/L	0.005				0.05670	11/12/03	13:25
237592	Be3130	0.005	U	mg/L	0.005				-0.00018	11/12/03	13:25
237592	Bi2230	0.015	U	mg/L	0.015				0.00404	11/12/03	13:25
237592	Ca3179	28.2		mg/L	0.05				28.23118	11/12/03	13:25
237592	Cd2265	0.005	U	mg/L	0.005				-0.00013	11/12/03	13:25
237592	Co2286	0.005	U	mg/L	0.005				0.00361	11/12/03	13:25
237592	Cr2677	0.005	U	mg/L	0.005				-0.00040	11/12/03	13:25
237592	Cu3247	0.005	U	mg/L	0.005				0.00001	11/12/03	13:25
237592	Fe2714	0.081		mg/L	0.05				0.08110	11/12/03	13:25
237592	K_7664	8.12		mg/L	0.2				8.1205	11/24/03	
237592	La4086	0.005	U	mg/L	0.005				0.00072	11/12/03	13:25
237592	Li6707	0.105		mg/L	0.005				0.10467	11/12/03	13:25
237592	Mg2790	28.9		mg/L	0.05				28.88541	11/12/03	13:25
237592	Mn2576	0.071		mg/L	0.005				0.07123	11/12/03	13:25
237592	Mo2020	0.01	U	mg/L	0.01				0.00626	11/12/03	13:25
237592	Na3302	81.6		mg/L	0.2				81.5987	11/24/03	
237592	Ni2316	0.005	U	mg/L	0.005				0.00073	11/12/03	13:25
237592	P_1782	0.04	U	mg/L	0.04				0.03380	11/12/03	13:25
237592	Pb220	0.005	U	mg/L	0.005				-0.00061	11/12/03	13:25
237592	Pd3404	0.01	U	mg/L	0.01				0.00278	11/12/03	13:25

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237592	S_1820	44.3		mg/L	0.025				44.27149	11/12/03	13:25
237592	Sb2068	0.01	U	mg/L	0.01				-0.00229	11/12/03	13:25
237592	Se196	0.015	U	mg/L	0.015				0.00239	11/12/03	13:25
237592	Si2881	13.7		mg/L	0.05				13.73487	11/12/03	13:25
237592	Sn1899	0.01	U	mg/L	0.01				0.00984	11/12/03	13:25
237592	Sr4215	0.416		mg/L	0.005				0.41608	11/12/03	13:25
237592	Th2837	0.01	U	mg/L	0.01				-0.00623	11/12/03	13:25
237592	Ti3372	0.005	U	mg/L	0.005				-0.00045	11/12/03	13:25
237592	Tl1908	0.025	U	mg/L	0.025				-0.01200	11/12/03	13:25
237592	U_3859	0.1	U	mg/L	0.1				0.04218	11/12/03	13:25
237592	V_2924	0.005	U	mg/L	0.005				0.00053	11/12/03	13:25
237592	W_2079	0.015	U	mg/L	0.015				0.00616	11/12/03	13:25
237592	Y_3710	0.005	U	mg/L	0.005				0.00025	11/12/03	13:25
237592	Zn2062	0.016		mg/L	0.005				0.01636	11/12/03	13:25
237592	Zr3496	0.005	U	mg/L	0.005				0.00223	11/12/03	13:25
237593	Ag3280	0.005	U	mg/L	0.005				0.00061	11/12/03	13:30
237593	Al3082	0.05	U	mg/L	0.05				0.04240	11/12/03	13:30
237593	As1890	0.005	U	mg/L	0.005				0.00245	11/12/03	13:30
237593	B_2496	0.025	U	mg/L	0.025				0.00276	11/12/03	13:30
237593	Ba4934	0.005	U	mg/L	0.005				0.00035	11/12/03	13:30
237593	Be3130	0.005	U	mg/L	0.005				-0.00024	11/12/03	13:30
237593	Bi2230	0.015	U	mg/L	0.015				0.00456	11/12/03	13:30
237593	Ca3179	10.1		mg/L	0.05				10.06773	11/12/03	13:30
237593	Cd2265	0.005	U	mg/L	0.005				0.00008	11/12/03	13:30
237593	Co2286	0.005	U	mg/L	0.005				0.00376	11/12/03	13:30
237593	Cr2677	0.005	U	mg/L	0.005				-0.00117	11/12/03	13:30
237593	Cu3247	0.005	U	mg/L	0.005				0.00354	11/12/03	13:30
237593	Fe2714	0.05	U	mg/L	0.05				-0.00052	11/12/03	13:30
237593	K_7664	5.25		mg/L	0.2				5.251	11/24/03	
237593	La4086	0.005	U	mg/L	0.005				0.00243	11/12/03	13:30
237593	Li6707	0.005	U	mg/L	0.005				0.00028	11/12/03	13:30
237593	Mg2790	0.065		mg/L	0.05				0.06452	11/12/03	13:30
237593	Mn2576	0.005	U	mg/L	0.005				0.00007	11/12/03	13:30
237593	Mo2020	0.01	U	mg/L	0.01				-0.00126	11/12/03	13:30
237593	Na3302	27.0		mg/L	0.2				27.0296	11/24/03	
237593	Ni2316	0.005	U	mg/L	0.005				0.00058	11/12/03	13:30
237593	P_1782	0.04	U	mg/L	0.04				0.01365	11/12/03	13:30
237593	Pb220	0.005	U	mg/L	0.005				-0.00062	11/12/03	13:30
237593	Pd3404	0.01	U	mg/L	0.01				0.00295	11/12/03	13:30
237593	S_1820	0.114		mg/L	0.025				0.11411	11/12/03	13:30
237593	Sb2068	0.01	U	mg/L	0.01				0.00315	11/12/03	13:30
237593	Se196	0.015	U	mg/L	0.015				0.00461	11/12/03	13:30
237593	Si2881	19.4		mg/L	0.05				19.37984	11/12/03	13:30
237593	Sn1899	0.01	U	mg/L	0.01				0.00298	11/12/03	13:30
237593	Sr4215	0.005	U	mg/L	0.005				0.00127	11/12/03	13:30
237593	Th2837	0.01	U	mg/L	0.01				-0.00160	11/12/03	13:30
237593	Ti3372	0.005	U	mg/L	0.005				0.00018	11/12/03	13:30
237593	Tl1908	0.025	U	mg/L	0.025				0.00549	11/12/03	13:30
237593	U_3859	0.1	U	mg/L	0.1				0.08671	11/12/03	13:30
237593	V_2924	0.005	U	mg/L	0.005				-0.00008	11/12/03	13:30
237593	W_2079	0.015	U	mg/L	0.015				0.00127	11/12/03	13:30
237593	Y_3710	0.005	U	mg/L	0.005				0.00004	11/12/03	13:30
237593	Zn2062	0.005	U	mg/L	0.005				0.00202	11/12/03	13:30
237593	Zr3496	0.008		mg/L	0.005				0.00762	11/12/03	13:30

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237594	Ag3280	0.005	U	mg/L	0.005				0.00008	11/12/03	13:51
237594	Al3082	0.05	U	mg/L	0.05				0.03466	11/12/03	13:51
237594	As1890	0.005	U	mg/L	0.005				0.00297	11/12/03	13:51
237594	B 2496	0.025	U	mg/L	0.025				0.00672	11/12/03	13:51
237594	Ba4934	0.005	U	mg/L	0.005				0.00033	11/12/03	13:51
237594	Be3130	0.005	U	mg/L	0.005				-0.00026	11/12/03	13:51
237594	Bi2230	0.015	U	mg/L	0.015				0.00643	11/12/03	13:51
237594	Ca3179	9.91		mg/L	0.05				9.91204	11/12/03	13:51
237594	Cd2265	0.005	U	mg/L	0.005				-0.00004	11/12/03	13:51
237594	Co2286	0.005	U	mg/L	0.005				0.00355	11/12/03	13:51
237594	Cr2677	0.005	U	mg/L	0.005				-0.00149	11/12/03	13:51
237594	Cu3247	0.005	U	mg/L	0.005				-0.00047	11/12/03	13:51
237594	Fe2714	0.05	U	mg/L	0.05				-0.01388	11/12/03	13:51
237594	K 7664	5.32		mg/L	0.2				5.3166	11/24/03	
237594	La4086	0.005	U	mg/L	0.005				0.00178	11/12/03	13:51
237594	Li6707	0.005	U	mg/L	0.005				0.00000	11/12/03	13:51
237594	Mg2790	0.05	U	mg/L	0.05				0.01025	11/12/03	13:51
237594	Mn2576	0.005	U	mg/L	0.005				-0.00010	11/12/03	13:51
237594	Mo2020	0.01	U	mg/L	0.01				0.00021	11/12/03	13:51
237594	Na3302	26.6		mg/L	0.2				26.6394	11/24/03	
237594	Ni2316	0.005	U	mg/L	0.005				-0.00015	11/12/03	13:51
237594	P 1782	0.04	U	mg/L	0.04				0.01818	11/12/03	13:51
237594	Pb220	0.005	U	mg/L	0.005				-0.00106	11/12/03	13:51
237594	Pd3404	0.01	U	mg/L	0.01				0.00366	11/12/03	13:51
237594	S 1820	0.025	U	mg/L	0.025				0.00859	11/12/03	13:51
237594	Sb2068	0.01	U	mg/L	0.01				-0.00077	11/12/03	13:51
237594	Se196	0.015	U	mg/L	0.015				0.00639	11/12/03	13:51
237594	Si2881	19.4		mg/L	0.05				19.40569	11/12/03	13:51
237594	Sn1899	0.01	U	mg/L	0.01				0.00162	11/12/03	13:51
237594	Sr4215	0.005	U	mg/L	0.005				0.00056	11/12/03	13:51
237594	Th2837	0.01	U	mg/L	0.01				-0.00252	11/12/03	13:51
237594	Ti3372	0.005	U	mg/L	0.005				0.00005	11/12/03	13:51
237594	Tl1908	0.025	U	mg/L	0.025				0.02433	11/12/03	13:51
237594	U 3859	0.1	U	mg/L	0.1				0.06365	11/12/03	13:51
237594	V 2924	0.005	U	mg/L	0.005				-0.00018	11/12/03	13:51
237594	W 2079	0.015	U	mg/L	0.015				0.00096	11/12/03	13:51
237594	Y 3710	0.005	U	mg/L	0.005				0.00004	11/12/03	13:51
237594	Zn2062	0.005	U	mg/L	0.005				0.00217	11/12/03	13:51
237594	Zr3496	0.005		mg/L	0.005				0.00520	11/12/03	13:51
lcsw-L11W1	Ag3280	0.052		mg/L	0.005	0.05	104.4%		0.05221	11/12/03	11:46
lcsw-L11W1	Al3082	1.92		mg/L	0.05	2	95.9%		1.91868	11/12/03	11:46
lcsw-L11W1	As1890	2.08		mg/L	0.005	2	104.1%		2.08211	11/12/03	11:46
lcsw-L11W1	B 2496	0.025	U	mg/L	0.025				0.00598	11/12/03	11:46
lcsw-L11W1	Ba4934	2.02		mg/L	0.005	2	101.2%		2.02382	11/12/03	11:46
lcsw-L11W1	Be3130	0.054		mg/L	0.005	0.05	108.4%		0.05419	11/12/03	11:46
lcsw-L11W1	Bi2230	0.015	U	mg/L	0.015				0.00685	11/12/03	11:46
lcsw-L11W1	Ca3179	20.8		mg/L	0.05	20	104.0%		20.79470	11/12/03	11:46
lcsw-L11W1	Cd2265	0.052		mg/L	0.005	0.05	104.9%		0.05243	11/12/03	11:46
lcsw-L11W1	Co2286	0.515		mg/L	0.005	0.5	103.0%		0.51509	11/12/03	11:46
lcsw-L11W1	Cr2677	0.203		mg/L	0.005	0.2	101.7%		0.20337	11/12/03	11:46
lcsw-L11W1	Cu3247	0.251		mg/L	0.005	0.25	100.4%		0.25093	11/12/03	11:46
lcsw-L11W1	Fe2714	1.03		mg/L	0.05	1	103.1%		1.03091	11/12/03	11:46
lcsw-L24W1	K 7664	18.3		mg/L	0.2	20	91.4%		18.282	11/24/03	
lcsw-L11W1	La4086	0.005	U	mg/L	0.005				0.00144	11/12/03	11:46

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06002.01.141

010060

system id	elem	result	qual	units	rl	tv	rec		ug/ml	date	time
lcsw-L11W1	Li6707	0.005	U	mg/L	0.005				0.00030	11/12/03	11:46
lcsw-L11W1	Mg2790	20.4		mg/L	0.05	20	101.9%		20.38276	11/12/03	11:46
lcsw-L11W1	Mn2576	0.516		mg/L	0.005	0.5	103.1%		0.51556	11/12/03	11:46
lcsw-L11W1	Mo2020	0.01	U	mg/L	0.01				0.00140	11/12/03	11:46
lcsw-L24W1	Na3302	18.6		mg/L	0.2	20	93.2%		18.6344	11/24/03	
lcsw-L11W1	Ni2316	0.511		mg/L	0.005	0.5	102.2%		0.51096	11/12/03	11:46
lcsw-L11W1	P_1782	0.04	U	mg/L	0.04				0.01782	11/12/03	11:46
lcsw-L11W1	Pb220	0.527		mg/L	0.005	0.5	105.4%		0.52704	11/12/03	11:46
lcsw-L11W1	Pd3404	0.01	U	mg/L	0.01				0.00705	11/12/03	11:46
lcsw-L11W1	S_1820	0.025	U	mg/L	0.025				0.02038	11/12/03	11:46
lcsw-L11W1	Sb2068	0.515		mg/L	0.01	0.5	102.9%		0.51453	11/12/03	11:46
lcsw-L11W1	Se196	2.15		mg/L	0.015	2	107.3%		2.14626	11/12/03	11:46
lcsw-L11W1	Si2881	0.05	U	mg/L	0.05				0.01599	11/12/03	11:46
lcsw-L11W1	Sn1899	0.01	U	mg/L	0.01				0.00294	11/12/03	11:46
lcsw-L11W1	Sr4215	0.005	U	mg/L	0.005				0.00030	11/12/03	11:46
lcsw-L11W1	Th2837	0.01	U	mg/L	0.01				-0.00654	11/12/03	11:46
lcsw-L11W1	Ti3372	0.005	U	mg/L	0.005				0.00071	11/12/03	11:46
lcsw-L11W1	Tl1908	2.22		mg/L	0.025	2	110.9%		2.21897	11/12/03	11:46
lcsw-L11W1	U_3859	0.1	U	mg/L	0.1				0.07891	11/12/03	11:46
lcsw-L11W1	V_2924	0.510		mg/L	0.005	0.5	102.0%		0.51012	11/12/03	11:46
lcsw-L11W1	W_2079	0.015	U	mg/L	0.015				0.00184	11/12/03	11:46
lcsw-L11W1	Y_3710	0.005	U	mg/L	0.005				0.00015	11/12/03	11:46
lcsw-L11W1	Zn2062	0.531		mg/L	0.005	0.5	106.2%		0.53080	11/12/03	11:46
lcsw-L11W1	Zr3496	0.005	U	mg/L	0.005				0.00140	11/12/03	11:46
pbw-L11W1	Ag3280	0.005	U	mg/L	0.005				0.00070	11/12/03	11:42
pbw-L11W1	Al3082	0.05	U	mg/L	0.05				0.01881	11/12/03	11:42
pbw-L11W1	As1890	0.005	U	mg/L	0.005				0.00151	11/12/03	11:42
pbw-L11W1	B_2496	0.025	U	mg/L	0.025				0.00927	11/12/03	11:42
pbw-L11W1	Ba4934	0.005	U	mg/L	0.005				0.00012	11/12/03	11:42
pbw-L11W1	Be3130	0.005	U	mg/L	0.005				-0.00005	11/12/03	11:42
pbw-L11W1	Bi2230	0.015	U	mg/L	0.015				0.00563	11/12/03	11:42
pbw-L11W1	Ca3179	0.05	U	mg/L	0.05				0.03755	11/12/03	11:42
pbw-L11W1	Cd2265	0.005	U	mg/L	0.005				0.00018	11/12/03	11:42
pbw-L11W1	Co2286	0.005	U	mg/L	0.005				0.00306	11/12/03	11:42
pbw-L11W1	Cr2677	0.005	U	mg/L	0.005				-0.00164	11/12/03	11:42
pbw-L11W1	Cu3247	0.005	U	mg/L	0.005				0.00019	11/12/03	11:42
pbw-L11W1	Fe2714	0.05	U	mg/L	0.05				-0.00499	11/12/03	11:42
pbw-L24W2	K_7664	0.2	U	mg/L	0.2				-0.1632	11/24/03	
pbw-L11W1	La4086	0.005	U	mg/L	0.005				0.00104	11/12/03	11:42
pbw-L11W1	Li6707	0.005	U	mg/L	0.005				0.00016	11/12/03	11:42
pbw-L11W1	Mg2790	0.05	U	mg/L	0.05				0.01320	11/12/03	11:42
pbw-L11W1	Mn2576	0.005	U	mg/L	0.005				0.00012	11/12/03	11:42
pbw-L11W1	Mo2020	0.01	U	mg/L	0.01				0.00290	11/12/03	11:42
pbw-L24W2	Na3302	0.2	U	mg/L	0.2				-0.0131	11/24/03	
pbw-L11W1	Ni2316	0.005	U	mg/L	0.005				-0.00034	11/12/03	11:42
pbw-L11W1	P_1782	0.04	U	mg/L	0.04				0.01860	11/12/03	11:42
pbw-L11W1	Pb220	0.005	U	mg/L	0.005				-0.00158	11/12/03	11:42
pbw-L11W1	Pd3404	0.01	U	mg/L	0.01				0.00226	11/12/03	11:42
pbw-L11W1	S_1820	0.025	U	mg/L	0.025				0.00864	11/12/03	11:42
pbw-L11W1	Sb2068	0.01	U	mg/L	0.01				0.00358	11/12/03	11:42
pbw-L11W1	Se196	0.015	U	mg/L	0.015				0.00139	11/12/03	11:42
pbw-L11W1	Si2881	0.05	U	mg/L	0.05				0.01859	11/12/03	11:42
pbw-L11W1	Sn1899	0.01	U	mg/L	0.01				0.00268	11/12/03	11:42
pbw-L11W1	Sr4215	0.005	U	mg/L	0.005				0.00021	11/12/03	11:42

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system id	elem	result	qual	units	rl	tv	rec		ug/ml	date	time
pbw-L11W1	Th2837	0.01	U	mg/L	0.01				-0.00142	11/12/03	11:42
pbw-L11W1	Ti3372	0.005	U	mg/L	0.005				0.00086	11/12/03	11:42
pbw-L11W1	Tl1908	0.025	U	mg/L	0.025				0.00399	11/12/03	11:42
pbw-L11W1	U_3859	0.1	U	mg/L	0.1				0.04330	11/12/03	11:42
pbw-L11W1	V_2924	0.005	U	mg/L	0.005				-0.00032	11/12/03	11:42
pbw-L11W1	W_2079	0.015	U	mg/L	0.015				0.00468	11/12/03	11:42
pbw-L11W1	Y_3710	0.005	U	mg/L	0.005				-0.00002	11/12/03	11:42
pbw-L11W1	Zn2062	0.005	U	mg/L	0.005				0.00193	11/12/03	11:42
pbw-L11W1	Zr3496	0.005	U	mg/L	0.005				0.00021	11/12/03	11:42

ICP ANALYSIS

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.141	Div 20	031106-12	11-12-03	water	S4 294

INSTRUMENT: TJACE 1 FILENAME: A3110612

INSTRUMENT DL:

010008

Analysis Report Averages 11/12/03 02:24:14 PM page 1

Method: DAILY1 Sample Name: blk Operator:
Run Time: 11/12/03 11:03 Filename: DAILY32
Mode: IR Type: X Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	count	count	count	count	count	count
Avge	-.00001	.00054	-.00005	.00007	-.00003	-.00008
SDev	.00003	.00002	.00002	.00003	0	0
%RSD	246.223	5.10779	33.5174	53.1128	14.7535	1.99075

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	count	count	count	count	count	count
Avge	-.00005	.00001	0	-.00002	.00003	.00042
SDev	.00001	0	.00002	0	.00001	0
%RSD	17.3184	33.0883	497.925	30.5879	34.2539	1.29706

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	count	count	count	count	count	count
Avge	-.00003	.00012	.00043	.00002	-.00002	0
SDev	0	.00222	.00005	.00007	.00002	0
%RSD	4.06668	1722.11	13.8519	294.31	107.74	64.7716

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	count	count	count	count	count	count
Avge	-.00001	-.00834	-.00028	0	.00003	-.00004
SDev	.00001	.00164	.00012	.00001	.00001	.00015
%RSD	112.914	19.6707	44.1359	488.129	48.9545	340.458

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	count	count	count	count	count	count
Avge	.00011	-.00005	0	0	61.0989	-.00016
SDev	.00012	.00002	.00001	.00006	.37731	.00009
%RSD	107.093	43.4153	602.047	812.529	.61754	58.1811

Elems	1960/2	Si2881	Sn1899	Sr4215	Th2837	Ti3372
Units	count	count	count	count	count	count
Avge	.00017	.00152	-.00001	0	.00001	-.00142
SDev	.00017	.00006	.00002	.00001	.00001	.00006
%RSD	101.696	4.1703	129.537	1324.24	124.646	4.51407

Elems	Tl1908	U_3859	V_2924	W_2079	Y_3710	Zn2062
Units	count	count	count	count	count	count
Avge	-.00005	.00383	0	.00005	0	0
SDev	.00001	.00007	0	.00007	.00001	0
%RSD	32.5196	1.8867	85.2472	132.906	308.777	85.2472

Elems	Zr3496	*Sc	*TIME
Units	count		
Avge	.00012	610950	10000
SDev	.00001	3774.54	0
%RSD	11.5619	.61781	0

20 Dec 03

12/5/03

11-12-03

Method: DAILY1 Sample Name: clp_std4 Operator:
Run Time: 11/12/03 11:08 Filename: DAILY32
Mode: IR Type: X Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1
Units	count	count	count	count	count	count
Avge	.05223	.09466	.37759	.38988	.10509	.20881
SDev	.00028	.00005	.00176	.00262	.00064	.00068
%RSD	.54034	.05799	.46751	.67257	.61124	.32904

Elems	1960/2	Tl1908	*Sc
Units	count	count	
Avge	.35814	.02603	598604
SDev	.00456	.00014	5673.12
%RSD	1.27563	.54955	.94772

Analysis Report Averages 11/12/03 02:24:14 PM page 3

Method: DAILY1 Sample Name: clp_std1 Operator:
Run Time: 11/12/03 11:12 Filename: DAILY32
Mode: IR Type: X Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790
Units	count	count	count	count	count	count
Avge	.12804	.13188	.09492	1.71313	3.37792	.0516
SDev	.00107	.003	.00172	.01911	.02184	.00047
%RSD	.836	2.27879	1.81885	1.11561	.64675	.92183

Elems	Na3302	*Sc
Units	count	
Avge	.01212	591915
SDev	.00016	4258.2
%RSD	1.36953	.71939

Method: DAILY1 Sample Name: clp_std5 Operator:
Run Time: 11/12/03 11:15 Filename: DAILY32
Mode: IR Type: X Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899
Units	count	count	count	count	count	count
Avge	.36537	.05776	.13862	.02937	.12354	.16023
SDev	.00299	.00043	.00173	.00024	.00062	.00031
%RSD	.82074	.75345	1.24979	.82635	.50543	.19755

Elems	Sr4215	Ti3372	*Sc
Units	count	count	
Avge	1.58791	1.0464	608022
SDev	.00334	.00253	1980.61
%RSD	.21072	.24183	.32574

Analysis Report Averages 11/12/03 02:24:14 PM page 5

Method: DAILY1 Sample Name: clp_std2 Operator:
Run Time: 11/12/03 11:19 Filename: DAILY32
Mode: IR Type: X Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ba4934	Be3130	Cr2677	Cu3247	Ni2316	*Sc
Units	count	count	count	count	count	
Avge	.66296	.18354	.26688	.32022	.67386	580391
SDev	.00348	.00332	.00278	.00197	.00648	23689.5
%RSD	.5255	1.81218	1.04246	.61674	.96189	4.08164

Method: DAILY1 Sample Name: clp_std3 Operator:
Run Time: 11/12/03 11:22 Filename: DAILY32
Mode: IR Type: X Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Cd2265	Co2286	Mn2576	V_2924	Zn2062	*Sc
Units	count	count	count	count	count	
Avge	1.00697	.24642	.37331	.07038	.07214	594958
SDev	.00259	.00017	.001	.00002	.00017	6829.94
%RSD	.25792	.06953	.26864	.03238	.23738	1.14797

Method: DAILY1 Sample Name: clp_std6 Operator:
Run Time: 11/12/03 11:26 Filename: DAILY32
Mode: IR Type: X Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	La4086	Na5889	Pd3404	S_1820	Th2837	U_3859
Units	count	count	count	count	count	count
Avge	.39382	.12868	.15273	.03741	.05715	.03296
SDev	.0001	.00008	.00004	.0001	.00033	.00005
%RSD	.02664	.06931	.02785	.27022	.59116	.17054

Elems	W_2079	Y_3710	Zr3496	*Sc
Units	count	count	count	
Avge	.10741	1.01665	1.17921	611792
SDev	.00112	.00008	.00042	6528.72
%RSD	1.04502	.00793	.03584	1.06714

Method: DAILY1 Sample Name: icv/ccv Operator:
Run Time: 11/12/03 11:31 Filename: DAILY32
Mode: CONC Type: Q Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.0182	9.887	5.132	4.859	10.07	1.086
SDev	.00445	.0151	.0208	.02	.0207	.0025
%RSD	.43771	.1528	.4047	.4114	.2056	.2322

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.111	20.35	1.034	5.081	2.013	2.053
SDev	.0166	.0781	.0011	.005	.0064	.0007
%RSD	.3253	.3839	.1067	.0992	.3204	.0336

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	10.24	18.51	5.014	4.790	20.13	1.036
SDev	.011	.1362	.0028	.037	.0593	.0039
%RSD	.1071	.7357	.0561	.7726	.2944	.3768

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.135	Q46.32	27.19	5.015	4.946	5.242
SDev	.0563	.3808	.0577	.0049	.1098	.0451
%RSD	1.097	.8222	.2122	.0986	2.22	.8599

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	5.272	1.045	1.048	1.039	99.64	5.513
SDev	.0341	.0111	.0237	.0018	.8645	.0589
%RSD	.6475	1.064	2.262	.1728	.8676	1.068

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.427	5.003	5.257	5.450	5.066	5.223
SDev	.046	.0202	.0077	.011	.0055	.0038
%RSD	.8469	.4032	.147	.2018	.108	.0724

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9637	4.906	Q5.510	1.048	5.092	Q1.109
SDev	.0164	.0167	.055	.0141	.0001	.0053
%RSD	1.697	.341	.9986	1.344	.0014	.4739

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	5.057	1.055	4.865	608723	10000
SDev	.0091	.0016	.0006	5235.42	0
%RSD	.1808	.1497	.0132	.86006	0

Method: DAILY1 Sample Name: icb/ccb Operator:
Run Time: 11/12/03 11:37 Filename: DAILY32
Mode: CONC Type: B Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00010	.0022	.0030	.0178	.0033	.0004
SDev	.00026	.0086	.0012	.0033	.0025	.0002
%RSD	251.39	397.7	38.22	18.57	75.99	58.3

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H.0052	.0093	.0004	.0023	-.0006	.0005
SDev	.0015	.0053	.0003	.001	.0012	.0005
%RSD	28.04	57.47	57.98	45.08	180.6	91.89

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0060	.0437	.0021	.0011	.0097	.0001
SDev	.01	.0088	.0011	.0007	.005	.0003
%RSD	167.9	20.11	54.01	64.21	51.2	220.8

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H.0092	.0133	H.3280	.0012	H.0186	.0078
SDev	.0027	.0064	.1192	.0016	.0165	.0008
%RSD	29.77	47.79	36.35	136.3	88.4	9.853

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	-.0020	.0029	.0077	.0026	102.0	.0068
SDev	.0002	.0001	.0002	.0007	.5923	.0021
%RSD	11.25	5.055	3.228	28.19	.5805	30.23

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0028	.0008	.0013	.0042	.0018	.0018
SDev	.0049	.0035	.0004	.0026	.0042	.0013
%RSD	171.8	460.8	31.91	61.21	236.1	72

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0013	.0019	.0044	.0471	.0015	.0041
SDev	.0022	.0009	.0014	.0031	.0015	.0037
%RSD	160.4	48.63	31.87	6.496	100.5	89.33

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	.0016	.0005	.0019	623254	10000
SDev	.0013	.0001	.0015	3585.74	0
%RSD	83.63	33.73	78.44	.57532	0

Method: DAILY1 Sample Name: pbw-L11W1 pg54-294 Operator:
Run Time: 11/12/03 11:42 Filename: DAILY32
Mode: CONC Type: S Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00070	.0188	.0015	.0093	.0001	-.0001
SDev	.00011	.0071	.006	.0007	.0001	.0001
%RSD	16.304	37.67	393.9	7.358	53.33	211.4

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	H.0056	.0376	.0002	.0031	-.0016	.0002
SDev	.0021	.0002	0	.0001	.0001	.0003
%RSD	37.26	.442	23.56	2.515	6.07	138.9

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0050	.0432	.0010	.0002	.0132	.0001
SDev	.0014	.0035	.0008	0	.0011	0
%RSD	28.38	8.101	77.94	8.044	8.427	30.76

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0029	.0273	H.3231	-.0003	H.0186	.0031
SDev	.0006	.0005	.1124	.0003	.0036	.0021
%RSD	21.1	2.001	34.79	91.11	19.17	68.81

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	-.0039	.0023	.0086	.0036	99.31	.0052
SDev	.0001	.0002	.0076	.0002	1.349	.0049
%RSD	3.304	7.945	87.87	4.971	1.358	93.63

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	H.0186	-.0016	.0014	.0027	.0002
SDev	.0031	.0009	.0006	.0037	.0025	0
%RSD	584.9	4.608	38.67	266.4	93.91	1.812

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0014	.0009	.0040	.0433	-.0003	.0047
SDev	.0018	.0005	.0007	.0167	0	.0017
%RSD	127.4	52.69	16.63	38.52	3.635	36.26

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	-.0000	.0019	.0002	606746	10000
SDev	0	.0003	.0002	8264.66	0
%RSD	188	17.65	115.1	1.36212	0

Method: DAILY1 Sample Name: lcsw-L11W1 Operator:
Run Time: 11/12/03 11:46 Filename: DAILY32
Mode: CONC Type: S Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.05221	1.919	2.082	.0060	2.024	.0542
SDev	.00049	.0009	.0055	.0011	.0056	.0007
%RSD	.94608	.0473	.2638	17.99	.2776	1.274

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0069	20.79	.0524	.5151	.2034	.2509
SDev	.0045	.0752	0	.0012	.0004	.0003
%RSD	65.96	.3615	.0058	.2344	.1805	.1154

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.031	16.37	.0014	.0003	20.38	.5156
SDev	.0032	.1185	.0004	0	.0158	.0013
%RSD	.3067	.7234	26.67	.3516	.0774	.2478

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0014	28.79	17.38	.5110	.0178	.5318
SDev	0	.1332	.1794	.0003	.0149	.0126
%RSD	.0554	.4628	1.032	.0531	83.45	2.366

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	.5255	.0071	.0204	.5145	98.67	2.132
SDev	.0049	.0013	.0029	.0037	.2754	.0208
%RSD	.9383	18.12	14.17	.7139	.2792	.976

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	2.156	.0160	.5270	2.146	.0029	.0003
SDev	.0106	.0003	.0075	.014	.0007	0
%RSD	.491	1.852	1.418	.6516	22.23	7.538

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0065	.0007	2.219	.0789	.5101	.0018
SDev	.0045	0	.0302	.0077	.0001	.0023
%RSD	69.37	1.02	1.36	9.789	.0209	125.7

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	.0001	.5308	.0014	602832	10000
SDev	0	.0004	.0002	1710.49	0
%RSD	29.39	.0683	17.15	.28374	0

Method: DAILY1 Sample Name: 237578 Operator:
Run Time: 11/12/03 11:51 Filename: DAILY32
Mode: CONC Type: S Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00051	.6198	.0145	.2037	.0216	.0004
SDev	.00012	.0024	.0027	.0003	.0017	.0001
%RSD	23.876	.3792	18.73	.1581	7.836	18.82

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0052	2.167	.0002	.0050	.0042	.0027
SDev	.0002	.0148	0	.0003	.0003	.0004
%RSD	4.107	.6838	10.27	5.464	7.248	16.35

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.143	2.341	.0049	.0815	.3881	.0245
SDev	.0098	.0125	.0005	.0001	.0115	.0006
%RSD	.8614	.5333	10.95	.1787	2.957	2.402

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0626	168.2	107.8	.0015	.0432	.0073
SDev	0	.6254	.297	.0005	.0006	.0015
%RSD	.0346	.3717	.2756	33.62	1.486	20.3

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	-.0010	.0041	20.17	.0032	97.49	.0117
SDev	.0015	.001	.188	.0016	.2953	.0014
%RSD	156.3	23.29	.9322	48.63	.3029	12.2

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0052	21.06	.0018	.0074	.0023	.0277
SDev	.0004	.0324	.0005	.0007	.0014	.0001
%RSD	7.67	.1537	29.43	10.05	61.22	.392

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0041	.0013	.0783	.0028	-.0003
SDev	.0011	.0003	.0182	.0193	.0003	.0004
%RSD	159.2	7.542	1418	24.68	12.33	164.7

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	.0007	.0147	.0007	595628	10000
SDev	.0001	.0007	.0004	1833.53	0
%RSD	12.09	4.773	54.81	.30783	0

Method: DAILY1 Sample Name: 237578d Operator:
Run Time: 11/12/03 11:56 Filename: DAILY32
Mode: CONC Type: S Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00017	.6593	.0082	.2056	.0195	.0002
SDev	.00029	.0317	.001	.0009	.0003	.0001
%RSD	165.31	4.813	11.59	.446	1.601	37.02

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0038	2.181	.0000	.0045	.0046	.0027
SDev	.0029	.0057	0	.0004	.0021	.0018
%RSD	76.73	.2624	607.1	8.931	46.34	65.93

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.227	2.278	.0051	.0811	.3732	.0245
SDev	.031	.0083	.0008	.0006	.0039	.0001
%RSD	2.528	.366	16.62	.7205	1.054	.5058

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0642	167.7	108.2	.0025	.0403	.0107
SDev	.003	1.351	.7028	.0011	.0004	.0004
%RSD	4.647	.8056	.6497	46.49	.9893	3.399

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	-.0003	.0037	19.65	.0009	98.61	.0126
SDev	.0011	.0002	.4706	.0015	.7603	.0006
%RSD	386.4	6.796	2.395	156.4	.771	5.063

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	21.39	.0034	.0043	.0036	.0278
SDev	.0018	.1564	.0009	.001	.0023	.0001
%RSD	1321	.7312	26.09	22.28	64.2	.2985

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0016	.0044	.0064	.0862	.0029	.0009
SDev	.0039	.0003	.0019	.0024	.0018	.0019
%RSD	244.6	7.88	28.82	2.784	64.47	210.8

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	.0010	.0147	.0016	602458	10000
SDev	.0005	.0003	.0019	4671.85	0
%RSD	50.95	1.831	119.7	.77546	0

Method: DAILY1 Sample Name: 237579 Operator:
Run Time: 11/12/03 12:01 Filename: DAILY32
Mode: CONC Type: S Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00058	.3400	.0111	.2098	.0080	.0001
SDev	.00045	.0302	.0003	.0021	.0001	.0001
%RSD	77.164	8.889	3.056	.9863	1.594	88.71

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0067	1.846	.0001	.0039	-.0007	.0013
SDev	.0003	.006	.0001	.0005	.0002	.0002
%RSD	4.971	.323	50.07	12.29	25.81	15.19

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2617	2.291	.0023	.0825	.2694	.0135
SDev	.0017	.0046	.0001	.0002	.0037	.0001
%RSD	.6545	.2003	3.295	.2619	1.386	.739

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0664	171.7	110.2	.0002	.0388	.0085
SDev	.0019	.629	.1004	.0005	.0108	.0065
%RSD	2.903	.3664	.0911	231.4	27.85	76.52

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	-.0044	.0043	19.78	.0028	95.96	.0109
SDev	.0049	.0019	.2997	.0013	1.378	.0008
%RSD	113.3	43.11	1.515	45.14	1.436	7.621

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0029	20.73	-.0001	.0056	.0099	.0218
SDev	.0054	.2227	.0011	.0033	.0035	0
%RSD	181.8	1.074	1644	58.88	35.57	.1282

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0030	.0025	.0013	.0852	.0019	.0026
SDev	.0016	.0001	.015	.0023	.0003	.0023
%RSD	52.46	4.901	1182	2.706	18.61	86.66

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	.0001	.0074	.0006	586314	10000
SDev	.0001	.0008	.0002	8406.79	0
%RSD	78.27	10.35	30.56	1.43383	0

Analysis Report Averages 11/12/03 02:24:14 PM

Method: DAILY1 Sample Name: 237579s Operator:
Run Time: 11/12/03 12:06 Filename: DAILY32
Mode: CONC Type: S Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.04223	2.304	2.119	.1974	2.049	.0529
SDev	.00001	.0141	.0045	.001	.0159	.0005
%RSD	.04598	.6135	.2109	.5038	.7753	1.007

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0071	22.63	.0517	.5195	.1836	.2591
SDev	.0037	.1079	.0002	.0031	.0015	.0016
%RSD	51.3	.4769	.3557	.6	.8403	.6359

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.234	26.88	.0020	.0827	21.19	.5234
SDev	.0117	.1006	.0003	0	.1199	.003
%RSD	.9493	.3744	17.06	.0489	.5657	.5772

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0678	202.6	132.5	.5094	.0527	.5257
SDev	.0018	.2619	.0545	.0028	.0159	.0047
%RSD	2.693	.1293	.0411	.5414	30.16	.8887

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	.5217	.0048	18.80	.3698	100.2	2.331
SDev	.0069	.0003	.2966	.0089	.2412	.0283
%RSD	1.322	5.954	1.577	2.403	.2407	1.213

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	2.318	19.73	.5225	2.320	.0035	.0209
SDev	.0151	.0401	.0061	.0194	.002	.0001
%RSD	.6494	.2035	1.177	.8381	57.02	.4694

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0059	.0020	2.283	.0560	.5143	-.0018
SDev	.0018	.0005	.0166	.0025	.0019	.0011
%RSD	31.28	23.78	.7282	4.543	.3659	60.43

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	.0001	.5365	.0011	612252	10000
SDev	0	.0067	.0001	1495.53	0
%RSD	29.47	1.248	13.52	.24426	0

Method: DAILY1 Sample Name: 237580 Operator:
Run Time: 11/12/03 12:10 Filename: DAILY32
Mode: CONC Type: S Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00031	.3537	.0191	.2735	.0385	.0000
SDev	.00019	.0129	.0005	.003	.0026	.0001
%RSD	60.799	3.642	2.699	1.109	6.742	768

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0064	6.526	.0002	.0098	.0015	.0094
SDev	.0016	.0322	.0001	.0012	.0001	.0005
%RSD	25.54	.4942	72.93	12.47	4.155	5.656

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.066	3.190	.0023	.1117	.9014	.0541
SDev	.0072	.0133	.0004	.001	.026	.0004
%RSD	.671	.4169	17.78	.9363	2.887	.8199

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0627	228.7	147.9	.0046	.0611	.0146
SDev	.002	2.307	.3329	.001	.0076	.0041
%RSD	3.197	1.009	.2252	22.56	12.43	28.02

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	.0009	.0052	27.66	.0038	74.09	.0211
SDev	.0012	.0001	.4256	.0046	.1556	.0033
%RSD	132	1.169	1.539	121.7	.2101	15.63

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0091	27.10	.0055	.0131	.0105	.0777
SDev	.0119	.0631	.0006	.0068	.0029	.0006
%RSD	130.8	.2328	10.83	52.1	27.78	.7234

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0040	.0011	-.0077	.0755	.0039	.0013
SDev	.0032	.0008	.0041	.0087	.0013	.0035
%RSD	78.06	72.02	53.33	11.54	33.65	267.4

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	.0001	.0450	.0006	452996	10000
SDev	.0001	.0007	.0007	912.168	0
%RSD	100.4	1.638	112.1	.20136	0

Method: DAILY1 Sample Name: 237581 Operator:
Run Time: 11/12/03 12:15 Filename: DAILY32
Mode: CONC Type: S Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00060	.0310	.0068	.2322	.0035	-.0000
SDev	.00115	.0043	.0034	.0003	.0001	0
%RSD	191.81	13.99	49	.1145	2.801	66.76

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0040	2.229	.0001	.0035	-.0010	.0009
SDev	.0051	.0429	.0005	.0012	.0001	.0001
%RSD	129.6	1.923	1032	33.38	15.49	7.006

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2755	4.071	.0014	.2491	.1026	.0401
SDev	.0038	.0046	.0011	.001	.0103	.0003
%RSD	1.373	.1131	77.91	.4032	10.03	.6428

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0395	586.18	190.4	-.0001	.0255	-.0017
SDev	.0011	.3641	1.396	.0006	.0006	.0076
%RSD	2.791	.4225	.7329	839	2.508	446.2

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	.0008	.0000	9.967	-.0013	102.9	.0086
SDev	.0052	.0042	.1976	.0058	.7184	.0127
%RSD	609.7	16140	1.983	445	.6981	148.6

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0075	7.098	.0000	.0079	.0104	.0064
SDev	.0012	.0591	.0009	.0034	.0046	.0001
%RSD	16.03	.8326	18690	43.9	44.56	1.477

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0019	-.0003	-.0209	.0490	.0001	-.0031
SDev	.0013	.0014	.0154	.0288	.0002	.004
%RSD	67.99	484.7	73.58	58.73	150.9	128.3

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	.0001	.0023	.0009	628706	10000
SDev	0	.0015	.0003	4357.19	0
%RSD	16.91	67.47	31.16	.69304	0

Method: DAILY1 Sample Name: 237582 Operator:
Run Time: 11/12/03 12:20 Filename: DAILY32
Mode: CONC Type: S Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00001	.0282	.0077	.2332	.0031	-.0000
SDev	.00044	.0002	.0028	.0001	.0001	0
%RSD	2747.4	.718	36.36	.0629	4.054	72.56

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0061	2.242	.0002	.0037	-.0012	-.0007
SDev	.0002	.0209	.0001	.0006	.0007	.0007
%RSD	3.556	.9306	24.33	16.57	53.76	109.5

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2025	4.073	.0022	.2466	.1060	.0388
SDev	.0151	.0187	.0004	.0002	.001	.0003
%RSD	7.481	.46	17.68	.0949	.9072	.8092

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0384	S85.78	189.2	-.0001	.0390	.0061
SDev	.002	1.076	.3177	.0011	.0033	.0002
%RSD	5.163	1.255	.168	865.5	8.549	3.742

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	-.0053	.0046	9.887	-.0002	103.4	.0248
SDev	.0019	.0029	.0524	.0029	.9925	.0032
%RSD	35.01	61.59	.5297	1374	.96	12.93

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	7.132	-.0015	.0079	.0254	.0064
SDev	.0002	.024	.0013	.0012	.0009	0
%RSD	38.65	.3359	87.08	15.49	3.358	.1862

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0017	.0002	-.0223	.0635	.0000	-.0009
SDev	.0038	.0001	.0206	.0105	.0009	.0014
%RSD	221.5	75.14	92.56	16.6	9450	161.5

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	.0001	.0012	.0007	631618	10000
SDev	.0002	.0003	.0007	6053.54	0
%RSD	386.1	25.6	90.39	.95841	0

Method: DAILY1 Sample Name: 237583 Operator:
Run Time: 11/12/03 12:25 Filename: DAILY32
Mode: CONC Type: S Corr. Factor: 1.00000
Lab ID.: Cust. Smpl. ID.: Cust. ID.:

Elems	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00005	.0960	.0072	.2341	.0042	-.0000
SDev	.00032	.0005	.0001	.0037	.0001	0
%RSD	595.15	.5399	1.301	1.601	2.903	61.07

Elems	Bi2230	Ca3179	Cd2265	Co2286	Cr2677	Cu3247
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	2.180	-.0000	.0036	-.0017	.0001
SDev	.0008	.0019	.0001	.0003	.0002	.0001
%RSD	74.05	.0858	127.3	9.557	10.24	225.5

Elems	Fe2714	K_7664	La4086	Li6707	Mg2790	Mn2576
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.326	4.214	.0020	.2561	.1105	.0489
SDev	.0058	.0437	.0004	.0005	.0002	.0001
%RSD	.4368	1.037	18.32	.1995	.2198	.1998

Elems	Mo2020	Na5889	Na3302	Ni2316	P_1782	2203/1
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0348	S87.57	193.3	-.0006	.0462	.0044
SDev	.001	1.071	.898	.0009	.0011	.0012
%RSD	2.961	1.223	.4645	146.8	2.301	27.49

Elems	2203/2	Pd3404	S_1820	Sb2068	Sc3613	1960/1
Units	ppm	ppm	ppm	ppm	%R	ppm
Avge	-.0041	.0029	9.854	.0035	101.1	.0205
SDev	.0012	.0009	.3171	.0004	.8749	.0008
%RSD	30.1	30.31	3.218	12.59	.8651	3.872

Elems	1960/2	Si2881	Pb220	Se196	Sn1899	Sr4215
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0066	7.801	-.0012	.0112	.0242	.0065
SDev	.0019	.0597	.0012	.0015	.0001	0
%RSD	28.75	.7651	97.09	13.63	.3635	.2072

Elems	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0009	.0010	-.0276	.0235	.0000	-.0030
SDev	.0033	.0004	.0005	.0049	.0002	.0043
%RSD	376.3	42.53	1.728	20.85	537.8	141.7

Elems	Y_3710	Zn2062	Zr3496	*Sc	*TIME
Units	ppm	ppm	ppm		
Avge	-.0001	.0140	.0001	617850	10000
SDev	.0001	.0002	.0004	5342.19	0
%RSD	165.1	1.428	350.3	.86464	0

Analysis Report QC Standard 11/12/03 12:39:08 PM page 1

Method: DAILY1 Sample Name: icv/ccv Operator:
Run Time: 11/12/03 12:34:23
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.0232	10.03	5.187	4.861	10.16	1.055	5.102
SDev	.0043	.04	.013	.011	.02	.001	.005
%RSD	.42133	.3592	.2516	.2274	.2151	.0572	.1048
#1	1.0263	10.05	5.178	4.853	10.17	1.055	5.105
#2	1.0202	10.000	5.197	4.868	10.14	1.054	5.098
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.0000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.000	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	20.32	1.022	5.051	2.009	2.076	10.20	18.81
SDev	.03	.002	.016	.006	.007	.06	.08
%RSD	.1470	.2266	.3077	.3003	.3379	.5614	.4178
#1	20.34	1.024	5.062	2.013	2.081	10.24	18.75
#2	20.29	1.020	5.040	2.005	2.071	10.16	18.86
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.060	4.846	20.12	1.036	5.149	Q47.02	27.25
SDev	.001	.000	.04	.002	.044	.04	.33
%RSD	.0098	.0079	.2161	.2195	.8475	.0812	1.204
#1	5.060	4.846	20.15	1.038	5.118	Q46.99	27.02
#2	5.059	4.847	20.09	1.035	5.180	Q47.05	27.48
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	QC Pass
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.970	5.207	5.201	5.242	1.036	1.024	1.040
SDev	.009	.034	.044	.011	.004	.021	.008
%RSD	.1750	.6568	.8491	.2086	.3628	2.073	.7389
#1	4.976	5.231	5.232	5.234	1.039	1.009	1.035
#2	4.964	5.182	5.170	5.249	1.034	1.039	1.046
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.5	5.543	5.502	4.999	5.223	Q5.510	5.009
SDev	.7	.041	.035	.018	.007	.010	.000
%RSD	.7369	.7449	.6354	.3582	.1421	.1730	.0032
#1	99.99	5.572	5.477	5.012	5.228	Q5.503	5.009
#2	101.0	5.514	5.527	4.987	5.218	Q5.517	5.010
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Fail	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.256	.9572	4.956	Q5.556	1.029	5.110	1.076
SDev	.018	.0085	.010	.036	.046	.019	.015
%RSD	.3384	.8867	.2063	.6455	4.515	.3655	1.428
#1	5.269	.9632	4.963	Q5.530	.9960	5.124	1.066
#2	5.244	.9512	4.948	Q5.581	1.062	5.097	1.087
Errors	QC Pass	QC Pass	QC Pass	QC Fail	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	5.082	1.032	4.828
SDev	.012	.005	.018
%RSD	.2273	.4463	.3744
#1	5.074	1.029	4.815
#2	5.090	1.036	4.841
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	614067	10000	--	--	--	--	--
SDev	4485.885	.0000000	--	--	--	--	--
%RSD	.7305205	.0000000	--	--	--	--	--
#1	610895	10000	--	--	--	--	--
#2	617239	10000	--	--	--	--	--

010090

Analysis Report Blank Sample 11/12/03 12:46:03 PM page 1

Method: DAILY1 Sample Name: icb/ccb Operator:
Run Time: 11/12/03 12:41:18
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00110	.0231	.0045	.0156	.0022	.0001	H.0074
SDev	.00027	.0066	.0003	.0037	.0016	.0002	.0022
%RSD	24.196	28.60	6.213	23.95	71.54	347.2	29.31
#1	.00091	.0278	.0043	.0183	.0034	.0002	H.0059
#2	.00129	.0184	.0047	.0130	.0011	-.0001	H.0089
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	.00500	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.00500	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0089	.0004	.0018	-.0009	-.0001	-.0041	.0527
SDev	.0026	.0001	.0009	.0007	.0001	.0009	.0028
%RSD	29.28	30.90	49.82	77.40	110.0	20.58	5.231
#1	.0107	.0003	.0024	-.0004	-.0000	-.0035	.0546
#2	.0070	.0004	.0012	-.0014	-.0001	-.0047	.0507
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0029	.0008	.0104	.0001	H.0076	.0181	H.4028
SDev	.0004	.0005	.0017	.0001	.0034	.0056	.0302
%RSD	12.35	57.15	16.15	218.7	45.20	30.80	7.503
#1	.0032	.0011	.0092	.0001	H.0100	.0220	H.4241
#2	.0027	.0005	.0116	-.0000	H.0052	.0141	H.3814
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass	LC High
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	H.0182	.0035	-.0023	.0040	.0015	.0032
SDev	.0003	.0056	.0019	.0007	.0012	.0092	.0039
%RSD	36.90	30.67	55.26	31.52	29.65	611.6	120.4
#1	.0012	H.0222	.0048	-.0028	.0048	-.0050	.0059
#2	.0007	H.0143	.0021	-.0018	.0031	.0080	.0005
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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.7	.0043	-.0001	.0055	-.0004	.0014	.0026
SDev	.4	.0047	.0007	.0003	.0002	.0011	.0014
%RSD	.3658	108.4	1170.	6.220	44.05	75.33	54.74
#1	100.5	.0076	-.0006	.0057	-.0003	.0022	.0037
#2	101.0	.0010	.0005	.0053	-.0005	.0007	.0016
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0012	-.0004	.0014	.0092	.0423	.0012	.0024
SDev	.0008	.0008	.0009	.0083	.0084	.0005	.0026
%RSD	69.81	186.4	60.88	90.29	19.92	42.18	108.0
#1	.0017	-.0010	.0020	H.0151	.0364	.0016	.0006
#2	.0006	.0001	.0008	.0033	.0483	.0009	.0042
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	.0011	.0011	.0021
SDev	.0008	.0002	.0009
%RSD	71.95	14.36	44.85
#1	.0016	.0012	.0028
#2	.0005	.0010	.0015
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	615314	10000	--	--	--	--	--
SDev	2253.549	.0000000	--	--	--	--	--
%RSD	.3662441	.0000000	--	--	--	--	--
#1	613720	10000	--	--	--	--	--
#2	616907	10000	--	--	--	--	--

010099

Analysis Report 11/12/03 12:50:55 PM

Method: DAILY1 Sample Name: 237584 Operator:
Run Time: 11/12/03 12:46:13
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00040	.1669	.0349	.1786	.0026	-.0002	.0083
SDev	.00002	.0059	.0012	.0009	.0000	.0000	.0001
%RSD	3.9637	3.525	3.455	.5124	.3433	24.30	.8548
#1	.00042	.1627	.0340	.1780	.0027	-.0002	.0082
#2	.00039	.1711	.0357	.1793	.0026	-.0001	.0083

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.5433	.0001	.0040	-.0007	.0002	.0745	3.681
SDev	.0008	.0001	.0002	.0003	.0003	.0096	.032
%RSD	.1372	90.31	4.908	37.12	146.4	12.84	.8699
#1	.5438	.0000	.0041	-.0009	.0004	.0812	3.658
#2	.5428	.0002	.0038	-.0005	-.0000	.0677	3.704

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0026	.1249	.0706	.0153	.0042	149.5	96.10
SDev	.0000	.0005	.0031	.0000	.0004	.3	.25
%RSD	.7505	.4089	4.311	.1701	10.19	.1733	.2592
#1	.0026	.1246	.0728	.0153	.0045	149.3	95.92
#2	.0026	.1253	.0685	.0153	.0039	149.6	96.27

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0290	.0009	-.0044	.0037	5.560	.0029
SDev	.0006	.0006	.0015	.0023	.0006	.121	.0004
%RSD	372.6	1.913	161.1	51.33	17.23	2.180	14.33
#1	-.0003	.0294	-.0001	-.0060	.0042	5.475	.0026
#2	.0006	.0286	.0020	-.0028	.0033	5.646	.0032

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.2	.0145	.0024	27.90	-.0026	.0064	.0022
SDev	.4	.0022	.0008	.03	.0020	.0013	.0020
%RSD	.4255	15.26	33.72	.1033	77.01	19.74	89.77
#1	101.9	.0129	.0018	27.92	-.0040	.0055	.0036
#2	102.5	.0160	.0029	27.88	-.0012	.0073	.0008

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0019	-.0013	.0012	.0114	.0746	.0051	.0012
SDev	.0000	.0031	.0004	.0104	.0093	.0002	.0012
%RSD	.7829	228.1	36.26	90.82	12.52	3.588	102.5
#1	.0019	.0008	.0015	.0188	.0812	.0052	.0021
#2	.0019	-.0035	.0009	.0041	.0680	.0049	.0003

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0034	.0012
SDev	.0000	.0003	.0001
%RSD	16.89	9.423	8.315
#1	.0002	.0037	.0013
#2	.0001	.0032	.0012

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	624375	10000	--	--	--	--	--
SDev	2623.366	.0000000	--	--	--	--	--
%RSD	.4201587	.0000000	--	--	--	--	--
#1	622520	10000	--	--	--	--	--
#2	626230	10000	--	--	--	--	--

Analysis Report 11/12/03 12:55:50 PM

Method: DAILY1 Sample Name: 237585 Operator:
Run Time: 11/12/03 12:51:06
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00045	.1319	.0339	.1616	.0004	-.0002	.0059
SDev	.00009	.0058	.0017	.0023	.0002	.0000	.0018
%RSD	20.613	4.368	5.102	1.418	37.72	14.99	30.75
#1	.00039	.1359	.0351	.1632	.0003	-.0002	.0072
#2	.00052	.1278	.0326	.1600	.0006	-.0002	.0046

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.5380	.0003	.0043	-.0013	-.0010	.0426	3.658
SDev	.0056	.0001	.0005	.0010	.0004	.0250	.036
%RSD	1.044	43.71	11.44	79.82	45.33	58.67	.9885
#1	.5420	.0003	.0047	-.0020	-.0013	.0249	3.633
#2	.5340	.0002	.0040	-.0005	-.0006	.0603	3.684

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0024	.1245	.0679	.0139	.0029	149.0	95.88
SDev	.0001	.0001	.0012	.0002	.0015	.1	.63
%RSD	5.574	.0895	1.777	1.191	50.41	.0811	.6575
#1	.0023	.1244	.0670	.0138	.0019	148.9	95.43
#2	.0025	.1246	.0687	.0140	.0040	149.1	96.33

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0404	.0063	-.0075	.0043	5.481	.0023
SDev	.0006	.0081	.0005	.0009	.0011	.061	.0032
%RSD	169.8	19.98	8.317	12.73	25.52	1.108	141.4
#1	-.0008	.0347	.0067	-.0068	.0051	5.438	.0000
#2	.0001	.0461	.0060	-.0081	.0035	5.524	.0045

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.4	.0171	-.0002	28.16	-.0029	.0056	.0078
SDev	.1	.0041	.0051	.17	.0008	.0048	.0030
%RSD	.1230	23.80	2346.	.5989	28.27	85.92	38.35
#1	103.5	.0142	-.0039	28.28	-.0023	.0022	.0057
#2	103.3	.0200	.0034	28.04	-.0034	.0089	.0099

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0018	-.0033	.0013	.0085	.0904	.0041	.0027
SDev	.0000	.0019	.0001	.0103	.0039	.0011	.0023
%RSD	.2711	58.00	3.820	121.5	4.311	27.44	83.18
#1	.0018	-.0046	.0013	.0158	.0876	.0033	.0044
#2	.0018	-.0019	.0013	.0012	.0931	.0049	.0011

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0022	.0004
SDev	.0002	.0001	.0012
%RSD	245.6	6.902	301.7
#1	-.0002	.0023	-.0005
#2	.0001	.0021	.0013

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	631880	10000	--	--	--	--	--
SDev	716.2992	.0000000	--	--	--	--	--
%RSD	.1133601	.0000000	--	--	--	--	--
#1	632386	10000	--	--	--	--	--
#2	631373	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 237586 Operator:
Run Time: 11/12/03 12:56:01
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00015	.2039	.0332	.1631	.0011	-.0001	.0061
SDev	.00097	.0051	.0033	.0006	.0001	.0001	.0003
%RSD	649.91	2.518	9.960	.3860	6.551	67.26	5.178
#1	.00083	.2076	.0356	.1635	.0011	-.0001	.0063
#2	-.00053	.2003	.0309	.1626	.0010	-.0002	.0059

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.7608	-.0000	.0033	-.0009	-.0003	.1946	3.807
SDev	.0034	.0001	.0003	.0004	.0000	.0110	.014
%RSD	.4429	305.4	8.587	44.32	.1328	5.642	.3619
#1	.7632	.0000	.0035	-.0006	-.0003	.2023	3.798
#2	.7584	-.0001	.0031	-.0012	-.0003	.1868	3.817

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0022	.1280	.0941	.0249	.0026	153.4	98.51
SDev	.0011	.0001	.0086	.0001	.0008	.5	.54
%RSD	49.70	.1100	9.173	.1981	29.03	.3003	.5495
#1	.0029	.1281	.1002	.0249	.0032	153.8	98.13
#2	.0014	.1279	.0880	.0248	.0021	153.1	98.90

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0449	.0040	-.0035	.0033	5.632	-.0005
SDev	.0003	.0011	.0026	.0001	.0015	.051	.0033
%RSD	349.7	2.380	65.58	1.400	43.75	.9097	669.8
#1	-.0001	.0441	.0059	-.0036	.0044	5.595	.0018
#2	.0003	.0456	.0022	-.0035	.0023	5.668	-.0028

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.1	.0124	-.0003	28.74	-.0010	.0040	.0062
SDev	.2	.0013	.0024	.01	.0008	.0020	.0038
%RSD	.2043	10.46	809.6	.0343	82.27	51.08	62.05
#1	99.93	.0134	.0014	28.75	-.0004	.0054	.0089
#2	100.2	.0115	-.0020	28.74	-.0016	.0025	.0035

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0029	-.0019	.0013	.0126	.0784	.0049	.0005
SDev	.0000	.0000	.0008	.0013	.0192	.0002	.0039
%RSD	1.180	2.187	64.58	10.35	24.44	3.696	721.5
#1	.0030	-.0019	.0019	.0136	.0919	.0050	.0033
#2	.0029	-.0020	.0007	.0117	.0648	.0048	-.0022

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0194	.0011
SDev	.0001	.0010	.0007
%RSD	70.65	5.156	59.12
#1	.0002	.0201	.0016
#2	.0001	.0187	.0007

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	611354	10000	--	--	--	--	--
SDev	1260.771	.0000000	--	--	--	--	--
%RSD	.2062259	.0000000	--	--	--	--	--
#1	610463	10000	--	--	--	--	--
#2	612246	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 237587 Operator:
Run Time: 11/12/03 13:00:57
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00031	.1580	.0373	.1568	.0003	-.0002	.0073
SDev	.00059	.0040	.0004	.0016	.0000	.0001	.0064
%RSD	188.77	2.545	1.106	1.032	12.94	55.86	88.27
#1	.00010	.1552	.0370	.1557	.0003	-.0002	.0118
#2	-.00073	.1608	.0376	.1580	.0002	-.0001	.0027

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.3597	-.0000	.0039	-.0013	-.0007	.0743	3.781
SDev	.0014	.0001	.0002	.0002	.0000	.0004	.037
%RSD	.3858	1338.	5.768	12.26	5.675	.4963	.9919
#1	.3587	-.0001	.0037	-.0012	-.0008	.0740	3.754
#2	.3606	.0001	.0040	-.0014	-.0007	.0745	3.808

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0015	.1257	.0404	.0038	.0030	151.8	98.19
SDev	.0004	.0006	.0017	.0000	.0003	1.5	.91
%RSD	25.52	.5173	4.245	.1704	8.458	.9599	.9296
#1	.0017	.1252	.0416	.0038	.0032	150.7	97.54
#2	.0012	.1262	.0392	.0038	.0029	152.8	98.83

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0401	.0041	-.0039	.0042	5.695	-.0004
SDev	.0005	.0012	.0033	.0014	.0003	.013	.0025
%RSD	184.3	3.078	80.51	35.41	7.098	.2253	581.7
#1	.0001	.0410	.0018	-.0029	.0040	5.686	.0014
#2	-.0007	.0392	.0065	-.0048	.0044	5.704	-.0022

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.0	.0088	-.0043	28.50	-.0012	.0001	.0008
SDev	.2	.0044	.0028	.06	.0002	.0004	.0026
%RSD	.1849	49.58	65.67	.2235	16.52	582.9	306.4
#1	103.8	.0057	-.0023	28.46	-.0013	.0004	.0026
#2	104.1	.0119	-.0063	28.55	-.0011	-.0002	-.0010

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	-.0010	.0011	.0064	.0704	.0049	.0023
SDev	.0000	.0002	.0008	.0004	.0080	.0000	.0014
%RSD	3.440	24.06	69.16	6.968	11.31	.2288	57.85
#1	.0009	-.0012	.0016	.0061	.0760	.0049	.0033
#2	.0008	-.0008	.0006	.0067	.0648	.0049	.0014

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0034	.0014
SDev	.0001	.0003	.0002
%RSD	308.4	9.326	17.23
#1	.0000	.0036	.0016
#2	-.0001	.0032	.0012

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	635058	10000	--	--	--	--	--
SDev	1194.303	.0000000	--	--	--	--	--
%RSD	.1880622	.0000000	--	--	--	--	--
#1	634213	10000	--	--	--	--	--
#2	635902	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 237588 Operator:
Run Time: 11/12/03 13:05:52
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00001	.1202	.0347	.1566	.0003	-.0000	.0085
SDev	.00030	.0037	.0056	.0017	.0000	.0002	.0004
%RSD	2554.8	3.071	16.29	1.071	5.052	343.4	4.204
#1	-.00020	.1228	.0307	.1578	.0003	.0001	.0083
#2	.00023	.1176	.0387	.1554	.0003	-.0002	.0088

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.3588	.0001	.0038	-.0011	-.0010	.0459	3.816
SDev	.0006	.0000	.0000	.0000	.0002	.0053	.057
%RSD	.1767	18.13	.6734	.9531	25.16	11.48	1.493
#1	.3583	.0001	.0038	-.0011	-.0008	.0496	3.776
#2	.3592	.0001	.0038	-.0011	-.0011	.0421	3.857

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0019	.1268	.0364	.0041	.0027	153.1	98.99
SDev	.0004	.0005	.0003	.0000	.0001	1.2	.67
%RSD	21.99	.4168	.8642	.5215	5.207	.7855	.6807
#1	.0016	.1264	.0362	.0040	.0026	152.3	98.51
#2	.0022	.1272	.0366	.0041	.0028	154.0	99.47

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	.0327	.0041	-.0058	.0033	5.805	.0002
SDev	.0001	.0173	.0009	.0006	.0031	.004	.0007
%RSD	13.07	52.92	21.75	10.09	91.95	.0680	307.5
#1	-.0006	.0205	.0048	-.0062	.0012	5.808	.0008
#2	-.0005	.0450	.0035	-.0053	.0055	5.803	-.0003

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.7	.0109	-.0034	28.50	-.0024	.0014	.0061
SDev	.9	.0015	.0024	.21	.0001	.0011	.0027
%RSD	.8654	13.55	69.53	.7295	3.528	80.10	43.35
#1	104.1	.0098	-.0017	28.65	-.0025	.0021	.0042
#2	105.3	.0119	-.0051	28.36	-.0024	.0006	.0080

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	-.0019	.0009	.0104	.0714	.0053	.0018
SDev	.0000	.0013	.0003	.0043	.0077	.0000	.0024
%RSD	.6928	70.68	36.95	41.54	10.77	.7442	135.7
#1	.0009	-.0029	.0007	.0074	.0659	.0053	.0001
#2	.0009	-.0010	.0011	.0135	.0768	.0053	.0034

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0026	.0020
SDev	.0000	.0002	.0012
%RSD	190.4	6.577	57.05
#1	-.0000	.0027	.0012
#2	.0000	.0025	.0029

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	639535	10000	--	--	--	--	--
SDev	5552.203	.0000000	--	--	--	--	--
%RSD	.8681624	.0000000	--	--	--	--	--
#1	635609	10000	--	--	--	--	--
#2	643461	10000	--	--	--	--	--

010109

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Method: DAILY1 Sample Name: 237589 Operator:
Run Time: 11/12/03 13:10:46
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00030	.1739	.0316	.1573	.0005	-.0001	.0084
SDev	.00090	.0057	.0018	.0020	.0000	.0001	.0010
%RSD	301.97	3.278	5.550	1.254	6.843	125.5	12.28
#1	-.00034	.1779	.0304	.1587	.0005	-.0000	.0076
#2	.00093	.1698	.0328	.1559	.0005	-.0002	.0091

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4091	.0000	.0042	-.0005	-.0004	.1899	3.834
SDev	.0017	.0001	.0001	.0006	.0002	.0084	.046
%RSD	.4238	277.6	3.707	107.9	47.77	4.440	1.211
#1	.4079	-.0000	.0041	-.0010	-.0003	.1839	3.801
#2	.4104	.0001	.0043	-.0001	-.0005	.1959	3.867

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0019	.1269	.0449	.0340	.0025	153.4	98.94
SDev	.0006	.0002	.0029	.0000	.0005	.1	.99
%RSD	33.22	.1439	6.510	.1114	21.97	.0845	1.002
#1	.0015	.1271	.0428	.0340	.0021	153.5	98.24
#2	.0024	.1268	.0469	.0340	.0029	153.3	99.64

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0299	.0021	-.0027	.0023	5.690	.0008
SDev	.0001	.0019	.0023	.0021	.0011	.025	.0018
%RSD	322.6	6.430	106.5	81.00	45.87	.4459	223.9
#1	-.0000	.0286	.0005	-.0042	.0016	5.672	-.0005
#2	.0001	.0313	.0037	-.0011	.0031	5.708	.0021

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.2	.0134	.0007	28.73	-.0011	.0050	.0096
SDev	.9	.0010	.0038	.16	.0022	.0029	.0031
%RSD	.9054	7.687	506.8	.5443	207.5	57.45	32.01
#1	102.6	.0127	-.0019	28.84	-.0026	.0030	.0075
#2	103.9	.0142	.0034	28.62	.0005	.0070	.0118

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	-.0026	.0011	-.0154	.0816	.0055	-.0016
SDev	.0000	.0004	.0001	.0003	.0006	.0004	.0019
%RSD	2.361	16.60	4.485	1.947	.7879	8.046	121.8
#1	.0011	-.0023	.0011	-.0156	.0821	.0051	-.0002
#2	.0011	-.0028	.0010	-.0152	.0812	.0058	-.0030

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0062	.0014
SDev	.0001	.0001	.0001
%RSD	89.48	1.740	8.199
#1	.0000	.0061	.0013
#2	.0002	.0062	.0015

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	630548	10000	--	--	--	--	--
SDev	5670.289	.0000000	--	--	--	--	--
%RSD	.8992630	.0000000	--	--	--	--	--
#1	626539	10000	--	--	--	--	--
#2	634558	10000	--	--	--	--	--

010103

Analysis Report 11/12/03 01:20:24 PM page 1

Method: DAILY1 Sample Name: 237590 Operator:
Run Time: 11/12/03 13:15:38
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00012	.0435	.0004	.2587	.0561	-.0004	.0046
SDev	.00052	.0021	.0002	.0028	.0007	.0000	.0040
%RSD	428.16	4.885	60.11	1.067	1.187	9.771	87.92
#1	.00049	.0420	.0005	.2568	.0556	-.0003	.0075
#2	-.00025	.0450	.0002	.2607	.0565	-.0004	.0017

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	28.15	.0002	.0046	-.0013	-.0004	.0247	9.669
SDev	.08	.0002	.0003	.0005	.0002	.0068	.027
%RSD	.2830	129.1	7.660	34.14	43.91	27.38	.2823
#1	28.20	.0004	.0049	-.0010	-.0006	.0295	9.650
#2	28.09	.0000	.0044	-.0016	-.0003	.0199	9.689

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0023	.1046	28.89	.0749	.0055	133.3	84.93
SDev	.0006	.0002	.10	.0001	.0003	.4	.20
%RSD	25.57	.1772	.3298	.0740	5.704	.3297	.2349
#1	.0027	.1047	28.83	.0749	.0057	133.6	85.07
#2	.0019	.1044	28.96	.0748	.0053	133.0	84.79

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0012	.0218	.0041	-.0049	.0046	45.01	.0013
SDev	.0006	.0129	.0002	.0007	.0015	1.20	.0020
%RSD	51.47	59.36	5.814	13.92	31.37	2.657	154.0
#1	.0016	.0309	.0039	-.0044	.0057	44.17	.0027
#2	.0008	.0126	.0042	-.0054	.0036	45.86	-.0001

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.4	.0168	.0010	13.69	-.0019	.0063	.0074
SDev	.2	.0013	.0032	.02	.0004	.0025	.0022
%RSD	.1645	7.469	305.1	.1151	19.70	40.02	29.35
#1	103.5	.0177	.0033	13.68	-.0016	.0081	.0059
#2	103.3	.0160	-.0012	13.70	-.0022	.0045	.0090

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4127	-.0074	.0006	.0055	.0575	-.0010	.0048
SDev	.0035	.0024	.0008	.0009	.0089	.0010	.0001
%RSD	.8419	32.33	118.6	16.05	15.46	92.51	2.469
#1	.4103	-.0057	.0012	.0061	.0637	-.0004	.0047
#2	.4152	-.0091	.0001	.0048	.0512	-.0017	.0049

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0019	.0019
SDev	.0001	.0003	.0007
%RSD	166.3	16.27	38.85
#1	.0001	.0021	.0024
#2	-.0000	.0017	.0014

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	631833	10000	--	--	--	--	--
SDev	1042.275	.0000000	--	--	--	--	--
%RSD	.1649606	.0000000	--	--	--	--	--
#1	632570	10000	--	--	--	--	--
#2	631096	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 237591 Operator:
Run Time: 11/12/03 13:20:34
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00202	.0493	.0051	.2600	.0561	-.0002	.0119
SDev	.00310	.0069	.0011	.0007	.0006	.0000	.0072
%RSD	153.09	14.05	22.68	.2828	1.071	6.826	60.83
#1	-.00017	.0444	.0043	.2595	.0557	-.0002	.0068
#2	.00421	.0542	.0059	.2606	.0565	-.0003	.0170

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	28.28	.0006	.0051	-.0020	.0019	.0106	9.673
SDev	.00	.0005	.0019	.0007	.0002	.0157	.086
%RSD	.0085	84.89	36.49	34.43	8.137	148.2	.8869
#1	28.29	.0002	.0038	-.0025	.0018	-.0005	9.612
#2	28.28	.0009	.0064	-.0015	.0020	.0216	9.733

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0038	.1041	28.91	.0713	.0048	132.9	83.61
SDev	.0029	.0000	.02	.0001	.0002	.4	.83
%RSD	77.66	.0303	.0711	.1517	4.436	.2764	.9922
#1	.0017	.1041	28.92	.0713	.0047	132.7	83.02
#2	.0058	.1041	28.89	.0714	.0050	133.2	84.20

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	.0420	.0113	-.0092	.0066	43.74	.0086
SDev	.0002	.0031	.0076	.0049	.0059	.22	.0079
%RSD	37.92	7.403	67.53	53.11	89.52	.4929	91.51
#1	-.0006	.0398	.0059	-.0057	.0024	43.59	.0030
#2	-.0004	.0442	.0167	-.0126	.0107	43.90	.0142

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.5	.0182	-.0018	13.65	-.0023	.0049	.0163
SDev	.6	.0069	.0064	.04	.0007	.0019	.0054
%RSD	.5462	37.72	362.7	.2624	30.03	39.59	32.86
#1	104.1	.0134	.0027	13.68	-.0018	.0063	.0126
#2	104.9	.0231	-.0062	13.63	-.0028	.0035	.0201

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4130	-.0082	.0015	.0038	.0917	-.0012	.0104
SDev	.0003	.0020	.0021	.0008	.0509	.0007	.0048
%RSD	.0659	23.82	139.2	20.18	55.49	52.63	45.74
#1	.4128	-.0068	.0000	.0044	.0557	-.0017	.0071
#2	.4132	-.0096	.0029	.0033	.1277	-.0008	.0138

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0013	.0009
SDev	.0002	.0014	.0009
%RSD	288.9	103.5	103.5
#1	-.0002	.0004	.0002
#2	.0001	.0023	.0016

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	638193	10000	--	--	--	--	--
SDev	3464.823	.0000000	--	--	--	--	--
%RSD	.5429115	.0000000	--	--	--	--	--
#1	635743	10000	--	--	--	--	--
#2	640643	10000	--	--	--	--	--

010109

Analysis Report 11/12/03 01:30:08 PM page 1

Method: DAILY1 Sample Name: 237592 Operator:
Run Time: 11/12/03 13:25:27
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00164	.0317	.0005	.2597	.0567	-.0002	.0040
SDev	.00106	.0013	.0001	.0015	.0008	.0000	.0044
%RSD	64.311	4.094	21.14	.5813	1.432	7.928	109.0
#1	-.00089	.0326	.0005	.2608	.0561	-.0002	.0072
#2	-.00239	.0308	.0006	.2586	.0573	-.0002	.0009

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	28.23	-.0001	.0036	-.0004	.0000	.0811	9.735
SDev	.47	.0002	.0000	.0016	.0007	.0431	.082
%RSD	1.681	170.2	.6565	384.2	3641.	53.09	.8402
#1	28.57	.0000	.0036	.0007	.0005	.1116	9.677
#2	27.90	-.0003	.0036	-.0015	-.0005	.0507	9.793

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.1047	28.89	.0712	.0063	133.9	83.95
SDev	.0015	.0006	.12	.0008	.0017	.5	.21
%RSD	208.9	.5375	.4152	1.056	27.38	.3454	.2549
#1	.0018	.1043	28.97	.0718	.0075	133.6	84.11
#2	-.0003	.1051	28.80	.0707	.0051	134.2	83.80

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0338	.0036	-.0027	.0028	44.27	-.0023
SDev	.0006	.0149	.0004	.0009	.0003	.70	.0061
%RSD	81.63	44.00	11.96	31.00	10.52	1.590	263.8
#1	.0012	.0443	.0033	-.0021	.0030	43.77	.0020
#2	.0003	.0233	.0039	-.0033	.0026	44.77	-.0066

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.1	.0123	-.0026	13.73	-.0006	.0024	.0098
SDev	.6	.0011	.0015	.08	.0004	.0014	.0009
%RSD	.6090	8.869	58.77	.5751	68.38	56.87	8.688
#1	104.6	.0115	-.0036	13.79	-.0003	.0014	.0105
#2	103.7	.0131	-.0015	13.68	-.0009	.0034	.0092

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4161	-.0062	-.0005	-.0120	.0422	.0005	.0062
SDev	.0031	.0015	.0013	.0070	.0207	.0019	.0035
%RSD	.7557	23.87	286.8	57.98	49.06	355.9	56.93
#1	.4139	-.0073	.0005	-.0071	.0568	.0019	.0087
#2	.4183	-.0052	-.0014	-.0169	.0276	-.0008	.0037

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0003	.0164	.0022
SDev	.0004	.0007	.0014
%RSD	162.2	4.069	60.79
#1	.0005	.0168	.0032
#2	-.0000	.0159	.0013

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	636258	10000	--	--	--	--	--
SDev	3877.066	.0000000	--	--	--	--	--
%RSD	.6093549	.0000000	--	--	--	--	--
#1	638999	10000	--	--	--	--	--
#2	633516	10000	--	--	--	--	--

Analysis Report 11/12/03 01:35:00 PM page 1

Method: DAILY1 Sample Name: 237593 Operator:
Run Time: 11/12/03 13:30:18
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00062	.0424	.0025	.0028	.0004	-.0002	.0046
SDev	.00057	.0014	.0000	.0013	.0004	.0000	.0009
%RSD	92.255	3.255	.0608	48.32	104.3	11.39	19.21
#1	.00102	.0434	.0025	.0037	.0006	-.0003	.0052
#2	.00021	.0414	.0025	.0018	.0001	-.0002	.0039

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	10.07	.0001	.0038	-.0012	.0035	-.0005	5.243
SDev	.18	.0003	.0008	.0013	.0008	.0320	.112
%RSD	1.809	295.0	21.52	112.7	21.64	6061.	2.128
#1	10.20	.0003	.0043	-.0002	.0041	.0221	5.164
#2	9.939	-.0001	.0032	-.0021	.0030	-.0231	5.322

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0024	.0003	.0645	.0001	-.0013	39.00	24.59
SDev	.0006	.0002	.0472	.0003	.0009	.46	.17
%RSD	26.79	69.60	73.19	372.9	75.37	1.180	.7001
#1	.0029	.0004	.0979	.0003	-.0006	38.67	24.47
#2	.0020	.0001	.0311	-.0001	-.0019	39.32	24.72

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0137	.0015	-.0017	.0030	.1141	.0032
SDev	.0012	.0169	.0001	.0004	.0024	.0768	.0005
%RSD	213.9	123.9	8.580	26.02	82.06	67.32	15.65
#1	.0015	.0256	.0016	-.0020	.0047	.1684	.0035
#2	-.0003	.0017	.0014	-.0014	.0012	.0598	.0028

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	105.3	.0120	.0009	19.38	-.0006	.0046	.0030
SDev	1.3	.0004	.0035	.05	.0003	.0024	.0001
%RSD	1.278	3.234	382.9	.2657	39.79	52.73	1.896
#1	106.2	.0123	.0034	19.42	-.0008	.0063	.0030
#2	104.3	.0117	-.0015	19.34	-.0005	.0029	.0029

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0013	-.0016	.0002	.0055	.0867	-.0001	.0013
SDev	.0006	.0009	.0002	.0028	.0339	.0013	.0003
%RSD	48.08	53.37	122.8	51.06	39.05	1574.	19.83
#1	.0017	-.0010	.0003	.0035	.1107	.0008	.0015
#2	.0008	-.0022	.0000	.0075	.0628	-.0010	.0011

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0020	.0076
SDev	.0003	.0007	.0038
%RSD	676.6	36.49	49.31
#1	.0003	.0025	.0103
#2	-.0002	.0015	.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	643068	10000	--	--	--	--	--
SDev	8172.033	.0000000	--	--	--	--	--
%RSD	1.270787	.0000000	--	--	--	--	--
#1	648847	10000	--	--	--	--	--
#2	637290	10000	--	--	--	--	--

010113

Analysis Report QC Standard 11/12/03 01:43:55 PM page 1

Method: DAILY1 Sample Name: icv/ccv Operator:
Run Time: 11/12/03 13:39:10
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.0296	10.08	5.221	4.925	10.22	Q1.101	5.156
SDev	.0003	.04	.006	.037	.08	.011	.024
%RSD	.02710	.3743	.1090	.7546	.7355	.9566	.4711
#1	1.0294	10.05	5.217	4.899	10.17	1.093	5.139
#2	1.0298	10.11	5.225	4.951	10.28	Q1.108	5.173
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	QC Pass
Value	1.0000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.000	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	20.36	1.027	5.084	2.019	2.097	10.23	18.89
SDev	.11	.003	.013	.006	.011	.01	.17
%RSD	.5416	.2519	.2595	.3181	.5425	.0778	.8972
#1	20.28	1.025	5.075	2.015	2.089	10.22	18.77
#2	20.44	1.029	5.094	2.024	2.105	10.24	19.01
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.103	4.855	20.31	1.043	5.193	Q47.24	27.66
SDev	.047	.035	.05	.005	.056	.22	.18
%RSD	.9286	.7140	.2607	.4323	1.075	.4600	.6572
#1	5.070	4.831	20.27	1.040	5.153	Q47.09	27.54
#2	5.137	4.880	20.34	1.046	5.232	Q47.39	27.79
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	QC Pass
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.999	5.120	5.173	5.226	1.045	1.042	1.054
SDev	.019	.079	.001	.018	.002	.006	.009
%RSD	.3884	1.545	.0243	.3389	.2318	.6159	.8298
#1	4.986	5.064	5.174	5.238	1.043	1.047	1.048
#2	5.013	5.176	5.172	5.213	1.047	1.037	1.060
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.2	5.530	5.494	5.015	5.203	Q5.501	5.061
SDev	.6	.014	.023	.013	.012	.011	.026
%RSD	.5833	.2470	.4123	.2619	.2348	.1916	.5201
#1	100.7	5.520	5.510	5.006	5.212	Q5.508	5.042
#2	101.6	5.539	5.478	5.025	5.194	5.493	5.079
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Fail	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.284	.9618	4.983	Q5.572	1.066	5.137	1.099
SDev	.042	.0057	.015	.037	.014	.010	.007
%RSD	.8025	.5959	.3013	.6722	1.339	.1910	.5948
#1	5.254	.9577	4.972	Q5.546	1.056	5.130	1.094
#2	5.314	.9658	4.993	Q5.598	1.076	5.144	Q1.103
Errors	QC Pass	QC Pass	QC Pass	QC Fail	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	5.108	1.039	4.848
SDev	.017	.003	.034
%RSD	.3245	.3111	.6970
#1	5.097	1.037	4.824
#2	5.120	1.042	4.872
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	618050	10000	--	--	--	--	--
SDev	3573.718	.0000000	--	--	--	--	--
%RSD	.5782247	.0000000	--	--	--	--	--
#1	615523	10000	--	--	--	--	--
#2	620577	10000	--	--	--	--	--

Analysis Report Blank Sample 11/12/03 01:50:50 PM page 1

Method: DAILY1 Sample Name: icb/ccb Operator:
Run Time: 11/12/03 13:46:05
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00015	.0239	.0013	.0140	.0026	-.0001	.0029
SDev	.00153	.0069	.0023	.0013	.0019	.0001	.0037
%RSD	1004.6	28.92	168.3	9.052	73.23	164.5	127.6
#1	-.00093	.0190	-.0003	.0149	.0040	.0000	.0003
#2	.00124	.0288	.0030	.0131	.0013	-.0001	H.0056
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.00500	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.00500	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0095	.0003	.0018	-.0010	-.0002	-.0061	.0332
SDev	.0015	.0004	.0006	.0006	.0005	.0071	.0285
%RSD	15.36	135.9	30.98	55.60	303.8	116.2	85.67
#1	.0106	.0000	.0022	-.0006	.0002	-.0011	.0131
#2	.0085	.0005	.0014	-.0015	-.0006	-.0111	.0534
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0020	.0009	.0057	.0001	H.0081	.0186	H.2237
SDev	.0002	.0004	.0072	.0002	.0029	.0004	.2019
%RSD	11.59	53.20	126.5	286.5	35.76	2.004	90.24
#1	.0018	.0012	.0006	.0002	H.0101	.0184	H.0810
#2	.0021	.0005	.0108	-.0001	H.0061	.0189	H.3665
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass	LC High
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	.0008	.0037	.0085	-.0052	.0047	H.0156	-.0023
SDev	.0008	.0054	.0106	.0073	.0018	.0016	.0020
%RSD	99.88	146.5	124.8	141.7	37.83	10.11	87.52
#1	.0014	-.0001	.0010	.0000	.0034	H.0167	-.0038
#2	.0002	.0075	.0161	-.0104	H.0059	H.0144	-.0009
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC High	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.5	.0097	-.0017	-.0008	-.0006	.0021	.0016
SDev	.3	.0086	.0081	.0048	.0013	.0026	.0026
%RSD	.2555	88.42	469.5	592.7	220.7	123.1	158.7
#1	101.4	.0036	.0040	-.0042	.0003	.0039	-.0002
#2	101.7	.0157	-.0075	.0026	-.0016	.0003	.0034
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0013	-.0039	.0011	.0025	.0323	.0012	.0023
SDev	.0009	.0050	.0002	.0065	.0271	.0018	.0021
%RSD	66.96	129.1	19.28	260.0	83.77	145.9	93.66
#1	.0020	-.0003	.0009	.0071	.0132	.0025	.0008
#2	.0007	-.0074	.0012	-.0021	.0515	-.0000	.0037
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	.0013	.0008	.0020
SDev	.0010	.0003	.0013
%RSD	77.87	39.88	66.09
#1	.0020	.0006	.0029
#2	.0006	.0010	.0011
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	620384	10000	--	--	--	--	--
SDev	1571.898	.0000000	--	--	--	--	--
%RSD	.2533753	.0000000	--	--	--	--	--
#1	619272	10000	--	--	--	--	--
#2	621495	10000	--	--	--	--	--

Analysis Report 11/12/03 01:55:42 PM page 1

Method: DAILY1 Sample Name: 237594 Operator:
Run Time: 11/12/03 13:51:01
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00009	.0347	.0030	.0067	.0003	-.0003	.0064
SDev	.00025	.0019	.0010	.0003	.0001	.0001	.0030
%RSD	279.58	5.559	35.22	4.073	24.67	36.95	46.09
#1	.00027	.0360	.0037	.0069	.0004	-.0003	.0043
#2	-.00009	.0333	.0022	.0065	.0003	-.0002	.0085

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	9.912	-.0000	.0036	-.0015	-.0005	-.0139	5.238
SDev	.032	.0001	.0003	.0003	.0001	.0005	.109
%RSD	.3265	235.7	8.739	19.45	29.81	3.739	2.078
#1	9.889	.0000	.0033	-.0013	-.0006	-.0135	5.161
#2	9.935	-.0001	.0038	-.0017	-.0004	-.0143	5.315

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0018	-.0000	.0103	-.0001	.0002	39.20	24.37
SDev	.0002	.0002	.0006	.0000	.0005	.16	.72
%RSD	9.958	2436.	5.359	28.65	220.5	.3983	2.969
#1	.0017	-.0001	.0106	-.0001	-.0001	39.09	23.85
#2	.0019	.0001	.0099	-.0001	.0006	39.31	24.88

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0182	.0061	-.0046	.0037	.0086	-.0008
SDev	.0002	.0003	.0016	.0005	.0004	.0030	.0013
%RSD	125.3	1.708	25.90	11.66	12.26	34.99	166.7
#1	-.0003	.0180	.0072	-.0042	.0040	.0107	-.0017
#2	-.0000	.0184	.0050	-.0050	.0033	.0065	.0001

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.7	.0135	.0028	19.41	-.0011	.0064	.0016
SDev	.2	.0070	.0051	.01	.0009	.0011	.0006
%RSD	.2383	51.63	183.0	.0324	83.18	17.19	38.48
#1	103.5	.0086	.0064	19.41	-.0004	.0072	.0021
#2	103.8	.0185	-.0008	19.40	-.0017	.0056	.0012

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0025	.0001	.0243	.0637	-.0002	.0010
SDev	.0000	.0005	.0001	.0052	.0021	.0002	.0021
%RSD	5.453	18.87	287.1	21.15	3.321	82.41	215.2
#1	.0006	-.0029	.0002	.0280	.0652	-.0001	-.0005
#2	.0005	-.0022	-.0001	.0207	.0622	-.0003	.0024

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0022	.0052
SDev	.0001	.0009	.0005
%RSD	162.1	42.98	8.902
#1	.0001	.0028	.0055
#2	-.0000	.0015	.0049

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	633282	10000	--	--	--	--	--
SDev	1501.895	.0000000	--	--	--	--	--
%RSD	.2371605	.0000000	--	--	--	--	--
#1	632220	10000	--	--	--	--	--
#2	634344	10000	--	--	--	--	--

Analysis Report QC Standard 11/12/03 02:04:35 PM page 1

Method: DAILY1 Sample Name: icv/ccv Operator:
Run Time: 11/12/03 13:59:51
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.0212	10.12	5.171	4.904	10.32	1.072	5.177
SDev	.0071	.02	.017	.027	.00	.005	.001
%RSD	.69636	.2253	.3325	.5490	.0066	.4490	.0131
#1	1.0162	10.11	5.159	4.885	10.32	1.068	5.177
#2	1.0262	10.14	5.184	4.923	10.32	1.075	5.178
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.0000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.000	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	20.08	1.016	5.041	2.005	2.117	10.16	19.20
SDev	.08	.005	.026	.011	.008	.05	.13
%RSD	.4069	.4691	.5107	.5517	.3961	.5154	.6906
#1	20.02	1.013	5.023	1.997	2.112	10.13	19.11
#2	20.14	1.020	5.059	2.013	2.123	10.20	19.30
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.136	4.937	20.31	1.040	5.155	Q48.09	27.63
SDev	.035	.015	.12	.005	.025	.19	.25
%RSD	.6807	.3019	.5882	.5289	.4773	.4047	.9227
#1	5.160	4.926	20.22	1.036	5.137	Q47.95	27.45
#2	5.111	4.947	20.39	1.044	5.172	Q48.22	27.81
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	QC Pass
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.961	5.172	5.210	5.273	1.047	1.057	1.058
SDev	.013	.011	.059	.022	.004	.008	.002
%RSD	.2532	.2192	1.131	.4252	.4124	.7765	.1447
#1	4.952	5.180	5.168	5.257	1.044	1.051	1.059
#2	4.970	5.164	5.252	5.289	1.050	1.063	1.057
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.00	5.597	5.583	5.021	5.247	Q5.582	5.010
SDev	.10	.072	.054	.032	.035	.060	.029
%RSD	.0992	1.283	.9698	.6326	.6585	1.074	.5764
#1	98.93	5.546	5.545	4.998	5.223	Q5.540	4.990
#2	99.07	5.647	5.621	5.043	5.271	Q5.624	5.031
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Fail	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.313	.9606	4.961	Q5.583	1.052	5.119	1.084
SDev	.034	.0028	.010	.092	.007	.025	.000
%RSD	.6349	.2936	.1966	1.652	.6815	.4982	.0139
#1	5.337	.9586	4.954	Q5.518	1.047	5.101	1.084
#2	5.289	.9626	4.968	Q5.648	1.057	5.137	1.084
Errors	QC Pass	QC Pass	QC Pass	QC Fail	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	5.103	1.020	4.889
SDev	.016	.007	.025
%RSD	.3182	.6929	.5179
#1	5.115	1.015	4.871
#2	5.092	1.025	4.907
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	604808	10000	--	--	--	--	--
SDev	625.7895	.0000000	--	--	--	--	--
%RSD	.1034690	.0000000	--	--	--	--	--
#1	604366	10000	--	--	--	--	--
#2	605251	10000	--	--	--	--	--

010124

Analysis Report Blank Sample 11/12/03 02:11:29 PM page 1

Method: DAILY1 Sample Name: icb/ccb Operator:
Run Time: 11/12/03 14:06:45
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00078	.0276	.0010	.0158	.0029	.0001	H.0095
SDev	.00019	.0107	.0022	.0031	.0021	.0002	.0023
%RSD	24.181	38.72	224.0	19.79	70.71	420.0	24.31
#1	.00091	.0351	.0026	.0180	.0044	.0002	H.0111
#2	.00064	.0200	-.0006	.0136	.0015	-.0001	H.0079
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	.00500	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.00500	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0125	.0004	.0021	-.0009	-.0000	-.0050	.0477
SDev	.0050	.0001	.0014	.0003	.0006	.0002	.0061
%RSD	40.07	36.28	68.09	34.26	3659.	4.767	12.72
#1	.0161	.0004	.0031	-.0007	.0004	-.0049	.0434
#2	.0090	.0003	.0011	-.0011	-.0005	-.0052	.0520
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0028	.0010	.0109	.0001	H.0086	.0208	H.4180
SDev	.0014	.0006	.0055	.0003	.0037	.0030	.0104
%RSD	48.59	55.50	50.47	261.6	43.10	14.34	2.484
#1	.0038	.0014	.0147	.0003	H.0112	.0229	H.4106
#2	.0019	.0006	.0070	-.0001	H.0060	.0187	H.4253
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass	LC High
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	.0007	.0062	.0063	-.0025	.0030	.0014	.0019
SDev	.0013	.0199	.0002	.0009	.0017	.0097	.0001
%RSD	179.8	323.2	2.924	38.12	56.27	669.1	2.918
#1	.0016	H.0202	.0062	-.0018	.0042	-.0054	.0019
#2	-.0002	-.0079	.0064	-.0031	.0018	.0083	.0018
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.5	.0072	-.0003	.0044	.0004	.0022	.0034
SDev	1.6	.0018	.0026	.0036	.0006	.0023	.0045
%RSD	1.525	24.24	784.9	81.62	126.4	105.7	132.3
#1	101.4	.0085	.0015	.0069	.0009	.0038	H.0066
#2	103.6	.0060	-.0022	.0019	.0000	.0006	.0002
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0016	-.0019	.0016	H.0149	.0493	.0011	.0037
SDev	.0011	.0019	.0011	.0047	.0024	.0010	.0032
%RSD	69.20	104.6	69.10	31.40	4.906	88.74	87.18
#1	.0023	-.0005	.0024	H.0182	.0476	.0018	.0060
#2	.0008	-.0032	.0008	H.0116	.0510	.0004	.0014
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	.0015	.0008	.0022
SDev	.0010	.0003	.0010
%RSD	69.86	39.90	47.51
#1	.0022	.0010	.0029
#2	.0007	.0006	.0014
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	626253	10000	--	--	--	--	--
SDev	9543.113	.0000000	--	--	--	--	--
%RSD	1.523843	.0000000	--	--	--	--	--
#1	619505	10000	--	--	--	--	--
#2	633001	10000	--	--	--	--	--

ICP ANALYSIS

K + Na

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.141	Div 20	031106-12	11-24-03	water	SS 124
18023.01.078	Div 18	03113-5	11-24-03	water	NA

INSTRUMENT: Spectro FILENAME: 031124

INSTRUMENT DL:

EVOLUTION by Micro-Active Australia Pty Ltd 2:48:56 PM November 24, 2003

010127

Starting run ...
Creating high priority queue entries ...
BACKGROUND CORRECTED INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:42:30 PM November 24, 2003

	K_766	Li670	Na589	Sc361
# 1	30.0	-14.5	35.5	4974.0
# 2	28.0	-7.5	38.5	4722.0
Mean	29.0	-11.0	37.0	4848.0
SD	1.4	4.9	2.1	178.2
%RSD	4.9	45.0	5.7	3.7

INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:42:30 PM November 24, 2003

	K_766	Li670	Na589	Sc361
# 1	0.0	-0.0	0.0	4974.0
# 2	0.0	-0.0	0.0	4722.0
Mean	0.0	-0.0	0.0	4848.0
SD	0.0	0.0	0.0	178.2
%RSD	1.2	41.7	9.4	3.7

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:45:36 PM November 24, 2003

	K_766	Li670	Na589
# 1	4846.5	39923.0	24769.0
# 2	4736.5	39034.0	24189.0
Mean	4791.5	39478.5	24479.0
SD	77.8	628.6	410.1
%RSD	1.6	1.6	1.7

INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:45:36 PM November 24, 2003

	K_766	Li670	Na589
# 1	1.0	8.1	5.0
# 2	1.0	8.1	5.0
Mean	1.0	8.1	5.0
SD	0.0	0.0	0.0
%RSD	0.0	0.0	0.1

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:48:44 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	1957.5	19923.5	14779.0	4981.0	4981.0
# 2	1906.5	19654.5	14581.0	4914.0	4914.0
Mean	1932.0	19789.0	14680.0	4947.5	4947.5

12/15/03

30 Dec 03

11-24-03

%RSD	1.9	1.0	1.0	1.0	1.0

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV

010128

EVOLUTION by Micro-Active Australia Pty Ltd 2:48:56 PM November 24, 2003

Weight : 1.0000 Volume : 1.00 Printed : 2:48:44 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.8002	4.9387	29.5014	4981.000 H	102.7471
# 2	19.5433	4.9384	29.5030	4914.000 H	101.3632
Mean	19.6718	4.9385	29.5022	4947.500 H	102.0551
SD	0.1816	0.0002	0.0011	47.376	0.9785
%RSD	0.9232	0.0036	0.0039	0.958	0.9588

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

Report name	Low limit	Value	High limit
K_766	18.000	19.672	22.000
Li670	4.500	4.939	5.500
Na589	27.000	29.502	33.000

EVOLUTION by Micro-Active Australia Pty Ltd 2:58:58 PM November 24, 2003 **010129**

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:52:52 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	33.5	-16.0	5.5	5058.5	5058.5
# 2	16.5	-18.0	38.5	4935.5	4935.5
Mean	25.0	-17.0	22.0	4997.0	4997.0
SD	12.0	1.4	23.3	87.0	87.0
%RSD	48.1	8.3	106.1	1.7	1.7

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:52:52 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.0328 L	-0.0011 L	-0.0652	5058.500 H	104.3478
# 2 L	-0.1350 L	-0.0017	0.0017	4935.500 H	101.8073
Mean L	-0.0511 L	-0.0014 L	-0.0318	4997.000 H	103.0776
SD	0.1186	0.0004	0.0473	86.974	1.7964
%RSD	232.1138	30.1289	148.9011	1.741	1.7428

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

Report name	CRDL	Value
K_766	0.100	-0.051
Li670	0.010	-0.001
Na589	0.050	-0.032
Sc361	0.000	103.078

BACKGROUND CORRECTED INTENSITIES
Identity 1 : pbw-124w2 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:56:00 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	10.5	-13.0	44.0	5263.0	5263.0
# 2	18.5	-17.0	22.0	5154.0	5154.0
Mean	14.5	-15.0	33.0	5208.5	5208.5
SD	5.7	2.8	15.6	77.1	77.1
%RSD	39.0	18.9	47.1	1.5	1.5

APPARENT CONCENTRATIONS
Identity 1 : pbw-124w2 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:56:00 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1 L	-0.2040 L	-0.0002	0.0073	5263.000 H	108.5717
# 2 L	-0.1224 L	-0.0013 L	-0.0335	5154.000 H	106.3204
Mean L	-0.1632 L	-0.0008 L	-0.0131	5208.500 H	107.4460
SD	0.0577	0.0007	0.0288	77.075	1.5920
%RSD	35.3462	95.1983	219.5836	1.480	1.4816

EVOLUTION by Micro-Active Australia Pty Ltd 3:05:40 PM November 24, 2003 010130

BACKGROUND CORRECTED INTENSITIES
Identity 1 : lcsw-L24w1 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:59:08 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	1925.5	-24.5	9947.5	5305.0	5305.0
# 2	1891.5	-23.5	9771.5	5201.0	5201.0
Mean	1908.5	-24.0	9859.5	5253.0	5253.0
SD	24.0	0.7	124.5	73.5	73.5
%RSD	1.3	2.9	1.3	1.4	1.4

APPARENT CONCENTRATIONS
Identity 1 : lcsw-L24w1 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:59:08 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	18.2636 L	-0.0029	18.6162	5305.000 H	109.4392
# 2	18.3005 L	-0.0028	18.6526	5201.000 H	107.2911
Mean	18.2820 L	-0.0028	18.6344	5253.000 H	108.3652
SD	0.0261	0.0001	0.0258	73.539	1.5189
%RSD	0.1426	3.0729	0.1383	1.400	1.4017

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237578 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:02:16 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	240.0	342.0	58705.0	5322.0	5322.0
# 2	220.0	332.0	58165.0	5247.0	5247.0
Mean	230.0	337.0	58435.0	5284.5	5284.5
SD	14.1	7.1	381.8	53.0	53.0
%RSD	6.1	2.1	0.7	1.0	1.0

APPARENT CONCENTRATIONS
Identity 1 : 237578 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:02:16 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	2.0011	0.0821 H	109.8836	5322.000 H	109.7904
# 2	1.8391	0.0809 H	110.4294	5247.000 H	108.2412
Mean	1.9201	0.0815 H	110.1565	5284.500 H	109.0158
SD	0.1146	0.0009	0.3860	53.033	1.0954
%RSD	5.9671	1.0572	0.3504	1.004	1.0048

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237579 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:05:24 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	219.5	335.0	58304.0	5564.0	5564.0
# 2	232.5	337.0	58394.0	5489.0	5489.0
Mean	226.0	336.0	58349.0	5526.5	5526.5

%RSD	4.1	0.4	0.1	1.0	1.0

APPARENT CONCENTRATIONS
Identity 1 : 237579 Identity 2 : pg55-124 Type : SAMPLE
EVOLUTION by Micro-Active Australia Pty Ltd 3:15:04 PM November 24, 2003

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Weight : 1.0000 Volume : 1.00 Printed : 3:05:24 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	1.7123	0.0771 H	104.3825	5564.000 H	114.7888
# 2	1.8610	0.0786 H	105.9733	5489.000 H	113.2397
Mean	1.7867	0.0778 H	105.1779	5526.500 H	114.0143
SD	0.1052	0.0010	1.1248	53.033	1.0954
%RSD	5.8870	1.3308	1.0694	0.960	0.9607

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237580 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:08:30 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	218.5	340.0	58357.0	4993.0	4993.0
# 2	223.5	333.0	58374.0	4911.0	4911.0
Mean	221.0	336.5	58365.5	4952.0	4952.0
SD	3.5	4.9	12.0	58.0	58.0
%RSD	1.6	1.5	0.0	1.2	1.2

APPARENT CONCENTRATIONS
Identity 1 : 237580 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:08:30 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	1.9329	0.0868 H	116.4343	4993.000 H	102.9949
# 2	2.0223	0.0865 H	118.4142	4911.000 H	101.3012
Mean	1.9776	0.0867 H	117.4242	4952.000 H	102.1481
SD	0.0633	0.0003	1.4000	57.983	1.1976
%RSD	3.1992	0.2904	1.1923	1.171	1.1724

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237580d Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:11:38 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	207.5	337.5	58017.0	4984.0	4984.0
# 2	215.5	333.5	57989.0	4889.0	4889.0
Mean	211.5	335.5	58003.0	4936.5	4936.5
SD	5.7	2.8	19.8	67.2	67.2
%RSD	2.7	0.8	0.0	1.4	1.4

APPARENT CONCENTRATIONS
Identity 1 : 237580d Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:11:38 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	1.8240	0.0864 H	115.9646	4984.000 H	102.8090
# 2	1.9491	0.0870 H	118.1623	4889.000 H	100.8468
Mean	1.8865	0.0867 H	117.0635	4936.500 H	101.8279
SD	0.0885	0.0004	1.5540	67.175	1.3875

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237581 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:14:46 PM November 24, 2003

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	K_766	Li670	Na589	Sc	Sc361
# 1	351.5	990.5	95345.5	5524.0	5524.0
# 2	357.5	999.5	95358.5	5488.0	5488.0
Mean	354.5	995.0	95352.0	5506.0	5506.0
SD	4.2	6.4	9.2	25.5	25.5
%RSD	1.2	0.6	0.0	0.5	0.5

APPARENT CONCENTRATIONS
Identity 1 : 237581 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:14:46 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	2.9495	0.2241 H	171.9838	5524.000 H	113.9626
# 2	3.0267	0.2275 H	173.1361	5488.000 H	113.2190
Mean	2.9881	0.2258 H	172.5599	5506.000 H	113.5908
SD	0.0547	0.0025	0.8148	25.456	0.5258
%RSD	1.8290	1.0882	0.4722	0.462	0.4629

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237581s Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:17:52 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	2517.5	994.0	104922.0	5546.5	5546.5
# 2	2508.5	988.0	104744.0	5481.5	5481.5
Mean	2513.0	991.0	104833.0	5514.0	5514.0
SD	6.4	4.2	125.9	46.0	46.0
%RSD	0.3	0.4	0.1	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : 237581s Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:17:54 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	22.9157	0.2239 H	188.4974	5546.500 H	114.4273
# 2	23.1071	0.2252 H	190.4098	5481.500 H	113.0848
Mean	23.0114	0.2246 H	189.4536	5514.000 H	113.7561
SD	0.1353	0.0009	1.3523	45.962	0.9493
%RSD	0.5880	0.4004	0.7138	0.834	0.8345

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237582 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:21:02 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	366.0	1032.0	96850.5	5637.0	5637.0
# 2	376.0	1010.0	97816.5	5587.0	5587.0
Mean	371.0	1021.0	97333.5	5612.0	5612.0
SD	7.1	15.6	683.1	35.4	35.4
%RSD	1.9	1.5	0.7	0.6	0.6

Identity 1 : 237582 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:21:02 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361

EVOLUTION by Micro-Active Australia Pty Ltd 3:29:36 PM November 24, 2003

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	ppm	ppm	ppm		ppm
# 1	3.0158	0.2287 H	171.1961	5637.000 H	116.2966
# 2	3.1371	0.2259 H	174.4525	5587.000 H	115.2639
Mean	3.0764	0.2273 H	172.8243	5612.000 H	115.7802
SD	0.0858	0.0020	2.3026	35.355	0.7303
%RSD	2.7880	0.8827	1.3323	0.630	0.6307

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237583 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:24:08 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	351.0	1028.5	97329.0	5645.5	5645.5
# 2	360.0	1017.5	98296.0	5590.5	5590.5
Mean	355.5	1023.0	97812.5	5618.0	5618.0
SD	6.4	7.8	683.8	38.9	38.9
%RSD	1.8	0.8	0.7	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : 237583 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:24:08 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	2.8749	0.2276 H	171.7832	5645.500 H	116.4722
# 2	2.9885	0.2274 H	175.1982	5590.500 H	115.3362
Mean	2.9317	0.2275 H	173.4907	5618.000 H	115.9042
SD	0.0804	0.0002	2.4148	38.891	0.8033
%RSD	2.7414	0.0672	1.3919	0.692	0.6931

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:29:26 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	1940.0	19925.5	14742.5	4999.5	4999.5
# 2	1893.0	19471.5	14387.5	4848.5	4848.5
Mean	1916.5	19698.5	14565.0	4924.0	4924.0
SD	33.2	321.0	251.0	106.8	106.8
%RSD	1.7	1.6	1.7	2.2	2.2

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:29:26 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.5467	4.9209	29.3192	4999.500 H	103.1292
# 2	19.6690	4.9585	29.5048	4848.500 H	100.0103
Mean	19.6079	4.9397	29.4120	4924.000 H	101.5698
SD	0.0865	0.0266	0.1312	106.773	2.2054
%RSD	0.4412	0.5385	0.4462	2.168	2.1713

Identity 1 : CLP_CCV_SC Identity 2 :

Report name	Low limit	Value	High limit
K_766	18.000	19.608	22.000
Li670	4.500	4.940	5.500
Na589	27.000	29.412	33.000

EVOLUTION by Micro-Active Australia Pty Ltd 3:40:12 PM November 24, 2003

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BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:33:40 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	29.5	-13.0	42.5	5111.0	5111.0
# 2	25.5	-10.0	39.5	5071.0	5071.0
Mean	27.5	-11.5	41.0	5091.0	5091.0
SD	2.8	2.1	2.1	28.3	28.3
%RSD	10.3	18.4	5.2	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:33:40 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	L -0.0107	L -0.0003	0.0068	5111.000 H	105.4322
# 2	L -0.0488	0.0004	0.0016	5071.000 H	104.6060
Mean	L -0.0298	0.0000	0.0042	5091.000 H	105.0191
SD	0.0269	0.0005	0.0037	28.284	0.5842
%RSD	90.3636	3604.7288	88.4777	0.556	0.5563

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

Report name	CRDL	Value
K_766	0.100	-0.030
Li670	0.010	0.000
Na589	0.050	0.004
Sc361	0.000	105.019

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237584 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:36:46 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	373.5	559.5	54836.0	5795.5	5795.5
# 2	377.5	547.5	54519.0	5701.5	5701.5
Mean	375.5	553.5	54677.5	5748.5	5748.5
SD	2.8	8.5	224.2	66.5	66.5
%RSD	0.8	1.5	0.4	1.2	1.2

APPARENT CONCENTRATIONS
Identity 1 : 237584 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:36:46 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	2.9912	0.1219 H	94.2448	5795.500 H	119.5704
# 2	3.0814	0.1213 H	95.2456	5701.500 H	117.6288
Mean	3.0363	0.1216 H	94.7452	5748.500 H	118.5996
SD	0.0638	0.0004	0.7077	66.468	1.3729
%RSD	2.1019	0.3681	0.7469	1.156	1.1576

Identity 1 : 237585 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:39:54 PM November 24, 2003

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	K_766	Li670	Na589	Sc	Sc361
EVOLUTION by Micro-Active Australia Pty Ltd 3:40:12 PM November 24, 2003					
# 1	358.5	555.0	54291.5	5753.5	5753.5
# 2	364.5	543.0	54290.5	5701.5	5701.5
Mean	361.5	549.0	54291.0	5727.5	5727.5
SD	4.2	8.5	0.7	36.8	36.8
%RSD	1.2	1.5	0.0	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : 237585 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:39:54 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	2.8818	0.1218 H	93.9899	5753.500 H	118.7029
# 2	2.9648	0.1203 H	94.8461	5701.500 H	117.6288
Mean	2.9233	0.1211 H	94.4180	5727.500 H	118.1659
SD	0.0586	0.0011	0.6054	36.770	0.7595
%RSD	2.0056	0.8828	0.6412	0.642	0.6427

EVOLUTION by Micro-Active Australia Pty Ltd 3:49:34 PM November 24, 2003 **010136**

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237586 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:43:02 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	368.0	554.0	53777.0	5689.5	5689.5
# 2	373.0	544.0	54011.0	5641.5	5641.5
Mean	370.5	549.0	53894.0	5665.5	5665.5
SD	3.5	7.1	165.5	33.9	33.9
%RSD	1.0	1.3	0.3	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : 237586 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:43:02 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.0031	0.1230 H	94.1466	5689.500 H	117.3810
# 2	3.0766	0.1218 H	95.3618	5641.500 H	116.3895
Mean	3.0399	0.1224 H	94.7542	5665.500 H	116.8853
SD	0.0520	0.0008	0.8592	33.941	0.7010
%RSD	1.7097	0.6732	0.9068	0.599	0.5998

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237587 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:46:10 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	360.5	541.5	53959.5	5645.5	5645.5
# 2	355.5	531.5	53837.5	5583.5	5583.5
Mean	358.0	536.5	53898.5	5614.5	5614.5
SD	3.5	7.1	86.3	43.8	43.8
%RSD	1.0	1.3	0.2	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : 237587 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:46:10 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	2.9609	0.1212 H	95.2032	5645.500 H	116.4722
# 2	2.9514	0.1203 H	96.0434	5583.500 H	115.1916
Mean	2.9562	0.1207 H	95.6233	5614.500 H	115.8319
SD	0.0067	0.0006	0.5941	43.841	0.9055
%RSD	0.2281	0.5247	0.6213	0.781	0.7818

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237588 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:49:18 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	368.5	561.0	55038.5	5689.0	5689.0
# 2	382.5	559.0	55275.5	5628.0	5628.0
Mean	375.5	560.0	55157.0	5658.5	5658.5

%RSD	2.6	0.3	0.3	0.8	0.8

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APPARENT CONCENTRATIONS
Identity 1 : 237588 Identity 2 : pg55-124 Type : SAMPLE
EVOLUTION by Micro-Active Australia Pty Ltd 3:59:00 PM November 24, 2003

Weight : 1.0000 Volume : 1.00 Printed : 3:49:18 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	3.0079	0.1245 H	96.3654	5689.000 H	117.3706
# 2	3.1711	0.1254 H	97.8304	5628.000 H	116.1107
Mean	3.0895	0.1249 H	97.0979	5658.500 H	116.7407
SD	0.1154	0.0006	1.0360	43.134	0.8909
%RSD	3.7349	0.4983	1.0669	0.762	0.7632

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237589 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:52:24 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	377.0	538.0	55187.0	5697.0	5697.0
# 2	376.0	535.0	55152.0	5597.0	5597.0
Mean	376.5	536.5	55169.5	5647.0	5647.0
SD	0.7	2.1	24.7	70.7	70.7
%RSD	0.2	0.4	0.0	1.3	1.3

APPARENT CONCENTRATIONS
Identity 1 : 237589 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:52:26 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	3.0796	0.1193 H	96.4898	5697.000 H	117.5359
# 2	3.1309	0.1208 H	98.1528	5597.000 H	115.4704
Mean	3.1053	0.1200 H	97.3213	5647.000 H	116.5031
SD	0.0363	0.0010	1.1759	70.711	1.4605
%RSD	1.1693	0.8368	1.2083	1.252	1.2536

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237590 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:55:32 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	919.5	426.5	46156.0	5639.5	5639.5
# 2	905.5	434.5	45734.0	5496.5	5496.5
Mean	912.5	430.5	45945.0	5568.0	5568.0
SD	9.9	5.7	298.4	101.1	101.1
%RSD	1.1	1.3	0.6	1.8	1.8

APPARENT CONCENTRATIONS
Identity 1 : 237590 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:55:32 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	8.0357	0.0961 H	81.5109	5639.500 H	116.3482
# 2	8.1224	0.1003 H	82.8681	5496.500 H	113.3946
Mean	8.0790	0.0982 H	82.1895	5568.000 H	114.8714
SD	0.0613	0.0030	0.9597	101.116	2.0885

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BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237591 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:58:38 PM November 24, 2003

EVOLUTION by Micro-Active Australia Pty Ltd 4:05:02 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	930.5	448.0	46316.0	5673.5	5673.5
# 2	930.5	445.0	46266.0	5571.5	5571.5
Mean	930.5	446.5	46291.0	5622.5	5622.5
SD	0.0	2.1	35.4	72.1	72.1
%RSD	0.0	0.5	0.1	1.3	1.3

APPARENT CONCENTRATIONS
Identity 1 : 237591 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:58:38 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	8.0849	0.1002 H	81.3031	5673.500 H	117.0505
# 2	8.2385	0.1014 H	82.7034	5571.500 H	114.9437
Mean	8.1617	0.1008 H	82.0032	5622.500 H	115.9971
SD	0.1086	0.0008	0.9902	72.125	1.4897
%RSD	1.3309	0.7853	1.2075	1.283	1.2843

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237592 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:01:46 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	929.5	452.0	46705.0	5769.0	5769.0
# 2	951.5	450.0	46875.0	5654.0	5654.0
Mean	940.5	451.0	46790.0	5711.5	5711.5
SD	15.6	1.4	120.2	81.3	81.3
%RSD	1.7	0.3	0.3	1.4	1.4

APPARENT CONCENTRATIONS
Identity 1 : 237592 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:01:46 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	7.9371	0.0995 H	80.6281	5769.000 H	119.0230
# 2	8.3039	0.1010 H	82.5693	5654.000 H	116.6477
Mean	8.1205	0.1002 H	81.5987	5711.500 H	117.8354
SD	0.2593	0.0011	1.3726	81.317	1.6796
%RSD	3.1934	1.0792	1.6822	1.424	1.4254

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237593 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:04:52 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	610.0	-20.0	15493.5	5731.0	5731.0
# 2	626.0	-19.0	15451.5	5650.0	5650.0
Mean	618.0	-19.5	15472.5	5690.5	5690.5
SD	11.3	0.7	29.7	57.3	57.3
%RSD	1.8	3.6	0.2	1.0	1.0

Identity 1 : 237593 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:04:52 PM November 24, 2003

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	K_766	Li670	Na589	Sc	Sc361
EVOLUTION by Micro-Active Australia Pty Ltd 4:14:40 PM November 24, 2003					
	ppm	ppm	ppm		ppm
# 1	5.1395 L	-0.0015	26.8735	5731.000 H	118.2381
# 2	5.3625 L	-0.0013	27.1858	5650.000 H	116.5651
Mean	5.2510 L	-0.0014	27.0296	5690.500 H	117.4016
SD	0.1577	0.0001	0.2208	57.276	1.1830
%RSD	3.0023	7.7570	0.8169	1.007	1.0077

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 4:10:10 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	1937.5	19830.5	14637.5	4978.5	4978.5
# 2	1899.5	19534.5	14493.5	4872.5	4872.5
Mean	1918.5	19682.5	14565.5	4925.5	4925.5
SD	26.9	209.3	101.8	75.0	75.0
%RSD	1.4	1.1	0.7	1.5	1.5

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 4:10:10 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.6047	4.9181	29.2330	4978.500 H	102.6954
# 2	19.6389	4.9501	29.5760	4872.500 H	100.5060
Mean	19.6218	4.9341	29.4045	4925.500 H	101.6007
SD	0.0241	0.0226	0.2425	74.953	1.5481
%RSD	0.1231	0.4581	0.8248	1.522	1.5238

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

Report name	Low limit	Value	High limit
K_766	18.000	19.622	22.000
Li670	4.500	4.934	5.500
Na589	27.000	29.404	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 4:14:22 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	19.5	-7.0	15.0	5110.0	5110.0
# 2	14.5	5.0	28.0	4995.0	4995.0
Mean	17.0	-1.0	21.5	5052.5	5052.5
SD	3.5	8.5	9.2	81.3	81.3
%RSD	20.8	848.5	42.8	1.6	1.6

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 4:14:24 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	L -0.1108	0.0011 L	-0.0468	5110.000 H	105.4115

Mean	L	-0.1342	0.0026	L	-0.0335	5052.500	H 104.2239
SD		0.0330	0.0021		0.0188	81.317	1.6796
%RSD		24.6224	80.4230		56.1685	1.609	1.6115

EVOLUTION by Micro-Active Australia Pty Ltd 4:24:02 PM November 24, 2003

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

Report name	CRDL	Value	
K_766	0.100	-0.134	Contaminated
Li670	0.010	0.003	
Na589	0.050	-0.034	
Sc361	0.000	104.224	

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237594 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:17:30 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	652.0	-11.0	15874.5	5947.5	5947.5
# 2	645.0	-12.0	15753.5	5854.5	5854.5
Mean	648.5	-11.5	15814.0	5901.0	5901.0
SD	4.9	0.7	85.6	65.8	65.8
%RSD	0.8	6.1	0.5	1.1	1.1

APPARENT CONCENTRATIONS
Identity 1 : 237594 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:17:30 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	5.3026	0.0005	26.5311	5947.500 H	122.7099
# 2	5.3305	0.0003	26.7477	5854.500 H	120.7890
Mean	5.3166	0.0004	26.6394	5901.000 H	121.7495
SD	0.0197	0.0002	0.1532	65.761	1.3583
%RSD	0.3714	44.3237	0.5750	1.114	1.1156

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237907 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:20:38 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	372.5	55.0	36126.5	5791.5	5791.5
# 2	381.5	55.0	35878.5	5691.5	5691.5
Mean	377.0	55.0	36002.5	5741.5	5741.5
SD	6.4	0.0	175.4	70.7	70.7
%RSD	1.7	0.0	0.5	1.2	1.2

APPARENT CONCENTRATIONS
Identity 1 : 237907 Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:20:38 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	2.9846	0.0145 H	62.1064	5791.500 H	119.4878
# 2	3.1233	0.0147 H	62.7646	5691.500 H	117.4223
Mean	3.0540	0.0146 H	62.4355	5741.500 H	118.4550
SD	0.0981	0.0001	0.4654	70.711	1.4605
%RSD	3.2119	0.9957	0.7454	1.232	1.2330

Identity 1 : 237907d Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:23:46 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
EVOLUTION by Micro-Active Australia Pty Ltd 4:32:32 PM November 24, 2003					
# 1	365.5	51.5	36117.5	5844.5	5844.5
# 2	384.5	54.5	36024.5	5725.5	5725.5
Mean	375.0	53.0	36071.0	5785.0	5785.0
SD	13.4	2.1	65.8	84.1	84.1
%RSD	3.6	4.0	0.2	1.5	1.5

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APPARENT CONCENTRATIONS
Identity 1 : 237907d Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:23:46 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	2.8935	0.0137 H	61.5271	5844.500 H	120.5825
# 2	3.1298	0.0145 H	62.6456	5725.500 H	118.1245
Mean	3.0116	0.0141 H	62.0864	5785.000 H	119.3535
SD	0.1671	0.0006	0.7909	84.146	1.7380
%RSD	5.5477	4.3729	1.2738	1.455	1.4562

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 237907s Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:26:54 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	2547.0	67.5	45924.0	5704.0	5704.0
# 2	2569.0	53.5	45827.0	5641.0	5641.0
Mean	2558.0	60.5	45875.5	5672.5	5672.5
SD	15.6	9.9	68.6	44.5	44.5
%RSD	0.6	16.4	0.1	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : 237907s Identity 2 : pg55-124 Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:26:54 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	22.5391	0.0174 H	80.1828	5704.000 H	117.6805
# 2	22.9938	0.0145 H	80.9078	5641.000 H	116.3792
Mean	22.7665	0.0160 H	80.5453	5672.500 H	117.0298
SD	0.3215	0.0021	0.5126	44.548	0.9201
%RSD	1.4122	12.8517	0.6364	0.785	0.7862

SOIL sample spiked with ZOUL ICAL-1 # 4245
DL 11-24-03

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 4:32:12 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	1935.0	19797.0	14632.0	4959.5	4959.5
# 2	1923.0	19514.0	14478.0	4871.5	4871.5
Mean	1929.0	19655.5	14555.0	4915.5	4915.5
SD	8.5	200.1	108.9	62.2	62.2
%RSD	0.4	1.0	0.7	1.3	1.3

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.6552	4.9286	29.3342	4959.500 H	102.3030

EVOLUTION by Micro-Active Australia Pty Ltd 4:42:34 PM November 24, 2003

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# 2	19.8898	4.9459	29.5503	4871.500 H	100.4854
Mean	19.7725	4.9372	29.4423	4915.500 H	101.3942
SD	0.1659	0.0122	0.1528	62.225	1.2853
%RSD	0.8388	0.2477	0.5191	1.266	1.2676

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

Report name	Low limit	Value	High limit
K_766	18.000	19.773	22.000
Li670	4.500	4.937	5.500
Na589	27.000	29.442	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 4:36:24 PM November 24, 2003

	K_766	Li670	Na589	Sc	Sc361
# 1	20.5	-11.5	45.0	5087.0	5087.0
# 2	16.5	-12.5	62.0	5008.0	5008.0
Mean	18.5	-12.0	53.5	5047.5	5047.5
SD	2.8	0.7	12.0	55.9	55.9
%RSD	15.3	5.9	22.5	1.1	1.1

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 4:36:24 PM November 24, 2003

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 L	-0.0999	0.0000	0.0121	5087.000 H	104.9365
# 2 L	-0.1375 L	-0.0003	0.0473	5008.000 H	103.3048
Mean L	-0.1187 L	-0.0001	0.0297	5047.500 H	104.1206
SD	0.0266	0.0002	0.0249	55.861	1.1538
%RSD	22.4109	152.1709	83.8274	1.107	1.1081

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

Report name	CRDL	Value	
K_766	0.100	-0.119	Contaminated
Li670	0.010	-0.000	
Na589	0.050	0.030	
Sc361	0.000	104.121	

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Div. 20
TASK ORDER: 031106-12
SRR: 25200
SDG: 237578
CASE: CNWRA
VTSR: November 06, 2003
PROJECT#: 06002.01.141

Certificates of Analysis

010143

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID
CERTIFICATE OF ANALYSIS

Catalog No. A509

Lot No: 1103070
Release Date: July, 2003
Expiry Date: July, 2006

Tests	Units	Value
Assay	%	69%
Color	APHA	<10
Aluminum	ppb	<0.2
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.2
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.2
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.2
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.2
Zirconium	ppb	<0.1

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

B McKelvey

Dr. B. McKelvey
QA/QC Manager

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

Fisher Chemical
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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/10/03
DATE EXPIRED: 10/10/2013
DATE OPENED: 10/13/03
INORG: 4295-4300 PO: F52242

010144

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A509 **Lot No: 1103050**
Date: May, 2003

Tests	Units	Value
Assay	%	69%
Color	APHA	<10
Aluminum	ppb	<0.2
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.2
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.2
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.2
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.2
Zirconium	ppb	<0.1

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/19/03
DATE EXPIRED: 09/19/2013
DATE OPENED: 09/19/03
INORG: 4035-4040 PO: E52225

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

B McKelvey

Dr. B. McKelvey
QA/QC Manager
Fisher Scientific Chemical Division
Pittsburgh, PA., 15275 Phone (412) 490-8300

Fisher Chemical
A Fisher Scientific Company

010145

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508 **Lot No: 4103030**
Date: March, 2003

Tests	Units	Value
Assay	%	36%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.5
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.1
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.5
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.5
Zirconium	ppb	<0.1

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

B McKelvey

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QA/QC Manager
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Pittsburgh, PA., 15275 Phone (412) 490-8300

Fisher Chemical
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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/10/03
DATE EXPIRED: 10/10/2013
DATE OPENED: 10/13/03
INORG: 4289-4294 PO: F52242

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508 **Lot No: 4102110**
Date: December, 2002

Tests	Units	Value
Assay	%	36%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.5
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.1
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.5
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.5
Zirconium	ppb	<0.1

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/10/03
DATE EXPIRED: 09/10/2013
DATE OPENED: 09/17/03
INORG: 4247-4252 PO: F52228

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

B McKelvey

Dr. B. McKelvey
QA/QC Manager

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

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/3/03
DATE EXPIRED: 12/3/2004 DK
DATE OPENED: 11/3/03
NORG: 4306 PO: 25861

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Certificate of Reference Material

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

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

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

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

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

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

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/5/03
DATE EXPIRED: 09/15/2004
DATE OPENED: 09/16/03
INORG: 4945 PO: 53228

SPEXertificate™

Certificate of Reference Material

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

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

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

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

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

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

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010149

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 Scandium IN 5% HNO_3 (abs)

Catalog Number: CGSC1-1and CGSC1-5

Lot Number: **W-SC02055**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/24/03
DATE EXPIRED: 10/01/2004
DATE OPENED: 09/24/03
INORG: 4201 PO: E52232

Starting Material:	Sc_2O_3
Starting Material Purity:	99.99%
Starting Material Lot No:	632-5721

CERTIFIED CONCENTRATION: 1000 ± 5 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1000 ± 5 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 995 ± 5 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3148a.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm .

O	Al	<0.070
M	Sb	<0.000050
M	As	<0.0010
M	Ba	<0.0010
M	Be	<0.000050
M	Bi	0.0043
O	B	<0.020
M	Cd	<0.00030
O	Ca	0.016
M	Ce	<0.00050
M	Cs	<0.000030
M	Cr	<0.00050
M	Co	<0.00030
M	Cu	<0.00060
M	Dy	<0.00060
M	Er	<0.00050
M	Eu	<0.00030
M	Gd	<0.00010
M	Ga	<0.00010
M	Ge	<0.00060
M	Au	<0.00030
M	Hf	0.0030
M	Ho	<0.000050
M	In	<0.00010
M	Ir	<0.00050
O	Fe	<0.16
M	La	<0.000050
M	Pb	0.00050
M	Li	<0.0010
M	Lu	<0.000040
M	Mg	<0.0030
M	Mn	<0.00040
O	Hg	i
M	Mo	<0.00020
M	Nd	<0.00020
O	Ni	<0.084
M	Nb	<0.000050
n	Os	
M	Pd	<0.00050
O	P	i
M	Pt	<0.00020
O	K	<5.01
M	Pr	<0.000030
M	Re	<0.00010
M	Rh	<0.00010
M	Rb	<0.00010
M	Ru	<0.00020
M	Sm	<0.00010
s	Sc	
O	Se	<0.67
O	Si	<0.034
M	Ag	0.0050
O	Na	<0.16
M	Sr	<0.000050
n	S	
M	Ta	<0.00070
M	Te	<0.0030
M	Tb	<0.000030
M	Ti	<0.00010
M	Th	0.0028
M	Tm	<0.000040
M	Sn	<0.00050
M	Ti	<0.0050
M	W	<0.0010
M	U	<0.00020
M	V	<0.00020
M	Yb	<0.00010
M	Y	<0.0040
M	Zn	0.0075
M	Zr	0.032

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.038 g/mL

QA:KL Rev.031303JTS

Paul R. Gaines

Quality Assurance Manager Expires: EXPIRES 01/2004

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
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010150

certificate of analysis

CUSTOM-GRADE SOLUTION

10,000 µg/mL Scandium IN 5% HNO_3 (abs)

Catalog Number: CGSC10-1and CGSC10-5

Lot Number: **T-SC02053**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/24/03
DATE EXPIRED: 10/01/2004
DATE OPENED: 09/24/03
INORG: 4260 PO: F52030

Starting Material:	Sc_2O_3
Starting Material Purity:	99.999%
Starting Material Lot No:	632-5721

CERTIFIED CONCENTRATION: 10,047 ± 29 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 10,047 ± 29 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 9994 ± 41 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3148a.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm .

O	Al	<0.070	M	Dy	<0.0060	M	Li	<0.010	M	Pr	<0.00030	M	Te	<0.030
M	Sb	<0.00050	M	Er	<0.0050	M	Lu	<0.00040	M	Re	<0.0010	M	Tb	<0.00030
M	As	<0.010	M	Eu	<0.0030	M	Mg	<0.030	M	Rh	<0.0010	M	Tl	<0.0010
M	Ba	<0.010	M	Gd	<0.0010	M	Mn	<0.0040	M	Rb	<0.0010	M	Th	0.028
M	Be	<0.00050	M	Ga	<0.0010	i	Hg		M	Ru	<0.0020	M	Tm	<0.00040
M	Bi	0.043	M	Ge	<0.0060	M	Mo	<0.0020	M	Sm	<0.0010	M	Sn	<0.0050
O	B	<0.034	M	Au	<0.0030	M	Nd	<0.0020	s	Sc		n	Ti	
M	Cd	<0.0030	M	Hf	0.030	O	Ni	<0.084	O	Se	<0.67	M	W	<0.010
O	Ca	0.17	M	Ho	<0.00050	M	Nb	<0.00050	O	Si	<0.034	M	U	<0.0020
M	Ce	<0.0050	M	In	<0.0010	n	Os		M	Ag	0.0050	M	V	<0.0020
M	Cs	<0.00030	M	Ir	<0.0050	M	Pd	<0.0050	O	Na	<0.16	M	Yb	<0.0010
M	Cr	<0.0050	O	Fe	<0.16	i	P		M	Sr	<0.00050	M	Y	<0.040
M	Co	<0.0030	M	La	<0.00050	M	Pt	<0.0020	n	S		M	Zn	0.075
M	Cu	<0.0060	M	Pb	0.0050	O	K	<5.01	M	Ta	<0.0070	M	Zr	0.32

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.073 g/mL

(over)

QA:KL Rev.021203DN

Paul R. Haines

Quality Assurance Manager

Expires:

EXPIRES
01/2004

010151

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Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/20/03
DATE EXPIRED: 06/30/2004
DATE OPENED: 06/23/03
INORG: 4139 PO: F52370

Catalog Number: PLB9-2X/2Y/2T **Lot No.** 9-143B

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 relevent to the certified properties listed below.

Certified Value: 999.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3107

The CRM is prepared gravimetrically using high purity (NH4)2(B4O7)-4H2O Lot# 08001E. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

Method: Titration with Sodium Hydroxide using Phenolphthalein as indicator. Sodium Hydroxide standardized against Potassium Biphthalate NIST SRM #84K.

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.000 @ 23.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.06	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.001	Re	<0.001
Ag	<0.002	Ga	<0.001	Rb	<0.001
Ba	<0.001	In	<0.001	Sr	<0.001
Be	<0.001	K	<0.01	Sb	<0.001
Bi	<0.001	Li	<0.001	Sn	<0.001
Cd	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.003	Mg	<0.001	V	0.004
Cr	<0.003	Na	0.026	Zr	<0.001
		Ni	<0.001	Zn	<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: JUN '03 Certifying Officer: N. Kocherakota

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Certificate of Reference Material

Catalog Number: PLLI2-2X/2Y **Lot No.** 9-102LI

Description: 1000 mg/L Lithium

Matrix: 2% HNO3

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

Certified Value: 1002 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3129a

The CRM is prepared gravimetrically using high purity Lithium 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: 1002 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 1.014 @ 24.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.009	Cu	0.01	Pb	0.001
As	0.004	Fe	0.045	Re	0.002
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.004	In	<0.001	Sr	0.001
Ba	0.004	K	0.05	Sb	0.002
Be	0.002	Mn	<0.001	Sn	<0.001
Bi	<0.001	Mo	0.002	Ti	0.005
Ca	0.03	Mg	0.003	Tl	<0.001
Cr	<0.001	Na	0.02	V	<0.001
Cd	<0.001	Ni	<0.001	Zr	<0.001
Co	0.002			Zn	0.20

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: MAY '03 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/12/03
DATE EXPIRED: 05/15/2004
DATE OPENED: 05/12/03
INORG: 4065 PO: F52181

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/12/03
DATE EXPIRED: 05/15/2004
DATE OPENED: 05/12/03
INORG: 4066 PO: F52181

Catalog Number: PLMO9-2X/2Y/2T **Lot No.** 9-49MO
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 relevent to the certified properties listed below.

Certified Value: 1000 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3134

The CRM is prepared gravimetrically using high purity Ammonium Molybdate Lot# 03011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 0.9987 @ 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	0.004	Pb	0.001
As	0.04	Fe	<0.01	Re	0.03
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.003	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.02	Sb	<0.001
Be	<0.001	Li	<0.001	Sn	<0.001
Bi	<0.001	Mg	0.007	Ti	0.004
Ca	0.006	Mn	<0.001	Tl	<0.001
Cr	<0.005	Na	0.009	V	0.004
Cd	<0.05	Ni	<0.001	Zr	<0.001
Co	<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.

Date of Certification: MAY '03 Certifying Officer: N. Kocherlakota

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/31/03
DATE EXPIRED: 10/31/2004 DK
DATE OPENED: 11/3/03
INORG: 4307 PO: F52261

010154

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLP9-2X/2Y/2T **Lot No.** 9-150P

Description: 1000 mg/L Phosphorus

Matrix: H2O

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

Certified Value: 1002.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3139a

The CRM is prepared gravimetrically using high purity (NH4)H2(PO4) Lot# W1002B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 0.9996 @ 24.0 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	<0.001	Pb	<0.001
As	0.001	Fe	<0.001	Rb	<0.001
Ag	<0.002	Ga	<0.001	Re	<0.001
B	<0.002	In	<0.001	Sn	<0.001
Ba	<0.001	K	0.006	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.004
Bi	<0.001	Mg	<0.001	Ti	0.004
Ca	0.004	Mn	<0.001	Tl	<0.001
Cr	<0.008	Mo	<0.001	V	<0.006
Cd	<0.001	Na	0.003	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	0.07

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

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

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Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/05/03
DATE EXPIRED: 08/30/2004
DATE OPENED: 09/05/03
INORG: 4232 PO: 55225

Catalog Number: PLSI9-2X/2Y/2T **Lot No.** 10-07SI

Description: 1000 mg/L Silicon

Matrix: H2O / 0.4% F-

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

Certified Value: 998.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM #3150

The CRM is prepared gravimetrically using high purity (NH4)2SiF6 Lot# 02021D. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Precipitation using Ammonium Molybdate and 8-Hydroxy Quinoline. Filter, dry, and weigh as (C9H7ON)4(H4)[Si(Mo12O40)]

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 26.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.020	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.003	In	<0.001	Sr	<0.001
Ba	<0.001	K	<0.010	Sb	0.03
Be	<0.001	Li	<0.001	Ti	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.018	Mn	<0.001	V	<0.001
Cr	<0.002	Mo	<0.001	Zr	0.05
Cd	<0.001	Na	0.02	Zn	0.06
Co	<0.001	Ni	0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: AUG '03 Certifying Officer: N. Kocherlakota

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Catalog Number: PLTI9-2X/2Y/2T **Lot No.** 10-38TI

Description: 1000 mg/L Titanium

Matrix: H2O/ 0.24% F-

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

Certified Value: 1001 mg/L

Uncertainty Associated with Measurement: 3.0mg/L

Certified Value is Traceable to: NIST SRM #3162a

The CRM is prepared gravimetrically using high purity (NH4)2TiF6 Lot# 02021E. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

Method: Precipitation using Ammonium Hydroxide. Filter, ignite, and weigh as TiO2.

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.001 @ 22.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.006	Cu	<0.10	Pb	<0.001
As	<0.001	Fe	<0.01	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	0.003	In	<0.001	Si	0.52
Ba	<0.001	K	<0.01	Sr	0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.013	Mn	<0.001	V	<0.001
Cr	<0.003	Mo	<0.001	Zr	0.01
Cd	<0.001	Na	0.02	Zn	0.03
Co	0.002	Ni	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

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Catalog Number: PLSR2-2X/2Y/2T **Lot No.** 9-166SR

Description: 1000 mg/L Strontium in 2% HNO3

Matrix: 2% HNO3

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

Certified Value: 1002.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3153a

The CRM is prepared gravimetrically using high purity Strontium Carbonate Lot# 02001B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.010 @ 22.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.001	Rb	<0.001
Ag	<0.002	Ga	<0.001	Re	<0.001
B	<0.003	In	<0.001	Si	0.043
Ba	0.008	K	0.10	Sb	<0.001
Be	<0.001	Li	0.007	Ti	<0.002
Bi	<0.001	Mg	<0.003	Tl	<0.001
Ca	0.014	Mn	<0.001	V	<0.001
Cr	0.001	Mo	<0.001	Zr	<0.001
Cd	<0.001	Na	0.01	Zn	0.04
Co	<0.001	Ni	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

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Catalog Number: PLSN5-2X/2Y/2T **Lot No.** 9-62SN

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 relevent to the certified properties listed below.

Certified Value: 1000 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3161a

The CRM is prepared gravimetrically using high purity Tin Metal Lot# 02891N. 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 Ammonium Hydroxide. Filter, ignite, and weigh as SnO2.

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.034 @ 24.8 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.007	Cu	<0.001	Pb	0.001
As	0.01	Fe	0.02	Rb	<0.001
Ag	0.002	Ga	<0.001	Re	<0.001
B	<0.03	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.10	Sb	0.002
Be	<0.001	Li	<0.001	Ti	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.004	Mn	<0.001	V	<0.001
Cr	<0.005	Mo	<0.001	Zr	<0.001
Cd	<0.001	Na	0.02	Zn	0.03
Co	0.008	Ni	<0.01		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

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Catalog Number: PLBI4-2X/2Y **Lot No.** 9-36BI

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 relevent to the certified properties listed below.

Certified Value: 1001 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3106

The CRM is prepared gravimetrically using high purity Bismuth Metal Lot# 04941B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.052 @ 23.1 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	0.034	Pb	0.006
As	<0.001	Fe	0.001	Re	<0.001
Ag	0.002	Ga	<0.001	Rb	<0.001
B	<0.04	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.001	Sb	<0.001
Be	<0.001	Li	<0.001	Sn	<0.001
Cd	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.006	Mg	<0.001	V	<0.002
Cr	<0.005	Na	0.005	Zr	<0.001
		Ni	<0.001	Zn	0.02

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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Catalog Number: PLLA2-2X/2Y **Lot No.** 10-17LA
Description: 1000 mg/L Lanthanum
Matrix: 2% HNO3

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

Certified Value: 996.5 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3127a

The CRM is prepared gravimetrically using high purity Lanthanum Oxide Lot# 06981D. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 995 mg/L

Uncertified Properties:

Density: 1.010 @ 23.8 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.009	Lu	<0.001	Tm	<0.001
Ca	0.05	Mn	<0.001	Ti	<0.001
Dy	<0.001	Mo	<0.001	Tb	<0.001
Er	<0.001	Nd	<0.001	Ta	<0.001
Eu	<0.001	Ni	<0.001	Tl	<0.001
Fe	0.006	Na	0.006	V	<0.001
Gd	<0.2	Pr	<0.001	W	<0.001
Ga	<0.001	Rb	<0.001	Y	<0.001
Hf	<0.001	Sc	<0.003	Yb	<0.001
Ho	<0.001	Sm	<0.001	Zr	<0.001
In	<0.001	Th	<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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Catalog Number: PLY2-2X/2Y/2T **Lot No.** 9-152Y
Description: 1,000 mg/L Yttrium
Matrix: 2% HNO3

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

Certified Value: 1001.5 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3167a.

The CRM is prepared gravimetrically using high purity Yttrium Oxide Lot# 08001A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.010 @ 24.8 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	<0.001	La	<0.001	Tb	<0.001
Ca	0.007	Lu	<0.001	Tm	<0.001
Dy	<0.001	Mn	<0.001	Tl	<0.001
Er	<0.001	Mo	<0.001	Th	<0.001
Eu	<0.001	Nd	<0.001	Ta	<0.001
Fe	0.003	Ni	<0.001	Ti	<0.001
Gd	<0.001	Na	0.005	V	<0.001
Ga	<0.001	Pr	<0.001	W	<0.001
Hf	<0.001	Rb	<0.001	Yb	<0.001
Ho	<0.001	Sc	<0.001	Zr	0.003
In	<0.001	Sm	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

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Catalog Number: PLPD3-2X/2Y **Lot No.** 9-74PD

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 relevent to the certified properties listed below.

Certified Value: 995 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3138

The CRM is prepared gravimetrically using high purity Palladium Powder Lot# 07991E. 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: 990 mg/L

Method: Precipitation using dimethyl glyoxime,filter,dry and weigh as Pd(C4H702N2)2.

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.025 @ 26.3 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	<0.004	Cr	<0.009	Pt	<0.004
Au	0.03	Fe	0.02	Re	<0.001
Ag	0.007	Ga	<0.001	Rh	0.002
B	<0.05	Ir	<0.001	Rb	<0.001
Be	<0.002	In	<0.001	Ru	<0.001
Bi	<0.001	Mg	<0.005	Sn	0.08
Ca	0.02	Mn	<0.001	Te	<0.001
Cd	<0.001	Na	<0.03	Ti	<0.001
Co	<0.001	Ni	0.004	W	<0.001
Cu	<0.006	Pb	<0.04	Zr	<0.001
				Zn	0.16

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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Catalog Number: PLS9-2X/2Y/2T **Lot No.** 8-74S
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 relevent to the certified properties listed below.

Certified Value: 1003 mg/L
Uncertainty Associated with Measurement: +/- 3 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 BaS04.

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.007 @ 23.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	<0.001	Cu	<0.001	Pb	0.002
As	<0.001	Fe	0.008	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Sn	<0.001
Ba	<0.001	K	<0.001	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	0.005	Ti	<0.002
Ca	0.009	Mn	<0.001	Tl	<0.001
Cr	<0.004	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.02	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	0.0075

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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Catalog Number: PLTH2-2X/2Y **Lot No.** 10-24TH

Description: 1000 mg/L Thorium

Matrix: 2% HNO3

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

Certified Value: 999 mg/L

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

Certified Value is Traceable to: NIST SRM #3159

The CRM is prepared gravimetrically using high purity Th(NO3)4-4H2O Lot# 01851R. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.010 @ 22.0 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.01	La	0.003	Tb	<0.001
Ca	0.27	Lu	<0.001	Tm	<0.001
Dy	<0.001	Mn	<0.001	Ti	<0.002
Er	<0.001	Mo	<0.001	Ta	<0.001
Eu	<0.001	Nd	0.003	Tl	<0.001
Fe	<0.01	Ni	<0.001	V	<0.001
Gd	<0.001	Na	0.04	W	<0.001
Ga	<0.001	Pr	<0.001	Y	0.002
Hf	<0.001	Rb	<0.001	Yb	<0.001
Ho	<0.001	Sc	<0.03	Zr	<0.001
In	<0.001	Sm	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

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INORG: 4142 PO: F52370

Catalog Number: PLU2-2X/2Y **Lot No.** 9-179U

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 relevent to the certified properties listed below.

Certified Value: 999.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3164.

The CRM is prepared gravimetrically using high purity Uranium Oxide Lot# 04001D. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 23.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.005	Cu	0.02	Pb	0.004
As	0.06	Fe	0.011	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.005	In	<0.001	Si	<0.10
Ba	0.004	K	0.008	Sr	0.003
Be	<0.001	Li	<0.001	Sb	0.003
Bi	<0.001	Mg	0.003	Ti	<0.001
Ca	0.012	Mn	0.003	Tl	<0.001
Cr	<0.010	Mo	0.006	V	<0.003
Cd	<0.001	Na	0.10	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	0.008

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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Catalog Number: PLW9-2X/2Y **Lot No.** 9-177W

Description: 1000 mg/L Tungsten

Matrix: H2O

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

Certified Value: 1,000 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3163

The CRM is prepared gravimetrically using high purity Ammonium Tungstate Lot# 02001H. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: Fume with Sulfuric Acid to dryness. Ignite and weigh as WO3.

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 0.9979 @ 23.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	<0.001	Pb	<0.001
As	0.01	Fe	<0.01	Rb	<0.001
Ag	<0.003	Ga	<0.001	Re	0.004
B	<0.005	In	<0.001	Si	.56
Ba	<0.001	K	0.05	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.001
Bi	<0.001	Mg	<0.001	Ti	<0.001
Ca	0.009	Mn	<0.001	Tl	<0.001
Cr	<0.001	Mo	0.005	V	0.001
Cd	<0.001	Na	0.03	Zr	<0.001
Co	0.001	Ni	<0.001	Zn	0.01

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: AUG '03 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/11/03
DATE EXPIRED: 08/15/2004
DATE OPENED: 08/13/03
INORG: 4212 PO: E52218

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SPEXertificate™

010167

Certificate of Reference Material

Catalog Number: PLZR2-2X/2Y/2T **Lot No.** 10-05ZR

Description: 1000 mg/L Zirconium

Matrix: 2% HNO3

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

Certified Value: 997 mg/L

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

Certified Value is Traceable to: NIST SRM 3169

The CRM is prepared gravimetrically using high purity Zirconyl Nitrate Lot# 11011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Evaporate to dryness. Fume with Sulfuric Acid. Ignite and weigh as ZrO2.

Instrumentation Analysis By ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.010 @ 23.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.03	Cu	0.002	Pb	0.002
As	<0.001	Fe	0.017	Rb	<0.001
Ag	<0.05	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Si	0.10
Ba	<0.001	K	0.10	Sr	<0.001
Be	<0.001	Li	0.002	Sb	<0.001
Bi	<0.001	Mg	0.003	Ti	<0.001
Ca	0.11	Mn	<0.001	Tl	<0.001
Cr	<0.009	Mo	<0.001	V	<0.001
Cd	0.004	Na	0.04	Zn	0.02
Co	<0.001	Ni	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: AUG '03 Certifying Officer: N. Kocherlakota

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DATE OPENED: 08/13/03
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Certificate of Reference Material

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DATE RECEIVED: 02/13/03
DATE EXPIRED: 02/15/2004
DATE OPENED: 02/13/03
INORG: 3951 PO: F52060

Catalog Number: PLNA2-3X/3Y **Lot No.** T8-73NA

Description: 10,000 mg/L Sodium

Matrix: 5% HNO3

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

Certified Value: 10,036.5 mg/L

Uncertainty Associated with Measurement: +/- 30 mg/L

Certified Value is Traceable to: NIST SRM 3152a

The CRM is prepared gravimetrically using high purity Sodium Carbonate Lot# 02021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 10,039 mg/L

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

Instrumentation Analysis By ICP spectrometer: 10,034 mg/ L

Uncertified Properties:

Density: 1.048 @ 23.9 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	<0.002	Pb	<0.001
As	<0.08	Fe	0.03	Re	<0.001
Ag	<0.02	Ga	<0.001	Rb	<0.001
B	<0.1	In	<0.001	Sr	<0.001
Ba	0.008	K	1.36	Sb	<0.001
Be	<0.01	Li	<0.002	Sn	<0.001
Bi	<0.001	Mg	0.60	Ti	<0.03
Ca	0.60	Mn	<0.02	Tl	<0.001
Cr	0.002	Mo	<0.001	V	<0.001
Cd	<0.01	Ni	<0.003	Zr	<0.001
Co	<0.001			Zn	<0.05

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: FEB -- '03 Certifying Officer: N. Kocherlakota

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/19/02
DATE EXPIRED: 11/30/2003
DATE OPENED: 11/19/02
INORG: 3723 PO: F52064

SPECertificate™ 010169

Certificate of Reference Material

Catalog Number: ICV-2A **Lot No.:** 22-12AS
Description: **Initial Calibration Verification Standard II**
Matrix: 5% Nitric Acid

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM	Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	2,000	2,005.40	3109a	Ni	500	500.58	3136
K	2,000	1,997.89	3141a	V	500	504.23	3165
Mg	2,000	1,992.26	3131a	Cr	200	203.21	3112a
Na	2,000	1,992.99	3152a	Cu	200	199.75	3114
Al	1,000	1,005.90	3101a	Ag	100	100.46	3151
Ba	1,000	1,001.51	3104a	Be	100	100.04	3105a
Fe	1,000	1,003.17	3126a	Mn	100	100.64	3132
Co	500	505.10	3113	Zn	100	100.52	3168a

Spex Reference Multi: Lot #4-63BD, 14-125AS

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

Date of Certification: NOV -- '02 Certifying Officer: N. Kocherlakota

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/19/02
DATE EXPIRED: 11/30/2003 DK
DATE OPENED: 11/19/02
INORG: 3224 PO: F52064

SPECertificate™ 010170

Certificate of Reference Material

Catalog Number: PLSB7-2X/2Y/2T **Lot No.:** 8-175SB-X/Y/T
Description: 1000 mg/L Antimony
Matrix: Water/0.6% Tartaric Acid/tr HNO_3

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: Antimony(Sb): 999 mg/L ± 3 mg/L
Traceable to: NIST SRM 3102a

The CRM is prepared gravimetrically using high purity Antimony Metal (Sb) Lot#R1198A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.
Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L
Method: Gravimetric analysis by evaporating to dryness, fuming with Nitric Acid, igniting and weighing as Sb_2O_4.
Instrumental Analysis by ICP spectrometer: 1000 mg/L
Uncertified Properties:
Density: 1.007 at 24.0°C

Trace Metallic Impurities in the Actual Solution via ICP Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ag	<0.001	Cu	<0.001	Pb	<0.001
Al	0.030	Fe	0.013	Rb	<0.001
As	0.001	Ga	<0.001	Re	<0.001
B	<0.001	In	<0.001	Sn	<0.001
Ba	<0.001	K	0.030	Sr	<0.001
Be	<0.001	Li	<0.001	Ti	0.001
Bi	<0.001	Mg	0.003	Tl	<0.001
Ca	0.012	Mn	<0.001	V	<0.001
Cd	<0.001	Mo	<0.001	Zn	<0.010
Co	<0.001	Na	0.005	Zr	<0.001
Cr	<0.001	Ni	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable to +/- 0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: NOV -- '02 Certifying Officer: N. Kocherlakota

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DATE EXPIRED: 11/30/2003
DATE OPENED: 11/19/02
INORG: 3775 PO: F54464

SPECertificate™

Certificate of Reference Material

Catalog Number: ICV-2C **Lot No.:** 22-13AS
Description: **Initial Calibration Verification Standard II**
Matrix: 5% Nitric Acid

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
As	500	497.85	3103a
Pb	500	495.41	3128
Se	500	501.98	3149
TL	500	501.89	3158
Cd	100	99.77	3108

Spex Reference Multi: Lot #4-51BDREF, 15-39AS, 11-173AS

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

Date of Certification: NOV -- '02 Certifying Officer: N. Kocherlakota

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

Catalog Number:	CGAL10-1 and CGAL10-5
Lot Number:	**W-AL04008**
Starting Material:	Al metal
Starting Material Purity (%):	99.998460
Starting Material Lot No	607116
Matrix:	5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004
DATE OPENED: 08/26/03
INORG: 4220 PO: F52224

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10070 ± 31 µg/mL

Certified Density: 1.059 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

Uncertainty (±) = $\frac{2[(\sigma s)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10006 ± 55 µg/mL**
ICP Assay NIST SRM 3101a Lot Number: 992003

Assay Method #2 **10070 ± 31 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

S	Al		M	Dy	< 0.02695	O	Li	0.00011	M	Pr	< 0.00135	M	Te	< 0.13473
M	Sb	< 0.00225	M	Er	< 0.02245	M	Lu	< 0.00180	M	Re	< 0.00449	M	Tb	< 0.00135
M	As	< 0.04491	M	Eu	< 0.01347	O	Mg	0.00470	M	Rh	< 0.00449	M	Tl	< 0.00449
M	Ba	< 0.04491	M	Gd	< 0.00449	M	Mn	< 0.01796	M	Rb	< 0.00449	M	Th	< 0.00449
O	Be	< 0.00017	M	Ga	< 0.00449	O	Hg	< 0.00700	M	Ru	< 0.00898	M	Tm	< 0.00180
M	Bi	< 0.00180	M	Ge	< 0.02695	M	Mo	< 0.00898	M	Sm	< 0.00449	M	Sn	< 0.02245
O	B	0.01164	M	Au	< 0.01347	M	Nd	< 0.00898	M	Sc	< 0.04491	M	Ti	< 0.22454
M	Cd	< 0.01347	M	Hf	< 0.00898	O	Ni	< 0.00600	M	Se	< 0.03593	M	W	< 0.04491
O	Ca	0.01903	M	Ho	< 0.00225	M	Nb	< 0.00225	O	Si	0.07389	M	U	< 0.00898
M	Ce	< 0.02245	O	In	< 0.03000	n	Os		M	Ag	< 0.00898	M	V	< 0.00898
M	Cs	< 0.00135	M	Ir	< 0.02245	M	Pd	< 0.02245	O	Na	0.03359	M	Yb	< 0.00449
O	Cr	0.00336	O	Fe	0.00493	O	P	< 0.03000	M	Sr	< 0.00225	M	Y	< 0.17963
M	Co	< 0.01347	M	La	< 0.00225	M	Pt	< 0.00898	O	S	< 0.10000	M	Zn	< 0.08982
M	Cu	< 0.02695	M	Pb	< 0.01347	O	K	0.02911	M	Ta	< 0.03144	M	Zr	< 0.02245

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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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 - 26.98154; +3; 6; $Al(H_2O)_6^{+3}$

Chemical Compatibility - Soluble in HCl, HNO_3, HF and H_2SO_4. Avoid neutral media. Soluble in strongly basic NaOH forming the $Al(OH)_4(H_2O)_2^{-}$ species. Stable with most metals and inorganic anions. The phosphate is insoluble in water and only slightly soluble in acid.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Al Containing Samples (Preparation and Solution) - Metal (Best dissolved in HCl / HNO_3); α- Al_2O_3 (Na_2CO_3 fusion in Pt^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 at ≈ conc.)
ICP-OES 394.401 nm	0.05 / 0.006 µg/mL	1	atom	U, Ce
ICP-OES 396.152 nm	0.03 / 0.006 µg/mL	1	atom	Mo, Zr, Ce
ICP-OES 167.078 nm	0.1 / 0.009 µg/mL	1	ion	Fe
ICP-MS 27 amu	30 ppt	n/a	M'	$^{12}C^{15}N$, $^{13}C^{14}N$, $^{1}H^{12}C^{14}N$, $^{11}B^{16}O$, $^{54}Cr^{2+}$, $^{54}Fe^{2+}$

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)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004
DATE OPENED: 08/26/03
INORG: 4220 PO: F52224

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010175

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 13, 2003

Expiration Date:

EXPIRES
1 FEB 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic 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 **10000 µg/mL Calcium in 1.4% (abs) HNO_3**

Catalog Number:	CGCA10-1 AND CGCA10-5
Lot Number:	**T-CA03010**
Starting Material:	CaO
Starting Material Purity (%):	99.9981
Starting Material Lot No	C27L01
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 01/09/03
DATE EXPIRED: 02/01/2004
DATE OPENED: 01/10/03
INORG: 3900 PO: F52071

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,007 ± 22 µg/mL

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:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum s_i$ = 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** **10,034 ± 25 µg/mL**
ICP Assay NIST SRM 3109a Lot Number: 000622

Assay Method #2 **10,007 ± 22 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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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		0.00064	M	Dy	<	0.02560	O	Li	<	0.00002	M	Pr	<	0.00128	M	Te	<	0.12798
M	Sb	<	0.00213	M	Er	<	0.02133	M	Lu	<	0.00171	M	Re	<	0.00427	M	Tb	<	0.00128
M	As	<	0.04266	M	Eu	<	0.01280	O	Mg		0.07143	M	Rh	<	0.00427	M	Tl	<	0.00427
O	Ba		0.00071	M	Gd	<	0.00427	O	Mn		0.00041	M	Rb	<	0.00427	M	Th	<	0.00427
O	Be	<	0.00009	M	Ga	<	0.00427	O	Hg	<	0.01100	M	Ru	<	0.00853	M	Tm	<	0.00171
M	Bi	<	0.00171	M	Ge	<	0.02560	M	Mo	<	0.00853	M	Sm	<	0.00427	M	Sn	<	0.02133
O	B	<	0.00054	M	Au	<	0.01280	M	Nd	<	0.00853	O	Sc	<	0.00002	M	Ti	<	0.21329
O	Cd	<	0.00450	M	Hf	<	0.00853	O	Ni	<	0.00230	O	Se	<	0.00620	M	W	<	0.04266
S	Ca			M	Ho	<	0.00213	M	Nb	<	0.00213	O	Si		0.00214	M	U	<	0.00853
M	Ce	<	0.02133	O	In	<	0.00200	n	Os			O	Ag	<	0.04000	O	V	<	0.00090
M	Cs	<	0.00128	M	Ir	<	0.02133	M	Pd	<	0.02133	O	Na		0.00571	M	Yb	<	0.00427
O	Cr		0.00238	O	Fe	<	0.00110	O	P	<	0.00480	O	Sr		0.08095	M	Y	<	0.17064
O	Co	<	0.00120	M	La	<	0.00213	M	Pt	<	0.00853	O	S		0.04048	O	Zn		0.07381
O	Cu		0.00405	M	Pb	<	0.01280	O	K	<	0.00170	M	Ta	<	0.02986	M	Zr	<	0.02133

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 - 40.078; +2; 6; $Ca(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl and HNO_3. Avoid H_2SO_4, HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

Ca Containing Samples (Preparation and Solution) - Metal (best dissolved in diluted HNO_3); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (dry ash and dissolution in dilute HCl. Do not heat when dissolving to avoid precipitation of SiO_2) .The oxide, hydroxide, carbonate, phosphate, and fluoride of calcium are soluble in % levels of HCl or HNO_3. The sulfates (gypsum, anhydrite, etc.), certain silicates and complex compounds require fusion with Na_2CO_3 followed by HCl / water dissolution. Contamination is a very real problem when analyzing for trace levels.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at* concs.)
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+	$^{16}O_2$, ^{12}C, $^{28}Si^{16}O$, $^{88}Sr^{++}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/09/03
DATE EXPIRED: 02/01/2004
DATE OPENED: 01/10/03
INORG: 3900 PO: E52071

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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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 26, 2002

Expiration Date: EXPIRES 1 FEB 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, QA Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **10000 µg/mL Iron in 3.5% (abs) HNO_3**

Catalog Number:	CGFE10-1 and CGFE10-5
Lot Number:	**T-FE03028**
Starting Material:	Fe metal
Starting Material Purity (%):	99.9992
Starting Material Lot No	23024
Matrix:	3.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 2/28/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 2/28/03
INORG: 3963 PO: E52064

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9920 ± 22 µg/mL

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:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum S_i$ = 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 **9920 ± 22 µg/mL**
ICP Assay NIST SRM 3126a Lot Number: 000606

Assay Method #2 **9962 ± 41 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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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	< 0.02421	O	Li	< 0.00003	M	Pr	< 0.00121	M	Te	< 0.12103
M	Sb	< 0.00202	M	Er	< 0.02017	M	Lu	< 0.00161	M	Re	< 0.00403	M	Tb	< 0.00121
M	As	< 0.04034	M	Eu	< 0.01210	O	Mg	< 0.00006	M	Rh	< 0.00403	M	Tl	< 0.00403
M	Ba	< 0.04034	M	Gd	< 0.00403	O	Mn	< 0.05000	M	Rb	< 0.00403	M	Th	< 0.00403
O	Be	< 0.00005	M	Ga	0.00394	O	Hg	< 0.01100	M	Ru	< 0.00807	M	Tm	< 0.00161
M	Bi	< 0.00161	i	Ge		M	Mo	< 0.00807	M	Sm	< 0.00403	M	Sn	0.04920
O	B	< 0.00090	M	Au	< 0.01210	M	Nd	< 0.00807	M	Sc	< 0.04034	M	Ti	< 0.20172
M	Cd	< 0.01210	M	Hf	< 0.00807	O	Ni	< 0.00230	M	Se	< 0.03228	M	W	< 0.04034
O	Ca	0.00707	M	Ho	< 0.00202	M	Nb	< 0.00202	O	Si	0.00781	M	U	< 0.00807
M	Ce	< 0.02017	M	In	< 0.04034	n	Os		M	Ag	< 0.00807	M	V	< 0.00807
M	Cs	< 0.00121	M	Ir	< 0.02017	M	Pd	< 0.02017	O	Na	0.00756	M	Yb	< 0.00403
M	Cr	0.00541	s	Fe		i	P		M	Sr	< 0.00202	M	Y	< 0.16138
O	Co	< 0.00110	M	La	< 0.00202	M	Pt	< 0.00807	O	S	< 0.07200	M	Zn	0.03739
M	Cu	< 0.02421	M	Pb	< 0.01210	O	K	< 0.00170	M	Ta	< 0.02824	M	Zr	< 0.02017

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 55.847; +3; 6; $Fe(H_2O)_6^{3+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF and H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Fe Containing Samples (Preparation and Solution) - Metal (Soluble in HCl); Oxides (If the oxide has been at a high temperature then Na_2CO_3 fusion in Pt^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 at ≈ concs.)
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^+	$^{40}Ar^{15}N^1H$, $^{40}Ar^{16}O$, $^{36}Ar^{17}O^1H$, $^{38}Ar^{18}O$, $^{37}Cl^{18}O^1H$, $^{40}Ca^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

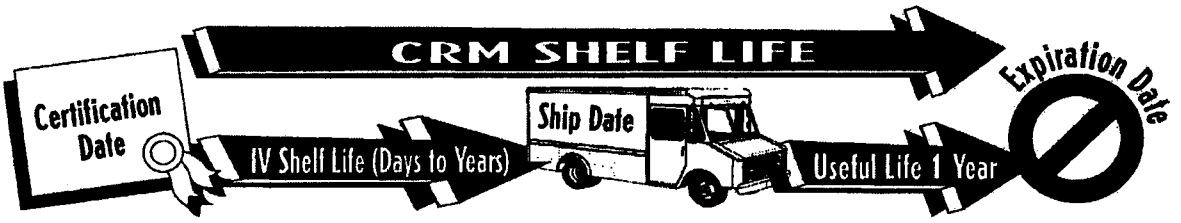
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 2/28/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 2/28/03
INORG: 3963 PO: F52004

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010183



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, 2002

Expiration Date: EXPIRES 1 MAR 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, QA Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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

010184

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **10000 µg/mL Potassium in 1.4% (abs) HNO_3**

Catalog Number:	CGK10-1, CGK10-2, and CGK10-5
Lot Number:	**W-K02111**
Starting Material:	KNO_3
Starting Material Purity (%):	99.997230
Starting Material Lot No	K18J19
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 1 of 2
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4320 PO: FS2258

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9930 ± 9 µg/mL

Certified Density: 1.024 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum s_i$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **9926 ± 62 µg/mL**
ICP Assay NIST SRM 3141a Lot Number: 891312

Assay Method #2 **9930 ± 9 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.02400	O Li < 0.00003	M Pr < 0.00120	M Te < 0.11998
M Sb < 0.00200	M Er < 0.02000	M Lu < 0.00160	M Re < 0.00400	M Tb < 0.00120
M As < 0.03999	M Eu < 0.01200	O Mg 0.00100	M Rh < 0.00400	M Tl < 0.00400
M Ba < 0.03999	M Gd < 0.00400	O Mn < 0.00003	M Rb 0.49948	M Th < 0.00400
O Be < 0.00020	M Ga < 0.00400	O Hg < 0.01500	M Ru < 0.00800	M Tm < 0.00160
M Bi < 0.00160	O Ge < 0.00150	M Mo < 0.00800	M Sm < 0.00400	M Sn < 0.02000
O B < 0.00060	O Au < 0.00300	M Nd < 0.00800	O Sc < 0.00002	O Ti < 0.00070
M Cd < 0.01200	M Hf < 0.00800	O Ni < 0.00230	O Se < 0.05000	M W < 0.03999
O Ca 0.00075	M Ho < 0.00200	M Nb < 0.00200	O Si < 0.00340	M U < 0.00800
M Ce < 0.02000	M In < 0.03999	n Os	M Ag < 0.00800	O V < 0.00090
M Cs < 0.00120	M Ir < 0.02000	M Pd < 0.02000	O Na 0.21730	M Yb < 0.00400
M Cr < 0.02000	O Fe 0.00212	O P < 0.00250	M Sr < 0.00200	M Y < 0.15998
M Co < 0.01200	M La < 0.00200	M Pt < 0.00800	O S < 0.07200	O Zn 0.00050
M Cu < 0.02400	M Pb < 0.01200	S K	M Ta < 0.02800	M Zr < 0.02000

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 29.0983; +1; (6); $K^+(aq)$
(Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Avoid use of $HClO_4$ due to insolubility of the perchlorate. Stable with all metals and inorganic anions except ClO_4^-.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

K Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt[a] followed by HCl dissolution-blank levels of K in sodium carbonate critical); Organic Matrices (Sulfuric/peroxide digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at 1000ppm.)
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, $^{23}Na^{16}O$, $^{78}Se^{12}$

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

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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

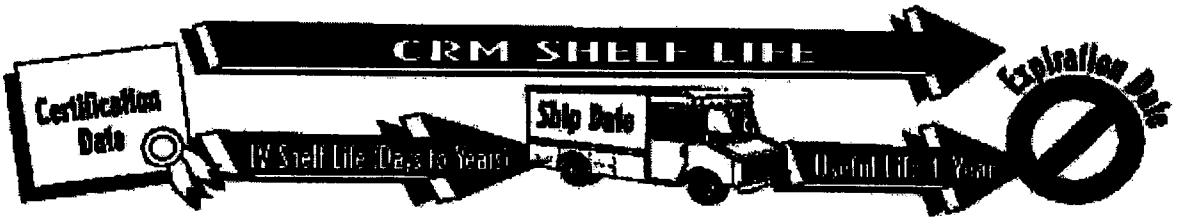
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 2 of 2
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4370 PO: P52258

Certification Date: January 30, 2003

Expiration Date:

EXPIRES
12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010187

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

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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 Magnesium in 1.4% (abs) HNO_3**

Catalog Number:	CGMG10-1 and CGMG10-5
Lot Number:	**T-MG03006**
Starting Material:	Mg metal
Starting Material Purity (%):	99.9968
Starting Material Lot No	RML91191
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4204 PO: F52391

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9921 ± 20 µg/mL

Certified Density: 1.050 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

"Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **9998 ± 20 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **9921 ± 20 µg/mL**
ICP Assay NIST SRM 3131a Lot Number: 991107

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.02454	M	Dy	< 0.02455	O	Li	0.00797	M	Pr	< 0.00123	M	Te	< 0.12275
M	Sb	0.00306	M	Er	< 0.02046	M	Lu	< 0.00164	M	Re	< 0.00409	M	Tb	< 0.00123
M	As	< 0.04092	M	Eu	< 0.01228	S	Mg		M	Rh	< 0.00409	M	Tl	< 0.00409
M	Ba	< 0.04092	M	Gd	< 0.00409	M	Mn	< 0.01637	M	Rb	< 0.00409	M	Th	< 0.00409
O	Be	< 0.00017	M	Ga	< 0.00409	O	Hg	< 0.00900	M	Ru	< 0.00818	M	Tm	< 0.00164
M	Bi	< 0.00164	M	Ge	< 0.02455	M	Mo	< 0.00818	M	Sm	< 0.00409	M	Sn	< 0.02046
O	B	0.00871	M	Au	< 0.01228	M	Nd	< 0.00818	M	Sc	< 0.04092	O	Ti	0.10206
M	Cd	< 0.01228	M	Hf	< 0.00818	O	Ni	0.01404	M	Se	< 0.03273	M	W	< 0.04092
O	Ca	0.01070	M	Ho	< 0.00205	M	Nb	< 0.00205	O	Si	0.03186	M	U	< 0.00818
M	Ce	< 0.02046	M	In	< 0.04092	n	Os		M	Ag	< 0.00818	M	V	< 0.00818
M	Cs	< 0.00123	M	Ir	< 0.02046	M	Pd	< 0.02046	O	Na	0.01817	M	Yb	< 0.00409
O	Cr	0.02315	O	Fe	0.02467	O	P	< 0.01600	M	Sr	< 0.00205	M	Y	< 0.16367
M	Co	< 0.01228	M	La	< 0.00205	M	Pt	< 0.00818	n	S		O	Zn	0.01892
O	Cu	0.00672	O	Pb	0.03236	O	K	< 0.05000	M	Ta	< 0.02864	M	Zr	< 0.02046

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 24.305; +2; 6; $Mg(H_2O)_6^{+2}$ 010190

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^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 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'	$^7Li^{16}O$, $^{48}Ti^{12}$, $^{48}Ca^{12}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

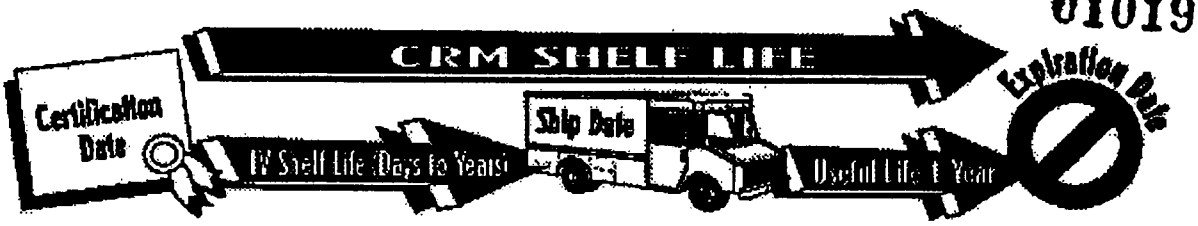
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4204 PO: E52391

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010191



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 28, 2002

Expiration Date: EXPIRES 01 02 004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, QA Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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

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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 Sodium in 1.4% (abs) HNO_3**

Catalog Number:	CGNA10-1, CGNA10-2, and CGNA10-5
Lot Number:	**T-NA03006**
Starting Material:	Na2CO3
Starting Material Purity (%):	99.999936
Starting Material Lot No	42095
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4205 PO: F52391

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,005 ± 7 µg/mL

Certified Density: 1.032 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10,067 ± 75 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 990907

Assay Method #2 **10,005 ± 7 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.02499	O Li < 0.00003	M Pr < 0.00125	M Te < 0.12494
M Sb < 0.00208	M Er < 0.02082	M Lu < 0.00167	M Re < 0.00417	M Tb < 0.00125
M As < 0.04165	M Eu < 0.01249	O Mg 0.00015	M Rh < 0.00417	M Tl < 0.00417
M Ba < 0.04165	M Gd < 0.00417	O Mn < 0.00003	M Rb < 0.00417	M Th < 0.00417
O Be < 0.00020	M Ga < 0.00417	O Hg < 0.01500	M Ru < 0.00833	M Tm < 0.00167
M Bi < 0.00167	O Ge < 0.00150	M Mo < 0.00833	M Sm < 0.00417	M Sn < 0.02082
O B < 0.00060	O Au < 0.00300	M Nd < 0.00833	O Sc < 0.00002	O Ti < 0.00070
M Cd < 0.01249	M Hf < 0.00833	O Ni < 0.00230	O Se < 0.05000	M W < 0.04165
O Ca 0.00160	M Ho < 0.00208	M Nb < 0.00208	O Si < 0.00340	M U < 0.00833
M Ce < 0.02082	M In < 0.04165	n Os	M Ag < 0.00833	O V < 0.00090
M Cs 0.00104	M Ir < 0.02082	M Pd < 0.02082	S Na	M Yb < 0.00417
M Cr < 0.02082	O Fe < 0.00110	O P < 0.04000	M Sr < 0.00208	M Y < 0.16658
M Co < 0.01249	M La < 0.00208	M Pt < 0.00833	O S < 0.07200	O Zn 0.00130
O Cu < 0.00140	M Pb < 0.01249	O K 0.00873	M Ta < 0.02915	M Zr < 0.02082

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.98977; +1; (6); Na^{+}(aq) largely ionic in nature (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ppm conc.)
ICP-OES	589.595 nm	0.07 / 0.00009 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	588.995 nm	0.03 / 0.006 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	330.237 nm	2.0 / 0.09 µg/mL	1	atom	Pd, Zn
ICP-MS	23 amu	310 ppt	n/a	M+	$^{46}Ti^{+2}$, $^{46}Ca^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

010194

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 24, 2003

Expiration Date: EXPIRES 01/2004

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4205 PO: F52391

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010195

Certificate Prepared By:	Debbie Newman, LIMS Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

Certificate of Analysis

CUSTOM-GRADE SOLUTION **1000 μg/mL Lithium in 0.1% HNO_3 (abs)** **010196**

Catalog Number: CGLI1-1, CGLI1-2 and CGLI1-5

Lot Number: **W-LI02066**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4149 PO: E52370

Starting Material:	Li_2CO_3
Starting Material Purity:	99.999%
Starting Material Lot No:	1053

CERTIFIED CONCENTRATION: 998 ± 2 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 998 ± 2 μg/mL
Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 1000 ± 4 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3129a.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	<0.010	M	Dy	<0.00060	s	Li		M	Pr	<0.000030	O	Te	<0.0090
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.044	M	Eu	<0.00030	O	Mg	<0.00010	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00020	M	Rb	<0.00010	M	Th	<0.00010
O	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.0070	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.0060	O	Au	<0.010	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00030
O	Cd	<0.0018	M	Hf	<0.00020	O	Ni	<0.0040	O	Se	<0.020	M	W	<0.0010
O	Ca	0.051	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	0.023	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		O	Ag	<0.0040	O	V	<0.0010
M	Cs	0.0018	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.10	M	Yb	<0.00010
O	Cr	<0.0020	O	Fe	<0.0020	O	P	<0.030	O	Sr	<0.0010	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.050	O	Zn	<0.030
M	Cu	<0.00060	M	Pb	<0.00030	O	K	0.0070	M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.004 g/mL **(over)**

QA:KL Rev.022403ON

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 01/2004

Certificate of Analysis

010197

CUSTOM-GRADE SOLUTION 1000 μg/mL Barium in 0.1% HNO_3 (abs)

Catalog Number: CGBA1-1, CGBA1-2, and CGBA1-5

Lot Number: **T-BA02021**

Starting Material:	$Ba(NO_3)_2$
Starting Material Purity:	99.999%
Starting Material Lot No:	21879

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/03/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 3/04/03
INORG: 3971 PO: E52064

CERTIFIED CONCENTRATION: 1003 ± 2 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1003 ± 2 μg/mL
Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 1002 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3104a.

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	n	Pr		i	Te	
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
s	Ba		M	Gd	0.0020	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	0.0010	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	0.0020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	i	Ni		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
n	Ce		i	In		n	Os		M	Ag	<0.00020	M	V	<0.00020
n	Cs		M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	O	P	<0.050	M	Sr	0.0040	M	Y	<0.0040
M	Co	<0.00030	n	La		M	Pt	<0.00020	n	S		O	Zn	<0.030
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.000 g/mL

(over)

QA:KL Rev.112702DN

Paul K. Haines
Quality Assurance Manager

Inorganic Ventures, Inc.
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Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

EXPIRES 1 MAR 2004

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

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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 Beryllium in 2% (abs) HNO_3**

Catalog Number:	CGBE1-1, CGBE1-2, and CGBE1-5
Lot Number:	**W-BE01100**
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: 991 ± 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 (□) = $\frac{\Sigma x_i}{n}$

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

(□) = mean
x_i = individual results
n = number of measurements
■S = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **991 ± 3 µg/mL (Avg 2 runs)**

ICP Assay NIST SRM 3105a Lot Number: 892707

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 05/09/03
DATE EXPIRED: 06/01/2004
DATE OPENED: 05/12/03
INORG: 40062 PO: F52181

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.

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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; $Be^{+2}(H_2O)_4$
Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.
Stability - 2-100 ppb levels stable for months in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10 % HNO_3 / LDPE container.
Be Containing Samples (Preparation and Solution) - Metal (is best dissolved in diluted H_2SO_4); BeO (boiling nitric, hydrochloric, or sulfuric acids or $KHSO_4$ fusion); Ores (H_2SO_4/HF digestion or carbonate fusion in Pt°); Organic Matrices (sulfuric/peroxide digestion or nitric/sulfuric/perchloric acid decomposition, or dry ash and dissolution according to the BeO procedure above).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ppm conc.)
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

010100

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 14, 2003

Expiration Date: EXPIRES 1 JAN 2004

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 05/09/03
DATE EXPIRED: 06/01/2004
DATE OPENED: 05/12/03
INORG: 4062 PO: F52181

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines 010201

inorganic ventures / iv labs

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

010202

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Chromium^{+3} in 1.4% HNO_3 (abs)

Catalog Number: CGCR(3)1-1, CGCR(3)1-2 and CGCR(3)1-5

Lot Number: **W-QCR02033**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03
DATE EXPIRED: 12/1/2004 DK
DATE OPENED: 11/5/03
INORG: 4318 PO: F52258

Starting Material:	Chromium Metal
Starting Material Purity:	99.995%
Starting Material Lot No:	F16I22

CERTIFIED CONCENTRATION: 995 ± 3 µg/mL

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Instrument Analysis: 995 ± 3 µg/mL (Avg of 3 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3112a.

Calculated Value: 1002 µg/mL
Method: Calculated, based on starting material.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room**. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.0028	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	O	Mg	<0.010	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.050	M	Rb	0.0066	M	Th	<0.00010
M	Be	<0.000050	M	Ga	0.00070	O	Hg	<0.10	M	Ru	0.017	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.10	i	Se		M	W	<0.0010
O	Ca	0.0011	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.10	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.10	n	Os		M	Ag	0.00070	i	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	0.016	M	Yb	<0.00010
s	Cr		O	Fe	<0.10	i	P		M	Sr	<0.000050	M	Y	<0.0040
O	Co	<0.10	M	La	<0.000050	M	Pt	<0.00020	n	S		O	Zn	<0.10
M	Cu	<0.00060	M	Pb	0.00039	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.010 g/mL

(over)

QA:KSL Rev.090403JTS

Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 12/2004

Certificate of Analysis

010203

CUSTOM-GRADE SOLUTION 1000 μg/mL Copper in 2% HNO_3 (abs)

Catalog Number: CGCU1-1, CGCU1-2 and CGCU1-5

Lot Number: **T-CU02060**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 03/13/03
INORG: 3955 PO: F52060

Starting Material:	Copper Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	K09C13

CERTIFIED CONCENTRATION: 1005 ± 2 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1005 ± 2 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1003 ± 5 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3114.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room**. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	<0.010	M	Dy	<0.00060	O	Li	<0.0050	M	Pr	<0.000030	O	Te	<0.031
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.00004	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.044	M	Eu	<0.00030	O	Mg	0.00080	M	Rh	0.0010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00020	M	Rb	<0.00010	M	Th	<0.00010
O	Be	<0.00020	O	Ga	<0.0070	O	Hg	<0.0070	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	0.000090	O	Ge	<0.010	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	0.0013
O	B	<0.0060	O	Au	<0.010	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00030
O	Cd	<0.0018	M	Hf	<0.00020	O	Ni	<0.0060	O	Se	<0.020	M	W	<0.0010
O	Ca	0.00058	M	Ho	<0.000050	M	Nb	<0.00005	O	Si	<0.0033	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		O	Ag	<0.0040	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	0.0024	O	Na	<0.10	M	Yb	<0.00010
O	Cr	<0.0020	O	Fe	<0.0020	O	P	<0.030	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.050	O	Zn	i
s	Cu		M	Pb	0.0029	O	K	<0.0060	M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.015 g/mL

QA:KSL Rev.070302DN

(over)

Quality Assurance Manager

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

EXPIRES 1 MAR 2004

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

010204

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Nickel in 1.4% (abs) HNO_3**

Catalog Number:	CGNI1-1, CGNI1-2, and CGNI1-5
Lot Number:	**T-NI02028**
Starting Material:	Ni pieces
Starting Material Purity (%):	99.9994
Starting Material Lot No	L06L02
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3957 PO: E52060

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 998 ± 2 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum S_i$ = 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**
ICP Assay NIST SRM 3136 Lot Number: 000612

Assay Method #2 **998 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

010205

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00938	M Dy < 0.06577	O Li < 0.00006	M Pr < 0.00329	M Te < 0.32886
M Sb < 0.00548	M Er < 0.05481	M Lu < 0.00439	M Re < 0.01096	M Tb < 0.00329
O As < 0.01689	M Eu < 0.03289	O Mg 0.00002	M Rh < 0.01096	M Tl < 0.01096
M Ba < 0.10962	M Gd < 0.01096	M Mn < 0.04385	M Rb < 0.01096	M Th < 0.01096
O Be < 0.00626	M Ga < 0.01096	O Hg < 0.03441	M Ru < 0.02192	M Tm < 0.00439
M Bi < 0.00439	M Ge < 0.06577	M Mo < 0.02192	M Sm < 0.01096	M Sn < 0.05481
O B < 0.03097	M Au < 0.03289	M Nd < 0.02192	M Sc < 0.10962	M Ti < 0.54811
M Cd < 0.03289	M Hf < 0.02192	S Ni	O Se < 0.01877	M W < 0.10962
O Ca < 0.01157	M Ho < 0.00548	M Nb < 0.00548	O Si 0.00188	M U < 0.02192
M Ce < 0.05481	M In < 0.10962	n Os	M Ag < 0.02192	M V < 0.02192
M Cs < 0.00329	M Ir < 0.05481	M Pd < 0.05481	O Na 0.00102	M Yb < 0.01096
M Cr < 0.05481	O Fe 0.00156	O P < 0.31280	M Sr < 0.00548	M Y < 0.43849
O Co 0.00182	M La < 0.00548	M Pt < 0.02192	O S < 0.07820	M Zn 0.00189
M Cu < 0.06577	M Pb < 0.03289	O K 0.00043	M Ta < 0.07674	M Zr < 0.05481

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69; +2; 6; $Ni(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Ni Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
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^+	$^{43}Ca^{16}O^1H$, $^{44}Ca^{16}O$, $^{23}Na^{37}Cl$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

010206

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
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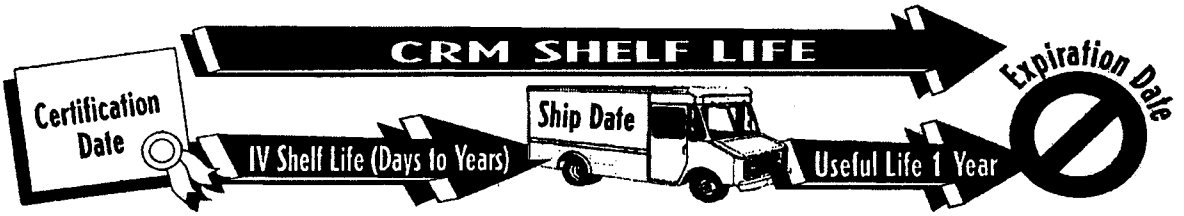
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (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, 2002

Expiration Date: EXPIRES 1 MAR 2004

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3957 PO: F52060

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010207

Certificate Prepared By:	Debbie Newman, QA Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Cadmium in 2% HNO_3 (abs)

Catalog Number: CGCD1-1, CGCD1-2 and CGCD1-5

010208

Lot Number: **T-CD01125**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/03/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 3/04/03
INORG: 3972 PO: F52064

Starting Material:	Cadmium Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	H02K40A

CERTIFIED CONCENTRATION: 1003 ± 3 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1003 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1003 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3108.

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	<0.00030	M	Dy	<0.00060	O	Li	<0.0050	M	Pr	<0.000030	O	Te	<0.031
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.12	M	Eu	<0.00030	O	Mg	<0.00010	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00020	M	Rb	<0.00010	M	Th	<0.00010
O	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.0070	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.0060	O	Au	<0.010	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00030
s	Cd		M	Hf	<0.00020	O	Ni	<0.0060	O	Se	<0.020	M	W	<0.0010
O	Ca	0.0018	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.010	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		O	Ag	<0.27	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	O	Pd	<0.053	O	Na	<0.10	M	Yb	<0.00010
O	Cr	<0.0040	O	Fe	<0.0020	O	P	<0.030	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.020	O	Zn	<0.030
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0060	M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.015 g/mL

(over)

QA:KL Rev.080102DN

Paul R. Haines

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EXPIRES 1 MAR 2004

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010209

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Cobalt in 2% (abs) HNO_3**

Catalog Number:	CGCO1-1, CGCO1-2, and CGCO1-5
Lot Number:	**T-CO01120**
Starting Material:	Co powder
Starting Material Purity (%):	99.9957
Starting Material Lot No	22897
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 3/03/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 3/04/03
INORG: 3973 PO: E52064

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 1.016 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S_i$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 4 µg/mL**
ICP Assay NIST SRM 3181 Lot Number: 000630

Assay Method #2 **1002 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

010210

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00025	M	Dy	< 0.02419	O	Li	0.00001	M	Pr	< 0.00121	M	Te	< 0.12097
M	Sb	< 0.00202	M	Er	< 0.02016	M	Lu	< 0.00161	M	Re	< 0.00403	M	Tb	< 0.00121
O	As	< 0.10000	M	Eu	< 0.01210	O	Mg	0.00045	M	Rh	< 0.00403	M	Tl	< 0.00403
M	Ba	< 0.04032	M	Gd	< 0.00403	O	Mn	0.00003	M	Rb	< 0.00403	M	Th	< 0.00403
M	Be	< 0.00202	M	Ga	< 0.00403	O	Hg	< 0.05000	M	Ru	< 0.00807	M	Tm	< 0.00161
M	Bi	< 0.00161	M	Ge	< 0.02419	M	Mo	< 0.00807	M	Sm	< 0.00403	M	Sn	< 0.02016
O	B	< 0.04000	M	Au	< 0.01210	M	Nd	< 0.00807	M	Sc	< 0.04032	M	Ti	< 0.20162
M	Cd	< 0.01210	M	Hf	< 0.00807	O	Ni	< 0.02000	M	Se	< 0.03226	M	W	< 0.04032
O	Ca	0.00325	M	Ho	< 0.00202	M	Nb	< 0.00202	O	Si	< 0.00400	M	U	< 0.00807
M	Ce	< 0.02016	M	In	< 0.04032	n	Os		M	Ag	< 0.00807	M	V	< 0.00807
M	Cs	< 0.00121	M	Ir	< 0.02016	M	Pd	< 0.02016	O	Na	0.00138	M	Yb	< 0.00403
M	Cr	< 0.02016	O	Fe	0.00875	n	P		M	Sr	< 0.00202	M	Y	< 0.16129
s	Co		M	La	< 0.00202	M	Pt	< 0.00807	n	S		M	Zn	< 0.08065
M	Cu	< 0.02419	M	Pb	< 0.01210	O	K	0.03000	M	Ta	< 0.02823	M	Zr	< 0.02016

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.9332; +2; 6; $Co(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	238.892 nm	0.01/.002 µg/mL	1	ion	Fe, W, Ta
ICP-OES	228.616 nm	0.01/.001µg/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^+	$^{42}Ca^{16}O^1H$, $^{40}Ar^{18}O^1H$, $^{36}Ar^{23}Na$, $^{43}Ca^{16}O$, $^{24}Mg^{35}Cl$

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

010211

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

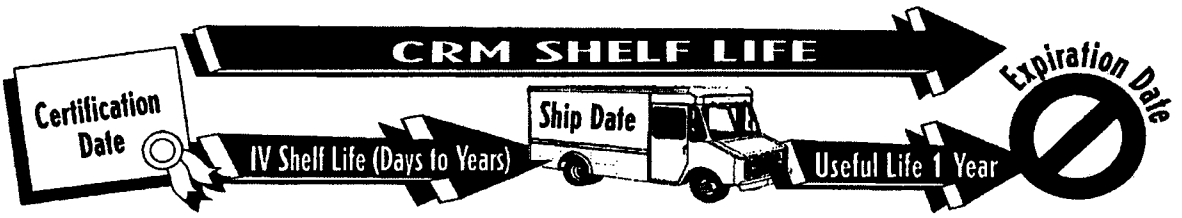
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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: September 05, 2002

Expiration Date: EXPIRES 1 MAR 2004

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 3/03/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 3/04/03
INORG: 3973 PO: F52064

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010212

Certificate Prepared By:	Debbie Newman, QA Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Manganese in 2% HNO_3 (abs)

Catalog Number: CGMN1-1, CGMN1-2, and CGMN1-5

010213

Lot Number: **T-MN02033**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/16/03
DATE EXPIRED: 02/01/2004
DATE OPENED: 01/16/03
INORG: 3921 PO: F52073

Starting Material:	Manganese Metal
Starting Material Purity:	99.998%
Starting Material Lot No:	21563

CERTIFIED CONCENTRATION: 1004 ± 3 μg/mL

The Certified Value is the wet assay value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1004 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1001 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3132.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm .

M	Al	<0.00090	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	0.0040	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	s	Mn		M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	i	Ga		O	Hg	<0.030	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	0.00024	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
M	Ce	<0.00050	i	In		n	Os		M	Ag	<0.00020	i	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	i	Fe		i	P		M	Sr	<0.000050	M	Y	<0.0040
O	Co	<0.050	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	<0.0020
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.015 g/mL

(over)

QA:KL Rev.082202DN

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Quality Assurance Manager

EXPIRES 1 FEB 2004

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010214

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Vanadium in 1.4% HNO_3 (abs)

Catalog Number: CGV1-1, CGV1-2 and CGV1-5

Lot Number: **T-V02032**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4321 PO: F52258

Starting Material:	Vanadium Pentoxide
Starting Material Purity:	99.999%
Starting Material Lot No:	46

CERTIFIED CONCENTRATION: 990 ± 2 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

($\bar{x}$) = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 993 ± 4 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 990 ± 2 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3165.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

M	Al	0.0095	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.042	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	0.0089	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	i	Mn		M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	0.016	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	0.00055
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	0.00024	O	Si	<0.030	M	U	0.0011
M	Ce	<0.00050	O	In	<0.070	n	Os		M	Ag	0.00044	s	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
O	Cr	<0.020	O	Fe	<0.050	i	P		M	Sr	<0.000050	M	Y	<0.0040
O	Co	<0.050	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0041
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.015 g/mL

(over)

QA:KLRev.082202DN

Paul R. Haines

Quality Assurance Manager

EXPIRES
Expires: 12/2004

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010215

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Zinc in 1.4% (abs) HNO_3**

Catalog Number:	CGZN1-1, CGZN1-2, and CGZN1-5
Lot Number:	**W-ZN02018**
Starting Material:	Zn shot
Starting Material Purity (%):	99.999889
Starting Material Lot No	J17L26
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 1162
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4319 PO: F55256

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1006 ± 3 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

($\bar{x}$) = 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** **1002 ± 6 µg/mL**
ICP Assay NIST SRM 3168a Lot Number: 001402

Assay Method #2 **1006 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION -** All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98. 010218

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00200	M	Dy	< 0.02440	O	Li	0.00001	M	Pr	< 0.00122	M	Te	< 0.12198
M	Sb	< 0.00203	M	Er	< 0.02033	M	Lu	< 0.00163	M	Re	< 0.00407	M	Tb	< 0.00122
M	As	< 0.04066	M	Eu	< 0.01220	O	Mg	0.00011	M	Rh	< 0.00407	M	Tl	< 0.00407
M	Ba	< 0.04066	M	Gd	< 0.00407	M	Mn	< 0.01626	M	Rb	< 0.00407	M	Th	< 0.00407
M	Be	< 0.00203	M	Ga	< 0.00407	O	Hg	< 0.01000	M	Ru	< 0.00813	M	Tm	< 0.00163
M	Bi	< 0.00163	M	Ge	< 0.02440	M	Mo	< 0.00813	M	Sm	< 0.00407	M	Sn	< 0.02033
O	B	0.00015	M	Au	< 0.01220	M	Nd	< 0.00813	M	Sc	< 0.04066	M	Ti	< 0.20331
M	Cd	< 0.01220	M	Hf	< 0.00813	O	Ni	0.00009	M	Se	< 0.03253	M	W	< 0.04066
O	Ca	0.00022	M	Ho	< 0.00203	M	Nb	< 0.00203	O	Si	< 0.00400	M	U	< 0.00813
M	Ce	< 0.02033	M	In	< 0.04066	n	Os		M	Ag	< 0.00813	M	V	< 0.00813
M	Cs	< 0.00122	M	Ir	< 0.02033	M	Pd	< 0.02033	O	Na	0.00055	M	Yb	< 0.00407
O	Cr	< 0.00100	O	Fe	0.00005	O	P	< 0.00300	M	Sr	< 0.00203	M	Y	< 0.16264
M	Co	< 0.01220	M	La	< 0.00203	M	Pt	< 0.00813	O	S	< 0.02000	s	Zn	
O	Cu	< 0.00050	M	Pb	< 0.01220	O	K	0.00018	M	Ta	< 0.02846	M	Zr	< 0.02033

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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.

010217

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39; +2; 4; Zn(OH)(aq)''

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media that promotes the formation of insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Zn Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl /HNO_3); Organic based (Dry ash at 450°C and dissolve ash in HCl) (Sulfuric/peroxide acid digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at 100 ncs.)
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'	$^{56}Ti^{16}O$, $^{56}Cr^{16}O$, $^{56}V^{16}O$, $^{30}S^{16}O_2$, $^{32}S^{16}O^{16}O$, $^{32}S^{17}O_2$, $^{32}S^{16}O^{17}O$, $^{32}S^{16}S$, $^{32}S_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010218

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 02, 2003

Expiration Date:

EXPIRES
1 DEC 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 2 of 2
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4319 PO: F52258

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

010219

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Silver in 3.5% HNO_3 (abs)

Catalog Number: CGAG1-1, CGAG1-2 and CGAG1-5

Lot Number: **T-AG02015**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004
DATE OPENED: 08/26/03
INORG: 4222 PO: E52224

Starting Material:	Silver Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	F15102

CERTIFIED CONCENTRATION: 1001 ± 2 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1004 ± 3 µg/mL
Method: Volhard Titration vs NIST SRM 999a Potassium Chloride

Instrument Analysis: 1001 ± 2 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3151.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room**. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	<0.00010	M	Dy	<0.00060	O	Li	<0.000030	M	Pr	<0.000030	O	Te	<0.030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.0050	M	Eu	<0.00030	O	Mg	<0.000040	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00030	M	Rb	<0.00010	M	Th	<0.00010
O	Be	<0.00050	M	Ga	<0.00010	O	Hg	0.00090	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.0020	O	Au	<0.012	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00070
O	Cd	<0.0020	M	Hf	<0.00020	O	Ni	<0.0070	O	Se	<0.036	M	W	<0.0010
O	Ca	<0.000050	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.0030	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.020	n	Os		s	Ag		M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
O	Cr	<0.0020	O	Fe	<0.00070	O	P	<0.030	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.020	O	Zn	<0.0010
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0060	M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.024 g/mL

QA:KL Rev.08210ZDN

Paul R. Haines

Quality Assurance Manager

Expires:

EXPIRES
1 SEP 2004

Certificate of Analysis

010220

CUSTOM-GRADE SOLUTION 1000 μg/mL Arsenic in 1.4% HNO_3 (abs)

Catalog Number: CGAS1-1, CGAS1-2 and CGAS1-5

Lot Number: **T-AS02019**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/09/03
DATE EXPIRED: 02/04/2004 DR
DATE OPENED: 01/10/03
INORG: 3899 PO: F52071

Starting Material:	Arsenic Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	23014

CERTIFIED CONCENTRATION: 1006 ± 3 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Calculated Value: 1003 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1006 ± 3 μg/mL (Average of 3 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3103a.

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	0.00030	M	Dy	<0.012	O	Li	<0.000020	M	Pr	<0.00060	M	Te	<0.060
O	Sb	<0.010	M	Er	<0.010	M	Lu	<0.00080	O	Re	<0.010	M	Tb	<0.00060
s	As		M	Eu	<0.0060	O	Mg	<0.000030	M	Rh	<0.0020	M	Tl	<0.0020
M	Ba	<0.020	M	Gd	<0.0020	O	Mn	<0.000030	M	Rb	<0.0020	M	Th	<0.0020
M	Be	<0.0010	M	Ga	<0.0020	O	Hg	<0.012	M	Ru	<0.0040	M	Tm	<0.00080
M	Bi	<0.00080	M	Ge	<0.012	M	Mo	<0.0040	M	Sm	<0.0020	O	Sn	0.00053
O	B	<0.012	M	Au	<0.0060	M	Nd	<0.0040	M	Sc	<0.020	M	Ti	<0.10
M	Cd	<0.0060	M	Hf	<0.0040	M	Ni	<0.016	M	Se	<0.016	M	W	<0.020
O	Ca	<0.0015	M	Ho	<0.0010	O	Nb	<0.0020	O	Si	0.0077	M	U	<0.0040
M	Ce	<0.010	M	In	<0.020	n	Os		M	Ag	<0.0040	M	V	<0.0040
M	Cs	<0.00060	M	Ir	<0.010	M	Pd	<0.010	O	Na	0.00096	M	Yb	<0.0020
M	Cr	<0.010	O	Fe	<0.0011	O	P	<0.0026	M	Sr	<0.0010	M	Y	<0.080
M	Co	<0.0060	M	La	<0.0010	M	Pt	<0.0040	O	S	<0.025	O	Zn	0.00019
M	Cu	<0.012	M	Pb	<0.0060	O	K	0.00096	M	Ta	<0.014	M	Zr	<0.010

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.010 g/mL

QA:KSL Rev.061202DN

(over)

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 1 FEB 2004

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010221

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/3/03
DATE EXPIRED: 11/4/04
DATE OPENED: 11/3/03 DR
INORG: 4313 PO: F52258

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Lead in 0.35% (abs) HNO_3**

Catalog Number:	CGPB1-1, CGPB1-2, and CGPB1-5
Lot Number:	**W-PB02114**
Starting Material:	Pb(NO3)2
Starting Material Purity (%):	99.999974
Starting Material Lot No	22150
Matrix:	0.35% (abs) HNO_3

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1006 ± 2 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

The Certified Value is the wet assay value. The following equations are used in the calculations of the certified value and the uncertainty:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1005 ± 2 µg/mL**
ICP Assay NIST SRM 3128 Lot Number: 991504

Assay Method #2 **1006 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

010222

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; $Pb(H_2O)_6^{+2}$ 010223

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 ppm conc.)
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)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

INORGANIC LABS/RADCHEM LABS 2 of 2
DATE RECEIVED: 11/3/03
DATE EXPIRED: 11/1/04 DM
DATE OPENED: 11/3/03
INORG: 4313 PO: F52258

Certification Date: January 23, 2003

Expiration Date: EXPIRES NOV 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010225

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Antimony in 0.7% HNO_3 (abs) / 3% Tartaric Acid

Catalog Number: CGSB1-1, CGSB1-2 and CGSB1-5

Lot Number: **T-SB02074**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3953 PO: F52060

Starting Material:	Antimony Metal
Starting Material Purity:	99.995%
Starting Material Lot No:	E14H25

CERTIFIED CONCENTRATION: 1003 ± 2 µg/mL

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Calculated Value: 999 µg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1003 ± 2 µg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3102a.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.**
An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Al	<0.0050	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	n	Te	
s	Sb		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	0.00030
O	Ba	<0.020	M	Gd	<0.00010	M	Mn	0.0080	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.030	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	0.00070	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	n	Sn	
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.020	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
M	Ce	0.0018	O	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	0.031	O	Fe	<0.050	O	P	<0.050	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.040	M	Pt	<0.00020	n	S		M	Zn	<0.0020
M	Cu	0.0016	M	Pb	0.0011	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.019 g/mL

(over)

QA:KL Rev.082202DN

Expires:

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 1 MAR 2004

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

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1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Selenium in 1.4% (abs) HNO_3**

Catalog Number:	CGSE1-1, CGSE1-2, and CGSE1-5
Lot Number:	**T-SE01102**
Starting Material:	Se shot
Starting Material Purity (%):	99.9971
Starting Material Lot No	C09L08
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4152 PO: 152370

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 995 ± 3 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

"Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 **995 ± 3 µg/mL (Avg. 2 runs)**
ICP Assay NIST SRM 3149 Lot Number: 992106

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION -** All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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4.3 **THERMOMETER CALIBRATION -** The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION -** In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00017	M	Dy	< 0.01196	O	Li	< 0.00003	M	Pr	< 0.00060	M	Te	< 0.05981
M	Sb	0.00160	M	Er	< 0.00997	M	Lu	< 0.00080	O	Re	< 0.00900	M	Tb	< 0.00060
O	As	< 0.00500	M	Eu	< 0.00598	O	Mg	< 0.00003	M	Rh	< 0.00199	M	Tl	< 0.00199
M	Ba	< 0.01994	M	Gd	< 0.00199	M	Mn	< 0.00798	M	Rb	< 0.00199	M	Th	< 0.00199
O	Be	< 0.00009	M	Ga	< 0.00199	O	Hg	0.01950	O	Ru	0.00220	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01196	O	Mo	< 0.00400	M	Sm	< 0.00199	M	Sn	< 0.00997
O	B	< 0.00006	M	Au	< 0.00598	M	Nd	< 0.00399	M	Sc	< 0.01994	M	Ti	< 0.09969
M	Cd	< 0.00598	M	Hf	< 0.00399	O	Ni	< 0.00090	S	Se		M	W	< 0.01994
O	Ca	0.00200	M	Ho	< 0.00100	O	Nb	< 0.00400	O	Si	0.00055	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01994	n	Os		M	Ag	0.00070	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	0.00355	M	Yb	< 0.00199
M	Cr	< 0.00997	O	Fe	0.00060	O	P	< 0.00300	M	Sr	< 0.00100	M	Y	< 0.07975
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	O	S	0.00500	M	Zn	< 0.03988
M	Cu	< 0.01196	M	Pb	< 0.00598	O	K	0.00070	M	Ta	< 0.01396	O	Zr	< 0.00040

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

010228

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96; +4; 6; H_2SeO_3

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels - stable for months alone or mixed with other elements at equivalent levels - in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Se Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Readily soluble in water); Minerals and alloys (Acid digestion with HNO_3 or HNO_3 / HF); Organic Matrices (Acid digestion with hot concentrated H_2SO_4 accompanied by the careful dropwise addition of H_2O_2 until clear)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ppm conc.)
ICP-OES	196.026 nm	0.08 / 0.006 µg/mL	1	atom	Fe
ICP-OES	203.985 nm	0.2 / 0.05 µg/mL	1	atom	Sb, Ir, Cr, Ta
ICP-OES	206.279 nm	0.3 / 0.16 µg/mL	1	atom	Cr, Pt
ICP-MS	82 amu	200 ppt	n/a	M'	$^{12}C^{35}Cl_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

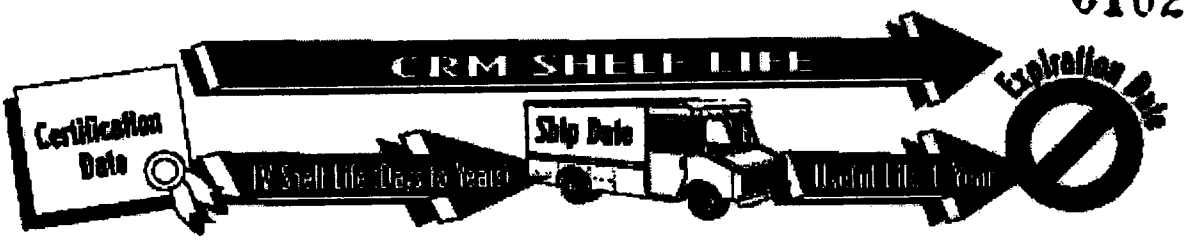
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4152 PO: E52370

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010229



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: November 27, 2002

Expiration Date: EXPIRES 01/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, QA Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

Certificate of Analysis

010290

CUSTOM-GRADE SOLUTION 1000 μg/mL Thallium in 0.5% HNO_3 (abs)

Catalog Number: CGTL1-1, CGTL1-2 and CGTL1-5

Lot Number: **T-TL01075**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/16/03
DATE EXPIRED: 02/01/2004
DATE OPENED: 01/16/03
INORG: 3922 PO: F52073

Starting Material:	Thallium Nitrate
Starting Material Purity:	99.999%
Starting Material Lot No:	59001

CERTIFIED CONCENTRATION: 997 ± 1 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Calculated Value: 1000 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 997 ± 1 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3158.

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	0.000080	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	s	Tl	
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	<0.00010	O	Hg	i	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	0.00060
O	B	<0.020	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	0.00090	M	Hf	0.0010	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	O	In	i	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	0.00010	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	O	P	i	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.015
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.002 g/mL

QA:KL Rev.031402DN

(over)

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES FEB 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION

1000 μg/mL Lanthanum in 1.4% HNO_3 (abs)

010231

Catalog Number: CGLA1-1 and CGLA1-5

Lot Number: **T-QLA01057**

Starting Material:	Lanthanum Oxide
Starting Material Purity:	99.999%
Starting Material Lot No:	LA-0-5-017

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004
DATE OPENED: 08/26/03
INORG: 4221 PO: E52224

CERTIFIED CONCENTRATION: 1002 ± 3 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1002 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1007 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3127a.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	<0.040	M	Dy	<0.00060	M	Li	<0.0010	O	Pr	<0.020	M	Te	<0.0030
M	Sb	<0.000050	M	Er	0.0010	M	Lu	0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
O	Ba	<0.020	M	Gd	0.039	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.030	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	0.00040	M	Sn	<0.00050
O	B	<0.020	M	Au	<0.00030	M	Nd	0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	0.00010	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
i	Ce		O	In	<0.030	n	Os		M	Ag	<0.00020	M	V	<0.00020
n	Cs		M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	O	P	<0.050	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	s	La		M	Pt	<0.00020	n	S		M	Zn	<0.0020
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.009 g/mL

(over)

QA:KSL Rev.121702DN

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 1 SEP 2004

Certificate of Analysis

010232

CUSTOM-GRADE SOLUTION 1000 μg/mL Palladium in 3.3% HCl (abs)

Catalog Number: CGPD1-1 and CGPD1-5

Lot Number: **T-PD02014**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 2/28/03
INORG: 3964 PO: F52064

Starting Material:	Palladium Nitrate
Starting Material Purity:	99.999%
Starting Material Lot No:	00614

CERTIFIED CONCENTRATION: 1001 ± 3 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Calculated Value: 1002 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1001 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3138.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.**
An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

M	Al	<0.00090	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.0017	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.060	M	Eu	<0.00030	M	Mg	0.0090	O	Rh	<0.020	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	0.00026	O	Hg	<0.030	O	Ru	<0.010	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	0.0058	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	0.00090	M	Nd	0.00090	M	Sc	<0.0010	M	Ti	<0.0050
O	Cd	<0.010	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	0.040	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		O	Ag	0.26	O	V	<0.010
i	Cs		M	Ir	<0.00050	s	Pd		O	Na	<0.090	M	Yb	<0.00010
O	Cr	<0.020	O	Fe	<0.050	O	P	<0.050	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	0.016	n	S		M	Zn	0.0030
M	Cu	0.0023	M	Pb	0.0022	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.022 g/mL

QA:KSL Rev.050202DN

(over)

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Technical Support: 800-569-6799

Paul R. Haines
Quality Assurance Manager

EXPIRES
1 MAR 2004

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

010233

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Sulfur in H_2O**

Catalog Number:	CGS1-1 and CGS1-5
Lot Number:	**W-QS01098**
Starting Material:	H_2SO_4
Starting Material Purity (%):	99.999965
Starting Material Lot No	N38818
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 1 of 2
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4317 PO: F52258

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1010 ± 2 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 8 µg/mL**
ICP Assay NIST SRM 3154 Lot Number: 892205

Assay Method #2 **1010 ± 2 µg/mL**
Acidimetric NIST SRM 84k Lot Number: 84k

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al		0.00025	M	Dy	<	0.01197	O	Li	<	0.00016	M	Pr	<	0.00060	M	Te	<	0.05984
M	Sb	<	0.00100	M	Er	<	0.00997	M	Lu	<	0.00080	M	Re	<	0.00200	M	Tb	<	0.00060
M	As	<	0.01995	M	Eu	<	0.00598	O	Mg	<	0.00004	M	Rh	<	0.00200	M	Tl	<	0.00200
M	Ba	<	0.01995	M	Gd	<	0.00200	M	Mn	<	0.00798	M	Rb	<	0.00200	M	Th	<	0.00200
O	Be	<	0.00200	M	Ga	<	0.00200	O	Hg	<	0.01100	M	Ru	<	0.00399	M	Tm	<	0.00080
M	Bi	<	0.00080	M	Ge	<	0.01197	M	Mo	<	0.00399	M	Sm	<	0.00200	M	Sn	<	0.00997
O	B	<	0.00990	M	Au	<	0.00598	M	Nd	<	0.00399	M	Sc	<	0.01995	M	Ti	<	0.09974
M	Cd	<	0.00598	M	Hf	<	0.00399	O	Ni	<	0.00230	O	Se	<	0.00620	M	W	<	0.01995
O	Ca		0.00020	M	Ho	<	0.00100	M	Nb	<	0.00100	O	Si	<	0.00410	M	U	<	0.00399
M	Ce	<	0.00997	M	In	<	0.01995	n	Os			M	Ag	<	0.00399	M	V	<	0.00399
M	Cs	<	0.00060	M	Ir	<	0.00997	M	Pd	<	0.00997	O	Na	<	0.00010	M	Yb	<	0.00200
M	Cr	<	0.00997	O	Fe		0.00015	O	P	<	0.00480	M	Sr	<	0.00100	M	Y	<	0.07979
M	Co	<	0.00598	M	La	<	0.00100	M	Pt	<	0.00399	s	S			O	Zn		0.00125
M	Cu	<	0.01197	M	Pb	<	0.00598	O	K	<	0.00170	M	Ta	<	0.01396	M	Zr	<	0.00997

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 32.066; +6; 6; (O=)$_2$S(OH)$_2$ 010235

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4 and HF aqueous matrices water and NH_4OH . Stable with all metals and inorganic anions at low to moderate ppm levels under acidic conditions except Ba and Pb and to a lesser extent Sr, and Ca.

Stability - 2-100 ppb levels- stability unknown- in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in LDPE container.

S Containing Samples (Preparation and Solution) - We most often get questions about the determination of S in Rocks, Silicates and insoluble sulfates (the finely powered sample is fused in a Pt* crucible with 4-8 times its weight of Na_2CO_3 + 0.5 grams KNO_3. The fuseate is extracted with water. Any $BaSO_4$ present in the sample is transposed by the carbonate fusion to the $BaCO_3$ which is left behind in the water-insoluble residue. If $PbSO_4$ is present the fuseate should be boiled with a sodium carbonate saturated with CO_2 solution for 1 hour or more where the $PbSO_4$ will be transposed to the water insoluble carbonate which can be filtered off. Boiling the fuseate with a saturated carbonate solution is good insurance for samples containing Ba, Sr, and Ca. The Ba, Pb, Sr, Ca, free filtrate can be acidified and measured by ICP.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at 100ppm)
ICP-OES	166.669nm	0.2 / 0.19 µg/mL	1	atom	Si, B
ICP-OES	182.034 nm	0.3 / 0.024 µg/mL	1	atom	
ICP-OES	143.328 nm	0.4 / 0.035 µg/mL	1	atom	
ICP-MS	32 amu	30,000 ppt	n/a	M$^+$	$^{16}O_2$, $^{14}N^{16}O$, $^{15}N^{17}O$, $^{14}N^{17}O^1H$, $^{15}N^{16}O^1H$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010236

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 282
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4317 PO: F52258

Certification Date: August 27, 2003

Expiration Date: EXPIRES 12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

Certificate of Analysis

010237

CUSTOM-GRADE SOLUTION 1000 μg/mL Thorium in 3% HNO_3 (abs)

Catalog Number: CGTH1-1 and CGTH1-5

Lot Number: **T-TH01059**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/08/03
DATE EXPIRED: 11/01/2004
DATE OPENED: 10/08/03
INORG: 4283 PO: F52240

Starting Material:	Thorium Nitrate
Starting Material Purity:	99.999%
Starting Material Lot No:	C01L32

CERTIFIED CONCENTRATION: 1001 ± 3 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

($\bar{x}$) = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1001 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM Lead Nitrate.

Instrument Analysis: 1002 ± 4 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3159.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm .

O	Al	<0.00090	M	Dy	0.0062	O	Li	<0.000030	M	Pr	0.00037	O	Te	<0.031
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.014	M	Eu	<0.00030	O	Mg	<0.000060	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	0.0050	M	Gd	0.0054	O	Mn	<0.0000030	M	Rb	<0.00010	s	Th	
O	Be	<0.00020	M	Ga	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	0.0095	M	Sn	<0.00050
O	B	<0.00060	M	Au	<0.00030	M	Nd	0.0026	M	Sc	<0.0010	O	Ti	<0.00092
O	Cd	<0.0045	M	Hf	<0.00020	O	Ni	<0.0023	M	Se	<0.010	M	W	<0.0010
O	Ca	<0.030	M	Ho	0.00022	M	Nb	<0.000050	O	Si	<0.0034	M	U	0.074
M	Ce	<0.00050	O	In	<0.0020	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.00010	M	Yb	<0.00010
O	Cr	<0.00080	O	Fe	<0.0011	i	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.072	O	Zn	<0.00058
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0017	M	Ta	<0.00070	M	Zr	0.0085

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.022 g/mL

QA:KL Rev.050802DN

(over)

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Paul R. Haines
Quality Assurance Manager

EXPIRES 01 NOV 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION

1000 μg/mL Uranium in 1% HNO_3 (abs)

Catalog Number: CGU1-1 and CGU1-5

010238

Lot Number: **T-U01056**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/03/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 3/04/03
INORG: 3974 PO: E52064

Starting Material:	Uranium Oxynitrate*
Starting Material Purity:	99.95%
Starting Material Lot No:	E14L40

CERTIFIED CONCENTRATION: 1001 ± 1 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Instrument Analysis: 1001 ± 1 μg/mL (Avg. 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3164.

Calculated Value: 1000 μg/mL
Method: Calculated, based on starting material.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.**
An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	<0.20	M	Dy	<0.0060	O	Li	<0.010	M	Pr	<0.00030	M	Te	<0.030
M	Sb	0.00020	M	Er	<0.0050	M	Lu	<0.00040	M	Re	<0.0010	M	Tb	<0.00030
[illegible]	As	<0.010	M	Eu	<0.0030	O	Mg	0.012	M	Rh	<0.0010	M	Tl	<0.0010
M	Ba	0.0022	M	Gd	<0.0010	M	Mn	<0.0040	M	Rb	<0.0010	M	Th	<0.0010
O	Be	<0.10	M	Ga	<0.0010	i	Hg		M	Ru	<0.0020	M	Tm	<0.00040
M	Bi	0.00030	M	Ge	<0.0060	M	Mo	<0.0020	M	Sm	<0.0010	M	Sn	0.043
O	B	0.0020	M	Au	<0.0030	M	Nd	<0.0020	M	Sc	0.00080	M	Ti	0.029
M	Cd	<0.0030	M	Hf	<0.0020	i	Ni		M	Se	<0.0080	M	W	<0.010
O	Ca	0.11	M	Ho	<0.00050	M	Nb	<0.00050	i	Si		s	U	
M	Ce	<0.0050	M	In	<0.010	n	Os		M	Ag	<0.0020	M	V	0.00040
M	Cs	<0.00030	M	Ir	<0.0050	M	Pd	<0.0050	O	Na	0.19	M	Yb	<0.0010
M	Cr	0.0047	i	Fe		i	P		M	Sr	0.0011	M	Y	0.56
M	Co	0.014	M	La	0.0014	M	Pt	<0.0020	i	S		M	Zn	0.020
M	Cu	0.022	M	Pb	0.0025	i	K		M	Ta	<0.0070	M	Zr	0.00060

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

****NOTICE TO ICP-MS USERS:** The ^{235}U in this standard is depleted. The certified abundances in Atom % are as follows:

	Isotope	Natural Abundance Atom %	IV's Certified Abundance Atom %
Uranium	^{238}U	99.3	99.8 ± 0.1
	^{235}U	0.70	0.195 ± 0.005

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.008 g/mL

(over) QA:KSL Rev.092502DN

Inorganic Ventures, Inc.
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Quality Assurance Manager

EXPIRES 1 MAR 2004

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 Tungsten in 1% (abs) HNO_3/1% (abs) HF**

Catalog Number:	CGW1-1 and CGW1-5
Lot Number:	**W-W01080**
Starting Material:	W Powder
Starting Material Purity (%):	99.990703
Starting Material Lot No	21418,C31H46,D02J21,E03K06,D11F29
Matrix:	1% (abs) HNO_3/1% (abs) HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4203 PO: E52383

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1001 ± 2 µg/mL

Certified Density: 1.006 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1001 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3163 Lot Number: 990209

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.01792	M	Dy	< 0.00595	O	Li	< 0.00008	M	Pr	< 0.00030	M	Te	< 0.02974
M	Sb	< 0.00050	M	Er	< 0.00496	M	Lu	< 0.00040	i	Re		M	Tb	< 0.00030
M	As	< 0.00991	M	Eu	< 0.00297	O	Mg	0.00120	M	Rh	< 0.00099	M	Tl	< 0.00099
M	Ba	< 0.00991	M	Gd	< 0.00099	M	Mn	< 0.00397	M	Rb	< 0.00099	M	Th	< 0.00099
M	Be	< 0.00050	M	Ga	< 0.00099	O	Hg	< 0.04778	M	Ru	< 0.00198	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00595	M	Mo	0.00050	M	Sm	< 0.00099	M	Sn	< 0.00496
O	B	< 1.19460	M	Au	< 0.00297	M	Nd	< 0.00198	O	Sc	< 0.00036	M	Ti	0.00198
M	Cd	< 0.00297	M	Hf	< 0.00198	M	Ni	< 0.00793	M	Se	< 0.00793	S	W	
O	Ca	0.00080	M	Ho	< 0.00050	O	Nb	< 0.06371	O	Si	< 0.01354	M	U	< 0.00198
M	Ce	< 0.00496	M	In	< 0.00991	n	Os		M	Ag	< 0.00198	M	V	< 0.00198
M	Cs	< 0.00030	M	Ir	< 0.00496	M	Pd	< 0.00496	O	Na	0.04778	M	Yb	< 0.00099
M	Cr	< 0.00496	O	Fe	< 0.03982	n	P		M	Sr	< 0.00050	M	Y	< 0.03965
M	Co	< 0.00297	M	La	< 0.00050	M	Pt	< 0.00198	n	S		M	Zn	< 0.01983
M	Cu	< 0.00595	M	Pb	0.00060	O	K	0.03146	O	Ta	< 0.39820	M	Zr	0.00079

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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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 - 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.OH) ; Organic Matrices (Dry ash at 450 °C in Pt^{6} and dissolve oxide with HF).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at [illegible] concs.)
ICP-OES	207.911 nm	0.03 / 0.001 µg/mL	1	ion	Ru, In
ICP-OES	224.875 nm	0.05 / 0.005 µg/mL	1	ion	Co, Rh, Ag
ICP-OES	209.475 nm	0.05 / 0.005 µg/mL	1	ion	Mo
ICP-MS	182 amu	5 ppt	n/a	M^+	$^{166}Er^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4203 PO: F52383

010242

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 10, 2003

Expiration Date: EXPIRES 1 2 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL **Yttrium** in 1.4% HNO_3 (abs)

Catalog Number: CGY1-1 and CGY1-5

010243

Lot Number: **T-Y01086**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/09/03
DATE EXPIRED: 06/01/2004
DATE OPENED: 05/12/03
INORG: 4063 PO: F52181

Starting Material:	Y_2O_3
Starting Material Purity:	99.999%
Starting Material Lot No:	Y-O-5-9503201

CERTIFIED CONCENTRATION: 1004 ± 3 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1004 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1004 ± 4 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3167a.

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	0.00021	M	Dy	<0.0060	M	Li	<0.010	M	Pr	<0.00030	M	Te	<0.030
M	Sb	<0.00050	M	Er	<0.0050	O	Lu	<0.000020	M	Re	<0.0010	M	Tb	<0.00030
M	As	<0.010	M	Eu	<0.0030	O	Mg	<0.000030	M	Rh	<0.0010	M	Tl	<0.0010
M	Ba	<0.010	M	Gd	<0.0010	O	Mn	<0.000020	M	Rb	<0.0010	M	Th	<0.0010
M	Be	<0.00050	M	Ga	<0.0010	O	Hg	<0.020	M	Ru	<0.0020	M	Tm	<0.00040
M	Bi	<0.00040	M	Ge	<0.0060	M	Mo	<0.0020	M	Sm	<0.0010	M	Sn	<0.0050
O	B	<0.00014	M	Au	<0.0030	M	Nd	<0.0020	O	Sc	0.00024	M	Ti	<0.050
M	Cd	<0.0030	M	Hf	<0.0020	M	Ni	<0.080	M	Se	<0.0080	M	W	<0.010
O	Ca	0.00014	M	Ho	<0.00050	M	Nb	<0.00050	O	Si	0.000077	M	U	<0.0020
M	Ce	<0.0050	M	In	<0.010	n	Os		M	Ag	<0.0020	O	V	<0.00080
M	Cs	<0.00030	M	Ir	<0.0050	O	Pd	<0.10	O	Na	<0.050	M	Yb	<0.0010
M	Cr	<0.0050	O	Fe	0.0015	O	P	<0.070	M	Sr	<0.00050	s	Y	
M	Co	<0.0030	M	La	<0.00050	M	Pt	<0.0020	O	S	<0.043	M	Zn	<0.020
M	Cu	<0.0060	M	Pb	<0.0030	O	K	<0.10	M	Ta	<0.0070	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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.010 g/mL **(over)**

QA:KL Rev.061802DN

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Quality Assurance Manager

EXPIRES
1 JUN 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION

1000 μg/mL Zirconium in H_2O tr. HF tr. HNO_3 010244

Catalog Number: CGZR1-1 and CGZR1-5
This standard should **not** be prepared or stored in glass.

Lot Number: **T-QZR01062**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3958 PO: F52060

Starting Material:	Zirconium Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	SP4811A

CERTIFIED CONCENTRATION: 1005 ± 6 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Instrument Analysis: 1005 ± 6 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3169

Calculated Value: 1000 μg/mL (For informational purposes)
Method: Calculated based on starting material.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room**.
An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	0.055	M	Dy	<0.012	O	Li	<0.000030	M	Pr	<0.00059	M	Te	<0.059
M	Sb	0.00017	M	Er	<0.0098	M	Lu	<0.00079	M	Re	<0.0020	M	Tb	<0.00059
M	As	<0.020	M	Eu	<0.0059	O	Mg	<0.000030	M	Rh	<0.0020	M	Tl	<0.0020
M	Ba	0.013	M	Gd	<0.0020	O	Mn	0.0020	M	Rb	<0.0020	M	Th	<0.0020
O	Be	<0.10	M	Ga	<0.0020	O	Hg	<0.011	M	Ru	<0.0040	M	Tm	<0.00079
M	Bi	<0.00079	M	Ge	<0.012	O	Mo	<0.10	M	Sm	<0.0020	M	Sn	0.0011
i	B		M	Au	<0.0059	M	Nd	<0.0040	O	Sc	<0.00016	O	Ti	0.0031
O	Cd	<0.0053	M	Hf	0.087	O	Ni	0.014	M	Se	<0.016	M	W	0.0016
O	Ca	0.0020	M	Ho	<0.00098	i	Nb		i	Si		M	U	0.00040
M	Ce	<0.0098	M	In	<0.020	n	Os		i	Ag		M	V	0.0016
M	Cs	<0.00059	M	Ir	<0.0098	i	Pd		O	Na	0.041	M	Yb	<0.0020
O	Cr	0.034	O	Fe	0.45	O	P	<0.0048	M	Sr	<0.00098	O	Y	<0.0010
M	Co	<0.0059	M	La	<0.00098	M	Pt	<0.0040	i	S		O	Zn	0.0057
M	Cu	0.013	M	Pb	<0.0059	O	K	0.013	M	Ta	0.0011	s	Zr	

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.000 g/mL

QA:KL Rev.100302DN

(over)

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Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES
1 MAR 2004

Certificate of Analysis

010245

CUSTOM GRADE SOLUTION 1000 μg/mL Boron in H_2O

Catalog Number: CGB1-1, CGB1-2 and CGB1-5

Lot Number: **T-B02038**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3954 PO: F52060

Starting Material:	H_3BO_3
Starting Material Purity:	99.999%
Starting Material Lot No:	S-B02032

CERTIFIED CONCENTRATION: 1001 ± 3 μg/mL

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Instrument Analysis: 1001 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3107.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	<0.00090	M	Dy	<0.0060	O	Li	<0.000024	M	Pr	<0.00030	M	Te	<0.030
M	Sb	<0.00050	M	Er	<0.0050	M	Lu	<0.00040	M	Re	<0.0010	M	Tb	<0.00030
M	As	<0.010	M	Eu	<0.0030	O	Mg	<0.000060	M	Rh	<0.0010	M	Tl	<0.0010
O	Ba	<0.00010	M	Gd	<0.0010	O	Mn	<0.000023	M	Rb	<0.0010	M	Th	<0.0010
O	Be	<0.00017	O	Ga	<0.0016	O	Hg	<0.015	M	Ru	<0.0020	M	Tm	<0.00040
M	Bi	<0.00040	M	Ge	<0.0060	M	Mo	<0.0020	M	Sm	<0.0010	M	Sn	<0.0050
s	B		M	Au	<0.0030	M	Nd	<0.0020	O	Sc	<0.000023	M	Ti	<0.050
M	Cd	<0.0030	M	Hf	<0.0020	O	Ni	<0.0023	O	Se	<0.0062	M	W	<0.010
O	Ca	<0.000070	M	Ho	<0.00050	M	Nb	<0.00050	O	Si	0.00067	M	U	<0.0020
O	Ce	<0.0030	M	In	<0.010	n	Os		M	Ag	<0.0020	O	V	<0.00083
M	Cs	<0.00030	M	Ir	<0.0050	M	Pd	<0.0050	O	Na	<0.00010	M	Yb	<0.0010
M	Cr	<0.0050	O	Fe	<0.0011	O	P	<0.0025	M	Sr	<0.00050	M	Y	<0.040
O	Co	<0.0011	M	La	<0.00050	M	Pt	<0.0020	O	S	<0.10	O	Zn	<0.00019
M	Cu	<0.0060	M	Pb	<0.0030	O	K	<0.0030	M	Ta	<0.0070	M	Zr	<0.0050

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.073102DN

(over)

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES
1 MAR 2004

Certificate of Analysis

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3956 PO: F52060

CUSTOM-GRADE SOLUTION 1000 μg/mL Molybdenum in H_2O tr. NH_4OH

Catalog Number: CGMO1-1, CGMO1-2 and CGMO1-5

010246

Lot Number: **T-MO01130**

Starting Material:	Ammonium Molybdenum Oxide
Starting Material Purity:	99.9943%
Starting Material Lot No:	21410

CERTIFIED CONCENTRATION: 997 ± 3 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Calculated Value: 1000 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 997 ± 3 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3134.

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	<0.050	M	Dy	<0.012	O	Li	<0.010	O	Pr	<0.10	i	Te	
M	Sb	0.0094	M	Er	<0.010	M	Lu	<0.00080	M	Re	<0.0020	M	Tb	<0.00060
M	As	<0.020	M	Eu	<0.0060	O	Mg	<0.050	M	Rh	<0.0020	M	Tl	<0.0020
M	Ba	<0.020	M	Gd	<0.0020	M	Mn	<0.0080	M	Rb	0.025	M	Th	<0.0020
M	Be	<0.0010	M	Ga	<0.0020	i	Hg		M	Ru	<0.0040	M	Tm	<0.00080
M	Bi	<0.00080	M	Ge	<0.012	s	Mo		M	Sm	<0.0020	M	Sn	<0.010
O	B	<0.50	M	Au	<0.0060	O	Nd	<0.050	O	Sc	<0.050	O	Ti	<0.0050
O	Cd	<0.50	M	Hf	<0.0040	M	Ni	<0.016	M	Se	<0.016	M	W	0.056*
O	Ca	0.00026	M	Ho	<0.0010	O	Nb	<0.10	O	Si	<0.10	M	U	<0.0040
O	Ce	<0.050	M	In	0.0024	n	Os		M	Ag	<0.0040	M	V	<0.0040
M	Cs	<0.00060	M	Ir	<0.010	M	Pd	<0.010	O	Na	<0.10	M	Yb	<0.0020
M	Cr	<0.010	O	Fe	<0.50	i	P		M	Sr	<0.0010	M	Y	<0.080
M	Co	<0.0060	M	La	<0.0010	M	Pt	<0.0040	i	S		M	Zn	<0.040
M	Cu	<0.012	M	Pb	< 0.0060	O	K	0.0098	M	Ta	<0.014	M	Zr	<0.010

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

*W impurity may be due to Mo doubly charged ion and represents the maximum concentration possible.

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 0.999 g/mL **(over)**

QA:KL Rev.073102DN

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 1 MAR 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Phosphorus in H_2O

Catalog Number: CGP1-1, CGP1-2 and CGP1-5

Lot Number: **T-P01118**

010247

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/01/03
DATE EXPIRED: 06/01/2004
DATE OPENED: 05/01/03
INORG: 4049 PO: F52180

Starting Material:	Phosphoric Acid
Starting Material Purity:	99.999%
Starting Material Lot No:	J18804

CERTIFIED CONCENTRATION: 1004 ± 2 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1004 ± 2 µg/mL
Method: Acidimetric Titration vs NIST SRM 84k KHP.

Instrument Analysis: 1000 ± 3 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3139a.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	<0.040	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.012	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	0.00070	O	Hg	<0.020	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	n	Sc		n	Ti	
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
M	Ce	<0.00050	M	In	<0.030	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	s	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0035
M	Cu	0.080	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 0.999 g/mL **(over)**

QA:KL Rev.122002DN

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 01 MAY 2004

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

010248

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** *The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Silicon in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGSI1-1, CGSI1-2, and CGSI1-5
Lot Number:	**W-SI02082**
Starting Material:	SiO2
Starting Material Purity (%):	99.996367
Starting Material Lot No	C05310C
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4153 PO: F52370

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1000 ± 5 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1000 ± 5 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3150 Lot Number: 991108

Assay Method #2 **1001 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

010249

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.02730	M Dy < 0.01358	O Li < 0.00009	M Pr < 0.00068	M Te < 0.06791
M Sb < 0.00113	M Er < 0.01132	M Lu < 0.00091	M Re < 0.00226	M Tb < 0.00068
M As < 0.02264	M Eu < 0.00679	O Mg < 0.04991	M Rh < 0.00226	M Tl < 0.00226
M Ba < 0.02264	M Gd < 0.00226	M Mn < 0.00906	M Rb < 0.00226	M Th < 0.00226
O Be < 0.00091	M Ga < 0.00226	O Hg < 0.04991	M Ru < 0.00453	M Tm < 0.00091
M Bi < 0.00091	M Ge < 0.01358	M Mo < 0.00453	M Sm < 0.00226	M Sn < 0.01132
O B 0.02409	M Au < 0.00679	M Nd < 0.00453	O Sc < 0.00091	O Ti 0.01325
M Cd < 0.00679	M Hf < 0.00453	O Ni < 0.01044	M Se < 0.01811	M W < 0.02264
O Ca 0.00135	M Ho < 0.00113	M Nb < 0.00113	s Si	M U < 0.00453
M Ce < 0.01132	M In < 0.02264	n Os	M Ag < 0.00453	O V < 0.00408
M Cs < 0.00068	M Ir < 0.01132	M Pd < 0.01132	O Na 0.02008	M Yb < 0.00226
O Cr < 0.00681	O Fe < 0.00499	O P < 0.02269	O Sr < 0.00032	M Y < 0.09055
M Co < 0.00679	M La < 0.00113	M Pt < 0.00453	O S < 0.11342	M Zn < 0.04528
O Cu < 0.00454	M Pb < 0.00679	O K < 0.00771	M Ta 0.00200	M Zr < 0.01132

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 28.0855; +4; 6; $Si(OH)_x(F)_y^{2-}$ **010250**

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 at ≥50 ppm)
ICP-OES	251.611 nm	0.012 / 0.003 µg/mL	1	ion	Ta, U, Zn, Th
ICP-OES	212.412 nm	0.02 / 0.01 µg/mL	1	ion	Hf, Os, Mo, Ta
ICP-OES	288.158 nm	0.03 / 0.004 µg/mL	1	ion	Ta, Ce, Cr, Cd, Th
ICP-MS	28 amu	4000 - 8000 ppt	n/a	M'	$^{14}N_2$, $^{12}C^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4153 PO: F52370

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010251

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 24, 2003

Expiration Date: EXPIRES 01 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

Certificate of Analysis

CUSTOM-GRADE SOLUTION

1000 μg/mL Titanium in 1.4% HNO_3 (abs) tr. HF 010252

Catalog Number: CGTI1-1, CGTI1-2 and CGTI1-5

This standard should **not** be prepared or stored in glass.

Lot Number: **T-TI02039**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/12/02
DATE EXPIRED: 12/1/2003 DR
DATE OPENED: 11/13/02
INORG: 3762 PO: F52061

Starting Material:	Titanium Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	F29I14

CERTIFIED CONCENTRATION: 1010 ± 3 μg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Calculated Value: 1002 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1010 ± 3 μg/mL (Average of 3 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3162a.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.**
An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	<0.010	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	O	Mg	< 0.020	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	M	Mn	0.0020	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.050	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.050	M	Au	<0.00030	M	Nd	<0.00020	O	Sc	<0.0020	s	Ti	
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.010	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.020	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	0.12	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.010	i	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	i	S		M	Zn	0.19
O	Cu	<0.040	M	Pb	<0.00030	n	K	0.23	M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.011 g/mL

QA:KL Rev.060502DN

(over)

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
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Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 12/2003

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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) HNO_3**

Catalog Number:	CGSR1-1, CGSR1-2, and CGSR1-5
Lot Number:	**T-SR01123**
Starting Material:	$SrCO_3$
Starting Material Purity (%):	99.9951
Starting Material Lot No	22593
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4154 PO: F52370

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 998 ± 2 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1002 ± 8 µg/mL**
ICP Assay NIST SRM 3153a Lot Number: 990906

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.00600	O Li < 0.00003	M Pr < 0.00030	O Te < 0.10000
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
O As < 0.00500	M Eu < 0.00300	O Mg 0.00037	O Rh < 0.00600	M Tl < 0.00100
M Ba 0.04001	M Gd < 0.00100	O Mn 0.00018	i Rb	M Th < 0.00100
O Be < 0.00009	M Ga < 0.00100	O Hg < 0.01500	O Ru < 0.00300	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00600	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
O B < 0.00060	M Au < 0.00300	M Nd < 0.00200	M Sc < 0.01000	M Ti < 0.05001
M Cd < 0.00300	M Hf < 0.00200	O Ni < 0.00300	O Se < 0.05000	M W < 0.01000
O Ca 0.03600	M Ho < 0.00050	M Nb < 0.00050	O Si 0.00056	M U < 0.00200
M Ce < 0.00500	O In < 0.00200	n Os	M Ag < 0.00200	M V < 0.00200
M Cs < 0.00030	M Ir < 0.00500	O Pd < 0.00400	O Na 0.00520	M Yb < 0.00100
O Cr < 0.00080	O Fe 0.00080	O P < 0.00480	s Sr	O Y < 0.00004
M Co < 0.00300	M La < 0.00050	M Pt < 0.00200	n S	M Zn < 0.02000
O Cu < 0.00140	M Pb < 0.00300	O K < 0.00170	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 87.62; +2; 6; $Sr(H_2O)_6^{+2}$
Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_2SO_4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1 - 3.5% HNO_3 / LDPE container.
Sr Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO_3); Ores (Carbonate fusion in Pt° followed by HCl dissolution); Organic Matrices (Dry ash and dissolution in dilute HCl).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES 407.771 nm	0.0004 / 0.00006 µg/mL	1	ion	U, Ce
ICP-OES 421.552 nm	0.0008 / 0.00004 µg/mL	1	ion	Rb
ICP-OES 460.733 nm	0.07 / 0.003 µg/mL	1	atom	Ce
ICP-MS 88 amu	1200 ppt	n/a	M+	$^{72}Ge^{16}O$, $^{176}Yb^{+2}$, $^{176}Lu^{+2}$, $^{176}Hf^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

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10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

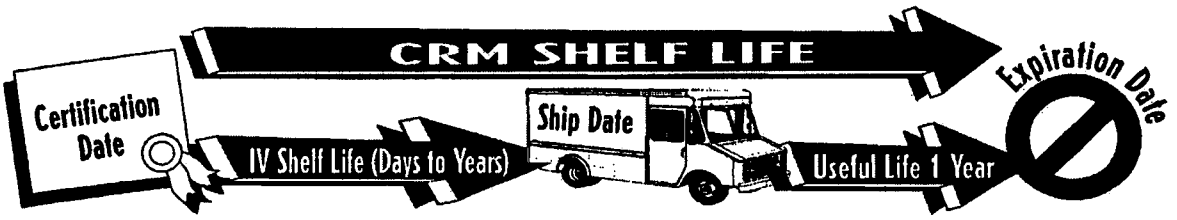
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 31, 2002

Expiration Date: EXPIRES 01/2004

INORGANIC LABS/RADCHEM LABS pg. 2 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4154 PO: F52370

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010256

Certificate Prepared By:	Debbie Newman, QA Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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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 Tin in H_2O tr HNO_3 tr HF**

Catalog Number:	CGSN1-1, CGSN1-2, and CGSN1-5
Lot Number:	**T-SN01110**
Starting Material:	#1, #2 SN SHOT
Starting Material Purity (%):	99.9969
Starting Material Lot No	AAJM H12H17, A23F09
Matrix:	H_2O tr HNO_3 tr HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 3/26/03
DATE EXPIRED: 4/01/2004
DATE OPENED: 3/28/03
INORG: 4026 PO: F52167

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1003 ± 5 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1003 ± 5 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3161a Lot Number: 993107

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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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 < 0.01217	O Li < 0.00002	M Pr < 0.00061	M Te < 0.06087
O Sb < 0.01000	M Er < 0.01014	M Lu < 0.00081	M Re < 0.00203	M Tb < 0.00061
M As < 0.02029	M Eu < 0.00609	O Mg < 0.00003	M Rh < 0.00203	M Tl < 0.00203
O Ba < 0.00070	M Gd < 0.00203	M Mn < 0.00812	M Rb < 0.00203	M Th < 0.00203
M Be < 0.00101	M Ga < 0.00203	O Hg < 0.01500	M Ru < 0.00406	M Tm < 0.00081
M Bi < 0.00081	M Ge < 0.01217	M Mo < 0.00406	M Sm < 0.00203	S Sn
O B < 0.01200	M Au < 0.00609	M Nd < 0.00406	M Sc < 0.02029	M Ti < 0.10144
O Cd < 0.00500	M Hf < 0.00406	O Ni < 0.01000	M Se < 0.01623	M W < 0.02029
O Ca < 0.00150	M Ho < 0.00101	M Nb < 0.00101	O Si 0.02700	M U < 0.00406
M Ce < 0.01014	M In < 0.02029	n Os	M Ag < 0.00406	M V < 0.00406
M Cs < 0.00061	M Ir < 0.01014	M Pd < 0.01014	O Na 0.00325	M Yb < 0.00203
M Cr < 0.01014	O Fe < 0.00110	O P < 0.00500	M Sr < 0.00101	M Y < 0.08115
O Co < 0.00200	M La < 0.00101	M Pt < 0.00406	N S	M Zn < 0.04058
M Cu < 0.01217	M Pb < 0.00609	O K < 0.00200	M Ta < 0.01420	M Zr < 0.01014

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 - 118.710; +4; 4,5, 6,7,8 $Sn(OH)_2F_2^{2-}$

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 $Sn(OH)_2F_2^{2-}$ for 1 year in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Sn(OH)_2F_2^{2-}$ 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 at ppm conc.)
ICP-OES	189.989 nm	0.03 / 0.003 µg/mL	1	ion	
ICP-OES	242.949 nm	0.1 / 0.01 µg/mL	1	atom	W, Mo, Rh, Ta, Co
ICP-MS	120 amu	5 ppt	n/a	M^+	^{104}Te, $^{104}Ru^{16}O$, $^{104}Pd^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 3/26/03
DATE EXPIRED: 4/01/2004
DATE OPENED: 3/28/03
INORG: 4026 PO: F52167

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010260

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 17, 2002

Expiration Date: EXPIRES 12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, QA Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

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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 Bismuth in 3.5% (abs) HNO_3**

Catalog Number:	CGBI1-1 and CGBI1-5
Lot Number:	**W-BI01089**
Starting Material:	Bi needles
Starting Material Purity (%):	99.999090
Starting Material Lot No	G25L16
Matrix:	3.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4200 PO: F52383

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 4 µg/mL

Certified Density: 1.026 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1002 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3106 Lot Number: 991212

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION -** All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

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4.3 **THERMOMETER CALIBRATION -** The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION -** In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00012	M	Dy	< 0.01202	O	Li	< 0.00002	M	Pr	< 0.00060	M	Te	< 0.06008
M	Sb	< 0.00100	M	Er	< 0.01001	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.02003	M	Eu	< 0.00601	O	Mg	0.00070	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.02003	M	Gd	< 0.00200	O	Mn	< 0.00020	M	Rb	< 0.00200	M	Th	< 0.00200
M	Be	< 0.00100	M	Ga	< 0.00200	O	Hg	< 0.01500	M	Ru	< 0.00401	M	Tm	< 0.00080
s	Bi		M	Ge	< 0.01202	M	Mo	< 0.00401	M	Sm	< 0.00200	M	Sn	< 0.01001
M	B	< 0.14018	M	Au	< 0.00601	M	Nd	< 0.00401	M	Sc	< 0.02003	M	Ti	< 0.10013
O	Cd	0.00017	M	Hf	< 0.00401	M	Ni	< 0.01602	M	Se	< 0.01602	M	W	< 0.02003
O	Ca	0.00245	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	0.00105	M	U	< 0.00401
M	Ce	< 0.01001	O	In	0.00105	n	Os		M	Ag	< 0.00401	M	V	< 0.00401
M	Cs	< 0.00060	M	Ir	< 0.01001	O	Pd	< 0.00400	O	Na	0.00240	M	Yb	< 0.00200
O	Cr	0.00020	O	Fe	0.00014	O	P	< 0.01000	M	Sr	< 0.00100	M	Y	< 0.08011
M	Co	< 0.00601	M	La	< 0.00100	M	Pt	< 0.00401	O	S	< 0.03000	O	Zn	0.00008
O	Cu	0.00014	O	Pb	0.00135	O	K	0.00039	M	Ta	< 0.01402	M	Zr	< 0.01001

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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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 - 208.9804; +3; 6 ;$Bi(O)(H_2O)_6^{3+}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4 and HF. **Avoid** basic media forming insoluble hydroxide. Stable with most metals and inorganic anions in acidic media. Many salts that are insoluble in water are soluble in HCl, HNO_3 and HF. The major problem with Bi^{3+} is its tendency to hydrolyze at higher concentrations or in dilute acid. Nitric acid solutions should be 5% to hold the Bi in solution in the 100 to 10000 µg/mL concentration range

Stability - 2-100 ppb levels stable for months in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5 - 7% HNO_3 / LDPE container.

Bi Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HNO_3); Alloys (Dissolve in conc. 4:1 HCl /HNO_3. Heating may be required.); Organic based (dry ash at 450°C and dissolve ash in HNO_3 or acid digestion with conc. hot sulfuric acid adding hydrogen peroxide dropwise and carefully until clear.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe interferences.)
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^+	$^{191}Ir^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

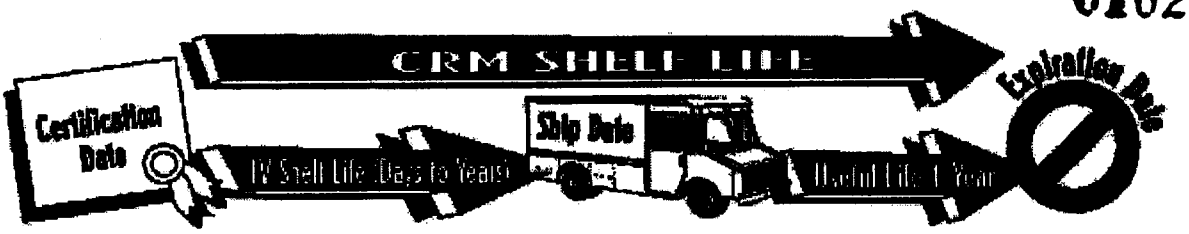
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4200 PO: F52383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010264



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 28, 2003

Expiration Date: EXPIRES 1/2/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Div. 20
TASK ORDER: 031106-12
SRR: 25200
SDG: 237578
CASE: CNWRA
VTSR: November 06, 2003
PROJECT#: 06002.01.141

Pipette Calibrations

Book/Page: 03 019

SwRI – Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

(Space provide for Inorganic Laboratories' Fixed Volume Pipette Verification Spreadsheet)

010263

L. Wright 11/4/03

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	1.0184	1.0102	1.0165	1.015	101.50
TMA1	1000	1.0187	1.0064	1.0019	1.009	100.90
TMA2	1000	1.0175	1.0126	1.0052	1.012	101.18
TMA3	1000	Out of Service				
TMA6	1000	1.0013	1.0015	1.0033	1.002	100.20
TMB1	900	0.9002	0.9001	0.9005	0.900	100.03
TMC1	800	0.803	0.7978	0.7995	0.800	100.01
TMDD1	750	0.7484	0.7491	0.7479	0.748	99.80
TMD1	700	0.7009	0.6906	0.6998	0.697	99.59
TMD2	700	0.7065	0.7082	0.7049	0.707	100.93
TME1	600	0.607	0.605	0.6051	0.606	100.95
TMF2	500	0.5077	0.5062	0.5026	0.506	101.10
TMF5	500	0.509	0.5061	0.501	0.505	101.07
ICF1	500	0.5012	0.5014	0.5003	0.501	100.19
L30-500	500	0.4997	0.4998	0.4989	0.499	99.89
TMG3	400	0.3979	0.3958	0.3995	0.398	99.43
TMH1	300	Out of Service				
TMH2	300	0.2993	0.2978	0.3009	0.299	99.78
TMJ1	250	0.25	0.2503	0.2499	0.250	100.03
TMJ2	250	0.2488	0.2492	0.2495	0.249	99.67
TMJ3	250	0.2504	0.2503	0.2519	0.251	100.35
TMK2	200	0.2	0.2001	0.2006	0.200	100.12
TML1	150	0.1486	0.1493	0.149	0.149	99.31
TMM1	120	0.1207	0.1202	0.1205	0.120	100.39
TMN3	100	0.1003	0.1001	0.1002	0.100	100.20
ICN1	100	0.1004	0.0999	0.0993	0.100	99.87
TMQ1	80	0.0799	0.08	0.0799	0.080	99.92
TMR1	70	Out of Service				
TMS1	60	Out of Service				
LAB-30A	50	0.0498	0.0497	0.0496	0.050	99.40
TMU1	40	0.0402	0.0403	0.0402	0.040	100.58
TMU2	40	0.04	0.0399	0.04	0.040	99.92
TMV1	30	0.0296	0.0298	0.0297	0.030	99.00
L30-20	20	0.0199	0.0198	0.0199	0.020	99.33
TMW1	25	0.025	0.025	0.0249	0.025	99.87
TMY1	15	Out of Service				

FRM-246 (Rev 1/Mar 03)

Book/Page 03 020

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

Balance #: 16 Thermometer #: G011 diH20 Temperature (°C): 2010266

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
Lab30	1000	1.0184	1.0102	1.0165
TMA1	1000	1.0187	1.0064	1.0019
TMA2	1000	1.0175	1.0126	1.0052
~~TMA3~~	~~1000~~	out		
TMA6 ~~out~~ OK	1000	~~1.0414~~ 1.0013 MW 10/31/03	~~1.0220~~ 1.0015	~~1.0105~~ 1.0033 MW 10/31/03
TMB1	900	0.9002	0.9001	0.9005
TMC1	800	0.8030	0.7978	0.7995
TMDD1	750	0.7484	0.7491	0.7479
TMD1	700	0.7009	0.6906	0.6998
TMD2	700	0.7065	0.7082	0.7049
TME1	600	0.6070	0.6050	0.6051
TMF2	500	0.5077	0.5062	0.5026
TMF5	500	0.5090	0.5061	0.5010
ICF1	500	0.5012	0.5014	0.5003
L30-500	500	0.4997	0.4998	0.4989
TMG3	400	0.3979	0.3958	0.3995
TMH1 out!	300	out of service 0.2192	0.2100	0.2182
TMH2	300	0.2993	0.2978	0.3009
TMJ1	250	0.2500	0.2503	0.2499
TMJ2	250	0.2488	0.2492	0.2495
TMJ3	250	0.2504	0.2503	0.2519
TMK2	200	0.2000	0.2001	0.2006
TML1	150	0.1486	0.1493	0.1490
TMM1	120	0.1207	0.1202	0.1205
TMN3	100	0.1003	0.1001	0.1002
ICN1	100	0.1004	0.0999	0.0993
TMQ1	80	0.0799	0.0800	0.0799
~~TMR1~~	~~70~~	out		
~~TMS1~~	~~60~~	out		
LAB-30A	50	0.0498	0.0497	0.0496
TMU1	40	0.0402	0.0403	0.0402
TMU2	40	0.0400	0.0399	0.0400
TMV1	30	0.0296	0.0298	0.0297
L30-20	20	0.0199	0.0198	0.0199
TMW1	25	0.0250	0.0250	0.0249
~~TMY1~~	~~15~~	out		

Analyst: Laura Wright Date: 10/21/03

Reviewed by: [illegible] Date: 12/02/03

FRM-243b (Rev 3/Mar 03)

Book/page: 04 015

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet) 010267

SwRI 11-14-03

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	0.0198	0.0198	0.0199	0.020	99.17
ADJ200-A	100	0.0988	0.0980	0.0984	0.098	98.40
	200	0.1987	0.1981	0.1984	0.198	99.20
	20	0.0199	0.0198	0.0198	0.020	99.17
ADJ200-C	100	0.0984	0.0983	0.0983	0.098	98.33
	200	0.1973	0.1975	0.1980	0.198	98.80
	20	0.0202	0.0199	0.0199	0.020	100.00
ADJ200-D	100	0.0980	0.0981	0.0988	0.098	98.30
	200	0.1977	0.1989	0.1986	0.198	99.20
	20				0.000	0.00
ADJ200-G	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-H	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-J	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00

FRM-247a (Rev 3/Oct 03)

Book/page: 04 016

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010268

Balance #: 16 Thermometer #: G 011 diH20 Temperature (° C) 22

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
20 µL – 200 µL		20	0.0198	0.0198	0.0199
	ADJ200-A	100	0.0988	0.0980	0.0984
	34	200	0.1987	0.1981	0.1984
		20	0.0199	0.0198	0.0198
	ADJ200-C	100	0.0984	0.0983	0.0983
	39	200	0.1973	0.1975	0.1980
		20	0.0202	0.0199	0.0199
	ADJ200-D	100	0.0980	0.0981	0.0988
	27	200	0.1977	0.1989	0.1986
		20			
	ADJ200-G	100			
		200			
		20			
	ADJ200-H	100			
		200			
		20			
	ADJ200-J	100			
		200			
		20			
	ADJ200	100			
		200			
		20			
	ADJ200	100			
		200			

LW 11/7/03

pipette verification performed 11-7 by L.W., computer spreadsheet posted 11-14 by J. Willis

Analyst: Laura Wright Date: 11/7/03

Reviewed by: John Willis Date: 11-14-03

Book/page: 04 017

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010269

JGV 11/11/03

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20				0.000	0.00
ADJ200-A	100				0.000	0.00
	200				0.000	0.00
	20		JGV 11/11/03		0.000	0.00
ADJ200-C	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-D	100				0.000	0.00
	200				0.000	0.00
	20	0.0200	0.0199	0.0199	0.020	99.67
ADJ200-G	100	0.1010	0.1001	0.1007	0.101	100.60
	200	0.2001	0.1997	0.1990	0.200	99.80
	20	0.0201	0.0202	0.0201	0.020	100.67
ADJ200-H	100	0.0990	0.0989	0.0991	0.099	99.00
	200	0.1989	0.1995	0.1979	0.199	99.38
	20	0.0201	0.0202	0.0202	0.020	100.83
ADJ200-J	100	0.0985	0.0990	0.0991	0.099	98.87
	200	0.1989	0.1991	0.1983	0.199	99.38
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200		JGV 11/11/03		0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00

FRM-247a (Rev 3/Oct 03)

Book/page: 04 018

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log #10270

Balance #: 34 Thermometer #: G 011 diH20 Temperature (° C) 21

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20			
ADJ200-A	100			
	200			
	20			
ADJ200-C	100		JGV 11/11/03	
	200			
	20			
ADJ200-D	100			
	200			
	20	0.0200	0.0199	0.0199
ADJ200-G	100	0.1010	0.1001	0.1007
	200	0.2001	0.1997	0.1990
	20	0.0201	0.0202	0.0201
ADJ200-H	100	0.0990	0.0989	0.0991
	200	0.1989	0.1995	0.1979
	20	0.0201	0.0202	0.0202
ADJ200-J	100	0.0985	0.0990	0.0991
	200	0.1989	0.1991	0.1983
	20			
ADJ200	100			
	200		JGV 11/11/03	
	20			
ADJ200	100			
	200			

J.V. 11/11/03

Analyst: J. Van Date: ~~10~~ 11/11/03

Reviewed by: ams Date: 11/17/03

Book/page: 04 023

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010271

11-21-03

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20	0.0204	0.0202	0.0203	0.020	101.50
ADJ200-A	100	0.0999	0.0998	0.0993	0.100	99.67
	200	0.1996	0.1990	0.1996	0.199	99.70
	20	0.0200	0.0203	0.0203	0.020	101.00
ADJ200-C	100	0.0995	0.0993	0.0991	0.099	99.30
	200	0.1992	0.1993	0.1996	0.199	99.68
	20	0.0202	0.0204	0.0200	0.020	101.00
ADJ200-D	100	0.0999	0.0995	0.0997	0.100	99.70
	200	0.1993	0.1995	0.1997	0.200	99.75
	20					
ADJ200-G	100					
	200					
	20					
ADJ200-H	100					
	200					
	20					
ADJ200-J	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					

FRM-247a (Rev 3/Oct 03)

Book/page: 04 024

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010272

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 21

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
20 µL – 200 µL		20	.0204	.0202	.0203
	ADJ200-A	100	.0999	.0998	.0993
		200	.1996	.1990	.1996
		20	.0200	.0203	.0203
	ADJ200-C	100	.0995	.0993	.0991
		200	.1992	.1993	.1996
		20	.0202	.0204	.0200
	ADJ200-D	100	.0999	.0995	.0997
		200	.1993	.1995	.1997
		20			
	ADJ200-G	100			
		200			
		20			
	ADJ200-H	100			
		200			
		20			
	ADJ200-J	100			
		200			
		20			
	ADJ200	100			
		200			
		20			
	ADJ200	100			
		200			

11-21-03

Analyst: John Wilks Date: 11-21-03

Reviewed by: Walter Allen Date: 12/22/03

Book/page: 04 025

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010273

JV 11/21/03

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20				0.000	0.00
ADJ200-A	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-C	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-D	100				0.000	0.00
	200				0.000	0.00
	20	0.0201	0.0201	0.0200	0.020	100.33
ADJ200-G	100	0.0989	0.0984	0.0989	0.099	98.73
	200	0.2001	0.2003	0.2050	0.202	100.90
	20	0.0202	0.0203	0.0204	0.020	101.50
ADJ200-H	100	0.1009	0.1010	0.1007	0.101	100.87
	200	0.1986	0.1984	0.1989	0.199	99.32
	20	0.0197	0.0198	0.0200	0.020	99.17
ADJ200-J	100	0.0991	0.0993	0.0991	0.099	99.17
	200	0.1989	0.1991	0.1992	0.199	99.53
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00

FRM-247a (Rev 3/Oct 03)

Book/page: 04 026

010274

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20			
ADJ200-A	100			
	200			
	20			
ADJ200-C	100			
	200			
	20			
ADJ200-D	100			
	200			
	20	0.0201	0.0201	0.0200
ADJ200-G	100	0.0989	0.0984	0.0989
	200	0.2001	0.2003	0.2050
	20	0.0202	0.0203	0.0204
ADJ200-H	100	0.1009	0.1010	0.1007
	200	0.1986	0.1984	0.1989
	20	0.0197	0.0198	0.0200
ADJ200-J	100	0.0991	0.0993	0.0991
	200	0.1989	0.1991	0.1992
	20			
ADJ200	100			
	200			
	20			
ADJ200	100			
	200			

J.V. 11/21/03

J.V. 11/21/03

Analyst: [signature] Date: 11/21/03

Reviewed by: [signature] Date: 12/22/03

Book/page: 04 069

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010275

11-14-03

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	0.0989	0.0991	0.0990	0.099	99.00
ADJ1000-C	500	0.4910	0.4961	0.4982	0.495	99.02
	1000	0.9834	0.9869	0.9843	0.985	98.49
	100	0.0990	0.0993	0.0996	0.099	99.30
ADJ1000-D	500	0.4924	0.4995	0.4983	0.497	99.35
	1000	0.9866	0.9860	0.9870	0.987	98.65
	100	0.1010	0.1015	0.0993	0.101	100.60
ADJ1000-E	500	0.4985	0.4977	0.4986	0.498	99.65
	1000	0.9977	0.9985	0.9961	0.997	99.74
	100	0.0999	0.1001	0.0992	0.100	99.73
ADJ1000-F	500	0.4989	0.4963	0.4960	0.497	99.41
	1000	1.0067	0.9976	0.9996	1.001	100.13
	100				0.000	0.00
ADJ1000-G	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-H	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-J	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00

FRM-247b (Rev 2/Oct 03)

Book/page: 04 070

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010278

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 22

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
100 µL – 1000 µL		100	0.0989	0.0991	0.0990
	ADJ1000-C	500	0.4910	0.4961	0.4982
	27	1000	0.9834	0.9869	0.9843
	hard turn	100	0.0990	0.0993	0.0996
	ADJ1000-D	500	0.4924	0.4995	0.4983
	27 "	1000	0.9866	0.9860	0.9870
		100	0.1010	0.1015	0.0993
	ADJ1000-E	500	0.4985	0.4977	0.4986
	34	1000	0.9977 ~~1.0065~~ LW 11/7/03	0.9985	0.9961
		100	0.0999	0.1001	0.0992
	ADJ1000-F	500	0.4989	0.4963	0.4960
	39	1000	1.0067	0.9976	0.9996
		100			
	ADJ1000-G	500			
		1000			
		100			
	ADJ1000-H	500			
		1000			
		100			
	ADJ1000-J	500		LW 11/7/03	
		1000			
		100			
	ADJ1000	500			
		1000			
		100			
	ADJ1000	500			
		1000			

pipet verification performed 11-7 by L.W., spreadsheet posted 11-14 by J. Wells

Analyst: Laura Wright Date: 11/7/03

Reviewed by: John Wells Date: 11-14-03

Book/page: 04 071

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

010277

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

TV 11/1/03

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	0.1025	0.1015	0.1013	0.102	101.77
ADJ1000-G	500	0.4996	0.4995	0.4992	0.499	99.89
	1000	0.9911	0.9915	0.9920	0.992	99.15
	100	0.1011	0.1014	0.1011	0.101	101.20
ADJ1000-H	500	0.4975	0.4965	0.4935	0.496	99.17
	1000	0.9978	0.9984	0.9981	0.998	99.81
	100	0.1009	0.1011	0.1015	0.101	101.17
ADJ1000-J	500	0.4985	0.4981	0.4973	0.498	99.59
	1000	0.9982	0.9971	0.9965	0.997	99.73
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00

FRM-247b (Rev 2/Oct 03)

Book/page: 04 072

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010278

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			
ADJ1000-C	500			
	1000			
	100			
ADJ1000-D	500			
	1000			
	100			
ADJ1000-E	500			
	1000			
	100			
ADJ1000-F	500			
	1000			
	100	0.1025	0.1015	0.1013
ADJ1000-G	500	0.4996	0.4993	0.4992
	1000	0.9911	0.9915	0.9920
	100	0.1011	0.1014	0.1011
ADJ1000-H	500	0.4975	0.4965	0.4935
	1000	0.9978	0.9984	0.9981
	100	0.1009	0.1011	0.1015
ADJ1000-J	500	0.4985	0.4981	0.4973
	1000	0.9982	0.9971	0.9965
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			

JGV 11/11/03

Analyst: [signature] Date: 11/11/03

Reviewed by: [signature] Date: 11/17/03

Book/page: 04 077

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet) 010279

11-21-03

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	0.1000	0.0993	0.1000	0.100	99.77
ADJ1000-C	500	0.4959	0.4983	0.4964	0.497	99.37
	1000	0.9941	0.9959	0.9933	0.994	99.44
	100	0.1003	0.1016	0.1007	0.101	100.87
ADJ1000-D	500	0.4953	0.4973	0.4966	0.496	99.28
	1000	0.9929	0.9916	0.9957	0.993	99.34
	100	0.1007	0.1000	0.1009	0.101	100.53
ADJ1000-E	500	0.4945	0.4978	0.4939	0.495	99.08
	1000	0.9944	0.9964	0.9986	0.996	99.65
	100	0.1020	0.1018	0.1008	0.102	101.53
ADJ1000-F	500	0.4958	0.4991	0.4973	0.497	99.48
	1000	0.9995	1.0077	0.9987	1.002	100.20
	100					
ADJ1000-G	500					
	1000					
	100					
ADJ1000-H	500					
	1000					
	100					
ADJ1000-J	500					
	1000					
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000	500					
	1000					

FRM-247b (Rev 2/Oct 03)

Book/page: 04 078

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010280

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	.1000	.0993	.1000
ADJ1000-C	500	.4959	.4983	.4964
	1000	.9941	.9959	.9933
	100	.1003	.1016	.1007
ADJ1000-D	500	.4953	.4973	.4966
	1000	.9929	.9916	.9957
	100	.1007	.1000	.1009
ADJ1000-E	500	.4945	.4978	.4939
	1000	.9944	.9964	.9986
	100	.1020	.1018	.1008
ADJ1000-F	500	.4958	.4991	.4973
	1000	.9995	1.0077	.9987
	100			
ADJ1000-G	500			
	1000			
	100			
ADJ1000-H	500			
	1000			
	100			
ADJ1000-J	500			
	1000			
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			

11-21-03

Analyst: John Wilk Date: 11-21-03

Reviewed by: [illegible] Date: 12/22/03

Book/page: 04 079

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

010281

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

J.V. 11/21/03

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	0.0991	0.0990	0.0989	0.099	99.00
ADJ1000-G	500	0.4985	0.4989	0.4990	0.499	99.76
	1000	0.9963	0.9968	0.9972	0.997	99.68
	100	0.1021	0.1010	0.1015	0.102	101.53
ADJ1000-H	500	0.5051	0.5042	0.5012	0.504	100.70
	1000	0.9975	0.9985	0.9979	0.998	99.80
	100	0.1009	0.1004	0.1007	0.101	100.67
ADJ1000-J	500	0.5011	0.4997	0.4992	0.500	100.00
	1000	1.0013	1.0025	1.0015	1.002	100.18
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00

FRM-247b (Rev 2/Oct 03)

Book/page: 04 080

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010282

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			
ADJ1000-C	500			
	1000			
	100			
ADJ1000-D	500			
	1000			
	100			
ADJ1000-E	500			
	1000			
	100			
ADJ1000-F	500		JV 11/21/03	
	1000			
	100 JV 11/21/03	~~0.0990~~ 0.0991	0.0990	0.0989
ADJ1000-G	500	0.4985	0.4989	0.4990
	1000	0.9963	0.9968	0.9972
	100	0.1021	0.1010	0.1015
ADJ1000-H	500	0.5051	0.5042	0.5012
	1000	0.9975	0.9985	0.9979
	100	.1009	JV 11/21/03 .1004	JV 11/21/03 .1007
ADJ1000-J	500	0.5011	0.4997	0.4992
	1000	1.0013	1.0025	1.0015
	100			
ADJ1000	500		J.V. 11/21/03	
	1000			
	100			
ADJ1000	500			
	1000			

Analyst: [signature] Date: 11/21/03

Reviewed by: [signature] Date: 12/22/03

Book/page: 04 125

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet) 010283

11-14-03

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	0.4949	0.4932	0.4938	0.494	98.79
ADJ5000-C	2500	2.4899	2.4903	2.4962	2.492	99.69
	5000	5.0189	5.0071	5.0011	5.009	100.18
	500	0.5091	0.5068	0.5080	0.508	101.59
ADJ5000-G	2500	2.5106	2.5156	2.5040	2.510	100.40
	5000	5.0016	5.0095	5.0121	5.008	100.15
	500	0.5033	0.5016	0.5088	0.505	100.91
ADJ5000-H	2500	2.4950	2.4843	2.4910	2.490	99.60
	5000	5.0141	4.9930	4.9982	5.002	100.04
	500	0.5003	0.4975	0.4956	0.498	99.56
ADJ5000-I	2500	2.4983	2.4824	2.4996	2.493	99.74
	5000	4.9885	4.9874	4.9773	4.984	99.69
	500				0.000	0.00
ADJ5000-J	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-K	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-L	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00

FRM-247c (Rev 2/Mar 03)

Book/page: 04 126

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010284

Balance #: 16 Thermometer #: G0011 diH20 Temperature (° C) 22

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500	0.4949	0.4932	0.4938
ADJ5000-C	2500	2.4899	2.4903	2.4962
89	5000	5.0189	5.0071	5.0011
	500	0.5091	0.5068	0.5080
ADJ5000-G	2500	2.5106	2.5156	2.5040
27	5000	5.0016	5.0095	5.0121
	500	0.5033	0.5016	0.5088
ADJ5000-H	2500	2.4950	2.4843	2.4910
34	5000	5.0141	4.9930	4.9982
	500	0.5003	0.4975	0.4956
ADJ5000-I	2500	2.4983	2.4824	2.4996
27	5000	4.9885	4.9874	4.9773
	500			
ADJ5000-J	2500			
	5000			
	500			
ADJ5000-K	2500			
	5000			
	500			
ADJ5000-L	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

LW 11/7/03

pipet verification performed 11-7 by L.W., spreadsheet posted 11-14 by J. Wills

Analyst: Laura Wright Date: 11/7/03

Reviewed by: John Wills Date: 11-14-03

Book/page: 04 127

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet) 010285

TJ 11/11/03

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	0.4975	0.4979	0.4971	0.498	99.50
ADJ5000-J	2500	2.4988	2.4983	2.4981	2.498	99.94
	5000	5.0075	5.0072	5.0061	5.007	100.14
	500	0.5011	0.5054	0.5073	0.505	100.92
ADJ5000-K	2500	2.5011	2.5081	2.5031	2.504	100.16
	5000	5.0625	5.0355	5.0335	5.044	100.88
	500	0.4994	0.4993	0.4981	0.499	99.79
ADJ5000-L	2500	2.4979	2.4963	2.4981	2.497	99.90
	5000	5.0521	5.0241	5.0341	5.037	100.74
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00

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010286

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G 011 diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500			
ADJ5000-C	2500			
	5000			
	500		J.V. 11/11/03	
ADJ5000-G	2500			
	5000			
	500			
ADJ5000-H	2500			
	5000			
	500			
ADJ5000-I	2500			
	5000			
	500	0.4975	0.4979	0.4971
ADJ5000-J	2500	2.4988	2.4983	2.4981
	5000	5.0075	5.0072	5.0061
	500	0.5011	0.5054	0.5073
ADJ5000-K	2500	2.5011	2.5081	2.5031
	5000	5.0625	5.0355	5.0335
	500	0.4994	0.4993	0.4981
ADJ5000-L	2500	2.4979	2.4963	2.4981
	5000	5.0521	5.0241	5.0341
	500			
ADJ5000	2500			
	5000			
	500		11/11/03	
ADJ5000	2500		J.V.	
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

Analyst: [signature] Date: 11/11/03

Reviewed by: [signature] Date: 11/17/03

Book/page: 04 133

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet) 010287

11-21-03

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	0.4950	0.4927	0.4943	0.494	98.80
ADJ5000-C	2500	2.4796	2.4815	2.4826	2.481	99.25
	5000	5.0028	4.9968	4.9972	4.999	99.98
	500					
ADJ5000-G	2500	OUT	OF	SERVICE		
	5000					
	500	0.5086	0.5059	0.5065	0.507	101.40
ADJ5000-H	2500	2.5045	2.5054	2.5020	2.504	100.16
	5000	5.0054	4.9968	5.0064	5.003	100.06
	500	0.5002	0.5043	0.5010	0.502	100.37
ADJ5000-I	2500	2.4903	2.4916	2.4963	2.493	99.71
	5000	4.9918	4.9871	4.9931	4.991	99.81
	500					
ADJ5000-J	2500					
	5000					
	500					
ADJ5000-K	2500					
	5000					
	500					
ADJ5000-L	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					

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SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010288

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500	.4950	.4927	.4943
ADJ5000-C	2500	2.4796	2.4815	2.4826
	5000	5.0028	4.9968	4.9972
	500			
ADJ5000-G	2500	OUT	OF	SERVICE
	5000			
	500	.5086	.5059	.5065
ADJ5000-H	2500	2.5045	2.5054	2.5020
	5000	5.0054	4.9968	5.0064
	500	.5002	.5043	.5010
ADJ5000-I	2500	2.4903	2.4916	2.4963
	5000	4.9918	4.9871	4.9931
	500			
ADJ5000-J	2500			
	5000			
	500			
ADJ5000-K	2500			
	5000			
	500			
ADJ5000-L	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

11-21-03

ADJ 5000 G was taken out of service 11-17-03, adjust set screw is dispensing 4-5mls @ all settings. JW

Analyst: John Wilks Date: 11-21-03

Reviewed by: Walter Alfa Date: 12/22/03

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SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet) 010289

JV 11/21/03

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	0.5003	0.5005	0.5007	0.501	100.10
ADJ5000-J	2500	2.4911	2.4895	2.4925	2.491	99.64
	5000	4.9910	4.9900	4.9899	4.990	99.81
	500	0.5025	0.5012	0.5009	0.502	100.31
ADJ5000-K	2500	2.4975	2.4985	2.4990	2.498	99.93
	5000	5.0255	5.0122	5.0890	5.042	100.84
	500	0.4992	0.4995	0.4990	0.499	99.85
ADJ5000-L	2500	2.4979	2.4985	2.4992	2.499	99.94
	5000	5.0131	5.0078	5.0100	5.010	100.21
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00

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SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010290

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500			
ADJ5000-C	2500			
	5000			
	500			
ADJ5000-G	2500			
	5000			
	500			
ADJ5000-H	2500			
	5000			
	500			
ADJ5000-I	2500			
	5000			
	500	0.5003	0.5005	.5,007
ADJ5000-J	2500	2.4911	2.4895	2.4925
	5000	4.9910	4.9900	4.9899
	500	0.5025	0.5012	0.5009
ADJ5000-K	2500	2.4975	2.4985	2.4990
	5000	5.0255	5.0122	5.0890
	500	0.4992	0.4995	0.4990
ADJ5000-L	2500	2.4979	2.4985	2.4992
	5000	5.0131	5.0078	5.0100
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

J.V. 11/21/03

JV 11/21/03

J.V. 11/21/03

Analyst: J. Vaw Date: 11/21/03

Reviewed by: [signature] Date: 12/22/03

SOUTHWEST RESEARCH INSTITUTE 010291
NUCLEAR PROJECT
CLIENT: Div. 20
TASK ORDER: 031106-12
SRR: 25200
SDG: 237578
CASE: CNWRA
VTSR: November 06, 2003
PROJECT#: 06002.01.141

Balance Calibrations

Southwest Research Institute
Division 01
BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
16	28	P37987	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
11-11-03	2.0000	2.0000	JW	SN: J50526-15
11-12-03	2.0000	2.0000	JW	"
11-13-03	2.0000	2.0000	JW	"
11-14-03	2.0000	2.0000	JW	"
11-17-03	2.0000	2.0000	JW	"
		AMS		

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

✓ AMS 11/17/03

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Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
16	28	P37987	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
11-24-03	2.0000	2.0000	JW	SN: J50526-15
11-25-03	2.0000	2.0000	JW	"
11-26-03	2.0000	2.0001	JW	"
12-1-03	2.0000	2.0000	JW	"
12-2-03	2.0000	2.0000	JW	"
12-3-03	2.0000	2.0000	JW	"
12-4-03	2.0000	2.0000	JW	"
12-6-03	2.0000	2.0001	[illegible]	SN: 99-J50526-15
12-5-03	2.0000	2.0000	JW	"
12-8-03	2.0000	2.0000	JW	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

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Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
19	27	0068597	±0.05	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
11-11-03	10.00	10.00	JW	SN:99-J50624-5
11-12-03	10.00	10.00	JW	"
11-13-03	10.00	10.01	JW	"
11-14-03	10.00	10.00	JW	"
11-17-03	10.00	10.00	JW	"
11-18-03	10.00	10.00	JW	"
11-19-03	10.00	10.01	JW	"
11-20-03	10.00	10.00	JW	"
11-21-03	10.00	10.00	JW	"
11-24-03	10.00	10.00	JW	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

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Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
34	28	1116031935	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	gw 11-11-03
11-11-03	2.0000	1.9999	gw	SN: 99-J050528-15
11-12-03	2.0000	2.0000	gw	--
11-13-03	2.0000	2.0000	gw	--
11-14-03	2.0000	2.0000	gw	--
11-17-03	2.0000	1.9999	gw	--
11-18-03	2.0000	2.0001	gw	--
11-19-03	2.0000	2.0000	gw	--
11-20-03	2.0000	2.0001	gw	--
11-21-03	2.0000	2.0000	gw	--
11-24-03	2.0000	2.0001	gw	--

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

FRM-112 (Rev 1/Dec 99)

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SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Div. 20
TASK ORDER: 031106-12
SRR: 25200
SDG: 237578
CASE: CNWRA
VTSR: November 06, 2003
PROJECT#: 06002.01.141

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK 01 029
METALS LAB
SOUTHWEST RESEARCH INSTITUTE 010295

DATE	INITIALS	READING (M OHMS)	SET PT./ QC LT. Green=OK	CALL FOR Service LT. Green=OK	USAGE (GALS)	COMMENTS
11/07	DR	18.0	✓	✓	51562.1	7:20 pm
11/10	DR	18.0	✓	✓	51569.3	8:15 pm
11/11/03	DR	18.0	✓	✓	51574.4	2:09. Filter changed by US Filter
11/12/03	DR	18.0	✓	✓	51578.9	6:13 pm
11/13/03	DR	18.0	✓	✓	51583.8	7:31 pm
11/14/03	DR	18.0	✓	✓	51585.5	6:40 pm
H			checked	AMS 11/17/03		
11/17/03	DR	18.0	✓	✓	51593.0	5:17 pm
11/21/03	AMS	18.0	✓	✓	51610.0	11:50 am
11/24/03	DR	18.0	✓	✓	51621.3	7 pm
11/25/03	DR	18.0	✓	✓	51624.9	6:50 pm
11/26/03	DR	18.0	✓	✓	51628.0	1 pm
12/1/03	DR	18.0	✓	✓	51634.9	6:30 pm
12/2/03	DR	18.0	✓	✓	51640.5	5:50 pm
12/3/03	DR	18.0	✓	✓	51642.7	5:12 pm
12/4/03	DR	18.0	✓	✓	51651.4	5:49 pm
12/5/03	DR	18.0	✓	✓	51657.3	5:01 pm
12/8/03	DR					→ out sick on 12/9/03
12/9/03	DR	18.0	✓	✓	51663.2	6 pm
12/10/03	DR	18.0	✓	✓	51665.7	6:30 pm
12/11/03	DR	18.0	✓	✓	51670.9	6:50 pm
12/12/03	DR	18.0	✓	✓	51673.7	3:25 pm
12/15/03	DR	18.0	✓	✓	51676.0	6:00 pm
12/16/03	DR	18.0	✓	✓	51683.4	5:48 pm
12/17/03	DR	18.0	✓	✓	51684.8	5:34 pm
12/18/03	DR	18.0	✓	✓	51688.8	4:48 pm
		VDS	12/22/03			