SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050426-3
SRR: 27509
SDG: 262217
CASE: CNWRA
VTSR: April 25, 2005
PROJECT#: 06002.01.242

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010002

Sample ID
CAL41

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262217

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.29	0.250
Magnesium	0.859	0.250
Silicon	12.6	0.125
Potassium	4.84	1
Sodium	77.2	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010003

Sample ID
CAL41

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262217D

SRR: 27509

Task Order: 050426-3

Analysis	Original Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Calcium	7.29	7.28	0.00%
Magnesium	0.859	0.837	2.59%
Silicon	12.6	12.6	0.00%
Potassium	4.84	4.75	1.88%
Sodium	77.2	76.6	0.78%
Strontium	<0.0250	<0.0250	0.00%

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010004

Sample ID
CAL42

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262218

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.68	0.250
Magnesium	0.888	0.250
Silicon	12.7	0.125
Potassium	4.14	1
Sodium	77.9	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010005

Sample ID
CAL42

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262218S

SRR: 27509

Task Order: 050426-3

Analysis	Original Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Calcium	7.68	99.9	100	92.2%
Magnesium	0.888	93.1	100	92.2%
Silicon	12.7	31.5	20.0	94.0%
Potassium	4.14	95.6	100	91.5%
Sodium	77.9	169	100	91.1%
Strontium	<0.0250	19.6	20.0	98.0%

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010006

Sample ID
CAL43

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262219

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.44	0.250
Magnesium	0.848	0.250
Silicon	12.5	0.125
Potassium	4.92	1
Sodium	78.5	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010007

Sample ID
CAL44

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262220

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.45	0.250
Magnesium	0.903	0.250
Silicon	12.7	0.125
Potassium	4.13	1
Sodium	78.4	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010008

Sample ID
CAL45

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262221

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.13	0.250
Magnesium	0.836	0.250
Silicon	12.6	0.125
Potassium	3.96	1
Sodium	78.5	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010009

Sample ID
CAL46

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262222

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.46	0.250
Magnesium	0.878	0.250
Silicon	12.8	0.125
Potassium	4.35	1
Sodium	78.0	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010010

Sample ID
CAL47

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262223

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.28	0.250
Magnesium	0.829	0.250
Silicon	12.8	0.125
Potassium	6.21	1
Sodium	79.0	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010011

Sample ID
CAL48

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262224

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.22	0.250
Magnesium	0.837	0.250
Silicon	12.8	0.125
Potassium	4.20	1
Sodium	79.8	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010012

Sample ID
CAL49

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262225

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	6.53	0.250
Magnesium	0.758	0.250
Silicon	12.8	0.125
Potassium	4.48	1
Sodium	79.4	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010013

Sample ID
CAL410

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262226

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	2.65	0.250
Magnesium	0.487	0.250
Silicon	13.7	0.125
Potassium	4.77	1
Sodium	109	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010014

Sample ID
CAL411

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/25/05

Matrix: Water

Project No.: 06002.01.242

Lab System ID: 262227

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	1.24	0.250
Magnesium	1.11	0.250
Silicon	25.4	0.125
Potassium	4.57	1
Sodium	172	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE 010015

Sample ID
LCSW - E15H1 / E16H1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 06002.01.242

Lab System ID: NA

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Calcium	93.5	100	93.5%
Magnesium	93.1	100	93.1%
Silicon	18.7	20.0	93.5%
Potassium	89.8	100	89.8%
Sodium	89.6	100	89.6%
Strontium	19.2	20.0	96.0%

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY 010016

Sample ID
PBW - E15H1 / E16H1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 06002.01.242

Lab System ID: NA

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	<0.250	0.250
Magnesium	<0.250	0.250
Silicon	<0.125	0.125
Potassium	<1.00	1
Sodium	<1.00	1
Strontium	<0.0250	0.0250

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050426-3
SRR: 27509
SDG: 262217
CASE: CNWRA
VTSR: April 25, 2005
PROJECT#: 06002.01.242

Task Orders/01-QPP-015

Southwest Research Institute

Laboratory Task Order

TO #: 050426-3 Revision: 1

SDG: 262217
VTSR: 04/25/05
CASE: CNWRA

SRR #'s: 27509
Client(s): Div. 20

Project(s): 06002.01.242
Manager(s): DAMMANN, MIKE
To PM: 05/20/05
To QA: 06/06/05
To Client: 06/20/05

010018

Instructions

DIVISION 20 - CNWRA. 4-WEEK TAT.
Point of Contact is BRADLEY WERLING (x6565). ELEVEN samples received for SILICON, CALCIUM, MAGNESIUM, SODIUM, POTASSIUM and STRONTIUM by ICP.
Work is 10 CFR 50 Appendix B, 10 CFR Part 21. CONTACT Charlie Butcher (ext. 5928, pager 271-5172) BEFORE STARTING ANY WORK ON THIS TASK ORDER. If Charlie Butcher is not available, contact MARK EHNSTROM (ext. 3530) or JOANN BOYD (ext. 2169)
CONTACT PM WITH ANY ADDITIONAL QUESTIONS.
Rev1 (JR052505) - Prelim results were emailed to Bradley Werling on 5/20/05, revised to QAU and to client dates.

Documents Related to this task order: 16856[COC 27509]

Test: DIL-DILUTION
Section: METALPREP

Holding: 28 days from CED

Prep, Dilution

Cnt: 11

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
262217		1	Water	CAL41	22 Apr 05	20 May 05
262218		1	Water	CAL42	22 Apr 05	20 May 05
262219		1	Water	CAL43	22 Apr 05	20 May 05
262220		1	Water	CAL44	22 Apr 05	20 May 05
262221		1	Water	CAL45	22 Apr 05	20 May 05
262222		1	Water	CAL46	22 Apr 05	20 May 05
262223		1	Water	CAL47	22 Apr 05	20 May 05
262224		1	Water	CAL48	22 Apr 05	20 May 05
262225		1	Water	CAL49	22 Apr 05	20 May 05
262226		1	Water	CAL410	22 Apr 05	20 May 05
262227		1	Water	CAL411	22 Apr 05	20 May 05

Test: ICP-SWRI
Section: METALS

Holding: 180 days from CED

ICP Analysis by SwRI Method

Cnt: 11

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
262217		1	Water	CAL41	22 Apr 05	19 Oct 05
262218		1	Water	CAL42	22 Apr 05	19 Oct 05
262219		1	Water	CAL43	22 Apr 05	19 Oct 05
262220		1	Water	CAL44	22 Apr 05	19 Oct 05
262221		1	Water	CAL45	22 Apr 05	19 Oct 05
262222		1	Water	CAL46	22 Apr 05	19 Oct 05
262223		1	Water	CAL47	22 Apr 05	19 Oct 05
262224		1	Water	CAL48	22 Apr 05	19 Oct 05
262225		1	Water	CAL49	22 Apr 05	19 Oct 05
262226		1	Water	CAL410	22 Apr 05	19 Oct 05
262227		1	Water	CAL411	22 Apr 05	19 Oct 05

010019

01-QPP-015
Division 01
Revision 5
June 2004

Document No._____

Division 01

Chemistry and Chemical
Engineering Division

QUALITY PROJECT PLAN FOR

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

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

010020

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

SwRI AUTHORIZATION SIGNATORIES

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

JO ANN BOYD (210) 522-2169 — DATE 6/4/04
Quality Assurance Manager

REZA KARIMI (210) 522-2412 — DATE 6/4/04
Director, Department of Analytical and Environmental Chemistry

MICHAEL G. MACNAUGHTON (210) 522-5162 — DATE 6/4/04
Vice President, Chemistry and Chemical Engineering Division

CHRISTOPHER HOBSON (210) 522-5838 — DATE 6/4/2004
Quality Assurance Engineer

TABLE OF CONTENTS

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

1.0 INTRODUCTION

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

2.0 SCOPE

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

3.0 REFERENCES

3.1 *SwRI Quality System Manual – 2000*

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

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

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

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

4.1 Indoctrination and Training

4.1.1 Personnel performing duties affecting quality shall receive quality training to the *SwRI Program Quality Plan (PQP-Nuclear), Nuclear Services* prior to performing any work on projects for nuclear utilities. This training will be conducted either by Institute Quality Systems (IQS) or Division 01 Quality Assurance personnel and documentation shall be evident in the personnel training files maintained in Division

01 Quality Assurance.

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

4.2 Qualification of Personnel

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

4.2.2 During the performance of each testing process, testing personnel shall have access to the necessary documented procedures, i.e., QPP, QAP, Task 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 or Division 01 Quality Assurance.

4.3 Design Control

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

4.4 Right of Access

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

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

4.5 Control of Supplier-Generated Documents

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

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

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

4.6 Acceptance of Services Only

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

4.7 Commercial Grade Items

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

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

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

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

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

(a) Damage was not sustained during shipment;

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

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

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

(a) Chemical name;

(b) Chemical grade;

(c) Lot code;

(d) Date received; and

(e) Shelf life, when applicable.

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

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

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

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

(a) Sample control number;

(b) Purchase order number;

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

(d) Task order number;

(e) Nuclear QA label; and

(f) Sample retention date, when applicable.

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

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

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

4.8 Inspection

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

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

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

(b) Testing processes;

(c) Calibration and major equipment;

(d) Sample and record retention; and

(e) Test records.

4.9 Inspection and Testing

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

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

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

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

4.10 Handling, Storage, Packaging, Preservation, and Delivery

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

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

4.11 Quality Assurance Records

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

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

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

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

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

4.12 10 CFR, Part 21

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

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

4.13 Certified Test Report

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

order/release line item number.

4.14 Valid Documents List

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

5.0 HISTORY OF REVISIONS

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

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

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

010029

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050426-3
SRR: 27509
SDG: 262217
CASE: CNWRA
VTSR: April 25, 2005
PROJECT#: 06002.01.242

Chain of Custody/Login Paperwork

168856

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 CNWRA - DW 20 Big 57

Client:

Client Purchase Order/Other ID:

Site/Zone ID:

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

SwRI Contact: Mike Damman

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Si, Ca, Mg, Na, K, Sr by ICP							Client RAD SUR	INTACT
CAL 41	4-22-05		W		1	X								
CAL 42														
CAL 43														
CAL 44														
CAL 45														
CAL 46														
CAL 47														
CAL 48														
CAL 49														
CAL 410														

REMARKS

Preservation
- a = HCl to pH <2
- ~~b = HNO_3 to pH <2~~ BW 4-25-05
- c = H_2SO_4 to pH <2
- d = NaOH to pH >12
- e = ~~Cool (4°C±2°C)~~
- f = Other (specify) NONE

Nuclear Safety related, use appropriate QA procedures

POC - Brad Werling x6565 fax 5184

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

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

Temp: 22.0°C Therm #: 027

Comments: RADIOACTIVE - max Np237 values 1.7×10^{-6} M or 2.8×10^{-4} MCi/mL

696/111

	Date	Time
Relinquished by (Print/Signature): Joe Bowen	4/25/05	4:30
Received by (Print/Signature):		
Relinquished by (Print/Signature):		
Received by (Print/Signature):		
Relinquished by (Print/Signature):		

SwRI Project#: 1.20.06002.01.242

Received by SwRI Lab: (Signature)

Date: 04/26/05 Time: 16:30

Samples Disposed: Date: Time:

Samples Disposed by:

00030

168 56

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 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 Darnell

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Si, Ca, Mg, Na, K, Sr, by ICP							
CAL 411	4-22-05		W		1	X						CLIENT RAD SIL	INITIAL

REMARKS

Preservation
- a = HCl to pH <2
- ~~b = HNO_3 to pH <2~~ BW 4-25-05
- c = H_2SO_4 to pH <2
- d = NaOH to pH >12
- e = Cool (4°C+2°C)
- f = Other (specify) none

Nuclear Safety related - use appropriate QA procedures

POC - Brad Werling x 6565 fax 5784

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

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

Temp: 22.0°C Therm #: 027

Comments: RADIOACTIVE: max Np237 values 1.7×10^{-6} M or 2.8×10^{-4} μCi/mL

696/11

Relinquished by (Print/Signature)	Date	Time
Jan Brown	4/25/05	4:30
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#: 1.20.06002.01.242

Received by SwRI Lab: (Signature)

Date	Time
04/25/05	1630

Samples Disposed:

Date	Time

Samples Disposed by:

1300131

SAMPLE LOG-IN SHEET

010032

Lab Name: Southwest Research Institute	Page 1 of 1
Received By (Print Name): CYNTHIA SAUCEDA	Log-in Date: 04/25/2005
Received By (Signature): Cynthia Saucedo	
Case Number: CNWRA	Sample Delivery Group No.
	SAS Number: N/A

Remarks: 06002.01.242

			Corresponding		Remarks: Condition of Sample Shipment, etc
		EPA Sample #	Sample Tag #	Assigned Lab #	
1.	Custody Seal(s)	Present/(Absent*) Intact/Broken	CAL41	None	262217	Intact
			CAL42	None	262218	Intact
2.	Custody Seal Nos.	N/A	CAL43	None	262219	Intact
3.	Chain-of Custody Records	(Present)/Absent*	CAL44	None	262220	Intact
4.	Traffic Reports or Packing Lists	Present/(Absent*)	CAL45	None	262221	Intact
5.	Airbill	Airbill/Sticker (Present)/Absent*	CAL46	None	262222	Intact
			CAL47	None	262223	Intact
6.	Airbill No.	HAND DELIVERED	CAL48	None	262224	Intact
7.	Sample Tags	Present/(Absent*)	CAL49	None	262225	Intact
	Sample Tag Numbers	Listed/(Not listed on Chain of Custody)	CAL410	None	262226	Intact
			CAL411	None	262227	Intact
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	04/25/2005				
12.	Time Received	16:30:00				

Sample Transfer	
Fraction: INORGANIC RAD	Fraction:
Area #: INORGANIC CAB	Area #:
By: CYNTHIA SAUCEDA	By:
On: 04/25/2005	On:

* Contact SMO and attach record of resolution

Reviewed By: CYNTHIA A. SAUCEDA	Logbook No.: Sample Receipt (27509)
Date: 04/25/2005	Logbook Page No.: ✓ 5418 (SECTION 1-2 OF 2)

010033

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050426-3
SRR: 27509
SDG: 262217
CASE: CNWRA
VTSR: April 25, 2005
PROJECT#: 06002.01.242

Copies of Login Book

Sample Login Book

010034

Apr 25, 2005

SwRI Login Area
Division 1

Sample Receipt: 27507	Project: 069.On Hold.	Client: Accutest Laborat
VTSR Date: Apr 25, 2005	VTSR Time: 08:25:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
262204	ARL-170, Batch #115534	Liquid
262205	Caustic Soda 50%, Batch 544B102	Liquid
262206	City Water	Drk Water
262207	CM-88 Emulsifier, Batch 503-094	Liquid
262208	Corsamul 410, Batch #8874	Liquid
262209	Corsamul 80, Batch #6950	Liquid
262210	Corsamul 800, Batch #9652	Liquid
262211	Corsapave 17, Batch #9041	Liquid
262212	Muriatic Acid 31-5%, Batch #7847-01-01	Liquid
262213	Propylene Glycol, Batch #2103160512	Liquid
262214	Texanol, Batch #0506	Liquid
262215	UMTP NAPTHA, Batch #2104140514	Liquid

Sample Receipt: 27508	Project: 06053.06.056	Client: UNITED STATES EN
VTSR Date: Apr 25, 2005	VTSR Time: 08:04:00	Manager: SPIES, RADONNA

System ID	Customer Sample ID	Matrix
262216	EVSR2005-13	Liquid

Sample Receipt: 27509	Project: 06002.01.242	Client: Div. 20
VTSR Date: Apr 25, 2005	VTSR Time: 16:30:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
262217	CAL41	Water
262218	CAL42	Water
262219	CAL43	Water
262220	CAL44	Water
262221	CAL45	Water
262222	CAL46	Water
262223	CAL47	Water
262224	CAL48	Water

Sample Login Book

010035

Apr 25, 2005

SwRI Login Area
Division 1

Sample Receipt: 27509	Project: 06002.01.242	Client: Div. 20
VTSR Date: Apr 25, 2005	VTSR Time: 16:30:00	Manager: DAMMANN, MIKE

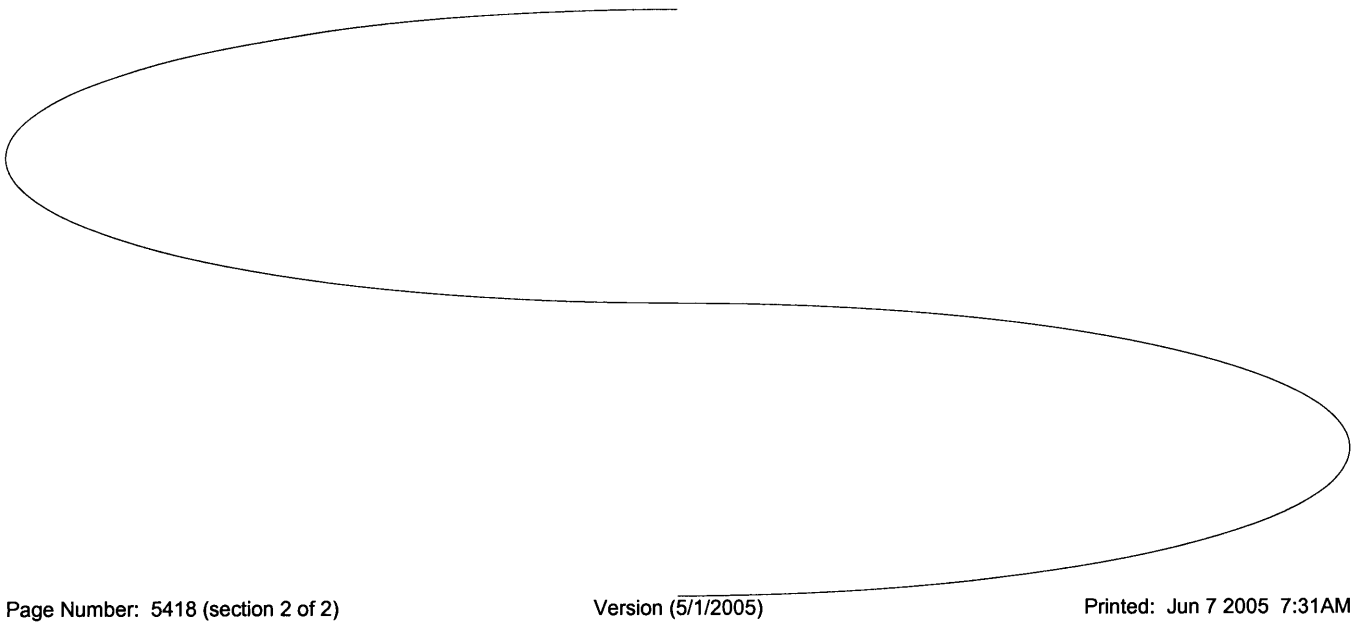
System ID	Customer Sample ID	Matrix
262225	CAL49	Water
262226	CAL410	Water
262227	CAL411	Water

Sample Receipt: 27510	Project: 10192.02.10X	Client: Lynx, LTD.
VTSR Date: Apr 26, 2005	VTSR Time: 13:30:00	Manager: SUN, GANG

System ID	Customer Sample ID	Matrix
262230	0504210836	Aqueous
262231	0504211055	Aqueous
262232	0504211204	Aqueous
262233	0504211304	Aqueous
262234	0504211336	Aqueous
262235	0504211338	Aqueous
262236	0504211406	Aqueous
262237	0504250831	Aqueous
262238	0504250915	Aqueous
262239	0504251005	Aqueous
262240	0504251047	Aqueous

Number of samples for today: 35

Number of Containers for today: 37



SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050426-3
SRR: 27509
SDG: 262217
CASE: CNWRA
VTSR: April 25, 2005
PROJECT#: 06002.01.242

RAW DATA

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 60 208

CLIENT(S): Div 20 010037
TASK ORDER(S): 050426-3 SDG(S): 262217
PROJECT NO(S): 06002.01.242
METHOD: 3005A ___ 3050B ___ 3050B-7.5 ___ 3010A ___ 3020A ___ 7760A ___ 7740A ___ $HClO_4$ ___ $HClO_4/H_2SO_4$ ___
Microwave ___ Fusion ___ Teflon ___ Rock ___ OTHER ___
MATRIX: Water ✓ Soil ___ Biota ___ Solid ___ Liquid ___ TCLP Ext ___ OTHER dilutions
INSTRUMENT: GFAA ___ ICP ___ ICP-MS ___ IC ___ FLAA ___ HYDRIDE ___ OTHER ___
ACID INORG #: HNO_3# 5219 HCl# 5090 H_2SO_4# ___ $HClO_4$# ___ HF# ___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM ___ SOURCE: IV INORG# 4691 EXP: 2/06 AMT: 100uL
Oven/Hotplate/ Block ID: Temperature (°C):

5-16-05

Sample Identification		df	WT(g)	I.V.(ml)	F.V.(ml)
PBW-E16H1		1		10	10
LCSW-E16H1*		1		10	10
262217		5		2	10
262217d		5		2	10
262218		5		2	10
262218s		5		2	10
262219		5		2	10
262220		5		2	10
262221		5		2	10
262222		5		2	10
262223		5		2	10
262224		5		2	10
262225		5		2	10
262226		5		2	10
262227		5		2	10

* 40uL ICAL-1 Spex#4837 exp. 10/05 and 100ul Spike-1 #5197 exp. 3/06
*40ul Si IV #5046 exp. 3/06 and 40ul Sr IV #4633 exp. 8/05
PBW&LCSW are prepared as 10mls 1%HNO_3 / 5% HCL

5-16-05

LOCATION:

PREPARED BY: DL DATE: 5-16-05
REVIEWED BY: Adams DATE: 5/16/05
DISPOSAL INT/DATE/LOC: ___

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 61 017

010038

CLIENT(S): DNV 20
TASK ORDER(S): 057426-3 SDG(S): 262217
PROJECT NO(S): 06002.01.242
METHOD: 3005A 3050B 3050B-7.5 3010A 3020A 7760A 7740A $HClO_4$ $HClO_4/H_2SO_4$
Microwave Fusion Teflon Rock OTHER dilutions
MATRIX: Water Soil Biota Solid Liquid TCLP Ext OTHER
INSTRUMENT: GFAA ICP ✓ICP-MS IC FLAA HYDRIDE OTHER
ACID INORG #: HNO_3# 5219 HCl# 5216 H_2SO_4# $HClO_4$# HF# H_2O_2#
INTERNAL STD: Sc @ 10 PPM ✓Be @ 10 PPM SOURCE: IV INORG# 4961 EXP: 7/06 AMT: 50uL
Oven/Hotplate/ Block ID: NA Temperature (°C): NA

Sample Identification		df	WT(g)	I.V.(ml)	F.V.(ml)
PBW-E19H1		1		5	5
LCSW-E19H1*		1		5	5
262217		5		1	5
262217d		5		1	5
262217s		5		1	5

* 20uL ICAL-1 Spex#4837 exp. 10/05 and 50ul Spike-1 #5197 exp. 3/06
PBW&LCSW are prepared as 5mls 1%HNO_3 / 5% HCL

LOCATION: NA

PREPARED BY: DC DATE: 5-19-05
REVIEWED BY: [signature] DATE: 5-19-05
DISPOSAL INT/DATE/LOC:

FRM-191 (Rev 4/Jan 05)

BOOK/ PAGE 19 102

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

010039

SPECTRO ICP DAILY LOG

ANALYST [signature]

DATE 5-16-05

POWER: 1200

FLOWS:
Aux 40
Coolant 60
Mass Flow Controller 586

CURRENT	PROPOSED	
5781	5078	Na
4772	4777	Fe
4935	4935	Sr

QC PREP DATE:	
CCV/ICV	05Feb2
CRI	
ICSA	
ICSAB	05Feb2

CLP_STD1_SC	05Feb2
CLP_STD2_SC	
CLP_STD3_SC	
CLP_STD4_SC	5.16.05
CLP_STD5_SC	
BLK_SC	05Feb2

FILE	CLIENT	TO#	PROJECT NO.	METHOD	PREP PAGE
050516	CH2M-WG	050428-2	06355.56.006	6010B	60-184
050516A	DIV 20	050428-3	06002.01.242	SW6I	60-208

5.16.05

COMMENTS:

MAINTENANCE:

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

OTHER:

REVIEWED BY: [signature]

DATE: 5-25-2005

BOOK/ PAGE 19 106

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

010040

SPECTRO ICP DAILY LOG

ANALYST [signature]

DATE 5-19-05

POWER: 1200

FLOWS:
Aux 40
Coolant 60
Mass Flow Controller 886

CURRENT	PROPOSED	
5062	5070	Na
4762	4772	Fe
4920	4936	Sr

QC PREP DATE:	
CCV/ICV	05Feb2
CRI	
ICSA	
ICSAB	05Feb2

CLP_STD1_SC	05Feb2
CLP_STD2_SC	
CLP_STD3_SC	5-19-05
CLP_STD4_SC	
CLP_STD5_SC	
BLK_SC	05Feb2

FILE	CLIENT	TO#	PROJECT NO.	METHOD	PREP PAGE
050519	DIVCO	050426-3	06002.01.242	SWLI	61-017
050519A	Bechtel	050504-1	06355.47.006	60-200-T	61-005

5-19-05

COMMENTS:

MAINTENANCE:

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

OTHER:

REVIEWED BY: [signature]

DATE: 5-25-2005

BOOK/ PAGE 09 212

SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

010041

TJA_2 TRACE ICP DAILY LOG

ANALYST [signature] DATE 5-16-05

As 189.042 Profile Line As Intensity: 382741

PEAK POSITION .037071
VERNIER POSITION 746

QC PREP DATE:	
CCV/ICV	05E02
CRI	
ICSA	
ICSAB	05E02

STDs PREP DATE:	
CLP_STD1_SC	05E02
CLP_STD2_SC	
CLP_STD3_SC	
CLP_STD4_SC	
CLP_STD5_SC	
CLP_STD6_SC	
BLK_SC	05E02

COMMENTS	FILE	CLIENT	TO#	PROJECT NO.	METHOD
B504281Z	YOSMAY	CH2M	050428-12	06355.56.006	60103 60-184
B504263	YOSMAY	Div 20	050426-3	06002.01.242	SWKJ
B505048A	YOSMAY	Bechtel	050504-8	06355.47.006	200.7 61-005
B505112	YOSMAY	Westin	050511-2	~~05~~ 05827.05.006	61-004

5-16-05

COMMENTS:

MAINTENANCE:
Changed pump tubing

REVIEWED BY: [signature] DATE: 5/25/05

ICP ICV/CCV SOLUTION

13 019

010042

CCV- 05E02

Date Prepared: 5-2-05 Prepared By: [signature]

HNO3 INORG #: 5217 HCl INORG #: 5088

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

Element	Std Conc (ppm)	Amt added	Check	Source	Inorg #	Stock Conc (ppm)	Exp Date
Sc	10	1ml	✓	INORGVENT	5175	10000	5-1-06
B	5	5ml	✓	SPEX	4966	1000	1-15-06
Li	5	5ml	✓	SPEX	4846	1000	10-30-05
Mo	5	5ml	✓	SPEX	4847	1000	10-30-05
P	5	5ml	✓	SPEX	4758	1000	8-30-05
Si	5	5ml	✓	SPEX	5038	1000	2-28-06
Ti	5	5ml	✓	SPEX	5040	1000	2-28-06
Sr	5	5ml	✓	SPEX	4759	1000	8-30-05
Sn	5	5ml	✓	SPEX	5037	1000	2-28-06
Bi	5	5ml	✓	SPEX	4912	1000	11-30-05
La	5	5ml	✓	SPEX	4845	1000	10-30-05
Y	5	5ml	✓	SPEX	4913	1000	11-30-05
Pd	1	1ml	✓	SPEX	4967	1000	1-15-06
S	1	1ml	✓	SPEX	4617	1000	6-30-05
Th	1	1ml	✓	SPEX	4760	1000	8-30-05
U	1	1ml	✓	SPEX	4619	1000	6-30-05
W	1	1ml	✓	SPEX	4661	1000	7-30-05
Zr	5	5ml	✓	SPEX	5039	1000	2-28-06
Na	10	1ml	✓	SPEX	4998	10000	1-30-06
ICV-2A	vary	10ml	✓	SPEX	4909	mix	11-30-05
ICV-2B	vary	1ml	✓	SPEX	4911	mix	11-30-05
ICV-2C	vary	10ml	✓	SPEX	4910	mix	11-30-05

Expiration Date: 6-30-05

ICP Calibration Blank/ICB/CCB Solution

13 004

ID: BLK- 0504

Date Prepared: 2-14-05 Prepared By: 010043

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4983

Added ✓ 50 ml HCL INORG #: 4993

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-05 INORG #: 4761

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 05C01

Date Prepared: 3-1-05 Prepared By:

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4979

Added ✓ 50 ml HCL INORG #: 4996

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: ~~4-1-05~~ 10-1-05 INORG #: 4761

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 05D01

Date Prepared: 4-1-05 Prepared By:

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 5166

Added ✓ 50 ml HCL INORG #: 5059

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-05 INORG #: 4761

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 05E02

Date Prepared: 5-2-05 Prepared By:

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 5217

Added ✓ 50 ml HCL INORG #: 5088

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

ICP Calibration Standards

13 030

Date Prepared: 5-2-05 Prepared By:

HNO3 INORG #: 5217 HCl INORG #: 5044

010044

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
5-2-05	STD1- 05E02	Al	50	2.50	✓	INORVENT	4762	10000	10-1-05
		Ca	50	2.50	✓	INORVENT	4988	10000	2-1-06
		Fe	50	2.50	✓	INORVENT	5048	10000	3-1-06
		K	50	2.50	✓	INORVENT	4907	10000	12-1-05
		Mg	25	1.25	✓	INORVENT	4656	10000	8-1-05
		Na	50	2.50	✓	INORVENT	4657	10000	8-1-05
		Li	10	5.00	✓	INORVENT	4628	1000	8-1-05
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD2- 05E02	Ba	10	5.00	✓	INORVENT	5027	1000	3-1-06
		Be	5	2.50	✓	INORVENT	4542	1000	6-1-05
		Cr	10	5.00	✓	INORVENT	4906	1000	12-1-05
		Cu	10	5.00	✓	INORVENT	5049	1000	3-1-06
		Ni	10	5.00	✓	INORVENT	5043	1000	3-1-06
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD3- 05E02	Cd	10	5.00	✓	INORVENT	5041	1000	3-1-06
		Co	10	5.00	✓	INORVENT	5044	1000	3-1-06
		Mn	10	5.00	✓	INORVENT	4989	1000	2-1-06
		V	10	5.00	✓	INORVENT	4916	1000	1-1-06
		Zn	10	5.00	✓	INORVENT	4915	1000	1-1-06
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD4- 05E02	Ag	2	1.00	✓	INORVENT	4764	1000	10-1-05
		As	10	5.00	✓	INORVENT	49837	1000	2-1-06
		Pb	10	5.00	✓	INORVENT	4774	1000	10-1-05
		Sb	10	5.00	✓	INORVENT	5042	1000	3-1-06
		Se	10	5.00	✓	INORVENT	4630	1000	8-1-05
		TL	10	5.00	✓	INORVENT	4980	1000	2-1-06
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD5- 05E02	B	10	5.00	✓	INORVENT	5047	1000	3-1-06
		Mo	10	5.00	✓	INORVENT	5050	1000	3-1-06
		P	10	5.00	✓	INORVENT	4593	1000	6-1-05
		Si	10	5.00	✓	INORVENT	4999	1000	3-1-06
		Ti	10	5.00	✓	INORVENT	4908	1000	12-1-05
		Sr	10	5.00	✓	INORVENT	4635	1000	8-1-05
		Sn	10	5.00	✓	INORVENT	5174	1000	5-1-06
		Bi	5	2.50	✓	INORVENT	4658	1000	8-1-05
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
5-2-05	STD6- 05E02	La	10	5.00	✓	INORVENT	4763	1000	10-1-05
		Na	1	0.05	✓	INORVENT	4657	10000	8-1-05
		Pd	10	5.00	✓	INORVENT	5045	1000	3-1-06
		S	10	5.00		INORVENT	4917	1000	1-1-06
		Th	10	5.00	✓	INORVENT	4844	1000	12-1-05
		U	10	5.00	✓	INORVENT	4828	1000	11-1-05
		W	5	2.50	✓	INORVENT	4660	1000	8-1-05
		Y	10	5.00	✓	INORVENT	5000	1000	3-1-06
		Zr	10	5.00	✓	INORVENT	4992	1000	8-1-05
		SC	10	0.500	✓	INORVENT	5175	10000	5-1-06

Expiration Dates:

STD1: 8-1-05 **STD4:** 8-1-05

STD2: 6-1-05 **STD5:** 6-1-05

STD3: 8-1-05 **STD6:** 8-1-05

Div 20
to#050426-3
06002.01.242

5/17/05

5/20/05

262217 for Ca
1.45786 ug/ml x AF5 = 7.29 mg/L

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
pbw-E15H1	Ca3179	0.250	U		mg/L	0.25				0.05	0.03855	0.0386	5	0.25	0.00771	05/16/05	14:00
pbw-E15H1	Mg2790	0.250	U		mg/L	0.25				0.05	0.00295	0.00295	5	0.25	0.00059	05/16/05	14:00
pbw-E15H1	Si2881	0.125	U		mg/L	0.125				0.025	0.1064	0.106	5	0.125	0.02128	05/16/05	14:00
pbw-E15H1	Sr4215	0.0250	U		mg/L	0.025				0.005	0.00015	0.00015	5	0.025	0.00003	05/16/05	14:00
lcsw-E15H1	Ca3179	93.5			mg/L	0.25		93.5%	100	0.05	93.48075	93.5	5	0.25	18.69615	05/16/05	14:05
lcsw-E15H1	Mg2790	93.1			mg/L	0.25		93.1%	100	0.05	93.07545	93.1	5	0.25	18.61509	05/16/05	14:05
lcsw-E15H1	Si2881	18.7			mg/L	0.125		93.5%	20	0.025	18.72535	18.7	5	0.125	3.74507	05/16/05	14:05
lcsw-E15H1	Sr4215	19.2			mg/L	0.025		96.0%	20	0.005	19.23635	19.2	5	0.025	3.84727	05/16/05	14:05
262217	Ca3179	7.29			mg/L	0.25				0.05	7.2893	7.29	5	0.25	1.45786	05/16/05	14:09
262217	Mg2790	0.859			mg/L	0.25				0.05	0.8588	0.859	5	0.25	0.17176	05/16/05	14:09
262217	Si2881	12.6			mg/L	0.125				0.025	12.58005	12.6	5	0.125	2.51601	05/16/05	14:09
262217	Sr4215	0.0250	U		mg/L	0.025				0.005	0.02035	0.0204	5	0.025	0.00407	05/16/05	14:09
262217d	Ca3179	7.28			mg/L	0.25	0.1%			0.05	7.27945	7.28	5	0.25	1.45589	05/16/05	14:14
262217d	Mg2790	0.837			mg/L	0.25	2.6%			0.05	0.83705	0.837	5	0.25	0.16741	05/16/05	14:14
262217d	Si2881	12.6			mg/L	0.125	0.0%			0.025	12.5699	12.6	5	0.125	2.51398	05/16/05	14:14
262217d	Sr4215	0.0250	U		mg/L	0.025	0.0%			0.005	0.02	0.02	5	0.025	0.004	05/16/05	14:14
262218	Ca3179	7.68			mg/L	0.25				0.05	7.6818	7.68	5	0.25	1.53636	05/16/05	14:19
262218	Mg2790	0.888			mg/L	0.25				0.05	0.888	0.888	5	0.25	0.1776	05/16/05	14:19
262218	Si2881	12.7			mg/L	0.125				0.025	12.7289	12.7	5	0.125	2.54578	05/16/05	14:19
262218	Sr4215	0.0250	U		mg/L	0.025				0.005	0.02065	0.0207	5	0.025	0.00413	05/16/05	14:19
262218s	Ca3179	99.9			mg/L	0.25		92.2%	100	0.05	99.9183	99.9	5	0.25	19.98366	05/16/05	14:24
262218s	Mg2790	93.1			mg/L	0.25		92.2%	100	0.05	93.06685	93.1	5	0.25	18.61337	05/16/05	14:24
262218s	Si2881	31.5			mg/L	0.125		94.0%	20	0.025	31.46455	31.5	5	0.125	6.29291	05/16/05	14:24
262218s	Sr4215	19.6			mg/L	0.025		98.0%	20	0.005	19.6025	19.6	5	0.025	3.9205	05/16/05	14:24
262219	Ca3179	7.44			mg/L	0.25				0.05	7.43895	7.44	5	0.25	1.48779	05/16/05	14:28
262219	Mg2790	0.848			mg/L	0.25				0.05	0.84835	0.848	5	0.25	0.16967	05/16/05	14:28
262219	Si2881	12.5			mg/L	0.125				0.025	12.5407	12.5	5	0.125	2.50814	05/16/05	14:28
262219	Sr4215	0.0250	U		mg/L	0.025				0.005	0.02025	0.0203	5	0.025	0.00405	05/16/05	14:28
262220	Ca3179	7.45			mg/L	0.25				0.05	7.45465	7.45	5	0.25	1.49093	05/16/05	14:33
262220	Mg2790	0.903			mg/L	0.25				0.05	0.9034	0.903	5	0.25	0.18068	05/16/05	14:33
262220	Si2881	12.7			mg/L	0.125				0.025	12.6862	12.7	5	0.125	2.53724	05/16/05	14:33
262220	Sr4215	0.0250	U		mg/L	0.025				0.005	0.0207	0.0207	5	0.025	0.00414	05/16/05	14:33
262221	Ca3179	7.13			mg/L	0.25				0.05	7.12755	7.13	5	0.25	1.42551	05/16/05	14:38
262221	Mg2790	0.836			mg/L	0.25				0.05	0.83615	0.836	5	0.25	0.16723	05/16/05	14:38
262221	Si2881	12.6			mg/L	0.125				0.025	12.61	12.6	5	0.125	2.522	05/16/05	14:38
262221	Sr4215	0.0250	U		mg/L	0.025				0.005	0.01955	0.0196	5	0.025	0.00391	05/16/05	14:38
262222	Ca3179	7.46			mg/L	0.25				0.05	7.45535	7.46	5	0.25	1.49107	05/16/05	14:43
262222	Mg2790	0.878			mg/L	0.25				0.05	0.87815	0.878	5	0.25	0.17563	05/16/05	14:43

010045

Div 20
to#050426-3
06002.01.242

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
262222	Si2881	12.8			mg/L	0.125				0.025	12.7512	12.8	5	0.125	2.55024	05/16/05	14:43
262222	Sr4215	0.0250	U		mg/L	0.025				0.005	0.0206	0.0206	5	0.025	0.00412	05/16/05	14:43
262223	Ca3179	7.28			mg/L	0.25				0.05	7.28165	7.28	5	0.25	1.45633	05/16/05	15:06
262223	Mg2790	0.829			mg/L	0.25				0.05	0.8286	0.829	5	0.25	0.16572	05/16/05	15:06
262223	Si2881	12.8			mg/L	0.125				0.025	12.78815	12.8	5	0.125	2.55763	05/16/05	15:06
262223	Sr4215	0.0250	U		mg/L	0.025				0.005	0.0203	0.0203	5	0.025	0.00406	05/16/05	15:06
262224	Ca3179	7.22			mg/L	0.25				0.05	7.2169	7.22	5	0.25	1.44338	05/16/05	15:11
262224	Mg2790	0.837			mg/L	0.25				0.05	0.83735	0.837	5	0.25	0.16747	05/16/05	15:11
262224	Si2881	12.8			mg/L	0.125				0.025	12.75335	12.8	5	0.125	2.55067	05/16/05	15:11
262224	Sr4215	0.0250	U		mg/L	0.025				0.005	0.0199	0.0199	5	0.025	0.00398	05/16/05	15:11
262225	Ca3179	6.53			mg/L	0.25				0.05	6.52925	6.53	5	0.25	1.30585	05/16/05	15:16
262225	Mg2790	0.758			mg/L	0.25				0.05	0.7579	0.758	5	0.25	0.15158	05/16/05	15:16
262225	Si2881	12.8			mg/L	0.125				0.025	12.81235	12.8	5	0.125	2.56247	05/16/05	15:16
262225	Sr4215	0.0250	U		mg/L	0.025				0.005	0.0182	0.0182	5	0.025	0.00364	05/16/05	15:16
262226	Ca3179	2.65			mg/L	0.25				0.05	2.6457	2.65	5	0.25	0.52914	05/16/05	15:20
262226	Mg2790	0.487			mg/L	0.25				0.05	0.48715	0.487	5	0.25	0.09743	05/16/05	15:20
262226	Si2881	13.7			mg/L	0.125				0.025	13.68625	13.7	5	0.125	2.73725	05/16/05	15:20
262226	Sr4215	0.0250	U		mg/L	0.025				0.005	0.01165	0.0117	5	0.025	0.00233	05/16/05	15:20
262227	Ca3179	1.24			mg/L	0.25				0.05	1.23665	1.24	5	0.25	0.24733	05/16/05	15:25
262227	Mg2790	1.11			mg/L	0.25				0.05	1.11415	1.11	5	0.25	0.22283	05/16/05	15:25
262227	Si2881	25.4			mg/L	0.125				0.025	25.43395	25.4	5	0.125	5.08679	05/16/05	15:25
262227	Sr4215	0.0250	U		mg/L	0.025				0.005	0.01375	0.0138	5	0.025	0.00275	05/16/05	15:25

010046

☐ 200.7 TAP No. 01-0406-028 Rev2/Mar02

☐ 6010B TAP No. 01-0406-130 Rev3/Mar05

☑ Other SWLI

QC STD. ID's	
CCV	05E02
CRI	
ICSA	
ICSAB	05E02

ICP CAL.STD. ID's	
Std0	05E02
Std1	
Std2	
Std3	
Std4	
Std5	
Std6	05E02

010047

Ca Mg Si Sr

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.242	Direct	050426-3	5-16-05	water	60-2048

INSTRUMENT: Trace 2 FILENAME: 050426s3

Method: DAILY2 Standard: blk
Run Time: 05/16/05 11:17:25

010048

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avge	-.0000	.0004	-.0001	.0002	-.0000	-.0001	-.0000
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	65.92	.8754	23.50	6.914	114.3	1.084	103.9
#1	-.0000	.0004	-.0001	.0001	-.0000	-.0001	-.0000
#2	-.0000	.0004	-.0001	.0002	-.0000	-.0001	-.0000

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avge	.0000	-.0000	-.0000	.0000	.0002	.0000	.0003
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0001
%RSD	6.635	268.7	47.57	199.9	1.924	141.4	17.88
#1	.0000	.0000	-.0000	-.0000	.0002	.0000	.0003
#2	.0000	-.0000	-.0000	.0000	.0002	.0000	.0004

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Avge	.0000	-.0000	.0000	.0000	-.0000	-.0001	-.0185
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0001
%RSD	84.54	87.25	141.4	47.57	402.0	23.10	.8085
#1	.0000	-.0000	.0000	.0000	-.0000	-.0001	-.0184
#2	.0000	-.0000	.0000	.0000	.0000	-.0001	-.0186

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avge	.0000	.0000	-.0000	.0000	.0001	.0006	-.0011
SDev	.0001	.0000	.0001	.0000	.0000	.0000	.0000
%RSD	41060.	74.14	1218.	125.6	2.656	3.615	1.237
#1	-.0000	.0000	.0001	.0000	.0001	.0006	-.0010
#2	.0000	.0000	-.0001	.0000	.0001	.0006	-.0011

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avge	71.46	-.0000	.0000	.0012	.0000	.0000	.0000
SDev	.35	.0001	.0001	.0000	.0001	.0000	.0000
%RSD	.4923	136.6	289.6	1.048	659.1	236.6	106.3
#1	71.71	-.0000	-.0000	.0012	-.0000	.0000	.0000
#2	71.21	-.0001	.0001	.0012	.0001	-.0000	.0000

Elem	Ti3349	Tl1908	U_4090	V_2924	W_2079	Y_3710	Zn2062
Avge	-.0001	-.0002	-.0003	-.0000	.0003	.0000	.0000
SDev	.0000	.0000	.0001	.0000	.0000	.0000	.0000
%RSD	36.67	8.423	14.71	4.772	9.067	52.52	356.1
#1	-.0001	-.0002	-.0003	-.0000	.0002	.0000	.0000
#2	-.0001	-.0002	-.0004	-.0000	.0003	.0000	-.0000

Elem	Zr3496
Avge	.0001
SDev	.0001
%RSD	159.4
#1	-.0000
#2	.0001

DL 5-16-05

5/17/05

010049

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	714531	10000	--	--	--	--	--
SDev	3480.380	.0000000	--	--	--	--	--
%RSD	.4870859	.0000000	--	--	--	--	--
#1	716992	10000	--	--	--	--	--
#2	712070	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std4
Run Time: 05/16/05 11:22:11

010050

Elem	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1	1960/2
Avge	.0776	.0961	.2760	.2406	.1377	.1860	.1995
SDev	.0001	.0001	.0002	.0002	.0002	.0007	.0013
%RSD	.1136	.0498	.0606	.0764	.1137	.3985	.6584
#1	.0775	.0961	.2758	.2405	.1376	.1854	.1985
#2	.0776	.0960	.2761	.2407	.1378	.1865	.2004

Elem	Tl1908
Avge	.1780
SDev	.0003
%RSD	.1425
#1	.1778
#2	.1782

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	707338	10000	--	--	--	--	--
SDev	229.1026	.0000000	--	--	--	--	--
%RSD	.0323894	.0000000	--	--	--	--	--
#1	707500	10000	--	--	--	--	--
#2	707176	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std1
Run Time: 05/16/05 11:26:35

010051

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.0937	.2154	.0846	.2301	3.519	.0816	.0078
SDev	.0000	.0001	.0001	.0004	.003	.0000	.0000
%RSD	.0457	.0572	.1484	.1738	.0842	.0385	.2940
#1	.0937	.2155	.0845	.2298	3.521	.0816	.0077
#2	.0937	.2153	.0846	.2304	3.517	.0816	.0078

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	697781	10000	--	--	--	--	--
SDev	684.4794	.0000000	--	--	--	--	--
%RSD	.0980937	.0000000	--	--	--	--	--
#1	698265	10000	--	--	--	--	--
#2	697297	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std5
Run Time: 05/16/05 11:30:17

010052

Elem	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899	Sr4215
Avge	.1398	.0251	.2482	.0261	.1434	.1288	2.665
SDev	.0003	.0001	.0002	.0000	.0004	.0002	.000
%RSD	.2320	.4154	.0762	.0958	.3152	.1448	.0184
#1	.1395	.0251	.2481	.0261	.1437	.1287	2.664
#2	.1400	.0250	.2483	.0261	.1431	.1290	2.665

Elem	Ti3349
Avge	2.641
SDev	.003
%RSD	.1089
#1	2.639
#2	2.643

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	724412	10000	--	--	--	--	--
SDev	714.1779	.0000000	--	--	--	--	--
%RSD	.0985872	.0000000	--	--	--	--	--
#1	724917	10000	--	--	--	--	--
#2	723907	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std2
Run Time: 05/16/05 11:33:58

010053

Elem	Ba4934	Be3130	Cr2677	Cu3247	Ni2316
Avge	1.194	1.355	.3766	.2860	.2940
SDev	.001	.000	.0002	.0002	.0008
%RSD	.0981	.0364	.0492	.0756	.2719
#1	1.195	1.355	.3768	.2862	.2934
#2	1.193	1.356	.3765	.2859	.2945

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	709926	10000	--	--	--	--	--
SDev	3238.549	.0000000	--	--	--	--	--
%RSD	.4561812	.0000000	--	--	--	--	--
#1	712216	10000	--	--	--	--	--
#2	707636	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std3
Run Time: 05/16/05 11:37:18

010054

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	.8436	.1776	.7812	.1811	.2486
SDev	.0010	.0004	.0010	.0001	.0007
%RSD	.1152	.2061	.1257	.0253	.2869
#1	.8443	.1778	.7819	.1811	.2491
#2	.8430	.1773	.7805	.1811	.2481

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	735524	10000	--	--	--	--	--
SDev	2250.721	.0000000	--	--	--	--	--
%RSD	.3060026	.0000000	--	--	--	--	--
#1	737115	10000	--	--	--	--	--
#2	733932	10000	--	--	--	--	--

010055

Method: DAILY2 Standard: clp_std6
Run Time: 05/16/05 11:40:59

Elem	La3988	Na5889	Pd3404	S_1820	Th2837	U_4090	W_2079
Avge	.5153	.0455	.1980	.0273	.0965	.0696	.1709
SDev	.0001	.0002	.0002	.0001	.0001	.0001	.0001
%RSD	.0290	.4274	.0813	.3161	.1075	.0823	.0719
#1	.5154	.0453	.1979	.0273	.0966	.0697	.1710
#2	.5152	.0456	.1981	.0274	.0964	.0696	.1708

Elem	Y_3710	Zr3496
Avge	.7775	1.951
SDev	.0003	.001
%RSD	.0431	.0490
#1	.7778	1.952
#2	.7773	1.950

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	707688	10000	--	--	--	--	--
SDev	1750.089	.0000000	--	--	--	--	--
%RSD	.2472966	.0000000	--	--	--	--	--
#1	706451	10000	--	--	--	--	--
#2	708926	10000	--	--	--	--	--

Standardization Report 05/16/05 11:44:50 AM page 1

Method: DAILY2 Slope = Conc(SIR)/IR 010056

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	25.7768	.000741	05/16/05 11:40:59
Al3082	308.215	clp_std1	blk	535.650	-.194531	05/16/05 11:40:59
As1890	189.042	clp_std4	blk	104.031	.006264	05/16/05 11:40:59
B_2496	249.678	clp_std5	blk	71.6331	-.011030	05/16/05 11:40:59
Ba4934	493.409	clp_std2	blk	8.37316	.000123	05/16/05 11:40:59
Be3130	313.042	clp_std2	blk	3.68867	.000465	05/16/05 11:40:59
Bi2230	223.061	clp_std5	blk	197.578	.004158	05/16/05 11:40:59
Ca3179	317.933	clp_std1	blk	232.193	-.003738	05/16/05 11:40:59
Cd2265	226.502	clp_std3	blk	11.8497	.000092	05/16/05 11:40:59
Co2286	228.616	clp_std3	blk	56.3129	.000118	05/16/05 11:40:59
Cr2677	267.716	clp_std2	blk	26.5520	-.000448	05/16/05 11:40:59
Cu3247	324.753	clp_std2	blk	34.9935	-.008619	05/16/05 11:40:59
Fe2714	271.441	clp_std1	blk	591.716	-.008665	05/16/05 11:40:59
K_7664	766.491	clp_std1	blk	217.566	-.068083	05/16/05 11:40:59
La3988	398.853	clp_std6	blk	19.4230	-.000203	05/16/05 11:40:59
Li6707	670.784	clp_std1	blk	2.84199	.000042	05/16/05 11:40:59
Mg2790	279.078	clp_std1	blk	306.306	-.002777	05/16/05 11:40:59
Mn2576	257.610	clp_std3	blk	12.8012	-.000081	05/16/05 11:40:59
Mo2020	202.030	clp_std5	blk	40.2921	.000307	05/16/05 11:40:59
Na3302	330.232	clp_std1	blk	6334.52	.797427	05/16/05 11:40:59
Na5889	588.991	clp_std6	blk	15.7226	.290482	05/16/05 11:40:59
Ni2316	231.604	clp_std2	blk	34.0157	-.000004	05/16/05 11:40:59
P_1782	178.287	clp_std5	blk	383.517	-.012367	05/16/05 11:40:59
2203/1	220.351	clp_std4	blk	36.2351	.000418	05/16/05 11:40:59
2203/2	220.352	clp_std4	blk	41.5646	-.000522	05/16/05 11:40:59
Pd3404	340.458	clp_std6	blk	51.8773	-.003267	05/16/05 11:40:59
S_1820	182.040	clp_std6	blk	374.022	-.224842	05/16/05 11:40:59
Sb2068	206.838	clp_std4	blk	72.0843	.076068	05/16/05 11:40:59
Sc3613	361.384	blk	dark	1.39939	.000000	05/16/05 11:40:59
1960/1	196.021	clp_std4	blk	53.7674	.002189	05/16/05 11:40:59
1960/2	196.022	clp_std4	blk	50.1449	-.001202	05/16/05 11:40:59
Si2881	288.158	clp_std5	blk	70.0705	-.086545	05/16/05 11:40:59
Pb220	220.353	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Se196	196.026	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Sn1899	189.989	clp_std5	blk	77.6768	-.000829	05/16/05 11:40:59
Sr4215	421.552	clp_std5	blk	3.75271	-.000008	05/16/05 11:40:59
Th2837	283.730	clp_std6	blk	108.197	-.001822	05/16/05 11:40:59
Ti3349	334.941	clp_std5	blk	3.78602	.000424	05/16/05 11:40:59
Tl1908	190.864	clp_std4	blk	56.1151	.009972	05/16/05 11:40:59
U_4090	409.014	clp_std6	blk	151.130	.051521	05/16/05 11:40:59
V_2924	292.402	clp_std3	blk	55.2145	.001275	05/16/05 11:40:59
W_2079	207.914	clp_std6	blk	29.2952	-.007771	05/16/05 11:40:59
Y_3710	371.030	clp_std6	blk	12.8592	-.000171	05/16/05 11:40:59
Zn2062	206.200	clp_std3	blk	40.2321	-.000112	05/16/05 11:40:59
Zr3496	349.621	clp_std6	blk	5.60265	-.000307	05/16/05 11:40:59

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 05/16/05 11:46:53
Comment:
Mode: CONC Corr. Factor: 1

010057

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9849	9.829	5.101	4.914	10.06	.9888	5.067
SDev	.0005	.015	.003	.025	.01	.0006	.004
%RSD	.0503	.1520	.0561	.5177	.1110	.0572	.0798
#1	.9846	9.818	5.099	4.896	10.05	.9892	5.064
#2	.9853	9.839	5.103	4.932	10.07	.9884	5.070
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.08	1.035	5.189	1.982	2.031	10.60	18.61
SDev	.05	.000	.000	.001	.006	.03	.06
%RSD	.2390	.0422	.0083	.0518	.2920	.3188	.3021
#1	20.12	1.034	5.189	1.983	2.027	10.63	18.57
#2	20.05	1.035	5.189	1.982	2.035	10.58	18.64
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.930	5.200	20.06	1.044	5.155	27.99	Q41.45
SDev	.009	.009	.00	.000	.009	.07	.08
%RSD	.1819	.1701	.0031	.0098	.1822	.2452	.2029
#1	4.923	5.194	20.06	1.044	5.148	27.94	Q41.39
#2	4.936	5.206	20.06	1.044	5.161	28.04	Q41.51
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.976	5.138	4.905	4.930	.9932	.9698	1.016
SDev	.003	.034	.019	.000	.0016	.0072	.005
%RSD	.0540	.6627	.3810	.0033	.1666	.7425	.5231
#1	4.978	5.162	4.892	4.930	.9944	.9749	1.020
#2	4.974	5.114	4.918	4.930	.9920	.9647	1.013
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

010058

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.22	5.141	5.179	5.120	4.922	5.166	4.923
SDev	.50	.048	.004	.008	.006	.018	.007
%RSD	.5085	.9434	.0676	.1559	.1244	.3581	.1523
#1	98.87	5.106	5.176	5.114	4.917	5.153	4.918
#2	99.58	5.175	5.181	5.126	4.926	5.179	4.929
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.196	.9914	4.974	5.192	Q.8390	5.072	1.019
SDev	.010	.0013	.007	.024	.0007	.003	.009
%RSD	.1957	.1305	.1376	.4612	.0786	.0657	.8502
#1	5.189	.9904	4.969	5.175	Q.8395	5.075	1.013
#2	5.203	.9923	4.979	5.209	Q.8386	5.070	1.025
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	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	5.000	1.046	4.856
SDev	.004	.004	.006
%RSD	.0705	.3716	.1163
#1	4.997	1.048	4.852
#2	5.002	1.043	4.860
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

010059

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	709018	10000	--	--	--	--	--
SDev	3632.407	.0000000	--	--	--	--	--
%RSD	.5123149	.0000000	--	--	--	--	--
#1	706450	10000	--	--	--	--	--
#2	711587	10000	--	--	--	--	--

Method: DAILY2 Sample Name: icb/ccb Operator: 010060
Run Time: 05/16/05 11:53:30
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	-.0022	H.0050	.0063	-.0000	-.0000	.0055
SDev	.0011	.0029	.0028	.0004	.0000	.0000	.0027
%RSD	481.7	134.9	56.70	7.037	73.77	365.7	49.66
#1	-.0010	-.0043	H.0070	.0066	-.0000	.0000	.0036
#2	.0005	-.0001	.0030	.0060	-.0001	-.0000	.0074
Errors	LC Pass	LC Pass	LC High	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0012	.0001	-.0000	-.0006	.0003	-.0041	-.0078
SDev	.0009	.0000	.0006	.0005	.0008	.0022	.0124
%RSD	78.17	21.45	1789.	79.94	253.2	53.57	160.0
#1	-.0019	.0001	-.0004	-.0010	-.0002	-.0056	-.0165
#2	-.0005	.0001	.0004	-.0003	.0009	-.0025	.0010
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0001	-.0055	-.0001	.0016	L-.3516	.0088
SDev	.0007	.0000	.0081	.0000	.0003	.2724	.0034
%RSD	25580.	25.89	147.4	56.23	15.42	77.47	39.06
#1	-.0005	.0001	-.0112	-.0001	.0014	L-.5442	.0064
#2	.0005	.0001	.0002	-.0000	.0018	L-.1590	.0113
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	L-.0103	.0040	-.0025	.0004	L-.0588	.0066
SDev	.0011	.0174	.0030	.0037	.0023	.0136	.0062
%RSD	173.6	168.9	75.93	146.6	599.4	23.07	94.02
#1	.0001	.0020	.0018	.0001	-.0012	L-.0492	H.0110
#2	-.0014	L-.0225	.0061	-.0051	.0020	L-.0684	.0022
Errors	LC Pass	LC Low	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010061

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.5	-.0032	.0014	.0040	-.0003	-.0001	.0010
SDev	.7	.0009	.0003	.0044	.0014	.0001	.0021
%RSD	.6865	28.94	19.08	111.8	448.7	138.8	213.8
#1	101.0	-.0025	.0012	.0008	.0007	-.0000	-.0005
#2	100.0	-.0038	.0016	.0071	-.0013	-.0002	.0024
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	-.0008	.0001	.0018	-.0302	-.0002	-.0028
SDev	.0000	.0005	.0001	.0007	.0008	.0004	.0012
%RSD	1253.	61.69	54.19	36.65	2.550	177.8	42.83
#1	-.0000	-.0012	.0001	.0013	-.0308	.0001	-.0020
#2	.0000	-.0005	.0001	.0023	-.0297	-.0005	-.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	-.0001	-.0002	.0002
SDev	.0000	.0003	.0007
%RSD	.4123	142.5	384.8
#1	-.0001	-.0004	-.0003
#2	-.0001	.0000	.0007
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010062

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	718244	10000	--	--	--	--	--
SDev	4995.002	.0000000	--	--	--	--	--
%RSD	.6954464	.0000000	--	--	--	--	--
#1	721776	10000	--	--	--	--	--
#2	714712	10000	--	--	--	--	--

Method: DAILY2 Sample Name: cri Operator: 010063
Run Time: 05/16/05 11:58:20
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0203	.1000	.0254	.1046	.0206	.0098	.0040
SDev	.0006	.0006	.0036	.0001	.0001	.0000	.0022
%RSD	2.690	.5953	13.98	.1392	.5856	.1226	54.36
#1	.0200	.0995	.0279	.1047	.0206	.0098	.0025
#2	.0207	.1004	.0229	.1045	.0207	.0098	.0055
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	.0200	.1000	.0200	.1000	.0200	.0100	
Range	50.00	50.00	50.00	50.00	50.00	50.00	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0008	.0108	.1020	.0193	.0492	.1163	.0017
SDev	.0005	.0000	.0000	.0008	.0001	.0085	.0099
%RSD	59.55	.2821	.0378	4.272	.2889	7.290	587.6
#1	-.0011	.0107	.1020	.0187	.0491	.1103	-.0053
#2	-.0005	.0108	.1019	.0199	.0493	.1223	.0087
Errors	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value		.0100	.1000	.0200	.0500	.1000	
Range		50.00	50.00	50.00	50.00	50.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0785	-.0021	.0313	.0211	-.1098	.0053
SDev	.0006	.0001	.0036	.0000	.0003	.0611	.0031
%RSD	130.8	.1102	168.9	.1398	1.508	55.67	57.57
#1	-.0008	.0784	-.0046	.0313	.0209	-.1530	.0032
#2	-.0000	.0785	.0004	.0314	.0213	-.0666	.0075
Errors	NOCHECK	QC Pass	NOCHECK	QC Pass	QC Pass	NOCHECK	NOCHECK
Value		.1000		.0300	.0200		
Range		50.00		50.00	50.00		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0808	.1048	.0073	.0062	.0021	-.0626	.1275
SDev	.0010	.0033	.0003	.0014	.0026	.0161	.0018
%RSD	1.245	3.120	4.371	21.89	123.7	25.74	1.392
#1	.0816	.1025	.0075	.0072	.0003	-.0512	.1263
#2	.0801	.1071	.0070	.0053	.0040	-.0740	.1288
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass
Value	.0800	.1000					.1200
Range	50.00	50.00					50.00

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

010064

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.28	.0051	.0148	.1070	.0066	.0116	.1020
SDev	.19	.0026	.0025	.0071	.0010	.0008	.0004
%RSD	.1875	51.56	16.86	6.608	15.40	6.848	.3493
#1	99.42	.0069	.0130	.1020	.0073	.0110	.1023
#2	99.15	.0032	.0165	.1120	.0059	.0121	.1018
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				.1000	.0060	.0100	.1000
Range				50.00	50.00	50.00	50.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0215	.0024	.0201	.0224	.1900	.1015	-.0018
SDev	.0000	.0001	.0001	.0031	.0043	.0002	.0019
%RSD	.1300	3.994	.6185	13.82	2.274	.1951	106.7
#1	.0215	.0023	.0200	.0202	.1869	.1017	-.0004
#2	.0215	.0024	.0202	.0246	.1930	.1014	-.0032
Errors	QC Pass	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	.0200		.0200	.0200	.2000	.1000	
Range	50.00		50.00	50.00	50.00	50.00	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0411	.0918
SDev	.0000	.0002	.0005
%RSD	989.7	.4782	.5840
#1	.0000	.0409	.0914
#2	-.0000	.0412	.0922
Errors	NOCHECK	QC Pass	QC Pass
Value		.0400	.1000
Range		50.00	50.00

010065

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	709408	10000	--	--	--	--	--
SDev	1294.713	.0000000	--	--	--	--	--
%RSD	.1825062	.0000000	--	--	--	--	--
#1	710323	10000	--	--	--	--	--
#2	708492	10000	--	--	--	--	--

Method: DAILY2 Sample Name: icsa Operator:
Run Time: 05/16/05 12:03:12
Comment:
Mode: CONC Corr. Factor: 1

010066

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0012	513.6	.0081	-.0123	.0023	-.0000	.0092
SDev	.0006	.6	.0046	.0009	.0000	.0000	.0023
%RSD	50.29	.1212	56.35	7.553	1.321	28.12	24.62
#1	-.0016	514.0	.0049	-.0117	.0023	-.0000	.0109
#2	-.0008	513.2	.0113	-.0130	.0023	-.0000	.0076
Errors	NOCHECK	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value		500.0					
Range		20.00					

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	463.2	-.0014	.0003	-.0016	.0023	191.5	-.0197
SDev	1.6	.0003	.0002	.0006	.0000	.3	.0174
%RSD	.3422	23.29	81.19	39.99	1.528	.1627	88.59
#1	462.1	-.0012	.0001	-.0020	.0023	191.3	-.0320
#2	464.4	-.0016	.0005	-.0011	.0023	191.7	-.0073
Errors	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass	NOCHECK
Value	500.0					200.0	
Range	20.00					20.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0040	.0003	540.6	-.0031	-.0001	-.0663	-.0211
SDev	.0009	.0001	.5	.0001	.0001	.1704	.0021
%RSD	22.46	24.37	.0918	2.113	73.89	256.9	9.881
#1	.0034	.0002	540.3	-.0032	-.0001	-.1868	-.0225
#2	.0046	.0003	541.0	-.0031	-.0002	.0541	-.0196
Errors	NOCHECK	NOCHECK	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value			500.0				
Range			20.00				

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0017	-.0195	.0423	-.0324	.0099	-.0423	.0121
SDev	.0016	.0081	.0015	.0033	.0006	.0022	.0029
%RSD	91.01	41.68	3.633	10.18	6.352	5.249	23.66
#1	.0006	-.0253	.0412	-.0301	.0095	-.0438	.0141
#2	.0029	-.0138	.0433	-.0348	.0104	-.0407	.0101
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

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

010067

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	91.61	.0000	-.0015	-.0081	-.0075	-.0010	-.0015
SDev	.51	.0140	.0084	.0044	.0017	.0009	.0007
%RSD	.5583	1412000.	555.6	54.60	22.49	94.27	44.41
#1	91.97	-.0099	.0044	-.0112	-.0063	-.0003	-.0010
#2	91.25	.0099	-.0074	-.0050	-.0087	-.0017	-.0020
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0168	.0151	-.0011	.0133	-.0271	.0002	-.0036
SDev	.0000	.0025	.0001	.0016	.0210	.0011	.0032
%RSD	.1697	16.66	12.89	11.84	77.61	571.7	89.06
#1	.0168	.0169	-.0010	.0144	-.0420	.0010	-.0013
#2	.0168	.0133	-.0012	.0122	-.0122	-.0006	-.0059
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0004	.0074	-.0006
SDev	.0001	.0001	.0003
%RSD	12.12	.6364	50.18
#1	-.0005	.0074	-.0004
#2	-.0004	.0074	-.0009
Errors	NOCHECK	NOCHECK	NOCHECK
Value			
Range			

010068

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	654550	10000	--	--	--	--	--
SDev	3656.449	.0000000	--	--	--	--	--
%RSD	.5586199	.0000000	--	--	--	--	--
#1	657136	10000	--	--	--	--	--
#2	651965	10000	--	--	--	--	--

Method: DAILY2 Sample Name: icsab Operator: 010069
Run Time: 05/16/05 12:08:02
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.094	516.4	1.046	1.057	.5318	.4857	.0100
SDev	.002	.4	.008	.007	.0001	.0000	.0010
%RSD	.1569	.0834	.7228	.6261	.0236	.0025	10.25
#1	1.093	516.7	1.041	1.052	.5319	.4857	.0093
#2	1.095	516.1	1.052	1.061	.5317	.4857	.0107
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	1.000	500.0	1.000	1.000	.5000	.5000	
Range	20.00	20.00	20.00	20.00	20.00	20.00	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	467.3	.9880	.4983	.4831	.5480	192.7	-.0107
SDev	1.1	.0018	.0019	.0006	.0008	.1	.0047
%RSD	.2300	.1846	.3733	.1257	.1415	.0343	43.36
#1	468.1	.9867	.4996	.4827	.5475	192.7	-.0140
#2	466.6	.9893	.4970	.4835	.5486	192.8	-.0074
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	500.0	1.000	.5000	.5000	.5000	200.0	
Range	20.00	20.00	20.00	20.00	20.00	20.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0043	1.297	545.5	.5091	1.052	.1521	-.0229
SDev	.0006	.003	.1	.0003	.000	.2873	.0060
%RSD	15.02	.2236	.0109	.0617	.0310	188.9	25.96
#1	.0038	1.295	545.5	.5089	1.052	-.0510	-.0271
#2	.0047	1.299	545.4	.5094	1.052	.3552	-.0187
Errors	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	NOCHECK	NOCHECK
Value			500.0	.5000	1.000		
Range			20.00	20.00	20.00		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9435	1.054	1.024	.9543	.0119	-.0467	1.065
SDev	.0004	.007	.001	.0105	.0005	.0004	.000
%RSD	.0443	.6812	.0589	1.097	4.287	.7504	.0373
#1	.9432	1.059	1.024	.9617	.0115	-.0470	1.065
#2	.9438	1.049	1.024	.9469	.0122	-.0465	1.065
Errors	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass
Value	1.000						1.000
Range	20.00						20.00

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

010070

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	91.20	1.037	1.028	1.068	.9776	1.031	1.018
SDev	.87	.012	.013	.007	.0068	.005	.002
%RSD	.9513	1.188	1.262	.7014	.6940	.4404	.1840
#1	90.59	1.028	1.037	1.062	.9824	1.034	1.017
#2	91.82	1.046	1.019	1.073	.9728	1.028	1.019
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				1.000	1.000	1.000	1.000
Range				20.00	20.00	20.00	20.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.087	.0179	1.002	1.018	1.039	.5133	-.0021
SDev	.001	.0046	.000	.007	.018	.0002	.0013
%RSD	.0894	25.46	.0450	.7210	1.684	.0407	59.46
#1	1.087	.0147	1.002	1.013	1.027	.5132	-.0030
#2	1.088	.0212	1.002	1.023	1.052	.5134	-.0012
Errors	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	NOCHECK
Value	1.000			1.000	1.000	.5000	
Range	20.00			20.00	20.00	20.00	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0004	1.007	.9217
SDev	.0000	.001	.0017
%RSD	10.78	.1187	.1815
#1	-.0004	1.008	.9205
#2	-.0004	1.006	.9229
Errors	NOCHECK	QC Pass	QC Pass
Value		1.000	1.000
Range		20.00	20.00

010071

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	651711	10000	--	--	--	--	--
SDev	6160.315	.0000000	--	--	--	--	--
%RSD	.9452525	.0000000	--	--	--	--	--
#1	647355	10000	--	--	--	--	--
#2	656067	10000	--	--	--	--	--

Method: DAILY2 Sample Name: icv/ccv Operator: 010072
Run Time: 05/16/05 12:16:33
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9828	9.818	5.089	4.909	10.07	.9879	5.069
SDev	.0028	.013	.012	.030	.03	.0008	.004
%RSD	.2872	.1290	.2404	.6190	.2970	.0756	.0718
#1	.9808	9.809	5.080	4.888	10.05	.9884	5.067
#2	.9848	9.827	5.098	4.931	10.09	.9874	5.072
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.01	1.034	5.177	1.978	2.030	10.61	18.65
SDev	.05	.001	.003	.004	.006	.03	.09
%RSD	.2251	.0516	.0514	.2054	.3155	.2400	.4963
#1	20.04	1.034	5.176	1.981	2.026	10.63	18.58
#2	19.98	1.033	5.179	1.975	2.035	10.60	18.72
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.925	5.210	20.05	1.045	5.152	28.15	Q41.53
SDev	.002	.014	.02	.001	.007	.08	.15
%RSD	.0493	.2666	.0748	.0901	.1339	.2780	.3529
#1	4.923	5.201	20.06	1.044	5.147	28.21	Q41.42
#2	4.927	5.220	20.04	1.046	5.157	28.10	Q41.63
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.981	5.140	4.931	4.953	.9919	.9399	1.022
SDev	.011	.006	.020	.010	.0026	.0030	.003
%RSD	.2287	.1197	.4119	.2028	.2659	.3169	.2742
#1	4.989	5.136	4.916	4.960	.9900	.9378	1.024
#2	4.973	5.144	4.945	4.946	.9937	.9420	1.020
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

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

010073

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.30	5.191	5.224	5.134	4.945	5.213	4.927
SDev	.28	.055	.017	.003	.000	.007	.001
%RSD	.2869	1.065	.3259	.0515	.0015	.1358	.0220
#1	99.10	5.152	5.236	5.133	4.945	5.208	4.928
#2	99.51	5.230	5.212	5.136	4.945	5.218	4.926
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.190	.9855	4.975	5.186	Q.8315	5.070	1.015
SDev	.008	.0023	.004	.028	.0137	.005	.008
%RSD	.1471	.2331	.0858	.5446	1.648	.1041	.7657
#1	5.185	.9839	4.972	5.166	Q.8412	5.067	1.009
#2	5.196	.9871	4.978	5.206	Q.8218	5.074	1.020
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	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	4.996	1.045	4.861
SDev	.000	.001	.006
%RSD	.0020	.0747	.1248
#1	4.996	1.045	4.856
#2	4.996	1.044	4.865
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

010074

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	709538	10000	--	--	--	--	--
SDev	2047.074	.0000000	--	--	--	--	--
%RSD	.2885082	.0000000	--	--	--	--	--
#1	708090	10000	--	--	--	--	--
#2	710985	10000	--	--	--	--	--

Method: DAILY2 Sample Name: icb/ccb Operator: 010075
Run Time: 05/16/05 12:23:11
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0011	.0049	.0064	.0000	-.0000	.0021
SDev	.0001	.0023	.0008	.0032	.0001	.0000	.0033
%RSD	90.37	207.0	15.81	50.68	213.4	.7854	160.4
#1	.0000	-.0027	.0043	.0087	.0001	-.0000	-.0003
#2	.0002	.0005	H.0054	.0041	-.0000	-.0000	.0044
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0011	.0003	-.0003	.0000	.0001	.0102	.0028
SDev	.0015	.0003	.0004	.0004	.0009	.0052	.0143
%RSD	127.4	100.6	160.6	7978.	1208.	50.71	511.8
#1	-.0022	.0001	-.0006	-.0003	.0007	.0065	-.0073
#2	-.0001	.0005	.0000	.0003	-.0006	.0138	.0129
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0001	-.0058	.0000	.0021	L-.3305	.0081
SDev	.0011	.0000	.0040	.0001	.0005	.0528	.0064
%RSD	264.8	10.73	68.26	202.5	22.68	15.98	79.31
#1	-.0011	.0001	-.0086	.0001	.0018	L-.3678	.0036
#2	.0003	.0001	-.0030	-.0000	.0024	L-.2931	.0126
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0064	-.0001	-.0002	.0011	L-.0821	.0027
SDev	.0008	.0008	.0076	.0017	.0064	.0043	.0020
%RSD	220.5	11.88	14920.	832.8	560.4	5.275	72.50
#1	.0009	.0069	-.0054	.0010	-.0034	L-.0790	.0041
#2	-.0002	.0059	.0053	-.0014	H.0057	L-.0852	.0013
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010076

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.1	.0003	.0046	.0006	-.0001	.0032	-.0012
SDev	.1	.0018	.0012	.0011	.0014	.0014	.0014
%RSD	.0892	590.0	26.19	186.0	1090.	44.46	119.0
#1	100.2	-.0010	.0037	-.0002	-.0011	.0022	-.0021
#2	100.1	.0016	.0054	.0014	.0009	.0042	-.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	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0026	.0002	.0040	-.0066	-.0003	-.0031
SDev	.0000	.0039	.0000	.0022	.0361	.0000	.0005
%RSD	62.27	149.2	5.624	54.29	550.1	10.10	16.46
#1	.0000	.0053	.0002	.0055	-.0321	-.0003	-.0027
#2	.0000	-.0001	.0002	.0024	.0190	-.0003	-.0035
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	-.0001	.0005
SDev	.0000	.0001	.0004
%RSD	53.41	71.13	80.47
#1	.0001	-.0001	.0009
#2	.0000	-.0002	.0002
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010077

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	715384	10000	--	--	--	--	--
SDev	596.0910	.0000000	--	--	--	--	--
%RSD	.0833247	.0000000	--	--	--	--	--
#1	715805	10000	--	--	--	--	--
#2	714962	10000	--	--	--	--	--

Method: DAILY2 Sample Name: pbw-E04E1 pg60-184 Operator: 010078
Run Time: 05/16/05 12:28:01
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	-.0012	.0034	.0049	-.0000	.0001	.0054
SDev	.0004	.0049	.0013	.0006	.0000	.0000	.0043
%RSD	42.95	409.5	38.12	12.98	182.2	17.83	79.40
#1	.0012	.0022	.0043	.0044	.0000	.0000	.0084
#2	.0007	-.0046	.0025	.0053	-.0000	.0001	.0024
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	.0001	-.0001	-.0007	.0005	.0032	.0094
SDev	.0003	.0006	.0004	.0000	.0003	.0076	.0005
%RSD	7.930	508.1	543.1	1.553	56.05	239.4	5.597
#1	.0043	.0005	-.0003	-.0007	.0003	-.0022	.0091
#2	.0039	-.0003	.0002	-.0007	.0008	.0085	.0098
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0001	.0065	.0001	.0012	.0164	.0344
SDev	.0006	.0001	.0033	.0000	.0008	.0130	.0006
%RSD	775.7	48.99	50.08	46.79	67.96	79.23	1.891
#1	.0003	.0001	.0089	.0001	.0017	.0256	.0339
#2	-.0005	.0001	.0042	.0000	.0006	.0072	.0348
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0022	.0004	-.0002	.0018	L-.1007	.0092
SDev	.0000	.0063	.0004	.0029	.0022	.0062	.0063
%RSD	328.9	282.7	86.66	1288.	120.8	6.145	68.34
#1	-.0000	-.0022	.0007	.0018	.0034	L-.1051	H.0136
#2	.0000	.0067	.0002	-.0022	.0003	L-.0963	.0047
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010079

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	106.2	-.0021	.0053	H.1472	.0000	.0029	-.0004
SDev	.7	.0049	.0003	.0047	.0020	.0018	.0010
%RSD	.6216	239.0	4.665	3.171	12740.	62.46	238.0
#1	105.8	-.0055	.0052	H.1439	.0014	.0016	.0003
#2	106.7	.0014	.0055	H.1505	-.0014	.0042	-.0011
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0019	.0002	.0012	.0259	-.0003	-.0015
SDev	.0000	.0032	.0000	.0021	.0131	.0004	.0014
%RSD	19.24	168.2	.2186	181.2	50.55	105.1	91.20
#1	.0000	.0041	.0002	.0026	.0351	-.0001	-.0005
#2	.0000	-.0004	.0002	-.0003	.0166	-.0006	-.0024
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0010	.0007
SDev	.0000	.0000	.0001
%RSD	131.1	3.004	21.77
#1	-.0001	.0010	.0008
#2	-.0000	.0010	.0006
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010080

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	759068	10000	--	--	--	--	--
SDev	4746.808	.0000000	--	--	--	--	--
%RSD	.6253464	.0000000	--	--	--	--	--
#1	755712	10000	--	--	--	--	--
#2	762425	10000	--	--	--	--	--

Method: DAILY2 Sample Name: lcsw-E04E1 Operator: 010081
Run Time: 05/16/05 12:32:47
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0963	3.705	3.819	.0024	3.866	.0957	.0007
SDev	.0004	.002	.000	.0004	.000	.0001	.0041
%RSD	.4602	.0648	.0018	16.76	.0081	.1269	579.0
#1	.0966	3.706	3.819	.0021	3.866	.0958	-.0022
#2	.0959	3.703	3.819	.0027	3.866	.0956	.0036

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	18.90	.0993	.9783	.3838	.4820	2.072	15.56
SDev	.02	.0007	.0011	.0003	.0001	.015	.03
%RSD	.0840	.6940	.1176	.0764	.0204	.7196	.1616
#1	18.91	.0998	.9775	.3836	.4819	2.083	15.57
#2	18.89	.0988	.9791	.3840	.4821	2.061	15.54

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0002	18.84	.9957	.0004	16.97	24.33
SDev	.0004	.0000	.01	.0003	.0000	.23	.03
%RSD	236.7	9.783	.0722	.0312	9.627	1.384	.1400
#1	-.0001	.0002	18.83	.9954	.0004	17.14	24.35
#2	.0005	.0002	18.85	.9959	.0004	16.81	24.30

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9502	.0019	.9519	.9499	.0037	-.0910	.9907
SDev	.0013	.0076	.0028	.0046	.0013	.0046	.0027
%RSD	.1314	395.3	.2963	.4798	35.32	5.073	.2740
#1	.9511	-.0034	.9539	.9531	.0027	-.0942	.9888
#2	.9493	.0072	.9499	.9467	.0046	-.0877	.9926

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	105.7	3.804	3.809	.1069	.9506	3.807	.0001
SDev	.0	.008	.014	.0008	.0040	.007	.0020
%RSD	.0452	.2150	.3697	.7345	.4186	.1750	2588.
#1	105.8	3.810	3.799	.1074	.9534	3.803	-.0013
#2	105.7	3.798	3.819	.1063	.9478	3.812	.0015

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0172	.0001	3.929	.0098	.9704	-.0029
SDev	.0000	.0012	.0001	.013	.0000	.0019	.0013
%RSD	.5910	7.038	103.9	.3399	.2500	.1973	45.40
#1	.0007	-.0163	.0002	3.920	.0099	.9717	-.0020
#2	.0007	-.0181	.0000	3.939	.0098	.9690	-.0038

010082

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.9775	.0005
SDev	.0000	.0003	.0001
%RSD	15.57	.0299	13.42
#1	-.0002	.9773	.0004
#2	-.0003	.9777	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	755408	10000	--	--	--	--	--
SDev	399.5153	.0000000	--	--	--	--	--
%RSD	.0528873	.0000000	--	--	--	--	--
#1	755691	10000	--	--	--	--	--
#2	755126	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262380 Operator: 010083
Run Time: 05/16/05 12:37:33
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.1513	.0053	.0534	.0388	.0000	.0077
SDev	.0005	.0022	.0012	.0011	.0003	.0000	.0026
%RSD	97.96	1.476	22.46	2.068	.6451	15.11	33.91
#1	.0009	.1529	.0044	.0542	.0390	.0000	.0095
#2	.0002	.1497	.0061	.0526	.0386	.0000	.0058

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	39.92	.0001	-.0002	.0020	.0057	.2598	3.084
SDev	.00	.0001	.0000	.0002	.0006	.0071	.015
%RSD	.0039	211.3	.8462	8.840	9.647	2.721	.4815
#1	39.92	-.0000	-.0002	.0022	.0061	.2548	3.073
#2	39.92	.0001	-.0002	.0019	.0053	.2648	3.094

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0255	12.82	.0094	.0003	32.03	45.05
SDev	.0001	.0001	.00	.0001	.0009	.07	.02
%RSD	114.2	.3514	.0253	1.356	338.9	.2141	.0351
#1	.0002	.0254	12.83	.0094	.0010	31.98	45.04
#2	.0000	.0255	12.82	.0093	-.0004	32.07	45.06

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.4911	.0081	.0001	.0021	6.173	.0058
SDev	.0002	.0192	.0040	.0026	.0001	.036	.0018
%RSD	78.99	3.900	50.07	1885.	6.430	.5840	31.64
#1	-.0001	.4775	.0052	.0020	.0020	6.147	.0071
#2	-.0003	.5046	.0109	-.0017	.0022	6.198	.0045

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.9	-.0035	.0032	17.57	.0028	.0010	-.0025
SDev	.1	.0007	.0004	.00	.0004	.0000	.0004
%RSD	.0641	18.98	11.73	.0072	13.78	2.729	17.67
#1	105.0	-.0040	.0035	17.57	.0031	.0010	-.0022
#2	104.9	-.0031	.0029	17.57	.0025	.0009	-.0028

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1543	-.0092	.0058	.0005	.0122	.0058	-.0035
SDev	.0001	.0015	.0004	.0050	.0014	.0012	.0001
%RSD	.0697	15.98	7.226	985.9	11.47	20.87	2.465
#1	.1542	-.0082	.0055	.0040	.0112	.0066	-.0036
#2	.1544	-.0103	.0061	-.0030	.0132	.0049	-.0035

010084

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.0224	.0002
SDev	.0001	.0001	.0005
%RSD	53.57	.2706	305.3
#1	-.0002	.0224	.0005
#2	-.0003	.0223	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	749610	10000	--	--	--	--	--
SDev	505.5814	.0000000	--	--	--	--	--
%RSD	.0674459	.0000000	--	--	--	--	--
#1	749968	10000	--	--	--	--	--
#2	749253	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262380d Operator: 010085
Run Time: 05/16/05 12:42:22
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.1361	.0057	.0532	.0385	.0000	.0055
SDev	.0008	.0010	.0019	.0005	.0000	.0000	.0006
%RSD	334.0	.7156	34.18	.9045	.0329	13.52	10.68
#1	-.0003	.1368	.0043	.0528	.0385	.0000	.0051
#2	.0008	.1354	.0070	.0535	.0385	.0000	.0059

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	40.04	.0002	-.0005	.0014	.0066	.2652	3.077
SDev	.08	.0000	.0002	.0004	.0005	.0199	.002
%RSD	.1904	11.30	39.79	27.76	7.080	7.504	.0518
#1	39.98	.0002	-.0007	.0011	.0069	.2512	3.076
#2	40.09	.0002	-.0004	.0017	.0062	.2793	3.079

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	.0254	12.84	.0094	.0008	31.83	44.84
SDev	.0000	.0000	.01	.0001	.0008	.16	.06
%RSD	6.910	.0610	.0832	.5454	100.2	.4947	.1360
#1	-.0005	.0253	12.83	.0094	.0002	31.95	44.88
#2	-.0005	.0254	12.84	.0094	.0013	31.72	44.80

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.4992	.0034	.0006	.0026	6.139	.0071
SDev	.0002	.0141	.0027	.0006	.0025	.003	.0057
%RSD	31.97	2.822	80.36	97.34	95.50	.0471	80.18
#1	.0006	.4892	.0054	.0010	.0008	6.141	.0111
#2	.0009	.5091	.0015	.0002	.0043	6.137	.0031

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.5	.0013	.0033	17.48	.0016	.0027	-.0020
SDev	.6	.0080	.0009	.00	.0013	.0033	.0016
%RSD	.5348	613.1	26.62	.0242	83.84	121.6	81.80
#1	103.9	.0070	.0040	17.48	.0025	.0050	-.0031
#2	103.1	-.0043	.0027	17.48	.0006	.0004	-.0008

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1539	-.0104	.0049	-.0011	.0140	.0059	-.0012
SDev	.0002	.0050	.0002	.0016	.0212	.0001	.0015
%RSD	.1522	47.67	4.955	137.3	151.6	1.731	130.7
#1	.1541	-.0069	.0051	-.0022	-.0010	.0058	-.0023
#2	.1538	-.0139	.0047	-.0000	.0289	.0060	-.0001

010086

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.0230	.0006
SDev	.0000	.0003	.0001
%RSD	.3438	1.205	23.80
#1	-.0002	.0228	.0007
#2	-.0002	.0232	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	739628	10000	--	--	--	--	--
SDev	3944.949	.0000000	--	--	--	--	--
%RSD	.5333689	.0000000	--	--	--	--	--
#1	742418	10000	--	--	--	--	--
#2	736839	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262380L df5 Operator:
Run Time: 05/16/05 12:47:09 010087
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0332	.0044	.0114	.0082	-.0000	.0092
SDev	.0003	.0032	.0006	.0011	.0000	.0000	.0023
%RSD	91.50	9.555	12.95	9.730	.0488	245.1	25.15
#1	.0001	.0354	.0048	.0106	.0082	-.0000	.0108
#2	.0005	.0309	.0040	.0121	.0082	.0000	.0076

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	8.445	.0003	-.0005	.0005	.0018	.0741	.5111
SDev	.017	.0002	.0002	.0000	.0002	.0044	.0040
%RSD	.1968	95.08	31.61	6.774	8.950	5.913	.7901
#1	8.433	.0001	-.0004	.0005	.0017	.0772	.5139
#2	8.457	.0004	-.0006	.0005	.0019	.0710	.5082

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0047	2.672	.0020	-.0003	5.722	8.076
SDev	.0004	.0000	.003	.0000	.0006	.092	.022
%RSD	108.8	.5195	.1230	.9481	191.8	1.617	.2714
#1	-.0007	.0047	2.675	.0020	-.0007	5.787	8.061
#2	-.0001	.0046	2.670	.0019	.0001	5.657	8.092

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0010	.1072	.0019	.0001	.0020	1.226	.0062
SDev	.0001	.0027	.0009	.0024	.0031	.008	.0032
%RSD	14.00	2.502	45.66	2306.	150.3	.6495	51.34
#1	.0009	.1091	.0025	-.0016	.0042	1.231	.0085
#2	.0011	.1053	.0013	.0018	-.0001	1.220	.0040

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.4	-.0006	.0007	3.709	.0007	.0003	-.0011
SDev	.3	.0032	.0003	.010	.0013	.0009	.0010
%RSD	.2500	545.3	44.59	.2611	178.1	328.3	89.94
#1	101.6	.0017	.0005	3.703	-.0002	.0009	-.0018
#2	101.2	-.0028	.0009	3.716	.0016	-.0003	-.0004

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0324	-.0032	.0022	.0022	.0050	.0012	-.0032
SDev	.0001	.0004	.0013	.0002	.0060	.0000	.0003
%RSD	.3356	12.41	59.84	11.29	119.4	.2919	9.660
#1	.0323	-.0035	.0031	.0023	.0093	.0012	-.0029
#2	.0324	-.0029	.0013	.0020	.0008	.0012	-.0034

010088

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0049	.0004
SDev	.0001	.0001	.0003
%RSD	100.2	1.855	78.53
#1	-.0002	.0049	.0007
#2	-.0000	.0050	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	724635	10000	--	--	--	--	--
SDev	1854.034	.0000000	--	--	--	--	--
%RSD	.2558576	.0000000	--	--	--	--	--
#1	725946	10000	--	--	--	--	--
#2	723324	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262380s Operator:
Run Time: 05/16/05 12:51:55
Comment:
Mode: CONC Corr. Factor: 1

010089

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0485	2.063	1.954	.0515	1.989	.0482	.0016
SDev	.0005	.001	.001	.0004	.002	.0001	.0060
%RSD	1.058	.0406	.0573	.7097	.0885	.1174	377.1
#1	.0481	2.063	1.953	.0517	1.988	.0482	.0058
#2	.0488	2.062	1.955	.0512	1.990	.0481	-.0026

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	58.20	.0489	.4878	.1937	.2508	1.299	21.28
SDev	.03	.0000	.0003	.0014	.0004	.012	.00
%RSD	.0468	.0757	.0506	.7045	.1547	.9573	.0224
#1	58.21	.0488	.4880	.1946	.2511	1.308	21.28
#2	58.18	.0489	.4876	.1927	.2505	1.290	21.29

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	.0269	31.79	.5079	.0005	51.84	73.48
SDev	.0002	.0001	.01	.0001	.0010	.07	.10
%RSD	40.53	.3135	.0159	.0187	213.2	.1441	.1398
#1	-.0007	.0269	31.79	.5080	-.0002	51.89	73.56
#2	-.0004	.0270	31.79	.5079	.0011	51.79	73.41

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4719	.5083	.4796	.4753	.0005	6.211	.5000
SDev	.0005	.0105	.0008	.0011	.0002	.027	.0009
%RSD	.1123	2.059	.1718	.2241	39.85	.4309	.1736
#1	.4715	.5157	.4790	.4745	.0007	6.230	.5006
#2	.4722	.5009	.4802	.4760	.0004	6.193	.4994

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	104.6	1.927	1.926	17.52	.4767	1.926	-.0014
SDev	.7	.014	.001	.01	.0010	.004	.0001
%RSD	.6787	.7203	.0747	.0622	.2053	.1904	5.072
#1	104.1	1.936	1.925	17.52	.4761	1.929	-.0013
#2	105.1	1.917	1.927	17.53	.4774	1.924	-.0014

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1531	-.0283	.0060	1.986	.0099	.4942	-.0033
SDev	.0001	.0016	.0001	.009	.0044	.0022	.0021
%RSD	.1007	5.747	2.094	.4630	45.11	.4495	64.21
#1	.1530	-.0295	.0059	1.979	.0067	.4927	-.0048
#2	.1532	-.0272	.0061	1.992	.0130	.4958	-.0018

010090

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0003	.5093	.0005
SDev	.0002	.0006	.0001
%RSD	65.50	.1105	29.28
#1	-.0004	.5097	.0006
#2	-.0001	.5089	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	747580	10000	--	--	--	--	--
SDev	5122.282	.0000000	--	--	--	--	--
%RSD	.6851817	.0000000	--	--	--	--	--
#1	743958	10000	--	--	--	--	--
#2	751202	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262380sd Operator:
Run Time: 05/16/05 12:56:41 010091
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0488	2.061	1.958	.0516	1.989	.0482	.0034
SDev	.0007	.000	.001	.0001	.001	.0000	.0029
%RSD	1.468	.0035	.0536	.1952	.0302	.0261	86.00
#1	.0483	2.061	1.957	.0517	1.990	.0482	.0055
#2	.0493	2.061	1.959	.0516	1.989	.0482	.0013

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	58.22	.0495	.4890	.1928	.2504	1.328	21.32
SDev	.14	.0008	.0011	.0002	.0019	.004	.04
%RSD	.2461	1.552	.2167	.0926	.7486	.3070	.1760
#1	58.12	.0489	.4883	.1927	.2517	1.325	21.34
#2	58.32	.0500	.4898	.1930	.2491	1.330	21.29

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0270	31.81	.5081	-.0007	51.97	73.29
SDev	.0012	.0001	.05	.0005	.0008	.10	.01
%RSD	244.8	.3285	.1539	.0905	110.8	.1849	.0158
#1	-.0004	.0269	31.78	.5078	-.0002	51.90	73.29
#2	.0014	.0271	31.84	.5084	-.0013	52.03	73.28

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4711	.5182	.4838	.4810	.0018	6.212	.5028
SDev	.0002	.0093	.0035	.0021	.0025	.025	.0039
%RSD	.0369	1.799	.7152	.4272	140.6	.4075	.7741
#1	.4713	.5248	.4862	.4796	.0000	6.229	.5001
#2	.4710	.5116	.4813	.4825	.0035	6.194	.5056

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	105.7	1.946	1.950	17.50	.4819	1.949	.0018
SDev	.5	.000	.004	.03	.0002	.003	.0011
%RSD	.4822	.0228	.2163	.1788	.0448	.1367	65.89
#1	106.0	1.946	1.947	17.52	.4818	1.947	.0026
#2	105.3	1.946	1.953	17.48	.4821	1.951	.0009

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1533	-.0240	.0058	1.974	.0134	.4952	-.0008
SDev	.0001	.0007	.0004	.014	.0090	.0011	.0038
%RSD	.0868	2.956	6.364	.6847	67.29	.2251	506.2
#1	.1534	-.0245	.0061	1.965	.0070	.4960	-.0035
#2	.1532	-.0235	.0056	1.984	.0197	.4944	.0020

010092

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0003	.5099	.0004
SDev	.0000	.0003	.0000
%RSD	3.846	.0549	4.476
#1	-.0003	.5101	.0004
#2	-.0003	.5097	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	755186	10000	--	--	--	--	--
SDev	3602.709	.0000000	--	--	--	--	--
%RSD	.4770622	.0000000	--	--	--	--	--
#1	757734	10000	--	--	--	--	--
#2	752639	10000	--	--	--	--	--

Analysis Report 05/16/05 01:06:01 PM page 1

Method: DAILY2 Sample Name: 262380aspk Operator: 010093
Run Time: 05/16/05 13:01:27 final sample spiked with soil spike-1 #5177
Comment: soil ICAL-1 #4837
Mode: CONC Corr. Factor: 1 DL 5-16-05

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0477	1.998	1.896	.0509	1.939	.0470	.0084
SDev	.0008	.002	.001	.0011	.003	.0001	.0097
%RSD	1.769	.1167	.0461	2.098	.1331	.1502	116.5
#1	.0471	1.999	1.897	.0501	1.941	.0469	.0015
#2	.0483	1.996	1.896	.0516	1.937	.0470	.0152

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	58.19	.0478	.4744	.1881	.2444	1.279	21.17
SDev	.21	.0001	.0020	.0007	.0002	.009	.09
%RSD	.3576	.1860	.4274	.3491	.0799	.7192	.4362
#1	58.05	.0477	.4730	.1877	.2445	1.272	21.23
#2	58.34	.0479	.4758	.1886	.2442	1.285	21.10

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0272	31.68	.4946	.0008	51.98	73.51
SDev	.0003	.0000	.07	.0011	.0001	.16	.09
%RSD	110.4	.0815	.2328	.2140	6.387	.3036	.1254
#1	-.0004	.0272	31.63	.4938	.0008	51.87	73.57
#2	-.0001	.0272	31.74	.4953	.0008	52.10	73.44

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4568	.5115	.4666	.4606	-.0007	6.255	.4667
SDev	.0022	.0008	.0072	.0012	.0034	.029	.0020
%RSD	.4834	.1537	1.540	.2600	505.2	.4695	.4344
#1	.4584	.5120	.4717	.4615	-.0030	6.234	.4681
#2	.4552	.5109	.4616	.4598	.0017	6.275	.4652

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.2	1.877	1.884	17.66	.4627	1.882	-.0010
SDev	1.1	.011	.002	.00	.0032	.002	.0027
%RSD	1.054	.5850	.0947	.0100	.6905	.1312	264.0
#1	103.9	1.869	1.886	17.66	.4649	1.880	-.0029
#2	102.4	1.885	1.883	17.66	.4604	1.884	.0009

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1544	-.0283	.0055	1.939	-.0025	.4821	-.0010
SDev	.0001	.0010	.0000	.003	.0238	.0006	.0007
%RSD	.0390	3.414	.1752	.1369	953.2	.1325	63.58
#1	.1545	-.0276	.0055	1.941	-.0193	.4816	-.0006
#2	.1544	-.0290	.0055	1.937	.0143	.4825	-.0015

010094

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0003	.4965	-.0002
SDev	.0001	.0027	.0007
%RSD	29.28	.5407	358.0
#1	-.0004	.4946	-.0006
#2	-.0003	.4984	.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	737119	10000	--	--	--	--	--
SDev	7706.050	.0000000	--	--	--	--	--
%RSD	1.045428	.0000000	--	--	--	--	--
#1	742568	10000	--	--	--	--	--
#2	731670	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262381 Operator: 010095
Run Time: 05/16/05 13:06:13
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.7703	.0108	.0482	.0518	.0001	.0076
SDev	.0002	.0261	.0010	.0006	.0001	.0000	.0095
%RSD	293.3	3.394	9.229	1.146	.1700	7.788	125.2
#1	-.0002	.7888	.0115	.0486	.0518	.0001	.0009
#2	.0001	.7519	.0101	.0478	.0517	.0001	.0143

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	48.36	.0000	.0001	.0158	.0113	.7316	7.232
SDev	.05	.0002	.0003	.0008	.0001	.0007	.031
%RSD	.1042	536.2	439.4	4.999	1.016	.0978	.4316
#1	48.39	-.0001	-.0002	.0163	.0114	.7321	7.210
#2	48.32	.0002	.0003	.0152	.0112	.7311	7.254

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0192	11.74	.0202	.0245	15.80	22.66
SDev	.0002	.0000	.02	.0000	.0003	.12	.07
%RSD	93.57	.1443	.2016	.1267	1.179	.7468	.3297
#1	.0001	.0192	11.76	.0203	.0243	15.72	22.61
#2	.0004	.0192	11.72	.0202	.0247	15.89	22.71

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0022	.1108	.0050	-.0006	.0024	42.90	.0119
SDev	.0003	.0076	.0004	.0030	.0000	.08	.0001
%RSD	15.00	6.910	8.720	536.1	.3002	.1975	1.107
#1	.0024	.1054	.0053	.0015	.0024	42.84	.0118
#2	.0019	.1162	.0047	-.0027	.0024	42.96	.0120

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	105.0	-.0019	.0053	5.420	.0013	.0029	-.0026
SDev	.3	.0015	.0012	.076	.0021	.0003	.0003
%RSD	.2460	81.80	23.06	1.409	161.6	10.15	11.46
#1	104.8	-.0030	.0061	5.474	.0028	.0031	-.0028
#2	105.2	-.0008	.0044	5.366	-.0002	.0027	-.0024

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1581	-.0098	.0326	.0013	.0055	.0181	-.0005
SDev	.0001	.0009	.0014	.0063	.0035	.0002	.0021
%RSD	.0465	9.159	4.445	475.6	63.28	1.070	412.4
#1	.1580	-.0091	.0337	-.0031	.0079	.0182	-.0020
#2	.1581	-.0104	.0316	.0058	.0030	.0179	.0010

010096

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0123	.0016
SDev	.0001	.0002	.0003
%RSD	50.67	1.901	15.20
#1	.0001	.0122	.0018
#2	.0003	.0125	.0015

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	750084	10000	--	--	--	--	--
SDev	1850.498	.0000000	--	--	--	--	--
%RSD	.2467053	.0000000	--	--	--	--	--
#1	748776	10000	--	--	--	--	--
#2	751393	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262383 Operator: 010097
Run Time: 05/16/05 13:10:59
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0150	.0034	.1646	.0252	.0000	.0002
SDev	.0002	.0041	.0014	.0003	.0000	.0000	.0043
%RSD	102.3	27.59	42.01	.1880	.0755	208.3	2090.
#1	-.0004	.0121	.0024	.1644	.0253	-.0000	-.0028
#2	-.0001	.0179	.0045	.1648	.0252	.0000	.0032

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	42.72	-.0002	-.0000	-.0007	.0049	.2080	51.60
SDev	.01	.0001	.0004	.0001	.0003	.0029	.30
%RSD	.0322	35.33	933.2	17.85	6.947	1.420	.5888
#1	42.73	-.0001	-.0003	-.0006	.0046	.2059	51.38
#2	42.71	-.0002	.0003	-.0007	.0051	.2101	51.81

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0537	23.65	.0218	.0018	134.1	173.8
SDev	.0000	.0004	.03	.0001	.0007	.3	.1
%RSD	11.21	.7551	.1133	.3022	41.66	.2334	.0378
#1	-.0003	.0535	23.67	.0218	.0012	133.9	173.8
#2	-.0004	.0540	23.63	.0219	.0023	134.3	173.8

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0033	11.03	.0023	-.0003	.0011	14.42	.0077
SDev	.0010	.03	.0016	.0021	.0013	.02	.0032
%RSD	28.99	.2553	69.80	630.5	120.5	.1689	41.34
#1	.0040	11.05	.0012	-.0018	.0002	14.40	.0099
#2	.0026	11.01	.0035	.0011	.0020	14.44	.0054

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	106.0	-.0080	.0053	22.30	.0006	.0009	-.0004
SDev	.4	.0040	.0029	.01	.0019	.0006	.0001
%RSD	.3518	49.72	54.34	.0297	335.3	67.76	20.43
#1	105.8	-.0052	.0032	22.30	-.0008	.0005	-.0003
#2	106.3	-.0108	.0073	22.31	.0019	.0013	-.0004

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1837	-.0227	.0018	.0001	-.0159	-.0000	-.0047
SDev	.0000	.0010	.0001	.0012	.0070	.0000	.0019
%RSD	.0086	4.438	7.170	858.7	43.61	584.0	41.04
#1	.1837	-.0234	.0017	-.0007	-.0110	.0000	-.0061
#2	.1837	-.0220	.0019	.0010	-.0209	-.0000	-.0033

010098

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0004	.0108	-.0002
SDev	.0000	.0001	.0002
%RSD	9.972	.6692	81.91
#1	-.0004	.0108	-.0001
#2	-.0003	.0109	-.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	757706	10000	--	--	--	--	--
SDev	2694.077	.0000000	--	--	--	--	--
%RSD	.3555570	.0000000	--	--	--	--	--
#1	755801	10000	--	--	--	--	--
#2	759611	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccv2 Operator: 010099
Run Time: 05/16/05 13:19:26
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9832	9.816	5.083	4.881	10.06	.9870	5.058
SDev	.0008	.003	.012	.012	.00	.0007	.023
%RSD	.0847	.0272	.2453	.2517	.0410	.0664	.4529
#1	.9838	9.818	5.074	4.872	10.06	.9875	5.042
#2	.9826	9.814	5.092	4.889	10.07	.9866	5.075
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1.100	11.00	5.500	5.500	11.00	1.100	5.500
Low	.9000	9.000	4.500	4.500	9.000	.9000	4.500

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	19.94	1.032	5.166	1.976	2.030	10.60	18.66
SDev	.03	.002	.001	.002	.000	.00	.02
%RSD	.1709	.1727	.0208	.0760	.0043	.0226	.1209
#1	19.97	1.030	5.166	1.977	2.030	10.60	18.68
#2	19.92	1.033	5.167	1.975	2.030	10.61	18.65
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.929	5.201	19.97	1.045	5.144	28.09	H41.34
SDev	.002	.002	.03	.000	.002	.08	.01
%RSD	.0404	.0322	.1409	.0108	.0379	.2967	.0295
#1	4.928	5.202	19.99	1.045	5.143	28.15	H41.35
#2	4.930	5.199	19.95	1.045	5.145	28.03	H41.34
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	5.500	5.500	22.00	1.100	5.500	33.00	33.00
Low	4.500	4.500	18.00	.9000	4.500	27.00	27.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.940	5.057	4.931	4.931	.9941	L.8929	1.021
SDev	.017	.009	.018	.026	.0009	.0199	.002
%RSD	.3385	.1706	.3691	.5301	.0861	2.234	.1852
#1	4.928	5.063	4.918	4.949	.9935	.9070	1.019
#2	4.952	5.051	4.944	4.913	.9947	L.8788	1.022
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

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

010100

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.10	5.186	5.192	5.119	4.931	5.190	4.920
SDev	.15	.022	.005	.009	.011	.004	.007
%RSD	.1495	.4152	.0985	.1836	.2304	.0726	.1515
#1	99.21	5.170	5.196	5.125	4.939	5.187	4.914
#2	99.00	5.201	5.188	5.112	4.923	5.193	4.925
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.195	.9894	4.971	5.180	L.8597	5.056	1.018
SDev	.008	.0068	.001	.009	.0085	.000	.006
%RSD	.1605	.6850	.0112	.1805	.9846	.0051	.5547
#1	5.189	.9942	4.972	5.174	L.8656	5.056	1.022
#2	5.201	.9847	4.971	5.187	L.8537	5.057	1.014
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass	LC Pass
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.993	1.041	4.863
SDev	.003	.001	.005
%RSD	.0577	.1038	.1078
#1	4.991	1.042	4.860
#2	4.995	1.041	4.867
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

010101

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	708100	10000	--	--	--	--	--
SDev	1093.187	.0000000	--	--	--	--	--
%RSD	.1543831	.0000000	--	--	--	--	--
#1	708873	10000	--	--	--	--	--
#2	707327	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccb2 Operator: 010102
Run Time: 05/16/05 13:26:03
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0015	.0029	.0034	.0001	.0000	.0037
SDev	.0003	.0042	.0013	.0001	.0001	.0000	.0021
%RSD	283.2	274.5	44.47	3.200	213.4	68.98	56.25
#1	-.0001	-.0044	.0038	.0035	-.0000	.0000	.0052
#2	.0003	.0014	.0020	.0033	.0001	.0000	.0023
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0001	-.0007	-.0009	-.0002	-.0111	.0027
SDev	.0002	.0000	.0004	.0011	.0002	.0116	.0100
%RSD	30.94	9.691	59.51	123.0	119.5	104.4	371.0
#1	.0007	-.0001	-.0010	-.0016	-.0003	-.0029	.0098
#2	.0005	-.0001	-.0004	-.0001	-.0000	-.0193	-.0044
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0002	-.0034	.0000	.0011	L-.1277	.0265
SDev	.0000	.0000	.0008	.0000	.0006	.0141	.0042
%RSD	15.70	20.19	24.06	2.128	50.63	11.00	15.81
#1	-.0001	.0002	-.0040	.0000	.0015	L-.1178	.0295
#2	-.0001	.0002	-.0028	.0000	.0007	L-.1376	.0235
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	-.0031	.0033	-.0021	-.0008	L-.1191	.0016
SDev	.0006	.0004	.0028	.0006	.0018	.0180	.0004
%RSD	461.7	11.56	85.91	28.92	221.3	15.11	26.69
#1	.0003	-.0029	.0013	-.0017	.0005	L-.1064	.0018
#2	-.0005	-.0034	.0052	-.0026	-.0021	L-.1319	.0013
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010103

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.5	.0006	-.0002	.0051	-.0003	.0001	.0006
SDev	.2	.0018	.0034	.0025	.0005	.0017	.0004
%RSD	.2142	303.1	1593.	49.94	157.4	2799.	80.49
#1	101.7	.0018	-.0026	.0033	-.0007	-.0011	.0009
#2	101.4	-.0007	.0022	.0069	.0000	.0013	.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	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0020	.0002	.0018	-.0072	-.0004	-.0024
SDev	.0000	.0030	.0001	.0035	.0069	.0003	.0020
%RSD	66.49	148.6	81.34	195.6	96.17	59.65	83.65
#1	.0000	-.0001	.0001	-.0007	-.0121	-.0006	-.0010
#2	.0000	.0041	.0003	.0043	-.0023	-.0002	-.0039
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0001	-.0001
SDev	.0001	.0000	.0004
%RSD	109.4	29.72	318.5
#1	-.0002	.0001	-.0004
#2	-.0000	.0002	.0001
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010104

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	725254	10000	--	--	--	--	--
SDev	1563.413	.0000000	--	--	--	--	--
%RSD	.2155675	.0000000	--	--	--	--	--
#1	726360	10000	--	--	--	--	--
#2	724149	10000	--	--	--	--	--

Method: DAILY2 Sample Name: cri Operator: 010105
Run Time: 05/16/05 13:30:49
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0206	.1007	.0236	.1024	.0206	.0099	.0055
SDev	.0014	.0133	.0045	.0000	.0000	.0000	.0039
%RSD	6.640	13.23	19.09	.0377	.0571	.1076	71.20
#1	.0196	.0913	.0204	.1024	.0206	.0099	.0027
#2	.0215	.1101	.0267	.1024	.0206	.0099	.0083
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	.0300		.0300	.1500	.0300	.0150	
Low	.0100		.0100	.0500	.0100	.0050	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0108	.1006	.0192	.0498	.1144	-.0014
SDev	.0015	.0001	.0017	.0003	.0001	.0027	.0242
%RSD	1210.	1.101	1.714	1.435	.1918	2.376	1755.
#1	-.0012	.0107	.0993	.0190	.0498	.1124	-.0185
#2	.0009	.0109	.1018	.0194	.0499	.1163	.0158
Errors	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High		.0150	.1500	.0300	.0750	.1500	
Low		.0050	.0500	.0100	.0250	.0500	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0784	.0006	.0314	.0210	-.0655	.0216
SDev	.0021	.0001	.0134	.0001	.0004	.3931	.0096
%RSD	5161.	.0750	2161.	.4078	2.029	600.5	44.63
#1	-.0014	.0784	-.0089	.0315	.0207	-.3434	.0148
#2	.0015	.0784	.0101	.0313	.0213	.2125	.0284
Errors	NOCHECK	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	NOCHECK
High		.1500		.0450	.0300		
Low		.0500		.0150	.0100		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0795	.0989	.0091	.0048	.0017	-.1158	.1269
SDev	.0002	.0113	.0039	.0010	.0063	.0029	.0006
%RSD	.2111	11.44	43.18	20.30	372.3	2.527	.5131
#1	.0796	.0909	.0063	.0055	-.0027	-.1179	.1264
#2	.0794	.1069	.0118	.0041	.0061	-.1138	.1274
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	.1200	.1500					.1800
Low	.0400	.0500					.0600

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

010106

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.5	.0063	.0127	.1145	.0063	.0106	.1029
SDev	.3	.0025	.0069	.0065	.0006	.0038	.0006
%RSD	.3407	39.23	54.44	5.694	10.38	35.89	.5574
#1	100.7	.0045	.0176	.1099	.0058	.0133	.1033
#2	100.2	.0080	.0078	.1191	.0067	.0079	.1025
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.1500	.0090	.0150	.1500
Low				.0500	.0030	.0050	.0500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0216	-.0003	.0201	.0168	.2188	.1010	.0017
SDev	.0001	.0035	.0001	.0031	.0491	.0005	.0033
%RSD	.3887	1389.	.3486	18.38	22.44	.4752	198.6
#1	.0215	.0022	.0202	.0146	.1841	.1006	-.0007
#2	.0217	-.0027	.0201	.0189	.2536	.1013	.0040
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	LC Pass	NOCHECK
High	.0300		.0300	.0300		.1500	
Low	.0100		.0100	.0100		.0500	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0411	.0926
SDev	.0001	.0002	.0003
%RSD	69.81	.4293	.2756
#1	-.0000	.0413	.0928
#2	-.0001	.0410	.0925
Errors	NOCHECK	LC Pass	NOCHECK
High		.0600	
Low		.0200	

010107

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	717875	10000	--	--	--	--	--
SDev	2462.146	.0000000	--	--	--	--	--
%RSD	.3429770	.0000000	--	--	--	--	--
#1	719616	10000	--	--	--	--	--
#2	716134	10000	--	--	--	--	--

Method: DAILY2 Sample Name: icsa Operator:
Run Time: 05/16/05 13:35:35 010108
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0010	512.3	.0037	-.0153	.0023	-.0000	.0161
SDev	.0009	.1	.0015	.0021	.0000	.0000	.0052
%RSD	91.01	.0170	39.98	13.57	.3115	171.0	32.06
#1	-.0003	512.4	.0027	-.0138	.0024	-.0000	.0125
#2	-.0016	512.2	.0048	-.0167	.0023	.0000	.0198
Errors	NOCHECK	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High		600.0					
Low		400.0					

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	463.5	-.0010	.0006	-.0011	.0015	191.7	.0127
SDev	1.3	.0002	.0005	.0008	.0006	.4	.0134
%RSD	.2857	20.44	88.54	78.82	41.10	.2244	105.1
#1	464.5	-.0012	.0009	-.0005	.0019	192.0	.0221
#2	462.6	-.0009	.0002	-.0017	.0011	191.4	.0033
Errors	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass	NOCHECK
High	600.0					240.0	
Low	400.0					160.0	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0042	.0004	540.1	-.0035	-.0023	.2627	-.0061
SDev	.0001	.0000	.3	.0000	.0005	.1853	.0009
%RSD	2.198	9.487	.0502	.6434	24.04	70.54	15.11
#1	.0043	.0004	540.3	-.0035	-.0019	.3938	-.0055
#2	.0042	.0004	539.9	-.0035	-.0027	.1317	-.0068
Errors	NOCHECK	NOCHECK	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High			600.0				
Low			400.0				

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0024	-.0105	.0439	-.0339	.0129	-.1129	.0002
SDev	.0023	.0012	.0043	.0004	.0039	.0019	.0008
%RSD	95.43	11.88	9.750	1.169	30.28	1.655	415.5
#1	.0040	-.0114	.0470	-.0342	.0157	-.1116	-.0004
#2	.0008	-.0096	.0409	-.0336	.0101	-.1142	.0007
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

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

010109

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	90.71	.0037	-.0002	-.0064	-.0079	.0011	-.0058
SDev	.86	.0027	.0029	.0029	.0012	.0010	.0045
%RSD	.9453	73.49	1258.	45.51	14.68	94.42	78.34
#1	90.11	.0056	-.0023	-.0043	-.0071	.0004	-.0090
#2	91.32	.0018	.0018	-.0085	-.0088	.0018	-.0026
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0168	.0137	-.0012	.0072	.0385	.0007	-.0036
SDev	.0000	.0009	.0000	.0025	.0474	.0001	.0028
%RSD	.2400	6.874	2.108	34.78	123.1	12.44	76.93
#1	.0169	.0144	-.0011	.0090	.0720	.0008	-.0056
#2	.0168	.0131	-.0012	.0054	.0050	.0007	-.0017
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0003	.0075	.0001
SDev	.0000	.0005	.0001
%RSD	12.89	6.513	161.2
#1	-.0004	.0072	.0002
#2	-.0003	.0079	-.0000
Errors	NOCHECK	NOCHECK	NOCHECK
High			
Low			

010110

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	648198	10000	--	--	--	--	--
SDev	6149.001	.0000000	--	--	--	--	--
%RSD	.9486300	.0000000	--	--	--	--	--
#1	643850	10000	--	--	--	--	--
#2	652546	10000	--	--	--	--	--

Method: DAILY2 Sample Name: icsab Operator: 010111
Run Time: 05/16/05 13:40:22
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.091	516.2	1.041	1.051	.5305	.4849	.0065
SDev	.000	.2	.004	.005	.0005	.0002	.0082
%RSD	.0346	.0398	.4263	.4570	.0952	.0320	125.3
#1	1.091	516.3	1.038	1.047	.5302	.4850	.0007
#2	1.091	516.0	1.044	1.054	.5309	.4848	.0123
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	1.200	600.0	1.200	1.200	.6000	.6000	
Low	.8000	400.0	.8000	.8000	.4000	.4000	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	464.1	.9821	.4961	.4818	.5506	192.3	-.0111
SDev	.1	.0009	.0011	.0009	.0015	.2	.0096
%RSD	.0259	.0924	.2199	.1798	.2718	.1217	86.70
#1	464.2	.9828	.4954	.4824	.5516	192.4	-.0179
#2	464.0	.9815	.4969	.4812	.5495	192.1	-.0043
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	600.0	1.200	.6000	.6000	.6000	240.0	
Low	400.0	.8000	.4000	.4000	.4000	160.0	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0045	H1.297	543.0	.5082	1.048	.0881	-.0089
SDev	.0005	.001	.0	.0001	.000	.0270	.0071
%RSD	11.23	.0639	.0009	.0137	.0003	30.64	79.63
#1	.0049	H1.296	543.0	.5083	1.048	.1072	-.0138
#2	.0041	H1.298	543.0	.5082	1.048	.0690	-.0039
Errors	NOCHECK	LC High	LC Pass	LC Pass	LC Pass	NOCHECK	NOCHECK
High		1.200	600.0	.6000	1.200		
Low		.8000	400.0	.4000	.8000		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9366	1.012	1.010	.9464	.0131	-.0944	1.065
SDev	.0078	.024	.007	.0057	.0030	.0148	.000
%RSD	.8312	2.353	.7057	.6044	23.15	15.69	.0155
#1	.9311	.9956	1.005	.9423	.0109	-.0839	1.065
#2	.9421	1.029	1.015	.9504	.0152	-.1049	1.065
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	1.200	1.200					1.200
Low	.8000	.8000					.8000

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

010112

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	91.05	1.019	1.027	1.071	.9677	1.024	1.015
SDev	.11	.002	.002	.005	.0062	.001	.003
%RSD	.1195	.2213	.2340	.4917	.6389	.0830	.3291
#1	90.97	1.021	1.025	1.068	.9633	1.024	1.018
#2	91.13	1.018	1.029	1.075	.9720	1.025	1.013
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High					1.200	1.200	1.200
Low					.8000	.8000	.8000

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.089	.0132	1.002	1.006	1.038	.5110	-.0049
SDev	.000	.0008	.000	.001	.009	.0005	.0037
%RSD	.0307	5.956	.0032	.1203	.8592	.0920	74.54
#1	1.089	.0138	1.002	1.005	1.032	.5107	-.0023
#2	1.088	.0127	1.002	1.007	1.044	.5113	-.0075
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	LC Pass	NOCHECK
High	1.200		1.200	1.200		.6000	
Low	.8000		.8000	.8000		.4000	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0004	1.002	.9325
SDev	.0000	.002	.0010
%RSD	6.521	.2039	.1065
#1	-.0004	1.004	.9318
#2	-.0004	1.001	.9332
Errors	NOCHECK	LC Pass	NOCHECK
High		1.200	
Low		.8000	

010113

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	650573	10000	--	--	--	--	--
SDev	731.1484	.0000000	--	--	--	--	--
%RSD	.1123853	.0000000	--	--	--	--	--
#1	650056	10000	--	--	--	--	--
#2	651090	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccv3 Operator:
Run Time: 05/16/05 13:48:50
Comment: 010114
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9809	9.825	5.076	4.884	10.04	.9879	5.048
SDev	.0010	.013	.002	.018	.01	.0001	.007
%RSD	.1054	.1356	.0395	.3779	.0836	.0097	.1416
#1	.9816	9.816	5.075	4.871	10.04	.9880	5.043
#2	.9802	9.835	5.078	4.898	10.05	.9878	5.053
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1.100	11.00	5.500	5.500	11.00	1.100	5.500
Low	.9000	9.000	4.500	4.500	9.000	.9000	4.500

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	19.94	1.027	5.159	1.977	2.032	10.54	18.72
SDev	.01	.002	.002	.002	.000	.01	.03
%RSD	.0420	.1751	.0318	.0951	.0064	.0553	.1699
#1	19.95	1.026	5.161	1.976	2.031	10.54	18.70
#2	19.94	1.029	5.158	1.978	2.032	10.54	18.74
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.929	5.210	19.99	1.045	5.156	28.37	H41.46
SDev	.002	.003	.00	.001	.002	.09	.02
%RSD	.0397	.0526	.0114	.1197	.0360	.3287	.0516
#1	4.928	5.208	20.00	1.044	5.155	28.30	H41.44
#2	4.931	5.212	19.99	1.046	5.158	28.43	H41.47
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	5.500	5.500	22.00	1.100	5.500	33.00	33.00
Low	4.500	4.500	18.00	.9000	4.500	27.00	27.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.927	5.083	4.924	4.941	.9984	L.8942	1.018
SDev	.006	.010	.026	.040	.0002	.0039	.004
%RSD	.1149	.1892	.5236	.8005	.0224	.4381	.4307
#1	4.932	5.076	4.906	4.969	.9982	L.8914	1.021
#2	4.923	5.090	4.943	4.913	.9985	L.8970	1.015
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

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

010115

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.06	5.213	5.229	5.122	4.935	5.224	4.912
SDev	.08	.033	.046	.001	.018	.019	.008
%RSD	.0796	.6241	.8704	.0210	.3601	.3733	.1644
#1	99.00	5.190	5.261	5.122	4.948	5.237	4.906
#2	99.11	5.236	5.197	5.123	4.923	5.210	4.918
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.193	.9875	4.975	5.178	L.8704	5.060	1.012
SDev	.007	.0055	.000	.005	.0122	.001	.001
%RSD	.1394	.5581	.0068	.1016	1.399	.0106	.0905
#1	5.188	.9914	4.975	5.174	L.8618	5.060	1.011
#2	5.198	.9836	4.975	5.182	L.8790	5.059	1.012
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass	LC Pass
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.995	1.044	4.892
SDev	.002	.000	.002
%RSD	.0301	.0049	.0475
#1	4.996	1.044	4.891
#2	4.994	1.044	4.894
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

010116

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	707806	10000	--	--	--	--	--
SDev	579.1205	.0000000	--	--	--	--	--
%RSD	.0818191	.0000000	--	--	--	--	--
#1	707396	10000	--	--	--	--	--
#2	708215	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccb3 Operator:
Run Time: 05/16/05 13:55:26 010117
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	-.0014	.0025	.0046	.0001	.0001	.0049
SDev	.0007	.0025	.0037	.0017	.0000	.0000	.0045
%RSD	1705.	178.8	146.9	37.42	59.48	11.42	92.25
#1	.0005	.0004	H.0051	.0058	.0000	.0001	.0081
#2	-.0005	-.0032	-.0001	.0033	.0001	.0001	.0017
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	-.0000	.0000	-.0005	.0008	.0016	.0054
SDev	.0003	.0001	.0010	.0000	.0004	.0040	.0123
%RSD	94.33	968.7	26150.	3.433	46.07	251.5	229.3
#1	.0006	.0000	.0007	-.0005	.0011	.0044	.0141
#2	.0001	-.0001	-.0007	-.0005	.0005	-.0012	-.0033
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0002	-.0007	-.0000	.0012	L-.1589	.0195
SDev	.0001	.0000	.0017	.0001	.0009	.3090	.0053
%RSD	20.95	9.547	251.0	180.0	74.49	194.5	27.00
#1	-.0004	.0002	.0005	-.0001	.0019	H.0596	.0158
#2	-.0003	.0001	-.0019	.0000	.0006	L-.3774	.0232
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	-.0004	-.0019	.0014	.0006	L-.1235	.0092
SDev	.0008	.0139	.0007	.0018	.0016	.0031	.0076
%RSD	87.66	3330.	37.79	135.9	262.6	2.480	82.40
#1	.0014	L-.0102	-.0014	.0027	-.0005	L-.1256	H.0145
#2	.0003	.0094	-.0024	.0001	.0017	L-.1213	.0038
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010118

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.4	-.0061	.0016	.0058	.0003	-.0010	.0001
SDev	1.0	.0004	.0009	.0029	.0015	.0005	.0009
%RSD	.9634	6.059	59.07	50.10	524.6	52.45	631.5
#1	99.73	-.0059	.0009	.0078	.0013	-.0013	.0008
#2	101.1	-.0064	.0023	.0037	-.0008	-.0006	-.0005
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0014	.0002	.0020	.0093	-.0002	-.0011
SDev	.0000	.0026	.0001	.0053	.0123	.0008	.0029
%RSD	131.1	193.2	40.41	264.4	131.1	392.6	260.7
#1	.0000	.0032	.0002	-.0018	.0180	.0004	-.0032
#2	.0001	-.0005	.0003	.0058	.0007	-.0008	.0010
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	-.0001	.0009
SDev	.0001	.0003	.0009
%RSD	92.71	288.2	101.1
#1	.0001	.0001	.0015
#2	.0000	-.0003	.0003
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010119

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	717484	10000	--	--	--	--	--
SDev	6972.780	.0000000	--	--	--	--	--
%RSD	.9718370	.0000000	--	--	--	--	--
#1	712554	10000	--	--	--	--	--
#2	722415	10000	--	--	--	--	--

Analysis Report 05/16/05 02:04:48 PM page 1

Method: DAILY2 Sample Name: ~~pbw-E15H1~~ pH 5-16-05 Operator:
Run Time: 05/16/05 14:00:13 PBW-E16H1
Comment:
Mode: CONC Corr. Factor: 1

010120

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	-.0084	.0022	.0008	.0001	.0001	-.0006
SDev	.0005	.0033	.0021	.0004	.0001	.0000	.0050
%RSD	116.9	39.34	97.95	59.17	46.23	4.381	817.6
#1	.0001	-.0060	.0007	.0011	.0002	.0001	-.0041
#2	.0008	-.0107	.0037	.0004	.0001	.0001	.0029
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0077	-.0000	.0002	-.0006	.0005	.0022	.0017
SDev	.0006	.0002	.0001	.0003	.0003	.0065	.0087
%RSD	7.786	323.3	68.60	53.02	56.20	302.3	513.8
#1	.0073	.0001	.0001	-.0008	.0007	-.0025	-.0045
#2	.0081	-.0002	.0003	-.0004	.0003	.0068	.0078
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0001	.0006	.0000	.0003	-.0114	.0375
SDev	.0001	.0000	.0055	.0001	.0004	.2782	.0070
%RSD	19.24	46.50	928.5	1617.	146.8	2448.	18.73
#1	.0003	.0001	-.0033	.0001	.0006	L-.2081	.0325
#2	.0004	.0001	.0045	-.0001	-.0000	H.1854	.0425
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	-.0048	.0001	-.0009	.0004	L-.1302	.0026
SDev	.0003	.0078	.0041	.0018	.0009	.0084	.0043
%RSD	377.2	161.7	4871.	190.4	211.3	6.456	166.7
#1	-.0003	.0007	.0030	.0003	-.0002	L-.1243	.0056
#2	.0001	L-.0104	-.0028	-.0022	.0011	L-.1362	-.0005
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010121

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	107.1	.0022	.0022	H.0213	-.0006	.0022	-.0014
SDev	.5	.0029	.0025	.0001	.0025	.0007	.0028
%RSD	.4943	131.3	112.7	.6978	444.7	31.20	199.9
#1	106.7	.0002	.0040	H.0212	.0012	.0027	-.0034
#2	107.5	.0043	.0005	H.0214	-.0024	.0017	.0006
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0012	.0003	.0022	.0221	-.0001	-.0029
SDev	.0000	.0023	.0000	.0020	.0057	.0004	.0004
%RSD	64.38	185.1	4.630	91.19	25.96	297.8	13.65
#1	.0001	.0029	.0003	.0008	.0180	-.0004	-.0027
#2	.0000	-.0004	.0003	.0036	.0261	.0001	-.0032
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0006	.0010
SDev	.0001	.0001	.0001
%RSD	388.2	12.51	7.094
#1	.0001	.0005	.0010
#2	-.0001	.0006	.0011
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010122

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	765243	10000	--	--	--	--	--
SDev	3767.465	.0000000	--	--	--	--	--
%RSD	.4923227	.0000000	--	--	--	--	--
#1	762579	10000	--	--	--	--	--
#2	767907	10000	--	--	--	--	--

Analysis Report 05/16/05 02:09:38 PM page 1

Method: DAILY2 Sample Name: ~~lcsw-E15H1~~ DH 5-16-05 Operator: 010123
Run Time: 05/16/05 14:05:00 LCSW-E16H1
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0460	1.753	1.833	.0009	1.823	.0456	-.0017
SDev	.0004	.000	.009	.0015	.003	.0000	.0050
%RSD	.8657	.0044	.4636	169.4	.1745	.0911	286.3
#1	.0457	1.753	1.839	-.0002	1.821	.0456	.0018
#2	.0463	1.752	1.827	.0019	1.825	.0457	-.0052

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	18.70	.0470	.4593	.1800	.2267	1.024	15.72
SDev	.01	.0001	.0012	.0006	.0001	.012	.01
%RSD	.0330	.2317	.2555	.3461	.0643	1.164	.0871
#1	18.69	.0469	.4585	.1805	.2266	1.015	15.71
#2	18.70	.0471	.4601	.1796	.2268	1.032	15.73

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0002	18.62	.4699	-.0005	16.57	23.95
SDev	.0004	.0001	.01	.0004	.0009	.20	.04
%RSD	108.9	51.75	.0326	.0937	177.9	1.180	.1803
#1	-.0007	.0001	18.62	.4696	-.0012	16.43	23.98
#2	-.0001	.0002	18.61	.4702	.0001	16.71	23.91

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4433	-.0089	.4503	.4507	-.0005	-.1299	.4448
SDev	.0013	.0025	.0010	.0014	.0058	.0019	.0047
%RSD	.2893	28.13	.2168	.3097	1257.	1.430	1.059
#1	.4442	-.0106	.4510	.4497	-.0046	-.1286	.4415
#2	.4424	-.0071	.4496	.4517	.0037	-.1312	.4481

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	106.6	1.907	1.892	3.745	.4506	1.897	.0003
SDev	.7	.007	.005	.000	.0006	.001	.0032
%RSD	.6138	.3452	.2478	.0087	.1343	.0508	1040.
#1	107.0	1.902	1.895	3.745	.4502	1.898	.0026
#2	106.1	1.912	1.889	3.745	.4510	1.896	-.0019

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	3.847	-.0152	.0001	1.856	-.0390	.4565	-.0053
SDev	.000	.0018	.0001	.009	.0296	.0018	.0023
%RSD	.0025	11.72	82.29	.4778	75.77	.3874	42.82
#1	3.847	-.0165	.0001	1.849	-.0599	.4577	-.0037
#2	3.847	-.0139	.0002	1.862	-.0181	.4552	-.0069

010124

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.4657	.0004
SDev	.0001	.0007	.0005
%RSD	27.75	.1529	128.0
#1	-.0003	.4652	.0000
#2	-.0002	.4662	.0008

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	761474	10000	--	--	--	--	--
SDev	4644.984	.0000000	--	--	--	--	--
%RSD	.6099995	.0000000	--	--	--	--	--
#1	764758	10000	--	--	--	--	--
#2	758189	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262217 Operator: 010125
Run Time: 05/16/05 14:09:50
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	-.0087	.0016	.0127	.1108	.0001	.0004
SDev	.0002	.0006	.0003	.0001	.0001	.0000	.0027
%RSD	56.85	6.759	16.99	.6170	.1032	8.012	762.3
#1	-.0006	-.0091	.0014	.0127	.1107	.0001	-.0016
#2	-.0003	-.0082	.0017	.0126	.1109	.0001	.0023

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.458	-.0000	-.0003	-.0007	-.0006	.0075	.6989
SDev	.002	.0000	.0003	.0005	.0003	.0004	.0085
%RSD	.1522	139.1	105.6	64.52	41.09	5.987	1.219
#1	1.456	-.0000	-.0005	-.0004	-.0004	.0078	.6928
#2	1.459	-.0001	-.0001	-.0011	-.0008	.0071	.7049

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0007	.1718	.0005	-.0001	13.30	18.08
SDev	.0007	.0000	.0039	.0000	.0004	.10	.04
%RSD	95.21	6.244	2.262	6.303	715.0	.7679	.2244
#1	-.0012	.0006	.1690	.0005	.0002	13.23	18.11
#2	-.0002	.0007	.1745	.0005	-.0003	13.38	18.05

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0176	.0026	.0005	.0008	1.586	.0053
SDev	.0003	.0022	.0000	.0015	.0032	.016	.0016
%RSD	111.8	12.63	.5606	304.7	412.7	.9917	29.86
#1	.0001	.0192	.0026	.0016	-.0015	1.597	.0064
#2	.0005	.0161	.0026	-.0006	.0030	1.575	.0042

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	108.2	.0054	.0006	2.516	.0012	.0022	.0000
SDev	.8	.0057	.0033	.003	.0010	.0003	.0001
%RSD	.7700	105.2	542.5	.1015	82.59	14.99	274.7
#1	108.8	.0014	.0030	2.514	.0019	.0025	-.0000
#2	107.7	.0094	-.0017	2.518	.0005	.0020	.0001

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	.0004	.0002	.0041	-.0104	-.0005	-.0036
SDev	.0000	.0003	.0000	.0059	.0086	.0001	.0011
%RSD	1.000	95.31	5.907	143.6	83.30	28.55	31.01
#1	.0041	.0001	.0002	-.0001	-.0165	-.0006	-.0044
#2	.0040	.0006	.0002	.0083	-.0043	-.0004	-.0028

010126

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0173	.0003
SDev	.0000	.0002	.0004
%RSD	21.86	1.414	146.1
#1	-.0001	.0172	-.0000
#2	-.0001	.0175	.0006

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	773472	10000	--	--	--	--	--
SDev	5987.073	.0000000	--	--	--	--	--
%RSD	.7740512	.0000000	--	--	--	--	--
#1	777706	10000	--	--	--	--	--
#2	769239	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262217d Operator:
Run Time: 05/16/05 14:14:36 010127
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	-.0102	.0035	.0125	.1108	.0001	.0027
SDev	.0003	.0056	.0005	.0003	.0002	.0000	.0054
%RSD	186.2	54.81	14.77	2.488	.2162	8.781	198.4
#1	-.0004	-.0062	.0038	.0123	.1110	.0001	.0066
#2	.0001	-.0141	.0031	.0127	.1107	.0001	-.0011

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.456	-.0001	-.0004	-.0002	.0000	-.0056	.6865
SDev	.002	.0000	.0002	.0004	.0003	.0038	.0022
%RSD	.1251	17.67	56.21	208.8	1452.	67.20	.3168
#1	1.457	-.0001	-.0005	-.0005	-.0002	-.0082	.6881
#2	1.455	-.0002	-.0002	.0001	.0002	-.0029	.6850

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0009	.0006	.1674	.0005	-.0003	13.16	18.08
SDev	.0004	.0000	.0001	.0000	.0014	.09	.05
%RSD	42.32	3.445	.0664	3.770	446.0	.6851	.2716
#1	-.0006	.0006	.1673	.0005	.0007	13.10	18.12
#2	-.0012	.0006	.1675	.0005	-.0013	13.22	18.05

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0064	.0026	-.0000	-.0037	1.571	.0028
SDev	.0013	.0002	.0012	.0020	.0009	.014	.0043
%RSD	260.1	3.248	44.47	6152.	23.16	.9223	153.0
#1	-.0004	.0063	.0035	.0014	-.0043	1.561	.0059
#2	.0014	.0066	.0018	-.0015	-.0031	1.581	-.0002

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	108.4	-.0033	.0011	2.514	.0009	-.0003	.0022
SDev	1.1	.0055	.0036	.002	.0017	.0006	.0012
%RSD	1.048	169.3	321.4	.0823	199.9	172.6	55.48
#1	109.2	.0006	-.0014	2.513	.0021	-.0007	.0014
#2	107.6	-.0071	.0037	2.515	-.0004	.0001	.0031

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0040	.0023	.0003	.0039	-.0164	-.0003	-.0026
SDev	.0000	.0021	.0001	.0014	.0145	.0000	.0004
%RSD	.1316	88.74	25.91	36.24	88.37	6.140	15.57
#1	.0040	.0038	.0002	.0049	-.0062	-.0003	-.0023
#2	.0040	.0009	.0003	.0029	-.0267	-.0003	-.0028

010128

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0169	.0002
SDev	.0000	.0002	.0005
%RSD	64.45	1.114	251.6
#1	-.0000	.0170	.0006
#2	-.0001	.0167	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	774825	10000	--	--	--	--	--
SDev	8164.255	.0000000	--	--	--	--	--
%RSD	1.053690	.0000000	--	--	--	--	--
#1	780598	10000	--	--	--	--	--
#2	769052	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262218 Operator:
Run Time: 05/16/05 14:19:23 010129
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	-.0084	-.0002	.0117	.0946	.0001	.0015
SDev	.0002	.0078	.0038	.0003	.0005	.0000	.0076
%RSD	36.55	92.43	1586.	2.535	.5325	8.007	519.0
#1	-.0004	-.0029	.0024	.0115	.0943	.0001	-.0039
#2	-.0006	-.0140	-.0029	.0120	.0950	.0001	.0069

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.536	-.0000	.0002	-.0005	.0002	.0042	.6989
SDev	.000	.0001	.0001	.0001	.0004	.0032	.0031
%RSD	.0138	311.4	28.10	27.13	162.8	76.47	.4459
#1	1.537	-.0001	.0002	-.0004	.0005	.0019	.6967
#2	1.536	.0000	.0001	-.0006	-.0000	.0064	.7011

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0007	.1776	.0005	-.0005	13.23	18.26
SDev	.0008	.0000	.0058	.0000	.0004	.16	.12
%RSD	182.8	4.315	3.263	6.354	88.17	1.237	.6310
#1	.0001	.0007	.1817	.0005	-.0008	13.11	18.17
#2	-.0010	.0007	.1735	.0006	-.0002	13.34	18.34

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0124	-.0012	.0031	.0006	1.581	.0049
SDev	.0001	.0026	.0003	.0011	.0008	.043	.0015
%RSD	14.15	20.85	29.27	35.87	120.7	2.691	30.38
#1	-.0004	.0142	-.0009	.0023	.0012	1.551	.0039
#2	-.0005	.0105	-.0014	.0038	.0001	1.611	.0060

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	107.4	.0020	.0017	2.546	.0017	.0018	.0006
SDev	.5	.0019	.0027	.010	.0006	.0024	.0003
%RSD	.4305	94.07	161.7	.3869	37.22	135.0	48.00
#1	107.1	.0034	.0036	2.539	.0012	.0035	.0004
#2	107.7	.0007	-.0002	2.553	.0021	.0001	.0008

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	.0018	.0004	-.0008	.0034	-.0001	-.0044
SDev	.0000	.0023	.0000	.0002	.0052	.0003	.0004
%RSD	.0738	131.9	5.124	19.26	153.3	411.6	10.14
#1	.0041	.0001	.0004	-.0007	.0071	.0001	-.0041
#2	.0041	.0034	.0004	-.0010	-.0003	-.0002	-.0047

010130

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0169	.0005
SDev	.0000	.0003	.0001
%RSD	43.52	1.529	13.06
#1	-.0001	.0171	.0005
#2	-.0000	.0167	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	767614	10000	--	--	--	--	--
SDev	3300.067	.0000000	--	--	--	--	--
%RSD	.4299126	.0000000	--	--	--	--	--
#1	765280	10000	--	--	--	--	--
#2	769947	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262218s Operator: 010131
Run Time: 05/16/05 14:24:09
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0458	1.779	1.850	.0116	1.916	.0456	.0040
SDev	.0004	.005	.002	.0004	.003	.0000	.0004
%RSD	.7900	.3021	.0925	3.203	.1677	.0367	9.199
#1	.0461	1.783	1.848	.0113	1.918	.0456	.0043
#2	.0455	1.775	1.851	.0119	1.913	.0456	.0038

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	19.98	.0466	.4603	.1798	.2293	1.023	17.74
SDev	.01	.0001	.0003	.0005	.0001	.007	.04
%RSD	.0284	.2078	.0727	.2982	.0355	.6926	.2198
#1	19.98	.0465	.4601	.1801	.2294	1.018	17.76
#2	19.99	.0467	.4606	.1794	.2292	1.028	17.71

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0009	18.61	.4703	-.0011	31.90	45.28
SDev	.0007	.0000	.00	.0001	.0003	.16	.16
%RSD	486.3	.7136	.0159	.0317	24.36	.4935	.3572
#1	.0006	.0009	18.61	.4702	-.0009	31.79	45.39
#2	-.0004	.0009	18.62	.4705	-.0013	32.01	45.16

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4446	.0195	.4511	.4440	.0017	1.598	.4528
SDev	.0041	.0055	.0007	.0002	.0034	.006	.0027
%RSD	.9303	28.38	.1583	.0535	205.0	.3936	.5858
#1	.4417	.0156	.4506	.4438	-.0008	1.602	.4509
#2	.4475	.0234	.4516	.4442	.0041	1.593	.4546

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	107.8	1.929	1.922	6.293	.4464	1.924	-.0003
SDev	.8	.013	.008	.014	.0004	.001	.0031
%RSD	.7442	.6576	.4222	.2149	.0896	.0632	898.2
#1	108.3	1.938	1.916	6.302	.4461	1.924	-.0025
#2	107.2	1.920	1.928	6.283	.4466	1.925	.0018

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	3.921	-.0119	.0004	1.862	-.0389	.4578	-.0042
SDev	.003	.0016	.0002	.004	.0031	.0009	.0019
%RSD	.0865	13.53	51.25	.2376	7.957	.1919	44.57
#1	3.923	-.0108	.0002	1.858	-.0367	.4571	-.0056
#2	3.918	-.0131	.0005	1.865	-.0411	.4584	-.0029

010132

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.4837	.0004
SDev	.0001	.0002	.0002
%RSD	44.98	.0382	40.72
#1	-.0001	.4836	.0003
#2	-.0002	.4839	.0006

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	770138	10000	--	--	--	--	--
SDev	5762.213	.0000000	--	--	--	--	--
%RSD	.7482058	.0000000	--	--	--	--	--
#1	774212	10000	--	--	--	--	--
#2	766063	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262219 Operator: 010133
Run Time: 05/16/05 14:28:59
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0112	.0009	.0127	.1105	.0001	.0029
SDev	.0006	.0017	.0046	.0007	.0004	.0000	.0016
%RSD	303.2	15.56	524.3	5.600	.3414	17.40	55.89
#1	-.0002	-.0100	.0042	.0132	.1108	.0001	.0041
#2	.0006	-.0124	-.0024	.0122	.1103	.0001	.0018

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.488	-.0001	.0003	.0005	.0006	.0094	.6529
SDev	.002	.0000	.0007	.0009	.0005	.0122	.0141
%RSD	.1494	29.24	205.2	202.5	79.87	130.0	2.158
#1	1.486	-.0002	.0008	-.0002	.0003	.0008	.6430
#2	1.489	-.0001	-.0001	.0011	.0009	.0180	.6629

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	.0007	.1697	.0003	-.0002	13.29	18.16
SDev	.0012	.0001	.0040	.0000	.0001	.23	.02
%RSD	218.2	13.37	2.371	3.311	63.01	1.756	.1076
#1	-.0014	.0006	.1725	.0003	-.0001	13.12	18.18
#2	.0003	.0007	.1668	.0003	-.0003	13.45	18.15

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0120	.0003	-.0012	-.0002	1.592	.0011
SDev	.0009	.0022	.0038	.0012	.0004	.003	.0015
%RSD	286.8	18.73	1127.	100.3	178.0	.1835	141.0
#1	-.0009	.0104	-.0024	-.0004	.0001	1.594	.0000
#2	.0003	.0135	.0031	-.0021	-.0005	1.590	.0021

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	108.2	-.0007	-.0004	2.508	-.0007	-.0005	.0003
SDev	.6	.0087	.0005	.005	.0005	.0026	.0009
%RSD	.5705	1293.	122.3	.1850	66.18	562.9	307.5
#1	108.6	.0055	-.0007	2.505	-.0010	.0014	-.0003
#2	107.7	-.0068	-.0001	2.511	-.0004	-.0023	.0009

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	.0013	.0003	.0053	-.0024	.0003	-.0038
SDev	.0000	.0004	.0000	.0002	.0099	.0003	.0016
%RSD	.3627	30.34	13.08	4.313	409.5	114.3	41.28
#1	.0041	.0010	.0002	.0054	-.0094	.0005	-.0049
#2	.0040	.0016	.0003	.0051	.0046	.0001	-.0027

010134

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0192	.0006
SDev	.0001	.0001	.0001
%RSD	40.57	.3836	24.36
#1	.0001	.0192	.0005
#2	.0001	.0191	.0007

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	772828	10000	--	--	--	--	--
SDev	4437.095	.0000000	--	--	--	--	--
%RSD	.5741371	.0000000	--	--	--	--	--
#1	775966	10000	--	--	--	--	--
#2	769691	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262220 Operator: 010135
Run Time: 05/16/05 14:33:45
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	-.0013	.0031	.0112	.1193	.0001	.0100
SDev	.0002	.0044	.0010	.0004	.0003	.0000	.0003
%RSD	28.67	347.4	34.29	3.897	.2186	16.00	3.457
#1	.0006	-.0044	.0038	.0109	.1191	.0001	.0102
#2	.0010	.0019	.0023	.0115	.1195	.0001	.0097

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.491	.0002	.0003	-.0008	.0003	.0153	.6269
SDev	.003	.0003	.0001	.0004	.0009	.0075	.0000
%RSD	.1693	113.3	18.98	48.42	270.2	49.13	.0009
#1	1.493	.0000	.0002	-.0005	-.0003	.0206	.6269
#2	1.489	.0004	.0003	-.0011	.0010	.0100	.6269

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0007	.1807	.0003	.0003	13.51	18.29
SDev	.0006	.0000	.0000	.0000	.0015	.01	.03
%RSD	82.62	3.478	.0044	12.79	442.6	.0716	.1577
#1	.0003	.0007	.1807	.0003	.0014	13.52	18.27
#2	.0012	.0007	.1807	.0003	-.0007	13.51	18.31

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0176	.0022	.0007	.0017	1.597	.0076
SDev	.0008	.0010	.0024	.0026	.0006	.002	.0001
%RSD	124.0	5.719	109.3	389.1	32.96	.1036	.7765
#1	-.0013	.0169	.0005	.0025	.0021	1.596	.0077
#2	-.0001	.0183	.0039	-.0012	.0013	1.598	.0076

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	108.2	-.0002	-.0011	2.537	.0012	-.0008	.0011
SDev	.1	.0009	.0019	.001	.0010	.0010	.0026
%RSD	.1178	400.3	175.6	.0268	81.34	126.3	239.0
#1	108.1	-.0008	.0003	2.537	.0019	-.0001	-.0007
#2	108.3	.0004	-.0025	2.538	.0005	-.0015	.0029

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	-.0010	.0002	.0047	.0433	-.0002	-.0019
SDev	.0000	.0008	.0003	.0044	.0169	.0001	.0007
%RSD	.8676	80.12	215.4	94.02	38.96	60.44	35.68
#1	.0041	-.0015	-.0001	.0016	.0314	-.0003	-.0024
#2	.0042	-.0004	.0004	.0078	.0552	-.0001	-.0014

010136

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.0569	.0002
SDev	.0000	.0000	.0005
%RSD	30.35	.0134	269.0
#1	-.0001	.0569	-.0002
#2	-.0002	.0570	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	773274	10000	--	--	--	--	--
SDev	891.6616	.0000000	--	--	--	--	--
%RSD	.1153100	.0000000	--	--	--	--	--
#1	772643	10000	--	--	--	--	--
#2	773904	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262221 Operator:
Run Time: 05/16/05 14:38:32
Comment:
Mode: CONC Corr. Factor: 1

010137

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	-.0114	.0052	.0112	.1155	.0001	.0021
SDev	.0004	.0045	.0038	.0023	.0002	.0000	.0038
%RSD	102.6	39.57	73.80	20.46	.1943	12.58	178.5
#1	.0001	-.0145	.0025	.0128	.1156	.0001	.0048
#2	.0008	-.0082	.0078	.0096	.1153	.0001	-.0006

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.426	.0001	-.0005	-.0004	.0002	-.0036	.6082
SDev	.001	.0002	.0002	.0019	.0016	.0114	.0169
%RSD	.0593	270.7	29.31	521.5	757.5	320.9	2.778
#1	1.425	-.0001	-.0004	.0010	.0014	-.0117	.5962
#2	1.426	.0002	-.0007	-.0017	-.0009	.0045	.6201

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0007	.1672	.0002	.0000	13.39	18.25
SDev	.0001	.0001	.0044	.0001	.0001	.17	.01
%RSD	854.3	9.399	2.654	39.33	231.6	1.243	.0749
#1	.0001	.0006	.1641	.0003	.0001	13.51	18.26
#2	-.0000	.0007	.1704	.0002	-.0000	13.27	18.24

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0031	.0017	-.0006	.0010	1.588	.0031
SDev	.0000	.0057	.0020	.0021	.0018	.002	.0019
%RSD	75.67	181.7	119.7	361.2	168.1	.1095	62.53
#1	.0000	.0071	.0003	.0009	-.0002	1.587	.0045
#2	.0001	-.0009	.0031	-.0021	.0023	1.590	.0017

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	107.4	.0012	-.0022	2.522	.0002	-.0011	-.0013
SDev	.0	.0001	.0043	.000	.0007	.0029	.0026
%RSD	.0452	9.353	193.7	.0155	376.3	273.3	193.2
#1	107.5	.0013	.0008	2.522	.0007	.0010	.0005
#2	107.4	.0011	-.0052	2.522	-.0003	-.0031	-.0032

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0039	.0020	.0004	.0006	-.0015	-.0000	-.0042
SDev	.0000	.0044	.0003	.0009	.0305	.0008	.0024
%RSD	.1960	221.6	75.61	151.9	2011.	3672.	58.34
#1	.0039	.0051	.0005	-.0000	-.0231	.0005	-.0059
#2	.0039	-.0011	.0002	.0012	.0200	-.0006	-.0025

010138

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0141	.0006
SDev	.0003	.0000	.0005
%RSD	870.4	.2367	90.67
#1	.0002	.0141	.0010
#2	-.0002	.0141	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	767768	10000	--	--	--	--	--
SDev	301.9346	.0000000	--	--	--	--	--
%RSD	.0393263	.0000000	--	--	--	--	--
#1	767981	10000	--	--	--	--	--
#2	767554	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262222 Operator:
Run Time: 05/16/05 14:43:22
Comment:
Mode: CONC Corr. Factor: 1

010139

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0032	.0018	.0111	.1168	.0001	.0079
SDev	.0005	.0027	.0008	.0007	.0002	.0000	.0011
%RSD	64.46	85.61	46.01	6.395	.1965	1.895	13.84
#1	.0010	-.0012	.0012	.0106	.1170	.0001	.0087
#2	.0004	-.0051	.0024	.0116	.1166	.0001	.0071

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.491	.0003	-.0001	-.0009	.0003	.0084	.7063
SDev	.002	.0001	.0010	.0002	.0005	.0162	.0117
%RSD	.1505	36.47	688.6	18.73	182.3	192.5	1.658
#1	1.493	.0004	.0006	-.0008	.0006	-.0030	.6981
#2	1.489	.0002	-.0009	-.0010	-.0001	.0198	.7146

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0007	.1756	.0001	-.0009	13.56	18.35
SDev	.0011	.0001	.0061	.0001	.0012	.38	.04
%RSD	887.3	7.545	3.498	48.36	128.2	2.803	.2406
#1	.0009	.0006	.1800	.0001	-.0001	13.29	18.39
#2	-.0007	.0007	.1713	.0001	-.0018	13.83	18.32

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0136	.0012	-.0002	.0008	1.590	.0032
SDev	.0006	.0100	.0023	.0012	.0060	.021	.0009
%RSD	153.1	73.58	188.4	550.0	769.0	1.352	28.88
#1	.0009	.0206	.0028	-.0011	-.0035	1.575	.0025
#2	-.0000	.0065	-.0004	.0006	.0050	1.605	.0038

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	108.4	-.0020	.0006	2.550	.0003	-.0003	.0001
SDev	.6	.0006	.0001	.004	.0000	.0001	.0016
%RSD	.5671	27.91	27.47	.1425	14.43	29.67	1352.
#1	108.9	-.0016	.0005	2.553	.0003	-.0002	-.0010
#2	108.0	-.0024	.0007	2.548	.0003	-.0003	.0013

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	-.0043	.0002	.0037	.0310	-.0005	-.0043
SDev	.0000	.0009	.0000	.0013	.0269	.0000	.0002
%RSD	.4149	19.97	5.892	34.91	86.80	3.964	3.581
#1	.0041	-.0037	.0002	.0028	.0500	-.0005	-.0044
#2	.0041	-.0050	.0002	.0046	.0120	-.0004	-.0042

010140

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.0117	.0000
SDev	.0001	.0005	.0004
%RSD	27.35	4.122	1547.
#1	-.0003	.0121	.0003
#2	-.0002	.0114	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	774728	10000	--	--	--	--	--
SDev	4364.263	.0000000	--	--	--	--	--
%RSD	.5633284	.0000000	--	--	--	--	--
#1	777814	10000	--	--	--	--	--
#2	771642	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccv4 Operator:
Run Time: 05/16/05 14:55:06 010141
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9789	9.824	5.039	4.866	9.950	.9882	5.018
SDev	.0002	.009	.002	.018	.007	.0004	.002
%RSD	.0189	.0919	.0471	.3726	.0694	.0421	.0383
#1	.9790	9.817	5.041	4.853	9.945	.9885	5.019
#2	.9788	9.830	5.038	4.879	9.955	.9879	5.016
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1.100	11.00	5.500	5.500	11.00	1.100	5.500
Low	.9000	9.000	4.500	4.500	9.000	.9000	4.500

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.05	1.022	5.141	1.977	2.029	10.55	18.69
SDev	.05	.004	.004	.002	.000	.00	.06
%RSD	.2374	.3863	.0712	.1024	.0129	.0145	.3326
#1	20.08	1.024	5.143	1.978	2.029	10.55	18.65
#2	20.02	1.019	5.138	1.975	2.028	10.55	18.73
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.926	5.198	19.99	1.042	5.140	27.84	H41.36
SDev	.002	.002	.01	.001	.006	.13	.02
%RSD	.0372	.0465	.0629	.1007	.1249	.4653	.0364
#1	4.927	5.200	19.99	1.042	5.144	27.94	H41.35
#2	4.925	5.196	19.98	1.041	5.135	27.75	H41.37
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	5.500	5.500	22.00	1.100	5.500	33.00	33.00
Low	4.500	4.500	18.00	.9000	4.500	27.00	27.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.878	5.004	4.911	4.925	.9983	L.8530	1.021
SDev	.003	.013	.018	.011	.0039	.0040	.008
%RSD	.0633	.2501	.3704	.2207	.3943	.4633	.7887
#1	4.876	5.013	4.923	4.933	.9955	L.8558	1.026
#2	4.881	4.995	4.898	4.918	1.001	L.8502	1.015
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

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

010142

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.75	5.176	5.201	5.124	4.920	5.193	4.909
SDev	.29	.016	.017	.017	.013	.006	.000
%RSD	.3015	.3175	.3310	.3277	.2705	.1156	.0007
#1	97.96	5.187	5.189	5.136	4.930	5.188	4.909
#2	97.54	5.164	5.213	5.112	4.911	5.197	4.909
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.205	.9866	4.964	5.131	L.8444	5.050	1.006
SDev	.002	.0026	.003	.010	.0123	.002	.001
%RSD	.0380	.2588	.0595	.2002	1.457	.0323	.0825
#1	5.203	.9884	4.966	5.138	L.8531	5.051	1.005
#2	5.206	.9848	4.962	5.124	L.8357	5.049	1.006
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass	LC Pass
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.988	1.041	4.925
SDev	.008	.002	.003
%RSD	.1511	.1537	.0699
#1	4.993	1.042	4.922
#2	4.982	1.040	4.927
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

010143

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	698412	10000	--	--	--	--	--
SDev	2093.036	.0000000	--	--	--	--	--
%RSD	.2996850	.0000000	--	--	--	--	--
#1	699892	10000	--	--	--	--	--
#2	696932	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccb4 Operator:
Run Time: 05/16/05 15:01:43 010144
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0065	.0029	.0031	.0002	.0001	.0059
SDev	.0005	.0029	.0006	.0005	.0000	.0000	.0032
%RSD	92.91	44.66	21.42	15.85	23.76	7.532	54.12
#1	.0002	-.0044	.0024	.0035	.0001	.0002	.0036
#2	.0010	-.0085	.0033	.0028	.0002	.0001	.0081
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	.0003	-.0000	-.0001	.0011	.0027	.0143
SDev	.0017	.0004	.0008	.0001	.0001	.0123	.0052
%RSD	156.0	129.4	1796.	223.9	13.47	449.7	36.35
#1	-.0001	.0000	-.0006	-.0002	.0010	-.0060	.0180
#2	.0022	.0006	.0005	.0000	.0013	.0115	.0106
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0002	.0012	-.0000	.0012	-.0196	.0182
SDev	.0006	.0001	.0051	.0000	.0003	.0079	.0014
%RSD	225.5	24.58	434.2	78.18	27.69	40.12	7.688
#1	-.0001	.0002	-.0024	-.0000	.0009	-.0141	.0172
#2	.0006	.0002	.0047	-.0000	.0014	-.0252	.0192
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0014	-.0075	.0011	-.0019	.0012	L-.1317	.0073
SDev	.0002	.0107	.0046	.0006	.0003	.0000	.0028
%RSD	17.13	142.2	400.6	29.41	24.31	.0048	37.94
#1	-.0015	.0000	.0044	-.0015	.0014	L-.1317	.0053
#2	-.0012	L-.0151	-.0021	-.0023	.0010	L-.1317	.0092
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010145

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.44	.0011	.0005	H.0107	-.0009	.0007	.0006
SDev	.00	.0003	.0019	.0024	.0019	.0011	.0016
%RSD	.0032	27.51	397.6	22.81	215.5	165.2	252.5
#1	99.44	.0013	-.0008	.0090	.0005	-.0001	-.0005
#2	99.43	.0009	.0018	H.0124	-.0022	.0015	.0018
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0006	.0002	.0004	.0234	-.0001	-.0009
SDev	.0001	.0016	.0000	.0005	.0220	.0009	.0002
%RSD	110.5	273.0	18.76	132.8	93.66	1531.	25.84
#1	.0000	.0005	.0002	.0000	.0079	-.0007	-.0011
#2	.0001	-.0017	.0002	.0008	.0390	.0006	-.0008
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0001	.0005
SDev	.0001	.0002	.0009
%RSD	222.3	275.2	168.1
#1	-.0000	.0002	-.0001
#2	.0001	-.0001	.0011
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010146

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	710464	10000	--	--	--	--	--
SDev	16.26346	.0000000	--	--	--	--	--
%RSD	.0022891	.0000000	--	--	--	--	--
#1	710475	10000	--	--	--	--	--
#2	710452	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262223 Operator: 010147
Run Time: 05/16/05 15:06:31
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	-.0047	.0036	.0136	.1181	.0001	.0044
SDev	.0004	.0037	.0004	.0005	.0003	.0000	.0020
%RSD	119.3	77.02	10.29	3.975	.2099	8.984	44.75
#1	-.0006	-.0073	.0034	.0140	.1179	.0002	.0030
#2	-.0001	-.0022	.0039	.0132	.1183	.0001	.0058

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.456	-.0000	.0001	.0002	.0003	.0055	1.011
SDev	.007	.0002	.0002	.0002	.0003	.0010	.004
%RSD	.4815	462.7	262.7	72.08	76.15	17.48	.3922
#1	1.461	.0001	.0002	.0001	.0005	.0048	1.008
#2	1.451	-.0002	-.0001	.0003	.0002	.0062	1.014

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	.0006	.1657	.0002	.0005	13.53	18.43
SDev	.0003	.0000	.0011	.0000	.0001	.13	.02
%RSD	43.61	3.737	.6477	5.449	23.58	.9824	.1172
#1	-.0008	.0006	.1665	.0002	.0004	13.63	18.41
#2	-.0004	.0007	.1650	.0002	.0005	13.44	18.44

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0080	.0027	-.0010	-.0019	1.585	.0018
SDev	.0008	.0056	.0009	.0023	.0004	.002	.0035
%RSD	1299.	69.26	32.55	233.0	23.36	.1030	195.4
#1	-.0005	.0041	.0033	-.0026	-.0022	1.586	-.0007
#2	.0006	.0120	.0020	.0006	-.0016	1.584	.0043

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	107.8	.0065	.0049	2.558	.0003	.0054	.0002
SDev	.3	.0018	.0035	.006	.0012	.0029	.0009
%RSD	.3101	27.78	71.22	.2248	477.7	53.72	397.3
#1	107.5	.0078	.0073	2.554	-.0006	.0075	.0009
#2	108.0	.0052	.0024	2.562	.0011	.0034	-.0004

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	.0028	.0005	-.0010	-.0115	-.0002	-.0019
SDev	.0000	.0014	.0000	.0021	.0106	.0006	.0013
%RSD	.3671	49.55	2.071	206.2	92.67	279.1	65.95
#1	.0041	.0018	.0005	.0005	-.0040	-.0006	-.0010
#2	.0041	.0038	.0004	-.0025	-.0190	.0002	-.0028

010148

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0107	.0004
SDev	.0000	.0001	.0003
%RSD	29.95	1.356	90.59
#1	.0000	.0108	.0006
#2	.0000	.0106	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	769992	10000	--	--	--	--	--
SDev	2446.589	.0000000	--	--	--	--	--
%RSD	.3177422	.0000000	--	--	--	--	--
#1	768262	10000	--	--	--	--	--
#2	771722	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262224 Operator: 010149
Run Time: 05/16/05 15:11:26
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	-.0074	.0036	.0099	.1162	.0001	.0001
SDev	.0003	.0008	.0034	.0001	.0001	.0000	.0013
%RSD	47.52	11.29	93.77	1.523	.0495	22.65	1393.
#1	-.0008	-.0080	.0060	.0098	.1163	.0001	-.0008
#2	-.0004	-.0068	.0012	.0100	.1162	.0002	.0010

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.443	-.0001	-.0008	-.0008	-.0004	.0005	.6764
SDev	.009	.0003	.0008	.0010	.0000	.0034	.0162
%RSD	.6527	340.5	102.1	121.9	.4654	618.4	2.395
#1	1.437	-.0003	-.0014	-.0015	-.0004	-.0018	.6649
#2	1.450	.0001	-.0002	-.0001	-.0004	.0029	.6878

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0006	.1675	.0001	-.0003	13.37	18.44
SDev	.0009	.0001	.0026	.0000	.0011	.14	.01
%RSD	126.6	15.10	1.555	54.71	352.2	1.046	.0625
#1	-.0014	.0006	.1656	.0000	.0005	13.27	18.45
#2	-.0001	.0007	.1693	.0001	-.0011	13.46	18.43

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0052	.0033	.0011	-.0011	1.612	.0001
SDev	.0003	.0023	.0015	.0022	.0039	.002	.0015
%RSD	100.4	43.73	45.48	204.0	358.1	.1472	2437.
#1	-.0001	.0069	.0043	-.0005	-.0039	1.614	-.0010
#2	-.0004	.0036	.0022	.0027	.0017	1.611	.0011

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	108.1	.0060	-.0001	2.551	.0018	.0019	-.0002
SDev	1.1	.0002	.0001	.003	.0010	.0001	.0023
%RSD	1.021	3.801	107.4	.1185	53.63	7.510	1464.
#1	108.9	.0062	-.0000	2.549	.0011	.0020	-.0018
#2	107.3	.0058	-.0002	2.553	.0025	.0018	.0015

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0040	.0006	.0002	.0030	-.0101	-.0012	-.0017
SDev	.0001	.0024	.0004	.0015	.0287	.0010	.0036
%RSD	1.528	408.0	202.0	49.52	283.2	86.47	215.1
#1	.0039	-.0011	-.0001	.0020	-.0304	-.0019	.0009
#2	.0040	.0023	.0004	.0041	.0102	-.0005	-.0043

010150

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.0077	-.0009
SDev	.0001	.0002	.0008
%RSD	80.09	2.500	92.58
#1	-.0003	.0076	-.0015
#2	-.0001	.0078	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	772651	10000	--	--	--	--	--
SDev	7926.667	.0000000	--	--	--	--	--
%RSD	1.025905	.0000000	--	--	--	--	--
#1	778256	10000	--	--	--	--	--
#2	767046	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262225 Operator:
Run Time: 05/16/05 15:16:12 010151
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	-.0043	.0027	.0108	.1156	.0002	-.0009
SDev	.0009	.0035	.0007	.0006	.0001	.0000	.0065
%RSD	3137.	81.80	25.50	5.972	.0837	.0742	767.9
#1	-.0006	-.0018	.0031	.0104	.1157	.0002	-.0055
#2	.0007	-.0068	.0022	.0113	.1156	.0002	.0038

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.306	.0001	-.0009	-.0002	.0003	.0168	.7053
SDev	.002	.0001	.0001	.0001	.0000	.0032	.0126
%RSD	.1322	65.84	11.90	40.64	2.104	18.88	1.784
#1	1.307	.0000	-.0008	-.0003	.0003	.0146	.7142
#2	1.305	.0001	-.0009	-.0002	.0003	.0191	.6965

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	.0007	.1516	.0002	-.0006	13.72	18.46
SDev	.0001	.0001	.0003	.0001	.0003	.13	.02
%RSD	25.84	8.487	.1710	40.89	48.71	.9282	.1125
#1	-.0007	.0006	.1514	.0001	-.0008	13.63	18.44
#2	-.0005	.0007	.1518	.0002	-.0004	13.81	18.47

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0046	.0028	.0009	.0016	1.618	.0018
SDev	.0005	.0070	.0050	.0002	.0004	.001	.0059
%RSD	55.61	153.4	181.1	25.32	26.16	.0696	330.9
#1	.0013	-.0004	.0063	.0011	.0013	1.617	-.0024
#2	.0005	.0096	-.0008	.0008	.0018	1.619	.0059

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	107.7	.0009	.0023	2.562	.0016	.0019	.0039
SDev	.1	.0016	.0019	.007	.0018	.0007	.0003
%RSD	.0472	175.8	80.19	.2719	117.4	39.11	9.122
#1	107.7	.0020	.0010	2.567	.0028	.0014	.0036
#2	107.8	-.0002	.0037	2.558	.0003	.0024	.0041

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0036	.0034	.0005	-.0024	-.0344	.0000	-.0057
SDev	.0000	.0008	.0000	.0005	.0018	.0002	.0010
%RSD	.3360	24.31	.8131	18.99	5.371	687.3	17.06
#1	.0037	.0028	.0005	-.0021	-.0357	-.0001	-.0063
#2	.0036	.0040	.0005	-.0027	-.0331	.0002	-.0050

010152

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0052	.0005
SDev	.0001	.0002	.0004
%RSD	486.9	4.248	73.97
#1	-.0001	.0050	.0003
#2	.0000	.0053	.0008

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	769780	10000	--	--	--	--	--
SDev	388.9087	.0000000	--	--	--	--	--
%RSD	.0505221	.0000000	--	--	--	--	--
#1	769505	10000	--	--	--	--	--
#2	770055	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262226 Operator:
Run Time: 05/16/05 15:20:58 010153
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0410	.0035	.0157	.1189	.0001	.0014
SDev	.0002	.0053	.0041	.0015	.0003	.0000	.0067
%RSD	79.53	12.86	117.5	9.769	.2135	12.84	484.4
#1	.0001	.0447	.0064	.0146	.1188	.0002	.0062
#2	.0005	.0373	.0006	.0167	.1191	.0001	-.0034

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.5291	.0000	.0005	-.0009	.0001	.0284	.7349
SDev	.0018	.0003	.0001	.0003	.0003	.0221	.0083
%RSD	.3472	1351.	32.24	30.79	363.1	77.82	1.126
#1	.5304	.0002	.0006	-.0011	-.0001	.0440	.7407
#2	.5278	-.0002	.0004	-.0007	.0003	.0128	.7290

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0008	.0974	.0005	-.0005	19.04	26.07
SDev	.0009	.0001	.0003	.0001	.0007	.07	.09
%RSD	647.9	6.912	.3391	20.17	140.5	.3698	.3503
#1	.0008	.0008	.0977	.0006	-.0000	19.09	26.00
#2	-.0005	.0008	.0972	.0004	-.0010	18.99	26.13

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0019	.0031	-.0011	.0034	1.599	.0038
SDev	.0011	.0000	.0010	.0004	.0047	.019	.0059
%RSD	158.6	1.914	31.29	30.89	137.3	1.210	158.5
#1	-.0001	-.0019	.0024	-.0009	.0067	1.613	.0080
#2	.0015	-.0019	.0038	-.0014	.0001	1.585	-.0005

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	107.3	.0118	.0024	2.737	.0003	.0055	.0024
SDev	.5	.0016	.0013	.000	.0001	.0014	.0014
%RSD	.4488	13.23	55.25	.0149	30.06	25.31	58.12
#1	106.9	.0129	.0033	2.738	.0002	.0065	.0033
#2	107.6	.0107	.0015	2.737	.0004	.0045	.0014

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0023	.0025	.0016	-.0030	.0220	-.0002	-.0042
SDev	.0001	.0010	.0001	.0015	.0180	.0005	.0007
%RSD	2.220	41.74	3.999	51.44	81.85	312.6	15.54
#1	.0024	.0018	.0015	-.0041	.0347	.0002	-.0047
#2	.0023	.0033	.0016	-.0019	.0093	-.0005	-.0038

010154

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0038	.0008
SDev	.0001	.0001	.0005
%RSD	199.9	3.374	63.91
#1	-.0000	.0039	.0012
#2	.0001	.0037	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	766428	10000	--	--	--	--	--
SDev	3494.522	.0000000	--	--	--	--	--
%RSD	.4559491	.0000000	--	--	--	--	--
#1	763957	10000	--	--	--	--	--
#2	768899	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262227 Operator:
Run Time: 05/16/05 15:25:44
Comment:
Mode: CONC Corr. Factor: 1

010155

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.6754	.0017	.0514	.2504	.0002	.0034
SDev	.0004	.0148	.0006	.0005	.0003	.0000	.0013
%RSD	386.3	2.190	34.74	1.028	.1384	5.806	37.12
#1	-.0002	.6858	.0013	.0510	.2507	.0002	.0042
#2	.0004	.6649	.0021	.0518	.2502	.0002	.0025

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2473	.0001	-.0002	-.0004	.0002	.2396	.7861
SDev	.0024	.0001	.0002	.0001	.0000	.0019	.0180
%RSD	.9657	78.93	95.36	26.93	5.362	.7799	2.294
#1	.2456	.0000	-.0003	-.0004	.0002	.2409	.7734
#2	.2490	.0001	-.0001	-.0005	.0002	.2382	.7989

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0025	.2228	.0048	-.0001	31.15	42.85
SDev	.0013	.0000	.0072	.0001	.0002	.40	.10
%RSD	193.4	.7397	3.224	2.370	185.9	1.292	.2218
#1	-.0016	.0025	.2279	.0048	.0000	30.86	42.91
#2	.0003	.0025	.2178	.0049	-.0003	31.43	42.78

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	.0039	.0030	-.0022	-.0041	1.604	.0040
SDev	.0003	.0050	.0008	.0000	.0055	.019	.0053
%RSD	58.53	127.2	27.91	1.190	134.8	1.161	131.3
#1	-.0007	.0004	.0024	-.0022	-.0080	1.591	.0003
#2	-.0003	.0075	.0036	-.0022	-.0002	1.617	.0077

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	108.3	.0077	.0006	5.087	-.0005	.0030	.0056
SDev	.8	.0069	.0019	.093	.0003	.0010	.0002
%RSD	.7336	89.71	319.9	1.828	63.88	34.92	3.051
#1	108.9	.0028	.0019	5.153	-.0007	.0022	.0058
#2	107.8	.0126	-.0008	5.021	-.0003	.0037	.0055

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0028	-.0003	.0151	-.0017	-.0093	-.0002	-.0055
SDev	.0000	.0000	.0005	.0010	.0219	.0004	.0020
%RSD	1.095	6.944	3.265	57.56	234.5	238.8	36.69
#1	.0027	-.0003	.0154	-.0010	-.0248	-.0005	-.0041
#2	.0028	-.0003	.0147	-.0024	.0062	.0001	-.0069

010156

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0162	.0017
SDev	.0000	.0000	.0006
%RSD	2.485	.1547	37.57
#1	.0001	.0162	.0013
#2	.0001	.0162	.0022

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	773966	10000	--	--	--	--	--
SDev	5716.251	.0000000	--	--	--	--	--
%RSD	.7385662	.0000000	--	--	--	--	--
#1	778008	10000	--	--	--	--	--
#2	769924	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccv5 Operator: 010157
Run Time: 05/16/05 15:34:12
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9776	9.832	5.027	4.865	9.929	.9885	5.013
SDev	.0014	.013	.001	.020	.014	.0001	.013
%RSD	.1451	.1271	.0109	.4024	.1437	.0084	.2584
#1	.9766	9.823	5.028	4.852	9.918	.9885	5.004
#2	.9786	9.841	5.027	4.879	9.939	.9886	5.023
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1.100	11.00	5.500	5.500	11.00	1.100	5.500
Low	.9000	9.000	4.500	4.500	9.000	.9000	4.500

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.05	1.023	5.138	1.976	2.029	10.53	18.74
SDev	.01	.004	.002	.002	.001	.01	.05
%RSD	.0321	.3748	.0443	.0924	.0698	.1398	.2545
#1	20.06	1.020	5.136	1.977	2.028	10.52	18.71
#2	20.05	1.026	5.140	1.974	2.030	10.54	18.78
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.926	5.207	19.99	1.040	5.132	28.07	H41.32
SDev	.006	.002	.00	.000	.020	.29	.02
%RSD	.1239	.0335	.0021	.0052	.3965	1.033	.0584
#1	4.922	5.208	19.99	1.040	5.117	27.87	H41.33
#2	4.930	5.206	19.99	1.040	5.146	28.28	H41.30
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	5.500	5.500	22.00	1.100	5.500	33.00	33.00
Low	4.500	4.500	18.00	.9000	4.500	27.00	27.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.846	5.064	4.896	4.892	1.000	L.8583	1.015
SDev	.005	.033	.008	.018	.005	.0234	.004
%RSD	.1135	.6473	.1595	.3594	.4800	2.732	.4296
#1	4.842	5.041	4.902	4.879	.9970	L.8749	1.012
#2	4.850	5.087	4.890	4.904	1.004	L.8417	1.018
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

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

010158

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.10	5.180	5.143	5.122	4.893	5.155	4.902
SDev	.28	.021	.017	.001	.009	.004	.001
%RSD	.2827	.4082	.3347	.0113	.1863	.0859	.0294
#1	99.30	5.195	5.131	5.123	4.887	5.152	4.903
#2	98.90	5.165	5.155	5.122	4.900	5.158	4.901
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.202	.9833	4.960	5.131	L.8538	5.046	1.011
SDev	.010	.0015	.002	.005	.0152	.009	.002
%RSD	.1900	.1495	.0480	.0886	1.775	.1824	.2125
#1	5.195	.9823	4.959	5.128	L.8431	5.039	1.012
#2	5.209	.9843	4.962	5.134	L.8645	5.052	1.009
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass	LC Pass
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.990	1.041	4.951
SDev	.000	.002	.003
%RSD	.0008	.1912	.0523
#1	4.990	1.043	4.949
#2	4.990	1.040	4.952
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

010159

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	708081	10000	--	--	--	--	--
SDev	2008.183	.0000000	--	--	--	--	--
%RSD	.2836093	.0000000	--	--	--	--	--
#1	709501	10000	--	--	--	--	--
#2	706661	10000	--	--	--	--	--

Method: DAILY2 Sample Name: ccb5 Operator:
Run Time: 05/16/05 15:40:51
Comment:
Mode: CONC Corr. Factor: 1

010160

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	-.0145	.0042	.0026	.0002	.0002	.0055
SDev	.0001	.0028	.0007	.0006	.0003	.0000	.0012
%RSD	11.12	19.58	17.20	24.33	192.4	.7673	21.41
#1	-.0006	-.0165	.0037	.0031	-.0001	.0002	.0047
#2	-.0005	-.0125	.0047	.0022	.0004	.0002	.0064
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0002	-.0003	-.0004	.0012	-.0019	.0129
SDev	.0025	.0000	.0007	.0001	.0008	.0275	.0306
%RSD	273.3	10.32	191.7	24.14	69.23	1429.	236.8
#1	-.0009	.0002	.0001	-.0004	.0006	-.0213	-.0087
#2	.0027	.0002	-.0008	-.0003	.0018	.0175	.0346
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	.0003	-.0048	.0001	.0011	L-.0983	.0276
SDev	.0004	.0003	.0058	.0001	.0003	.2859	.0150
%RSD	72.67	99.40	122.2	185.9	24.31	290.8	54.28
#1	-.0008	.0001	-.0089	-.0000	.0009	L-.3005	.0170
#2	-.0003	.0004	-.0006	.0002	.0013	H.1039	.0382
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	-.0014	.0009	.0014	.0014	L-.1420	.0086
SDev	.0004	.0005	.0010	.0031	.0050	.0194	.0014
%RSD	41.84	32.22	112.6	215.7	361.3	13.66	15.94
#1	.0014	-.0011	.0002	.0036	-.0022	L-.1558	.0096
#2	.0007	-.0017	.0016	-.0008	.0050	L-.1283	.0077
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010161

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.4	-.0014	-.0001	.0070	.0013	-.0005	.0007
SDev	.6	.0043	.0025	.0044	.0017	.0031	.0018
%RSD	.5993	317.2	2882.	62.51	134.8	626.2	266.4
#1	100.0	.0017	.0017	.0039	.0025	.0017	-.0006
#2	100.9	-.0044	-.0019	H.0101	.0001	-.0027	.0020
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0010	.0002	.0025	-.0141	-.0003	-.0033
SDev	.0002	.0012	.0003	.0000	.0160	.0000	.0025
%RSD	185.6	115.1	186.2	.0037	113.4	13.09	74.64
#1	-.0000	.0002	-.0001	.0025	-.0255	-.0003	-.0050
#2	.0002	.0018	.0004	.0025	-.0028	-.0003	-.0016
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0000	.0003
SDev	.0001	.0002	.0006
%RSD	128.8	685.7	188.0
#1	.0000	-.0001	-.0001
#2	.0002	.0002	.0007
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010162

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	717667	10000	--	--	--	--	--
SDev	4276.582	.0000000	--	--	--	--	--
%RSD	.5959006	.0000000	--	--	--	--	--
#1	714643	10000	--	--	--	--	--
#2	720691	10000	--	--	--	--	--

Div 20
to#050426-3
06002.01.242

5/20/05

262217 for K

0.9671 ug/ml x df5 = 4.84 mg/L

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV
pbw-E16H1	K_766	1.00	U		mg/L	1			
pbw-E16H1	Na589	1.00	U		mg/L	1			
lcsw-E16H1	K_766	89.8			mg/L	1		89.8%	100
lcsw-E16H1	Na589	89.6			mg/L	1		89.6%	100
262217	K_766	✓ 4.84			mg/L	1			
262217	Na589	77.2			mg/L	1			
262217d	K_766	4.75			mg/L	1	1.9%		
262217d	Na589	76.6			mg/L	1	0.8%		
262218	K_766	4.14			mg/L	1			
262218	Na589	77.9			mg/L	1			
262218s	K_766	95.6			mg/L	1		91.5%	100
262218s	Na589	169			mg/L	1		91.1%	100
262219	K_766	4.92			mg/L	1			
262219	Na589	78.5			mg/L	1			
262220	K_766	4.13			mg/L	1			
262220	Na589	78.4			mg/L	1			
262221	K_766	3.96			mg/L	1			
262221	Na589	78.5			mg/L	1			
262222	K_766	4.35			mg/L	1			
262222	Na589	78.0			mg/L	1			
262223	K_766	6.21			mg/L	1			
262223	Na589	79.0			mg/L	1			
262224	K_766	4.20			mg/L	1			
262224	Na589	79.8			mg/L	1			
262225	K_766	4.48			mg/L	1			
262225	Na589	79.4			mg/L	1			
262226	K_766	4.77			mg/L	1			
262226	Na589	109			mg/L	1			
262227	K_766	4.57			mg/L	1			
262227	Na589	172			mg/L	1			

rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
0.2	0.281971069	0.282	5	1	0.056394214	05/16/05	2:58 PM
0.2	-0.13145931	-0.131	5	1	-0.026291861	05/16/05	2:58 PM
0.2	89.7577896	89.8	5	1	17.95155792	05/16/05	3:00 PM
0.2	89.62290487	89.6	5	1	17.92458097	05/16/05	3:00 PM
0.2	4.8355	4.84	5	1	0.9671	05/19/05	10:18 AM
0.2	77.23841546	77.2	5	1	15.44768309	05/16/05	3:02 PM
0.2	4.752796919	4.75	5	1	0.950559384	05/16/05	3:03 PM
0.2	76.58136373	76.6	5	1	15.31627275	05/16/05	3:03 PM
0.2	4.135720056	4.14	5	1	0.827144011	05/16/05	3:05 PM
0.2	77.89711895	77.9	5	1	15.57942379	05/16/05	3:05 PM
0.2	95.61386443	95.6	5	1	19.12277289	05/16/05	3:10 PM
0.2	168.8476668	169	5	1	33.76953337	05/16/05	3:10 PM
0.2	4.915226006	4.92	5	1	0.983045201	05/16/05	3:14 PM
0.2	78.45547469	78.5	5	1	15.69109494	05/16/05	3:14 PM
0.2	4.128945334	4.13	5	1	0.825789067	05/16/05	3:17 PM
0.2	78.36569424	78.4	5	1	15.67313885	05/16/05	3:17 PM
0.2	3.961475918	3.96	5	1	0.792295184	05/16/05	3:19 PM
0.2	78.50750215	78.5	5	1	15.70150043	05/16/05	3:19 PM
0.2	4.35309364	4.35	5	1	0.870618728	05/16/05	3:22 PM
0.2	77.96257559	78	5	1	15.59251512	05/16/05	3:22 PM
0.2	6.206267403	6.21	5	1	1.241253481	05/16/05	3:32 PM
0.2	79.03269137	79	5	1	15.80653827	05/16/05	3:32 PM
0.2	4.198247901	4.2	5	1	0.83964958	05/16/05	3:35 PM
0.2	79.78106086	79.8	5	1	15.95621217	05/16/05	3:35 PM
0.2	4.479267798	4.48	5	1	0.89585356	05/16/05	3:38 PM
0.2	79.40269525	79.4	5	1	15.88053905	05/16/05	3:38 PM
0.2	4.773457999	4.77	5	1	0.9546916	05/16/05	3:41 PM
0.2	109.0915944	109	5	1	21.81831888	05/16/05	3:41 PM
0.2	4.56862071	4.57	5	1	0.913724142	05/16/05	3:44 PM
0.2	171.593542	172	5	1	34.31870839	05/16/05	3:44 PM

5/20/05

010163

div20_050426(3)spec

☐ 200.7 TAP No. 01-0406-028 Rev2/Mar02

☐ 6010B TAP No. 01-0406-130 Rev3/Mar05

☑ Other SwRI

QC STD. ID's	
CCV	05E02
CRI	
ICSA	
ICSAB	

ICP CAL.STD. ID's	
Std0	05E02
Std1	05E02
Std2	
Std3	
Std4	
Std5	
Std6	

010164

K + Na

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.242	DW20	050426-3	5-16-05	Water	60-208

INSTRUMENT: Spectro FILENAME: 0505164

EVOLUTION by Micro-Active Australia Pty Ltd 2:52:12 PM May 16, 2005

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

010165

BACKGROUND CORRECTED INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:46:10 PM May 16, 2005

	K_766	Na589	Sc361
# 1	14.0	31.0	4959.0
# 2	10.0	39.0	4885.0
Mean	12.0	35.0	4922.0
SD	2.8	5.7	52.3
%RSD	23.6	16.2	1.1

INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:46:10 PM May 16, 2005

	K_766	Na589	Sc361
# 1	0.0	0.0	4959.0
# 2	0.0	0.0	4885.0
Mean	0.0	0.0	4922.0
SD	0.0	0.0	52.3
%RSD	22.5	17.2	1.1

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:49:02 PM May 16, 2005

	K_766	Na589
# 1	4677.5	26364.0
# 2	4625.5	26146.0
Mean	4651.5	26255.0
SD	36.8	154.1
%RSD	0.8	0.6

INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:49:02 PM May 16, 2005

	K_766	Na589
# 1	0.9	5.3
# 2	0.9	5.3
Mean	0.9	5.3
SD	0.0	0.0
%RSD	0.2	0.4

5/17/05

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:51:54 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	1891.0	15910.5	5004.0	5004.0
# 2	1865.0	15749.5	4945.0	4945.0
Mean	1878.0	15830.0	4974.5	4974.5
SD	18.4	113.8	41.7	41.7
%RSD	1.0	0.7	0.8	0.8

5-16-05

APPARENT CONCENTRATIONS

EVOLUTION by Micro-Active Australia Pty Ltd 2:58:48 PM May 16, 2005

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:51:54 PM May 16, 2005

010166

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	20.0155	29.9249	5004.000 H	101.6680
# 2	19.9755	29.9756	4945.000 H	100.4679
Mean	19.9955	29.9502	4974.500 H	101.0679
SD	0.0282	0.0359	41.719	0.8486
%RSD	0.1412	0.1198	0.839	0.8397

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

Report name	Low limit	Value	High limit
K_766	18.000	19.996	22.000
Na589	27.000	29.950	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:55:48 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	32.5	38.0	5016.0	5016.0
# 2	23.5	36.0	5021.0	5021.0
Mean	28.0	37.0	5018.5	5018.5
SD	6.4	1.4	3.5	3.5
%RSD	22.7	3.8	0.1	0.1

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:55:48 PM May 16, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.2154	0.0044	5016.000 H	101.9121
# 2	0.1195	0.0006	5021.000 H	102.0138
Mean	0.1675	0.0025	5018.500 H	101.9630
SD	0.0678	0.0027	3.536	0.0719
%RSD	40.4877	109.5852	0.070	0.0705

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

Report name	CRDL	Value	
K_766	0.100	0.167	Contaminated
Na589	0.050	0.002	
Sc361	0.000	101.963	

BACKGROUND CORRECTED INTENSITIES
Identity 1 : pbw-E16H1 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:58:40 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	19.5	24.5	5453.5	5453.5
# 2	18.5	22.5	5415.5	5415.5
Mean	19.0	23.5	5434.5	5434.5
SD	0.7	1.4	26.9	26.9
%RSD	3.7	6.0	0.5	0.5

APPARENT CONCENTRATIONS
Identity 1 : pbw-E16H1 Identity 2 : Type : SAMPLE

EVOLUTION by Micro-Active Australia Pty Ltd 3:04:12 PM May 16, 2005

Weight : 1.0000 Volume : 1.00 Printed : 2:58:40 PM May 16, 2005

010167

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0606 L	-0.0247	5453.500 H	110.8116
# 2	0.0521 L	-0.0279	5415.500 H	110.0386
Mean	0.0564 L	-0.0263	5434.500 H	110.4251
SD	0.0060	0.0023	26.870	0.5466
%RSD	10.6657	8.5693	0.494	0.4950

BACKGROUND CORRECTED INTENSITIES
Identity 1 : lcsw-E16H1 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:00:22 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	1921.5	10785.5	5637.0	5637.0
# 2	1880.5	10594.5	5572.0	5572.0
Mean	1901.0	10690.0	5604.5	5604.5
SD	29.0	135.1	46.0	46.0
%RSD	1.5	1.3	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : lcsw-E16H1 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:00:22 PM May 16, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	18.0417	17.9810	5637.000 H	114.5443
# 2	17.8614	17.8682	5572.000 H	113.2221
Mean	17.9516	17.9246	5604.500 H	113.8832
SD	0.1275	0.0798	45.962	0.9349
%RSD	0.7101	0.4450	0.820	0.8210

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262217 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:02:06 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	130.0	9272.0	5640.0	5640.0
# 2	135.0	9365.0	5691.0	5691.0
Mean	132.5	9318.5	5665.5	5665.5
SD	3.5	65.8	36.1	36.1
%RSD	2.7	0.7	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : 262217 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:02:06 PM May 16, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	1.0988	15.4401	5640.000 H	114.6054
# 2	1.1346	15.4553	5691.000 H	115.6428
Mean	1.1167	15.4477	5665.500 H	115.1241
SD	0.0253	0.0107	36.062	0.7336
%RSD	2.2685	0.0695	0.637	0.6372

Keep last result visible enabled ...
BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262217d Identity 2 : Type : SAMPLE

EVOLUTION by Micro-Active Australia Pty Ltd 3:10:12 PM May 16, 2005

Weight : 1.0000 Volume : 1.00 Printed : 3:03:52 PM May 16, 2005

010168

	K_766	Na589	Sc	Sc361
# 1	115.0	9221.0	5674.0	5674.0
# 2	114.0	9204.0	5624.0	5624.0
Mean	114.5	9212.5	5649.0	5649.0
SD	0.7	12.0	35.4	35.4
%RSD	0.6	0.1	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : 262217d Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:03:52 PM May 16, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.9505	15.2624	5674.000 H	115.2970
# 2	0.9506	15.3702	5624.000 H	114.2799
Mean	0.9506	15.3163	5649.000 H	114.7884
SD	0.0001	0.0762	35.355	0.7192
%RSD	0.0094	0.4976	0.626	0.6265

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262218 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:05:34 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	96.5	9275.5	5613.5	5613.5
# 2	105.5	9385.5	5636.5	5636.5
Mean	101.0	9330.5	5625.0	5625.0
SD	6.4	77.8	16.3	16.3
%RSD	6.3	0.8	0.3	0.3

APPARENT CONCENTRATIONS
Identity 1 : 262218 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:05:34 PM May 16, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.7865	15.5192	5613.500 H	114.0663
# 2	0.8678	15.6397	5636.500 H	114.5342
Mean	0.8271	15.5794	5625.000 H	114.3002
SD	0.0575	0.0852	16.263	0.3308
%RSD	6.9571	0.5469	0.289	0.2894

Keep last result visible enabled ...
Starting run ...
Creating high priority queue entries ...
BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262218s Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:10:00 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	2026.0	19976.0	5597.0	5597.0
# 2	1998.0	19991.0	5545.0	5545.0
Mean	2012.0	19983.5	5571.0	5571.0
SD	19.8	10.6	36.8	36.8
%RSD	1.0	0.1	0.7	0.7

APPARENT CONCENTRATIONS

EVOLUTION by Micro-Active Australia Pty Ltd 3:17:14 PM May 16, 2005

Identity 1 : 262218s Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:10:00 PM May 16, 2005

010169

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.1669	33.5989	5597.000 H	113.7307
# 2	19.0787	33.9401	5545.000 H	112.6729
Mean	19.1228	33.7695	5571.000 H	113.2018
SD	0.0624	0.2413	36.770	0.7480
%RSD	0.3262	0.7145	0.660	0.6607

Keep last result visible enabled ...
Starting run ...
Creating high priority queue entries ...
BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262219 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:14:12 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	121.0	9329.5	5606.0	5606.0
# 2	112.0	9310.5	5552.0	5552.0
Mean	116.5	9320.0	5579.0	5579.0
SD	6.4	13.4	38.2	38.2
%RSD	5.5	0.1	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : 262219 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:14:12 PM May 16, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	1.0207	15.6309	5606.000 H	113.9138
# 2	0.9454	15.7513	5552.000 H	112.8153
Mean	0.9830	15.6911	5579.000 H	113.3645
SD	0.0532	0.0851	38.184	0.7767
%RSD	5.4110	0.5426	0.684	0.6852

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262220 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:17:04 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	109.0	9279.0	5557.5	5557.5
# 2	90.0	9240.0	5540.5	5540.5
Mean	99.5	9259.5	5549.0	5549.0
SD	13.4	27.6	12.0	12.0
%RSD	13.5	0.3	0.2	0.2

APPARENT CONCENTRATIONS
Identity 1 : 262220 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:17:04 PM May 16, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.9156	15.6822	5557.500 H	112.9272
# 2	0.7360	15.6641	5540.500 H	112.5814
Mean	0.8258	15.6731	5549.000 H	112.7543
SD	0.1270	0.0128	12.021	0.2445
%RSD	15.3792	0.0815	0.217	0.2169

EVOLUTION by Micro-Active Australia Pty Ltd 3:25:42 PM May 16, 2005

010170

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262221 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:19:56 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	100.5	9424.5	5633.0	5633.0
# 2	93.5	9318.5	5579.0	5579.0
Mean	97.0	9371.5	5606.0	5606.0
SD	4.9	75.0	38.2	38.2
%RSD	5.1	0.8	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : 262221 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:19:56 PM May 16, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.8211	15.7147	5633.000 H	114.4630
# 2	0.7635	15.6883	5579.000 H	113.3645
Mean	0.7923	15.7015	5606.000 H	113.9138
SD	0.0408	0.0187	38.184	0.7767
%RSD	5.1479	0.1192	0.681	0.6819

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262222 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:22:48 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	110.5	9363.0	5651.0	5651.0
# 2	100.5	9295.0	5588.0	5588.0
Mean	105.5	9329.0	5619.5	5619.5
SD	7.1	48.1	44.5	44.5
%RSD	6.7	0.5	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : 262222 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:22:48 PM May 16, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.9124	15.5618	5651.000 H	114.8291
# 2	0.8288	15.6232	5588.000 H	113.5476
Mean	0.8706	15.5925	5619.500 H	114.1884
SD	0.0591	0.0434	44.548	0.9062
%RSD	6.7937	0.2785	0.793	0.7936

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:25:40 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	1900.5	15970.5	5109.0	5109.0
# 2	1876.5	15904.5	5051.0	5051.0
Mean	1888.5	15937.5	5080.0	5080.0
SD	17.0	46.7	41.0	41.0
%RSD	0.9	0.3	0.8	0.8

APPARENT CONCENTRATIONS

EVOLUTION by Micro-Active Australia Pty Ltd 3:32:42 PM May 16, 2005

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:25:40 PM May 16, 2005

010171

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.7006	29.4193	5109.000 H	103.8039
# 2	19.6750	29.6346	5051.000 H	102.6241
Mean	19.6878	29.5269	5080.000 H	103.2140
SD	0.0181	0.1523	41.012	0.8343
%RSD	0.0919	0.5157	0.807	0.8083

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

Report name	Low limit	Value	High limit
K_766	18.000	19.688	22.000
Na589	27.000	29.527	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:29:34 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	2.5	25.5	5061.0	5061.0
# 2	13.5	31.5	5047.0	5047.0
Mean	8.0	28.5	5054.0	5054.0
SD	7.8	4.2	9.9	9.9
%RSD	97.2	14.9	0.2	0.2

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:29:34 PM May 16, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 L	-0.1036 L	-0.0195	5061.000 H	102.8275
# 2	0.0126 L	-0.0082	5047.000 H	102.5427
Mean L	-0.0455 L	-0.0139	5054.000 H	102.6851
SD	0.0822	0.0080	9.899	0.2014
%RSD	180.6565	57.8184	0.196	0.1961

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

Report name	CRDL	Value
K_766	0.100	-0.046
Na589	0.050	-0.014
Sc361	0.000	102.685

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262223 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:32:26 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	143.5	9444.0	5606.0	5606.0
# 2	143.5	9333.0	5552.0	5552.0
Mean	143.5	9388.5	5579.0	5579.0
SD	0.0	78.5	38.2	38.2
%RSD	0.0	0.8	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : 262223 Identity 2 : Type : SAMPLE

EVOLUTION by Micro-Active Australia Pty Ltd 3:41:16 PM May 16, 2005

Weight : 1.0000 Volume : 1.00 Printed : 3:32:26 PM May 16, 2005

010172

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	1.2346	15.8236	5606.000 H	113.9138
# 2	1.2479	15.7895	5552.000 H	112.8153
Mean	1.2413	15.8065	5579.000 H	113.3645
SD	0.0094	0.0241	38.184	0.7767
%RSD	0.7561	0.1522	0.684	0.6852

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262224 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:35:22 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	99.0	9440.0	5583.5	5583.5
# 2	104.0	9519.0	5577.5	5577.5
Mean	101.5	9479.5	5580.5	5580.5
SD	3.5	55.9	4.2	4.2
%RSD	3.5	0.6	0.1	0.1

APPARENT CONCENTRATIONS
Identity 1 : 262224 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:35:22 PM May 16, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.8152	15.8808	5583.500 H	113.4561
# 2	0.8641	16.0316	5577.500 H	113.3340
Mean	0.8396	15.9562	5580.500 H	113.3950
SD	0.0345	0.1066	4.243	0.0863
%RSD	4.1102	0.6681	0.076	0.0761

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262225 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:38:14 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	117.5	9494.0	5602.0	5602.0
# 2	98.5	9487.0	5625.0	5625.0
Mean	108.0	9490.5	5613.5	5613.5
SD	13.4	4.9	16.3	16.3
%RSD	12.4	0.1	0.3	0.3

APPARENT CONCENTRATIONS
Identity 1 : 262225 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:38:14 PM May 16, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.9882	15.9191	5602.000 H	113.8324
# 2	0.8035	15.8420	5625.000 H	114.3002
Mean	0.8959	15.8805	5613.500 H	114.0663
SD	0.1306	0.0545	16.263	0.3308
%RSD	14.5737	0.3433	0.290	0.2900

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262226 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:41:08 PM May 16, 2005

EVOLUTION by Micro-Active Australia Pty Ltd 3:47:12 PM May 16, 2005

010173

	K_766	Na589	Sc	Sc361
# 1	118.5	13122.0	5646.0	5646.0
# 2	109.5	12871.0	5557.0	5557.0
Mean	114.0	12996.5	5601.5	5601.5
SD	6.4	177.5	62.9	62.9
%RSD	5.6	1.4	1.1	1.1

APPARENT CONCENTRATIONS
Identity 1 : 262226 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:41:08 PM May 16, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.9889	21.8558	5646.000 H	114.7274
# 2	0.9205	21.7808	5557.000 H	112.9170
Mean	0.9547	21.8183	5601.500 H	113.8222
SD	0.0484	0.0530	62.933	1.2802
%RSD	5.0675	0.2429	1.123	1.1247

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262227 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:44:00 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	117.0	20678.0	5680.5	5680.5
# 2	105.0	20653.0	5657.5	5657.5
Mean	111.0	20665.5	5669.0	5669.0
SD	8.5	17.7	16.3	16.3
%RSD	7.6	0.1	0.3	0.3

APPARENT CONCENTRATIONS
Identity 1 : 262227 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:44:00 PM May 16, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.9680	34.2698	5680.500 H	115.4292
# 2	0.8594	34.3677	5657.500 H	114.9614
Mean	0.9137	34.3187	5669.000 H	115.1953
SD	0.0768	0.0692	16.263	0.3308
%RSD	8.4050	0.2017	0.287	0.2872

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:46:52 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	1886.0	15943.5	5047.0	5047.0
# 2	1904.0	15874.5	5030.0	5030.0
Mean	1895.0	15909.0	5038.5	5038.5
SD	12.7	48.8	12.0	12.0
%RSD	0.7	0.3	0.2	0.2

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:46:52 PM May 16, 2005

	K 766	Na589	Sc	Sc361

EVOLUTION by Micro-Active Australia Pty Ltd 3:57:12 PM May 16, 2005

010174

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.7910	29.7310	5047.000 H	102.5427
# 2	20.0491	29.7023	5030.000 H	102.1969
Mean	19.9201	29.7167	5038.500 H	102.3698
SD	0.1825	0.0203	12.021	0.2445
%RSD	0.9162	0.0683	0.239	0.2389

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

Report name	Low limit	Value	High limit
K_766	18.000	19.920	22.000
Na589	27.000	29.717	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:50:44 PM May 16, 2005

	K_766	Na589	Sc	Sc361
# 1	20.5	28.0	5086.5	5086.5
# 2	15.5	25.0	5015.5	5015.5
Mean	18.0	26.5	5051.0	5051.0
SD	3.5	2.1	50.2	50.2
%RSD	19.6	8.0	1.0	1.0

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:50:44 PM May 16, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0849 L	-0.0152	5086.500 H	103.3462
# 2	0.0348 L	-0.0201	5015.500 H	101.9020
Mean	0.0598 L	-0.0176	5051.000 H	102.6241
SD	0.0354	0.0035	50.205	1.0212
%RSD	59.2150	19.7105	0.994	0.9951

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

Report name	CRDL	Value
K_766	0.100	0.060
Na589	0.050	-0.018
Sc361	0.000	102.624

☐ 200.7 TAP No. 01-0406-028 Rev2/Mar02

☐ 6010B TAP No. 01-0406-130 Rev3/Mar05

☑ Other Soils

QC STD. ID's	
CCV	05E02
CRI	
ICSA	5-19-05
ICSAB	

ICP CAL.STD. ID's	
Std0	05E02
Std1	05E02
Std2	
Std3	
Std4	5-19-05
Std5	
Std6	

010175

K

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.292	DIV 20	050426-3	5-19-05	Water	61-017

INSTRUMENT: Spectro FILENAME: 050519

EVOLUTION by Micro-Active Australia Pty Ltd 10:06:50 AM May 19, 2005

Keep last result visible enabled ...
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 : 10:00:56 AM May 19, 2005

010176

	K_766	Na589	Sc361
# 1	26.0	38.5	4522.5
# 2	12.0	12.5	4392.5
Mean	19.0	25.5	4457.5
SD	9.9	18.4	91.9
%RSD	52.1	72.1	2.1

INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 10:00:56 AM May 19, 2005

	K_766	Na589	Sc361
# 1	0.0	0.0	4522.5
# 2	0.0	0.0	4392.5
Mean	0.0	0.0	4457.5
SD	0.0	0.0	91.9
%RSD	50.3	70.6	2.1

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 10:03:46 AM May 19, 2005

	K_766	Na589
# 1	4710.5	26974.5
# 2	4662.5	26708.5
Mean	4686.5	26841.5
SD	33.9	188.1
%RSD	0.7	0.7

5/20/05

INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 10:03:46 AM May 19, 2005

	K_766	Na589
# 1	1.0	5.8
# 2	1.0	5.8
Mean	1.0	5.8
SD	0.0	0.0
%RSD	0.3	0.3

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 10:06:40 AM May 19, 2005

	K_766	Na589	Sc	Sc361
# 1	1927.0	16384.5	4736.0	4736.0
# 2	1906.0	16351.5	4696.0	4696.0
Mean	1916.5	16368.0	4716.0	4716.0
SD	14.8	23.3	28.3	28.3
%RSD	0.8	0.1	0.6	0.6

5-19-05

APPARENT CONCENTRATIONS

EVOLUTION by Micro-Active Australia Pty Ltd 10:13:48 AM May 19, 2005

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 10:06:40 AM May 19, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.9833	29.8339	4736.000 H	106.2563
# 2	19.9334	30.0278	4696.000 H	105.3577
Mean	19.9583	29.9308	4716.000 H	105.8070
SD	0.0353	0.1371	28.284	0.6354
%RSD	0.1769	0.4579	0.600	0.6005

010177

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

Report name	Low limit	Value	High limit
K_766	18.000	19.958	22.000
Na589	27.000	29.931	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 10:10:32 AM May 19, 2005

	K_766	Na589	Sc	Sc361
# 1	29.0	11.5	4612.0	4612.0
# 2	24.0	22.5	4577.0	4577.0
Mean	26.5	17.0	4594.5	4594.5
SD	3.5	7.8	24.7	24.7
%RSD	13.3	45.8	0.5	0.5

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 10:10:32 AM May 19, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.1005 L	-0.0279	4612.000 H	103.4707
# 2	0.0487 L	-0.0070	4577.000 H	102.6845
Mean	0.0746 L	-0.0174	4594.500 H	103.0776
SD	0.0367	0.0148	24.749	0.5560
%RSD	49.1224	84.9644	0.539	0.5394

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

Report name	CRDL	Value
K_766	0.100	0.075
Na589	0.050	-0.017
Sc361	0.000	103.078

BACKGROUND CORRECTED INTENSITIES
Identity 1 : pbw-E19H2 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 10:13:24 AM May 19, 2005

	K_766	Na589	Sc	Sc361
# 1	17.5	10.0	4399.0	4399.0
# 2	25.5	20.0	4395.0	4395.0
Mean	21.5	15.0	4397.0	4397.0
SD	5.7	7.1	2.8	2.8
%RSD	26.3	47.1	0.1	0.1

APPARENT CONCENTRATIONS
Identity 1 : pbw-E19H2 Identity 2 : Type : SAMPLE

EVOLUTION by Micro-Active Australia Pty Ltd 10:21:18 AM May 19, 2005

Weight : 1.0000 Volume : 1.00 Printed : 10:13:24 AM May 19, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 L	-0.0141 L	-0.0298	4399.000	98.6858
# 2	0.0764 L	-0.0101	4395.000	98.5960
Mean	0.0312 L	-0.0199	4397.000	98.6409
SD	0.0640	0.0139	2.828	0.0635
%RSD	205.4817	69.7496	0.064	0.0644

010178

BACKGROUND CORRECTED INTENSITIES
Identity 1 : lcsw-E19H2 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 10:15:06 AM May 19, 2005

	K_766	Na589	Sc	Sc361
# 1	1778.0	10037.5	4430.5	4430.5
# 2	1771.0	10032.5	4447.5	4447.5
Mean	1774.5	10035.0	4439.0	4439.0
SD	4.9	3.5	12.0	12.0
%RSD	0.3	0.0	0.3	0.3

APPARENT CONCENTRATIONS
Identity 1 : lcsw-E19H2 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 10:15:06 AM May 19, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.7066	19.5201	4430.500	99.3935
# 2	19.5524	19.4356	4447.500	99.7754
Mean	19.6295	19.4779	4439.000	99.5844
SD	0.1091	0.0598	12.021	0.2700
%RSD	0.5557	0.3068	0.271	0.2712

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262217 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 10:18:00 AM May 19, 2005

	K_766	Na589	Sc	Sc361
# 1	107.0	9052.5	4448.0	4448.0
# 2	104.0	9005.5	4437.0	4437.0
Mean	105.5	9029.0	4442.5	4442.5
SD	2.1	33.2	7.8	7.8
%RSD	2.0	0.4	0.2	0.2

APPARENT CONCENTRATIONS
Identity 1 : 262217 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 10:18:00 AM May 19, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.9824	17.5303	4448.000	99.7866
# 2	0.9518	17.4824	4437.000	99.5395
Mean	0.9671	17.5063	4442.500	99.6630
SD	0.0216	0.0339	7.778	0.1747
%RSD	2.2372	0.1935	0.175	0.1753

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262217d Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 10:20:52 AM May 19, 2005

EVOLUTION by Micro-Active Australia Pty Ltd 10:26:52 AM May 19, 2005

	K_766	Na589	Sc	Sc361
# 1	117.0	8982.0	4457.0	4457.0
# 2	119.0	8999.0	4418.0	4418.0
Mean	118.0	8990.5	4437.5	4437.5
SD	1.4	12.0	27.6	27.6
%RSD	1.2	0.1	0.6	0.6

010179

APPARENT CONCENTRATIONS
Identity 1 : 262217d Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 10:20:52 AM May 19, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	1.0913	17.3582	4457.000	99.9888
# 2	1.1253	17.5451	4418.000	99.1127
Mean	1.1083	17.4516	4437.500	99.5507
SD	0.0240	0.1322	27.577	0.6195
%RSD	2.1673	0.7573	0.621	0.6223

✓ Not Reported Repeated from original run on 5/16/05
SR 5/20/05

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262217s Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 10:23:44 AM May 19, 2005

	K_766	Na589	Sc	Sc361
# 1	1923.5	19359.0	4497.5	4497.5
# 2	1910.5	19134.0	4419.5	4419.5
Mean	1917.0	19246.5	4458.5	4458.5
SD	9.2	159.1	55.2	55.2
%RSD	0.5	0.8	1.2	1.2

APPARENT CONCENTRATIONS
Identity 1 : 262217s Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 10:23:44 AM May 19, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	21.0156	37.1314	4497.500 H	100.8986
# 2	21.2442	37.3479	4419.500	99.1464
Mean	21.1299	37.2397	4458.500 H	100.0225
SD	0.1617	0.1531	55.154	1.2390
%RSD	0.7651	0.4110	1.237	1.2387

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 10:26:42 AM May 19, 2005

	K_766	Na589	Sc	Sc361
# 1	1934.0	16323.0	4805.5	4805.5
# 2	1915.0	16248.0	4771.5	4771.5
Mean	1924.5	16285.5	4788.5	4788.5
SD	13.4	53.0	24.0	24.0
%RSD	0.7	0.3	0.5	0.5

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 10:26:42 AM May 19, 2005

	K 766	Na589	Sc	Sc361

EVOLUTION by Micro-Active Australia Pty Ltd 10:33:34 AM May 19, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.7635	29.2912	4805.500 H	107.8176
# 2	19.7082	29.3645	4771.500 H	107.0538
Mean	19.7359	29.3278	4788.500 H	107.4357
SD	0.0391	0.0518	24.042	0.5401
%RSD	0.1981	0.1767	0.502	0.5027

010180

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

Report name	Low limit	Value	High limit
K_766	18.000	19.736	22.000
Na589	27.000	29.328	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 10:30:36 AM May 19, 2005

	K_766	Na589	Sc	Sc361
# 1	22.0	15.5	4655.5	4655.5
# 2	25.0	37.5	4597.5	4597.5
Mean	23.5	26.5	4626.5	4626.5
SD	2.1	15.6	41.0	41.0
%RSD	9.0	58.7	0.9	0.9

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 10:30:36 AM May 19, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0230 L	-0.0207	4655.500 H	104.4479
# 2	0.0583	0.0210	4597.500 H	103.1450
Mean	0.0407	0.0002	4626.500 H	103.7965
SD	0.0250	0.0295	41.012	0.9213
%RSD	61.4710	15302.6533	0.886	0.8876

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

Report name	CRDL	Value
K_766	0.100	0.041
Na589	0.050	0.000
Sc361	0.000	103.796

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050426-3
SRR: 27509
SDG: 262217
CASE: CNWRA
VTSR: April 25, 2005
PROJECT#: 06002.01.242

010181

Certificates of Analysis

010182

Fisher Scientific

TRACEMETAL GRADE NITRIC ACID
CERTIFICATE OF ANALYSIS

B McKelvey

Dr. B. McKelvey
QA/QC Manager

CATALOG NUMBER: A509
LOT NUMBER: 1104120
RELEASE DATE: January, 2005
EXPIRY DATE: January, 2008

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

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

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.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 4/30/05
DATE EXPIRED: 4/28/2005
DATE OPENED: 4/28/2005
INORG: 5217-5222 PO: P-501647

010183

Fisher Scientific

TRACEMETAL GRADE HYDROCHLORIC ACID
CERTIFICATE OF ANALYSIS

B McKelvey

Dr. B. McKelvey
QA/QC Manager

CATALOG NUMBER: A508
LOT NUMBER: 4104090
RELEASE DATE: November, 2004
EXPIRY DATE: November, 2007

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

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

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.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/1/05
DATE EXPIRED: 3/1/07
DATE OPENED: 3/3/05
INORG: 5085-25010 PO: F55147

010184

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-SC02058**

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/05/05
DATE EXPIRED: 2/1/06
DATE OPENED: 01/06/05
INORG: 4961 PO: F55104

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: 1007 ± 3 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1005 ± 2 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3148a.

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

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

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

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

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

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

QA:KL Rev.010604DN

Paul R. Haines

Quality Assurance Manager Expires: EXPIRES 01 FEB 2006

010185

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010186

SPEXertificate™

Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/23/04
DATE EXPIRED: 11/15/2005 DK
DATE OPENED: 11/25/04
INORG: 4837 PO: F54741

Catalog Number: ICAL-1 **Lot No.:** 28-64AS
Description: **Instrument Calibration Standard 1**
Matrix: 5% Nitric Acid

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	5,000	5011.87	3109a
K	5,000	5011.80	3141a
Mg	5,000	5020.86	3131a
Na	5,000	4995.13	3152a

Spex Reference Multi: Lot #6-28VY, 6-104VY, 25-178AS-REF

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

Date of Certification: OCT - - 2004 Certifying Officer: N. Kocherlakota

4837

010187

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
CERTIFIED

4837

SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA

010188

SPECertificate™

Certificate of Reference Material

Catalog Number: SPIKE-1 **Lot No.:** 28-176AS
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	198.56	3101a	Pb	50	50.06	3128
As	200	197.01	3103a	Sb	50	48.62	3102a
Ba	200	199.49	3104a	V	50	49.87	3165
Se	200	198.51	3149	Zn	50	49.70	3168a
TL	200	199.25	3158	Cu	25	25.15	3114
Fe	100	98.90	3126a	Cr	20	19.81	3112a
Co	50	50.04	3113	Ag	5	4.96	3151
Mn	50	49.90	3132	Be	5	4.92	3105a
Ni	50	50.16	3136	Cd	5	4.96	3108

Spex Reference Multi: Lot #4-24BD, 2-61BD, 17-55AS, 16-68AS

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 4/18/06
DATE EXPIRED: 4/30/09
DATE OPENED: 4/18/06
INORG: 5197 PO: 55160

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.

1 of 2
5197

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

010189

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001 CERTIFIED

2 of 2
5107

SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732 549 7144 • 1 800 LAB SPEX • Fax: 732 603 9647 • CRMSales@spexcsp.com • www.spexcsp.com

010190

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Lithium in 0.1% (abs) HNO_3**

Catalog Number:	CGLI1-1 and CGLI1-5
Lot Number:	**W-LI02073**
Starting Material:	Li2CO3
Starting Material Purity (%):	99.997165
Starting Material Lot No	1123
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 VDJ
DATE OPENED: 07/01/04
INORG: 4608 PO: F53406

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 995 ± 2 µg/mL

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

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **995 ± 2 µg/mL**
ICP Assay NIST SRM 3129a Lot Number: 000505

Assay Method #2 **995 ± 6 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00120	M	Dy	< 0.01199	S	Li		M	Pr	< 0.00060	M	Te	< 0.05994
M	Sb	< 0.00100	M	Er	< 0.00999	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.01998	M	Eu	< 0.00599	O	Mg	0.00650	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.01998	M	Gd	< 0.00200	O	Mn	0.00006	M	Rb	< 0.00200	M	Th	< 0.00200
O	Be	< 0.00020	M	Ga	< 0.00200	O	Hg	< 0.01500	M	Ru	< 0.00400	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01199	M	Mo	< 0.00400	M	Sm	< 0.00200	O	Sn	< 0.00600
O	B	0.00020	M	Au	< 0.00599	M	Nd	< 0.00400	M	Sc	< 0.01998	O	Ti	< 0.00070
M	Cd	< 0.00599	M	Hf	< 0.00400	O	Ni	< 0.00230	M	Se	< 0.01598	O	W	< 0.00400
O	Ca	0.04050	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	0.04650	M	U	< 0.00400
M	Ce	< 0.00999	O	In	< 0.00400	n	Os		M	Ag	< 0.00400	O	V	0.00009
M	Cs	< 0.00060	M	Ir	< 0.00999	M	Pd	< 0.00999	O	Na	0.03200	M	Yb	< 0.00200
M	Cr	< 0.00999	O	Fe	0.00200	O	P	< 0.00250	O	Sr	0.00026	M	Y	< 0.07992
M	Co	< 0.00599	M	La	< 0.00100	M	Pt	< 0.00400	O	S	0.01250	O	Zn	0.00145
O	Cu	0.00100	M	Pb	< 0.00599	O	K	0.00950	M	Ta	< 0.01399	M	Zr	< 0.00999

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

010192

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 6.941; +1; (6); $Li^{+}(aq)$ large effective radius due to hydration sphere (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Li Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt° followed by HCl dissolution-blank levels of Li in sodium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤1ppm.)
ICP-OES 670.784 nm	0.002 / 0.00002 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES 460.286 nm	0.9 / 0.04 µg/mL	1	atom	Zr, Th
ICP-OES 323.261 nm	1.1 / 0.05 µg/mL	1	atom	Sb, Th, Ni
ICP-MS 7 amu	10 ppt		n/a	M+

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 x05
DATE OPENED: 07/01/04
INORG: 46038 PO: F53406

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010193

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 12, 2003

Expiration Date: EXPIRES 01 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010194

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Scandium in 5% (abs) HNO_3**

Catalog Number:	CGSC10-1, CGSC10-2, and CGSC10-5
Lot Number:	**X-SC02061**
Starting Material:	Sc_2O_3
Starting Material Purity (%):	99.996918
Starting Material Lot No	BSC-632-1-5736
Matrix:	5% (abs) HNO_3

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,007 ± 21 µg/mL

Certified Density: 1.071 g/mL (measured at 22° C)

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

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM-certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

• "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or International standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

• This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10,005 ± 26 µg/mL**
ICP Assay NIST SRM 3148a Lot Number: 792111

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/31/05
DATE EXPIRED: 3/31/06 hp
DATE OPENED: 3/31/05
INORG: 5105 PO: 32106

5105

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

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

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 44.95591; +3; 6; $Sc(H_2O)_6^{+3}$

Chemical Compatibility - Soluble in HCl, H_2SO_4 and HNO_3. Avoid HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride. The fluoride is soluble in excess HF forming ScF_6^{-3} (not recommended for standard preparations)

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10% HNO_3 / LDPE container. Small atomic radius increases hydrolysis requiring higher acid levels than other Rare Earths.

Sc Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H_2O / HNO_3); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H_2O / HCl or HNO_3), (Aqua Regia or nitric / perchloric / sulfuric acid digestions can be used. **Exercise caution when using perchloric acid.**)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	335.373 nm	0.004 / 0.00002 µg/mL	1	ion	
ICP-OES	337.215 nm	0.004 / 0.00002 µg/mL	1	ion	Ti, U, Ni, Rh
ICP-OES	424.683 nm	0.003 / 0.00002 µg/mL	1	ion	Ce
ICP-MS	45 amu	2.3 ppt	n/a	M+	$^{13}O_2{}^{16}CH$, $^{29}Si^{16}O$, $^{90}Zr^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 01, 2004

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

4 of 4
5175

010198

SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLB9-2X/2Y/2T **Lot No.** 10-119B

Description: 1000 mg/L Boron

Matrix: H2O

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

Certified Value: 1001 mg/L

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

Certified Value is Traceable to: NIST SRM 3107

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

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

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.001 @ 22.3 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.06	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.001	Re	<0.001
Ag	0.002	Ga	<0.001	Rb	<0.001
Ba	<0.001	In	<0.001	Sr	<0.001
Be	<0.001	K	<0.06	Sb	<0.001
Bi	0.03	Li	<0.001	Si	0.01
Cd	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.001	Mg	<0.001	V	0.003
Cr	<0.001	Na	0.01	Zr	<0.001
		Ni	0.001	Zn	0.004

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

Date of Certification: JAN '05 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/17/05
DATE EXPIRED: 01/15/2006 W03
DATE OPENED: 01/19/05
INORG: 49666 PO: F55130

Report of Certification

010199

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
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010200

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLLI2-2X/2Y **Lot No.** 11-24LI
Description: 1000 mg/L Lithium
Matrix: 2% HNO3

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

Certified Value: 1000.5 mg/L
Uncertainty Associated with Measurement: +/-3 mg/L
Certified Value is Traceable to: NIST SRM #3129a

The CRM is prepared gravimetrically using high purity Lithium 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: 1001 mg/L

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

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.015 @ 22.8 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.002	Cu	<0.001	Pb	<0.001
Al	0.007	Fe	0.013	Re	<0.001
Ag	<0.001	Ga	<0.001	Rb	<0.001
Be	<0.001	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.027	Sb	<0.001
Bi	<0.001	Mg	0.002	Si	0.014
B	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.008	Ni	0.001	V	<0.001
Cr	<0.004	Na	0.01	Zn	3.0
Cd	<0.001			Zr	0.002

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

Date of Certification: OCT '04 Certifying Officer: N. Kocherlakota

010201

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647 • CRMSales@spexcsp.com • www.spexcsp.com

010202

INORGANIC LABS/RADIOCHEM LABS
DATE RECEIVED: 11/09/04
DATE EXPIRED: 10/30/2005 WCS
DATE OPENED: 11/09/04
INORS: 4847 PO: F54767

SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLMO9-2X/2Y/2T **Lot No.** 11-51MO
Description: 1000 mg/L Molybdenum
Matrix: H2O

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

Certified Value: 1000 mg/L
Uncertainty Associated with Measurement: +/-3.0 mg/L
Certified Value is Traceable to: NIST SRM #3134

The CRM is prepared gravimetrically using high purity (NH4)6(Mo)7(O)24-4H2OLot# 03011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 09989 @23.7 Degrees Celsius

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

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

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

Date of Certification: OCT '04 Certifying Officer: N. Kocherlakota

010203

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA

010204

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLP9-2X/2Y/2T **Lot No.** 10-125P
Description: 1000 mg/L Phosphorus
Matrix: H2O

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

Certified Value: 1001 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM 3139a

The CRM is prepared gravimetrically using high purity (NH4)2(H)PO4 Lot# 07901A. 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: Precipitation using Magnesia Mixture. Filter, ignite and weigh as Mg2P2O7.

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

Density: 1.000 @ 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	0.001	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.002	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.01	In	<0.001	Si	0.085
Ba	0.001	K	0.027	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.01
Bi	<0.001	Mg	<0.001	Ti	0.002
Ca	0.002	Mn	<0.001	Tl	<0.001
Cr	<0.001	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.008	Zr	<0.001
Co	<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.

Date of Certification: AUG 04 Certifying Officer: N. Kocherlakota

Report of Certification

010205

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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010206

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/31/06 DL
DATE OPENED: 3/28/05 DL
INORG: 5038 PO: F55148

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLSI9-2X/2Y/2T **Lot No.** 11-33SI
Description: 1000 mg/L Silicon
Matrix: H2O / 0.4% F-

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

Certified Value: 1001.5 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM #3150

The CRM is prepared gravimetrically using high purity (NH4)2SiF6 Lot# 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: 1004 mg/L

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

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.001 @ 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	0.003	Cu	<0.001	Pb	<0.001
Ag	<0.001	Fe	0.02	Rb	<0.001
As	<0.06	Ga	<0.001	Re	<0.001
Ba	<0.001	In	<0.001	Sr	<0.001
Be	<0.001	K	0.14	Sb	<0.001
B	<0.004	Li	0.008	Ti	<0.001
Bi	<0.001	Mo	<0.001	Tl	<0.001
Cd	<0.001	Mg	<0.001	V	<0.001
Ca	0.016	Mn	<0.001	Zn	0.002
Cr	<0.001	Na	0.003	Zr	0.002
Co	<0.001	Ni	<0.004		

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

Date of Certification: FEB '05 Certifying Officer: N. Kocherlakota

010207

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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010208

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Certificate of Reference Material

Catalog Number: PLTI9-2X/2Y/2T **Lot No.** 10-172TI

Description: 1000 mg/L Titanium

Matrix: H2O/ 0.24% F-

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

Certified Value: 998 mg/L

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

Certified Value is Traceable to: NIST SRM #3162a

The CRM is prepared gravimetrically using high purity (NH4)TiF6 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: 999 mg/L

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

Instrumental Analysis by ICP spectrometer: 997 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	0.004	Cu	0.04	Pb	<0.001
As	<0.001	Fe	0.002	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Si	3.0
Ba	<0.001	K	<0.10	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	<0.003	Tl	<0.001
Ca	0.012	Mn	<0.001	V	<0.001
Cr	<0.07	Mo	<0.001	Zr	0.004
Cd	<0.001	Na	0.02	Zn	0.004
Co	0.002	Ni	<0.001		

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

Date of Certification: FEB '05 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/16/05
DATE EXPIRED: 2/28/06
DATE OPENED: 3/28/05
INORG: 5040 FO: F55148

Report of Certification

010209

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647 • CRMSales@spexcsp.com • www.spexcsp.com

010210

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLSR2-2X/2Y/2T **Lot No.** 10-111SR

Description: 1000 mg/L Strontium in 2% HNO3

Matrix: 2% HNO3

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

Certified Value: 998 mg/ L

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

Certified Value is Traceable to: NIST SRM #3153a

The CRM is prepared gravimetrically using high purity Strontium Carbonate Lot# 09031B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

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

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.009 @ 24.1 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.001	Cu	<0.001	Pb	0.001
As	<0.001	Fe	0.001	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Si	0.002
Ba	0.02	K	0.015	Sb	<0.001
Be	<0.001	Li	<0.001	Ti	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.008	Mn	<0.001	V	<0.001
Cr	<0.004	Mo	<0.001	Zr	0.004
Cd	<0.001	Na	0.005	Zn	0.04
Co	<0.001	Ni	<0.001		

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

Date of Certification: AUG '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/01/04
DATE EXPIRED: 08/30/2005 W3
DATE OPENED: 09/01/04
INORG: 4759 PO: F53435

010211

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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010212

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 2/28/2006
DATE OPENED: 3/28/05
INORG: 5037 PO: 55148

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLSN5-2X/2Y/2T **Lot No.** 11-45SN

Description: 1000 mg/L Tin

Matrix: 20% HCL

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

Certified Value: 997.5 mg/L

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

Certified Value is Traceable to: NIST SRM #3161

The CRM is prepared gravimetrically using high purity Tin Metal Lot# 10951C. 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.

Instrumental Analysis by ICP spectrometer: 996 mg/L

Uncertified Properties:

Density: 1.041 @ 22.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.10	Cu	<0.001	Pb	0.001
Ag	0.004	Fe	0.10	Re	<0.001
Al	0.007	Ga	<0.001	Rb	<0.001
B	<0.001	In	<0.01	Sb	0.002
Ba	<0.001	K	<0.20	Si	0.09
Be	<0.001	Li	<0.001	Sr	<0.001
Bi	<0.001	Mo	<0.001	Ti	<0.001
Co	0.007	Mn	<0.001	Tl	<0.001
Cd	<0.01	Mg	<0.001	V	<0.20
Ca	0.07	Na	0.045	Zn	0.70
Cr	0.007	Ni	0.045	Zr	<0.001

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

Date of Certification: FEB '05 Certifying Officer: N. Kocherlakota

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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010214

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/29/04
DATE EXPIRED: 11/30/2005 YOS
DATE OPENED: 12/29/04
INORG: 4912 PO: F55102

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLBI4-2X/2Y **Lot No.** 10-173BI

Description: 1000 mg/L Bismuth

Matrix: 10% HNO3

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

Certified Value: 1002.5 mg/L

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

Certified Value is Traceable to: NIST SRM #3106

The CRM is prepared gravimetrically using high purity Bismuth Metal Lot# 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: 1003 mg/L

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

Instrumental Analysis by ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 1.052 @ 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	0.02	Cu	<0.001	Pb	0.006
As	<0.001	Fe	0.001	Re	<0.001
Ag	0.002	Ga	<0.001	Rb	<0.001
B	<0.002	In	<0.001	Sr	<0.001
Ba	0.002	K	0.010	Sb	<0.001
Be	<0.002	Li	<0.001	Si	0.005
Cd	<0.001	Mn	<0.001	Ti	<0.002
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.125	Mg	<0.001	V	<0.001
Cr	<0.001	Na	0.006	Zr	<0.001
		Ni	0.002	Zn	0.08

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

Date of Certification: NOV '04 Certifying Officer: N. Kocherlakota

Report of Certification

010215

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647 • CRMSales@spexcsp.com • www.spexcsp.com

010216

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/22/04
DATE EXPIRED: 10/30/2005
DATE OPENED: 11/29/04
INORG: 4815 PO: F54767

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLLA2-2X/2Y **Lot No.** 11-12LA

Description: 1000 mg/L Lanthanum

Matrix: 2% HNO3

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

Certified Value: 1000 mg/L

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

Certified Value is Traceable to: NIST SRM #3127a

The CRM is prepared gravimetrically using high purity La(NO3)3-6H2O Lot# 03951B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.010 @ 22.3 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.02	Lu	<0.001	Th	<0.001
Ca	0.029	Mn	<0.001	Tm	<0.001
Dy	<0.001	Mo	<0.001	Ti	<0.001
Er	<0.001	Nd	<0.001	Tb	<0.001
Eu	<0.001	Ni	<0.001	Ta	<0.001
Fe	0.005	Na	0.01	Tl	<0.001
Gd	<0.001	Pr	<0.001	V	<0.001
Ga	<0.001	Rb	<0.001	W	<0.001
Hf	<0.001	Sc	0.002	Y	<0.001
Ho	<0.001	Sm	<0.001	Yb	<0.001
In	<0.001			Zr	<0.001

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

Date of Certification: OCT '04 Certifying Officer: N. Kocherlakota

010217

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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010218

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/03/04
DATE EXPIRED: 11/30/2005 VX
DATE OPENED: 12/03/04
INORG: 4913 PO: F5510

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLY2-2X/2Y/2T **Lot No.** 10-121Y

Description: 1,000 mg/L Yttrium

Matrix: 2% HNO3

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

Certified Value: 1000 mg/ L

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

Certified Value is Traceable to: NIST SRM 3167a

The CRM is prepared gravimetrically using high purity Yttrium Oxide Lot# 01031B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.011 @ 21.8 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	<0.001	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	0.015	Ni	<0.001	Ti	<0.001
Gd	<0.001	Na	0.006	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	<0.001
In	<0.001	Sm	<0.001		

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

Date of Certification: NOV '04 Certifying Officer: N. Kocherakota

010219

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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010220

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLPD3-2X/2Y **Lot No.** 9-99PD

Description: 1000 mg/L Palladium

Matrix: 10% HCl

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

Certified Value: 999 mg/L

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

Certified Value is Traceable to: NIST SRM #3138

The CRM is prepared gravimetrically using high purity Palladium Metal Lot# 06021C. 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 Dimethyl Glyoxime. Filter, dry, and weigh as Pd(C4H7O2N2)2.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.017 @ 24.2 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Fe	0.033	Re	<0.001
Au	0.002	Ga	<0.001	Rh	<0.001
Ag	<0.001	Ir	<0.001	Rb	<0.001
B	<0.001	In	<0.001	Ru	<0.001
Be	<0.001	Mg	0.001	Sn	<0.001
Bi	<0.001	Mn	<0.001	Te	<0.001
Ca	0.006	Na	0.005	Ti	<0.001
Cd	<0.001	Ni	0.001	W	<0.001
Co	<0.001	Pb	0.002	Zr	<0.001
Cr	<0.002	Pt	0.008	Zn	0.06
Cu	0.002				

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

Date of Certification: JAN '05 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/17/05
DATE EXPIRED: 01/15/2006 YYS
DATE OPENED: 01/19/05
INORG: 4967 PO: F55130

010221

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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010222

SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLS9-2X/2Y/2T **Lot No.** 10-122S

Description: 1000 mg/L Sulfur

Matrix: H2O

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

Certified Value: 1001 mg/L

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

Certified Value is Traceable to: NIST SRM #3154

The CRM is prepared gravimetrically using high purity Ammonium Sulfate Lot# 05891M. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

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

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.001 @ 22.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	<0.001	Cu	<0.001	Pb	<0.001
As	0.003	Fe	0.014	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.001	In	<0.001	Si	0.003
Ba	<0.001	K	<0.10	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	0.005	Ti	<0.001
Ca	0.012	Mn	<0.002	Tl	<0.001
Cr	<0.001	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.01	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	<0.002

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

Date of Certification: JUN - - 2004 Certifying Officer: N. Kochendarfer

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/25/04
DATE EXPIRED: 06/30/2005 NO
DATE OPENED: 06/29/04
INORG: 4617 PO: F53398

010223

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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010224

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLTH2-2X/2Y **Lot No.** 11-15TH

Description: 1000 mg/L Thorium

Matrix: 2% HNO3

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

Certified Value: 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.

Instrumental Analysis by ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.010 @ 22.0 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.01	La	0.003	Tb	<0.001
Ca	0.27	Lu	<0.001	Tm	<0.001
Dy	<0.001	Mn	<0.001	Ti	<0.002
Er	<0.001	Mo	<0.001	Ta	<0.001
Eu	<0.001	Nd	0.003	Tl	<0.001
Fe	<0.01	Ni	<0.001	V	<0.001
Gd	<0.001	Na	0.04	W	<0.001
Ga	<0.001	Pr	<0.001	Y	0.002
Hf	<0.001	Rb	<0.001	Yb	<0.001
Ho	<0.001	Sc	<0.03	Zr	<0.001
In	<0.001	Sm	<0.001		

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

Date of Certification: AUG '04 Certifying Officer: N. Kocherlakota

Report of Certification 010225

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647 • CRMSales@spexcsp.com • www.spexcsp.com

010226

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLU2-2X/2Y **Lot No.** 10-127U

Description: 1000 mg/L Uranium

Matrix: 2% HNO3

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

Certified Value: 1004 mg/L

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

Certified Value is Traceable to: NIST SRM #3164

The CRM is prepared gravimetrically using high purity Uranium(V,VI) Oxide Lot# 04001D. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

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

Instrumental Analysis by ICP spectrometer: 1005 mg/L

Uncertified Properties:

Density: 1.010 @ 21.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.005	Cu	0.01	Pb	0.008
As	0.04	Fe	0.41	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.003	In	<0.001	Si	0.03
Ba	<0.001	K	0.022	Sr	0.003
Be	<0.001	Li	<0.001	Sb	0.003
Bi	<0.001	Mg	0.002	Ti	<0.001
Ca	0.09	Mn	0.003	Tl	<0.001
Cr	<0.002	Mo	0.004	V	0.004
Cd	<0.001	Na	0.08	Zr	0.002
Co	<0.001	Ni	<0.001	Zn	0.06

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

Date of Certification: JUN - - 2004 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/25/04
DATE EXPIRED: 06/30/2005 WJ
DATE OPENED: 06/29/04
INORG: 4619 PO: F53398

Report of Certification

010227

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 07/29/04
DATE EXPIRED: 07/30/2005 YO
DATE OPENED: 07/29/04
INORG: 4661 PO: 553417

SPEXertificate™

01022

Certificate of Reference Material

Catalog Number: PLW9-2X/2Y **Lot No.** 10-139W
Description: 1000 mg/L Tungsten
Matrix: H2O

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

Certified Value: 1003 mg/L
Uncertainty Associated with Measurement: +/-3.0 mg/L
Certified Value is Traceable to: NIST SRM #3163

The CRM is prepared gravimetrically using high purity Ammonium Tungstate Lot# 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: 1004 mg/L

Method: Fume with Sulfuric acid to dryness. Ignite and weigh as WO3.

Instrumental Analysis by ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 0.9998 @ 21.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.003	Cu	<0.001	Pb	<0.001
As	0.004	Fe	<0.01	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	0.003
B	<0.002	In	<0.001	Si	0.60
Ba	<0.001	K	0.13	Sr	<0.001
Be	<0.01	Li	<0.001	Sb	0.001
Bi	<0.001	Mg	<0.001	Ti	<0.001
Ca	0.006	Mn	<0.001	Tl	<0.001
Cr	<0.003	Mo	0.004	V	<0.003
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: JUL '04 Certifying Officer: N. Kocherlakota

Report of Certification

010229

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
CERTIFIED

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05 DK
DATE EXPIRED: 2/28/06
DATE OPENED: 2/28/05
INORG: S039 PO: F25148

SPEXertificate™ 010230

Certificate of Reference Material

Catalog Number: PLZR2-2X/2Y/2T **Lot No.** 11-69ZR
Description: 1000 mg/L Zirconium
Matrix: 2% HNO3

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

Certified Value: 1004 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM #3169

The CRM is prepared gravimetrically using high purity Zirconyl Nitrate Lot# 02041A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

Method: Fume with Sulfuric Acid to dryness. Ignite and weigh as ZrO2.

Instrumental Analysis by ICP spectrometer: 1004 mg/L

Uncertified Properties:

Density: 1.011 @ 22.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.001	Cu	<0.001	Pb	<0.001
Ag	0.03	Fe	0.02	Re	<0.001
Al	0.004	Ga	<0.001	Rb	<0.001
Ba	<0.002	In	<0.001	Sb	<0.001
Be	<0.001	K	<0.20	Sr	<0.001
Bi	0.15	Li	<0.001	Si	<0.10
B	<0.004	Mn	<0.001	Tl	<0.001
Cr	<0.001	Mg	<0.001	Ti	<0.003
Cd	<0.001	Mo	<0.001	V	<0.001
Co	<0.002	Ni	<0.001	Zn	0.001
Ca	<0.001	Na	0.004		

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

Date of Certification: FEB '05 Certifying Officer: N. Kocherlakota

010231

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA

010232

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/31/05
DATE EXPIRED: 1/31/2006 DK
DATE OPENED: 1/31/05
INORG: 4998 PO: E55139

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLNA2-3X/3Y **Lot No.** V9-56NA
Description: 10,000 mg/L Sodium
Matrix: 5% HNO3

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

Certified Value: 9984 mg/L
Uncertainty Associated with Measurement: +/- 30.0 mg/L
Certified Value is Traceable to: NIST SRM # 3152a

The CRM is prepared gravimetrically using high purity Sodium Carbonate Lot# 05031C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 9983 mg/L

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

Instrumental Analysis by ICP spectrometer: 9985 mg/L

Uncertified Properties:

Density: 1.048 @ 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	<0.001	Cu	0.01	Pb	0.009
As	<0.01	Fe	0.02	Re	<0.001
Ag	<0.02	Ga	<0.001	Rb	<0.001
B	<0.05	In	<0.001	Sr	<0.002
Ba	0.01	K	2.50	Sb	<0.001
Be	<0.009	Li	<0.002	Si	0.14
Bi	0.001	Mg	0.20	Ti	<0.02
Ca	0.75	Mn	0.001	Tl	<0.001
Cr	<0.02	Mo	<0.001	V	0.002
Cd	<0.001	Ni	<0.006	Zr	<0.01
Co	<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.

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

010233

Report of Certification

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
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010234

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/08/04
DATE EXPIRED: 11/30/2005 MM
DATE OPENED: 12/09/04
INORG: 4908 PO: F55102

SPEXertificate™

Certificate of Reference Material

Catalog Number: ICV-2A **Lot No.:** 6-114MS
Description: **Initial Calibration Verification Standard II**
Matrix: 5% Nitric Acid

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

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

Instrumental Analysis by ICP Spectrometer:

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

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

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 '04 Certifying Officer: N. Kocherlakota

Report of Certification

010235

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

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
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010236

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/03/04
DATE EXPIRED: 11/30/2005 MX
DATE OPENED: 12/07/04
INORG: 4911 PO: E55102

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLSB7-2X/2Y/2T **Lot No.** 10-43SB
Description: 1000 mg/L Antimony
Matrix: H2O/0.6Tart.Acid/tr.HNO3

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

Certified Value: 1004 mg/ L
Uncertainty Associated with Measurement: +/-3.0mg/L
Certified Value is Traceable to: NIST SRM 3102a

The CRM is prepared gravimetrically using high purity Antimony Metal Lot# 04021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis
Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1005 mg/L

Method: Evaporate to dryness. Fume with Nitric Acid. Ignite and weigh as Sb2O4.

Instrumental Analysis by ICP spectrometer: 1002 mg/ L
Uncertified Properties:

Density: 1.046 @ 25.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.03	Cu	0.002	Pb	0.009
As	<0.001	Fe	0.03	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.01	Si	<0.01
Be	<0.001	Li	<0.001	Ti	<0.003
Bi	0.002	Mg	0.005	Tl	<0.001
Ca	0.14	Mn	<0.001	V	<0.001
Cr	<0.002	Mo	<0.001	Zr	<0.001
Cd	<0.001	Na	0.005	Zn	0.02
Co	<0.001	Ni	<0.001		

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

Date of Certification: NOV '04 Certifying Officer: N. Kocherlakota

Report of Certification

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

010237

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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

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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647 • CRMSales@spexcsp.com • www.spexcsp.com

010238

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/09/04
DATE EXPIRED: 11/30/2005 WX
DATE OPENED: 12/09/04
INORG: 4910 PO: F55102

SPEXertificate™

Certificate of Reference Material

Catalog Number: ICV-2C **Lot No.:** 6-146MS
Description: Initial Calibration Verification Standard II
Matrix: 5% Nitric Acid

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
As	500	499.69	3103a
Pb	500	499.61	3128
Se	500	499.91	3149
TL	500	499.92	3158
Cd	100	99.90	3108

Spex Reference Multi: Lot #9-34AS, 11-173AS, 1-57GM, 15-39AS 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: NOV '04 Certifying Officer: N. Kocherlakota

Report of Certification

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

010239

Material Source:

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

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

Statistical estimator and Confidence limits:

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

Certification Traveler Report:

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

Legal Notice:

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010240

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Aluminum in 5% (abs) HNO_3**

Catalog Number:	CGAL10-1 and CGAL10-5
Lot Number:	**X-AL04016**
Starting Material:	Al metal
Starting Material Purity (%):	99.996430
Starting Material Lot No	607116
Matrix:	5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS 1 of 2
DATE RECEIVED: 09/01/04
DATE EXPIRED: 10/01/2005 VOS
DATE OPENED: 09/01/04
INORG: 4762 PO: F53434

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,020 ± 40 µg/mL

Certified Density: 1.070 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum s_i$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

"Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported. taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10,020 ± 40 µg/mL**
ICP Assay NIST SRM 3101a Lot Number: 010808

Assay Method #2 **10,043 ± 87 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

s	Al		M	Dy	< 0.02419	O	Li	0.00166	M	Pr	< 0.00121	M	Te	< 0.12095
M	Sb	< 0.00202	M	Er	< 0.02016	M	Lu	< 0.00161	M	Re	< 0.00403	M	Tb	< 0.00121
M	As	< 0.04032	M	Eu	< 0.01210	O	Mg	0.00685	M	Rh	< 0.00403	M	Tl	< 0.00403
M	Ba	< 0.04032	M	Gd	< 0.00403	M	Mn	< 0.01613	M	Rb	< 0.00403	M	Th	< 0.00403
O	Be	< 0.00017	M	Ga	< 0.00403	O	Hg	< 0.00700	M	Ru	< 0.00806	M	Tm	< 0.00161
M	Bi	< 0.00161	M	Ge	< 0.02419	M	Mo	< 0.00806	M	Sm	< 0.00403	M	Sn	< 0.02016
O	B	0.00975	M	Au	< 0.01210	M	Nd	< 0.00806	M	Sc	< 0.04032	O	Ti	0.00705
M	Cd	< 0.01210	M	Hf	< 0.00806	O	Ni	< 0.00600	M	Se	< 0.03225	M	W	< 0.04032
O	Ca	0.10166	M	Ho	< 0.00202	M	Nb	< 0.00202	O	Si	0.07884	M	U	< 0.00806
M	Ce	< 0.02016	O	In	< 0.03000	n	Os		M	Ag	< 0.00806	M	V	< 0.00806
M	Cs	< 0.00121	M	Ir	< 0.02016	M	Pd	< 0.02016	O	Na	0.06639	M	Yb	< 0.00403
O	Cr	0.00581	O	Fe	0.00954	O	P	< 0.03000	M	Sr	< 0.00202	M	Y	< 0.16126
M	Co	< 0.01210	M	La	< 0.00202	M	Pt	< 0.00806	O	S	< 0.10000	O	Zn	0.07676
M	Cu	< 0.02419	M	Pb	< 0.01210	O	K	0.01992	M	Ta	< 0.02822	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 - 26.98154; +3; 6; $Al(H_2O)_6^{3+}$

Chemical Compatibility - Soluble in HCl, HNO_3, HF and H_2SO_4. Avoid neutral media. Soluble in strongly basic NaOH forming the $Al(OH)_4(H_2O)_2^-$ species. Stable with most metals and inorganic anions. The phosphate is insoluble in water and only slightly soluble in acid.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Al Containing Samples (Preparation and Solution) - Metal (Best dissolved in HCl / HNO_3); α- Al_2O_3 (Na_2CO_3 fusion in Pt); γ- Al_2O_3 (Soluble in acids such as HCl); Ores (Carbonate fusion in Pt followed by HCl dissolution); Organic Matrices (sulfuric/peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppm concs.)
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	Mg, 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+	$^{13}C^{14}N$, $^{12}C^{15}N$, $^{1}H^{13}C^{14}N$, $^{11}B^{16}O$, $^{54}Cr^{2+}$, $^{54}Fe^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS 2 of 2
DATE RECEIVED: 09/01/04
DATE EXPIRED: 10/01/2005 VOS
DATE OPENED: 09/01/04
INORG: 4762 PO: F53434

010243

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 **IV Shelf Life** - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 **Expiration Date** - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 23, 2004

Expiration Date:

EXPIRES
1 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010244

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Calcium in 1.4% (abs) HNO_3**

Catalog Number:	CGCA10-1, CGCA10-2, and CGCA10-5
Lot Number:	**X-CA03030**
Starting Material:	CaO
Starting Material Purity (%):	99.999155
Starting Material Lot No	C27L01
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/27/05
DATE EXPIRED: 2/1/06 OK
DATE OPENED: 1/28/05
INORG: 4988 PO: E55133

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,035 ± 24 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:

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

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

$(\bar{x})$ = 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** **10,035 ± 24 µg/mL**
EDTA NIST SRM 928 Lot Number: 392110

Assay Method #2 **10,046 ± 65 µg/mL**
ICP Assay NIST SRM 3109a Lot Number: 000622

1 of 4
4988

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00069	M Dy < 0.04098	O Li < 0.00002	M Pr < 0.00205	M Te < 0.20492
M Sb < 0.00342	M Er < 0.03415	M Lu < 0.00273	M Re < 0.00683	M Tb < 0.00205
M As < 0.06831	M Eu < 0.02049	O Mg 0.05295	M Rh < 0.00683	M Tl < 0.00683
O Ba 0.00065	M Gd < 0.00683	O Mn 0.00038	M Rb < 0.00683	M Th < 0.00683
O Be < 0.00009	M Ga < 0.00683	O Hg < 0.01100	M Ru < 0.01366	M Tm < 0.00273
M Bi < 0.00273	M Ge < 0.04098	M Mo < 0.01366	M Sm < 0.00683	M Sn < 0.03415
O B < 0.00054	M Au < 0.02049	M Nd < 0.01366	O Sc < 0.00002	M Ti < 0.34153
O Cd < 0.00450	M Hf < 0.01366	O Ni < 0.00230	O Se < 0.00620	M W < 0.06831
s Ca	M Ho < 0.00342	M Nb < 0.00342	O Si 0.00132	M U < 0.01366
M Ce < 0.03415	O In < 0.00200	n Os	M Ag < 0.01366	O V < 0.00090
M Cs < 0.00205	M Ir < 0.03415	M Pd < 0.03415	O Na 0.01000	M Yb < 0.00683
O Cr 0.00103	O Fe < 0.00110	O P < 0.00480	O Sr 0.03530	M Y < 0.27323
O Co < 0.00120	M La < 0.00342	M Pt < 0.01366	O S 0.00412	O Zn 0.02353
O Cu < 0.00400	M Pb < 0.02049	O K < 0.00170	M Ta < 0.04782	M Zr < 0.03415

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

2 of 4
4988

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 40.078; +2; 6; $Ca(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl and HNO_3. Avoid H_2SO_4, HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

Ca Containing Samples (Preparation and Solution) - Metal (best dissolved in diluted HNO_3); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (dry ash and dissolution in dilute HCl. Do not heat when dissolving to avoid precipitation of SiO_2) .The oxide, hydroxide, carbonate, phosphate, and fluoride of calcium are soluble in % levels of HCl or HNO_3. The sulfates (gypsum, anhydrite, etc.), certain silicates and complex compounds require fusion with Na_2CO_3 followed by HCl / water dissolution. Contamination is a very real problem when analyzing for trace levels.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe 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, $^{28}Si^{16}O$, $^{44}Sr^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

010247

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / 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 20, 2004

Expiration Date: EXPIRES 1 FEB 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Malda, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Iron in 4.8% (abs) HNO_3**

Catalog Number:	CGFE10-1, CGFE10-2, and CGFE10-5
Lot Number:	**X-FE03041**
Starting Material:	Fe metal
Starting Material Purity (%):	99.998667
Starting Material Lot No	23387
Matrix:	4.8% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006
DATE OPENED: 2/28/05
INORG: 5048 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,041 ± 21 µg/mL

Certified Density: 1.061 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
$\sum s$ = 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** **10,041 ± 21 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **10,017 ± 40 µg/mL**
ICP Assay NIST SRM 3126a Lot Number: 000606

5048
1 of 4

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00270	M Dy < 0.02528	O Li < 0.00003	M Pr < 0.00126	M Te < 0.12640
M Sb < 0.00211	M Er < 0.02107	M Lu < 0.00169	M Re < 0.00421	M Tb < 0.00126
M As < 0.04213	M Eu < 0.01264	O Mg < 0.00006	M Rh < 0.00421	M Tl < 0.00421
M Ba < 0.04213	M Gd < 0.00421	O Mn < 0.05000	M Rb < 0.00421	M Th < 0.00421
O Be < 0.00005	M Ga < 0.00421	O Hg < 0.01100	M Ru < 0.00843	M Tm < 0.00169
M Bi < 0.00169	i Ge	M Mo < 0.00843	M Sm < 0.00421	M Sn < 0.02107
O B < 0.00090	M Au < 0.01264	M Nd < 0.00843	M Sc < 0.04213	M Ti < 0.21066
M Cd < 0.01264	M Hf < 0.00843	O Ni < 0.00230	M Se < 0.03371	M W < 0.04213
O Ca 0.03107	M Ho < 0.00211	M Nb < 0.00211	O Si 0.01673	M U < 0.00843
M Ce < 0.02107	M In < 0.04213	n Os	M Ag < 0.00843	M V < 0.00843
M Cs < 0.00126	M Ir < 0.02107	M Pd < 0.02107	O Na 0.00956	M Yb < 0.00421
M Cr < 0.02107	s Fe	i P	M Sr < 0.00211	M Y < 0.16853
O Co 0.01195	M La < 0.00211	M Pt < 0.00843	O S < 0.07200	M Zn 0.08761
M Cu < 0.02528	M Pb < 0.01264	O K 0.00239	M Ta < 0.02949	M Zr < 0.02107

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 55.847; +3; 6; $Fe(H_2O)_6^{3+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF and H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Fe Containing Samples (Preparation and Solution) - Metal (Soluble in HCl); Oxides (If the oxide has been at a high temperature then Na_2CO_3 fusion in Pt* followed by HCl dissolution otherwise dissolve in dilute HCl); Ores (See Oxides above using only the fusion approach).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ 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	0.005 / 0.001 µg/mL	1	ion	Hf, Nb
ICP-MS	56 amu	970 ppt	n/a	M+	$^{40}Ar^{16}N^{1}H$, $^{40}Ar^{16}O$, $^{38}Ar^{18}O^{1}H$, $^{38}Ar^{18}O$, $^{37}Cl^{18}O^{1}H$, $^{40}Ca^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

010251

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 22, 2004

Expiration Date: EXPIRES 1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

5048
4 of 4

010252

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Potassium in 1.4% (abs) HNO_3**

Catalog Number:	CGK10-1, CGK10-2, and CGK10-5
Lot Number:	**X-K02116**
Starting Material:	KNO3
Starting Material Purity (%):	99.996753
Starting Material Lot No	K18J19
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 12/02/04
DATE EXPIRED: 12/01/2005 YES
DATE OPENED: 12/02/04
INORG: 4907 PO: F55162

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9957 ± 28 µg/mL

Certified Density: 1.023 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** **10,011 ± 16 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **9957 ± 28 µg/mL**
ICP Assay NIST SRM 3141a Lot Number: 891312

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.02426	O Li < 0.00003	M Pr < 0.00121	M Te < 0.12131
M Sb < 0.00202	M Er < 0.02022	M Lu < 0.00162	M Re < 0.00404	M Tb < 0.00121
M As < 0.04044	M Eu < 0.01213	O Mg 0.00109	M Rh < 0.00404	M Tl < 0.00404
M Ba < 0.04044	M Gd < 0.00404	O Mn < 0.00003	M Rb 0.63001	M Th < 0.00404
O Be < 0.00020	M Ga < 0.00404	O Hg < 0.01500	M Ru < 0.00809	M Tm < 0.00162
M Bi < 0.00162	O Ge < 0.00150	M Mo < 0.00809	M Sm < 0.00404	M Sn < 0.02022
O B < 0.00060	O Au < 0.00300	M Nd < 0.00809	O Sc < 0.00002	O Ti < 0.00070
M Cd < 0.01213	M Hf < 0.00809	O Ni < 0.00230	O Se < 0.05000	M W < 0.04044
O Ca 0.01360	M Ho < 0.00202	M Nb < 0.00202	O Si < 0.00340	M U < 0.00809
M Ce < 0.02022	M In < 0.04044	n Os	M Ag < 0.00809	O V < 0.00090
M Cs 0.00050	M Ir < 0.02022	M Pd < 0.02022	O Na 0.19537	M Yb < 0.00404
M Cr < 0.02022	O Fe 0.00297	O P < 0.00250	M Sr < 0.00202	M Y < 0.16175
M Co < 0.01213	M La < 0.00202	M Pt < 0.00809	O S < 0.07200	O Zn < 0.00020
M Cu < 0.02426	M Pb < 0.01213	S K	M Ta < 0.02831	M Zr < 0.02022

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 ≈ concs.)
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, $^{23}Na^{16}O$, $^{78}Se^{2+}$

010254

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

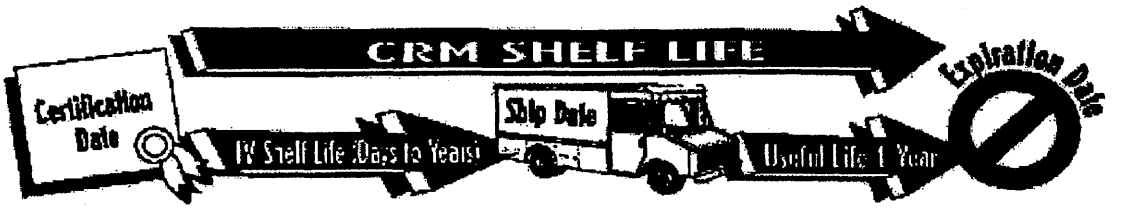
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 30, 2004

Expiration Date:

EXPIRES
1 Dec 2005

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 12/02/04
DATE EXPIRED: 12/01/2005 VOS
DATE OPENED: 12/02/04
INORG: 4907 PO: F55102

010255

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010256

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Magnesium in 1.4% (abs) HNO_3**

Catalog Number:	CGMG10-1, CGMG10-2, and CGMG10-5
Lot Number:	**X-MG03018**
Starting Material:	Mg metal
Starting Material Purity (%):	99.994984
Starting Material Lot No	91191
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 V01
DATE OPENED: 07/29/04
INORG: 4656 PO: F53417

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,039 ± 31 µg/mL

Certified Density: 1.051 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum s$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10,039 ± 31 µg/mL**
ICP Assay NIST SRM 3131a Lot Number: 991107

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

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

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

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

010258

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 24.305; +2; 6; $Mg(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, HNO_3, and H_2SO_4 avoid HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicates, carbonates, hydroxides, oxides, and tungstates in neutral and slightly acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

Mg Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO_3); Oxide (Readily soluble in above compatible aqueous acidic solutions); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	279.553 nm	0.0002 / 0.00003 µg/mL	1	ion	Th
ICP-OES	280.270 nm	0.0003 / 0.00005 µg/mL	1	ion	U, V
ICP-OES	285.213 nm	0.002 / 0.00003 µg/mL	1	atom	U, Hf, Cr, Zr
ICP-MS	24 amu	42 ppt	n/a	M+	$^7Li^{16}O$, $^{48}Ti^{+2}$, $^{48}Ca^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Ps.2 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VPS
DATE OPENED: 07/29/04
INORG: 4656 PO: F53417

010259

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 15, 2004

Expiration Date:

EXPIRES
1 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010260

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Sodium in 1.4% (abs) HNO_3**

Catalog Number:	CGNA10-1, CGNA10-2, and CGNA10-5
Lot Number:	**W-NA03010**
Starting Material:	Na2CO3
Starting Material Purity (%):	99.999819
Starting Material Lot No	42063
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 WS
DATE OPENED: 07/29/04
INORG: 4657 PO: F53417

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,006 ± 6 µg/mL

Certified Density: 1.032 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum s_i$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10,006 ± 6 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **10,019 ± 33 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 990907

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/256522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.00600	O Li < 0.00003	M Pr < 0.00030	M Te < 0.02998
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.00999	M Eu < 0.00300	O Mg 0.00010	M Rh < 0.00100	M Tl < 0.00100
M Ba < 0.00999	M Gd < 0.00100	O Mn < 0.00003	M Rb < 0.00100	M Th < 0.00100
O Be < 0.00020	M Ga < 0.00100	O Hg < 0.01500	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	O Ge < 0.00150	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
O B < 0.00060	O Au < 0.00300	M Nd < 0.00200	O Sc < 0.00002	O Ti < 0.00070
M Cd < 0.00300	M Hf < 0.00200	O Ni < 0.00230	O Se < 0.05000	M W < 0.00999
O Ca 0.00050	M Ho < 0.00050	M Nb < 0.00050	O Si < 0.00340	M U < 0.00200
M Ce < 0.00500	M In < 0.00999	n Os	M Ag < 0.00200	O V < 0.00090
M Cs < 0.00030	M Ir < 0.00500	M Pd < 0.00500	S Na	M Yb < 0.00100
M Cr < 0.00500	O Fe < 0.00110	O P < 0.04000	M Sr < 0.00050	M Y < 0.03997
M Co < 0.00300	M La < 0.00050	M Pt < 0.00200	O S < 0.07200	O Zn 0.00250
O Cu < 0.00140	M Pb < 0.00300	O K 0.04000	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.98977; +1; (6); $Na^{+}(aq)$ largely ionic in nature (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppm.)
ICP-OES	589.595 nm	0.07 / 0.00009 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	588.995 nm	0.03 / 0.006 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	330.237 nm	2.0 / 0.09 µg/mL	1	atom	Pd, Zn
ICP-MS	23 amu	310 ppt	n/a	M'	$^{46}Ti^{+2}$, $^{46}Ca^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 27, 2003

Expiration Date:

EXPIRES
10 2005

INORGANIC LABS/RADCHEM LABS pg. 2 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VOS
DATE OPENED: 07/29/04
INORG: 4657 PO: E53417

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant
Certificate Approved By:	Katalin Le, QC Supervisor
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director

010264

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Barium in 0.1% (abs) HNO_3**

Catalog Number:	CGBA1-1, CGBA1-2, and CGBA1-5
Lot Number:	**X-BA02027**
Starting Material:	Ba(NO3)2
Starting Material Purity (%):	99.999730
Starting Material Lot No	21879
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/18/05
DATE EXPIRED: 3/1/2006 DR
DATE OPENED: 2/18/05
INORG: 5027 PO: F55142

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum s$ = 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**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **996 ± 4 µg/mL**
ICP Assay NIST SRM 3104a Lot Number: 992907

1 of 4
5027

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00011	M Dy < 0.01269	O Li < 0.00400	M Pr < 0.00063	M Te < 0.06343
M Sb < 0.00106	M Er < 0.01057	M Lu < 0.00085	M Re < 0.00211	O Tb < 0.00390
M As < 0.02114	O Eu < 0.00040	O Mg 0.00009	M Rh < 0.00211	M Tl < 0.00211
s Ba	O Gd < 0.00052	M Mn < 0.00846	M Rb < 0.00211	M Th < 0.00211
M Be < 0.00106	M Ga < 0.00211	O Hg < 0.01200	M Ru < 0.00423	M Tm < 0.00085
M Bi < 0.00085	M Ge < 0.01269	M Mo < 0.00423	O Sm < 0.00071	M Sn < 0.01057
M B < 0.14800	M Au < 0.00634	O Nd < 0.00330	M Sc < 0.02114	M Ti < 0.10571
M Cd < 0.00634	M Hf < 0.00423	M Ni < 0.01691	M Se < 0.01691	M W < 0.02114
O Ca 0.00072	M Ho < 0.00106	M Nb < 0.00106	O Si < 0.00340	M U < 0.00423
M Ce < 0.01057	M In < 0.02114	n Os	M Ag < 0.00423	M V < 0.00423
M Cs < 0.00063	M Ir < 0.01057	M Pd < 0.01057	M Na < 0.21142	M Yb < 0.00211
M Cr < 0.01057	O Fe 0.00062	O P < 0.00260	O Sr 0.00379	O Y 0.00040
M Co < 0.00634	M La < 0.00106	M Pt < 0.00423	O S < 0.02500	O Zn < 0.00039
M Cu < 0.01269	M Pb 0.00020	O K < 0.00180	O Ta < 0.00690	M Zr < 0.01057

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

2 of 4
5027

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 137.33; +2; 6; $Ba(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_2SO_4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, iodate, molybdate, sulfite and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1 -10,000 ppm solutions chemically stable for years in 1-3.5% HNO_3 / LDPE container.

Ba Containing Samples (Preparation and Solution) - Metal(is best dissolved in diluted HNO_3). Ores(Carbonate fusion in Pt[a] followed by HCl dissolution. If sulfate is present dissolve the fusedate using HCl /tartaric acid to prevent $BaSO_4$ precipitate). Organic Matrices (dry ash and dissolve in dilute HCl.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES 455.403 nm	0.002 / 0.0001 µg/mL	1	ion	Zr, U
ICP-OES 233.527 nm	0.004 / 0.0003 µg/mL	1	ion	
ICP-OES 230.424 nm	0.004 / 0.0005 µg/mL	1	ion	Mo, Ir, Co
ICP-MS 138 amu	1 ppt	n/a	M[+]	$^{120}Sn^{18}O$, $^{122}Te^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

3064
5027

010267

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 05, 2004

Expiration Date:

EXPIRES
1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

4 of 4
5087

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Beryllium in 2% (abs) HNO_3**

Catalog Number:	CGBE1-1, CGBE1-2, and CGBE1-5
Lot Number:	**W-BE01104**
Starting Material:	Be(OOCCH3)2
Starting Material Purity (%):	99.999897
Starting Material Lot No	01-10-01
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS pg 1 of 2
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VDS
DATE OPENED: 06/01/04
INORG: 4592 PO: F53393

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1007 ± 4 µg/mL

Certified Density: 1.023 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1007 ± 4 µg/mL**
ICP Assay NIST SRM 3105a Lot Number: 892707

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00800	M	Dy	< 0.01305	O	Li	< 0.00002	M	Pr	< 0.00065	M	Te	< 0.06525
M	Sb	< 0.00109	M	Er	< 0.01087	M	Lu	< 0.00087	M	Re	< 0.00218	M	Tb	< 0.00065
M	As	< 0.02175	M	Eu	< 0.00652	O	Mg	< 0.00003	M	Rh	< 0.00218	M	Tl	< 0.00218
M	Ba	< 0.02175	M	Gd	< 0.00218	O	Mn	< 0.00002	M	Rb	< 0.00218	M	Th	< 0.00218
s	Be		M	Ga	< 0.00218	O	Hg	< 0.01500	M	Ru	< 0.00435	M	Tm	< 0.00087
M	Bi	< 0.00087	M	Ge	< 0.01305	M	Mo	< 0.00435	M	Sm	< 0.00218	M	Sn	< 0.01087
O	B	< 0.01200	M	Au	< 0.00652	M	Nd	< 0.00435	O	Sc	< 0.00009	M	Ti	< 0.10874
M	Cd	< 0.00652	M	Hf	< 0.00435	M	Ni	< 0.65245	M	Se	< 0.01740	M	W	< 0.02175
O	Ca	0.00164	M	Ho	< 0.00109	M	Nb	< 0.00109	O	Si	0.00649	M	U	< 0.00435
M	Ce	< 0.01087	M	In	< 0.02175	n	Os		M	Ag	< 0.00435	M	V	< 0.00435
M	Cs	< 0.00065	M	Ir	< 0.01087	M	Pd	< 0.01087	O	Na	0.00368	M	Yb	< 0.00218
O	Cr	< 0.00900	O	Fe	0.00268	n	P		M	Sr	< 0.00109	M	Y	< 0.08699
M	Co	< 0.00652	M	La	< 0.00109	M	Pt	< 0.00435	i	S		M	Zn	< 0.04350
M	Cu	< 0.01305	M	Pb	< 0.00652	O	K	< 0.10000	M	Ta	< 0.01522	M	Zr	< 0.01087

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 9.01218; +2; 4; $Be'(H_2O)_4^{+2}$
Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.
Stability - 2-100 ppb levels stable for months in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10 % HNO_3 / LDPE container.
Be Containing Samples (Preparation and Solution) - Metal (is best dissolved in diluted H_2SO_4.) BeO (boiling nitric, hydrochloric, or sulfuric acids or $KHSO_4$ fusion); Ores (H_2SO_4/HF digestion or carbonate fusion in Pt[3]); 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 or obvious.)
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+	

010270

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT). Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 08, 2004

Expiration Date: EXPIRES 1 2005

INORGANIC LABS/RADCHEM LABS Pg. 3 of 3
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VOS
DATE OPENED: 06/01/04
INORG: 4593 PO: F53393

010271

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, Production Manager
Certificate Approved By:	Katalin Le, QC Manager
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director

010272

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Chromium (+3) in 1.4% (abs) HNO_3**

Catalog Number:	CGCR(3)1-1, CGCR(3)1-2, and CGCR(3)1-5
Lot Number:	**X-CR02137**
Starting Material:	Cr pieces
Starting Material Purity (%):	99.997404
Starting Material Lot No	F02N38
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 12/03/04
DATE EXPIRED: 12/01/2005 VOS
DATE OPENED: 12/03/04
INORG: 4906 PO: F55102

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 2 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

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

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum s$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3112a Lot Number: 990607

Assay Method #2 **1004 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00120	M Dy < 0.02432	O Li < 0.00002	M Pr < 0.00122	M Te < 0.12159
M Sb < 0.00203	M Er < 0.02027	M Lu < 0.00162	M Re < 0.00405	M Tb < 0.00122
M As < 0.04053	M Eu < 0.01216	O Mg < 0.00030	M Rh < 0.00405	M Tl < 0.00405
M Ba < 0.04053	M Gd < 0.00405	M Mn < 0.01621	M Rb < 0.00405	M Th < 0.00405
M Be < 0.00203	M Ga < 0.00405	O Hg < 0.01500	M Ru < 0.00811	M Tm < 0.00162
M Bi < 0.00162	M Ge < 0.02432	M Mo < 0.00811	M Sm < 0.00405	M Sn < 0.02027
O B < 0.01000	M Au < 0.01216	M Nd < 0.00811	M Sc < 0.04053	O Ti < 0.00100
M Cd < 0.01216	M Hf < 0.00811	O Ni < 0.02000	M Se < 0.03242	M W < 0.04053
O Ca 0.01818	M Ho < 0.00203	M Nb < 0.00203	O Si < 0.20000	M U < 0.00811
M Ce < 0.02027	M In < 0.04053	n Os	M Ag < 0.00811	O V < 0.02000
M Cs < 0.00122	M Ir < 0.02027	M Pd < 0.02027	O Na 0.00647	M Yb < 0.00405
s Cr	O Fe < 0.01000	O P < 0.04000	M Sr < 0.00203	M Y < 0.16212
M Co < 0.01216	M La < 0.00203	M Pt < 0.00811	i S	O Zn < 0.00400
M Cu < 0.02432	M Pb 0.00089	O K < 0.00180	M Ta < 0.02637	M Zr < 0.02027

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

010274

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 - 51.9961; +3; 6; $Cr(H_2O)_6^{3+}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most 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.

Cr Containing Samples (Preparation and Solution) - Metal (soluble in HCl); Oxides/Ores (Chrome ore/oxides are very difficult to dissolve. The following procedures [A-D] are commonly used:

A. Fusion with $KHSO_4$ and extraction with hot KCl. The residue fused with Na_2CO_3 and $KClO_3$, 3:1.

B. Fusion with NaKSO4 and NaF, 2:1.

C. Fusion with magnesia or lime and sodium or potassium carbonates, 4:1.

D. Fusion with Na_2O_2 or NaOH and KNO_3 or NaOH and Na_2O_2.

Nickel, iron, copper, or silver crucibles should be used for **D**. Platinum may be used for **A, B and C**;

Organic Matrices (Ash at 450°C followed by one of the fusion methods above or sulfuric/hydrogen peroxide acid digestions **may** be applicable to **non oxide** containing samples).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	205.552 nm	0.006 / 0.0008 µg/mL	1	ion	Os
ICP-OES	284.325 nm	0.008 / 0.0007 µg/mL	1	ion	
ICP-OES	276.654 nm	0.01 / 0.001 µg/mL	1	ion	Cu, Ta, V
ICP-MS	52 amu	40 ppt	n/a	M+	$^{35}S^{16}O$, $^{36}Ar^{16}O$ - The ^{52}Cr, ^{53}Cr, ^{54}Cr lines suffer from many more potential interferences from sulfur, chlorine and argon compounds of oxygen, nitrogen and carbon.

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

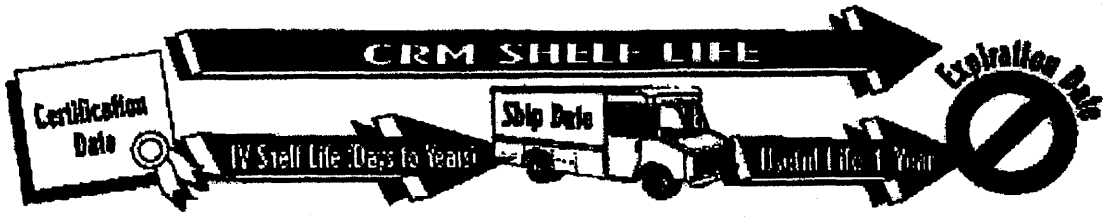
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 12/02/04
DATE EXPIRED: 12/01/2005 VOS
DATE OPENED: 12/02/04
INORG: 4906 PO: E55102

010275

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 16, 2004

Expiration Date:

EXPIRES
1 Sep 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

010276

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Copper In 2% (abs) HNO_3**

Catalog Number:	CGCU1-1, CGCU1-2, and CGCU1-5
Lot Number:	**X-CU02067**
Starting Material:	Cu shot
Starting Material Purity (%):	99.999437
Starting Material Lot No	K09C13
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 2/1/2006
DATE OPENED: 2/28/05
INORG: 5049 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1003 ± 3 µg/mL

Certified Density: 1.015 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 ($\bar{x}$) = $\frac{\sum x_i}{n}$

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum s$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1003 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 392110

Assay Method #2 **1001 ± 2 µg/mL**
ICP Assay NIST SRM 3114 Lot Number: 891811

5049
1 of 4

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/256522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.03027	O	Li	< 0.00002	M	Pr	< 0.00151	M	Te	< 0.15134
M	Sb	< 0.00252	M	Er	< 0.02522	M	Lu	< 0.00202	M	Re	< 0.00504	M	Tb	< 0.00151
M	As	< 0.05045	M	Eu	< 0.01513	O	Mg	0.00001	M	Rh	< 0.00504	M	Tl	< 0.00504
M	Ba	< 0.05045	M	Gd	< 0.00504	M	Mn	< 0.02018	M	Rb	< 0.00504	M	Th	< 0.00504
M	Be	< 0.00252	M	Ga	< 0.00504	O	Hg	< 0.01500	M	Ru	< 0.01009	M	Tm	< 0.00202
M	Bi	< 0.00202	M	Ge	< 0.03027	M	Mo	< 0.01009	M	Sm	< 0.00504	O	Sn	0.00439
M	B	< 0.35312	M	Au	< 0.01513	M	Nd	< 0.01009	M	Sc	< 0.05045	M	Ti	< 0.25223
M	Cd	< 0.01513	M	Hf	< 0.01009	M	Ni	< 0.04036	M	Se	< 0.04036	M	W	< 0.05045
O	Ca	0.00011	M	Ho	< 0.00252	M	Nb	< 0.00252	O	Si	< 0.00340	M	U	< 0.01009
M	Ce	< 0.02522	M	In	< 0.05045	n	Os		M	Ag	< 0.01009	O	V	< 0.00300
M	Cs	< 0.00151	M	Ir	< 0.02522	M	Pd	< 0.02522	O	Na	0.00044	M	Yb	< 0.00504
M	Cr	< 0.02522	O	Fe	0.00054	O	P	< 0.00260	M	Sr	< 0.00252	M	Y	< 0.20178
M	Co	< 0.01513	M	La	< 0.00252	M	Pt	< 0.01009	n	S		M	Zn	< 0.10089
s	Cu		M	Pb	0.00050	O	K	< 0.00180	M	Ta	< 0.03531	M	Zr	< 0.02522

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

5649
284

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.546; +2; 6; $Cu(H_2O)_6^{2+}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Cu Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	324.754 nm	0.06/.001 µg/mL	1	atom	Nb, U, Th, Mo, Hf
ICP-OES	224.700 nm	0.01/.001µg/mL	1	ion	Pb, Ir, Ni, W
ICP-OES	219.958 nm	0.01/.002 µg/mL	1	atom	Th, Ta, Nb, U, Hf
ICP-MS	63 amu	10 ppt	n/a	M+	$^{23}Al^{40}Na$ $^{47}Ti^{16}O$, $^{14}N^{12}C^{37}Cl$, $^{16}O^{12}C^{35}Cl$, $^{40}Ca^{16}O$, $^{23}Na^{40}Ca$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

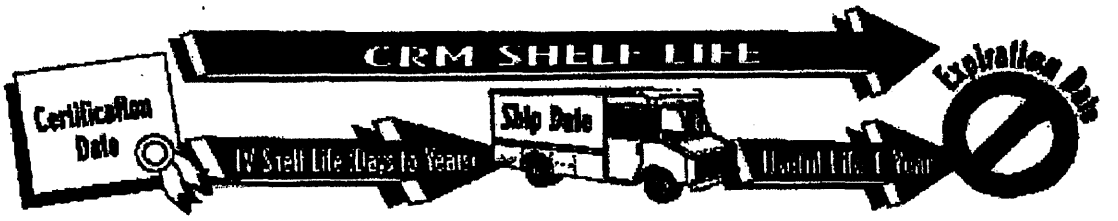
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: August 16, 2004

Expiration Date: EXPIRES 1 AUG 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

010280

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Nickel in 1.4% (abs) HNO3**

Catalog Number:	CGNI1-1, CGNI1-2, and CGNI1-5
Lot Number:	**X-NI02032**
Starting Material:	Ni pieces
Starting Material Purity (%):	99.999371
Starting Material Lot No	L06L02
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006
DATE OPENED: 3/28/05
INORG: 5043 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **999 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1002 ± 3 µg/mL**
ICP Assay NIST SRM 3136 Lot Number: 000612

5043
1 of 1

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00938	M	Dy	< 0.06577	O	Li	< 0.00006	M	Pr	< 0.00329	M	Te	< 0.32886
M	Sb	< 0.00548	M	Er	< 0.05481	M	Lu	< 0.00439	M	Re	< 0.01096	M	Tb	< 0.00329
O	As	< 0.01689	M	Eu	< 0.03289	O	Mg	0.00002	M	Rh	< 0.01096	M	Tl	< 0.01096
M	Ba	< 0.10962	M	Gd	< 0.01096	M	Mn	< 0.04385	M	Rb	< 0.01096	M	Th	< 0.01096
O	Be	< 0.00626	M	Ga	< 0.01096	O	Hg	< 0.03441	M	Ru	< 0.02192	M	Tm	< 0.00439
M	Bi	< 0.00439	M	Ge	< 0.06577	M	Mo	< 0.02192	M	Sm	< 0.01096	M	Sn	< 0.05481
O	B	< 0.03097	M	Au	< 0.03289	M	Nd	< 0.02192	M	Sc	< 0.10962	M	Ti	< 0.54811
M	Cd	< 0.03289	M	Hf	< 0.02192	S	Ni		O	Se	< 0.01877	M	W	< 0.10962
O	Ca	< 0.01157	M	Ho	< 0.00548	M	Nb	< 0.00548	O	Si	0.00188	M	U	< 0.02192
M	Ce	< 0.05481	M	In	< 0.10962	n	Os		M	Ag	< 0.02192	M	V	< 0.02192
M	Cs	< 0.00329	M	Ir	< 0.05481	M	Pd	< 0.05481	O	Na	0.00102	M	Yb	< 0.01096
M	Cr	< 0.05481	O	Fe	0.00156	O	P	< 0.31280	M	Sr	< 0.00548	M	Y	< 0.43849
O	Co	0.00182	M	La	< 0.00548	M	Pt	< 0.02192	O	S	< 0.07820	M	Zn	0.00189
M	Cu	< 0.06577	M	Pb	< 0.03289	O	K	0.00043	M	Ta	< 0.07674	M	Zr	< 0.05481

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69; +2; 6; $Ni(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Ni Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3) Oxides (Soluble in HCl) Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≠ 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'	$^{44}Ca^{16}O^{1}H$, $^{44}Ca^{16}O$, $^{23}Na^{37}Cl$

5043
2 of 4

010282

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 27, 2004

Expiration Date: EXPIRES 1 APR 2006

5043
3 of 4

010283

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul Gaines

5043
4 of 4

010284

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Cadmium in 2% (abs) HNO_3**

Catalog Number:	CGCD1-1, CGCD1-2, and CGCD1-5
Lot Number:	**Y-QCD01109**
Starting Material:	Cd shot
Starting Material Purity (%):	99.998904
Starting Material Lot No	C14M30
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2005 DR
DATE OPENED: 2/28/05
INORG: 5041 PO: F55147

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 3 µg/mL

Certified Density: 1.013 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 $(\pm) = 2\left[\frac{\sum s_i^2}{(n)^{1/2}}\right]^{1/2}$

$(\bar{x})$ = 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**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1000 ± 3 µg/mL**
ICP Assay NIST SRM 3108 Lot Number: 890312

5041
1 of 4

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.01191	O	Li	< 0.00002	M	Pr	< 0.00060	O	Te	< 0.00700
M	Sb	0.00039	M	Er	< 0.00993	M	Lu	< 0.00079	M	Re	< 0.00199	M	Tb	< 0.00060
M	As	< 0.01985	M	Eu	< 0.00596	O	Mg	0.00002	M	Rh	< 0.00199	M	Tl	< 0.00199
M	Ba	< 0.01985	M	Gd	< 0.00199	M	Mn	< 0.00794	M	Rb	< 0.00199	M	Th	< 0.00199
M	Be	< 0.00099	M	Ga	< 0.00199	O	Hg	< 0.01200	M	Ru	< 0.00397	M	Tm	< 0.00079
M	Bi	< 0.00079	M	Ge	< 0.01191	M	Mo	< 0.00397	M	Sm	< 0.00199	M	Sn	< 0.00993
O	B	< 0.00900	M	Au	< 0.00596	M	Nd	< 0.00397	M	Sc	< 0.01985	M	Ti	< 0.09925
s	Cd		M	Hf	< 0.00397	O	Ni	< 0.00300	M	Se	< 0.01588	M	W	< 0.01985
O	Ca	0.00378	M	Ho	< 0.00099	M	Nb	< 0.00099	O	Si	< 0.00340	M	U	< 0.00397
M	Ce	< 0.00993	O	In	< 0.00200	n	Os		M	Ag	< 0.00397	M	V	< 0.00397
M	Cs	< 0.00060	M	Ir	< 0.00993	M	Pd	0.00691	M	Na	< 0.19849	M	Yb	< 0.00199
M	Cr	< 0.00993	O	Fe	< 0.00110	O	P	< 0.00300	M	Sr	< 0.00099	M	Y	< 0.07940
M	Co	< 0.00596	M	La	< 0.00099	M	Pt	< 0.00397	O	S	< 0.03000	O	Zn	0.00040
M	Cu	< 0.01191	M	Pb	< 0.00596	O	K	0.00015	M	Ta	< 0.01389	M	Zr	< 0.00993

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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 r
ren oved for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Formin Solution - 112.41; +2; 4 ;Cd₂(OH) (aq)$^{3+}$ and Cd(C
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, and HF. Avoid basic media forming insoluble carbonate and hyc
most metals and inorganic anions in acidic media. The sulfide, carbonate, oxalate, phosphate, and cyanide are insoluble i
in HCl, HNO_3 and NH₄OH. The chloride, bromide and iodide are soluble in water. CdI_2 is one of the fewiodides soluble i
com pounds of Cd are soluble in excess NaI, due to the formation of the complex ion, CdI_4^{2-}.
Stability - 2-100 ppb levels stable for months in 1% HNO_3/ LDPE container. 1-10,000 ppm solutions chemically stable fo
HNO_3/LDPE container.
Cd Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl or HNO_3); Ores
HNO_3 then take to fumes with H_2SO_4. The silica and lead sulfate are filtered off after addition of water.); Organic based (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)
ICP-OES	214.438 nm	0.003 / 0.0003 µg/mL	1	ion	Pt, Ir
ICP-OES	228.802 nm	0.003 / 0.0003 µg/mL	1	atom	Co, Ir, As, Pt
ICP-OES	226.502 nm	0.003 / 0.0003 µg/mL	1	ion	Ir
ICP-MS	111 amu	11 ppt	n/a	M^+	$^{95}Mo^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

010287

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 19, 2005

Expiration Date: EXPIRES 1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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4064

010288

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Cobalt in 2% (abs) HNO_3**

Catalog Number:	CGCO1-1, CGCO1-2, and CGCO1-5
Lot Number:	**X-CO01123**
Starting Material:	Co powder
Starting Material Purity (%):	99.999403
Starting Material Lot No	23171
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/06 DR
DATE OPENED: 2/28/05
INORG: 5044 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1003 ± 2 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
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1007 ± 5 µg/mL**
ICP Assay NIST SRM 3181 Lot Number: 000630

Assay Method #2 **1003 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

5044
1 of 4

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00030	M Dy < 0.02394	O Li 0.00001	M Pr < 0.00120	M Te < 0.11970
M Sb < 0.00200	M Er < 0.01995	M Lu < 0.00160	M Re < 0.00399	M Tb < 0.00120
O As < 0.10000	M Eu < 0.01197	O Mg 0.00128	M Rh < 0.00399	M Tl < 0.00399
M Ba < 0.03990	M Gd < 0.00399	O Mn < 0.00400	M Rb < 0.00399	M Th < 0.00399
M Be < 0.00200	M Ga < 0.00399	O Hg < 0.05000	M Ru < 0.00798	M Tm < 0.00160
M Bi 0.00020	M Ge < 0.02394	M Mo < 0.00798	M Sm < 0.00399	M Sn < 0.01995
O B 0.00103	M Au < 0.01197	M Nd < 0.00798	M Sc < 0.03990	M Ti < 0.19949
M Cd < 0.01197	M Hf < 0.00798	O Ni < 0.02000	M Se < 0.03192	M W < 0.03990
O Ca 0.00168	M Ho < 0.00200	M Nb < 0.00200	O Si < 0.00400	M U < 0.00798
M Ce < 0.01995	M In < 0.03990	I Os	M Ag < 0.00798	M V < 0.00798
M Cs < 0.00120	M Ir < 0.01995	M Pd < 0.01995	O Na 0.00095	M Yb < 0.00399
M Cr 0.00080	O Fe < 0.00400	n P	M Sr < 0.00200	M Y < 0.15960
s Co	M La < 0.00200	M Pt < 0.00798	n S	O Zn 0.00020
M Cu 0.00023	M Pb 0.00150	O K 0.00048	M Ta < 0.02793	M Zr < 0.01995

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+	$^{42}Ca^{16}O^{1}H$, $^{40}Ar^{18}O^{1}H$, $^{40}Ar^{19}Na$, $^{43}Ca^{16}O$, $^{24}Mg^{35}Cl$

5044
2of4

010290

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 30, 2004

Expiration Date: EXPIRES 1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant
Certificate Approved By:	Katalin Le, QC Manager
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director

010292

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Manganese in 2% (abs) HNO_3**

Catalog Number:	CGMN1-1, CGMN1-2, and CGMN1-5
Lot Number:	**X-MN02037**
Starting Material:	Mn pieces
Starting Material Purity (%):	99.995300
Starting Material Lot No	21563
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/27/05
DATE EXPIRED: 2/1/06 DR
DATE OPENED: 11/28/05
INORG: 4989 PO: F55133

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1006 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

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

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

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

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

Σs_i = The summation of all significant estimated errors.
(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1006 ± 2 µg/mL**
ICP Assay NIST SRM 3132 Lot Number: 890903

Assay Method #2 **1008 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

1 of 4
4989

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00221	M Dy < 0.02471	O Li 0.00020	M Pr < 0.00124	M Te < 0.12355
M Sb < 0.00206	M Er < 0.02059	M Lu < 0.00165	M Re < 0.00412	M Tb < 0.00124
M As < 0.04118	M Eu < 0.01236	O Mg 0.03350	M Rh < 0.00412	M Tl < 0.00412
M Ba < 0.04118	M Gd < 0.00412	s Mn	M Rb < 0.00412	M Th < 0.00412
M Be < 0.00206	O Ga < 0.05000	i Hg	M Ru < 0.00824	M Tm < 0.00165
M Bi < 0.00165	O Ge < 0.00300	M Mo < 0.00824	M Sm < 0.00412	M Sn < 0.02059
O B 0.00295	M Au < 0.01236	M Nd < 0.00824	M Sc < 0.04118	M Ti < 0.20592
M Cd < 0.01236	M Hf < 0.00824	M Ni < 0.03295	M Se < 0.03295	M W < 0.04118
O Ca 0.00340	M Ho < 0.00206	M Nb < 0.00206	O Si 0.00275	M U < 0.00824
M Ce < 0.02059	M In < 0.04118	n Os	M Ag < 0.00824	M V < 0.00824
M Cs < 0.00124	M Ir < 0.02059	M Pd < 0.02059	O Na 0.00225	M Yb < 0.00412
M Cr < 0.02059	O Fe < 0.01000	i P	M Sr < 0.00206	M Y < 0.16474
M Co < 0.01236	M La < 0.00206	M Pt < 0.00824	i S	O Zn 0.00250
M Cu < 0.02471	M Pb < 0.01236	O K 0.00105	M Ta < 0.02883	M Zr < 0.02059

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.9380; +2; 6; $Mn(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3/ LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO_3/LDPE container.
Mn Containing Samples (Preparation and Solution) - Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H_2SO_4 and heat to SO_3 fumes - dense white fumes).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES	257.610nm	0.0014 / 0.00002 µg/mL	1	ion	Ce, W, Re
ICP-OES	259.373 nm	0.0016 / 0.00002 µg/mL	1	ion	U, Ta, Mo, Fe, Nb
ICP-OES	260.569 nm	0.0021 / 0.00002 µg/mL	1	ion	Co
ICP-MS	55 amu	10 ppt	n/a	M$^+$	$^{40}Ar^{14}N^1H$, $^{39}K^{16}O$, $^{37}Cl^{18}O$, $^{40}Ar^{15}N$, $^{38}Ar^{17}O$, $^{40}Ar^{18}O^1H$, $^{38}Ar^{16}O^1H$, $^{37}Cl^{16}O^1H$, $^{23}Na^{32}S$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

3 of 4
4989

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010295

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 13, 2004

Expiration Date: EXPIRES 1[illegible]2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	J.A. Struthers
Certificate Approved By:	Katalin Le, QC Manager	K. Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R. Gaines

4 of 4
4989

010296

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Vanadium in 1.4% (abs) HNO_3**

Catalog Number:	CGV1-1, CGV1-2, and CGV1-5
Lot Number:	**X-QV01102**
Starting Material:	V_2O_5
Starting Material Purity (%):	99.986532
Starting Material Lot No	Stractor 46
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Page 1 of 3
DATE RECEIVED: 12/9/2004
DATE EXPIRED: 01/01/2006 KE
DATE OPENED: 12/9/04
INORG: 4916 PO: F55103 VOS 12/15/04

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 999 ± 3 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum s$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

· This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **999 ± 3 µg/mL**
ICP Assay NIST SRM 3165 Lot Number: 992706

Assay Method #2 **1007 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00600	M Dy < 0.00597	O Li < 0.00002	M Pr < 0.00030	M Te < 0.02984
M Sb 0.04543	M Er < 0.00497	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.00995	M Eu < 0.00298	O Mg < 0.10000	M Rh < 0.00100	M Tl < 0.00100
M Ba < 0.00995	M Gd < 0.00100	M Mn 0.00069	M Rb < 0.00100	M Th < 0.00100
M Be < 0.00050	M Ga < 0.00100	O Hg < 0.01200	M Ru < 0.00199	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00597	M Mo 0.01481	M Sm < 0.00100	M Sn < 0.00497
O B < 0.04000	M Au < 0.00298	M Nd < 0.00199	M Sc < 0.00995	M Ti < 0.04973
M Cd < 0.00298	M Hf < 0.00199	M Ni < 0.07957	M Se < 0.00796	M W < 0.00995
O Ca 0.00596	M Ho < 0.00050	M Nb < 0.00050	O Si 0.04964	M U < 0.00199
M Ce < 0.00497	M In < 0.00995	n Os	M Ag < 0.00199	s V
M Cs < 0.00030	M Ir < 0.00497	M Pd < 0.00497	O Na < 0.01000	M Yb < 0.00100
O Cr < 0.10000	O Fe 0.08936	O P < 0.10000	M Sr < 0.00050	M Y < 0.03979
O Co < 0.00200	M La < 0.00050	M Pt < 0.00199	n S	M Zn < 0.01989
M Cu < 0.00597	M Pb < 0.00298	O K 0.03276	M Ta < 0.00696	M Zr < 0.00497

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 50.9415; +5; 6; $H_3V_4O_{12}^{3-}$

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4, HF, H_3PO_4 and strong basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

V Containing Samples (Preparation and Solution) - Metal (Fusion with NaOH or KOH in Ni* or Na_2CO_3 / KNO_3); Oxides (V_2O_3 - use HCl, V_2O_4 - use HCl or HNO_3, V_2O_5 - use concentrated acids); Ores (Na_2CO_3 / KNO_3 in Pt* ***caution - nitrates attack Pt*** followed by water extraction of fusesite); Organic Matrices (Ash at 450 °C followed by dissolving according to V_2O_5 above).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES 309.311 nm	0.005 / 0.001 µg/mL	1	ion	Mg, U, Th
ICP-OES 292.402 nm	0.006 / 0.001 µg/mL	1	ion	Th
ICP-OES 290.882 nm	0.008 / 0.0008 µg/mL	1	atom	Hf, Nb
ICP-MS 51 amu	4 ppt	n/a	M+	$^{35}S^{16}O^1H$, $^{35}Cl^{16}O$, $^{35}Ar^{16}C$, $^{35}Ar^{16}N$, $^{35}Ar^{16}N^1H$, $^{37}Cl^{14}N$, $^{35}S^{16}N$, $^{34}S^{16}O$, $^{34}S^{17}O$, $^{35}Ru^{16}$, $^{35}Pd^{16}$

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

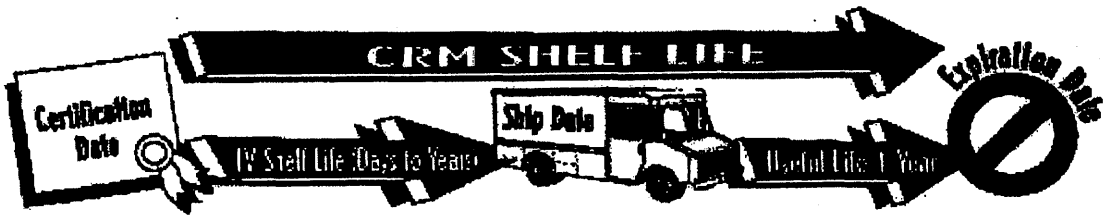
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 12/9/2004
DATE EXPIRED: 01/01/2006 VOS for KE
DATE OPENED: 12/9/04
INORG: 4916 PO: F55102

010299

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 26, 2004

Expiration Date: EXPIRES 01 JAN 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

010300

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.lvstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Zinc in 1.4% (abs) HNO_3**

Catalog Number:	CGZN1-1, CGZN1-2, and CGZN1-5
Lot Number:	**X-ZN02020**
Starting Material:	Zn shot
Starting Material Purity (%):	99.999889
Starting Material Lot No	J17L26
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 12/03/04
DATE EXPIRED: 01/01/2006 VOS
DATE OPENED: 12/07/04
INORG: 4915 PO: E55106

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 2 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
σ_s = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1005 ± 4 µg/mL**
ICP Assay NIST SRM 3168a Lot Number: 001402

Assay Method #2 **1002 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00200	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.

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 interferences.)
ICP-OES 213.856 nm	0.002 / 0.0004 µg/mL	1	atom	Ni, Cu, V
ICP-OES 202.548 nm	0.004 / 0.0002 µg/mL	1	ion	Nb, Cu, Co, Hf
ICP-OES 206.200 nm	0.006 / 0.0006 µg/mL	1	ion	Sb, Ta, Bi, Os
ICP-MS 66 amu	7 ppt	n/a	M^+	$^{48}Ti^{16}O$, $^{54}Cr^{16}O$, $^{50}V^{16}O$, $^{32}S^{16}O_2$, $^{32}S^{16}O^{16}O$, $^{32}S^{16}O_2$, $^{32}S^{16}O^{16}O$, $^{32}S^{34}S$, $^{33}S_2$

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)

INORGANIC LABS/RADCHEM LABS Page 2 of 2
DATE RECEIVED: 12/03/04
DATE EXPIRED: 01/01/2006 min
DATE OPENED: 12/07/04
INORG: 4915 PO: F55106

010303

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 19, 2004

Expiration Date:

EXPIRES
1 JAN 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010304

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 Silver in 3.5% HNO_3 (abs)

Catalog Number: CGAG1-1, CGAG1-2 and CGAG1-5

Lot Number: **W-AG02018**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/01/04
DATE EXPIRED: 10/01/2005 YOS
DATE OPENED: 09/01/04
INORG: 4760 4 PO: F53434

Starting Material:	Silver Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	G14K25

CERTIFIED CONCENTRATION: 996 ± 3 µg/mL

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

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

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

Classical Wet Assay: 999 ± 3 µg/mL
Method: Volhard Titration vs NIST SRM 999a Potassium Chloride

Instrument Analysis: 996 ± 3 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	X	<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.072103/TS

Paul R. Haines

Quality Assurance Manager

Expires: EXPIRES 1 2005

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Arsenic in 1.4% (abs) HNO_3**

Catalog Number:	CGAS1-1, CGAS1-2, and CGAS1-5
Lot Number:	**X-AS02026**
Starting Material:	As Polycrystaline lump
Starting Material Purity (%):	99.998994
Starting Material Lot No	23115
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/27/05
DATE EXPIRED: 2/11/06 DR
DATE OPENED: 1/28/05
INORG: 4987 PO: E55132

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 997 ± 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 ($\bar{x}$) = $\frac{\sum x_i}{n}$

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum s$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **997 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3103a Lot Number: 010713

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

1 of 4
4987

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00038	M	Dy	< 0.01596	O	Li	0.00009	M	Pr	< 0.00080	M	Te	< 0.07978
O	Sb	< 0.01000	M	Er	< 0.01330	M	Lu	< 0.00106	O	Re	< 0.01000	M	Tb	< 0.00080
s	As		M	Eu	< 0.00798	O	Mg	0.00009	M	Rh	< 0.00266	M	Tl	< 0.00266
M	Ba	< 0.02660	M	Gd	< 0.00266	O	Mn	< 0.00003	M	Rb	< 0.00266	M	Th	< 0.00266
M	Be	< 0.00133	M	Ga	< 0.00266	O	Hg	< 0.01200	M	Ru	< 0.00532	M	Tm	< 0.00106
M	Bi	< 0.00106	M	Ge	< 0.01596	M	Mo	< 0.00532	M	Sm	< 0.00266	O	Sn	0.00049
O	B	< 0.01200	M	Au	< 0.00798	M	Nd	< 0.00532	M	Sc	< 0.02660	M	Ti	< 0.13297
M	Cd	< 0.00798	M	Hf	< 0.00532	M	Ni	< 0.02128	M	Se	< 0.02128	M	W	< 0.02660
O	Ca	0.00189	M	Ho	< 0.00133	O	Nb	< 0.00200	O	Si	0.00415	M	U	< 0.00532
M	Ce	< 0.01330	M	In	< 0.02660	n	Os		M	Ag	< 0.00532	M	V	< 0.00532
M	Cs	< 0.00080	M	Ir	< 0.01330	M	Pd	< 0.01330	O	Na	0.00159	M	Yb	< 0.00266
M	Cr	< 0.01330	O	Fe	< 0.00110	O	P	< 0.00260	M	Sr	< 0.00133	M	Y	< 0.10638
M	Co	< 0.00798	M	La	< 0.00133	M	Pt	< 0.00532	O	S	< 0.02500	O	Zn	0.00057
M	Cu	< 0.01596	M	Pb	< 0.00798	O	K	0.00132	M	Ta	< 0.01862	M	Zr	< 0.01330

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.9216; mix of +3 and +5; 6; H_3AsO_4 and $HAsO_2$
Chemical Compatibility - Arsenic has no cationic chemistry. It is soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices water and NH_4OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.
Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
As Containing Samples (Preparation and Solution) - As^{+5} (soluble in 1:1 H_2O / HNO_3); Oxides (the oxide exists in crystalline and amorphous forms where the amorphoric form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (One gram of powered sample is fused in a Ni^0 crucible with 10 grams of a 1:1 mix of K_2CO_3 and KNO_3 and the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of the sample are fused with 15 grams of a 1:1 Na_2CO_3 / Na_2O_2 mix in a Ni^0 crucible. The fuseate is extracted with water and acidified with HNO_3)
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES 189.042 nm	0.05 / 0.005 µg/mL	1	atom	Cr
ICP-OES 193.696 nm	0.1 / 0.01 µg/mL	1	atom	V, Ge
ICP-OES 228.812 nm	0.1 / 0.01 µg/mL	1	atom	Cd, Pt, Ir, Co
ICP-MS 75 amu	20 ppt	n/a	M$^+$	$^{40}Ar^{35}Cl$, $^{59}Co^{16}O$, $^{38}Ar^{37}Ar^1H$, $^{38}Ar^{37}Cl$, $^{38}Ar^{39}K$, $^{150}Nd^{2+}$, $^{150}Sm^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010309

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 17, 2004

Expiration Date: EXPIRES 1 FEB 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade **1000 µg/mL Lead in 0.35% (abs) HNO_3**

Catalog Number:	CGPB1-1, CGPB1-2, and CGPB1-5
Lot Number:	**W-PB02115**
Starting Material:	Pb(NO3)2
Starting Material Purity (%):	99.999974
Starting Material Lot No	22150
Matrix:	0.35% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS 1 of 2
DATE RECEIVED: 09/17/04
DATE EXPIRED: 10/01/2005 WDS
DATE OPENED: 09/17/04
INORG: 4774 PO: F54131

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1002 ± 3 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:

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum s$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

• "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

• This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 **1002 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **998 ± 3 µg/mL**
ICP Assay NIST SRM 3128 Lot Number: 991504

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00270	M Dy < 0.01193	O Li < 0.00002	M Pr < 0.00060	M Te < 0.05965
M Sb < 0.00099	M Er < 0.00994	M Lu < 0.00080	M Re < 0.00199	M Tb < 0.00060
M As < 0.01989	M Eu < 0.00597	O Mg 0.00008	O Rh < 0.00900	O Tl 0.00130
M Ba < 0.01989	M Gd < 0.00199	M Mn < 0.00795	M Rb < 0.00199	M Th < 0.00199
M Be < 0.00099	M Ga < 0.00199	O Hg < 0.01500	M Ru < 0.00398	M Tm < 0.00080
O Bi < 0.02000	M Ge < 0.01193	M Mo < 0.00398	M Sm < 0.00199	M Sn < 0.00994
O B < 0.04000	M Au < 0.00597	M Nd < 0.00398	M Sc < 0.01989	M Ti < 0.09942
M Cd < 0.00597	M Hf < 0.00398	M Ni < 0.01591	M Se < 0.01591	M W < 0.01989
O Ca 0.00009	M Ho < 0.00099	M Nb < 0.00099	O Si < 0.00340	M U < 0.00398
M Ce < 0.00994	M In < 0.01989	n Os	M Ag < 0.00398	M V < 0.00398
M Cs < 0.00060	M Ir < 0.00994	M Pd < 0.00994	O Na < 0.00600	M Yb < 0.00199
M Cr < 0.00994	O Fe 0.00011	O P < 0.00500	M Sr < 0.00099	M Y < 0.07954
M Co < 0.00597	M La < 0.00099	M Pt < 0.00398	O S < 0.10000	M Zn < 0.03977
M Cu < 0.01193	s Pb	O K < 0.00180	M Ta < 0.01392	M Zr < 0.00994

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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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 - 207.2; +2; 6; $Pb(H_2O)_6^{+2}$
Chemical Compatibility - Soluble in HCl, HF and HNO_3. Avoid H_2SO_4. Stable with most metals and inorganic anions forming insoluble carbonate, borate, sulfate, sulfite, sulfide, phosphate, oxalate, chromate, tannate, iodate, and cyanide in neutral aqueous media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.
Pb Containing Samples (Preparation and Solution) - Metal (Best dissolved in 1:1 H_2O / HNO_3.) Oxides (The many different Pb oxides are soluble in HNO_3 with the exception of PbO_2 which is soluble in HCl or HF). Ores and Alloys (Best attacked using 1:1 H_2O / HNO_3.) Organic Matrices (Dry ash and dissolve in dilute HCl.).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤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

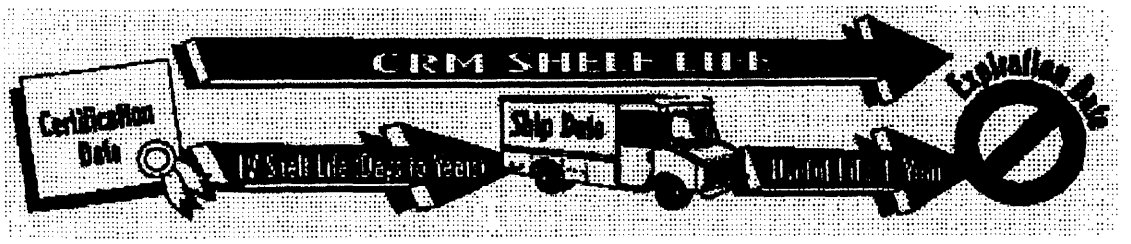
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 09/12/04
DATE EXPIRED: 10/01/2005 VOS
DATE OPENED: 09/12/04
INORG: 4774 PO: F54731

010313

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 17, 2003

Expiration Date:

EXPIRES
01 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010314

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Antimony in 0.7% (abs) HNO_3 / 3% Tartaric Acid**

Catalog Number:	CGSB1-1, CGSB1-2 and CGSB1-5
Lot Number:	**X-SB02083**
Starting Material:	Sb shot
Starting Material Purity (%):	99.993665
Starting Material Lot No	D29N32
Matrix:	0.7% (abs) HNO_3 / 3% Tartaric Acid

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006
DATE OPENED: 2/28/05
INORG: 5042 PO: F55147

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 999 ± 3 µg/mL

Certified Density: 1.020 g/mL (measured at 22° C)

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

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

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

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

$\sum s_i$ = The summation of all significant estimated errors.
(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **999 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3102a Lot Number: 990707

Assay Method #2 **1001 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

5042
1 of 4

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.02186	M	Dy	< 0.00598	O	Li	< 0.00002	M	Pr	< 0.00030	M	Te	< 0.02988
s	Sb		M	Er	< 0.00498	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	< 0.00030
M	As	< 0.00996	M	Eu	< 0.00299	O	Mg	0.00074	M	Rh	< 0.00100	M	Tl	0.00015
O	Ba	0.00011	M	Gd	< 0.00100	O	Mn	0.00139	M	Rb	< 0.00100	M	Th	< 0.00100
O	Be	< 0.00001	M	Ga	< 0.00100	O	Hg	< 0.01500	M	Ru	< 0.00199	M	Tm	< 0.00040
M	Bi	0.00386	M	Ge	< 0.00598	M	Mo	< 0.00199	M	Sm	< 0.00100	M	Sn	< 0.00498
O	B	0.00045	M	Au	< 0.00299	M	Nd	< 0.00199	O	Sc	< 0.00016	O	Ti	0.00056
M	Cd	< 0.00299	M	Hf	< 0.00199	O	Ni	0.00219	M	Se	< 0.00797	M	W	< 0.00996
O	Ca	0.00521	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	0.00388	M	U	< 0.00199
O	Ce	< 0.00300	M	In	< 0.00996	n	Os		M	Ag	< 0.00199	M	V	< 0.00199
M	Cs	< 0.00030	M	Ir	< 0.00498	M	Pd	< 0.00498	O	Na	0.00298	M	Yb	< 0.00100
O	Cr	0.00696	O	Fe	0.00715	O	P	< 0.04000	M	Sr	< 0.00050	M	Y	< 0.03984
M	Co	0.00052	O	La	< 0.00120	M	Pt	< 0.00199	n	S		M	Zn	< 0.01992
O	Cu	0.00239	M	Pb	0.00040	O	K	0.00497	M	Ta	< 0.00697	M	Zr	< 0.00498

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

5042
2 of 4

010316

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 Formin Solution - 121.75; +3 ; 6; $Sb(O)C_4H_4O_6^{-1}$
Chemical Compatibility - Stable in concentrated HCl, dilute or concentrated HF. Stable in dilute HNO_3 as the fluoride or tartrate complex. Avoid basic media. Stable with most metals and inorganic anions in acidic media as the tartrate provided the acidity is not too high or the acid is oxidizing causing loss of the stabilizing tartrate ion. The fluoride complex of antimony is stable in strong acid but you should only mix with other metals that are fluorinated.
Stability - 2-100 ppb levels stable for months in 1% HNO_3/ LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-2% HNO_3/ LDPE container.
Sb Containing Samples (Preparation and Solution) - Metal and alloys (Soluble in H_2O / HF /HNO_3 mixture); Oxides (Soluble in HCl and tartaric acid or H_2O / HF / HNO_3 mixtures); Ores (Fusion with Na_2CO_3 in Pt followed by dissolving the fusesate in a H_2O / HF / HNO_3 mixture); Organic based (Sulfuric acid / hydrogen peroxide digestion)
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES	206.833 nm	0.03 / 0.003 µg/mL	1	atom	Ta, Cr, Ge, Hf
ICP-OES	217.581 nm	0.05 / 0.005 µg/mL	1	atom	Nb, W, Re, Fe,
ICP-OES	231.147 nm	0.06 / 0.006 µg/mL	1	atom	Ni, Co, Pt
ICP-MS	121 amu	5 ppt	n/a	M$^+$	$^{105}Pd^{16}O$, $^{89}Y^{16}O_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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3of4

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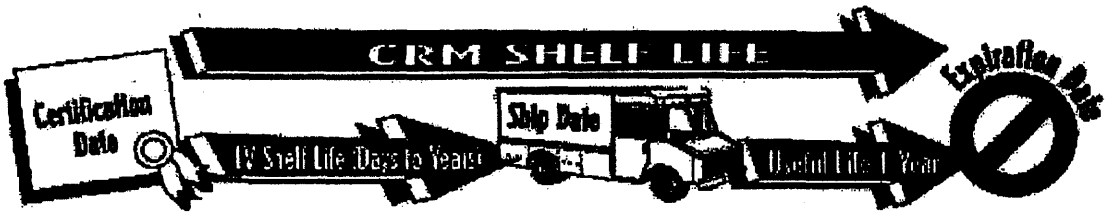
11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 22, 2004

Expiration Date:

EXPIRES
1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	
Certificate Approved By:	Katalin Le, QC Manager	
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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4864

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Selenium in 1.4% (abs) HNO_3**

Catalog Number:	CGSE1-1, CGSE1-2, and CGSE1-5
Lot Number:	**X-QSE01091**
Starting Material:	Se shot
Starting Material Purity (%):	99.997834
Starting Material Lot No	I20L45
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 1005
DATE OPENED: 07/01/05
INORG: 4630 PO: F53406

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 1.009 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1005 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3149 Lot Number: 992106

Assay Method #2 **1004 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00030	M	Dy	< 0.01196	O	Li	< 0.00003	M	Pr	< 0.00060	M	Te	< 0.05982
M	Sb	< 0.00100	M	Er	< 0.00997	M	Lu	< 0.00080	O	Re	< 0.00900	M	Tb	< 0.00060
O	As	< 0.00500	M	Eu	< 0.00598	O	Mg	0.00021	M	Rh	< 0.00199	M	Tl	< 0.00199
M	Ba	< 0.01994	M	Gd	< 0.00199	M	Mn	< 0.00798	M	Rb	< 0.00199	M	Th	< 0.00199
O	Be	< 0.00009	M	Ga	< 0.00199	O	Hg	0.01054	O	Ru	< 0.00700	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01196	O	Mo	< 0.00400	M	Sm	< 0.00199	M	Sn	< 0.00997
O	B	< 0.00006	M	Au	< 0.00598	M	Nd	< 0.00399	M	Sc	< 0.01994	M	Ti	< 0.09969
M	Cd	0.00060	M	Hf	< 0.00399	O	Ni	0.00028	S	Se		M	W	< 0.01994
O	Ca	0.00100	M	Ho	< 0.00100	O	Nb	< 0.00400	O	Si	< 0.00300	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01994	n	Os		M	Ag	< 0.00399	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	0.00402	M	Yb	< 0.00199
M	Cr	0.00080	O	Fe	0.00271	O	P	< 0.00300	M	Sr	< 0.00100	M	Y	< 0.07976
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	O	S	< 0.04000	M	Zn	0.00400
M	Cu	0.00130	M	Pb	< 0.00598	O	K	0.00060	M	Ta	< 0.01396	O	Zr	0.00005

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments Including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96; +4; 6; H_2SeO_3

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels - stable for months alone or mixed with other elements at equivalent levels - in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Se Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Readily soluble in water); Minerals and alloys (Acid digestion with HNO_3 or HNO_3 / HF); Organic Matrices (Acid digestion with hot concentrated H_2SO_4 accompanied by the careful dropwise addition of H_2O_2 until clear)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤Concs.)
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, Te
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

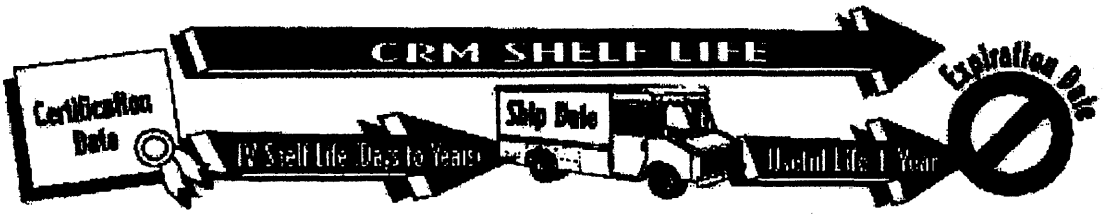
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS pg 2 of 2
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 \YRS
DATE OPENED: 07/01/04
INORG: 4630 PO: F53406

010321

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 23, 2004

Expiration Date: EXPIRES 01 Dec 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010322

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Thallium in 0.5% (abs) HNO_3**

Catalog Number:	CGTL1-1, CGTL1-2, and CGTL1-5
Lot Number:	**X-TL01091**
Starting Material:	TlNO3
Starting Material Purity (%):	99.999824
Starting Material Lot No	G09P28
Matrix:	0.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/27/05
DATE EXPIRED: 2/1/06
DATE OPENED: 11/28/05
INORG: 4990 PO: F55133

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 999 ± 3 µg/mL

Certified Density: 1.001 g/mL (measured at 22° C)

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

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
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

· This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **999 ± 3 µg/mL (Avg of 2 runs)**
ICP Assay NIST SRM 3158 Lot Number: 993012

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4990

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Al < 0.02018	M Dy < 0.01211	O Li < 0.00002	M Pr < 0.00061	M Te < 0.06055
M Sb < 0.00101	M Er < 0.01009	M Lu < 0.00081	M Re < 0.00202	M Tb < 0.00061
M As < 0.02018	M Eu < 0.00606	O Mg 0.00030	M Rh < 0.00202	s Tl
M Ba < 0.02018	M Gd < 0.00202	M Mn < 0.00807	M Rb < 0.00202	M Th < 0.00202
M Be < 0.00101	M Ga < 0.00202	O Hg < 0.01200	M Ru < 0.00404	M Tm < 0.00081
M Bi < 0.00081	M Ge < 0.01211	M Mo < 0.00404	M Sm < 0.00202	M Sn < 0.01009
O B < 0.00140	M Au < 0.00606	M Nd < 0.00404	M Sc < 0.02018	M Ti < 0.10091
O Cd < 0.00540	M Hf < 0.00404	O Ni < 0.00090	M Se < 0.01615	M W < 0.02018
O Ca 0.00015	M Ho < 0.00101	M Nb < 0.00101	O Si < 0.00340	M U < 0.00404
M Ce < 0.01009	M In < 0.02018	n Os	M Ag < 0.00404	M V < 0.00404
M Cs < 0.00061	M Ir < 0.01009	M Pd < 0.01009	O Na 0.00124	M Yb < 0.00202
M Cr < 0.01009	O Fe < 0.00100	O P < 0.00260	M Sr < 0.00101	M Y < 0.08073
M Co < 0.00606	M La < 0.00101	M Pt < 0.00404	O S < 0.03000	O Zn 0.00154
M Cu < 0.01211	M Pb < 0.00606	O K < 0.00180	M Ta < 0.01413	M Zr < 0.01009

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

2 of 4
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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 204.383; +1; 6; $Tl(H_2O)_6^{+}$

Chemical Compatibility - Soluble in HCl, HNO_3, and H_2SO_4. Stable with most metals and inorganic anions. The sulfite, thiocyanate and oxalate are moderately soluble; the phosphate and arsenite are slightly soluble and the sulfide is insoluble.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Tl Containing Samples (Preparation and Solution) - Metal (Best dissolved in HNO_3 which forms chiefly the Tl^{+} ion.) Oxide (The thallous oxide is readily soluble in water. The thallic oxide requires high levels of acid) Ores (Carbonate fusion in Pt* followed by HCl dissolution) Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	190.864 nm	0.04 / 0.004 µg/mL	1	ion	V, Ti
ICP-OES	276.787 nm	0.1 / 0.01 µg/mL	1	atom	Ta, V, Fe, Cr
ICP-OES	351.924 nm	0.2 / 0.02 µg/mL	1	atom	Th, Ce, Zr
ICP-MS	205 amu	2 ppt	n/a	M+	$^{189}Os^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

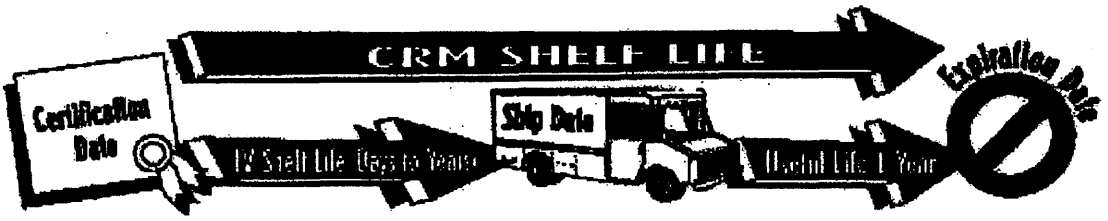
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

3084
4990

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010325



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 05, 2004

Expiration Date: EXPIRES 1 FEB 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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4990

010326

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Boron in H_2O**

Catalog Number:	CGB1-1, CGB1-2, and CGB1-5
Lot Number:	**X-B02047**
Starting Material:	H_3BO_3
Starting Material Purity (%):	99.999998
Starting Material Lot No	OV0133
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006 OK
DATE OPENED: 2/28/05
INORG: 5047 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

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

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

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** **1005 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3107 Lot Number: 991907

5047
INCL

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.00600	O Li < 0.00002	M Pr < 0.00030	M Te < 0.03000
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.01000	M Eu < 0.00300	O Mg < 0.00006	M Rh < 0.00100	M Tl < 0.00100
O Ba < 0.00010	M Gd < 0.00100	O Mn < 0.00002	M Rb < 0.00100	M Th < 0.00100
O Be < 0.00017	O Ga < 0.00160	O Hg < 0.01500	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00600	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
s B	M Au < 0.00300	M Nd < 0.00200	O Sc < 0.00002	M Ti < 0.05000
M Cd < 0.00300	M Hf < 0.00200	O Ni < 0.00230	O Se < 0.00620	M W < 0.01000
O Ca < 0.00007	M Ho < 0.00050	M Nb < 0.00050	O Si 0.00067	M U < 0.00200
O Ce < 0.00300	M In < 0.01000	n Os	M Ag < 0.00200	O V < 0.00083
M Cs < 0.00030	M Ir < 0.00500	M Pd < 0.00500	O Na < 0.00010	M Yb < 0.00100
M Cr < 0.00500	O Fe < 0.00110	O P < 0.00250	M Sr < 0.00050	M Y < 0.04000
O Co < 0.00110	M La < 0.00050	M Pt < 0.00200	O S < 0.10000	O Zn < 0.00019
M Cu < 0.00600	M Pb < 0.00300	O K < 0.00300	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

010328

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 10.811; +3; 4; $B(OH)_3$ and $B(OH)_4^-$
Chemical Compatibility - Moderately soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices and very soluble in NH_4OH . Stable with all metals and inorganic anions at low to moderate ppm levels.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-1,000 ppm solutions chemically stable for years in 1% HNO_3 / LDPE container. 1000 -10,000 ppm stable for years in dilute NH_4OH / LDPE container.
B Containing Samples (Preparation and Solution) - Metal (Crystaline form is scarcely attacked by acids or alkaline solutions; amorphous form is soluble in conc. HNO_3 or H_2SO_4); $B(OH)_3$ (water soluble); Ores(avoid acid digestions and use caustic fusions in Pt*); Organic Matrices (dry ash mixed with Na_2CO_3 in Pt* at 450°C then increase heat to 1000°C to fuse; or perform a Na_2O_2 fusion in a Ni* crucible / Parr bomb).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	249.773 nm	0.003 / 0.001 µg/mL	1	atom	W, Ce, Co, Th, Ta, Mn, Mo, Fe
ICP-OES	249.678 nm	0.004 / 0.003 µg/mL	1	atom	Os, W, Co, Cr, Hf
ICP-OES	208.959 nm	0.007 / 0.0005 µg/mL	1	atom	Mo
ICP-MS	11 amu	700 ppt	n/a	M+	

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 13, 2004

Expiration Date: EXPIRES 1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Molybdenum in H_2O tr. NH_4OH**

Catalog Number:	CGMO1-1, CGMO1-2, and CGMO1-5
Lot Number:	**X-MO02004**
Starting Material:	(NH4)6Mo7O24xH2O
Starting Material Purity (%):	99.995645
Starting Material Lot No	23221
Matrix:	H_2O tr. NH_4OH

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006 OK
DATE OPENED: 2/28/05
INORG: 5050 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 0.998 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum S$ = 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 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **1002 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3134 Lot Number: 891307

5050
1 of 4

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.05000	M Dy < 0.01202	O Li < 0.01000	O Pr < 0.10000	i Te
M Sb < 0.00100	M Er < 0.01002	M Lu < 0.00080	M Re 0.00541	M Tb < 0.00060
M As 0.00801	M Eu < 0.00601	O Mg < 0.05000	M Rh < 0.00200	M Tl < 0.00200
M Ba < 0.02004	M Gd < 0.00200	M Mn < 0.00801	M Rb < 0.00200	M Th < 0.00200
M Be < 0.00100	M Ga < 0.00200	i Hg	M Ru < 0.00401	M Tm < 0.00080
M Bi < 0.00080	M Ge < 0.01202	s Mo	M Sm < 0.00200	M Sn < 0.01002
O B < 0.50000	M Au < 0.00601	O Nd < 0.05000	O Sc < 0.05000	O Ti < 0.00500
O Cd < 0.50000	M Hf < 0.00401	M Ni < 0.01603	M Se < 0.01603	M W 0.03907
O Ca 0.00150	M Ho < 0.00100	M Nb < 0.00100	O Si < 0.10000	M U < 0.00401
O Ce < 0.05000	M In < 0.02004	n Os	M Ag < 0.00401	M V < 0.00401
M Cs < 0.00060	M Ir < 0.01002	M Pd < 0.01002	O Na < 0.10000	M Yb < 0.00200
M Cr < 0.01002	O Fe < 0.50000	i P	M Sr < 0.00100	M Y < 0.08014
M Co < 0.00601	M La < 0.00100	M Pt < 0.00401	i S	M Zn < 0.04007
M Cu < 0.01202	M Pb < 0.00601	O K 0.03500	M Ta < 0.01403	M Zr < 0.01002

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

5150
2of4

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 - 95.94; +6; 6,7,8,9; $[MoO_4]^{-2}$ (chemical form as received)
Chemical Compatibility - Mo is received in a NH_4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The $[MoO_4]^{-2}$ is soluble in concentrated HCl $[MoOCl_4]^{-}$, dilute HF / HNO_3 $[MoOF_4]^{-2}$ and basic media $[MoO_4]^{-2}$. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the $[MoO_4]^{-2}$ chemical form.
Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $[MoOF_4]^{-2}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $[MoO_4]^{-2}$ chemically stable for years in 1% NH_4OH in a LDPE container.
Mo Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3 or hot dilute HCl); Oxide (soluble in HF or NH_4OH) ; Organic Matrices (Dry ash at 450°C in Pt* and dissolve oxide with HF or HCl).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	202.030 nm	0.008 / 0.0002 µg/mL	1	ion	Os, Hf
ICP-OES	203.844 nm	0.012 / 0.002 µg/mL	1	ion	
ICP-OES	204.598 nm	0.012 / 0.001 µg/mL	1	ion	Ir, Ta
ICP-MS	95 amu	3 ppt	n/a	M+	$^{40}Ar^{39}K^{16}O$, $^{79}Br^{16}O$, $^{190}Os^{2+}$, $^{190}Pt^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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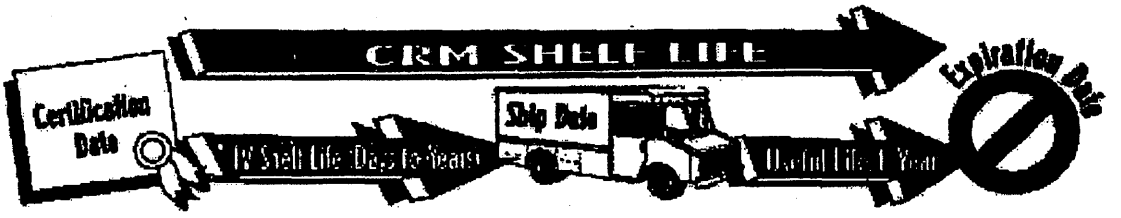
11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 26, 2004

Expiration Date: EXPIRES 1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul Gaines

5050
4 of 4

010334

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Phosphorus in H_2O

Catalog Number: CGP1-1, CGP1-2 and CGP1-5

Lot Number: **W-P01123**

Starting Material:	Phosphoric Acid
Starting Material Purity:	99.999%
Starting Material Lot No:	J18804

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VOS
DATE OPENED: 06/01/04
INORG: 4593 PO: E53393

CERTIFIED CONCENTRATION: 1006 ± 4 µg/mL

The Certified Value is the wet assay value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

Classical Wet Assay: 1006 ± 4 µg/mL
Method: Acidimetric Titration vs NIST SRM 84k KHP.

Instrument Analysis: 1002 ± 4 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3139a.

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

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

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

O	Al	<0.040	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.012	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	0.00070	O	Hg	<0.020	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	n	Sc		n	Ti	
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
M	Ce	<0.00050	M	In	<0.030	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	s	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0035
M	Cu	0.080	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.001 g/mL (over)

QA:KL Rev.010804DN

Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 1 JUN 2005

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

Members of IQ Net : Argentina **(IRAM)**, Australia **(QAS)**, Austria **(ÖQS)**, Belgium **(Avinter)** , Brazil **(FCAV)**, Canada **(QMI)**, Hong Kong **(HKQAA)**, Columbia **(ICONTEC)**, Czech Republic **(CQS)**, Denmark **(DS)**, Finland **(SFS)**, France **(AFAQ)**, Germany **(DQS)**, Greece **(ELOT)**, Hungary **(MSZT)**, Ireland **(NSAI)**, Israel **(SII)**, Italy **(CISQ)**, Japan **(JQA)**, Korea **(KSA-QA)**, Netherlands **(KEMA)**, Norway **(NCS)**, Poland**(PCBC)**, Portugal **(APCER)**, Singapore **(PSB)**, Slovenia **(SIQ)**, Spain **(AENOR)**, Switzerland **(SQS)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of a standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceabl to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Silicon in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGSI1-1, CGSI1-2, and CGSI1-5
Lot Number:	**X-SI02087**
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
DATE RECEIVED: 1/31/05 AR
DATE EXPIRED: 3/1/2006 AR
DATE OPENED: 1/31/05
#NORG: 4999 PO: F55139

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 996 ± 2 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** **996 ± 2 µg/mL**
ICP Assay NIST SRM 3150 Lot Number: 991108

Assay Method #2 **999 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

1664
4999

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.02730	M Dy < 0.01358	O Li < 0.00009	M Pr < 0.00068	M Te < 0.06791
M Sb < 0.00113	M Er < 0.01132	M Lu < 0.00091	M Re < 0.00226	M Tb < 0.00068
M As < 0.02264	M Eu < 0.00679	O Mg < 0.04991	M Rh < 0.00226	M Tl < 0.00226
M Ba < 0.02264	M Gd < 0.00226	M Mn < 0.00906	M Rb < 0.00226	M Th < 0.00226
O Be < 0.00091	M Ga < 0.00226	O Hg < 0.04991	M Ru < 0.00453	M Tm < 0.00091
M Bi < 0.00091	M Ge < 0.01358	M Mo < 0.00453	M Sm < 0.00226	M Sn < 0.01132
O B 0.02409	M Au < 0.00679	M Nd < 0.00453	O Sc < 0.00091	O Ti 0.01325
M Cd < 0.00679	M Hf < 0.00453	O Ni < 0.01044	M Se < 0.01811	M W < 0.02264
O Ca 0.00135	M Ho < 0.00113	M Nb < 0.00113	s Si	M U < 0.00453
M Ce < 0.01132	M In < 0.02264	n Os	M Ag < 0.00453	O V < 0.00408
M Cs < 0.00068	M Ir < 0.01132	M Pd < 0.01132	O Na 0.02008	M Yb < 0.00226
O Cr < 0.00681	O Fe < 0.00499	O P < 0.02269	O Sr < 0.00032	M Y < 0.09055
M Co < 0.00679	M La < 0.00113	M Pt < 0.00453	O S < 0.11342	M Zn < 0.04528
O Cu < 0.00454	M Pb < 0.00679	O K < 0.00771	M Ta 0.00200	M Zr < 0.01132

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

20 of 4
4999

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 28.0855; +4; 6; $Si(OH)_x(F)_y^{2-}$
Chemical Compatibility - Soluble in HCl, HF, H_3PO_4, H_2SO_4 and HNO_3 as the $Si(OH)_x(F)_y^{2-}$. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths, or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming silicic acid (silicic acid is soluble up to ~100 ppm in water) in all dilute acids except HF.
Stability - 2-100 ppb levels - stability unknown - (alone or mixed with all other metals) as the $Si(OH)_x(F)_y^{2-}$. 1-10,000 ppm single element solutions as the $Si(OH)_x(F)_y^{2-}$ chemically stable for years in 2-5 % HNO_3 / trace HF in a LDPE container.
Si Containing Samples (Preparation and Solution) - Metal (Soluble in 1:1:1 H_2O / HF / HNO_3); Oxide - SiO_2, amorphic (Dissolve by heating in 1:1:1 H_2O / HF / HNO_3); Oxide - quartz (Fuse in Pt^{lb} with Na_2CO_3); Geological Samples (Fuse in Pt^{lb} 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^{lb} and dissolve by gently warming with 1:1:1 H_2O / HF / H_2SO_4 or fuse / ash with Na_2CO_3 and dissolve fuseate with HCl / H_2O); Silicone Oils - dimethyl silicones depolymerize to form volatile monomer units when heated (Measure directly in alcoholic KOH / xylene mixture where sample is treated first with the KOH at 60-100 °C to "unzip" the Si-O-Si polymeric structure or digest with concentrated H_2SO_4/H_2O_2 followed by cooling and dissolution of the dehydrated silica with HF.) Note that the direct analysis of silicone oils in an organic solvent will result in false high results due to high vapor pressure of volatile monomer units like hexamethylcyclotrisiloxane. The KOH forms the $K_2{}^+Si(CH_3)_2O^-$ salt which is not volatile at room temperature.
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe interferences.)
ICP-OES	251.611 nm	0.012 / 0.003 µg/mL	1	ion	Ta, U, Zn, Th
ICP-OES	212.412 nm	0.02 / 0.01 µg/mL	1	ion	Hf, Os, Mo, Ta
ICP-OES	288.158 nm	0.03 / 0.004 µg/mL	1	ion	Ta, Ce, Cr, Cd, Th
ICP-MS	28 amu	4000 - 8000 ppt	n/a	M+	$^{14}N_2$, $^{12}C^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

010339

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 24, 2004

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul Gaines

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Titanium in 1.4% (abs) HNO_3 tr. HF**

Catalog Number:	CGTI1-1, CGTI1-2, and CGTI1-5
Lot Number:	**X-QTI01116**
Starting Material:	Ti granules
Starting Material Purity (%):	99.960814
Starting Material Lot No	K27M07
Matrix:	1.4% (abs) HNO_3 tr. HF

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 998 ± 4 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

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

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

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

$(\bar{x})$ = 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** **998 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3162a Lot Number: 992801

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS 93-1 of 2
DATE RECEIVED: 12/03/04
DATE EXPIRED: 12/01/2005 WOS
DATE OPENED: 12/03/04
INORG: 4908 PO: F55103

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.01201	M Dy < 0.01190	O Li < 0.00080	M Pr < 0.00060	M Te < 0.05951
M Sb < 0.00099	M Er < 0.00992	M Lu < 0.00079	M Re < 0.00198	M Tb < 0.00060
M As < 0.01984	M Eu < 0.00595	O Mg < 0.00040	M Rh < 0.00198	M Tl < 0.00198
M Ba < 0.01984	M Gd < 0.00198	O Mn 0.00161	M Rb < 0.00198	M Th < 0.00198
M Be < 0.00099	M Ga < 0.00198	O Hg < 0.06004	M Ru < 0.00397	M Tm < 0.00079
M Bi < 0.00079	M Ge < 0.01190	M Mo < 0.00397	M Sm < 0.00198	M Sn < 0.00992
O B < 0.00801	M Au < 0.00595	M Nd < 0.00397	O Sc < 0.00008	s Ti
M Cd < 0.00595	M Hf < 0.00397	M Ni < 0.01587	M Se < 0.01587	M W < 0.01984
O Ca < 0.00024	M Ho < 0.00099	M Nb < 0.00099	O Si < 0.01601	M U < 0.00397
M Ce < 0.00992	M In < 0.01984	n Os	M Ag < 0.00397	O V < 0.00801
M Cs < 0.00060	M Ir < 0.00992	M Pd < 0.00992	O Na 0.14051	M Yb < 0.00198
M Cr < 0.00992	O Fe < 0.00400	O P < 0.02001	M Sr < 0.00099	M Y < 0.07935
M Co < 0.00595	M La < 0.00099	M Pt < 0.00397	I S	O Zn < 0.00080
O Cu < 0.01201	M Pb < 0.00595	O K 0.26095	M Ta < 0.01389	M Zr < 0.00992

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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 - 47.867; +4; 6; $Ti(F)_6^{2-}$
Chemical Compatibility - Soluble in concentrated HCl, HF, H_3PO_4, H_2SO_4, and HNO_3. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF.
Stability - 2-100 ppb levels stable (Alone or mixed with all other metals) as the $Ti(F)_6^{2-}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Ti(F)_6^{2-}$ chemically stable for years in 2-5% HNO_3 / trace HF in an LDPE container.
Ti Containing Samples (Preparation and Solution) - Metal (Soluble in H_2O / HF *caution -powder reacts violently*); Oxide - low temperature history *anatase or rutile* (Dissolved by heating in 1:1:1 H_2O / HF / H_2SO_4); Oxide - high temperature history (>800°C) *brookite* (fuse in Pt* with $K_2S_2O_7$); Ores (fuse in Pt* with KF + $K_2S_2O_7$ - no KF if silica not present); Organic Matrices (Dry ash at 450°C in Pt* and dissolve by heating with 1:1:1 H_2O / HF / H_2SO_4 or fuse ash with pyrosulfate if oxide is as plastic pigment and likely in brookite crystalline form).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at + concs.)
ICP-OES	334.941 nm	0.0038 / 0.000028 µg/mL	1	ion	Nb, Ta, Cr, U
ICP-OES	336.121 nm	0.0053 / 0.000034 µg/mL	1	ion	W, Mo, Co
ICP-OES	323.452 nm	0.0054 / 0.00092 µg/mL	1	ion	Ce, Ar, Ni
ICP-MS	48 amu	14 ppt	n/a	M+	$^{32}S^{16}O$, $^{32}S^{16}N$, $^{14}N^{16}O^{16}O$, $^{14}N^{14}N$, $^{40}Ar^{12}C$, ^{40}Ca, [^{96}X (where X = Zr, Mo, Ru)]

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 12/02/04
DATE EXPIRED: 12/01/2005 v01
DATE OPENED: 12/02/04
INORG: 4908 PO: F55100

010343

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 28, 2004

Expiration Date:

EXPIRES
1 DEC 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

010344

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Strontium in 0.1% (abs) HNO_3**

Catalog Number:	CGSR1-1, CGSR1-2, and CGSR1-5
Lot Number:	**W-SR01124**
Starting Material:	$SrCO_3$
Starting Material Purity (%):	99.996751
Starting Material Lot No	22593, 22878
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS 1 of 2
DATE RECEIVED: 7/8/04
DATE EXPIRED: 8/1/2005 DR
DATE OPENED: 7/8/04
INORG: 4635 PO: F53408

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 1.001 g/mL (measured at 22° C)

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

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

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

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

ΣS_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1005 ± 2 µg/mL**
ICP Assay NIST SRM 3153a Lot Number: 990906

Assay Method #2 **1004 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.00055	O Li < 0.00003	M Pr < 0.00003	O Te < 0.10000
M Sb < 0.00005	M Er < 0.00046	M Lu < 0.00004	M Re < 0.00009	M Tb < 0.00003
O As < 0.00500	M Eu < 0.00028	O Mg 0.00030	O Rh < 0.00600	M Tl < 0.00009
O Ba 0.02200	M Gd < 0.00009	O Mn < 0.00003	i Rb	M Th < 0.00009
O Be < 0.00009	M Ga < 0.00009	O Hg < 0.01500	O Ru < 0.00300	M Tm < 0.00004
M Bi < 0.00004	M Ge < 0.00055	M Mo < 0.00018	M Sm < 0.00009	M Sn < 0.00046
O B < 0.00060	M Au < 0.00028	M Nd < 0.00018	M Sc < 0.00092	M Ti < 0.00459
M Cd < 0.00028	M Hf < 0.00018	O Ni < 0.00300	O Se < 0.05000	M W < 0.00092
O Ca 0.02500	M Ho < 0.00005	M Nb < 0.00005	O Si < 0.00340	M U < 0.00018
M Ce < 0.00046	O In < 0.00200	n Os	M Ag < 0.00018	M V < 0.00018
M Cs < 0.00003	M Ir < 0.00046	O Pd < 0.00400	O Na 0.00410	M Yb < 0.00009
O Cr < 0.00080	O Fe < 0.00110	O P < 0.00480	s Sr	O Y < 0.00004
M Co < 0.00028	M La < 0.00005	M Pt < 0.00018	n S	O Zn 0.00720
O Cu < 0.00140	M Pb < 0.00028	O K < 0.00170	M Ta < 0.00064	M Zr < 0.00046

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 ≥ppm conc.)
ICP-OES	407.771 nm	0.0004 / 0.00008 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}GeO, $^{176}Yb^{2+}$, $^{175}Lu^{2+}$, $^{176}Hf^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

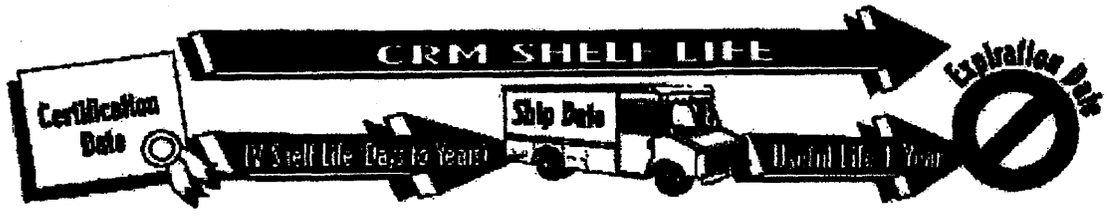
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 22, 2003

Expiration Date: EXPIRES 01 2005

INORGANIC LABS/RADCHEM LABS 2 of 2
DATE RECEIVED: 2/8/04
DATE EXPIRED: 8/1/2005
DATE OPENED: 2/8/04
INORG: 4635 PO: DR/F53408

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

010348

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Tin in H_2O tr HNO_3 tr HF**

Catalog Number:	CGSN1-1, CGSN1-2, and CGSN1-5
Lot Number:	**Y-QSN01140**
Starting Material:	Sn Shot
Starting Material Purity (%):	99.999438
Starting Material Lot No	G12M23
Matrix:	H_2O tr HNO_3 tr HF

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 994 ± 4 µg/mL

Certified Density: 0.998 g/mL (measured at 22° C)

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

Certified Value $(\bar{x}) = \frac{\Sigma x_i}{n}$ — $(\bar{x})$ = mean; x_i = individual results; n = number of measurements

Uncertainty $(\pm) = 2[(\frac{\Sigma s_i}{n})^2]^{1/2}$ — Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **994 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3161a Lot Number: 993107

Assay Method #2 **998 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/31/05
DATE EXPIRED: 3/1/06
DATE OPENED: 3/31/05
INORG: 5124 PO: 52166

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.00050	M Dy < 0.01205	O Li < 0.00002	M Pr < 0.00060	M Te < 0.06026
O Sb < 0.01000	M Er < 0.01004	M Lu < 0.00080	M Re < 0.00201	M Tb < 0.00060
M As < 0.02009	M Eu < 0.00603	O Mg < 0.00003	M Rh < 0.00201	M Tl < 0.00201
O Ba < 0.00070	M Gd < 0.00201	M Mn < 0.00804	M Rb < 0.00201	M Th < 0.00201
M Be < 0.00100	M Ga < 0.00201	O Hg < 0.01500	M Ru < 0.00402	M Tm < 0.00080
M Bi < 0.00080	M Ge < 0.01205	M Mo < 0.00402	M Sm < 0.00201	s Sn
O B < 0.01200	M Au < 0.00603	M Nd < 0.00402	M Sc < 0.02009	M Ti < 0.10041
O Cd 0.00009	M Hf < 0.00402	O Ni < 0.01000	M Se < 0.01607	M W < 0.01205
O Ca < 0.00150	M Ho < 0.00100	M Nb < 0.00100	O Si < 0.06340	M U < 0.00201
M Ce < 0.01004	M In < 0.02009	n Os	M Ag < 0.00402	M V < 0.01004
M Cs < 0.00060	M Ir < 0.01004	M Pd < 0.01004	O Na < 0.00010	M Yb < 0.00201
M Cr < 0.01004	O Fe < 0.00110	O P < 0.00500	M Sr < 0.00100	M Y < 0.00804
O Co < 0.00200	M La < 0.00100	M Pt < 0.00402	n S	M Zn < 0.04017
M Cu < 0.01205	M Pb 0.00593	O K < 0.00200	M Ta < 0.01406	M Zr < 0.01004

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 118.710; +4; 4,5, 6, 7,8, $Sn(OH)_xF_y^{z-}$

Chemical Compatibility - Soluble in HCl and dilute HF / HNO_3. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F^- away. (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated.) Stable with most inorganic anions provided it is in the chemical form shown above.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $Sn(OH)_xF_y^{z-}$ for 1 year in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Sn(OH)_xF_y^{z-}$ chemically stable for years in 2-5% HNO_3 / trace HF in a LDPE container.

Sn Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3 or HCl); Oxides - SnO (soluble in HCl), SnO_2 -very resistant to all acids including HF(Fusion with equal parts of Na_2CO_3 and S. It is then soluble in water or dilute acids as the thiostannate.); Alloys (Treat first 0.1 g with 10 mL conc. H_2SO_4 to boiling until the alloy disintegrates and nearly all of the sulfuric acid is expelled. Then add 100 mL O_2 free water and 50 mL of conc HCl or transfer to a plastic container and add 1 mL HF in either case warming gently to bring about solution.); Organic Matrices (Volatility and precipitation of the insoluble stannic oxide are problems. Consultation of the literature should be made for individual matrices / Sn compounds.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined Indicates severe)
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, ^{125}Te, $^{101}Ru^{16}O$, $^{108}Pd^{16}O$
ICP-MS	120 amu	5 ppt	n/a	M$^+$	

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)

010351

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 01, 2005

Expiration Date: EXPIRES 01-2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

4 of 4

010352

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Bismuth in 3.5% (abs) HNO_3**

Catalog Number:	CGBI1-1, CGBI1-2, and CGBI1-5
Lot Number:	**X-BI01091**
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: 07/29/04
DATE EXPIRED: 08/01/2005 V05
DATE OPENED: 07/29/04
INORG: 4658 PO: E53417

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 999 ± 2 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 (±) = $\frac{2[(\Sigma s)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **999 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3106 Lot Number: 991212

Assay Method #2 **1003 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00012	M	Dy	< 0.01202	O	Li	< 0.00002	M	Pr	< 0.00060	M	Te	< 0.06008
M	Sb	< 0.00100	M	Er	< 0.01001	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.02003	M	Eu	< 0.00601	O	Mg	0.00070	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.02003	M	Gd	< 0.00200	O	Mn	< 0.00020	M	Rb	< 0.00200	M	Th	< 0.00200
M	Be	< 0.00100	M	Ga	< 0.00200	O	Hg	< 0.01500	M	Ru	< 0.00401	M	Tm	< 0.00080
s	Bi		M	Ge	< 0.01202	M	Mo	< 0.00401	M	Sm	< 0.00200	M	Sn	< 0.01001
M	B	< 0.14018	M	Au	< 0.00601	M	Nd	< 0.00401	M	Sc	< 0.02003	M	Ti	< 0.10013
O	Cd	0.00017	M	Hf	< 0.00401	M	Ni	< 0.01602	M	Se	< 0.01602	M	W	< 0.02003
O	Ca	0.00245	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	0.00105	M	U	< 0.00401
M	Ce	< 0.01001	O	In	0.00105	n	Os		M	Ag	< 0.00401	M	V	< 0.00401
M	Cs	< 0.00060	M	Ir	< 0.01001	O	Pd	< 0.00400	O	Na	0.00240	M	Yb	< 0.00200
O	Cr	0.00020	O	Fe	0.00014	O	P	< 0.01000	M	Sr	< 0.00100	M	Y	< 0.08011
M	Co	< 0.00601	M	La	< 0.00100	M	Pt	< 0.00401	O	S	< 0.03000	O	Zn	0.00008
O	Cu	0.00014	O	Pb	0.00135	O	K	0.00039	M	Ta	< 0.01402	M	Zr	< 0.01001

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

010354

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do nd return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 208.9804; +3; 6 ;Bi(O)(H$_2$O)$_6$$^{3+}$

Chemical Compatibility - Stable in HCl, HNO$_3$, H$_2$SO$_4$ 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 carefuly 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, Tl Cu
ICP-OES	306.772 nm	0.08 / 0.01 µg/mL	1	atom	Th, U, Zr, Hf, Fe
ICP-MS	222.825 nm	0.1 / 0.02 µg/mL	1	atom	Cr, Hf, Ce, Os
ICP-MS	209 amu	2 ppt	n/a	M$^+$	^{193}Ir^{16}O

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO-ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

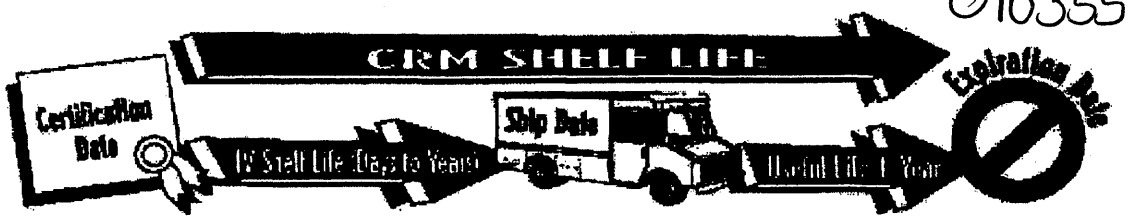
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VOID
DATE OPENED: 07/29/04
INORG: 4658 PO: F53407

010355

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 19, 2004

Expiration Date:

EXPIRES
1 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010356

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Lanthanum in 1.4% (abs) HNO_3**

Catalog Number:	CGLA1-1 and CGLA1-5
Lot Number:	**W-LA01094**
Starting Material:	La2O3
Starting Material Purity (%):	99.991832
Starting Material Lot No	RP-LA-0-5-017
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS 31 of 3
DATE RECEIVED: 09/01/04
DATE EXPIRED: 10/01/2005 VDJ
DATE OPENED: 09/01/04
INORG: 4763 PO: F53434

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1003 ± 3 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

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

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** **1003 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1003 ± 4 µg/mL**
ICP Assay NIST SRM 3127a Lot Number: 890402

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Al < 0.00992	M Dy < 0.00595	O Li < 0.00002	M Pr < 0.00030	M Te < 0.02975
M Sb < 0.00050	M Er < 0.00496	M Lu < 0.00040	M Re < 0.00099	M Tb < 0.00030
M As < 0.00992	M Eu < 0.00298	O Mg 0.00281	M Rh < 0.00099	M Tl < 0.00099
M Ba < 0.00992	O Gd < 0.00080	O Mn < 0.00002	M Rb < 0.00099	M Th < 0.00099
M Be < 0.00050	M Ga < 0.00099	i Hg	M Ru < 0.00198	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00595	M Mo < 0.00198	M Sm < 0.00099	M Sn < 0.00496
O B < 0.03600	M Au < 0.00298	M Nd 0.00020	O Sc < 0.00003	M Ti < 0.04958
M Cd < 0.00298	M Hf < 0.00198	M Ni < 0.00793	M Se < 0.00793	M W < 0.00992
O Ca 0.00903	M Ho < 0.00050	M Nb < 0.00050	O Si < 0.01000	M U < 0.00198
O Ce < 0.00300	M In < 0.00992	n Os	M Ag < 0.00198	O V < 0.00080
M Cs < 0.00030	M Ir < 0.00496	M Pd < 0.00496	O Na < 0.05000	M Yb < 0.00099
M Cr < 0.00496	O Fe < 0.00150	n P	O Sr < 0.00004	M Y < 0.03966
M Co < 0.00298	s La	M Pt < 0.00198	O S < 0.04300	O Zn 0.10539
M Cu < 0.00595	M Pb < 0.00298	O K < 0.10000	M Ta < 0.00694	O Zr < 0.00070

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

010358

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 138.9055; +3; 6 to 8, 9,10 for some compounds; $La(OH)_x(H_2O)_y^{(3-x)+}$

Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid HF, H_3PO_4, H_2SO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride and sparingly soluble sulfates (La - Eu exhibit low sulfate solubility). Avoid mixing with elements / solutions containing moderate amounts of fluoride.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5 % HNO_3 / LDPE container.

La Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolved by heating in H_2O / HNO_3); Ores (Carbonate fusion in Pt° followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H_2O / HCl or HNO_3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppm conc.)
ICP-OES	333.749 nm	0.01 / 0.001 µg/mL	1	ion	
ICP-OES	408.672 nm	0.01 / 0.001 µg/mL	1	ion	Th
ICP-OES	412.323 nm	0.01 / 0.001 µg/mL	1	ion	Ce, Th
ICP-MS	139 amu	1 ppt	n/a	M'	$^{123}Sb^{16}O$, $^{123}Te^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS P3 of 3
DATE RECEIVED: 09/01/04
DATE EXPIRED: 10/01/2005 VOS
DATE OPENED: 09/01/04
INORG: 4763 PO: E53434

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 23, 2003

Expiration Date:

EXPIRES
1 2 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010360

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Sodium in 1.4% (abs) HNO_3**

Catalog Number:	CGNA10-1, CGNA10-2, and CGNA10-5
Lot Number:	**W-NA03010**
Starting Material:	Na_2CO_3
Starting Material Purity (%):	99.999819
Starting Material Lot No	42063
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS 1 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VOS
DATE OPENED: 07/29/04
INORG: 4657 PO: F53417

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,006 ± 6 µg/mL

Certified Density: 1.032 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10,006 ± 6 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **10,019 ± 33 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 990907

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.00600	O Li < 0.00003	M Pr < 0.00030	M Te < 0.02998
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.00999	M Eu < 0.00300	O Mg 0.00010	M Rh < 0.00100	M Tl < 0.00100
M Ba < 0.00999	M Gd < 0.00100	O Mn < 0.00003	M Rb < 0.00100	M Th < 0.00100
O Be < 0.00020	M Ga < 0.00100	O Hg < 0.01500	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	O Ge < 0.00150	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
O B < 0.00060	O Au < 0.00300	M Nd < 0.00200	O Sc < 0.00002	O Ti < 0.00070
M Cd < 0.00300	M Hf < 0.00200	O Ni < 0.00230	O Se < 0.05000	M W < 0.00999
O Ca 0.00050	M Ho < 0.00050	M Nb < 0.00050	O Si < 0.00340	M U < 0.00200
M Ce < 0.00500	M In < 0.00999	n Os	M Ag < 0.00200	O V < 0.00090
M Cs < 0.00030	M Ir < 0.00500	M Pd < 0.00500	S Na	M Yb < 0.00100
M Cr < 0.00500	O Fe < 0.00110	O P < 0.04000	M Sr < 0.00050	M Y < 0.03997
M Co < 0.00300	M La < 0.00050	M Pt < 0.00200	O S < 0.07200	O Zn 0.00250
O Cu < 0.00140	M Pb < 0.00300	O K 0.04000	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.98977; +1; (6); $Na^+_{(aq)}$ largely ionic in nature (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at stdconcs.)
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

010362

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

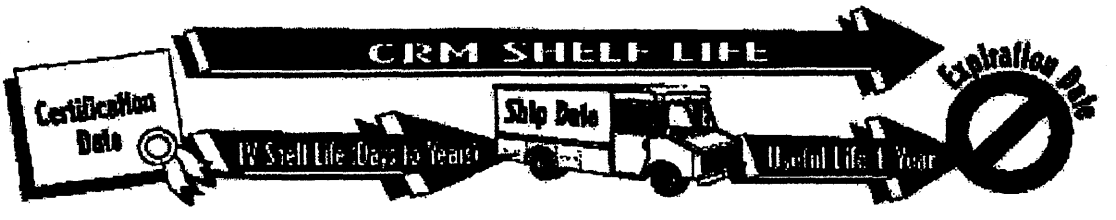
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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 27, 2003

Expiration Date: EXPIRES 1 Oct 2005

INORGANIC LABS/RADCHEM LABS pg. 2 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VOS
DATE OPENED: 07/29/04
INORG: 4657 PO: E53417

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010363

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant
Certificate Approved By:	Katalin Le, QC Supervisor
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director

010364

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Palladium in 3.3% (abs) HCl**

Catalog Number:	CGPD1-1, CGPD1-2, and CGPD1-5
Lot Number:	**X-PD02027**
Starting Material:	Pd(NO3)2
Starting Material Purity (%):	99.999248
Starting Material Lot No	11974A-00
Matrix:	3.3% (abs) HCl

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05 DR
DATE EXPIRED: 3/1/2006 DR
DATE OPENED: 2/28/05
INORG: 5045 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 1 µg/mL

Certified Density: 1.022 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1004 ± 1 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3138 Lot Number: 990207

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

5045
1 of 4

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00400	M	Dy	< 0.00060	O	Li	< 0.04000	M	Pr	< 0.00003	O	Te	< 0.01300
O	Sb	< 0.00500	M	Er	< 0.00050	M	Lu	< 0.00004	M	Re	< 0.00010	M	Tb	< 0.00003
O	As	< 0.01400	M	Eu	< 0.00030	O	Mg	< 0.01100	O	Rh	< 0.00600	M	Tl	< 0.00010
M	Ba	< 0.00100	M	Gd	< 0.00010	O	Mn	< 0.00650	M	Rb	< 0.00010	M	Th	< 0.00010
O	Be	< 0.00009	M	Ga	< 0.00010	O	Hg	< 0.01100	O	Ru	< 0.00200	M	Tm	< 0.00004
M	Bi	< 0.00004	M	Ge	< 0.00060	M	Mo	< 0.00020	M	Sm	< 0.00010	O	Sn	< 0.00700
O	B	< 0.00090	O	Au	< 0.00300	M	Nd	< 0.00020	O	Sc	< 0.00009	O	Ti	< 0.00100
O	Cd	< 0.00600	M	Hf	< 0.00020	O	Ni	0.01800	M	Se	< 0.00080	M	W	< 0.00100
O	Ca	0.00700	M	Ho	< 0.00005	M	Nb	< 0.00005	O	Si	0.00600	M	U	< 0.00020
M	Ce	< 0.00050	O	In	< 0.03300	n	Os		O	Ag	< 0.00670	M	V	< 0.00020
M	Cs	< 0.00003	M	Ir	< 0.00050	s	Pd		O	Na	0.01500	M	Yb	< 0.00010
O	Cr	0.00450	O	Fe	0.04600	O	P	0.00600	M	Sr	< 0.00005	M	Y	< 0.00400
M	Co	< 0.00030	M	La	< 0.00005	O	Pt	< 0.00600	O	S	< 0.02500	O	Zn	< 0.00060
O	Cu	0.00360	M	Pb	< 0.00030	O	K	< 0.02000	M	Ta	< 0.00070	M	Zr	< 0.00050

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 106.42; +2; 6; $Pd(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media. Avoid contact with water soluble organics such as aldehydes since Pd^{2+} is easily reduced.
Stability - 2-100 ppb levels. 2ppb Pd is stable for 1 day in 1% HNO_3 /LDPE container. 10 ppb is stable for 3 days in 1% HNO_3 / LDPE container. 100 ppb is stable for ≥ 5 months in 1% HNO_3 /LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Pd Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3 or Aqua Regia); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	340.458 nm	0.04 / 0.003 µg/mL	1	atom	Ce, Th, Zr
ICP-OES	363.470 nm	0.05 / 0.007 µg/mL	1	atom	
ICP-OES	229.651 nm	0.07 / 0.004 µg/mL	1	ion	Co
ICP-MS	105 amu	2 ppt	n/a	M+	$^{40}Ar^{65}Cu$, $^{89}Y^{16}O$

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

010366

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 13, 2004

Expiration Date: EXPIRES 1 MAR 2006

5045

3 of 4

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010367

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

5045
4 of 4

010368

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Sulfur in H_2O**

Catalog Number:	CGS1-1, CGS1-2, and CGS1-5
Lot Number:	**X-S01069**
Starting Material:	H2SO4
Starting Material Purity (%):	99.999965
Starting Material Lot No	N38818
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 12/9/04
DATE EXPIRED: 01/01/2006 KE
DATE OPENED: 12/9/04
INORG: 4917 PO: F55102 WS 12/15/04

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1007 ± 7 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum s$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1012 ± 2 µg/mL**
Acidimetric NIST SRM 84k Lot Number: 84k

Assay Method #2 **1007 ± 7 µg/mL**
ICP Assay NIST SRM 3154 Lot Number: 892205

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00025	M	Dy	< 0.01197	O	Li	< 0.00016	M	Pr	< 0.00060	M	Te	< 0.05984
M	Sb	< 0.00100	M	Er	< 0.00997	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.01995	M	Eu	< 0.00598	O	Mg	< 0.00004	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.01995	M	Gd	< 0.00200	M	Mn	< 0.00798	M	Rb	< 0.00200	M	Th	< 0.00200
O	Be	< 0.00200	M	Ga	< 0.00200	O	Hg	< 0.01100	M	Ru	< 0.00399	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01197	M	Mo	< 0.00399	M	Sm	< 0.00200	M	Sn	< 0.00997
O	B	< 0.00990	M	Au	< 0.00598	M	Nd	< 0.00399	M	Sc	< 0.01995	M	Ti	< 0.09974
M	Cd	< 0.00598	M	Hf	< 0.00399	O	Ni	< 0.00230	O	Se	< 0.00620	M	W	< 0.01995
O	Ca	0.00020	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	< 0.00410	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01995	n	Os		M	Ag	< 0.00399	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	< 0.00010	M	Yb	< 0.00200
M	Cr	< 0.00997	O	Fe	0.00015	O	P	< 0.00480	M	Sr	< 0.00100	M	Y	< 0.07979
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	s	S		O	Zn	0.00125
M	Cu	< 0.01197	M	Pb	< 0.00598	O	K	< 0.00170	M	Ta	< 0.01396	M	Zr	< 0.00997

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

010370

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)$_2$

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4 and HF aqueous matrices water and NH_4OH . Stable with all metals and inorganic anions at low to moderate ppm levels under acidic conditions except Ba and Pb and to a lesser extent Sr, and Ca.

Stability - 2-100 ppb levels - stability unknown- in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in LDPE container.

S Containing Samples (Preparation and Solution) - We most often get questions about the determination of S in Rocks, Silicates and insoluble sulfates (the finely powered sample is fused in a Pt* crucible with ± 6 times its weight of Na_2CO_3 + 0.5 grams KNO_3. The fuseate is extracted with water. Any $BaSO_4$ present in the sample is transposed by the carbonate fusion to the $BaCO_3$ which is left behind in the water-insoluble residue. If $PbSO_4$ is present the fuseate should be boiled with a sodium carbonate saturated with CO_2 solution for 1 hour or more where the $PbSO_4$ will be transposed to the water insoluble carbonate which can be filtered off. Boiling the fuseate with a saturated carbonate solution is good insurance for samples containing Ba, Sr, and Ca. The Ba, Pb, Sr, Ca, free filtrate can be acidified and measured by ICP.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 12/9/2004
DATE EXPIRED: 01/01/2006 WOS for ICE
DATE OPENED: 12/9/04
INORG: 4917 PO: F55102

010371

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 30, 2004

Expiration Date: EXPIRES 01 JAN 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010372

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Thorium in 3% (abs) HNO_3**

Catalog Number:	CGTH1-1, CGTH1-2, and CGTH1-5
Lot Number:	**X-TH01064**
Starting Material:	Th(NO3)4x4H2O
Starting Material Purity (%):	99.998809
Starting Material Lot No	X-25828-7
Matrix:	3% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 11/03/04
DATE EXPIRED: 10/01/2005 VOS
DATE OPENED: 11/02/04
INORG: 4844 PO: F54766

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 998 ± 3 µg/mL

Certified Density: 1.022 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 3 µg/mL**
ICP Assay NIST SRM 3159 Lot Number: 992912

Assay Method #2 **999 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Al < 0.00998	M Dy < 0.00599	O Li < 0.05000	M Pr < 0.00030	M Te < 0.02995
M Sb < 0.00050	M Er < 0.00499	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.00998	M Eu < 0.00300	O Mg < 0.02000	M Rh < 0.00100	M Tl < 0.00100
M Ba < 0.00998	M Gd < 0.00100	M Mn 0.00049	M Rb < 0.00100	s Th
M Be < 0.00050	M Ga < 0.00100	i Hg	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00599	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00499
M B < 0.06987	M Au < 0.00300	M Nd 0.00044	M Sc < 0.00998	M Tl < 0.04991
M Cd < 0.00300	M Hf < 0.00200	M Ni < 0.00799	M Se < 0.00799	M W < 0.00998
O Ca < 0.10000	M Ho < 0.00050	M Nb < 0.00050	i Si	M U 0.00406
M Ce 0.00267	M In < 0.00998	n Os	M Ag < 0.00200	M V < 0.00200
M Cs < 0.00030	M Ir < 0.00499	M Pd < 0.00499	O Na < 0.05000	M Yb < 0.00100
M Cr < 0.00499	O Fe < 0.05000	i P	M Sr < 0.00050	M Y < 0.03993
M Co < 0.00300	M La 0.00076	M Pt < 0.00200	i S	M Zn 0.00425
M Cu < 0.00599	M Pb < 0.00300	O K < 0.03000	M Ta < 0.00699	M Zr 0.01978

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 232.0381; +4; 8; $Th(OH)^{+3}$ and $Th(OH)_2^{+2}$

Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_3PO_4, H_2SO_4 and HF although solubilities may not be a problem depending upon pH and matrix (For example: ThF_4 is soluble in acids). Avoid neutral to basic media. Th^{+4} is stable with most metals and inorganic anions forming an insoluble carbonate, oxide, fluoride, oxalate, sulfate and phosphate in neutral to slightly acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Th Containing Samples (Preparation and Solution) - Metal (Soluble in Aqua Regia); Oxide (The heated oxide is not soluble in acids except hot conc. H_2SO_4); Ores (Na_2O_2 fusion at 480 ± 20°C for 7 minutes, cool and treat sintered mass with 50 mL cold water and stand until disintegrated. The mass is transferred to a beaker and acidified with HCl with 25 mL excess HCl added. Any residue is collected on a Whatman No. 42 filter, dried and ignited to 1000 °C in Pt* crucible and the ash treated with H_2SO_4 / HF and fumed. If residue remains, then treat it by peroxide fusion as above.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	283.730 nm	0.07 / 0.007 µg/mL	1	ion	U, Zr
ICP-OES	283.231 nm	0.07 / 0.007 µg/mL	1	ion	U, Mo, Ti, Fe, Cr
ICP-OES	274.716 nm	0.08 / 0.008 µg/mL	1	ion	Ti, Ta, Fe, V
ICP-MS	232 amu	1 ppt		n/a	M+

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 11/02/04
DATE EXPIRED: 12/01/2005 VOS
DATE OPENED: 11/02/04
INORG: 4844 PO: F54766

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: June 24, 2004

Expiration Date:

EXPIRES
1 2 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010376

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Uranium in 1% (abs) HNO_3**

Catalog Number:	CGU1-1, CGU1-2, and CGU1-5
Lot Number:	**X-U01061**
Starting Material:	$UO_2(NO_3)_2.6H_2O$
Starting Material Purity (%):	99.994419
Starting Material Lot No	RB0018
Matrix:	1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/14/04 DR
DATE EXPIRED: 11/1/2005
DATE OPENED: 10/15/04
INORG: 4828 PO: FS4761

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 997 ± 2 µg/mL

Certified Density: 1.007 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
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **997 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3164 Lot Number: 891509

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Al	0.05166	M	Dy	< 0.01494	M	Li	< 0.02490	M	Pr	< 0.00075	M	Te	< 0.07470
M	Sb	< 0.00125	M	Er	< 0.01245	M	Lu	< 0.00100	M	Re	< 0.00249	M	Tb	0.00003
M	As	< 0.02490	M	Eu	< 0.00747	M	Mg	< 0.07470	M	Rh	< 0.00249	M	Tl	< 0.00249
M	Ba	< 0.02490	M	Gd	0.00310	M	Mn	0.00083	M	Rb	< 0.00249	M	Th	< 0.00249
M	Be	< 0.00125	M	Ga	< 0.00249	i	Hg		M	Ru	< 0.00498	M	Tm	< 0.00100
M	Bi	< 0.00100	M	Ge	< 0.01494	M	Mo	0.00093	M	Sm	0.00010	O	Sn	< 0.10000
M	B	< 0.17429	M	Au	< 0.00747	M	Nd	< 0.00498	M	Sc	< 0.02490	M	Ti	0.00258
M	Cd	0.00103	M	Hf	< 0.00498	M	Ni	< 0.01992	M	Se	< 0.01992	M	W	< 0.02490
O	Ca	0.05395	M	Ho	0.00052	M	Nb	< 0.00125	i	Si		s	U	
M	Ce	0.00010	M	In	< 0.02490	n	Os		M	Ag	< 0.00498	M	V	< 0.00498
M	Cs	< 0.00075	M	Ir	< 0.01245	M	Pd	< 0.01245	O	Na	0.00664	M	Yb	< 0.00249
M	Cr	< 0.01245	M	Fe	< 0.49798	i	P		M	Sr	< 0.00125	M	Y	0.00062
M	Co	< 0.00747	M	La	0.00145	M	Pt	< 0.00498	i	S		M	Zn	0.00114
M	Cu	0.00072	M	Pb	0.00217	i	K		M	Ta	< 0.01743	M	Zr	< 0.01245

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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 - 238.0289; +6; 8; UO_2^{2+}(uranyl)

Chemical Compatibility - Soluble in HCl and HNO_3. Avoid H_3PO_4. H_2SO_4 and HF matrices should not be a problem depending upon [U]. Although the UO_2^{2+} ion is distinctly basic, any U^{4+} will precipitate in basic media. UO_2^{2+} salts are generally soluble in water and UO_2^{2+} is stable with most metals and inorganic anions. The uranyl phosphate is insoluble in water. UF_4 and UF_6 are water soluble.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

U Containing Samples (Preperation and Solution) - Metal (Dissolves rapidly in HCl and HNO_3); Oxide (Soluble in HNO_3); Ores (Digest for 1-2 hours with 1 gram of ore to 30 mL 1:1 HNO_3. Silica insolubles are removed by filtration after bringing the sample to fumes with conc. H_2SO_4.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at * concs.)
ICP-OES	385.958 nm	0.3 / 0.01 µg/mL	1	ion	Th, Fe
ICP-OES	367.007 nm	0.3 / 0.02 µg/mL	1	ion	Th, Ce
ICP-OES	263.553 nm	0.3 / 0.01 µg/mL	1	ion	Ce, Ir, Th, Rh, W, Zr, Ta, Ti, V, Hf, Fe, Re, Ru
ICP-MS	238 amu	2 ppt	n/a	M+	$^{206}Pb^{16}O_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 15, 2004

Expiration Date: EXPIRES 1-2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010380

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Tungsten in 1% (abs) HNO_3/1% (abs) HF**

Catalog Number:	CGW1-1 and CGW1-5
Lot Number:	**W-W01082**
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

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1001 ± 3 µg/mL

Certified Density: 1.007 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 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3163 Lot Number: 990209

Assay Method #2 **1001 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VOID
DATE OPENED: 07/29/04
INORG: 4660 PO: E53417

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.01792	M	Dy	< 0.00595	O	Li	< 0.00008	M	Pr	< 0.00030	M	Te	< 0.02974
M	Sb	< 0.00050	M	Er	< 0.00496	M	Lu	< 0.00040	i	Re		M	Tb	< 0.00030
M	As	< 0.00991	M	Eu	< 0.00297	O	Mg	0.00120	M	Rh	< 0.00099	M	Tl	< 0.00099
M	Ba	< 0.00991	M	Gd	< 0.00099	M	Mn	< 0.00397	M	Rb	< 0.00099	M	Th	< 0.00099
M	Be	< 0.00050	M	Ga	< 0.00099	O	Hg	< 0.04778	M	Ru	< 0.00198	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00595	M	Mo	0.00050	M	Sm	< 0.00099	M	Sn	< 0.00496
O	B	< 1.19460	M	Au	< 0.00297	M	Nd	< 0.00198	O	Sc	< 0.00036	M	Ti	0.00198
M	Cd	< 0.00297	M	Hf	< 0.00198	M	Ni	< 0.00793	M	Se	< 0.00793	S	W	
O	Ca	0.00080	M	Ho	< 0.00050	O	Nb	< 0.06371	O	Si	< 0.01354	M	U	< 0.00198
M	Ce	< 0.00496	M	In	< 0.00991	n	Os		M	Ag	< 0.00198	M	V	< 0.00198
M	Cs	< 0.00030	M	Ir	< 0.00496	M	Pd	< 0.00496	O	Na	0.04778	M	Yb	< 0.00099
M	Cr	< 0.00496	O	Fe	< 0.03982	n	P		M	Sr	< 0.00050	M	Y	< 0.03965
M	Co	< 0.00297	M	La	< 0.00050	M	Pt	< 0.00198	n	S		M	Zn	< 0.01983
M	Cu	< 0.00595	M	Pb	0.00060	O	K	0.03146	O	Ta	< 0.39820	M	Zr	0.00079

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 183.85; +6; 6,7,8,9; WOF_4^{-2} (chemical form as received)

Chemical Compatibility - W is very readily hydrolyzed requiring 0.1 to 1% HF solutions for stable acidic solutions. The WOF_4^{-2} is soluble in % levels of HCl and HNO_3 provided it is in the WOF_4^{-2} form. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths. Is best to be mixed only with other fluorinated metals (Ti, Zr, Hf, Nb, Ta, Mo, Si, Sn, Ge). Look for yellow WO_3 precipitate if mixed with other transition elements at higher levels indicating instability. The yellow WO_3 will form over a period of weeks even in trace HF, therefore, HF levels of W multi- element blends should be ~ 1 %.

Stability - 2-100 ppb levels stable (Alone or mixed with all other metals that are at comparable levels) as the WOF_4^{-2} for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the WOF_4^{-2} chemically stable for years in 1% HF in an LDPE container.

W Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3); Oxide (Soluble in HF or NH_4OH) ; Organic Matrices (Dry ash at 450 °C in Pt* and dissolve oxide with HF).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ppm conc.)
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
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VOS
DATE OPENED: 07/29/04
INORG: 4660 PO: E53417

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010383

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 18, 2003

Expiration Date:

EXPIRES
12 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010384

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Yttrium in 1.4% (abs) HNO_3**

Catalog Number:	CGY1-1, CGY1-2, and CGY1-5
Lot Number:	**Y-QY01107**
Starting Material:	Y_2O_3
Starting Material Purity (%):	99.999896
Starting Material Lot No	9918901OYL
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/31/05
DATE EXPIRED: 3/1/2006 DR
DATE OPENED: 1/31/05
INORG: 5000 PO: F55139

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 the wet assay value. The following equations are used in the calculations of the certified value and the uncertainty:

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

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

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

$\sum s_i$ = 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** **996 ± 2 µg/mL**
ICP Assay NIST SRM 3167a Lot Number: 790412

Assay Method #2 **998 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

5000

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy 0.00030	O Li < 0.00002	M Pr < 0.00030	M Te < 0.02985
M Sb < 0.00050	M Er < 0.00498	M Lu < 0.00040	M Re < 0.00100	M Tb 0.00099
M As < 0.00995	M Eu 0.00027	O Mg 0.00001	M Rh < 0.00100	M Tl < 0.00100
M Ba < 0.00995	M Gd < 0.00100	O Mn < 0.00002	M Rb < 0.00100	M Th < 0.00100
M Be < 0.00050	M Ga < 0.00100	O Hg < 0.02000	M Ru < 0.00199	M Tm 0.00007
M Bi < 0.00040	M Ge < 0.00597	M Mo < 0.00199	M Sm 0.00014	M Sn < 0.00498
O B < 0.00100	M Au < 0.00299	M Nd 0.00008	O Sc < 0.00003	M Ti < 0.04976
M Cd < 0.00299	M Hf < 0.00199	M Ni < 0.00796	M Se < 0.00796	M W < 0.00995
O Ca 0.00026	M Ho 0.00006	M Nb < 0.00050	O Si 0.00016	M U < 0.00199
M Ce 0.00010	M In < 0.00995	n Os	O Ag < 0.02000	O V < 0.00080
M Cs < 0.00030	M Ir < 0.00498	O Pd < 0.10000	O Na < 0.05000	M Yb 0.00028
M Cr < 0.00498	O Fe 0.00079	O P < 0.07000	O Sr < 0.00004	s Y
M Co < 0.00299	M La 0.00025	M Pt < 0.00199	O S < 0.04300	O Zn < 0.00040
M Cu < 0.00597	M Pb < 0.00299	O K < 0.10000	M Ta < 0.00697	O Zr < 0.00070

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 88.9059; +3; 6; $Y(OH)(H_2O)_x^{+2}$
Chemical Compatibility - Soluble in HCl, H_2SO_4 and HNO_3. Avoid HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride.
Stability - 2-100 ppb levels stable for months in 1% HNO_3/ LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3/ LDPE container.
Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H_2O/ HNO_3); Ores (Carbonate fusion in Pt[D] followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H_2O / HCl or HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES	360.073 nm	0.005 / 0.000036 µg/mL	1	Ion	Ce, Th
ICP-OES	371.030 nm	0.004 / 0.00007 µg/mL	1	Ion	Ce
ICP-OES	377.433 nm	0.005 / 0.0009 µg/mL	1	Ion	Ta, Th
ICP-MS	89 amu	0.8 ppt	n/a	M[+]	$^{73}Ge^{16}O$, $^{178}Hf^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 19, 2005

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, Production Manager	Debbie Newman
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

4 of 4
5000

010388

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Zirconium in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGZR1-1 and CGZR1-5
Lot Number:	**W-ZR01056**
Starting Material:	ZrO2
Starting Material Purity (%):	99.994542
Starting Material Lot No	22855
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 01/23/04
DATE EXPIRED: 08/01/2005 V03
DATE OPENED: 01/23/04
INORG: 4442 PO: F52306

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1004 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3169 Lot Number: 990109

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al 0.01416	M Dy < 0.01188	O Li < 0.00012	M Pr < 0.00059	M Te < 0.05942
M Sb < 0.00099	M Er < 0.00990	M Lu < 0.00079	M Re < 0.00198	M Tb < 0.00059
M As < 0.01981	M Eu < 0.00594	O Mg < 0.00012	M Rh < 0.00198	M Ti < 0.00198
M Ba < 0.01981	M Gd < 0.00198	O Mn < 0.00401	M Rb < 0.00198	M Th < 0.00198
O Be < 0.40048	M Ga < 0.00198	O Hg < 0.04405	M Ru < 0.00396	M Tm < 0.00079
M Bi < 0.00079	M Ge < 0.01188	O Mo < 0.40048	M Sm < 0.00198	M Sn < 0.00990
M B < 0.13864	M Au < 0.00594	M Nd < 0.00396	O Sc < 0.00064	O Ti < 0.16019
O Cd < 0.02123	M Hf 0.04403	O Ni 0.01214	M Se < 0.01585	M W < 0.01981
O Ca 0.00809	M Ho < 0.00099	O Nb < 0.08010	O Si < 0.80096	M U < 0.00396
M Ce < 0.00990	M In < 0.01981	n Os	O Ag < 0.40048	M V < 0.00396
M Cs < 0.00059	M Ir < 0.00990	M Pd < 0.00990	O Na < 0.02803	M Yb < 0.00198
O Cr < 0.00881	O Fe 0.00344	O P < 0.01922	M Sr < 0.00099	O Y < 0.00401
M Co < 0.00594	M La < 0.00099	M Pt < 0.00396	O S < 0.28033	O Zn < 0.04005
M Cu < 0.01188	M Pb < 0.00594	O K < 0.00681	M Ta < 0.01386	s Zr

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 91.224; +4; 6, 7, 8; $Zr(F)_x^{+4}$

Chemical Compatibility - Soluble in concentrated HCl, HF, H_2SO_4 (very hot) and HNO_3. Avoid H_3PO_4 and neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions but precipitation with phosphate, oxalate, and tartrate with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $Zr(F)_x^{+4}$ + $Zr(OH)_xF_y^{+z}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Zr(F)_x^{+4}$ chemically stable for years in 2-5% HNO_3 / trace HF in an LDPE container.

Zr Containing Samples (Preparation and Solution) - Metal (Soluble in H_2O / HF / HNO_3); Oxide - unlike TiO_2, the ZrO_2 is best fused in one of the following ways (Na_2O_2 in Ni*, Na_2CO_3 in Pt* or Borax in Pt*); Organic Matrices (Dry ash at 450 °C in Pt* and dissolve by fusing with Na_2CO_3 and dissolving in HF / HNO_3 / H_2O).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤5ppm conc.)
ICP-OES 343.823 nm	0.007 / 0.0004 µg/mL	1	ion	Hf, Nb
ICP-OES 339.198 nm	0.008 / 0.0007 µg/mL	1	ion	Th, Mo
ICP-OES 272.261 nm	0.018 / 0.001 µg/mL	1	ion	Cr, V, Th, W
ICP-MS 90 amu	2 ppt	n/a	M+	$^{74}Ge^{16}O$, $^{74}Se^{16}O$, [$^{180}X^{+2}$ (where X = Hf, Ta, W)]

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/23/04
DATE EXPIRED: 08/01/2005 VDS
DATE OPENED: 01/23/04
INORG: 4442 PO: E52306

010391

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 19, 2003

Expiration Date: EXPIRES 01/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010392

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050426-3
SRR: 27509
SDG: 262217
CASE: CNWRA
VTSR: April 25, 2005
PROJECT#: 06002.01.242

Pipette Calibrations

Book/Page 04 015

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log 010393

Balance #: 12 Thermometer #: G011 diH20 Temperature (°C): 23

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
Lab30	1000	1.0085	1.0081	1.0088
TMA1	1000	1.0049	1.0038	1.0004
TMA2	1000	1.0078	1.0054	1.0028
TMA3	1000	Not	Found	—
TMA6	1000	1.0076	1.0059	1.0040
TMB1	900	0.9084	0.9025	0.9001
TMC1	800	0.8049	0.7961	0.8030 KE 4-15-05
TMDD1	750	0.7516	0.7494 0.6955	0.7470
TMD1	700	0.6952 ~~0.7024~~ KE 4-15-05	~~0.7043~~ 0.7043	~~0.7024~~ 0.6967
TMD2	700	0.7024	0.7043	0.7024
TME1	600	0.5956	0.5967	0.5941
TMF2	500	0.4979	0.4982	0.4984
TMF5	500	0.5034	0.5003 KE 4-15-05	~~0.4~~ 0.5016
ICF1	500	KE 4-15-05 ~~0.5~~ 0.4985	0.4974	0.4938
L30-500	500	0.5011	0.5016	0.5016
TMG3	400	0.3933	0.3935	0.3921
TMH1	300	out	of	service
TMH2	300	0.2976	0.2965	0.2965
TMJ1	250	0.2476	0.2477	0.2478
TMJ2	250	0.2486	0.2483	0.2477
TMJ3	250	0.2489	0.2499	0.2497
TMK2	200	0.2000	0.2000	0.1998
TML1	150	0.1482	0.1480	0.1483
TMM1	120	0.1201	0.1196	0.1191
TMN3	100	out	of	service
ICN1	100	0.0996	0.0999	0.0996
TMQ1	80	0.0795	0.0799	0.0800
TMR1	70	out	of	Service
TMS1	60	out	of	Service
LAB-30A	50	Not	found	
TMU1	40	0.0402	0.0398	0.0400
TMU2	40	0.0406	0.0400	0.0397
TMV1	30	0.0297	0.0294	0.0297
L30-20	20	0.0203	0.0201	0.0200
TMW1	25	0.0248	0.0247	0.0246
TMY1	15	Out	of	Service

Analyst: [signature] Date: 4-15-05

Reviewed by: John Wills Date: 4-15-05

Book/Page: 04 016

010394

SwRI – Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

(Space provide for Inorganic Laboratories' Fixed Volume Pipette Verification Spreadsheet)

4/15/05

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	1.0085	1.0081	1.0088	1.008	100.85
TMA1	1000	1.0049	1.0038	1.0004	1.003	100.30
TMA2	1000	1.0078	1.0054	1.0028	1.005	100.53
TMA3	1000	Out of Service				
TMA6	1000	1.0076	1.0059	1.0040	1.006	100.58
TMB1	900	0.9084	0.9025	0.9001	0.904	100.41
TMC1	800	0.8049	0.7961	0.8030	0.801	100.17
TMDD1	750	0.7516	0.7494	0.7470	0.749	99.91
TMD1	700	0.6952	0.6955	0.6967	0.696	99.40
TMD2	700	0.7024	0.7043	0.7024	0.703	100.43
TME1	600	0.5956	0.5967	0.5941	0.595	99.24
TMF2	500	0.4979	0.4982	0.4984	0.498	99.63
TMF5	500	0.5034	0.5003	0.5016	0.502	100.35
ICF1	500	0.4985	0.4974	0.4938	0.497	99.31
L30-500	500	0.5011	0.5016	0.5016	0.501	100.29
TMG3	400	0.3933	0.3935	0.3921	0.393	98.24
TMH1	300	Out of Service				
TMH2	300	0.2976	0.2965	0.2965	0.297	98.96
TMJ1	250	0.2476	0.2477	0.2478	0.248	99.08
TMJ2	250	0.2486	0.2483	0.2477	0.248	99.28
TMJ3	250	0.2489	0.2499	0.2497	0.250	99.80
TMK2	200	0.2000	0.2000	0.1998	0.200	99.97
TML1	150	0.1482	0.1480	0.1483	0.148	98.78
TMM1	120	0.1201	0.1196	0.1191	0.120	99.67
TMN3	100	out	of	service	0.000	0.00
ICN1	100	0.0996	0.0999	0.0996	0.100	99.70
TMQ1	80	0.0795	0.0799	0.0800	0.080	99.75
TMR1	70	Out of Service				
TMS1	60	Out of Service				
LAB-30A	50	not	found		0.000	0.00
TMU1	40	0.0402	0.0398	0.0400	0.040	100.00
TMU2	40	0.0406	0.0400	0.0397	0.040	100.25
TMV1	30	0.0297	0.0294	0.0297	0.030	98.67
L30-20	20	0.0203	0.0201	0.0200	0.020	100.67
TMW1	25	0.0248	0.0247	0.0246	0.025	98.80
TMY1	15	Out	of	service		

FRM-246 (Rev 1/Mar 03)

Book/page: 08 009

010395

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

Jason A. Naegeli 05/26/05

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					
ADJ200-A	100					
	200					
	20					
ADJ200-C	100					
	200					
	20					
ADJ200-D	100					
	200					
	20	0.0200	0.0198	0.0198	0.020	99.33
ADJ200-G	100	0.0998	0.0991	0.0983	0.099	99.07
	200	0.2012	0.2002	0.1977	0.200	99.85
	20	0.0204	0.0204	0.0202	0.020	101.67
ADJ200-H	100	0.0993	0.0993	0.0997	0.099	99.43
	200	0.1995	0.2000	0.1998	0.200	99.88
	20	0.0196	0.0200	0.0198	0.020	99.00
ADJ200-J	100	0.0994	0.0992	0.0996	0.099	99.40
	200	0.2011	0.2004	0.2003	0.201	100.30
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200-K	100					
	200					

FRM-247a (Rev 3/Oct 03)

FRM-244 (Rev 2/Sept 02)

Book/page: 08 010

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010396

Balance #: 16 Thermometer #: GDU diH20 Temperature (° C) 22.0

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20	WAA 05/02/05		
ADJ200-A	100			
	200			
	20			
ADJ200-C	100			
	200			
	20			
ADJ200-D	100			
	200			
	20	0.0200	0.0198	0.0198
ADJ200-G	100	0.0988	0.0991	0.0983
	200	0.2012	0.2002	0.1977
	20	0.0204	0.0204	0.0202
ADJ200-H	100	0.0993	0.0993	0.0997
	200	0.1995	0.2000	0.1998
	20	0.0196	0.0200	0.0198
ADJ200-J	100	0.0994	0.0992	0.0996
	200	0.2011	0.2004	0.2003
	20			
ADJ200-K	100			
	200			
	20	WAA 05/02/05		
ADJ200	100			
	200			

Analyst: Noora A. Naeeli Date: 05/02/05

Reviewed by: Valerie Ogden Date: 05/26/05

Book/page: 08 011

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

5-18-05

010397

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	0.0199	0.0200	0.0198	0.020	99.50
ADJ200-A	100	0.0998	0.1001	0.1002	0.100	100.03
	200	0.1996	0.1997	0.1997	0.200	99.83
	20					
ADJ200-C	100	OUT	OF	SERVICE		
	200					
	20					
ADJ200-D	100	OUT	OF	SERVICE		
	200					
	20	0.0200	0.0202	0.0202	0.020	100.67
ADJ200-G	100	0.0988	0.0992	0.0990	0.099	99.00
	200	0.1986	0.1990	0.1995	0.199	99.52
	20					
ADJ200-H	100					
	200					
	20					
ADJ200-J	100					
	200					
	20					
ADJ200-K	100	GLOVEBOX-	NOT IN	USE		
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					

Book/page: 08 012

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010398

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	.0199	.0200	.0198
ADJ200-A	100	.0998	.1001	.1002
	200	.1996	.1997	.1997
	20			
ADJ200-C	100	OUT	OF	SERVICE
	200			
	20	.0200	.0202	.0202
ADJ200-D	100	.0988	.0992	.0990
	200	.1986	.1990	.1995
	20			
ADJ200-G	100			
	200			
	20			
ADJ200-H	100			
	200			
	20			
ADJ200-J	100			
	200			
	20			
ADJ200-K	100	GLOVEBOX NOT IN USE		
	200			
	20			
ADJ200	100			
	200			

JW 5-18-05

JW 5-18-05

Analyst: John Wills Date: 5-18-05

Reviewed by: [signature] Date: 05/26/05

Book/page: 08 069

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010399

Warren A. Naegeli 05/26/05

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	0.1017	0.1018	0.1017	0.102	101.73
ADJ1000-G	500	0.4934	0.4945	0.4960	0.495	98.93
	1000	0.9919	0.9960	0.9992	0.996	99.57
	100	0.1010	0.1013	0.1017	0.101	101.33
ADJ1000-H	500	0.4954	0.4990	0.4978	0.497	99.48
	1000	0.9969	0.9992	1.0071	1.001	100.11
	100	0.0995	0.0993	0.0996	0.099	99.47
ADJ1000-J	500	0.4961	0.4966	0.4967	0.496	99.29
	1000	1.0018	0.9998	0.9978	1.000	99.98
	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: 08 070

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010400

Balance #: 16 Thermometer #: G011 diH20 Temperature (° C) 22.0

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	0.1017	0.1018	0.1017
ADJ1000-G	500	0.4934	0.4945	0.4960
	1000	0.9919	0.9960	0.9992
	100	0.1010	0.1013	0.1017
ADJ1000-H	500	0.4954	0.4990	0.4978
	1000	0.9969	0.9992	1.0071
	100	0.0995	0.0993	0.0996
ADJ1000-J	500	0.4961	0.4966	0.4967
	1000	1.0018	0.9998	0.9978
	100			
ADJ1000-K	500			
	1000			
	100			
ADJ1000	500			
	1000			

WAN 05/02/05

WAN 05/02/05

Analyst: Wanda A. Naegeli Date: 05/02/05

Reviewed by: [signature] Date: 05/26/05

Book/page: 08 071

010401

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

5-26-05

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	0.1011	0.1016	0.1014	0.101	101.37
ADJ1000-C	500	0.4931	0.4919	0.4954	0.493	98.69
	1000	0.9945	0.9924	0.9916	0.993	99.28
	100	0.1018	0.1015	0.1019	0.102	101.73
ADJ1000-D	500	0.4960	0.5085	0.5028	0.502	100.49
	1000	1.0009	0.9998	0.9940	0.998	99.82
	100	0.1006	0.1001	0.1002	0.100	100.30
ADJ1000-E	500	0.5002	0.5001	0.4999	0.500	100.01
	1000	1.0012	0.9999	0.9999	1.000	100.03
	100	0.1014	0.1015	0.1012	0.101	101.37
ADJ1000-F	500	0.4959	0.4956	0.4962	0.496	99.18
	1000	0.9950	1.0040	0.9941	0.998	99.77
	100					
ADJ1000-G	500					
	1000					
	100					
ADJ1000-H	500					
	1000					
	100					
ADJ1000-J	500					
	1000					
	100					
ADJ1000-K	500	GLOVEBOX-	NOT IN	USE		
	1000					
	100					
ADJ1000	500					
	1000					

FRM-247b (Rev 3/Apr 04)

Book/page: 08 072

010402

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	.1011	.1016	.1014
ADJ1000-C	500	.4931	.4919	.4954
	1000	.9945	.9924	.9916
	100	.1018	.1015	.1019
ADJ1000-D	500	.4960	.5045	.5028
	1000	1.0009	.9998	.9940
	100	.1006	.1001	.1002
ADJ1000-E	500	.5002	.5001	.4999
	1000	1.0012	.9999	.9999
	100	.1014	.1015	.1012
ADJ1000-F	500	.4959	.4956	.4962
	1000	.9950	1.0040	.9941
	100			
ADJ1000-G	500			
	1000			
	100			
ADJ1000-H	500			
	1000			
	100			
ADJ1000-J	500			
	1000			
	100			
ADJ1000-K	500	Glovebox – not in use		
	1000			
	100			
ADJ1000	500			
	1000			

5/18/05

5/18/05

Analyst: John Wilks Date: 5-18-05

Reviewed by: Walt Alger Date: 05/27/05

Book/page: 08 129

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010403

Warren A. Naegeli 05/26/05

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	0.5070	0.5055	0.5046	0.506	101.14
ADJ5000-J	2500	2.5064	2.5057	2.5038	2.505	100.21
	5000	5.0696	5.0245	5.0218	5.039	100.77
	500	0.5084	0.5098	0.5071	0.508	101.69
ADJ5000-K	2500	2.4846	2.4861	2.4895	2.487	99.47
	5000	5.0117	4.9884	4.9769	4.992	99.85
	500	0.5028	0.5053	0.5021	0.503	100.68
ADJ5000-L	2500	2.4953	2.4958	2.4917	2.494	99.77
	5000	5.0105	4.9925	4.9900	4.998	99.95
	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: 08 130

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010404

Balance #: 116 Thermometer #: 6011 diH20 Temperature (° C) 22.0

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	0.5070	0.5055	0.5046
ADJ5000-J	2500	2.5064	2.5057	2.5038
	5000	5.0696	5.0245	5.0218
	500	0.5084	0.5098	0.5071
ADJ5000-K	2500	2.4846	2.4861	2.4895
	5000	5.0117	4.9884	4.9769
	500	0.5028	0.5053	0.5021
ADJ5000-L	2500	2.4953	2.4958	2.4917
	5000	5.0105	4.9925	4.9900
	500			
ADJ5000-M	2500			
	5000			
	500			
ADJ5000-N	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

WAA 05/02/05

WAA 05/02/05

Analyst: Wayne A. Naegeli Date: 05/02/05

Reviewed by: Walter Agin Date: 05/26/05

Book/page: 08 131

010405

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

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	0.5068	0.5069	0.5089	0.508	101.51
ADJ5000-C	2500	2.4975	2.4968	2.4947	2.496	99.85
	5000	5.0011	5.0012	5.0063	5.003	100.06
	500					
ADJ5000-G	2500	OUT	OF	SERVICE		
	5000					
	500					
ADJ5000-H	2500	OUT	OF	SERVICE		
	5000					
	500	0.5022	0.5022	0.5030	0.502	100.49
ADJ5000-I	2500	2.4937	2.5089	2.4986	2.500	100.02
	5000	5.0089	5.0347	5.0038	5.016	100.32
	500					
ADJ5000-J	2500					
	5000					
	500					
ADJ5000-K	2500					
	5000					
	500					
ADJ5000-L	2500					
	5000					
	500					
ADJ5000-M	2500	GLOVEBOX-	NOT IN	USE		
	5000					
	500	0.5007	0.5041	0.5064	0.504	100.75
ADJ5000-N	2500	2.4780	2.4797	2.5042	2.487	99.49
	5000	5.0356	4.9964	4.9968	~~4.997~~	~~99.94~~
	500				5.0096	100.19
ADJ5000	2500				WD3	05/27/05
	5000					
	500					
ADJ5000	2500					
	5000					

FRM-247c (Rev 3/Apr 04)

Book/page: 08 132

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010406

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	.5068	.5069	.5089
ADJ5000-C	2500	2.4975	2.4968	2.4947
	5000	5.0011	5.0012	5.0063
	500			
ADJ5000-G	2500	Out	OF	Service
	5000			
	500			
ADJ5000-H	2500	Out	OF	Service
	5000			
	500	.5022	.5022	.5030
ADJ5000-I	2500	2.4937	2.5089	2.4986
	5000	5.0089	5.0347	5.0038
	500			
ADJ5000-J	2500			
	5000			
	500			
ADJ5000-K	2500		5-18-05	
	5000			
	500			
ADJ5000-L	2500			
	5000			
	500			
ADJ5000-M	2500	Glovebox	not in	use
	5000			
	500	.5007	.5041	.5064
ADJ5000-N	2500	2.4780	2.4797	2.5042
	5000	5.0356	4.9964	4.9968
	500			
ADJ5000	2500			
	5000			
	500		5-18-05	
ADJ5000	2500			
	5000			

Analyst: John Wills Date: 5-18-05

Reviewed by: [signature] Date: 05/27/05

010407

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050426-3
SRR: 27509
SDG: 262217
CASE: CNWRA
VTSR: April 25, 2005
PROJECT#: 06002.01.242

Balance Calibrations

010408

Southwest Research Institute
Division 01
BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
12	Bldg. 70 Lab 27	1122510787	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
5-9-05	2.0000	2.0000	KE	SN:99-J50526-15
5-10-05	2.0000	2.0000	KE	"
5-11-05	2.0000	2.0000	KE	"
5-12-05	2.0000	2.0000	KE	"
5-13-05	2.0000	2.0000	KE	"
5-16-05	2.0000	2.0000	KE	"
5-17-05	2.0000	2.0000	KE	"
5-18-05	2.0000	2.0000	JW	"
5-19-05	2.0000	2.0000	KE	"
5-20-05	2.0000	2.0000	KE	"

KE If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

Southwest Research Institute®
Division 01
BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
19	Bldg. 70 Lab 27	0068597	±0.05	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
5-17-05	10.00	10.00	KE	SN:99-J50624-5
5-18-05	10.00	10.00	JW	"
5-19-05	10.00	10.00	KE	"
5-20-05	10.00	10.00	KE	"
5-23-05	10.00	10.00	KE	"
5-24-05	10.00	10.00	KE	"
5-25-05	10.00	10.00	KE	

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
34	Bldg. 70 Lab 27	1116031935	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
5-10-05	2.0000	2.0000	KE	SN:99-J50526-15
5-11-05	2.0000	2.0000	KE	"
5-12-05	2.0000	2.0000	KE	"
5-13-05	2.0000	1.9999	KE	"
5-16-05	2.0000	2.0000	KE	"
5-17-05	2.0000	2.0000	KE	"
5-18-05	2.0000	2.0000	JW	"
5-19-05	2.0000	2.0000	KE	"
5-20-05	2.0000	2.0000	KE	"
5-23-05	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

010410

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050426-3
SRR: 27509
SDG: 262217
CASE: CNWRA
VTSR: April 25, 2005
PROJECT#: 06002.01.242

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

040005

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

010411

HIGH PURITY SYSTEM (HP)

DATE / TIME	INITIALS	RESISTIVITY MONITOR (M OHMS)	RESISTIVITY MONITOR QC LT.	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
4/30/04 5:50pm	DR	18.04	✓	✓	✓	1540.1	All OK
5/3/04 4:45pm	DR	18.05	✓	✓	✓	1552.6	All OK
5/4/04 5:20pm	DR	18.05	✓	✓	✓	1570.8	—
5/5/04 5:40pm	DR	18.05	✓	✓	✓	1585.3	—
5/6/04 6:35pm	DR	18.05	✓	✓	✓	1598.9	—
5/7/04 5:18pm	DR	18.06	✓	✓	✓	1626.8	—
5/10/04 6:26pm	DR	18.03	✓	✓	✓	1650.3	—
5/11/04 6:37pm	DR	18.04	✓	✓	✓	1666.8	—
5/12/04 5:04pm	DR	18.03	✓	✓	✓	1680.1	—
5/13/04 11:22pm	DR	18.04	✓	✓	✓	1706.6	—
5/14/04 6:20pm	DR	18.04	✓	X	✓	1732.1	Need P.O. / Call U.S. Filter
5/17/04 6:33pm	DR	18.05	✓	X	✓	1756.0	Need P.O.
5/18/04 6:25pm	DR	18.04	✓	X	✓	1782.0	Call P.O. and U.S. Filter
5/19/04 6:09pm	DR	18.03	✓	X	✓	1815.4	Waiting on U.S. Filter ✓
5/20/04 12:01pm	DR	18.04	✓	✓	✓	1829.3	Tank Xchange. Back online.
5/21/04 6:23pm	DR	18.03	✓	✓	✓	1867.0	—

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
4/30/04 5:52pm	DR	✓	✓	894.9	All OK.
5/3/04 4:46pm	DR	✓	✓	895.3	—
5/4/04 5:23pm	DR	✓	✓	895.8	—
5/5/04 5:40pm	DR	✓	✓	897.3	—
5/6/04 6:36pm	DR	✓	✓	897.4	—
5/7/04 5:19pm	DR	✓	✓	898.0	—
5/10/04 6:26pm	DR	✓	✓	898.1	—
5/11/04 6:37pm	DR	✓	✓	898.2	—
5/12/04 5:09pm	DR	✓	✓	898.3	—
5/13/04 11:20pm	DR	✓	✓	898.5	—
5/14/04 6:21pm	DR	✓	✓	898.8	—
5/17/04 6:34pm	DR	✓	✓	899.8	—
5/18/04 6:26pm	DR	✓ (16.0)	✓	902.1	—
5/19/04 6:11pm	DR	X (16.0)	✓	904.5	Waiting on U.S. Filter.
5/20/04 12:03pm	DR	✓ (15.0)	✓	908.1	Tank Xchange. Back online.
5/21/04 6:23pm	DR	✓ (14.5)	✓	909.5	—

Legend: Check = Green (OK); X = Red (call for service)

RSpor 5/6/04

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050426-3
SRR: 27509
SDG: 262217
CASE: CNWRA
VTSR: April 25, 2005
PROJECT#: 06002.01.242

010412

SURVEILLANCE REPORTS
From Division 30

010412-A

Institute Quality Assurance Surveillance Report

Project Number: 20.06002.01.031	Report Number: 2005-SR-0213	Page 1 of 1

Surveillance Scope: Monitor the Tests for Trace Metal Analysis by ICP and ICPMS testing. The client is SwRI® Division 20 and this is a QA Nuclear surveillance.

Reference Documents: Task Order 050325-1, **050426-3** and 050502-4.

Starting Date: 6/01/2005 **Ending Date:** 6/01/2005

Institute QA Representative: Mark R. Ehnstrom MRE

Person(s) Conducting Test/Exam/Procedure: Various Division 01 personnel

Satisfactory Findings: Test records were reviewed for ICP and ICPMS testing for major and minor elements for three task orders for Division 20. Test notes clearly indicated that 10 CFR 50, Appendix B and 10 CFR Part 21 were applicable to this testing. The sample Receipt and Laboratory Sample Identification numbers were noted. Documentation packages included information such as Laboratory Fixed and Adjustable Pipette Verification Log information; Balance Verification Logs; ICP Calibration Blank Solution Information; and Certificates of Analysis and of Reference Materials from the suppliers that provided materials during the test.

Unsatisfactory Findings: N/A

Nonconformance Report Number: N/A **CAR/SCAR Number:** N/A

Attachments: None

Recommendations/Actions: Direct reference to specific test methods or SwRI procedures could not be identified in two of the data packages. These two packages stated that the test method was, "Buy SwRI Method." It is recommended that the specific test methods be referenced in the instruction area of the Laboratory Task Order Form.

Equipment Calibration: Standards used for calibration were traceable to NIST.

Approved: _____
Institute Quality Assurance

Date: 06/06/2006

Distribution: Original – IQS Records
Cc: CC-J. Boyd (01)
R. Presas (01)
C. Hobson (30)